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DCRK5 DCRK7 DCRK8 DCRK12
Automatic power factor regulator

PROGRAMMING SOFTWARE MANUAL

CE

Summary

Introduction

With DCRKSW programming software, you can connect a DCRK regulator to a PC via an RS232 serial port for faster, easier entry of set-up parameters and to check functioning of the PFC panel. It is also an effective aid in tracing any faults or problems as you can check all the measurements and the values. The software provides the following functions:

- Graphic display of all the measurements returned by the device with numeric and bar-graph type readout.
- For each step:
  - Status display (ON/OFF)
  - Function display (step/alarm/fan)
  - Display of the power set or measured
  - Display of the number of switching operations
  - Display of total step functioning time
  - Manual close/open commands
- Access to the Basic and Advanced Setup menus
- Access to alarm properties
- Possibility of set-up parameter save/load/printout
- Display of virtual front panel with the possibility of activating the keys
- Automatic switching from manual/automatic mode
- Keypad lock function
- Procedure for automatic testing of the PFC panel, with printout of the test report

Minimum resources of the PC

- Windows$^®$ 95/98/2000 operating system
- Graphic card with 1024x768 or higher resolution
- A free standard RS232 serial interface (COM:)
- 64Mb of RAM
- Pentium$^®$ class or higher processor
- CD-ROM drive for installation

Installation

To install the software, you need a PC with the operating system already installed and running and the program setup CD. You should also have at least a basic knowledge of the PC and be familiar with Windows$^®$. operating system commands.

The software is delivered on a CD with two different installation procedures. Use the standard installation procedure, resident in the *Setup1* directory, with the first releases of the Win 95 and 98 operating systems and the new installation procedure, held in the Setup2 directory, for the latest releases of Win 98 and Win 2000 operating systems.

Setup1:
1. Close all applications running
2. Insert the CD in the drive
3. From the Setup1 directory, start the *Setup.exe* program
4. Press the button with the icon of a PC to start the installation procedure.
5. A window is displayed asking you to specify the directory in which you want to install the program. To change directory, enter the new name in the specific box.
6. Follow the instructions provided. If a message is displayed indicating that there are more recent files present on the PC than those being installed, maintain the files already present (answer YES or 'keep' to the prompt)

Setup2:
1. Close all applications running
2. Insert the CD in the drive
3. From Setup2 directory, start *setup.exe*
4. A window is displayed asking you to specify the directory in which you want to install the program. To change the directory, enter the new name in the specific box.
5. If you want to reboot the system at the end of installation, carry out the procedure.

PC – DCRK connection
To use the software, the PC must be connected to a DCRK regulator using a serial cable. This cable
(Lovato code 51C11) includes an RS232/TTL converter that makes it possible to convert the TTL signals
present on the rear connector of the DCRK into an isolated RS232 signal that can be connected to the PC.
To check correct connection immediately, connect the end with the RJ6 telephone jack to the device and the
end with the DB9 connector to the serial port of the PC and start the software. If the software does not
activate communication (ONLINE mode), check that the number of the serial port used on the PC matches
that selected in the *Configuration-Options* menu.
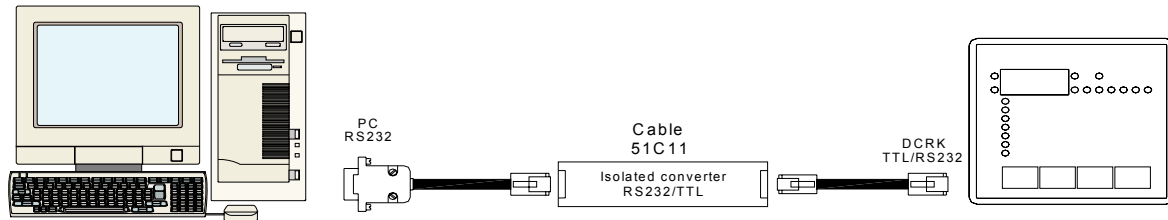
Note:
This type of connection is intended for use during the setting, test or diagnostic phases and is not suitable for
a permanent serial connection.

