Film-Tech

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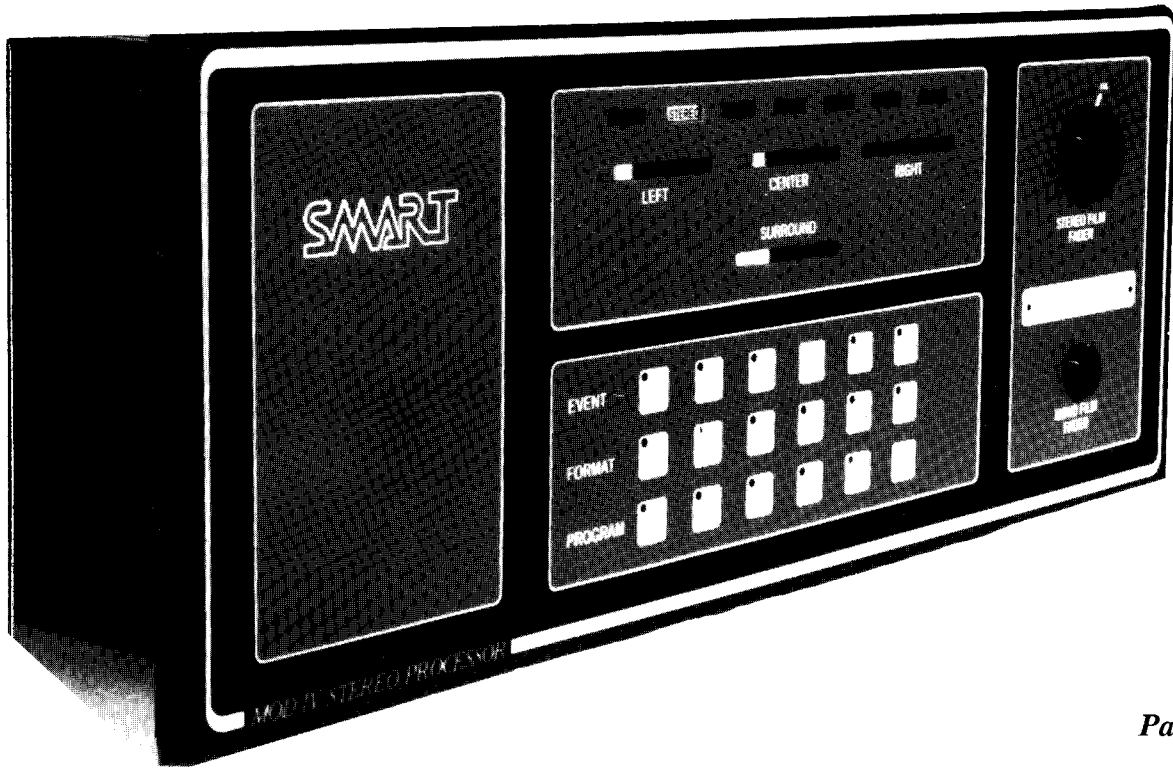
MOD IV STEREO PROCESSOR INSTALLATION AND SERVICE

The MOD IV Stereo Processor System is the most advanced and best sounding all-function booth stereo processor ever offered to the theatre industry. This product is the culmination of many years of development and experience, 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 use of the capability of the MOD IV, 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 has a sound quality second to none.

Any reference to Dolby in this manual refers to Dolby Labs, a registered name and trademark of Dolby Licensing Corp. San Francisco. Smart Theatre Systems does not build or sell Dolby brand equipment.

This manual is divided into sections that cover all vital aspects of the MOD IV 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.



UNIQUE FEATURES:
In addition to the standard decoder features you find on other fine brands, the MOD IV offers many extras that make operation easier and the stereo system more flexible.

The MOD IV has TWO master FADER controls on the front panel to independently adjust the MONAURAL FILM soundtrack level and any STEREO soundtrack level. This unique feature makes the MOD IV totally automation capable. The operator can preset the right auditorium volume for trailers with the MONO fader, and a different volume level for any stereo format (Optical, Magnetic, Stereo Generator) and not have to stand near the equipment when formats change to adjust the sound levels.

STATUS INDICATORS:
The operator control panel features a STATUS DISPLAY readout that shows the mode the system is in at any time. L.E.D.lamps indicate the format selected, the music-film status, which program format has been selected. The status lights can be seen from a distance so it is not necessary to be at the processor to verify the status.

MICROPROCESSOR LOGIC AND PROGRAM STORAGE:
The MOD IV uses a microprocessor to store up to 6 sound changes within a show, and the ability to store commands for 3 different shows per screen.

BAR CODE/FOIL SENSOR CUEING:
The MOD IV microcontroller based program sequencer can respond to either foil cues or bar codes placed on the film. This facility gives the MOD IV great flexibility when working in a highly automated booth. One foil cue sensor can be routed through the MOD IV which enables the sensor to provide sound change cues to the MOD IV, and after a 45 minute timeout, switches the foil cue sensor's output back to the automation for the end-of-show cue.

UPDATING FOR THE FUTURE:
Since the MOD IV system is totally modular, any new circuit developments or format options may be plugged into the existing main system under a factory exchange or update promotion. The system can stay up with current and future technology at minimum expense.

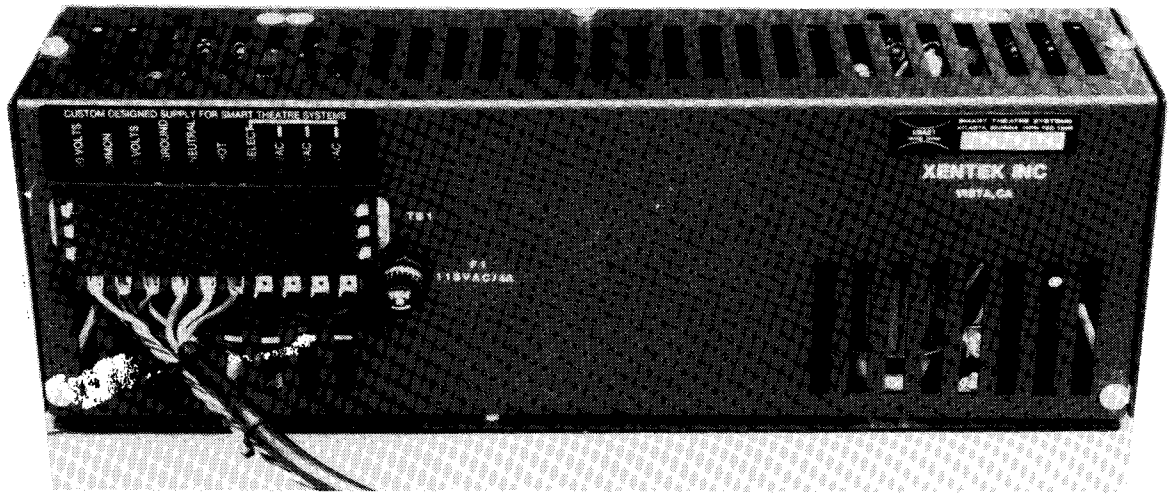
ERGONOMIC DESIGN:

The control panel is laid out for minimum operator confusion and ease of operation. Spacious, logical placement of critical controls are clearly labeled and easy to locate and use. No tiny knobs in cramped and unlikely places to irritate the operator.

MOD IV COMPONENTS

There are three (3) main components included in the MOD IV 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.

117 VAC 50/60 Hz Supply. Supplies are available for other countries.



POWER SUPPLY:

A heavy duty fully-regulated power supply is furnished with the MOD IV decoder. This bipolar 10 ampere supply is heavily filtered and supplies 5 amperes of current @ 20 volts for the positive circuits, and 5 amperes @ 20 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. 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 IV 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.

MAIN FRAME CARD CAGE AND CONTROLLER ELECTRONICS:
The "working" part of the MOD IV 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 (SVA)STEREO sound system with the necessary cards, update to an SVA and SR stereo system, and eventually, a six channel system with subwoofer and microprocessor 1/3 octave equalizers just by adding additional plug-in cards. The SMART MOD IV is the only system on the market that can offer these options.

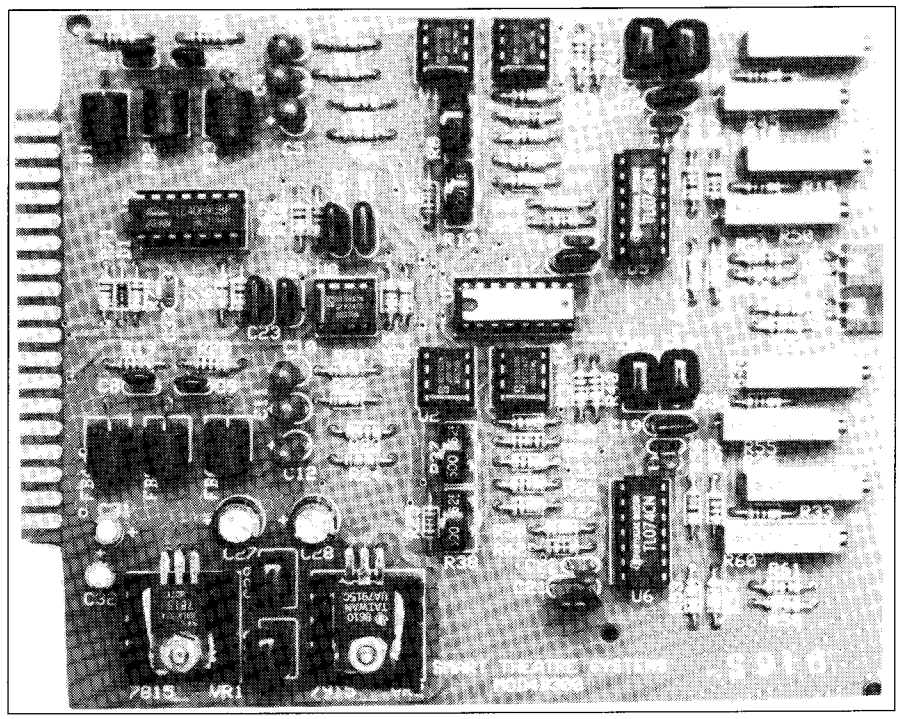
EMERGENCY POWER SUPPLY:
The MOD IV has a complete emergency backup system supplied with the system. The emergency power supply is a UL listed DC supply that is packaged in a small power pack that plugs directly into a nearby AC socket. This supply is polarized and caution should be exercised when making connection to the processor to see that the hookup polarity is correct.

DESCRIPTION OF THE INDIVIDUAL PLUG-IN CARDS:

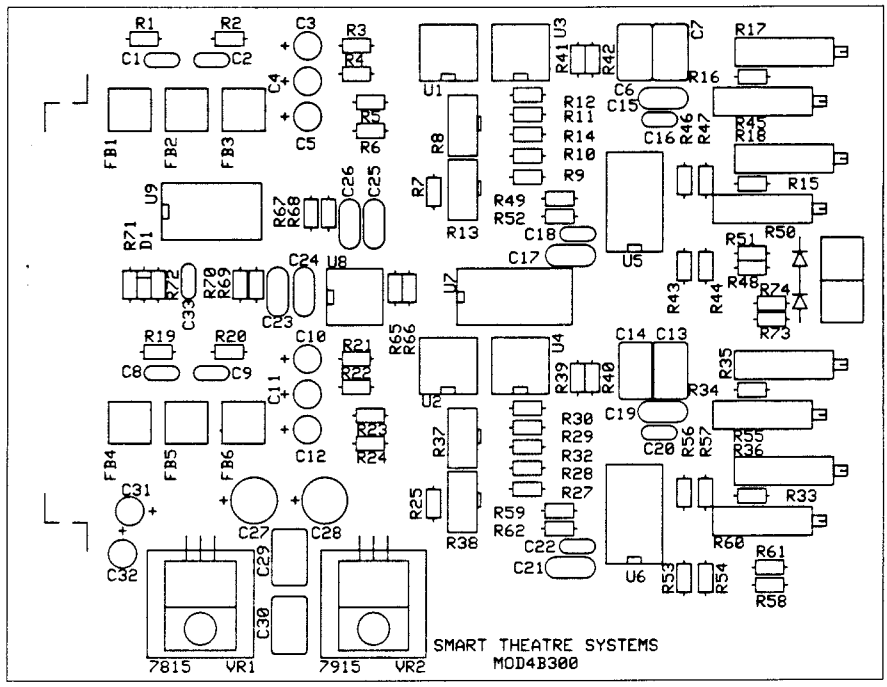
Each card has its own on-board voltage regulators that stabilize the circuits locally as well as filter unwanted signals that may be on the main power busses.

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

DUAL PROJECTOR PREAMP CARD:
There are 4 stereo solar cell preamplifiers in the MOD IV: each preamplifier channel is equiped with slit-loss correction. The Stereo-optical preamplifiers on this card increase the incoming level from the stereo solar cells Electronic change-over circuitry between stereo pairs is built on the card to be used in dual projector booths. If the installation is a single projector booth, the second stereo preamplifier channel is left unconnected.



The photo above shows the preamplifier PC card. There are two solar preamplifier gain controls and two slit correction circuits for each projector to optimize the signal from the stereo solar cell. There is sufficient gain built into the preamps for narrow slit optical sound lenses. The card is silk screened on both sides to make it easier to see the location of each preamplifier gain and slit-loss correction control pot.



PROJ 1

L GAIN

L HF

R GAIN

R HF

PROJ 2

L GAIN

L HF

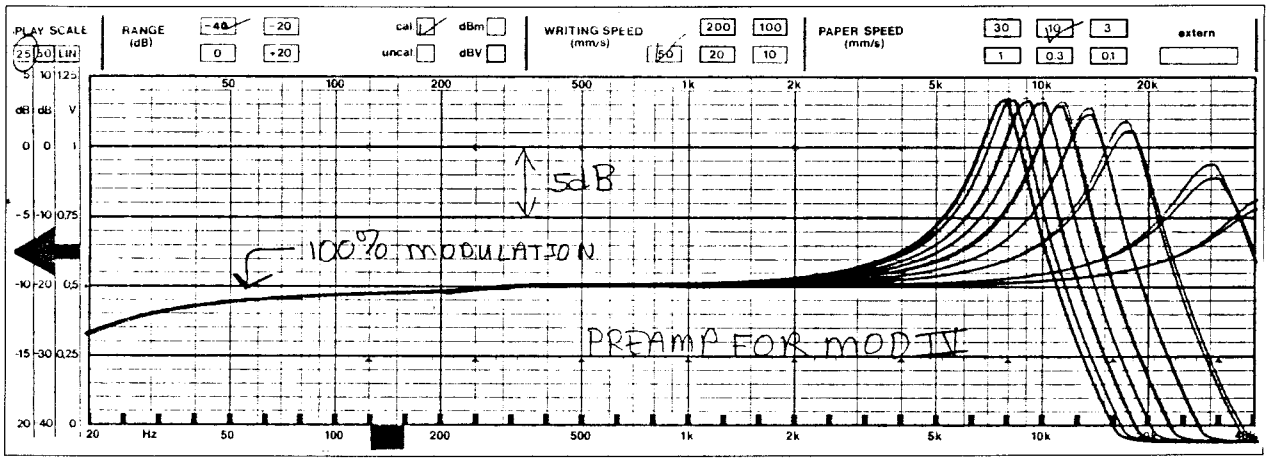
R GAIN

R HF

DUAL PROJECTOR STEREO SOLAR CELL PREAMPLIFIER

SLIT LOSS correction is mandatory when using any of the Dolby noise reduction cards in the MOD IV processor. Without a flat audio signal from the preamplifiers, the top bands of the noise reduction cards will not track properly. In order to set the slit-loss, perfect alignment of the "A" chain optical soundhead must be completed, and then a pink noise loop run while monitoring the preamplifier output with a Real-Time Analyzer. Adjust the slit-loss pot (on the appropriate channel) for the flattest HF response.

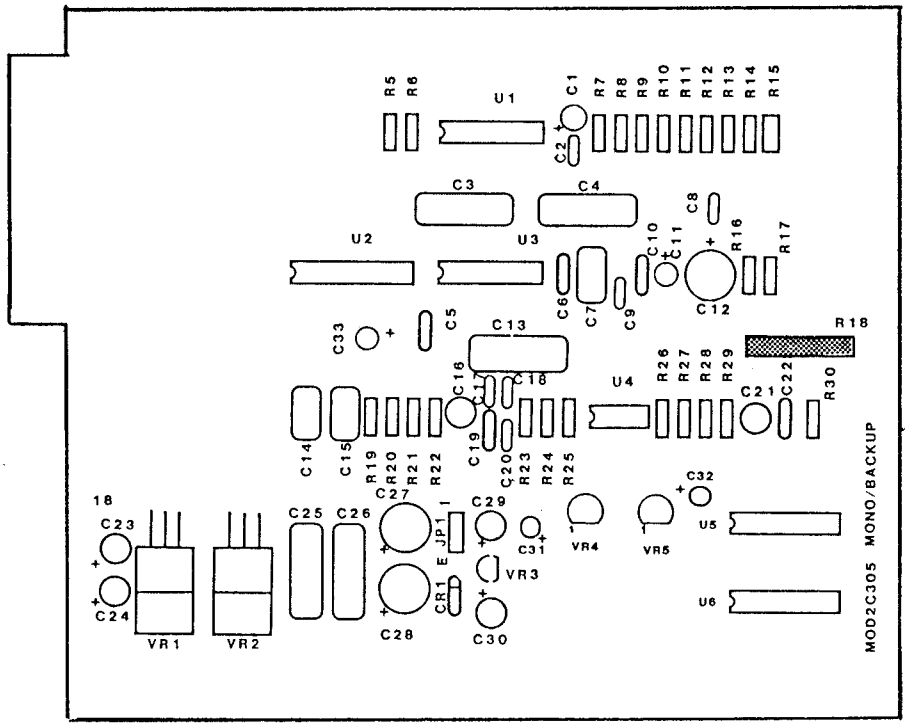
When using the SMART noise reduction module, it is recommended that the slit-correction be "dialed out" by turning the slit-correction pots fully clockwise. The design scheme of the SMART noise reduction differs from Dolby, and the HF correction is dynamic in the module. Therefore, slit-correction can be detrimental.



This response plot of one channel of the stereo preamplifier shows the action of the SLIT-LOSS correction circuits at various settings of the slit-loss control pot. There are 4 slit-loss pots on the dual channel stereo preamplifer card; one for each channel (two projectors)

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.



MONO/BACKUP CARD

The MONO card also contains all the necessary circuitry for the emergency backup system in the event of loss of sound within the MOD IV 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.

SMART NOISE REDUCTION CARD:

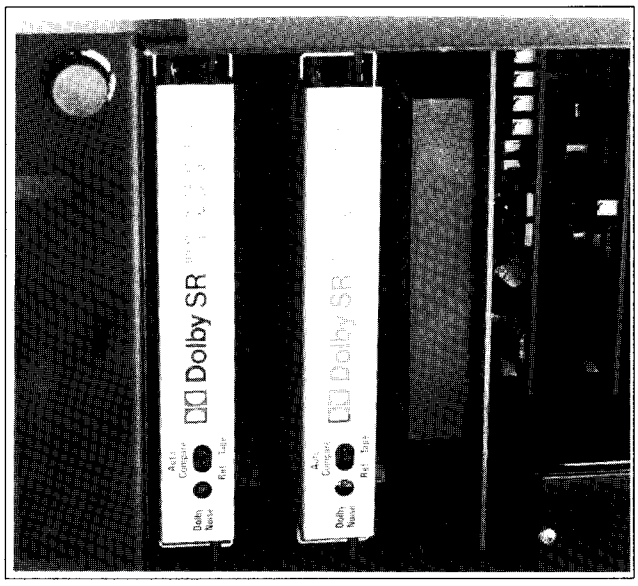
Two noise reduction modules are soldered to the plug-in card. One card is used in the Left Total signal path and the other in the Right Total path. The noise reduction circuits in each module accurately track the special encoding placed on the

film during the recording process. The noise reduction modules will reduce noise 10 dB in the mid-to-lower audio frequencies, and 15 dB in the extreme high frequency audio range.

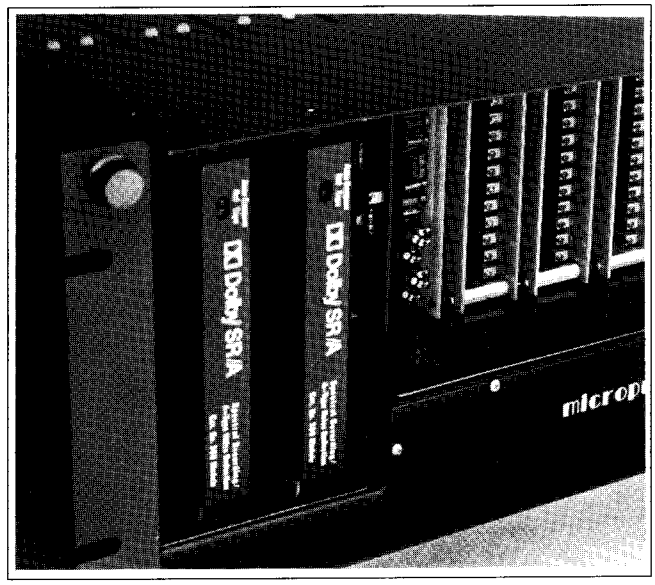
SMART PLUG-IN DUAL CHANNEL NOISE REDUCTION CARD

DOLBY NOISE REDUCTION OPTION:

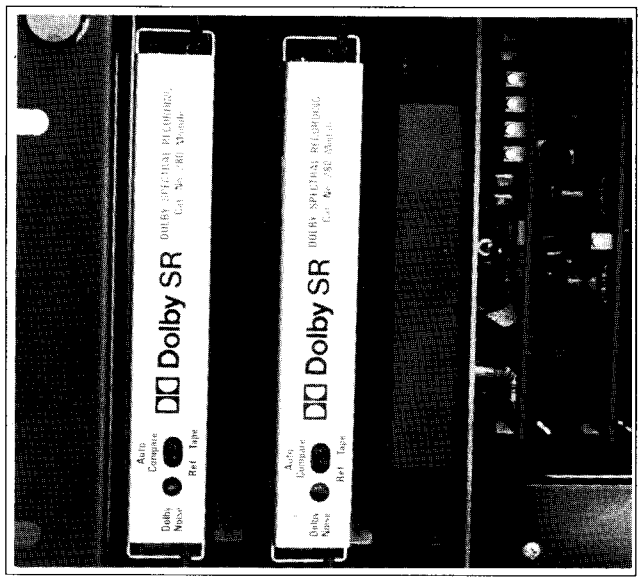
The MOD IV will accept any of the current Dolby noise reduction cards, including the Cat.# 300 combination "Type A" and "SR" cards. Special card slots are provided for these cards. Notice that none of the Dolby cards are pin compatible and each card must be placed in its own respective slot in order to operate and generate the correct audio output voltage to the system matrix. Dolby cards are available from an authorized Dolby dealer and are not offered by SMART.



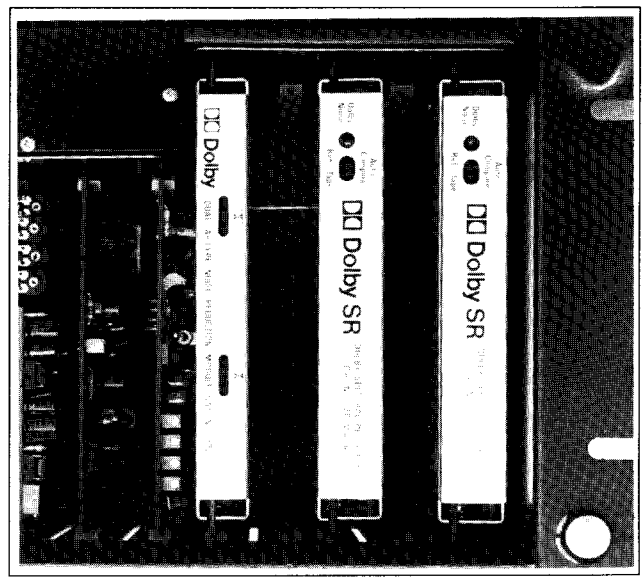
MOD IV WITH SMART NR



WITH DOLBY CAT. # 300 COMBINATION NR



SMART NR AND CAT.# 280 SR CARDS



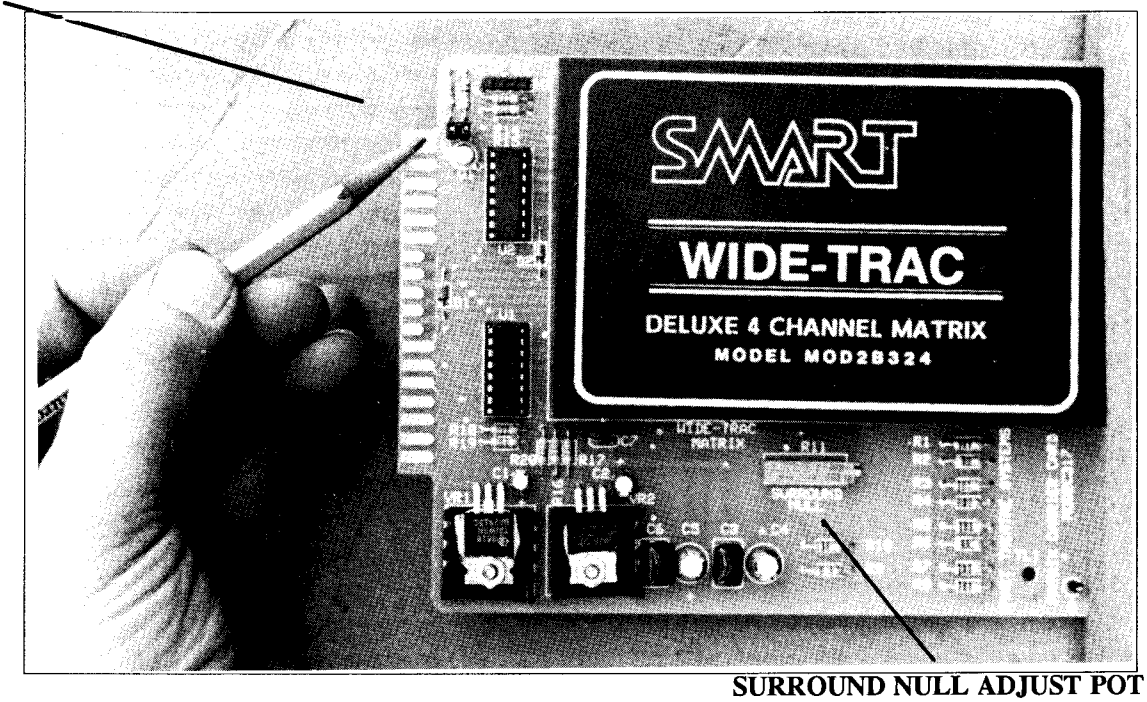
CAT. # 222 AND CAT.# 280 SR CARDS

from the Left Total and Right Total soundtracks on the film. There is a surround null adjustment trimpot which will allow the installer to minimize surround channel crosstalk without disturbing the input signal calibration settings of the preamplifier and noise reduction circuits.

When using the Dolby Cat. #300 combo NR cards, remove the shunt (jumper) on the MOD2C317 Matrix card to "enable" the Cat #300 NR cards. This is a very important step that should not be overlooked.

DELAY/SURROUND GENERATOR:

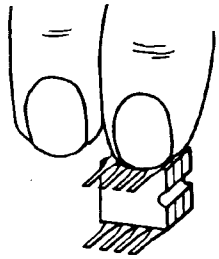
The time delay portion of the MOD IV system is contained on this



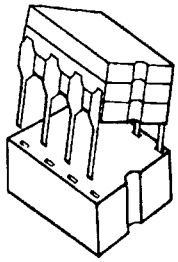
SURROUND NULL ADJUST POT

DOLBY CAT. #300 CARD. When a pair of the Cat. 300 cards are used in the MOD IV, a TL072 IC must be plugged into the mother board to accomodate the difference in levels required with this model noise reduction card. Unlike the Cat. 222, the Cat. 280, the Cat. 22, and the SMART NR, the input drive for the Cat. 300 must be 388 millivolts and the output drive must be 388 millivolts for the card to track its noise reduction expansion range. An audio pad is on the motherboard, and the IC circuit compensates for the additional output drive needed. If you plan to use the CAT. 300's in one of the **early** MOD IV's, the IC is is empty. Follow the tips below to add a TL072 chip. The additional chip plugs into a socket that is located right behind the LEFT EQ card.

