CONTENTS

MANUAL

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MANUAL

CE

An introduction to the Solar System

The following parts may also be required. These are not available from Optikinetics:

1. Glue for bonding gobos to effect carriers. Cyanoacrylate type "Super-Glue" should be used.
2. Plug for DMX input. XLR type five pin female line connector. Used in professional lighting.
3. Plug for DMX output. XLR type five pin male line connector. Used in professional lighting industry.
4. DMX control cable. Screened twisted-pair data cable. Commonly used in the computer industry.
5. Memory card battery. Commonly used for professional applications. Type number: CR2016
6. DMX output fuse. 0.5 amp ultra-fast blow, PCB socket mounting. Type number: PCC-0.5A

APPENDIX B. CONTROL SELECT SUMMARY

Solar System Control is selected by the three numeric push switches on the front. These show a three digit number. The numbers may be changed by pressing the buttons above and below each digit. The values displayed in the windows correspond to the method of control as follows:

001-503 This selects operation using DMX control. The number selected is the number of the first DMX channel used by the Solar System.

6FR Selects planet gears to be placed in the loading ports. The second digit "F" is the number of the planet gear in the front loading port, the third digit "R" is the number of the planet gear in the rear loading port. Values of F and R must be between 1 and 8.

7FR Selects planet gears to be placed in the optical port. The second digit "F" is the number of the planet gear in the front of the optical port, and the third digit "R" is the number of the planet gear in the rear of the optical port. Values of F and R must be between 1 and 8.

If the switches are set to any other values than above, the Solar System may behave unpredictably.

APPENDIX C. CONTROL CHANNEL SUMMARY

MODE \ DMX CHANNEL	1	2	3	4	5	6	7	8	9	10
MANUAL	FRONT SELECT	FRONT MODE	FRONT SPEED/ POSITION	REAR SELECT	REAR MODE	REAR SPEED/ POSITION	SHUTTER			
AUTO PROGRAM	FRONT SELECT	FRONT MODE	FRONT SPEED/ POSITION	REAR SELECT	REAR MODE	REAR SPEED/ POSITION	SHUTTER	PROGRAM		
AUTO PLAY										
CUE PROGRAM	FRONT SELECT	FRONT MODE	FRONT SPEED/ POSITION	REAR SELECT	REAR MODE	REAR SPEED/ POSITION	SHUTTER	PROGRAM	PAGE	SCENE
CUE PLAY	PAGE	SCENE								

NOTES:
1. CHANNEL 1-8 THE DMX ADDRESS SET ON THE NUMERIC PUSH SWITCHES
2. CHANNEL NOT USED IGNORED BY [illegible]

FIG.17.

According to mode of operation, the Solar System requires up to 10 channels from a DMX lighting desk. The various channels required in the various modes, and their functions are shown in Fig.17.

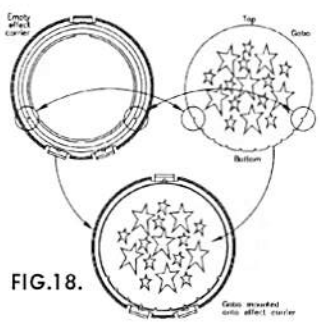


FIG.18.

1. Introduction

When installed and operated correctly, your Optikinetics Solar System will give long and reliable service. It is essential that you read and understand this manual before proceeding with the installation or operation of the unit.

The Solar System must be used with one of the Optikinetics range of effects projectors. At the time of writing: Solar 250 and 575, K1, K2, K2+ and K4.

Up to sixteen two inch effect carriers fit into the Solar System, and may be projected in pairs, superimposed one over each other. Both projected images may then be controlled independently. A wide range of two inch effects is available from Optikinetics and its agents.

Control of the Solar System is achieved by one of two methods. The first, by means of a DMX signal from a digital lighting desk. Seven control channels are required to control all features of the Solar System. This may be reduced to six channels if control over the shutter of the projector is not required. The second method of controlling the Solar System is by means of a memory card installed in the Solar System itself. In this case, no control desk is required other than for the initial programming of the card, and the Solar System will run through a pre-programmed sequence stored in the memory card.

If operation with a memory card is not required, simply do not insert a memory card into the Solar System. No additional adjustment for operation with or without a memory card is necessary. The programming of sequences onto a memory card for subsequent playback is achieved using a lighting desk connected to the Solar System. The memory card will then "learn" a sequence from the desk for future playback. Programming of a memory card in this way requires a total of ten control channels from the lighting desk. The use of a digital desk is mandatory. A single memory card will store sixteen sequences, each with up to 256 steps. Suitable memory cards are available from Optikinetics. Nothing else apart from a memory card must be allowed to enter the memory card slot, or damage will result.

1.1. TYPES OF EFFECT CARRIER

The Optikinetics two inch effect carrier was developed specially for the Solar System. Figure 1A shows the plastic moulded effect carrier without any effect mounted onto it.

Figure 1B shows an effect carrier with a 2" circular piece of glass mounted in it, the complete assembly is supplied by Optikinetics. Numerous types are available including dichroic colour filters, printed effects and customised artworks. Printed glass is a little fragile, and must be handled carefully to avoid scratching the ink from the glass.

Figure 1C shows an effect carrier with a 'D' size stainless steel gobo mounted in it. Full details of fitting procedure are in Appendix D of this manual.

All two inch effect carriers have three snap-fit flexible tabs. These tabs allow the effect carriers to be quickly and easily installed and removed from the Solar System, without tools, providing positive location.

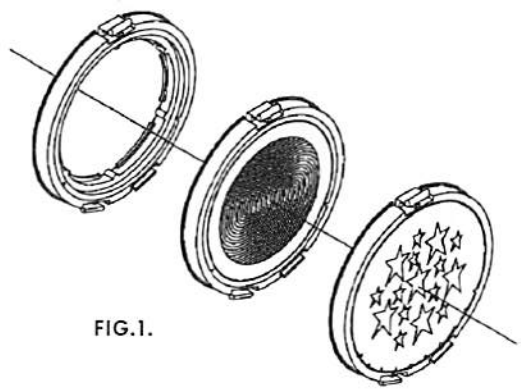


FIG.1.

