

## Aviom-Yamaha Digital Snake

### Remote Control of Yamaha Mic Preamps with the 6416Y2 and VDCs

Aviom 6416Y2 A-Net® Cards and 6416dio Digital I/O Modules can be combined with Yamaha® digital consoles and AD8HR mic preamps to create a powerful, high fidelity digital snake. With Pro64® A-Net as the backbone, the system is quick to set up, simple to use, and easily scaled as additional split locations are required. Using the integrated Virtual Data Cables™, control data for the AD8HRs can be passed directly from the console control surface to the preamps, using the same network infrastructure as the digital audio.

#### SYSTEM OVERVIEW

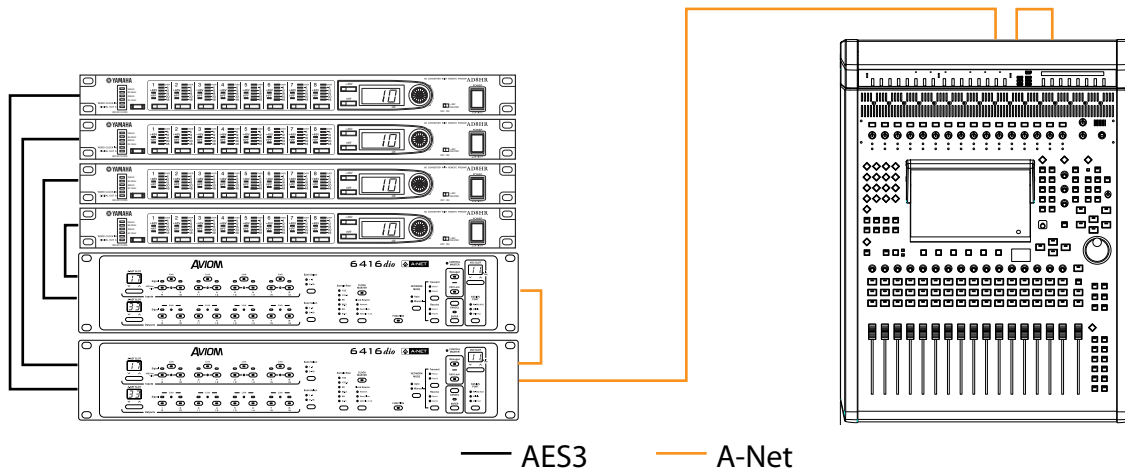
On stage, each AD8HR provides 8 mic inputs and can operate at 44.1/48kHz or 88.2/96kHz. Audio is output as AES3 digital data, which is compatible with Pro64 6416dio Digital I/O Modules. Each 6416dio has 16 channels in and 16 channels out, so one 6416dio is required for every two AD8HRs used.

At 44.1/48kHz, up to 64 channels can be input into the Pro64 network; at 88.2/96kHz, the maximum is 32 channels.

At FOH, the Yamaha digital console (DM2000, M7CL, PM5D, etc.) will be populated with 6416Y2 A-Net Cards. Each 6416Y2 supports 16 channels in and 16 channels out at 44.1/48kHz and 8 channels in and 8 channels out at 88.2/96kHz. (Note that this is a limit of Yamaha's MY card slot not the Pro64 network or 6416Y2 card itself.)

Control data (RS-422) for remote control of the AD8HRs can be passed directly from the console into the Pro64 VDCs at FOH. Back on stage, the control data is output from one of the 6416dio modules to the AD8HRs.

✓ **NOTE:** While the 01v96 and 02R96 digital consoles are compatible with the 6416Y2 card for digital audio I/O routing, no provision for controlling remote preamps via RS-422 is available on these consoles



Sample stage rack (LEFT) with 32 channels of mic preamps connected to 6416dio Digital I/O Modules. A single Cat-5e cable is used to connect the stage rack to the console (RIGHT).

