AMX Programmer Certification Practical Exam

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.
- 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.
- Create a program for a 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.

Supporting Documents

The exam includes several supporting documents to better simulate a real project. Along with this System Requirements document, there is Device Specification document with all the RS232 protocols for the devices in the system. In addition, there is an A/V drawing and a control drawing. 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.

Deliverables

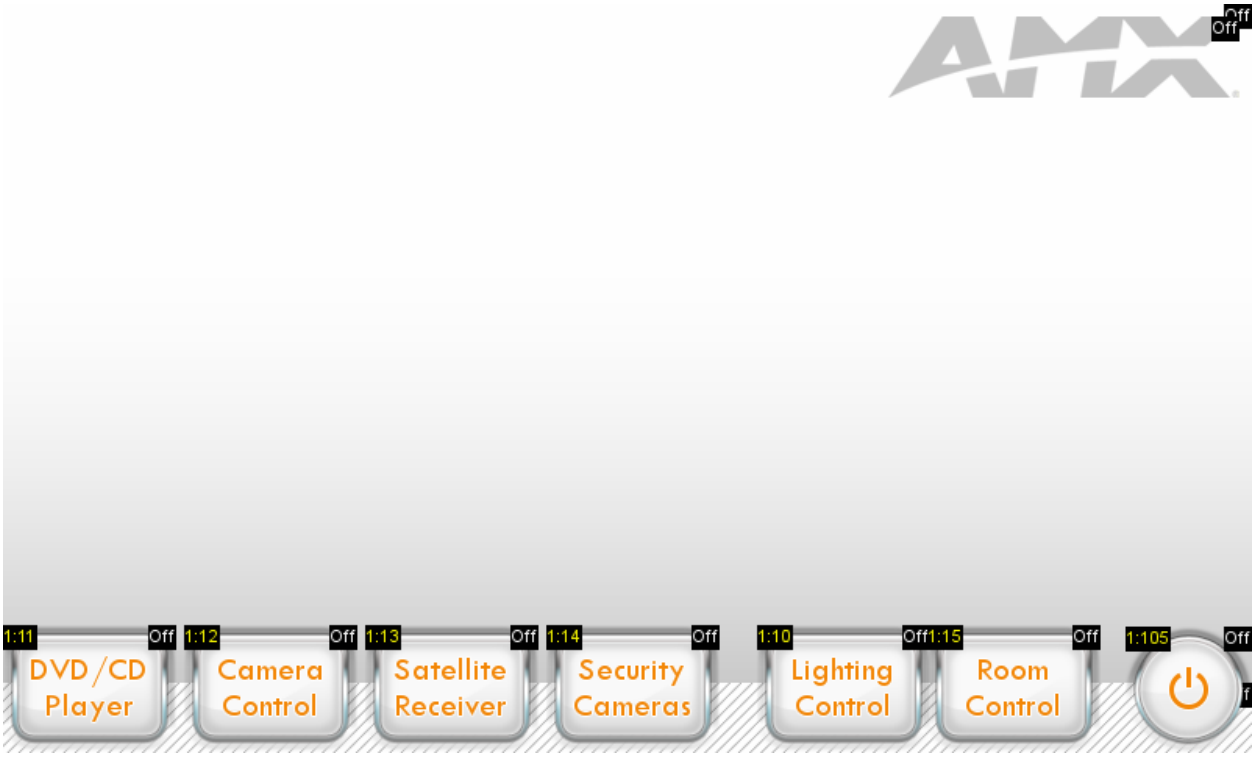
Your single exported workspace (apw) file (which should include AXS, IR and TP4 files) can be submitted by:

- Entering **AMX University**
- Clicking **Learn Tracks & Courses**
- Launching the **ONL – Programmer 2 Practical Exam** -OR- **ONL – Programmer 2 Maintenance Practical Exam**
- Once exam launches, **follow on-screen instructions to upload** your practical

System Requirements

Overview – Please note that the screenshots below are just for your reference. Assume no feedback is handled by the panel whether it's 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	Latching: On while one	- Route the active Security Camera to Video