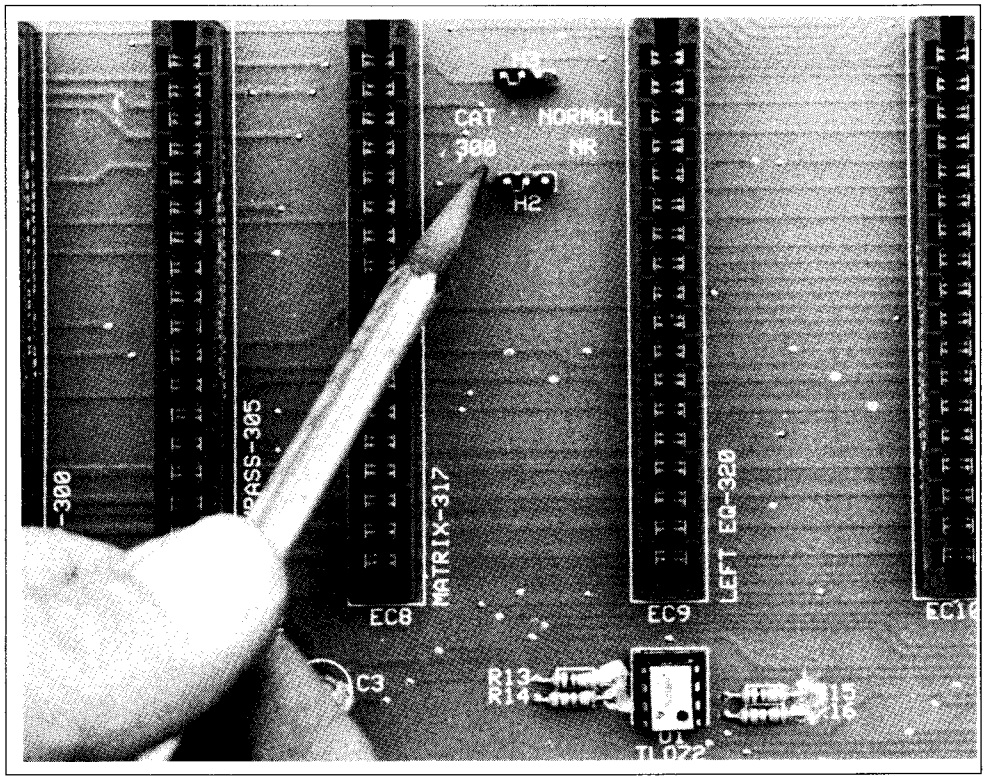
Current production units have the IC installed. You need to move a shunt on the motherboard if you use the Dolby Cat. #300 cards.



Before you install the TL072 chip, verify that its pins match the holes in the socket. If they don't, align the pins by laying the chip on its side on a table (or other flat surface) and gently press the top edge of the chip (not the pins) as shown. Repeat for the other row of pins.



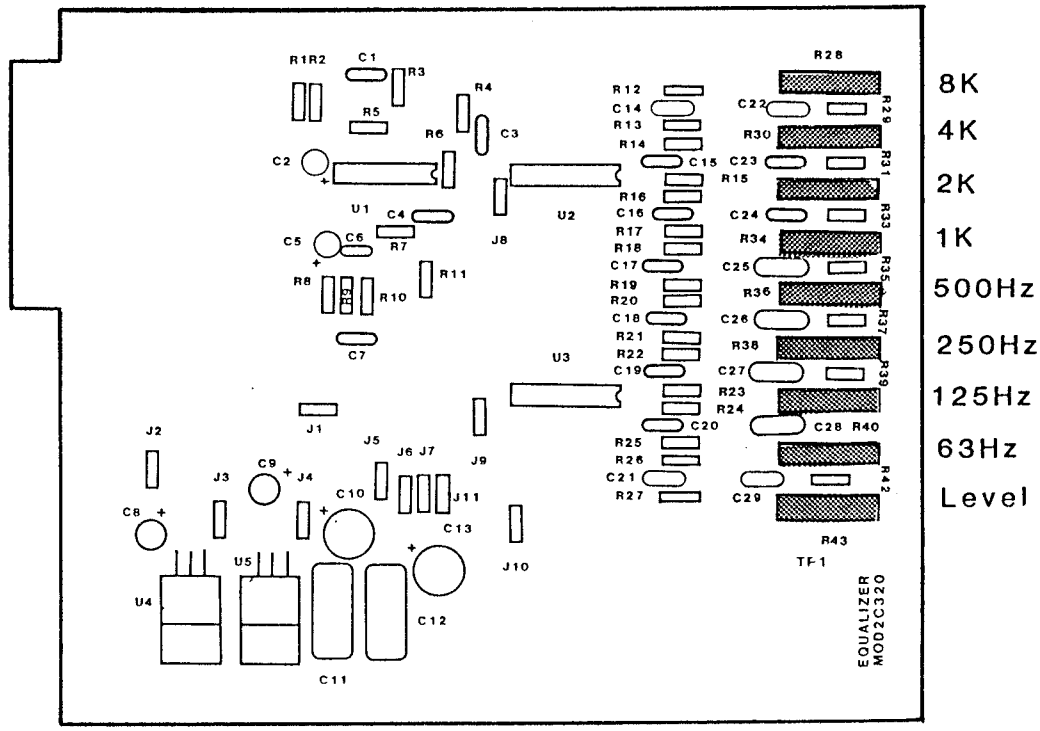
Carefully insert the pins on one side of the chip halfway into the holes on the same side of the socket. Then, tilt the chip to insert the other pins.



Current production MOD IV processors have the TL072 chip installed. You must move two shunts if you plan to use the Dolby Cat. #300 cards. Only early production units require the addition of the IC.

EQUALIZERS:

Three one third octave room tuning equalizers are used for Stage channel sound (Left, Center, Right). The filters are minimum phase, combining type circuitry. The multiturn pots on the front edge of the cards allow precise adjustments to be made. The equalizers are cut only (-12 dB minimum) on all bands up through 4 kHz, and are boost and cut (+6 dB) on all bands from 5 kHz up.



SURROUND CHANNEL OCTAVE EQUALIZER

SURROUND EQUALIZER:

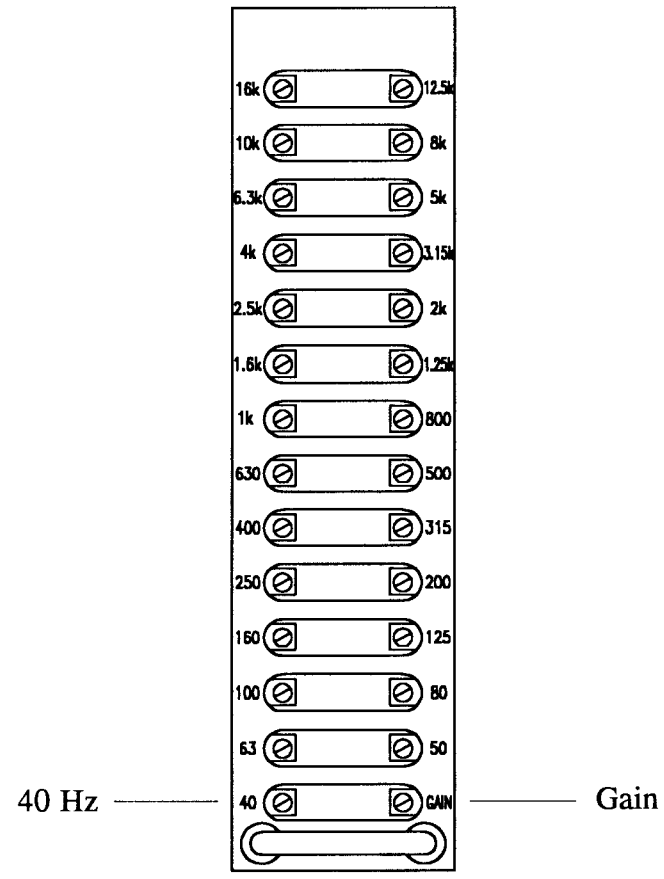
The fourth equalizer in the system is for the surround channel of any signal passing through the MOD IV, i.e. Magnetic, Stereo Generator, Stereo-Optical, Digital, etc. This one octave card may replace any of the 1/3 octave filters sets in an emergency.

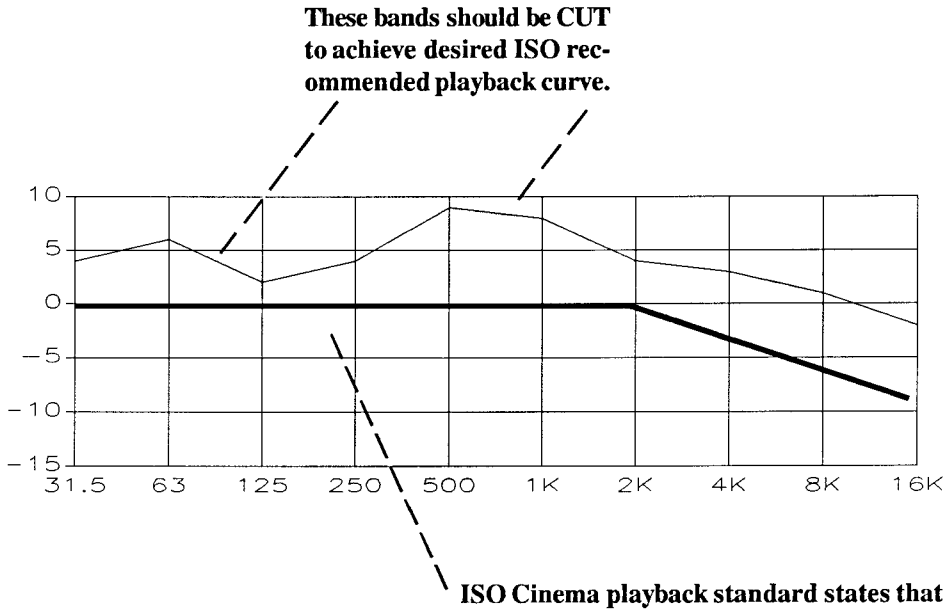
STAGE CHANNEL EQUALIZERS.

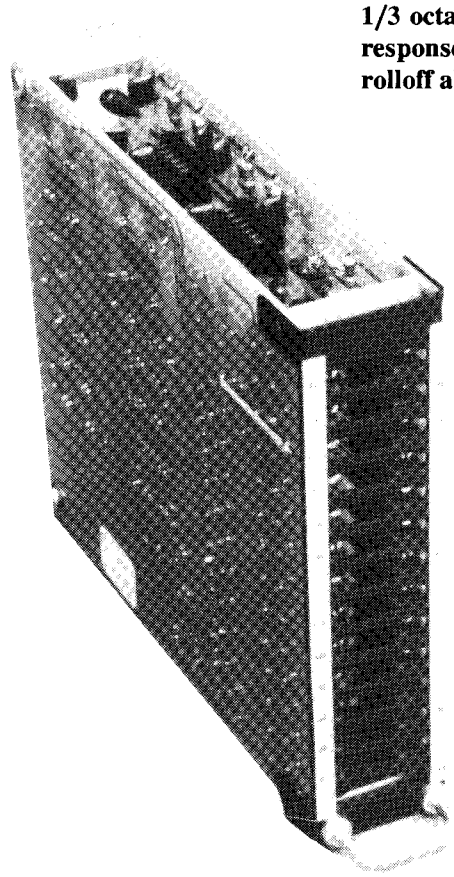
The 1/3 octave stage channel equalizers in the MOD IV (3 supplied) allow the same tuning results obtained in professional room tuning filter sets used in high-end sound playback applications. Sound contractors learned, a long time ago, that boosting frequency bands adjacent to bands that are cut

duce a phase shift to which that the ear is very sensitive. Although the test instruments show a nice curve, the sound has a coloration that is not natural. For this reason, we encourage you to apply the minimum amount of boost and cut whenever needed. Never over-equalize the system. All frequencies may be cut and boosted by as much as 7 dB in each of the 1/3 octave bands . The use of bass and treble controls on the equalizer has also been avoided to further minimize phase shift. The circuit design of the equalizer is low-noise, minimum-phase, combining filters, on ISO band centers. Each filter section uses single turn pot for adjustment. The equalizers are factory set for flat response during final QC test.

Before attempting to equalize be sure the stage speaker connections are properly polarized, the polarity of the components in each speaker system is correct, and the speaker devices are mechanically aligned according to the manufacturer's recommendations. Remember that equalizers are used to tune the room, *NOT* fix poor speaker design or poor installation.

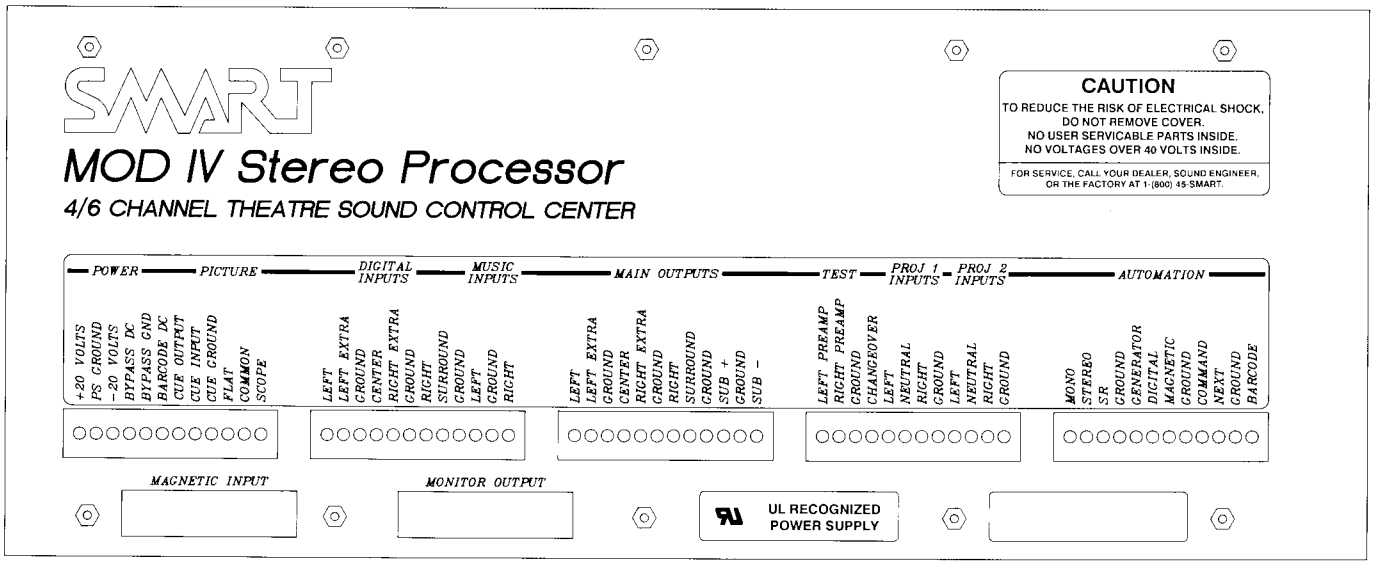






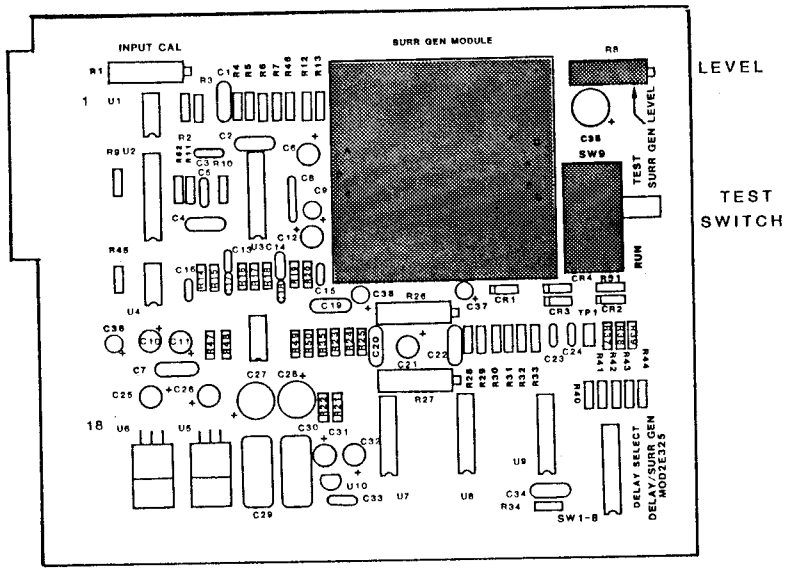
The 1/3 octave plug-in equalizers are a standard feature of the MOD IV processor. For economy, one octave equalizers, like the surround channel equalizer, may be substituted when ordering the product.

MICROPROCESSOR EQUALIZER. The MOD IV is prewired for a microprocessor 1/3 octave equalizer option currently in development. When available, the digital filter cards for each stage channel plug into the positions used for standard analog equalizers. The computer control board for all channels fits into the compartment labeled "Microprocessor Equalizer" below the main PC boards.



All connections are made to rear of the MOD IV with plug-in connectors (supplied). Inputs, Outputs, Power, and control connections are carefully laid out in groups. Please do not bundle the wires together with tie-wraps. Make sure each group has good separation between low-level and high-level signals.

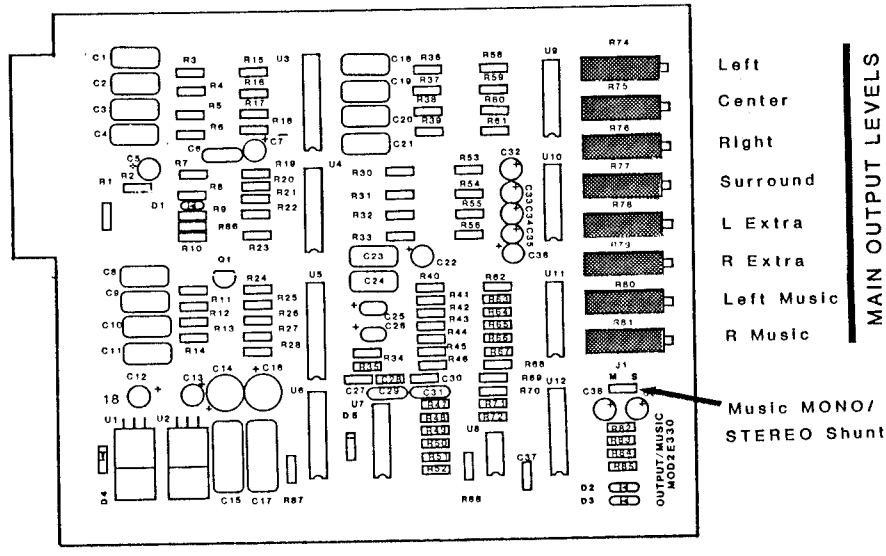
DELAY/SURROUND GENERATOR:
The time delay portion of the MOD IV system is contained on this card, along with the Stereo Generator Surround Module. The surround channel passes through the time delay when any Stereo-Optical format or Stereo Generator format is selected by the operator. 35mm magnetic, 70mm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



TIME DELAY/SURROUND GENERATOR 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.



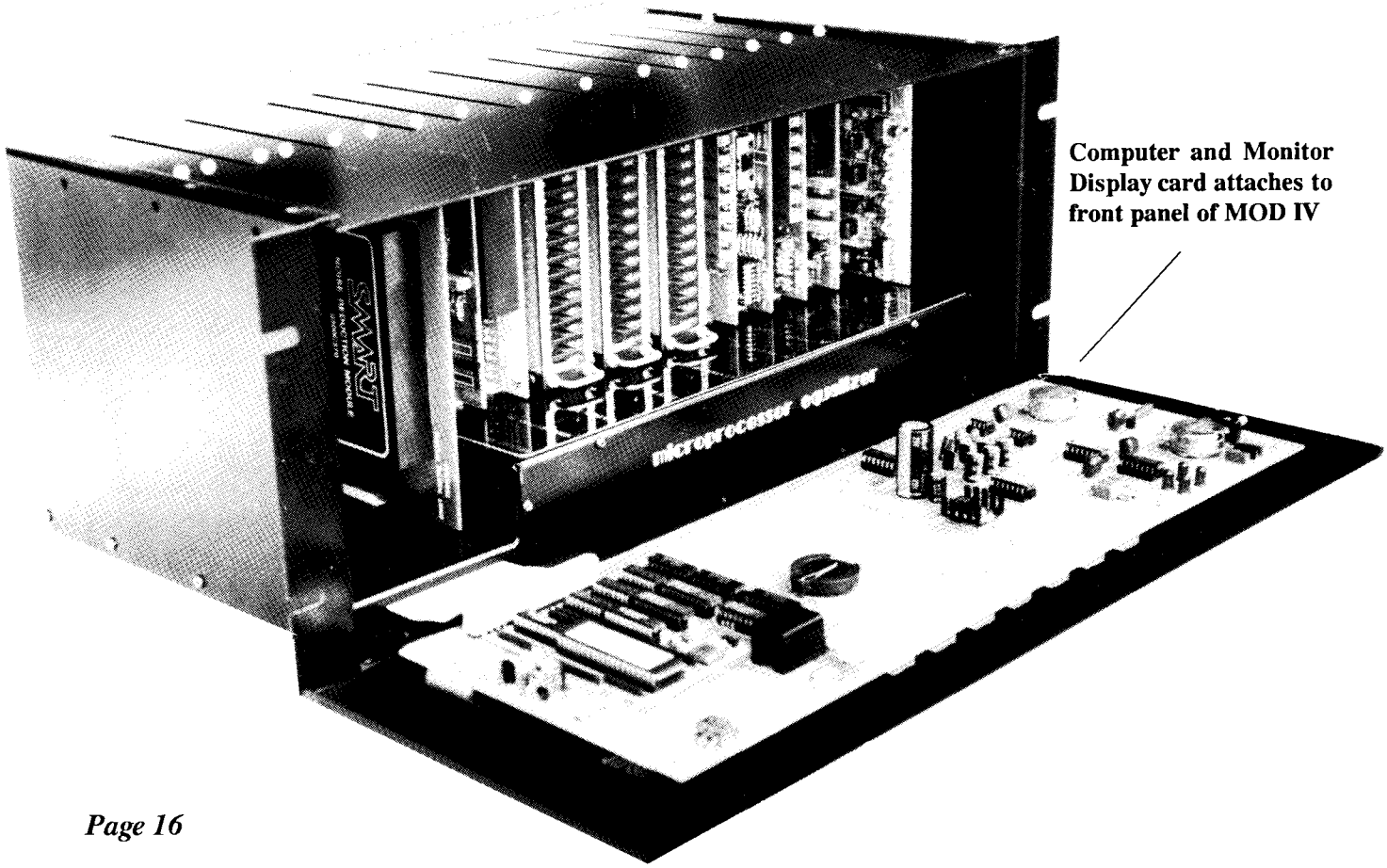
OUTPUT/MUSIC CARD

Music Fade-in and Fade-out (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.

COMPUTER LOGIC CARD/DISPLAY CARD:
The MOD IV front panel holds the microprocessor logic circuits, which control all functions of the processor. In addition, external commands are available from this card to control other equipment in the sound system. For example, a 70mm 6-channel magnetic system or digital decoder may be easily interfaced to the MOD IV and controlled by the logic circuits through a DB25 socket on the rear of the chassis.

The front panel PC board also contains the display LED's and system status lights, along with meter LED's to monitor audio signal level on each of the four primary sound channels.

When the MOD IV is first turned on, you will see a sequence of LED's flashing on the front panel. This is normal. After about ten seconds, the MUSIC LED should be on. (The MUSIC button has a picture of musical notes.) Also, one of the SHOW LED's will be on.

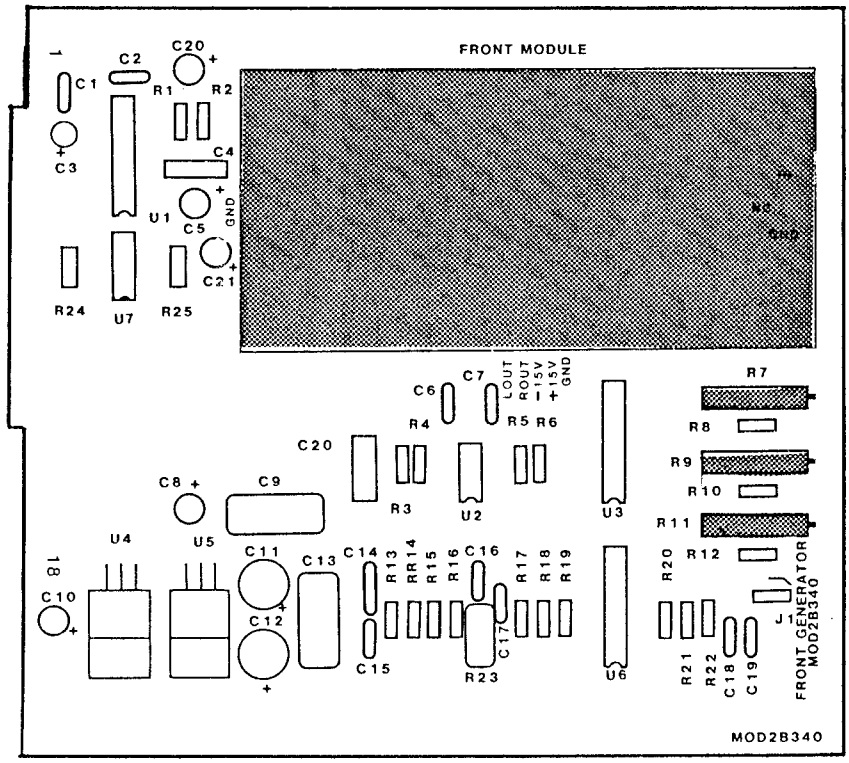


Computer and Monitor Display card attaches to front panel of MOD IV

FRONT STEREO GENERATOR:

A deluxe Stereo Generator (synthesizer) is also offered as a standard feature of the MOD IV 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.

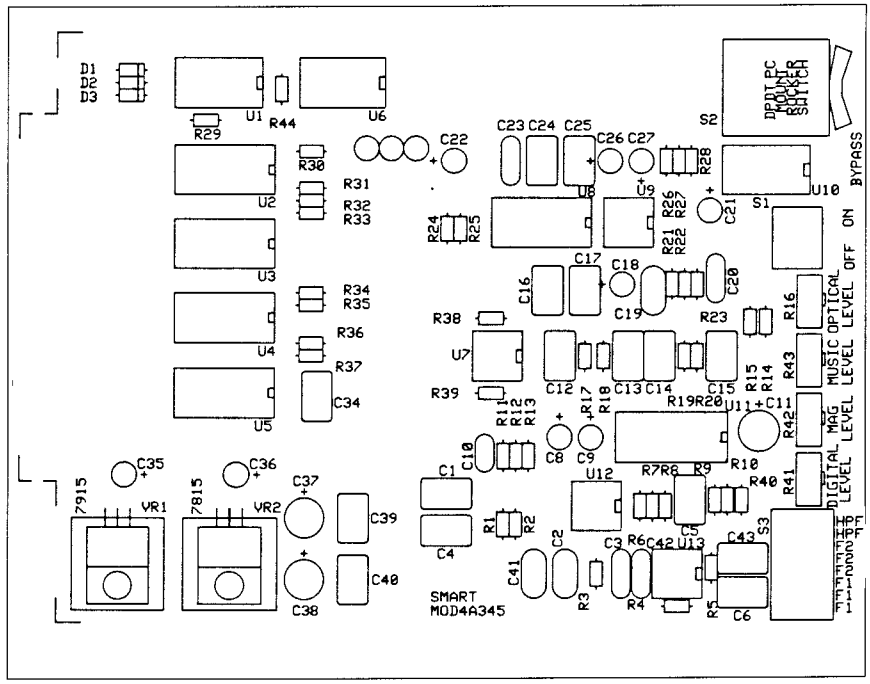
The output levels for the three stage synthesizer channels are adjusted ONLY after the main stereo-optical channels have been correctly adjusted. The synthesizer levels should be set to be the same as other stereo channels so that a transition between film format modes will appear smooth to the audience 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.



SUB WOOFER/BASS EXPANDER (SBE CARD). The last PC board on the far right of the MOD IV cardcage contains the subwoofer output circuitry and the EMERGENCY BYPASS switch. The bypass audio level is set by a multi-turn pot on the mono PC card.

The optical expander circuit works only when optical sound formats have been selected (SVA,SR & Stereo Generator), and not on Magnetic, Digital inputs, or non-sync music. The small ON-OFF toggle switch on the front of the PC board turns the subwoofer circuit on or off. The Sub-Bass optical expander expands the output level at a 1.5 to 1 ratio in the low frequencies.

Bandpass shaping for the low frequency subwoofer output is selectable with various settings of the DIP switches at the front of the PC card. The High Pass filter has a fixed slope of 12 dB/ octave, and the Low pass filter is 18 dB/octave. The following combinations of switches will configure the filters for the desired LF bandpass output.

