



Rohde&Schwarz Products: Handheld Spectrum Analyzer R&S®FSH

FSHRemote Remote Control and Data Access for the R&S®FSH

Application Note 1MA70

FSHRemote is a program for reading data and controlling a Handheld Spectrum Analyzer R&S®FSH from a remote computer.

The physical connection can be via either a fixed phone network, a mobile phone network or LAN/Internet. Use FSHRemote from a PC to control all the functions of the FSH or to read any measurement data. Undertake a diverse range of monitoring tasks with the R&S®FSH under remote control. No need for a PC at the R&S®FSH end.



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1 Introduction

FSHRemote is a Program for connecting an R&S®FSH handheld spectrum analyzer to a remote computer, and providing complete control of all functions from the computer.

The physical connection can be either with a serial cable, a telephone modem connected to a fixed phone network (POTS), a mobile phone (or other wireless user equipment) over a mobile phone network, or via LAN/Internet using a serial server (LAN-RS232 converter).

Use FSHRemote from a PC to remote control all the functions of the R&S®FSH or to read any measurement data. Undertake a diverse range of monitoring tasks with the R&S®FSH, such as spectrum analysis or power measurements.

An important design feature of FSHRemote is that the R&S®FSH can be connected directly to a modem, mobile phone, or serial server (LAN-RS232 converter); there is no need for a PC at the R&S®FSH end.

The Handheld Spectrum Analyzer R&S®FSH is abbreviated to FSH for the remainder of this Application Note.

2 Software Features

FSHRemote is simple to install and simulates the user interface of the FSH in a somewhat altered form on the screen of the PC. The following functions are provided:

- connection management between the PC and the FSH either:
 - direct device-to-device using the optical serial RS-232-C cable FSH-Z34 or the optical USB cable FSH-Z37
 - via a fixed phone network with two telephone modems
 - via a mobile phone network with two Mobile phones as wireless modems
 - via a fixed phone network with one telephone modem and one wireless modem
 - via LAN/Internet with a serial server (LAN-RS232 converter) and a LAN/Internet connection
- frequency and measurement range settings
- selection of type of measurement
- level settings
- marker functions
- either manual trigger or continuous recording of measurement values
- time-controlled reading and storing of measurement results
- user defined scripts for measurement sequences
- 3D display of the measurements in waterfall and spectrogram mode

3 Hardware and Software Requirements

Hardware Requirements

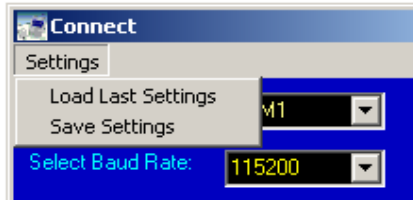
CPU: Pentium 300 MHz or better

Hard Disk: 8 MBytes free

Monitor: SVGA color monitor, resolution 800x600 or better

Modem: either 56K telephone modems, GPRS mobile phones or wireless modems that can transmit data on two or more time slots (for example GPRS classes 6 or 10), or other appropriate mobile phones, or a serial server (LAN-RS232 converter), with a fixed IP address, providing long range connection through LAN/Internet host and a serial device.

Note: *For better performance with the 3D display of the measurements a graphic card with hardware acceleration is recommended..*



Software Requirements

Microsoft 32-bit operating system (Windows 95/98/NT/2000/ME/XP)

FSH firmware version 5.0 or later

Remote control software R&S®FSH-K1 must be activated in the FSH (order Option Key)

4 Installing and Starting FSHRemote

To install FSHRemote execute the file FSHRemote_<version number>.exe with a double click. The installation wizard is activated; the first option is choose the language (English or German) for the installation.

Follow the instructions from the wizard. In the course of the installation select the directory of your choice in which the program is to be installed.

FSHRemote requires approximately 8 MB RAM on a hard disk. The wizard also adds an entry for FSHRemote in the Start->Programs menu of the computer.

No other parameters are required for installation.

For de-installation, Rohde & Schwarz supplies the program uninstall.exe, which removes FSHRemote completely from the computer.

Warning: *De-install removes the program files and also the directory in which FSHRemote is installed. Make sure you have archived any other files or subdirectories present in the directory before de-installation.*

To start the program select FSHRemote from the Program submenu in the Windows Start menu. When FSHRemote starts, the Registration form appears. Please register the installation; it is free and does not result in any further commitments for you or your company.

If FSHRemote has not been registered, you can still start the program by clicking the *Continue* button.

Welcome to FSHRemote, version 1.0 Rohde & Schwarz GmbH & Co. KG

You are using an unregistered version of FSHRemote. This version has full functionality and no expiration date. As we are continuously improving the program, we depend on your comments and experience with FSHRemote. Therefore, we kindly ask you to register FSHRemote. Registration is free of charge and does not obligate you or your company.

To register:

1. Fill out the registration form below.
2. Click 'Copy Registration Form to Clipboard'.
3. Open your mail client and paste the clipboard into the email message field with 'Ctrl-C'.
4. Send the registration form to TM-Applications@rsd.rohde-schwarz.com.

You will receive an email from Rohde & Schwarz with your registration key.

Name *

* The registration key is derived from your name. Please fill out Email and country as well. All other fields may be filled out optionally. Please help us by also providing these few details.

Company	<input type="text"/>	Dep.	<input type="text"/>
Street	<input type="text"/>	City	<input type="text"/>
Telephone	<input type="text"/>	Country *	<input type="text" value="..."/>

E-Mail *

Comments

Copy Registration Form to Clipboard

Once you received your registration key

1. Enter your User Name and Registration Key.
2. Click 'Continue'.

FSHRemote will start immediately. This registration form will no longer appear at program start.

User Name	<input type="text"/>	Continue
Key Code	<input type="text"/>	

Fig 1 Registration form

If you complete the Registration form, you will be sent a keycode. Enter the code into the Registration form and click the Continue button. The Main Window for FSHRemote appears.

Once FSHRemote has been registered, the registration form does not appear any more.

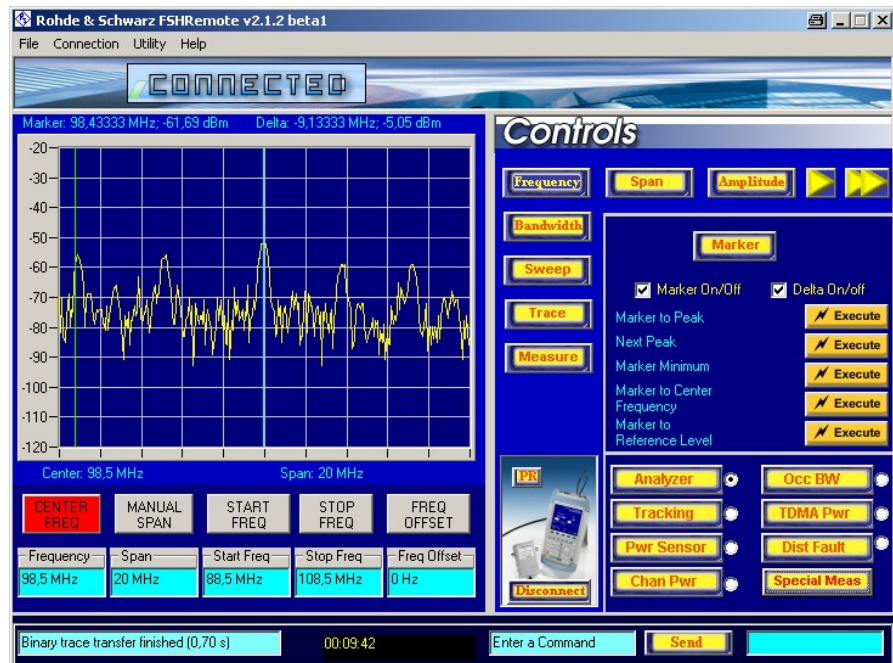


Fig 2 FSHRemote Main Window

5 Connecting the Computer to the FSH

There are five options for transferring data between the PC and the FSH:

- Direct device-to-device using either the Optical RS-232-C cable FSH-Z34 or the Optical USB Interface cable FSH-Z37 supplied with the FSH. If your FSH came with the Optical USB Interface cable FSH-Z37, please see Appendix E and Connecting the PC, FSH and Modems or Serial Servers (LAN-RS232 Convertors) – TCP/IP Connection with two PCs for further information.
- Via a fixed phone network with one telephone modem and one wireless modem.
- Via a mobile phone network with two mobile phones (or alternative suitable wireless devices) as wireless modems.
- Via a fixed phone network with two telephone modems.
- Via LAN/Internet with a serial server (LAN-RS232 converter). This option requires some basic knowledge of the necessary settings needed for a successful TCP/IP connection

Configuring the Communication Devices

Before first use you have to configure the modems or mobile phones in use, as required for all the communication options apart from the direct device-to-device connection with the serial optical cable. From the *Utility* menu select *Set Devices*. The device at the FSH-end must be configured to communicate with the PC.



Fig 3 Modem Selection

1. Configuring the modems/mobile phones:

From the *Available Devices* drop-down menu, select the device to configure. The AT instructions required to configure a modem or mobile phone are stored in the SETTINGS.INI file, which are stored in the same directory as FSHRemote. For further information about SETTINGS.INI see Appendix A.

As the majority of modems are functionally compatible, you can use the settings for the Creativ Labs modem for many other modems too. The settings for mobile phones are also extremely similar, so that the values from the supplied SETTINGS.INI can often be used.

Select or enter manually the COM port to which the device is connected. The default baud rate is 19200, which is more than adequate. Click on the button *Set Device* to store the configuration. Once the values are saved the *Set Device* window disappears.

Store the selected values in the modem. If, as is the case with some mobile phones, the values cannot be stored, either leave the mobile phone switched on, or re-enter the values each time after switching the mobile phone on.

2. Configuring a serial server(LAN-RS232 converter):

In the case of an LAN/Internet connection the usage of the Set Device dialog box is not possible as every serial server has its own way of saving its settings. There are several main parameters, which have to be set:

1. The IP address of the server: After setting a fixed IP address for the server, this will be the address which FSHRemote uses to access FSH. The IP address must be fixed and not dynamically allocated - FSHRemote does not scan the entire domain, but connects to a specified IP address. The instructions on setting a fixed IP address for your serial server can be found in its documentation.
2. The logical port of the server: This is the second main parameter to establish a TCP/IP connection and corresponds to the TCP layer. A serial server may have a number of available ports. When used as a host, it listens on a particular port for a connection request. This is the port, on which the service for converting network and RS232 data is available. There are serial servers on which you can associate any port with this service, and some where it is fixed and cannot be changed. Please refer to your serial server's documentation for instructions on altering the port for the TCP/IP connection.
3. Operating mode: In the case of listening for a connection request, the serial server has to be set in Host-Based mode. Please refer to your serial server's documentation for its available operating modes.

4. Once the network settings allowing the serial server to communicate with the network have been made, one of its serial ports has to be set accordingly, to be able to establish a connection to the FSH via its optical cable. The main parameter to be set here is the baud rate – it must be the same as the baud rate set on the FSH. Any baud rate, which is supported by both the serial server and the instrument is applicable. We recommend using the highest baud rate of 115200. Please refer to your serial server's manual for instructions on setting the baud rate of its RS232 ports.
5. Additional notes:
 - a. Some serial servers need a special null modem adapter (cross link cable) to be able to connect to the FSH optical cable. Please see the appendix for the wiring of such an adapter.
 - b. In our tests for this purpose we used the serial server of Moxa Inc. NPort Express. Another serial server which we have tested, is the AXIS 2490 Serial Server from AXIS Communications. A special setting, which has to be made here is to deactivate its telnet options as otherwise there are problems with binary data transfers. In this case no additional null modem adapter is necessary to connect to the FSH optical cable.

Connecting the PC, FSH and Modems or Serial Servers (LAN-RS232 Convertors)

From the *Connection* menu select the connection method used:

- *Direct Serial Port Connection.*
- *Two Modems Connection* with a telephone modem at each end.
- *Two Mobile Phones Connection* with a mobile phone at each end.
- *Modem to Mobile Phone Connection* with a telephone modem connected to the PC and a mobile phone at the FSH.
- *Mobile Phone to Modem Connection* with a mobile phone connected to the PC and a telephone modem at the FSH.
- *TCP/IP Connection* with the FSH connected to a serial server, which is connected to the network and a PC with a network connection.



Fig 4 Connection Menu

Note: *The direct connection is particularly useful for getting started with FSHRemote and the FSH, as the reaction of the FSH to instructions from the program are simple to observe. The data transfer rate is the fastest possible, and is not subject to additional delays also possible with, for example, a wireless modem. The data transfer is free, too!*

Direct connection via the serial or USB port:

If the computer is close to the FSH, it can be connected directly to the PC using either the Optical RS-232-C interface cable FSH-Z34 or the Optical USB interface cable FSH-Z37 supplied with the FSH. If your FSH came with the Optical USB Interface cable FSH-Z37, please see Appendix E for further information..

Once the cable has been connected at both ends, select *Direct Serial Port Connection*.

The *Connect* window opens to set the connection data. Select the COM port and the baud rate and click on *Connect*. Make certain the value for baud rate matches the value set up for the FSH; otherwise the connection fails and FSHRemote displays an error message.

