



T100 Vector Impedance Analyzer

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User Manual Ver. 1.1

T100 is a state of the art portable Vector Impedance Analyzer. This powerful yet handy instrument is specifically designed for the advanced amateur radio experimenters working at the VHF/UHF band.

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GENERAL DESCRIPTION

The T100 Vector Impedance Analyzer is essentially a device to inject an RF signal into whatever is connected to its test port, and measures the amplitude and phase of the reflected RF signal.

The reflected amplitude and phase are calibrated with industrial standard 3-term Open/Short/Load (OSL) calibration method.

T100 Vector Impedance Analyzer can operate from 100MHz to 170MHz (VHF), and from 400MHz to 470MHz (UHF), with a 25KHz minimum step size.

T100 MENU STRUCTURE

MAIN MENU

SINGLE FREQ

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

SWEEP FREQ PLOT

SWR

IMPEDANCE (Z)
RESISTANCE (R)
REACTANCE (X)
RETURN LOSS (S11)

PHASE ANGLE

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

PC MODE

KEY DEFINITIONS



POWER : Press and hold this key for two seconds to turn on or off T100 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 (SERIAL)
- 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/decrease the frequency. Hold to increase/decrease 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 the 25KHz steps. Frequencies outside the valid operating range will be ignored.



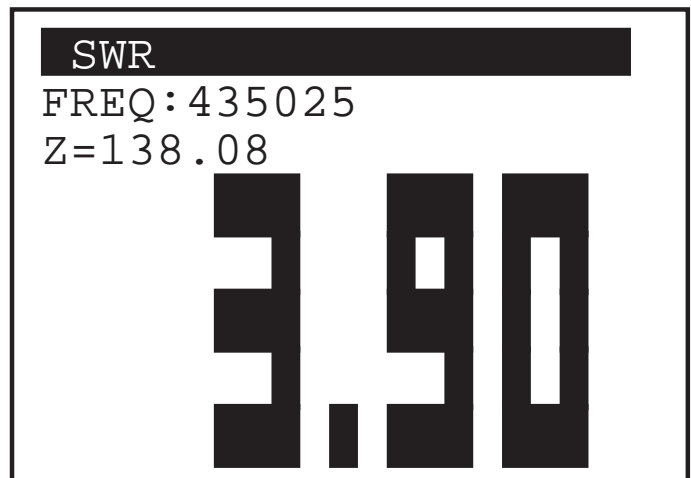
BACK : Cancel the current operation and/or go back to the previous menu.

SINGLE FREQ

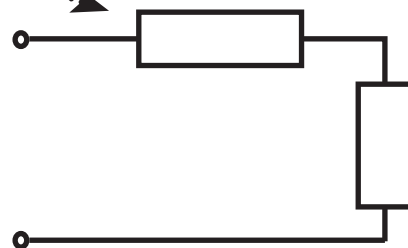
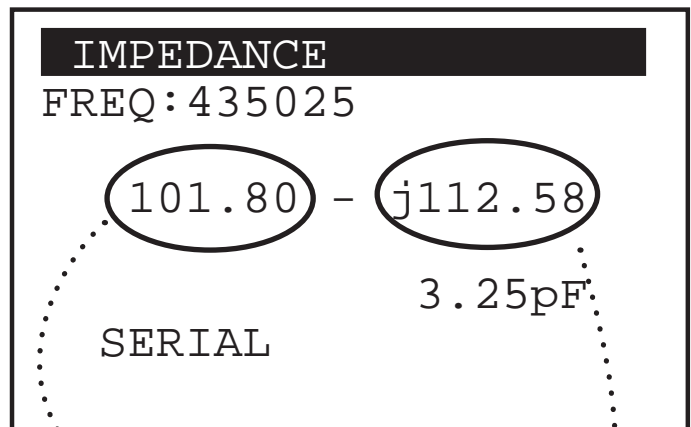
In this mode, T100 can display the measured data in any of the following four representations. You may switch cyclically through these representations with the MODE key.

