

CPC 80

User Manual



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The product information, specifications, and technical data embodied in this manual represent the technical status at the time of writing and are subject to change without prior notice.

We have done our best to ensure that the information given in this manual is useful, accurate and entirely reliable. However, OMICRON does not assume responsibility for any inaccuracies which may be present.

The user is responsible for every application that makes use of an OMICRON product.

OMICRON translates this manual from the source language English into a number of other languages. Any translation of this manual is done for local requirements, and in the event of a dispute between the English and a non-English version, the English version of this manual shall govern.

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About this manual

This User Manual provides information on how to use the *CPC 80* test system safely, properly and efficiently. The *CPC 80* User Manual contains important safety rules for working with the *CPC 80* and gets you familiar with operating the *CPC 80*. Following the instructions in this User Manual will help you to prevent danger, repair costs, and avoid possible down time due to incorrect operation.

The *CPC 80* User Manual always has to be available on the site where the *CPC 80* is used. The users of the *CPC 80* must read this manual before operating the *CPC 80* and observe the safety, installation, and operation instructions therein.

Reading the *CPC 80* User Manual alone does not release you from the duty to comply with all national and international safety regulations relevant to working on high-voltage equipment.

Safety symbols used

In this manual, the following symbols indicate safety instructions for avoiding hazards.



DANGER

Death or severe injury will occur if the appropriate safety instructions are not observed.



WARNING

Death or severe injury can occur if the appropriate safety instructions are not observed.



CAUTION

Minor or moderate injury may occur if the appropriate safety instructions are not observed.

NOTICE

Equipment damage or loss of data possible

1 Safety instructions

Before operating the *CPC 80*, read the following safety rules carefully. If you do not understand the safety rules, contact OMICRON before proceeding.

Maintenance and repair of the *CPC 80* is only permitted by qualified experts at OMICRON repair centers.

1.1 General

Always observe the five safety rules:

- ▶ Disconnect completely
- ▶ Secure from reconnection
- ▶ Verify that the installation is dead
- ▶ Carry out grounding and short-circuiting
- ▶ Provide protection against adjacent live parts

1.2 Operator qualifications and safety standards

Testing with the *CPC 80* may only be carried out by qualified, skilled and authorized personnel. Before starting to work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on the *CPC 80* must be under constant supervision of an experienced operator while working with the equipment.

Testing with the *CPC 80* must comply with the internal safety instructions as well as additional relevant documents.

In addition, observe the following safety standards, if applicable:

- EN 50191 (VDE 0104) "Erection and Operation of Electrical Equipment"
- EN 50110-1 (VDE 0105 Part 100) "Operation of Electrical Installations"
- IEEE 510 "IEEE Recommended Practices for Safety in High-Voltage and High-Power Testing"

1.3 Operating the measurement setup

Only personnel qualified in electrical engineering and trained by OMICRON are authorized to operate the *CPC 80*. Before starting the work, clearly establish the responsibilities.

Personnel receiving training, instructions, directions, or education on the *CPC 80* must be under constant supervision of an experienced operator while working with the equipment.

The operator is responsible for the safety requirements during the whole test.

- ▶ Do not enter the high-voltage test area if the red warning light of the *CPC 80* is on since all outputs carry dangerous voltage or current.
- ▶ Always obey the five safety rules and follow the detailed safety instructions in the respective user manuals.

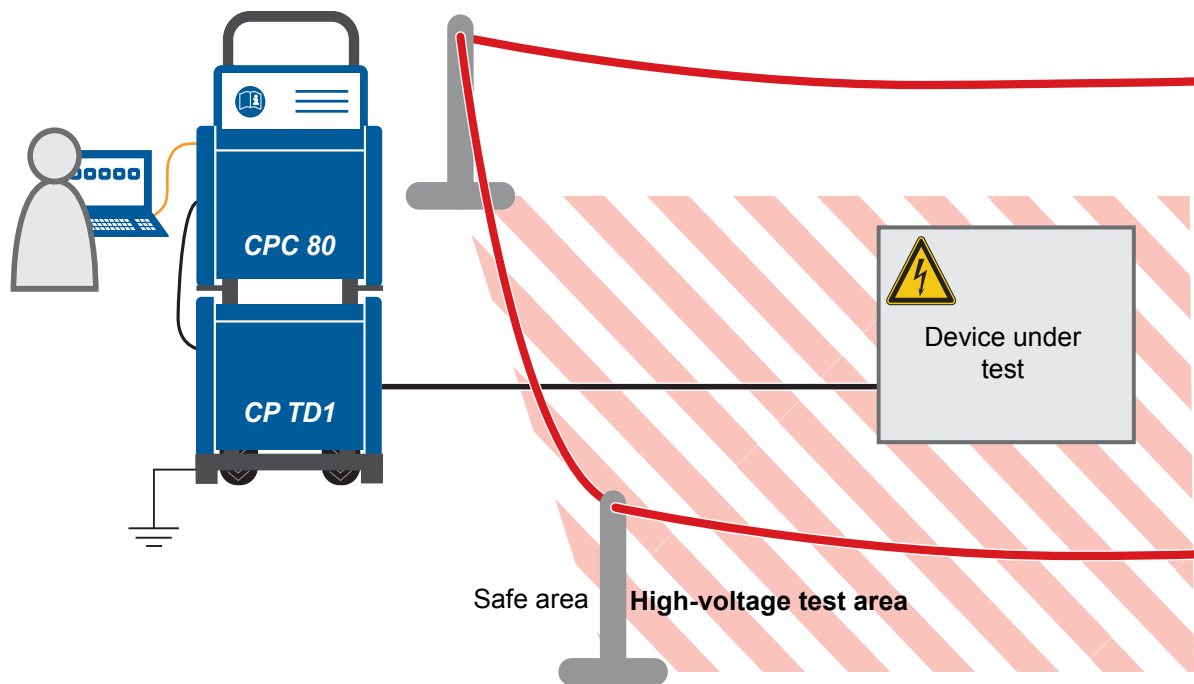


Figure 1-1: Separation of safe and high-voltage test area

Before performing tests using high voltage, observe the following instructions:

- ▶ Only use the test equipment with a good connection to substation ground.
- ▶ Do not insert objects (for example screwdrivers, etc.) into any input/output socket.
- ▶ Do not operate the *CPC 80* under ambient conditions that exceed the temperature and humidity limits listed in 13 "Technical data" on page 90.
- ▶ Only use the *CPC 80* on dry, solid ground.
- ▶ Do not operate the *CPC 80* in the presence of explosives, gas or vapors.
- ▶ Opening the *CPC 80* invalidates all warranty claims.
- ▶ Do not use extension cables on a cable reel. This will cause overheating. Run out extension cables before use.
- ▶ If the *CPC 80* does not seem to function properly, do not use it anymore. Contact OMICRON technical support.

1.4 Orderly measures

The CPC 80 User Manual or alternatively the e-book in PDF format always has to be available where the *CPC 80* is used. It must be read and observed by all users of the *CPC 80*.

The *CPC 80* may be used only as described in 8 "Application" on page 66. Any other use is not in accordance with the regulations.

The manufacturer and/or distributor is not liable for damage resulting from improper use. The user alone assumes all responsibility and risk.

Following the instructions provided in this User Manual is also considered part of being in accordance with the regulations.

1.5 Disclaimer

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

1.6 Static charges

Static charges on bushings or other apparatus such as transformer windings may be induced by test potentials. While the voltage may not be significant enough to do any damage, it can be a source for serious accidents due to falls caused by reflex action.

High static charges may also be encountered at the bushing capacitance taps if the covers are removed. Also, you should use safety grounds before handling.

1.7 Related documents

- Refer to the documents listed below for detailed information about the test systems used with the *CPC 80*.

Title	Description
CPC 100 Reference Manual	Contains detailed hardware and software information on the <i>CPC</i> accessories including relevant safety instructions.
CP TD1 User Manual	Contains detailed hardware and software information on the <i>CP TD1</i> including relevant safety instructions.

1.8 Compliance statement

Declaration of conformity (EU)

The equipment adheres to the guidelines of the council of the European Community for meeting the requirements of the member states regarding the electromagnetic compatibility (EMC) directive, the low voltage directive (LVD) and the RoHS directive.

FCC compliance (USA)

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Declaration of compliance (Canada)

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

1.9 Recycling



This test set (including all accessories) is not intended for household use. At the end of its service life, do not dispose of the test set with household waste!

For customers in EU countries (incl. European Economic Area)

OMICRON test sets are subject to the EU Waste Electrical and Electronic Equipment Directive 2012/19/EU (WEEE directive). As part of our legal obligations under this legislation, OMICRON offers to take back the test set and ensure that it is disposed of by authorized recycling agents.

For customers outside the European Economic Area

Please contact the authorities in charge for the relevant environmental regulations in your country and dispose the OMICRON test set only in accordance with your local legal requirements.

2 Introduction

2.1 Designated use

The *CPC 80* is a control unit based on the *CPC 100* hardware concept. In contrast to the *CPC 100* the *CPC 80* only comes with the booster output. It is not equipped with any inputs or directly usable outputs and therefore intended for use with *CPC* accessories for testing.

Currently the *CPC 80* is used in the following combinations:

- With the *CP TD1* for dissipation/power factor testing
- As slave unit with a *CPC 100* as master
As mentioned above, dedicated accessories are required to allow for dedicated testing. The synchronization of *CPC* devices affects various applications as it allows for increased testing power.

2.2 Installation of the *CPC Toolset*

The *Primary Test Manager* DVD contains *Primary Test Manager*, the *CPC Start Page*, *CPC Excel File Loader*, Excel Templates (for specific applications), *CPC Editor* (to create and edit *CPC 80* test templates), *OMICRON Device Browser*, *CPC 80* Upgrade Packages, Manuals and Application Notes, Foxit PDF Reader (redistributable), *OMICRON News*, and Product Application Videos.

To start the installation:

1. Close all other major programs running on your computer.
2. Insert the *Primary Test Manager* DVD into your computer's DVD drive.

Note: Should the Setup Wizard not start automatically a few seconds after the DVD has been inserted into the DVD drive, launch the Windows Explorer and double-click `setup.exe` on the *Primary Test Manager* DVD.

3. On the start screen, click the language of your choice and follow the on-screen instructions.

Note: The selected language affects all subsequent dialog boxes and all installed files.

2.2.1 System requirements

Characteristic	Requirement (*recommended)
Operating system	Windows 10 64-bit* Windows 8.1 64-bit* , Windows 8 64-bit* , Windows 7 SP1 64-bit* and 32-bit
CPU	Multicore system with 2 GHz or faster* , single-core system with 2 GHz or faster
RAM	min. 2 GB (4 GB*)
Hard disk	min. 4 GB of available space
Storage device	DVD-ROM drive
Graphics adapter	Super VGA (1280×768) or higher-resolution video adapter and monitor ¹
Interface	Ethernet NIC
Installed software required for the optional Microsoft Office interface functions	Microsoft Office 2016* , Office 2013* , Office 2010* , Office 2007*

1. We recommend graphics adapter supporting Microsoft DirectX 9.0 or later.

2.3 Cleaning



WARNING

Death or severe injury caused by high voltage or current possible

► Prior to cleaning disconnect the *CPC 80*.

► To clean the *CPC 80*, use a cloth dampened with isopropanol alcohol or water.

3 Hardware overview

3.1 CPC 80 front panel

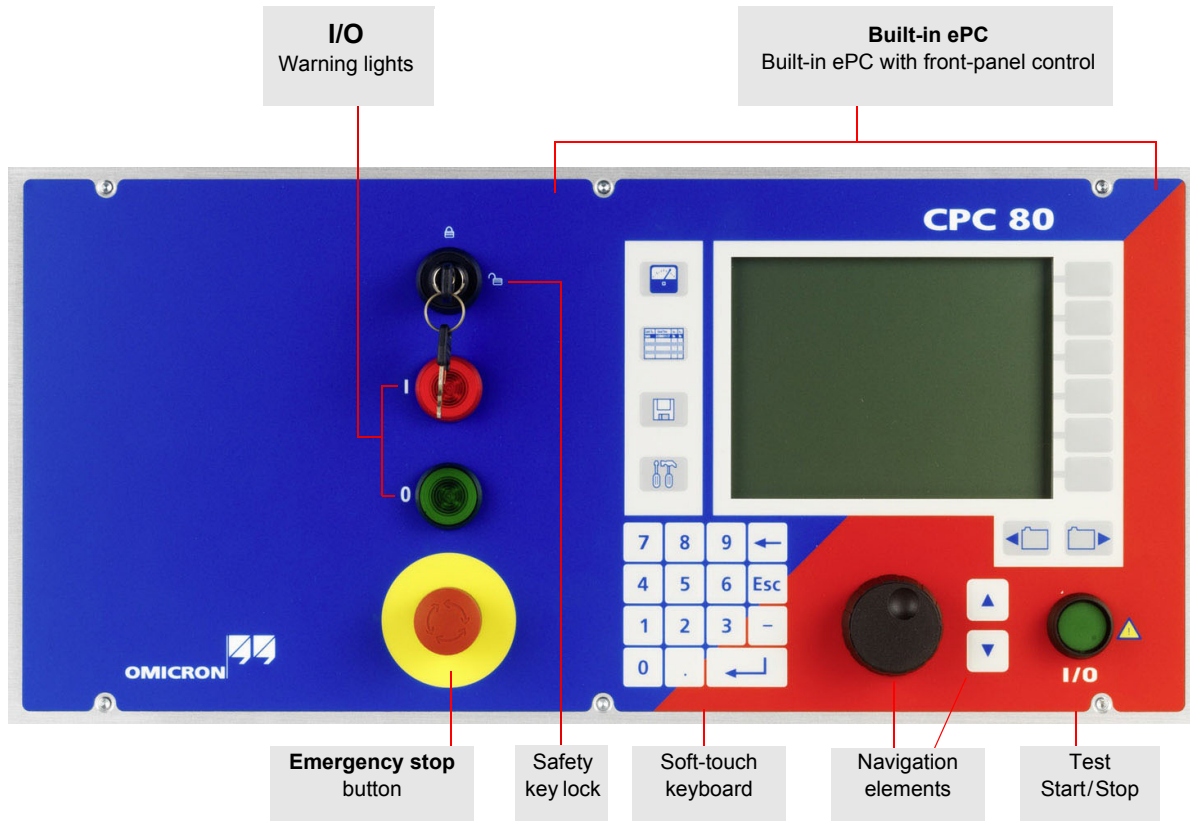


Figure 3-1: CPC 80 front panel with safety lights, **Emergency stop** button and ePC

3.1.1 Safety key lock

- To activate the CPC 80, put the key into the safety key lock and turn it horizontally to the right (see picture below).

In the "enable" position, there are two possibilities:

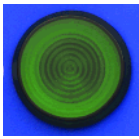
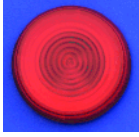


1. Test not yet started, turn the key and remove it from key lock:
The software does not accept any more entries and/or commands.
2. Test running, turn the key and remove it from key lock:
The current or voltage quantities being applied cannot be changed or stopped by pushing the I/O (test start/stop) push-button.

Note: The **Emergency Stop** button stops every test at any time.

3.1.2 Warning lights

Table 3-1: Warning lights

Workflow	Light		Operating condition
1. Outputs are switched OFF	Green light (0) on		Safe operating condition
2. Values are set and output is ready to be switched ON	Red warning light (I) flashing		 Dangerous operating condition
3. Output is switched ON	Red warning light (I) flashing		 Dangerous operating condition

3.1.3 Emergency Stop button



Pressing the Emergency Stop button *immediately* shuts off the output and terminates running tests.

Once the reason for the Emergency Stop is cleared and the **Emergency Stop** button released, the test needs to be re-started by pressing the I/O (test start/stop) push-button while in Test Card view.

Note: Stopping a test via the **I/O** button does not shut off the *CPC 80* outputs instantaneously. First, the currently running test sequence finishes, then the test execution is stopped with a predefined ramp function.

3.1.4 Ext. Booster

Socket to connect the external booster.

- Enable any external booster in the *CPC 80* software on the tab **Options | Device Setup** (refer to 5.7.1 "Device setup" on page 31).

3.1.5 Built-in ePC

The built-in ePC of the *CPC 80* provides front panel control.

- Refer to chapters 4 and 5 for information on how to work with the front panel control components, how to set up a test, execute it and save it for later use.

Via the built-in ePC, the *CPC 80* can be accessed from a stand-alone PC, for example, a notebook, via a PC network and via the Internet (refer to 9 "CPC 80 in a Network" on page 70).

Note: We recommend not to use more than 50 test results in one test procedure.



Figure 3-2: The *CPC 80*'s built-in ePC, components overview

Table 3-2: ePC elements on the *CPC 80*

Element	Description
View selector	► Press to switch between views. ► Refer to 4.3 "View selector" on page 21
LCD monitor	High-contrast gray-scale graphical LCD display (320x240 pixels)
Jog-dial handwheel	Jog-dial handwheel with <i>click</i> (Enter) function. Pressing the handwheel corresponds to the Enter function of the soft-touch keyboard. ► Turn the handwheel to navigate through the user interface. Alternatively, press the Up/Down keys. ► If the focus is set onto a data entry field or a combo box, press the handwheel to enable data entry. ► Turn the handwheel to change the entry field's value or browse through the preset values of the combo box.

Table 3-2: ePC elements on the *CPC 80* (continued)

Element	Description
Up/Down keys	Soft-touch keys supplementing the handwheel. Contrary to the handwheel, the Up/Down keys change a value in fixed steps. ► Use the handwheel for fine adjustment.
Context-dependent menu keys	Soft-touch keys that change their function according to the displayed test card. The individual key function is displayed in the button right next to the menu key.
Tab selector	► If a test procedure comprises more than one test card, use these keys to change between the single test cards.
I/O (test start/stop)	► After setting the test parameters in the Test Card view, release the Emergency Stop button and set the safety key lock to the "enable" position (horizontal). ► Press the I/O (test start/stop) button to activate the <i>CPC 80</i> outputs and starts a test. ► Press this push-button a second time to stop the test.

3.2 Connectors on the *CPC 80* side panel

The grounding terminal, external booster connection, mains power supply socket, automatic circuit breaker and mains power switch are located on the left housing side.

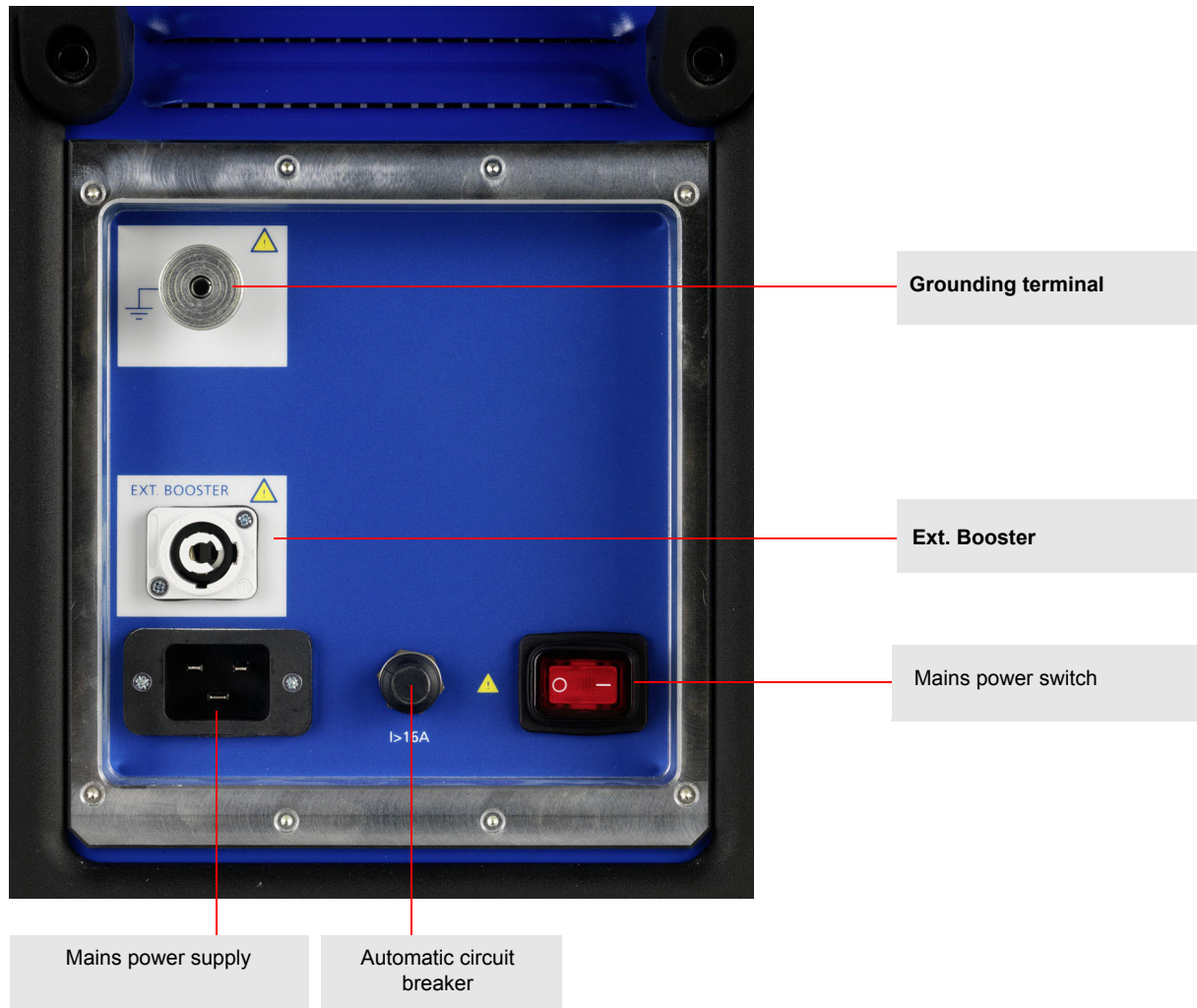


Figure 3-3: Left side view of the *CPC 80*

3.3 ePC Interfaces

The ePC interfaces are located on the right housing side.

