



302



302 Compact Production Mixer User Guide and Technical Information

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The 302 is the essential portable mixer for production companies and camera operators wanting to take control of their audio. The 302 is stunning in size, flexibility, control and performance; it is the most compact and cost-effective battery-powered professional audio mixer in its class.

With important features to accommodate nearly any over-the-shoulder production, the 302 can interface with any professional microphone, wireless system, or camera /recorder input. Its microphone inputs share the same superb circuitry of all Sound Devices field production tools.

With many of the controls of the flagship 442 mixer the 302 has a complete feature-set in a compact, functional design. All controls are accessible on its three main surfaces. The high-efficiency power circuitry runs the mixer from either three internal AA batteries or external 5-18 VDC.

The 302 is part of Sound Devices family of field production audio tools, which includes mixers, preamplifiers, computer interfaces, recorders, and accessories.

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QUICK START CHECKLIST

Proper setup of sound sources and input devices is quick and easy with the 302. Follow the steps outlined below for basic interconnection.

Powering

1. Insert three AA-batteries with + side first into the mixer battery tube.
2. Switch on the mixer power by sliding the power switch to INT. The power LED will illuminate solid green with good batteries.

Interconnection

1. Connect the output XLR connectors of the 302 to the destination recorder, camera, or other input.
2. Connect microphones or other signal sources to the input XLR connectors.
3. Switch phantom or T-power on, as required by the microphones.

Setting Output Gain Structure

1. Determine the required input level of the destination. If a line level connection is required, no further output level adjustment is needed on the 302. If the input level requires less than line level, such as microphone or a -10 dBu level, adjust the master output level accordingly (*see Output Level Control*).
2. Turn on the 302's tone oscillator. Adjust the input sensitivity on the destination device so that the 302 output is at an average level with sufficient headroom to accommodate signal peaks. For many digital cameras and recorders, this is often a range between -20 and -12 dBfs as read on the recorder or camera's peak meter. With analog devices running nominal levels near 0 VU is typical.

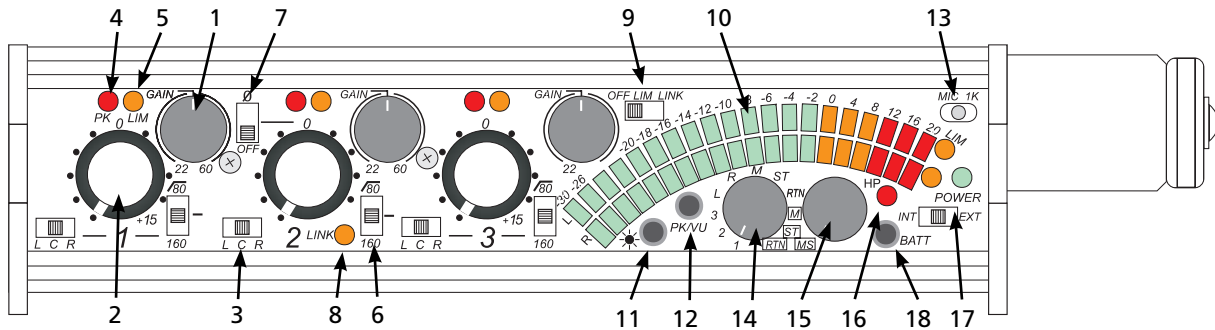
Setting Input Levels

1. Select the overall level, mic or line for the input channel.
2. Set the channel fader to the unity gain position.
3. Raise the gain control (trim) so that signal indicates on the mixer.

Monitoring

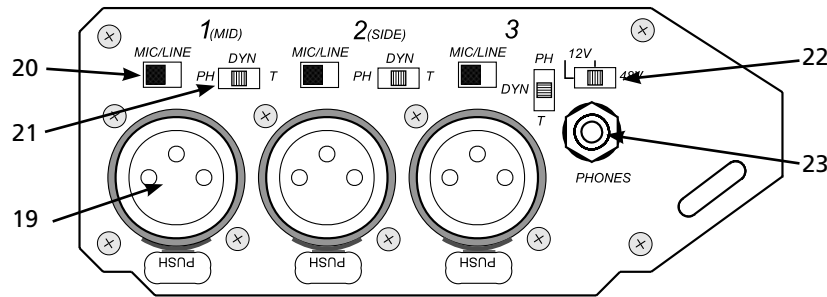
1. Connect headphones to the headphone connector located on the input panel.
2. Set the headphone source to ST to monitor stereo program. Raise the headphone volume level to the required level. NOTE: The 302 headphone output is capable of producing ear-damaging levels. Turn down levels before switching source.
3. Monitor individual sources by moving the headphone selection switch to the 1, 2, or 3 positions.

FRONT PANEL DESCRIPTIONS



- 1. Gain (Trim)**
The coarse gain control. Sets the input range so that fine gain control can be applied with the channel fader.
- 2. Fader**
The primary control for adjusting gain during operation. Allows fine control over input levels.
- 3. Pan Switch**
Assigns the input channel to the output bus. Left-only, Center (equal left and right), or Right-only.
- 4. Peak LED**
When illuminated, indicates that the channel is very near overload.
- 5. Limiter LED**
When illuminated, indicates that the channel limiter is operating and reducing channel gain to prevent overload.
- 6. High-Pass Filter (Low Cut)**
Three-position switch engages the high-pass shelving filter. Used to reduce excessive low frequencies. 12 dB per octave at 80 Hz or 160 Hz. Center position is off.
- 7. Polarity Reverse Switch – Channel 2**
When engaged, the polarity of channel 2 is reverse (180° out-of-phase) with respect to input channels one and three. Useful to flip the stereo image when using MS stereo techniques.
- 8. Stereo Link LED (Channels 1 & 2)**
Indicates that channels 1 and 2 are linked as a stereo pair. Engaged via a user setup. In L/R stereo link channel 2 fader controls overall stereo level. When in MS position channel 1 fader controls Mid, channel 2 fader controls the amount of stereo (side) information.
- 9. Limiter Switch**
Activates both input and output limiters. ON is dual-mono limiter operation, LINK is stereo operation. Output limiter threshold controlled in User Setup menu.
- 10. Output Meter**
Sunlight-viewable, 40-segment LED output meter indicates peak, VU, or combination peak/VU output levels. Calibrated in dBu when peak-reading.
- 11. Meter Brightness**
Controls the brightness of the LED output meter. Each push selects among four brightness levels.
- 12. Meter Ballistics**
Toggles among the available meter ballistic options: VU-only, peak-only, combo peak/VU, peak-hold/VU.
- 13. Mic / Tone Switch**
Two-position switch activates either the slate microphone in the left-momentary position, or a tone oscillator in the right-latched position. Additional options available in the User Setup Menu.
- 14. Headphone Selector**
Sets the signal source sent to headphones. Options include: channel PFL 1, 2, 3; left output bus; right output bus; Mono (summed left and right); STereo master; RTN - stereo monitor return; MS-mono; MS-stereo; RTN-MS.
- 15. Headphone Volume**
Adjusts the overall volume of the headphones. NOTE: the headphone output is capable of ear-damaging levels. Take care when adjusting among signal sources.
- 16. Headphone LED**
Indicates overload of the headphone circuit and RTN circuit.
- 17. Power Switch / LED**
Three-position switch selects between internal battery power or external DC sources. Power LED illuminates when power is on. LED flashes when voltage reaches low limit (see Powering).
- 18. Battery Check Button**
Depressing indicates both internal and external battery levels on the output meter. Battery level is shown for two seconds after button pressing.

