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Dolby

Model CP650

Digital Cinema Processor

Installation Manual

Issue 1A Part No. 91569

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Chapter 1 Introduction

1.1 About the Dolby CP650 Cinema Processor

The Dolby CP650 is a self-contained, all-digital cinema processor capable of supporting Dolby Digital, Dolby Digital Surround EX, Dolby SR, Dolby A-type, and Academy mono playback.

The CP650 provides inputs for two projector soundheads, an external six-channel processor, two nonsync sources, and a PA microphone. Its audio outputs are balanced, with a multipin connector configured to the THX® standard. The CP650 is also the first cinema processor to incorporate an Ethernet connection, enabling theatre personnel to monitor the unit's functions remotely from a PC.

For decoding analog soundtracks, the CP650's state-of-the art design incorporates the only digital implementations of Dolby A-type and Dolby SR decoding to meet Dolby Laboratories' own rigorous standards. Reductions in the cost of powerful DSP circuitry have made it possible for the first time to replace the analog circuitry previously necessary for the accurate reproduction of A-type and SR soundtracks.

An easy-to-read LCD screen, plus simple front-panel format selection and control buttons make it easy to install, operate, and maintain the CP650. Installation is further simplified by built-in test instrumentation that includes a real-time analyzer. Third-octave equalization, plus bass and treble trim controls, are provided for up to seven channels (Left, Center, Right, Left Surround, Right Surround, Back Surround Left, and Back Surround Right).

Easily-programmed internal software manages most existing or likely future formats. While an external PC is not required for setup, a full-featured software package is available in a variety of languages to facilitate the setup process. A serial connector for a PC, an input for a calibration microphone multiplexer, and a variety of test points are all accessible behind an access door on the front panel. Built-in diagnostic software runs automatically whenever the CP650 is turned on.

Calibration settings for a given theatre can be stored on a PC, and, if necessary, transferred directly to another CP650, or other modules, minimizing the need for additional calibration after repairs. As improvements to the CP650 digital control and processing software are developed, the latest revisions will be downloadable from a PC to the CP650. Updates to the digital processing used for Dolby Digital soundtracks are included from time to time on Dolby Digital release prints, and download automatically into the CP650 the first time such a print is played in the cinema.

The standard Model CP650 includes a Cat. No. 794 plug-in module featuring Dolby Digital Surround EX decoding capability plus an AES/EBU digital input accommodating stereo PCM audio and Dolby Digital (AC-3) bitstreams.

Options available for the CP650 include a remote fader (Cat. No. 771), and a remote unit duplicating many of the CP650 front panel controls (Cat. No. 779).

1.2 Hardware Configurations Available

The CP650 is available in three versions:

Model CP650

- Dolby Digital soundtrack decoding capability
- Dolby Digital Surround EX decoding and AES/EBU digital input
- Dolby A-type and SR analog soundtrack decoding capability
- Six-channel analog input

Model CP650D

- Dolby Digital soundtrack decoding capability
- Dolby A-type and SR analog soundtrack decoding capability
- Six-channel analog input
- Upgradable to Dolby Digital Surround EX decoding and AES/EBU digital input by installing upgrade kit UEX/650, which includes a Cat. No. 794 plug-in circuit board.

Model CP650SR

- Dolby A-type and SR analog soundtrack decoding capability
- Six-channel analog input
- Upgradable to Dolby Digital soundtrack decoding by adding upgrade kit UD/650, which includes a Cat. No. 773 plug-in circuit board.
- Upgradable to Dolby Digital Surround EX decoding and AES/EBU digital input by adding upgrade kits UD/650 and UEX/650, which includes a Cat. No. 794 plug-in circuit board.

1.3 Accessories

- Cat. No. 771 Remote Fader
- Cat. No. 779 Remote Control Unit
- Upgrade kit UD/650, which includes the Cat. No. 773 circuit board
- Upgrade kit UEX/650, which includes the Cat. No. 794 circuit board

1.4 List of Catalog 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
Cat. No. 797	Flash memory module, part of the Cat. No.774 board

1.5 Specifications

Signal Inputs

Optical: Balanced inputs for two projectors with stereo solar cells or analog LED readers. Digitally controlled gain and digital slit loss EQ. Power available for external cell preamp circuits. 9-pin D-connectors.
Digital film reader: Inputs for two Dolby digital soundheads. 25-pin D-connectors.
Nonsync: Two stereo inputs, 21 kΩ, sensitivity: 0.2–4V (NS 1), 0.06–1.5V (NS 2). RCA-type phono jacks.
Six-channel analog input: For external digital processor,10 kΩ (L, R), 27 kΩ (C, Ls, Rs, SW), 300 mV operating level. 25-pin D-connector.
Microphone: Balanced input for PA mic or B-chain alignment mic (or multiplexer), 15 V phantom power switchable via front-panel DIP switch. Rear-panel XLR and front-panel 9-pin D-connector.
AES/EBU digital input: Accommodates stereo PCM audio at 48, 44.1, or 32 ksps. Also accepts Dolby Digital or Dolby E bitstreams. Input via 25-pin D-connector, 110Ω ±20 %, balanced.

Main Eight-Channel Signal Outputs

Balanced, output impedance: 100Ω (load >600Ω).
Maximum level: +26 dBu (balanced loads), +20 dBu (unbalanced).
Typical operating level: –10 dBu with fader set to 7.
Operating range: 20–780 mV.

Other Connections

Cat. No. 779 remote control unit and **Cat. No. 771** remote fader connector (terminals for stripped wires).
Connectors (front and rear) for external **PC control and setup**, RS-232C (9-pin D-connector).
Hearing impaired output: center-weighted sum of L, R, and C, output impedance 100Ω, output level 200 mV fixed, unbalanced (RCA-type phono jack).
Automation connector for controlling and indicating format, fader select, and mute. Interface similar to Model CP65.
Connector for **Ethernet** link (future use, RJ-45 connector).

Dolby Decoding

5.1 channels, Dolby Digital, and Dolby Digital Surround EX
Four channels, Dolby A-type
Two channels, Dolby SR

Loudspeaker Equalization

L, C, R, Ls, Rs, Bsl, Bsr: 27-band digital 1/3-octave, plus bass and treble control.
SW: digital parametric with 12 dB cut capability.

Distortion

Typically 0.005% in Dolby SR mode (output –10 dBu, input 10 dB over Dolby level).

Dynamic Range

Typically 99 dB with fader set to 7.

Dimensions and Weight

3-U rack-mount chassis. Faceplate: 5 3/8"(H) x 17 5/8"(W) (137 mm x 448 mm).
Maximum projection behind equipment rack rail: 14 3/8" (365 mm).
Maximum projection in front of mounting plate:1 1/2" (38 mm).
Weight: 23 lbs. (10.4 kg).
Shipping Weight: 30 lbs. (13.6 kg).

Power Requirements

Main supply: 100–120 and 200–240 VAC, 50–60 Hz, 100 W max.
Built-in bypass power supply.
Unit designed to operate from a centrally switched power source.

1.6 List of Nonsync Formats Available

Format 60: Nonsync 1 and Format 61: Nonsync 2

This external audio format has two discrete input channels (Lt, Rt) and is input through the Non Sync 1 or Non Sync 2 input jacks. Lt and Rt are passed to the L and R outputs of the CP650. The Lt and Rt channels are also passed through the Dolby Pro Logic decoder, with only the surround output being routed to both the Ls and Rs outputs of the CP650.

Format 64: Public Address

This external audio format has one channel and is input through the microphone input jack. The audio output is sent only to the Center Channel output of the CP650.

Format 65: Public Address

This external audio format has one channel and is input through the microphone input jack. The audio output is sent only to the Ls and Rs outputs of the CP650.

Format 66: Test Tone

This format turns on an internally generated 320 Hz test tone at Dolby level for general test purposes.

Format 70: Video PA

This external audio format has two discrete input channels (L and R) and is input through the **Non Sync 1** input jacks. The audio is processed with Mono decoding, and the resulting audio is sent to the **C, Ls, and Rs channels**. There is no derived subwoofer channel.

Format 71: Video Mono

This external audio format has two discrete input channels (L and R) and is input through the **Non Sync 1** input jacks. The audio is processed with Mono decoding, and the resulting audio is sent to the **C channel** only. There is no derived subwoofer channel.

Format 73: Video LCR

This external audio format has two discrete input channels (L and R) and is input through the **Non Sync 1** input jacks. The audio is processed with **Dolby Pro Logic** decoding. The audio is output on **channels L, C, and R**. There is no subwoofer output.

Format 74: Video Pro Logic no SW

This external audio format has two discrete input channels (L and R) and is input through the **Non Sync 1** input jacks. The audio is processed with **Dolby Pro Logic** decoding. The audio is output on **channels L, C, R, Ls, and Rs**. There is no subwoofer output.

Format 75: Video Pro Logic with SW

This external audio format has two discrete input channels (L and R) and is input through the **Non Sync 1** input jacks. The audio is processed with **Dolby Pro Logic** decoding. The audio is output on **all channels**. The subwoofer channel is generated.

Format 80: External Digital Input

This external digital audio format can carry up to six channels (L, C, R, Ls, Rs, SW) and is input via an AES/EBU bitstream connected to the rear-panel Option Card I/O connector (see table A-2 in Appendix B). The bitstream can be PCM or Dolby Digital encoded.

Format 81: External 6-Channel Dolby Digital with Digital Surround EX

This external audio format has six input channels (L, C, R, Ls, Rs, SW), and eight output channels (L, C, R, Ls, Rs, SW, Bsl, Bsr) and is input via a bitstream connected to the rear-panel Option Card I/O connector.

Format 87 External 6-Channel analog with Digital Surround EX

This external audio format has six discrete input channels (L, C, R, Ls, Rs, SW), and eight output channels (L, C, R, Ls, Rs, SW, Bsl, Bsr). The audio is input through the 6-channel analog input connector.

1.7 How to Identify Types of Soundtracks

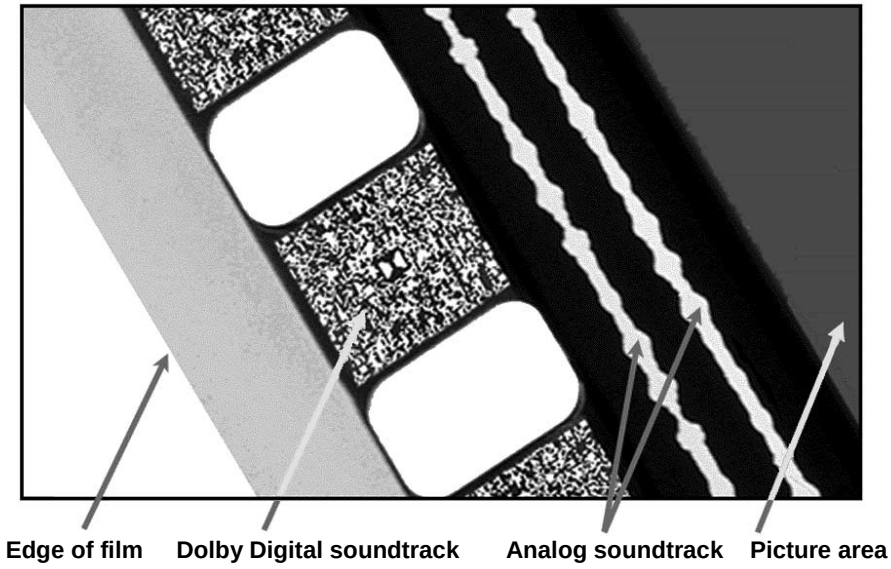
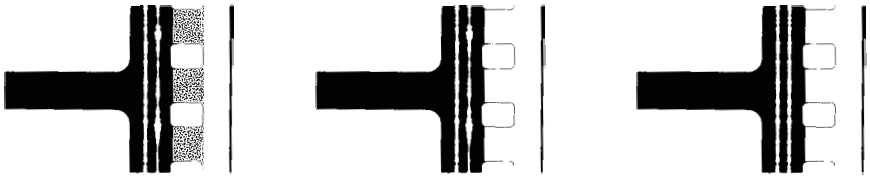


Figure 1–1 Photograph of Film Soundtracks

A Dolby Digital, Dolby Digital Surround EX, stereo optical (Dolby A-type or SR), or mono optical print should be identified as such on both the film can and the leader. However, with handling, the identification may be lost. If neither is available, close inspection of the film itself will help distinguish the various types. Digital data blocks are printed between the perforations on the side of the film next to the analog (Dolby SR) track.



Dolby Digital or Dolby Digital Surround EX Print
The digital data is clearly visible between perforations next to the analog track. The analog track is Dolby SR encoded.

Analog Dolby SR or A-type Print

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

Analog Mono Print

Both tracks are the same.

Figure 1–2 Film Soundtrack Identification

1.8 Regulatory Notices

1.8.1 FCC

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense.

1.8.2 Canada

This Class A digital apparatus complies with Canadian ICES-003.

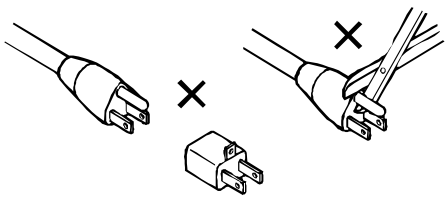
1.8.3 UL

WARNING: Troubleshooting must be performed by a trained technician. Do not attempt to service this equipment unless you are qualified to do so.

Check that the correct fuses have been installed. To reduce the risk of fire, replace only with fuses of the same type and rating.

Exposed portions of the power supply assembly are electrically "hot." In order to reduce the risk of electrical shock, the power cord MUST be disconnected when the power supply assembly is removed.

The ground terminal of the power plug is connected directly to the chassis of the unit. For continued protection against electric shock, a correctly wired and grounded (earthed) three-pin power outlet must be used. Do not use a ground-lifting adapter and never cut the ground pin on the three-prong plug.



1.8.4 UK

As the colours of the cores in the mains lead may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

- The core that is coloured green and yellow must be connected to the terminal in the plug identified by the letter **E** or by the earth symbol ⏚ or coloured green or green and yellow.
- The core that is coloured blue must be connected to the terminal that is marked with the letter **N** or coloured black.
- The core that is coloured brown must be connected to the terminal that is marked with the letter **L** or coloured red.

This apparatus must be earthed.

1.8.5 Notices for Europe

This equipment complies with the EMC requirements of EN55103-1 and EN55103-2 when operated in an E2 environment in accordance with this manual.

IMPORTANT SAFETY NOTICE

This unit complies with the safety standard EN60065. The unit shall not be exposed to dripping or splashing and no objects filled with liquids, such as coffee cups, shall be placed on the equipment. To ensure safe operation and to guard against potential shock hazard or risk of fire, the following **must** be observed:

GB

- Ensure that your mains supply is in the correct range for the input power requirement of the unit.
- Ensure **fuses** fitted are the **correct rating and type** as marked on the unit.
- The unit **must be earthed** by connecting to a correctly wired and **earthed** power outlet.
- The **power cord** supplied with this unit must be wired as follows:

Live—Brown Neutral—Blue Earth—Green/Yellow

IMPORTANT – NOTE DE SECURITE

Ce materiel est conforme à la norme EN60065. Ne pas exposer cet appareil aux éclaboussures ou aux gouttes de liquide. Ne pas poser d'objets remplis de liquide, tels que des tasses de café, sur l'appareil. Pour vous assurer d'un fonctionnement sans danger et de prévenir tout choc électrique ou tout risque d'incendie, veillez à observer les recommandations suivantes.

F

- Le selecteur de tension doit être placé sur la valeur correspondante à votre alimentation réseau.
- Les fusibles doivent correspondre à la valeur indiquée sur le materiel.
- Le materiel doit être correctement relié à la terre.
- Le cordon secteur livré avec le materiel doit être cablé de la manière suivante:

Phase—Brun Neutre—Bleu Terre—Vert/Jaune

WICHTIGER SICHERHEITSHINWEIS

Dieses Gerät entspricht der Sicherheitsnorm EN60065. Das Gerät darf nicht mit Füssigkeiten (Spritzwasser usw.) in Berührung kommen; stellen Sie keine Gefäße, z.B. Kaffeetassen, auf das Gerät. Für das sichere Funktionieren des Gerätes und zur Unfallverhütung (elektrischer Schlag, Feuer) sind die folgenden Regeln unbedingt einzuhalten:

D

- Der Spannungswähler muß auf Ihre Netzspannung eingestellt sein.
- Die Sicherungen müssen in Typ und Stromwert mit den Angaben auf dem Gerät übereinstimmen.
- Die Erdung des Gerätes muß über eine geerdete Steckdose gewährleistet sein.
- Das mitgelieferte Netzkabel muß wie folgt verdrahtet werden:

Phase—braun Nulleiter—blau Erde—grün/gelb

NORME DI SICUREZZA – IMPORTANTE

Questa apparecchiatura è stata costruita in accordo alle norme di sicurezza EN60065. Il prodotto non deve essere sottoposto a schizzi, spruzzi e gocciolamenti, e nessun tipo di oggetto riempito con liquidi, come ad esempio tazze di caffè, deve essere appoggiato sul dispositivo. Per una perfetta sicurezza ed al fine di evitare eventuali rischi di scossa êlettrica o d'incendio vanno osservate le seguenti misure di sicurezza:

I

- Assicurarsi che il selettore di cambio tensione sia posizionato sul valore corretto.
- Assicurarsi che la portata ed il tipo di fusibili siano quelli prescritti dalla casa costruttrice.
- L'apparecchiatura deve avere un collegamento di messa a terra ben eseguito; anche la connessione rete deve avere un collegamento a terra.
- Il cavo di alimentazione a corredo dell'apparecchiatura deve essere collegato come segue:

Filo tensione—Marrone Neutro—Blu Massa—Verde/Giallo

AVISO IMPORTANTE DE SEGURIDAD

Esta unidad cumple con la norma de seguridad EN60065. La unidad no debe ser expuesta a goteos o salpicaduras y no deben colocarse sobre el equipo recipientes con liquidos, como tazas de cafe. Para asegurarse un funcionamiento seguro y prevenir cualquier posible peligro de descarga o riesgo de incendio, se han de observar las siguientes precauciones:

E

- Asegúrese que el selector de tensión esté ajustado a la tensión correcta para su alimentación.
- Asegúrese que los fusibles colocados son del tipo y valor correctos, tal como se marca en la unidad.
- La unidad debe ser puesta a tierra, conectándola a un conector de red correctamente cableado y puesto a tierra.
- El cable de red suministrado con esta unidad, debe ser cableado como sigue:

Vivo—Marrón Neutro—Azul Tierra—Verde/Amarillo

VIKTIGA SÄKERHETSÅTGÄRDER!

Denna enhet uppfyller säkerhetsstandard EN60065. Enheten får ej utsättas för yttre åverkan samt föremål innehållande vätska, såsom kaffemuggar, får ej placeras på utrustningen." För att garantera säkerheten och gardera mot eventuell elchock eller brandrisk, måste följande observeras:

S

- Kontrollera att spänningsväljaren är inställd på korrekt nätspänning.
- Konrollera att säkringarna är av rätt typ och för rätt strömstyrka så som anvisningarna på enheten föreskriver.
- Enheten måste vara jordad genom anslutning till ett korrekt kopplat och jordat el-uttag.
- El-sladden som medföljer denna enhet måste kopplas enligt foljande:

Fas—Brun Neutral—Blå Jord—Grön/Gul

BELANGRIJK VEILIGHEIDS-VOORSCHRIFT:

Deze unit voldoet aan de EN60065 veiligheids-standaards. Dit apparaat mag niet worden blootgesteld aan vocht. Vanwege het risico dat er druppels in het apparaat vallen, dient u er geen vloeistoffen in bekers op te plaatsen. Voor een veilig gebruik en om het gevaar van electrische schokken en het risico van brand te vermijden, dienen de volgende regels in acht te worden genomen:

NL

- Controleer of de spanningscaroussel op het juiste Voltage staat.
- Gebruik alleen zekeringen van de aangegeven typen en waarden.
- Aansluiting van de unit alleen aan een geaarde wandcontactdoos.
- De netkabel die met de unit wordt geleverd, moet als volgt worden aangesloten:

Fase—Bruin Nul—Blauw Aarde—Groen/Geel

Chapter 2
Installation

Do not connect the CP650 to mains power until all connections have been made.

If air-conditioning noise is audible in the theatre, arrange for lubrication of the motor, fan bearings, adjustment of belts and drives, and cleaning of filters to reduce the ambient noise to a minimum. If the air-conditioning cannot be repaired switch it off while the CP650 is being aligned.

2.1 Replacing an Existing Sound System

If the CP650 replaces an existing cinema sound system, play a typical film before you remove the old system so you will have a benchmark for comparison to the new system.

2.1.1 Before playing the film:

- Verify that the existing power amplifiers are in good working order.
- Verify that the existing speakers are in good working order, and that there is no loose or missing hardware, structural parts, or damaged drivers in the enclosures.
- Verify that all wiring is present and properly connected and that crossovers are operating and are correctly adjusted.
- Check the polarity of the speaker connections.
- Verify that there are adequate ground (earth) connections.
- Verify that radio interference problems are adequately resolved.

2.1.2 While playing the film:

While you run the film, listen carefully in various parts of the theatre for audio system problems, including:

- Hum,
- Noise, clicks, pops,
- Distorted sound,
- Poor tonal balance (lack of high-frequency or bass content),

These problems must be resolved before you can proceed with the new installation.

2.1.3 Disconnect the old system

- Disconnect power from the existing cinema sound equipment.
- Disconnect all cabling from the existing sound processor. Leave the cables connected to the power amplifiers, booth monitor, etc.

2.2 Check Fuse and Bypass Mains Voltage Selector

WARNING: Check that the correct main fuse has been installed. To reduce the risk of fire, replace only with fuses of the same type and rating.

The CP650 uses a universal switching power supply that can accommodate nominal mains voltages from 100 to 120, and 200 to 240 VAC, at frequencies from 50 to 60 Hz.

Check Main Fuse

The main power supply fuse is a 6.3 Amp, 250V, 20 mm, time-lag, low breaking capacity fuse (T 6.3 L). With a small flat-blade screwdriver, open the fuse compartment door on the AC power input housing (see figure 2-1).

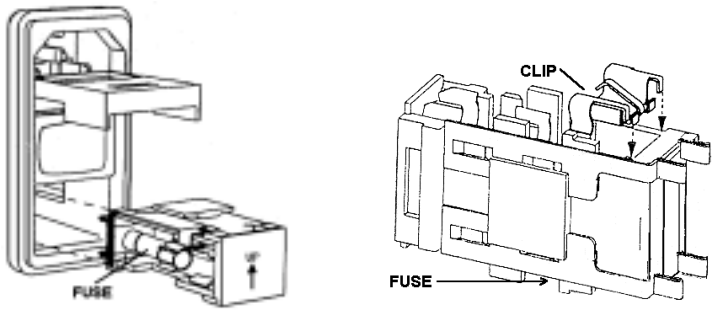


Figure 2–1 Check main fuse.

Remove the fuse carrier and check that the fuse in the active (left position) is of the correct rating. The fuse carrier must be inserted into the compartment with the fuse oriented to the left. *Do not force the carrier into the compartment. Damage will result.* The polarizing clip must be attached on the right side of the carrier at the rear. Snap the fuse compartment door closed.

Check Bypass Supply Mains Voltage Setting

The bypass power supply mains voltage selector switch is accessible through a hole in the top cover of the CP650. Use a screwdriver to set the switch to either 120 or 220 VAC. Figure 2-7 shows the switch location.

Be sure to check this setting. If the bypass voltage selector is set to 120 V and the unit is connected to 220 V mains voltage, the bypass power supply fuse will blow.

Bypass Power Supply Fuse

The bypass power supply fuse is accessible by removing the front panel and the front sub-panel. The fuse is a 315 mA, 250V, 20 mm, time-lag, low breaking capacity fuse (T .315 L).

Internal Fuse

The switching DC power supply contains a separate internal fuse, not accessible to the installation engineer or user. Do not remove the power supply cover. The CP650 main fuse will protect most fault conditions. If this fuse blows, the power supply has certainly failed.

2.3 Mount the CP650

To avoid heat problems, do not mount the Dolby CP650 immediately above or below the power amplifiers. Locate the power amplifiers away from the CP650 to avoid hum pickup problems. Always leave a 1U (1.75", 43 mm) space above and below the CP650 to provide adequate ventilation. Install an air guide or baffle to deflect hot air from equipment below the CP650.

To ensure good ground contact, install a star washer on at least one (and preferably all) rack mounting screw(s) per piece of equipment (Figure 2-2). This will also aid in the prevention of electrical noise problems.

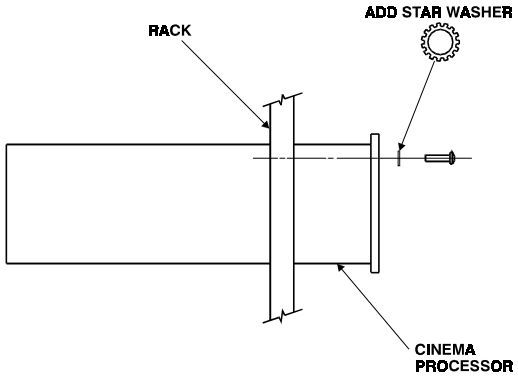


Figure 2–2 Install Star Washers to Rack Mounting Screws

Proper shielding and termination of cables and cable assemblies are also very important. Follow the methods shown in the wiring diagrams.

If you are installing a Dolby Cat. No. 701 Digital Soundtrack Reader, refer to its installation manual for mounting and alignment.

2.4 Connect the CP650

Refer to the appropriate fold-out pages *(at the end of this chapter)* showing connections to the CP650.

Shields must be connected as shown in the fold-out pages to avoid radio frequency interference.

Note: Follow all local codes and regulations covering electrical wiring. It is recommended that conduit be used for wiring runs.

Connector shells have been included in your installation kit for use in countries that are governed by the EMC directives. The shells **must** be used as noted on the fold-out pages.

