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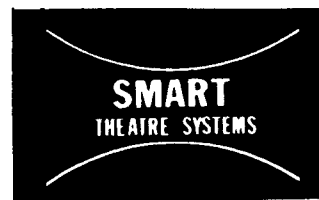
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# INSTALLATION AND OPERATION MANUAL

SG1100 SURROUND GENERATOR



**SMART THEATRE SYSTEMS**  
P.O. BOX 80361, ATLANTA, GEORGIA 30341

The SG1100 Surround Generator is similar in circuitry and set up procedure to the Smart SG1130 Stereo Generator. Instead of 5 channel operation, the SG1100 has only two channels and is recommended for installation in FRONT-SURROUND theater sound systems. No special solar cells are needed, and the unit need not be part of a stereo optical system. The only requirements are that the theater have a standard optical solar cell preamplifier, two power amplifiers, and a stage loudspeaker along with wall surround speakers.

The circuitry for the front channel of the SG1100 is a line amplifier that passes the audio input signal through one section of the master fader to the CENTER channel output. This signal has a flat audio response and does not affect the signal, other than adjust the volume level. A front channel NORMAL-BYPASS switch allows the incoming signal to either pass through the FRONT circuitry, or bypass around the circuitry in the event of a problem. In effect, this switch connects the input terminals to the output terminals so that the audio signal goes around the active circuits.

The SURROUND SOUND MODULE contains the necessary circuitry to derive a separate source for the special effects on the soundtrack. A front panel control, labeled "REAR DETECT" allows the operator to adjust the sensitivity of the module to accommodate the different recording techniques used by various filmmakers. The synthesized surround channel should be monitored in the booth during the first showing of a new print to determine if the last setting of the control is still correct for the new picture. A slight trim may be necessary to keep dialog out of the surround channel. A full TIME DELAY circuit on the main printed circuit board allows the installer to "SYNCRONIZE" the surround channel with the front channel to avoid echo in the auditorium.

The SG1100 is LEVEL SENSITIVE and MUST BE CALIBRATED by the installer for proper operation. A Dolby tone loop is used to make this adjustment. If the SG1100 is not properly set up, you may encounter distortion, or a poor signal-to-noise ratio. The unit has four high level inputs. One or both of the inputs labeled "Input 1 & Input 2" must be fed from the current booth preamplifier. The other inputs are duplicates of the latter, and are described later in this manual. The Smart SXL735 Sound Control Center is ideal as a "head end" for the Surround Generator. This unit provides the proper solar cell interfacing to the SG1100 for effective operation. Two inputs are provided so that the SG1100 can also be drive from the left and right halves of a stereo preamplifier such as the Dolby CP50.

The SURROUND MODULE not only contains the sensing circuitry that detects special effects on the monaural soundtrack, but 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. This setting is usually near the center of the control range of the pot. 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 effects and Voice	OFF
Loud effects and Voice	ON
Loud Music	ON

As the table above shows, there are some conditions that will allow voice to appear on the surround channel. When the sound effects are ACCOMPANIED BY VOICE material, Then the voice may also be passed to the surround.

The SURROUND MODULE contains a VCA (voltage controlled amplifier) that quickly fades the surround material IN and OUT, instead of "Chopping" on and off.

A more detailed description of the operation of the SG1100 is covered under the individual headings of this manual.

There are four audio inputs on the rear terminal barrier strip of the SG1100 Surround Generator INPUT 1 is used when feeding the unit from a monaural preamplifier. This input is switched when the NORMAL-BYPASS switch is activated. This allows the signal from the preamplifier to be "hard wired" around the active circuits, and routed directly to the center channel (stage) power amplifier. INPUT 2 is used only when the SG1100 is being driven from a stereo system preamplifier. It is good practice to GROUND Input 2 to the nearest ground terminal if it is not being used. Input 2 is NOT switched by the NORMAL-BYPASS panel switch. Shielded audio cable should be used to connect the preamplifier output to the SG1100 input terminals. Two other inputs are provided on the rear of the unit. They are simply labeled " 1 and 2" These additional terminals are paralleled across the main input terminals and are convenient for hooking up an active booth monitor.

