

AMX Practical Exam Documentation

We have included all of the files required for you to complete your Programming Certification Practical. Included in this document are the instructions for the Testing Emulator, the System Requirements, and the Device Specification. Also in the Zip file is a PDF of the Video and Control drawings, Touch Panel files needed to assist you in programming, IP Addressing.txt file and the Testing Emulator the will allow you to test your program.

If you have any questions, you can reach out to traininghelp@harman.com

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Introduction

The purpose of this practical exam is to allow you the opportunity to demonstrate your knowledge and skill of NetLinx programming. Please remember the following when programming your system:

- Your program should be written so it will work in any master with any System ID.
- Any state change made to a device on the emulator must be accounted for when possible and reflected on the touch panel feedback.
- All device configurations are to be done in the program. Do not assume that it has or will be done using send commands from a terminal or any other manner.
- Program the system to use a touch panel at address 10001 connected to the master of your system using the channel numbers as described below. Provide feedback to the touch panel for each device. **Do not change the assigned channel numbers in the touch panel file as an automated test harness is used to evaluate each submission.**
- Create a program for an NI-3101-SIG with the device number of 5001.
- Include a #WARN 'I spent __ hrs on this program' message in your NetLinx code to give us an ideal of how long coding is taking for this exam.
- Include a #WARN 'System Requ ver: __ Device Specs ver: __ VideoFlow ver: __ ConnectorDetail ver: __ ControlSingleLines ver: __ ' message in your NetLinx code to let the grader know which version of these documents you used.

Include a #WARN 'Code tested on master/controller type ____ with firmware version ____'.

Deliverables

Upon completion of your code, create an .axw file which contains all relevant components of the workspace including: All source code files, Touch Panel file, module file etc. Once you have exported the workspace, go to the following URL:

<https://transfer.harman.com/filedrop/training.help@harman.com>

- In the "from" field enter your *HPU login email address*
- In the subject field enter "<First Name> <Last Name> - Professional Programmer Exam"
- Click "add files" to attach your .axw file

Documentation

The exam includes several supporting documents to better simulate a real project. Along with this System Requirements enclosed, there are also Device Specifications included in this

document with all the RS232 protocols for the devices in the system. In the zip file, there is a audio/video and a control drawings.

Use the drawings to infer the following list of information:

- The full device addresses (D:P:S) of all the devices and use them in your program.
- Proper input/output numbers for different sources on the switcher and the video projector.
- The proper input being used by the video projector.

An IP_ADDRESSING.TXT file to be used for reading into code the IP address of the laptop running the emulator. The formatting in this file must be followed exactly and all parameters correctly used in code. The file should be saved to the user root directory of the master. Your logic should support reading in the data for more than just the one device shown.

Testing Emulator

The testing emulator is meant to provide a means to test and troubleshoot the AMX Programmer Practical exam in the absence of controlled equipment. The program connects to the NetLinx master and responds as if it were a device connected to the controller.

You will still need a NetLinx master and a G4 or G5 touchpanel. The version of master is unimportant, although to fully test the practical you will need at least Duet-capable firmware. Recommended NetLinx masters are therefore any NI- or NX-series integrated controller or an NXC-ME260/64. DVX or DGX switchers meet this requirement.

Using the AMX Programmer Practical testing emulator:

You will need a relatively current JVM on the PC you intend to run the emulator. Go to www.java.com if you do not have the Java Runtime Environment. This program was written against J2SE v1.6.0_07. Older versions may work, but nothing older than 1.5. It is *not* required that Java run inside a browser session. Only the Java Runtime Environment is necessary.

Double-click the jar file to get started.

When the application opens, you will be presented with a launcher for the individual connected devices specified in the test.

First, type the IP address of the NetLinx master you will load the program to. This will populate a similar field in all the device emulators you launch. This will make it convenient to connect.

Pressing Connect on the individual device emulators will cause the that emulator to attempt a connection with the NetLinx master specified by the IP address.

NOTE: Due to a limitation of the process I used to connect, you will need to edit the DEFINE_DEVICE section of your Programmer Practical Exam. The devices are configurable, but the defaults are as follows:

12x4 matrix switcher — 8001:1:0

Video Projector — 8002:1:0

DVD player — 8003:1:0

DirecTV satellite receiver — 8005:1:0

The lighting emulator does not attempt to connect, as it is a server application and is waiting for the NetLinx master to connect on TCP port 24.

Note: In your NetLinx code, you need to use the IP address of the PC running the emulator instead of 192.168.1.112 (as required by the test).

If the connection has been successful, the connect button will turn yellow. The commands and strings to and from the NetLinx master will appear in the console window. The device should visibly react to the correct strings.

Notes on the emulator's behavior:

Each of the devices will appear as two windows. Selecting one brings the other to the front. Closing one closes the other.

Closing the Emu Launcher closes all the device emulators. Pressing 'Bring All to Front' on the Emu Launcher is a handy way to call the devices to attention without clicking on a dozen Start Menu items.

The device's behavior has been coded to Device Specification 2.1. Certain elements of the protocols have been altered in a way that is not backwards compatible with previous specifications. Emulators for the previous versions are available upon request.

Known issues:

With NX-series masters, turn off Authentication On Server Ports

Current NX-series firmware at the time of this writing has an uneasy relationship with the WDM port, which the emulator uses for device communication. This port, intended to support G3WebControl panels, pre-dates many efforts to make the controllers more secure on the network. This port does not support authentication. As a result, when Authentication On

Server Ports is checked the WDM port is closed. It cannot comply with the authentication requirement without changing the protocol. For the emulator to function, this option must be deselected.

The lighting section of the emulator attempts to open a TCP Server Socket on port 24 of the host PC. It does not attempt to alter the network firewall settings of the host PC. If the network firewall is on, either an exception must be made for TCP port 24, or the firewall needs to be turned off temporarily. Windows Firewall may also block an application's access to the network even if the specific protocol and port are allowed. Shutting off the firewall is the most expedient way to allow the lighting emulator to function.

The lighting section will not display any characters received until a line ending is encountered. This is natural behavior for the PrintStream upon which it is based. Other solutions will be explored.

There are some bizarre resize/redraw behaviors. These are cosmetic and will be dealt with in later releases.

Occasionally, the command window will be blank, even though commands have been received. This is a threading/concurrency issue between the application thread and Swing. Sending another command will cause the display to show the entire history.

If an invalid IP address is provided, that does not immediately be denied, the device emulators may have trouble letting go and accepting the new address. Closing the emulator and starting over is the workaround.

Only IPv4 addresses are recognized in the IP Address field. Attempting to use a DNS name or IPv6 address will not result in a successful connection.

Using the NetLinxPracticalExamEmulator.jar with NX –series controllers running Rev 1.4.0 or newer firmware.

- 1) Logon to the controller through the web console.
- 2) On the Security settings page under the General tab un-check "Authentication On Server Ports".

System Configuration

192.168.2.75/web/http/nxmaster/default.html#/security-general

System Configuration

Home Network **Security** System Modules

General Roles Users LDAP Profile

Modify system security settings.
Press the Accept button to save changes. Press the Cancel button to revert values from the System.

