

# RelayPro-110™

## User Manual



## Table of Contents

<b>1. INTRODUCTION .....</b>	<b>4</b>
1.1 What is RelayPro.....	4
1.2 Why use RelayPro.....	4
1.3 What type of relays can be tested.....	4
1.4 Limitations.....	4
1.5 Performance Specification .....	5
1.6 Power Requirements .....	5
1.7 Software .....	5
1.8 Setup - Hardware Installation .....	5
<b>2. SCREEN OVERVIEW.....</b>	<b>6</b>
2.1 Report Details.....	6
2.1.1 Date/Time .....	6
2.1.2 Testing Officer .....	6
2.1.3 Relay Type.....	6
2.1.4 Serial Number.....	7
2.2 Relay Protection.....	7
2.3 Status Window.....	7
2.4 Controls .....	7
2.5 Contact Results .....	7
2.6 Coil Results .....	8
2.7 Relay Data / Relay Notes.....	8
2.7.1 Relay Data .....	8
2.7.2 Relay Notes.....	8
2.8 Additional Information .....	9
2.8.1 Full Drop-Away Voltage Ramp and Full Stroke Voltage Ramp.....	9
<b>3. SETTINGS .....</b>	<b>10</b>
3.1 Users.....	10
3.2 Report.....	10
3.3 Organization .....	10
3.4 Advanced Options.....	10
3.4.1 Profile Folder .....	10
3.5 Test Options.....	10
3.5.1 Contact Resistance State.....	10
<b>4. PROFILE EDITOR .....</b>	<b>11</b>
4.1 Relay Information .....	11
4.2 Relay Parameters.....	11
4.2.1 Contact Layout – define each contact configuration. ....	11
4.3 Test Parameters.....	12
4.3.1 Add / Remove / Edit Test Parameters.....	12
4.3.2 Test Parameters Settings.....	13
4.4 Advanced Options.....	13
4.4.1 Contact Cleaner .....	13
<b>5. FUNCTIONS.....</b>	<b>14</b>
5.1 Test.....	14
5.2 Clean.....	14
5.3 Verify .....	14
5.4 Zero Reference.....	14
<b>6. TEST DESCRIPTION.....</b>	<b>16</b>
6.1 Contact Resistance.....	16
6.2 Switch Time .....	16
6.3 Coil Resistance .....	16

6.4	Ramp Voltage .....	16
<b>7.</b>	<b>HELP .....</b>	<b>17</b>
7.1	Calibration .....	17
7.2	Zero Failure.....	17
7.2.1	Test Base is dirty or damaged.....	17
7.2.2	Zero results exceed the maximum trim limits. ....	17
7.3	Calibration .....	17
7.4	Comms Failure .....	17
7.5	F.A.Q.....	17
7.6	To uninstall Application .....	17
<b>8.</b>	<b>UPDATES AND TECHNICAL SUPPORT .....</b>	<b>18</b>
8.1	Software & Hardware updates.....	18
8.2	Technical Support .....	18
A1	Legal .....	20
A1.1	User License Agreement .....	20
A1.2	Copyright/Ownership.....	21
A1.3	Trademark .....	21
A1.4	Disclaimer of Warranties.....	21
A1.5	Disclaimer of Damages.....	21
A1.6	Warning Regarding use of RelayPro.....	21
A2	Relays (Testable).....	23

## 1. INTRODUCTION

### 1.1 WHAT IS RELAYPRO

RelayPro is an automated relay tester that performs rapid testing and analysis of a relay's operation. Simply plug in relay, select relay type and press 'TEST'. RelayPro's auto logic identifies Pass/Fail status of the relay automatically.

RelayPro tests Static contact resistance, Contact configuration, Contact switch time, Coil resistance, Coil power, Energize voltage and Release voltage.

RelayPro displays Test Results in table and graphical format. Reports are created automatically and can be printed in single or batch modes.

RelayPro suits many styles of relays, including BR-930 Style Q Relays, US&S PN150/PN250 (VCOR), GRS/Safetran vital plug in relays and NS.1 relays. Customised solutions may be available to suit other applications.

RelayPro is capable of testing 5V DC to 120V AC or DC Relays.

### 1.2 WHY USE RELAYPRO

- Reduce downtime in your signalling system
- Reduce maintenance costs
- Implement preventative maintenance
- Easily track down previously hard-to-find faults
- Clean contacts with the RelayPro controlled current burst cleaner
- Know the condition of your relays

### 1.3 WHAT TYPE OF RELAYS CAN BE TESTED

RelayPro is capable of testing many styles of relays. An external port labelled Test Base at the rear of the unit allows for connection to a relay base. This may be wired to suit any style of relay being powered by 5-110V DC. This port is capable of testing up to twenty contacts simultaneously.

The list of testable Relays is updated frequently, in accordance with client requests. The list in Appendix 2 is current at time of publication. Please contact [support@mrdd.com.au](mailto:support@mrdd.com.au) if you have an application that is not on the list. Relay types can be tested if the specification details are added to the Profile Table (Section 4).

If a Relay fails a test, please ensure the profile table for selected relay matches the manufacturer's specification. Please see Section 4 (Profile Editor) for instructions.

### 1.4 LIMITATIONS

RelayPro tests and documents specific Relay performance parameters, assisting Operators to assess operational condition. Operators are required to perform Visual inspections.

RelayPro tests a relay to the test parameters set and stored by the user in the profile table. Please see 'Tests Performed' for details of how a relay is tested. RelayPro does not test a relay for reverse voltage operation and AC immunity as this is not practical in a portable test unit of this size.

As each user has different performance requirements for the relays they are testing, the profile table can be edited. It is the responsibility of the user to produce and ensure test parameters are correct. A profile table is provided with the system to get user started.

