univox
BY EDIN

Univox FSM 2.0

Multitone Field Strength Measurement
Microprocessor controlled

User Guide

FSM 2.0, Part No 401040

Content

Introduction

We thank you for having chosen a Univox® product and hope that you will be satisfied. Please read this User Guide carefully before installation and use of this product.

In the package you will find the following product parts:

- Univox® FSM 2.0
- XLR/RCA adaptor
- RCA/3.5mm cable for connection of the signal source to the loop amplifier
- Earphone adapter
- USB-card with a full user guide, product information and signal files as **wav** files
- Short User Guide / Certificate using Univox® FSM 2.0
- Bag

1. **LCD (display)**
2. **Blue LED, Ready**
   A. Flashes after each completed measurement
   B. Continuous light when in Hold mode

Controls

3. **Start** Start/activates the FSM or proceeds to the measurement step
4. **Light** Illuminates LCD. Increases battery drain, use with caution.
5. **Stop** Turns the instrument off (saves battery)
6. **Hold** Toggle switch (on/off) freezes display

7. Output for headphones or external measurement equipment
8. Output level adjustment
9. 9V-battery compartment (rear side)

System overview

Univox® FSM 2.0 is an advanced and outstanding Field Strength Meter with many features not seen elsewhere. It is based on the experience from Univox® FSM which was the first true rms Field Strength Meter in the world.

As the very first of its kind Univox® FSM 2.0 makes fast and accurate frequency measurements possible by using multitone measurements (many sine waves simultaneously presented). Multitone measurements have only been possible up to now in laboratories or similar environments.

Overspill measurement below the background noise level is for the first time possible with the built-in sharp programmable notch filter in Univox FSM 2.0.

The LCD display and microprocessor (µP) makes Univox® FSM 2.0 easy and straight forward to use. The measurement process is controlled by the µP and displays a step-by-step procedure, according to the international standard IEC 60118-4.

Univox® FSM 2.0 has many built-in features that are controlled by the µP:
calibrated A-weighted filter, tracking switching capacitor filters, automatic gain range setting, auto off/battery save function etc. With all these features it is possible to perform many different kind of measurements. The µP can easily be updated in case of future IEC standard enhancements.

Please note, specification could change without notice.

Signal sources

Multitone signals

Some of the measurements are based on very exact frequencies. Three input signals using multitone measurements are stored on the USB-card: **1kHz.wav**, **3_freq.wav** and **16_freq.wav**. Use a verified quality computer, MP3 or CD player as signal source. It is recommended to use the wave format to maintain quality. Do not change the format to a compressed one. Do not use any other standard signals as frequency calibration is very precise and vital for correct result.

The measurements are based on exact sine wave frequencies and complex multitone signals in each sound file (5min duration). The signals are mathematically generated and are downsampled to 44kHz/16bit.

- **1kHz.wav** 1kHz sine wave, peak level = -3dB (rms -3dB) re FS (Full Signal)
- **3_freq.wav** sine waves: 100Hz, 1kHz, 5kHz, max peak level = -3.3dB (rms -11.1dB) re FS
- **16_freq.wav** 16 sine waves: 100-10kHz, max peak level = -2dB (rms -10.5dB) re FS. Each sine waves level is -20dB re FS.

The file **3_freq.wav** consists of three multitone sine waves and is suitable for quick basic check of the upper 5kHz and lower 100Hz frequencies.

The file **16_freq.wav** is a more complex and wide multitone signal for comprehensive frequency measurements. The simultaneously presented 16 sine waves with the µP tracking filter give a more correct and steady measurement compared to pink noise. As it presents the full spectra it will work fine with different AGC-systems and other regulation systems in amplifiers.

Speech

To commission the level of a loop system, real speech is recommended as final test to verify that the output power stage can handle the maximum peaks together with level adjustments like AGC.

It is very important that the maximum level can be achieved at (400mA/m=(0dB)) according to IEC 60118-4 standard.

The following speech signal sources are stored on the enclosed USB card as wave files. Use a verified quality computer or MP3 player as signal source. Do not convert the files to any compressed format.

1. ITU-speech, file **ITU.wav**, is an artificial speech based on many different languages. It is a mathematically well defined signal with separate male and female voices. As level is the primary test the male and female signals are mixed together.
2. **HAspeech.wav** is a wave file used by the Hearing Instrument manufacturers for testing equipment with “real world signals”.

Basic program description

There are 5 different programs, numbered 1-5. Each press on the Start button will either start the Univox® FSM 2.0 or proceed to the next program. Each measurement repeats continuously. The blue LED will flash once for each completed measurement. The completion time depends on the complexity of the program.

Measurements/programs

1. Noise measurement, dB and dB(A), approximately 1 measurement/sec
2. Field distribution and overspill measurements, dB, approximately 3 measurements/sec
3. Frequency, dB at 100 – 1000 – 5000Hz re 1kHz (IEC) 1.1 sec/measurement
4. Frequency spectrum (16 frequencies) re 1kHz, each measurement 5-8 sec
5. Field Strength level, 3 measurements/sec

Auto on/off function will shut down the Univox® FSM 2.0 after approximately 60sec to save battery life.

