

# **SC 28F and SC 216**

**Operators Manual**

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## 1. INTRODUCTION.

Welcome to the SUNNSPOTS™ family. The SC 28F and SC 216 are two scene portable stage lighting control consoles. Features include crossfade slider controls for smooth, accurate scene changes, an audio sync input jack and sensitivity control which allow the lights to “dance to the music,” and flash buttons that permit any channel's lights to be instantly turned on to full brilliance regardless of the channel's settings. Blackout and restore switches allow the lights to be turned off and on altogether without disturbing any of the fader presets. Light Emitting Diodes reflect channel operation and intensity levels, and during blackouts, these LEDs allow you to preview scene settings.

Like all SUNNSPOTS™ components, the SC 28F and SC 216 include digitally controlled SUNNPLEX™, a multiplexing system that allows the various parts of the lighting system to be interconnected by way of standard three conductor microphone cables. This eliminates the fragile and expensive multi-wire snakes required by other lighting systems. The application of this technology to stage lighting equipment makes system setup and operation easy and convenient. Also, in most cases, SUNNPLEX™ allows coded lighting control signals to be sent through audio snakes without interference to other signals.

The **sunn** SC 28F and SC 216 are phantom powered by **sunn's** dimmer packs through the same microphone cord that carries the SUNNPLEX™ signal, and thus does not require a separate AC cord. This fact, coupled with the controller's small size, allows the controller to be operated virtually anywhere within the reach of a microphone cord.

## 2. CONTROLS.

The SC 28F is a two-scene, eight channel controller, while the SC 216 is a two-scene, sixteen channel controller. Other than the number of channels, the two products are identical.

Figure 1 shows the top of the SC 28F and SC 216 lighting control consoles. The function of each of the controls is described in the paragraphs that follow.

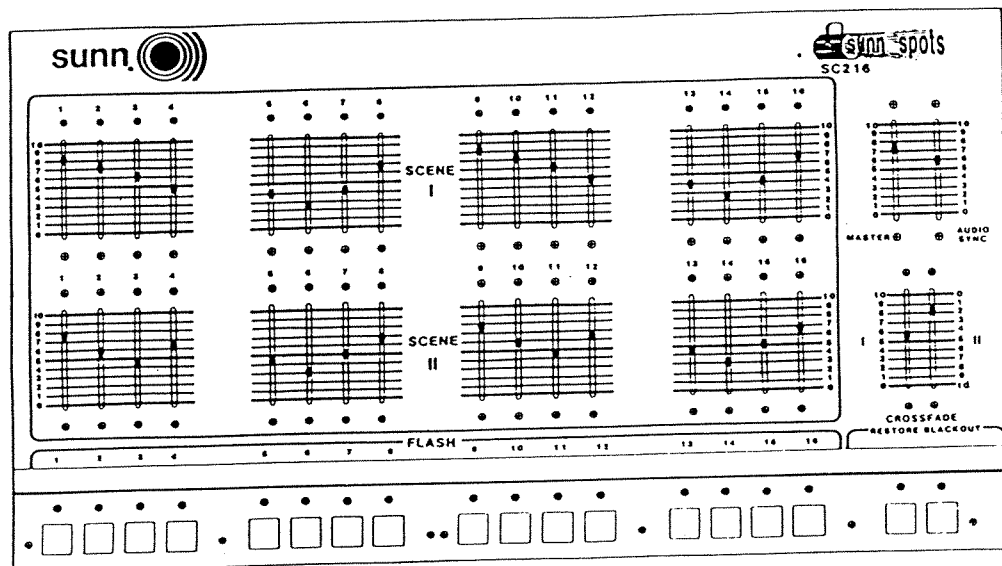


FIGURE 1

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2-1. SCENE I SLIDE CONTROLS. When SCENE I is selected (see Section 2-4), the positions of the sixteen SCENE I slide controls (numbered 1-16) determine the brightness of the lights connected to channels 1-16 on the dimmer packs. With a control in its minimum position (0) the corresponding light(s) will be completely off, and with the control in the maximum position (10) the corresponding light(s) will be at full brightness. By setting the slide controls between these two extremes, any intermediate brightness level may be achieved. When audio sync is active (see Section 2-9), the intensities of the individual lights are determined by the setting of the SCENE I slide controls (also referred to as sliders or faders), the position of the AUDIO SYNC sensitivity control, and the instantaneous level of the audio input. This will be explained in more detail in Section 2-9 and Section 6.

2-2. SCENE II SLIDE CONTROLS. When SCENE II is selected, the SCENE II slide controls determine the brightness of their corresponding lights. Audio sync does not affect SCENE II; otherwise, the SCENE I and SCENE II controls operate in identical fashion.