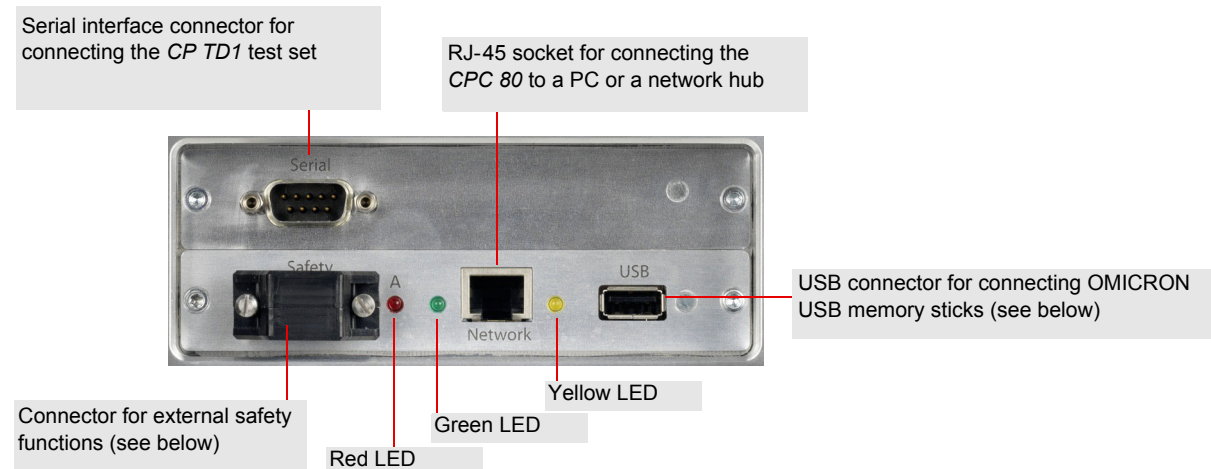


Figure 3-4: Right side view of the CPC 80

The CPC 80 supports the USB interface 1.1 and 2.0 for connecting the USB memory stick shipped with the CPC 80. The full functionality is guaranteed only for the stick delivered with the CPC 80.

The network interface is an auto-cross-over Ethernet connector that can be connected to a network hub or directly to a PC or a notebook.:

Table 3-3: LEDs on the CPC 80 ePC interface

LED	Description
Green	The CPC 80 is properly connected to a PC or network.
Yellow	Data are being transferred from/to the network.
Red	For diagnosis purposes

The connector for external safety functions allows connecting the following accessories:

- External Emergency Stop and "test start/stop" button, TRC1
- CP Strobe warning light

The **Safety** plug contains a jumper for the emergency stop or "dead man" function. As long as the plug is placed on the connector, these functions are bridged. If the plug is removed, emergency stop is active.

4 Getting started with the *CPC 80* software

4.1 Test cards and test procedures

4.1.1 Test cards

A test card carries out one specific test, and holds a number of user-definable test settings and test results. The *CPC 80* software comprises the following test cards:

- **Comment**
- **CP TD1 High-Voltage Source**
- **Quick**
- **Ramping**
- **Sequencer**
- **TanDelta - PF**

Test card default

Filling out a test card with certain values and pressing **Save As Default** makes this card the new default for that test card. Each card of this type that will later be inserted to a test procedure will already hold these new settings.

4.1.2 Test procedure

A test procedure contains multiple test cards. You can define a test procedure and the settings of all single test cards. Within a test procedure, each test card and its associated test is executed individually in a user-defined order.

Note: The *CPC 80* allows using more test cards in one test procedure but we recommend not to use more than 15 test cards to keep the tests clearly structured.

Test procedure default

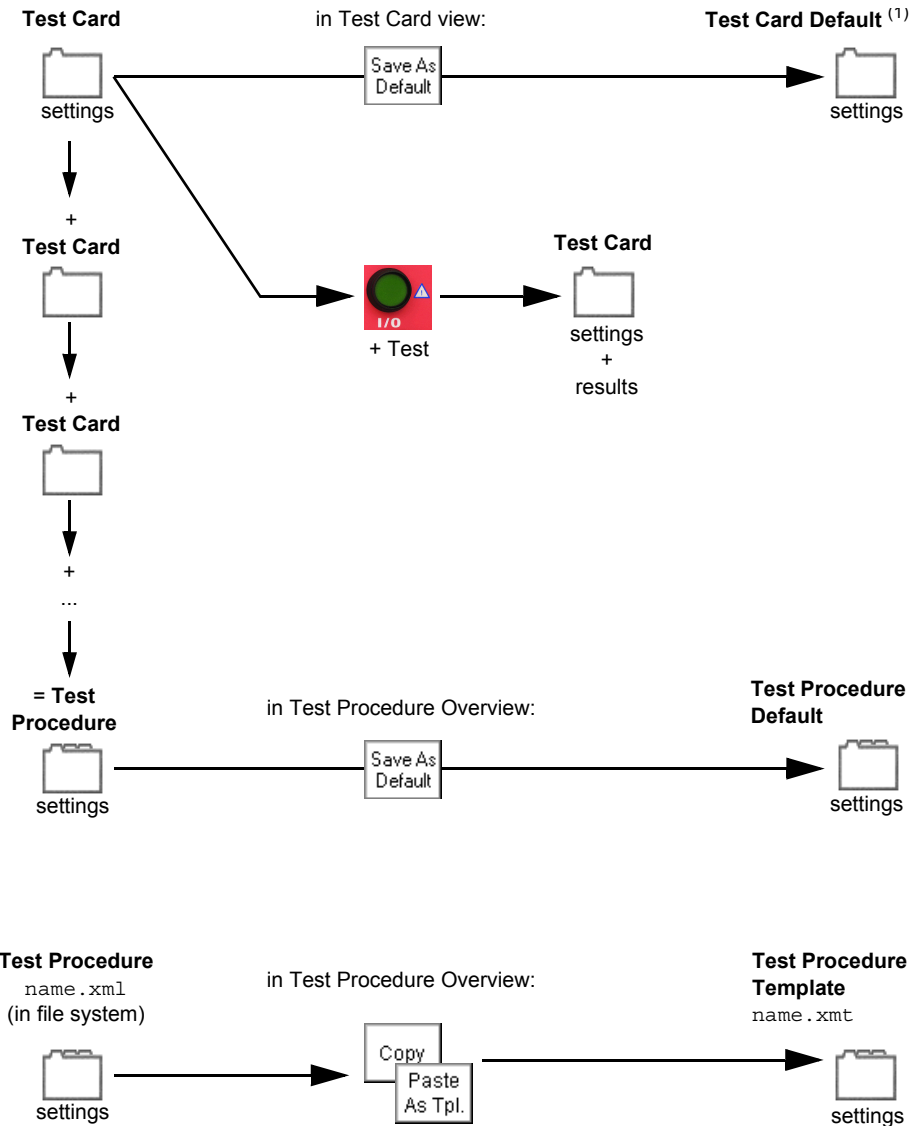
A test procedure with all of its test cards and specific settings – but without test results – can be made the test procedure default.

Note: When the *CPC 80* software starts, it automatically loads the test procedure default.

Test procedure template

A report can be copied/pasted to be a test procedure template.

In this process, the settings are preserved, however, the test results are deleted.



(1) One Test Card Default for each type of test card

The following sections emphasize on test cards, defaults and templates in more detail. Also refer to 5.8 "Creating defaults and templates" on page 40.

4.1.3 Report

For archiving or reporting purposes, or later processing, a test procedure with all of its test cards, specific settings, test results and assessments can be saved. It is then considered a report.

A report can later be opened at any time in the **CPC 80 File Operations** menu.

4.2 Starting the software

The *CPC 80* software starts in the Test Card view loading the test procedure default (refer to 4.1 "Test cards and test procedures" on page 19). This default can be customized to specific requirements.

If you have created a user-defined test procedure default, the *CPC 80* starts up loading your most frequently used test cards already containing specific values.

► Refer to 5.8 "Creating defaults and templates" on page 40 for more information.

4.3 View selector

	Test Card view (default view upon start-up) View to set up test cards, compose test procedures, enter test settings, define test cards or the test procedure default, start tests etc.
	Test Procedure Overview Provides an enhanced overview of all test cards of the currently active test procedure. Defines the test procedure default.
	File Operations Save, load, delete, copy and rename test procedures. Some of these features call up the <i>Phrase Editor</i> (described in 7.2 "String Editor" on page 63).
	Options Specify general parameters, such as display and regional settings, date and time, decimal symbol, network settings, system information and the device setup.

4.4 Test Card view

The Test Card view displays the test procedures. The *CPC 80* software starts in the Test Card view loading the test procedure default.

A test card inserted to the Test Card view loads the values from the respective test card default. If no test card default has been defined, the test card opens with preset default values.

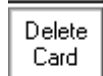


Any test card with its settings can be made a test card default for that particular type of card. Each card of this type that will later be inserted to a test procedure will already hold these new settings.

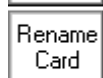
The Test Card view comprises a number of context-dependent menu keys. Some examples are given below:



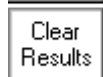
Inserts a test card of your choice and places it after the selected test card of the current test procedure.



Deletes the current test card from the test procedure.



Opens the *String Editor*. You can rename the current test card to any new name of your choice (max. 15 characters).



Clears the results of the current test card, and thus enables the start of a new test.



Makes the current test card with all of its settings the new default for that particular type of card.

Note: The actual function of the context-dependent menu keys depends on the selected view, test mode, test card and selected UI element.



To make the above listed functions visible, the focus must be set onto the test card tab designation, for example, **TanDelta - PF**.

4.5 Inserting test cards



The **Insert a new test card** dialog box displays the available tests and their associated test cards in a tree-like structure.

- Use the context-dependent **Up/Down** menu keys to the right, or the handwheel, to browse through the structure.



The group of tests expands and displays all of its associated test cards.

- Browse to the test card of your choice, and when it is highlighted press **Enter**. This will switch from the **Insert a new test card** dialog to the Test Card view, inserting the test card of your choice after the last selected test card in the Test Card view.

Note: Only licensed test cards can be inserted.

All test cards are displayed in the **Insert a new test card** dialog, but you can only insert those you hold the license for.

You can insert as many test cards as needed and of all types of your choice by repeating this process. If you need more than 15 test cards in one test procedure, we recommend to combine a smaller number of cards into groups, and to save these groups as test procedure templates with individual names (refer to 5.8.3 "Test procedure templates" on page 42).

- Press **Esc** to close **Insert a new test card**, and return to the previous view without inserting a new test card.

4.6 Setting up a test card

Note: Each parameter whose numerical value can be changed in a data entry field has an associated minimum and maximum value as well as a preset number of decimal characters.

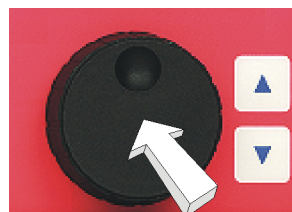
Additionally, each numerical value has a

- fixed precision value that is used as a step size when increased/decreased by means of the handwheel
- a coarse step value that is used as a step size when increased/decreased by pressing the **Up/Down** keys.



Within one test card, turn the handwheel or use the **Up/Down** keys for navigation. A selected UI element is highlighted.

If a data entry field is highlighted, press the handwheel to "enter" and activate the field.



► Alternatively, type in the value of your choice using the numeric soft-touch keys:

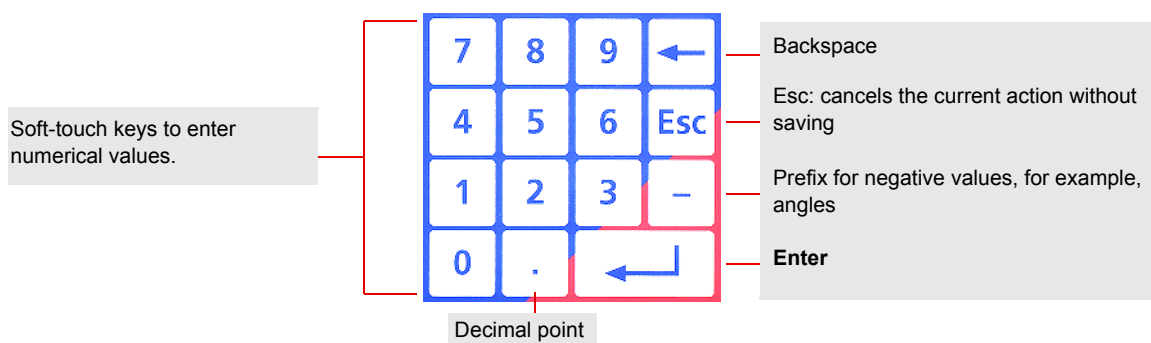


Figure 4-1: Soft-touch keys to enter numerical values

- Press **Esc** on the soft-touch keyboard while entering a value to discard the entry and restore the previous value.
- Press either the handwheel or the **Enter** key to confirm your entry.
- Move forward to the next UI element of your choice by turning the handwheel or the **Up/Down** keys.

Note: If a number key is pressed with the focus set onto a data entry field, this number is automatically written to the data entry field, and the field is enabled for data entry.



- Press the context-dependent menu key **Back to Top** to terminate the data entry mode, accept all current values and set the focus onto the test card tab.

Combo box

The same principle applies for combo boxes:

1. Press the handwheel (to "enter" the combo box for selection).
 2. Navigate through the list of available parameters, either by rotating the handwheel or by using the **Up/Down** keys.
- Press **Esc** while scrolling through the list of values to close the combo box and return to the previous value.

Check box

- Set the focus onto the check box and press either the **Enter** key or the handwheel to select/clear a check box.

List box

#	V	A	°	W	Time	
*1	1000	4.1945m	-89.85	10.90m	1' 0"	▲
2	9996	41.872m	-89.81	1.3871	10' 0"	
3	12002	50.279m	-89.81	1.9985	2' 0"	
4	4993	20.913m	-89.81	347.2m	1' 0"	▼

Figure 4-2: Example of a list box

In a *read-only* list box (Figure 4-2), turning the handwheel scrolls from line to line.

When using the **Up/Down** keys, a read-only list box is treated as one UI element:

- Press one of the keys to exit the list box and set the focus onto the next/previous UI element.

In an *editable* list box, turning the handwheel scrolls from table cell to table cell:

- Press either the handwheel or **Enter** to "enter" a cell and to edit the value.
When using the **Up/Down** keys, the focus proceeds to the same table cell one line above or below.

4.7 Settings page

Press the **Settings** menu key to open the **Settings** page. The **Settings** page allows setting the test cards individually.

- ▶ To set the same properties for all test cards in a test procedure, go to the **Device Setup** tab in the **Options** view (see 5.7 "Options" on page 31).
- ▶ Do not use the **Settings** page described here but the **Device Setup** tab in the **Options** view to set the test cards.
- ▶ Only set the test cards individually via the **Settings** page if absolutely necessary.

If a test card contains results, the settings cannot be changed. When a file containing results is loaded, the **Settings** page can be used to view the settings of the test procedure.

4.8 Starting a test

Note: Tests can only be started and stopped with the I / O (test start / stop) push-button while in the Test Card view. Each test card represents a separate test, and is started individually.

Preconditions to start a test

1. The required test card is defined, the test parameters are set.
2. The software is in the Test Card view.
3. The Emergency Stop button is released.
4. The safety key lock is set to the "enable" position.



- ▶ Press the I/O (test start/stop) push-button to start the test.
- ▶ Press this push-button a second time to stop the test.

Note: Stopping a test *does not shut off* the *CPC 80* outputs *instantaneously*. First, the currently running test sequence finishes, then the test execution is stopped with a predefined ramp function.

WARNING



Death or severe injury caused by high voltage or current possible

Stopping a test does not shut off the *CPC 80* outputs instantaneously. First, the currently running test sequence finishes, then the test execution is stopped with a predefined ramp function.

- ▶ In a hazardous situation never press "Stop Test".
- ▶ Instead, press the Emergency Stop button.

While a test is running, several functions such as changing the test card, changing the view etc., are disabled.



To repeat the test, the test results need to be cleared beforehand. Otherwise the start is blocked.

5 General software elements and settings

5.1 Temperature monitoring

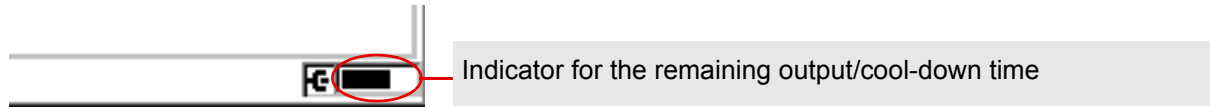


Figure 5-1: Temperature gauge

The temperature gauge's bar represents an indicator for the remaining time the *CPC 80* can output power.

Each test card displays a temperature gauge that displays the *CPC 80* temperature condition. When the temperature limit is reached, the output is automatically switched off before the device overheats.

In addition, if an output is activated, both the *CPC 80* current consumption via the power supply and the current on the high-current outputs are monitored and, together with the temperature, displayed by this temperature gauge.

With active outputs, the temperature gauge bar represents an indicator for the remaining time the *CPC 80* can output power. With deactivated outputs, the temperature gauge bar indicates how much the device has already cooled off.

► To reach a maximum output time, let the *CPC 80* cool off completely before switching it on again.

5.2 Overload indication

For each line of measurement results there is a separate overload indication in the top right corner on the *CPC 80*'s screen (or in the report).

No overload indication means no overload during that step of the measurement sequence. In the test report, "No" appears in the overload field or column.



Dotted overload indication means that there was an overload during that step of the measurement sequence but not all the time. In the test report, "Yes" appears in the overload field or column.



Solid overload indication means a permanent overload during that step of the measurement sequence. In the test report, "Yes!" appears in the overload field or column.

5.3 Test procedure overview

Name	Date/Time	Res.	Asse...	
TR Data	2012-02-24 10:...	No	n/a	Insert Card
HV output ...	2012-02-24 10:...	No	n/a	
1 H+HL (V)	2012-02-24 10:...	No	n/a	Delete Card
2a H (V)	2012-02-24 10:...	No	n/a	
2b H (F)	2012-02-24 10:...	No	n/a	Save As Default
3a HL (V)	2012-02-24 10:...	No	n/a	
3b HL (F)	2012-02-24 10:...	No	n/a	Clear Results
HV output ...	2012-02-24 10:...	No	n/a	
5a L (V)	2012-02-24 10:...	No	n/a	Clear All Results
5b L (F)	2012-02-24 10:...	No	n/a	
Version	2012-02-24 10:...	No	n/a	New Test

Type: TanDelta-PF
File name:-

Figure 5-2: Test procedure overview

The Test Procedure Overview lists all test cards of the currently active test procedure in a list box showing the card's name, its creation date and time, whether test results are available and the test card's assessment status.

