

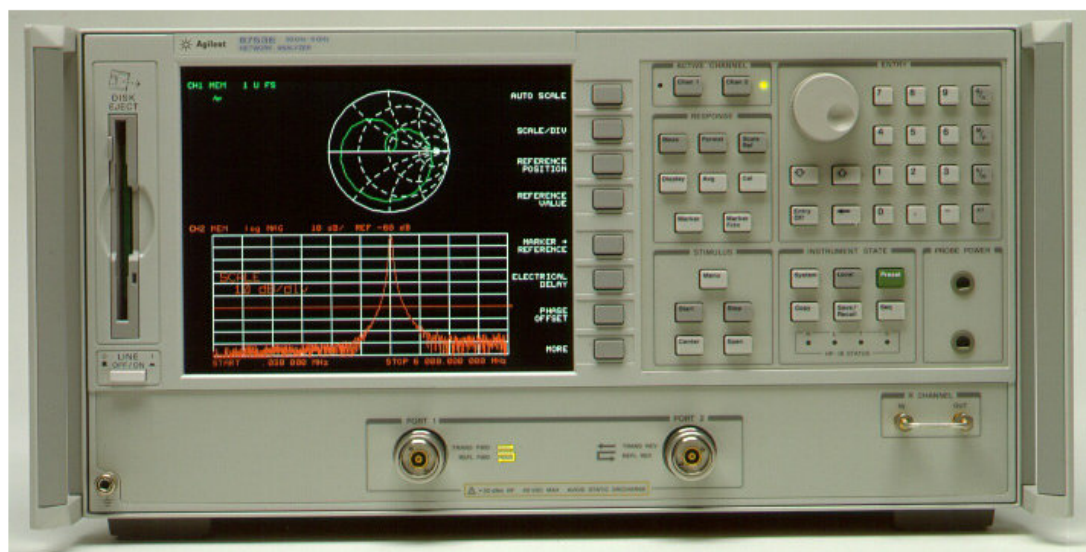


VNA1

BoardNumber = 0, Device Number =8

HOW TO CALIBRATE AND SAVE DATA

DEVICE HP8753E (30 kHz – 6 GHz)



FRONT PANEL --- CALIBRATION kit 85032B type N



THE BUTTONS TO BE PRESSED ARE IN BOLD

Before starting the calibration, you have to set:

FREQUENCY BAND: **STIMULUS** -> **START** F_{min} – **STOP** F_{max}

NUMBER OF POINTS: **STIMULUS** -> **MENU** -> **NUMBER OF POINTS** -> **1601**
x1

FILTER IF AVERAGE: **RESPONSE** -> **AVG** -> **IF BAND** -> **3 kHz**

To start calibrating: **RESPONSE** -> **CAL**

Check that the selected calibration kit is the right one:

CAL-KIT -> **SELECT CAL-KIT**-> **85032B (N 50 Ω)**

CAL -> **CALIBRATE** -> **MENU**

FULL 2-PORT

Connect the kit loads to port 1 and 2 of the VNA and start the measurement.

!! THE SEX INDICATED ON THE DEVICE IS THE ONE OF THE CABLE !!

THE PERFORMED MEASUREMENTS ARE UNDERLINED ON THE SCREEN

FORWARD and REVERSE port are signed on the device

REFLECTION FORWARD (OPEN, SHORT, LOAD)

REFLECTION REVERSE (OPEN, SHORT, LOAD)

TRANSMISSION (insert transition F/F) **DO BOTH FWD+REF**

ISOLATION **OMIT**

At the end, press the button: **Done 2 Port Cal**

Calibration has to be saved in one of the 31 available registers.

INSTRUMENT/STATE -> **SAVE/RECALL** (save type, points, data)

CALIBRATION CHECK

To check that the calibration you have done is correct, you can measure the $|S_{11}|$ and $|S_{21}|$ (in dB) of the last element inserted in calibration (transition F/F).

RESPONSE -> MEAS; **RESPONSE -> SCALE/REF**

Typically, you must find: $|S_{11}| < -50$ dB and $|S_{21}| \cong 0$ dB in the whole band.
Plot S_{21} , phase included. **(REPORT)**.

