

## DOLBY MODEL 361

## OPERATING INSTRUCTIONS

See separate instructions for Model M16 and Model M16H

Revised Version - March 1975

### 8.1 Introduction

These instructions supersede all previous 361 instructions. The new instructions allow for a greater variety of operating conditions, including those of the pre-1975 instructions. In particular, the new instructions take account of elevated level operation and the use of non-standard (user-selected) magnetic flux levels for Dolby Level.

The pre-1975 recommendation of Dolby Laboratories was a strict adherence to 185 nWb/m for A-Type Dolby Level in magnetic recording. The intention was to promote tape interchangeability without any theoretical need for Dolby Tone on each tape or for recorder adjustment in order to match any tape being played. With the new high output tapes the previous procedures have not proved to be practicable in some cases in which studios have used various elevated level test tapes and recording procedures. Confusion and incorrect operation of the Dolby units have sometimes been the result.

These new instructions recognize the existing situation and include procedures for operation under the following conditions:

- A. Standard recording level with standard Dolby Level (185 nWb/m).
- B. Elevated recording level with standard Dolby Level (185 nWb/m).
- C. Elevated recording level with elevated Dolby Level (user-selected).

Condition A is the one applying in pre-1975 Dolby instructions. Many studios continue to operate on this standard, choosing to use standard level recording tapes (e.g. for minimum print-through) or choosing to take some of the headroom of high output tapes in the form of reduced distortion. These considerations are particularly relevant in classical music, in which long-term storage quality and standardization are important. Many popular music studios also continue to operate under standard condition A, primarily in Europe.

When studios change to high output tapes, they often change the operation of their Dolby units to condition C, either intentionally or inadvertently: it is the latter which causes problems because such studios often do not record Dolby Tone on the beginning of the tape. (A short recording of Dolby Tone will always ensure correct decoding or overdubbing at any time by any studio, regardless of the flux level used for Dolby Level). Since many studios, especially in the Los Angeles area, are already effectively operating in accordance with condition C, a recommended alignment procedure is included in these instructions.

A procedure for condition B is also included, as there are some studios which up to now have been operating in accordance with condition A but who wish to use elevated level on high output tape while still retaining Dolby Level at the 185 nWb/m standard. Some studios are already operating in this way (e. g. some in London).

For initial calibration, check through the reasons given for operation under the three different conditions below (A, B, C). choose the condition that matches your situation best; use it for initial calibration and ignore the others. For normal operation, section 8.3 applies regardless of the initial calibration method used.

Note that the actual noise reduction operation of the Dolby system is the same regardless of the calibration procedure used. Consistent use of any of the following procedures will produce correct results. However, various steps of the different procedures should not be mixed together.

Before proceeding to the calibration instructions below, check that the installation has been carried out according to 'Installation Instructions: Model 361'. In particular, check that all of the LINK DOLBY TONE connectors on the backs of the 361 units are wired. This is very important. Also check that all of the 361 and recorder termination switches are set correctly.

## 8.2 361 Initial Calibration: CONDITION A

Condition A: Standard recording level with standard Dolby Level (185 nWb/m).

Some of the following are reasons for operation under condition A:

- a) You record classical music or other demanding material at standard recording levels. Noise is not particularly a problem and it is important, by appropriate choice of tape, to minimize distortion, print-through and high frequency compression.
- b) The original tapes of the material you record must be stored on a long term basis. Therefore, standard level recording tapes must be used in order to minimize print-through and ensure long-term stability of the recording. Dolby Level standardization for ease of auditioning and collating material is also important.
- c) You are a new Dolby user and have checked that other studios with which you will be exchanging tapes operate on this standard.
- d) Not necessarily any of the above, but you are already operating under these conditions, having followed the original recommendations, and you wish to continue on the same standard for the sake of convenience.

The pre-1975 Dolby 361 calibration procedures can be used for operation under condition A. Alternatively, the following new procedure is a particularly convenient one, in that it separates tape recorder calibration from Dolby 361 calibration; the end result is still condition A.

### Procedure A

For standard recording level with standard Dolby Level (185 nWb/m).

