

SECTION 3

CAT. NO. 280 CALIBRATION -- DOLBY NOISE

This section describes Dolby Noise, Auto Compare and their use during calibration. Alignment and operation of the Cat. No. 280 in specific Dolby interface frames is covered in Section 5 -- Practical Operation.

3.1 Dolby Noise

Dolby Noise is an alignment signal derived from internally generated pink noise. The pink noise is generated at an accurate level with respect to the Cat. No. 280's internal signal levels and then interrupted every two seconds by a 20 ms gap of silence. These periodic interruptions (sometimes called "nicks") serve to positively distinguish Dolby Noise from other pink noise. These interruptions also provide the synchronization signal for the Auto Compare circuit used during playback.

The Cat. No. 280 is switched into the Dolby Noise mode whenever the "Dolby Tone" or "Cal" button on the interface frame is pressed. The YELLOW LED on the front of the Dolby SR module will be ON.

When making a recording using the Dolby SR process, the user should always record a short section of Dolby Noise at the beginning of each reel (just as is done with Dolby tone for A-type recordings). This Dolby Noise positively identifies the recording as being Dolby SR encoded, and provides an accurate alignment reference for the decoder. When Dolby Noise is recorded (the "Dolby Tone" or "Cal" button on the interface frame is pressed), the Dolby Noise is sent to the recorder at 15 dB below Dolby Level. This lower level is compensated by gain in the calibration meter amplifier so that Dolby Noise will read on the Dolby Level dot in the center of the calibration meter. In other words, the level of the Dolby Noise on the calibration meter will read very low during normal playback, but will read Dolby Level--the center dot--when the Dolby Tone/Cal button is pressed.

3.2 Auto Compare

The Auto Compare feature provides a simple and convenient way of quickly verifying the recording channel. During the Auto Compare mode, the internal reference pink noise and the recorded Dolby Noise are alternately switched to the monitor output on four-second intervals. This provides, in effect, a continuous A/B comparison between the reference pink noise generator and the Dolby Noise off the tape.

The Auto Compare feature in the Cat. No. 280 module allows the easy identification of errors in level, high and low frequency response (including wrong equalization settings), azimuth, or any other audible conditions.

The Dolby Noise recorded on the tape has interruptions every two seconds. The internal reference noise, on the other hand, is continuous and does not have the interruptions. This leads to an easily identifiable pattern of four seconds of continuous reference noise and four seconds of the interrupted or "nicked" Dolby Noise. After several initial alignment sessions, the "nicked/continuous" pattern is easily identified as a tape/reference pattern, even though the two noises may sound identical -- which they will, if the recorder and Dolby SR levels are aligned properly. Two LEDs on the front of the Cat. No. 280 indicate whether the monitor

is receiving the internal reference noise (RED) or the Dolby Noise from the recorder (GREEN).

3.3 Auto Compare Control

Auto Compare is controlled by the Dolby Tone/Cal button on the interface frame and the status of the tape recorder. An Auto Compare sequence will automatically begin IF the recorder is playing Dolby Noise AND the Dolby Tone/Cal button on the interface frame is pressed. In other words, when the Dolby Tone/Cal button is pressed, the Cat. No. 280 automatically recognizes Dolby Noise at its input; the four second alternating reference/tape sequence will automatically begin.

When a Cat. No. 280 is installed, the Dolby Tone/Cal button is used only in association with Dolby Noise and has no application with other tones or program material. If the button is inadvertently left pressed while playing program material, the tape will not be decoded and the Auto Compare circuit may occasionally be triggered by transient program material, resulting in bursts of reference noise being sent to the monitor. If the Dolby Tone/Cal button is released, the situation returns to normal and the tape will be correctly decoded.

The exact operation of the Auto Compare feature depends on which Dolby interface frame the Cat. No. 280 has been installed in and whether the interface frames are used for dedicated encode/decode or changeover operation. The mode of operation is selected by the rear switch on the module. These specific differences are discussed in Section 5 -- Practical Operation.

3.4 Auto Compare Metering

The calibration meters in the interface frames (360 Series and M Series) were designed to read correctly on sine waves at a single level--specifically Dolby Level. In order for Dolby Noise to produce an accurate and reliable meter reading, the Dolby Noise is band limited to reduce meter bounce and reduce the effects of recorder frequency response errors at extreme frequencies. The meter signal is then amplified so that Dolby Noise reads Dolby Level the dot on the calibration meter. When the Dolby Tone/Cal button is not pressed, the meter functions normally, as with a Cat. No. 22 installed.

An important point to remember:

Although the Dolby Noise is always recorded at -15 dB with respect to the established Dolby Level, it is metered at Dolby Level on the calibration meter whenever the Dolby Tone/Cal button is pressed.

3.5 Auto Compare Synchronization

In currently available Dolby interface frames, the Auto Compare switching circuits are not synchronized between channels, unless the user has modified the interface frame as suggested in Appendix 1. In the Dolby SR module for the SP and XP Series, the Cat. No. 431, Ref/Tape switching will be synchronized between channels. Regardless of whether synchronization is provided, it is important to remember to listen to only one channel at a time for valid Auto Compare information.