2. ANATOMY OF THE SOLAR SYSTEM

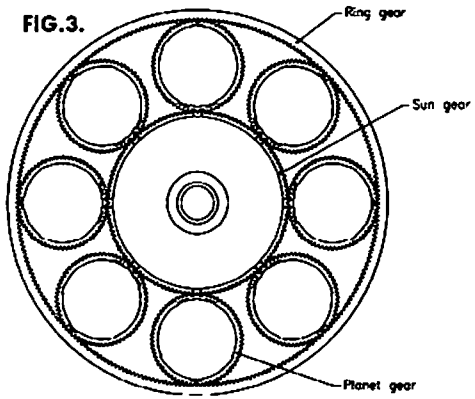
A brief guide to the construction and techniques involved in the Solar System.

2.2. GEAR ARRANGEMENT

The heart of the Solar System is a pair of planetary geartrains. Each consists of a sun gear, a ring gear and eight planet gears as shown in Figure 2. Each geartrain is flat. The two geartrains are closely positioned back-to-back as shown in Figure 3.

Each of the sixteen planet gears has an open centre to mount any two inch effect carrier. The optical axis of the projector is shown in Figure 3. This is the path of light through the gate of the projector in which the Solar System is installed. Hence the two effect carriers mounted in the planet gears at the bottom of the geartrain are projected simultaneously.

FIG.3.



Each sun gear and ring gear is driven independently by a motor. This allows any of the eight planet gears in either geartrain to be positioned in the projector gate. As there are eight planet gears in each geartrain, there are sixty four possible combinations of two effect carriers.

Having selected the appropriate pair of effects to be projected, the motors are then able to rotate the planet gears about their centres. This rotation is independent for each geartrain. Hence, both of the projected effect carriers may be rotated at different speeds, and in different directions. It is possible to halt the motion of either of the geartrains at any particular position. This enables a stationary image of an effect at a specified angle to be projected.

The motors are controlled by a microprocessor within the Solar System. This allows all these functions and more to be controlled by a DMX lighting desk or a memory card.

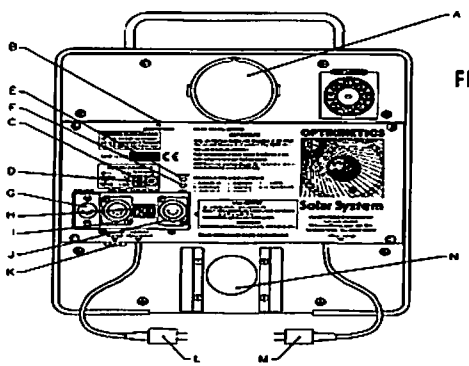
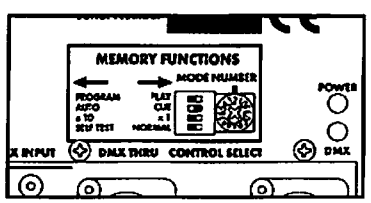


FIG.4.

FIG.5.



6. MAINTENANCE

The only maintenance required by the Solar System is a periodic examination and cleaning of the geartrains. To do this, the Solar System should be placed flat on a bench without power applied. Remove both loading port caps. The ring gears and sun gears may be rotated by hand. Any dirt or grit should be carefully removed from the gear teeth using a tooth brush.

The scope of parts replacement by a competent service technician is limited due to the alignment of the gear systems. If in doubt, consult Optikinetics. In difficulty: return to the factory.

The motors must not be removed from the unit. Loss of gear alignment will occur.

7. TECHNICAL SPECIFICATIONS

Effects changer and rotator for up to sixteen two inch effect carriers. Sixty-four combinations of two effects may be projected at any time, with individual control over rotational speed, direction and position of each effect.

Power supply :	**12 V~ 10% 2 amps**
Host projector types :	**Solar 250, Solar 575**
Type of Effects :	**Optikinetics two inch effect carriers**
Number of effects :	**16**
Rotational speed of effects :	**1.5-24 revolutions per minute**
Positional resolution of effects :	**1.8 degrees**
DMX control specification :	**Complies with USITT DMX512/1990 No internal line termination on DMX input. Null start code required.**
Memory card type :	**38 pin battery-backed 32k static RAM**
Ambient temperature :	**0-40 degrees centigrade**
Environmental protection rating :	**IP20**
Recommended attitude :	**Any angle provided it is anchored to the projector**
Environment :	**Dry, no condensing moisture**
Overall dimensions :	**306 mm x 336 mm x 137 mm (WxHxD)**
Nett weight :	**4.7 k**
Gross weight :	**6.0 k**
Packed size :	**430 mm x 400mm x 200 mm**

APPENDICES

APPENDIX A. ACCESSORIES

Accessories and spare parts currently available for the Solar System from Optikinetics include:

Accessory	Part number
Empty effect carrier (For D size gobos)	FG9000
Wooden storage box (For storing sixteen effect carriers)	FG9001
Memory card	FG9002
Projector shutter lead	FG9003
12 volt AC extension lead	FG9004
DMX termination plug	FG9005
Loading port cap	PN5161
Instruction manual	PN5174
Quick reference card	PN5175

5.6. CUE PLAY MODE

The two desk channels required for this mode of operation are shown in Fig. 15.

In this mode, it is possible to play back any of the sixteen scenes of any of the sixteen pages of the active block of the memory card using only two desk channels. The procedure is as follows:

1. Set the PROGRAM/PLAY switch to PLAY. Set the AUTO/CUE switch to CUE. Select the block of the memory card to be played back using the rotary switch.
2. The Solar System must be connected to a lighting desk with two channels available. The first channel is called the page channel, and the second is called the scene channel.
3. Set the page and scene channels to the desired page and scene. Channels are divided into 16 pages or scenes, as shown in Fig. 15. The Solar System will instantly recall the scene.
4. In addition to the 16 scenes, the scene channel also has a section labelled chase. If chase is selected each of the scenes in the selected page is played back in sequence through scene 1, 2, 3 and so on until either a termination scene or the end of the page is reached. At this point, playback will restart from scene one of the page. Chase lengths of between two and sixteen scenes are therefore possible.

