

DA-10tm
Digital Cinema
Theatre Automation
User's Guide

Revision A

Table of Contents

Foreword.....	3
Introduction.....	4
What's in the Box	4
What it Does	4
How it Works.....	4
Installation.....	5
System Requirements	5
Mounting.....	5
Power Connection.....	5
Configuration	6
Strategy	6
Identifying Your House Functions	6
Wiring Your House Functions to Individual Relays	6
Cue Bank or "Q" Relays.....	6
Event Bank or "K" Relays.....	8
Utility Relays.....	9
Testing Your House Functions One Relay at a Time.....	9
Overview	9
Connecting to a PC.....	9
Serial Port Configuration.....	11
Cue Manager Software	11
Testing Individual Relays.....	11
Designing Your Presentation.....	12
Running a Show Using Serial Communications	12
Overview	12
Programming the DA-10.....	12
Testing Your Macro Cues	15
Connecting the DA-10 to the Server	16
Configuring the Server	17
Testing Your Presentation	17
Running a Show Using GPIO Communications	17
Overview	17
Programming the DA-10.....	18
Testing Your Macro Cues	21
Connecting the DA-10 to the Server	21
Configuring the Server	24
Testing Your Presentation	25

Wiring Front Panel Switches	26
Interfacing a Fire Alarm	27
Wiring the Auxiliary Pulse On Panic Stop Relay	29
Installing the DX Auxiliary Relay Board	30
Operation.....	31
Powering the System On	31
Running a Digital Show	31
Remote Control Box Installation and Operation	32
Overview.....	32
Understanding the Data Link.....	32
Configuring an Automation.....	33
Configuring a Remote Control Box	35
Operation	36
Troubleshooting	38
Digital Cinema Server and DA-10 are Not Communicating	38
Programmed Macro Cues are Not Firing	38
Data Bus.....	39
Table of Figures:	
Figure 1: Example of Relay Terminal Block Connections	7
Figure 2: Wiring the K6 Relay	8
Figure 3: Programming Cable Properly Connected at Connector J8	10
Figure 4: Connecting the Programming Cable to the PC Serial Port.....	10
Figure 5: Cue Manager Test Relays Dialog Box	11
Figure 6: Cue Manager Add Macro Cue Dialog Box	13
Figure 7: Cue Manager Test Macro Cues Dialog Box.....	15
Figure 8: Server Communications Cable Properly Connected at J8.....	16
Figure 9: Serial Communications Port on a Dolby Cinema Server	16
Figure 10: Cue Manager Add Macro Cue Dialog Box	18
Figure 11: Cue Manager Test Macro Cues Dialog Box.....	21
Figure 12: Server GPIO Cable Properly Connected to DA-10	23
Figure 13: GPIO Cable Properly Connected to Server	23
Figure 14: DA-10 START/STOP Terminal Block.....	27
Figure 15: External Device Properly Wired to Panic Stop Relay	29
Figure 16: DX Auxiliary Relay Board	30
Figure 17: Data Link Daisy Chain Wiring	33
Figure 18: DA-10 Automation Data Link Connection Terminals	34
Figure 19: DA-10 Automation Address Switch Settings	34
Figure 20: DA-10 Automation Address Switch Settings	39

Forward

The advent of digital cinema presents new challenges and opportunities to theatre owners and operators. Digital cinema provides an unprecedented movie-going experience while offering new revenue opportunities and potential for reduced operating expenses.

The migration to digital cinema requires the installation of new equipment. For some screens, a digital projector and cinema server are added to an existing film projector and automation, establishing dual film/digital or hybrid capability. For other screens, film projectors are removed and replaced with digital projectors and cinema servers. For new screens, installation options now include digital only, hybrid, or film only configurations.

During digital presentations, the automated control of house functions can no longer be performed using traditional film-based cueing systems. Instead, cinema automations are controlled using digital communications including serial, General Purpose Input/Output (GPIO), and Ethernet protocols.

The DA-10 Digital Cinema Theatre Automation connects to popular digital cinema servers providing digital control of theatre house functions.

Introduction

What's in the Box

Item

DA-10 Automation

Bag of 6 Front Panel Switches

User's Guide

What it Does

The DA-10 Digital Theatre Automation:

1. Connects to Doremi, Dolby, GDC, and other popular digital cinema servers.
2. Controls theatre house functions using relay contact closures.
3. Fires any combination of relays in response to a command from a cinema server.
4. Provides six general purpose front panel switches for manual control of house functions.
5. Supports the control and monitoring of multiple digital systems through a remote box.
6. Interfaces to a fire alarm or other panic stop devices.
7. Has a built-in local alarm.
8. Has a dedicated relay to control external devices whenever there is a panic stop.
9. Accepts GPIO or serial input commands.
10. Outputs GPIO, serial commands or contact closures to start or stop cinema server as required.

How It Works

In straightforward terms, the DA-10 automation is a bank of relays under microprocessor control.

The DA-10 connects to a digital cinema server using a serial or a GPIO connection.

The DA-10 receives serial or GPIO commands from the digital server.

Whenever an auditorium transition is encountered in a presentation's timeline, the digital cinema server sends a command to the DA-10.

When the DA-10 receives a command, it executes a Macro Cue that is stored in its memory. A Macro Cue is a preprogrammed set of actions such as relay contact closures.

Macro Cues are programmed into the DA-10 using a PC and Cue Manager software.

Installation

System Requirements

Required Equipment

- Digital Cinema Server with GPIO or serial interface
- Component Engineering DA-10 Digital Cinema Theatre Automation
- Component Engineering Cue Manager Software with Programming Cable
- PC-Compatible Computer with serial port (or USB-to-serial-port converter)

Optional Equipment

- Serial Communications Cable, required for serial server communications, supplied by Component Engineering
- GPIO Communications Cable, required for GPIO communications, supplied by server manufacturer (Doremi, GDC, etc.)
- DX Auxiliary Relay Board, providing two additional contact closures for control of server start and stop functions

Mounting

The DA-10 is available in two mechanical configurations: a 2U rack mount configuration and a wall mount configuration.

Power Connection

Power requirements for the DA-10's own operation are small. The main front panel power fuse is a 3/16 amp SLO at 110 VAC (1/10 amp SLO at 230 VAC).

A power input block labeled "AC POWER" with three terminals "L", "N", and "G" is provided at the rear of the main circuit board for connection to line hot, neutral, and ground connections respectively.

18 gauge wire is sufficient for power connections as long as the insulation is adequate. Observe that the ground terminal is connected to the chassis. A ring type of terminal and lock washer should be used under the ground screw if available.

Configuration

Strategy

We recommend the following installation strategy:

1. Install the DA-10 into your projection booth.
2. Identify your house functions.
3. Wire your house functions to the DA-10's relay banks.
4. Test your house function wiring one relay at a time using Cue Manager software.
5. Design your presentation.
6. Program DA-10 Macro Cues using Cue Manager software.
7. Test DA-10 Macro Cues using Cue Manager software.
8. Connect the DA-10 to your digital cinema server for running a show.
9. Program the digital cinema server for running a show.
10. Test your presentation.

Identifying Your House Functions

In straightforward terms, the first thing to decide is “what you want to do”. Identify the house functions you would like to control and how many DA-10 relay contact closures you will need.

Wiring Your House Functions to Individual Relays

The DA-10 provides 13 low voltage and 2 high voltage output relays providing contact closures for controlling auditorium equipment. Output relays are organized into 2 banks, the Cue or “Q” bank and the Event or “K” bank.

Cue Bank Relays

The Cue or Q bank consists of seven socketed relay packages. Each relay package contains two contacts that open/close when energized. Each contact has its own common. The relays are labeled Q1 through Q7. For each relay package in the Q bank, one contact is labeled A and the second contact is labeled B. On the DA-10's main circuit board, the contacts are labeled Q1A, Q1B, then Q2A, Q2B, etc.

All relay signal lines and commons are connected to orange, screw-top terminal blocks. Signal lines are wired to the upper tier of the terminal blocks. Commons are wired to the lower tier of the terminal blocks.

The images in Figure 1 show the terminals for the Q1A contact and Q1B contacts. The pattern repeats for the rest of the relays in the Q bank.

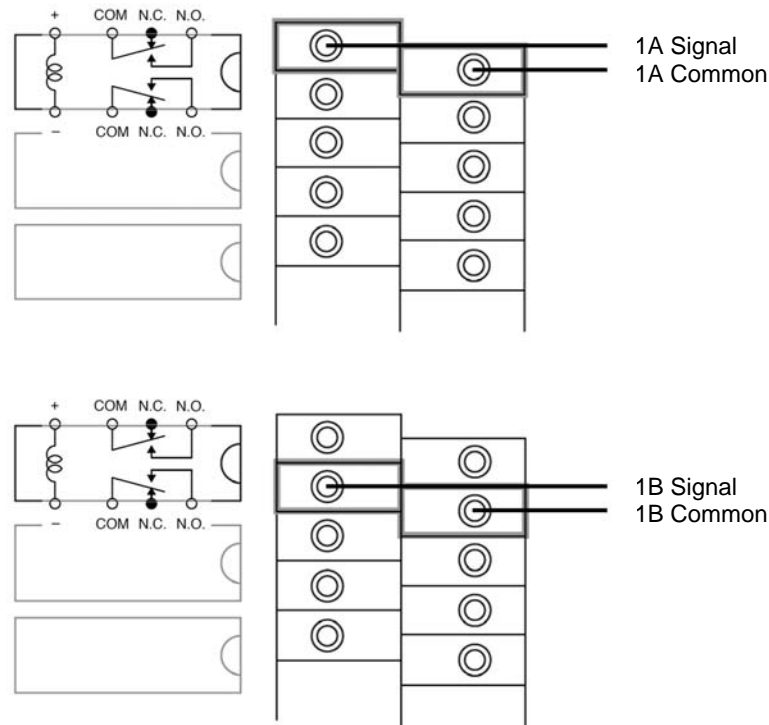


Figure 1: Example of Relay Terminal Block Connections

Contacts in each relay package can be used independently of each other or wired to form a single SPDT contact set. Stated another way, as normally installed each contact can have its own common or the contacts can share a common.

As normally installed, both contacts form “Make” or “normally open” contacts. If a “Break” or “normally closed” contact is needed, remove the relay cover, unplug the relay package from its socket and move it one position, then replace the relay cover. Then the top contact forms a “Make” or “normally open” contact and the bottom contact forms a “Break” or “normally closed” contact. Using the Q1 relay contacts as an example, once the Q1 relay is moved one position in its socket, the Q1A signal line and its common forms a “Make” or “normally open” connection and the Q1B signal line and its common forms a “Break” or “normally closed” connection.

Independent of how they are wired, both contacts are energized at the same time for each relay package. For example if Q1 receives a control signal and is energized, then both contacts Q1A and Q1B change state.

Event Bank Relays

The Event or K bank consists of six socketed relay packages. Each relay package contains two contacts that open/close when energized. Each contact has its own common. The relays are labeled K1 through K6. For each relay package in the K bank, one contact is labeled A and the second contact is labeled B. On the DA-10's main circuit board, the contacts are labeled K1A, K1B, then K2A, K2B, etc.