3.6 Dolby Tone and the Cat. No. 280

Dolby Tone is used to establish the decode level for Dolby A-type NR and has no application in setting the decode level for Dolby SR. When the Dolby Tone/Cal button is pressed with the Cat. No. 280 installed, the calibration meter on the Dolby frame cannot be used for reading external tones because of the band limiting and gain used. When the Dolby Tone/Cal is not pressed, the calibration meter functions normally as if a Cat. No. 22 were installed, without the extra gain and band limiting.

If the Dolby interface frame and the tape recorder have been properly aligned using external tones, Dolby Noise will be correctly set for the proper decode level during playback. (Dolby Noise will read Dolby Level on the calibration meter when the Dolby Tone/Cal button is pressed.) If tapes are played that have been recorded with the tape recorder set up for a different reference flux level, the "Play Cal" on the recorder (or, sometimes more conveniently, the input potentiometer on the interface frame) will have to be adjusted to obtain the Dolby Level reading while the Dolby Noise is being played AND the Dolby Tone/Cal button is depressed.

Note:

As a safeguard, Dolby SR levels should always be established using Dolby Noise, even though the recorder and overall system may have been carefully aligned using tones. System levels are set using tones and test tapes in the conventional manner with the Dolby SR processing switched off (NR OFF on the associated interface frame). Following that, the Dolby SR level alignment is checked using Dolby Noise with the Dolby Tone/Cal button pressed. As Auto Compare provides the user with an accurate reference for setting playback frequency response and decode level, the user should always attempt to get the Dolby Noise that has been recording on the tape to audibly match the reference noise.

SECTION 4 SYSTEM ALIGNMENT

4.1 General System Alignment

This section covers general recording levels for optimum performance of Dolby SR. As covered in Section 3, the signal levels through the Dolby interface frame should be set using external tones and test tapes with the Dolby SR switched OFF (NR OFF on the interface frame).

4.2 Recording Levels for Dolby SR

Dolby Level can be established anywhere in the 100 nWb/m through 500 nWb/m region, and the Dolby SR system will give good results in all practical recording situations. Because of the overload characteristics associated with modern recording tapes, however, it is recommended that Dolby Level be established in the 185 nWb/m or 200 nWb/m region in order to achieve the very highest measured signal-to-noise ratio performance.

The Dolby SR process is capable of giving magnetic recording the capacity for extraordinarily high dynamic range, in some cases as high as 100 dB for 15 IPS 1/4-inch tape. In order to measure such a high signal-to-noise ratio (under test bench conditions), the noise and overload points of the tape and that of the associated electronic circuits in the recording system (including the Dolby interface frame and the Cat. No. 280 module) must be reasonably matched. In most real recording situations with Dolby SR, the overall performance of the recording system is limited by the microphone pre-amplifiers or the ambient noise level found at the recording location, so such attention to precise matching is unwarranted.

The basic Cat. No. 280 based Dolby SR system (encode-decode) has a clip to noise window of approximately 107 dB. The internal reference level of the Dolby SR electronics, or Dolby Level, is set to be about 20 dB below the internal clip point and about 85 dB above the electronic noise floor of the system. Modern recording tape has a saturation point around 15 dB above 185 nWb/m; therefore, if 185 nWb/m or 200 nWb/m is the chosen reference, tape saturation will occur just before the Cat. No. 280 clips, and the noise floor measured will be essentially that of the tape -- the desired effect. Recording studios that use 185 nWb/m or 200 nWb/m as a reference can continue to record using already established procedures, and obtain maximum benefits of Dolby SR.

Note:

While the clip point of the SR circuits themselves is about 21 dB above Dolby level, the actual headroom through the system may be limited by the line amplifier, the interface frame, and how the output level has been adjusted. For example, when the Cat. No. 280 is installed in the Model 360 Series, the maximum output level is +21 dBm into 600 ohms -- that is, 17 dB above Dolby Level. If the output potentiometer has been set so that Dolby Level is equal to +8 dBm (a common 0 VU output level for U.S. broadcast applications), the headroom will be limited to 13 dB above Dolby Level.

Listed below are the maximum output levels of Dolby interface frames with the Cat. No. 280 module installed:

360 Series	+ 20 dBm into 200 ohms
	+ 21 dBm into 600 ohms
	+ 22 dBm into 10 K ohms (bridging)
M Series	+ 21 dBm into 200 ohms
	+ 22 dBm into 600 ohms
	+ 23 dBm into 10 K ohms (bridging)

4.3 General Alignment Using VU Meters

The following is a general alignment procedure for use with external VU meters and reference tapes with a 185 nWb/m or 200 nWb/m test tape:

1. Switch the Dolby SR process OFF (NR OFF on the associated Dolby interface frame).
2. Play the reference level tape on the recorder.
3. Adjust the Dolby frame "input" potentiometer so the calibration meter on the interface frame reads the dot in the center -- Dolby Level.
4. Adjust the "output" potentiometer to restore reference level at the Dolby interface frame's output.
5. Send a tone at reference level from the console to align the record aspects of the Dolby interface frame. (With the Model 361, this has been already accomplished with the steps above.)
6. Adjust the record sensitivity of the recorder to give a Dolby Level reading on the Dolby frame calibration meter.
7. With the Dolby Tone/CAL button depressed, record a short section of Dolby Noise. Play this section back and verify that it reads Dolby Level on the calibration meter.

