

Dolby
Model CP650
Digital Cinema Sound
Processor

User's Manual

Issue 1

Part No. 91570



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WARNING: To avoid the risk of electrical shock or fire, **do not attempt to service the CP650 or remove the front panel. Do not remove the power supply housing located on the rear of the Digital Soundhead.** Refer all service and repairs to qualified technicians. This apparatus shall not be exposed to dripping or splashing and no objects filled with liquids shall be placed on the apparatus.

The CP650 was installed and adjusted initially by a trained engineer so that your theatre would have the same standard playback characteristics as the dubbing theatres in which all Dolby films are mixed. This results in the most accurate sound reproduction possible. **Do not attempt to adjust any controls within the CP650 except those specified in this manual.** Adjusting internal controls requires the use of special test equipment. Tampering with these controls can have an adverse effect on the sound in your theatre and will require a service call to restore proper operation. The first thing to do when you have a problem is to read *Section 4 Troubleshooting*.

In addition, do not adjust any of the controls on the other audio equipment in your theatre sound system, such as power amplifiers. They have been preset by the installer. For example, misadjusting the power amplifier gain controls can cause channel imbalance and/or too much power amplifier noise. Those controls have been set by the installer for correct channel balance. The film play level should be correct in the theatre with the front panel fader reading **7.0**.

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Chapter 1 Introduction

1.1 About the CP650

The Dolby CP650 Digital Cinema Sound Processor is the heart of your theatre sound system. All sound sources are connected to the CP650, which processes the signals appropriately and feeds them to the power amplifiers. Entirely self-contained, the CP650 provides both Dolby Digital and Dolby analog processing. An easy-to-read front panel screen and uncomplicated front-panel buttons make it easy to operate. Software that can be readily programmed controls all existing film sound formats.

Calibration settings for a given theatre can be stored on a PC and, should the need arise, they can be transferred directly to another CP650, thereby reducing or eliminating the need for recalibration after repairs. As improvements to the CP650 digital control and processing software are developed, the latest revisions can be downloaded from a PC to the CP650 hardware. Moreover, updates to the audio coding used for Dolby Digital soundtracks, which are included from time to time right on Dolby Digital release prints, download automatically into the CP650 the first time such a print is played in the cinema.

1.2 About This Manual

This user's manual has been prepared specifically to help projectionists get the most from the Model CP650 and the theatre sound system once it has been installed and aligned. (Installation and alignment instructions are supplied to the local distributor or installation company.) We suggest that you keep this manual readily available.

The manual is organized as follows:

- **Chapter 1, Introduction**, this chapter.
- **Chapter 2, Operating Instructions**, covers the basic control functions and operation of the CP650.
- **Chapter 3, Maintenance and Adjustments**, contains tips for maintaining the CP650 and the theatre sound system.
- **Chapter 4, Troubleshooting**, will help you track down problems in the sound system without test equipment. It consists of a troubleshooting chart and procedures to follow during a show, between shows, and after closing.
- The **Appendices** contain valuable background information to help you get the most out of the Model CP650 and your theatre sound system.

Chapter 2 Operating Instructions

2.1 The CP650 Front Panel

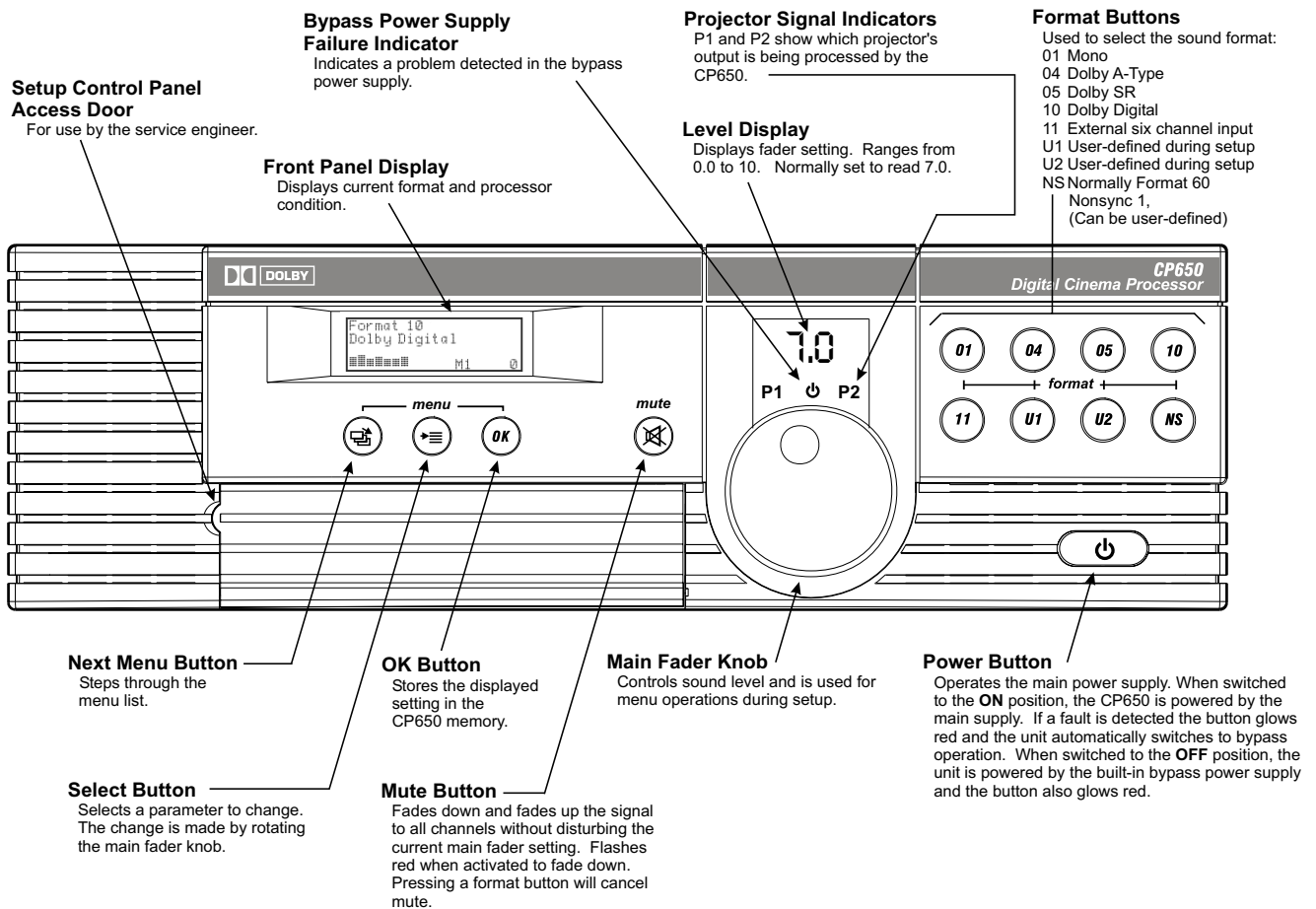
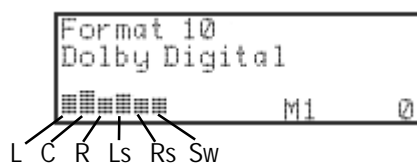


Figure 2-1 CP650 Front Panel

Front Panel Display

Day-to-day operation of the CP650 is performed through interaction with this display.



The example above shows the normal display when the CP650 is playing a film with a Dolby Digital soundtrack. The top two lines display the current format selected. The bottom left area contains a bar graph display of the sound signals present on each channel. As the film plays, the bars will move, confirming that sound is passing through the CP650.