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

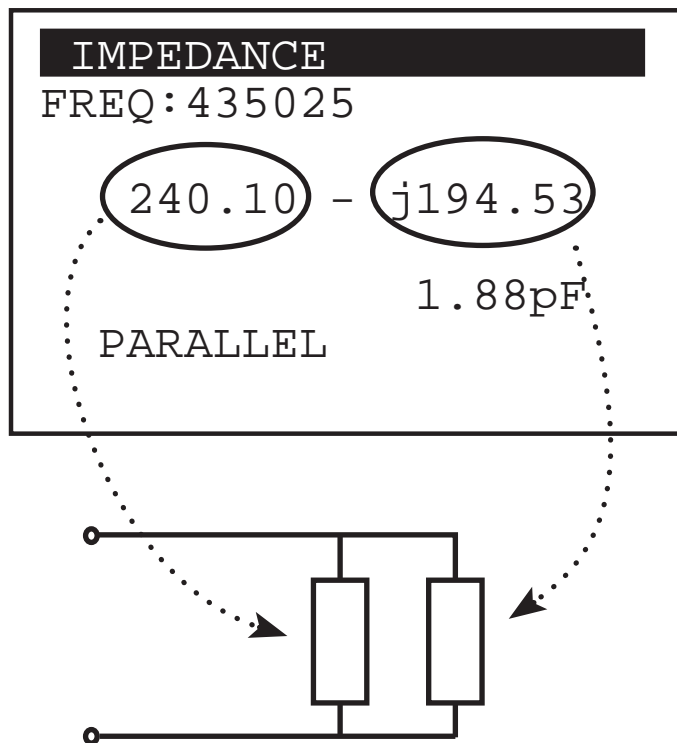
SWR displays the Standing Wave Ratio in large font for easy reading. It also displays the impedance (Z) for reference.



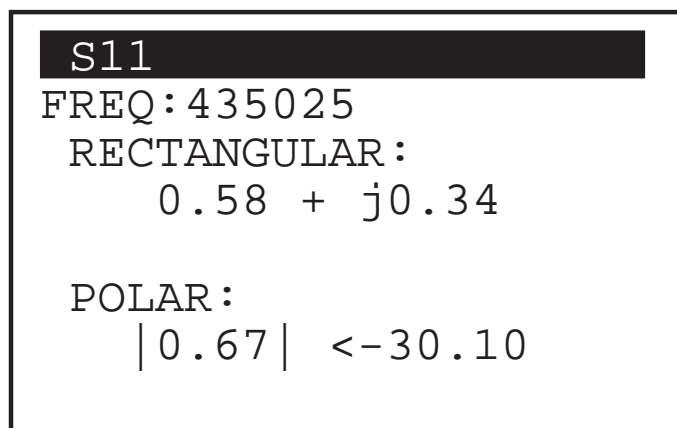
IMPEDANCE (SERIAL) displays the impedance seen from the test port. The impedance is resolved into the real (resistive) part and imaginary (reactive) part connected in series. The corresponding inductance or capacitance is also displayed according to the sign of the reactance.



IMPEDANCE (PARALLEL) 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 displays the rectangular and polar representations of the S11 measured.



SWEEP FREQ PLOT

Under this menu, T100 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

Use the MODE key to switch cyclically between any of 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 on the plot 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, and 1MHz.

CALIBRATION

T100 Vector Impedance Analyzer employs industrial standard Open/Short/Load (OSL) calibration method to eliminate various system errors. To perform accurate measurements, T100 needs to be calibrated against the OPEN, SHORT, and LOAD standards. Three high quality OPEN, SHORT, and LOAD SMA terminators are included for this purpose. Resulting calibration data to be used in computations will be stored in non-volatile memory in T100.

Calibration data is locked upon power up of T100 to avoid accidental erasure. It has to be unlocked in the SETTINGS menu, before CALIBRATION can be performed.

Connect securely the OPEN standard, and then press the OK key to start 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, T100 can be re-calibrated at any time.

