

Remote Operation of Windows Based T&M Instruments with Android Tablets

Application Note

Products

R&S® AFQ100B	R&S® FSV	R&S® SMU200A
R&S® AMU200A	R&S® FSVR	R&S® UPP
R&S® CMW270/280/500	R&S® FSQ	R&S® UPV
R&S® ESR	R&S® FSW	R&S® ZNB
R&S® ESRP	R&S® SMATE200A	R&S® ZVA
R&S® FSL	R&S® SMJ100A	R&S® ZVL

This document describes how a Windows®-based R&S® T&M instrument is remotely operated by an Android™ tablet as if working on it locally. Step-by-step procedures are provided for setting up and configuring the T&M instrument and the tablet.

On the tablet, a special App implements the Windows® "Remote Desktop" functionality. T&M instrument and tablet are connected via WLAN (also called Wi-Fi network).

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1 Introduction

Tablet computers, or simply "tablets", provide easy mobile access to networks while offering a very good usability, especially regarding display, size, weight and handling. Sometimes tablets replace notebooks, sometimes they open new applications. Increasingly, tablets have proven their capabilities in business areas.

Remote operation of Windows®-based Test & Measurement (T&M) instruments¹ is done mainly from desktop computers, sometimes via notebooks. Tablets are also very appropriate since they satisfy all requirements for remote control of T&M instruments which are:

- A display for monitoring the ongoing operations and providing buttons and other interactive GUI elements
 - An interface to press the buttons, select or enter values, launch actions etc.
 - The capability to access the network (a LAN or WLAN) with the T&M instrument
- Typically, remote operation requires only the computing capacity of a modest client application (while the main computing takes place on the T&M instrument) and only a minimum of manual entries of numbers and letters.

The following descriptions refer to tablets with the Android² operating system. The same considerations are valid for the Apple® iPad® (see application note 1MA216). Procedures and handling for Windows RT tablets are similar.

The R&S CMW270/280/500³ is used as example for a typical R&S T&M instrument. The front page lists other R&S instruments that may be operated as described in this document.

Use Cases

- Monitoring the T&M instrument outside the usual control room
- Presenting the operation of a T&M instrument in a meeting/teaching room
- Accessing T&M instruments without dedicated displays or instruments which have been installed in places that are difficult to reach

Implementation Principle

Remote operation by tablet is adopted for T&M instruments running on Windows XP or Windows 7. An App implements the common Windows "Remote Desktop" functionality on the tablet. "Remote Desktop" is the standard mechanism for remote control of Windows-based T&M instruments by a desktop computer. It allows to control the T&M instrument remotely as if working on it locally.

For accessing the T&M instrument from the tablet a WLAN connection is required. This wireless connection can be established e.g. via a WLAN router between T&M instrument and tablet or even directly between both devices if the instrument is equipped with a WLAN USB adapter.

¹ Supported Windows-based R&S products are referred to as "T&M instruments".

² Android is a trademark of Google Inc.

³ The R&S CMW270/280/500 is referred to as "CMW" in this document.

2 Functional Description

The "Remote Desktop" functionality for controlling the T&M instrument by tablet comprises the following main characteristics:

- The T&M instrument acts as server and generates content which is transmitted to the tablet and shown on its display; the tablet is the client. The display of the tablet shows the same content as a T&M instrument's display would do.
- In the opposite direction, the tablet transmits commands from its user interface (touch screen) to the T&M instrument which determine its behaviour.
- An appropriate protocol controls the data exchange between T&M instrument and tablet.

The "Remote Desktop" functionality is realized by Microsoft's Remote Desktop Protocol (RDP). The RDP software consists of a server and a client component. On Windows systems the server and client components are included in the Windows operating system. Thus, the T&M instrument operating on Windows is ready for RDP. On the tablet, RDP client software which is appropriate for the client's operating system has to be installed.

VNC (Virtual Network Computing) is an alternative to RDP. VNC also allows to control a T&M instrument from a remote computer as if working on the instrument locally. It uses similar concepts as RDP but is independent of the operating system.

WLAN Connection

WLAN is used for the wireless connection between T&M instrument and tablet.

Fig. 1 illustrates one possible realization with an intermediate WLAN router.



Fig. 1: T&M instrument connected with tablet via WLAN router

For providing the T&M instrument with WLAN access, the following solutions are possible:

- The T&M instrument is connected by (hardwire) Ethernet with a WLAN router. In this case the tablet will wirelessly connect to the WLAN router and access the T&M instrument from there. A group of T&M instruments can use the same WLAN router. This connection type is called **infrastructure** mode: The WLAN router acts as WLAN access point which provides the T&M instrument with information to establish the WLAN connection. It is recommended to apply DHCP (Dynamic Host Configuration Protocol) on the WLAN router whereby all address information of the T&M instrument is automatically assigned. Most T&M instruments use DHCP by default.
- The T&M instrument is connected by Ethernet with a network providing wireless connectivity. In this case the tablet will wirelessly connect to the T&M instrument via any dedicated WLAN access point provided by the network. This case is not described in the following sections since configurations and operation are very similar to the previous case.
- The T&M instrument is equipped with a WLAN USB adapter. In this case the T&M instrument sets up an own wireless network and the tablet connects to this network. The devices communicate directly with each other (point-to-point); no additional WLAN access point is engaged and the T&M instrument is not available at other WLAN access points. This is the WLAN **ad hoc** mode. Static address information (no DHCP) is used for the T&M instrument and the tablet. The connection only has to be configured once, the settings are saved. A WLAN USB adapter has a range of about 10 m.

Note: WLAN connections with several WLAN USB adapters in near vicinity would disturb each other.

For a T&M instrument with WLAN USB adapter, the WLAN infrastructure mode would also be possible. In infrastructure mode the WLAN USB adapter operates as a bridge to another WLAN access point (with greater coverage area) and the tablet connects to the access point. The infrastructure mode with USB adapter is useful if the distance between controlling tablet and T&M instrument exceeds 10 m.

Note: A WLAN connection is not as stable as a LAN connection, and sporadic disturbances of the WLAN connection can occur depending on the local conditions.

