

BRAND ELECTRONICS
DIGITAL POWER METER
MODEL 20-1850

OPERATING INSTRUCTIONS

SPECIFICATIONS

WARRANTY INFORMATION

OPERATING INSTRUCTIONS

The Power Meter has the following displays:

- 1) **"0000W 0.000kWh (or 0000 kWh)"** This displays the amount of power being used *right now* (Watts) and the amount of power which has been used (kilo-Watt hours). This reading is displayed after the unit is reset or first plugged in (after the calibration cycle).
- 2) **"000.0 Total hrs"**. This displays the amount of time since the Power Meter was last reset.
- 3) **"\$000.00 @10c/kWhr"**. This displays the cost of running the device since the Power Meter was last reset. The rate shown is user selectable (default is 10c). Instructions for resetting this are below.
- 4) **"\$000.00 av/month"**. This displays the estimated cost of running the device for one month (based on 30 days).
- 5) **APeak 0000 Watts®**. This displays the peak power. This display is reset by pressing the ENTER button.
- 6) **A00.00Irms 0.00PF®**. This displays the rms current and power factor of the load. The display shows A----A when first selected while the reading is updated.
- 7) **A000.0 Volts rms®**. This displays the rms voltage.
- 8) **A0000VA 0000VARs®**. This displays Volt-Amps and Volt-Amps- Reactive. The display shows A----A when first selected while the reading is updated.

Use of your Power Meter is very simple:

- 1) Plug the Power Meter into an electrical outlet within reach of the device you wish to measure. The Power Meter automatically turns on and will display "BRAND ELECTRONIX" briefly as the Power Meter performs an automatic calibration of its internal circuitry. The Power Meter will then display "0000 W 0000.0 kWhr" (if something is already plugged in and drawing power, the display may not be zero).
- 2) Plug your appliance into the receptacle on the Power Meter.
- 3) Turn on the appliance (if necessary).

NOTE

Plugging in a device before plugging in the Power Meter is ok, even if the device is "on",

- 4) The number displayed on the Power Meter is the power being used by the appliance in "Watts". For example, if you plugged in a lamp with a 100 Watt bulb, the Power Meter would read approximately "100".
- 5) The "kWhr" value will change depending upon the power being used. For example, if you plug in a 100 Watt lightbulb, the value would be approximately "0.100 kWhr" after 1 hour.

6) To find the cost of running a device, depress the ">" button until the display reads "\$000.00 @10c/kWhr". Now depress the "ENTER" button. The Power Meter display will show "10.0 cents/kWhr" (10 cents is the default value). Depress the "<" or ">" buttons to decrease or increase the value to the desired amount. Pushing the "<" or ">" button once will decrease or increase the value by .1 cent; keeping either button depressed will continuously decrease or increase the value. When you have entered the desired value, simply depress the "ENTER" button again, and the Power Meter will begin to display the cost. To see the "W kWhr" display again simply depress the "<" or ">" arrow button. Doing so will not reset any values. You may switch back and forth between the displays at any time.

7) To see the estimated cost of running the device for one month (30 days), depress the "<" or ">" buttons until the display reads "\$000.00 av/month". The actual value displayed will depend upon the cost per kilo-Watt hour entered, and the amount of electricity used by the device since the Power Meter was last reset. This display is very useful to find the cost of running devices which cycle on and off (like refrigerators, freezers, air conditioner, etc).

8) The advanced displays described previously are all accessed using the A<A and A>@ buttons.

MEMORY

Your Power Meter is equipped with non-volatile memory for the following information:

kWhr

Cost per kWhr

Total cost

Total Time

These values are updated approximately every 8 minutes (the display will momentarily show ADATA SAVE@ when this happens). If the Meter losses power, the last saved data is used when the Meter is restarted.

To CLEAR the MEMORY, push and hold the ENTER button then press and release the RESET button, the release the ENTER button.

RECALIBRATION

Your Power Meter is capable of approximately 1% accuracy if calibrated with a precision source just before taking a measurement. This procedure should only be used if you have a need for high precision and have access to a high precision power and voltage source: Energize the meter for at least 15 minutes before conducting this calibration.

Plug the Meter into an outlet with NO load attached. During the Brand Electronics display, depress BOTH A<A and A>@ buttons simultaneously for approximately 3 seconds. The meter will briefly display ACal 0 w/no load@ then the Meter will display APress RESET@. Press **ENTER** to continue with the calibration. The meter will display A0000 W Pot1000. Plug in a known load. The display will show a value close to the actual. Depress the A<A or A>@ buttons to decrease or increase the value until the correct power is shown. Press the ENTER button. The meter will display Axxx.x VOLTS Pot 1000@. The xxx.x should be close to the actual value. Change the value as previously described and push the ENTER button. RESET the Meter and use as normal.