## Application Note

### EXTENDING THE NETWORK

Expanding the functionality of the Pro64 system beyond the stage-to-FOH snake is as simple as connecting additional Pro64 I/O modules. The following Pro64 devices can be used:

- 6416dio Digital I/O Modules for digital splits
- 6416o Output Modules for analog splits
- 6416Y2 A-Net Interface Cards for console-to-console connections
- the ASI A-Net Systems Interface module for outputs to Pro16® Personal Mixers or output modules

### SETTING UP THE NETWORK

Configuring the audio in the Pro64 network is no different for this application than any other Pro64 system: each module (or card) must have a base Slot set and input and output channels must be activated as needed. Refer to the 6416dio and 6416Y2 User Guides and the 6416Y2 Quick Start Guide for more information.

This system utilizes the added functionality of controlling the mic preamps remotely using RS-422 over the Pro64 network, and that communications pathway must be configured before data can pass between the devices over the network. Additionally, because this system uses multiple digital devices, the digital clock structure must be configured correctly on each digital device. Both steps are straightforward and are detailed below.

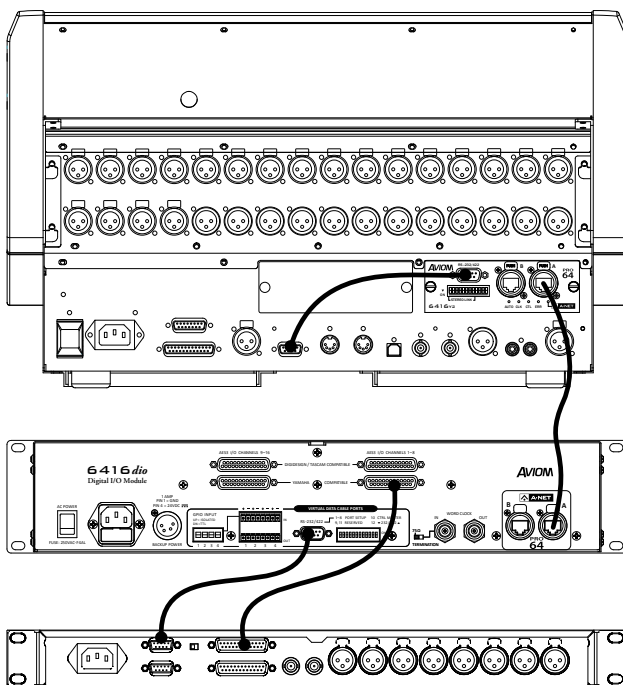
### REMOTE CONTROL WITH VDCS

Pro64 Virtual Data Cables can be used to send control data right from the console to the AD8HR preamps. Most consoles output the control data through a rear panel serial port labeled "REMOTE" using RS-422. Getting that data into the Pro64 network requires connecting a short straight-through DB9 cable (also referred to as a serial cable) from the console to the RS-422 port on the 6416Y2 card. A second DB9 cable is used to connect the RS-422 VDC port on a 6416dio to the Yamaha mic preamps being controlled. Only one 6416Y2 and one 6416dio will be involved in the remote control interface.

✓ **NOTE:** *In a straight-through cable, pin 1 is connected to pin 1 on each end of the cable, pin 2 goes to pin 2, etc. Do not use a crossover cable or null modem cable for this application.*

Multiple Yamaha mic preamps can be controlled using this method by daisy chaining the RS-422 connections from one AD8HR to the next; each preamp is assigned a unique ID and can be addressed separately from within the Yamaha user interface. Note that daisy chaining multiple RS-422 connections requires a specially wired cable, as specified in the Yamaha documentation.

Some consoles, such as the LS9 series, provide the remote control data right on the backplane for the card slot, eliminating the need for the external RS-422 DB9 jumper cable at the console. A cable will still be required to connect the 6416dio RS-422 port to the AD8HR preamps, however.