INPUT PANEL DESCRIPTIONS



19. Transformer-Balanced Inputs

Can be used unbalanced by grounding pin-3 to pin-1 of the XLR connector. Pin-1 = ground; pin-2 = 'hot'; pin-3 = 'cold'.

20. Mic/Line Channel Switch

Selects the input level of the adjacent connector. Mic level has 40 dB more gain than line level.

21. Phantom/DYNamic/T-Power Selection

Selects the microphone powering type of the adjacent input. DYN position turns off all microphone powering. Mic powering is selected per input.

NOTE: Use T-Powering only for T-Powered microphones.

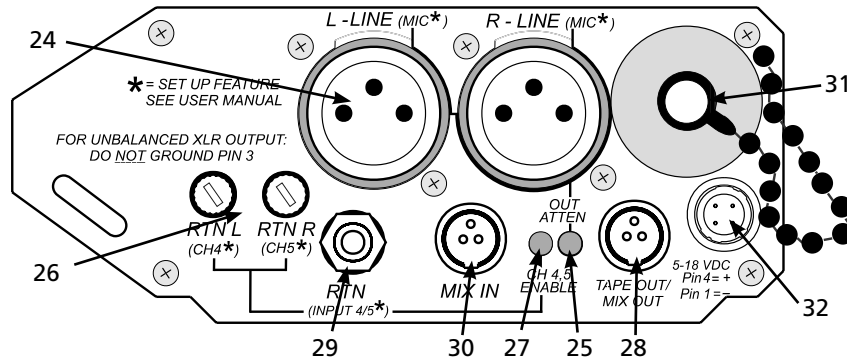
22. Phantom Voltage Selection

Selects between 48 V or 12 V phantom voltage for the input channels. The three-position switch uses two positions for 12 V—there is no difference between these positions.

23. Headphone Output

1/8-inch TRS stereo headphone output. Can drive headphones from 8 to 2000 ohms to required monitoring levels.

OUTPUT PANEL DESCRIPTIONS



24. XLR Master Outputs

Active-balanced outputs. Pin-1 = ground; pin-2 = 'hot'; pin 3 = 'cold'. Can be unbalanced by using pin-2 for signal and pin-1 for ground.

25. Output Attenuation LED

When illuminated, indicates that the XLR output connectors are set for a level other than the factory default of line level. See User Menu to set XLR output levels.

26. Return Level (Channel 4/5 Level) Control

Adjusts the gain of the return feed to balance program and monitor signals in headphones.

27. Channel 4/5 Activation LED

When illuminated, indicates that the return connector is now set as an input 4 and 5 connections.

28. Tape Out / Mix Out

Unbalanced stereo output on TA3-type connector. Same program as master output. Pin-1 = ground, pin-2 = left, pin-3 = right. Also used to link to the Mix In of a 442 or 302.

29. Return (Channel 4/5) Input

Unbalanced stereo 1/8-inch input connector for return monitor audio. 1/8-inch wired tip = left, ring = right, sleeve = ground. Connection used for inputs 4 & 5 when selected in Setup Menu.

30. Mix In

An input to the master bus designed exclusively to link the Tape Out/ Mix Out of 302, 442, MixPre, or MP-2 to the 302 for additional inputs. Pin-1 = ground, pin-2 = left, pin-3 = right. Shell of TA3 connector must be grounded to pin-1 to open connection.

31. Battery Tube

Holds three-AA batteries for internal powering.

Accepts alkaline and lithium cells or NiHM rechargeable cells.

32. DC Input

Accepts DC voltages from 5 - 18 V for mixer powering. Four-pin Hirose connector wired pin-4 positive (+), pin-1 negative (-). Ext DC is completely isolated (floating) from the rest of the circuitry.

INPUT CHANNELS

The inputs of the 302 consist of three, full-featured microphone preamplifiers. Each channel has a wide gain range to accommodate nearly all signal types. The 302 easily accepts signals from low-sensitivity ribbon and dynamic microphones, medium level wireless and condenser mic outputs, and "hot" line-level signals.

302 input channels are transformer-balanced. The isolation characteristics of transformers are superior to other balancing techniques for the hostile and uncontrolled environments of field production. Transformers provide galvanic isolation from the driving source, meaning there is no direct electrical connection. Signals are "transformed" magnetically. The input transformers in the 302 use premium magnetic core material to achieve high signal handling capability (especially at low frequencies) while keeping distortion to a minimum. Because of their inherently high common mode impedance, transformers are unrivaled by any other type of input for common-mode noise rejection.

The inputs of the 302 can be used balanced or unbalanced. When unbalancing, ground pin-3 to pin-1 of the XLR connector. There is no change in gain between unbalanced and balanced connections into the 302.

Mic/Line Level Selection

The Mic/Line switch on the input panel is used to select the input level for each channel. Taking into account all gain stages, the 302 has up to 75 dB of available gain from mic input to line output. When in the LINE position, the input channel sensitivity is reduced by 40 dB.

Gain / Trim

Like traditional mixing consoles, the 302's microphone preamp gains are set via the gain control. The gain, or trim, adjusts the input sensitivity of a channel input so that the channel fader can be set to operate in a usable range. Once set, the gain is typically kept at the set level and all mixing is done on the channel fader. The gain adjustment features a pop-up knob so that it can be adjusted easily and then hidden from the mixing surface.