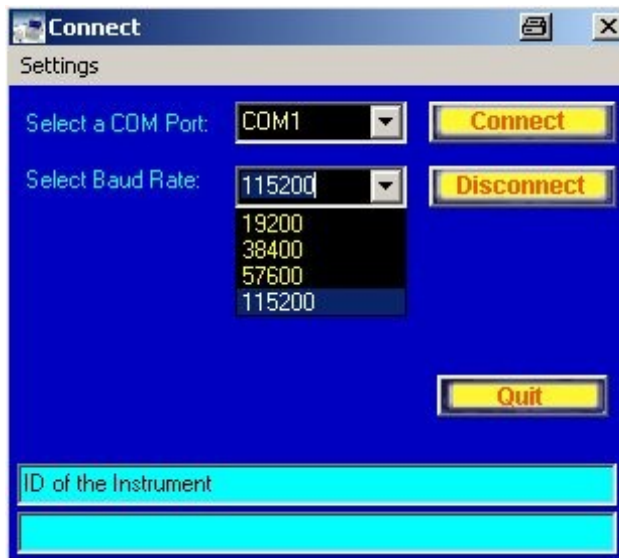


Fig 5 The Connect window for Direct Serial Port Connection

Once the connection has been established, the serial number of the connected FSH is displayed and the *Connect* window is closed.

With a telephone modem at each end:

Make sure to have set up the modem at the FSH end according to the instructions given above. Connect one modem to the PC and the fixed phone

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network, and the other to the FSH using the optical RS-232-C serial cable and (of course) also to the telephone line.

As both the FSH and the modem are data end equipment of equal status, an additional null modem (crosslink) cable must be connected to the RS-232-C cable using a male-male gender changer. Small adapters with these functions are also commercially available (see picture).



Fig 6 Connect the FSH to a modem or mobile phone using a null modem adapter (crosslink cable) and a male-male gender changer

To establish the connection select *Two Modems Connection* from the *Connection* menu. The *Connect* window opens to specify the connection set up.

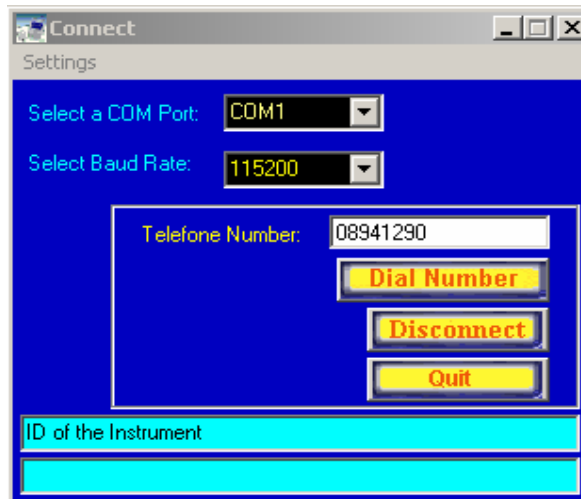


Fig 7 The Connect menu for Two Modems Connection

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Select the COM port and the baud rate for the PC side of the connection. As the modem is connected directly to the PC a relatively high data rate (up to 115 kbaud) can be selected.

The baud rate that the modem on the FSH side uses to transfer data is specified in the SETTINGS.INI file. If 19200 baud is selected, the FSH must be set up for 19200, too. See additional information in Appendix A.

Data transfer with 19200 baud should always be possible with a 56-k modem. For higher data rates, perform a test. Enter the telephone number of the target modem and click on *Dial Number*. If the connection is successfully established, a picture of an FSH appears on the FSHRemote main menu beneath the *Measure* button.

Note: *Some modems and mobile phones cannot sufficiently supply the optical RS-232-C serial cable with power. A separate power supply and buffer amplifier must be incorporated in the set up instead of the null modem adapter and the gender changer. A circuit diagram for a suitable buffer amplifier is included in Appendix A.*

With a mobile phone at each end

Make sure to have set up the mobile phone at the FSH end according to the instructions given above. Connect the PC to a mobile phone using the serial cable supplied with the GPRS mobile phone (or wireless terminal). Connect the FSH to the other mobile phone using the optical RS-232-C serial cable, with a null modem adapter and a male-male adapter as described above for a telephone modem.

To establish the connection select *Two Mobile Phones Connection* from the *Connection* menu. The *Connect* window opens to specify the connection set up.

Select the COM port and the baud rate for the PC side of the connection, as determined by the attached mobile phone. The baud rate that the mobile phone on the FSH side uses to transfer data is specified in the SETTINGS.INI file and is stored in the mobile phone with Set Devices. If 19200 baud is selected, the FSH must be set up for 19200, too.

We recommend the use of 2 GPRS mobile phones with a baud rate of 19200 baud. See additional information in Appendix A.

Enter the data (!) telephone number of the mobile phone attached to the FSH and click on *Dial Number*. The connection can take several minutes, please be patient. If the connection is successfully established, a picture of an FSH appears on the FSHRemote main menu beneath the *Measure* button.

Mixed telephone modem and mobile phone modem connection:

Connect the modem and mobile phone to the PC and FSH as described above.

Enter the connection data, as described above, using *Connection - Modem to Mobile Phone Connection* or *Connection - Mobile Phone to Modem Con-*

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nection as applicable. We recommend a baud rate of 19200 for the connection.

Note: Each window includes the buttons *Save Settings* and *Load Settings*. *Save Settings* saves the current settings for COM port, baud rate, and phone number. *Load Settings* recalls the last saved settings. No need to re-enter the same data each time a connection is established.

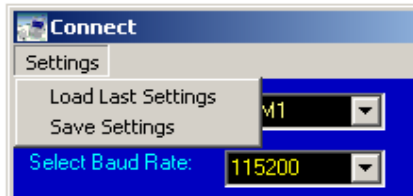


Fig 8 Saving and recalling connection settings

Warning: If an FSH running in battery mode is switched off and back on, the baud rate is reset to 19200. If you are working with higher baud rates, de-activate the *Auto Power Down* function and connect FSH to an uninterruptable power supply.

TCP/IP connection with a serial server (LAN-RS232 converter) and a network connection:

Make sure to have set up the serial server at the FSH end according to the instructions given above. Connect the PC to the LAN/Internet network, and the serial server to the FSH using the optical RS-232-C serial cable, and to the network.

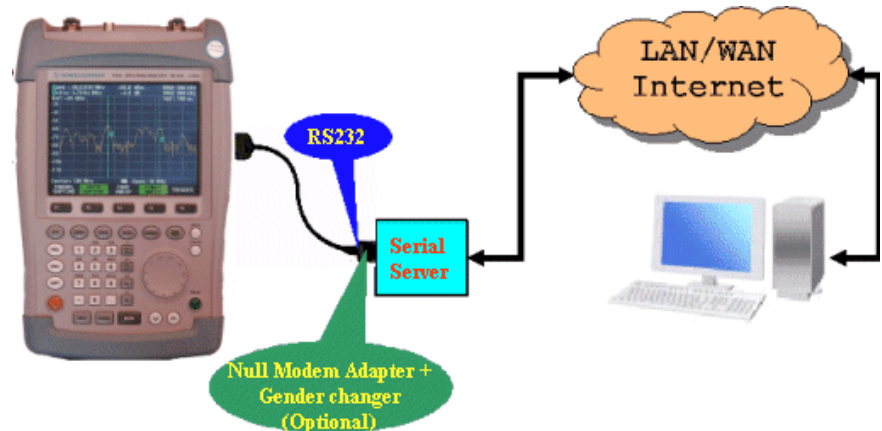


Fig 9 LAN/Internet connection using the TCP/IP protocol

As both the FSH and the serial server may be data end-equipment of equal status, an additional null modem (crosslink) cable may have to be connected to the RS-232-C cable using a male-male gender changer. Small adapters with these functions are commercially available. There are also serial servers, which do not need these additional adapters. Refer to the manual of your serial server to see which is the case. To establish a connection to the serial server with the specified IP address,

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it has to match the range of IP addresses the PC with FSHRemote can communicate within its current sub group. This range of addresses is determined by the setting of the PC's own IP address and the network sub-mask setting, which can be found in the Control Panel / Network settings under "Properties" for the "Internet Protocol" (TCP/IP) components. The IP communication protocol can be tested by opening a command prompt and typing in the following command:

```
C:\>ping <hostname>
```

If the serial server is not visible you may have to change the settings of its IP address, network sub-mask, (standard gateway). Please refer to the manual of your serial server in this case.

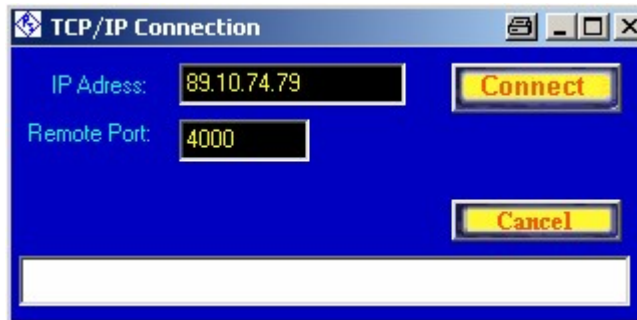


Fig 10 TCP/IP Connection dialog box

Note: You can also use the name of the computer in the network instead of an IP address:



Fig 11 TCP connection using a computer name instead of an IP address

Note: The settings for the IP address and the port number in the TCP/IP Connection dialog box are automatically saved after a connection has been established, so that you don't have to enter them manually every time.

Warning: If a FSH running in battery mode is switched off and back on, the baud rate is reset to 19200. If you are working with higher baud rates, de-activate the Auto Power Down function and connect FSH to an uninterruptable power supply.

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TCP/IP connection with two PCs:

A special server functionality has been included in FSHRemote so that communication between two PCs each running an instance of FSHRemote is possible. This is especially useful when no serial server hardware is available or the FSH instrument is controlled via its Optical USB Interface Cable FSH-Z37 (see Appendix E: Optical USB Interface Cable FSH-Z37) so that the usage of a serial server with an RS232 interface is not possible.

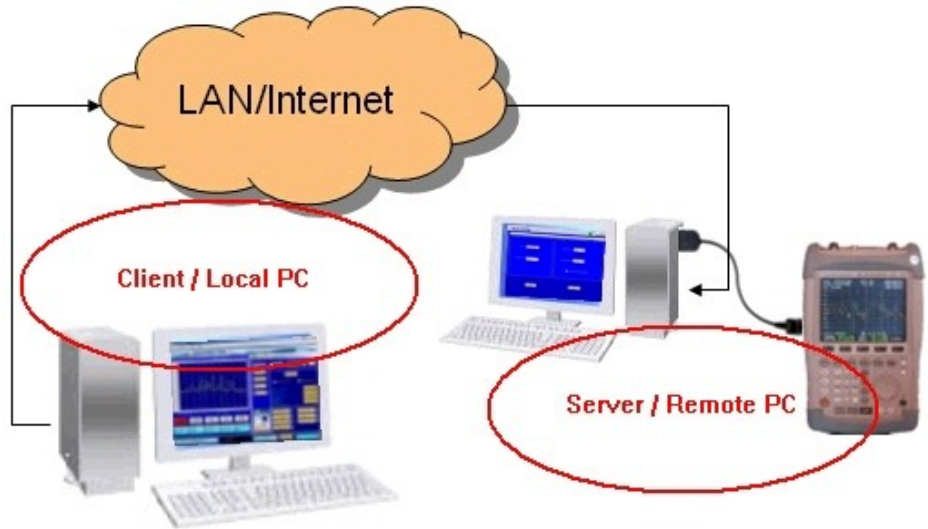


Fig 12 TCP/IP connection with two PCs

In order to start the server functionality of FSHRemote use "Utility->Start as Server..."

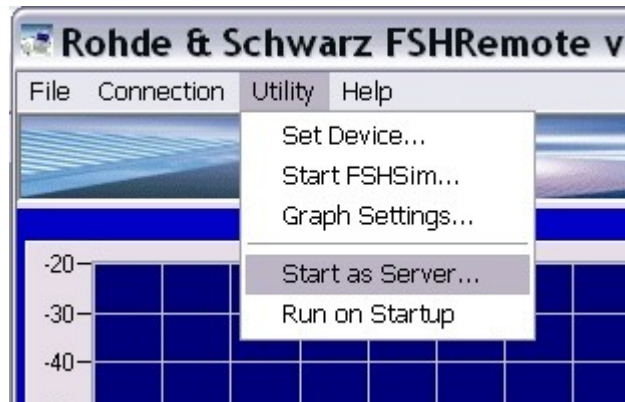


Fig 13 Start the server functionality

The following dialog box appears:

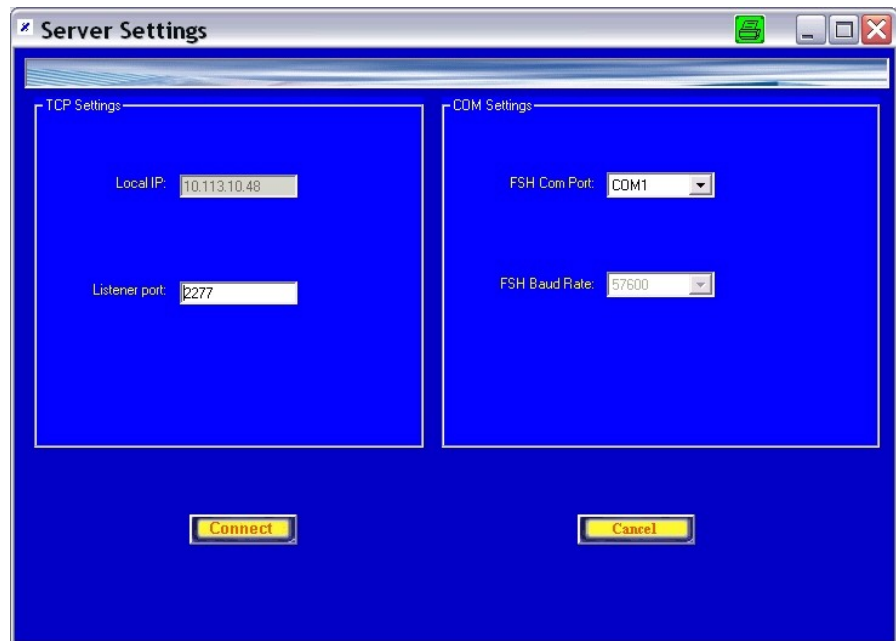


Fig 14 Server window

This window is separated into two blocks. The left one is used to indicate the IP address of the host PC (read only) and the port on which the server should listen for incoming connection requests. Use these settings when choosing "Connection->TCP/IP connection" on the local instance of FSHRemote.