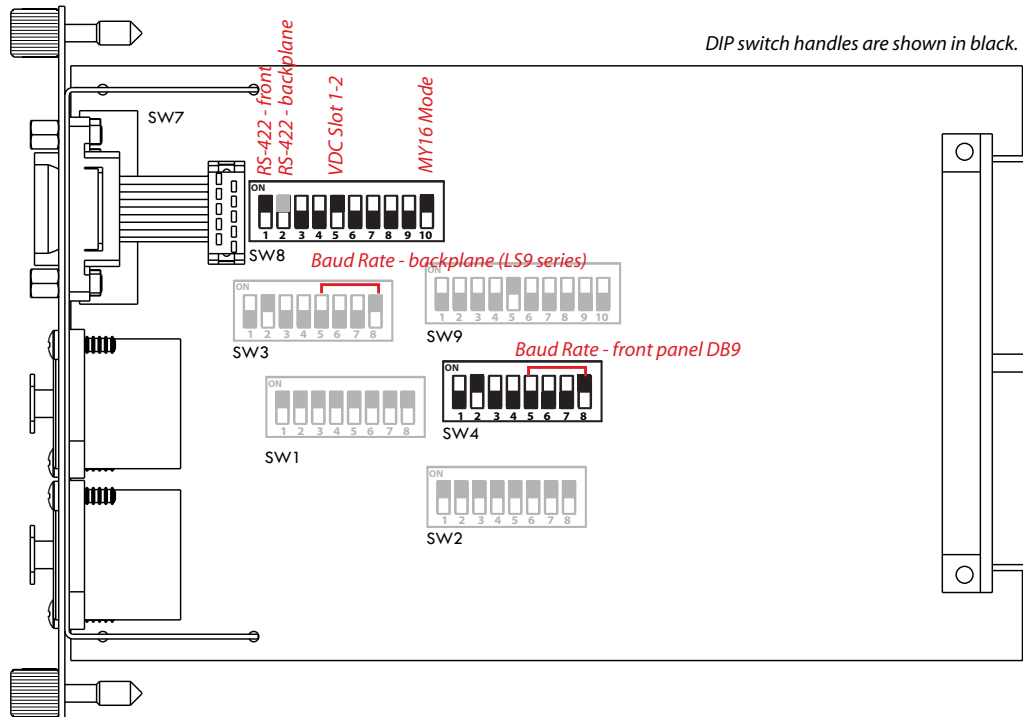
*This diagram shows a DM1000 console with one 6416Y2 card installed connected to a 6416dio Digital I/O Module and an AD8HR mic preamp. RS-422 is connected between the DM1000 and the 6416Y2 card and between the 6416dio and the AD8HR. Remote control data travels over a pair of Virtual Data Cables.*

## CONFIGURING THE CARD AND THE CONSOLE FOR REMOTE CONTROL

The first step is to configure the 6416Y2 card correctly before loading it into the console or powering up the console. The Yamaha devices communicate using RS-422 at a 38.4k baud rate, with 8 data bits, 1 stop bit, and no parity. The internal DIP switches highlighted below illustrate the switch positions to match these settings on the card. Note that any available

odd-even pair of VDC Slots can be used. Consult the 6416Y2 User's Guide for more information.

Configuring the card to receive control data from the backplane is the same (required for the LS9 series consoles), but use the switch block marked "SW3" for baud rate and set DIP switch 2 in SW8 up for RS-422.

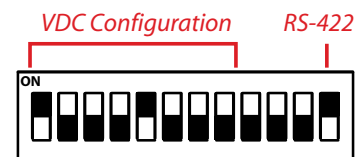


VDC 1-2 are set to transmit/receive RS-422 control data at the 38.4k baud rate from the external control port. Set the DIP switches on SW4 for the front panel connector or on SW3 for consoles such as the LS9 series that use the backplane connector.

After loading the card into the console and connecting the DB9 cable if necessary, be sure the console's RS-422 data rate is set for 38.4k baud. (See the documentation that came with your Yamaha product for additional information on changing its control data communication parameters.)

## CONFIGURING THE 6416DIO FOR REMOTE CONTROL

The next step is to configure the VDCs on the 6416dio which will be passing control data to the AD8HRs. Connect its RS-232/RS-422 port to the first Yamaha mic preamp with a serial DB9 cable. Set the port to RS-422, 38.4k baud, 8 data bits, 1 stop bit, and no parity (shown at right). Activate the same VDC Slots that were activated on the 6416Y2.



6416dio rear panel DIP switches (shown in black) configured for AD8HR remote control data; set DIP switch #12 up for RS-422.

Finally, connect additional Yamaha mic preamps by daisy chaining the RS-422 connections. This requires a special DB9 cable, as specified in the Yamaha documentation.

At this point changes to mic pre parameters can be made on the Yamaha control surface. Consult the documentation

## Application Note

that came with your Yamaha product for information on selecting mic preamps to control and changing specific parameters.