Faders

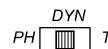
While both the gain and the fader control the gain of a given channel, the fader is the primary channel level control used in operation. The gain can be thought of as a "coarse" gain adjustment to be adjusted during setup, and the Fader is a "fine" level adjustment to be adjusted while recording. With a properly set gain control, the fader can be set to a nominal 0 (unity) level. With the fader at unity, the dynamic range of the mixer is maximized. There is a wide range of control for the input, allowing for smooth level changes with adequate control of attenuation and gain.

Microphone Powering

Phantom powering and T-powering are methods of providing power to microphones by applying a voltage using the same wires that carry the audio signal. The 302 produces phantom or T-power for microphones requiring power.

Condenser microphones require power for various parts of their operation, including impedance converters, preamplifier circuitry, and in some cases, to polarize microphone capsules. The 302 can provide either phantom power or T-power to each channel and is selected per channel.

If neither phantom or T-power are required, for instance with dynamic microphones, it is good practice to turn off microphone powering.

Phantom Power Basics

Phantom powering is a fixed DC voltage between 12 and 48 volts. This voltage is resistively applied to pin-2 and pin-3 of an XLR connector relative to pin-1. (Note that as there is no voltage difference between the signal pins -2 and -3—a dynamic mic can operate just fine in the presence of phantom powering.)

When phantom is selected, the 302 can provide up to 10 mA to each input at 48 V, sufficient for the most power-hungry condenser microphones. When acceptable, using 12 V phantom is recommended to extend battery

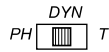
runtime. Many microphones do not require 48 V phantom and can be properly powered from 12 V phantom power. The phantom voltage level is globally selected for all inputs - either 12 V or 48 V.

Microphones draw differing amounts of current based on their design. Many phantom-powered mics will operate at 12 V with no difference in performance as compared to operating off of 48 V. As the mics draw the same current no matter what the phantom voltage, operating at 48 V consumes four times the power as 12 V with no performance gain! This excess power draw can make a significant difference in battery life and is the reason the 302 allows the user to select the phantom voltage.

It is generally good practice to turn off phantom power when not using a phantom powered mic, as phantom power can capacitively couple noise into the mic inputs with poor mic cables. Also, turn phantom power off when using ribbon microphones since an improperly wired cable can permanently damage the microphone. The DYN (dynamic) position applies no voltage to the microphone input.

The 12 V / 48 V phantom voltage switch sets the overall phantom voltage selection. It does not apply this voltage to an input, only sets the phantom voltage available.

T-Powering



T-powering is a microphone powering scheme used by several European condenser microphone manufacturers. Today, T-powered microphones are not as common as phantom powered microphones, but many are still in regular use. Unlike phantom power, T-power resistively applies 12 V between the signal pins -2 and -3. T-power can be selected for each input. The 302 provides positive T-power, where pin-2 on the XLR-3 connector has +12 volts relative to pin-3. When using "red dot" T-powered microphones (reverse polarity T-power) use a polarity-reversing adapter on the input, otherwise damage to the microphone may occur. Do not apply phantom power to T-powered microphones.

NOTE: Phantom and T-powering are not interchangeable. Use T-powering only for T-powered microphones.

High-Pass Filters



Each channel of the 302 has a two-position high-pass filter. High-pass (or low-cut / low roll-off) filters are useful for removing excess low frequency energy in audio signals. Wind noise is a common unwanted low frequency signal and a high-pass filter is effective for reducing wind noise. For most audio applications engaging the high-pass filter is beneficial, since little usable audio information exists below 80 Hz, especially for speech reproduction.

The 302's high-pass filters features a 12 dB/octave slope with either 80 Hz or 160 Hz corner (- 3 dB) frequencies. The 160 Hz settings can be used when aggressive filtering is required. The 302's high-pass circuit is unique because of its placement before any electronic amplification. Most mixer's high-pass circuits are placed after the mic preamp, where all of the high-energy low-frequency signals get amplified. Because the 302's circuit cuts low-frequency signals before amplifying, higher headroom is achieved in presence of signals with a lot of low-frequency energy.

Where possible, attempt to equalize at the sound source with microphone selection, use of windscreens, microphone placement, and on-board microphone filtering. Many microphones have on-board high pass filters, and the high-pass filters on the 302 can be used in conjunction with the microphone's filters to increase the filter's slope.

The high-pass filter can be removed by placing it in the center position.

Pan Switches



The pan switches assign an input channel's audio signal to the outputs. Inputs can be sent to the left, right, or both outputs equally. The 302 features excellent "off-attenuation" of the channels in the left and right positions.

Input Channel Limiters

The input channel limiters act solely as "safety" limiters, and are enabled when the output limiters are enabled via the "LIM" switch on the front panel. (See Setup Menu to defeat Channel Limiters entirely.) In normal operation with a properly set gain structure, the threshold of the channel limiter will rarely be reached. If extremely high input signal levels are approached, such as in high SPL environments or with misadjusted settings, the channel limiter(s) will activate to prevent the input channel from clipping. Without a channel limiter, "hot" signals could overload the channel and cause distortion. It is recommended that the channel limiters be used at all times. Below the factory-set threshold (just below clipping), the limiter has no effect on audio. There is no user-adjustments to the channel limiter thresholds.

When input channels 1 & 2 are linked as a stereo pair, their channel limiters also link to perform the same gain reduction to both channels equally. Each channel has an orange limiter LED which illuminates in proportion to the amount of limiting. If the orange LED for a channel comes on regularly, it is recommended to turn down the Gain.

Peak and Limit LEDs



Each channel has an indication of peak signal activity. When a channel approaches 3 dB below its clipping level, the red Peak LED illuminates. If the red Peak LED for a channel comes on often, it is recommended to turn down the Gain.

The channel limiter LED will illuminate when the input limiter is active.

Polarity Reverse - Channel 2



Engaging the polarity reverse switch inverts the polarity of channel 2. Polarity reversal is often used to quickly reverse the stereo field in MS recording. The normal position is OFF, with polarity reversal occurring when the switch is in the "∅" position.

NOTE: Be advised that an audible pop occurs when the polarity switch changes states.

Stereo Linking of Channels 1 and 2

Stereo linking allows input channels 1 and 2 to be controlled as a single, stereo input. This is useful when stereo microphones or stereo line level signals are used with the 302 and the operator wants a single knob for controlling the overall signal.

