

Intelligent Power System®

Operating Instructions &

Installation Guide

Dimmers Distribution Amplifiers Status Monitor Auxiliary Control (AC-100)

Before attempting to connect or operate this equipment, please read these instructions completely.

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The lightning flash symbol within an equilateral triangle is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.	
The exclamation point within an equilateral triangle is intended to alert the user of the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.	

WARNING

TO REDUCE THE RISK OF FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS EQUIPMENT TO RAIN OR MOISTURE.



WARNING to Service Personnel



The IPS dimmer electronics operate at line voltage potential! They are electrically isolated by optically coupling the input and output data streams. DO NOT connect non-isolated test equipment to the circuit common point in the dimmers. Destruction of the dimmer and test equipment and possible injury to personnel will result. Measurements of input and output voltages must be referenced to Power Line Neutral only.

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Safety Information

Information in this document is subject to change without notice and does not represent a commitment on the part of Entertainment Technology, Inc.

Written by Jon R. Farley and Steven B. Carlson Compiled and Edited By Jon R. Farley.

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This document contains information for the following IPS products:

IPS-AC-100 IPS-DB-1206, IPS-DB-2403, IPS-DB-6003 IPS-DS-1206, IPS-DS-2403 IPS-SA-104, IPS-SA-104-WB, IPS-SA-108, IPS-SA-108-WB IPS-SM-101

"WARNING: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with this instruction manual may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user, at his own expense, will be required to take whatever measures may be required to correct the interference."

If you need help, consult your dealer. You may also find the following booklet helpful: <u>How to Identify</u> <u>and Resolve Radio-TV Interference Problems</u>. This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, stock no. 004-000-00345-4.

This section applies to Connector Strip Dimmer Systems **IPS-DS-1206**, and **IPS-DS-2403**.

Controls and Components



- Field Wiring Compartment.
- Head-End Processor.
- Oimmer (Typical of 6 or 3).

Field Wiring Compartment



- **1** 3/4" Knock-out for power wiring
- Grounding Lug
- OPhase terminals
- A Neutral terminals.
- O Neutral bus jumpers

The inside of the Field Wiring Compartment cover has a wiring diagram.



Installation Guide

Head-End Processor



- Blank knockout for analog input option.
- **2** DMX512 Input Connector.
- **3** DMX512 Pass-Through Connector.
- Red LED Error Indicators.
- **O** DMX512 Termination Switch.
- Four-digit LED Display.
- Function Select Push Buttons.

Dimmers



• Heat Sink.

Load Receptacle (Theatrical Pin Connector, NEMA L5-20R "Twist-Lock", or NEMA 5-20R duplex Straight Blade.)

- Socus Button.
- Green LED.

B Red LED.

Power Requirements

IPS 1200 and 2400 Watt dimmer systems are designed to operate on a 50 or 60 Hertz, 20 Amp, 120/208 VAC, three phase "WYE" power service. However, they will tolerate a wide variety of input voltages. For these systems to function normally the Phase to Neutral voltage must be in the range of 90 to 140 VAC.

If a system is miswired to voltages greater than 180 VAC, the dimmers will shut down and flash the 'Mis-Wire' warning. It will not attempt to bring up loads when in overvoltage shutdown. IPS is designed to safely tolerate a 230 VAC line indefinitely, and a 280 VAC line for 15 minutes. Line voltages greater than 280 VAC may destroy the over voltage protection components in the dimmers and the Head-End Processor.

Connecting Power



WARNING

Wiring must comply with all applicable building codes. If the information in this section is not consistent with the electrical code in your area, you must disregard this section and follow the dictates of your code!

Field wiring of the IPS DS series dimming system is a straight forward matter. A total of 5 wires need to be brought to the unit: The three "phase" wires, a Neutral, and a Ground. The "phase" wires carry up to 20 amps each, and the Neutral carries the "unbalanced" current.

If the unit is being set up for portable use, 10/5 SO cable should be used to make the power connections. In permanent installations, 20 amp rated conductors, such as 12 gage THHN, should be used for the "phase" conductors and Ground, and

the next size larger conductor, i.e. 10 gage THHN, for the Neutral.

All connections are made in the Field Wiring Terminal Compartment at the left end of the enclosure. The terminals are revealed by removing the Field Wiring Compartment Cover.

The connections are made as follows: The Ground (Green) wire connects to the grounding lug at the left of the terminal block; The Neutral (White) wire connects to any one of the three Neutral terminals, retaining the jumpers which bus these terminals together; and the three "phase" wires (Black, Red, and Blue or Orange) connect one to each of the three "phase" terminals. Since each dimmer is a separate single phase load, there is no requirement that the phases be connected in any particular order.

The IPS System Status Monitor includes a function which can report the total load on each phase of your power service. For this function to work, you <u>must</u> ensure that the wires feeding all dimmers and dimmer outlets are wired in the same order. The following scheme is suggested:

Connector	Wire	Conductor	IPS
"X"	Black	Phase A	"A"
"Y"	Red	Phase B	"B"
"Z"	Blue or	Phase C	"C"
	Orange		
"W"	White	Neutral	"N"
"G"	Green	Ground	Lug

Securely tighten all terminals, and replace the Field Wiring Compartment Cover when done.

Mounting

The innovative design of the IPS connector strip enclosure allows a wide range of installation options. This section discusses the basic ground rules of installation, but cannot cover every conceivable variation.



Cross section of DS system enclosure.

• Track to capture 1/2" hex head bolt.

- **2** Track to capture 5/16" carriage bolt.
- **3** Unistrut[®] compatible track.
- **4** Dimmer protection fin.
- O Dimmer heat sinks.

In situations in which the dimmer system is to be mounted below a pipe, possibly with fixtures hung from it, the most convenient mounting means is two "C" clamps bolted into the top extruded track.

The heads of the 1/2" bolts are slid into the track from the end, and then the "C" clamp stud is screwed down onto the captured bolt. It is important when doing this to securely tighten the stud against the top of the dimmer enclosure so it does not rotate. Set the angle of the "C" clamp by loosening the smaller set screw on the side of the clamp. Do not use a clamp whose set screw is missing or has been sheared off.

The 5/16" carriage bolt track is useful for attaching the dimmer system to vertical surfaces, or to clamp it to a set of vertically running pipes. Again the heads of the bolts are slid into the track, and the mounting means are securely tightened against the system enclosure.

NOTE: If fixtures are to be hung from the dimmer enclosure when it is mounted from the back extruded track, a minimum of six carriage bolts must be used in mounting the unit. These bolts should be evenly spaced along the length of the track.

The most versatile of the DS enclosure's extruded mounting tracks is the "Unistrut"[®] compatible track on the unit's bottom surface. This track accepts a wide variety of standard hardware which may be used for mounting the dimmer system itself, or for the attachment of lighting fixtures. A particularly useful configuration mounts the dimmer system above a pipe batten with "Unistrut"[®] pipe clamps, and then hangs lighting fixtures from the batten with conventional "C" clamps.



WARNING

In all cases where an IPS dimmer system is hung above personnel, it must be equipped with safety cables or chains to prevent it from falling should the mounting means fail!

Thermal Environment

Since IPS connector strip dimmers are convection cooled, it is imperative that they be mounted with their heat-sink fins running vertically. It is not acceptable to mount the dimmer system lying on its face or back, or to hang it so that its long dimension runs vertically. DS series dimming systems are designed primarily for pipe, beam, and truss mounting, they are not as well suited for boom or tormentor lighting positions. Use IPS Plugging Box Dimming System in these applications.

Connecting to the DMX512 Network

Basic DMX512 installation consists of connecting IPS units together in "daisychain" fashion. A cable runs from the control console to the "DMX IN" connector on the first IPS unit. Another cable runs from the "DMX OUT" connector on the first unit to the "DMX IN" connector on the second unit. All units are connected together in this fashion.

Setting the Termination Switch



In addition to connecting the cables, the termination switches must be set correctly on each IPS unit. The rules for setting these switches are as follows:

- If a unit has cable plugged into its "DMX OUT" connector which runs to another IPS unit, the switch should be in the left hand (unterminated) position.
- If a unit does not have a cable plugged into its "DMX OUT" connector, the switch should be set to the right hand (terminated) position.
- No more than 1 termination switch may be set to the right hand position on any one cable run.

See the "Control Signal Cabling" section for a full discussion of DMX512 issues.

Setting the Dimmer Address

Each IPS dimmer package must have an unique starting address within the DMX512 network. IPS system addresses are set electronically in the Head-End Processor and retained indefinitely in nonvolatile memory.

IPS addresses represent the DMX ID number of the first dimmer in the IPS package. For instance, if the address is set to 007, then the first dimmer in the unit will be dimmer 7, the second will be dimmer 8, etc. For talkback to work properly, each IPS package must decode a unique range of addresses and must not overlap with other IPS units. If the unit mentioned above at address 007 contains six dimmers, the next unit must be set to address 013 to avoid overlapping address ranges.

IPS addresses are set with the buttons and display on the Head-End Processor. Buttons are identified as 'L', 'C', and 'R' (short for Left, Center, and Right).

Set the IPS starting address as follows:

1. Press the 'L' button once. This places the display in the "Display/Set Address" mode (indicated by "A" in left most digit).



2. Press the 'C' button to increase the address by three. Press the 'R' button to decrease the address by three.

3. When the display shows the correct address, press the 'L' button again. (The display will blank after about one minute)

To verify the address, or make a change, press the 'L' button several more times until the "Display/Set Address" mode shows again. For full information about Head-End Processor menus, see the Dimmer System User's Guide.

Plugging Box Dimmer Systems

This section applies to Plugging Box Dimmer Systems **IPS-DB-1206**, **IPS-DB-2403**, and **IPS-DB-6003**.



- Carry Handle.
- **2** Head-End Processor & DMX512 connectors.
- San. (Air Inlet)
- Power inlet connector.
- **6** Dimmer heat sink. (Typical of 6 or 3)

6 Dimmer focus button and indicator LEDs. (Typical of 6 or 3)

✔ Load Receptacle. (Typical of 6 or 3)

Head-End Processor



• Blank knockout for analog input option.

- **2** DMX512 Pass-Through Connector.
- **3** DMX512 Input Connector.
- Red LED Error Indicators.
- **•** DMX512 Termination Switch.
- 6 Four-digit LED Display.
- Function Select Push Buttons.

Dimmers



• Load Receptacle (Theatrical Pin Connector, NEMA L5-20R "Twist-Lock", or NEMA 5-20R duplex Straight Blade.)

- 2 Heat Sink. (Air Exhaust)
- Green LED.
- 4 Red LED.
- Focus Button.

Power Requirements

IPS 1200 and 2400 Watt dimmer systems are designed to operate on a 50 or 60 Hertz, 20 Amp, 120/208 VAC, three phase "WYE" power service. IPS 6000 Watt dimmer systems are designed to operate on a 50 or 60 Hertz, 50 Amp, 120/208 VAC, three phase "WYE" power service. These systems, however, will tolerate a wide variety of input voltages. For them to function normally the Phase to Neutral voltage must be in the range of 90 to 140 VAC.

If a system is miswired to voltages greater than 180 VAC, the dimmers will shut down and flash the 'Mis-Wire' warning. Dimmers will not attempt to bring up loads when in over-voltage shutdown. IPS is designed to safely tolerate a 230 VAC line indefinitely, and a 280 VAC line for 15 minutes. Line voltages greater than 280 VAC may destroy the over voltage protection components in the dimmers and the Head-End Processor.

Connecting Power

Field wiring of the IPS DB series dimming system is a straight forward matter. A total of 5 wires need to be brought to the unit: The three "phase" wires, a Neutral, and a Ground. The "phase" wires carry up to 20 (or 50) amps each, and the Neutral carries the "unbalanced" current.

All IPS-DB series dimmer systems use flanged inlets for power connections. 1200 and 2400 Watt systems use a NEMA type L21-20P connector. 6000 Watt systems use a VEAM CIR065GRH Connector. Recommended cable is 10/5 type SO for 1200 and 2400 Watt systems and 6/5 type SO for 6000 Watt systems.

The IPS System Status Monitor includes a function which can report the total load on each phase of your power service. For this function to work, you <u>must</u> ensure that the wires feeding all dimmers and dimmer outlets are wired in the same order. The following scheme is suggested:

Connector	Wire	Conductor
"X" or "A"	Black	Phase A
"Y" or "B"	Red	Phase B
"Z" or "C"	Blue or	Phase C
	Orange	
"W" or "N"	White	Neutral
"G"	Green	Ground

Mounting

IPS DB series dimmer systems may be mounted in any orientation, provided that the front and back panels are kept open to allow air flow. The handle of the DB enclosure is drilled to accept two standard "C" clamps to allow the unit to be hung from a pipe.



WARNING

In all cases where an IPS dimmer system is hung above personnel, it must be equipped with safety cables or chains to prevent it from falling should the mounting means fail!

Thermal Environment

IPS DB series dimming systems are fan cooled. Air inlet and exhaust ports must be kept open and free of obstruction at all times. Fan operates in one of two modes set in the Head-End Processor, and runs only when needed.

See the Dimmer System User's Guide for full information on fan operation.

