

The Ursa Major Space Station SST-282



“What is it, and what will it do for me?”

Broadly speaking, the Space Station is a sound processor, one that adds delay and reverberation effects to a “dry” (non-reverberant) sound source. As such, it’s part of a large and popular family of devices that includes plates, springs, echo chambers and delay units.

But the Space Station is a very advanced, very distinct member of this family. The effects it produces are based on current digital technology, some proprietary randomizing techniques, and a practical understanding of the key role played by delay and reverberation in the way we hear sound. Not surprisingly, Space Station users have found a wide range of applications for their units. Professional sound recording studios use it to simulate acoustic spaces, to manipulate the sounds of instruments and voices in new ways, and to produce bizarre science-fiction effects. Musicians find the Space Station helpful as a way to enhance live performances. Broadcasters have learned it adds warmth and body to an announcer’s voice, and produces better in-house commercials. Filmmakers know it’s a useful tool for improving sound tracks. And night clubs and discos occasionally use the Space Station to improve the natural reverberant qualities of their rooms.

In fact, just about anyone who reproduces sound is likely to find that a Space Station offers a wealth of sensible and exciting effects, at a remarkably reasonable price.

“How does it work?”

The Space Station has been designed to fully integrate your control of the delay and reverberation process. Its front panel, though a bit bewildering at first, suggests the Space Station’s ability to manipulate sound in ways that range from simple to extremely complex.

One of the best ways to look at this powerful new tool is in terms of the different ways it can process an original sound source. The Space Station has three basic modes of operation — as a pure delay unit, as an effects device that feeds back sound from a single tap, and as a full-fledged reverberation system.

DELAY MODE: Simple time delay has become something of a commonplace in the audio world. A tape recorder can be made to work as an unsophisticated delay unit, with a tape loop that will repeat an incoming sound signal a fraction of a second after it occurs. More elaborate delay systems have been devised, but their principle is the same — a direct repetition of the original “direct” sound, slightly delayed.

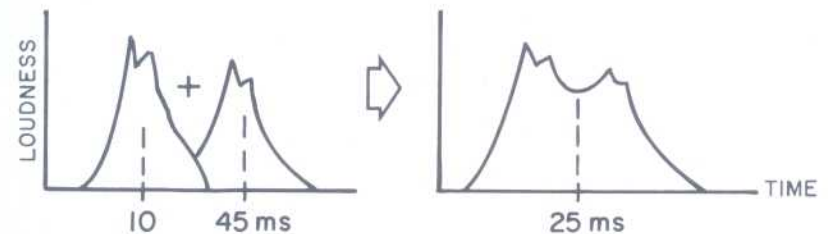
While a tape loop allows you to repeat, or “tap,” the sound only once, many