All relay signal lines and commons are connected to orange, screw-top terminal blocks. Signal lines are wired to the upper tier of the terminal blocks. Commons are wired to the lower tier of the terminal blocks.

Contacts in each relay package can be used independently of each other or wired to form a single SPDT contact set. Stated another way, as normally installed each contact can have its own common or the contacts can share a common.

As normally installed, both contacts form “Make” or “normally open” contacts. If a “Break” or “normally closed” contact is needed, unplug the relay package from its socket and move it one position. Then the top contact forms a “Make” or “normally open” contact and the bottom contact forms a “Break” or “normally closed” contact. Using the K1 relay contacts as examples, once the K1 relay is moved one position in its socket, the K1A signal line and its common forms a “Make” or “normally open” connection and the K1B signal line and its common forms a “Break” or “normally closed” connection.

Independent of how they are wired, both contacts are actuated at the same time for each relay package. For example if K1 receives a control signal, then both contacts K1A and K1B change state.

Special Case – K6

Relay K6 is an auxiliary relay that can be wired to fire at the same time as any other relay K1 through K5. To do this, solder a wire between the pads at K6 and your choice of Event Lines 1 - 5 as shown in Figure 2. As wired in the example below, K6 is fired at the same time that K2 fires.

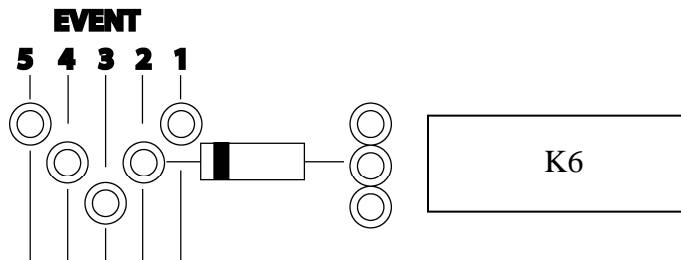


Figure 2: Wiring the K6 Relay

Relay contacts are rated at 300 mA AC, or 1 Amp DC. The relays are closed for approximately 1/3 second. Circuit voltages of more than 48 volts are not recommended.

Utility Relays

Utility Relay 1 is installed in a socket labeled “UTIL”. Utility Relay 1 is dual function and may be wired as normally open or normally closed. Utility Relay 1 is a high voltage DC relay. This means the contact is energized with a DC signal from the DA-10 but that the relay contacts are generally used to switch high voltage AC or DC. The contacts on this relay are rated to switch 10 Amps at 120VAC (or 7.5 Amps at 240VAC).

Utility Relay 2 is installed in a socket labeled “LOCK”. Utility Relay 2 is a single function relay, is wired normally open, and pulses closed for 500 milliseconds. Utility Relay 2 is a high voltage DC relay. This means the contact is energized with a DC signal from the DA-10 but that the relay contacts are generally used to switch high voltage AC or DC. The contacts on this relay are rated to switch 10 Amps at 120VAC (or 7.5 Amps at 240VAC).

Testing Your House Functions One Relay at a Time

Overview

Once wired, DA-10 relays can be fired manually for the purpose of testing the connection to your house functions using Cue Manager software.

Connecting to a PC

In order to test individual relays, you will need a computer with a serial port, Cue Manager software installed on the computer, and a programming cable. The programming cable is included with the Cue Manager software. The programming cable is 10 feet in length and is terminated by a female DB-9 connector and a 6-position female plug. Connect the 6-position female plug to the 6-pin header J8 on the MCU board (reference Figure 3). Connect the DB-9 connector to a serial port on the computer (reference Figure 4). Note: If your computer does not have a serial port you must first install a USB-to-serial-port converter on your computer which will provide the necessary serial port.

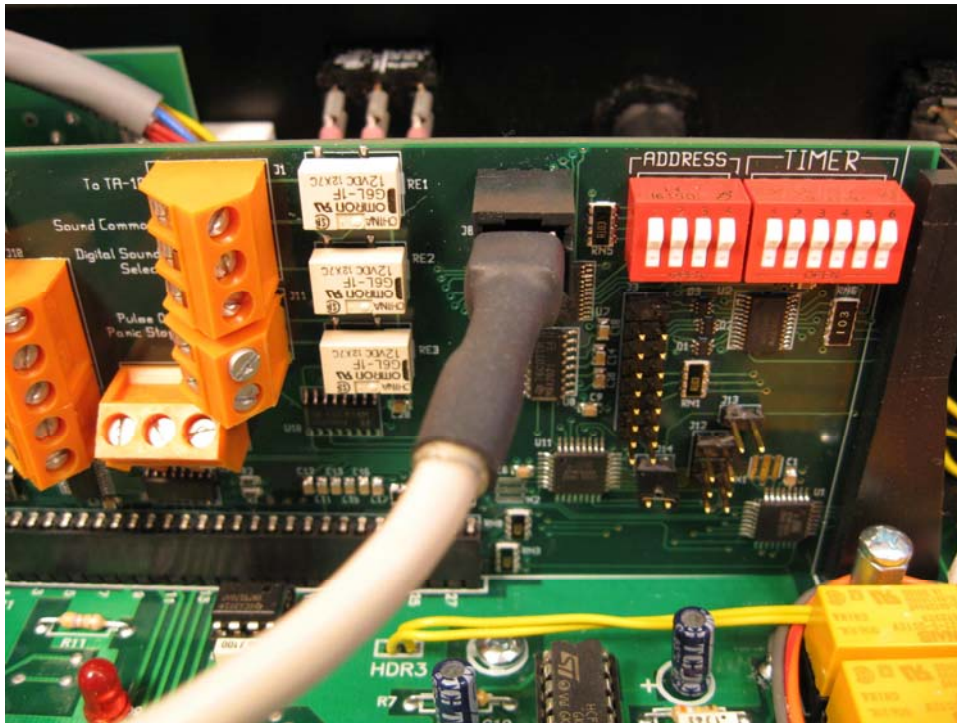


Figure 3: Programming Cable Properly Connected to the DA-10 at Connector J8

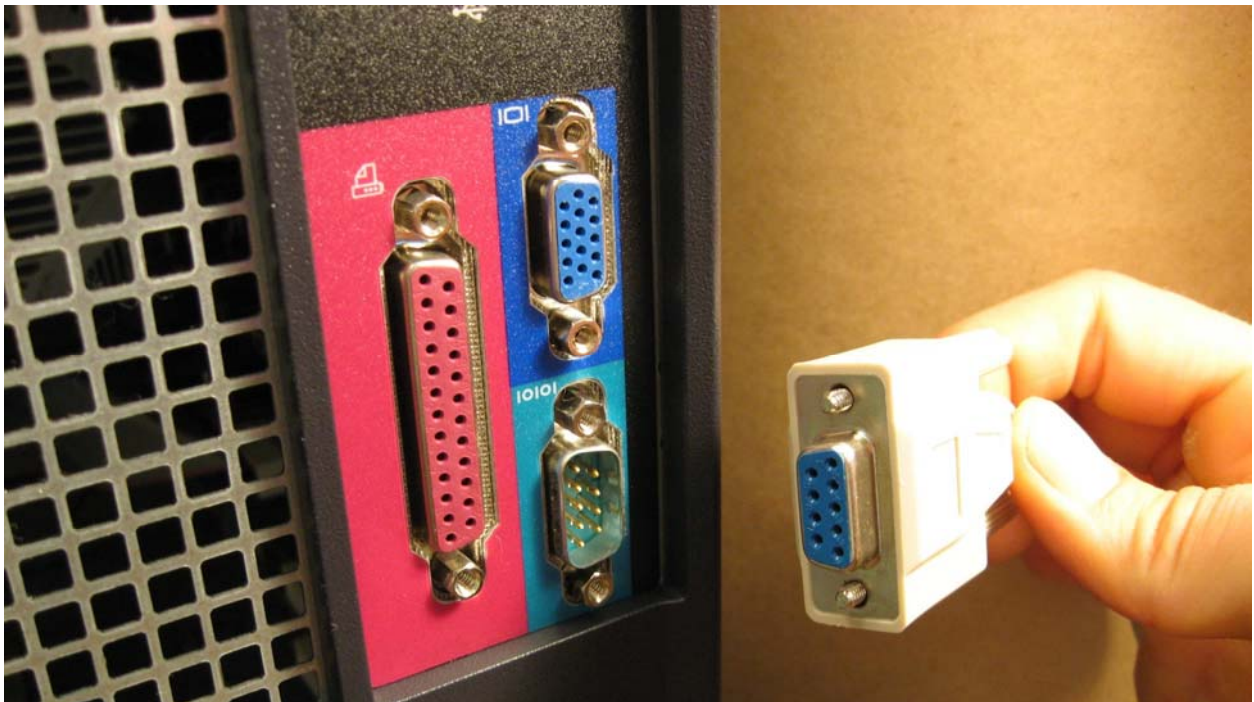


Figure 4: Connecting the Programming Cable to the PC Serial Port

Serial Port Configuration

Confirm that the parameters for the serial port on your PC are configured as follows:

Data Rate: 9600
Data Bits: 8
Parity: Even
Stop Bits: 1
Flow Control: Hardware Flow Control

To confirm your PC settings right click on **My Computer**, left click **Properties, Hardware, Device Manager, Ports, Communications Port(s), Port Settings**.

Cue Manager Software

The next step is to install Cue Manager software on to your PC's hard disk. To do this, insert the Cue Manager's CD and follow the instructions in the installation wizard.

Testing Individual Relays

To test individual relay connections, turn on the DA-10 main power. Start Cue Manager software on your PC by clicking on the shortcut installed on your desktop. Wait until "Connected" is displayed on the Automation Status line at the bottom of your screen. Click the "Test Relays" button. Using the test relays dialog, fire the Cue bank relays, Event bank relays, and auxiliary relays one at a time. Refer to the settings above if unable to connect properly. The Test Relays dialog box is show below in Figure 5.

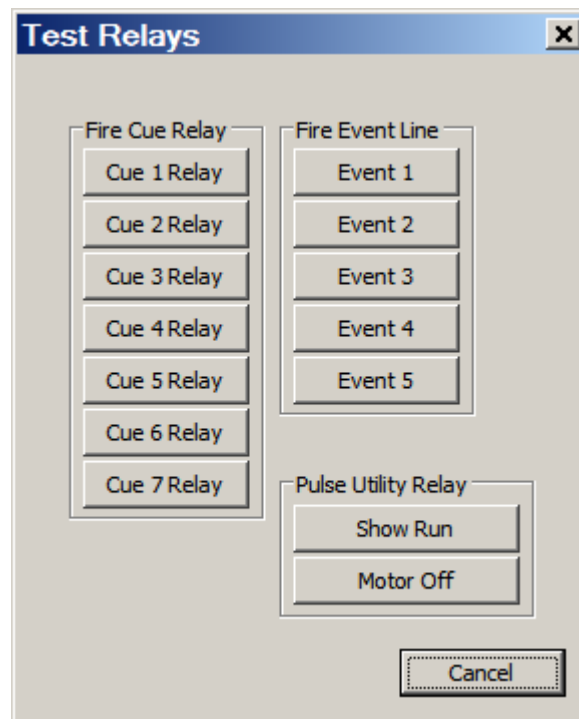


Figure 5: Cue Manager Test Relays Dialog Box

Designing Your Presentation

In straightforward terms, designing your presentation is a matter of deciding “what you want to do” and “when you want to do it”.