3 Setup

The setup consists of:

1. Providing WLAN access for the T&M instrument; this can be done in different ways
2. Installing the RDP client App on the tablet
3. Establishing the WLAN connection on the tablet
4. Establishing the RDP connection

3.1 Providing WLAN Access for the T&M Instrument

Instructions are given for the following solutions:

- WLAN connection via WLAN router (WLAN infrastructure mode)
- WLAN connection via WLAN USB adapter (WLAN adhoc mode) which the T&M instrument is equipped with.

3.1.1 WLAN Connection via WLAN Router

Many WLAN routers are appropriate, e.g. the DIR-635 WLAN router from D-Link, see [1]. The following descriptions merely show the basic line of configuration tasks. Most default settings can be kept. Please refer to the vendor's user manual for details.

1 Access the WLAN Router

An IP connection, e.g. via modem, and a desktop computer (or notebook) are required for accessing and configuring the D-Link WLAN router.

- Plug a RJ-45 cable into the Internet port of the router and the other end of the cable into the modem which the desktop computer is also connected to.
- Turn on the WLAN router.
- Turn on the desktop computer.
- On the desktop computer, open a web browser such as the Internet Explorer and enter the IP address of the router. Then log in as described in the router's manual.
Note: It is even possible to directly access the WLAN router via tablet if both have Internet access.

2 Configure the WLAN Router

It is assumed that the WLAN router provides a DHCP server.

- Configure the network parameters:
 - Keep the router's IP address and the subnet mask.
 - DHCP server: Enabled
The WLAN router automatically assigns an IP address and related parameters to the T&M instrument.
(In case you have disabled the WLAN router's DHCP server and no other DHCP server is involved, you have to disable/uncheck DHCP at the T&M instrument and the tablet; in this case you can manually change the static address information at the T&M instrument.)
- Configure the wireless LAN parameters:
 - Wireless network name (SSID, Service Set Identifier):
Create a name using up to 32 characters or keep the default name.
This network name will appear in the list of Wi-Fi networks on the tablet.
 - Wireless channel: e.g. "6"
***Attention:* Take care that the WLAN channel does not overlap with any measurement frequency. Otherwise the measurement can be disturbed.**
 - 802.11 mode: e.g. "Mixed 802.11n, 802.11b, and 802.11g"
 - Channel width: e.g. "Auto"
 - Transmission rate: e.g. "Auto"
- Configure the wireless security:
 - Security mode: e.g. "WPA-Personal"

Note: Configuration of the Internet parameters is not required, so simply skip the related configuration windows.

3 Connect the T&M instrument with the WLAN Router

It is assumed that the instrument is not connected with another router or DHCP server.

- Connect a RJ-45 cable to a LAN port of the T&M instrument.
- Connect the other end of the cable to a WLAN router's LAN port.

Note: In this way, you can connect several T&M instruments with the WLAN router.

3.1.2 WLAN Connection via WLAN USB Adapter

Static T&M instrument address information and the WLAN adhoc mode are applied.

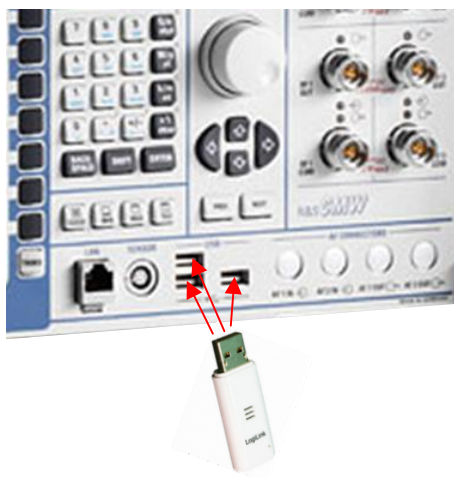


Fig. 2: Connecting a WLAN USB adapter to an R&S T&M instrument

Note: The WLAN signals from the WLAN USB adapter can disturb measurements with very low RX levels, e.g. sensitivity measurements. USB connectors on the rear of the T&M instrument cause less interference due to the larger distance to its RX unit.

First Commissioning

Some installation and configuration steps are required. These steps are described in the following sections.

Prerequisites for the First Commissioning:

- A T&M instrument with display or a remote desktop connection between the T&M instrument and a desktop computer (or notebook) is required.
- Keep the desired WLAN network name (SSID), encryption mode and password for network access at hand.

Further Starts of Operation

The configurations of the first commissioning are kept. So simply proceed as follows:

- Insert the WLAN USB adapter into an empty USB port of the running T&M instrument. The WLAN USB adapter gets active according to the stored configuration.

Note: The drives, directories and paths in the following descriptions are examples and depend on the type of T&M instrument.

3.1.2.1 Installation for Windows XP T&M Instruments

1 Install the WLAN USB Adapter

Many WLAN USB adapters are appropriate. Rohde & Schwarz uses the LogiLink WL0049A as example device. A driver for the WLAN USB adapter is required.

Proceed as follows:

A) The driver is taken from the .zip package provided together with this application note.

1. Unzip the .zip package (e.g. "SupplementaryFiles.zip") and copy the "...Setup.exe" file onto the running T&M instrument (e.g. into the folder "C:\Temp").
2. Execute the .exe file.
3. Accept the License Agreement.
4. Select the "Install driver only" option.
5. Close the installer program after the installation has completed successfully.
6. Insert the WLAN USB adapter into an empty USB port of the T&M instrument. You can use any of its USB ports.

If the driver file is not automatically found after plugging in the WLAN USB adapter, a "Files Needed" window is displayed (e.g. asking for the "rt2870.sys" file). Here, you can manually enter the correct path for driver files: "C:\windows\system32\DRVSTORE\...\\".

