


# Professional Products

## Model 361

DOLBY LABORATORIES INC
London San Francisco

## Introduction

The Dolby A-Type Noise Reduction System has been designed to reduce noises commonly encountered in audio signal recording and transmission systems. These noises may take the form of rumble, hum, crosstalk, clicks, pops, buzzing, and hiss, as well as discrete frequency interference such as television synchronizing pulse crosstalk. All of these noises are reduced by the system without affecting the overall frequency response or dynamics of the signal itself.

In the particular field of magnetic tape recording, the system will reduce tape hiss and also alleviate other problems such as print-through and high-frequency modulation noise. The print-through reduction is of special significance, as it allows the long-term storage of high-quality master tapes with minimal degradation.

The system is suitable for use in any situation in which the signal is available for processing at both ends of the recording or transmission chain. The processing operations can be separated by any distance or any time duration, since once correctly adjusted, the system parameters are extremely accurate and stable. Furthermore, the system is tolerant of gain-errors in the recording or transmission channel. An incorrect level to the playback unit of $\pm$ 2 dB does not result in any perceptible alteration of the restored signal.

It should be appreciated that when recording or transmission noise is reduced, other noises masked by it naturally become more apparent. Full use of the increased dynamic range provided by the noise reduction system may therefore sometimes require a tightening of standards in the rest of the chain - i.e. in connection with noise from microphone amplifiers, mixers and monitor amplifiers, as well as noise from wholly acoustic sources such as buzzing fluorescent lights, creaking chairs, and the movement of persons in the studio. (On the other hand, it can be argued that acoustic noises, having purely natural origins, contribute to a feeling of realism and immediacy).

The Dolby 361 Series units are compact second-generation Dolby A-Type (professional) noise reduction units which are fully compatible with the A301. Designed with space and weight in mind, the units are especially useful for multi-track and portable work. The Model 361 is a single processor unit with built-in changeover facilities. This model is designed to serve one recorder track during both recording and playback (with monitoring of line-in or the unrestored tape signal during recording). The operating mode is set by pushbutton switches on the front panel. Remote facilities are also provided, enabling changeover to be controlled automatically by the record relay circuit of the tape recorder.

The circuits used are highly stable and do not require any adjustments, apart from input and output levels, which are set during installation. The noise reduction circuitry is factory-set to precise limits and contains no adjustable controls. All components are mounted in a single module which can be purchased separately. Should failure ever occur, plug-in substitution will rapidly restore operation of the system with no adjustments necessary. A removable front panel allows the input and output controls to be adjusted from the front to match the unit to any of the normal studio signal levels; the panel also provides front access to the noise reduction module.

An internal Dolby Tone oscillator is provided for establishing correct operating levels. The characteristic modulation of this tone also serves as identification for Dolby-processed tapes. All oscillators in a multi-channel installation can be controlled by a single switch.

DOLBY TONE BUTTON FOR OPERATION OF INTERNAL OSCILLATOR. PROVIDES DOLBY LEVEL SIGNAL FOR IDENTIFICATION AND CALIBRATION PURPOSES.

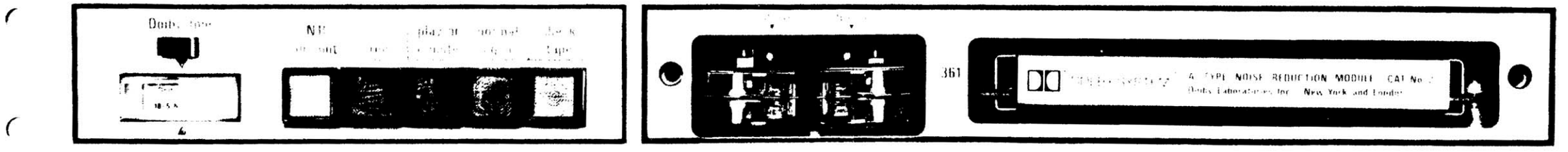
INTERNALLY ILLUMINATED NR IN-OUT BUTTON CONTROLS NOISE REDUCTION ACTION.