2.4.1 Motor Start Relays (Models CP650 and CP650D)

For two-projector installations, motor start relays are required for projector changeover. Digital data on the soundtrack is read in advance of the picture; therefore an advanced changeover signal is required. Projector motor start contact closures provide this signal to the CP650. **Isolated** contact closures from mechanical or opto-isolated relays wired across projector motors must be used. Refer to the **Installation Wiring Inputs and Control diagram** at the end of this chapter.

Signal levels:

Motor Start:	Less than 1 Vdc with respect to signal ground.
Motor Off:	Greater than 3.5 Vdc, less than 18 Vdc.

If the CP650 is to be used in a platter operation (single projector), a jumper must be installed. A pre-wired connector is installed at the factory for this purpose.

2.4.2 Remote Controls

Three types of remote controls can be used with the CP650:

The **Cat. No. 779 CP650 Remote Control Unit** duplicates the front-panel format selection, fader, and mute functions of the CP650.

The **Cat. No. 771 Remote Fader** duplicates the front-panel main fader knob and level display of the CP650.

A customer-supplied **100k linear pot**, wired as a variable resistor, can also be used. Minimum pot resistance corresponds to a front panel fader setting of maximum (10).

Details on how to connect any of these remote controls to the CP650 are shown in the **Installation Wiring Input and Control** drawing located at the end of this chapter.

2.4.3 Solar Cell Reader Boards

Most new projectors sold around the world incorporate a reverse-scan LED analog soundhead reader. In addition, many existing projectors are being upgraded to include this superior method of playing back SVA soundtracks. The Dolby Cat. No. 655 solar cell preamp board is an example of this kind of upgrade. The output of the solar cell in this system is at a lower level than a normal incandescent exciter lamp solar cell. In order to provide the correct signal level for the cinema processor this small preamp board is mounted in the soundhead. Some care needs to be given to the wiring between the board and the CP650 in order to avoid grounding problems and to provide immunity to RF interference. In principle, this means separating the audio ground connections and the RF shielding screen connections.

The 0 V point (audio ground) must be connected from the inboard reader board to the CP650 by a separate wire (or wires) along with the audio signal wires. The cable shield (screen) must be kept separate from the audio ground connections. It must be connected only to the chassis or enclosure of the equipment at each end.

The following diagrams show two connectors on the Cat. No. 655 circuit board. The three-pin connector, J1, is used for the power connections. The signal output connector, J2, provides six output pins: two each for the balance left and right outputs, and two 0 V audio ground connections.

Note: The physical orientation of the board mounting in the projector and the orientation of the connector body mounting on the board affect which channel appears on which pin of the connector. **Be aware that pin allocations for the channels will vary depending on mounting arrangements of the board and connector**. The J2 connector pin solder hole with a square outline is pin 1.

J2 Pin Number	Signal
1	**Right (or Left)** +
2	Signal Ground
3	**Right (or Left) –**
4	**Left (or Right)** +
5	Signal Ground
6	**Left (or Right)** –
J1 Pin Number	**Power from CP650**
7	+ 15 V
8	– 15 V
9	Signal Ground

There must be a connection between the ground pins at the Cat. No. 655 solar cell circuit board and the audio common in the CP650. This connection must **not** use the shield of the optical input cable, since doing so may impose RF energy on the CP650 ground system.

Pin numbers 6 and 9 of each nine-pin D connector ("Projector") on the CP650 allow these connections to be made. The wire that connects either of these pins to the Cat. No. 655 audio ground should pass inside the same shield as the optical input cables and not connect with the shield at any point.

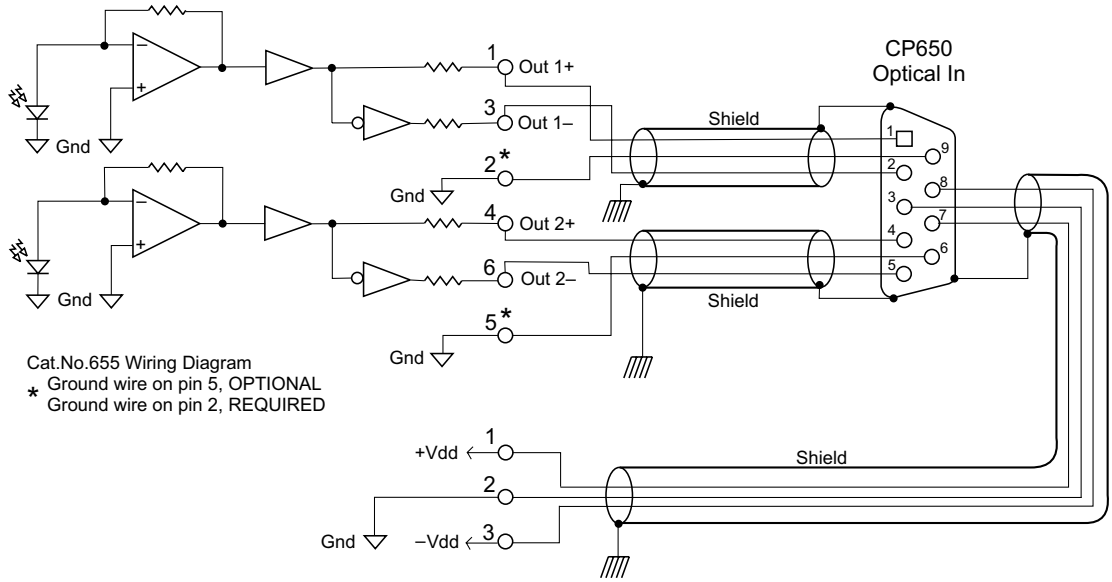


Figure 2–3 Wiring Using Two 3-Conductor Shielded (screened) Cables

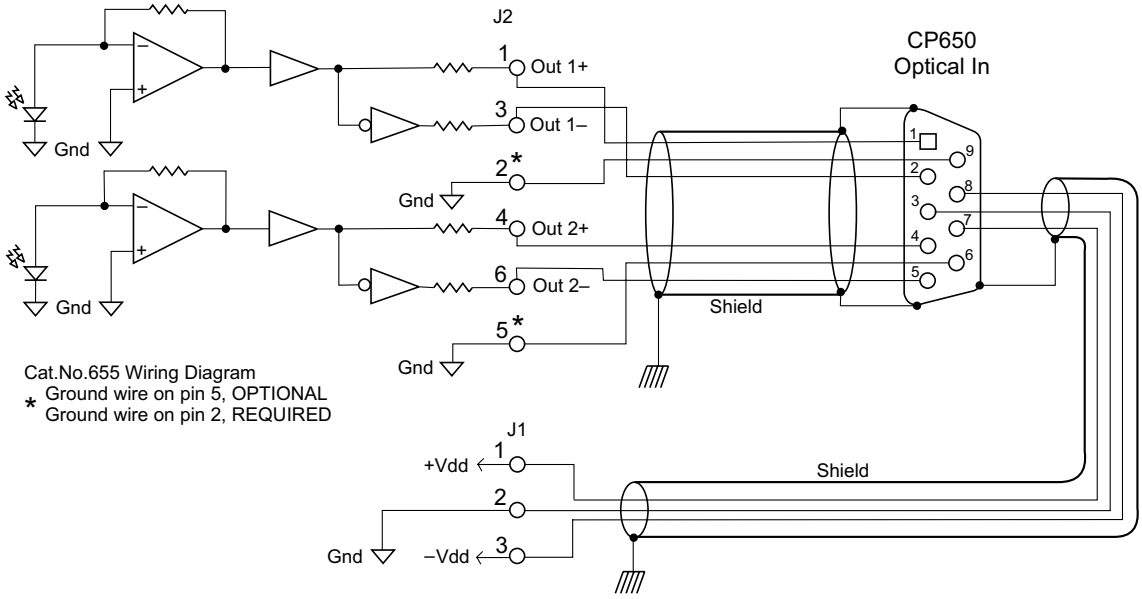


Figure 2–4 Wiring Using One 5- or 6-Conductor Shielded (screened) Cable

For Non-EU Countries Only:

If you find it necessary to use 2- or 4-conductor shielded cables, use the following wiring diagrams.

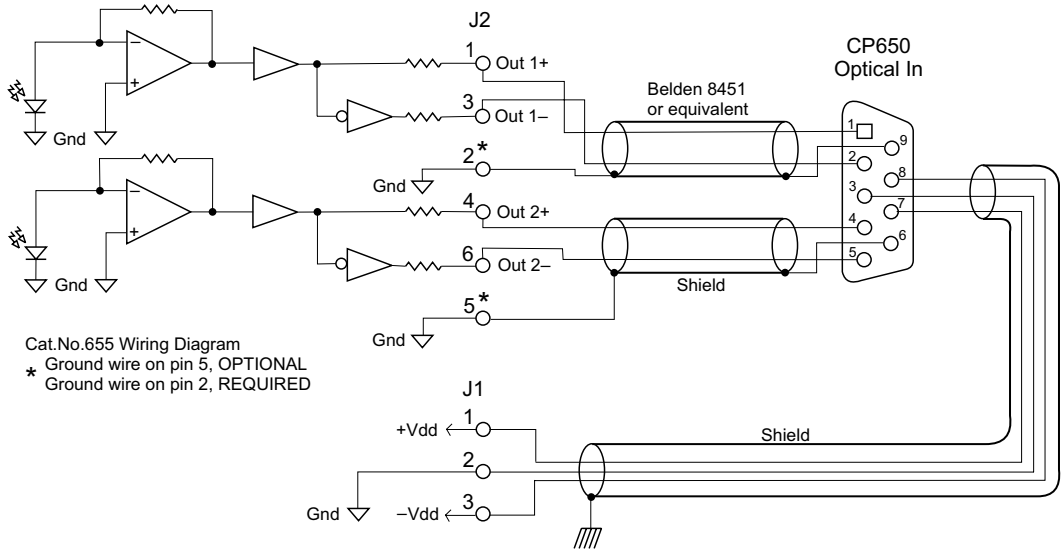


Figure 2–5 Wiring Using Two 2-Conductor Shielded (screened) Cable

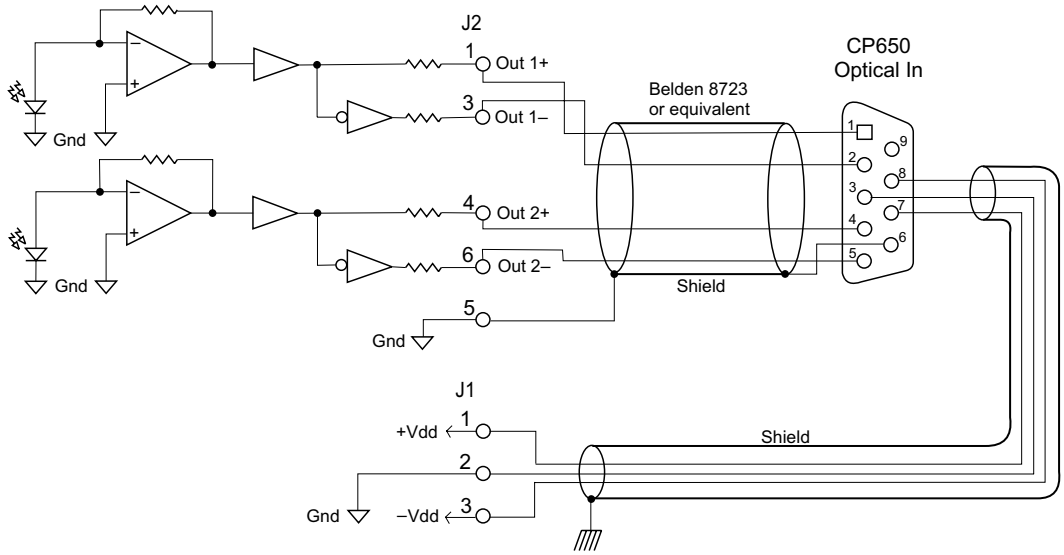


Figure 2–6 Wiring Using One 4-Conductor Shielded (screened) Cable

2.4.4 Nonsync Sources

The CP650 has two sets of nonsync inputs, designated nonsync 1 (Format 60), and nonsync 2 (Format 61). The input impedance is 11 kΩ. They both have a wide range of input level adjustment, but to further extend the possible range of input levels, the two sets of inputs have different gain adjustment ranges:

- The nonsync 1 input will accommodate input levels between approximately 0.2 and 4 volts.
- The nonsync 2 input will accommodate input levels between approximately 0.06 and 1.5 volts.

2.5 Exploded View and Board Locations

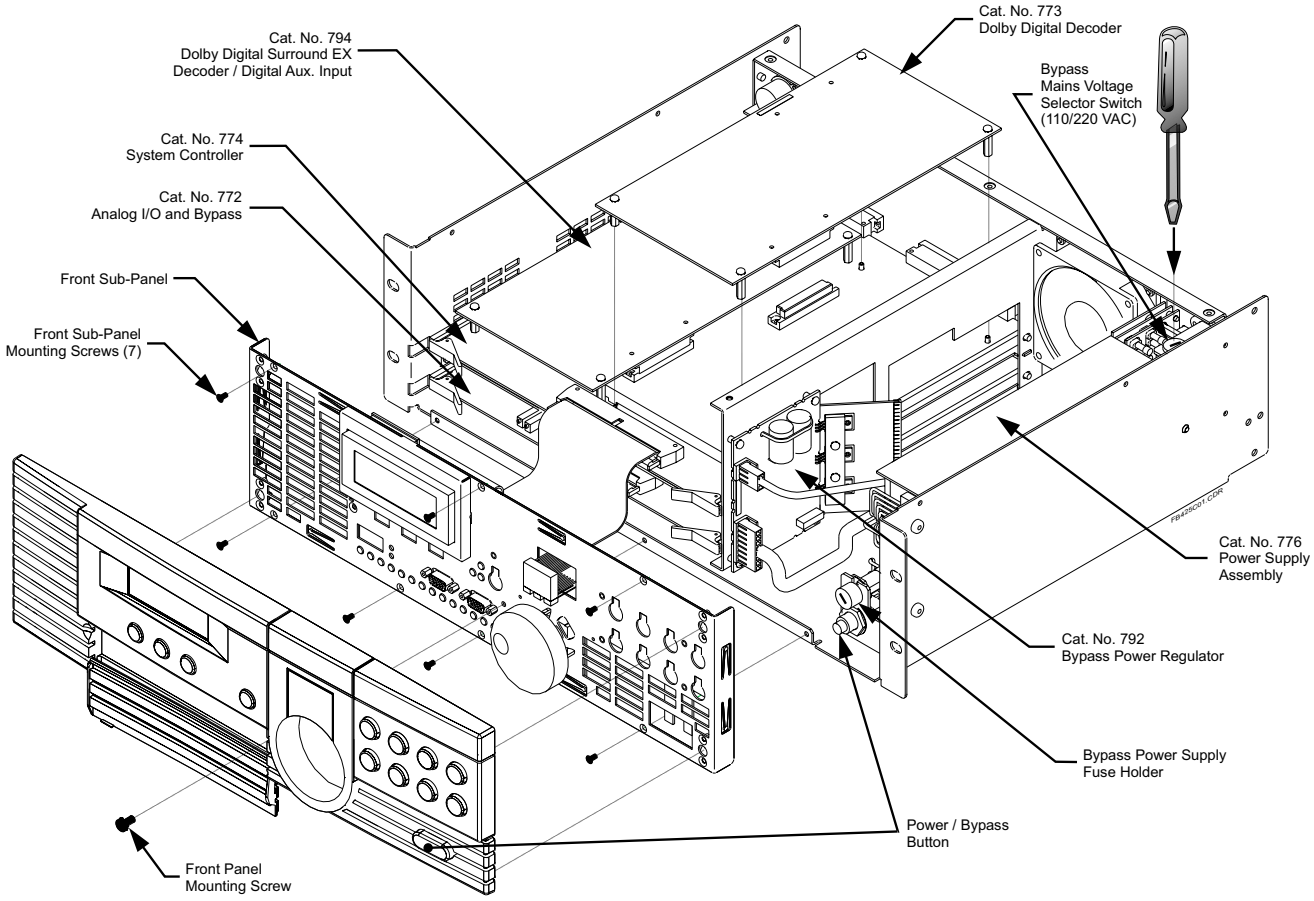
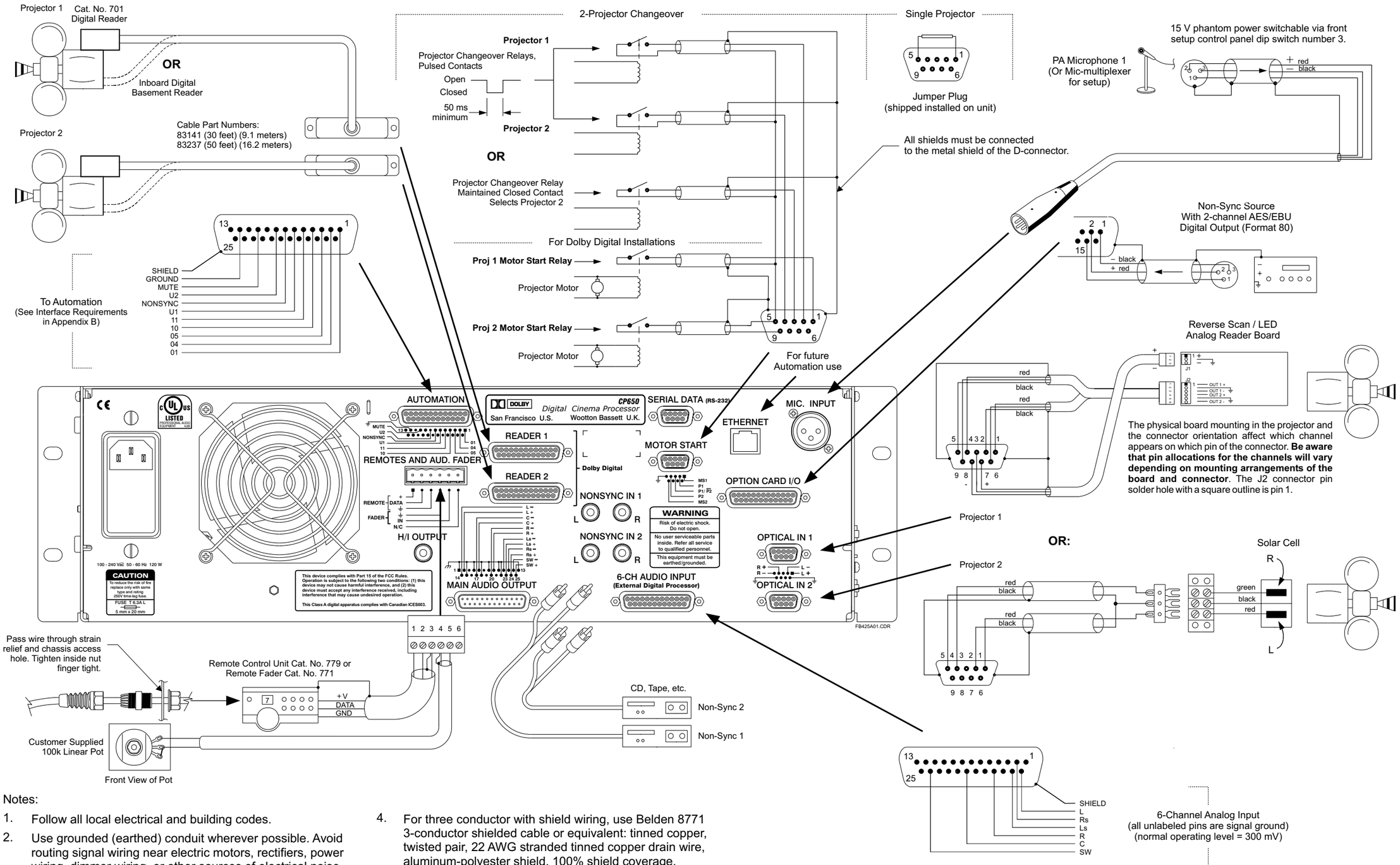


Figure 2–7 Model CP650 Exploded View

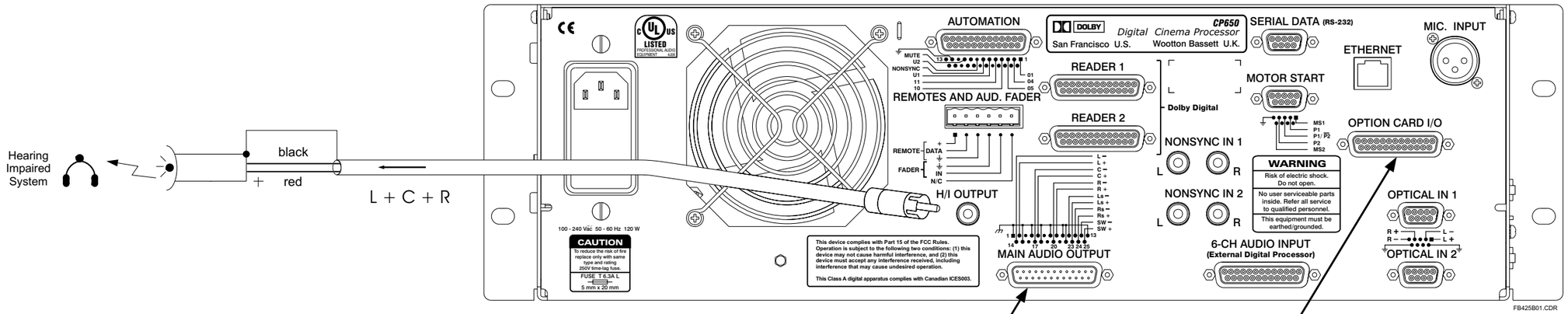
Disassembly steps can be found in the troubleshooting section of this manual. See Chapter 9, section 9.3.2.

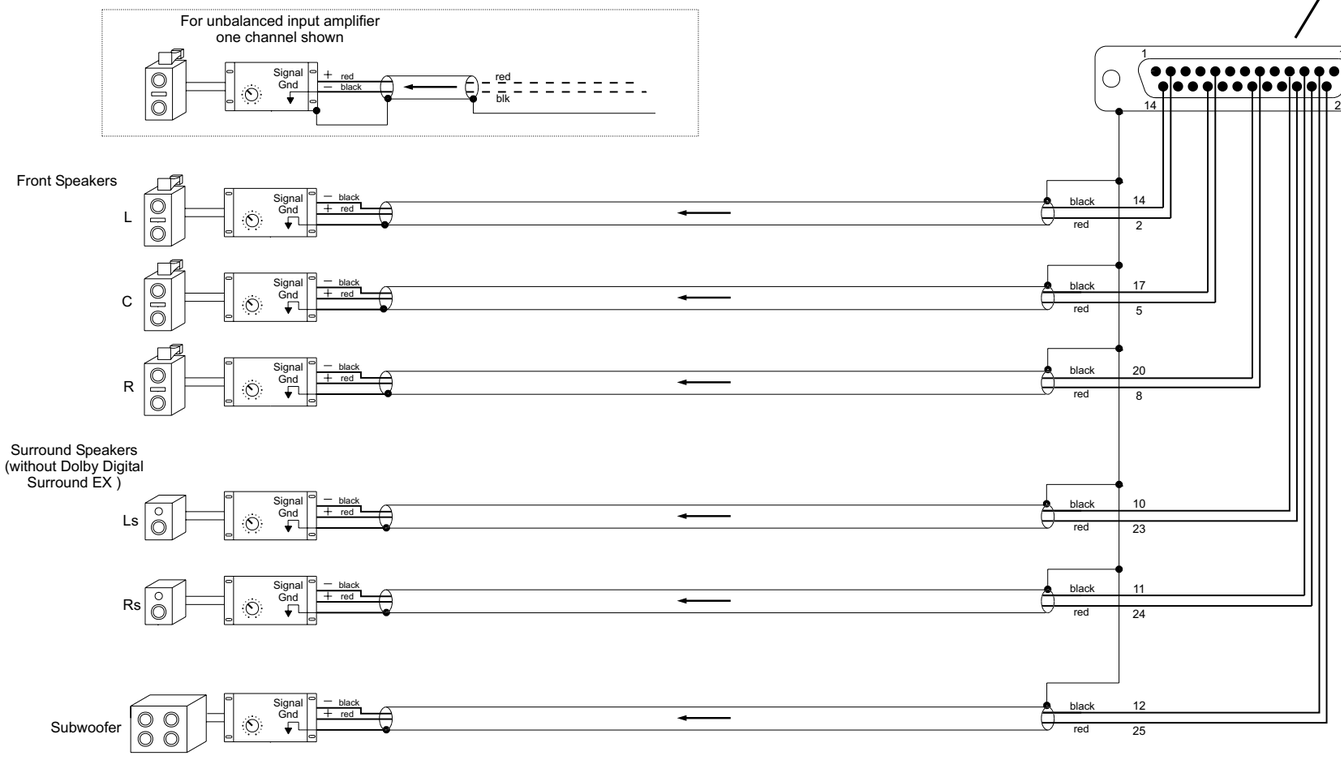


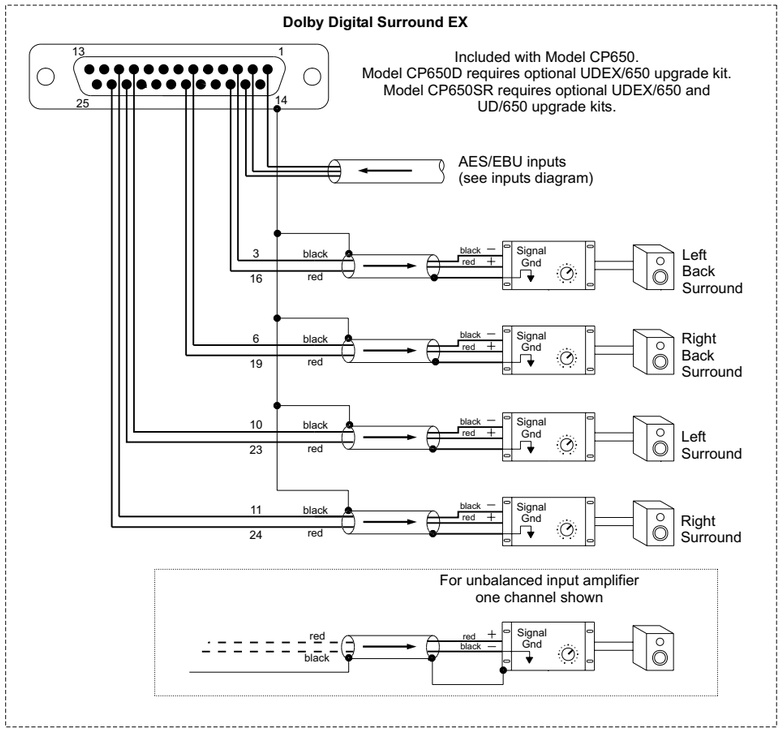
Notes:

1. Follow all local electrical and building codes.
2. Use grounded (earthed) conduit wherever possible. Avoid routing signal wiring near electric motors, rectifiers, power wiring, dimmer wiring, or other sources of electrical noise.
3. For two conductor with shield wiring, use Belden 8451 2-conductor shielded cable or equivalent: tinned copper, twisted pair, 22 AWG stranded tinned copper drain wire, aluminum-polyester shield, 100% shield coverage, conductor-to-conductor 111 pF per meter.
4. For three conductor with shield wiring, use Belden 8771 3-conductor shielded cable or equivalent: tinned copper, twisted pair, 22 AWG stranded tinned copper drain wire, aluminum-polyester shield, 100% shield coverage, conductor-to-conductor 75 pF per meter.
5. All shields must be connected to the CHASSIS of the CP650. This achieves the required RF interference immunity. A metal housing must be used for all D-connectors and the shields must be connected to the housing. Chassis ground and circuit (audio) ground are internally connected.

