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**10 Amp Digital Micro-Ohm Meter
Model: Micro Junior 2**

Table of Contents

	<u>Section</u>	<u>Page</u>
Table of Contents		2
Safety Precautions	1 – 0	3
Uncrating Procedure	2 – 0	4
Introduction	3 – 0	5
Technical Specifications	4 – 0	6
Front Panel Description	5 – 0	7
Front Panel Descript. Cont.	5 – 1	8
Front Panel Display screens	6 – 0	9
Screen Descriptions, Settings & Selections	6 – 1	10
Range Selection		10
Archive Menu		10
• Show		10
• Print		10
• Erase		10
Set Up Menu		11
• Clock Screen		11
• Interval Test		12
• Contrast		12
• Printer		13
Testing Screen Descriptions	6 – 2	13
Range Selection		13
• Single mode		14
• CONT mode (Continuous)		14
• AUTO mode (Automatic)		15
• INTER mode (Interval)		15
• Cross Current Measurements		16
Print Command		17
Store Command		17
System Details	7 – 0	18
Battery Check	7 – 1	18
Li-Ion Charger	7 – 2	18
Limitations of Testing	7 – 3	19
Transformer Windings	7 – 4	19
Low Resistance Testing	7 – 5	19
Getting Started Quickly	8 – 0	20
Operation	8 – 1	20
Single, Continuous, and Automatic Modes		20, 21
Cross Current Measurements	8 – 2	21
Test Report	8 – 3	21
Trouble Shooting	9 – 0	22
Warranty	10 – 0	23

The following safety precautions must be observed during all phases of operation, service, and repair of this instrument. By purchasing this equipment the purchaser assumes all liability for the operation and use of this equipment. The intended use of the instrument, its design and manufacture, is to be conducted within the precautions or other specific warnings located within this manual. Failure to comply with these precautions and other specific warnings violates safety standards of design, manufacture, and intended use. Raytech assumes no liability for the operation and use of this equipment.

SAFE OPERATION

Only qualified knowledgeable persons should be permitted or attempt to operate this test equipment. All test personnel should fully familiarize themselves with the correct application and operation of this and all test equipment prior to operation. Persons directly and indirectly engaged in the operation of this test equipment should keep clear of all high voltage apparatus while conducting tests and measurements.

BEFORE APPLYING POWER

Read this manual carefully before operating the system. The Micro Jr. 2 is battery operated. The battery pack is charged via an external power supply which can handle input voltage from 100 to 240 vac 50/60Hz (auto-sense).

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE

Do not operate the instrument in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made by qualified service personnel. Do not replace components with power cable connected. To avoid injuries, always disconnect power, discharge circuits, and remove external voltage sources before touching components.

DO NOT SUBSTITUTE PARTS OR MODIFY INSTRUMENT

Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the instrument. Return the instrument to a RAYTECH Switzerland service department for service to ensure proper operation and that safety features are maintained.

Instruments, which appear damaged or defective, should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

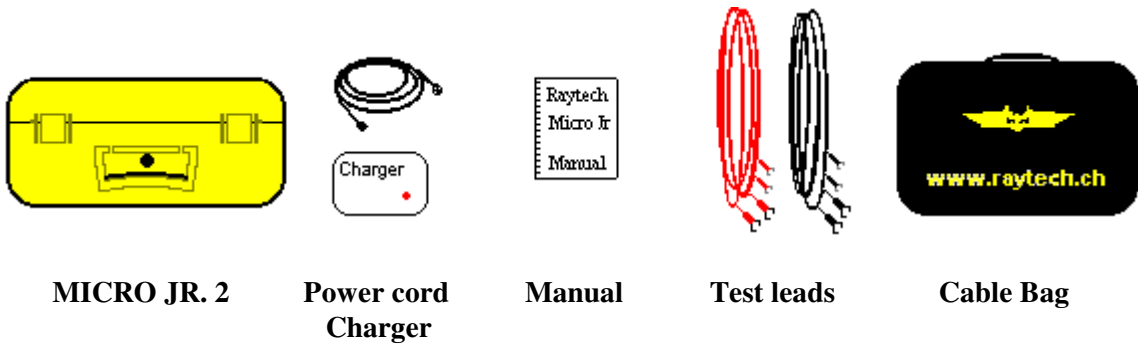
TEST WARNINGS!

- 1. Do not use on live circuits.**
- 2. Do not use test probes when testing inductive loads (Motors, transformers).**

UNCRATING:

2 - 0

Unpack your new MICRO JR. 2 and check to see that you have the following items:



If any of the above items are missing or damaged contact your local representative or RAYTECH Switzerland immediately.

* Note:

The Micro JR. 2 Fieldcase is a waterproof design that may incorporate a pressure relief valve. This valve should be slightly open when encountering atmospheric changes; i.e... Airplane Travel, High altitudes, etc... Close the valve when transporting the equipment in wet conditions.

Raytech Digital Micro ohm meter, Micro Jr. 2 was designed for high degree of accuracy for the measurement of very low resistance. This technology was then packaged into a portable test system for use by apparatus manufacturers, rebuild shops, and electrical maintenance crews.

Ease of use: This intelligent system has an easy to use operation screen, which allows quick selection of the current level and resistance level to be measured. The system has the ability to reverse current flow automatically and provide extremely accurate results.

Impressive Accuracy: The Micro Jr. 2 is a high precision, fully automatic, microprocessor based system. This system is designed for highly accurate readings on-site with laboratory precision.

