Film-Tech

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INSTALLATION AND OPERATION MANUAL

MOD II STEREO PROCESSING CENTER

SMART
THEATRE SYSTEMS

3856 Green Industrial Way, Atlanta, Ga 30341

THE XENTEK XPD120-4241 POWER SUPPLY

IS UL RECOGNIZED UNDER UL FILE

#E58320, SECTION 18 VOL 1

THE OUTPUT OF THIS POWER SUPPLY IS ±20 VDC, 5 AMPERES PER POLARITY. ALL EQUIPMENT CONNECTED TO THIS SUPPLY HAS NO VOLTAGE EXCEEDING ±20 VOLTS WITH RESPECT TO THE COMMON CONNECTION.

MOD II STEREO INSTALLATION

CRASH COURSE

MOD II SYSTEM

INTRODUCTION

Smart Theatre Systems is proud to present our first modularsound processor, the MOD II SYSTEM. This system was in devlopement for over a year, and its advanced designs andfeatures combine to make the heart of your sound system the best it can be. The finest amplifiers, speakers and crossovers can still only reproduce the signal fed into them,so it makes sense to start with the best sound processoravailable, the Smart MOD II.

The MOD II can be configured in a variety of ways, from a simple mono system to a full four channel optical stereo with four channel stereo generator AND Left Extra and Right Extra bass enhancement for optical prints. In addition, six channel magnetic signals from our magnetic sound processor can be routed directly through the MOD II fader, EQ, and output circuitry for total control over the sound operation of your booth.

Another feature currently under development is an on-board diagnostic computer which can quickly determine the operational status of the system and report defects on the front panel display and remotely through a modem connection to the phone line to your computer. This feature will be automatically activated every time the system is turned on and will indicate to the operator any fault conditions that are detected. It can also be activated manually at any time, and remotely from your computer.

Even though we know that there is very little time for reading manuals in the ALWAYS last-minute scramble to open a theatre, we would still like to encourage you to read the sections on INSTALLATION, CALIBRATION, and OPERATION. If you REALLY do not have time for this, then AT LEAST read the section called CRASH COURSE. This section should get you far enough along so that when you call our WATS line number for technical help, you will know the right questions to ask.

Wiring to the MOD II is very straightforward and should not cause any problems. If you have a MOD II in one of our pre-wired racks, it is even simpler: you only need to connect your solar cell(s) to the projector input(s), connect your music source for intermission music, and connect any required logic wiring for changeover, program selection, and music on/off.

Calibration is very simple, as we have done some of it for you. All MOD II's will be shipped with channel balance and EQ's preset for an "average" theatre. We have studied a number of theatres and, based on certain factors, have determined settings that will generally yield acceptable results. PLEASE NOTE THAT WE ARE NOT SAYING THAT IT WILL PERFORM OPTIMALLY IN YOUR THEATRE WITH THESE SETTINGS. OPTIMAL PERFORMANCE CAN ONLY BE OBTAINED AFTER CAREFUL AND METHODICAL STEPS USING THE PROPER TEST EQUIPMENT AND A WELL-CALIBRATED AND EDUCATED EAR. In general, though, if you set the preamp calibration levels and the time delay properly, you should have a pretty good sounding system. From this starting point, you should be able to turn it into a great sounding system.

The MOD II Stereo Controller System is the most advanced and best sounding all- function booth stereo system ever offered to the theatre industry. Almost 3 years went into the development of the product, with many proven state-of-the-art techniques borrowed from the recording and professional sound industries that have been incorporated into a theatre product for the first time.

In order to get the optimum results of the capability of the MOD II, the theatre engineer installing the system should be totally familiar with all the features and adjustments offered in order to provide the theatre with all that the product can deliver. Careful attention to detail and familiarity with the installation instructions will allow you to offer a system that is superior to all others with a sound quality second to none.

This manual is divided into sections that cover all vital aspects of the MOD II and provide a reference to areas that require more detailed instruction. We also advise that you read the SMART BOOK FOR THEATRE SOUND ENGINEERS for a review of the many considerations that determine whether the system you install will be a great system, or only a good system. Room acoustics, speaker systems, and interface to other equipment can limit performance if not fully understood.

You may order the SMART BOOK FOR THEATRE SOUND ENGINEERS from Smart Theatre Systems, 3856 Green Industrial Way, Atlanta, Georgia, 30341. This hardcover book sells for $25.

MOD II COMPONENTS

The MOD II central soundtrack processing system is made up of the following components:

1. Central Card Cage electronics package.

2. Remote Control Center.

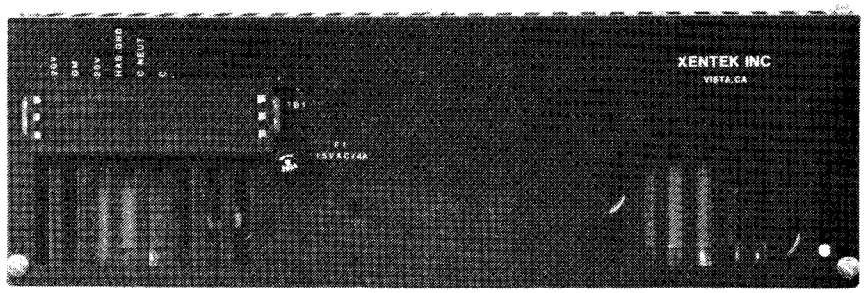
3. Regulated Master System Power Supply.

4. Emergency Sound Backup Power Supply.

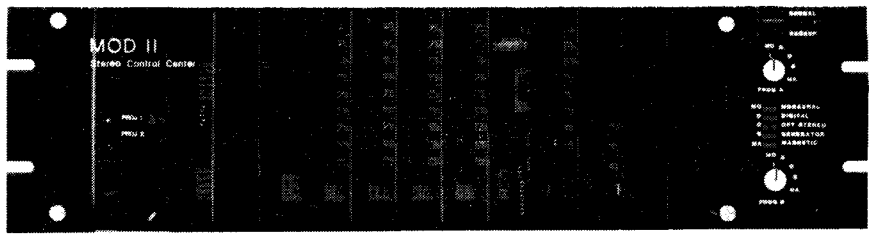
5. Various plug-in printed circuit cards to expand from a basic monaural sound processor to a full 6-channel SVA and Stereo Synthesized Mono Deluxe system. Optional plug-in cards allow bass enhancement, computer diagnostic testing, and monaural Hi-Fi enhancement capabilities.

There are three (3) main components included in the MOD II system and several optional feature plug-in cards to give the system even greater flexibility. The system cannot operate without the three main components, but can operate without the options.

POWER SUPPLY: A heavy duty fully-regulated power supply is furnished with the MOD II decoder. This dual 10 ampere supply is heavily filtered and supplies 5 amperes of current @ 21 volts for the positive circuits, and 5 amperes @ 21 volts for the negative pole circuits (relative to ground). The supply is fully capable of supplying the decoder, and many other system components such as magnetic preamplifiers, a 70mm processor, electronic crossovers, etc., and still have extra current to spare. This large supply is UL recognized and has been chosen because several SMART products are in development that will benefit from this scheme in the near future.



THE UL RATED SUPPLY PROVIDES VERY LOW HUM AND VERY HIGH CURRENT FOR THE MOD II AND OTHER COMPONENTS IN THE RACK.



THE CARD CAGE ELECTRONICS SHOULD BE PLACED IN THE EQUIPMENT RACK NEAR THE ELECTRONIC CROSSOVER AND POWER AMPLIFIERS.

MAIN FRAME CARD CAGE ELECTRONICS. The "working" part of the MOD II system is housed in a card cage rack mount assembly that contains plug-in component cards for easy servicing and future expansion of the system. A theatre may elect to start with a basic MONO sound system with a few necessary cards, update to a Front-Surround stereo system, and eventually, a full four or six channel system just by adding additional plug-in cards. The SMART MOD II is the only system on the market that can offer these options.

CONTROL PANEL(REMOTE). The full feature remote control panel may be rack mounted near the card cage and power supply, or run several hundred feet from the sound processor for true remote operation. All operator functions and adjustments are easily accessed through the remote control panel. Other configurations of the panel are available under special order for specific custom applications. The MOD II system cannot operate without the standard control panel or a variation of circuits in a compatible customized control panel.

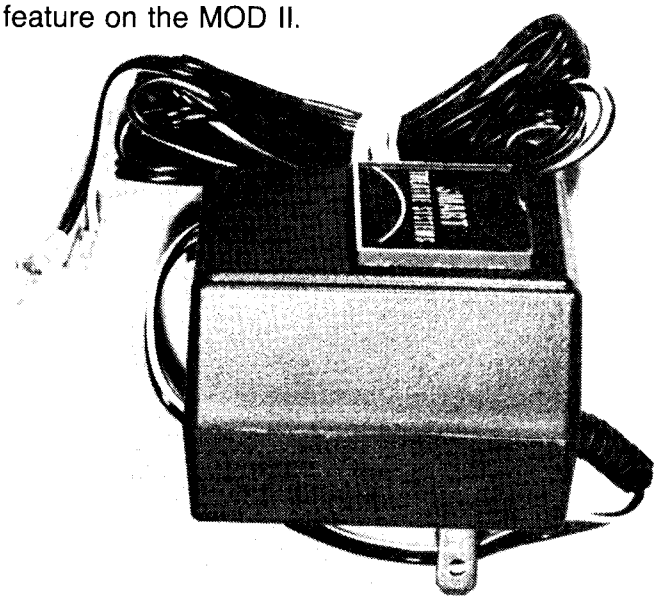
THE MOD II REMOTE MAY BE INSTALLED ANY WHERE IN THE BOOTH, OR NEAR THE CARD CAGE IN THE EQUIPMENT RACK.

OPTIONAL ADDITIONS:

Computer Service Analyzer.
Monaural Fidelity Enhancer.
Bass Sub-Woofer Processor
Stereo Signal Level Limiter.
Pink-Noise Generator Test Card

EMERGENCY SOUND BACKUP POWER SUPPLY

A backup power supply is included with the MOD II to power thebackup preamp built into the MOD II. This is a wall-plug type supply that delivers about 15 VDC at 100 mA. The backup capability is a standard feature on the MOD II.



DESCRIPTION OF THE INDIVIDUAL PLUG-IN CARDS

PC CARDS ARE BEHIND THE REMOVABLE FRONT COVER.

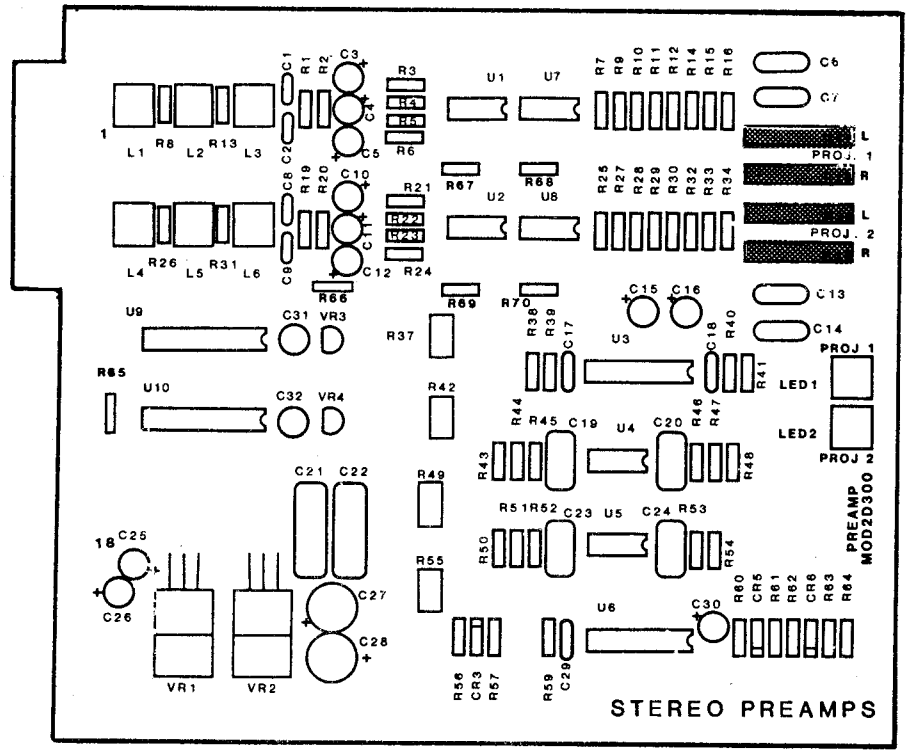
Many of the plug-in system cards contain extra IC chips used with the optional Computer Diagnostic feature of the MOD II system. These IC's sample the audio from various sections of the system and are switched by the computer into the diagnostic circuits. The sampling chips do not process the audio that is heard by the audience, but are part of the self-check capability of the unit. You may find that some IC sockets are empty if the MOD II was purchased without the computer option. The missing chips must be plugged into the sockets if the MOD II is expanded to the computer version. Also, the Remote Control Panel must be exchanged because the computer version has an alphanumeric Liquid Crystal Display in place of the *PROGRAM STATUS* window in the Remote Panel.

Each card has its own voltage regulators that stabilize the circuits locally as well as filter unwanted signals that may be on the main power busses. This feature contributes greatly to the excellent sound quality of the MOD II.

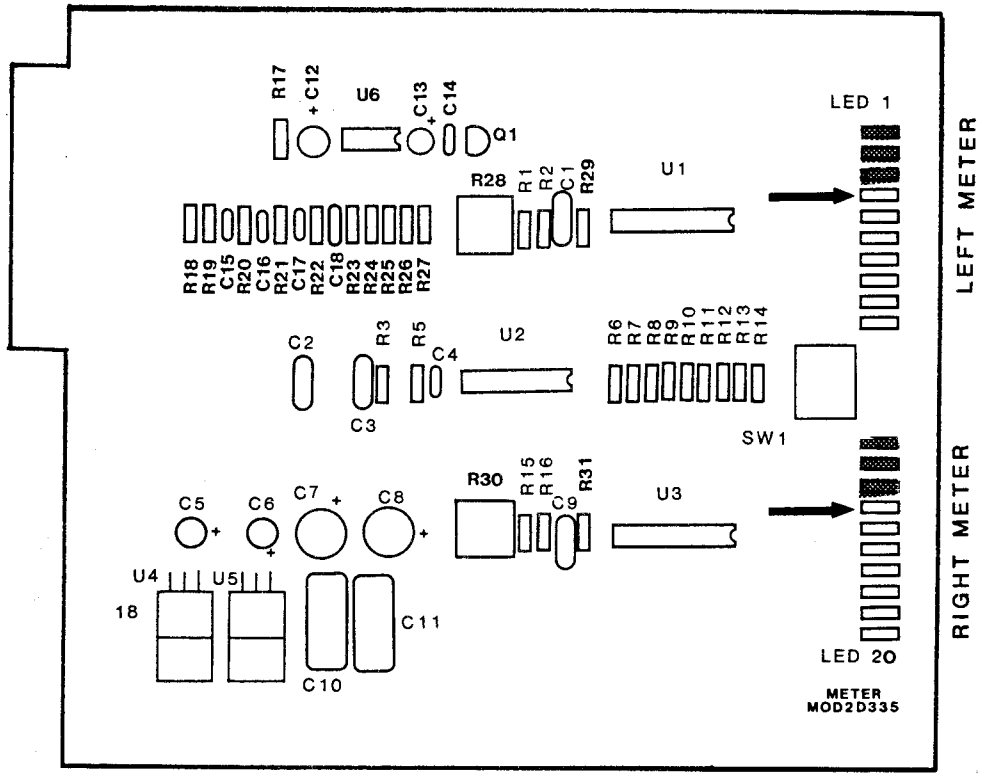
Test points are included on some cards for the sound engineer to access vital circuit points with his scope meter. These terminals will accept a meter probe or "alligator" clip.

PLUG-IN CARDS

PREAMP CARD. The Stereo-optical preamplifiers on this card increase the incoming level from the stereo solar cells. There are four identical preamps on the card. Electronic changeover between stereo pairs is built into the card to be used in dual projector booths. RF interference protection is built in to reduce the risks of noise when used in the vicinity of radio or TV transmitting antennas.



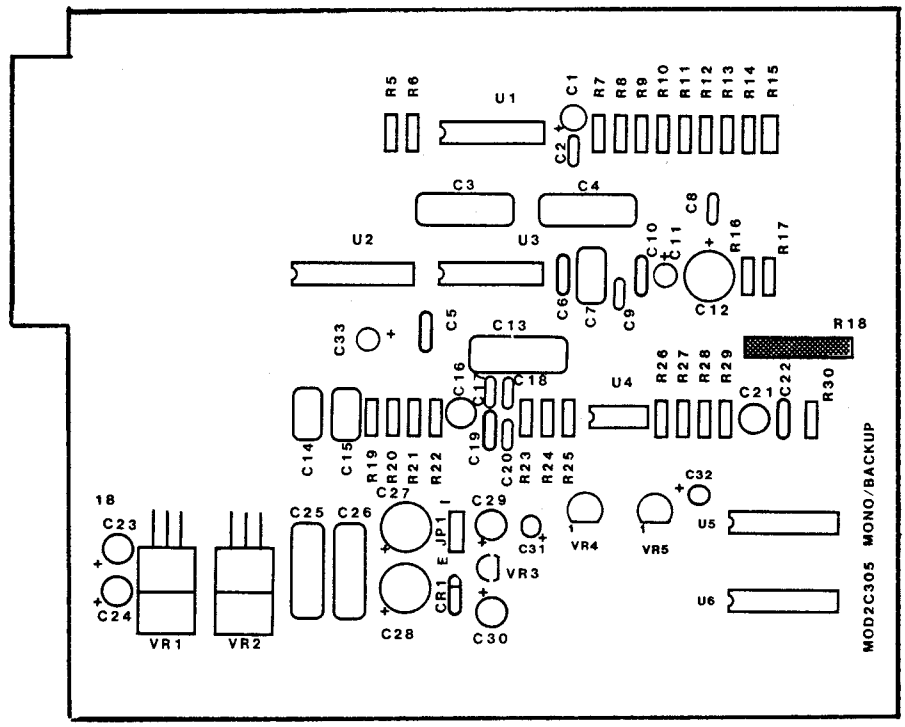
STEREO PREAMP CARD



METER CARD

LED METER CARD. This card is the main visual program signal indicator for the MOD II system. In the normal mode of operation, it displays the composite Left channel soundtrack (Left Total) and the composite Right channel film signal (Right Total). A 5 position DIP (Dual In-line Package) switch allows the sound engineer to use the LED Meters to make the necessary set-up adjustments to the system during installation. The LED meters are peak responding to the audio signals.