M1 indicates that the projector 1 motor contact is closed (in two-projector installations). In single-projector installations it will always show as **M1**. The motor start signal is used during projector changeovers on Dolby Digital films in two-projector installations.

The **0** shown on the bottom right displays the Dolby Digital film error rate. The first indication of satisfactory digital film playback is by detecting a low error rate. The error rate is a number between 0 and 8. With a correctly aligned digital film reader, most films will play at an error rate of **6** or lower. If the digital error rate exceeds **8**, or if the display shows “**F**” (data not readable) or “**-**” (no digital soundtrack), the CP650 will automatically switch to playing the film’s analog soundtrack until usable data appears.

Level Display

The main fader level is displayed as a two-digit number. Starting from a display of 0.0, the level increases as the fader knob is rotated clockwise. As with previous generations of Dolby cinema processors, a fader setting of **7.0** is the correct operating level. This setting matches the level used during production of the film.

Main Fader Knob

Use this knob to adjust the sound level. As the main fader is turned, the numbers on the display will move from **0.0** to **10**. A fader reading of **7.0** is the correct operating level. The main fader knob rotates continuously with no end-stops. The knob is also used to choose various menu items during setup operations.

Projector Signal Indicators

P1 and **P2** show which projector analog optical sound input has been selected by the CP650.

Bypass Power Supply Failure Indicator

This indicator turns on if a problem is detected in the bypass power supply circuitry.

Power button

The power button operates the main power supply for the CP650. In the **ON** position, the CP650 is powered by the main supply. As with other Dolby cinema processors, the CP650 has a separate backup (bypass) power supply. In the **OFF** position, the unit is powered by the built-in bypass power supply, and the power button glows red. It also glows red if a fault is detected during normal operation (power button in the **ON** position), indicating that the unit has automatically switched to bypass operation.

Format Buttons

Used to select the desired film sound format:

01 Mono

04 Dolby A-type

05 Dolby SR

10 Dolby Digital

11 External six-channel signal

U1, U2 Set by the user. See instructions later in this chapter.

NS Nonsync, for intermission music tape, CD player, and so on. Usually Format 60 and can be set to other formats.

Setup Control Panel Access Door

For use only by the service or installation engineer.

Mute Button

Press the mute button to fade down the sound on all channels without disturbing the current fader setting. The speed of fade-in/fade-out is adjustable from 0.2 sec to 5 sec. The button flashes red when mute is activated.

Menu Control Buttons

Use the menu control buttons to navigate through the various menus displayed on the front panel screen, select various menu options, and store setup data.

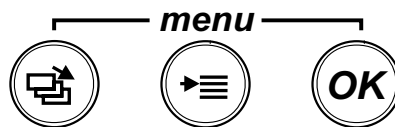


Figure 3-2 CP650 Setup Menu Control Buttons



Use the left-hand **next menu** button to step through the menu list. Press and release the button once to change the display to the next menu item. Press and hold the button while rotating the main fader knob to step the display through all menu items.



Use the center **select parameter** button to select a parameter to adjust when there are multiple items available on the display. Press and release the button to select among them. Then, to make the adjustment, rotate the main fader knob.



Use the right-hand **OK** button to accept the setting displayed on the front panel screen and store it in CP650 memory. Any changes to settings will occur immediately but will not be saved until this button is pressed. Leaving the current menu before pressing the **OK** button will cause the change to be discarded.

Note: For convenience, pressing the current format (glowing) button causes the CP650 to immediately return to the top-level screen display. This feature is handy for making a quick change, then returning to normal operation.

2.2 Normal Operation

2.2.1 Power On

During the CP650 installation, the power-on state of the unit was configured from the following choices. Each time the CP650 is connected to power, it automatically sets itself to the selected “wake-up” state:

- **Projector 1 or 2** selected by the installation technician.
- If the **front-panel fader** is selected, the system will start up at the last fader setting before power was turned off. If the **auditorium fader** was selected, the system will read the setting of the auditorium fader knob.
- The **film sound format that was active** when power was turned off, **or** the **film sound format previously stored** as the “power-on” format. (The format options can be set using the procedure described later in this chapter.)

If power has been removed for longer than approximately three weeks, the CP650 wake-up state is:

- **Front-panel main fader** activated and set to **7.0**.
- **Format 10**, Dolby Digital.
- **Power-on format** is set to **Last Format** used before power was turned off.

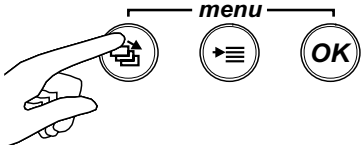
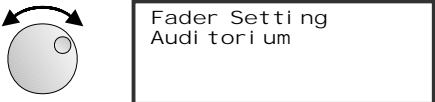


2.2.3 Main Fader

The **main front panel fader knob** on the CP650 controls the volume level in the theatre. It works in both normal and bypass operation. When the CP650 has been correctly installed, setting the fader to **7.0** plays the film at the level at which it was mixed. This is the proper level for any Dolby encoded film.

Although a minor adjustment in playback level might be required under unusual circumstances, avoid significant deviations from the correct level **7.0** established by the installer. If the playback level is set too low, dialogue may be hard to understand; too high a level may cause complaints from the audience, and under extreme circumstances, can damage the theatre's sound system.

Auditorium Fader

If an analog (not a Dolby Cat. No. 779 Digital Remote Unit or Cat. No. 771 Remote Fader) auditorium fader has been installed, it is activated by performing the following menu steps:

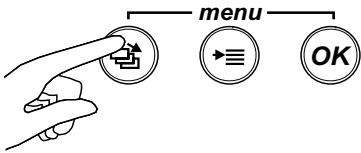
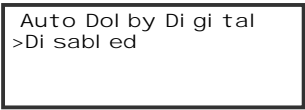
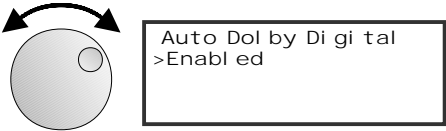
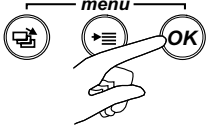

	<p>Press the left menu button to step the menu to Fader Setting.</p> <hr/> <p>Note: you can also press and hold the left menu button while rotating the front-panel fader knob clockwise to step through the menu items.</p>
	<p>Rotate the fader knob to select Auditorium.</p>
	<p>Press the OK button to save the change.</p> <hr/> <p>Note: When auditorium fader is selected, the CP650 front-panel main fader and any Cat. No. 779 or Cat. No. 771 remote faders installed in your system will be disabled. Only the analog auditorium fader pot will be active.</p>
	<p>Press the illuminated format button to return to normal operation.</p>

To return control back to the main fader and/or digital remote faders, repeat the above steps and select **Local** on the fader setting menu.

2.2.4 Setup for Automatic Selection of the Dolby Digital Format

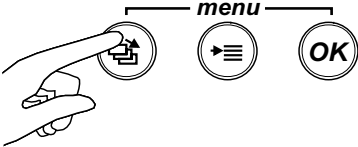


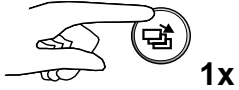


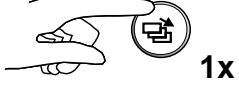


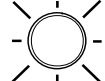
CP650 units equipped to play Dolby Digital films can be set up to sense the presence of Dolby Digital data on the film and automatically switch the CP650 to the Dolby Digital format from any other film format. In other words, if the CP650 is operating in Format 01, 04, 05, or 11, it will automatically switch to Format 10 when a Dolby Digital film is detected. CP650s are shipped from the factory with this feature enabled.