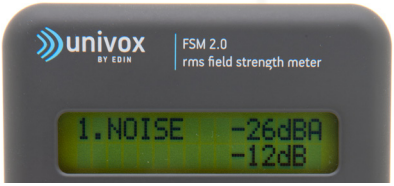
To start/activate Univox® FSM 2.0

Press Start. Univox® FSM 2.0 activates and program 1 starts.

Using the instrument

1. Press buttons approximately ¼ of a second for correct use
2. Hold the instrument in vertical position for measuring the vertical field strength (normal)
3. Measure at the correct listening place and height (normally 1.2m for sitting and 1.7m for standing positions)
4. Hold Univox® FSM 2.0 in a fixed position during measurements (between each flash of the blue LED)
5. The displayed resolution is 1dB. It must be taken into consideration when interpretating the values

Quick check of field strength/background noise



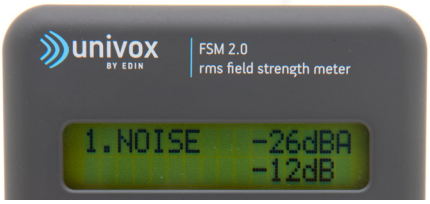
Press **Start** to activate program 1.

Noise measurement

Document the dB and dBA value.

Note The loop amplifier must be diconnected

Field strength measurement



1. Activate the existing signal source; talk into the microphone or use other normally used signal source. Document the dB value.
2. When using speech as real signal, note the highest level out of several measurements, as speech varies.
3. When using 1kHz sine wave, just document the dB value.

Overspill/Field strength variation measurement

Press **Start** to activate program 2. **Coverage**

Connect input signal **1kHz** to the amplifier and adjust the input according to manual. Set the fieldstrength to approximately -12dB. Note that level as the reference level. Overspill level should normally be 32dB below the reference level.

Measure the variation inside (Field Strength Variation) and outside (overspill) the loop.

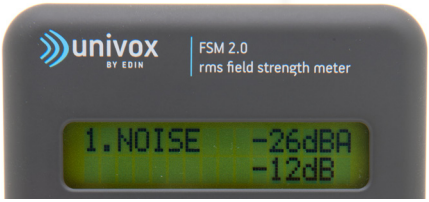
IEC 60118-4

Accepted variation is ±3dB within the listening volume.

Step by step description for a Certificate

Study section **Using the intstrument**, page 7. See **Certificate of Conformity – using Univox FSM 2.0**.

1. Background noise measurement



Description

The autorange feature of program 1 sets the instrument's gain automatically, depending on the noise level, individually for the A-weighted and flat response for the best dynamic range for noise measurements.

Procedure

1. Disconnect the Loop Amplifier
2. Document the dB and dBA value
3. Press **Start** again for ¼ of second to advance to next program

Note If the level for dBA and dB is equal, the background noise is audible in hearing aids. It is likely from any switching electronics not following the EMC-regulation.

IEC 60118-4

1. For long time listening it is recommended that the background level is below -47dB(A)
2. If the level is higher than -32dB(A) the owner of the premises should be told and given some suggestion how to accomplish a lower background noise

3. For short time announcement the background noise exceeds -22dBA, as the Loop System still will be beneficiary for the Hearing Aid user

2. Field strength variation/overspill

Description

The precise frequency signal together with the tracking filter in Univox® FSM 2.0 make measurements below the background noise possible.

Procedure

1. Press **Start** to activate program 2 **Coverage**
2. Connect the signal source, file **1kHz.wav** to the amplifier and adjust the input according to the amplifiers instruction manual. Set the field strength to approximate -12dB at reference
3. Measure the variation inside the listening volume at (1.2m) for sitting and (1.7m) for standing hight (Field Strength Variation).
4. If necessary, measure the overspill (normally defined as below -32dB) of the loop

IEC 60118-4

Stated field strength variation is ±3dB within the listening volume.

3. Quick frequency test

Description

Univox® FSM 2.0 automatically calculates the levels for 100Hz, 1kHz and 5kHz relative 1kHz. The level for measurement is set automatically.

As all three frequencies are presented simultaneously (multi-frequency test) the old measurement problem with AGC-system is solved. Another advantage is the speed, full measurement with all frequencies is made repeatingly approximately every second.

Note 1 High frequency drop is caused by the condition of the room. The highest drop will normally be in the middle of the loop.

Note 2 A loop amplifier cannot compensate high frequency drops (normally occurs in the center of the loop), as the variation is due to physic variation of the room, not the amplifier. The only real solution is to decrease the distance between wires to reduce the metallic influence. Tone controls (often called metal correction) cannot control local frequency VARIATION caused by the room. Double check that the amplifier does not saturate/clip AND can deliver the full 400 mA/m, after any frequency adjustment(s).
The variation of the room is caused by the room itself, and will still be present even if the treble from the amplifier is increased.

