OmégaWatt
La Faurie
F-26340 AUREL, France
www.omegawatt.fr

User Manual

MICROLOGGER

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1 <u>OVERVIEW</u>

The Microloggers are designed for the measurement of several kinds of data with a very large autonomy. They use a CR2032 battery for real time clock and data acquisition. Measurements are saved on a non-volatile memory;

Only the Enerplug logger is to be connected to the mains. Other Microloggers only use safe voltage.

Micrologger Temp *May be fitted with other types of enclosures*	ENERPLUG. *Depending on your country, may be fitted with other plugs/sockets*

1.1 Safety remarks :

The Enerplug system was designed and tested in accordance with CEI 61010-1/EN 61010-1/VDE 0411-1 and CEI 61010-2-032/EN 61010-2-032/VDE 0411-2-032.

The safety of the operator and system is garantied provided that it is correctly used. The Enerplugs can be installed by anybody. Please respect all instructions for your own safety and to avoid any risk to others. The Enerplug should only be installed in norms compliant electrical installations.

Meaning of the symbols :
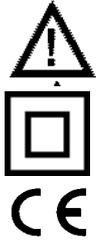
: Danger ! please the manual.

: Double insulation

: CE conform

Remark : The earth connection is only connected from the input plug to the output socket. The enclosure is made of insulating material and is not connected to earth.

CAT II, 250Vac : The maximum allowable voltage between phase and neutral line is 250 Vac.

The system is designed to be installed in domestic houses or buildings and connected to a grid with overvoltage (voltage surges) limited to 4kV or less. If necessary, additional protections should be added before the system can be installed.

The Enerplug should not be used in case :
• the outer cover of the enclosure is opened
• external damages are visible
• the connecting wires are damaged or pourly insulated
• after extended storage periods in severe conditions (humidity, dust, low temperature...)

Safety recommandations :
• The Enerplug enclosure should not present traces of dust, humidity or grease.
• Avoid large mecanical stress such as chocs, vibrations, high temperatures or magnetic fields.
• The Enerplug enclosure must be closed using their original screws.

Attention !
The maximum allowable current capacity of the Enerplug is indicated on its label. The Enerplug should not be used in cases where the max current between input and output might be exceeded.

2 MAIN FEATURES

• User Interface on a colored display Palm Pilot. The PDA has wireless communication to the Multivoies system via infrared (IrDA). See compatibility list at the end of this document.

• The PDA interface allows
- Real time data display
- Recording setup
- To transfer Recorded measurements to a personal computer

• Extremely low power consumption. The loggers are powered out of a CR2032 and the typical autonomy is above 2 years. (The Enerplugs are also powered from the grid whenever connected)

• Very large memory.

• Small size.

3 LOGGER VERSIONS

Version	Measurement	Detail
-Temp	Temperature	-20°C/105°C Typical accuracy +/-0.5°C
-Temp/Hygro	Temperature and Humidity	-20°C/100°C 0/100%RH Typical accuracy 2%RH +/-0.5°C
-Impulse	Pulses (count of events such as electrical contact closing)	-0 to 32000 counts per interval frequency max : 10 Hz
-Enerplug	Active power	-2 to 3000 Watts. Typical accuracy +/-1% + 1Watt.
-Lampcount	Time of use of lights	- Records up to 32000 events (ON and OFF times)

Memory autonomy :

Logger	Memory	Number of samples	Period of measurements		
			1 s	1 min	10 min
-Temp	128 kb	65536	18h 12 min	45days 12hours	455 days
-Temp/Hygro	128 kb	32768	9h 6 min	22days 18hours	227 days
-Impulse	128 kb	65536	18h 12 min	45days 12hours	455 days
-Enerplug	128 kb	65536	18h 12 min	45days 12hours	455 days
-Enerplug2 (double mem)	256 kb	131071	36h 24 min	91days	2,5 years
-Enerplug-V (w/ voltage)	256 kb	65536	18h 12 min	45days 12hours	455 days

4 HOW TO USE

The loggers do not have display or button. The only way to communicate with the devices is via infrared communication. The PDA user interface is

relatively straightforward but the user is advised to read carefully the following instructions before using the Loggers.

The loggers are always active, provided their internal battery is in good condition. To achieve a typical autonomy of 2 years out of a small CR2032 battery, the loggers use a very low power sleep mode and regular wakes-up to achieve different tasks :
- Real time clock and memorization of data when required
- Sensor interrogation
- Infrared reception (watch if a device is trying to communicate)

Infrared communication is the most energy consuming task when established with a remote device like a PDA. The loggers are NOT intended for extended periods of real time viewing of sensor value on the PDA display. This would drain the battery within less than 100 hours.