Main window
The main window displays all the various measurements returned by the device, providing a complete
overview of PFC panel status.
All the functions are accessible from the drop-down menus and those used most frequently are also shown
on the toolbar. Some of these functions are blocked and can be accessed only after entering the user-
modifiable password (at the first setting, the default password is *LOVATO*).

The following are displayed in the main window:
- Three 7-segment displays indicating respectively current power factor, the setpoint power factor and the
  average weekly power factor.
- A graphic representation of the phase displacement angle in the four quadrants.
- Panels with voltage, current, Delta-kvar, capacitor overload and temperature, each with numeric and bar
  graph readout and, where available, an indicator of the MAX value detected. If the DCRK has been
  programmed with the Auto-Setup procedure, some of these measurements are not available.

A set of panels, one for each step, with the following information:
- An icon representing relay status (ON/OFF) and function (capacitor bank, fan command or global alarm).
- A box indicating the power of the step in Kvar. This box usually indicates the power set (programmed in
  the setup). If the step trimming function has been activated on the DCRK, this box shows the measured
  power of the bank of capacitors. If the DCRK has been programmed with Auto-Setup, the power of the
  step will not be available.
- A graphic bar indicating the percentage ratio between the power set and that measured. This is available
  only when the step trimming function has been activated.
- A box indicating the total number of switching operations of the step. The count is maintained even if the
  device is switched off. This counter can be reset from the Instruments-Reset-Switching operations
  counter menu. *Note:* the DCRK distributes the number of switching operations equally between steps
  with the same power. It is normal therefore that steps of different power have a different number of
  switching operations.
- A box indicating the total switch-in time of the steps in hours-minutes. The switch-in time is reset each
  time the device is switched off or using the Instruments-Reset-step functioning time menu.

Lastly, the following are indicated, from left to right, on the *status bar* close to the lower edge of the main
window:
- Model and release of the internal firmware of the DCRK connected
- Serial communication status (ONLINE = connection active, OFFLINE = connection not active)
- DCRK operating mode (MANUAL / AUTOMATIC)
- Any alarm conditions
- Page refresh rate
- Setup mode (None/Standard/ Autosetup)

Main window

Switches to ONLINE mode (communication ON)

Selects MANUAL mode on the DCRK

Accesses the Basic, Advanced setup and alarm properties menus

Switches locking of the DCRK keypad ON/OFF

Real-time measurements with numeric value and bar-graph

Switches to OFFLINE mode (communication OFF)

Switches to AUT mode on the DCRK

Displays the virtual front panel

Opens the TEST capacitors window

Delta-kvar graphic bar.
IN = kvar to be switched in
OUT = kvar to be switched out

Marker and numeric value of the max. peak detected

DCRK Remote control

View Password Configuration Mode Communication Parameters Tools

Lovato electric DCRK Control panel

* ACTUAL COS-PHI

0.94 IND

SETPOINT COS-PHI

0.90 IND

WEEK AVG P.F.

0.95

IND-   IND+

20°

CAP-   CAP+

	VOLTAGE	CURRENT	DELTA kVar	CAP OVRL	TEMP
	402 V	43.9 A	0	099 %	021°C

	STEP 01	STEP 02	STEP 03	STEP 04	STEP 05	FAN	ALARM	STEP 08	STEP 09	STEP 10	STEP 11	STEP 12
kvar	5,0	10,0	20,0	20,0	20,0	---	---	---	---	---	---	---
w%	100%	100%	100%	100%	100%							
Cnt	00000	00001	00001	00001	00000	00000	00000	---	---	---	---	---
me	00:00	00:00	00:00	00:00	00:00	00:00	00:00	---	---	---	---	---
	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT	IN OUT

DCRK7 R 00   ONLINE   MAN MODE   0,0   STANDARD

Current P.F. measure-ment

Average weekly P.F.

Power of the steps

Number of operations counter

Total time of use of the step

Step manual control buttons

Graphic representation of the phase displacement angle (in the 4 quadrants).
Blue marker = current angle
White marker = Setpoint

Setting of P.F: setpoint

Step status and function icon

Serial connection status

DCRK operating mode MAN / AUT

Graphic bar of percentage power measured in relation to that set

Access to Setup menus

Device settings are entered via the setup parameters which you can display and modify from the specific *Parameters* menu or directly from the toolbar by clicking on the matching icon. If you have not entered the password previously, only the current settings are displayed without transmission of modifications to the device.

