



# **S8400/4**

**8 x 4 Digital Video  
Analog Audio Switcher**



## **Statement of Warranty**

The ISIS Group, Inc. warrants its products for a period of seven (7) years from the date of shipment to be free from defects in materials and workmanship and meets applicable published specifications. Equipment which has been operated within its ratings and has not been subjected to mechanical or other abuse or modification by the purchaser, its agents, and/or employees, will, at the option of The ISIS Group, be replaced or repaired if it is returned, freight prepaid, to ISIS. Equipment that fails under conditions other than described herein will be repaired at the price of components and labor in affect at the time of repair.

This warranty is in lieu of all other warranties, expressed or implied, with respect to the condition or performance of any ISIS Group product, its merchantability or fitness for a particular purpose. ISIS is not liable for any consequential damages.

## **FCC Compliance**

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

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January 2006

Part Number 71-0032

# ***ISIS S8400 Multipurpose Switching System***

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## **EC declaration of conformity**

### **Declaration**

We certify that the apparatus to which this declaration relates conforms to the requirements of the EMC and Low Voltage Directives.

### **Covering the following:**

S8400 range of modules in the S8400 rack mounting frame and remote control panels.

Above rack mounting frame containing any mix of S8400 modules installed in accordance with instructions in our User's Guide and with any vacant spaces covered with front and rear blank panels.

### **Applicable standards:**

Emissions	EN 55103-1: 1996
Susceptibility	EN 55103-2: 1996
Safety	EN 60950



**Issued:** 11<sup>th</sup> October 2001.

# Installation and Operation Manual

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# Important Safeguards and Notices

Information on the following pages provides important safety guidelines for both Operator and Service personnel. Specific warnings and cautions will be found throughout the manual where they apply, but may not appear here. Please read and follow the important safety information, noting especially those instructions related to risk of fire, electric shock or injury to persons.

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## WARNING



*Any instructions in this manual that require opening the equipment cover or enclosure are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.*

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## Symbols and Their Meaning in This Manual



The lightning flash with arrowhead symbol, within an equilateral triangle, alerts the user to the presence of “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 alerts the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.



This symbol represents a protective grounding terminal. Such a terminal must be connected to earth ground prior to making any other connections to the equipment.



The fuse symbol indicates that the fuse referenced in text must be replaced with one having the ratings indicated.

# *Important Warnings and Cautions*

## **Warnings**

- Heed all warnings on the unit and in the operating instructions.
- Do not use this product in or near water.
- Disconnect ac power before installing any options.
- This product is grounded through the grounding conductor of the power cord. To avoid electrical shock, plug the power cord into a properly wired receptacle before connecting the product inputs or outputs.
- Route power cords and other cables so that they are not likely to be damaged.
- Disconnect power before cleaning. Do not use liquid or aerosol cleaners; use only a damp cloth.
- Dangerous voltages exist at several points in this product. To avoid personal injury, do not touch exposed connections and components while power is on.
- Do not wear hand jewelry or watches when troubleshooting high current circuits, such as the power supplies.
- During installation, do not use the door handles or front panels to lift the equipment as they may open abruptly and injure you.
- To avoid fire hazard, use only the specified correct type, voltage and current rating as referenced in the appropriate parts list for this product. Always refer fuse replacements to qualified service personnel.
- To avoid explosion, do not operate this product in an explosive atmosphere unless it has been specifically certified for such operation.
- Have qualified personnel perform safety checks after any completed service.

## Warnings (continued)

- If equipped with redundant power, this unit has two power cords. To reduce the risk of electrical shock, disconnect both power supply cords before servicing.
- This equipment may employ laser(s). If it does, they comply with the current construction requirements of the code of Federal regulations, title 21, chapter I, subchapter J, sections 1010.2 and 1010.3 and sections 1040.10 and 1040.11.
- Do not attempt to view light output of the laser transmitter, eye damage may result. Always use an optical power meter to verify laser output.
- To prevent injury:
  - Never install telephone wiring during a lightning storm.
  - Never install telephone jacks in wet locations unless the jack is specifically designed for wet locations.
  - Never touch uninsulated telephone wires or terminals unless the telephone line has been disconnected at the network interface.
  - Use caution when installing or modifying telephone lines.