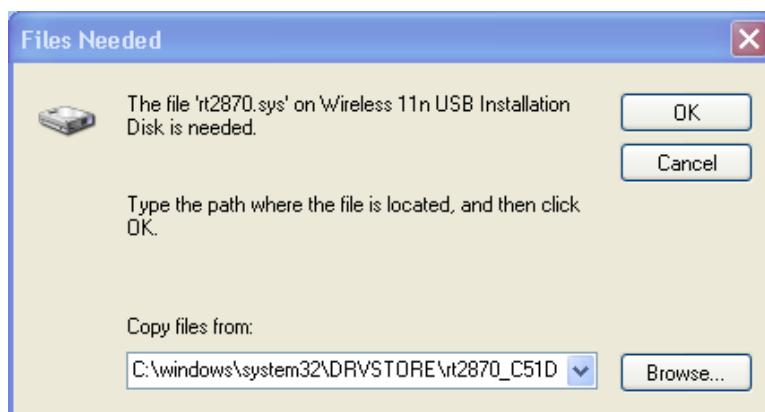


Fig. 3: "Files Needed" window

B) The T&M instrument has a CD/DVD drive and the driver is available on CD/DVD as supplement of the WLAN USB adapter.

1. Insert the WLAN USB adapter into an empty USB port of the running T&M instrument.
Windows detects that new hardware has been added and starts the "Found New Hardware" dialog. Click on "Cancel".
2. Install the driver for the WLAN USB adapter from the CD/DVD according to the instructions of the vendor of the adapter (insert the CD, after start of the driver installation (e.g. by auto-start) follow the instructions of the installation wizard, etc.).

2 Configure Auto-Start of the ad hoc WLAN Network

- Under "Control Panel/Administrative Tools/Computer Management", select the "Services and Applications/Services" view. Ensure that the "Wireless Zero Configuration" service status is "Started" and that its "Startup Type" is "Automatic".

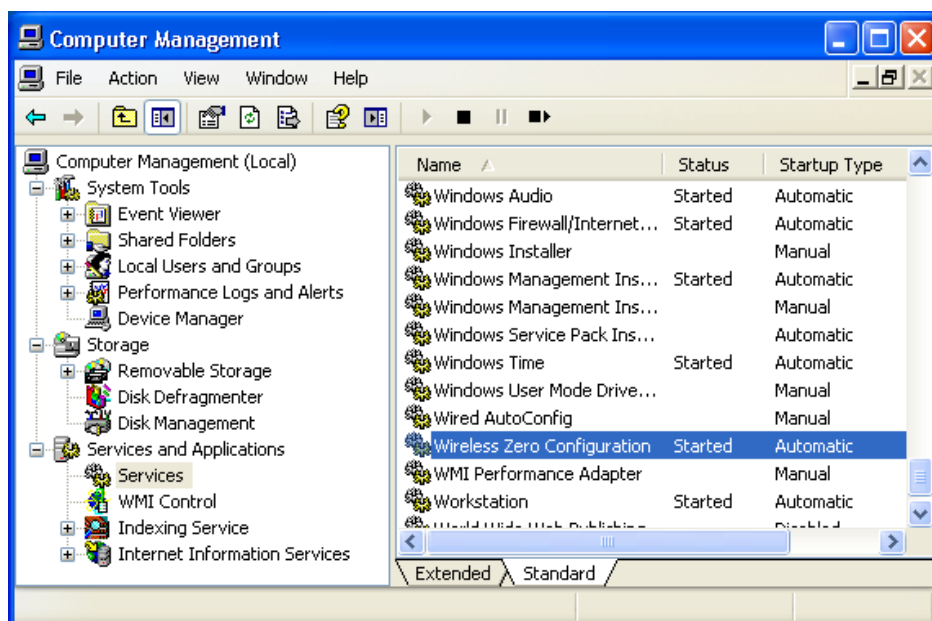


Fig. 4: Wireless zero configuration

3 Configure the Network Settings

General Settings:

1. Select "Control Panel/Network Connections". Then right-click on the "Wireless Network Connection" entry and select "Properties" in the context window. The "Wireless Network Connection Properties" window is opened.

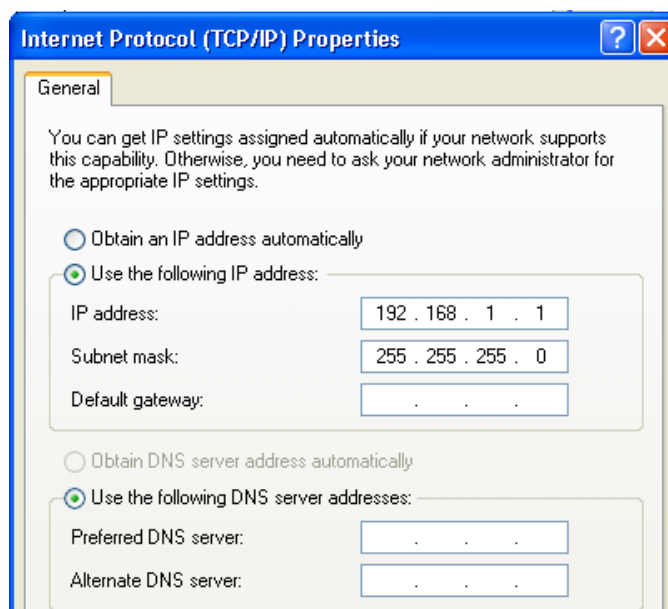
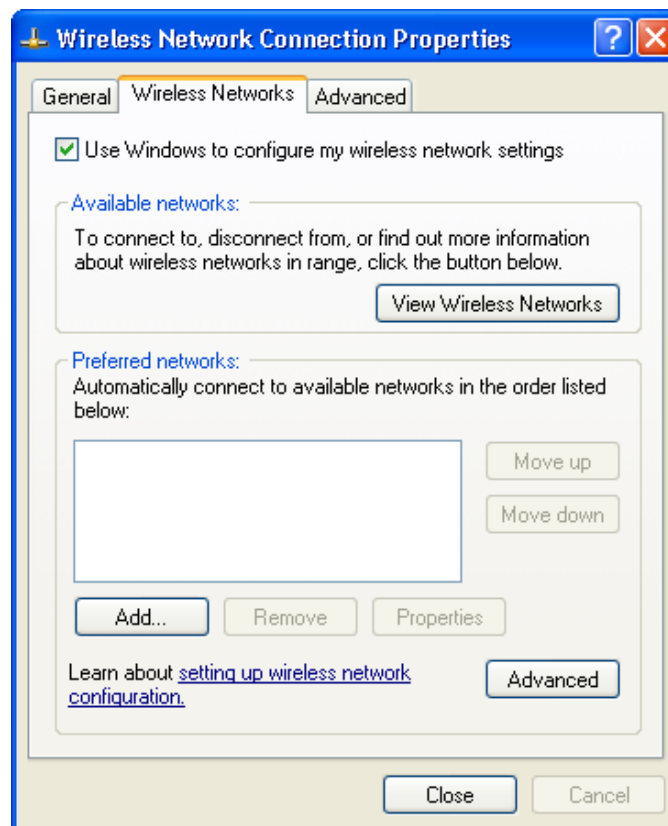