This method of accessing DCRK settings is handier and more immediate compared with direct access from the front keypad as, using the PC; the following are displayed:

- Code of the parameter
- Description in the language set
- Value set
- Graphic box or drop-down box with possible options

The parameters have been grouped in two menus that reflect the organization described in the operations manual.

- Basic setup (basic settings such as primary CT, number and power of the steps, etc.)
- Advanced setup (particular operating modes and other advanced functions)

In addition to these two menus, the properties of the alarms have been grouped in a third window from which you can modify the behavior of the device following occurrence of an alarm.

You can save the complete series of settings of an device in a file so as to re-use these to set another device with the same settings.

You can save the complete series of settings of a DCRK on the disk of the PC in an ASCII text file for fast, easy reloading of these in another device. This function is useful when programming a number of control units with the same settings or in order to maintain a master file of the original settings of a system. To save the parameters on disk, select the *Parameters-Save to file* menu and enter the name required.

The following are saved in each file:
- Type (number of steps) and internal release of the device
- P.F. setpoint
- Basic setup parameters
- Advanced setup parameters
- Properties of the alarms

This type of file has a .PAR extension. To carry out the reverse operation, i.e. to transfer a file from the PC to the DCRK, access the *Parameters-Load from file* menu. Obviously, this operation can be carried out only between devices of the same type, i.e. with the same number of steps and with the same internal release. From the *Parameters-Print* menu, you can obtain a printout of the settings to be filed with system documentation.

Basic setup

Code of the parameter

Description

Graphic bar. Drag this with the mouse to modify the setting

Setting of the parameter. Highlighted in yellow if different from the factory-set default value. Double clicking on this box, the parameter can be set using the numeric keypad

Base setup

Base setup

P.01	CT primary winding	100 A
P.02	Smallest step kvar	5.00
P.03	Capacitor rated voltage	400 V
P.04	Reconnection time	10s
P.05	Sensitivity	60
P.06	Step 01 coefficient	1
P.06	Step 02 coefficient	2
P.06	Step 03 coefficient	4
P.06	Step 04 coefficient	4
P.06	Step 05 coefficient	4

Scroll bar to access the parameters below

Transmit | Receive | Default | Exit

Transmits the values displayed in the window to the DCRK and saves them. Enabled only with password.

Receives the values of the parameters from the DCRK and displays these in the window

Resets the values to the factory-set default

Scroll down box with possible options

Closes the setup window

Advanced setup

Advanced setup

Advanced setup

P.11	Wiring configuration	Three-phase
P.12	CT connection	Auto
P.13	Frequency setting	Auto
P.14	Step trimming	OFF
P.15	Regulation mode	Standard
P.16	Step selection mode	Standard
P.17	Cogeneration Setpoint	OFF
P.18	Disconnection sensitivity	OFF
P.19	Step disconnection passing in MAN	OFF
P.20	Overload alarm threshold	125%

Transmit | Receive | Default | Exit

Properties of the alarms
Using this window, you can personalize the behavior of the device following occurrence of a specific alarm, setting the following properties for each alarm:

- *Enabled* – Establishes whether or not the alarm is to be enabled. If an alarm is disabled, it is no longer generated (the device behaves as if the alarm does not exist).
- *Relay* – Establishes whether or not the contact of the global alarm is to be activated following occurrence of the alarm concerned.
- *Disconnection* – Establishes whether or not the control unit must disconnect the step when the alarm occurs. The step is disconnected gradually with a time of two seconds between one step and the next.
- *Delay* – Sets the delay between occurrence of the conditions that generate the alarm and activation of this. The delay is expressed in minutes or seconds according to which of the two min and sec options is selected. The maximum programmable delay is 240 minutes.

Some of the properties of the alarms are not accessible (modifiable) as, due to their nature, they must behave in a certain way (for example, there is no point in setting a delay on a micro-interruption).

Note:
Unlike the parameters, the properties of the alarms cannot be set from the front panel of the device. The programming software therefore represents the only possible means of displaying / setting these properties.

