

1 **TXI Access Protocol**
2 **100 Mbit/s 802.5 Changes**

3 K. T. Wilson
4 BPDA/662
5 RTP, NC

6
7 Phone: (919) 543-2276
8 FAX: (919) 254-0741

9
10 ktwilson@vnet.ibm.com

11
12
13
14 August 27th, 1997

1. Definitions

This document uses the following terms to indicate the type of IEEE 802.5 protocol being used.

FDX This term is used is used to indicate the "*Full-Duplex*" operation supported by the 802.5 TXI Access Protocol. The TXI Access Protocol can be used to support a 100/16/4 Mbit/s "Dedicated Token Ring" Station.

HDX This term is used is used to indicate the "*Half-Duplex*" operation supported by the 802.5 TKP Access Protocol. The TKP Access Protocol can be used to support a 100/16/4 Mbit/s "Token Passing" Station.

The following terms are used to describe the protocol defined by the ISO/IEC 8802-5 Standard.

TKP Access Protocol This protocol is specified by the ISO/IEC 8802-5:1995 Standard and its update: ISO/IEC 8802-5:1997 REV. These Standards specify the original "Token Passing Protocol".

TXI Access Protocol This protocol is defined in the ISO/IEC 8802-5:1997 Standard Supplement titled "Dedicated Token Ring". This Supplement specifies the "Transmit Immediate Protocol".

1.1 TXI Access Protocol Network Configuration

Figure 1-1 illustrates example TXI and TKP Access Protocol connections to 100/16/4 Mbit/s Switch Ports including:

1. a **new FDX** 100/16/4 Mbit/s Station using a 100 Mbit/s protocol based on a *modified* 16/4 Mbit/s 802.5 TXI Access Protocol,
2. a **FDX** 100/16/4 Mbit/s Station using the *standard* 16/4 Mbit/s 802.5 TXI Access Protocol and
3. a **HDX** 16/4 Mbit/s Concentrator (and its attached Stations) using the *standard* 16/4 Mbit/s 802.5 TKP Access Protocol.