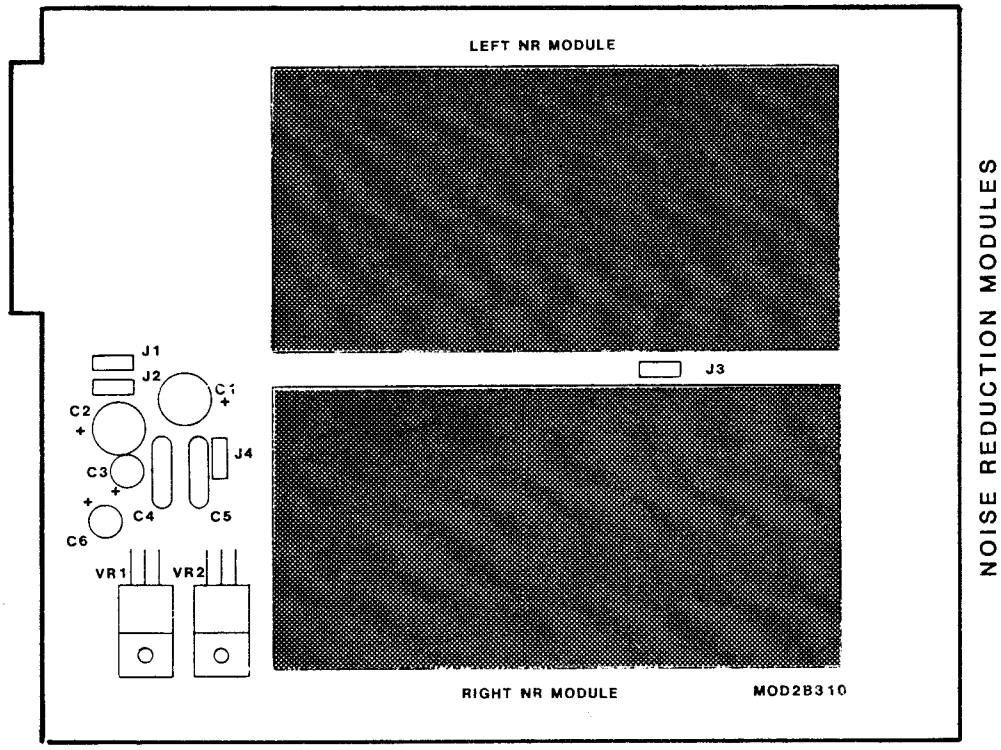
A "pink noise" generator is also located on the LED METER CARD. This source is used with the computer diagnostics option version of the MOD II system to generate the wide-band source that the computer analyzes to check system performance.



MONO/BACKUP CARD

MONO/BACKUP CARD. The output signals from the selected stereo preamp pair (through the electronic changeover) feed the MONO CARD. The LT and RT signals are mixed into a mono signal and any soundtrack noise or pops are minimized by the exclusive *SMART ELECTRONIC SOUNDTRACK CLEANER* circuit. Also, the necessary band shaping takes place to emulate a bright "Academy Curve" characteristic for mono soundtrack reproduction.

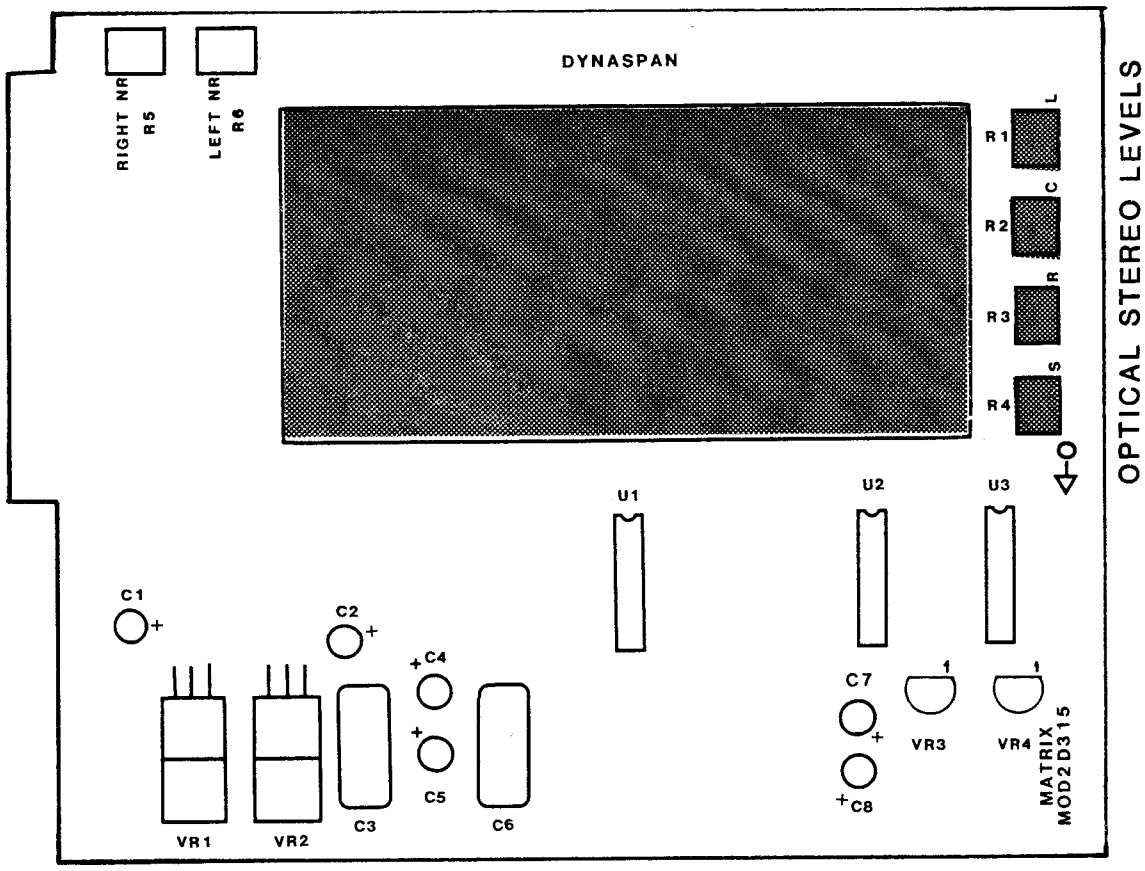
The MONO card also contains all the necessary circuitry for the emergency backup system in the event of loss of sound within the MOD II system. The preamps sum all four projector solar cell inputs for backup use. The emergency circuit is powered by a small external power supply furnished with the system.



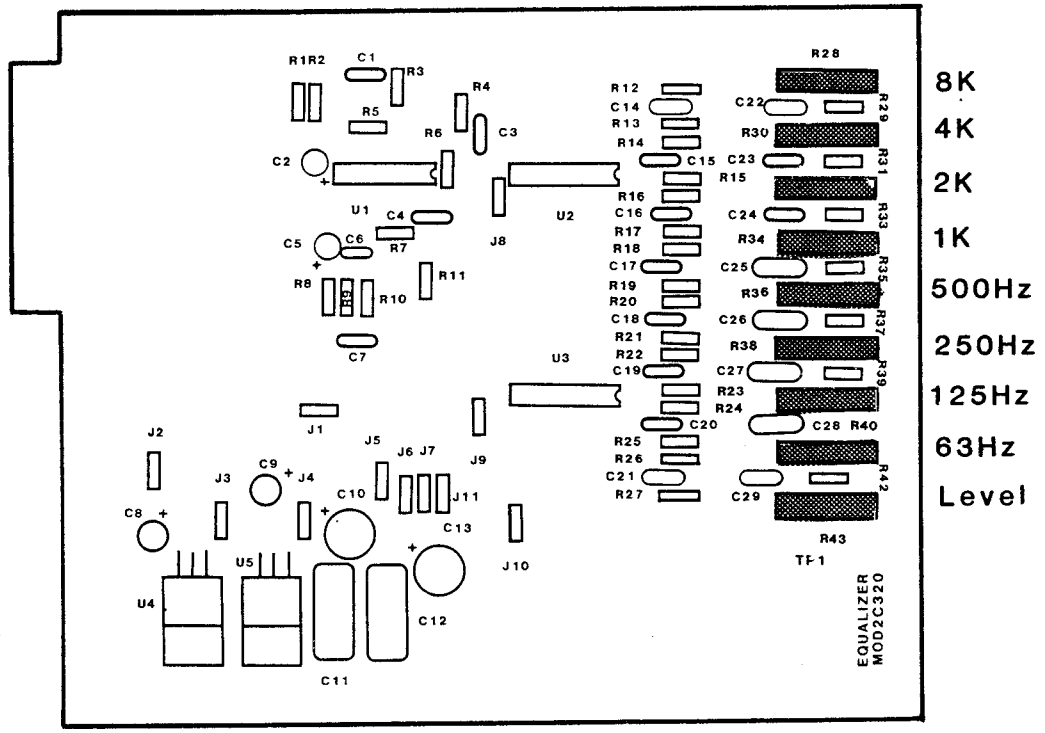
NOISE REDUCTION CARD

NOISE REDUCTION CARD. Two noise reduction modules are soldered to the plug-in card. One card is used in the LT signal path and the other in the RT path. The noise reduction circuits in each module accurately tracks the special encoding placed on the film during the recording process. The noise reduction modules will reduce noise 10 dB in the mid-to-lower audio frequencies, and 15 dB at very high frequencies. No optical lens slit-correction circuitry is required as it is in other brands of decoders, for the noise reduction to properly perform.

MATRIX CARD. The *SMART "DYNASPAN"* (Dynamic Expander) is the portion of the system that separates the Center and Surround signals from the Left Total and Right Total soundtracks on the film. No adjustments are required for the circuit other than the initial "Encode Calibration Tone" used to set up the preamplifiers during installation. The trim pots on the board are factory calibrated, but will allow special matching to outside signals (such as Digital input or 70mm Magnetic signals) to balance the DynaSpan against other sources.

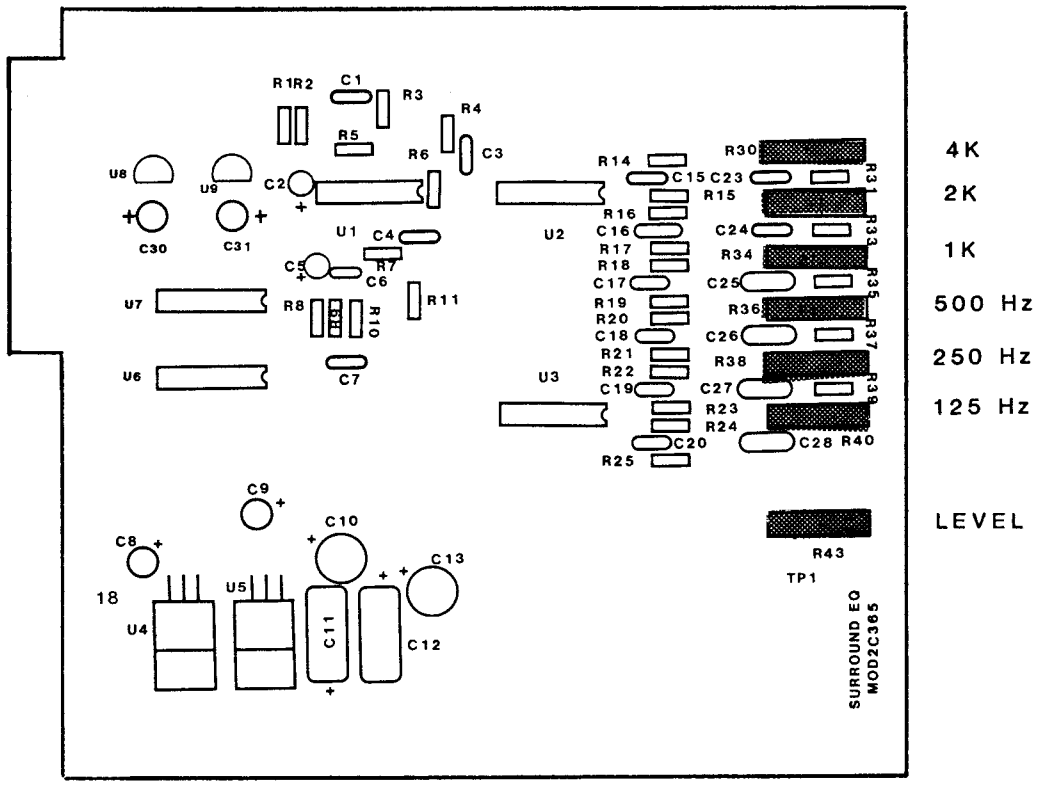


MATRIX DECODER CARD



FRONT CHANNEL EQ CARD

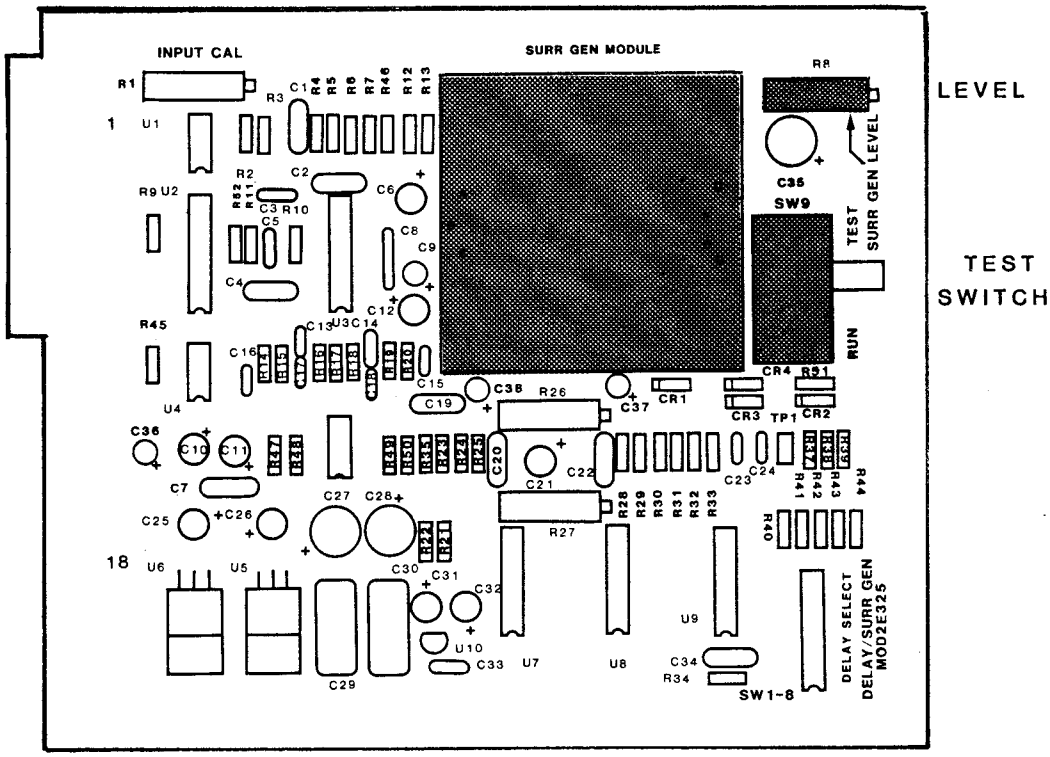
EQUALIZERS. Three One Octave Room Tuning equalizers are used for Stage channel sound (Left, Center, Right). The multi-turn pots on the front edge of the cards allow precise adjustments to be made. SMART is an advocate of one-octave tuning as opposed to third-octave systems because of the notorious phase shift noted in the latter type of tuning. An explanation of this practice is covered in *"The SMART Book for Theatre Sound Engineers."*



SURROUND EQ CARD

SURROUND EQUALIZER. The fourth equalizer in the system is for the surround channel of any signal passing through the MOD II, i.e. Magnetic, Stereo Generator, Stereo-Optical, Digital, etc. The surround equalizer card also carries the computer sampling circuits for ALL 4 equalizers in the card cage. This card may be replaced by any of the MOD II equalizers in an emergency.

DELAY/SURROUND GENERATOR. The time delay portion of the MOD II system is contained on this card, along with the Stereo Generator Surround Module. The surround channel passes through the time delay when the Stereo-Optical format or Stereo Generator format is selected by the operator on the *MODE SELECT* logic, located on the main card cage system. 35mm magnetic, 70mm magnetic or digital inputs are *NOT* time delayed.



TIME DELAY/SURROUND GENERATOR CARD

Time delay of the surround channel is necessary for two reasons in optical stereo: 1) to mask any front-to-surround crosstalk and, 2) to synchronize the stage and surround channels sufficiently to eliminate echo which will occur due to the different sound path lengths from stage and surround speakers.

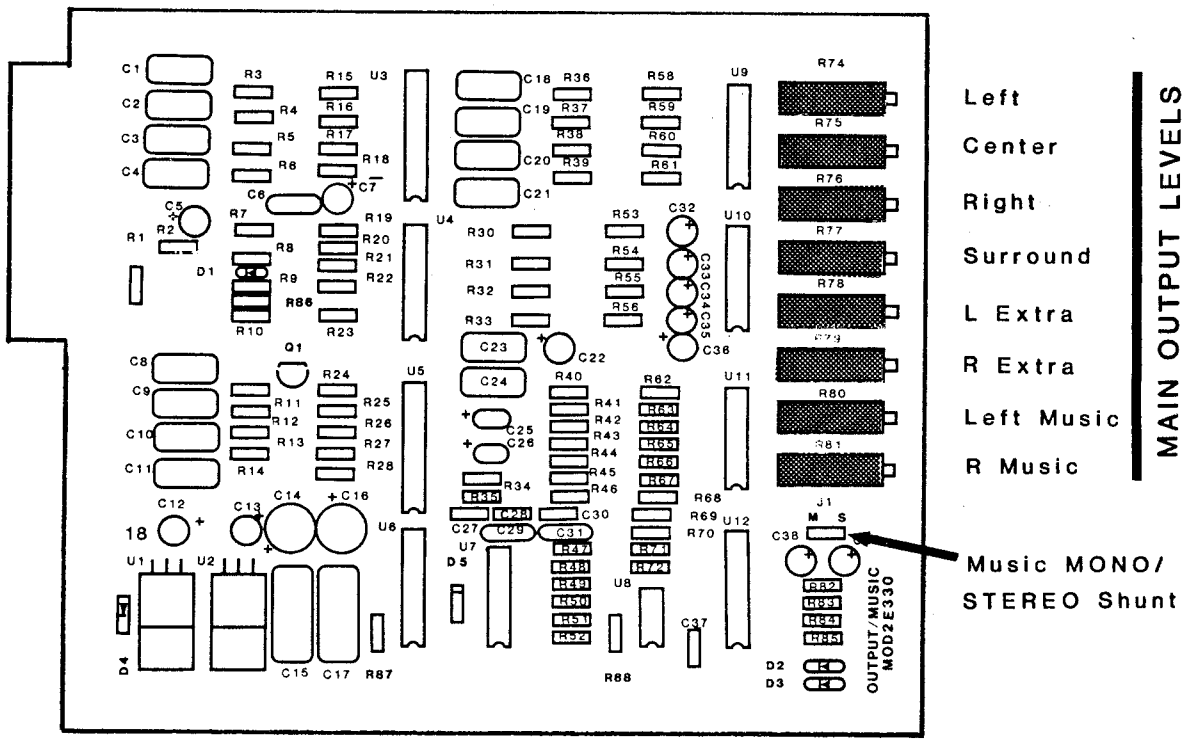
Since magnetic (and any future digital) playback uses discrete channels, the time delay for synchronization is applied directly to the surround soundtrack. There is no need to eliminate front-to-surround crosstalk in these formats since the discreet tracks have very low crosstalk already. In optical stereo, the surround track is encoded into the left and right tracks and cannot be delayed on the soundtrack; therefore, the processor must provide the delay after the surround track has been extracted from the left and right tracks.

The time delay card also contains the surround generator portion of the Smart Stereo Generator. In the 2 channel configuration (center-surround), the Mono/Backup Card supplies the center signal, and the surround generator module derives the surround signal. In the 4 channel con-

figuration, another card, the Front Generator, synthesizes the stage channel signals, and the surround generator module creates the surround signal.

If you have not ordered the Stereo Generator option, there will be several components missing from the Delay Card; most noticeably, the black, potted surround generator module. If you later desire to upgrade to the Stereo Generator option, a new time delay card with surround generator circuitry will be sent to you to replace the existing time delay card.

The amount of time delay is adjusted by means of 8 DIP switches. With all switches set to the right (on) position, the delay is 35 mSec (milliseconds). Each switch set to the left (off) position adds 10 mSec of delay. All switches set to the left position yields 115 mSec of delay.