Procedure

1. Connect the signal source, file **13_freq.wav** to the loop amplifier
2. Adjust the input level according to the amplifiers instruction manual
3. Make sure that the output do NOT saturate or clip, normally -12dB Field Strength level is a secure level.

4. Do the frequency test at sufficient places in the listening volume. 1.2m for sitting and 1.7m for standing height. If the installation is used for only sitting people, only 1.2m documentation is required.
5. Document the results into the certificate
6. Press **Start** again for ¼ of second to advance to next program

IEC 60118-4

Specified frequency variation is ±3dB.

Note Please see **Overspill/Field strength variation measurement** for details.

4. Frequency measurement

Description

Univox® FSM 2.0, makes a full automatic frequency/spectrum measurement without the need for manual calibration or setting the level of the measurement. This also avoids common mistakes when trying to set correct levels for frequency measurements. The program makes relative frequency measurements possibly with accurate result.

Function description

1. Each frequency is measured
2. The gain is calculated and corrected for each frequency for highest dynamic range
3. The highest measured level is calculated
4. All other levels on other frequencies are related (-dB) to the highest measured level
5. Frequency levels are presented as bar graphs on the lower display with 1dB resolution (total +/- 4dB)
6. The field strength level is presented on the upper right of the display (normally -12dB)

Procedure

1. Connect the signal source, file **16_freq.wav**
2. Adjust the input level according to the amplifiers instruction manual
3. Make sure that the output do NOT saturate or clip, normally -12dB Field Strength level is a secure level (Upper right corner of the display)

4. Check the frequency variation at 1.2m for sitting and 1.7m for standing height. Installations for sitting people only, measurement for 1.7m is not necessary.
5. Press **Start** again for ¼ of second to advance to next program

Adjustments

High frequency drop is caused by the condition of the room. The highest drop will normally be in the middle of the loop.

IMPORTANT!

Any frequency corrections strongly increase the saturation/clipping risk in the amplifier. A 12dB increase in correction increases the power demand from the amplifier by 16 times!

Any frequency correction measured made at low level (100 mA/m) will LIKELY saturate the amplifier for normal program signals of 400 mA/m.

IEC 60118-4

Specified frequency variation is ±3dB.

Note Frequency measurements are not correlated to the field strength. The output performance must be checked after any frequency corrections.

5. Field strength

Description

Univox® FSM 2.0 sets the internal gain for the highest possible dynamic range.

Procedure

1. Connect the signal source, file **1kHz.wav**
2. Adjust the input level according to the amplifiers manual
3. Check the variation at 1.2m for sitting and 1.7m for standing height. Document the result into the certificate. It is only necessary to document the used height i.e. if only sitting position is used only that position needs to be documented.

IEC 60118-4

Accepted variation is ±3dB re 400mA/m (0dB).

Field strength

Activate the existing signal source; speak normally into the microphone or other normally used signal source. Document the value into the certificate.

Real signals, like speech, fluctuates. Note the highest level out of several measurements.

When using sine wave, just note the measured value.

Press **Start** again for ¼ of second to advance to next program.

6. Final confirmation and comissioning

Connect the actual signal source, preferably speech, and adjust the input level according to the instructions of the amplifier's manual. Verify that the highest peak is 400mA/m (0dB) by several measurements, normally more than 10 seconds.

Accessories

680060 Etymotic Research ER-6i earphones

Other information

Security/Warranty

Basic knowledge in audio and video installation techniques is required to achieve existing regulations. The installer is responsible for the installation hereby avoiding any risk or cause of fire. Please also note that warranty is not valid for any damage or defects on the product due to incorrect or incautious installation.

Maintenance and care

Under normal circumstances Univox® products do not need any special maintenance. Should the unit become dirty, wipe the unit with a slightly damp cloth. Do not use solvent or heavy cleaning agents.

Trouble shooting guide

Please also note that warranty is not valid for any damage or defects on the product due to incorrect or incautious use.

When Univox® FSM 2.0 automatically shuts down quickly, please replace the batteries.

Should the product not work after having made the product test as described above, please contact the local distributor of the product for further instructions.

Service

Should the system not work after having replaced the batteries, please contact the local distributor of the product for further instructions. If the product is to be sent to Bo Edin AB, please enclose a filled Service Form, see www.univox.eu, Support.

Technical data

For additional information, please refer to product data sheet/brochure and CE certificate which can be downloaded from www.univox.eu, Product data. If required, spare part lists or other technical documents can be ordered through support@edin.se.

Recycling directives/Environment/Correct disposal

When this product is finished with, please follow existing disposal regulations. Thus if you respect these instructions you ensure human health and environmental protection.

Distributor

Univox by edin, the world's leading expert and producer of high quality hearing loop systems, created the very first true loop amplifier 1969. Ever since our mission is to serve the hearing community with the highest degree of service and performance with strong focus on Research and Development for new technical solutions.

Hearing excellence since 1965

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