## 1.5 PERFORMANCE SPECIFICATION

Contact Resistance	+/- 1% + 0.001Ω, 0.001Ω resolution
Coil Resistance	+/- 1% + 0.1Ω, 0.1Ω resolution
Contact Switch Time	+/- 0.01 sec, 0.001s resolution
Flash Clean Current	100mA to 3000 mA CCS +/- 1%
Voltage Output	0 – 110V @ 500mA (+/- 1% + 0.1V, 0.1V resolution)

## 1.6 POWER REQUIREMENTS

Voltage	12-24 Vdc
Current	3.75A (minimum)

(Targus APA30 Notebook PSU or similar is suitable)

## 1.7 SOFTWARE

- Operating System: Microsoft Windows XP or higher
- Install RelayPro software from CD or USB drive.
- The latest software is available from the MRD website
- To use the 110V functionality, the software must be at least V8.6

## 1.8 SETUP - HARDWARE INSTALLATION

- Connect provided USB cable between computer and the RelayPro test box
- Windows will recognize the RelayPro as a new device. The USB driver is located on the installation CD or USB Drive, or in the folder \RelayPro\USB driver
- Plug power cable into power socket located on rear of the test box
- Connect the RelayPro and Test Base using the 50-pin D-Sub cable
- Switch test box on. Switch located on back of test box
- Front power indicator should illuminate
- Execute RelayPro.exe to begin testing relays.

## 2. SCREEN OVERVIEW

The following overview will help you to familiarize yourself with the RelayPro testing environment. RelayPro’s main screen is divided into seven boxes. Contained in these boxes are the following categories: Report Details, Relay Parameters, Status Window, Controls, Contact Results, Coil Results and Relay Data/Notes.

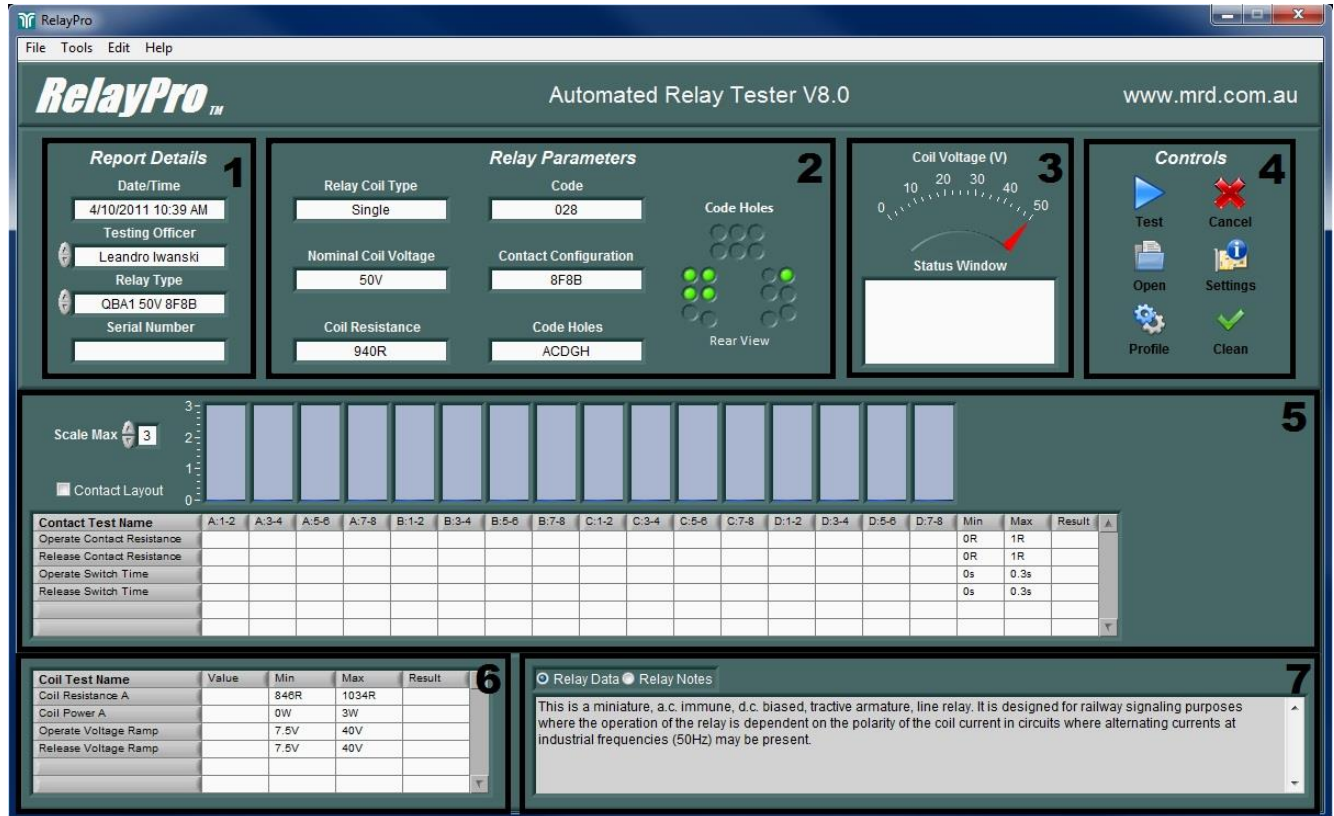


Figure 1 – Screen Overview

### 2.1 REPORT DETAILS

Information selected in the ‘Report Details’ box appears on the test report for each relay.

#### 2.1.1 Date/Time

The current Date/Time appears on each test report.

You can also open the Date/Time properties dialog box by clicking Start, Settings, Control Panel and then double clicking Date/Time.

#### 2.1.2 Testing Officer

By clicking in the Testing Officer window or clicking the up/down arrows located beside this parameter, the current Testing Officer can be changed. The selected Testing Officer is printed on the report when testing a relay. This person also appears as signatory on the test report. You can add/delete Testing Officers names and change access rights through the User tab in the Settings window.

#### 2.1.3 Relay Type

Set the Relay Type by selecting from the list. The Relay Type setting recalls Relay Test parameters, and appears on the test report. You can add/delete relays by editing the Relay Profile.

