



PLC 816e
Programmable Lighting Controller

OPERATOR'S MANUAL

sunn 

SUNN is a product line of Fender Musical Instruments Corporation.

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1 - INTRODUCTION

The PLC 816e is a fully programmable sixteen channel stage lighting control console with memory storage of up to one hundred and one "scenes" or "cues" and up to fifty "songs" which are pre-programmed sequences of scenes. Features include two dual digit numerical displays which show the current scene number and the next scene number, a "GO" switch to initiate a timed crossfade from the current scene to the next scene, a fade time control which determines the length of the crossfade, a grand master control for overall intensity, two user programmable switches for instant access to two often used scenes, a full flash switch to bring all light channels to maximum intensity, and a black out switch to turn all light channels off. There is also a programmable footswitch which can duplicate the function of any of the front panel controls.

Special effects include a programmable chase which can be stored as a scene, and audio sync which allows the light intensity to be controlled by an audio source. A full MIDI implementation is also provided allowing you to connect the PLC 816e to a MIDI controller or sequencer to create automated lighting effects.

Like all SUNNSPOTS components, the PLC 816e uses the SUNNPLEX multiplexing system that allows the various parts of the lighting system to be interconnected by way of standard three conductor microphone cables. 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.

2 - SYSTEM CONNECTION

POWER

Figure 1 shows a drawing of the rear panel of the PLC 816e. To the far left is the power jack where an optional external power supply can be connected. With the SUNNPLEX system the SUNN controllers derive their power directly from the SUNN dimmer packs via the mic cable which connects them. This eliminates the need for an external power supply. The power jack is provided for those users who only wish to use the PLC 816e as a MIDI controller where SUNN dimmer packs are not connected to the PLC 816e. In this case a common AC to DC wall mount transformer can be used to power the PLC 816e. The supply must deliver at least 7 volts DC at 300 milli-amps, 9 to 12 volts is recommended however. The plug polarity must be negative at the center and positive at the shell.

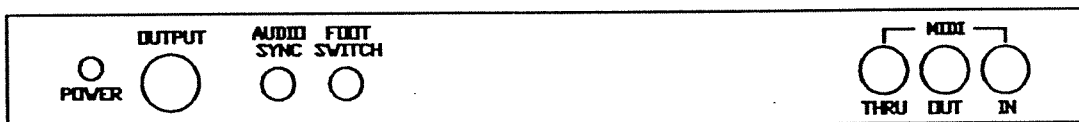


fig. 1 rear panel

There is no on/off switch on the PLC 816e so it powers up whenever you connect it to a power supply or whenever you connect it to a SUNN dimmer pack that is turned on. If you have lights connected to the dimmers they will immediately turn off when the PLC 816e turns on. This is because the PLC 816e calls up scene number 00 which is the "black" scene, whenever it powers up.

NOTE: It is recommended that you turn the dimmer off before connecting the PLC 816e.

OUTPUT JACK

There is a male XLR jack on the back panel. This jack is used to connect the PLC 816e to a SUNN dimmer pack or to a SUNN DePlex 216 using a standard balanced, shielded microphone cable. As mentioned in the previous section, the PLC 816e is powered from the dimmer packs through the microphone cable.

WARNING: You need to connect at least two dimmer packs to the PLC 816e to supply enough current for it to operate properly. Be aware that marginal mic cables and connectors may cause noticeable problems by delivering insufficient power to the PLC 816e.

When interconnecting, you can daisy chain as many as 25 dimmer packs together by using mic cables from one dimmer to the next. If you find that a mic cord is too short to reach be-

tween 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 connectors must always correspond to pin 1 on the female connectors, the same for pins 2 and 3.

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 PLC 816e, at least sixteen channels must be available on your dimmer packs; this is possible by using four or more four channel dimmer packs. (If you are connecting to the DePlex 216, it will receive all sixteen channels). Naturally, if you do not need all sixteen channels you can use the PLC 816e with fewer dimmer packs, adding more as future needs dictate. All SUNN four channel dimmer packs are factory set to respond to channels 1-4, therefore you will have to change the "addresses" of any dimmer packs that you want to respond to 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 channels on the PLC 816e. 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 PLC 816e, outlet 2 to channel 6 and so on. Similarly, the dimmer pack addresses may be set so that outlets 1-4 correspond to channels 9-12 or 13-16. You may also opt to have more than one dimmer pack set to the same group of four channels. In many applications it is preferable to have more than one lamp per channel.

CAUTION: The AC outlets on the SUNN 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 (guitar amps, fans, refrigerators, etc.) 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 DIMMER PACK AND TO THE CONNECTED EQUIPMENT.**

When you plug the dimmer packs in, you will obtain the best results if you adhere to the following rules:

- 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.
- Always use quality 16 gauge (or heavier) grounded extension cords.
- Make certain that the rating of the breaker or fuse for the chosen outlet is adequate. The required rating (in amps) of the fuse or breaker can be calculated with the formula:

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

where I = the current (amps)
P = the power (watts)
E = the voltage (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.

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

AUDIO SYNC INPUT JACK

In order to use the audio sync features an audio signal must be patched into this 1/4" phone jack. Effective signal sources include microphones, outputs from mixing consoles, drum machines, etc. Generally, lower frequency audio signals at line level produce best 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 (Shure type A95UF) should be used to convert to an unbalanced signal at the sync input. Only shielded audio cable should be used between the audio source and the audio sync input jack.