CP650 INSTALLATION WIRING
INPUT AND CONTROL CONNECTIONS



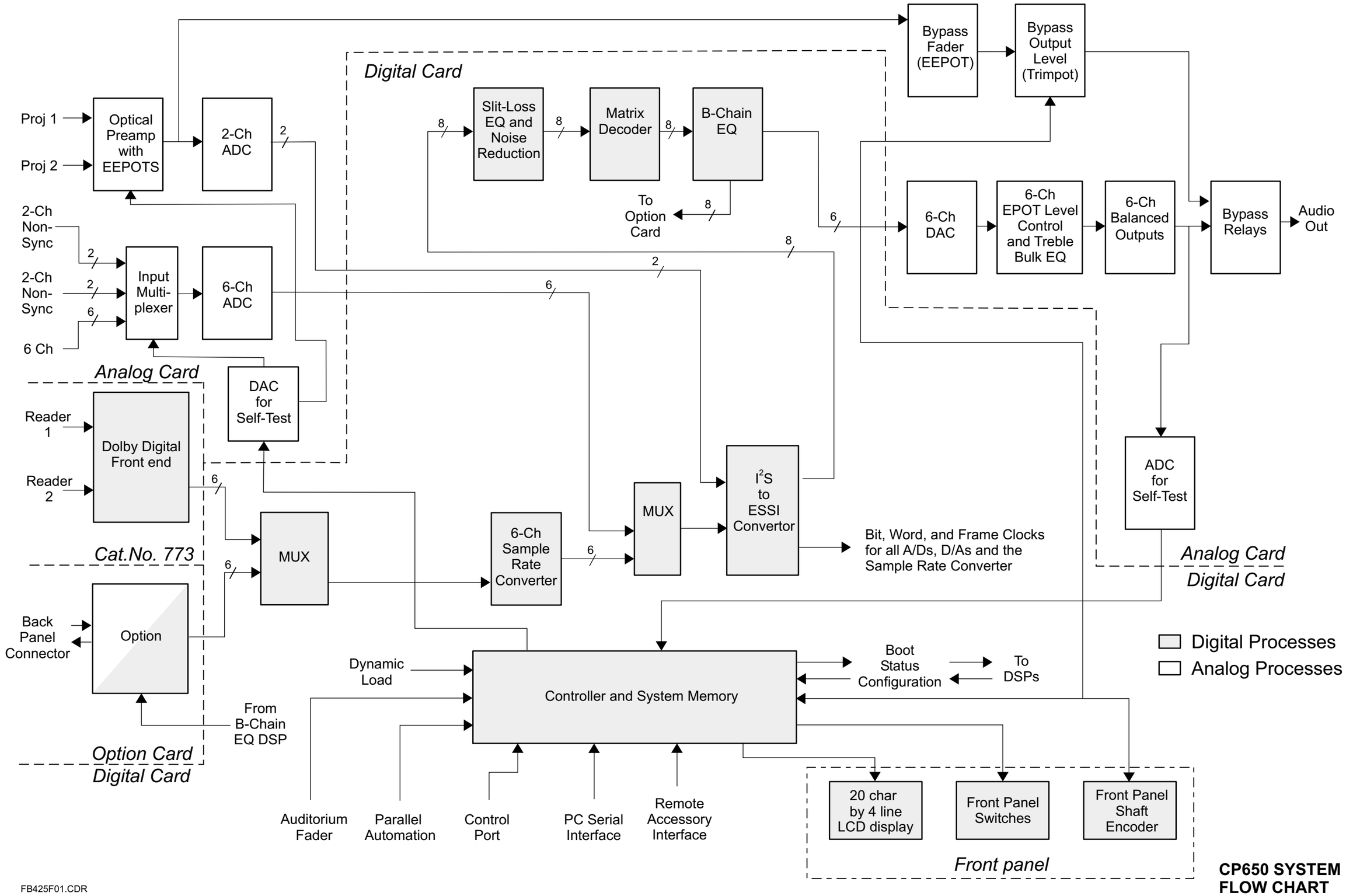




Notes:

1. Follow all local electrical and building codes.
2. Use grounded (earthed) conduit wherever possible. Avoid routing signal wiring near electric motors, rectifiers, power wiring, dimmer wiring, or other sources of electrical noise.
3. For two conductor with shield wiring, use Belden 8451 2-conductor shielded cable or equivalent: tinned copper, twisted pair, 22 AWG stranded tinned copper drain wire, aluminum-polyester shield, 100% shield coverage, conductor-to-conductor 111pF per meter.
4. All shields must be connected to the CHASSIS of the CP650. This achieves the required RF interference immunity. A metal housing must be used for all D-connectors and the shields must be connected to the housing. Chassis ground and circuit (audio) ground are internally connected.

CP650 INSTALLATION WIRING
AUDIO OUTPUT CONNECTIONS



FB425F01.CDR

CP650 SYSTEM FLOW CHART

Chapter 3
Front Panel and Alignment Overview

This chapter describes the features on the CP650 front panel, along with of an overview of the general principles involved in the alignment of Dolby cinema equipment. It is useful to develop an understanding of why the CP650 is aligned as described in this manual. If the installer is already familiar with the CP650 and these principles, or is in a hurry to complete the installation, this chapter may be read later. Continue the setup procedure beginning with the next chapter.

3.1 The CP650 Front Panel

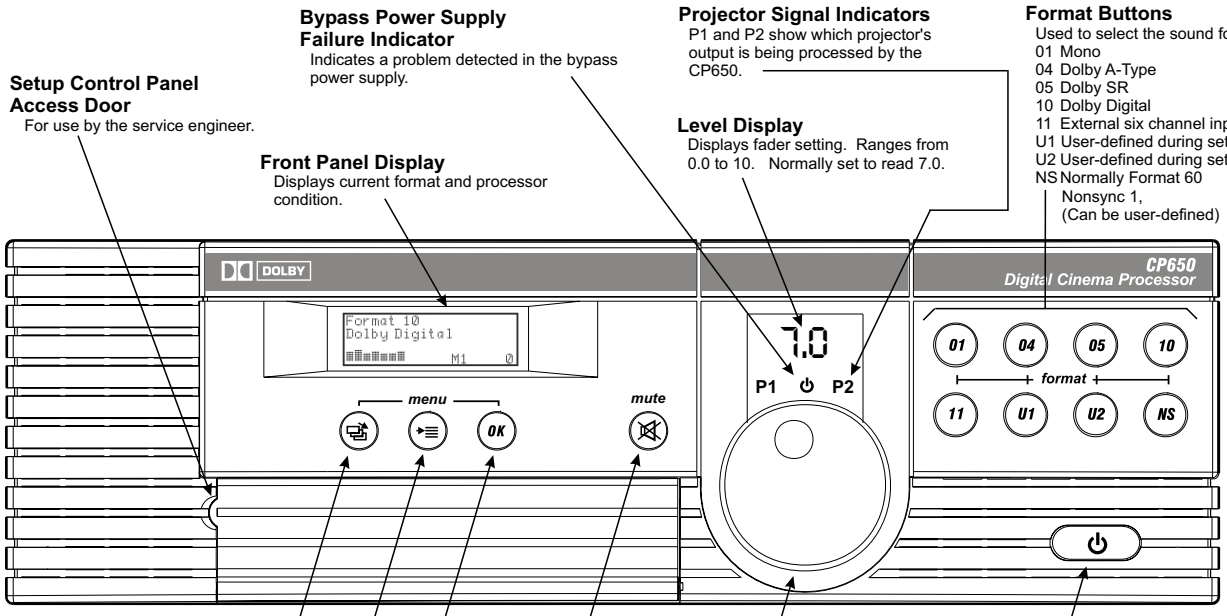
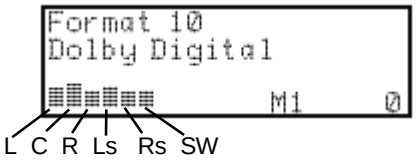


Figure 3–1 Front Panel Controls

Front-Panel Display



Day-to-day operation of the CP650 is performed through interaction with this display. The 20-character, four-line LCD provides a read-out of processor condition, operation mode, and is used to perform local alignment of the CP650 by the service engineer if PC setup software is not used.

The example above shows the normal display when the CP650 is in use. The bottom left area contains a **bar graph** display of signals present. Each bar will move as a film is playing for confirmation that sound is being processed by the CP650. Reading from left to right, the graph displays the Left, Center, Right, Left Surround, Right Surround, and Subwoofer channels.

M1 indicates that the projector 1 motor contact is closed or jumpered (motor start connector on the back panel). The motor running signals are used in the timing of changeovers while running Dolby Digital films in a two-projector system.

The **0** shown on the bottom right is a display of Dolby Digital film error rate. The first indication of satisfactory playback is by detecting a low error rate. The error rate is a number between 0 and 8. With a correctly aligned digital reader, most films will play at an error rate of **6** or lower. If the error rate is above **8**, the CP650 will revert to analog soundtrack playback and no error rate number will be displayed.

Level Display

The main fader level is displayed as a two-digit number. Starting from a display of 0.0, the level increases from –90 dB to –10 dB (display 4.0) as the fader knob is turned clockwise. The level then increases in smaller steps from –10 dB to +10 dB (display 10). As with previous generations of Dolby cinema processors, a fader setting of 7.0 (0 dB) is the nominal 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. A fader reading of 7.0 is the nominal correct operating level. The main fader knob rotates continuously with no end-stops. The knob is also used for data selection during setup operations.

Projector Signal Indicators

P1 and **P2** show which projector optical input has been selected.

Bypass Power Supply Failure Indicator

This indicator appears 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 utilizes a separate backup (bypass) power supply. When the power button is in the **OFF** position the unit is powered by the built-in bypass power supply. A red LED built into the switch is activated when the unit is powered from the bypass supply. Additionally, the red LED glows if a fault in the main power supply is detected during normal operation (power button in the **ON** position) indicating that the unit has automatically switched to bypass operation.

Format Buttons

Select the desired format. Pressing a format button during menu operations will return the display to the top level menu.

Setup Control Panel Access Door

For use by the service engineer, the access door is opened to expose the setup control panel.

Mute Button

Pressing the mute button fades the audio output to all channels without disturbing the current main fader setting. The speed of fade-in and fade-out is separately adjustable from 0.2 to 5 sec using the front panel menu buttons or PC setup software. The mute button flashes red when mute is activated.

Operation and Setup Menu Control Buttons

The menu control buttons are used by both the operator and the service engineer to navigate through the various menus displayed on the front panel screen, select various menu options, and store setup data.

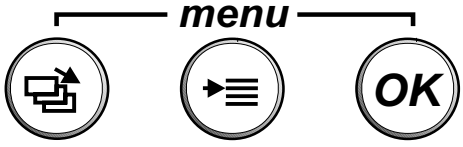


Figure 3–2 CP650 Operation and Setup Menu Control Buttons

The left-hand **next menu** button is used to step through the menu list. Pressing and releasing the button once will change the display to the next menu item. Pressing and holding the button while rotating the main fader knob will step the display through all menu items.

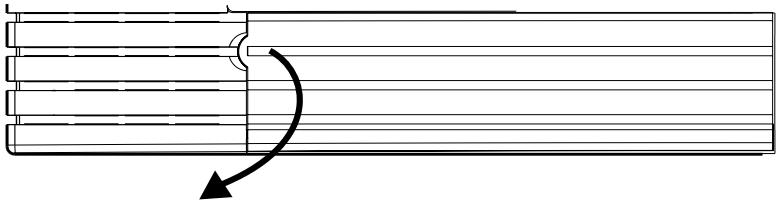
The center **adjust parameter** button is used to select a parameter to adjust when there are multiple items available on the display. Pressing and releasing the button will select among them. The adjustment is then made by rotating the main fader knob.

The right-hand ***OK*** button is used 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 button will cause the change to be discarded.

Note: For convenience, pressing the illuminated format button once, or any other format button twice, causes the CP650 to immediately return to the menu top-level screen display. This feature is handy for making a quick change, then returning to normal operation. This feature is not active in setup mode (described below).

3.2 The Setup Control Panel

The setup control panel is located behind the front panel access door.



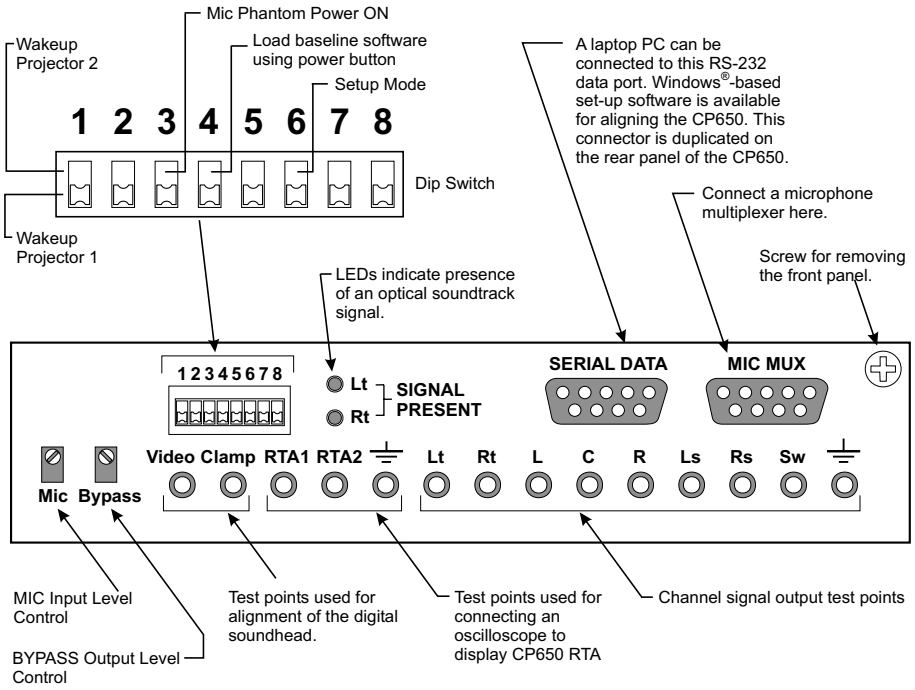


Figure 3–3 Setup Control Panel Description

Mic Input Level Control

This ten-turn potentiometer has an end-to-end range of 46 dB. It is factory-adjusted to accommodate most microphones.

Bypass Output Level Control

This ten-turn potentiometer has an end-to-end range of 30 dB.

Setup DIP Switch

The eight-position DIP switch is used to set the functions shown. All switches are factory-set to down. Switches 2, 5, 7, and 8 are not used. DIP switch 6 is used to enter CP650 setup mode.

Lt/Rt Signal Present LEDs

These LEDs indicate that signals exist on the Lt and Rt sound channels from the film's analog soundtrack. They flash during film playback in both normal and bypass operation.

Serial Communications Port (RS-232)

A laptop PC can be connected to this port using a straight-through (pin 1 to pin 1, pin 2 to pin 2, etc.) cable. A cable with receive and transmit lines swapped (null modem cable) will not work. Setup software is available for aligning the CP650. This connector is duplicated on the rear panel of the CP650.

MIC MUX Connector

When setting up a CP650, a microphone multiplexer can be plugged into this connector (or to the XLR connector on the rear panel for some types of units).

Test Points

These test points are provided to allow rapid access to the required signals used during CP650 setup. Each test point is a 2-mm diameter female socket that accepts a 2-mm male test pin. Test point pins can be obtained in the USA from ITT Pomona® Electronics. Type 3221 is a useful, stacking, pin-to-BNC female adapter.

3.3 Power Supply Voltage Test Points

Six test points are located behind the front panel for measuring power supply voltages. They can be accessed by removing the front panel. See Section 9.3.1 for the voltage test ranges.

Main power supply DC test points:

+15 V, -15 V, +5 V

Bypass power supply DC test points:

+14 VB, -14 VB, +5 VB

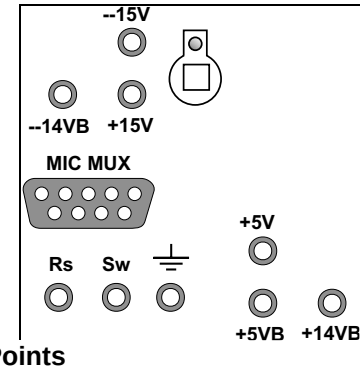


Figure 3–4 Power Supply Voltage Test Points
(A portion of the front sub-panel with front panel removed is shown in this figure.)

3.4 Aligning the B-Chain and A-Chain

The B-chain is made up of system components from the main fader through to the loudspeakers. In the CP650, B-chain adjustments include speaker equalization, level settings, surround speaker delay settings, and mute fading time.

It is not practical for the entire cinema industry to standardize on a single make and model of loudspeaker. And, the different acoustical characteristics of individual theatres would, to some extent, negate the need for any such standardized speakers. Electronic equalization of each loudspeaker system achieves consistent results in a broad spectrum of environments, and with a broad range of speakers. Accurate equalization requires the use of standardized acoustic measurement procedures.

A built-in pink noise generator provides a continuous random noise signal that covers the total bandwidth. This signal is used to measure and adjust the response of the loudspeakers. The use of random noise eliminates the problems inherent with the use of test tones (standing wave patterns in the theatres) and enables the frequency response of the entire system to be observed. Each channel can be measured and adjusted independent of the other channels.

A multi-microphone setup with multiplexer is placed in the auditorium to receive the pink noise reproduced by the loudspeaker. The output of the selected microphone is fed to a real time analyzer (RTA) circuit built into the CP650 cinema processor (or to your separate RTA if you prefer.) Equalization can be performed by using an oscilloscope connected to the RTA output test points or by using a PC running Dolby setup software. Either display will represent the spectrum received by the microphones. The effect of adjustments to the equalizers is quickly and easily seen.

One of the problems inherent in equalization is the nature of the environment. In an open space, a perfect loudspeaker, radiating a perfectly flat pink noise response in all directions, placed in front of a perfectly flat microphone, producing perfectly flat response to sounds arriving from all directions, will display a perfectly flat response on the RTA output. In an enclosed space such as a theatre, the results are different. When the pink noise generator is first turned on, all of the sound that initially reaches the microphone comes directly from the loudspeaker– and the response is flat, for a few milliseconds. Then, reflected sound from the walls, ceiling, floor, seats, etc. arrives at the microphone, together with the direct sound from the loudspeaker. This indirect or reflected sound reinforces the direct sound. The system soon settles into an equilibrium condition. As much energy is being absorbed by the walls, ceiling, etc. as is fed into the room. Since high- and mid-frequency energy is absorbed when sound is reflected, the displayed response appears to have a falling treble characteristic. At first glance, boosting the high frequencies may appear to be the logical solution to achieve a flat steady-state response, but such an arrangement works only on sustained sounds. Dialogue contains short, impulsive sounds that will yield a much-too-bright result because there is no time for reverberation to build and add to the original sound. A standard response curve is required that favors such impulsive “first arrival” sound and implies the same gently falling response that is observed when the output of an ideal loudspeaker is measured with a perfect microphone in the theatre.

The amount of reverberation varies with frequency. As frequency rises, more audio is absorbed rather than being reflected. A typical reverberation curve in a theatre rolls off at about 3 dB per octave above 2 kHz. This characteristic is used to define the standard steady-state response curve for all dubbing theatres in which films with Dolby soundtracks are mixed and for all Dolby processor-equipped cinemas.

The size of the theatre affects the reverberation time, and therefore the measurement of frequency response. After alignment to this standard curve, some slight adjustment of high-frequency slope may be necessary for extremely large or small theatres. The Bulk EQ Treble Adj. menu selection can be used to reduce the output by approximately 1 dB at 8 kHz for very a large theatre; or to increase the output 1 dB at 8 kHz for a very small theatre. Any such adjustment should be based on an evaluation, by ear, of actual known films rather than as a rule of thumb.

Some loudspeakers used in theatres are far from ideal and require boosting of the low- and high-frequency extremes in order to produce an approximation of the standard reference response curve. Bass and treble controls centered on the turnover points of typical loudspeakers lift the ends of the spectrum without the need for large amounts of narrow-band boost from the third-octave EQ circuitry.

The final factor is masking of the screen. The masking curtains must be drawn back sufficiently to clear the left and right screen speakers before any adjustments or measurements are made. The high-frequency horns should clear the screen frame and be mounted as close as possible to the screen. Conventional black felt side-masking can severely restrict high-frequency response. Consequently, there would be severe losses if the left and right loudspeakers were equalized with the masking set for a 2.35:1 film, and then the masking were brought in for a 1.85:1 film, thus obscuring the outer speakers. To avoid this problem, some theatres have installed acoustically transparent masking cloth, and others leave the masking open whenever they are showing a 1.85:1 film with a stereo soundtrack. Moving the speakers towards the center of the screen to clear heavy masking is not a good solution, since the stereo separation would be degraded.

Repainted screens cannot be used for quality sound playback, because the perforations, which allow the high frequencies through the screen, can become clogged with paint.

Chapter 4
B-Chain Alignment

4.1 Check Theatre Equipment

Thoroughly check the loudspeakers and power amplifiers for any sources of poor performance, using the suggested checklists below as a guide.

Speakers

- Loudspeaker cables – Check that they are in good condition and that they are the correct gauge for the impedance of the speakers and the length of the run.
- Speaker wiring – Check that the speakers are connected to the correct power amp channel.
- Rattles – A leak in the low-frequency driver cabinet may sound like a rattle.
- Loose bolts or other hardware.
- Open drivers – In systems with pairs of drivers, one voice coil of the pair may be open but the system will still function. Check the speakers with an ohm meter. If one channel requires markedly more equalization than the other, or if one speaker overloads at lower levels than the other speakers, an open driver circuit could be the cause.
- Missing drivers or other components.
- Crossover settings matching the type of drivers in use and the acoustics of the theatre – The high-frequency driver level control must be set for the best possible frequency response before you attempt any equalization. This is especially true if the system uses active crossovers with bi-amp equipment.
- Polarity switched between the low-frequency and high-frequency drivers, and between the channels.
- Aiming of speakers – Ensure that the speakers are correctly aimed into the auditorium, and that they are not obstructed by the screen frame, struts, or other obstructions.

Amplifiers

- Distortion.
- Gross gain differences among amplifiers – If one amplifier differs in performance from the others, it should be checked and repaired if necessary, before proceeding further. Input gain controls should all be at the same setting.
- Blown fuses.
- Good cooling air movement through power amplifiers.

Air-conditioning

If air-conditioning noise is audible in the theatre, arrange for lubrication of the motor and fan bearings, adjustment of belts and drives, and cleaning of filters to reduce the ambient noise to a minimum.

4.2 Microphone Placement

Position a microphone multiplexer in the center of the listening area. Place each microphone in the auditorium so that each is substantially in the reverberant field rather than in an area that receives the most direct energy from the speakers. In addition, avoid perfect symmetry. Arrange the microphones so that they are not arranged in a perfect square or rectangle parallel to the sides of the room. Take care not to place any of the microphones (except mic number 1) on the central axis of the room. Standing waves and nodes at these positions can cause measurement errors. Microphone number 1 should be placed 2/3 of the distance from the front speakers to the rear, at the exact side-to-side center of the room, approximately five feet above the floor level, and pointed straight up, 90° to the screen. Placement of this microphone is important for output level adjustments.

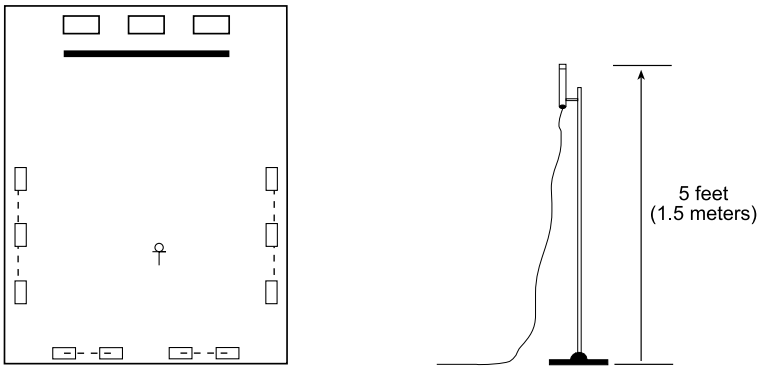
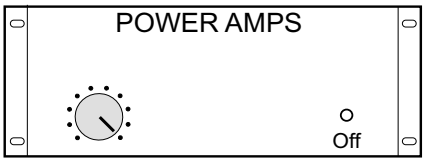


Figure 4–1 EQ Microphone Placement

If a single microphone is used (NOT advised), the recommended position would be 2/3 of the way from the front speakers to the rear, off the axis of the center speaker, 5 feet above the floor level, and pointed straight up, 90° to the screen.