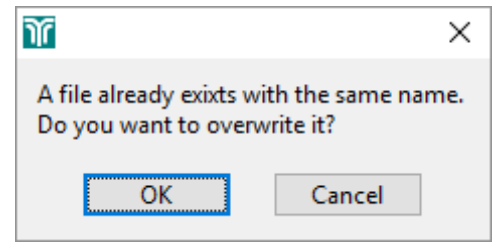
**Note: RelayPro DOES NOT automatically identify the Relay. The Relay Type must be correct otherwise the Relay may be overloaded under test.**

### 2.1.4 Serial Number

Enter the Relay’s serial number in this field. The Serial Number controls the filename of the PDF report. For example, serial number Q123456 will generate report file Q123456.pdf.

Note: The software creates the filename using the exact text of the Serial Number: No on-the-fly changes are possible. If the Serial Number is not changed, RelayPro will overwrite the existing file.

RelayPro warns before overwriting any file.

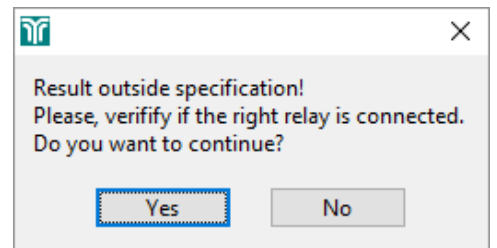


## 2.2 RELAY PROTECTION

RelayPro initially tests the Relay Coil Resistance and compares this to the allowable range defined in the Test Parameters. If the measured resistance is too low or too high, RelayPro displays a warning message. Operators are expected to review their actions when warnings appear.

**WARNING: Ignoring the warning message may cause damage from high voltage being applied.**

Note: Test Parameters are secure. Only Administrators may modify The Relay Profile.



## 2.3 STATUS WINDOW

The Status Window displays the actual relay coil voltage and additional test information.

## 2.4 CONTROLS

The Controls box contains the frequently used controls of the RelayPro. Other controls and functions can be found in the menu options located horizontally at the top of the screen.

## 2.5 CONTACT RESULTS

This box contains contact test parameters and results from the relay under test. It is displayed in graphical and numerical formats. The selected relays contact label and layout are also shown as table header. Check or uncheck “Contact Layout / Contact Label” to display contact label or configuration as header. The bar graph maximum scale can be changed using Scale Max control. See Figure 2 and Figure 3.

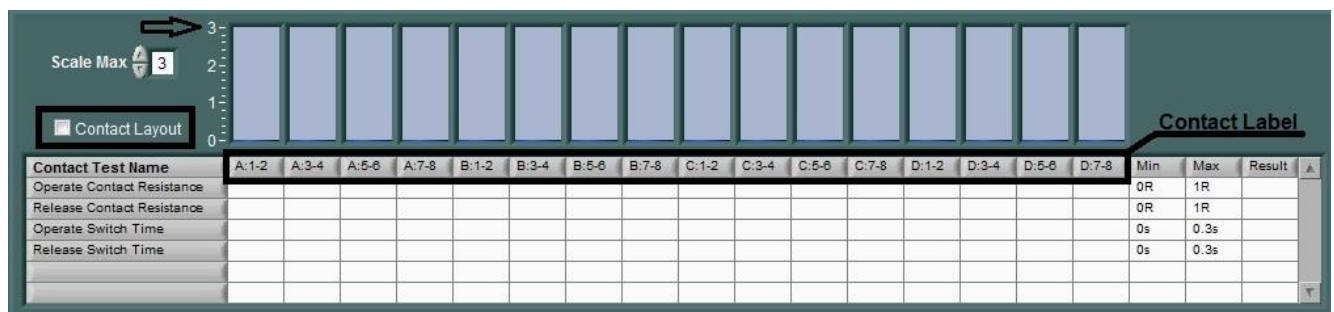


Figure 2 – Contact Label

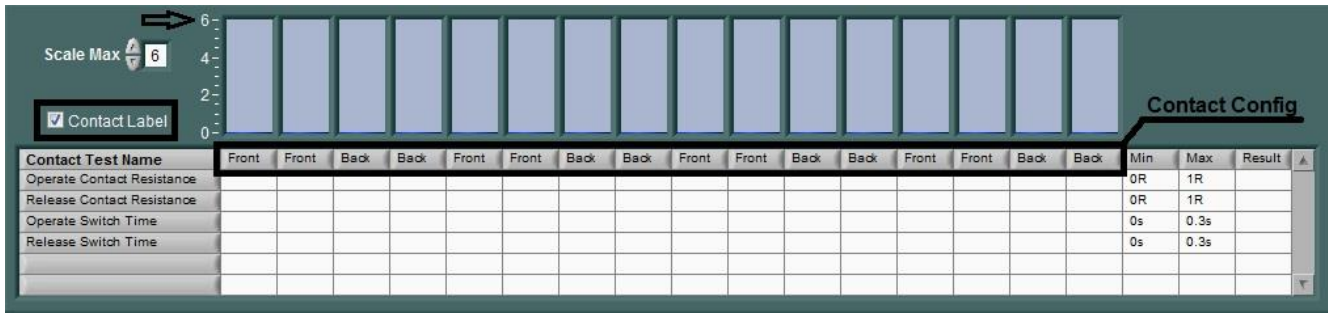


Figure 3 – Contact Configuration

Every table row indicates a contact test in this example the “Operate Contact Resistance” will be the first contact test performed. Also, the Min and Max specification is displayed as well as Result. After the test is completed, select which parameter will be displayed in a graphical format. See Figure 4.



Figure 4 – Contact Test Result

## 2.6 COIL RESULTS

This table displays coil test parameters and results. Each row indicates the test performed.

Administrators can edit all parameters in the Relay Profile, current for example.

## 2.7 RELAY DATA / RELAY NOTES

This window contains two text fields. Use the Radio buttons to toggle between fields.

### 2.7.1 Relay Data

Relay Data displays text recalled from the Relay Profile. The information is generic, relating only to that type of relay.