Note:

The Dolby SR circuits in the Cat. No. 280 have been set to have unity gain at Dolby Level within the 700 - 1 kHz region. If the external tone is in this frequency band, it will make no difference if the alignment is done with or without the Dolby SR process switched in. Tape recorder frequency response measurements and equalization adjustments should always be done with Dolby SR switched off, as there will be noticeable deviations outside the 700 - 1 kHz region. As Dolby A-type must be switched off for alignment, it is probably a good practice to be consistent, and turn Dolby SR off as well.

4.4 Using VU Meters with High Level Reference Tapes

It has become common practice for many U.S. studios to use a reference flux level of 250 nWb/m, 261 nWb/m or 320 nWb/m, any of which can be established as a reference level for Dolby SR with good results. Some European studios, however, have established an alignment tone that is closely related to "peak recording level" and can be as high as 1000 nWb/m, a few dB below tape saturation. If such a high flux level is set to equal Dolby Level in the interface frame, much of the headroom of Cat. No. 280 will go unused and the noise floor will be influenced by that of the Dolby SR processing electronics; the full effect of the Dolby SR process will not be obtained. In order to get the maximum measured performance from Dolby SR when using such a high flux level reference tape, it is necessary to alter the suggested alignment procedure. The following are two possible solutions, either of which will give acceptable results:

- a. Establish a secondary tone, lower than the reference flux level by a fixed amount, that will serve as the Dolby calibration tone. The secondary tone will read lower on the recorder and console meters but at Dolby Level--the center dot--on the interface frame. The reference alignment tone will read high, or even off scale, on the Dolby calibration meter.
- b. Always align the Dolby interface frame with the high flux level reference tone to the "DIN" dot on the upper part of the Dolby calibration meter. The "DIN" indication is placed approximately 5 dB above Dolby Level on the Dolby calibration meter. (Some older meters may be labeled "32" or not have any upper mark at all.) Dolby Noise will still be generated and metered at Dolby Level--the center dot.

Regardless of the specific procedure used to set reference level through the Dolby interface frame, Dolby Noise must be set to read Dolby Level--the center dot--on the Dolby calibration meter. It is important to remember that the level of Dolby Noise is pre-set to 15 dB below the established Dolby Level at the tape recorder. The Dolby Noise is automatically restored to read Dolby Level when the Dolby Tone/CAL button is pressed. When playing back previously recorded Dolby Noise, the Dolby Tone/CAL button should be pressed and, if necessary, the "Play Cal" on the recorder adjusted so the Dolby calibration meter reads Dolby level.

4.5 Aligning with Peak Program Meters

Like VU meters, peak program meters can be used to set signal levels through the Dolby interface frame. Peak program meters are widely used, especially in Europe, because their faster rise times more accurately indicate the peak level of complex program material, while VU meters read the average program level. Studios using peak reading meters, therefore, need less headroom between their 100% reference level and the clipping or overload point on the tape. It is typical when aligning Cat. No. 22 Dolby A type modules to set Dolby Level about 5 dB below the 100%, or "peak reference" alignment tone, normally used by some studios. In the case of Dolby SR, much of the available headroom in the Cat. No. 280 will go unused and the measured noise floor will be influenced by the Dolby SR processing electronics. In order to obtain the full benefits of the Dolby SR process when aligning with peak reading meters, Dolby Level should be established at roughly 10 - 15 dB below the peak indications on the meters. This should, in most cases, result in a flux level of around 200 nWb/m being chosen for Dolby Level.

The following is a general alignment procedure that should be followed when aligning Dolby SR using external peak program meters:

1. Switch the Dolby SR process OFF (NR OFF on the associated Dolby interface frame).
2. Send a tone from the console at the chosen Dolby Level (10 to 15 dB below 100%) or if adjusting the playback side, play a tape recorded at this level.
3. Adjust the Dolby interface frame "input" potentiometer so the calibration meter reads the dot in the center -- Dolby Level.
4. Adjust the "output" potentiometer to restore unity gain through the Dolby interface frame.
5. Send a tone at reference level from the console to align the record aspects of the Dolby interface frame. (With the Model 361, this has been already accomplished with the steps above.)
6. Adjust the record sensitivity of the recorder to give a Dolby Level reading on the Dolby frame calibration meter.
7. With the Dolby Tone CAL button depressed, record a short section of Dolby Noise. When it is replayed, verify that it reads Dolby Level on the calibration meter.

Note:

Various peak reading meters use different dynamic characteristics and scales to indicate peak level. When aligning a Dolby interface frame with external peak reading meters, remember that reference level actually corresponds to a numerical indication on the scale that indicates the studio's standard operating level. For optimum performance of the Dolby SR circuit, the level which corresponds to the center dot on the Dolby calibration meter should be about 10-15 dB below the maximum program level indicated on the peak reading meter.

