ANSI/IEEE Stds 802.5r and 802.5j, 1998 Edition

(Amendments to ANSI/IEEE Std 802.5, 1998 Edition)

(Adopted by ISO/IEC and redesignated as
ISO/IEC 8802-5:1998/Amd 1:1998)

IEEE Standard for Information technology—

Telecommunications and information exchange between systems—

Local and metropolitan area networks—

Specific requirements

Part 5: Token ring access method and physical layer specifications

Amendment 1: Dedicated token ring operation and fibre optic media

Adopted by the ISO/IEC and redesignated as
ISO/IEC 8802-5:1998/Amd 1:1998

Sponsor

LAN/MAN Standards Committee
of the
IEEE Computer Society

Abstract: This amendment to Local and Metropolitan Area Network standard, ISO/IEC 8802-5 : 1998, is part of a family of local area network (LAN) standards dealing with the physical and data link layers as defined by the ISO/IEC Open Systems Interconnection Basic Reference Model. The requirements for dedicated token ring (DTR) operation are specified, including the changes and additions to the Medium Access Control (MAC) layer to provide for an additional full-duplex mode of operation (switching), and for interconnection of shared LAN segments to switch ports. Also specified are the characteristics of a fibre optic interface for connecting a 4 Mbit/s or 16 Mbit/s token ring station to the trunk coupling unit (TCU) of a token ring, including station, port, and channel requirements. Fibre optic trunk signaling recommendations are also made.
Keywords: data processing interconnection, dedicated token ring, fibre optic media, full duplex operation, insertion key, local area network (LAN), medium access control (MAC), token ring

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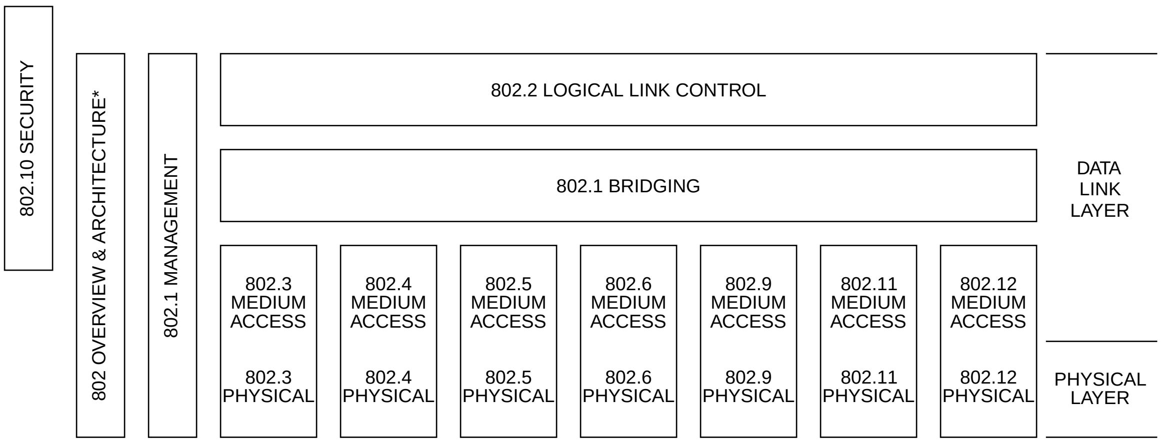
ANSI/IEEE Std 802.5r-1997 and 802.5j-1997, 1998 Edition

Introduction to ANSI/IEEE Std 802.5r-1997 and 802.5j-1997, 1998 Edition

(This introduction is not a part of ANSI/IEEE Stds 802.5r-1997 and 802.5j-1997, or of ISO/IEC 8802-5 : 1998/Amd. 1: 1998.)

This standard is part of a family of standards for local and metropolitan area networks. The relationship between the standard and other members of the family is shown below. (The numbers in the figure refer to IEEE standard numbers.)



* Formerly IEEE Std 802.1A.

This family of standards deals with the Physical and Data Link layers as defined by the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) Basic Reference Model (ISO/IEC 7498-1 : 1994). The access standards define seven types of medium access technologies and associated physical media, each appropriate for particular applications or system objectives. Other types are under investigation.

The standards defining the technologies noted above are as follows:

- IEEE Std 802 — *Overview and Architecture.* This standard provides an overview to the family of IEEE 802 Standards.
- ANSI/IEEE Std 802.1B and 802.1k [ISO/IEC 15802-2] — *LAN/MAN Management.* Defines an OSI management-compatible architecture, and services and protocol elements for use in a LAN/MAN environment for performing remote management.
- ANSI/IEEE Std 802.1D [ISO/IEC 10038] — *Media Access Control (MAC) Bridges.* Specifies an architecture and protocol for the interconnection of IEEE 802 LANs below the MAC service boundary.
- ANSI/IEEE Std 802.1E [ISO/IEC 15802-4] — *System Load Protocol.* Specifies a set of services and protocol for those aspects of management concerned with the loading of systems on IEEE 802 LANs.
- ANSI/IEEE Std 802.1F — *Common Definitions and Procedures for IEEE 802 Management Information*
- ANSI/IEEE Std 802.1G [ISO/IEC 15802-5] — *Remote Media Access Control (MAC) Bridging.* Specifies extensions for the interconnection, using non-LAN communication technologies, of geographically separated IEEE 802 LANs below the level of the logical link control protocol.
- ANSI/IEEE Std 802.2 [ISO/IEC 8802-2] — *Logical Link Control*

