

MFJ

VHF/UHF Graphical Antenna Impedance Analyzer

Model MFJ-227



INSTRUCTION MANUAL

CAUTION: Read All Instructions Before Operating Equipment !

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MFJ-227 Vector Impedance Analyzer

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GENERAL DESCRIPTION

MFJ-227 Vector Impedance Analyzer is a device for measuring the complex impedance presented on its type N test port. This is accomplished by injecting an RF signal generated by MFJ-227 into the target under test connected to the test port, and measuring the amplitude and phase of the RF signal reflected by the target under test. The reflected amplitude and phase are corrected with industrial standard 3-term Open/Short/Load (OSL) calibration method. MFJ-227 Vector Impedance Analyzer can operate from 88MHz to 228MHz (VHF), and from 390MHz to 600MHz (UHF), with a 25KHz minimum step size.

MFJ-227 MENU STRUCTURE

MAIN MENU

SINGLE FREQ

- SWR
- IMPEDANCE (SERIES)
- IMPEDANCE (PARALLEL)
- S11 (RECTANGULAR & POLAR)

SWEEP FREQ PLOT

- SWR
- IMPEDANCE (Z)
- RESISTANCE (R)
- REACTANCE (X)
- RETURN LOSS (S11)
- PHASE ANGLE
- SMITH CHART

CALIBRATE

- CONNECT OPEN
- CONNECT SHORT
- CONNECT LOAD

SETTINGS

- BACKLIGHT
 - AUTO
 - ON
 - OFF
- AUTO POWER OFF
 - ENABLE
 - DISABLE
- BATTERY
 - ALKALINE
 - NIMH
- CAL DATA PROTECT
 - LOCK CAL DATA
 - UNLOCK CAL DATA
- INFO
- RESET TO DEFAULTS

PC MODE

KEY DEFINITIONS



POWER : Press and hold this key for two seconds to turn on or off MFJ-227 Vector Impedance Analyzer.



CONFIRM : Use this key to confirm the desired selections and frequencies entered.



MODE : In SINGLE FREQ, this key is used to switch between the following modes cyclically:

- SWR
- IMPEDANCE (SERIES)
- IMPEDANCE (PARALLEL)
- S11

In SWEEP FREQ PLOTS, this key is used to switch between the following functions cyclically:

- FREQUENCY
- Y SCALE
- ALIGNMENT
- STEP SIZE



ARROWS : These keys are used to select the desired menu items or options. They are also used to increase or decrease the frequency. Keep



holding the keys to increase or decrease the frequency automatically. In SINGLE FREQ, the step size is fixed at 25KHz. In SWEEP FREQ PLOT, the current step size can be selected with the MODE key.



NUMERIC : Use these keys to enter the desired frequency directly. Frequencies within the valid operating range will automatically be aligned to 25KHz boundaries. Frequencies outside the valid operating range will be ignored.



BACK : Cancel the current operation and/or go back to the previous menu.

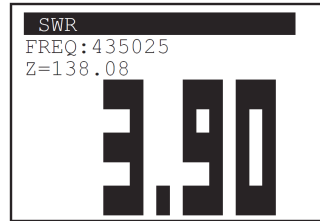
SINGLE FREQ

In this mode, MFJ-227 can display the measured data in any of the following four representations. You may switch cyclically through these representations with the MODE key.

- SWR
- IMPEDANCE (SERIES)
- IMPEDANCE (PARALLEL)
- S11 (RECTANGULAR & POLAR)

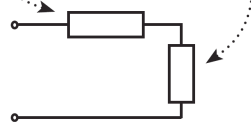
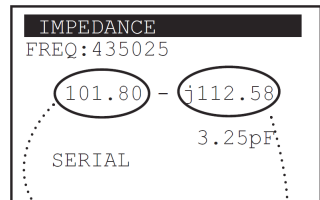
SWR

This mode displays the Standing Wave Ratio in large font for easy reading. It also displays the impedance (Z) for reference.