You can expand the scale using the function **SCALE -> AUTOSCALE**

Then you can visualize the scattering parameter S_{11} on Smith Chart.

RESPONSE -> MEAS -> S11; **RESPONSE -> FORMAT -> SMITH CHART**

The transition F/F will give place to a point in the origin. **(REPORT)**.

As a further verification, you should measure S_{11} on Smith Chart, leaving port 1 open. How does the open port act? **(REPORT)**.

SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2019) in a "TempData" folder.

Select the file: **DataAcquisition9.m**

Open the file and delete the comment (%) to the VA device number you used (**VNA1 BoardNumber = 0, DeviceNumber = 8**), and to the correspondent dataStruct command.

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder (presumably TempData) with the name 'NewName' you have to type: **save('NewName','dataStruct')**.

To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.

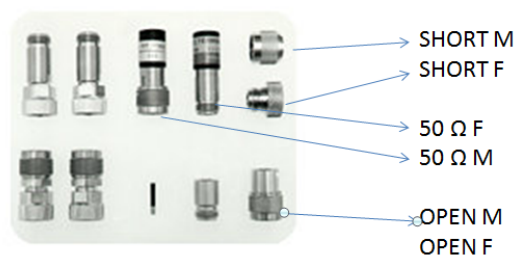


VNA2

BoardNumber = 0, Device Number =16

HOW TO CALIBRATE AND SAVE DATA

STRUMENTO HP8753C (300 kHz – 3 GHz) (3 MHz – 6 GHz)



CALIBRATION kit 85032F type N



THE BUTTONS TO BE PRESSED ARE IN BOLD

Before starting the calibration, you have to set:

FREQUENCY BAND: **STIMULUS** -> **START Fmin – STOP Fmax**

NUMBER OF POINTS: **STIMULUS** -> **MENU** -> **NUMBER OF POINTS** -> **801 x1**

FILTER IF AVERAGE: **RESPONSE** -> **AVG** -> **IF BW** -> **3 kHz**

To start calibrating: **RESPONSE** -> **CAL**

Check that the selected calibration kit is the right one

CAL-KIT (N 50 Ω) -> N 50 Ω

CAL -> CALIBRATE -> MENU

FULL 2-PORT

Connect the kit loads to port 1 and 2 of the VNA and start the measurement.

!! THE SEX INDICATED ON THE DEVICE IS THE ONE OF THE CABLE !!

THE PERFORMED MEASUREMENTS ARE UNDERLINED ON THE SCREEN

FORWARD and REVERSE port are indicated on the device

REFLECTION FORWARD (OPEN, SHORT, LOAD)

REFLECTION REVERSE (OPEN, SHORT, LOAD)

TRANSMISSION (insert transition F/F) (4 measurements)

ISOLATION OMIT

At the end, press the button: **Done 2 Port Cal**

Calibration has to be saved in one of the 5 available registers.

INSTRUMENT/STATE -> SAVE/RECALL (save type, points, data)



CALIBRATION CHECK

To check that the calibration you have done is correct, you can measure the $|S_{11}|$ and $|S_{21}|$ (in dB) of the last element inserted in calibration (transition F/F).

RESPONSE -> MEAS->S11 Refl->FWD; RESPONSE->MEAS->S21 Trans -> FWD

Typically, you must find: $|S_{11}| < -50$ dB and $|S_{21}| \cong 0$ dB in the whole band. Plot S21, phase included. **(REPORT)**.

You can expand the scale using the function **SCALE -> AUTOSCALE**

Then you can visualize the scattering parameter S11 on Smith Chart.

RESPONSE -> MEAS ->S11; RESPONSE -> FORMAT ->SMITH CHART

The transition F/F will give place to a point in the origin. **(REPORT)**.

As a further verification, you should measure S11 on Smith Chart, leaving port 1 open. How does the open port act? **(REPORT)**.

SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2019) in a "TempData" folder.

Select the file: **DataAcquisition9.m**

Open the file and delete the comment (%) to the VA device number you used. **(VNA2 BoardNumber = 0, DeviceNumber = 10)**, and to the correspondent `dataStruct = command`.