The right side of the window contains settings of the connection to the COM port, where the FSH instrument is connected. The program automatically detects if an FSH instrument is present on the specified COM port and sets it to the highest baud rate for a faster communication.

The "Connect" button starts the server with the specified settings:

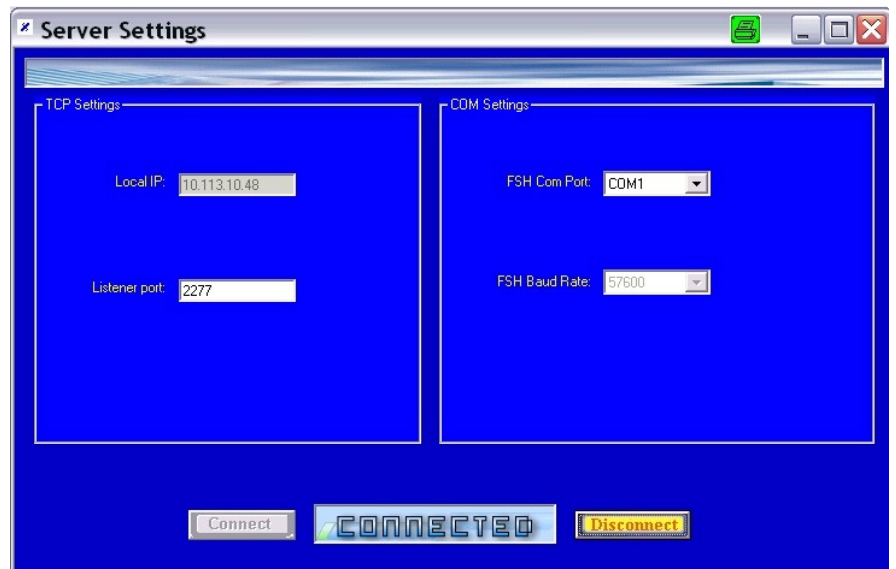


Fig 15 Successful connection

After a successful connection the “Connected” picture and the “Disconnect” button are displayed. The FSHRemote server is now ready to receive connections on the TCP port specified in the “TCP Settings” block of the window.

At the local side use the same procedure as described in “TCP/IP connection with a serial server (LAN-RS232 converter) and a network connection” to connect to the server.

After a clients requests a connection to the FSHRemote server, its IP address is displayed in the window:



Fig 16 Client requests connection

Pressing the “Disconnect” button disconnects the server and “Cancel” sets the program to its initial state.

Starting FSHRemote in server mode at windows startup:

This feature is useful when using FSHRemote as server at a remote location where an operator is not physically present. It allows automatic start and connection of the FSHRemote server to the FSH instrument making it available for clients even after a power failure. This feature assumes that after a power failure the remote computer restarts itself and loads windows.

To activate this feature check the “Run on Startup” option:



Fig 17 Run FSHRemote server on windows start

Activating this option will automatically launch FSHRemote in its server mode the next time windows starts and try to connect it to an FSH Instrument.

6 Operating FSHRemote

Once a connection is established between the FSH and the PC, FSHRemote displays "Connected" in its main window, a picture of an FSH and at the bottom of the main window the elapsed time since the connection has been established.



Fig 18 The display once a connection is established

Setting the FSH

FSHRemote provides access to all the functions that can be set directly on an FSH:


- Frequency
- Span
- Level settings
- Bandwidth
- Sweep
- Trace
- Marker functions


Additionally, the Measure Button and the switches that appear on the lower right provide access to all the measuring options of the FSH such as *Analyzer, Tracking, Pwr Sensor, TDMA Power, Chan Pwr, Occ BW, Dist Fault*


and *Special.Meas*. The *PR* and *Disconnect* buttons are only available while a connection to the FSH exists. *PR* activates a *PRESET* of FSH, *Disconnect* ends the connection.


Use the input field to the left of the *Send* button to manually input any command from the "Remote Control for R&S FSH FSH-K1" Operating Manual. The field to the right shows the response from the FSH. Note that all commands must be preceded by a *CMD*, *GET* or *SET*, followed by the required command. Example: *CMD Send PRESET Send* presets the FSH. You may use the Return key of your PC instead of the *Send* button to send your commands to FSH.

Example: Read the Measured Spectrum

The arrow key  on the upper right retrieves the current measurement data from the FSH. The time required depends on the type of connection. With a modem to modem fixed line connection, the retrieval time is less than an second; for a GPRS connection the retrieval can take up to 4 seconds depending on the quality of the mobile radio connection. The sweep time must be added, too. For each query the FSH sends about 1.2 kByte data to the PC (2.4 kByte if Auto Peak Detector is used).




The  key requests continuous reading of the measurement data. The repeat rate depends on the type of connection. For a GPRS connection and a short sweep time, a rate of about one measurement every 4 seconds is obtained and for a fixed line connection - about 1 measurement every second. If sweep time is set to values above 1 second, repetition rate is decreased accordingly.

In Continuous mode, stop data retrieval with the  button before entering a command.

At any time you can click on the button named "3D" in the lower right corner of the two dimensional graph, where the trace is displayed. This opens the *3D Representation* window allowing you to view your data in a three dimensional format especially useful for waterfall display. If you stop the continuous displaying with the stop button and then resume it again with the  button, the 3D display will not be cleared but will display the next trace after the last one. Clearing the graph is done explicitly by using the *View->Clear Graph* command.

For detailed instructions on using this feature please refer to Appendix B – "3D Data Representation".

To read the current values, click on the software button as appropriate. To establish the center frequency set on the FSH, first click on the *Frequency* button. Beneath the measurement display, user interface elements for setting the FSH frequency appear; click on *Center Frequency*, to send the query from FSHRemote to the FSH. The current value for center frequency is displayed beneath the buttons.

Note: *If you are working in single sweep mode and wish to initiate a new sweep, click on the  button. If you only wish to update the display without initiating a new sweep, click on the  button and then on the  button.*

To alter a value enter the new value in the window and press Return. Enter the value in either:

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- scientific notation. For example; 100e-3 for 0,1 or 98,5e6 for 98,5 MHz)
- suitable SI abbreviations for the unit. For example; 100 m for 100e-3 or 10 M for 10e6
- decimal separator: use , (comma) or . (dot) according to the country settings of your operating system

Almost all the functions provided by the FSH can be used. To work with markers, click on the *Marker* button. FSHRemote checks which markers are active and displays them in the measurement curve. Switch on the marker, respectively the delta marker, by activating the selection box *Marker On/Off* or *Delta On/Off*. read the current values of the markers use the soft buttons beneath the measurement display. In order to set a new value for a marker enter the new setting in the text filed beneath its soft button and press ENTER. The marker goes to the specified new position.

Note the status messages displayed at the bottom of the FSHRemote window. These messages show information about the current action as well as the time required for the action. Before beginning a new action, wait until the "finished" message from the preceding action is displayed.

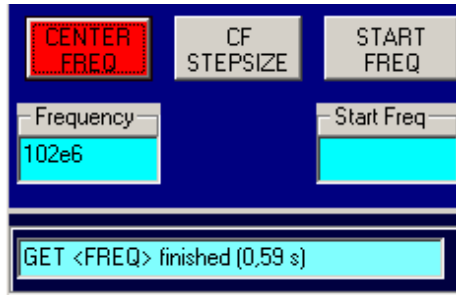


Fig 19 Status Messages

Note: *Some functions of the FSH require the connection of measurement bridges, calibration standards or similar equipment. In remote operation, an operator must have access to the FSH to complete the test set up. Only use such functions when the correct set up has been confirmed.*

Note: *In order to keep the data traffic low FSHRemote keeps track of the main FSH settings such as the frequency, span, etc. in an internal database. Click on the soft buttons underneath the measurement display to update these values. If the instrument is presetted using the PR button these values are presetted as well.*

Saving measurement data:

The *File* menu includes functions to save measurement data.

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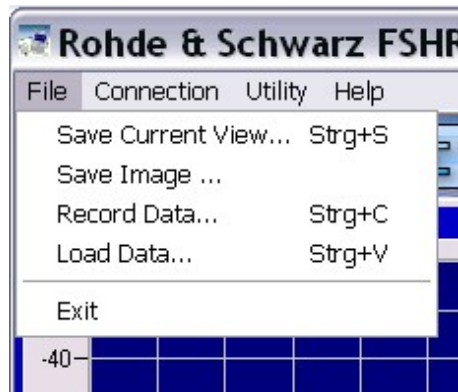


Fig 20 The File Menu

Save Current View writes the currently displayed data to an ASCII file. Depending on the detectors activated, frequency and the accompanying level values, or frequency, minimum and maximum levels (with the AUTOPEAK detector) are stored. The file is in CSV format and is compatible with the FSHView software. Traces stored with FSHRemote can be loaded into FSHView and vice versa. Exceptions are the Power sensor mode and the Receiver mode of the FSH instruments where the two programs are incompatible yet.

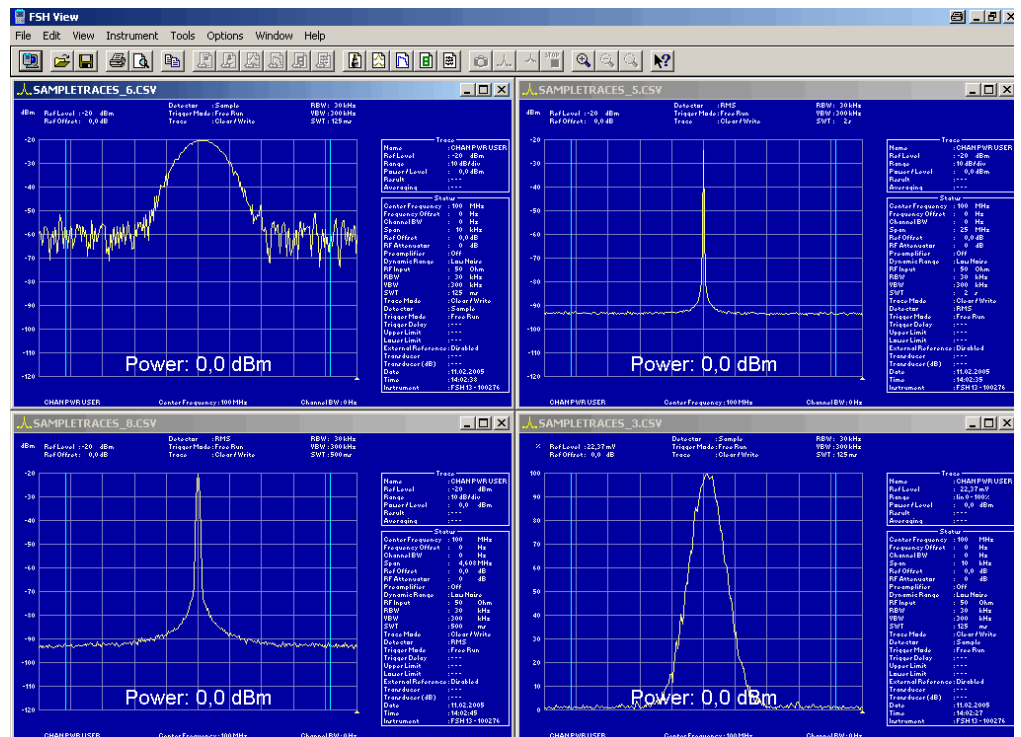


Fig 21 The Sweeps saved with FSHRemote are loaded into FSHView

Use *Load data* to recall and display a set of stored values.

Note: Sweeps saved with earlier versions of FSHRemote may have problems with the scaling of the graph when displayed. If that is the case use the “Graph Settings” dialog box to rescale the graph manually. You can access this dialog box from Utility → Graph Settings.

