SEPEHR ERTEBAT PISHRO

info@sepcomm.com

Double Inductive Load Tester

PREFACE

Rising the demand for the high quality automotive electrical parts, makes the need for sophisticated test equipment, unavoidable. An equipment capable of approving the durability of a relay or switch, by applying sufficient current on intended loads to its contacts.

Regarding the standard document number 9602901199 Rev. B the required common loads are mostly resistive, Inductive and lamp. Contacts on automotive relays should face these loads with the maximum steady state passing current of up to 50 Amps. This ought to be accompanied with the potency of enduring peak current, equal to 3 times of steady state current.

The DOUBLE INDUCTIVE LOAD TESTER is designed and manufactured to force DC current from 10 to 50 Amps as nominal and 20 to 200 Amps as peak current to the contacts of two separate relays simultaneously. The PLC controlling system of the machine rapidly varies the amount of the applied current and simulates required load.

At instant of closing the contact, a peak current will be derived from it, unless in resistive load condition. This peak current reduces smoothly till achieving the nominal current value. The reduction time of this phenomenon characterizes the type of contrary load. This has to be mentioned that, irrespective of load type, the behavior of current change on any contact, follows the “discharging formula of capacitor”.

Reduction time between 200 to 300 msec. defines lamp load and 500 msec. defines the inductive load.

The ability of an operator to define the reduction time (Tdc), on this machine, enables him to define the load type.

Observing the given values, Peak current (Ipeak) - Nominal current (Inom) – closing time (Ton) – opening time (Toff) and reduction time (Tdc), the PLC manages the current value and evaluates the condition of a contact.

This process will be repeated as many times as the request of the operator. (Test Cycle)

In case of main power failure, under any circumstances, system memorizes all the parameters and resumes the test, by reconnecting of the power.

The operation of the machine will be described later on the next pages.

Test types upon relay variety

There are, mostly, three types of magnetic automotive relays,

- Single pole single trough. SPST
- Single pole double trough. SPDT
- Twin relay

The DOUBLE INDUCTIVE LOAD TESTER performs different types of testing for the above relay types. Two of SPST relays can be tested at the same time, each with their own Inom and Ipeak but the same timing parameters. (Ton-Toff and Tdc).This is called “DUAL LOAD TEST”.

One SPDT relay may be tested employing both loads but only the first power supply. To establish this situation, the positive pole of load number one should be connected to the common pin of the relay contact. The negative pole of the same load must be connected to NO pin of the same relay, while its NC pin has to be connected to the negative pole of the second load. This test is called “CHANGE OVER TEST” and will be described later.

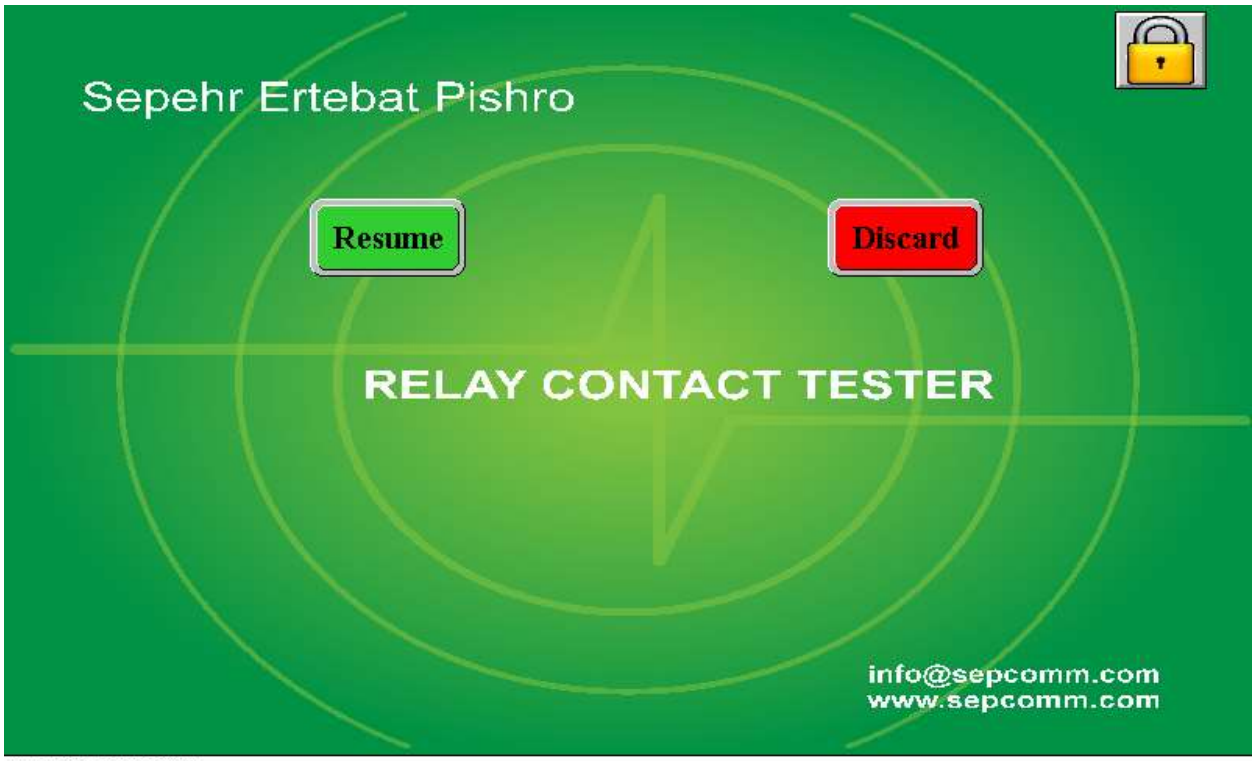
There are some types of automotive relays that has to be operated and tested in various time zones. To obtain this purpose, the “MOTOR LOAD TEST” is defined on this machine. During this test, operator has the ability to address 8 separate time zones and set the loads to be operational or not in any or all of them. Pressing the start button, the loads will be used to serve the contact of the relay (s) under test. In each time zone the required condition will be observed and finishing all zones, the test counter will be increased by one. Deploying zero on any of the time zones, the test recycles from that point.

The standard number 9602901199-B section 10-2 emphasizes on using the H4 lamps as a load for testing the contacts of certain relays. To obtain this requirement a separate “LAMP LOAD TEST” is developed on this product. Tow conditions are considered for this test. First HIGH and the second, LOW. 15 Amps is the amount of the current witch is considered to be passed from the contacts of the relay, in high mode; and 10 Amps is for the low mode. Four H4 lamps are used for each load; totally 8. In high condition, 4 high beam part of the lamps are applied to serve around 15 Amps, and in low condition 3 low beam part apply almost 10 Amps. The high/low mods are selectable on the software menu.

In any relay, “cut in/cut out” excitation voltage are the most significant parameters that should be measured and observed. To do this, a variable power supply is manipulated with the machine. EXCITATION TEST is the menu that should be used for this purpose.

“SETTING” menu in this tester is prepared with two goals. Maintenance, initiation current adjustment. In this menu you can drive currents from 10 to 200 Amps from each load. By giving a number from -1000 to 1000 in initial window of menu you can reduce or increase the current gradually. IMPORTANT NOTICE:

THE + AND – POLES OF THE LOAD SHOULD BE SHORTED BY THE SUPPLIED HEAVY WIRE AND FASTENED HARDLY.