- Insert Card ► Press **Insert Card** to switch to the **Insert a new test card** dialog.
 After inserting a new test card, the software automatically switches to the Test Card view, inserting the test card of your choice after the last selected test card in the Test Card view.
- Delete Card ► Press **Delete Card** to delete the currently highlighted test card from the test procedure.
- Save As Default ► Press **Save As Default** to save the current test procedure as the test procedure default. The *CPC 80* software will start with this default in the futures.
- To learn more about defaults, refer to section "Creating defaults and templates" on page 40 of this chapter.

Clearing results

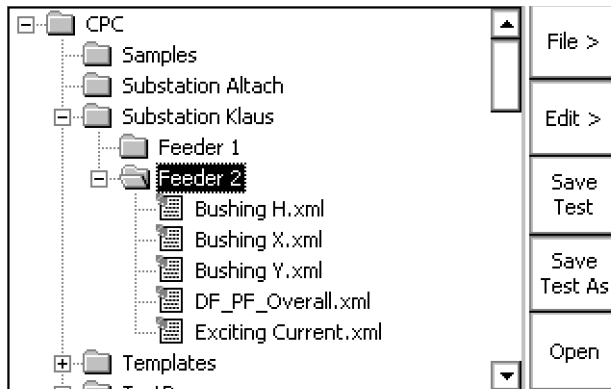
- Press **Clear Results** to clear the test results of the currently highlighted test card ("2a H (V)" in Figure 5-2).
- Press **Clear All Results** applies to *all* test cards and clears the results of all cards listed in the Test Procedure Overview.

After both **Clear Results** and **Clear All Results**, re-start the test in the Test Card view by pressing the I/O (test start/stop) push-button.

Press **New Test** to automatically switch back to the Test Card view, and open the test procedure default.

5.4 The CPC 80 file system

File Operations comprises a **File** and an **Edit** submenu with additional menu items as well as an **Open** and various **Save...** functions.



Inside the **CPC** "root" folder, you can create additional folders in a tree-structure of your choice, save tests in these folders, and carry out file operations, such as open, save, rename, copy, paste etc. For **CPC 80** units with a USB memory stick plugged in, a second tree root **USB Disk** is displayed.

The **CPC 80** file system differentiates two file types:

	name. xml	A test procedure with all of its test cards and specific settings. An .xml file may also contain test results and assessments that were stored together with the settings as report in the CPC 80 file system for archiving purposes.
	name. xmt	Test procedure template: a user-defined template containing one or more test cards with their specific test settings but without test results.

Note: The file containing the up-to-date measurements should be saved regularly. If the test unit is switched off, or in case of a power outage, all unsaved measurements will be lost.

► Long-press the **File operations** button  to save the currently open test.

5.5 Navigating through the file system

- Highlight a test or a folder using the handwheel or the **Up/Down** keys.
- To expand a collapsed folder tree , highlight it, and press either the handwheel or **Enter**. The folder expands and displays its subfolders and the tests it contains.
- Browse to the test card of your choice, and press the handwheel or **Enter** when its highlighted.

5.6 Menus

5.6.1 Main file operations menu

File >	Opens the submenu File (refer to 5.6.2 "Submenu File" on page 30)
Edit >	Opens the submenu Edit (refer to 5.6.3 "Submenu Edit" on page 31)
Save Test	Saves the currently open test – the test card(s) previously opened in the Test Card view (refer to Note below).
Save Test As	Opens the <i>String Editor</i> . You can save the currently open test under a new name (15 characters max.).
Open	Use the handwheel or the Up/Down keys to select a test, and press Open to open it. Changes to Test Card view.
New Test	Closes the current test card(s), changes to Test Card view and opens the test procedure default.

NOTICE

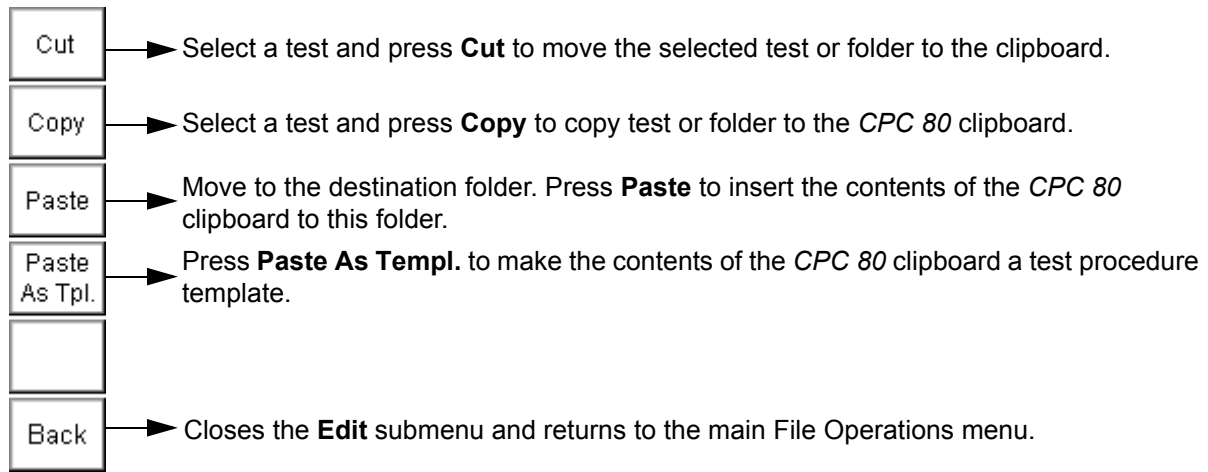
Loss of data possible

Unlike the other menu items, the two **Save...** functions of the main File Operations menu directly effect the *currently open* test. Pressing **Save** does not save the test that you may have highlighted in the folder tree, but the one that is currently open.

5.6.2 Submenu File

New Folder	Opens the <i>String Editor</i> . You can create a new folder with any name of your choice.
Insert After...	Appends the contents of a test file (.xml) or template (.xmt) of your choice to the currently open test.
Delete	Deletes the currently selected test or folder from the <i>CPC 80</i> disk space.
Rename	Opens the <i>String Editor</i> that enables you to rename the current test to any new name of your choice.
	(not used)
Back	Closes the submenu and returns to the main File Operations menu.

5.6.3 Submenu Edit



Note: If a folder is cut or copied to the clipboard, all of its subfolders will also be put to the clipboard. Cutting or copying a test or folder, and trying to paste it in the same location, opens the *String Editor*. Since a test or folder cannot exist twice under the same name at the same location, determine a new name for it using the *String Editor*.

► For more information about the *String Editor*, refer to 7.2 "String Editor" on page 63.

5.7 Options

Changes made in the **Options** view are automatically saved when the view is changed (for example when **Options** is left to change to Test Card view). Alternatively, changes can be saved instantly by pressing **Save Options**.

Upon a power supply loss or an accidental switching-off of the *CPC 80*, unsaved changes are lost, and the old values are restored.

5.7.1 Device setup

The **Device Setup** tab in the **Options** view allows you to change the settings of all test cards of the test procedure running on the *CPC 80* and all test cards inserted afterwards. The test cards can be instantiated in different ways and for different purposes. Table 5-1: "Instantiation procedures" below displays the instantiation procedures and the associated default values.

Table 5-1: Instantation procedures

Procedure	Default values
New test card	Booster, clamp and default frequency set in the Options view
New test card saved as default	Booster and clamp set in the Options view
New test procedure from template (*.xmt)	Booster, clamp and frequency remain as defined in the template
New procedure from report (*.xml)	Booster, clamp and frequency remain as defined in the report

Because the settings of a test card containing results cannot be changed, the settings made in the **Device Setup** tab in the **Options** view only apply to new test cards if the currently loaded procedure contains results.

- To change the settings of a test procedure containing results (for example, after pressing the **Keep Results** menu key or after loading a file), clear the results by pressing the **Clear Results** menu key in all test cards before setting the test procedure in the **Options** view.

It is strongly recommended to set the test cards using the **Options** view. If absolutely necessary, you can alternatively set a test card individually using the **Settings** menu key (see 4.7 "Settings page" on page 26).

The screenshot shows the 'Device Setup' tab selected. The 'External booster' dropdown is set to 'CB2'. There are checkboxes for 'Disable ground check' and 'Fan always on full speed', both of which are unchecked. The 'Default freq.' is set to '60.00 Hz' and 'Auto save' is set to 'OFF'. On the right sidebar, the 'Remote Mode' button is at the top, followed by 'Save Options', 'Restore Defaults', and 'Reboot' at the bottom.

Figure 5-3: Options tab Device Setup

External booster

The *CP TD1* is automatically detected. All other boosters have to be selected manually as they only act as passive units which do not communicate with CPC interfaces.

Disable ground check

An error message (313) appears if there is no ground connection, neither via PE (protective earth wire of the power supply) nor via grounding terminal (see Figure 3-3: "Left side view of the CPC 80" on page 17) or the power supply has no galvanic connection to ground. The latter is the case on very special power supplies like with diesel generators or when insulation transformers are used.

WARNING



Death or severe injury caused by high voltage or current possible

This is a safety-relevant message. If the reason for this message is that neither the PE nor grounding the terminal is connected, it can cause injury or possibly death of the operating staff.

- ▶ For safe operation always make sure that both PE and grounding terminal are connected.

If the PE connection and the galvanic ground connection of the power supply are both intact and the error message still appears, you can activate the **Disable ground check** check box and continue testing (see 5.7.1 "Device setup" on page 31).

WARNING



Death or severe injury caused by high voltage or current possible

Disabling the ground check can lead to death or severe injury if either the PE connection or the galvanic connection to ground is defective.

- ▶ Make sure that the PE connection and the galvanic connection to ground are both intact.
- ▶ Handle with caution.

Note: After the *CPC 80* has been rebooted, the **Disable ground check** check box is cleared for safety reasons.

Default freq.

The **Default freq.** data entry field allows you to enter the default frequency. For the default value associated with different instantiation procedures, see Table 5-1: "Instantiation procedures" on page 32.

Auto save

The **Auto Save** feature automatically saves the current test settings in fixed intervals. These intervals can be set in the **Auto Save** box. There are three time intervals available (10, 30 or 60 minutes), and the option **OFF** which disables **Auto Save**.

Auto Save saves all actual data to a file named `lastmeas.xml`. Depending on the set time interval, in case of a system crash, `lastmeas.xml` may contain more actual data than the last manually saved test. The file is created during the next booting process.

Auto Save works in Test Procedure Overview, File Operations or Options without any restrictions. In the Test Card view, **Auto Save** does not work as long as a test is running, or as long as inputs are measured (for example, in **TanDelta - PF**).

In a case like this, **Auto Save** repeats the attempt to save the test settings in intervals until the test is finished and it can save the data. After this, **Auto Save** returns to the set time interval.

Fan always on full speed

If selected, the *CPC 80* cools down faster. Thus, the duty cycle can be increased.

Restore defaults

Note: Pressing the **Restore defaults** menu key resets all user-specific settings made in the *CPC 80* software to factory-defined defaults including:

- test card defaults
- test procedure default
- all settings made at the **Device Setup** tab (sets external booster to CB2, sets CT and VT to "OFF", and sets the value in the "Default freq." data entry field to 50 Hz)
- *String Editor* template strings (refer to 7.3 "Template phrases" on page 64)

5.7.2 Network

Figure 5-4: Options tab Network

Via the built-in ePC, the *CPC 80* can be accessed from a stand-alone PC, for example, a notebook and via a PC network. At the **Network** tab the communication settings are specified.

In the combo box select between:

DHCP/Auto IP	Configures all communication parameters automatically; the DHCP server will do it for you or it will be done via the Auto IP mechanism. The data entry fields for IP address, Subnet Mask, Default Gateway and DNS are read-only, no data can be entered. This is the recommended setting.
Static IP	Configure the communication parameters manually by entering the values into the data entry fields using the soft-touch keys.

Section "CPC 80 in a Network" in chapter 9 explains in detail how to connect the *CPC 80* to either a stand-alone PC or a PC network, and how to configure such a connection.

► Once the communication parameters are configured, press **Save Options** to save them to the Windows Registry.

Note: For a change to come into effect, the *CPC 80* needs to be restarted.

5.7.3 Display

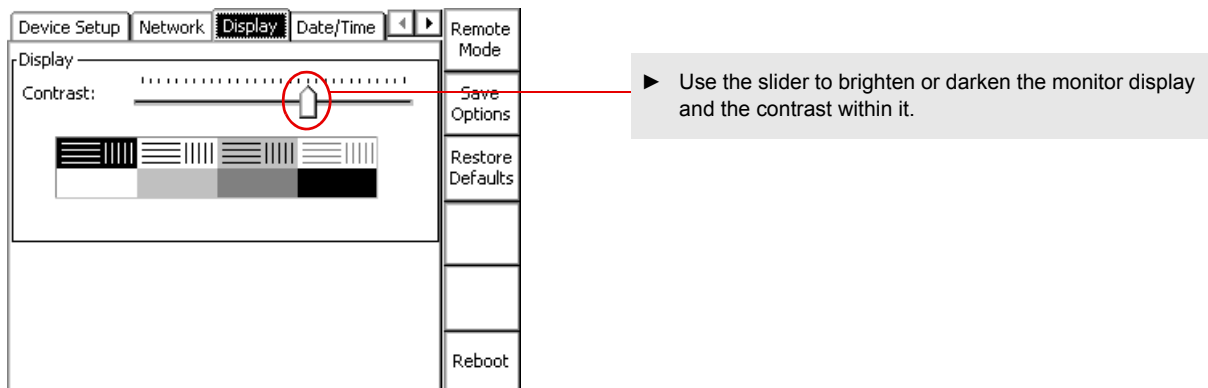


Figure 5-5: Options tab Display

- Add contrast to increase the difference in shading between areas.

5.7.4 Synchronization

Synchronize up to two slave units (*CPC 100* or *CPC 80*) with a *CPC 100* set as master unit for testing with the **Quick**, **Sequencer** and **Ramping** test cards.

Note: **Synchronization** requires the CPC Sync plug-in card and license, and the *TRC1*.

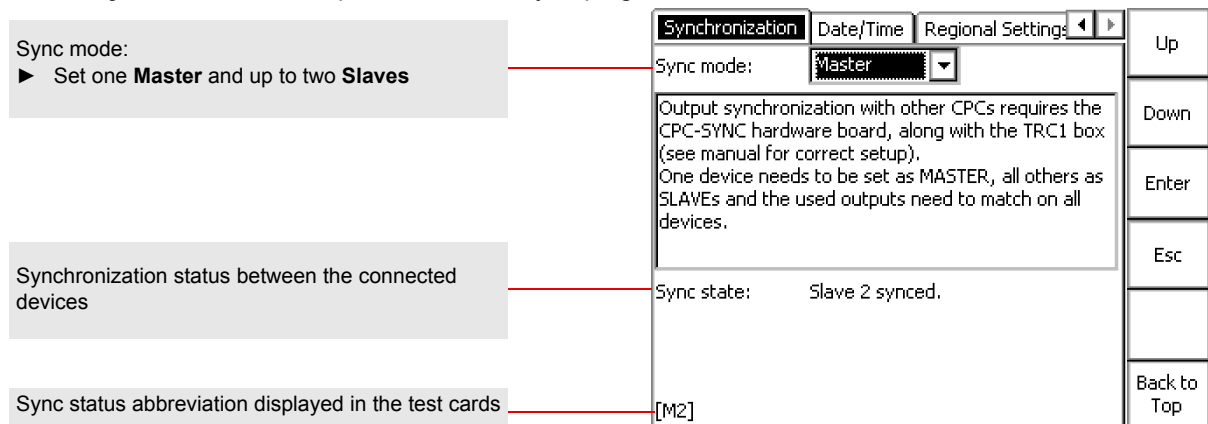


Figure 5-6: Options tab Synchronization

	Displayed on	Status
M1	Master	Slave 1 synchronized
M2	Master	Slave 2 synchronized
M	Master	Both slaves synchronized with master
S	Slave	Status OK
EV	Slave	CPC version mismatch
EO	Slave	Different outputs set on master and slave(s) Set the same outputs on all devices.

	Displayed on	Status
ES	All	No TRC1 connected
EC	All	Sync cable(s) error/not connected

Available output ranges in the **Quick**, **Sequencer** and **Ramping** test cards with synchronized CPC devices:

- AC 800 A
- CB2 1000 A
- CB2 2000 A
- Output for customized matching transformer

Note: The output value depends on the number of synchronized CPC devices (for example: 3 CPC devices – max. output value: $800\text{ A} \times 3 = 2400\text{ A}$).

NOTICE

Equipment damage possible

- When connecting devices in series, make sure that the insulation of the equipment housing can withstand the maximum applied voltage.

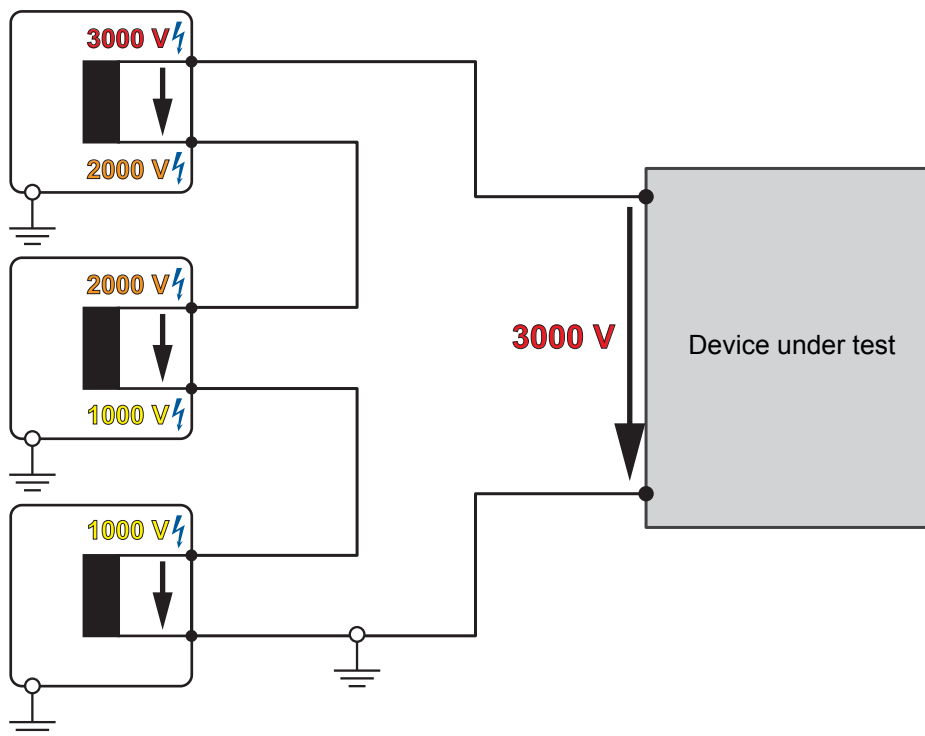


Figure 5-7: Series connection of devices causing increasing voltage stress on the housing insulation

5.7.5 Date/time

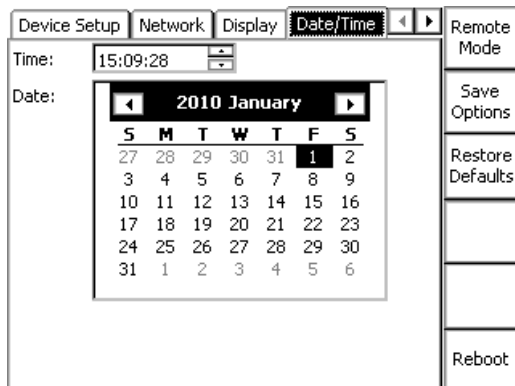


Figure 5-8: Options tab Date/Time

To set the time

- ▶ put the focus onto the “Time:” field using the handwheel
-  ▶ use the **Up / Down** keys to select between hours, minutes and seconds
-  ▶ turn the handwheel to increase or decrease the value
- ▶ press the handwheel to acknowledge your entry

Note: Changing the current date and time does not require pressing **Save Options**.