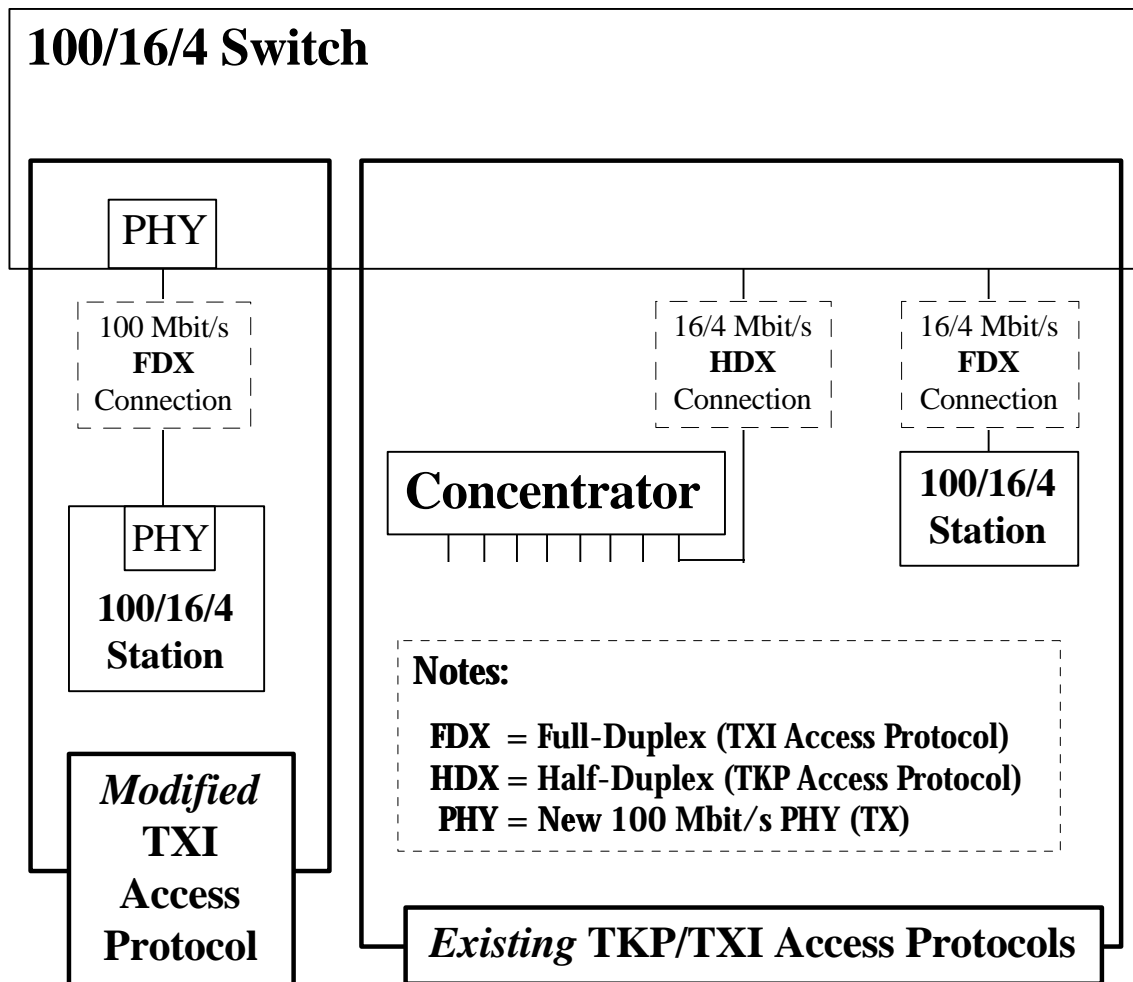


Figure 1-1 - Network Containing New 100/16/4 Mbit/s FDX Stations

2. IEEE 802.5 Architectural Changes

This document identifies the changes needed in the IEEE 802.5 document to support 100 Megabit per second (100 Mbit/s) Token Ring and addresses only *switched* Token Ring support.

2.1 TXI Access Protocol Changes

Table 1 identifies the modifications to the IEEE 802.5 Standards document required to support the 100 Mbit/s TXI Access Protocol.

2.1.1 Design Philosophy

The design philosophy for the 100 Mbit/s TXI Access Protocol is one of “*least change*” to the 16/4 TXI Access Protocol defined by the ISO/IEC 8802-5:1997 Supplement defining the Dedicated Token Ring Port and Station.

The TXI Access Protocol supports 100/16/4 Mbit/s operation.

2.1.2 MAC Layer Assumptions

The following MAC Layer assumptions were used in developing Table 1.

1. The TXI Access Protocol supports the 4, 16 and 100 Mbit/s link speeds.
2. No 802.5 timer values need to be changed.
3. No changes will be made to the 802.5 MAC Frame formats between the MAC and its *upper* layers.
4. The layout of the Frame and Abort Sequence as seen on the 100 Mbit/s Link are changed to agree with the requirements of the TX PCS/PMD framing requirements. This change will be made so few if any changes have to be made to the Port and Station Operation Tables.
5. The Port and Station *Join* Machines will be changed either through words or minor Port and Station Operation Table changes to recognize the new (to 802.5) TX PCS/PMD Link Negotiation conditions. This includes the following.
 - a) A new method of indicating a Lobe Test failure.
 - b) The failure of the Link Negotiation process.
 - c) The mapping of TX Error conditions to the 802.5 error conditions (e.g., burst error, code violation, etc.).
 - d) Other TX Link Negotiation process conditions (still being defined).These changes will be made so few, if any, changes have to be made to the Port and Station Operation Tables.

6. The Station and Port *Transmit* Machines will be changed with minor Port and Station Operation Table changes to recognize the maximum Frame size for 100 Mbit/s (suggest the maximum be 4550 octets).
7. No changes are foreseen in the Station and Port *Monitor* Machines.
8. The Source Routing function remains unchanged.