## Cautions

- When installing this equipment, do not attach power cord to building surfaces.
- To prevent damage to equipment when replacing fuses, locate and correct the trouble that caused the fuse to blow before applying power.
- Verify that all power supply lights are off before removing power supply or servicing equipment.
- Use only specified replacement parts.
- Follow static precautions at all times when handling this equipment.

## Cautions (continued)

- Leave the back of the frame clear for air exhaust cooling and to allow room for cabling. Slots and openings in the cabinet are provided for ventilation. Do not block them.
- Front door is part of fire enclosure and should be kept closed during normal operation.
- This product should be powered on as described in the manual. To prevent equipment damage select the proper line voltage at the ac input connector as described in the Installation documentation.
- To prevent damage to this equipment read the instructions in this document for proper input voltage range selection.
- To reduce the risk of electric shock, ensure that the two power supply cords are each plugged into a separate branch circuit.
- Circuit boards in this product are densely populated with surface mount and ASIC components. Special tools and techniques are required to safely and effectively troubleshoot and repair modules that use SMT or ASIC components. For this reason, service and repair of ISIS products incorporating surface mount technology are supported only on a module exchange basis. Customers should not attempt to troubleshoot or repair modules that contain SMT components. ISIS assumes no liability for damage caused by unauthorized repairs. This applies to both in- and out-of-warranty products.

## North American Power Supply Cords

This equipment is supplied with molded grounding plug (NEMA 5-15P) at one end and molded grounding connector (IEC 320-C13) at the other end. Conductors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Operation of this equipment at voltages exceeding 130 VAC will require power supply cords which comply with NEMA configurations.

## **International Power Supply Cord**

This equipment is supplied with molded grounding connector (IEC 320-C13) at one end and stripped connectors (50/5 mm) at the other end.

Connectors are CEE color coded, light blue (neutral), brown (line) and green/yellow (ground).

Other IEC 320-C13 type power supply cords can be used if they comply with the safety regulations of the country in which they are installed.

### **Note:**

This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference, in which case the user will be required to correct the interference at his own expense.

## SECTION I

### S8400/4

#### General Description

The S8400/4 is a multifunction SMPTE 259M video and analog audio core product designed specifically for ENG, SNG and Flyaway units. The S8400/4 simplifies the design of new broadcast vehicles and provides the unique functionality of 6 individual routing, timing and distribution products in an easy-to-install, cost-effective and space-saving 2RU frame.

The system is housed in a 3.50" (2RU) x 19" frame, 13" deep. The frame contains a maximum of 9 modules, and integrates the functionality of an 8 x 4 SDI video and analog audio router, a digital NTSC/PAL sync generator, color black generator, color bar generator, tone generator and a source ID. Operator control is provided through a separate 2RU primary control panel. The system operates on +6.5VDC and  $\pm 15$ VDC directly from 100-240VAC auto-ranging external power packs.

Options include a remote aux bus control panel, SDI video D/A converter, analog audio DA, SDI video DA, along with redundant AC or DC power supplies.

#### SDI Video

The SDI video crosspoint module is a complete 8 x 4 video router, including crosspoints, reclockers, input and output amplifiers and vertical interval source ID keyer. The source ID signal, which is generated within the source ID generator module, is switch selectable as on or off, and has a maximum of 30 characters. This information, located just outside the active picture area on lines 13 through 20, allows the source ID to be viewed on an underscanned or pulse-cross monitor. This ID signal appears only on the PGM output bus. The other three busses, PVW and AUX-1 and AUX-2, are "clean feeds".

Input 1 is hardwired SDI color black, which is generated on the sync generator module. Input 8 is hardwired SDI color bars, which is generated within the color bar module. Inputs 2 - 7 are external primary SDI inputs and are terminated in 75 $\Omega$ . These 6 SDI external primary inputs are automatically cable equalized and reclocked to their incoming SMPTE 259M standard (270Mb/s). Each video output bus provides 4 SDI video outputs.

