Film-Tech

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INSTALLATION AND OPERATION MANUAL

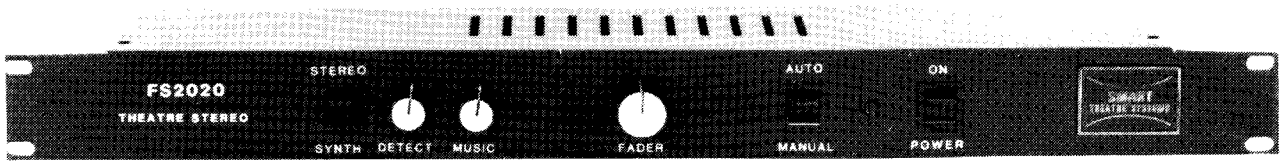
FS2020 FRONT-SURROUND PROCESSOR

SMART THEATRE SYSTEMS

SMART THEATRE SYSTEMS

3856 Green Industrial Way, Atlanta, GA 30341 (404) 452-1820

FS2020 DECODER



MADE IN U.S.A.

FRONT-SURROUND SVA STEREO DECODER AND STEREO GENERATOR

FEATURES

* SVA Optical Stereo Decoder
* Surround Generator for Monaural Films
* Two or Single Projector System
* Built-in Time Delay
* Stereo Non-sync Music Fade In Out
* All Adjustments on Rear
* Master Fader for Film
* Separate Music Level
* Easy Operation
* Adjustable Sensitivity Control
* Dynamic Noise Reduction Circuits
* Automation Capable
* Quality Engineered
* Simple Installation
* Electronic Soundtrack Cleaner
* Single or Dual Projector Operation
* 120 VAC or 240 VAC 50/60 Hz

The SMART FS2020 is a brand new decoder package that incorporates both SVA Stereo Optical circuitry with a surround generator specifically for Front-Surround Stereo theatre applications. Many long narrow theatre auditoriums cannot realize benefit from a full four channel stereo system and are more suitable for a Front-Surround system for the added excitement of a stereo effect. The SMART FS2020 is the first product to combine these desirable features into one low cost unit. The product can be used in new booth installations or added to existing mono systems. A split SVA solar cell, and extra amplifier channel, and surround speakers are all that is necessary. Some of the best design was borrowed from the SMART SR135 Stereo Decoder and the SG1100 Stereo Generator to create the FS2020. The exclusive SMART "Electronic Soundtrack Cleaner" is used in both Optical Stereo and Generator modes of operation to reduce film noise by greater than dB without affecting the fidelity of the soundtrack. Four solar cell preamplifiers are used for dual projector applications. Each preamplifier has its own calibration trim control. Front panel controls include the Master Fader, Music Level, Surround Detect, mode selection, manual or automation mode switch, and power. All circuit calibration controls are accessible from the rear of the chassis. A super quiet double delay is used in both the SVA and Generator modes of operation. The SMART FS2020 occupies only 1¾ inches of rackspace.

WIDE SCREEN STEREO

SMART THEATRE SYSTEMS

3856 Green Industrial Way, Atlanta, GA 30341 (404) 452-1820

FS2020 Front-Surround Stereo Decoder and Synthesizer

CRASH COURSE

For those installers who have installed this product before, here is a brief checklist of each step of hookup and adjustment. A detailed description is offered for each phase or option within this manual. If you have not installed this product before, we suggest you become familiar with the unit by reading this manual.

- Install into rack in a well ventilated place. Hook solar cells to input using only three conductor shielded audio cable. Make sure shield is not grounded at the projector end.

- Align the stereo solar cell.

- Connect each output to respective input of following piece of equipment (equalizer, amplifier, etc) using shielded audio cable.

- Hook the DIR (direct output) to the active booth monitor input (SMART EX510 or similar unit). See details of a dual channel booth monitor (SMART EX505)in this manual.

- Connect a CD or tape player to MUSIC INPUT terminals using shielded cable.

- Turn the house power amplifiers off before calibrating the decoder.

- Short one solar cell input to the neutral terminal and measure output of the DIRECT OUTPUT with an accurate meter. Raise the opposite preamp trim control until you read .5 volts AC while running Dolby™ Tone cat. 69 loop.

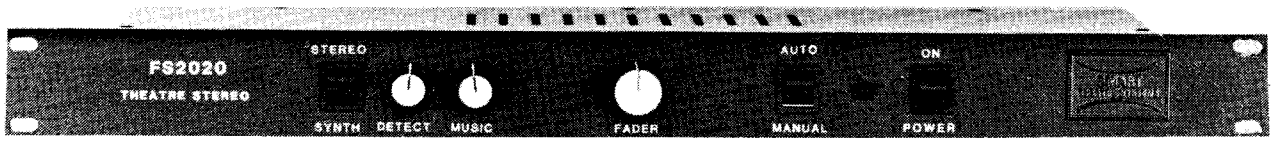
- Remove short on first solar cell input and short the other input to neutral. Adjust opposite preamp level pot until .5 volts AC is measured at the DIRECT OUTPUT terminal.

- Remove the shorting wire and move meter to the SURROUND OUTPUT terminal. Adjust either preamp level pot very slightly until you get the lowest possible reading on the meter on a sensitive meter scale.

- Turn on power amplifiers and set FS2020 master fader at 12 to 2 o'clock setting. Run pink noise side of cat. 69 loop. Set center channel stage speaker for 85 dB SPL. Use a Front-Surround test loop (Choo-Choo track) to set surround channel level in the auditorium.

- Switch MONO-STEREO-SYNTH panel switch to MONO (center position). The mono sound pressure level on the center stage speaker should drop from 85 dBA to 79 dBA.

- Place the AUTO-MANUAL switch in the MANUAL position and adjust the music level control on the front panel for proper playback level in the auditorium.



FS 2020 FRONT-SURROUND STEREO INSTALLATION INSTRUCTIONS

The FS2020 is a unique product that features a two projector Front-Surround Stereo Decoder and built-in surround generator for monaural soundtracks. The product achieves superior performance due to the use of premium low noise integrated circuits at the projector preamplifiers, and careful audio design. All adjustments are made from the rear of the unit while the product is installed into the system, and calibration is fast and easy for all modes of operation. Some other outstanding features include:

* Balanced projector inputs with high common mode rejection to minimize RF and EMI from local booth sources.

* All steel chassis with an external UL listed power supply that keeps hum radiation outside the sensitive high gain circuits.

* The same deluxe surround generator used in the popular SG1130B Stereo Generator.

* Stereo intermission music (non-sync) fade-in and fade-out. May be remotely actuated by automation equipment.

* Monaural "modified academy" curve for trailers, shorts, promos, etc. where the stereo generator feature is not desired.

* Easy calibration using standard test equipment.

* Adjustable time delay for the surround channel of the SVA stereo and Stereo generator.

* Clean panel layout for operator convenience.

* Premium components used throughout.

The Stereo Generator SURROUND MODULE contains the sensing circuitry that detects special effects on the monaural soundtrack. It also contains a logic system that "votes" between dialog and effects on the soundtrack. The sensitivity of the logic system is controlled by the front panel REAR DETECT knob. A setting must be found that *rejects dialog*, but allows the effects to pass to the surround channel. Remember that the FS2020 utilizes an *EFFECTS type* surround channel that is *only on* during special dramatic effects in the film. This feature is different than an "ambience" surround channel used on other brands of Stereo Synthesizers. Here is a "truth table" that will help you understand the conditions that allow the surround to turn on.

SOUNDTRACK AUDIO	MODE
Voice	OFF
Soft Music	OFF
Effects	ON
Soft Effect and Voice	OFF
Loud Effects and Voice	ON
Loud Music	ON

The SURROUND MODULE also contains a VCA (voltage controlled amplifier) circuit that quickly fades the surround material IN and OUT, instead of "chopping" on and off. The Surround Channel time delay aids in masking any "bleed through" from front channel material.

PRELIMINARY INSTALLATION INSTRUCTIONS

Mount the FS2020 in the equipment rack away from heavy hum producing and heat generating components. It is recommended that the operator panel be placed at eye level so that the controls can be easily identified in a dimly lit booth. Make sure that all cable connections are properly dressed. Projector input leads should enter from the left side of the chassis (rear view), and audio output lines, control lines, and high level music input lines from the right side of the chassis. NEVER lace or tie wrap high level and low level lines together. Supersonic oscillation can easily occur that will introduce distortion or output clipping into the decoder.

POWER PACK. The AC power pack should be plugged into a convenient outlet in the equipment rack and wired to the POWER terminals on the rear barrier strip. Since the output of the power pack is AC, it does not require polarization. Either lead may be connected to either terminal. The power pack has a nominal output voltage of 20 VAC at 500ma.

