Film-Tech

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FIELD SERVICE TECHNICIAN INSTRUCTION MANUAL

CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION CAUTION

THIS SYSTEM IS TO BE SERVICED BY AUTHORIZED SERVICE PERSONEL

RGM INDUSTRIES

MSS-4000 STEREO SOUND SYSTEM

SOUNDSATION

Stereo

MSS 4000 SYSTEM

Surround

Easy to Operate ● Reliable ● Practical Price

SOUNDSATION is a practical, all modular-component, intergrated sound system designed to reproduce MONOPHONIC, STEREOPHONIC and SURROUND EFFECT films for all theaters. This versatile easy-to-operate unit was specifically designed to meet the needs of the value conscious theater owner.

Start with a single channel MONOPHONIC sound and build your system to suit your theater's particular needs all the way up to a fully intergrated STEREO–SURROUND sound system, playing all encoded sound tracks.

SOUNDSATION SERIES:

Series I: Monophonic – One channel
Series II: Monophonic with surround channel
Series III: Stereophonic –left & right with surround
Series IV: Stereophonic left, right,center & surround channel.

When the engineers designed the MSS 4000 they incorporated all the necessary components theater's required for a modern STEREO SURROUND SYSTEM. This resulted in a modular pre-wired console that reduces equipment and installation cost dramatically. After the mechanical mounting and easy connecting of power, exciter lamp, speakers and solar cell the system is ready to be calibratedand provide your theater with the rich and dynamic sounds of today's films.

The MSS 4000 is housed in a steel wall mounting cabinet 19" deep 20" wide 28" high. The complete system weight is 92 lbs. and contains the following:

* COMMAND MODULE, contains Pre-amp,Noise Reduction, Surround Decoder, Half octive equalization, Fader, Level Set Meter, Intermisson Sound Control, and Emergency Bypass.

* POWER AMPLIFIERS, Four 100 watt (4 ohms) solid state RGM model MPA-100. This amplifier is short circuit proof by means of internal circuitry. Optional 181 watt (4 ohms) RGM model MPA-181 are available.

* EXCITER LAMP SUPPLY, 9 volt 4 amp all silicon solid state, electronically filtered DC power with emergency AC power transfer capabilites.

* MONITOR AMPLIFIER, all silicon solid state with self contained 4" X 6 " speaker.
This unit monitors the power amplifiers output and is controlled by means of a separate volume control.

* VU LEVEL METER, measures output level of power amplifiers.

* CONTROL PANEL, controls are AC power system switch & power fuse, theater level control, monitor level control, VU level meter range switch, monitor channel selector switch, monitor power fuse and indicator.

Connections to the MSS 4000 are made to the barrier strip located on the rear section of the cabinet. All internal connections are pre-wired at the factory.

Practical Products From Imaginative Thinking

RGM INDUSTRIES, INC.

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MSS 4000 SYSTEM

MONO, STEREO, SURROUND EFFECTS

THE MSS 4000 IS A TOTALLY INTERGRATED SOUND REPRODUCTION SYSTEM FOR OPTICAL MONOPHONIC, STEREOPHONIC AND SURROUND EFFECTS SOUND FILM.

THE STANDARD MSS 4000 SYSTEM IS OPTIMIZED FOR USE IN SMALL AND MEDIUM SIZE THEATRES. THE RELATIVELY SHORT DISTANCE BETWEEN LEFT AND RIGHT CHANNELS ELIMINATE THE NEED FOR A THIRD CENTER CHANNEL THEREBY REDUCING THE SYSTEM COST. HOWEVER, CENTER CHANNEL SOUND PROCESSING IS OPTIONALLY AVAILABLE TO ENABLE THE MSS 4000 SYSTEM TO BE USED FOR LARGER THEATRES THAT REQUIRE A CENTER CHANNEL.

THE "MSS 4000" CONSISTS OF THE FOLLOWING SEGMENTS:

COMMAND MODULE CM 4000:

COMMAND MODULE (CM 4000) PROCESSES THE SIGNAL FROM THE DUAL CHANNEL PHOTOVOLTAIC CELL ASSEMBLY AND DISTRIBUTES IT TO THE POWER AMPLIFIERS.

THE CM 4000 CONSISTS OF THE FOLLOWING MODULES:

PRE-AMPLIFIERS:

AMPLIFIES THE SIGNAL FROM THE STEREO PHOTO-VOLTAIC CELL RAISING THE SIGNAL TO A STAND-ARD LINE LEVEL FOR PROCESSING.

NOISE REDUCTION:

NR MODULE REDUCES HIGH FREQUENCY NOISE 15 DB BY USE OF A VARIABLE BANDWIDTH FILTER CON-TROLLED BY THE AMPLITUDE, FREQUENCY AND PER-SISTENCE CHARACTERISTICS OF THE SOUNDTRACK. FRONT PANEL LED'S DYNAMICALLY INDICATE BAND-WIDTH. THE NR MODULE ALSO OPERATES ON MONO-PHONIC SOUNDTRACKS WITH THE SAME EFFICIENCY, A FEATURE NOT FOUND IN OTHER SYSTEMS.

ACADEMY FILTER, METERING MODULE:

AFM MODULE IS ACTIVATED WHEN OPERATING IN THE MONOPHONIC MODE ENABLING PROPER REPRODUCTION OF MONOPHONIC SOUNDTRACK TO ACADEMY CURVES.

AFM METERING CIRCUIT MEASURES THE PRE-AMP, OUTPUTS AND FINAL STAGE OF THE "A" CHAIN. THUS FACILITATING EASIER CALIBRATION AND CHECK OUT.

SURROUND EFFECT DECODER MODULE:

SED MODULE DECODES THE STEREO SOUNDTRACK PROGRAMMING FOR THE SURROUND EFFECTS CHANNEL. A VARIABLE TIME DELAY IS INCORPORATED IN THE SURROUND OUTPUT TO REMOVE ECHO EFFECTS.

HOUSE EQUALIZER MODULE:

HE MODULE IS A DYNAMIC 16 BAND HALF OCTIVE EQUALIZER FOR LEFT AND RIGHT CHANNELS. THESE EQUALIZERS ARE OPERATIONAL IN MONOPHONIC AS WELL AS STEREOPHONIC MODE. THEY OPERATE WITH ALL SOUNDTRACKS AND MATCH SYSTEM CHARACTERISTICS WITH THEATRE ACOUSTICS.

LEVEL CONTROL MODULE:

LC MODULE IS A 3 CHANNEL AUDIO LEVEL CONTROL WHICH IS CAPABLE OF REMOTE AND LOCAL OPERATIONS.

POWER AMPLIFIERS:

THREE - 75 WATT (OPTIONAL 131 WATT) ALL SILICON SOLID-STATE AUDIO POWER AMPLIFIERS. THE AMPLIFIER IS SHORT-CIRCUIT PROOF AND PROTECTED FROM OVERLOADS BY MEANS OF INTERNAL SOLID-STATE CIRCUITRY. FUSE PROTECTION IS PROVIDED FOR INTERNAL POWER SUPPLY PROTECTION.

EXCITER LAMP SUPPLY:

9 VOLT, 4 AMP ALL SILICON SOLID-STATE EXCITER LAMP POWER SUPPLY, ELECTRONICALLY FILTER DC POWER WITH EMERGENCY AC POWER TRANSFER CAPABILITIES.

MONITOR AMPLIFIER:

ALL SILICON 3 WATT MONITOR AMPLIFIER WITH SELF-CONTAINED 4" x 6" SPEAKER. THIS AMPLIFIER MONITORS THE POWER AMPLIFIERS AND IS CONTROLLED BY MEANS OF A SEPARATE VOLUME CONTROL AND CHANNEL SELECTOR SWITCH.

MONITOR VU LEVEL METER:

MEASURES THE OUTPUT LEVEL OF POWER AMPLIFIERS.

CONSOLE CABINET:

CONTAINS OPERATING CONTROLS FOR AUDIO POWER AMPLIFIER VOLUME, MONITOR AMPLIFIER VOLUME, AND AUXILIARY INPUT (NON-SYNC.). THIS HOUSES ALL AFORESAID COMPONENT MODULES AND PROVIDES FOR CONNECTION TO A REMOTE PROJECTOR.

SPECIFICATIONS

MSS 4000

CONTROLS: OPERATING PANEL

THEATRE VOLUME LEVEL CONTROL
MONITOR LEVEL CONTROL
VU LEVEL METER RANGE SWITCH
AC POWER SYSTEM SWITCH
MONITOR CHANNEL SELECTOR SWITCH
FUNCTION SWITCH (NON-SYNC., SYNC.)
MONITOR AMPLIFIER INDICATOR
MONITOR POWER SUPPLY FUSE ½AMP 3AG
AC POWER FUSE 6AMP 3AG

EXCITER LAMP SUPPLY PANEL

"DC" TO "AC" EMERGENCY TRANSFER SWITCH, POWER OFF.

AUDIO POWER AMPLIFIER PANEL

AC POWER ON-OFF SWITCH.

CONNECTIONS:

ALL CONNECTIONS ARE MADE TO THE BARRIER STRIPS LOCATED IN THE CONSOLE CABINET ELIMINATING THE NEED FOR WIRING TO INDIVIDUAL COMPONENTS.

INSTALLATION INSTRUCTIONS

MSS4000 SERIES SOUND SYSTEM

When installing the MSS 4000 into an existing theater it is recommended to run a short film with dialogue and music and also run a pink noise loop in order to analyze the auditorium characteristics using the EXISTING SOUND SYSTEM. This will serve as a comparison for the new MSS 4000 sound system.

CAUTION! PRIOR TO ANY INSTALLATION VERIFY THAT ALL HIGH VOLTAGE HAS BEEN DISCONNECTED AT THE CIRCUIT BREAKER PANEL.

Although you may have installed other sound systems and are quite knowledgeable it would be greatly appreciated if the installation and alignment be made in accordance with these instructions and procedures.

CAUTION Measure AC input terminals to insure that all HIGH VOLTAGE IS DISCONNECTED prior to removing the existing sound system.

1, Remove existing sound system and locate MSS4000 as close to the projector as possible to reduce length of low level signal leads. This is to reduce hum and extraneous noise pick up.

2, Remove unit from crate and inspect for damage due to shipment. Open latches on right side for internal inspection of modules and cables.

TO PREVENT INJURY A SCAFFOLD SET AT THE DESIRED MOUNTED HEIGHT SHOULD BE PLACED UNDER THE CONSOLE PRIOR TO SECURING UNIT TO WALL.

3, The console cabinet should be mounted on a solid concrete or block wall using (4) steel stud anchor bolts 1/4 X 2 1/4 " long Mc Master-Carr #97046A552 or equal via the (4) 1/4" diameter holes provided in the back door assembly.

Mounting the console cabinet to a sheet rock dry wall will require securing a 1" plywood sheet wide enough to span at least 2 vertical studs (27" minimum width) and (32" minimum vertical length). The plywood must be secured to the studs by means of at least (6) 1/4" X 2 1/2" steel screws. The console cabinet should then be mounted to the plywood sheet by means of (4) 1/4 X 1 1/2 steel screws via the (4) mounting holes provided in the back door assembly.

