



Univox[®] FSM 2.0

Multitone Field Strength Measurement
Microprocessor controlled

User Guide



FSM 2.0, Part No 401040

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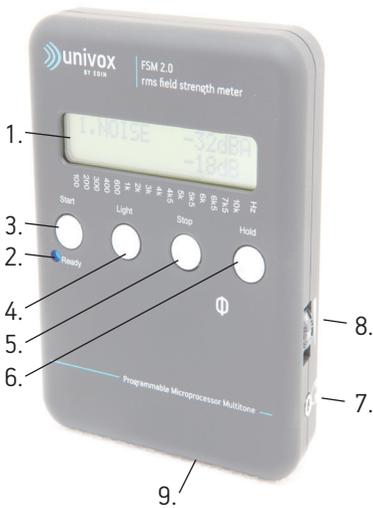
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Introduction

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

In the package you will find the following product parts:

- Univox FSM 2.0 Field Strength Meter
- XLR/RCA adapter
- RCA/3.5mm cable for connection of the signal source to the loop amplifier
- Earphone adapter, 3.5mm stereo jack/3.5mm mono plug
- USB memory card containing full user guide, product information and audio files (test signals)
- Certificate of Calibration
- Bag



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

Buttons

3. **Start**
Starts/activates the FSM or proceeds to the next measurement step
4. **Light**
Illuminates LCD when pressed.
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 Field Strength Meter with several 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 (several sine waves presented simultaneously). Multitone measurements have up to now only been possible 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) make 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 kinds of measurements. The μP can easily be updated in case of future IEC standard enhancements. **Note:** standard specification could change without notice.

Univox FSM 2.0 can also be connected to any external measurement equipment. Read more in the section Connection to external measurement equipment.

Audio files (test signals)

Multitone and sine wave audio files

Some of the measurements are based on precise frequencies and other are based on multitone signals. Five audio files are stored on the USB card:

1kHz.wav, 1kHz_pulse.wav, 1k6Hz_pulse.wav, 3_freq.wav and 16_freq.wav.

Use a verified quality computer, MP3 or CD player as signal source. It is recommended to keep the wav 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 results.

The measurements are based on exact sine wave frequencies and complex multitone audio files (5 min duration). The signals are mathematically generated and are down sampled to 44kHz/16bit.

- **1kHz.wav**
1kHz sine wave, peak level = -3dB (rms -3dB) re FS (Full Signal)
- **1kHz_pulse.wav**
1kHz sine wave pulses (1.5 sec on/3 sec off), peak level = -3dB (rms -3dB) re FS
- **1k6Hz_pulse.wav**
1k6Hz sine wave pulses (3 sec on/3 sec off), peak level = -3dB (rms -3dB) re FS
- **3_freq.wav**
Simultaneous sine waves: 100Hz, 1kHz, 5kHz, max peak level = -3.3dB (rms -11.1dB) re FS
- **16_freq.wav**
16 simultaneous sine waves: 100Hz-10kHz, max peak level = -2dB (rms -10.5dB) re FS. Each sine wave level is -20dB re FS.

The audio file **3_freq.wav** consists of three simultaneous sine waves and is suitable for quick basic check of the upper 5kHz and lower 100Hz frequencies in relation to the 1kHz value.

The audio 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 gives a more correct and steady measurement compared to pink noise. The wide band signal is compatible with frequency dependent AGC circuitries and alike.

Speech audio files

Real speech or a synthesized speech signal is recommended for commissioning of the loop system for 400mA/m with ± 3 dB according to IEC.

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

1. ITU-speech, **itu.wav** is an artificial speech audio file, 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. HA-speech, **haspeech.wav** is a wav file used by the Hearing Instrument manufacturers for testing equipment with "real world signals". The signal consists of short pieces of real speech in six major languages, mixed together.

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

Measurement 4, frequency spectrum, is not compulsory according to the IEC standard. To save battery life, the Auto on/off function will shut down the Univox FSM 2.0 after approximately 5 min without use.