- ANSI/IEEE Std 802.3 [ISO/IEC 8802-3] — *CSMA/CD Access Method and Physical Layer Specifications*
- ANSI/IEEE Std 802.4 [ISO/IEC 8802-4] — *Token Passing Bus Access Method and Physical Layer Specifications*
- ANSI/IEEE Std 802.5 [ISO/IEC 8802-5] — *Token Ring Access Method and Physical Layer Specifications*
- ANSI/IEEE Std 802.6 [ISO/IEC 8802-6] — *Distributed Queue Dual Bus Access Method and Physical Layer Specifications*
- ANSI/IEEE Std 802.9 [ISO/IEC 8802-9] — *Integrated Services (IS) LAN Interface at the Medium Access Control (MAC) and Physical (PHY) Layers*
- ANSI/IEEE Std 802.10 — *Interoperable LAN/MAN Security*
- ANSI/IEEE Std 802.11 [ISO/IEC DIS 8802-11] — *Wireless LAN Medium Access Control (MAC) and Physical Layer Specifications*
- ANSI/IEEE Std 802.12 [ISO/IEC DIS 8802-12] — *Demand Priority Access Method, Physical Layer and Repeater Specifications*

In addition to the family of standards, the following is a recommended practice for a common Physical Layer technology:

- IEEE Std 802.7 — *IEEE Recommended Practice for Broadband Local Area Networks*

The following additional working group has authorized standards projects under development:

- IEEE 802.14 — *Standard Protocol for Cable-TV Based Broadband Communication Network*

Conformance test methodology

An additional standards series, identified by the number 1802, has been established to identify the conformance test methodology documents for the 802 family of standards. Thus the conformance test documents for 802.3 are numbered 1802.3.

ANSI/IEEE Std 802.5r-1997 and 802.5j-1997, 1998 Edition [ISO/IEC 8802-5 : 1998/ Amd. 1: 1998]

This amendment to the IEEE 802.5 token ring standard extends the capability of token ring by defining and specifying dedicated token ring operation, a new class of token ring adapters that can operate in full duplex mode, and a new C-Port for attachment of stations to the LAN. This standard provides for the interconnection of shared and dedicated token ring LAN segments via the newly defined C-Port. Full backward and forward compatibility of hardware is provided for, with newly defined C-Ports able to detect and interoperate with both legacy token ring adapters, and with adapters designed to this new standard. Additionally, the newly defined adapters can operate in full duplex mode when connected to a C-Port, and can operate in classic or shared mode when attached to a shared concentrator port as defined in the base standard.

This amendment also defines operation over fibre optic media, upgrading the "Trial Use" optical fibre standard to full-use status. Also described are recommendations for fibre trunk interconnection.

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When the IEEE Standards Board approved IEEE Std 802.5r and IEEE Std 802.5j on 16 September 1997, it had the following membership:

IEEE Std 802.5r-1997 was approved by the American National Standards Institute on 2 June 1998. IEEE Std 802.5j-1997 was approved by the American National Standards Institute on 15 April 1998.

Contents

Annexes

Information technology—
Telecommunications and information exchange between systems—
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Part 5: Token ring access method and physical layer specifications

Amendment 1: Dedicated token ring operation and fibre optic media

1. Changes to clauses 1 and 2 of ISO/IEC 8802-5 : 1998

This standard, an amendment to the existing text of the ISO/IEC 8802-5 : 1998, specifies the requirements for dedicated token ring stations and ports. It also specifies characteristics of a fibre optic interface for connecting a 4 or 16 Mbit/s token ring station to the trunk coupling unit (TCU) of a token ring. The text assumes all material, including references, acronyms, and definitions contained in the base text. The clause and subclause numbering in the following clauses corresponds to the clause and subclause numbering to be expected in a combined document (i.e., when these additions are incorporated). Unaffected clauses are skipped.

Dedicated token ring (DTR) defines a new protocol for full-duplex token ring operation, sometimes referred to as "switching." This amendment requires that all conformant DTR ports and stations be able to operate compatibly with the preexisting standard in a shared token ring environment.

The specification of token ring operation over fibre optic media, as defined within this amendment, replaces and renders obsolete ISO/IEC TR 11802-4 : 1994, Fibre optic station attachment.