Connecting to the DMX512 Network

Basic DMX512 installation consists of connecting IPS units together in "daisychain" fashion. A cable runs from the control console to the "DMX IN" connector

Plugging Box Dimmer Systems

on the first IPS unit. Another cable runs from the "DMX OUT" connector on the first unit to the "DMX IN" connector on the second unit. All units are connected together in this fashion.

Setting the Termination Switch



In addition to connecting the cables, the termination switches must be set correctly on each IPS unit. The rules for setting these switches are as follows:

- If a unit has cable plugged into its "DMX OUT" connector which runs to another IPS unit, the switch should be in the left hand (unterminated) position.
- If a unit does not have a cable plugged into its "DMX OUT" connector, the switch should be set to the right hand (terminated) position.
- No more than 1 termination switch may be set to the right hand position on any one cable run.

See the "Control Signal Cabling" section for a full discussion of DMX512 issues.

Setting the Dimmer Address

Each IPS dimmer package must have an unique starting address within the DMX512 network. IPS system addresses are set electronically in the Head-End Processor and retained indefinitely in nonvolatile memory. IPS addresses represent the DMX ID number of the first dimmer in the IPS package. For instance, if the address is set to 007, then the first dimmer in the unit will be dimmer 7, the second will be dimmer 8, etc. For talkback to work properly, each IPS package must decode a unique range of addresses and must not overlap with other IPS units. If the unit mentioned above at address 007 contains six dimmers, the next unit must be set to address 013 to avoid overlapping address ranges.

IPS addresses are set with the buttons and display on the Head-End Processor. Buttons are identified as 'L', 'C', and 'R' (short for Left, Center, and Right).

Set the IPS starting address as follows:

1. Press the 'L' button once. This places the display in the "Display/Set Address" mode (indicated by "A" in left most digit).



2. Press the 'C' button to increase the address by three. Press the 'R' button to decrease the address by three.

3. When the display shows the correct address, press the 'L' button again. (The display will blank after about one minute)

To verify the address, or make a change, press the 'L' button several more times until the "Display/Set Address" mode shows again. For full information about Head-End Processor menus, see the Dimmer System User's Guide. The IPS Status Monitor is a data display and analysis system which reports the operational status of IPS dimming systems. It collects status information from IPS dimmers over the DMX512 data network.

This section applies to Status Monitor model **IPS-SM-101**.

Controls and Components



- Video Display.
- **2** Status Monitor Enclosure.
- 3 Number Keypad.
- Function Keys.
- G Cursor Keys.

Rear Panel



- 2 Power Indicator.
- **3** Video Output Connector.
- **4** DMX from Console Connector.
- **5** DMX to Dimmers Connector.

6 Talkback Termination Switch.

Connecting the Power Supply

Plug the external wall-mount power supply into a convenient AC wall outlet.

Plug the 1/8" mini-phone plug into the Power Inlet Jack on the rear of the Status Monitor.

Power Supply Rating:

12 Volts DC Output 800 mA Output on 1/8" mini-phone plug, center terminal positive.

For replacement order Entertainment Technology inventory number Y05-5210.

Connecting the Video Monitor

Plug the video monitor into a convenient AC wall outlet.

Connect the 9 pin video cable from the video monitor to the video output connector on the rear of the Status Monitor.

Switch on the video monitor.

Monitor Type

The Status Monitor requires an IBM MDA compatible TTL monochrome display with 9 pin "D" connector.

For replacement, call Entertainment Technology at 972-840-1640.

Connecting to the DMX512 Network

Install the Status Monitor between the lighting control console and the IPS dimmers.

Status Monitor

Plug the DMX512 cable from the lighting console into the "DMX from Console" connector.

Plug the DMX512 cable from the dimmers into the "DMX to Dimmers" connector.

If a Distribution Amplifier is part of the system, install the Status Monitor between the lighting console and the Distribution Amplifier.

If an Auxiliary Control Unit is part of the system, install the Status Monitor between the Auxiliary Control Unit and the Dimmers.

If both an Auxiliary Control Unit and a Distribution Amplifier are included in the system, install the Status Monitor between the Auxiliary Control Unit and the Distribution Amplifier.

Refer to the "Control Signal Cabling for DMX512" section for a full discussion of DMX system layouts.

Position of Talkback Termination Switch



If the lighting console in the system is IPS compatible (for example ACCESS or ACCESS-Pro) or if an Auxiliary Control Unit is installed, set the Talkback Termination switch in the pass-thru position.

If the lighting console is not IPS compatible, or if you are not sure, set the Talkback Termination switch in the terminate position. This setting correctly terminates the talkback pair from the dimmers, and disconnects it from the control console.

Using Multiple Status Monitors on one DMX Link

On occasion it may be useful to install more than one IPS Status Monitor on a single DMX512 data link. The rules for such an installation are only a slight extension of those for a singe monitor.

When deciding where to connect the Status Monitors in the DMX network, treat the group of Status Monitors as though they were one unit. Connect this group according to the rules in the previous sections.

Set the Talkback Termination switch on the unit closest to the console according to the rules in the previous section.

Set the Talkback Termination switch on all other Status Monitors to the Pass-Thru position.

Portable Distribution Amplifiers

IPS Portable Distribution Amplifiers facilitate the connection of large numbers of IPS dimmer units to one control console, and help simplify cabling when dimmers are being installed in widely separated parts of a building.

This section applies to Distribution Amplifiers **IPS-SA-104**, and **IPS-SA-108**.

Controls and Components



1 "From Console" connector.

2 "To Dimmers" connector. Typical of eight (four).

3 Channel status indicators. Typical of nine (five).

• Power inlet connector and fuse holder.

Channel Status Indicators



- Red power indicator LED.
- **2** Green DMX512 data indicator LED.

• Yellow Talkback data indicator LED.

Connecting Power

Attach the standard IEC power cord (provided) to the power inlet connector on the Distribution Amplifier rear panel. Plug the cord into a convenient AC wall outlet.

Selecting Input Voltage

IPS portable distribution amplifiers may be modified to operate on 240 VAC by changing an internal plug connection. To make this change, follow these steps:

1. Turn the unit over and remove the four screws which retain the enclosure bottom. Lift the bottom away from the top.

2. Note that the cable from the power inlet connector to the printed circuit board has two connectors on it, one marked 120V and the other marked 240V. Unplug the 120V connector from the printed circuit board and plug the 240V connector in its place.

3. Replace the enclosure bottom and its screws.

4. Change the fuse to the appropriate size for 240 volt operation.

5. Mark the outside of the enclosure to indicate that the unit is set for 240 volt operation.

Fuse Ratings

Slo-Blow Type 0.5 Amp for 120 Volt operation 0.25 Amp for 240 Volt operation.

Connecting to the DMX512 Network

See the "Control Signal Cabling for DMX512" section for a full discussion of the use of IPS distribution amplifiers.

Wall Box Distribution Amplifiers

IPS Wall Box Distribution Amplifiers facilitate the connection of large numbers of IPS dimmer units to one control console, and help simplify cabling when dimmers are being installed in widely separated parts of a building.

This section applies to Distribution Amplifiers **IPS-SA-104-WB**, and **IPS-SA-108-WB**.

Controls and Components



- Main printed circuit board.
- Pield wiring compartment.
- **3** "DMX from Console" terminal strip.
- "DMX to Dimmers" terminal strip. Typical of eight (four).

Physical Installation

IPS Wall Box Distribution Amplifiers are built into standard utility enclosures and designed primarily for surface mounting.

Securely anchor the box to a wall in a convenient dry location. Do not block access to the cover of the box.

Power is admitted to the field wiring compartment. DMX cabling is brought into the main section of the enclosure. All wiring to the Amplifier should be run in conduit.

Connecting Power

Connect line and neutral respectively to the black and white wires provided in the Field Wiring Compartment. Connect ground to the green chassis screw in the Field Wiring Compartment. Power may be fed from any convenient utility circuit.

Connecting to the DMX512 Network

All DMX512 connections to IPS Wall Box Distribution Amplifiers are made through terminal strips. Route the DMX512 cable through a knock-out to its appropriate connection point. Strip back only about one inch of cable jacketing and shield when making the connection.



Make the connections according to the following table:

Terminal Signal Name		Wire
GND	Common	Shield (drain)
TALK-	Talkback -	White w/ Orange
TALK+	Talkback +	Orange w/ White
DMX-	Dimmer Drive -	White w/ Blue
DMX+	Dimmer Drive +	Blue w/ White

IMPORTANT: Note that the numbering scheme on the terminal strip is not the same as that for XLR connectors!

See the "Control Signal Cabling for DMX512" section for a full discussion of the use of IPS distribution amplifiers.

Auxiliary Control Unit

This section applies to Auxiliary Control Unit **IPS-AC-100**.

Controls and Components



- Controls and Indicators.
- **2** Field wiring compartment.
- Processor board power cable.
- I/O Board.
- Processor board.

I/O Board



• Panic, Work Light and Take-Control station button terminals.

2 Panic, Work Light and Take-Control station LED terminals.

- Preset station button terminals.
- Preset station LED terminals.
- Slider station terminals.
- **6** DMX from Console terminals.
- OMX to Dimmers terminals.
- Connections to Processor Board.

Field Wiring Compartment



- Line & Neutral for Processor Board.
- **2** Grounding Terminal.

Controls and Indicators



- Four digit LED display.
- Special indicator LEDs.
- Ontrol buttons.

Physical Installation

The IPS-AC-100 is housed in a 10" x 12" x 4" surface mount junction box with standard knock-outs for conduit connections. Securely mount the enclosure to a wall or equipment panel with screws or bolts through its four mounting holes.

Install the AC power conduit into one of the three knock-outs in the lower left corner of the enclosure which open into the field wiring compartment. Install control wiring conduit into any of the knock-outs which open into the main body of the enclosure.

If loose wiring is brought directly into the enclosure, make sure appropriate bushings and strain reliefs are used.

Connecting Power

Connect line and neutral respectively to the black and white wires provided in the Field Wiring Compartment. Connect ground to the green chassis screw in the Field Wiring Compartment. Power may be fed from any convenient utility circuit. Make sure the Processor Board Power Cable is plugged into its corresponding connector on the Processor Board.

Connecting Control Stations

Connecting Slider Stations

+5V and COMM provide power to all slider stations. The output signal of each slider is connected to one of the fader inputs. The function of the input terminals changes depending on which Analog Input mode has been selected. In the following table, each column represents one Analog Input mode. The numbers in parenthesis indicate which Take-Control button enables each input.

Term.	Mode 1	Mode 2	Mode 3
P1-1	Fader 1	Fader 1 (1)	Fader 1 (1)
P1-2	Fader 2	Fader 2 (1)	Fader 2 (1)
P1-3	Fader 3	Fader 3 (1)	Fader 3 (1)
P1-4	Fader 4	Fader 4 (1)	Fader 4 (1)
P1-5	Fader 5	Fader 5 (1)	Fader 1 (2)
P1-6	Fader 6	Fader 6 (1)	Fader 2 (2)
P1-7	Fader 7	Fader 7 (1)	Fader 3 (2)
P1-8	Fader 8	Fader 8 (1)	Fader 4 (2)
P1-9	+5V	+5V	+5V
P2-1	Fader 9	Fader 1 (2)	Fader 1 <i>(3)</i>
P2-2	Fader 10	Fader 2 (2)	Fader 2 <i>(3)</i>
P2-3	Fader 11	Fader 3 (2)	Fader 3 <i>(3)</i>
P2-4	Fader 12	Fader 4 (2)	Fader 4 (3)
P2-5	Fader 13	Fader 5 (2)	Fader 1 (4)
P2-6	Fader 14	Fader 6 (2)	Fader 2 (4)
P2-7	Fader 15	Fader 7 (2)	Fader 3 (4)
P2-8	Fader 16	Fader 8 (2)	Fader 4 (4)
P2-9	COMM	COMM	COMM

Connecting Button Stations

Connect the signal wire from each button to one of the switch inputs. Connect the signal wire from each LED to one of the LED outputs. Keep Button Common and LED Common separate from each other.

Term.	Button	Term.	LED
P10-1	Panic	P7-1	Panic
P10-2	Switch 1	P7-2	Switch 1
P10-3	Switch 2	P7-3	Switch 2
P10-4	Switch 3	P7-4	Switch 3
P10-5	Take-Con 1	P7-5	Take-Con 1
P10-6	Take-Con 2	P7-6	Take-Con 2
P10-7	Take-Con 3	P7-7	Take-Con 3
P10-8	Take-Con 4	P7-8	Take-Con 4
P10-9	Common	P7-9	Common
P11-1	Preset Off	P8-1	Preset Off
P11-2	Preset A	P8-2	Preset A
P11-3	Preset B	P8-3	Preset B
P11-4	Preset C	P8-4	Preset C
P11-5	Preset D	P8-5	Preset D
P11-6	Preset E	P8-6	Preset E
P11-7	Preset F	P8-7	Preset F
P11-8	Preset G	P8-8	Preset G
P11-9	Common	P8-9	Common

Connecting to the DMX512 Network

All DMX512 connections to IPS Auxiliary Control Units are made through terminal strips. Remove only about one inch of cable jacketing and shield when making the connection.