FOOTSWITCH JACK

This jack is for the footswitch provided with the PLC 816e. It is a momentary, normally open type switch. The function of the footswitch is programmable and can be set to duplicate any of the front panel switches with the exception of the Store switch. You can also use an Ensoniq foot pedal in this jack (model CVP-1). This can be purchased from any Ensoniq keyboard dealer. With the foot pedal you can duplicate the function of any of the front panel sliders with the exception of the Audio Sync slider.

MIDI IN

This is the MIDI input jack. You would normally connect this to the output of a MIDI sequencer or MIDI controlling device. Consult the MIDI section of this manual to find out which functions are controllable via MIDI.

MIDI OUT

This is the MIDI output jack. You would normally connect this to the input of a MIDI sequencer in order to record scene or control changes. Consult the MIDI section of this manual for more information on using a MIDI sequencer.

MIDI THROUGH

The MIDI data at the MIDI input is duplicated here to allow daisy chaining of several MIDI devices along with the PLC 816e.

3 - SLIDE CONTROLS

CHANNEL FADERS

Figure 2 shows a diagram of the front panel of the PLC 816e. The eight channel faders are grouped to the left of the panel and are labeled 1-8 at the top and 9-16 at the bottom. Eight faders are used to control sixteen channels. The BANK switch to the left of the sliders allows you to select which channels you are currently addressing, 1-8 or 9-16. The bank LEDs to the left of the numbers will indicate which channels are currently active. A channel fader determines the relative brightness of the lamps which are connected to that particular channel. The channel faders are used to create "scenes" or "looks" which can then be stored in memory for later recall during the performance. All channel sliders are scaled by the Grand Master fader. This is explained in more detail in the following section on the Grand Master.

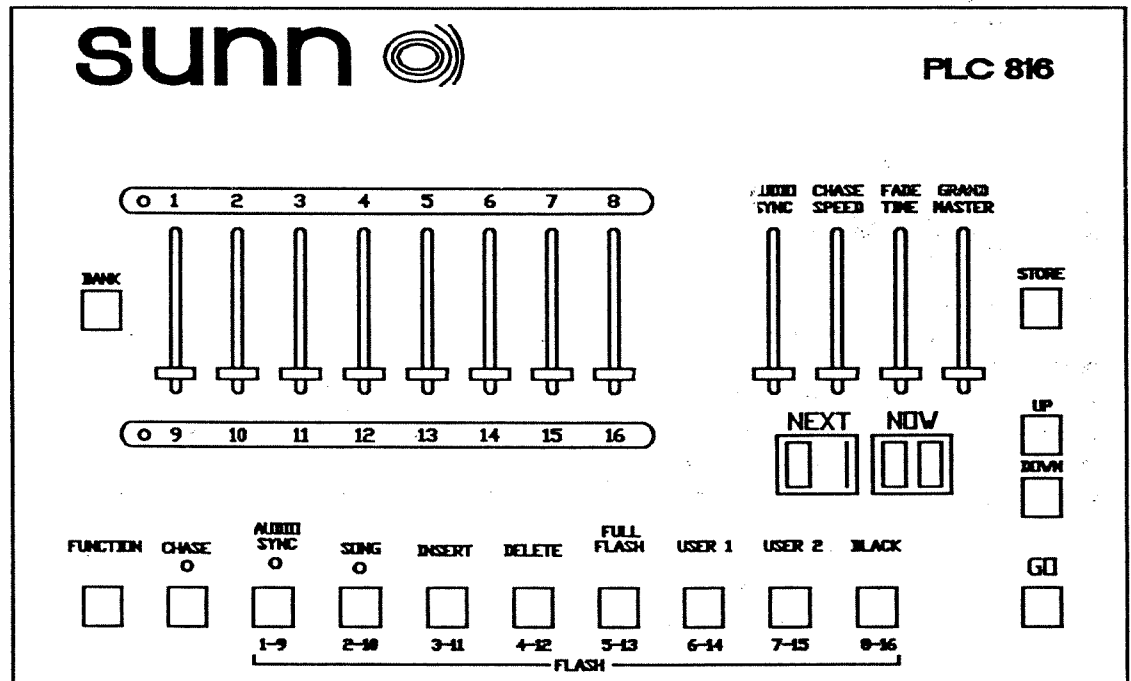


fig. 2 front panel

Whenever you move a channel fader several things happen. First the lights connected to that channel immediately begin to follow the movement of the slider. NOTE: The Grand Master must be set high enough to allow changes to be noticed. Also the period in the "Now" display will light up. This indicates that the current scene has been modified from its stored value.

This is a reminder to show you that the current scene on stage is a modified version of the stored scene.

AUDIO SYNC SLIDER

Continuing from left to right on the front panel, the Audio Sync slider controls the gain of the audio signal applied to the Audio jack. You should adjust the level of the audio at the source as well as with this control to get the optimum effect. Audio can be used to control light intensity as well as chase speed. For more information, consult the sections on audio sync and chase.

CHASE SPEED

This slider adjusts the speed of a chase whenever the chase is controlled by the internal clock or from MIDI. Its value will also be saved in memory whenever you create a chase scene. Moving this control will cause the period in the Now display to light, showing that the existing program has been modified.

FADE TIME

This determines the time it will take for your "Next" scene to crossfade to your "Now" scene when the Go switch is pressed. It also determines the fade time when Black, User 1 or User 2 is pressed. The crossfade time can vary from 0 to 10 seconds. It's value is saved with a scene when you store the scene to memory.