INPUT WIRING. The FS2020 uses an exciter changeover scheme for two projector operation. Even though it does not matter which projector is wired to either set of projector inputs, it is less confusing to follow convention so that the adjusting controls coincide with the labeled input terminals. If the installation is in a single projector booth, wire only to the projector one input set of terminals. It is good practice to short the projector two input terminals (L)eft and (R)ight to the (N)eutral terminal. DO NOT SHORT THESE TERMINALS TO THE GROUND TERMINAL!

SOLAR CELL HOOKUP. Connect the wire from the left solar cell(red) to the (L)eft input terminal of the FS2020. Connect the wire from the right solar cell(green) to the (R)ight input terminal. The neutral solar cell lead (black) should be connected to the (N)eutral input terminal, and the shield of the cable to the (G)round terminal. Be sure to *cut off the shield at the projector end* so that a ground loop is not created. Only the FS2020 end of the shielded cable should be connected.

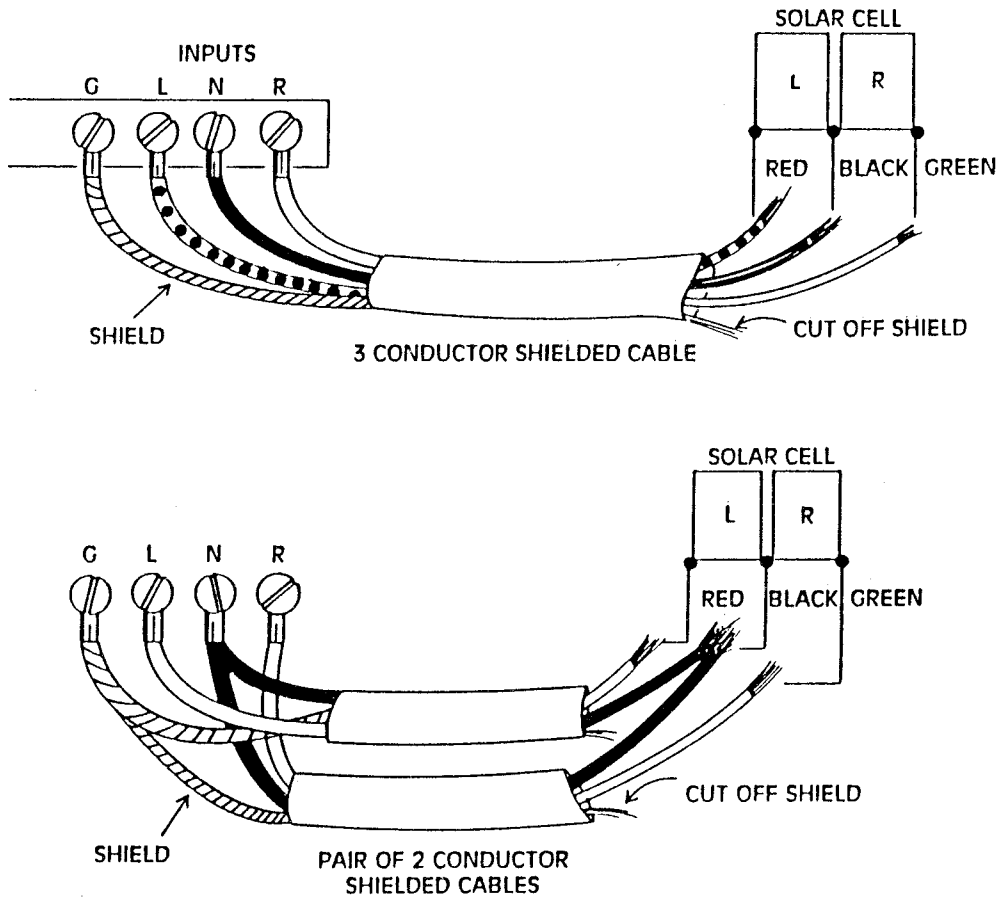


Fig. 1

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 film left or right channel in either front or surround channels. This is a common error, so verify correct wiring before proceeding.

OUTPUT CONNECTIONS. The respective outputs of the two channel decoder are labeled **C OUT** (front output) and **S OUT** (surround output). Shielded wires connected to each of these output terminals are connected to the proper inputs of two power amplifiers. A convenient (G)round terminal between the output terminals may be used for one or more cable shield connections. The output level of these terminals is affected by the setting of the master fader.

DIRECT OUTPUT. The output terminal labeled "DIR"(direct) is used to feed an active booth monitor system the audio signal from the FRONT channel. It contains the sum of the signals that appear on the film soundtrack less the surround information. This separate output is not affected by the setting of the master fader, and remains constant. You may connect an active monaural booth monitor to this terminal for monitoring the film soundtrack. The monitor must contain it's own amplifier. However, the intermission music *does not appear at this output,* as it does on the main outputs. The DIR terminal is used as a calibration test point in setting the correct operating levels of the FS2020.

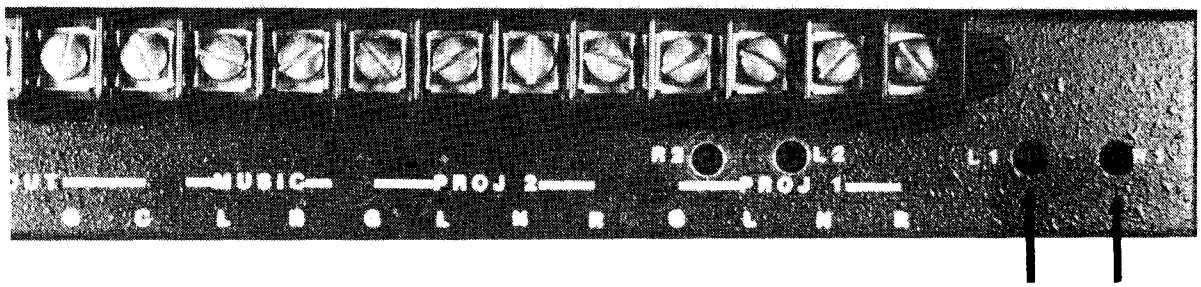
BOOTH MONITOR HOOKUP. The DIR (direct) output signal terminal on the barrier strip at rear of the chassis is an ideal signal to feed a single channel active booth monitor (a monitor that contains its own amplifier). This signal contains the sum of the Left, Center, and Right soundtrack channels from the film. In a Front-Surround system you may wish to monitor the Front signals and also monitor the Surround channel signal separately. The SMART EX505 Monitor-Exciter Supply has two audio inputs and a selector switch on the front panel of the product to select either the Front or Surround channel. Normally the selector switch is left in the Front position. If a two channel monitor is used, the DIR terminal is not used to feed the monitor because it has a fixed output level for the Front signal ONLY. The surround channel could only be fed from the MAIN SURROUND output terminal. The surround channel signal would then vary as the MASTER FADER is changed from one setting to another. It is better idea to feed the two channel monitor from the **C OUT** output terminal and the **S OUT** output terminal so that both channels track together. Refer to the EX505 installation and instruction manual for further details.

An audio selector switch can be added to a single channel active booth monitor to select the Front or Surround channel audio. Refer to the manufacturer's schematic diagram for possible modifications to allow a switch to be added.

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

MUSIC INPUT PADS. There are two fixed input attenuators that set the gain range of the stereo music inputs. This is necessary because of the wide range of tape players that are available on the market. Some may have a very high output level, while others are medium output. To avoid overdriving the inputs to the FS2020 music inputs, the product is shipped with the internal "shunt" tabs in the high level position. This will accommodate most high level players without the risk of overdrive distortion and crosstalk to the film channel. The front panel MUSIC LEVEL control should run between 2 o'clock and 4 o'clock for normal operation. This gives the operator some working range if he wishes to adjust for minor tape recording variations. If the tape player used does not have sufficient output capability to drive the music inputs, remove the top chassis cover and move the two "shunts" to the LOW position. This will add 12 dB of gain to each music input channel. Again, the MUSIC LEVEL panel control should operate in the 2 to 4 o'clock position for minimum crosstalk to the film channel. Shunts are moved to the center and rear pins of the headers on the printed circuit board to activate the low setting.

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



Use the tuning wand to set levels

ADJUSTMENT AND CALIBRATION PROCEDURES

The setup and adjustment to the FS2020 is simple and straight forward. An accurate service meter or scope is all that is needed to calibrate the product. However, before any adjustments can be made, you must make sure the split stereo solar cell is perfectly aligned in order for the decoder to properly process the stereo soundtrack. To align the solar cell:

1. Turn off all power amplifiers that are connected to the outputs of the FS2020. Open the master fader to its maximum position.