	From		То
Terminal	Console	Terminal	Dimmers
P3-1	Common	P4-1	Common
P3-2		P4-2	Talkback -
P3-3		P4-3	Talkback+
P3-4	DMX In -	P4-4	DMX Out -
P3-5	DMX In +	P4-5	DMX Out+

See the "Control Signal Cabling for DMX512" section for a full discussion of DMX512 cabling issues.

Control Signal Cabling for DMX512

DMX512 Fundamentals

DMX512 is a digital data transmission protocol for lighting consoles and dimmers published by USITT. Since its introduction in 1986, it has seen wide acceptance in the theatrical and entertainment lighting industries, and has been applied and extended in ways hardly foreseen by its originators. As a distributed dimming system with full status reporting back to the console, IPS has itself stretched the boundaries of DMX while still remaining absolutely consistent with the original specification.

All IPS system elements are designed to be part of an extensive, bi-directional, DMX512 data network. Output levels are transmitted to dimmers and other devices on the Primary DMX data channel, and dimmer status is transmitted back to the console or Status Monitor on the secondary channel. The physical network interface for IPS units consists of "DMX-IN" and "DMX-OUT" connectors, and possibly a termination switch. The basic network is constructed by "daisy chaining" units together.

The DMX512 issue which is least understood is that of cable layout and termination. For a DMX512 network to function reliably it must be

constructed as a simple daisy chain, with no branching runs and with both ends of the cable terminated in its characteristic impedance. If branching runs are required, each must be driven from a distribution amplifier and must be constructed as a simple daisy chain with proper termination. Any other layout invites unreliable operation. These rules are doubly important with IPS, because dimmer talkback will not function if they are violated.

The Network Architecture diagram on this page represents the layout which all IPS systems must follow. Subsequent paragraphs refer to this diagram in discussing each system element.

Basic IPS System

The most basic IPS system consists of an IPS compatible console (such as ACCESS) and a single IPS dimmer system. The console, item ① in the architecture drawing, produces DMX512 data, and the dimmer system, item ⑧, consumes it. Talkback data is returned to the console over the second DMX512 wire pair, and the console and dimmer system respectively terminate each end of the cable.



- Control Console (DMX512 Source)
- **2** Auxiliary Control Unit
- Status Monitor
- Additional Status Monitors

- Distribution Amplifier
- **6** Additional Distribution Amplifiers
- Dimmer System, Daisy Chain connection
- **3** Dimmer System, Terminated connection

Control Signal Cabling for DMX512

The idea of DMX consumers and producers logically divides a system into two halves which can be discussed separately. The producing half consists of the control console and its associated accessories. The consuming half consists of dimmers and other devices which respond to DMX data, as well as distribution amplifiers and the bulk of the DMX wiring. Draw a line, if you will, dividing items ④ and ⑤. Consider everything to the left of the line a DMX producer, and every thing to the right a DMX consumer.

"DMX Consumer" Half of System

The consumer half contains most of the complexity (and equipment) of a DMX system. The first addition to the basic IPS system is likely to be more dimmers ⑦. As stated before, additional dimmers are connected to the DMX network in Daisy Chain fashion: the data cable runs from the console to DMX-IN of the first unit, from DMX-OUT of the first to DMX-IN of the second, and so on until the last unit. All termination switches are set for Pass-Thru except the one on the last unit on the cable. Up to 32 units may be connected in this fashion.

Distribution Amplifiers

If more than 32 dimmer systems are to be used in an installation, or if Daisy Chain cabling is inconvenient, a distribution amplifier (5) needs to be added to the system. In fact, most IPS installations should include a distribution amplifier to simplify cable runs.

The most efficient use of distribution amplifier capacity is obtained by providing separately amplified DMX data lines to each distinct mounting position in a venue and then using Daisy Chain connections within each position. It is easy to Daisy Chain units within one mounting position as they are typically all together in a row.

If more than eight runs are required to service the various mounting positions, additional distribution amplifiers [©] may be added. Good practice dictates that all additional distribution amplifiers should be fed directly from the first distribution amplifier [©]. This minimizes the possibility that subtleties like propagation delay and wave form distortion will affect the system.

The only real restrictions on the use of IPS distribution amplifiers is their placement in the DMX network. Because these amplifiers collect talkback data from each of their output cables and actively drive it back to the console, they must be placed electrically nearest the console in the DMX Consumer half of the system. If dimmers are placed between the distribution amplifier and the console, a talkback conflict will occur.

Adding Non-IPS Equipment

The next level of complexity in a DMX system is the one which is required to fully benefit from DMX512's promise, namely the free mixing of equipment from different manufacturers. Unfortunately the reality of DMX is somewhat more chilling than its promise, and there are substantial differences in implementation and many possible conflicts.

Outside of signal timing, which the end user can't control anyway, DMX conflicts usually have to do with the following:

Integrity (and presence) of pins 4 and 5. Conflicting uses of pins 4 and 5. Line termination issues, especially: Re-amplified DMX-OUT connectors. Incorrect termination resistor value. No termination/permanent termination

Mixing IPS and non-IPS equipment in a Daisy Chain configuration may range in difficulty from "Plug and go" to "Nightmare". If the foreign unit's DMX receiver is RS-485 compliant and pins 4 and 5 are passed through, then no problems should be encountered. However many popular products avoid the issue of line termination and unit loading by re-amplifying the signal in every unit. This makes each daisy chain cable a separate RS-485 link starting at one unit and ending at the next. Many units which re-amplify also terminate their input with values other than 120 ohms (Typically 100 to 2000 ohms) and fail to support pins 4 and 5. It is nearly impossible to use equipment with these failings in a daisy chained IPS system.

In a system with a distribution amplifier the situation is eased somewhat by the use of a separate DMX link for each different equipment

type. By putting all the moving lights, say, on a separate cable driven directly from a distribution amplifier issues of electrical compatibility are limited to the connection to the first device on the cable where they may be easily solved. This first link then serves as a gateway to the foreign system.

"DMX Producer" Half of System

The producer half of a DMX system is somewhat less complicated, often consisting simply of the control console. Virtually any DMX512 control console may be used with IPS provided that it does not use pins 4 and 5 for anything other than IPS Talkback, or that if it does, pins 4 and 5 are not connected. The Talkback Termination switch on the IPS-SM-101 Status Monitor automatically isolates pins 4 and 5 from the console when set to the terminate position.

The addition of a status monitor ③ gives the user access to a wealth of information about system performance. The status monitor goes in line after the console and before the first dimmer system or distribution amplifier. If additional status monitors ④ are required, they should be installed after the first status monitor and before the first dimmer system or distribution amplifier. If a status monitor needs to terminate the talkback line, it must be the one closest to the console.

If an Auxiliary Control Unit ⁽²⁾ is part of the system it must be located electrically closest to the control console, ahead of any status monitors. Because of its special function, the Auxiliary Control Unit does not pass Talkback data thru to the console. If status monitoring is required in a system with auxiliary control, it must be accomplished with an IPS-SM-101.

DMX Cabling and Termination

As you can see, the DMX network is as distinct a system entity as the dimmers and console. For it to function well, it must be planned as carefully as the power distribution. This section summarizes some of the technical details necessary for planning a DMX512 data network.

Recommended Cable

Mfg.	Туре	Color Code
Alpha	3492	Belden
Belden	8132	Western Electric
Belden	9842	Western Electric
TMB Associates	Pro-Plex	ICEA

For plenum applications use Belden 88102.

Wiring Color Codes

	ICEA	Belden	WE
First	Black	Black	White w/ Blue Stripe
Pair	White	Red	Blue w/ White Stripe
Second	Red	Black	White w/ Orange Stripe
Pair	Green	White	Orange w/ White Stripe

ICEA = Insulated Cable Engineers Assn. WE = Western Electric.

Connectors

Type: XLR-5

Transmitter: Female Receiver: Male

Pin	Signal Name	
1	Common (Shield)	
2	Dimmer Drive -	
3	Dimmer Drive +	
4	Talkback -	
5	Talkback +	

Type: IPS terminal strips

Used in wall box distribution amplifiers and connector plates.

Terminal	Signal Name	
GND	Common (Shield)	
TALK-	Talkback -	
TALK+	Talkback +	
DMX-	Dimmer Drive -	
DMX+	Dimmer Drive +	

Control Signal Cabling for DMX512

Terminating Network

In cases where an IPS peripheral is not the last node on a DMX512 data cable, it may be necessary to hand terminate the cable to obtain proper operation.



DMX Pitfalls

While there are many ways to construct a reliable DMX512 network, there are probably more ways to construct one which is non-functional, or worse, partially functional or intermittent.

This section presents some examples of **BAD PRACTICE** in constructing a DMX512 network. *These configurations should be AVOIDED!!*





Unterminated cable in DMX-OUT

Other things to avoid when planning an IPS installation include the following:

Multiple terminations/No terminations

Each DMX data link should be terminated once at each end of the cable run. The control console should automatically take care of its end. On the dimmer end, the termination switch must be set in the last unit on the cable only! All others must be set for Pass-Thru.

Talkback interrupted by non-IPS device.

Many supposedly DMX compatible products do not support pins 4 and 5 of the data connector. When units of this type are used with IPS, downstream IPS units are cut off from the Talkback wire pair and that pair is left unterminated which will likely prevent Talkback from working at all.

Non-standard signals on Pins 4 & 5.

The inverse problem of that mentioned above is competing uses of the second DMX data channel. Different manufacturers have used this wire pair for a variety of functions, including: Dimmer Talkback (like IPS), Levels for additional dimmers, Multiplexed analog levels for AMX192 converters, Dimmer over-temp contact closures, Power for dimmer fans, and Power for the control console. Not all of these uses are consistent with the DMX512 specification and some might even destroy the talkback line drivers in IPS dimmers. Be very cautious when mixing IPS and non-IPS equipment!

Bad grounding practice.

It is unlikely that you will have a grounding problem in an all IPS system due to its extensive use of optical isolation. When adding other equipment, look for and eliminate the following:

Shorts between ground and neutral.

Connections of DMX shield to XLR connector case, conduit, or faceplate metal. (Grounding should occur within equipment only!)

Common-mode voltage between units in excess of 5V RMS. (Solve w/ optical isolation)

Ungrounded metal panels.

Control Signal Cabling for AMX192

Fundamentals

Any IPS dimmer system may be supplied from the factory fitted to receive USITT's AMX192 multiplexed analog dimmer control protocol instead of DMX512. When so fitted, 4 pin XLR connectors replace the normal DMX connectors. Like DMX512, AMX192 is designed to be daisy chained from unit to unit. Unlike DMX, however, AMX192 signals are not digital in nature. They consist of one signal line carrying time-multiplexed analog levels, and a signal pair carrying a differential clock which synchronizes the whole system to the analog data.

There is no provision for secondary data channels in AMX192, so Talkback data is not available when this protocol is used.

Basic Connections

To a large extent, connecting AMX192 is a "Plug and Go" process. The standard allows data for up to 192 dimmers on one cable, and connections for up to 16 receiving units. Distribution amplifiers are generally not available, so cabling is limited to a basic daisy chain.

Since AMX is a multiplexed protocol (like DMX), each receiver needs to have an address so it knows which portion of the transmitted data to use. The AMX address for an IPS dimming system is set exactly the same as the DMX address. The largest valid AMX address is 190.

One of the limitations of AMX192 is its lack of optical isolation between different system elements. This leaves the system more vulnerable to common mode voltage problems than a well laid out DMX system. All of the problems normally associated with AMX192 distribution may occur with IPS. IPS dimmers are factory adjusted to operate on AMX control signals ranging from 0 to +5 VDC. Since the output of analog consoles can drift with age, the IPS Head-End can be re-trimmed by the user to match the actual console output. See the "Analog Input Trim" function in the Dimmer System User's Guide.

Cables and Connectors

Recommended Cable

AMX192 cable has two twisted pairs and no shield. Typical choices are:

Mfg.	Туре
Alpha	1132
Belden	9156
Belden	8723

Connectors

The AMX192 specification allows either of two connectors to be used. Nearly all current equipment which supports this protocol uses the full size 4 pin XLR connector. However, older equipment may be encountered which still uses the mini-XLR connector.

Connector: XLR-4 Transmitter: Male Receiver: Female

Pin	Signal Name
1	Analog Common
2	Clock +
3	Analog Level
4	Clock -

Connector: Mini-XLR Equipment: Female Cables: Male

Pin	Signal Name
1	Clock-
2	Analog Common
3	Clock +
4	Analog Level

Control Signal Cabling for 0 - 10VDC Analog

Fundamentals

Any IPS dimmer system may be supplied from the factory fitted to receive 6 discrete 0-10 VDC analog control inputs in addition to either DMX512 or AMX192. When so fitted, a female 9 pin 'D' sub-miniature connector is installed in the blank opening on the Head-End Processor.

Analog control inputs interact with either of the other two protocols in a "Highest level takes precedence" fashion.