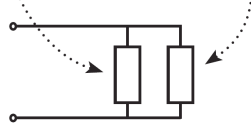
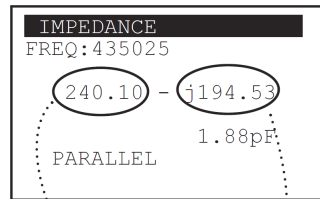
IMPEDANCE (SERIES)

This mode displays the impedance seen at the test port. The impedance is resolved into the real (resistive) part and imaginary (reactive) part connected in series. The corresponding inductance or capacitance is also displayed according to the sign of the reactance.



IMPEDANCE (PARALLEL)

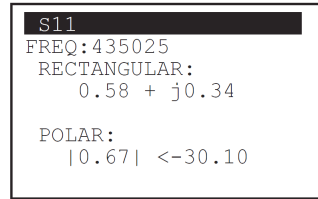
This mode displays the impedance seen from the test port. The impedance is resolved into the real (resistive) part and imaginary (reactive) part connected in parallel. The corresponding inductance or capacitance is also displayed.



according to the sign of the reactance.

S11

This mode displays the rectangular and polar representations of the S11 measured.



SWEEP FREQ PLOT

Under this menu, MFJ-227 can plot any of the following measured data over the desired frequency range:

- SWR
- IMPEDANCE (Z)
- RESISTANCE (R)
- REACTANCE (X)
- RETURN LOSS (S11)
- PHASE ANGLE
- SMITH CHART

Within any of these sweep frequency plots, use the MODE key to switch cyclically between the following parameters to change their value.

FREQUENCY - use the ARROW keys to increment or decrement the frequency by the value of STEP SIZE. The cursor will move accordingly. The frequency can also be entered directly using the numeric keys.

Y SCALE - use the ARROW keys to select the maximum value on the Y axis. Possible values are 3, 10, 30, 100, 300, and 1000.

ALIGNMENT - use the ARROW keys to select if the directly entered frequency should be aligned to the CURRENT position of the cursor, BEGIN (leftmost on the plot), CENTER (of the plot), or END (rightmost of the plot). Ranges outside the valid frequencies will be shaded.

STEP SIZE - use the ARROW keys to select the desired frequency step size. Possible values are

25KHz, 100KHz, 500KHz, 1MHz, and 2MHz on the VHF band, while 3MHz frequency step size is also possible on the UHF band.

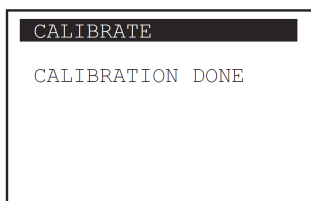
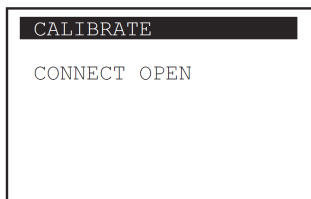
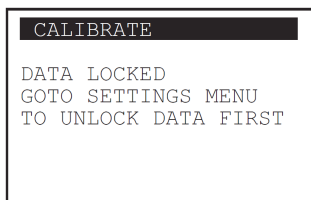
CALIBRATION

MFJ-227 Vector Impedance Analyzer employs the industrial standard Open/Short/Load (OSL) calibration method to eliminate various system errors. To perform accurate measurements, MFJ-227 needs to be calibrated against some OPEN, SHORT, and LOAD references. Three high quality OPEN, SHORT, and LOAD terminators are available in the MFJ-252N kit (not included) for this purpose. Resulting calibration data to be used in computations will be stored in non-volatile memory in MFJ-227.

Calibration data is locked by default to avoid accidental erasure. It has to be unlocked in the SETTINGS menu before a CALIBRATION can be performed.

Connect securely the OPEN standard, and then press the CONFIRM key to start the calibration. Likewise for the SHORT and LOAD standards in sequence to complete the calibration.

Calibration data will be locked again automatically after calibration. The instrument is now ready to use. If desired, MFJ-227 can be re-calibrated at any time.



SETTINGS

A number of general options and information are available in this menu.

BACKLIGHT

AUTO - Turn off backlight automatically if no key is pressed for 30 seconds.

ON - Leave backlight always on.

OFF – Leave backlight always off.