### 2.7.2 Relay Notes

Operators create and edit Relay Notes. Notes are included in the Test report. Typical notes might include General appearance, damage etc.



## 2.8 ADDITIONAL INFORMATION

Depending on the tests in use, there may be some additional input required from the Testing Officer.

### 2.8.1 Full Drop-Away Voltage Ramp and Full Stroke Voltage Ramp

Designed specifically for the VCOR or PN150/PN250 series of relays, the full drop-away and full stroke tests require user input. This test was designed as the normal pickup voltage and drop-away voltage tests are a simple connected/disconnected test. Whereas the specifications for the VCOR relays define a full drop-away/stroke value.

In order to test to this value, the user must slowly decrease/increase the voltage using the pop-up until they see the relay make a full drop-away or full stroke (pickup).

The steps to test “Minimum Full Drop Away”:

- 1) Watch the relay contact pins
- 2) Slowly reducing the voltage, ensuring to pause when the relay contact pins open
- 3) When the contact pins open, very slowly drop the voltage more, until the contact pins are as far away as possible from each other
- 4) Once the contact pins are as far away as possible from each other (or “Fully dropped”), select “OK”.

The steps to test “Maximum Full Stroke”:

- 1) Watch the relay contact pins
- 2) Slowly increase the voltage, ensuring to pause when the relay contact pins make a connection
- 3) When the connection is made, very slowly increase the voltage until the contact pins are firmly against each other
- 4) Once the contact pins are at full connection select “OK”.

## 3. SETTINGS

### 3.1 USERS

Testing Officers can be added/delete/edit through this window. To add simply click Add then enter the new testing officer or to delete just select the user then click Delete. Click Edit to change password and right of a particular testing officer. As default, all added users are “Operator” and it is required an Administrator Password to change rights. The default password is “relaypro”. No password is required if the operator is logged in as an administrator. See Table access restrictions.

Functions	Operator	Administrator
Test Relay	✓	✓
Clean Relay	✓	✓
Settings	✓	✓
Relay Profile	x	✓
Calibrate	x	✓
Software Update	x	✓

As the user selects a Testing Officer which has a password it will be asked after it is selected.

### 3.2 REPORT

- Report – Select where all reports will be saved. It supports mapped network drive.
- Logo – Select a .jpg picture to be used in the report. Depending on the resolution of the picture it may not work. In this case just reduce the picture resolution.
- Logo Scale – This control can scale up or down to suit the report.
- RelayPro Serial Number – Enter the RelayPro Serial Number in this field. If not empty it will be displayed in the report and calibration certificate.
- Append Data to Report Name – when select all new test report will concatenate date to the relay serial number. This is useful when testing relays periodically.
- Report Sample – Generates a sample report to verify logo size and Organization information.

### 3.3 ORGANIZATION

Enter the organization details in this field. All information will be displayed in the report.

### 3.4 ADVANCED OPTIONS

#### 3.4.1 Profile Folder

Select the profile folder to be display in the Relay Type list. The default is the main root of the profile folder. If the user selects a specific folder the list will only display the Relay Profile under that root.

#### Example

\RelayPro\Profiles path is selected as default, even if a folder is inside this path all files containing a relay profile will be displayed in the Relay Type List. However, if the user selects a specific folder \RelayPro\Profiles\Q-Style only the relay profiles inside Q-Style folder will be displayed.

### 3.5 TEST OPTIONS

#### 3.5.1 Contact Resistance State

This sets a value where the RelayPro will identify the contact state of a relay. As default any value measured bigger than 470R will be identified as open state and any value smaller than 4.7R will be identified as close state. This setting is used when measuring contact resistance, switch time, operate voltage and others. This is a global setting used for all relay profiles.

## 4. PROFILE EDITOR

Use the Profile Editor to create, open, modify or delete Relay Profiles. There four tabs: Relay Parameters, Contact Parameters, Test Parameters and Advanced Options. Users must actively Save changes before closing the Profile Editor, or opening another Profile.

### 4.1 RELAY INFORMATION

- Relay Type – This field is used as a file name and also will be added in Relay Type drop down menu in the main screen. This name should contain basic information to identify the relay.
- Relay Coil Type – This field is displayed on the main screen and report. It can be Single, Dual, Latch or Current depending the relay.
- Coil Voltage – The coil voltage is the nominal voltage applied to the relay when testing.
- Coil Resistance – DC Coil Resistance is the nominal coil resistance of the relay.
- Code – Relay Code (leave blank if not applicable).
- Contact Configuration – Inform contact arrangement.
- Code Holes – Relay Code Holes (leave blank if not applicable).
- Code Holes Type – Select a defined type of code holes (graphical indication).
- Relay Data – Extra information about the relay. This is display in the main screen.

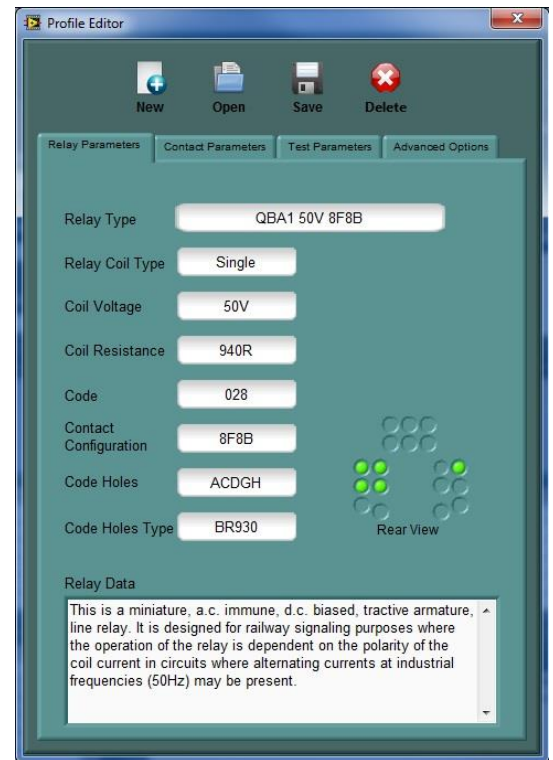


Figure 5 - Profile Editor

### 4.2 RELAY PARAMETERS

#### 4.2.1 Contact Layout – define each contact configuration.

- F – Front
- B – Back
- HF – Heavy Front
- HB – Heavy Back
- “ “ – skip
- OPEN – verify if the contact is open at any coil state
- CLOSE – verify if the contact is close at any coil state
- Contact Label – define each contact name.
- Coil Layout – define coil polarity.

