Alcorn McBride Inc.

V16X User's Guide

SYNCHRONOUS SHOW CONTROLLER

October 15th, 2019

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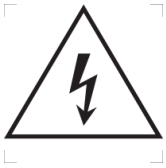
Every effort has been made to assure the accuracy of the information contained in this manual, and the reliability of the Alcorn McBride V16X and V4X hardware and software. Errors can sometimes go undetected, however. If you find one, please bring it to our attention so that we can correct it for others. Alcorn McBride welcomes comments and suggestions on the content and layout of its documentation.

Applications described herein are for illustrative purposes only. Alcorn McBride Inc. assumes no responsibility or liability for the use of these products, and makes no representation or warranty that the use of these products for specific applications will be suitable without further testing or modification. Alcorn McBride products are not intended for use in applications where a malfunction can reasonably be expected to result in personal injury. Customers using or selling Alcorn McBride products for use in such applications do so at their own risk, and agree to fully indemnify Alcorn McBride for any damages resulting from such improper use or sale. Alcorn McBride Inc. reserves the right to make changes to these products, without notice, in order to improve their design or performance. The unit requires installation into a suitable fire enclosure in the final assembly.

This unit has been tested and found to comply with the following:

FCC 47 CFR Part 15B:2017, ISED ICES-003: Issue 06 (2016)
EN 55032 Class A Conducted and Radiated Emissions
EN 55035, EN 61000-3-2, and EN61000-3-3 Immunity



Caution, shock hazard, disconnect all power sources before servicing.

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

WELCOME!

Congratulations on your shiny new Alcorn McBride V16X Show Controller!

The V16X is designed to be the ultimate show control solution for attractions that demand precisely synchronized control between multiple systems.

One significant challenge with ride-based attractions is the ability to precisely synchronize on-board audio with off-board audio, video, lighting, animatronics, etc. For these types of attractions, the V16X is intended to serve as the off-board synchronized control source. It works in tandem with RidePlayer, AV Binloop Uncompressed, and many other devices to ensure that both on-board and off-board systems are tightly synchronized. This is accomplished by our state-of-the-art SyncCore synchronization system that can use one of several methods to maintain lock between products like the V16X and RidePlayer. These industry-standard methods include PTP (IEEE-1588), NTP, GPS, SMPTE LTC, and Video Genlock.

It's also common for ride-based show control applications to require advanced communications with many different types of third-party equipment. This includes devices like the PLC systems commonly used for ride control, projectors, video players, audio players, audio DSPs, matrix switchers, motion controllers (animatronics), and much more. The V16X harnesses the power of the Alcorn McBride show control engine to easily integrate with many industry-standard devices and serve as the master show control system for themed attractions. This includes capabilities like using timelines to synchronize audio playback to SMPTE timecode or triggering complex playback routines via GPIO, Serial, or Ethernet commands. It even works in tandem with our ShowTouch apps and devices to provide intuitive touch panel controls that can be custom-made for the attraction.

This product leverages 32 years of experience designing products specifically for themed entertainment applications. In true Alcorn McBride fashion, the solid-state and rugged design will ensure years of 24/7 maintenance free operation which is essential to zero downtime for attractions. At Alcorn McBride, it is our passion to engineer solutions that are uniquely suited for themed entertainment. We hope that you love using this product as much as we enjoyed designing it!

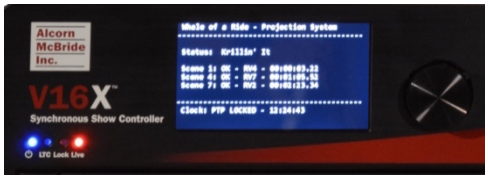
PRODUCT FEATURES

SHOW CONTROL FEATURES

This product features the powerful and flexible Alcorn McBride ControlCore. This technology provides the ability to control and monitor components deployed in themed attractions like PLCs, animation controllers, video playback, projection, DSP systems, matrix switchers, and much more.

The control feature set is as follows:

- **Alcorn McBride Show Control Core**
  - Control of 3rd Party Devices (PLC, DSP, Animation, AV, etc.)
  - Timeline Programming
  - ShowTouch Integration
  - PLC Integration – ride control monitoring/triggering
  - Advanced Scripting Control
- **4 x Network Control Ports (Isolated)**
- **16 x Serial Control Ports**
  - **4 x RS422/RS232**
  - **12 x RS232**
- **16 x CC/Voltage Inputs**
- **16 x CC Outputs /w Self-Healing Polymer Fuse**
- **16 x User-Programmable Front-Panel Buttons**
- **4.3" Touch-Enabled TFT Display**



SYNCHRONIZATION FEATURES

V16X is equipped with the Alcorn McBride SyncCore system to provide for extremely precise synchronization between the on-board and off-board systems. This technology uses several industry-standard methods to maintain a very precise clock between V16X and other SyncCore-enabled products like the RidePlayer.

Synchronization features include:

- PTP (IEEE-1588)
- NTP
- GPS /w PPS Clock Input
- SMPTE LTC
- Genlock

PHYSICAL FEATURES

This product's solid-state design enables it to integrate well into any commercial A/V installation. It's designed to be mounted into a standard 19" equipment rack and requires only 2RU of space. The rear-panel of the unit offers professional-grade phoenix terminals for easy wire termination in the field, and industry standard connectors for network, genlock, and power.

- Phoenix connectors for solder-free installation
- Flexible Power Supply Options
    - **V16X** - Built-in 110-240VAC Auto-sensing power supply
    - **V16X-DC** – Built-in 24VDC power supply
- 4.3" TFT Display
- Control status LEDs
- IO status LEDs
- Front-panel buttons
- Removable SD Card for storage of scripts and panels
- Dimensions – 19" W x 14" Dx 3.5" H - 2U Rack Mount
- Weight – 14 Lbs.