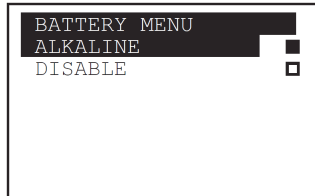
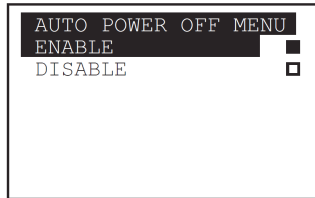
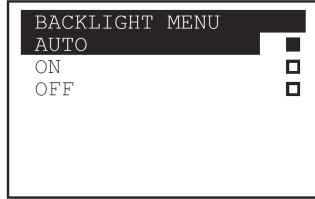
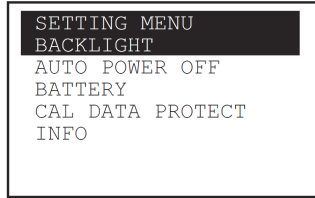
AUTO POWER OFF

ENABLE – Automatic power off if no key is pressed for 5 minutes.

DISABLE - No automatic power off.

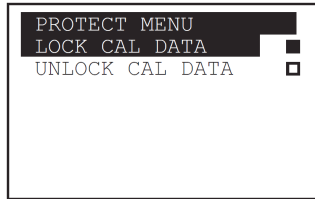
BATTERY

Choose between **ALKALINE** and **NIMH** to reflect the type of batteries being used. It only affects the threshold voltage dictating when a low battery sign on the upper right hand corner of the display will appear.



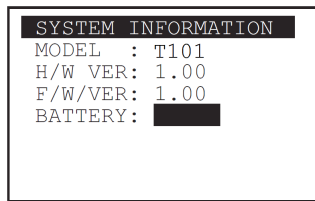
CAL DATA PROTECT

Select **UNLOCK CAL DATA** before calibration. Calibration data will be locked automatically after calibration. Alternatively, choose **LOCK CAL DATA** to lock calibration data manually if necessary.



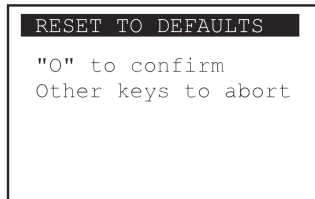
INFO

Display general information of the device, as well as the battery voltage. (5 blocks on the battery bar as battery full and 1 block as battery empty.)



RESET TO DEFAULTS

Use this function to put your analyzer back to the default factory settings. However, calibration data will not be changed.



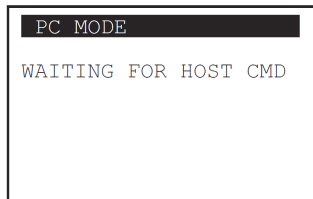
PC MODE

MFJ-227 is capable of communicating with a PC via an emulated serial link over the USB connection. A link to the virtual serial port driver for *Windows is available on our website at www.mfjenterprises.com. It should be installed before connecting your MFJ-227 to a PC.

A PC host program for *Windows is also available on our web site to control MFJ-227 from a PC and display the measured data. The (virtual) serial communication between MFJ-227 and the PC should be configured as follows:

Baud Rate = 115200 baud
Parity Bit = None
Data Bits = 8
Stop Bit = 1

After entering the PC MODE, MFJ-227 will display the "WAITING FOR HOST CMD" message and listen to the serial port.



To command MFJ-227 to tune to a specific frequency, the host program shall transmit a six-digit frequency in ASCII characters via the serial port.

To command MFJ-227 to take a measurement, send an ASCII character 'S'. Then receive from the serial port a null terminated ASCII string. This is the measured magnitude and argument in degrees, separated by a comma. The same result will be displayed on MFJ-227 at the same time.

Send another 'S' to repeat measurement at the same frequency, or issue another six digit frequency to tune to a new frequency. Sending an ASCII character 'D' will bring MFJ-227 back to the initial state, displaying the "WAITING FOR HOST CMD" message and listen to the serial port.

** More commands may be available in future firmware releases. Please visit the MFJ-227 support page on our web site for any updates. Instructions for installation of the programs and drivers are included with those programs.*

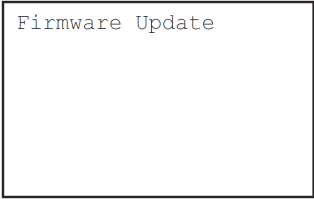
FIRMWARE UPDATE

MFJ-227 firmware can be updated as new releases downloaded from the Internet to a PC and programmed to the MFJ-227 via the USB interface.