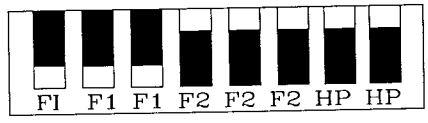


THE SBE (Sub-Bass Expander) CARD ALSO CONTAINS THE OPERATOR EMERGENCY BAYPASS SWITCH AT THE TOP.

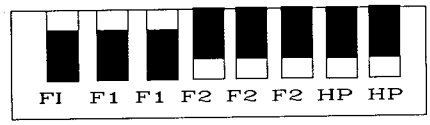
DIP SWITCH SETTINGS FOR VARIOUS FREQUENCY BANDPASS CHARACTERISTICS

ALL switches UP for wide-band frequency response. Useful when feeding a sub-woofer power amplifier that has built-in filters.

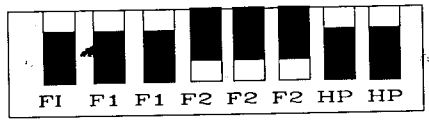
ALL F1 switches and HPF (high pass filters)DOWN for 25-80 Hz frequency response.



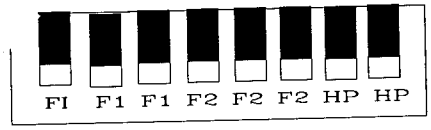
ALL F1 switches DOWN - ALL other switches UP for 10-65 Hz Response to sub-woofer output.



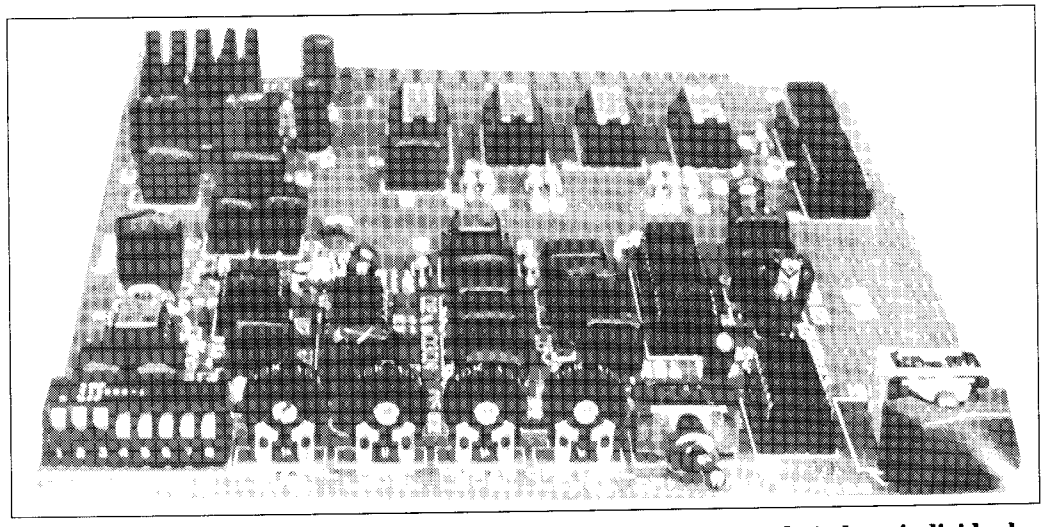
ALL F2 and HPF switches DOWN results in 35-225 Hz bandpass.



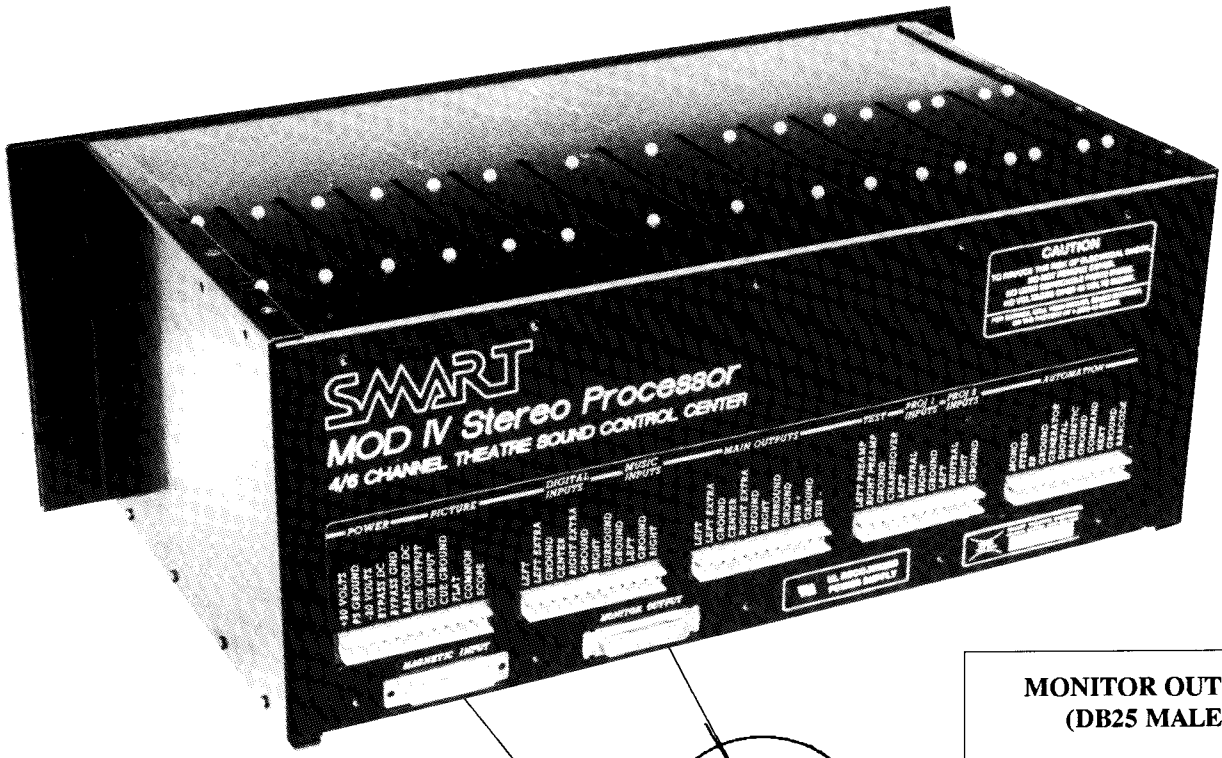
F2 switches DOWN with ALL other switches UP will give a 10-200 Hz response.

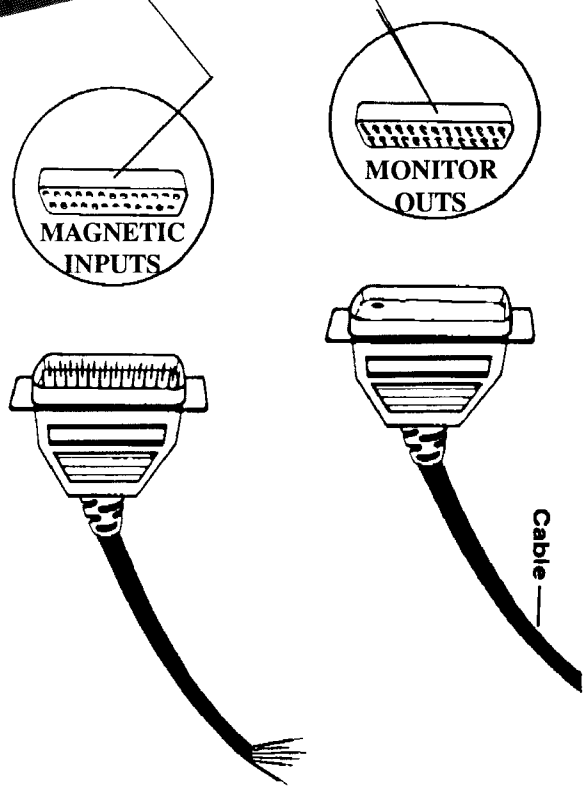


If ALL DIP switches are set to the DOWN position, the output response will be 23-68 Hz.



SBE (Sub-Bass Expander) has individual output level adjustments for each format. Optical, Digital, Magnetic, and non-sync Music sub-bass levels may be set separately. The sub-bass ON-OFF switch kills sub-woofer.





From a 6-channel 70mm Magnetic Processor. If using the SMART MP7035, use shielded serial computer cable same as Monitor. Male DB25 on one end and Female DB25 on the other.

MAGNETIC INPUTS (DB25 FEMALE)	
Left Buss	1
LE Buss	2
Center Bus	3
RE Buss	4
Right Buss	5
Sur Buss	6
LPF Select	10
Mag ENABLE	11
MUTE	12
CHANGEOVER	13
GROUND	16-20

MONITOR OUTPUT (DB25 MALE)	
Left +	2
Left -	14
LE+	16
LE-	3
Center +	5
Center-	17
RE+	19
RE-	20
Right+	8
Right-	20
Sur Left+	23
Sur Left-	10
Sur Right+	24
Sur Right-	11
Subwoof+	25
Subwoof-	12

Output pinout of the DB25 connector is compatable with THX monitor if you use a shielded SERIAL printer computer cable. The cable should have a male DB25 on one end, and female on the other end. All pins of one DB25 must be connected to the mate (25 pins).

SPECIAL CONNECTORS. The DB25 computer type connectors on the rear of the MOD IV allow extra "ins" and "outs. One is for mating a 6-channel Magnetic Processor to the MOD IV to permit the 6-channel Master Fader and computer to control the show, and the other connector is for the booth monitor.

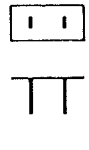
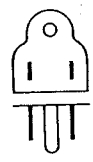
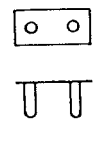
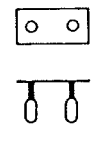
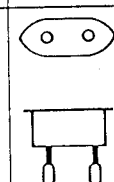
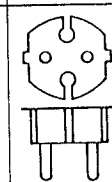
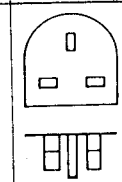
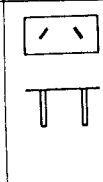
INSTALLATION INSTRUCTIONS

PROCESSOR PLACEMENT IN THE RACK:
Before mounting the MOD IV processor 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 processor is placed at eye level for easy visibility of the system operation status.

Make sure that the processor unit is not immediately adjacent to hum producing magnetic fields radiated by large power transformers. The preamplifier sections of the MOD IV have a large amount of available gain that will amplify hum fields if proper attention is not given to component placement.

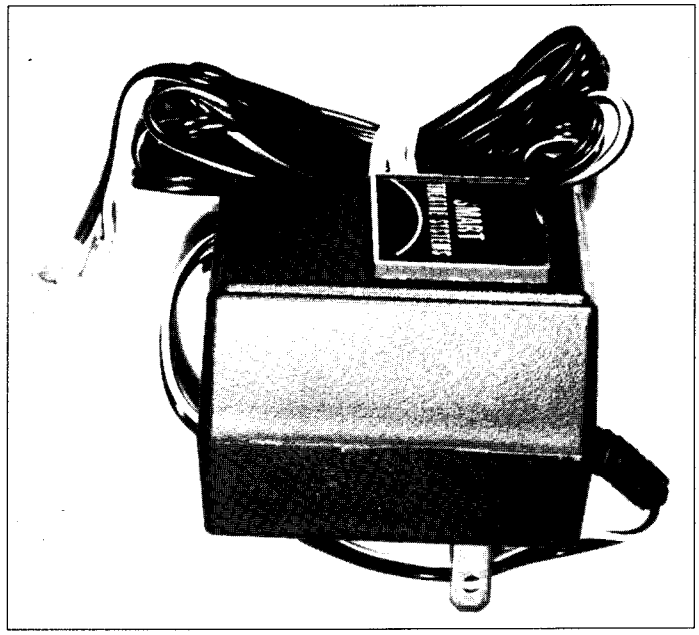
POWER SUPPLY INSTALLATION:
Place the power supply in a convenient position in the equipment rack away from major heat producing components and high gain audio circuits. A good place is usually on the floor of the equipment rack. Run the factory-supplied power supply wiring harness along the left side of the equipment cabinet (when viewed from the rear) to the MOD IV processor. Dress the wires for appearance and craftsmanship. The wiring harness has a connector that plugs into the back of the MOD IV and is polarized with a mechanical key in the connector. As you are looking at the back of the MOD IV, the power connector will plug into the left end connector, and the wires from the plug will exit from the bottom of the connector. The red wire should go to the terminal marked +20 VOLTS, the black wire to PS GROUND, and the yellow wire to -20 VOLTS. Remember to check all connections before applying power to the system. A wire that is reversed could be very destructive to the system.

INTERNATIONAL AC PLUGS/ CONNECTORS

SAFETY STANDARDS	UL/CSA/JIS	UL/CSA			TUV/VDE	TUV/VDE	BSI	SAA
Configuration								
Use for Countries	North, Central & South America, China, Japan	North & Central America	South East Asia; Middle East, Africa, Spain; Italy	European Countries	European Countries;	North European Countries; Germany	England; Singapore	Australia; New Zealand

EMERGENCY SUPPLY:

The second UL Listed power supply furnished with the MOD IV 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. The leads from this supply are part of the power supply wiring harness. The black lead with white stripe should connect to the MOD IV terminal marked BYPASS DC, and the black lead should connect to the terminal marked BYPASS GND.



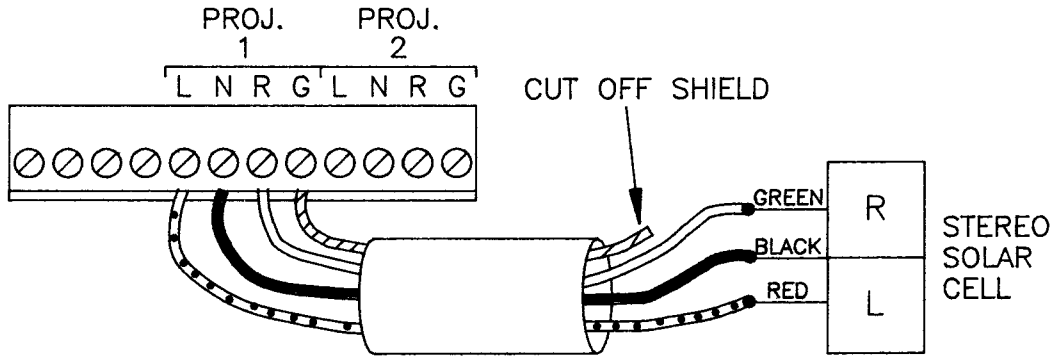
The Emergency Power Supply furnished with the MOD IV is for 117 VAC operation. It produces 15 VDC to power the emergency preamp and line amplifier. Dealers in countries that require other voltages should procure a suitable "power pack" in their own country for use on the MOD IV. The master supply is available in other voltages from the factory, but not the small emergency supply.

WIRING HOOKUP INSTRUCTIONS:

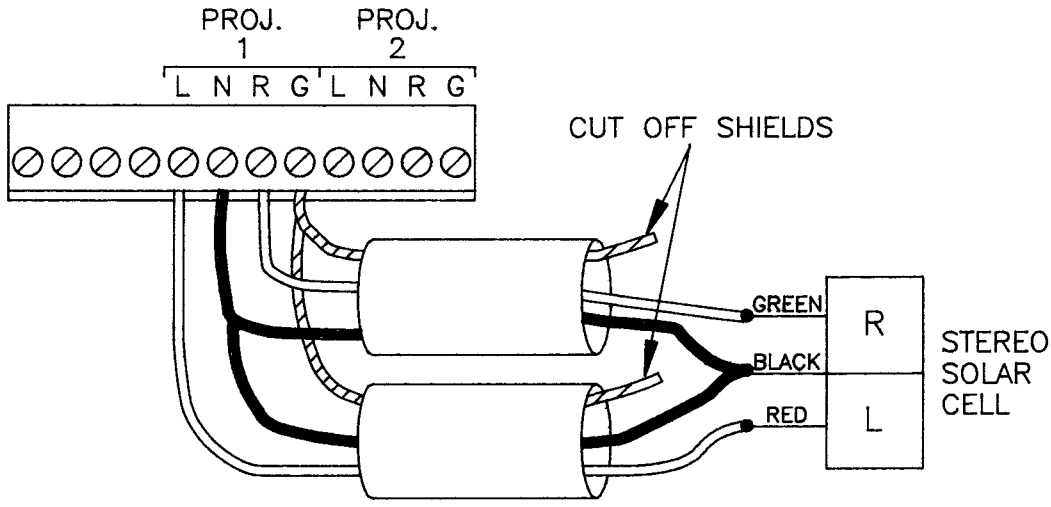
SOLAR CELL HOOKUP:

Connect the wire from the left solar cell(red) to the LEFT PREAMP input terminal of the MOD IV. Connect the wire from the right solar cell(green) to the RIGHT PREAMP input terminal. The common solar cell lead (black) should be connected to the NEUTRAL PREAMP input terminal, and the shield of the cable to the GROUND terminal. Be sure to cut off the shield at the projector end so that a ground loop is not created. Only the MOD IV end of the cable shield should be grounded.

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.



3 CONDUCTOR SHIELDED CABLE



PAIR OF 2 CONDUCTOR SHIELDED CABLE

Two methods may be used when wiring the stereo solar cells to the processor. Make sure the shield of the cable is connected only at the processor ground terminal end.

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 ungrounded, the film sound will appear at the main outputs, and the music will slowly fade out. Connect a pair of unshielded twisted pair wires to the command terminal and a nearby GROUND terminal. A remote SPST switch may be positioned near the projector(s) to activate the transition. If no remote switch is desired, the front panel MUSIC-FILM switch provides the same action. Alternatively, a booth automation system may be used to control the MUSIC/FILM change. **WHETHER MANUAL OR AUTOMATIC CONTROL IS USED, *MAKE SURE* THAT NO OTHER VOLTAGE SOURCE IS ON THE SWITCH OR RELAY CONTACTS. OTHERWISE, THE MOD IV MAY BE DAMAGED.**

NEXT TERMINAL:
The NEXT terminal may be hooked to an automation system capable of supplying a momentary contact closure for each desired sound format change. Each time the NEXT terminal is momentarily grounded, the MOD IV computer sequencer will advance to the next programmed event. This terminal may also be connected directly to a cue foil sensor, if one is available, to achieve the same result.

CUE INPUT / CUE OUTPUT TERMINALS:
In many cases, an outboard cue foil sensor is used ONLY to provide an end-of-show cue. It is possible to use this cue sensor to provide format changes and still provide the end-of-show cue function. Disconnect this cue sensor from the automation system and re-connect it to the CUE INPUT terminal on the MOD IV. Then, connect the CUE OUTPUT terminal on the MOD IV to the automation system where the outboard cue sensor was connected. When the show starts, the CUE INPUT terminal acts just like the NEXT terminal and provides for sound format changes. Simply add foil cues to the outboard sensor for each sound change. After 45 minutes, the CUE INPUT is routed to the CUE OUTPUT and back to the automation system for the end-of-show cue.

EXTERNAL FORMAT TERMINALS:
The EXTERNAL FORMAT TERMINALS are provided for direct control of the sound format. A momentary ground on one of these terminals will switch the MOD IV to the desired format.

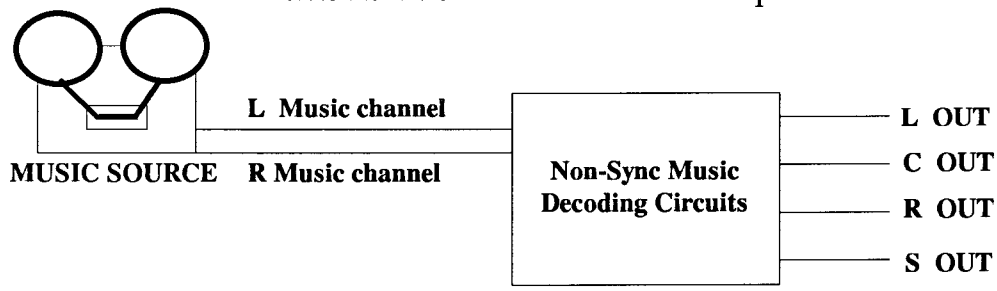
OUTPUTS:
The six channel outputs are labeled LEFT, LEFT EX(tra), CENTER, RIGHT, RIGHT EX(tra), and SURROUND. Shielded cable should be run between these terminals and the next piece of equipment in the sound system (equalizer, amplifier, etc.). Convenient GROUND terminals are provided near the outputs.

CHANGEOVER WIRING OF DUAL PROJECTOR PREAMPS: Changeover between projectors is done electronically in the MOD IV. 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 has at least 3 dB more circuit noise than an electronic changeover and is NOT recommended in high quality systems.

Projector changeover is accomplished by using only a single pair of wires and either a manual switch or relay contacts in the automation system. A relay closure in the automation equipment will execute a changeover by grounding the CHANGEOVER terminals. Run a pair of twisted unshielded wires to the "dry" contacts of the automation projector changeover relay. Connect one wire from the other end of the pair to the CHANGEOVER terminal of the MOD IV only. Ground the other wire of the pair to the nearest ground terminal on the MOD IV. When the automation relay closes, projector TWO of the MOD IV 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 CHANGEOVER terminal is **grounded.**

DIGITAL INPUTS:
The MOD IV 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 multi-channel source and route the signals through the MOD IV using the present PC cards. Incoming signals from the Digital input terminals must be trimmed externally to match levels from the Stereo-Optical signals for 4 or 6 channel operation. These adjustments must be made at the output of the external digital processor or interlock audio tape machine. Final output levels may be adjusted for the overall system at the output-line PC card.

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 DIGITAL selector program switch on the MOD IV front control panel.

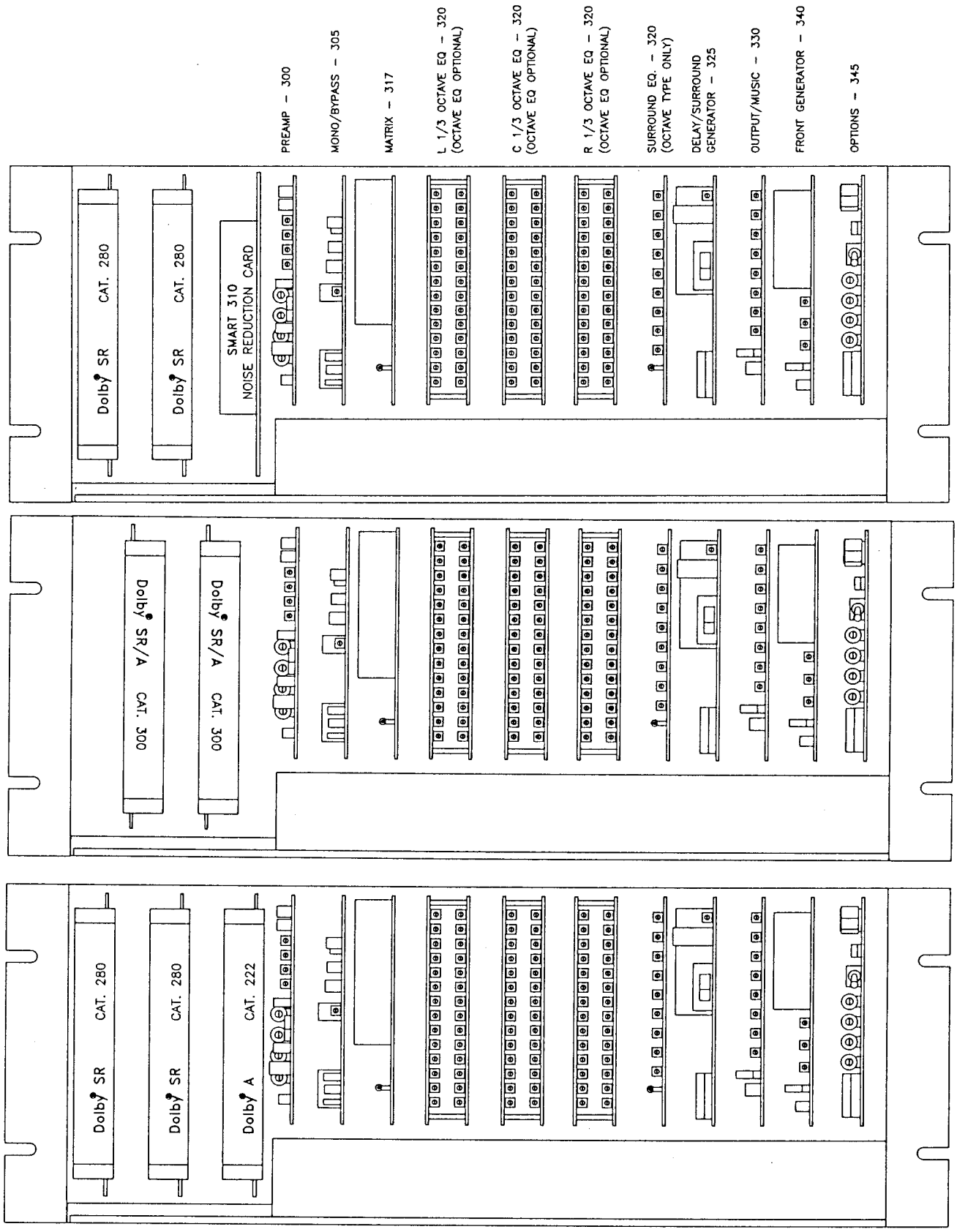


STEREO MUSIC SOURCE:
The non-sync music inputs for the MOD IV feature a special music matrix decoder that separates in-phase and out-of-phase signals on a standard two channel recording (CD player or tape) and creates four channels of auditorium music. Connect your stereo music source to the LEFT and RIGHT MUSIC inputs on the MOD IV.

MONO MUSIC SOURCE:
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 MOD IV is moved to the MONO position for this use. The music source is connected to both LEFT and RIGHT MUSIC inputs. Music will appear on all stage channel and surround speakers when mono material is feeding the sound system.

REAR CHASSIS DB25 CONNECTORS:
The computer type DB25 connectors on the chassis are for special inputs and outputs. One the far left (as you view the rear of the chassis) are the inputs for 70mm magnetic signals from an external controller. The adjacent DB25 provides monitor outputs of all channels for a THX booth monitor/crossover package. A standard shielded serial port computer cable is used to connect the processor and the monitor without additional wiring.

CALIBRATION:
The Sound Systems must be on for at least one hour before alignment. All doors should be closed and the exhaust fan should be running if the MOD IV is placed in an equipment rack.



P.C. CARD LINEUP WITH VARIOUS NOISE REDUCTION OPTIONS FOR TYPE "A" AND SR FORMATS.

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.

B CHAIN CALIBRATION

PRELIMINARY:
It is necessary to have a SMART PINK NOISE SWITCHING CARD and, optionally, an EXTENDER CARD for performing the calibration and testing of the MOD IV. The PINK NOISE card may be plugged directly in without the extender card, but it is easier if the extender card is used with the PINK NOISE card. The PINK NOISE card plugs into the MATRIX CARD position for setting house EQ and levels and into the PREAMP CARD position for setting sub-bass levels. The PINK NOISE CARD has seven switches. The bottom switch is used to select NORMAL or CHOO-CHOO modes. The top six switches are used to turn individual channels on and off. These channel switches are three position, center off, with the top position giving an in phase signal and the bottom position giving an out of phase signal. There is a built-in high quality pink noise source which feeds these switches.