Basic Connections

Though extremely simple in principle, analog control systems can be very complex in execution. The idea, simply put, is that a dedicated wire carries the control signal for each dimmer in the system. For small numbers of dimmers this is extremely easy to set-up, however complexity increases proportionally as the number of dimmers increases. In addition, there are many opportunities for handwired custom connections which may be hard to decipher after they are in place.

If the output of your controller is a terminal strip, it should be relatively easy to connect the cable running to the IPS. If the output of your controller uses some kind of multi-pin connector an adapter will



need to be built. Since it is unlikely that the control signals from your console are bundled in groups of six, it may be useful to build a junction box with terminal strips in which the control signals may be rerouted. By providing a terminal for each control signal and a common bus for all of the return connections it becomes a simple matter to group the signals for each cable run.

IPS dimmers are factory adjusted to operate on analog control signals ranging from 0 to +10 VDC. Since the output of analog consoles can drift with age, the IPS Head-End can be re-trimmed by the user to match the actual console output. See the "Analog Input Trim" function in the Dimmer System User's Guide.

Cables and Connectors

Recommended Cable

The cable to each IPS unit with analog control should be seven wire, 20 gage, stranded multi-conductor, with no shield. Typical choices are:

Mfg.	Туре
Alpha	1896/7
Belden	9439

Connectors

Connector: DB-9 Source: Male Receiver: Female

Pin	Signal Name
1	Control 1
2	Control 2
3	Control 3
4	Control 4
5	Control 5
6	Control 6
7,8,9	Signal Common

Dimmer System Fundamentals

This chapter applies to all IPS Dimmer Systems.

The Intelligent Power System dimmer represents the most significant advance in dimming technology since the introduction of electronic dimming over 40 years ago. By applying microprocessors, the latest in power handling semiconductors, and a systems engineering design approach, IPS redefines the state of the art. Your lighting system will never be the same again!

The IPS dimmer is a multi-mode unit which automatically analyzes its connected load and picks the most appropriate dimming technique. Depending on the load, the dimmer will use either Reverse Phase Control (RPC) or Forward Phase Control (FPC). Whenever possible, the dimmer will choose RPC because of the advantages it offers in terms of reduced lamp noise and increased regulation accuracy. Both techniques control the average power applied to the load by limiting current flow to only certain portions of each power line half cycle.

Forward Phase Control is the technique used by all previous electronic dimmers, although earlier implementations have been far less sophisticated than IPS. This scheme only allows current to flow during the latter portion of each half cycle. As the relative duration of the conducting portion is increased, so is the average power applied to the load, and hence its brightness.

Reverse Phase Control, on the other hand, limits current flow to the early portions of each half cycle. The dimmer monitors the power applied to the load in real time during the half cycle and adjusts its switch-off point as needed to regulate the light output.



When switching-off the output in each half cycle, it is important to control the slope of the falling wave form so as to minimize the acoustic noise made by the lamp filament, and the radio frequency noise radiated by the dimmer. Previous dimming technologies accomplished this by placing a large coil of wire in series with the output of the dimmer. The unique power stage in IPS dimmers allows this function to be performed directly in the dimmer. By stretching this fall time out to 450 or even 800 μ S, IPS dimmers achieve exceptionally quiet operation without high insertion losses, and without the line distortion caused by inductors.



As you can see, IPS is a unique and highly sophisticated dimmer which frees you from many of the limitations of previous systems.



IPS Dimmer User's Guide

Basic Concepts

The Head-End Processor is the communications manager for the IPS dimmer system. It receives the DMX512 data stream, determines which portion of the data is applicable and then instructs the dimmers to go to output levels accordingly. It queries the dimmers for operating status, and makes this data available both on the local 4 digit display and over the DMX512 network. It accepts control input from its three push buttons to allow operating modes to be selected and data to be displayed.



The 4 digit display is the primary indicator of the Head-End operating state. In normal operation it displays a dash "-" character which repeatedly marches across the digit positions. Head-End menus are selected with the 'L' button and are indicated by letter or number codes on the display. No matter what menu is selected, after a couple of minutes the Head-End automatically returns to the "Normal" state.

The two individual LEDs (1 and 2) are used to indicate special conditions. LED 1 indicates that a DMX512 or AMX192 data stream is not present, and LED 2 indicates that the dimmer system is in Preset Playback mode.

All parameters which may be set in the Head-End menus may also be set by a command data stream on the DMX512 network. Refer to the controller's users guide for information on the remote setting of dimmer parameters.

Head-End Processor Menus

Normal

Display reads: [] Dashes march through digits.		
Operation:		
L Button:	Change to "Display/Set	
	Address" menu.	
C Button:	No action.	
R button:	No action.	

This is the state the dimmer system will maintain during normal remote control operation.

"Display/Set Address" menu

Display reads: [A x x x] A = Menu indicator. x x x = Address in decimal.		
Operation:		
L Button:	Change to "Playback Preset"	
	menu.	
C Button:	Increase Address by 3.	
R Button:	Decrease Address by 3.	

This menu allows the DMX512 or AMX192 network address of the first dimmer in the unit to be examined and set. To set the address, change the number in the display with the 'C' and 'R' buttons, and then exit the menu by pressing the 'L' button.

"Playback Preset" menu

Display read	s: [PLA x]	
PLA = Me	PLA = Menu indicator.	
x = Preset number. (1 - 6 or "-")		
Operation:		
L Button:	Change to "Local Dimmer	
	Control" menu.	
C Button:	No Action.	
R Button:	Select next Preset.	

This menu allows one of the six internal presets to be selected for playback. To choose a preset, change the number in the display with the ' \mathbf{R} ' button, and then exit

the menu by pressing the 'L' button. A preset selected in this manner will automatically come on any time the dimmer system is powered. To disable preset playback, press the '**R**' button until the display shows a dash "-" and then exit the menu as above.

"Local Dimmer Control" menu

Display reads: [L x y y] L = Menu indicator. x = Dimmer number. (1 - 6) y y = Locally set level in Decimal. (00 - 99, FL) Operation: L Button: Change to "Record Preset" menu. C Button: Select next dimmer. R Button: Increase level of selected dimmer.

This menu allows individual dimmer levels to be set from the Head-End keyboard. Select the dimmer to set with the 'C' button. Set the dimmer's level with the 'R' button. Exit the menu with the 'L' button. If no DMX512 or AMX192 data stream is present, and the discrete analog inputs are at zero, these locally set levels will remain on indefinitely. If console data is present, the levels will be terminated as soon as the menu is exited.

"Record Preset" menu

Display reads: [r E C x] r E C = Menu indicator. x = Preset number. (1 - 6 or "-")		
Operation:	Change to "Display/Set	
L Button:	Dimmer Preheat" menu.	
C Button:	No Action.	
R Button:	Next Preset.	

This menu allows levels which have been set from the console, by the "Local Dimmer Control" menu, or by the individual dimmer Focus Buttons to be saved into internal presets for later playback. To record a preset, first set the desired levels, then enter this menu. Select the preset number to record with the '**R**' button and then exit the menu with the '**L**' button. If the dash "-" is displayed when the menu is exited, no preset record will take place.

"Display/Set Dimmer Preheat" menu

Display reads: [P = x x] P = = Menu indicator. x x = Preheat mode. ("" or "On")	
Operation: L Button:	Change to "Display/Set Dimmer Response Speed" menu.
C Button:	No Action.
R Button:	loggie Preneat Setting.

This menu allows dimmer preheat operation to be enabled or disabled for all dimmers in the unit . Change the setting with the '**R**' button, then exit the menu with the '**L**' button.

When preheat is set to "On", the dimmers will automatically apply a small voltage to lamps which are off to keep them from getting "cold". This is useful when it is necessary to get large wattage lamps to come on as quickly as possible.

It is not a good idea to enable preheat in all of the dimmers in a venue as this will cause tremendous amounts of current to be drawn from the power service even though no lights are on. Use the preheat function judiciously on the lamps which really need it, but otherwise leave it off.

"Display/Set Dimmer Response Speed" menu

Display read	s: [S P x x]		
SP = Menu	S P = Menu indicator.		
x x = Spee	d Indicator. (20 - 55 or "FA")		
Operation:			
L Button:	Change to "Display/Set Fan		
	Mode" or "Display Console		
	Data" menu.		
C Button:	Next Response Selection.		
R Button:	Enable Controlled Response.		

This menu allows the dimmer response time for all dimmers in the package to be set to one of 9 values. Enable controlled response with the '**R**' button. Select the response time with the '**C**' button, then exit the menu with the '**L**' button.

The Speed indicator is decoded as follows:

- FA = As fast as possible
- 20 = 200 mS
- 25 = 250mS
- 30 = 300 mS
- 35 = 350mS
- 40 = 400 mS
- 45 = 450 mS
- 50 = 500 mS
- 55 = 550mS.

Controlled response time is used to normalize the amount of time different sized lamps take to come on. The factory default setting is 350mS. When set to "FA", low wattage lamps will come on noticeably faster than high wattage lamps.

"Display/Set Fan Mode" menu

Display read	s: $[F = x x]$	
F = = Menu indicator.		
x x = Mod	e indicator. ("°C" or "On")	
Operation:		
L Button:	Change to "Display Console	
	Data" menu.	
C Button:	No Action.	
R Button:	Toggle Fan Mode.	

This menu only appears on IPS-DB series dimmer systems. It allows the fan operation mode in these units to be set. Select the mode with the '**R**' button, then exit the menu with the '**L**' button. When the mode indicator reads "°C" the fan will come on if any dimmer in the box exceeds 45°C and will go off again when all dimmers are below 35°C. When it reads "On", the fan will come on any time a DMX512 or AMX192 signal is present, and will go off again when the signal is removed and all dimmers are below 35°C.

"Display Console Data" menu

Display read	s: [d x y y]
d = Menu	indicator.
x = Dimme	er number. (1 - 6)
y y = Cons	ole level in Hexadecimal.
	(OO - FF)
Operation:	
L Button:	Change to "Display/Set Non-
	Dims" menu.
C Button:	Select next dimmer.
R Button:	No action.

This menu displays the actual DMX512, AMX192 or Analog level which has been set for each dimmer.

"Display/Set Non-Dims" menu

Display read	s: [n x y y]		
n = Menu	indicator.		
x = Dimme	er number. (1 - 6)		
y y = Non-	Dim threshold level in decimal		
	("", 01 - 98)		
Operation:			
L Button:	Change to "Analog Input		
	Trim" menu, "Display/Set		
Demo Unit Input Mode"			
	menu, or "Display/Set		
	Address" menu.		
C Button:	Select next dimmer.		
R Button:	Increase threshold level.		

This menu allows individual dimmers to be configured for "Non-Dim" operation. Select the dimmer to configure with the 'C' button, set the "Non-Dim" threshold level with the 'R' button, then exit the menu with the 'L' button. The "Non-Dim" threshold is the input level at which the dimmer will switch from full off to full on. Select a threshold of "- -" to convert a dimmer back to normal operation. When selected as a "Non-Dim", a dimmer will not attempt to regulate its output.

"Analog Input Trim" menu

Display read	s: [A n x x]
A n = Men	u indicator.
x x = Trim	operation to perform.
	("", "FL", "00")
Operation:	
L Button:	Change to "Display/Set Demo
	Unit Input Mode" menu, or
	"Display/Set Address" menu.
C Button:	Select trim operation.
R Button:	Execute trim operation.

This menu only appears on IPS dimmer systems which have an AMX192 or Analog input option Installed. It allows the analog input section to be calibrated to the actual control voltage used by the control console.

For AMX, set the first dimmer on the data link to FULL. For Discrete Analog set all control inputs to FULL. Select the "FL" trim function with the 'C' button, then execute the function with the 'R' button. Return all control levels to Zero. Select the "00" trim function with the 'C' button, then execute the function and the 'R' button. Exit the menu with the 'L' button.

"Display/Set Demo Unit Input Mode" menu

Display read	s: [- x x -]		
= Me	nu indicator.		
x x = Inpu	x x = Input mode indicator.		
	("CO", or "PC")		
Operation:			
L Button:	Change to "Display/Set		
	Address" menu.		
C Button:	No action.		
R Button:	Toggle input mode.		

This menu only appears on IPS demonstrator units. It allows the DMX512 input to be configured for either normal console operation (-CO-), or for connection to the IPS demonstration program running on a personal computer (-PC-). Press the '**R**' button to toggle the mode selection, then press the '**L**' button to exit the menu.

Diagnostic Error Report

Display reads: [E r r x]			
Err=Me	nu indicator.		
x = Error Code. (1 - 7)			
Operation:			
L Button:	Change to "Display/Set		
	Address" menu.		
C Button:	No action.		
R Button:	No action.		

This display will only be seen if the dimmer system detects an internal error upon power-up. Error codes are:

Code	Definition
1	Head-End ROM Checksum error.
2	E ² PROM was blank, or invalid and has been re-initialized.
3	One or more dimmers are absent or not responding.
4	Reserved.
5	Head-End and dimmers are not all configured for the same voltage.
6	One or more dimmers have reported a fatal error.
7	Unit is miswired to high voltage.