Note: For Latch relay coil A is used to energize and B to de energize relay coil.

## 4.3 TEST PARAMETERS

In this section, the user can select and set PASS/FAIL threshold for each test.

### 4.3.1 Add / Remove / Edit Test Parameters

There are two ways to add a new test to the relay profile by simply clicking “ADD” or right click on the table then select “ADD”. Follow the same instruction to remove and edit a test. See Figure 6.

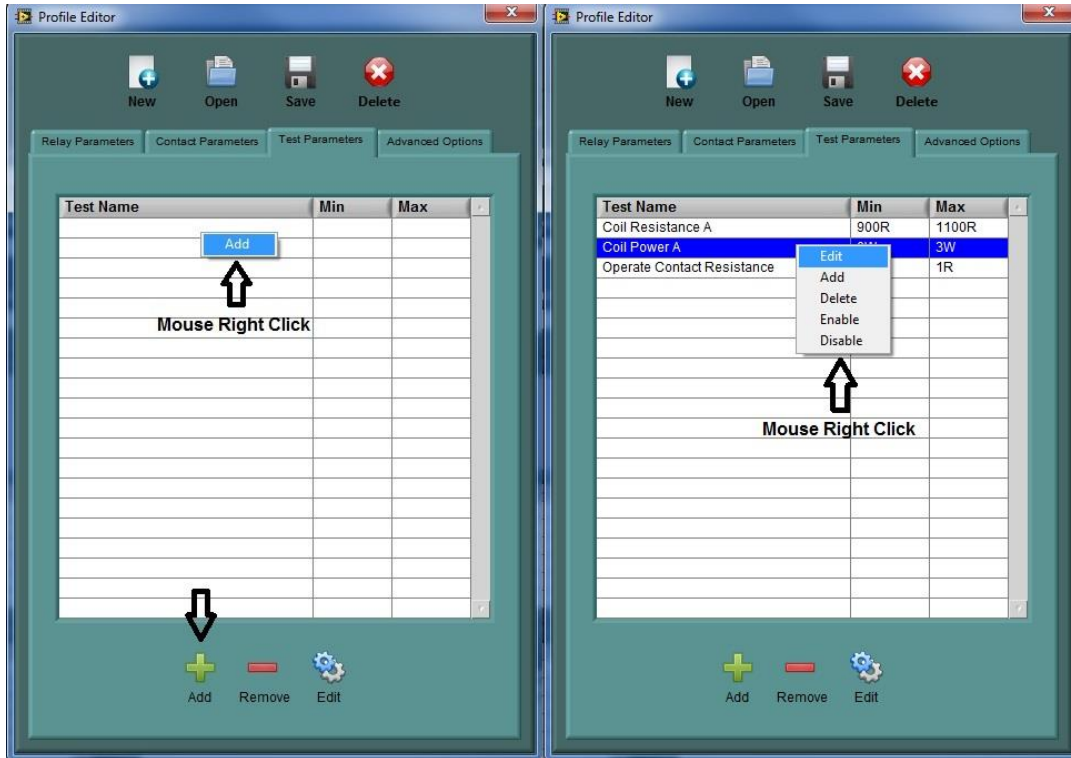


Figure 6 - Add/Remove/Edit Test Parameters

### 4.3.2 Test Parameters Settings

When adding or editing the Test Parameters Settings window will be displayed. Select a test from a list of pre-programmed scripts. Depending on the test selected different options set will appear. The RelayPro software executes the test list in sequence. The order of the test can be modified dragging the test. Using the CTRL keyboard + dragging will duplicate the test.

Note: In this list there are different types of test and some are specific for a relay type. It may not be suitable for all relays. Others are just configuration tests and they will not appear in the test table in the main screen.