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called `dataStruct`.

To save measurements in the current folder (presumably TempData) with the name 'NewName' you have to type: **`save('NewName','dataStruct')`**.

To re-load data in MATLAB Workspace, you have to type: **`load ('NewName')`**

The `dataStruct` can be saved in a file .mat also from the Workspace variables list, right-clicking on the `dataStruct` variable.

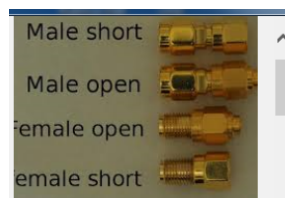
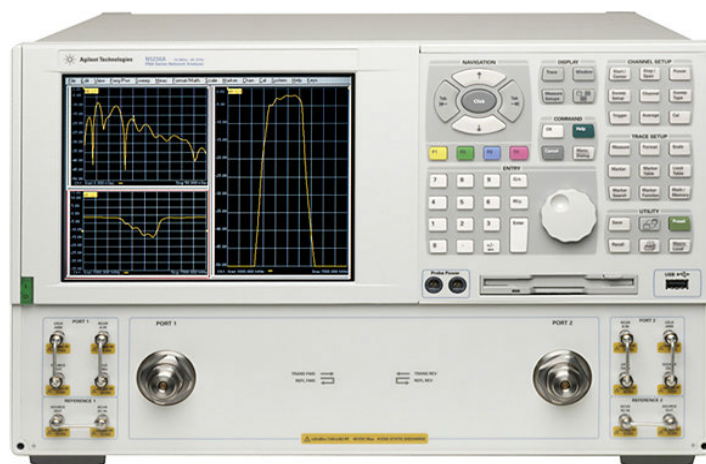


PNA

BoardNumber = 0, Device Number =16

HOW TO CALIBRATE AND SAVE DATA

N5230A (10 MHz – 20 GHz)



MANUAL CALIBRATION kit: 85052D type 3.5 mm

ELECTRONIC: E-CAL N4691-60006 type 3.5 mm



Before starting the calibration, you have to set:

FREQUENCY BAND: **Channel** -> Start/Stop -> Start Fmin – Stop Fmax

NUMBER OF POINTS: **Sweep** -> Number of Points -> 1601

FILTER IF **Sweep** -> IF Bandwidth -> 3 kHz

MANUAL CALIBRATION

Calibration -> Calibration Wizard

UNGUIDED -> Next

2 Port Solt

View/ Select Cal Kit -> 85052D or 85032F

Connect successively OPEN SHORT LOAD to port 1 and 2 and execute the Thru connection with transition F/F.

!! THE SEX INDICATED ON THE DEVICE, IS THE ONE OF THE LOAD !!

Calibration (**State and Cal Set Data *.csa**) must be saved in a file inside the group folder. The group folder has to be created in

Desktop -> **LaboratoryElectronics1**

ELECTRONIC CALIBRATION

To start calibrating click on:

Calibration -> Calibration Wizard -> Use Electronic Calibration (Ecal)

Connect port 1 and 2 of the PNA to the electronic calibration kit.

Next -> **2 port Ecal** -> **Next** -> **Measure**

Calibration must be saved in a file inside the group folder.



CALIBRATION CHECK

To check that the calibration you have done is correct, you can measure the $|S_{11}|$ and $|S_{21}|$ (in dB) of the last element inserted in calibration (transition F/F).

RESPONSE -> MEAS; **RESPONSE -> SCALE/REF**

Typically, you must find: $|S_{11}| < -50$ dB and $|S_{21}| \cong 0$ dB in the whole band.
Plot S21, phase included. **(REPORT)**.

You can expand the scale using the function **SCALE -> AUTOSCALE**

Then you can visualize the scattering parameter S11 on Smith Chart.

RESPONSE -> MEAS ->S11; **RESPONSE -> FORMAT ->SMITH CHART**

The transition F/F will give place to a point in the origin. **(REPORT)**.

As a further verification, you should measure S11 on Smith Chart, leaving port 1 open. How does the open port act? **(REPORT)**.

SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2019) in a "TempData" folder.