ALL WIRING SHALL BE DONE IN ACCORDANCE WITH NATIONAL ELECTRICAL CODE AND LOCAL COMMUNITY CODES.

4, Connect speaker wires to the related speaker terminals located on the inside back door of the console

5, Install shielded audio wire from projector solar cell to PRE AMPLIFIER input terminals located at rear of command module. Refer to schematic diagram for wiring information. Do not ground shield wire at the solar cell end. Single point audio ground occurs at the command module power supply.

6, Wire the exciter lamp bulb from the terminals located in the SOUND HEAD to the exciter lamp power supply terminals located on the inside back door of the console.

CAUTION INSURE THAT PANEL BREAKERS ARE OFF AND THERE IS NO HIGH VOLTAGE PRESENT IN ASSOCIATED CIRCUITS.

7, Plug AC line cord into the 125VAC 60Hz.outlet DEDICATED FOR AUDIO SOUND SYSTEM. Verify that OUTLET HAS PROPER AMPACITY BREAKER INSTALLED.

Should hard wiring be required see paragraph 8.

8, Connect the 125VAC 60Hz using #12AWG NEC approved wire. This wire must be from a DEDICATED CIRCUIT DIRECTLY FROM THE CIRCUIT BREAKER PANEL with the PROPER AMPACITY BREAKER.

STOP STOP STOP STOP STOP

PLEASE!! RECHECK ALL WIRING NOW, OTHER WISE PRAY FOR FORGIVENESS.

9, Place all power switches into the OFF POSITION. Turn on AUDIO SOUND SYSTEM breaker at the panel breaker box there by applying 105-125VAC power to the system. Turn on POWER switch located on the top of unit. The AC POWER, MONITOR LAMP AND COMMAND MODULE LED"S should light.

PROCEED TO COMMAND MODULE SOUND PROCESSOR ALIGNMENT.

INSTALLATION INSTRUCTIONS
COMMAND MODULE
CM 4000

[ ] Inspect all components for shipping damage prior to installation.

[ ] Verify that all system power is OFF.

[ ] Install the CM 4000 chassis in the 7" panel opening above the left and right power amplifier module.

[ ] Connect the shielded audio cable from the power amplifiers to the CM 4000 respective output terminal (L-Left, R-Right, S-Surround).

[ ] Check to insure that the AC input and Audio output connectors are properly connected to their respective (Right, Left and Surround) power amplifiers.

[ ] Slide the CM 4000 power supply module into the black slotted guides mounted on the left side of the CM 4000 chassis (as viewed from the rear).

[ ] Connect the power supply AC input and DC output connector to the power supply module. This connector is a part of the MSS 4000 harness.

[ ] Connect the lead with a 3 pin polarized connector from the power supply to the mating 3 pin connector located on left side (as viewed from the rear) of the CM 4000 mother board.

INSTALLATION INSTRUCTIONS

CM 4000

[ ] Connect the 2 wire twisted lead (or shielded) from the theatre level control to the "level control" terminals at the rear of the CM 4000. "CAUTION" DO NOT turn power on without level control connected. Damage to the volume control module could occur.

[ ] Install photovoltaic cell (soler cell) in accordance with included instructions. Service and clean Excitor Lamp Optical system.

[ ] Wire photovoltaic cell to the CM 4000 using 3 wire shielded cable such as Beldon #8771. Insure that polarity is maintained from the photovoltaic cell Right and Left (Red and Green) to R and L input, Ground (Black) to E, Shield to S of the CM 4000. The right side is closest to the film edge. Do not connect the shield at the photovoltaic cell end.

[ ] At this point stop and recheck wiring and polarity.

[ ] Check that the pre-amplifier module card is already installed, if not insert module card at this time.

[ ] Place "normal - Bypass" switch into the normal position and insert ATAS test link card #1 into the noise reduction module connector. Connect test link card to ATAS dual trace oscilloscope.

[ ] Verify that all switches and controls are in the following positions:

CONSOLE:

[ ]	Theatre level	-	minimum
[ ]	Monitor level	-	midrange
[ ]	Output meter switch	-	"L"
[ ]	Meter range switch	-	"Low"
[ ]	Power Amplifiers	-	OFF (Down)
[ ]	Excitor Lamp Supply	-	"DC"

CM 4000

[ ]	Normal - Bypass	-	normal
[ ]	Noise Reduction	-	out
[ ]	Stereo Surround - Mono	-	stereo surround
[ ]	Optical - Non Sync - Bypass	-	optical
[ ]	Meter Switch	-	Pre Amp "L"
[ ]	Bypass Potentiometers (behind two holes located below normal-bypass toggle switch)	-	midrange

[ ] Turn system power on.

[ ] Verify the power supply indicators (red LED's) + 15, - 15 are on.

INSTALLATION INSTRUCTIONS

CM 4000

[ ] Measure Excitor Lamp voltage and adjust to 9 volts at 4 amps.

[ ] Adjust cell as close to Film track as possible keeping slit image at upper portion of cell active area.

[ ] Thread up continuous tone test film CAT 69 or equal.

[ ] Raise the control panel of the "MSS 4000" and adjust the "L" and "R" pre-amplifier controls (outer trim pots on pre-amp module) for a "0" reading (.5v) on the CM 4000 meter, switching from Pre Amp "L" - "R". This should be an approximate setting only.

[ ] Plug in ATAS test link #1 with dual trace oscilloscope in place of the link card immediately after the Academy filter. If ATAS is not available connect dual trace oscilloscope to the two wire jumpers immediately after the pre-amp module.

[ ] Stero cell alignment film (cat 97 or equal) loop is now threaded into the projector. While running this loop adjust the cell across the film plane for a minimum but equal amount of cross talk from left to right. There should be approximately 18 to 22 DB separation.

[ ] Pink noise test loop should now be threaded up and run. Switch "O scope" to the (CH B) "sweep time/CM" and adjust azimuth for the thinnest trace possible.

INSTALLATION INSTRUCTIONS

CM 4000

[ ] Connect ATAS Real Time Analyzer to the left and right channel alternately and adjust focus for maximum high frequency.

[ ] It may be necessary to repeat the azimuth and focus adjustment to obtain maximum results.

[ ] Now adjust the H.F. controls on the pre-amplifier module [inner trim pots] for a flat frequency response to at least 9KC. If this is not possible examine the slit and associated optics.

[ ] Thread the continuous tone loop #69 and re-adjust the pre-amplifier gain controls [outer trim pots] for "0" level on the CM 4000 meter switching alternately L and R.

[ ] Turn System power OFF.

[ ] Remove the ATAS test link and replace with link card previously removed.

[ ] Proceed with Auditorium equalization.

INSTALLATION INSTRUCTIONS

CM 4000

[ ] Connect ATAS Real Time Analyzer to the left and right channel using ATAS plug-in board. If not available connect Real Time Analyzer to left and right jumpers immediately after noise reduction module. Adjust optic (solar cell) focus for maximum high frequency.

[ ] It may be necessary to repeat the azimuth and focus adjustment to obtain maximum results.

[ ] Now adjust the H.F. controls on the pre-amplifier module (inner trim pots) for a flat frequency response to at least 9KC. If this is not possible examine the slit and associated optics.

[ ] Caution: These potentiometers should never be adjusted more than 20 degrees from each other. Unwanted phase shifting between left and right channel will occur above 7KC if set incorrectly. Remove pink noise test loop and thread the continuous tone loop #69 and re-adjust the pre-amplifier gain controls (outer trim pots) for "0" DB .5V RMS level on the CM 4000 panel meter switching alternately pre-amp L and R positions.

[ ] Turn System power OFF.

[ ] Remove the ATAS test link and replace with link card previously removed.

[ ] Proceed with Auditorium equalization.

EQUALIZATION OF AUDITORIUM

USING RGM INDUSTRIES ATAS

[ ] Verify that all equalizer board frequency trimmer potentiometers are set at approximately midrange.

[ ] Remove link card immediately after Academy Filter and insert pink noise generator link card.

[ ] Place controls and switches in the following positions:

CONSOLE:

[ ]	Theatre level	- minimum
[ ]	Monitor level	- midrange
[ ]	Output meter switch	- "L"
[ ]	Meter range switch	- "Low"
[ ]	Power Amplifier switches	- On (Up)
[ ]	Excitor Lamp Supply	- "DC"

CM 4000

[ ]	Normal - Bypass	- normal
[ ]	Noise Reduction	- in
[ ]	Stereo Surround - Mono	- stereo surround
[ ]	Optical - Non Sync - Bypass	- optical

EQUALIZATION OF AUDITORIUM

USING RGM INDUSTRIES ATAS

[ ]	Meter switch	- output
[ ]	Bypass Potentiometers (behind two holes located below normal-bypass toggle switch)	- midrange

[ ] Turn system power on.

[ ] Verify the power supply indicators (red LED's) + 15, - 15 are on.

[ ] Turn on pink noise generator and switch to LEFT channel.

[ ] Advance "Theatre Level" control until pink noise level indicates 0 on output meter of the CM 4000 with meter level at low position.

[ ] Turn Theatre level down.

[ ] Set up the calibrated microphone at approximately 1/2 to 1/3 from the rear wall of theatre slightly to the right of the center axis of the left speaker.

[ ] Connect to Real Time Analysis.

[ ] Plug jumper cable (yellow plugs both end) from the RTA "Trigger" terminals to the EXT. TRI G" of the O scope.

EQUALIZATION OF AUDITORIUM

USING RGM INDUSTRIES ATAS

[ ] Connect channel A to the red "OUTPUT" terminal of RTA and switch O scope mode to channel A, DC input.

[ ] Set Source to "EXT" and SYNC to + and O scope.

[ ] Set Sweep time to 2m second.

[ ] Turn RTA on and Theatre level up.

[ ] Adjust scope for 5 volts/cm and adjust microphone input level of RTA for approximately 1 cm (5 V) of trace on scope.

[ ] Start adjusting the 16 (1/2 octave) bands for as flat a frequency response as possible until 2 KHZ. After 2 KHZ adjust for a 3 DB per octive roll off (4 KHZ - 3 DB, 8 KHZ - 6 DB, etc.)

[ ] Repeat trimmer adjustment so that there is only a small variation between trimmer in order to prevent poor phase response.

[ ] Repeat the same procedure for the right channel.

[ ] Relocate the microphone to the center of the auditorium and repeat adjustment if necessary. Caution - only a very slight adjustment should be made at this point.

EQUALIZATION OF AUDITORIUM

USING RGM INDUSTRIES ATAS

[ ] Turn power off and remove the pink noise analyser.

[ ] Replace link card and turn power on.

[ ] Thread up and play 1 KHZ test loop.

[ ] Set CM 4000 "output" meter switch into the L (Left) output and balance the volume level card for equal output to R (Right) channel. The volume level adjustments are on top of the module card with the S (Surround) in front, L (Left) in the middle and R (Right) at the rear.

[ ] Set the surround test switch located on the pre-amp module from the N (Normal) to the S (Surround) position. This should activate the surround speakers and will permit setting the level of the surround output equal to the front output.

[ ] Return above switch to N (Normal).

