AVIOM®

Using Fiber Optics With Pro16 Systems

Aviom's ultra-fast Pro16® A-Net® is capable of sending data up to 500 feet (150 meters) between devices using standard Cat-5e cables. For applications requiring longer cable runs, fiber optic media converters can be used to extend the distance between devices to up to 50 miles (80 kilometers). Applications for this technology include live sound reinforcement, remote recording and broadcast where the source audio and production equipment are in separate buildings, and permanent installations where audio needs to travel between floors of a building.

There are two types of fiber optic technologies—single-mode and multi-mode. Using multi-mode fiber optics, the distance between Pro16 devices can be extended to 1.2 miles (2 kilometers). Single-mode fiber offers even longer cable lengths—up to 50 miles (80 kilometers) between devices. Either single- or multi-mode fiber can be used with Pro16 A-Net systems.

FIBER MEDIA CONVERTERS

Integrating fiber into an existing Pro16 system is as simple as using a pair of media converters to switch the data stream from Cat-5 to fiber and back to Cat-5. It's important, however, to select a media converter that is not designed specifically for Ethernet data packets. These devices will not work with A-Net data.

Some off-the-shelf media converters look only at the "physical layer" of the data stream. Because Ethernet and A-Net use a common physical layer, these devices should work as outlined in this document. Aviom has tested and approved Transition

Figure 2. The LightViper EF-2 Physical Layer Ethernet Converter is a mullti-mode device optimized to work with bidirectional or unidirectional A-Net systems.

Networks® model E-100BTX-FX-05. Additional information is available at www.transition.com.

In addition, LightViper collaborated with Aviom on an Ethernet-to-fiber converter optimized for audio. Because of this, the LightViper™ EF-2 offers some design advantages over standard media converters. Find out more at www.lightviper.com.

HOW IT WORKS

Media converters change the format of an Ethernet-based signal on Cat-5 into a format compatible with fiber optics. At the other end of the fiber cable run, a second media converter is used to change the data back to its original format.

One important difference to note between Cat-5 and fiber is that Cat-5 cables and RJ45 jacks are bidirectional while fiber is not. Thus, every fiber run in a system must include two fiber cables, one carrying data in each direction. These are typically labeled transmit (or Tx) and receive (or Rx).

To use Pro16 with fiber optic media converters, note the following conditions:

- Two media converters are required for each run (one at either end).
- Two fiber optic cables must be used, one for transmit (Tx) and one for receive (Rx).
- No more than 16 channels in each direction (32 channels total) can be transmitted on a given fiber optic cable pair.
- Systems larger than 32 channels require the use of multiple pairs of media converters and multiple pairs of cables.
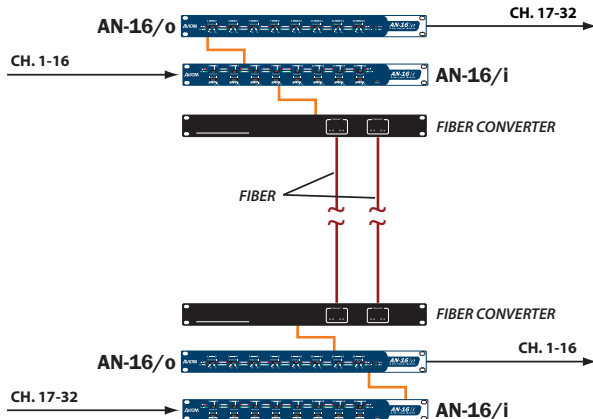
Figure 1. This bidirectional (16x16) setup with the LightViper EF-2 Physical Layer Ethernet Converter could be used to send audio in a typical stage to front-of-house situation.

A basic A-Net-to-fiber optic system requires the following:

- One Pro16 input module, such as the AN-16/i, AN-16/i-M, or Aviom 16/o-Y1 A-Net Card
- Two media converters, such as the Transition Networks model E-100BTX-FX-05 or the LightViper EF-2
- Two fiber optic cables to connect the media converters
- At least one Pro16 output module, such as the AN-16/o Output Module or a network device like the AN-16SBR System Bridge
- Cat-5 cables to connect the Aviom devices to the media converters