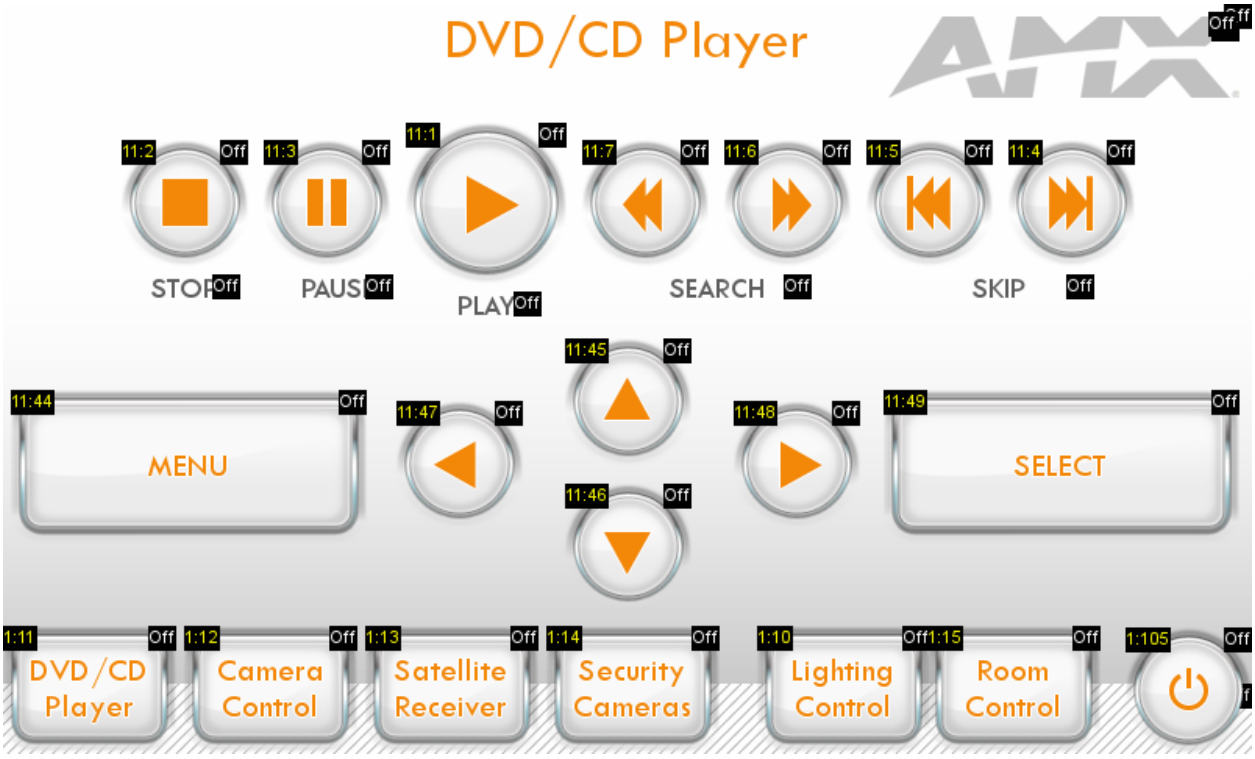
	Cameras	of the security cameras is the active source	Projector - Select Composite input for Video Projector If the system is not on, call the system power macro.***
15	Room Control	Momentary	
105	Power	Latching: On while System Power is on	- Refer to the Room Control Page description for more information