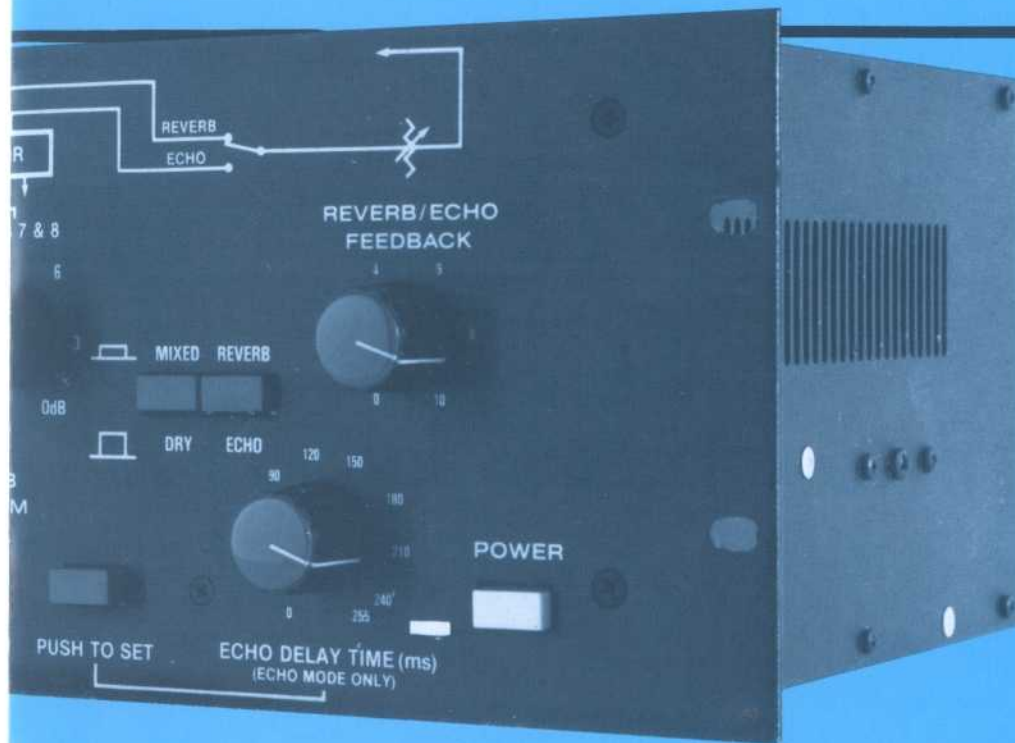


common delay units now offer several taps in an effort to simulate a more complex sound, like the early reflections of the walls of a room. By comparison, the Space Station features more than 20 taps. Of these, eight function independently as delay taps, while the others are reserved for reverberation effects.

These eight “audition delay taps” can be positioned at will along a digital Random Access Memory that is 255 milliseconds long. Their specific arrangement depends on your choice of the 16 different delay programs available on the control panel, each of which synthesizes a carefully planned effect. These effects include various kinds of acoustic spaces (Rooms 1, 2, 3, & 4), comb filtering (Combs 6, 10, 22, & 38), delay clusters (Fatty, Cloud, Slap 1,

When short delays are added to ordinary speech, the ear combines the two sounds and “hears” a fatter, stronger voice.





Slap 2, & Echo), and multiple repetitions of a sound (Space Repeats 2, 3, & 4).

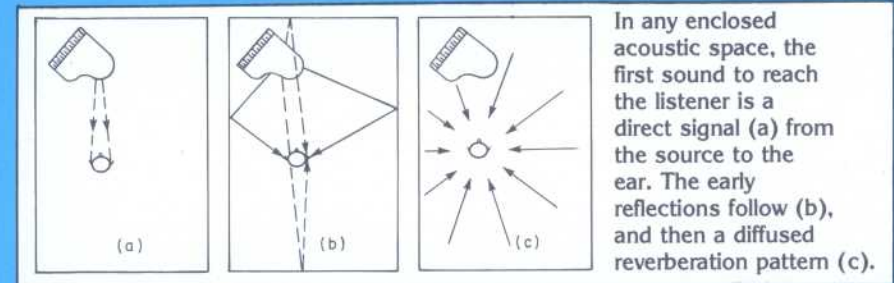
In addition, the eight taps are arranged in alternating left-right pairs, which can lend an astonishingly realistic stereophonic quality to the original sound, even for a strictly monaural source. And a built-in mixer lets you control the relative volume available from each pair of taps, and to mix in an appropriate degree of direct sound at the same time.

The Space Station's delay effects have been chosen to offer an extremely wide array of applications. One of the most universal is the use of short delays, from 10 to 70ms, to improve the intelligibility of speech. Voices of announcers or actors gain considerable warmth when they are "fattened" by the Space Station, especially in comparison with a close-miked sound. Likewise, the Space Station's ability to reproduce various kinds of acoustic spaces allows you to place a voice or instrument into an environment that may sound like anything from a closet to a cargo hold or a concert hall. Other delay effects can interact in fascinating ways with the sound source to produce choruses, robot voices, tuned percussive sounds, ricocheting echoes — the possibilities are almost endless.