BIDIRECTIONAL SYSTEMS

Integrating fiber into a 16x16 Pro16 system is straightforward. Simply identify the Cat-5 cable that is carrying all 32 channels and "replace" that cable with a pair of media converters and a pair of fiber cables. For details on configuring 32-channel Pro16 systems, refer to your products' User Guides or www.Aviom.com.
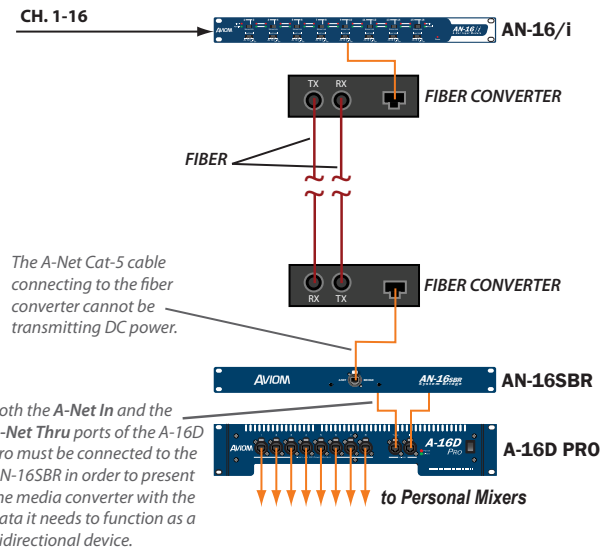
Connect this cable to the RJ45 port on one of the media converters. Run the fiber cables to the second location and connect the second media converter. Connect the RJ45 port on this second media converter to the same A-Net jack previously used for the 32-channel cable. Figure 1 illustrates a basic 16x16 Pro16 system with a fiber run.

UNIDIRECTIONAL SYSTEMS

Setting up 16x0 or 32x0 systems is a bit more complicated because fiber is designed for bidirectional (Tx and Rx) data. The LightViper EF-2 eliminates this complexity, and configuring a unidirectional system is much the same as configuring a bidirectional (16x16) fiber run. Figure 3 illustrates a 16x0 run with EF-2 media converters.

CH. 1-16 AN-16/i
FIBER CONVERTER
FIBER
FIBER CONVERTER
AN-16/o CH. 1-16
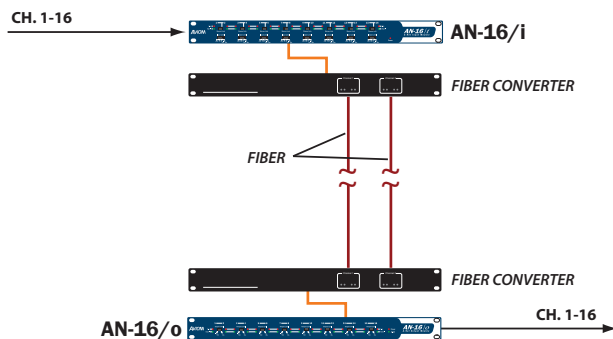
Figure 3. A unidirectional (16x0) system requires no special configuration with the LightViper EF-2. The EF-2 also supports 32x0 systems.

CH. 1-16 AN-16/i
TX RX FIBER CONVERTER
FIBER
RX TX FIBER CONVERTER

The A-Net Cat-5 cable connecting to the fiber converter cannot be transmitting DC power.

AVIOM AN-16SBR **AN-16SBR**

Both the A-Net In and the A-Net Thru ports of the A-16D Pro must be connected to the AN-16SBR in order to present the media converter with the data it needs to function as a bidirectional device.

A-16D PRO **A-16D PRO**
to Personal Mixers

Figure 4. A unidirectional (16x0) system with off-the-shelf converters requires that a second copy of the A-Net data be looped back into the media converter.

Unlike the LightViper EF-2, most off-the-shelf media converters require two-way data transmission, which requires additional configuration. Note that off-the-shelf converters cannot support 32x0 runs.

To configure a 16x0 run with off-the-shelf media converters, you need to simulate bidirectional data flow to "trick" the converters. This will have no impact on the performance of the audio system and simply involves presenting data to both the Tx and Rx sides of the fiber gear.

The details of how to do this depend on what Pro16 gear you have in your system. If your system includes an output module with an A-Net Expansion jack (such as the AN-16/o) connected to one of the media converters, use a short jumper to connect the A-Net Out port of the output device to its own A-Net Expansion port. This will send a copy of the A-Net stream back to the media converter. While no Pro16 gear will ever use this copy of the data, it satisfies the media converters' requirement to see data in both directions.

Alternatively, you can use any A-Net Out or A-Net Thru to provide a data stream to the media converter. The key is to use the AN-16SBR to get this data stream, as well as the main data stream, onto the Cat-5 cable connected to the media converter. Figure 4 illustrates an example.

Note: Be sure to use Port C on the System Bridge for connecting the second data stream and Port D for the main data stream of their equipment.