

Technics

by Panasonic

RS-1500US

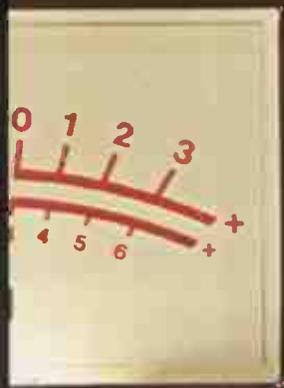
"Isolated Loop" Three-Motor,
Direct-Drive Tape Deck



Professional Series

Professional Series

267mm Made in Japan



timer start



push



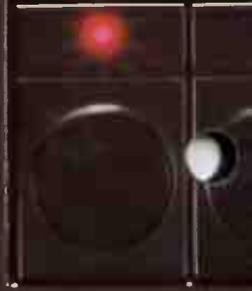
playback head

4t 2t

RP-2224

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RS-1500US "Isolated Loop" Three-Motor, Direct-Drive Tape Deck

Every so often, there appears in any field an innovation so significant that it must be considered a landmark in that field, the establishment of a new standard of excellence. Considering both performance and operational advantages, the "Isolated Loop" tape path introduced in the Technics RS-1500US tape deck will qualify this professional unit not only as state-of-the-art, but as the beginning of a new technological generation. To realize the full potential possible with this design, there was no choice but to employ an all direct-drive tape transport system, with quartz-controlled, phase-locked servo control. Electronically as well, the RS-1500US was built as an uncompromising challenge to tape decks now available. Separate microphone amplifier, recording amplifier, mixing amplifier and three-way bias and equalization controls all serve to help assure flawless recording and playback under any circumstances. In fact, even without the "Isolated Loop" design, the RS-1500US

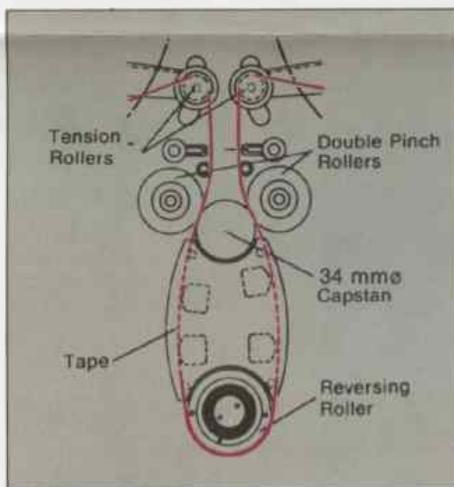
would very likely have outperformed most or all of the tape decks now on the market. The performance specifications and laboratory measurements show not simply marginal improvements over other decks, but significant leaps. The RS-1500US elevates tape recording performance to a level where "negative" factors like wow and flutter, speed deviation and fluctuation, and modulation noise become difficult to measure. On the positive side, we recommend you subject this unit to the most careful scrutiny possible, both in operation and a listening comparison with other decks. If possible, switch from "source" to "tape" on pure test tones between 5 and 10 kHz. This will demonstrate dramatically how faithfully the RS-1500US reproduces sound. Once you've checked it out thoroughly and compared it with other decks, we think you'll come away convinced that indeed a new "state-of-the-art" has been established for tape recording equipment.

Professional in Every Sense



"Professional" is not just a cliché when applied to the RS-1500US tape deck. The two-track, two-channel design bespeaks a commitment to sound quality, with increased dynamic range, lower noise, and editing/splicing capabilities required in professional applications. The four-head configuration, with both two-track and four-track playback heads, provides recording, playback and erasure capabilities worthy of this high-quality unit. The sophisticated electronics of the RS-1500US, too, provide the control and performance essential to truly professional recording. The RS-1500US is no shelf-top, stay-at-home, either. With the optional carrying case and 24-volt battery adaptor, the RS-1500US is ready to go anywhere, record anywhere.