## **Analog Audio**

The analog audio crosspoint module is a complete 8 x 4 stereo audio router, including crosspoints, and input and output amplifiers. The module provides routing of 2 channels (1 stereo pair) per output bus, with audio-follow-video as the default mode. Audio breakaway of the 2 channels from the video is possible, however the left and right channels cannot be switched separately from each other. Input 1 is internally terminated as silent. Input 8 is hardwired AES tone, which is generated within the tone generator. The AES tone is converted to analog on the audio crosspoint module. Inputs 2 - 7 are balanced external primary analog inputs and are high impedance bridging. Each audio output bus provides one or more left and right channel outputs. Input and output connectors are three-pin detachable compression-type.

## **Control Module**

The primary control module provides communication interface between the primary control panel, remote aux bus control panel and the video and audio crosspoint modules.

## **Sync Generator**

The digital NTSC/PAL sync generator provides internally wired reference for the router, color bar generator and color black generator. The standards compliant sync generator derives its reference from the internal 27 MHz TCXO or from an external reference. The generator provides an adjustable timing range for the color black and color bar generators, with reference to the external input. Front mount LED lamps indicate the presence of the external genlock reference, and also whether the generator is operating in genlock mode.

## **Color Black Generator**

The color black generator derives its reference from the internal sync generator. The generator develops 6 color black signals. One SDI color black signal is internally wired to the #1 input of the SDI video router and another SDI color black signal is internally wired to the color bar generator reference input. Four analog color black outputs are available through BNC connectors on the rear connector channel.

## **Color Bar Generator**

The color bar generator derives its reference from the internal color black generator. The SMPTE 259M SDI color bar signal is jumper-selectable to either 75% or 100% SMPTE bars. One SDI color bar signal is internally wired to the #8 input of the router. Source ID is supplied to the color bar generator. The source ID is positioned in a window in the active picture's center one-third and does not interfere with the I and Q bars. An AES 48KHz silence reference is available through a BNC connector on the rear connector channel. This AES output provides reference to ancillary equipment.

## **Source ID Generator**

The source ID generator develops an identification screen with a maximum of 30 changeable characters, on three lines. The alpha-numeric character set is selectable through the use of a cursor switch and scroll buttons located on the color bar module. The source ID signal is provided in two formats. The first is internally wired to the color bar generator. One character of the source ID can be selected to blink to indicate that the received picture is active and not a freeze frame. The second format, a vertical interval source ID signal, is internally wired to the SDI video router keyer. This signal is switch selectable on/off and is keyed above the active picture area, which can then be viewed on an underscanned or pulse-cross monitor.

## **AES Tone Generator**

The AES tone generator develops reference tone and silence. AES silence is not utilized in the analog audio version of the switcher. AES tone is internally wired to the analog audio router, where it is decoded into analog signals and supplied to input #8 left and right channels. The tone is jumper-selectable for either 440Hz or 1kHz at +4dB. Channel ID is present within the audio tones. Once every 30 seconds the left channel mutes, provides a single short tone, mutes again and then returns to constant tone. Similarly, the right channel mutes after 30 seconds of constant tone, provides two short tones, mutes again and then returns to constant tone. The left and right audio tones also click in time with the blinking video character to provide an aural indication that the audio is active and is in lip-sync with the video.

## **Primary Control Panel**

The primary control panel is a separate 2RU rack-mountable panel. The panel interfaces to the module frame via a 15-conductor control cable, and operates on +6.5VDC, which it receives through the control cable. The panel integrates

the functionality of an 8 input, 4 output bus router control panel with independent video or audio breakaway and bus lock. Each router bus has individual pushbuttons for input selection 1 through 8, plus one button for video breakaway and one for audio breakaway. Holding down the 'video breakaway' and selecting a different source causes only the video level to switch. Likewise, holding down 'audio breakaway' and selecting a different source causes only the audio level to switch. There is a 'bus lock' function associated with each of the 4 buses to 'lock' or prevent crosspoint switching on that particular bus. When the 'bus lock' pushbutton is activated, an internal red light in the 'bus lock' switch illuminates.