TECHNICAL SUPPORT

Now that we've tantalized you with all of the wonderful things this product can do, I'll bet you're chomping at the bit to flip all the switches and push all the buttons. Not so fast! Before we get to the fun stuff, we just want to take a moment to remind you that we are here to help. Chances are that you're building something really cool and we want you to have access to the resources and support you need to be successful.

To start, you'll find a wealth of information on our website. This includes Application Notes that give you detailed documentation and examples for how this product is used in common types of themed entertainment projects. You'll also find the latest downloads for software, firmware, drawings, 3D models, cutsheets, and other helpful resources on our Support page. The Knowledge Base is especially handy for common questions and helpful troubleshooting tips. And last, but certainly not least, you always have our friendly and mildly entertaining staff available by email or telephone.

Application Notes	http://www.alcorn.com/applications
Support Resources	http://www.alcorn.com/support
Knowledge Base (FAQ)	https://alcornmcbride.zendesk.com/hc/en-us
Email Support	support@alcorn.com
Telephone Support	(407) 296-5800 (Mon-Fri 9am-6pm EST)

GETTING STARTED

Alright, time to roll up your sleeves and get to work! This section will guide you through basic concepts that will help you get on your way with an V16X.

WIRING AND CONNECTIVITY

A few connections are required to experience the core functionality of an V16X. If you're the DIY-type that's comfortable with purchasing and terminating your own connectors, you'll be happy to know that this product uses industry-standard connectors which are documented in detail in the **Hardware Information** section of this User's Guide.

POWER

The V16X can be ordered with one of two power supply options:

- **V16X** - Built-in 110-240VAC Auto-sensing power supply
- **V16X-DC** – Built-in 24VDC power supply

The AC option is the standard and preferred by many customers; however, there are many applications that benefit from having a DC power input. Whichever your preference, be sure to order the appropriate version of the V16X for your power needs.

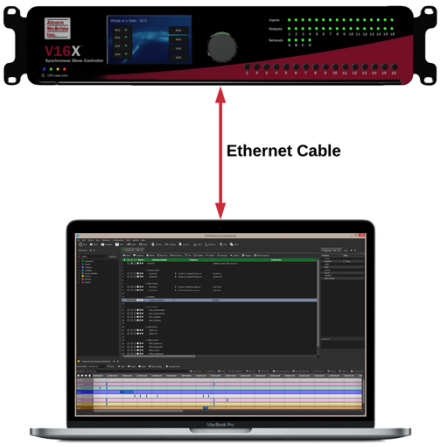
For the standard V16X, you simply need to connect AC power using the included IEC power cable.

For the V16X-DC, you need to apply a 24VDC power source to the power input terminals. Be sure to observe the correct polarity for the Positive (+24VDC) and Negative (-) terminals.

Once you have connected the power source, the V16X can be powered up by simply flipping the power switch to the ON position. HEY!!! What are you doing?!? We didn't actually say to power up yet, but you went ahead and did it anyway didn't you?!?! <Head Slap> Alright… clearly you're excited so I guess we'll cut you some slack, but could you at least try to follow instructions next time?

NETWORK CONTROL

While the V16X sure looks pretty when you power it up, network connectivity is required to actually make it do magical things. The goal here is to interface a V16X to your Windows or macOS computer running our WinScript Live software. This application empowers you to configure, program and monitor the unit.



The V16X has 4 standard RJ45 Ethernet connectors that support 10/100/1000BT networks. They provide access to 4 isolated networks labeled Network A, B, C, and D that can be used by the V16X to control and monitor devices that are connected to the networks.

Let's go ahead and plug in one end of your Ethernet cable to Port A and the other end to your computer.

NETWORK CONFIGURATION

Now that we're good to go with connections, we just need to do a little bit of configuration before we can connect your computer to an V16X. Before we get started, it's helpful to know that a V16X ships with the following default IP address configurations:

V16X Port C	
Control IP	192.168.2.254
Subnet Mask	255.255.255.0

V16X Port D	
Control IP	192.168.3.254
Subnet Mask	255.255.255.0

V16X Port A	
Control IP	192.168.0.254
Subnet Mask	255.255.255.0

V16X Port B	
Control IP	192.168.1.254
Subnet Mask	255.255.255.0

If you're at ease in the world of networking, you can easily adjust these settings for your V16X to operate on an existing network. For more information on how to access the network configuration menu, see the **Display and Navigation Buttons** section of this User's Guide.

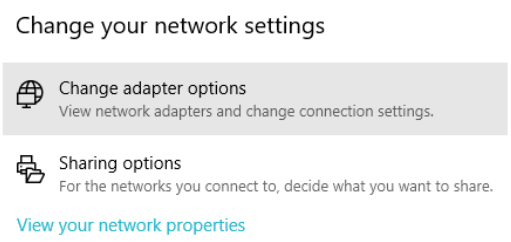
For those that just wish to connect a computer directly to Network A of the V16X, the easiest way is to set your computer to a static IP address that is compatible with V16X default network settings. For example, this configuration would work nicely for your computer:

Computer Ethernet Port	
IP	192.168.0.100
Subnet Mask	255.255.255.0

CONFIGURING STATIC IP - WINDOWS 10

1. Right-click on the Windows icon in the bottom-left and select **Network Connections**

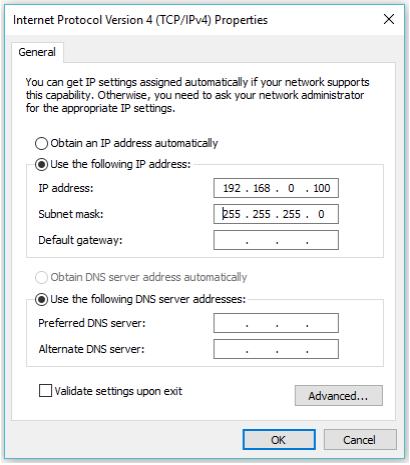
2. Select **Change adapter options**



3. Right-click on the network interface that is connected to the V16X and select **Properties**

4. Select **Internet Protocol Version 4 (TCP/IPv4)** from the list of items and click the **Properties** button below.

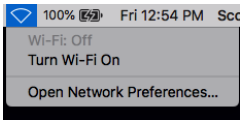
5. Select **Use the following IP address**, enter the IP address as **192.168.0.100**, and enter the Subnet Mask as **255.255.255.0** as indicated in the screenshot below:



6. Click the **Ok** button to apply the static IP address.

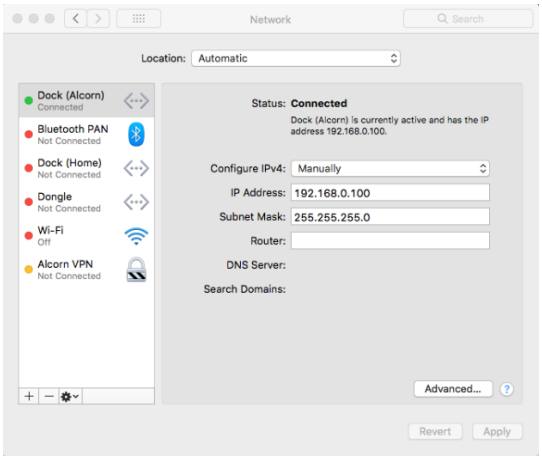
CONFIGURING STATIC IP – OS X

1. Click on the network icon in the OS X menu bar and select **Open Network Preferences**.



2. Select the network interface that is connected to the V16X from the available interfaces on the left.

3. Configure the network interface **Manually**, specify an IP address of **192.168.0.100**, and a Subnet Mask of **255.255.255.0** as indicated in the screenshot below.



4. Click **Apply** to enable the new static IP configuration

CONTROLLING WITH WINSCRIPT LIVE

At this point, everything should be wired up, configured, and ready to go. The next step is to connect to the V16X using our WinScript Live software. Once connected, you will have access to configure, control, and monitor your V16X unit.

Before we can get started, you'll want to make sure to install the latest version of WinScript Live on your Windows or macOS computer. This software can be downloaded for free from our website at www.alcorn.com.

Once the software is installed, follow these instructions to start a test sequence:

1. Launch WinScript Live and click the **Connect** button on the splash screen

2. Your V16X unit should automatically appear in the connection list. Click it once to select, and then click the **OK** button to connect.

3. Select **Retrieve** and click **OK**. WinScript Live will then load the project currently stored on the V16X.

4. Congratulations! You are in control of your V16X unit. There are many places you can go from here, but here are some helpful suggestions:

    - The powerful show control engine of the V16X empowers you with advanced scripting capability, timeline features, and device control. To learn more, the detailed documentation of our show control platform is built right into the WinScript Live software. If you are new to Alcorn McBride show control, we also strongly encourage you to access the training content included with WinScript Live using the **Examples** screen and/or sign up for our next training class.

    - Visit our Applications page at www.alcorn.com to access more detailed examples on application-specific topics.

HARDWARE INFORMATION

OVERVIEW

The V16X has an assortment of dedicated hardware for the purpose of configuration, status monitoring, and interfacing to other hardware. This section covers these features in more detail.

DISPLAY AND NAVIGATION WHEEL

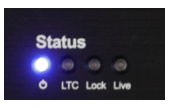
The V16X features a 4.3" TFT display. This display is primarily used to share project-specific information (i.e. "Preshow – Running - 01:02:03.00") from the show control script. However, this display also offers a full menu system that can be accessed using the navigation wheel adjacent to the display.

To access the menu system, simply press in the navigation wheel. The wheel can then be rotated and pressed to browse the menu system, select items, and change settings.

INDICATOR LEDS

The front-panel of a V16X has a full set of indicator LEDs to provide an overall status of different features of the device.

STATUS



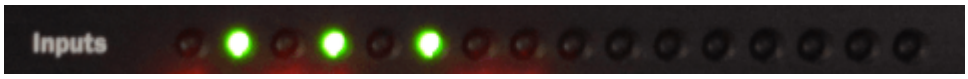
Power – ON whenever power is applied to the unit and the power switch is on
LTC – ON whenever SMPTE LTC is being actively generated or read
Lock – ON whenever the sync system is locked to the configured sync source
Live – ON whenever WinScript Live is connected to the unit

NETWORK

These indicators display both network link and activity for all of the Control Network ethernet ports.

LED State	Description
OFF	No network link
SOLID GREEN	Network link active – No network activity detected
BLINKING ORANGE	Network link active – Network activity detected

INPUTS



These are digital inputs that can be used to trigger show control events. These inputs can be configured via software to accept contact-closure or voltage triggers (5-24VDC).

LED State	Description
OFF	Inactive – No contact closure detected or voltage input is <9VDC
GREEN	Active – Contact closure detected or voltage input is 9-24VDC

OUTPUTS

These are dry-contact relay outputs that are rated to 900mA and protected with inline self-healing polymer fuses. These relays are normally open (NO) and both relay contacts (COMMON = C, and NORMALLY OPEN = NO) are accessible for each output.

LED State	Description
OFF	Inactive – Relay contact is OPEN
RED	Active – Relay contact is CLOSED

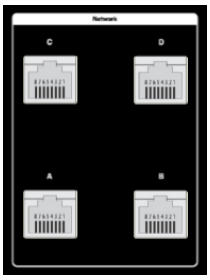
BUTTONS

The front panel buttons can be configured by WinScript Live software to trigger show control. Panel space is left above these buttons to allow for labels to be installed.