Unique Measuring Technique: This newly designed technique of measurement incorporates a high precision measurement circuit which will automatically measure with current flow in one direction, then the system will reverse the current flow and display very accurate results to 0.1 μ Ohm. The system allows long term measurements at 10 amperes without frequent recharging.

Operation: The Micro Jr. 2 applies a preset current level and resistance range selected by the user. The results of the test are displayed within a few seconds automatically. The results are reported on the easy to read liquid crystal display.

Compact Design: The Micro Jr. 2 is a lightweight system that comes complete with its own rugged waterproof Fieldcase.

Simple Maintenance: There is No maintenance required. There is no calibration procedure (No potentiometers to turn). This is due to the utilization of high precision components in the design.

Advanced Protection: Upon powering on the system initializes itself with a self-calibrating, circuit checking sequence. If any problems are detected during this initialization period, or during operation, the operator is immediately notified. The system constantly monitors the condition when turned on. The Micro Jr. 2 has extensive protection built in to the circuitry. This is one of the many reasons we can extend our warranty to 2 years.

TECHNICAL SPECIFICATIONS

4 – 0

MODEL: Micro-Jr. 2
SIZE: L: 406 mm (16") W: 330 mm (13") H: 178 mm (7").
WEIGHT: 5.9 kg (13 lbs.).
INPUT POWER: 100 to 250 Vac 50 / 60 Hz Auto-ranging battery charger.
INTERNAL POWER: Lithium-Ion Battery, 14.8V / 6 Ah
TEST CURRENT: User Selectable: 10, 1, 0.1, 0.01, 0.001 Ampere.
PANEL DISPLAY: LCD Graphic with back lighting.
FRONT PANEL: Sealed anodized with a multi-actuation rotary knob.
INTERFACE: 9 Pin RS232 Serial
PRINTER: Internal panel mount printer
MEMORY STORAGE: Internally stores up to 2000 complete test results.

RESISTANCE RANGE: 0.1 $\mu\Omega$ to 400k Ω

MEASUREMENT PARAMETERS:

Current Range	Measuring Range	Accuracy	Resolution
10 Amp (F/R) :	0.1 $\mu\Omega$... 40m Ω	$\pm 0.1\mu\Omega \pm 0.1\%$ Rdg	5 Digits or 0.01 $\mu\Omega$
10 Amp :	1 $\mu\Omega$... 40m Ω	$\pm 1\mu\Omega \pm 0.1\%$ Rdg	5 Digits or 0.1 $\mu\Omega$
1 Amp (F/R) :	1 $\mu\Omega$... 1 Ω	$\pm 1\mu\Omega \pm 0.1\%$ Rdg	5 Digits
1 Amp :	10 $\mu\Omega$... 1 Ω	$\pm 10\mu\Omega \pm 0.1\%$ Rdg	5 Digits
0.1 Amp :	100 $\mu\Omega$... 10 Ω	$\pm 0.1m\Omega \pm 0.1\%$ Rdg	5 Digits
0.01 Amp :	1m Ω ... 400 Ω	$\pm 1m\Omega \pm 0.1\%$ Rdg	5 Digits
0.001 Amp :	10m Ω ... 40k Ω	$\pm 10m\Omega \pm 0.1\%$ Rdg	5 Digits
0.001 Amp :	40k Ω ... 400k Ω	$\pm 10m\Omega \pm 1\%$ Rdg	5 Digits

F/R = automatic Forward / Reverse current measurement

TEMPERATURE: Operating: -10° C to 60° C Storage: -20° C to 70° C

CABLE SET / ACCESSORIES

Current and voltage lead set - 5 Meters, Power supply cord, Battery charger, Instruction Manual, cable bag.

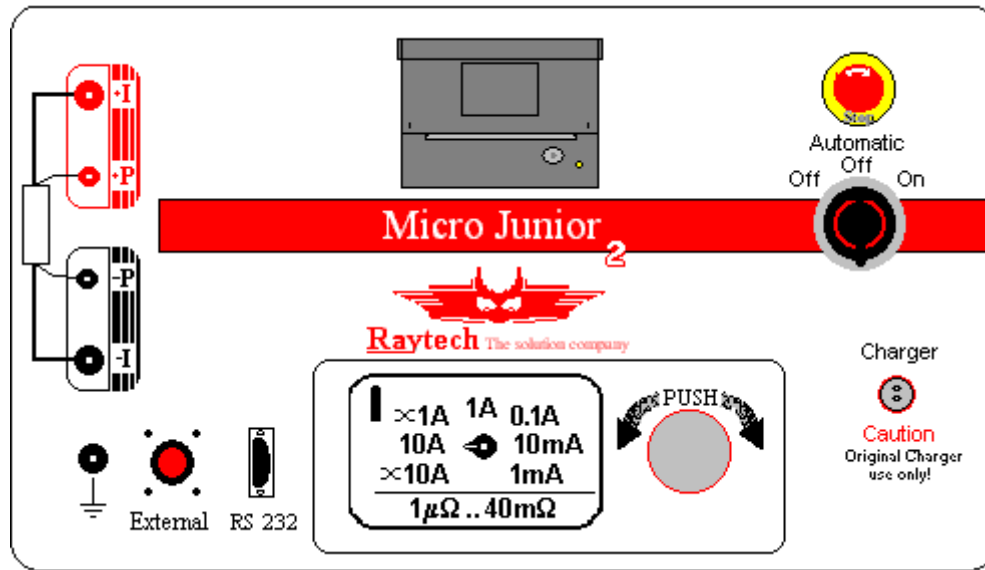
MICRO JR. 2 FEATURES:

- Microprocessor based system
- Automatic measurements of Low Resistance
- Automatic current reversal mode for greater accuracy
- Internal storage for 2000 test results
- Response time less than 2 seconds
- Single push button operation
- Automatic shut-off to extend battery life
- Lithium Battery power source
- Runs for more than 5 hours continuous at 10 amps
- Complete automatic calibration system
- Heavy duty protection circuitry
- Internal Panel Mount Printer
- External connection Port & RS232 (serial) Interface
- 2 Year standard warranty


MICRO JR. 2 OPTIONAL ITEMS:

Part No - MJO 201 – Kelvin probe set
Part No - TP 02 – Temperature probe
Part No - WR50-1A – Ext. power supply (50A / 50V) for Winding Resistance measurements

* Specifications are subject to improvement at anytime.




This is the power on switch. Turning the switch to the “ON” position applies power to the test set. Turning the switch to the “OFF” position turns off the instrument. The switch defaults to the “Automatic off” position and will automatically turn off after being idle for a certain period (dependent upon battery charge).

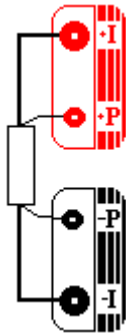
Charger

Lithium Ion Charger Input


Emergency OFF
 Press to stop - Turn Clockwise to release


Earth Ground Terminal

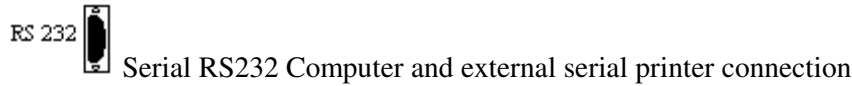

External
 This port is used for an external connection to the 50A/50V Transformer Winding Resistance Power Supply Option: WR50-1A.
 This port can also be used with an optional temperature probe TP 02.

Test Connections:



- +I = Positive Current connection**
- +P= Positive Potential (voltage) connection**
- I = Negative Current connection**
- P= Negative Potential (voltage) connection**

Computer Connection:



Buttons:

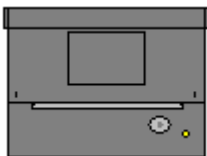


This is a multi-actuation rotary knob which is the main control and input.

This rotary knob allows the user:

- To select the current and Resistance range.
- To start a test sequence.
- To store a test.
- To put the test set into various measuring modes
- To view Archive data (previous Test Reports saved into memory).
- To print a test.

Printer:



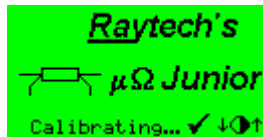
This panel mount printer allows the user to print out stored results or current results.

The single button on the printer is for Form-Feed.

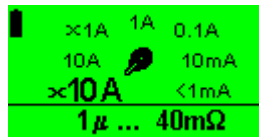
To tear paper, pull paper towards the front of the instrument against the serrated cutting edge.

TYPICAL DISPLAY SCREENS:

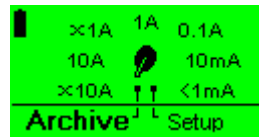
6 - 0



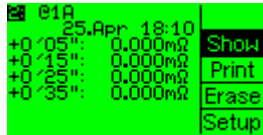
START UP



CURRENT & RANGE SELECTION



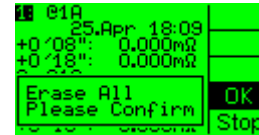
ARCHIVE HIGHLIGHTED



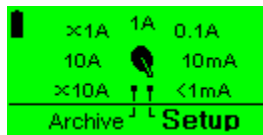
ARCHIVE MEMORY LOC.



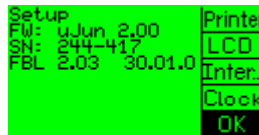
ARCHIVE SHOW MENU



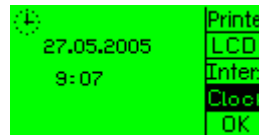
ARCHIVE ERASE MENU



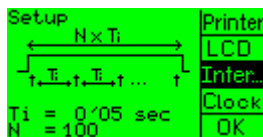
SETUP HIGHLIGHTED



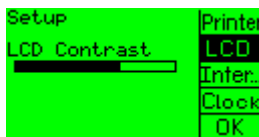
SETUP MENU



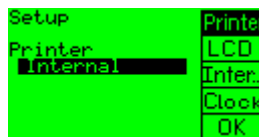
SETUP CLOCK



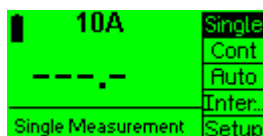
SETUP INTERVAL TEST



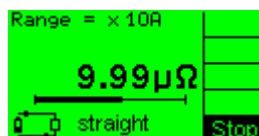
SETUP CONTRAST



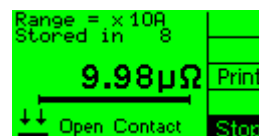
SETUP PRINTER



10A RANGE PRETEST



x 10A RANGE REVERSE TEST

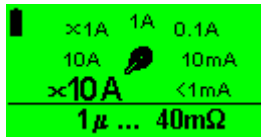


10A RANGE AUTO. TEST

Further details of these menus and screens are located on the following pages.