1.1 Scope

Add the following to 1.1 after item q), and change the period after item q) to a semicolon:

r) Defines the dedicated token ring (DTR) media access protocols, including finite state machines (FSMs) and state tables (clause 9);

s) Defines the frame formats and MAC frames, timers, and error counters for the DTR Station and DTR C-Port (clause 10);

t) Defines the DTR Station and C-Port Management (clause 11);
u) Provides informative information on the functional description of the DTR concentrator (annex K);
v) Provides informative information on the low-level FSMs of the DTR Station and the C-Port in Station Emulation mode using the TXI access protocol (annex L);
w) Provides informative information on the low-level FSMs of the C-Port in Port mode using the TXI and TKP access protocol (annex M);
x) Provides informative information on the low-level FSMs of the C-Port in Port mode using the TKP access protocol (annex N);
y) Provides informative information on channel considerations for 16 Mbit/s DTR (annex O);
z) Provides normative information on the BER criteria for lobe media testing (annex P);
aa) Provides informative information on the low-level FSMs of the DTR Station using the TKP access protocol (annex Q);
bb) Provides informative information on the low-level FSMs of the C-Port in Station Emulation mode using the TKP access protocol (annex R);
cc) Provides informative information on modifications to clause 4 TKP access protocol when used to support C-Port operation (annex S);
dd) Provides informative information on an optional method for DTR concentrator autodetection (annex T);
ee) Defines the functional, electrical, and optical characteristics of a fibre optic interface for connecting a 4 or 16 Mbit/s token ring station to the trunk coupling unit (TCU) of a token ring;
ff) Provides informative guidance for connecting fibre trunk cables between trunk coupling units;
gg) Describes signaling provisions for bypass of the station from the ring and self-test capabilities.

Add the following items as subjects for future study after item g):

h) Speed negotiation process.
i) Low-power protocols for managing stations and C-Ports when the MAC is suspended and the hardware is in a low-power mode.

1.2 Normative references

Add the following normative references to 1.2 of ISO/IEC 8802-5 : 1998:

IEC 60793-2 : 1989, Optical fibres—Part 2: Product specifications.

IETF RFC 1573, K. McCloghrie and F. Kastenholz, “Evolution of the Interfaces Group of MIB-II,” January 20, 1994.[1]

IETF RFC 1748, K. McCloghrie and E. Decker, “IEEE 802.5 MIB using SMIv2,” December 29, 1994.

IETF RFC 1902, J. Case, K. McCloghrie, M. Rose, and S. Waldbusser, “Structure of Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2).” January 1996.

IETF RFC 1903, J. Case, K. McCloghrie, M. Rose, and S. Waldbusser, “Textual conventions for Version 2 of the Simple Network Management Protocol (SNMPv2).” January 1996.

IETF RFC 1907, J. Case, K. McCloghrie, M. Rose, and S. Waldbusser, “Management Information Base for Version 2 of the Simple Network Management Protocol (SNMPv2).” January 1996.

[1]Online copies of IETF RFCs are available via FTP from the InterNIC Directory and Database Services server, ds.internic.net, as rfc/rfc####.txt or rfc/rfc####.ps (#### is the RFC number without leading zeroes).

ISO/IEC 9314-3 : 1990, Information processing systems—Fibre Distributed Data Interface (FDDI)—Part 3: Physical Layer Medium Dependent (PMD).

ISO/IEC 9595 : 1991, Information technology—Open Systems Interconnection—Common management information service definition.

ISO/IEC 9596-1 : 1991, Information technology—Open Systems Interconnection—Common management information protocol—Part 1: Specification.

ISO/IEC 10040 : 1992, Information technology—Open Systems Interconnection—Systems management overview.

ISO/IEC 10165-1 : 1993, Information technology—Open Systems Interconnection—Management Information Services—Structure of management information: Management Information Model.

ISO/IEC 10165-4 : 1992, Information technology—Open Systems Interconnection—Structure of management information—Part 4: Guidelines for the definition of managed objects.

ISO/IEC 10165-5 : 1994, Information technology—Open Systems Interconnection—Structure of management information: Generic management information.

1.3 Definitions

Modify the following definition:

1.3.80 verified frame: A valid frame as defined in 4.3.2, addressed to the station, for which the information field has met the validity requirements as specified in 3.3.5.2 or 10.3.6.5 as appropriate.

This amendment adds new definitions to the base standard. Definitions will be resorted and renumbered in a future edition incorporating amendments into the base standard.

Add the following to 1.3:

1.3.1 bypass: The state of the fibre optic station attachment when the fibre optic trunk coupling unit (FOTCU) does not route the station signals onto the trunk ring. Instead, the station signals are returned to the station for lobe testing, and trunk signals continue along the trunk.

1.3.2 bypass key: A signaling pattern sent by a fibre optic station to leave the ring and enter the BYPASS state. This pattern consists of a low light-level detected at the fibre optic trunk coupling unit (FOTCU) for greater than 4 ms. (See 13.7.2.2.)

1.3.3 classic concentrator: Concentrator operation supporting the classic station described in clause 8.

1.3.4 classic station: A station the operates in the token passing mode only.

1.3.5 classic token ring: Token ring architecture according to clauses 3 and 4. Provides shared bandwidth to multiple nodes on a single token ring.