There are two modes of operation for stereo linking, X/Y link and MS stereo. In both cases, input channels 1 and 2 are used for the inputs. Stereo linking is selected in the User Setup menu.

X/Y Stereo Link - Input channels 1 and 2 can be linked as a stereo pair to simplify control with stereo microphones. X/Y stereo linking is set in the User Menu. When in X/Y stereo link operation, channel 1 and 2 pan controls still control signal routing. Channel fader 2 con-

trols the overall level of both inputs. The channel gain and high-pass controls still function on each channel.

In X/Y Stereo linking, the input limiters for channels 1 and 2 are linked to operate identically on each signal.

MS Stereo - When MS stereo linking is set in the User Menu, input channels 1 and 2 are linked as an MS (mid-side) stereo pair. MS is a popular stereo configuration because of its good spatial placement, mono-compatibility, and surround compatibility.

The 302's MS matrix uses the channel 1 input as the Mid signal and channel 2 as the side signal. The channel 2 fader controls overall gain. Channel 1 fader and channel 2 pans are disabled. The Gain Trims and high-pass filters still act individually. The Gain Trim controls for inputs 1 and 2 can be used to vary the Mid and Side levels respectively. Using the channel 2 gain trim is an effective way to control stereo spread.



Inputs 4 & 5

When additional input channels are needed, such as when multiple wireless receivers are used, the Return connector can be set as the channel 4 and 5 input connector. This functionality is set in the User Menu (see **User Menu**).

Several options are available for channels 4 and 5. Either or both inputs 4 and 5 can be sent to the left, right, or left and right output bus. The input sensitivity of channels 4 and 5 are controlled by the trim control adjacent to the connector. Note, this unbalanced input is suitable for aux or line level devices only. There are no microphone preamps on channels 4 and 5.

To indicate that the Return connector is now input channels 4/5, the 4/5 Input LED on the output panel illuminates.

OUTPUTS

The 302 is a two-bus mixer. Since each input can be "hard panned" between the left and right output bus the 302 is easily used in either stereo or dual-mono operation. Because dialog is often recorded in mono, each output connector can be used to feed a separate camera or recorder. XLR Outputs and Tape Outputs are both sent from the master output bus and share the same program content.

The 302 has no master level control. The master bus is factory-set to unity gain, or "0" dB.

XLR Outputs

The master XLR outputs are active-balanced connections, each capable of driving long lines. The master

output level from the factory is set at unity gain, where +4 on the meter (peak-viewing) corresponds to +4 dBu signal level at the master XLR output.

The 302 features a unique master output level adjustment. This can be thought of as a master level control which is placed after the output meters. With this, it is possible to make the 302's meter correspond directly to the recorders meters. By adjusting the attenuation level in the setup menu (see **Setup Menu for adjustment**) the output level of the 302 can be adjusted to anything from line level to microphone level. Output levels are set depending on the device (camera, recorder, transmitter, etc.) that the outputs are connected. This control is ideal since the gain structure can be precisely set for a given piece of equipment.

When the output level is set to a level different than the factory default of Line, the Output Attenuation LED on the output panel illuminates. This is a quick reminder that the XLR output is not line-level. See Appendix C for more information on output attenuation and meter matching.

Tape Out (Mix Output)



The 302 has an unbalanced, two-channel tape level output on a single locking TA3-type connector. Tape output program is identical to XLR output program, although they are isolated from each other. The 302 tape output

is typically used to interface the 302 mixer with consumer-type inputs such as MiniDiscs, DATs, and compact cassette recorders. The tape output is also used to feed wireless transmitters when the masters are connected to cameras or recorders. The tape output is isolated from the main output – devices connected to the tape out have no effect on the master outputs.

The Tape Out is also used when linking the 302 to another 302 mixer or Sound Devices 442 Field Mixer. Using the XL-1 cable supplied with the 442, connect the 302 Mix Output to the 442 Mix In connection. All three of the 302 inputs appear at the 442 master outputs.

OUTPUT LIMITERS

In addition to the limiters on each input channel, the 302 has a software-controlled limiter for the output buses. Output limiters are used to prevent overload of recorders, cameras, and wireless transmitters connected to the 302. The output limiter on the 302 is a optoisolator-based peak limiting circuit. Its threshold of operation is set in the User Menu. The output limiter can be set in one of two positions, Link or LIM.

Link (Stereo Operation)



When set in the link position, the output limiter acts identically on each output bus. If one output makes the

limiter engage, the other bus will follow suit. This is very useful when using the 302 in stereo—limiter operation will not affect the stereo image.

LIM (Dual-Mono)

When using each output bus separately the output limiter should be set to the ON position. This position engages each output limiter separately. They will act on each respective output bus independently of the other.

While all dynamics processing “distorts” the audio signal, overloading a circuit is usually far more objectionable. For most applications the limiters are a significant benefit and should be enabled.

TONE OSCILLATOR / SLATE MICROPHONE

A single 3-position switch controls both the tone oscillator and the slate microphone. The tone/slate switch is located in the upper right corner, protected from inadvertent engagement by the end panel. When the tone oscillator or slate microphone is engaged program is interrupted to the master bus.

Tone Oscillator



Tone is used to set gain structure between the 302 and the next device in the signal path. The tone oscillator uses the locking position of the switch.

From the factory, the tone oscillator is set to output a 1 kHz tone at 0 dBu to the outputs (when the outputs are set to Line level). In the Setup Menu, the tone frequency and output level can be adjusted and tone can be defeated.

When engaged, the 302 tone oscillator attenuates the headphone output by 20 dB to save the operator’s ears. This feature can be defeated in the Setup Menu.

Pressing the battery check button when the tone oscillator is active sets the left output to cycle between 0 and -20 dB. This is helpful to verify proper left and right channel connection. Turning off the tone oscillator or pressing the battery check button again stops the output cycling.

When adjusting the output attenuation in setup mode, activating the tone oscillator will output a full-scale tone to aid in gain structure setup.

Slate Microphone

The slate microphone is used to audibly notate scenes at the mixer location. Its audio performance is not suitable for critical recording applications; it should only be used for documenting scenes to tape. The slate mic uses the momentary switch position.