Four 8-position dipswitches, one associated with each output bus, allow the panel to permanently 'lock' or prohibit an individual source from being selected on a specific bus.

Program bus tally is provided through a separate 9-pin 'D' connector (J6).

## **Options**

### **SDI D/A Converter**

The SDI converter module provides two independent SDI-to-analog video converters for monitoring and/or delivery of NTSC/PAL video to analog destinations. Each SDI input provides two NTSC/PAL BNC outputs. A maximum of two converter modules can be added to the S8400/4 modular frame. The SDI module requires an external video coax connection from one of the SDI output busses to the input to the converter. Any of the D/A converter inputs may be connected to any of the SDI output busses.

### **Analog Audio DA**

The Analog Audio DA is a modular, high performance audio amplifier intended for studio quality audio distribution. Inputs can be connected balanced or unbalanced. Outputs are always balanced. The amplifier is designed as two, one-input by four-output stereo amplifiers. Both preset and variable gain controls are available which will provide a gain range of -6 to +33dB. The module requires an external audio shielded pair connection from one of the audio output busses to the input to the amplifier.

### **SDI DA**

The SDI DA option provides an SDI video distribution amplifier for monitoring and/or delivery of SDI video to SDI destinations. The input SDI signal is buffered to four outputs. A maximum of one DA module can be added to the S8400/4 modular frame. The SDI module requires external video coax connections for the input and outputs of the module.

### **Redundant AC Power Supply**

The redundant power supply option provides a second auto-ranging AC power supply. The S8400-AC/4 is supplied with one power supply as standard. A maximum of one redundant AC power supply can be added to the S8400/4 modular frame.

### **Remote Control Panel**

The remote control panel is a separate 1RU rack-mountable panel, which interfaces to the module frame via a 15-conductor control cable. The panel provides parallel control of aux buses 1 and 2. Selection is provided for 8 inputs

to the 2 output buses, with independent video and audio breakaway and bus lock. Each router bus has individual pushbuttons for input selection 1 through 8, plus one button for video breakaway and one for audio breakaway. Holding down the 'video breakaway' and selecting a different source causes only the video level to switch. Likewise, holding down 'audio breakaway' and selecting a different source causes only the audio level to switch. There is also a 'bus lock' function associated with each of the 2 buses to 'lock' or prevent crosspoint switching on that particular bus. When 'bus lock' is activated, an internal red light in the 'bus lock' switch illuminates.

Two 8-position dipswitches, one for each output bus, allow the panel to permanently 'lock' or prohibit a source from being selected on a specific bus.

## SECTION II

### S8400/4

#### Specifications

##### Video:

###### Inputs:

Number	6 external, plus 2 internal
Type	75Ω, BNC per IEC 169-8
Signal level	800mV ±10%
Data Rate	<40Mbps to >360Mbps
Equalization	Automatic, >300 meters Belden 8281

###### Outputs:

Buses	4
Outputs per bus	4
Impedance	75Ω, BNC per IEC 169-8
Signal Level	800mV ±10%

###### Performance:

Serial Operating Standards	SMPTE 259M serial digital interface NTSC/PAL 4:2:2 component
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##### Audio:

###### Inputs:

Number	6 external, plus 2 internal
Type	Differential input
Impedance	>20K

###### Outputs:

Buses	4
Outputs per bus	PGM - 2 pair (left and right channel) PVW - 1 pair (left and right channel) AUX-1 - 1 pair (left and right channel) AUX-2 - 1 pair (left and right channel)
Impedance	<30Ω balanced
Gain	Unity

Temperature:

Performance	5-40° C
Operating	0-50° C
Power Dissipation	65W
Frame Size	3.5" (2RU) x 19" x 13"
Frame Weight	≈10 lbs
Control Panel Size	3.5" (2RU) x 19" x 5"
Control Panel Weight	≈4 lbs
Remote Control Panel Size	1.75" (1RU) x 19" x 1.75"
Remote Control Panel Weight	≈2 lbs
Power Supply Size	3.5" x 7" x 2"
Power Supply Weight	≈1lb

## SECTION III

### S8400/4

#### Installation and Setup

The S8400/4 is designed to be mounted in a standard 19" equipment rack. There are no special cooling requirements, though care should be taken to ensure that extremely hot equipment not be installed directly beneath the frame. It is also recommended that, if possible, one rack-unit of space be left above the frame.