RANGE SELECTION Screen:

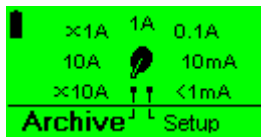
Allows setting of Resistance & Current levels. Selection is made by turning the rotary knob to the desired Current or Resistance range then pressing the rotary knob to confirm selection.



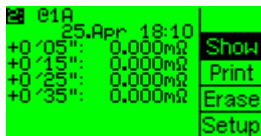
ARCHIVE Screens:

This is where the memory locations are kept.

In the RANGE SELECTION Screen, position the pointer with the rotary knob to highlight “Archive”.



Press the rotary knob to view the Archive (memory locations) and this screen will appear:



SHOW: This selection allows viewing of all of the memory locations.

Press down on rotary knob to scroll through stored tests, the following screen will appear:



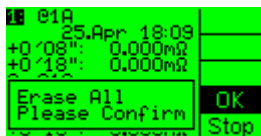
Press stop to revert back to the previous screen.

PRINT: This selection will print the highlighted memory location.



Position the pointer with the rotary knob to highlight “SETUP” and return the RANGE SELECTION screen.

ERASE: This selection will erase all of the memory locations.

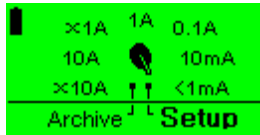


Press “OK” to erase all of the stored results.

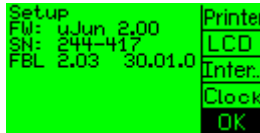
* If you do not wish to erase the stored results, position the pointer with the rotary knob to highlight “STOP” and press the rotary knob to cease this action. *

SETUP MENU SCREEN:

Includes selections for Printer options, LCD Contrast, Interval Test mode and Clock adjustments. In the RANGE SELECTION Screen, position the pointer with the rotary knob to highlight “Setup”.



Press the rotary knob to view the Setup options and this screen will appear:

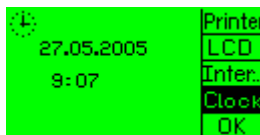


This screen first displays:
 Firmware (FW)
 Serial Number (SN)
 Flash Boot Loader (FBL)

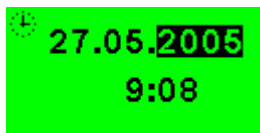
Selections are made by turning the rotary knob to highlight the desired position then pressing the rotary knob for the desired selection.

CLOCK:

The time can be set by turning the rotary knob and pressing the desired selection. Selections are made in this order: Year, Month, Day, Hour, and Minute.



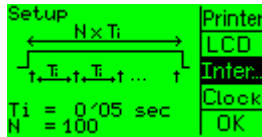
Press the rotary knob while “Clock” is highlighted and this screen will appear:



You are now able to adjust the Year, Month, Day, Hour, and Minute. Using the rotary knob, turn clockwise or counter-clockwise to change the highlighted number. Press the rotary knob to proceed to the next number.

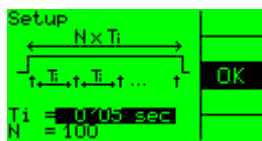
INTERVAL TEST Screens:

The **INTER** (Interval Testing) mode will measure and store, automatically, numerous single sequential tests at timed intervals that are preset by the operator. The test set measures continuously in this mode.



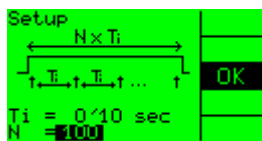
In this **INTER** mode, the instrument will continuously measure multiple tests (current is always on) until the operator selects and presses “Stop” or until the number of tests that were pre-selected have been achieved. The instrument will automatically save test results in a memory location that will increment by the pre-selected timed interval.

While “Inter” is highlighted, press the digipot to pre-select a desired measurement setup:



Ti = Time Interval of Tests
 N = Number of tests to be performed

You are now able to adjust the Time Interval. Using the digipot, turn clockwise or counter-clockwise to enter the desired time. Once the desired Time is reached, press OK with the digipot. The following screen will appear:

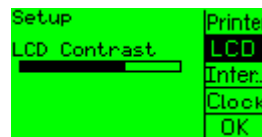


You are now able to adjust the Number of Tests. Using the digipot, turn clockwise or counter-clockwise to enter the desired number of tests. Once the desired number is reached, press the digipot to select “OK”.

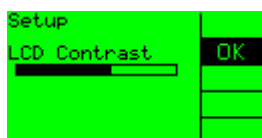
- * The minimum amount of time is 5 seconds, maximum of 10 minutes.
- * The minimum number of tests are 2, maximum of tests 2000.

CONTRAST Screen:

The Contrast (LCD) can be changed by pressing and then turning the rotary knob for the desired view.



While “LCD” is highlighted, press the digipot. The following screen will appear:



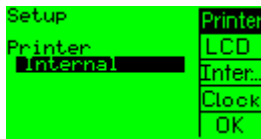
You are now able to adjust the contrast. Using the digipot, turn clockwise or counter-clockwise to adjust the brightness or darkness of the screen.

SCREEN DESCRIPTIONS, SETTINGS & SELECTIONS:

6 – 1

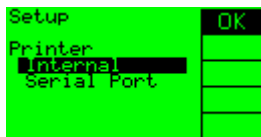
PRINTER Screens:

This screen allows the user to select either the Internal panel mount Printer or external Serial Printer.



- Internal** – Default for the internal panel mount printer.
- Serial** – An external printer connected to the 9 Pin connector.