INTERLOCKED ILLUMINATEL BUTTONS TO CONTROL SIGNAL APPEARING AT 'to monitor' CONNECTOR ON REAR. BUTTONS HAVE NO EFFECT ON REC/PLAY MODE OF UNIT.

MULTI-TURN POTENTIOMETER ADJUSTS INPUT SENSITIVITY TO SUIT STUDIO LINE LEVEL. ADJUST USING STANDARD TEST TAPE AND METER ON UNIT.

MULTI-TURN POTENTIOMETER ADJUSTS OUTPUT LEVEL TO SUIT STUDIO LINE LEVEL WHEN PLAYING STANDARD TEST TAPE. USED IN CONJUCTION WITH INPUT LEVEL CONTROL TO PRODUCE UNITY GAIN THROUGH MODEL 361.

S8 S2 S5 S6 RV1 RV2




M1 S3 S4 RL2 RL1

METER TO ASSIST IN CALIBRATION OF RECORDER GAIN CONTROLS. CALIBRATED FOR DOLBY LEVEL AND EUROPEAN AND U.S. TEST TAPES.

INTERLOCKED ILLUMINATED BUTTONS TO CONTROL MODE OF UNIT. IN REMOTE POSITION, 24V APPLIED TO 'remote' CONNECTOR ON REAR CAUSES UNIT TO SWITCH TO RECORD MODE.

PLUG-IN RELAYS TO CONTROL SIGNAL ROUTING, REC/PLAY MODE OF MODULE, AND REC/PLAY INDICATOR LAMPS.

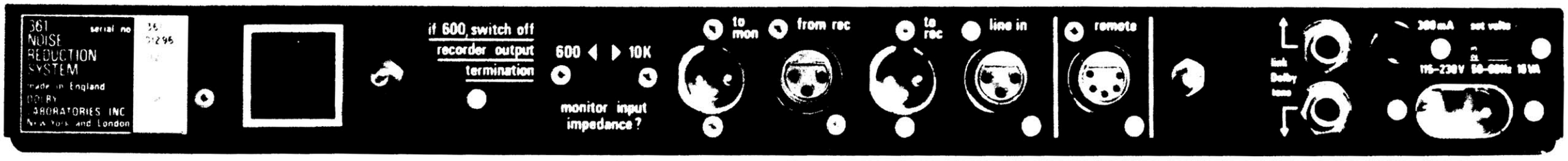
PLUG-IN CAT No 22 NOISE REDUCTION MODULE CONTAINS ALL CIRCUITRY FOR NOISE REDUCTION FUNCTIONS.

REMOTE CONNECTOR FOR REC/PLAY MODE SWITCHING AND NR IN-OUT

300 mA FUSE (SLOW BLOW)

VOLTAGE ADJUST (SLIDE SWITCH)

JM5 JF4 JM3 JF2 JF8 FS1 S1




S7 JF9 JM1

SWITCH TO SELECT CORRECT TERMINATION CONDITIONS. SET SWITCH TO CORRESPOND TO INPUT IMPEDANCE OF MONITORING SYSTEM USED. IF MONITOR HAS 600 OHM INPUT IMPEDANCE, DISCONNECT OR SWITCH OFF ANY TERMINATION WHICH MAY BE ON TAPE RECORDER OUTPUT; ALSO DISCONNECT ANY TERMINATION WHICH MAY BE CONNECTED TO RECORDER FEED OF MIXER.

JACKS LINKING DOLBY TONE FUNCTION ON SEVERAL UNITS. ALSO FOR REMOTE OPERATION OF DOLBY TONE.

POWER CONNECTOR. CENTRAL PIN IS CONNECTED TO CHASSIS.