In the Setup Menu, a one second 400 Hz tone can be set to precede the slate microphone. The slate microphone signal is sent to all outputs. In the Setup Menu, the slate microphone can be disabled to prevent unintended activation. Also, the switch assignments of slate and tone can be reversed for convenience.

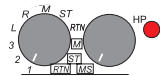
HEADPHONE MONITORING

The 302 has a flexible headphone circuit capable of selecting a variety of audio signals for listening in headphones. Most professional headphones ranging in impedance from 8 ohms to 1000 ohms can be used with the 302.

NOTE: THE 302 IS CAPABLE OF PRODUCING EAR-DAMAGING LEVELS IN HEADPHONES. TURN DOWN THE HEADPHONE VOLUME BEFORE SELECTING A MONITORING SOURCE.

The headphone level control adjusts the overall volume sent to the headphones. The level control adjusts both the left and right headphone outputs simultaneously.

HP Monitor Selection



Several signal sources can be sent to the headphones. The front panel rotary switch selects the signal.

PFL 1 - PFL solo monitoring of the channel one input signal. Channel is monitored in mono. Pre-fade, post limiter, post high-pass. Useful for setting the channel gain.

PFL 2 - same as above, but for channel 2 input.

PFL 3 - same as above, but for channel 3 input.

L - Left output bus, monitored dual-mono.

R - Right output bus, monitored dual-mono.

M - Summed mono of left and right output bus.

ST - Stereo monitoring of master output bus. This is the primary monitoring path.

RTN - Stereo return from the RTN monitor input path.

M-MS - Monitoring of the mono signal of an MS stereo signal.

ST-MS - Monitoring of discrete MS signals in headphones as decoded stereo signal.

RTN-MS - Monitoring of discrete MS return signal in headphones as decoded stereo signal.

Headphone Level and Overload LED

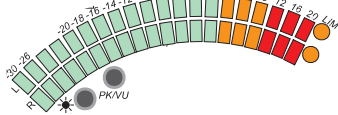
The headphone level knob controls overall headphone level to the phones. The adjacent LED indicates that the headphone circuit is overloading. The LED will also illuminate with an overloaded RTN signal.

THE METER

The meter on the 302 provides a great deal of audio signal information for the operator. The ability to view peak level (PPM), average levels (VU), or a combination of both is unique to Sound Devices LED-based meters. In addition to the flexibility to provide multiple meter ballistics, the meter does not have the inherent limitations of LCD and mechanical meters—sluggish indications in cold temperature with LCD's and fragility with mechanical meters. The 302 meters share the same technology and software programmability used in Sound Devices larger 442 field mixer.

Source

The meter can display levels of the output bus, the PFL levels or levels from the RTN inputs. Default operation is always the output bus except when PFL's are selected via the rotary switch. This operation can be altered via the setup mode.



Scale

The 302's numerical meter scale is calibrated for dBu in peak operation, and for VU in VU operation. The 302's scale is designed for today's quiet recording devices, providing maximum resolution between -30 to 0 dBu (-50 to -20 dBFS). This allows the user to record with a full 12 to 20 dB of headroom while in the fine-resolu-

tion green-colored part of the meter. Additionally, the meter color changes to orange at 0 dBu and then red at +8 dBu. These color changes correspond to -20 dBFS and -12 dBFS respectively, which are commonly used recording levels for today's recording devices.

Ballistics

The 302 output meter can indicate several different selections of ballistics. The available choices that are selected with the front panel meter ballistics button can be selected via a User Setup. To move from one setting to the next depress the meter ballistics button. Settings include:

VU - calibrated to show average loudness of audio signals. Useful when connecting to analog recorders or in combination with peak readings. VU meters are too slow to be used as the sole metering with digital devices.

Peak - important setting used to know the absolute peak signal level to prevent overload of downstream devices. Peak-only is commonly used in Europe, but is being replaced by the PPM/VU combination metering.

Peak with VU combination - a very informative setting which for many users is the default used with the 302. Indicates the absolute peak level as well as the "loudness" of the signal.

Peak-Hold with VU - similar to Peak/VU combination, but with the peak level being held for 1500 ms. Useful when a peak signal is encountered while the operator is not viewing the meters - peak held long enough to know if signal exceeded desired levels.

Illumination Intensity

The output meter can be set for comfortable viewing in all lighting conditions. Four levels of brightness are available by depressing the meter intensity button.

POWERING

The 302 can be powered from either internal batteries or from external DC. The power-efficient 302 can operate from three AA alkaline batteries for nearly a production day (without phantom powering). While many users prefer external DC sources supplying both their mixer and wireless receivers, the use of internal batteries is perfectly feasible for both operation and backup with the 302.

Power Switch and LED

The 3-position power switch selects between internal batteries, external DC, or off. Because of the power supply design of the 302, the unit takes approximately 10 seconds to fully stabilize its power supply after power-up. Additionally, there is sufficient capacitance in the circuit to toggle between internal and external without disruption in audio.

The power LED illuminates solid green to indicate good power. When the power source falls below the threshold voltage (see chart below) the power LED begins to flash. Once flashing changing the power source is recommended.

Internal Batteries

The 302 uses a unique battery tube to hold 3-AA batteries. This robust tube is sealed to prevent any battery leakage from ruining the internal circuitry. The threaded-nickel cap extends beyond the panel to make battery changes easy and quick. In normal operation the battery compartment extends no farther than adjacent XLR connectors.

Note: Remove batteries when the unit is stored.

External DC Sources

For extended mixer runtime use an external DC source. The 302 can be powered from any DC source with a voltage range of 5 V to 18 V. If using an AC-DC transformer make certain its voltage falls in the 5 - 18 V range and can supply at least 4 watts. If an over voltage is applied to the mixer an internal poly fuse is opened to prevent mixer damage. The fuse is reset when the voltage is removed. In addition, the external DC supply is isolated (floating) from the circuitry to minimize

ground loop and interaction among devices sharing the same DC source.

The DC connector is a Hirose 4-pin female. This locking connector mates to Hirose P/N HR10-7P-4P (Sound Devices p/n XL-H). Pin-4 is the positive voltage and pin-1 is negative.

Power Metering

The battery check button indicates battery voltages of internal and external power supplies on the output meter. The left meter shows the internal battery voltage and the right meter shows the external battery voltage. Since many different battery types are available for external use, the external DC metering can be customized for a given battery in the Setup Menu. The power meter is read from left to right, with the highest voltage indicated with LED's lit all the way to the left (green).