There are two high level outputs on the SG1100 Surround Generator. They are labeled C OUT(center) and S OUT(surround) The Center out should be wired to the amplifier feeding the main stage speaker. The surround output is then wired to the amplifier that powers the surround speakers. Convenient GROUND terminals are provided for the shield of each output cable. Each of the outputs of the SG1100 is controlled by the dual MASTER FADER control on the front panel.

The printed circuit card in the SG1100 is grounded to the chassis. Also, the third wire of the AC cable is connected to the printed circuit card. This effectively provides common ground

for the printed circuit board, chassis, equipment rack, and the booth electrical system. If for some reason, the ground for the AC cable or printed circuit board must be broken from the system ground, two small jumpers have been provided on the PC card that can be cut. These wire loops may be "snipped" individually to change the grounding scheme. It is very important to observe good grounding practice for a quiet, humfree system.

The SG1100 will operate on 115 volt AC or 230 volt AV sources. The transformer is designed to accept either 50 Hz or 60 HZ. Each unit is shipped with the jumper in the 115 volt position. If 230 volt operation is desired, the two 115 jumpers must be removed, and one wire jumper installed in the 230 volt position. The power supply in the SG1100 is bi-polar and fully regulated.

If separate house equalizers are used in the sound system, they should FOLLOW the SG1100. DO NOT equalize before going into the unit. Also we do not recommend shaping of the surround channel audio. This channel is band pass filtered in the time delay section restricting the amount of shaping that can be performed. A good choice of equalizers is the SMART EQ600 three channel unit that is optimized for theater use.

The SG1100 Surround Generator is designed to be a UNITY GAIN device. That is, if you feed one volt of audio to it's input terminals, you will get one volt of audio at the outputs. However, there are two gain controls inside the unit that will allow you to alter the gain in order to adapt to various preamplifiers that have different output capabilities. Keep in mind the levels must be set so that you can achieve the necessary reference level the SG1100 must have, in order to properly operate. An input signal too low will result in a noisy system. Signals that are too high will cause the surround channel to turn on during the wrong program material. For these reasons, the SG1100 MUST be adjusted with a known reference level. The readily available Dolby Cat. 69 tone loop is ideal for this use. This loop is accurately recorded at 50% modulation and provides the proper reference.

#### TOOLS NEEDED

- (1) Dolby Cat 69 Test Tone Loop.
- (1) Small flat blade screwdriver or tuning tool.
- (1) Small phillips screwdriver.

Set the MASTER FADER from panel control to 5 or 6 on the dial. Place the NORMAL-BYPASS switch to the NORMAL position. Set the front panel REAR DETECT control to it's fully counterclockwise position.

Set the output level of the preamplifier feeding the SG1100 to it's normal operating level. With the Dolby tone loop running on the selected projector, set the input

control of the SG1100 until the front panel LED "snaps on". The LED has a sharp turn on characteristic. Disregard any flickering of the LED caused by the splice in the film loop. The unit is now calibrated.

With the reference tone still running, switch the front panel NORMAL-BYPASS switch to BYPASS. If the level is lower in the bypass position, readjust the preamplifier level, and recalibrate the input level until the two levels are the same. This adjustment is important to the operator that may need this emergency feature some day.