OPERATIONAL THEORETICS

Pre-amp

The pre-amp first stage amplifier is an operational amplifier, operated as a low input impedance current to voltage convertor. This operating mode obtains the best linearity from the projector solar cell, since the cell is operated in the photo-voltaic or current source mode. The input is diode protected against transients that might otherwise harm the amplifier.

The input stage is followed by a sharp cutoff filter to remove frequency components above 12K Hz, because of the pratical limit of optical sound tracks, the sound energy above 12K Hz is predominately noise, and the filter improves the signal-to-noise ratio by not passing this noise.

The third stage of the pre-amp is a variable gain stage that allows the pre-amp output level to be set at a working line level of 0.5V RMS regardless of solar cell and exciter lamp/optics variations.

The fourth pre-amp stage is an adjustable high frequency roll-off characteristics of the finite optical slit width. The curve follows the equation

$$E_O = E_I \left[\frac{X}{\text{Sin } X}\right]$$

All the above stages are indentical for the Left and Right channels.

The Left channel output is also capable of being inverted by the surround test switch and is connected to the output during the Surround Check mode.

The raw DC power input (+18, -18) is regulated "on-card" to ±12VDC by means of intergrated circuits to stabilize the voltage and prevent cross-coupling to other modules via the power supply.

Noise Reduction

The CM-4000 Noise Reduction system is a dynamically varying bandwidth filter. The circuit has a minimum cutoff frequency of 1.5K Hz and varies out to 20K Hz. The incoming signal is continuously analyzed to determine the optimum cutoff frequency at any instant. Amplitude, frequency and persistance factors all determine the variable attack and release times of the filter to minimize any noise modulation of the signal. The Noise Reduction unit has front panel LED displays that indicate "Low," "Mid" or "High" (red, yellow, green) cutoff frequencies. Figure 1 shows the system block diagram.

The heart of the CM-4000 Noise Reduction system is a voltage controlled low-pass filter. This filter is controlled by an FET used in the variable resistance mode of operation. When the FET is biased to pinch-off the filter has its minimum bandwidth (1.5K Hz). *The maximum slope of the filter skirt in the cutoff region is 9db/octive and typically gives 15db of attenuation at 10K Hz when the filter is at minimum bandwidth.

*As this voltage is varied positively from pinch-off, the bandwidth of the low-pass filter is continuously varied out to maximum bandwidth (20K Hz).

The control circuit of the CM-4000 Noise Reduction system continuously analyzes the incoming signal to determine amplitude, frequency, and persistance components. When these factors dictate a wider bandwidth, the proper voltage is applied to the FET in the low-pass filter to widen the filter bandwidth. The attack and release time constants of this control voltage are continuously varied by the control circuit to minimize audible noise modulation.

The display driver circuit of the CM-4000 Noise Reduction system monitors the control circuit output voltage and compares it to levels corresponding to "Low," "Mid" and "High" frequencies. The driver circuit then energises the appropriate LED (s) on the front panel that dynamically indicate the filter bandwidth.

A front panel switch also allows operation in the bypass mode when noise reduction is not desired. In this mode the LED's will still be illumated but at a reduced level.

This system of noise reduction is fully compatible with Dolby encoded films with only a minor degredation in overall dynamic range. This system also reduces noise due to film track degredation (dirt, scratches, etc.) on normal as well as Dolby encoded films, a capability not present in the CP50 or CP100 Dolby cinema processors. It will not however prevent "pop's" due to damaged sound tracks.

Academy Filter and Meter Driver

The CM-4000 "Academy Filter" and Meter Driver card contains a switchable "Academy Filter" and a front panel VU meter amplifier. The "Academy Filter" is activated by a front panel switch and is used when a normal monaural film is being presented. This filter compensates for the pre-emphasis of the high frequencies during the dubbing process that generates the film sound track on normal films. The filter is bypassed when a Dolby encoded film is being shown.

The Meter Driver circuit amplifies the monitored signals (Left and Right pre-amp output, and Left and Right Fader card output of the CM-4000) and presents them to the VU meter for display. The circuit has adjustable gain and is calibrated for 0.5VAC level at "0" DB meter reading on the front panel of the CM-4000.

Power Supply

The CM-4000 Power Supply Module developes the raw DC voltage for use in each card. The 115VAC line is connected via a fuse on the Power Supply Module front panel. The transformer secondary voltage is full-wave rectified and filtered to produce $\pm$18 Volts DC main power for all the CM-4000 cards. (Each card has its own positive and negative voltage regulators to produce $\pm$12V on the card.) Two red LED's are provided on the Module front panel to indicate presence or absence of the main power voltages.

Fader Card

The CM-4000 Remote Fader Card is multichannel voltage controlled attenuator that adjusts the auditorium sound level in all channels simultaneously. Figure 4 shows the block diagram.

Each Voltage Controlled Attenuator (VCA) consists of a fixed resistor in series with a Light Dependant Resistor (LDR). The LDR resistance varies from near infinity when dark to same low value at maximum illumination. The illumination is controlled by voltage V1 applied to the integral high LDR resistance and maximum attenuation and vice-versa for V1 = 10 volts (maximum). The balance between each channel is adjustable by means of the (3) 20 turn potentiometers located on the top of the Fader Card marked L, R, S.

The voltage, V1, is controlled by the Front Panel Fader control. The VCA outputs are buffered and applied to the CM-4000 Module outputs for connection to the power amplifiers.

One-Half Octive Equalizer

The CM-4000 One-Half Octive Equalizer provides auditorium frequency response compensation in one-half octive lands from 63Hz to 11.3K Hz. The boast or cut at each frequency is 10db minimum. These Equalizers are used in the Left and Right channels. Figure 3 shows the Equalizer block diagram.

The input signal is buffered by a unity gain amplifier and applied to the four filter blocks. Each

filter block consists of four adjustable filter. The adjustments allow continuous settings from full boost to flat to full cut at its particular frequency. The four frequencies processed in each filter block are widely spaced in frequency to prevent interaction.

The output amplifier sums the four Filter Block outputs with the input signal and buffers the signal to the output. Thus, all frequency components of the input signal are present in the output, modified as necessary to equalize or "flatten" the auditorium frequency response.

The adjustments are made using a Pink Noise source as the input to the Equalizer Cards.)Pink Noise has equal noise at all frequencies in the audio spectrum.) The signal is applied via the power amplifiers to thw Left and Right speakers separately. The speaker output is monitored with a microphone connected to a Real Time Analyzer (RTA). The RTA indicates relative response at each frequency. The Equalizer settings are adjusted to remove response peaks and valleys at any frequency by either cutting on boosting that frequency trimmer potentiometer. Thus, the auditorium response can be adjusted to provide improved sound quality.

Surround Decoder

The CM-4000 Surround Decoder card processes the phase encoded surround channel information and derives the Left and Right Front channels and the Surround channel. All processing is done with linear circuitry and does not employ Sansui QS matrix processing. Figure 2 shows the

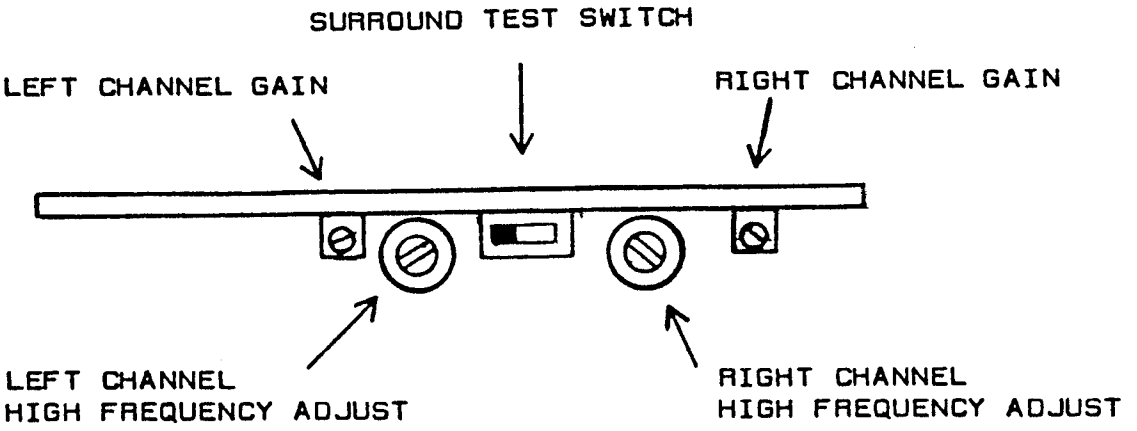
basic block diagram for the CM-4000 Surround Decoder.

The L_t and R_t signal inputs are the encoded left and right film sound tracks as sensed by the silicon photo cell and plifier by the pre-amps. The L_t and R_t signals are applied to input circuits that derive the Sum and Difference of the signals. The Sum and Difference signals pass through identical precision phase shift networks that derive two outputs each. The relative phase of the two outputs is 90^{o}.

The Decoder Matrix processes the four phase shifted outputs to derive Left, Right and Surround outputs. The Left and Right channel signals are buffered and outputs directed to the equalizer cards. The Decoder Matrix Surround channel has trim adjustments to produce a true "null" of (45db) when no Surround information is present in the film track. These trimmers are preset at the factory for best performance.

The Surround channel information will reach the listener sooner than the Left or Right channel sound because the Surround speakers are closer to the listener than the Left and Right speakers. Therefore, the CM-4000 Surround Decoder provides an adjustable time delay to compensate for these different sound path lengths. The adjustment allows proper compensation for all but the very largest auditoriums (1000 seats or more). The time delay output is a low pass filter, buffer amplified and is directed to the Fader Card, by means of the "Mono-Stereo/Surround" switch.