2. Connect one probe of your dual trace scopeto the left projector solar cell input of the FS2020. Connect the scope ground clip to the nearby neutral solar cell terminal.

3. Connect the other probe lead to the right solar cell input terminal of the FS2020. Connect the other scope clip to the neutral terminal.

4. Run a LEFT-RIGHT test loop on the projector and adjust the scope for a proper display on both channels. Adjust the solar cell for minimum crosstalk on each channel.

5. Run a pink noise loop or 9KHz loop to set the azimuth and focus of the sound lens while monitoring with an X-Y setting on the scope. These settings are critical to good high frequency response and crosstalk rejection on the surround channel. Focus affects response and azimuth affects the amount of crosstalk on the surround channel.

NOTE: You may not measure the exact same level from each half of the split solar cell due to minor sensitivity differences in the solar cell sections. Ignore these differences during this phase of installation. Balancing can be accomplished in the later stages of installation.

6. Replace the Left-Right alignment loop with the Dolby cat. 69 reference level loop. Move the probe of your meter or scope to the **DIRECT** output of the FS202 and monitor the level while adjusting the input trim controls for each preamplifier. Here is the procedure:

A. Temporarily short one solar cell input with a short piece of wire from the (L)eft solar cell input to the (N)eutral terminal.

B. Adjust the Right preamplifier trim control (located on the rear of th chassis until you read .5 volts RMS output on your meter. If you use an oscilloscope to measure AC voltage, remember that a scope reads peak-to-peak voltage. The scope should read 1.4 volts peak-to-peak in order to equal 0.5 volts RMS on a meter.

C. Move the temporary short from the (L)eft solar cell to the (R)ight solar cell. (between right and neutral).

D. Adjust the Left preamplifier trim control until you read .5 volts on the DIRECT output.

E. Move your meter probe to the surround output terminal. Remove the shorting wire on the solar cell inputs. Slowly adjust either the left or right preamplifier input trim controls until you observe the lowest possible reading on your meter. This is the null setting which controls the crosstalk between the center stage channel and surround.

F. Lower the master fader setting from its maximum setting to about mid-scale (2 o'clock).

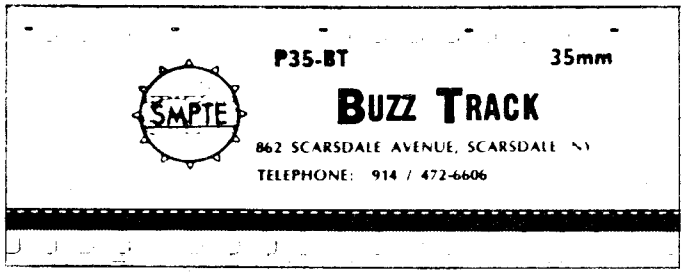
This completes the set up of the stereo film system in the FS2020. the next step is to balance the auditorium levels, mono level, and time delay setting.

AUDITORIUM LEVEL. With the Master Fader set at 2 o'clock position, run the pink noise side of the Cat.69 test loop. Turn all level controls on the individual power amplifiers to their minimum setting and apply AC power to the amps. Raise the level of the CENTER power amplifier until 85 dBA is present at the rear of the auditorium. If you don't have a sound pressure meter for these measurements, adjust for normal listening level. Now *short the LEFT or RIGHT solar cell lead* to (N)eutral at the input of the FS2020. Adjust the SURROUND channel power amplifier level for 85 dBA in the room. Remove the short on the solar cell terminals. Replace the film you were using for the time delay test with a Front-surround test loop (choo-choo track) Dolby™ Cat. 151. The sound of this track will quickly alternate between the center channel and the surround channel. Adjust the surround channel power amplifier for equal sound pressure from the front stage speaker and the surround speakers.

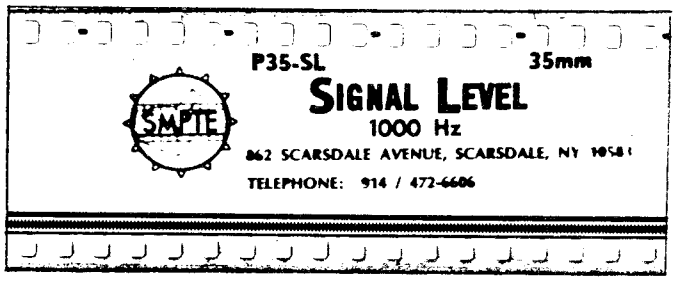
STANDARD 35MM TEST FILMS

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

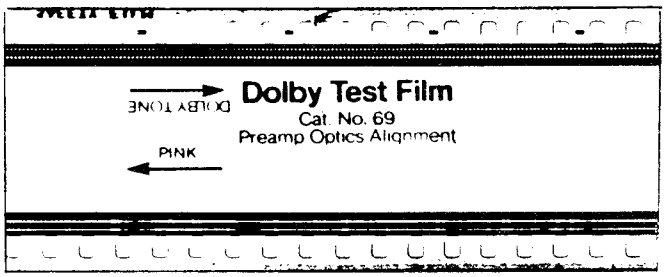
Loops may be made by wrapping and splicing a length of test film so that it forms a circle. Generally 5 feet is more than enough. The test "loop" is threaded only through the optical sound head components. Threading procedures will vary among different brands of sound heads.



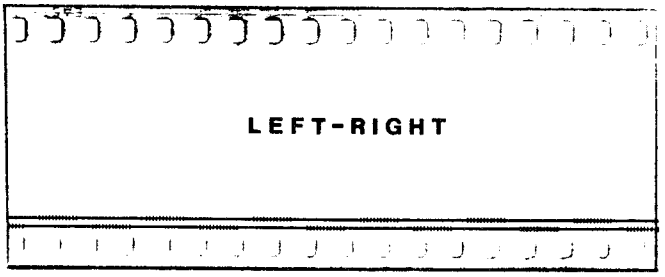
BUZZ TRACK. Is Used to set the lateral position of the "idler" or sound impedance drum. As the adjusting screw is turned a high frequency sound is heard, or a low buzz. Adjust the drum until your are between the two tones, and no sound is heard.



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



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



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

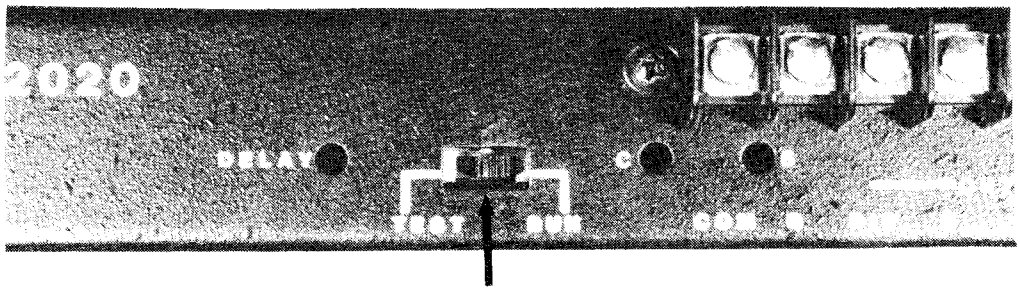
Many other special test films are available for sound system alignment.

MONAURAL LEVEL. Switch the front panel STEREO-MONO-SYNTH switch to the MONO position. While a pink noise loop is running, measure the sound pressure level in the auditorium. It should drop from 85 dBA to 79 dBA. A fixed 6 db attenuator in the FS2020 decreases the signal level to compensate for the louder recording practice with monaural soundtracks. This completes the mono and stereo speaker balance and level adjustments.

SURROUND CHANNEL ADJUSTMENTS. The surround channel speakers must be adjusted for level and time delay. Short *either* solar cell input lead to the neutral terminal. This will force the surround channel to full output. Using any available soundtrack (feature, trailers, short subject, etc.) adjust the time delay for a proper setting when standing ⅔rds of the length of the auditorium from the screen. The time delay control on the rear of the chassis increases the delay with a clockwise rotation of the control. A point will be reached where the sound from the center stage speaker and the sound from the surround speakers will be "synchronized". Adjust the control a little farther to increase the delay about 10 milliseconds greater. This is the correct setting. The operating range of the built in time delay circuit in the FS2020 is from 30 milliseconds to 105 milliseconds.