The time duration of each scene during cue play mode will be the duration programmed into the card for that scene. However, if the x10/x1 switch is in the x10 position, the time durations will all be ten times longer during cue play mode.

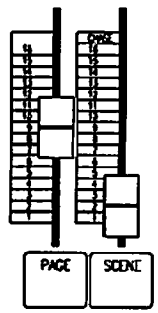


FIG.15.

5.7. MASTER-SLAVE OPERATION

When operating in Auto Play mode, it is possible to use a single Solar System with a memory card to control other Solar Systems so that all linked units operate in synchronism. This will be useful in situations where stand-alone operation of several synchronised projected images is required. Master-Slave operation is only possible using a Solar System fitted with a DMX output socket.

The Solar System which has the memory card installed is the Master, and the others are the Slaves. The Master unit operates in Auto Play mode exactly as described in section 5.4.

Slave units are connected to the DMX output socket of the Master unit using a standard DMX cable. Multiple Slave units may be connected by daisy-chaining the DMX link using the DMX input and DMX through sockets. The last Solar System in the chain must have a DMX termination plug fitted to the DMX through connector. All Slave units should be operating with a DMX start address of 001.

The DMX output signal from the Master Solar System only operates in Auto play mode. The DMX LED will flash to indicate that the DMX output is operating. This output should not be used to drive any type of lighting fixture other than Solar Systems, or unpredictable results will occur.

Fig.16. shows Master-Slave configuration with only a single Slave unit connected to the Master.

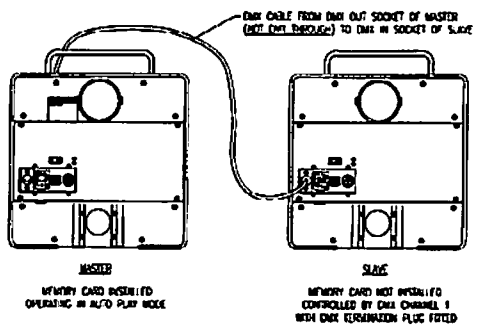


FIG.16.

2.3. FRONT PANEL LAYOUT

Front panel of the Solar System shown in Figure 4. Parts are as follows:

A. Loading port. This is a hole in the metalwork to allow effect carriers to be loaded into the planet gears of the front geartrain. A similar hole is at the rear of the unit to allow effect carriers to be loaded into the rear geartrain. Both loading ports have caps to seal the holes. These must be used at all times except when installing or removing effect carriers to ensure that no dirt or grit enters the geartrains through the loading ports.

B. Memory card slot. This is where the memory card is installed, if used.

C. DIP switches. During normal operation, these four switches may all be in the off position, to the right. The top three switches control memory card functions, and have no effect if a card is not installed. The bottom switch starts a selftest sequence if moved to the on position. Selftest will only be performed if there is no memory card installed.

D. Rotary switch. Again, controls the memory card, and has no effect if a card is not installed.

E. Power LED. Green LED illuminates to indicate that the unit has a 12V AC supply.

F. DMX LED. Red LED illuminates to indicate that valid DMX data is being received. During auto play operation the LED also flashes to indicate transmission of DMX data via the DMX output. During selftest operation, this LED remains off.

G. DMX input connector. This is a five-pin industry standard input connector for the DMX control signal. A daisy chain five-pin DMX through connector is also provided.

H. Numeric push switches set various operating modes of the Solar System, such as control input selection and DMX address. Setting of these switches is adjusted by the small buttons above and below each number. Refer to Appendix B for a summary of operation.

I. DMX Thru. A daisy chain five-pin DMX through connector is also provided.

J. DMX output connector. (Situated on the back of the unit) This output provides a DMX output signal to control slaved units during Auto play mode using a memory card.

K. Shutter output. Quarter inch (1/4") mono jack socket which provides an output to drive the shutter input of projectors equipped with shutters.

L. Animate input. Sound animated 12V AC input from the projector if equipped with an animated output.

M. Power input. 12V AC input from the projector provides power to the Solar System. The gears will move to their reset positions when power is applied to this input

N. Optical port. This aperture passes right through the Solar System to enable the light path to pass through. The two effect carriers to be projected appear at the optical port.

Figure 5 shows the DIP switches and rotary switch in detail.

The top switch selects Program or Play operation, where a memory card is either programmed or used to control the Solar System respectively. The next switch selects Auto or Cue modes, and the third switch selects x10 or x1 time scaling. The bottom of the four DIP switches enables a selftest sequence to be performed by the unit.

The rotary switch selects which of the sixteen blocks of the memory card is either programmed to or played back from.

Further details of memory card operation and selftest operation are given in later sections.

3. INSTALLATION

This section is to guide the installer through the steps required to produce the best performance from the Solar System. This is a general set of guidelines, and does not take into account details of specific installations.

3.1. MOUNTING IN PROJECTOR

The Solar System is mounted into the projection gate of an Optikinetics effects projector as shown in Fig.6. showing the Solar System installed into a K2 projector. The Solar System has four metal slideways which mate with corresponding slideways in the gate of the projector.

FIG.6.

Carefully slide the Solar System down until it seats firmly into the bottom of the gate. It is essential that the unit is installed with sockets and switches facing forwards as shown in Fig.6. This ensures that the effect carriers are in the correct optical position of the projector. If installed the wrong way round, the projected images will have a brown edge, and the carriers will be heat damaged.

Use of a safety chain or cable is strongly recommended to attach the Solar System to a secure anchorage. The handle on the top of the Solar System is a suitable attaching point.

The Solar System is powered from any of the 12V sockets on the side of the projector. Plug the "POWER INPUT" cable into one of these sockets. If the cable does not reach that far, extend using one of the two extension leads supplied with the Solar System.

For projectors equipped with animated 12V outlets. The "ANIMATE INPUT" cable should be connected to one of these sockets (an extension cable is supplied if required).

The K2, K4 and Solar 575 projectors may be equipped with a mechanical shutter to switch light output on or off. This may be controlled by the Solar System, and in turn by a DMX lighting desk. A control lead with a quarter inch mono jack plug is provided with each Solar System to enable this. This should be connected between the "SHUTTER OUTPUT" socket on the Solar System, and the "SHUTTER CONTROL INPUT" socket on the rear panel of the projector.