What will impress the serious recording specialist the most, however, are the new breakthroughs in transport system dynamics. The transport system starts with a direct-drive capstan, employing the same principle Technics originally developed for disc turntables like the SP-10 MKII. The speed of this capstan is regulated by a quartz controlled, phase-locked servo system, which effectively eliminates speed deviation and fluctuation as sources of concern. Unique in tape recorder technology, the capstan of the RS-1500US is 34 mm in diameter, for increased tape contact and less possibility of slippage. By means of two pinch rollers in contact with the same capstan, an isolated, closed-loop system is formed.



The tape in this loop is, as the name suggests, isolated from external influences such as may be imposed by the take-up reel or the supply reel. It is within

this loop that the recording, playback and erasure heads are brought into contact with the tape. The double pinch-roller system, employing a reversing roller at the bottom of the tape loop, not only isolates the tape from disturbances, but also maintains very low tension over the heads—no more than 80 grams, in fact. This permits the attainment of near-perfect tape wrap over the heads, without drop-outs, and with very little modulation noise.

Tape tension control extends to the reel motors, where direct-drive motors with electronic commutation maintain uniform tension between reels and pinch rollers no matter how much tape is wound on either reel. Thus, the constantly changing tape tension that occurs with conventional reel motors, as the tape is wound from one reel to the other, is not a problem with the RS-1500US.

Function controls, including tape speed selector, are all of the IC-plus-transistor full-logic type, without mechanical switches or relays which may wear out and malfunction. Just as important, these controls permit absolute freedom in switching from one mode to the other—it is not necessary to press the stop button between modes. When engaging the play button in the FF or rewind mode, the tape is automatically brought to a momentary halt before proceeding to the play mode. This short pause insures that no more than the usual forces are imposed on the tape.

More detailed explanations of the operating principles and performance features of the RS-1500US are found on the following pages of this brochure. We invite you to read it and see for yourself why this tape deck is professional in every sense of the word.

Advanced-Technology Drive System



All Direct-Drive Principle

The direct-drive concept was originally introduced by Technics in 1969, for use in high-grade turntables, and was adopted in the Technics RS-275US cassette deck in 1970. Now, in the RS-1500US, direct-drive is applied to a tape transport system—i.e., the capstan, flywheel and motor all rotate as a uniform entity. There is no speed reduction or transmission system involving belts or other mechanisms that could cause instability in rotational speed or high-frequency pitch changes known as flutter—the wow and flutter rating of 0.018% (WRMS) of the RS-1500US will no doubt go unchallenged by other tape decks for some time to come. The direct-drive principle extends to the reel motors, also. Brushless DC motors of very high torque, with electronic commutation, are unitized with the diecast reel tables. This design incorporates complete electronic torque control, and accounts for the complete freedom of the RS-1500US from mechanical switching noises.

The high torque of the electronically-controlled capstan and reel motors gives the RS-1500US a rapid build-up time of 0.7 second to its rated speed of 15 inches (38 cm) per second. Conventional tape decks rise very rapidly to the rated speed, but continue beyond point, then dip back below it, requiring a longer time to stabilize—as much as 6 seconds with some machines. Another advantage of electronic commutation is that tape travel tension in play and record can be made

practically constant, regardless of the amount of tape wound on the take-up and supply reels. This is achieved through electronic monitoring of tape reel speeds with simultaneous control of the motor current.

Quartz Controlled Phase-Locked Servo System

The constant, precise rotational speed of the capstan results from the use of a phase-locked servo system controlled by a quartz oscillator.

Quartz oscillators supply frequencies of a stability second only to atomic clocks. As this frequency is produced by a quartz crystal, environmental factors like temperature and humidity will not significantly affect its performance. Likewise, the passage of time, which can adversely affect electronic components, will not cause significant drift in the quartz oscillator.