2.1.3 PHY Layer Assumptions

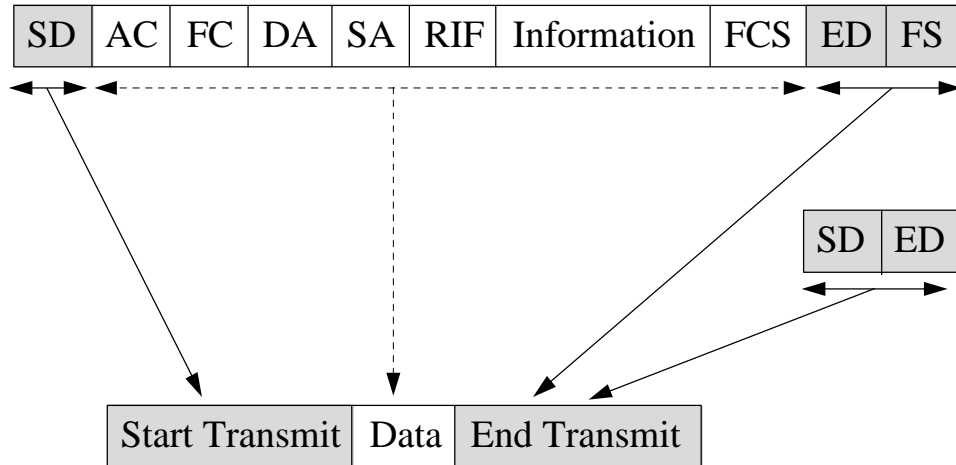
The following PHY Layer assumptions were used in developing Table 1.

1. The TXI Access Protocol supports the 4, 16 and 100 Mbit/s link speeds as follows.
 - a) The Station attempts to open at the highest speed selected via Option Flags (a new Option Flag is required for 100 Mbit/s). If the Station or Port supports 100 Mbit/s, then they request the TX PHY to negotiate to bring up the link as follows.
 - i) If the TX Link Negotiation fails due to incompatibility, the Station closes (returns to Bypass).
 - ii) If the TX Link Negotiation fails due to no response (TX is not on the other end of the link), then the Station switches to the speed selected via the 16/4 Option flag (it is suggested an auto ring-speed process be initiated).
2. The layout of the Frame, Token and Abort Sequence as seen on the 100 Mbit/s Link will be changed to agree with the requirements of the TX PCS/PMD framing procedure which requires *all* data to be within a single envelope.

Figure 2-1 is an example of how the current 16/4 Mbit/s 802.5 Frame and Abort Sequence Formats (specified in clause 3 of ISO/IEC 8802-5) can be mapped into a *single* 100 Mbit/s TX transmission envelope that represents the 802.5 Frame and Abort Sequence Formats.

NOTE: I have used the terms "Transmit Start" and "Transmit End" to avoid confusing them with the current "Starting Delimiter" and "Ending Delimiter" respectively already defined in ISO/IEC 8802-5:1995.

Existing 16/4 Mbit/s Frame and Abort Sequence Formats



Proposed 100 Mbit/s Frame and Abort Sequence Format

Where:

—— = control
 ---- = data

Figure 2-1 - Proposed 100 Mbit/s Full-Duplex Frame and Abort Sequence Format

Figure 2-1 illustrates the following mapping of the 802.5 Frame and Abort Sequence into a single TX PHY transmission envelope as follows.

1. Control Mapping

- The "Starting Delimiter" (SD) field of the 802.5 Frame is mapped into "Start Transmit" field.
- The "Ending Delimiter" (ED) and "Frame Status" (FS) fields of the 802.5 Frame are mapped into the "End Transmit" field.
- The "Starting Delimiter (SD) and Ending Delimiter (ED) fields" of the 802.5 Abort Sequence are mapped into the "End Transmit" field.

2. Data Mapping

The fields containing the 802.5 Frame data ["Access Control (AC)" field through and including the "Frame Check Sequence (FCS)" field] are mapped into the "data" field.

115

Table 1 - 100 Mbit/s TXI Access Protocol		
802.5 Change	Purpose of Change	Change Size/Risk
Clause 1	Definitions unique to TXI Access Protocol at 100 Mbit/s.	small/low
Clause 2	Definition of the configurations supported by the TXI Access Protocol at 100 Mbit/s.	small/low
Clause 9.1	Define unique definitions used in 9.2 and 9.3 for the TXI Access Protocol at 100 Mbit/s.	small/low
Clause 9.2	<ul style="list-style-type: none"> Change the Join Station Operation Table to support the TXI Access Protocol at 100 Mbit/s. 	medium/low
	<ul style="list-style-type: none"> Change the Transmit Station Operation Tables to support the TXI Access Protocol at 100 Mbit/s. 	small/low
Clause 9.3	<ul style="list-style-type: none"> Change the Join Port Operation Tables to support the TXI Access Protocol at 100 Mbit/s. 	medium/low
	<ul style="list-style-type: none"> Change the Transmit Port Operation Tables to support the TXI Access Protocol at 100 Mbit/s. 	small/low
Clause 9.7	Change the PHY requirements unique to the TXI Access Protocol at 100 Mbit/s for Clauses 9.2 and 9.3.	medium/low
Clause 10	Change the definition of the Frame, Token and the Abort Sequence for the TXI Access Protocol at 100 Mbit/s for Clauses 9.1, 9.2 and 9.3.	medium/low
Annex A	Change the normative requirement statements to support the TXI Access Protocol at 100 Mbit/s	small/low
Annex L	Change the Join and Transmit FSMs to support changes made to the Station Operation Tables in 9.2.	small/low
Annex M	Change the Join and Transmit FSMs to support changes made to the Port Operation Tables in 9.3.	small/low

