

# **RAMCORDER**

## **RCMB / OH1600**

### **OPERATION MANUAL V2.4**



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## **Introduction**

Thank you for purchasing your Ramcorder. These recent additions to the HD Electric product family are the first in a new line of faster and more powerful Windows™ driven data collection systems that are being introduced.

The RCMB is a meter base recorder for residential or commercial 240-volt, single-phase meter sockets. It was designed to be both powerful and simple-to-use. Easy-to-learn Windows™ software is used to program the unit and perform data analysis on collected data. The RCMB can store true RMS voltage and current data on a cycle-by-cycle basis. The unit measures down to zero volts, requires no batteries, and includes 2 MB of memory.

The OH1600 is a hot stick mountable, battery powered overhead line current and temperature recorder for application on lines up to 69kV phase-to-phase and 1600 amps. It uses the same powerful graphing and analysis software package as the RCMB. Data from multiple OH1600 units can be merged into one file and then a single graph can be printed to simplify phase balance analysis.

## **Additional Support**

This manual will answer most questions regarding the operation of the RCMB and OH1600. If additional help is needed please contact HD Electric Company at (847) 473-4980 and ask for Ramcorder Technical Support. Questions can also be sent to Support@hdelec.com.

The software is available for downloading at: [www.HDElectricCompany.com/Ramcorder](http://www.HDElectricCompany.com/Ramcorder)

## **Parts List**

Verify all of the following items were received with the Ramcorder:

- \* RCMB or OH1600 unit
- \* 12VDC power adapter
- \* DB-9 computer cable
- \* Software Installation CD
- \* Instruction Manual

## **Hardware Requirements**

The software requires a computer running Windows™ 95/98/2000 or NT and at least 20 MB of free hard disk space (40 MB of free space is recommended). Due to the large number of calculations required when creating graphs, computers with processor speeds of 166 MHz or faster are recommended. One RS-232 communications port on the computer must be available for connection to the unit. A color printer is recommended to produce printouts of graphs and data.

## **Application**

The RCMB is intended for residential troubleshooting and short or long term end-of-line monitoring. There are two meter base types available for installation in either ring or ring-less style meter sockets.

The OH1600 is intended to measure RMS current values on phase or neutral conductors, insulated or uninsulated, up to phase-to-phase voltages of 69kV. Conductor sizes can range from 0.25" to 1.0" nominal. Currents can range from 0 to 1600 amps.

## **Getting Started**

### **Software Installation**

Install the software per the instructions on the CD. The Ramcorder software will only run on computers using Windows™ 95/98/2000 or NT operating systems.

Once the installation is complete, the program can be started by clicking the Windows™ START button, then going to Programs/HD Electric/Ramcorder Utilities.

Once the program starts, the screen should display the title page as shown in Figure 1 (the version may be different than the one shown).



Figure 1

## Connecting the unit to a Computer

- 1) Connect the male end of the DB-9 cable to the RCMB/OH1600. Connect the female end to the RS-232 communication port on the computer.
- 2) Plug the 12VDC power supply end into a standard 120V wall outlet. Plug the connector end of the 12VDC power supply into the socket on the faceplate of the RCMB/OH1600 unit. The OH1600 can be used without the power supply if batteries are installed.
- 3) For the OH1600, **Pull** the toggle switch and move it from the 'Off' to the 'Communicate' position.
- 4) The 'Power Indicator' light (RCMB) or 'Operation Indicator' light (OH1600) should now be illuminated.

## Programming for Data Collection

### Establishing Communications

Run the software (if the title screen is still shown from the install procedure, just click OK). Click on 'Communications' and then 'Establish Communications'. For the OH1600, wait for the LED to stop flashing before establishing communications.

Once communications is established, the unit will display the baud rate at which the connection was made – usually 57,600 bits/sec, Figure 2. If there is a problem connecting at this speed, the unit will try a lower rate. If you have trouble establishing communications, see Appendix E for troubleshooting assistance.

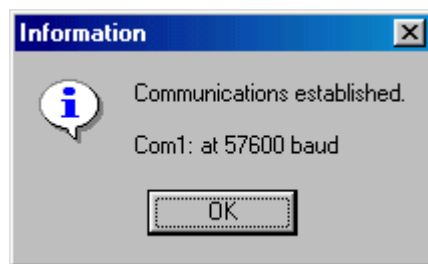


Figure 2

## Setting the Clock

After establishing communications, the time clock must be verified and updated if not correct.

Click 'Communications' and then 'Set Clock'. The time and date currently held in the Ramcorder's memory will be displayed. It can be adjusted manually by selecting the month/day/time by using the control buttons, or it can be done automatically by clicking the 'Sync to Pc' button (verify the computers clock is correct!) then click 'OK'.

The 'Sync to Pc' option is of special importance when multiple OH1600 units are being used and it will be desirable to merge the data collected from several OH1600 units onto the same chart. See Appendix B for more information.

## Editing the Data Collection Settings

Select 'Communications' and then 'Edit User Data'.

This screen is used to specify the parameters the RCMB/OH1600 will use when collecting data. An RCMB screen is used in this example, Figure 3. Similar fields are used for an OH1600.