CONNECTORS

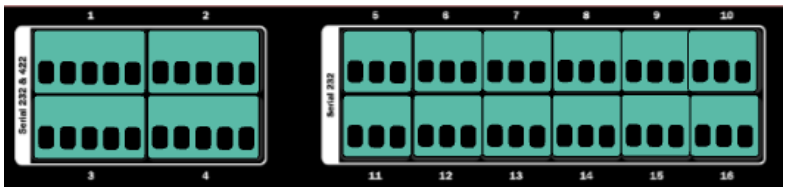
NETWORK PORTS

These are standard RJ45 Ethernet connectors that support 10/100/1000BT networks. They provide access to 4 isolated networks that can be used by the V16X to control and monitor devices that are connected to the networks. They are also used by a computer running our WinScript Live software to connect to the V16X to configure, program, and monitor the unit.



SERIAL PORTS

The V16X has a total of 16 serial ports that can be used to control devices. Ports 1-4 can be configured to operate in either RS422 or RS232 mode, and ports 5-16 operate in RS232 mode.



Connector Information

Connector Type	Phoenix
Mating Plug (1-4)	Phoenix Contact 5447890
Mating Plug (5-16)	Phoenix Contact 5447874
Recommended Wire	18 AWG Stranded

Pinouts

Serial Ports (1-4)	
RS232 TX RS422 TX (-)	1
RS422 TX (+)	2
RS422 RX(-)	3
RS232 RX RS422 RX (+)	4
Ground	5

Serial Ports (5-16)	
RS232 TX	1
Ground	2
RS232 RX	3

GPS PORT

This port functions as a dedicated GPS interface (including PPS input) to provide highly accurate clock synchronization. It can function in both RS232 and RS422 modes and is configured via software.

Connector Information

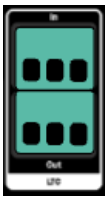
Connector Type	Phoenix
Mating Plug	Phoenix Contact 5447913
Recommended Wire	18 AWG Stranded

Pinouts

GPS Port	
RS232 TX RS422 TX(-)	1
RS422 TX(+)	2
RS422 RX(-)	3
RS232 RX RS422 RX(+)	4
Ground	5
Power (5VDC)	6
GPS PPS	7

SMPTE LTC

These connectors provide access to the SMPTE Timecode (LTC) input and output.



Connector Information

Connector Type	Phoenix
Mating Plug	Phoenix Contact 5447874
Recommended Wire	18 AWG Stranded

Pinouts

LTC IN	
LTC IN (+)	1
LTC IN (-)	2
GND	3

LTC OUT	
LTC OUT (+)	1
LTC OUT (-)	2
GND	3

GENLOCK

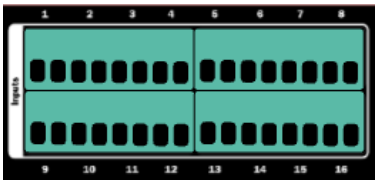
These are standard BNC connectors that provide access to the genlock system of the V16X. The input will accept a Blackburst, Composite Sync, or Tri-level video sync source. The output will provide a Composite Sync signal that can be fed into other genlock-capable devices like the AV Binloop Uncompressed video player. A yellow LED illuminates when the V16X has successfully genlocked to an incoming sync source. DIP switches allow the user to configure termination and video genlock type for the genlock input.

Termination Switch	
ON (UP)	75Ω Termination
OFF (DOWN)	No Termination

Sync Mode Switch	
ON (UP)	Blackburst/Tri-level
OFF (DOWN)	C-Sync

DIGITAL INPUTS

These are digital inputs that can be used to trigger show control events. These inputs can be configured via software to accept contact-closure or voltage triggers (5-24VDC).



Connector Information

Connector Type	Phoenix
Mating Plug	Phoenix Contact 5447926
Recommended Wire	18 AWG Stranded

Pinout

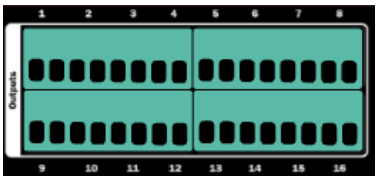
T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16

Digital Inputs (1-8)	
IN1(+)	T1
IN1(-)	T2
IN2(+)	T3
IN2(-)	T4
IN3(+)	T5
IN3(-)	T6
IN4(+)	T7
IN4(-)	T8
IN5(+)	T9
IN5(-)	T10
IN6(+)	T11
IN6(-)	T12
IN7(+)	T13
IN7(-)	T14
IN8(+)	T15
IN8(-)	T16

Digital Inputs (9-16)	
IN9(+)	B1
IN9(-)	B2
IN10(+)	B3
IN10(-)	B4
IN11(+)	B5
IN11(-)	B6
IN12(+)	B7
IN12(-)	B8
IN13(+)	B9
IN13(-)	B10
IN14(+)	B11
IN14(-)	B12
IN15(+)	B13
IN15(-)	B14
IN16(+)	B15
IN16(-)	B16

DIGITAL OUTPUTS

These are dry-contact relay outputs that are rated to 900mA and protected with inline self-healing polymer fuses. These relays are normally open (NO) and both relay contacts (COMMON = C, and NORMALLY OPEN = NO) are accessible for each output.



Connector Information

Connector Type	Phoenix
Mating Plug	Phoenix 5447926
Recommended Wire	18 AWG Stranded

Pinout

T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13	T14	T15	T16
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12	B13	B14	B15	B16

Digital Outputs (1-8)	
OUT1(NO)	T1
OUT1(C)	T2
OUT2(NO)	T3
OUT2(C)	T4
OUT3(NO)	T5
OUT3(C)	T6
OUT4(NO)	T7
OUT4(C)	T8
OUT5(NO)	T9
OUT5(C)	T10
OUT6(NO)	T11
OUT6(C)	T12
OUT7(NO)	T13
OUT7(C)	T14
OUT8(NO)	T15
OUT8(C)	T16

Digital Outputs (9-16)	
OUT9(NO)	B1
OUT9(C)	B2
OUT10(NO)	B3
OUT10(C)	B4
OUT11(NO)	B5
OUT11(C)	B6
OUT12(NO)	B7
OUT12(C)	B8
OUT13(NO)	B9
OUT13(C)	B10
OUT14(NO)	B11
OUT14(C)	B12
OUT15(NO)	B13
OUT15(C)	B14
OUT16(NO)	B15
OUT16(C)	B16

SYNCHRONIZATION

Precise synchronization between show systems, especially those involving ride vehicles, is one of the biggest challenges faced in themed entertainment applications. Doing this properly involves achieving two critical conditions:

1. **Phase-locked Clocks** – All clocks must operate at the same rate to avoid 'drifting' from one another
2. **Precise Triggering** - All systems must start playback simultaneously with extreme precision

The unique design of the SyncCore technology integrated into RidePlayer, V16X, and BinloopX enables these products to easily achieve both conditions and ensure precise synchronization between all on-board and off-board show systems throughout the entire attraction.