Controls and Indicators

Each dimmer in an IPS system is a self contained micro-computer system having a power supply, a micro-processor, memory, and a communication channel as well as power control and sensing electronics. Each dimmer is capable of determining both the line and load voltage, the load current, and its own operating temperature, and adjusts its operation accordingly.



Focus Button

IPS dimmers normally operate under the control of the Head-End processor. When conditions require an operator to locally turn on a circuit, the "Focus" button is used. The action of this button is a function of the current state of the dimmer.

If the dimmer is set to a level of zero by the control console (or the Head-End processor) then the Focus button behaves as follows: If the dimmer is presently off, a tap on the button will take it to full on. If the dimmer is presently on, a tap will turn it off. Whether on or off, pressing and holding the button will cause the dimmer to ramp up in intensity. Releasing the button will then cause the dimmer to hold an intermediate level.

Lights turned on in this fashion will remain on indefinitely. However, when the control console (or Head-End) subsequently sets a non-zero level for a dimmer, the focus level will be canceled, and the dimmer will once again follow the higher priority control.

If the dimmer is already set to a non-zero level by the control console (or Head-End) the Focus button becomes a "Flash-to-Full" control, overriding the set level only while the button is pressed.

LEDs

The two LEDs associated with each dimmer report various operating conditions. The indications are as follows:

Red LED	Green LED	Condition
Off	Off	Normal Operation
Off	Flashing	No Load
Off	On	Focus Mode
Flashing Quickly	Off	Over-sized Load or Overload
Flashing Slowly	Off	Over Temperature
On	Off	Other error (Query Status Monitor)
Flashing	Flashing	Mis-Wire to Line Voltage

Load Types

IPS dimmers are designed to operate a wide variety of lighting loads of up to their rated capacity. The range of load types which may be connected includes incandescent lamps, and a number of "well-behaved" inductive loads such as low-voltage (step-down transformer) incandescent lamps, fluorescent lamps, and most types of small motors.

IPS dimmers are NOT designed to drive large motor loads (3 Amps or greater), or motors with start-up capacitors. Attempting to drive such loads may damage the dimming electronics.

When operating low-voltage type fixtures, observe the following precautions: If the fixture has a conventional magnetic transformer, be sure it has internal fusing and is approved for dimming by its manufacturer. Load the IPS dimmer to only 80% of its capacity (960VA for a 1.2KW dimmer) to compensate for losses in the transformers. If the fixture has an "electronic transformer", make sure it is approved for dimming by its manufacturer.

Neon signs can be particularly difficult to dim as they tend to reflect back nearly all of the energy which is applied to them. For best results with neon, an IPS dimmer should be loaded to no more than 50% of its capacity (600VA for a 1.2KW dimmer), should be configured for Forward Phase Control operation, and should have an incandescent load of 100 to 200 watts added to help absorb the reflected energy. Failure to take these precautions may result in damage to the dimming electronics.

Also, for best results, increase the neon transformer voltage 50% over the normal requirements for the selected length and diameter of the tube. Use only Low Power Factor (without power factor compensation), current limiting, high-voltage transformers. Mount the transformer with the lamp it operates. This will increase lamp stability and dimming range. Neon tubes must be pumped for a hard vacuum to minimize impurities in the lamp to insure flicker-free operation at low light levels.

To place a dimmer into Forced Forward Phase Control mode, follow this procedure:

On the Head-End Processor, press the 'L' button until you are in the "Playback Preset" menu. Press and hold the 'C' button until the left hand digit changes to 'H'. Press the 'L' button three more times until the left hand digit changes to 'C'. Press the 'C' button until the second digit shows the number of the dimmer you wish to modify (1 - 6). Press the 'R' button until the third digit shows '2'. Press the 'L' button three more times until the left hand digit changes to 'A'.

To return a dimmer to normal dimming operation, follow the same procedure as outlined above, except when pressing the '**R**' button change the third digit to '0', instead of '2'.

Dimming Modes

The IPS dimmer is capable of several operational modes, and automatically selects the one which is best suited to the particular load and power service to which it is connected. As the dimmer brings a load up from zero it performs an analysis of its output voltage and current to determine which mode to use. The operator will never be aware that this has occurred, except by noting the reported dimming mode on the Status Monitor.

The four modes in which the dimmer may operate are Trial, Warm-up, Normal FPC, and Normal RPC. In each mode the dimmer analyzes its operating parameters to determine if it is permissible to move to the next mode. When coming up from a level of zero, the dimmer is in the Trial mode and makes an initial determination of the character of the load. If it appears to be a normal incandescent lamp which is already warm, the dimmer will move immediately to the Normal RPC dimming mode. Otherwise it moves to the Warm-up mode.

In Warm-up mode the dimmer applies power to the load in a current limited fashion bringing it to the point of incandescence as rapidly as possible. When the voltage and current on the load indicate that it is thoroughly heated, the dimmer moves to the Normal RPC dimming mode.

In normal RPC mode the dimmer handles the load with a reverse phase control wave form which is optimal for normal incandescent lamps. Unless the load exhibits some aberrant behavior, the dimmer will stay in this mode until the level is returned to zero. If the load or the service shows a significant inductive characteristic, the dimmer will switch to Normal FPC mode as this is the best way to handle an inductive load.

In Normal FPC mode, the dimmer behaves much like a conventional SCR based dimmer, handling the load with a forward phase control wave form.

Non-Dim Operation

When set for Non-dim operation, the IPS dimmer bypasses the dimming modes mentioned above, and simply switches into full conduction. Normal overload protection is still active, but the dimmer does not attempt to regulate its output voltage. Non-dim mode is intended to control small motors and fans such as those found in color scrollers and scenic projectors. It is NOT designed to run large loads or flash pots!

Thermal Protection

The portion of the IPS output wave form which generates the most heat is the transition from on to off (off to on for FPC). This portion is known as the transition time, and its duration directly affects the amount of heat generated. Unlike any other dimmer, the IPS dimmer can control the duration of this portion of its output

Dimmer Operation

wave form and thus, to a certain degree, its operating temperature.

If the dimmer is in its normal operating temperature range, it will use the longest transition time available (800 µS for 2.4KW and 6.0KW dimmers, 450 µS for 1.2KW dimmers). Should its operating temperature reach 85°C (likely only if the ambient temperature is very high), it will automatically select a shorter transition time to reduce the amount of heat generated. In many cases this will be sufficient to stabilize the temperature. Should the temperature continue to rise, and reach 95°C, the dimmer will completely shut down to prevent an over temperature failure. After an over temperature shut-down the temperature must drop to 50°C and the level must be reset to zero to resume normal operation.

Overload Protection

The IPS dimmer can detect an overload in one of two ways, either by calculating the load size from the measured voltage and current, or by the hardware current limiter tripping and shutting down the output. The former protects the dimmer from mis-sized loads, such as 2000 watts connected to a 1.2KW dimmer. The latter protects the dimmer from catastrophic faults like short circuits. The Over-sized load threshold is about 35% above the nominal dimmer capacity, roughly 1600 Watts for a 1.2K, 3200 Watts for a 2.4K, and 8000 Watts for a 6.0K. This gives enough latitude for lamp manufacturing tolerances and load shift with temperature, yet still protects the dimmer from gross loading errors.

Once an overload has been detected, the dimmer spends about 5 seconds monitoring the load before deciding to shut down. If the hardware current limit caused the fault, the load is monitored at extremely low voltages. If the fault has not cleared at the end of this time, the dimmer shuts down and reports the error. Depending on the cause, the Status Monitor will show either "Over-sized Load", or "Overload".

The load must be reduced to the correct size and the level must be reset to zero before the dimmer will resume normal operation.

Lamp Response controls

In almost all cases it is desirable to have lamps of different wattages and types respond to level changes at the same rate. Yet the intrinsic physical properties of different lamp types cause each one to respond differently. The IPS system contains two features which help blend across these differences, Controlled Response Time, and Lamp Preheat. While these are technically Head-End functions, they significantly affect the perceived performance of the dimmer and so warrant discussion here.

Controlled Response Time sets the maximum rate at which changes in level can occur. This has the effect of "slowing down" small lamps so they behave more like larger ones. Studies in an actual production environment showed that a response time of 350 mS adequately blends all typical theatrical lamps without adding significant "lag" to the system. IPS units may be set to any of nine values from "as fast as possible" up to 550 mS. An example which would use a setting of "as fast as possible" is the traditional "marquee" chase in which small wattage lamps are switched on and off in rapid succession. A long response time will tend to blur the individual steps of this kind of effect.

As somewhat the inverse of controlled response, Lamp Preheat is used to "speed up" large wattage lamps so they behave more like smaller ones. This function applies a very small voltage to a lamp when it is set to a level of zero to warm its filament and hence shorten the time it takes to come on. This would be used to make a few 6K loads in a rig respond more like the 1K and 2K loads.

Please Note: It is a bad idea to preheat every lamp in a venue because a tremendous amount of current will be consumed even though no light is being produced. If you have a few small lamps in a rig composed mostly of 6Ks, set a long response time on the small lamps rather than preheating all the big ones.

Status Monitor Fundamentals

This chapter applies to Status Monitor model IPS-SM-101.

The IPS-SM-101 Status Monitor is a data display and analysis unit for reporting the operational status of an IPS dimmer system. It passively monitors both the console's DMX512 data and the IPS talkback data to build a complete record of system activity. This collected information is then processed into a number of status displays which allow the operator to check any operational aspect at a glance. In addition, the unit is sensitive to changes in reported status and alerts the operator when such changes occur.

Keypad



O Function Keys: Select status display modes and initiate special functions . Current definition shown at bottom of video screen.

2 Number Keys: Allow selection of specific dimmers for study in Dimmer Detail display.

3 Cursor Keys: Move dimmer pointer through Status Overview display, selecting dimmer for study in Dimmer Detail display.

4 Additional Cursor Keys: Left key = Home. Right key = End.

Status Display



• System Message area. Data link status and operator alerts.

- **2** Dimmer Status Overview area.
- 3 Status Detail area.
- Function key definitions.

III

Status Monitor User's Guide

Status Overview

When the unit powers up, it is in the Status Overview display in which the bottom half of the display contains a key to Status Overview symbols and the function keys may be used to select each display mode.

The normal 'Status OK' indicator is a solid block so that a group of good dimmers simply appears as a solid band. This causes any dimmer with a special condition to call attention to itself.

Dimmer Detail

Status Detail area contains complete status information for one dimmer. Dimmer is selected with cursor keys or number pad. Information is divided into three categories, Dimmer Configuration, Operating Status, and Alerts.

Dimmer Configuration shows the actual number of the dimmer displayed, the DMX address of the package which contains it, It's offset within the package, and its rating in Kilowatts.

The Toggle Detail function (**F5**) changes the display to additionally show The total number of dimmers in the package, the package firmware revision, the full output voltage, the fall/rise time mode, and the load/source mode (Review the Dimmer System User's Guide for an explanation of these modes).

The Operating Status display shows the dimmer's present heatsink temperature in degrees C, its present output level, its connected load in Kilowatts and the load type, and the present power line voltage.

The load size report is accurate to approximately +/- 20%. The load type is an indication of whether the dimmer is operating in reverse or forward phase control mode. Sometimes an incandescent load will be reported as inductive due to high inductance in the building wiring or service transformer.

The Alerts display shows any exceptional conditions which have been reported by the dimmer. These reports include such conditions as No Load, Focus Mode, Over Temperature, and Overload.

System Load

Status Detail area contains a connected load analysis display showing utilization of available mains power and load balance among phases. Information is divided into three categories, On Line, Connected Load, and On Line Capacity

The On Line area shows the total number of IPS dimmer packages connected to the system along with the total number of dimmers.

The Connected Load area shows totals of the actual connected load wattage on the system. Totals are shown for the entire system and also for each power line phase. The percentage of the connected load on each phase is shown in tabular and graphic form.

The On Line Capacity area shows the sum of the capacities of all dimmers in the system. This sum is also broken out by power line phase. This area also shows the percentage of the system capacity which is presently in use. These percentages are presented in both tabular and graphic form.

Note: For the values presented in this display to be accurate, all dimmers in the system must be connected to the power line in the same fashion, and have been brought up to a non-zero level for at least 30 seconds. Refer to the Installation Guide for recommended wiring practice.

Also Note: Wattage numbers in this display are rounded to the nearest 1000 watts. Sometimes the total of the three

Status Monitor Functions

phases appears to be off by 1000 watts due to this rounding.

Phase	Actual	Rounded
	Value	Value
Α	1200	1000
В	1200	1000
С	1200	1000
Total	3600	4000

Configuration Snapshot

Status Detail area contains a comparison display revealing discrepancies between the present system configuration and connected load, and the values previously stored. This display is divided into three areas, one for checking individual dimmers, one for system wide totals, and one for comparison analysis.

The dimmer area shows all the present information and all the stored information about any single dimmer in the system. Dimmers are selected for examination with the cursor keys and number pad as in the Dimmer Detail display. The **F2** Next Change and **F3** Next Dimmer functions may also be used to select dimmers.

The totals area shows the present number of IPS packages and dimmers connected to the system compared to stored counts.

The comparison area reports the total number of discrepancies found, and the nature of each.