CALIBRATE

DATA LOCKED
GOTO SETTINGS MENU
TO UNLOCK DATA FIRST

CALIBRATE

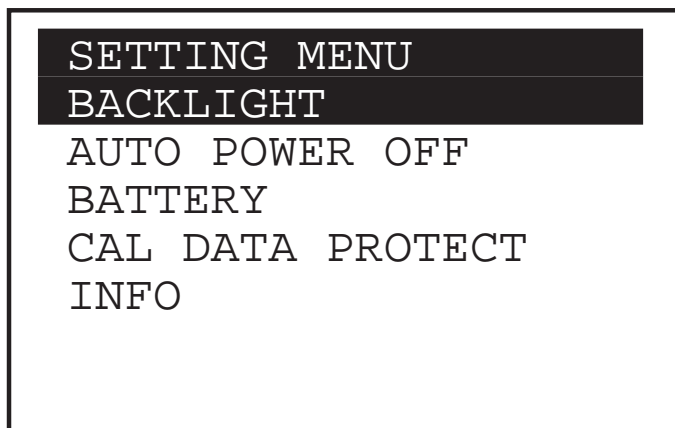
CONNECT OPEN

CALIBRATE

CALIBRATION DONE

SETTINGS

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

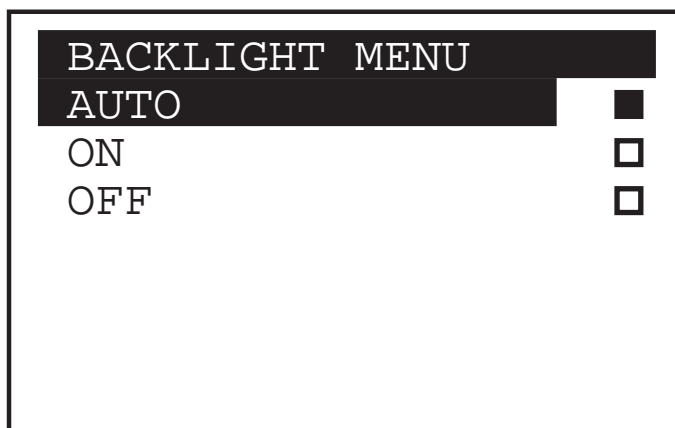


BACKLIGHT

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

ON - Leave backlight always on

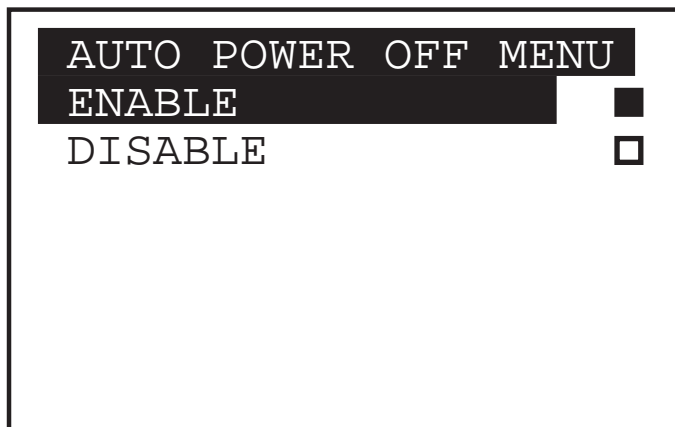
OFF - Leave backlight always off



AUTO POWER OFF

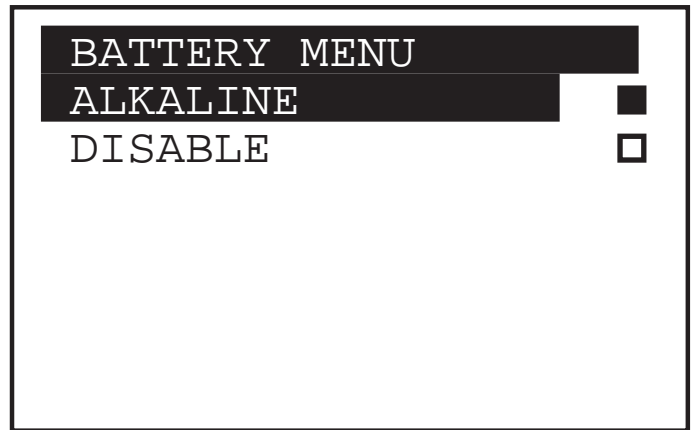
ENABLE - Automatic power off if no key is pressed for 5 minutes.

DISABLE - No automatic power off.



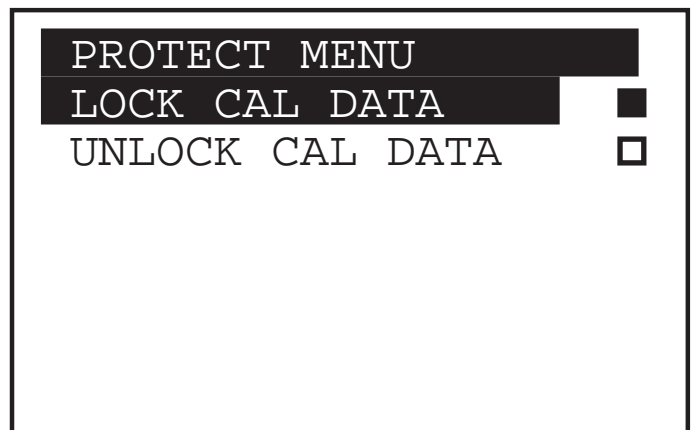
BATTERY

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.