2-3. FLASH BUTTONS. Pressing any one of these momentary pushbuttons will cause the light(s) of the corresponding channel to come on at full brightness, regardless of the settings of that channel's slide controls, or of the positions of the CROSSFADE controls or MASTER control (see Section 2-5). BLACKOUT, however, overrides the FLASH buttons( see Section 2-6). Any or all flash buttons may be used simultaneously.

2-4. CROSSFADE SLIDE CONTROLS I and II. The positions of these controls determine how much information each scene is contributing to the intensity of the lights. With the CROSSFADE I control set at 10 and the CROSSFADE II control set at 0, the lights will respond to the settings of the SCENE I slide controls. Likewise, with the CROSSFADE II control set at 10 and the CROSSFADE I control set at 0, the lights will respond to the settings of the SCENE II slide controls. With the CROSSFADE sliders in intermediate positions, SCENE I and SCENE II information is blended, or mixed, and the intensity of each of the lights is determined in part by the SCENE I sliders and in part by the SCENE II sliders.

Note that the CROSSFADE sliders operate in opposite directions; moving the sliders up turns SCENE I up and turns SCENE II down, and vice-versa. This allows you to fade gradually and smoothly (crossfade) from one scene to the other simply by grasping both sliders between the thumb and forefinger and moving them as if they were a single control.

The CROSSFADE sliders can also be operated separately for special effects (see Section 6).

2-5. MASTER FADER. The MASTER slide control, also referred to as the GRAND MASTER, determines the overall brightness of the lights. Turning this control down dims all of the lights simultaneously and boosting this control brightens all of the lights. Moving the MASTER fader does not alter the relative intensity of the lights (how bright each light is in relation to the others). Relative intensity is determined entirely by the settings of the SCENES I and II sliders and CROSSFADE controls, along with any instantaneous variations introduced by audio sync (see Sections 2-1, 2-2, 2-4 and 2-9).

2-6. BLACKOUT SWITCH and LED. Momentarily tapping the BLACKOUT switch instantly causes all of the lights to turn completely off. The red LED above the BLACKOUT button indicates that blackout has been selected. The BLACKOUT switch overrides all slide controls and FLASH buttons. The PREVIEW LEDs (see Section 2-8), however, will remain on, giving an indication of how bright the lights will be when the scene is "restored" (see Section 2-7).

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2-7. RESTORE SWITCH and LED. After blackout has been selected (see Section 2-6), control of the lights may be returned to the slide controls by touching the RESTORE switch. The green LED above the RESTORE switch will light, indicating that the blackout is no longer in effect.

2-8. PREVIEW LEDs. The sixteen yellow LEDs located between the FLASH buttons and the SCENES I and II slide controls indicate the relative intensity of the lights in the lighting system (i.e., how bright each channel's lights are in relation to those of the other channels). These LEDs are particularly useful in "previewing" the scene during a blackout.

2-9. AUDIO SYNC SENSITIVITY CONTROL. Lights can be made to pulsate in rhythm to any audio source patched into the back panel AUDIO SYNC INPUT jack (see Section 3-2). This effect is called "audio sync" ("sync" is short for synchronization). The SC 216 can accept a wide range of audio input signal levels, from microphone level (0 to 1 V RMS) to line level (1 to 10 V RMS) to power amplifier output level (over 10 V RMS). By adjusting the AUDIO SYNC sensitivity control (the fader labeled "AUDIO SYNC"), a satisfactory effect can usually be obtained with virtually any signal source. The setting for line level inputs will generally fall between 3 and 7, with 7 to 10 being the best for mic inputs. Set the control for the best desired effect. Under no circumstances should you ever use power amp outputs (speaker level) for input to the Audio Sync circuitry.

While the sensitivity of an audio source is controlled by the AUDIO SYNC fader, the effect that the audio has on any individual channel is determined by the setting of that channel's SCENE I fader. With SCENE I selected, moving a SCENE I channel fader up increases both the overall intensity of that channel's lights and the extent to which the lights pulsate in response to the audio sync. The audio sync effect is greater with lower MASTER settings. When SCENE II is selected, the overall intensity of each channel's lights is controlled by the SCENE II faders and the degree of audio sync pulsation is determined by the SCENE I faders.

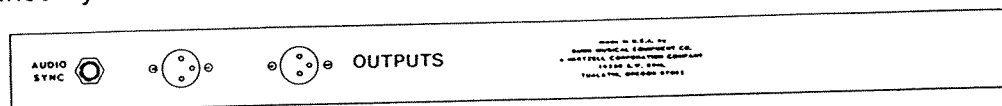


FIGURE 2

### 3. BACK PANEL JACKS.

3-1. OUTPUT JACKS. There are two male XLR-type 3-pin audio jacks on the back panel. Either of these jacks may be used to connect the controller to a dimmer pack using standard balanced, shielded microphone cable. Both jacks are identical in function; thus, the remaining jack may be used to connect other dimmer packs into the system (see Sections 4 and 7).