SECTION 5 PRACTICAL OPERATION

There are differences in the detailed alignment procedure and the operation of the Auto Compare circuit between the Model 360, Model 361 and M-Series units; therefore, a separate procedure is provided for each. Please refer to the appropriate section on the following pages.

5.1 Model 360 Operation

Two Model 360 units and two Cat. No. 280 modules are required per channel for record and playback operation without repatching. One Model 360 is dedicated to record (REC button pressed), while the other is dedicated to playback (PLAY button pressed). The configuration switch on both Cat. No. 280 cards should be set to the "360" position.

The Dolby Tone/Cal buttons on the two units should be linked together by connecting the frames with a 1/4-inch phone plug on the rear of the chassis. This allows the user to engage the Dolby Noise mode in both units by pressing either Dolby Tone/Cal button.

The units are initially aligned with external tones with the Dolby SR and DN switched off (Dolby NR and Dolby Tone OFF on the interface frames). The alignment is done in the conventional manner as if Cat. No. 22 modules were installed; that is, a reference tape is played and the "input" potentiometer on the playback unit is adjusted to obtain Dolby Level--the dot in the center of the calibration meter. The "output" potentiometer on the playback unit is adjusted to restore reference level to the console. Following playback unit alignment, the record unit is adjusted by sending a reference tone from the console and adjusting the "input" potentiometer on the record unit to obtain Dolby Level on the calibration meter. The "output" potentiometer on the record unit is then adjusted to obtain reference level at the recorder.

5.2 Auto Compare in the Model 360

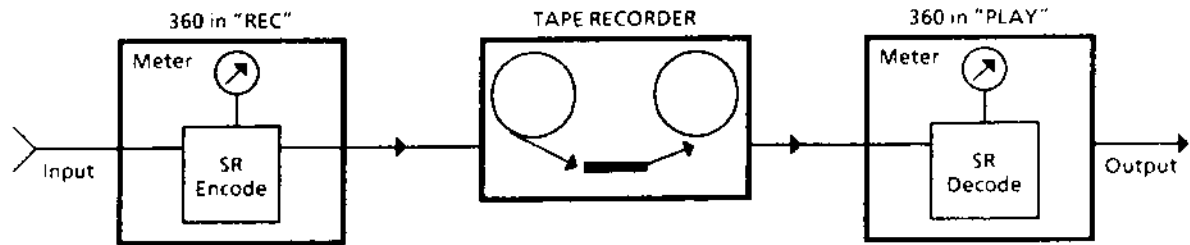
When the Dolby Tone/Cal button is pressed on either unit (assuming they have been linked; otherwise both buttons will have to be pressed), the Cat. No. 280 in the record unit will send Dolby Noise to the recorder. The calibration meter will read the "Line In" signal (see note on calibration meters reading on early Cat. No. 280 modules). The YELLOW LED on the record or encode Cat. No. 280 will be ON. Neither the RED nor GREEN LED will be ON, as the record Cat. No. 280 is not in the Auto Compare mode. The playback or decode Cat. No. 280 will automatically begin the Auto Compare sequence in any of the following cases:

1. The recorder is recording and playing back the Dolby Noise generated by the encode Cat. No. 280.
2. The recorder is stopped but switched to "INPUT," thereby feeding the record unit's Dolby Noise to its output.
3. The recorder is playing back previously recorded Dolby Noise.

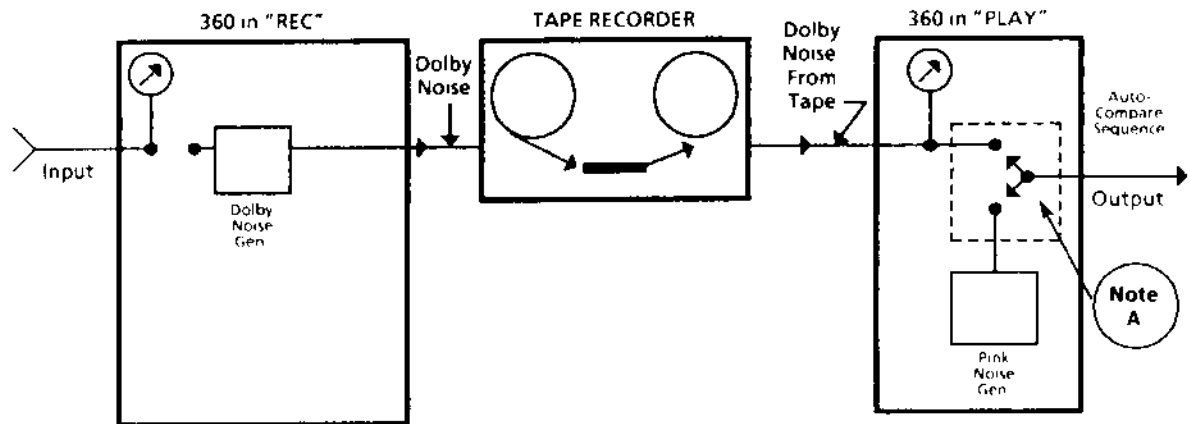
The YELLOW indicator on the playback Cat. No. 280 will be ON and the RED or GREEN LEDs will indicate the source of the noise being fed to the monitor. The RED LED will indicate the reference noise being generated inside the playback Cat. No. 280 and the GREEN LED indicates the Dolby Noise from the recorder. The calibration meter on the playback unit will indicate the replay signal from the tape.