****** 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.

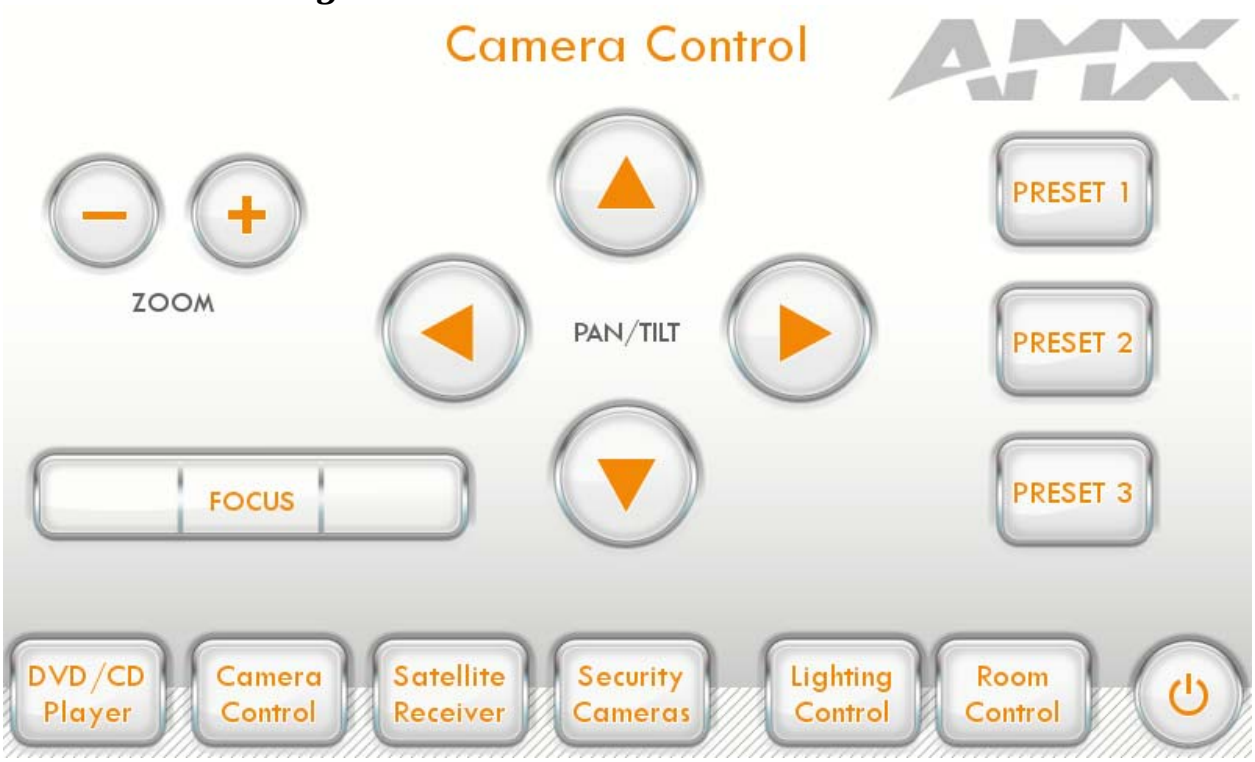
BUTTON	LABEL	FEEDBACK	FUNCTION
1 – 3 & 6 – 7	PLAY, STOP, PAUSE, SEARCH FWD & REV	Latching	- Send the corresponding command
4 – 5	SKIP FWD & REV	Momentary if confirmed by the DVD/CD Player	- Send the corresponding command
44 – 49	MENU, UP, DOWN, LEFT, RIGHT & SELECT	Momentary if confirmed by the DVD/CD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

Programming Requirements

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.