To enable the auto-digital feature:

	<p>Press the left menu button.</p>
	<p>The Auto Dolby Digital select screen will appear.</p>
	<p>Rotate the front-panel fader knob to display enabled.</p>
	<p>Press the OK button to save the change.</p>
	<p>Press the illuminated format button to return to normal operation.</p>

2.2.5 Assigning Formats to the U1, U2 and NS Buttons

The U1 and U2 buttons (User Format 1 and User Format 2) and the NS button (nonsync) can be assigned to any available format. Then, when the button is pressed, the assigned format will be selected.

	<p>Press the left menu button multiple times to step through the menus to User Format 1.</p> <hr/> <p>Note: you can also press and hold the left menu button while rotating the front-panel fader knob clockwise to step through the menu items.</p>
 <div data-bbox="480 701 786 808" style="border: 1px solid black; padding: 5px;"> <p>User Format 1 >Format 13 Surround EX</p> </div>	<p>Rotate the fader knob to select one of the many format choices available. This example shows Format 13, Dolby Digital Surround EX, selected.</p>
 <div data-bbox="480 846 786 954" style="border: 1px solid black; padding: 5px;"> <p>Savi ng Changes. . .</p> </div>	<p>Press the OK button to save the assignment to the User 1 button.</p>
	<p>Press the left menu button once to step to the User Format 2 menu.</p>
 <div data-bbox="480 1122 786 1229" style="border: 1px solid black; padding: 5px;"> <p>User Format 2 >Format 65 Publ i c Address LsRs</p> </div>	<p>Rotate the fader knob to select the desired format. This example shows Format 65, PA microphone sent to left and right surround speakers.</p>
 <div data-bbox="480 1249 786 1357" style="border: 1px solid black; padding: 5px;"> <p>Savi ng Changes. . .</p> </div>	<p>Press the OK button to save the assignment to the User 2 button..</p>
	<p>Press the left menu button once to step to the Nonsync Format menu.</p>
 <div data-bbox="480 1498 786 1606" style="border: 1px solid black; padding: 5px;"> <p>Nonsync Format >Format 60 Nonsync 1</p> </div>	<p>Rotate the fader knob to select the desired format to be selected when the NS button pressed. This example shows Format 60, the Nonsync 1 rear panel input.</p>
 <div data-bbox="480 1635 786 1742" style="border: 1px solid black; padding: 5px;"> <p>Savi ng Changes. . .</p> </div>	<p>Press the OK button to save the assignment to the NS button.</p>
	<p>Press the illuminated format button to return to normal operation.</p>

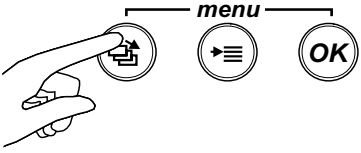

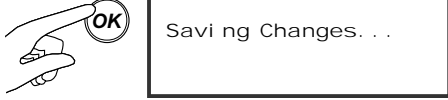
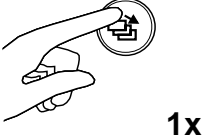

2.2.6 The Mute Function



Use the mute function between intermission music and starting the projector to prevent the audience from hearing annoying thumps and leader crackle at the beginning of the show. It is also useful if the film breaks or runs out while the projector is active, since it suppresses the very loud signal that occurs when leaders or tails pass through the projector.

When you press the mute button, the volume will automatically fade all the way down on all channels. The button will flash, indicating that the CP650 outputs are muted. When you press the button again, or select a new format, the volume will automatically rise to the level set by the fader.

The fade-out and fade-in time can be set to work from 0.2 to 5 seconds by following this procedure:








Mute Fade Time

	<p>Press the left menu button multiple times to step through the menu items to Mute Fade-in Time.</p> <hr/> <p>Note: you can also press and hold the left menu button while rotating the front-panel fader knob clockwise to step through the menu items.</p>
	<p>Rotate the knob to select the desired time for the sound to fade-in. The time is adjustable from 0.2 to 5.0 seconds.</p>
	<p>Press the OK button to save the change.</p>
	<p>Press the left menu button once to step the menu to Mute Fade-out Time.</p>
	<p>Rotate the fader knob to select the desired time for the sound to fade-in. The time is adjustable from 0.2 to 5.0 seconds.</p>

 <div data-bbox="480 264 786 367" style="border: 1px solid black; padding: 5px; display: inline-block;">Savi ng Changes. . .</div>	<p>Press the OK button to save the change.</p>
	<p>Press the illuminated format button to return to normal operation.</p>

2.2.7 Setting the Front Panel Display Contrast

The liquid crystal display (LCD) contrast can be adjusted to give the clearest possible readability.

 <div data-bbox="587 748 655 770" style="margin-left: 100px;"><i>menu</i></div>  	<p>Press the left menu button multiple times to step through the menu items to Contrast Adjustment.</p> <hr/> <p>Note: you can also press and hold the left menu button while rotating the front-panel fader knob clockwise to step through the menu items.</p>
 	<p>Rotate the fader knob while watching the display. Adjust for the most pleasing appearance. This example shows the contrast set to “10”.</p>
 <div data-bbox="480 1294 786 1397" style="border: 1px solid black; padding: 5px; display: inline-block;">Savi ng Changes. . .</div>	<p>Press the OK button to save the change.</p>
	<p>Press the illuminated format button to return to normal operation.</p>

2.2.8 Operation With an Automation System

When the CP650 in your theatre is connected to automation equipment, the format selection is duplicated elsewhere. In most cases, the front-panel buttons of the CP650 can usually be used to override commands from the automation system; however, as automation equipment differs from installation to installation, check with the installer of your system if you have any questions about its operation and whether you can easily override the automation commands.

2.3 Bypass Operation

The CP650 has an independent power supply for emergency operation. If the main power supply or processor circuitry fails, the unit will **automatically** switch to bypass operation, allowing the show to continue with limited sound processing functions. Bypass operation is indicated by the front-panel power button glowing red.

In the case of other problems, such as distortion or the loss of a channel, the bypass mode can be selected **manually** by pressing the power button.

There are other components in the theatre sound system that could also fail. Be sure to refer to Chapter 4, Troubleshooting, any time there is a problem.

The following occurs when the CP650 is operating in the bypass mode:

- The power button glows red.
- Only the front-panel main fader operates; no other remote fader works.
- All other front-panel buttons do not work.
- The optical preamp circuit of the selected projector remains operational and is fed to the CP650 left, center, and right channel outputs.
- Even when a stereo print is playing, a mono signal is fed to all screen speakers. Thus, you can switch to the bypass mode to keep the show going if one of the power amplifiers fails.
- All Dolby processors, speaker equalizers, and subwoofer circuits are switched out of the signal path.

Be sure to follow the troubleshooting procedures and, if necessary, call your service engineer as soon as possible.

Note: The CP650 will **not** operate, **even in the bypass mode**, if there is a fault in any of the following areas:

- The AC mains power to the CP650.
- Bypass power supply fuse or bypass power supply circuit.
- The optical preamplifier circuitry or bypass circuitry on the Cat. No. 772 board.

It is strongly recommended that a spare Cat. No. 772 board be kept on hand for substitution in emergencies.