Memorization of data and sensor interrogation may lead to battery shorter life time when low recording periods are selected (1 to 5 seconds). It is recommended to set the period to 1 hour when the logger is not used. (or to remove the battery)

The use of the logger follows 3 steps :
1. Set up to start a measurement campaign
2. Installation the logger
3. Data transfer

4.1 Set up to start a measurement campaign

It is necessary to prepare the logger before starting measurements.
For that purpose, you need to check :
- If the battery has sufficient autonomy for the required duration of the measurement campaign. (keep a record of loggers last battery change date)
- Is the time/date correct on the PDA.
- What recording period should be chosen.

The logger has to be set up using the PDA.
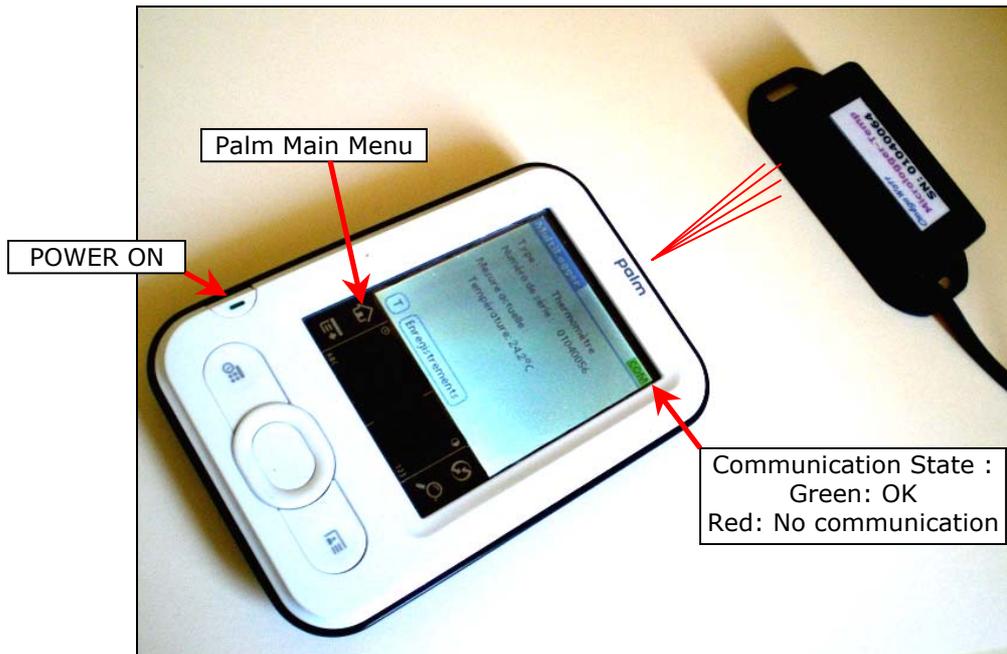
Example of IR communication using Palm Zire 22.

4.2 Communication between a logger and a PDA

- Turn on the PDA (refer to the PDA documentation).
- Install the ML1.prc software on the Palm. (Copy it using a memory card or from the PC via Hotsynch)
- Direct the PDA at the Micrologger.
- Remove all other Microloggers in the area (especially in direct line of sight of the infrared beam from the PDA)
- Tap on 'ML1' icon to launch the program

The infrared transceiver of the logger is located behind this window :
Communication is generally possible between 1 cm and about 1 meter in direct sight.

After a short while (generally less than 2 seconds), the COM icon (in the PDA screen upper right position) should turn green indicating that communication is established.