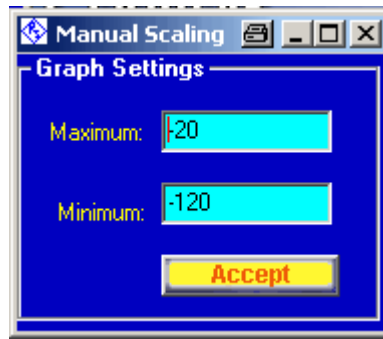


Fig 22 The Graph Settings dialog box

Record Data writes the current values at a time interval which can be set to any value from 1 second to about 50 days. Select *Record Data* and enter time interval in the **Record Time Interval** dialog box:



Fig 23 The Record Time Interval dialog box

If FSH is set to external triggering, you are asked to enter a timeout value for external trigger instead. If no external trigger occurs within the timeout period recording of data is stopped and has to be started again.

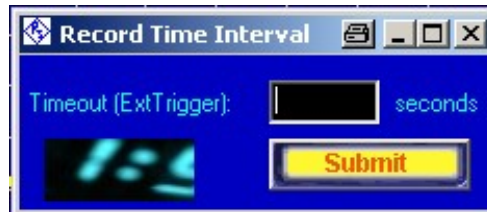



Fig 24 External Trigger Timeout dialog box

Click *Submit* and enter the name of the file to store the data in. The smallest possible interval is determined by the type of connection between the PC and the FSH. With a mobile radio connection, data transfer can be up to 4 seconds, which has consequences for the minimum interval. Add sweep time, if sweep time is set to values above 1 second.

To stop recording data, click on .

You can view your saved data by clicking *File->Load Data*. If you have saved more than one set of trace data the sets are displayed one after the other in the 2D display and in a waterfall or spectrogram manner in the 3D display. For further instructions on using the 3D representation please refer to Appendix B – “3D Data Representation”.

Special Measurement Mode

The Special Measurement function allows the user to create and execute user defined scripts in order to operate the FSH spectrum analyzer. The syntax of these scripts is based on the FSH-K1 command syntax - CMD, GET and SET with corresponding parameters - and has some additional commands described in Appendix C: Special Measurement Commands. Some examples are provided in subdirectory SpecialMeas of FSHRemote installation directory.

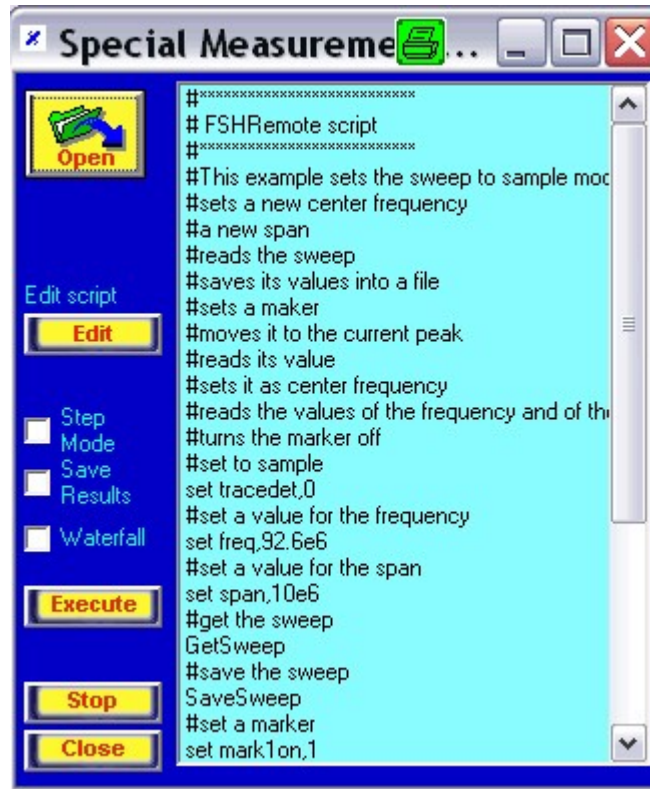


Fig 25 Special Measurement Window

Steps in order to create and use a script for a special measurement:

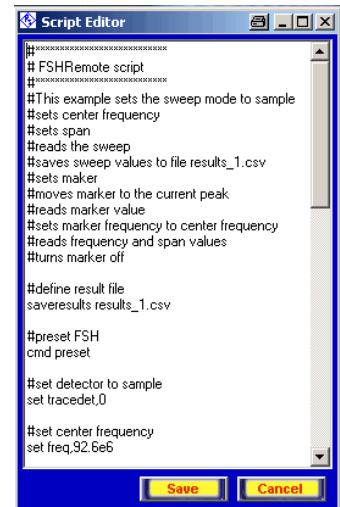
Click the "*Special Meas*" button in the lower right corner of FSHRemote



The *Special Measurement* dialog box opens

Select "*Open*" to open or create a new script file (in .txt format)

Click on "Edit" to edit the current script within the built-in text editor. Since the script files are stored as pure ASCII text, they may be edited with any other text editor as well (e.g. notepad.exe)



```
#FSHRemote script
#This example sets the sweep mode to sample
#sets center frequency
#sets span
#reads the sweep
#saves sweep values to file results_1.csv
#sets maker
#moves marker to the current peak
#reads marker value
#sets marker frequency to center frequency
#reads frequency and span values
#turns marker off

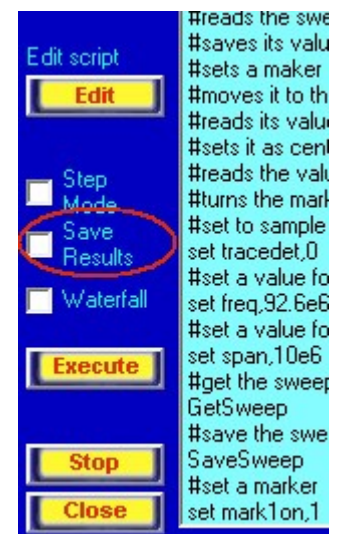
#define result file
saveresults results_1.csv

#preset FSH
cmd preset

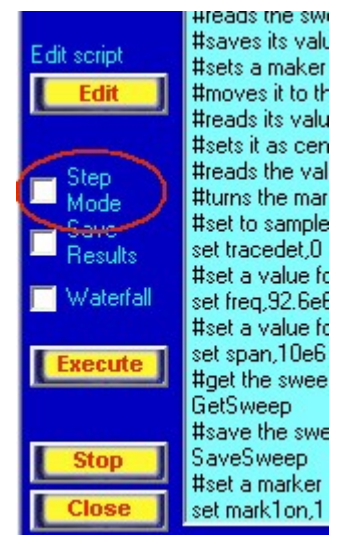
#set detector to sample
set tracedet,0

#set center frequency
set freq,92.6e6
```

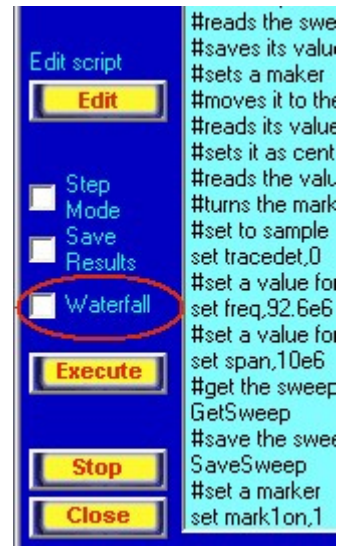
If you have not specified a file to save the measured data from FSH during the execution of the script, you can do it by marking the "Save Data" check box. Within the script you can also instruct FSHRemote to save the data into file by using the command: "saveresults <filename.csv>"



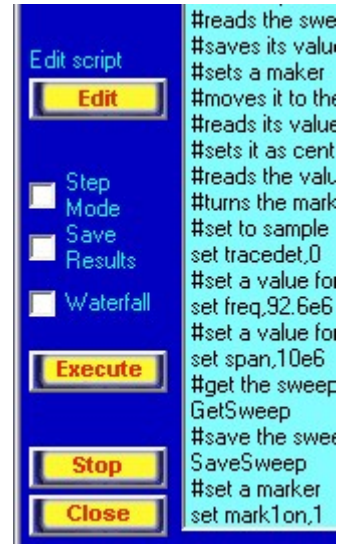
Activate *Step Mode* check box if you want to run the script step by step. Step mode can be activated during script execution by the command "stepmode". When in this mode the "Execute" button changes into a "Next" button, which allows you to execute the next command and jump to the line before the next one. It jumps over all the comment lines.



Activate *Waterfall* check box if you want to use the 3D representation and display the traces in a waterfall or spectrogram manner and not one by one.



Click "Execute" to run the script
Execution of the script can be stopped by clicking the "Stop" button
"Close" exits the special measurement mode



Note: *If the "Save Results" check box has not been activated and the script contains any commands which read data from FSH, you are prompted to specify a file. You can overrule this by adding a NOSAVE entry to the script file.*

Please see Appendix C: Special Measurement Commands for a detailed description of the available commands.

Sets of data recorded using the Special Measurement feature are saved into separate files which makes them faster to load and display in a loop from within a script using the "loadtrace" command than large sets of data recorded in a single file using *Menu->Record Data*. In order to slow down the process you can use the "pause <sec>" command in your script.

7 Additional Information

This application note and the associated program FSHRemote are updated from time to time. Please visit the website [1MA70](#) in order to download new versions. After installation, the latest program information can be found in the file *history.rtf* in the installation directory. You can access this file also from link *Programs/FSHRemote/History* from your *Start Programs* folder.

For general information about using the FSH and its features, see the FSH Operating Manual and the FSH-K1 (Remote Control) Operating Manual.

Please send any comments or suggestions about this application note to TM-Applications@rsd.rohde-schwarz.com.

Requests for support for your own programs for remote-controlling the FSH may also be sent to the above address.

Please note further, that a complete solution for spectrum monitoring is available from Rohde&Schwarz called R&S[®] ARGUS Spectrum Monitoring System. FSH is well suited for integration into ARGUS. For detailed information please refer to www.argus.rohde-schwarz.com or contact us via e-mail to argus@rohde-schwarz.com.

8 Ordering Information

Handheld Spectrum Analyzer

R&S [®] FSH3 with Preamplifier	100 kHz to 3 GHz	1145.5850.03
R&S [®] FSH3 with Tracking Generator	100 kHz to 3 GHz	1145.5850.13
R&S [®] FSH3 with Tracking Generator and Preamplifier	100 kHz to 3 GHz	1145.5850.23
R&S [®] FSH6 with Preamplifier	100 kHz to 6 GHz	1145.5850.06
R&S [®] FSH6 with Tracking Generator and Preamplifier	100 kHz to 6 GHz	1145.5850.26
R&S [®] FSH18	10 MHz to 18 GHz	1145.5850.18

Remote Control (required)

Remote Control R&S [®] FSH-K1	1157.3458.02
RS-232-C Interface Cable FSH-Z34	1145.5815.02
USB Interface Cable FSH-Z37	1300.7733.02

For additional information about the FSH, see the Rohde&Schwarz website www.rohde-schwarz.com. Use "FSH" as a search string.

9 Appendix A

The SETTINGS.INI File

The SETTINGS.INI file contains the commands to configure the modems and mobile phones used for the connection. Use any text editor to modify and extend the file.

SETTINGS.INI consists of a number of blocks. The first block, DEVICES, contains the names of the modems used; enter the names of your choice. The supplied example file includes two telephone modems and two mobile phones. The following blocks begin with the names of the example devices, and include the commands for the corresponding device.

```
[DEVICES]
INIT1=MODEM_CREATIVE_FSH      Modem at FSH, eg: Creative Labs
INIT2=MODEM_ELSA_FSH         Modem at FSH, eg: ELSA
INIT3=NOKIA6310_PC           Mobile phone at the PC eg: Nokia 6310,
INIT4=NOKIA6310_FSH          Mobile phone at the FSH eg:Nokia 6310,

[MODEM_CREATIVE_FSH]         commands for CREATIVE modem at FSH
INIT1=ATQ0
INIT2=AT&F
INIT3=ATS0=1
INIT4=AT&C0
INIT5=AT+IPR=19200
INIT6=ATQ1
INIT7=AT&W0

[MODEM_ELSA_FSH]             commands for ELSA modem at FSH
INIT1=ATQ0
INIT2=AT&F
INIT3=ATS0=1
INIT4=AT&C0
INIT5=AT%B=19200
INIT6=ATQ1
INIT7=AT&W0

[NOKIA6310_PC]                commands for Nokia 6310 at PC
INIT1=ATQ0
INIT2=AT+CGATT=1
INIT3=AT&W0

[NOKIA6310_FSH]              commands for Nokia 6310 at FSH
INIT1=ATQ0
INIT2=ATS0=1
INIT3=AT+CGATT=1
INIT4=AT+IPR=19200
INIT5=ATQ1
INIT6=AT&W0
```

To define a modem, add the name to the DEVICES block and add a block with the defined name containing the AT commands for the modem. Devices that are not required can be deleted.

The commands have the following meanings:

ATQ0 switches the output of the modem result codes on. ATQ1 switches the output of the modem result codes off.

ATS0=1 sets the modem to respond to an incoming call at the first ring tone

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AT&W0 saves the settings permanently in modem memory 0

AT+CGATT=1 switches a mobile phone into GPRS mode

AT+IPR=19200 or AT%B=19200 sets the baud rate for the modem at the FSH end to 19200 baud. This baud rate must also be set as the Serial Baud-Rate in the setup of the FSH itself.