3-2. AUDIO SYNC INPUT JACK. In order to use the audio sync function a signal must be patched into this 1/4" phone jack. Effective signal sources include microphones placed in front of bass guitar amps, drums and main PA loudspeakers; main, monitor, effects and auxiliary outputs from mixing consoles; and power amplifier output jacks. Generally, lower frequency audio signals produce better results.

When using a balanced source, such as a low impedance balanced microphone or the balanced output of a mixing console, a balanced-to-unbalanced transformer (e.g., Shure type A95UF) should be used to create an unbalanced signal for the controller. Only shielded audio cable should be used between the audio source and the AUDIO SYNC input jack.

**CAUTION:** If you send your audio sync input signals or controller output signals through the same snake as your mixing console's input signals, it is best to avoid using a power amplifier output for the audio sync signal. To do so runs the risk of creating a ground loop or unintentional (and sometimes inaudible ultrasonic) feedback.

#### 4. INTERCONNECTING

Lighting control systems consist of three fundamental components: the lights (and their fixtures); the dimmer pack(s), which provide(s) the right amount of power to each of the lights; and a controller which tells the dimmer pack how much power to supply to the lights, and thus ultimately determines how bright the lights will be.

Figure 3 illustrates the simplest method of interconnecting the components of the lighting system.

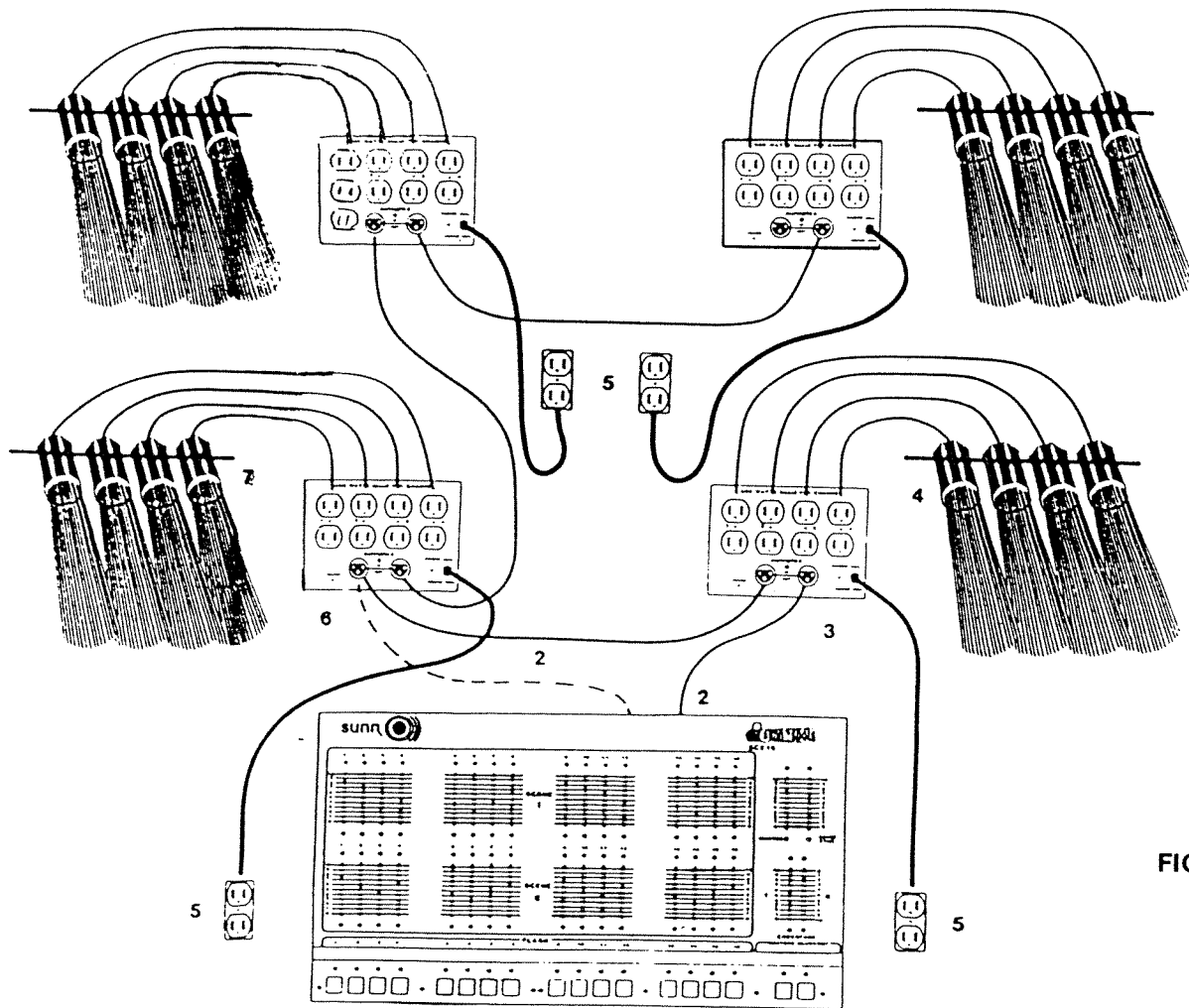


FIGURE 3

The controller (1) is connected via mic cable (2) to dimmer pack (3), which in turn is connected to lights (4). A second mic cord (5) "jumps" from dimmer pack (3) to dimmer pack (6), which is connected to its lights (7). Similarly, two more dimmer packs are "daisy-chained" to the first two using additional mic cords. Such daisy-chaining can be used to connect as many as 25 dimmer packs into the system (see Section 7). Note that the back panel has a second output jack which may be used instead of, or in addition to, one of the dimmer pack output jacks (a cord patched in this manner is indicated by the dotted line (8)).

All dimmer packs must also be connected to AC outlet(s) (9). Since the controller is "phantom powered" (that is, it receives its power from the dimmer packs via the mic cord), there is no need for it to be located near an outlet.

If you find that a mic cord is too short to reach between two parts of your lighting system, you can link two cords in series to create a longer one. To do this, simply connect the male end of one cord to the female end of another. Repeat this with as many cords as necessary to arrive at the required length. In similar fashion an audio snake may be wired in series with a mic cord. Note, however, that any cord used in this application **MUST** be wired properly. Pin 1 on the male connector at one end of the cord must be connected to Pin 1 on the female connector at the other end, and similarly Pin 2 must go to Pin 2 and Pin 3 to Pin 3. Otherwise, the system will not operate. Be sure to check this, because not all cords are wired the same.