### CONFIGURING THE CLOCKS

All devices in a digital audio network need to be run from the same clock in order to avoid clock synchronization errors which can produce audible ticks, pops, and dropouts. The system outlined here is comprised of three groups of digital products (AD8HR mic preamps, the Pro64 network, and one or more digital consoles), all of which must follow a common clock. Each device needs to be told what to use as its source for that common clock.

### SELECTING A CLOCK SOURCE

The Pro64 network can generate and distribute its own highly accurate and stable clock, take in an externally distributed clock at each node (i.e., “house clock”), or take in and distribute an external clock. In this case, the external clock could come from one of the AD8HRs, the digital console, or a dedicated clock generator or other external device. The AD8HR preamps can generate their own clock and output it, or run off an external clock received as a signal embedded in an AES3 data stream or through its dedicated Word Clock In jack. Similarly, the console can generate and output its own clock or run off an external clock received a variety of ways.

A few rules to keep in mind:

- If you elect to use the internally generated Pro64 network clock, that clock must be passed to both the console and the AD8HRs.
- If you elect to use the console as the source of the clock, one of the 6416Y2 cards must be set as the network Control Master, which will automatically set it as the Clock Master for the network, slaved to the digital console’s clock. That clock must then be passed on to the 6416dio modules through the network and then on to the AD8HRs.
- If you use one of the AD8HRs as the source of the clock, a 6416dio must be set as the Pro64 Clock Master, slaved to the AD8HR clock, and the 6416Y2 cards and the digital console itself must all be set as slaves.
- If you use an externally generated clock, every device must slave to that clock. One Pro64 device must still be set as the network Clock Master, but that device will run off the external clock.

✓ **NOTE:** A 6416Y2 cannot be the Clock Master without being the Control Master, so there is no separate Clock Master switch on the card. If it is set as the Control Master, it automatically becomes the Clock Master and begins to slave to the console’s clock. By contrast, the 6416dio can be the Clock Master without being the Control Master.

**Failing to set the clock parameters correctly for all devices in the network will result in clicks and pops or audio dropouts.**

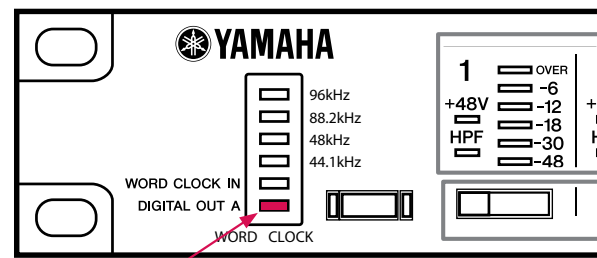
### USING THE PRO64 NETWORK AS THE CLOCK SOURCE

When the Pro64 network is the clock source, both the Yamaha console and the AD8HRs need to be set up to sync to an external clock.

The first step is to set one of the 6416dio modules to be the Control Master and Clock Master for the Pro64 network. Then, there are two choices for syncing the AD8HRs to the network: AES3 or Word Clock. (Using AES3 is easier, as it requires no extra cables.)

### TO USE AES3 TO SYNC THE AD8HR PREAMPS:

- Connect the AD8HR AES output’s DB25 multipin cable to one of the 6416dio modules.
- On the AD8HR front panel, press the Word Clock button until the amber LED next to Digital Out A is lit and flashing.
- Press the Word Clock button a second time to confirm the change. The AD8HR is now set to sync to the network via the AES clock.



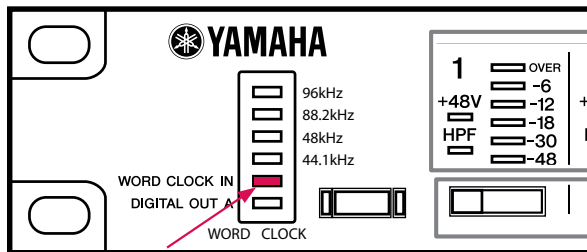
The AD8HR set to sync to AES clock

Repeat this clock setup for each AD8HR.