When power is applied, the Solar System will perform an initialisation routine. Motors and gears will rotate. After a few seconds activity will cease, and the Solar System will await commands from whatever is controlling it.

Only one Solar System may be powered by any one projector.

Ensure that no cables are allowed to come into contact with any hot parts of the projector. On the Solar 575 the hottest part is the lamp hatch on top. LAMP HATCH GETS HOTTER AFTER PROJECTOR HAS BEEN SWITCHED OFF THAN WHEN OPERATING.

3.2. LOADING EFFECT CARRIERS

For a lighting desk to be able to call up a particular effect in the Solar System for projection, the effect carriers must be installed into the correct planet gears. The planet gears of the front and rear geartrains are designated 1 to 8. Planet gear 1 of both geartrains is identified by a silver mark on its edge. This mark is visible through the loading port when this planet gear is at the top of the geartrain. The front geartrain is viewed from the front, or the rear geartrain is viewed from the rear, the other planet gears, 2 to 8, are sequentially numbered clockwise from planet gear number one. Shown in Fig.7. This illustration is also printed on both sides of the Solar System for easy reference.

5.4. AUTO PLAY MODE

In this mode, the Solar system plays back the scenes from the memory card without the use of a lighting desk. The procedure is as follows:

1. Set the PROGRAM/PLAY switch to PLAY. Set the AUTO/CUE switch to AUTO. Select the block of the memory card to be played back using the rotary switch.
2. Scenes from the memory card will be played back sequentially by the Solar System. The scenes will be played in order: page 1, 2, 3 and so on until either a termination scene or page 16 scene 16 is reached. At this point, playback will restart from page 1 scene 1.

The time duration of each scene during auto play mode will be the duration programmed into the card for that scene. However, if the x10/x1 switch is in the x10 position, the time durations will all be ten times longer during auto play mode.

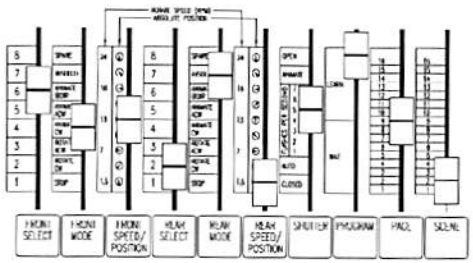


FIG.14.

5.5. CUE PROGRAM MODE

The ten desk channels required for this mode of operation are shown in Fig. 14.

In this mode, one can program any scene information into any scene on any page of the memory card. Programming is done scene by scene, no sequencing is involved. The procedure is as follows:

1. Set the PROGRAM/PLAY switch to PROGRAM. Set the AUTO/CUE switch to CUE. Select the block of the memory card to be programmed using the rotary switch.
2. Solar System must connect to DMX lighting desk with 10 channels. The first 7 channels are control channels for manual operation, and the 8th is the program channel. The 9th channel is the page channel, and the 10th is the scene channel.
3. Initially, the program channel must stay at 0%.
4. Set the scenes on channels 1 to 7. The Solar System will do whatever these channels are set to.
5. Set the page and scene channels to the desired page and scene to be programmed. These channels are divided into sixteen page or scenes each as shown in Fig. 14.
6. Flash the program channel high and then low using either the channel slider or the flash button. The channel must not remain high for longer than 5 seconds. The scene is now programmed into the selected scene of the selected page, overwriting any scene previously stored there.
7. If the program channel is flashed high for a period of longer than 5 seconds, a termination scene is programmed into the memory card at the selected scene of the selected page.
8. When all desired scenes have been programmed, return the PROGRAM/PLAY switch to the PLAY position to prevent random scenes from being programmed into the memory card. This will cause the Solar System to enter cue play mode as described in section 5.6.

As each scene is being programmed, the Solar System automatically inserts a time duration for that scene in the memory card. If the x10/x1 switch is set to the x1 position, the time duration for each scene is 6 seconds. If the switch is in the x10 position, the duration is one minute.

5.3. AUTO PROGRAM MODE

The eight desk channels required for this mode of operation are shown in Fig. 13.

In this mode, a sequence is generated by a lighting desk, and remembered by the memory card as the desk is running. The procedure is as follows:

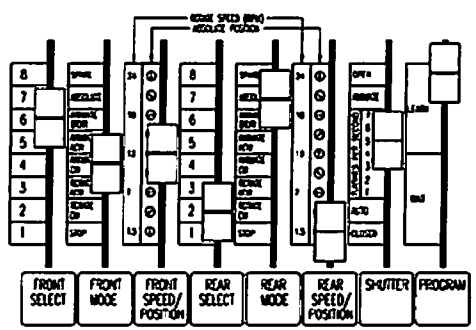
1. Set PROGRAM/PLAY switch to PROGRAM. Set AUTO/CUE switch to AUTO. Select the block of the memory card to be programmed using the rotary switch.
2. Solar System must be connected to a DMX lighting desk with 8 channels available. The first 7 channels are for manual operation of the Solar System. The 8th is the program channel.
3. Using the programming features on the desk, the sequence may be composed and edited until correct. With program channel below 50%, the sequence may be observed as the desk runs through its program, without programming the memory card. Steps of the sequence will only be programmed into the memory card when the program channel is above 50%.
4. Reset the desk to start the sequence from the beginning. When the sequence begins, the program channel must go above 50%. That is, push channel 8 slider high. This could be included in the sequence programmed into the desk. The sequence programmed to the memory card will begin at the instant the program channel goes above 50%.
5. The Solar System will perform all of the steps in the sequence as the desk is running, but this time each step is programmed to the memory card. The time duration of each step of the sequence is also programmed into the card alongside each scene. If the x10/x1 switch is set to x10 the time duration of each step from the desk is multiplied by ten before being programmed into the card. In this way one can record a long sequence into the memory card in only one tenth of the time that it will eventually run for when it is in run mode.
6. At the end of the desired sequence, the control channel should revert to 0%. At the instant the program channel goes below 50% the Solar System will stop programming the card and write a termination scene in the next available scene.