Select the file: **DataAcquisition9.m**

Open the file and delete the comment (%) to the VA device number you used.
(**BoardNumber = 0, DeviceNumber = 16**). Enable the PNA **dataStruct** line.

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder 'laboratory' with the name 'NewName', you have to type: **save('NewName','dataStruct')**.

To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.

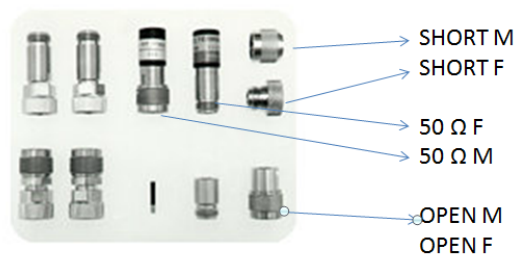


FIELDFOX NETWORK ANALYZER

IP Number = 151.100.44.73

HOW TO CALIBRATE AND SAVE DATA

DEVICE N9916A (30 kHz – 14 GHz)



CALIBRATION kit 85032F Type N



THE BUTTONS TO BE PRESSED ARE IN BOLD

To perform **MECHANICAL** calibration, you have to preset:

FREQUENCY BAND: **Freq-Dist** → **Start Fmin – Stop Fmax**

NUMBER OF POINTS: **Sweep** → **Resolution** → **1601 x1**

To start calibrating: **CAL** → **Mechanical Cal**

Change Cal Type → **1 port or Full 2 port** → **select and Finish**

Change Dut Connectors - > **Type N**

Change Gender → **Dut Port 1 – female** → **next port 2**

Dut Port 2 – female → **next port**

Select Cal Kit → **85032F Type N Cal Kit** → **Finish**

You have to connect the calibration kit loads to port 1 and 2 of the Field Fox and then perform the calibration. **Start Calibration** → **Measure** → **Finish** (at the end)

Calibration must be saved in a device state file. To save it in the computer, use the link at WinSCP on the Desktop.

The device is controlled also by **FieldFoxRemoteDisplay** on the desktop (file → connect → select analyzer → ok). In this way, on the computer monitor will appear a front panel image of the device that can be used remotely.

You can save data directly on the device (only if it is strictly necessary).

To save data in the working directory (TempData) click on FieldFox icon (WinSCP) in the desktop. A double directory opens. Select on the left TempData and on the right /USERDATA/FILE.

NB: You can save two types of data with the command

Save/Recall → **Device** → **INTERNAL** → **FILE**

1) File Type - > **PNG** (to save the screen-shot)

2) File Type → **Data (CSV)** (to save data that they may be processed)

Give a name to the file → click **DONE**



CHECK CALIBRATION (Full-2 port case)

To check that the calibration you have done is correct, you can measure the last element inserted in calibration (transition F/F).

In particular, the magnitude in dB of S11 and S21.

MEAS->S11, MEAS->S21

You must find: $S_{11}dB < -50$ dB and $S_{21}dB \cong 0$ dB in the whole band. Plot S21, phase included. **(REPORT)**.

You can expand the scale using the function **SCALE -> AUTOSCALE**

Then you can visualize the scattering parameter S11 on Smith Chart.

MEAS ->S11; FORMAT ->SMITH CHART

The transition F/F will give place to a point in the origin. **(REPORT)**.

As a further verification, you should measure S11 on Smith Chart, leaving port 1 open. How the leaved open port acts? **(REPORT)**.

SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2018) in a "TempData" folder.

Select the file: **DataAcquisition8.m**

Open the file and delete the comment (%) to the IPaddress you have used, and to the correspondent dataStruct

(FFPNA dataStruct=getdataFFPNA(IPaddress);)

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder (presumably TempData) with the name `NewName` you have to type: **save('NewName','dataStruct')**.