Recording a Snapshot

The Status Monitor will record up to three "Snapshots" of the system configuration and connected load for later use. To record one of these Snapshots, press the following keys while in the Snapshot Config menu:

F4 Record Snapshot

to start the process, and then one of the four following to complete the process:

- F2 Record Snap 1
- F3 Record Snap 2
- F4 Record Snap 3
- F5 Cancel Record.

Selecting a Snapshot for Comparison

To select one of the previously recorded Snapshots for comparison to the present system configuration, press the following keys while in the Snapshot Config menu:

F5 Select Snapshot

to start the process, and then one of the four following to complete the process:

F2 Select Snap 1 F3 Select Snap 2 F4 Select Snap 3 F5 Select None.

Any time a Snapshot is selected for comparison, the Status Monitor will automatically alert the operator to changes in system configuration or connected load.

DMX512 Analyzer

Status Detail area contains a DMX512 traffic analysis display. This display is divided into three areas, Received DMX, Console Data statistics, and Dimmer Data statistics.

The Received DMX area displays the actual levels transmitted by the console for three or six dimmers and a traveling bar graph representing the talk back data for these same dimmers.

Compare the DMX levels to those shown on the console's screen to verify correct data transmission. Check the smoothness of the bar graphs' movement to verify successful talkback data transmission. Jerky or uneven movement of the bargraph indicates a likely DMX address conflict. The Console Statistics area presents three characteristics of the data transmission: Dimmers per Packet, Packets per Second, and Framing Error count.

Dimmers per Packet indicates the number of data bytes the console is sending in each repetition of the DMX512 data packet. Packets per Second indicates the number of times a second a complete DMX packet is transmitted. Framing Errors is a running total of the number of DMX data bytes received from the console which generated framing errors.

The Dimmer Statistics area presents three characteristics of the dimmer talkback data transmission: Framing Error count, Last DMX address at which an error occurred, and Protocol Error count.

Framing and Protocol errors typically occur when two IPS units are set to the same DMX address, or when the DMX data cable is improperly terminated. These running counts provide a good indication of the general health of the DMX512 network. The DMX address of the last error is useful in tracking down IPS units set to overlapping addresses.

The "Zero Errors" function (**F5**) resets all running error counts to zero.

Option Select

Status Detail area shows current settings of all operator preference parameters and screen titles.

Titles

F2 EDIT TITLES starts the title editor. Function keys change to allow selection of title to edit. Press one of the following to start editing a title:

> F2 Edit Main F3 Edit Snap 1 F4 Edit Snap 2 F5 Edit Snap 3

The selected field will be highlighted in reverse video. Use \leftarrow and \rightarrow to select a character in the title to modify. Use \uparrow and \checkmark to change the value of the selected character. F2 RESET TO BLANKS clears the title. F3 CENTER TEXT moves the text to the center of the title line. F4 CANCEL EDIT quits the title editor with no changes made. F5 RECORD EDIT quits the editor and saves the new title.

Options

F4 NEXT OPTION and **F5** CHANGE VALUE are used to set the values of the operator preference parameters.

DMX Starting Address sets the name of first dimmer displayed. If your system has only one DMX link, set this value to '0001'. If you have more than one DMX link, set this value to one higher than the last dimmer on the previous link. Use the number pad to enter the value (enter all four digits), or use F5 CHANGE VALUE to select one of the standard values.

Dimmers to Display selects whether 256 or 512 dimmers are shown in the Dimmer Overview display. Choose the setting which best suits your system.

Auto Detail on Alert when set to ON causes the display to automatically change to Dimmer Detail any time an alert condition is received from a dimmer.

Snapshot Load Size Δ selects the minimum amount a load value must change before it generates an alert. The preferred setting is 200W. Some large lamps, however, may actually shift more than 200 Watts as they warm up and generate false alerts. If this occurs, change the setting to 400W

Screen Saver when set to ON causes the screen to blank after 5 minutes of no keyboard activity. This helps prevent image burn-in on the video screen. Any keystroke will restore the screen.

Using a Status Monitor to Troubleshoot Your System

To understand the uses of the Status Monitor, let's look at a large hypothetical touring system and see how the SM-101 can make installation and troubleshooting much easier. The features of our rig are a mix of those found in several real-world IPS Installations. They include:

- One console with 512 channels/dimmers, DMX output, profiles, 24 Submasters, and patching
- One SM-101 Status Monitor
- One SA-108 Distribution Amplifier Each SA-108 output drives one part of the system.
- 50 IPS DS-1206 strips (300 1.2kW dimmers) for on-stage electrics and towers
- 24 DMX color scrollers
- 48 2.4kW conventional DMX dimmers in a rack for front of house circuits (This rack belongs to the house)
- 24 motorized pattern wheels powered from IPS dimmer outputs
- 2 fog machines powered from rack dimmer outputs
- 4 DMX moving lights
- Low-voltage special effects lights
- Lots of DMX cable

Each piece of equipment has been checked out "stand-alone" and works.

The console DMX output connects to the input of the SM-101 Status Monitor. The output of the SM-101 connects to the SA-108 Distribution Amp. The SA-108 drives eight separate DMX cable runs which carry DMX512 data to all parts of the theatre. In wringing-out the system, we will "de-bug" each element in turn.

The Console

Start by turning on the console and connecting it to the SM-101. Don't connect

the SM-101 to the SA-108 just yet. Press F4, DMX ANALYZER on the Status Monitor. The CONSOLE DATA area will give you the console's vital statistics. It will tell you that valid DMX is being received, the refresh rate, and whether framing errors are occurring. If these fields are blank, or show numbers that jump all over the place, check that the console is set up to send DMX, and that it has a valid patch. If you have data errors, check the data cable.

The RECEIVED DMX area displays the actual DMX levels transmitted by the console. Verify that the console patch is correct by selecting dimmers or channels and watching the levels. Remember, the Status Monitor doesn't operate on or change the data stream in any way. It is simply a viewport into your DMX data. If it says that dimmer 263 is at 27% when you think it should be at FULL, trust the SM-101 and check the console setup.

Problems in console setup (patching, Submasters, profiles, etc.) is one of the major sources of trouble in a DMX installation!

We will return to this screen later when it's time to set up the scrollers, fog machines, and moving lights.

The Distribution Amp

Turn on the SA-108 with nothing plugged in. Make sure that all the red POWER LEDS are on. Make sure the green and yellow data LEDS are off, showing an idle (no data) link. Connect the DMX cable from the SM-101 to the FROM CONSOLE input. The green DMX LEDS should be on. A fast console sending all levels at zero might show a steady on, while a slower console sending all levels at FULL might pulse. Get a feel for the "typical" look of the DMX LED.

IPS Dimmers

These are the easiest to set up, so we'll do them first. Power up the bar at DMX

Using a Status Monitor to Troubleshoot Your System

address 001. Set the termination switch to the TERMINATE position.

Connect the DMX cable from the first output of the SA-108 to the dimmer's DMX input. Plug in a test load. Tap the local focus button on the dimmer to verify that the dimmer and load are OK.

When the DMX was connected to the IPS dimmer, the yellow TLK LED on the SA-108 output started to pulse, showing the presence of talkback data. The yellow LED on the TO CONSOLE link is also pulsing, showing talkback data on the link. The talkback data is synchronized to the DMX, so faster consoles make the TLK LED flash more rapidly.

On the SM-101 main screen a solid white block representing the first six dimmers should have appeared. Press F1, DIMMER DETAIL, and look at the vital signs. Raise and lower the dimmer level at the console and watch the level display change. Disconnect the load, and watch the NO LOAD warnings appear. Press the focus button and the indicator will change.

Move the termination switch on 001 to the unterminated position and power up and connect the dimmer at address 007. Terminate it, and verify that it is reporting back correctly.

At this point, flushed with success, unterminate 007, connect and power-up the remaining eight bars on this link, which have been preset to the correct addresses. Make sure the last bar on the link is terminated. The screen shows solid white for the first 60 dimmers. Perfect!

This process continues uneventfully through the second and third SA-108 links. The fourth link is powered up and . . . disaster! ALL the talkback data has gone berserk. Whole sections of the screen are coming and going, and every kind of weird error is being reported . . . what happened? Most likely, two bars are set at the same address, causing talkback collisions. Press F4, DMX ANALYZER. The DIMMER DATA display shows a continuously increasing error count. Press F5, ZERO ERRORS. The errors reset to zero and immediately increase. The system may be reporting the address where the overlap has occurred. If so, selectively power down bars until normal operation is restored. Or, since bars set at duplicate addresses will both respond to levels, step through the dimmers at the console until two dimmers come up simultaneously. Correct the address on the offending dimmer system and continue.

If duplicate addressing is not the problem, then improper termination is the next most likely suspect. If the last bar on the link is not terminated, talkback data may not be reliably transmitted. The DMX cable acts as an antenna for noise that can garble all talkback transmissions, not just those on that particular link.

The opposite case is too many terminations. The signal is swamped out by the excessive loading. In either case, check each unit and make sure that the terminations are correct.

The next possibility is a bad cable. If talkback is fine on a link, up to a point, and gone after that, check the cable.

Problems with incorrect addressing and termination are probably the single largest cause of problems in DMX installations!

In this case, the bar intended for address 102 was really set to address 105, and overlapped with the unit at address 107. The SM-101 pinpointed the collision address. It's worth noting that bringing units on-line one at a time when a rig is first set up can catch these sorts of problems very quickly. It is often faster to do this than to turn everything on and then try to chase down why <u>nothing</u> seems to work.

Using a Status Monitor to Troubleshoot Your System

Let's assume that the rest of the IPS dimmers come on-line without incident.

Conventional Dimmers

All we can do is set the starting address of the rack. It can't talk back, so we won't know about overloads, burn-outs, and the like. The SM-101 will tell us that the console is patched correctly, at least.

Color Scrollers

The color scrollers have been mounted and connected into the DMX links. A few scrollers have been set to the wrong address, which takes a while to find since they can't talkback. Some scrollers have been having some problems getting to the correct color. The SM-101 DMX ANALYZER screen will display the hex value the console is transmitting, along with the percentage level. Here, the console used an odd translation that caused certain hex values to be missed. The cues were rewritten to take this into account.

One scroller killed the talkback data from all dimmers downstream when plugged in. It was an older model that didn't pass DMX pins 4 & 5 back through. If you have many scrollers like this, drive them from a separate SA-108 output with no IPS units sharing the link. This can also happen with dimmer banks, or any DMX device that plays fast and loose with the DMX specification.

Moving Lights

Moving lights have the same issues as scrollers, only worse. Many of them don't pass DMX pins 4 & 5 back. Some of them use completely non-standard electrical interfaces to the DMX link and re-transmit the data from fixture to fixture. It is strongly suggested, unless you know otherwise, that moving lights be placed on their own separate link on the SA-108. The SM-101 again can be helpful in making sure that the console is sending the correct hex values for the various moving light attributes.

Motorized Pattern Wheels

A nice thing about IPS dimmers is their ability to control inductive loads, like small motors. The wheels plug into the dimmers and the speed is set by the console in the cue. Two wheels were plugged into the wrong dimmers. Since the load type for these dimmers was reported as "inductive," it was easy to spot the error and get them replugged.

Low-Voltage Special Effects Lights

A number of set pieces have several hundred 12 volt lamps driven from stepdown transformers. The first time these were turned on, two of the six dimmers controlling them reported "overload shutdowns." The problem was traced to a short-circuit in the wiring in the set. The combination of an overload-protected dimmer and status reporting made this potentially dangerous problem easy to find and fix.

Fog Machines

The fog machine motors were powered from the house dimmer bank. Unfortunately, these dimmers cannot control a motor load. The operation was erratic, and after a short time the motors burned out and the dimmers were damaged. Since these dimmers don't talk back, the fault wasn't noticed until the dimmer circuit breaker tripped. The fog machines were repaired and moved to IPS dimmers and now work fine.

Maintenance

During the load-in, the SM-101 SYSTEM LOAD function was used to make sure that the connected load was evenly balanced across the power line phases, and did not exceed the service rating. The SM-101 detects how many IPS dimmers are connected and their power capacity, and shows this information in the ONLINE CAPACITY display. As the load is increased, it's easy to see not only the phase balance, but also the percentage of total capacity in use. In the early stages of set-up, SYSTEM LOAD was used to verify that the feeders were correctly connected to the distribution system. Several IPS bars had power input cables that had been miswired, placing loads on the wrong phases. This error was easily found and corrected.

During dress rehearsals, a number of specials were added, and some dimmers were repatched to overcome DMX addressing problems in the console. Again, SYSTEM LOAD made it easy to redistribute the loads and keep the phases balanced.

Once the show was in, the SM-101 SNAPSHOT function was used to reduce lamp check time to a minimum. Here's how it was done. First, the overhead electrics were brought to a level of 30% for about thirty seconds. This gave the lamps time to warm-up and provided an accurate load report. SNAPSHOT 1 was then stored and titled "Stage Electrics" using the snapshot title function. Snapshots store everything about the state of the system at the instant they are recorded. Dimmer addresses, dimmer type, dimmer capacity, load type, load size, dimmer operating mode. . . it's all recorded. Then two other snapshots, "Tower Left" and "Tower Right" were recorded in the same manner. Since the front of house circuits are on conventional dimmers, they cannot be

recorded in a snapshot and will have to be checked manually.