Although it is possible to program a sequence into the memory card using a manual desk without program and playback facilities, it is not recommended. If attempted, the manual movement of sliders may be slow enough to record several scenes where only one was intended. And, mistakes made by the operator will be programmed into the card, and will be impossible to edit out later.

It should be noted that some effect select operations of the Solar System may take several seconds to complete. When programming a scene which involves such an operation, the time duration of this scene must be longer than the few seconds taken for the change to be complete. If too short a duration is programmed, then the next scene will be lost.

The time duration of each scene must be between one second and two minutes. The total number of scenes must not exceed 255. Any further scenes will not be programmed into the memory card.

When programming begins, the first scene is stored as scene one of page one in the memory card. All of the scenes of page one are programmed up to scene sixteen. Page two is then programmed from scene one through to scene sixteen. Likewise pages three to sixteen are then programmed. Any scenes already programmed into the card will be overwritten by the new scenes, although any scenes which are in pages further up the card will remain intact.



3.3. LOADING EFFECTS WITH POWER APPLIED

If power has already been applied and the Solar System has initialised, there is an easy method of loading effect carriers into the correct planet gears. Set the first digit of the numeric switches to 6. This causes the planet gears numbered as the other two digits of the switches to be placed in the loading ports. The second digit is the front planet gear, and the third digit is the rear planet gear. For example, if the switches are set to 623, planet gear number 2 is positioned in the front loading port and planet gear number 3 is positioned in the rear loading port.

Having selected the planet gears, the effect carriers may be carefully installed as shown in Fig. 8. The effect carrier will only locate in one orientation due to the spacing of the snap-fit tabs, and must be installed so that the side with the glass or gobo goes into the planet gear first. To install the effect carrier, locate the two snap-fit tabs close together into the corresponding keyways in the planet gear as shown. Then press gently into place, on the plastic and not on the glass or the metal gobo. The third snap-fit tab will locate in the third keyway, and click into place.

Once effects have been loaded: fit loading port caps to protect from dirt or grit.

To remove the effect carriers, there is a lip around the inside of each one to allow it to be pulled out of the planet gear. Alternatively, the push gently out from the opposite side of the Solar System.

Faulty effect carriers must not be used in the Solar System. Any damage of to the effect carrier may cause the effect carrier to fall out of the planet gear during operation. If either the glass, gobo or entire effect carrier become loose inside the Solar System, damage is likely to result. The glass or gobo must be securely bonded to the plastic moulding so that it does not fall out and the snap-fit tabs must be intact.

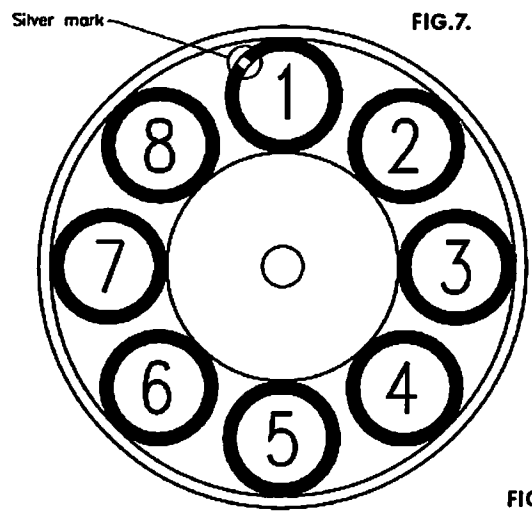


FIG.7.

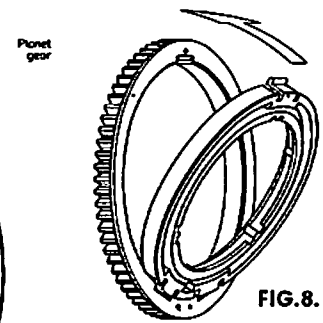


FIG.8.

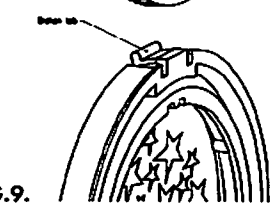
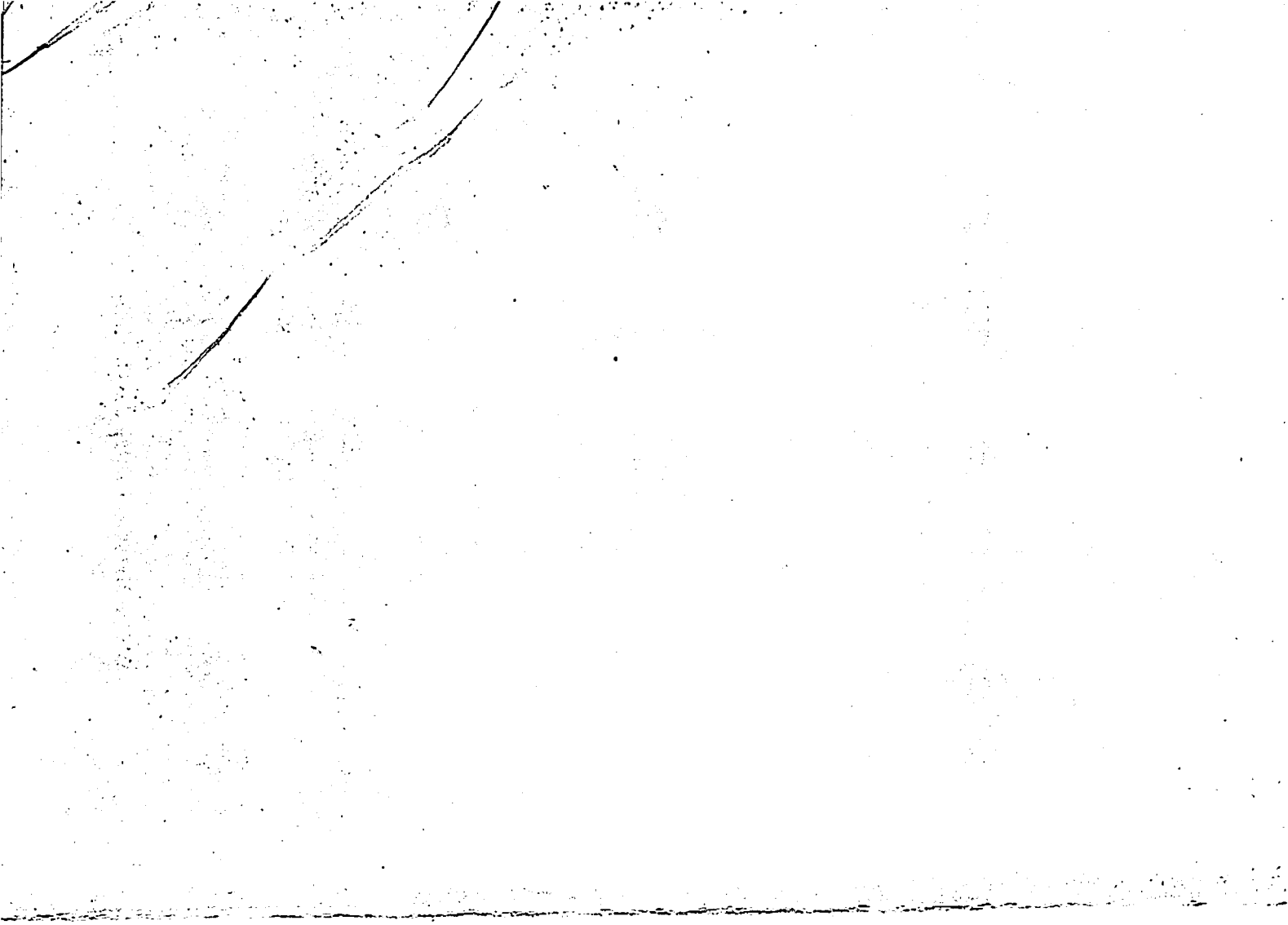