FOR DETAILED DESCRIPTION SEE SECTION 9

## MODEL 361 CONTROLS AND CONNECTORS

Drg. No. A00 689

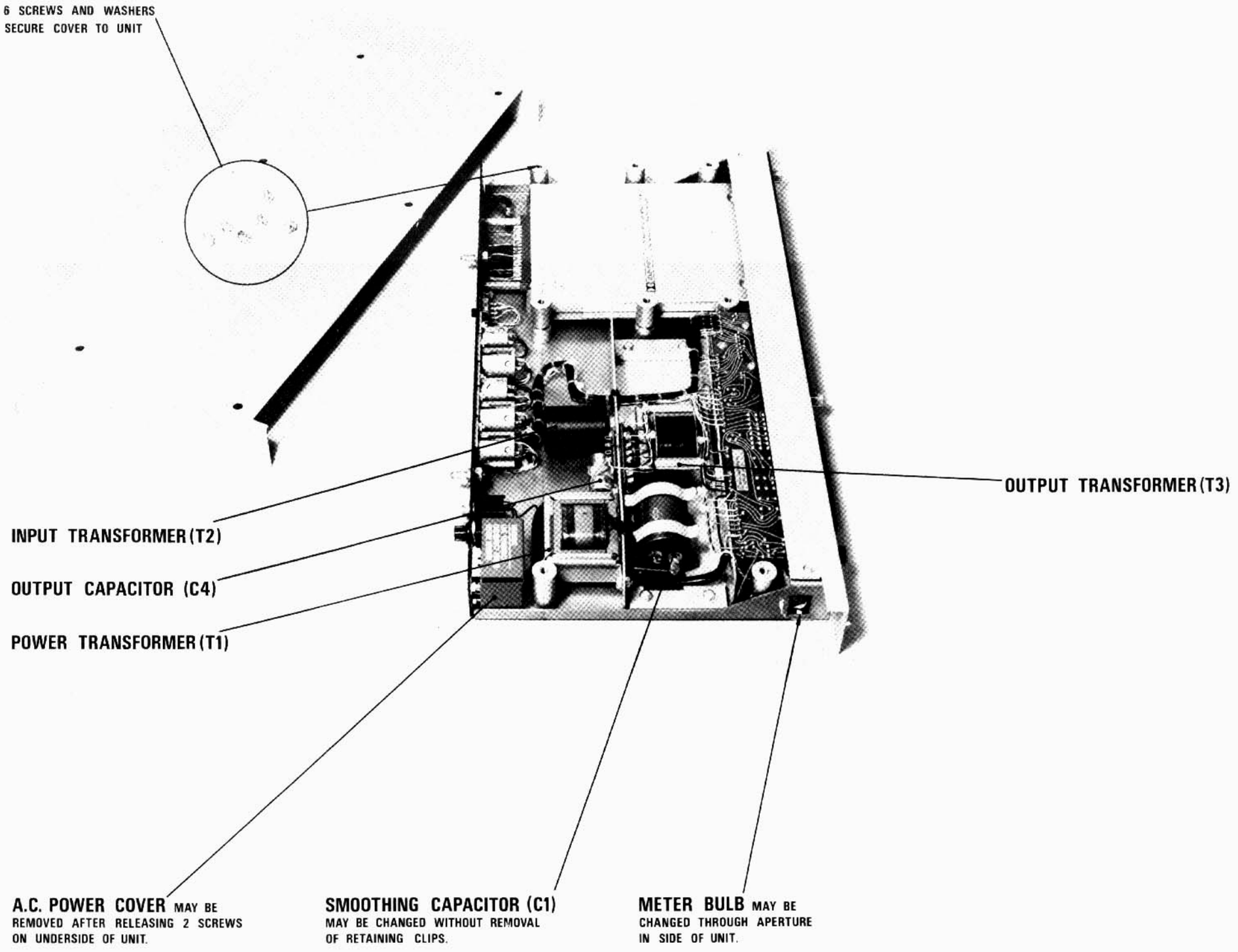
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Specifications - Model 361