Note: *The modem or mobile phone at the FSH must be configured using SETTINGS.INI prior to the first connection. At the PC end, the default values of modems can be used, mobile phones have to be configured as well.*

For further commands and information about the commands, please see the manual supplied with your modem or mobile phone.

Recommended Wiring for a Null Modem Adapter

The cables supplied with modems, mobile phones, and the FSH are normally intended for connecting the device to a PC. To connect the FSH to a modem or mobile phone, a null mode adapter is required to connect to the supplied cable. The diagram below shows the wiring required between two male plugs.

Note that all pins on both ends are connected, apart from pin 9.

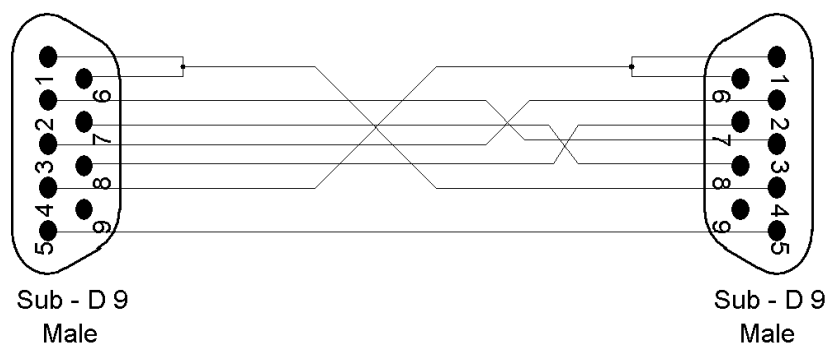


Fig 26 Wiring for a null modem adapter

The wiring can also consist of a null mode cable, connected to a gender changer to change the female plug into a male plug.

Recommended Wiring for a Buffer Amplifier

Some modems or mobile phones do not have enough power or the necessary level to power the FSH's optical RS-232-C cable. In such cases a buffer amplifier and 5V power supply is required.

The assembly of an amplifier corresponding to the diagram below makes no particularly special requirements and can be assembled on a normal experimental board or with a simple printed circuit board.

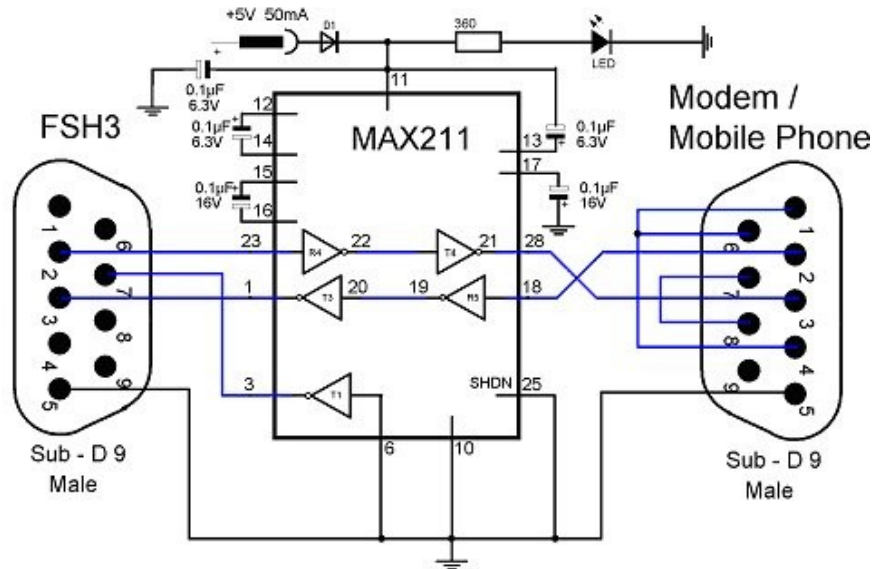


Fig 27 Wiring for a null modem adapter with a buffer amplifier

The connections from pins 1,4 and 6, or 7 and 8, from the modem support the data handshake without which many modems will not function correctly. The connection from pin 2 on the modem side to pin 3 on the FSH side transfers data from the modem to the FSH. The connection from pin 2 on the FSH side to pin 3 on the modem side transfers data from the FSH to the modem. The connection to pin 7 on the FSH side provides power for the optical RS-232-C serial cable.

Additional notes

Data telephone number:

Some mobile radio operators provide a separate telephone number for data communications as opposed to the 'normal' number for voice calls. Only the data telephone number supports the necessary high baud rate for remote control. A connection to a voice call number with a data rate of usually only 9600 baud will probably be too slow to operate the FSH successfully.

Baud rate for telephone modems:

The specified maximum modem baud rate usually only applies in the direction from the network to the PC or the connected terminal. In the other direction from the PC to the network, the majority of modems have a maximum data rate of 33,000 baud. This is too slow to set the FSH for a baud rate of 38,400, so the FSH must be set for a baud rate of 19,200. The modem on the FSH side must also be set to this speed using the SETTINGS.INI file.

Baud rate for mobile phone connections:

The majority of mobile phone networks are optimised for maximum data rates from the base station to the mobile phone, too. The direction from the mobile phone to the base station, as required when the FSH connected to a mobile phone sends data, is mostly notably slower.

Class 6 and class 10 GPRS mobile phones can in principle use two time slots to upload data, resulting in a maximum data rate to the base station of 28,800 baud. However, this data rate is still not enough to operate the FSH with a quicker baud rate than 19,200. UMTS networks will be the first to offer still higher data rates. In GPRS there is also an additional delay time in data transfer in both directions of about 0.5 seconds.

Error messages:

Error messages are generated when a function cannot run, or failed to complete.

Some FSH models do not support all functions. For example, if the tracking generator is not built in, an error message is generated if an attempt is made to switch on tracking. The error code of the error message is displayed; for details see "Acknowledge Response" in the FSH-K1 Operating Guide.

Internet connections and firewalls:

If the local area network of the PC with FSHRemote and/ or the local area network of the serial server providing the FSH with an IP address (if they are not directly connected to the internet) are hidden behind firewalls, certain settings to these firewalls may have to be made, to allow the access in both directions.

1. The serial server of FSHRemote is behind the firewall of its LAN: The firewall administrator has to open a port in the firewall and associate it with the service of the serial server so that it is visible from the outside world. Please note that opening ports in the firewall may present a threat to the network from outside attacks.
2. The PC with FSHRemote is behind the firewall of a LAN: In this case the administrator of the firewall has to allow this PC to access IPs outside the LAN's domain.

10 Appendix B: 3D Data Representation

FSHRemote allows you to view the trace data from the FSH instrument in three dimensional space in a waterfall or spectrogram display.

To activate the 3D representation mode, click on the “3D” button located in the lower right corner of the default display:

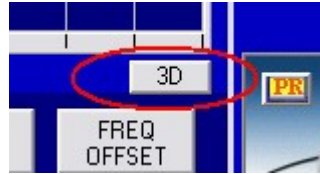


Fig 28 Button to activate the 3D representation

The following window appears:

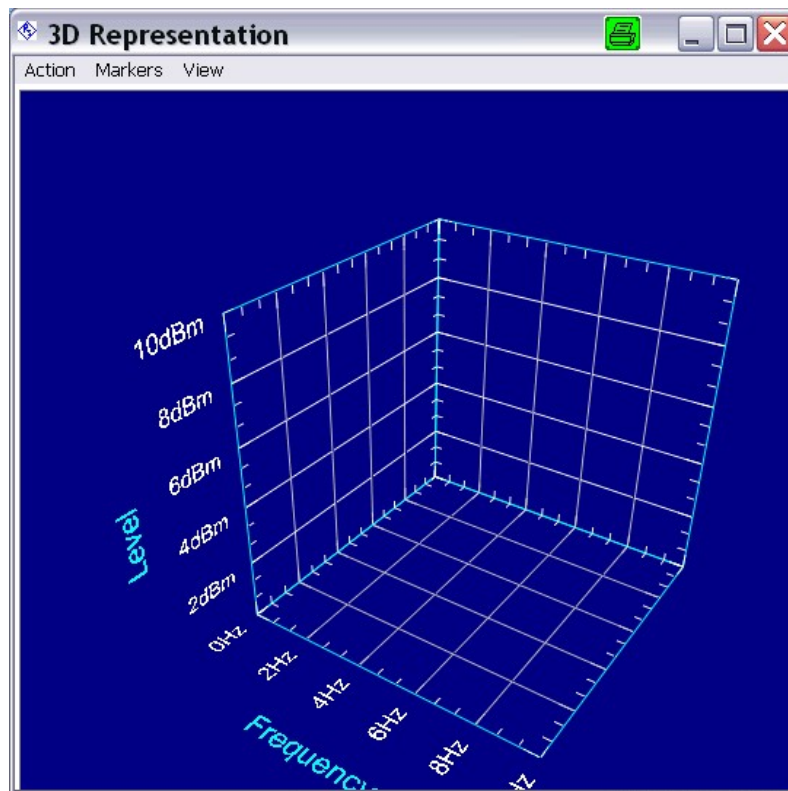



Fig 29 3D Representation window

Each trace displayed in the default display is also shown here.

There are three ways to obtain data sets for a waterfall/spectrogram view:

- using the the  button to display the trace of the FSH continuously
- load a file with more than one data set saved in it
- start a script with the *Waterfall* check box activated

The view of the graph can be adjusted with the *View* menu:

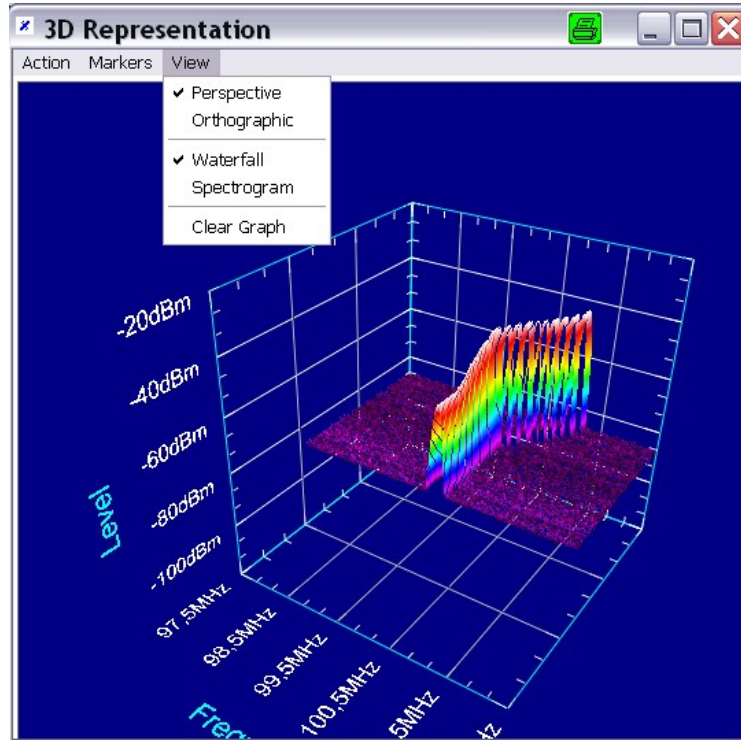


Fig 30 Perspective waterfall 3D representation in continuous display mode

The same view in orthographic projection:

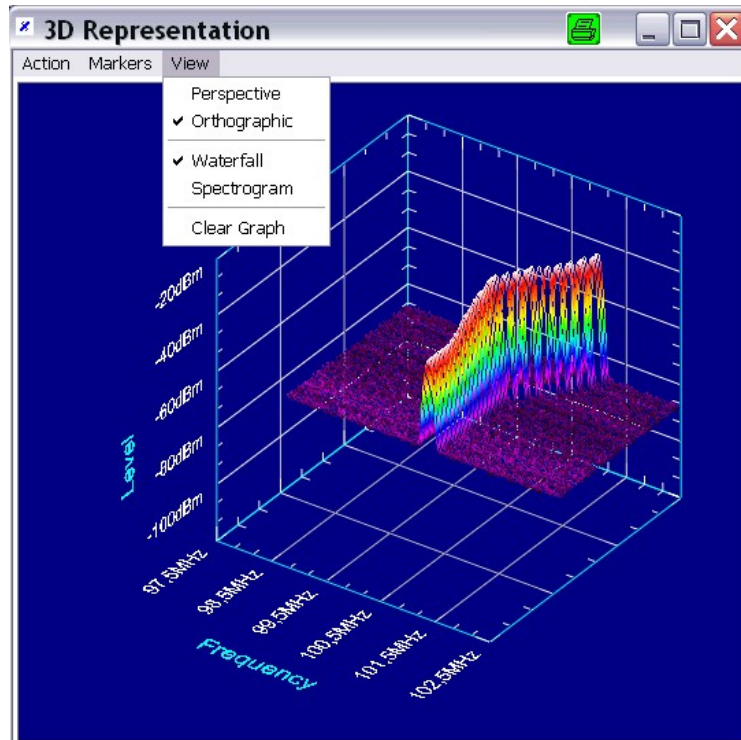


Fig 31 3D orthographic projection

And as a spectrogram:

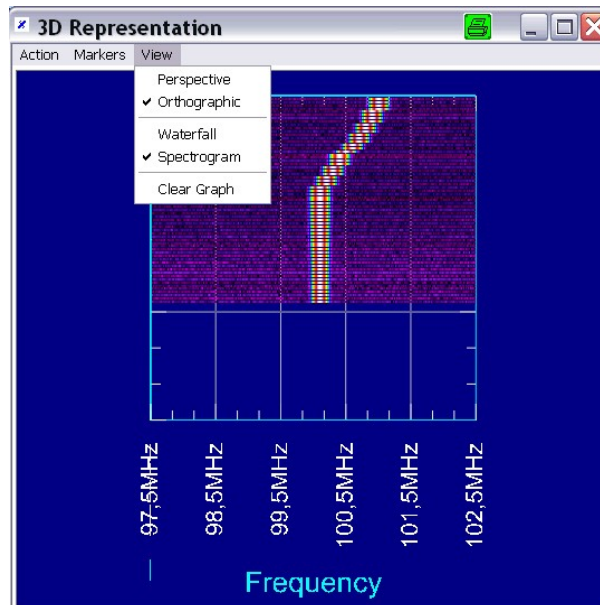


Fig 32 Spectrogram display

Note that you can also achieve these views by rotating, translating and zooming the graph using the mouse and keyboard.