System Security

Security Presets: Low Medium High

☐ Audit Log

☐ Banner Display

☒ USB Host Port

☐ Inactivity Timeout: 10 Minutes

☐ Password Expiration: 60 Days

Cryptography Strength: Low High

Password Complexity: Low Medium High

Lockout Access

HTTP/HTTPS

Telnet/SSH/SSH FTP Access

☒ FTP Access: Port Number: 21

☒ Authentication On Server Ports

☐ Authenticate AMX Devices On ICSLAN Ports

ICSLAN AMX Device Connection

☐ Authenticate AMX Devices On LAN Ports

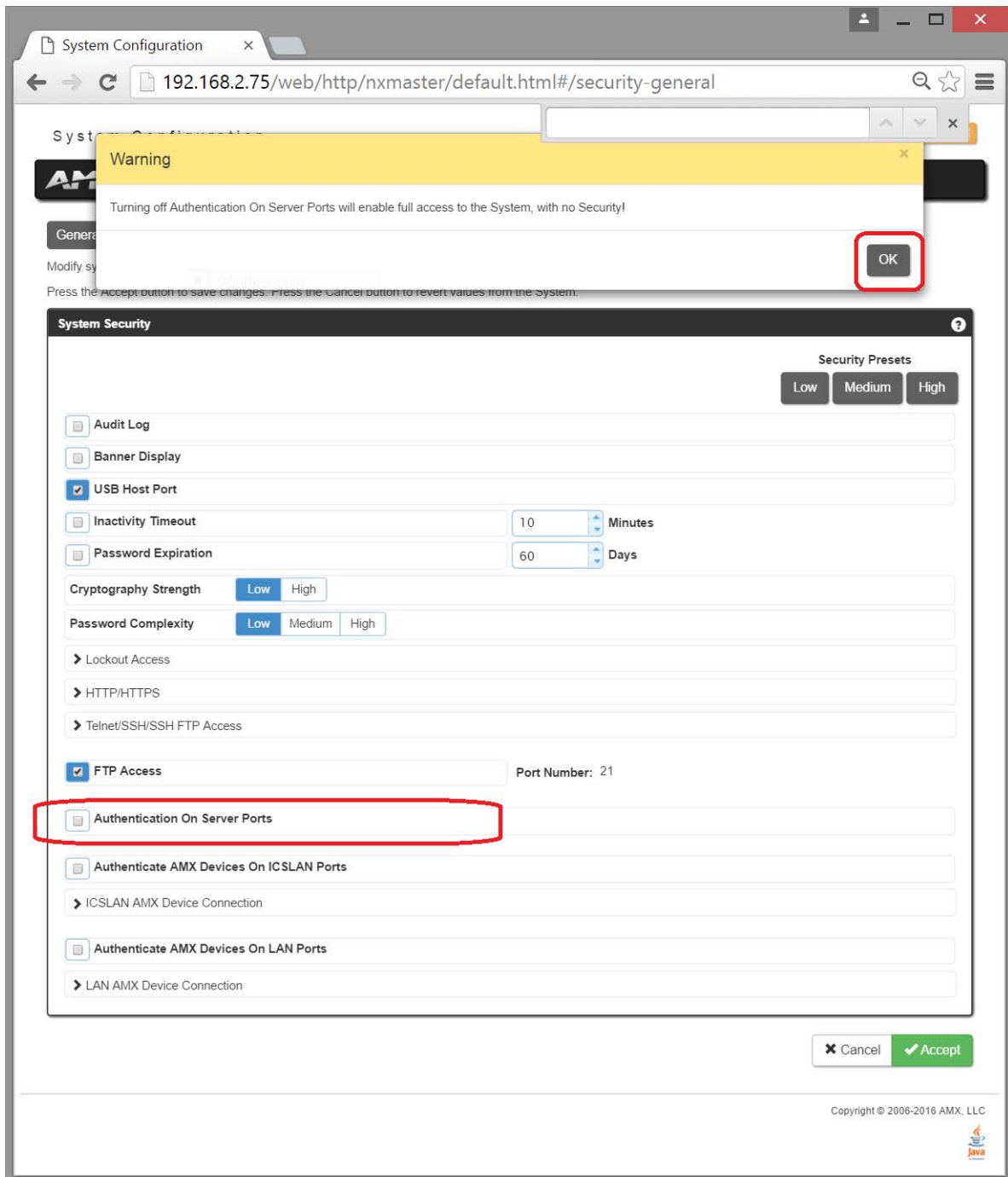
LAN AMX Device Connection

Cancel Accept

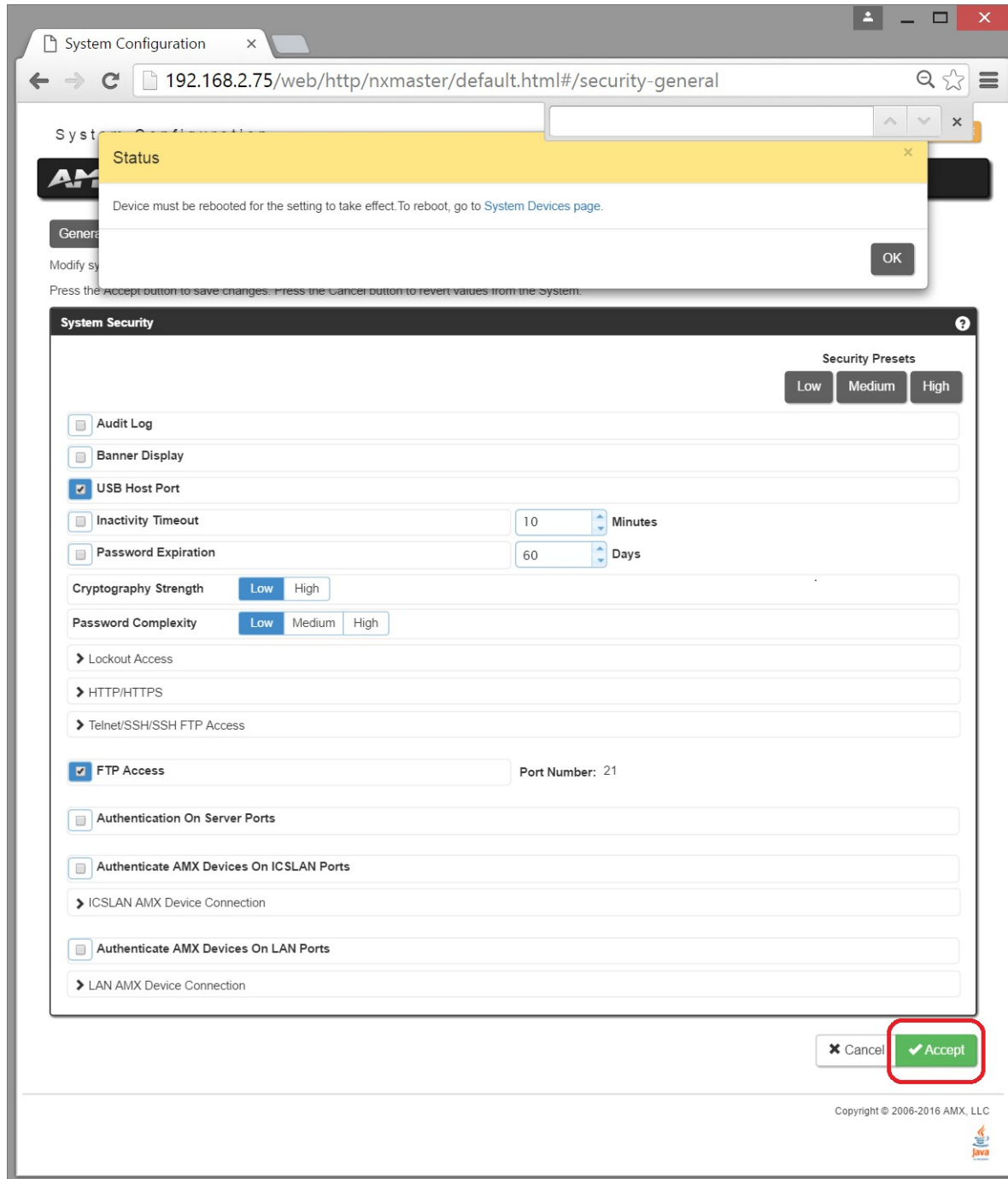
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- 3) Accept the Security Warning by clicking OK in the dialog window.