| | |
|---|---|
| Layout: | One signal processor with built-in changeover relay circuits. In addition to record-play mode changing, the unit is transferred automatically from line-in to line-out. Control either remotely (record relay of tape recorder) or by illuminated push-button switches on front panel. |
| Signal connections: | XLR input and output for line-in and line-out, and to and from recorder (cable connectors provided with unit). Rear panel switch for establishing correct termination conditions. |
| Operating controls: | Illuminated push-button switches for REC/PLAY mode, REMOTE control, noise reduction IN/OUT, and monitoring mode - NORMAL (line-in during recording, decoded signal during playback) or CHECK (encoded signal directly from tape).. Push-button switch for DOLBY TONE calibration oscillator. |
| Remote control: | Five-pin XLR connector for remote control of record-play mode and line-in, line-out changeover (cable connector provided with unit). Control by external source of 24 volts dc, 6 mA (on for record mode). Alternatively, control by external single pole contact (closed for record mode). Also remote Dolby Tone. |
| Panel meter: | Level setting meter for recorder gain calibration. Calibration marks for Dolby Level (185 nWb/m, Ampex-NAB level) and DIN level (320 nWb/m). |
| Dolby Tone oscillator: | Internal oscillator provided for establishing correct operating levels on an international basis. Push-button Dolby Tone is recorded at Dolby Level (185 nWb/m) and is modulated in a characteristic way for identification. Provision for linking together Dolby Tone oscillators in multi-track installations (cable connectors provided with unit). |
| Input circuit: | Bridging transformer, 10K balanced floating. |
| Output circuit: | Transformer, 20 ohm output impedance, balanced floating; will drive any load impedance from 200 ohms upwards. |

| | |
|---|---|
| Signal levels: | Input and output levels adjusted by multi-turn potentiometers accessible from front of unit. Minimum input 350 mV for Dolby Level, 600 mV for DIN level. Maximum output level +22 dB into bridging load; +21 dBm into 600 ohms; +20 dBm into 200 ohms. |
| Overall frequency response: | ±1 dB from 30 Hz to 20 kHz. |
| Overall total harmonic distortion: | At +8 dBm, less than 0.1% at 1 kHz; less than 0.2% from 40 Hz to 20 kHz. |
| Noise reduction: | Dolby A-Type professional characteristic, providing 10 dB of noise reduction from 30 Hz to 5 kHz, rising to 15 dB at 15 kHz. With noise reduction action switched off, unit becomes unity-gain line amplifier. |
| Overall noise level: | Record-playback, 80 dB (unweighted, 30 Hz to 20 kHz bandwidth) below Dolby Level. |
| Matching between units: | ±1 dB at any level and any frequency, 30 Hz to 20 kHz. |
| Signal delay: | Constant with frequency, 24 μsec per channel. Overall encode-decode process, 48 μsec. |
| Phase error: | Less than 5°, 20-20 kHz overall encode-decode. |
| Stability: | System is highly stable - does not require routine alignment. |
| Operating temperature: | Up to 45° C. |
| Construction: | Plug-in Noise Reduction Module (Cat. No. 22) and changeover relays accessible through front panel. Fibreglass printed circuits, solid state devices throughout. |
| Finish: | Steel case, grey stoved plastic textured finish; front panel clear anodized with black characters. |
| Size: | 44 x 483 mm rack mounting ($1\frac{3}{4}$" x 19"). Maximum projection behind mounting surface - 228 mm ($8\frac{15}{16}$"). Maximum projection in front of mounting surface - 22 mm ($\frac{7}{8}$"). Sixteen-track installation requires 710 mm (28") of rack space. |

| | |
|---|---|
| Weight: | 5.5 kgs (12 lbs). |
| Power Requirements: | Units are designed for operation from centrally switched power source. Power cables provided.<br><br>100-130 V and 200-260 V, 50-60 Hz single phase, 16 VA. |