5.7.6 Regional settings

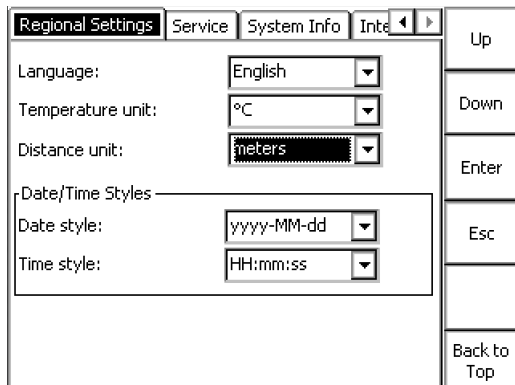


Figure 5-9: Options tab Regional Settings

Choose a regional setting for language, temperature unit, distance unit, date and time style. These settings affect the way the *CPC 80* software displays and sort dates, times, numbers and decimal points.

5.7.7 Service

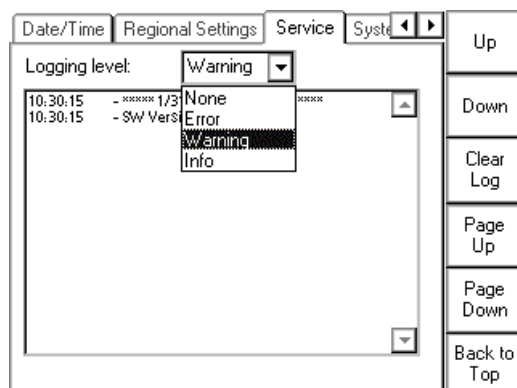


Figure 5-10: Options tab **Service**

During operation, the *CPC 80* creates a logfile with a user-definable logging level (see table below).

Every time the *CPC 80* is switched on, it generates a new logfile, and saves the existing one as the "previous" logfile. This way, the occurrences of the previous and the current session can be viewed.

The logging level specifies the occurrences to be recorded in the logfile:

Logging level	Records
None	Nothing
Error	Internal errors, hardware errors, operational errors, overload conditions, etc.
Warning	<i>Default setting</i> Non-critical errors such as over-temperature, malfunction, etc.
Info	Additional operational information about the <i>CPC 80</i> This setting is suggested if the operator suspects, for example, an incorrect functioning or an operational malfunction of the <i>CPC 80</i> . it records every relevant operational activity of the <i>CPC 80</i> . The logfile can then be sent to OMICRON for diagnosis.

Note: The logging levels are hierarchical. If the logging level is set to **Warning**, **Errors** are also recorded, or if **Info** is set, the logging levels **Warning** and **Error** also apply.

- Use the scroll bar or the **Page Up/Page Down** buttons to navigate up and down in the list of logged occurrences.



- Press **Clear Log** to delete all logfile entries and starts recording occurrences anew.

5.7.8 System info

Regional Settings	Service	System Info	Inte	▶	Remote Mode
Serial Number: AG158A					Save Options
OS Version: Windows CE 4.20					
Software Version: 2.10 (706)					
Hardware: CPC80					
Memory information					Restore Defaults
Free memory: 16252 KB					
Free disk space: 16336 KB					
					Reboot

Figure 5-11: Options tab **System Info**

Displays the following system information:

Serial Number	<i>CPC 80</i> serial number
OS Version	Operating system with version
Software Version	<i>CPC 80</i> software version
Hardware	<i>CPC 80</i> hardware The last two positions indicate the <i>CPC 80</i> hardware version.
Free memory	Currently available free memory (RAM)
Free disk space	Free disk space

5.8 Creating defaults and templates

The *CPC 80* software differentiates three types of templates:

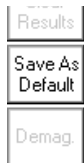
1. Test card default
2. Test procedure default (default upon start-up)
3. Test procedure templates.



Pressing the **Restore Defaults** menu key at the **Options** tab **Device Setup** resets all user-specific settings to factory-defined defaults.

This includes the test card defaults and the test procedure default.

5.8.1 Test card default



Any test card with its actual settings can be made a test card default for that particular type of card.

For example, filling out a **TanDelta - PF** test card with values and pressing **Save As Default** makes these settings the new **TanDelta - PF** test card default.

Note: The actual function of the context-dependent menu keys depends on the selected view, test mode, test card and selected UI element.



To make the function **Save As Default** visible, the focus must be set onto the test card tab designation, for example, **TanDelta - PF**.

Each card of this type that will later be inserted to a test procedure will already hold these new settings.

Note: A test card default contains user-defined settings, not test results.

In the *CPC 80* file system, a test card default is not visible as a "file" (refer to 5.4 "The *CPC 80* file system" on page 29).

5.8.2 Test procedure default

The *CPC 80* software always starts with the test procedure default. As long as no user-defined test procedure default is created, this default contains one empty **TanDelta - PF** test card. The default can be customized according to your specific requirements with as many test cards as needed and of all types of your choice.

Note: The *CPC 80* allows using more test cards in one test procedure but we recommend not to use more than 15 test cards to keep the tests clearly structured.

If you need more test cards in one test procedure, we recommend not to save all cards in one, for example, the test procedure default, but to combine a smaller number of cards to logical groups, and to save these logical groups as test procedure templates with individual names (refer to "Test procedure templates" on page 42 of this chapter).

In the *CPC 80* file system, the test procedure default is not visible as a "file" (refer to 5.4 "The CPC 80 file system" on page 29).

Step 3

Switch to the Test Procedure Overview...

Name	Date/Time	Res.	Asse...	
Comment 1	2012-02-24 10:...	No	n/a	Insert Card
TanDelta-...	2012-02-24 10:...	No	n/a	Delete Card
TD1-HV-S...	2012-02-24 10:...	No	n/a	Save As Default
Comment 2	2012-02-24 10:...	No	n/a	Clear Results
				Clear All Results
				New Test

... and press **Save As Default** to make this test procedure the new test procedure default.

Step 2

A number of test cards are inserted to the currently open test procedure.

TanDelta-PF 1

8021 V 45.00 Hz ☐ Assessment

☐ Auto test points [V, f] Cref: 357.0 nF

8021 V 45.00 Hz DFref: 0.08 %

Mode: UST-A

±20Hz 0 1 Cp, DF(tan δ)

V A Hz F % ?

Assessed:n/a

Insert Card
Delete Card
Rename Card
Clear Results
Save As Default
Settings

Step 1

TanDelta-PF 1

8021 V 45.00 Hz ☐ Assessment

☐ Auto test points [V, f] Cref: 357.0 nF

8021 V 45.00 Hz DFref: 0.08 %

Mode: UST-A

±20Hz 0 1 Cp, DF(tan δ)

V A Hz F % ?

Assessed:n/a

Insert Card
Delete Card
Rename Card
Clear Results
Save As Default
Settings

Test card 1

Quick 1 TD1-HV-Source 1

V test: 5000.0 V V max: 12000.0 V

f test: 60.00 Hz Search F0... Wiring...

☐ Test cycle... t on ~ 13 min

☒ CR500 C: 885.17 nF ☐ Check C... Tanδ=n/a

L comp.: 8.000 H

V A ° W Time

Assessed:n/a

Enter
Back to Top

Test card 2

TD1-HV-Source 1 Comment 2

Comment:

Test_passed

Insert Card
Delete Card
Rename Card
Clear Comment
Save As Default
Edit

Test card 3

Figure 5-12: Creating a user-defined default by customizing the test procedure default



Step 1: In the test card view, insert as many test cards as needed to the currently open test procedure default.



Step 2: At the *CPC 80* front panel view selector, switch to the Test Procedure Overview.



Step 3: Press **Save As Default** to make this test procedure the new test procedure default.

5.8.3 Test procedure templates

A test procedure template is a user-defined test procedure, and can be created from any test procedure saved to the *CPC 80* file system (a `name.xml` file; refer to "The *CPC 80* file system" on page 29 of this chapter).

To create a test procedure template from an `.xml` file:



- ▶ Go to "File Operations"
- ▶ Highlight the `name.xml` file of your choice
- ▶ Select **Edit | Copy** to copy the test procedure



- ▶ Press **Paste As Templ.**

A file `name.xmt` is generated. If this file `name.xmt` already exists, you will be asked whether or not to overwrite the existing file.

If you press **No**, the *String Editor* opens (refer to 7.2 "String Editor" on page 63): Give the test procedure template a name of your choice (max. 15 characters), and select **OK**. The file name extension `.xmt` is appended automatically.

In this process, the settings of the original `name.xml` file are taken over to the newly created test procedure template `name.xmt`. The test results, however, are not taken over.

The original file `name.xml` remains unchanged.

6 Test Cards

6.1 TanDelta - PF test card

6.1.1 Main page (1/2)

- ▶ Select "Assessment" to automatically assess the test, clear for no assessment.
- ▶ Enter the nominal values in the entry fields (here "Cref" and "DFref"; availability and naming depend on the measuring mode). These values serve as reference for the assessment. Their tolerance range can be set on the **Settings** Page (refer to 6.1.3 on page 47).

A measurement is rated as 'OK' if **both** values are within their tolerance range. The assessment is displayed in the test point tables's column "?"

Note: While a test is running, new nominal values can already be entered.

Test voltage and frequency.

Select for automatic measurement, clear for manual measurement. *).

Selecting enables the list boxes.

Selecting a measuring mode and pressing the handwheel displays an image that shows the according arrangement of the internal measurement switch-matrix. **)

*) **"Auto test points" cleared = manual measurement:** Applies the set test voltage and frequency to the CP TD1's output. When the measurement is finished, its results are displayed in the results table.

"Auto test points" selected = automatic measurement: Enables the output of a series of test points, e. g., combining a series of voltage values with one fixed frequency value creates a voltage ramp. Combining a series of frequency values with one fixed voltage value creates a frequency ramp. Furthermore, a combination of both is possible.

- ▶ Set a test voltage and frequency of your choice, and press **Add To Auto**. The values are entered into the list boxes.
- ▶ Set a second test voltage and/or frequency, and again press **Add To Auto**. The value(s) is/are appended to the list.
- ▶ Repeat this procedure as often as you need.

Note: You cannot enter the same value twice. Double entries are rejected. If you need identical test points for an increasing and a decreasing voltage ramp, set values very close to each other, e.g., 2000 V and 2001 V.

The *CP TD1* then puts out the specified list of values as follows:

1. All voltages are issued in the exact order they were entered using the **first** frequency value of the list.
2. All voltages are issued once more in the exact order they were entered using the **second** frequency value of the list (if any).
3. ... and so forth.

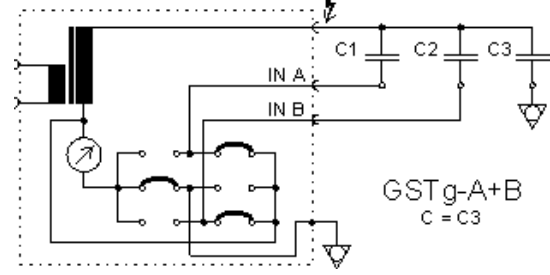
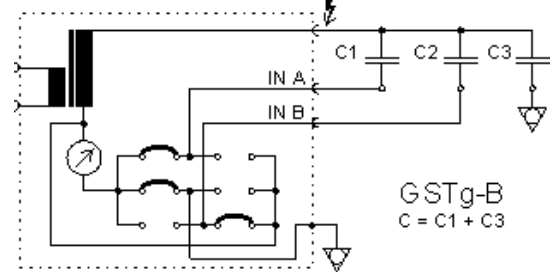
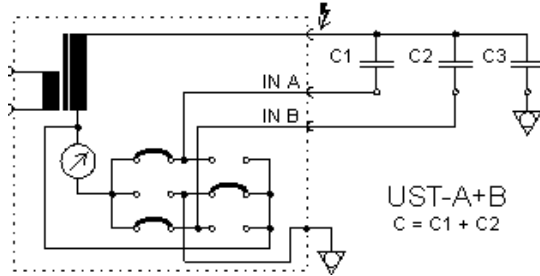
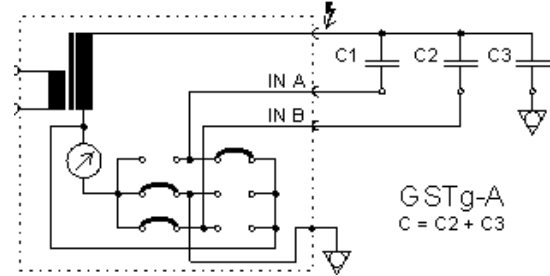
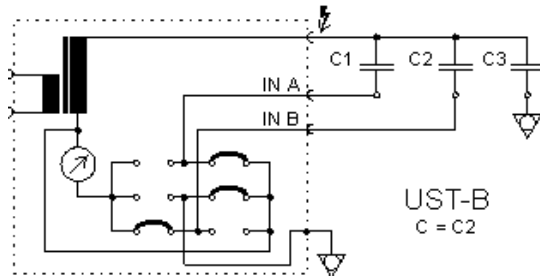
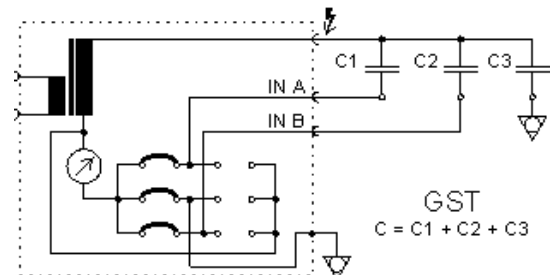
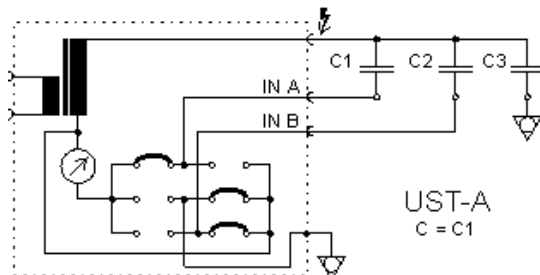
Each combination is one individual measurement, and its result is displayed in the results table with an individual line.

- To delete an entry from a list box, place the cursor on the value and press **Delete Value**.
- To delete all values from both list boxes, place the cursor on "Auto test points (V, f)" and press **Delete List**.

During the measurement, the list boxes display the current output values.

****) Measuring modes and their according arrangements of the internal switch-matrix in the CP TD1.**

The switch-matrix determines what capacities are actually measured.



6.1.2 Main page (2/2)

Compound measurement setting.

- C_p , DF ($\tan \delta$) = parallel capacitance & dissipation factor
- C_p , PF ($\cos \varphi$) = parallel capacitance & power factor
- C_p , P_{test} = parallel capacitance & power
- C_p , $P@10kV$ = parallel capacitance & power - linearly interpolated to 10 kV test voltage
- Q_{test} , S_{test} = reactive & apparent power
- Z = impedance with phase angle
- C_p , R_p = parallel capacitance & parallel resistance
- L_s , R_s = serial inductance & serial resistance
- C_p , Q = parallel capacitance & quality factor
- L_s , Q = series inductance & quality factor

The averaging factor determines the number of measurements. A factor of 3 means: the *CP TD1* carries out 3 measurements whose results are then averaged. The higher the factor, the more accurate the measurement but the longer the measuring time.

Filter bandwidth of measurement.

Note: If the test frequency equals the default frequency (as set at **Options | Device Setup**), the filter bandwidth is always ± 5 Hz, regardless of the set value. This even applies if the option "use default frequency of xx.xx Hz" is not specifically selected.

± 5 Hz means that interferences at frequencies with an offset of $\geq \pm 5$ Hz from the measuring frequency will not affect the results.

The smaller the filter bandwidth, the longer the measuring time.

6.1.3 Settings page (1/2)

The TanDelta Settings page allows for the setting of additional measurement options. To open it, press the **Settings** button on the **TanDelta - PF** Main Page.

The *CP TD1* leaves OMICRON factory-calibrated. If a component needs to be exchanged by a spare part, the *CP TD1* must be re-calibrated.

To re-calibrate, set the focus onto the test card tab designation **TanDelta - PF** and press **Edit Calib** to enable the entry fields:

- Cx = correction factor for Cmeas (multiplier)
- DF/PF + = corrective value added to dissipation or power factor (can be + or -).

Note: You must enter your name and press **Update Calib.** to complete the re-calibration.

At **Assessment Limits**, set the tolerance of the Main Page's nominal values for the assessment.

For the capacitance, the tolerance is entered in percent, for the dissipation factor this is a multiplier.

Note: Availability and naming of the entry fields depend on the measuring mode, e.g., DF and PF are the same entry field.

If selected, the beeper sounds during the entire test to signal the output of hazardous high voltages. If cleared, the beeper sounds at the beginning and the end of the test only.

If selected, the *CPC 80* checks whether the shield of the high-voltage cable is connected. For some large inductive loads, the *CPC 80* can accidentally report shield check error even when the shield is connected. If this is the case, it makes sense to clear the check box.

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Never operate the *CP TD1* with unconnected shield of the high-voltage cable.
- ▶ If the **Perform shield check** check box is cleared, make sure that the shield is connected before operating the *CP TD1*.

6.1.4 Settings page (2/2)

Selecting **Compensations** converts the actually measured dissipation or power factor to normalized values corresponding to an ambient temperature of 20 °C. The values entered at **Compensations** then represent the existing ambient condition.

1. Enter oil temperature, ambient temperature (at bushing) and relative humidity.
2. Then place the cursor on "k".

The medium the measurement takes place in, oil or air, determines the k-factor.

- ANSI C57.12: The oil temperature is the determining medium for the k-factor.
- Bushings: The air temperature at the respective bushing is the determining medium for the k-factor. **Bushings** provides three bushing types to select from: RBP (**R**esin **B**onded **P**aper), RIP (**R**esin **I**mpregnated **P**aper) and OIP (**O**il **I**mpregnated **P**aper). The k-factor changes accordingly.

Select if you use an external CT.

The entered ratio is used to calculate the measured current accordingly.

Note: Use ext. CT can only be selected if there are no measurement results yet.

Press to return to **TanDelta's** Main Page

6.1.5 Templates

The test procedures for designated applications are controlled by templates available on the *CPC 80* or on the *CPC Start Page*.

The templates are pairs of XML documents and Microsoft Excel templates designed by OMICRON for designated applications. The XML templates are predefined test procedures, often with comments, that run on the *CPC 80* and guide your through the test. Once completed, the XML file is saved, downloaded to the PC and then loaded into the corresponding Microsoft Excel template. There the results are post-processed and a final test report is generated. The template pairs facilitate and speed testing with the *CP TD1* and the evaluation of results.

- To perform a test using a template, open the template for your application and run the test procedure according to the template.

6.2 Comment card

The **Comment** card is inserted to a test procedure in the same manner like a test card. It can be used to write a user-defined comment or note regarding the test procedure or other important information such as operational data of a transformer.

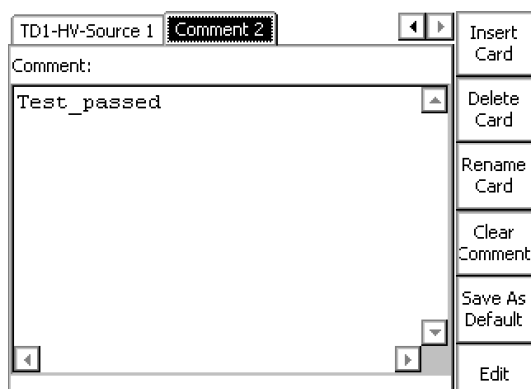


Figure 6-1: Comment test card

-  ► Insert a **Comment** card to the actual test procedure by pressing **Insert Card**. If required, you can insert more than one **Comment** card.
-  ► Press the context-dependent menu key **Edit** to start the *String Editor*.

When used for the **Comment** card, the *String Editor* differentiates between the input modes **Form Editor** and **Text Editor**.

After pressing **Edit**, **Text Editor** is active. With the exception of the context-sensitive keys to switch between these two modes, the user interface is identical.

To create "flowing" text with no tabs in it, both input modes can be used.