Main(#8); 800X480

Resume/Discard

During each variety of tests, the machine may face the main power failure, for any reason. After regaining the power and pushing the start, above window will appear. In this case, the operator may decide to resume the previous test or discard it and continue with a new one. Pushing the Resume, test restarts exactly from its interrupted point and continues to the end.

Table 1： Specifications

Input Voltage	180-264VAC AC input active surge current limiting
Efficiency	High efficiency up to 91.5% Built- in active PFC function, PF>0.95
Input Current	35A/230VAC
In Rush Current(Typ.)	60A/220VAC
Power	5000 watt at full load
Output voltage	2X13.5VDC MAX
Peak Output Current	2X200 Amps DC Max
Peak current duration	250-500 msec.
Output steady state I	2 X 10-50 Amps DC – 0.1 Amp accuracy
Steady state current duration	Normal Test 2 X 1- 1000000 msec. (Motor Load Test) 0.1-999.9Sec
Protection	Short circuit/overload/over voltage/over temperature/fan alarm
Relay Excitation voltage	1.5-15 VDC (Manual Ctrl)
Environmental	Up to 23 °© No dust Laboratory condition

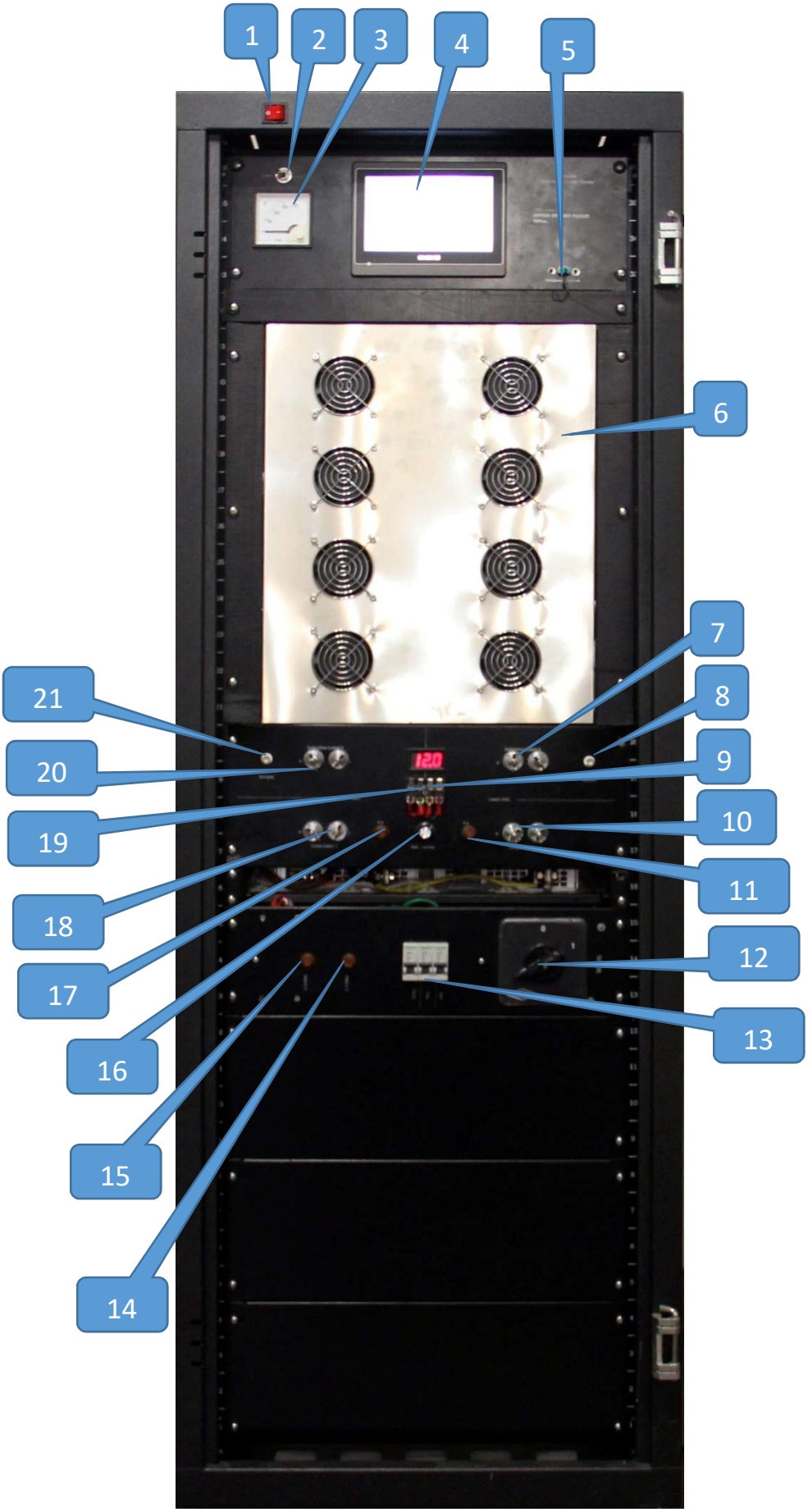
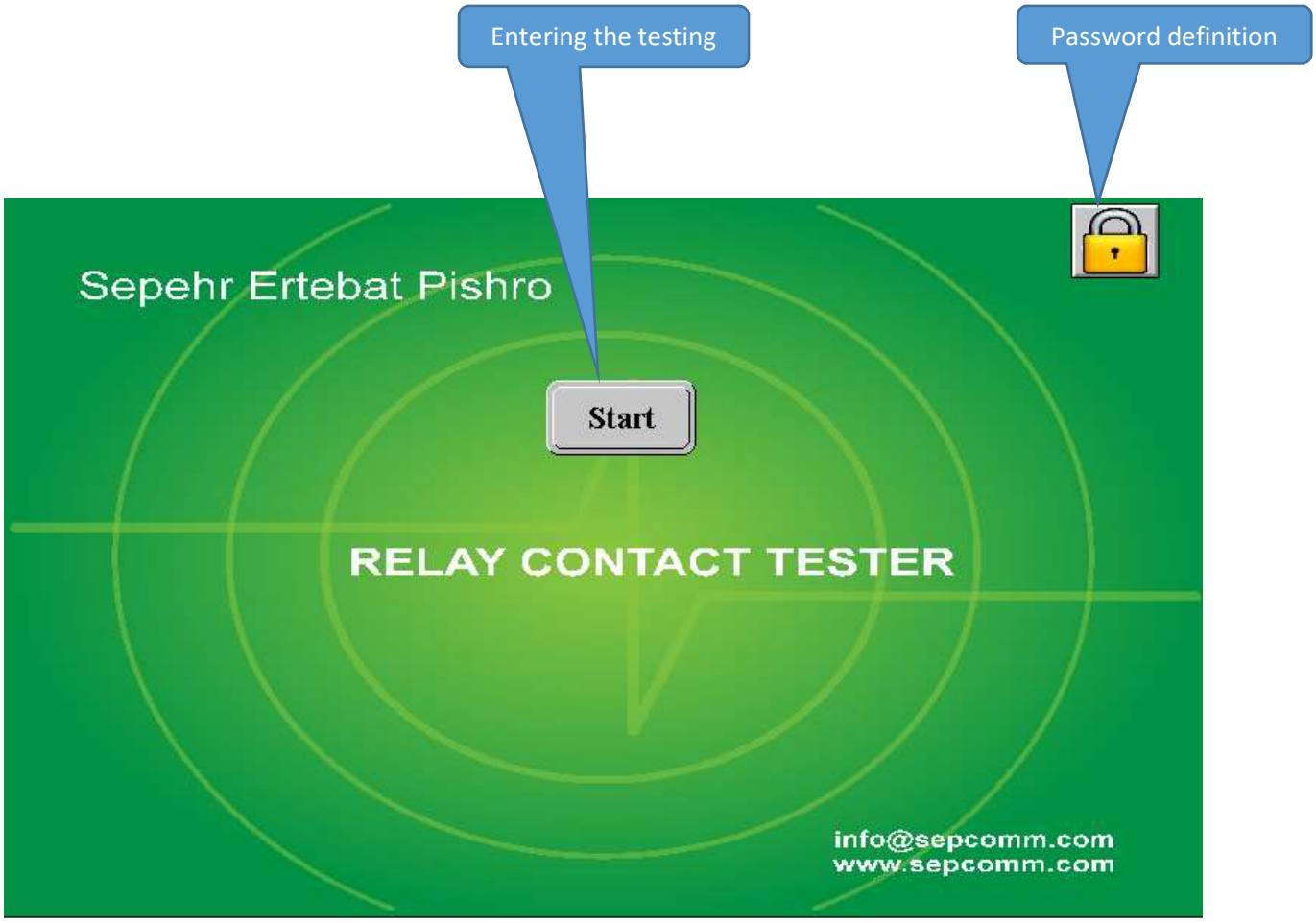