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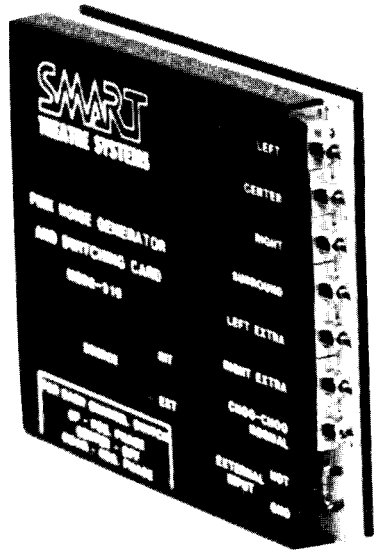
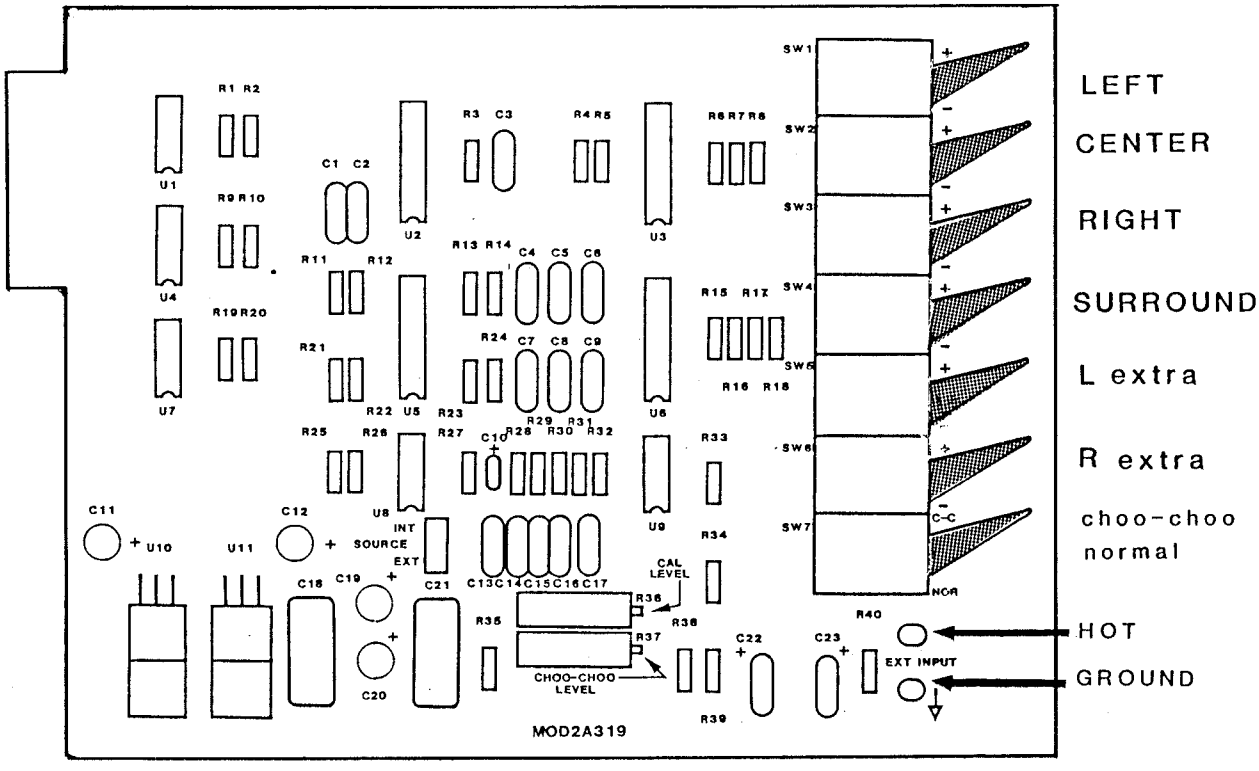


OPTIONAL PINK NOISE TEST CARD.

For the following procedures, select FILM and STEREO by pushing the appropriate buttons on the front panel. Also, set the front panel STEREO FILM FADER to the CAL line.



PINK NOISE TEST CARD

EQUALIZATION AND HOUSE LEVELS:
The equalizers are normally shipped with flat frequency response. The 1/3 octave equalizers are cut only up to the 5 kHz band, so the trimpots are fully clockwise to obtain flat response in these bands. The trimpots are 15 turn types. The top 6 bands (5 kHz and up) are boost and cut (± 6dB). For flat response in these bands, the trimpots are first turned fully CW and then turned down 8 turns.

The surround equalizer is an octave band type. The bottom two bands (60 and 125 Hz.) are boost and cut (±12 dB). The top 6 bands (250 Hz. and up) are cut only.

Remove the MATRIX CARD from its slot and set it aside. Plug the PINK NOISE CARD into the MATRIX CARD slot. Make sure the NORMAL/CHOO-CHOO switch is in the NORMAL position. Turn on the appropriate channel switch on the PINK NOISE CARD for the channel you wish to equalize. Perform the equalization and then adjust the output trimpot on the OUTPUT/MUSIC CARD so that 85 dBC spl is measured in the auditorium. Do this for the four main channels. If LE and RE are being used, turn on the pink noise for these channels (one at a time) and adjust the output trimpots for 85 dBC spl. There are no equalizers for the LE and RE channels.

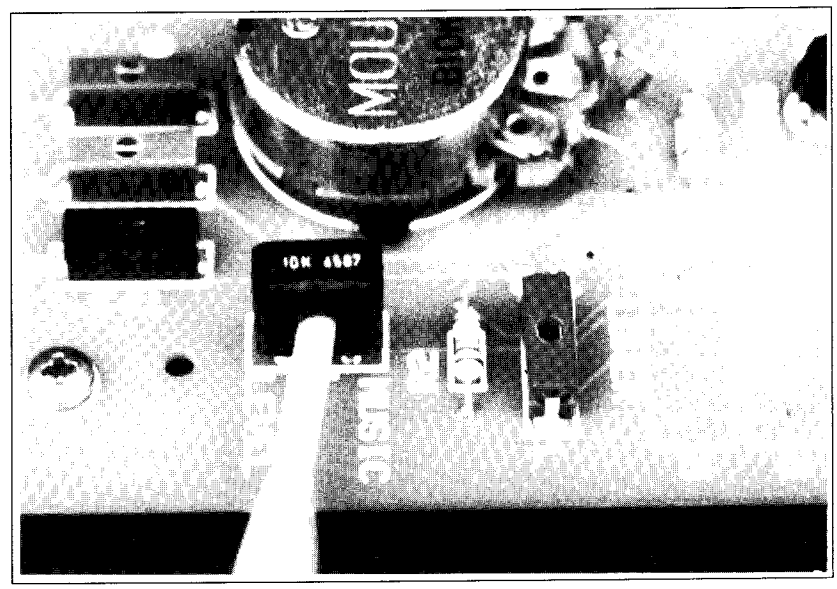
SUB-BASS LEVELS:
Remove the PREAMP CARD from its slot and set it aside. Remove the PINK NOISE CARD from the MATRIX CARD slot and plug it into the PREAMP CARD slot. Do not plug the MATRIX CARD back in yet.

Turn on the LEFT and RIGHT pink noise switches. Adjust the OPTICAL LEVEL trimpot for 90 dBC spl from the subwoofer. The measurement is made in the auditorium with a sound pressure meter.

TIME DELAY:
Locate the 325 TIME DELAY/SURROUND GENERATOR Card. The bottom of this card contains 8 small dip switches. Each dip switch equals 10 mSec (milliseconds) of delay. All switches in the "Off" position equals 35 mSec of delay. Switch number one produces 45 mSec of delay, switch number two is 55 mSec, etc. With all 8 switches depressed you would have 115 mSec of delay. Measure the total number of

number two is 55 mSec, etc. With all 8 switches depressed you would have 115 mSec of delay. Measure the total number of feet from the rear seat closest to the surround speaker 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.

MUSIC LEVELS:
Set the MUSIC LEVEL TRIMPOT (located on the right end of the front panel display board) to about the 3 o'clock position. Select MUSIC on the front panel, and turn on the non-sync music source. Turn the left and right music level



trimpots (the 2 bottom trimpots on the OUTPUT/MUSIC CARD) to obtain a normal house level. These trimpots should be about right as shipped from the factory, but may need minor adjustments. DO NOT TURN THESE UP TOO HIGH as music-to-film crosstalk may suffer. 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

INITIAL CHECKOUT:
Before applying electrical power to the system, push each printed card firmly into its card edge 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. Check all screws on the rear chassis barrier strips for correct tightness.

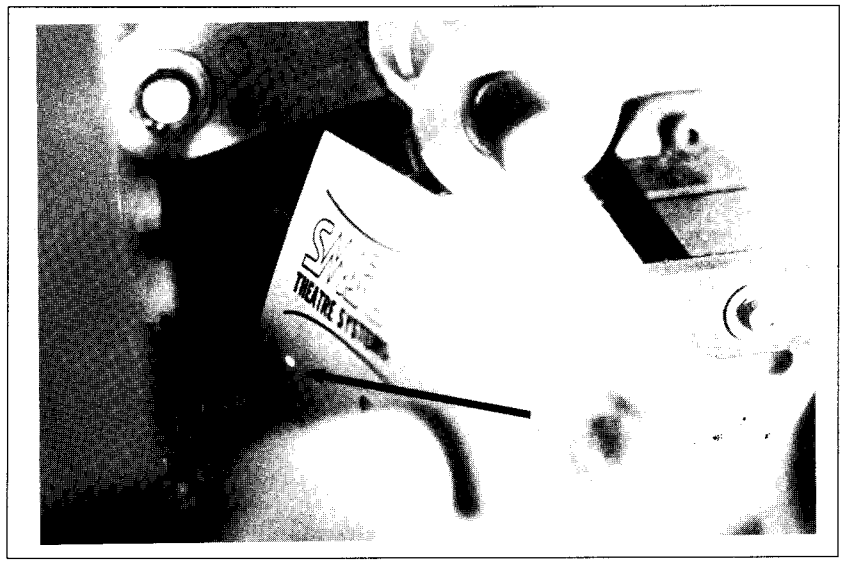
A CHAIN CALIBRATION

PRELIMINARY:

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

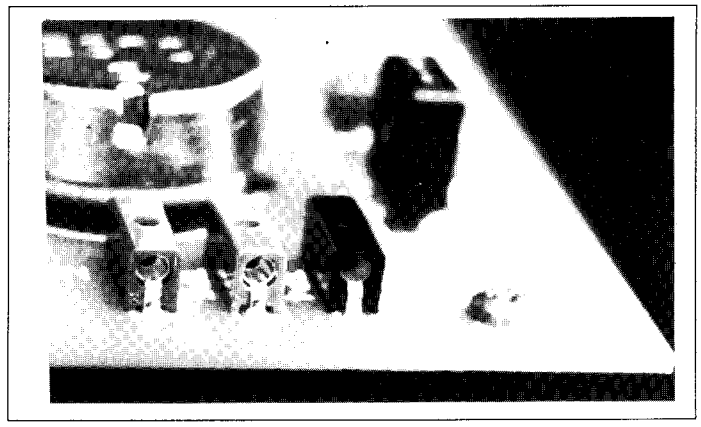
2. Set exciter lamp voltage for at least 80% of rated voltage.

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 the best (most even and brightest) illumination on the cell area. A white business card is handy for this.

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



Mini-banana test sockets on the display board (on front panel) are preamp outputs. Red-Left, Green-Right channels

4. Connect scope and real time analyzer on rear of MOD IV at the Left Preamp and the Right Preamp outputs on the rear chassis (marked LEFT PRE and RIGHT PRE) or at the test points (mini-banana jacks) on the front panel display board.

5. Locate gain controls on 300 Preamp Card. Turn gain controls fully clockwise.

6. Turn the STEREO FILM FADER all the way down to avoid excessive noises in the auditorium for the next steps.

SOUNDHEAD ALIGNMENT:

1. Play a S.M.P.T.E. Buzz Track loop. Adjust the lateral film guide assembly or exciter lamp assembly. Monitor the preamp signals with the oscilloscope. Adjust for minimum signal on the left and right channels. Refer to specific instructions in the projector soundhead manual. Minor variations in alignment procedure depend on the individual mechanical design of the soundhead.

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

3. Repeat steps 1 and 2 until no further improvement can be obtained.

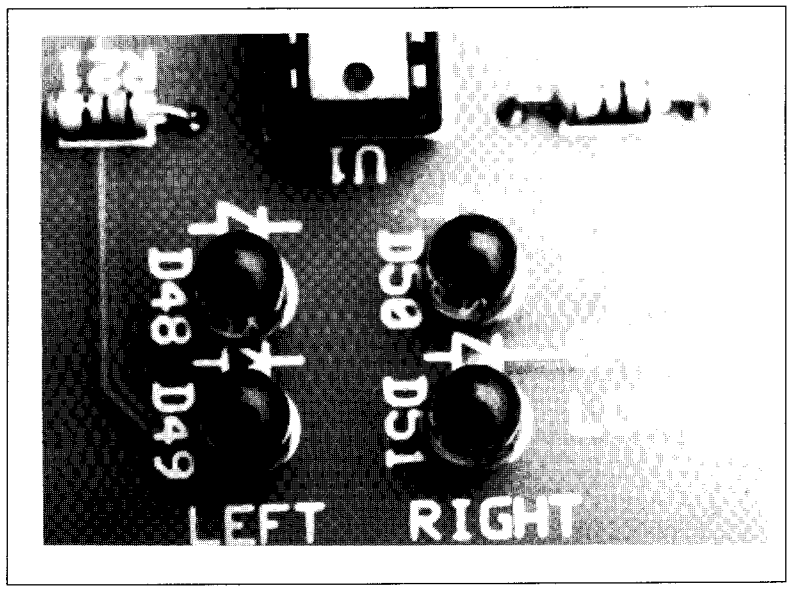
4. Play Pink Noise side of CAT.# 69 Test Film. Switch scope to X/Y Mode. Adjust soundhead optical lens azimuth for narrowest diagonal trace. Observe the real time analyzer and focus the lens for maximum high frequency output while maintaining the best azimuth. This is not easy, but it is one of the most critical adjustments affecting the overall system performance and is often not done as well as it should be.

5. Adjust the vertical and lateral alignment of the EXCITER LAMP for maximum output on both channels. This is especially critical with a narrow slit optical lens because there is a much smaller "window" for the light to pass through.

5. Check the high frequency output on both channels. Make sure the response is the same on both channels. With a narrow slit optical lens, the response should be flat within -3 dB out to about 12 kHz. with NO slit loss correction. If not, this MUST be corrected before proceeding with the next steps. It is not permissible to use slit loss correction to correct poor high frequency response caused by misalignment of the optical

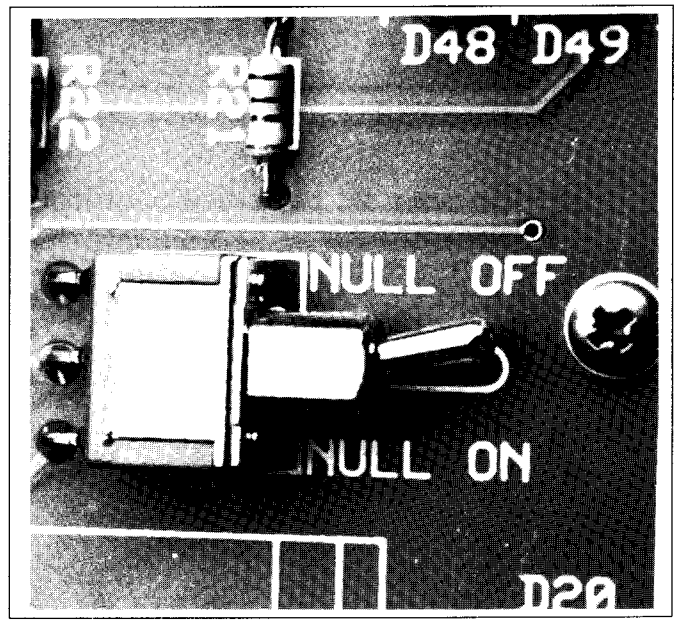
soundhead. An EXCITER LAMP out of alignment, the barrel of the optical lens crooked, or oil in the optical lens, will all affect output and balance.

OPTICAL PREAMP CALIBRATION:
Run a Dolby Cat.69 loop, tone side. Observe the preamp calibration LED's on the front panel display board. These LED's are located near the right, top end of the display board on the component side. Adjust the LEFT and RIGHT trimpots on the PREAMP CARD until both LED's for left and both LED's for right are on simultaneously. There are preamp testpoints located just to the right of the calibration LED's to which you may hook up an AC voltmeter to accurately measure the preamp levels. The correct level for Dolby tone is 707 mV AC.



The Dolby tone calibrate LED's are on the display board on the back side of the folding front cover. The calibration accuracy is extremely high (a fraction of a dB). Disregard film splices in the test loop when setting the correct film soundtrack reference level.

Run the pink noise side of the Cat.69 loop. Observe the frequency response on your RTA which is still connected to the preamp testpoints, and adjust the left and right slit loss correction trimpots on the PREAMP CARD for optimum high frequency response.



SURROUND NULL:
Plug the MATRIX CARD back into its slot. Run Dolby tone again and adjust the NULL trimpot on the MATRIX CARD for the minimum signal in the surround channel. Turn the STEREO FILM FADER up to the CAL line, and listen on the booth monitor as you adjust for minimum sound.

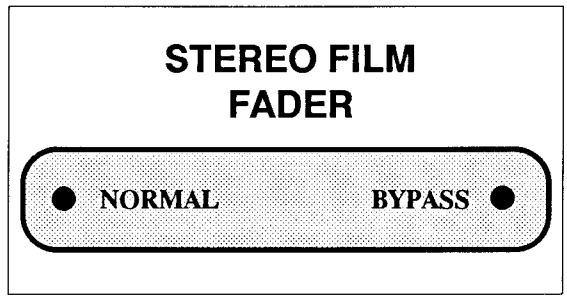
Helpful Hints

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.

BYPASS:
Listen to the CENTER channel on the booth monitor. Switch from normal to backup (the Red switch on the card cage logic module) and set the backup level control on 305 Mono Card to achieve equal levels from both sound sources. This completes the "A" Chain and BYPASS calibrations.



Normal-Bypass LED's on the front operating panel indicate whether the full system or emergency system is operating.

OPERATING INSTRUCTIONS

The MOD IV 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.

TURNING ON THE SYSTEM:
The sound engineer who installed the sound system has provided a way to apply power 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.

MUSIC 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

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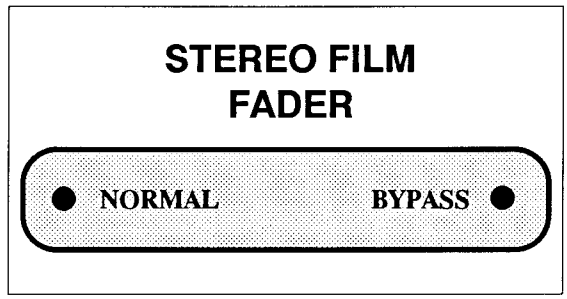

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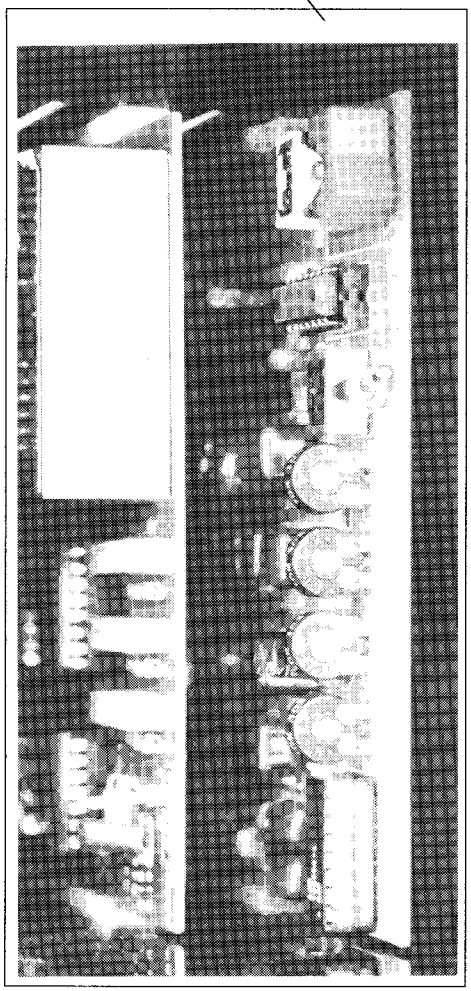
MUSIC SELECTION:
It is likely that the sound system will be turned on before the arrival of the first audience of the day. If the automation

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. MUSIC may also be selected by pressing the front panel pushbutton which has the picture of the musical notes in it.

PROGRAM SELECTION:
The program selectors are on the front panel of the MOD IV system. The three rows are labeled EVENT, FORMAT, and PROGRAM. The system will default to SHOW 1, 2, or 3 and NON-SYNC MUSIC when the system is powered up. When the system is placed into FILM mode, the EVENT 1 LED and one of the FORMAT LED's will be on. As the cues are received by the MOD IV, the EVENT LED's will indicate which event is up, and the FORMAT LED's will indicate which format is active. If a film break should occur, the booth automation system will place the MOD IV in MUSIC mode. After the film break is repaired, the MOD IV will go back to the same point in its sequence of events with no operator action required. At the end of the show, the booth automation will place the MOD IV back into MUSIC mode, and the sequence of events will be reset for the next show.



RED Emergency Bypass switch on the top of the Sub-Bass card.

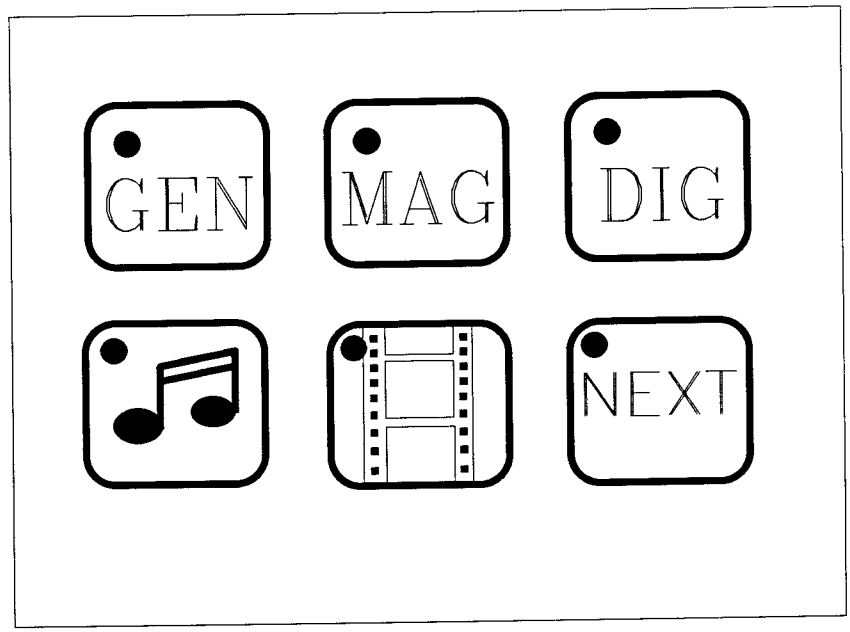
EMERGENCY BYPASS SWITCH:
The MOD IV contains a backup system that will keep the show sound on the screen in the event of a failure of the main system. This special circuitry is located on the MONO card in the main card cage unit and is activated by the red NORMAL-BACKUP switch located on the SBE (Sub-Bass Expander card) at the far right slot in the MOD IV chassis. A separate power supply supplies the backup system.

STEREO FILM FADER:
This control is located on the MOD IV Front 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 FILM FADER:
This control sets the level for the sound system when the MONO function is selected on the active FORMAT selector switch. Therefore, trailers or short subjects may be adjusted for a different playback level than the stereo source. It is

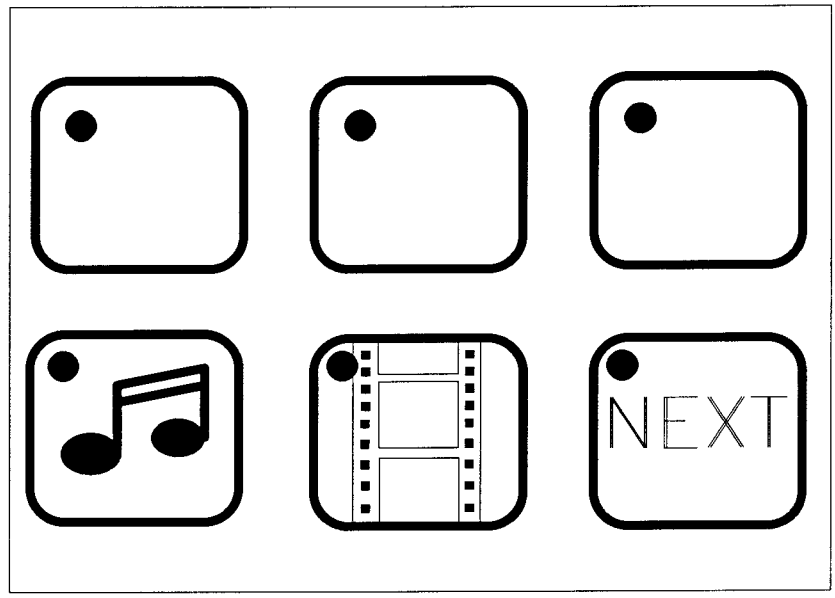
common to find previews recorded at a much higher level than the feature film. This demands that the operator be available when the trailers are finished to adjust the sound level for the feature film. In a multiplex, theatre this feature is greatly appreciated. Setting the proper sound levels for the mono source and stereo source should be done during the first new feature film change for the week.

MUSIC LEVEL CONTROL:
The music level control allows the operator to set the auditorium music loudness separately from the film level. Pre-show music is usually played 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. The MUSIC LEVEL trimpot is located on the right end of the front panel display board.



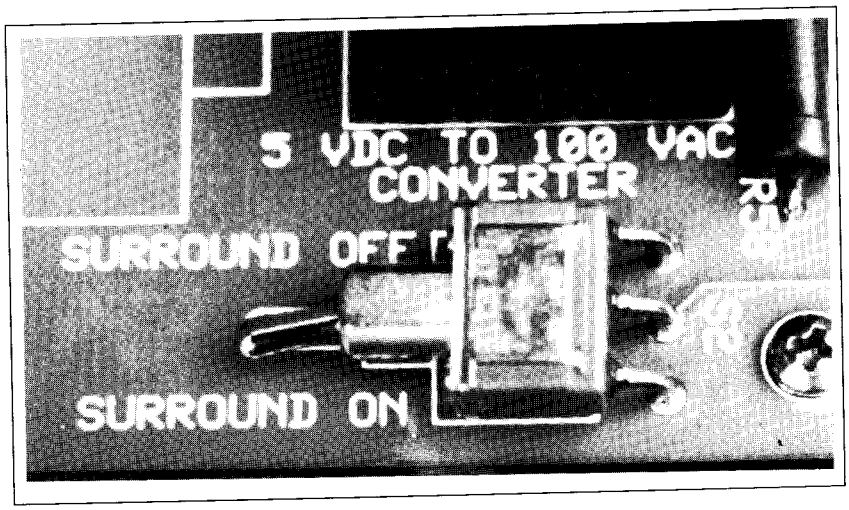
AUTOMATIC SURROUND GENERATOR:
The MOD IV system contains a surround generator for monaural soundtracks when the system is placed into the STEREO GENERATOR mode of operation. This circuit needs no adjustment by the installer or operator. This new version of a previous product adjusts its sensitivity to soundtrack material automatically. The surround generator is a potted module circuit on the TIME DELAY/SURROUND GENERATOR card.

MUSIC BUTTON (musical notes):
This front panel pushbutton 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.



FILM BUTTON (film frames):
This front panel pushbutton will manually select the FILM mode of operation and will cause the non-sync music to fade out. Normally, this switching is accomplished by the booth automation system, but this pushbutton may be used to select FILM mode (overriding MUSIC mode) if the automation should fail and lock the sound system into MUSIC mode.

SURROUND ON/OFF SWITCH:
There may be cases where a stereo mode (Stereo-Optical or Stereo Generator) has been selected but the surround channel must be turned off. The SURROUND ON/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 SURROUND ON/OFF switch is located near the top edge of the front panel display board and is clearly labeled.

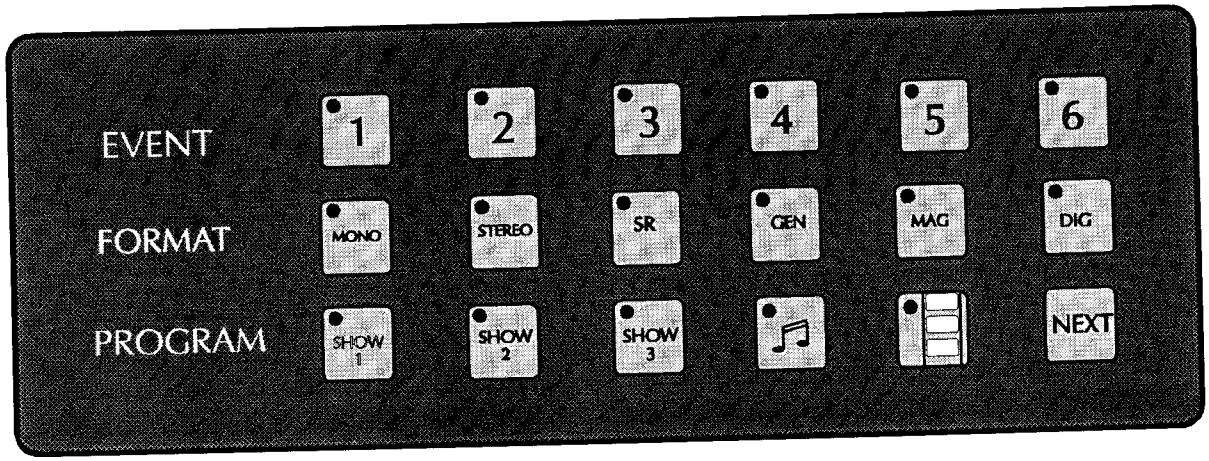


The surround channel may be turned off for all formats by using the SURROUND ON-OFF switch on the display board behind the folding front panel.