Code of the alarm

Description of the alarm

Properties enabled
If this box is not selected, the alarm is never generated

Relay properties : Establishes whether the global alarm contact (if programmable) is to be activated when the alarm occurs

Disconnection properties : Establishes whether the steps are to be disconnected when the alarm occurs

Activation delay: Establishes the delay with which the alarm is activated after occurrence of the conditions that generate this

Transmits the properties of the alarms to the DCRK. Enabled only with password.

Receives the properties of the alarms from the DCRK and displays these in the window

Sets the properties of the alarms to the factory-set default value

Selection of time base for delay activation

Alarm properties

		Enabled	Relay	Disconnect	Delay		
A01	Under compensation	☑	☑	☐	015	○ sec	● min
A02	Over compensation	☑	☐	☐	120	● sec	○ min
A03	Low current	☑	☐	☑	005	● sec	○ min
A04	High current	☑	☐	☐	120	● sec	○ min
A05	Low voltage	☑	☑	☐	005	● sec	○ min
A06	High voltage	☑	☑	☐	015	● sec	○ min
A07	Capacitor overload	☑	☑	☑	180	● sec	
A08	Overtemperature	☑	☑	☑	030	● sec	○ min
A09	No-voltage release	☑	☐	☑	000	○ sec	○ min

Transmit Receive Default Exit

Front panel
Using the programming software, you can also display a 'virtual' representation of the front panel of the DCRK on the monitor of the PC; this is useful, for example, if you want to demonstrate functioning by projecting the image of the monitor of the PC.
Accessing this window from the *Display-Front Panel* menu, the front panel of the device connected is shown, with real-time display of the readouts and leds in their current status. Clicking with the mouse on the keys, you can select the measurements and functions in the same way as on the physical device. However, you cannot access those functions (such as parameter programming, reset max. peaks, etc.) that require simultaneous pressing and/or holding down of the keys.
There are four types of front panels which represent the DCRK5, DCRK7, DCRK8 and DCRK12 respectively. Display will be adapted automatically to the model currently connected.