To perform the lamp check (system check, really), the three check cues and corresponding snapshots are loaded in turn. The SM-101 will flag any differences between the live rig and the snapshot. The complete rig, except for FOH, is checked in about three minutes. Why did we use three cues and snapshots? Because the power service in our venue isn't up to having everything in the rig turned on at once. Most aren't, in fact. Remember that lamp in-rush currents are fifteen to twenty times greater than the rated current.

During the show, a master snapshot can be used to monitor the show in real-time. Thresholds for alarms, either 200 W or 400 W of load change can be used. This can catch a burn-out the instant it happens, but you still have to send somebody up to change the lamp. Watch out for small loads, such as practicals and small inductive loads. These may report as NO LOAD all the time (because they are so small), or they may only report as a load when set to FULL. This can cause false LOAD CHANGE alarms in the snapshots as a dimmer is faded in or out.

As you can see, the SM-101 is a powerful diagnostic tool designed to save you time and money, and keep your system in top operating condition. You will undoubtedly find many new and useful ways to utilize it in your work.

Auxiliary Control Unit Fundamentals

This chapter applies to Auxiliary Control Unit IPS-AC-100.

The IPS-AC-100 Auxiliary Control Unit adds secondary manual control into a DMX512 based lighting system. It is installed between the main lighting control console and the dimmers and merges levels from a variety of manual control stations into the primary DMX data stream. This greatly simplifies the implementation of house and work light controls in a variety of venues.



The IPS-AC-100 supports a wide range of control options. It merges levels from 16 pots, 4 switch closures, and an incoming DMX512 data stream to create an output DMX512 data stream. In this way House Light, Work Light, and Stage dimmers are all serviced from one DMX data cable, and all of the various control points have equal access to the entire lighting system. In addition, the IPS-AC-100 supports the storing and playing back of presets in IPS dimmers.

The relationships between the system inputs and the dimmers they control are all programmable by the system user. Each DMX address in the output stream may be programmed to follow any pot or switch input, the panic input, and the DMX512 input. The output level will be the highest of the three. In addition, up to seven presets may be stored in IPS dimmers for playback from AC-100 inputs. Again, output levels are the higher of the DMX512 and the preset levels.



For further versatility, the pot inputs may be partitioned in one of three ways: as sixteen separate inputs, as eight inputs with two control points, or as four inputs with four control points.



Auxiliary Control Unit User's Guide

Auxiliary Control Unit Features

From the end-user's standpoint, an AC-100 system may include any combination of the following control features. The details of each are discussed in turn.

Slider Stations

Slider stations are used to manually fade lighting levels up and down and to individually balance lighting levels in a particular room. A slider station contains from 1 to 16 linear potentiometers (pots) for setting levels, and optionally a "Master" slider and/or a "Take-Control" push button.

Each slider may have any number of DMX output addresses assigned to it. The output level of a DMX address so assigned will follow the setting of the slider.

Take Control

The AC-100 may be configured to have one station of up to 16 sliders, two stations of up to 8 sliders each, or four stations of up to 4 sliders each. When configured for multiple stations, the AC-100 activates its "Take-Control" push button inputs. One "Take-Control" button is associated with each slider station. Control of the lights is granted to the station whose "Take-Control" button was most recently pressed. When control passes from one station to another, the AC-100 fades the lighting levels from the old to the new levels. An LED indicates the active station.

Switch Stations

General Purpose Switches

General Purpose Switches are latching push button controls to which any DMX address may be assigned. When so assigned, the level of the DMX address will go to full anytime the switch is activated. These controls might be used for general room illumination or work lighting. A DMX address cannot simultaneously be assigned to a slider and a General Purpose Switch.

Panic Switch

The Panic Switch is a latching push button control which takes assigned DMX addresses to full regardless of other control assignments and settings. This control might be used to bring house and aisle lights to full brightness in the case of an emergency.

Preset Select Stations

If the AC-100 is connected to IPS dimmers, it can be used to record and play back up to seven complete presets. An eighth preset called "Off" is also available which has all levels permanently set to zero. A Preset Select stations has from 2 to 8 buttons. Presets are selected simply by pressing one of these buttons. An illuminated LED indicates the currently selected preset. Lights fade from the old to the new preset levels.

Presets are normally recorded from the AC-100 front panel as described in the programming section, however it is also possible to record a preset by pressing and holding one of the preset select buttons for 5 seconds.

DMX512 Input

A theatrical style lighting control console may be connected to the DMX512 input on the AC-100. Addresses on the incoming DMX line are automatically connected to the corresponding addresses on the outgoing DMX line. If desired, the console may be blocked from controlling certain DMX addresses. See the "Console Enable" option in the programming section.

Overview of Programming



- Four digit LED display.
- **2** Special Indicator LEDs.

LED 1 = No DMX data. LED 2 = Undefined.

- **3** Up/Down arrow buttons.
- OK" Select button.

Programming the AC-100 is accomplished thru the 4 digit LED display and three push buttons. In general, the up and down arrows are used to enter a value for a parameter, and "OK" is used to accept the value and move on to the next parameter. Sixty seconds after a programming operation the unit returns to the idle state.

DMX512 Control Options

Each DMX512 address in the output data stream has several control options which may be set through the AC-100 front panel. These options are "Control Assignment", "Panic Enable", and "Console Enable".

The "Control Assignment" option selects which of the 16 faders and 3 General Purpose switches will have control of the address. The "Panic Enable" option selects whether the Panic switch will also have control of the address. The "Console Enable" option selects whether a connected DMX512 control console will also have control of the address.

Programming

This section describes how to program the control options for each DMX address in the output data stream. Select each output address in turn, then step through the three option menus to review or set the control options for that address.

Idle

Display r '=' ma	eads: [= = = =] rches thru digits.	
Operation:		
OK:	Change to "DMX Select"	

Press "OK" to change to the first menu.

"DMX Select" Menu

Display re	ads:		[d x	x x]	
d = Me	enu Indi	cato	r.		
XXX =	DMX ad	Idres	s in d	decim	al
Operatior	າ:				
[™] , ₩ :	Select	DMX	(Add	ress	
OK:	Accept	t Sele	ectior	n and	Change
	to "As	sign	Con	trol"	-

With the Up and Down arrow keys, select the DMX512 output address to be programmed. Press "OK" to accept the selection and change to the next menu.

"Assign Control" Option Menu



With the Up and Down arrow keys, select the Fader (P1 - 16) or Switch (S1 - 3) input which will control the selected DMX address. "-no" = not assigned. Press "OK" to make the control assignment and change to the next menu.

"Panic Enable" Option Menu

Display re	eads:		[P x 2	x x]	
P = Me	enu Indi	cato	r.		
XXX =	Enable	Choi	се		
	("У	ES", '	"no")		
Operation	ר:				
· ↑ , ↓ :	Select	Enak	ole Ch	oice.	
OK:	Accept	t Sele	ection	and	Change
	to "Ċc	nsol	le Ena	ble".	0

With the Up and Down arrow keys, select whether or not the Panic Switch will control the selected DMX address. Press "OK" to accept the selection and change to the next menu.

"Console Enable" Option Menu



With the Up and Down arrow keys, select whether or not the corresponding address on the DMX input data stream will control the selected DMX output address. Press "OK" to accept the selection and return to the "DMX Select" menu.

Recording Presets

This section describes the process of saving levels into each of the seven presets. Before starting, set the desired lighting levels on the DMX control console or on the fader stations.

NOTE: Presets only function with IPS dimmers. If you have a mix of IPS and non-IPS dimmers, only the IPS dimmers will respond to preset commands.

Idle

```
Display reads: [= = = ]

'=' marches thru digits.

Operation:

OK: Change to "DMX Select"
```

Press "OK" to change to the next menu.

"DMX Select" Menu

```
Display reads: [d x x x]
d = Menu Indicator.
xxx = DMX address in decimal.
Operation:
<u>Press and Hold</u> OK: Change to
"Learn Preset".
```

Press and hold "OK" to change to the "Learn Preset" menu.

"Learn Preset" Menu



With the Up and Down arrow keys, select the Preset number to record. Press "OK" to accept the selection and change to the next menu. If Preset number is "-", the function is canceled with no changes made.

"Fade Time" Menu



With the Up and Down arrow keys, select the fade time for the previously selected preset. Fade times may be set to 00, 01, 02, 05, 10, 15, 30, 60, 120, or 240 seconds. Press "OK" to store the fade time

and all current levels into the preset and return to the "DMX Select" menu. If fade time is "- - -", the function is canceled with no changes made.

Recording from a Preset Select Station

Presets may also be recorded from a Preset Select button station. As before, the lighting levels should be set before starting. Press and hold the Preset Select button for the preset that is to be recorded. After about 5 seconds, the LED for that preset will illuminate indicating that new levels have been recorded. Presets recorded from a Preset Select station always have a fade time of 2 seconds. It is not possible to record levels for the "Off" preset.

Changing Analog Input Configuration

This section describes how to change the configuration of the Analog pot and Take-Control inputs.

Idle

```
Display reads: [= = =]
'=' marches thru digits.
Operation:
OK: Change to "DMX Select"
```

Press "OK" to change to the next menu.

"DMX Select" Menu



Press and hold "OK" to change to the "Learn Preset" menu.

"Learn Preset" Menu

D'au la sur da	
Display reads:	[L r P x]
LrP = Menu Ir	ndicator.
x = Preset num	lber (1 - 7, "-")
Operation	
Operation.	
Press and Hold	OK: Change to
	"Set-Up".

Press and hold "OK" to change to the "Set-Up" menu.

"Set-Up" Menu

Display re	eads:	[S U x x]
		[AnA]
S U =	Menu Ir	ndicator.
xx = S	et-Up o	ption ("-1" - "-3").
A n A	= Analo	og Trim function.
Operation	ר:	
· ↑ , ↓ :	Select	Set-Up option or
	Analo	og Trim function.
OK:	Accep	t selection and change
	to "D	MX Select", or execute
	Analo	og Trim function.

With the Up and Down arrow keys, select the Set-Up option to use. Press "OK" to accept the selection and return to the "DMX Select" menu. See the following section for a list of set-up options. If menu reads "AnA" when "OK" is pressed, the Analog Trim function is executed.

Set-Up Options

There are three valid configuration set-ups for the pots and Take-Control inputs. They are:

Mode 1: 16 Faders, No Take-Control.

In this configuration any DMX address may be assigned to any one of the 16 pot inputs. Take-Control inputs are not active.

Mode 2: 8 Faders, 2 Take-Controls.

In this configuration any DMX address may be assigned to any one of the first 8 faders. Pot inputs 9 thru 16 provide a second set of levels for faders 1 thru 8. Take-Control button 1 selects inputs 1 thru 8. Take-Control 2 selects inputs 9

thru 16. Take-Control inputs 3 and 4 are not active.

Mode 3: 4 Faders, 4 Take-Controls.

In this configuration any DMX address may be assigned to any one of the first 4 faders. Pot inputs 5 thru 8, 9 thru 12, and 13 thru 16 provide three additional sets of levels for faders 1 thru 4. Take-Control button 1 selects inputs 1 thru 4. Take-Control button 2 selects inputs 5 thru 8. Take-Control button 3 selects inputs 9 thru 12. Take-Control button 4 selects inputs 13 thru 16.

Analog Trim

This function is initiated from the "Set-Up" menu. It is used to calibrate the AC-100 to the actual voltages supplied from the system faders. The Analog Trim function should be executed at the time a system is first installed. It should only need to be repeated if there is a change in system configuration.

"Analog Trim for Zero" Function

Display reads:[A n 0 0]A n 0 0 = Menu Indicator.Operation:♠,♥:No Action.OK:Set Low end calibration for
analog inputs and change
to "Analog Trim for Full".

Set all individual channel pots connected to the AC-100 to their minimum position. Set all master pots to their maximum position. Press "OK" to store the Zero calibration values and change to the "Analog Trim for Full" function. For the system to trim properly, the Zero levels must be less than 0.78 volts DC.

"Analog Trim for Full" Function

Display re	eads: [AnFL]
AnF	L = Menu Indicator.
Operatior	1:
· ↑ , ↓ :	No Action.
OK:	Set High end calibration for
	analog inputs and change

to "DMX Select".

Set all individual channel pots and master pots connected to the AC-100 to their maximum position. Press "OK" to store the Full calibration values and return to the "DMX Select" menu. For the system to trim properly the Full levels must be between 2.8 volts DC and 5.0 volts DC.

Checklist

Many apparent faults in complex systems such as a lighting control installation are due to operator error or to conditions which have occurred outside of the equipment itself. In cases where operating problems have been encountered, run through the following checklist before searching for defective equipment.

