



APPLICATIONS

The **LEVEL TEST SET ET 91** is a hand held battery operated, multifunction measuring instrument, intended for the test of Carrier Frequency Systems up to 600 channel capacity, Power Line Carrier, Audio Tone, and FSK Communications Systems.

In selective receiving mode four special bandwidths are provided for the measurement of noise, carrier leak, cross-talk and non-linear distortion.

- **Comfortable Frequency Setting Modes**

Test instructions of FDM systems often specify the test frequency in format: Carrier \pm Channel Frequency. In compliance with the mentioned format ET 91 provides the separate setting of carrier and audio frequencies and so:

No frequency calculation is required!

- **Comfortable Frequency Tracking Modes**

The test procedure of FDM equipment usually requires different generator and level meter frequency settings. For example:

Feeding audio frequency test signal to the input of the tested channel on the following frequencies:

1000, 1200, 1400, 1600, etc Hz

Selective level measurement at a designated test point of the tested equipment on the following frequencies:

Carrier + 1000, 1200, 1400, 1600, etc Hz or
Carrier - 1000, 1200, 1400, 1600, etc Hz

Using up the advantageous feature of ET 91 that the generator and the level meter are in the same instrument extremely comfortable tracking modes are provided. In these modes the selective level meter is controlled by the generator according to the above mentioned rules.

No frequency calculation is required !

Only one frequency setting is required !

Four instruments in one

- **100Hz to 2400 kHz Level Generator**
For the generation of measuring voltage for the test of FDM transmission systems up to 600 channels
- **100Hz to 2400 kHz Level Meter**
For selective and wideband level measurements with auto ranging
- **Spectrum Analyzer**
For the measurement of transmission characteristics as well as cross-talks and other interference signals.
- **Psophometer**
For noise measurement in the speech channels according to ITU-T Rec. O.41

- **Automatic End to End Measurements**

For the test of carrier frequency cables and voice channels in Master-Slave mode. The Master initializes the measurements and collects the results. The Slave performs the measurements according to the Master's commands and sends back the results. The two instruments communicate over the tested line.

- **High Resolution Spectrum Analyzer**

ET 91 provides a high sensitivity spectrum analyzer suitable for the measurement of transmission characteristics as well as cross-talks and other interference signals.

The obtained spectrum trace can be evaluated in four modes like: NORM, PEAK, AVG, SAVG and interpreted in dBm or dBm/Hz

- **Measuring Bridge**

ET 91 provides a built in bridge to perform the measurement of Return Loss, Impedance and LCL Balance according to ITU-T Rec. O.9.

- **Memory Locations for Test Setups**

To speed up routine tests ET 91 provides memory locations for 100 user defined test setups containing generator, level meter test parameters and limit values for PASS/FAIL indication and 100 memory locations to store results.

- **USB Ports for Result and Setup Transfer**

ET 91 has two USB ports for data transfer:

USB A host port for USB stick

USB B device port for PC connection

The USB stick provides data transfer between a PC and ET 91 without installing a special device driver to the PC. This solution is advantageous for the user who does not have administrative right to install a special driver to his PC.

PC program for data transfer is provided.

SPECIFICATIONS

Transmitter

Transmitting Modes
 1 FREQ (Transmitting one single frequency)
 MTTs (Transmitting Multi Tone Test Signal)
 Frequency Range ... 100 Hz to 2400 kHz in 1 Hz steps
 Frequency Accuracy $2 \times 10^{-6} \pm 1$ Hz
 Balanced and Coaxial Outputs
 10 to 2400 kHz $\sim 0, 75, 135 (125), 150 \Omega$
 100 Hz to 10 kHz $\sim 0, 600 \Omega$
 Level Range of Balanced Output
 10 to 2400 kHz +10 to -60 dBm, dB
 100 Hz to 10 kHz +20 to -60 dBm, dB
 Level Range of Coaxial Output
 $\sim 0, \Omega$ +10 to -60 dBm, dB
 75, 135(125), 150 Ω +10 to -60 dBm
 600 Ω +4 to -60 dBm
 Level Resolution 0.1 dB
 Level Accuracy at 0 dBm Freq.>200Hz $\pm 0,3$ dB