Route the output cable to the CP650 and connect it to the microphone connector on the rear panel or front setup panel (XLR on the rear panel or 9 pin D-connector "MIC MUX" input on front setup panel). The mic input connectors are wired in parallel. Phantom power is optionally provided to both mic connectors by moving DIP switch 3 to the up position.

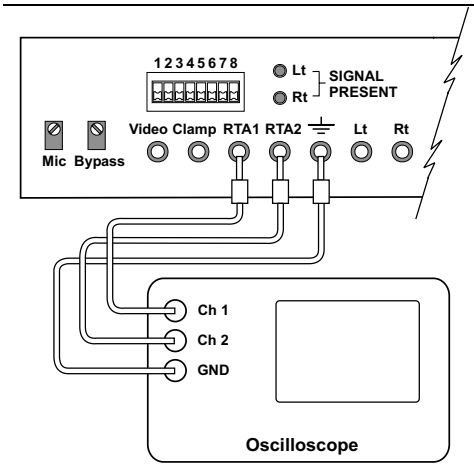
4.3 Initial Setup



Set all the gain controls on all power amplifiers to a known repeatable setting. **The preferred setting for most amplifier gain controls is maximum.**

If a different setting is required in order to optimize the noise performance of the system, the controls should be locked in position or marked clearly.

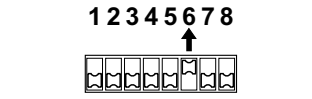
***Caution**: The following steps will cause the CP650 to output pink noise to the power amplifiers. The CP650 output levels may be set too high. If you are unsure of the settings on your unit, turn off the power amplifiers before selecting the "Calibrate SPL" menu item shown in Section 4.4 below. Then, select and observe the present output level adjustment settings. (press left menu button two times while the unit is in setup mode.)*

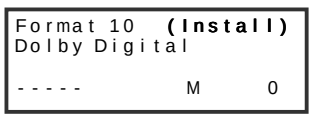


Connect an oscilloscope to the following test points located on the setup panel:

RTA1-to-scope channel 1
RTA2-to-scope channel 2

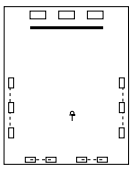
Set the oscilloscope to display both channels. Use the "chop" mode instead of "alt" mode for the best display results.





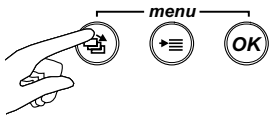
Slide DIP switch-6 to the UP position. This switches the CP650 into setup mode.

"(Install)" appears on the display screen.



If a microphone multiplexer is being used, select MIC 1.

4.4 SPL (Sound Pressure Level) Calibration

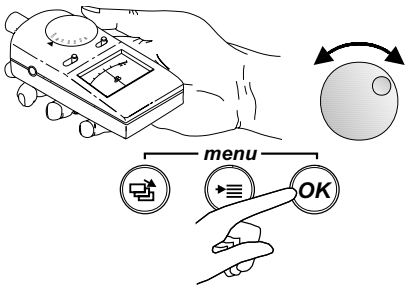



```
Calibrate SPL
Enter Room Reading:
> xx.x dB
Press OK to contunue
```

Press the left menu button once to move the display one menu step.

"Calibrate SPL" appears on the screen and pink noise is sent to the center channel speaker.

The scope should now be receiving sync signals from the CP650. Set the scope vertical inputs to 100 mV/div. Set the horizontal sweep rate to 1 ms/div. Temporarily switch the inputs to GND and move the vertical position of each trace to line up with the bottom screen graticule line. **Do not move the vertical positions after completing this step**. Switch the inputs to DC and adjust the sync to trigger on the waveform. Adjust the scope horizontal position offset such that each displayed burst appears on the left and right-hand sides of the screen. If necessary, adjust the Mic input level pot until the center area of the displayed pink noise moves to the middle of the scope screen.




```
Please Wait...
Calibrating....
```

With a sound pressure level meter, measure the noise level in the room. Rotate the front panel knob until the room reading is shown on the front panel screen.

Note: Hold the sound pressure level meter near the location of Mic 1. The adjustment range is from 45 to 108.5 dB in 0.5 dB steps.

Press the ***OK*** button.

Wait while the system automatically calibrates to the room reading.

Note: The calibration is retained in CP650 memory and can be used in future alignments. However, it is advisable to recalibrate the system when re-arranging microphones because the sound pressure level will vary slightly with microphone placement.

```
Mic Level Too Low

Proceeding
Uncalibrated
```

Note: The spectrum analyzer, built into the CP650, has automatic level control covering a range of mic input levels. However, if you see an error message reporting mic level too low or too high:

The microphone(s) may require phantom power. Move DIP switch 3 UP, press / hold the left menu button, and rotate the main fader counterclockwise one step back to the Calibrate SPL Menu, and repeat the above steps.

OR

While watching the oscilloscope RTA display, adjust the "Mic" gain control to place the flat part of the signal in the approximate center of the screen. The trimpot is accessible through an opening in the setup panel. Then press / hold the left menu button, and rotate the main fader counterclockwise one step back to the Calibrate SPL menu, and repeat the above steps.

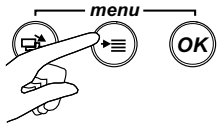
4.5 Initial Output Level Calibration

Each of the channels should now be adjusted to give a reasonable sound pressure level in the room. It is not necessary to get exact readings at this point since the levels will change slightly during equalization of the room. Exact output level adjustment will be performed after equalization.

4.5.1 Main Channels

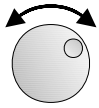
After auto-calibration, the **Output Levels** adjust screen appears with **Center Channel** active.

Note: The RTA oscilloscope display is not active on this menu.

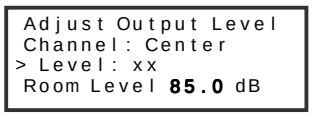


Press the center menu button, moving the cursor down one line to **Level:**

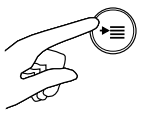
Note: The **Level:** line on the display shows a relative number. The number has no units.



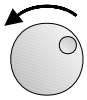
Rotate the main fader knob to change the CP650 pink noise output signal level into the auditorium while watching the measured **Room Level** shown on the bottom line of the display. Set it to **85 dB**.



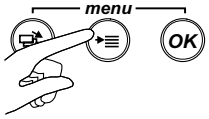
Note: If the room level does not appear, the calibration step may have failed or was not performed. Repeat Section 4.4.



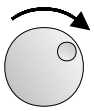
Press the center menu button once to move the cursor back up to the **Channel:** selection.

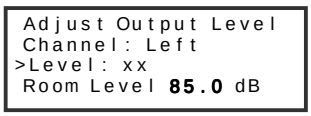


Rotate the main fader knob counterclockwise to change the Channel selection to **Channel: Left.**

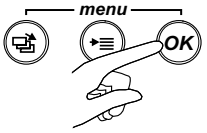


Press the center menu button, moving the cursor down one line to **Level:**



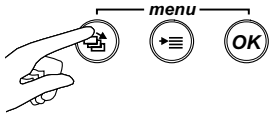
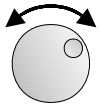


Rotate the main fader knob to set the room level to **85 dB.**

Right = 85 dB	Repeat this process for the **Right** screen channel.
Ls and Rs = 82 dB	Repeat this process setting the **Ls** and **Rs** channels to **82 dB**.
 Saving Changes..... ...	When all channels have been adjusted, press the right-hand **OK** button. "Saving Changes" appears on the front panel screen. **Note: If any other button is pressed, all of these settings will be lost!**

4.5.2 Subwoofer Channel

The initial subwoofer level adjustment uses a displayed RTA reference line, established from the center channel pink noise level. The subwoofer level is adjusted to match the displayed reference line. Final subwoofer level adjustments for both digital and optical signal paths are carried out later, after the room is equalized.

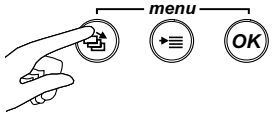
 Digital Subwoofer >Level: xx Polarity: Normal Center Noise: Off	Switch the microphone multiplexer to cycle. Press the left menu button once to move the display one menu step. The **Digital Subwoofer** channel adjust menu appears next. Scope channel 2 displays a reference line. Note: The RTA oscilloscope display is active on this menu.
Digital Subwoofer >**Level**: xx Polarity: Normal Center Noise: Off 	Pink noise is now present on the subwoofer channel only (100 Hz bandwidth). Using the front panel knob, adjust the subwoofer channel level by moving the average subwoofer RTA display to the reference line displayed on the scope.
 Saving Changes..... ...	Press the right-hand **OK** button to save the level setting.

4.6 Room Equalization

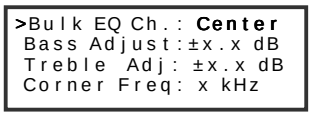
Room equalization is performed using the real-time analyzer (RTA) circuit built into the CP650 along with an oscilloscope for RTA display. The adjustments for the five full-range channels involves two steps: coarse, or “bulk,” adjustment using bass and treble controls, and fine adjustment, using a 27-band equalizer. Subwoofer channel equalization involves setting the frequency, "Q," and level of "cut" using a single-band parametric equalizer circuit.

The RTA screen on the scope displays a standard (ISO 2969) response curve. The ideal setting is reached when the room response readings fall on (or very close to) this standard curve.

4.6.1 Setting Coarse (Bulk) EQ

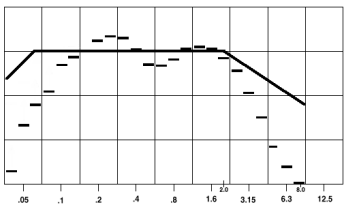


Press Left menu button.

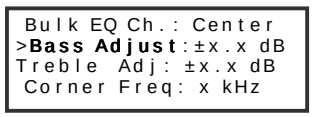


The **Bulk EQ** menu appears with **Center** channel selected.

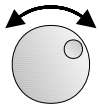
Pink noise will appear at the center channel speaker.



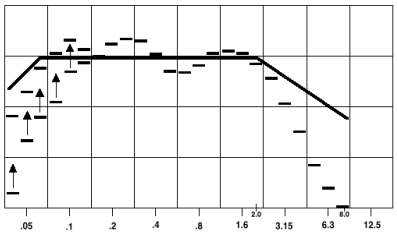
The standard response curve should appear over the average of the displayed mid-frequency peaks. If this is not the case, the scope setup step may have been performed incorrectly. See Section 4.4, first step.



Press the center menu button to move cursor down to **Bass Adjust:**

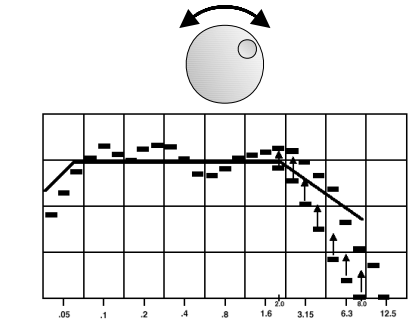


Slowly move the front panel knob to adjust the low-frequency response as close as possible to the reference line displayed on the RTA.



```
Bulk EQ Ch.: Center
Bass Adjust:±x.x dB
>Treble Adj: ±x.x dB
Corner Freq: x kHz
```

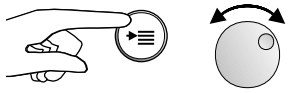
Press the center menu button to move cursor down to **Treble Adjust:**



Slowly move the front panel knob to adjust the high-frequency response as close as possible to the reference line displayed on the RTA.

If a satisfactory response is not obtained, try changing the corner frequency. Pressing the center menu button again moves the cursor to set the **Corner frequency**. The frequency selections are 1, 2, 3, or 4 kHz by rotating the front panel knob.

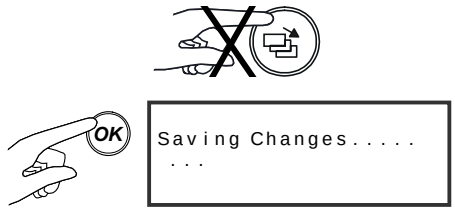
1, 2, 4 KHz



L, R,
Ls, Rs

Adjust each of the remaining full-range channels by using the center menu button to move the cursor to **Bulk EQ Ch.:,** and front panel knob to select the desired channel

Note: Bulk equalization facilities for the surround channels are slightly different than for the screen channels. The corner frequency is fixed at 2 kHz and is not changeable. There is also a 3 dB level shift to the standard response curve displayed on the scope.



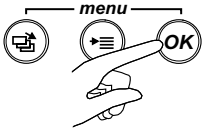
Note: Do not press the left menu change button. All settings would be lost!

Press the right-hand **OK** button to save all bulk EQ settings.

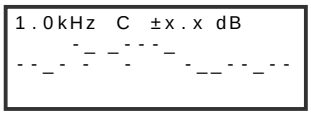
4.6.2 Setting Fine EQ (1/3 octave)

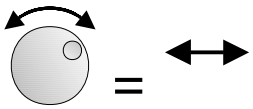
```
B-Chain EQ
Channel Select
>Center
Press OK to continue
```

Press the left menu button once to move to the **B-Chain EQ** menu. The software enters this menu with **Center** channel selected.



Press the OK button to begin final EQ on this channel.

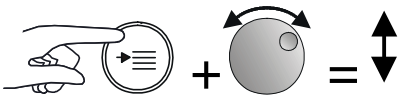




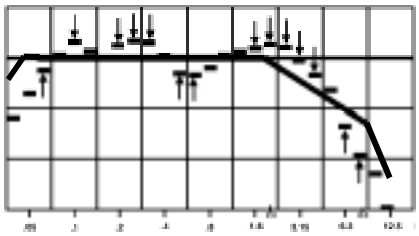
The 27-band RTA now displays on the oscilloscope.

1 kHz is the default start frequency band selected. A small marker on the scope trace shows the frequency band selected. Turn the front panel knob (with no button pressed) to select the active band. The CP650 screen cursor (line) blinks to indicate which band is active.

When the front panel knob is rotated to select frequencies at the far left (or right) side of the LCD screen, the displayed bands will "scroll" left (or right) to show the low or high frequency bands.



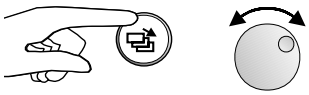
Press **and hold** the middle menu button while moving the front panel knob to adjust the level of the selected band. Perform fine adjustment of each band adjusting the response to be as close as possible to the standard curve displayed on the scope.



All of the equalizer bands interact with each other. You should not start at the low frequency end of the response curve and merely work your way to the high frequency end. As each band is adjusted, the response of adjacent bands is affected. Start at the center frequencies. The desired curve is a flat frequency response up to 2 kHz, falling at 3 dB per octave to 8 kHz (1 dB per third-octave band). If modern woofer systems (vented-box direct radiator enclosures) are installed in the theatre, moderate bass equalization down to 40 Hz may be used. Once an adjustment seems OK, work on the frequencies on either side of it. You may find that a cut at one frequency is followed by a slight boost at adjacent frequencies.

Note: Do not press the left menu change button. All settings would be lost!

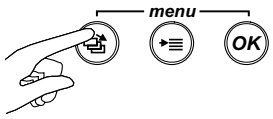
When the desired response for this channel has been achieved, press the right-hand **OK** button to save the settings.

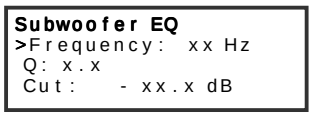


L, R, Ls, Rs

Press the left menu button once, then move the front panel knob to select the next channel to be equalized. Repeat the above procedure for the remaining full-range channels.

4.6.3 Setting Subwoofer Channel EQ





Press the left menu button twice to move to the **Subwoofer EQ** screen.

Equalization facilities for the subwoofer channel are different than for the other channels. This process is designed to correct the principal room resonance in the operating range of the subwoofer. The subwoofer equalizer is a cut-only filter, with adjustable frequency (25 to 125 Hz), Q (sharpness- four choices), and amount of cut (0 to 12 dB). There is no standard curve displayed for this function.

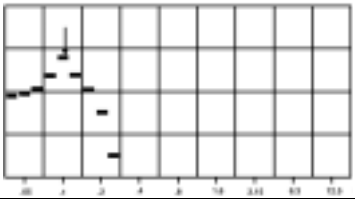
The center menu button is used to select **Frequency**, **Q**, or **Cut**, then the main fader knob to change the setting.

Q = 2.0

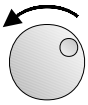
Press the center menu button to move the cursor to **Q:** , then rotate the front panel knob to set Q to **2.0**. This will produce a moderately wide notch.

Cut = 0.0 dB

Press the center menu button, moving the cursor to **Cut:**, then rotate the front panel knob setting cut to **0.0 dB** (minimum cut). This will disable the EQ so that you can determine the low-frequency resonant peak to be equalized. The factory setting is 0.0 dB.

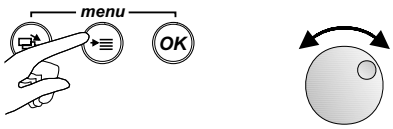


From the analyzer display, determine the primary low-frequency resonant peak of the room.

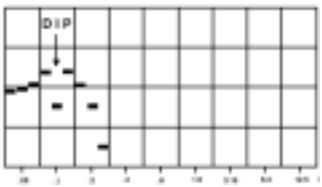


Cut = 12.0 dB

Rotate the front panel knob counterclockwise to set the Cut to maximum, 12 dB.



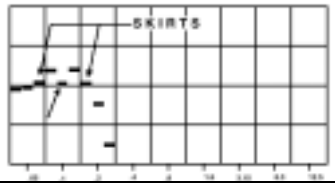
Frequency



Press the center menu button to move the cursor to **Frequency:**, then rotate the front panel knob. A dip in the frequency response will move along the frequency axis of the scope RTA display.

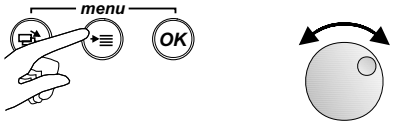
Adjust the frequency until the center of the dip is in the same band as the peak displayed in the previous unequalized frequency response.

Cut

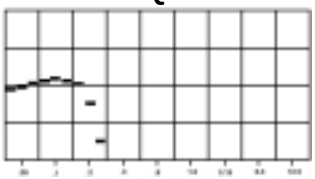


Press the center menu button to move the cursor to **Cut:**

Slowly reduce the amount of cut to flatten the dip displayed above. The center of the dip should be at the same level as the skirts.

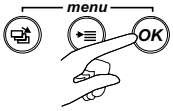


Q



Press the center menu button to move the cursor to **Q:**

Adjust Q for the flattest possible frequency response.



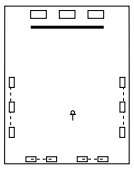
When the desired response has been achieved, press the right menu **OK** button to save the settings.

After saving the settings the display returns the Subwoofer EQ screen.

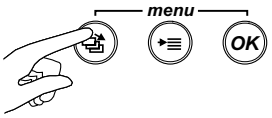
4.7 Final Output Level Calibration

Now that room equalization is complete, the sound pressure level in the theatre can be set accurately.

Main Channels


MIC 1

If a microphone multiplexer is being used, select MIC 1.




```
Output Levels
>Channel: Center
 Level: xx
Room Level xx.x dB
```

L, C, R = 85 dBC
Ls, Rs = 82 dBC

Press the left menu button to display the Output Levels screen.

Repeat the output level setting steps given in Section 4.5.1, starting with the second step in that section.

Note: Since the sound pressure level calibration was performed earlier, a recalibration is not required unless the microphone placement has changed. Repeat the steps in Section 4.4 if necessary.

Digital Subwoofer Channel

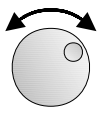
```
Digital Subwoofer
>Level: xx
 Polarity: Normal
 Center Noise: Off
```

Switch the microphone multiplexer to cycle.

Press the left menu button once to move the display one menu step to **Digital Subwoofer Level**.

Note: The RTA oscilloscope display is active on this menu. If the reference line does not appear, the calibration step may have failed or was not performed. Repeat the SPL steps in Section 4.4.

```
Digital Subwoofer
>Level: xx
 Polarity: Normal
 Center Noise: Off
```



Pink noise is now present on the subwoofer channel only (100 Hz bandwidth).

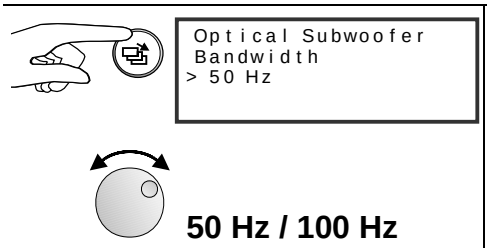
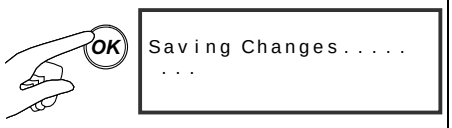
Using the front panel knob, adjust the subwoofer channel by moving the average subwoofer RTA display to the reference line displayed on the scope.


```
Saving Changes.....
...
```

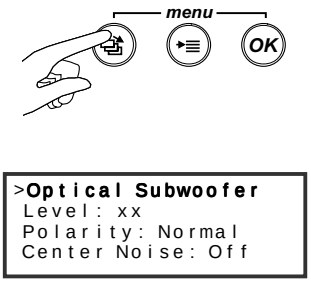
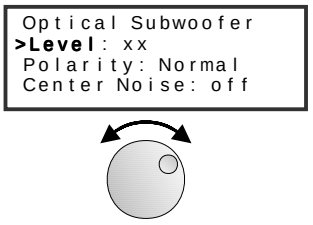
Press the right-hand **OK** button to save the final level setting.

Optical Subwoofer Bandwidth

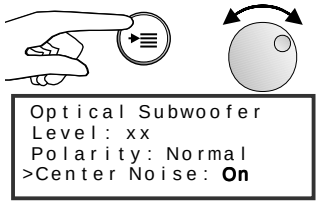
This menu item sets upper frequency limit of the subwoofer channel to either 50 or 100 Hz. The recommended setting depends on the type of screen speakers in your cinema. If you have direct radiator type screen speakers, set the bandwidth to 50 Hz. If you have the older horn-loaded type of screen speakers (such as Altec A-4), set the bandwidth to 100 Hz.

	Press the left menu button once to move the display one menu step to the **Optical Subwoofer Bandwidth**. Rotate the front panel knob to select the desired bandwidth.
	Press the right-hand **OK** button to save the selection.

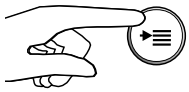
Optical Subwoofer Channel Level

	Press the left menu button once to move the display one menu step to the **Optical Subwoofer Level** setup menu. Pink noise is now present on the subwoofer channel only. Note: The RTA oscilloscope level reference line displays 10 dB lower for this adjustment and the pink noise generator bandwidth is 50 Hz for the optical subwoofer setup. If the reference line does not appear, the calibration step may have failed or was not performed. Repeat the steps in Section 4.4.
	Rotate the front panel knob to move the average level of the displayed pink noise up or down to the meet the reference line.

Subwoofer Speaker Polarity Check

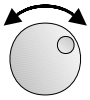


Using the center menu button, move the cursor to **Center Noise,** then rotate the front panel knob to **On.**



Polarity:

Press the center menu button to move the cursor to **Polarity:**



Normal / Inverse

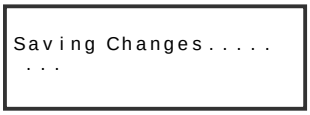
20 – 80 Hz

Level

Use the front panel knob to switch between **Normal** and **Inverse** polarity.

Note the change in the average level of the RTA bands between 20 and 80 Hz. There should be a **level DECREASE** when the polarity is **Inverse**. The polarity of the subwoofer wiring is incorrect if you do not see a decrease. In this case, reverse the subwoofer speaker wiring connections.

If the subwoofer wiring polarity is correct, you will see a level increase between 20 and 80 Hz on the RTA display when the front panel knob is rotated to "normal".



Press the right **OK** button to save the settings.

Note: The subwoofer polarity will always be reset to the "normal" setting. "Inverse" is a temporary setting for this test only.

Chapter 5
A-Chain Alignment

5.1 Overview

The A-chain alignment involves adjustments made to the projector soundhead optics, solar cell, and optical preamplifier board. It is the part of the sound system that covers the film path, analog soundtrack solar cell, optical preamplifier, slit loss equalizer, digital soundtrack reader, associated digital signal processing and decoding circuitry, and Dolby processing circuits.

The A-Chain optical level is calibrated with the Cat. No. 69T Dolby Tone test film. This film is used to establish the correct Dolby operating level within the CP650.

A Cat. No. 69P pink noise test film is used for A-chain frequency response and soundhead alignment. Pink noise has a constant amount of energy per 1/3-octave band, creating a flat response on a real-time analyzer display.

The optical slit is the key element in the A-chain because it imposes the initial limitation on the high-frequency response of the system. Light from the exciter lamp passes through the optical slit and is focused on the optical soundtracks on the film. The light that passes through the soundtracks falls on the stereo solar cell, which generates an electrical signal proportional to the audio signal recorded on the optical soundtracks. The slit introduces high frequency loss, which must be compensated by circuitry in the CP650.

The slit image must be correctly focused on the film and must be set at precisely a right angle to the direction of film movement in order to maintain the correct phase relationships between the two optical tracks. Any azimuth error will show as a loss of high frequency in the front channels and potentially excessive crosstalk in the surround channels.