The screenshot shows a 'User data' dialog box with the following sections:

- Product type / Firmware version:** RCMB v2.09
- Memory:** Total: 2093056 Bytes, Used: 0 Bytes, Available: 2093056 Bytes
- Input Transducers:** Four checked options: Phase 1 Volts (Channel 1), Phase 1 Amps (Channel 2), Phase 2 Volts (Channel 3), and Phase 2 Amps (Channel 4).
- Estimated storage time:** 3.03 Hours
- Test Type:** Radio buttons for 'Average over storage period' (unselected) and 'Min, Max, Average' (selected).
- Storage period:** A numeric input field with '10', and radio buttons for 'Cycles' (selected), 'Seconds' (unselected), and 'Minutes' (unselected).
- Site text:** A text area containing 'Fast Test - 10 cycle storage - Min/Max/Avg'.
- Buttons:** 'OK' (with a green checkmark), 'Cancel' (with a red X), and 'Help' (with a question mark).

Figure 3

- Memory: This section displays the total amount of memory in the RCMB (2 MB) or OH1600 (512KB). Also shown is memory available/memory used in the unit currently connected.
- Site text: Space available for user comments like data collection location, customer complaint, reason for test, etc.
- Input Transducers: The RCMB has four channels (two voltage, two current) and the OH1600 has two channels (one current, one ambient air temperature). Channels that are not needed for a particular recording can be turned off to extend the memory available for the desired measurements.
- Estimated Storage Time: Given the number of channels, test type, and storage period, the unit displays the estimated time that data can be collected before the memory fills up. The Ramcorder stops recording when the memory is full. The OH1600 is limited to 30 days collection because this is its maximum battery life.
- Test Type: Both ‘Average’ and ‘Min, Max, Average’ recordings are available. The selection will apply to all channels.
- If ‘Average’ is selected the unit will **average together** the RMS values of **each cycle** sampled during the ‘Storage Period’ and store the result once per storage period.
- If ‘Min, Max, Average’ is selected the unit will calculate and store each of these values once per ‘Storage Period’. The min and max values stored will be the actual minimum and actual maximum RMS **cycle** sampled during the storage period. The average value stored each storage period will be the average of all the RMS values calculated for each cycle over the storage period.
- Storage Period: This determines how often the unit will actually store data in its memory. The unit will sample every cycle regardless of the storage period.

After the recording parameters have been selected and any desired notes are added to the ‘Edit User Data’ screen, the information is sent to the unit by simply clicking the ‘OK’ button at the bottom of the screen. A message will warn the user of the changes. Clicking ‘OK’ again will then update the units’ memory with a new collection program. Any previously collected data will be erased.

Terminate communications by selecting ‘Communications’ and ‘Terminate Communications’. Disconnect all cables and exit the software program.

If an OH1600 is being programmed, **Pull** the toggle switch and move it to the ‘Off’ position.

The RCMB/OH1600 is now ready to be installed in the field.

## **Field Installing the RCMB/OH1600**

### **RCMB**

There are two different styles of the RCMB. The ‘RG’ type mimics a ring style meter and is the most common type. It can be used in either a ring or ring-less type base. The ‘NR’ type has built-in adjustable clamps and is mainly for application on ring-less type bases.

Regardless of which RCMB is used, it is installed between the meter base and the meter. A standard ring is used to retain the RCMB to the meter. Figure 4 an example of a ring type RCMB installed in a ring-less base with the enclosure cover holding the unit in place.

The RCMB must be properly grounded in order to obtain true voltage readings. There are two ground points on the RCMB to which the green grounding lead can be connected. One ground point is on center on the rear surface of the unit and is used to make ground connections inside of the meter base housing. The second ground point is on the left side of the RCMB. This ground point may be used to ground the RCMB to a ground point external to the meter base housing.

When using the ground point on the rear of the RCMB, connect the ground clip to the chosen ground point within the meter base housing. Carefully position the excess ground lead inside of the meter base housing, away from the meter contacts and mounting surfaces.

Carefully install the RCMB into the meter base. Avoid contact with the meter contacts on the front of the RCMB, as they will become energized during installation.

### **WARNING: ELECTRICAL SHOCK HAZARD**

When installing or removing an RCMB into or from a meter base, the meter contacts on the front of the unit will become or will be energized. Always use proper protective equipment and safe work practices when working with exposed energized conductors. When installing or removing the RCMB, or the meter, Use voltage insulating gloves, face and eye protection and FR clothing. This product is designed for use by professionals trained in its use and application in and around high voltage electrical equipment. If you are not trained in the work methods required for safe operation, do not proceed until you obtain the training. Failure to follow these recommended practices may result in severe injury or death.

After installing the RCMB into the meter base, observe the indicator lights and review the instructions on the face of the RCMB. LED's verify all connections have been properly made. Once the LED's have been verified, plug in the meter and install the retaining ring. The RCMB begins recording as soon as 240V is supplied and stops recording when it is pulled from the socket or power is lost. It will resume recording when power is restored or the RCMB is re-installed into another live socket.



