IntMobil 3.0

MoData2 - Software for Intensive Measurement

Manual

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1. Installation

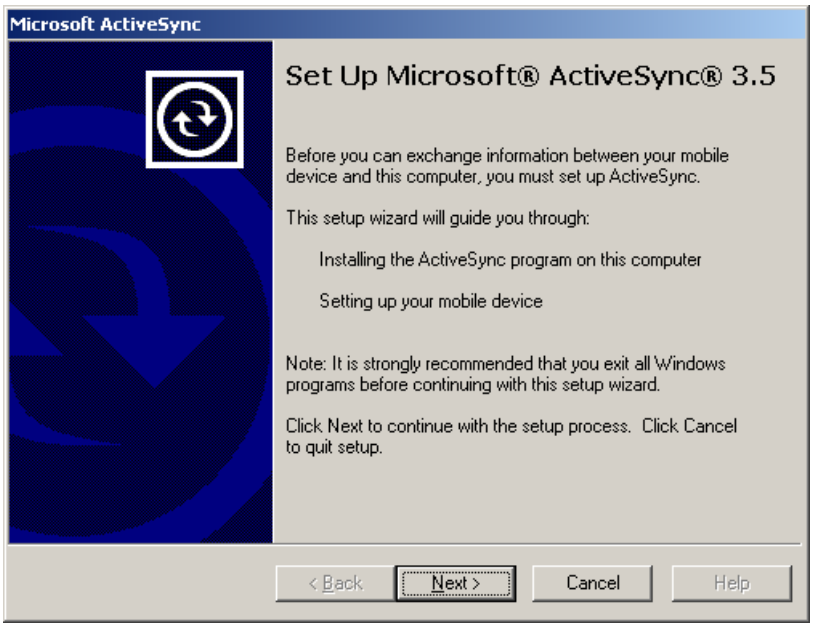
1.1 Installation of ActiveSync

To implement the data exchange between the MoData2 computer and your PC via the serial interface, it is vital to install Microsoft's "ActiveSync" software on your PC.

The "**ActiveSync\English**" directory on the IntMobil CD contains the English installation file "msasync.exe".

Microsoft offers the most current ActiveSync version for free downloading on the Internet, for instance version 3.7.1 at:

www.microsoft.com/windowsmobile/resources/downloads/pocketpc/activesync37.mspx



After the installation of ActiveSync and the establishment of a "partnership", the MoData2 will be set up as an additional drive with write and read access on your PC.

With ActiveSync you may not only import your data from and export it to the MoData2 computer, but you may also install new software on it.

1.2 New configuration of the MoData2 computer

The MoData2 computer will always be completely configured before delivery for you to be able to start measuring directly after having unwrapped the device.

The computer, however, loses its configuration and additionally installed software after approximately three weeks without battery charging.

After a deep discharge or a hard reset (see Chapter 1.5.2) only the actual operating system of the computer and office programs are available. In this case, additionally installed software (e.g. IntMobil or NaMobil) has to be re-installed.

The following steps must be taken after a deep discharge or hard reset:

1. Perform the basic configuration.
2. Put the Windows desktop in order.
3. Configure the system control either manually or automatically.
4. Install additional software (e.g. IntMobil or NaMobil).

The CF card

The MoData2 computer is equipped with a "compact flash card" (CF card). Files and installation packages can be stored on a CF card, which won't lose any data in case of a deep discharge or hard reset.

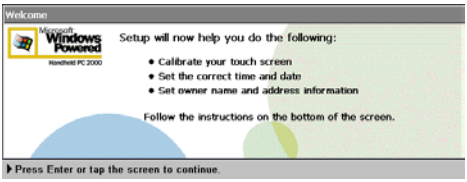
Chapter 1.2.2 "Automatic configuration with the CF card" describes how to configure the system control by means of the CF card.

Chapter 1.3.2 explains how to install the "IntMobil" software with the "**IntMobil_30.cab**" installation package directly from the CF card without a PC connection.

1.2.1 Basic configuration

Connect the MoData2 computer to the battery charger to charge the computer battery and to be able to switch on the MoData2 computer. Activate the MoData2 computer by pressing the red key (in the middle of the top row of keys) and wait a few seconds until the screen displays data.

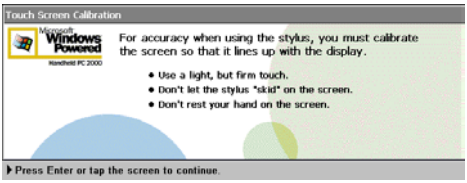
The computer's battery-charge lamp blinks to indicate the charging operation, and the Windows setup welcome display appears:



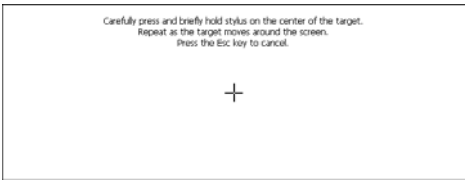
Press the <**Enter**> key or tap the screen to start the screen's calibration.

Screen calibration

The instructions for calibrating the touch screen appear:



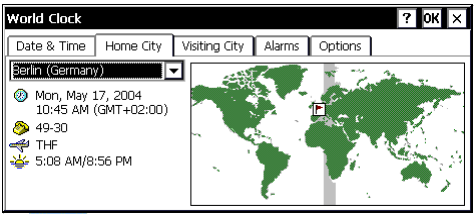
Read the instructions carefully and follow the notes on calibrating by means of the target and stylus.



The screen's calibration is necessary for the MoData2 computer to be able to precisely recognize the position of each of the stylus's touches on the screen.

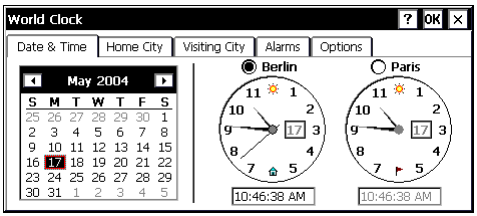
Adjusting the world clock

After the screen calibration has been finished, the "**World Clock**" dialog with the "**Home City**" tab appears:



For instance, select the city of "**Berlin**" or any other town located near your hometown.

Then click on the "**Date & Time**" tab using the stylus and set the date on the calendar.

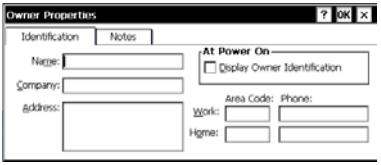


Set the current time on the left clock by "turning" the minute hand on the clock face with the stylus or by directly entering the time in the field underneath via the MoData2 keyboard.

To finish your entry, click the "**Next**" button on the bottom right side of the screen. Date, time and home city are set correctly now.

Adjusting the owner properties

The "**Owner Properties**" are shown next:



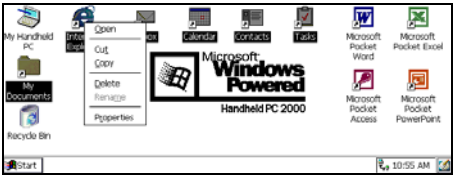
You may enter your name and other contact information in this display. If you activate the "**Display Owner Identification**" box, your contact information will be shown each time the MoData2 computer is switched on.

Click the "**Next**" button on the bottom right side of the screen and close the setup by clicking "**Done**".

The Windows desktop appears on the screen:

As the desktop symbols "**Tasks**", "**Internet Explorer**", "**Contacts**", "**Calendar**", "**My Documents**" and "**Inbox**" are unnecessary and just take up useful space on the screen, they can be deleted.

Mark the above mentioned symbols one after the other with the stylus while keeping the <**Ctrl**> key pressed. Then release the <**Ctrl**> key. Keep the <**Alt**> key pressed. Click one of the marked symbols. A menu box opens up next to the clicked symbol:



Release the <**Alt**> key and click "**Delete**". After you have answered the confirmation enquiry by clicking the "**Yes**" button, the symbols will be shifted from the desktop into the recycle bin.