Fig. 5: Internet Protocol (TCP/IP) properties

2. Within the "General" tab select "Internet Protocol (TCP/IP)" and click on the "Properties" button. The "Internet Protocol (TCP/IP) Properties" window is displayed.
3. Define the static IP address of the T&M instrument.
4. Click "OK". The window is closed.

Wireless Settings:**Fig. 6: Wireless network connection properties**

5. In the "Wireless Network Connection Properties" window select the "Wireless Networks" tab.
6. Make sure the top box is checked ("Use Windows to configure my wireless network settings").
7. Click on the "Advanced" button which opens another window.
8. Select "Computer-to-computer (ad hoc) networks only" mode and then "Close" the window.
9. Click on the "Add..." button which opens another window.
10. Configure the "Wireless network properties" on the "Association" tab.
 - Enter the desired network name (e.g. "SFC-100123").
This network name will appear in the list of Wi-Fi networks on the tablet.
 - Check "Connect even this network is not broadcasting".
 - Select the appropriate network authentication and encryption method for the connection, e.g. "Open" and "WEP".
 - Uncheck "The key is provided for me automatically".
 - Enter a password consisting of exactly 13 characters in the "Network key" field.
You will have to enter this password at the tablet during establishment of the WLAN connection.
11. Click "OK" and "OK" to complete the configuration and close the configuration windows.

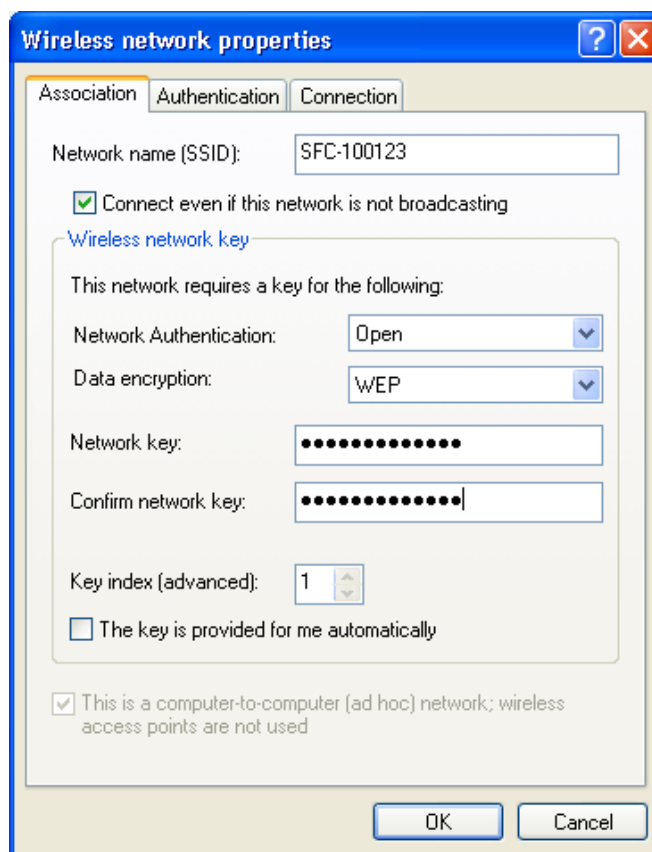


Fig. 7: Wireless network properties – association

The WLAN standard and the channel are automatically determined.

3.1.2.2 Installation for Windows 7 T&M Instruments

Most steps are analogous as for the Windows XP installation. For details about these steps, see the Windows XP installation.

1 Check the Virtual Wi-Fi Bus Driver

Windows 7 uses Virtual Wi-Fi to abstract the WLAN hardware into multiple virtual adapters. In this way the Windows 7 T&M instrument can establish a WLAN adhoc connection while keeping the capability to setup or access other WLAN networks. The two files "netwifibus.inf" and "vwifibus.sys" are required. Rohde & Schwarz provides them together with this application note.

- Check if the files "netwifibus.inf" and "vwifibus.sys" are already available in the "C:\Windows\" directory of the T&M instrument (see **Fig. 8**).
- If these files are not yet installed on the T&M instrument, take the Rohde & Schwarz files "netwifibus.inf" and "vwifibus.sys" and copy them manually into the "C:\Windows\inf" directory.

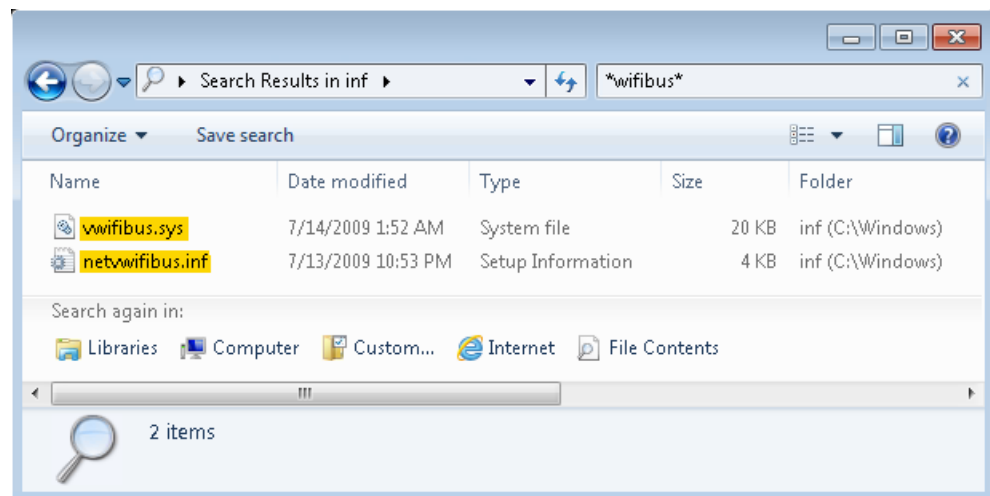


Fig. 8: Files for the Wi-Fi bus driver

2 Install the WLAN USB Adapter

Proceed in the same way as for the Windows XP installation.