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21

Table 2: tester controls and configuration

Item #	Description
1	Rack Fan on/off switch (operates manually)
2	Amp meter input selection switch (operates manually)
3	Ampere meter 0-200 Amps (indicator)
4	Industrial HMI display (touch control)
5	USB port (for report extraction)
6	Main load number one(number two at the back side)
7	Connection poles for inductive load number 2 (+ at left – at right)
8	BNC connector for monitoring of load 2 operation (only in inductive load operation)
9	Load number 2 relay excitation output connector
10	Connection poles for lamp load number 2 (+ at left – at right)
11	Load number 2 relay excitation fuse (F2 3 Amps)
12	Main AC switch
13	Sub fuses for power supply 1 & 2 and controlling system
14	Load number 2 AC fan fuse (220VAC 3 Amps)
15	Load number 1 AC fan fuse (220VAC 3 Amps)
16	Excitation voltage control knob (1.5 to 15.1 VDC)
17	Load number 1 relay excitation output connector
18	Connection poles for lamp load number 1 (+ at left – at right)
19	Load number 1 relay excitation output connector
20	Connection poles for inductive load number 1 (+ at left – at right)
21	BNC connector for monitoring of load 1 operation (only in inductive load operation)

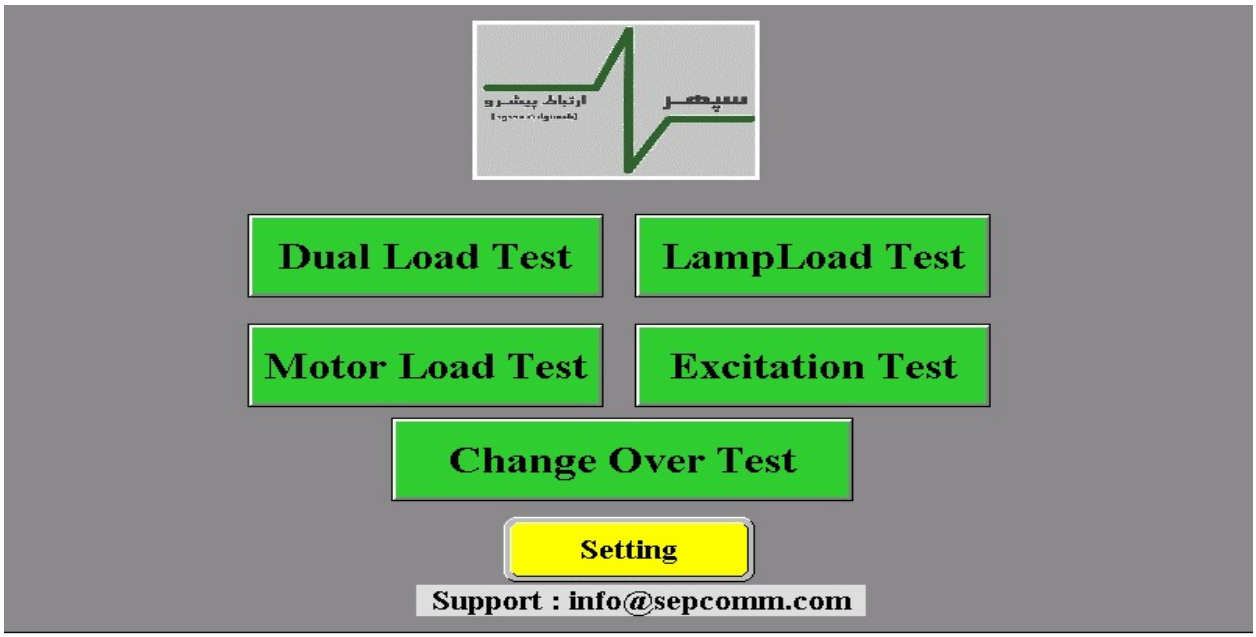
OPERATION



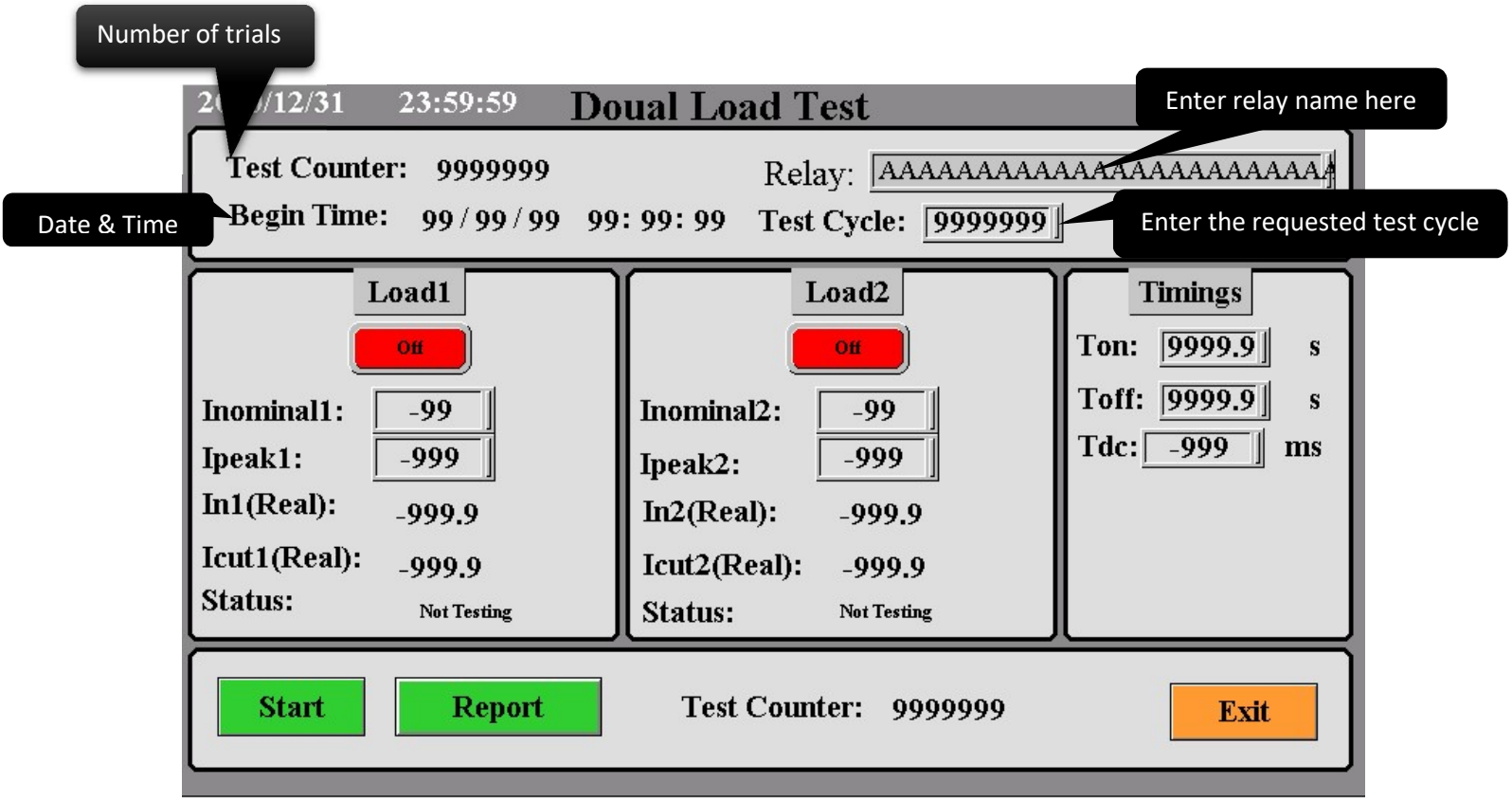
START

When the system is powered up, at the first time, above window will popup.

Pressing the lock button you can change the passwords. There are three levels of passwords, one for operator (recent is 1) one for supervisor (recent is 22) and the highest level is for admin (recent is 333). Operator is able to operate the system only and the supervisor and admin have the permission to do the time adjustments, get the report and change the passwords.



Pressing the start button, above window will show up. As it is obvious, operator can select the next performance that he or she wants to perform.



Dual Load Test