Figure 4

### **OH1600**

**Pull** the toggle switch towards you and move it from the 'Off' position to the 'Run' position. Hang the unit on the conductor by means of the retaining clamp. The retaining clamp is then tightened down so the conductor is held in place in the circular part of the current transducer. The OH1600 is for use ideally on conductors ranging in size from 0.25" to 1.0". The unit will work on sizes out of this range - but accuracy should be verified. The unit will automatically begin recording once 3 amps of current is sensed and will continue to record until the memory is full or the recorder is turned off.

### **WARNING: ELECTRICAL SHOCK HAZARD**

When installing or removing an OH1600 onto or from electrical conductors always use proper protective equipment and safe work practices when working with energized or de-energized conductors. The OH1600 can be installed on high voltage lines with a hot stick and all required personal protective equipment including voltage insulating gloves, face and eye protection and FR clothing. Rigorous hot stick work practices and all OSHA and company work practices must be followed. Never connect the computer interface cable to the OH1600 while it is recording. This product is designed for use by professionals trained in its use and application in and around high voltage electrical equipment. If you are not trained in the work methods required for safe operation, do not proceed until you obtain the training. Failure to follow these recommended practices may result in severe injury or death.

If multiple OH1600 units are being installed on different phases of the same multi-phase system with a desire to eventually merge the data, refer to Appendix B for additional information. See the illustration on the following page for an example of three phases of a circuit merged into a single chart as shown in Figure 5.

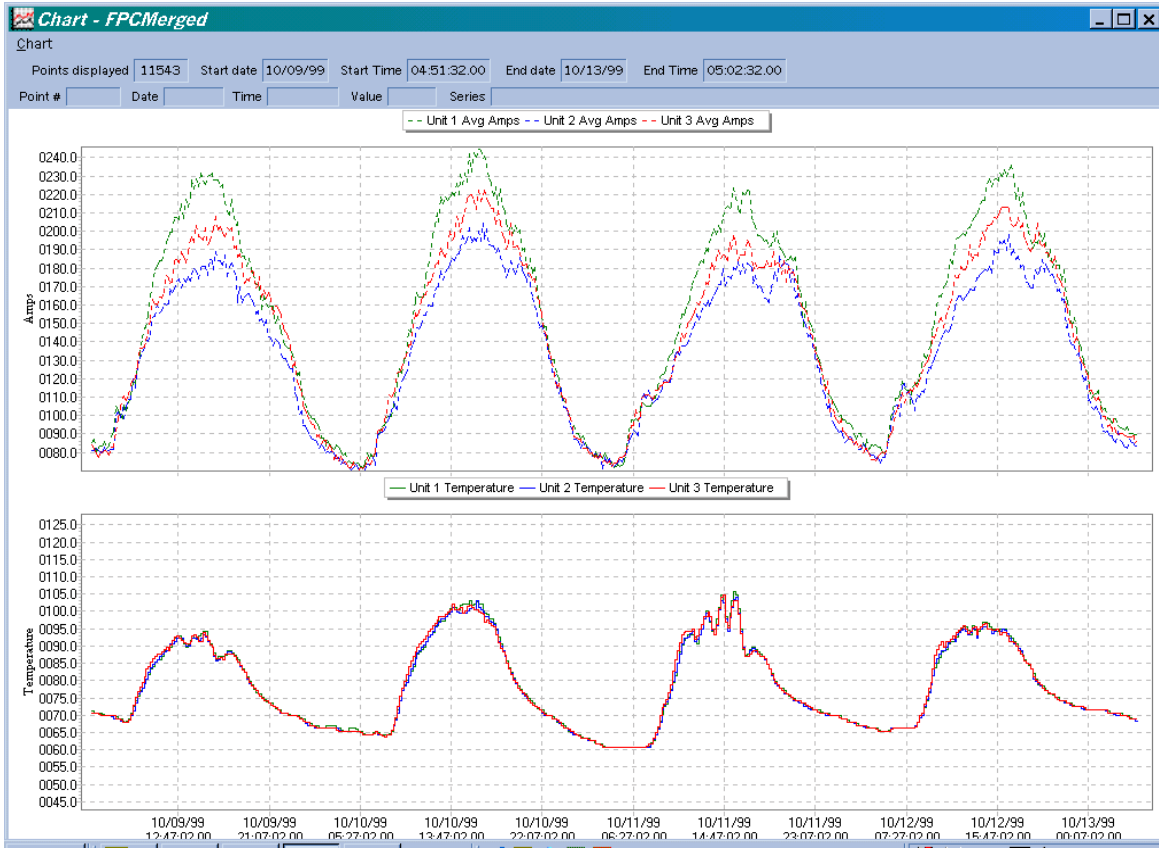


Figure 5

## **Downloading Data from the RCMB/OH1600**

To download the collected data, the RCMB/OH1600 unit must have power from either the 12VDC supply (RCMB & OH1600), the line-power being monitored (RCMB only), or battery power (OH1600 only).

Note: (OH1600 Only) – After data is collected and the OH1600 is powered up and connected to the computer for download, the LED will flash rapidly for up to 75 seconds while the memory is being initialized. Do not attempt to proceed to the ‘Establish Communications’ step below until the LED stops flashing and is solidly lit.