360

RECORD/PLAY:



DOLBY NOISE/CAL, RECORD/PLAY:



Note A: Cat. No. 280 modules before serial number 456 have the playback meter signal connected to the output of the Auto Compare switch. Boards stamped 456 and above have the calibration meter connected as drawn. The result is that when an early generation Cat. No. 280 is used, the calibration meter will read the reference noise/Dolby Noise sequence, while with later generation boards, the calibration meter will always read the Dolby Noise from the recorder.

5.3 Model 361 Operation

The Model 361 is designed for changeover operation of one module. Relays inside the interface frame place the Cat. No. 280 module either in the input (RECORD) signal paths of a recorder or the output (PLAY) signal paths. A selector switch on the front of the Model 361 allows the module to be manually switched between the RECORD and PLAY modes. Typically, the Model 361 is automatically switched under control from the recorder.

Initial alignment of the Model 361 is done with Dolby SR and DN switched OFF, as when a Cat. No. 22 module is installed. A reference tape is played and the "input" potentiometer on the Model 361 is adjusted so the calibration meter reads Dolby Level. The "output" potentiometer is then adjusted to restore reference level to the rest of the system.

Unlike the M Series, SP- and XP-Series units, the Model 361 has only one "input" and one "output" potentiometer (and, therefore, only one output line amplifier). This generally simplifies alignment, in that the record side adjustments will automatically be correct if the playback alignment has been done. This is true provided that the recorder is set for unity gain, that the "Line In" and "To Monitor" levels are expected to be identical, and there are no unusual loading or impedance matching conditions.

Note that it is possible to use two Model 361 units for simultaneous encode/decode operation as if they were Model 360 units. In this case, the configuration switch on the rear of the Cat. No. 280 should be put in the "360" position and the general alignment procedure for the 360 Series followed. The console should be connected through to the recorder using the "Line In" and "To Recorder" connections on the record unit and the REC and NORMAL buttons should be pressed. On the playback unit, the recorder is connected through the "From Recorder" and "To Monitor" connections and the PLAY and NORMAL buttons pressed.

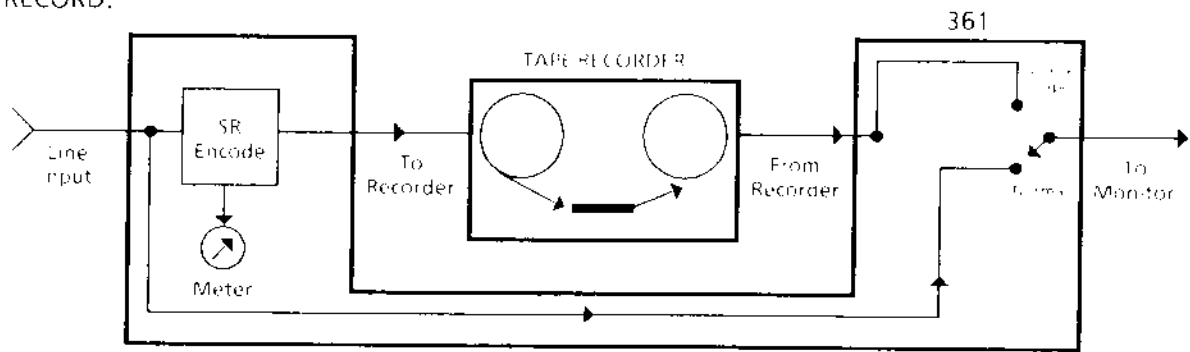
5.4 Auto Compare in the Model 361

The "automatic" Auto Compare sequence is available only when playing back previously recorded Dolby Noise. In playback, the line amplifier drives the "To Monitor" output while the Auto Compare circuit alternately switches between the Dolby Noise from the recorder and the internal reference noise. The RED (reference) and GREEN (tape) LEDs will indicate the source of the signal being sent to the monitor.

