INSTRUCTION MANUAL

ENGLISH

MUX R

MULTIPLEXER

RAYTECH GMBH , OBEREBENESTRASSE 11, CH-5620 BREMGARTEN, SWITZERLAND

Contents

1 Safety Precautions

The following safety precautions must be observed during all phases of operation, service, and repair of this Multiplexer. By purchasing this equipment the purchaser assumes all liability for the operation and use of this equipment. The intended use of the multiplexer, 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 GmbH 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.

GROUND THE MULTIPLEXER
To minimize shock hazard, the multiplexer chassis and cabinet must be connected to a properly grounded receptacle. Non grounded multiplexers are dangerous and may cause damage.

DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE
Do not operate the multiplexer in the presence of flammable gases or fumes.

KEEP AWAY FROM LIVE CIRCUITS
Operating personnel must not remove multiplexer 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 MULTIPLEXER
Because of the danger of introducing additional hazards, do not install substitute parts or perform any unauthorized modification to the multiplexer. Return the multiplexer to a Raytech service department for service to ensure proper operation and that safety features are maintained.

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

2 Description

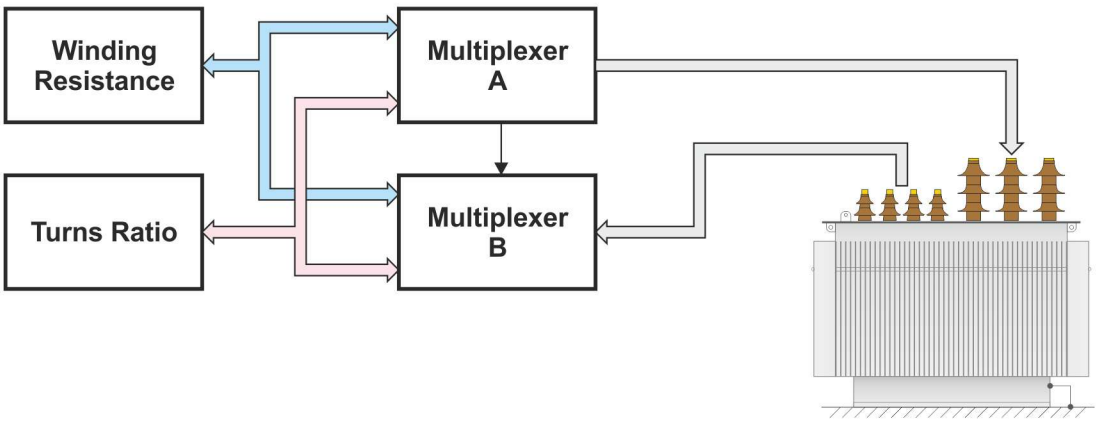
Raytech Multiplexer is designed to reduce cabling time and increase test performance. It is meant to be used with Raytech Winding Resistance (WR) and Turns Ratio Meters (TR-MARK II/III). Any Multiplexer configuration can be easily controlled by a Winding Resistance Meter touch panel or by remote. The following examples will give you an impression, how a Multiplexer works and how it can be used.

2.1 Advantages and Features

- Minimizes cabling time.
- Does all measurements with one cabling per transformer, including Winding Resistance and Turns Ratio.
- Uses up to three Multiplexers and measure transformers with three winding systems with one cabling sequence.
- Get your own configuration containing from one to three Multiplexers, from one to three Winding Resistance Meters and one Turns Ratio Meter.
- Control your tap changer with a powerful tap changer interface.
- Operate all instruments on a touch screen or by remote control.
- Get a customized complete solution containing WR, TR and Multiplexers. Ask Raytech for a ATOS (Automatic Transformer Observing System)

2.2 Example

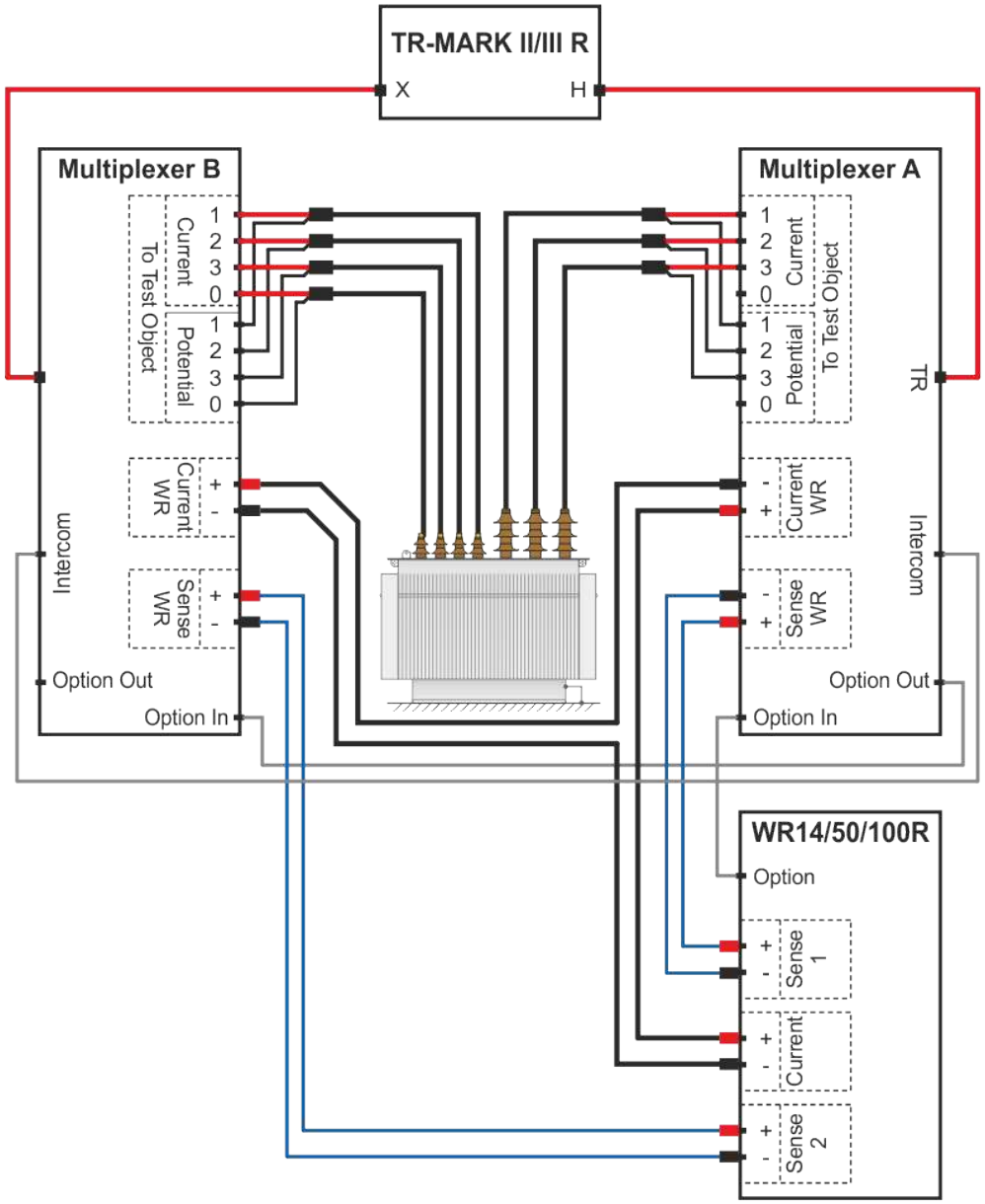
2.2.1 Block diagram



Multiplexers are directly connected to the test object. Raytech Meters are connected to Multiplexers. It is the interface between transformer and instruments.

2.2.2 Schematic Diagram

Here you will find more details about how the example in chapter ‘2.2.1’ would be set up with Multiplexers and Raytech devices. In later chapters, this kind of diagram will be used to illustrate several Multiplexer setups.

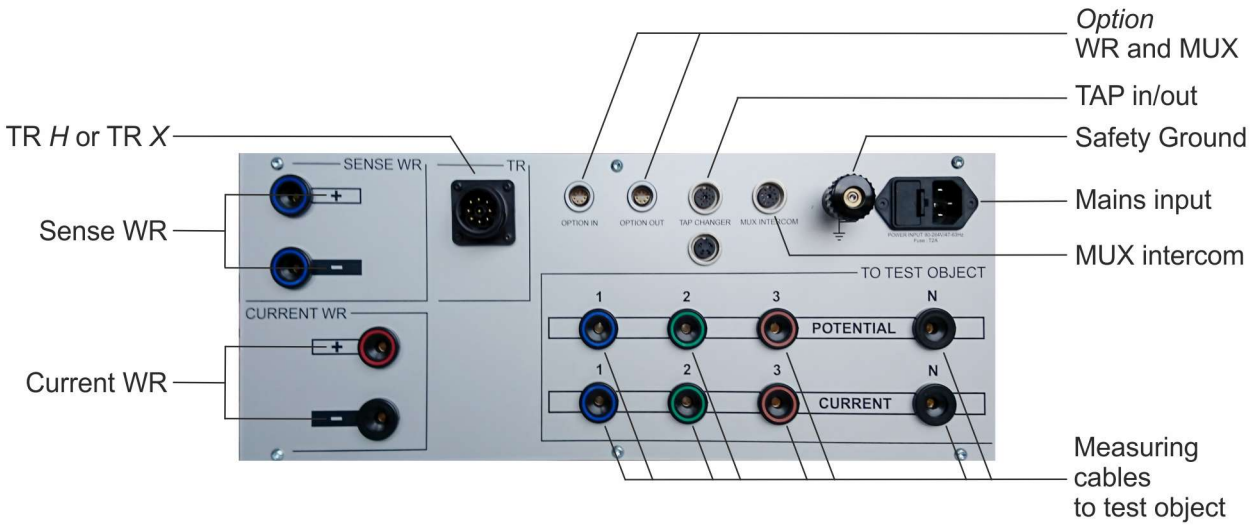


NOTE:
A complete system containing Multiplexers and Raytech devices is called ATOS for Automatic Transformer Observing System. Ask your local representative

3 Overview

3.1 Front Panel

3.2 Rear Panel



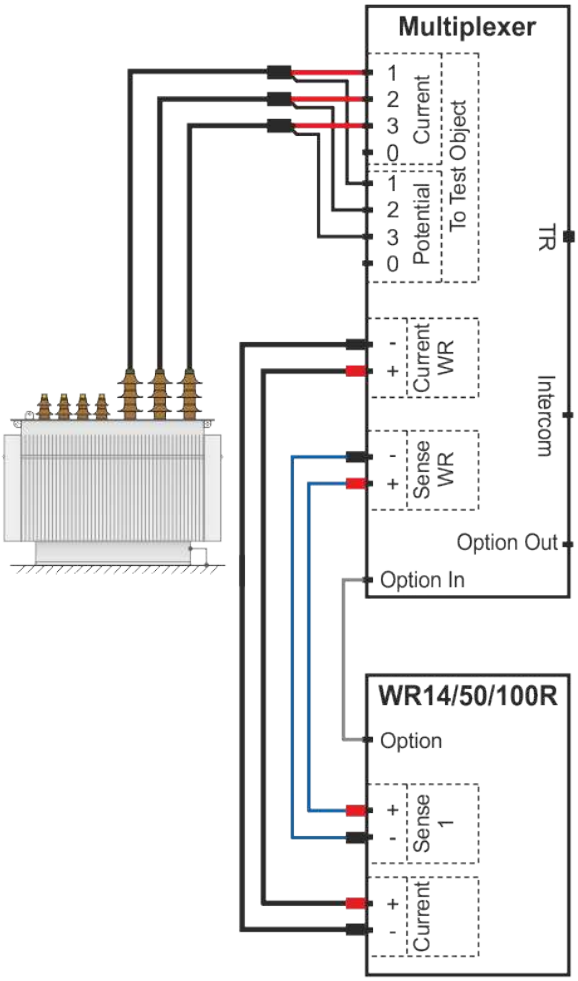
NOTE:
Multiplexers do not need a main power switch. They will automatically be switched on, when the controlling Winding Resistance Meter starts up.