This test is mainly for testing two SPST relays at the same time. Every individual load has its own Nominal (Inominal) and Peak current (Ipeak). But the timings are the same for both. Operator has to define below information prior to test:

1- Relay name
2- Requested test cycle
3- Load 1 Inominal
4- Load 1 Ipeak
5- Load2 Inominal
6- Load2 Ipeak

Below information has to be defined to the system by supervisor:

7- Ton (the time that the contact must stay closed)
8- Toff (the time that the relay must stay off)
9- Tdc (the time that should take for Ipeak to decrease toward Inominal)

Pressing the start button test begins and the actual test cycle will be shown on the “TEST COUNTER” portion of the menu.

On every cycle of the test, as soon as the contact closes the peak current passes through it, according to the amount of Tdc (100-500 MSc) the Ipeak reduces toward Inominal in accordance with the capacitor discharge formula. Passing Inominal continues, achieving the end of Ton, relay contact opens and the zero current passes by.

Ending Toff the cycle starts again. This can be monitored on the tow BNC connectors beside the load poles.

Please notice that the above testing procedure is common for all tests unless for the lamp test.

During the dual test operation, in this procedure, it may happen that one of the relays malfunctions. In this situation the testing goes on for the healthy relay, but an error will be prompted for the failed relay and its testing stops. At the end of the test, the number of test cycle that the failure happened, on the relay, will be shown on the report for the same relay (FAILED COUNTER) accompanied by the type of failure. (Short or Open). Otherwise testing continues till test counter reaches the test cycle

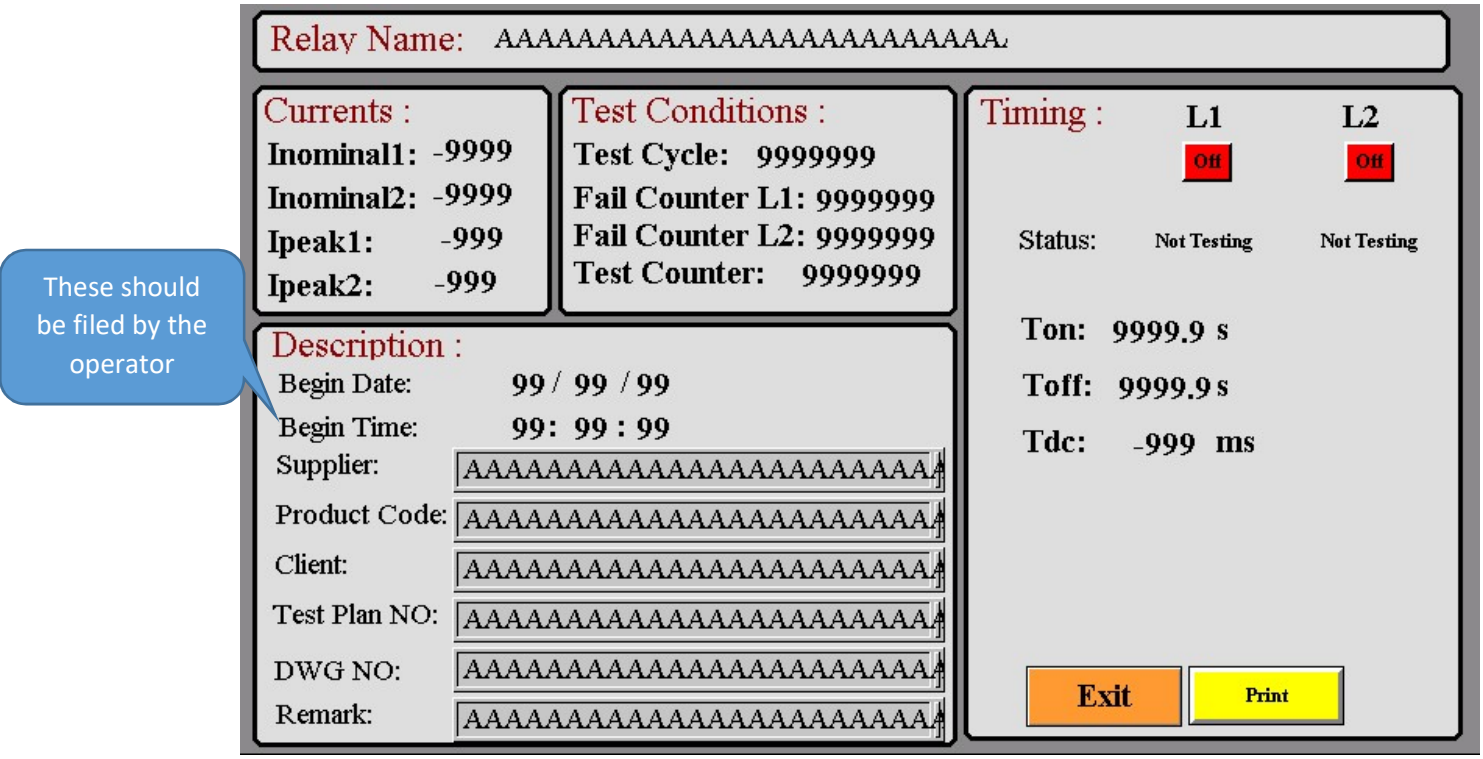
and the alarm goes on. Pressing the stop button resets the alarm and the report button becomes available.

Every test has its own report. There are two types of information on the reports. Series of info that nobody can do any changes on it, and some other information that operator has to feel before getting the print.