To start/activate Univox FSM 2.0

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

Using the instrument

1. Hold the instrument in vertical position for measuring the vertical field strength.
2. Measure at appropriate listening positions and chosen measurement height (normally 1.2m for sitting and 1.7m for standing listeners).
3. Hold Univox FSM 2.0 in a fixed position during measurements (between each flash of the blue LED).
4. The displayed resolution is 1dB. It must be taken into consideration when interpreting the values.

Certificate of Conformity - Step by step

Activate FSM 2.0, see Using the instrument above and the Measurement protocol Certificate of Conformity.

1. Background noise measurement (Noise)



Description

The auto-range feature 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. FSM-2.0 can measure background noise levels down to -52dBA.

Procedure

1. Disconnect the Loop Amplifier from mains power.
2. Press start to activate FSM 2.0 and program 1. Noise
3. Document the background noise levels, with A-weighted filter (dBA) and flat (dB) in different positions throughout the listening area.

Note: If the level for dBA and dB is equal, the background noise is more likely to be audible in the hearing aid.

IEC 60118-4

1. For long time listening it is recommended that the background noise level is below -47dB(A).
2. If the background noise level is higher than -32dB(A), the owner of the premises should be informed and given some suggestions how to accomplish a lower background noise level.
3. For short time announcements, background noise levels of up to -22dBA, can be accepted, as the loop system still will be of use for to hearing aid user.

2. Field strength deviation/overspill (Coverage)



Description

The precise 1kHz frequency signal together with the tracking filter in Univox FSM 2.0 make measurements below the background noise level possible.

Procedure

1. Press **Start** to activate program 2 **Coverage**
2. Connect the signal source and activate the audio file **1kHz.wav**.
3. Adjust the input level according to the amplifier's manual.
4. Adjust the field strength to approximately -12dB at a reference measuring point.
5. Measure the variation (field strength deviation) inside the listening area at 1.2m for sitting and/or 1.7m for standing height. If both sitting and standing positions are used, measure at 1.45m.
6. If necessary, measure the overspill distribution outside of the loop (as overspill is not regulated in the IEC 60118-4 standard, the overspill can be defined as magnetic field above -32dB).

IEC 60118-4

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

3. Basic frequency test (FQ)



Description

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

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

Note 1 High frequency drop is caused by construction metal in the room. The highest drop will normally occur in the middle of the loop.

Note 2 A loop amplifier cannot fully compensate for high frequency drops as the variation is due to the physical variation of the room, not the amplifier. The only real solution is to decrease the distance between the loop wires to reduce the metallic influence. Tone controls (often called metal loss correction or alike) cannot control local frequency variation caused by the room. After any frequency adjustment(s), double-check that the amplifier does not saturate/clip AND that it can deliver the full 400 mA/m (0dB) in program peaks.

Procedure

1. Press start to activate program 3 **FQ**.
2. Activate the audio file **3_freq.wav**.
3. Adjust the input level according to the amplifier's manual.
4. Make sure that the output does NOT saturate or clip. -12dB field strength level is a secure level (the -12dB level is normally already set in step 2).
5. Perform the frequency test at 1.2m for sitting and 1.7m for standing listening height. If both sitting and standing positions are used, measure at 1.45m.
6. Document the results in the certificate. The 1kHz dB value will always be set to 0dB. The 100Hz and 5kHz dB values will be measured in relation to the 0dB at 1kHz.

IEC 60118-4

Specified frequency variation is ± 3 dB for 100Hz and 5kHz relative to 1kHz (0dB).

4. Comprehensive frequency measurement (not required for IEC certificate) (Freq)



Description

Univox FSM 2.0 makes a full automatic frequency/spectrum measurement without the need for manual calibration or setting of 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 possible with accurate results.