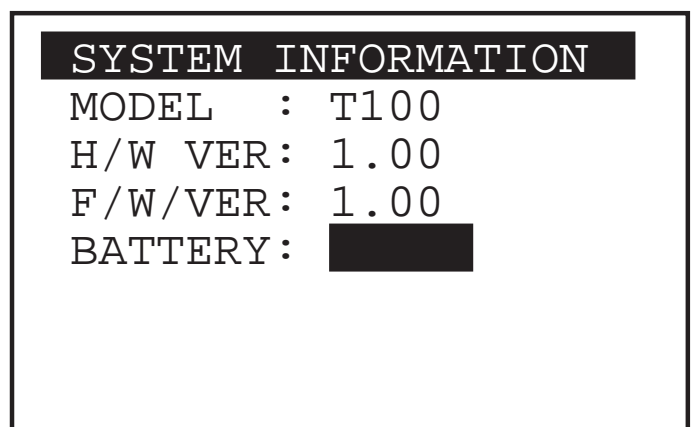
CAL DATA PROTECT

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.)



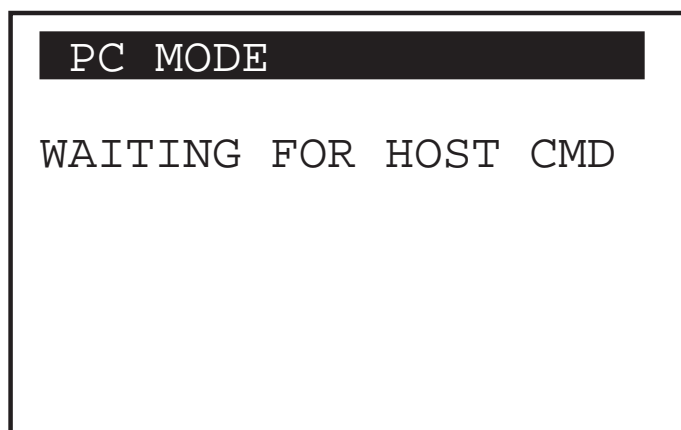
PC MODE

T100 is capable of communicating with a PC via an emulated serial link over the USB connection. Virtual serial port driver for Windows XP is included in the T100 CD-ROM and should be installed before connecting your T100 to a PC. A sample host program for Windows XP is also included to demonstrate controlling T100 from a PC, and displaying T100 measured data.

The (virtual) serial communication between T100 and the PC should be configured as follows:

Baud Rate = 38400 baud
Parity Bit = None
Data Bits = 8
Stop Bit = 1

On entering the PC MODE, T100 will display the "WAITING FOR HOST CMD" message and listen to the serial port.



To command T100 to tune to a specific frequency, the host program shall transmit a six-digit frequency in ASCII characters via the serial port.

To command T100 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 T100 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 T100 back to the initial state, displaying the "WAITING FOR HOST CMD" message and listen to the serial port.

```
PC MODE
FREQ : 144000
|S11|    <S11
0.9577   -14.72
```

FIRMWARE UPDATE

T100 firmware can be updated as new releases are available. Updated firmware file can be downloaded from the Internet to a PC and programmed to the T100 via the USB interface.

Caution

1. Please use fresh batteries when updating firmware.
2. Do not turn power off or remove batteries during firmware updating.

Firmware Update

Hold down the "Mode" key while switching on T100 to enter the "Firmware Update" Mode. T100 will show the screen on the left.

On a PC running Windows XP operating system, open a DOS console in a directory with the two files `update.exe` and `firmware.ENC`.

Plug in the USB cable to connect the PC and T100. Find out which USB emulated COM port T100 is connected to from the Control Panel/System/Hardware/Device Manager on the PC.

With T100 at "Firmware Update" mode, issue the following command in the DOS console to update the firmware with the file `firmware.ENC` :

```
update firmware.ENC -COMx -38400
```

T100 SPECIFICATIONS

Frequency Range: 100MHz ~ 170MHz (VHF)
400MHz ~ 470MHz (UHF)
PLL Synthesized

Frequency Resolution : 25KHz

Test Port Connector : SMA

Output Power : > 0dBm (typical)

Harmonics : < -30dB (minimum)

Display :
128 x 64 dots graphical LCD with backlight

Physical Dimensions :
140mm(length) x 68mm(width) x 25mm(thick)

Net Weight : 130 gram (without batteries)

Power : AA Size Battery x 2

ACCESSORIES

SMA connector for OPEN Calibration: P/N 202112

SMA connector for SHORT Calibration: P/N 132331

SMA connector for LOAD Calibration: P/N 132360

SMA male to BNC female adaptor

SMA male to SO-239 adaptor

USB A to mini-B cable

CD-ROM