Communication not established yet	Communication established
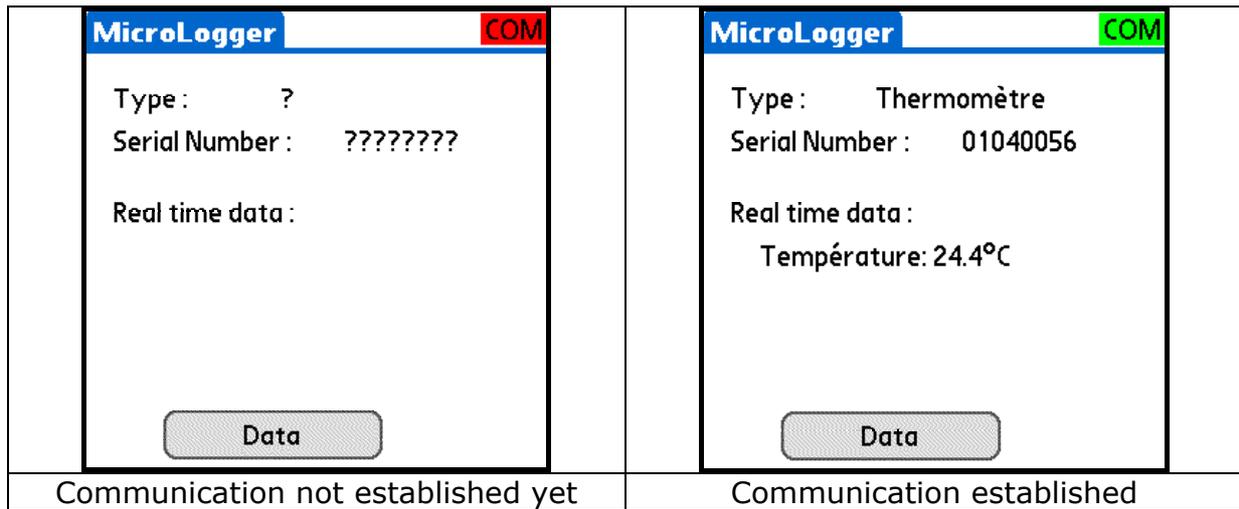
The PDA automatically detects the type of logger. The serial number and real time measurements are displayed. Once a logger is detected, communication is only possible with this logger. If you place another logger in front of the PDA, if will take about 8 seconds for the PDA to detect the new logger. Alternatively, you may exit and return to ML1 for faster detection.

If the communication indicator COM stays red and just briefly turns green and red again, the battery of the logger is probably low. It should be noted that the logger can still record for weeks, even when the battery is too low for proper communication. (but the battery will have to be replaced before transferring the data to the PDA)

4.3   Starting a campaign using the PDA

Once the communication is established, Tap "Data" to access the data menu.

	In the DATA menu, you can visualize the information regarding on-going recordings. To start a new campaign, Tap "Start a new Campaign"
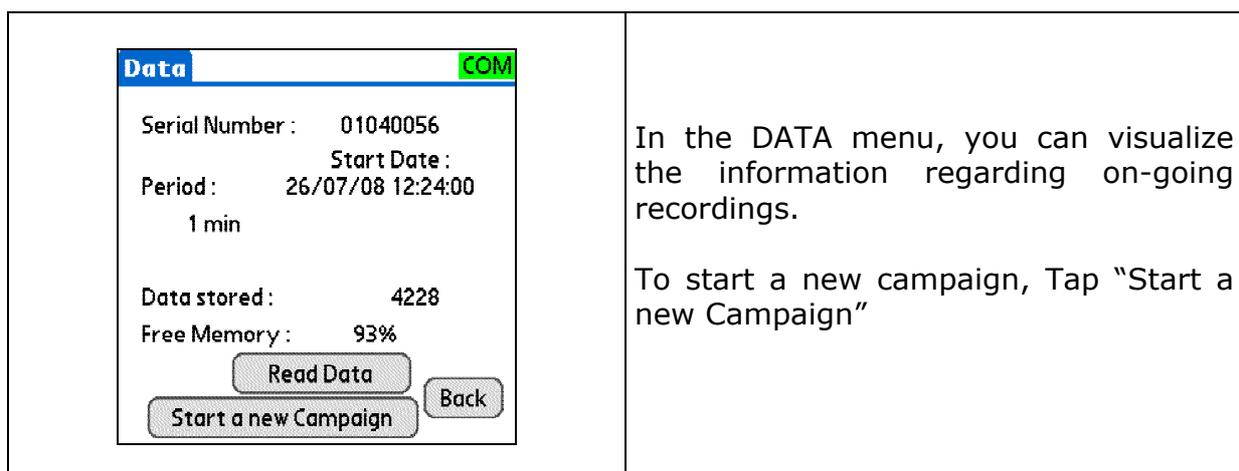
New Campaign Beware that all data will be erased Period : ▼ 1 min Memory full by 12/09/08 22:45 [CANCEL] [START]	Now you need to select the recording period. Tap the Arrow next to the "Period" Label to display the list choice.
New Campaign 1 s 2 s 5 s Beware that all do 10 s will be erased 15 s 20 s Period : ▼ 30 s 1 min Memory full by 12. 10 min 2:45 1 heure [CANCEL] (	In this list, Tap the interval duration that suits your application. The "Memory full by" then shows the date at which the logger memory is full. Now Do NOT forget to confirm the start of recording by pressing "Start".
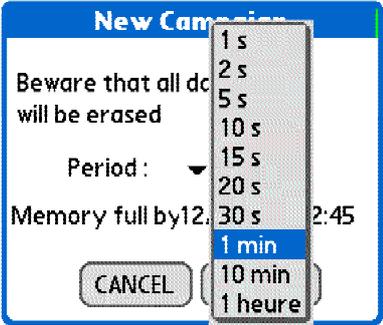
In order to make sure the configuration was done properly, you can check that the start date and period are correct in the Data menu. Also, the number of data stored should increase in accordance to the recording period. For some loggers (Temp-Hygro, Enerplug-V...), 2 data are stored each time.