- 1) Select ‘Communications’, ‘Establish Communications’, ‘Download from Unit’, and ‘Acquired Data’. See Figure 6. A filename will be requested for the data. The

RCMB/OH1600 will begin to copy its data into the computer. This may take several minutes based on the quantity of data collected and the download speed.

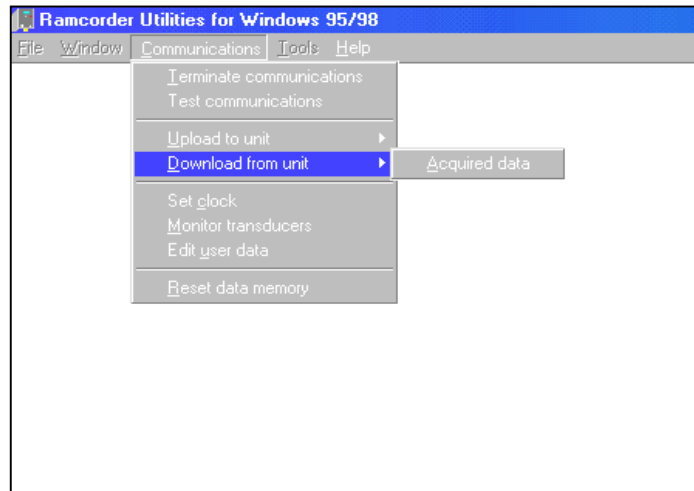


Figure 6

- 2) After all the data has been downloaded it must be 'processed'. The option to do this is offered and it can be done immediately after the download is complete. If a processing error occurs, it can be attempted again by selecting 'Process Raw Data' in the 'Tools' menu. Once processing is complete the filename chosen will become available in the 'File' / 'Open' menu for data analysis.

## **Data Analysis**

### **Viewing Data/Charts**

Select 'File', 'Open', and then select file. The info box will open as shown in Figure 7. This gives the user information relating to the type of collection that was used to create the data, the dates of the test, and any site text that was entered by the installer.

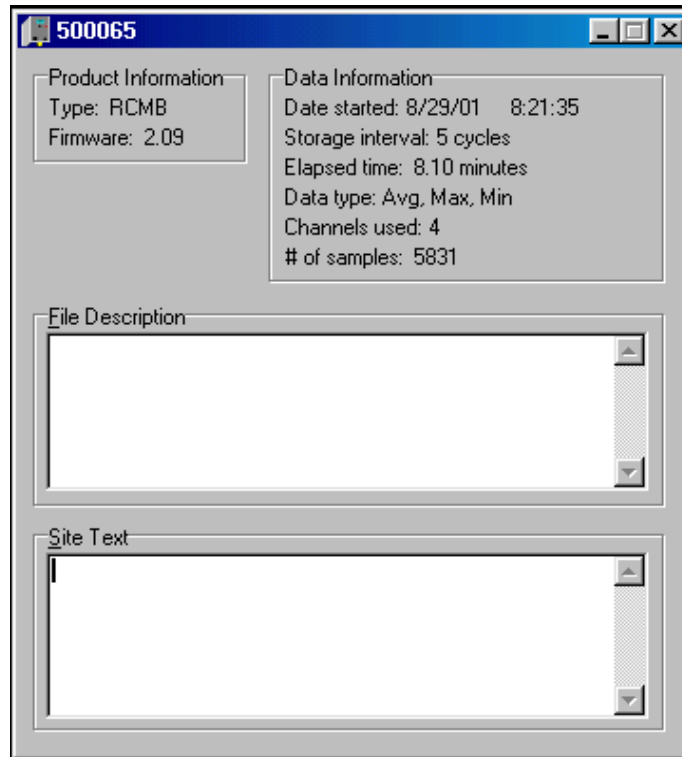


Figure 7

To view data only, select 'Tools', and 'View Data'. To view charts, go into the 'Tools' menu and select 'Chart'. The window shown in Figure 8 will be displayed.

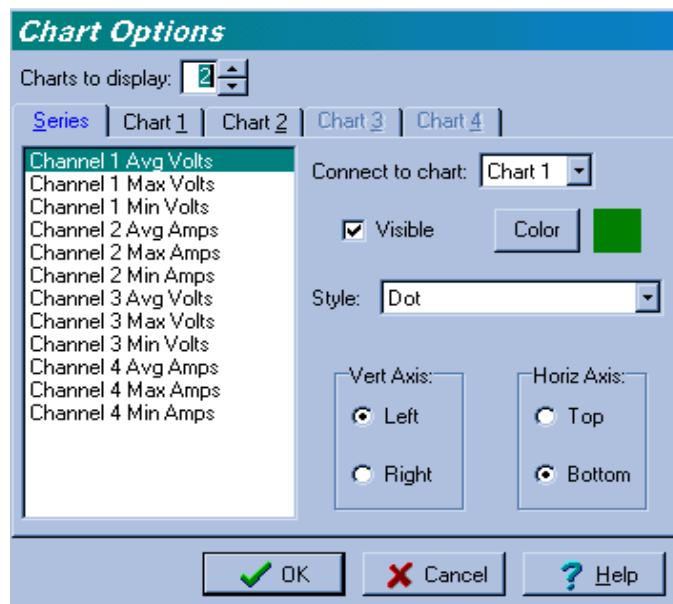


Figure 8

The chart can be quickly displayed by accepting all the 'Series' and 'Chart' default values and simply clicking 'OK'.