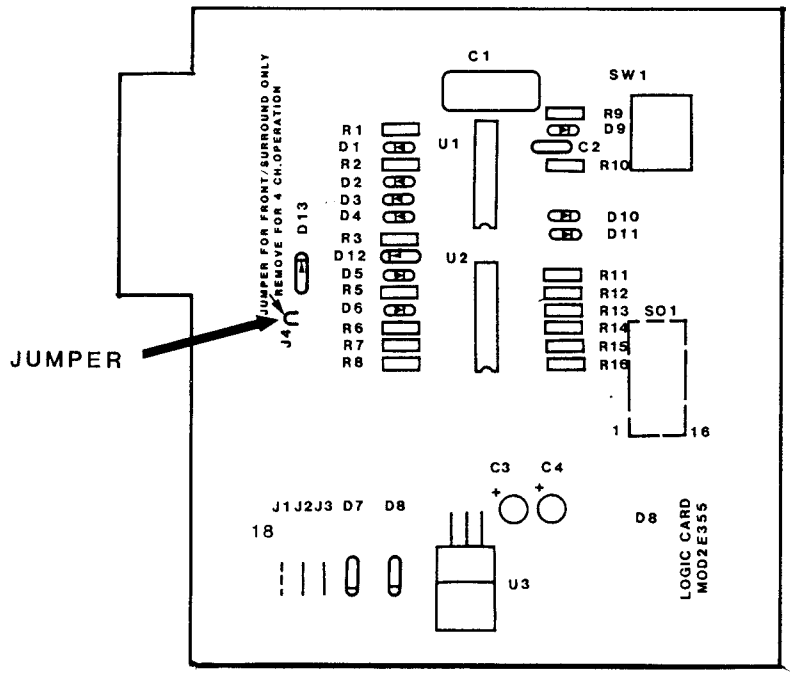


OUTPUT/MUSIC CARD

OUTPUT/MUSIC CARD. Six channels of audio comprised of the four primary stereo channels (Left, Center, Right, and Surround) along with a Left-Extra and Right-Extra channel pass through the MASTER VCA (Voltage Controlled Amplifiers). The VCA exhibits very close tracking between channels and is controlled by the *STEREO FADER* and *MONO FADER* contained in the Remote Control Panel. The Left-Extra and Right Extra signals are derived from the primary 35mm stage channel material through a low pass filter to the LE and RE stage amplifiers. This feature is welcomed in 70mm installations that already have the extra amplifiers and speakers.

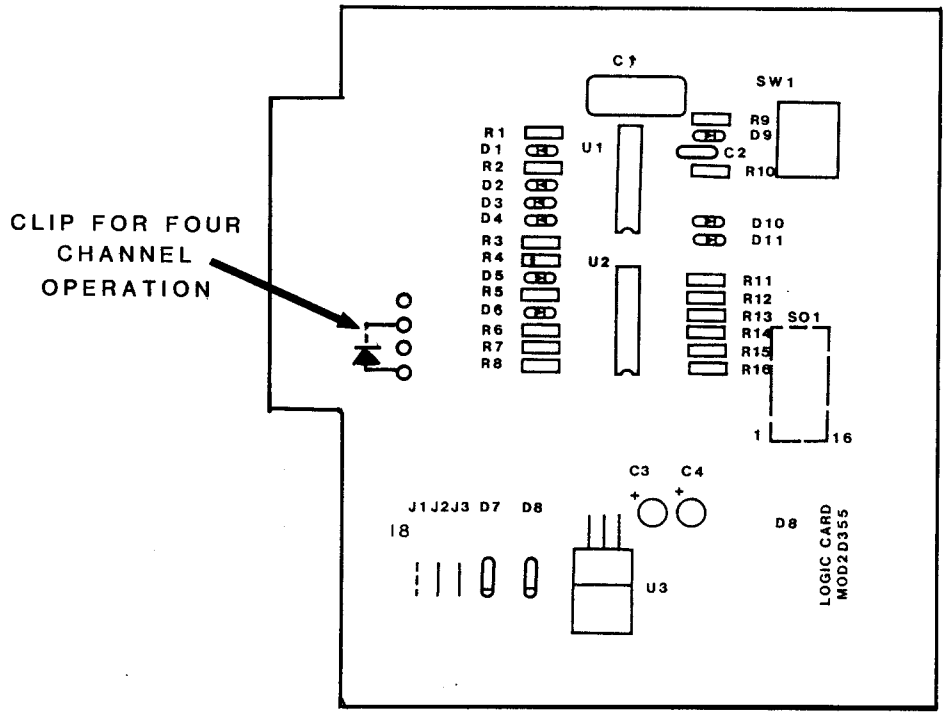
Music Fade-in and Fade-out (which may be controlled by the automation) is also on this card, along with a special music matrix to generate a four channel, non-sync sound from a standard two channel music tape player or CD player.

LOGIC CARD. The last position in the MOD II card cage contains the Logic circuits, which control all functions of the MOD II system. In addition, external commands are available from this card to control other equipment in the sound system. A 70mm 6-channel magnetic system or digital decoder may be easily interfaced to the MOD II and controlled by the logic circuits through terminals on the rear of the main card cage chassis.

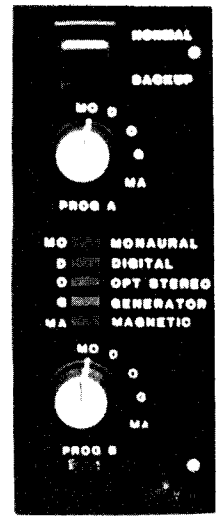


LOGIC CARD

There are currently two variations of the LOGIC CARD. Two-channel systems have an extra diode on the LOGIC CARD to accommodate the way the center channel is derived in the generator mode. If you have a four-channel system, this extra diode will not be installed. At present, this diode is added to the D version LOGIC CARD in two-feed through holes. On the E version card, there will be a jumper, J4, which is in place for two-channel systems. J4 will be cut out on four-channel systems.

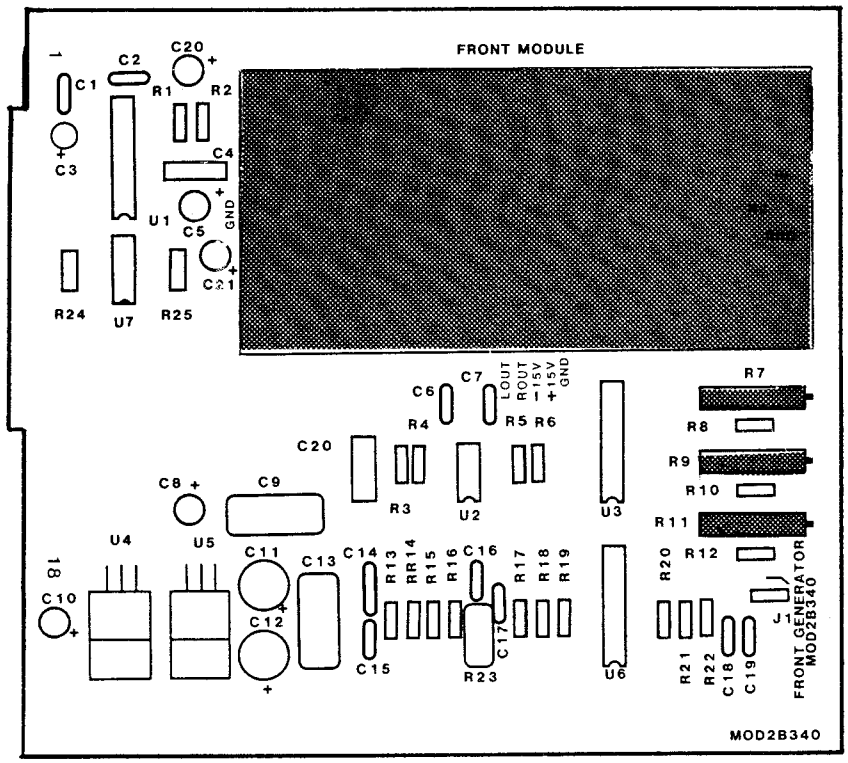


LOGIC CARD



LOGIC MODULE

FRONT STEREO GENERATOR. *A deluxe Stereo Generator (synthesizer) is offered as an option to the MOD II system. The front channel circuits are included on this card. The surround generator is part of the DELAY/SURROUND GENERATOR* card in another part of the system. Trim pots are positioned at the front of the board and allow trimming levels from the Left, Center, and Right Generator outputs to match levels of the Stereo-optical signals when each is selected.

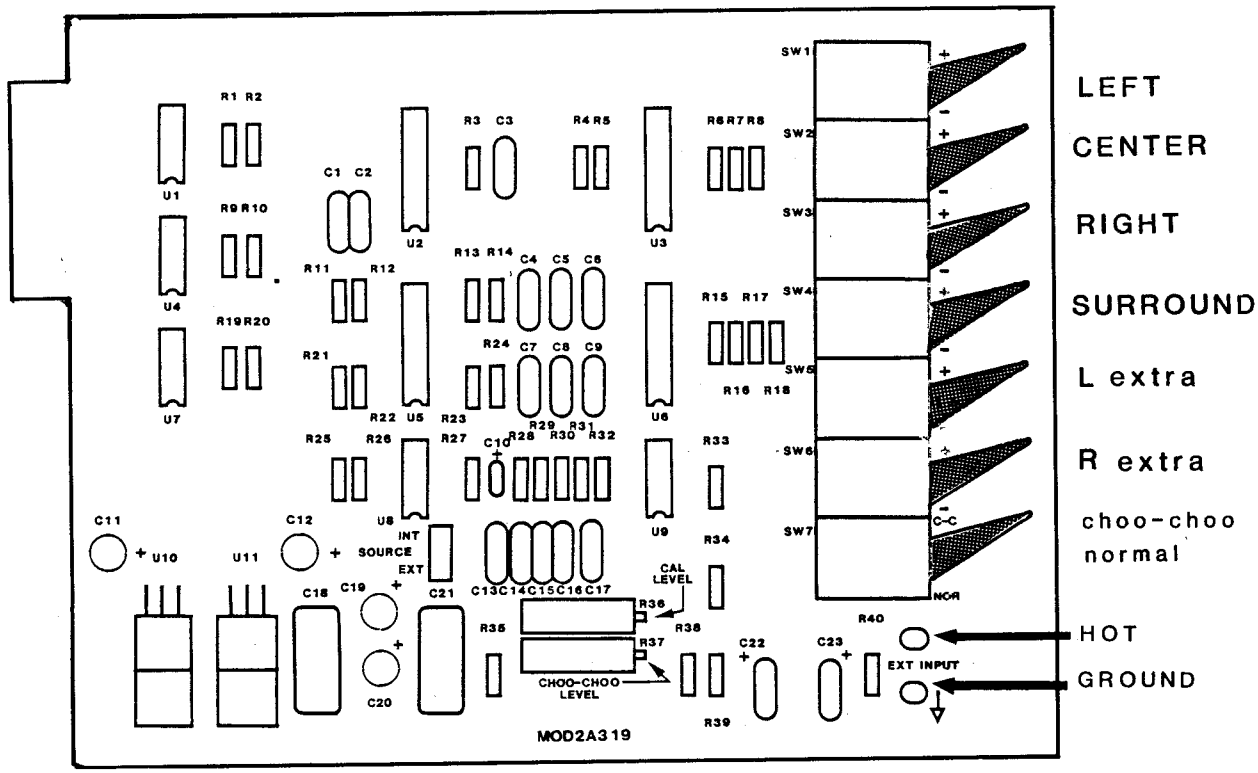


L GEN LEVEL

C GEN LEVEL

R GEN LEVEL

BASS EXPANSION CARD. A special option used with theatre sub-woofer systems. The detector circuits sense the presence of bass material on the soundtrack and expand the signal for a more potent bass signal through low pass filters to the sub-woofer amplifier and separate stage speaker system. This card may be plugged into the option slot of the MOD II and its operation selected by the *OPTION* button on the Remote Control Panel.



PINK NOISE TEST CARD

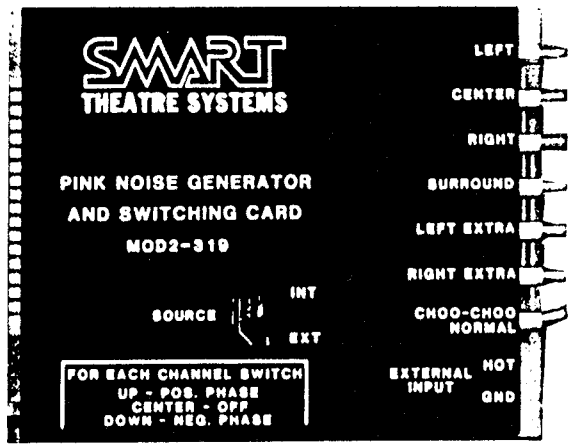
NOISE SWITCHING CARD. The MOD2X319 card is a tool designed for Field Engineers to aid in the adjustment of MOD II system levels and house equalization curves. Included are six switches for channel selection (L,C,R,S,LE & RE) which can feed a positive phase or negative phase pink noise (or external signal) to each channel of the MOD II. Also, there is a seventh switch which is used to select a simulated "Choo-Choo" Track generator for setting surround levels for the optical stereo mode. Either the internal pink noise generator or an external signal source can be used with this card.

INITIAL CONDITIONS. The channel selector switches are three position switches. For each channel, UP is positive phase, MIDDLE is off, and DOWN is negative phase. Set all channel selector switches to the MIDDLE position to begin. Set the Choo-Choo/Normal switch to the Normal position.

EQUALIZATION. Remove the MATRIX card from the Card Cage and plug in the PINK NOISE SWITCHING CARD in its place. Set the MOD II for Optical Stereo operation, and set the Master

Fader to #4. After setting up a Real Time Analyzer in the auditorium, begin the equalization process by setting one of the channel switches (e.g. Center) to the UP position. Adjust the Master Fader as desired to achieve a normal SPL reading of 85dBC in the auditorium. Equalize the selected channel [see the section on EQ cards]. Turn off this channel and select the next channel to be equalized. Do this for the four main channels (L,C,R,S).

OUTPUT LEVELS. Select each channel, one at a time, and check the auditorium level on each channel with the Real Time Analyzer. Using the Center channel level as a reference, adjust the other channels for the same level (on the Real Time Analyzer), using the output level trimpots on the Output/Music card.

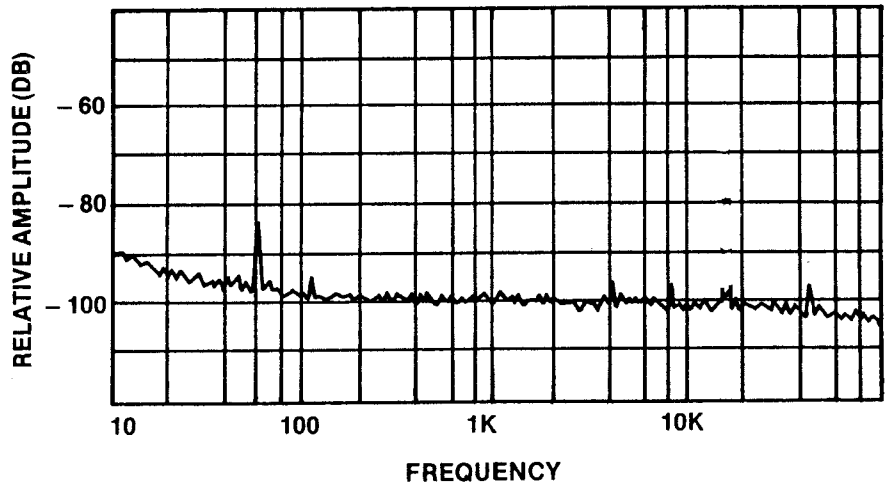


OPTIONAL TEST CARD

SYSTEM PHASING. Set the Center channel switch to the UP position and note the OVERALL level reading on the Real Time Analyzer. Leave the Center channel switch ON and set the Left channel switch to the UP position. The OVERALL level reading on the Real Time Analyzer should increase by 3 or 4dB. If the level decreases instead, set the Left channel switch to the DOWN position, and check for a level increase. If the level increases in this condition, then there is a phase (polarity) reversal on the Left channel relative to the Center channel. The most likely place for this to occur is in the speaker wiring, either at the amplifier or at the speaker. Turn the Left channel switch off (middle position) and repeat the procedure with the other channels (Center channel switch stays on).

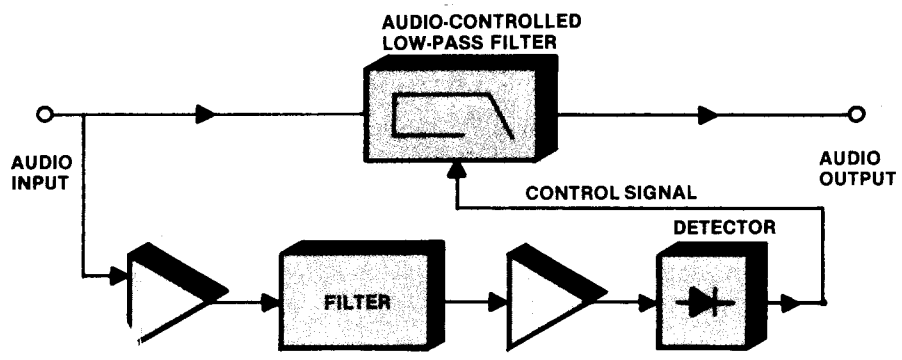
Note that in bi-amped systems, you may have only one of the drivers reversed. If the woofer is out of phase, it should be easily seen on the Real Time Analyzer when combining with the Center channel. However, the woofer could be in phase and the HF driver out of phase. This may not be readily apparent on the Real Time Analyzer when combining with the Center channel (due to short wavelengths at the higher frequencies and room acoustics).However, you will probably see response problems at the crossover point when you are attempting the house equalization. You will most likely correct this type of problem then.

ELECTRONIC SOUNDTRACK CLEANER. One of the exclusive features of SMART processing equipment is the Electronic Soundtrack Cleaner circuit use in the monaural processing chain that removes a substantial amount of film noise even on new prints. The circuit incorporates the patented DNR (Dynamic Noise Reduction) system. By using a dynamically controlled audio bandwidth, responsive to both amplitude and frequency content of the signal, the system is able to provide up to 14 dB improvement in the Signal-to-Noise ratio. Because the dynamic Noise reduction is non-complimentary (the audio does not have to be processed in a special way prior to reproduction) it is compatible with any film soundtrack.



The noise spectrum of the monaural chain is relatively uniform over a wide frequency band.

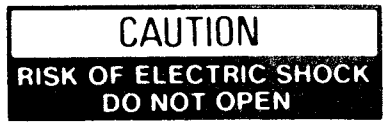
The audio bandwidth of the soundtrack increases when signals are above the film noise floor so it is important that the threshold level for operation is correctly set. This is no problem because the SMART processor must be set properly for the stereo decoding of the SVA noise reduction modules. When the stereo portion of the system is set, the mono Soundtrack cleaner is automatically set to the proper operating level also.



Block diagram of a single ended dynamic noise reduction Electronic Soundtrack Cleaner. This circuit is able to provide up to 14 dB of noise reduction when used with a non-encoded soundtrack source.

IMPORTANT

The lightning flash with arrowhead, within an equilateral triangle, is intended to alert the user of the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



CAUTION:
TO PREVENT THE RISK OF ELECTRIC SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER-SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

INSTALLATION INSTRUCTIONS

COMPONENT PLACEMENT

Before mounting the MOD II components in the equipment rack or projector console, be sure to select a well ventilated place that allows cool air to circulate around the individual components. In SMART prewired rack systems, the Master Power supply is mounted on the floor of the rack, and the Rack-mounted Remote panel is placed at eye level for easy visibility of the system operation status. The card cage is generally close to the Remote so that the *PROGRAM MODE SELECTORS* are associated with the remote controls. Of course the Remote Panel can be placed anywhere in the booth if the customer so desires.

Make sure that the card cage unit is not immediately adjacent to hum producing magnetic fields radiated by large power transformers. The preamplifier sections of the MOD II have a large amount of available gain that will amplify hum fields if proper attention is not given to component placement. The Remote Panel contains no audio components; all functions are DC signals and logic control lines that run back to the main card cage to control their operation.