Selective receiver

Receiving Modes
 1 FREQ (Receiving one single frequency)
 MTTs (Receiving Multi Tone Test Signal)
 Frequency Range 100 Hz to 2400 kHz
 Frequency Accuracy $2 \times 10^{-6} \pm 1$ Hz
 Direct Frequency Setting in 1 Hz steps
 Frequency Setting in Carrier \pm Tone Format
 Carrier Frequency 4 to 2396 kHz in 1 kHz steps
 Tone Frequency 100 Hz to 3,9 kHz in 1 Hz steps
 Band width
 200 Hz to 10 kHz 20 Hz
 10 to 2400 kHz 20, 200 Hz, 1.74, 1.95, 3.1 kHz
 Balanced and Coaxial Inputs
 10 to 2400 kHz 75, 135 (125), 150 Ω or high
 100 Hz to 10 kHz 600 Ω or high
 Measuring Range
 With 20 Hz band width -120 to +10 dB
 Level Resolution 0.1 dB
 Level Accuracy at 0 dBm, Freq.>200Hz $\pm 0,3$ dB
 Units dB, dBm, dBr, mV

Wideband Receiver

Balanced and Coaxial Inputs
 10 to 2400 kHz 75, 135 (125), 150 Ω or high
 100 Hz to 10 kHz 600 Ω or high
 Selectable 3 dB Band Filters Measuring Ranges
 100 Hz to 4kHz -100 to +10 dB
 1200 Hz to 120 kHz -90 to +10 dB
 3 kHz to 300 kHz -90 to +10 dB
 6 kHz to 600 kHz -80 to +10 dB
 12 kHz to 1200 kHz -70 to +10 dB
 24 kHz to 2400 kHz -70 to +10 dB
 Level Resolution 0.1 dB
 Level Accuracy at 0 dBm, Freq.>200Hz $\pm 0,3$ dB

Selectable Receiver-Transmitter Tracking Modes
 (When the receiver is controlled by the transmitter)

Synchronic frequency tuning:
 Receiver Frequency = Transmitter Frequency
 Special tracking mode for FDM channel test:
 Transmitting at the audio fr. input of channel
 Receiving at the carrier frequency band
 Receiver Frequency = Carrier \pm Tx Frequency

Wideband Noise Measurement

Frequency Range 100 Hz to 2400 kHz
 Filters Psophometer, 3.1, 4, 20, kHz
 120, 300, 600, 1200, 2400 kHz
 Measurement times 1, 5, 10, 30 sec
 1, 5, 10, 30 min
 1, 2, 4, 8, 12, 24, 48, 72 hours
 Evaluation
 For 1 sec to 1 min Quasi analog
 Over 1 min Histogram with 60 time slots

Impulse Noise Measurement

Pulse width >500 ns
 Interval size 10 ms
 Threshold range 1 to 500 mV
 Maximum count 65000
 Measurement times 1, 5, 10, 30 sec
 1, 5, 10, 30 min
 1, 2, 4, 8, 12, 24, 48, 72 hours
 Evaluation
 For 1 to 30 sec Numeric
 Over 30 sec Histogram with 60 time slots

Spectrum Analyzer

Frequency Range 100 Hz to 2400 kHz
 Line impedances
 10 to 2400 kHz 75, 135(125), 150 Ω or High
 100 Hz to 10 kHz 600 Ω or High

Frequency Range	Bandwidth & Freq. Step
2,4 MHz	500 Hz to 8 kHz
1,2 MHz	500 Hz to 4 kHz
600 kHz	500 Hz to 2 kHz
300 kHz	500 Hz to 1 kHz
20 kHz	50 Hz to 100 Hz
4 kHz	10 Hz to 20 Hz

Display range down to -140 dBm/Hz
 Number of displayed frequencies 300
 Saving of result the actual content of display
 Evaluation NORM, PEAK, AVG, SAVG
 Units dB, dBm, dBm/Hz, dBr

LCL Balance Measurement

Impedance
 10 to 2400 kHz 75, 135 (125), 150 Ω
 200 Hz to 10 kHz 600 Ω
 Display range 0 to 70 dB
 Accuracy at 40 dB
 200 Hz to 10 kHz ± 2 dB
 10 to 2400 kHz ± 1 dB

Return Loss Measurement

Nominal Impedance (Z)	
10 to 2400 kHz.....	75, 135 (125), 150 Ω
200 Hz to 10 kHz	600 Ω
Impedance limits	Z/2 to 2Z
Display range	0 to 40 dB
Accuracy at 20 dB	± 1 dB

NEXT / LOSS Measurement

Frequency	
Frequency Range	100 Hz to 2400 kHz
Resolution	Automatically changed with range
Output Impedances	
10 to 2400 kHz	75, 135 (125), 150 Ω
100 Hz to 10 kHz.....	600 Ω
Input Impedances	
10 to 2400 kHz	75, 135 (125), 150 Ω or High
100 Hz to 10 kHz.....	600 Ω or High
Measuring range.....	up to 80 dB