TOP VIEW



PRE AMPLIFIER MODULE CONTROLS

CM 4000 NOISE REDUCTION BLOCK DIAGRAM

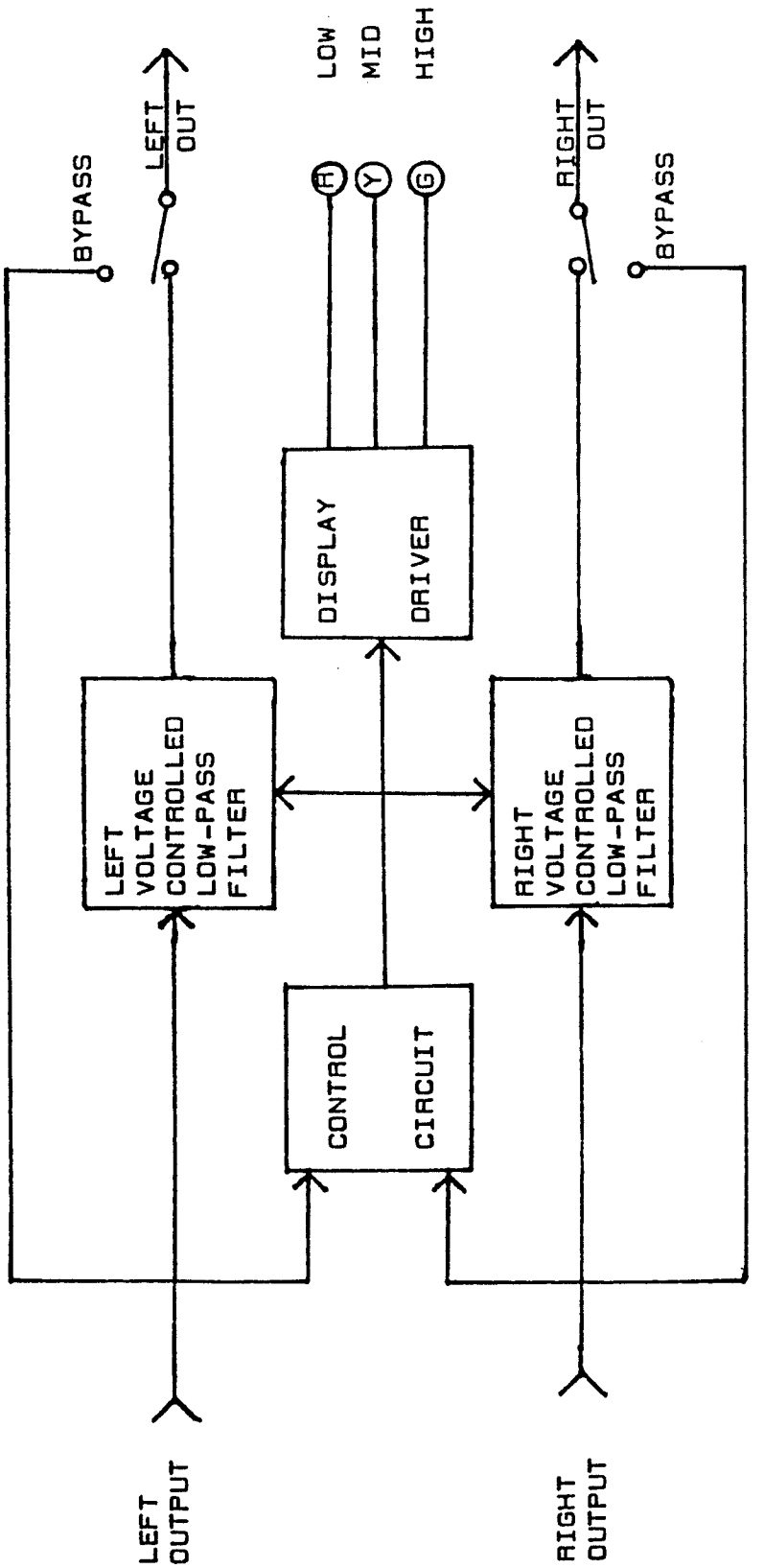
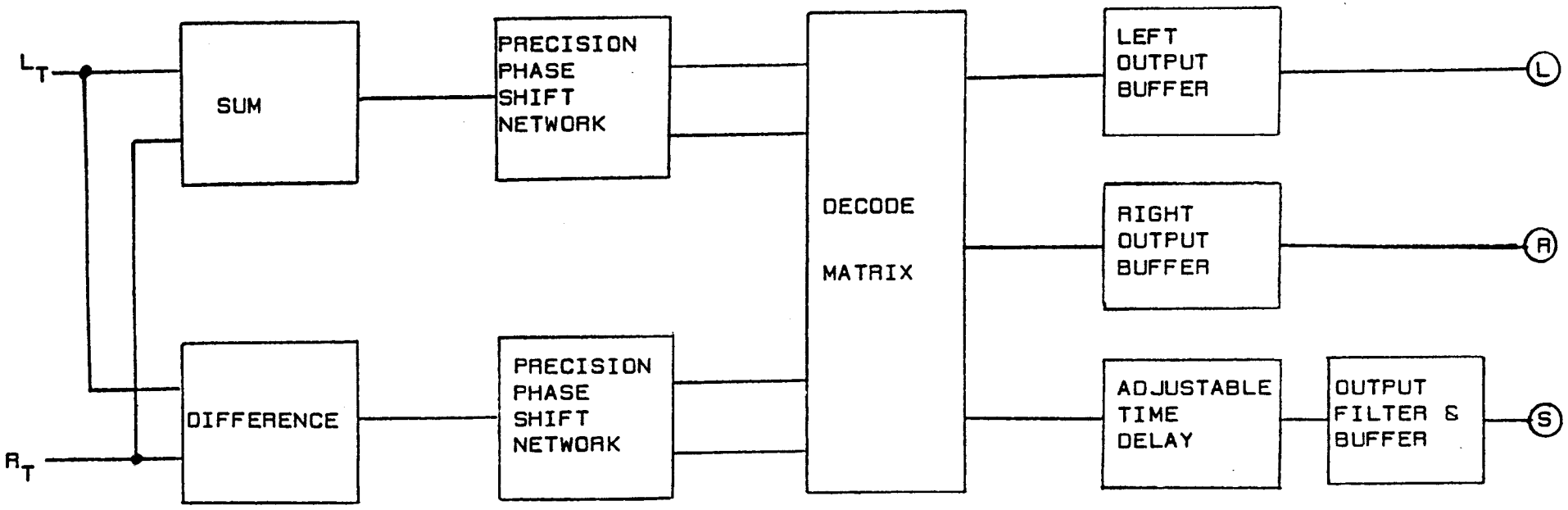
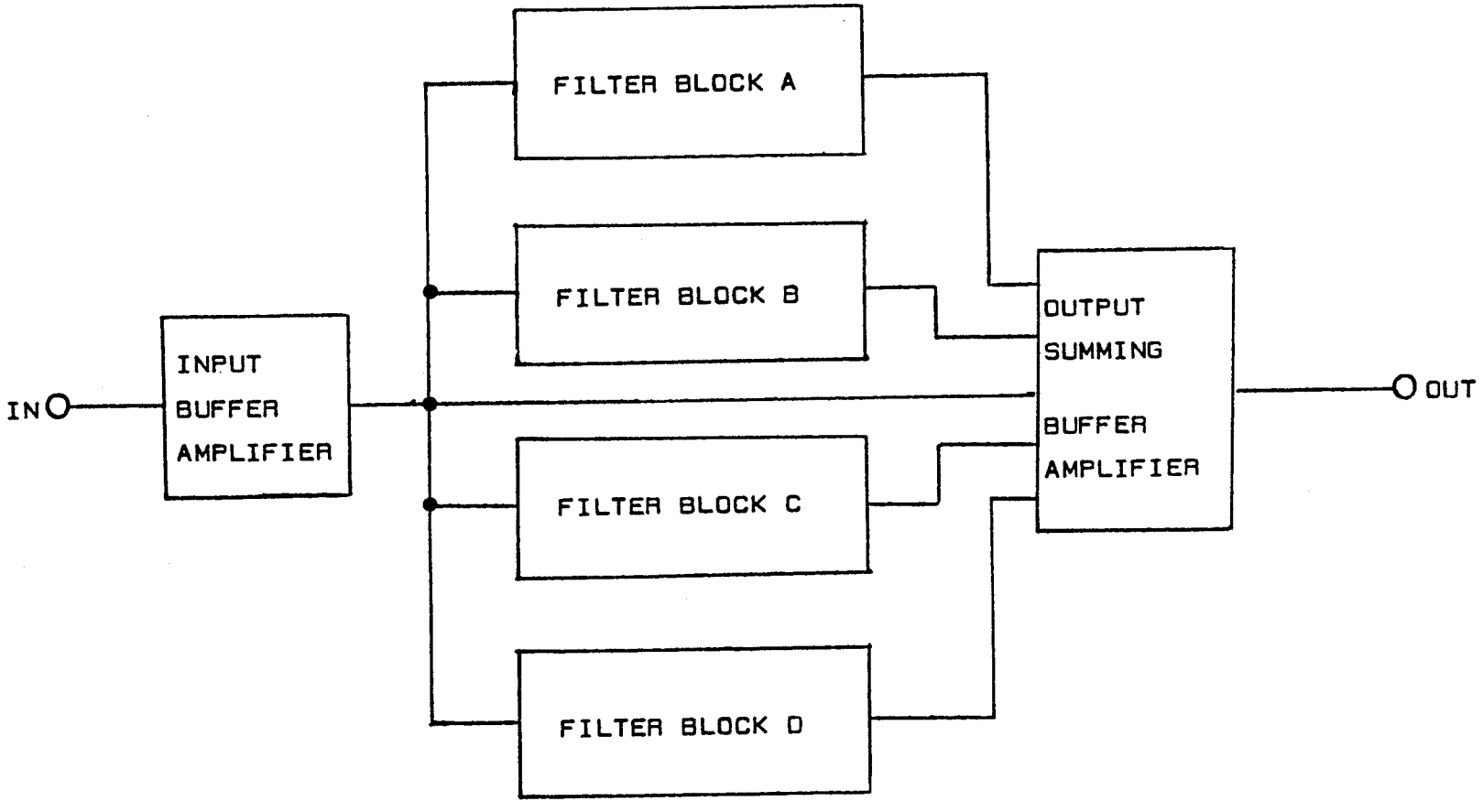