Moving the 3D display

You can move the 3D Graph as you require for the view best meeting.

Rotate by holding the left mouse button anywhere within the area of the display. Now moving the mouse will rotate the graph.

To zoom in/out either use the mouse scroll button or hold down the "ALT" key on the keyboard while moving the mouse away from you to zoom out or towards you to zoom in.

Translating the graph in X, Y and Z directions is done by holding the "SHIFT" key on the keyboard and moving the mouse in the corresponding direction.

You can also move the displayed traces within the graph in the X, Y and Z directions by holding one of the X, Y or Z keys and moving the mouse.

Using markers

You can set an arbitrary number of markers on the displayed traces. To enter marker mode select from the *Action* menu:

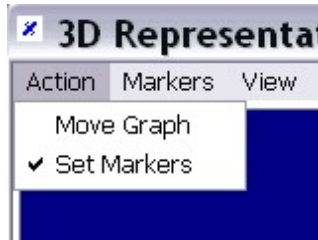


Fig 33 Using markers

To set a marker just click anywhere on one of the displayed traces. While moving the mouse cursor over the trace, the number of the current trace, and the level and frequency (or sweep time if in zero span) of the current point are continuously updated on the display:

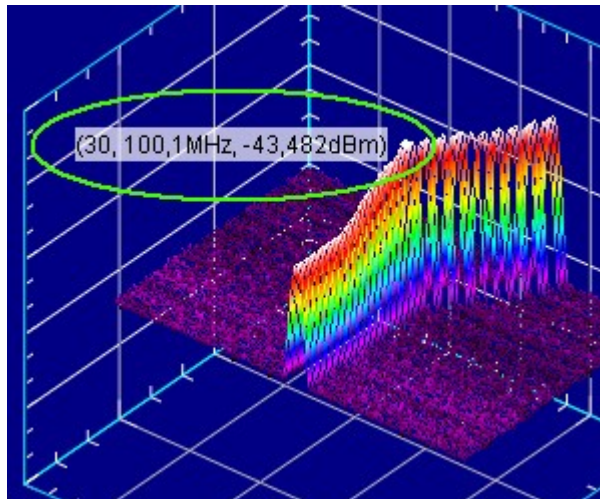


Fig 34 Set a marker

Once a marker is set a new one automatically pops up. If you don't want to set anymore markers click on the *Move Graph* command in the *Action* menu and the last marker, which has not been set yet disappears.

Note: *If you set a marker on a trace point of a trace which disappears after some time in the waterfall mode, the marker moves on to the point with the same frequency (sweep time) of the next trace indicating its new level and trace number.*

To delete the markers use *Markers->Delete Markers*

Simultaneous view

Using the *3D Representation* window you can display the data simultaneously in the default graph and in the 3D graph either in real time or as with saved data sets:

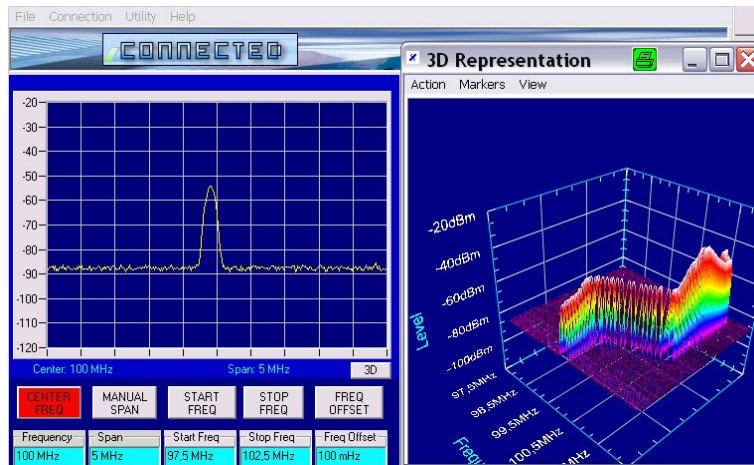


Fig 35 Simultaneous display

Note: To see an example of loading a set of saved data into the waterfall display of FSHRemote you can start the waterfall example (*waterFallLoad.txt*) which is located in the directory *SpecialMeas/waterfall_example*. This example loads a set of 270 files with saved traces. To do this first activate the 3D Display mode and then switch to the "Special Measurement" mode and open the file with the script. Clicking on "execute" will execute the script and load the data. You can also load files recorded using the Record Data feature.

11 Appendix C: Commands for Special Measurement Mode

The following commands are available for Special Measurement mode scripts. The commands can be written using upper or lower case letters.

CMD	CMD followed by a FSH-K1 command executes this command.
SET	SET followed by a FSH-K1 command executes this command.
GET	GET followed by a FSH-K1 command executes this command. All results obtained by get commands are saved to result file unless NOSAVE is specified.
GETSWEEP <i>n</i>	Waits until the sweep is completed and reads its values. Use "savesweep" command to save measured values. For external triggering, <i>n</i> specifies a timeout value in seconds. Range for <i>n</i> is from 0 to 357913 (appr. 99 hours). This command is equivalent to GET TRACE.
QUICKSWEEP	Same as GETSWEEP, but does not retrieve settings information from FSH. Thus faster readout of FSH is possible.
SAVESWEEP	Saves sweep values to a result file. Depending on detector mode 301 or 602 amplitude values and their corresponding frequency value is saved.
LOADTRACE <filename.csv /.dat>	Loads the saved trace from the selected file into FSHRemote. It can be used to load single traces or if called from within a loop - a waterfall display. Please have a look at the waterfall example in the SpecialMeas directory.
SAVESCREEN <filename.wmf>	Saves the current view of the default 2D graph to the specified file <filename.wmf>.
NOSAVE	If NOSAVE command is specified in the script file, you are not prompted to specify a results file and no results are written to file. This command is overruled by the Save Results checkbox and command "saveresults"

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PAUSE <i>n</i>	Suspends script execution for <i>n</i> seconds, <i>n</i> = 1 to 357913 (appr. 99 hours). If <i>n</i> is 0 or omitted, you are prompted to continue. Note that fractions of seconds are accepted too.
DO - LOOP <i>n</i>	Loops script execution <i>n</i> times for the block encapsulated by the do and loop instructions, <i>n</i> = 1 to 32767. <i>n</i> = -1 allows endless execution of the loop
WATERFALL ON/OFF	Switches on or off the waterfall display of traces in the 3D representation graph. (same as checking the Waterfall checkbox).
# <i><Script comments></i>	Any line starting with a #-sign is considered to be a script comment line and is not executed.
COMMENT <i><comment_text></i>	Saves <i>comment_text</i> as comment to result file. If <i>comment_text</i> contains " i ", the actual value of the loop counter is saved to file.
SAVERESULTS <i><resultfile.csv></i>	Saves results to file <i><resultfile.csv></i> (same as checking Save Results checkbox).
STEPMODE	Switches on step mode during script execution (same as checking Step Mode checkbox). The script is executed step by step by clicking the Next button. Once this command is executed, stepmode remains on. Stepmode can be switched off by unchecking Step Mode checkbox. The rest of the script will be executed in normal mode then.
SCANSTART <i>frequency [HZ]</i>	Set a frequency to start a scan from. (See the FrequencyScan.txt example script)
SCANSTEP <i>frequency [HZ]</i>	Set a step for the frequency incrementation. (See the FrequencyScan.txt example script)
SCANSTOP <i>frequency [HZ]</i>	Sets a stop frequency for a scan.
SCANLVLUPPL <i>n [dB]</i>	Set an upper limit for the level (levels above this value are recorded) – Receiver Mode. (See the FrequencyScan.txt example script)
SCANLVLLOWL <i>n [dB]</i>	Set a lower limit for the level (levels below this value are recorded) – Receiver Mode. (See the FrequencyScan.txt example script)

AUTORECALL <dataset name>	Sets a dataset domain to recall instrument settings from. Please have a look at the "GenerateDataSetNamesAndFileNames.txt" script
AUTOLOAD <filename>	sets a file mask to load displays from. Please have a look at the "autoLoadTracesExample.txt" script

Please note that the commands SCANSTART, SCANSTEP and SCANSTOP are designed to work together and the script will loop between the ScanStep and ScanStop statements. If needed you can also insert other statements within this loop e.g.:

```
#*****  
# FSHRemote script  
#*****  
ScanStart 100e6  
  
ScanStep 10e4  
  
Get freq  
  
Get span  
  
Scanstop 107e6
```

For further instructions please have a look at the frequencyScan.txt script

Additional explanations can be found in the special measurement examples, provided in the subdirectory *SpecialMeas* of the FSHRemote installation directory.

Note: *The SAVERESULTS command has been designed to accept filenames either with a normal file name or with a "*" in them and thus generate a new file name using the current value of the index of a do loop.*

Example:

```
SaveResults myRes_*.csv  
Do  
    getsweep  
    savesweep  
    get freq  
    get span  
Loop 3
```

Will generate the following files:

myRes_1.csv, myRes_2.csv, myRes_3.csv for the three sweeps and a myRes_VALUES.csv for the values of the frequency and the span.

File Format of Script Files:

The scripts are saved as pure ASCII text files. Besides the built in script editor of FSHRemote you can use any text editor such as notepad.exe to edit the files. Upper and lower case letters may be used. Be sure to save the script files as pure text files if you use other text processing programs such as Microsoft® Word or similar.

File Format of Result Files:

Results are saved in a file format, which can be read directly from Microsoft® Excel. The saved values are separated by a semicolon ";". If the file extension was specified as .csv, the file can be directly processed by Microsoft® Excel. The results are saved in the directory of the script file, this is the subdirectory SpecialMeas of the FSHRemote installation directory by default.

The following script file EXAMPLE_3.TXT was used to demonstrate the result file format

```
#*****  
# FSHRemote script  
#*****  
cmd preset  
saveresults results.csv  
comment NewMeasurement  
set freq,98.5e6  
set span,20e6  
set marklon,1  
get mark1  
comment StartLoop  
do  
  pause 2  
  comment i Next Peak  
  cmd marknxtpk  
  get mark1  
  loop 3  
  cmd local  
#end
```

The results file RESULTS.CSV obtained with this script example looks like this:

```
29.08.2004; 09:28:48,215; <comment____>; NEWMEASUREMENT  
29.08.2004; 09:28:49,078; <get mark1____>; 98500000; -49,17  
29.08.2004; 09:28:49,086; <comment____>; STARTLOOP  
29.08.2004; 09:28:51,102; <loopcount____>; 1; NEXT PEAK  
29.08.2004; 09:28:51,359; <get mark1____>; 102300000; -52,7  
29.08.2004; 09:28:53,383; <loopcount____>; 2; NEXT PEAK  
29.08.2004; 09:28:53,625; <get mark1____>; 105766670; -54,07  
29.08.2004; 09:28:55,637; <loopcount____>; 3; NEXT PEAK  
29.08.2004; 09:28:55,887; <get mark1____>; 97633330; -55,74
```

Every result is preceded by date and time, when the result has been measured, followed by the command and the result. Since the command in this example was GET MARK1, the result contains the frequency and the measured level of the FSH Marker.

Note: Results are appended to file RESULTS.CSV. Repeated execution of a script file results in increase of length of this file. Change file name in order to avoid this before running the script again. Time resolution is 0.001 s, but this is not very exact due to Microsoft® Windows limitations. Use user defined format hh:mm:ss,000 in Microsoft® Excel for calculations.

Note: Files with trace data generated by appending several measurements cannot be loaded into the FSHView software. They work only in FSHRemote.

Latest information on Special Measurement Mode can be found in the file *history.rtf* which is located in the installation directory. You can access this file also from link Programs/FSHRemote/History from the Start Programs folder of your PC.

12 Appendix D: Troubleshooting

The FSHSim Diagnostics program

In order to locate and fix a problem preventing normal communication between FSHRemote and the FSH spectrum analyzer, you can replace the FSH by a computer running the FSHSim diagnostics program.