- 4) Register the change by clicking Accept. A reboot of the master is required to complete the process.



- 5) Follow the instructions in the above section Testing Emulator for emulator configuration and master connection details.

System Requirements

Overview – Please note that the screenshots below are just for your reference. Assume no feedback is handled by the panel whether it is momentary or latching.

Main Page



Description – This is the main navigation page.

BUTTON	LABEL	FEEDBACK	FUNCTION
10	Lighting Control	Momentary	
11	DVD/CD Player	Latching: On while DVD/CD Player is the active source	- Select Component input for Video Projector If the system is not on, call the system power macro.***
12	Camera Control	Latching: On while Local Camera is the active source	- Select S-Video input for Video Projector If the system is not on, call the system power macro.***

13	Satellite Receiver	Latching: On while Satellite Receiver is the active source	- Select HDMI input for Video Projector If the system is not on, call the system power macro.***
14	Security Cameras	Latching: On while one of the security cameras is the active source	- Route the active Security Camera to Video Projector - Select Composite input for Video Projector If the system is not on, call the system power macro.***
15	Room Control	Momentary	
105	Power	Latching: On while System Power is on	- Refer to the Room Control Page description for more information

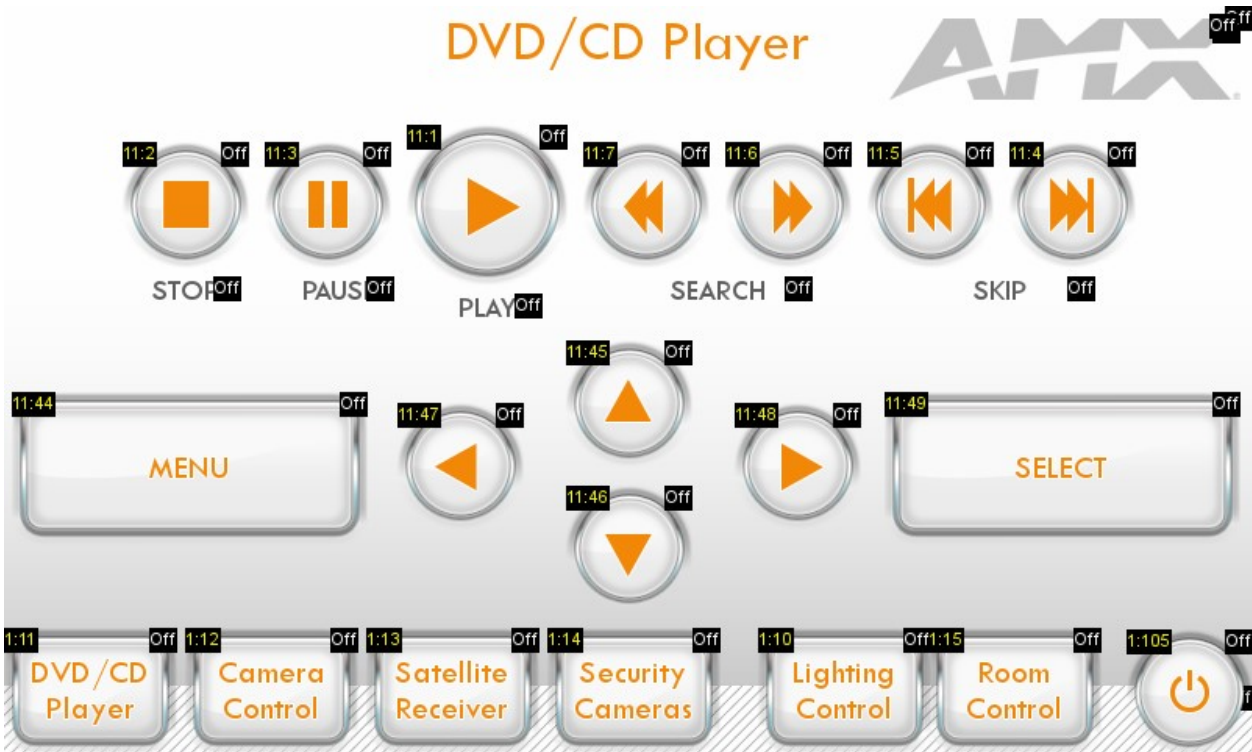
***** See the Room control page for the details of the system power macros.**

Programming Requirements – Please remember that all the devices are on a NI-3101SIG at an address of 5001.

1. Create a variable to keep track of which source is currently selected.
2. Provide appropriate feedback for the four “source” buttons using the variable specified in the first requirement.
3. Since the projector is performing the source selection, the variable should be updated by any input changes to the projector. (See room control page)



DVD/CD Player Page



Description – This DVD/CD Player switches to a different mode based on the disc inserted into the player and it will notify the programmer of the status change.

BUTTON	LABEL	FEEDBACK	FUNCTION
1 – 3 & 6 – 7	PLAY, STOP, PAUSE, SEARCH FWD & REV	Latching	- Send the corresponding command
4 – 5	SKIP FWD & REV	Momentary if confirmed by the DVD/CD Player	- Send the corresponding command
44 – 49	MENU, UP, DOWN, LEFT, RIGHT & SELECT	Momentary if confirmed by the DVD/CD Player	- Send the corresponding command - Navigation buttons should be disabled if the DVD/CD Player is in the CD mode.

Programming Requirements

**** Please note that programming of the DVD transports is optional. No points are deducted if you choose not to provide code for this section. However, you will earn up to 5 bonus points added to your final score if you choose to complete these programming requirements.**

1. The DVD/CD Player must be given a correct device address (D:P:S) based on the system drawing.
2. The device must be properly configured for control in the DATA_EVENT.
3. The programmer must correctly use the RS232 protocol for this DVD/CD Player (Device Specification.doc) and provide feedback by parsing the responses when applicable.
4. Periodically check for player status while the system power is on with a TIMELINE.
5. Please note that the "Transport Status Inquiry" command for this device only responds with a valid reply when the power is on so please use this command to detect power status for the unit. Remember to continue polling for the status every second and use the response to turn on the DVD/CD Player when selected as a source.