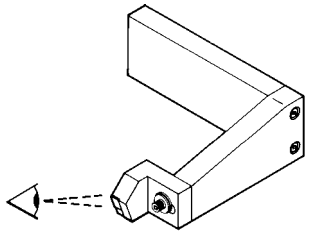
Each channel in the CP650 optical preamplifier is equipped with a slit loss equalizer control. Adjustment of this control shifts a fixed amount of boost upward or downward in frequency, but the shape of the curve remains constant. A flat response to 16 kHz can be achieved.

5.2 Reverse-Scan Checkup - Projector

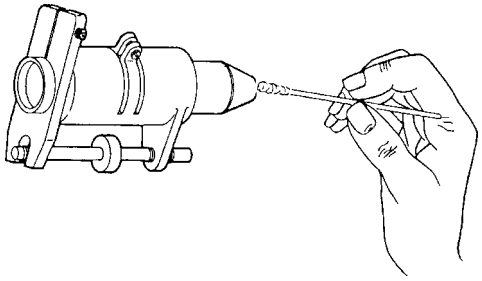
Clean the optical surfaces with a cotton swab moistened with glass cleaner. Inspect the film guides for evidence of cuts, cracks, surface defects, or any foreign materials that could impair smooth film guiding.

This section will be expanded with more detail in future manual releases.

5.3 Analog Optical Alignment - Projector

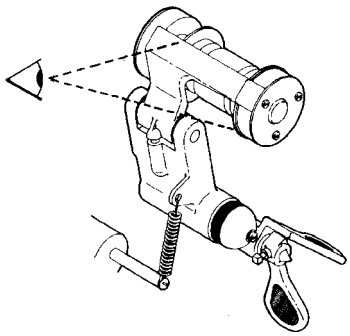


If a stereo solar cell is already installed on Projector No. 1, inspect the surface of the cell for cracks, chipping, or other damage. If the cell appears to require replacement, remove the mounting bracket from the projector and replace the cell and mounting block assembly.

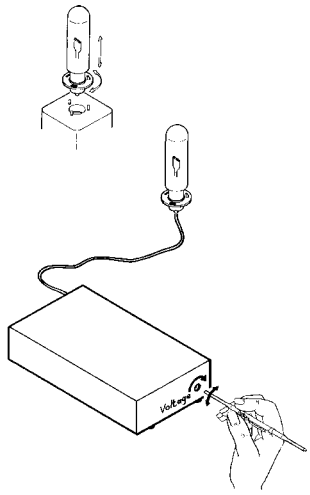


Clean the lens surfaces with a cotton swab moistened with glass cleaner. But keep in mind that you may find, during optical preamp adjustment, that it will be necessary to remove and inspect the lens if the high-frequency response is not correct.

If the lens is removed, clean the lens as indicated above and look through the lens at a light. Repeated heating and cooling of the lens can cause oil or other contaminants to enter the lens barrel. Verify that there is a clear, unobstructed light path through the lens and that the edges of the slit are sharp without cracks or corrosion. Fit a new lens assembly if you are unable to clear the optical path through the slit.



Inspect the lateral film guides for evidence of cuts, cracks, surface defects, or any foreign materials that could impair the film guiding. Clean or replace the guides, as necessary. The guide roller must rotate freely; if it is spring-mounted, make sure that lateral movement and return are not obstructed. If the roller has a felt or rubber insert, check for a flat spot and replace the roller if necessary.

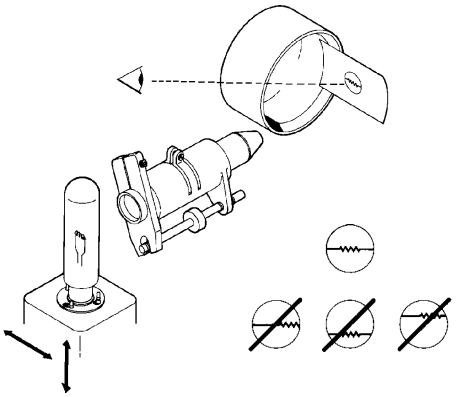


Remove the existing exciter lamp and replace with a new lamp.

Adjust the exciter lamp DC voltage to 70% to 85% of the rated voltage. Using an AC millivolt meter or oscilloscope, verify that there is no more than 3% ripple present with the lamp on.

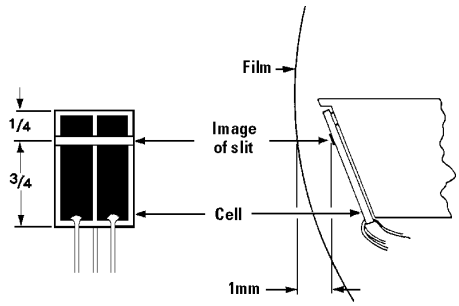
LAMP VOLTAGE	DC ADJUSTMENT
6 V	4–5 Volts
9 V	6.5–8 Volts

If the projector uses a plastic light pipe or tube, verify that the light output is not appreciably affected by dirt, cracks or flaws, yellowing, or foreign matter. Replace if necessary.

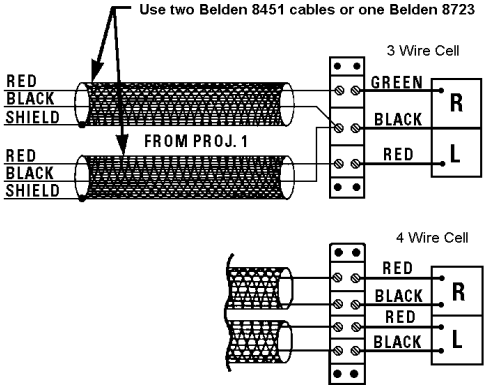


Place a white card at the front of the lens close to the position of the film sound track. Adjust the position of the exciter lamp until the image of the filament is centered both vertically and horizontally as shown.

If you have difficulty obtaining an image of the filament, place a piece of tissue paper over the lens to assist in seeing the image. Some projectors do not use adjusting screws to change the position of the lamp; shims are sometimes used for positioning.



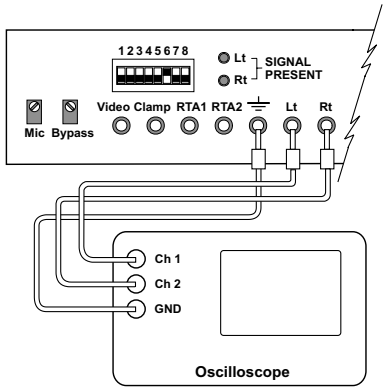
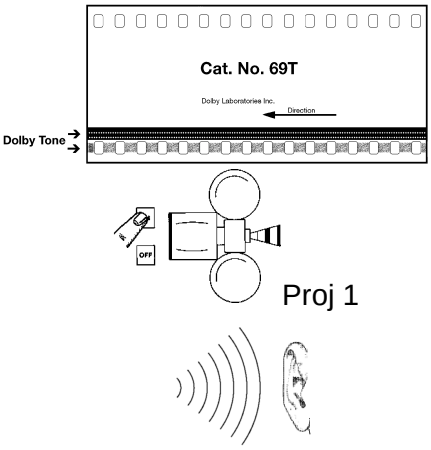
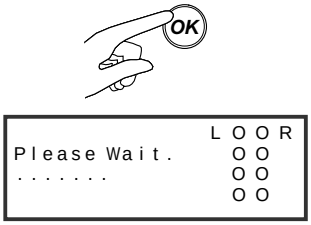
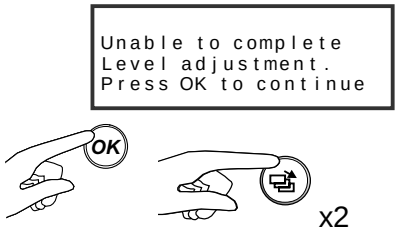
Loosely install the stereo solar cell bracket on the projector. Position the bracket carefully until the surface of the cell is 1 mm from the film plane surface. If this distance is exceeded, there will be crosstalk between the two optical stereo tracks. Check the image of the slit on the cell: It should be a thin sharp line. The slit image should be the width of the cell, and positioned three-quarters of the way up the cell. Try to get the best compromise among all of these conditions and then tighten the cell bracket mounting screws.

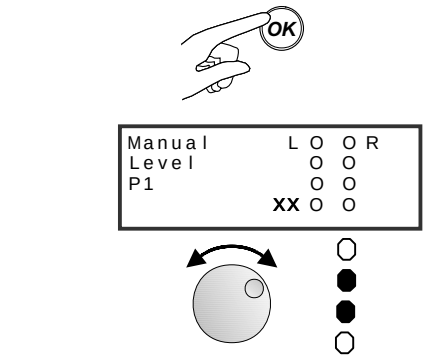


Confirm that the cell wiring and connections are correct. Shielded cables must be used. The inner conductors must be wired to the CP650 OPTICAL input connectors exactly as shown on the wiring diagram foldout.

NOTE: The solar cell associated with the right channel is closest to the edge of the film.

5.4 Dolby Level Set

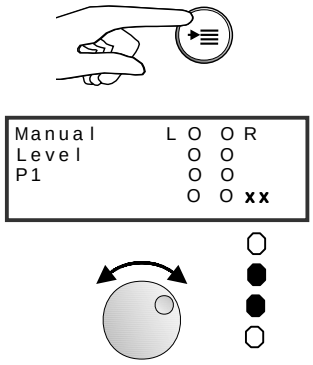
	Connect the oscilloscope to the Lt and Rt test points.
	Press the left menu button to move the display to **Automatic Optical Level Adjust Projector 1.**
	Thread and play a Dolby Tone test film, Cat. No. 69T on projector 1. The film emulsion should face away from the screen. Verify that the signal present LEDs on the CP650 setup panel are on. The Dolby tone signal should be visible on the oscilloscope. Listen to the tone on the booth monitor to identify any problems with distortion or unwanted film playing speed variations.
	Press the OK button to begin the automatic level calibration for projector 1. Perform automatic calibration for Projector 2 if the theatre is equipped with a second projector.
	If there is a problem with automatic calibration, this screen will appear. In this case, press the OK button to return to the Automatic Optical Level adjust screen, then press the left menu button twice to move to the Manual Optical Level Adjust menu for Projector 1.



Press the OK button to begin Manual adjustment.

The number displayed on the bottom line represents the level setting for Left channel. The four vertical circles display the Left channel signal level, similar to an LED meter.

Rotate the front panel knob until the two center circles fill black.

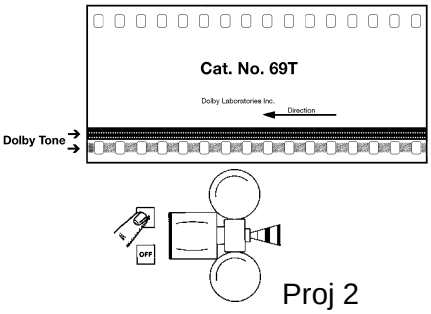


Press the center menu button to select the Right channel.

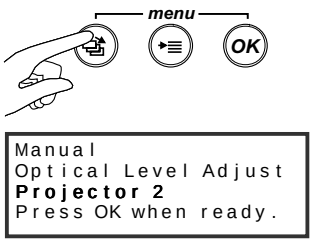
The number displayed on the bottom line will move the right-channel column.

Rotate the front panel knob until the two center circles fill black.

Press the OK button to save the level settings.

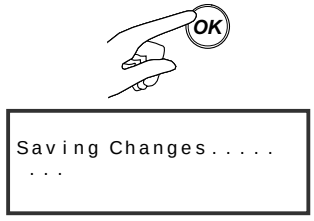


Stop the projector and load / run Cat. No. 69T film loop on projector 2, if so equipped.

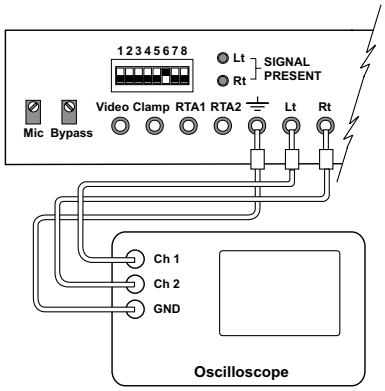
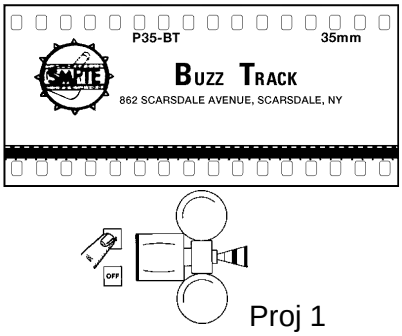
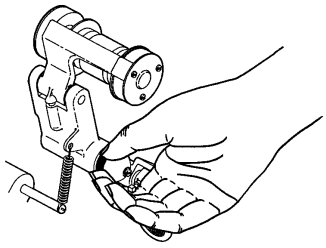


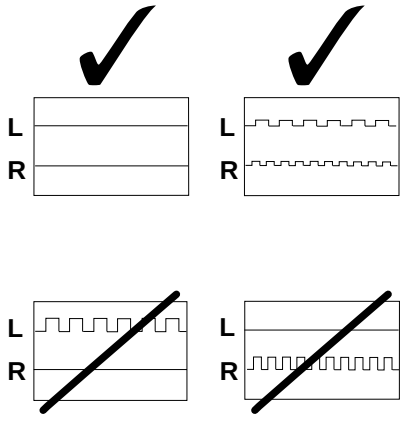
Press the left menu button moving the displayed menu to Manual Adjust for projector 2.

Repeat the procedure above for left and right channels.

	Press the OK button to save the level settings for Projector 2, left and right channels.

5.5 Film Path Alignment Check

	Connect the oscilloscope to the Lt and Rt test points.
	Thread and play a SMPTE Buzz Track test film. This film has modulation just beyond the normally scanned areas of the optical sound tracks. The objective of this test is to ensure that the slit illuminates only the soundtracks.
	The method of positioning the slit relative to the optical tracks varies with the design of projector installed. In many cases, the film guide is adjusted laterally for a null if the lens and exciter lamp are fixed in position. If the film guide cannot be moved, then adjust the lens and LED / exciter lamp assembly laterally.

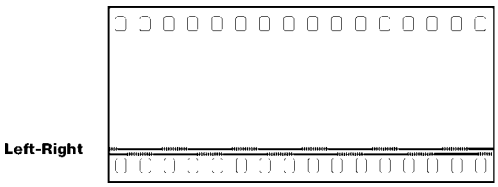


OSCILLOSCOPE TRACES

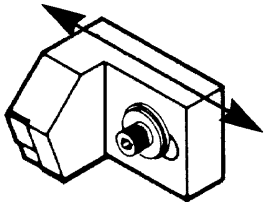
The adjustment is correct when there is no signal output while the film is running. It may not be possible to adjust for a null with some older slits; in such instances, adjust for a minimum and equal signal on L and R.

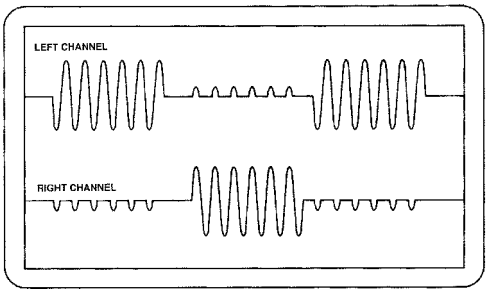
Some projectors use a lens with an adjustable slit width. The adjustment is correct at the point when the left and right signals both disappear equally.

5.6 Cell Alignment Check



Remove the SMPTE Buzz Track test film and thread and play the Cat. No. 97 Stereo Cell Alignment Film.



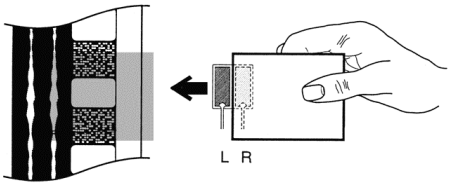


If a large amount of crosstalk is present on the scope display, loosen the stereo solar cell head and move it from side to side until the crosstalk is minimum and equal.

Note: The right channel is the track toward the outside of the projector. On some projectors, it may be necessary to stop the film to adjust the position of the cell.

Lock the cell bracket into position after completing this adjustment. Check that the crosstalk does not change as the bracket is tightened.

5.7 Cell Wiring Check

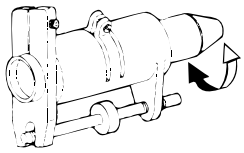


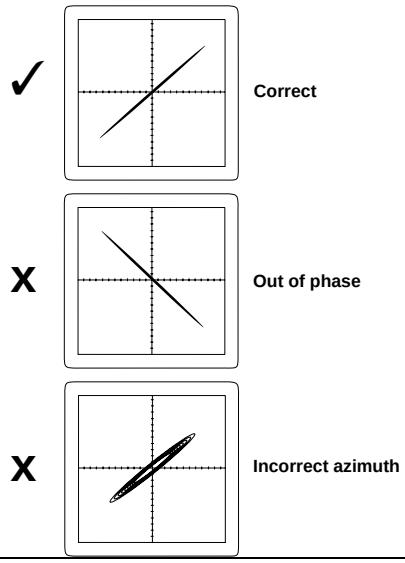
Verify that the outputs of the right and left solar cells are properly connected by placing a white card over the right sound track (nearer the outside of the projector) and verifying that the level of the right channel drops, as indicated by the **Rt Signal Present** LED on the CP650 setup panel.

If the film path, optics, or LED / exciter lamp were adjusted, repeat the previous film path alignment and cell alignment steps. The optimum setting is attained when no further adjustments are required using the two test films.

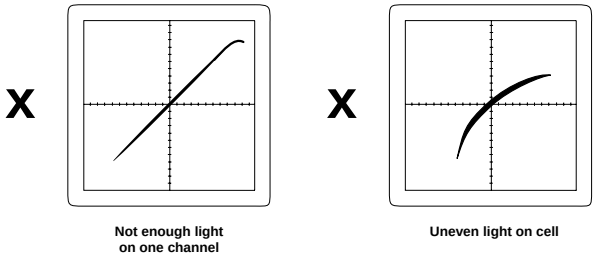
5.8 Azimuth Check

Thread and play the Cat. No. 69 P pink noise test film.





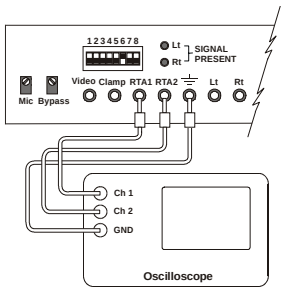
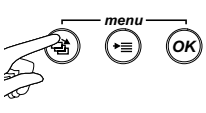
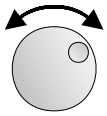
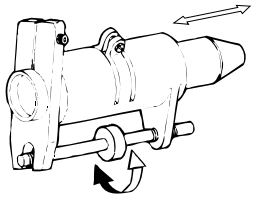
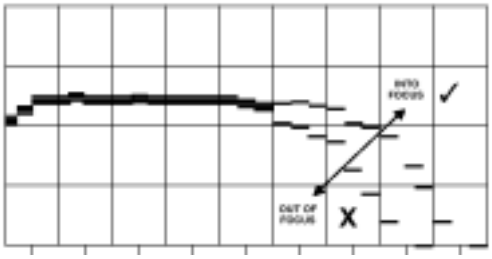
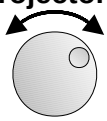
Switch the oscilloscope to the X/Y mode and adjust the azimuth of the projector optics for the narrowest diagonal trace.



Also, if the ends of the trace display thicker than the center area, then improper lighting of the edges of the optical tracks should be corrected.

Note If necessary, repeat the buzz track and cell alignment steps or LED / exciter lamp position steps above to reduce such blooming to a minimum.

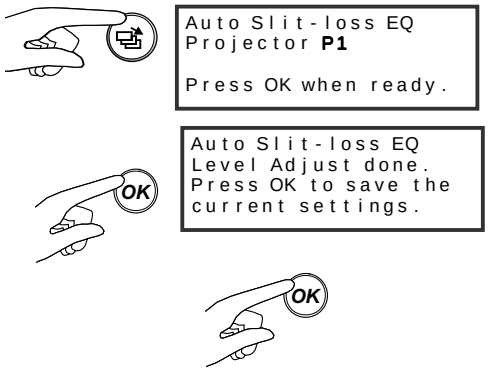
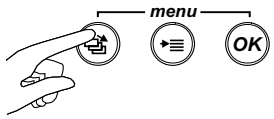
5.9 Focus Check

	Reconnect the scope to RTA1 and RTA2 test points.
 Optical Focus >Projector: P1 Channel: Left Press OK when ready.  **= Projector or Channel**  **= Select P1 then Left/Right**	Press the CP650 left menu button to move to the optical focus adjust menu. The scope RTA will display the frequency response of the left channel optical preamp output for projector 1. The center menu button selects the projector or channel. The front panel knob selects P1/P2, or Left/Right channel to view. Select projector 1.
 **Left / Right Channels:** 	With the pink noise test film running, observe the high frequency response displayed on the scope. Adjust the focus of the sound track lens for the best high frequency response on both the left and right channels. The RTA trace shown may not be typical of your results. Merely attempt to obtain the best response. The azimuth and focus adjustments interact so you must repeat the azimuth and focus adjustments until no further improvement is obtained. **Do not proceed to the next step until both the left and right results are similar.**
Projector 2  **Left/Right**	Repeat the focus adjustment for projector 2.

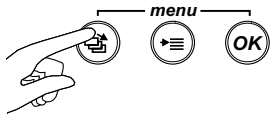
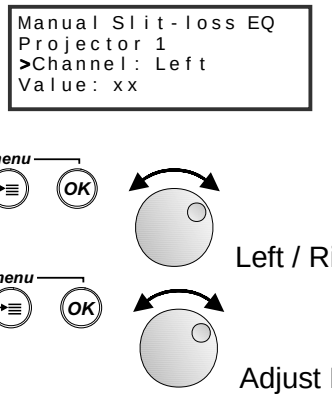
5.10 Optical HF Equalization (Slit-Loss EQ)

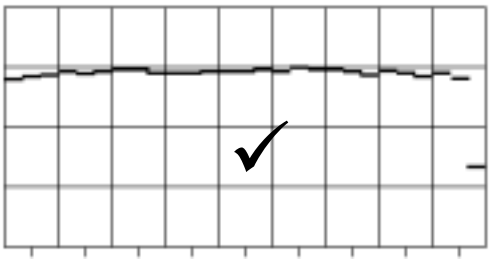
This step adjusts the high frequency response of the optical preamplifier circuit. The CP650 provides automatic or manual facilities for optical, or slit-loss, high frequency equalization. The Auto menu appears first:

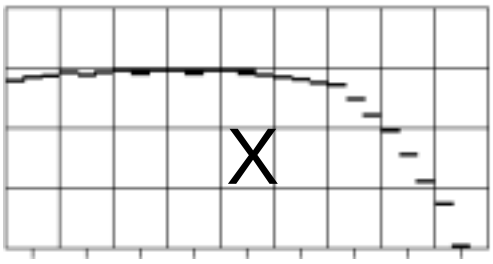
Auto Slit Loss EQ

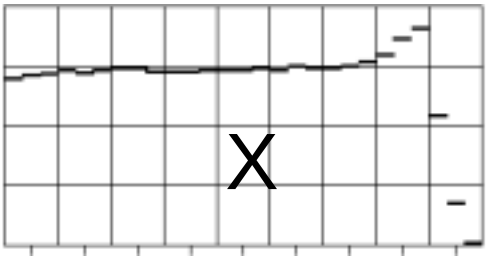
	Continue to play the Cat. No. 69 P pink noise test film.
Projector 1: 	Move the CP650 menu display to Auto Slit-Loss EQ for Projector 1. Press the OK button to begin automatic equalization. The HF response on both the Left and Right channels are automatically equalized. You can observe the action on the scope RTA display. Dots shown on the front panel display show progress. When the dots reach the end of the line, the right channel is automatically equalized. When EQ is completed, as shown on the display, press the OK button to save the settings.
	Press the left menu button to move to the Projector 2 menu and repeat the procedure above if a second projector is installed.

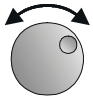
Manual Slit-Loss EQ

	The next menu is used for manually adjusting the slit-loss EQ.
Projector 1: 	Use the center menu button to chose between the channel to be adjusted and the setting (value).



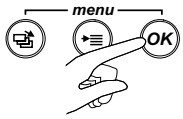






Rotate the front panel knob for the most extended high frequency response without "peaking."

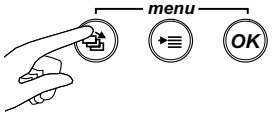
Note: If this procedure does not improve the response, the problem may be a degraded slit or lens damage.




```
Saving Changes.....
...
```

When the desired response has been achieved, press the right menu **OK** button to save the settings.

After saving the settings the display returns the Manual Slit-Loss EQ, Projector 1 menu.



Projector 2:

```
Manual Slit-loss EQ
Projector 2
>Channel: Left
Value: xx
```

Press the left menu button to move to the Manual Slit-Loss EQ, Projector 2 menu and repeat the procedure above.

Chapter 6
Digital Soundheads

6.1 Mechanical Alignment

Mechanical alignment of the Cat. No. 701 (or 700) Digital Soundhead consists of confirming that the film path through the Digital Soundhead is aligned with the path through the projector. For built-in reverse-scan (basement) digital soundheads, see the manufacturer's instructions.

1. Thread a length of film from a supply reel through the digital soundhead (refer to the threading diagram located on the soundhead), and continue through the projector as you would any film.
2. Apply tension to the film and inspect for equal tension on both edges of the film.
3. Check for uneven forces on the rollers, or twisting of the film.
4. When the path is aligned, tighten the soundhead mounting bolts and reel arm.