Caution

1. Please use fresh batteries when updating firmware.
2. Do not power off the analyzer or remove batteries during firmware updating.
3. Do not remove the USB cable or power off the computer during firmware updates.

Hold down the “Mode” key while switching on MFJ-227 to enter the “Firmware Update” Mode..



Firmware Update

Please download our Firmware Update Tools for Windows from our web site at www.mfjenterprises.com.

Plug in the USB cable to connect MFJ-227 to your PC to update the firmware. Display on your MFJ-227 will not change while updating. * Wait until MFJ-227 turns off automatically after firmware update, then UNPLUG the USB cable.

MFJ-227 SPECIFICATIONS

Frequency Range: 88MHz ~ 228MHz (VHF band)
390MHz ~ 600MHz (UHF band)

PLL Synthesized

Frequency Resolution : 25KHz

Test Port Connector : Type N

Output Power : > 0dBm (typical)

Harmonics : < -25dBc (typical)

Display :

128 x 64 dots graphical LCD with backlight

Physical Dimensions :

165mm(length) x 78mm(width) x 32mm(thick)

Net Weight : 215 gram (without batteries)

Power : AA Size Battery x 2 (not included)

ACCESSORIES

INCLUDED

N type male to SMA female adapter

N type male to SO-239 adapter

USB A to mini-B cable

AVAILABLE SEPARATE

MFJ-252N Calibration Load Set

12 MONTH LIMITED WARRANTY

MFJ Enterprises, Inc. Warrants to the original owner of this product, if manufactured by MFJ Enterprises, Inc. and purchased from an authorized dealer or directly from MFJ Enterprises, Inc. to be free from defects in material and workmanship for a period of 12 months from date of purchase provided the following terms of this warranty are satisfied. Prices subject to change without notice.

- The purchaser must retain the dated proof-of-purchase (bill of sale, canceled check, credit card or money order receipt, etc.) describing the product to establish the validity of the warranty claim and submit the original or machine reproduction of such proof-of-purchase to MFJ Enterprises, Inc. at the time of warranty service. MFJ Enterprises, Inc. shall have the discretion to deny warranty without dated proof-of-purchase. Any evidence of alteration, erasure, or forgery shall be cause to void any and all warranty terms immediately.
- MFJ Enterprises, Inc. agrees to repair or replace at MFJ's option without charge to the original owner any defective product under warranty, provided the product is returned postage prepaid to MFJ Enterprises, Inc. with a personal check, cashiers check, or money order for \$12.00 covering postage and handling.
- MFJ Enterprises, Inc. will supply replacement parts free of charge for any MFJ product under warranty upon request. A dated proof-of-purchase and an \$8.00 personal check, cashiers check, or money order must be provided to cover postage and handling.
- This warranty is NOT void for owners who attempt to repair defective units. Technical consultation is available by calling (662) 323-5869.
- This warranty does not apply to kits sold by or manufactured by MFJ Enterprises, Inc.
- Wired and tested PC board products are covered by this warranty provided only the wired and tested PC board product is returned. Wired and tested PC boards installed in the owner's cabinet or connected to switches, jacks, or cables, etc. sent to MFJ Enterprises, Inc. will be returned at the owner's expense unrepaid.
- Under no circumstances is MFJ Enterprises, Inc. liable for consequential damages to person or property by the use of any MFJ products.
- Out-of-warranty Service: MFJ Enterprises, Inc. will repair any out-of-warranty product provided the unit is shipped prepaid. All repaired units will be shipped COD to the owner. Repair charges will be added to the COD fee unless other arrangements are made.
- This warranty is given in lieu of any other warranty expressed or implied.
- MFJ Enterprises, Inc. reserves the right to make changes or improvements in design or manufacture without incurring any obligation to install such changes upon any of the products previously manufactured.
- All MFJ products to be serviced in-warranty or out-of-warranty should be addressed to MFJ Enterprises, Inc., 300 Industrial Park Road, Starkville, Mississippi 39759, USA and must be accompanied by a letter describing the problem in detail along with a copy of your dated proof-of-purchase.
- This warranty gives you specific rights, and you may also have other rights which vary from state to state.



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