3 Configure the Network Settings

Proceed in the same way as for the Windows XP installation.

4 Configure Auto-Start of the ad hoc WLAN Network

The "start wlan adhoc network.bat" configuration, provided together with this application note, is used (alternatively, you might create this file by yourself).

1. Copy the "start wlan adhoc network.bat" file into the "Start menu/All Programs/Startup" directory of the T&M instrument.
2. Right-click on the file and select "Edit" from the context window.
The file is opened with Windows Notepad.

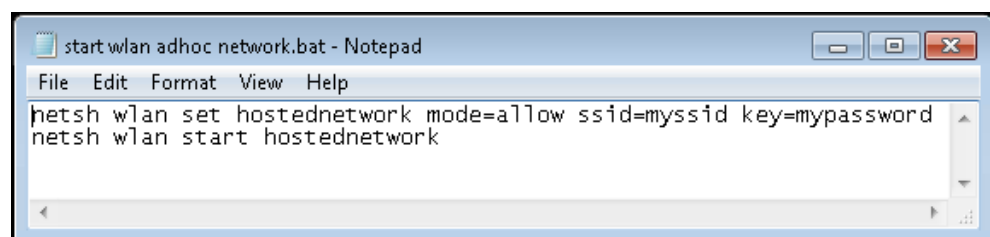


Fig. 9: Configuring the ad hoc WLAN network

3. Edit the file as follows:
 - Replace "myssid" by the same network name (e.g. "SFC-100234") as set during the configuration of the network settings in the previous section.
This network name will appear in the list of wireless networks on the tablet.
 - Replace "mypassword" by the network key as set during the configuration of the network settings in the previous section.
You will have to enter this password at the tablet during establishment of the WLAN connection.
4. Save and close the file.
5. Restart the T&M instrument (alternatively, you can also run the .bat file).

3.2 Installing the RDP Client Application on the Tablet

Several RDP Apps provide the required functionality. R&S has tested and recommends to use the "2X Client RDP/Remote Desktop" App which is a free download.

Prerequisite:

The tablet is connected to the Internet.

You have a Google account (required for Android tablets).

Procedure:

Proceed as follows on the tablet:

1. Tap the "Play Store" icon in the list of App icons or on the Home screen.
2. Tap the Magnifier icon on the right top of the screen.
3. Enter "2x" on the empty search box via the tablet keyboard and then tap the Enter key.
4. Select and tap the "2X Clients for RDP/Remote Desktop" App and download it. The 2X Client App is installed. Afterwards the "2X Client" icon is shown on the Apps screen.

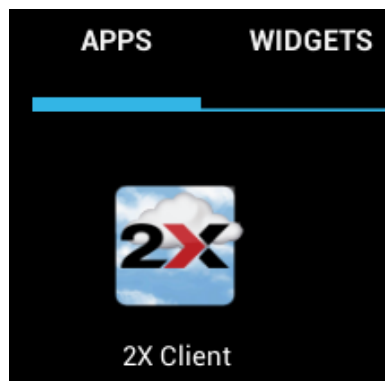


Fig. 10: 2X Client RDP App

3.3 Establishing the WLAN Connection on the Tablet

Note: The tablet uses "Wi-Fi" as name for WLAN.

Prerequisites: In case of a WLAN connection via WLAN router, the WLAN router is running; in case of a WLAN connection via WLAN USB adapter, the T&M instrument is running (and configurations have been done according to chapter 3.1).

Proceed as follows on the tablet:

1. In the Apps area, tap the "Settings" icon.
2. If "Cellular Data" or "Mobile Network" (except for Wi-Fi) is available on your tablet, then make sure that this option is switched off. Thereby concurrent data transmission via the cellular networks (e.g. GSM, LTE) is excluded.
3. Make sure that "Bluetooth" is switched off. This avoids interference between Bluetooth and WLAN.

- If Wi-Fi is in state OFF, then turn on Wi-Fi by dragging the ON/OFF slider in the Wi-Fi row into the ON position.
The tablet automatically detects the WLAN access point provided by the WLAN router or the WLAN USB adapter and connects to the WLAN.

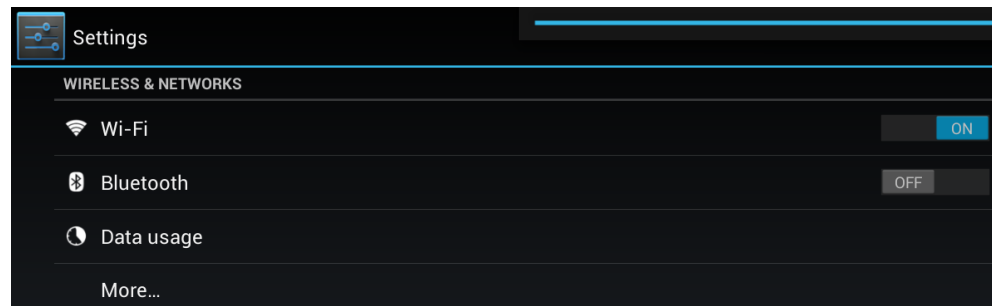


Fig. 11: Wireless and networks overview

- Tap "Wi-Fi".
The configured WLAN networks are shown with their network names and the connection states are indicated. Particularly the WLAN with the network name you have configured before at the WLAN router or at the T&M instrument with USB adapter is shown with state "Connected" (in the figure: "cmw500-123").