SURROUND DETECT SENSITIVITY. The front panel control labeled REAR DETECT allows the operator to adjust for minor differences in print soundtrack recordings. Fully counterclockwise rotation of the control turns the surround systems OFF. As the pot is rotated clockwise, more and more material is allowed to appear on the surround system. The sensitivity of the detection circuitry should be set so that special effects "trigger" the surround system. If dialog appears, decrease the sensitivity slightly until the dialog disappears. Refer to the logic "truth table" at the front of this manual for clarification of what material may appear on the surround channel. We have found that a control setting of around 12 o'clock seems normal for most soundtracks. We suggest that the operator monitor the surround channel during the first showing of a new feature to assure a proper setting. Heavy limiting and distortion on trailers or snipes may cause erratic action of the surround. The operator is advised to *turn the surround off* by rotating the REAR DETECT control to the fully counter-clockwise position.

TEST SWITCH. The TEST switch on the rear of the chassisallows the SURROUND GENERATOR to be forced on at all times. This may be convenient if you are setting house levels while in the SYNTH mode of operation, or want to verify the proper time delay setting while playing a monaural film. The switch *must be left in the RUN position when testing is completed.*



Return to RUN position after setup

FINAL CHECKOUT. It's now showtime! Place a reel of feature film stereo optical material on the projector and evaluate your work. Pay particular attention to any crosstalk that appears on the surround channel. The small amount that may appear could be due to projector "skew" caused by lateral play in the soundhead mechanism. Normally the time delay on the surround channel will mask the crosstalk so that the audience is not aware of it.

During soundtrack passages of dialog, the sound should be reproduced through the center stage speaker ONLY. When music or effects appear on the track, the Surround channel will instantaneously respond providing a very pleasant stereo effect.

BIG TIP. We recommend that the projector soundhead has a .5 mil (or smaller) slit in the optical sound lens for extended high frequency response. No slit correction circuitry is used in the FS2020.

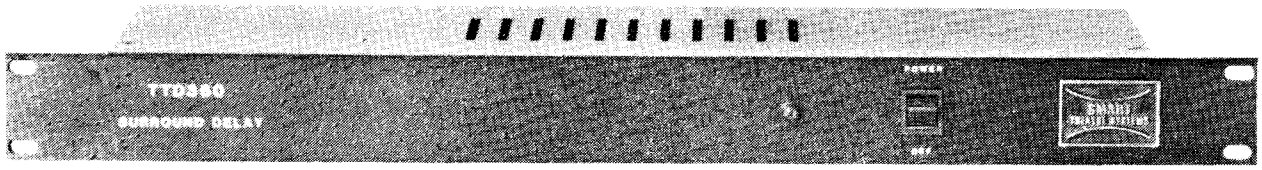
HOUSE EQUALIZATION. The performance of the FS2020 can be improved with the addition of the EQ600 three channel Theatre Equalizer. This product follows the FS2020 and shapes the room response of the house by removing large "lumps" in the room-speaker system response. Also, the soundtrack playback can be "sweetened" for a more pleasant overall sound quality. Refer to the EQ600 equipment manual for a complete description of features and capabilities. Only two of the three channels are used for a Front-Surround system.

DON'T TOUCH! Inside the FS2020 chassis there are four upright pots on the main P.C. card that are factory adjusted for maximum common mode rejection of RF and extraneous noise at the inputs of the balanced solar cell preamplifier. Changing these settings will degrade the performance of the circuit. Also, two pots associated with the time delay section are factory adjusted for optimum bias to the MN3005 time delay chips. These pots are set for the individual characteristics of each chip and should not be touched unless a chip has been replaced.

ADDITIONAL COMMENTS

SPLIT SURROUND. Very long, narrow theatres and large motion picture palaces have a special problem setting the time delay properly because of the extreme distance from the rear seats and the screen. If the time delay of the surround channel is set to accommodate listeners in the rear of the house, the listeners in the center of the auditorium will hear an echo due to the long delay setting. Likewise, if the time delay setting is set for the middle of the seating area, the listeners in the rear will hear crosstalk in the surround speakers because of insufficient delay "masking".

This problem can be corrected by using a second time delay following the built-in time delay in the FS2020. Set the FS2020 for proper delay in the center of the auditorium. Feed the input of another time delay product from the output terminals of the FS2020. Adjust the second delay to accommodate the rear seats. Check for proper playback level through each system with a "choo-choo" test loop. This method requires another surround channel power amplifier and separate wiring to the second group of speakers. An ideal product for this application is the SMART TTD360 Time Delay.



SMART TTD360 used as a second delay

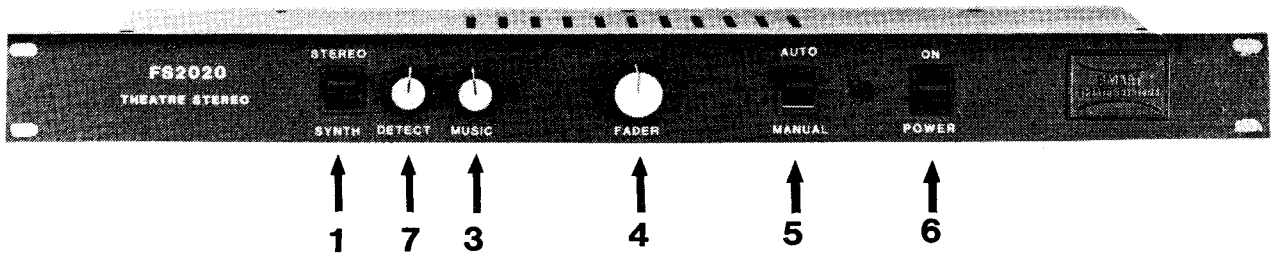
POWER AMPLIFIERS. Some power amplifiers do not have output level controls and rely on the device that is feeding it to control the drive. The FS2020 has individual output trim pots that are accessible from the rear of the chassis via a small hole using "tuning wand"to access the pots. The MASTER FADER will vary the stereophonic signals to the amplifier but cannot adjust individual balance between channels. We suggest you use the output trim adjustments to balance the Front and Surround channels when setting the sound pressure level in the room.

GROUNDING PRACTICE. Good grounding practice in a theatre sound system assures the lowest possible noise pickup from extraneous spikes and AC line garbage generated by other booth equipment. Do not rely on the ground plug on the AC power line for good earth ground. It may be several ohms above actual earth ground. Find a good electrical or earth ground and run a braided ground strap or heavy gauge wire to this point from the equipment rack. Sometimes this is difficult in an old building. However, a grounding rod can be specified in a new building and is well worth the effort and extra expense. Follow all other recommended grounding procedures.

SCREENING ROOM USE. The FS2020 has an adjustable time delay range of 30 milliseconds to 105 milliseconds on the surround channel output. This range will accommodate proper settings in most standard or mini-cinema auditoriums. When the FS2020 is used in rooms smaller than 30 feet in length, the time delay may be at the "edge" of it's adjustment range. A factory modification of the time delay section of the product will allow a shorter delay adjustment. This special modification is by request when the order is placed with the factory, and a small charge is added to the purchase price for the changes.

WIDE SCREEN
STEREO

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



OPERATION

(1) STEREO-MONO-SYNTHESIZER SWITCH. This three position Format switch is used to activate the Front-Surround SVA stereo operation (UP position), or the Front-Surround Stereo Generator (DOWN position), or the monaural single channel playback (MIDDLE position). This switch should be left in the MONO position at all times unless you are playing a genuine stereo optical print or wish to synthesize surround effects from a monaural film. DO NOT run mono films in the stereo position. DO NOT run trailers in the Stereo or Synth position.

(3) NON-SYNC LEVEL CONTROL. Adjusts the loudness of the intermission music source independently from the FILM sound. The playback level is usually set below the level of the main feature film presentation.

(4) MASTER FADER CONTROL. This control raises or lowers the level of the Front-Surround film decoder outputs. It also controls the monaural soundtrack playback. It does not control the non-sync source level.

(5) AUTO-MANUAL. The FS2020 has remote music fade capability that allows the non-sync source to be controlled by automation or a remote switch. If this feature has been provided in your system, make sure the switch is in the AUTO position. If no remote switch has been installed, place the switch in the MANUAL position for intermission music, and in the AUTO position for film playback.

(6) POWER SWITCH. This is the main power switch to the FS2020. This switch is not used if the all of the sound system components are on a single master power switch or circuit breaker.

(7)DETECT LEVEL. This front panel control allows a small adjustment to the sensitivity of the SURROUND GENERATOR and is only active when the STEREO-MONO-SYNTH switch is in the SYNTH position. Many monaural films are heavily compressed and recorded near 100% modulation for most of the film. However, there are small differences in the recording level from one film producer to another. The REAR DETECT control is normally set at mid-position for most films, but can be adjusted to either side for the best effect. The feature films should be monitored during the first play in the theatre to determine if the adjustment needs fine tuning.

A more detailed description of the controls and features of the FS2020 Stereo Decoder is given in the technical portion of this manual.