GRAND MASTER

The overall brightness of all the lamps is controlled by this fader. This means that in order to achieve full intensity for a lamp you not only must have its channel fader to full but also the Grand Master to full. All of the channel faders are scaled by the Grand Master. This means that when you move a channel slider from its lowest intensity to its highest, the lamp will vary in brightness from off, to however high the Grand Master is set. When you move the Grand Master, all the channels will change in intensity but still retain their relative brightness to each other. The Grand Master also determines the brightness of any of the flash effects.

The Grand Master value is not stored when you save a scene to memory. Although it can be controlled from MIDI, it is more or less a manual control for determining the overall intensity of the entire lighting system.

4 - SWITCH CONTROLS

BANK SWITCH

This determines the bank of lighting channels (1-8 or 9-16) currently being controlled by the channel faders. An LED will light next to the numbers which are above or below the channel faders to indicate the current bank.

FUNCTION SWITCH

This switch accesses functions which are generally used to configure your lighting system. Please consult the chapter "Special Functions" for more information.

CHASE SWITCH

This switch is used to write chase patterns and can be used to turn a chase off that was called from memory. The chapter entitled Chase explains in detail how to create and store a chase.

AUDIO SYNC SWITCH

This enables or disables the audio sync special effect. There is an LED above the switch to indicate when audio sync is on. When enabled, any audio signal present at the audio jack is added to the light intensity of the individual lighting channels. The effect is a "pile on" type effect, which means that the lights are made brighter by the amount of audio signal added. This also means that in order to see the effect, the lights cannot be at or near full intensity, since they can't be forced to go any brighter by the audio signal. An exception to this is when you are mixing audio sync with chase. For technical reasons the audio will set the absolute level of the channel receiving the effect rather than adding to the already existing level. For the most dramatic effect, use a low frequency or pulsing type of audio source such as a drum machine, set the lights to a low intensity or off, then adjust the level from the audio source or the audio sync slider. The lights should pulse with the audio signal.

The state of the audio sync switch (on or off) can be stored as part of a scene when it is saved to memory. Whenever that particular scene is recalled later, the audio sync LED will light, indicating that it's active. The value of the audio sync slider is not stored. You can also program which channels will receive the audio. This is done using the function switch. Consult the Special Functions chapter for more info on how to do this.

SONG SWITCH

This switch enables or disables the song mode of operation. Consult the chapter "Song Mode" for more information.

INSERT SWITCH

This switch is used to insert a step into a song sequence. Consult the chapter on song mode for more information.

DELETE SWITCH

This switch is used in song mode to delete a step within a song sequence. Consult the chapter on song mode for more information.

FULL FLASH SWITCH

Pressing this switch temporarily brings all channels to full intensity regardless of any other condition. As soon as you release the switch, all channels revert back to their previous settings before the switch was pressed. NOTE: The grand master slider will determine the actual level of the full flash.

CAUTION: By pressing Full Flash you are drawing the maximum power from your AC service on stage all at once. If you are operating with a marginal amperage rating from your fuse box, you will probably blow a fuse, especially if you are driving a lot of lamps.

USER SWITCHES

There are two user programmable switches provided, User 1 and User 2. These give you instant access to two scenes which are used most frequently. They can also be used as panic buttons if you become lost in your show. A user scene can be any stage look or special effect that you create from the front panel controls. Consult the chapter "Saving Scenes" as to how to save a user scene.

When you press a User switch, "U1" or "U2" will appear in the Now display. As with the Go switch you can call the scene in two ways. A quick press of the switch will call the scene instantly with no crossfade from the current scene, a longer held switch press (about 1 second) will cause the scene to fade in at its stored fade rate. Try experimenting with different lengths of switch presses to see just how long to hold the switch, the actual time required is .2 seconds for a timed fade.

BLACK SWITCH

This does exactly what you would think. It brings all channels to 0 (off). By pressing Black you are calling scene number 00 which is the blackout scene. If you press and release the switch quickly, the channels will go to black instantly. If you press and hold the switch momentarily (about 1 second), the scene will fade to black at the rate determined by the fade time control (from 0 to 10 seconds). Fade time is not stored with scene 00 nor can you write to this scene number.

GO SWITCH

This is the most often used switch. It initiates the crossfade from the scene displayed in "Now" to the scene displayed in "Next". A short press will call the next scene instantly with no crossfade, a long press (about 1 second) will cause a crossfade at the rate that was stored with the scene. After Go is pressed, the number in Next is moved to Now then the number in Next is incremented automatically to the next consecutive scene number. In a typical performance you would operate from a cue sheet which would list the scenes in numbered order. With the PLC 816e you can have your list of cues stored in memory as consecutive scene numbers and call them one after the other by simply hitting the Go switch at the proper cue.

In song mode the Go switch will call the scenes in the order called out in the song. The advantage of song mode is that you can store the scene numbers in any order. Consult the chapter "Song Mode" for more information.

UP AND DOWN SWITCHES

These switches serve several purposes but in general they are used to select values in the Next and Now displays. In normal operation of the PLC 816e, the Up and Down switches are used to select the next scene. After hitting Go the next consecutive scene number will automatically be placed in the Next display. If this isn't the next scene you want, use the Up or Down switch to select another scene. These switches will auto-repeat at high speed if you hold them down.

Up and Down have different functions when you are operating in song mode, saving a scene to memory, or when setting one of the special functions. Consult the individual chapters on each of these operations for more information.

STORE SWITCH

"Store" is used to write data to memory. There are several types of information which can be stored including scenes, songs, and system parameters. The next chapter explains how to save a scene. The chapter "Song Mode" describes how to create and save a song and the chapter "Special Functions" explains the system parameters.