1. Define the auditorium transitions you would like during a presentation (for example "Start Ads", "Start Feature", "Credits", and "End Show").
2. Identify the house function(s) you wish to perform at each transition.

Running a Show Using Serial Communications

Overview

A presentation is managed using a timeline consisting of ads, trailers, a main feature, and/or other content stored on the digital cinema server. Automation Event cues are added to the timeline as required using the server’s user interface.

When the presentation is running and an Automation Event cue is encountered in the timeline, the server issues a command through its serial interface instructing the DA-10 to execute a corresponding Macro Cue stored in the automation.

Programming the DA-10

The process of programming the DA-10 involves creating and editing Macro Cues using Cue Manager software, storing the Macro Cues in the DA-10’s memory, saving the Macro Cues to disk (optional), and printing the Macro Cues (optional).

Cue Manager Software

Cue Manager software allows you to create DA-10 Macro Cues. A Macro Cue is a set of *triggers* and *actions*. *Triggers* determine what causes the Macro Cue to fire. *Actions* determine what the automation does when the Macro Cue is fired.

Cue Manager software communicates with the DA-10 to store Macro Cues in the automation. Once the Macro Cues are stored, the automation will respond to *triggers* and perform the *actions* specified. Macro cues stored in the DA-10 remain in effect until modified or deleted.

Creating and Editing Macro Cues

Run Cue Manager software by clicking on the Cue Manager shortcut that is installed on your desktop.

Use the Add/Edit Macro Cue dialogs to create and edit macro cues. Refer to the Cue Manager Software User’s Guide for details.

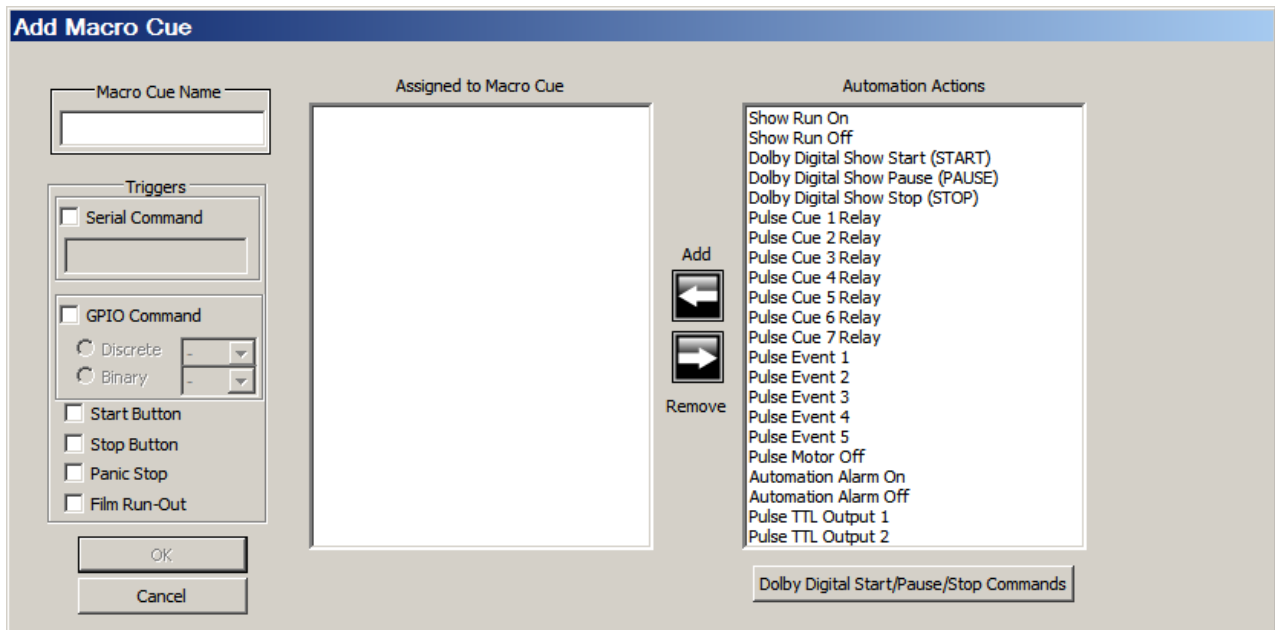


Figure 6: Cue Manager Add Macro Cue Dialog Box

For each Macro Cue select a trigger from the following list:

Available Triggers

- Serial Command
- GPIO Command
- Start Button
- Stop Button
- Panic Stop

Add actions to your Macro Cues according to the following table:

Automation Action

Description

Pulse Cue 1 Relay	actuates Q1A, Q1B relay contacts
Pulse Cue 2 Relay	actuates Q2A, Q2B relay contacts
Pulse Cue 3 Relay	actuates Q3A, Q3B relay contacts
Pulse Cue 4 Relay	actuates Q4A, Q4B relay contacts
Pulse Cue 5 Relay	actuates Q5A, Q5B relay contacts
Pulse Cue 6 Relay	actuates Q6A, Q6B relay contacts
Pulse Cue 7 Relay	actuates Q7A, Q7B relay contacts
Pulse Event 1	actuates K1A, K1B relay contacts
Pulse Event 2	actuates K2A, K2B relay contacts
Pulse Event 3	actuates K3A, K3B relay contacts
Pulse Event 4	actuates K4A, K4B relay contacts
Pulse Event 5	actuates K5A, K5B relay contacts
Show Run On	turns show run LED on, actuates Utility Relay 1
Show Run Off	turns show run LED off, de-actuates Utility Relay 1
Dolby Digital Show Start	sends serial command to server to Start
Dolby Digital Show Pause	sends serial command to server to Pause

Dolby Digital Show Stop	sends serial command to server to Stop
Pulse Motor Off	pulses Utility Relay 2 closed for 500 ms
Automation Alarm On	turns automation alarm on
Automation Alarm Off	turns automation alarm off
Pulse TTL Output 1	pulses TTL 1 terminal high for 500 ms
Pulse TTL Output 2	pulses TTL 2 terminal high for 500 ms

A total of seven automation actions can be assigned to each DA-10 Macro Cue that you create. When the Macro Cue is executed in response to a command from the server, all actions contained within the Macro Cue are fired.

Configuring Macro Cues for Serial Communications

In order for a DA-10 Macro Cue to respond to a command issued by a digital cinema server over a serial connection, the Macro Cue must be programmed to include the following:

1. You must assign a Macro Cue Name. While it is not required, we recommend that the name you assign to the Macro Cue is the same name that you assigned to the corresponding automation event when you programmed the server's presentation timeline.
2. You must check the Serial Command check box.
3. You must assign a Serial Command string to the Macro Cue. A command string is a series of ASCII characters that must exactly match the serial command string programmed into the corresponding server's Automation Event. Command strings are case sensitive and must *exactly match* the server's Automation Event command strings.
4. You must assign at least one Automation Action to the Macro Cue.
5. Once you have completed the items above, the OK button is activated. Press OK to display the Macro Cue on your screen.

Saving Macro Cues to the Automation

The Update Automation command is available whenever cues are displayed on the computer screen and "Connected" is displayed on the Automation Status line at the bottom of your screen. This command uploads the cues displayed on your screen to the automation, overriding any cues stored in the automation.

Saving Macro Cues to Disk

The Save to File command is available whenever cues are displayed on the computer screen. This command opens the Save to File dialog and allows you to save the cues displayed on your computer screen to a file. The file extension is .DX. Saved files can be stored for later use, for archival purposes, for emailing to colleagues, and for transferring Macro Cues to other automations, thus easily replicating your presentation from screen to screen.

To replicate a presentation, load the contents of your .DX file into Cue Manager software using the Open File Command, then transfer the configuration from Cue Manager to the new automation using the Update Automation Command.

Printing Macro Cues to a Printer or PDF File

The Print command is available whenever cues are displayed on the computer screen. This command opens the Print dialog and allows you to print the cues that are displayed on the computer screen to the host computer's printer. If no printer is available, a useful approach is to install a PDF print driver on your computer and print the Macro Cue Report to a PDF file on your computer's disk for later reference.

Testing Your Macro Cues

Once programmed, DA-10 Macro Cues can be fired manually for the purpose of testing your presentation's auditorium transitions for completeness.

The Test Macro Cues command is available whenever cues are displayed on the computer screen, the automation has been updated, and no subsequent changes have been made.

Click the Test Macro Cues button to display the test Macro Cues dialog box. Macro Cues programmed into the DA-10 are listed in the dialog box. When you press a Trigger Macro Cue button, all of the actions assigned to the Macro Cue are performed.

If no Macro Cues are stored in the automation the "Test Macro Cues" button is inactive.

The Test Macro Cues dialog box is show below in Figure 7.

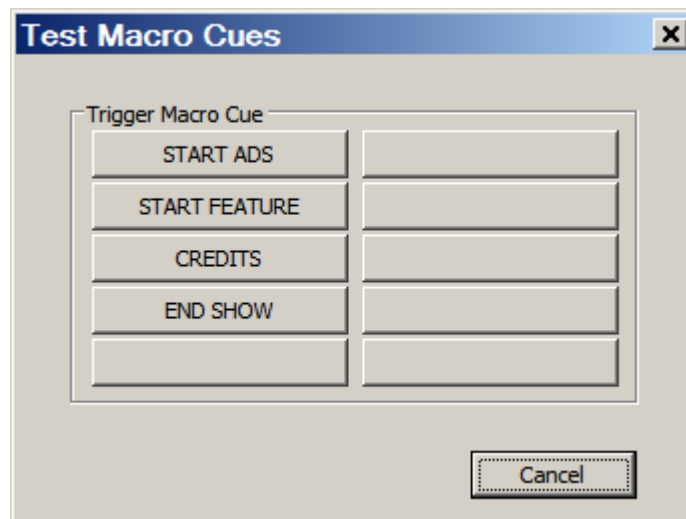


Figure 7: Cue Manager Test Macro Cues Dialog Box

Connecting the DA-10 to the Server

In order to run a digital show with serial communications, you will need a digital cinema server that supports serial communications, a DA-10 Digital Cinema Theatre Automation, and a serial communications cable. The communications cable is available from Component Engineering in a variety of lengths and is terminated on one end by a female DB-9 connector and on the other end by a 6-position female plug. Connect the 6-position female plug to the 6-pin header J8 on the DA-10 MCU board. Connect the DB-9 connector to the serial port on the cinema server. An example of a wiring configuration for the Dolby Digital Cinema Server is shown in Figures 8 and 9.