Power Consumption

The 302 can vary in the amount of current it draws. Several functions of the 302 directly affect current draw in different ways. The following list highlights the larger current drawing functions (listed from highest to lowest current draw).

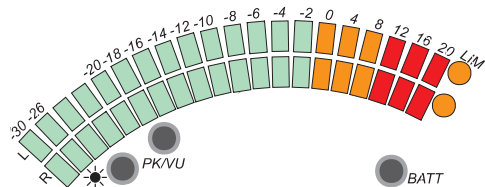
- Microphone powering - the main source of current beyond the idle current draw. (See Phantom Power) 48 V phantom can draw copious amounts of current out of the batteries depending on what model microphone is used. Two phantom powered microphones draw twice as much current as one. Microphones vary widely in their current draw depending on type and phantom voltage applied.
- Output drive level - higher output drive levels into multiple, low-impedance inputs increases current draw.
- Headphone output circuit - high headphone output levels increase current draw.
- Meter brightness - current draw is slightly increased with higher illumination intensities.

Experimentation is recommended to determine battery life for each individual setup and application.

THE SETUP MENU

The 302 has 18 available setup features (see Appendix for Setup Chart). Setups, typically set-and-forget features infrequently changed, are easily accessed directly on mixer's the front panel.

Entering the Setup Menu



To access the setup menu perform the following steps:

1. Turn off the mixer, if already on.
2. Depress and hold the Peak/VU selection switch while switching power on.
3. The setup mode is now enabled.

The mixer will not pass audio when in the setup menu. When in the setup menu the left meter (L) position indicates the selected setup feature. The right meter (R) position indicates the values selected for the setup. Use the PK/VU button advance from one setup to another. If the intended feature is passed, setup mode must be re-entered since you can only step forward through the menu.

To adjust values, the meter brightness button (left) and the battery check button (right) allow selection among setup values. Some setups have multiple values while others have only two values.

Setup Example

The following steps show how to change the tone oscillator frequency from the factory default of 1 kHz to 100 Hz.

1. Enter the setup menu by holding down the PK/VU button while powering the mixer.
2. Press the PK/VU button six times until the left meter LED is at the -16 position (see Appendix - SETUP MENU).
3. To move among parameter values, press the brightness LED and battery check LED until the 100 Hz position is selected (-24 LED).
4. Press the PK/VU button multiple times until the meters perform their scrolling dance. This saves all parameter into memory.

To save new values to memory, the PK/VU button must be repeatedly pressed until the last setup is reached. At that point the meters will scroll and the new values will be saved to memory.

User Default

A memory location is available to store user-defined default settings. The user default is helpful to save a new "baseline" of settings different than the factory default settings. To save a user default perform the following:

1. Hold down both the meter brightness button and battery check button while powering the mixer.
2. The current settings will be saved as the user default.

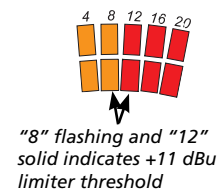
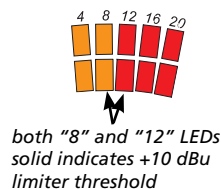
The user default settings can be recalled from the setup menu by applying the user default restore (see setup menu).

Output Limiter Adjustment

Output limiter thresholds are adjustable between +4 dBu and +20 dBu in 1 dB increments. The threshold level is shown on the lower (right) meter string by illuminating LEDs. Because LEDs are spaced every 4 dB, a combination of flashing and solid adjacent LEDs indicate limiter levels between the numbered LEDs. Factory default is 20 dBu. Each press of the battery button or meter brightness control changes the threshold by 1 dB. Three possible LED indications show threshold value:

- **Single solid LED** - actual value indicates threshold.
- **Flashing LED next to a solid LED** - indicates that the threshold is one dB above or below the solid LED value.
- **Two solid LEDs** - threshold value is even number value between the two indicated values.

Two examples are shown below, a setting of +10 dBu and +11 dBu thresholds.



SPECIFICATIONS

Measurement settings (unless otherwise specified): Gain controls for the channel being measured at mid point, all other channels gains fully down; pan switches centered; low-cut off; inputs in 'mic' position; outputs in 'line' position. Mic input driven with 150 ohm source. Outputs measured with 100k ohm load. Temperature at 25° C.

Maximum Gain, typical (trim, fader, master, phones RTN fully up):

	XLR Input Mic Setting	XLR Input Line Setting	RTN / ch 4/5
XLR output @ factory (line) setting	75 dB	35 dB	20 dB
XLR output attenuated	0 - 16 dB 2 dB steps	40 to 56 dB, 2 dB steps	25 - 41 dB, 2 dB steps
Tape output TA3-type	61 dB	21 dB	6 dB
Headphones, 1/4-in and 1/8-in	95 dB	55 dB	30 dB

Inputs:

	Impedance: (Ohms Actual)	Type:	For use with:	Max Input Level:
XLR, mic setting	2.5k	transformer-balanced	< 600 ohm mics	0 dBu (0.78 Vrms)
XLR, line setting	16k	transformer-balanced	< 2k ohm outputs	+40 dBu (80 Vrms)
Mix In	4.2k	unbalanced, stereo	302, 442 Mix Out (1.8k)	+6 dBu (1.5 Vrms)
Return & ch 4/5	10k	unbalanced	< 2k ohm outputs	+30 dBu

Outputs:

	Impedance: (Ohms Actual)	Type:	For use with:	Max Output Level:
XLR, factory Line setting	150	active-balanced	>= 600 ohm mics	+20 dBu (7.8 Vrms)
XLR, mic (lowest) setting	150	active-balanced	< 2k ohm outputs	-36 dBu
Tape out / mix out TA3	1.8k	unbalanced, stereo	> 6k ohm inputs	+6 dBu (1.5 Vrms)
Headphones - 1/8-inch	200	unbalanced, stereo	8 - 2k ohm phones	+20 dBu (7.8 Vrms)

Frequency Response:

20 Hz - 30 kHz, +0.2, -0.5 dB,
-1 dB @ 5 Hz and 50 kHz typical

Equivalent Input Noise:

-126 dBu (-128 dBV) maximum (22 Hz - 22 kHz band-
width, flat filter, trim control fully up)

Input Clipping Level:

0 dBu minimum (trim control fully down)

Line Output Clipping Level (1% THD):

20 dBu minimum
18 dBu minimum with 600 ohm load

Dynamic Range:

115 dB minimum (trim fully down)

THD + Noise:

0.007% typical (1 kHz, +4 dBu at Line out)
0.009 max (50 Hz to 20 kHz, +18 dBu at Line out,
fader fully up)

Output Noise:

-100 dBu (-102 dBV) maximum (22 Hz - 22 kHz band-
width, flat filter, master gain fully up, faders fully
down)

Common Mode Rejection Ratio:

120 dB minimum at 80 Hz, mic input
100 dB minimum at 10 kHz, mic input

L/R Gain Matching, Mic In to Line Out:

+/- 0.1 dB

High-Pass Filters:

Switchable 80 Hz or 160 Hz, 12 dB/oct

Mic Powering (each mic selectable):

Dynamic (no power applied),
12 V Phantom - through 680 ohm resistors, 10 mA per
mic available,
48 V Phantom - through 6.8k resistors, 10 mA per
mic available, 12 V T-Power - through 180 ohm resis-
tors, 10 mA per mic available.

Input Limiters:

+18 dBu threshold, 20:1 limiting ratio, 1 mS attack time, 200 mS release time.

Temperature:

Operating: -20°C to 60°C, 0 to 95% relative humidity; (non-condensing)
Storage: -40°C to 85°C

Output Limiters:

Affects the outputs of the mixer.
Threshold selectable from +4 dBu to +20 dBu, 1 dB steps, 20:1 limiting ratio, 1 mS attack time, 200 mS release time.

Power supply:

Internal ± 16 V (bi-polar) regulated audio rails, 2.4 - 6 V range internal batteries,
Isolated (floating) external DC input jack, 5-18 V
Locking 4-pin Hirose connector, pin-4 = (+), pin-1 = (-), use Hirose #HR10-7P-4P (DigiKey# HR100-ND) for locking mating DC connector.

Power Consumption:

130 mA @ 4.5 V, internal batteries, idle, no phantom
55 mA @ 12 V external DC, idle, no phantom

Metering:

40-segment (2 x 20), sunlight-viewable
Selectable Peak, VU, or Peak (with or without peak hold) + VU ballistics.

Weight:

0.85 kg, (1.8 lbs) unpackaged with three alkaline AA batteries

Dimensions:

47 mm x 214 mm x 114 mm (H x W x D)
1.8" x 8.4 x 4.5"

WARRANTY & APPROVALS

Warranty

Sound Devices, LLC warrants the 302 Production Mixer against defects in materials and workmanship for a period of ONE (1) year from date of original retail purchase. This is a non-transferable warranty that extends only to the original purchaser. Sound Devices, LLC will repair or replace the product at its discretion at no charge. Warranty claims due to severe service conditions will be addressed on an individual basis. THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE. SOUND DEVICES, LLC DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOUND DEVICES, LLC IS NOT RESPONSIBLE FOR SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING FROM ANY BREACH OF WARRANTY OR UNDER ANY OTHER LEGAL THEORY. Because some jurisdictions do not permit the exclusion or limitations set forth above, they may not apply in all cases.

For all service, including warranty repair, please send the 302, along with proof of purchase date to:

Sound Devices, LLC
Service Repair
300 Wengel Drive
Reedsburg, WI 53959 USA

FCC Statement

This device has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

CE Conformity Statement

Declaration of Conformity
According to ISO/IEC Guide 22
Manufacturer's Name: Sound Devices, LLC
Manufacturer's Address: Sound Devices, LLC
300 Wengel Drive
Reedsburg, WI 53959 USA
declares that the product: 302 Production Mixer
is in conformity with:

Document No.	Description
EN55103-1 (1997)	Emissions standard for product family audio devices for professional use
EN55103-2 (1997)	Immunity standard for product family audio devices for professional use
EN55022 (1995)/ CISPR 22 (1997)	Radiated and Conducted emissions, Class B
EN61000-4-2 (1995)/ IEC1000-4-2 (1995)	ESD - 6kV contact, 8kV air-discharge
EN61000-4-3 (1995)/ IEC1000-4-3 (1995)	Radiated RF Immunity, 3 V/m, 80% 1 kHz amplitude modulation
EN61000-4-4 (1995)/ IEC1000-4-4 (1995)	EFT/Burst, I/O lines, ± 0.25 kV to ± 1.0 kV
EN61000-4-6 (1996)/ IEC1000-4-6 (1996)	Conducted RF Immunity, 3 V, 80% 1 kHz amplitude modulation

Tested by:
March 26, 2003
L. S. Compliance, Inc. Cedarburg, Wisconsin

Matthew Anderson
Director of Engineering

APPENDIX A - ACCESSORIES

Several high-value accessories are available for the 302 mixer, including a carry-case, cables, and power accessories. For a full list of Sound Devices products and accessories, visit our web site www.sounddevices.com/products.

CS-302 Carry case designed exclusively for the 302 mixer. Features a bottom-side pouch that accepts an NP-type battery and leather shoulder strap. Accepts Portabrace RM-multi and RM-deluxe accessories and AH-2 harness (not included).

XL-1 . . TA3-F to TA3-F link cable for 302-to-302 and 302-to-442 linking; 6-inch.

XL-3 . . 3.5 mm to TA3-F link cable for MixPre/MP-2 Tape Output to 442 Mix In; 12-inch.

XL-4 . . Bag of four (4) TA3-F-type connectors.

XL-H . . Bare Hirose connector, (Hirose p/n HR10-7P-4P) to mate with locking 4-pin DC power jack.

XL-NPH NP-type battery cup with 12-inch cable with Hirose 4-pin locking power jack at equipment end. For use with 302, 442N, 442, and MixPre.

APPENDIX B - METERING & GAIN MATCHING

The 302 includes a unique output attenuator circuit which is adjusted via "user setups". This can be thought of as a master gain control which comes after the 302's output meter. This circuit allows the user to match the 302's output level to any recording device. When properly set, dynamic range of the system is maximized and the 302's meters will "match" the recorder's meters.

For simple interconnection the following three settings are identical to setting the output switch on the 442 mixer to "Line", "Tape", or "Mic". 0 dB – Line, 14 dB – Tape, 40 dB – Mic.

However, to tailor the 302's outputs exactly to the recording device, the 302's output can be attenuated from full line-level in steps of 1 dB from 0 to 16 dB (line/tape levels), then 40 to 56 dB (mic levels). So if 40 dB of attenuation is "too hot" for a given device's mic input, the attenuator could be set to 50 dB or more.