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### TO USE WORD CLOCK TO SYNC THE AD8HR PREAMPS:

- Connect the AD8HR AES output's DB25 multipin cable to one of the 6416dio modules.
- Connect the Word Clock Out jack on a 6416dio module to Word Clock In on the AD8HR preamp using a BNC-BNC cable.
- On the AD8HR front panel, press the Word Clock button until the amber LED next to Word Clock is lit and flashing.
- Press the Word Clock button a second time to confirm the change. The AD8HR will then lock to the incoming Word Clock signal from the Pro64 network, and then display the network sample rate (for example, 48kHz).
- To add more AD8HR preamps to this system, the Word Clock jacks on the back of the AD8HR preamps need to be daisy chained together, as can be seen on page 11 of the Yamaha AD8HR manual. Alternatively, you may pass Word Clock directly from other 6416dio modules to the other AD8HR preamps. Either way, each additional AD8HR needs to be set to receive Word Clock, as described above.

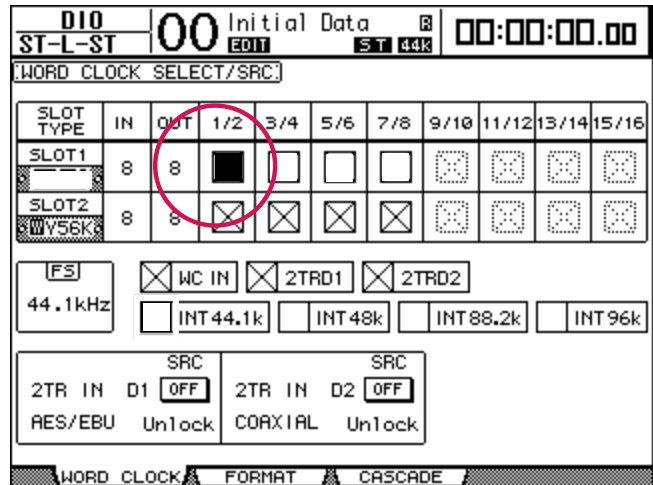


AD8HR set to sync to Word Clock

### TO SET UP THE CONSOLE TO SLAVE TO THE PRO64 NETWORK:

- On the Yamaha console, go to the digital I/O or clock page (this is different on each console).
- You should see each 6416Y2 card that is connected to an MY expansion slot in the console.
- Use the cursor to select channels 1-2 on the first 6416Y2 card.
- Press the Enter button on the Yamaha console to confirm the clock change.

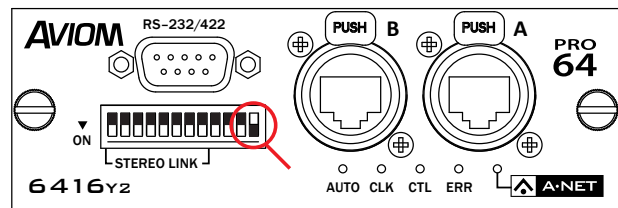
Clock setup screens vary from console to console, so consult your console's manual for detailed guidance on navigating the interface.



DM1000 set to sync to a Pro64 clock

### USING THE CONSOLE AS THE CLOCK SOURCE

If the Yamaha console is set to run off its internal clock, one 6416Y2 card in that console must be set as the Pro64 network Control Master, which will automatically make it the Clock Master as well, slaved to the console. All other 6416Y2 cards must be set as slaves.

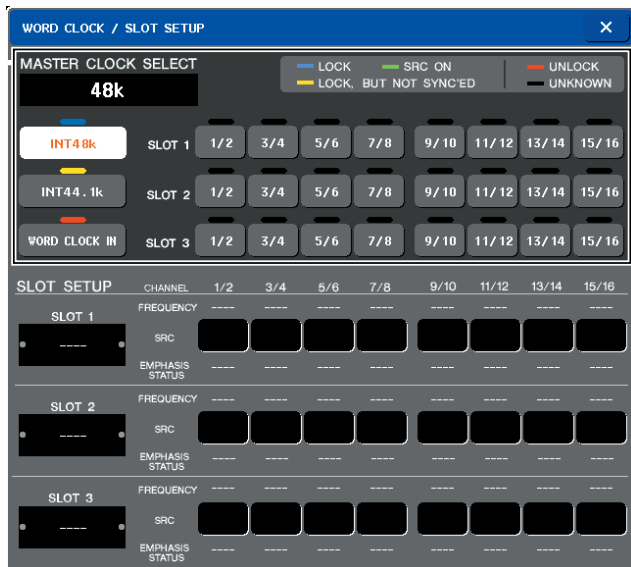


Moving switch #12 to the down position sets the 6416Y2 as the Control Master, which will slave the Pro64 network to the console's clock.