Note:
The quality of the graphic representation of the front panel may vary according to the graphic resolution of your PC and/or the monitor settings used.
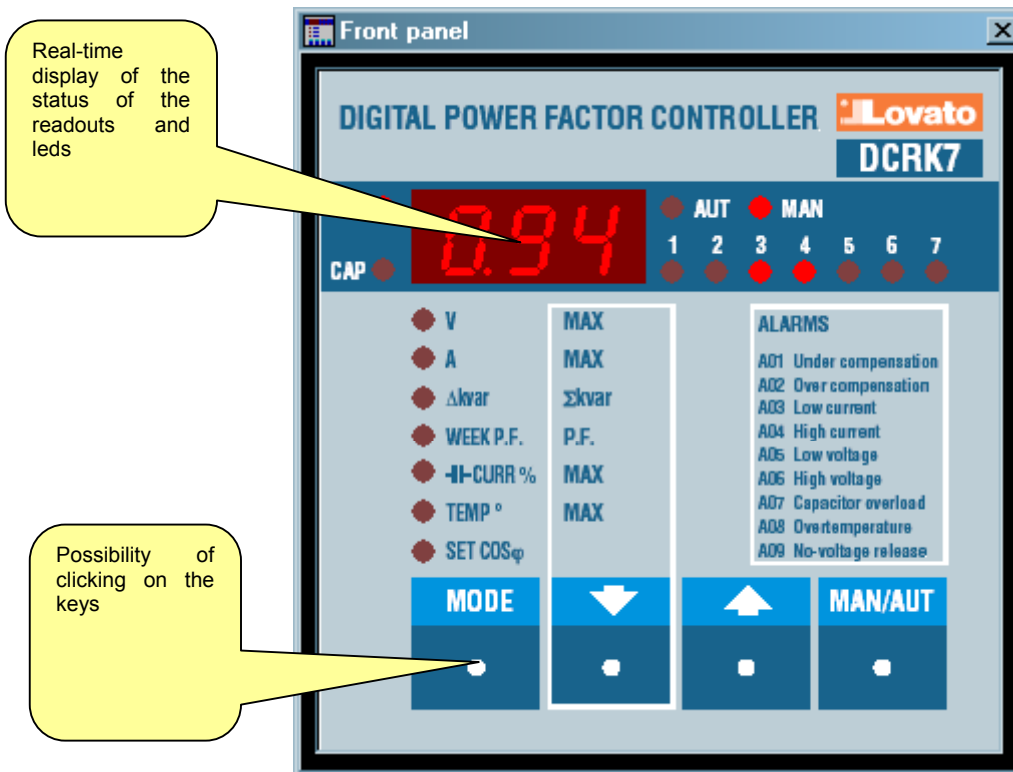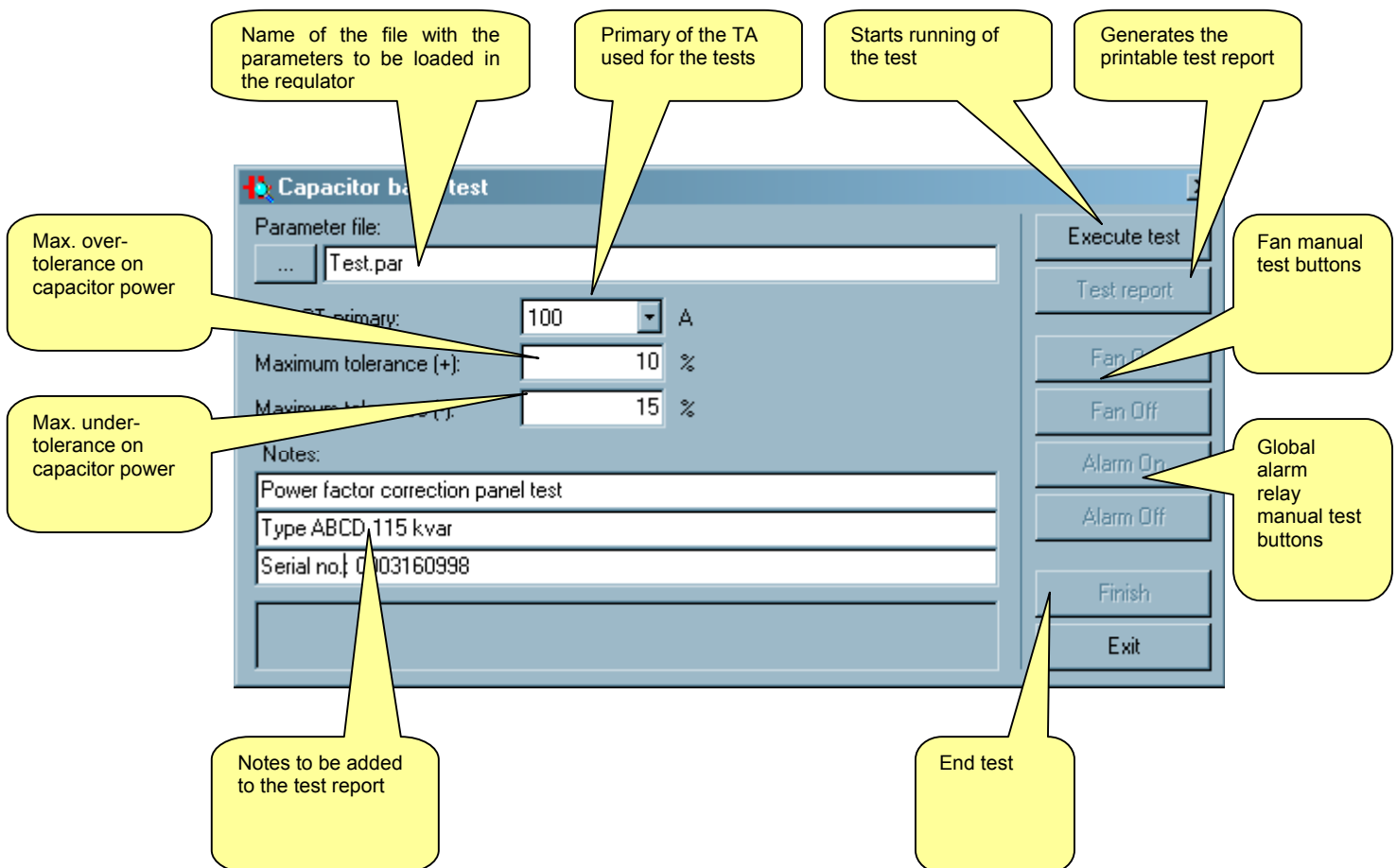
Capacitor test

The *Capacitor test* function has been provided to facilitate testing of the PFC panel by manufacturers of this type of panels. The test consists in a cycle during which all the steps available are activated one by one and their effective measured power is checked comparing this with that set in the setup parameters.