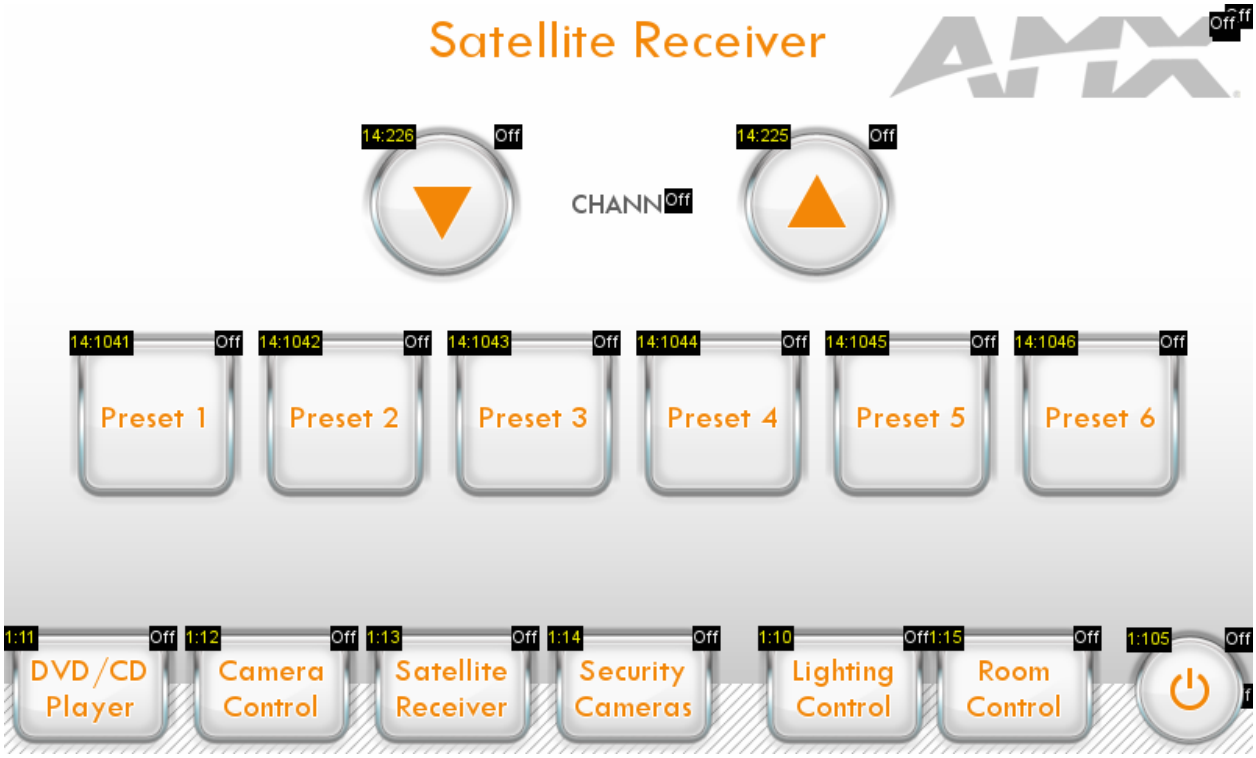
BUTTON	LABEL	FEEDBACK	FUNCTION
132 – 135 & 158 – 159	UP, DOWN, LEFT, RIGHT & ZOOM +/-	Latching while confirmed by Local Camera (Duet Virtual Device)	Turn on the proper SNAPI channel number for the Duet Virtual Device while the buttons are held down.
3016	FOCUS	N/A	Track when the Active Bargraph is being 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.

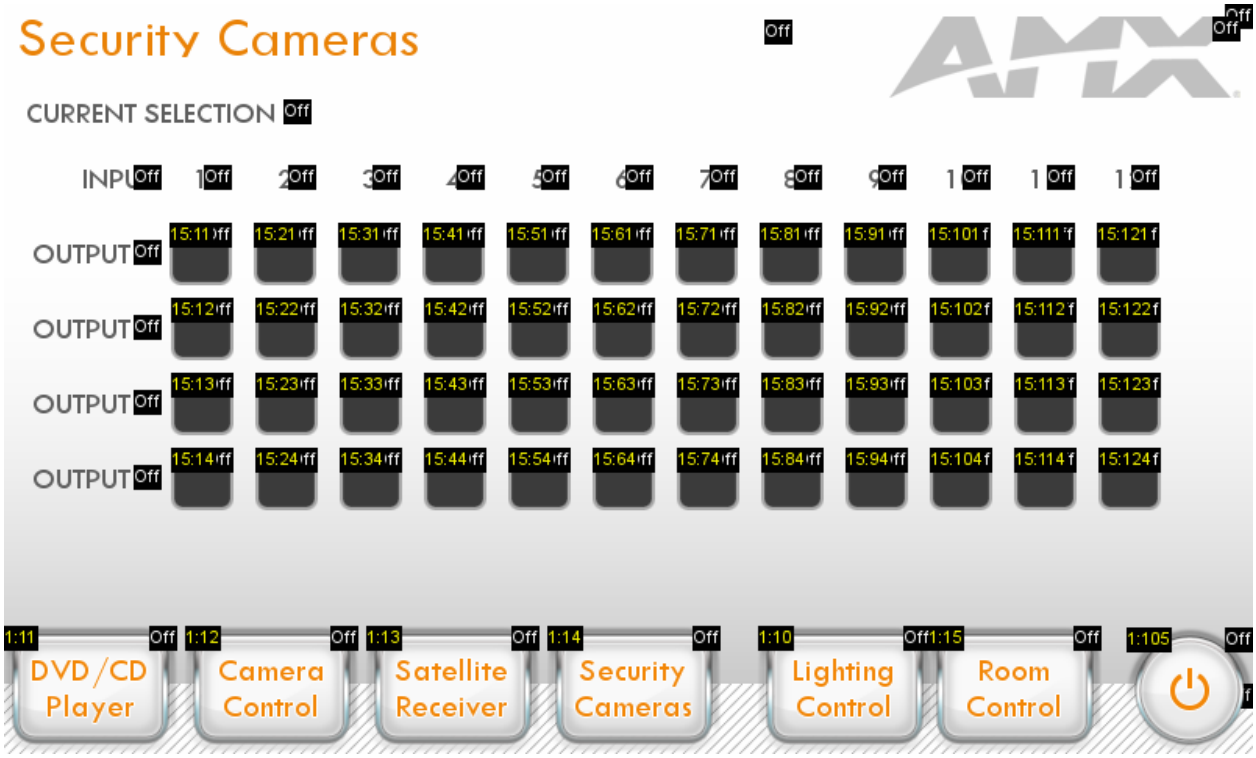
BUTTON	LABEL	FEEDBACK	FUNCTION
1041 – 1046	Preset 1 – Preset 6	Momentary	- Send predefined Preset channels using the XCH command in mode 1
225 – 226	Channel UP & DOWN	CHANNEL_EVENTs on Satellite Receiver	Pulse IR codes for channel up and down