If the front-panel bypass power supply failure indicator (located directly above the main fader knob) is on, the CP650 will not operate in bypass mode.

Chapter 3

Maintenance and Adjustments

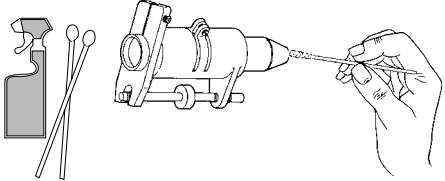
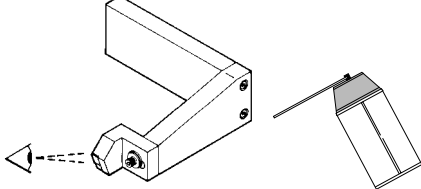
Having the very best equipment in your installation does not in itself guarantee that you will always achieve best results. A number of routine maintenance and adjustment procedures, requiring no special test equipment or technical knowledge, are necessary to realize the full potential of the sound system on a day-to-day basis. These procedures can also prevent costly show cancellations and service calls.

A Dolby Cat. No. 69T test film is required for proper maintenance of your sound system. We also recommend that you keep on hand the Dolby Cat. No. 251 Jiffy Test Film and run it regularly to check the theatre sound system thoroughly (see Appendix C).

3.1 Soundhead Maintenance

No single maintenance procedure is more vital to good sound in the theatre than regular cleaning of the projector soundhead optics. A clean soundhead keeps your theatre sounding its best.

3.1.1 Analog Sound System

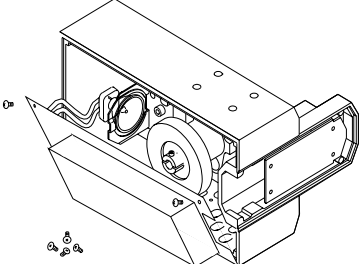
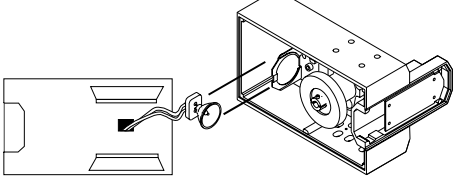
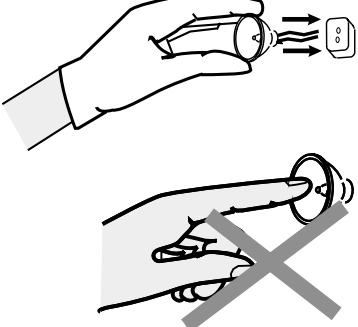
	<p>Use lint-free cotton swabs and window or glass cleaner to clean the optical barrel lens surfaces.</p>
	<p>Never touch or attempt to clean the solar cell. The solar cell and its adjustments are extremely delicate. We strongly recommend that you use compressed air (readily available in convenient pressurized cans) to blow dirt and debris away from the cell. But be very careful that the nozzle or tube end never touches the cell. Cold liquid spraying out of the can can crack the cell.</p>

3.1.2 Digital Sound System

The digital soundhead, like the analog soundhead, should be kept clean and free of dust and dirt for best performance. Wiping the external surfaces with a clean cloth on a regular basis will keep the soundhead looking new. The optical path should be inspected regularly and kept clean with a photographer's lens cleaning kit (available from most camera stores). Take care not to scratch the lens. The film path (rollers and drum) should be cleaned regularly, as you would on the projector. Acetone, carbon tetrachloride, and other dangerous cleaners **should not** be used.

3.1.3 Replacing the Exciter Lamp (Cat. No. 700 Digital Soundhead)

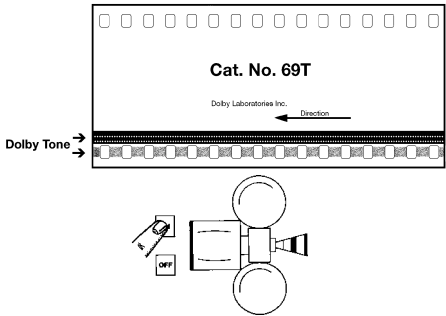
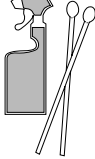
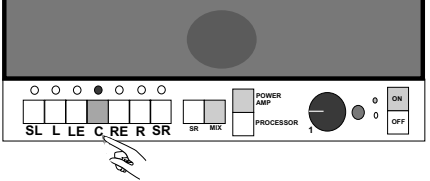

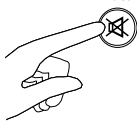

The exciter lamp in the Cat. No. 700 Digital Soundhead has been designed for long life and should provide over 8,000 hours of reliable use under normal circumstances. Routine replacement will depend on your theatre's hours of operation. Use only a General Electric EPT, reflector-type, 42 Watt lamp (Dolby Part Number 34010). To replace the exciter lamp:





	<p>Disconnect AC mains power.</p> <p>Carefully remove the six screws holding the rear cover/power supply assembly.</p>
	<p>Allow the lamp to cool if necessary.</p> <p>With the rear cover removed, the lamp will be visible but still attached to the rear cover assembly by its two supply wires. Slide the lamp out of its mounting bracket then remove the lamp from the socket.</p>
	<p>Using gloves or a clean, lint-free cloth, carefully remove a new lamp from its protective box.</p> <p>Place the new lamp in the socket.</p> <p>Be careful not to touch the bulb or inner surface of the reflector in the lamp. If either is accidentally touched, carefully clean the area with isopropyl alcohol when the bulb is cool. Allow time to dry.</p>
	<p>Slide the lamp back into its bracket in the soundhead, replace the rear cover assembly, and tighten the six screws.</p>

3.2 Dolby Level Calibration

Proper decoding of Dolby encoded soundtracks requires careful level matching of each channel of each soundhead and the CP650. When the CP650 was first installed, the technician made this adjustment for you. We recommend that you routinely perform these steps to compensate for the normal aging of the soundtrack light source. **It is always necessary to adjust Dolby Level whenever an exciter lamp is replaced** (see Appendix C for a description of why Dolby Level is important). The CP650 has an automatic level adjustment facility for easy calibration.

A loop of Dolby Cat. No. 69T test film is required for this adjustment. The test film is available from your theatre equipment supplier.

	 <p>On Projector 1, clean the optics as described earlier. Thread and play the Dolby Tone test film Cat. No. 69T. Ensure that the arrow is going in the correct direction.</p>
	<p>Switch the booth monitor to Center channel.</p>
	<p>Listen to the tone on the booth monitor to identify any problems with distortion or speed variations. Call your service technician if you hear problems.</p>
	<p>Press the Mute button.</p>
	<p>Press the left menu button multiple times to step through the menu items to Automatic Optical Level Adjust, Projector 1.</p> <p>Note: you can also press and hold the left menu button while rotating the front-panel fader knob clockwise to step through the menu items.</p>

 <div data-bbox="483 253 786 353" style="border: 1px solid black; padding: 5px;"> Please Wait. L O O R 0 0 0 0 ~ ~ </div>	<p>Press the OK button. With the Dolby tone test film running, the CP650 automatically calibrates the left and right channels to the Dolby tone playing on the film.</p>
<div data-bbox="328 454 632 555" style="border: 1px solid black; padding: 5px;"> Automatic Optical Level Adjust done. Press OK to save the Current settings. </div> 	<p>The CP650 will display this screen when the calibration has finished. Press the OK button to save the settings.</p>
 <p style="text-align: center; margin-left: 100px;">1x</p>	<p>In two-projector installations, press the left menu button once to move to the Automatic Optical Level Adjust, Projector 2.</p> <p>Repeat the previous two steps to automatically adjust the projector 2 Dolby level.</p>
	<p>Press the illuminated format button to return to normal operation. This will also cancel the mute.</p>