FIG.9.

3.4. LOADING EFFECTS WITHOUT POWER APPLIED

If power has not been applied to the Solar System, the ring gear has to be rotated by hand until the desired planet gear comes into view in the loading port. To do this, the Solar System must be out of the projector. The ring gears are then accessible at the bottom of the unit, and may be freely turned. Planet gear number one must be identified by looking for the silver mark at its edge, and subsequent planet gears can then be located by counting clockwise as described in section 3.2.



3.5. CHECKING EFFECT POSITIONING

Once the effects have been loaded and the Solar System loaded into a projector, the unit may be checked for correct effect positioning. With power applied to the Solar System, set the first digit of the numeric push switches to 7 positions the planet gears specified by the other two numbers in the optical port. For example, by setting the numeric push switches to 723, planet gear 2 from the front planet gears and planet gear 3 from the rear planet gears are positioned in the optical port. The effects loaded into these may then be projected to verify that they are loaded in the correct places.

3.6. DMX CONTROL CABLE

A standard DMX cable must be used as specified by USITT standard DMX/1990.

The type of connector used to connect to this input of the Solar System is a conventional five pin female XLR line connector. The connections to the various pins are as follows:

Pin 1	Signal common (Screen)	Pin 2	Data complement
Pin 3	Data true	Pin 4	Not used
Pin 5	Not used		

The correct cable to use is a shielded twisted-pair type cable, suitable for EIA-422 or EIA-485 use. Suitable cable types from the manufacturers Alpha or Belden are:

Alpha	5271	Belden	9841

Sources of the cable and connectors are listed in Appendix A.

A corresponding five pin DMX through socket is provided on the Solar System to allow the DMX line to be daisy-chained to further DMX receivers. All five pins of the input connector are connected to the corresponding pins of the through connector, including pins four and five. These pins are used in some applications to provide a second DMX link, so continuity through the Solar System is ensured.

For the Solar System to respond to DMX input, the numeric push switches must be set to the address of the first DMX channel to be used. Valid addresses are any number between 001 and 503.

The Solar System will only respond to DMX data with zero or null start code. The start code is transmitted by a DMX lighting desk when the channel information is transmitted. If a desk has no obvious method of setting up a start code it will probably transmit a null start code.

3.7. DMX LINE TERMINATION

The Solar System contains no termination resistors connected to the DMX input lines. It is essential that DMX lines are correctly terminated at the end furthest from the lighting controller. A DMX line without correct termination is likely to result in unreliable operation. If a Solar System is connected as the last fixture on the DMX line, furthest from the controller, a DMX termination plug must be installed into the DMX through connector. A termination plug is included with each Solar System.

3.9. SELFTEST OPERATION

To test the operation of the Solar System as fully as possible without the use of a DMX input, a selftest mode is provided once the Solar System is installed in a projector and power is applied. Selftest operation is achieved by moving the bottom of the four DIP switches to the left-hand position. The Solar System then runs through a pre-programmed sequence of operations. During this time, all sixteen of the effect carriers will be projected, sometimes stationary, sometimes rotating. Also the shutter of the projector, if connected, will open and close according to the preset program.

The sequence will repeat for as long as the DIP switch is set to SELFTEST. Normal operation will resume as soon as soon as the DIP switch is moved back to the NORMAL position.

Selftest operation will override all other modes of operation, except for the memory card modes. Selftest operation will not function if a memory card is installed.

called the active block. The blocks within the memory card are labelled 0-9 and A-F. The active block is set by means of the small rotary switch on the front panel. Because of this method of dividing the memory card into sixteen separate blocks, a single memory card may be thought of as a miniature library of sixteen separate programs.

Because it is possible to generate chases and sequences of variable length during playback from the memory card, a termination scene is used to indicate the end of the chase or sequence. A termination scene is programmed into the memory card during programming, and this scene does not cause the Solar System to generate a projected scene. More than one termination scene may exist in any one block of a memory card.