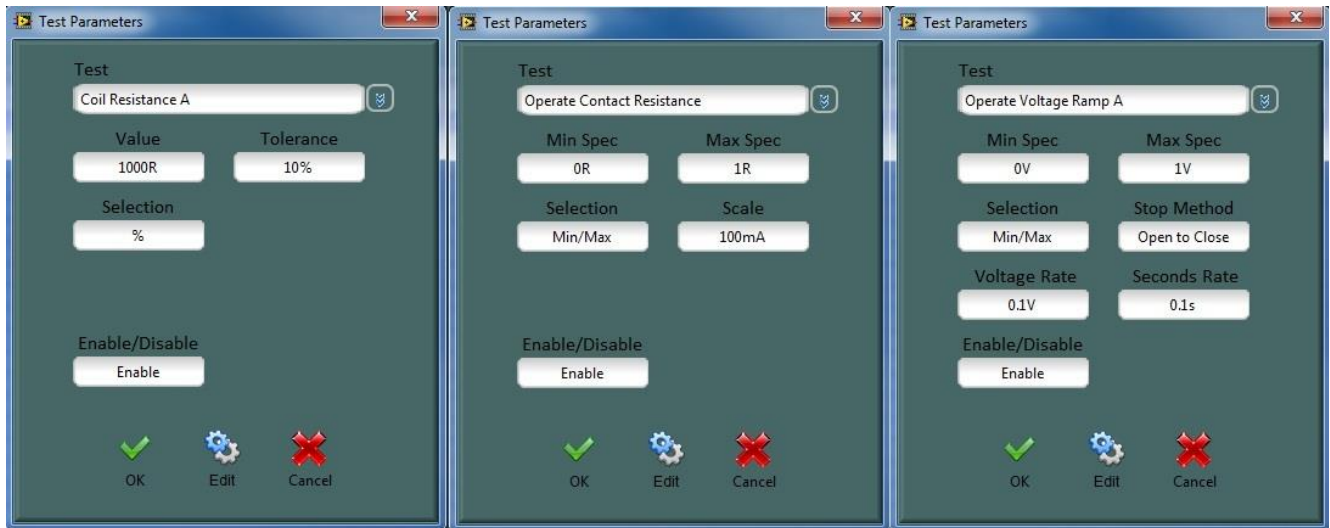


Figure 7 - Test Parameters Settings

- Selection – This control changes between Min/Max Spec to a Value/Tolerance. It mainly use when the user need to setup threshold around a number.
- Enable/Disable – Enable or disable the selected test. When the test is disabled it will not be tested. There are 2 ways to enable or disable a test, right click on the Test Parameters table (see Figure 6) or through this control.
- Scale – This option is enabled when testing contact resistance. It defines the constant current source. The RelayPro uses an automatic scale (see table for more information).
- Stop Method – This option is enabled when voltage ramp test is selected. It defines which contact state the test should stop.
- Voltage/Second Rate – This option is enabled when voltage ramp test is selected. It defines the voltage step and time.
- Edit – This function will call the Test Script Editor. Please refer to Test Script for more information.

## 4.4 ADVANCED OPTIONS

### 4.4.1 Contact Cleaner

- Clean Current – Set the Current used when cleaning a contact. Range is 100mA to 3A.
- Repetition – Set the number of cleaning cycles that will be completed
- ON/OFF Time – This is the Current duration during each cycle

## 5. FUNCTIONS

This section describes all RelayPro functions.

### 5.1 TEST

To start testing a relay simply select the relay from the relay Type menu then click test from the Controls box or through Tools – Test Menu. As soon as the test starts the status window indicates the current test.

### 5.2 CLEAN

The ‘Clean’ function applies a controlled current burst to the selected contact whilst at the same time the relay coil is energized/de-energized (see Contact Cleaner). The resulting plasma arc cleans the contact surface.

The flash cleaning method is only to be used with relays that have contacts in good mechanical surface condition (determine by visual inspection) but have high contact resistance due to oxidized residue or any minor contaminants at the point of contact. This method eliminates the need to open the relay for manual cleaning, thereby, reducing the turn-around time, and reducing the risk of inadvertent alteration to the relay characteristics.

The relay should be tested before and after the cleaning process and contact resistance measurements recorded for comparison with the corresponding relay specifications.

### 5.3 VERIFY

The Verification routine verifies the main parameters measured by the RelayPro. It provides enough information to ensure the tester is working within the specification. This process is divided in two parts: Verify and Zero.

The “Verify Test” measures and compares the following parameters, Contact Resistance, Coil Resistance and Coil Voltage. The 1R Precision Reference (provided) and a calibrated Voltmeter (not provided) are needed to proceed with the test. It is responsibility of the user to ensure the voltmeter is calibrated.

To start click Tools → Verify, then follow the instructions on the screen. After the verification is completed a Verification dd-mm-yyyy.pdf report will be generated under “Report” folder. The report contains the following information:

- Company Logo
- Organization Details
- Testing Officer
- Date
- Result
- RelayPro Serial Number

All details can be altered in the Settings menu.

### 5.4 ZERO REFERENCE

The Test Base contacts degrade with use. The “Zero Test” routine measures the resistance between the Test Base contact and the Zero Reference, indicating the severity of degradation.

The Zero Reference has 0Ω in every contact. Any resistance measured in this test is an error and is added to the Relay contact resistance. It is the responsibility of the user to check if this error is within an acceptable value (less than 0.1Ω). External factors affect this value: it is not constant, and cannot be simply deducted from the contact resistance. The Test Base can be cleaned using a contact cleaner (it may or may not solve any problem).

The Test Base is a consumable part: it will degrade with use and is not covered by warranty. The Test Base contacts are repairable, or the entire unit is replaceable.

### To start the Zero Test routine

- Select “Zero Reference” in Relay Type
- Select “Test” in the Controls Panel

RelayPro displays the results on the main screen.

## 6. TEST DESCRIPTION

### 6.1 CONTACT RESISTANCE

The Contact Resistance Test passes a precise constant current through each contact, measures the associated voltage drop, and calculates contact resistance. Results are displayed in graph and digital format.

The contact resistance measurement features an auto range using three different scales for high precision.

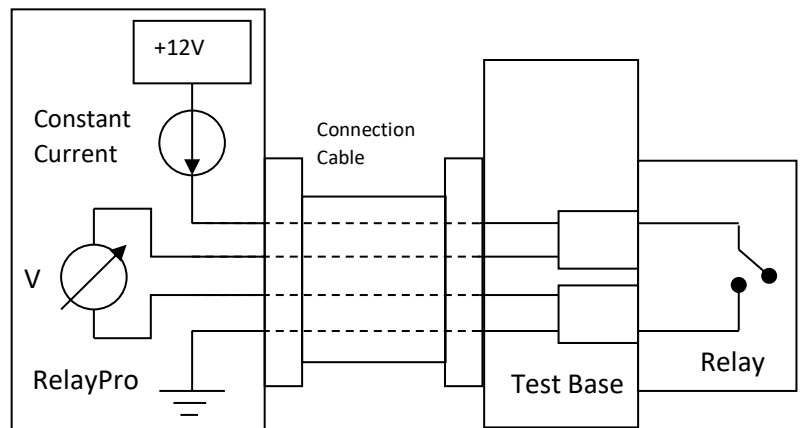
Scale	Current (mA)	Range (ohm)	Precision (ohm)
1	100	0-5	0.001
2	10	5-50	0.01
3	1	50-500	0.1

The selected Current in the Test Parameters at Relay Profile is the starting point of the scale. For example, 100mA is selected then 100mA, 10mA and 1mA will be used. If 1mA is selected then only 1mA will be used.