## **Chart Manipulation**

### **Removing Series from Charts**

Once the chart is drawn, quantities can be easily removed from an individual chart by double-clicking on the chart and removing the 'check' in the boxes next to each quantity.

### **Observing Dates and Times**

General date and time info is displayed on the bottom axis. Specific information can be found for any point on the chart by positioning the mouse pointer directly on the line and clicking the left mouse button (The pointer will transform into a 'hand' symbol when it is directly over the line). Point-specific data is displayed in boxes at the top of the screen.

Note: If a point on the line between two data points is chosen, the values for the data point to the left of the hand will be displayed.

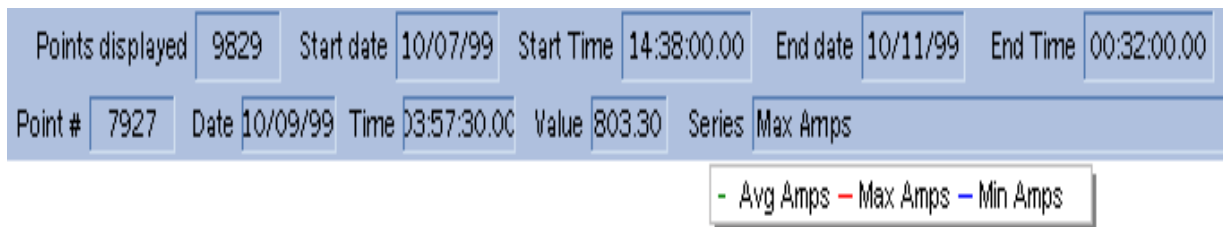


Figure 9

### **Zoom**

This feature makes it simple to display only the part of the chart that is of interest.

Press and hold the left mouse button. While holding the button down, drag the box outline from upper-left to lower-right and include the areas to be expanded. When the button is released the zoom will be activated. The program allows up to 10 zoom levels. Un-zoom is achieved by opening a box on the chart from bottom-right to top-left. It can be located any place on the chart and can be any size. This will cause the program to un-zoom to the previous perspective.

The two charts in Figure 10 illustrate this feature. The first chart shows some typical data with the area of interest selected with zoom. The second chart shows the graph after the mouse button is released. Note that zooming in on one chart also automatically zooms in all associated charts to keep the x-axis time scale correct for all displayed data.

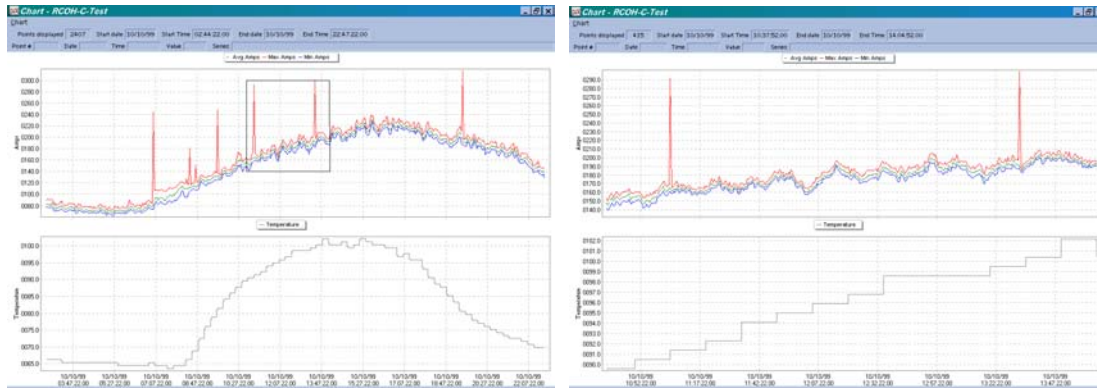


Figure 10

### **Vertical Reposition**

The graphed lines on an individual chart can be repositioned vertically by holding the right mouse button and moving the mouse up or down.

### **Set Axis Values**

The upper and lower limits of the left axis can be manually scaled by double-clicking on it and then going to the 'Axis' tab on the 'Chart' tab. Click the 'Change' buttons to set the values.

### **Printing Data/Charts**

#### **Printing Data**

Simply selecting 'File' and then 'Print' with a table open will print the ENTIRE data file. In most cases, this would be an extremely large number of pages. A more often desired option is to print only the part of the data table that is being studied. This is done using the mouse to select the data of interest prior to selecting 'File' and 'Print'. See Figure 11.