The Windows desktop appears without the unnecessary symbols:

To gain space for new symbols drag the "**My Handheld PC**" symbol to the bottom left corner using the stylus.

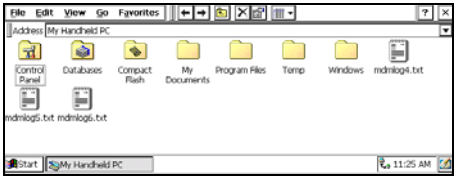
The Windows desktop is now perfectly arranged:

At this stage, the MoData2 computer is basically configured, but the configuration of the system control, e.g. for the backlighting and ActiveSync, and the installation of additional software (e.g. IntMobil or NaMobil) still have to be accomplished.

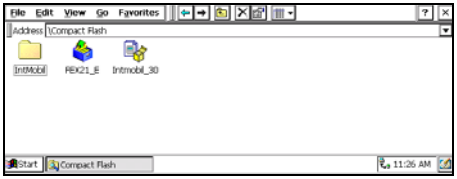
1.2.2 Automatic configuration with the CF card

The "**fex21_e.exe**" backup file containing the system control configuration is pre-installed on the CF card in the MoData2 computer and can be started from there via the "**Windows Explorer**".

Start the "**Windows Explorer**" via **Start** -> **Program Files** -> **Windows Explorer**.

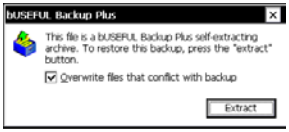


Double-click the "**Compact Flash**" symbol. The files and folders of the CF card appear:



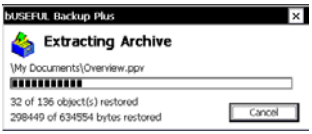
Start the configuration from the CF card by double-clicking the self-executing "**FEX21_E**" backup file.

The start dialog of the backup program appears:

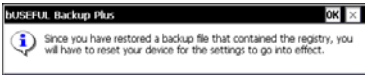


Activate the "**Overwrite files**" box and click the "**Extract**" button afterwards.

While the archive is being extracted, the settings of the MoData2 computer are overwritten with the correct configuration:



After the backup archive has been extracted, a note indicates that a soft reset needs to be carried out for the changes to go into effect:



Perform the soft restart as described in Chapter 1.5.1. Afterwards, you may install additional software (e.g. IntMobil 3.0 or NaMobil 3.0).

1.2.3 Manual configuration without the CF card

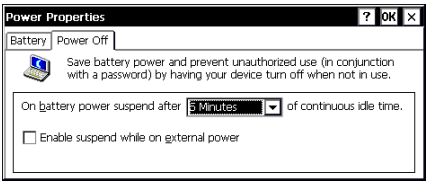
If there is no CF card installed in the MoData2 computer or if you don't find the "**fex21_e.exe**" configuration file on the CF card, you have to perform the system control configuration manually.

Select the system control via: "**Start**" -> "**Settings**" -> "**Control Panel**":

Make the following adjustments in the system control:

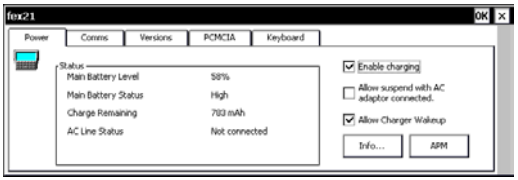
Power Properties, "**Power Off**" tab

On battery power suspend after:	5 minutes
Enable suspend while on external power:	Off



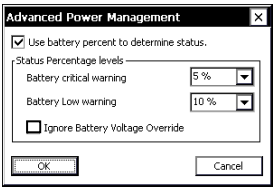
fex21, "**Power**" tab

Enable charging:	On
Allow suspend with AC adaptor connected:	Off
Wakeup:	On



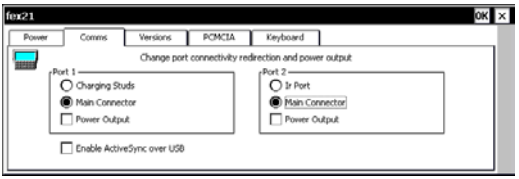
fex21, "**APM**" dialog

Use battery percent to determine status:	On
Battery critical warning:	5 %
Battery low warning:	10%
Ignore battery voltage override:	Off



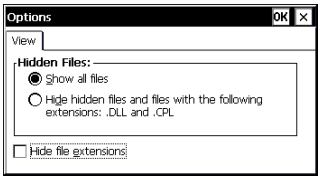
fex21, "**Comms**" tab

Port 1 Main Connector	Active
Port 1 Power Output	Off
Port 2 Main Connector	Active
Port 2 Power Output	Off
Enable ActiveSync over USB	Off



Options, "**View**" tab (via Start -> Settings -> Control Panel -> View -> Options)

Show all files:	Active
Hide file extensions:	Off



1.3 Installation of IntMobil 3.0

To be able to perform intensive measurements with the MoData2 computer, you have to install the IntMobil 3.0 software on the MoData2 computer.

For this, you receive together with the IntMobil 3.0 software a CD containing an installation package and the complete setup program.

"**IntMobil_30.cab**" is the name of the installation package for intensive measurements.

If the software has been delivered together with the MoData2 computer, the CF card installed in the MoData2 computer contains a write-protected copy of the installation package.

The installation package on the CF card can be used for quickly installing the software without a PC connection, for instance on site.

Chapter 1.3.2 describes the installation of the CF card.

1.3.1 Installing IntMobil 3.0 from the CD

A prerequisite for the installation of IntMobil 3.0 from the CD is the correct installation of ActiveSync on your PC, as described in Chapter 1.1, and the correct configuration of the system control, as described in Chapter 1.2.

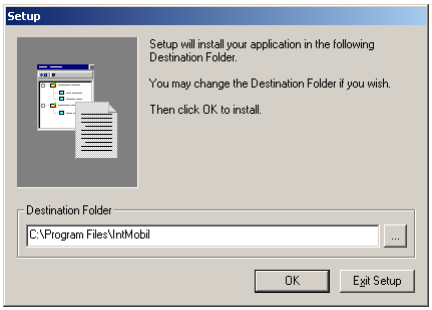
Connect the MoData2 computer to your PC via the transfer cable.

If ActiveSync does not start the connection from the PC to MoData2 automatically, check the ActiveSync settings on your PC and start the connection manually from MoData2 via "**Start**" -> "**Programs**" -> "**Communication**" -> "**PC Link**".

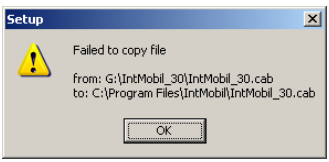
To install software from the CD, a "guest logon" is sufficient.

For installing IntMobil 3.0, start the "**Setup.exe**" file from the CD in the "**IntMobil_30**" directory.

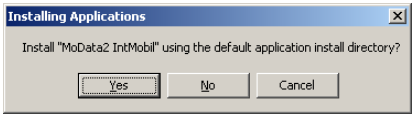
A request to select the destination folder for the installation appears on the PC screen:



Note
Please pay attention to the fact that there must not be a write-protected version of "**Intmobil_30.cab**" in the PC directory "**C:\Program Files\IntMobil**". If necessary, delete this file as otherwise the installation will be aborted and an error message will be displayed.