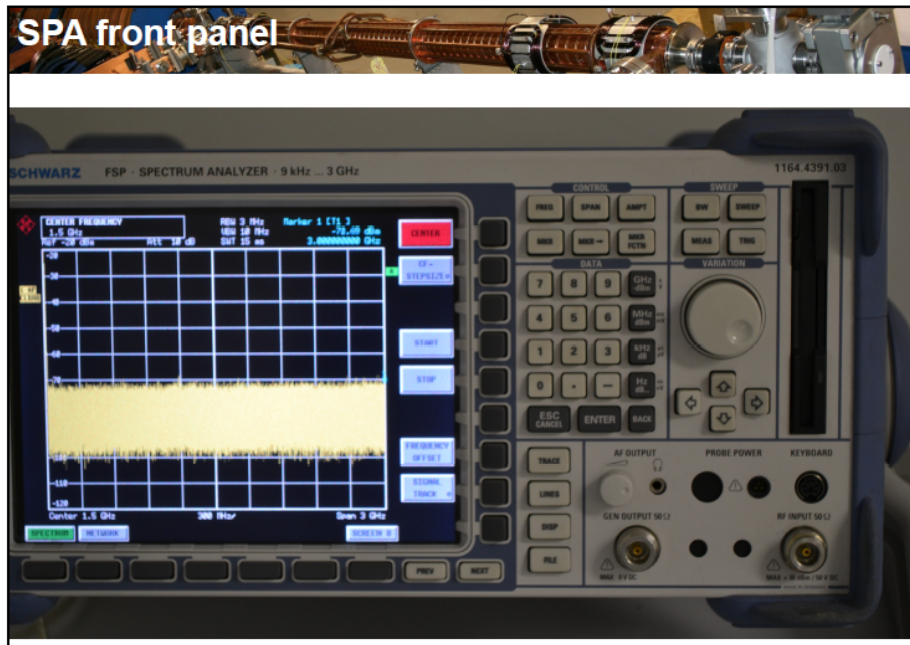
To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.



R&S SPECTRUM ANALYZER (9kHz, 3 GHz)

IP Number = 151.100.44.144



SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2019) in the “TempData” folder of the desktop; thus select the file: **DataAcquisition9.m**

Open the file and uncomment (i.e. delete %) the proper IPaddress line; uncomment also the relevant dataStruct:

dataStruct = getdataRSSPA (IPaddress).

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder (presumably TempData) with the name `NewName` you have to type: **save('NewName','dataStruct')**.

To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.



To save the spectrum shape in a USB memory, you can use the function
after inserting the USB memory in the device:

TRACE -> NEXT -> ASCII FILE EXPORT ->
select file name and directory from keyboard

To capture the screen-shot of the device:

HCOPY -> PRINT SCREEN.
select file name and directory from keyboard

To access to Windows XP, click on:

<CTRL><ESC> Documents -> My Documents -> Removable Disk (F:).

To come back, press the button **minimize** at the top right in the screen

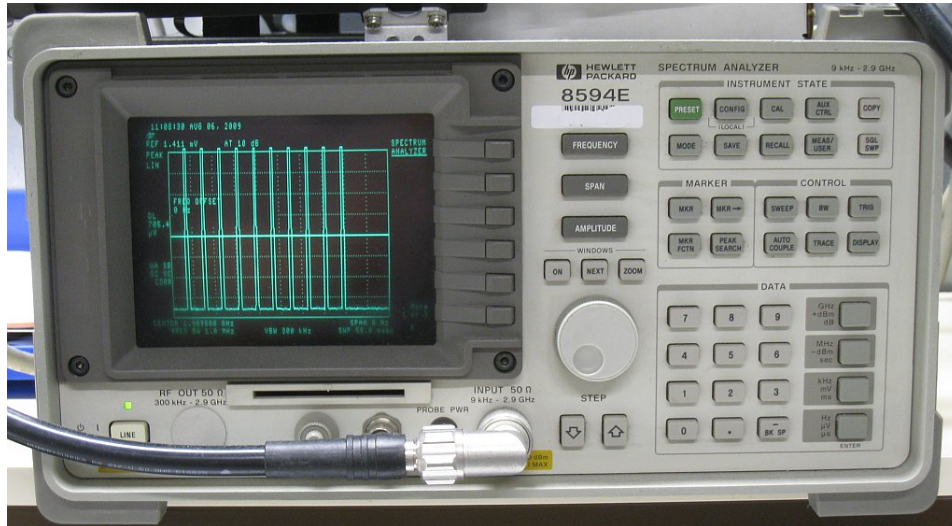
To access to Windows XP, you can press the button that has **Windows icon**
on the keyboard.