1.3.6 conformance test interface connector: A connector defined for the purpose of conformance testing.

1.3.7 C-Port: A concentrator port in a dedicated token ring concentrator.

1.3.8 data transfer unit (DTU): The entity in the dedicated token ring (DTR) concentrator that provides frame forwarding between C-Ports and the data transfer service (if there is one).

1.3.9 dedicated token ring (DTR): Token ring architecture according to clauses 3, 9, and 10. Provides shared bandwidth to multiple node count classic token rings or single classic stations, and enhanced full-duplex dedicated bandwidth to single stations attached to a DTR concentrator.

1.3.10 dedicated token ring (DTR) concentrator: A concentrator with C-Ports that provide shared and dedicated connectivity domains to attaching stations.

1.3.11 dedicated token ring (DTR) Station: A Station that supports the token passing protocol (TKP) and transmit immediate protocol (TXI) access protocols specified in clauses 3, 4, 9, and 10. *Note:* Within this document, "Station" when capitalized is used to indicate that the entity may be either a data station, or a C-Port in Station Emulation mode.

1.3.12 fibre: A filament-shaped optical waveguide made of dielectric materials.

1.3.13 fibre optic cable: A cable containing one or more optical fibres compatible with specifications in 13.7.2.5.

1.3.14 fibre optic channel: The data path from any transmitting station's fibre optic medium interface connection (FMIC) or transmitting concentrator's FMIC to the next receiving FMIC.

13.15 fibre optic interface (FOI): The interface between a station's physical (PHY) layer and the optical medium. It is bounded on one side by the medium interface connector (MIC) or PHY layer I/O interface, and on the other by the fibre optic medium interface connection (FMIC).

1.3.16 fibre optic medium interface connection (FMIC): The mechanical and optical interface between the station or fibre optic interface and the fibre optic cable. This is a duplex optical port at which conformance testing is performed.

13.17 fibre optic station (FODTE): A compliant token ring station with a fibre optic interface (FOI) as described in this standard.

1.3.18 fibre optic trunk coupling unit (FOTCU): A physical device that enables a fibre optic station to connect to a trunk cable. The FOTCU contains the means for inserting the fibre optic station into the ring, or conversely, bypassing the fibre optic station. *Syn:* **fibre optic concentrator lobe port**.

1.3.19 full-duplex operation: Use of the transmit immediate protocol (TXI) access protocol where data transfer between a dedicated token ring (DTR) Station and C-Port may occur simultaneously and bidirectionally.

1.3.20 insert: The fibre optic station transmit signals will be routed to the next downstream station in the ring, and input signals will be routed from the next upstream station in the ring.

13.21 insertion: A signaling pattern sent by a fibre optic station to request to join the ring (INSERT). This pattern consists of an alternating pattern of normal data signals and low light-level signals. See 13.7.2.2.

1.3.22 insertion key echo: The return of the insertion key to the station by the fibre optic trunk coupling unit (FOTCU). See 13.7.2.2.

1.3.23 lobe: A set of transmission elements in the data path between a station's transmitter and its own receiver when the station is in the Bypass state.

1.3.24 management routing interface (MRI): The management interface between the C-Port Medium Access Controls (PMAC) and the dedicated token ring (DTR) concentrator management.

1.3.25 phantom drive: A technique where a dc power source is superimposed on the transmit and receive signal pairs in a transparent or “phantom” fashion (7.2.1) such that its application does not affect the data bearing signals on either pair. For classic token ring, this dc power source is normally applied to request a concentrator to insert a station into the ring. For dedicated token ring, this dc power source is used as part of the registration process.

1.3.26 Port mode: The operation of a C-Port when configured as a port that connects to the media and waits for the start of station registration.

1.3.27 registration: The process whereby both the dedicated token ring (DTR) Station and the C-Port exchange information after the DTR Station exits the Bypass state as the result of a connection request.

1.3.28 Station Emulation mode: The operation of a C-Port when configured to emulate a station using the token passing protocol (TKP) or transmit immediate protocol (TXI) access protocol.

1.3.29 token passing protocol (TKP): Token ring protocol wherein normal data transmission occurs upon the capture of a token.

1.3.30 token passing protocol (TKP) access protocol: The classic token ring protocol specified in clauses 3 and 4 wherein normal data transmission occurs upon the capture of a token.

1.3.31 transmit immediate protocol (TXI) access protocol: The access protocol specified in clause 9 where the protocol does not require the station to gain access to a token in order to transmit information. Data transmission uses the transmit immediate function and may be full duplex.