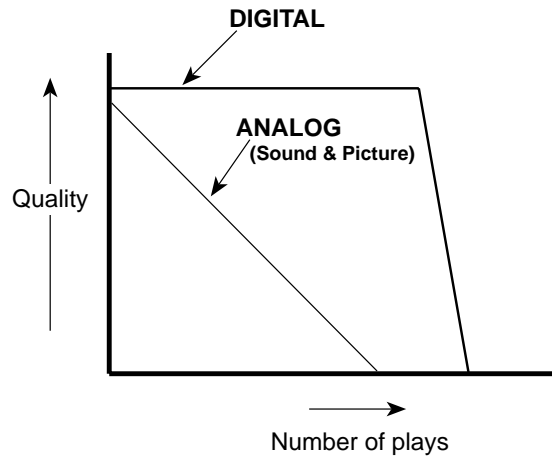
3.3 Film Print Cleanliness

A high-quality Dolby-equipped theatre system is like a high-quality home stereo system. It can sound only as good as the program material playing through it. Just as a good home stereo clearly reproduces the annoying pops and clicks on poorly-received radio signals, a good theatre system reproduces pops, crackles, and other noises from worn and dirty film prints.

If you receive a poor print from your distributor, there is little you can do except, if possible, arrange a replacement. But while a print is in your theatre, you should treat it with respect and care to be sure your audiences receive the best in both sound and picture. Of greatest importance, the print should be kept as clean as possible when the film is played, when the print is stored between shows, and when a platter reel is prepared. In particular, when individual reels are unwound to make up a platter reel, **do not let the film touch the floor** or come in contact with other sources of dust and dirt.

The Dolby Digital print format has robust error-correction information encoded along with the audio data, and the CP650 uses a powerful digital error-correction technique, allowing the data to be decoded perfectly even if scratches and dirt are present. However, best performance will be obtained if the print is kept clean. Standard film cleaners will provide good results.

The sound quality of the digital track degrades differently than the analog track. With any analog track, print wear will reduce the quality more or less gradually; the more wear, the lower the quality of the sound. With a digital soundtrack, wear will have no audible effect until the print is degraded beyond usability. By this time the picture quality is usually unacceptable too. At this point, wear also may exceed the error correction capabilities of the CP650, and the processor will automatically switch to playing the analog Dolby SR track.



Chapter 4

Troubleshooting

Your theatre sound system consists of a number of critical audio components in addition to the Dolby CP650. Thus, the first step when something goes wrong with the sound is to determine which component is causing the problem. If you are unable to solve the problem using the information that follows, call your local authorized service engineer. Appendix E contains a list of circuit boards available. The troubleshooting chart located at the end of this chapter may also be helpful.

4.1 If Film Sound Is Lost

1. Check that the correct format button is glowing on the CP650 front panel and the correct projector (P1 or P2) is selected.
2. Verify that the lamp or LED in both the analog and digital (if present) film readers are on.
3. Confirm that the mute button is **not** flashing, the **fader** display is **4.0** or above. If your installation uses a remote auditorium fader, check the setting of this fader.
4. Switch the CP650 to bypass by pressing the front-panel power button. If sound is restored it will play in mono, but you can continue the show while you try to find the source of the trouble.
5. If these steps do not restore film sound, press the front-panel power button again. When the CP650 self-test is finished, press the **NS** front-panel button and play your source of intermission music. If the system operates properly in this format, there is no problem with the equipment following the CP650 (such as power amplifiers and loudspeakers). The problem may be in the projector(s). Double-check both projectors, and if possible, continue the show using the other projector.

4.2 If One Channel Fails or is Distorted

1. Switch the CP650 to bypass by pressing the front-panel power switch. A mono signal is fed to all three screen channels. If the problem in one channel persists, the power amplifier or speaker for that channel is probably at fault. If the problem is **not** in the Center channel, switch the faulty amplifier off (be sure that the amplifier is not shared with the Center channel) and finish the show in bypass.
2. If you are showing a mono film and the Center channel has failed or is distorted, switch the CP650 to Bypass so that the mono signal is fed to the still-functioning Left and Right channels. Turn off the power amplifier for the Center channel.

4.3 If Switching to Bypass Does Not Restore Sound

1. Check the film reader LEDs or exciter lamps, fader setting, and the mute button. Make certain that all components including power amplifiers are receiving AC mains power.
2. If the bypass power appears to work (front panel power button glows red), open the front panel access door and check if the **signal present** lights are flashing. If they are, and sound is still not available, check for AC power to the power amplifiers.
3. If the **signal present** lights are not flashing, the Cat. No. 772 circuit board may be faulty. Call your service engineer.

4.4 If You Hear Extraneous Noises When Playing a Digital Film

1. Press the **Format 05** front-panel button to play the film in analog Dolby SR format.
2. If the noises persist, switch the CP650 to bypass by pressing the front-panel power button.
3. If the noises still persist, check the power amplifiers, as it is unlikely that the digital and analog parts of the system have both failed.

4.5 Excessive or Inappropriate Sound From Surround Speakers

As an emergency measure to continue the show, switch off the surround channel power amplifier(s). At your next opportunity, contact your service engineer to determine if the problem is related to the film itself or to the theatre sound system.

4.6 Troubleshooting Chart

The following pages may be helpful in finding sound problems with your system.

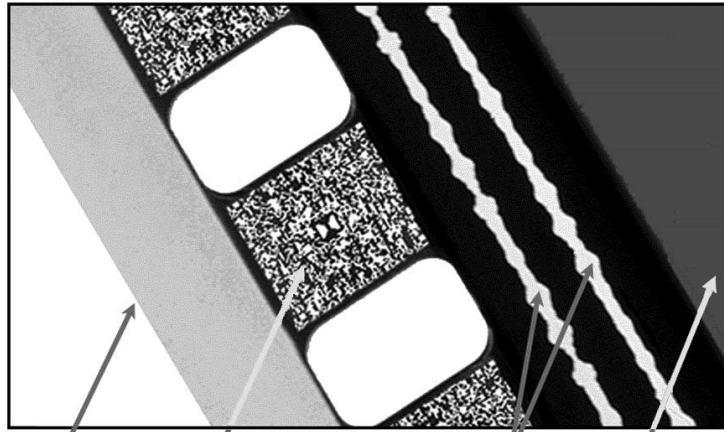
Symptom	Possible Cause	Recommended Action
NO SOUND AT ALL		
No sound, front panel lights look normal.		Verify that the selected format, mute status, and fader setting are correct. If no formats produce sound, there may be a CP650 internal problem. Call your local service engineer.
No sound, front panel dark, power button not glowing.	No power to CP650.	See if AC mains panel circuit breaker feeding the CP650 is tripped. Verify that all power connectors are fully inserted into their sockets. Press main power button. If CP650 still does not come on, call your service engineer.
No sound, and switching to Bypass doesn't restore sound. OR No sound, front panel dark, power button is illuminated, and system is already in Bypass.	Film sound reader on the projector Power amplifiers switched off.	Check that the film sound reader LED or exciter lamp is on. If not, fade up background music and transfer the reel to the alternative projector and continue the show until the LED/lamp or its power supply can be replaced. Call service engineer. Check that the signal present LEDs inside the setup panel access door are flashing while film is running. If not, call your service engineer. Check power feed to power amplifiers for tripped circuit breaker or fuse or accidental disconnection.