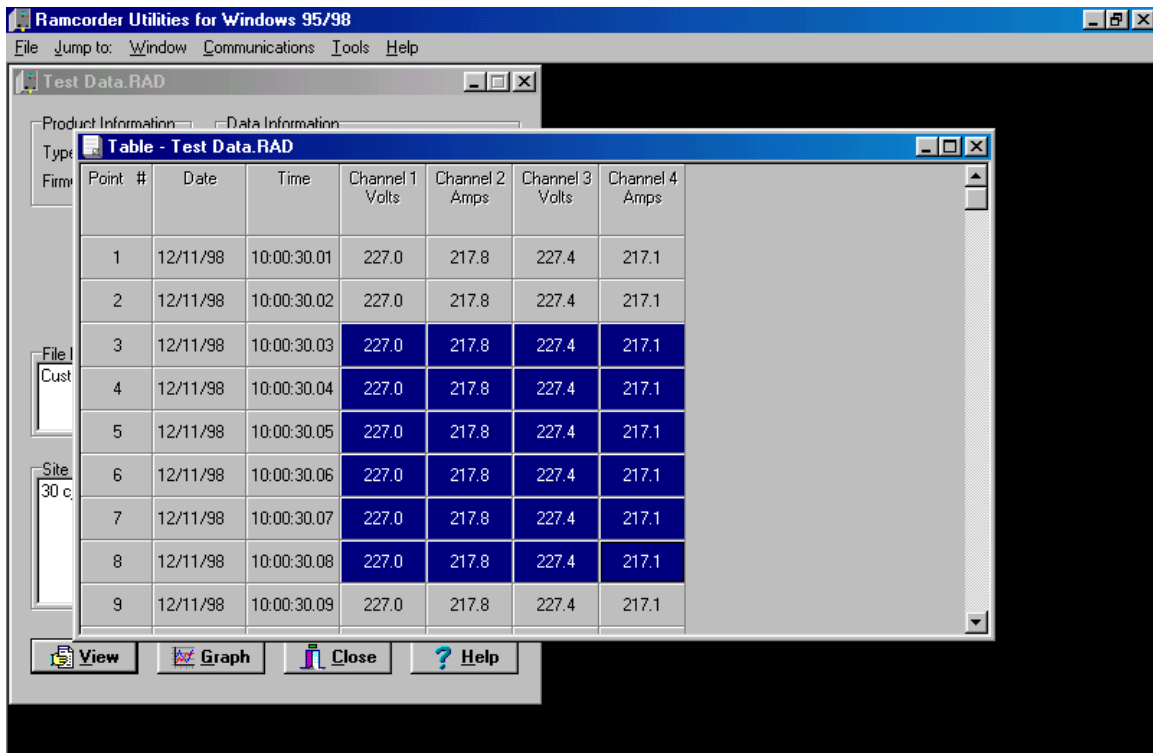


Figure 11

This example would result in only the ‘highlighted’ data from rows #3 through #8 being printed.

### Printing Charts

To print a chart, select ‘File’ and then ‘Print’ while a chart is displayed.

## Appendix A – Field Monitoring the RCMB

With a portable computer and the DB-9 cable, it is possible to monitor voltage and current readings while the RCMB is installed. See Figure 12.

Connect the computer to the RCMB via the DB-9 cable. After establishing communications, select 'Communications' then 'Monitor Transducers'. The display is updated two times per second.

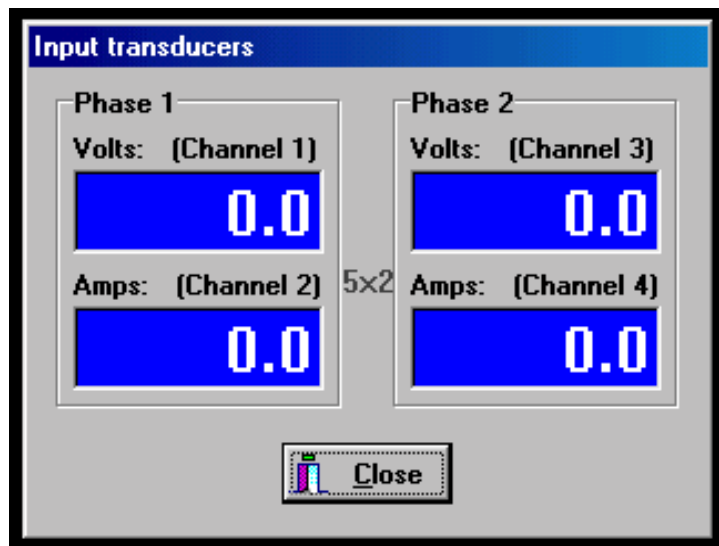


Figure12

## **Appendix B: Merging OH1600 Data Files**

The data from two, three, or a maximum of four OH1600 units can be merged together and graphed on a single chart provided the guidelines below are adhered to.

- 1) All units must be setup using the *same* collection settings in the 'Edit User Data' screen (test type, storage interval). Only the information in the Site Text box can vary between units.
- 2) The 'Sync to Pc' option in 'Communications' / 'Set Clock' must be used on all units that will eventually have their data merged together. All units must be synchronized from the *same* computer clock prior to data collection.
- 3) All units must be both installed and removed from the conductors on which they are collecting data within one hour of each other (usually takes no more than 5 minutes).