- Check the power at the outlet. Is it present and of correct voltage?
- Are the console, status monitor, and distribution amplifiers plugged in and turned on?
- Is the console configured and patched correctly? Is the grand master up?
- Are all the DMX512 cables in good condition and installed correctly?
- Are the DMX512 termination switches set to the left hand position in all units except the last one on each cable?
- Are non-IPS peripherals on the network properly terminated according to their position in the network?
- Do all non-IPS peripherals support the IPS talkback protocol on the second data link? Do they pass the wiring for the second link through?
- Are there more than 32 DMX512 receivers on the network? (Note: An accessory such as a color scroller counts as one receiver.)
- Is the DMX512 common line (Pin 1) connected to earth ground at more than one point? IPS does not ground this wire, but other equipment might!
- Has an IPS-AC-100 been programmed to lock out console control of certain dimmers?
- If analog or AMX192 controls are in use, has the Analog Trim function been executed to calibrate the inputs? (This applies to both the Head-End Processor and the Auxiliary Control Unit.)



Troubleshooting

The following list of possible symptoms may help you isolate certain system problems:

The dimmers don't seem to respond correctly to the console.	Is the console patched? Are all the data cables connected? Are the termination switches set correctly? Is there power to the dimmers and to the distribution amplifier? Is a Head-End Processor in the Playback Preset or Local Dimmer Control state? Is an IPS-AC-100 setting the dimmer level or locking out the consle? Have the dimmers been correctly configured for Normal or "Non-Dim" operation? Has a dimmer shut down due to overload? Has a dimmer shut down due to over temperature?
The Status Monitor data is garbled.	Are the termination switches set correctly? Have two IPS dimmer systems been set to the same DMX512 network address? Has a non-IPS distribution amplifier been used? (IPS distribution amplifiers incorporate special circuitry to combine the multiple talkback data streams.) Is a non-IPS peripheral using a different talk-back protocol on the second DMX512 channel? Is DMX512 data being correctly transmitted from the control console?
The dimmer forgot a configuration change.	Configuration changes are saved when the Head-End menus are exited. If power is removed from the dimmer system before a menu is exited, any changes which have been made will be lost.
The no-load report is wrong.	The IPS dimmer detects load size by measuring the current drawn by the load circuit. For very small loads set to low output levels this current may be of a very small value. Sometimes an IPS dimmer will see this small current as being below its No-Load detection threshold and make an erroneous report. It will, however, continue to control the load correctly.
The load size report is wrong.	Most incandescent lamps are manufactured to a +/-20% tollerence. A lamp marked as 1000 watts may actually range from 800 to 1200 watts. The value reported by the Status Monitor is the actual value of the lamp rounded to the nearest 100 watts. For low-voltage lamps with transformer ballasts, the reported load may be slightly low due to the phase shift introduced by the transformer.
Sometimes talkback response is slow.	Talkback is timed to the console update rate. If a console slows its update rate sometimes (like during a disk transfer), talkback response will slow down also.
Analog or AMX192 controls don't work correctly.	Is the analog Common wire grounded at more than one place? Is the analog Common wire missing, damaged or shorted to another conductor? Are any of the analog conductors shorted to the conduit or to a connector shell? Is there excessive common- mode voltage between the control point and the dimmers? (Analog inputs do not have optical isolation!) Has the Analog Trim function been executed? Any time analog controls are connected to an IPS product, the Analog Trim function should be executed to calibrate the inputs to the actual control signals. See sections on the Head-End Processor and the Auxiliary Control Unit for details on the Analog Trim function.

A. Cables, Connectors, and Pinouts

Power Cables

IPS DS Series Power Cable

NEMA L21-20P Connector	10/5 SO Cable	IPS DS series Terminal Block
"X"	Black	"A"
"Y"	Red	"B"
"Z"	Blue or Orange	"C"
"W"	White	"N"
"G"	Green	Lug

IPS DB 12/24 Series Power Cable

NEMA L21-20P Connector	10/5 SO Cable	NEMA L21-20R Connector
"X"	Black	"X"
"Y"	Red	"Y"
"Z"	Blue or Orange	"Z"
"W"	White	"W"
"G"	Green	"G"

IPS DB 60 Series Power Cable

Terminated by User	6/5 SO Cable	VEAM CIR065GRH Connector
	Black	"A"
	Red	"B"
	Blue or Orange	"C"
	White	"N"
	Green	"G"

Data Cables

DMX512 Cable

5 Pin XLR Male From Console	2 Pair + Shield RS-485 Cable	5 Pin XLR Female To Dimmer System
1	Common (Shield)	1
2	Dimmer Drive -	2
3	Dimmer Drive +	3
4	Talkback -	4
5	Talkback +	5



Appendices

A. Cables, Connectors, and Pinouts

AMX192 Cable

4 Pin XLR Female From Console	2 Pair Unshielded Cable	4 Pin XLR Male To Dimmer System
1	Analog Common	1
2	Clock +	2
3	Analog Level	3
4	Clock -	4

Analog Cable

Console Connector	9 Wire Multi-Conductor Cable	9 Pin 'D' Male To Dimmer System
	Control 1	1
	Control 2	2
	Control 3	3
	Control 4	4
	Control 5	5
	Control 6	6
	Signal Common	7,8,9

Connector Pinouts

DMX512

Connector: XLR-5 DMX Source: Female DMX Receiver: Male

Pin	Signal
1	Common (Shield)
2	Dimmer Drive -
3	Dimmer Drive +
4	Talkback -
5	Talkback +

AMX192

Connector: XLR-4 AMX Source: Male AMX Receiver: Female

Pin	Signal
1	Analog Common
2	Clock +
3	Analog Level
4	Clock -

A. Cables, Connectors, and Pinouts

IPS Analog Input

Connector: DB-9 Analog Source: Male Analog Receiver: Female

Pin	Signal
1	Control 1
2	Control 2
3	Control 3
4	Control 4
5	Control 5
6	Control 6
7,8,9	Signal Common

NEMA L21-20 4 Pole, 5 Wire Twistlock

Pole	Signal
"X"	Phase A
"Y"	Phase B
"Z"	Phase C
"W"	Neutral
"G"	Ground

VEAM CIR065GRH-32A-5S

Pole	Signal
"A"	Phase A
"B"	Phase B
"C"	Phase C
"N"	Neutral
"G"	Ground

IPS-SA-104/108-WB DMX512 Terminal Strip

Terminal	Signal
GND	Common (Shield)
TALK-	Talkback -
TALK+	Talkback +
DMX-	Dimmer Drive -
DMX+	Dimmer Drive +

IPS-SW-101/102/103 Connector Plate Terminal Strips

Terminal	Signal
GND	Common (Shield)
TALK-	Talkback -
TALK+	Talkback +
DMX-	Dimmer Drive -
DMX+	Dimmer Drive +

Connector Strip

The DS Series enclosure is constructed from a number of extruded aluminum pieces and stamped face plates. The primary structural member of the enclosure is the extruded channel to which all other pieces are screwed. If all of the heat sinks and face plates are removed, this channel carries nothing but two wiring harnesses and a terminal block. To maintain the integrity of the dimmer system during servicing or repair, only remove the items being serviced from the dimmer enclosure.

Important: Many of the enclosure screws require lock-washers and/or flat washers. Note the location of these washers as you disassemble the unit so they may correctly reinstalled during reassembly.



WARNING

The IPS dimmer system contains High Voltage! Disconnect power from the unit before opening any panels.

Removing a Dimmer:

The electronics for each dimmer are constructed on a single printed wiring board which is attached to back of the dimmer heat sink. To remove the electronics, take the following steps:

1. Disconnect power from the dimmer system. High voltage is present inside the enclosure when the system is powered.

2. Remove the four cap screws which retain the dimmer heat sink. These screws require a 9/64" hex screwdriver.

3. Slowly rock the right side of the heat sink away from the system enclosure taking particular care not to damage the

Focus Button which is captured below the dimmer outlet face plate.

4. Reach behind the dimmer when you are able, and unplug the Mate-N-Lok or Anderson power connector and the MTA-156 control input connector.

5. Remove the dimmer from the enclosure.

Reverse the preceding steps to re-install the dimmer.

Removing the Head-End Processor:

The Head-End Processor is constructed in a manner similar to the dimmers. To remove this assembly, take the following steps:

1. Disconnect power from the dimmer system and unplug any DMX cables.

2. Remove the four Phillips head screws which retain the Head-End face plate.

3. Slowly pull the Head-End assembly away from the enclosure.

4. Reach behind the face plate when you are able, and unplug the Mate-N-Lok power connector and the MTA-156 control signal connector.

5. Remove the Head-End assembly from the enclosure.

Reverse the preceding steps to re-install the assembly.

B. Dimmer System Enclosures

Plugging Box

The IPS DB series enclosure is constructed from four pieces of sheet aluminum: 1. Bottom/Sides, 2. Front Panel, 3. Rear Panel, 4. Top/Handle. Access to the interior of the enclosure is gained by removing the Top/Handle panel.

Important: Many of the enclosure screws require lock-washers and/or flat washers. Note the location of these washers as you disassemble the unit so they may correctly reinstalled during reassembly.



WARNING

The IPS dimmer system contains High Voltage! Disconnect power from the unit before opening any panels.

Opening the Enclosure:

1. Disconnect power from the unit.

2. Remove the eight flat-head screws which hold the top to the side panels.

3. Remove the four pan-head screws and lock-washers which hold the handle to the left side panel. Notice that the screw closest to the front is longer than the other three.

4. Lift the Top/Handle away from the enclosure.

Removing a Dimmer:

1. Open the Enclosure.

2. Remove the dimmer hold-down bracket which is retaining the dimmer you wish to remove.

3. Remove the two pan head screws in the rear panel which are anchoring the dimmer's heat sink.

4. Unplug the dimmer's power connector.

5. Slide the dimmer away from the back panel and unplug the MTA-156 data connector.

6. Lift the dimmer out of the enclosure.

Reverse the preceding steps to re-install the dimmer.

Removing the Head-End Processor:

The Head-End Processor is attached to the front panel of the unit. To remove the Head-End Processor, you must first remove this panel.

1. Open the Enclosure.

2. Remove the three pan-head screws and two flat head screws which retain the front panel.

3. Carefully lift the front panel away from the enclosure.

4. Unplug the Mate-N-Lok power connector.

5. Unplug the MTA-156 data connector.

6. Unplug the two MTA-100 DMX512 connectors.

7. Unplug the fan connector on the fly lead.

8. Unplug any leads connected to any optional input boards.

9. Remove the five pan-head screws which hold the Head-End Processor to the front panel.

10. Lift the Head-End Processor away from the front panel.

Reverse the preceding steps to re-install the assembly.

USITT Standards

The following standards documents may be obtained from United States Institute for Theatre Technology, 6443 Ridings Road, Syracuse, NY 13206-1111. They describe electrical and communication protocol standards for communications between lighting control consoles and dimmer systems.

DMX512/1990

Digital Data Transmission Standard for Dimmers and Controllers.

AMX192

Analog Multiplex Data Transmission Standard for Dimmers and Controllers.

Other

National Electric Code

A publication of the National Fire Protection Association which is the basis for most electrical building codes in the United States.

D. Glossary

AMX: Short for AMX192.

AMX192: Multiplexed analog dimmer control protocol standard published by USITT.

Analog: In the context of dimmer control, this usually refers to a scheme in which a low voltage circuit is used to control the output level of a dimmer.

DMX: Short for DMX512.

DMX512: Serial data transmission protocol standard published by USITT.

Fader: A lighting control device which gradually raises or lowers the levels of a number of dimmers.

Fall Time: The duration of the portion of an RPC wave form in which the control device is switching off. Longer fall times produce quieter lamps and generate less electronic noise.

Forward Phase Control: A

technique for dimming lights in which the power line wave form is chopped by delaying some amount of time into each half cycle, and then switching on a control device. This technique is used in all SCR based dimmers.

FPC: Short for Forward Phase Control.

Half Cycle: The portion of a sinusoidal wave form in which the signal is of one polarity only. Every full cycle is composed of two Half

Cycles. Electronic dimmers control the amount of current conducted in each Half Cycle of the power line.

µS: Abbreviation for microsecond.

mS: Abbreviation for millisecond.

Microsecond: One millionth of a second.

Millisecond: One thousandth of a second.

Non-Dim: A power circuit which switches instantly from off to on.

Pot: Short for Potentiometer. An electrical device for manually setting a voltage level.

Reverse Phase Control: A technique for dimming lights in which the power line wave form is chopped by delaying some amount of time into each half cycle, and then switching off a control device. This technique is used in IPS dimmers.

Rise Time: The duration of the portion of an FPC wave form in which the control device is switching on. Longer rise times produce quieter lamps and generate less electronic noise. In SCR based dimmers, the rise time is controlled by an inductor (choke).

RPC: Short for Reverse Phase Control.

RS-485: The underlying communications protocol standard on which DMX512 is based.

Take-Control: A lighting control function in which turning-on one control station, turns-off all other control stations.

Talk-Back: A data transmission from a controlled device (like a dimmer) to its controller.

Termination: Circuit added at the end of a data cable to prevent signal reflections. For DMX512, this is a 120 ohm resistor.

USITT: United States Institute for Theatre Technology. A professional organization serving the live theatre and entertainment industries.



2413 S Shiloh Rd. Garland, Texas 75041 972-840-1640 Phone 972-278-9152 Fax www.etdimming.com

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