ECHO MODE: The Space Station's capabilities are by no means limited to straight delay effects. A ninth tap, the echo tap, allows you to extend the original sound much further than the memory's 255ms by feeding it back again and again into that memory. The duration or decay time of this echo can be varied by

adjusting the feedback control, and the length of time between each repetition of the echo can also be independently adjusted by the delay time control knob. In addition, all of the 16 delay programs can be used to modify the echo feedback, creating an amazing choice of complex special effects, many of which are unique to the Space Station.

REVERB MODE: True reverberation is a rich, random pattern of sound reflections whose echo density increases as the sound decays. Simulating realistic reverb effects electronically is a challenging problem, and can't be done with delay taps alone (what you get is flutter echo, with very low density). The Space Station solves this problem by incorporating more than a dozen additional taps, plus a patented randomizing algorithm, in its reverb mode.



These extra taps feed the sound back to the equalizer and then to the memory, producing a natural buildup and decay of the reverberant sound that can be manipulated in a variety of ways. Once again, the 16 delay programs are available to adjust the early reflection patterns of the sound, while the equalizer can be used to produce frequency absorption patterns that are typical of reflective or absorptive walls. Moreover, the unit offers a useful choice of medium or long programs that control buildup and decay times of the sound.

The end result is a degree of realism and control over the separate phases of reverberation that, ultimately, must be heard to be believed.

"How can I hear what a Space Station sounds like?"

Ursa Major has produced several demonstration tape cassettes for different applications of the Space Station. These are available for \$2.00 each from the manufacturer, or from dealers; names and addresses of dealers will be supplied upon request. Or you may contact any of our franchised dealers for a live demonstration of the Space Station. We think you'll be impressed by what you hear.

CONTROLS

Input Controls: The Input Level control adjusts gain so that a wide range of source levels can be connected. Changes in this control don't upset the mixing ratios. A four LED Peak Level indicator shows signal levels at 0 (overload), -6, -15, and -30dB in the digital domain, and is a true peak sense and hold circuit. It permits easy and secure setting of the proper operating level.

Mixer: The SPACE STATION has a 9-input/stereo output mixer for the eight Audition Delay Taps and the Direct signal. Taps 1, 3, 5, & 7 are fed to the left summing amplifier, Taps 2, 4, 6, & 8 to the right summer, and Direct to both left and right summers. Using the five mixing controls with reverberation, for example, gives controls over the proportion of direct to reverberant sound in the output, and over the amount of early-arriving vs. later-arriving reverberation.

Equalization: A simple shelving equalizer is placed in the circuit so that the high and/or low frequencies applied to the processor from the source, or from feedback, can be attenuated to simulate rooms with more absorbent walls, or smaller volumes. It changes the relative decay time at high and low frequencies.

DELAY PROGRAMS

Rooms 1, 2, 3, & 4: These four programs use semi-randomly chosen delays spaced to sound like the early reflections of rooms. The maximum delay time in each program appears at the last taps, 7 and 8, and ranges from about 70ms in Room 1 to 255ms in Room 4. The smaller rooms are appropriate for auditioning with the Medium Reverb Program and shorter decay times, while the two larger rooms provide a more spacious sound and would normally be used with the Long Reverb Program and greater feedback. In the smaller rooms, the taps are closely spaced so that when all are auditioned equally, the gaps are filled in well and no disturbing echo is heard, as would occur with a single tap at the longest delay time. Like all the Audition Delay Programs, the Rooms can also be used without feedback to modify sounds by simply adding pure delay, or multiple delays. This is a good set of programs for general enhancement, or for creating multiple, abrupt-ending echoes.