1. Disconnect the 361 power (which de-energizes the relays) and press the 361 CHECK buttons to bypass the units both to and from the recorder.

Note: Bypassing of the 361 units is not normally required during routine alignment of the tape recorder; the signals to and from the recorder can pass unmodified through the 361 units (with the NR switches set to the OUT or released position). Nevertheless, during initial installation of the Dolby 361 units the bypassing exercise is useful for familiarization purposes; the bypass mode can be used in the event of Cat. No. 22 Noise Reduction Module failure.

2. Adjust both play and record aspects of the tape recorder, including its line level interfacing with the console. Use an Ampex (185 nWb/m) test tape. European equivalent is a DIN 320 nWb/m test tape. The input and output line voltages of the recorder must be the same (also, recorder and console meter readings should match or at least have a known relationship: correct the meter calibrations if necessary). If the machine has separate sync level controls, they should be set to match play level.

Note: As an alternative to the tapes mentioned above, Dolby Level Reference Tapes are now available from Dolby Laboratories. The tapes are available in  $\frac{1}{2}$ ", 1" and 2" versions - Cat. No. 72, 73 and 74 - and contain 5, 8 and 10 minutes, respectively, of Dolby Tone at standard Dolby Level, 185 nWb/m.

3. Restore power to the 361 units and press the NORMAL monitor buttons to put the 361 units back into the circuit. Press the 361 REMOTE (play) buttons. Set the NR switches to the OUT (released) position.
4. Play the test tape used during recorder calibration (step 2 above) again and check the recorder line output meter reading. The playback level (and sync level) controls on the recorder should be trimmed, if necessary, so that the recorder line output level is the same as in step 2 above.

Note: No trimming should be necessary with bridging (10 kohm) tape return inputs on the console. With '600 ohm' tape return inputs, no trimming should be necessary if the actual impedance is reasonably close to 600 ohms (adjust impedance with extra resistors if necessary).

5. Continue playing the test tape and adjust the INPUT controls on the 361 units (remove front cover-plates) until the 361 meters read on the DOLBY LEVEL dot (with Ampex test tape) or read on the DIN dot (with DIN test tape, which is 4.8 dB higher). View meters from front rather than radially for DIN reading; i. e. do not allow for parallax.
6. Remove the test tape. Use blank tape and put the recorder into record mode. Ensure that the recorder output switches are set to the 'playback' (from tape) position. Press the 361 REC buttons if the units are not wired for remote mode control by the recorder.
7. Press the 361 CHECK buttons.
8. Feed test tone at any convenient level from the console to the recorder (through the 361 units).
9. Check that the 361 NR buttons are in the OUT (released) position.

While recording the test tone, adjust the OUTPUT controls on the 361 units until the recorder meters and/or the tape return meters on the console give the same readings as would be obtained without the 361 units. This completes the alignment.

10. As a check on the alignment, continue recording and press the DOLBY TONE button on one 361 unit to record Dolby Tone (note: for correct routine operation of the Dolby system it is essential that all of the LINK DOLBY TONE connectors should be wired). The alignment is satisfactory if the 361 meters read within the DOLBY LEVEL dot while the DOLBY TONE button is depressed. This is independent of whether an Ampex or DIN test tape has been used during recorder calibration.

Note: If the 361 meter readings are outside the DOLBY LEVEL dot (e. g. due to '600 ohm' impedance discrepancies in the console and/or the tape recorder, as well as tolerances in the 361 units), then the recorder input level controls should be trimmed.

### Simplified Procedure

The above procedure (steps 1-10) results in optimum consistency of meter readings throughout the whole audio chain (console, 361, recorder, 361, console), especially with consoles having 600 ohm tape return inputs. However, a simpler and often more convenient variation also gives good results, especially with consoles having bridging tape return inputs. The simplified procedure below does not require tone from the console for 361 alignment.

#### Procedure

Carry out all steps up to and including step 6 above. Then replace steps 7 - 10 with the following steps:

- 7a. While recording, press the DOLBY TONE button on one 361 unit (note: for correct routine operation of the Dolby system it is essential that all of the LINK DOLBY TONE connectors should be wired).
- 8a. Continue recording Dolby Tone and adjust the OUTPUT controls on the 361 units until the 361 meters read on the DOLBY LEVEL dot. This is independent of whether an Ampex or DIN test tape has been used during recorder calibration. Alignment is now complete.