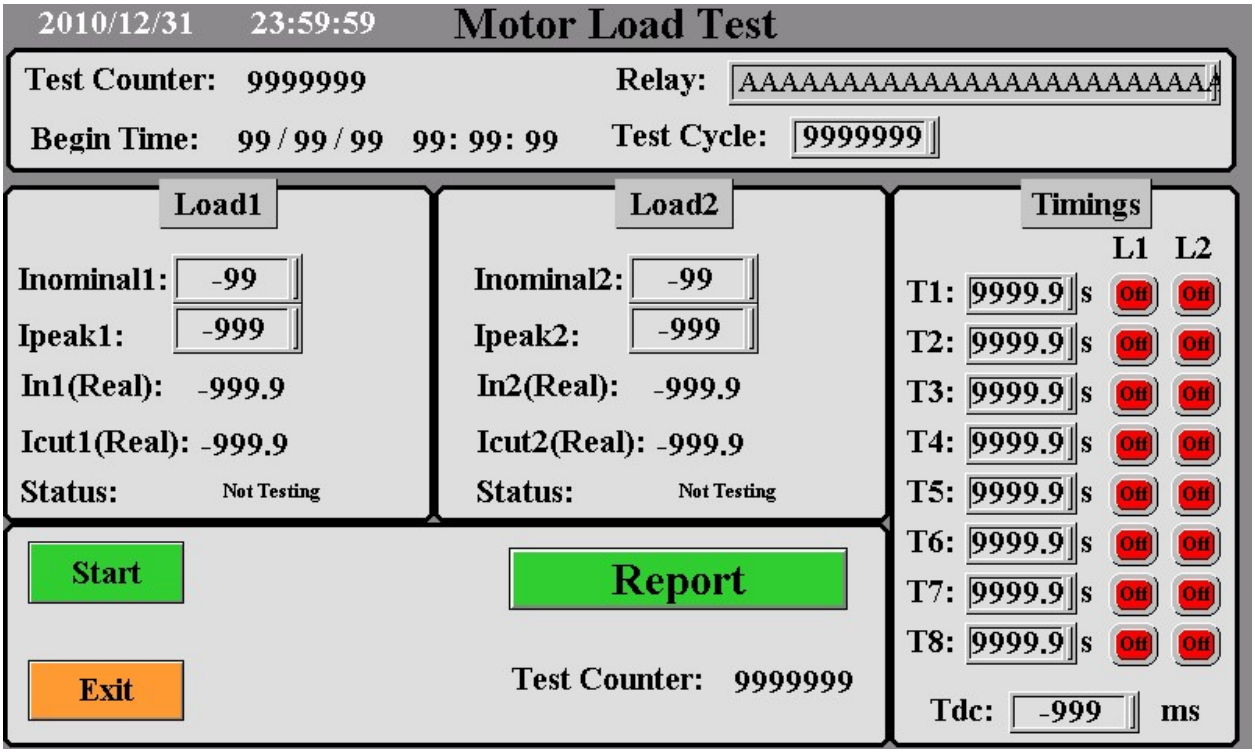
The information that system prepares and are not editable are:

1- Timing information
2- Current information
3- Test cycling information
4- Test Conclusion information

The others that the operator has to prepare are the ones listed on the left bottom corner of the page.



Filling all the needed information, operator places a flash memory on the USB slot, prepared at the front upper panel of the system, and pushes the print button. A BMP file with a name including date and time will be saved on the flash memory. This file can be printed, later on, using a PC and a printer.



Motor Load Test

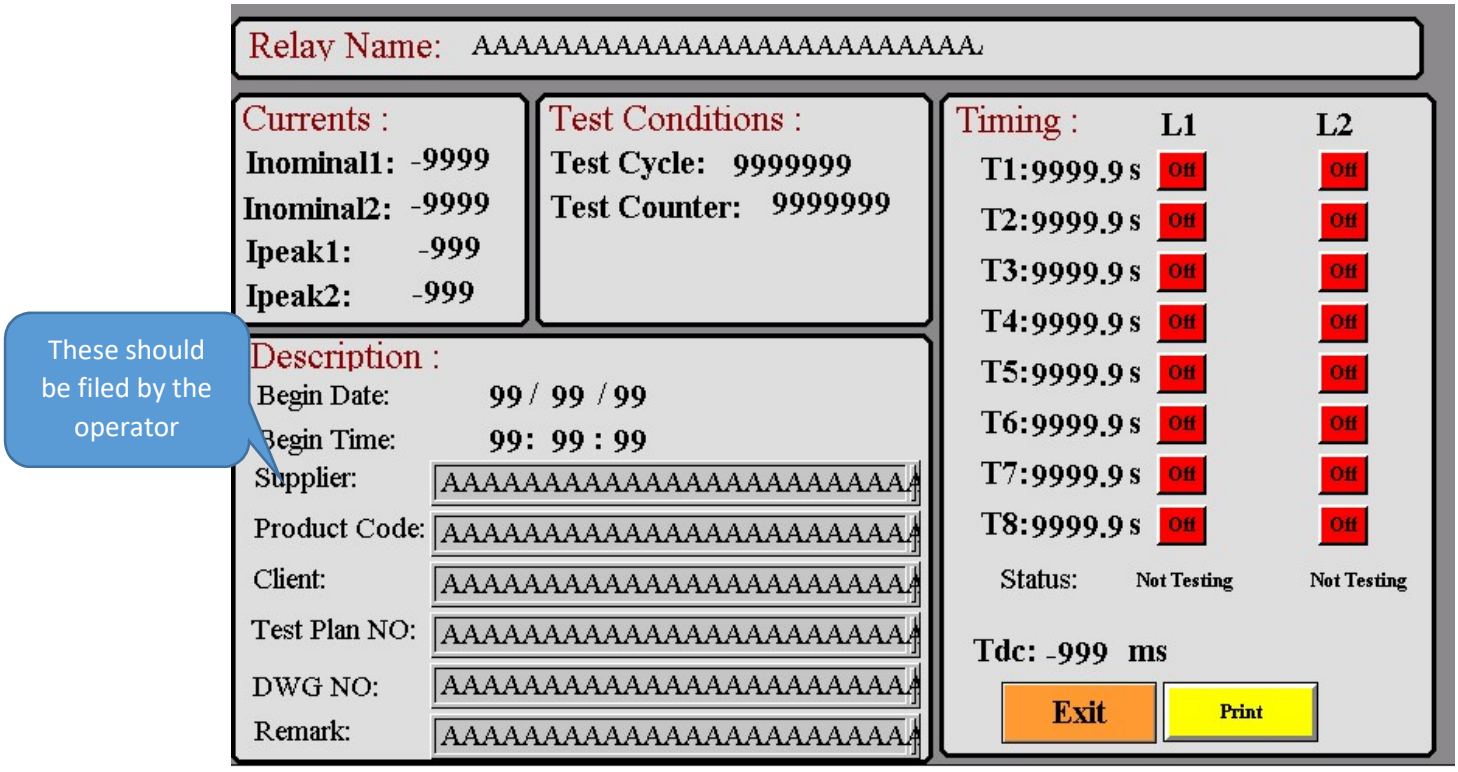
As it was mentioned before, this test is prepared for the relays that operate in more than one time zone in a car. Actually, the test sequence on each cycle are the same as it was tolled on the dual load tester paragraph. (From the current variation point of view) The only difference is, the quantity of Ton/Toff that can be more than one in each cycle of the test.