FIGURE 1



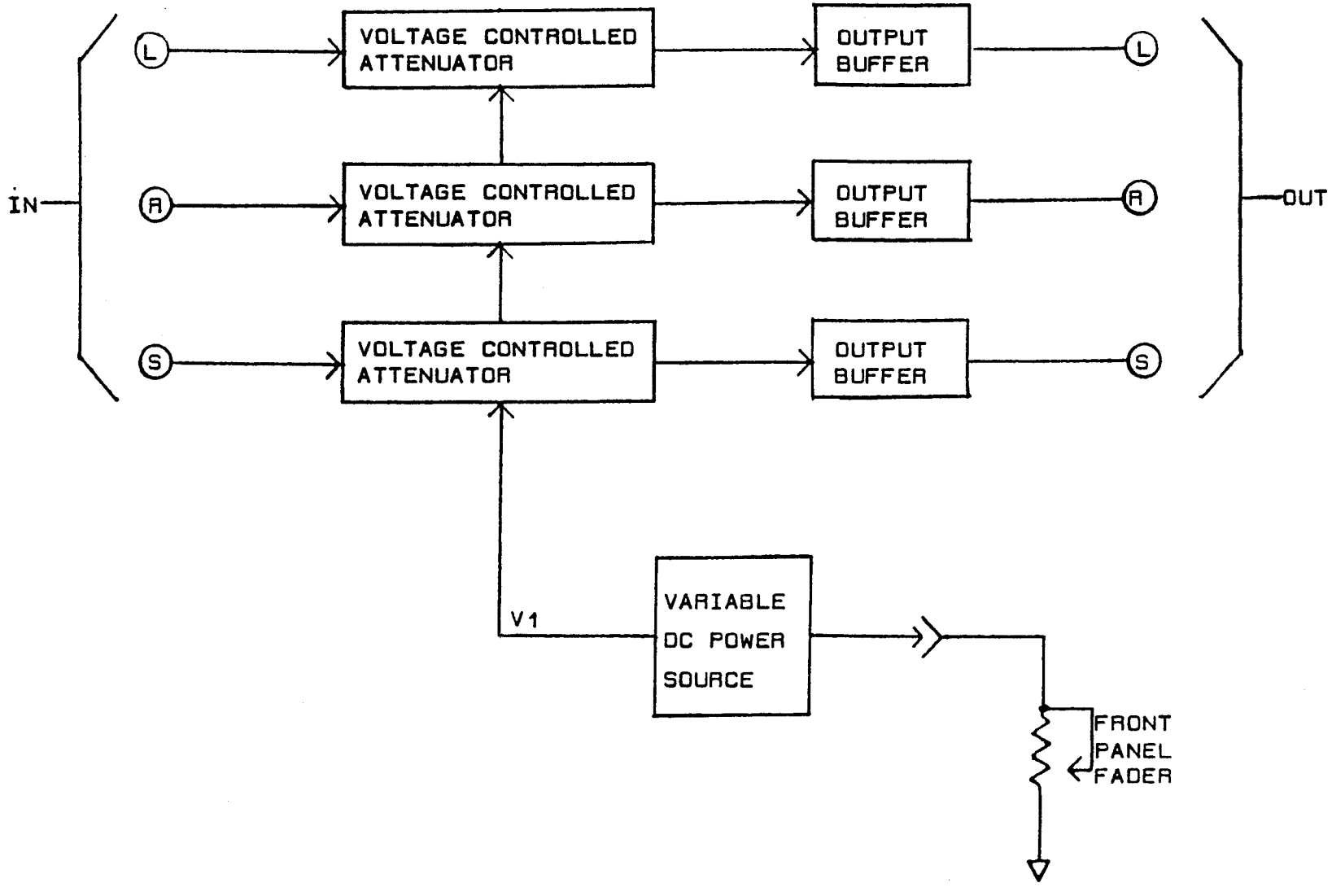
CM 4000 SURROUND DECODER BLOCK DIAGRAM

FIGURE 2



CM 4000 ONE HALF OCTIVE EQUALIZER BLOCK DIAGRAM

FIGURE 3



CM 4000 REMOTE FADER CARD BLOCK DIAGRAM

FIGURE 4

TROUBLE SHOOTING GUIDE

SOUND SYSTEMS

The first step in trouble shooting is to re-check the following items:

1. Input and output connections relative to installation wiring diagram.
2. Power input voltage is a minimum of 120 VAC at 60 HZ.
3. Operating and function switches in proper position. according to Start-Up Instructions in manual.
4. Resistance test mode with ohmmeter at TB-1 and TB-2 in accordance with installation instructions.
5. Audio line shields grounded at <u>one point only</u> which is at proper terminal at TB-2. Grounding the shield at other than TB-2 will cause <u>GROUND LOOPING</u>.
6. HI and LO side of audio input line <u>UNGROUNDED WITH AMPLIFIERS UNPLUGGED</u>.
7. Speaker lines not shorted to each other or to ground. <u>SPEAKER INPUT NOT GROUNDED.</u>

TROUBLE SHOOTING GUIDE

SOUND SYSTEMS

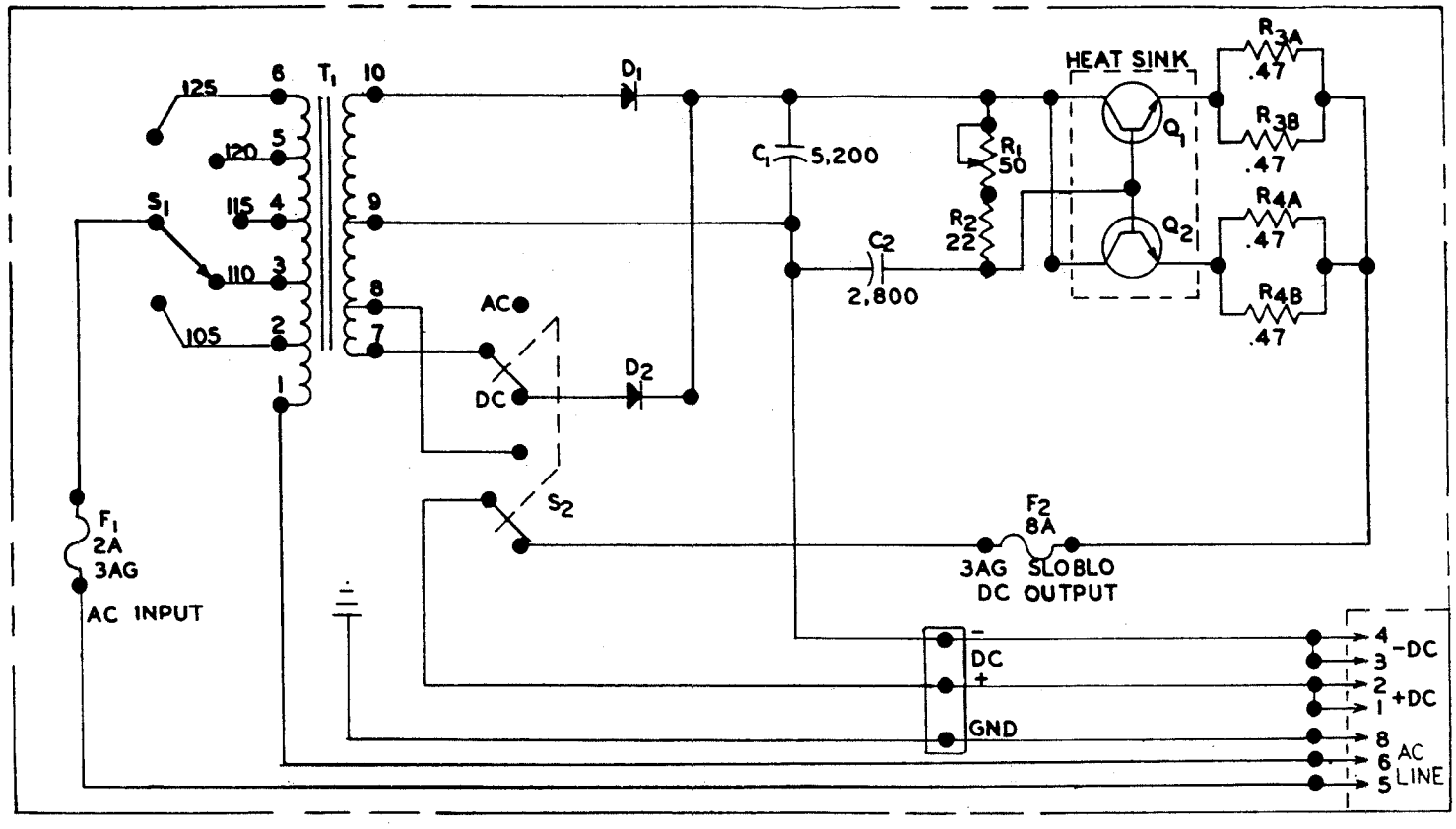
SYMPTOM	SERVICE PROCEEDURE
Pilot lights not on, monitor power amp or exciter	Check power input wires at TB-2 measure with AC volt meter at TB-1 for a MINIMUM of 120 VAC 60 HZ.
Exciter Lamp Supply not on	Check connectors and slide alignments, check fuse on panel and also at rear of ELS module check Switch position.
Exciter Lamp not on but supply is on	Check change-over switch either manual or automation. Measure ELS output with voltmeter at TB-2. Measure voltage at Exciter Lamp socket. Voltage at Exciter Lamp MUST BE 8.5V MINIMUM
No audio output Power Amp pilot lamp off. Monitor lamp on	Check power Amp switch position. Check fuse on power Amp panel. Replace only WITH RATED SIZE FUSE if blown. Check connectors and slide alignment.
No audio output Pilot lamp on. No monitor output Pilot lamp on.	Check audio function switch. Should be in sync on film position. Check input & output connector and slide alignment.

TROUBLE SHOOTING GUIDE

SOUND SYSTEMS

SYMPTON	SERVICE PROCEEDURE
	Check exciter lamp. Check audio wiring from solar cell to console cabinet T8-2.
No Theatre audio but good booth audio	Check speaker and connectors for shorts open or ground from T8-2
Low theatre volume with noise, booth and theatre	Check HI & LO audio connectors for reversal. Check for shorted or grounded audio leads or open LO side. Check Solar Cell alignment. Check Exciter Lamp voltage. MUST BE 8.5 MINIMUM
Theatre volume OK no monitor. Pilot light on or dim.	Remove Monitor Amp Module and substitute with another. Check Monitor speaker.