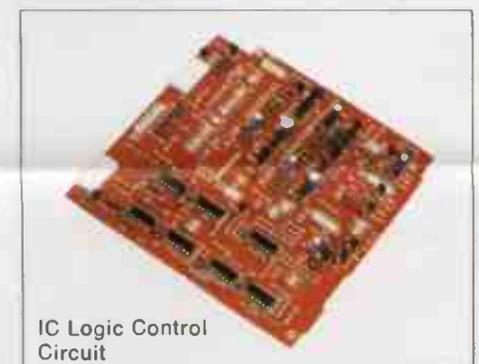
The quartz oscillator of the RS-1500US provides a reference frequency of 4,194,304 Hz. This frequency is divided into several stages by a specially designed IC to provide the reference against which capstan speed is measured, and instantly corrected if even the slightest deviation exists.

A newly developed frequency generator in the capstan motor, featuring a variable reluctance construction, produces a signal representing actual motor speed. The reference voltage is compared with the voltage obtained by the actual motor frequency. If they are identical, no

correction occurs. If there is any deviation, the motor instantaneously receives a command to accelerate or decelerate by the necessary magnitude. The RS-1500US presents an additional refinement to this system in that the phase of reference and motor frequencies are employed in the comparison and correction process. Rather than having to wait for a complete revolution to be made, the difference in phase can be detected instantly. This allows corrections to be made instantaneously and prevents overshooting the target speed. The advantage of this is motor speed (and tape speed) accuracy and stability that other drive systems cannot approach.

Tape Tension Control

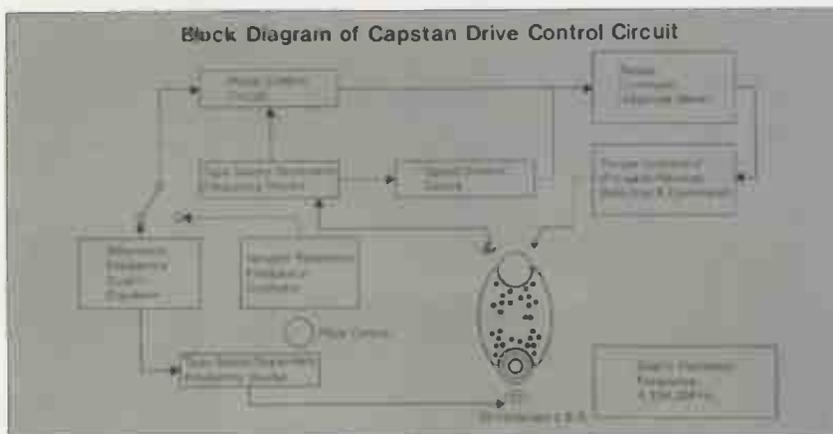
The RS-1500US "Isolated Loop" system, employing a single capstan and two pinch rollers, produces a working tape-tension of only 80 grams inside the loop. This is half the tension obtained with the conventional system. The result of lower tape tension is an effective reduction of wow and flutter.



IC Logic Control Circuit

IC Logic Control

Function and mode controls employ all solid-state transistorized switching which uses not a single relay or mechanical switch. In all mode-to-mode switching (except "play" to "FF" or "REW"), the IC logic control automatically brings the tape transport to a momentary halt between modes, permitting direct switching to any other mode without straining the tape. Electronic switching permits positive activation with a light touch of the finger, and no mechanical linkage to break down.



New Standards in Open-Reel Performance

Tape Speed Deviation: $\pm 0.10\%$

Tape Speed Fluctuation: 0.05% (max.)

The ability to maintain a constant tape speed is one of the most important attributes of a high-quality tape deck. At 15 inches-per-second rated tape speed, the "Isolated Loop" design of the RS-1500US permits a deviation of no more than $\pm 0.10\%$ over the entire length of the tape. This represents 1/10th to 1/5th the deviation of high-quality decks available in the past. The measure of the servo control system is the ability of the tape transport mechanism to maintain a constant speed, whatever that speed may be. The RS-1500US has a maximum tape speed fluctuation of 0.05%—a figure almost unmeasurable, and certainly inaudible.