Video input and output signals are distributed through industry standard 75Ω BNC connectors.

**NOTE: It is recommended that all unused primary video inputs and all unused video D/A inputs be terminated with precision 75Ω terminations.**

The audio connections are made with separate three-pin Weco-type connectors for each audio channel. The connectors have a removable mate that is wired to the audio cable with screw down compression terminals. The input and output audio connections are all the same style connectors.

Audio input and output cables must be wired to conform to the silk-screen on the rear of the frame. All connectors have the same orientation. Shield (or ground) is the middle of the three pins. Be sure to maintain the polarity as shown, so that input phases match the output.

## Module Settings

### Sync Generator

#### Setup

Set jumper **JP1** to either 7.5 IRE or 0 IRE for NTSC analog color black blanking setup.

#### Video Standard

Set jumper **JP2** to either NTSC (525) or PAL (625) frequency standard.

#### Genlock

Set the Genlock ON/OFF (**S1**) switch to the proper position. In the OFF (down) position, the LED turns on RED and the sync generator is forced to the free-run condition, regardless of whether a genlock signal is present. In the ON (up) position, the module locks to the incoming reference signal, if it is present, and the LED turns on GREEN. If no signal is present, the generator will revert to a free-run mode. If a genlock signal is present, but the switch is in the off position, the LED will light WHITE.

#### Genlock Phasing

The two front-edge pushbuttons are used to adjust the genlock phase, which is the phase of the output color black videos (both analog and serial digital) relative to the genlock reference input. When the module is in free-run mode, the pushbuttons are disabled. Each button press advances (or retards) the genlock phase by one 37 nsec clock. There is a total range of  $\pm 4.7 \mu\text{sec}$  ( $\pm 127$  clocks).

There is a variable capacitor adjacent to the pushbuttons to fine phase the genlock timing ( $\approx 50$  nsec window).

#### Analog Color Black level

**R74** may be used to set the analog output color black level.

## Color Bar Generator

### Bars

Set jumper **JP1** to 75% or 100% to adjust maximum amplitude of SMPTE color bars.

### 440/1KHz

Set jumper **JP6** to either 440Hz or 1kHz to adjust the AES tone frequency.

### Vertical Interval Insert Generator On/Off

Position the switch to either turn on (up) or turn off (down) the Program Bus vertical interval ID generator display. NOTE: This switch only controls the vertical interval ID signal. The source ID located in the color bar signal is present at all times.

## Character Generator/Source ID

Programming of the source ID character generator is accomplished by using the three-position mode switch and the up/down pushbuttons along the front edge of the color bar module. When the mode switch is in the center position, programming is disabled and the source ID display cursor is turned off. The up/down pushbuttons are also disabled.

When the mode switch is in the down position, the LED on the module flashes GREEN, a flashing cursor is displayed and the up/down pushbuttons determine where the cursor should be positioned on the screen. "Up" means to the right and down, and "Down" means to the left and up. If a pushbutton is pressed and held, the cursor will advance in the desired direction. When the cursor reaches the end of the screen, the next push of the button will cause it to "wrap-around" to the next position.

When the mode switch is in the up position, the LED flashes RED, the flashing cursor is displayed in its current position, and the up/down pushbuttons cause the character at that position to cycle through the available characters. "Up" means advancing through the alphabet (A, B, C, D...), and "Down" means recessing (Z, Y, X, W...). If a pushbutton is pressed and held, the characters will advance in the desired direction. When the available characters reaches the end, the next push of the button will cause it to "wrap-around" to the next character. The character set that is available includes the 26 letters of the English alphabet, the 10 numerals, a blank space and an assortment of 22 special symbols (including /, \, \_, <, >, ", ', :, [, ], \$, =, +, #, ? and !