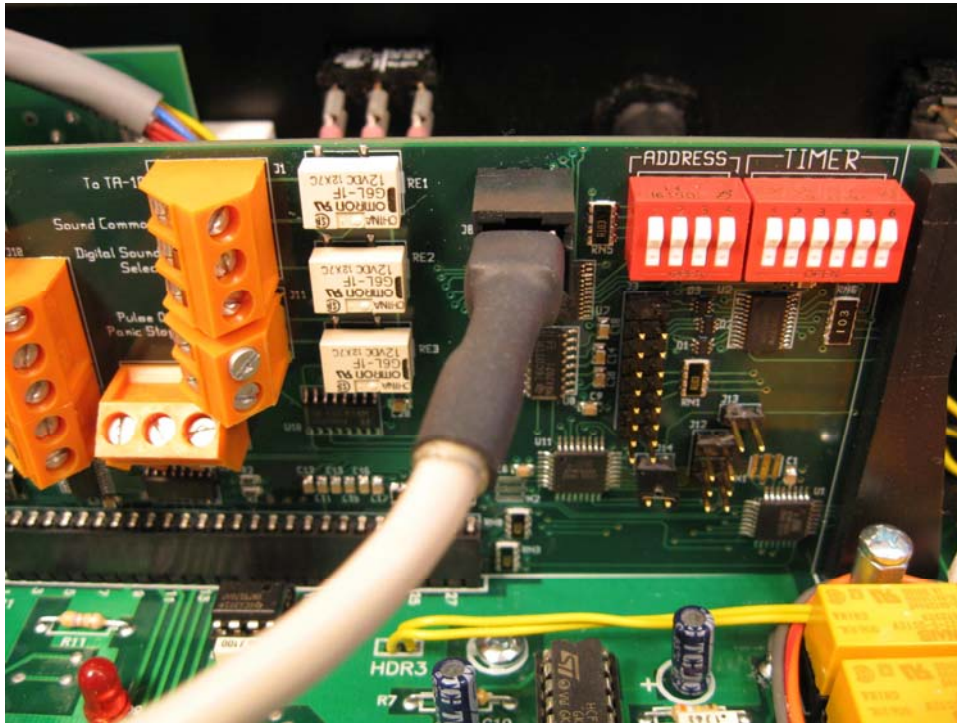


Figure 8: Server Communications Cable Properly Connected to the DA-10 at Connector J8

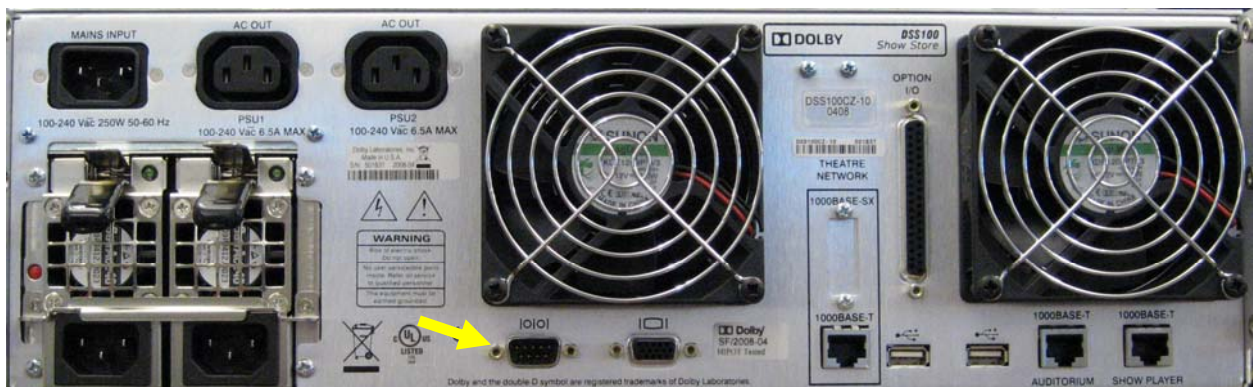


Figure 9: Serial Communications Port on a Dolby Digital Cinema Server

Configuring the Server

Create Automation Event cues using the digital cinema server user interface. Refer to the digital server's user's guide for more information. Note: This procedure varies widely depending upon the server manufacturer. Name the Automation Event cues. It is recommended, but not required, that the Automation Event cues and the corresponding DA-10 Macro Cues share the same name.

For serial communications, Automation Event cues must contain serial command strings. A command string is a series of ASCII characters that must exactly match the serial command string programmed into the corresponding DA-10 Macro Cue. Command strings are case sensitive and must *exactly match* the DA-10 Macro Cue command strings.

Confirm that the digital server's serial port parameters are configured as follows:

Data Rate: 9600
Data Bits: 8
Parity: Even
Stop Bits: 1
Flow Control: Hardware Flow Control

Note: If you are using Dolby Show Manager software to configure your system you must activate the "Serial Automation" sub-tab under the "System" tab. In order to activate the "Serial Automation" sub-tab, go to **System, Auditorium** and check the "this auditorium uses serial automation" check box.

Testing Your Presentation

You already know that the Macro Cues programmed into the DA-10 are correct because you tested them with the Test Macro Cues function.

Now the challenge is to confirm that each of the Automation Events programmed into your timeline communicates correctly with the DA-10 to execute the correct Macro Cue.

To test your presentation, create a short timeline in the digital server using clips or content such as trailers. Add your Event cues to the timeline. Play the timeline. Verify that the server Event cues trigger the appropriate DA-10 Macro Cues and that the desired auditorium transitions occur as expected.

Running a Show Using GPIO Communications

Overview

A presentation is managed using a timeline consisting of ads, trailers, a main feature, and/or other content stored on the digital cinema server. Automation Event cues are added to the timeline as required using the server's user interface.

When the presentation is running and an Automation Event cue is encountered in the timeline, the server issues a command through its GPIO interface instructing the DA-10 to execute a corresponding Macro Cue stored in the automation.

Programming the DA-10

The process of programming the DA-10 involves creating and editing Macro Cues using Cue Manager software, storing the Macro Cues in the DA-10's memory, saving the Macro Cues to disk (optional), and printing the Macro Cues (optional).

Cue Manager Software

Cue Manager software allows you to create DA-10 Macro Cues. A Macro Cue is a set of *triggers* and *actions*. *Triggers* determine what causes the Macro Cue to fire. *Actions* determine what the automation does when the Macro Cue is fired.

Cue Manager software communicates with the DA-10 to store Macro Cues in the automation. Once the Macro Cues are stored, the automation will respond to *triggers* and perform the *actions* specified. Macro cues stored in the DA-10 remain in effect until modified or deleted.

Creating and Editing Macro Cues

Run Cue Manager software by clicking on the Cue Manager shortcut that is installed on your desktop.

Use the Add/Edit Macro Cue dialogs to create and edit macro cues. Refer to the Cue Manager Software User's Guide for details.

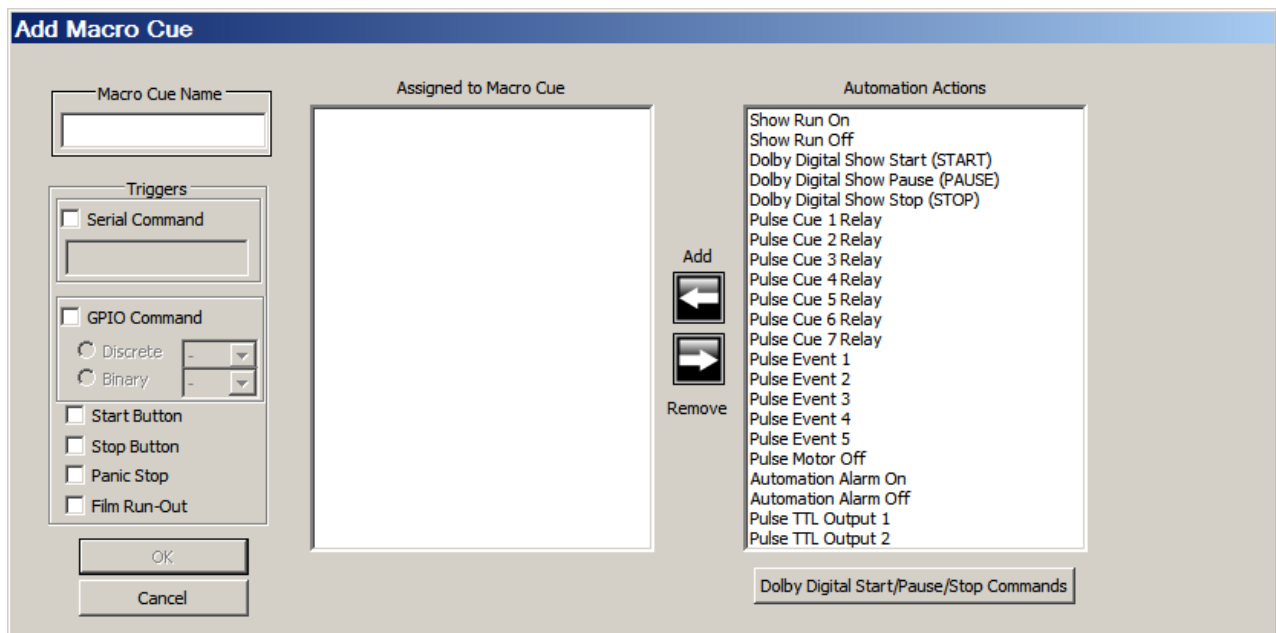


Figure 10: Cue Manager Add Macro Cue Dialog Box

For each Macro Cue select a trigger from the following list:

Available Triggers

Serial Command
GPIO Command
Start Button
Stop Button
Panic Stop

Add actions to your Macro Cues according to the following table:

<u>Automation Action</u>	<u>Description</u>
Pulse Cue 1 Relay	actuates Q1A, Q1B relay contacts
Pulse Cue 2 Relay	actuates Q2A, Q2B relay contacts
Pulse Cue 3 Relay	actuates Q3A, Q3B relay contacts
Pulse Cue 4 Relay	actuates Q4A, Q4B relay contacts
Pulse Cue 5 Relay	actuates Q5A, Q5B relay contacts
Pulse Cue 6 Relay	actuates Q6A, Q6B relay contacts
Pulse Cue 7 Relay	actuates Q7A, Q7B relay contacts
Pulse Event 1	actuates K1A, K1B relay contacts
Pulse Event 2	actuates K2A, K2B relay contacts
Pulse Event 3	actuates K3A, K3B relay contacts
Pulse Event 4	actuates K4A, K4B relay contacts
Pulse Event 5	actuates K5A, K5B relay contacts
Show Run On	turns show run LED on, actuates Utility Relay 1
Show Run Off	turns show run LED off, de-actuates Utility Relay 1
Dolby Digital Show Start	sends serial command to server to Start
Dolby Digital Show Pause	sends serial command to server to Pause
Dolby Digital Show Stop	sends serial command to server to Stop
Pulse Motor Off	pulses Utility Relay 2 closed for 500 ms, then open
Automation Alarm On	turns automation alarm on
Automation Alarm Off	turns automation alarm off
Pulse TTL Output 1	pulses TTL 1 terminal high for 500 ms
Pulse TTL Output 2	pulses TTL 2 terminal high for 500 ms

A total of seven automation actions can be assigned to each Macro Cue that you create. When the Macro Cue is executed in response to a command from the server all actions contained within the Macro Cue are fired.