There are two controls on the PC card near the time delay section. The one labeled BIAS is factory set and should not be adjusted. It sets the proper bias for the individual characteristics of the MN3005 time delay chip. The other pot labeled DELAY, is used by the installer to adjust the amount of delay required on the surround channel. The placement of surround speakers and the length of the auditorium will dictate the amount of delay required. A movable "shunt" jumper is provided inside the unit to assist in properly setting the time delay. Move the shunt to the TEST POSITION. This will force the surround channel ON. Run a reel of feature film. Have your assistant stand in the auditorium while you adjust the DELAY control. His signal will be indicated when the sound from the front speakers and surround speakers are in perfect "sync". This observation should be made at a point that is two-thirds to the rear of the room from the front stage speaker. After this adjustment is made, move the test "shunt" to the other two prongs of the 3 pin header. This is the normal operating position.

Play a feature film on the system while switching between the NORMAL and BYPASS positions of the front panel switch. There should be no difference in level. Set the REAR DETECT sensitivity control to the center of its range. As effects material appears on the soundtrack, the rear channel should quickly appear, and then disappear when the passage is over. A small adjustment of the DETECT control may be necessary to get the desired results. DO NOT USE TRAILERS OR SNIPES for this test. This type of material is generally recorded at maximum modulation with a great deal of distortion and recorder overload. Unreliable operation may result, with the surround channel cutting in and out between dialog segments. Mark the setting of the preamplifier that is driving the SG1100. Now that a reference has been established, the preamplifier setting MUST NOT BE CHANGED. It may be wise to remove the knob. All auditorium volume changes are now made by using the MASTER FADER control on the SG1100.

The front panel control labeled REAR DETECT allows the operator to adjust for minor differences in soundtrack recordings. Fully counterclockwise rotation of the control turns the surround channel OFF. As the pot is rotated clockwise, more and more material is allowed to appear on the surround speakers. The sensitivity of the detection circuit

should be set so that special effects "trigger" the surround system ON. If dialog appears, decrease the sensitivity slightly until the dialog disappears. Refer to the "truth table" at the beginning of this manual for clarification of what material may appear on the surround channel. We suggest the operator monitor the surround channel during the first showing of a new feature to assure a proper setting.

The LED near the NORMAL-BYPASS switch monitors the incoming audio of the SG1100. It's primary use is to calibrate the synthesizer to the 50% modulation level so that the internal logic circuits can properly track. The LED is always connected to the audio input and will blink when the soundtrack level is at 50% modulation or more. This gives the operator a handy indication of the sound volume in the auditorium. It is advisable to instruct the operator of this feature so he is aware of it's function.

## SG1100 SERVICE

Almost every component used in the SG1100 is available locally from a radio parts house. The only parts that are not likely to be found are the special sealed modules, and the time delay chip. Refer to the schematic diagram and parts list for information regarding a component description. IC sockets are used to facilitate easy removal and replacement of any Integrated Circuit, should this ever become necessary.

Each unit is burned in for a minimum of 48 hours before Q.C. testing and packaging. A failure of one or more functions of the SG1100 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 1/2 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 PLUS 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 PLUS 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 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 SG1100 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 is likely that a bad capacitor or



resistor is causing an input bias that forces the output of the amplifier to shift. The NE570 is single ended and will measure 7 volts at the output pins. Also check for a hairline short in the PC card foil traces. Here are several tips that will aid in troubleshooting.