Impedance Measurement

Measuring range	
200 Hz to 2400kHz.....	50 to 1600 Ω
Accuracy	
200 Hz to 2400 kHz.....	± 5% ± 5 Ω

Group Delay Distortion Measurement (SW Option)

Test signal	37MTT, 200 to 3700 Hz
Resolution.....	100 Hz
Z output / input.....	600 Ω
Output level	-30 dB/tone (-7dB peak)
Input level range	-60 to -20 dB/tone
Group delay distortion range	0 to 10 ms
Resolution.....	1 μs
Accuracy.....	According to ITU.O.81

Phase Jitter & Frequ Error Meas. (SW Option)

Test signal.....	1020 Hz, 0 to -30 dBm
<u>Phase Jitter measurement (O.91)</u>	
Measuring range	0.2 to 30.0 degrees p-p
Filter	4 to 300 Hz
<u>Frequency Error Measurement</u>	
Measuring range	± 30 Hz
Resolution	0.1 Hz

External Attenuator (HW Option)

Attenuation	40 dB
Frequency Range	10 kHz to 2400 kHz
Accuracy	±0.5 dB
Max. input level	+40 dB
Input Impedance	>3.7 kΩ Coax
Output connector	Balanced
ET91 settings	Balanced, Unterminated, dB

Micro Interruption Measurement (SW Option)

Test Signal	
Frequency	1020 Hz
Input level	from 0 to -30 dBm
Impedance	600 Ω
Selectable Threshold	
Below the normal input level	3, 6, 10, 20 dB
Accuracy of Threshold	
For 3, 6, 10 dB.....	± 1 dB
For 20 dB.....	± 2 dB
Measuring time adjustable.....	4 min to 72 hours
	4, 8, 12, 24 min
	1, 2, 4, 8, 12, 24, 48, 72 hour
Interruption Categories	0.6 ms to 3 ms
	3 ms to 30 ms
	30 ms to 300 ms
	300 ms to 1 min
	>1 min
Evaluation	Relative duration, Errored sec
Count & time distribution/category	

GENERAL SPECIFICATIONS**Power supply**

Internal rechargeable NIMH battery pack	
Operation time	approx. 8 hours

Charging

From 230V mains	with mains adapter
From 12V car battery	with car adapter
Fast charging time	less than 3 hours

Display320 x 240 dot TFT-LCD

Connectors

For mains or 12V car adapter.....	2.1/5.5 mm coaxial
Balanced connectors	4 mm banana sockets
Coaxial connectors	BNC sockets
Ground connector	4 mm banana socket
USB A	USB 1.1 host port for USB stick
	(FAT16, FAT32 file system supported)
USB B	USB 1.1 device port to connect PC

Over voltage protection

Between a and b or ground	200V DC
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Ambient temperature ranges

Reference	23±5°C
	Rel. humidity 45% to 75%
Normal operation	0 to +40°C
	Rel. humidity 30% to 75% *($<25\text{g/m}^3$)
Limits of operation	-5 to +45°C
	Rel. humidity 5% to 95% *($<29\text{g/m}^3$)
Storage and transport	-40 to +70°C
	Rel. humidity 95% at +45°C *($<35\text{g/m}^3$)

* without condensation

Dimensions.....224 x 160 x 44 mm

Weight.....approx. 1.5 kg

ORDERING INFORMATION**LEVEL TEST SET ET 91**437-000-000**Including:**

Operating Manual
 Short form Operation Instruction
 Calibration Certificate
 2 Balanced Measuring Cables
 2 Coaxial Measuring Cables
 USB cable
 USB stick
 Mains adapter 100 to 264 VAC
 Carrying case
 Battery pack (built in)

Options :

40 dB External Attenuator coax	Y 107-439
40 dB External Attenuator balance	Y 107-448
Car lighter power adapter EAA10	367-000-000
Group Delay Distortion Measurement	SW437-570-000
Phase Jitter and Frequ. Error Meas.	SW437-560-000
Micro Interruption Measurement	SW437-530-000
Spectrogram SW set	SW437-580-000
Spectral Trace as Reference	SW437-590-000
PC control program for result transfer and parameter editor	SW437-100-000
Calibration Report	CR437-000-000E

DATA SUBJECT TO BE CHANGED WITHOUT PRIOR NOTICE

02.01.2017.