To change Printer setup, press digipot while “Printer” is highlighted. This screen will appear:



Using the digipot, scroll up or down to select the desired port. After printer or external port is selected, press “OK” to return to the Range Selection Screen.

TESTING SCREEN DESCRIPTIONS:

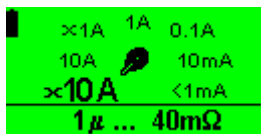
6 – 2

TESTING Screens:

RANGE SELECTION:

Test selections are initially made by turning the rotary knob to the desired selection of current or resistance range then pressing the rotary knob to begin that sequence.

When the Micro-Jr 2 is first powered on the following RANGE SELECTION screen will appear:



Select the desired test range by turning the rotary knob. The pointer will turn to the available ranges. Press the rotary knob when the desired range is highlighted to select that range.

The following Ranges can be selected:

- <1 mA / Resistance range: 10Ω ...400kΩ
- 10 mA / Resistance range: 1Ω ...400Ω
- 0.1A / Resistance range: 100mΩ ...10Ω
- 1A / Resistance range: 10mΩ ...1Ω
- x1A / Resistance range: 1mΩ ...1Ω
- 10A / Resistance range: 1mΩ ... 40mΩ
- x10A / Resistance range: 1μΩ ... 40mΩ

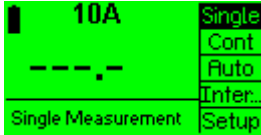
* Note:

For the descriptions of the various adjustments and options for testing, this manual will use the 10A and x10A Ranges as examples on the following pages.

TESTING Screens: con't.

10A Screen:

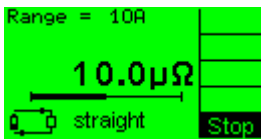
When the 10A range (or any other Range) is selected, the following screen will appear to allow the user to select the type of test mode required:



SINGLE Test mode:

The system will conduct and run a single test on a device. The test measurement sequence completes within a few seconds.

Selection of “Single” starts a test sequence. The following screen will appear:

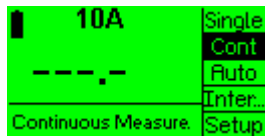


Once the test has completed the user has the option to:

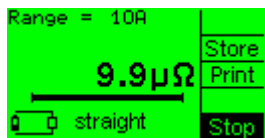
- “GO” : Start another test.
- “Store” : allows the user to save a reading into a memory location (Archive).
- “Print” : allows the user to go to the print screen.
- “Mode”: Select another test mode.
- “Setup” allows the user to go to the Range Selection screen.

CONT (Continuous) Test mode:

Selection of “Cont” starts a continuous test sequence.



In the continuous test mode the test set will measure until the user selects and presses “Stop”. The test system has an output of current that runs continuously while the resistance measurements are being taken. Selection of “Cont” starts a continuous test sequence. The following screen will appear:



Note: The user can Select “Store” or “Print” at anytime that the system is measuring.

After the user Selects and presses “Stop”. The test sequence will halt. The user now has the ability to:

- “Store” : allows the user to save a reading into a memory location (Archive).
- “Print” : allows the user to go to the print screen.
- “Auto” : allows a test to be made then automatically saves it in memory.
- “Setup” allows the user to go to the Range Selection screen.

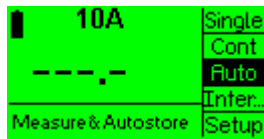
TESTING SCREEN DESCRIPTIONS:

6 – 2

TEST Screens: con't.

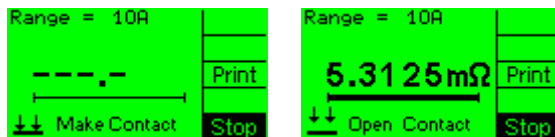
AUTO mode:

Selection of “Auto” allows a number of tests to be made then automatically saved to memory.



When selected to begin this test the system prompts the operator to “Make Contact ” to the device under test. The system automatically detects when the contact is made to the device under test and begins the measurement sequence. After completion of the test the system saves the results in memory then prompts the operator to “Open Contact” to the device. Once the contacts have been removed from the device under test it is then detected by the system. The system then prompts the operator to “Make Contact ” to the device again to repeat the process of the next measurement sequence.

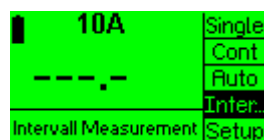
The system automatically detects when contact is made to the device under test and begins and ends the measurement automatically saving the data to memory until the operator selects “Stop”.



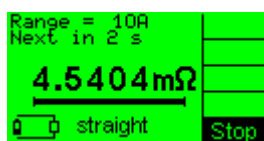
Note: The user can Select “Print” at anytime that the system is measuring.

INTER... (Interval) Mode :

Selection of “Inter...” mode will measure and store, automatically, numerous single sequential tests at timed intervals that are preset by the operator. The test set also measures continuously in this mode.

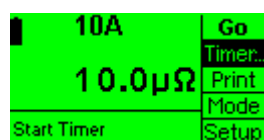


In this mode, the instrument will continuously measure multiple tests until the operator selects and presses “Stop” or until the number of tests that were pre-selected have been achieved. The instrument will automatically save test results in a memory location that will increment by a timed interval. Pre-selected variables are preset by the operator in the SET UP menu (See page 12).



The test system indicates and counts down the time between test results taken and stored.

TIMER feature:



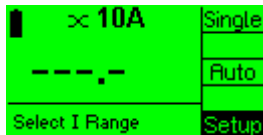
The Timer feature is typically used with the transformer Winding Resistance option: WR50-1A. This feature allows the operator to record the time required to prepare a heated transformer winding (or any heated device) for cooling curve measurements.