4 Using Multiplexer Hardware

In this chapter, several possible Multiplexer configurations will be shown. That's only a part of what is doable and thought to give you an impression of the benefits a system based on Raytech Multiplexers offers to you.

4.1 Case 1: One Winding Resistance Meter (WR) and one Multiplexer

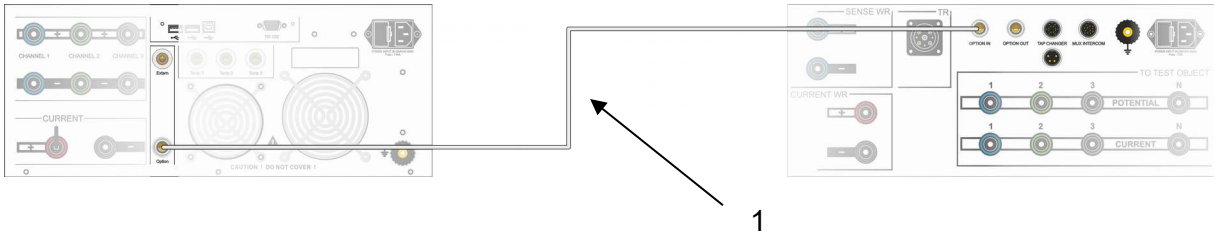
4.1.1 Schematic Diagram



This is the minimum configuration for a Multiplexer use. A Raytech Winding Resistance Meter is controlling a Multiplexer. Every winding resistance of one winding system (primary, secondary, tertiary) can be measured with one cabling. In other words: to measure every winding of a standard H/X transformer, you have to connect your system only twice to the transformer under test.
In the example shown, the high voltage side is ready to be measured. Because of the delta configuration of the primary windings, H1-H2, H2-H3 and H3-H1 will be measured. H0 cables are not used.
After the cabling is done, for instance the user will give the command to switch H1-H2 and start measurement. Both is done on the touch panel of the Winding Resistance Meter or by remote. Then no change of cabling is necessary for next measurements. Just stop current measurement, give the order to switch to H2-H3 or what ever and start measurement again.

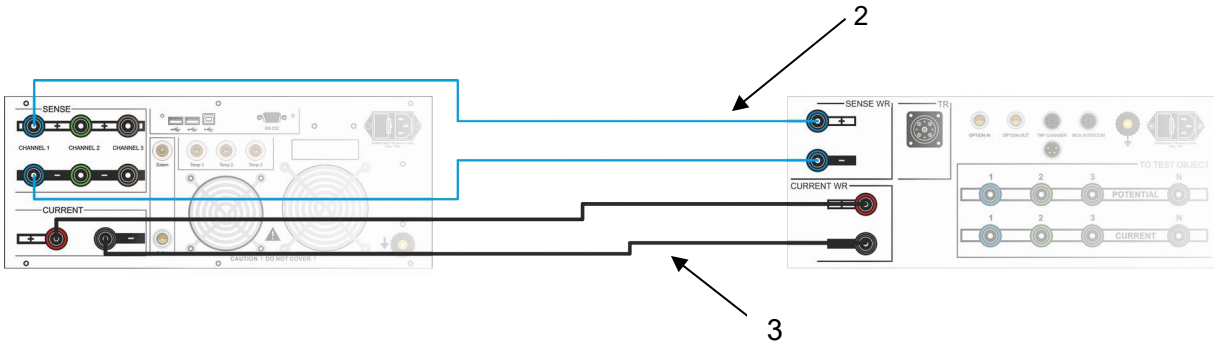
4.1.2 Connections: One WR50 and one Multiplexer

Start with the Option cable:



No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
1	Option Cables	30493-100	Option In/Out	Option Out

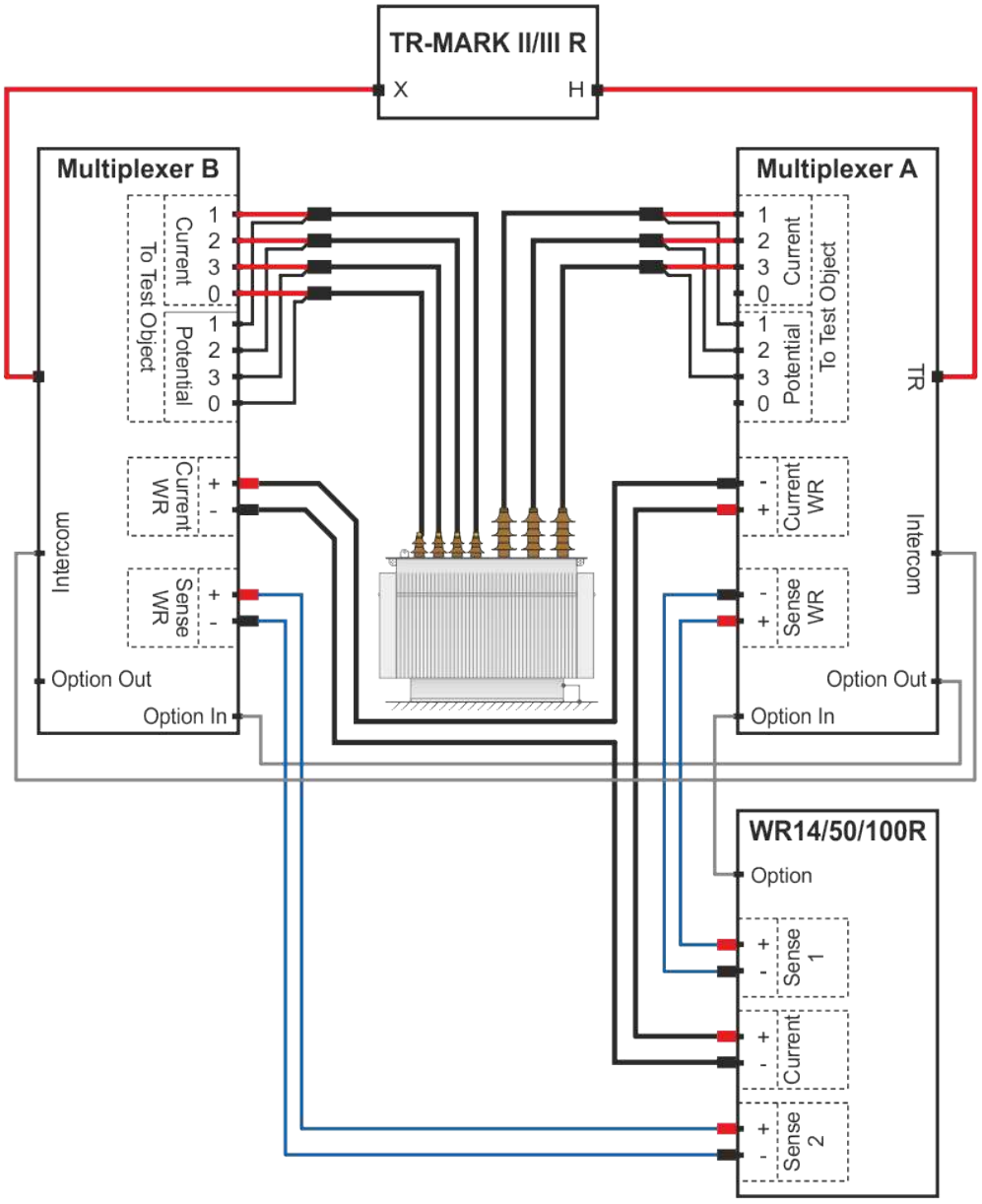
Continue with connecting Current and Potential Cables



No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
2	Sense Cables (blue)	30492-100	Sense +/-	Channel 1 +/-
3	Current Cable (black)	30491-100	Current -	Current +/-

4.2 Case 2: One WR, one TR and two Multiplexers

4.2.1 Schematic Diagram



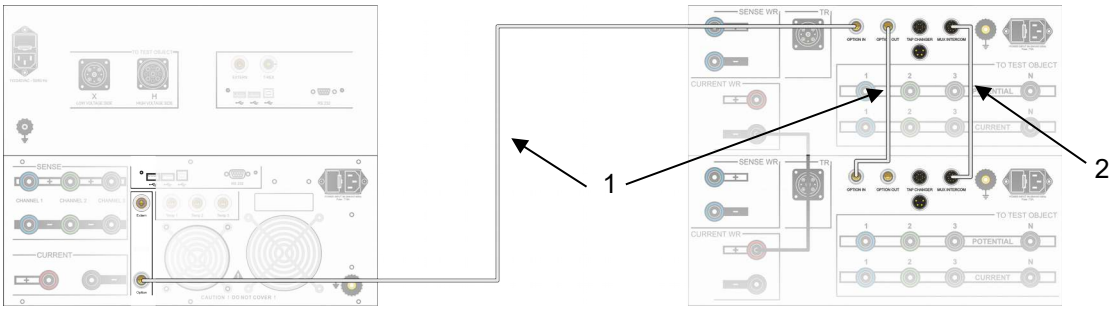
A second Multiplexer gives you more options and more comfort. First of all, you don't have to do a second cabling to measure primary and secondary winding systems resistance. Here the Multiplexers will do all the work for you. Two Multiplexers also give you the possibility to connect a Raytech TR-Mark II or TR-Mark III. Then TR measurement can be done with the same cabling. This configuration gives you every measurement options for a common transformer, except measuring primary and a secondary winding with two different currents at the same time.

Of course, transformers with a tertiary winding system can also be measured. To measure third windings resistances and TR H/Y, connect cables of Multiplexer B to tertiary windings.

In this setup, you can also could use a T-Rex together with a TR-MARK II or a TR-MARK III. It does not matter for the system itself. Please see Chapter '4.4 Case 4: Two WR, one TR, one T-Rex and three Multiplexers' for an example with a T-Rex and the corresponding cabling.

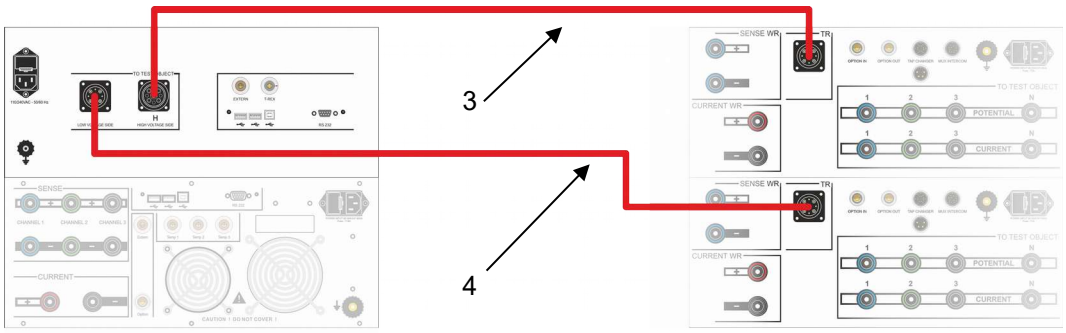
4.2.2 Connections: One WR, one TR and two Multiplexers

Start with the Option and Intercom cables:



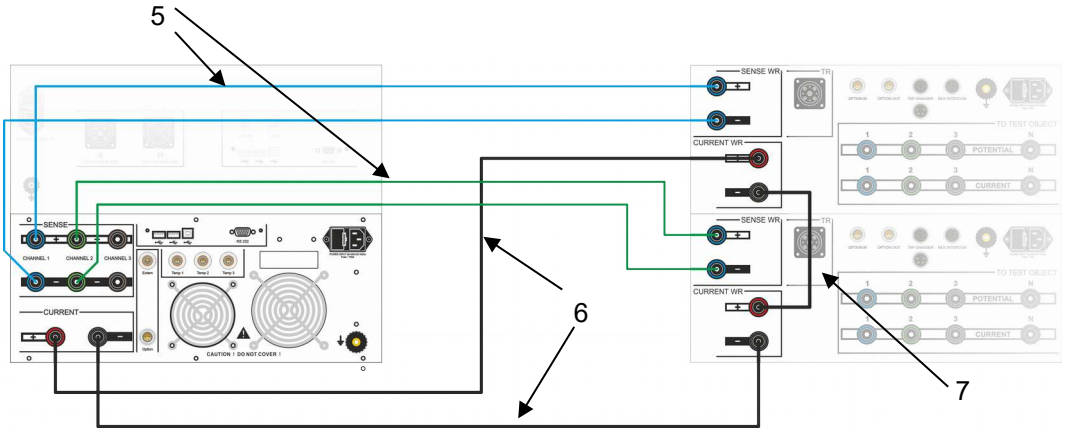
No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
1	Option Cables	30493-100	Option In/Out	Option Out
2	Intercom Cable 2 Multiplexer	30570-100	Mux Intercom	-

Then connect TR to Multiplexer:



No.	Cable Type	Part No.	Connect on Mux to	Connect on TR to
3	Standard TR Cable	30015-100	TR	H
4	Special TR Cable (fem-fem)	30576-100	TR	X

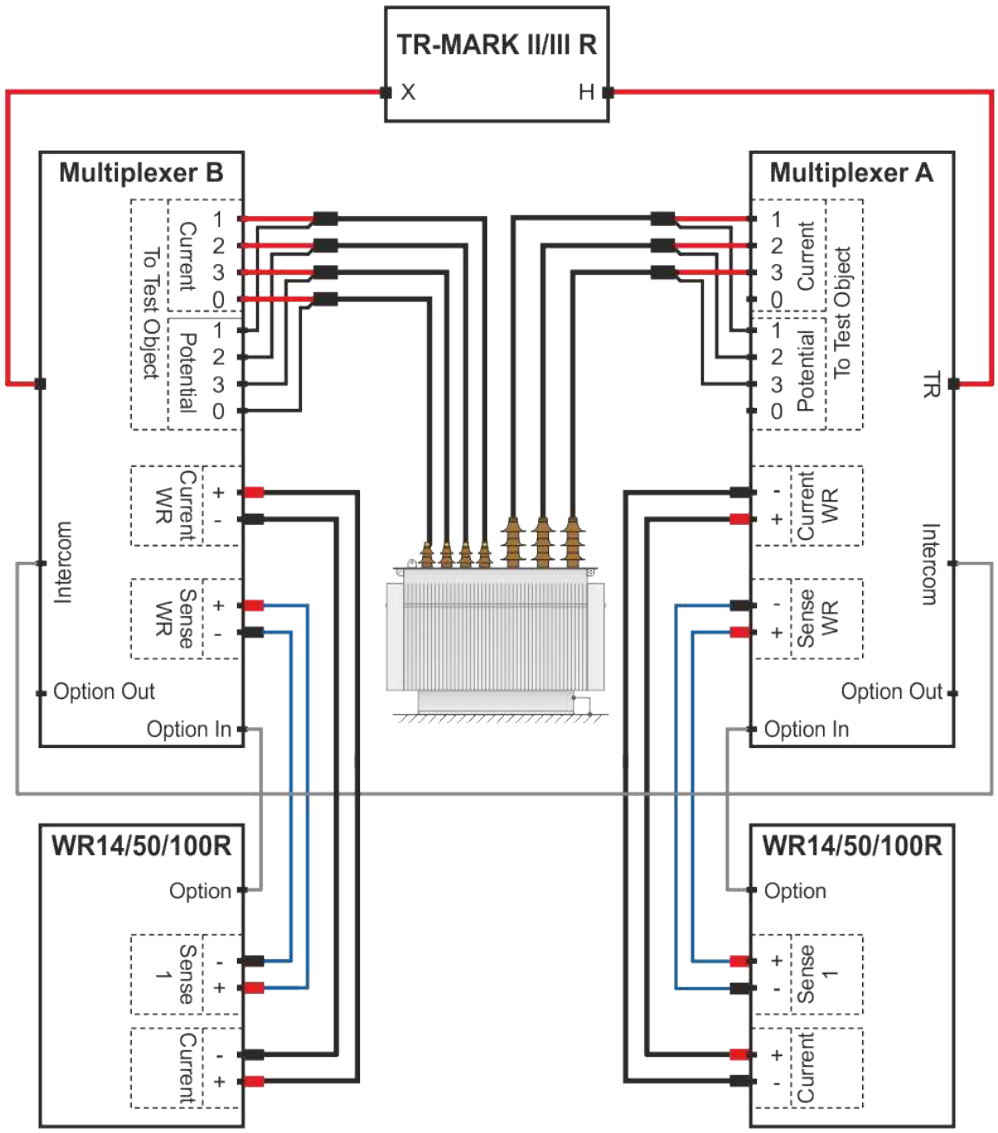
Continue with connecting Current and Potential Cables



No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
5	Sense Cables (blue)	30492-100	A: Sense +/-	Channel 1 +/-
5	Sense Cables (green)	30492-100	B: Sense +/-	Channel 2 +/-
6	Current Cable (black)	30491-100	B: Current -	Current -
7	Current Jumper Cable (black)	30588-100	A/B: Current +/-	

4.3 Case 3: Two WR, one TR and two Multiplexers

4.3.1 Schematic Diagram



Often primary and secondary winding systems have very different winding resistances. To get reliable results, different currents ranges are needed for the two winding systems. If you add a second WR to the example in chapter ‘4.2’ you get the possibility to measure both winding systems with different currents at the same time.

This configuration will also safe measuring time. Measuring primary and secondary side with different currents at the same time is possible. Especially big transformers need time to get charged, so you may safe measuring cycles.

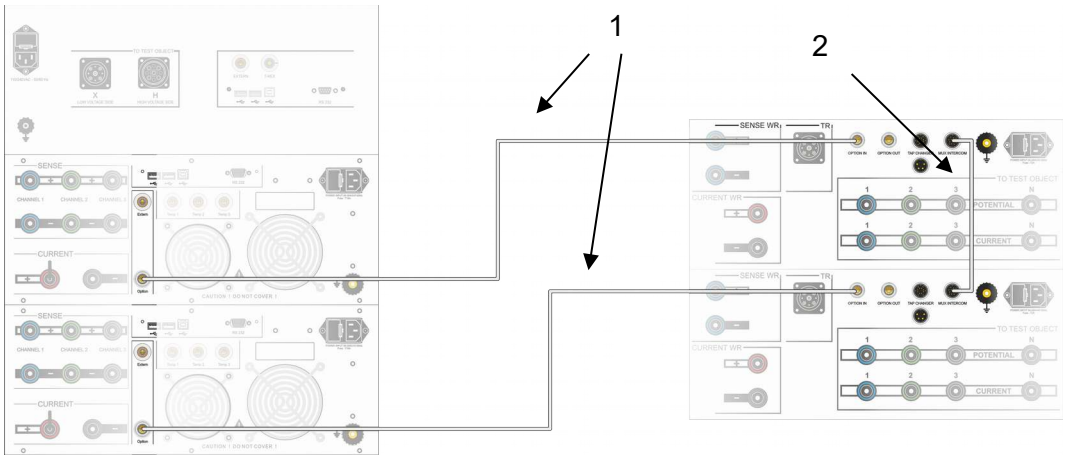
You are also saving measuring time when doing both winding systems at time, because the core will be energized by the primary winding system. Saturation can be reached easier with a current flowing on the primary side, because it usually has more turns.

Of course, transformers with a tertiary winding system can also be measured. To measure third windings resistances and TR H/Y, connect cables of Multiplexer B to tertiary windings.

In this setup, you can also use a T-Rex together with a TR-MARK II or a TR-MARK III. It does not matter for the system itself.

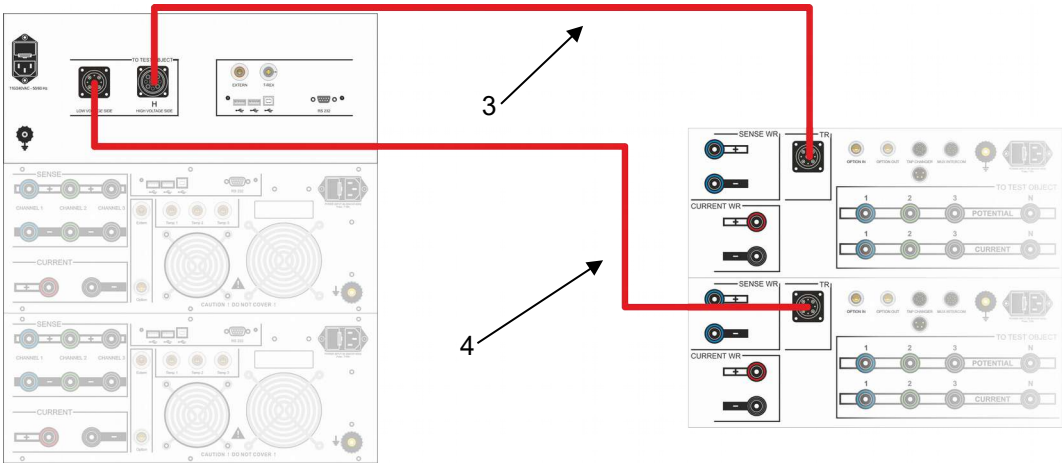
4.3.2 Connections: Two WR, one TR and two Multiplexers

Start with the Option cable:



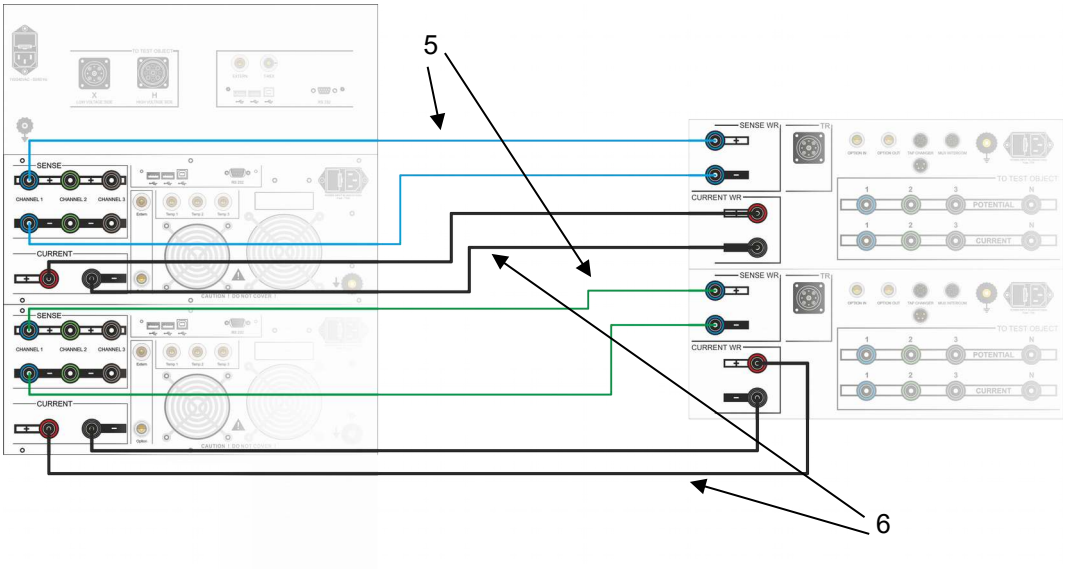
No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
1	Option Cables	30493-100	Option In/Out	Option Out
2	Intercom Cable 2 Multiplexer	30570-100	Mux Intercom	-

Then connect TR to Multiplexer:



No.	Cable Type	Part No.	Connect on Mux to	Connect on TR to
3	Standard TR Cable	30015-100	TR	H
4	Special TR Cable (fem-fem)	30576-100	TR	X

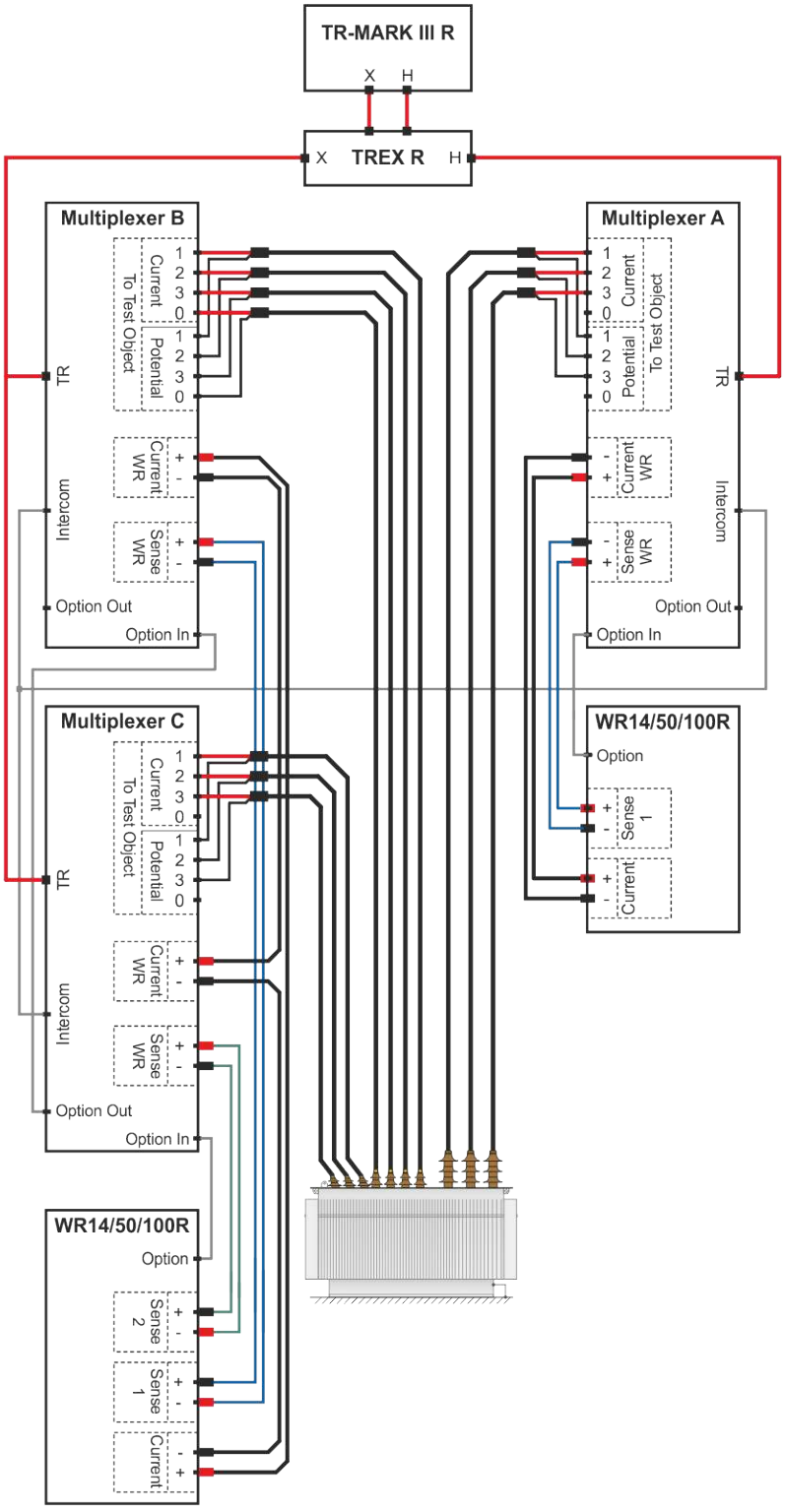
Go on with connecting Current and Potential Cables



No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
5	Sense Cables (blue)	30492-100	Sense +/-	Channel 1 +/-
6	Current Cable (black)	30491-100	Current +/-	Current +/-

4.4 Case 4: Two WR, one TR, one T-Rex and three Multiplexers

4.4.1 Schematic Diagram:



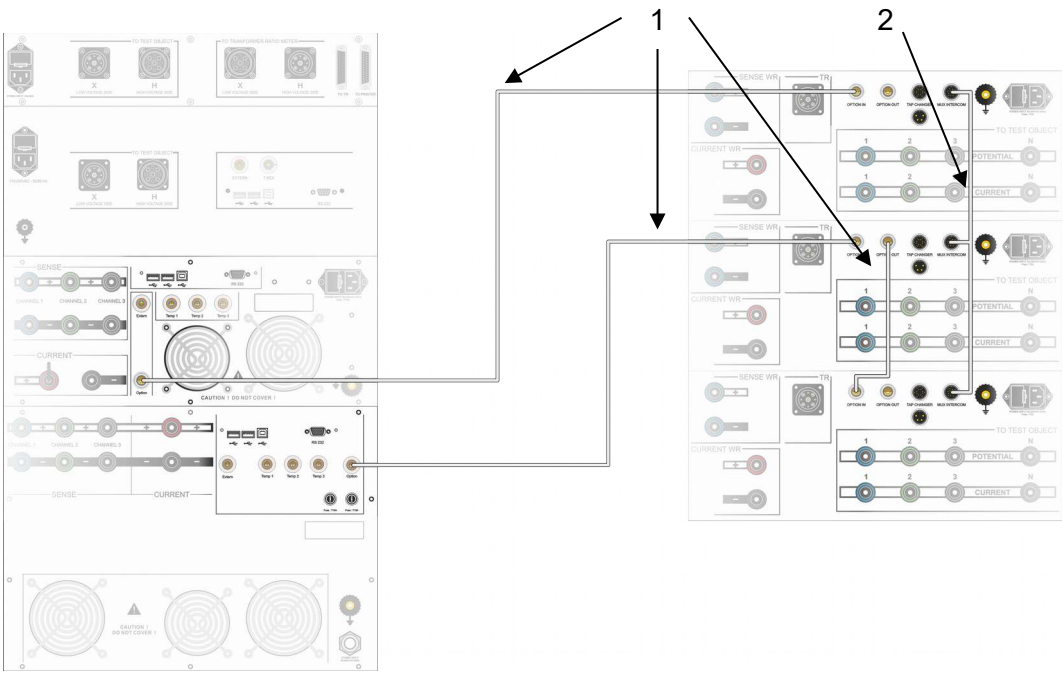
This may be a common full support solution for transformer manufacturers. The WR on the secondary / tertiary side may be more powerful than the one on the primary side; as usually a higher current is needed for the low voltage side.

Of course, you can also use a third WR to have an independent current source for every winding system. Usually it is not necessary, as secondary and tertiary windings are very similar. It can be measured in series and you can safe one WR meter.

Raytech TR-Mark II/III will on X side be connected to secondary and tertiary Multiplexer. The operator can easily command TR measurement primary to secondary or primary to tertiary.

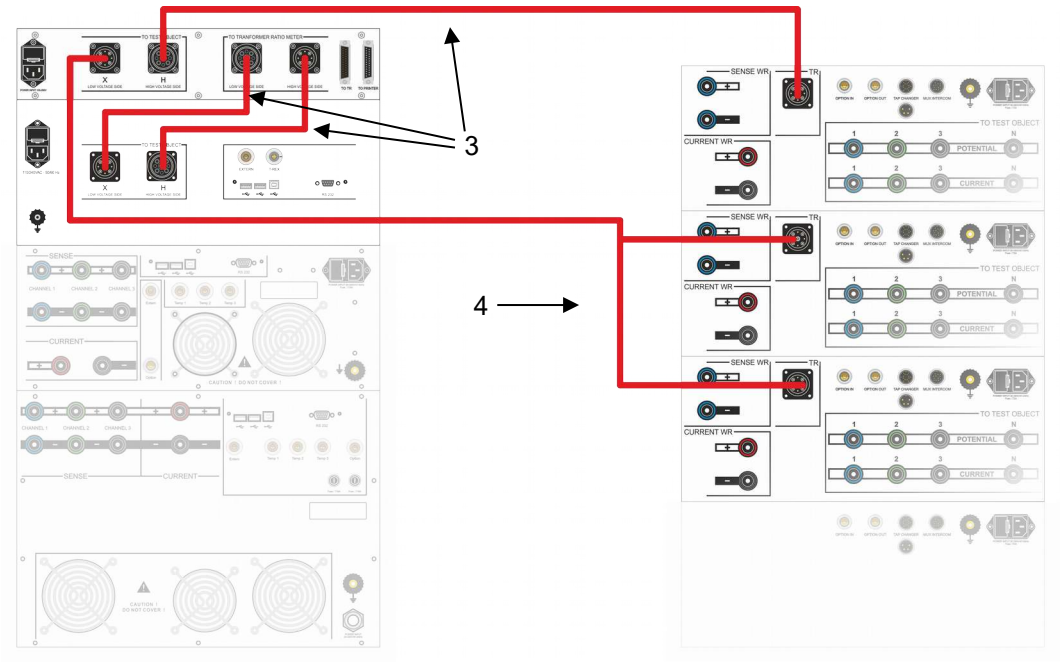
4.4.2 Connections: Two WR, one TR and two Multiplexers

Start with the Option and Intercom cables:



No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
1	Option Cables	30493-100	Option In/Out	Option Out
2	Intercom Cable 2 Multiplexer	30570-100	Mux Intercom	-

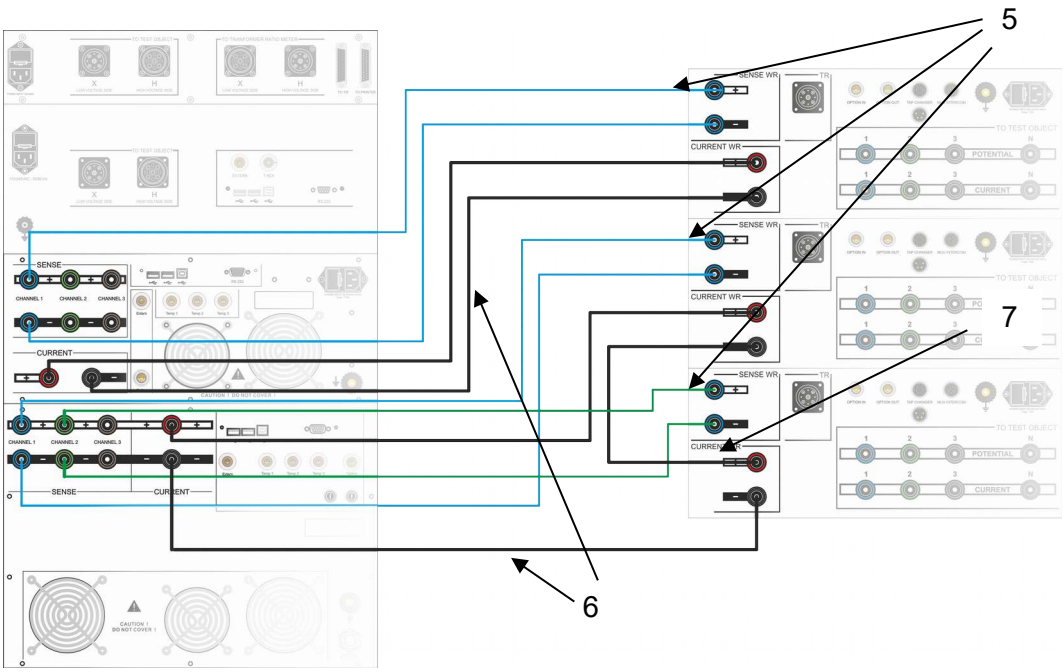
Then connect TR (and T-Rex) to Multiplexer:



No.	Cable Type	Part No.	Connect on TR to	Connect on T-Rex to
3	Standard TR Cable	30015-100	H	H
3	Standard TR Cable	30015-100	X	X

No.	Cable Type	Part No.	Connect on Mux to	Connect on TR or T-Rex to
3	Standard TR Cable	30015-100	A: TR	T-Rex: H
4	Special Y-TR Cable (fem-fem)	30573-100	B/C: TR	T-Rex: X

Go on with connecting Current and Potential Cables



No.	Cable Type	Part No.	Connect on Mux to	Connect on WR to
5	Sense Cables (blue)	30492-100	A: Sense +/-	A: Channel 1 +/-
5	Sense Cables (blue)	30492-100	B: Sense +/-	B: Channel 1 +/-
5	Sense Cables (green)	30492-100	C: Sense +/-	B: Channel 2 +/-
6	Current Cable (black)	30491-100	A: Current +/-	A: Current +/-
6	Current Cable (black)	30491-100	B: Current +	B: Current +
6	Current Cable (black)	30491-100	C: Current -	B: Current -
7	Current Jumper Cable (black)	30588-100	A/B: Current +/-	

4.5 Multiplexers Tap Changer Interface

4.5.1 General Description

Every winding system could have its own tap changer. They are easy to control with Multiplexers; every Multiplexer is equipped with a powerful tap changer interface.