Camera Control Page



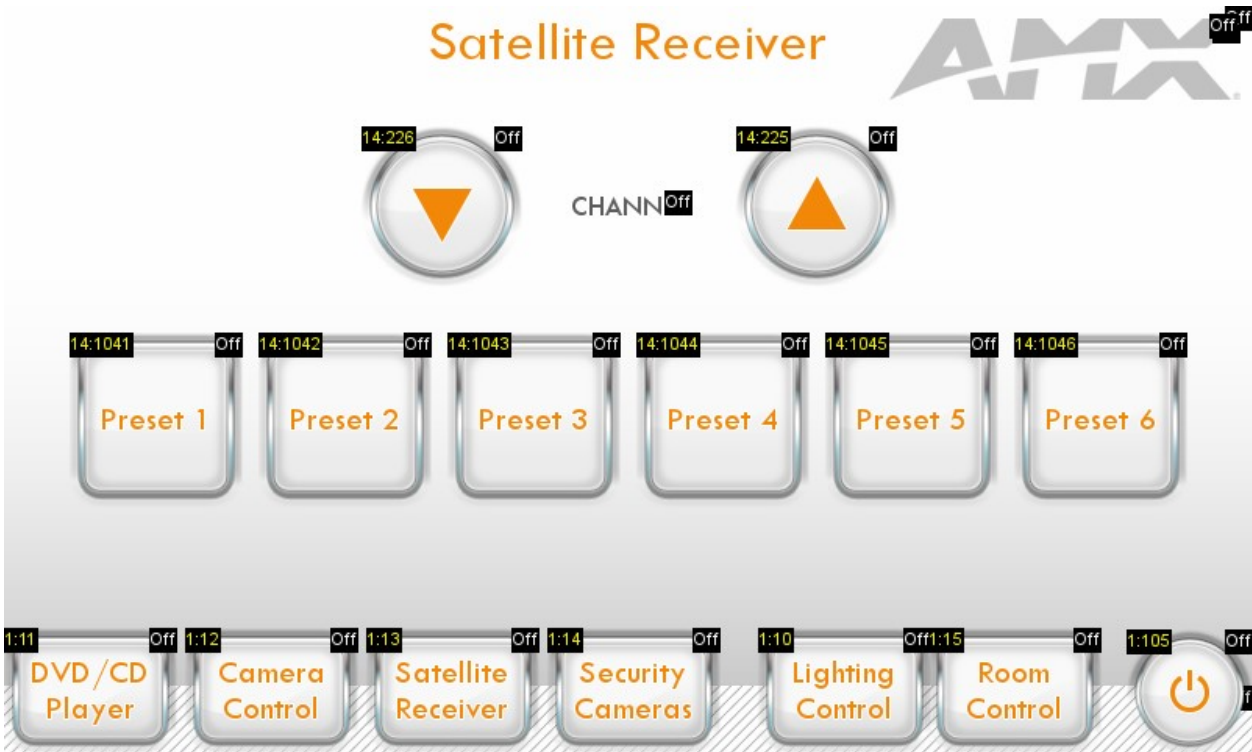
Description – This Local Camera will be controlled using a Duet module. For the purpose of the exam, only the COMM (.jar) module for Sony EVID100 will be used.

BUTTON	LABEL	FEEDBACK	FUNCTION
132 – 135 & 158 – 159	UP, DOWN, LEFT, RIGHT & ZOOM +/-	Latching while confirmed by Local Camera (Duet Virtual Device)	Turn on the proper SNAPI channel number for the Duet Virtual Device while the buttons are held down.
3016	FOCUS	N/A	Track when the Active Bargraph is being used by the user by setting a flag (variable) on PUSH/RELEASE.
261 – 263	PRESET 1 – 3	Latching: Only one button on if confirmed by Local Camera (Duet Virtual Device)	Send a proper command to the Duet Virtual Device to call the appropriate preset.

Programming Requirements

1. The Camera must be given a correct device address (D:P:S) based on the system drawing.
2. The Duet Virtual Device for the module must be given a valid Duet virtual device number.
3. Sony EVID100's COMM module (.jar) must be properly added to the main program.
Remember to use only the module for control and feedback of the camera.
4. The device must be properly configured for control in the DATA_EVENT.
5. The programmer must correctly use SNAPI explained in "Sony EVID100 Interface.doc" for this Camera and provide feedback by parsing the responses when applicable.
6. Program the active bargraph to update the focus level while the bargraph is being touched and display the focus level from the camera (Duet Virtual Device) while the bargraph is not being touched by the user.

Satellite Receiver Page



Description – This Satellite Receiver will be controlled via IR.

BUTTON	LABEL	FEEDBACK	FUNCTION
1041 – 1046	Preset 1 – Preset 6	Momentary	- Send predefined Preset channels using the XCH command in mode 1
225 – 226	Channel UP & DOWN	CHANNEL_EVENTS on Satellite Receiver	Pulse IR codes for channel up and down

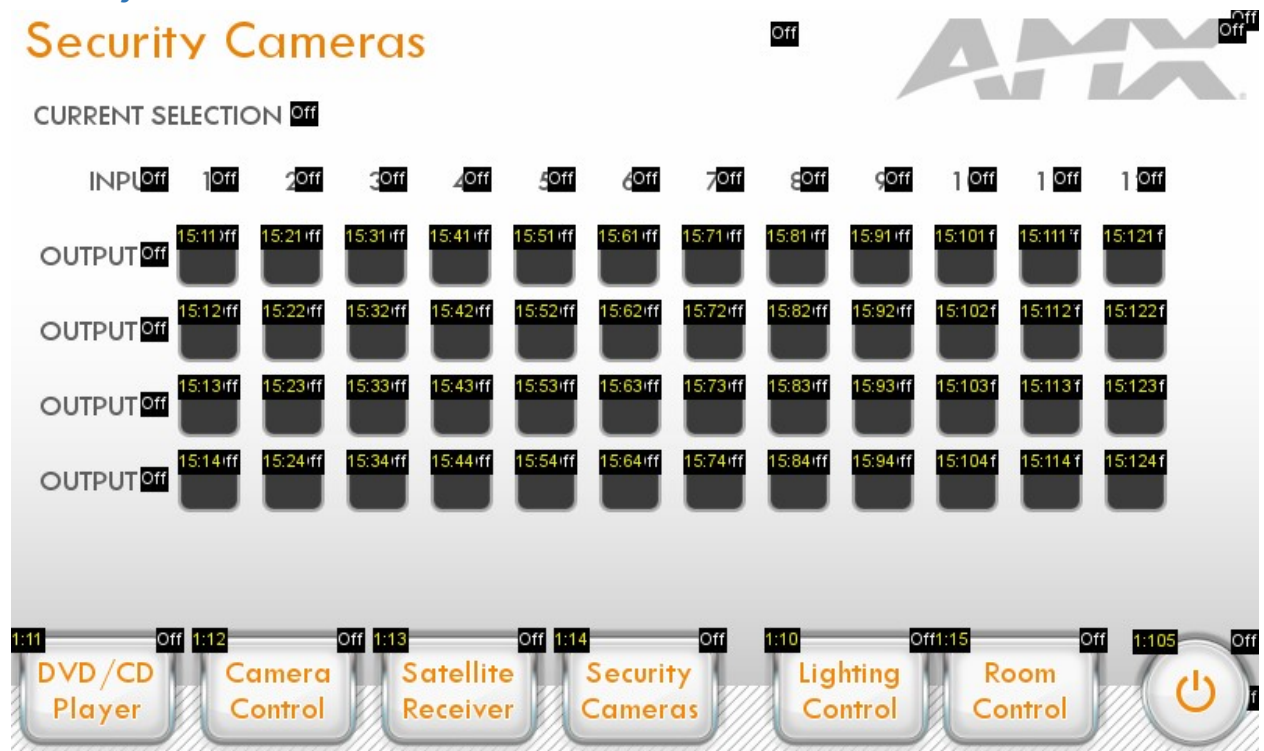
Programming Requirements

1. The Satellite Receiver must be given a correct device address (D:P:S) based on the system drawing.
2. The device must be properly configured for control in the DATA_EVENT. This includes setting the carrier on, the mode to IR, and the queuing times to 3 tenths of a second on and 2 tenths of a second off. See the IR/Serial port SEND_COMMANDs in AMX-2.
3. The programmer must demonstrate the ability to find the proper IR file and map it to the correct IR device.