4.4   Installing the logger.

The loggers should be kept in cool places during operation. Real time clock shift may result from very low or very high temperatures. The loggers should stay between (-10°C/+50°C during operation). Very high humidity levels or condensing humidity may cause irreversible damages to the loggers or drain the battery.

4.4.1 Temperature logger

For ambient temperature measurements, the logger should be installed at approximately 1,5 m above ground; The sensor should be kept away from heat sources (radiators, direct sunlight...).

4.4.2 Humidity/Temperature logger

The sensor can be preferably installed in an air duct (air extraction) or in a similar way as the Temperature sensor.

4.4.3 Impulse logger

This logger counts pulses, such as the number of closings of a dry contact. It can be used with several types of counters (water, gas, electricity..) fitting with an pulse output.

The Impulse logger accepts pulse frequency up to 10 Hz and debounces the contact (this is necessary for mechanical contacts such as reed).

The Impulse logger has a polarized input, meaning that the logger is used with electronic contact (such as NPN outputs), it has to be wired correctly (the flow of current in the contact must be from + to – wires of the logger.

The Impulse logger current through the contact is very small (a few microamps). As a results, some pulse outputs of counters are not compatible with the Impulse logger.

4.4.4 Enerplug (or Enerplug–V)

The Enerplug is a combination of a micrologger and a precision electronic energy meter (class 1). The Enerplug uses a small burden (5 mOhms) for the measurement of currents and can easily withstand 16 Amps. Beware that some versions of Enerplug are limited to lower currents (10 Amps) due to the input and output cables rating. The maximum allowable current is indicated on the label attached to the enclosure.

The use of the Enerplug is similar to the use of other microloggers. The real-time display shows :
  - Active power (Watts)
  - Voltage (Volts)
  - Current (Amps)
  - Power Factor (Unit)

Please note that only active power is recorded in memory. The Enerplug-V has the same display but the average voltage values are stored along with the active power.

The green LED flashes when power is measured. The frequency is 1Hz for 60Watts, 10Hz for 600Watts. A 1 Watt load yield one flash every 60 seconds. (i.e. each green LED pulse corresponds to $1/60^{th}$ of a WattHour).

4.4.5 Light logger

The sensor should face the light source. Beware that other light sources and sun cannot reach the sensor. Also make sure that the logger temperature stays low when the light is ON during extended periods of time (especially incandescent lights).

4.5   Transfer the data from the logger to PDA.

During a campaign, you can transfer the recorded data to the PDA for further analysis. The data need to be firstly read using the PDA, and the, transferred from the PDA to a computer.

From the main menu, Tap "Data" to access the DATA menu.