PHASE-LOCKED CLOCKS

Let's say you and a friend buy identical wristwatches and set both to the exact same time. When you meet up again a week later, you might be surprised to see that the watches are likely many seconds off from one another. Why? Well, there are many contributing factors such as crystal frequency precision, temperature, mechanical tolerance, etc. Bottom line… the watches run at slightly different rates and this difference compounds over time. The same concept also holds true with the audio and video clocks used as the basis for AV playback. Without a shared reference clock, all AV components will play at slightly different rates and drift from one another over time.

The solution to this problem is to phase-lock these clocks with each other. This generally involves one piece of equipment serving as the clock 'master' and distributing its clock to other 'slave' devices. The 'slave' devices then speed up or slow down their clocks to stay in perfect time with the 'master' device.

SyncCore allows AV clocks to be phase-locked by any of the following methods:

- **PTP (IEEE-1588)**
- **NTP**
- **GPS**
- **Genlock**

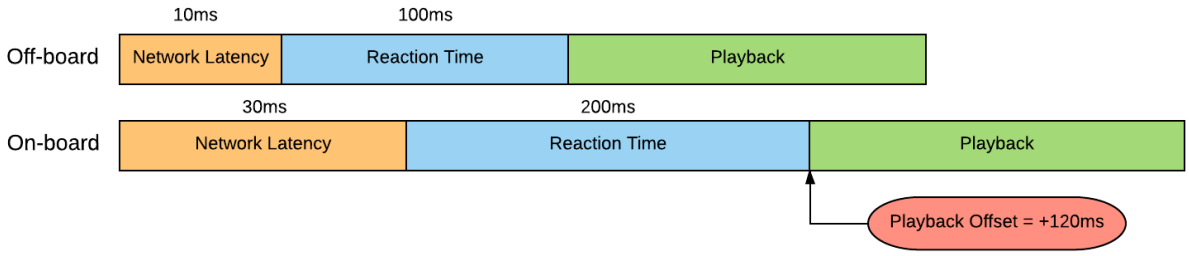
PRECISE TRIGGERING

No matter how perfectly locked clocks may be, it doesn't do much good if you can't start playback at the same time. To illustrate by example, let's walk through a typical dark ride system that requires synchronized on-board audio and off-board audio. If the on-board audio starts playing 300ms late, it's going to be off consistently for 300ms the entire time. There are several common factors that make this a challenging problem to contend with.

PLAYBACK LATENCY

First, most AV playback equipment is not capable of triggering consistently upon command. This is especially true for PC-based hardware running operating systems that are often busy running unpredictable tasks. Let's say you send a command to play audio and playback begins about 100ms after the command is issued. Repeat this same process, and next time it might take 200ms. It is simply impossible to ensure synchronization between two (or more) devices when playback reaction time is not consistent.

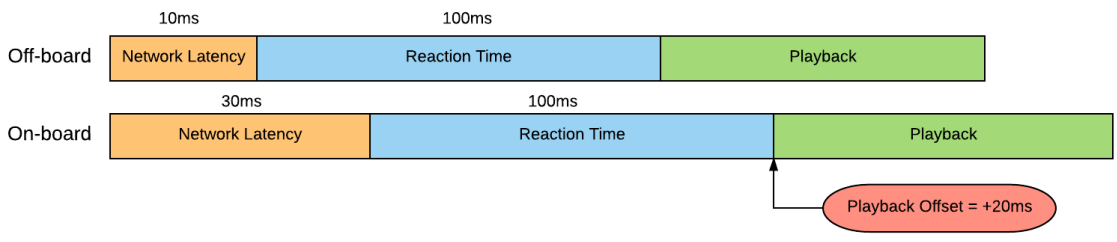
Network Latency + Inconsistent Playback Device



NETWORK LATENCY

Specialized AV playback equipment can greatly improve this situation by offering consistent reaction time. Let's say that this equipment guarantees that playback will begin exactly 100ms after a command is received. The idea is that you send the same command to two different devices and they both start after exactly 100ms. Viola! They are synchronized! The catch is that those commands must be received by both devices at exactly the same time for this concept to work. This is quite challenging, especially via wireless networks where packet latency can sometimes exceed 300ms.

Network Latency + Consistent Playback Device

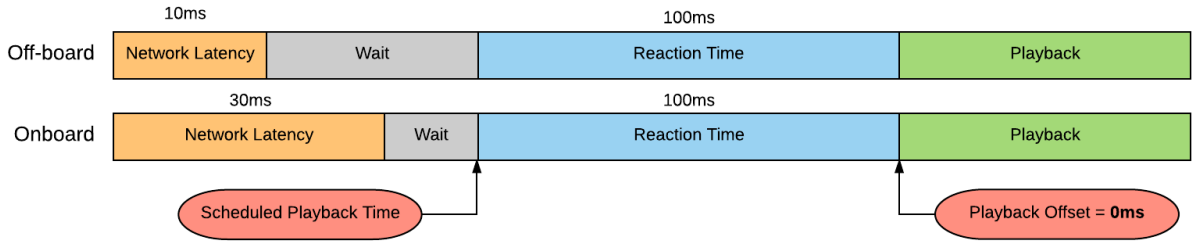


SCHEDULED PLAYBACK

To overcome these common problems, SyncCore enabled products take a unique approach. The same clock references that are used to maintain phase-lock between on-board and off-board devices are also used to maintain a very precise master clock. In other words, all devices keep track of the current hour, minute, second, and millisecond with a precision as tight as a few nanoseconds.