**CAUTION:** Once a mic cable has been plugged into a dimmer pack, be certain that no microphone is accidentally plugged into the other end of the cable, as this may destroy the microphone.

In order to utilize all sixteen channels of the SC 216 controller, (eight channels if SC 28F), at least sixteen channels must be available on your dimmer packs; this is possible by using four or more four-channel dimmer packs. (Naturally, if you do not need all sixteen channels you can use the SC 216 with fewer dimmer packs, adding more as future needs and finances dictate.) All **sunn** four-channel dimmer packs are factory preset to respond to channels 1-4. Therefore, you will have to change the "addresses" (the channels to which they respond) of any dimmer packs you wish to control with the sliders of channels 5-16. Your dimmer pack operator's manual explains how this is done. The outlets on four-channel dimmer packs are marked 1, 2, 3 and 4; if the dimmer pack is set up to respond to channels 1-4, the outlet markings correspond to the channel markings on the controller. If the dimmer pack is set up to respond to channels 5-8, then outlet 1 on that dimmer pack corresponds to channel 5 on the controller, outlet 2 to channel 6, 3 to 7, and 4 to 8, as you would expect. Similarly, the dimmer pack addresses may be set so that outlets 1-4 correspond to channels 9-12 or 13-16.

**CAUTION:** The outlets on the dimmer packs are **ONLY** for resistance type loads (e.g. quartz or incandescent lamps). **DO NOT** connect transformer or ballast-type lamps (low voltage "rain lights," mercury, halide or fluorescent lamps) or anything other than lighting fixtures (no guitar amps, PA equipment, fans, refrigerators) to the outlets. Extension cords, however, may be connected between the outlets and the lighting fixtures. **FAILURE TO OBSERVE THE ABOVE PRECAUTIONS MAY VOID THE WARRANTY AND CAUSE DAMAGE TO THE UNIT AND TO THE CONNECTED EQUIPMENT.**

When you plug the dimmer pack(s) in, you will obtain the best results if you adhere to the following rules:

1. Use a power outlet located as close as possible to an electrical service panel (fusebox). It is best if that outlet is on a separate fuse or circuit breaker from your audio equipment.
2. Always use quality 16 gauge (or heavier) grounded extension cords.
3. Make certain that the rating of the breaker or fuse for the chose outlet is adequate. The required rating (in amps) of the fuse or breaker can be calculated with the formula:

$$I = \frac{P}{E}$$

where I = the current (in amps),  
P = the power (in watts),  
and E = the voltage (in volts).

In a standard 120 VAC electrical system, 100 watts = 5/6 amp. A safe rule of thumb is to call 100 watts 1 amp. Thus, if you are using four 500 watt bulbs (2000 watts total), you should have at least a 20 amp service.

4. **IMPORTANT!** do not run any lighting power cords near sensitive audio cables (e.g. mic cords, guitar cords, snakes, etc.).

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## 5. OPERATING HINGS

When you set up your lighting system, there are several factors to consider: coverage, placement and aiming of lights; color; availability of AC power; and convenience of operation.