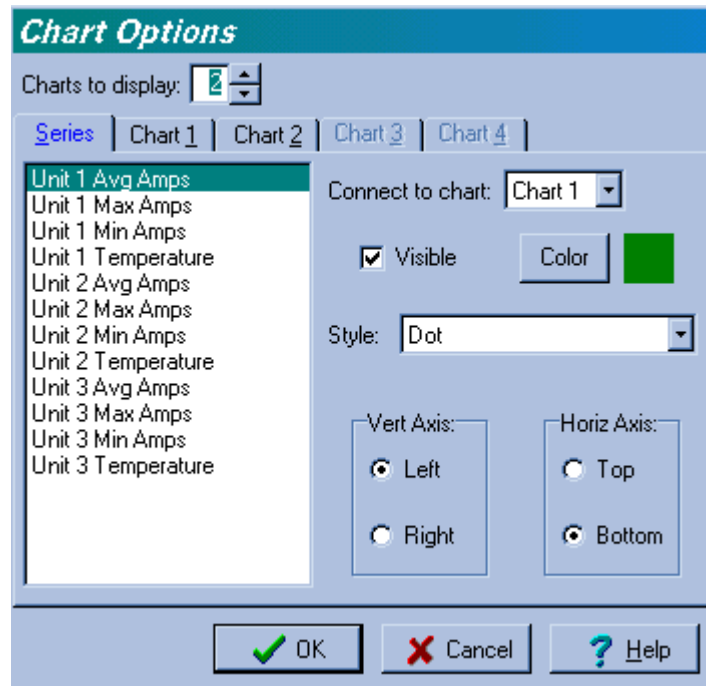
Once all the units have collected data and the data files have been downloaded via the Ramcorder software, repeat the 'file', 'open' process for each file.

A small window for each file should now be open in the main window (each small window shows 'product info', 'data info', etc). On the main window, click 'tools' and then 'merge RCOH data files'. Name the new combined file. Once the new file is created, close all the small windows.

Click 'File', 'Open' and open the new merged file. Click 'tools' and then 'chart' to graph the new chart. Accept the default chart settings and click 'OK'. All graphs will be displayed on one chart.

## Appendix C: Customizing Graphs

Once a file is opened and the 'Chart' option is selected, the following screen appears:



(Merged OH1600 File Screen Shown)

Figure 13

**Charts to Display** – Controls the number of charts that are displayed on one graph and the number that will print on one page of a printout. The RCMB defaults to two charts – one for voltage values and one for current values. The OH1600 defaults to two charts also – one for current values and one for ambient temperature values. The maximum number of charts allowed is four.

**Connect to Chart** – Each quantity shown in the Series list must be assigned to either a specific chart number, or to no chart (not displayed at all). By changing these assignments, it is possible to put any chosen quantity on any chart. Also, any combination of currents, voltages, and temperatures (OH1600 only) can be attained.

**Color** – The color button can be used to change the default line colors. Highlight the quantity on the 'Series' list and then click on the color button. A palette of possible colors will be displayed.

**Style** - Changes line type used to display quantities. All 'average' values default to 'dot', 'maximum' values to 'solid', and 'minimum' values to 'dash'.

## Charts

Clicking on one of the 'Chart' tabs will display the 'Chart Options' window. Click on the 'Title' tab on the right side of the window (between the Scaling and Labels tabs). A screen similar to the one in Figure 14 should now be displayed. Only the axis Axis/Title tab in 'Chart Options' will be discussed here.

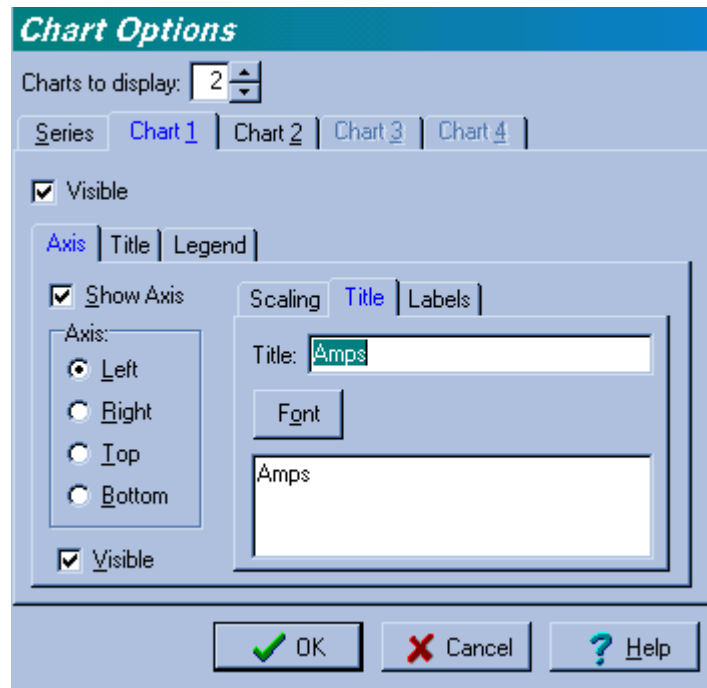


Figure 14

To change the vertical axis title that is displayed on the chart selected, type in a new title and click 'OK'.