TESTING Screens: con't.

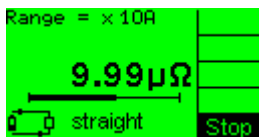
x10A Screen (Forward / Reverse test) :

x10 or x1 Ranges are for making measurements where the current is first positive (+) DC sourced then negative (-) DC sourced. Basically, the current flow through the device under test is reversed or crossed. The system measures in both positive and negative sourced modes then the resultant resistance value is displayed. This can be very beneficial when testing in areas with high background interference. This mode also offers the highest degree of resolution.

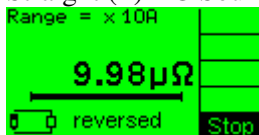
When the x10A range is selected, the following screen will appear:



Selection of “Single” starts a Forward/Reverse test sequence. The following screens then appear:

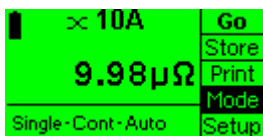


Straight (+) DC Sourced, Then:



Reversed (-) DC Sourced.

At the end of the test sequence the following screen appears:



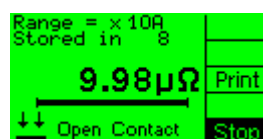
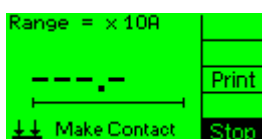
The user now has the option to:

- “GO” : Start another test.
- “Store” : allows the user to save a reading into a memory location (Archive).
- “Print” : allows the user to go to the print screen.
- “Mode” : Select another test mode.
- “Setup” : allows the user to go to the Range Selection screen.

Selection of “Mode” reverts back to the x10A range initial screen, where the options of Single, Auto, and Setup are shown.

AUTO mode:

Selection of “Auto” allows a series of tests to be made then automatically saved to memory. This mode operates identical to all other test Ranges. For explanation: see ”**AUTO mode** “page 15.



Press stop with the rotary knob. The test will stop.

TESTING SCREEN DESCRIPTIONS:

6 – 2

TEST Screens: con't.

PRINT command:

The Print mode is available after each test sequence is run. Selection of “Print” allows the user to print the test results that are displayed on the screen. The following screen will appear when “Print” is selected:

∞ 10A	Header
9.98 $\mu\Omega$	Data
Print Data	FF
	Stop

Selection of “HEADER” allows the user to Print a Header.

Selection of “DATA” allows the user to Print the data.

Selection of “FF” allows the user to Form Feed the paper.

Selection of “STOP” returns to the Test screen.

Press “Stop” then “Setup” to go back to the Range Selection Screen.

STORE command:

The Store mode is available after each test sequence is run. Selection of “Store” allows the user to store the previous test results that are displayed on the screen to the archive (Memory).

The numbered memory locations are allocated sequentially. The saved data consists of time stamp and date of test, Current Range and Resistance value resultant

10A	Go
4.3168m Ω	Store
Store Data	Print
	Mode
	Setup

When “Store” is selected, the data is saved to a memory location and the following screen will appear:

10A	Go
4.3168m Ω	Print
Stored in 63	Mode
↓	Setup

In this example the data was saved to memory location 63.

Press “Setup” to go back to the Range Selection screen, Press “Print” to print test results, or Press “Mode” to access other testing modes.

SYSTEM DETAILS:

7 – 0

Battery Check:

7 – 1

The instrument is battery operated. Before operating the Micro Jr. 2, check the battery indicator located on the upper left hand of the display. The Battery indicator will give a good indication of the battery charge. A full Charge will allow the Micro Jr. 2 to operate continuously for 5 Hours at 10-ampere output or (typically) a month of daily usage. Recharge the batteries at any time. The system can be operated while charger is plugged into the mains power (110-220 v).

Li-Ion Charger:

7 – 2

Precautions

- * This charger is for indoor use only. Do not expose to water or dust.
- * To avoid overheating, the charger must not be covered while in use.
- * This charger is designed for use with Lithium-ion batteries installed in the Raytech Micro-Ohm meter only.
- * The mains outlet must be easily accessible. Should a faulty Condition occur; remove the plug from the mains outlet immediately.
- * High voltage inside! Do not remove cover! There are no user serviceable components inside.

Features

- 3-step charge control for safe, fast charging of Lithium-ion Batteries.
- One voltage level: Quick bulk charge.
- LED-indicator with three different colors show the charge status.
- Built in timer for prolonged charging




Charging Instructions

1. Connect the charger to the Micro-Jr. 2 before it is connected to the mains outlet.
2. When charging is complete, disconnect from the mains before removing Micro-Jr connections.

Explanation of Charging Function

The charger works in three different modes. An LED-indicator with three different colors shows the mode that the charger is in:

LED Indicator Charge Status:

<u>Bulk Charge</u>		Orange LED. Battery < 95% Capacity. The charger is in constant current mode. Charge current is maximum.
<u>Balancing Charge</u>		Yellow LED. Battery > 95% Capacity. The charger is in timer/trickle mode. Charge current is less than maximum.
<u>Standby mode</u>		Green LED. Battery at full Capacity. The charge is stopped. Charge current is zero.

WARNING ! :

The charger has an internal slow blow glass fuse which will blow if a fault occurs in the charger. Unit must be repaired by qualified service personnel only.