SPECIFICATIONS

NOTE: All readings +/- 2 in least significant digit

FUNCTION	RANGE	RESOLUTION/ACCURACY
POWER (Watts)	0-1850	1 Watt/ +/- 1.5%
Power used (kWhr)	.001-9999	1 W-hr/+/- 1.5%
Time (hours)	.1-6555.5	.1 hour/+/- 2%
Cost	0-\$655.55	\$.01/ +/- 2%
Cost/Month	0-\$655.55	\$.01/ +/-2%
Peak Watts	0-1850	1 W/ +/- 1.5%
Current (rms) (Amps)	0.20-15.00	.01 A/ +/- 3%
Voltage (rms) (Volts)	70-130.0	.1 V/ +/- 2%
Volt Amps	20-1850*	1 VA/ +/-5%
VARs	20-1850*	1 VAR/ +/-5%
Power Factor	0-1.0 lead or lag*	.01/ +/- 5%
Power Supply	70-130 vac, 30-130 hz. Any waveform.	N/A

* VA and VAR readings below 20 (and amps below .2) are not generally accurate. Power Factor for Loads less than 20 Watts are not generally accurate. These values may not be zero when no load is attached to the Meter.

LIMITED LIFETIME WARRANTY

BRAND ELECTRONICS warrants your Power Meter to be free of defects in craftsmanship and materials for 6 months from date of purchase. Should the Power Meter fail during this period, simply return the Power Meter to the address below for repair or replacement. Please include a note describing the problem and a return address. Should the Power Meter fail (for any reason) after the 6 month period, you may return your meter for repair or replacement for a single \$40 payment.

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COMMENTS

BRAND ELECTRONICS welcomes your comments and questions about the Power Meter. Please write to the above address. Please include your serial number (found on the bottom of the Power Meter) in your correspondence.

Use of the Datalogging Features of the 20-1850 Digital Power Meter

Installation/Configuration of PC Software

The 20-1850 Digital Power Meter with the datalogging option comes with a PC software program that allows the user to acquire current readings from the meter and allows the user to start and complete power logging sessions with the meter. The PC software needs to be installed and configured as follows:

- 1) Make a directory on your PC's hard drive with the name of your choice.
- 2) Copy the LOGGER10.EXE file from the installation floppy to this directory.
- 3) Start the LOGGER10.EXE program.
- 4) On the Menu Bar of the program, select the *Options, Comm Port* menu item. Then select the Serial port number for the port that will be used to connect to the meter.
- 5) This Comm Port selection process only needs to be done once; the Comm Port setting is saved for subsequent sessions with the software.
- 6) **NOTE: Your meter is capable of only one function at a time. During internal logging, the meter display functions will not work as expected. Also, you cannot simultaneously run the PC logger program.**

Quick Start: Typical Logging Session

The steps below show how to complete a typical data logging session with the Digital Power Meter.

- 1) Plug in the power cord from the Power meter into an AC receptacle.
- 2) Connect the serial cable from the 9-pin serial connector on the PC to the RJ-11 (telephone-type) jack on the back panel of the meter. Make sure that the PC is powered on when connecting to the meter.
- 3) If the LOGGER10 program is not running on the PC, start the program.
- 4) On the main screen of the PC program, click the "Enter" button. The current reading of the Meter should be shown. To see the other values that the meter displays, click the Left or Right arrow buttons to cycle through all possible displays. See the main 20-1850 power meter operating manual for explanations of these displays.

from the prior logging session, and thus will allow recovery of most of the data from that session.

Other Features

Changing the Logging Interval in mid-Session: It is possible to change the logging interval in the middle of a logging session. Assume that a logging session is started with a 5 minute logging interval. After collecting 50 readings, you would like to change the logging interval to 15 minutes and you want to retain the prior logged data (i.e. you don't want to start a new logging session). On the *Options, Logger Settings* screen, simply select the "15 min intervals" option and click "Send to Meter". The meter will continue logging, but the interval for future periods will be 15 minutes. (The accuracy of the average power reading in the interval where the change was made will be compromised).

Immunity to Power Outages: When the power is removed from the meter, the internal measuring and logging circuitry ceases to operate. However, logged values and other key parameters are retained in non-volatile memory. Also, a battery-operated clock continues to keep accurate time within the meter. When power is restored to the meter, the meter continues its logging process. There will be *no* readings stored for the time period when the meter was not powered (and average power was obviously 0 Watts). Readings will only be available for the periods when power was applied to the meter.

The first row indicates that the average power consumption logged between 23:10 and 23:15 on 3/26/1999 was 41 watts.

Logging interval boundaries are on "even" clock time intervals; intervals will always fall cleanly within clock hour boundaries. For example, with 15 minute logging, intervals will always be hh:00 - hh:15, hh:15 - hh:30, hh:30 - hh:45, hh:45 - hh+1:00.

Validity of Real-Time Readings

The PC software program allows you to view a number of values currently being measured by the meter, such as power, voltage, and power factor. Documentation on the types of values displayed is provided in the standard 20-1850 power meter manual. When the datalogging feature of the meter is OFF (via use of the "Data Collect OFF" option described in step 6 of the Quick Start section), all of these real-time readings are valid. When the datalogging feature of the meter is enabled, a number of the displayed values are not valid, including:

- Total kWh
- Total \$ used
- Average \$/month

Issues affecting Logged Data

The first logging interval and the last logging interval are partial intervals; these readings do not have data from the full logging interval. Therefore, the accuracy of the average power values in those two intervals is compromised.