FUSING. The FS2020 uses one main fuse for the power supply. Replace with a 2 Amp 3AG type *only*.

FS2020 SERVICE

A fanning strip makes connecting input and output leads easier. Leads are permanently soldered to the strip and then mated to the screw terminals. If the unit ever has to be removed for service, the fanning strip can be quickly removed. Fanning strips may be ordered separately from SMART THEATRE SYSTEMS is you cannot procure them locally.

The latest SMART equipment uses "shunts", instead of switches to select the various operation selections. This is generally a one time function, and is set by the sound engineer during installation. To move the "shunt", simply pull the plastic shorting plug straight up, and place on the desired pins. Note that the two small holes face downward when properly installed.

Almost every component used in the FS2020 is available locally from a radio parts house. The only parts that are not likely to be found are the special sealed modules, and the time delay chip. Refer to the schematic diagram and parts list for information regarding a component description. IC sockets are used to facilitate easy removal and replacement of any Integrated Circuit, should this ever become necessary.

Each unit is burned in for a minimum of 168 hours before Q.C. testing and packaging. A failure of one or more functions of the FS2020 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? (Power L.E.D. ON)

2. Has the fuse blown? (replace with 2 amp 3AG type only)

3. Are all panel switches in their proper position?

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

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

A quick check of the power supply voltages will indicate the proper operating voltages for the active components. Place your service meter negative lead on a convenient chassis GROUND point. Switch the meter to the +30 D.C. range and measure the voltage input to the POSITIVE regulator (pin 1). It should be 18-24 volts. Now measure the output of the regulator (pin 3). This voltage should be very close to +15 volts. Now, do the same with the NEGATIVE regulator. Use the positive lead of your meter on the chassis GROUND, and the negative lead for voltage measurements. Pin 2 is the input to the regulator, and pin 3 is the output. Again, you should measure nearly -15 volts. If you cannot obtain the voltages mentioned, you could have a bad diode in the rectifier bridge, a shorted filter capacitor, or an open winding on the transformer. **BE CAREFUL NOT TO SHORT THE PINS ON THE REGULATORS WHILE MAKING THESE TESTS. A MOMENTARY SHORT COULD DESTROY THE IC REGULATORS.**

When you are satisfied that the voltages are correct, go to the section for the circuitry that appears to be giving trouble. The most practical way to troubleshoot audio circuits is through signal tracing. Put an audio signal into the input and follow the signal with a scope until the signal stops. This method allows you to locate a defective component in the related section.

Since the FS2020 uses a bi-polar supply, each audio IC op-amp output should measure nearly 0 volts D.C. with no signal. That is, you should be able to probe each output pin with your service meter and see a minimum offset. If the op-amp is showing a few volts at the output pin, it 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.

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 problem is in the device itself, or elsewhere.

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

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

Signal tracing procedures may also be employed when servicing the time delay portion of the SURROUND CHANNEL. A signal at the input, through the filter circuit, the delay chip, and the anti-alias filter will reveal where the signal has stopped. Refer to the schematic for pin identification of the signal flow. The HFE4047 clock associated with the delay chip must be operating properly for the audio signal to pass through the delay chip. An oscilloscope will reveal high level square wave pulses on pins 10 and 11 of the 4047 when this device is operating. If either phase of the clock fails, no audio can pass. We suggest you **NOT REMOVE** the delay chip itself unless you are positive it has failed. This component is very expensive, and can be easily destroyed by stray static caused by handling. The BIAS pots near the chips are factory set to each individual chip, and *should not be moved* unless the IC must be replaced by a new device.

The SURROUND MODULE in the FS2020 contains 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 FS2020 be returned to the factory for servicing if a module failure is verified. The "plated through" holes on the main PC card are easily damaged when service is attempted without the aid of the proper de-soldering equipment.

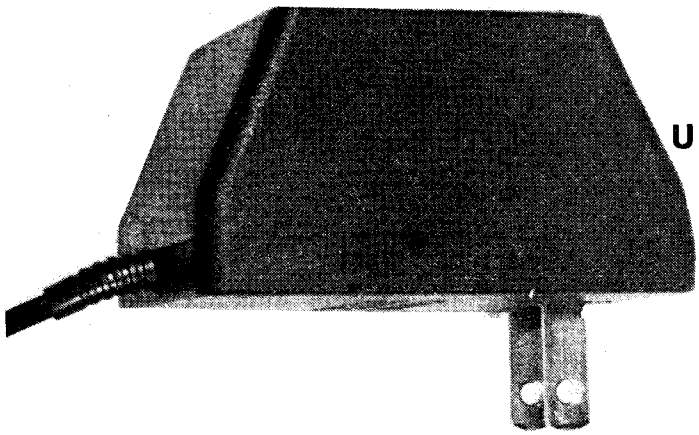
An important part of any pre-service call is to make sure that the operator or other theater personnel is fully familiar with the operation of this equipment. Often service calls are made unnecessarily because the operator was not trained with the correct operation procedures.

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

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. SMART's toll-free telephone number for technical support is 1-(800)-45-SMART

We reserve the right to *make improvements* to our products without notice. If you have questions regarding updates that do not agree with the schematics in this manual, please contact us for additional information regarding circuit changes.

Refer to the schematic diagram at the end of this manual for component values and circuit wiring.



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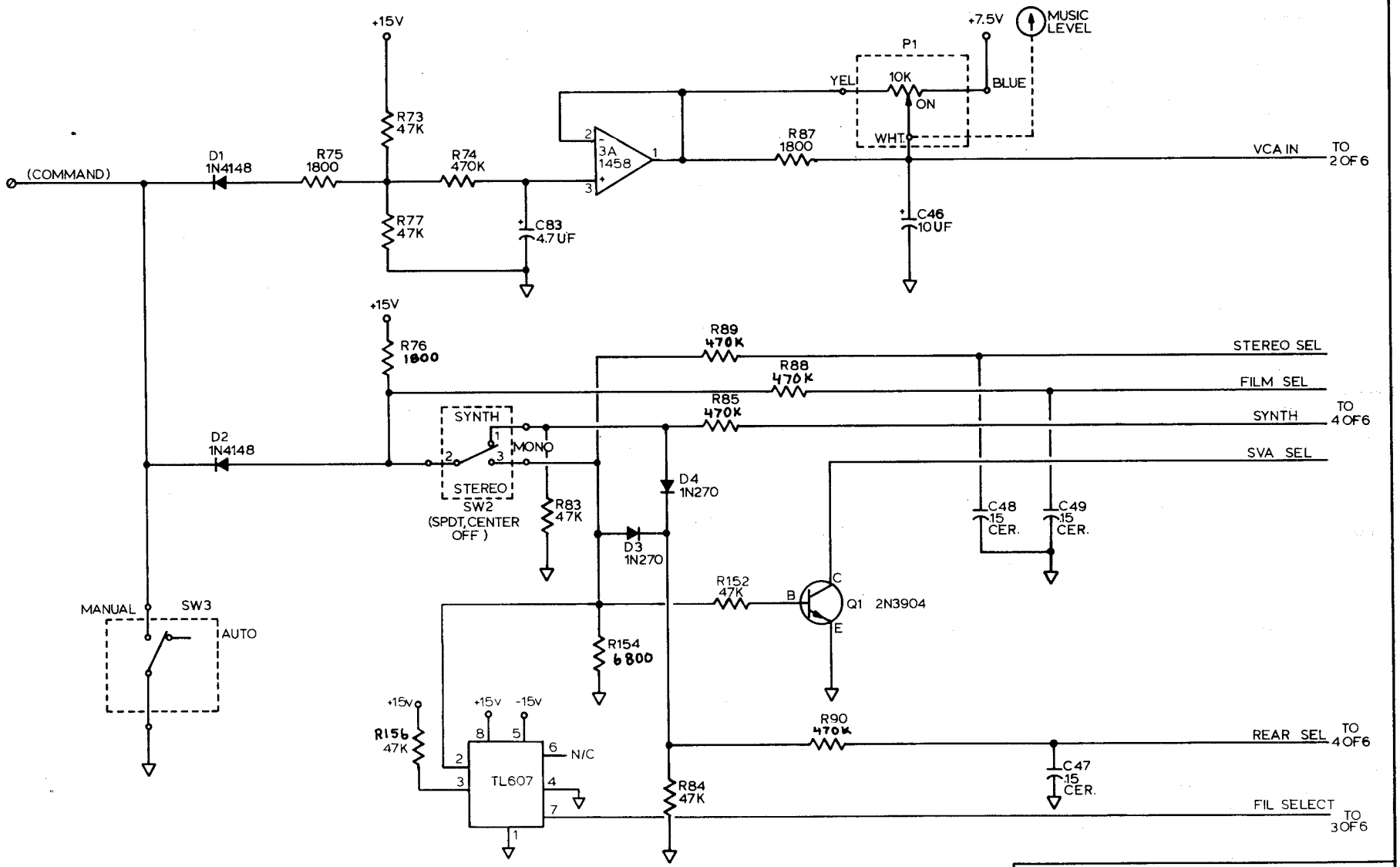