Configuring Macro Cues for GPIO Communications

In order for a DA-10 Macro Cue to respond to a GPIO command issued from a server, the Macro Cue must be programmed to include the following:

1. You must assign a Macro Cue Name. While it is not required, we recommend that the name you assign to the Macro Cue is the same name that you assigned to the corresponding automation event when you programmed the server's presentation timeline.

2. You must check the GPIO Command check box.
3. You must choose either Discrete Mode or Binary Mode and select the numerical command the server will send to the DA-10 that causes the Macro Cue to be executed. Refer to “Configuration, Running a Show Using GPIO Communications, Configuring the Server” in this manual.
4. You must assign at least one Automation Action to the Macro Cue.
5. Once you have completed the items above the OK button is activated. Press OK to display the Macro Cue on your screen.

Programming Macro Cues that Start or Stop a Digital Show

Program your Macro Cues to start or stop a digital show from the automation as follows:

1. If your server has GPI inputs, use Automation Action “Pulse TTL Output 1” to start your show. Use “Pulse TTL Output 2” to stop or pause your show.

Program two of the servers GPI inputs to start or stop the server.

2. If your server requires contact closures (GDC, etc) for starting and stopping a show, pulse the cue or event relays wired into the inputs of the server. Use Automation Actions “Pulse Cue X Relay” or “Pulse Event X” as required to do this. Program two of the server's inputs to start or stop the server.
3. If your server requires contact closures (GDC, etc.) for starting and stopping a show, and you have installed the DX Auxiliary Relay Board for this purpose, use Automation Actions “Pulse TTL Output 1” to start your show and “Pulse TTL Output 2” to stop your show. Program two of the server's inputs to start or stop the server.

Saving Macro Cues to the Automation

The Update Automation command is available whenever cues are displayed on the computer screen and “Connected” is displayed on the Automation Status line at the bottom of your screen. This command uploads the cues displayed on your screen to the automation, overriding any cues stored in the automation.

Saving Macro Cues to Disk

The Save to File command is available whenever cues are displayed on the computer screen. This command opens the Save to File dialog and allows you to save the cues displayed on your computer screen to a file. The file extension is .DX. Saved files can be stored for later use, for archival purposes, for emailing to colleagues, and for transferring Macro Cues to other automations, thus easily replicating your presentation from screen to screen.

To replicate a presentation, load the contents of your .DX file into Cue Manager software using the Open File Command, then transfer the configuration from Cue Manager to the new automation using the Update Automation Command.

Printing Macro Cues to a Printer or PDF File

The Print command is available whenever cues are displayed on the computer screen. This command opens the Print dialog and allows you to print the cues that are displayed on the computer screen to the host computer's printer. If no printer is available, a useful approach is to install a PDF print driver on your computer and print the Macro Cue Report to a PDF file on your computer's disk for later reference.

Testing Your Macro Cues

Once programmed, DA-10 Macro Cues can be fired manually for the purpose of testing your presentation's auditorium transitions for completeness.

The Test Macro Cues command is available whenever cues are displayed on the computer screen, the automation has been updated, and no subsequent changes have been made.

Click the Test Macro Cues button to display the test Macro Cues dialog box. Macro Cues programmed into the DA-10 are listed in the dialog box. When you press a Trigger Macro Cue button, all of the actions assigned to the Macro Cue are performed.

If no Macro Cues are stored in the automation the "Test Macro Cues" button is inactive.

The Test Macro Cues dialog box is show below in Figure 11.

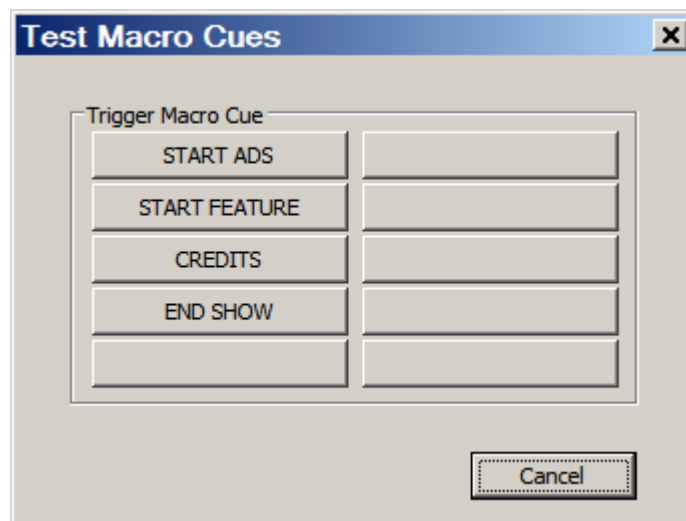


Figure 11: Cue Manager Test Macro Cues Dialog Box

Connecting the DA-10 to the Server

In order to run a digital show you will need a cinema server with GPIO, a DA-10 Digital Cinema Theatre Automation, and a GPIO cable. The GPIO cable is supplied with the cinema server and is terminated on one end by a male DVI or DB37 connector and on the other end by individual stripped wires.

Connect the DVI or DB37 end of the cable to the cinema server. Connect four General Purpose Output lines to the DA-10's General Purpose Input terminal blocks labeled GPI 0 - GPI 3 at J10 on the DA-10's MCU board. This connection allows the server to send commands to the automation. We recommend using the server's General Purpose Output lines 0 - 3.

Connect two General Purpose Input lines to the DA-10's General Purpose TTL outputs (TTL 1 - 2) of connector J9 of the DA-10's MCU board. This connection allows the automation to send commands to the server e.g., commands to start and stop a show. We recommend using the server's General Purpose Inputs 0 - 1.

Refer to the server manufacturer's documentation to identify the proper connections. As an example for Doremi:

<u>Doremi GPIO Signal</u>	<u>Wire Color Code</u>
GPO 0	pink with black stripe
GPO 1	pink
GPO 2	blue
GPO 3	blue with white stripe
GND	orange
GND	orange with black stripe
GND	light blue
GND	light blue with black stripe
GPI 0 (+)	brown
GPI 1 (+)	white with black stripe
GPI 0 (-)	brown with white stripe
GPI 1 (-)	white

Insulate and tie back any unused GPIO wires.

An example of a wiring configuration for the Doremi Digital Cinema Server is shown in Figures 12 and 13.

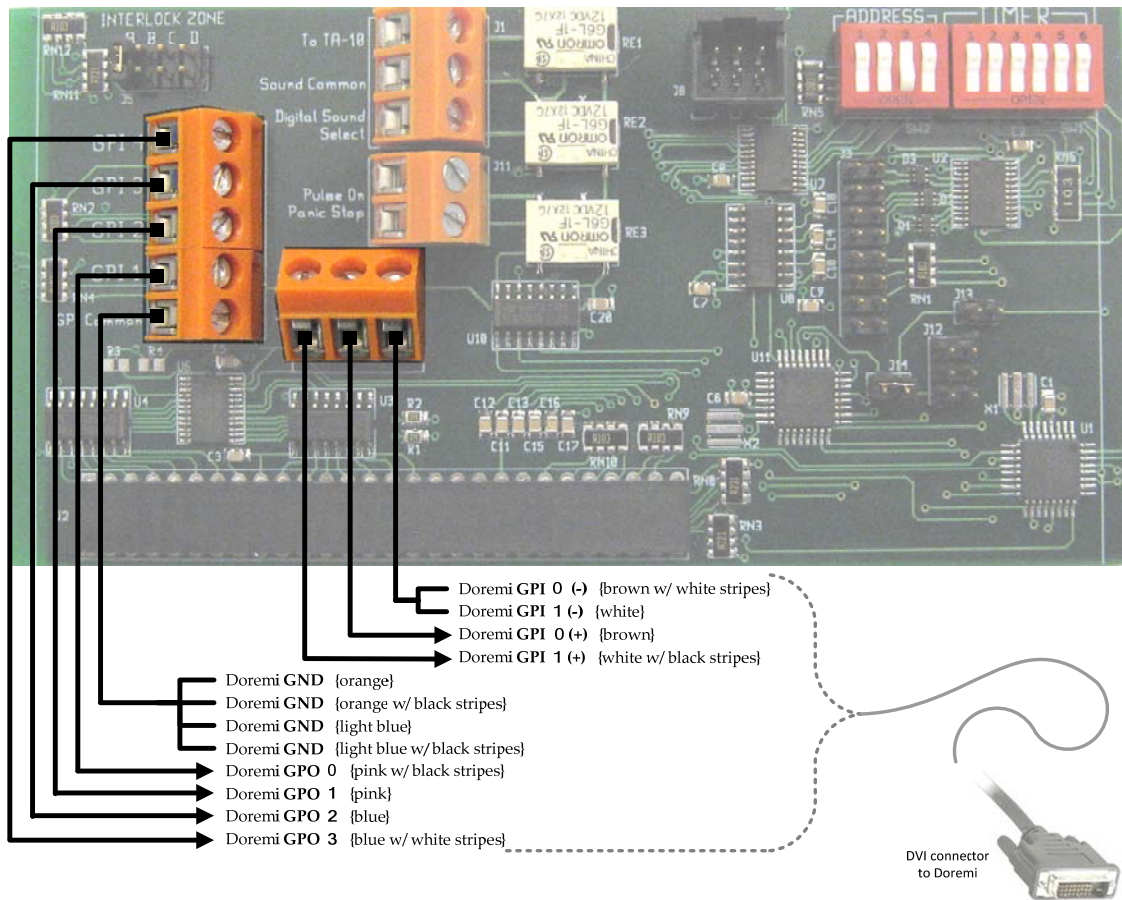


Figure 12: Server GPIO Cable Properly Connected to the DA-10 MCU Board

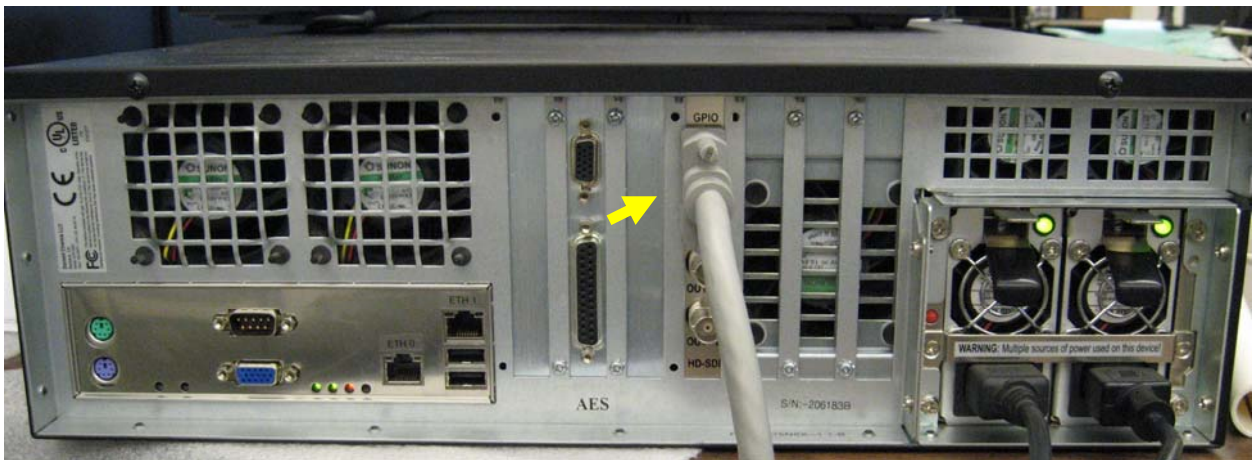


Figure 13: GPIO Cable Properly Connected to a Doremi Digital Cinema Server

Special Case – Servers Requiring Contact Closures for Start/Stop Control

Some digital servers require contact closures instead of standard GPIO connections to start and stop the server from the automation.