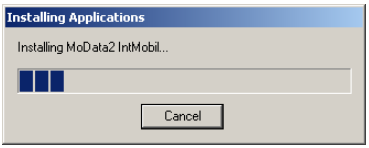


The installation package will be copied to the proposed directory (here: "C:\Program Files\IntMobil") first and then transferred to and installed on the MoData2 computer. A question about the installation directory on the MoData2 computer follows:



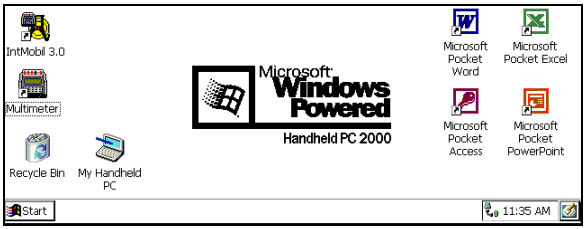
Confirm the directory by clicking "**Yes**".

ActiveSync then transfers the "**Intmobil_30.cab**" installation package to the MoData2 computer and shows the progressing installation on the PC screen:



After the transfer of the installation package and automatic installation, you will be asked to check the screen of the Modata2 computer for further necessary steps:

Click the "**OK**" button. The Windows desktop shows the two installed programs "**IntMobil 3.0**" and "**Multimeter**":

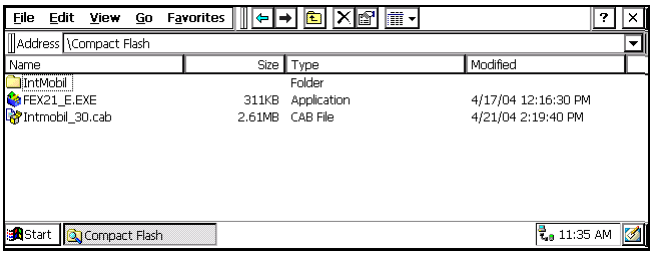


The installation of IntMobil 3.0 is complete.

1.3.2 Installing IntMobil 3.0 from the CF card

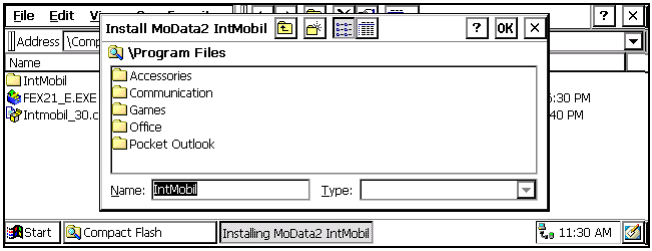
The "**Intmobil_30.cab**" installation package stored on the CF card enables you to install the IntMobil 3.0 software directly on the MoData2 computer without a PC connection.

To install from the CF card, you have to invoke the directory of the CF card named "**Compact Flash**" via the **Windows Explorer** or via "**My Handheld PC**":



Start the installation by invoking the "**Intmobil_30.cab**" file.

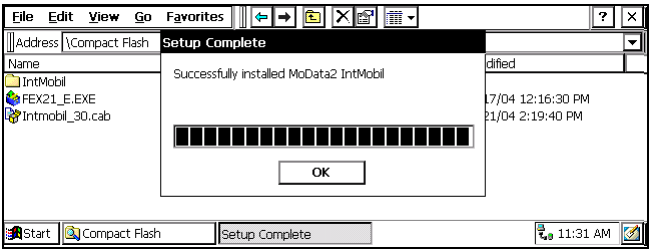
You will then be requested to enter the desired directory for the installation:



Confirm the suggested "**IntMobil**" directory for the installation.

The MoData2 computer then installs the IntMobil 3.0 software in the "**Program Files \ IntMobil**" directory.

After the installation has been successfully completed, the screen shows a corresponding note:



Click the "**OK**" button and close the Windows Explorer.

The Windows desktop shows the two installed programs "**IntMobil 3.0**" and "**Multimeter**":

The installation of IntMobil 3.0 is complete.

1.4 Software updates on the Internet

To ensure that the MoData2 computer always works with the most current intensive measurement version, you will find the respective version of the "**IntMobil_30.cab**" installation package on the homepage of Weilekes Elektronik at:

http://www.weilekes.de/english/download/edownload_index.htm

or directly as file link at:

http://www.weilekes.de/Download/Deutsch/Intmobil_30.zip

After having downloaded the "**Intmobil_30.zip**" file, you have to extract the file (e.g. using the "WinZip" software), provide the "**Intmobil_30.cab**" file with a write protection and copy it to the CF card of the MoData2 computer. You can directly write on the CF card via a transfer cable using the Windows Explorer and ActiveSync; you don't have to remove the CF card from the MoData2 computer for this.

After having copied the "**Intmobil_30.cab**" to the CF card and having provided it with a write protection, proceed as described in Chapter 1.3.2 "Installing IntMobil 3.0 from the CF card".

You may safely overwrite an existing installation of IntMobil 3.0 with a new, more current installation.

1.5 Resets

There are two ways of resetting available for the MoData2 computer to return to a defined state after a breakdown or malfunction: soft and hard resets.

1.5.1 Soft reset

With a soft reset the MoData2 computer can be set back to a defined initial state after the keyboard has blocked or a program has crashed.

To perform a soft reset, you have to simultaneously press the two keys for the intensity control (to the left of the red ON key) with the computer being switched on. After a few seconds the display illumination goes out. Release the two keys.

The fex21 computer then performs a soft reset. The "Husky fex21" symbol appears briefly on the screen, being followed by the usual Windows desktop.

1.5.2 Hard reset

A hard reset deletes all settings, data and installed software on the MoData2 computer. The MoData2 computer will be reset to the original delivery state as set by the computer manufacturer.

To perform a hard reset, you have to simultaneously press the two keys for the intensity control (to the left of the red ON key), the red ON key and the (+) key of the display illumination for more than about 6 seconds with the computer being switched on. Afterwards you may release the four keys and switch on the computer with the red ON key.

The fex21 computer then performs a hard reset. The "Husky fex21" symbol appears briefly on the screen, being followed by the introduction for the Windows setup.

Proceed as described in Chapter 1.2: "New configuration of the MoData2 computer". Afterwards you may install the software as described in Chapter 1.3.

2. Measuring Methods

2.1 Measuring methods of IntMobil 3.0

The "IntMobil" program allows intensive measurements according to four different methods:

- 2-electrode method
- 3-electrode method
- Adding-up method
- IFO method

The integration of these four measuring methods into one software ensures the availability of optimum solutions for each individual measurement.

These four different measuring methods and their differences will be explained in detail hereafter.

2.2 Method: IFO

IFO (Intensive Fault Location) is preferentially being used with new pipelines with intact coatings and a relatively small number of defects.

IFO only serves to detect faults and does not allow measuring potentials. For checking the potential at a test point during the IFO measuring, it is necessary to switch to the 2-electrode method.

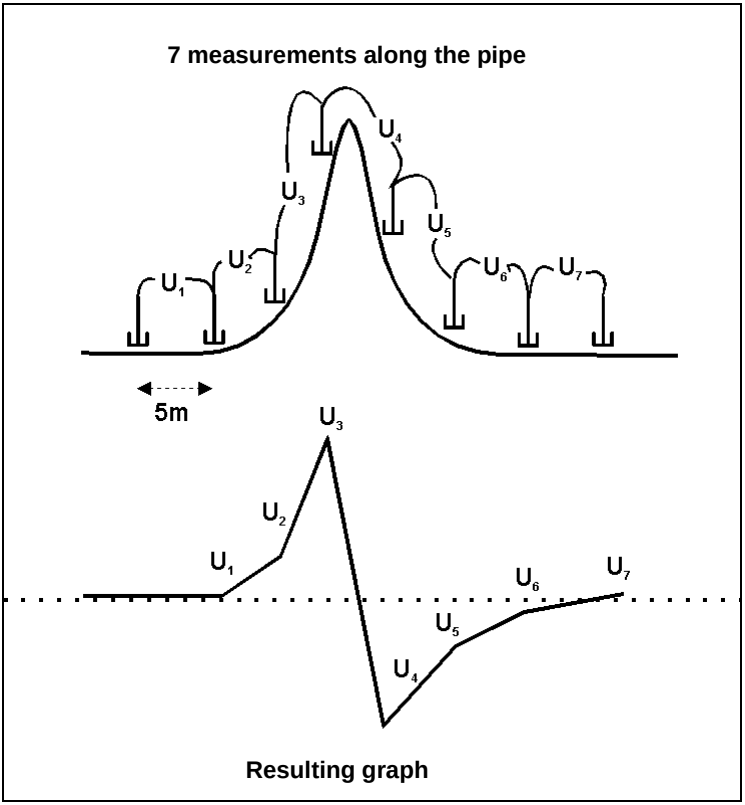
In order to optimize the measurement of even the smallest voltage differences, it is common habit to increase the feeding current of the rectifier while measuring with the IFO method, which produces a more negative potential.