Wow and Flutter: 0.018% (WRMS, 15 ips)

Wow and flutter, the respective low and high-frequency distortions which occur in turntables and tape recorders, are held in the RS-1500US to an infinitesimal 0.018%. This was made possible only by machining all moving parts to the closest tolerances and by the use of extremely stable DC, direct-drive motors. The absence of wow and flutter will be heard as an extreme clarity in the high ranges, and the complete absence of repetitive pitch changes which usually result from out-of-round capstans, or tapes that are not running smoothly over the recording or playback heads.

Tape Speed Rise Time: 0.7 sec

As shown in the illustrations on the right, the high torque and electronic control of the RS-1500US have the tape moving at a rated speed of 15 ips within 0.7 second after the play button is pushed. This is considerably faster than the rise time of

conventional tape recorders, which go through several fluctuations above and below rated speed before they stabilize. This rapid start-up and stabilization avoids "blurring" at the beginning of recordings, which can occur with other machines.

Level Fluctuation: 0.2 dB

The toughest test of a tape recorder is an oscilloscope comparison of a signal before and after recording. Such a comparison in the case of the RS-1500US shows a remarkable consistency between the source signal and recorded signal, maximum fluctuation amounting to a mere 0.2 dB at 20 kHz. Compared with tape decks produced in the past, this is a significant improvement in performance, and accounts for the extremely high-quality sound production you can expect from the RS-1500US.

Modulation Noise

Modulation noise, usually caused by small tape vibration as it passes over the heads, is significantly lower in the RS-1500US than in tape decks of the past. The graphs illustrate this freedom from modulation noise, showing analysis of an 8 kHz signal recorded at zero VU as it is being played back. The improvement is quite significant and reflects the almost complete lack of vibration of any component in the RS-1500US drive system.

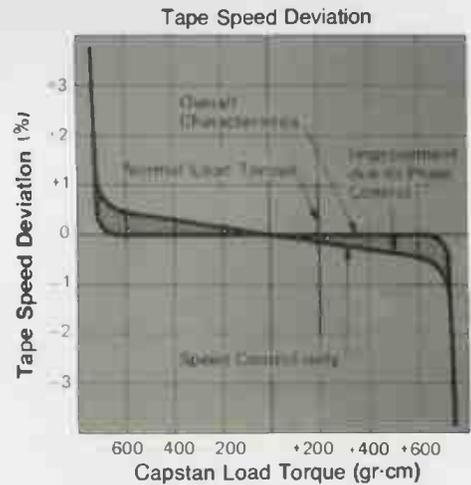
Tape Tension Characteristics

Electronically-commutated, direct-drive reel motors permit the maintenance of even tape tension from the beginning to the end of each reel. This is in sharp contrast to the tension characteristics of conventional tape recorders, in which

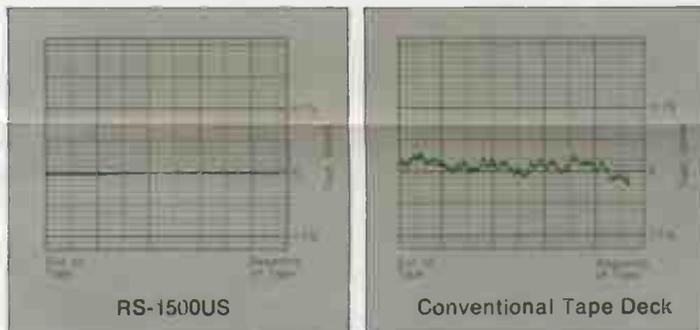
tension at the supply reel is lower at the beginning of tape wind, and correspondingly higher at the take-up reel. In these machines, tape tension constantly changes as the reels are wound, with consequently changing loads on the capstan/pinch roller transport mechanism. In the RS-1500US, smooth, stable tape travel extends through the entire transport system, from the supply reel, to the "Isolated Loop," to the take-up reel.

Tape Speed vs. Load Torque

As the illustration shows, the combination of speed control with phase control virtually eliminates any speed fluctuation resulting from changes in torque imposed by the load. The shaded area indicates the improvement made by phase control, as compared with speed control alone. It is obvious from this curve that the extremely low speed fluctuation of the RS-1500US could not have been obtained with conventional speed control systems.