FLASH CHANNELS

Some of the switches double as individual channel flash switches. The channel numbers are labeled below each switch. These allow you to flash individual channels during live performance and also allow you to select channels when writing a chase pattern. The chapter entitled Special Functions explains the flash mode and the chapter on chase explains chase write.

5 - SAVING SCENES

Once you have created a look on stage either by setting the individual light channels to different values or by creating a chase, you will want to save it to memory. Once it has been saved it will always be available for later recall until you later edit it or over-write the particular scene with a new one. Memory is not lost when you turn the PLC 816e off.

To save the current panel settings as a scene, first press the Store switch, the number in the Now display will flash showing that you are now in store mode. With the Up or Down switch, select the number that you want to assign to the new scene. Once you have selected the number, press Store again and hold it down for 2 seconds. When Now stops flashing, the scene is saved. If you only want to edit or touch up an existing scene, call up the scene, make any adjustments, then press and hold down the Store switch for 2 seconds. When Now stops flashing, the scene is re-saved at its original number.

While in store mode, you can also assign the current scene to one of the user switches instead of a scene number. Press User 1 or User 2 instead of using Up or Down to select a scene number. "U1" or "U2" will appear in the Now display. Hold down Store for 2 seconds as before to save.

6 - CHASE

Chase sequences are programmable and are created using the chase controls. Chases can be created "on the fly" or can be stored in memory as a scene. A chase sequence is made up of steps. Each step can be either a channel flash or a scene flash. You can have up to sixteen steps in a chase.

When the chase is running, the PLC 816e will flash each step in order and continue to repeat at whatever speed you program it. You may also choose to control the chase speed from MIDI clocks or from an external audio source. Consult the special functions chapter for details on how to program the chase source.

CREATING A CHASE

To create a chase sequence, first press the Chase switch. The red LED above it will flash. This means that chase is recording. Now you can start entering the elements that you want your chase to be composed of. To add a channel flash, press a channel flash switch. The bottom row of switches starting with the Audio Sync switch double as flash buttons. The channel number is labeled under each switch. The bank switch determines which bank you are selecting (1-8 or 9-16). **NOTE:** Whenever the chase LED is flashing the bottom row of switches are in flash mode and their normal functions are temporarily suspended.

To enter a scene into the sequence, select any scene number with the Up or Down switch (it will be displayed in Next), then press the Go switch. It will be added to the end of the chase sequence. After sixteen chase steps have been entered, the chase is full and no more steps can be added. You can have fewer steps if you choose.

By pressing the Chase switch again, the Chase LED will stop flashing but remain lit and the flash switches will return to their normal functions. If you press the Chase switch a third time (while the Chase LED is lit but not flashing), the chase will be turned off and the pattern erased.

CHASE SPEED

To control the speed of a chase use the Chase Speed slider. If you would like to control the speed from MIDI or from audio, use function number 1 and select the desired chase source. Selection 0 is internal clock, 1 is audio, and 2 is MIDI. Consult the special functions section for more details.

STORING THE CHASE

You must store your chase in memory if you want to be able to call it up later, otherwise it will be lost when you call a new scene. Store it the same as you would a regular scene; press Store, select the scene number you want to save it to, then hold Store for one second. To remove it from memory, simply record another scene over it.

PROGRAMMING HINTS

The most powerful chase tool is the scene chase. By using scenes as chase steps you can achieve the most dramatic effect because all of the lights can change with each step. You can also mix scenes with individual channel flashes in the same chase sequence.

In your overall stage look you may want some lights to chase while others remain the same. For example you may want the lights at the front of the stage to remain fully lit while you step through three different colors at the back of the stage. To do this you must first create and store three different scenes. Scene 1 will have all of the front lights on with only the blue lights on in back, scene 2 will have all front lights on and only the red on in back, and scene 3 will have all front lights on and only the green on in back. Next write a chase sequence that contains scenes 1, 2, and 3 as the three chase steps.

When creating a chase pattern from single channel flashes, you will probably want to chase some channels while others remain at some constant level. As in our previous example, you may want all front lights to remain on while you chase through the individual lights at the back of the stage. To do this you must first call a scene that sets the front light levels then follow that call with a call to a chase scene that chases the back lights. Two scenes are required because the PLC 816e can store a scene as a normal scene (a configuration of light settings) or as a chase pattern. It cannot store a combination of both. Another alternative would be to have the first step in the chase be a scene that sets the overall look on stage.

NOTE: Chase flashes do not send MIDI.

7 - SONG MODE

Song mode is ideal for someone who needs to step through an entire light show from the footswitch. It allows you to store a series of scene numbers in random orders called songs. During performance the scenes can then be recalled as steps in a song by simply pressing Go or the footswitch which is configured for Go at each cue point. Remember, you must press and hold the switch for at least .2 seconds to achieve a fade, a quick switch press will call the scene instantly with no crossfade.

Up to 50 songs are allowed with each song addressing up to 99 steps. The amount of song memory available inside the PLC 816e is limited and there is not enough for all 50 songs to contain a full 99 steps. But the memory is adjustable through one of the special functions to allow more song memory in exchange for less scene memory. For most systems 101 scenes are far more than what is needed. So for each scene that is sacrificed, 18 song steps can be gained. Consult the chapter "Special Functions" for information on how to re-configure the memory.