116 **3.**

3. Attachments

The following additional figures were used during the Presentation of this paper.

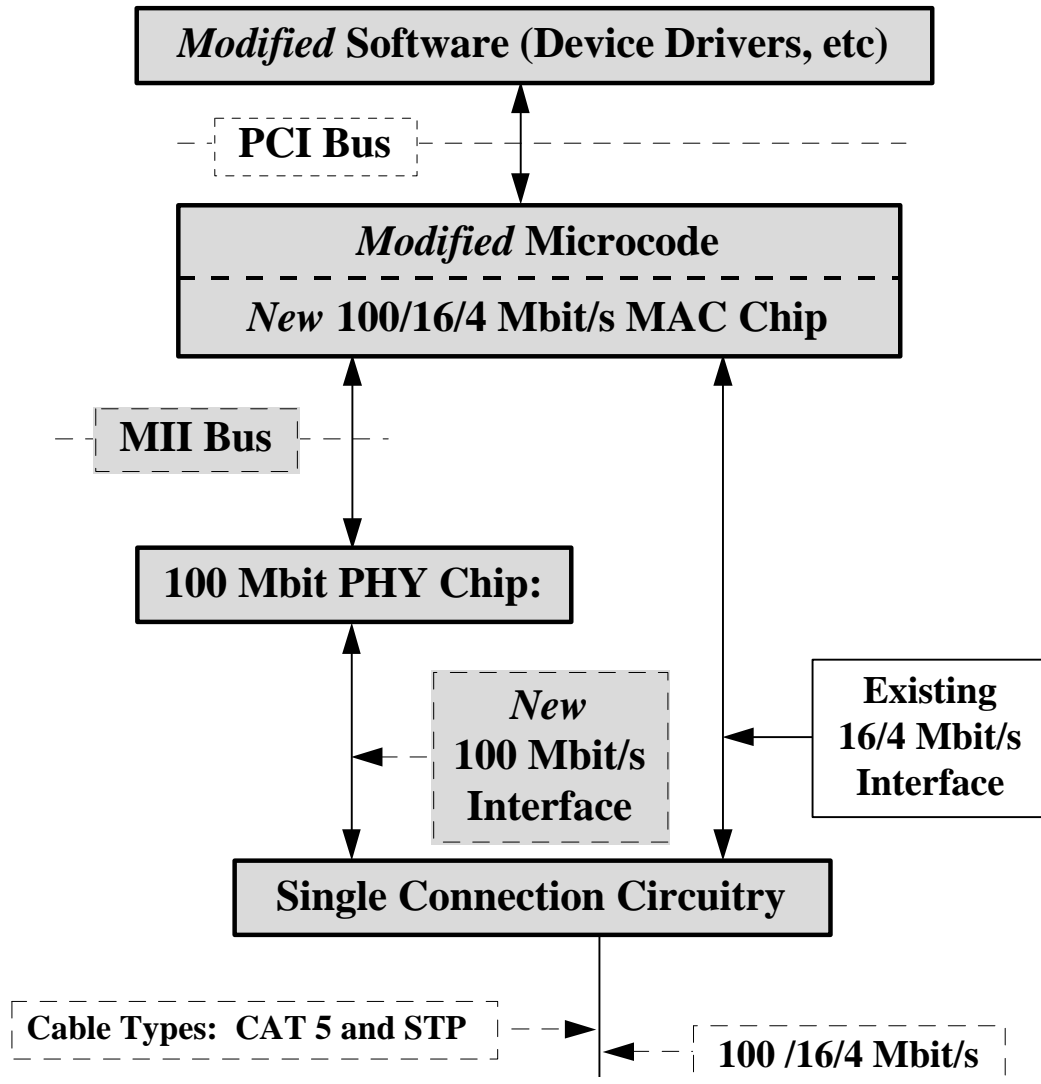
Figure 3-1 is an overview of the adapter causing least change the the TXI Access Protocol.