1.5 Abbreviations and acronyms

Add the following abbreviations and acronyms to 1.5 of ISO/IEC 8802-5 : 1998:

C-Port	=	DTR concentrator port
CTIC	=	conformance test interface connector
DAC	=	duplicate address check
DRD	=	destination route descriptor
DTE	=	data terminal equipment
DTR	=	dedicated token ring
DTU	=	data transfer unit
FMIC	=	fibre optic medium interface connection
FODTE	=	fibre optic data terminal equipment
FOTCU	=	fibre optic trunk coupling unit
LMT	=	lobe media test
MRI	=	management routing interface
NA	=	numerical aperture
ORX	=	optical receiver
OTA	=	optical transmit asymmetry
OTX	=	optical transmitter
PMAC	=	DTR C-Port MAC protocol entity
PPHY	=	DTR C-Port PHY protocol entity
SMAC	=	DTR Station MAC protocol entity
SPHY	=	DTR Station PHY protocol entity
TKP	=	token passing protocol
TXI	=	transmit immediate protocol

Modify the title of 1.6 to differentiate this subclause from the DTR Station, as follows:

1.6 Conformance requirements—classic station

Add the following dynamic conformance requirement to 1.6.2 after item k):

l) Optionally perform the registration query protocol described in 9.1.5 and specified in 9.5 and 9.6.

Modify the title of 1.7 to differentiate this subclause from the DTR concentrator, as follows:

1.7 Conformance requirements—classic concentrator

Add the following after 1.7, and renumber existing 1.8 as 1.10:

1.8 DTR conformance requirements

The conformance requirements for dedicated token ring entities are described in the following subclauses. The appropriate subclauses for the classic token ring station and classic concentrator are also listed for completeness.

Subclause	Protocol	Station or port type
1.6	Classic	Classic token ring station
1.6.2	TKP	DTR Station using TKP with registration query protocol
1.7	Classic	Classic concentrator TCU port (Unchanged)
1.8.1	TXI	DTR Station
1.8.2	TKP	DTR C-Port—Port mode
1.8.3	TXI	DTR C-Port—Port mode
1.8.4	TKP	DTR C-Port—Station Emulation mode
1.8.5	TXI	DTR C-Port—Station Emulation mode

The supplier of a protocol implementation which is claimed to conform to this standard shall complete a copy of the PICS proforma in annex A and shall provide the information necessary to identify both the supplier and the implementation.

1.8.1 Conformance requirements—DTR Station

1.8.1.1 Static conformance requirements—MAC sublayer

A DTR Station implementing the TXI access protocol and claiming conformance to this standard shall

a) Implement the frame format, associated address formats and fields, and MAC frame vectors and subvectors defined in clauses 3 and 10.

b) Support 48-bit addressing and use either a universally administered individual address or a locally administered individual address as defined in 3.2.4.
c) Exhibit external behavior corresponding to the system timing parameters specified in 10.4.1.
d) Exhibit external behavior corresponding to the Station policy flags and variables specified in 10.5.1.
e) Implement capabilities corresponding to the error counters defined in 10.6.1.
f) Recognize the first bit of the source address as the indication of the presence of the routing information field in the frame format defined in 3.2.5. Note that the ability to generate or respond to frames with source routing information is optional.

1.8.1.2 Static conformance requirements—PHY layer

A DTR Station implementing the TXI access protocol and claiming conformance to this standard shall

a) Use a data signaling rate at 4 Mbit/s or 16 Mbit/s as defined in 5.2. Implementations may support either or both data rates.
b) Encode and decode symbols as defined in 5.5 and 5.6.
c) Achieve the signal timing synchronization as defined in 5.7.
d) Add latency as defined in 5.8.
e) Support either STP or UTP cabling at the MIC as defined in 7.2. Implementations may support either or both media types using the appropriate MIC connector (MIC_S for STP and MIC_U for UTP).
f) Provide phantom signaling and wire fault detection as defined in 7.2.1.
g) Meet the transmit specifications defined in 7.2.2.
h) Meet receiver jitter tolerance specifications as defined in 7.2.3.
i) Operate with the channels specified in 7.2.4.

1.8.1.3 Dynamic conformance requirements

A DTR Station requesting the TXI access protocol and claiming conformance to this standard shall perform the registration process described in 9.1.4 and 9.1.4.1, and specified in 9.2. If TXI access protocol is successfully negotiated, then the DTR Station shall

a) Complete the Join state machine functions defined in 9.2.1.1.
b) Transmit queued PDUs as frames as defined in 9.2.1.2.
c) Perform the Monitor state functions defined in 9.2.1.3.
d) Perform according to the State Operation tables specified in 9.2.5.

If TXI access protocol is not successfully negotiated, then the DTR Station may continue operating in classic token ring mode with the conformance requirements specified by 1.6.

1.8.2 Conformance requirements—C-Port/TKP/Port mode

1.8.2.1 Static conformance requirements—MAC sublayer

A DTR concentrator C-Port in Port mode and implementing the TKP access protocol and claiming conformance to this standard shall

a) Implement the token format, the frame format, associated address formats and fields, and MAC frame vectors and subvectors defined in clauses 3 and 10.
b) Support 48-bit addressing and use either a universally administered individual address or a locally administered individual address as specified in 3.2.4.

c) Exhibit external behavior corresponding to the system timing parameters specified in 10.4.2 and 3.4.
d) Exhibit external behavior corresponding to the C-Port policy flags and variables specified in 10.5.2.
e) Implement capabilities corresponding to the error counters defined in 10.6.2 and 3.6.
f) Recognize the first bit of the source address as the indication of the presence of the routing information field in the frame format defined in 3.2.5. Note that the ability to generate or respond to frames with source routing information is optional.