This can be done in one of two ways:

1. Use two unused DA-10 dual function relays (Q1-Q7, K1-K6). Assign one relay to a DA-10 Macro Cue and assign the other relay to a second DA-10 Macro Cue. Assign a trigger (Start Button for example) to the first Macro Cue and the second trigger (Stop Button for example) to the other Macro Cue.
2. If all of the DA-10's relays are already being used, install Component Engineering's DX Auxiliary Relay Board into the automation. The auxiliary relay board provides two additional dual function relays that are wired into and controlled by the DA-10's TTL Output 1 and TTL Output 2. With the relay board wired into the TTL outputs, assign TTL 1 to a DA-10 Macro Cue and assign TTL 2 to a second DA-10 Macro Cue. Assign a trigger (Start Button for example) to the first Macro Cue and the other trigger (Stop Button for example) to the second Macro Cue.

Configuring the Server

Create Automation Event cues using the digital cinema server user interface. Refer to the digital server's user's guide for more information. Note: This procedure varies widely depending upon the server manufacturer. Name the Automation Event cues. It is recommended, but not required, that the Automation Event cues and the corresponding Macro Cues share the same name.

For GPIO communications, Automation Event cues must contain General Purpose Output (GPO) commands. A GPO command pulses one or more signal lines connected between the server and the automation.

If your presentation includes four or fewer Automation Events, program the server's General Purpose Outputs according to the following table:

<u>For Automation Event</u>	<u>GPO 3</u>	<u>GPO 2</u>	<u>GPO 1</u>	<u>GPO 0</u>
1	-	-	-	pulse low
2	-	-	pulse low	-
3	-	pulse low	-	-
4	pulse low	-	-	-

Stated another way, the first Automation Event pulses GPO 0 low. This causes the DA-10 to execute a Macro Cue. Each event is assigned its own GPO line. This is called Discrete Mode.

If your presentation includes five or more Automation Events, program the outputs according to the following table:

<u>For Automation Event</u>	<u>GPO 3</u>	<u>GPO 2</u>	<u>GPO 1</u>	<u>GPO 0</u>
1	-	-	-	pulse low
2	-	-	pulse low	-
3	-	-	pulse low	pulse low
4	-	pulse low	-	-
5	-	pulse low	-	pulse low
6	-	pulse low	pulse low	-
7	-	pulse low	pulse low	pulse low
8	pulse low	-	-	-
9	pulse low	-	-	pulse low
10	pulse low	-	pulse low	-

Stated another way, the first Automation Event pulses GPO 0 low. The third Automation Event pulses GPO 0 and GPO 1 low. Each event is assigned a binary code. The DA-10 executes a Macro Cue depending upon its binary code. This is called Binary Mode.

Testing Your Presentation

You already know that the Macro Cues programmed into the DA-10 are correct because you tested them with the Test Macro Cues function.

Now the challenge is to confirm that each of the Automation Events programmed into your timeline communicates correctly with the DA-10 to execute the correct Macro Cue.

To test your presentation, create a short timeline in the digital server using clips or content such as trailers. Add your Event cues to the timeline. Play the timeline. Verify that the server Event cues trigger the appropriate DA-10 Macro Cues and that the desired auditorium transitions occur as expected.

Wiring Front Panel Switches

Six SPDT (center off) momentary switches have been provided for the installer to assign and wire as desired. Switches can be wired to manually control individual house functions, send a start command to a server, send a stop command to a server, execute a DA-10 Macro Cue or to perform other functions. Hold switches or other types are available up request.

Wire the switches prior to mounting the switches in the DA-10's front panel switch cutouts. Install unwired switches for unassigned switch positions to complete the look of the front panel. Front panel switches can be used to perform a very wide range of functions. We have included a few common examples below.

Example 1 - Controlling a House Function Using a Front Panel Switch

You may use a front panel switch to manually control a house function wired to any DA-10 relay by connecting it in parallel with the relay.

Connect the center common terminal of the switch to the common of the DA-10 relay that controls the house function. Connect the "make" side terminal of the switch to the signal line of the relay. Note: By wiring both "make" sides of the momentary switch to the same relay, both positions control the same function. If you wire each "make" side to different relays you can control two house functions that share a common with one switch.

Example 2 -Using a Front Panel Switch to Start and Stop a Server

You may use a front panel switch to send start and stop commands to your server.

Connect the center common terminal of a front panel switch to the "GND" terminal of the terminal block labeled "GND", "GO", "STOP", and "LOCK" on the DA-10's main circuit board. Connect one "make" terminal of the switch to the "GO" terminal. Connect the other "make" terminal of the switch to the "STOP" terminal.

Create a Macro Cue with the "Start Button" as a trigger. For serial communications use the "Digital Show Start" Automation Action. For GPIO communications use "Pulse TTL Output 1" Automation Action.

Create a Macro Cue with the "Stop Button" as a trigger. For serial communications use the "Digital Show Stop" Automation Action. For GPIO communications use "Pulse TTL Output 2" Automation Action.

Example 3 - Using a Front Panel Switch to Execute a Macro Cue

You may use a front panel switch to execute a Macro Cue.

A front panel switch can be used to simulate an incoming GPIO command. This makes it possible to execute Macro Cues containing "GPIO Command" triggers. You can do this even if your server uses serial communications. Wire the front panel switch in parallel with GPI terminals 0 - 3 at J10 on the DA-10's MCU board according to the following tables:

Switch "Make" Terminal Connection

GPI 0
GPI 1
GPI 2
GPI 3

Executes Macro Cue Containing (Discrete Mode)

GPIO Command, Discrete - 1
GPIO Command, Discrete - 2
GPIO Command, Discrete - 3
GPIO Command, Discrete - 4

Switch "Make" Terminal Connection

GPI 0
GPI 1
GPI 2
GPI 3

Executes Macro Cue Containing (Binary Mode)

GPIO Command, Binary - 1
GPIO Command, Binary - 2
GPIO Command, Binary - 4
GPIO Command, Binary - 8

Interfacing a Fire Alarm

Wiring the Fire Alarm

Scheme 1

Connect the fire alarm's output contact closure relay to a single DA-10 automation at the terminal block labeled "GND", "GO", "STOP", and "LOCK" on the DA-10's main circuit board as shown in Figure 14. Wire the fire alarm to the "STOP" and "GND" terminals. When the fire alarm's output contacts are closed the fire alarm Macro Cue below is executed.

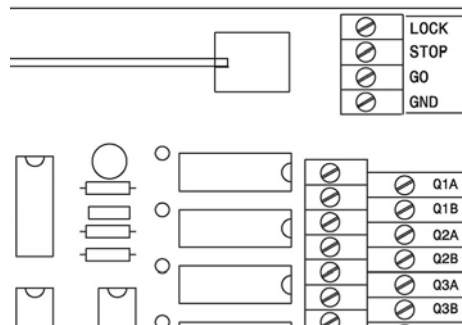


Figure 14: DA-10 START / STOP Terminal Block

Scheme 2

Connect multiple fire alarm output contact closure relays to multiple DA-10 automations at the terminal blocks labeled "GND", "GO", "STOP", and "LOCK" on the DA-10's main circuit board. Wire the fire alarm to the "STOP" and "GND" terminals of each automation. Program a fire alarm Macro Cue into each DA-10 separately. When the fire alarm output contacts are closed the fire alarm Macro Cues stored in the automations are executed.

Scheme 3

If remote boxes are wired into the system, connect the fire alarm's output contact closure relay to the two pole terminal strip labeled "PANIC" in any of the remote boxes. When this terminal is closed a code is put on the data link that fires the Panic Stop Macro Cue below.

Note: This method will not work if the Remote Box is turned off. If this scheme is used it is wise to have the Remote Box powered from the same (or similar) uninterruptible circuit as the alarm system.

Fire Alarm Macro Cue

The DA-10 can be programmed to transmit a stop command to your digital server in the event of a fire alarm.

1. Create a Macro Cue called Fire Alarm with “Stop Button” selected as its trigger.
2. Assign an automation action that stops the show as follows:
 - a. Use Digital Show Stop if your server uses serial communications.
 - b. Use Pulse TTL Output 2 if your server has a GPIO input wired to TTL Output 2 for this purpose.
 - c. Use Pulse TTL Output 2 if your server requires a contact closure and you have installed the DX Auxiliary Relay Board.
 - d. Use the appropriate Pulse Cue Relay or Pulse Event action if your server requires a contact closure and you are using a cue bank or event bank relay for this purpose.
3. Assign any additional automation actions such as house lights up, etc. to the Macro Cue that you would to occur in the event of a fire alarm.

Panic Stop Macro Cue

The DA-10 can be programmed to transmit a stop command to your digital server in the event of a remote box panic stop generated by a fire alarm, panic button, or other device.

1. Create a Macro Cue called Panic Stop with “Panic Stop” selected as its trigger.
2. Assign an automation action that stops the show as follows:
 - a. Use Digital Show Stop if your server uses serial communications.
 - b. Use Pulse TTL Output 2 if your server has a GPIO input wired to TTL Output 2 for this purpose.
 - c. Use Pulse TTL Output 2 if your server requires a contact closure and you have installed the DX Auxiliary Relay Board.
 - d. Use the appropriate Pulse Cue Relay or Pulse Event action if your server requires a contact closure and you are using a cue bank or event bank relay for this purpose.
3. Assign any additional automation actions such as house lights up, etc. to the Macro Cue that you would to occur in the event of a fire alarm.

Wiring the Auxiliary Pulse On Panic Stop Relay

Description

When the DA-10 receives a panic stop signal over the automation bus, the Pulse On Panic Stop relay automatically pulses closed for 500 milliseconds. This relay may be connected to any external device that can utilize a low voltage relay contact closure input.