After the calibration procedure A above has been carried out, it is normally unnecessary to make any further adjustments on the Dolby 361 units. Level variations due to changes in tape sensitivity should be compensated by adjusting the input level controls on the tape recorder.

8.2 361 Initial Calibration: CONDITION B

Condition B: Elevated recording level with standard Dolby Level (185 nWb/m).

Some of the following are reasons for operation under condition B:

- a) You move your Dolby 361 units around and patch them into a particular session only when required. On non-Dolby sessions, your recorders are set up for elevated level operation on high output tape. When patching in your Dolby units you want to continue operating at elevated level without having to recalibrate anything.
- b) You use the Dolby system all the time but you feel that you would like to improve the signal-to-noise ratio still further by recording at elevated level on high output tape. At the same time you want to retain Dolby Level at the standard 185 nWb/m for compatibility with standard level tapes you have already recorded (i. e. under condition A above). Print-through is not a serious problem with the type of material you record.
- c) Some other studios in your area (e. g. London) are recording in this way and you would not only like your Dolby Level but your recorded signal levels to be compatible for overdubbing purposes.

The pre-1975 Dolby 361 calibration procedures took account of the above conditions only to the extent that increasing the output from the console was recommended for elevating the recording level. Such an increase in console level is not always possible or practicable. The following improved procedure is therefore recommended.

Procedure B

For elevated recording level with standard Dolby Level (185 nWb/m).

1. Disconnect the 361 power (which de-energizes the relays) and press the 361 CHECK buttons to bypass the units both to and from the recorder.

Note: Bypassing of the 361 units is not normally required during routine alignment of the tape recorder; the signals to and from the recorder can pass unmodified through the 361 units (with the NR switches set to the OUT or released position). Nevertheless, during initial installation of the Dolby 361 units the bypassing exercise is useful for familiarization purposes; the bypass mode can be used in the event of Cat. 22 Noise Reduction Module failure.

2. Adjust both play and record aspects of the tape recorder for operation at the desired elevated recording level, including line level interfacing of the recorder with the console. Any test tape can be used for this step. The input and output line voltages of the recorder must be the same (also, recorder and console meter readings must match or at least have a known relationship; correct the meter calibrations if necessary). If the machine has separate sync level controls, they should be set to match play level.
3. Restore power to the 361 units and press the NORMAL monitor buttons to put the 361 units back into the circuit. Press the 361 REMOTE (play) buttons. Set the NR switches to the OUT (released) position.
4. Play the test tape used during recorder calibration (step 2 above) again and check the recorder line output meter reading. The playback level (and sync level) controls on the recorder should be trimmed, if necessary, so that the recorder line output level is the same as in step 2 above.

Note: No trimming should be necessary with bridging (10 kohm) tape return inputs on the console. With '600 ohm' tape return inputs, no trimming should be necessary if the actual impedance is reasonably close to 600 ohms (adjust impedance with extra resistors if necessary).

5. Next play an Ampex (185 nWb/m) test tape. Because of the elevated level settings, the recorder meters will read low. European equivalent is to play a DIN (320 nWb/m) test tape.

Note: As an alternative to the tapes mentioned above, Dolby Level Reference Tapes are now available from Dolby Laboratories. The tapes are available in  $\frac{1}{2}$ ", 1" and 2" versions - Cat. No. 72, 73 and 74 - and contain 5, 8 and 10 minutes, respectively, of Dolby Tone at standard Dolby Level, 185 nWb/m.

6. While playing the test tape, adjust the INPUT controls on the 361 units (remove front-cover plates) until the 361 meters read on the DOLBY LEVEL dot (with Ampex test tape) or read on the DIN dot (with DIN test tape, 4.8 dB higher). View meters from front rather than radially for DIN reading; i.e. do not allow for parallax.
7. Remove the test tape. Use blank tape and put the recorder into record mode. Ensure that the recorder output switches are set to the 'playback' (from tape) position. Press the 361 REC buttons if the units are not wired for remote mode control by the recorder.
8. Press the 361 CHECK buttons.
9. Feed test tone at any convenient level from the console to the recorder (through the 361 units).