To enter song mode, press the song switch. The LED above the switch will light and the letters "Sn" will appear in the Next display and "01" will appear in the Now display. This is to indicate that you are ready to enter song number 1. At this point you may either select a different song number or go ahead and begin song number 1. To select a different song number use the Up or Down switch. (Whenever "Sn" is displayed in Next you are in song select). To call the first step of the song, hit Go. You are now in the song. Next will display "01" indicating that you are at the first step of the song and Now will display the scene number stored at that step. If the song is empty, "E-" will be displayed in Now instead of a scene number. "E-" represents the end of the song or the end step. Therefore if there is nothing stored in the song, the first step will be the end step.

During song mode, Next is used to display the song step (1-99) and is also used to indicate song select mode ("Sn" displayed). This is different from the normal mode of operation for the PLC 816e where Next shows the next scene to be called. Now will continue to show the currently selected scene number as before.

CREATING A SONG

Before you create a song you must first create the scenes that you will be using in the song. A song is only a list of scene numbers and doesn't contain any of the scene information. The song uses the scenes that you have created and stored in the scene memory. Consult the previous chapter on saving scenes if you haven't already done so.

It can be helpful to work from a prepared cue sheet which contains the scene numbers at the proper cue points in the music, that way you can simply enter the scene numbers into the PLC 816e song memory right off of the list. Once entered, there are facilities provided for quick editing of the song list.

If you are beginning with a song that is empty, Next should display "01" and Now should display "E-". This indicates that the first step is the end of the song. Press the Store switch once,

"E-" in Now will start to flash indicating that step 1 is ready to record. To abort the process, simply press Store again and Now will stop flashing.

Select the scene number you want to place at step 1 by using the Up or Down switch. The Now display will show the selected scene number and if you have lights connected, the stage will also change to show your selection. (NOTE: Even though "E-" may be what's in the Now display, the last called scene will be the one that's actually up on the stage). Once you have selected a scene for that step simply hold down the enter switch for 2 seconds. After the step has recorded, the Next display will automatically increment to the next song step and Now will display "E-". This indicates that the end has now been moved up one step. "E-" will remain flashing indicating that you may now enter the next step in the song. If you are finished entering the song, press Store once again (do not hold for 2 seconds) and you will exit the song enter mode.

After a song list is entered there are several different editing functions provided to help you make changes to the song without erasing then re-entering the whole thing. You can also scan through the steps of a song at high speed by pressing and holding the up or down switch. As long as you are not recording a song (scene number or "E-" in Now flashing), or are in song select ("Sn" in Next), the Up and Down switches allow you to move to a desired step in the song. The scenes that are called using these switches are called on stage instantly though, without their recorded fade times. This can be a convenience during performance as it allows the Down switch to be used to back up one step.

CHANGE SCENE NUMBER

To change the scene number stored at a particular step, first advance or retreat to that step in the song. Hit Store once. The scene number will flash indicating that it's ready to record. Select a new scene number with Up or Down, then press and hold Store for 2 seconds. When the scene number stops flashing, the new scene number has been recorded over the old one.

DELETE STEP

To delete a scene from a song list, first go to that step, then press Delete and while still holding it down, press Store. Hold down both keys for 2 seconds. When the step number stops flashing the scene at that step will be erased and all subsequent scenes will be moved down one step to fill the gap.

To remove several scene steps, go to the first step you want to remove, then press Store once. The step number will flash indicating record mode. To remove that step, hold Delete for 2 seconds (you don't have to hold Store this time). The remaining steps in the song will then all be moved down one notch to fill the gap left by the one removed. You will still be in record mode. You may then re-press and hold Delete for as many times as you want to remove more scenes from the song. When you're finished press Store once again to leave record mode.

DELETE ENTIRE SONG

To remove an entire song, select the song you want to remove by going to song select ("Sn" displayed in Next), then select the song number you want to erase with the Up or Down switch. Hold down Delete then press Store and hold down both for 2 seconds. When the song number stops flashing, the song has been erased.

INSERT STEP

To insert a new scene into the middle of an existing song list, first go to the step in the song where you want the new one to be added. Press Store once to go into record mode (scene number in Now will flash). Press Insert and "___" will appear in the Now display. This indicates that this step is ready for a new scene to be inserted. You may abort the insertion process at any time by pressing Store once again. Select a scene number for the new step you want to insert. Once selected, hold down Store for 2 seconds. After the scene number stops flashing, the insertion is complete and all subsequent scenes in the song order will be moved up one step to accommodate the new one.

NOTE: Depending on how much song memory is currently being used, the amount of time needed to store the insertion will vary. This is because the entire memory is being rearranged to make room for the new step. This may also apply to other song memory operations.

ADDING MORE STEPS TO END OF SONG

This is basically the same operation as starting a new song from scratch. First go to the end step ("E-" displayed in Now), then go into record by pressing Store once. Select a new scene with Up or Down and then press and hold Store for 2 seconds. The song step will automatically be incremented to the next step and you will remain in record mode. This makes it convenient to add a series of entries to the end of a song. As before, simply press Store again to exit record mode.

8 - MIDI

With MIDI you can do the following: Record your control changes (slider moves, switch presses, special effects, etc.) with a MIDI sequencer and play them back into the PLC 816e for an automated lighting sequence, control the PLC 816e from another source such as a MIDI keyboard or percussion controller, transfer the memory from one PLC 816e to another or to a computer for storage.

If you've never used MIDI before, here is a very brief description of what it does. It provides a digital interface for connecting one MIDI instrument to another MIDI instrument by means of a single MIDI cable. What happens after they are connected depends a lot on the particular instruments you're using and how they were designed to use MIDI. For the most part, MIDI was designed to transfer musical performance information, especially information related to synthesizers (e.g. note on, note off, control change, etc.). Fortunately this same information lends itself easily to instruments like the PLC 816e lighting controller.