Description of the measuring method

The IFO method measures the on- and off-voltage drops along pipelines. For this, two electrodes are placed at ground level along the line at distances of 5 or 10 m. The standard step size is 5 m, i.e. both electrodes will be shifted by another step (of 5 m) in the measuring direction after each measurement has been completed.

For an evaluation of the values of the IFO measurement, the difference between the measured on- and off-voltages will be compared. An increment of the voltage differences followed by a reversed polarity indicates a likely defect location.

2.2.1 Symbolic demonstration of an IFO measurement

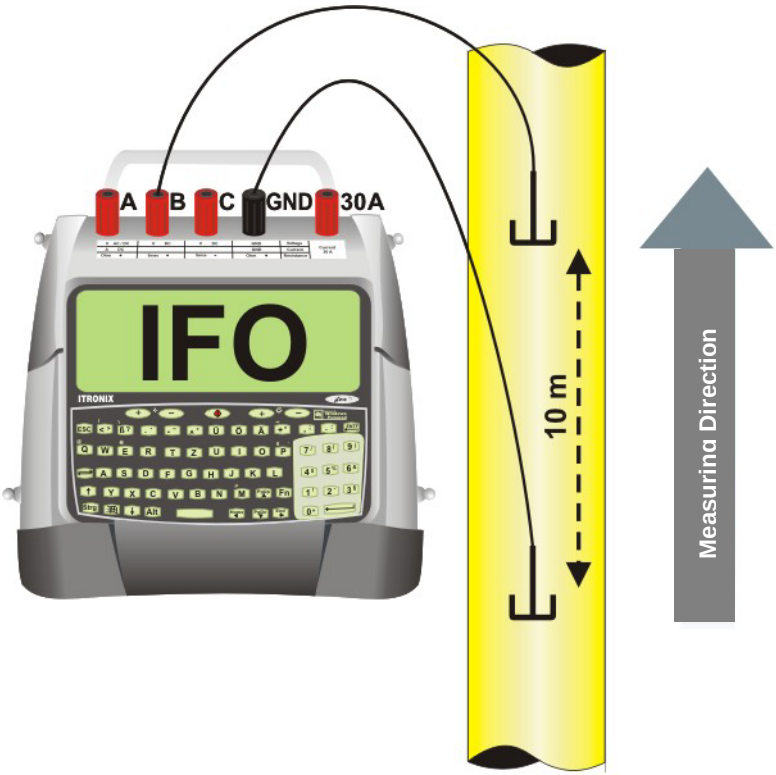


Note regarding the electrode placing

Selecting a distance of 10 m between the two moving electrodes offers advantages when measuring small voltage drops. A distance of 5 m, however, allows to determine the absolute voltage gradient by simply adding up the voltage drops measured.

2.2.2 Measuring array: IFO

The measuring array for the IFO measurement is very simple to implement: Just connect terminal channel B and the ground to the 2 electrodes used.



2.3 Method: 2-electrodes

This method is definitely the most frequently applied one for intensive measurements.

The switching-on and -off potentials as well as the values of the respective voltage gradients are measured at each individual measuring point.

The measuring of the on- and off-potentials is performed by means of a direct connection of the measuring contacts, while the measuring of the on- and off-voltage gradients takes place at a 90-degree lateral angle at a minimum distance of about 5 to 10 m to the pipe axis. To ensure a reliable comparison of the voltage gradient values, the measurement has to take place at a constant lateral distance to the pipeline.

Advantages of the 2-electrode method

Since this direct way of collecting measuring values does not require any adding up, it is very easy to perform from the measuring technique point of view.

Disadvantages of the 2-electrode method

As this method requires a direct connection to the test point it possibly requires rather large cable lengths, i.e. at least half of the distance between the two test points.

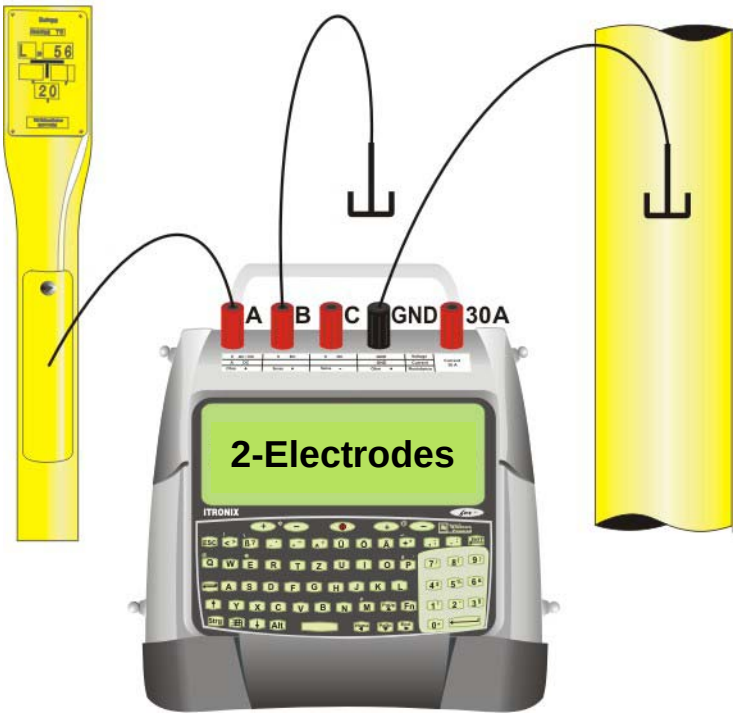
Moreover, taking the lateral measurements of the voltage gradients requires a constant and relatively large distance to the pipeline axis (about 10 m), which means that difficulties may arise in uneven terrain or built-up areas.

2.3.1 Measuring array: 2-electrode method

Applying this method requires a proper connection to the test point. For measuring potentials, channel A of the MoData2 multi task converter (MTC) is to be linked with the test point.

The lateral measuring electrode is to be connected to channel B of MoData2.

The reference electrode being directly on top of the pipe axis is to be connected to the black ground terminal of the MTC.



2.4 Method: 3-electrodes

The 3-electrode method constitutes an extension of the 2-electrode method. In contrast to the latter, the 3-electrode method allows measuring two voltage gradients symmetrically along both sides of the pipe axis.

The MoData2 system thus allows the calculation of IR-free potentials according to the so-called “extrapolation method” by measuring the potential and the two voltage gradients on the left and right sides of the pipe exactly simultaneously.

Advantages of the 3-electrode method

This method offers considerable advantages when evaluating intensive measurement data of parallel pipelines. Interfering external voltage gradients on one side of the pipe axis can be suppressed during the evaluation of the measurement data thus allowing a more realistic data evaluation.

Frequent use is being made of the 3-electrode method when re-measuring pipe locations that have been detected earlier with the IFO method as being flawed. The measurement of the left and right side voltage gradients combined with a calculation of the IR-free potential allows in most cases a more precise assessment of the cathodic protection at the flawed pipe spots than it would be the case with other measurement methods.