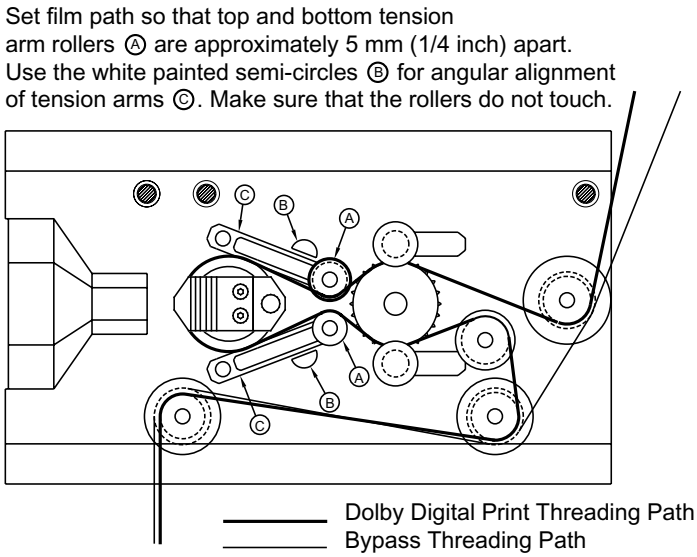


Figure 6–1 Digital Soundhead Adjustments

6.2 Adjustment with Oscilloscope

NOTE: The Cat. No. 701 Digital Soundhead is optically aligned at the factory and should not require adjustment unless the CCD Circuit Board has been disturbed.

The following test setup will enable adjustment of focus and confirmation or adjustment of light level and optical alignment.

1. Make sure power to the digital soundhead is provided. Power to the CP650 should also be on.
2. Open the CP650 front panel setup access door.
3. Connect a probe from Channel 1 of a 20 MHz or greater bandwidth oscilloscope to the VIDEO Test Point with the ground lead attached to the ground test point.
4. Connect a second probe from the scope's Channel 2 to the CLAMP signal test point to trigger the scope. Connect the second probe's ground wire to the ground test point.
5. Set the trigger source on the scope to Channel 2.
6. Adjust the Channel 2 vertical trace position to move the trace off the screen. It is not necessary to view this signal after triggering has been established.
7. Adjust the scope for one horizontal trace across the screen, and adequate vertical gain (approximately 2 μ sec/div. horizontal, 1 V/div. vertical).
8. With digital film threaded and running in the projector, observe the video waveform. (See figure 6-2 below).

6.3 Focus Adjustment

Cat. No. 701 (or 700) Digital Soundheads are factory adjusted and should not require adjustment during installation. If the soundhead has become misadjusted, it may be necessary to re-focus. Using the setup as above, adjust the objective lens/CCD assembly in the reader head by loosening the 2 mm hex socket set screw (located below the lens bore), which holds the lens/CCD assembly in place, then moving the assembly back and forth. There are two methods for moving the assembly. A flat blade screw driver inserted in the oval slot above the lens can be twisted to slide the assembly. Alternatively, if the CCD circuit board cover is removed, the assembly can be moved back and forth with the thumb and forefinger. The best focus is achieved when the scope pattern has minimum brightness in the center of the trace. There will always be some light here; look for the most "in-focus" display possible, while maintaining minimum brightness inside the envelope. This should correlate with minimum error rate. Re-tighten the lens holding screw.

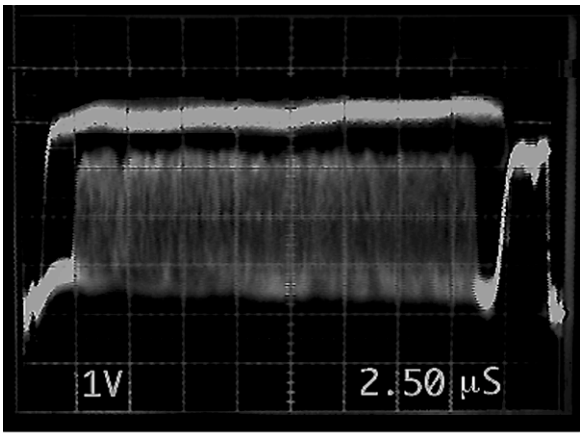


Figure 6–2 Digital Video Oscilloscope Image – Focus Adjustment.

6.4 LED Brightness Confirmation and Adjustment

The optimum peak video signal voltage (unobstructed light through the perf hole) is **4 V**, measured from the 0 V reference baseline to the **upper trace**. If necessary, adjust the Cat. No. 701 power supply output to achieve the correct video voltage. See the figure below for adjustment location (VR1). The back cover of the digital soundhead must be removed to gain access to the output adjustment.

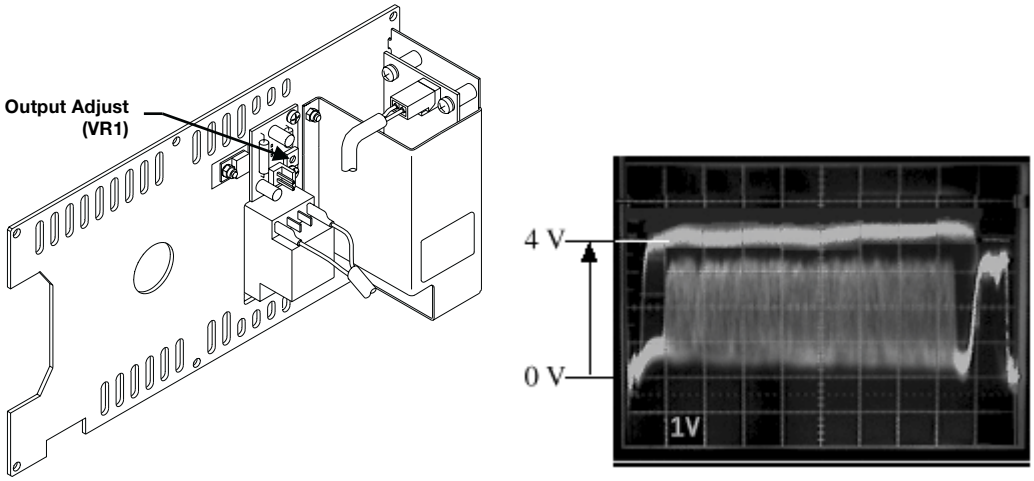


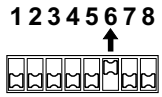
Figure 6–3 Cat. No. 701 LED Brightness Adjustment

6.4.1 Inboard Digital Readers

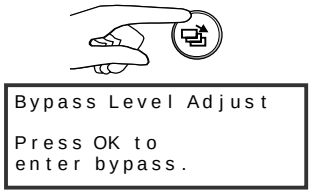
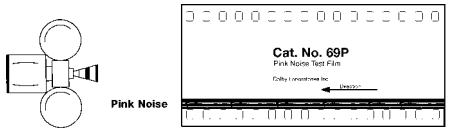
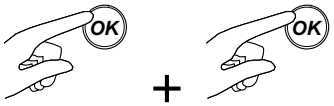
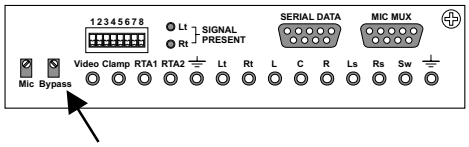
There are several varieties of basement readers, some use lamps, and some use LEDs as the illumination source. Refer to the instructions for the built-in reader for details on adjusting lamp/LED current. In any case, the proper video level is 4 Volts. If the top of the video waveform is not reasonably flat (+/- 1 division), check for dirt, dust, or other obstruction to the light path, and clean.

Chapter 7
Final Adjustments

7.1 Bypass Level Adjustment



DIP switch 6 UP

	Press the left menu to move the Bypass Level Adjust menu (or press and hold while rotating the front panel knob). Press the OK button, switching the CP650 to bypass operation. The main power button will illuminate, confirming that the unit is in bypass.
	Thread and play a loop of Cat. No. 69P pink noise test film.
 **Normal / Bypass** 	Using the OK button, toggle back and forth between normal and bypass operation, while setting the bypass level trimpot located through the access hole on the setup panel. Adjust the pot until the audio level is the same for normal and bypass. When finished, leave the CP650 in normal operating mode (Power button **not** showing red).

Optical Surround Level Trim

It is recommended that you perform this adjustment. See Appendix C.

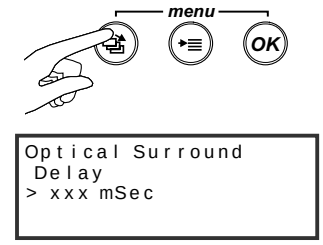
7.2 Setting Optical Surround Delay

In analog optical formats, the CP650 incorporates a delay line in the surround channel to ensure that sound from the rear of the theatre arrives at the listeners' ears approximately 20 milliseconds after the arrival of sound from the front speakers. The delay is adjustable from 20 to 150 ms in 1 ms steps. The setting is stored to CP650 memory using the procedure outlined below. Use the following formula to calculate the correct delay setting:

1. Estimate the distance between a rear seat and the nearest surround loudspeaker, in feet. If the metric system is used, convert the distance from meters to feet by multiplying by three (3).
2. Estimate the distance from this seat to the front loudspeakers, in feet. If the metric system is used, multiply the distance by three (3) to convert distance from meters to feet.
3. Subtract the distance measured in step 1 above from the distance measured in step 2, then add 20. The result is the delay time, in milliseconds.

For example:

- The selected seat is 10 feet (3.3 meters) from the nearest surround speaker.
- The selected seat is 80 feet (26.7 meters) from the front speakers.
- The delay is set for (80-10) + 20 = 90 milliseconds.

	Press the left menu button to move to the Optical Surround Delay setting menu.
	Rotate the front panel knob to show the desired delay then push the OK button.

You can verify that the delay setting is acceptable by listening to a familiar Dolby Stereo film that ideally contains both center channel dialogue and some discernible surround sound. The Dolby Cat. No. 251 SR/Digital "*Jiffy*" film serves very well for this purpose. If a stereo film is not available, the delay time can be checked with a mono film if the film is played in Format 04, Dolby stereo optical with surround. All speakers should be ON for this test.

While the film is playing, walk around the theatre and listen carefully to the surround speakers during center channel dialogue. The dialogue should appear to be coming primarily from the screen, and not from the surround speakers.

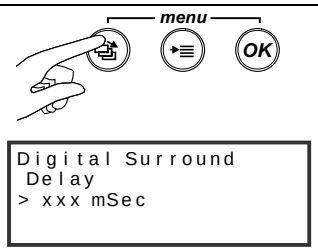
If you hear discernible dialogue from the surround speakers, the delay time was probably set too long.

If you hear an objectionable amount of dialogue from the surround speakers that persists regardless of the delay time setting, there is probably a severe gain or azimuth error in the system. Re-check both the Dolby level and the A-chain alignment of the optical system.

In many films, the surround information is intended for subtle effects and may provide only a low-level ambience. If the surround level and delay time have been adjusted as previously described, the surround information will be at the level desired by the film director. Do not be tempted to increase the surround level because the effect desired by the film production team may be impaired or destroyed.

7.3 Setting Digital Surround Delay

The CP650 automatically calculates a typical digital surround delay based on the optical surround delay setting performed in the previous section. Actual theatre geometry affects the amount of surround delay required, therefore you may wish to set the delay manually.

	Press the left menu button to move to the Digital Surround Delay setting menu.
	Rotate the front panel knob to show the desired delay then push the OK button.

Tables 7-3 and 7-4 show approximate delay values (in milliseconds) based on theatre width and length. Setting of surround delay should be verified by listening at various locations in the theatre.

Table 7-3. Surround delays based on theatre dimensions in feet

Length (feet) \ Width (feet)	20	30	40	50	60	70	80	90	100	110	120	130	140
20	10	10	10	10	10	10	10	10	10	10	10	10	10
30	10	10	10	10	10	10	10	10	10	10	10	10	10
40	20	20	20	20	20	20	20	20	20	20	20	20	20
50	30	20	20	20	20	20	20	20	20	20	20	20	20
60	30	30	30	30	30	30	30	30	30	30	30	30	30
70	40	30	30	30	30	30	30	30	30	30	30	30	30
80	50	40	40	40	40	40	40	40	40	40	40	40	40
90	50	50	40	40	40	40	40	40	40	40	40	40	40
100	60	50	50	50	50	50	50	50	50	50	50	50	50
110	70	60	60	50	50	50	50	50	50	50	50	50	50
120	70	70	60	60	50	50	50	50	50	50	50	50	50
130	80	80	70	70	60	60	60	60	60	60	60	60	60
140	90	80	80	70	70	60	60	60	60	60	60	60	60
150	90	90	80	80	80	70	70	70	70	70	70	70	70
160	100	100	90	90	80	80	70	70	70	70	70	70	70
170	110	100	100	90	90	80	80	80	80	80	80	80	80
180	110	110	100	100	100	90	90	80	80	80	80	80	80
190	120	120	110	110	100	100	90	90	90	90	90	90	90
200	130	120	120	110	110	100	100	100	90	90	90	90	90

Table 7-4. Surround delays based on theatre dimensions in meters

Length (meters) \ Width (meters)	10	15	20	25	30	35	40	45	50
10	20	20	20	20	20	20	20	20	20
15	20	20	20	20	20	20	20	20	20
20	30	30	30	30	30	30	30	30	30
25	40	40	40	40	40	40	40	40	40
30	50	50	50	50	50	50	50	50	50
35	60	60	50	50	50	50	50	50	50
40	80	70	60	60	60	60	60	60	60
45	90	80	70	70	70	70	70	70	70
50	100	90	80	80	80	80	80	80	80
55	110	100	90	90	80	80	80	80	80
60	120	110	110	100	90	90	90	90	90
65	130	120	120	110	100	100	100	100	100
70	140	140	130	120	110	110	110	110	110
75	150	150	140	130	120	120	110	110	110

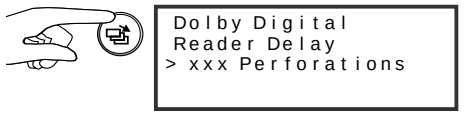
7.4 Setting Dolby Digital Reader Delay

On a Dolby Digital print, the digital sound data is located six frames in advance of the analog soundtrack, and 26 frames in advance of the picture. When the digital soundhead is mounted above the analog soundhead (as with the Cat. No. 701) a delay is necessary in order to synchronize the digital soundtrack with the analog track and the picture. In the CP650, this delay is set by entering the number of film perforations, within the range from 12 perfs (approximately 160 ms delay) to 512 perfs (approximately 5 seconds).

Soundhead delay can be determined in either of the two ways described below: **static or dynamic**.

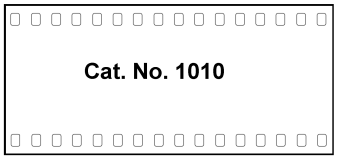
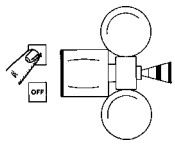
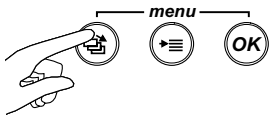
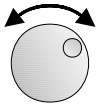
Static

1. Thread a length of Cat. No. 1010 Digital Soundhead alignment test film such that the “bullet” frame (perf 106) is located in the picture gate, and perf number 26 is located at the analog soundhead.
2. With the length threaded through the Cat. No. 701 Digital Soundhead, read the number of the perforation present in the light path of the digital soundhead. Enter this number using the procedure shown below:

	Press the left menu button to move to the Digital Reader Delay setting menu.
 **= xxx Perfs**	Rotate the front panel knob to show the number of perforations obtained above, then push the OK button.

3. Verify the accuracy of the setting by running a loop of Cat. No. 1010 test film and observing that the flash on the screen coincides with a pip in the sound.

Dynamic

  **Proj 1**	Thread a loop of Cat. No. 1010 Digital Soundhead alignment test film through the projector, analog soundhead, and digital soundhead. Run the projector.
 	Press the left menu button to move to the Dolby Digital Reader Delay setting menu. Both optical and digital audio are present while the CP650 is set to this menu item.
 **= xxx Perfs** 	The audio contains equal digital and optical sound simultaneously. Rotate the front panel knob to set the number of perfs that produce a minimum delay between the analog and digital track, then push the OK button.

The tables below show representative delay settings for a variety of common projectors in use:

Table 7-5. Typical Delay Settings for Dolby Digital Readers

Projector	Delay - Perfs
Ballantyne 35mm	247
Century 35mm (SA)	245
Century 35/70 (JJ)	309
Cinemeccanica V5	252
Cinemeccanica V8	260

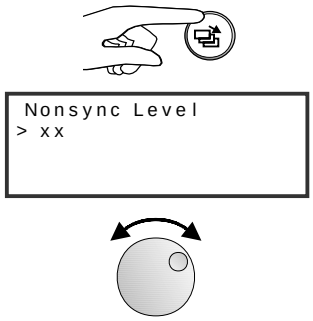
Projector	Delay - Perfs
Christie	250
Norelco/ Kinoton AAII (DP70)	283
Simplex 35mm (XL)	242
Simplex 35/70	298

Table 7-6. Typical Delay Settings for Built-in Digital Readers:

Projector	Delay - Perfs
Century w/ Component Engineering or Kelmar	20
Christie	26
Ernemann 15	30

Projector	Delay - Perfs
Cinemeccanica V5	28
Simplex 5 Star w/ Component Engineering or Kelmar	26

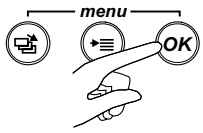
7.5 Nonsync Level Adjustment



Press the left menu button to move to the Nonsync 1 (or Nonsync 2) Level adjust menu.

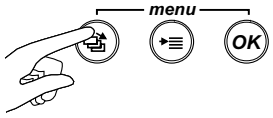
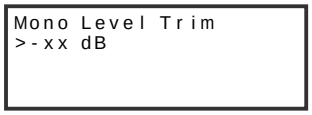
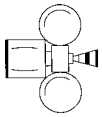
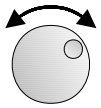
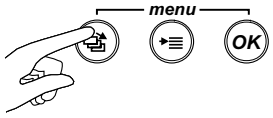
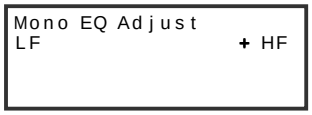
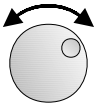
Play a CD or cassette, etc, on the nonsync device and adjust the front panel knob for the desired level in the theatre. If possible, select a recording that has a natural ambience such as an orchestral work.

Note: During nonsync level setting, the main fader level is fixed at 7.0. This makes special fader settings for Nonsync unnecessary.

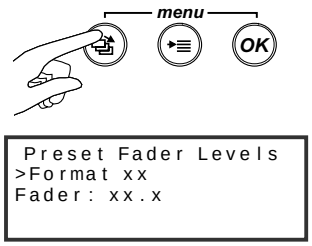
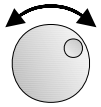
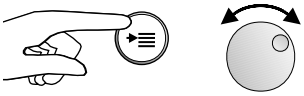
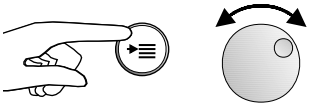


Press the OK menu button to save the desired level setting.

7.6 Mono Level Trim and EQ Adjustment

 	Press the left menu button to move to the Mono Level Trim menu.
	Thread and play a mono film familiar to you.
	While the film is running, adjust the front panel knob to the desired loudness level. Note: During mono level setting, the main fader level is fixed at 7.0. This makes special fader settings for mono films unnecessary.
	Press the OK menu button to save the desired level setting.
  	Press the left menu button to move to the Mono EQ Adjust menu. If necessary, adjust the front panel knob to change the equalization for a more pleasing sound. Note: With the "+" symbol located at the far-right position (HF setting) of the display, the CP650 applies the "Academy" filter.
	Press the OK menu button to save the desired EQ setting.

7.7 Preset Fader Levels

	Press the left menu button to move to the Preset Fader Levels menu. Preset levels can be assigned to each CP650 format button.
 **01, 04, 05, 10, 11, U1, U2, NS**	Rotate the front panel knob to select the format button you wish to preset.
 **0–10 (or None)**	Press the center menu button to move to "Fader:" select and rotate the front panel knob to the desired level setting.
	Press the OK menu button to save the setting.
 **01, 04, 05, 10, 11, U1, U2, NS**	Press the center menu button to move to "Format" and rotate the front panel knob to select the next format button you wish to preset. Repeat the steps above to set the preset fader level and save the change.

7.8 Assigning User Button Formats

Any available format can be assigned to the U1 and U2 buttons ("User 1" and "User 2"). Then, when the button is pressed, that format will be selected.

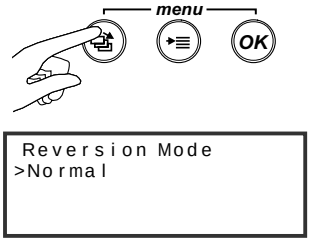
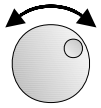
 User Format 1 > Format xx *format name*	Press the left menu button to move to the to the User Format 1 menu.
 User Format 1 >Format 13 Surround EX	Rotate the fader knob to select one of the many format choices available to you. This example shows format 13, Dolby Digital Surround EX, selected.
 Saving Changes...	Press the OK button to save the assignment to the User 1 button.
 **1X**	Press the left menu button once to step to the **User Format 2** menu.
 User Format 2 >Format 65 Public Address LsRs	Rotate the fader knob to select the desired format. This example shows format 65, PA microphone sent to left and right surround speakers.
 Saving Changes...	Press the OK button to save the assignment to the User 2 button.

7.9 Assigning NS Button Format

The nonsync button, "NS,"can be assigned to any available format. Then, when the button is pressed, that format will be selected. Follow the procedure in the previous steps.

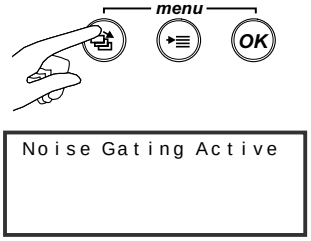
7.10 Reversion Mode

Note: Be aware that leaving the CP650 set to **No Reversion** mode prevents automatic switching to optical sound if there is a loss or failure of the Dolby Digital soundtrack.

	Press the left menu button to move to the Reversion Mode menu.
	Rotating the front panel knob will switch the CP650 between Normal and No Reversion. Note: The mode will always be set to normal after switching the power on.
	Press the OK menu button to save the setting.

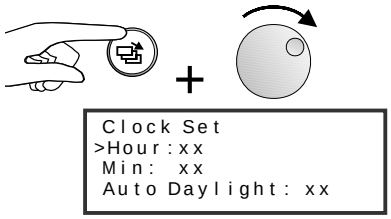
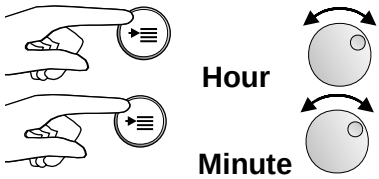
7.11 Noise Gating

This menu item is for special applications. It can be used with specialized test equipment to make RT-60 measurements.

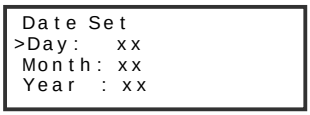
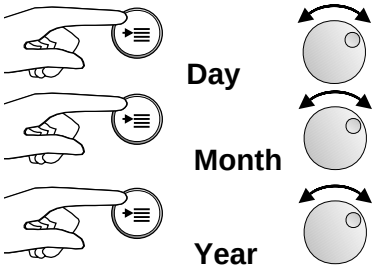
	Press the left menu button to move to the Noise Gating Active screen. When this menu item is selected, connecting certain automation port terminals to ground will cause pink noise to be sent to individual or all channels.

7.12 Clock Set

The clock is used only to "time-stamp" event log messages to aid in troubleshooting. The CP650 will operate perfectly without setting the clock.

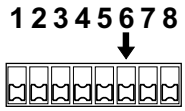
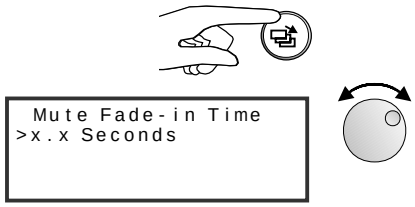
	Press the left menu button, or press **and hold** the button while rotating the front panel knob to move to the Clock Set menu.
	Press the middle menu button to choose between setting Hour and minute. Rotate the front panel knob to set the times.
	Press the middle menu button to select Auto Daylight and rotate the front panel knob to set it on or off. With Auto Daylight set to On, the CP650 internal clock will automatically set itself forward and backward one hour on the date established for Daylight Savings Time in the USA.
	Press the OK button to save the settings.

7.13 Date set

 	Press the left menu button to move to the Date Set menu.
	Press the middle menu button to choose between setting the day, month, or year. Rotate the front panel knob to make the settings.
	Press the OK button to save the settings.

7.14 Mute Fade Time Adjustment

The mute speed is the length of time it takes for the sound to fade from the normal setting to muted after the **MUTE** button is pressed, and the time it takes to fade back to normal after the **MUTE** button is pressed again. Both times are independently adjustable.

	Slide DIP switch 6 **down** to the normal position. The CP650 will switch to normal operation with the user's menu choices available.
	Press the left menu button multiple times to move to the Mute **Fade-in** Time screen. Set the desired fade in time using the front panel knob.
	Press the OK button to save the settings.
	Press the left menu button to set the mute **fade-out** time using the same procedure.

Chapter 8
Accessories

Details on the remote control unit and remote fader will be added in future releases of this manual

Chapter 9
Maintenance and Troubleshooting

9.1 Print Cleanliness

As with any soundtrack, keeping the film print clean will give best performance. 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 read 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 has properties unlike those of an analog track with regard to print wear. With any analog track, print wear will degrade quality in a more or less linear fashion; the more wear, the lower the quality of the sound. With a digital soundtrack, wear will have no audible effect until the picture quality is degraded beyond use. At this point, wear may exceed the error correction capabilities of the Dolby Digital decoder, and the CP650 will automatically switch to the analog Dolby SR track.