Accurate results are achieved through a 4 Wire Kelvin measurement method up to the Test Base contact. This eliminates resistance error from cables and connections between the RelayPro and relay.

### 6.2 SWITCH TIME

This test is performed by measuring the time it takes for a relay contact to change state from Open to Close or Close to Open. Open and Close values are defined at the Settings Menu.



### 6.3 COIL RESISTANCE

Coil resistance is performed by passing a precise constant current through the coil. The voltage drop across the coil is measured and the coil resistance is calculated. The result

is displayed on screen in digital format. The coil resistance measurement features an auto range using 2 different scales for high precision results.

Scale	Current (mA)	Range (ohm)	Precision (ohm)
1	10	0-500	1
2	1	500-5000	1

### 6.4 RAMP VOLTAGE

The relay Operate / Release voltage is measured using a Ramp Method. It consists of sweeping the coil supply voltage from zero up to nominal rated voltage, while measuring if any front contact changes state.

The ramp parameters can be set in the Relay Profile – Test Parameters.



## 7. HELP

### 7.1 CALIBRATION

It is recommended that the RelayPro is calibrated on a regular basis to verify and correct any measurement drift that has occurred at any stage over this period.

Complete Calibration by:

- Returning tester to the manufacturer, or
- The unit can be calibrated by the end user (optional RelayPro Cal Kit required)

### 7.2 ZERO FAILURE

Zero failure may occur in the following instances:

#### 7.2.1 Test Base is dirty or damaged.

Solution: Clean Test Base contacts using a cotton swab and contact cleaner.

#### 7.2.2 Zero results exceed the maximum trim limits.

Solution: Replace contacts in the Test Base or order a replacement.

### 7.3 CALIBRATION

It is recommended that the RelayPro is calibrated on a regular basis to verify and correct any measurement drift that has occurred at any stage over this period.

Calibration can be performed by returning tester to the manufacturer or alternatively the unit can be calibrated using the RelayPro Cal Kit (not provided).

### 7.4 COMMS FAILURE

If Comms Failure occurs check the following:

1. USB cable is connected between the computer and the test box.

### 7.5 F.A.Q.

Q. Why do readings sometimes change when re-testing the same relay?

A: Possible reasons:

1. Dirty or pitted contacts exhibit a dynamic resistance. Current cleaning is effective in removing oxidation film and contact dust.
2. Temperature affects the contacts resistance by a small amount. RelayPro is accurate enough to measure this change. Allow the relay to cool down following the current cleaning of the contacts.
3. Calibration drift can affect RelayPro's accuracy. This drift could represent a very small measurement error. To ensure high accuracy, RelayPro should be calibrated on a regular basis.

### 7.6 TO UNINSTALL APPLICATION

- Open the Start menu, Settings and Control panel in the Windows task bar.
- Click Add/Delete Program
- Choose RelayPro from the list
- Click Add/Delete
- Follow uninstall instructions

## 8. UPDATES AND TECHNICAL SUPPORT

### 8.1 SOFTWARE & HARDWARE UPDATES

When available, Software & Hardware updates are located at [www.mrd.com.au](http://www.mrd.com.au).

### 8.2 TECHNICAL SUPPORT

Please email any support questions to [support@mrd.com.au](mailto:support@mrd.com.au)

Alternatively phone MRD office on: +61 7 3821 5151

# Appendix

## A1 LEGAL

### A1.1 USER LICENSE AGREEMENT

#### A1.1.1 Important Notice

Read this License Agreement carefully before using this Software. BY USING THIS SOFTWARE IN ANY WAY YOU ACKNOWLEDGE THAT YOU HAVE READ, UNDERSTOOD AND AGREE TO THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE TO THESE TERMS, DO NOT USE THE SOFTWARE IN ANY WAY, AND PROMPTLY RETURN IT OR DELETE ANY COPIES OF THIS SOFTWARE IN YOUR POSSESSION.

#### A1.1.2 License Grant

MRD Rail Technologies Pty Ltd grants you a non-exclusive license to use this software, and any associated documentation ("the software"), as indicated herein. If you have purchased a Single User License, one copy of the software may be installed and used, for internal use only, on a single computer. The software is in "use" on a single computer when it has been loaded into temporary memory (i.e. RAM) or installed into permanent memory (hard disk or other device) of that computer. If you have purchased a Multiple User License (you specified several copies of the software when you purchased it), the Software may be installed and used, for internal purposes only, on the number of computers authorized at the time of the purchase.

#### A1.1.3 Restrictions

You MAY NOT: (a) copy and distribute the Software or any portion of it; (b) sublicense, lease, rent, or transfer this Software to another; (c) cause or permit reverse engineering, disassembly, decompilation or alteration of this Software; (d) remove any product identification, copyright notices, or other notices or proprietary restrictions from this Software; (e) copy the documentation accompanying the Software.

#### A1.1.4 Term

This License is effective until terminated. You may terminate it at any time by destroying the Software, together with all copies thereof. This License will also terminate if you fail to comply with any term or condition of this Agreement. Upon such termination, you agree to destroy the Software, together with all copies thereof.

#### A1.1.5 Warranty

The media on which you receive MRD software are warranted not to fail to execute programming instructions, due to defects in materials and workmanship, for a period of 90 days from date of shipment, as evidenced by receipts or other documentation. MRD will, at its option, repair or replace software media that do not execute programming instructions if MRD receives notice of such defects during the warranty period. MRD does not warrant that the operation of the software shall be uninterrupted or error free.

A Return Material Authorization (RMA) number must be obtained from the factory and clearly marked on the outside of the package before any equipment will be accepted for warranty work. MRD will pay the shipping costs of returning to the owner parts which are covered by warranty.

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## A2 RELAYS (TESTABLE)

The list below is current at time of publication. If you have a requirement that is not listed here or in the RelayPro software, please contact [support@mrd.com.au](mailto:support@mrd.com.au) for assistance.