POWER SUPPLY INSTALLATION. The Mod II uses an external regulated power supply to provide all power to the circuits and still have a large reserve for other components in the equipment rack. The main supply delivers 5 amperes of current for the positive polarity circuits and 5 amperes of current for the negative circuits. This external supply minimizes the chances of hum pickup when high gain electronic circuits are placed in the same chassis as the supply. Also, the large power capacity of the supply provides a very "stiff" supply to all cards in the MOD II so that power sag (momentary drop of the supply output due to heavy loads) is practically impossible. Therefore, the transient peak response characteristics of the system and stability are excellent. The MOD II Master power supply is UL recognized.

Place the power supply in a convenient position in the equipment rack away from major heat producing components and high gain audio circuits. A good place is usually on the floor of the equipment rack. Connect heavy color coded wire (AWG 16 or larger) to the output terminals of

the supply and run them along the left side of the cabinet to the MOD II card cage. Dress the wires for appearance and craftsmanship. Cut off the surplus wire and connect them to the appropriate terminals of the MOD II main unit. See FIGURE 1 for the correct hook up. Check your work to assure that the polarity is correct on the leads from the supply to the processor. A wire that is reversed could be very destructive to the system.

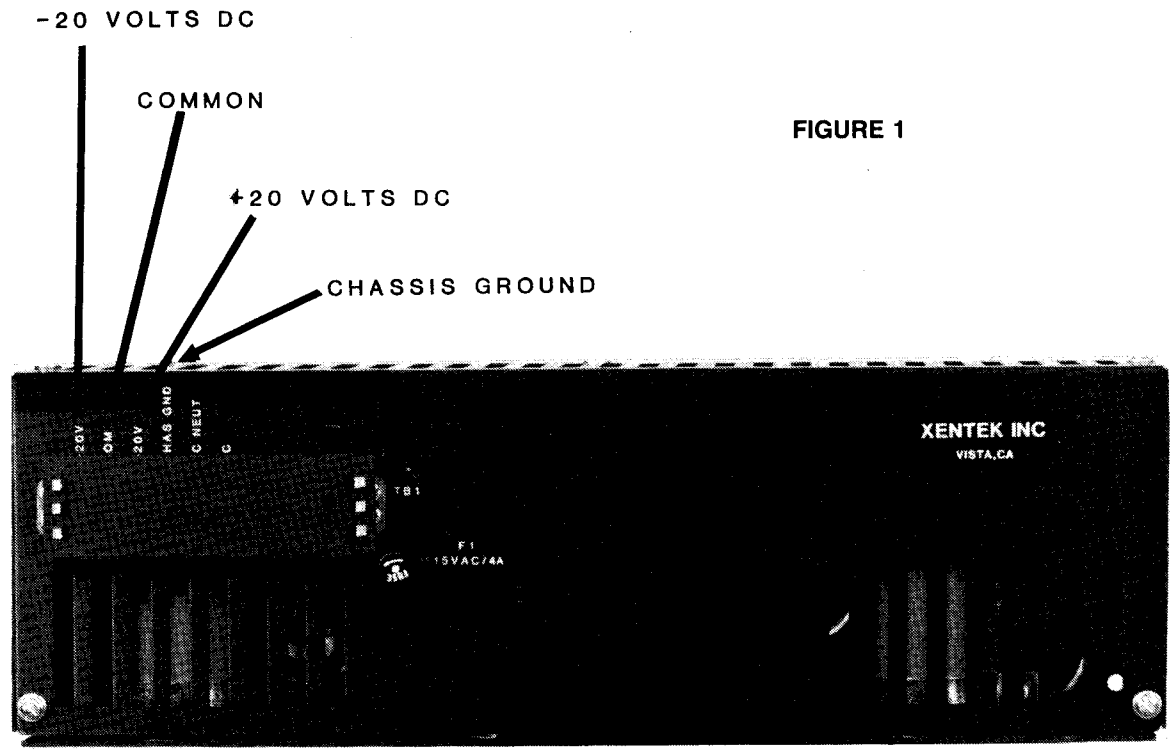


FIGURE 1

EMERGENCY SUPPLY. The second power supply furnished with the MOD II system is a small power pack for the built-in emergency backup circuits. The power pack should be plugged into a nearby AC power strip, and the output leads run to the appropriate terminals on the rear of the MOD II card cage. *BE SURE TO OBSERVE POLARITY WHEN HOOKING UP THE EMERGENCY SUPPLY.*

Place the power supply in a convenient position in the equipment rack away from major heat producing components and high gain audio circuits; a good place is usually on the floor of the equipment rack. Connect heavy color coded wire (AWG 16 or larger) to the output terminals of the supply and run them along the left side of the cabinet to the MOD II card cage; dress the wires for appearance and craftsmanship. Cut off the surplus wire and connect them to the appropriate terminals of the MOD II main unit. See FIGURE 1 and FIGURE 2 for the correct hook up. Check your work to assure that the polarity is correct on the leads from the supply to the processor. A wire that is reversed could be very destructive to the system.

Before applying electrical power to the system, push each printed card firmly into its edge card socket to assure a positive electrical connection for the card. The printed circuit cards may be only partially connected if they move during shipment to the theatre or during installation.

THE SYSTEM WILL NOT WORK PROPERLY IF THE CARDS ARE NOT FIRMLY SEATED.

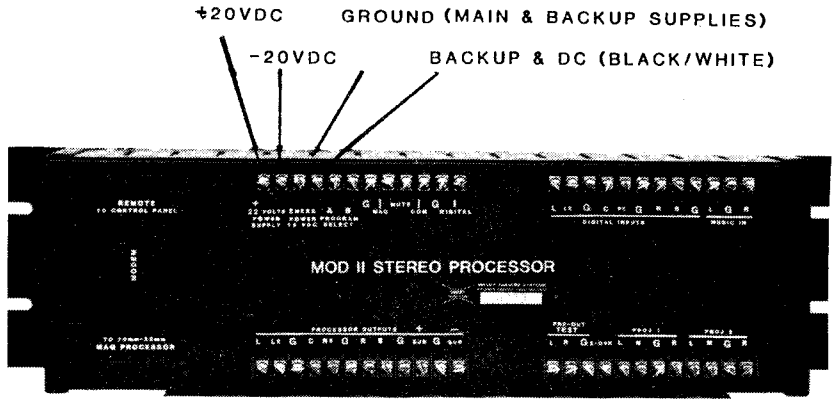
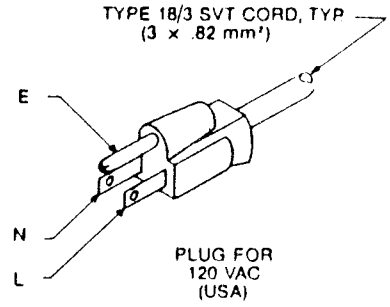


FIGURE 2

The power cord is terminated in a "U-Ground" plug to USA standards. The green/yellow wire, connected to the long prong, is electrically attached directly to the chassis. Some sound engineers will lift this ground to suppress ground loops with a three prong to two prong adapter plug, rather than damaging the power plug. It is not recommended that the ground be defeated because it eliminates the intrinsic safety feature of the three-wire system.



CONDUCTOR		WIRE COLOR	
		Normal	Alt
L	LINE	BROWN	BLACK
N	NEUTRAL	BLUE	WHITE
E	EARTH GND	GREEN-YELLOW	GREEN

AC MAINS LINE CORD DETAIL

FIGURE 3

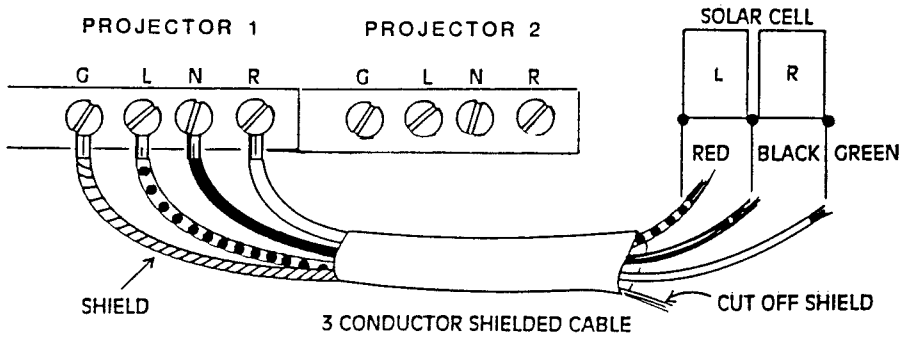
If the ground is defeated, certain fault conditions in the unit or system to which it is connected can result in the appearance of full line voltage between the chassis and earth ground. Such voltage is capable of causing electrical shock, possibly resulting in severe injury or even death!.

WARNING

Disconnect the power supplies from the AC power line before replacing components to avoid the danger of electrical shock.

HOOKUP INSTRUCTIONS

SOLAR CELL HOOKUP. Connect the wire from the left solar cell(red) to the (L)eft input terminal of the MOD II. Connect the wire from the right solar cell(green) to the (R)ight input terminal. The neutral solar cell lead (black) should be connected to the (N)eutral input terminal, and the shield of the cable to the (G)round terminal. Be sure to *cut off the shield at the projector end* so that a ground loop is not created. Only the MOD II end of the shielded cable should be connected.



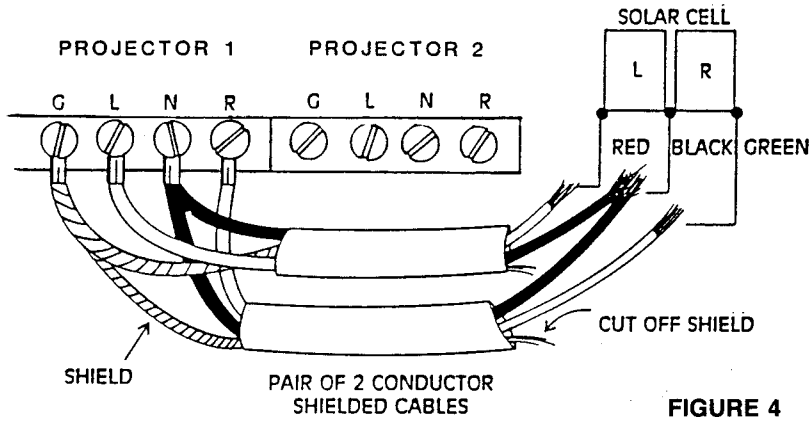


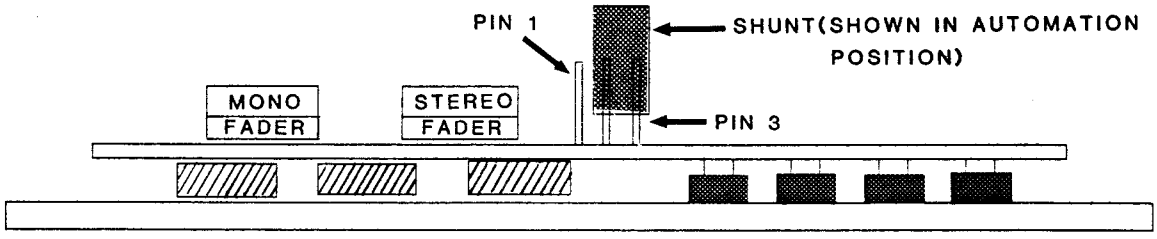
FIGURE 4

DOUBLE CHECK your work to see that the solar cell leads arrive at the proper terminals. A reversal of two of the three leads will cause very strange results. You may hear the center channel information through the surround speakers, the surround through the stage, and the left channel out of phase with the right. This is a common error, so verify correct wiring before proceeding.

COMMAND TERMINAL. The four channel intermission music fade circuit is activated remotely by grounding the command terminal. When grounded, the film source is muted and the music will fade-in. When the command terminal is un-grounded, the film sound will appear at the main outputs, and the music will slowly fade-out. Connect a pair of unshielded twisted wires to the command terminal and a nearby (G)round terminal. A remote SPST switch may be positioned near the projector(s) to activate the transmission. If no remote switch is desired, the front panel MUSIC switch provides the same action.

COMMAND TERMINAL. The music command terminal may also be connected to an automation system to automatically control the selection of music and film. Normally, you will configure your automation so that on power up, the automation relay contacts will be closed across the Command Terminal and Ground Terminal on the MOD II. When the automation switches over to film mode, the relay contacts will open, and the MOD II will switch to film mode.

The MOD II music control circuitry (in the MOD II REMOTE unit) is configured at the factory to allow automated or manual music/film switching from the projector. There is a shunt (jumper) in the MOD II REMOTE which selects this automation mode.If you are not using automated or manual switching from the projector, you may still use the MUSIC pushbutton on the MOD II REMOTE UNIT to select music or film and, on power up, the MOD II will be in film mode. If you are not using automation and want the MOD II to power up in music mode, you must remove the top cover of the MOD II REMOTE UNIT and move the shunt to the manual position. The shunt is a shorting device that slides down over two of three pins on the circuit board. Selection is made by moving the shunt to fit over either pins 1 and 2 or pins 2 and 3. See the diagram below.



If you are using automation, you may wish to wire an SPST switch in series with the wire from the command terminal so that you can disable the automation control of music in case an automation failure locks the MOD II in music mode during a film. The switch should be placed so that it is convenient to the operator.

PROGRAM SELECTOR. Terminals marked PGM (PROGRAM) A & B allow remote wiring of the program buttons on the front panel of the MOD II. This allows the operator to switch modes of operation without returning to the equipment rack. He can set the "A" program selector switch to his first choice, i.e. MONO for trailers, and the "B" selector for OPTICAL STEREO. A momentary contact remote switch will toggle the logic and electronic audio switching system between the modes; the front panel program buttons also perform this function. Unshielded small gauge wire can be run to the remote location because there is no audio on the wires, only DC control voltages.

PROGRAM SELECTORS. The A and B PROGRAM SELECT terminals can be connected to an automation system to allow automatic program switching. The automation must provide a pulse (momentary) contact closure to either A or B terminal and ground. If your automation system can interface to sensing foil sensors, you can use that automation feature to sense film changes (i.e. between mono trailer and stero feature) and activate the A or B PROGRAM selection.

Using the automation to control PROGRAM selection and MUSIC/FILM selection allows total automation control of a music-to-film-to-music sequence without operator intervention (except to start the sequence), in most cases.

MUSIC LEVEL CONTROL. The front panel music level control on the Remote Panel allows the operator to set the auditorium music loudness at a different setting from the film level. Often pre--show music is lower in volume than the feature film. This control is independent from the master fader, and should operate in the high end of it's range.

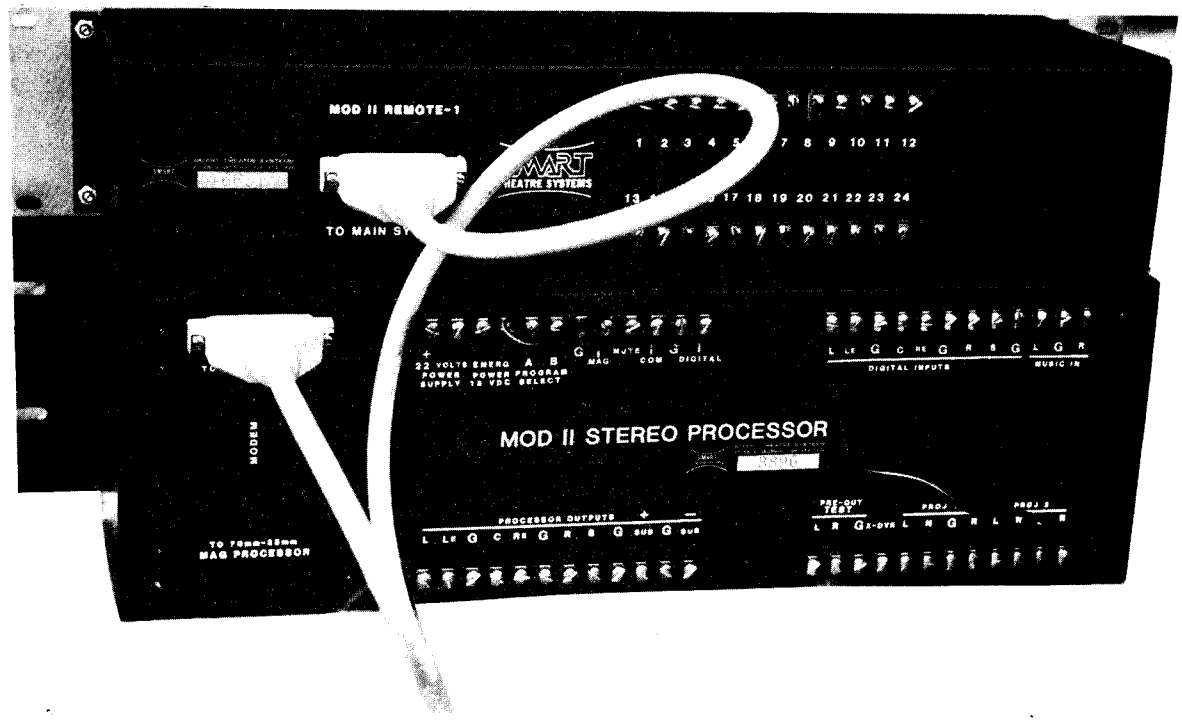
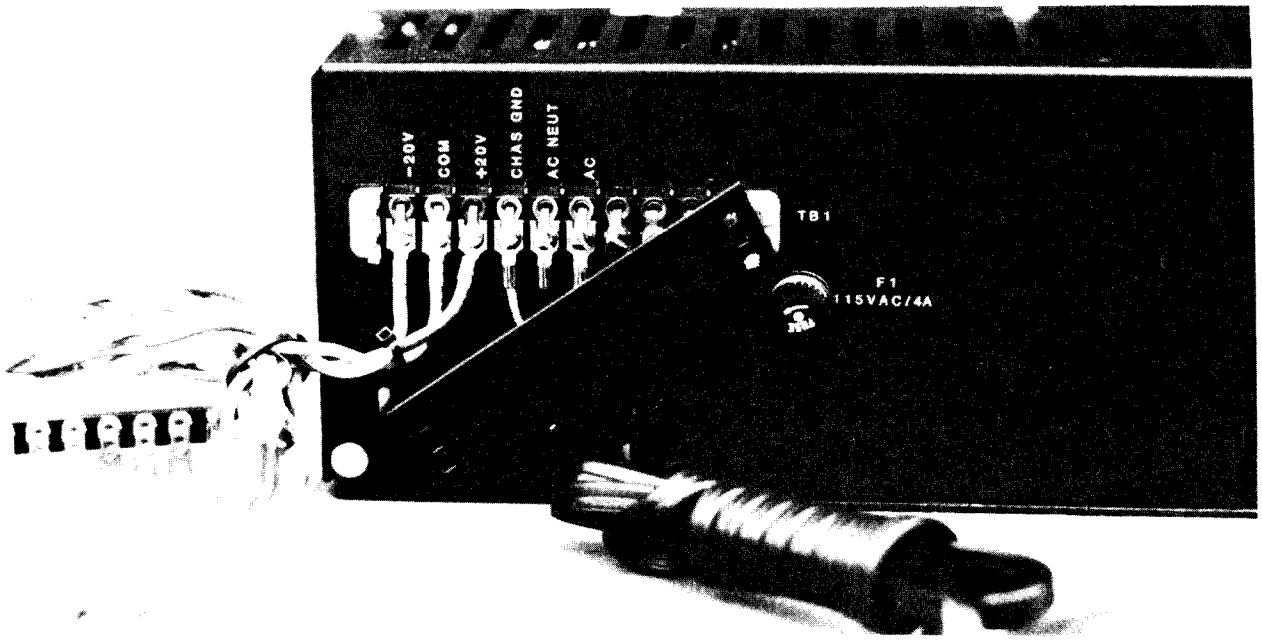


FIGURE 5

CONTINUOUS COMMAND CHANGEOVER. This method allows remote changeover between pairs of projectors, using only a single pair of wires, and is preferred for automated systems. A relay closure in the automation equipment will execute a changeover by grounding the X-OVER terminal. Run a pair of twisted unshielded wires to the "dry" contacts of the automation changeover relay; connect one of the wires at the other end of the pair to the projector X-OVER terminal of the MOD II only. Ground the other wire of the pair to the nearest ground terminal. When the automation relay contacts close, projector TWO preamps of the MOD II will be "enabled," and the first pair of stereo preamplifiers (PROJ 1) will be "disabled." Releasing the relay will cause the reverse action to occur. In other words, PROJ 1 is always ON until the X-OVER terminal is grounded.