Besides entering the relay name, test cycle and current information, operator allocates time to each of 8 time zones (T1 to T8). Pressing the red buttons in front of each time zone, changes its color to green. Green means the specified load (L1 or L2) is on and for the off state of the loads, they may be kept red.

Tdc, is another parameter that has to be mentioned by the operator for this test.

As pushing the start button, testing initiates and preforms the tasks in each of the time zones one by one up to the end of them. If the operator demands for less than 8 time zones (for example 2), he or she has to write

number zero (0) on the next time zone. In this state, only the tasks on 2 of the zones will be done and the test cycle returns to the beginning, reaching the 0 on third time zone.



Finishing the test an alarm, showing the end of the test, will run off. Pushing the stop button, the REPORT button will appear. Energizing it the report page will pop out and you can print the report; as it was tolled before.

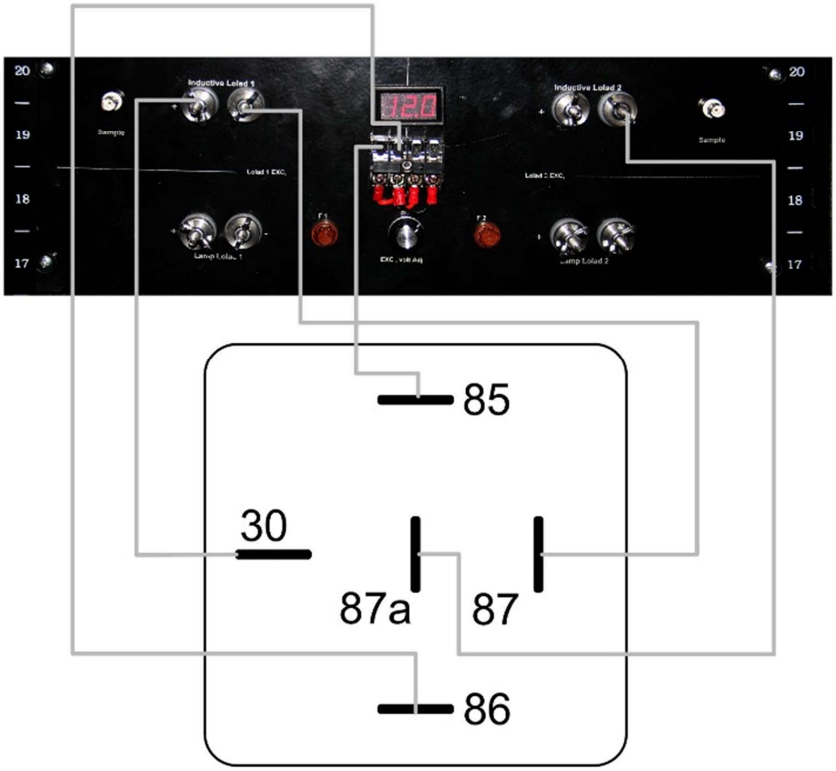
Change Over Test

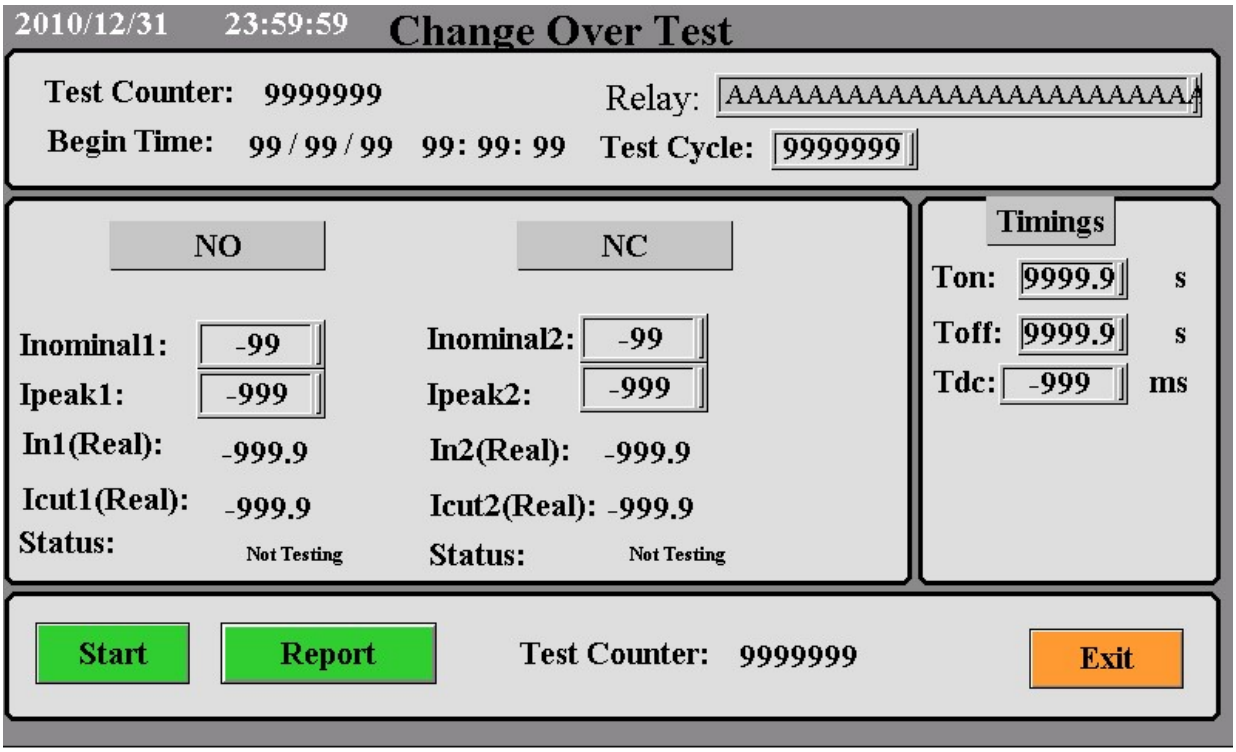
This test is for the relays with 5 pins. These relays are made with single pole double through contacts. (SPDT)

By connecting the relay contacts to the loads as shown on the next page, the operator will employ both loads, but power supply number one for this test, only. The circuit diagram showing the way of wiring of the relay to the loads is on the next page and it must be observed for sure. As before, operator has to employ the needed parameters to the system and push the start button. As testing starts, proper current will be applied to the NC

