

ADAM Theory

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There are 3 types of intercoms in the ADAM family:

- ZEUS intercoms (standalone system supporting up to 24 ports)
- ADAM-CS intercoms (supporting up to 64 ports)
- ADAM intercoms (supporting up to 136 ports in a single frame, expandable to many frames)

ADAM intercoms can consist of one or more frames. An ADAM frame consists of a digital audio backplane, 17 slots for audio devices, 2 slots for Master Controller (MC) cards, and 2 power supplies.

The available audio devices include the following:

- Analog I/O (AIO) cards
- Dual Bus Expander (DBX) cards

ADAM-CS intercoms are smaller versions of ADAM intercoms (the equivalent of two MC cards with up to 8 AIO cards).

ADAM and ADAM-CS intercoms may be interconnected using a Trunk Master TM to create an intercom network in a “hub and spoke” configuration, with the TM as the hub for control purposes.

ZEUS intercoms are like mini-ADAM intercoms (the equivalent of a single MC card with three AIO cards). ZEUS II intercoms may also be connected to a Trunk Master, and provide limited expansion to more ports.

In a single frame ADAM intercom, only AIO and MC cards are used.

In a multi-frame ADAM intercom, the audio between frames is relayed by DBX cards.

In a multi-frame intercom using DBX cards, only the first frame has MC cards. These MC cards are programmed with different firmware than the standard MC card, and operate only as Peripheral Controller (PC) cards. The control functions performed by MC cards in other intercoms are actually performed by the DBX cards in these systems.

Here is a description of the roles of each type of card:

Master Controller (MC) cards are used in single frame intercoms. They are also used (with different firmware and a different purpose) in multi-frame intercoms with DBX cards, but are called Peripheral Controllers in this case.

In other words, there are usually two MC cards in each frame (to provide redundancy of control operations). One MC is Active, and the other is Standby. The active MC is the “brains” of the intercom. This MC controls all of the functionality of the intercom, providing simple point-to-point audio connections, as well as more complex operations such as party lines, IFB's and isolation functions. The MC does not deal with audio, but rather sends commands to the AIO cards to control their mixers and audio functions. The MC monitors reports from the AIO cards regarding the keypanel states, configures the keypanels according to a saved configuration file, and acts on events, such as key press notifications, that it receives from the AIO cards.

The MC also talks externally with other devices such as LCP-102, PAP, UIO-256 and the Trunk Master, as well as with a computer running the intercom configuration software called ADAMedit. ADAMedit is used to configure and monitor the intercom, and is useful, but not required once the intercom is configured and running.

Analog I/O (AIO) cards support 8 external input and output ports for connecting keypanels, or other audio devices, to the intercom. The AIO card communicates with intercom keypanels and collects and reports key status to the intercom controller (either an MC or DBX card). The AIO card accepts analog audio from the keypanel or other device, digitizes the audio, and puts it on the backplane in the appropriate TDM timeslot so that the audio may be accessed by other AIO or BX cards on the backplane. Outgoing audio to a keypanel or other device is also provided by the AIO card. The AIO card pulls the appropriate TDM audio timeslots from the backplane, performs the audio mixing (as instructed by the intercom controller), converts the digital audio signal to analog and sends it to the external devices.

The AIO card is essentially an A/D and D/A card for external audio, as well as a digital audio mixer, and data controller for the keypanel devices. The AIO card performs these operations under the control of either an MC or DBX card.

Dual Bus Expander (DBX) cards provide both intercom control (like an MC card) and an audio path from one frame to TWO other frames (forwarding up to 128 audio timeslots between each frame). In an intercom using DBX cards, the first frame has two Peripheral Controller (PC) cards instead of MC cards (same hardware, but different firmware). Unlike MC cards, the PC cards provide only the external functions (ADAMedit, Trunk Master, PAP, LCP, UIO, etc...), while the control of the intercom lays with the active DBX card in the first frame. DBX cards communicate with each other in a coaxial ring, and all AIO cards relay keypanel events to the active DBX card. DBX cards allow much larger intercoms to be created (up to 7 frames and 784 ports are currently supported).

Each card has a CPU (Motorola ColdFire for the DBX cards, Motorola 68340 for the MC and PC cards, Intel 80196 for the AIO and SBX cards), a Field Programmable Gate Array "FPGA" (Xylinx for the AIO card, and Alteras for all other cards), as well as static or dynamic RAM, and FLASH EPROM's for firmware and configuration information (except for the AIO and SBX cards which have no configuration FLASH).

The FLASH devices are typically AMD 29F010/F040 or equivalent. The firmware FLASH on each card is field upgradeable and can be downloaded via the ADAMedit software interface. The intercom configuration is stored in FLASH on the MC (or DBX) card and can be uploaded and saved to file using ADAMedit. ADAMedit is also used to create and download the initial configuration for the intercom.

The FPGA's control the address decoding and peripheral access on each card (including control of the audio ASIC's, control bus communications, and other peripherals). The AIO's Xylinx FPGA is downloaded from the AIO firmware, and can be upgraded by downloading new firmware to the AIO card. The Altera FPGA's are configured from socketed on-board PROMS and can be upgraded by replacing the PROM chip. FPGA upgrades are seldom, if ever, needed.