Symptom	Possible Cause	Recommended Action
NO SOUND IN SOME FORMATS		
No Dolby Digital sound (Format 10). Front panel normal, analog film formats (05) play OK.	No Dolby Digital data available. Not a Dolby Digital print. Projector not running. Digital data on the film badly damaged. Digital film reader not working Film not threaded correctly in digital reader.	Verify that the LED (or exciter lamp) in the digital film reader is on and that the print you are playing includes Dolby Digital information and is correctly threaded through the digital reader.
Power button illuminated. Front panel dark. There is sound.	System is in Bypass operation.	Turn on the CP650 by pressing the front-panel power button. Call service engineer if the system is still not operating correctly.
FADER PROBLEMS		
Front panel fader knob has no effect.	External analog remote fader selected.	Select front panel (“local”) fader by pressing the left menu button to show the Fader Setting menu, then turning the front-panel knob to display “Local.” Press the OK button. This will restore volume control to the main front panel fader and any digital remotes that are connected.
Fader level display changes when no change is made to the CP650 front-panel fader.	A remote digital fader is being operated. A format with a different fader setting was selected. Analog remote fader is selected and being changed.	

Symptom	Possible Cause	Recommended Action
CONTROL PROBLEMS		
CP650 won't accept a format button selection, and gives "Format Unavailable" message.	<p>CP650 doesn't have the optional modules needed for that format, or that part of the system is not working. For example:</p> <p>Format 10 requires the Dolby Digital Cat. No. 773 board.</p> <p>Formats 13, 80, or 81 require the Cat. No. 794 Dolby Digital Surround EX board.</p>	
When the digital Format 10 is selected, front panel display reads " Reverted! " and " Optical Dolby SR ".	<p>No Dolby Digital data available. Not a Dolby Digital print. Projector not running. Digital data on the film badly damaged. Digital film reader not working Film not threaded correctly in digital reader.</p>	Verify that the LED (or exciter lamp) in the digital film reader is on and that the print you are playing includes Dolby Digital information and is correctly threaded through the digital reader.

Appendix A

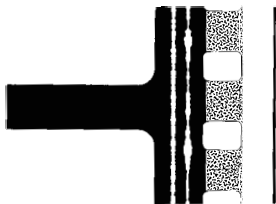
How to Identify Sound Tracks on Prints



Edge of film Dolby Digital soundtrack Analog soundtrack Picture area

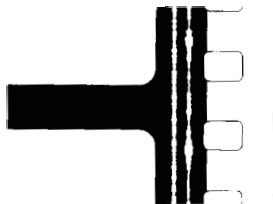
A Dolby Digital film print or a stereo analog optical print (A-Type or SR), or a mono analog optical print should be identified as such on both the film can and leader. However, with handling, the identification may be lost. If you are not sure if you have a stereo analog print, play a reel and find a section with music and/or effects only (on dialogue or narration, stereo soundtracks look much the same as mono soundtracks). Examine the soundtracks closely.

On music and effects, the two soundtracks will appear to be different on a stereo print. On a mono print they are identical. If you received the wrong print, be sure to check with your local exchange or the film distributor.



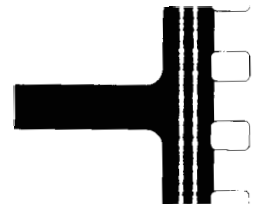
Dolby Digital or Dolby Digital Surround EX Print

The digital data blocks are clearly visible between perforations next to the analog track. The analog track is Dolby SR encoded.



Analog Stereo Print

Clear differences between channels will be seen in some places along the track.



Mono Print

Both tracks are the same.

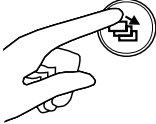

There is no way to tell by visual inspection if a stereo print is Dolby A-type or Dolby SR encoded. The majority of stereo prints are now Dolby SR encoded. If you are in doubt, listen to the track and compare playback quality in Formats 04 and 05. If you are unable to do this before the show, play the film in Format 04 Dolby A-type.

Appendix B

Advanced Operations

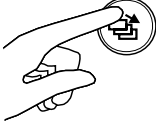
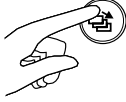


B.1 Display The Event Log

As in the previous section, the event log also provides useful information when explaining any problems to your service engineer.

	<p>Press the left menu button multiple times to step through the menus to About this CP650.</p> <hr/> <p>Note: you can also press and hold the left menu button while rotating the front-panel fader knob clockwise to step through the menu items.</p>
<div data-bbox="432 1048 735 1151" style="border: 1px solid black; padding: 5px;"> <p>Event Log (newest) 13 MAR-00 17: 50: 27 Startup 12 MAR-00 14: 29: 13</p> </div>	<p>The event log is made up of a list of event names, dates, and times. Rotating the fader knob will scroll the display up and down the list. The most recent events are at the top of the list.</p>
	<p>Press the illuminated format button to return to normal operation.</p>

B.2 Display Information About This CP650 Unit

The last menu items provide information about the hardware and software installed in your CP650 unit. This information is useful when discussing problems to your service engineer.

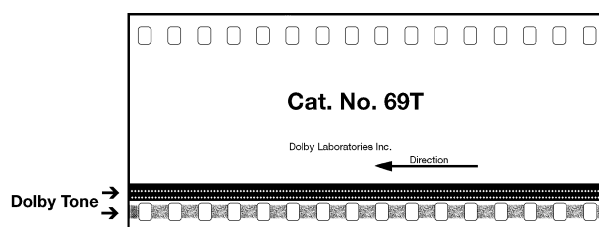
	<p>Press the left menu button multiple times to step through the menus to About this CP650.</p> <hr/> <p>Note: you can also press and hold the left menu button while rotating the front panel fader knob clockwise to step through the menu items.</p>												
<div data-bbox="421 817 724 920" style="border: 1px solid black; padding: 5px;"> <p>About this CP650: System v. a. b. c. d Cat. No. xyz installed Cat. No. xyz installed</p> </div>	<p>About this CP650 is made up of three menu screens. Pressing the left menu button cycles the menu display between these three screens.</p> <p>The first information screen displays the version number of the installed system control software, and lists any optional circuit boards installed in your unit.</p>												
 <div data-bbox="481 1055 785 1158" style="border: 1px solid black; padding: 5px;"> <p>About this CP650: Module Version 01010101010000</p> </div>	<p>The second information screen displays the version numbers of the various software “modules” running in your unit.</p>												
 <div data-bbox="481 1332 785 1435" style="border: 1px solid black; padding: 5px;"> <p>About this CP650: Hardware Information Network: xxxxxxx Boards: 4374x</p> </div>	<p>The third information screen, bottom line, displays the version number of each circuit board installed in your unit. The version numbers are listed for each board in the following order:</p> <p>Cat. No. 772, Cat. No. 773, Cat. No. 774, Cat. No. 777, Cat. No. 794</p> <p>If an “x” is displayed, the corresponding board is not installed. In the example shown, the following board versions are installed:</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;">Board</th> <th style="text-align: left;">Version</th> </tr> </thead> <tbody> <tr> <td>Cat. No. 772</td> <td>4</td> </tr> <tr> <td>Cat. No. 773</td> <td>3</td> </tr> <tr> <td>Cat. No. 774</td> <td>7</td> </tr> <tr> <td>Cat. No. 777</td> <td>4</td> </tr> <tr> <td>Cat. No. 794</td> <td>Not Installed</td> </tr> </tbody> </table>	Board	Version	Cat. No. 772	4	Cat. No. 773	3	Cat. No. 774	7	Cat. No. 777	4	Cat. No. 794	Not Installed
Board	Version												
Cat. No. 772	4												
Cat. No. 773	3												
Cat. No. 774	7												
Cat. No. 777	4												
Cat. No. 794	Not Installed												
	<p>Press the illuminated format button to return to normal operation.</p>												

Appendix C

Test and Demonstration Films

Several test and demonstration films produced by Dolby Laboratories are available from your equipment supplier. For proper system maintenance, the Cat. No. 69T Test Film is required and the Cat. No. 251 Jiffy Test Film is strongly recommended. The Cat. No. 69T Test Film should be formed into loops for ease of use. Other test films are for use by your service engineer with special test equipment.