4. Provide feedback for “Channel UP & DOWN” buttons by using CHANNEL_EVENTS from the IR device.
5. Create an integer array and assign 6 TV station numbers during the ONLINE event for this device.

Security Cameras

Security Cameras



Description – This Security Cameras page provides direct control over the Matrix Switcher. Please note that all the buttons on this page are on TP’s Port 15.

BUTTON	LABEL	FEEDBACK	FUNCTION
11 – 14	N/A	Latching: Turn on Button 11 – 14 when Input 1 is connected to Outputs 1 – 4 respectively.	- Route Input 1 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
21 – 24	N/A	Latching: Turn on Button 21 – 24 when Input 2 is connected to Outputs 1 – 4 respectively.	- Route Input 2 to Outputs 1 – 4 respectively - Select Composite input for Video Projector

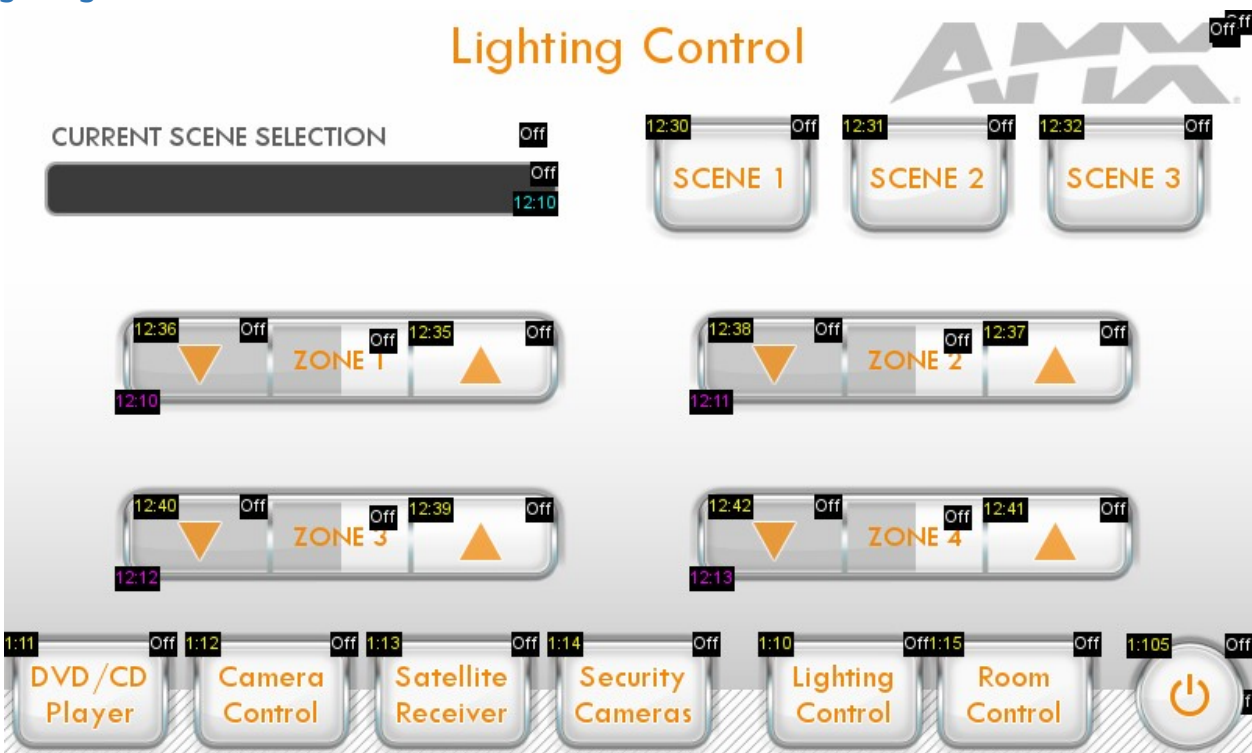
31 – 34	N/A	Latching: Turn on Button 31 – 34 when Input 3 is connected to Outputs 1 – 4 respectively.	- Route Input 3 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
41 – 44	N/A	Latching: Turn on Button 41 – 44 when Input 4 is connected to Outputs 1 – 4 respectively.	- Route Input 4 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
51 – 54	N/A	Latching: Turn on Button 51 – 54 when Input 5 is connected to Outputs 1 – 4 respectively.	- Route Input 5 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
61 – 64	N/A	Latching: Turn on Button 61 – 64 when Input 6 is connected to Outputs 1 – 4 respectively.	- Route Input 6 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
71 – 74	N/A	Latching: Turn on Button 71 – 74 when Input 7 is connected to Outputs 1 – 4 respectively.	- Route Input 7 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
81 – 84	N/A	Latching: Turn on Button 81 – 84 when Input 8 is connected to Outputs 1 – 4 respectively.	- Route Input 8 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
91 – 94	N/A	Latching: Turn on Button 91 – 94 when Input 9 is connected to Outputs 1 – 4 respectively.	- Route Input 9 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
101 – 104	N/A	Latching: Turn on Button 101 – 104 when Input 10 is connected to Outputs 1 – 4 respectively.	- Route Input 10 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
111 – 114	N/A	Latching: Turn on Button 111 – 114 when Input 11 is connected to Outputs 1 – 4 respectively.	- Route Input 11 to Outputs 1 – 4 respectively - Select Composite input for Video Projector

121 – 124	N/A	Latching: Turn on Button 121 – 124 when Input 12 is connected to Outputs 1 – 4 respectively.	- Route Input 12 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
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Programming Requirements

1. The Matrix Switcher must be assigned a correct device address (D:P:S) based on the drawing.
2. The device must be correctly configured for control in the DATA_EVENT.
3. The programmer must demonstrate the ability to use BUTTON_EVENT stacking or a channel array to combine multiple events into one stack of code.
4. The programmer must correctly use the RS232 protocol for the Matrix Switcher and provide feedback by parsing the responses when applicable.
5. The string parsing routine should account for future expansion possibilities and be able to parse multiple digit input & output numbers.
6. The programmer must track switcher status based on the responses coming back from the switcher. Please use a variable to track the input and an array to track the switcher status (similar to the Programmer 2 switcher exercise).

Lighting Control



Description – This Lighting Control device has an IP address of 192.168.1.112 and Unit ID of 1.