Use only the USB key provided in the laboratory.



HP 8594E SPECTRUM ANALYZER (9kHz, 2.9 GHz)

BoardNumber = 1, DeviceNumber = 18



SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2019) in a "TempData" folder.

Select the file: **DataAcquisition9.m**

Open the file and remove the comment (%) to the board and device number of the device you have used (**BoardNumber=1, DeviceNumber=18**).

Enable the line **dataStruct=getdataHPSPA(BoardNumber,DeviceNumber);**

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

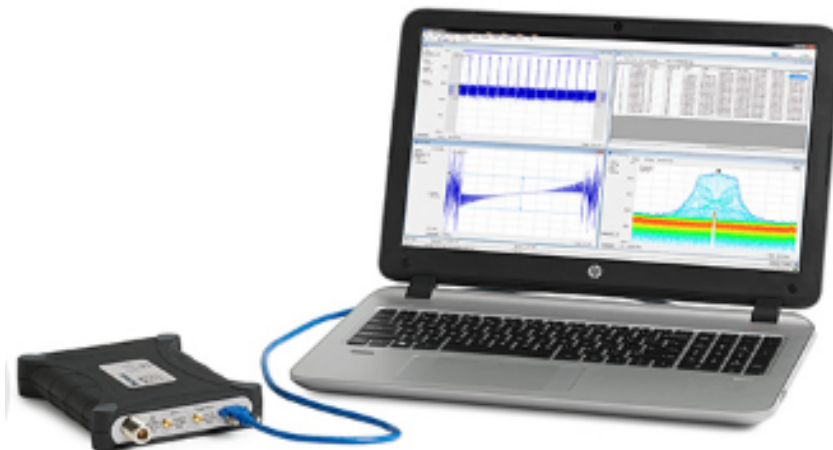
To save measurements in the current folder (presumably TempData) with the name 'NewName' you have to type: **save('NewName','dataStruct')**.

To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.



RSA 306 SPECTRUM ANALYZER



Copy the MATLAB Routines (MatlabRoutines_2017) in a “TempData” folder.

Save device data from the screen in TempData with save as (.csv format)

Select the file: **DataAcquisitionX.m**

Open the file and remove the comment (%) to the control lines below **Read data file for Tektronix SPA.**

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder (presumably TempData) with the name `NewName` you have to type: **save('NewName','dataStruct')**.

To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.

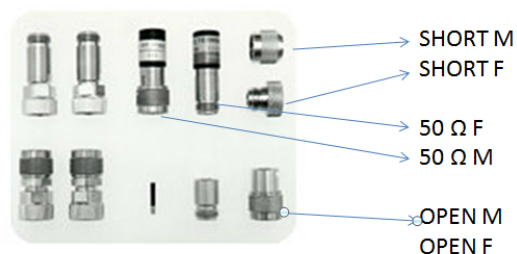


FIELDFOX NETWORK ANALYZER

IP Number = 151.100.44.28

HOW TO CALIBRATE AND SAVE DATA

STRUMENTO N9918A (30 kHz – 18 GHz)



CALIBRATION kit 85052D type 3.5mm



THE BUTTONS TO BE PRESSED ARE IN BOLD

To perform **MECHANICAL** calibration, you have to preset:

FREQUENCY BAND **Freq-Dist** → **Start Fmin – Stop Fmax**

NUMBER OF POINTS: **Sweep** → **Resolution** → **1601 x1**

To start calibrating: **CAL** → **Mechanical Cal**

Change Cal Type → **1 port or Full 2 port** → **select and Finish**

Change Dut Connectors - > **Type N**

Change Gender → **Dut Port 1 – female** → **next port 2**

Dut Port 2 – female → **next port**

Select Cal Kit → **85032F Type N Cal Kit** → **Finish**

You have to connect the calibration kit loads to port 1 and 2 of the Field Fox and then perform the calibration. **Start Calibration** → **Measure** → **Finish** (at the end)

Calibration must be saved in a device state file. To save it in the computer, use the link at WinSCP on the Desktop.