Data COM Serial Number : 01040056 Start Date : Period : 26/07/08 12:24:00 1 min Data stored : 4228 Free Memory : 93% [Read Data] [Start a new Campaign] [Back]	In the DATA menu, you can visualize how many data were stored. To upload the data, Tap "Read Data"
Transmission COM File name : ML0000 Progress : 0% [CANCEL] [START]	A file will be prepared whose name is automatically determined : MLxxxx.pdb with the number xxxx increasing starting from 0. Tap "START" to start data transfer.
Transmission COM File name : ML0000 Progress : 60% [CANCEL] [START]	During transmission, the progress is indicated. If very few data were recorded, the transfer is so fast that the PDA immediately returns to DATA menu. In case of bad communication, transfer stop and you are prompted if you want to cancel or try again
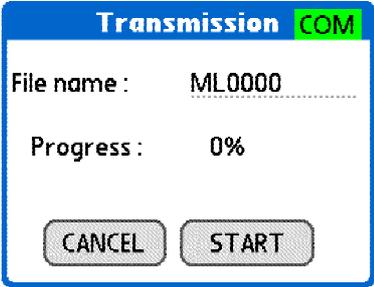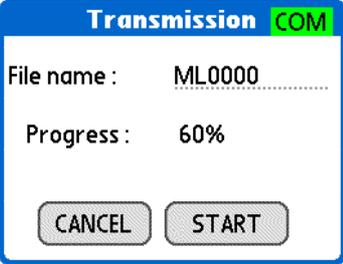
During Data transfer, it is recommended to keep a short distance between the PDA and the logger (and again, to keep all other loggers away).

4.6 Replacing the battery

The loggers use 3Volts CR2032 lithium batteries. It is strongly advised to keep a record of the battery change date in order to make sure the autonomy of the logger is sufficient.

When using the PDA, the main menu warns you when the battery is either low or very low (in which case, you need to replace the battery urgently).

To replace the battery, open the enclosure (For the Enerplug, you have to **remove the plug from the grid** before). The (+) of the coin battery is on top of the printed circuit board.

5 DATA FILE DOWNLOAD

After download, the data files are stored in the PDA memory as databases (with default name MLxxxx.pdb). These database are automatically transferred to the PC during HotSynch (refer to your PDA documentation) :

- Install Palm Desktop on the PC.
- Plug the USB cable to the PC and to the PDA.
- Turn on the PDA.
- Make sure the Palm Desktop software is started.
- Click the « HotSync » button (Star)

The databases are by default located in :
C:\program files\palmone\name_of_the_PDA\backup

C:\program files\palmone: installation directory of the Palm DESKTOP software.
Name_of_the_PDA: is the name you have to input at first Hotsynch to the PC with the PDA.

Another option is to use a memory card to transfer the MLxxxx.pdb files to a PC, using a card reader on the PC side.

6 DATA FILES TREATEMENT

First install CRELOGGER1.EXE on your personal computer (under windows O.S). Backup the database in your database directory (recommended). Launch CRELOGGER1.
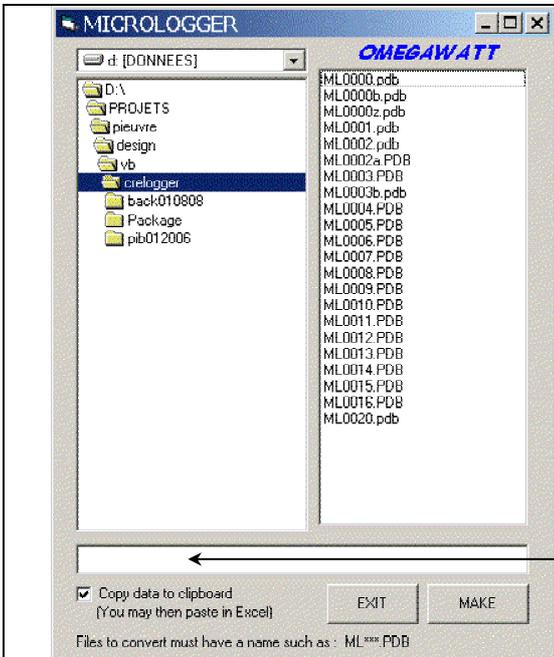
Select the file to convert :
  MLxxxx.PDB

Click « Make»

Wait until « Done » appears in the state bar.

CRELOGGER1.EXE creates a text file named ML1.TXT (and overrides the previous one…). The file format is :

Fichier	ML0022	File name
Thermomètre	01040033	Logger SN
Date	°C	

16/03/05 18:53:00	24.3
16/03/05 18:54:00	24.2
16/03/05 18:55:00	24.2
16/03/05 18:56:00	24.1

Values

Data are separated with tabulations. Importing this kind of files in a spreadsheet like Excel is straightforward. (Just Copy/Paste)

For some loggers, there are two columns (For instance for Temp/Hygro and Enerplug-V).