Wiring

The Pulse On Panic Stop connections are located on the DA-10 MCU board's orange two position screw-top terminal block labeled "Pulse on Panic Stop" (J11) as shown in Figure 15. You can connect any external device that can process a low voltage relay contact closure. For example, you could wire an external alarm into this relay. Typically one side of the relay is wired to the external device signal line and the other side is wired to the device common.

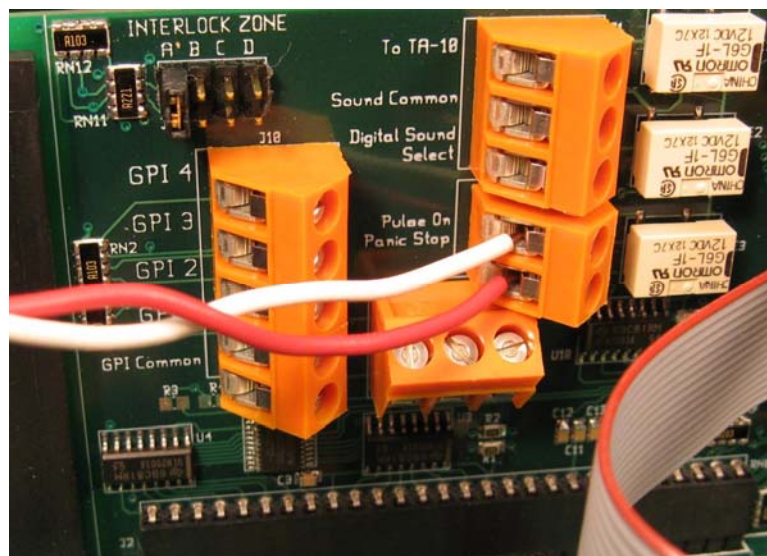


Figure 15: External Device Properly Wired into the DA-10 Pulse On Panic Stop Relay

Installing the DX Auxiliary Relay Board

Overview

Component Engineering's DX Auxiliary Relay Board is an accessory for the DA-10 that provides two additional low voltage relays. The relays can be used for any purpose. However, the Auxiliary Relay Board is most commonly used to start or stop a show for digital cinema servers requiring contact closures for this purpose.

The DX Relay Board converts the TTL output signals generated by the DA-10 MCU Board into momentary relay contact closures (or openings). The DA-10 TTL output ports are wired into the DA Relay Board TTL input ports. When the DA Relay Board receives a TTL signal from the DA-10, the Relay Board fires a relay.

To install the DX Auxiliary Relay Board refer to the DX Relay Board User's Guide. A photo of an installed Auxiliary Relay Board is shown in Figure 16.

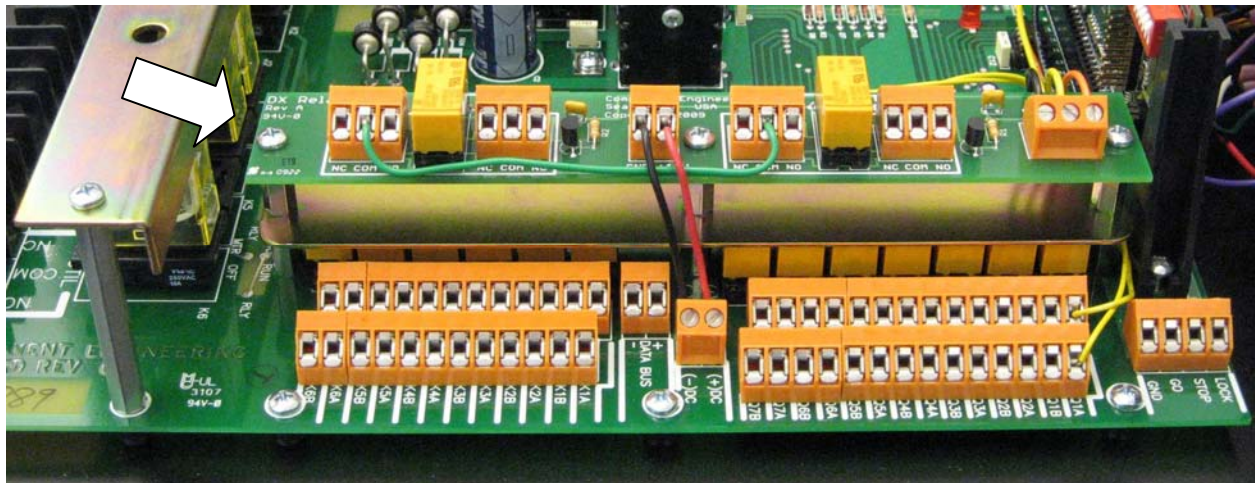


Figure 16: DX Auxiliary Relay Board

Operation

Powering the System On

Turn the POWER switch on and verify the POWER LED is lit.

Running a Digital Show

Start a show using the server's presentation scheduler, Play button, using a DA-10 front panel switch wired and programmed for this purpose, or Remote Box start button.

Remote Control Box Installation and Operation

Overview

A network of DA-10 automations can be wired together and controlled using the Automation Remote Control Box from Component Engineering. This network uses a two-conductor RS-485 bus for communication between devices. Up to 32 DA-10 automations can be controlled by one or more Remote Control Boxes on the network.

The purpose of the Automation Network is to provide control and monitoring for a number of DA-10s from a single (or multiple) remote locations using Remote Control Boxes as follows:

1. Remote manual show start and stop for one or more DA-10s.
2. Remote panic or fire alarm show stop for one or more DA-10s.
3. Remote show ready to start indicator.
4. Remote show run indicator.
5. Remote audible alarm.

Understanding the Data Link

1. The Data Link's RS-485 bus is capable of operating over fairly long distances and is quite immune to noise.
2. All DA-10s and Remote Control Boxes are wired in series.
3. The bus is wired as a daisy chain with no Ts or Ys. See Figure 17 below.
4. It is recommended that connections be made with standard two-conductor shielded wire, normally with a thin foil shield, like you would use for audio wiring. Observe and maintain polarity of the two conductors (+), (-) throughout the network.

Daisy chain separate lengths of wire between devices, because both ends of the shield must be terminated to chassis ground at every device on the network. Depending upon the length of the electrical ground runs and the tightness of wire and conduit connections, there is the possibility of a voltage difference between the grounds of any two chassis. Therefore, before actually connecting the second end of a shield to the ground terminal, it is wise to check for voltage between the unattached shield and the ground terminal. If there is any voltage indicated, a 47 to 100 ohm resistor should be soldered on the end of the shield with the other end of the resistor going to the ground screw.

5. DA-10s on the network have unique network addresses.
6. Remote Control Boxes require master or slave designation. The master Remote Control Box must be connected at one end of the daisy chain.

7. Devices at both ends of the daisy chain (DA-10 or Remote Control Box) must load the Data Link.

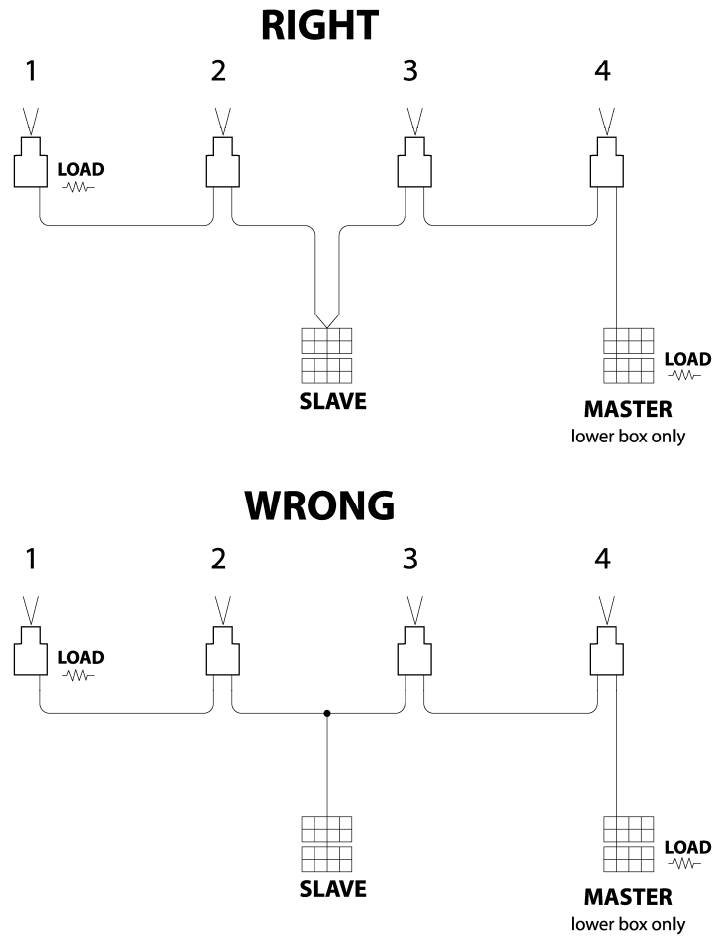


Figure 17: Data Link Daisy Chain Wiring

Configuring an Automation

Connecting the Wires

Look for a two terminal orange block labeled “DATA BUS” located between the Cue and Event terminal blocks on the DA-10 main circuit board. Connect the + conductor of the data link to the terminal marked “+”. Connect the - conductor of the data link to the terminal marked “-”. Connect the shield wire to the “CHASSIS GROUND SCREW” shown in Figure 18 below.

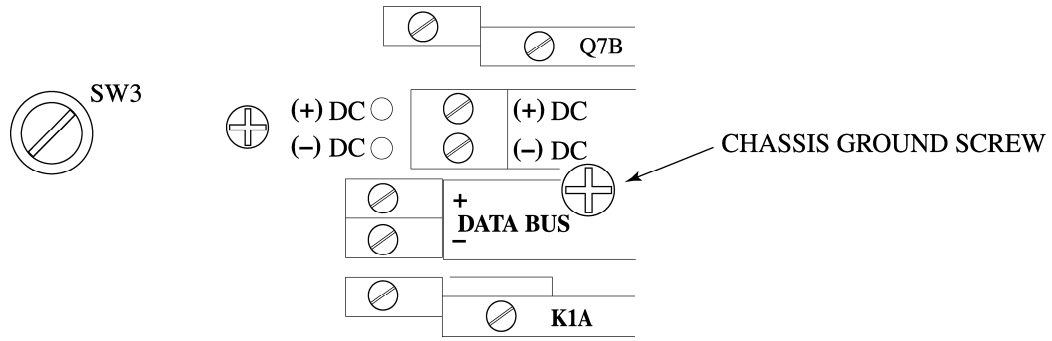


Figure 18: DA-10 Automation Data Link Connection Terminals

Setting the Automation Address

If your DA-10 is being monitored or controlled through a remote box, it must be assigned a discrete automation address. Set the automation address using the four-position DIP rocker switch located on the DA-10 MCU board labeled "ADDRESS". Reference Figure 19 for details on how to set the switches for each of the sixteen possible assignments. It is important to make certain that no two automations share a common address - each address may be assigned only once.