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FS2020 SOUNDTRACK DECODER			
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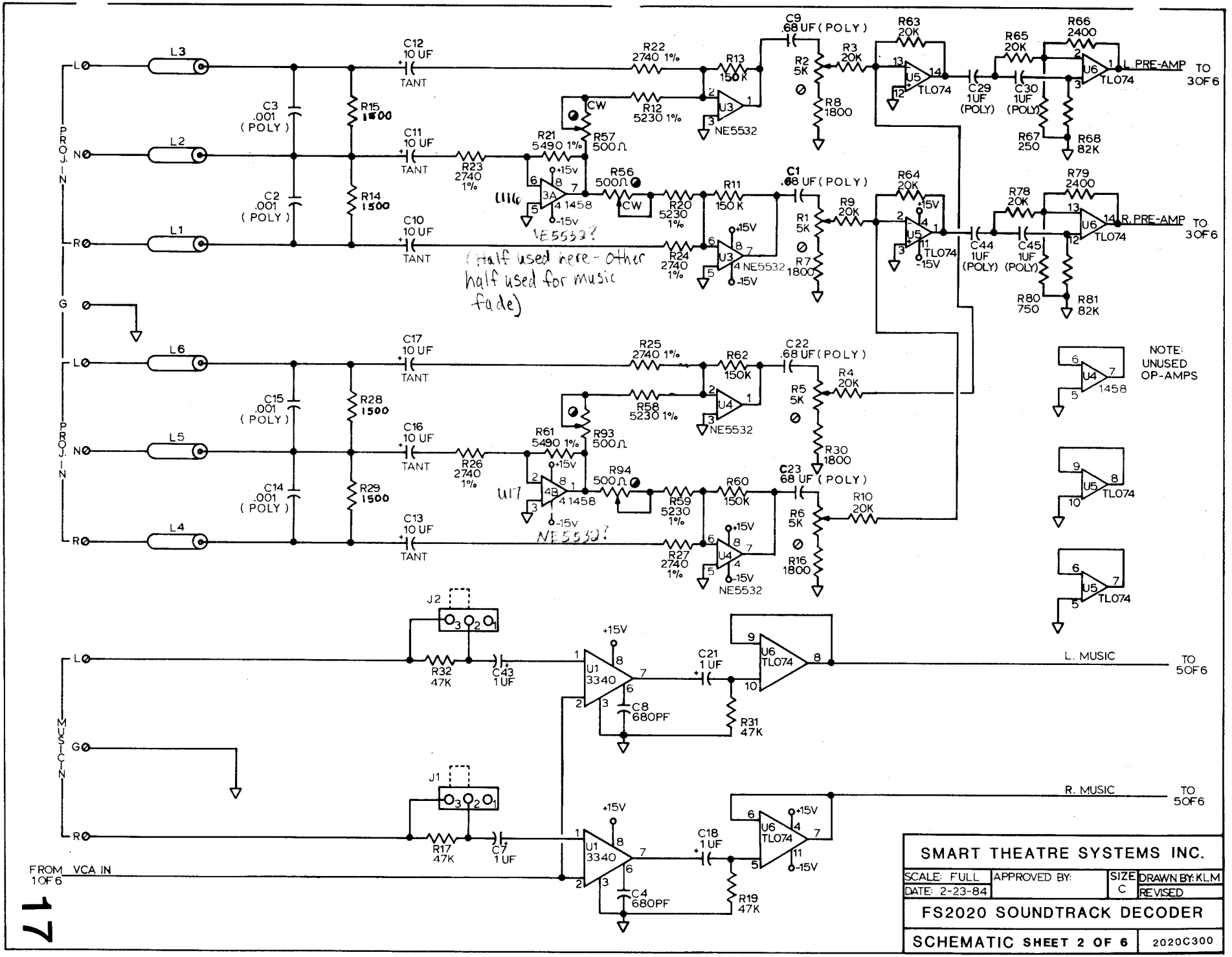

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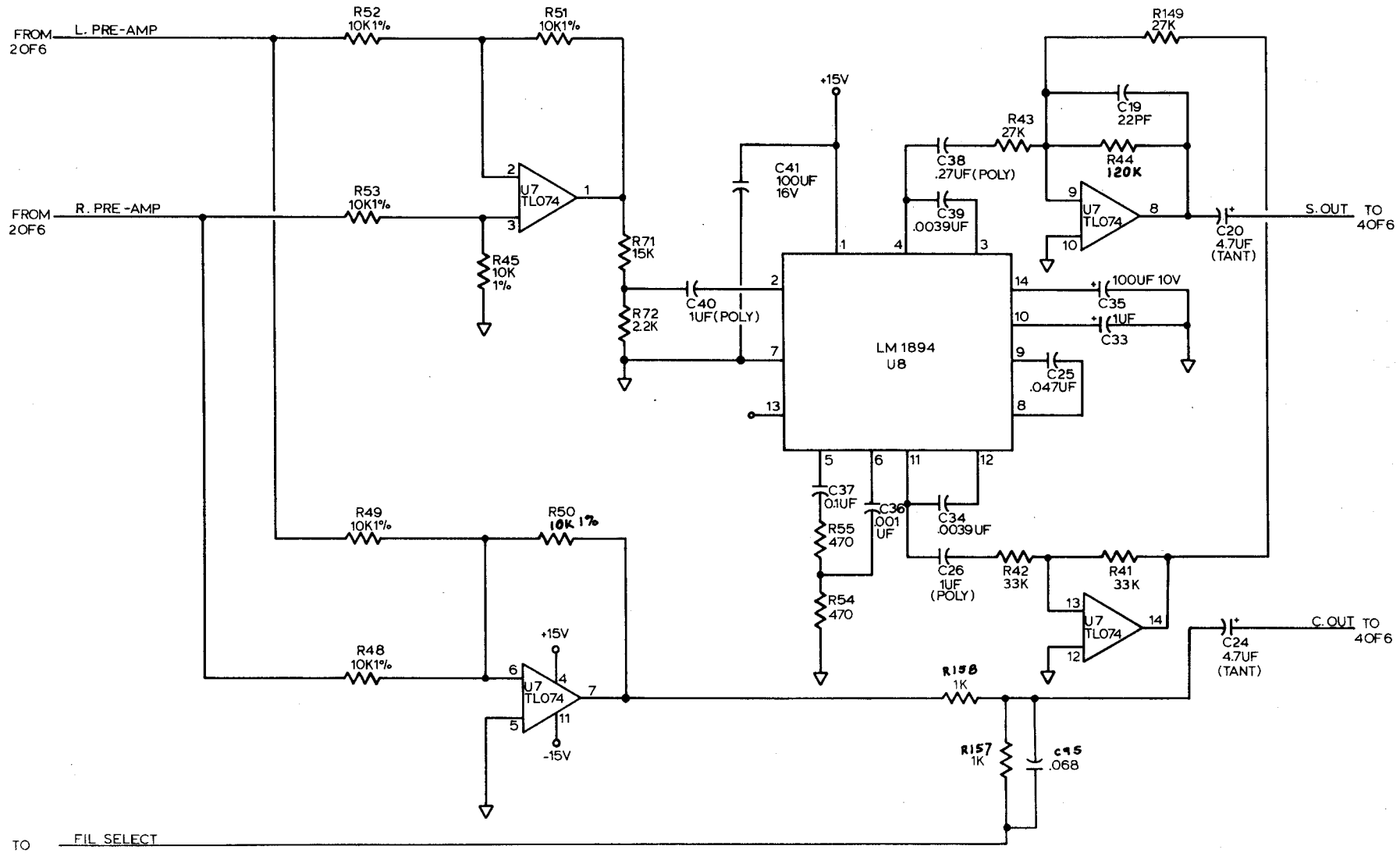