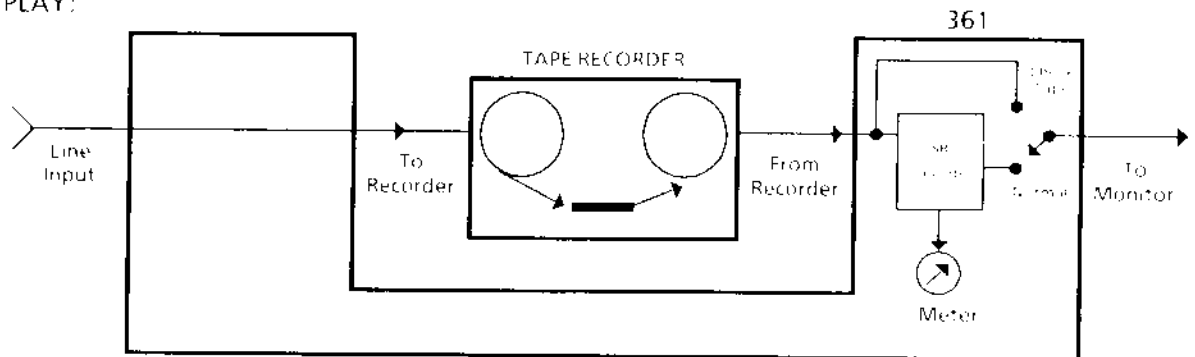
With the Model 361, the "automatic" Auto Compare sequence is not available while recording Dolby Noise because the output line amplifier is being used to drive the recorder (the "To Recorder" send). While Dolby Noise is being recorded, the monitor will receive the Dolby Noise direct from the generator in the NORMAL mode and will receive the Dolby Noise being returned from the recorder in the CHECK TAPE mode. By switching back and forth between NORMAL and CHECK TAPE, a useful "manual" Auto Compare function can be achieved. The reference signal heard in the NORMAL switch position, however, will not be pink noise but the interrupted or "nicked" Dolby Noise and, of course, the switching will not be synchronized. The calibration meter on the Model 361 will indicate the Dolby Noise being returned from the recorder regardless of whether the interface frame switch is in the NORMAL or CHECK TAPE position.

361

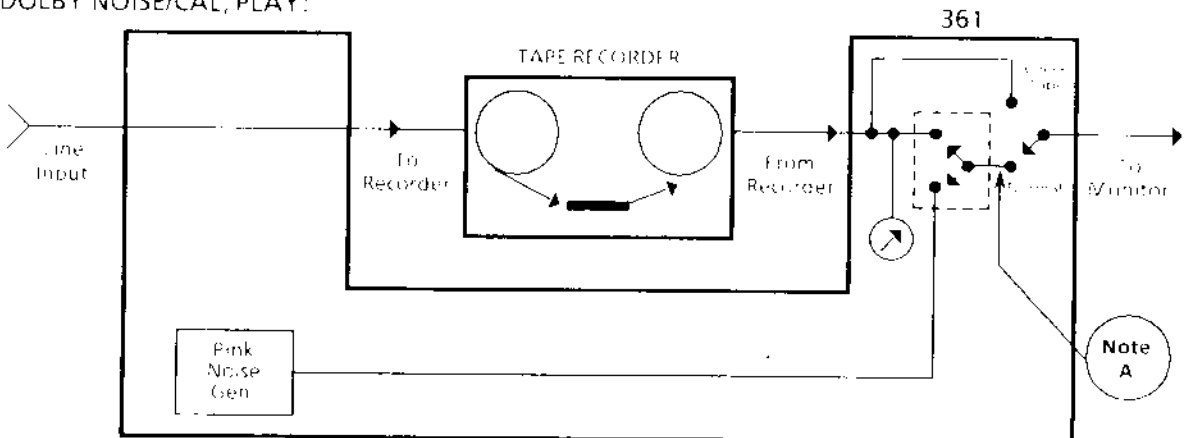
RECORD:



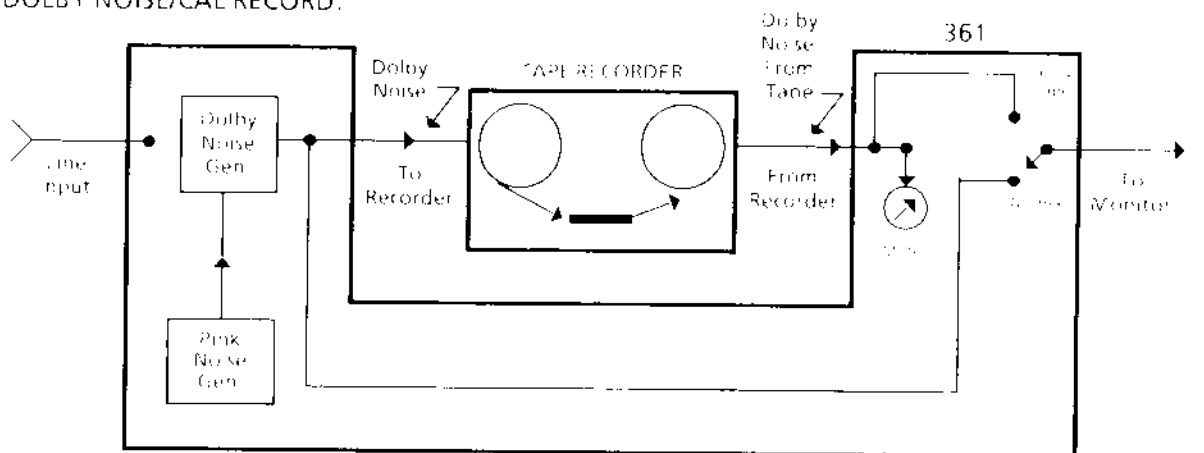
PLAY:



DOLBY NOISE/CAL, PLAY:



DOLBY NOISE/CAL RECORD:



Note A: Cat. No. 780 modules before serial number 456 have the meter connected to the output of the Auto Compare switch. Boards stamped 456 and above have the calibration meter connected as drawn. The result is that when an early generation Cat. No. 780 is used, the calibration meter will read the reference noise/Dolby Noise sequence, while with later generation boards, the calibration meter will always read the Dolby Noise from the recorder.