The console can distribute clock from its Word Clock Out to all other digital devices in the system or, more conveniently, the Pro64 network can be used to distribute the clock. Be sure to set the Clock Source for each 6416dio in the system to Network, and then AD8HR preamps can be synchronized via AES3 or Word Clock as described above.

Clock setup screens vary from console to console, so consult your console's manual for more information.

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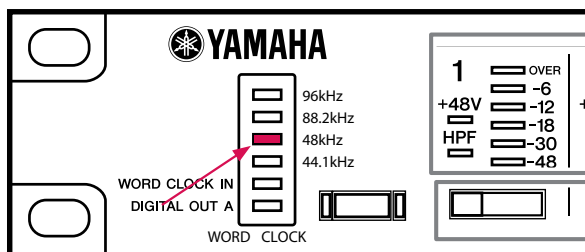


The clock setup screen on an M7CL set to run off its internal clock at 48kHz

### USING AN AD8HR AS THE CLOCK SOURCE

The AD8HR can generate its own clock internally, which can be passed to the Pro64 network via its Word Clock Out or as a clock embedded in the AES3 digital audio stream. To set the AD8HR to use its internal clock:

- On the AD8HR front panel, press the Word Clock button until the amber LED next to desired sample rate is lit and flashing.
- Press the Word Clock button a second time to confirm the change. The AD8HR is now set to use its internal clock, which will be automatically output through the Word Clock Out jack and embedded in the AES3 data stream.

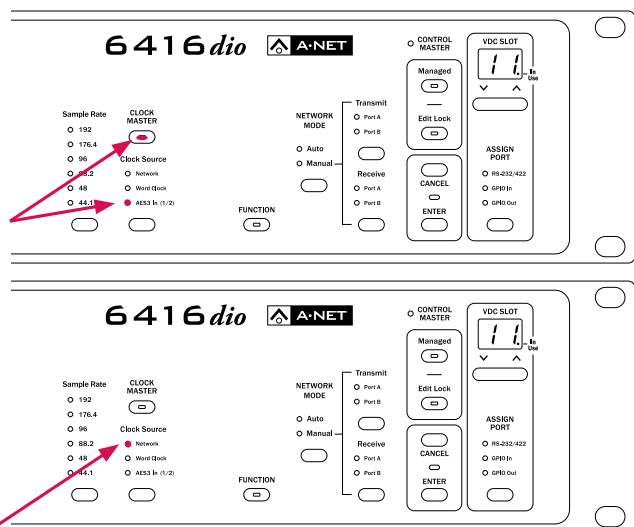


AD8HR set to use its internal clock at 48kHz

Note that only one AD8HR in a system can be set to use its internal clock. All other AD8HRs must be syncing to that clock,

either via daisy-chained Word Clock or through the Pro64 network as outlined in the sections above.

The 6416dio to which the master AD8HR is connected should be set as the Pro64 Clock Master (and, in most cases, the Control Master as well), and the clock source on that device must be set to either AES3 or Word Clock In. As before, using the clock signal embedded in the AES3 data stream is simpler, as no additional cables are required. The Clock Source on all other 6416dio modules in the network should be set to "Network" (or "Word Clock" if the Word Clock from the AD8HR is being distributed externally by a dedicated cable).