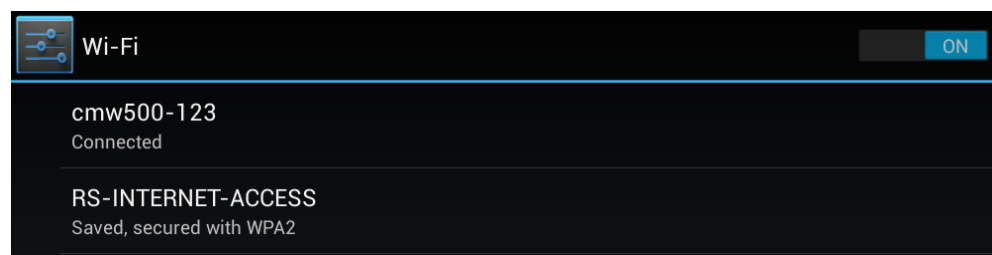


Fig. 12: Wi-Fi networks

3.4 Establishing the RDP Connection

RDP operates on the WLAN connection which has been established in the previous section.

Prerequisites:

- The T&M instrument which will be accessed remotely is already running.
- If a WLAN router is used with DHCP server enabled, the T&M instrument also has enabled DHCP (this usually is the default setting).
- In case of DHCP enabled, the T&M instrument gets its IP address from the DHCP server in the LAN (here the WLAN router). So look up this IP address from the T&M instrument after having connected T&M instrument and WLAN router. At the CMW you get the IP address from the "Setup" window under "System" > "Lan-Services".

Proceed as follows on the tablet:

- Look for the "2X" icon in the Apps Area and tap that icon.

The 2X Client application is started. Then it shows the already defined connections (if there are any), or detects that there is no connection and opens a dialog box.

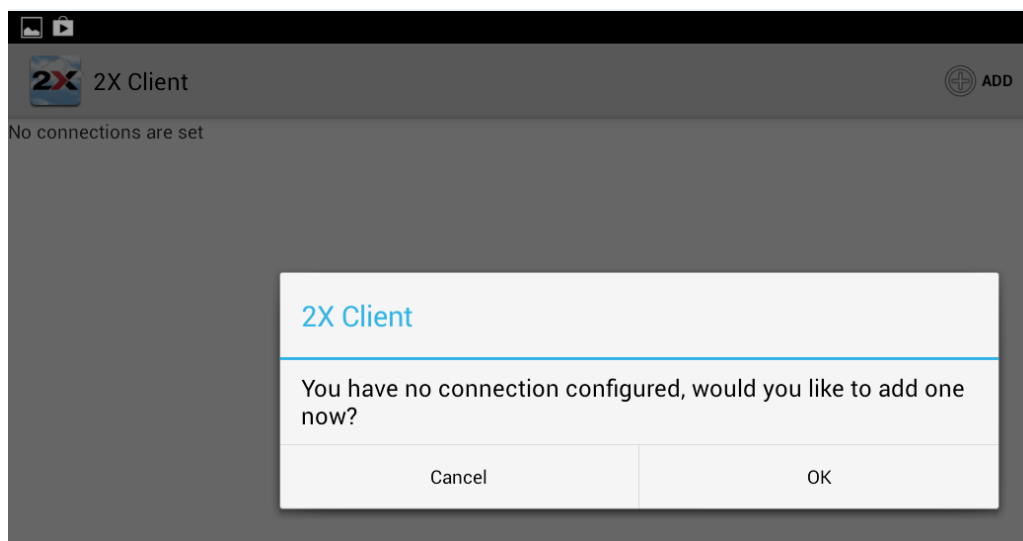


Fig. 13: 2X Client – no connections

Setup a New RDP Connection:

This section is only relevant for the first setup of the RDP connection. The settings will be remembered at later starts.

2. If the dialog box is shown (no RDP connection has been configured before), tap "OK" in the dialog box. Else, tap "ADD" on the upper right corner.
A new screen is displayed.
3. Select "RDP Connection".
The "Connection" screen is displayed.
4. Enter the connection information according to the figure below.
 - The hostname of the T&M instrument in the "Alias" row (optional); this name provides a readable identification of the connection
 - The T&M instrument's IP address in the "Server" row; see *Prerequisites* above for details about the IP address.
 - The port number "3389" which is the default TCP port for Windows RDP connections and which the T&M instrument listens to
 - The T&M instrument's user name "instrument" which is fixed (optional)
 - The password for the T&M instrument (optional)
(see the user manual for the instrument)

Note: If you have entered the instrument's user name and password, these settings will be used to skip the login window of the T&M instrument. Otherwise, the login window will be displayed when you connect to the instrument and you have to log in manually.

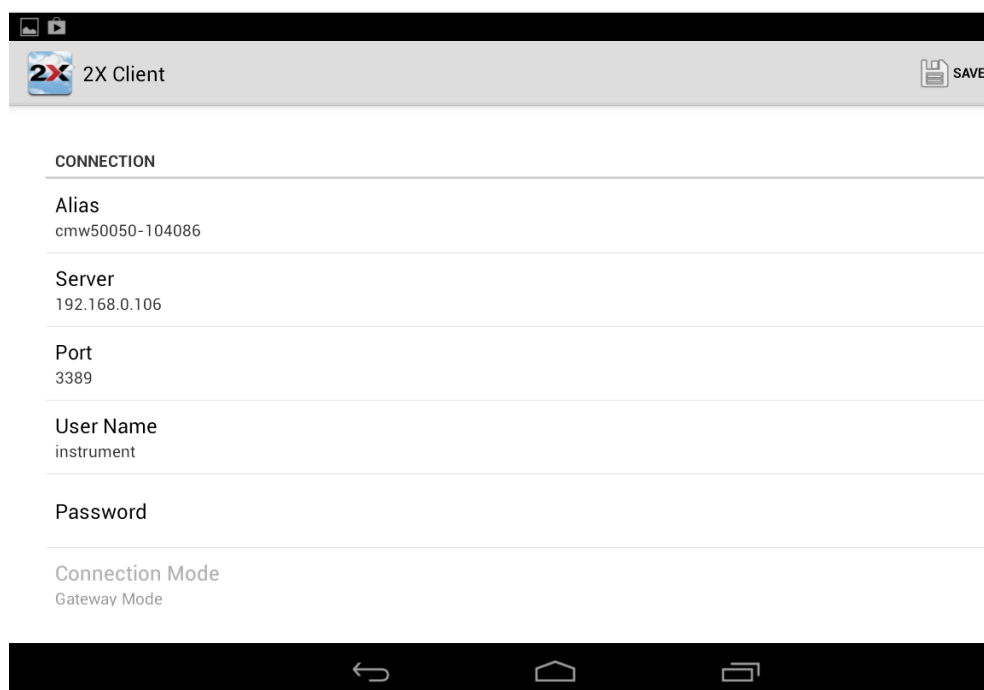


Fig. 14: 2X Client – connection screen

5. Tap "SAVE" on the upper right corner. The new connection is shown.



Fig. 15: 2X Client – available RDP connections

Reconfigurations:

If you have saved a faulty connection configuration, then touch and hold the displayed connection (indicated by the hostname or IP address of your T&M instrument). At the dialog box, tap "Edit".

The "Connection" screen is opened.

Build-up of the RDP Connection:

6. Tap the desired connection (indicated by hostname or IP address).
 - The remote desktop connection with this instrument is built up.
 - If you have configured the user name and password in the App, the login window is skipped.
 - Else, the login window is displayed and a keyboard pops up (or you have to open the keyboard via "KEYBOARD" in the upper right corner). In this case, enter the T&M instrument 's user name ("instrument") and password (see the user manual for your T&M instrument) to access the instrument.

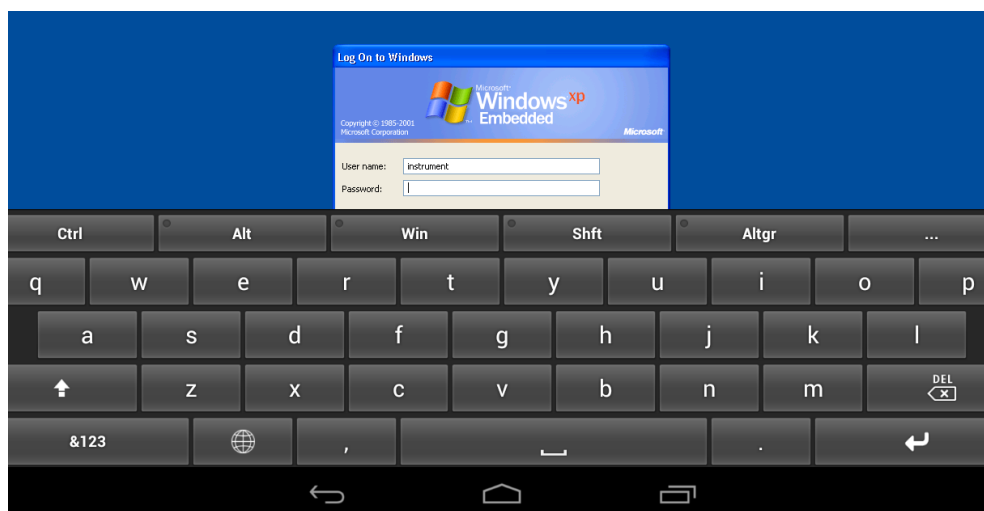


Fig. 16: Log on to the T&M instrument

Finally, the screen of the T&M instrument is displayed on the tablet.

4 Operation

4.1 Locking the Tablet's Screen Rotation Function

Proceed as follows:

1. Hold the tablet in landscape format.
2. Swipe one finger from the top of any screen to open the notification shade.
3. Tap the "AUTO ROTATE" icon.
The icon changes to "ROTATION LOCKED".

4.2 Controlling the T&M Instrument via RDP

4.2.1 Operation via Virtual Mouse and Keyboard

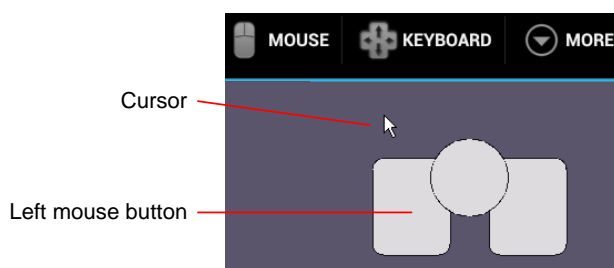


Fig. 17: Accessing virtual mouse and keyboard on the tablet

The tablet provides a virtual mouse and a keyboard for controlling the remote desktop screen.

- Tap "MOUSE" on the upper right to get a virtual mouse cursor and the related tap area.
- Tap "KEYBOARD" on the upper right to get a keyboard.

The keyboard shows letters by default; you can switch to numbers and special characters via the "&123" key, and back to letters via the "abcd" key.

4.2.2 Control Elements of the T&M Instrument Views

In this section, the CMW is used as example.

Tabs

Tabs are used to organize and distribute the content of a firmware application over several views.

- Tap a tab to change to the related view.

Buttons

- Tap a button to launch its function.

Softkeys, Hotkeys and Hardkeys

The softkeys are the buttons on the right side, the hotkeys are the buttons on the bottom of the T&M instrument's display. The currently active softkey determines which hotkeys are available.

Hardkeys are the buttons on a panel outside of the T&M instrument's screen.

- Tap a softkey, hotkey or hardkey to activate it.

Check Boxes, Radio Buttons, List Boxes

- Click on a checkbox or radio button with the left mouse button to switch its state.
- Click on a list box with the left mouse button to open the list.
Click on a list entry to select this entry.