10. Check that the 361 NR buttons are in the OUT (released) position. While recording the test tone, adjust the OUTPUT controls on the 361 units until the recorder meters and/or the tape return meters on the console give the same readings as would be obtained without the 361 units. This completes the alignment.
11. As a check on the alignment, continue recording and press the DOLBY TONE button on one 361 unit to record Dolby Tone (note: for correct routine operation of the Dolby system it is essential that all of the LINK DOLBY TONE connectors should be wired). The alignment is satisfactory if the 361 meters read within the DOLBY LEVEL dot while the DOLBY TONE button is depressed. This is independent of whether an Ampex or DIN test tape has been used during recorder calibration.

Note: If the 361 meter readings are outside the DOLBY LEVEL dot (e.g. due to '600 ohm' impedance discrepancies in the console and/or the tape recorder, as well as tolerances in the 361 units) then the recorder input level controls should be trimmed.

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### Simplified Procedure

The above procedure (steps 1 - 11) results in optimum consistency of meter readings throughout the whole audio chain (console, 361, recorder, 361, console), especially with consoles having 600 ohm tape return inputs. However, a simpler and often more convenient variation also gives good results, especially with consoles having bridging tape return inputs. The simplified procedure below does not require tone from the console for 361 alignment.

### Procedure

Carry out all steps up to and including step 7 above. Then replace steps 8 - 11 with the following steps:

- 8a. While recording, press the DOLBY TONE button on one 361 unit (note: for correct routine operation of the Dolby system it is essential that all of the LINK DOLBY TONE connectors should be wired).
  - 9a. Continue recording Dolby Tone and adjust the OUTPUT controls on the 361 units until the 361 meters read on the DOLBY LEVEL dot. This is independent of whether an Ampex or DIN test tape has been used during recorder calibration. Alignment is now complete.
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After the calibration procedure B above has been carried out, it is normally unnecessary to make any further adjustments on the Dolby 361 units. Level variations due to changes in tape sensitivity should be compensated by adjusting the input level controls on the tape recorder. However, if the type of tape is markedly different (allowing operation at a different elevated level - e.g. + 4 dB instead of + 2 dB), then the complete procedure B above must be carried out again.

Operating note: Under operating condition B, an elevated signal level passes through the processing portions of the 361 units (but the line output circuits handle normal signal levels). The elevated signal level can be handled adequately by the 361 circuits since the internal overload point is 20 dB above Dolby Level. This is above the saturation point of high output tape; the 361 units therefore do not limit the signal levels which can be used.

Under this operating condition, the 361 meters will read high on program material and may frequently deflect full scale. No harm is done since the meter circuits include overload protection.

## 8.2 361 Initial Calibration: CONDITION C

Condition C: Elevated recording level with elevated Dolby Level (user-selected).

Some of the following are reasons for operation under condition C:

- a) You do not use a standard Ampex calibration tape (185 nWb/m) but instead use one of the other recently available test tapes.
- b) You move your Dolby units around and patch them into a particular session only when required. On non-Dolby sessions, your recorders are set up for elevated level operation on high output tape. When patching in your Dolby units you want to continue operating at elevated level without having to recalibrate anything.
- c) Most of the studios with which you exchange tapes are operating with an elevated Dolby Level (e.g. 3 dB above Ampex level) on high output tape and you wish to be compatible with them.
- d) Some of your clients have their own ideas about recording levels and types of tape to be used. You want to accommodate them during their sessions simply by readjusting your recorder, leaving the Dolby 361 settings alone.

Non-standard Dolby Level operation (condition C) was not considered at all in the pre-1975 Dolby calibration procedures. Nevertheless, such operation is a reality in some studios (e.g. many in the Los Angeles area). Therefore, for such cases - in which the user effectively selects his own tape flux level for Dolby Tone - the following procedure is recommended:

### Procedure C

For elevated recording level with elevated Dolby Level (user-selected).