Disadvantages of the 3-electrode method

The voluminous measuring array requires a relatively large number of staff to operate the system. The double-sided measurement of the voltage gradients at the largest possible and constant electrode distance (e.g. 20 m between the left and the right electrode) leads in difficult terrain to a slow daily progress.

2.4.1 Measuring array: 3-electrode method

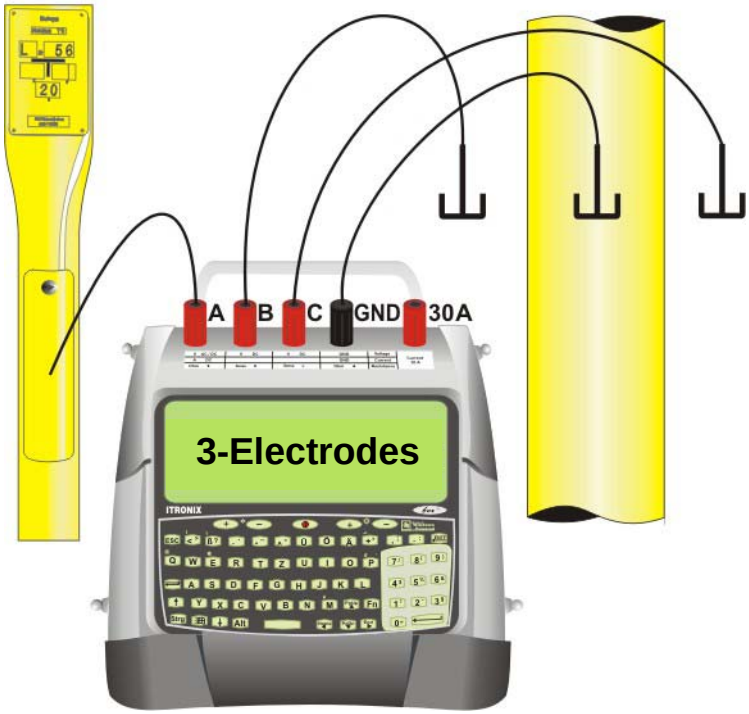
Applying this method requires a proper connection to the test point.

For measuring potentials, channel A of the multi task converter (MTC) is to be linked with the test point.

The lateral measuring electrodes are to be connected to channels B and C of the MTC.

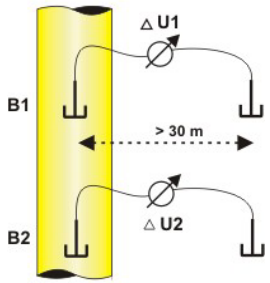
The reference electrode being directly on top of the pipe axis is to be connected to the black ground terminal of the MTC.

It will be sensible to compensate electrode differences to ensure a reliable calculation of the IR-free potential.



2.5 Method: Adding-up

The adding-up method allows to easily perform longitudinal voltage measurements and a subsequent calculation of potentials and voltage gradients.
The adding-up method is based on the assumption that the voltage between two reference electrodes being installed on "remote ground" is more or less 0 mV. This means that, for instance, during a voltage gradient measurement the position of the laterally mounted reference electrode is of no importance as long as it is installed on "remote ground" only.



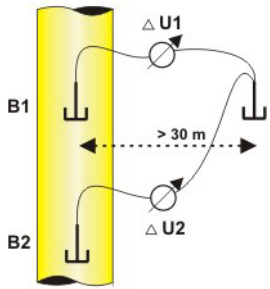
Mathematically expressed:

[**1**] $U_{A1} - U_{A2} = 0$
[**2**] $U_{A1} = U_{A2}$
(considering remote ground!)

Thus:

[**3**] $U_{B1} - U_{A1} = U_{B1} - U_{A2}$
[**4**] $U_{B2} - U_{A2} = U_{B2} - U_{A1}$

The laterally positioned reference electrode may be installed on remote ground at will.



Assumption:
[**5**] $\Delta U_1 = U_{B1} - U_{A1}$
[**6**] $\Delta U_2 = U_{B2} - U_{A1}$

resulting in equation (for U_{A1}):
[**7**] $\Delta U_1 - U_{B1} = \Delta U_2 - U_{B2}$
[**8**] $0 = \Delta U_1 + (U_{B2} - U_{B1}) - \Delta U_2$

Thus:
$\mathbf{\Delta U_2 = U_{B2} - U_{B1} + \Delta U_1}$

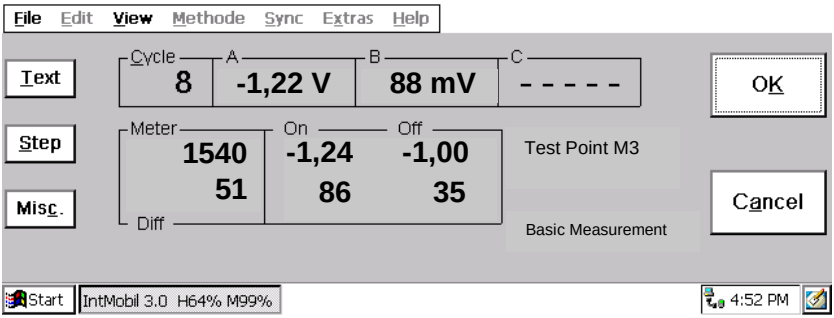
This means that the voltage gradient ΔU_2 can be calculated by taking the differential voltage $U_{B2} - U_{B1}$ (voltage drop alongside the pipeline) and adding ΔU_1 (basic voltage).

The procedure of calculating the potential is similar.

2.5.1 Basic value collection

Prerequisites for any calculation are the so-called "basic values" that are to be collected when commencing the measuring and again whenever further measuring contacts are being reached.

Each time basic values are measured, IntMobil shows "Basic Measurement" beneath the line for the text entry on the display of the current measuring mode.



Basic values are taken by means of the 2-electrode method. Please refer to Chapter 2.3.1 for the measuring array.

Basic values may be taken and calculated at any test point. This results in a higher accuracy of the calculation of further potentials and voltage gradients.

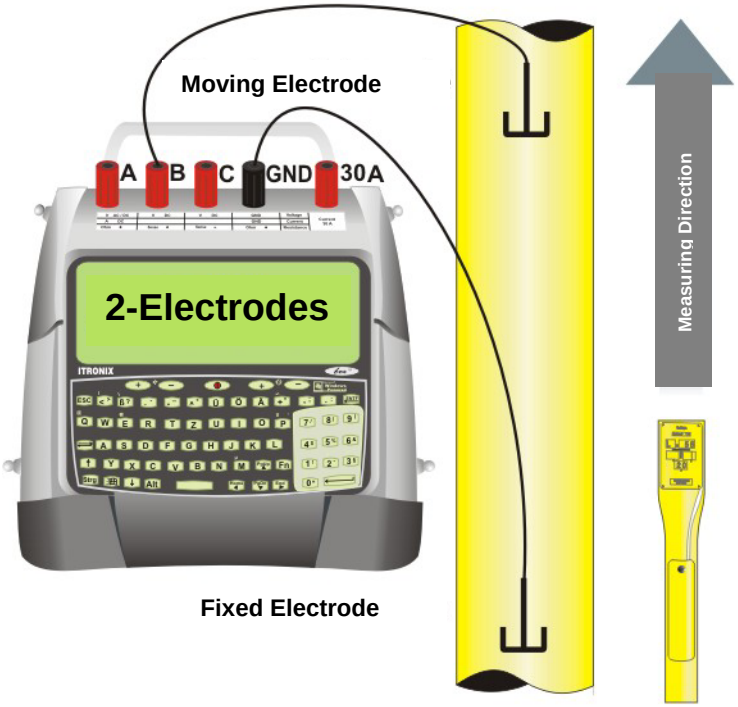
Notes regarding the adding-up method:

When taking basic values at stray current-influenced pipes, problems may arise during the adding-up procedure. The basic values may drift during the intensive measurement thus leading to incorrect values.