5-1. **COVERAGE AND PLACEMENT OF LIGHTS.** Stage lighting can be divided into two prime areas of concern — floodlighting and spotlighting. The goal of floodlighting is to bathe rather broad areas of the stage in color, while spotlighting is used to focus attention on one part of the stage. With both floodlighting and spotlighting, the intensity and the color of the light will play important roles in affecting the mood of the audience.

Since floodlighting is intended for broader coverage of the stage, lamps with a wide beam should be chosen for this application. For spotlighting, lamps with narrow beams should be chosen. Many different types of lighting fixtures are available through professional lighting supply companies. **sunn** offers several options including F-40 “Par” fixtures (available in groups of four as the LG-4 Light Group, which also includes a truss-style mounting bar), or individual Par 56 or Par 64 cans which may be mounted on **sunn’s** CB 100 truss bars. “Par” stands for “parabolic aluminized reflector”; the lights for Par fixtures contain a built-in lens and reflector and are available in several sizes, wattages, and beam width, as indicated by their part numbers. Section 9 explains how to decipher these numbers. Choose the lamps most appropriate to your needs.

Some adjustment in coverage is possible simply by moving the light; the area covered by a light increases as the light is placed further away (good for floodlighting) and becomes smaller as it is moved closer (good for spotlighting). There is, however, a limit on how far away you can locate the fixture, since the light’s intensity **DECREASES** with distance.

Placement of the lights is often a compromise between physical considerations (shape of the room and stage, available power, mounting options) and the ideal set-up. Room architecture and mounting options will probably determine whether you place the lights individually in different locations or mount them to a truss assembly. If you use a truss you will have to determine whether to hang it from hooks screwed into the ceiling or set it atop a tripod, or “tree.” In any case, you want to place the lights where they will most effectively enhance the show.

Where you locate your floodlights is largely a matter of personal preference. If you have enough lights available, it is best to illuminate each area of the stage with several lights. This minimizes unwanted shadows, and allows you to change the colors illuminating the area by using different gels on each of the lights and mixing the lights in different proportions.

The best location for spots is usually in front of the stage, and fairly close in.

If you are only using a few lights (e.g. a single LG-4 group) they may have to serve dual functions, as spots and floods. In this case, medium beam width lights should be selected. They should be aimed on specific people, but should cover a wider area than a spot would cover. If only one or two people will be spotlighted in the performance, it is possible to use one or two lights as spotlights and the rest as floods.

One very effective setup with the SC 216 utilizes four four-channel dimmer packs. One dimmer pack, controlled by channels 1-4 of the controller, powers the spotlights which are located in front of the stage; two dimmer packs, controlled by channels 5-8 and 9-12, supply power to the floodlights which flank the stage; and the fourth dimmer pack is positioned over the drummer and is controlled by channels 13-16 (see Figure 4).

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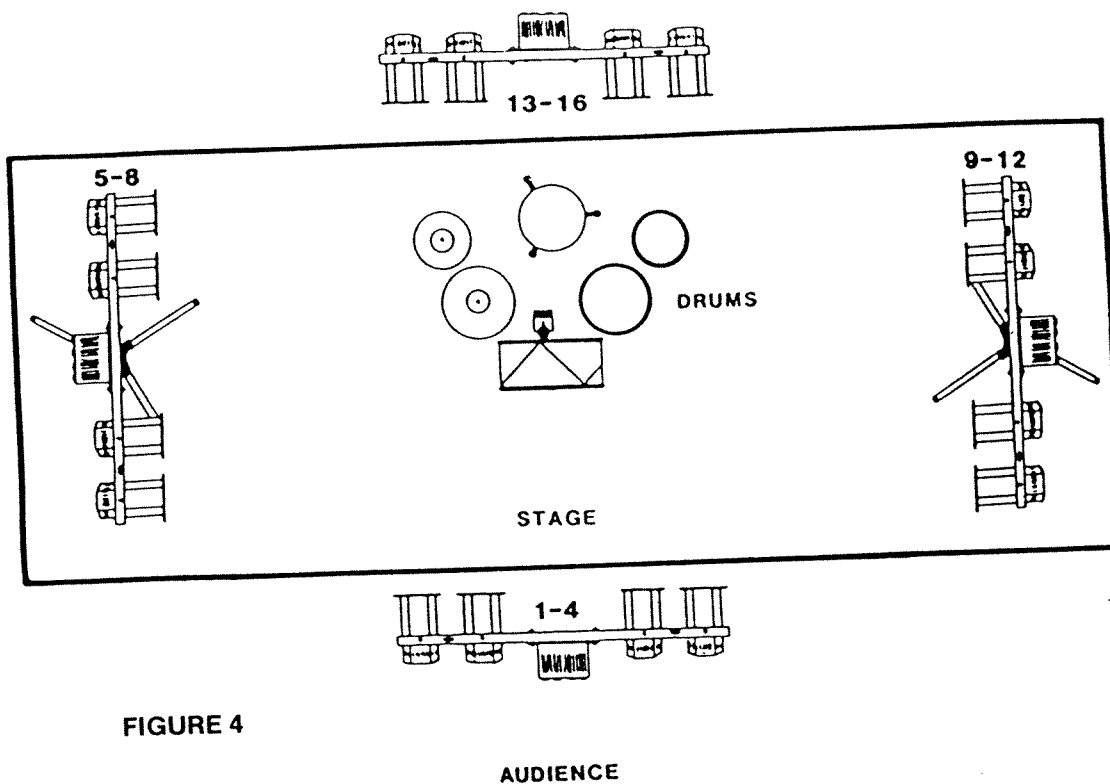