MIDI, like audio, requires separate lines for input and output. If you are working with a MIDI sequencer, you will want to connect the MIDI out of the PLC 816e to the MIDI in on the sequencer and the MIDI out of the sequencer to the MIDI in on the PLC 816e. If you are only controlling the PLC 816e from a remote MIDI source such as a keyboard, you only need to connect the MIDI in on the PLC 816e to the MIDI out of the controlling device. The MIDI through jack on the PLC 816e enables you to daisy chain other MIDI instruments to the incoming MIDI signal. To do so, connect the through jack from one device to the MIDI in of the next device in the chain.

The PLC 816e makes use of MIDI program changes, MIDI continuous controllers (sliders) and MIDI switches. It can also respond to MIDI note numbers such as those sent by a MIDI keyboard or a MIDI percussion controller. It also uses MIDI system exclusive messages to transfer its memory contents. A list of the MIDI messages that are sent and received by the PLC 816e is given at the end of this chapter.

Scene changes are sent out from the PLC 816e as MIDI program changes. In addition each light channel is given its own MIDI continuous controller number. The controller numbers used for this are 16 - 31, starting with light channel number 1. Controller number 13 is assigned to the Grand Master slider, controller number 14 to the Fade Time slider, and controller number 15 to the Chase Speed slider. The level for each control can vary from 0 (off) to 127 (maximum). This allows a sequencer to record movements from these sliders as continuous controller changes.

The Full Flash and Audio Sync switches can transmit a press or release using MIDI switch numbers. Full Flash uses switch number 94 and Audio Sync uses switch number 95. MIDI switches send a value of 127 for on and 0 for off.

USING A MIDI SEQUENCER

All sequencers are different in their number of features and their ease of use. Become familiar with the one you are using before attempting to use it with the PLC 816e. Make sure your se-

quencer is capable of recording continuous controller information if you intend to record slider moves and switch presses and not just scene changes. Most sequencers can, but some only record notes in addition to some other musical information.

All MIDI sequencers have one thing in common, they record MIDI information and then play it back. With the PLC 816e you can record scene changes, any slider move except the Audio Sync slider, and you can record the following switch presses: Audio Sync, Full Flash, User 1 and 2 (recorded as scene changes), and individual channel flashes when using the flash mode in "Special Functions".

When recording the PIC 816 with your sequencer, scene changes initiated when you press Go will be recorded as a MIDI program change message. A fade time value of 0 is sent if the scene was called instantly with a quick press of Go. When you move a slider, either a channel slider or one of the other sliders except Audio Sync, a MIDI control change message will be recorded. Whenever one of the switches are pressed or released (only those switches listed above), a MIDI switch on or off message will be recorded. Whenever an individual channel is flashed when using the flash mode in "Special Functions", a MIDI control change value of full channel intensity (127) and a value of 0 will be recorded when the individual flash switch is pressed then released. You will find when recording lighting information, that unless you are recording a lot of slider moves, the PLC 816e uses very little sequencer memory.

When playing the recorded MIDI information back into the PLC 816e, the lights will respond as recorded. One important thing to remember though is that the Grand Master scales all lighting signals whether they are from actual slider moves or from MIDI. This means that if you record your channel slider moves then adjust the Grand Master during playback, the overall intensity of all the lights will change but they will still remain the same relative to each other. You can think of the Grand Master like a master volume control in audio applications.

Be careful when recording Grand Master slider moves. If your sequencer turns the Grand Master to 0, it will stay there even after the sequencer is turned off. You must move it back up manually or make sure the sequencer turns it back on.

It is best to give the PLC 816e its own MIDI channel while sequencing, especially if there are other MIDI instruments being driven by the same sequence. The MIDI channel on the PLC 816e is set to channel 1 at the factory but you can change it with one of the special functions. Consult the chapter "Special Functions" for more information.

The simplest type of lighting sequence is a recording of scene changes at appropriate cues in a piece of recorded music. This only requires selecting a scene in Next and hitting Go at the right spot while overdubbing your lighting track. Since scene changes are recorded as MIDI program changes, you can see why a separate MIDI channel for the lights is a good idea. You wouldn't want your synthesizer changing programs each time your sequencer sent a scene change to the PLC 816e. If your sequencer allows multi-tracking, a separate track for the lights is also a good idea. If your sequencer allows merging of tracks, a good method of recording complex lighting changes is to use two tracks to create the lighting sequence. You can record as many changes as you can execute on the first track, then add more changes by recording them on to another track and then merging or "bouncing" them over to the first track whenever you have them right. This way you don't have to try to do it all in one pass and you can take the time to get each pass right, "piling on" to the good track only when

it's perfect. This method is good for recording lots of musically synced flashes that you normally couldn't execute in real time.

USING AN EXTERNAL MIDI CONTROLLER

If you're driving the PLC 816e from a MIDI keyboard or some other type of MIDI controller, you have several options. You can use MIDI control change messages to control the level of the individual light channels or you can use MIDI note numbers. The notes that the PLC 816e responds to are middle C (note number 60) through D# one octave higher (note number 75). Light channel 1 is assigned to middle C with each consecutive light channel assigned to the next consecutive note number (increasing by musical half steps). The velocity of the note received will determine the brightness of the light (scaled by the Grand Master). A note off (key release) will turn the light off. Be sure to allow a note of sufficient duration to turn the light on. Quick notes won't be noticed because of the slowness of the lamp filaments to respond to the desired intensity. If you are using a percussion controller to drive the lights from a drum set for example, adjust the controller so that a drum will output the desired MIDI note number assigned to the particular light channel that you want the drum to flash. If the controller will send velocity, the intensity of the hit will determine the brightness of the flash. Program the controller so that it sends a note off following the note on after a long enough time to achieve the desired effect.