With this approach, playback times are scheduled based upon this shared master clock. This greatly reduces the impact of network latency because the time that the command arrives is irrelevant as long as it arrives before the scheduled playback time.

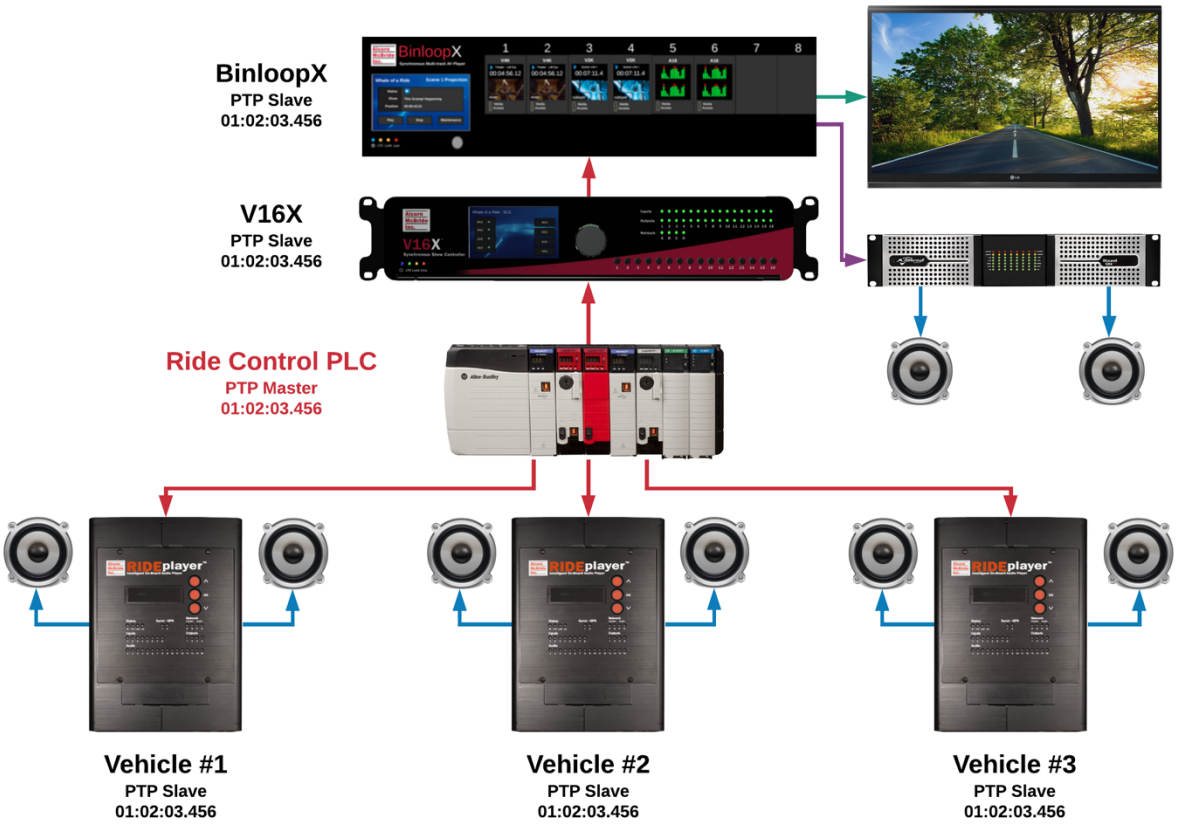
Scheduled Playback Time



SYSTEM ARCHITECTURE

Sounds great! But how do we actually use it in a real application?

To answer that question with a pretty picture, here is a representation of a typical dark ride system that uses the Ride Control PLC as the PTP clock master for the entire attraction. In this example, the V16X, BinloopX, and RidePlayer would all be configured to lock directly to the PLC's master PTP clock to ensure perfect synchronization for all show systems throughout the attraction.

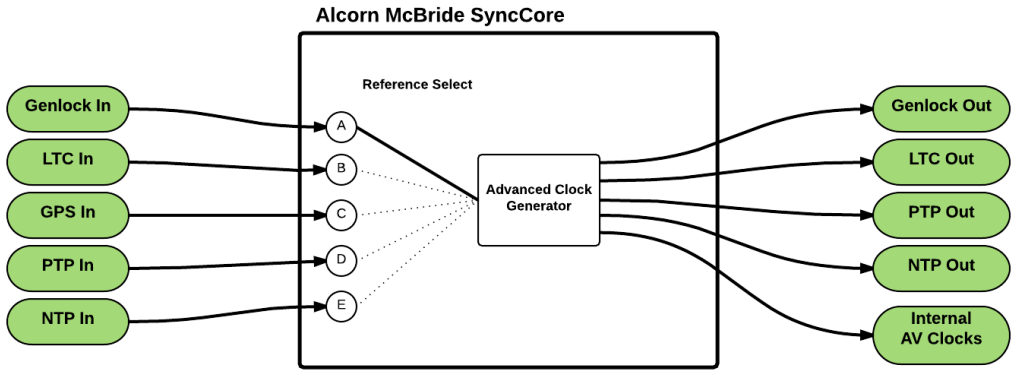


SYNC CONFIGURATION

The SyncCore system is able to achieve precise synchronization from any of the following reference clocks:

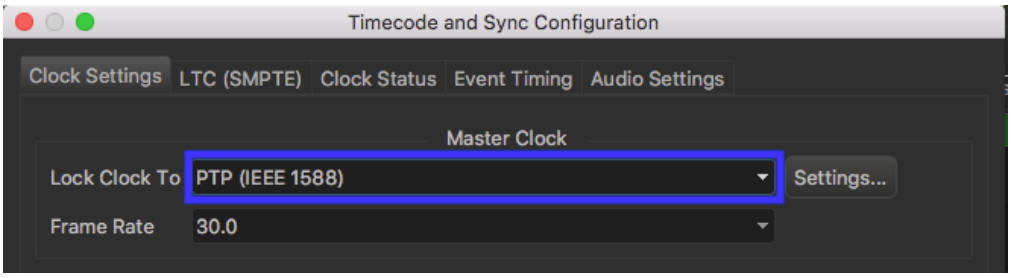
- **PTP (IEEE-1588)**
- **NTP**
- **GPS**
- **SMPTE LTC**
- **Genlock**

Here's a simple diagram to illustrate these synchronization methods, how they can be selected, and the resulting outputs that can be used to synchronize the entire system:



LOCKING TO A SYNC REFERENCE

Within your WinScript Live project, you can configure an external sync reference by accessing the **Configuration→Sync** menu option. Here, you can choose the reference source you want this unit to synchronize with and specify a master Frame Rate for the show control system.



If your application does not require the use of an external reference clock, you can leave this selection at its default value of **Internal**. In this mode, the product will generate its own clocks internally.

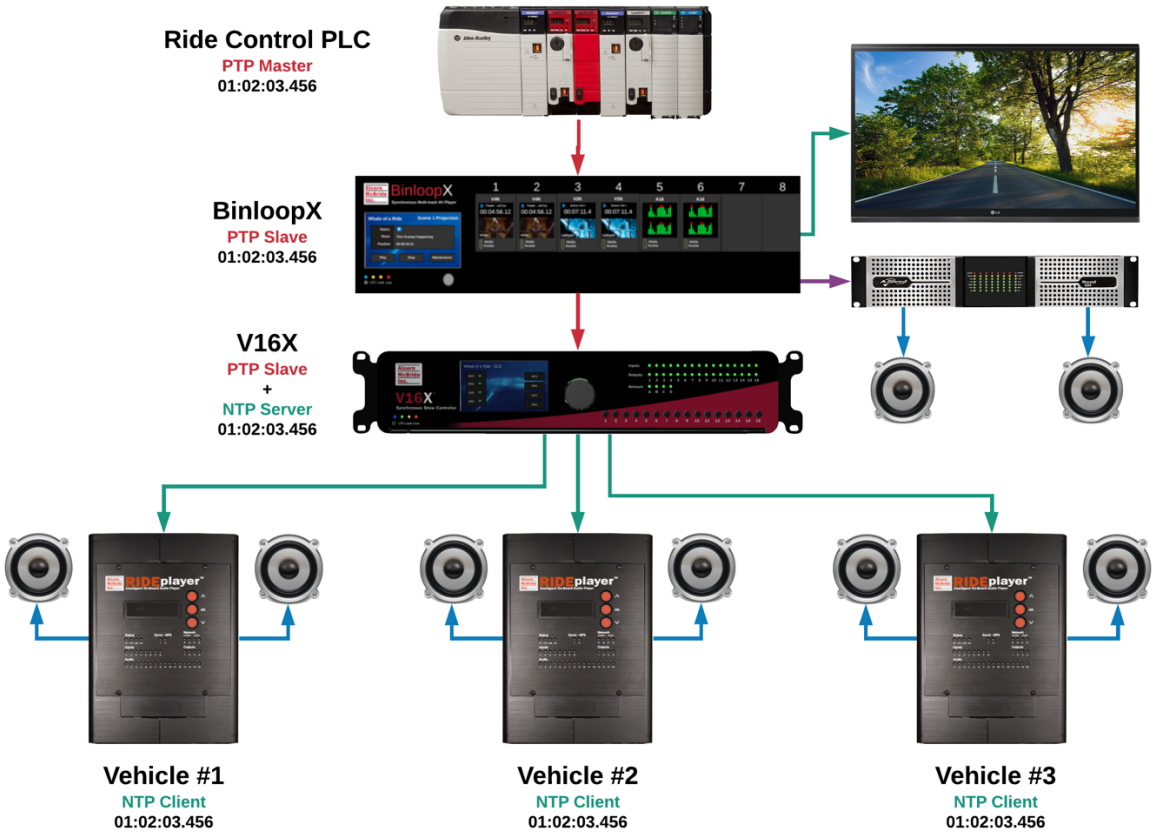
DISTRIBUTING A SYNC REFERENCE

Not only can this product lock to an external sync reference, it is also capable of distributing sync references as well.

Genlock is always distributed automatically based upon the master Frame Rate you have selected. There's also the option to distribute a clock via network using NTP or PTP as well. This option is also configured from the Sync Configuration screen which is accessed using the **Configuration→Sync** menu.

One important thing to note is that it is possible for SyncCore products to lock to an external reference and simultaneously distribute another type of reference. A common example of this would be configuring a V16X to lock to an external PTP Master (i.e. Ride Control PLC). This V16X may then need to synchronize precisely with RidePlayers over a wireless network which may not support PTP distribution. To overcome the limitations of the wireless network, the V16X could be configured to distribute a sync reference as an NTP Server. We would then configure the RidePlayer units to lock to the V16X via NTP.

The hybrid system architecture would look like this:



DIGITAL INPUT WIRING

VOLTAGE

Using Voltage Inputs instead of Contact Closures will add complexity to the wiring but will provide greater reliability over long distance cable runs.

Advantages

- The installer can overcome long distances when connecting contact closures by using higher voltage sources to compensate for resistance in wiring.
- Inputs can be completely isolated from one another.

Disadvantages

- The installer must provide an external power supply for the contact closure(s).