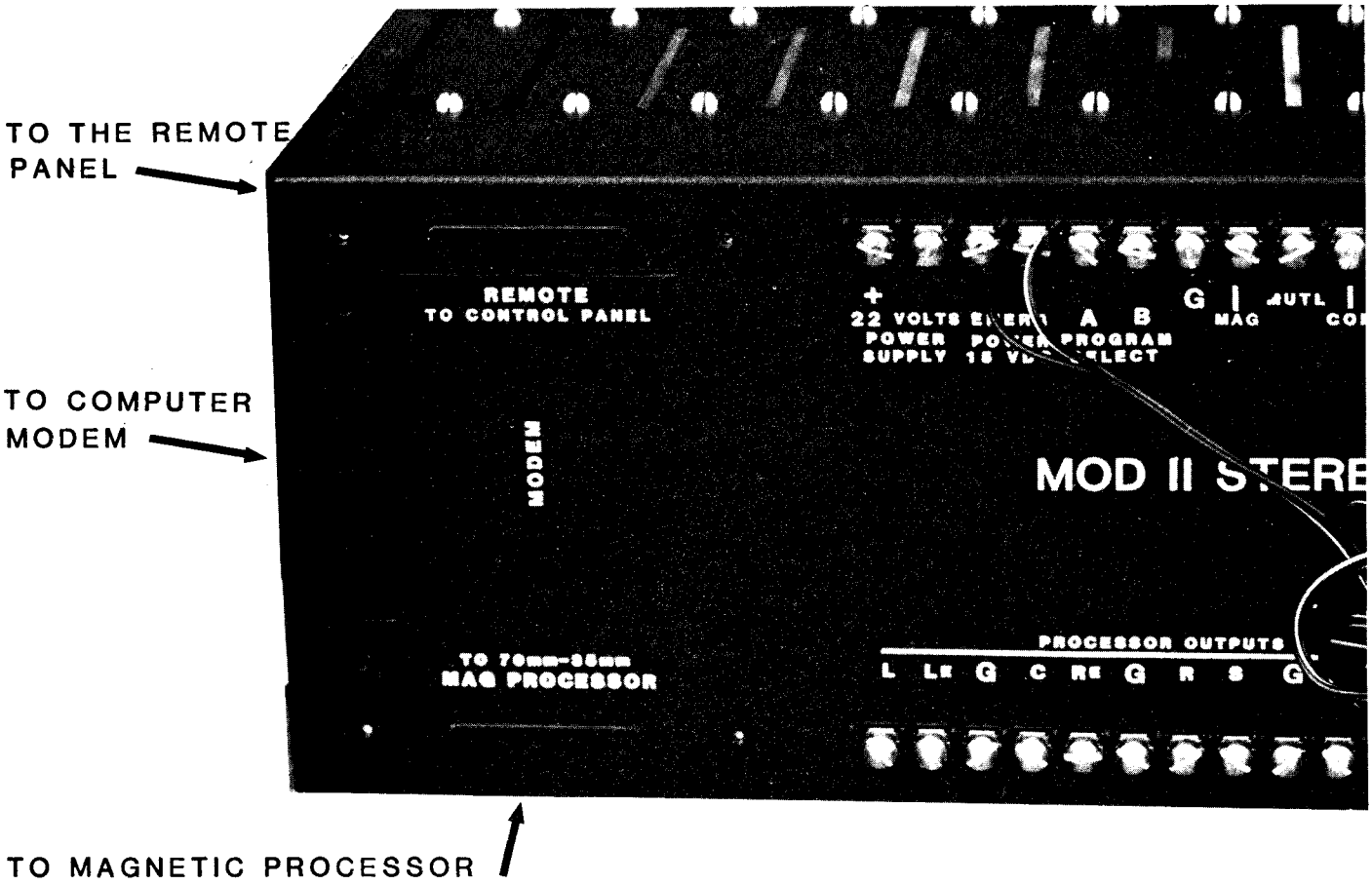


MASTER POWER SUPPLY

CHANGEOVER(X-OVR) WIRING. Changeover between projectors is done electronically in the MOD II. This necessitates that *BOTH* exciter lamps be lit at the same time. No exciter light changeover is provided in the unit. An exciter light changeover is at least 3 dB noisier than an electronic changeover.

LINK CARD. A special card without electronic components is furnished with each MOD II system. This card is used in the OPTION CARD slot when no extra options have been installed. The purpose of the card is to complete the signal path for each of the audio channels to the output card. The system will not operate if the card has been removed or was never installed.

OUTPUTS. The six channel outputs are labeled (L)eft, (LE)xtra, (C)enter, (R)ight, (RE)xtra, and (S)urround. Shielded cable should be run between these terminals and the next piece of equipment in the sound system (equalizer, amplifier, etc.). Convenient ground (GND) terminals are provided near the outputs.



The Remote Panel is connected to the main frame electronics by a standard 25 conductor computer cable. If the distances are greater than a few feet between the units, a 25 conductor round cable must be run to connect the products. SMART offers this special cable with a DB25 connected to one end of the cable. The other end of the cable may be run through conduit and connected to the terminals of the Remote back panel. An example is a lamp console REMOTE PANEL unit that may be 50 feet from the main sound equipment rack. Special cable may be ordered from SMART cut to length. Please contact the factory for price quotes on cable and other special modifications.

DIGITAL INPUTS. The MOD II system has 6 inputs on the rear barrier strip labeled for each channel of an external decoder. When digital decoders are available in the future, it is likely that features recorded in this format will be intermixed with other standard formats. It will be necessary to be able to route the signals through the existing MASTER FADER, House EQ and power amplifiers that now exist in the theatre. The Digital inputs accept any high level (1 volt AC) multi-channel source and route the signals through the MOD II using the present PC cards.

Another application of the Digital Input terminals is for external sync sources. Sound-Interlock from a 35mm reproducer or a single 16mm projector may be fed into the Digital inputs and selected with the front panel MODE selector program switches on the main card cage.

DIGITAL INPUTS. The DIGITAL INPUTS do not have input level trimpots; it is expected that the external source will have its own output level controls. If the external source levels are not adjustable, the MOD II internal levels in OPTICAL STEREO and GENERATOR modes can be adjusted to match the external source levels if needed.

The DIGITAL INPUTS connect directly to the internal system buss of the MOD II. All internal sources (i.e. optical stereo, mono, stereo generator) share the system buss through the SMART Buss Switching Scheme. In this scheme, only one source is connected to the buss at a time, and this connection is made through an electronic switch (typically, a TL185 CMOS QUAD SWITCH IC). The logic circuitry in the MOD II sends a control signal to activate the source selected by the operator. The MOD II logic circuitry provides a control signal to an external source. This signal appears at the DIGITAL terminal on the upper-left barrier strip on the rear of the MOD II card cage. If you wish to connect an external source permanently to the DIGITAL INPUTS, the SMART Buss Switching Scheme must be employed in the external source device to prevent buss loading when modes other than DIGITAL are selected. Please contact the factory for details on implementing a buss switching scheme.

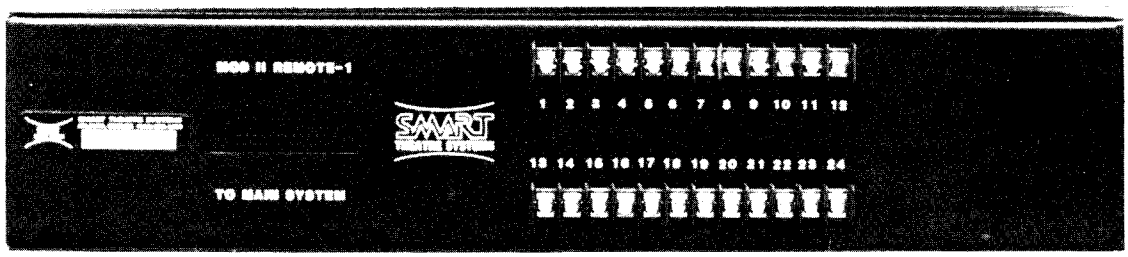


FIGURE 6

REMOTE MOUNTING OF CONTROL PANEL. The standard rack mounted Remote Control Panel for the MOD II is usually mounted in the same equipment rack as the main card cage electronics; however, the Remote Panel may be installed anywhere in the theatre. There are no audio signals present in the Remote Panel; only logic and control signals. Special Remote Panels may be customized in quantities for a theatre customer. Contact the SMART factory for quotations.

MUSIC INPUTS. The MOD II is designed to handle both stereo and mono music sources. There are left and right inputs which are designed to match the levels from most typical tape players, CD players, or cartridge players. Use shielded two conductor or single conductor wire to hook up the music source to the MOD II. If you use two conductor wire, use one of the wires for hot, one for ground, and connect the shield to ground only at the MOD II end. If you use single conductor wire, the shield must be grounded at the MOD II and at the music source.

Since many music sources use RCA PHONO PLUG connectors, you may want to obtain a standard RCA type stereo patch cord and cut the plugs off one end to connect to the MOD II, and the other end will plug directly into the music source. In this case, connect the shield to ground on the MOD II.

MONO MUSIC SOURCE. The non-sync music inputs for the MOD II feature a special music matrix decoder that separates in-phase and out-of-phase signals on a standard two channel recording (CD player or tape) and create four channels of auditorium music. Occasionally, a theatre may use a monaural sound player, such as a background music cartridge player, that does not have stereo capabilities. A jumper on the OUTPUT CARD in the main frame of the MOD II may be moved to the mono position for this use. Connect the mono signal th both L & R music inputs. Adjust the L & R music trimpots so that L & R volumes are equal. (You can use your monitor to check the L to R balance.) Music will appear on all stage channel speakers and the surround speakers when mono material is feeding the sound system.

Helpful Hints

1. Dress high level AUDIO OUTPUT leads to the left of the rack, along with the power wires, and dress the low level leads to the right of the rack (when viewed from the rear). *NEVER TIE WRAP OR BUNDLE HIGH LEVEL AND LOW LEVEL AUDIO WIRES TOGETHER.*

2. Push the PC cards in firmly before turning on the system. It is possible to cause a regulator "latch-up" if only partial connection is made to the card when a card is plugged in with the power already applied.

3. Recheck the power supply hookup before turning the system on. You could have the positive and negative supplies wired backwards.

4. If the system hums and you have no emergency backup sound, you have the emergency supply wires reversed.

INSTALLING THE STEREO GENERATOR OPTION CARD. A Stereo-Generator card may be installed into the system at any time by plugging in the optional Synthesizer card. The output levels for the three stage synthesizer channels are adjusted *ONLY* after the main stereo-optical channels have been correctly adjusted. The synthesizer levels should be set to be the same as other stereo channels so that a transition between film format modes will appear smooth to the audience without large level changes between program sources. Three multi-turn pots are located on the front of the Stereo Generator PC board to adjust the Left, Center, and Right channel outputs. The surround stereo generator module is located on the time-delay surround card.

A new TIME DELAY/SURROUND GENERATOR CARD must replace the existing card (which has no SURROUND GENERATOR module). If you have a FRONT/SURROUND stereo system with GENERATOR and you are upgrading to a FOUR CHANNEL stereo system, you will already have a SURROUND GENERATOR module and will only need to add the FRONT GENERATOR card and clip out one diode on the LOGIC card. The upgrade package includes detailed instructions.

If the MOD II system is in the MUSIC mode, set it to FILM mode. If the music command terminal is not hooked up to automation or an external music switch, you may defeat music mode by pressing the MUSIC pushbutton on the REMOTE UNIT. The MUSIC LED will go out. If the COMMAND terminal is hooked to automation, the MOD II could be locked in MUSIC mode by the automation system. In this case, you will need to TEMPORARILY disconnect the wire to the COMMAND terminal until calibration is complete.

If the COMMAND terminal is hooked to an external MUSIC/FILM switch, make sure the switch is in FILM mode.

In all cases, the MUSIC LED in the MUSIC pushbutton will not be lit in FILM mode.

MOD II SYSTEM CONFIGURATIONS

SYSTEM 1 - MONO

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
CENTER EQ CARD	MOD2X320
OUTPUT/MUSIC CARD	MOD2X330
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

SYSTEM 2 - FRONT/SURROUND(SVA ONLY)

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
METER CARD	MOD2X335
NOISE REDUCTION CARD	MOD2X310
MATRIX CARD	MOD2X315
CENTER EQ CARD	MOD2X320
SURROUND EQ CARD	MOD2X365
TD/SUR GEN CARD	MOD2X325
OUPUT CARD	MOD2X330
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

SYSTEM 2G - FRONT/SURROUND WITH SURROUND GENERATOR

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
METER CARD	MOD2X335
NOISE REDUCTION CARD	MOD2X310
MATRIX CARD	MOD2X315
CENTER EQ CARD	MOD2X320
SURROUND EQ CARD	MOD2X365
TD/SUR GEN CARD	MOD2X325
OUTPUT/MUSIC CARD	MOD2X330
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

SYSTEM 4 - FOUR CHANNEL STEREO

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
METER CARD	MOD2X335
NOISE REDUCTION CARD	MOD2X310
MATRIX CARD	MOD2X315
LEFT EQ CARD	MOD2X320
CENTER EQ CARD	MOD2X320
RIGHT EQ CARD	MOD2X320
SURROUND EQ CARD	MOD2X365
TD/SUR GEN CARD	MOD2X325
OUTPUT/MUSIC CARD	MOD2X330
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

SYSTEM 4G - FOUR CHANNEL STEREO - FOUR CHANNEL STEREO GENERATOR

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
METER CARD	MOD2X335
NOISE REDUCTION CARD	MOD2X310
MATRIX CARD	MOD2X315
LEFT EQ CARD	MOD2X320
CENTER EQ CARD	MOD2X320
RIGHT EQ CARD	MOD2X320
SURROUND EQ CARD	MOD2X365
TD/SUR GEN CARD	MOD2X325
OUTPUT/MUSIC CARD	MOD2X330
FRONT GENERATOR CARD	MOD2X340
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

SYSTEM 6G - SIX CHANNEL STEREO WITH STEREO GENERATOR

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
METER CARD	MOD2X335
NOISE REDUCTION CARD	MOD2X310
MATRIX CARD	MOD2X315
LEFT EQ CARD	MOD2X320
CENTER EQ CARD	MOD2X320
RIGHT EQ CARD	MOD2X320
SURROUND EQ CARD	MOD2X365
TD/SUR GEN CARD	MOD2X325
OUTPUT/MUSIC CARD	MOD2X330
SUB BASS OPTION CARD	MOD2X345
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

SYSTEM 6GS - SIX(6) CHANNEL STEREO AND SUB BASS EXPANDER

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
METER CARD	MOD2X335
NOISE REDUCTION CARD	MOD2X310
MATRIX CARD	MOD2X315
LEFT EQ CARD	MOD2X320
CENTER EQ CARD	MOD2X320
RIGHT EQ CARD	MOD2X320
SURROUND EQ CARD	MOD2X365
TD/SUR GEN CARD	MOD2X325
OUTPUT/MUSIC CARD	MOD2X330
FRONT GENERATOR CARD	MOD2X340
SUB BASS OPTION CARD	MOD2X345
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

SYSTEM 6G-SP - SIX CHANNEL STEREO WITH AND SUB BASS EXPANDER, AND COMPUTERIZED TESTING

PREAMP CARD	MOD2X300
MONO/EMERGENCY CARD	MOD2X305
METER CARD	MOD2X335
NOISE REDUCTION CARD	MOD2X310
MATRIX CARD	MOD2X315
LEFT EQ CARD	MOD2X320
CENTER EQ CARD	MOD2X320
RIGHT EQ CARD	MOD2X320
SURROUND EQ CARD	MOD2X365
TD/SUR GEN CARD	MOD2X325
OUTPUT/MUSIC CARD	MOD2X330
FRONT GENERATOR CARD	MOD2X340
SUB BASS OPTION CARD	MOD2X345
COMPUTER I/O CARD	MOD2X350
COMPUTER UP CARD	MOD2X375
LOGIC CARD	MOD2X355
MODE SELECTOR CARD	MOD2X360
REMOTE UNIT	--------

CALIBRATION

Before calibrating the system make sure that all modes and functions of the MOD II are operating correctly. This will save a great deal of time if you have to troubleshoot a problem later if the system will not calibrate properly.

The Sound Systems must be on for at least one hour before alignment. All doors should be closed and exhaust fan running if the MOD II card cage unit is placed in equipment rack.

NOTE: Push all cards firmly into card cage. Cards may become unseated during shipment. Check all screws on the rear barrier strip so that the spade lugs or fanning strips (if used in this installation) are tight.

ABOUT EXCITER BULBS.....

Before installing an exciter lamp supply, you should be familiar with the types of bulbs that are currently used in modern soundheads. If you have an older soundhead that does not accept a' pre-focused bulb, the base fixture should be changed out so that a pre-focused bulb may be installed.

BXN BULBS. This 10 volt, 5 ampere type is intended for AC operation from an AC exciter supply. The bulb contains two filaments that are twisted around each other in opposite directions. The bulbs will work on a DC supply, but should be changed out for the **BXM** type which works better on DC supplies. BXN bulbs are offered by G.E., Norelco, Marble Co., and Westinghouse.

BXM BULBS. A 9 volt 4 ampere bulb is designed to be powered by a DC source. This bulb is very popular in Stereo sound systems because of the adjusted filament height and very low hum from a DC supply. The BXN bulb will replace the BXM type directly.

FOREIGN BULBS: Outside the U.S., pre-focused 6.3 volt bulbs are popular. Manufactured by Osram, the bulbs are marketed under several other brand names such as Cinemecannica, etc. These bulbs like DC supplies and are generally run between 4.5 volts and 5 volts for long life.

EXTENDED BULB LIFE. Many experiments have indicated that bulb life can be maximized by running the exciter bulb at 75% to 80% of its rated voltage from an adjustable exciter supply. It is important to make the voltage measurement at the bulb and not at the supply end of the wire feeding the bulb. Because the voltage will drop across the wire resistance of the cable, it is common to feed a higher voltage than the bulb needs in order to overcome the losses. A snake track loop will indicate if the bulb filament is evenly illuminated by measuring the output of the solar cell (through a preamp or processor) with a meter or scope. Lower operating voltages on the bulb will also prolong the bulb aging due to "clouding".

REGULATED SUPPLIES. There are very few truly regulated supplies on the market. In fact only two that we know of, and SMART makes one of them. Some supplies have large transistors mounted on heat sinks that may lead the user to believe it is regulated. These transistors are used to vary the output voltage, or may be used as a capacitance multiplier so that small electrolytics may be used for DC filter circuits. However, these supplies are not regulated. Any change or fluctuation in the AC line power to the supply will result in a change in output to the bulb. This may cause a stereo system to fall out of calibration and mis-track an encoded soundtrack. You may test a supply for regulation by placing a meter across the bulb terminals and varying the AC line input with a variac. A fully regulated supply should show a "rock steady" output with a line voltage ranging from 108 VAC to 130 VAC.