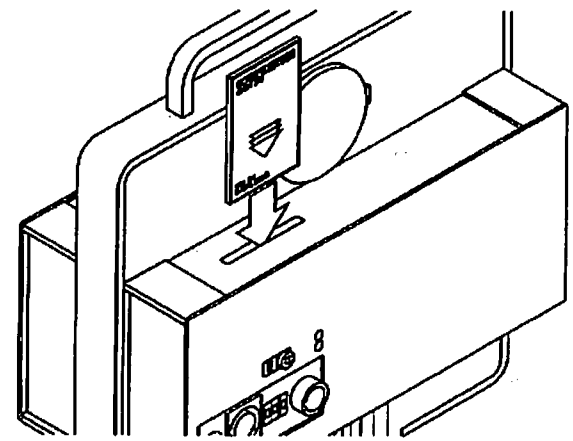
A further DIP switch provided on the Solar System is a x10/x1 switch. This affects the time duration recorded along with each scene. If this switch remains in the x1 position, the program modes will operate as above. If the memory card is programmed with the switch in the x10 position, then the time duration programmed into the card will be ten times its original value. The programmed time duration may therefore be up to a maximum of twenty minutes in ten second intervals. If the switch is in the x10 position during playback from the memory card, then the time duration stored in the card is multiplied by ten if it is used to generate a sequence or chase. If the switch is in the x10 position during both programming and playback, then the time intervals generated during a sequence or chase will be one hundred times their original value. In this case each duration may be up to 200 minutes in intervals of 100 seconds.

It is also possible to program an "embedded reset" into the memory card. As described in section 4.5 it is possible to reset the Solar System by setting control channels two, three, five and six simultaneously to 100%. If the Solar System detects a scene with these four channels set to 100% during playback, the unit will reset as previously described. This feature may be used for installations where a Solar System is used in auto play mode and is completely unattended. An embedded reset encountered during a sequence will reset the unit and give peace of mind against malfunction. After the unit has reset, the sequence will restart from the beginning.

5.2. INSTALLATION OF MEMORY CARD

The memory card is installed into the Solar System as shown in Figure 12. There is a slot in the metal panel immediately below the front loading port. Insert the memory card into the slot in the direction of the arrows on the card. The arrows must face forwards as shown. The card will meet with slight resistance as it reaches the socket within the Solar System. Gently push the card into the slot until it comes to a stop. The card should be gripped tightly enough in its socket not to rattle. If not then it is probably not pushed in far enough.

FIG.12.



2. Auto play mode

In this mode, the Solar System plays back the contents of the memory card and repeats the programmed sequence. At the end of the sequence, the cycle repeats continuously. This mode is particularly useful for advertising or other stand-alone applications where it is required to generate projection sequences without the use of a control desk.

Total number of desk channels required: None

3. Cue program mode

This method of programming allows individually selected scenes to be programmed into the memory card one at a time. A total of 256 scenes may be programmed.

Total number of desk channels required: 10

4. Cue play mode

This method is useful for applications where control of the Solar System from a lighting desk is required, but there is only a minimum of channels available from the desk. Instant recall of any of the stored scenes (256 maximum) is possible using a minimal number of desk channels. It is also possible in this mode to generate a chase of up to sixteen scenes.

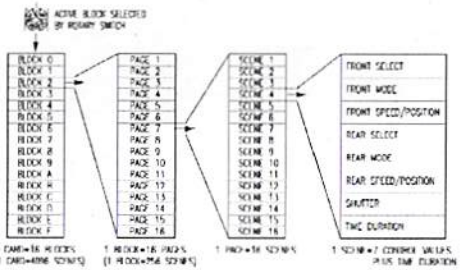
Total number of desk channels required: 2

5.1. SCENES, TIMES, PAGES AND BLOCKS

In order to appreciate the various functions of memory card operation, a short lesson on how information is stored in the memory card may be helpful.

Fig.11. shows a diagram of this scene, page and block structure of the memory card.

FIG.11.



The basic item of information which is stored is a scene. This consists of the valu @‡-5‡ C°êcontrol chan .∞- necessary to make the Solar System behave as required. Also included with each scene, is a time duration. This is used if a sequence is being generated during the play modes of operation, allowing different scene durations during the sequence. The duration of each scene may be anything up to 120 seconds, or two minutes, in intervals of one second.

Next is the page. A page consists of sixteen scenes, stored in the memory card in sequence.

A block is the next largest section of the card. A block consists of sixteen pages, again stored in the memory card in sequence. The total number of scenes which may be stored in a block is therefore 256. (16x16=256)

The entire memory card contains sixteen blocks. A Solar System with a memory card installed may only program to, or play back from one of the sixteen blocks of the memory card. This block is

4. MANUAL OPERATION

This section describes operation of the Solar System "live" from a DMX lighting desk. Memory card operation is different and more complicated. To avoid confusion, no memory card operations are available without a card installed. If you do not require any memory card functions, simply do not install a card.

For manual operation, install Solar System should in a projector with power applied, effect carriers installed, and control signal connected. Set the numeric switches to the DMX channel being used.

The following description refers to input levels for each channel from the DMX lighting desk of 0% to 100%. This refers to a numeric value of zero to 255 for a DMX desk. All functions are described assuming a linear output from the desk, varying over the entire output range. Old, cheap or badly maintained lighting desks may have slightly non-linear outputs, in which case the percentage levels quoted here may not correspond exactly to the slider positions.

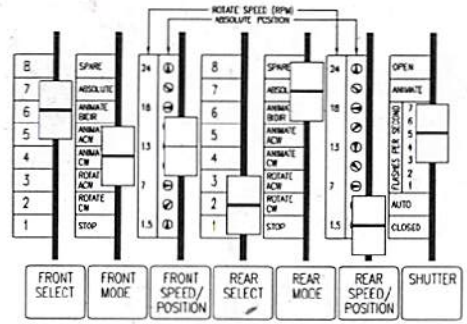
For a summary of the channel allocations used for the various modes of operation, see Appendix C.

4.1. CHANNEL ALLOCATION

For manual operation, the Solar System requires seven DMX control channels. The first six control the mechanical parts of the Solar System, and the seventh controls the shutter of the projector if it has one. If the projector has no shutter, or if shutter control is not required, the total number of channels required is reduced to six. The allocation of the seven channels is as follows:

Channel 1	Front select
Channel 2	Front mode
Channel 3	Front speed/position
Channel 4	Rear select

FIG.10.