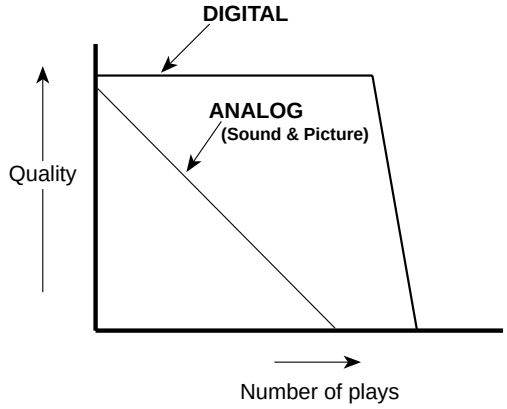


Figure 9–1 Digital/Analog Track Wear

9.2 Digital Soundhead Maintenance

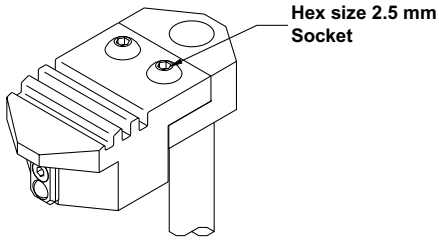
The digital soundhead should be kept clean and free of dust and dirt for best performance, just like the analog soundhead. Wiping the external surfaces with a clean cloth on a regular basis will keep the head looking new. The optical path should be inspected regularly and kept clean with a photographer's lens cleaning kit (available from most camera stores). Use 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**.

9.2.1 Replacing the Cat. No. 701 Digital Soundhead LED Assembly

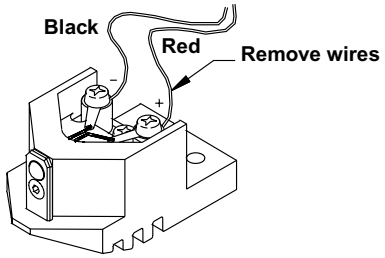
In normal operation, the LED assembly used in the Cat. No. 701 Digital Soundhead will exhibit gradually reduced light output over its life. If it becomes necessary to replace the LED, follow the procedure outlined below. The LED assembly is Dolby Part Number 83308.

Installation

1. Turn off power to the Cat. No. 701 soundhead.
2. Remove the two screws that mount the LED assembly to the arm.
3. Carefully pull the LED assembly off the pivot pin.

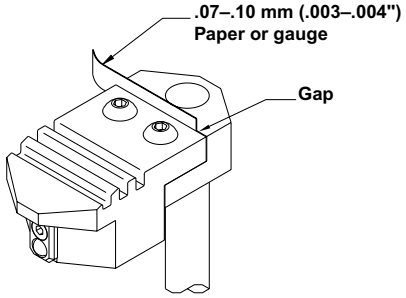


4. Carefully turn over the assembly and loosen the two screw terminals, and remove the wires. Note the wire colors and terminal locations.



5. Attach the wires to the replacement LED assembly using the same wire locations as in the original LED assembly. The wires may require restripping since they have been compressed previously, and could be too weak. Inspect the wires carefully before attaching them to the terminals.

6. Remount the LED assembly onto the pivot pin. Initial adjustment can be made by tightening the screws slightly with a parallel gap between the rear of the LED assembly and the facing edge of the arm. Using a sheet of paper will usually provide the proper clearance.

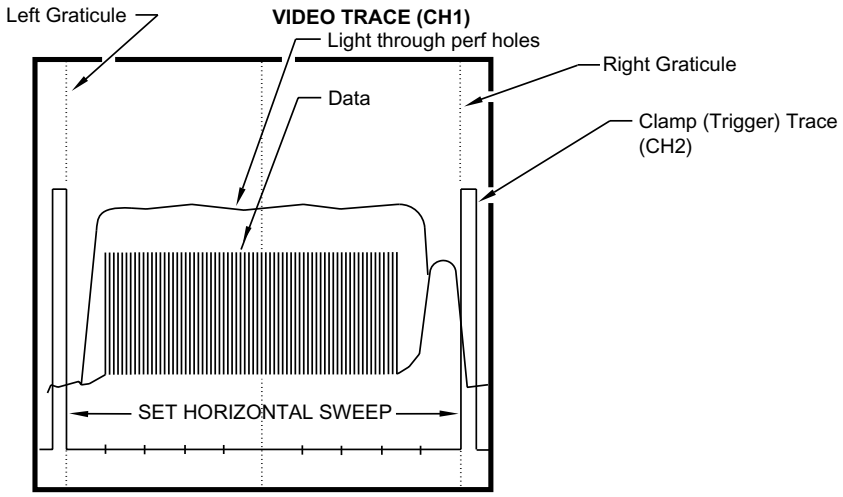


Alignment

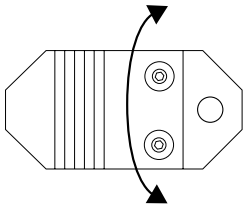
Class 2 LED Product per EN 60825-1:1996. Do not stare into the red LED beam. Do not attempt to view the LED beam with any type of optical device.

1. Connect an oscilloscope (20 MHz minimum bandwidth) to test points on the setup control panel. Some digital oscilloscopes may not be usable for this procedure even though they may have the required bandwidth.
   a. Ensure that the probes are 1X. and connect scope Channel 1 to the "Video" test point. Connect only this probe's ground to the ground test point.
   b. Connect scope Channel 2 to the "Clamp" test point.
   c. Set both channel vertical input sensitivity controls to 1 Volt/div, DC coupling. Set the vernier to calibrated (usually the inner knob— rotate until it "clicks").
   d. Set horizontal sweep rate to 2 µsec/div.
   e. Set the trigger source to Channel 2 and positive polarity.
   f. Turn on power to the digital soundhead and the CP650.

2. Set the oscilloscope display
   a. Thread and play a Cat. No. 69T Dolby tone test film loop.
   b. Display only Channel 2, and adjust trigger level to lock on to the clamp signal.
   c. Adjust horizontal position to line up inside edge of left clamp signal with left screen graticule.
   d. Adjust the timebase sweep vernier to line up the inside edge of right clamp signal with right screen graticule.
   e. Select Channel 1 display.
   f. Temporarily switch the scope channel 1 input (video) to GND and adjust the vertical position to coincide with a horizontal screen graticule. This is the 0 V reference baseline.

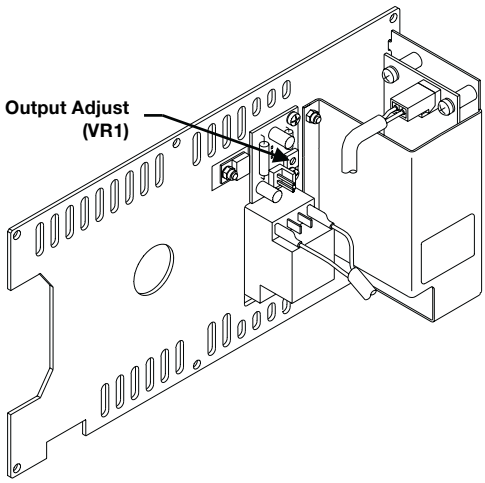


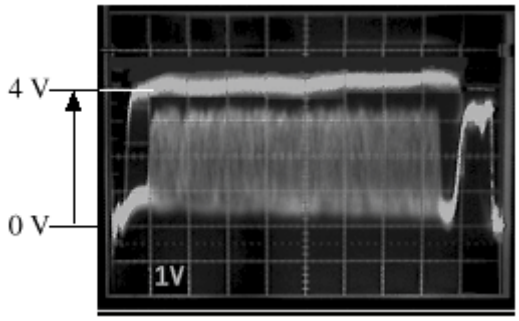
3. Adjust the LED Position
   a. Switch the Channel 1 video input coupling back to DC.



   b. Loosen the 2.5 mm hex screws and carefully rotate the LED assembly while watching the scope image. Adjust for maximum video signal voltage (unobstructed light through the perf hole) on the **upper trace**. Also, the waveform must be reasonably flat (fit within one scope major division). In other words, adjust for peak voltage with minimum ripple.

4. Check / Set LED drive current
   The optimum peak video signal voltage (unobstructed light through the perf hole) is **4V**, measured from the 0V reference baseline to the **upper trace**. If necessary, adjust the Cat. No. 701 power supply output to achieve the correct video voltage. See the figure below for adjustment location (VR1). The back cover of the digital soundhead must be removed to gain access to the output adjustment.





9.2.2 Replacing the Cat. No. 700 Digital Soundhead Exciter Lamp

To replace the exciter lamp, carefully remove the six screws holding the rear cover/power supply of the digital soundhead. Allow the lamp to cool if necessary. 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 base. Carefully remove a new lamp from the protective box, and using gloves or a clean, lint-free cloth, replace the lamp in the socket. 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. Slide the lamp back into its base in the soundhead, replace the rear cover assembly and tighten the six screws.

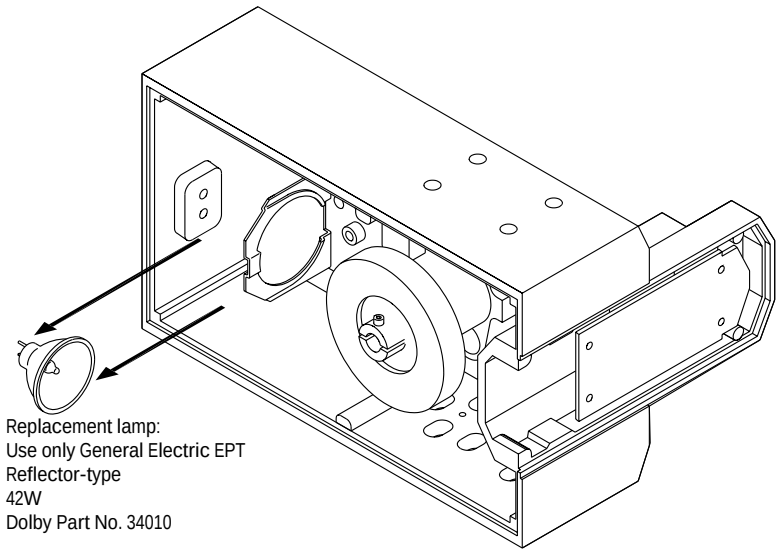
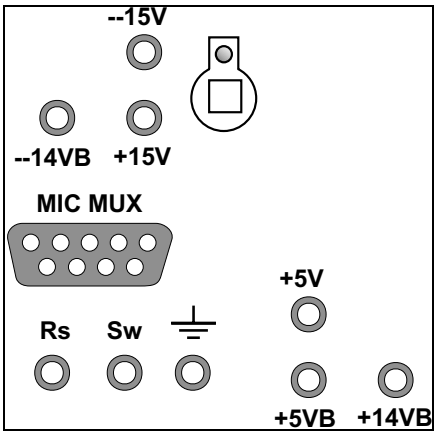


Figure 9–2 Digital Soundhead Exciter Lamp Replacement.

9.3 CP650 Troubleshooting

9.3.1 Power Supply Voltage Ranges

Six test points are located on the front sub-panel for measuring power supply voltages. They can be accessed by removing the front panel:



Main Power Supply Voltage Ranges:

Test Point	Voltage Range
+15 V	14.5 to 15.8
-15 V	-14.5 to -15.8
+5 V	4.85 to 5.15

Bypass Power Supply Voltage Ranges:

Test Point	Voltage Range Main AND Bypass Supplies On	Voltage Range ONLY Bypass Supply On
+14 VB	13.9 to 15.2	11.0 to 12.5
-14 VB	-13.9 to -15.2	-11.0 to -12.5
+5 VB	4.6 to 5.0	4.6 to 5.0

9.3.2 Exploded View and Board Locations

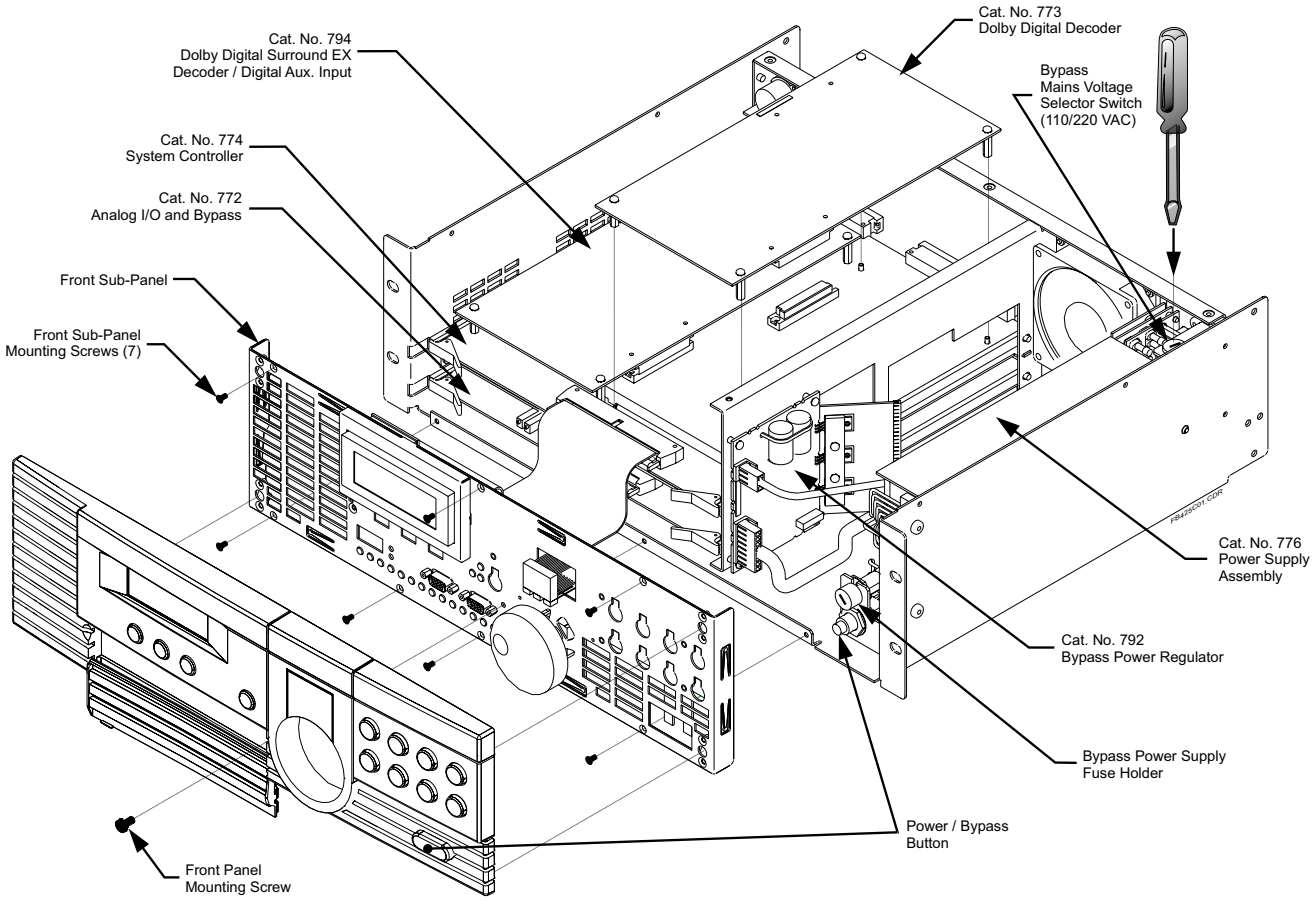


Figure 9–3 Model CP650 Exploded View

Note: Many components used on the circuit boards are sensitive to electrostatic damage. It is essential to wear an earthing strap while handling or changing CP650 circuit boards.

To gain access to the CP650 circuit boards:

1. Remove the AC mains power cable.
2. Open the setup control panel access door.
3. Remove the front panel mounting screw located in the upper right-hand corner of the setup control panel and carefully pull the front panel toward you to remove it.
4. Remove the 7 front sub-panel mounting screws and carefully pull it toward you to remove it.
5. Unplug the two flat cables connected to the internal circuit boards.

The power supply assembly can be removed by loosening the two finger screws on the front edge of the assembly and the two rear panel screws above and below the AC mains connector. From the front of the unit, carefully remove the connector at the backplane along with the two front connectors then slide the assembly out.

9.3.3 Troubleshooting Chart

The following chart may assist you in solving problems.

Symptom	Probable Cause	Recommended Action
NO SOUND AT ALL		
No sound, front panel dark, power button not glowing.	No power to either main or bypass systems.	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, check fuse behind plastic door in AC mains power inlet module located on the rear of the unit.
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.	Defective analog reader LED, exciter lamp, or LED/lamp power supply. Projector selection wire/switch is faulty. No signals coming from stereo solar cells. Power amplifiers switched off.	Check that the 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. If the front panel indication (*P1*, *P2*) for the currently active projector is not correct, check the projector selector switch wiring. In addition, check that the switch or relay is operating properly. Check that the **signal present** LEDs inside the setup panel access door are flashing while film is running. If not, there is no signal from the solar cells, or the Cat. No. 772 analog board has failed. Check power feed to power amplifiers for blown circuit breaker or fuse or accidental disconnection.
No sound, front panel normal.	Check the causes listed above, plus wrong format selected, system muted, or fader turned down.	Check same components as mentioned above. Then verify selected format, mute status, and fader setting. If no formats produce sound, there may be a CP650 internal problem. Call your local service engineer.

Symptom	Probable Cause	Recommended Action
NO SOUND IN SOME FORMATS		
No analog film sound (Formats 01,04, or 05)**.** Front panel normal, Dolby Digital sound OK, and nonsync OK.	The analog LED or exciter lamp or power supply may have failed or the wrong projector may be selected. Solar cell connections may be loose or damaged. The remote solar cell preamp board used with LED analog readers may have failed.	If the signal present LEDs inside the access door are not flashing, verify exciter operation and solar cell connections as described above. Substitute known good Cat. No. 772 board.
No Dolby Digital sound (Format 10). Front panel normal, analog sound OK.	Digital reader LED not working, Dolby Digital decoder board Cat. No. 773 not installed or not working, non-Dolby Digital print being played, film not threaded correctly in reader, reader failure.	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. If the CP650 accepts a Format 10 command, the digital sub-system is probably still working.
No sound on external six-track input (Format 11, 70 mm, external Dolby model DA20, or other multichannel sound sources), Front panel normal.	Cat No. 772 board defective. Wrong format, external device not receiving good data. Six-channel input connector not fully plugged in.	Check external device for audio output. Re-seat the six-channel connector.
No sound in nonsync	Nonsync source not working, nonsync level set too far down, faulty Cat. No. 772 board. If nonsync is a user format, is the input from Nonsync 1 or Nonsync 2? Which channels are the signals being sent to? Are those power amplifiers working?	Verify output of nonsync source. Determine from front panel display which channels the output is directed to and verify that power amplifiers and speakers for those channels are working. After checking the above, adjust nonsync level in setup, changing both left and right channels by equal amounts.
Power button illuminated. Front panel dark. There is sound.	System is in Bypass operation.	Turn on the CP650 with the front panel power button. Call service engineer if the system is still not operating correctly.

Symptom	Probable Cause	Recommended Action
FADER PROBLEMS		
Front panel **fader knob** has no effect.	External **analog** remote fader pot 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 control to the main front panel fader and any digital remotes that are connected.
Fader level display changes when no change of CP650 front panel fader has been made.	A remote digital fader is being operated. A format with a different fader setting was selected. Analog remote fader is selected and being changed.	**Note**: Digital remote faders are always active. Disconnect the remote to disable it.
CONTROL PROBLEMS		
CP650 won't accept a format, and gives "Format Unavailable" message.	CP650 doesn't have the optional modules needed for that format, or that part of the system is not working. For example: Format 10 requires the Dolby Digital Cat. No. 773 board. Formats 13, 80, or 81 require the Cat. No. 794 Dolby Digital Surround EX board. Digital reader LED not working, non-Dolby Digital print being played, film not threaded correctly in reader, reader failure.	Obtain and install the necessary circuit boards. If they are already present, ensure that they are firmly seated in their connectors. 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. If the CP650 accepts a Format 10 command, the digital sub-system is probably still working.
Front panel display reads "***Reverted!***" when Format 10 is selected and stays in optical Dolby SR.	No Dolby Digital data available, not a Dolby Digital print, projector not running, or data blocks badly damaged.	Review each possible cause.

Symptom	Probable Cause	Recommended Action
RUMBLES, WHISTLES, HUM etc. IN SOUND		
Rumble in sound, regardless of format.	Audio grounding scheme may need changing.	Call service engineer.
Whistles in sound.	Audio grounding scheme may need changing.	Call service engineer.
Hum (power line frequency) in sound.	Malfunctioning exciter lamp or lamp power supply.	Cover the solar cells with a business card or other opaque object. **Do NOT touch the cells and do NOT disturb the position of the cell bracket!** • If the hum disappears, the problem is in the exciter lamp.
	Stray light striking the stereo solar cells.	• If hum persists, turn out all lights in the booth to check if stray light is striking the cells. If the hum disappears, turn on booth lights that are usually on during projection, one at a time, until you detect hum again. Redirect the light from the offending source or keep it off during a showing. If the hum still is present, the problem is either in the grounding or wiring or in the CP650. Call your service engineer.

Symptom	Probable Cause	Recommended Action
TROUBLE IN ONE OR MORE CHANNELS		
One channel fails.	Defective power amplifier, external crossover, or wiring for that channel.	Place the CP650 in bypass. All three screen speakers should become active. If not, there is a fault in the power amplifier, external crossover, or wiring for the missing channel.
		Check if the amplifier is on and check for blown fuses.
	Power amplifier input level setting.	Check that the power amplifier volume control setting has not been changed.
		Check that the wiring from the CP650 to the amplifier or the loudspeaker wiring has not been broken or disconnected.
	Malfunctioning board in CP650.	If the power amplifier and the wiring are satisfactory, the problem may be a malfunctioning circuit in the CP650. Switch to bypass and call service engineer.
The sound from **one** channel is distorted and you can hear the distortion through the booth monitor at normal listening level.	Defective power amplifier for that channel.	Check that the amplifier is on and the fuses are OK.
	Defective speaker for that channel. (If the booth sound is OK but sound in the auditorium is bad).	Check speaker.
	Malfunctioning Cat. No. 772 board in CP650.	Call service engineer.
	Wiring from the stereo solar cell to the CP650.	Check that the wiring from the stereo solar cell to the CP650 has not become damaged and that the solder connections to the fanning strip are secure. Check that the D-connector for the solar cell is firmly plugged into the CP650. Call service engineer if wiring problems are found.

Symptom	Probable Cause	Recommended Action
The sound from **two** or more channels is distorted and you can hear the distortion through the booth monitor at normal listening level.	Malfunctioning two-channel power amplifier.	If two distorted channels are served by the same two-channel amplifier, the problem may be in the amplifier. See the manufacturer's instructions. Call service engineer.
When a stereo film is projected, the sound appears to be coming from the wrong speakers.	The A-chain has become misaligned.	Check Dolby level calibration. Call service engineer.
Sound from the front (screen) channels is leaking into the surround channel.	The A-chain has become misaligned. Surround sound delay set improperly. Surround sound level set too high.	Call service engineer. Call service engineer. Call service engineer.
You hear an echo in a small theatre.	Surround sound delay set improperly.	Call service engineer.
The sound level in bypass is higher or lower than the normal sound level.	Adjust with the front panel knob, since other parts of the system may be malfunctioning.	Call service engineer.

Symptom	Probable Cause	Recommended Action
There is distortion when you play non-sync sound, but sound from the film is not distorted.	The nonsync source is introducing distortion. Excessive output level from nonsync source. Defective Cat. No. 772 board.	Change the nonsync selection (in case the track being played is distorted). If you have control of the output level of the device (cassette deck, CD player, etc.), it will be useful to turn down its volume, especially if you have to operate the nonsync with the fader set far below 7. If this does not help, try a different device. If changing both the device and the selection does not eliminate the distortion, the problem is in the CP650, probably on the Cat. No. 772 board. Call service engineer.
Nonsync sound is heard in other formats.	The nonsync source output level is set far too high or there is a balanced/unbalanced wiring problem.	Turn down nonsync source level if possible and call service engineer. If turning the nonsync source down doesn't correct the problem, turn it off during the show.
Sound from a mono film is distorted, as is sound from the center channel of a stereo film.	Malfunctioning power amplifier. Malfunctioning loudspeaker.	Interchange power amplifiers to determine if distortion is still present. Interchange speakers to determine if distortion is still present.

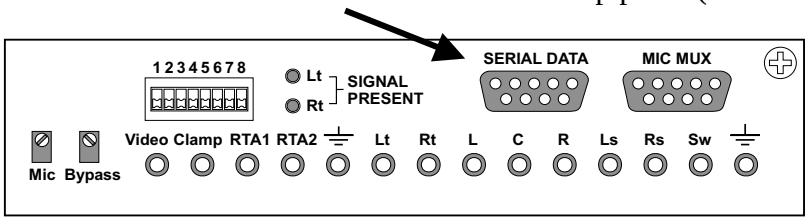
Symptom	Probable Cause	Recommended Action
CHANGEOVER AND CONTROL TROUBLES		
Projector changeover command does not change the sound to the output of the selected projector and the front panel indicators *P1 or P2* do not light according to the projector selected.	Defective changeover relay or switch. Defective wiring from relay or switch to terminals on rear of the CP650. Defective Cat. No. 772 board.	If possible, check that the relay or switch contacts actually open and close as the changeover command is issued several times. Check that the wiring has not been damaged and that connections are firmly made at both ends. Call service engineer.
With an automation system connected to the CP650: The CP650 freezes into one format and does not accept any other selected format when you press the front panel switches.	Incorrect wiring to D-connector plugged into CP650 or defective or incorrectly programmed automation equipment.	Unplug the D-connector from the back of the CP650. If you can exercise local control over the CP650, the problem is either the wiring to the automation equipment or the automation equipment itself. Call service engineer. If you cannot exercise local control over the CP650 even with the automation equipment disconnected from the CP650, switch to bypass and call service engineer.