1.8.2.2 Static conformance requirements—PHY layer

A DTR concentrator C-Port in Port mode and implementing the TKP access protocol and claiming conformance to this standard shall

a) Use a data signaling rate at 4 Mbit/s or 16 Mbit/s as defined in 5.2. Implementations may support either or both data rates.
b) Encode and decode symbols as defined in 5.5 and 5.6.
c) Achieve the signal timing synchronization defined in 5.7.
d) Add latency as defined in 5.8.
e) Support either STP or UTP cabling at the MIC as defined in 8.1.1. Implementations may support either or both media types using the appropriate MIC connector (MIC_S for STP and MIC_U for UTP).
f) Provide static impedance capability as defined in clause 8.
g) Meet the transmit specifications defined in 7.2.2.
h) Meet the receiver jitter tolerance specifications defined in 7.2.3.
i) Operate with the channels specified in 7.2.4.
j) Provide a repeat path as specified in 9.7.1.
k) Provide a PMC as specified in 9.7.3.
l) Support the detection of phantom drive, and indicating its state to the PMAC as specified in 9.7.2.

1.8.2.3 Dynamic conformance requirements

A DTR concentrator C-Port operating in Port mode and claiming conformance to this standard shall perform the registration process described in 9.1.4 and 9.1.4.2, and specified in 9.3. If TXI access protocol is negotiated, the DTR C-Port shall meet the conformance requirements described in 1.8.3. If TKP access protocol is requested by the attached station, then the DTR C-Port shall

a) Complete the Join state machine functions defined in 9.3.1.1.
b) Transmit queued PDUs as frames defined in 9.4.2.2.
c) Perform the Monitor state functions defined in 9.4.2.3.
d) Perform according to the operation tables specified in 9.4.4.

1.8.3 Conformance requirements—C-Port/TXI/Port mode

1.8.3.1 Static conformance requirements—MAC sublayer

A DTR concentrator C-Port in Port mode and implementing the TXI access protocol and claiming conformance to this standard shall

a) Implement the frame format, associated address formats and fields, and MAC frame vectors and subvectors defined in clauses 3 and 10.
b) Support 48-bit addressing and use either a universally administered individual address or a locally administered individual address as specified in 3.2.4.
c) Exhibit external behavior corresponding to the system timing parameters specified in 10.4.2.

d) Exhibit external behavior corresponding to the C-Port policy flags and variables specified in 10.5.2.
e) Implement capabilities corresponding to the error counters defined in 10.6.2.
f) Recognize the first bit of the source address as the indication of the presence of the routing information field in the frame format defined in 3.2.5. Note that the ability to generate or respond to frames with source routing information is optional.

1.8.3.2 Static conformance requirements—PHY layer

A DTR concentrator C-Port in Port mode and implementing the TXI access protocol and claiming conformance to this standard shall

a) Use a data signaling rate at 4 Mbit/s or 16 Mbit/s as defined in 5.2. Implementations may support either or both data rates.
b) Encode and decode symbols as defined in 5.5 and 5.6.
c) Achieve the signal timing synchronization defined in 5.7.
d) Add latency as defined in 5.8.
e) Support either STP or UTP cabling at the MIC as defined in 8.1.1. Implementations may support either or both media types using the appropriate MIC connector (MIC_S for STP and MIC_U for UTP).
f) Provide static impedance capability as defined in clause 8.
g) Meet the transmit specifications defined in 7.2.2.
h) Meet the receiver jitter tolerance specifications defined in 7.2.3.
i) Operate with the channels specified in 7.2.4.
j) Provide a repeat path as specified in 9.7.1.
k) Provide a PMC as specified in 9.7.3.
l) Support the detection of phantom drive, and indicating its state to PMAC as specified in 9.7.2.

1.8.3.3 Dynamic conformance requirements

A DTR concentrator C-Port operating in Port mode and claiming conformance to this standard shall perform the registration process described in 9.1.4 and 9.1.4.3, and specified in 9.3. If TKP access protocol is requested by the attached station, and the request is granted by the C-Port, the DTR C-Port shall meet the conformance requirements described in 1.8.2. If TXI access protocol is negotiated, then the DTR C-Port shall

a) Complete the Join state machine functions defined in 9.3.1.1.
b) Transmit queued PDUs as frames as defined in 9.3.1.2.
c) Perform the Monitor state functions defined in 9.3.1.3.
d) Perform according to the operation tables specified in 9.3.4.