C.1 Cat. No. 69T: Dolby Tone



This film is required to maintain your theatre system. The Dolby tone recorded on the film is used during automatic calibration of the operating level in the CP650. This simple procedure must be performed whenever an exciter lamp or soundhead LED is replaced, and should also be performed regularly to compensate for the normal aging (and resultant lower sound output on analog soundtracks).

Why is adjusting Dolby level important? The accurate reproduction of analog Dolby soundtracks requires that the decoders in the theatre act as precise mirror images of the encoders used when the tracks were recorded. This precision is ensured in two ways. First, the circuits are manufactured to very close tolerances. Second, a reference Dolby Level has been established so that any Dolby encoded film can be accurately decoded by any Dolby cinema processor.

C.2 Cat. No. 251: Jiffy Test Film

This eight-minute test film is strongly recommended to help keep your system sounding its best. No special equipment is required because the tests have been specifically designed to permit subjective judgment by ear. Each test is described by either a male or female voice and is supplemented by captions on the screen that help identify the causes of sound system problems. Visual checks are also included to assist in identifying some picture projection problems.

Tests provided on the Cat. No. 251 include: Level Set, Channel Identification, Channel Level and Loudspeaker Equalization, Loudspeaker and Amplifier Condition,

Projector Wow and Flutter, Overall System Performance, Visual “Quick-checks,” and a Noise and Interference Test.

- Duration: 8 minutes
- Picture format: 35 mm color, can be screened either 1.85:1 widescreen or 2.39:1 anamorphic
- Sound format: Dolby Digital and Dolby SR

C.3 Cat. No. 69P, Cat. No. 97, Cat. No. 151B, and Cat. No. 566 Test Films

These specialized analog test films are for use only by trained engineers with special test equipment and need not be kept on hand at the theatre. The Cat. No. 97 is used for aligning stereo solar cells in projector soundheads, while the Cat. No. 151B is used to set the level of the surround speakers relative to the screen speakers. The Cat. No. 566 is used to measure the uniformity of light along the slit of the sound lens assembly in the projector.

C.4 Cat. No. 1010, Cat. No. 1011, and Cat. No. 1012 Test Films

These specialized digital test films are for use only by trained engineers with special test equipment and need not be kept on hand at the theatre. They are used to set up the Dolby Digital portions of the CP650.

Appendix D

The Evolution of Dolby Film Sound

Going to the movies today is more exciting and involving than ever before, thanks in large part to a continuing effort to improve film sound undertaken by Dolby Laboratories in the early 1970s. Indeed, the history of cinema sound over the past two decades closely mirrors the history of Dolby film sound technologies.

Optical soundtracks

The photographic, or “optical,” soundtrack was the first method of putting sound on film. Today it remains the standard, in both analog and digital forms.

The classic analog optical soundtrack consists of an opaque area adjacent to the picture containing narrow, clear tracks that vary in width according to variations in the sound. As the film is played, a beam of light from an exciter lamp or LED in the projector’s soundhead shines through the moving tracks. Variations in the width of the clear tracks cause a varying amount of light to fall on a solar cell, which converts the light to a similarly varying electrical signal. That signal is amplified and ultimately converted to sound by loudspeakers in the auditorium.

Economy, simplicity, and durability are among the advantages that have contributed to optical sound’s universal acceptance. The soundtrack is printed photographically on the film at the same time as the picture and can last just as long, which—with care—can be a long time indeed. And the optical soundhead within the projector is itself economical and easily maintained.

Success gets in the way of progress

Motion pictures with sound were first shown to significant numbers of movie-goers in the late 1920s. Within a few years, many thousands of theatres were equipped to show “talking pictures” with optical soundtracks.

This phenomenally rapid acceptance of a sophisticated new technology was not without drawbacks, however. Equipment was installed in cinemas so rapidly that there was no time to take advantage of the improvements that occurred almost daily.

A good example is loudspeaker design. The first cinema loudspeakers had very poor high-frequency response. Speakers with superior response became available within just a few years, but there was no time to retrofit the original systems with new units. Engineers were too busy equipping other cinemas with their first sound installations.

This caused a dilemma for soundtrack recordists. Should the tracks be recorded to take advantage of the improved speakers, or should they be prepared to sound best on the many older installations already in place? Given that it was impractical to release two versions of a given title, the only alternative was to tailor soundtracks to the older

speakers. The result was to ignore the improved high-frequency response of the newer, better units.

To forestall compatibility problems, in the late 1930s a de facto standardization set in, the cinema playback response that today is called the “Academy” characteristic. Cinema owners knew what to expect from the films, and therefore what equipment to install. Directors and sound recordists knew what to expect from cinema sound systems, and thus what kind of soundtracks to prepare. The result was a system of sound recording and playback that made it possible for just about any film to sound acceptable in any cinema in the world. The problem was that the system lacked the flexibility to incorporate improvements beyond the limitations that existed in the 1930s.

Magnetic striping and multichannel sound

In the early 1950s, as the film industry sought to woo viewers away from their fascinating new television sets, a new method of putting sound on film was introduced. After the picture was printed, narrow stripes of iron oxide material (similar to the coating on magnetic recording tape) were applied to the release print. The sound was then recorded on the magnetic stripes in real time. In the cinema, magnetic prints would be played back on projectors equipped with magnetic heads similar to those on a tape recorder, mounted in a special soundhead assembly called a “penthouse.”

Magnetic sound was a significant step forward, and at its best provided much-improved fidelity over the conventional optical soundtrack. It also enabled the first multichannel sound reproduction, dubbed “stereophonic sound,” ever heard by the public. The voice of an actor appearing to the left, center, or right of the picture could be heard coming from speakers located at the left, center, or right of the new wide screens also being introduced at this time. Music took on a new dimension of realism, and special sound effects could emanate from the rear or sides of the cinema. The two main magnetic systems adopted were four-track 35 mm CinemaScope system, introduced with *The Robe*, and six-track 70 mm Todd-AO, first used for *Oklahoma!*

Magnetic falls into disuse

Magnetic sound was widely adopted in the 1950s. By the 1970s, however, when the film industry experienced an overall decline, the expense of magnetic release prints, their comparatively short life compared to optical prints, and the high cost of maintaining the playback equipment led to a massive reduction in the number of magnetic releases and cinemas capable of playing them. Magnetic sound came to be reserved for only a handful of first-run engagements of “big” releases each year.

By the mid-1970s, then, movie-goers were again hearing low fidelity, mono optical releases most of the time, with only an occasional multitrack stereo magnetic release. Ironically, just as the industry was reverting to mono optical, more and more movie-goers were enjoying better sound at home over superior hi-fi stereo systems.