FIGURE 4

AUDIENCE

Many other setups are possible, of course. Since circumstances vary so much from one user to the next, the best advice we can give is to observe and to experiment.

5-2. AIM. When you aim the lights, it is best to have two people working together - one to aim, and one to stand in the target area. If you are setting up alone, remember that people have height. If you aim the lights at the floor of the target area, you will end up illuminating people's feet, not their bodies. One useful trick with spotlights is to aim the beams at the microphones of the people you are trying to highlight. This will usually get you in the ballpark. Unfortunately, it is awkward to have to re-aim a light, and especially a spotlight, during a show; so try to aim as well as possible BEFORE the show begins.

5-3. COLOR. Color can have profound psychological effects on the audience, and gearing the color to the material being performed can greatly increase the impact of the performance. Blue light creates quiet, contemplative moods, while red generally has the opposite effect. Yellow is energetic. Pinks and purples are usually complimentary to skin tones. Brighter colors are generally preferred for spots. Experiment.

5-4. DIMMER PACK PLACEMENT. The dimmer packs should be located as close as possible to the lights they drive. Not only is it less expensive to run one extension cord to a dimmer pack than it is to run four from the dimmer pack to the lights, but also the "switching transients" generated by the dimmer packs are more likely to be a problem when more extension cords are used (for more on this, see Section 8 and the rules listed in Section 4).

How and where you choose to mount your dimmer packs depends upon your particular circumstances; the operator's manuals included with your dimmer packs outline the available options. Whatever method you choose, however, always make sure that you:

- Keep the dimmer pack away from low-level audio lines,
- Protect the dimmer packs from possible spilled drinks,
- When rack-mounting dimmer packs, do not mount audio equipment in the same rack, as doing so may result in audio interference problems.



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5-5. LIGHTING CONTROLLER PLACEMENT. Since the SC controllers are phantom powered, they may be located anywhere within reach of the mic cord. Care should be taken to insure that nothing is set down on top of the controller, since excessive pressure can damage the slide controls.

## 6. OPERATION OF THE SC 28F AND SC 216 CONTROLLERS.

Once you have set up your system, it is time to see it in action. First, select SCENE I by pushing the MASTER and the CROSSFADE controls I and II all the way up; this puts the MASTER control and CROSSFADE control I at "10" and CROSSFADE control II at "0". If the red BLACKOUT LED is lit, tap the RESTORE button. The green RESTORE LED should now be on, and the SCENE I slide controls will be in charge of the lights. A signal (the SUNNPLEX™ signal) will be sent from the controller to the dimmer packs via the mic cord, telling the dimmer packs how much power to supply to each of the lights. Changing any one of the SCENE I slide controls will cause that channel's lights to brighten or dim proportionately.

Now, set up a different scene on the SCENE II sliders. Grasp both of the CROSSFADE controls between your thumb and index finger and simultaneously move both controls toward you. This causes SCENE I to "crossfade" smoothly into SCENE II at a rate determined by how quickly you move the controls. With the CROSSFADE controls all the way toward you, the SCENE II sliders now control the intensity of the lights, and when the CROSSFADERS are in intermediate positions the lights respond to a blend of the two scenes.

The CROSSFADE controls do not have to be moved together. For example, it is possible to "lead in" to a scene by turning that scene's CROSSFADE control up (towards "10") before turning the other one down.

You can also "sum" the two scenes by moving both CROSSFADERS to "10". For example, if you set the channel 1 faders of both SCENES I and II to "5", and both crossfade controls to "10", the channel 1 light will be on a full intensity, since the "5" of SCENE I is being added to the "5" of SCENE II, giving a total of 10 for the channel 1 light. As another example, set up SCENE I so that its channels 1-8 slide controls are at "10" and channels 9-16 are at "0". Then set SCENE II so that its channels 1-8 controls are at "0" and channels 9-16 are at "10". Now, with either one of the scenes individually selected (e.g., CROSSFADER I at "0" and CROSSFADER II at "10"), only that scene's lights will be lit; but when both CROSSFADE controls are at "10" all of the lights will be on at full brightness.