6 SCREWS AND WASHERS SECURE COVER TO UNIT
OUTPUT TRANSFORMER (T3)
INPUT TRANSFORMER (T2)
OUTPUT CAPACITOR (C4)
POWER TRANSFORMER (T1)
A.C. POWER COVER MAY BE REMOVED AFTER RELEASING 2 SCREWS ON UNDERSIDE OF UNIT.
SMOOTHING CAPACITOR (C1) MAY BE CHANGED WITHOUT REMOVAL OF RETAINING CLIPS.
METER BULB MAY BE CHANGED THROUGH APERTURE IN SIDE OF UNIT.

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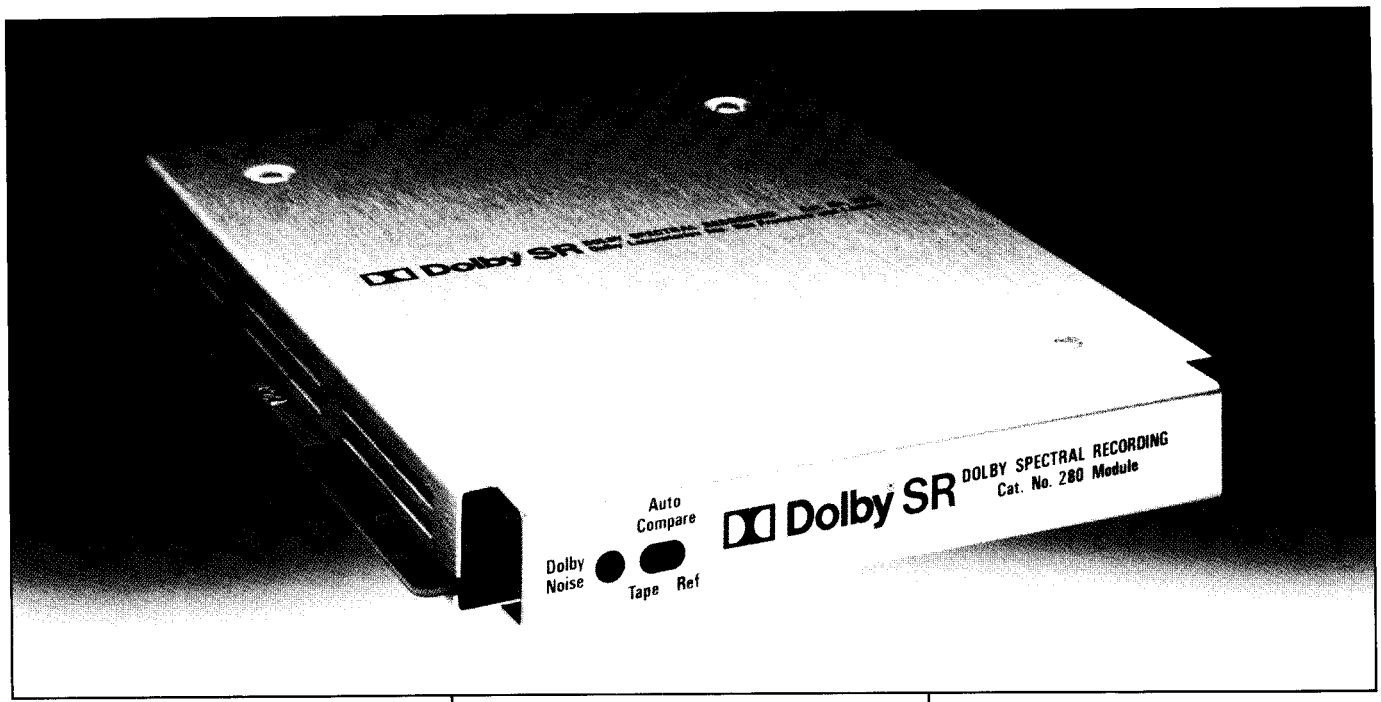
# Dolby® SR

## Cat. No. 280
## Spectral Recording Module
## User Information



# Dolby Cat. No. 280
# Spectral Recording Module

**Dolby SR**




The Cat. No. 280 module is the first commercially available embodiment of the new spectral recording process developed by Dolby Laboratories. The module has been designed for ease of installation in existing 360-Series and M-Series frames from Dolby Laboratories.