Dolby gets involved

By the late 1980s, the situation that prevailed in the mid-1970s had completely changed. Thanks to new technology and a turnaround in the financial decline of the industry, almost all major titles by that time were being released with wide-range multichannel stereo soundtracks, as is the case today.

The breakthrough was the development by Dolby Laboratories of a highly practical 35 mm stereo optical release print format originally identified as Dolby Stereo. In the space allotted to the conventional mono optical soundtrack are two soundtracks that not only carry left and right information as in home stereo sound, but are also encoded with a third center-screen channel and—most notably—a fourth surround channel for ambient sound and special effects.

This format not only enabled stereo sound from optical soundtracks, but higher-quality sound as well. Various techniques were applied to the soundtrack during both recording and playback to improve fidelity. Foremost among these was Dolby noise reduction to lower the hissing and popping associated with optical soundtracks, and loudspeaker equalization to adjust the cinema sound system to a standard response curve.

As a result, stereo optical prints could be reproduced in cinemas installing Dolby-manufactured cinema processors with far wider frequency response and much lower distortion than conventional soundtracks. In fact, the Dolby optical format led to a new worldwide playback standard (ISO 2969) for wide-range stereo prints.

An important advantage of the Dolby optical format was that the soundtracks were printed simultaneously with the picture, just like mono prints. Thus four-channel stereo optical release prints cost no more to make than mono prints, and far less than magnetic prints. In addition, conversion to stereo optical proved relatively simple, and once the equipment was installed, very little maintenance was required. The result was multichannel capability equaling that of four-track magnetic 35 mm (which soon became obsolete), with consistently higher fidelity, greater reliability, and far lower costs.

The next step: Dolby SR

In 1986, Dolby Laboratories introduced a new professional recording process called Dolby SR (spectral recording). Like Dolby noise reduction, it was a mirror-image, encode-decode system used both when a soundtrack is recorded and when it is played back. It provided more than twice the noise reduction of Dolby A-type, and, moreover, permitted loud sounds with wider frequency response and lower distortion.

The 35 mm optical soundtracks treated with Dolby SR instead of Dolby A-type not only sounded superb in cinemas equipped with new SR processors, but also played back satisfactorily in all cinemas. This led to the situation today, whereby the analog soundtracks on virtually all prints are Dolby SR tracks.

The Digital age begins

The next film sound development from Dolby Laboratories was Dolby Digital, introduced in 1992. Dolby Digital puts a six-channel digital optical soundtrack in addition to a four-channel SR analog track on 35 mm prints. This format is yet another significant step forward in film sound, providing independent left, center, right, left surround, and right surround channels, plus a sixth channel for bass effects.

In addition to its six-channel capability, Dolby Digital provides extraordinary dynamic capability, wide frequency range, low distortion, and relative immunity to wear. Its combination of high quality, reliability, and practicality has been proved in cinemas around the world, and today it is the most popular digital format, with the most equipped cinemas worldwide and the most releases.

As with previous Dolby developments, Dolby Digital did not obsolete existing cinema installations. Prints can play conventionally in any cinema, while the digital track can be reproduced in cinemas with Dolby Digital soundtrack readers and decoders.

Dolby Digital Surround EX

The newest Dolby format, Dolby Digital Surround EX was introduced in 1999, and adds a third surround channel to the Dolby Digital format. Enabling improved realism, more precise sound placement, and exciting special effects, the third channel is reproduced by rear-wall surround speakers, while the left and right surround channels are reproduced by speakers on the side walls.

As with all Dolby soundtrack improvements, Dolby Digital Surround EX is backwards-compatible, with prints playable in all Dolby Digital cinemas, whether or not equipped to decode the additional surround track. To find films that use the new format and cinemas in your area equipped to play it, visit www.dolby.com/movies/.

Making films sound better

Dolby-format release prints, and the equipment for playing them, are only part of the chain that extends from the original location, through the dubbing theatre, to the processing laboratory, and finally into the cinema. Developments like Dolby SR and Dolby Digital ensure that the soundtrack itself remains one of the strongest links. But the extreme fidelity of the latest Dolby formats can reveal the quality of each step in the recording, mixing, and dubbing processes, and this has necessitated new approaches to soundtrack production. Admittedly, the results can vary—the final reproduced soundtrack can be no better than the elements it comprises—but Dolby film sound at its best means not only better quality sound, but sound in the theatre that consistently realizes the director's original intentions.

While Dolby's involvement with film sound first achieved wide recognition with the spectacular audio effects of such films as *Star Wars*, it has long since come to mean more than just special or dramatic effects. The objective is high-quality sound reproduction overall—from the dialogue and the score to the sound design and effects. Dolby technology is a means, not an end. It can be likened to an artist's palette that provides the director with a full range of colors, where before there were but a few. Above all, Dolby formats have been developed to enhance that very special experience of going to the movies.

Appendix E

Reference Information

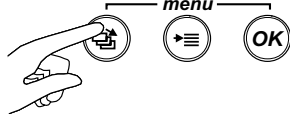
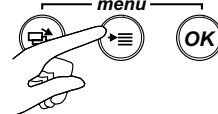
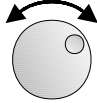
List of Cat. Numbers Used

Cat. No. 771	Remote Fader
Cat. No. 772	Analog I/O and Bypass Circuit Board
Cat. No. 773	Dolby Digital Film Decoder Circuit Board
Cat. No. 774	System Controller Circuit Board
Cat. No. 775	Backplane Board
Cat. No. 776	Power Supply Assembly
Cat. No. 777	Front Panel Circuit Board
Cat. No. 779	Remote Control Unit
Cat. No. 792	Bypass Power Regulator Circuit Board
Cat. No. 794	Dolby Digital Surround EX Decoder with Digital AES/EBU Input Board

Appendix F

CP650 Menu Listing

The options shown in bold are the default settings when the unit is shipped from the factory.

				Notes
	Format and CP650 status display			This is the top-level menu display.
1	Fader Setting	Local /Auditorium	Local /Auditorium	
2	Auto Dolby Digital	Enabled /Disabled	Enabled /Disabled	
3	Auto Digital Target		Select Target Format: Format 10 or Format 13	
4	Automatic Optical Level Calibration Projector 1			Press OK to start and to save
5	Automatic Optical Level Calibration Projector 2			Press OK to start and to save
6	Manual Optical Level Calibration Projector 1		Set level	Press OK to start and to save
7	Manual Optical Level Calibration Projector 2		Set level	Press OK to start and to save
8	User Format 1 select		Select Format to assign to the U1 button	Default is Format 13
9	User Format 2 select		Select Format to assign to the U2 button	Default is Format 65
10	Nonsync Format select		Select Format to assign to the NS button	Default is Format 60
11	Mute Fade-in Time		0.2–5 Seconds	
12	Mute Fade-out Time		0.2–5 Seconds	
13	Power-on Format select	Select from Format list or select Last Format used.	Select from Format list or select Last Format used.	
14	Contrast Adjustment		Set the display contrast	
15	Event Log		Scroll up and down the event listing	
16	About this CP650 - Screen 1 • Control software version number • Circuit boards installed			Useful for telephone discussions with your service engineer.
17	About this CP650 - Screen 2 • Software module version numbers			
18	About this CP650 - Screen 3 • Network address • Board version numbers			
19	Return to the top-level menu display			