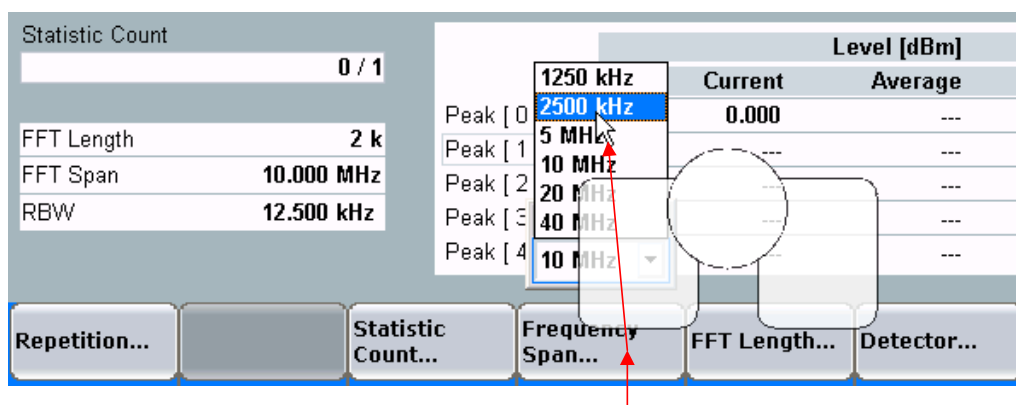


Fig. 18: List box

Taskbar

The taskbar is a horizontal bar at the bottom of the T&M instrument's display which allows to select the desired firmware application (e.g. "LTE Signaling").

- Tap the "TASKS" hardkey to have the taskbar displayed.
Alternatively, move the mouse cursor to the bottom edge of the CMW window to have the taskbar displayed.

Input Boxes and Keyboard

1. Click with the left mouse button on an input box. Then tap "KEYBOARD" on the upper right corner.
2. a) *Letters*: Enter a letter string as required via keyboard.
b) *Numbers*: Switch the keyboard display mode to numbers and enter the number.
3. Tap the "Return" key to save the entry.



Fig. 19: Input box and keyboard

Scrolling

The generator, signaling and measurement views match the T&M instrument's screen size, so no scrolling is required and available for these views. Configuration trees to be accessed via the "Configure..." hotkey and "Signaling Controller" / "Measurement Controller" views can have a larger size than the T&M instrument's screen.

- Scroll up/down in configuration trees by left-clicking on the scroll bar with the virtual mouse.

4.2.3 Starting a Firmware Application on a CMW

Example: Start the LTE signaling and LTE measurement application.

Main line of steps:

1. Load signaling and measurement firmware applications:
 - Select the "SIGNAL GEN" hardkey. The "Signaling Controller" window is opened.
You can expand compact tree views by tapping the "+" symbol at a tree knot.
 - Check the "LTE Signaling" checkbox via virtual mouse.
 - Select the "MEASURE" hardkey. The "Measurement Controller" window is opened.
 - Check the "LTE TX Measurement" checkbox via virtual mouse.
2. Click on the "TASKS" hardkey to get the taskbar.
3. Tap the "LTE Signaling" task on the taskbar.
4. Configure the signaling application by tapping softkeys and hotkeys, by clicking on check boxes and list boxes. Activate the keyboard for entering values in input boxes.
5. Start signaling: Tap the "LTE Signaling" softkey, then click on the "ON OFF" hardkey.
After successful start the softkey label shows "ON".
6. Switch to LTE measurement by selecting the "LTE TX Meas." softkey near the top of the softkey bar.
7. Configure the measurement application via softkeys, hotkeys, etc.
8. Start the measurement: Tap the "LTE TX Meas." softkey, then click on the "ON OFF" hardkey.
9. Check/edit the main signaling settings by tapping the "LTE Signaling" softkey while the LTE measurement view is still displayed. LTE signaling hotkeys are shown in the hotkey bar at the bottom of the screen.

Note: It is not possible to start a firmware application via keyboard.

4.3 Disconnecting from the T&M Instrument

1. Tap "MORE" on the upper right corner of the screen.
2. Tap "Disconnect".

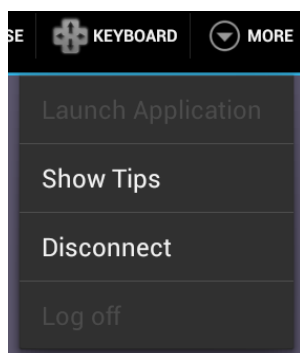


Fig. 20: Disconnect via 2X Client

After disconnecting the 2X Client screen shows the available connections.

Alternative:

1. Move the cursor of the virtual mouse to the bottom edge of the screen. The Windows taskbar is shown.
2. Click on "Start".
3. Click on "Disconnect".



Fig. 21: Disconnect via Windows taskbar

If you re-connect to the T&M instrument after having disconnected before, 2X Client automatically logs in if you have entered user name and password during configuration of your RDP connection.

Note:

A remote log off from the T&M instrument or shutdown via the 2X Client App or the Windows taskbar is not supported.

5 Related Documents

- [1MA216: Remote Operation of Windows-Based T&M Instruments with Apple iPad](#)
This document describes how a Windows-based R&S T&M instrument is remotely operated by an Apple iPad as if working on it locally. On the iPad, a special App implements the Windows Remote Desktop functionality. T&M instrument and iPad are connected via WLAN.
- [7BM82: Apple iPad Remote Control for Broadcasting T&M Instruments](#)
This application note explains the setup and operation of R&S T&M instruments via iPad with the example of the Remote Desktop – RDP App from MochaSoft and the WL0049A USB WLAN adapter from LogiLink.
- [RAC-0703-0029: Remote Operation of R&S Instruments Using Remote Desktop Connection via LAN](#)
This application note describes how to use the “Remote Desktop Connection” program to operate R&S T&M instruments connected in a LAN from a remote computer and how to connect and configure various kinds of networks (DHCP, Fixed IP address, Direct).
- [1ER01: Remote Monitoring and Control of the R&S® RTO with a Web Browser](#)
This application note describes remote operation or monitoring of the R&S RTO digital oscilloscope through a standard web browser. The common cross-platform technology Virtual Network Computing (VNC) is used as a server on the instrument.

6 References

- [1] DIR 635 WLAN router from D-Link, documentation
http://www.dlink.com/uk/en/home-solutions/support/product-/media/Consumer_Products/DIR/DIR%20635/Manual/DIR_635_Manual_EN_UK.pdf
- [2] 2X RDP client software
<http://www.2x.com>
- [3] 2X Client manual for Android
<http://www.2x.com/docs/en/manuals/html/client-android/2XClientForAndroid.html>

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