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 frequency levels are in relation (-dB) to the frequency with the highest measured level.
5. Frequency levels are presented as bar graphs on the lower display with 1dB resolution (total 8dB).
6. The field strength level is presented on the upper right of the display (normally approx. -12dB).

Procedure

1. Activate the audio file **16_freq.wav**.
2. Make sure that the output does NOT saturate or clip. -12dB field strength level is a secure level (the -12dB level is normally already set in step 2).
3. Check the frequency variation at 1.2m for sitting and 1.7m for standing height. At installations for sitting audience only, measurement at 1.7m is not necessary.

Adjustments

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

Important! Any high 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 high frequency correction made at a low level (-12dB/100 mA/m) will LIKELY saturate the amplifier for normal program signal peaks of 400 mA/m.

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

5. Adjustment of field strength level (Field)



Description

The FSM 2.0 measures the magnetic field strength level approximately 3 times/sec.

Procedure

1. Activate the audio file **1kHz_pulse.wav**.
2. Adjust the input level according to the amplifier's manual.
3. Read the highest value within 2-5 seconds and adjust the output current until peak values of 0dB (400mA/m) \pm 3dB are reached. A good reference measurement position is midway between the center of the loop and the loop perimeter.
Note: A continuous sine wave is not recommended since the loop driver's AGC might decrease the level.
4. Check the variation at 1.2m for sitting and 1.7m for standing height. Document the result in 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.
5. As an alternative, activate the audio file **itu.wav** and read the highest value during min. 30 sec. Adjust the amplifier's output current until peak values of 0dB (400mA/m) \pm 3dB are reached.

IEC 60118-4

Accepted variation is \pm 3dB re 400mA/m (0dB) through the whole listening volume.

6. Final confirmation and commissioning

Connect the actual signal source/s, preferably speech, and adjust the input level according to the instructions of the amplifier's manual.

If a microphone is used, speak normally into the microphone. If the ITU or HA synthesized speech signals are preferred, use the audio sources available on site (e.g. CD player or audio system).

Verify that the highest peak is 400mA/m (0dB). As real signals like speech fluctuate, several measurements have to be performed, usually for 20-30 seconds. The time it will take before an accurate peak value is reached, is depending on the evenness of the program signal (crest factor).

Document the highest peak value in the certificate.

Another easy way of confirming that the magnetic field strength level is OK, is to use Univox Listener. If the LED lights up green occasionally the level is according to the IEC standard.

7. Voltage clipping in program peaks

To ensure that dynamic signals like music is presented more fairly, it has to be verified that 400mA/m (0dB) can be reached in the program peaks also at 1.6kHz. This can be achieved in one of two ways:

1. When using the primary sound source, ensure that the driver is not peak-clipping by observing that the clip/peak indicator doesn't light red.
2. If a primary sound source is not yet present, activate the audio file **1k6Hz_pulse.wav** instead and verify that 400mA/m (0dB) can be reached in the program peaks.

Connection to external measurement equipment

The FSM 2.0 can be connected to external measurement equipment using the headphone output. Output level is 100mV RMS at max volume setting. Max load 1k Ω .

Therefore any system – computer, level meter, smartphone or alike with appropriate software can use the FSM 2.0 as a field strength measurement "head".

General information

Security/Warranty

Basic knowledge in audio 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 handling.

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.

FSM 2.0 is calibrated upon delivery and there is normally no need for re-calibration.

Trouble shooting guide

- When Univox FSM 2.0 automatically shuts down quickly, please replace the batteries.
- If the buttons are pressed down too hard, the Univox FSM 2.0 might shut itself off. If so, just activate the FSM 2.0 again by pressing the Start button.
- To listen to the sound of a loop with earphones, please use the included 3.5mm earphone adapter to receive sound in both ears.

Service

Should the system still not work after trouble shooting, please contact the local distributor of the product for further instructions.

Always enclose a filled out 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. 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.



Notes

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.

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Hearing excellence since 1965