1.8.4 Conformance requirements—C-Port/TKP/Station Emulation mode

1.8.4.1 Static conformance requirements—MAC sublayer

A DTR concentrator C-Port in Station Emulation mode implementing the TKP access protocol and claiming conformance to this standard shall

a) Implement the token format, the frame format, associated address formats and fields, and MAC frame vectors and subvectors defined in clauses 3 and 10.
b) Support 48-bit addressing and use either a universally administered individual address or a locally administered individual address as defined in 3.2.4.
c) Exhibit external behavior corresponding to the system timing parameters specified in 3.4.2 and additionally the optional timer (TLMTR) specified in 10.4.3.

d) Exhibit external behavior corresponding to the C-Port and Station policy flags and variables specified in 10.5.1 and 10.5.2.
e) Implement capabilities corresponding to the error counters defined in 3.6.
f) Recognize the first bit of the source address as the indication of the presence of the routing information field in the frame format defined in 3.2.5. Note that the ability to generate or respond to frames with source routing information is optional.

1.8.4.2 Static conformance requirements—PHY layer

A DTR concentrator C-Port in Station Emulation mode implementing the TKP access protocol and claiming conformance to this standard shall

a) Use a data signaling rate at 4 Mbit/s or 16 Mbit/s as defined in 5.2. Implementations may support either or both data rates.
b) Encode and decode symbols as defined in 5.5 and 5.6.
c) Achieve the signal timing synchronization defined in 5.7.
d) Add latency as defined in 5.8.
e) Support either STP or UTP cabling at the MIC as defined in 7.2. Implementations may support either or both media types using the appropriate MIC connector (MIC_S for STP and MIC_U for UTP).
f) Provide phantom signaling and wire fault detection as defined in 7.2.1.
g) Meet the transmit specifications defined in 7.2.2.
h) Meet the receiver jitter tolerance specifications defined in 7.2.3.
i) Operate with the channels specified in 7.2.4.
j) Provide a repeat path as specified in 9.7.1.
k) Provide a PMC as specified in 9.7.3.

1.8.4.3 Dynamic conformance requirements

A DTR concentrator C-Port in Station Emulation mode requesting the TKP access protocol and claiming conformance to this standard shall

a) Complete the Join state machine functions defined in 9.3.1.1 and 9.5.2.1.
b) Transmit queued PDUs as frames as defined in 9.5.2.2.
c) Perform the Monitor state functions defined in 9.5.2.3.
d) Perform according to the operation tables specified in 9.3.4 and 9.5.4.

1.8.5 Conformance requirements—C-Port/TXI/Station Emulation mode

1.8.5.1 Static conformance requirements—MAC sublayer

A DTR concentrator C-Port in Station Emulation mode implementing the TXI access protocol and claiming conformance to this standard shall

a) Implement the frame format, associated address formats and fields, and MAC frame vectors and subvectors defined in clauses 3 and 10.
b) Support 48-bit addressing and use either a universally administered individual address or a locally administered individual address as defined in 3.2.4.
c) Exhibit behavior corresponding to the system timing parameters specified in 10.4.1.
d) Exhibit external behavior corresponding to the C-Port and Station policy flags and variables specified in 10.5.1 and 10.5.2.
e) Implement capabilities corresponding to the error counters defined in 10.6.1.

f) Recognize the first bit of the source address as the indication of the presence of the routing information field in the frame format defined in 3.2.5. Note that the ability to generate or respond to frames with source routing information is optional.

1.8.5.2 Static conformance requirements—PHY layer

A DTR concentrator C-Port in Station Emulation mode implementing the TXI access protocol and claiming conformance to this standard shall

a) Use a data signaling rate at 4 Mbit/s or 16 Mbit/s as defined in 5.2. Implementations may support either or both data rates.
b) Encode and decode symbols as defined in 5.5 and 5.6.
c) Achieve the signal timing synchronization defined in 5.7.
d) Add latency as defined in 5.8.
e) Support either STP or UTP cabling at the MIC as defined in 7.2. Implementations may support either or both media types using the appropriate MIC connector (MIC_S for STP and MIC_U for UTP).
f) Provide phantom signaling and wire fault detection as defined in 7.2.1.
g) Meet the transmit specifications defined in 7.2.2.
h) Meet the receiver jitter tolerance specifications defined in 7.2.3.
i) Operate with the channels specified in 7.2.4.
j) Provide a repeat path as specified in 9.7.1.
k) Provide a PMC as specified in 9.7.3.

1.8.5.3 Dynamic conformance requirements

A DTR concentrator C-Port in Station Emulation mode requesting the TXI access protocol and claiming conformance to this standard shall perform the registration process described in 9.1.4 and 9.1.4.1, and specified in 9.2. If TXI access protocol is successfully negotiated, then the DTR C-Port in Station Emulation mode shall

a) Complete the Join state machine functions defined in 9.3.1.1 and 9.2.1.1.
b) Transmit queued PDUs as frames as defined in 9.2.1.2.
c) Perform the Monitor state functions defined in 9.2.1.3.
d) Perform according to the operation tables specified in 9.3.4 and 9.5.4.

If TXI access protocol is not successfully negotiated, then the DTR C-Port in Station Emulation mode may continue operating in TKP access protocol, with the conformance requirements specified in 1.8.4.