Limitations of Resistance Testing:

7 – 3

This Test system is capable of sourcing 10 amperes at 0.9 volts DC. The cable leads that carry the test current should have a total resistance not exceeding 40 milliohms. Beyond the 40 milliohms the test set decreases the available output current. A warning message, "Use 1 Amp range" will be displayed. However, the system will continue to measure and display slightly less accurate results. If the message, "Rx Too High" or "+++." is viewed in the display, then mandatory range switching must be complied with.

Transformer windings:

7 – 4

Use of any micro ohm meter for high inductive winding resistance is not recommended. The inductive characteristics of transformer winding testing require a long period to saturate the winding to get a stable reading. In addition, care must be taken when removing test leads such that a voltage charge does not remain on the winding. Lethal currents may remain and might cause personal injury and damage to the instrument. Specialized test sets with higher potential compliance voltages and current should be considered for winding resistance measurements.

Low Resistance Testing:

7 – 5

The Micro Jr. 2 is an extremely useful device for checking Switch Contacts, SF6 Switchgear, Busbars, Splices, Joints, Fuses, Breaker contacts, Railbonds, and Low inductive windings.

The Micro Jr. utilizes a 4 wire measuring technique. The Two (2) connections on the front plate marked **+I** & **-I** are the current leads. The Two (2) connections on the front plate marked **+P** & **-P** are the Potential sense or Voltage measuring leads.

By connecting a test specimen to the Current leads (See figure 1) and applying the Potential leads across the resistance to be measured. The points where the potential leads are connected determine the resistance reading.

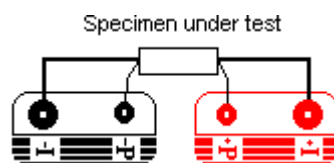


Figure 1

The test set employs a very simple principle of Ohm's law: $R=V/I$
R = Resistance, **V** = Voltage, **I** = Current

WARNINGS!

BEFORE OPERATING THIS OR ANY OTHER TEST EQUIPMENT READ ALL SAFETY WARNINGS AND UNDERSTAND THEM FULLY.

OPERATION:

This section describes a typical, step by step, operation of the Micro Jr. 2

Open the top protection lid of the case and attach the test leads to the test set.

The Two (2) connections on the front plate make **+I** & **-I** are the current leads.

The Two (2) connections on the front plate make **+P** & **-P** are the Potential or Voltage leads.

By connecting a test specimen to the Current leads (See figure 2) and applying the potential leads across the specimen the resistance readings will be determined.

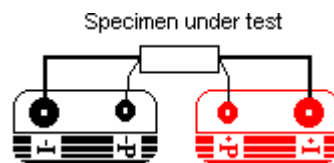
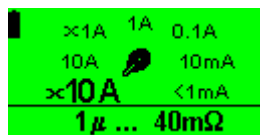


Figure 2

Turn the Power switch to the “ON” position. The Instrument will make the initial calibration check. Then the Initial Range selection screen will appear.



Select the resistance range expected to be measured with the multi-turn Knob.

(Selecting the cross current, x10A & x1A measurement range: see page 16).

Press the multi-turn Knob when the indicator is pointing at the resistance and current level to be measured (If unsure of current level, then start at the 1 mA range and increase the current range until a valid reading appears).

After the current range is selected press the multi-turn Knob again. The following measuring modes can then be accessed: **SINGLE**, **CONT** (Continuous), **AUTO** (Automatic)

SINGLE:

The **SINGLE** mode allows a single test to be made. Turn the multi-turn knob until “Single” is highlighted. Press the multi-turn Knob to select. The test set will start a measuring sequence immediately. The system will sense the current output, and if a valid reading is detected, then record the results on the display. The results can then be “Stored” or “Printed”.

* Additional information: See Section 6-2 **Page 14**

CONT (Continuous)

The **CONT** (Continuous) mode allows a single test to be made continuously. The instrument will continuously measure until the operator presses “Stop”.

Turn the multi-turn Knob until “Cont” is highlighted. Press the multi-turn Knob to select. The test set will start measuring immediately. The system will sense the current output and, if it is a valid reading, display the results on the display. If the STOP button is selected the last valid reading displayed will remain on the display.

* Additional information: See Section 6-2 **Page 14**

AUTO (Automatic)

The **AUTO** (Automatic) mode will measure and store, automatically, numerous single sequential tests. The instrument will continuously measure multiple tests until the operator selects and presses “Stop”.

Turn the multi-turn Knob until “Auto” is highlighted. Press the multi-turn Knob to select. The test set will start measuring immediately and prompt the operator to Make Contact with the test probes. The system will sense the current output, and if it is a valid reading, then display the results on the display. The instrument will automatically save this last result in a memory location and then prompt the operator to remove the test probes (Remove Contact). The instrument will then repeat the process. Press the STOP button to end the measuring sequence.

Note 1: The instrument will halt the measuring process if excessive interference is detected.

Note 2: If a warning message, “Rx Too High” is displayed, Or if “+++.” is displayed, Then return to the “SET UP” screen and select the next higher resistance range.

* Additional information: See Section 6-2 **Page 15**

Cross Current measurements (Forward / Reverse):

The Micro Jr. 2 was designed to allow measurements with the current flow in a forward direction and then in a reverse direction. The current flow through the device under test is reversed (or crossed) automatically during a testing sequence in Ranges **x10 A** and **x1 A**.