You can hear pops or thumps during projector changeover.	If the projector changeover relay power is DC, a diode should be soldered across the winding of the relay to prevent switching noise from leaking into the audio wiring. This diode may be missing or defective.	If possible, check that the diode is installed across the relay winding. If you are familiar with such electronic components, check to see that it is not defective. If the diode is not present or if it appears to be open, install a good diode. Activate the changeover and use a multimeter to find the polarity of DC that appears on the relay coil. Install the diode with the band end soldered to the terminal that is positive when measured with the meter. The diode should be a 1N4004 (1A, 400 V), or 1N4008 (1A, 800 V), or equivalent.
	If the projector changeover relay is AC powered, a capacitor soldered to the relay coil terminals may be defective.	Install a .01 µF 600 V capacitor across the relay coil terminals.
	Malfunctioning Cat. No. 772 board.	Call service engineer to correct the malfunction.

Appendix A
Software Operations

A.1 Updating CP650 Software

1. Connect the PC to the CP650 Cinema processor using a serial cable connected to the CP650 serial data connector on the front setup panel (or on the rear panel).



2. Run the CP650 PC Setup Software on the PC.
3. From the "Action" menu, choose "Connect" or click on the connect icon.
4. If prompted, choose to "Retrieve" cinema processor settings.
5. From the "Action" menu, choose "Update Software...".
6. If desired, you may save the newly retrieved settings to disk.
7. Browse for and select the software update file (.bin) to be used for updating the CP650.
8. Select "Update Now".
9. Note: This process CANNOT be interrupted or the CP650 will become inoperable.
10. When the update has finished, the CP650 will automatically restart.
11. Next, the PC software will automatically reconnect, send additional information, and instruct the CP650 to restart a second time.

The update process is now complete. The CP650 will contain updated software while retaining the original alignment settings.

A.2 Transferring Settings Between Two CP650s

1. Connect the PC to the source CP650 using a serial cable.

2. Run the CP650 PC Setup Software on the PC.

3. From the "Action" menu, choose "Connect" or click on the connect icon.

4. If prompted, choose "Retrieve" cinema processor settings.

5. After the settings have been retrieved, from the "Action" menu choose "Disconnect" or click on the disconnect icon.

6. From the "File" menu choose "Save" or click on the save icon.

7. Save the retrieved settings to disk. The file name should end with the ".dby" extension.

8. Unplug the serial cable from the source CP650 and plug it into the destination CP650.

Note: If you have closed the CP Setup program or opened another settings parameter file (.dby), then before continuing you must select "Open" from the "File" menu and open the file that was saved in step 6 above.

9. Repeat steps 1 through 3.

10. When prompted, select "Send Settings".

11. The saved settings will be sent to the destination CP650.

12. You must select "Disconnect" from the "Action" menu or click the disconnect icon to allow the settings to be saved in the destination CP650.

Appendix B
Back Panel Connectors

B.1 Output Connectors

Main Audio Output Connector

The main audio outputs of the CP650 are sourced from balanced output circuits. The connector type and pin configuration conform to the THX® standard. With a Cat. No. 794 Surround EX decoder board installed (standard Model CP650), the Left Surround and Right Surround outputs on this connector are disabled. All surround channel audio outputs appear on the Option Card I/O connector.

Table A-1 Main Audio Output Connector Pinout

Pin	Connection
1	Chassis
2	Left +
3	n.c.
4	Chassis
5	Center +
6	n.c.
7	Chassis
8	Right +
9	Chassis
10	Left Surround –* (Models CP650D and CP650SR)
11	Right Surround –* (Models CP650D and CP650SR)
12	Subwoofer -
13	Chassis
14	Left -
15	Chassis
16	n.c.
17	Center -
18	Chassis
19	n.c.
20	Right -
21	n.c.
22	Chassis
23	Left Surround +* (Models CP650D and CP650SR)
24	Right Surround +* (Models CP650D and CP650SR)
25	Subwoofer +

* See Option Card I/O connector table for surround outputs on Model CP650. Model CP650 contains a Cat. No. 794 board.

Option Card I/O Connector

The pinout of this connector is determined by the type of option board installed in the connectors of the Cat. No 774 system controller board.

In a standard CP650, the Cat. No. 794 Dolby Digital Surround EX Decoder / Digital Aux Input board is shipped in this location. Output signals for the surround channels appear on this connector. The AES/EBU digital input pins can be connected to a device incorporating an AES/EBU digital output. Format 80 enables this input.

Table A-2 Option Card I/O Connector with Cat. No. 794 Installed

Pin	Connection
1	AES/EBU Input –
2	AES/EBU Input +
3	Back Surround Left – Output
4	n.c.
5	n.c.
6	Back Surround Right – Output
7	n.c.
8	n.c.
9	Chassis
10	Left Surround – Output
11	Right Surround – Output
12	n.c.
13	n.c.
14	n.c.
15	Chassis
16	Back Surround Left + Output
17	n.c.
18	Chassis
19	Back Surround Right + Output
20	n.c.
21	n.c.
22	Chassis
23	Left Surround + Output
24	Right Surround + Output
25	n.c.

Hearing-Impaired (H/I) Output Connector

The Hearing-Impaired output is an unbalanced signal output. The connector used is a female phono jack (RCA-type).

B.2 Input Connectors

Dolby Digital Reader Connectors (Reader 1 and 2)

These connectors are used for connecting up to two Dolby Digital film soundtrack readers to the CP650 or CP650D. These connections are inactive on model CP650SR. The pinout and the signals on these connectors are identical to the Dolby models DA20 and CP500D.

Note: if only one projector input is required (platter operation), then the interconnecting cable must be plugged into **READER 1**.

Table A-3. Dolby Digital Reader Input Connector Pinout

Pin Number	Signal Name	Signal Description
1	n.c.	
2	n.c.	
3	n.c.	
4	TTCO	Row Clock Return
5	TCOGND	Row Clock Common
6	FTCO	Row Clock Send
7	TSCO	Pixel Clock Return
8	SCOGND	Pixel Clock Common
9	FSCO	Pixel Clock Send
10	n.c.	
11	n.c.	
12	n.c.	
13	n.c.	
14	VO	Differential Video V0
15	VOGND	V0 Common
16	+15VIDEO	+15VDC
17	V1	Differential Video V1
18	V1GND	V1 Common
19	-15VIDEO	-15VDC
20	n.c.	
21	n.c.	
22	n.c.	
23	n.c.	
24	n.c.	
25	n.c.	

Motor Start Connector

The motor start connector is used to interconnect the changeover control lines of the CP650 with the theatre control system. If the CP650 is to be used in a platter operation (single projector), a jumper must be installed on this connector between pins 1 and 5. This configuration is identical to the one used on the Dolby Model CP500.

Motor Start: Less than 1 VDC with respect to signal ground.

Motor Off: Greater than 3.5 VDC, less than 18 VDC.

Table A-4 Motor Start Connector Pinout

Pin	Connection
1	Motor Start 1
2	P1 Changeover select (gnd)
3	P1 / P2 Changeover select (gnd for P2)
4	P2 Changeover select (gnd)
5	Chassis Gnd
9	Motor Start 2

Optical Input Connectors (1 and 2)

There are two connectors for analog solar cell inputs from analog sound heads. Up to two projectors can be connected to the CP650. The pinout for each connector is identical. In addition to providing for the input of the analog sound head signals, the CP650 has bipolar DC outputs to supply power to optical preamplifiers (+/-14 VDC). This DC voltage is supplied from the CP650 bypass power supply to ensure that optical preamplifiers still function if the CP650 switches to bypass operation during a performance. The maximum supply current available is 15 mA per preamp.

Table A-5 Optical Input Connector Pinout

Pin	Connection
1	L+
2	L-
3	GND
4	R+
5	R-
6	GND
7	+14 V supply
8	-14 V supply
9	GND

MIC Input Connector

The MIC Input is a balanced input using a 3-pin XLR female connector. This connector is a duplicate of the MIC MUX input connector on the front setup panel.

Table A-6 MIC Input Connector Pinout

Pin	Connection
1	shield
2	+ signal
3	– signal

Mic Mux Connector on front setup control panel

An EQ microphone or mic multiplexer can be connected at this location without the need for access to the CP650 rear panel. Pins 1, 2, and 5 are wired in parallel with the rear panel microphone input XLR connector. If you wish to use a connector already wired for use with a Dolby CP500, add a jumper between pins 5 and 6.

Note: It is essential that nothing be connected to the rear panel microphone input connector if this front panel connector is used for performing equalization.

Table A-7 Mic Mux Connector

Pin	Connection
1	+ mic signal
2	– mic signal
3	n.c.
4	n.c.
5	Mic cable ground
6	n.c.
7	+15 V
8	Data ground
9	Digital control signals for multiplexer

Nonsync Input Connectors (1 and 2)

Both Nonsync input connectors are female phono (RCA-type) connectors and the input circuit is unbalanced, 11KΩ, sensitivity: 0.2–4V for NS 1, and 0.06–1.5 V for NS 2.

Remote Unit and Remote Fader Connector

Table A-8 Remote Unit and Remote Fader Connector Pinout

Pin	Connection
1	Power +
2	Remote Data
3	Chassis Gnd
4	Chassis Gnd
5	Remote Fader Wiper
6	n.c.

6-Channel Analog Audio Input Connector

This input is an unbalanced analog audio input. The nominal reference level is approximately 300mV. There are no input level trim controls within the CP650 for this input.

Table A-9 6-Channel Analog Input Connector Pinout

Pin	Connection	
1	Signal Ground	
2	EXT3	Right Surround Channel External Input
3	Signal Ground	
4	Signal Ground	
5	Signal Ground	
6	Signal Ground	
7	Signal Ground	
8	Signal Ground	
9	Signal Ground	
10	Signal Ground	
11	Signal Ground	
12	Signal Ground	
13	Signal Ground	
14	EXT0	Left Channel External Input
15	EXT2	Left Surround Channel External Input
16	Signal Ground	
17	EXT1	Right Channel External Input
18	Signal Ground	
19	Signal Ground	
20	EXT4	Center Channel External Input
21	Signal Ground	
22	Signal Ground	
23	Signal Ground	
24	EXT5	Subwoofer Channel External Input
25	Signal Ground	

B.3 I/O Connectors

Automation I/O Connector

This connector is a 25-pin female D-connector, wired to closely match the configuration of the Dolby Model CP65.

Table A-10 Automation I/O connector Pinout

Pin	Connection	Specification	
1	S0 (automation select) format 01 Mono	Control signal LOW = select LOW = < 2.4 Vdc for at least 20 ms If a solid state switch is used, it must have a saturation (on) voltage of less than 2.4 V at a current of 2.5 mA, or a resistance of 950 ohms or less, and 0V offset.	
2	S1 (automation select) format 04 A-type		
3	S2 (automation select) format 05 SR		
4	S3 (automation select) format 10 Digital		
5	S4 (automation select) format 11 External 6-channel analog		
6	S5 (automation select) format User1		
7	S6 (automation select) format Nonsync		
8	S7 (automation select) format User2		
9	(automation select) remote fader select		
10	(automation select) mute		
11	n.c. (-15V in Model CP65)		
12	DGND		
13	+15V (through a PTC resistor)		
14	ID0 (automation indicator) format 01 Mono	ID on = internal 1.5K resistor to +15 V ID off = Open Circuit	
15	ID1 (automation indicator) format 04 A-type		
16	ID2 (automation indicator) format 05 SR		
17	ID3 (automation indicator) format 10 Digital		
18	ID4 (automation indicator) format 11 External 6-channel analog		
19	ID5 (automation indicator) format User1		
20	ID6 (automation indicator) format Nonsync		
21	ID7 (automation indicator) format User2		
22	Fader local / Remote fader (automation indicator)	HIGH = Local	Internal circuit: HIGH = 10K to +15 V. LOW = 500 Ohms +1.2V fixed drop to GND
23	Mute (automation indicator)	LOW = Muted	
24	n.c.		
25	Projector Status (automation indicator)s	Internal circuit: HIGH = Projector 1: 1.5K to +13 VDC (1.5K to +10 VDC in bypass) LOW = Projector 2: 1.5K to GND	

Note: In order to maintain CP65 compatibility, the order of the select/indicator lines does not correspond to the front panel button order.

Serial Data (RS-232) Connector

This connector “mirrors” the RS-232 connector located on the front setup panel. A PC can be connected at either location for performing complete cinema processor alignment using Dolby alignment software.

Table A-11 Serial Data (RS-232) Connector Pinout

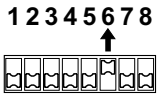
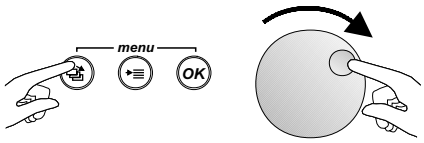
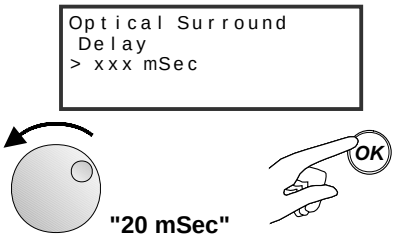
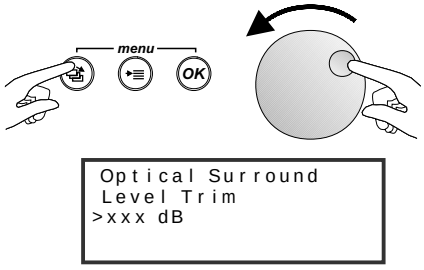
Pin	Connection
2	Data Out
3	Data In
4	Tied to pin 6
5	Chassis
6	Tied to pin 4
7	Tied to pin 8
8	Tied to pin 7

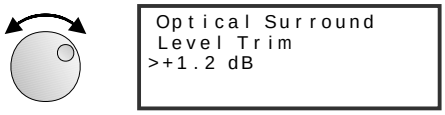
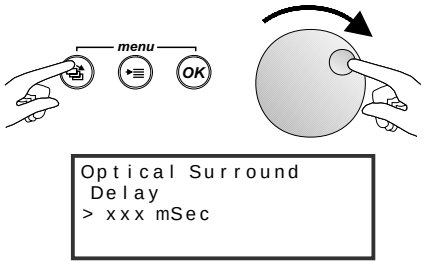
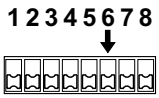
Ethernet Connector

For future automation use.

Appendix C
Optical Surround Level Trim

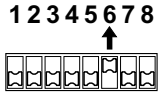
Use this procedure to subjectively balance front and surround loudspeaker levels using the Cat. No. 151B test film. The film contains band-limited noise, restricted to the range 500 Hz to 2 kHz. The noise is cycled between the front center speaker and rear surround speakers. The surround level should have already been set using the final output level calibration procedure in Section 4.7.

	Check that DIP switch 6, located on the setup control panel is UP.
	Temporarily set the optical surround delay to minimum (20 ms). This step eliminates any confusion while the test film noise cycles between front and rear speakers. Press and hold the left menu button while rotating the front panel knob to step the menu to **Optical Surround Delay**.
	Note: If the optical surround delay has been set during a previous CP650 system setup then write down the current delay setting displayed! Rotate the front panel knob counterclockwise to set the delay to 20 ms. Then press the OK button to save the setting.
	Press and hold the left menu button while rotating the front panel knob counterclockwise until the **Optical Surround Level Trim** menu appears.
	Thread and play a loop of the Cat. No. 151B test film.

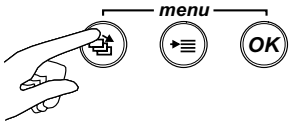
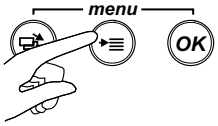
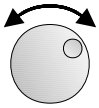
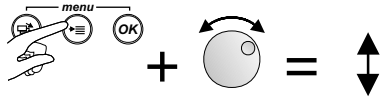
	Walk around the auditorium, and make an overall judgment of the surround level compared to the screen level. Because of the “diffuse” nature of the surround sound, it will commonly require a slight increase in surround level to get it to match the screen level. The tonal balance and acoustic level should subjectively match. Rotate the fader knob to set the surround level trim desired. The range is -3 dB to +6 dB. This example shows the level trim set to set to +1.2 dB.
	Press the OK button to save the change.
	If a previous CP650 setup has been performed, restore the **original optical surround delay** setting noted in the step above.
	Press the OK button to re-save the original setting.
	If you are NOT continuing with final adjustments (Chapter 7), move DIP switch 6 DOWN.

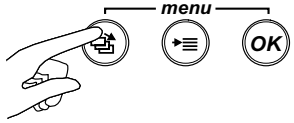
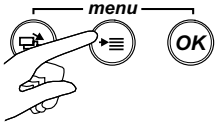
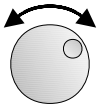
Appendix D
Setup and User Menus

D.1 CP650 Setup Menu

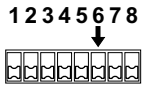


DIP switch 6 UP

				**Notes**
	Format and CP650 status display		0–10	Adjust fader. Standard setting is7.0.
1	Calibrate SPL		45–108.5 dB	Calibrates CP650 internal SPL meter to agree with auditorium sound level meter reading.
2	Output Level Adjust (initial)	Channel: Level:	L, C, R, Ls, Rs 1–127 (.3 dB steps)	Subwoofer level is set in separate menu items
3	Digital Subwoofer Level Adjust (initial)	Level: Polarity: Center Noise:	1–127 (.3 dB steps) Normal / Inverse on / off	Perform initial **level** adjustment only.
4	Bulk EQ Adjust	Channel: Bass Adjust: Treble Adjust: Corner Frequency:	L, C, R, Ls, Rs ± 6 dB ± 10 dB 1, 2, 3, 4 kHz	Set these before adjusting B-Chain EQ. (Fixed at 2 kHz for Ls,Rs)
5	B-Chain EQ Adjust		Select channel: L, C, R, Ls, Rs	 Press OK to start
			Select frequency band: 40 Hz–16 kHz ↔	
		 Hold down middle button and turn the knob to adjust level: ± 6 dB in the selected band.		 **TO EXIT**: Press OK to save, then press the Left button to move back to the channel selection menu.
6	Subwoofer EQ Adjust	EQ center frequency: EQ filter width ("Q"): Level Cut:	25–125 Hz 0.5, 1, 2, 4 0 to -12 dB	
7	Output Level Adjust (final)	Channel: Level:	L, C, R, Ls, Rs 1–127 (.3 dB steps)	Final level adjustment after EQ
8	Digital Subwoofer Level Adjust (final)	Level: Polarity: Center Noise:	1–127 (.3 dB steps) Normal / Inverse on / off	Perform final **level** adjustment only.
9	Optical Subwoofer Bandwidth	50 Hz / 100 Hz	50 Hz / 100 Hz	Match SW to LF limit of main screen speakers
10	Optical Subwoofer Level	Level: Polarity: Center Noise:	1–127 (.3 dB steps) Normal / Inverse on / off	Perform final **level** adjustment and **polarity** check.

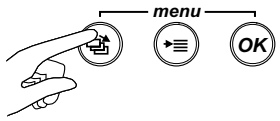
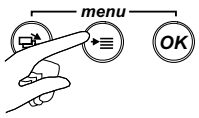
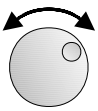
				**Notes**
11	Automatic Optical Level Adjust, Projector **1**			Run Cat. No. 69T test film and Press OK. (OK).
12	Automatic Optical Level Adjust, Projector **2**			
13	Manual Optical Level Adjust, Projector **1**			Run Cat. No. 69T test film and Press OK. (OK)
		Left channel / Right channel	Adjust level of selected cell: 0–63 (.3 dB steps)	
14	Manual Optical Level Adjust, Projector **2**			Run Cat. No. 69T test film and Press OK. (OK)
		Left channel / Right channel	Adjust level of selected cell: 0–63 (.3 dB steps)	
15	Optical Focus	Projector: Channel:	P1 / P2 L / R	Adjust lens for max HF
16	Automatic Slit-loss Projector **1**			Run Cat. No. 69P test film and Press OK. (OK)
17	Automatic Slit-loss Projector **2**			
18	Manual Slit-loss Projector **1**	Channel: Value:	L / R 1–127	
19	Manual Slit-loss Projector **2**			
20	Bypass Level Adjust			(OK) Bypass / Normal
21	Optical Surround Level Trim		-3 to +6 dB	Run Cat. No. 151B test film
22	Optical Surround Delay Adjust		20–150 ms	
23	Digital Surround Delay Adjust		20–150 ms	
24	Dolby Digital Reader delay		16–512 perfs.	
25	Nonsync 1 Level Adjust		1–127	
26	Nonsync 2 Level Adjust		1–127	
27	Mono Level Trim		0 to –12 dB	
28	Mono treble EQ adjust		LF ◄——► HF	
29	Preset Fader Levels	Format: Fader level:	1,4,5,10,11,U1,U2,NS 0–10 or None	
30	Set User Format 1		Select format	
31	Set User Format 2		Select format	
32	Set Nonsync format		Select format	
33	Reversion Mode	Normal / No Reversion	Normal / No Reversion	Recommended for test use only.
34	Noise Gating Active			Special application. For use with RT-60.
35	Clock Set	Hour: Minute: Auto daylight savings:	Set Set on/off	
36	Date Set	Day: Month: Year:	Set Set Set	

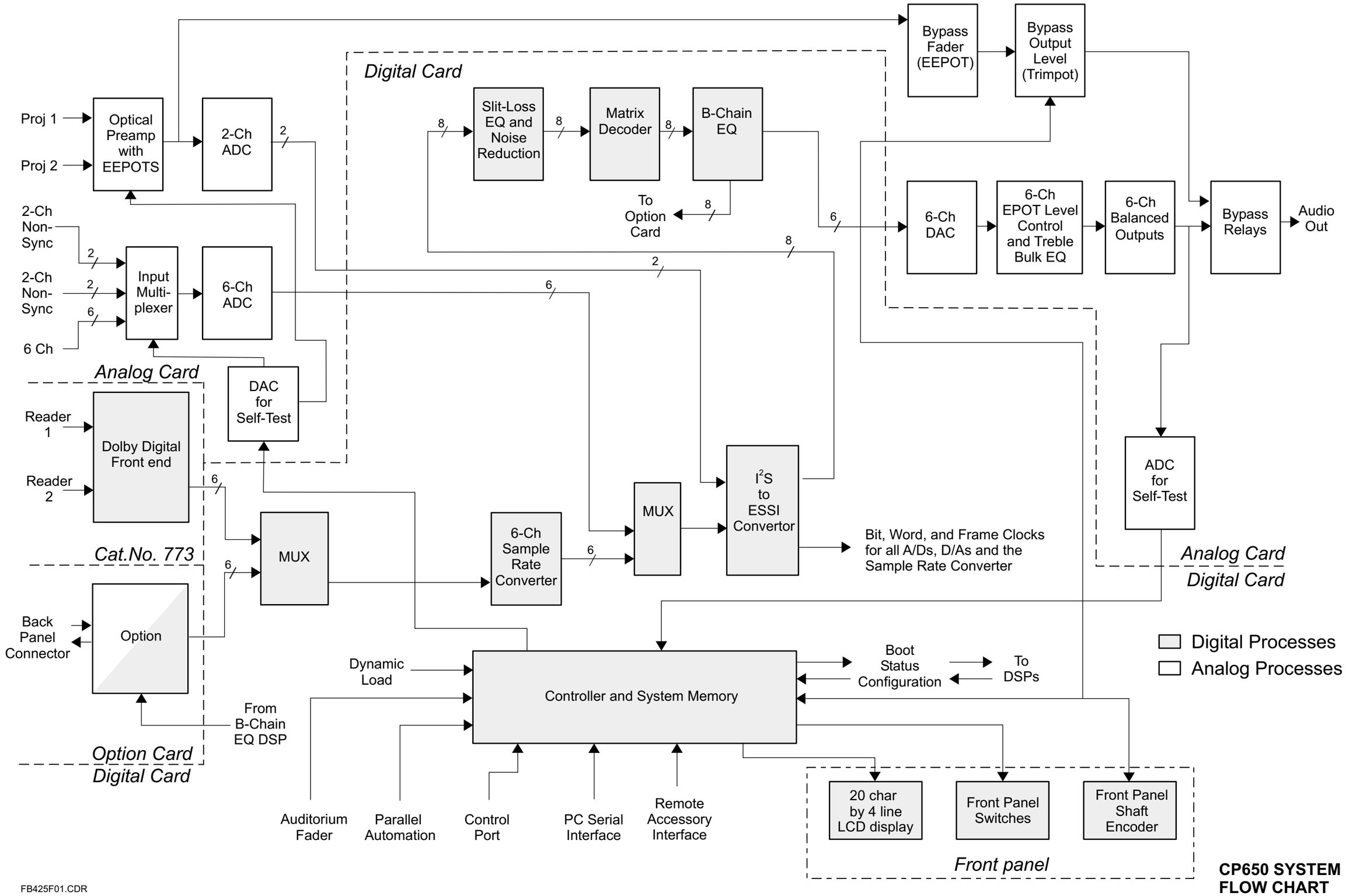
D.2 CP650 User Menu



DIP switch 6 DOWN

The options shown in bold are the default settings when the unit was 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 Press OK to save
5	Automatic Optical Level Calibration **Projector 2**			Press OK to start Press OK to save
6	Manual Optical Level Calibration **Projector 1**		Set level	Press OK to start Press OK to save
7	Manual Optical Level Calibration **Projector 2**		Set level	Press OK to start Press OK 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	Useful for telephone discussions with your service engineer.
16	About this CP650 - **Screen 1** • Control software version number • Optional boards installed			
17	About this CP650 - **Screen 2** • Software module version numbers			
18	About this CP650 - **Screen 3** • Network address • Board version numbers			The version numbers are listed for each board in the following order: **Cat. No. 772,** **Cat. No. 773,** **Cat. No. 774,** **Cat. No. 777,** **Cat. No. 794** "x"=Board not installed
19	Return to the top-level menu display			



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CP650 SYSTEM FLOW CHART