Dolby spectral recording is a new audio recording technique which provides audible signal integrity superior to that of any other recording method in use. The performance of Dolby SR with contemporary analog professional tape recorders stands up to extensive scrutiny. The Cat. No. 280 module has been designed to allow easy user evaluation and operational use of the Dolby SR process, using existing frames, with no major studio equipment changes or capital expenditure.

The Cat. No. 280 spectral recording module utilizes function logic similar to that of the Dolby Cat. No. 22 A-type noise reduction module; consequently the control facilities of 360, 361 and M-Series units operate normally, such as IN/OUT, RECORD/PLAY and input/output gain controls.

Dolby SR modules incorporate a new recorder alignment and verification tool called Auto Compare. A built-in pink noise generator in the module applies bursts of noise (Dolby Noise) at a calibrated level to the recorder. The signal is used at the head of a tape to identify the use of Dolby SR, and to assist in recorder calibration (however, the spectral recording process is more tolerant of input/output gain errors than Dolby A-type noise reduction). During playback, the Auto Compare circuitry automatically alternates the monitor output between the Dolby Noise off-tape and the internal noise generator. LED indicators on the module front indicate the current monitor condition. Auto Compare assists in recorder set-up alignment, but additionally provides a rapid method of checking a recorder track by ear during a session.

Dolby Laboratories has delivered over 80,000 Cat. No. 22 noise reduction modules throughout the world, and this widespread availability of interfaces accepting the Cat. No. 280 modules will facilitate adoption of the new Dolby SR process.

Other Dolby SR configurations are under development, including the Cat. No. 431, a module for Dolby SP-and XP-Series units. In addition, two testers assist in process evaluation and module performance verification.

Full descriptive information about the Dolby spectral recording process, and product leaflets describing other Dolby SR modules and testers are available on request from Dolby Laboratories.

# Dolby Cat. No. 280 Specifications

## INTERFACES:
The Cat. No. 280 module can be installed in the following frames:

### Model 360
All module functions available, including simultaneous record/play Auto-Compare if two Model 360s are used in dedicated Record and Play modes.

### Model 361
Auto-Compare functional during tape-playback following recording, but not during simultaneous recording.

### M-Series Units
Cat. No. 280 modules can be installed in all channels of an M16 except numbers 2 and 10. Simultaneous record/play Auto-Compare.

## CAT. NO. 280 MODULE SPECIFICATIONS:

### Layout:
A pair of printed circuit cards mounted together form the module. Signal input/output and control functions compatible with Cat. No. 22 noise reduction module.

### Input Circuit:
680 k ohms unbalanced, 300 mV rms for reference level.

### Peak Encode Input Level:
3.0 V rms (20 dB above reference level).

### Peak Decode Output Level:
3.0 V rms from Output 1,
5.0 V rms from Output 2.

### Line Amplifier:
When mounted in interface frame, maximum output +22 dB into bridging load, +21 dB into 600 ohms
(0 dB = 0.775 V rms).
(A 6 dB higher level is possible using +36 V line-amplifier supply voltage.)

### Overall Frequency Response:
±1 dB, 20 Hz-20 kHz (encode/decode).

### Bandwidth Limitation:
Internal filters: 10 Hz-50 kHz.

### Overall Total Harmonic Distortion:
0.2% 2nd & 3rd harmonic at 3 dB below peak level, 20 Hz-20 kHz.
Negligible higher order distortion components at any level.