Hardware:

- 2 relay contacts, normally open, 250V / 3A
- 2 relay contacts, normally open, 60V / 3A
- 2 digital in, prepared for tap changer use
- 2 digital in, ready for general use.
- 2 digital out, darlington open collector, to control external relays.

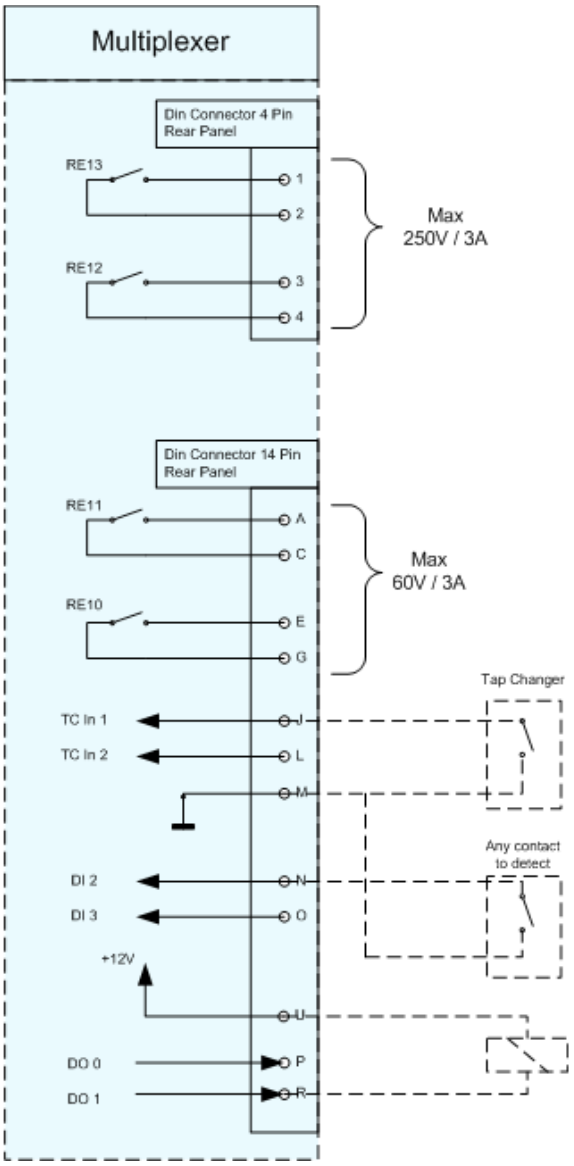
Software:

Multiplexers tap changer interface can be easily controlled by the Winding Resistance Meters remote interface. A local control of tap changer interface is not available.

NOTE:
To control the tap changer interface, please see the latest version of 'Command Set WR-xx' Raytech No.90104 for commands and description.

4.5.2 Pin Assignment and Schematic of Tap Changer Interface

Use the supplied 4 Pin and 14 Pin Din connector to connect your tap changer individually to the Multiplexer. Pin assignment is as followed:



Every Element in the ‚Multiplexer' field can be set or read by the controlling WR unit or its remote control.

'RE' stands for Relays 'TC in' and 'DI' name digital inputs 'DO' names digital outputs. Use **RE12** and **RE13** to switch heavy loads, like a powerful tap changer actor.

Use **RE10** and **RE11** to switch loads up to 60V / 3A.

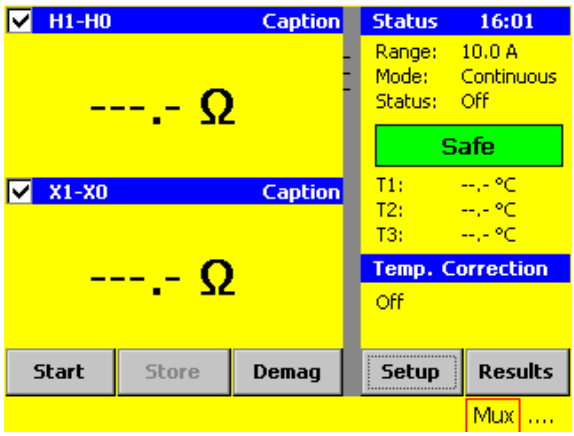
TC in 1 and **TC in 2** are digital inputs, proposed to be used as signals from tap changers. **Di 2** and **DI 3** are digital inputs, for universal use. They are of the same type as 'TC in'. Switch this inputs to Multiplexers GND with a working contact. Then it will be detected as 'on'. See graphic on the left.

DO 0 and **DO 1** are open collector digital outputs. Use Mulitplexers +12V. 'DO' will switch to 'GND' when set. See graphic on the left.

Caution: maximum current on +12V should be less than **500mA**.

4.6 Configure your Multiplexer Setup

A Raytech Winding Resistance Meter can control up to three Multiplexers. It will automatically detect how many Multiplexers are connected, and which Multiplexer addresses are available. The allocation of Multiplexers to Winding Resistance Meters channels is done by the user individually, to get the best fit for your needs.
When connecting a Multiplexer for the first time to a Winding Resistance Meter, you will find the following indication on the bottom of its touch panel:

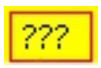


This 'Mux' surrounded by a red line indicates, that Multiplexers are found, but the configuration is not complete yet. Please see the following chapter, to get an overview of all Multiplexer indications.

4.6.1 Multiplexer Indications on WR Touch Screen

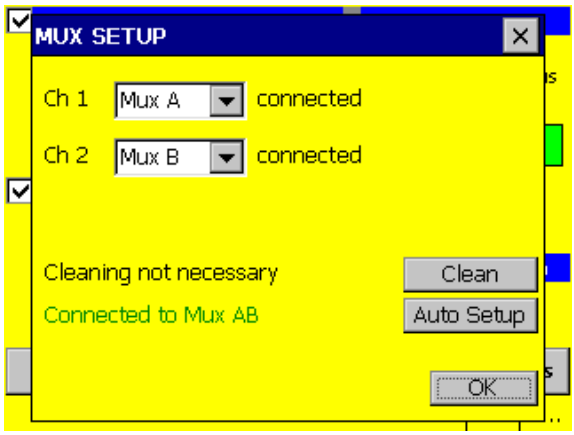
This indication shows that the specified Multiplexer configuration is correctly found and working.

The red box indicates, that something is not optimal with a Mux.
Ether an unallocated Multiplexers is found or a Multiplexer is ready for cleaning.
Touch the Indication to get to the Multiplexer configuration Menu.



In the Multiplexer configuration allocated devices are not found.
This Indication is usually followed by a message box.

NOTE:
To get to the Multiplexer configuration menu, touch any of these three indications



Every available Channel on the controlling Winding Resistance Meter will be displayed, with a combobox where you can select your options

To every channel a Multiplexer (A to C) can be allocated. Or select Rx to keep the corresponding channel as a non-multiplexed channel.
'Auto Setup' will bring any detected Multiplexer in to ascending order to channel number.

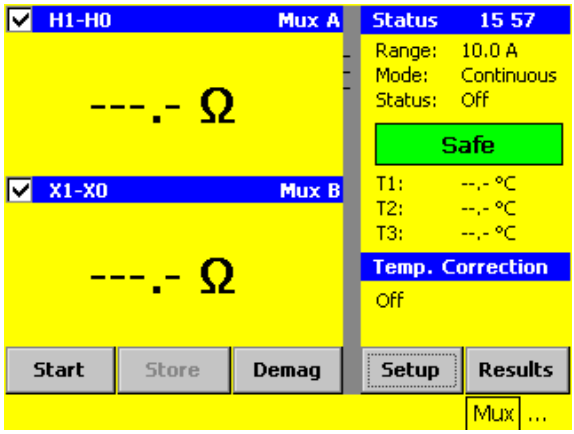
4.7 Transformer Profiles

Raytech winding resistance meters can be used in a simple mode. Then measurements can be done very fast without entering any additional data. But in simple mode, the device does not know anything about the test object. Measurements can be stored, but the assignment to winding systems and so on must be done manually.

It is recommended to use profiles to make control of Multiplexers easier and automate acquisition of measured data.

Please see Insruction Manual WR-XX-Rack or Instruction Manual WR-XX for detailed information about transformer profiles.

4.8 Controlling a Multiplexer

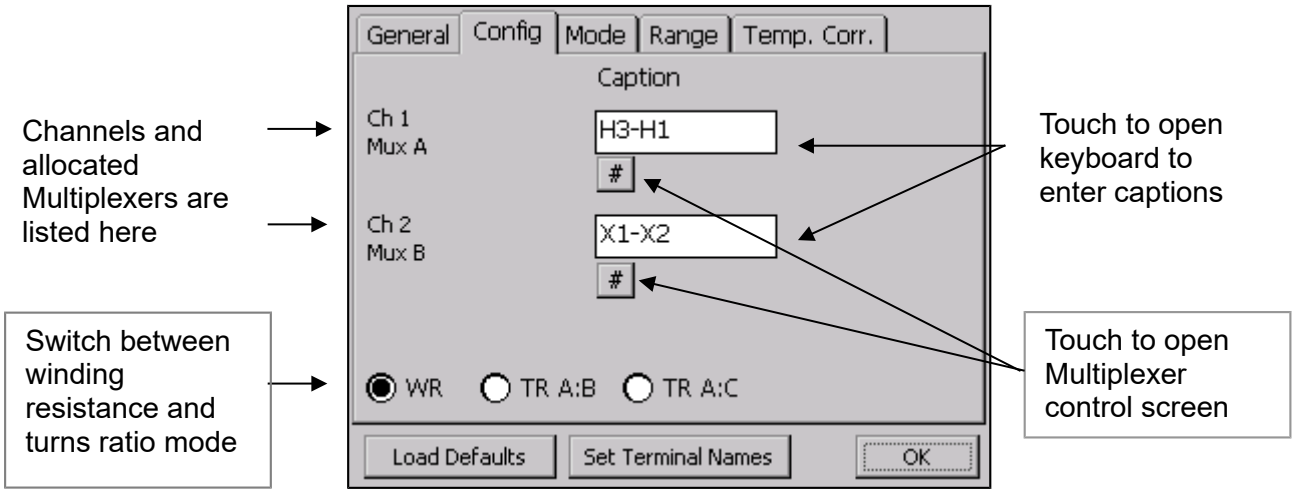


When a multiplexer is connected successfully to a Winding Resistance Meter, and it is allocated in the actual Multiplexer configuration, an indication 'Mux' plus the address letter A to C will be displayed in the affecting channel header. This 'Mux' text works also as a direct link button to the multiplexer control screen.