PROGRAMMING AND OPERATING THE MOD IV COMPUTER.

Computer SEQUENCER

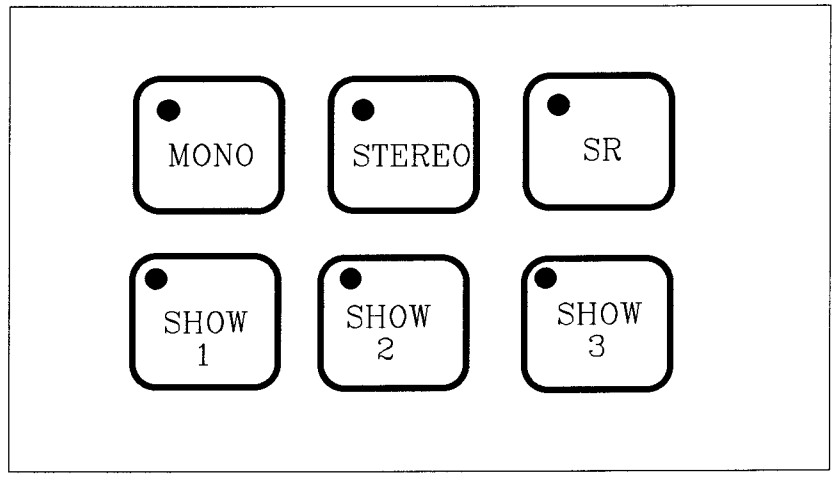
The MOD IV can store up to six sound changes for three different shows. The operator simply programs the sound formats desired for a show, and the MOD IV remembers the order in which these sound changes are to occur. Then, when the show is running, the MOD IV responds to cues from the booth automation system (or directly from the cue sensors) and changes the sound format. Three shows can be held in memory simultaneously, and the MOD IV has battery backup to retain the memory when the power is off.



There are three rows of pushbutton switches on the front panel of the MOD IV. They are labeled EVENT, FORMAT, and PROGRAM. All the buttons except NEXT have LED's to indicate when a particular function is active.

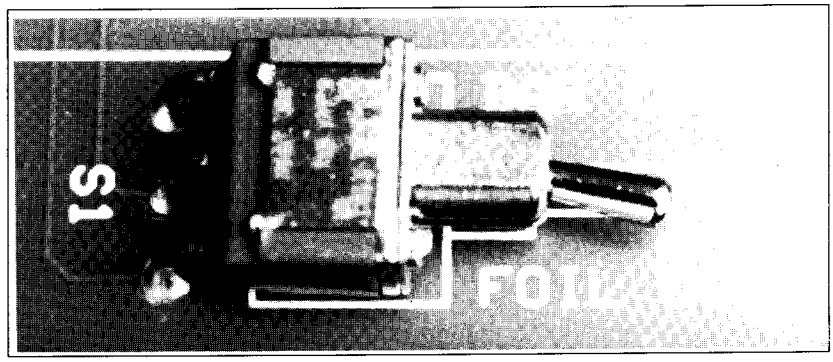
The EVENT buttons are numbered 1 to 6. The numbers represent the order in which the FORMAT changes are to take place. EVENT 1 represents the desired FORMAT in effect when the show starts. EVENT 2 represents the desired FORMAT for the first sound change. EVENTS 3 to 6 represent the FORMATS for the remaining sound changes.

The FORMAT buttons select the desired FORMAT for each EVENT. They are labeled MONO (monoaural), STEREO (with type A noise reduction), SR (stereo with type SR noise reduction cards installed), GEN (stereo generator for mono prints), MAG (magnetic), and DIG (digital input for future formats).



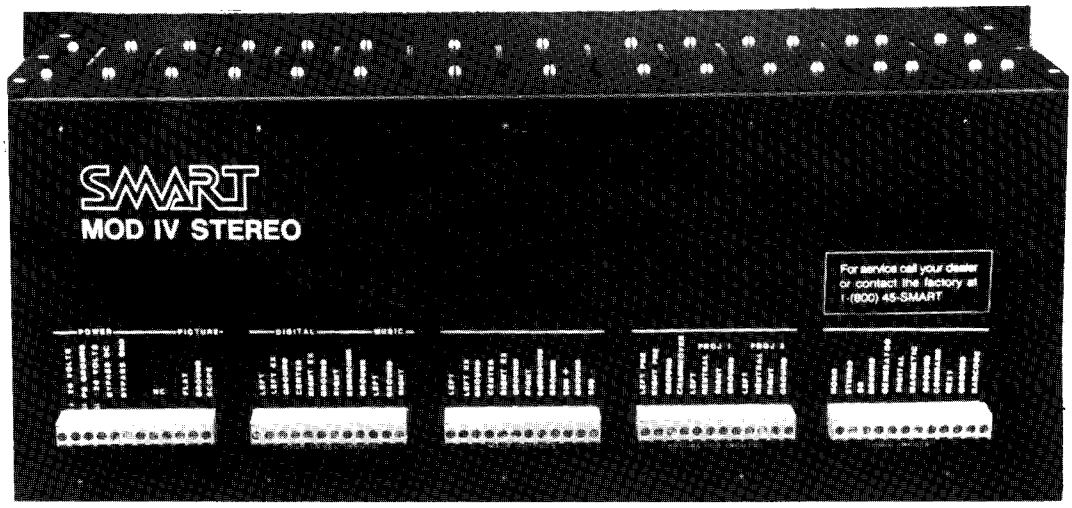
The PROGRAM buttons consist of the three SHOW selectors (1, 2, and 3), FILM and MUSIC selectors, and the NEXT event selector. The MUSIC button is indicated by a picture of musical notes, and the FILM button has a picture of film frames.

To program a show, first select the desired SHOW button (1, 2, or 3). If a show is running, you cannot change that show, but you may select another one to program. Normally, the EVENT and FORMAT LED's indicate the status of the currently running show along with the row of green LED's at the top of the MOD IV front panel. However, when you are running one show and begin to program another, the EVENT and FORMAT button LED's change to indicate the programming status.



Before operating the MOD IV, determine whether you want Foil Sense capability from the "pickoff" of the projector, or Bar Code reader (with the proper reading device). Move the switch on the display board to the desired mode of operation.

If a show is running, and you notice that an incorrect format has been programmed, the mistake may be corrected by simply pressing the proper FORMAT button. This takes effect immediately and changes the programming so that the show runs correctly thereafter.

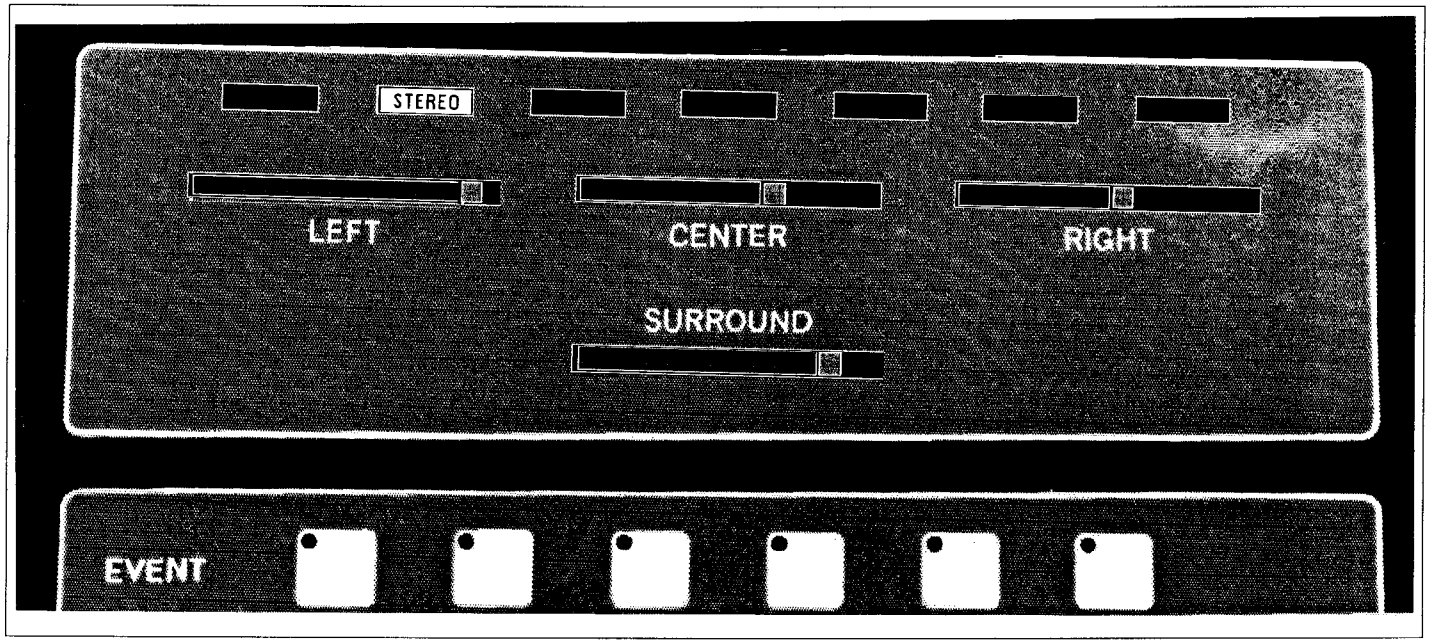


REAR VIEW OF CHASSIS SHOWS PLUG-IN CONNECTORS.

After selecting the show to be programmed, select EVENT 1, and then select the desired FORMAT for the beginning of the show. Now select EVENT 2 and the desired FORMAT for the sound change. Continue in this manner until you have selected all the EVENTS and FORMATS you need (up to six). Press the NEXT pushbutton to end the programming mode.

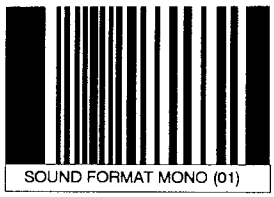
To select a SHOW to run, the MOD IV MUST be in MUSIC mode. Then, press the SHOW 1, 2, or 3 button as desired. If it is in FILM mode, the MOD IV assumes a show is running and another show can only be selected to program, NOT to run.

If you need to check the programming on a show, select FILM mode and the SHOW to be checked. Then use the NEXT button to step through the sequence. At the end of the sequence, the MOD IV will go back into MUSIC mode.

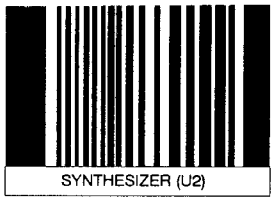


The front panel status indicators show the current mode of operation of the processor even when another show is being programmed on another memory bank. VU weighted volume indicators constantly show program material on each channel. These indicators monitor the program busses and are not affected by the setting of the master faders.

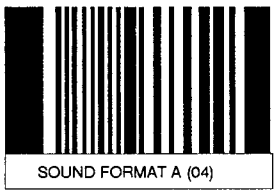
BAR CODE READER



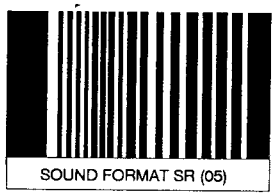
The MOD IV has been designed to read the various bar code formats that are beginning to come into use in the theatre industry. These bar codes are placed on the film during its production or by the operator as a film is being made up on the platter. Then as the film plays, the bar codes used to perform various automation and sound change functions.



The MOD IV bar code decoding is done in software running on the built in computer sequencer. The incoming codes are sampled and compared to the known codes in a look-up table in the computer. When a match is found, the appropriate function is executed. This is usually a sound format change, but may also be a picture format change (flat or scope). The MOD IV will recognize all sound change barcodes, and FLAT and SCOPE lens change barcodes as well. Because the codes are compared in a look-up table, the MOD IV is able to accommodate new types of bar codes that may emerge in the industry. New codes are entered into the ROM memory in the microcontroller chip at SMART. Then, by exchanging the old chip for the one with the new codes, the MOD IV bar code decoding is easily updated.



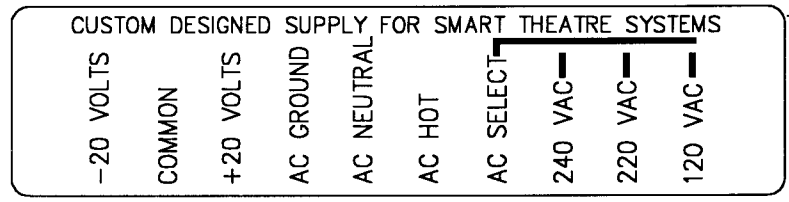
There is a switch labeled FOIL CUES and BAR CODE on the front panel display board. When running films with bar codes, this switch should be placed in the BAR CODE position. If foil cues are being used instead of bar codes, then place the switch in the FOIL CUES position.



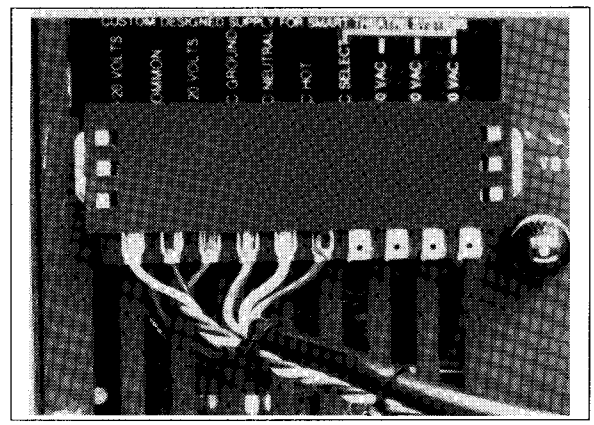
There is a set of three terminals on the rear chassis of the MOD IV labeled FLAT, SCOPE and COMMON. These are isolated relay contacts which may be used to activate a lens turret control system for simple automation of picture format changes. The relay contacts are rated at one ampere of current. These relays are only used in the BAR CODE mode of operation. They are normally open and will close momentarily (approximately 1/2 second) when a FLAT or SCOPE bar code is detected.

The bar codes standards have not been finalized at the time of the printing of the manual. Therefore, *they have not been included in the current version of the software* on the MOD IV Computer Sequencer. The EPROM chips will be exchanged with a later version when the industry code becomes available.

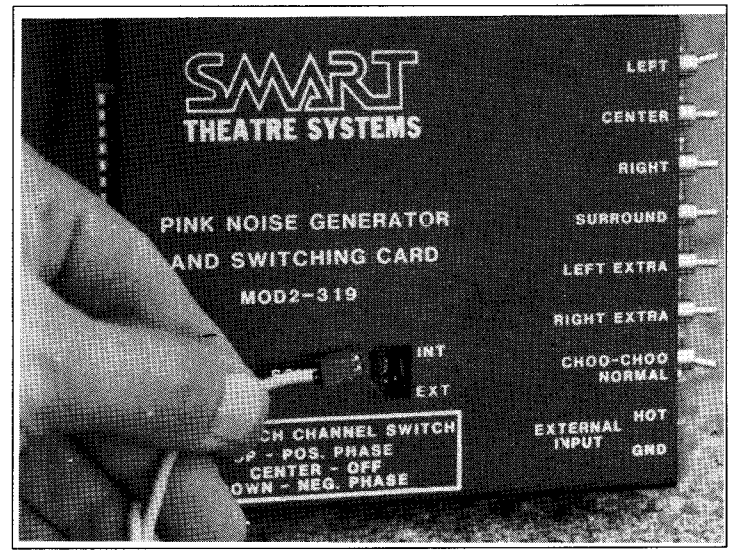
Mod IV Regulated Master Power Supply



The massive Xentek power supply is custom made for SMART Theatre Systems to power the MOD IV processor. This supply is fully regulated on the +20 and -20 DC outputs. The domestic version is only for 117VAC line voltage. Export models are available with multi tap transformers for other line voltages. Please check with the factory when ordering an export processor for other countries.



Be sure to replace to safety cover over the terminals of the power supply after you finish making any connections or changes.



The MOD2-319 Pink Noise card may also be used for "burst testing" by removing the jumper shunt and replacing with a connector that can remotely short the INT terminals for a pink noise burst through each of the selected processor channels..

REMOTE CONTROL MASTER FADERS

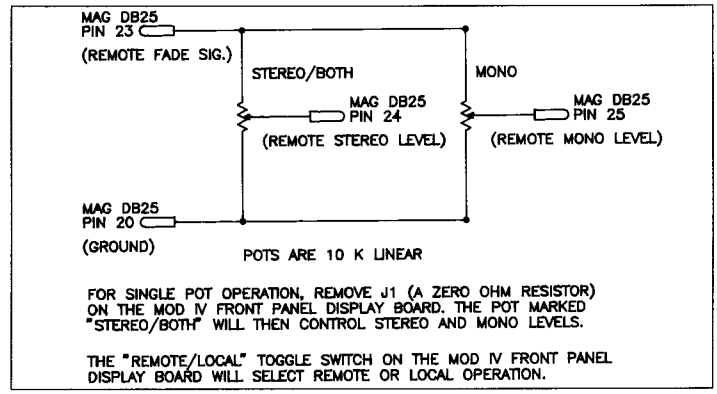
There are several ways the installer can add remote master fader capability to the MOD IV processor. One way is to purchase the REM-MOD4 remote control slave unit to install in the remote location.

The sound engineer may elect to supply his own custom made panel with remote pots. The following hookup instructions will aid in completing the installation to meet the customer's requests.

The pots in the REM-MOD4 are each 10Kohm linear type. If you supply your own pots, you should use this part.

The Master Faders on the front panel of the MOD IV may be remoted separately to two remote pots, or the functions of the Mono and Stereo pots can be combined into a single pot at the remote location. If you use just one remote pot, then cut the J1 jumper on the display PC board on the front panel. This is a zero ohm resistor. Leave the jumper in place if you plan to run two sets of control lines to two remote pots. Connections are made on the DB25 computer type connector on the back of the MOD IV processor. You can purchase the correct DB25 mating plug at almost any local parts house or computer supply store.

The toggle switch on the right hand side of the front panel display boards allows the operator to select either local or remote operation of the Master Faders. This switch is easily accessible by opening the hinged front panel.



Simple hookup scheme for connecting a single remote pot to control both the Master Stereo and Master Mono Faders.

MOD IV SERVICE

CAUTION

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

Almost every component used in the MOD IV is available locally from a radio parts supplier. The only parts that are not likely to be found locally are:
1. The special sealed modules.
2. The time delay IC chip.

Authorized dealers and distributors of SMART products are encouraged to have these special items in their repair stock for immediate use, should the need arise.

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 IV 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? (Control panel lit.)

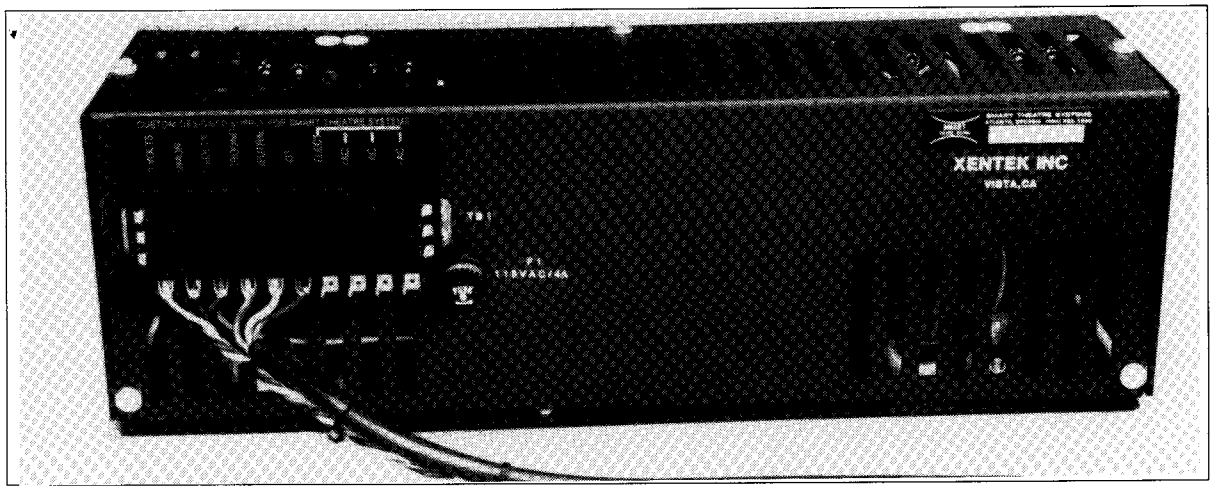
2. Has the power supply fuse blown? (Replace with a 4 amp 3AG type only)

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 GROUND point (such as a terminal strip ground). Switch the meter to the PLUS 30 D.C. range and measure the voltage input to the power supply input terminal on the MOD IV 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 by unplugging the power plug at the processor 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 SELF-PROTECT*

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 adefective component in the related section.

Since the MOD IV uses a bi-polar supply, each audio IC opamp 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 opamp 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 positive 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.

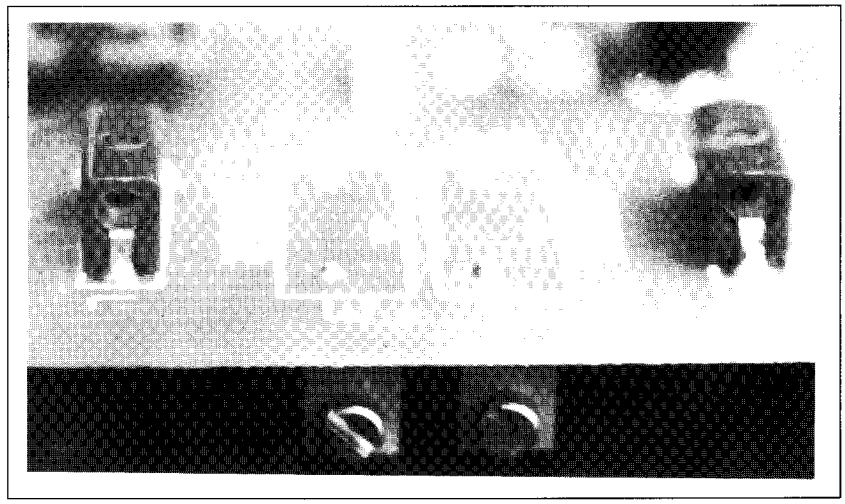
2. Very hot IC's usually indicate an internal short.

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 opamp 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



DO NOT TOUCH! The controls under the right side of the display board are factory adjust pots and require special test equipment and procedures in order to set correctly.

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 IV 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 IV 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 opamps 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.

SERVICE ACCESS:
The MOD IV 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 LED's in, or otherwise service the front panel, the printed circuit card must be detached from the front panel. First, remove the 50 pin ribbon cable and the 9 pin membrane switch connector. Then, remove the 8 screws holding it to standoffs mounted on the rear of the front panel. It is NOT 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 and LED's are clear of their holes.

To reassemble the unit, follow the directions in reverse. Before tightening the screws holding the card to the standoffs, make sure the LED's are seated squarely in their front panel holes.

P.C. CARD COMPONENT REPLACEMENT
All IC's in the MOD IV PC cards are socketed and can easily be replaced from the top surface of the boards.

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

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 IV 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.

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 ``Soldapult.'' 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.

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.

TROUBLESHOOTING IC OPAMPS:

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

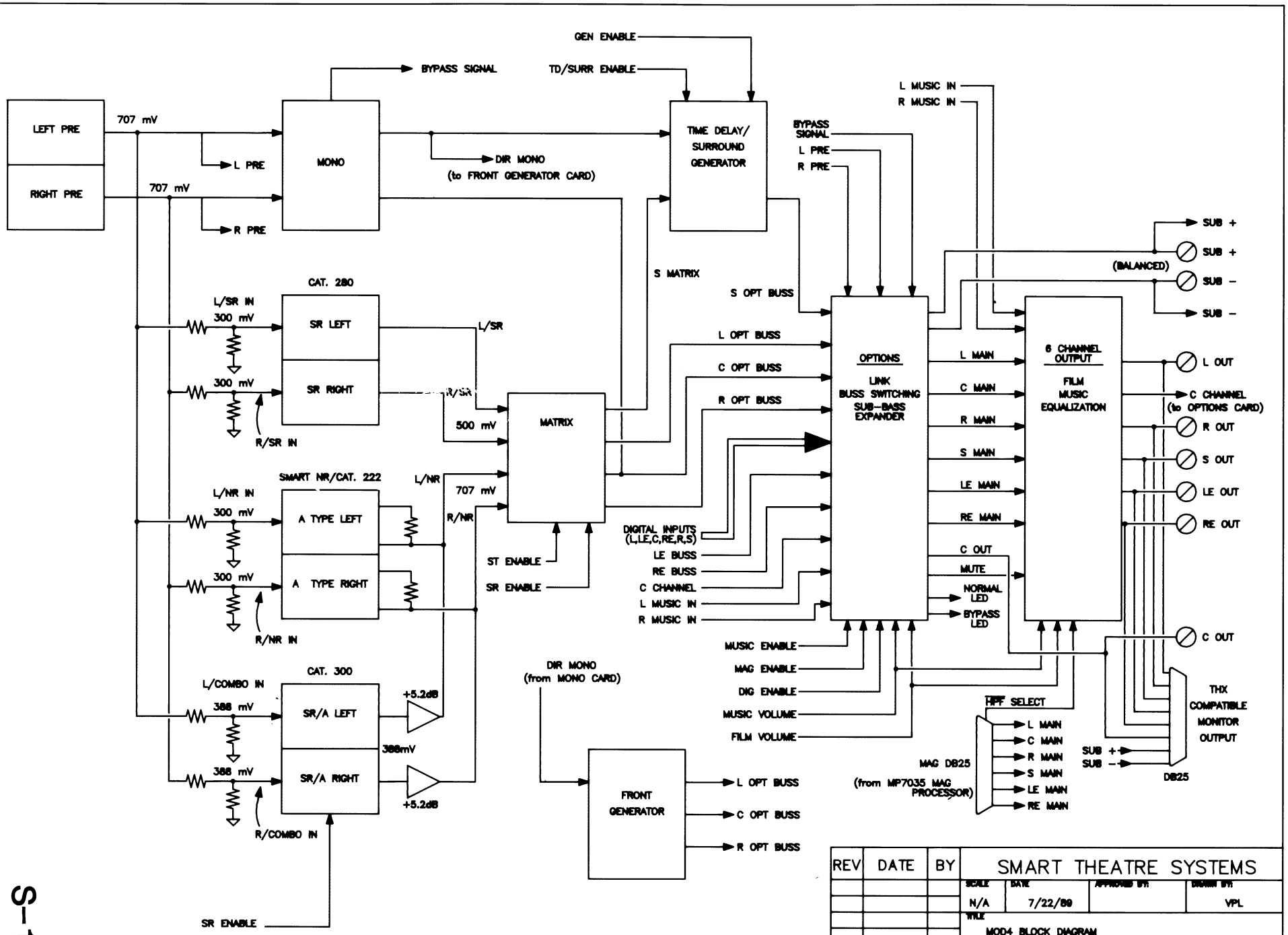
A defective opamp may appear to work, yet it may have extreme temperature sensitivity. If parameters appear to drift excessively, freeze-spray may aid in diagnosing the problem. Freeze-spray is also invaluable in tracking down intermittent problems. But use sparingly because it can cause resistive short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

We recommend that all plug-in or front panel PC cards 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 IV system. This also allows us to add reliability data to our files so that future revisions may be undertaken if necessary to improve the long term reliability of the system.

It is an excellent idea to have at least one set of the critical PC cards on hand in each multiplex for any backup use that may become necessary. These spares may be purchased separately.

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.

Out of the U.S. customers should call (404) 452-1820 during business hours, or send a FAX (404) 455-4066 for a prompt response.