Furthermore, it must be noted that upon each electrode shifting larger electrode differences may lead to significant step changes of the voltage gradient and/or potential values. Therefore, keep the number of electrode shifts as small as possible.

2.5.2 Measuring array: Adding-up method

After the measurement of basic values has been completed, the so-called "fixed-electrode" has to be placed exactly where the reference electrode was positioned during the basic measurement of voltage gradients and potentials. The so-called "moving-electrode" has to be placed according to the step size along the pipeline.



After a measurement has been completed, the moving electrode will be repositioned by one step size in the measuring direction along the pipeline.

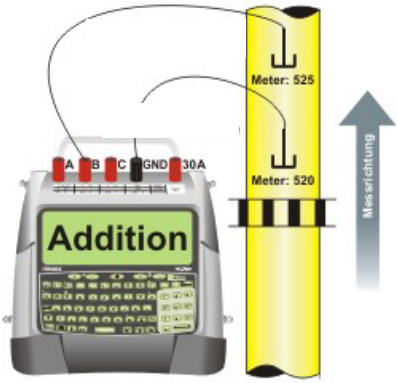
The fixed electrode remains at its location and will only be moved and repositioned after an electrode shift or in the course of a new basic measurement.

2.5.3 Shifting electrodes

The fixed electrode remains positioned during the basic measuring value collection. During the progress of the measuring procedure increasingly larger cable lengths will be required between the fixed electrode and the MTC. If an extension cable is unavailable, the fixed electrode has to be shifted to make further intensive measurements possible.

After the measurement has been completed (at position 520 m), the electrode may be shifted.

The IntMobil has to be informed of such a shift via the "E-Shifting" menu item.



After having shifted the electrode, position the fixed electrode at the point you have just measured (here: 520 m), while placing the moving electrode at step size distance in the measuring direction.

IntMobil stores the latest voltage gradient and potential values measured during the electrode shift and uses these values as new basic values for the addition of measured longitudinal voltages between the fixed and the moving electrode.

Note regarding the shifting of electrodes

Shifting electrodes is not only helpful after the available cable length has been fully used, but also when crossing railway lines or roads.

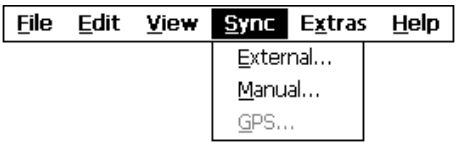
Collect the measuring values beyond the railway line. Afterwards, shift the electrodes as described above with the fixed electrode being positioned beyond the railway line.

Cabling across the obstacle will then be necessary for the period of one measurement only.

3. Synchronization

3.1 Synchronization

By means of the "**Sync**" menu you may synchronize the MoData2 computer with the switching cycle of the cathodically protected pipeline.



We recommend performing a synchronization on each new measuring day before the first data acquisition.

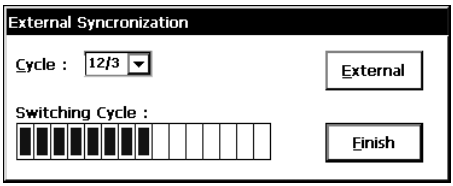
The internal clock of the MoData2 computer allows a deviation of ± 0.25 s without re-synchronization over a period of 24 hours at an ambient temperature of +10°C to +30°C. A larger deviation may occur in case of extreme temperatures.

The IntMobil 3.0 program offers three synchronization possibilities:

- external synchronization
- manual synchronization
- GPS synchronization

3.1.1 External synchronization

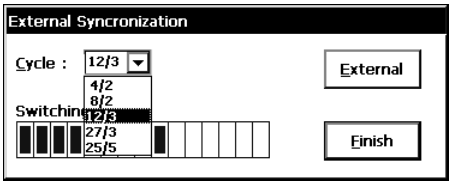
Selecting the "**Sync**" -> "**External**" menu invokes a dialog with a bar chart showing the current cycle position of the MoData2 timer:



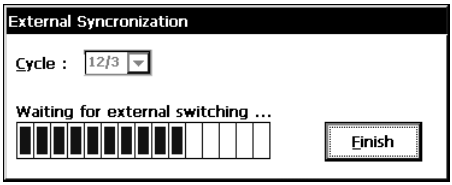
In the example, the MoData2 screen shows the switching cycle 12 / 3 at 8 s after the switch-off edge.

To implement the external synchronization, connect the MoData2 to a potential-free switching contact (e.g. Teletakt-N or MiniTrans) by means of the delivered "**External Synchronization Cable**" via the 5-pole "**Ext. Sync/Relay**" female connector. By means of this cable, the MoData2 is able to detect the opening of the contact by itself and re-synchronize itself.

Select the desired switching cycle by pressing the letter <**C**> (for cycle) or with the stylus directly via the display:

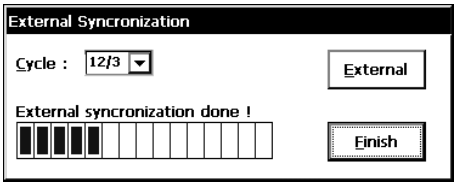


Start the actual synchronization via the "**External**" button or <**E**> key:



The MoData2 computer waits for the external contact to open.

After the synchronization has been accomplished, the following confirmation appears:



Exit the synchronization by pressing the "**Finish**" button or the <**F**> or <**Esc**> key.

Important note:

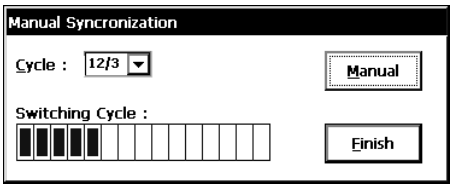
When connecting the MoData2 to a time switch, make sure that there are no other active connections to the potential-free contact. An external voltage may destroy the external synchronization input of the MoData2.

Make sure to avoid an erroneous connection to the switching 230 V- receptacle of a Teletakt-N or Syntakt time switch.

3.1.2 Manual synchronization

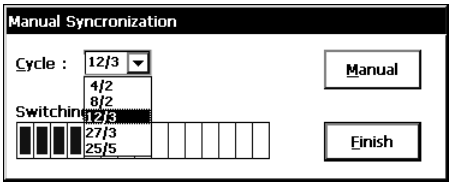
Always synchronize manually when an external or GPS synchronization is impossible.

Selecting the "**Sync**" -> "**Manual**" menu invokes a dialog with a bar chart showing the current cycle position of the MoData2 timer:



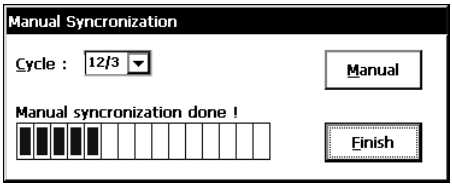
The MoData2 computer in the example shows the switching cycle 12 / 3 at 5 s after the switch-off edge.

Select the desired switching cycle by pressing the letter <**C**> (for cycle) or with the stylus directly via the display:



A multimeter showing clearly the potential value and the switch-off edge is necessary for manual synchronization. In the switch-off moment (the potential changes from the ON to the OFF value) you have to press either the <**M**> or the <**Enter**> key.

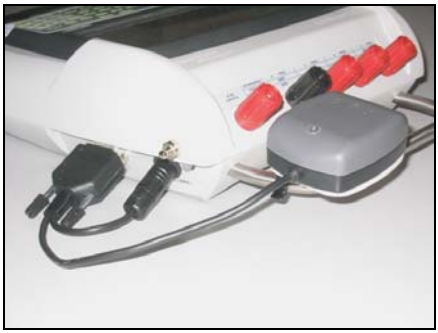
After the synchronization has been accomplished, the following confirmation appears:



Exit the manual synchronization dialog by pressing the "**Finish**" button or the <**F**> or <**Esc**> key.