### Overall Dynamic Range of SR System:
105 dB — clipping level to CCIR/ARM noise level.
93 dB — clipping level to CCIR Rec. 468-2 weighted noise level.
108 dB — clipping level to NAB A-weighted noise level.
105 dB — clipping level to unweighted noise level, 20 Hz-20 kHz.

### Typical Obtainable Dynamic Range, 15 ips:
90-95 dB.

### Matching Between Units:
±1 dB at any level and any frequency, 20 Hz-20 kHz.

### Signal Delay:
17 μs overall, encode/decode.

### Phase Difference, SR in/SR out:
Less than 2 degrees, 20 Hz-20 kHz overall, encode/decode.

### Calibration Facilities:
Dolby Noise generator for establishing correct levels and frequency response, via built-in meter amplifier and interface frame meter. Output signal can also be fed to external analysis facilities. Automatic audible Auto-Compare function, allowing comparison of Dolby Noise from tape with internally generated reference pink noise.

### Status Indicators:
Yellow LED on front of module indicates Dolby Noise mode.
Auto-Compare Tape/Reference function status indicated by green and red LEDs on front of module.
(LED control signal available for remotely situated LEDs or lamps.)

### Control Inputs:
External +18 to +30 V to actuate record mode (provided in interface frame).
External single pole switch for process in/out (provided in interface frame).
External single pole switch for Dolby Noise mode (provided in interface frame).
Internal three position switch to adjust operating logic to Model 360, Model 361, or M-Series interface frame.

### Stability:
System is highly stable — does not require routine alignment (no adjustable internal controls).

### Operating Temperature:
Up to 45 degrees C.

### Construction:
Fiberglass printed circuits, solid state devices throughout; clear anodized aluminum covers, black characters.

### Size:
192 x 155 x 20 mm (7.6 x 6.1 x 0.8 inches).

### Weight:
500 gm (18 oz.).

### Power Requirements:
SR circuit: +20 V to +28 V, 100-140 mA.
Line amplifier: +18 V to +36 V, 13-17 mA.

**Dolby**

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Specifications subject to change without notice.

# SECTION 1
# INTRODUCTION

## 1.1 Dolby Spectral Recording

Dolby spectral recording, or Dolby SR, has been developed to answer the needs of modern professional recording. The Cat. No. 280 SR module is the first implementation of this new recording process. It can be used in existing interface frames manufactured by Dolby Laboratories and will, therefore, allow a widespread introduction of this new high-quality recording format.

## 1.2 Dolby SR Packaging

To facilitate easy interchange, the Dolby SR circuit has been packaged in the same card profile and pin out as the familiar Cat. No. 22 noise reduction module. This will allow the process to be conveniently used in commonly available 360-Series and M-Series interface frames. The Cat. No. 280 cannot be used in the SP unit due to incompatibilities with the Cat. No. 230 carrier card. A specific Dolby SR module, the Cat. No. 431, will be available for the existing SP- and XP-Series multi-track frames.

While the Cat. No. 280 is generally compatible with the Cat. No. 22 module, there is one major difference: the standard Cat. No. 280 module is physically thicker (about .15 inch, 3 mm) than the Cat. No. 22, and therefore will not fit in some existing Cat. No. 22 applications. To address situations where the Cat. No. 22 cards have been mounted close together, such as in the Model 362, a special packaging adaptation of the Cat. No. 280 has been developed, the Cat. No. 280-L. This long but thin adaptation extends the Dolby SR circuits forward of the front panel by about 7 1/2 inches, or 190 mm, thereby allowing Dolby SR modules to be used in close-pitch situations.

The increased thickness of the Cat. No. 280 will not allow standard modules to fit in a few channels of the M-Series frame. To accommodate M-series channels 1,10 and 18, special module covers (Cat. No. 359) must be installed on the Cat. No. 280 modules used in these channels only.