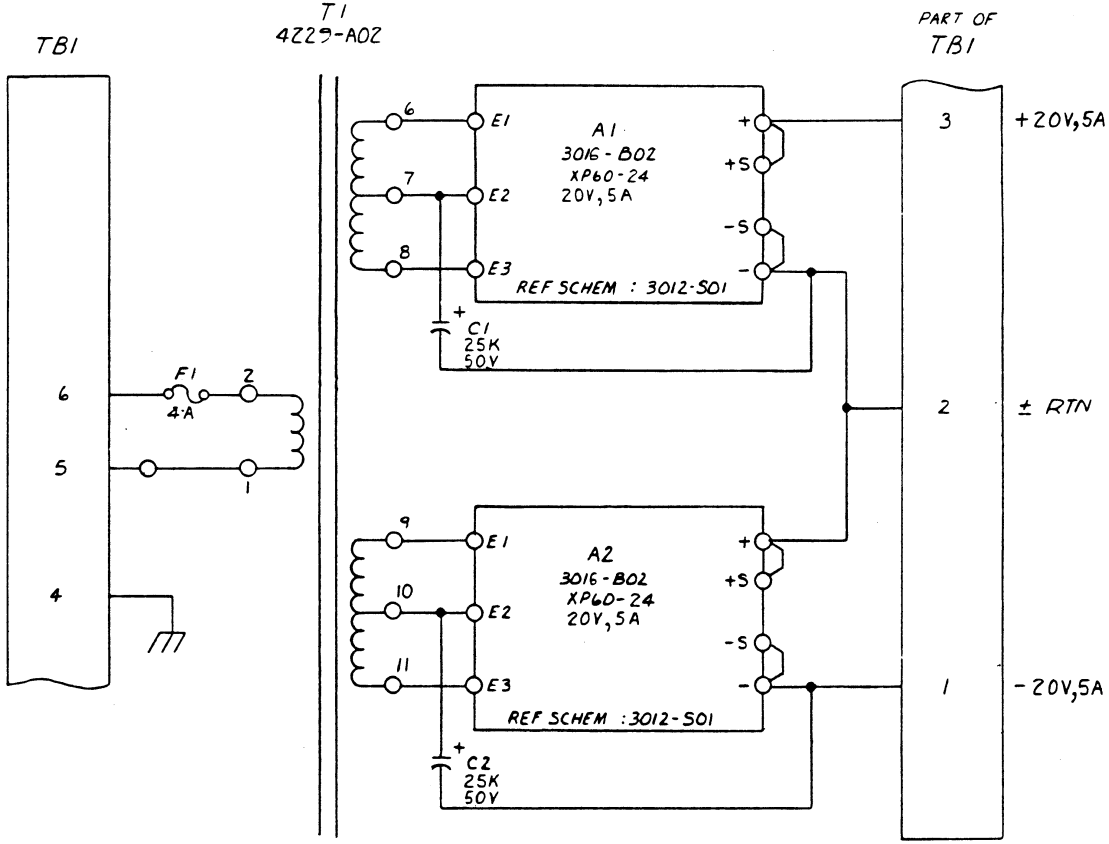


REV	DATE	BY	SMART THEATRE SYSTEMS			
			SCALE	DATE	APPROVED BY:	DRAWN BY:
			N/A	7/22/89		VPL
			TITLE			
			MOD4 BLOCK DIAGRAM			
			COMMENTS			DRAWING #
						MOD48S00

S-1

S-2

REV'S CNS				
REV	BY	DESCRIPTION	APPR	DATE
NC	BM	INITIAL RELEASE		3-17-94

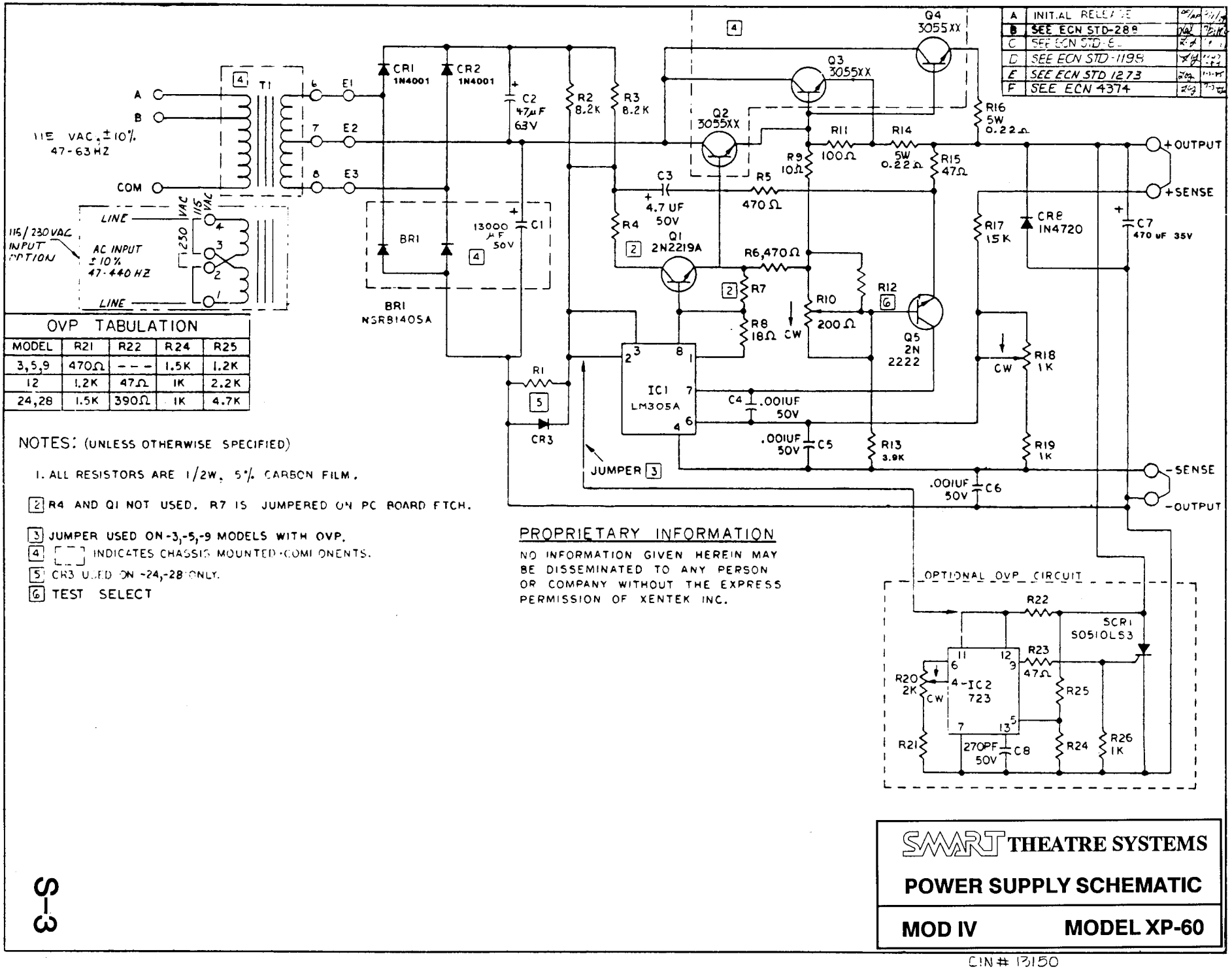


NOTES: UNLESS OTHERWISE SPECIFIED

SMART THEATRE SYSTEMS

POWER SUPPLY SCHEMATIC

MOD IV **MODEL XP-60**



A	INITAL RELEASE		
B	SEE ECN STD-289		
C	SEE ECN STD-E		
D	SEE ECN STD-1195		
E	SEE ECN STD 1273		
F	SEE ECN 4374		

OVP TABULATION

MODEL	R21	R22	R24	R25
3,5,9	470Ω	- - -	1.5K	1.2K
12	1.2K	47Ω	1K	2.2K
24,28	1.5K	390Ω	1K	4.7K

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL RESISTORS ARE 1/2W, 5% CARBON FILM.

[2] R4 AND Q1 NOT USED. R7 IS JUMPERED ON PC BOARD ETCH.

[3] JUMPER USED ON -3,-5,-9 MODELS WITH OVP.

[4] [ ] INDICATES CHASSIS MOUNTED COMPONENTS.

[5] CR3 USED ON -24,-28 ONLY.

[6] TEST SELECT

SMART THEATRE SYSTEMS

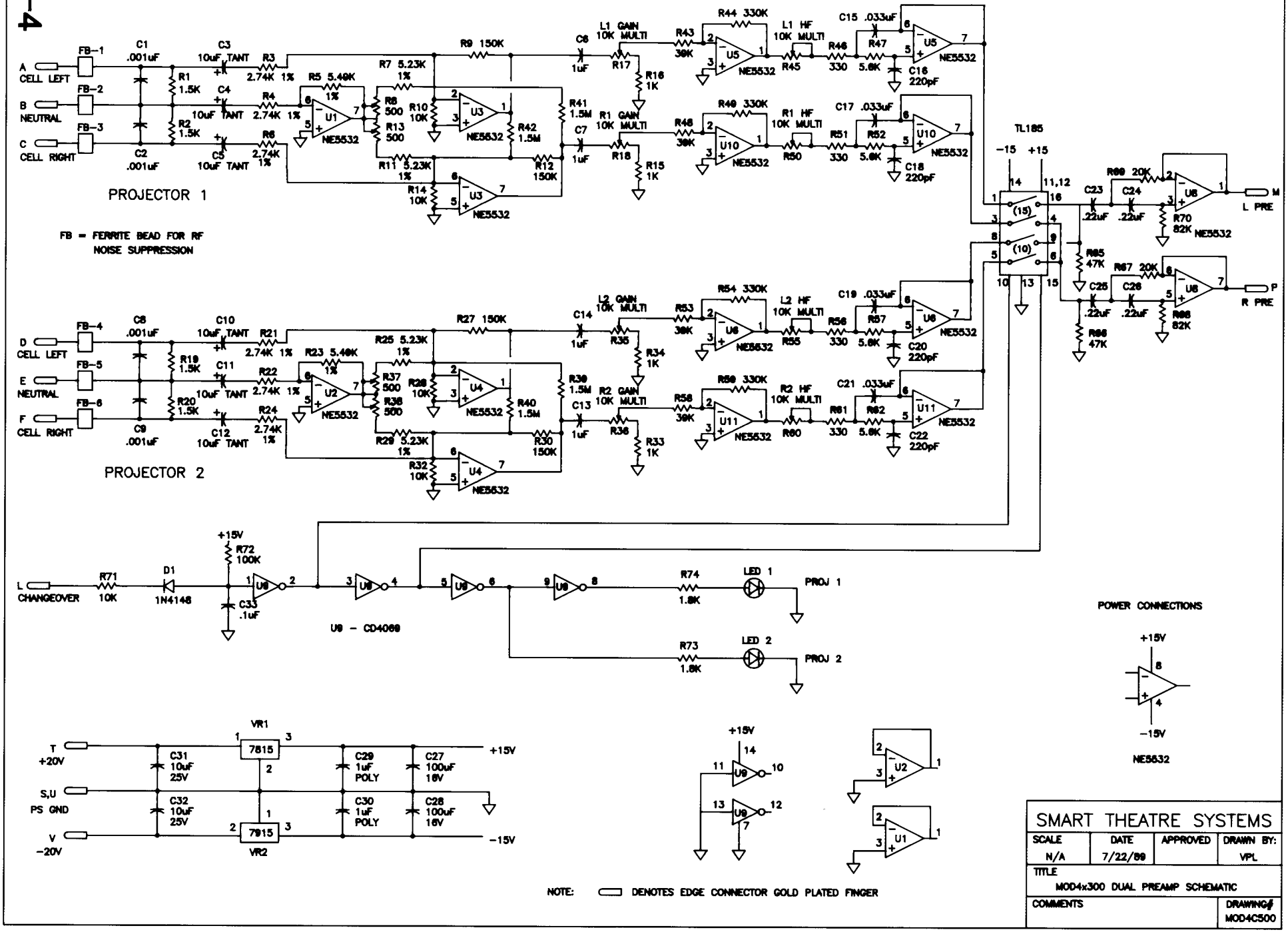
POWER SUPPLY SCHEMATIC

MOD IV MODEL XP-60

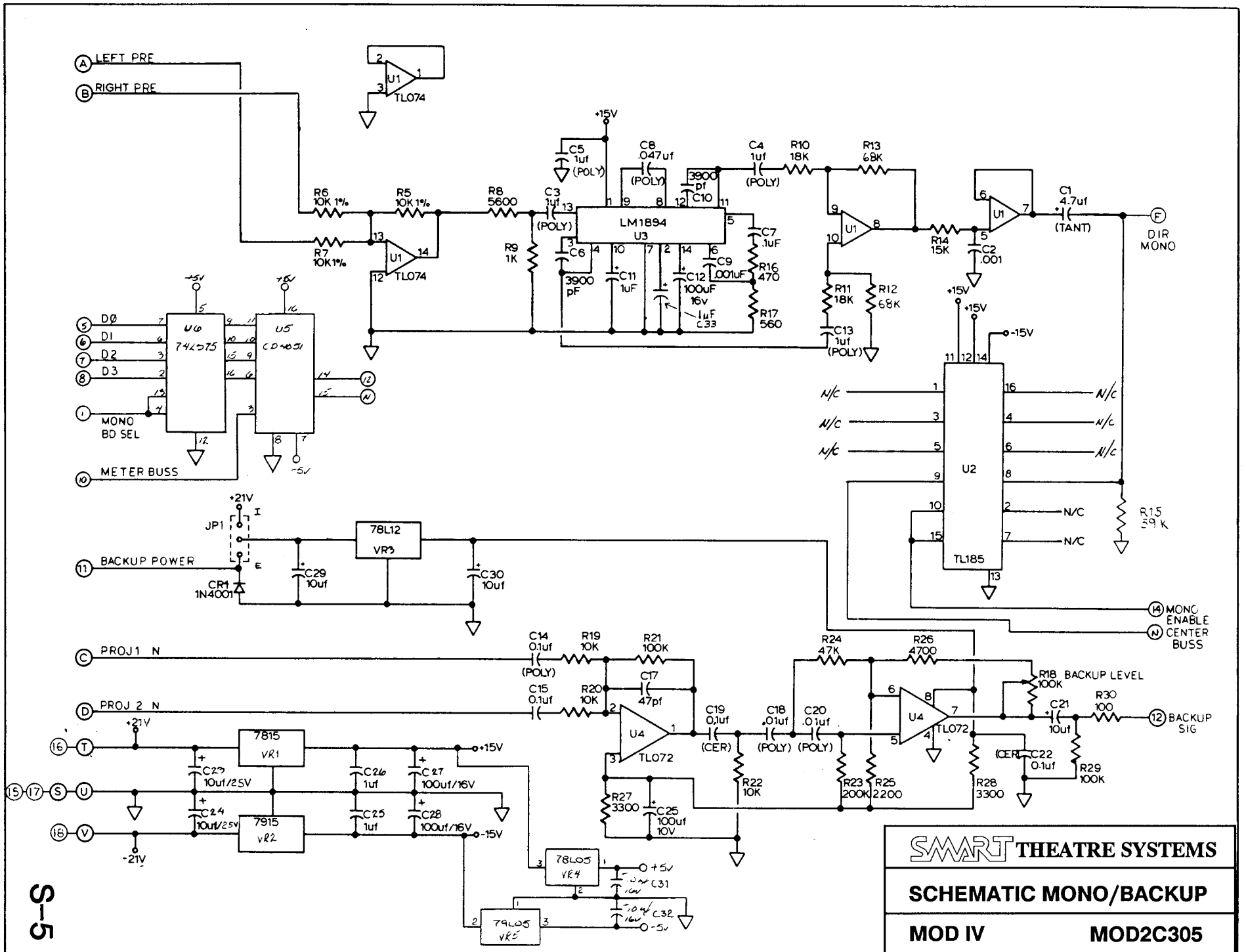
S-3

CIN # 13150

S-4



SMART THEATRE SYSTEMS			
SCALE N/A	DATE 7/22/89	APPROVED	DRAWN BY: VPL
TITLE MOD4x300 DUAL PREAMP SCHEMATIC			
COMMENTS			DRAWING# MOD4C500

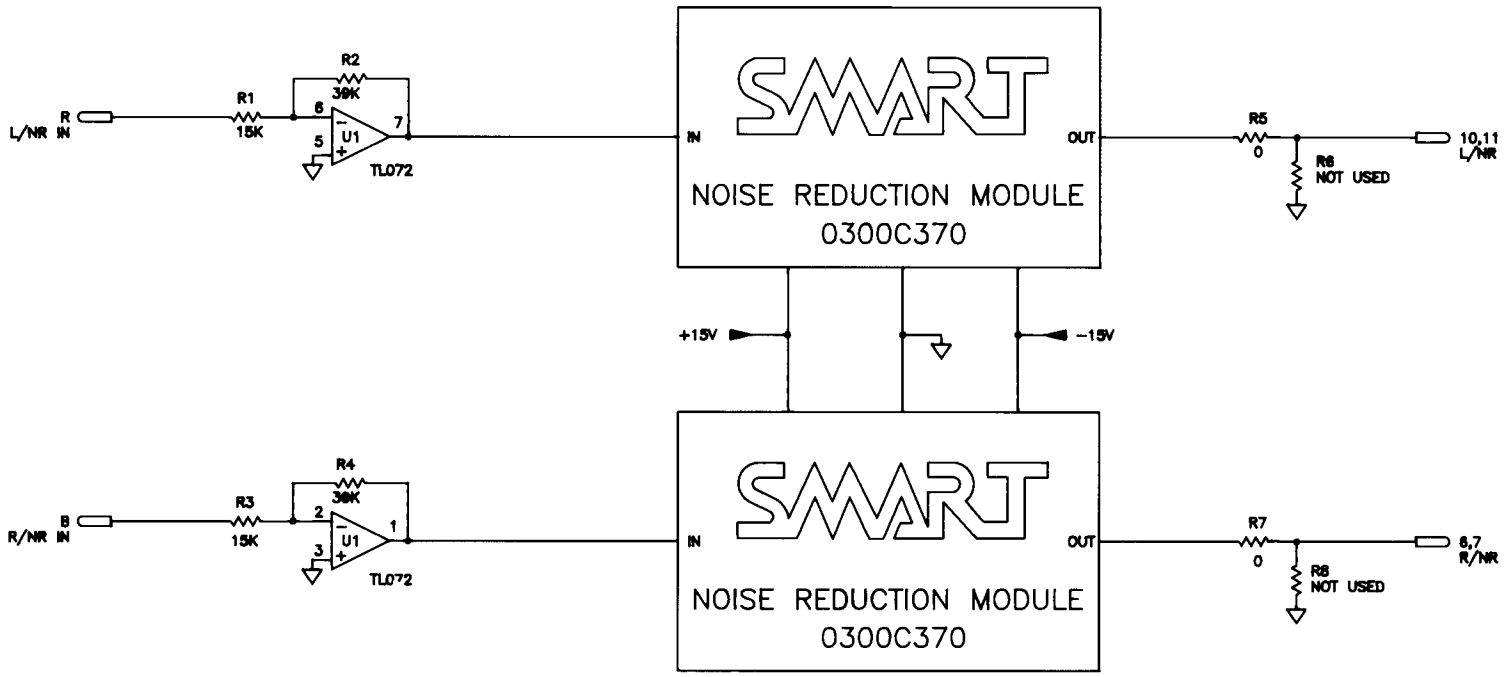


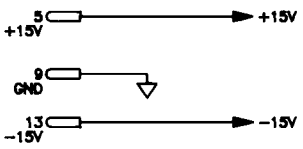
SMART THEATRE SYSTEMS

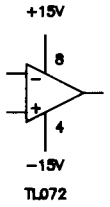
SCHEMATIC MONO/BACKUP

MOD IV **MOD2C305**

S-5



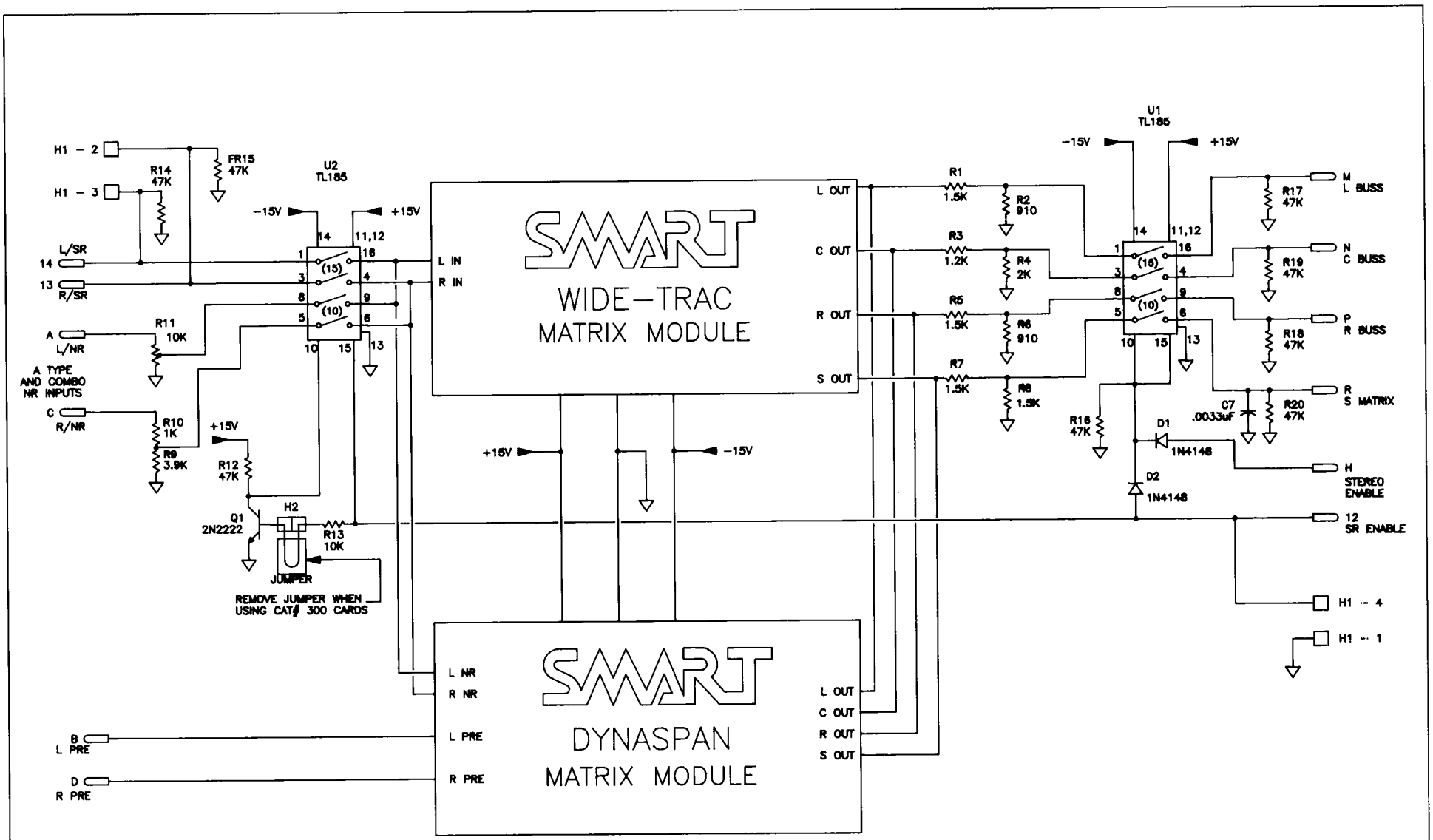




NOTE:

1) ▭ DENOTES GOLD PLATED EDGE CONNECTOR FINGER

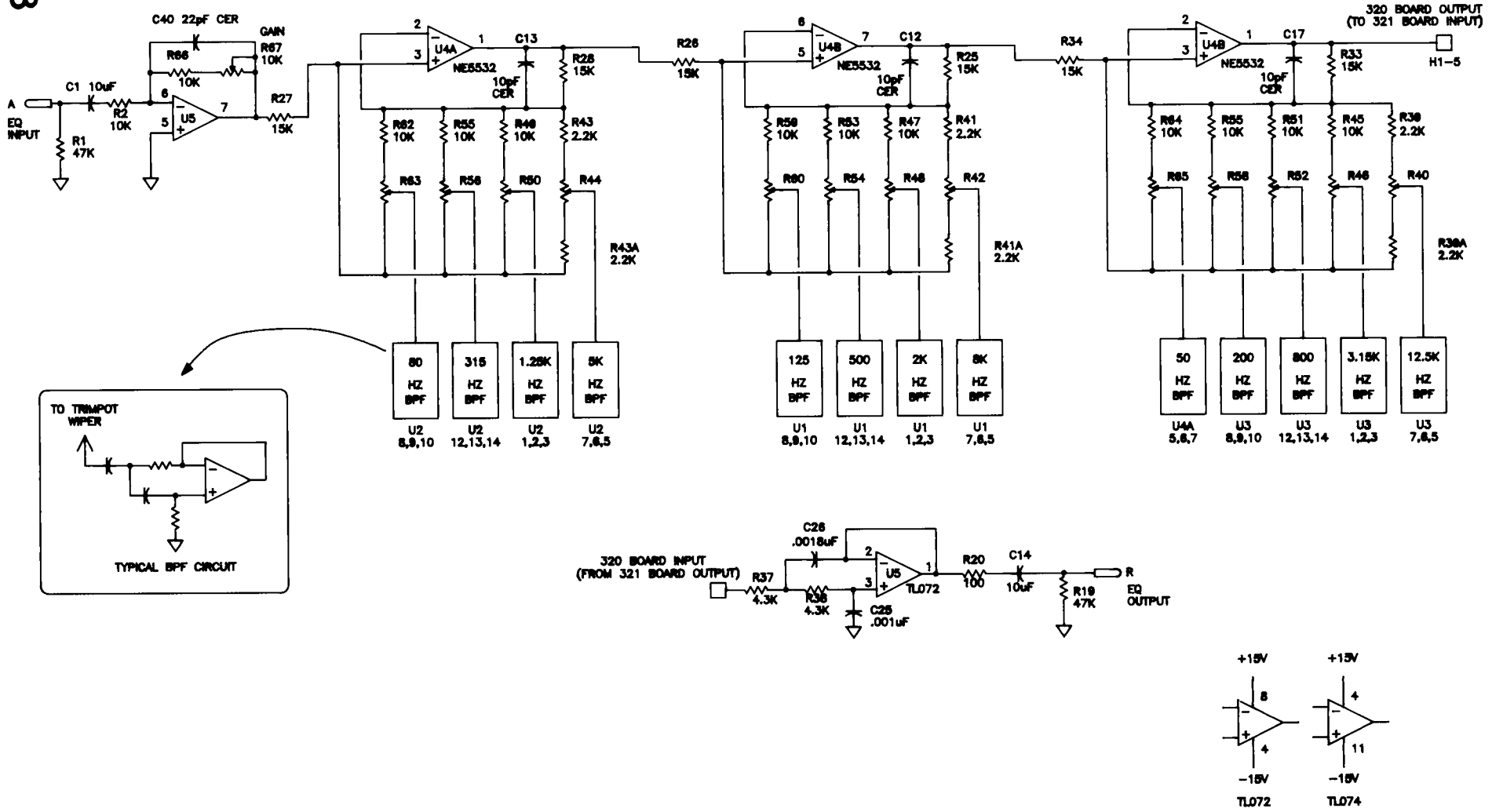
SMART THEATRE SYSTEMS			
SCALE: N/A	DATE: 8/3/89	APPROVED:	DRAWN BY: VPL
TITLE: MOD4x310 NOISE REDUCTION CARRIER CARD SCHEMATIC			
COMMENTS:			DRAWING#: MOD4A510



NOTES:

1) ▭ DENOTES GOLD PLATED EDGE CONNECTOR FINGER
2) H1 AND DYNASPAN MODULE USED ONLY ON MOD II

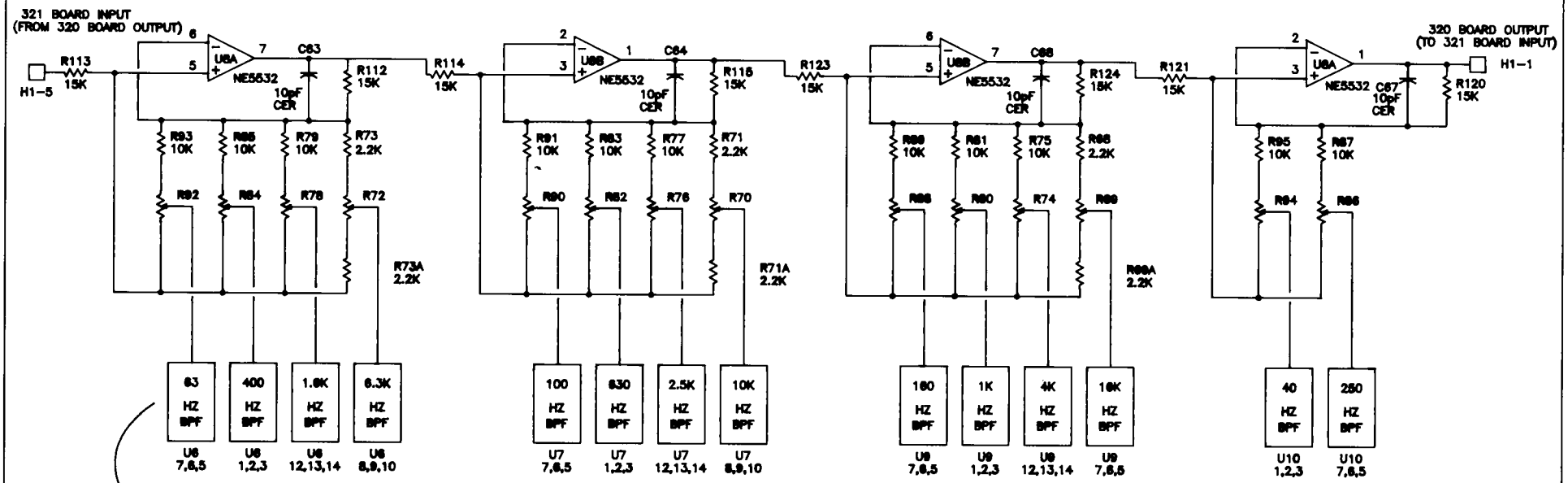
SMART THEATRE SYSTEMS			
SCALE N/A	DATE 06/31/90	APPROVED	DRAWN BY: VPL
TITLE MOD2x317 MATRIX CARRIER CARD SCHEMATIC			
COMMENTS			DRAWING# MOD48517