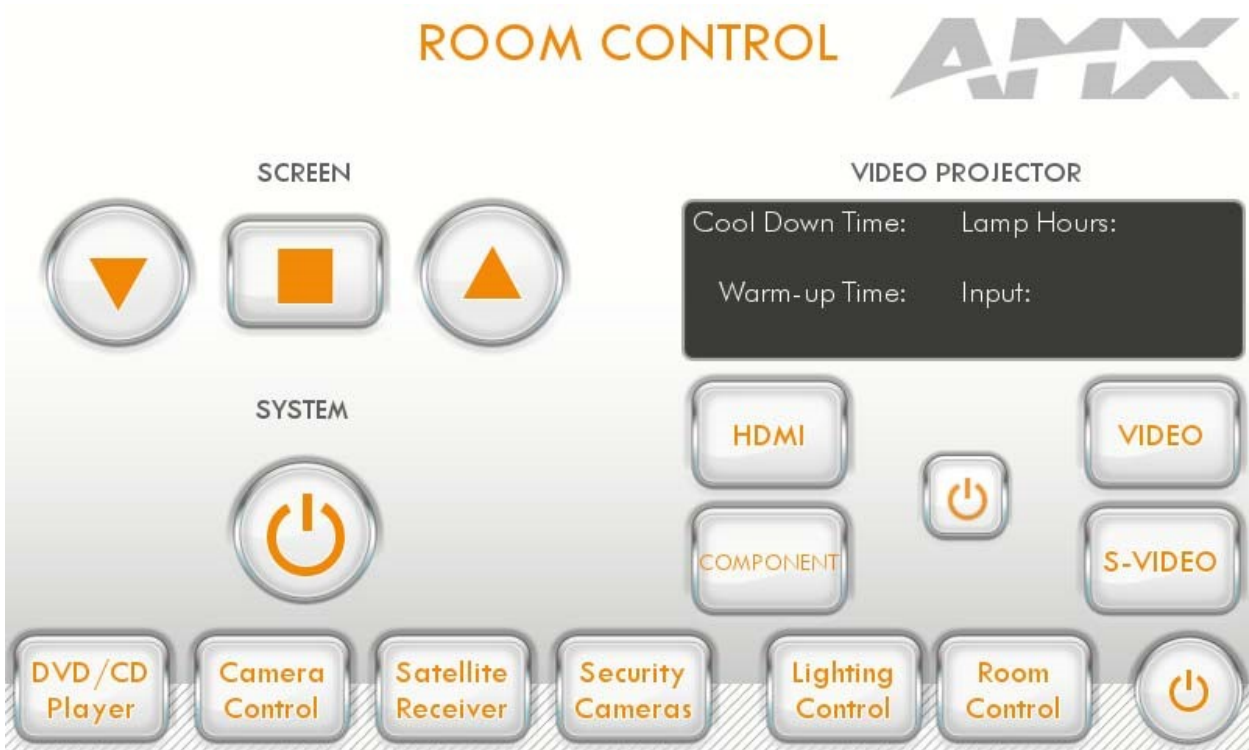
BUTTON	LABEL	FEEDBACK	FUNCTION
30 – 32	SCENE 1 – 3	Flash while recalling then latch once the scene has been set	- Recall the proper scene (preset) information - Display the scene name in the text window (Address Code 10)
35 – 36	Arrow Up & Down	Momentary	- Raise or lower dimmer for zone 1 - Display zone intensity on zone 1 bargraph
37 – 38	Arrow Up & Down	Momentary	- Raise or lower dimmer for zone 2 - Display zone intensity on zone 2 bargraph
39 – 40	Arrow Up & Down	Momentary	- Raise or lower dimmer for zone 3 - Display zone intensity on zone 3 bargraph
41 – 42	Arrow Up & Down	Momentary	- Raise or lower dimmer for zone 4 - Display zone intensity on zone 4 bargraph

Programming Requirements

1. The Lighting Control must be given a correct device address (D:P:S) based on the drawing.
2. The device must be correctly configured for control in the DATA_EVENT.
3. The IP address, port and protocol must be read in from the IP_ADDRESSING.TXT file and properly used in code to establish a connection to the lighting device on the emulator.
4. The programmer must correctly use the TCP/IP protocol for this Lighting Control and provide feedback by parsing the responses when applicable.
5. Define a structure to store the light intensity and the fade time. Define another structure to store a scene (preset) name and four instances of the structure defined previously. Finally, create an array to store three instances of the second structure and use it to store lighting presets for the system.
6. Initialize the preset array defined above when the master comes online.
7. Initiate connection to the Lighting Control device when the master comes online and maintain connection in case of any error/disconnect. Also ensure the lights connect if the lighting interface comes online after the master.
8. Report any dimmer level changes coming from the device to the appropriate bargraphs. The bargraph levels have the range of 0 – 255.



Room Control Page



Description – This Room Control page provides Projector Screen control, Video Projector and System Power.

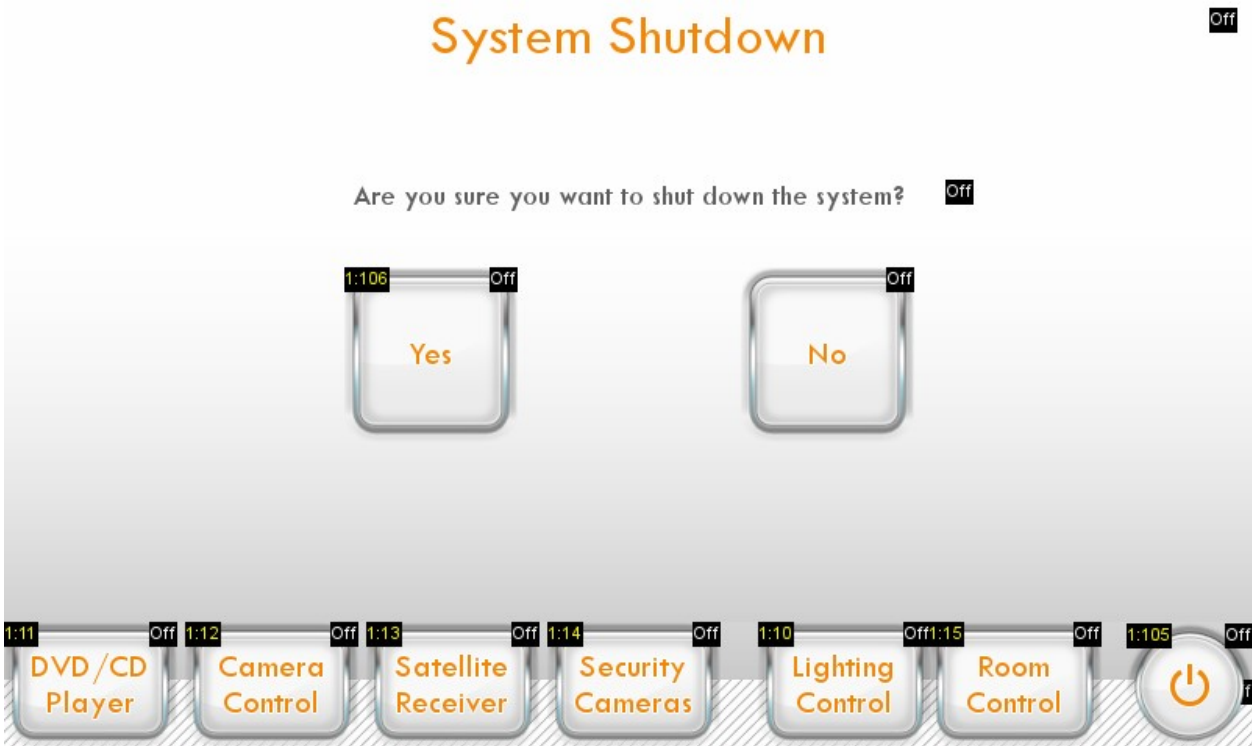
BUTTON	LABEL	FEEDBACK	FUNCTION
31 – 34	HDMI, Component, S-VIDEO & VIDEO	Latching: On after confirming source select	- Send the proper command - Update the Input text field (Address code 15) when the change is confirmed.
255	Power	Latching: On after confirming Power On. Off after confirming Power Off.	- Send Power On/Off command based on the power status. - Begin polling for Lamp Hour every 30 seconds and update the Lamp Hour text field (Address code 14) with the value. - Update Cool Down Time (Address code 12) while cooling down. - Update Warming Up time (Address code 13) while warming up.