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-PI or the Operation/Reference manual for the NI-3101-SIG for more details.
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



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	- Route Input 5 to Outputs 1 – 4

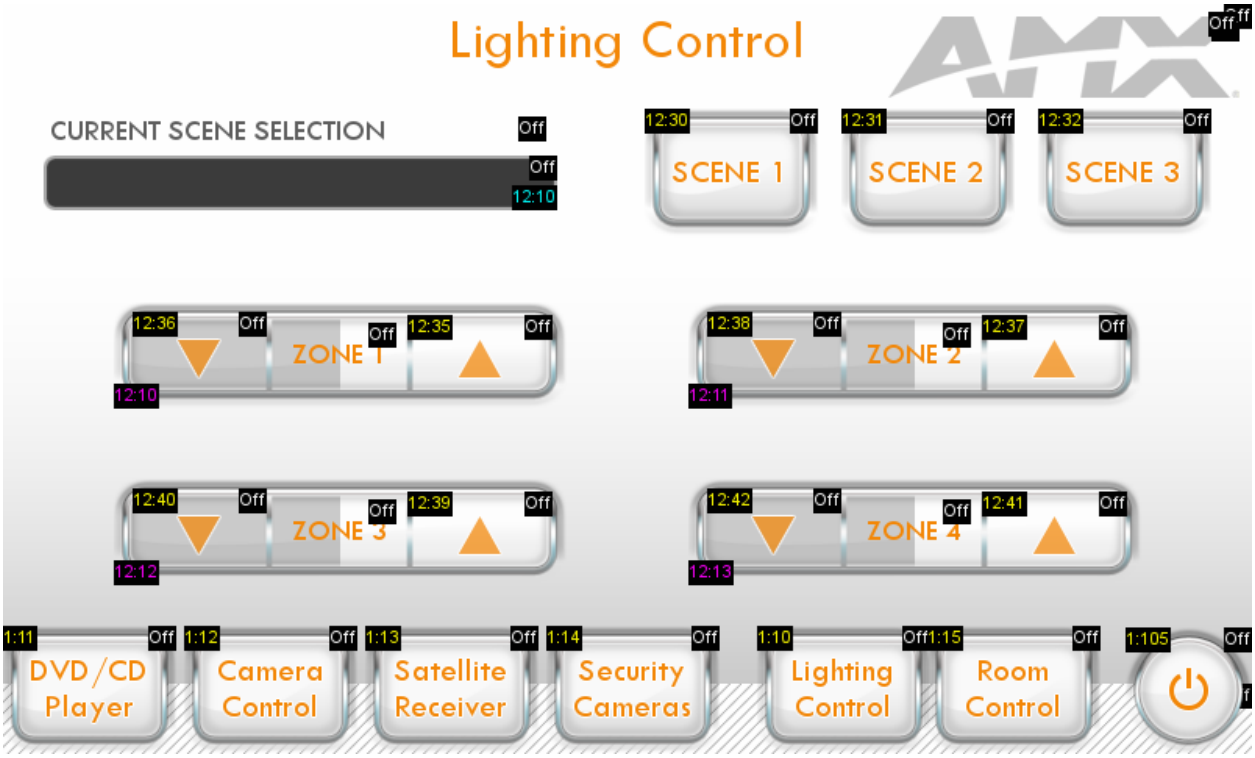
		when Input 5 is connected to Outputs 1 – 4 respectively.	respectively - Select Composite input for Video Projector
61 – 64	N/A	Latching: Turn on Button 61 – 64 when Input 6 is connected to Outputs 1 – 4 respectively.	- Route Input 6 to Outputs 1 – 4 respectively - Select Composite input for Video Projector
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