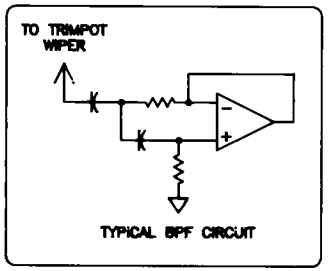


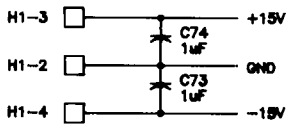
NOTES:

1) ALL TRIMPOTS ARE 10K MULTITURN
2) U1,U2,U3 ARE TL074
3) U4 IS NE5532, U5 IS TL072
4) ▭ DENOTES EDGE CONNECTOR GOLD PLATED FINGER

SMART THEATRE SYSTEMS			
SCALE N/A	DATE 7/22/89	APPROVED	DRAWN BY: VPL
TITLE MOD4x320 1/3 OCTAVE EQ SCHEMATIC			
COMMENTS			DRAWING# MOD4D520

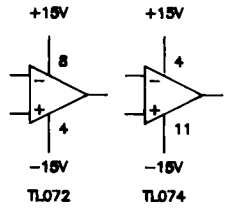




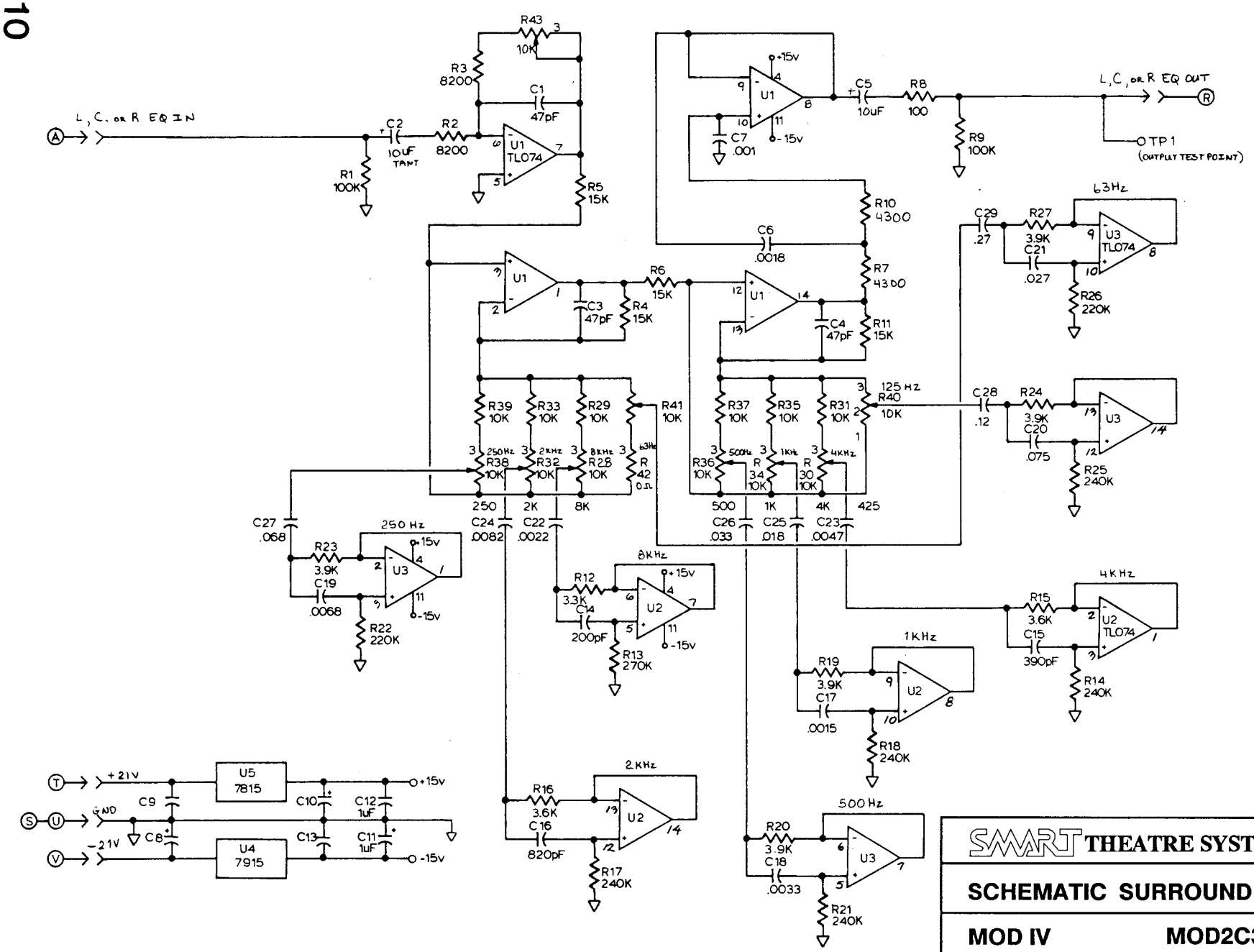


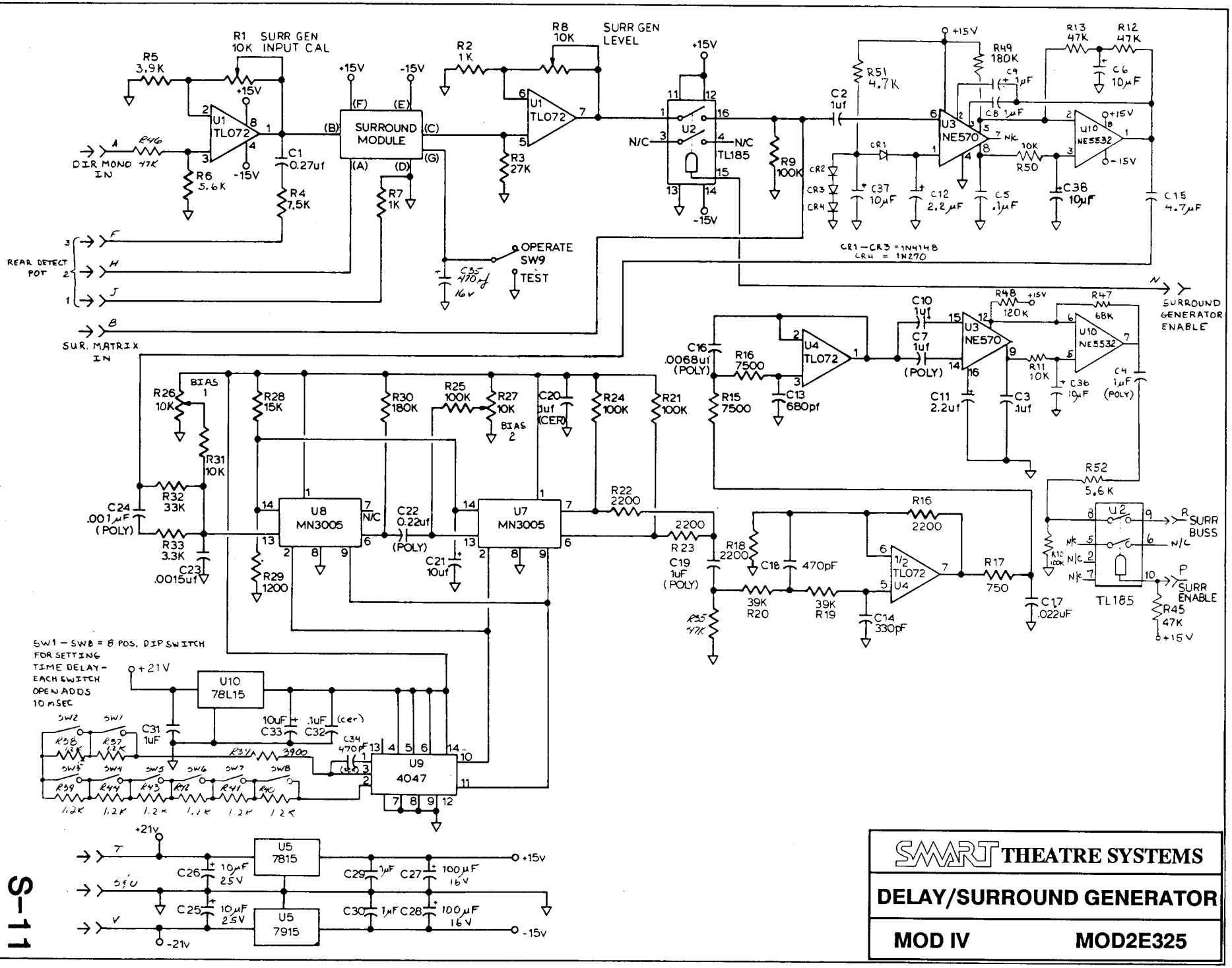
NOTES:

1) ALL TRIMPOTS ARE 10K MULTITURN
2) U8,U7,U9 ARE TL074
3) U10 IS TL072



SMART THEATRE SYSTEMS			
SCALE N/A	DATE 7/22/99	APPROVED	DRAWN BY: VPL
TITLE MOD4x321 1/3 OCTAVE EQ SCHEMATIC			
COMMENTS			DRAWING# MOD4D521


L, C, OR R EQ IN
L, C, OR R EQ OUT
TP 1
(OUTPUT TEST POINT)
+15v
-15v
+21V
-21V
GND
U1 TL074
U2 TL074
U3 TL074
U4 7915
U5 7815
63Hz
125 Hz
250 Hz
500Hz
1KHz
2KHz
4KHz
8KHz
SMART THEATRE SYSTEMS
SCHEMATIC SURROUND EQ
MOD IV
MOD2C320



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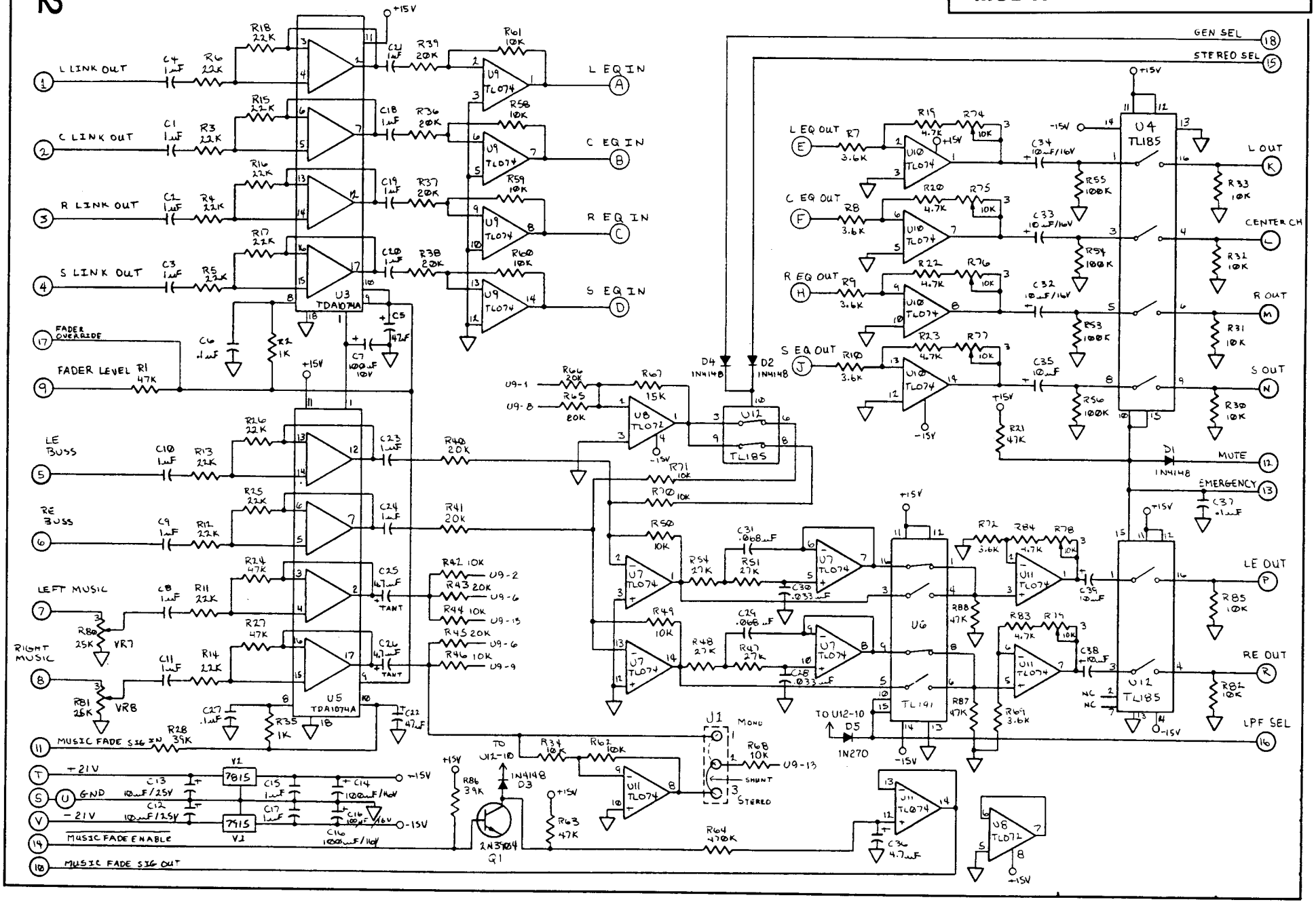
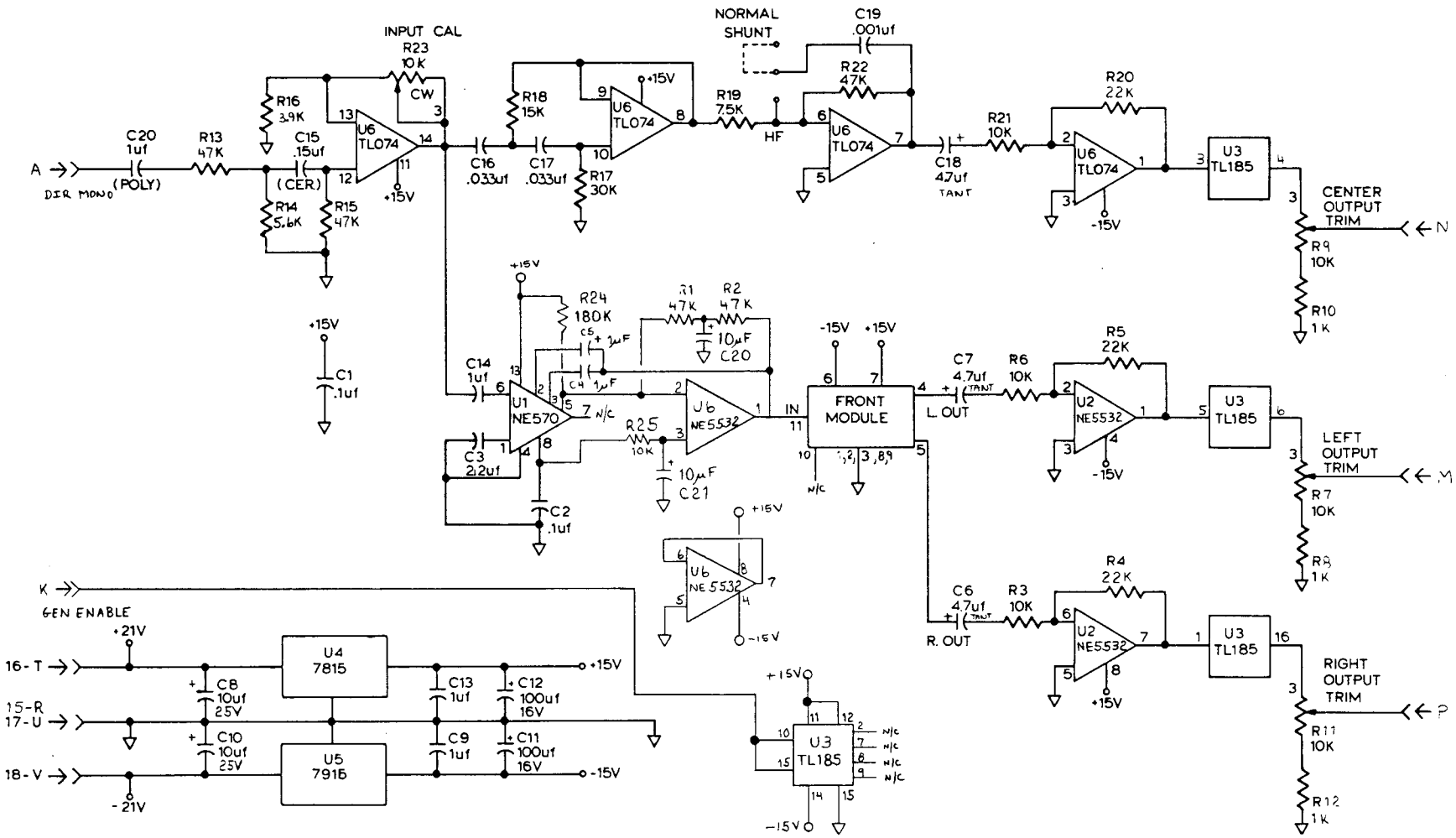
SMART THEATRE SYSTEMS	
DELAY/SURROUND GENERATOR	
MOD IV	MOD2E325

SMART THEATRE SYSTEMS

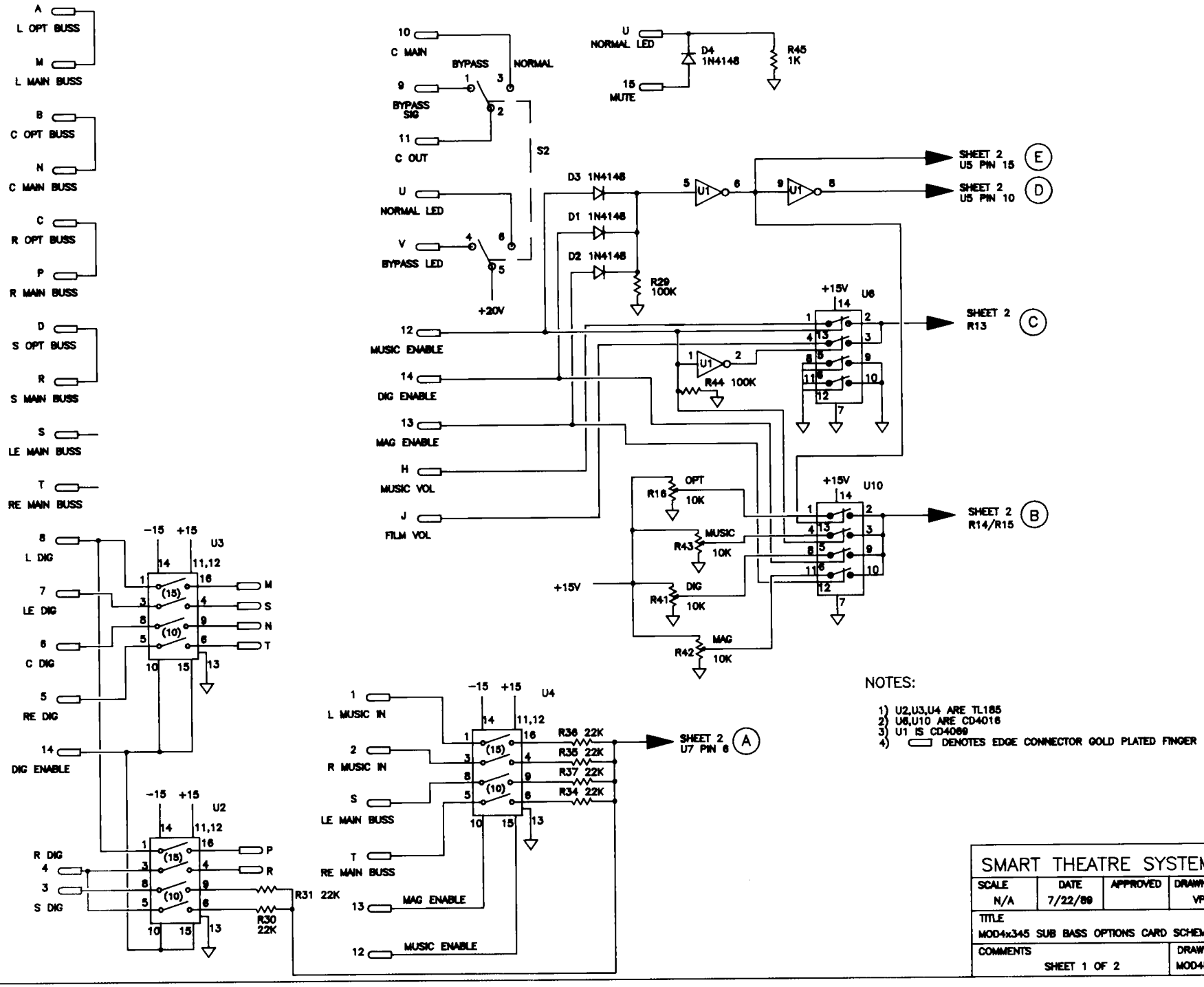
SCHEMATIC OUTPUT/MUSIC

MOD IV MOD2E330





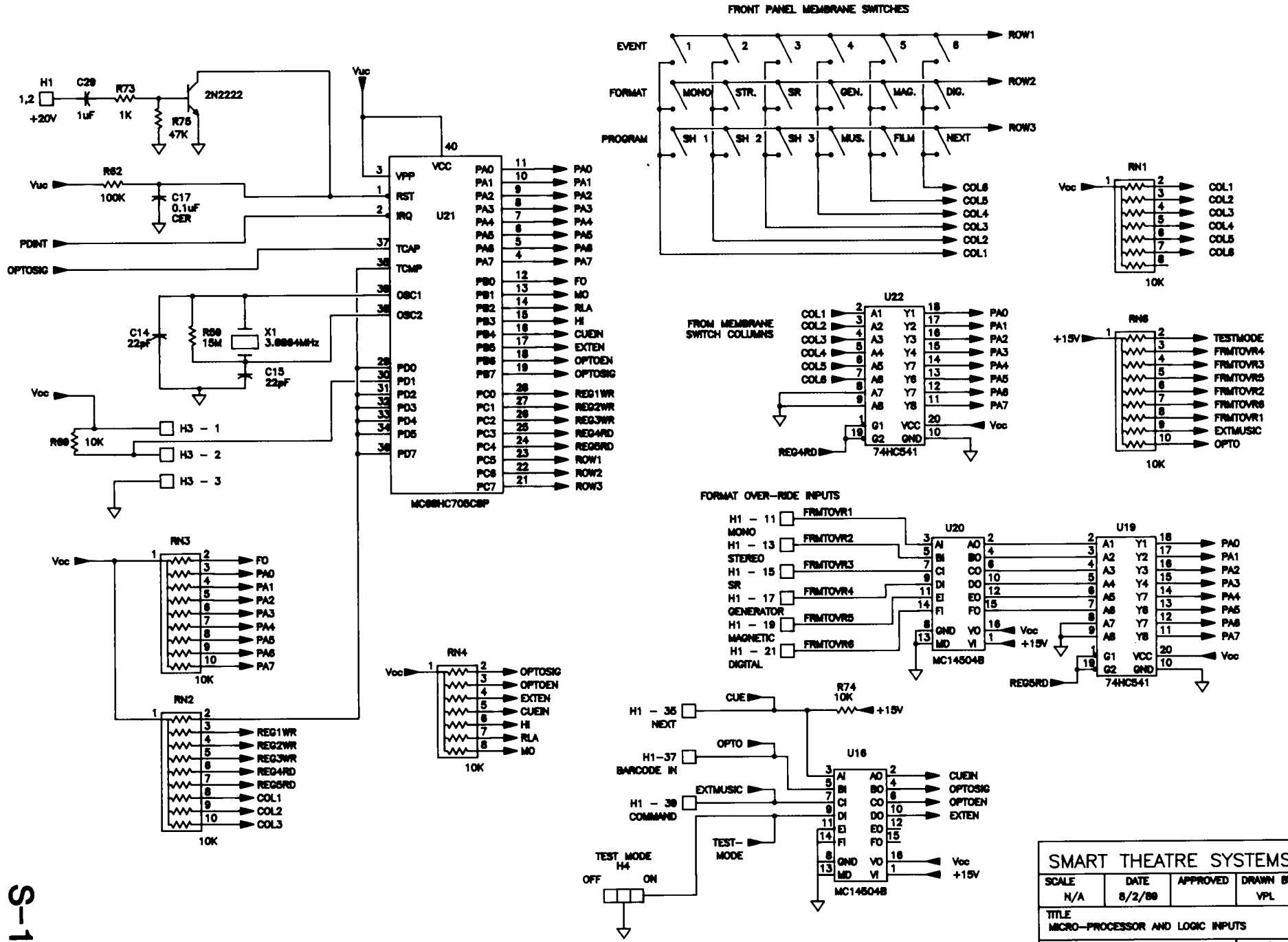
SMART THEATRE SYSTEMS	
SCHEMATIC FRONT GENERATOR	
MOD IV	MOD2B340