A	ORIG ISSUE 9/24/73
B	REVISED 6/27/74

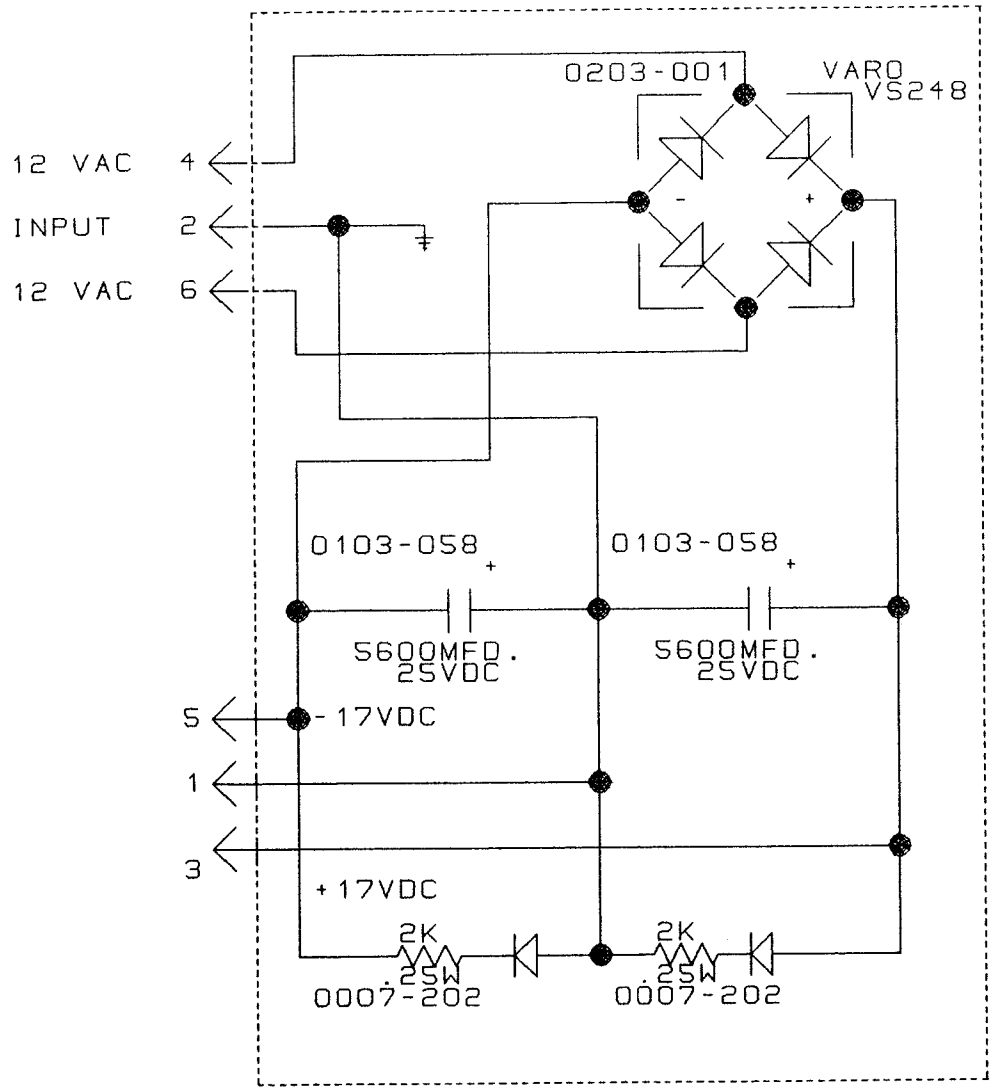


S_2

DC 8-9VDC @ 4A 105-125 VAC LINE

EMERGENCY AC 9VAC @ 4A 115VAC LINE

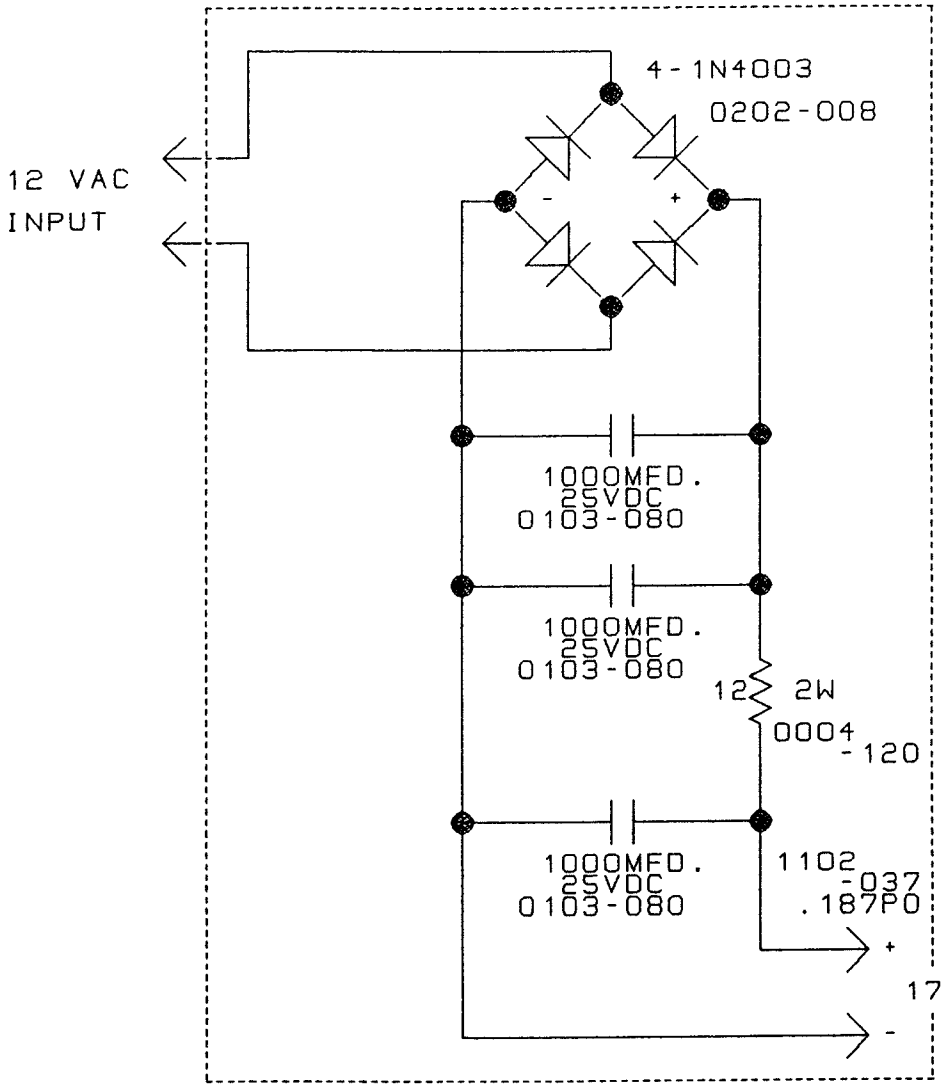
ELS 2301-002			
SCALE	APPROVED BY	DRAWN BY	
DATE 6-27-74		G.A. BARDEN	
EXCITER LAMP SUPPLY			
PAS 1000/1000A/1500		DRAWING NUMBER	



POWER SUPPLY BI-PLOAR
EXTERNAL XFMR. MODEL
12-0-12VAC IN, +18 -18 OUT

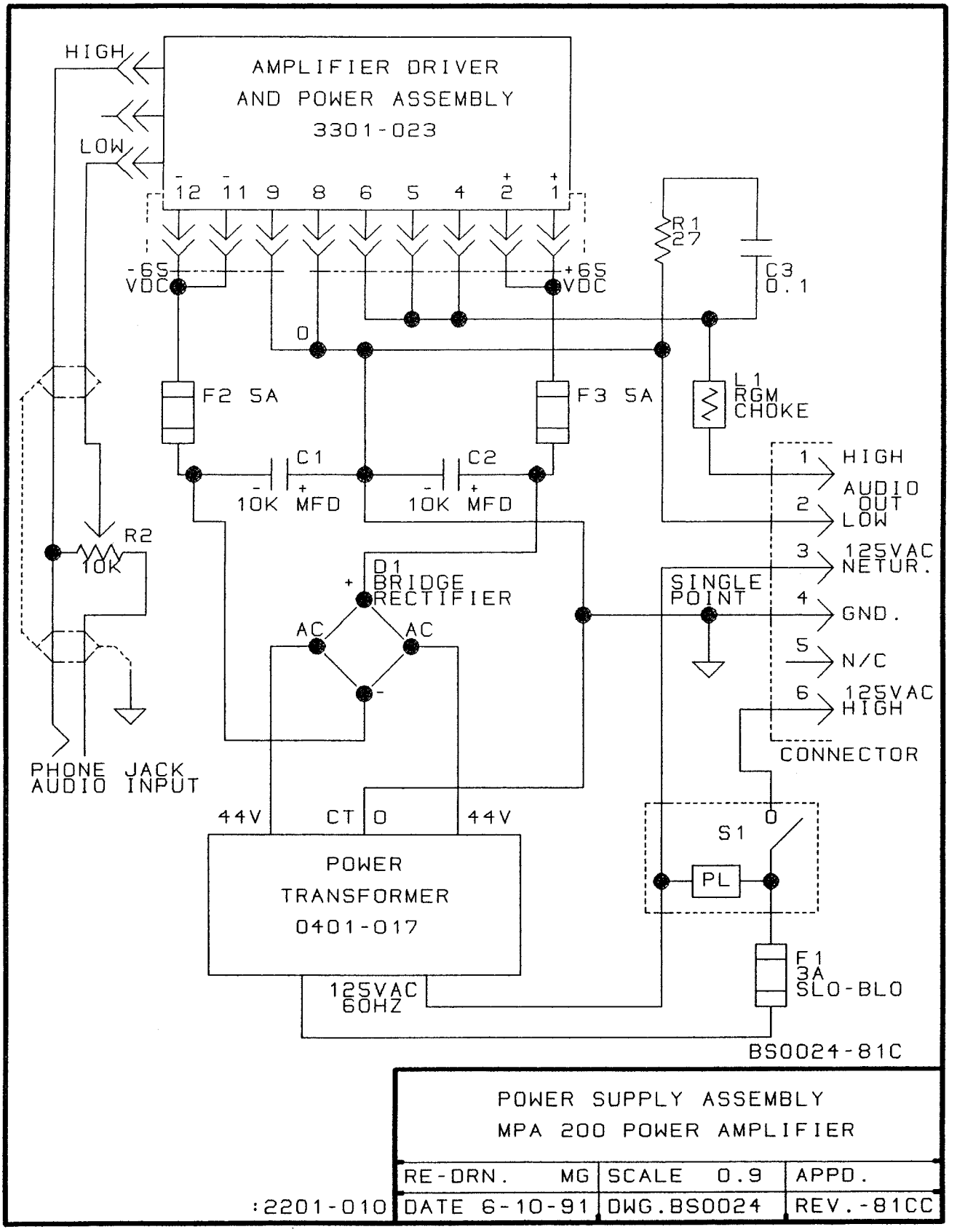
RGM Ind.	DRN. MG.	4/15/91
SCALE .95		REV