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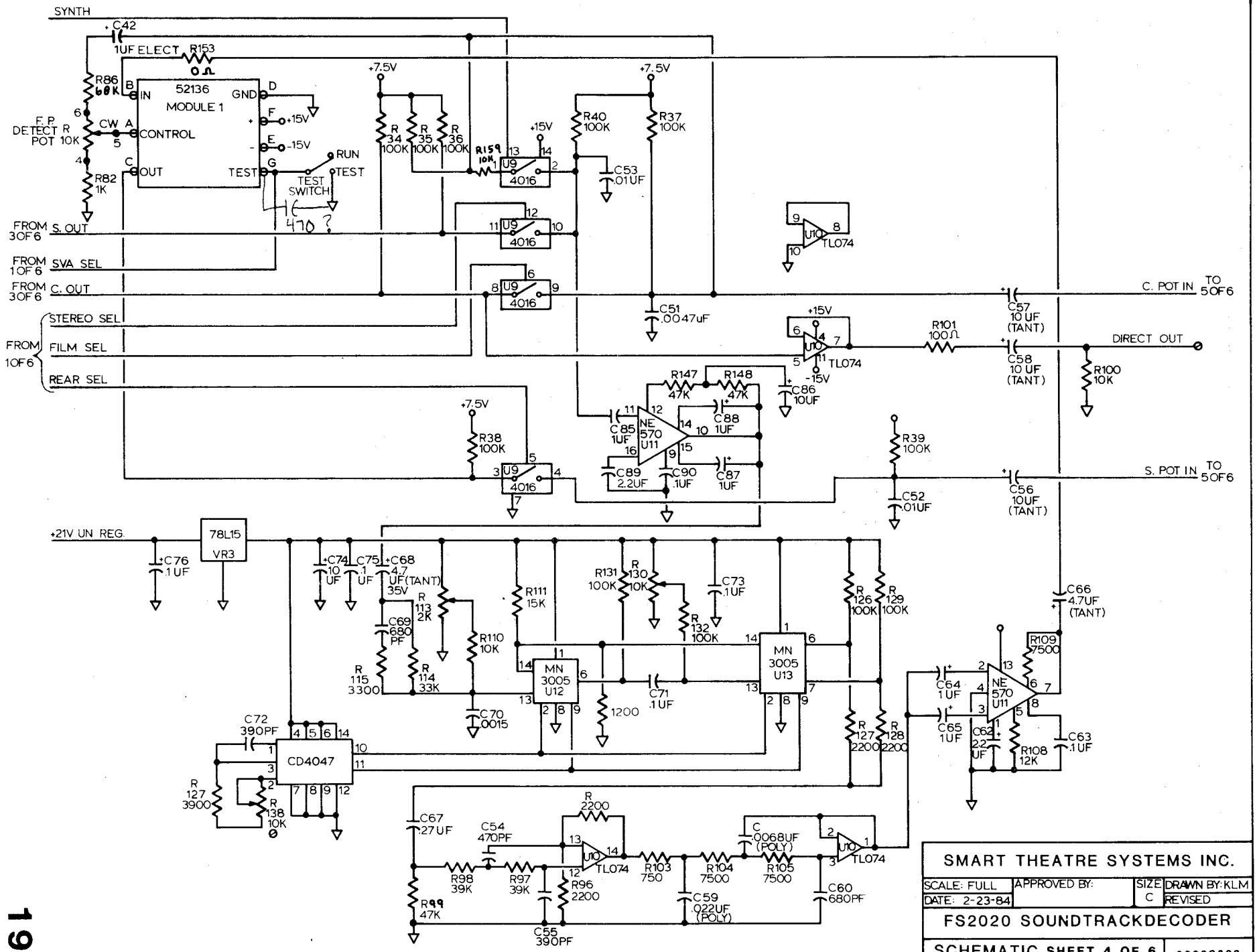

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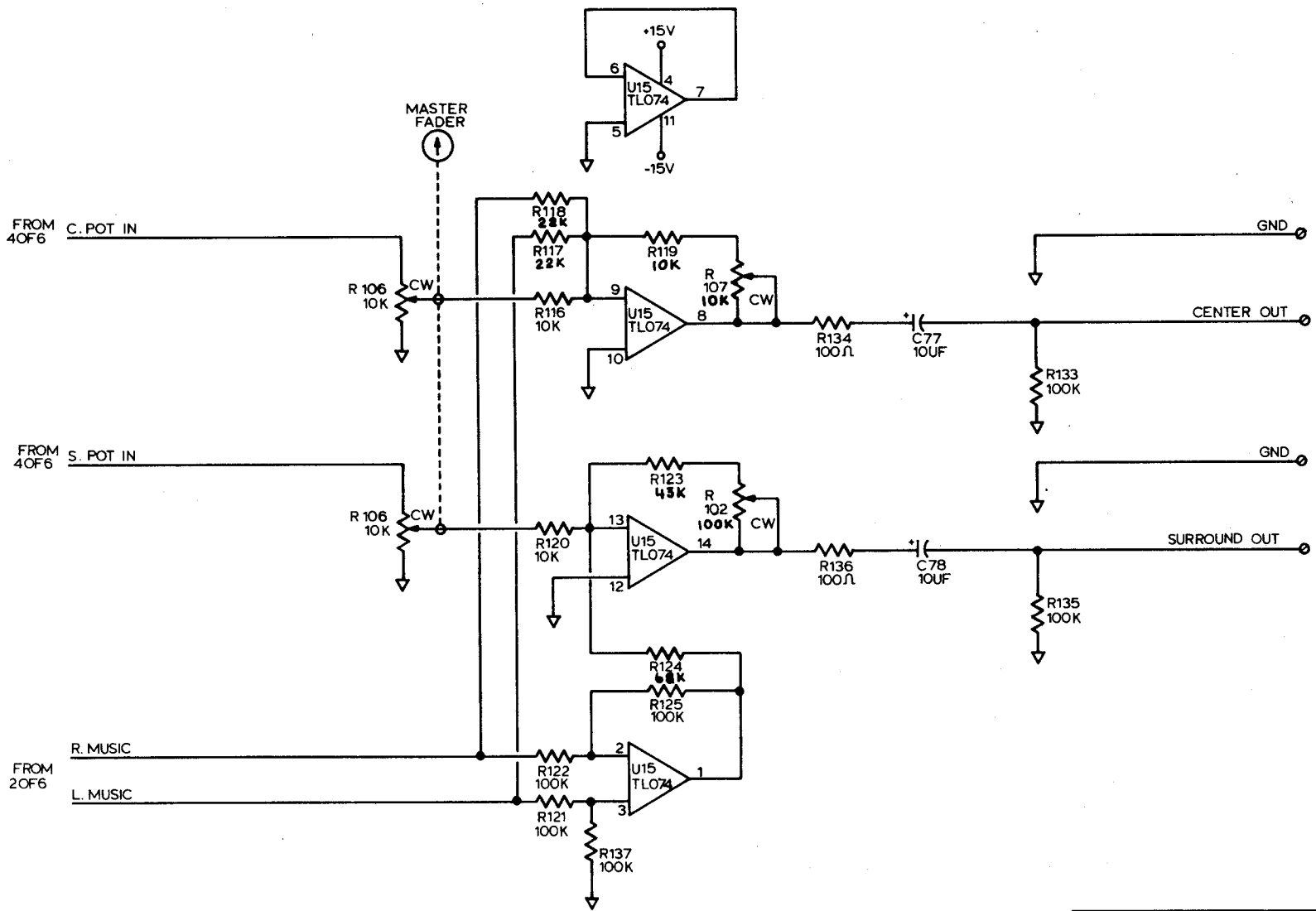
FS2020 SOUNDTRACKDECODER