## 1.3 Dolby SR Compatibility

Electrically, the Dolby SR process is very different from A-type noise reduction. Both Dolby A-type NR and Dolby SR are complementary processes that, when decoded properly, give excellent results. Dolby SR, however, goes far beyond noise reduction systems in its ability to improve the overall quality of a recording or transmission channel. Dolby A-type and Dolby SR are not considered cross-compatible--Dolby SR encoded tapes should not be decoded with Dolby A-type cards and vice versa.

## 1.4 Dolby SR Calibration

As with A-type noise reduction, Dolby SR requires the decode module to be correctly set in level with respect to the encode module. With A-type, this is accomplished using Dolby Tone; with the Dolby SR process, it is achieved using a new, easily identifiable alignment signal: Dolby Noise. Dolby Noise, abbreviated DN, is always used to establish correct decode level.

In addition to the Dolby spectral recording circuits and the Dolby Noise generator, the Cat. No. 280 contains an important new feature--Auto Compare. The Auto Compare circuit, using Dolby Noise as a signal, gives the user valuable gain and frequency response information about the recording channel. The Auto Compare mode allows an automatic aural comparison of the recorded Dolby Noise signal and the internally generated pink noise. The user can quickly, by ear, verify the performance of the recording system by comparing the reference pink noise with the Dolby Noise from the tape. The Auto Compare feature is discussed fully in Section 3 -- Calibration.

## 1.5 Cat. No. 280 Applications

The following is a summary of how the Cat. No. 280 can be used in specific Dolby interface frames. A full discussion of Cat. No. 280 operation in these units is covered in Section 5 -- Practical Operation.

### 360 Series

Model 360

The Model 360 is intended for single-channel, dedicated encode or decode operation. Two interface frames and two Cat. No. 280 modules are required for one channel of simultaneous record and playback operation. The Auto Compare feature can be fully operational during both record and playback.

Model 361

The Model 361 is designed for changeover operation of a single module for both record and playback. The Cat. No. 280 module is switched into the record and playback signal paths just as with the Cat. No. 22. The Auto Compare sequence is available only when playing back previously recorded Dolby Noise.

Model 362

The Model 362 is designed to hold two Cat. No. 22 A-type modules, and functions as a dual-channel Model 360. Due to height restrictions, two standard Cat. No. 280 modules cannot be installed. To incorporate Dolby SR in the Model 362, a special adaptation, the Cat. No. 280-L, must be used. The Cat. No. 280-L contains the two circuit cards that make up the standard Cat. No. 280 module, with one mounted behind the other. This results in a module that is of single thickness but double length, therefore extending forward of the front panel by $7\frac{1}{2}$ inches (190 mm).

### M-Series

The M-Series chassis was designed to hold 16 Cat. No. 22 A-type modules. Two chassis can be linked to accommodate 24 or 32 channels. It is possible to use Dolby SR in all channels, provided that special covers

are installed on the Cat. No. 280 modules used in channels 1, 10 and, in the M-24 unit, channel 18. Cat. No. 280 modules with standard covers can be used in all other M-series channels. The special cover, referred to as the Cat. No. 359, will be available through Dolby product distributors.

### SP/XP Series

The greater thickness of the Cat. No. 280 prohibits its use in the SP Series. Additionally, there are some electrical incompatibilities with the Cat. No. 230 carrier card. The Cat. No. 431, due in late 1986, will fit both the SP and XP multi-track units. This module will be a plug-in replacement for the entire Cat. No. 230/22 combination in existing SP units and for the Cat. No. 331 A-type module in the newer XP frames.

### Cinema Products (CP50, CP100, CP200)

The Cat. No. 280 requires minor modification for use within cinema units. In a few special situations, however, it may be necessary to use a Cat. No. 280 in a CP50, CP100 or a CP200. In this case, contact Dolby Laboratories for more information.

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