CONTACT CLOSURE

Using Contact Closures over Voltage Inputs provides a simple installation but limits cabling distance.

Advantages

- Contact closure installations require only wiring and contacts
- No external power supply is required.

Disadvantages

- To be reliable, the contact closure must be located close (10-20 ft) from the unit.
- The wiring will not be isolated. Errors and problems in any circuit could affect other contact closure inputs.
- A high voltage short to this wiring could damage the V16X.

SPECIFICATIONS

CONTROL

Show Control	Advanced Scripted Control Timeline Programming ShowTouch Touch Panel Integration Tightly-integrated Device Control (PLC, DSP, Animation, AV, Projection, etc.)
Display	4.3" TFT LCD /w navigation wheel
LED Indicators	Power, LTC, Sync, Live Mode, Ethernet, Inputs, Outputs
Ethernet	4 x 10/100/1000BT (A, B, C, and D)
Serial	4 x RS232/RS422 (5-pin Phoenix) 12 x RS232 (3-pin Phoenix)
Digital Inputs	16 x Contact/Voltage (5-24VDC) Inputs – (4 x 8-pin Phoenix)
Digital Outputs	16 x Dry-contact Relay Output /w 900mA self-healing fuses – (4 x 8-pin Phoenix)
Show Memory	Removable SD Card /w Captive Socket

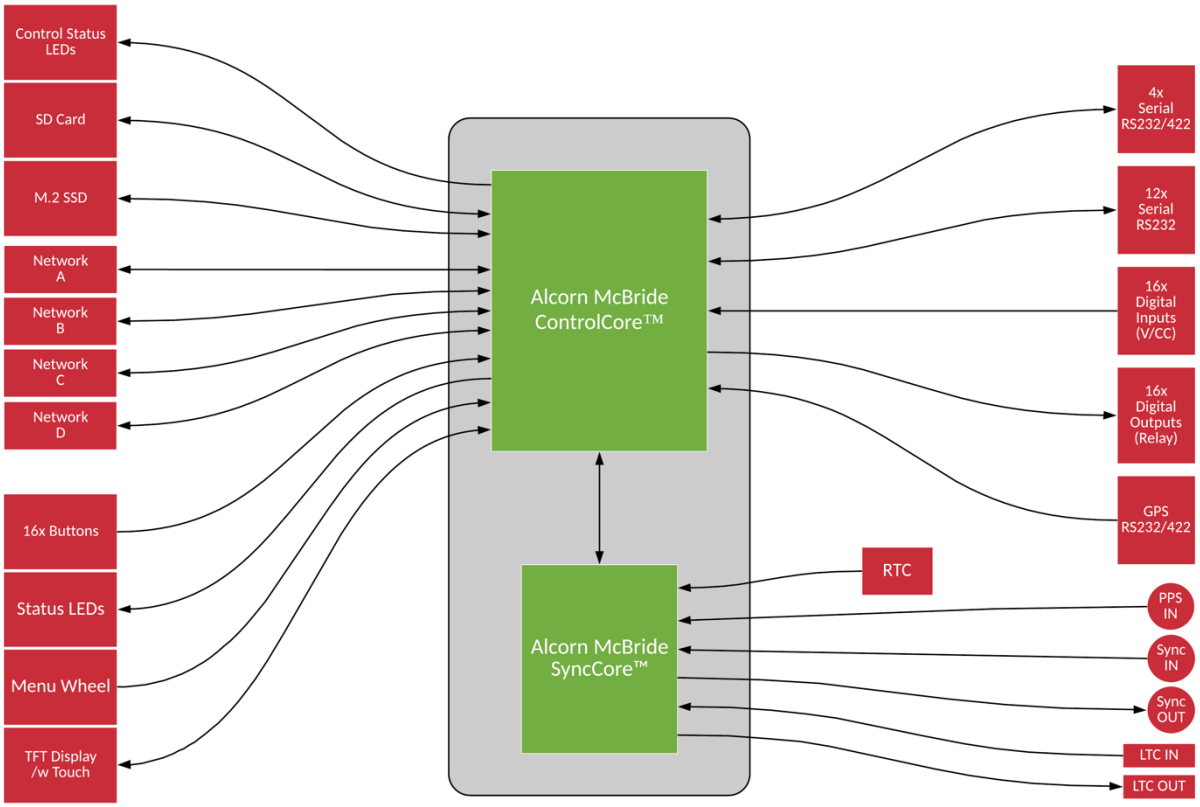
SYNCHRONIZATION

Sync Inputs	GPS In (Serial Port – 7-pin Phoenix) PTP In – IEEE-1588 (Network A or B – RJ45) NTP In (Network A or B – RJ45) Genlock In - Blackburst, C-Sync, Tri-level (BNC) SMPTE LTC In (3-Pin Phoenix)
Sync Outputs	PTP Out – IEEE-1588 (Network A or B – RJ45) NTP Out (Network A or B – RJ45) Genlock Out - C-Sync (BNC) SMPTE LTC Out (3-Pin Phoenix)
Frame Rates	23.976, 24, 25, 29.97, 30, 47.952, 48, 50, 59.94, 60
GPS Type	NMEA-0183 /w PPS Clock Input
Clock Accuracy	GPS - <1uS /w <1ppB Free-run accuracy PTP - <1uS /w <1ppB Free-run accuracy Genlock + NTP - <1mS /w <10ppB Free-run accuracy

PHYSICAL

Size	19"W x 14"L x 3.5"H
Weight	14 lbs
Power	**V16X** – 110-240VAC **V16X-DC** – 24VDC
Operating Temperature	0C (32F) to 38C (100F) 0-90% Relative Humidity
Mounting	Standard 19" Rack Mount
Configuration Switches	Genlock Type, Genlock Termination

BLOCK DIAGRAM



PRODUCT PHOTOS

Front View

Rear View (V16X)