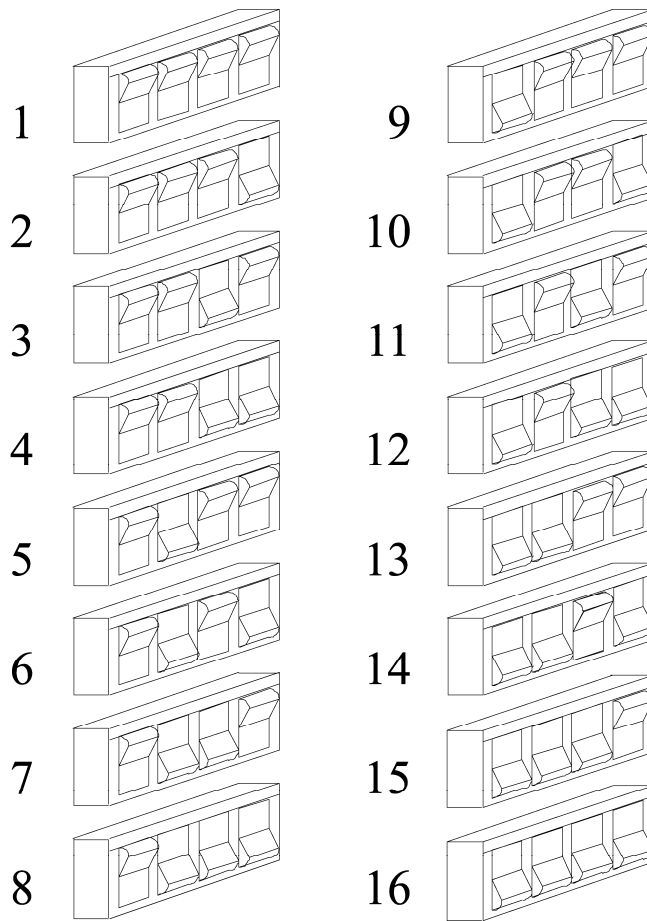


Figure 19: DA-10 Automation Address Switch Settings

Loading the Data Link

If you are installing the automation at one or the other end of the data link daisy chain, then you must load the data link bus at that point.

Look for switch “SW3” located in the center of the DA-10’s main circuit board. SW3 looks like a screw head on a short black plastic stud. When the screw is turned down, a 150 ohm resistor is connected to the data link, loading the bus. When the screw is backed-out a half turn or so, the 150 ohm resistor is disconnected from the bus.

Configuring a Remote Control Box

Connecting the Wires

Look for two pairs of two three position orange terminal blocks labeled “1-16 BUSS” and “17-32 BUSS”. An automation bus can support 16 automations. A remote control box can be connected to two busses allowing a total of 32 automations on the network. Connect all automations with address 1-16 to one bus and all automations with address 17-32 to the other. For automations with address 1-16 use one of the two terminal blocks if the remote box is installed at the end of the data link daisy chain. Use both terminal blocks if the remote box is installed in the middle of the daisy chain. Use the other pair of terminal blocks for the bus with automation addresses 17-32.

Connect the + conductor of the data link to the terminal marked “+”. Connect the - conductor of the data link to the terminal marked “-“. Connect the shield wire to the terminal marked “SHLD”.

Setting the Master Slave Link

A remote box can be configured to be either a “Master” or a “Slave”. Only one (1) remote box on any data link can be the master. All other remote boxes on any data link must be slaves. It is recommended that the “Master” remote box be wired at one or the other end of the data link daisy chain.

Find the jumper labeled “MASTER SLAVE SELECTOR”. Move the jumper to the appropriate position.

It has been found that the best choice for the “Master” remote box is at the end of the line. In other words, at the end of the longest cable run. Usually this will be downstairs in the box office or in the manager’s office. There will be confusion on the line if the master is in the middle trying to send information requests out in both directions.

Loading the Data Link

If you are installing the remote box at either end of the data link daisy chain, than you must load the data link bus at that point.

Look for switch “SW2” located on the remote box main circuit board. SW2 looks like a screw head on a short black plastic stud. When the screw is turned down, a 150 ohm resistor is connected to the data link, loading the bus. When the screw is backed-out a half turn or so, the 150 ohm resistor is disconnected from the bus.

Operation

The red LED indicates that a show is ready to start. The green LED indicates a show is running. Specifically:

Green LED and Red LED are Both Off

Pressing the START (green) button will have no effect.
Pressing the STOP (red) button will have no effect.

Green LED is On

Show Run is on.

Pressing the START button will have no effect.

Pressing the STOP button will:

If a Macro Cue residing on the target automation contains a “Stop Button” trigger, the Macro Cue will be executed.

If no Macro Cue residing on the automation contains a “Stop Button” trigger, then no effect.

Example: A Macro Cue residing on the target automation is programmed with a “Stop Button” trigger and a “Digital Show Stop” Automation Action. Pressing the STOP button will execute the Macro Cue, sending a stop command to a serial digital cinema server, stopping the show.

Red LED is On

A Macro Cue residing on the target automation contains a “Start Button” trigger AND Show Run is off.

Pressing the START button will execute the Macro Cue containing the “Start Button” trigger.
Pressing the STOP button will have no effect.

Example: A Macro Cue residing on the target automation is programmed with a “Start Button” trigger and a “Digital Show Start” Automation Action. Pressing the START button will execute the Macro Cue, sending a start command to a serial digital cinema server, starting the show.

Show Run Details

Executing a Macro Cue containing the “Show Run On” Automation Action turns the green LED at the Remote Control Box on. Executing a Macro Cue containing the “Show Run Off” Automation Action turns the green LED at the Remote Control Box off.

Alarm Details

Executing a Macro Cue containing the “Automation Alarm On” Automation Action turns the Remote Control Box alarm on.

When the automation is in the alarm state, both the red and green lights on the remote box flash.

To turn the alarm located at the Remote Control Box off, you must turn the alarm off at the automation. This will turn the Remote Control Box alarm off.

In order to turn the alarm off from the automation a Macro Cue containing the “Stop Button” trigger AND the “Alarm Off” Automation Action must reside in the automation. In addition, you must wire a front panel switch into the STOP terminal of the DA-10. Refer to “Configuration, Wiring Front Panel Switches”.

Troubleshooting

Digital Cinema Server and DA-10 are Not Communicating

Serial Communications

Confirm that the cinema server and the DA-10 are powered on. Confirm that the communication cable is properly connected between the DA-10 and the server. Confirm that the server's serial port parameters are properly configured as follows:

Data Rate: 9600
Data Bits: 8
Parity: Even
Stop Bits: 1
Flow Control: Hardware Flow Control

The DA-10 serial port settings are fixed and cannot be modified.

GPIO Communications

Confirm that the cinema server and the DA-10 are powered on. Confirm that the GPIO cable is properly connected between the DA-10 and the server.

Programmed Macro Cues are Not Firing

Use Cue Manager software to confirm that Macro Cues are actually stored in the automation and programmed correctly. Use Cue Manager software to test individual relays with the "Test Relays" command. Test Macro Cues with Cue Manager "Test Macro Cues" command.

Use the digital cinema server's show management software to confirm that Automation Event cues are actually programmed correctly into the server's playlist timeline.

Serial Communications

Use Cue Manager software to confirm that the serial command strings for cues defined in the cinema server *exactly* match the serial command strings assigned to Macro Cues stored in the automation. Command strings are case-sensitive.

Use the cinema server's show management software to confirm that serial automation cues are programmed correctly.

GPIO Communications

Review wiring between the server's GPO ports and the DA-10's GPI ports.

Use Cue Manager software to confirm that GPIO Discrete Mode or Binary Mode commands match the wiring and programming of the server's General Purpose Outputs.

Data Bus

IT WON'T WORK if you do not follow the instructions:

- ✓ You must have the wiring exactly right
- ✓ You must have the address switches in the DA-10 set correctly
- ✓ You must have the master/slave link correct in the Remote Box
- ✓ You must have the load switches set properly

The first step in trouble shooting a data bus is to check that all the basic wiring has been done correctly. The next step is to make sure that each device is properly configured for the task it has been assigned.

Take the covers off all of the devices and check that the polarity of the bus wiring is correct throughout the system. Ensure also that the data bus has not been confused with the DC + and - in the DA-10 or the AC line and Neutral in the remote boxes.

If you find these errors or hear that these errors were made and then corrected you will have to replace every 75176 chip in the system. There is one chip in each device. This is an inexpensive chip, be sure to replace them all.

While you are at each DA-10 ensure that the address dip switches are set properly as shown in Figure 20. If two or more switches are set alike the servers with the same address will stop at the same time.

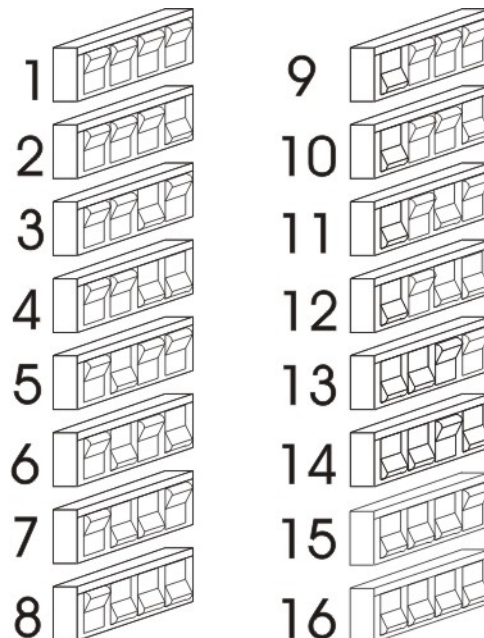


Figure 20: DA-10 Automation Address Switch Settings

Check that only one individual remote box is designated as the master. It is best if this remote is at one end of the Data Bus.

The next step is to determine which two devices are at the ends of the bus. You can tell the ends by the fact that there is only one pair of wires attached to the device. Once the ends are identified, ensure that the load switch screw in each of the end devices is turned full down. No device should have three pairs of wires attached. If you find this condition or bus wires that are spliced together in Ts along the way, the bus will have to be re-wired as a daisy chain with no Ts or Ys.

Now turn off all of the devices, DA-10s and Remote boxes alike. Measure the resistance across the Data + and -. It should be between 70 and 100 ohms. If the number is lower than 75 it indicates that some of the devices in the middle of the bus have their load screws engaged. You must find these devices and unscrew the load switch screws.

If it is higher than 100 ohms it indicates that only one-load screw is engaged. If it is very high or infinite there could be no load screws, a break, or poor connections in the line. Blown 75176 chips can also cause bad readings.

You must identify the problems and repair them. Once all of these conditions have been met the data bus is properly set up. If you have done all of these things and are still having problems you need to isolate the device or wiring that is causing them. Begin at the end of the bus with the master remote on it. Disconnect the Data + wire and turn on the device. If all is well add another device. What you are trying to do is create a very small data bus and increase it one device at a time until it fails. Each new device will have to be loaded as the end device and disconnected from the one in front of it. As they are eliminated as problems you will need to unload them again before moving on to the next device down the line.