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Apple Token Ring NB/c Card: Hardware Overview (3/95)

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TOPIC -----

This article provides a hardware overview of the Apple Token Ring NB/c Card.

DISCUSSION -----

The Token Ring NB/c Card is a 7 inch single board communications controller that occupies a NuBus slot on a Macintosh computer, and is the only Token Ring card from Apple supported for the Centris/Quadra 610, Quadra 660AV, and Power Macintosh 6100 when installed with the NuBus adapter card. It provides high speed (4 and/or 16 Mbps) Token Ring network communications and is compatible with the IBM Token Ring adapter at the physical transmission level. The transmission speed is selectable under software control.

Designed to the 2.0 NuBus specifications, the Token Ring NB/c Card functions as a NuBus slave device. As a NuBus slave, it will relinquish control of all of its internal resources to the NuBus master.

The overall design of the Token Ring NB/c Card can be divided into two main functional blocks, the Macintosh Coprocessor Platform and the Token Ring Interface.

Macintosh Coprocessor Platform (MCP) Slave-only Interface

The MCP consists of 4 major components: the MCP/Token Ring Interface, PROM, OTPROM, and the NuBus interface. Each of these components is discussed below:

- Read Only Memory

The Token Ring NB/c Card provides space for 32KB of ROM, provided by a 32K x 8 bit OTPROM. This ROM contains the NuBus configuration information required to interface the Token Ring NB/c Card into the Macintosh environment; the Slot Manager configuration information, checksum, version number, and copyright notice. The ROM is mapped at adapter addresses Fc000 - FFFFF. It appears as an 8-bit device on byte lane 1 to NuBus.

- NuBus Interface

The NuBus interface provides an 8/16/32 bit interface between the Token Ring NB/c Card's Token Ring interface and NuBus. It is based on the NuBus MCP ASIC's jointly developed by Apple and TI, the 74ACT2441 and 74BCT2425. Access to the

NuBus interface is controlled through a set of Control Registers located at addresses C0000 - C800F.

- MCP/Token Ring Interface

The MCP/Token Ring interface consists of a 64 KByte region of RAM which is shared between the IBM chipset and NuBus as well as a set of shared registers resident on the IBM chipset. Buffers and Data are stored in the Shared RAM, while interrupts and status are obtained through the chipset's registers. The IBM chipset does not have DMA capability, and as such the NuBus host must perform the transferring of data between the Shared RAM and its own RAM. Both Shared RAM and the chipset's registers are 16 bit entities.

Token Ring Interface

The Token Ring Interface section of the Token Ring NB/c Card is implemented using the "IBM Token-Ring Mini-Card Sub-Assembly". This module includes the Token Ring Controller, the analog circuitry for the front end, and chipset ROM containing the microcode executed by the controller. 64 KBytes of Shared RAM is accessible by both the IBM chipset and the NuBus host.

- The Ring Interface

Physical connection to the ring is through a IBM Token Ring Adapter compatible DB-9 nine pin connector. This connector provides correct signal connection to the IBM-specified Type 1 Cabling System.

- Burned-in UnitID

The UnitID or Serial number is stored in a separate 32 byte PROM, occupying six words of address space of the NuBus host processor, starting at location 40000. The UnitID is the network node address of a Token Ring NB/c card and its host. Each Token Ring Adapter has a unique six byte (48 bit) burned-in UnitID. The UnitID contained in this PROM is to be used as the default node address when the adapter is opened. If desired, an alternate node address may be specified. In either case, it is the responsibility of the low level protocol firmware to supply the address to be used when the adapter is opened. Failure to do so will result in an open error. Assignment of a range of UnitIDs is coordinated by the IEEE. Note that before the BIA PROM can be accessed, the "external DMA register" must be initialized to the value "000A" by the NuBus host.

- UnitID PROM Addressing

The format of the UnitID/Burned-in Address consists of two 24 bit fields:

- The Corporate ID (assigned by IEEE)
- The Manufacturer-provided address (assigned by Apple)

The latter is unique for every Networking product sold by Apple computer.

Article Change History:

27 Mar 1995 - Added Quarda 610, 660AV, and 6100 computers are supported.

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