The first three channels control the operation of the front geartrain, and hence how the effect carriers loaded into the front of the Solar System are projected. Likewise, the next three channels control the operation of the rear geartrain. The last channel controls the shutter of the projector if applicable. The layout of these seven channels is shown in Fig.10.

4.2. EFFECT SELECTION

Channels one and four control which of the eight effect carriers in the front and rear respectively are projected. These operate independently, allowing sixty-four combinations of projected effect. The operation of these channels is as follows:

0% -12%	Effect number 1		
13%-25%	Effect number 2	26%-37%	Effect number 3
		38%-50%	Effect number 4

Hence as a desk slider is moved from the bottom to the top of its travel, effects number one through eight will be successively projected. The change from one effect to the next will be abrupt. Projection of half of effect number one and half of effect number two, for example, is not possible.

4.3. EFFECT MODE

Channels two and five control the mode of operation of the front and rear effect respectively. The operation of these channels is as follows:

0% -12%	Stationary	51%-62%	Animated rotate anticlockwise
13%-25%	Rotate clockwise	63%-75%	Animated rotate bidirectional
26%-37%	Rotate anticlockwise	76%-87%	Absolute position
38%-50%	Animated rotate clockwise	88%-100%	Not used - see section on system reset

The first mode of operation is stationary effect. In this mode, the effect does not rotate, but remains in the position it last stopped at when leaving one of the other modes.

There is a total of five modes which cause the effect to rotate. The first two cause the effect to rotate continuously in either a clockwise or anticlockwise direction. The other three rotate modes cause the rotation to be activated by the animated 12V AC signal connected to the Solar System. In this way, sound-activated rotation is achieved. The first of the animated modes causes intermittent rotation only in clockwise direction, and the second causes only intermittent anticlockwise rotation. The last of the animated modes causes random direction changes according to the animated signal.

The speed of rotation in all five of the rotate modes is controlled by channels three and six for the front and rear effect respectively. The speed is continuously variable according to the channel input as follows:

0%	1.5 revolutions per minute	100%	24 revolutions per minute
50%	13 revolutions per minute		

The next mode is the absolute position. In this mode the effect remains stationary, but may be positioned through 360°. The angle at which the effect is positioned is controlled by channels three and six for the front and rear effect respectively. The angle corresponds to the input as follows:

0%	12 o'clock	75%	9 o'clock
25%	3 o'clock	100%	12 o'clock
50%	6 o'clock		

In this instance, 12 o'clock is referred to as the position where the image is the right way up. That is, the top of the effect is projected to the top of the projection screen.

The use of channels 3 and 6 varies depending on whether rotate or absolute mode is being used. The front and rear effects operate entirely independently. For example: it is possible for the front effect to rotate clockwise with channel 3 controlling the speed of rotation; whilst the rear effect is operating in absolute position mode with channel 6 controlling the orientation of the effect.

4.4 SHUTTER CONTROL

Channel 7 controls operation of the projector shutter, if it has one. The shutter can only be either open or closed. When open, the light is "on", an image is projected. When closed, the light is "off", no image is projected. If the Solar System is being used with a projector which has no shutter, the light is always "on", and this channel may be ignored. This channel controls the shutter as follows:

0% -10%	Closed	81%-90%	Animated
11%-20%	Auto	91%-100%	Open
21%-80%	Flash - variable rate, 1-7 flashes per second		

The shutter may simply be open or closed as described above, or operate in several other modes.

In Auto mode, the shutter remains open for as long as no select operation occurs. As soon as a select operation is requested by channels one or four, the shutter closes and will reopen when the select operation is complete. The result is a much "neater" change from one effect to another, as the changing movement of the effect is not seen on the projection screen.

Flash mode causes the shutter to rapidly open and close in a continuous cycle causing the image to flash. Flash rate increases as channel input increases, from 1 flash to 7 flashes per second.

Animated mode causes the shutter to periodically open and close according to the animated signal applied to the Solar System, resulting in sound animated flashing of the image.

4.5. SYSTEM RESET

As a "just-in-case" measure, the Solar System has a remote system reset facility. This initialises the unit as if just switched on. To achieve this, channels 2, 3, 5 and 6 must all be at 100% simultaneously. Beware of doing this accidently.

This facility is provided to guard against those occasions where the unexpected happens and the mechanics of a lighting fixture get out of sync, threatening to wreck the lightshow. In this case, by flashing channels two, three, five and six simultaneously to maximum, recovery is possible.

5. MEMORY CARD OPERATION

The memory card facility of the Solar System offers more flexibility than manual operation. The memory card is credit card sized, quickly and easily installed, and will remember scenes and sequences of Solar System operation. The card will remember the information programmed into it when the Solar System is switched off, or even when the card is removed. In this way information can be transfered from one Solar System to another, or kept in a library of stored programs.

The correct type of memory card to be used with the Solar System is an Optikinetics 32k SRAM card available from Optikinetics. Do not attempt to use of any other type of memory card.

The basic method of programming the memory card is by using a conventional DMX lighting desk connected to the Solar System as described for manual operation.

Information is stored in the memory card as scenes. A scene is defined by the set of 7 values of the control channels used for manual operation. Also stored with each scene is a time duration which is used by some of the modes of operation which create sequences of scenes.

As well as the 7 control channels from the lighting desk used to set up the scene information, up to 3 memory channels may also be required from the desk to control programming of the memory card. Hence a maximum of 10 desk channels is required to fully control the memory card functions.

For the memory card to remember information, it has a small battery fitted. When a new card is supplied from Optikinetics, the battery is supplied separately and must be fitted before the card can be used. Details of how to install the battery, are given in Appendix E. Eventually, the battery in a memory card will reach the end of its life and the stored program information may be lost. To avoid this, it is advisable to replace the battery every year. Refer to Appendix E for further details.

Memory card operation of the Solar System has four separate modes of operation. The various modes are selected by the DIP switches on the front panel. If no memory card is installed, these switches have no effect. The various modes are:

1. Auto program mode

This mode of operation programs a sequence of scenes into the memory card. The sequence must be generated by the DMX lighting desk playing a sequence previously programmed into it. As the desk plays its sequence, the information is stored in the memory card. The programmed sequence may be of any length up to 256 scenes.

Total number of desk channels required: 8