5.5 M-Series Operation

Like the Model 361, the M Series has been designed for changeover operation of one module. Solid-state switches in the Cat. No. 44 interface module place the Cat. No. 280 module either in the input (RECORD) signal paths or the output (PLAY) signal paths. The M Series is typically switched between the record and playback modes under control from the recorder. Additionally, the Cat. No. 44 interface module contains a dedicated input buffer and line amplifier and individual level trims for the "From Recorder" and "To Recorder" signal lines. (The older Cat. No. 44 modules have a fixed level of +4 dBm or 1.23 volts at the "To Recorder" outputs, while the Cat. No. 44H cards have an adjustable output.)

Alignment of the M Series is done by playing a reference tape on the recorder and adjusting the "From Recorder" input potentiometer to obtain Dolby Level on the Cat. No. 44 calibration meter. The "To Monitor" potentiometer is adjusted to restore reference level to the output of the M Series. The record side is adjusted by sending a reference level signal in to the "Line In" inputs with the M-Series in the record mode. (The "meter reads Line In" LED on the Cat. No. 44 interface module will be ON.) The "Line In" potentiometer is adjusted to obtain Dolby Level on the calibration meter and the "To Recorder" output potentiometer is adjusted to restore reference level at the recorder.

Note that it is possible to use two M-Series channels for simultaneous encode/decode operation as if they were Model 360 units. In this case, the configuration switch on the rear of the Cat. No. 280 should be put in the "360" position and the general alignment procedure for the 360 Series followed. The console should be connected through to the recorder using the "Line In" and "To Recorder" connections on the record channels and "Rec Rem" triggers linked so that the channel is locked into encode or record operation. The "Line In" and the "To Rec" (on the Cat. No. 44H version only) potentiometers are used to set record path input and output levels.

On the channels used for playback, the recorder is connected through the "From Recorder" and "To Monitor" connections and "Rec Rem" triggers linked for play, or decode, operation. The "From Rec" and "To Mon" potentiometers are used to set playback path input and output levels. (Refer to the M-Series manual for specific information regarding the remote record/play connections.)

5.6 Auto Compare in the M Series

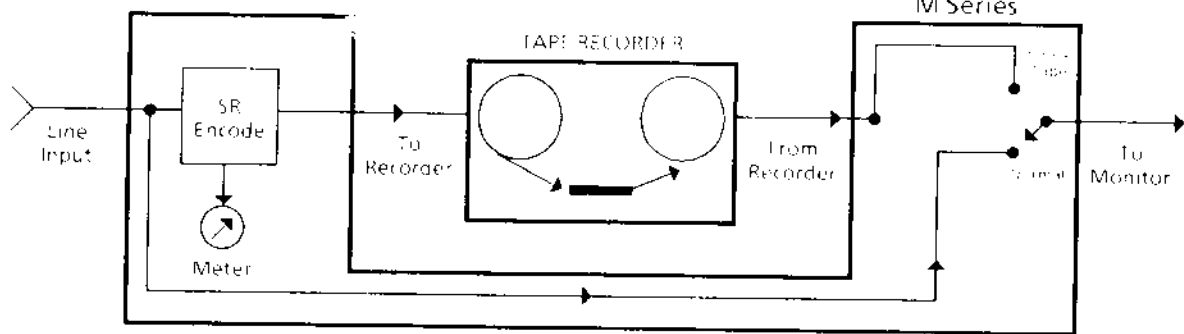
The Auto Compare sequence is available in both record and playback when the Cat. No. 280 is used in the M Series. The monitor-select switches on the common facilities module, Cat. No. 45, are left in the NORMAL position. As with all other units, the button labeled "Dolby Tone" on the Cat. No. 45 must be switched ON for Auto Compare to operate.

In record, Dolby Noise generated on the Cat. No. 280 is sent to the recorder via the "To Recorder" line amplifier on the Cat. No. 44 interface module. The recorder returns the Dolby Noise to the M-Series (recorder is in "INPUT," "SYNC," or "PLAY") via the "From Recorder" input buffer. The Auto Compare circuit alternately switches between the Dolby Noise from the recorder and the internal reference noise. The RED (reference) and GREEN (tape) LEDs will indicate the source of the signal being sent to the monitor. If the recorder is in PLAY, the function of the Auto Compare is identical, except that Dolby Noise is not sent to the recorder.