When a upload of data from the meter occurs and then the meter is allowed to continue logging, the accuracy of the data from interval where the upload occurred may be affected. This will certainly occur if the upload process coincides with the time when the meter should be recording the results from a completed logging interval. For example, assume the meter is operating with a logging interval of 5 minutes and an upload is started at 01:04:55. Assume that the upload takes 10 seconds to complete. Were it not for the upload process, the meter would write a new value to its memory at 01:05:00. However, the upload is occurring at that time and locks-out the meter's normal write. The meter misses this memory write and writes next at 01:10:00. The value written at 01:10:00 will be abnormally high because it will include energy from two logging intervals.

Using the Data Recovery Option

The meter has a valuable feature for recovering data from prior logging sessions. Suppose you have collected data from 100 logging intervals. You then stop the logging and start a new logging session, without having uploaded the data from the first session. You still have the ability to recover most of the data from the first session. Select the menu option *Options, Recovery, Upload all Data from meter*. The meter will then upload all 8,121 readings from its memory. The values will be placed in the DATATEMP.DAT file located in the same directory where LOGGER10.EXE is located. If 3 logging intervals elapsed in the new logging session, those three values will be the first three rows of the file. Values 4 through 100 will be values

- 5) To start a logging session, select the *Options, Logger Settings* menu option. A dialog will appear that controls the logging process on the meter. A number of actions are performed with this dialog.
- 6) From the Logger Settings dialog, the first step to perform is to ensure that any current logging session is stopped, so that a new session can be started. To do this, select the "Data Collect OFF" option on the dialog and then click the "Send to Meter" button. To verify that the meter received this command, click the "Read Meter" button. The display should show "LOGGER OFF" and "0 entries". This action caused the meter to stop logging and to reset the memory pointer inside the meter to the beginning of the meter's memory.
- 7) Next, from the Logger Settings dialog, select the logging interval you wish to use, e.g. "15 min intervals". Click the "Send to Meter" button to tell the meter to start logging data at this selected interval. To verify the success of this command, click the "Read Meter" button, and the display should update to show that the logging interval is "15 minutes". Also, the display will show the current time as read by the clock inside the meter. This time should be close to the time shown as the PC Clock time. (Each time the "Send to Meter" button is clicked, the clock inside the meter is synchronized with the PC clock.)
- 8) The meter has now been launched and is logging power data. You can connect the load to be measured at this point (or actually at any point prior to this). You can also unplug the meter and take it to the load that needs to be measured. No data will be recorded during the time when the meter is without power; recording will resume when the meter is powered up again.
- 9) After the data collection period is complete, connect the meter to the PC with the serial cable and start the PC program. Select the *File, Upload and Save Log* menu option. Type in a file name to save the logged data to. The meter uploads the data to the PC and the PC stores the data in the file. Open the file in any text editor to examine the logged data.
- 10) After uploading data, the meter is still logging new data and appending it to its memory; the meter's logging process is *not* stopped or reset by an upload. This allows the user to upload the data at multiple times during a long recording session. The only way to stop the logging process and reset the memory pointer in the meter is to issue the "Data Collect OFF" command described in Step 6).

Description of Data in the Log File

The data in log file consists of a separate row for each logging interval. Each row contains a date/time value and an average power consumption value, expressed in Watts. A Tab character, facilitating importation of the file into a spreadsheet or database program separates the date/time value and the average power value. The date/time value marks the *start* of the logging interval recorded. Here is an excerpt from a file collected with a 5 minute logging interval:

```
03/26/1999 23:10:00 0041
03/26/1999 23:15:00 0027
03/26/1999 23:20:00 0000
```

SOFTWARE INSTALLATION AND USE INSTRUCTIONS FOR MODEL 20-1850/CI

Software installation:

Create a new directory on your PC for the software installation (we suggest “powermeter”)

Copy the program (201850CI.exe) into the new directory.

Run the program by double clicking the program (we suggest creating a shortcut).

You MUST select a comm port when the program is first run.

Select Options, then Comm Port. Select the serial communication port (1, 2, 3, 4 or 5) that you will be connecting the Power Meter to (the port is saved, you can change it later if desired).

Connecting the Power Meter to the PC:

Plug you Power Meter into a nearby outlet.

Plug the RJ-11 phone cord into the jack on back of the meter. (*Note, any phone extension cable can be used for greater length, just reuse the provided adapter*).

Plug the RS-232 end of the cable into the comm port you selected.

Software instructions:

Start the program. Ensure the correct comm port is selected.

Using the mouse, select “Connect”. You should see the display update within a few seconds. If the communications is not correct you will get an error message; recheck comm port and connections.

The display will update every 4 seconds.

To save data, select one or more of the displays.

Select Options, Interval and choose which interval you desire (5 sec default).

Select, File, Capture Data to file. You will be prompted for a file name. All files are saved as “text files”.

The software will continue to save data until you close the file. The number of entries is shown on the bottom of the Power Meter screen.