When interconnecting the 302 to any recording device, the best way to set the level between them is to match the 302's output clipping level with the recorder's input clipping level. When this is done and the recording device's input gain controls are kept fixed, two things will happen: (1) The dynamic range of the recording is maximized. (2) All level metering can be done via the 302's meter.

The recorder's level meter can be ignored since the only way for the recorder to clip is for the 302 to clip. The 302's meters match the recorder's meters in that the clip points match. Because most recorder's meter ballistics and scale are different, it is impossible to make the 302 meter exactly match a given recorder's meter. However, this is irrelevant if the clip levels match.

To facilitate matching the clipping levels of the 302's output to the recorder's clip level, the 302 includes a

full-scale tone output function. "Full scale" is the same as "clipping level." To activate this full scale tone, turn on the tone switch while in setup mode #1. Be extremely careful when doing this, as a full-scale tone is extremely loud and can hurt the operator's ears. Make sure to turn down the headphone level and the level going to any amplifiers, etc. from the 302.

The failsafe way to set proper levels is as follows:

1. Connect 302's XLR outputs to recording device.
2. Enter setup mode #1 (see "Setup Mode" section).
3. Turn down headphones and any amplifiers connected to the 302's other outputs.
4. Turn on the tone oscillator via its switch.
5. Turn the recording device's input gain control to its detented point (or half-way if no detent).
6. Adjust the 302's Output Attenuator via the up/down buttons until the recorder is just shy of clipping as indicated on its meter.
7. If the 302's Output Attenuator is at 0 dB and the recorder is not to its clip level, increase the recorder's gain control until it is to the clip level.
8. Fix the recorder's gain controls with tape so that they do not get bumped.
9. Exit the 302's setup menu by pressing the PK/VU switch until the startup sequence happens. Note: The setup menu must be exited in this manner or else the setting will not be saved.
10. It is recommended that the 302's limiters be turned on at all times, as they will not activate until just before clipping.

APPENDIX C - SETUP MENU (v 1)

Below is the chart of setups for the 302. See Setup Menu on page 12 for instructions on how to enter and navigate the setup menu.

Meter Pos.	Setup	Setting (value on R meter) [factory default bold/underlined]	Description
-30	XLR Attenuation Level	<u>Line-level (0)</u> , add the indicated values on left and right meter for attenuation amount	Selects the amount of attenuation from Line level on the XLR outputs.
-26	Output Limiter Threshold Adjustment	1 dB increments from +4 to +20 dBu , level shown on meter	Sets the output limiter threshold in dBu. see page 12 in User Guide for more details.
-24	Stereo Link, Channels 1 /2	<u>OFF (-30)</u> , Stereo Link (-26), MS Link (-24)	Links inputs 1 and 2 as a stereo pair, either X-Y or MS stereo
-22	Input Limiter Defeat	<u>OFF (-30)</u> , ON (-26)	When ON, input limiters remain OFF at all times
-20	RTN L to Channel 4 Input	<u>OFF (-30)</u> , L-only (-26), R-only (-24), L+R (-22)	Routes RTN-Left signal to the master bus with the set pan assignment.
-18	RTN R to Channel 5 Input	<u>OFF (-30)</u> , L-only (-26), R-only (-24), L+R (-22)	Routes RTN-Right signal to the master bus with the set pan assignment.
-16	Tone Oscillator Frequency	1000 (-30) , 400 (-26), 100 (-24), Hz	Selects the frequency of the sine wave tone oscillator
-14	Tone Oscillator Level	OFF (-30), -20 dBu (-26) -10 dBu (-24), 1 dB increments to +8, 0 dBu is default	Selects the output level of the tone oscillator in dBu at LINE level
-12	Slate Mic ON/OFF	<u>ON (-30)</u> , Tone + Slate (-26), OFF (-24)	Activates the slate mic. Tone and slate offers a 400 Hz tone preceding the slate mic.
-10	Metering Source	<u>ST & PFL (-30)</u> , Follows headphone switch position (-26), STereo only (-24)	Selects the metering source. PFL levels are show on the left meter
-8	VU Reference Level	0 dBu (-30) , +4 dBu (-26), +8 dBu (-24)	Selects 0 VU-to-dBu reference level
-6	Split-Ear Monitor	<u>OFF (-30)</u> , ON (-26), Program Mix (-24)	Assigns summed-mono RTN signal to left headphone output and R program to right headphone output. Active in RTN position.
-4	Headphone Attenuation w/Tone	<u>ON (-30)</u> , OFF (-26)	Reduces the headphone level by 20 dB when tone oscillator is activated
-2	External Battery Voltage Reference	1 (-30) , 2 (-26), 3 (-24), 4 (-22), 5 (-20), 6 (-18), see voltage metering chart below	Selects the external DC range of the voltage check function and power LED flash point
0	Meter Ballistics Select	<u>VU PPM VU-PPMHold VU-PPM (-30)</u> , PPM VU-PPMHold VU-PPM (-26), VU VU-PPM-Hold VU-PPM (-24), PPM VU-PPM (-22), VU VU-PPM (-20)	Selects meter ballistics choices selected when toggling the front panel meter ballistics switch
4	Master Peak LED Threshold Adjust	1 dB increments from +4 to +20 dBu , level shown on meter	Sets the signal level where the "20" LED illuminates. Used to set an alternate peak level
8	Slate / Tone Switch	<u>Normal (-30)</u> , reversed (-26), tone only (-24), slate only (-22)	Changes the functionality of the slate / tone switch. Switch can be defeated by engaging setup -14 and setup -12
12	Default Restore	<u>OFF (-30)</u> , User Default (-26) Factory (-24)	Resets setup menu to either the stored default or the factory values

Setting	High Voltage	LED Flash Point	Low Voltage	Power Source
1	4.5	3.4	3.0	Internal batteries
2	13.0	11.5	11.0	12 V NiCad, NiMH, Li, etc.
3	17.0	11.5	11.0	Expanded range of setting #1
4	8.5	5.75	5.5	6 V NiMH, Li, etc.
5	14.0	11.4	10	12 V Lead Acid
6	7.0	5.7	5.0	6 V Lead Acid
6	17.0	11.5	5.0	Full range of DC input, with cutoff for 12 V NiCad, etc.

Voltage Metering Chart

← factory setting

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