101 – 103	Screen UP, DOWN & STOP	- Use CHANNEL_EVENT - Screen UP ON while relay UP is on and etc...	- Relays for UP & DOWN need to be engaged for 2.5 seconds. - Relay for STOP needs to be engaged for 0.5 seconds.
			- Prevent relays from turning on at the same time
105	System Power	Latching: On if System Power is ON. Off if System Power is OFF.	- If the system power is off, turn amplifier power and device power on according to the “Device Specification.doc”. - Turn on the popup “Confirm” if the system is on.

Programming Requirements

1. The relay and the Video Projector must have proper device addresses (D:P:S) assigned to them based on the system drawing.
2. The Video Projector must have proper configuration for control in the DATA_EVENT.
3. The programmer must correctly use the RS232 protocol for this Video Projector and provide feedback by parsing the responses when applicable.
4. Create a DEFINE_FUNCTION with a return type to calculate the checksum for all the Video Projector commands.

System Shutdown Confirmation Page



Description –This System Shutdown Confirmation Page comes up when the System Power buttons is pressed while the system is ON.

BUTTON	LABEL	FEEDBACK	FUNCTION
106	Yes	Momentary	Initiate the 'System Power Off' macro
N/A	No	Momentary	Close the "Confirm" popup.

Programming Requirements

- The 'System Power Off' macro should include the following list of events.
 - 0 Seconds – Turn off Satellite Receiver & DVD/CD Player. Turn off Video Projector & Local Camera as well.
 - 2 seconds – Raise the screen
 - 6 seconds – Turn off amplifier power**
 - 10 seconds – Turn off device power**
- The 'System Power On' macro should include the following list of events.
 - 00 seconds – Turn on device power relay **, lower the screen & turn on Video

Projector

- b. 01 seconds – Turn on amplifier power relay **
- c. 31 seconds – If a source button initiated the macro then turn on the source and switch Video Projector to the appropriate input.

** Refer to the System Drawing to figure out which relay channels are needed.

Virtual Keypad

Description - Integrate an instance of Virtual Keypad to the system and implement source select (Security Cameras, DVD/CD Player, Room Camera and Satellite Receiver) and system power button.

BUTTON	LABEL	FEEDBACK	FUNCTION
5	DVD/CD	Same as DVD/CD Player button	- Same as the DVD/CD Player button
6	Camera	Same as Camera button	- Same as the Camera button
7	Sat. Rcvr.	Same as Satellite Receiver button	- Same as the Satellite Receiver button
8	Security Camera	Same as Security Cameras button	- Same as the Security Cameras button
12	System Power	Latching	- If the system power is off, turn on amplifier and device power. - If the system power is on, turn off amplifier and device power. (Note this is slightly different from how the TP button behaves.)

Programming Requirements

1. The virtual device must be given a proper device address (D:P:S) based on the Duet Virtual Device addressing scheme.
2. The keypad must be properly configured with proper button labels on the ONLINE event.

Touch Panel

Programming Requirements

1. Query the touch panel device for its MAC address using the “”?MAC” command.
2. Save the MAC address as received in the custom event to an ASCII text file in the user root directory of the master.

3. The file must be named MAC_ADDRESSING.TXT.
4. The file csv format must be as follows
 - a <D:P:S>,<macAddress>,<date&Time>
5. Your logic should support entries for multiple device entries but only one entry for each device.

Device Specifications

Introduction

The following document includes all the control protocols for the system. Please note that the commands listed here are complete and there are no other commands available which means, don't assume there are other commands due to similarities to other existing protocols.

Matrix Switcher

Serial Port Configuration: RS232 – 9600, N, 8, 1 – No hardware handshaking **Serial Protocol**

ASCII command protocol:

To execute a switch: `#*#S`

The first number is the desired input number, the second number is the desired output number and the letter S is to execute the switch. For example, `3*2S` will switch Input 3 to Output 2. `4*2S` will switch Input 4 to Output 2.

In response to any switch commands, the switcher will respond with `OUT#IN#S` if it was successful or append X to the original command to report an error. For example, if `7*1S` is sent to the switcher, you may receive `OUT1IN7S` for confirmation. If `31*5S` is sent to the switcher, you will receive `31*5X` as an error. As another example, if `12*4S` is sent to the switcher then you may receive `OUT4IN12S` for a confirmation.

Lastly, the switcher will also report any switcher changes initiated by the front panel to the third-party control device (i.e. AMX) if the control device is connected to the RS232 port.

Video Projector

Serial Port Configuration: RS232 – 38400, N, 8, 1 – No hardware handshaking **Serial Protocol**

PC Control Codes - \$xx indicates a hexadecimal character

Function	Code Data	Response
POWER ON	\$02, \$00, \$00, \$00, \$00, CKS	\$22, \$00, \$00, \$D0, \$00, CKS
POWER OFF	\$02, \$01, \$00, \$00, \$00, CKS	\$22, \$01, \$00, \$D0, \$00, CKS
INPUT SELECT HDMI	\$02, \$03, \$00, \$00, \$02, \$01, \$01, CKS	\$22, \$03, \$00, \$D0, \$01, \$01, CKS
INPUT SELECT COMPONENT	\$02, \$03, \$00, \$00, \$02, \$01, \$11, CKS	\$22, \$03, \$00, \$D0, \$01, \$11, CKS
INPUT SELECT VIDEO	\$02, \$03, \$00, \$00, \$02, \$01, \$06, CKS	\$22, \$03, \$00, \$D0, \$01, \$06, CKS
INPUT SELECT S-VIDEO	\$02, \$03, \$00, \$00, \$02, \$01, \$0B, CKS	\$22, \$03, \$00, \$D0, \$01, \$0B, CKS
PICTURE MUTE ON	\$02, \$10, \$00, \$00, \$00, CKS	\$22, \$10, \$00, \$D0, \$00, CKS
PICTURE MUTE OFF	\$02, \$11, \$00, \$00, \$00, CKS	\$22, \$11, \$00, \$D0, \$00, CKS
LAMP INFORMATION*	\$03, \$8C, \$00, \$00, \$00, CKS	\$23, \$8C, \$00, \$04, \$XX, \$XX, \$XX, CKS
RUNNING STATUS REQUEST**	\$00, \$85, \$00, \$D0, \$01, \$01, CKS	\$20, \$85, \$00, \$D0, \$01, \$SS, \$II, CKS

All other commands, or incorrectly formatted commands will be ignored by the projector and will not generate any response. The projector has 30 seconds of warm-up time and 75 seconds of cool-down time at which point only the RUNNING STATUS REQUEST command will be accepted.