Note: The PLC 816e does not send MIDI notes even though it will respond to them.

Another possible use would be to control lighting functions from a dedicated MIDI keyboard controller. If the controller has programmable sliders or pedals, you can control the Grand Master, Chase Speed, or individual light channels from your MIDI keyboard. You could also call scenes by making program changes from the keyboard.

DUMPING THE MEMORY

The PLC 816e allows for memory transfer via MIDI system exclusive messages. A memory dump is initiated from one of the special functions. Consult the next chapter for more information. While a dump is being received, "rd" will appear in Now. The display will be restored when the dump has been received. If an error occurs during the receive process, the message "Er" will appear in Now. A dump cannot be received while in song mode.

You can use the memory dump function to transfer the contents of one PLC 816e to another or you can transfer to a computer for storage to disk. You must have special software and a MIDI interface for your computer to do this. A generic MIDI data dump record program will generally work provided it has sufficient memory capacity. The size of PLC 816e memory dump varies depending on the amount of memory being used. The system exclusive format is included at the end of this chapter for reference.

MIDI DATA FORMAT

All numbers are expressed in hexadecimal unless stated otherwise.

TRANSMITTED AND RECEIVED DATA:

Grand Master slider	Bn 0D wv	(n = MIDI channel 0 - F)
Fade Time slider	Bn 0E wv	(wv = slider position 0 - 7F)
Chase Speed slider	Bn 0F wv	
Light Channel 1	Bn 10 wv	
.	.	.
Light Channel 16	Bn 1F wv	
.	.	.
Full Flash Switch	Bn 5E wv	(for switches wv = 0 or 7F)
Audio Sync Switch	Bn 5F wv	
.	.	.
Scene Change	Cn pp	(pp = program no. 0- 63)
User 1 Switch	Cn 64	
User 2 Switch	Cn 65	
.	.	.
Memory Dump	F0 08 4C 03 7F aa aa aa aa dd..... F7	

First 5 bytes are dump header, aa = highest used memory address in nibblized form high address sent first, dd = memory contents in nibblized form sent high nibble first (length determined by amount of memory used).

RECEIVED ONLY DATA:

9n 3C wv	note on received by light channel 1 (wv = velocity)
.	.
9n 4B wv	light channel 16
8n 3C wv	note off received by light channel 1
.	.
8n 4B wv	light channel 16
F8	MIDI clock
FA	MIDI start
FC	MIDI stop
F0 08 4C 03 00 F7	memory dump request

9 - SPECIAL FUNCTIONS

There are nine special functions provided which are accessed by pressing the switch labeled Function. In order to call a specific function, you must hold down the function switch while pressing the Up or Down switch. The Next display will show "F" followed by the function number (0-8). Once the desired function number is reached, release the function switch. You may then use Up or Down to select a value or perform some other operation depending on the particular function selected. You can exit function mode by pressing Function once again. Whenever a special function involves choosing a particular value, that value will be stored in non-volatile memory until you decide to change it again. The special functions are as follows:

- F0 - Switches now become flash buttons.
- F1 - Select chase source.
- F2 - Select MIDI channel.
- F3 - Display amount of song memory remaining.
- F4 - Initiate memory dump.
- F5 - Select audio sync channels.
- F6 - Re-configure memory.
- F7 - Erase entire memory.
- F8 - Select footswitch function.

F0 - FLASH MODE

This special function will probably be the one you use most. It allows you to flash individual light channels by temporarily changing the bottom row of switches into flash buttons. The switches are labeled at the bottom with the channel numbers they address. The bank switch determines whether you are flashing channels 1-8 or 9-16. You can easily jump in and out of flash mode by simply pressing the Function switch. The Grand Master level determines the brightness of the flash. In addition, Go will become the full flash button. The channel that is flashed will remain at maximum as determined by the Grand Master for as long as the switch is held. In order to notice a change, the particular channel being flashed cannot already be at or near maximum. When the switch is released, the channel will return to its previous level. A MIDI value will also be transmitted whenever the flash switch is pressed or released.

F1 - SELECT CHASE SOURCE

Use Up or Down to select between three chase sources: 0 = internal clock, 1 = audio input, and 2 = MIDI clocks. The selection will only apply to the currently selected scene and that scene of course must be a chase. The selection can be stored along with the scene whenever you save the scene to memory. If you have already saved the scene, save it again after changing the source.

Internal clock is the default setting when you first create a chase. The speed is set by the position of the Chase Speed slider. With audio as the source, the speed is controlled by

whatever audio signal is sent to the audio input jack. The PLC 816e tries to detect a beat from the audio signal. In order to work properly the signal must vary in intensity from beat to beat. You can adjust the signal gain at the source as well as with the Audio Sync slider to get the optimum result. With MIDI clocks as the source, you must provide a MIDI timing signal (such as one from a MIDI drum machine) at the MIDI in jack. The chase speed slider will determine whether the chase will sync to whole, 1/2, 1/4, 1/8, or 1/16 notes.

F2 - SELECT MIDI CHANNEL

Use Up or Down to select the MIDI channel as displayed in Now. This will be the MIDI channel that the PLC 816e transmits and receives on. Setting the value to "00" sets it to omni mode. In omni mode, the PLC 816e will transmit on MIDI channel 1 and receive on all incoming MIDI channels indiscriminately.