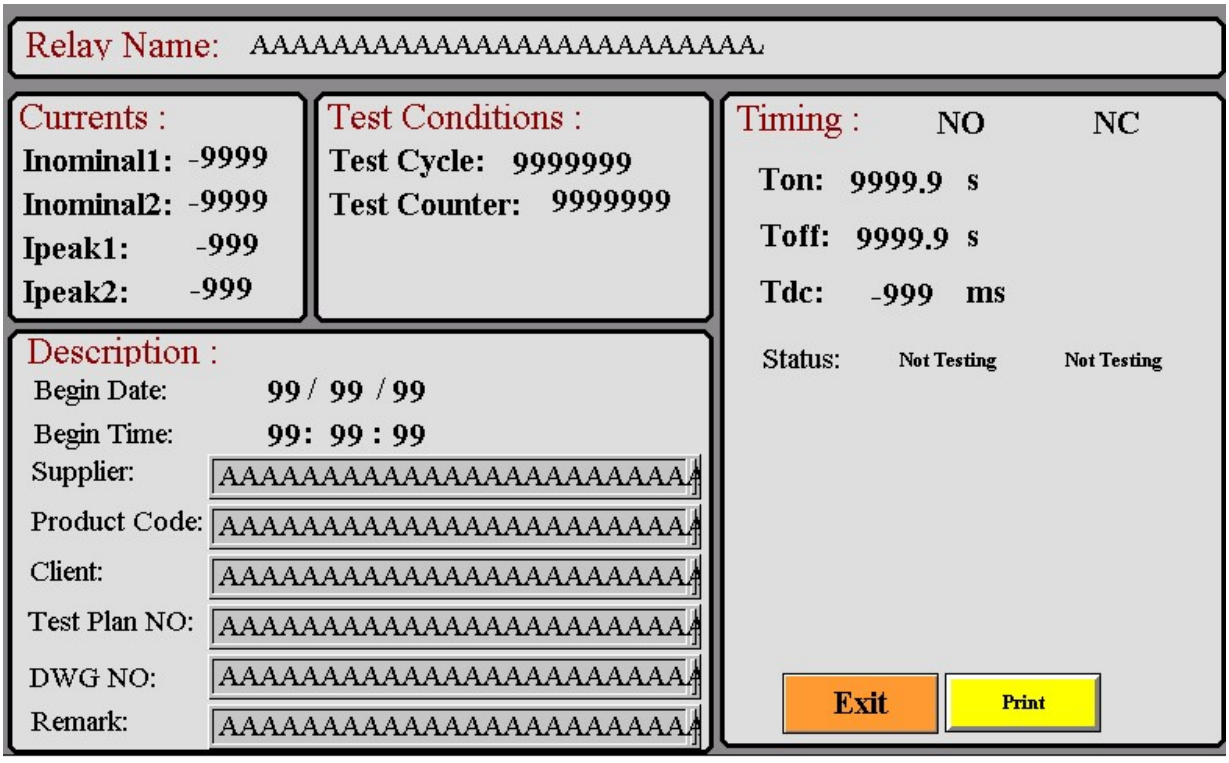
contact of the relay. By the first timeout, the second proper current passes through NC contact of the relay. This will continue up to reaching the requested test cycle or facing a problem on the relay. On the report you will have access to needed information of the test.

Wiring of the SPDT relays for CHANGE OVER testing





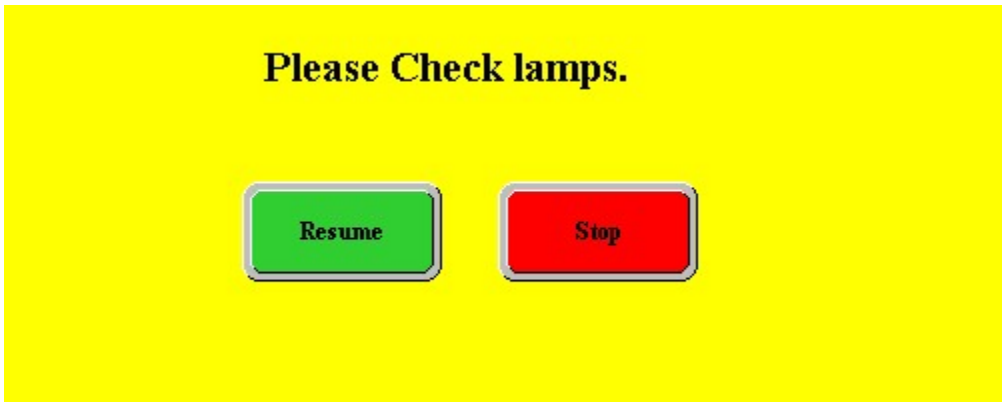
Pushing the report button, below window will pop out and operator may have access to the results of the test. It can be printed as it was tolled before.



Lamp Test

As it was tolled previously, there are some tests that the actual lamps must be implemented, as load. In this test operator has no control over the amount of the current. The machine had been setup to draw around 15 Amps in high and almost 10 Amps in low mode. 4XH4 high beam portion of lamps in high and 3XH4 low beam portion of lamps are involved to perform this task. The lamps type used in this tester are H4 40/45 watt lamps.

Besides the relay name, the parameters that must be given to the system are the test mode (High/Low), the quantity of test cycle and the timings (Ton/Toff). Please notice that there are no Tdc in this test. During the lamp test, two types of failure can happen. First, malfunction of relay (short or open) second burning out of one of the lamps. In the first case, machine stops and gives the alarm of the relay failure. But in second case machine gives pause to test and asks the operator to check the lamps.



Facing the above prompt, operator has to push the Resume button. All functional lamps in the recent test will become turned on for 30 seconds. Now operator has the chance to recognize the burned lamp and change it.

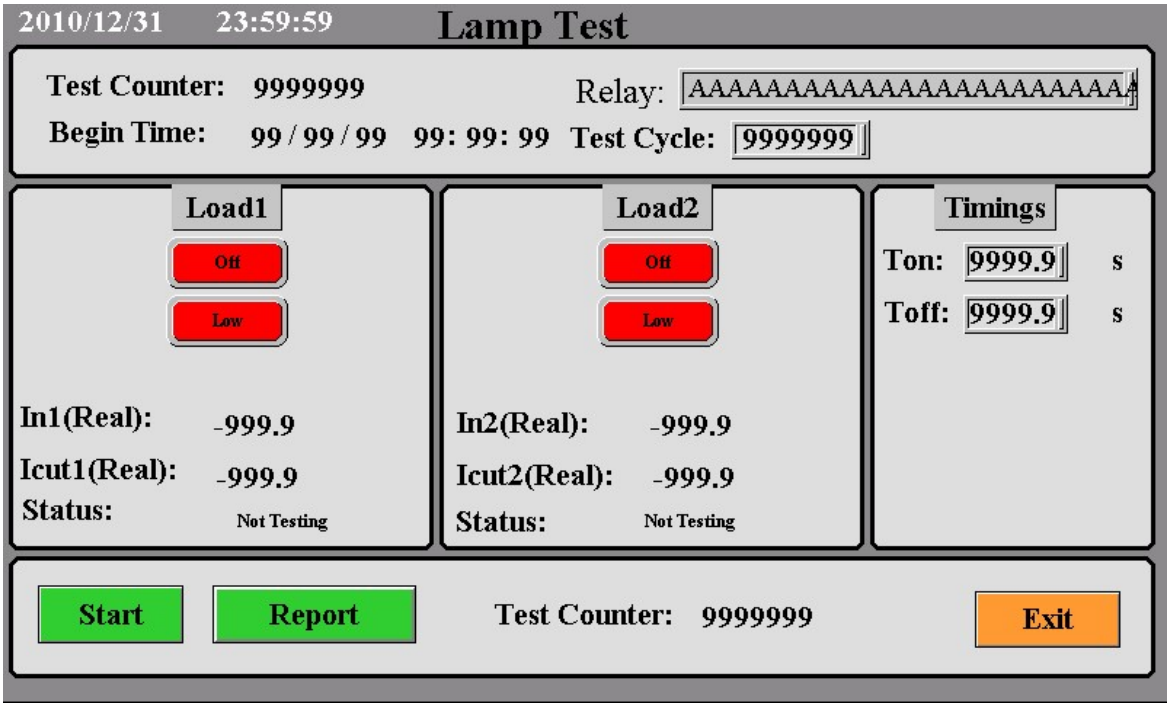
Please notice that in any Pause in this machine, during the testing period, none of the parameters of the test will be lost or become zero.