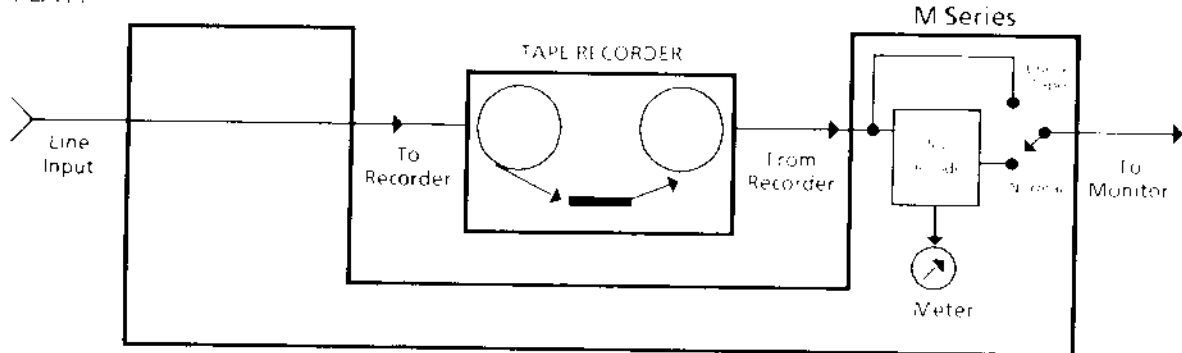
When the monitor select switch on the Cat. No. 45 is in the LINE IN position, the calibration meter and the monitor will always receive the "Line In" signal. If the monitor select switch is in the CHECK position, the monitor will always receive the signal from the recorder. This will be true regardless of the status of the Auto Compare circuit.

M SERIES

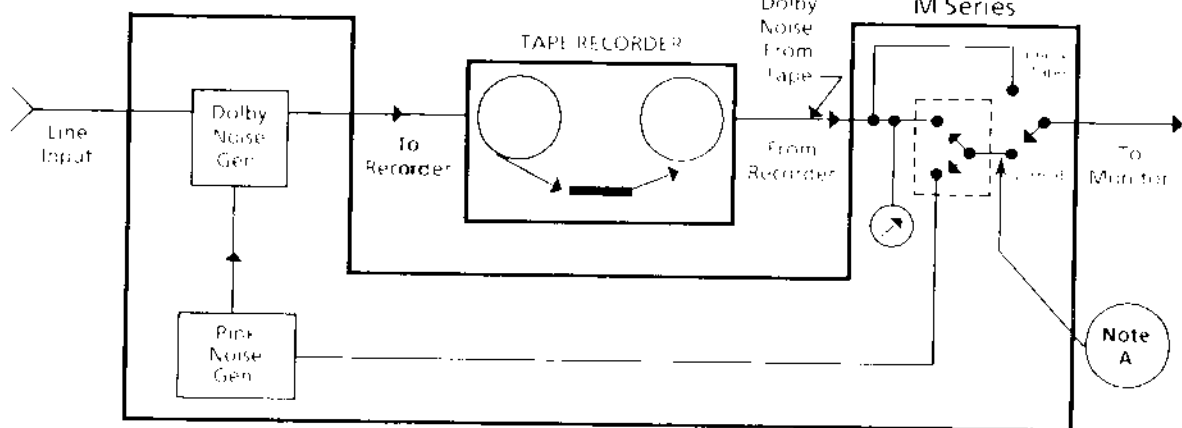
RECORD:



PLAY:

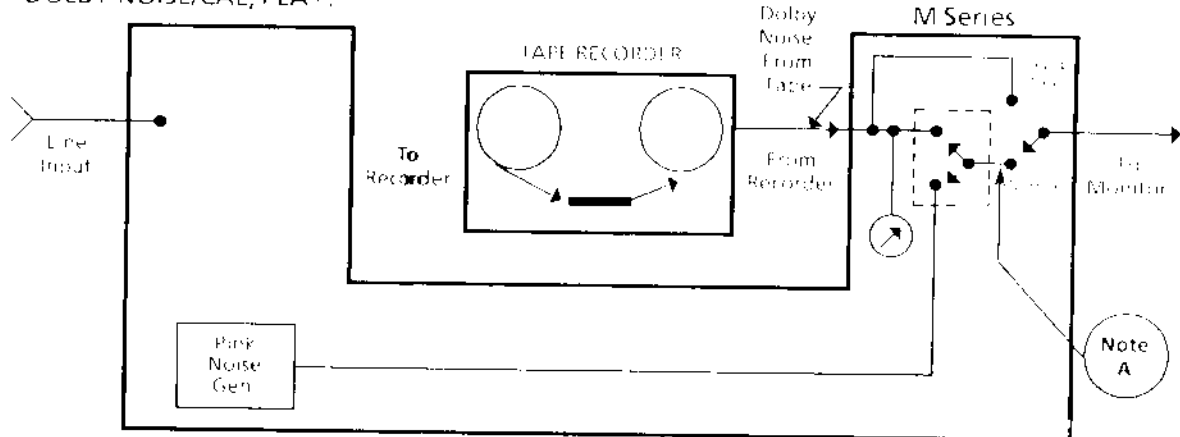


DOLBY NOISE/CAL, RECORD:



Note A

DOLBY NOISE/CAL, PLAY:



Note A

Note A: Cat. No. 280 modules before serial number 456 have the meter connected to the output of the Auto Compare switch. Boards stamped 456 and above have the calibration meter connected as drawn. The result is that when an early generation (Cat. No. 280) is used, the calibration meter will read the reference noise/Dolby Noise sequence, while with later generation boards, the calibration meter will always read the Dolby Noise from the recorder.