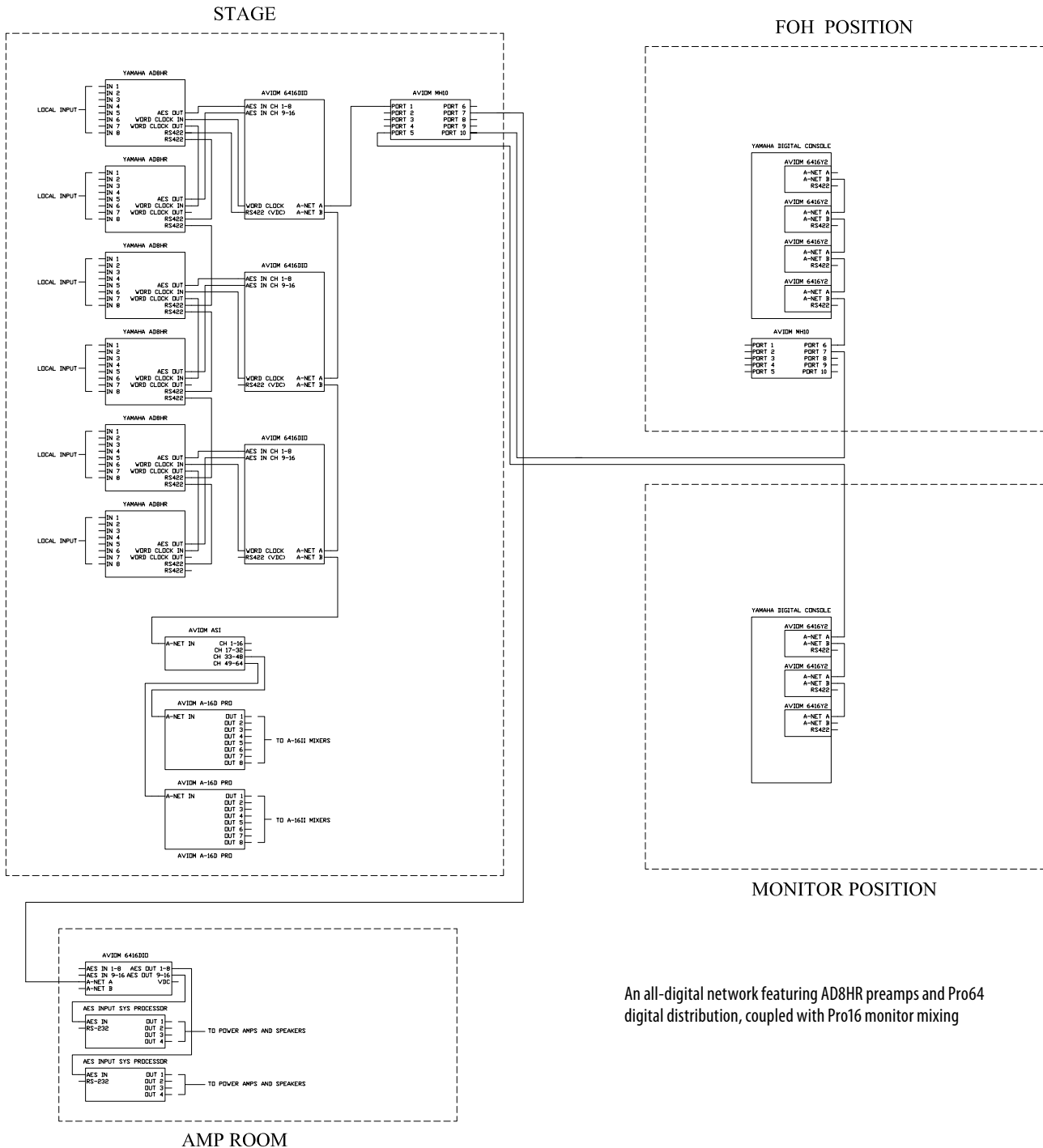
6416dio set as Clock Master, slaved to an external AES3 signal (TOP), and a 6416dio clock slave, set to receive its clock from the network (BOTTOM)

Finally, be sure to set the console to slave to the first 6416Y2 card, as described in the section above on using the Pro64 network as the clock source.

## BEYOND THE SNAKE

One of the advantages of a digital audio backbone is the ability to tie additional locations into the system easily. Remember that each digital device added to this system must be set to use the same clock source as every other device. Otherwise, ticks, pops, and audio dropouts will occur as the

different clocks fall in and out of sync with one another. If, for instance, you add a second console to the system, be sure that it is set to slave to Pro64 network or a externally distributed Word Clock.



An all-digital network featuring AD8HR preamps and Pro64 digital distribution, coupled with Pro16 monitor mixing