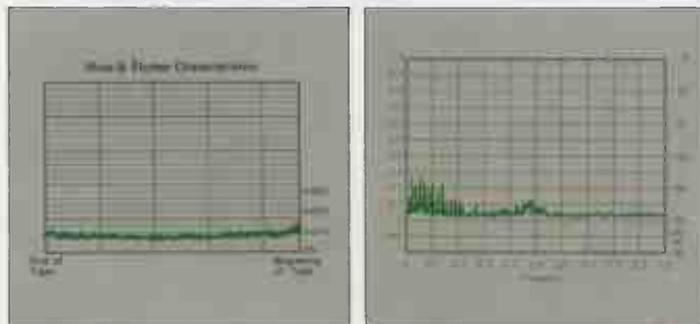
Comparison of Level Fluctuation



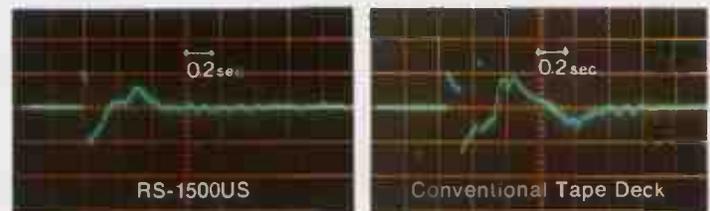
Comparison of Tape Speed Accuracy



Comparison of Modulation Noise

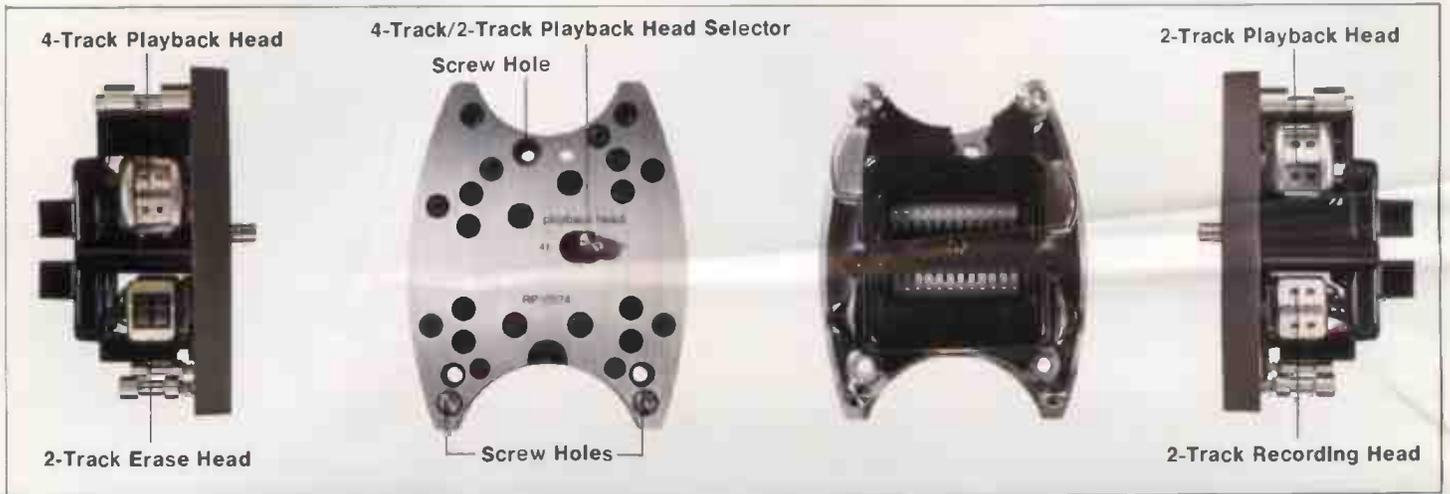


Wow and Flutter Characteristics Frequency Spectrum of Wow and Flutter (0-200 Hz RMS)