The normal sequence for programming a display is as follows: put the mode switch in the "down" (cursor position) mode. Use the up/down buttons to position the cursor over the first character that you wish to change. Put the mode switch in the "up" (character select) position. Use the up/down buttons to cycle through the characters until you reach the one you want. If you are finished, return the mode switch to the center position to turn off the cursor. Otherwise, put the mode switch in the lower position, move the cursor to another position and proceed with the character selection as above.

### **Programming the "jitterbug"**

By programming a special character onto the source ID screen, the user can initialize a single animated sequence which automatically steps through four characters at approximately one second per character. This animated bug can be used as a heartbeat to indicate to the receiving location that the generating signal is live and not a freeze frame output of a frame store. On first-time power-up, a bug is automatically placed in the lower right hand corner of the display screen as the last character in the last row.

To place a bug on the screen, place the mode switch in the down position and use the up/down pushbuttons to place the cursor over the character position where the bug is desired. Place the mode switch in the up position and use the up/down buttons to select the asterisk (\*) character. Put the mode switch in the center (off) position to start the bug sequence. To remove the bug, place the cursor over the (\*) position and select any other character or the blank space character. Return the mode switch to the center position.

NOTE: If a visual bug is present in the source ID, the audio tone generator will click in time with the changing characters in the bug sequence. If no bug is present, the audio tone will be continuous.

NOTE: In order to "flash erase" the entire display, put the mode switch up (character select mode) and hold both pushbuttons down for 3 seconds. The display will reset itself to all "blank spaces".

## **Control Panel Installation**

The S8400/4 control panel is designed to be mounted in a standard 19” equipment rack. There are no special cooling requirements, though care should be taken to ensure that extremely hot equipment not be installed directly beneath the unit.

The primary and remote control panels are connected to the modular frame via 15 conductor control cables. A 15 meter cable is supplied as standard with the primary control panel, and a 10 meter cable is supplied with the remote control panel. A different length of cable may be utilized, provided that it does not exceed 30 meters. The cable is terminated with standard male 15-pin ‘D-sub’ connectors at both ends, and all wires are pin-to-pin.

## **Control Panel Settings**

### **Crosspoint Inhibit**

Located at the rear of the main control panel are four dipswitches, one associated with each of the output busses. Each switch contains eight rockers, one for each of the inputs associated with that particular bus. The remote control panel contains two dipswitches.

Normal operation is with the rockers in the open or “off” position. Closing a rocker (or “on”) will prohibit the operation of that specific crosspoint on that particular bus only. Closing a rocker on the main control panel will not inhibit the corresponding pushbutton on the remote control panel, or vice versa.

### **Program Tally**

The PGM TALLY connector (**J6**), which is located at the rear of the main control panel, is provided for camera tally switching on the PGM bus. Refer to Section IV for the pin wiring of the ‘D’ connector. The eight tally relays inside the control panel provide normally open dry-contact switches, with pins 1-8 corresponding to the eight inputs, and pin 9 the common.

## **SECTION IV**

### **S8400**

#### **Diagrams**

Control Panel Pin Assignments

Program Tally Pin Assignments

# Main & Remote Control Panel

## 15-PIN "D" CONNECTOR

### Pin Assignments

1	TALLY OUT
2	DATA IN (+)
3	CLOCK (+)
4	SHIFT 11 IN (+)
5	DA
6	SIGNAL GND
7	+6.5 VDC
8	GND
9	SHIFT 7 OUT
10	DATA IN (-)
11	CLOCK (-)
12	SHIFT 11 IN (-)
13	CLEAR
14	+6.5 VDC
15	GND

## Program Tally (J6)

### 9-PIN "D" CONNECTOR

#### Pin Assignments

1	INPUT 1 TALLY
2	INPUT 2 TALLY
3	INPUT 3 TALLY
4	INPUT 4 TALLY
5	INPUT 5 TALLY
6	INPUT 6 TALLY
7	INPUT 7 TALLY
8	INPUT 8 TALLY
9	TALLY COMMON