When the test is initiated the current flow is first positive (+) DC sourced then automatically switches current flow to negative (-) DC sourced. The potential leads are not reversed. Measurements are taken from the (+) Positive measurement readings and measurements are taken from the (-) Negative measurement readings. These readings are then combined with the resultant


value of resistance being very accurate with a resolution of 0.1 μOhm .

* Additional information: See Section 6-2 **Page 16**

TEST REPORT:

The user may, at the completion of each test, print the results or may recall previous tests from a memory location and print these results as well.

The test report is printed in the general following manner:

Test  Report
Measured by Raytech $\mu\text{OhmJunior II}$
S/N : 251'001

Operator :
Object :
Site :
Dataset :
Range : **x10 A**
Date : **25 . May . 06**
Time : **20 : 21 : 22**

δTime Rx T1 T2 T3
+0'07" : 9.999 $\mu\Omega$
+0'10" : 10.01 $\mu\Omega$

Troubleshooting

General

9 – 0

At powering on, the Micro Jr. 2 internal calibration and check sequence is performed. Upon completion of the check sequence the test set will proceed to the “Range Selection” Screen. Should there be any problem with the test set an error message will appear.

SYSTEM DOES NOT DISPLAY ANYTHING:

1. Check the display for any Initialization.
2. Plug the test set into a main power outlet to check to see if the battery is completely discharged.
3. Contrast is set too low. Page 12

SYSTEM POWERS ON BUT THE DISPLAY FADES OUT OR BLINKS:

1. Check the battery charge.

TEST CURRENT CANNOT BE TURNED ON

1. Does the unit have an external safety switch incorporated? Is it properly operating?
2. Is the system connected in an area with excessive interference?

“WARNING Rx TOO HIGH” or “+++.” IS DISPLAYED.

1. A warning message, “Rx Too High” or “+++.” will be displayed if the resistance being measured is too high for the range selected.
2. The current leads total resistance has exceeded the current capability of the instrument. Reduce the current lead length or increase the wire gauge of the current lead used. Page 19

THE DISPLAY BACKLIGHT GOES OUT FREQUENTLY

1. As the battery charge decrease the display back-light will go out more frequently to reserve the battery power.

THE TEST SET TURNS OFF MORE FREQUENTLY

1. As the battery charge decrease the test set will automatically turn off more frequently to reserve the battery power.

THE TEST SET DISPLAYS +++.” BUT CURRENT IS FLOWING

1. The test set is not reading any test voltage on the “+P” & “- P” leads.
2. The resistance value is beyond the limit of the selected range (Over Range).

ERRATIC OR ERRONEOUS READINGS

Possible causes

1. Test lead damaged or not connected.
2. Poor test lead connection.
3. Test set attached to a “Live” load or high interference load.

The Micro Jr. 2 is designed to be trouble free.

If problems or questions do arise please contact our service support group.

SYSTEM UPGRADES

System firmware upgrades are available at no charge from the web site www.raytech.ch. This firmware is downloaded to a Windows based computer and then can be used to upgrade the Flash EPROM in the Micro-Jr 2 via the RS232 link. For further details or assistance please contact our support group.

1. RAYTECH Switzerland shall at their option and expense, repair, replace or newly provide any parts or services that prove to be defective within the warranty limitation period- irrespective of the operating time of the test equipment provided that the cause of the defect occurred prior to the time at which the risk was passed.
2. Warranty claims are subject to a warranty limitation period of 24 months from the date of shipment.
3. The purchaser is obligated to immediately notify RAYTECH Switzerland in writing form of any defects of the supplied test equipment.
4. RAYTECH Switzerland must always be given the opportunity to rectify a defect within a reasonable time. The purchaser shall grant an adequate time within the test equipment shall be repaired.
5. RAYTECH Switzerland covers the costs associated with the repair of the defect. Especially the costs for the material and work. Cost for sending the faulty test equipment shall be borne by the purchaser. RAYTECH Switzerland shall not be liable for material damage, or financial loss due to the loss of production, loss of data, loss of information, data or interest, regardless of their legal basis.
6. Warranty claim rights on replacement parts as well as repair of defective parts shall expire after 12 months.
7. Warranty limitation period shall be extendable according to the price list. The purchaser has the right to extend the warranty period by purchasing additional warranty years.

Limitation of Warranty

The foregoing warranty shall not apply to defects resulting from improper and unauthorized modifications or misuse and abuse of the product, negligence, alteration, modification, faulty installation by the customer, customer's agents or employees. Attempted or actual dismantling, disassembling, service or repair by any person, firm, or corporation not specifically authorized in writing by RAYTECH Switzerland.

Defects caused by or due to handling by carrier, or incurred during shipment, trans-shipment, or other move. Inadequate maintenance by the customer, second source supplied software or interfacing, operation outside the environmental limits, or improper site preparation.

Exclusive remedies provided herein are the customer's sole and exclusive remedies.

RAYTECH Switzerland shall not be liable for any damages resulting from the use of this equipment whether direct, indirect, special, incidental, or consequential damages, or whether based on contract, tort, or any other legal theory.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED.

Arbitration

1. All disputes arising out of or in connection with the contract between the purchaser and RAYTECH Switzerland and including those regarding the legal validity of this contract and this arbitration clause shall be settled out of court and shall be referred to arbitration for final decision.
2. Any disputes between the purchaser and RAYTECH Switzerland shall be settled according to the rules of settlement and arbitration of the chamber of commerce in Zurich by one or more arbitrators appointed also according to the rules of arbitration of the chamber of commerce in Zurich Switzerland.