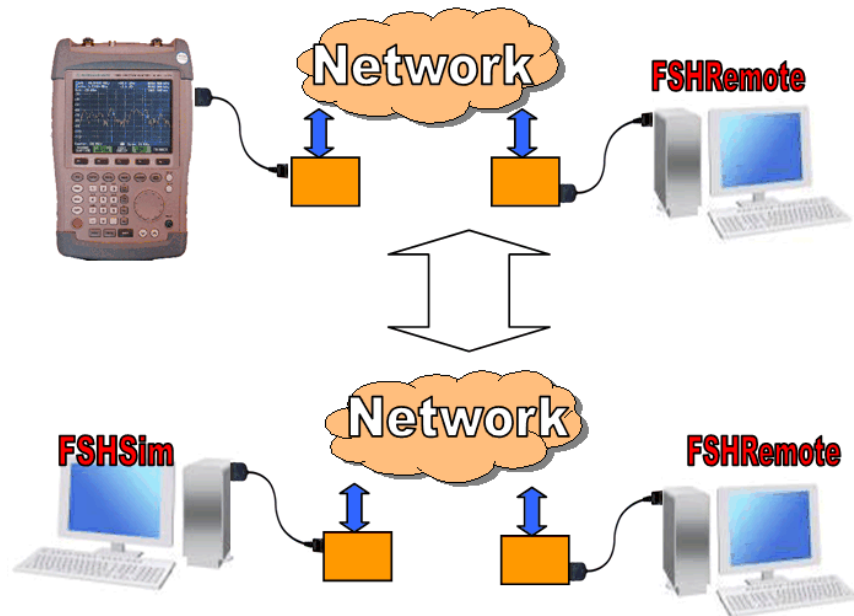


Fig 36 Replacing FSH spectrum analyzer by a computer running FSHSim

FSHSim is a tool integrated within FSHRemote and has two main purposes:

1. It simulates the behaviour of an FSH spectrum analyzer during the initial connection process. It connects to a port, listens to it and then replies as a FSH spectrum analyzer to the queries sent to it by FSHRemote:
2. It also configures the modems and offers suggestions for remedying problems in modem communications.

Note: *If you connect a PC instead of an FSH spectrum analyzer to a modem, the null modem (cross link) cable no longer needs to be used. In this instance, use a direct cable.*

Starting FSHSim

There are two ways to start FSHSim:

1. By selecting *Utility -> Start FSHSim*



Fig 37 Starting FSHSim

2. From the Programs menu by clicking on its icon:

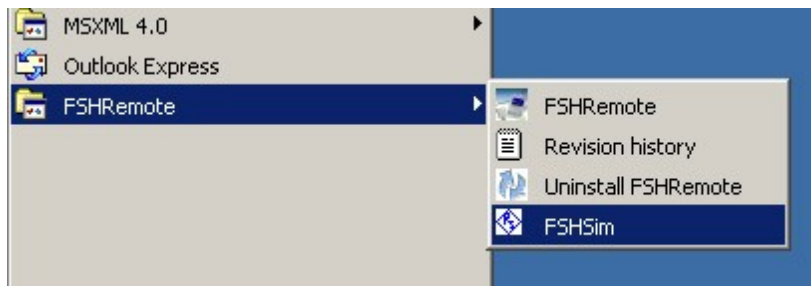


Fig 38 Starting FSHSim 2

Once FSHSim has been started its main window is displayed on the screen:

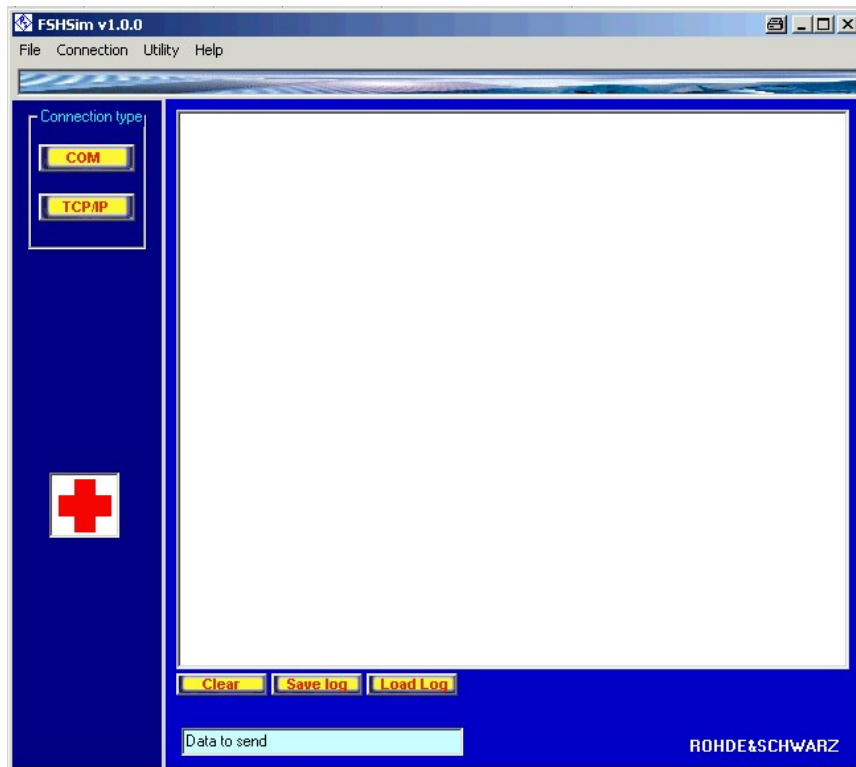


Fig 39 FSHSim Main Window

Connecting FSHSim

There are two types of ports to which you can connect FSHSim, according to the two main types of connections you can establish with FSHRemote. You can connect the program to a COM port or to a TCP/IP port. Use either the *Connection* menu or the quick buttons *COM* and *TCP/IP* on the upper left side of the main window.

FSHSim for COM port connections

Replace the FSH spectrum analyzer by a PC running FSHSim as shown below, and connect this PC to the remote modem:

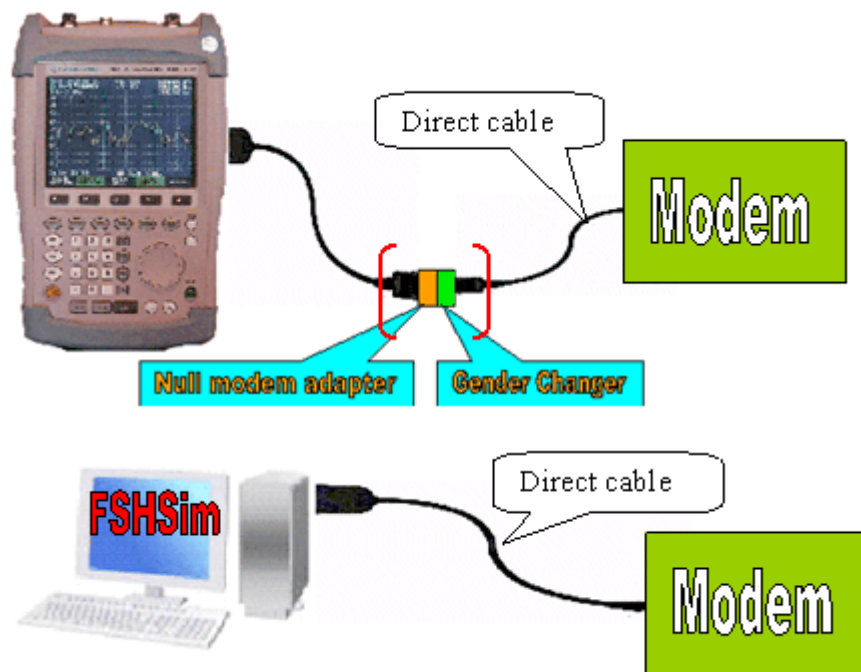


Fig 40 PC with FSHSim instead of a FSH

Note: Please use only a direct cable without Null modem adapter to connect modem and PC

Connecting to a COM port:

If the COM connection is selected the following dialog box is displayed:

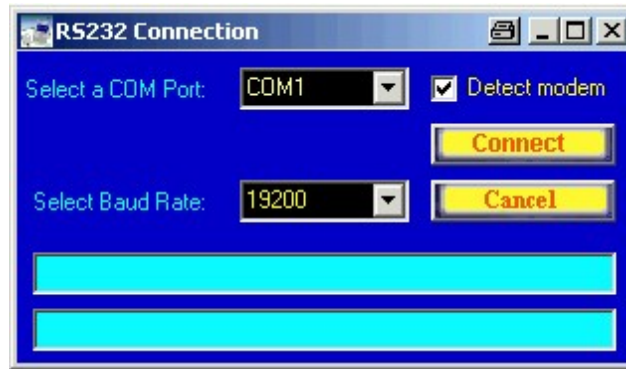


Fig 41 Connecting FSHSim to a COM port

FSHSim can automatically detect a modem when it connects to the selected COM port. Check the option “*Detect Modem*” in the dialog box. If no modem is detected or the modem does not answer the query, an error message and a dialog box are displayed asking whether you want to reset the modem to its factory settings. Resetting is sometimes helpful as a previously made setting may prevent the modem from returning any answers to the queries. After pressing the *Connect* button, FSHSim issues a reset command. If this is also not successful, a list of possible reasons and suggestions for solving the problem will be displayed. The connection with the specified COM port is nevertheless activated, and you can send and receive any data through it.

When the “*Detect modem*” option has been selected, the following dialog box is displayed after connecting:

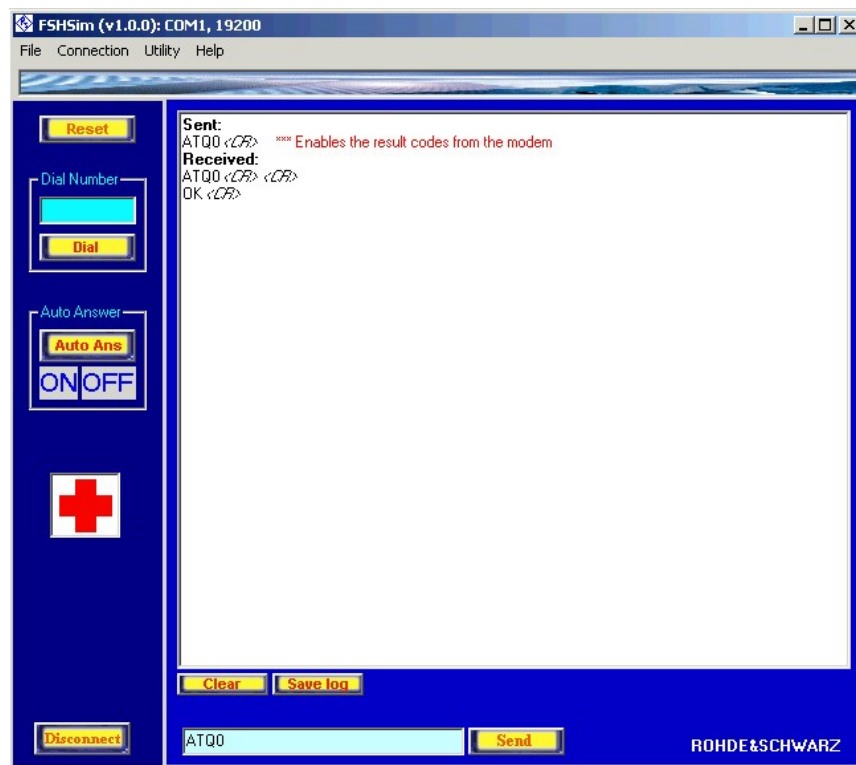


Fig 42 COM Port Connection

If the “*Detect modem*” option has not been selected then no initialization commands are sent to the COM port and the main text box of FSHSim remains empty.

Following reasons could prevent the computer from communicating with the modem:

1. Improper physical connection (data cables not plugged in, etc.)
2. Power supply not plugged into receptacle and modem therefore not powered up

It is very unlikely that the modem itself is faulty, however this may occur. Checking modem operation is fairly simple when the modem is an external device. Generally, if the modem has failed its self tests on power-up, the front panel lights will indicate a problem. For example, if the MR (modem ready) light does not come on, the modem may have a problem. Or if the HS light (external Smartmodem and V-series System Products) does not come on, the modem may be incorrectly configured. Please check your modem manual for further information.

Sometimes a modem failure may be caused by a power surge; an incompatible component in the communication link; an improper connection; or simply a device that is not plugged in or turned on. Before initiating the tests described in this chapter, re-examine the communications equipment to make sure none of the above conditions is causing the problem.

Verifying the PC (DTE)-to-modem connection

The first interface to verify is the one between the DTE and the modem. This involves the cable, the modem, and the DTE.

1. Connect FSHSim to the COM port where the modem is connected to with the correct baud rate and the “*Detect modem*” option selected. An initialization command is sent to the modem and an answer is displayed. If successful, proceed with the following steps. Otherwise read the explanations on the screen.
2. Press the *Reset* in FSHSim button in order to reset the modem to its factory settings (a command AT&F is sent to the modem).

Verifying the connection of the modem to the telephone line

Once you are certain that the modem is receiving and responding to commands from the DTE, you can verify the modem’s dialing capabilities by attempting a call. This will also test the telephone lines.

1. Try to dial an existing telephone number (preferable of a phone in the same room or an available mobile phone) by entering the number in the Dial Number text box and click the *Dial* button.



Fig 43 Dial Number

If your modem does not detect the dial tone FSHSim changes the modem settings automatically and dials the number again.