- Compose a text of your choice by selecting the individual characters and symbols needed one by one and confirm them by pressing the handwheel. When finished, acknowledge with **OK**.

6.2.1 Form Editor – Text Editor

- To create a "2 columns" layout, press **Edit Form**.
- Enter the first word, then a **tab**. The tab substitutes a column break.
- Enter the word for the second column, then a carriage return.

The difference between **Form Editor** and **Text Editor** is that text left of the tab (the "first column") cannot be accessed anymore in **Text Editor** – it is protected.

- To add, edit or delete first column entries use the **Form Editor**.
- Find more information on function and handling of the *String Editor* in 7.2 "String Editor" on page 63.

6.2.2 How to change a comment



- ▶ If you need to change an existing comment, press **Edit**. This starts the *String Editor*.
- ▶ Start the appropriate input mode, **Form Editor** or **Text Editor**, change the entries of your choice and press **OK**.

6.2.3 How to clear a comment



- ▶ Press **Clear Comment**.

The context-dependent menu keys change and provide two more keys: **Clear All** and **Clear Text**.

- **Clear All**: Deletes the entire comment at once, that is, all text in all columns.
- **Clear Text**: Deletes all to the right of the tab, that is, everything but the left-hand side column.

6.3 CP TD1 High-Voltage Source test card

In addition to the Dissipation Factor (TanDelta)/Power Factor test, the *CP TD1* can also be used as a high-voltage source for measuring, for example, partial discharge or conducting high-voltage tests on rotating machines.

To compensate capacitive currents, a parallel resonance circuit can be set up.

The compensation using the *CP CR500* compensation reactor is realized in two different ways:

1. By parallel-circuiting the compensation reactors to measure as closely as possible to the resonance frequency when measuring with nominal frequency is required.
2. By setting the frequency to measure at exactly the resonance frequency.
The longest output duration is achieved with testing at resonance frequency, in most cases accomplished by a combination of both procedures.

The **CP TD1 High-Voltage Source** test card can be used for both manual and fully automatic testing by toggling defined ramps and sequences. The test card is also helpful in setting up the optimum test configuration to achieve the best possible test duration.

6.3.1 Typical test procedure

Without compensation:

If the capacitance of the test object is smaller than 80 nF, no compensation is required with a test voltage of up to 12 kV for **t on** > 2 min. If the test voltage is lower than 12 kV, it is also possible to test a larger capacitance without compensation. The needed current can be calculated with $I_c = (2 \cdot \pi \cdot f) \cdot C \cdot U$.

The **t on** time is > 2 min. for currents of up to 300 mA.

With compensation:

1. Determine the capacitance of the test object.
2. Calculate the inductors needed for the compensation: either manually or by using the **CP TD1 High-Voltage Source** test card.
3. Set the test voltage.
4. Set **f test** (manually or with **Search f0...**).
5. *If required:* Define the test cycle.
6. Start the test.

6.3.2 Main page

The screenshot shows the main configuration window for the CP TD1 High-Voltage Source. The window is titled "Quick 1 TD1-HV-Source". It contains several input fields and buttons for configuring the test.

- Set test voltage:** Points to the "V test:" field, which is set to 5000.0 V.
- Define automatic test cycle:** Points to the "Test cycle..." checkbox, which is checked.
- Set maximum voltage:** Points to the "V max:" field, which is set to 12000.0 V.
- Set test frequency:** Points to the "F test:" field, which is set to 60.00 Hz.
- Activate search of resonance frequency:** Points to the "Search f0..." button.
- Show wiring configuration (test setup)*:** Points to the "Wiring..." button.
- Activate the test to determine the test capacitance:** Points to the "Check C..." button.
- Activate configuration of test setup with the CP CR500:** Points to the "CR500" checkbox, which is checked.
- Set or show test capacitance:** Points to the "C:" field, which is set to 885.17 nF.
- Select or show compensation inductance:** Points to the "L comp.:" field, which is set to 8.000 H.
- Time of the test: starts again from zero if Keep Result is pressed:** Points to the "Time" field in the table below.
- Watt losses of the test setup (test object and inductors):** Points to the "W" field in the table below.
- Measured output voltage:** Points to the "V" field in the table below.
- Phase angle between output voltage and output current:** Points to the "°" field in the table below.
- Output current of the CP TD1:** Points to the "A" field in the table below.

The table at the bottom of the window has the following columns: #, V, A, °, W, Time. The "Assessed:" field is set to n/a. The "Back to Top" button is located at the bottom right.

*Wiring Information:

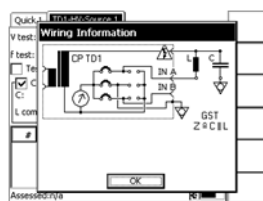


Figure 6-2: CP TD1 High-Voltage Source test card

6.3.3 Settings page

Quick 1 TD1-HV-Source 1

CP CR500 available

L1 40H, L2 40H: 2 x

L1 80H, L2 40H: 0 x

L1 80H, L2 80H: 2 x

L min= 6.6667 H

L max= 80.000 H

L calc.= 7.948974 H

L comp.: 8.000 H

CP CR500 wiring for L comp.

3 x 40H 4 x 80H

885.17 nF

f test: 60.00 Hz

f0 comp.= 59.81 Hz

Enter

Set test frequency

Test information*

Shows resonance frequency with selected L comp. and capacitance set in main page

OK

Back to Top

Show minimum inductance possible with available CP CR500

Show maximum inductance possible with available CP CR500

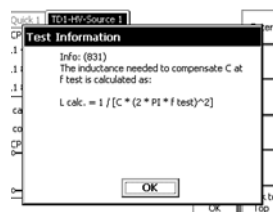
Set available CP CR500

Show calculated inductance for resonance frequency with f test and capacitance set in main page

Select or show compensation inductance combinations possible with available CP CR500

Show configuration for selected L comp.

*Test Information:



Note: Set your CP CR500 you have available. Press the **Save as Default** soft key. The settings will be saved for future use of the test card.

Figure 6-3: CP TD1 High-Voltage Source test settings

Activate C Test

1. Set your test voltage for the capacity test (**V test**).
2. Press the **Check C...** button.
3. The dialog shows the internal connection of the *CP TD1* and the test mode (GSTg-A+B), as well as the test setup:

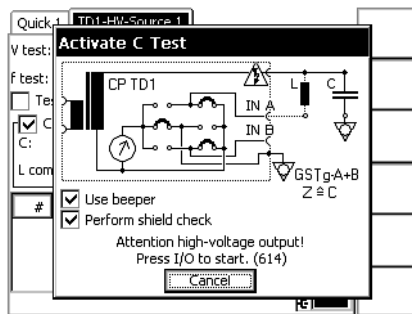


Figure 6-4: Activate C Test

4. **Use beeper**: activate or deactivate beeper
5. **Perform shield check**: activate or deactivate the shield check of the high-voltage cable
6. Press the I/O (test start/stop) push-button to start the test.
7. The test progress is shown in the status bar. During the measurement, the test voltage can be set or changed.
8. **C** and **Tanδ** are shown during and after the test and the best **L comp.** is set for the frequency chosen and the measured capacity.

 If the capacity cannot be compensated with the available *CP CR500* set in the main page and the chosen frequency, an information symbol will appear next to the **L comp.** field. If you click this symbol, the warning message shows the **L calculated** for the resonance frequency with the given **C** and **f test**, and the **L comp.** which comes closest to the **L calc.** and **f test**.

Search f₀...

1. Set the test voltage (**V test**).
2. Press the **Search f₀...** button.
3. The dialog shows the internal connection of the *CP TD1* and the test mode (GST), as well as the test setup:

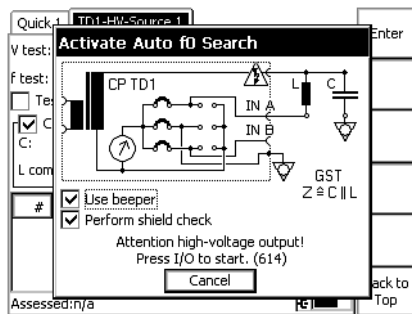


Figure 6-5: Activate Auto f₀ Search

4. **Use beeper**: activate or deactivate beeper
5. **Perform shield check**: activate or deactivate the shield check of the high-voltage cable
6. Press the I/O (test start/stop) push-button to start the search.
7. The search progress is shown in the status bar. During the measurement, the test voltage can be set or changed.
8. The resonance frequency f₀ for the test setup is set in **f test**:

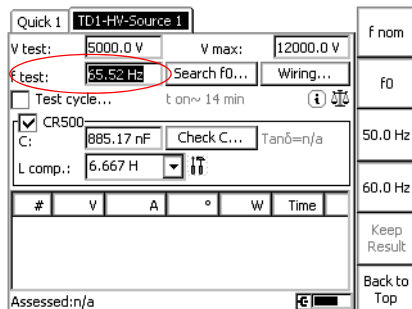


Figure 6-6: Set resonance frequency

9. If the resonance frequency cannot be found with the frequency range of 15 Hz to 400 Hz, a warning message appears:

t on time

If the *CP CR500* setting is selected, the calculated output time is shown for the given configuration (**C**, **L comp.** and **f test**). The output time is limited by the needed current of the *CP TD1* or the duty cycle of the *CP CR500*. The needed output current is defined by the losses of the test object, the losses of the inductors (*CP CR500*) and the needed capacitive or inductive current if not testing at resonance frequency f₀.

Note: The **t on** time is a rough calculation and is also dependent on the internal temperature of the **CP TD1** high-voltage transformer. Therefore, the real output time can be longer or shorter.

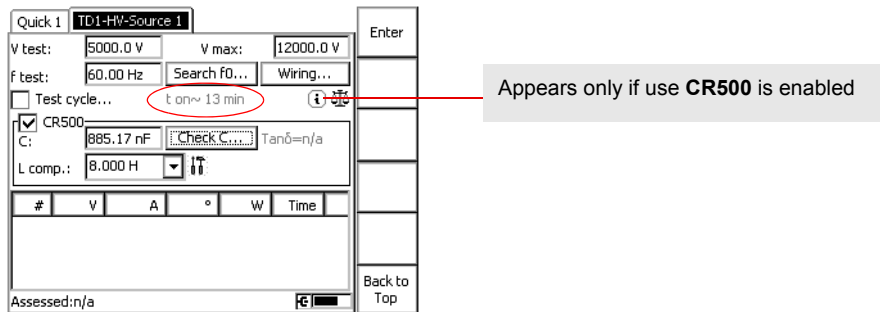


Figure 6-7: t on time

The **test information** dialog shows the known values and details of the test setup. The **rel. temperature** is the relative temperature of the **CP TD1** high-voltage transformer (0 to 100%). The **t on** time is always calculated for a rel. temperature < 25%. The **I out estimated** is the calculated current needed from the **CP TD1**. The actual **I out** can be higher or lower.

Test cycle

If the **Test cycle** check box is selected, the **CP TD1** performs an automated test defined by the test cycle.

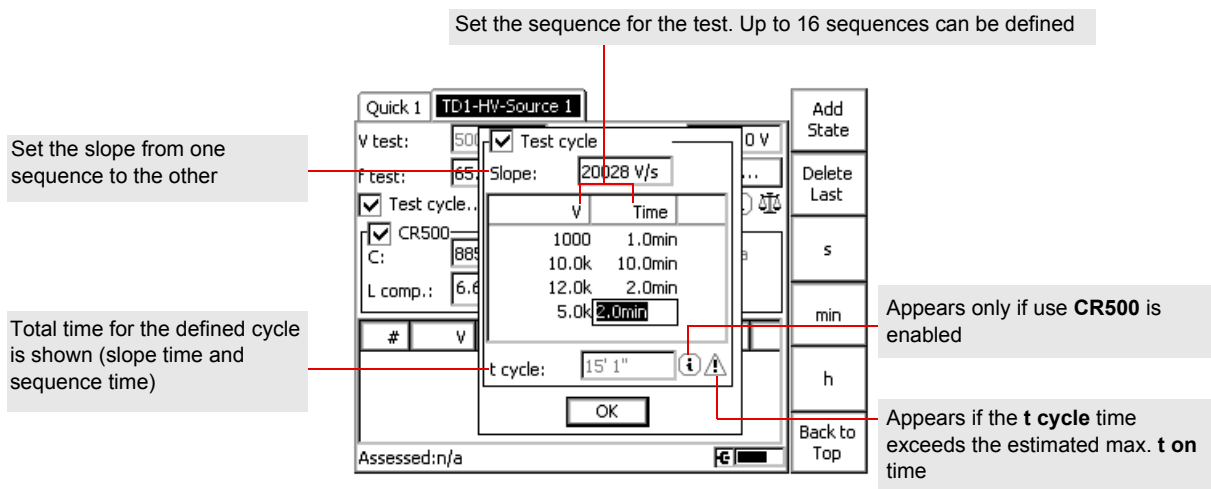


Figure 6-8: Test cycle

Pressing the I/O (test start/stop) push-button of the *CPC 80* will display the following dialog.

1. The dialog shows the internal connection of the *CP TD1* and the test mode (GST), as well as the test setup:

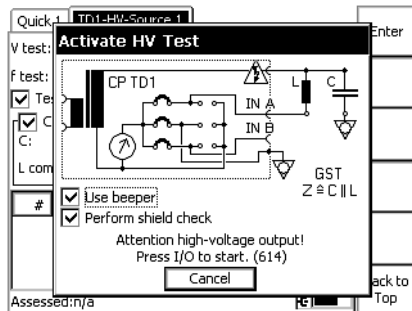


Figure 6-9: Activate HV Test

2. **Use beeper**: activate or deactivate beeper
3. **Perform shield check**: activate or deactivate the shield check of the high-voltage cable
4. Press the I/O (test start/stop) push-button to start the test cycle.
5. After completing the test, a result line for each sequence is generated:

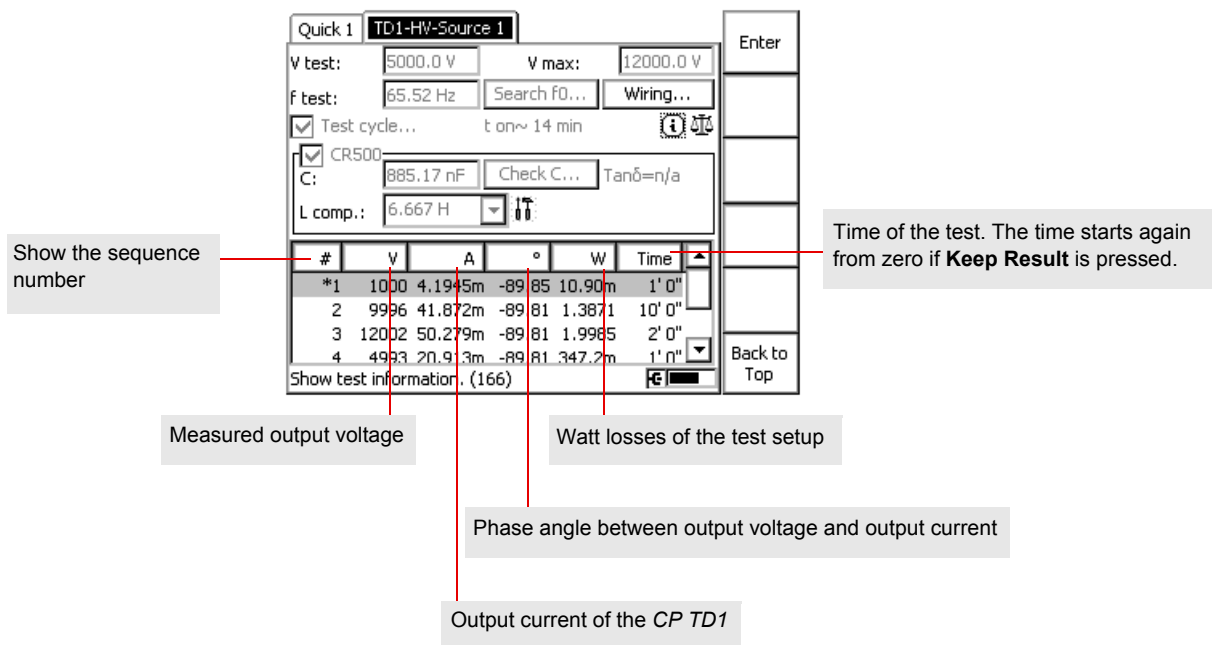


Figure 6-10: Results of the HV test

6.4 Quick test card

Quick is the most basic mode to operate *CPC 80* booster outputs in a manual-like mode with front panel control.

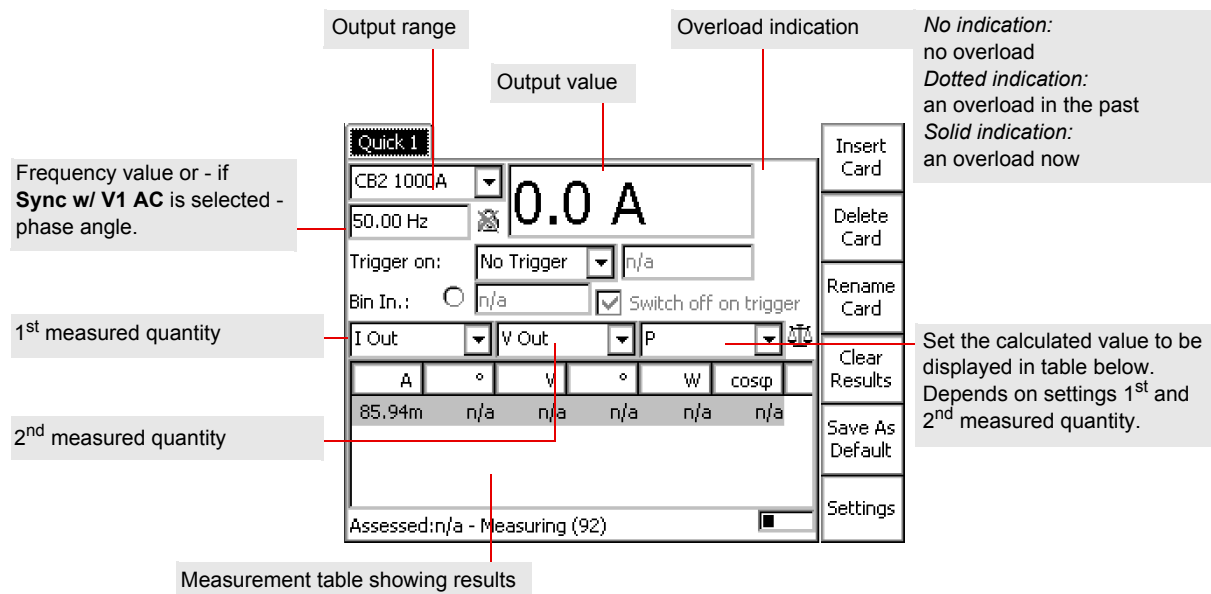


Figure 6-11: Quick test card

Range

The **output range** combo box provides a list of available output ranges including either **CB2:**, **CU20:** or **CU1:** output ranges if the respective external booster was selected at the **Options** tab **Device Setup** or on the **Settings** page.

6.4.1 Settings page

Settings ► Press the **Settings** key to open the **Settings** page.

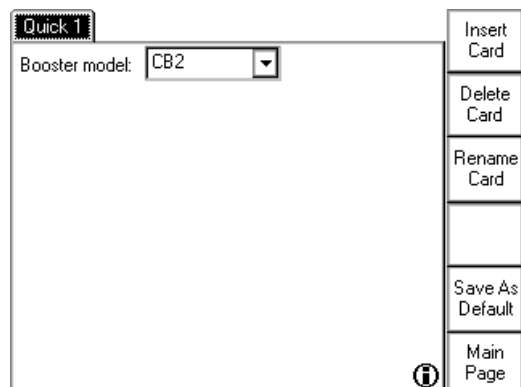


Figure 6-12: Quick test settings

The **Settings** page allows setting the test cards individually. In the **Device Setup** tab in the **Options** view (see 5.7 "Options" on page 31), the same properties can be set for all test cards of a test procedure.

- In general, do not use the **Settings** page but the **Device Setup** tab in the **Options** view to set the test cards.
- Only use the **Settings** page to individually set the test cards if absolutely necessary.