F3 - DISPLAY AMOUNT OF SONG MEMORY REMAINING

When this function is selected, Now remains blank until you press the Go switch. As long as Go is held, Next and Now will show you the number of song steps still available in memory. If you find you are running out and will need more, use function 6 to gain more song memory.

F4 - INITIATE MEMORY DUMP

Function 4 is used to transfer the memory contents from one PLC 816e to another or to a computer. To transfer, connect the MIDI out from the PLC 816e to the MIDI in of the receiving PLC 816e or computer. If transferring to another PLC 816e, make sure that the receiving unit is not in song mode. Press Go and "--" will begin to flash in Now. While receiving, "rd" should appear in the Next display on the receiving unit. When "--" stops flashing, the PLC 816e is through sending. If an error is detected in the receiving PLC 816e, "Er" will be displayed in Next.

F5 - SELECT AUDIO SYNC CHANNELS

From this function you can select which light channels will respond to audio when the Audio Sync effect is turned on. The selection will be the same for all scenes that use Audio Sync.

In order to see which channels are being selected or deselected, Audio Sync should be on and an audio signal should be present. You will have to turn on Audio Sync before turning on the special functions since this function uses the flash switches to turn the individual channels on and off. Use the Bank switch and the individual channel flash switches to toggle channels on and off, you will have to observe the stage lights to see which channels are being affected.

F6 - CHANGE MEMORY CONFIGURATION

For this function, the highest available scene number is displayed in Now. This will be set to 99 from the factory. This means that you can have 99 scenes in memory to work with (101 including User 1 and 2). This will only leave you with enough memory for 173 song steps. For most systems 99 scenes is far more than what is needed. You can give up some of your scene memory in exchange for more song memory. For each scene that you give up, you

can gain 18 song steps in return. For example if you reset the maximum scene value from 99 to 50, you will increase the number of song steps available to 1055. To re-configure, use Up or Down to select the number of the highest scene you will need. Press Store and hold it down for 2 seconds. When Now stops flashing, the process is complete. If you are changing from a higher value to a lower value, you are losing the use of any scene numbers above the selected maximum. This also means that if you have any songs already written that use those scene numbers that are now removed, the song will no longer be able to call the unavailable scene when it is stepped to. "--" will appear in Now during song mode whenever a scene is called that no longer exists. If you are changing the maximum scene number from a lower value back up to a higher one, the re-configure function will only let you set it as high as there is memory available. If there is not enough song memory to steal back for scene memory, the maximum scene number will only be set as high as possible without erasing any song data. For example, if you try to set the max scene back to 99 from 50 after you have used up 200 song steps, max will only go back to 97 unless you go back into song mode and free up some song memory by erasing some steps or some songs.

F7 - ERASE ENTIRE MEMORY

This allows you to reset all memory settings back to their default values. All system parameters are reset and **all scene and song memory is erased**. To execute, hold down Delete then press Store and hold down both for 4 seconds. The PLC 816e will go black for awhile then reset to the power up state.

F8 - SELECT FOOTSWITCH FUNCTION

This allows you to select how you will use the footswitch that is provided with the PLC 816e. You also have the option of using an Ensoniq foot pedal (model CVP-1). Use Up or Down to select from 0 to 13 for footswitch operations or 14 to 24 for pedal operations. The selections allow the foot switch or pedal to duplicate most of the front panel controls. The selections correspond to the following:

<u>Footswitch</u>	<u>Foot Pedal</u>
0 - Go	14 - Grand Master
1 - Black	15 - Chase Speed
2 - Full Flash	16 - Fade Time
3 - User 1	17-24 - Channel sliders
4 - User 2	
5 - Audio Sync	
6 - Up	
7 - Down	
8 - Bank	
9 - Chase	
10 - Song	
11 - Insert	
12 - Delete	
13 - Function	

10 - TROUBLESHOOTING

PROBLEM: Buzz in the audio system.

Lighting control and audio signals have always been enemies. That annoying little buzz 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. SUNN dimmer packs control this problem with high frequency filters that suppress the RFI.

If a buzz is present, make sure you have followed the rules listed in Chapter 2. In addition, always follow good audio practices:

- Use balanced (3 pin) cables.
- 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 packs into another AC outlet.

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 SUNN 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. 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.

CONTROLLER

When the PLC 816e is first powered up, the numbers in the Next display should read "01" and the numbers in the Now display should read "00". If this is not the case, check the power pin from the dimmer mic cable with a volt meter to see if it is delivering at least +15 VDC. Excessive resistance in the mic cable or its connectors can result in faulty operation. To check the power coming from a dimmer pack, measure the voltage between pin 1 (ground) and pin 2 of the cord. +15 VDC should be present at pin 2. If voltage is present to the PLC 816e and the LEDs or displays do not light, there is a problem with the controller. If the LEDs do light, but the controller doesn't affect the stage lights, re-check the mic cord. Also to insure that enough power is available to the controller, make sure you have at least two SUNN dimmers attached to the PLC 816e. Also make sure that the dimmer pack you are testing is set up to be addressed by the desired channels on the PLC 816e. There are no user-serviceable parts in the PLC 816e, therefore, any internal problem with it should be referred to a qualified service technician.

11 - 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 diameter in inches; and the letters following the par number indicate 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 lighting specialty stores. We recommend using the high temperature variety. Their greater life expectancy more than offsets the greater cost.

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