CKS (Checksum) – The checksum is calculated by adding all the bytes in the command and if the total is greater than a byte then take the lower byte as the checksum.

For example, the checksum for the Power On command (\$02, \$00, \$00, \$00, \$00, CKS) is calculated by adding all the bytes and taking the sum

$$\$02 + \$00 + \$00 + \$00 + \$00 =$$

$$\$02.$$

As for the commands like the RUNNING STATUS REQUEST, the sum of all the bytes total up to \$00 + \$85 + \$00 + \$D0 + \$01 + \$01 = \$157 which is greater than a byte so please take the lower byte of \$57 as the checksum.

The checksum should be verified when receiving information from the device. If the string received is \$20, \$85, \$00, \$D0, \$01, \$00, \$76 then add up all the bytes except for the last byte, take the lower byte and compare the sum to the last byte. $\$20 + \$85 + \$00 + \$D0 + \$01 + \$00 = \$176$. Therefore, the string in the example has the correct checksum.

**LAMP INFORMATION* – All bytes (hex numbers) are stored in reverse. In order to convert these values into decimal numbers, launch the Windows calculator in the scientific mode and type the bytes in reverse then convert it to a decimal number. For example, \$30, \$2A, \$00, \$00 should be typed in as 00 00 2A 30 in Hex and then click on the Dec radio button to convert. The answer should be 10800.

\$XX, \$XX, \$XX, \$XX – Stores the current lamp time in seconds. For example, \$30, \$2A, \$00, \$00 is equal to 10800 seconds.

***RUNNING STATUS REQUEST* – Returns the projector status in response to the Running Status Request command. The status information is embedded in the sixth byte and it can store one of four values:

- \$00 – Idling
- \$03 – Warming Up
- \$04 – Power On
- \$05 – Cooling

The seventh byte contains the currently selected input:

- \$01 – HDMI
- \$06 – Video
- \$0B – S-Video
- \$11 – Component

Lighting Control

TCP/IP Port Configuration: TCP/IP Server – Port 24, Default IP Address – 192.168.1.112 **TCP/IP Protocol**

Syntax Conventions – The following conventions are used for the API command descriptions in this chapter. All of the commands are case sensitive. All commands must be terminated with a carriage return. Responses are terminated with a carriage return and line feed pair.

FADEDIM

Syntax

FADEDIM, <intensity>, <fade time>, <delay time>, <address>

Parameter	Description	Format
intensity	Target intensity for specified dimmer	0 – 100 (percent)
fade time	Time for dimmers to fade from current intensity to target intensity	If omitted, time defaults to 0 seconds
delay time	Time for dimmers to delay before starting to fade	If omitted, time defaults to 0 seconds
address	System address of dimmer to fade	[unit #:zone #]

Description

Fades one or more system dimmers to a target intensity using a specified fade time and after a specified delay time.

Example

Fade unit 1, zone 2, to 100% with a 3 second fade time and a 4 second delay time

FADEDIM,100,3,4,[1:2]

RAISEDIM

Syntax

RAISEDIM, <address>

Parameter	Description	Format
address	System address of zones to fade	[unit #:zone #]

Description

Starts raising one or more dimmers

Example

Start raising unit 1, zone 3

RAISEDIM,[1:3]

LOWERDIM

Syntax

LOWERDIM, <address>

Parameter	Description	Format
address	System address of zones to fade	[unit #:zone #]

Description

Starts lowering one or more dimmers

Example

Start lowering unit 1, zone 3

LOWERDIM,[1:3]

STOPDIM

Syntax

STOPDIM, <address>

Parameter	Description	Format
address	System address zones to fade	[unit #:zone #]

Description

Stops raising/lowering one or more dimmers

Example

Stop raising/lowering unit 1, zone 3

STOPDIM,[1:3]

DL Monitor Output (Dimmer Level Monitor String)

Syntax

DL,<address>,<level>

Parameter	Description	Format
Address	System address of zone that changed	[unit #:zone #]
Level	New level of the zone	0 – 100 (percent)

Description

The DL monitor string is output from a unit when any zone in the system changes level. The lighting system will send out one DL status message for every 1 percent change in level on any load regardless of the ramp rate. In addition, the status messages are sent from the lighting interface regardless of how the change was initiated (whether by a lighting keypad, a lighting controller automated event, or via IP command from a third party control system).

Example

Unit 1, zone 4 changes level to 50%

DL,[1:4],50

DVD Player

Serial Port Configuration: RS232 - 9600, N, 8, 1 – No hardware handshaking

Serial Protocol

The protocol is as follows (\$xx indicates a hexadecimal character) all commands and responses are terminated by a carriage return:

Stop – \$20, \$20

Play – \$20, \$21

Pause – \$20, \$22

Search Rev – \$20,

\$31 Search Fwd –

\$20, \$32 Skip Rev –

\$20, \$33 Skip Fwd –

\$20, \$34

Menu (DVD only) – \$24, \$2A

Select (DVD only) – \$24, \$2B

Arrow up (DVD only) – \$24, \$2C

Arrow down (DVD only) – \$24,
\$2D Arrow right (DVD only) –
\$24, \$2E Arrow left (DVD only) –
\$24, \$2F Disc Type Inquiry –
\$21, \$11 Transport Status
Inquiry – \$21, \$12 Power Toggle
– \$22, \$00

The Player will respond to the Disc Type Inquiry with the Disc Type

Responses below:

DVD – \$11, \$01

CD – \$11, \$02

No Disc – \$11, \$03

The Player will respond to the Transport Status Inquiry with the Transport Status

Responses below while the power is on:

Play – \$12, \$01

Stop – \$12,

\$02 Pause –

\$12, \$03

Search Rev – \$12, \$06

Search Fwd – \$12, \$07

The player will send the Disc Type responses whenever a disc is changed and when the player is powered on.

The player will respond with a \$06 if the command is valid or a \$05 if the command is not valid. The inquiry command will only receive the command responses listed above.

If the player is off, a Transport Status Inquiry will be NAK'd (\$05 will be sent).

Integrated Camera with Pan/Tilt

Please refer to the Sony EVID100 Duet module documentation for more information.

In order to obtain the module, launch your web browser and go to [the AMX website](#).

Motorized Projection Screen

The circuits for up and down need to be latched for 2.5 seconds to make the screen move. Once this is done, the screen will travel until it reaches its internal limit.

The circuit for stop will interrupt the screen's motion before the limit is reached. The

stop contact is momentary but needs to be engaged for at least ½ second.

Do not energize two or more of these contacts at the same time. Damage to the screen control will result.

Power

There are two contact-closure-controlled devices: an amplifier and a rack mounted power strip.

To avoid a popping sound coming from the speakers, the amplifier should be turned on at least one second after the rack power strip. When shutting down the system, the amplifier should be turned off at least one second before turning off the rack power.

Satellite Receiver

IR Port Configuration: IR-1 – Carrier On – IR Mode

Please use the IR file for DirecTV HR20 (DIRECTv8_DISCRETES.IRL).

In order to obtain the IR file, launch your web browser and go to [the AMX website](http://the.AMX.website).