When the check box "Copy data to Clipboard" is checked, you can directly paste the measurements in an Excel Sheet right after the "Done" appears in the state bar. (i.e. you do not need to open ML1.TXT and copy all data to the clipboard manually)

Recommendations
- Proper organization of measuring campaigns requires time and rigor. Make sure you have :
    - A good time reference (so as to adjust the time on your PDA)
    - A paper list of sensors with information (Serial Number / Where it is installed / When measurements are started / Last battery change date / Remarks)
    - A charged PDA (IRDA is energy consuming. You should keep the PDA charger nearby, just in case.)
    - Preferably a Laptop to transfer the data from the PDA (in case the PDA does not have a Memory Card)
    - Read your PDA manual (you need to be familiar with using the PDA)
- When communicating from a PDA to a logger, keep **all other loggers away.** They might interfere with infrared communication. This is especially true during setup and download phases.
- Get familiar with the loggers and communication in the lab before doing a real campaign on site. Check that downloaded data are OK.
- Keep the loggers away from fluorescent lights. CFL generate high frequency light pulses that may keep the logger IRDA communication awake and thus consume much more power than usual. The infrared window of the loggers should never directly face a CFL, or if so, there should be at least 5 meters in between. This is also true for fluorescent tubes with electronic ballasts;

Tips to use the PDA :
- Shut down the PDA when you do not use it. Infrared communication is energy consuming – especially when the communication with a logger is not established (the PDA constantly sends IR pulses in order to wake the logger).
- Backup regularly the data to a PC (hot synch). Most PDA have volatile memory (i.e. memory is lost when battery is fully discharged !)
- Cleanup the PDA memory before it is full. The use of "fileZ" or other such file browser software is recommended. It also facilitates transfer of files between the PDA and the memory card (when available).

Reference Conditions :
Ambiant temperature : +23°C +/-5°C
Relative humidity : < 80 %
Display : remote on a digital assistant (Palm compatible)
Display refresh rate : 0.5 to 1Hz
Recording period : 1 second to 1 hour
Supply : via any of the measurement phases.
Consumption : <1W

Electrical safety :
CAT II 250 V. Max overvoltage : 4 kVca
Electromagnetic compatibility : CE (CEI 61236-1, CEI 61236/A1)

Environnemental conditions :
Service temperature 0°C to +40°C
Storage temperature –10°C to +60°C (without battery)
Relative humidity 80 % maximum, not condensing
Altitude 2000 m maximum
Mecanical : IP 20

Dimensions :
Enerplug : L x h x l : 84 mm x 25 mm x 50 mm. Weight 350g (incl. wires)

Temp/Hygro Accuracy:

Refer to SHT15/75 graphs below.
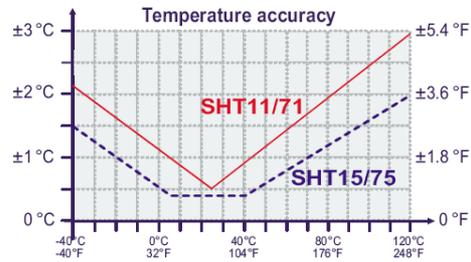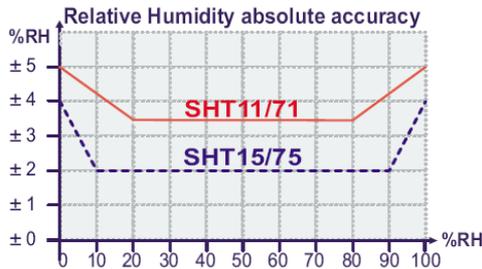
7 COMPATIBILITY LIST

The PDA software was designed to be compatible with most Palm OS based PDA. But due to differences in Infrared hardware, there might be some issues with certain PDA.

The software have been tested with the following devices :

Device	Software required	Remark
Palm Tungsten Tx	ML1.prc	
Palm Tungsten E2	ML1.prc	
Palm Zire 72	ML1.prc	
Palm Zire 72s	ML1.prc	
Palm Zire 22	ML1.prc	
Palm Tungsten T	ML2.prc	Special software
Palm Tungsten E	ML2.prc	Special software
Palm OS 4.0	ML1BW.prc	Black and white screen

Know issues with Palms PDA :
Due to the large variety of PDA, collection of user's software and number of different logger setups, it was impossible to test every single combination.

From time to time, a few bugs might appear on the PDA and the user should be familiar with simple restoration function. Generally, a soft reset (push a small button at the rear of the device) solves the issue.

- Zire 22 : It has been observed that after using ML1 on Zire 22, it may be difficult to receive files from another PDA using Infrared Beaming. Beaming from the Zire 22 is still possible. A soft reset (button at the rear of the Palm) also solves this issue.