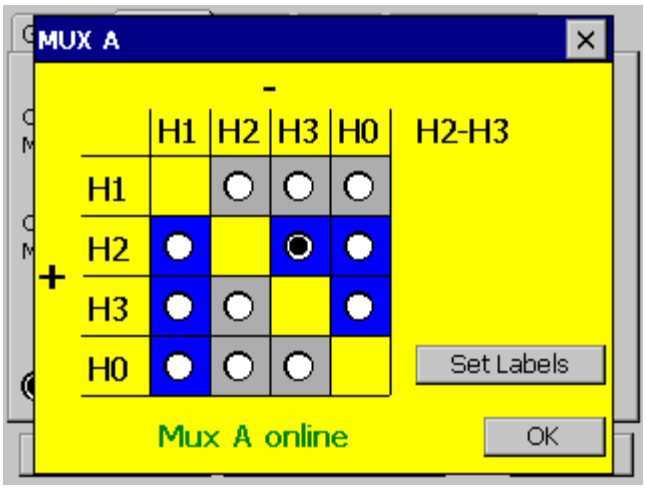
Multiplexer Menu can also be reached by touching Setup in the screen left. Then choose the *'Config'* tab. Even if no Multiplexer is connected, this tab will provide an easy way to set your captions and terminal names.

4.8.1 Multiplexer Menu without Transformer Profiles

When multiplexer menu (config) is opened as described in previous page and no profiles are used, the following screen appears:

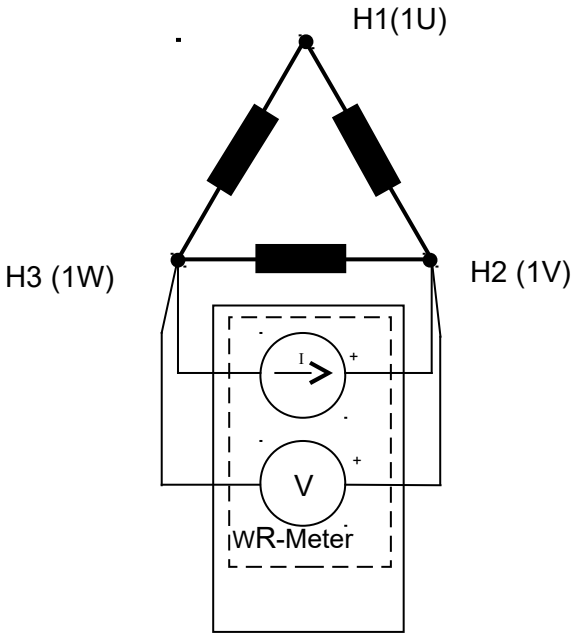


When the # button is touched as described above, a simple screen to control Multiplexer with a dot matrix is opened. This is the way, to switch a winding resistance meter to any test object. It's recommended when the device under test is no transformer. The following page shows how this screen looks, and how explains how to use it.
The radio buttons at the bottom of the screen must be set on WR to use the simple screen.
If a turns ratio meter should be connected to the test object, TR A:B or TR A:C must be chosen.
Please see chapter '4.10 Turns Ratio Measurement' for details about turns ratio measurement.



The displayed matrix shows, how your Winding Resistance Meter is switched to the connected transformer or other test object. Current and potential (channel) are always switched to the same configuration.
Rows show where positive WR connections are switched to, while columns show where negative connections are switched to.

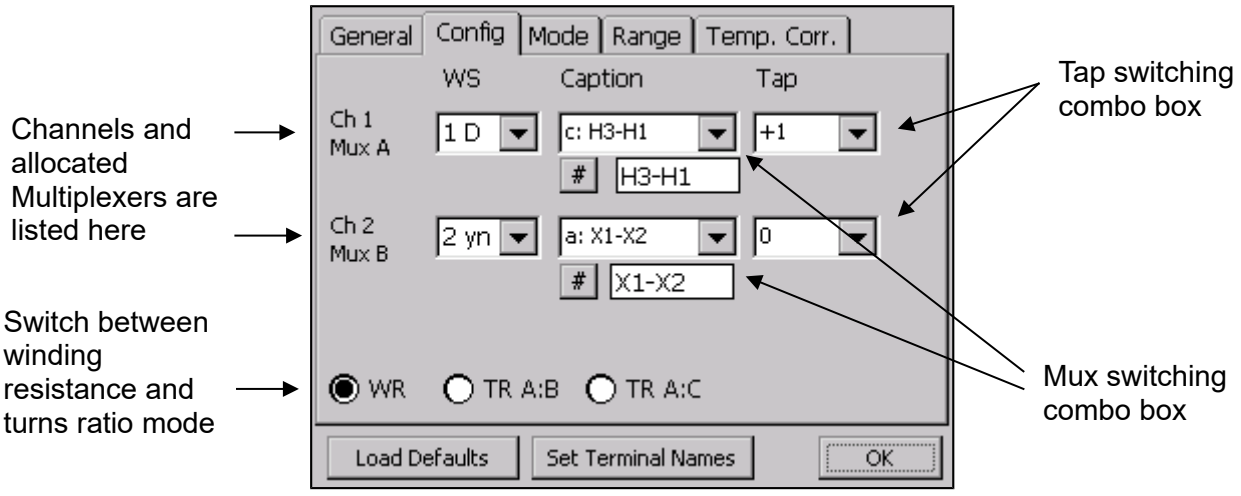
In the example before, positive (current +, sense +) is switched to H2 and negative is switched to H3. If no Multiplexer would be used, the measurement setup would be as followed:



Current Terminals are represented by a current source and Sense terminals are represented by a Voltmeter.

4.8.2 Multiplexer Menu when using Transformer Profiles

When multiplexer menu (config) is opened as described in 4.8 Controlling a Multiplexer and profiles are used, the following screen appears:



Because of the transformer profile, a Raytech winding resistance meter knows how to switch a Multiplexer to measure a transformer. By touching the Mux switching combo box, a selection of possible relay configuration appears.

By touching, a configuration can be selected and Multiplexers will be switched automatically.

Of course, also here the # button can be touched as described in chapter ‘4.8.1 Multiplexer Menu without Transformer Profiles’ to control Multiplexers manually. Then the Multiplexer control screen with the dot matrix is opened, but only the combinations corresponding the chosen transformer profile can be selected.

To control Multiplexers for winding resistance measurement, the radio buttons at the bottom of the screen must be set on WR.

If a turns ratio meter should be connected to the test object by Multiplexers, TR A:B or TR A:C must be chosen. Please see chapter ‘4.10 Turns Ratio Measurement’ for details about turns ratio measurement.

4.9 Controlling two Multiplexers connected to one WR

The control concept and control screens remain the same, no matter how many Multiplexers are connected to a WR. But the following chapters show how Multiplexers are thought to be used.

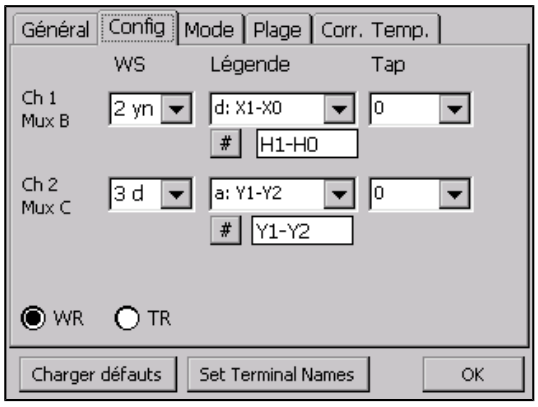
Let’s assume you have the configuration shown in chapter ‘4.4 Case 4: Two WR, one TR, one T-Rex and three Multiplexers’. The primary winding system is measured by a WR and Multiplexer A. Secondary and Tertiary winding system is measured by a second WR and Multiplexer B and C.

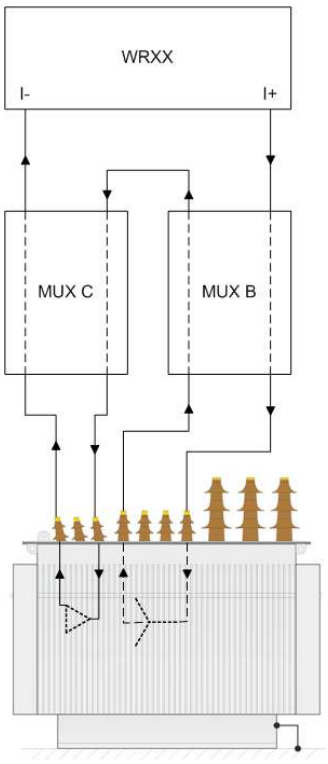
To keep the following schematics simple, only current paths are drawn. One of the WR channels (potential) is connected to each Multiplexer, which automatically switches the potential lines in the same way as the current lines.

4.9.1 Measure secondary and tertiary winding systems resistance in series

As usually secondary and tertiary windings have similar winding resistances, they can be measured with the same current at high accuracy. The schematic example besides shows a typical application.

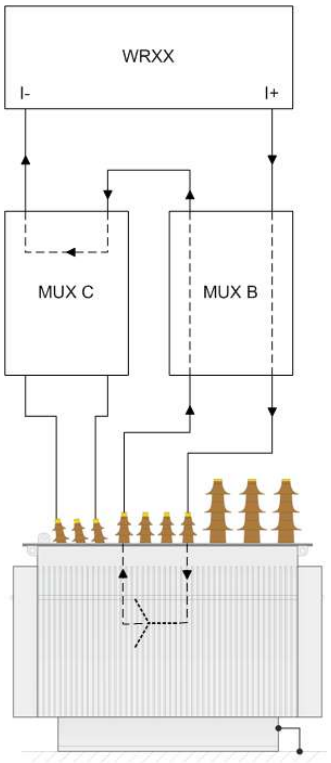
Multiplexers are controlled as described in the previous chapters.



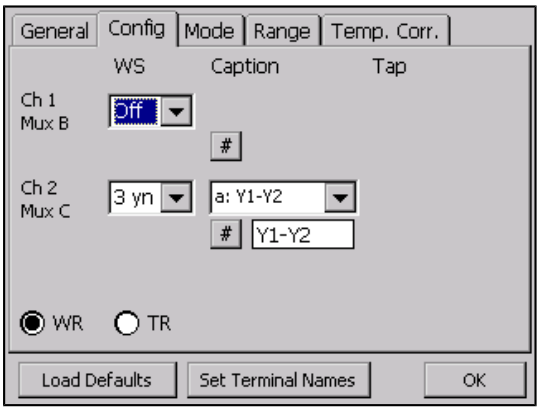


4.9.2 Measure secondary and tertiary winding system resistances separately

The schematic besides shows, how only the secondary winding resistance is measured. Notice what MUX C is doing.



This mode of MUX C is called “Bypass”. Choose ‘Off’ in the Multiplexer control screen (Config).

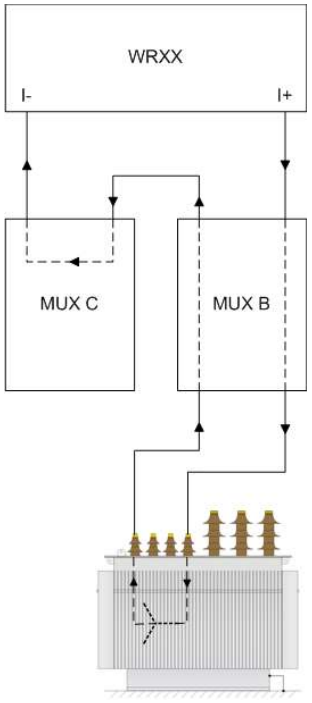


If you have a look to chapter ‘8 A look under the hood’ you will find the relay that shortens the current terminals.

In Bypass mode, this relay is closed, all the other relays are opened.