SCHEMATIC SHEET 4 OF 6 — 2020C300



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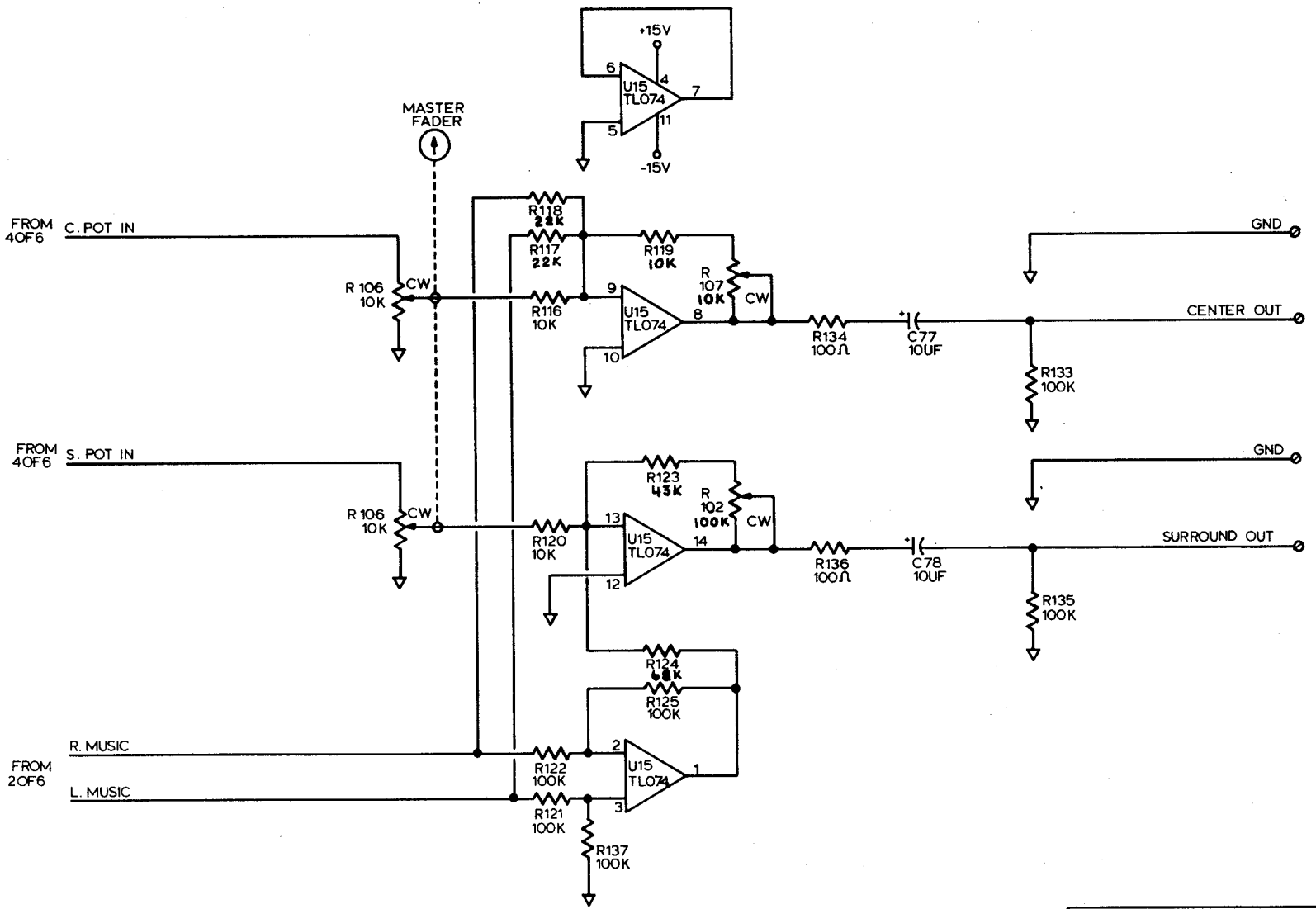

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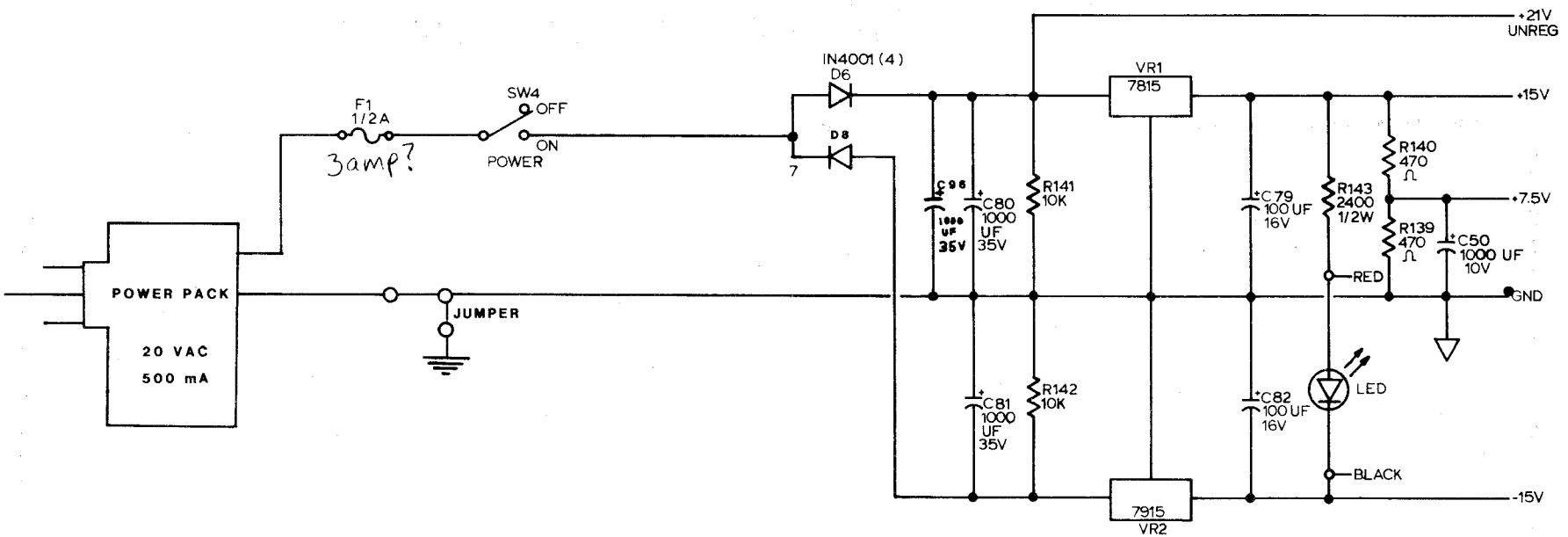

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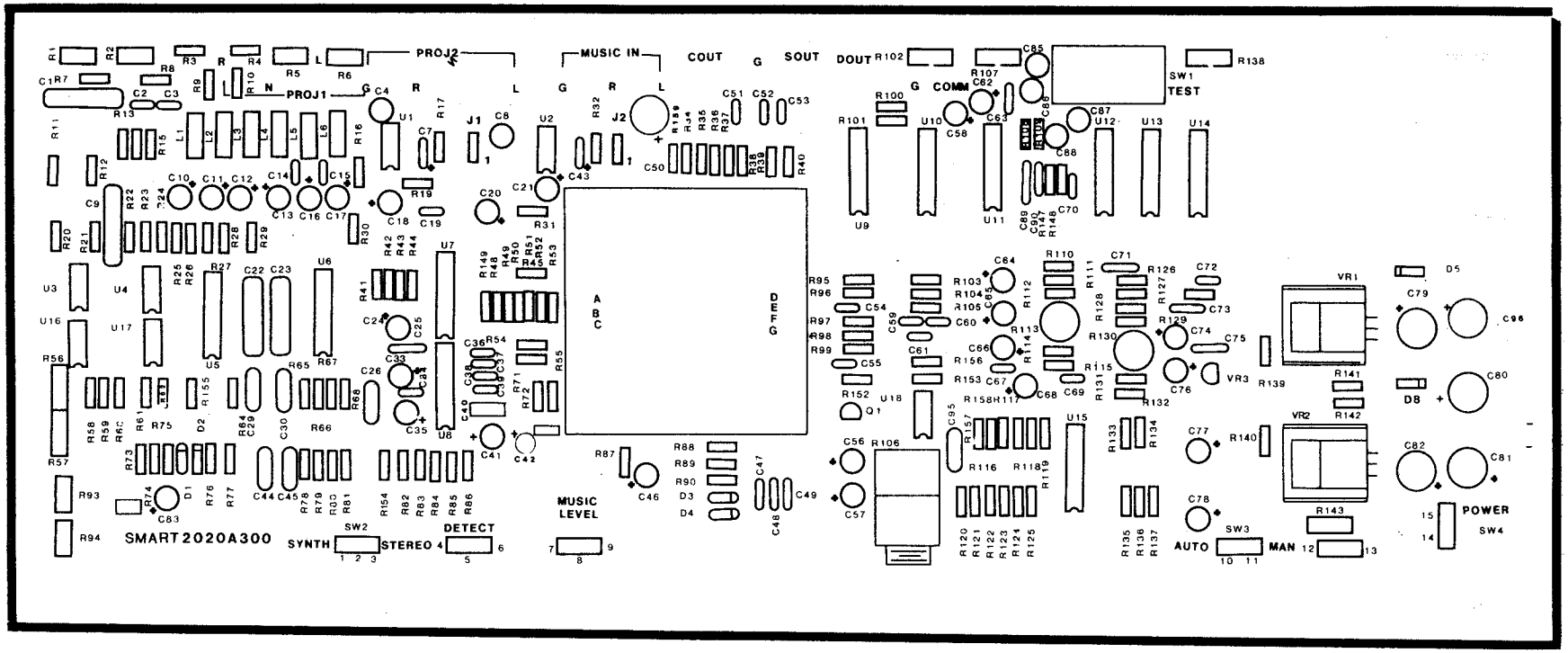

COMPONENT LAYOUT FS2020