If you hear your modem dialing, but you cannot hear a dial tone, then there is no connection between the modem and the telephone line. After some seconds "NO CARRIER" will be displayed.

2. If you hear the phone on the other end ringing, then the remote phone is responding properly. Press the **Cancel** button to hang up.
3. You can check the modem's answering capabilities by dialing its phone number from another telephone or from another modem. If the modem receives a call the following should be displayed in the main text box of FSHSim:

Received:

<CR>

RING<CR>

4. Try dialing to another modem to see if you can make a connection. A connection is indicated by two whistling sounds of different tones (the carriers), followed by a hissing sound. The modem should respond with a CONNECT XXXXX result code.

When connected you can use the *Send* button and its text box to send data to the remote modem or to the local one if not connected. The results are displayed in the main text box.



Fig 44 Send data manually

Once these steps have been completed, both modems should be functioning correctly. If no errors have occurred within these steps, you can use the *Utility* -> *Set Device* dialog box in the same way as in FSHRemote to configure the modem and try to establish a modem to modem connection between the PC running FSHRemote and the PC running FSHSim. In order to do this proceed with the following steps:

1. Configure one of the two modems with the *Set Device* dialog box as if it is connected to a FSH spectrum analyzer, and reset the settings of the other modem.
2. Connect the first modem with the PC running FSHSim and the second modem to the PC running FSHRemote.
3. Connect FSHSim to the COM port of the modem.
4. On the PC running FSHRemote select *Connection* -> *Modem to modem connection* and connect as described in the "Connecting the PC, FSH and Modems / Serial Server (LAN-RS232 Converter)" section.

If the connection is successful, FSHRemote displays an artificial sweep on its screen transmitted by FSHSim. The FSHSim screen displays the log of the communication in its main text box allowing you to trace the queries and the responses during the initialization. In this way, certain problems such as inconsistencies in the baud rate can easily be uncovered. If an error occurs FSHSim offers an explanation for the cause and a possible solution.

FSH Remote Control

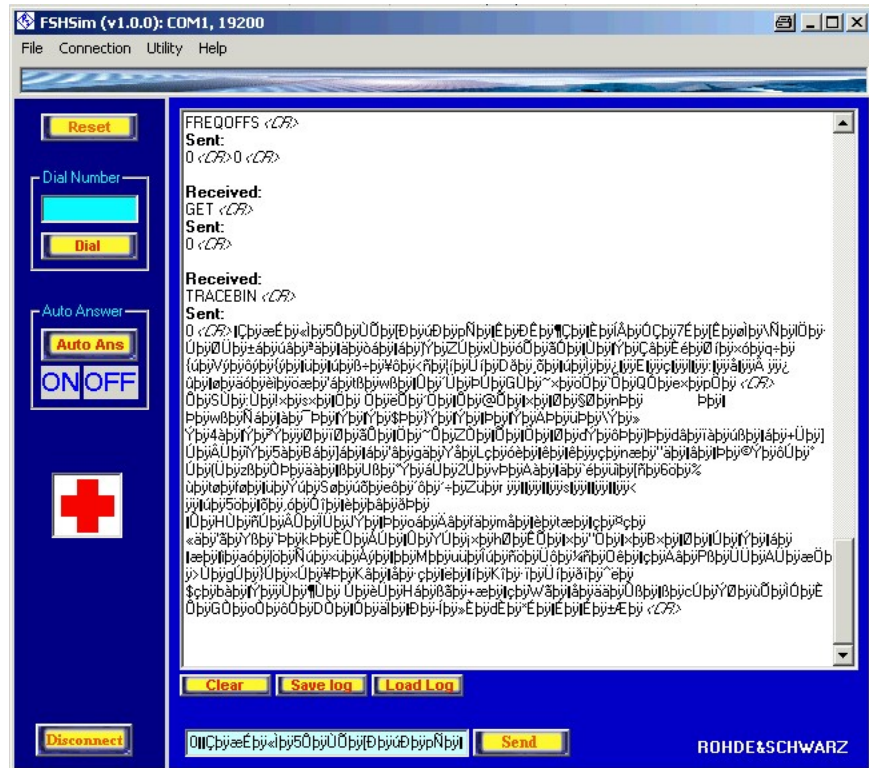


Fig 45 The display after a successful connection

You are now ready to reconnect the FSH to the modem instead of the PC running FSHSim. If you still receive the error message “No FSH found at the specified address” with no other explanations from FSHRemote or FSHSim, and despite a successful modem to modem connection, the problem is likely to stem from the connection between the modem and the PC running FSHSim. Please recheck the cabling, especially whether you really have a crosslink cable between modem and FSH.

Sometimes the signal levels from and to the modem are not high enough to drive the FSH, especially some modems cannot supply the power for the electronic in the optical RS232 cable. You can measure this with an oscilloscope, the signal levels should be higher than 5 volts. In this case please use the buffer amplifier described in Appendix A, "Recommended Wiring for a Buffer Amplifier" for modem to FSH connection.

If the connection has been successful, you are ready to test it using a FSH spectrum analyzer:

1. Reconfigure the modem in order to be able to connect to an FSH using the *Utility->Set Device* dialog box.
2. Connect the FSH to the modem, instead of the PC, using a cable with opposite wiring (e.g. by adding an additional null modem adapter).
3. Start FSHRemote on the other PC and use the *Connection* menu as previously described to connect.

Using FSHSim for TCP/IP port connections

If you want to test the network connection for a TCP/IP communication between FSHRemote and a FSH spectrum analyzer, proceed with the following steps (explained in detail in following sections):

1. Connect the computer running FSHSim directly to the network.
2. Connect FSHSim to a TCP port on the computer to act as a listener.
3. Test the connection between FSHRemote and FSHSim.
4. Add a serial server (LAN-RS232 converter) between the computer running FSHSim and the network and connect FSHSim to the COM port of the serial server.

FSHSim with a direct connection to the network:

Connect the PC running FSHSim, which acts as an FSH spectrum analyzer, directly to the network without using a serial server:

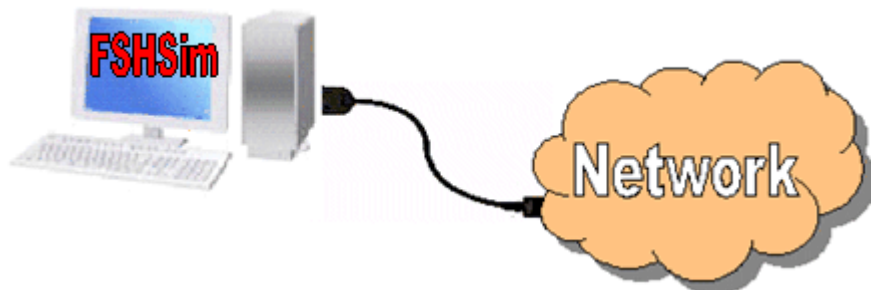


Fig 46 Direct connection to the network

1. Start FSHSim, select the *TCP/IP* button and type in the port (in the displayed dialog box as described in the "Connecting FSHSim" section) through which you want to listen.

The following dialog box is displayed after selecting the TCP/IP connection:

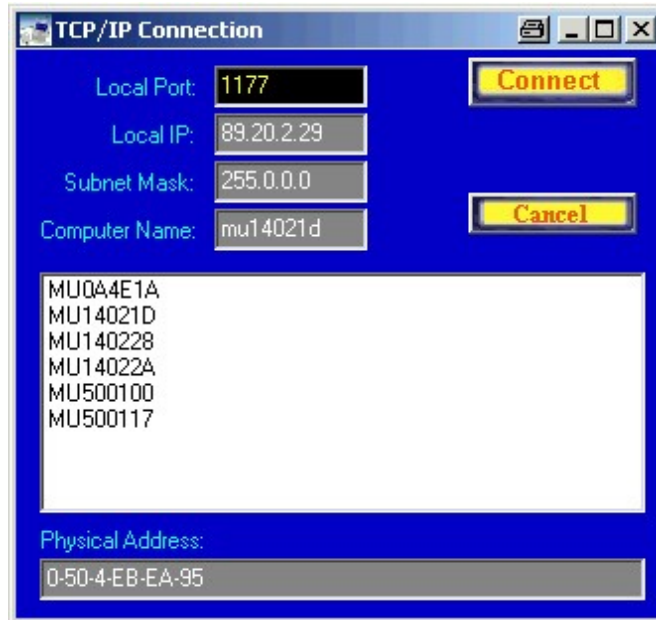


Fig 47 Computers seen by TCP/IP connection

It displays the current network settings of the PC and a list of other workstations connected to the same network and subnetwork.

Please note that when you select this type of connection, in order to listen for a TCP/IP connection you are only asked to specify a TCP port and no IP address. This is because FSHSim uses the IP address allocated to the PC. Should the list remain empty then no other stations are connected to the network, they are not visible or the settings are incorrect. (e.g. the subnet mask does not correspond to the current network). Note that if you wish to connect to FSHSim via TCP/IP from the same LAN the other computer has to be visible in this list.

2. Connect a PC running FSHRemote to a PC running FSHSim using the port and IP address of the PC running FSHSim. If this is unsuccessful, then there is no connection between the two PCs. Please refer to the section "TCP/IP connection with a serial server (LAN-RS232 converter) and a network connection".

FSHSim for a TCP/IP connection with a serial sever (LAN-RS232 converter):

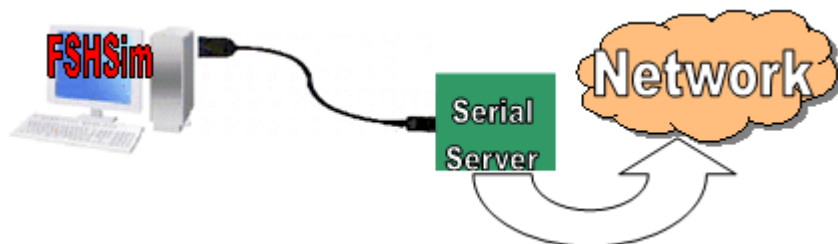


Fig 48 Connecting FSHSim to the network via a serial server

In order to verify that the serial server has been properly configured and communicates with the network, connect the PC to the COM port of the serial server as shown in fig 29. Make sure your serial server is configured properly and visible in the network as described in the section: "TCP/IP connection with a serial server (LAN-RS232 converter) and a network connection" (see page 11 of this application note). Then click on the *COM* button on the upper left side of the FSHSim main window and select the COM port of the PC and the baud rate for the connection (do not select the "*Detect Modem*" option). FSHSim then listens for data through the port and answers if the correct queries have been made (i.e. FSH K1 remote control commands). You can now run FSHRemote on a PC connected to the same network as the serial server (LAN-RS232 converter) and establish a TCP/IP connection as described in the section "TCP/IP connection with a serial server (LAN-RS232 converter) and a network connection". If the serial server has been properly configured the connection between FSHRemote and FSHSim should be successful.

If not, check following items:

1. IP/Port Connection: FSHRemote is not connected to the right IP/Port of the serial server – please refer to section "Configuring the communication devices".
2. The cable between the PC and the serial server: try using a null modem adapter or replace it in case it is faulty.
3. The baud rate setting in the serial server is not the same as in FSHSim (the FSH spectrum analyzer respectively). This will be detected and reported by FSHSim. In this case, change the setting of the baud rate and then try connecting again. The network settings of the serial server and of the PC running FSHRemote need not to be changed.

After a successful TCP/IP connection between FSHRemote and FSHSim has been established, you are ready to test the connection with the FSH spectrum analyzer again. Proceed with the following steps:

1. Connect the FSH to the serial server again, using an appropriate cable.
2. Start FSHRemote on the other PC and use the *Connection* menu as previously described to connect.

Additional Notes

FSHSim allows easy tracing of the communications between FSHSim and FSHRemote. Each received command and its response are displayed in detail with some additional comments. You can save this log into an *.rtf* (Rich Text Format) file and load these log files back into the text box by using the *File->Save log* and *File->Load log* menus or the quick buttons underneath the text box:

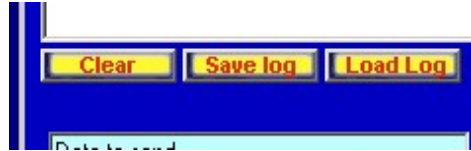


Fig 49 Log buttons

The *Clear* button clears the contents of the main text box.

To disconnect FSHSim and FSHRemote, use the button on lower left corner of FSHSim or *Connection->Disconnect*.

13 Appendix E: Optical USB Interface Cable FSH-Z37

The driver, which comes with the Optical USB interface cable FSH-Z37, emulates a COM interface. Check the number of this COM interface as described in the installation manual and use this COMx in FSHRemote for the direct connection of FSH to your PC.

Different to RS-232, an USB interface is highly unsymmetrical. With USB, there are master devices and slaves. USB masters are built into computers, all peripheral devices such as printers and the optical interface cable FSH-Z37 are slaves. Unfortunately all mobile phones and modems are slaves too. This means, these devices may only be connected to a computer, containing a USB master controller. A direct connection of FSH to a mobile phone or a modem as with RS-232, is not possible with USB. If your application needs the direct connection of FSH to a modem or mobile phone, please use RS-232-C interface cable FSH-Z34, order number 1145.5815.02, which may be ordered separately from your Rohde&Schwarz representative.



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