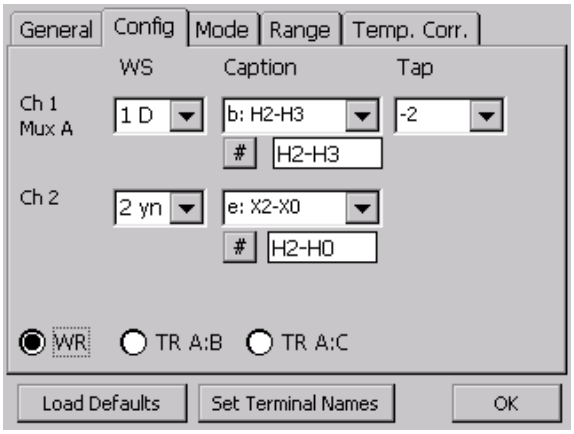
4.9.3 There is no tertiary winding system

Watching from the Multiplexers side, there is no difference between measuring secondary winding systems winding resistance separately and this case. You can handle the Multiplexer in the same way.



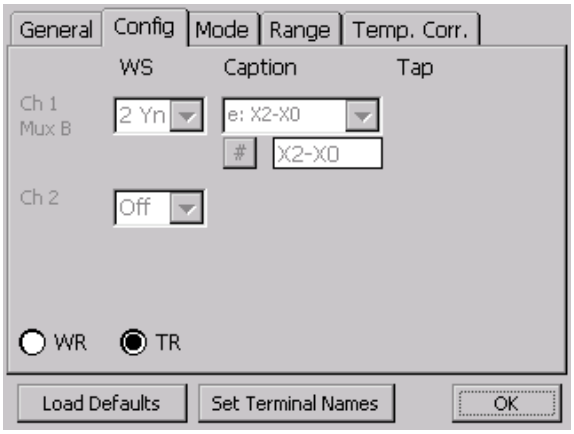
4.10 Turns Ratio Measurement

To measure turns ratio with a TR-MARK II or TR-MARK III, two or three multiplexers are needed. The following procedure explains hot to bring all connected Multiplexers into turns ratio mode.



Switch Mux A, choose TR A:B or A:C

In case of using three Multiplexers, the Multiplexer on the high voltage side (Mux A) is used do control if turns ratio is measured primary to secondary (TR A:B), or primary to tertiary (TR A:C) winding system



Switch Mux B and C to TR

All Multiplexers that are connected to the same Winding Resistance Meter are automatically switched to TR.

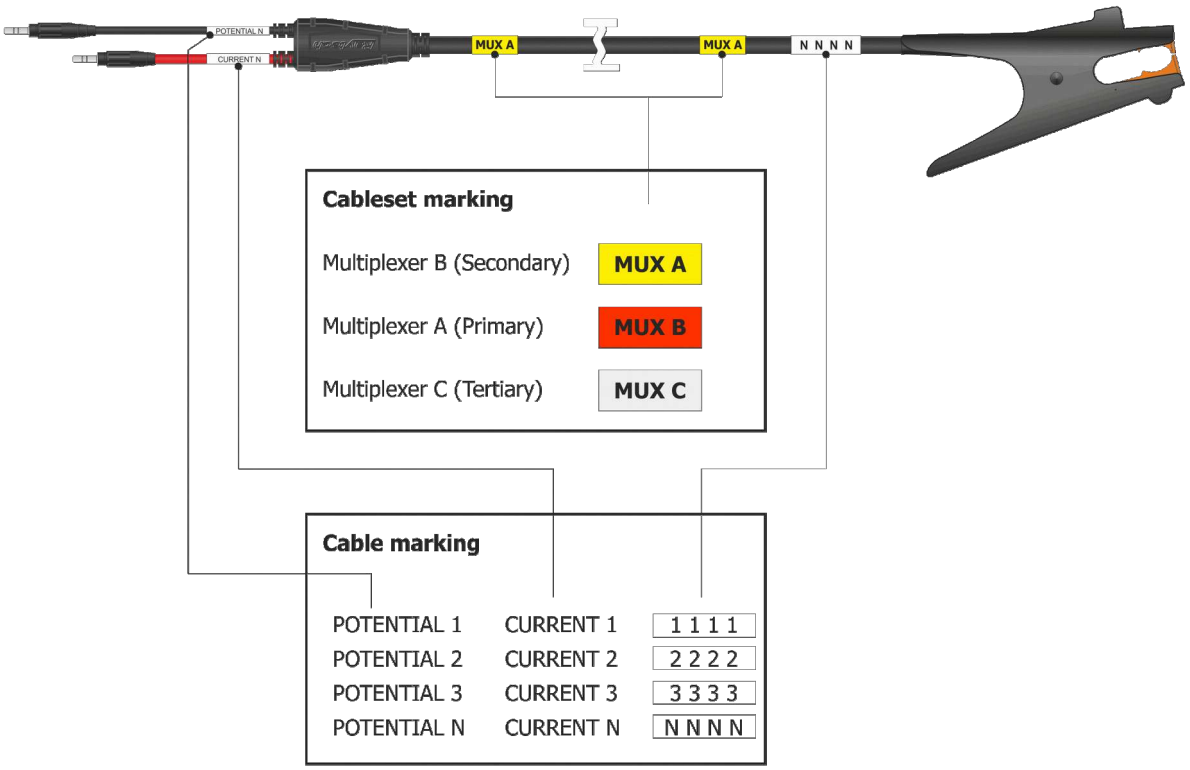
We recommend to switch all Multiplexers to TR, eaven those wo are not used during the TR measurement.
In some cases, the WR firmware switches all Multiplexer to TR, when one is set to TR. This feature reduces operating time

Start turns ratio mesurement as usual on TR-MARK II/III. Please see the corresponding chapers in your TR-MARK II/III instruction manual.

5 Hooking up a transformer

A color scheme and text on cable ends help to do the cabling to test object. Labels are located near plugs and clamps of cables. By using the Kelvin Measuring Cables current and potential connection will be done together in one clamb.

Example: Clamp end of cable to test object



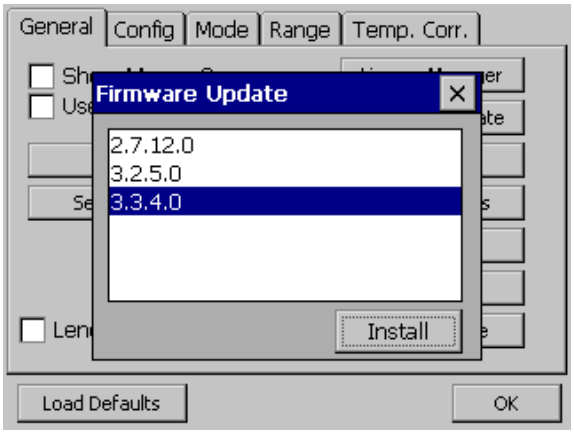
NOTE:

No extra external leads or jumpers are required when using the Raytech Multiplexer. All interconnections are made internally and controlled by touch panel or by remote.

6 Firmware update

6.1 Update Winding Resistance Meter

Raytech Multiplexers are controlled by a Raytech Winding Resistance Meter. Your Winding Resistance Meter firmware has to be updated, if you are using a version below 2.5.4.0. And it should be updated if you are using an older version than 2.7.0.0. Only this and newer versions will provide all the Multiplexer features.



Copy the new Firmware (.zip file) WRXXX to your USB key, root directory.

Connect the USB-key to the instrument.
Go to Menu Setup, choose chart *General*, then press Firmware Update.
Choose a version and touch Install.
It will automatically install the new firmware and restart the system

WARNING !

DO NOT TURN DEVICES OFF DURING A RUNNING UPDATE PROCESS.

DO NOT DISCONNECT USB MEMORY KEY DURING A RUNNING UPDATE PROCESS

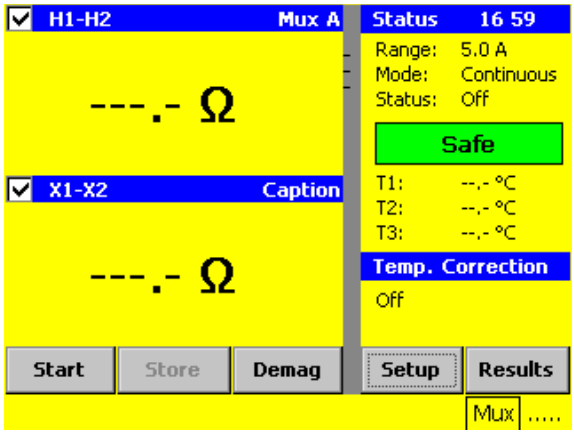
6.2 Update Multiplexer

It is always recommended to use the latest version of Multiplexer firmware. To check the installed firmware version or update to a new firmware, follow the procedure below:

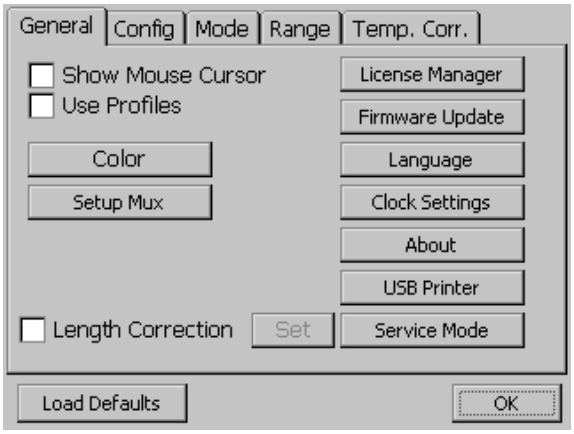
CAUTION !

Only a Multiplexer A (WRMUX A) can be updated. You may have to change cabling to do that. Connect only one Multiplexer to the commanding WR. Disconnect the ‘Mux Intercom’ Cable.

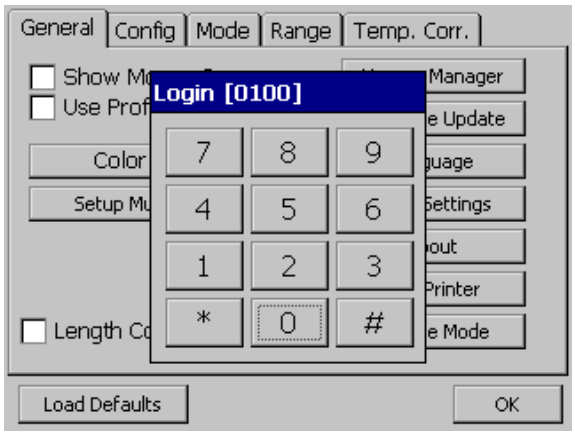
On WR main screen touch Setup



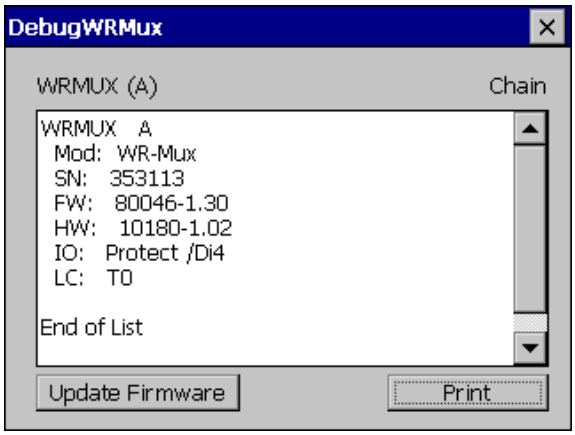
then touch Service Mode



Enter '0100#'

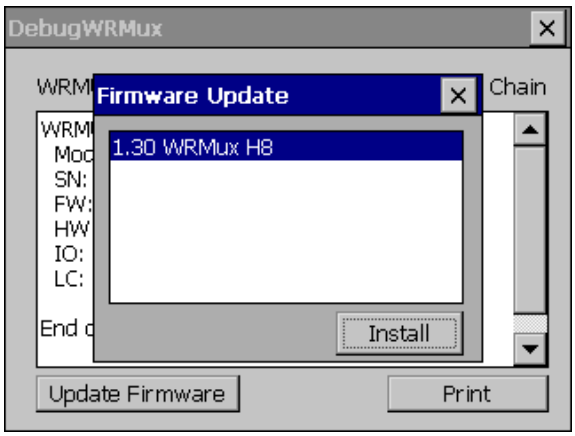


Connect a USB Memory Stick containing the new firmware version in its root directory to the controlling WR.
Touch the button Update Firmware



to get to the update screen.