3.1.3 GPS synchronization

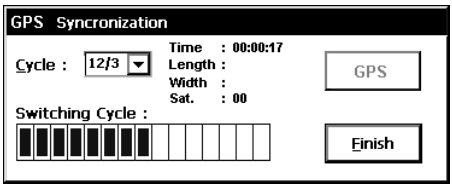
By means of the GPS synchronization you may synchronize the MoData2 without connecting it to a potential-free switching contact. This way you may perform an on-site re-synchronization by means of a GPS receiver at any time without having direct access to a rectifier.



MoData2 computer with connected GPS antenna

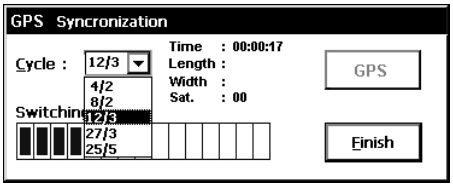
Before starting the synchronization, connect the GPS receiver, which is available as optional equipment, via the circular connector to the "**Charge / GPS**" female connector and via the 9-pole Sub-D male connector to the "**PC / GPS**" female connector.

The selection of the "**Sync**" -> "**GPS**" menu invokes a dialog with a bar chart showing the current cycle position of the MoData2 timer and the status of the GPS receiver:

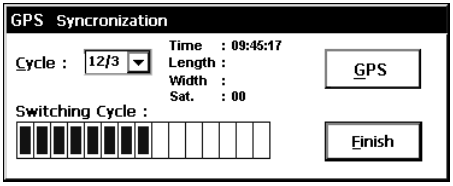


The GPS receiver, which is mounted to the steel bail of the MoData2 computer must be aligned in such a way that a clear view of the sky/horizon is ensured. An interruption of the signal reception due to the erection of buildings etc. must be avoided.

Select the desired switching cycle by pressing the letter <**C**> (for cycle) or with the stylus directly via the display:

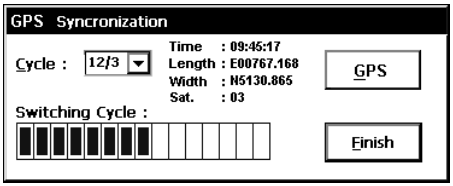


As long as the GPS receiver has not received a valid time signal, the "**GPS**" button remains inactive. As soon as the signal reception is sufficient the MoData2 computer shows the current time after approximately 20 s; the "**GPS**" button becomes active:



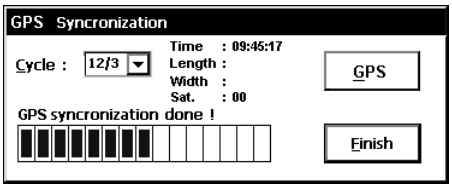
The shown time is the UTC time, which differs by -2 h or –1 h from the CET, depending on whether the current time is the summer or winter time. As only the seconds are used for ensuring a synchronous switching cycle to a time base (e.g. the DCF receiver in the Teletakt-N or MiniTrans), the deviation regarding the hours is unimportant.

After a further period of about 20 seconds to 5 minutes has elapsed and when the reception of GPS positioning data is sufficient, the MoData2 computer shows in addition to the time the GPS position in the WGS-84 with longitude and latitude. At the same time it also shows the number of currently received satellites:



At least 3 satellites must be received to determine longitude and latitude. The reception of 4 or more satellites is necessary for a higher positioning accuracy.

To synchronize the MoData2 computer by means of the GPS receiver, press the <**G**> key. The MoData2 computer synchronizes itself at that moment to the received GPS time and confirms a successful synchronization:



Exit the GPS synchronization dialog by pressing the "**Finish**" button or the <**F**> or <**Esc**> key.

4. Batteries and Charging

4.1 Charging the batteries

The rechargeable lithium ion battery of the MoData2 computer and the rechargeable lead battery of the MoData2 measurement interface are both charged simultaneously via a 4-pole round female connector. The charging connector on the right side of the MoData2 is marked by "**Charge / GPS**".

Use only the battery charger delivered together with your MoData2 or the corresponding external 12 V battery charger.

4.1.1 Charging details of the MoData2 computer

The rechargeable battery of the MoData2 computer is fully charged within about 3 hours.

Important: The MoData2 computer must be switched on for charging!

An orange LED at the bottom right of the MoData2 case indicates the charging status of the MoData2 computer during the charging. This LED flashes regularly during the charging process. After the charging has been finished, the LED is continuously illuminated.

Irregular flashing indicates a charging problem. In this case, ask the manufacturer for information.

Important note:

The rechargeable battery of the MoData2 computer will **not** be charged if the MoData2 computer is switched off or in the "standby mode".

Please make sure that the system control settings for the current supply have been adjusted correctly as described in Chapter 1.2.3.

If the current supply settings in the system control are incorrect, the MoData2 computer does not switch on itself automatically when the battery charger is connected or it switches off after a short period of time. In both cases the MoData2 computer will not be charged.

4.1.2 Charging details of the MoData2 interface

The rechargeable lead battery of the MoData2 measurement interface is completely charged within about 14 hours; however, after a charging time of 6 hours the capacity already amounts to about 70 %.

Green / red charging LED

You may check the charging status of the rechargeable lead battery by monitoring the green/red illuminated LED next to the "Charge / GPS" connector.

As long as the MoData2 measurement interface is inactive, the LED is illuminated in red color during charging. It goes out as soon as the lead battery is charged by 100 %, with the battery charger being connected.

When the MoData2 measurement interface is active, the LED is illuminated in green color when there's no charging or in orange color when the battery charger is connected.

Note:

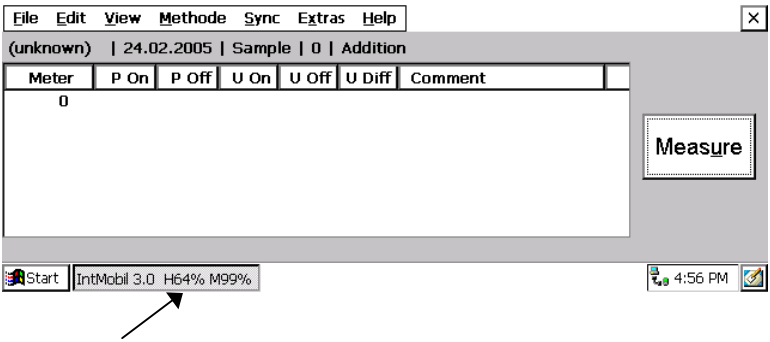
When the MoData2 measurement interface is active (e.g. during a voltage measurement) and the battery charger is connected, only a float charging of the MoData2 takes places.

To charge the lead battery, you have to exit all programs using the MoData2 measurement interface (e.g. "NaMobil 3.0" or "IntMobil 3.0).

4.2 Automatic battery monitoring

The charging status of the lithium ion and lead batteries is shown in the task bar during the operation of the "IntMobil 3.0" and "NaMobil 3.0" programs:

For example:

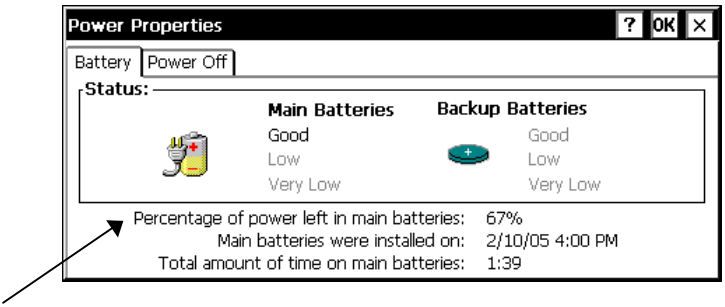


The example shows a charging status of 64 % for the (H)usky lithium ion battery and of 99 % for the (M)oData2 lead battery.