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.

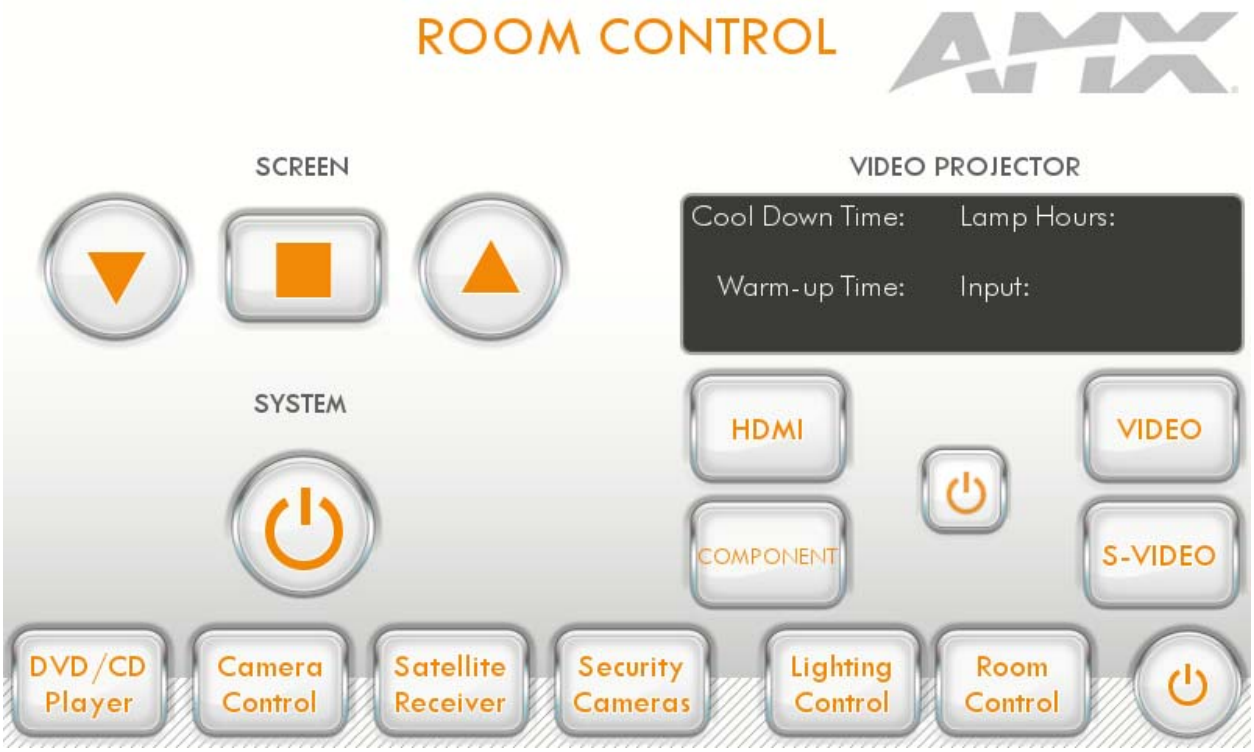
BUTTON	LABEL	FEEDBACK	FUNCTION
30 – 32	SCENE 1 – 3	Flash while recalling then latch once the scene has been set	- Recall the proper scene (preset) information - Display the scene name in the text window (Address Code 10)
35 – 36	Arrow Up & Down	Momentary	- Raise or lower dimmer for zone 1 - Display zone 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 programmer must correctly use the TCP/IP protocol for this Lighting Control and provide feedback by parsing the responses when applicable.
4. 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 at three instances of the second structure and use it to store lighting presets for the system.
5. Initialize the preset array defined above when the master comes online.
6. Initiate connection to the Lighting Control device when the master comes online and maintain connection in case of any error/disconnect.
7. 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.