If a test card contains results, the settings cannot be changed. When a file containing results is loaded, the **Settings** page can be used to view the settings of the test procedure.

6.4.2 Measuring with Quick

The combo boxes **1st measured quantity** and **2nd measured quantity** provide **I Out** and/or **V Out** for selection.

I Out sel and **V Out sel** designate the frequency-selective measurement to filter out interferences as they usually occur in substations. The measured input is filtered according to the set output frequency.



- After having set all necessary parameters, press the I/O (test start/stop) push button. The **Quick** test card enters the “on” state, the set power output value is switched to the **CPC 80**’s outputs, and the measuring continues.



- Press the **Quick** test card menu key **Keep Results** to save the currently measured values and “freeze” their display in the measurement table. Both the “measuring” and the “on” state remain active, the measurement continues in a new line of the measurement table.

6.4.3 Trigger settings

A trigger is the occurrence of a selected event, for example, a binary trigger is the first change of the state at the binary input.

The diagram illustrates the Trigger settings interface with the following components and callouts:

- Select the trigger event**: Points to the **Trigger on:** dropdown menu.
- Threshold value for trigger on measurements**: Points to the **n/a** input field next to the **Trigger on:** dropdown.
- Indicates the signal condition at the binary input Bin In**: Points to the **Bin In:** radio button and **n/a** input field.
- Delay time display**: Points to the **Delay time display** section, which states: "The delay time is the time between the last change of the **CPC 80** output value and the occurrence of the trigger event."
- Switch off on trigger**: Points to the checkbox labeled **Switch off on trigger**.
- Instructions for trigger settings**: A list of instructions:
 - Select to switch off the **CPC 80** outputs when the trigger event occurs.
 - Clear to leave the **CPC 80** outputs on after the trigger event occurred. The measurement values are “frozen”.
 - To store the results, press **Keep Results**.

Note: Some of the trigger events offered in the **Trigger on:** combo box depend on the measured quantity settings below (trigger on measurement).

Trigger on Overload: the occurrence or the clearing of an output overload condition (clearing is delayed by 100 ms to debounce)

6.5 Sequencer test card

Use the **Sequencer** test card to define a sequence of states to be applied to a connected test object. A sequence of up to 7 states can be defined. The states within that sequence execute sequentially. For each state, a trigger signal can be specified to prematurely terminate this state and execute the next one.

A sequence of states can either be executed once from state 1 to state x, or repeated continuously. Furthermore, the complete sequence can prematurely be terminated if during the execution of one of its states this state's specified trigger condition occurs.

Switch off on trigger, i.e., abort sequence when the trigger condition becomes true

Synchronize with **V1 AC** (needs up to 200 ms to synchronize)

The sequence is repeated endlessly.***)

Output range selection

States table (state-specific settings):

- output quantity settings
- trigger specification*)
- duration of state if no trigger occurs**)

A	Hz	Trigger	Thresh	s
0.0	50.00	No Trigger	n/a	2.000

Figure 6-13: Sequencer test card

- *) **Note:** Some of the trigger events offered in the **trigger event** combo box depend on the measured quantity settings below (trigger on measurement).
Trigger on Overload: the occurrence or the clearing of an output overload condition (clearing is delayed by 100 ms to debounce)

**) Setting a time of 0.000 s makes the state infinite. Only a trigger signal will terminate it.

***) This option can lead to a freeze of the *CPC 80* caused by a memory overflow. This can happen if there are too many results in a certain time. In this case, the *CPC 80* can only be switched off via the **Emergency Stop** button. The *CPC 80* will work properly again after rebooting the device.

Manual
Trigger

- Press **Manual Trigger** to manually initiate a trigger signal (i.e., a premature termination) of the current state at any time. This manual trigger has the same function as an automatic trigger signal.

Add
State

- Press the **Add State** button to define additional states (max. 6).

6.6 Ramping test card

Use the **Ramping** test card to define a series of ramps to be applied to a connected test object.

A series of up to 5 ramps can be defined. The ramps within that series execute sequentially, and run from a start to an end value within a set period of time.

It is possible to specify a trigger signal that prematurely terminates either the entire series of ramps or the actual ramp only, and then continues with the next one (if any).

Switch off on trigger, i.e., when a trigger condition becomes true

Output range selection & actual output value

Ramped quantity & fixed quantity

Ramps table (ramp-specific settings):

- output quantity settings
- ramp duration if no trigger occurs
- trigger specification

Start value of ramp

Ramping 1			
CB2 2000A	n/a	☐ SOOT	
Amplitude	50.00 Hz	Start val.:	0.0 A
A	s	Trigger	Thresh
0.0	2.000	No Trigger	n/a
I Out	V Out	P	☐ ΔT
A	°	V	° W cosφ
Assessed:n/a			

Insert Card

Delete Card

Rename Card

Clear Results

Save As Default

Settings

Figure 6-14: Ramping test card



- Press **Manual Trigger** to manually initiate a trigger signal (i.e., a premature termination) of the current state at any time. This manual trigger has the same function as an automatic trigger signal.

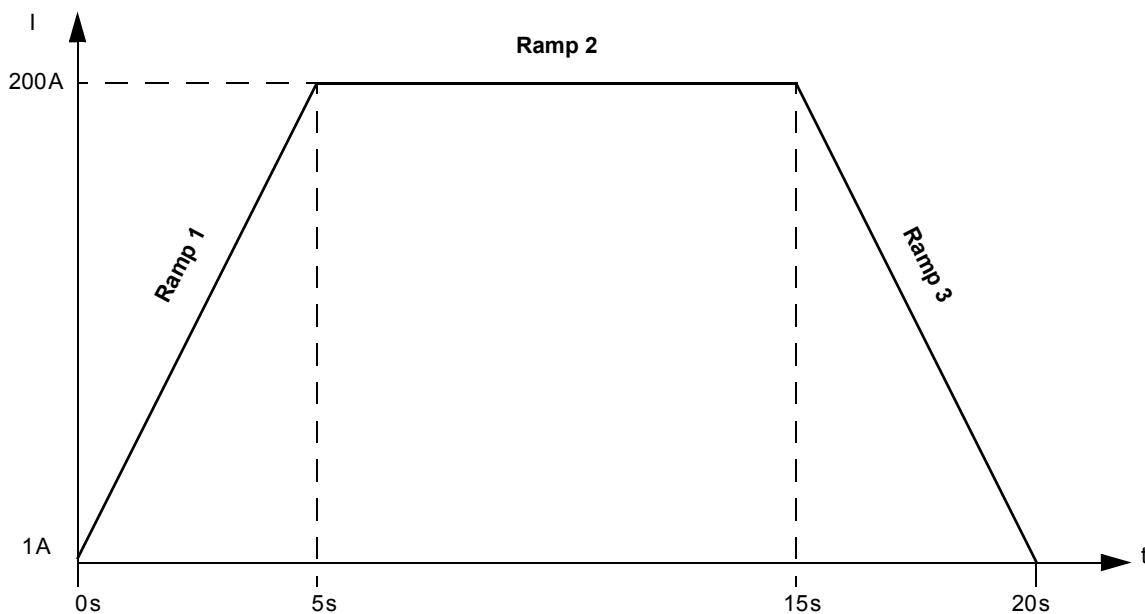


- Press the **Add Ramp** button to define additional ramps (max. 5).

Example of a series of ramps

	A	s	Trigger	Thresh
Ramp 1	200.0	5.000	No Trigger	n/a
Ramp 2	200.0	10.000	Binary	n/a
Ramp 3	0.0	5.000	No Trigger	n/a

The three ramps defined in the ramps table shown above result in an output signal like this:



Ramp 1

- from 1 A
(set at "Start val:")
- to end value 200 A
(set in line 1 column "A")
- in 5 s
(set in line 1 column "s")

Ramp 2

- from 200 A
(end value of ramp 1)
- to end value 200 A
(set in line 2 column "A")
- for 10 seconds
(set in line 2 column "s")

Ramp 3

- from 200 A
(end value of ramp 2)
- to end value 0 A
(set in line 3 column "A")
- in 5 seconds
(set in line 3 column "s")

7 Common functions

This chapter describes functions and procedures that repeat in all or various test cards.

7.1 Test assessment

After a test, the test assessment icon is displayed in the left bottom corner of the test card.

- To assess a test, set the focus on the assessment icon by turning the handwheel.



The scale symbol designates that no manual assessment was done yet.

If this icon is selected, the test card's bottom line shortly shows "Change test assessment [OK/ Failed]", and then returns to "Assessed: n/a".

The context-dependent menu keys now provide the option to manually assess the test as either **OK** or **Failed**.

Assessing the test appends the actual date and time to the bottom line string "Assessed:" and displays a corresponding icon on the screen:



Test OK



Test failed

- Press **Clear Assess.** to clear both the assessment and the assessment's date/time stamp in the bottom line, and to perform a new assessment.

7.2 String Editor

The *String Editor* is used to name or rename test cards, tests and templates, and to fill out the **Comment** card.

Every time such an operation becomes necessary, the *String Editor* starts automatically.

The number of available characters to choose from depends on the *String Editor*'s use. If, for example, a user-defined comment is to be entered in the **Comment** card, the number of available characters is bigger than if a test is to be renamed. This difference are special characters such as !, ?, _, [], etc.

7.2.1 Important special characters

↵ carriage return (line feed)

→ tab (special function in Form Editor mode; refer to 6.2.1 on page 49).

When started from Test Card view, Test Procedure Overview or File Operations, the *String Editor*'s respective entry field shows a default name.

- To accept the default name, press the menu key **OK** or **Save**.

To change the default name, and to enter a name of your choice:

-  ► Delete the default name by repeatedly pressing the backspace key.
-  ► Enter the new test or folder name by consecutively selecting the characters of your choice from the on-screen keyboard using the **Up / Down** keys or the handwheel.
- Confirm every selected character by pressing the handwheel or **Enter**.
-  ► Use the *String Editor's* arrow buttons to move the cursor to the position of your choice. These buttons are only available if the focus is on the character selection.
- In the **Comment** card, press **Carriage Return** to start a new line. Otherwise, **Carriage Return** is disabled.
- Once the new name is entered, press the context-dependent menu key **OK** or **Save** to exit the *String Editor*.
- Press **Cancel** to close the String Editor and discard all changes.

7.3 Template phrases

The *String Editor* provides a feature that allows you to save phrases like test cards names, tests, templates, folders and files. Once these phrases are saved, they can then be selected as template phrases from the combo box **Select a phrase**.

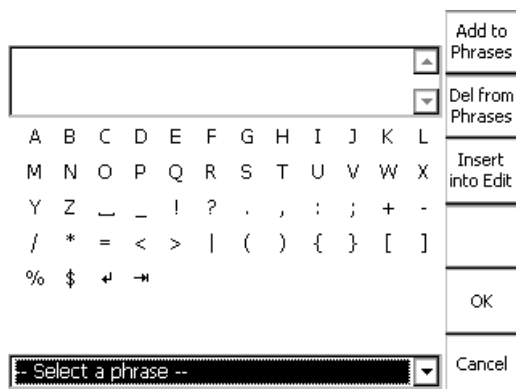


Figure 7-1: CPC String Editor with focus on "Select a phrase"

Saving a phrase

- Enter a name of your choice.
- Put the focus on the combo box **Select a phrase**.



- Press **Add to Phrases** to add this name to the list of template phrases.

Selecting a template phrase

- Put the focus onto the combo box.
- Press the handwheel and turn it to browse through the list of available, that is, previously saved, template phrases.

- ▶ Highlight the template phrase of your choice, and press the handwheel or the context-dependent menu key **OK**. The template phrase is then automatically added to the upper entry field.

Inserting a template phrase

- ▶ Select a template phrase as described above.



- ▶ Once the template phrase of your choice is highlighted, press **Insert into Edit**. The phrase is then automatically inserted into the upper entry field at the cursor position (refer to Figure 7-1).

Deleting a template phrase

- ▶ Highlight a template phrase as described above.



- ▶ Press **Del from Phrases** to delete the selected phrase template from the list.

Note: The **Restore defaults** menu key in the **Options** tab **Device Setup** (refer to 5.7.1 "Device setup" on page 31) resets all user-specific settings made in the *CPC* software to factory-defined defaults. This also includes the *String Editor's* template phrases.

8 Application

Before setting the *CPC 80* into operation and carrying out a test, it is essential that you have read and understood the instructions in chapter 1 "Safety instructions" on page 7.

- ▶ Be aware that all output sockets of the *CPC 80* can carry life-hazardous voltage potential and provide life-hazardous currents.

8.1 Preparations in the substation

Prior to connecting a test object to the *CPC 80*, the following steps need to be carried out by an authorized employee of the utility:

- ▶ Turn off and disconnect the high voltage from the test object.
- ▶ Protect yourself and your working environment against accidental re-connection.
- ▶ Verify a safe isolation of the test object.
- ▶ Earth-connect and short-circuit the test object's terminals using a grounding set.
- ▶ Protect yourself and your working environment with a suitable protection against other (possibly live) circuits.
- ▶ Protect others from accessing the dangerous area and accidentally touching live parts by setting up a suitable barrier and, if applicable, warning lights.
- ▶ If there is a longer distance between the location of the *CPC 80* and the area of danger, a second person with an additional **Emergency Stop** button is required.

8.2 General steps for testing with the *CPC 80*

8.2.1 Connection

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Verify that the substation is prepared accordingly and you comply with all safety regulations.
- ▶ Make sure that the *CPC 80* is switched off. Push the **Emergency Stop** button.
- ▶ Connect the *CPC 80* grounding terminal to the substation ground. Use a wire with a cross-section of $\geq 6 \text{ mm}^2$, otherwise the housing may feed high voltage.

1. Connect the *CPC 80* to the mains power supply using the provided cable.
2. With the test object grounded and short-circuited, connect the *CPC 80* to the test object according to your requirements.
3. Set up a barrier to separate the high voltage area from the safe area.
 - ▶ See Figure 1-1: "Separation of safe and high-voltage test area" on page 8).

WARNING



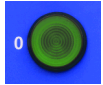
Death or severe injury caused by high voltage or current possible

- ▶ Do not enter the high voltage area during measurement.
- ▶ Remain in the safe area.
- ▶ Before entering the high voltage area, follow the steps in chapter 8.2.3 "Disconnection" on page 69.

4. Remove the grounding set from the test object.

8.2.2 During testing

5. Turn on the *CPC 80* POWER switch on the left side panel.



The green warning light "O" lights up, showing that none of the *CPC 80* outputs carries a dangerous voltage or current yet.

WARNING



Death or severe injury caused by high voltage or current possible

If none or both lights on the front panel are lit, the *CPC 80* is either not supplied by mains or it is defective.

- ▶ If the *CPC 80* is defective, do not use it.
- ▶ Contact OMICRON support.

6. Set up your test in the *CPC 80* software, and, where applicable, determine whether you want to perform an automatic or a manual test.
 - ▶ For a detailed description of how to use the software refer to sections 4 "Getting started with the *CPC 80* software" on page 19 and 5 "General software elements and settings" on page 27.
7. Once all test cards are prepared and the parameters set, make sure the safety key lock is in position "release" (horizontal).
8. Start the test by pressing the green I/O (test start/stop) push-button on the *CPC 80* front panel.

Note: An error message (313) appears if there is no ground connection, neither via PE (protective earth wire of the power supply) nor via grounding terminal (see 2.1.2 "High-voltage and High-current outputs" on page 25).

WARNING



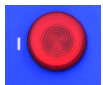
Death or severe injury caused by high voltage or current possible

This is a safety-relevant message. If the reason for this message is that neither the PE nor the grounding terminal is connected, this can cause injury or possibly death of the operating staff.

- ▶ Make sure that both PE and grounding terminal are connected.

If the power supply has no galvanic connection to ground, like on special power supplies with diesel generators or when insulation transformers are used, there is the option to activate the **Disable ground check** check box in the **Options** view – **Device Setup** tab (see "Device Setup" on page 53).

Important: If the ground check is disabled, the operator is fully responsible for any hazard that might occur due to improper grounding.



9. If a potentially hazardous voltage and/or current level is applied to the *CPC 80* outputs, the red signal light "I" starts flashing.

8.2.3 Disconnection

1. After testing, switch off the high voltage or current immediately with the **I/O** (test start/stop) button.
2. Turn the safety key to "lock" (vertical position) and remove the key to prevent anyone from accidentally starting a test and putting out high voltage or current.

WARNING



Death or severe injury caused by high voltage or current possible

- ▶ Do not touch any metallic terminals and housing components without a visible ground connection.
- ▶ Observe the warning lights: only when the green warning light is on and the red light is off, switch off the safety key lock and remove the key.
- ▶ After turning off the *CPC 80* outputs, earth-connect and short-circuit the test object's terminals again using a grounding set.

3. Remove the barrier between the safe area and the high voltage area.
4. Remove the connection between the *CPC 80* and the test object.

9 CPC 80 in a Network

9.1 General

The interface to access the *CPC 80* built-in ePC is an Ethernet board. The *CPC 80* can be connected with a 10BaseT ("twisted pair") connection cable to either a stand-alone PC, or an existing PC network.

For this, the Ethernet board provides one RJ-45 connector:

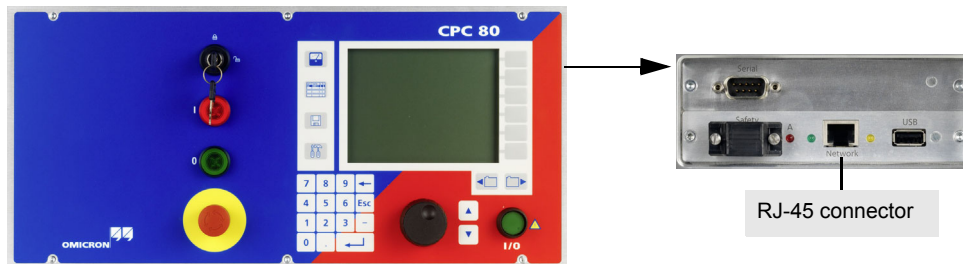


Figure 9-1: RJ-45 connector of the *CPC 80*

The communication protocol is the TCP/IP protocol.

9.2 Setting the communication parameters

CPC 80

For two devices to communicate using TCP/IP (the most-commonly used protocol for Ethernet), both devices need a unique network address. In addition, these devices need an identical subnet mask.



The *CPC 80* communication parameters are set in the **Network** tab of the **Options** view (refer to 5.7.2 "Network" on page 34).

DHCP/Auto-IP

Most PC networks have a DHCP (**D**ynamic **H**ost **C**onfiguration **P**rotocol) server that provides an address for every device connected to the network and defines the subnet mask. When connected to such a network, setting the *CPC 80* to DHCP/Auto-IP mode enables it to obtain an address from the DHCP server. If there is no DHCP server (for example, because the *CPC 80* is directly connected to a PC), the *CPC 80* generates its address automatically (Auto-IP).

Older versions of Microsoft Windows, such as Windows 95 or NT 4.0, support DHCP but not Auto-IP.

- For details about how to establish a communication via a direct connection, refer to the section "Setup for Windows 2000, Vista, XP" on page 72 of this chapter.

Static IP

In smaller PC networks, all computers have individual static IP addresses. Ask your system administrator to provide you with a unique address and all other settings for the *CPC 80*.

- If in doubt, set the PC and *CPC 80* to DHCP/Auto-IP.

IP address

This is the unique network address of the *CPC 80*. You need this setting only if static IP addresses are used. Your system administrator will provide you with a valid static IP address.

Subnet mask

This is the filter for the IP address. It has to be identical for all devices within one network. You need this setting only if static IP addresses are used. Your system administrator will provide you with a valid subnet mask.

Default gateway

This is the address of a local IP router on the same network the *CPC 80* is in. It is used to enable data traffic to destinations beyond the local network.

Commonly, the default gateway is not needed and can therefore be set to 0.0.0.0 for DHCP/Auto IP. This setting is only accessible if static IP addresses are used. Your system administrator will provide you with details.

DNS

This is the address of the **D**omain **N**ame **S**ystem server. Commonly, this address is not needed and can therefore be set to 0.0.0.0. This setting is only accessible if static IP addresses are used. Your system administrator will provide you with details.