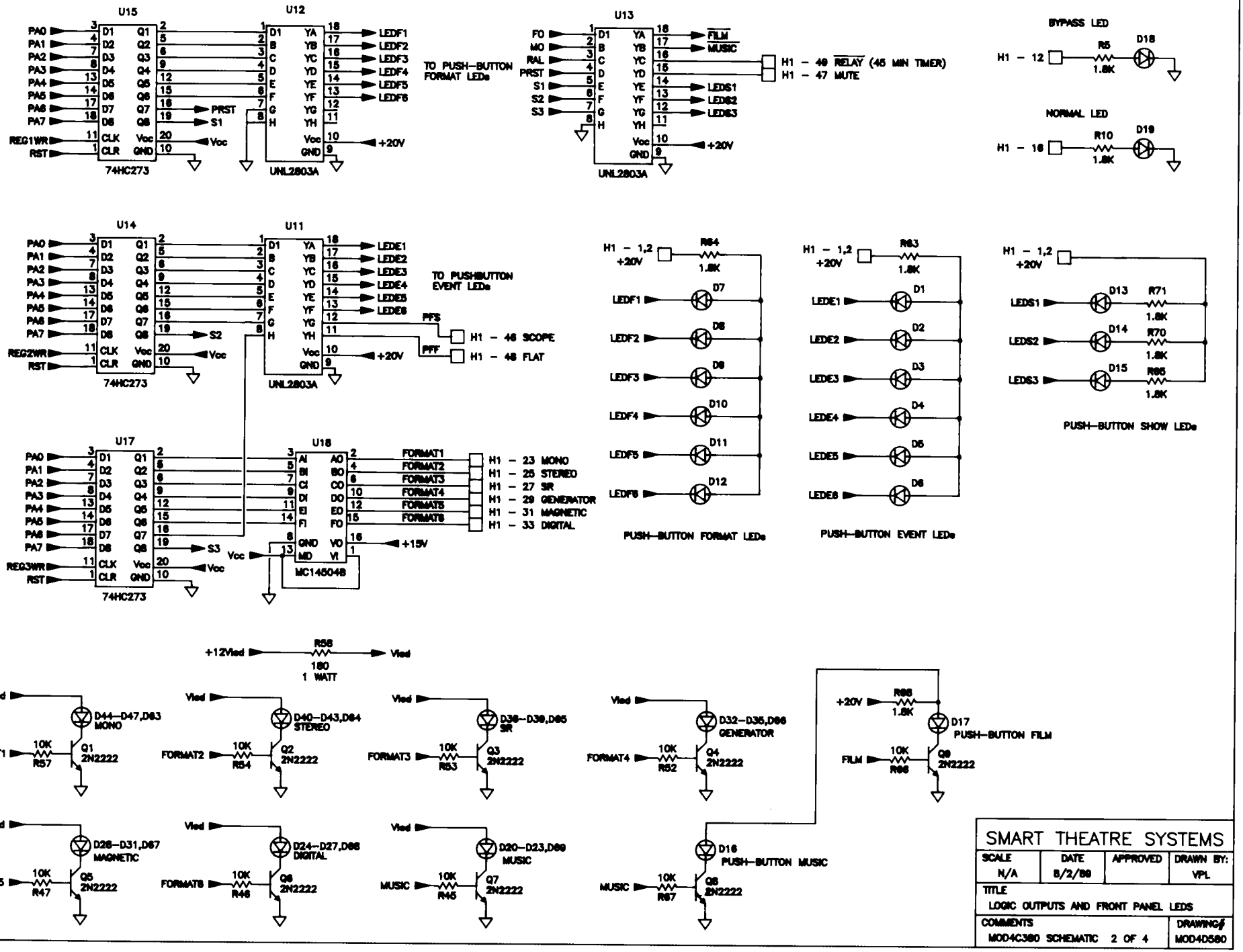


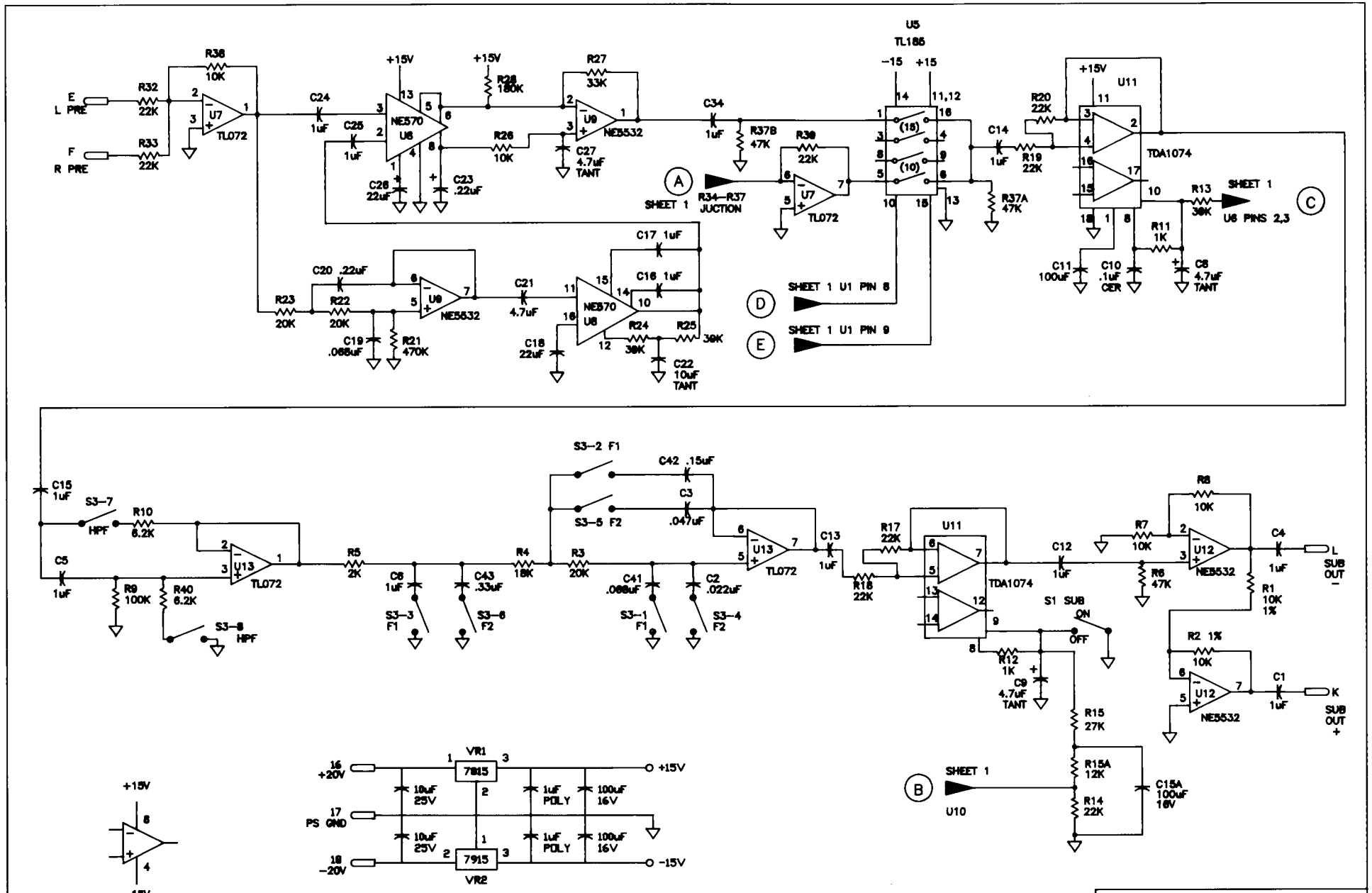
NOTES:

1) U2,U3,U4 ARE TL185
2) U6,U10 ARE CD4016
3) U1 IS CD4069
4) ▭ DENOTES EDGE CONNECTOR GOLD PLATED FINGER

SMART THEATRE SYSTEMS			
SCALE N/A	DATE 7/22/80	APPROVED	DRAWN BY: VPL
TITLE MOD4x345 SUB BASS OPTIONS CARD SCHEMATIC			
COMMENTS SHEET 1 OF 2			DRAWING# MOD4D545


FRONT PANEL MEMBRANE SWITCHES
EVENT
FORMAT
PROGRAM
1
2
3
4
5
6
MONO
STR.
SR
GEN.
MAG.
DIG.
SH 1
SH 2
SH 3
MUS.
FILM
NEXT
ROW1
ROW2
ROW3
COL6
COL5
COL4
COL3
COL2
COL1
H1
1,2
+20V
C29
1uF
R73
1K
2N2222
R75
47K
Vuc
R62
100K
C17
0.1uF
CER
PDINT
OPTOSIG
C14
22pF
R59
15M
X1
3.6864MHz
C15
22pF
Vcc
R60
10K
H3 - 1
H3 - 2
H3 - 3
U21
MC68HC705C8P
VCC
VPP
RST
IRQ
TCAP
TCMP
OSC1
OSC2
PA0
PA1
PA2
PA3
PA4
PA5
PA6
PA7
PB0
PB1
PB2
PB3
PB4
PB5
PB6
PB7
PC0
PC1
PC2
PC3
PC4
PC5
PC6
PC7
PD0
PD1
PD2
PD3
PD4
PD5
PD7
FO
MO
RLA
HI
CUEIN
EXTEN
OPTOEN
OPTOSIG
REG1WR
REG2WR
REG3WR
REG4RD
REG5RD
ROW1
ROW2
ROW3
RN1
10K
RN2
10K
RN3
10K
RN4
10K
RN6
10K
TESTMODE
FRMTOVR4
FRMTOVR3
FRMTOVR5
FRMTOVR2
FRMTOVR6
FRMTOVR1
EXTMUSIC
OPTO
U22
74HC541
FROM MEMBRANE SWITCH COLUMNS
REG4RD
U19
REG5RD
FORMAT OVER-RIDE INPUTS
H1 - 11
MONO
H1 - 13
STEREO
H1 - 15
SR
H1 - 17
GENERATOR
H1 - 19
MAGNETIC
H1 - 21
DIGITAL
FRMTOVR1
FRMTOVR2
FRMTOVR3
FRMTOVR4
FRMTOVR5
FRMTOVR6
U20
MC14504B
+15V
R74
10K
CUE
H1 - 35
NEXT
OPTO
H1-37
BARCODE IN
EXTMUSIC
H1 - 39
COMMAND
TEST-
MODE
TEST MODE
H4
OFF
ON
U16
MC14504B
CUEIN
OPTOSIG
OPTOEN
EXTEN
SMART THEATRE SYSTEMS
SCALE
N/A
DATE
8/2/89
APPROVED
DRAWN B
VPL
TITLE
MICRO-PROCESSOR AND LOGIC INPUTS
COMMENTS
MOD4C380 SCHEMATIC 1 OF 4
DRAWING
MOD4D5
S-16


U15
74HC273
U12
UNL2803A
TO PUSH-BUTTON FORMAT LEDs
U13
UNL2803A
H1 - 40 RELAY (45 MIN TIMER)
H1 - 47 MUTE
BYPASS LED
NORMAL LED
U14
74HC273
U11
UNL2803A
TO PUSHBUTTON EVENT LEDs
H1 - 46 SCOPE
H1 - 48 FLAT
U17
74HC273
U18
MC145048
H1 - 23 MONO
H1 - 25 STEREO
H1 - 27 SR
H1 - 29 GENERATOR
H1 - 31 MAGNETIC
H1 - 33 DIGITAL
PUSH-BUTTON FORMAT LEDs
PUSH-BUTTON EVENT LEDs
PUSH-BUTTON SHOW LEDs
+12Vled
Vled
D44-D47,D63 MONO
D40-D43,D64 STEREO
D36-D39,D65 SR
D32-D35,D66 GENERATOR
D28-D31,D67 MAGNETIC
D24-D27,D68 DIGITAL
D20-D23,D69 MUSIC
D16 PUSH-BUTTON MUSIC
D17 PUSH-BUTTON FILM
SMART THEATRE SYSTEMS
SCALE N/A
DATE 8/2/89
APPROVED
DRAWN BY: VPL
TITLE LOGIC OUTPUTS AND FRONT PANEL LEDS
COMMENTS MOD4C380 SCHEMATIC 2 OF 4
DRAWING# MOD4D580



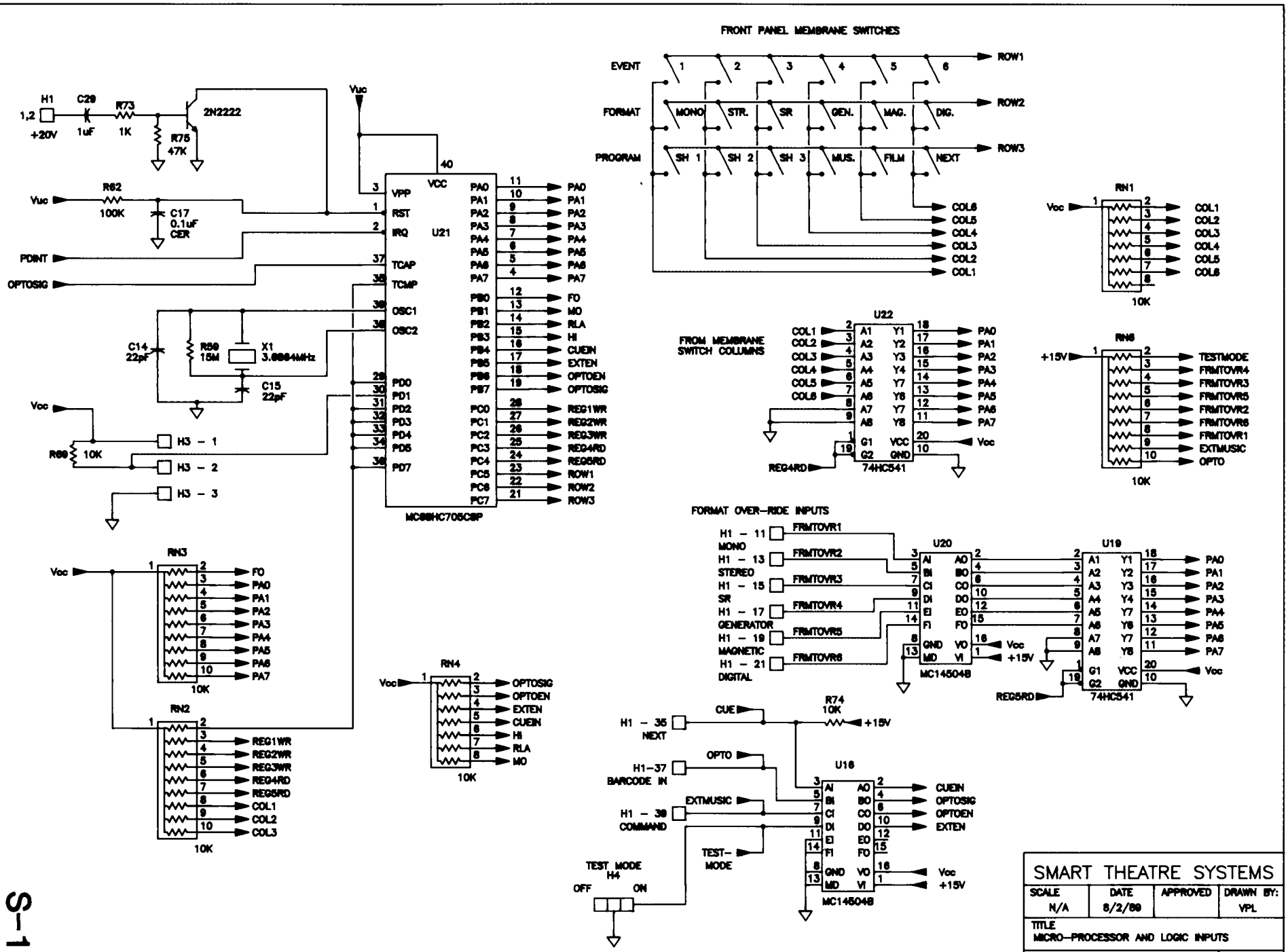
S-15

SMART THEATRE SYSTEMS

SCALE	DATE	APPROVED	DRAWN BY:
N/A	7/22/89		VPL

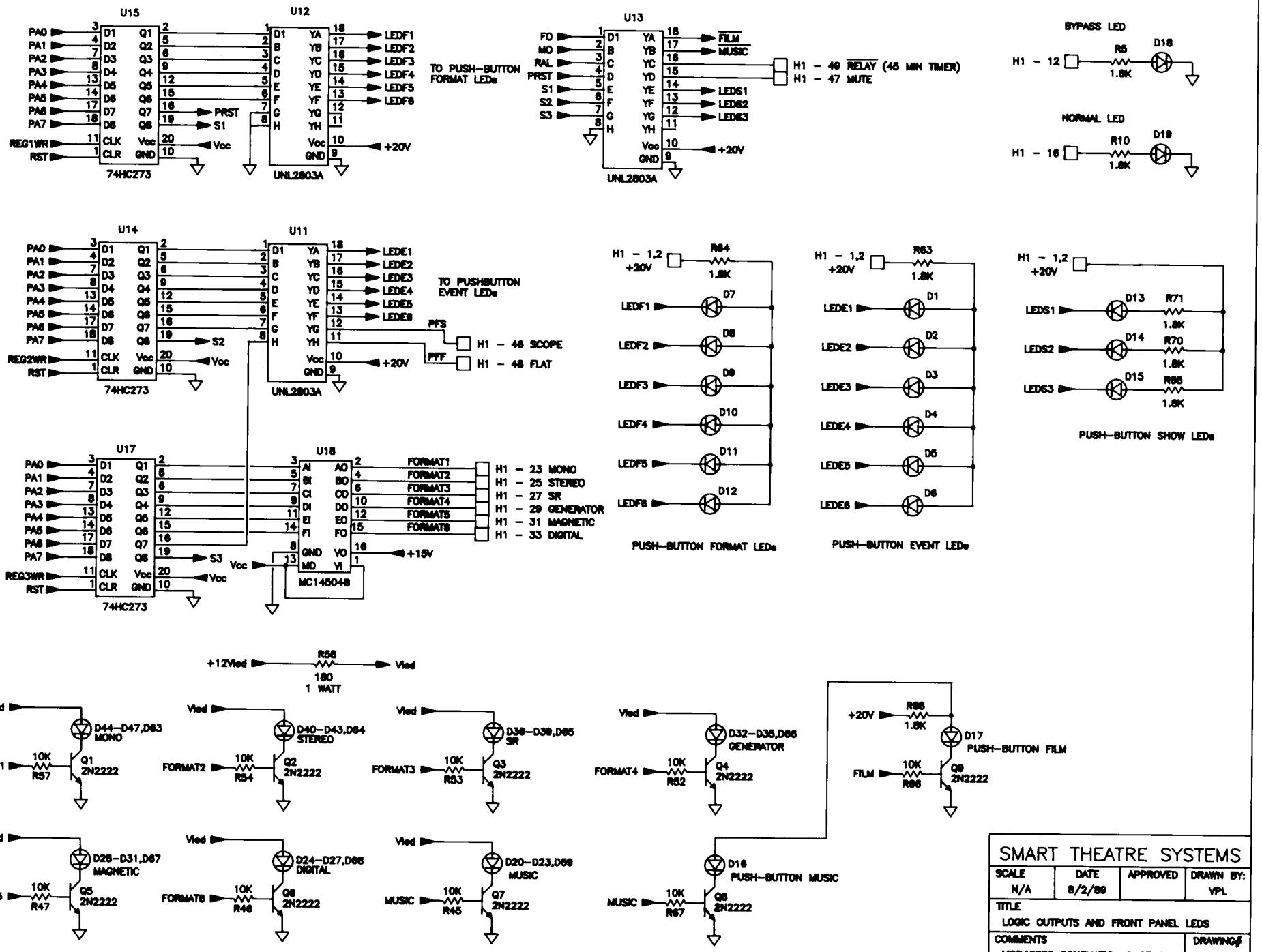
TITLE
MOD4x345 SUB BASS OPTIONS CARD SCHEMATIC

COMMENTS	DRAWING#
SHEET 2 OF 2	MOD4D545

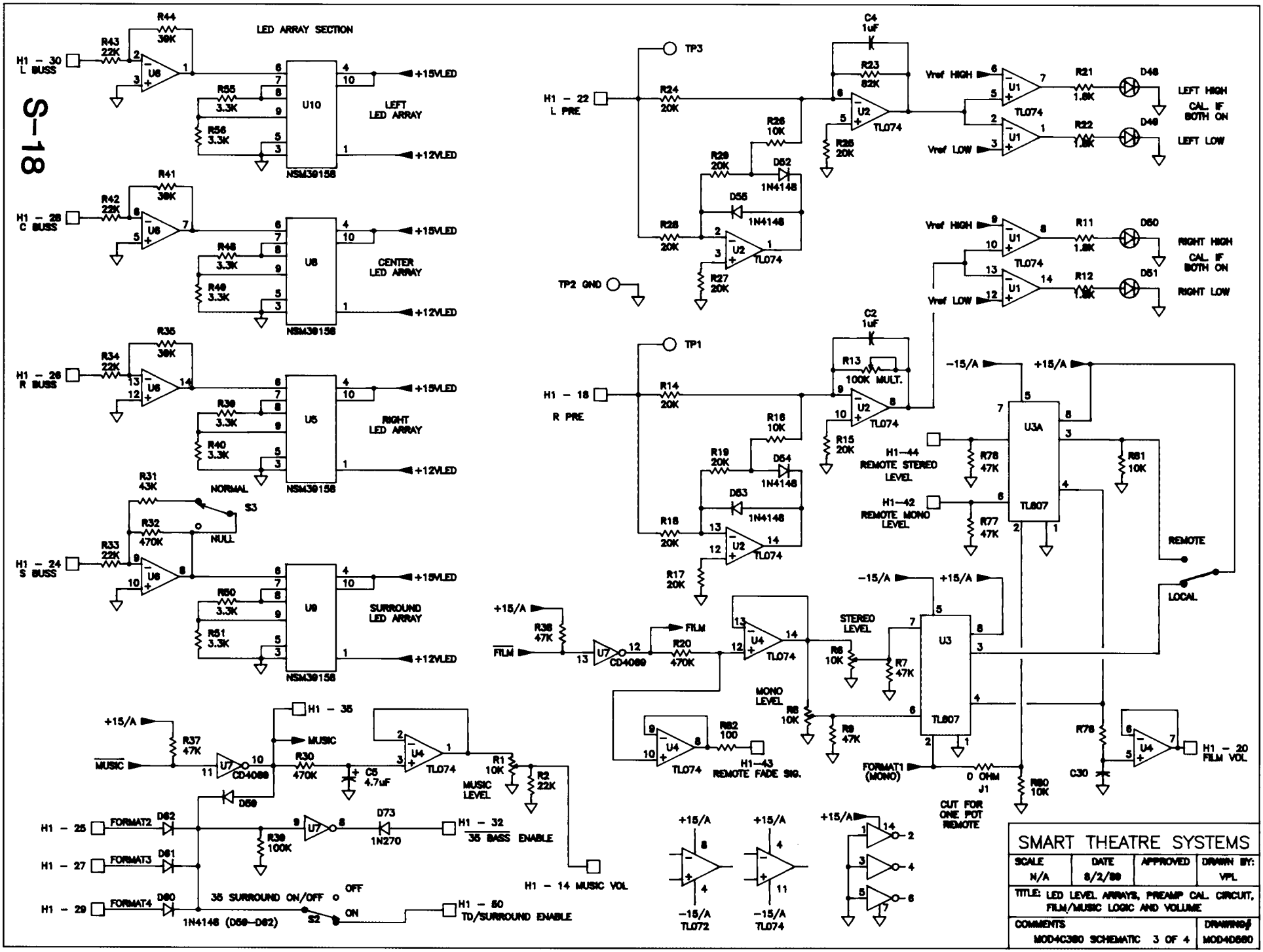


S-16

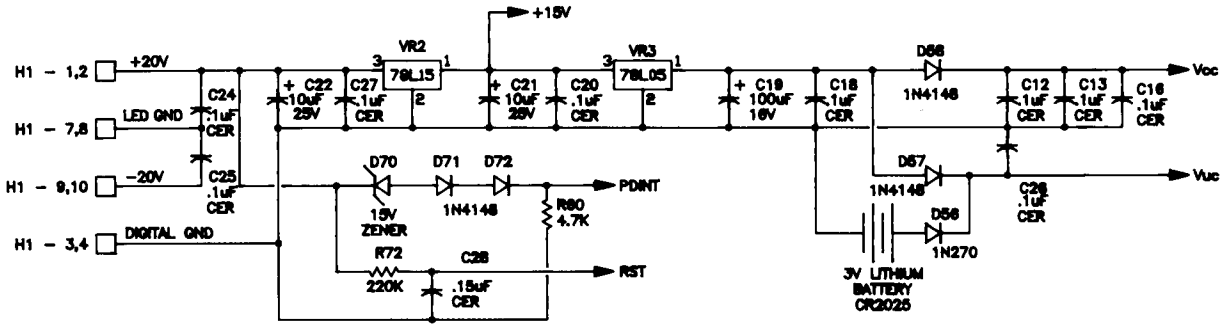
SMART THEATRE SYSTEMS			
SCALE: N/A	DATE: 8/2/89	APPROVED:	DRAWN BY: VPL
TITLE: MICRO-PROCESSOR AND LOGIC INPUTS			
COMMENTS: MOD4C380 SCHEMATIC 1 OF 4			DRAWING #: MOD4D580



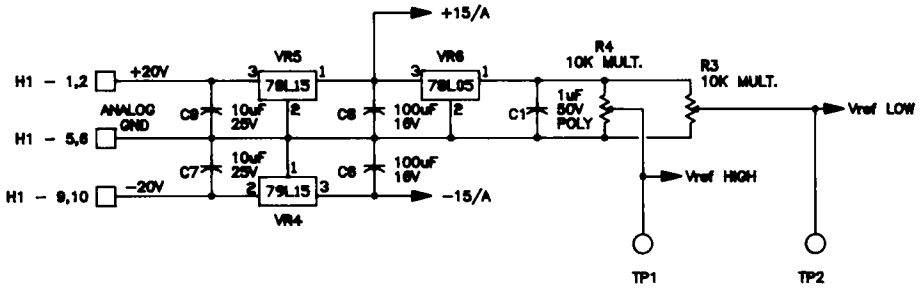
SMART THEATRE SYSTEMS			
SCALE N/A	DATE 8/2/89	APPROVED	DRAWN BY: VPL
TITLE: LOGIC OUTPUTS AND FRONT PANEL LEDS			
COMMENTS: MOD4C380 SCHEMATIC 2 OF 4			DRAWING# MOD4D580


S-18
LED ARRAY SECTION
H1 - 30 L BUSS
H1 - 28 C BUSS
H1 - 26 R BUSS
H1 - 24 S BUSS
R43 22K
R42 22K
R34 22K
R33 22K
R44 39K
R41 39K
R35 39K
R31 43K
R32 470K
R55 3.3K
R56 3.3K
R48 3.3K
R49 3.3K
R39 3.3K
R40 3.3K
R50 3.3K
R51 3.3K
U6
U10
U8
U5
U9
NSM39158
NORMAL
NULL
S3
+15VLED
+12VLED
LEFT LED ARRAY
CENTER LED ARRAY
RIGHT LED ARRAY
SURROUND LED ARRAY
TP3
TP2 GND
TP1
H1 - 22 L PRE
H1 - 18 R PRE
R24 20K
R28 20K
R14 20K
R18 20K
R17 20K
R23 82K
R26 10K
R29 20K
R27 20K
R13 100K MULT.
R16 10K
R19 20K
R15 20K
C4 1uF
C2 1uF
D52 1N4148
D55 1N4148
D54 1N4148
D53 1N4148
TL074
U1
U2
Vref HIGH
Vref LOW
R21 1.8K
R22 1.8K
R11 1.8K
R12 1.8K
D48
D49
D50
D51
LEFT HIGH CAL. IF BOTH ON
LEFT LOW
RIGHT HIGH CAL. IF BOTH ON
RIGHT LOW
-15/A
+15/A
U3A
TL807
U3
R78 47K
R77 47K
R81 10K
H1-44 REMOTE STEREO LEVEL
H1-42 REMOTE MONO LEVEL
REMOTE
LOCAL
STEREO LEVEL
MONO LEVEL
R6 10K
R7 47K
R8 10K
R9 47K
R80 10K
FORMAT1 (MONO)
0 OHM J1
CUT FOR ONE POT REMOTE
R76
C30
H1 - 20 FILM VOL
+15/A
R36 47K
FILM
U7
CD4069
R20 470K
U4
TL074
R82 100
H1-43 REMOTE FADE SIG.
MUSIC
R37 47K
R30 470K
C5 4.7uF
R1 10K
R2 22K
MUSIC LEVEL
H1 - 35
D59
H1 - 25 FORMAT2
H1 - 27 FORMAT3
H1 - 29 FORMAT4
D62
D61
D60
R38 100K
D73
1N270
H1 - 32 35 BASS ENABLE
35 SURROUND ON/OFF
OFF
ON
S2
1N4148 (D59-D62)
H1 - 50 TD/SURROUND ENABLE
H1 - 14 MUSIC VOL
-15/A TL072
-15/A TL074
SMART THEATRE SYSTEMS
SCALE N/A
DATE 8/2/88
APPROVED
DRAWN BY: VPL
TITLE: LED LEVEL ARRAYS, PREAMP CAL. CIRCUIT, FILM/MUSIC LOGIC AND VOLUME
COMMENTS MOD4C380 SCHEMATIC 3 OF 4
DRAWING# MOD4D680

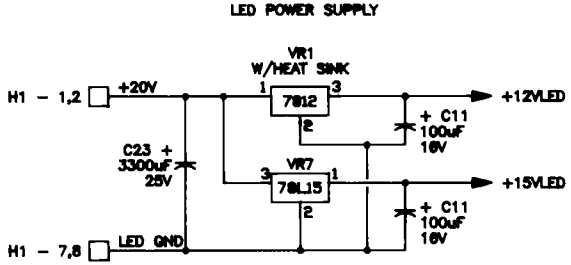
DIGITAL CIRCUITRY POWER SUPPLY



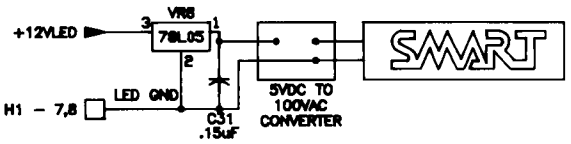
ANALOG CIRCUITRY POWER SUPPLY



LED POWER SUPPLY



POWER SUPPLY FOR ELECTROLUMINESCENT SMART LOGO



SMART THEATRE SYSTEMS			
SCALE N/A	DATE 8/2/89	APPROVED	DRAWN BY: VPL
TITLE FRONT PANEL POWER SUPPLIES, VOLTAGE REFERENCES			
COMMENTS MOD4C380 SCHEMATIC 4 OF 4			DRAWING# MOD4D580