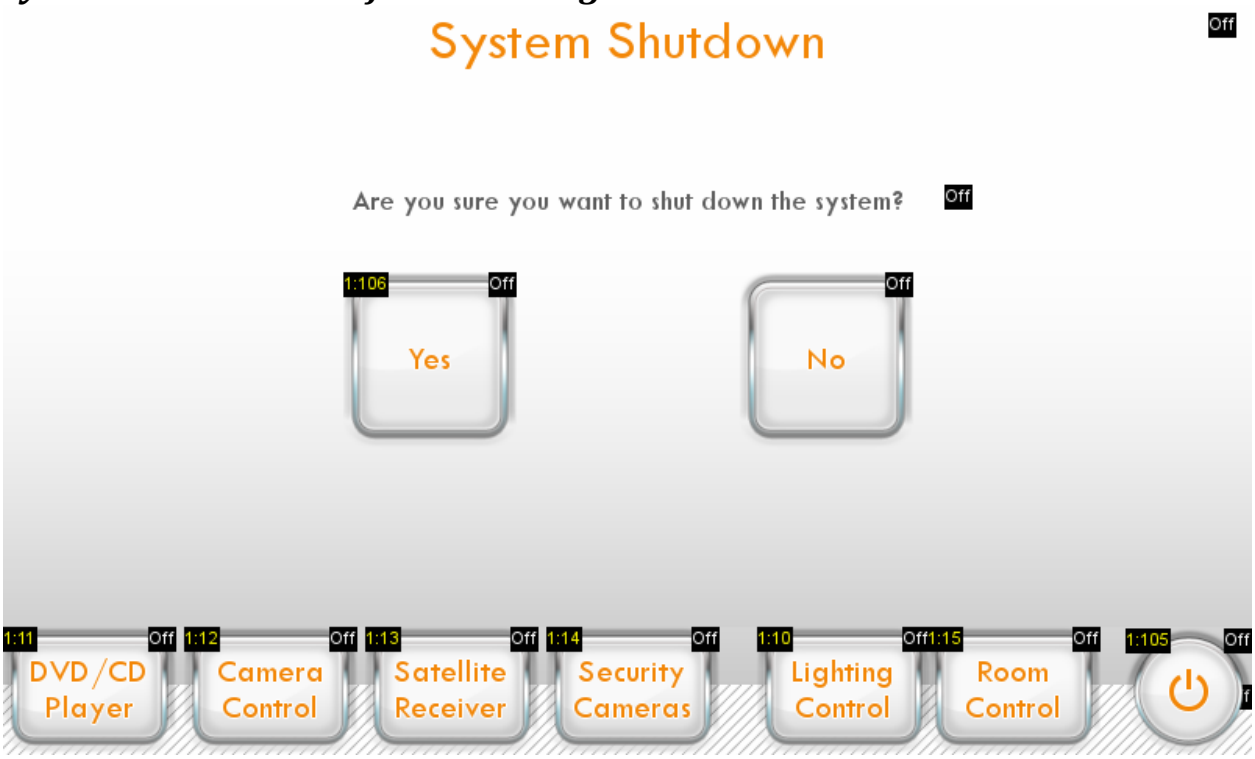
BUTTON	LABEL	FEEDBACK	FUNCTION
31 – 34	HDMI, Component, S-VIDEO & VIDEO	Latching: On after confirming source select	- Send the proper command - Update the Input text field (Address code 15) when the change is confirmed.
255	Power	Latching: On after confirming Power On. Off after confirming Power Off.	- 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

1. The' System Power Off' macro should include the following list of events.
    a. 0 Seconds – Turn off Satellite Receiver & DVD/CD Player. Turn off Video Projector & Local Camera as well.
    b. 2 seconds – Raise the screen
    c. 6 seconds – Turn off amplifier power**
    d. 10 seconds – Turn off device power**

2. The 'System Power On' macro should include the following list of events.
    a. 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 if off, turn on amplifier and device power. - If the system power if 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.