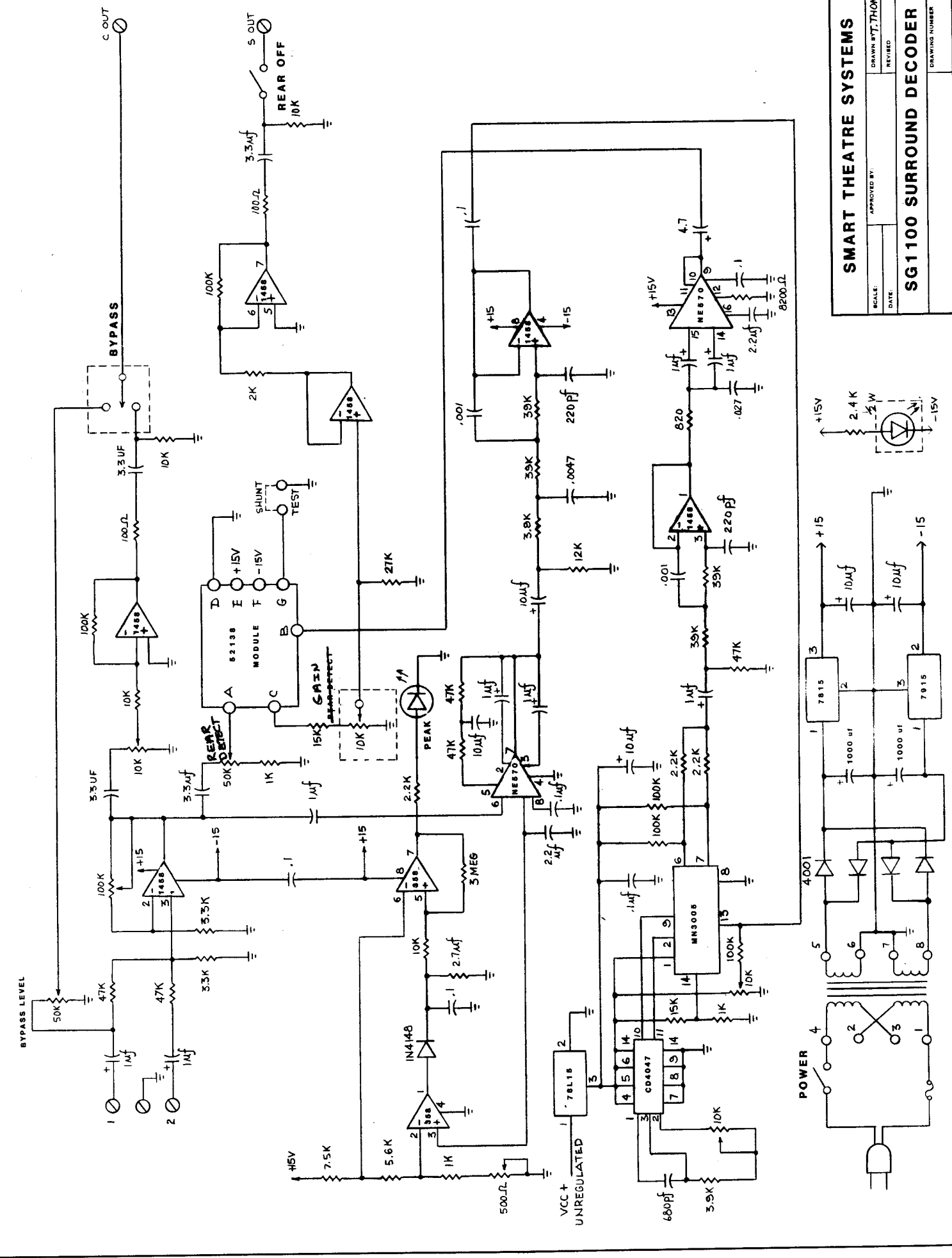
1. Make sure the switches are in the proper position before testing the unit.
2. Very hot IC's usually indicate an internal short.
3. An open resistor may lead you to believe that an IC is defective. Use a substitute device to see if problem is in the device itself, or elsewhere.
4. Shorted input capacitors 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 EFFECTS (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 4047 clock IC 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 pot near the chip is 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 SG1100 is hermetically sealed in epoxy and cannot be serviced in the field. This sub-circuit is very densely packaged and contain components that are hand selected for accuracy. In the event of a failure of the module, the pins must be de-soldered with suction and the module removed. Replacement modules are available on an EXCHANGE ONLY basis. We suggest the SG1100 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.

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 THEATRE SYSTEMS**  
 DRAWN BY: THOMAS  
 REVISED  
 DATE:  
 APPROVED BY:  
**SG100 SURROUND DECODER**  
 DRAWING NUMBER