Note: The RelayPro includes a Q-style Test Base by default. Other Relays require a compatible Test Base, sold separately.

#	Relay Type
Q-Style	
1	QBA1 12V 12F4B
2	QBA1 12V 8F8B
3	QBA1 24V 12F4B
4	QBA1 24V 4F4B
5	QBA1 24V 6F6B
6	QBA1 24V 8F4B
7	QBA1 24V 8F8B
8	QBA1 50V 12F4B
9	QBA1 50V 4F4B
10	QBA1 50V 6F6B
11	QBA1 50V 8F4B
12	QBA1 50V 8F8B
13	QBBA1 12V 2x4F4B
14	QBBA1 12V 2x6F2B
15	QBBA1 24V 2x4F4B
16	QBBA1 24V 2x6F2B
17	QBBA1 50V 2x4F4B
18	QBBA1 50V 2x6F2B
19	QBCA1 12V 2HF4F4B
20	QBCA1 24V 2HF4B
21	QBCA1 24V 2HF4F4B
22	QBCA1 50V 2HF4B
23	QBCA1 50V 2HF4F4B
24	QBCA1 50V 2HF6B
25	QECX1 0.4A 4F
26	QECX1 0.4A 4F2B
27	QECX20 0.058A 4F2B
28	QL1 12V 11F4B
29	QL1 24V 11F4B
30	QL1 24V 8F6B
31	QL1 50V 11F4B
32	QL1 50V 8F6B
33	QN1 12V 12F4B
34	QN1 12V 8F4B
35	QN1 12V 8F8B
36	QN1 24V 12F4B

37	QN1 24V 4F4B
38	QN1 24V 6F6B
39	QN1 24V 8F4B
40	QN1 24V 8F8B 250R
41	QN1 24V 8F8B
42	QN1 50V 12F4B
43	QN1 50V 4F4B
44	QN1 50V 6F6B
45	QN1 50V 8F4B
46	QN1 50V 8F8B
47	QNA1 24V 12F4B
48	QNA1 24V 4F4B
49	QNA1 24V 6F6B
50	QNA1 24V 8F4B
51	QNA1 24V 8F8B
52	QNA1 50V 12F4B
53	QNA1 50V 4F4B
54	QNA1 50V 6F6B
55	QNA1 50V 8F4B
56	QNA1 50V 8F8B
57	QNA2 50V 16F
58	QNA2 50V 8F4B
59	QNC1 24V 2HF4B
60	QNC1 50V 2HF2F2B
61	QNC1 50V 2HF4B
62	QNC1 50V 2HF5B
63	QNCM1 12V 2HF4MB
64	QNCM1 12V 2HF4MF4MB
65	QND2 24V 12F4B
66	QND2 24V 8F8B
67	QND2 50V 12F4B
68	QND2 50V 8F8B
69	QNM1 12V 4MF4MB
70	QNN1 12V 2x4F4B
71	QNN1 12V 2x6F2B
72	QNN1 24V 2x4F4B
73	QNN1 24V 2x6F2B
74	QNN1 50V 2x4F4B
75	QNN1 50V 2x6F2B
76	QNNA1 50V 2x2F2B
77	QNNA1 50V 2x4F2B
78	QNNA1 50V 2x4F4B
79	QNNA1 50V 2x6F2B



80	QNNM1 50V 2x5F3B
81	QNNM2 50V 2x2F2B
82	QNNM2 50V 2x2F3B
83	QNNM2 50V 2x4F4B
84	QNNS1 24V 2x4F4B
85	QNNS1 24V 2x6F2B
86	QNNS1 50V 2x4F4B
87	QNNS1 50V 2x6F2B
88	QR15 50V 4X2 CO *
89	QS2 12V 6F6B
90	QS2 24V 8F4B
91	QS2 50V 8F4B
92	QSPA1 24V 8F4B
93	QSPA1 50V 8F4B
94	QSR2 24V 8F4B
95	QSRA1 12V 8F4B
96	QSRA1 24V 8F4B - PSS
97	QSRA1 24V 8F4B
98	QSRA1 50V 4F2B
99	QSRA1 50V 6F6B
100	QSRA1 50V 8F4B - 1000
101	QSRA1 50V 8F4B - 1420
102	QSRA4 12V 6F2B
103	QSRA450V 6F2B
104	QT2 125MA 2F
105	QT2 125MA 2F1B
106	QT2 125MA 2F2B
107	QT2 155MA 2F2B
108	QTA2100MA 2F
109	QTA2100MA 2F2B
110	QTA2155MA 2F
111	QTA2155MA 2F2B
112	ZeroReference
113	ZJ1511
114	ZJ1611
115	ZJ4511
116	ZJ4611
117	ZJ5511
118	ZJ5611
<b>Alstom Relays*</b>	
119	56001-785
<b>BLIB Relays*</b>	
120	SR840
121	SR844

<b>PN250*</b>	
<b>122</b>	N322554-701
<b>123</b>	N322554-702
<b>PN150 (VCOR)</b>	
<b>124</b>	N322500-701
<b>125</b>	N322500-702
<b>126</b>	N322500-705
<b>127</b>	N322500-801
<b>128</b>	N322500-812
<b>129</b>	N322502-001
<b>130</b>	N322503-702
<b>131</b>	N322503-902
<b>132</b>	N322504-001A
<b>133</b>	N322504-001B
<b>134</b>	N322505-701
<b>135</b>	N322505-806
<b>136</b>	N322507-701
<b>137</b>	N322508-703
<b>138</b>	N322516-701
<b>139</b>	N322525-001
<b>140</b>	N436788
<b>NS1 Relays*</b>	
<b>141</b>	NS1-L-1232
<b>142</b>	NS1-L-428
<b>143</b>	NS1-L-828
<b>144</b>	NS1-P-1232
<b>145</b>	NS1-P-428
<b>JRF Relays*</b>	
<b>146</b>	JRF-51103 6F2B

## End of Manual