The device is controlled also by **FieldFoxRemoteDisplay** on the desktop (file → connect → select analyzer → ok). In this way, on the computer monitor will appear a front panel image of the device that can be used remotely.

You can save data directly on the device (only if it is strictly necessary).

To save data in the working directory (TempData) click on FieldFox icon (WinSCP) in the desktop. A double directory opens. Select on the left TempData and on the right /USERDATA/FILE.

NB: You can save two types of data with the command

Save/Recall → **Device** → **INTERNAL** → **FILE**

1) File Type - > (to save the screen-shot)

2) File Type → **Data (CSV)** (to save data that they may be processed)

Give a name to the file → click **DONE**



CHECK CALIBRATION (Full-2 port case)

To check that the calibration you have done is correct, you can measure the last element inserted in calibration (transition F/F).

In particular, the magnitude in dB of S11 and S21.

MEAS->S11, MEAS->S21

You must find: $S_{11}dB < -50$ dB and $S_{21}dB \cong 0$ dB in the whole band. Plot S21, phase included. **(REPORT)**.

You can expand the scale using the function **SCALE -> AUTOSCALE**

Then you can visualize the scattering parameter S11 on Smith Chart.

MEAS ->S11; FORMAT ->SMITH CHART

The transition F/F will give place in a point in the origin. **(REPORT)**.

As a further verification, you should measure S11 on Smith Chart, leaving port 1 open. How the leaved open port acts? **(REPORT)**.

SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2018) in a "TempData" folder.

Select the file: **DataAcquisition8.m**

Open the file and delete the comment (%) to the IPaddress you have used, and to the correspondent dataStruct

(FFPNA dataStruct=getdataFFPNA(IPaddress);)

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder (presumably TempData) with the name `NewName` you have to type: **save('NewName','dataStruct')**.

To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.



FIELDFOX SPECTRUM ANALYZER

IP Number = 151.100.44.73

N9916A (30 kHz – 14 GHz)



SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2019) in a “TempData” folder.

Select the file: **DataAcquisition9.m**

Open the file and uncomment (i.e. delete %) the proper IPaddress line; uncomment also the relevant dataStruct:

dataStruct=getdataFFSPA(IPaddress)

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder (presumably TempData) with the name `NewName` you have to type: **save('NewName','dataStruct')**.

To re-load data in MATLAB Workspace, you have to type: **load ('NewName')**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.



The device is controlled also by **FieldFoxRemoteDisplay** on the desktop (file -> connect -> select analyzer ->ok). In this way, on the computer monitor will appear a front panel image of the device that can be used remotely.

You can save data directly on the device (only if it is strictly necessary).

To save data in the working directory (TempData) click on FieldFox icon (WinSCP) in the desktop. A double directory opens. Select on the left TempData and on the right /USERDATA/FILE.

NB: You can save two types of data with the command

Save/Recall -> Device -> INTERNAL -> FILE

1) File Type - > (to save the screen-shot)

2) File Type -> Data (CSV) (to save data that they may be processed)

*Give a name to the file -> click **DONE***



ENA NETWORK ANALYZER

BoardNumber = 1, DeviceNumber = 17

DEVICE E5063A (100 kHz – 18 GHz)



SAVE DATA

Copy the MATLAB Routines (MatlabRoutines_2018) in a “TempData” folder.

Select the file: **DataAcquisition8.m**

Open the file and remove the comment (%) to the board and device number of the device you have used (**BoardNumber=1, DeviceNumber=17**).

Enable the line **dataStruct=getdataENA(BoardNumber, DeviceNumber);**

Press the green button RUN. The acquired data end up in MATLAB Workspace.

Data are stored in the variable called dataStruct.

To save measurements in the current folder (presumably TempData) with the name ‘NewName’ you have to type: **save(‘NewName’,’dataStruct’)**.

To re-load data in MATLAB Workspace, you have to type: **load (‘NewName’)**

The dataStruct can be saved in a file .mat also from the Workspace variables list, right-clicking on the dataStruct variable.