Chose your firmware in the displayed list and touch Install.



7 Cleaning Relays for maximum performance

7.1 General

For a maximum performance and a minimum relays contact resistance, a Multiplexer will ask from time to time for a cleaning cycle. The advice to do a cleaning cycle will be displayed on the commanding Winding Resistance Meter screen. To make sure your work is not interrupted, you will never be forced to start a cleaning cycle.

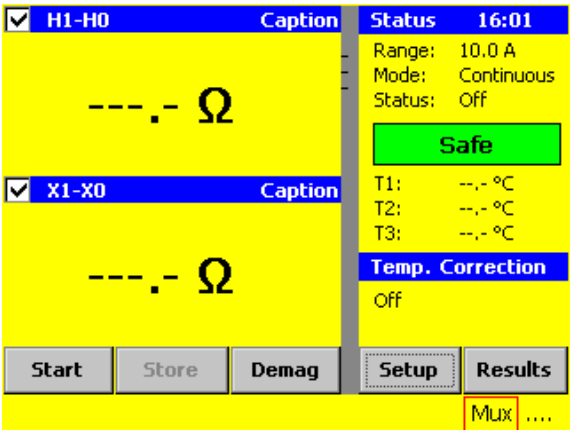
A complete cleaning cycle will switch Multiplexers relays in a defined order and timing under at ideal voltage and current. A cycle will take about 30 seconds.

NOTE:
You will be asked to start a cleaning cycle, but never be forced to do it.The software handles the conditions that may make a cleaning cycle necessary. You don't have to care about when it is time to do it.

WARNING !
DISCONNECT LEADS TO TEST OBJECT BEFORE STARTING A CLEANING CYCLE.

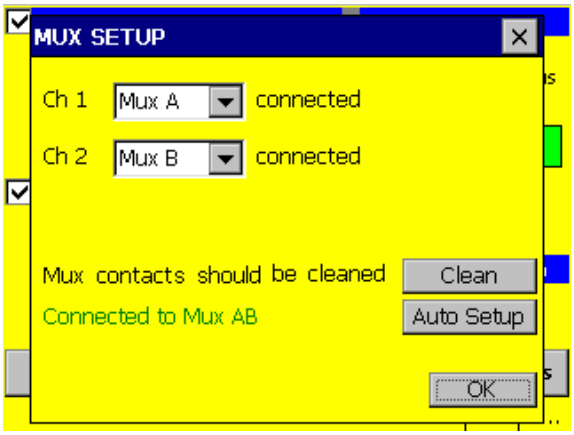
7.2 Doing a cleaning cycle

7.2.1 Indication



For additional safety, please switch Multiplexers to 'Bypass' before go on.

When it is time to do a cleaning cycle, you will notice the Multiplexer indication on the bottom right of the Winding Resistance screen. The border aroung Mux ist geting red.
Touch it, and you will get to the 'Multiplexer Setup Screen' shown bellow.



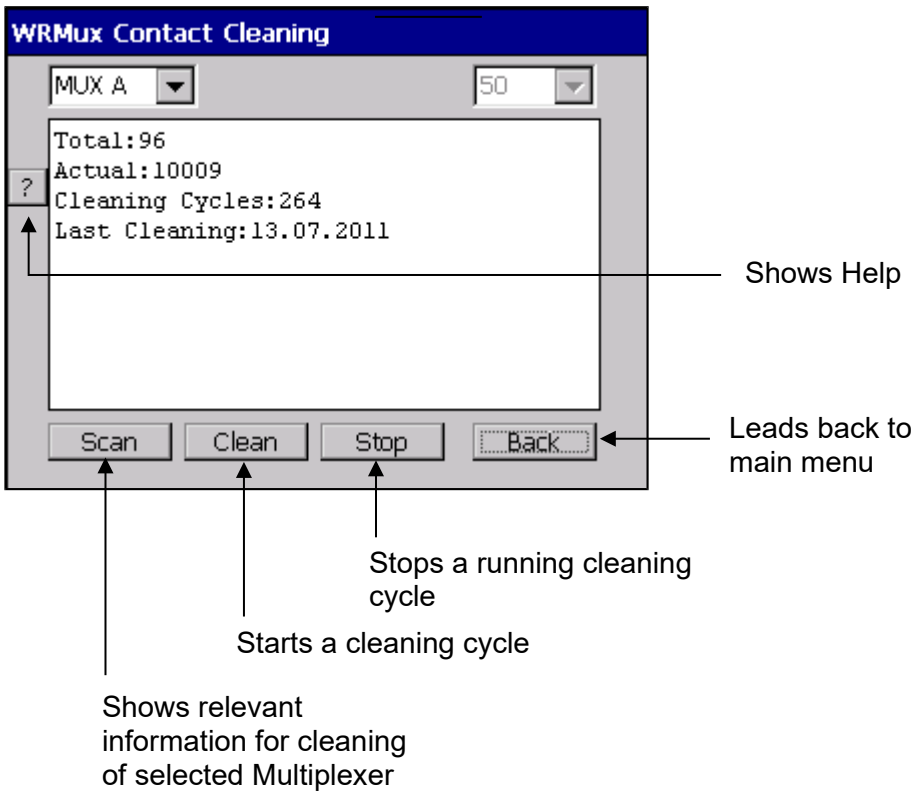
This screen is already known.

The only new thing is the message ‘Mux contacts should be cleaned’.

It appears when the software decides that it is time for a cleaning cycle.

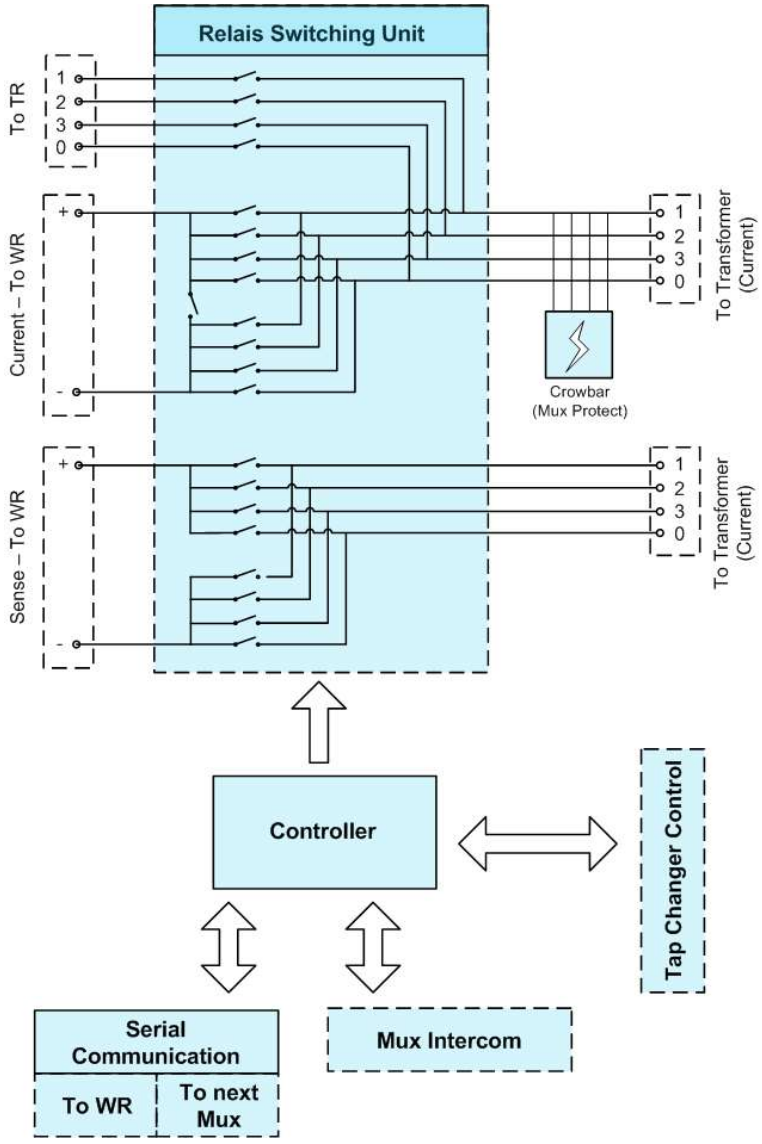
Touch [Clean] to get to the ‘WRMux Contact Cleaning Screen’.

7.2.2 WRMux cleaning Screen



8 A look under the hood

To give you a better understanding of what Multiplexer really is, see the following schematic diagram. In a way a Multiplexer is a micro controller based relay box, containing features for transformer measurements based on Raytech instruments.



9 Specifications

- Power Supply: 100..240 VAC
- Case: 19” Rack 4U
- Weight: 9.1 kg (20 lb)
- Size: L: 414mm (16.5”) W: 432mm (17”) H: 174 (7”)
- Front Panel: Sealed, Anodized
-
- Interface: Raytech Serial Intercom
- Max. Voltage from DUT[1]: 600 V at terminals to test object[2]
- Max. WR operat. Current: 120 A
- Max. TR operat. Voltage: 250 VAC
- Mech. Relais Life: Min. 1’000’000 cycles
- Insertion Error: Less than 0.01 %

1 DUT: Device Under Test

2 DO NOT operate Multiplexer with external power supplies. The specified voltage only refers to kickback voltages of a transformer. It is strongly recommended to magnetize a transformer first on the primary side to avoid induced high voltage.

Appendix

MUX R
MULTIPLEXER

Appendix

A Good to know

- Raytech Integrated Safety Unit is designed to give you a central interlock system and a central connection point for a warning lamp. It comes in a 19'' 4U rack version and also supplies Raytech devices with fused electrical power.
- Raytech provides support to set up systems based on Multiplexers.
- T-Base Pro is a powerful software to remote control Raytech test instrument, data exchange and analyse measured data of it.
- A complete customised system including as many Multiplexers, Winding Resistance Meters, Turns Ratio Meters and an Integrated Safety Unit (ISU) is also available. It is called Automatic Transformer Observing System (ATOS). Ask your local vendor about it.

Integrated Safety Unit:

B Warranty

Raytech GmbH Switzerland shall at their option and expense, repair, replace any part or parts that may 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 expiration of the warranty period.

Warranty claims are subject to a warranty limitation period of 24 months from the date of shipment.

The purchaser is obligated to immediately notify Raytech GmbH Switzerland in writing of any defects of the supplied test equipment.

Raytech GmbH Switzerland must always be given the opportunity to rectify a defect within a reasonable amount of time. The purchaser shall grant an adequate amount of time that the test equipment shall be repaired.

Raytech GmbH Switzerland covers the costs associated with the repair of the defect; Especially the costs for the material and work. Cost for shipping the faulty test equipment shall be borne by the purchaser. Raytech GmbH 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.

Warranty claim rights on replacement parts as well as repair of defective parts shall expire after 12 months.

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 GmbH 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

All disputes arising out of or in connection with the contract between the purchaser and Raytech GmbH 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. Any disputes between the purchaser and Raytech GmbH 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.

C Contacts

Raytech Switzerland

Raytech GmbH
Oberenbenestrasse 11
5620 Bremgarten

Phone: +4156 648 6010
Fax: +41 56 648 6011

Mail: welcome@raytech.ch
Web: www.raytech.ch

Your Local Representative

D Index