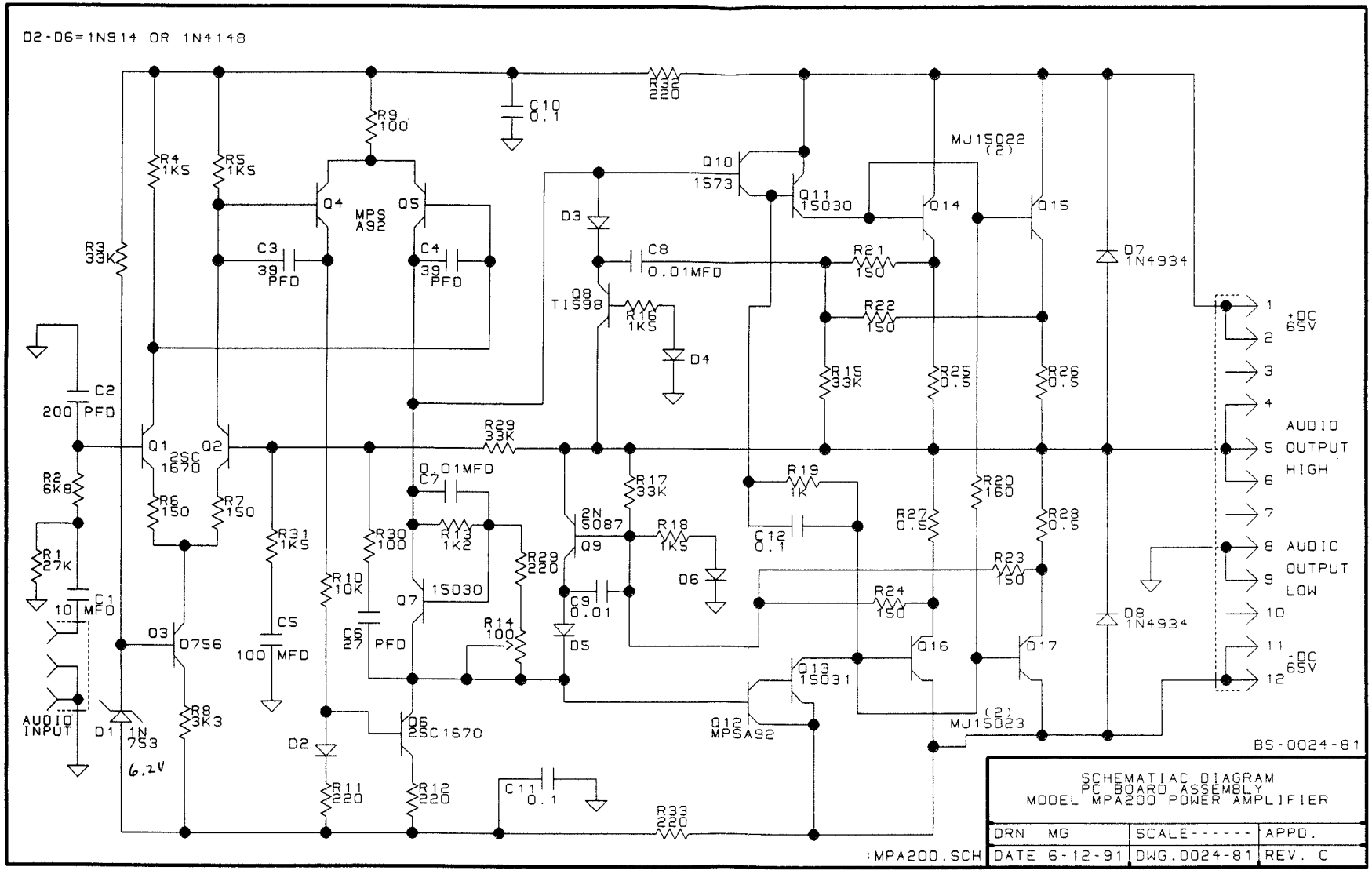
B:PS18-18L

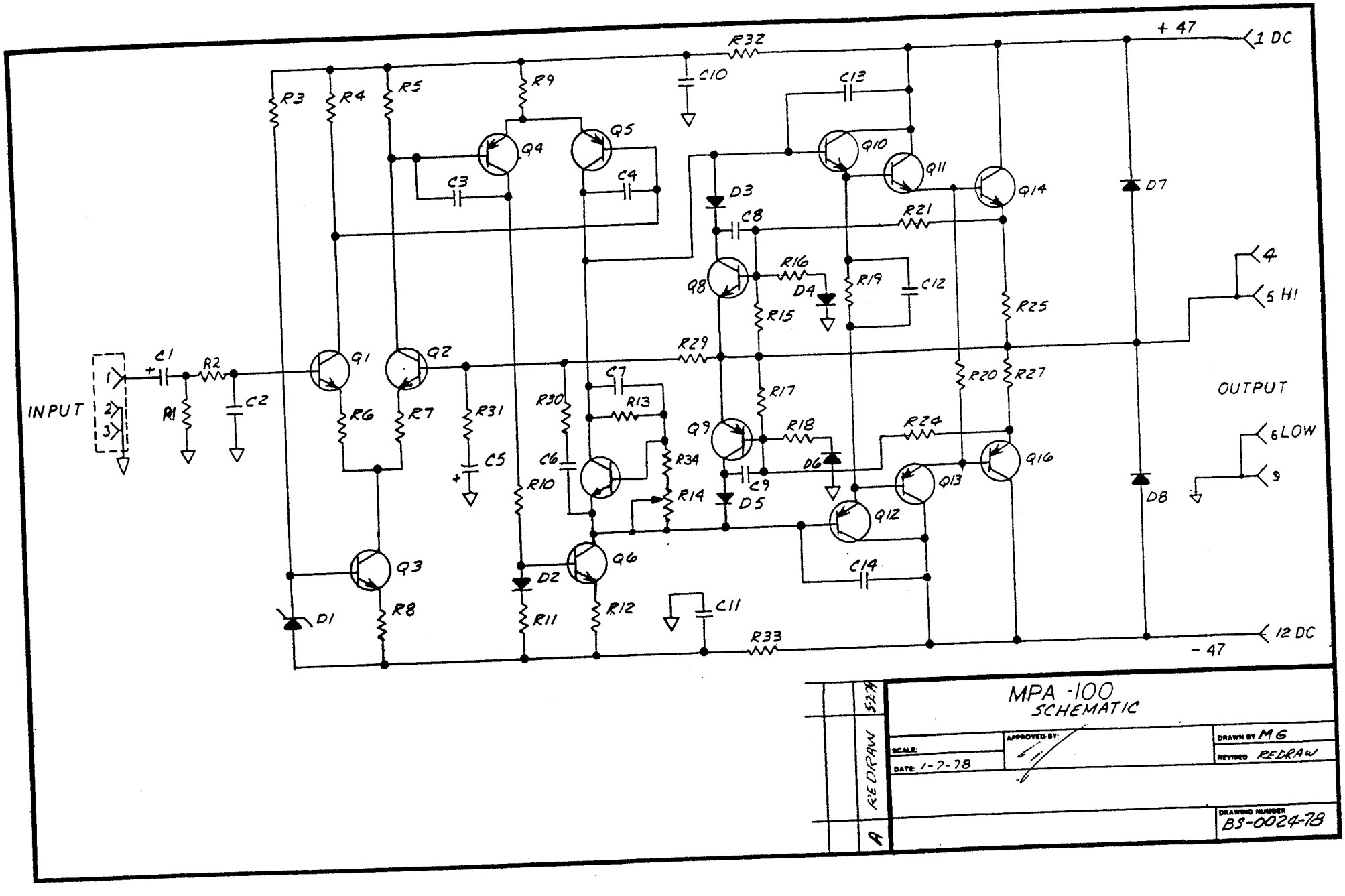


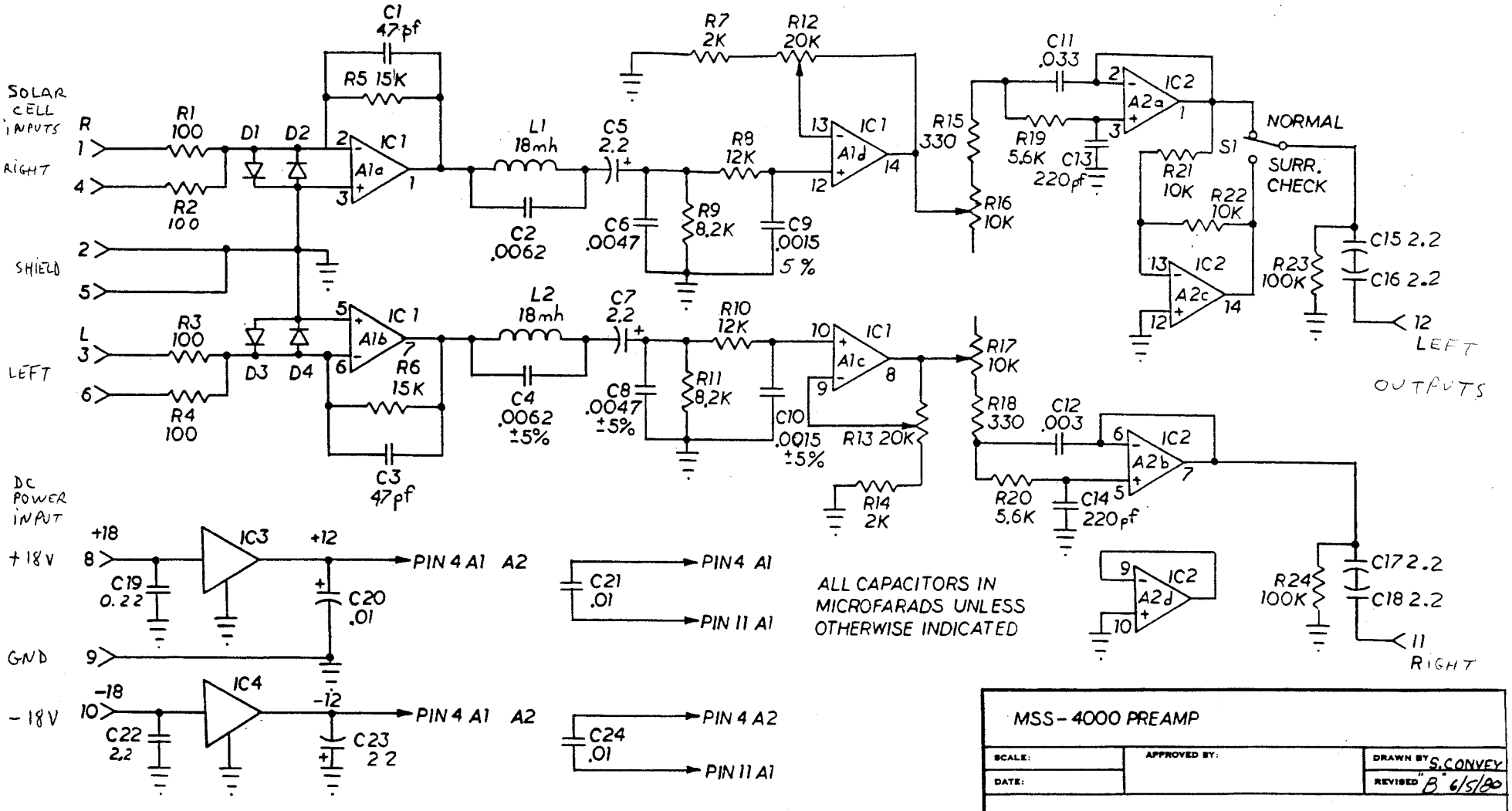
MONITOR AMP POWER SUPPLY
EXTERNAL XFMR. MODEL
12 VAC IN 17VDC OUT