Some of the most dynamic effects available with the SC 216 are made possible by the FLASH buttons. These allow you to play along with the music, and also permit you instantly to spotlight anyone on stage. In addition, if you are caught napping and discover the show is about to start before you have set up your scenes (of course this will never happen to you), you can hit the FLASH buttons (the panic buttons) and adjust the scenes while you are holding the FLASH buttons down. The performers will probably congratulate you on your dramatic use of the lights, and you won't have to look for another job.

Audio sync can be used to add variety to the lighting without requiring constant attention. Once you have patched a suitable audio source into the AUDIO SYNC INPUT jack (see Section 3-2), move the CROSSFADERS up (selecting SCENE I) and adjust the SCENE I and MASTER faders somewhere in the middle of their range. Now advance the AUDIO SYNC fader until the lights pulse to the music. Move the SCENE I faders up and down; you will notice that when a light is at full intensity it is unaffected by the audio, making it possible to have the spot lights fully on while the floods flash in rhythm. Turning down a channel fader turns that channel's lights out. Crossfading into SCENE II gives the SCENE II faders control of the overall light intensity, while the SCENE I faders control the effect that audio sync has on the lights. Turning down a SCENE II fader while the same channel's fader on SCENE I is up causes the corresponding lights to pulse on and off to the music.

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To fade to black (fade-out) or to fade the lights on (fade-in), use the MASTER level control. The MASTER level control varies the brightness of all of the lights simultaneously, without changing their relative brightness. By moving the MASTER fader more quickly or more slowly, you have complete control over the duration of the fades. Incidentally, the FLASH buttons are not affected by the setting of the MASTER control. Therefore, you can continue to use spotlights and create special effects even during a fade.

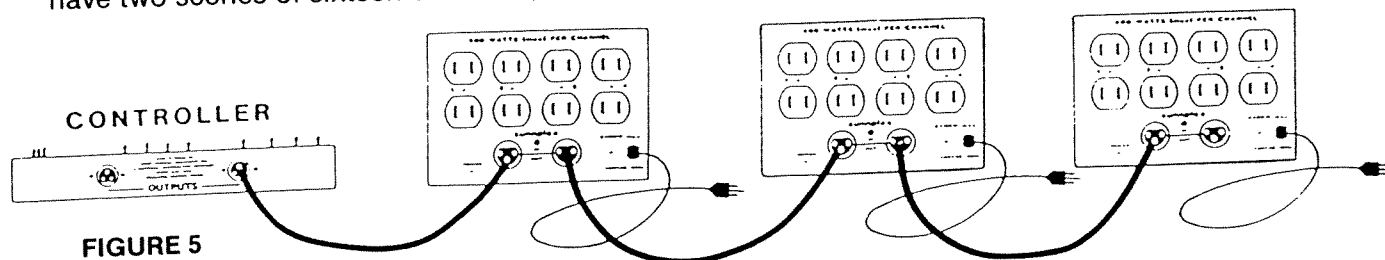
For instant blackouts, tap the BLACKOUT button. The preview LEDs will allow you to see how the lights will look when you turn the lights back on with the RESTORE button.

The more you use your lighting control console the more you will appreciate the amount of power you have at your fingertips.

## 7. EXPANDING THE SYSTEM.

To expand your SUNNSPOTS™ Lighting System you can add more dimmer packs, or you can run more than one independent system.

7-1. MULTIPLE DIMMER PACKS. A single **sun** controller can run as many as 25 dimmer packs at once, thus allowing you to add practically any number of lights. With the controller connected to one dimmer pack the SUNNPLEX™ signal may be routed over a mic cord to a second dimmer pack by patching it to the unused connector of either the controller or the first dimmer pack (see Figure 5). This process may be repeated to "daisy-chain" many dimmer packs together. Turning up the channel 1 fader will now turn up light 1 on each dimmer pack. The same is true for fader 2, etc. You still have two scenes of sixteen channels, but with more lights.



7-2. MULTIPLE SYSTEMS. You may also use more than one controller, making more scenes and more channels available, and giving you much more control over the stage lighting. In this case, you will need at least two sets of dimmer packs; one dedicated to one controller and the other dedicated to the other controller. This gives you two independent lighting systems at your command. Each system can have up to 25 dimmer packs. CARE MUST BE TAKEN, HOWEVER, TO INSURE THAT THE DIMMER PACKS OF ONE CONTROLLER ARE NOT CONNECTED TO THOSE OF ANOTHER CONTROLLER, AND THAT THE CONTROLLERS THEMSELVES ARE NOT CONNECTED TOGETHER. Otherwise, "buss contention" and unpredictable results will ensue.

## 8. TROUBLESHOOTING.

PROBLEM: Buzz in the audio system.