Figure 3-2 is an overview to illustrate where the MII interface fits within the 802.5 Standard.

Figure 3-3 is an overview of bit mapping into the Start Transmit and End Transmit functions identified in Figure 2-1.

100 Mbit/s Token Ring

Adapter Overview

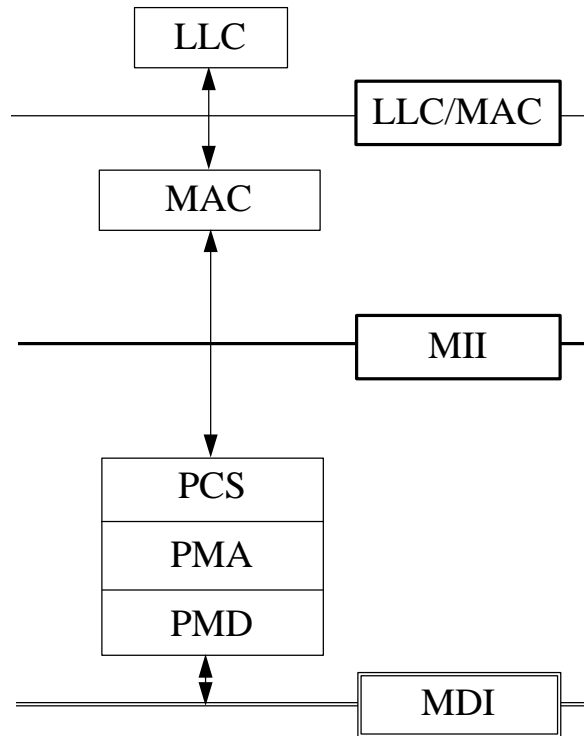


KTWilson 8/27/97

124

125 **Figure 3-1 - Adapter Overview**

MAC relationship to PCS/PMA/PMD

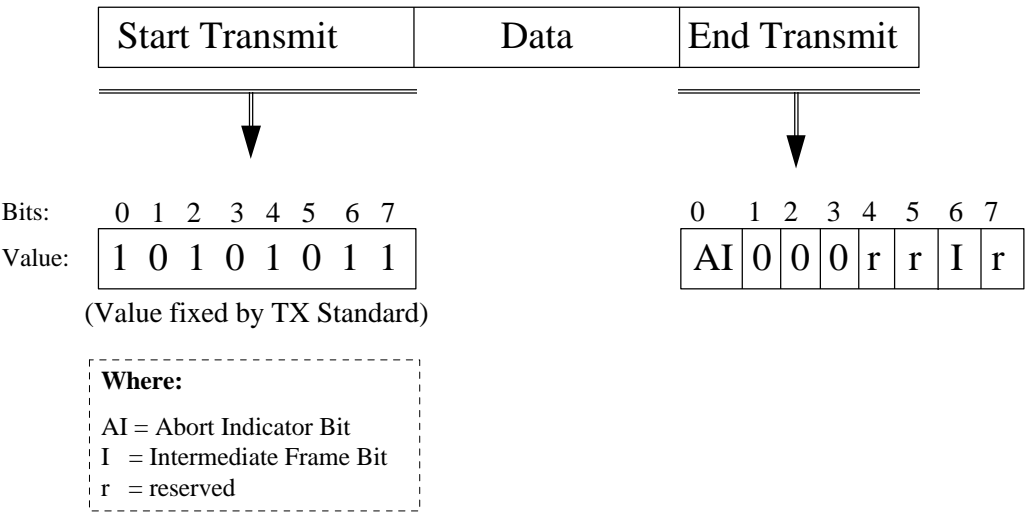


ktwilson 8/27/97

126

127 **Figure 3-2 - Importance of MII**

Start and End Transmit Bit Mapping



128

KTWilson 8/27/97

129 **Figure 3-3 - Bit Mapping Overview**