1. Disconnect the 361 power (which de-energizes the relays) and press the 361 CHECK buttons to bypass the units both to and from the recorder.
2. Adjust both play and record aspects of the tape recorder for operation at the desired elevated recording level, including line level interfacing of the recorder with the console. Any test tape can be used. The input and output line voltages of the recorder must be the same (also recorder and console meter readings must match or at least have a known relationship; correct the meter calibrations if necessary). If the machine has separate sync level controls, they should be set to match play level.
3. Restore power to the 361 units and press the NORMAL monitor buttons to put the 361 units back into the circuit. Press the 361 REMOTE (play) buttons. Set the NR switches to the OUT (released) position.

4. Play the test tape used during recorder calibration (step 2 above) again and check the recorder line output meter reading. The playback level (and sync level) controls on the recorder should be trimmed, if necessary, so that the recorder line output level is the same as in step 2 above.

Note: No trimming should be necessary with bridging (10 kohm) tape return inputs on the console. With '600 ohm' tape return inputs, no trimming should be necessary if the actual impedance is reasonably close to 600 ohms (adjust impedance with extra resistors if necessary).

5. Use blank tape and put the recorder into record mode. Ensure that the recorder output switches are set to the 'playback' (from tape) position. Press the 361 REC buttons if the units are not wired for remote mode control by the recorder.
6. Press the 361 CHECK buttons.
7. Feed test tone at 0 VU level (or 5 dB below DIN peak level for European operation) from the console to the 361 units.
8. Adjust the INPUT controls on the 361 units (remove front-cover plates) until the 361 meters read on the DOLBY LEVEL dot.
9. Check that the 361 NR buttons are in the OUT (released) position. While recording the test tone, adjust the OUTPUT controls on the 361 until until the recorder meters and/or the tape return meters on the console give the same readings as would be obtained without the 361 units. This completes the alignment.
10. As a check on the alignment, continue recording and press the DOLBY TONE button on one 361 unit to record Dolby Tone (note: for correct routine operation of the Dolby system it is essential that all of the LINK DOLBY TONE connectors should be wired). The alignment is satisfactory if the 361 meters read within the DOLBY LEVEL dot while the DOLBY TONE button is depressed. This is independent of the type of test tape used during recorder calibration.

Note: If the 361 meter readings are outside the DOLBY LEVEL dot (e.g. due to '600 ohm' impedance discrepancies in the console and/or the tape recorder, as well as tolerances in the 361 units), then the recorder input level controls should be trimmed.

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Simplified Procedure

The above procedure (steps 1 - 10) results in optimum consistency of meter readings throughout the whole audio chain (console, 361, recorder, 361, console), especially with consoles having 600 ohm tape return inputs. However, a simpler and often more convenient variation also gives good results, especially with consoles having bridging tape return inputs. The simplified procedure below does not require tone from the console for 361 alignment.

Procedure

Carry out all steps up to and including step 5 above. Then replace steps 6 - 10 with the following steps:

- 6a. While recording, press the DOLBY TONE button on one 361 unit (note: for correct operation of the Dolby system it is essential that all of the LINK DOLBY TONE connectors should be wired).
- 7a. Continue recording Dolby Tone and adjust the OUTPUT controls on the 361 units (remove front cover plates) until a level corresponding to 0 VU (or about 5 dB below DIN peak level for European operation) is obtained at the recorder.
- 8a. Continue recording DOLBY TONE and adjust the INPUT controls on the 361 units until the 361 meters read on the DOLBY LEVEL dot. Alignment is now complete.

After the calibration procedure C above has been carried out, it is normally unnecessary to make any further adjustments on the Dolby 361 units. Level variations due to changes in tape sensitivity should be compensated by adjusting the input level controls on the tape recorder. Furthermore, all adjustments for operation with different types of tape can be made on the recorder (including test tape changes, changes from normal to high output recording tape, and even changes in elevated level operating conditions - e.g. + 2 dB, + 3 dB, + 4 dB). This flexibility is an advantage of operating condition C. However, because Dolby Tone is not at a standard flux level, in contrast with operating conditions A and B, the disadvantage is that it becomes absolutely essential that Dolby Tone is always recorded at the beginning of each tape so that the tape can be properly decoded or over-dubbed at any time by any studio.