Lapsing the 30 second, if the burned lamp is changed, the test will resume. Otherwise, pause happens again and system waits for the operator to perform the proper action. Pushing the stop button, test stops, resetting the

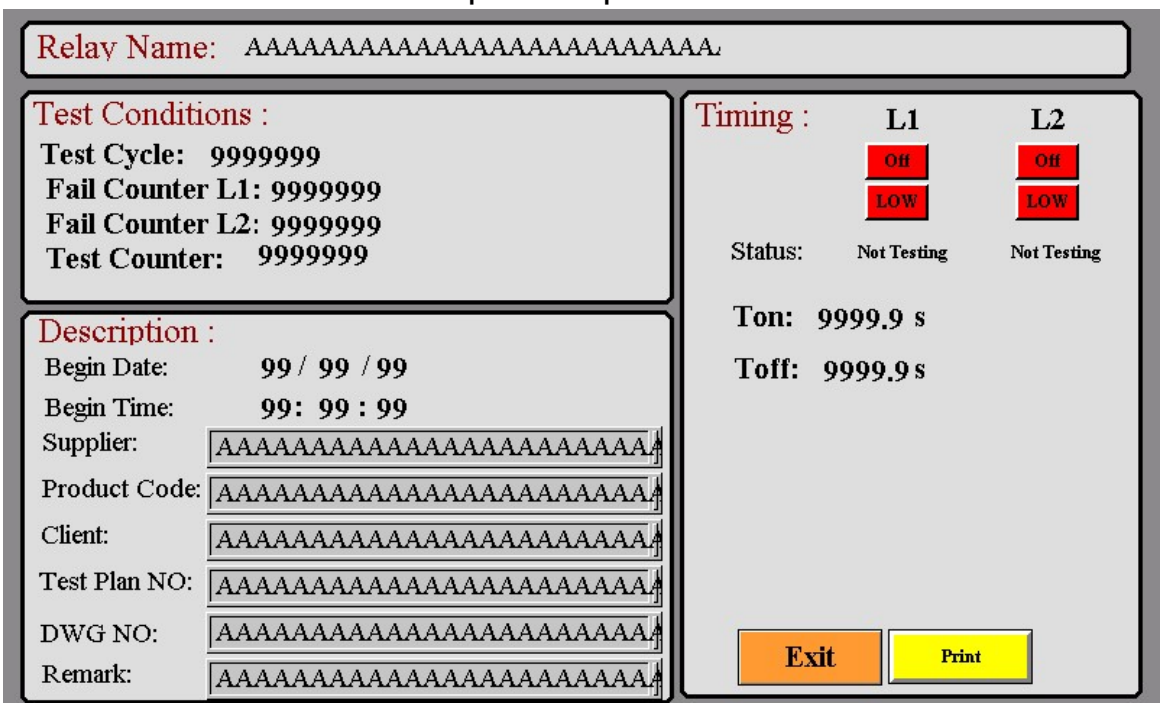
test parameters. To initiate a new test, all the parameters of the new test should be given to the system.

The Lamp test and its report menu pictures are shown at the next page.

Lamp test main menu



Lamp test report menu



Excitation Test

For obtaining the “cut in/cut out” excitation voltage of any automotive relay. Connect the coil of the relay to exciter output of load number one. Turn the knob CCW to see the 1.5 volts on the digital voltmeter. Go to the Excitation test menu and press ON. Turn the knob CW gently and listen to the relay till it clicks. Stop turning the knob at once and write down the displayed number on the digital voltmeter or measure the voltage. This is the cut in voltage. Continue to 12 volts and start decreasing the voltage by turning the knob CCW. Go on until the relay clicks again. This is the cut out voltage.

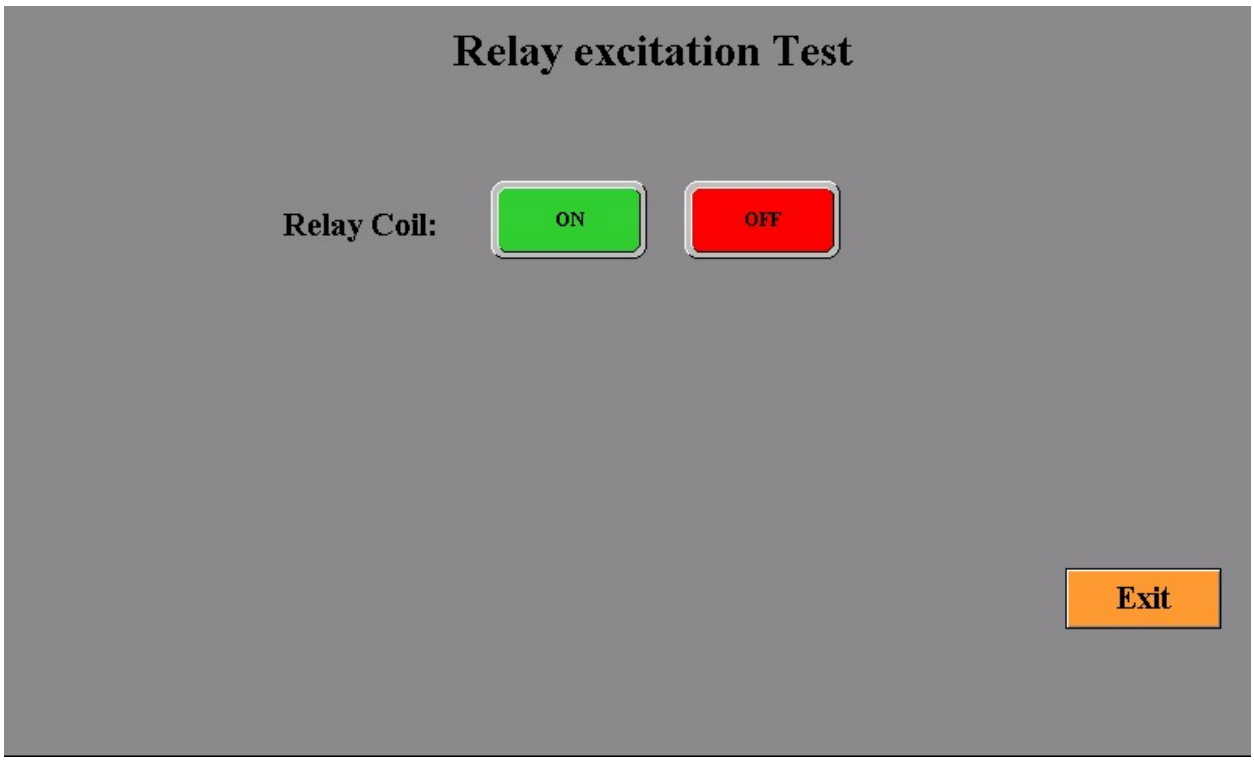


Table 3 : trouble shooting

No.	symptom	Possible cause	solution
1	Connecting the system to AC outlet, turning the main switch to on, but system don't start.	Fuses for PS1, PS2 or CTRL are not working properly	Check the fuses by changing their state for several times. Contact the support center at sadeghi@sepcomm.com
2	System turns on but nothing on HMI	HMI is disconnected from PLC	Check the cable connected between PLC and HMI
3	Pushing the start button, test starts, but stops at once and open fault is prompted.	Fuse F1 or F2 are burned out.	Check fuses and replace with a 3 Amp fuse.
		The relay coil is open.	The relay should be marked as false and repeat the test with a new one.
		Power supplies are under over current condition	Turn the PS1 & PS2 fuse off and turn them on after 10 second.
4			