Combs 6, 10, 22, and 38: The four Comb programs are for special effect signal modification by comb filtering. Comb filters are created when a signal and one or more delayed versions of itself are combined. The result is called a comb because there are periodic nulls and peaks spread across the spectrum, placed at frequencies related to the reciprocal of the delay time. Because the delay times and tap gains are precise in the Space Station, the nulls produced are very deep; and, because there are four taps plus the Direct signal to combine for each output channel, the complexity of the resultant sound is much greater than with traditional DDL's. Furthermore, the left and right delays are interlaced so that they may be externally summed to yield combs of closer spacing and still more complex and varied sound. And

when the Echo mode is used to create fed-back comb effects also, these can be auditioned through one of the Comb programs to make things even more interesting. Comb filters make good sci-fi machine-like voices, or tune percussive sounds, or place a sharp bite and edge on instruments like guitar and harp.

Delay Clusters — Fatty, Cloud, Slap 1, Slap 2, and Echo: As with other aspects of the Space Station, these effects are so new we had to invent names for them. This family of programs uses delay taps spaced close together, in clusters on the time axis. The clusters occur at progressively later times as you move from Fatty to Echo. Fatty, with all its taps placed under about 40ms, has no audible separation from the source, but is an excellent loudness-enhancing effect that's great with almost any source. (Comb filtering isn't a problem with these programs due to randomized choice of times; moreover, the 7kHz delay response reduces any tendency to comb at higher frequencies.) In Cloud, the cluster is later, almost with a gap, while Slap 1 and Slap 2 are delayed enough to be heard as a real slap echo — except, of course, with eight delay taps for greater fatness and loudness intensification. Echo produces a single repeat of the source at about 250ms, again with eight delays for more punch.

Space Repeats 2, 3, and 4: These three programs provide for 2, 3, or 4 repetitions of a sound, with even spacing in time from 0 to 255ms, and with L-R, L-center-R, or L-R-L-R motion, respectively. All eight taps are used, even with the two repeat program, to provide extra punch at each hit. Space Repeats are dynamite with percussive sound, or sharp transients, since these tend to reveal the spatial movement and time syncopation best. Of course, Space Repeats may be used with any echo or reverberant effect to cause the decaying signal to ricochet in stereo space as it dies out.

SPECIFICATIONS

Input: Active differential input, 10K ohms High pin, 20K ohms Low pin, XLR-3 connector. Sensitivity at 1kHz for 0dB LED is 0dBm minimum.

Outputs: Single-ended from op-amp, source resistance 47 ohms, minimum load resistance for +18dBm is 600 ohms, XLR-3 connectors.

Specifications for Delay-Only Mode

Measured from input to output, any single Audition Delay Tap.

Frequency Response: 20-7kHz, ref. 1kHz at -3dB re 0 LED: +1/-4dB
20-6kHz, ref. 1kHz at -3dB re 0 LED: +1/-1dB

Dynamic Range: 80dB minimum, 20-20kHz noise bandwidth.

Total Distortion and Noise: 0.1% typical, 0.2% max at 1kHz, just below 0dB LED threshold, including quantizing noise.

Preemphasis/Deemphasis: none.

Delay Settings: 16 programs of 8 delay tap times, pre-programmed to 1ms resolution over range of 1 to 255 ms.

Sampling Rate: 16kHz nominal.

Specifications for Reverberation Mode

Decay Time: Zero to 3.5 sec maximum at 500Hz, 1/3rd octave pink noise, with HF and LF Equalization set flat, Long reverb program, and Room 4 delay program.

Equalization: +0/-10dB, shelving at 20Hz
+0/-10dB, shelving at 7kHz.

General Specifications

Size: Standard relay rack, 19 x 5-1/4 x 9" (48.3 x 13.9 x 22.9cm), excluding rear protrusion of connectors. Weight approximately 10lbs (4.5kg).

Power: 115/230VAC, 50/60Hz, 30 watts nominal. Detachable international power cord. Regulated supplies retain regulation down to 95VAC for international use. 100/200VAC unit available on special order.

Environment: 10-40 degrees C operating, 0-70 degrees C storage; RH up to 95% non-condensing.

Limited Warranty: Parts and labor are guaranteed under normal use for one year after shipment.

In accordance with a policy of product improvement and development we reserve the right to modify or change design or price without prior notice. Manufactured under U.S. patent.



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