Comparison of Tape Speed Rise Time

Flexible Performance Features

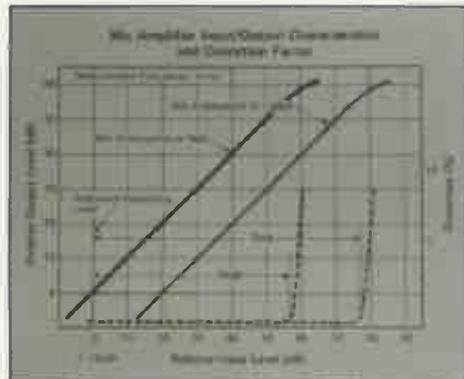


4-Head Construction

Four separate heads are provided in the RS-1500US, for recording, playback (two-track and four-track), and erasure. The four-track two-channel head is provided for reproducing any such tapes that you may have on hand. The two-track is for truly professional quality recording and playback. A convenient switch allows you to select between playback heads in an instant. The head module is a plug-in type, and can be removed by releasing three screws.

Microphone Amplifier

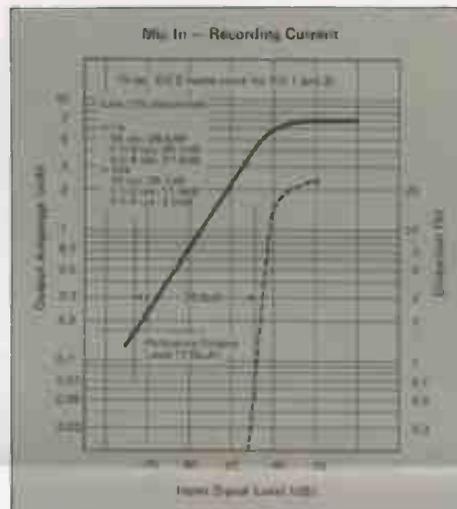
The mic amp consists of a three-stage direct-coupled amplifier circuit using low-noise silicon transistors in the first stage. This not only improves signal-to-noise ratio, but provides a 55 dB dynamic margin at the rated input of -72 dB. If the mic attenuator is used, an additional 20 dB dynamic range is available, for a total of 75 dB. Recording linearity is assured under any conceivable condition. This dynamic range is especially important in live recordings, where sudden surges of sound would be clipped in conventional recorders.



Recording Amplifier

An SEPP circuit is used in the output stage of the recording amplifier to assure that full dynamic range is always main-

tained. Linearity extends to +25 dB (at 1 kHz) above the standard recording level of "0" VU. For this reason, the tape itself will saturate before the amplifier will. As for distortion, the figures in the chart will show that the recording amplifier of the RS-1500US delivers clean performance befitting the finest of professional equipment.



Mixing Amplifier

An FET operation amplifier is used in conjunction with a mixing circuit to create a mixing amplifier in which mixing loss is non-existent. The RS-1500US mixing amplifier assures that if the microphone level control is changed, the line-in level will remain as originally set. The big benefit, of course, will be a vastly improved S/N ratio in mixing recording.

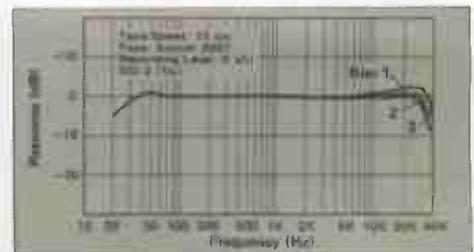


3-Way Bias and Equalization Selection

Any popular type of recording tape can be used in the RS-1500US. As each of these tapes require different bias and equalization settings, the RS-1500US is equipped with two three-position switches, one for bias and one for equalization. Thus, nine combinations of settings are possible, to accommodate virtually any kind of tape at any speed.