## Appendix D: Exporting Graphs

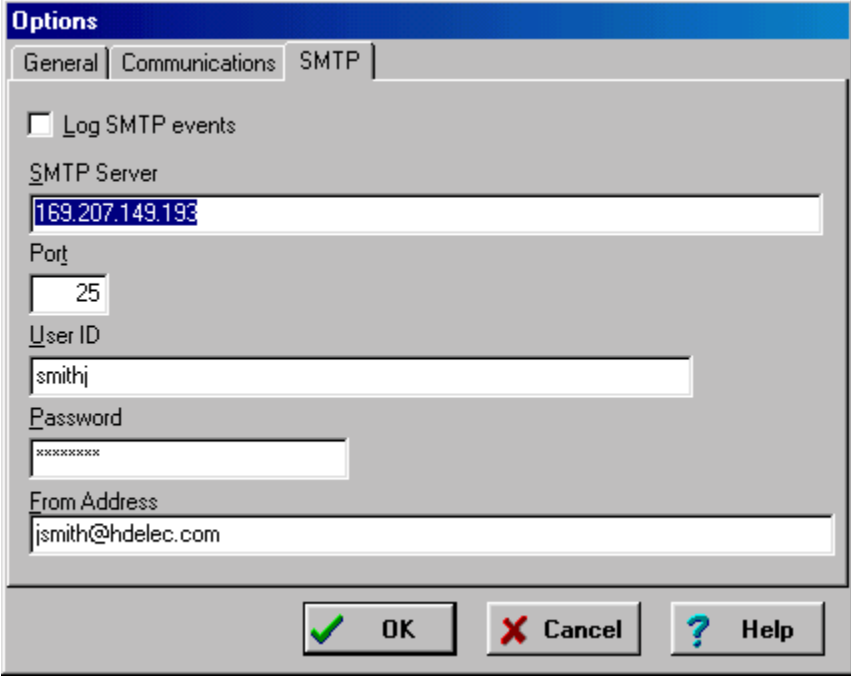
### **Export as a Bitmap File**

Arrange the graph as it should appear in the bitmap graphic file. Select “Chart” and then “Export” from the pull-down menu. A dialog box will appear. Select the folder in which to save the bitmap, and then assign a filename. Click ‘OK’ to create the bitmap. The bitmap file can now be placed in another application such as Microsoft Word or attached to e-mail.

### **Export Directly to E-mail**

This feature automatically creates a bitmap file of the graph and automatically attaches it to an email for easy distribution.

For this feature to be active, the following information must be entered in the SMTP info screen. This screen is accessed from the main screen by clicking ‘Tools’, ‘Options’, and the ‘SMTP’ tab.



The image shows a screenshot of a software dialog box titled "Options". It has three tabs: "General", "Communications", and "SMTP". The "SMTP" tab is selected. The dialog box contains the following fields and controls:

- Log SMTP events
- SMTP Server: 169.207.149.193
- Port: 25
- User ID: smithj
- Password: xxxxxxxx
- From Address: jsmith@hdelec.com

At the bottom of the dialog box are three buttons: "OK" (with a green checkmark icon), "Cancel" (with a red X icon), and "Help" (with a blue question mark icon).

Figure 15

While displaying a graph, select the ‘Chart’ pull-down menu and click on ‘Send Chart by E-mail’.

## **Appendix E: Troubleshooting**

*Symptom:* Unit will not communicate with computer - “communication time out” or “invalid unit type” error occurs.

*Solution:* Incorrect communication port is selected. Go into TOOLS / OPTIONS / COMMUNICATIONS and make sure the correct Com port is selected. Terminate any other program that may also use the selected Com port.

*Symptom:* Unit is only able to download a portion of the data it has collected to the computer before a timing error occurs (usually somewhere between 20% and 90%).

*Solution:* When this error occurs, the unit will automatically lower the communication baud rate. It will notify you that this change is being made after an unsuccessful download. At this point, try to download the information again.

If this fails, set the communications Baud Rate to match your computer Com port baud rate. Go to TOOLS / OPTIONS / COMMUNICATIONS and select the baud rate.

If this fails, go to TOOLS / OPTIONS / COMMUNICATIONS and increase the ‘TIMEOUT’ setting by a few seconds. Lower the ‘BLOCK SIZE’ parameter if neither of the previous modifications solve the problem.

*Symptom:* ‘No Firmware’ error.

*Solution:* Firmware in unit was inadvertently erased go to website: [www.HDElectricCompany.com/Ramcorder](http://www.HDElectricCompany.com/Ramcorder) to download the firmware. Contact HD Electric Company for instructions on reloading at [Support@hdelec.com](mailto:Support@hdelec.com) or (847) 473-4980.

*Symptom:* Text will not fit in data boxes. Screen is displayed improperly or items overflow past edge of screen.

*Solution:* Change Windows™ font size settings to small. From Windows™ main screen, select START / SETTINGS / CONTROL PANEL / DISPLAY / SETTING TAB / ADVANCED. Change the ‘Font Size’ to small.

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