9.2.1 PC or notebook

If your PC or notebook is capable of communicating in a PC network, communication with your *CPC 80* either within a network or via a direct connection to the *CPC 80*, should work without changing any of your PC settings.

Note: To avoid possible communication problems, we recommend to first fully boot the *CPC 80*, then connect the *CPC 80* to the PC and eventually start the *CPC Start Page*.

Computers with a Windows 95 or a NT 4.0 operating system need a special setup. These details are explained in chapter "Setup for Windows 2000, Vista, XP" on page 72 of this chapter.

In a network with static IP addresses, your system administrator will provide you with valid settings for the *CPC 80*.

- In a network with dynamic address configuration (DHCP or Auto-IP), set your *CPC 80* to "DHCP/Auto-IP". Both the addresses of your PC and *CPC 80* will be generated automatically.

9.2.2 Troubleshooting in case of communication problems

Should communication problems occur, the *CPC Start Page* will assist you in accessing the *CPC 80* through the network, and, if possible, make suggestions about the settings to enter. Generally, all you need to do is to press **OK** a few times to acknowledge suggested settings.

- Since the *CPC 80* may re-boot, make sure to save your data beforehand.
- If your *CPC 80* is not listed on the *CPC Start Page* although correctly connected, check the Ethernet connection cable:

9.2.3 Connection from the *CPC 80* network port (RJ-45) to the PC

- ▶ Connect and disconnect the 10BaseT connection cable several times and check whether the "link indicator" LED¹ near the PC's port turns on and off.

Note: In general, communication is established quicker. However, under certain circumstances it may take up to 2 minutes until a proper communication is set up. During this phase, we recommend to click the **Refresh** button on the *CPC Start Page* from time to time.

- ▶ If you still cannot establish a connection, try another 10BaseT connection cable on a different port of the hub.
- ▶ If the link indicator LED works but you still cannot establish communication, try deactivating firewall and/or antivirus software on your computer. Applications like these may interfere and prevent proper communication.

9.2.4 Firewall and anti-virus software

Firewall and antivirus software often block data traffic on several ports of the Ethernet interface. This may prevent proper communication between *CPC* and PC.

- ▶ Whenever communication problems occur, try to temporarily deactivate firewall and/or antivirus software that are installed on your computer.

Note: By default, the *CPC* software uses port 4987 to find connected *CPC* sets, and port 21 (FTP port) to download data from the *CPC*. It also needs the possibility to send and receive ICMP data packages ("PING" command has to work).

During installation of the *CPC Start Page* you are asked to open some ports on Windows firewalls. It is recommended to allow this. Otherwise, the "find" algorithm will not work.

9.2.5 DHCP allocator service

In most PC networks there is a DHCP server that provides the connected network nodes with valid addresses. That way, every PC in the network is assigned a unique address.

Because there is no DHCP server present when a *CPC* is connected directly to a PC (point to point), the *CPC 80* is capable of providing the PC with a valid address as long as there is no server detected and the *CPC Start Page* is running on the PC. The address is chosen from the Auto-IP address range, so it does not interfere with other addresses within the network. It is also assured that only those PCs are provided with an IP address that run the *CPC Start Page*.

9.2.6 Setup for Windows 2000, Vista, XP

Note: Disconnecting your PC from the network and establishing a direct connection to the *CPC 80*, for example, to test it in the office before you take it out for testing, may work - but establishing a communication hours later is no longer possible.

The reason for this is that the DHCP server provides the PC with both a valid address and an expiration date. The expiration date can be in hours or even weeks. After the address has expired, you need to change your PC configuration in order to establish a new communication.

Note: Windows 95 and NT 4.0 do not support Auto-IP.

1. LED close to your PC's Ethernet connector that displays data traffic by going on and off.

There are two methods of using a Windows 95 or Windows NT 4.0 PC or notebook alternatively in a network or connected directly to *CPC 80* without the necessity of having to re-configure its settings for each case:

Installation of a second Ethernet network interface card.

This network card's port is used exclusively for communication with the *CPC 80*. It should be configured statically. It is recommended to set the network card to the Auto-IP address range:

- IP address: 169.254.77.33 ,
- Subnet Mask: 255.255.0.0 ,
- Default Gateway: 0.0.0.0
- DNS: 0.0.0.0

This way, it is possible to connect your PC to the network using the first network card's port, and directly to the *CPC 80* using the second network card's port.

► Set the *CPC 80* to DHCP/Auto-IP to connect it to the network or directly to the PC.

Setting PC and *CPC 80* to a static IP address.

The DHCP server generates addresses within an address range defined by the subnet mask. In general, it is also possible to set static addresses within this range.

The addresses need to be provided by your system administrator.

Note: Do not set addresses by your own. Always consult your system administrator. If, by mistake, an IP address is used twice in the network, communication of one or both of the devices will fail to work.s

10 OMICRON *Device Browser*

10.1 General

The OMICRON *Device Browser* is an application embedded in the Windows operating system. You can access the directory of the connected *CPC 80* through Windows Explorer and other applications, such as Editor and Excel.

10.2 Installation of the OMICRON *Device Browser* software

The OMICRON *Device Browser* software is included in the *CPC Toolset* and will be automatically installed together with the *CPC Start Page*.

10.2.1 System requirements

For the installation requirements, see 2.2.1 "System requirements" on page 12.

10.3 Using the OMICRON *Device Browser*

The OMICRON *Device Browser* allows you to access your *CPC 80* through the Windows operating system. With the OMICRON *Device Browser*, you can conduct easy file operations (for example cut, copy, delete, rename) in the Windows operating system from and to the *CPC 80*.

Furthermore, you can obtain direct reports of your tests, open or save your tests with *CPC Editor* or *CPC Excel File Loader*. The OMICRON *Device Browser* can be used to upgrade your *CPC 80* or configure your *CPC 80* Network Configuration.

10.3.1 Upgrading and configuring the network of the *CPC 80*

Right-click on the respective device on the right-hand side pane to open the context menu and select either one of the options.

Note: Only connected devices are displayed.

The **Set Network Configuration** option is used to set the network configuration of your *CPC 80*. Use the **Upgrade Device** option to upgrade the software of your *CPC 80* with a newer version. With the **View** option you can select how the connected devices are displayed.

Note: These two options are also available via the *CPC Start Page* from the **Manage** drop-down menu.

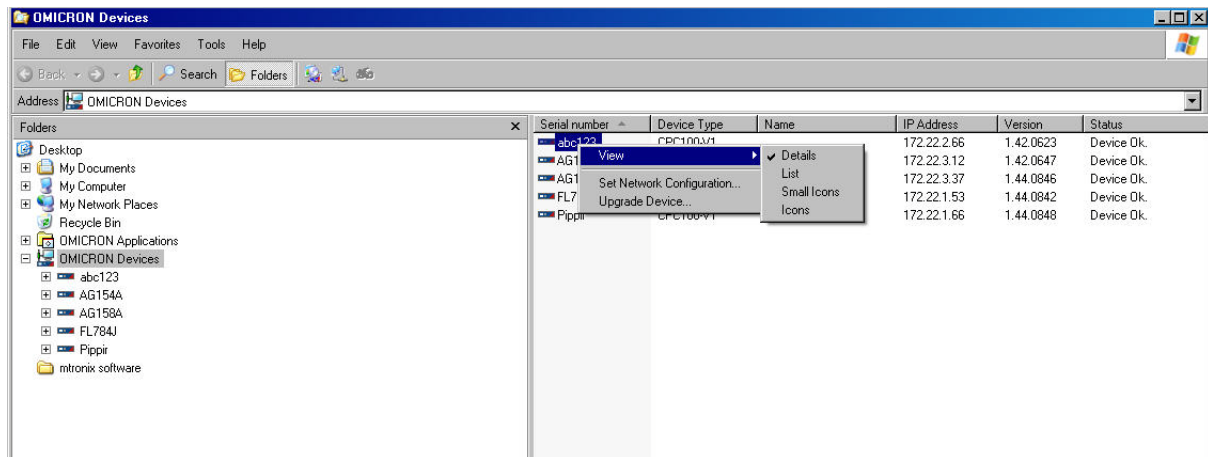


Figure 10-1: Upgrading and configuring the network

10.3.2 Viewing logfiles

During operation, the *CPC 80* creates a logfile with a user-definable logging level (refer to 5.7.7 "Service" on page 38).

- To view the logfiles, click on the **Logfiles** folder of the device on the left-hand side pane. All available logfiles will be displayed.

10.3.3 Viewing test files

- To display all tests, click on the **Tests** folder of the device on the left pane. All available tests will be listed.
- Right-click on the respective test on the right pane to open the context menu or use the Windows Explorer menus. You can cut, copy, delete or rename the test files. It is also possible to display test reports and to open the test file using the *CPC Editor*.
- To display a test report, right-click on the file name and select **Display Test Report** from the context menu.

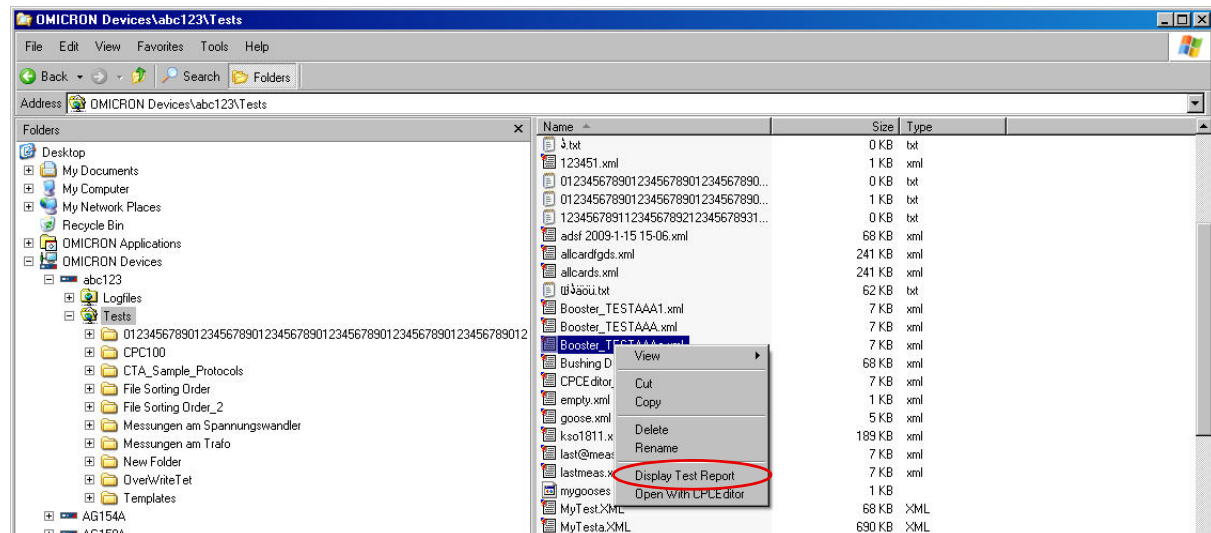


Figure 10-2: Viewing and editing test files

The test report contents are then displayed in a separate window.

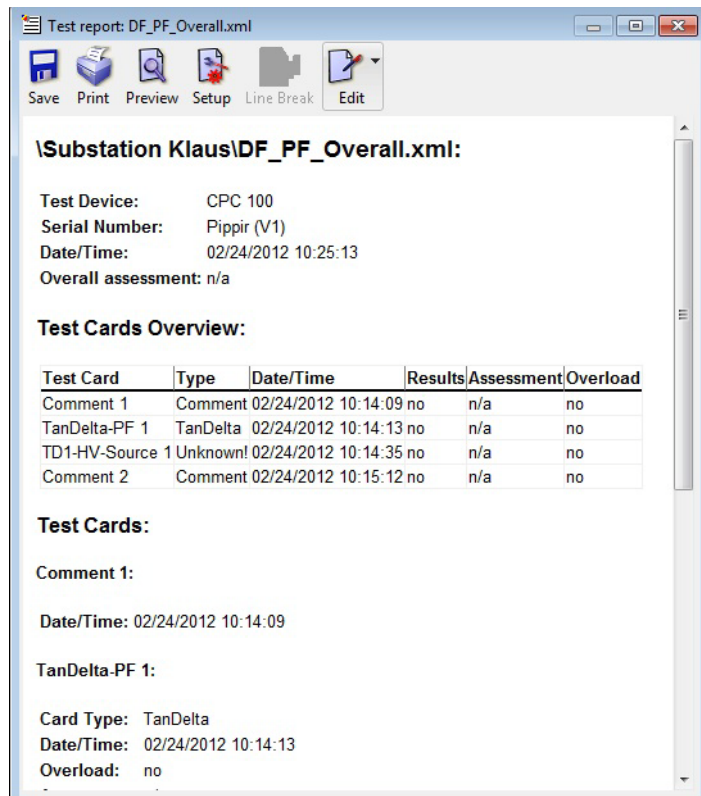


Figure 10-3: Test report contents

CPC 80 User Manual

The **Open With CPCEditor** context menu allows you to directly open and edit your tests from the *CPC 80* with *CPC Editor*. The *CPC Editor* can also be accessed via the *CPC Start Page*.

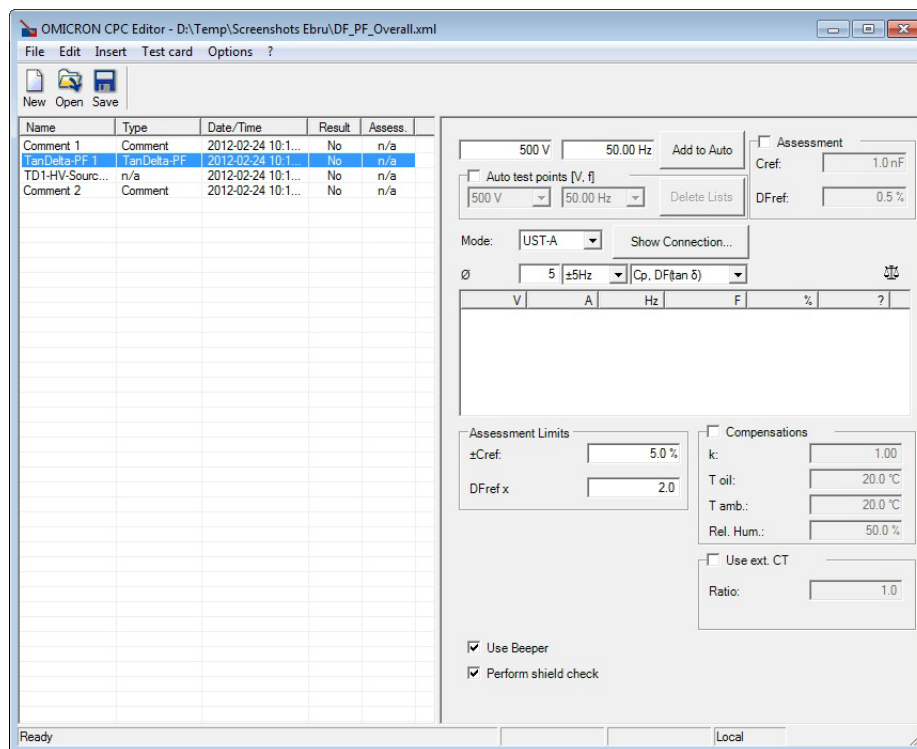


Figure 10-4: Directly open and edit your tests

You can save tests directly to the *CPC 80* from the *CPC Editor*.

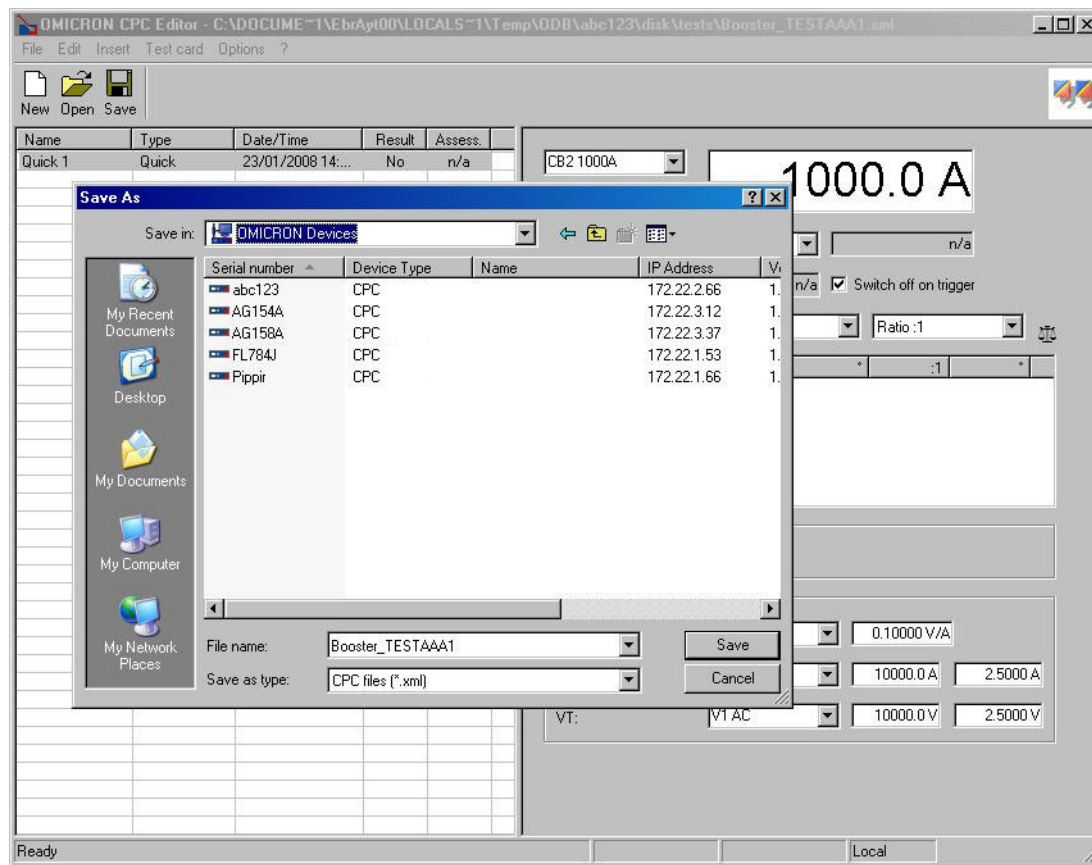


Figure 10-5: Saving tests with the *CPC Editor*

Additionally, you can load test results directly into the *CPC Excel File Loader*.

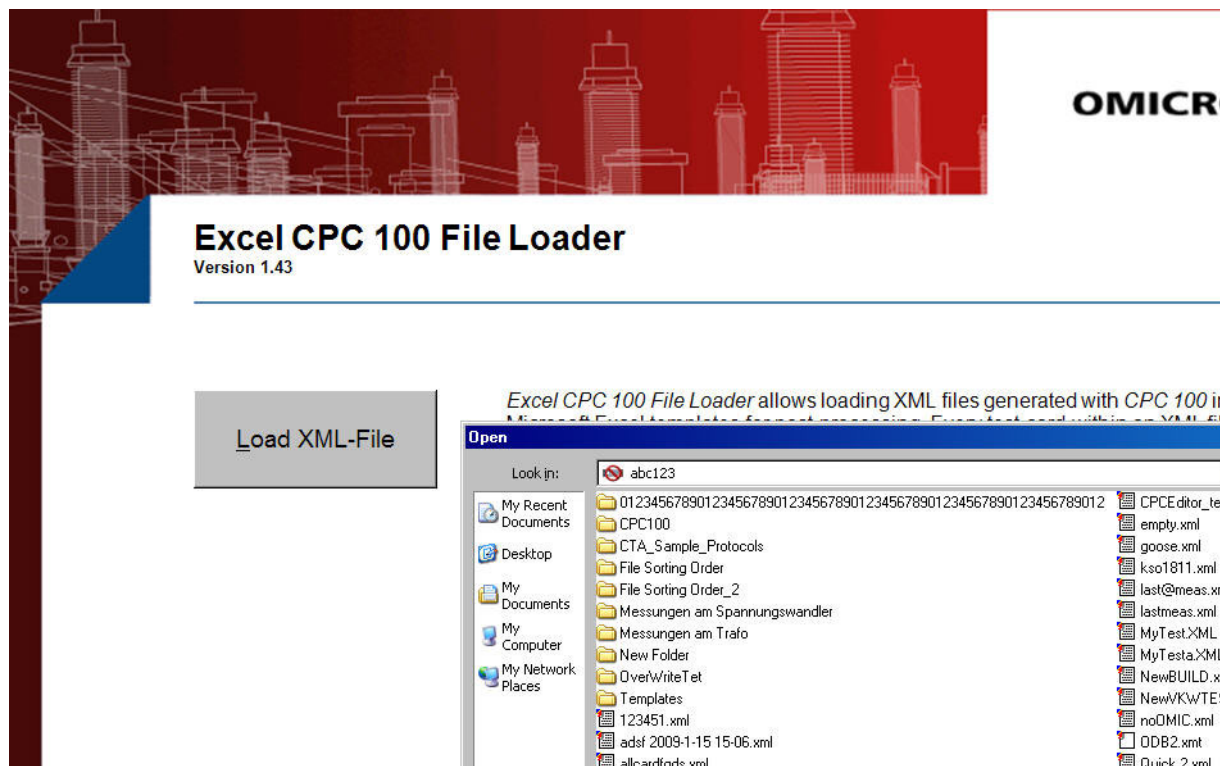


Figure 10-6: Loading files into the *CPC Excel File Loader*

11 *CPC Editor*

11.1 General

The *CPC Editor* is used for offline test preparation, that is to set up single test cards and/or entire tests with all of their test-specific settings on a PC, independent from the availability of a *CPC 80*.