Bias/EQ	1	2	3
1		FOR X	
2	MAX FM	SCOTCH BII SCOTCH BII AMPEX 3000 WHEELER AMPEX 3000-1 BASF 3000-1 BASF PROFESSIONAL 3000-1 SONY F-100-10410	SCOTCH BII MAXELL 100 MAXELL 100 MAXELL 100
3	SCOTCH BII SCOTCH BII MAXELL 100 MAXELL 100 MAXELL 100	SCOTCH BII SONY BII	100-1000

Bias Characteristics



Equalization Characteristics



Optional Accessories

Level M
The pre
both rec
scales a
+6 dB
fullness
recordin
accurate
heavy m

Meter S
Permits
normal
(+6 dB)

Real Tin
The tape
elapsed
tape spe
accurate
tape tha
will thus
procedu



Carrying Case (RP-9100)
Extremely strong carrying case with firmly locking catches. Designed for long service life.



Battery Adaptor (RP-086)
The RS-1500US is designed to operate with either standard AC power, or 24 V DC. This optional battery adaptor will enable you take the unit virtually anywhere, for recording at locations where electrical outlets are not available.



Remote Control Unit (RP-9690)
Allows remote control of all transport functions with the same IC logic fingertip ease as the main unit itself.



Dust Cover (RP-9110)
Neatly fits over the whole tape path, and may be left on during play or recording.



Shelf Brackets (pair) (RP-9130)
Attached to both sides of the RS-1500US for ready mounting into a standard 19-inch rack.



10" Empty Reel (RP-10A)
Designed specifically for use with the RS-1500US.

Professional Controls for Professional Performance



Level Meters

The precision level meters indicate in both record and playback modes. Two scales are given, indicating +3 dB or +6 dB respectively. This provides the fullness of scale required for most recording material, as well as permitting accurate monitoring of music containing heavy musical peaks.



Meter Scale Selector

Permits setting of the level meters for normal range (+3 dB) or high range (+6 dB) indication.

Real Time Tape Counter

The tape counter shows actual tape time elapsed in minutes and seconds (at 15 ips tape speed). This is considerably more accurate for locating precise points on the tape than is the conventional counter, and will thus be valuable for editing procedures.



Timer Start

This is an auxiliary power switch which automatically turns the RS-1500US on, when it is connected to an optional timer device. The unit will go directly into recording or playback mode (depending on which has been set) when power is turned on by the timer.

Edit Dial

In editing/splicing, it is not necessary to mark or cut the tape at the point of contact with the two-track playback head. Instead, simply turn the take-up reel by hand until the edit dial has made half a revolution; the desired point will then be located at the tape position marker for easy cutting and splicing.



Cue Button

To aid in editing, the tape is put into contact with the playback heads in the fast-forward and rewind modes. By means of blip-counts, one can quickly locate a desired section of tape. This editing feature also works when the reels are turned by hand.

Pitch Control Knob

When this button is in, tape speed is governed by the quartz-controlled, phase-locked circuitry. If it is necessary to vary tape speed, however, pulling the knob disengages the quartz control, allowing changes in speed of up to $\pm 6\%$ (one-half tone).

Mic Attenuator Switch

20 dB attenuation can be switched into the microphone input path. This is useful when there is a possibility of overloading the recording amplifier through excessive signal levels from high-output microphones.

Line-In and Microphone Recording Level Controls

Independent circuits are provided for line-in and microphone signals, with mic/line mixing possible. An outer ring on each control can be used to index level settings, for precise return to a desired level setting.

Output Level Control

This controls the signal level of line-out, and the headphone jacks. When the control is set at the dot mark, a "0" VU reading indicates a magnetic flux density of 185 nWb/m.

Record Mode Switches

These activate the recording amplifiers and the bias oscillator. The RS-1500US automatically assumes the playback mode when the recording mode switches are in the "off" position.

Monitor Switches

Tape/source monitoring is possible for each channel.

Tape Speed Selector

The RS-1500US provides tape speeds of 15, 7-1/2 and 3-3/4 inches per second. Sophisticated switching circuitry changes tape speed without stopping the tape transport. So switching is instant and build-up time significantly reduced. Also, there's no worry about stretched or broken tapes.

Headphone Jack

Level is controlled by the output level control. Designed for low impedance headphones.

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