4.3 Manual battery monitoring

You may also monitor the lithium ion battery of the MoData2 computer manually via the: "**Start**" -> "**Settings**" -> "**Control Panel**" -> "**Power**" menu.

The battery capacity is shown as "Percentage of power left in main batteries":



This example shows a battery capacity of the lithium ion battery of 67 %.

4.4 Power consumption and operating hours

MoData2 computer

The MoData2 computer is powered by a 7.4 V / 1,000 mAh rechargeable lithium ion battery.

The average power consumption of the MoData2 computer amounts to about 100 mA when being switched on. When being switched off, the MoData2 computer absorbs about 2 mA for data retention.

MoData2 measurement interface

The MoData2 measurement interface contains a 6 V / 1,300 mAh rechargeable lead-gel battery.

The power consumption of the MoData2 measurement interface varies between 75 mA for voltage measurements and up to 130 mA for resistance measurements.

The operation of a GPS receiver (accessories) absorbs additional 75 mA (type: Holux 210) or 150 mA (type: Fortuna U2).

Overall operating time

The average operating time of the MoData2 amounts to about 10 hours, depending on the measuring method and temperature.

The rechargeable batteries' operating time only lasts 5 hours in case of continuous resistance measurements with a GPS receiver being connected, no matter whether or not the GPS receiver is actively used.

We therefore advise against connecting the GPS receiver when performing resistance measurements in order to extend the batteries' operating time.

5. Technical Data

5.1 MoData2 computer

Type:	Itronix fex21
Case:	Impact-resistant plastic
Size:	190 x 155 x 37 mm (D x W x H)
Weight:	800 g
Ingress protection:	IP 65
Screen:	6.5", 16 grayscale with backlight 640 x 240 pixel, touch screen
Keyboard:	Fluorescent membrane keyboard (waterproof)
Operating system:	Windows Handheld PC 2000
Processor:	Toshiba 129 MHz
Memory:	32 MB
ROM:	32 MB
Interfaces:	2 x 9 pin serial port infrared interface
Modem:	V34 analog (installed)
Current supply:	Rechargeable lithium ion battery with a life of approx. 10 h
Operating temperature:	-10°C to 50°C
Other:	Compact flash card (CF card) 64 MB (installed)

5.2 MoData2 multi task converter

Case:	Plastic
Size:	290 x 260 x 70 mm (D x W x H)
Weight:	2.25 kg (including MoData2 computer)
	7.80 kg (complete system carry case)
Interfaces:	2 x 9 pin serial port 12 V charging socket (with internal isolation) Terminal for synchronization or relay cable
Current supply:	Rechargeable lead battery 6 V / 1.3 Ah with a life of approx. 10 h
Equipment:	MoData2 including Itronix fex21
	Stylus for screen operation External 230 V battery charger Synchronization cable Transfer cable User manual
Options:	System carry case "Sprint" carrying strap for maintenance "Marathon" carrying strap for intensive measurements External 12 V battery charger GPS antenna with integrated receiver

5.3 Measuring ranges and accuracy

The following tables contain details on the available measuring ranges, resolutions and maximum deviations.

5.3.1 DC voltage measurement (Channels A, B and C)

Input impedance: > 10 MΩ

DC voltage attenuation: 16.6 Hz / 60 dB (factor 1,000)
50.0 Hz / 100 dB (factor 100,000)

Measuring range	Resolution	Max. deviation
± 1 V	0.1 mV	± 0.5 % ± 0.5 mV
± 10 V	1 mV	± 0.5 % ± 5 mV
± 100 V	10 mV	± 0.5 % ± 10 mV

No simultaneous measurement of the 3 channels, time difference between channels < 100 m

Measuring range	Resolution	Max. deviation
± 1 V	0.1 mV	± 0.5 % ± 1.0 mV
± 10 V	1 mV	± 0.5 % ± 10 mV
± 100 V	10 mV	± 0.5 % ± 20 mV

Simultaneous measurement of the 3 channels, time difference between channels< 5 ms

5.3.2 AC voltage measurement (Channel A)

Input impedance: > 10 MΩ

Measuring range	Resolution	Max. deviation
1 V eff.	0.1 mV	± 2.0 % ± 1 mV
10 V eff.	1 mV	± 2.0 % ± 10 mV
100 V eff.	10 mV	± 2.0 % ± 50 mV

Frequency range 10 Hz to 120 Hz, cut-off frequency 800 Hz (3 dB)

5.3.3 Micro voltage measurement (Channel A)

Input impedance: > 1 MΩ

Measuring range	Resolution	Max. deviation
± 80000 µV	1 µV	± 0.2 % ± 5 µV

AC voltage attenuation: 16.6 Hz / 60 dB (factor 1,000)
50.0 Hz / 100 dB (factor 100,000)

5.3.4 Current measurement (Channel A)

Measuring range	Int. shunt	Resolution	Max. deviation
± 10 mA	10 Ω	1 µA	± 1.0 % ± 5 µA
± 100 mA	3 Ω	10 µA	± 1.0 % ± 20 µA

AC voltage attenuation: 16.6 Hz / 60 dB (factor 1,000)
50.0 Hz / 100 dB (factor 100,000)

5.3.5 Current measurement (30 A current input)

Measuring range	Int. shunt	Resolution	Max. deviation
± 30 A	0.01 Ω	1 mA	± 1.0 % ± 3 mA

AC voltage attenuation: 16.6 Hz / 60 dB (factor 1,000)
50.0 Hz / 100 dB (factor 100,000)

5.3.6 Resistance measurement

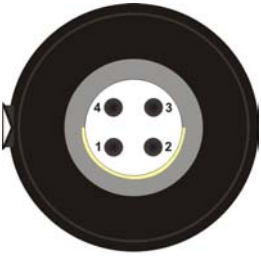
Measuring method : Wenner, 2-pole or 4-pole

Measuring frequency : 128 Hz

Output voltage : max. 2 V eff. 1 K measuring range
max. 10 V eff. 10 K measuring range
max. 10 V eff. 800 K measuring range

Measuring range	Resolution (4-pole)	Max. deviation
1 K	0.01 Ω 0.1 Ω 1 Ω	0.0 Ω - 9.9 Ω ± 1.0 % ± 0.05 Ω 10.0 Ω - 199.9 Ω ± 1.0 % ± 0.50 Ω 200 Ω - 999 Ω ± 1.0 % ± 5 Ω
10 K	10 Ω 100 Ω	0.00 KΩ - 0.99 KΩ ± 1.0 % ± 50 Ω 1.0 KΩ - 9.9 KΩ ± 1.0 % ± 100 Ω
800 K	10 Ω 100 Ω 100 Ω 1 KΩ	0.00 KΩ - 9.99 KΩ ± 1.0 % ± 0.1 KΩ 10.0 KΩ - 99.9 KΩ ± 1.0 % ± 0.5 KΩ 100.0 KΩ - 199.9 KΩ ± 1.0 % ± 1.0 KΩ 200.0 KΩ - 799.9 KΩ ± 1.0 % ± 5.0 KΩ

5.4 Terminal assignment



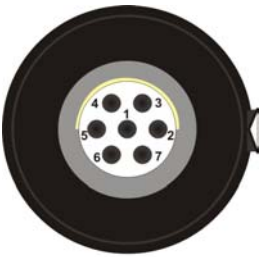
Charge / GPS

1 : Charging voltage GND

2 : Charging voltage + 12 V

3 : GPS supply GND

4 : GPS supply + 5 V



Relay / Sync

2 : Potential-free contact

3 : Potential-free contact

4 : External synchronization

5 : External synchronization