RGM Ind.	DRN. MG.	4/10/90
B:2301-004L	SCALE .95	REV A

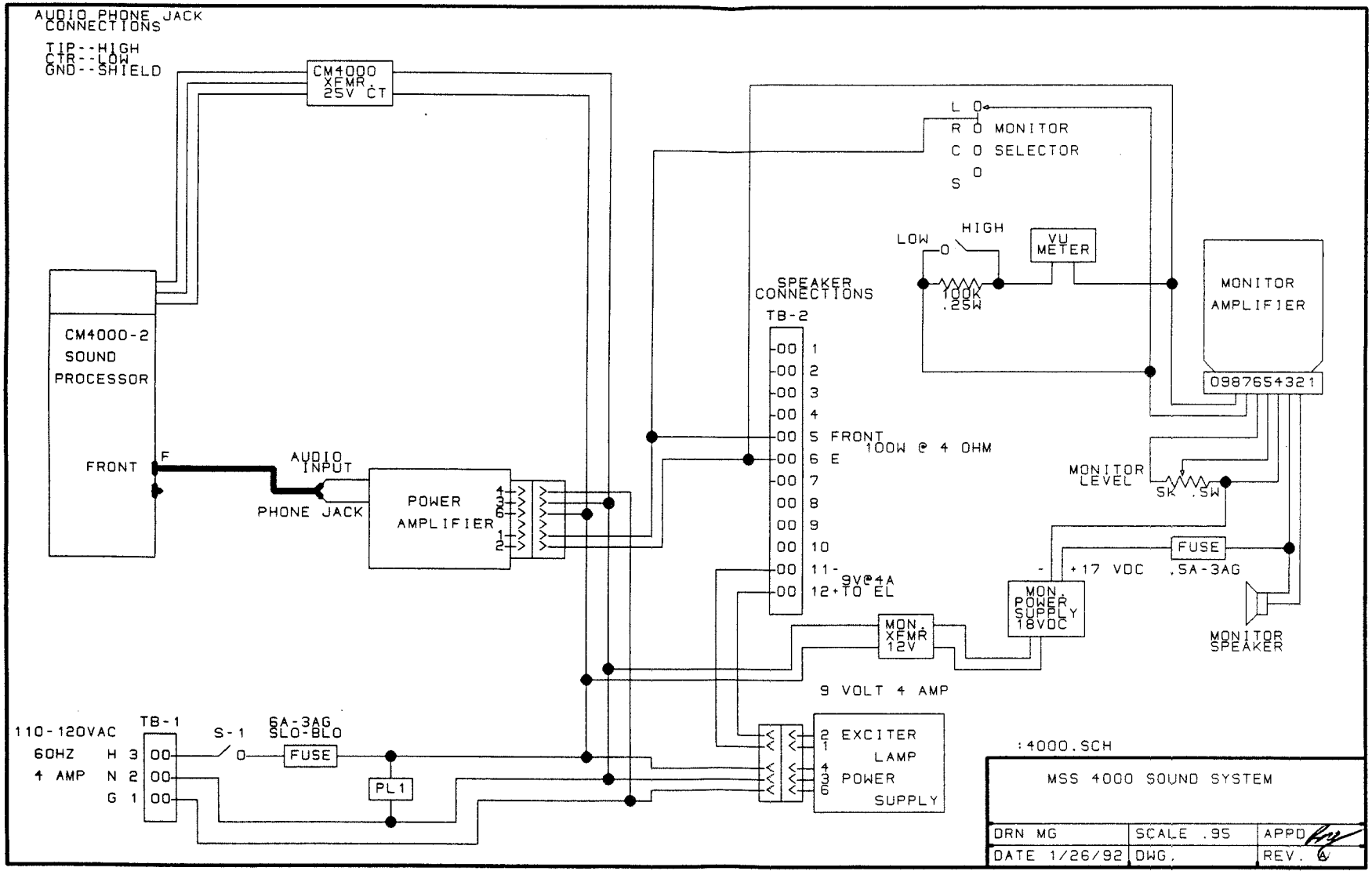

HIGH
LOW
AMPLIFIER DRIVER
AND POWER ASSEMBLY
3301-023
- 12
- 11
9
8
6
5
4
+ 2
+ 1
-65 VDC
+65 VDC
0
R1
27
C3
0.1
F2 5A
F3 5A
L1
RGM
CHOKE
C1
10K MFD
C2
10K MFD
R2
10K
D1
BRIDGE
RECTIFIER
AC
AC
+
-
SINGLE
POINT
1 HIGH
AUDIO
OUT
2 LOW
3 125VAC
NETUR.
4 GND.
5 N/C
6 125VAC
HIGH
CONNECTOR
PHONE JACK
AUDIO INPUT
44V
CT
0
44V
POWER
TRANSFORMER
0401-017
S1
PL
F1
3A
SLO-BLO
125VAC
60HZ
BS0024-81C
POWER SUPPLY ASSEMBLY
MPA 200 POWER AMPLIFIER
RE-DRN. MG
SCALE 0.9
APPD.
:2201-010
DATE 6-10-91
DWG.BS0024
REV.-81CC

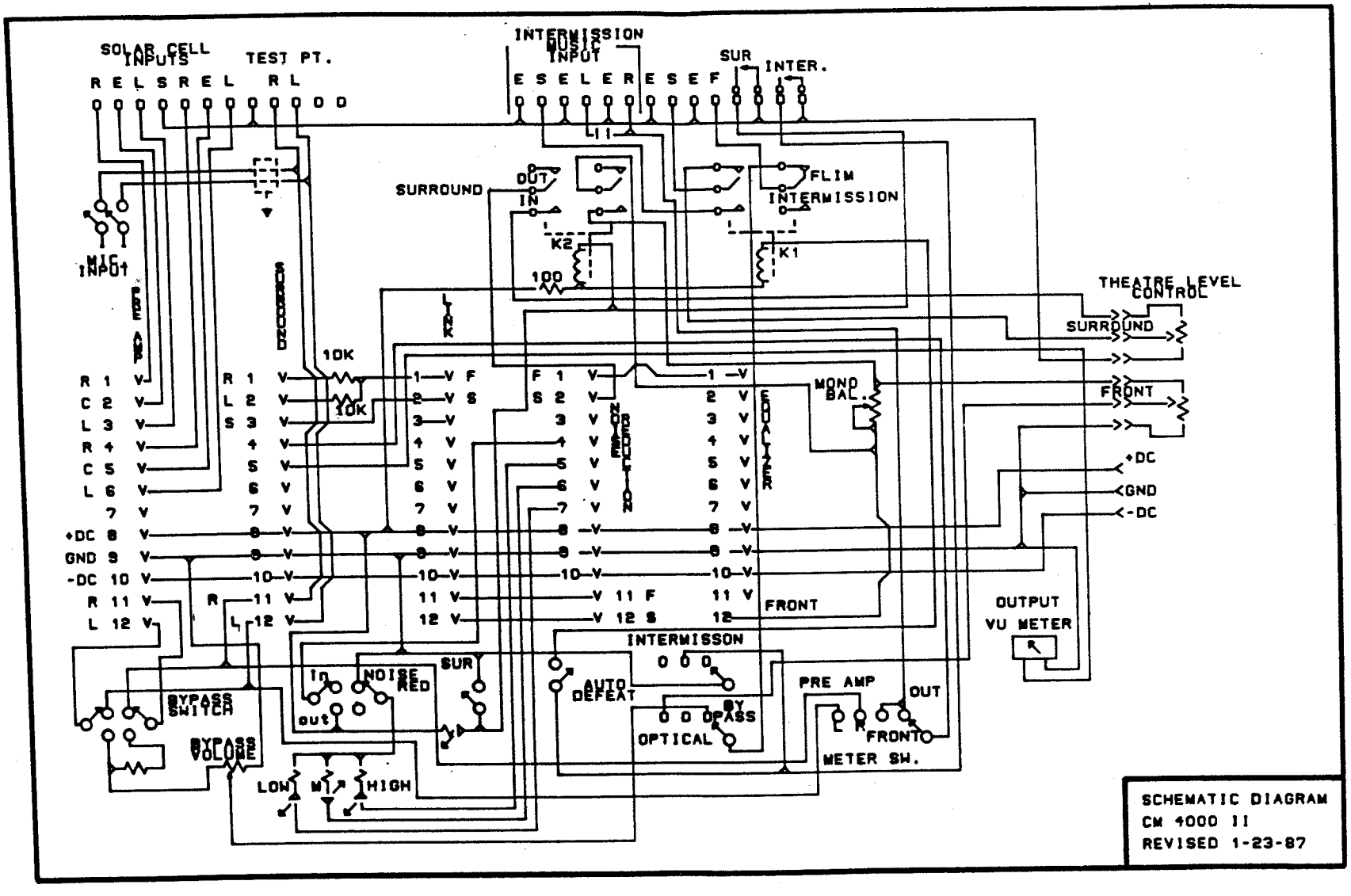

D2-D6=1N914 OR 1N4148
R9 100
C10 0.1
R32 220
MJ15022 (2)
Q10 1573
Q11 15030
Q14
Q15
R4 1K5
R5 1K5
Q4
MPS A92
Q5
D3
R3 33K
C3 39 PFD
C4 39 PFD
C8 0.01MFD
R21 150
D7 1N4934
Q8 TIS98
R16 1K5
R22 150
D4
+DC 65V
C2 200 PFD
R15 33K
R25 0.5
R26 0.5
Q1 2SC 1670
Q2
R29 33K
AUDIO OUTPUT HIGH
R2 6K8
C7 0.01MFD
R17 33K
R19 1K
R20 160
R6 150
R7 150
2N 5087
Q9
R18 1K5
C12 0.1
R27 0.5
R28 0.5
R31 1K5
R30 100
R13 1K2
R29 220
D6
R1 27K
C1 10 MFD
R10 10K
Q7 15030
C9 0.01
R24 150
R23 150
AUDIO OUTPUT LOW
C6 27 PFD
R14 100
D5
D8 1N4934
D3 D756
C5 100 MFD
Q16
Q17
Q13 15031
-DC 65V
AUDIO INPUT
D1 1N 753 6.2V
R8 3K3
Q6 2SC1670
Q12 MPSA92
(2) MJ15023
D2
R11 220
R12 220
C11 0.1
R33 220
BS-0024-81
SCHEMATIAC DIAGRAM
PC BOARD ASSEMBLY
MODEL MPA200 POWER AMPLIFIER
DRN MG
SCALE------
APPD.
DATE 6-12-91
DWG.0024-81
REV. C
:MPA200.SCH


+ 47
1 DC
R32
C10
C13
R3
R4
R5
R9
Q4
Q5
Q10
Q11
Q14
D7
C3
C4
D3
C8
R21
R16
D4
R19
C12
Q8
R15
R25
4
5 HI
R29
C1
R2
Q1
Q2
C7
R17
R20
R27
INPUT
1
2
3
R1
C2
R6
R7
R31
R30
R13
C5
C6
R34
Q9
R18
R24
OUTPUT
6 LOW
9
D6
Q16
Q13
R10
R14
D5
C9
D8
Q12
Q3
Q6
C14
D2
D1
R8
R11
R12
C11
R33
12 DC
- 47
MPA -100
SCHEMATIC
SCALE:
APPROVED BY:
DRAWN BY MG
DATE: 1-7-78
REVISED REDRAW
DRAWING NUMBER
BS-0024-78
A
REDRAW
5278



MSS-4000 PREAMP		
SCALE:	APPROVED BY:	DRAWN BY S. CONVEY
DATE:		REVISED "B" 6/5/80
		DRAWING NUMBER BS-0017-79A


AUDIO PHONE JACK CONNECTIONS
TIP--HIGH
CTR--LOW
GND--SHIELD
CM4000 XFMR. 25V CT
CM4000-2 SOUND PROCESSOR
FRONT
AUDIO INPUT
PHONE JACK
POWER AMPLIFIER
L
R
C
S
MONITOR SELECTOR
LOW
HIGH
100K .25W
VU METER
MONITOR AMPLIFIER
0987654321
SPEAKER CONNECTIONS
TB-2
1
2
3
4
5 FRONT 100W @ 4 OHM
6 E
7
8
9
10
11- 9V@4A
12+ TO EL
MONITOR LEVEL
5K .5W
FUSE
.5A-3AG
+17 VDC
MON. POWER SUPPLY 18VDC
MON. XFMR 12V
MONITOR SPEAKER
9 VOLT 4 AMP
110-120VAC
60HZ
4 AMP
TB-1
H 3
N 2
G 1
S-1
6A-3AG SLO-BLO
FUSE
PL1
2 EXCITER LAMP
4 POWER SUPPLY
6
:4000.SCH
MSS 4000 SOUND SYSTEM
DRN MG
SCALE .95
APPD
DATE 1/26/92
DWG.
REV. A


SOLAR CELL INPUTS
TEST PT.
INTERMISSION MUSIC INPUT
SUR INTER.
SURROUND
OUT
IN
FLIM INTERMISSION
K2
K1
100
MIC INPUT
LINK
10K
10K
THEATRE LEVEL CONTROL
SURROUND
FRONT
+DC
GND
-DC
MONO BAL.
ZONE REDUCTION
EQUALIZER
FRONT
OUTPUT VU METER
INTERMISSON
AUTO DEFEAT
OPTICAL
BYPASS
PRE AMP
OUT
FRONT
METER SW.
BYPASS SWITCH
BYPASS VOLUME
LOW
HIGH
NOISE RED
SUR
SCHEMATIC DIAGRAM
CM 4000 II
REVISED 1-23-87