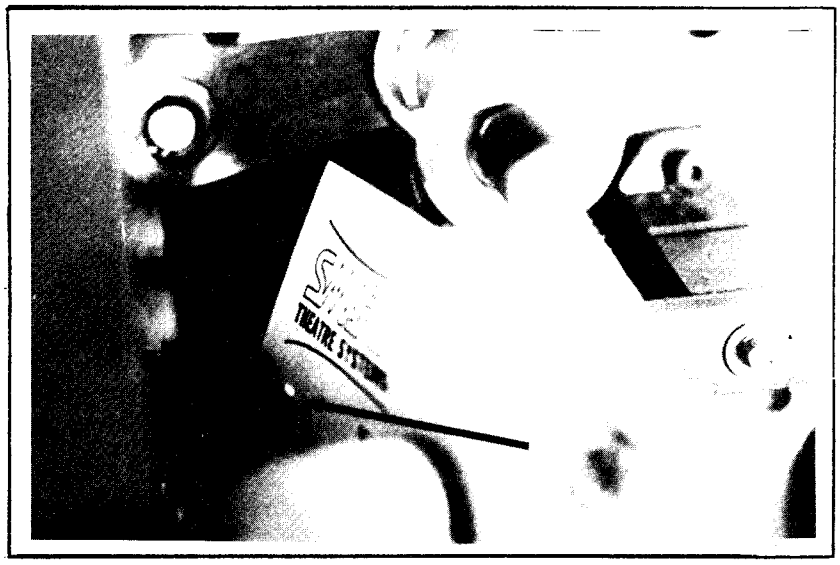
"A" CHAIN ALIGNMENT

SYSTEM SET-UP

1. Clean soundhead optics, exciter lamp, optical lens and solar cell before attempting a soundhead alignment.

2. Set exciter lamp voltage for at least 80% of rated voltage.

BXM 9 Volt 4 Amp.	7.2 Volts
BXN 10 Volt 5 Amp	8 Volts
Most Foreign 6.3 Volt 4 Amp	5 Volts



Adjust exciter lamp vertically and horizontally for best illumination on the cell area. A white business card is handy for this.

3. Make sure film/cell spacing is approximately 1mm and slit image is striking the top one-third of solar cell (see chapter on solar cells.)

4. Connect scope and Real Time Analyzer on rear of MOD II at the Left Preamp and the Right Preamp outputs (Marked **L Pre** and **R Pre.**) Set MASTER FADERS counter-clockwise to avoid loud noises through the speakers during calibration procedures.

5. Thread SVA REFERENCE (CAT.69) Tone Test Film in projector and run the test film.

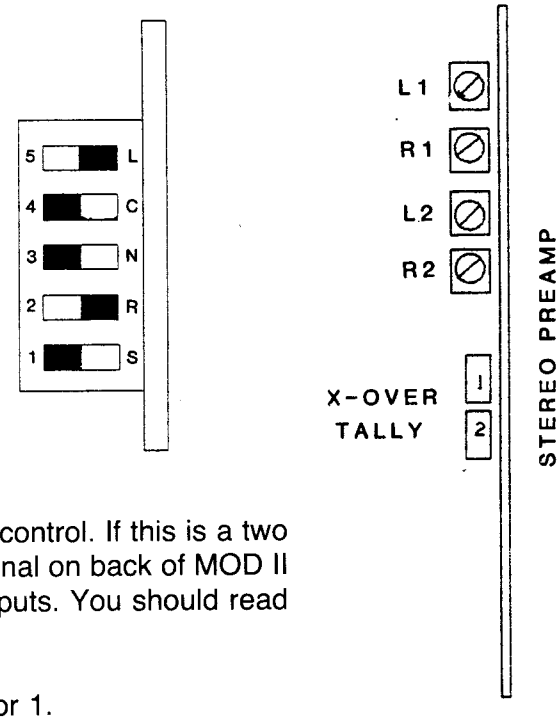
6. Locate the 335 Meter Card (Card 3). Depress meter switches (the D.I.P. switches on the card)

7. Adjust preamp levels as follows:

A) Make sure you are changed over to the correct projector by observing the changeover LED's on the preamp card.

B) Note that clockwise rotation of the trimpots increases gain.

C) Turn Projector 1 Left Cahnnel gain control clockwise until first red LED on Meter Card just ignites, then counter-clockwise about one quarter to one half turn. Red LED should *just blink on and off* with the REFERENCE tone. All green and yellow LED's on meter card should be lit (on the channel you are adjusting).

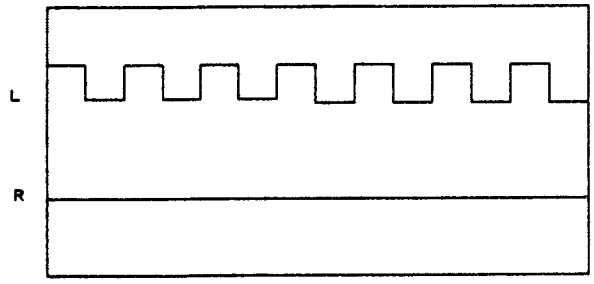


D) Repeat the same procedure with Right Channel gain control. If this is a two projector system, changeover by grounding X-OVR terminal on back of MOD II card cage, and repeat this procedure with Projector 2 inputs. You should read 710 mV AC ± 25 mV at Left and Right preamp output.

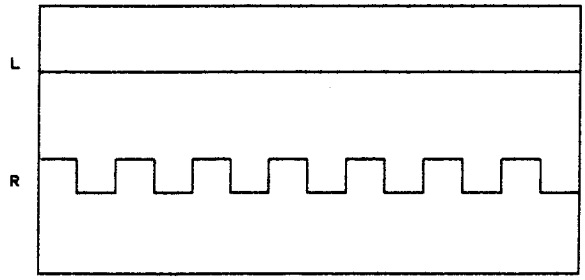
E) Remove short from X-OVR terminal to select Projector 1.

8. Play a S.M.P.T.E. Buzz Track tone. Adjust lateral film guide assembly or exciter lamp assembly. This will depend on mechanical design of the soundhead.

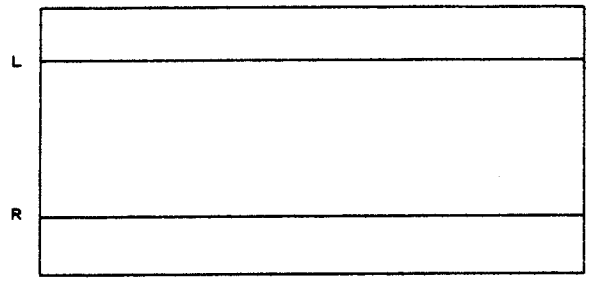
9. Play CAT 97 Stereo Cell Alignment Film. Move solar cell laterally and vertically until you have achieved minimum crosstalk between channels.



WRONG (TOO FAR LEFT)

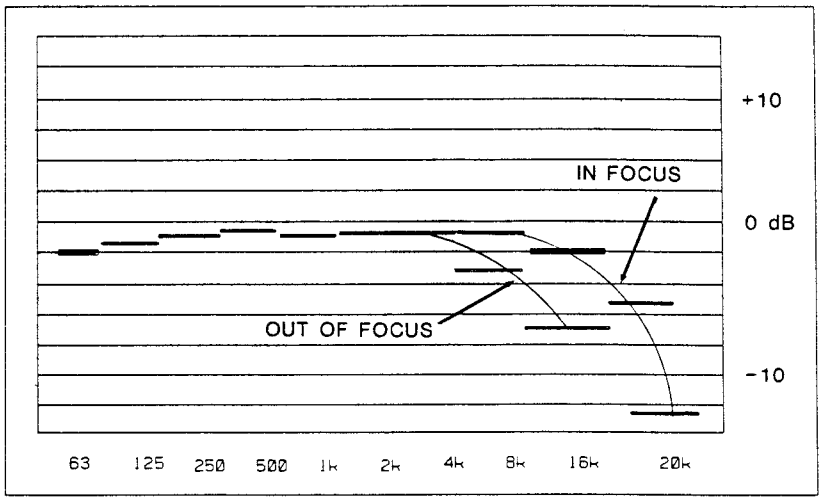


WRONG (TOO FAR RIGHT)

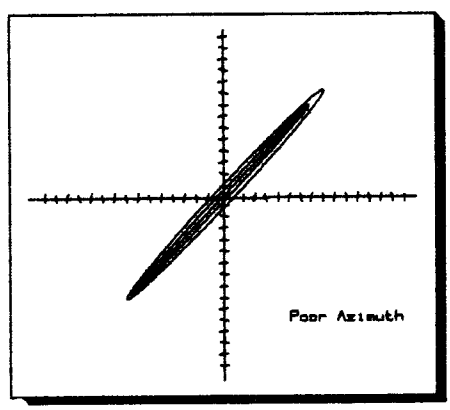


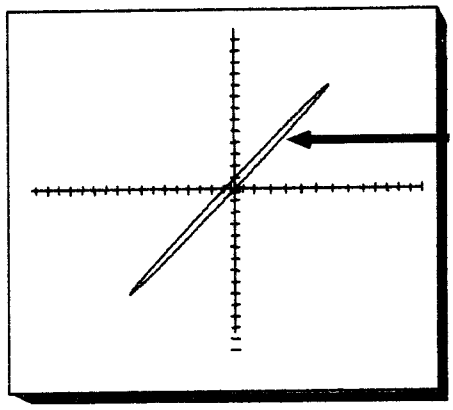
CORRECT

10. Repeat Buzz Track Alignment if corrections are made. Repeat Step #9.



11. Play Pink Noise side of CAT 69 Test Film. Switch scope in X/Y Mode. Adjust soundhead optical lens azimuth for narrowest diagonal trace. Observe real time analyzer and focus lens for maximum high frequency output with the best azimuth.



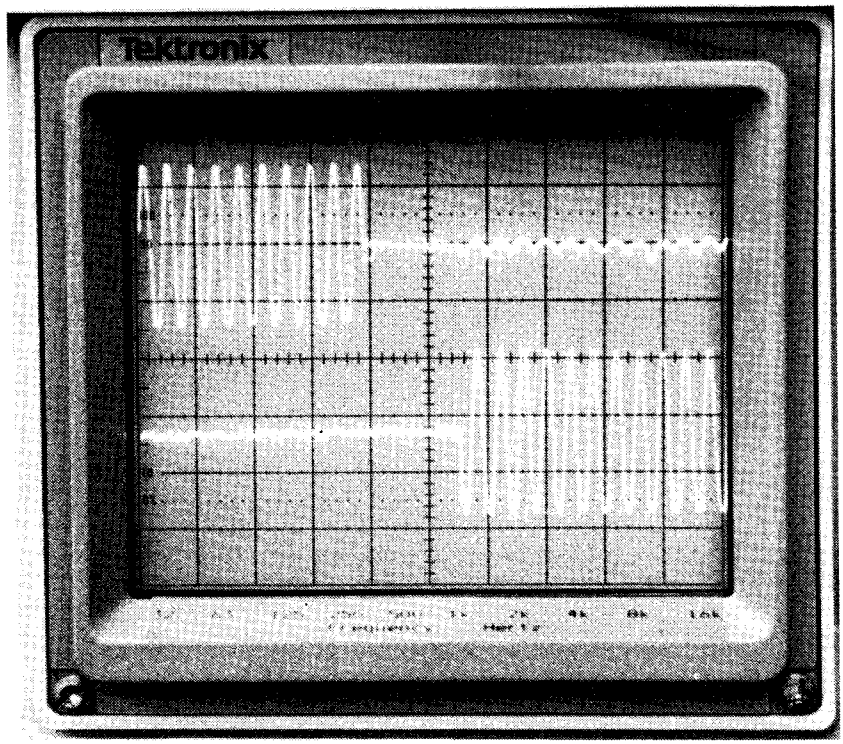


Adjust Azimuth for minimum opening. A Straight line is ideal.

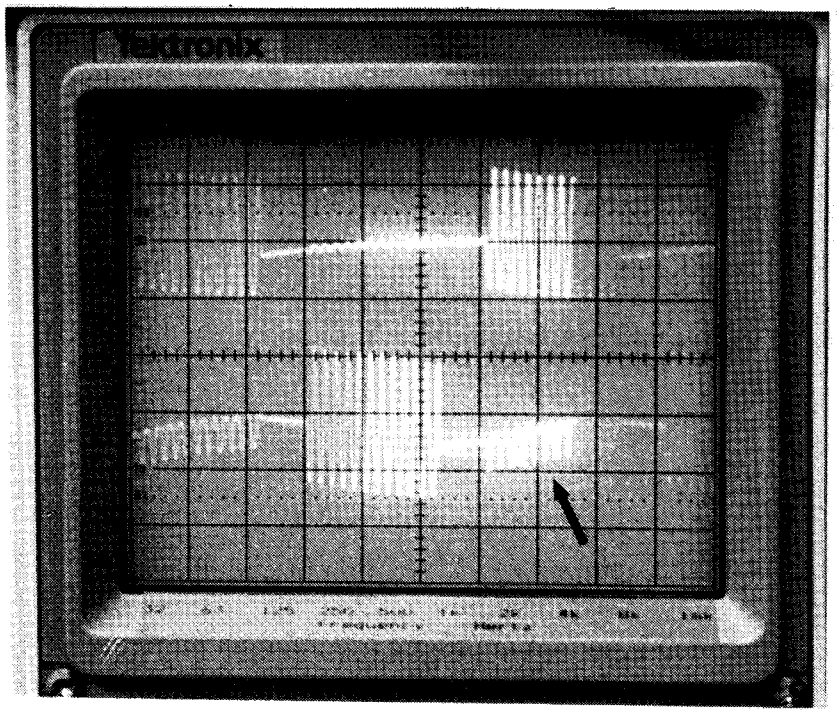
Poor Azimuth

Good Azimuth

12. Check high frequency output on both channels. Make sure response is the same on both channels. If not, this must be corrected before proceeding with next step. An Exciter Lamp out of alignment, the barrel of optical lens crooked, or oil in optical lens, will all effect output and balance.



LOW CROSSTALK BETWEEN CELLS



HIGH CROSSTALK

13. Repeat Step 6 and 7; then go to Step 14.

14. Adjust the four trimpots (2 trimpots on 2 channel systems) on the edge of the 315 Dynaspan Card. Calibrate with CAT.90 Dolby Film. Place meter ground on ground post and probe center pin of center trimpot. Set output to 750 mV AC. Short the right channel to neutral on solar cell inputs. Set the left control on the Dynaspan to 700 mV AC. Remove the jumper. Short the left channel to neutral on solar cell inputs. Set the right channel Dynaspan control to 700 mV AC. Set the surround channel pot to 320 mV AC.

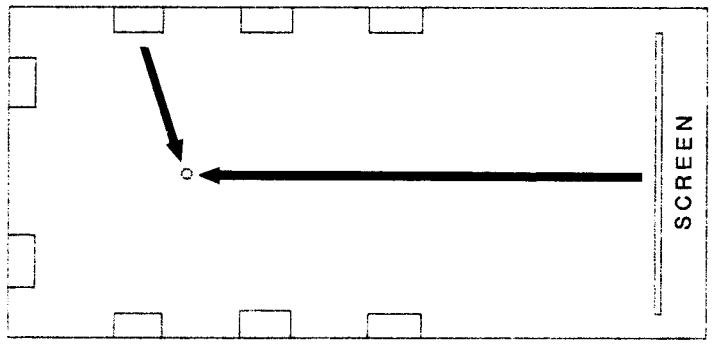
15. Locate 335 Meter Card (#8). Run CAT.69 SVA REFERENCE Tone test film. Turn off switch #2 on Meter Card. Turn on switch #3-Null. Set the Program A selector in "O" Optical Stereo. Adjust the left channel Projector 1 Preamp Gain control until you have the least number of LED's illuminated on bottom display of meter card. You should have only two or three LED's illuminated. This step is very important. The least number of LED's that are lit means you are achieving the best possible null, and optimum performance (minimum crosstalk) in the surround channel.

16. Hook AC voltmeter to main CENTER out. Set the STEREO FADER control to 4.5 on the fader setting. Note the voltmeter reading. Switch from normal to backup (the Red switch on the card cage logic module) and set the backup level trimpot on 305 Mono Card to achieve the same voltmeter reading as before. This completes the "A" Chain and backup calibrations.

17. Turn the projector off. Set the PROGRAM A selector to Digital. There are six inputs on the rear of the MOD II marked "Digital In". Begin with center iput. Hook pink noise generator to center Digital input. Each card contains nine controls. Top to bottom, 8K, 4K, 2K, 1K, 500, 250, 125, 63, Level. Set pink noise level (measured at Digital Input) at 1 Volt AC. Adjust level control from 150 to 170 mV AC. Perform room equalization (see section on room equalization.) Be sure that EQ levels are at 150-170 mV AC. Move to left and right channels and follow same procedure. Surround channel-refer to the chapter on room equalization.

18. Locate 330 Output Card (#11). Controls are, from top- Left, Center, Right, Surround, Left Extra, Right Extra, Left Music and Right Music levels.

19. Locate 325 Delay Card, (#10). The bottom of this card contains 8 small dip switches. Each dip switch equals 10 mS of delay, switch number two is 55 mS (milliseconds), etc. With all eight switches depressed you would have 115 mS of delay. Note total feet from the rear seat closest to the surround to the stage speaker. Deduct distance from the seat to the surround speaker. Now add 20 to this number to get the delay (in milliseconds) required in the auditorium.



Apply pink noise to left channel Digital Input on Rear of MOD II. Measure left output and set output control for 250 - 270 Mv. AC. Repeat the same process for the Center, Right and Surround channels. Set the music control on Remote Panel to approximately 12:00. Press the music switch on the Remote Panel. The Program 'A' light will go off and music light will illuminate. Non-Sync music will fade up while film level fades out. The music levels have been factory set for optimum level.

Check music decoding with the use of a known stereo music source. Vocals should be included in the listening test. Monitor music through the booth monitor, switching from center to rear. Set either left or right music trim so that minimum vocal sound appears in the surround channel.

Helpful Hints

1. If you are unable to get a good "A CHAIN" alignment, investigate soundhead mechanical problems before proceeding to align the sound system.

2. Listen for *wow, flutter, & wobble* when running test films. The problem could be mechanical lockup of stabalizer, bearings, rollers, etc.

3. Make sure that the shield for the solar cell cable is not grounded at the projector end of the cable. Also, check to see that none of the solar cell leads are grounded to touching the projector soundhead housing.

MATRIX ADJUSTMENT

The MATRIX CARD will not normally require adjustment in the field, but adjustments may be made to accommodate special situations, such as "odd sized" houses or unusual acoustical conditions. With the factory settings, the balance between all main channels should be correct for most houses. The surround channel should still be checked for proper level by using a "Choo-Choo" test loop.

Matrix adjustments to the levels described in this section presume that the output levels, EQ curves, and power amp levels have been set for equally balanced acoustic levels from the four main channels in the auditorium.

Basically, there are two methods for adjusting Matrix output levels: 1) by using SVA REFERENCE tone test loop and 2) using the SMART MOD2X319 PINK NOISE SWITCHING CARD. Refer to the section on the PINK NOISE SWITCHING CARD entitled "OPTICAL STEREO MATRIX LEVELS" for details on using the PINK NOISE SWITCHING CARD.

USING SVA REFERENCE TONE TEST LOOP. Thread a CAT. 69 loop, tone side, and run the loop. Connect an ac voltmeter to the wiper (middle pin) of the center matrix level trimpot. For each of the other channels, connect the voltmeter to the wiper of the appropriate trimpot. The voltmeter should be set to the 1 or 2 volt range. You will be measuring voltages from 300 mV to 800 mV. Use the following table to determine the proper voltages and conditions under which they are measured:

CHANNEL	VOLTAGE	**CONDITIONS**
CENTER	750 mV	L & R SOLAR CELL INPUTS BEING FED
LEFT	700 mV	SHORT BETWEEN R & N SOLAR CELL INPUTS
RIGHT	700 mV	SHORT BETWEEN L & N SOLAR CELL INPUTS
SURROUND	320 mV	SHORT BETWEEN R & N SOLAR CELL INPUTS

Note that surround should be checked under two conditions, The voltage measurements should agree for both conditions.