The prepared test file (.xml file¹) is then uploaded to the *CPC 80* using the OMICRON *Device Browser*.

The *CPC Editor* also opens executed and assessed test files that were downloaded from the *CPC 80* to your computer to view them, edit them, and, if required, save them on your computer's hard disk.

Additionally, a test file can be saved as test procedure template, that is a user-defined template containing one or more test cards with all of their specific test settings. To learn more about templates in general, please refer to 5.8 "Creating defaults and templates" on page 40.

11.2 Installing the *CPC Editor*

For the installation procedure, see 2.2 "Installation of the CPC Toolset" on page 11.

1. An .xml file is a test with all of its test cards and specific settings. It may also contain test results and assessments that were stored together with the settings as report in the *CPC 80* file system for archiving purposes.

11.3 Working with the *CPC Editor*

Note: This section describes the *CPC Editor*-specific functionality only.

Since the user interfaces and the functionality of the *CPC Editor* test cards largely resemble the actual test cards in the *CPC 80*, all information about the definition and meaning of the single test card parameters can be found in the chapters of the respective test cards.

To start the *CPC Editor*, click the *CPC Editor* icon on the *CPC Start Page*.

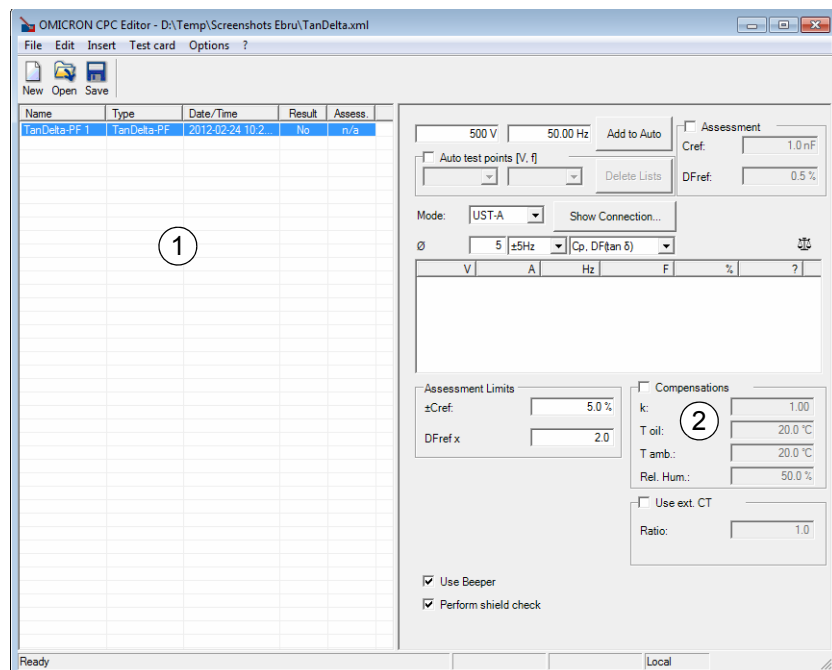


Figure 11-1: *CPC Editor* user interface holding one blank **TanDelta - PF** test card

Apart from the pull-down menus and the toolbar, the *CPC Editor* interface consists of two panes:

- ① The left-hand side list view pane resembles the Test Procedure Overview of the *CPC 80* software (refer to 5.3 "Test procedure overview" on page 28), and lists test cards showing the card's name, its creation date and time, whether test results are available and the test card's assessment status
- ② The right-hand side test card pane resembles the user interface of the selected test card as it is laid out in the *CPC 80* software. Here, the test card-specific parameters are specified.

11.3.1 Appending a Test Card

Appending a test card means:

- appending it to an empty list, that is, make it the first test card
- appending it to the last position of an already existing list of test cards.

When the *CPC Editor* starts, the list view pane is empty. To insert a test card, either:

- right-click the list view pane to open the shortcut menu and click **Insert Test Card...**

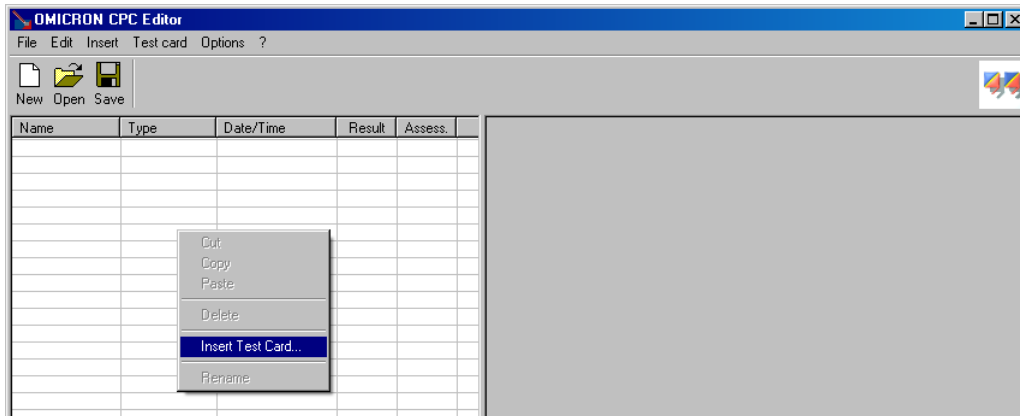


Figure 11-2: Shortcut menu of the list view panel

- or select the pull-down menu item **Insert | Test Card...**

In the **Insert Test Card** dialog box, select the test card of your choice and click **Append**.

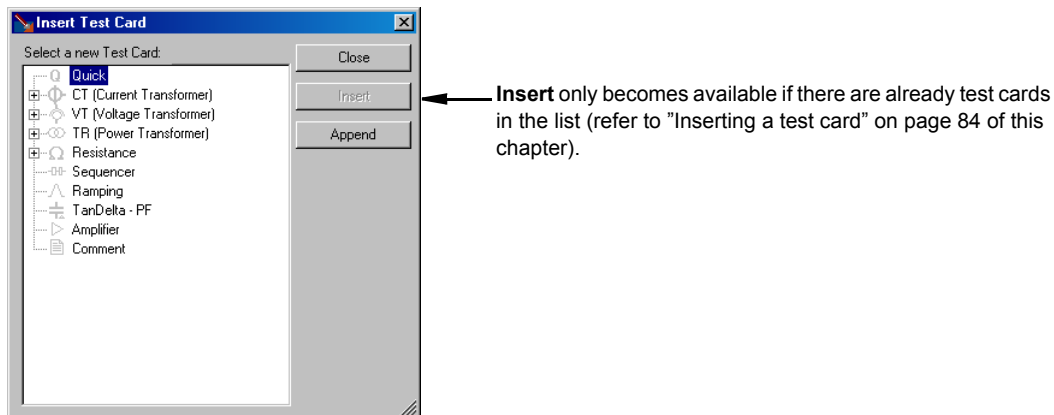


Figure 11-3: **Insert Test Card** dialog

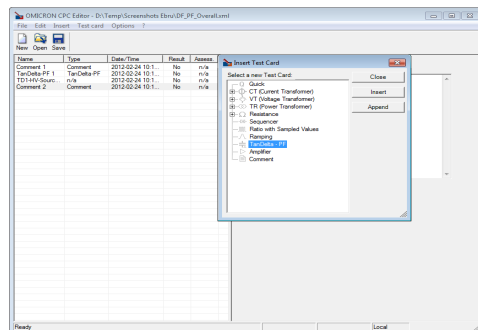
11.3.2 Inserting a test card

Inserting a test card means: inserting it into an already defined list of test cards.

The procedure of inserting resembles the one of appending a test card (described in "Appending a Test Card" on page 83 of this chapter). The difference is that the inserted test card is positioned in the list right *before* the currently selected test card rather than appended to the end.

Name	Type	Date/Time	Result	Assess.
TanDelta-PF 1	TanDelta-PF	2012-02-24 10:2	No	n/a
TanDelta-PF 1	TanDelta-PF	2012-02-24 10:1...	No	n/a
TD1-HV-Sourc...	n/a	2012-02-24 10:1...	No	n/a

Predefined list of test cards, **TanDelta - PF** selected.



Select

- Insert|TestCard
- TanDelta - PF
- Insert

Name	Type	Date/Time	Result	Assess.
Comment 1	Comment	2012-02-24 10:1...	No	n/a
TanDelta-PF 1	TanDelta-PF	2012-02-24 10:1...	No	n/a
TD1-HV-Sourc...	n/a	2012-02-24 10:1...	No	n/a
TanDelta-PF 2	TanDelta-PF	2012-02-27 11:4...	No	n/a
Comment 2	Comment	2012-02-24 10:1...	No	n/a

TanDelta - PF is inserted before the selected **Comment** test card.

Figure 11-4: Example: inserting a **TanDelta - PF** test card to an existing list of test cards

11.3.3 Inserting from file

Select **Insert | From File...** to browse for a previously saved **.xml** file. This **.xml** file is a test file that was either:

- previously created with the *CPC Editor*, and saved to the computer's hard disk
- or previously created (and even executed and assessed) with the *CPC 80*, and then uploaded to the computer's hard disk by means of the *OMICRON Device Browser*.

Just like inserting a single test card, inserting an **.xml** file means, positioning its entire contents (one or more test cards) in the list right before the currently selected test card.

11.3.4 Copying a test card

In most cases, it is easier to copy/paste an existing and already parametrized test card, and to rename it accordingly, than to start a new one from the beginning.

To copy a test card either

- ▶ right-click the list view pane to open the shortcut menu and click **Copy**
- ▶ or select **Edit | Copy**.

This copies the selected test card to the clipboard.

You now have three choices.

1. Insert the test card from the clipboard into your list view:
 - ▶ either right-click the list view pane to open the shortcut menu and click **Insert Copied Test Card**
 - ▶ or select **Insert | Test card copied**

Note: Note that the inserted test card is positioned in the list right *before* the currently selected test card.
2. Paste the test card from the clipboard into the list view overwriting a test card of your choice:
 - ▶ either right-click the list view pane to open the shortcut menu and click **Paste**
 - ▶ or select **Edit | Paste**

Note: Note that the selected test card is overwritten by the one pasted from the clipboard.
3. Paste the test card from the clipboard into the list view of another running instance of the *CPC Editor*:
 - ▶ Change to the other running instance of the *CPC Editor*, or start the *CPC Editor* once more and:
 - ▶ insert the test card either via the shortcut menu item **Insert Copied Test Card** or the pull-down menu item **Insert Copied Test Card**
 - ▶ or overwrite the selected test card with the test card from the clipboard either via the shortcut menu item **Paste** or the pull-down menu item **Edit | Paste**.

11.3.5 Renaming a test card

To rename the currently selected test card to any new name of your choice:

- ▶ either right-click the list view pane to open the shortcut menu and click **Rename**
- ▶ or select **Test card | Rename**

Enter the name of our choice (256 characters max.) and press **Enter**.

11.3.6 Saving a test



- ▶ Click the **Save** icon or select **File | Save** with the "Save as type:" option "CPC files (*.xml)" to save the currently open test, that is, the test card(s) listed in the list view with all of their settings, under its actual name.

If this test does not have a name yet, the **Save As** dialog box opens. Browse to the destination folder of your choice, and name your test accordingly.



- Note:** The file name extension `.xml` is appended automatically. Do not enter any other file name extension as the **File Open** command will then not show this file anymore.

11.3.7 Saving a test as template

Using the **File | Save As...** command with the "Save as type:" option "CPC templates (*.xmt)", any test file can be saved as a test procedure template, that is, a user-defined template containing one or more test cards with all of their specific test settings but without test results.

Note: To learn more about templates in general, please refer to 5.8 "Creating defaults and templates" on page 40.

In this process, the settings of the original `name.xml` file are taken over to the newly created test procedure template `name.xmt`. Possible test results in the `name.xml` file, however, are not taken over. The original file `name.xml` remains unchanged.

The template is then uploaded to the *CPC 80* using the *OMICRON Device Browser*.

Note: The file name extension `.xmt` is appended automatically. Do not enter any other file name extension as the *CPC 80* will not recognize it as a valid template.

11.3.8 Deleting a testcard

To delete a test card from a test or a test procedure template:

- ▶ either right-click the list view pane to open the shortcut menu and click **Delete**
- ▶ or select **Edit | Delete**

Note: To delete an entire test or template, that is, an `.xml` or `.xmt` file, from your computer, use Windows Explorer.

11.3.9 Preparing a test offline with a PC

Outline of a typical proceeding for an offline test preparation with a PC using the *CPC Editor* and *OMICRON Device Browser*.

It is recommended to create subfolders in a tree structure that corresponds with the substation.

- ▶ Start the *CPC Editor*
- ▶ Set up the required test card(s) for this substation, compose your entire test, and eventually save the test in the appropriate folder that you created before.

Note: If single test cards or entire tests are similar or even identical, use the *CPC Editor*'s copy/paste functionality, rather than creating new tests from the beginning.

- ▶ Once all tests are composed, use the *OMICRON Device Browser*'s upload function to transfer the entire tree structure from your PC to the *CPC 80* at once.
Single files can be transferred directly from the *CPC Editor* using **Save as...** from the **File** menu.

12 *CPC Excel File Loader*

12.1 General

The *CPC Excel File Loader* allows loading XML files into Microsoft Excel templates for post processing. The *CPC Excel File Loader* is installed with the *CPC Start Page*. After the installation, you can start the *CPC Excel File Loader* directly from the *CPC Start Page* by clicking on the respective icon.

12.1.1 System requirements

► For the installation requirements, see 12.1.1 "System requirements" on page 88.

12.2 Installing the *CPC Excel File Loader*

► For the installation procedure, see 2.2 "Installation of the CPC Toolset" on page 11.

12.3 Working with the *CPC Excel File Loader*

The *CPC Excel File Loader* allows loading XML files generated with the *CPC 80* into Microsoft Excel templates for post-processing. Every test card within an XML file is represented by a sheet of a Microsoft Excel workbook. You can load new XML files into the Microsoft Excel template by generating all sheets or by loading data into existing sheets of the workbook. The mapping between the data in the file and in the sheets is done by using the same name for the *CPC 80* test card and the corresponding sheet.

Note: For correct data mapping, use unique names for the test cards in the XML files.

In a blank Microsoft Excel customer sheet, you can reference to the data in the sheets designed by OMICRON using Microsoft Excel formulas. If the data in the OMICRON sheets is updated, the customer sheet is updated as well. By this means, special forms for post-processing of the data, the so-called templates, can be created easily.

12.3.1 Templates

Templates are pairs of XML documents and Microsoft Excel templates designed by OMICRON or end users for designated applications. The XML templates are predefined test procedures, often with comments, that run on the *CPC 80* and guide the user through the test. Once completed, the XML file is saved, downloaded to the PC and then loaded into the corresponding Microsoft Excel template. There the results are post-processed and a final test report is generated. The template pairs facilitate and speed testing with the *CPC 80* and the evaluation of results.

Note: The version of the two templates must match. There is a version check. If an error message appears after loading the XML template, the templates do not match. Thus, use a template pair of the same version.

To run a test procedure according to a template:

1. Upload the XML template or a whole folder of templates for the intended application from the PC to the *CPC 80*.
The XML templates (*.xmt files) are available on the *CPC Start Page*.
2. Open the template on the *CPC 80*.

3. Run the test procedure according to the template.
4. After completing the test procedure, save the test as a new file.
5. Open the corresponding Microsoft Excel template by double-clicking the *.xlt file in the folder labeled with the test procedure name. A Microsoft Excel workbook appears.
6. Click the **Load XML-File** button and open the *.xml file directly from your *CPC 80*. The *CPC Excel File Loader* loads the test results from the XML file to the Microsoft Excel template.
7. After all worksheets are filled with data, the test results are calculated and displayed.

13 Technical data

13.1 General

Table 13-1: General specifications

Characteristic	Rating
Single-phase, nominal ¹	100 V AC to 240 V AC
Single-phase, permissible	85 V AC to 264 V AC (L-N or L-L)
Frequency, nominal	50/60 Hz
Power consumption	< 7000 VA for a time < 10 s
Connection	IEC320/C20
Automatic circuit breaker	16 A
PC Interface	Ethernet and USB stick

1. If the power supply is ≤ 190 V AC, the *CPC 80* cannot provide the full output power. The same applies when an external booster is used. Therefore, in order to gain the full output power, provide a sufficient power supply (190 V ... 240 V AC).

13.2 Mechanical data

Table 13-2: Mechanical data

Characteristic	Rating
Dimensions (W x H x D), cover, without handles	468 x 394 x 233 mm 18,4 x 15,1 x 9,2 in
Weight	18 kg 39,7 lb

13.3 Environmental conditions

Table 13-3: Environmental conditions

Characteristic		Rating
Temperature	Operating	−10 °C ... +55 °C +14 °F ... +131 °F
	Storage and transportation	−30 °C ... +70 °C −22 °F ... +158 °F
Max. altitude	Operating	2,000 m 6,550 ft
	Storage and transportation	12,000 m 40,000 ft

13.4 Standards conformity

Table 13-4: Standards conformity

EMC, safety		
EMC	IEC/EN 61326-1 (industrial electromagnetic environment) FCC subpart B of part 15, class A	
Safety	IEC/EN/UL 61010-1	
Other		
Shock	IEC/EN 60068-2-27 (15 g/11 ms, half-sinusoid, 3 shocks in each axis)	
Vibration	IEC/EN 60068-2-6 (frequency range 10 Hz ... 150 Hz, acceleration 2 g continuous (20 m/s ² /65 ft/s ²), 20 cycles per axis	
Humidity	IEC/EN 60068-2-78 (5 % ... 95 % relative humidity, no condensation), tested at 40 °C/104 °F for 48 hours	
Protection class	IP22 (in upright position) according to IEC/EN 60529	
Prepared for tests conforming to	IEE 510, EN 50191, VDE 104	

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The OMICRON Bootloader software

The OMICRON Bootloader software includes software parts developed by:

- Intel Corporation (IXP400 SW Release version 2.3)
- Intrinsyc Software (Intrinsyc Bootloader)
- Swedish Institute of Computer Science, Adam Dunkels (lwIP TCP/IP stack)
- Mark Adler (puff - decompress the deflate data format)
- Jean-loup Gailly and Mark Adler ("zlib" general purpose compression library)

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lwIP TCP/IP stack

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puff (Mark Adler)

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zlib (Jean-loup Gailly and Mark Adler)

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The data format used by the zlib library is described by RFCs (Request for Comments) 1950 to 1952 in the files <ftp://ds.internic.net/rfc/rfc1950.txt> (zlib format), [rfc1951.txt](ftp://ds.internic.net/rfc/rfc1951.txt) (deflate format) and [rfc1952.txt](ftp://ds.internic.net/rfc/rfc1952.txt) (gzip format).

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