This test comprises:

- Check on of the correctness of the connections to the regulator
- Check on functioning of the entire circuit of each step (internal relay, wiring, contactor, fuses, etc.)
- Check on the power of the banks of capacitors, defining the permitted tolerance
- Automatic loading of a file with all the settings defined for a particular type of panel.
- Printout of a test report

Procedure to run the capacitor test:
1. Prepare a file with suitable setup parameters for the type of panel to be tested, containing the data of the steps (smallest power step, nominal voltage, coefficients of each step). Once you have created this file, it can be re-used for other panels with the same characteristics.
    Note: It is not necessary to set the value of the primary of the CT (parameter P.01) in this file as this parameter is not used in the test phase. For example, if you intend to use the *Fast setting of the CT* function (see DCRK operations manual), P.01 can be left set to OFF.
2. Prepare a complete, powered electrical panel with a dummy load and an external CT connected to the ammeter inputs of the DCRK so that the variations in reactive power imposed by activation of the steps can be read by the regulator.
3. Activate the capacitor test by clicking on the *Instruments-Capacitor test* menu. The window shown in the figure below will be displayed.

4. Specify the name of the file to be loaded (point 1.) in the *Parameters file* box.
5. Specify the primary of the CT used for testing in the *Test primary CT* box
6. Specify the permitted percentage tolerance on the measured power of the capacitors. To pass the test, the power on all the banks of capacitors, compared with the nominal power specified in the file, must be within these margins.
7. Compile any notes to be added to the test report, such as total power, serial number etc.
8. Click on *Run test* to start the test. The software will load the parameters required in the DCRK, and connect each bank for a few seconds, measuring the reactive power generated. The result of the test will be displayed in the main window. For each step, a green box will indicate that the value is within the parameters while a red box will indicate that the power is not correct.
9. If steps programmed as fan or global alarm are specified in the file, these can be checked manually using the specific buttons.
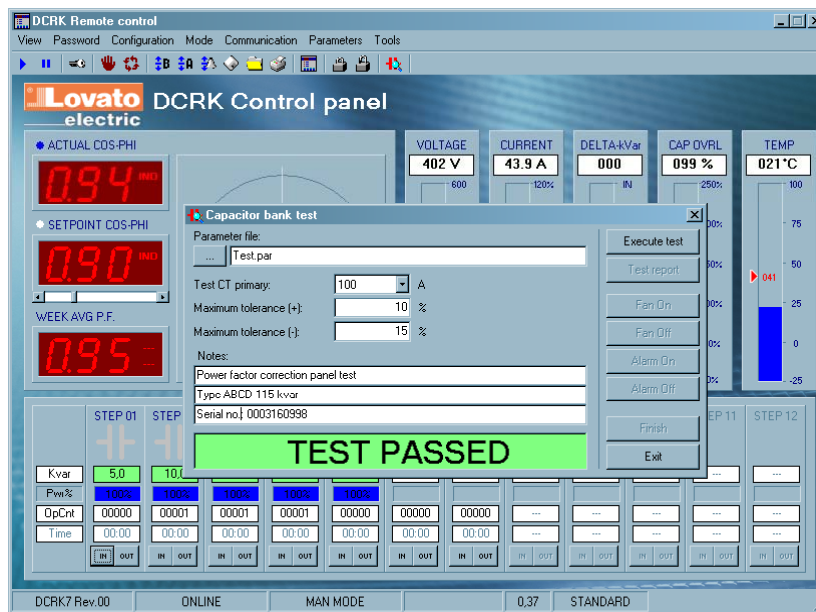
10. At the end of the test, if this has been passed, you can generate a test report by clicking on *Test Report*.
11. The test report can be printed (to attach it to the panel) or saved in a file.