This completes the Matrix output level adjustments.

NOISE REDUCTION LEVEL ADJUSTMENTS. There are two trimpots located on the top rear of the Matrix Card. These are only accessible with an Extender Card (SMART #MOD2A311) and are not normal field adjustments. These trimpots are factory set to the proper level going into the DYNASPAN MODULE for proper matrix decoding. If they have been tampered with, they may be reset as follows:

1) Put the matrix card on the extender card. (available separately from the factory)

2) Run SVA REFERENCE tone loop.

3) Check preamp test points for 707 mV plus or minus 10 mV on left and right channels. Adjust preamp levels if needed (refer to preamp adjustment section).

4) Connect AC voltmeter to wiper of left NR trimpot.

5) Set left NR trimpot for 500 mV on voltmeter.

6) Connect AC voltmeter to wiper of right NR trimpot.

7) Set right NR trimpot for 500 mV on voltmeter.

Please note that if the NR levels are re-adjusted, the matrix output levels will also need to be re-adjusted.

OPTICAL STEREO MATRIX LEVELS. This section is applicable to those MATRIX cards which have Matrix Level trimpots. Re-install the MATRIX card in its place. Remove the PREAMP card, and install the PINK NOISE SWITCHING CARD in place of the PREAMP card. For the following adjustments, use an AC voltmeter with a 2 to 3 volt range. The voltmeter will be connected between ground and the wipers of the Matrix Level trimpots.

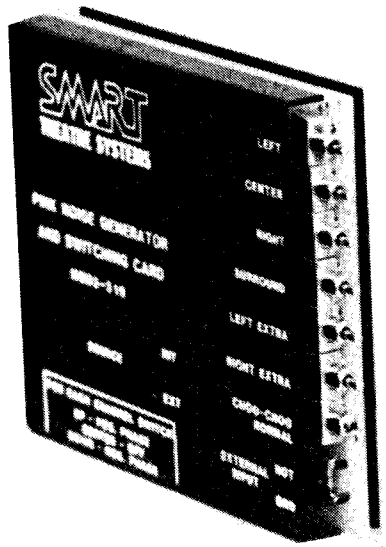
First, connect the voltmeter to the wiper (middle pin) of the Left channel Matrix Level trimpot. Set the Left channel switch on the PINK NOISE SWITCHING CARD to the UP position. The Choo-Choo/Normal switch should still be in the Normal position. All other switches should be in the MIDDLE position (off). Adjust the Left Matrix Level trimpot to obtain a voltmeter reading of 1.1 to 1.2 millivolts.

Connect the voltmeter to the wiper of the Center channel Matrix Level trimpot. Set the Right channel switch on the PINK NOISE SWITCHING CARD to the UP position. Leave the Left switch in the UP position. Adjust the Center channel Matrix level trimpot to obtain a voltmeter reading of 0.9 to 1.0 millivolts.

Connect the voltmeter to the wiper of the Right channel Matrix Level trimpot. Set the Left channel switch on the PINK NOISE SWITCHING CARD to the DOWN position. Leave the Right switch in the UP position. Adjust the Right chanel Matrix level trimpot to obtain a voltmeter reading of 1.1 to 1.2 millivolts.

Connect the voltmeter to the wiper of the Surround channel Matrix Level trimpot. Leave the Right switch in the UP position. Adjust the Surround channel Matrix level trimpot to obtain a voltmeter reading of 0.5 volts. Set the Left channel switch on the PINK NOISE SWITCHING CARD to the UP position. Set the Right channel switch on the PINK NOISE SWITCHING CARD to the DOWN position. The voltmeter reading should be 0.5 volts.

This completes the MATRIX card setup; however, there is a preferred way to set the Surround level which uses the simulated Choo-Choo track generator. Set the Choo-Choo/Normal switch to the Choo-Choo postion and set the Surround channel Matrix Level trimpot on card MOD2X315 so that the Surround level in the auditorium matches the level from the stage, just as you would when using a standard Choo-Choo track test loop.



OPTIONAL PINK NOISE TEST CARD

NARROW SLIT OPTICAL SOUND LENSES

With the introduction of narrow slit optical sound lenses (NSOL) came questions about their benefits and possible drawbacks. Until recently NSOL lenses were very difficult to produce because of the precision tolerance that had to be held during every phase of manufacturing. Small errors could cause the product to be rejected and with a low manufacturing yield, the price would be high. Most of the early lenses were mainly used in laboratories for special work with optical recordings. The standard lens had a slit beamwidth of about 1 mil until a few years ago when lenses of 0.6 mil were successfully manufactured on production lines. Modern manufacturing techniques and automation in optics field can now produce NSOL lenses with precision tolerance at a relatively low cost.

Why would a smaller slit be desirable? Modern release prints of optical stereo feature films are capable of capturing frequencies up to 15 kHz in the recording process. Depending on the care exercised in the printing of the print itself, frequencies can be expected to be present above at least 12 Khz, and higher on a quality release print. A 1 mil, or even 0.6 mil lens cannot read this information reliably and needs assistance from electronic peaking circuits to play back the weak high frequency tones.

At this point we must digress to review how the lens and exciter lamp produce a source for the solar cell to "read" the soundtrack. The exciter lamp must produce a constant light output that is focused through the lens onto the moving optical soundtrack. It is extremely important that the filament of the lamp is dead center to the slit of the lens, and has equal brightness in the center of the filament to each edge of the slit of the lens. A misaligned bulb can produce a hot spot in the center of the film soundtrack if not properly powered or mechanically out-of-center. A bulb with too much age may have a sagging filament that can produce more brightness on the edges of the lens than the center. Either case may cause poor stereo sound reproduction.

The slit of the lens is very similar to the operation of the gap width of a magnetic tape recording head. The slit must be wide enough to allow several cycles of information to occur while the soundtrack is in front of the light beam of the lens. If the slit is too wide, the high frequency response of the playback will be severly reduced. As the slit is made smaller, the high frequency response increases. The speed at which the film moves past the lens slit is a factor. The signal induced onto the solar cell is related to motion and the number of optical modulation changes that pass the slit within a given time. A low frequency on the soundtrack provides fewer changes per second than the mid or high frequencies. At high frequencies, the number of changing optical patterns seen at the top and bottom of the lens slit may be different and, as a result, cancel each other. Theoretically,in tape recording, if a wavelength of the signal is equal to the width of the slit of the recorder, no signal is recorded. In playback, no signal is reproduced. In the optical Variable Area recording process a valve is opening and closing. However, the size of the slit is critical to the desired frequency response of the system during playback.

Figure 1 shows the frequency response of a 1 mil optical lens wire a pink noise soundtrack as a source. Notice the roll-off of the frequency response around 6.3 kHz. Figure 2 shows the same soundtrack played with a NSOL 0.487 mil lens. The frequency response is extended well beyond 12 kHz without slit correction circuitry.

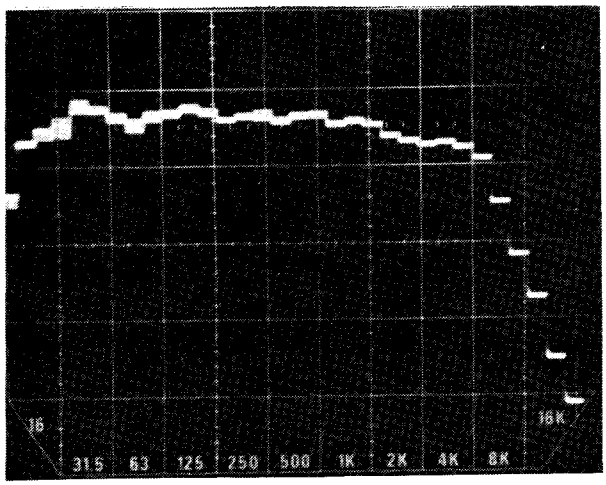


FIGURE 1

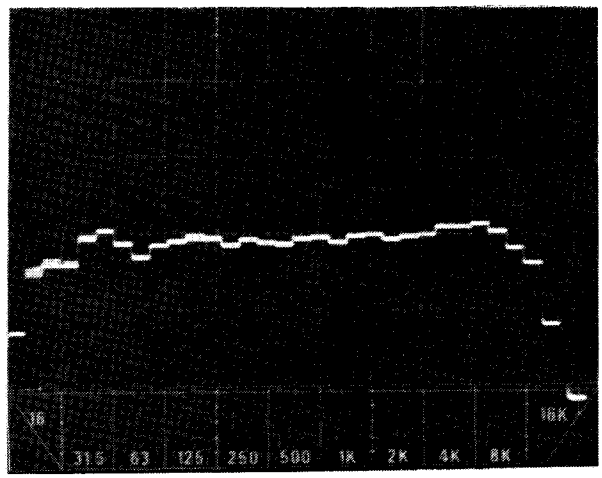


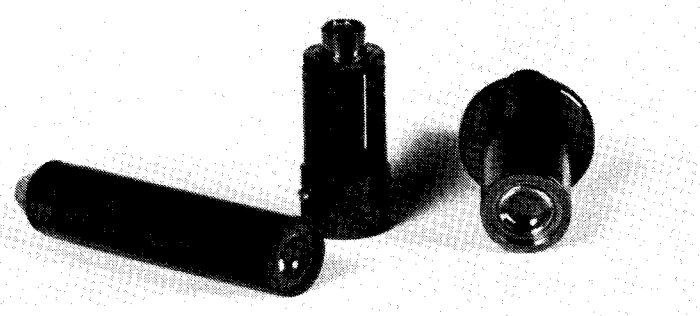
FIGURE 2

Problems could arise with some stereo processors when attempting to calibrate the sound system if a NSOL lens has been installed. On some processors it is not possible to reduce the slit correction circuits to a flat position and a resulting high frequency bump will appear in addition to the phase inherent shift. Also **Figure 2** shows that the narrower lens has a lower light output onto the film that results in a 6 dB voltage output of the solar cell. This could present a problem in systems with marginal gain in the preamplifiers or increased signal-to-noise ratio if the preamplifiers are not particularly quiet.

Another consideration in using NSOL lenses is that alignment (focus, azimuth) is very critical. It is much more difficult to line up the lens because of the narrow beam of light emmitted and projector soundhead with sloppy tolerances. When properly installed the results are superb.

Preamplifiers must be very quiet (free from circuit noise), when using narrow slit lenses, and wiring from the solar cell to the processor must be carefully routed using a high grade of shielded wire to reduce possible hum pickup because of the lower signal.

NSOL lenses can provide a very "sweet" sound high end to the theatre stereo system with the MOD II system. Keep in mind the precautions regarding the critical alignment and very good wiring practices that are demanded with these devices.

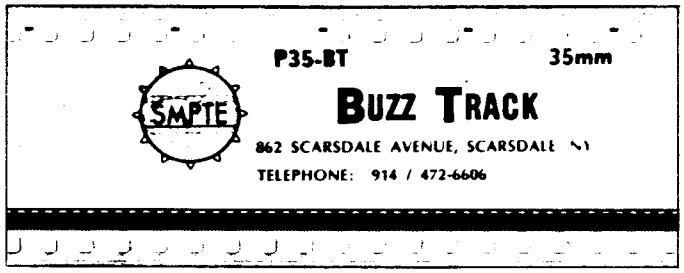


Narrow Slit lenses are available for most brands of soundheads.

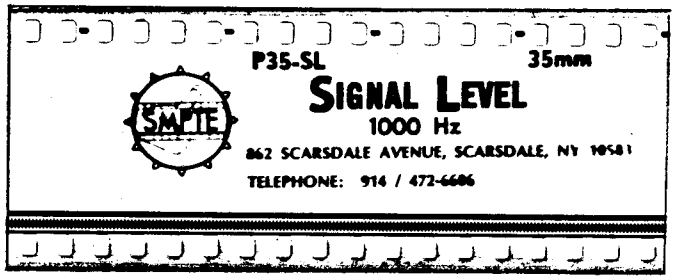
STANDARD 35MM TEST FILMS

Test films are basic to the alignment and calibration of many stereo optical and monaural sound theatre systems. Several of these films are available from SMPTE, while others are produced by Dolby Labs.

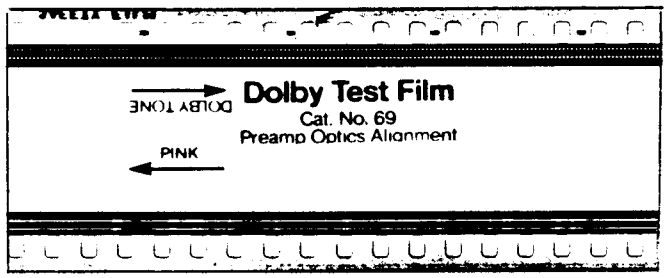
Loops may be made by wrapping and splicing a length of test film so that it forms a circle. Generally 5 feet is more than enough. The test "loop" is threaded only through the optical sound head components. Threading procedures will vary among different brands of sound heads.



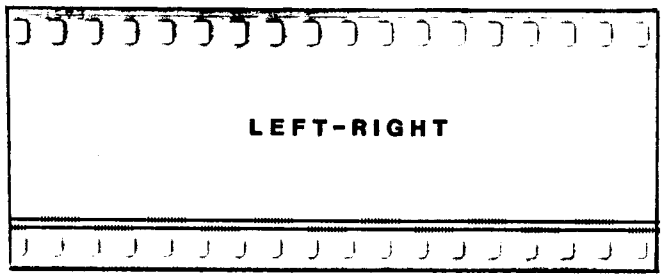
BUZZ TRACK. Is Used to set the lateral position of the "idler" or sound impedance drum. As the adjusting screw is turned a high frequency sound is heard, or a low buzz. Adjust the drum until your are between the two tones, and no sound is heard.



SIGNAL LEVEL. A 1 kHz tone used to set reproducible level in monaural systems. The level is not an absolute reference, but may be used as a reference if special equipment is calibrated to this film.



DOLBY TEST FILM. Contains two test tracks. One is the Dolby reference tone for setting noise reduction tracking, and the other is pink noise for EQ applications. Film is turned over to use each side.

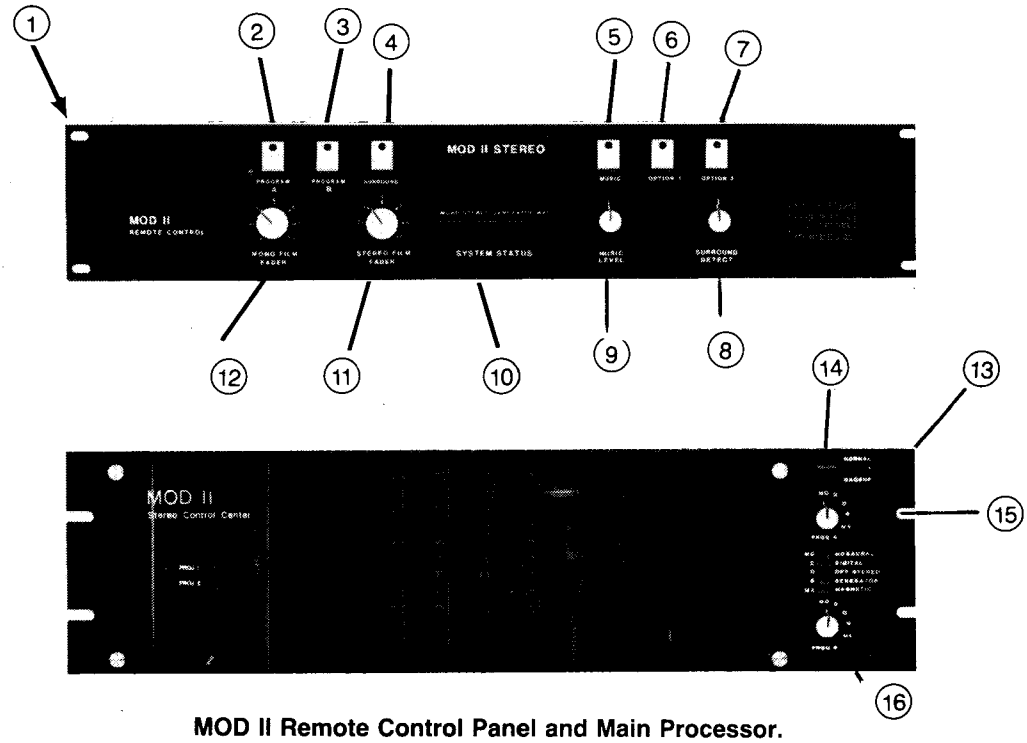


LEFT-RIGHT. Alignment film for setting mechanical position of a split stereo solar cell. Must be used with a dual trace oscilloscope with each input monitoring a each channel of the solar cell outputs.

Many other special test films are available for sound system alignment.

OPERATING INSTRUCTIONS

The MOD II system is one of the easiest systems to operate. However, it may appear complex because the system is full of features not offered on competitive products. The Manager/ Operator of the theatre should review the operation instructions to assure that emergency functions are also understood, should they ever be needed.



MOD II Remote Control Panel and Main Processor.

[1] Remote Control Panel
[2] Program A Selector Button
[3] Program B Selector Button
[4] Stereo Surround ON/OFF Button
[5] Non-Sync Intermission Music
[6] Option 1 Select
[7] Option 2 Select
[8] Surround Detect Threshold (Generator)
[9] Non-Sync Music Level
[10] System Status Indicators
[11] Stereo Film House Level
[12] Mono Film House Level
[13] Main Processor Card Cage
[14] Normal-Emergency Backup Switch
[15] Program A Select Switch
[16] Program B Select Switch

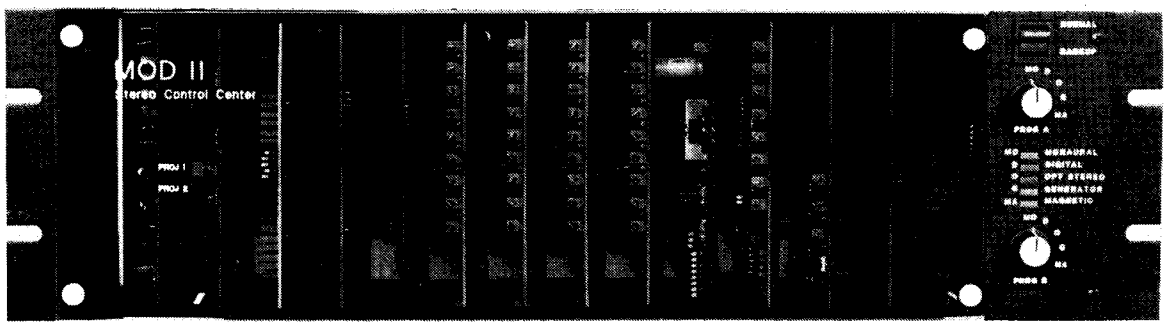
OPERATOR CONTROLS

TURNING ON THE SYSTEM. The sound engineer who installed the sound system has provided a way to apply AC to the system through a master power switch or circuit breaker. Also, several of the individual components in the equipment rack have their own power switches. Become familiar with all switches or breakers that control power to the sound equipment.

If the components are normally turned on individually, it is important that the processing components are turned on first and the power amplifiers are turned on after all other components are on for a few seconds. This will allow time for the low level circuits to stabilize before the power amplifiers can pass a "turn-on thump" to the auditorium speakers.

PROGRAM SELECTION. It is likely that the sound system will be turned on before the arrival of the first audience of the day. If the automation equipment is in its intermission mode when the sound is turned on, the sound system will lock into its intermission music mode. If the music player (CD player or tape machine) is running, music will be heard in the auditorium and available on the booth monitor.