Lighting control and audio signals have always been enemies. That annoying little buzz that gives lighting control a bad name is caused by "switching transients," which are high current spikes of power originating in the triacs that control the intensity of the lights. These transients are the source of a couple of different kinds of interference. One of these is radio frequency interference (RFI), which radiates from unfiltered control systems and is picked up by the audio system. **sun** dimmer packs control this problem with high frequency filters that suppress the RFI.

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If a buzz is present, make sure you have followed the rules listed in Section 4. In addition, always follow good audio practices:

- Use balanced (3 pin) mics and cords.
- Use high quality instrument cords.
- Use three wire (grounded) power cords on instrument amplifiers.
- Repair faulty jacks on guitars and equipment.

This should eliminate any buzz caused by the lighting system. However, if you still have problems, try plugging the dimmer pack(s) into different AC outlet(s).

PROBLEM: High pitched "whine" in the audio system.

If a whine is present, and you are sending controller signals through a snake, then either the snake has some unbalanced channels, or it has excessive "crosstalk." If either is the case, use a mic cord. (NOTE: a "whine" on unterminated or unused channels may be normal).

PROBLEM: The lighting system does not operate properly.

Whenever you troubleshoot any system, first verify that it is correctly interconnected and that it is plugged into a working AC outlet. Next, isolate the problem to one part of the system by verifying the proper operation of the other parts.

DIMMER PACKS. All **sun** dimmer packs have a self-test feature built into them; with lights plugged into the dimmer pack, and the dimmer pack plugged into an AC socket, the lights will come on at full intensity when no mic cord is attached to the dimmer pack. If any lights do not come on, and the lights are known to be good, the problem may be caused by one or more blown fuses inside the dimmer pack. These should only be replaced by qualified service personnel.

WARNING: Busses, triacs, heatsinks and parts of the circuit board are at 120 VAC potential. Do not open the case without first disconnecting the AC cord. Install only fuses of the same rating indicated on the circuit board.

If there is still a problem in the dimmer pack, refer it to a qualified service technician.

LIGHTS. If you suspect a burned-out light, try plugging it into a working channel. If it still doesn't come on, replace it. Lights may also be tested by plugging them directly into any 3-prong AC outlet (be careful - the lights get hot, and they are bright). Replace any burned out lights.

MIC CORD. The quickest way to determine if you have a faulty mic cord is to swap it with one that is known to be good. If the problem disappears, your cord is probably bad. Cords can be tested easily with an ohmmeter. Measure the resistance between pin 1 on the male end and pin 1 on the female end. The reading should be close to 0 ohms. Now repeat the test for pins 2 and for pins 3. Again, you should read 0 ohms. If these readings are correct, measure between pin 1 and 2, between pin 1 and 3, and between pin 2 and 3 on one of the connectors. The meter should show an open circuit. If the cord is bad, repair or replace it.

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CONTROLLER. After verifying proper operation of the other parts of the system, plug in the controller. Either the red LED above the BLACKOUT switch or the green LED above the RESTORE switch should light. If neither LED lights, unplug the cord from the controller and measure the voltage between pin 1 (the ground) and pin 2 of the cord. +15 VDC should be present at pin 2. If it is not, the problem is either in the mic cord or in the dimmer pack. If the voltage is present and neither LED came on, there is a problem with the controller. If one of the LEDs did light, but the controller doesn't affect the lights, re-check the mic cord. Make sure that the dimmer pack you are using in the test is set up to be addressed by the controller you are plugging into it; otherwise, it may not respond to the controller even though both the controller and the dimmer pack are operating properly. There are no user-serviceable parts in the controller; therefore, any problem with the controller should be referred to a qualified service technician.

## 9. SERVICE INFORMATION.

LIGHTS: The lights that are suitable for use with your lighting system depend upon the intended use, the size and style of your light fixtures, and the power rating of your dimmer packs.

If you are using Par fixtures, the suitability of a lamp may be determined from its part number. A typical such number is:

150 Par 38/NSP.

The first number (150 in this example) is the power rating of the lamp; "Par" stands for "parabolic aluminized reflector" and indicates that the lamp has a reflector built into it; the Par number (38 in the example), divided by eight gives the lamp's intended use (N = narrow, M = medium, W = wide, VW = very wide, SP = spot, and FL = flood). Thus, the above example translates to:

150 watt lamp with built-in parabolic aluminized reflector; the lamp has a diameter of 4.75" and is intended for use as a narrow spot.

Lamps with the same diameter as Pars are available for use as washes, and are indicated by the letter "R", in the place of "Par." "R" stands for "reflector."

For further information on lamps, see lighting specialty stores, books and catalogs.

GELS: Gels are available in many colors through specialty lighting stores. We recommend using the high temperature variety. Their greater life expectancy more than offsets their greater cost.

Other than lights gels and microphone cords, there are no user-serviceable parts in the SUNNSPOTS™ Lighting Systems. If you have problems, contact your dealer for the location of the nearest **sun** Authorized Service Center.