PROGRAM SELECTORS are on the main card cage unit of the MOD II system. They are labeled *PROGRAM A* and *PROGRAM B*. When the system is powered up OR the system is reset by going to the intermission non-sync music mode, the *PROGRAM A* selection is active. If the *PROGRAM A* selector switch is moved while it is active, the system will select each source as the control is moved to that position. A red LED indicator associated with each function switch indicates whether *PROGRAM A* or *PROGRAM B* is active.



PRE-PROGRAMMING of sources is easily accomplished by setting the PROGRAM A function switch on the first desired format i.e. *MONO* for trailers, and the *PROGRAM B* switch to the feature film format (Stereo-Optical, Synthesized Stereo, Magnetic, etc). If the sound system is connected to the automation, a trigger from the automation will switch the system from *PROGRAM A* to *PROGRAM B* at the appropriate time. When the show is over, the intermission non-sync command from the automation will reset the function switches back to *PROGRAM A* for the next show.

EMERGENCY BACKUP SWITCH. The MOD II contains a backup system that will keep the show sound on the screen in the event of a failure of the main system. This special circuitry is located on the MONO card in the main card cage unit and is activated by the red *NORMAL-BACKUP* switch. A separate power supply supplies the backup system.

STEREO MASTER FADER. This control is located on the Remote Panel and is used to set the system level for any stereo program (multi-channel format). This includes Stereo-Optical, Stereo Generator, and Magnetic Stereo. The *STEREO FADER* is completely independent from the *MONO MASTER FADER.*

MONO MASTER FADER. This control sets the level for the sound system when the MONO function is selected on the active PROGRAM selector switch. Therefore, trailers or short subjects may be adjusted for a different playback level than the stereo source. It is common to find previews recorded at a much higher level than the feature film. This demands that the operator be available when the trailers are finished to adjust the sound level for the feature film. In a multiplex, theatre this feature is greatly appreciated. Setting the proper sound levels for the mono source and stereo source should be done during the first new feature film change for the week.

SURROUND DETECT CONTROL. The MOD II system contains a surround generator for monaural soundtracks when the system is expanded from the basic monaural package. Front-Surround Stereo configurations and full four and six channel systems contain the surround generator on the surround time-delay PC card.

The Rear Detect control on the remote Panel sets the sensitivity of the surround generator circuits. The threshold of the analog logic of the circuit is affected by the setting of the control. Clockwise rotation of the control makes the circuit more sensitive, and counter clockwise adjustments less sensitive. The normal setting for the pot is in its mid-position. The control should not be moved unless the surround channel is coming on and off at the wrong times, or dialog is consistently appearing on the surround channel. The surround generator may be defeated by using the surround button on the Remote Panel.

PROGRAM SELECT SWITCHES. Two soft-touch switches on the Remote Panel manually select the *PROGRAM A* or *PROGRAM B* mode that has been pre-programmed on the main card cage unit. Modern multiplex theatres use automation equipment to change modes, but the manual switches also contain LED's that indicate the program mode that has been selected in the system.

OPTION BUTTONS. Additional soft-touch buttons are provided to select the operation of option cards that may be installed in the main card cage. If these options have been furnished, the option buttons will "toggle" the option function on and off. The LED on the button indicates that the option is ON.

MUSIC BUTTON. This switch will manually select the non-sync music source and fade-out any film source if the system is not being used with an automation system that performs this function. The red LED remotely indicates that the music is playing through the system. If you have an automated system, the LED will indicate the MUSIC status, but the button can override the automation control of music. Do not normally press the MUSIC button in automated systems.

SURROUND BUTTON. There may be cases where a stereo mode (Stereo-Optical, Stereo Generator, Magnetic Multi-channel) has been selected but the surround channel must be turned off. the Surround-Off button will silently turn off the surround channel and allow all stage channels to continue to operate. An example may be where a poorly recorded mono track is synthesized into stereo through the Stereo Generator, but is mistracking on the surround speakers. Another case may be a Stereo-Optical soundtrack that contains no recorded surround information. It is wise to turn the surround channel off in order to keep any soundtrack noise out of the surround speakers. The LED in the center of the button indicates that the surround channel is active. Pushing the button will turn off the track and extinguish the light.

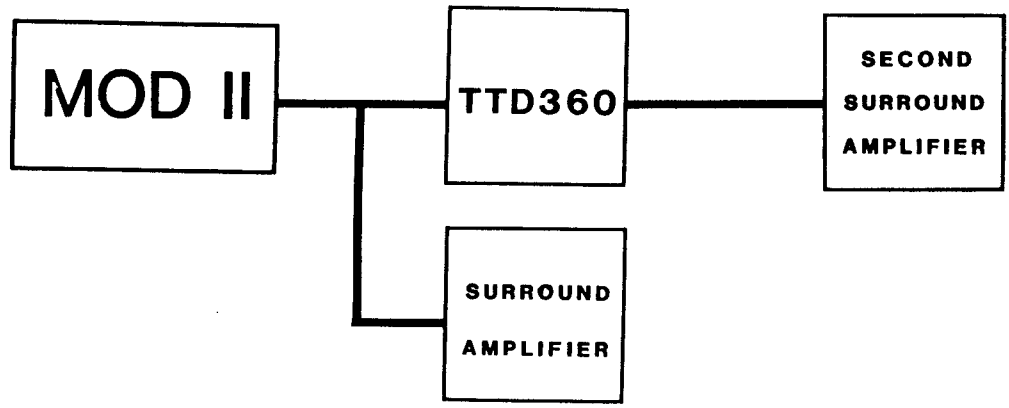
STATUS WINDOW. A window in the center of the Remote Panel contains a row of LEDs that shows which program source that is active. These status indicators advise the operator whether the film format playing through the system is *MONO, OPTICAL STEREO, STEREO GENERATOR, or MAGNETIC.*

Another version of the Remote panel is offered as an option to the standard MOD II system. A computer diagnostics card may be added to the main card cage that will test the sound system every time it is powered up each day, or be tested by remote control over a telephone line to the theatre circuit's home office central computer. When the optional computer card is added, another version of the remote panel must be used that has an alphanumeric illuminated Liquid Crystal Display is installed into the status window of the Remote Panel. The LCD displays vital system information in addition to system status messages.Consult the special manual that covers the computer testing system for further information if you have this option installed.

A description of each of the functions of the MOD II system is covered in the technical and installation section of this manual. For further information, please refer to the appropriate section of this manual.

ADDITIONAL COMMENTS

SPLIT SURROUNDS. Very long, narrow theatres and large motion picture palaces have a special problem. Setting the time delay for the surround speakers is difficult because the farthest seats are an extreme distance from the screen. If the time delay is set to accommodate the listeners in the rear of the house, the listeners seated in the center of the auditorium will hear an echo. Likewise, if the delay setting is set for the middle of the seating area, the listeners at the rear of the house will hear crosstalk because of insufficient "masking". This problem can be corrected by installing a second time delay connected to the surround output of the MOD II system. Set the delay of the MOD II for correct delay in the middle of the auditorium. Feed the input of another time delay product (The SMART TTD 360 is designed as a stand-alone delay) and adjust the second delay for the rear of the auditorium. Check for proper playback level and delay time using a "Choo-Choo" test soundtrack, or the SMART pink noise option PC card. A second power amplifier is required on the surround channel to feed the distant speakers from the second delay unit.



The **WIDE SCREEN STEREO** logo shown above may be used by the theatre that installs a SMART stereo product to advertise the playback capability of the theatre. This logo may be incorporated into a newspaper ad, program flyers, or reproduced for special promotional activities. The logo tells the patrons that the theatre is presenting it's feature in Stereo. This pertains to optical stereo, synthesized stereo, or magnetic 35MM/70MM formats.

WIDE SCREEN
STEREO

SERVICE

WARNING

Disconnect the power supplies from the AC power line before replacing components to avoid the danger of electrical shock.

Service instructions are included for use by qualified personnel only. To avoid electrical shock, do not perform servicing other that described within the Operating Instructions unless you are qualified to do so. Refer all such servicing to qualified service personnel.

Repairs to this product should be performed in accordance with applicable safety standards, and should be performed only by a trained service technician.

Almost every component used in the MOD II is available locally from a radio parts house. The only parts that are not likely to be found are the special sealed modules and the time delay chip. Refer to the schematic diagram and parts list for information regarding a component description. IC sockets are used to facilitate easy removal and replacement of any Integrated Circuit, should this ever become necessary.

Each unit is burned in for a minimum of 48 hours before Q.C. testing and packaging. A failure of one or more functions of the MOD II will result in a service call from the owner. Always check the *obvious causes* of the symptoms first:

1. Is the unit receiving A.C. power? (Remote Control and Main Unit L.E.D's ON)

2. Has the power supply fuse blown? (Replace with 4 amp 3AG type only)

3. Are all controls in their normal operating mode?

4. Is the supporting equipment functioning properly? (Amplifiers, equalizers, exciter lamp supply, etc.)

When all symptoms point to an internal problem, your only choice is to substitute a spare (or similar piece of equipment) and fix the unit in the booth or shop.

A quick check of the power supply voltages will indicate the proper operating voltages for the active components. Place your service meter **negative lead** on a convenient chassis **GROUND** point. Switch the meter to the PLUS 30 D.C. range and measure the voltage input to the power supply input terminal on the MOD II card cage. It should be 20 volts. Now measure the negative voltage from the power supply. Use the *positive lead* of your meter on the chassis *GROUND*, and the negative lead for voltage measurements. Again, you should measure 20 volts. If you cannot obtain the voltages mentioned, you may have a shorted connecting cable or a bad power supply. Disconnect the low voltage cable at the power supply end and make the tests again on the power supply terminals. **BE CAREFUL NOT TO SHORT THE PINS ON THE POWER SUPPLY TERMINALS WHILE MAKING THESE TESTS. A MOMENTARY SHORT COULD PRODUCE A DANGEROUS SPARK BEFORE THE SUPPLY GOES INTO ITS SELF-PROTECT MODE.**

When you are satisfied that the voltages are correct, go to the schematic diagram and study the circuit layout. *The most practical way to troubleshoot audio circuits is through signal tracing*. Put an audio signal into the input and follow the signal with a scope until the signal stops. This method allows you to locate a defective component in the related section.

Since the MOD II uses a bi-polar supply, each audio IC op-amp output should measure nearly 0 volts D.C. with no signal. That is, you should be able to probe each output pin with your service meter and see a minimum offset. If the op-amp is showing a few volts at the output pin, it likely that a bad capacitor or resistor is causing an input bias that forces the output of the amplifier to shift. A defective IC could also be the culprit. Also check for a hairline short in the PC card foil traces. Here are several tips that will aid in troubleshooting. SOME OF THE IC's OPERATE ON A SINGLE-ENDED SUPPLY. These chips get their current from the negative supply rail with a ground return. Single-ended chips may show a very large offset voltage at their outputs.

1. Make sure the switches are in the proper position before testing the unit.

2. Very hot IC's usually indicate an internal short.

3. An open resistor may lead you to believe that an IC is defective. Use a substitute device to see if the problem is in the device itself or elsewhere.

4. Shorted input capacitors may bias an IC op-amp OFF.

5. Be sure IC's are firmly in their sockets. They can be vibrated loose during shipment.

Signal tracing procedures may also be employed when servicing the time delay portion of the *SURROUND CHANNEL*. A signal at the input, through the filter circuit, the delay chip, and the anti-alias filter will reveal where the signal has stopped. Refer to the schematic for pin identification of the signal flow. The HFE4047 clock associated with the delay chip must be operating properly for the audio signal to pass through the delay chip. An oscilloscope will reveal high level square wave pulses on pins 10 and 11 of the 4047 when this device is operating. If either phase of

the clock fails, no audio can pass. We suggest you NOT REMOVE the delay chip itself unless you are positive it has failed. This component is very expensive and can be easily destroyed by stray static caused by handling. The BIAS pots near the chips are factory set to each individual chip, and should not be moved unless the IC must be replaced by a new device.

The *MATRIX MODULE* and *NOISE REDUCTION CARDS* in the MOD II contain many components and IC's that are factory calibrated. The module is not intended to be serviced without special test equipment and test fixtures. A defective module is replaced on an *EXCHANGE ONLY* basis. We suggest the MOD II be returned to the factory for servicing if a module failure is verified. The "plated through" holes on the main PC card are easily damaged when service is attempted without the aid of the proper de-soldering equipment.

An important part of any pre-service call is to make sure that the operator or other theater personnel *is fully familiar* with the operation of this equipment. Often service calls are made unnecessarily because the operator was not trained with the correct operation procedures.

MANY IC DEVICES CAN BE DESTROYED BY HANDLING. CMOS logic devices and Bi-FET Op Amps *are very static sensitive*. They are safe when plugged into their sockets, but removal can expose the inputs to conduct static electricity from tools, your hands, or other static generating components. **USE PROPER HANDLING PROCEDURES** when removing IC's from their sockets.

This manual is included with each shipment so that you can leave a copy with the theatre owner or operator.

The LED meters on the second card in the MOD II main card cage are not only used for monitoring program material during the theater's performance but are also used to *make all set up calibrations* during the installation phase. See the section of this manual that describes the LED meter use.

SERVICE ACCESS. The MOD II contains up to 14 plug-in printed circuit cards, depending on the system configuration. These cards should be removed *ONLY WHEN MAIN POWER HAS BEEN REMOVED*. Plugging in a card with power present can cause a jolt to the input regulators, causing them to fail. It should never be necessary to remove the main "Mother Board" that lies at the rear of the card cage.

To replace pushbutton switches or LED's in the Remote Panel connections to the vertical card must be detached from the front panel by removing the six screws holding it to standoffs mounted on the rear of the front panel. It is necessary to remove the knobs on the Fader pots before attempting to release the card. After the screws have been removed, it is possible to slowly and carefully pull the card back from the front panel so that all buttons and LED's are clear of their holes. The card may then be disconnected from the ribbon connector and removed.

To reassemble the unit, follow the directions in reverse. Before tightening the screws holding the vertical card to the standoffs, test all buttons to make sure that they do not bind against the front panel when operated. If they do, realign the panel as necessary.

CAUTION

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Repairs to this product should be performed in accordance with applicable safety standards, and should be performed only by a trained service technician.

P.C. CARD COMPONENT REPLACEMENT

All IC's in the MOD II are socketed and can easily be replaced from the top surface of the PC boards.

If any of the CMOS logic chips are replaced, use reasonable care to avoid damage due to static electricity. If the relative humidity is below 50%, use a grounded workbench and make sure that the PC board is grounded to it. To prevent static damage to a chip, do not touch any of the leads unless you are also touching the workbench, or you are connected to it through a standard high--resistance grounded wrist strap. (Such wrist straps are connected to ground through a 1 megohm or more resistor, greatly reducing danger to personnel due to electric shock.)

Other components are soldered in place and may be replaced following the instructions covered in this section.

If filter capacitors are to be replaced, fasten them securely to the board using the original factory installation as a model. This will prevent them from breaking loose from vibration in the future.

REPLACEMENT PARTS.

If you have difficulty finding parts for this or any other SMART product, The SMART Technical Support Department stands ready to supply you with the required parts at a fair price. Please contact us at the address on the title page of this manual.

REPLACEMENT OF COMPONENTS ON PRINTED CIRCUIT BOARDS. It is important to use the correct technique for replacing components mounted on PC boards. Failure to do so will result in possible circuit damage and/or intermittent problems.

The circuit boards used in the MOD II are of the double-sided plated-through variety. This means that there are traces on both sides of the boards, and that the through-holes contain a metallic plating in order to conduct current through the board. Because of the plated-through holes, solder often creeps 1/16" up into the hole, requiring a sophisticated technique of component removal to prevent serious damage to the board.

A) COMPONENT REMOVAL: If the technician has no practical experience with the demanding technique of removing components from double-sided PC boards without board damage, it is wiser to cut each of the leads of the defective component from its body while the leads are still soldered to the board. The component is then discarded, and each lead is heated independently and pulled out of the board with long nose pliers. Each hole may be cleared of solder by carefully heating with a low-wattage soldering iron and sucking out the remaining solder with a spring-activated desoldering tool. *THIS METHOD IS THE BEST METHOD OF CLEARING A PLATED-THROUGH HOLE OF SOLDER.*

Another technique is:

1. Use a 30 watt soldering iron to melt the solder on the underside (solder side) of the PC board. Do not use a soldering gun or high wattage iron! As soon as the solder is molten, vacuum it away with a spring activated desoldering tool like the Edsyn "Soldapullit." Do not overheat the board! Overheating will almost surely damage the board by causing the conductive foil to separate from the board. Use a pair of fine needle-nose pliers to wiggle the lead horizontally until it can be observed to move freely in the hole.

2. Repeat step 1 until each lead to be removed has been cleared of solder and is free to move.

3. Now lift the component out of the holes.

B) COMPONENT INSTALLATION:

1. Bend the leads of the replacement component until it will fit easily into the appropriate PC board holes. Using a good brand of rosin-core solder, solder each lead to the bottom side of the board with a 30 watt soldering iron. Make sure that the joint is smooth and shiny. If no damage has been done to the plated through hole, soldering the topside pad is not necessary. However, if the removal procedure did not progress smoothly, it would be prudent to solder each lead at the topside as well in order to avoid potential intermittent problems.

2. Cut each lead of the replacement component close to the solder (underside) side of the PC board with a pair of diagonal cutters.

3. Remove all residual flux with a cotton swab moistened with a solvent like 1,1,1 trichloroethane, naptha, or 99% isopropyl alcohol. The first two solvents are usually available in the supermarkets under the brand name "Energine" Fire proof spot remover and regular spot remover, respectively. The alcohol, which is less effective, is usually available in drug stores. Rubbing alcohol is highly diluted with water and is ineffective.

It is good policy to make sure that the defluxing operation has actually removed the flux and has not just smeared so that it is less visible. While most rosin fluxes are not corrosive, they can slowly absorb moisture and become sufficiently conductive to cause progressive deterioration of performance.

5. TROUBLESHOOTING IC OP-AMPS

IC op-amps are usually operated so that the characteristics of their associated circuits are essentially independent of IC characteristics and dependent only on external feedback components. The feedback forces the voltage at the (-) input terminal to be extremely close to the voltage at the (+) input terminal. Therefore if the technician measures more than a few millivolts between these terminals, the IC is probably bad.

Exceptions are IC's used without feedback (as comparators) and IC's whose outputs have been saturated due to excessive input voltage because of a defect in an earlier stage. Also, be sure that the voltmeter is not interacting with these sensitive points and affecting the measured voltage. However, if an IC's (+) input is more positive than its (-) input, yet the output of the IC is sitting at -14 volts, this almost certainly indicates that it is bad. The same holds true if the above polarities are reversed.

Because the characteristics of the MOD II circuits are independent of op-amp AC characteristics, an op-amp can usually be replaced without need for calibration. However some of the control circuitry is sensitive to DC op-amp characteristics, like bias current and offset voltage. Because of this, high performance dual op-amps are used in several sockets. These devices must be replaced with exact replacements; garden variety IC's are not satisfactory.

A defective op-amp may appear to work, yet it may have extreme temperature sensitivity. If parameters appear to drift excessively, freeze-spray may aid in diagnosing the problem. Freeze-spray is also invaluable in tracking down intermittent problems. But use sparingly because it can cause resistive short circuits due to moisture condensation on cold surfaces.

We recommend that all plug-in PC cards or Remote Panel which requiring repair be sent to our factory, if at all possible. We can normally turn a repair around in a short time and get it back into the customer's hands far faster than would be the case should someone attempt a repair with no experience with the MOD II system. This also allows us to add reliability data to our files so that future revisions may be undertaken if necessary to improve the evolution reliability problems.

It is an excellent idea to have at least one set of the critical PC cards on hand at all times as a backup.

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SMART THEATRE SYSTEMS maintains a factory service department that can provide quick handling of replacement parts, or telephone advice in the event of a problem in installation or service. Our Watts service number is 1-800-45-SMART and a technician can be reached during normal business hours from 8 AM to 5 PM (Eastern time) Monday-Friday.

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