Add 1.9 as follows:

1.9 Fibre optic media conformance requirements

An implementation claiming conformance to ISO/IEC 8802-5 and operating in Station or hub mode shall meet all appropriate parameters in 1.6.1 with the following exceptions: 1.6.1.2, items f), g), h), and j) shall not apply. The exceptions are replaced by the following subclauses:

— Subclause 1.6.1.2f) is replaced by 13.7;
— Subclause 1.6.1.2g) is replaced by 13.7.2.2;
— Subclause 1.6.1.2h) is replaced by 13.7.2.3;
— Subclause 1.6.1.2j) is replaced by 13.7.2.5.

Insert the following two clauses after 2.4:

2.5 Physical structure of a DTR network

The basic DTR network can include DTR concentrators, lobe cables, and attaching stations as shown in figure 2.5-1.

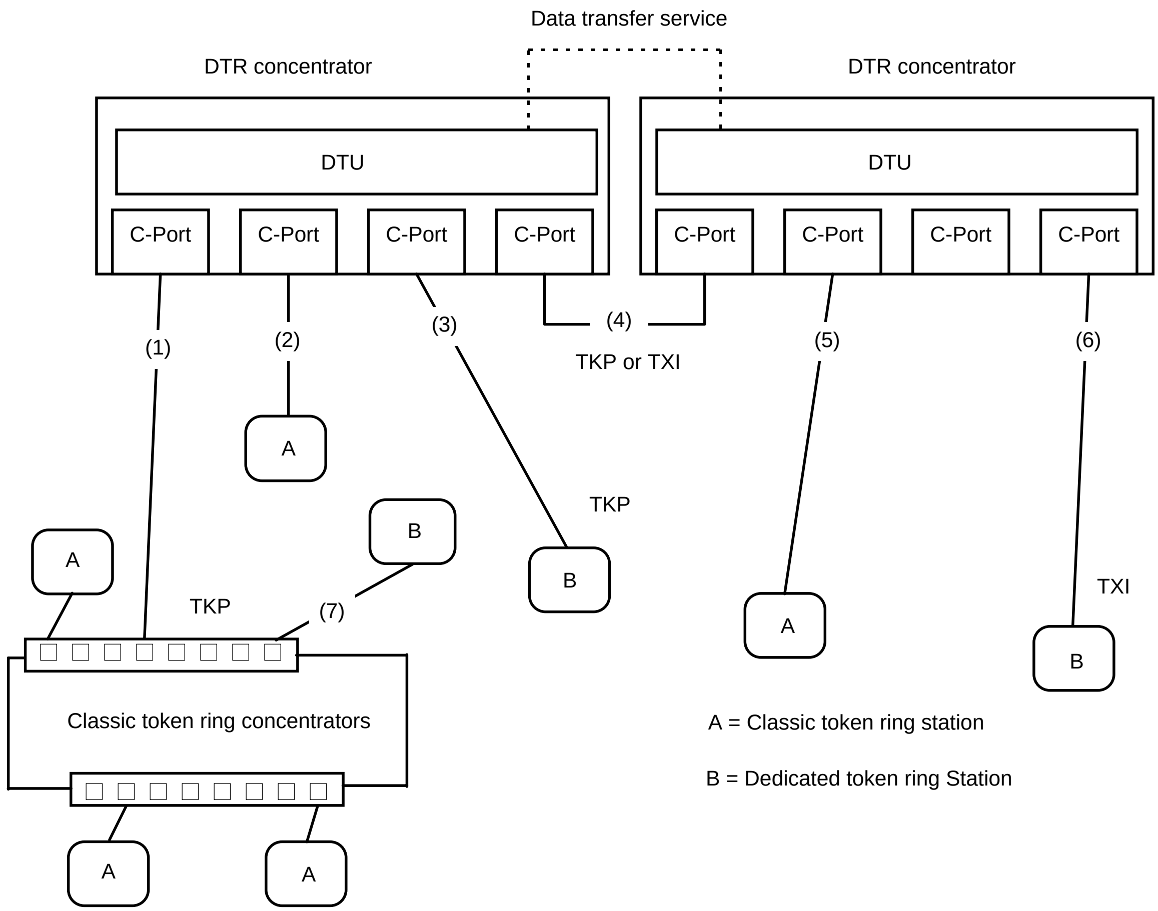


Figure 2.5-1—DTR network

The DTR concentrator consists of C-Ports and a data transfer unit (DTU). The C-Port provides the basic connectivity between the DTR concentrator and the token ring stations or other DTR concentrators by lobe cables. The DTU provides connectivity between the C-Ports within a DTR concentrator. In addition to direct connectivity between DTR C-Ports, DTR concentrators may be connected by a data transfer service [e.g., asynchronous transfer mode (ATM), fibre distributed data interface (FDDI), etc.] that allows communication using a protocol not specified by this standard or the base token ring standard. Recommendations for the DTU are found in annex K of this standard, while the specifications and use of the data transfer service are beyond the scope of this standard.

The attaching stations (A and B in figure 2.5-1) are specified by clauses 3, 5, and 7 of ISO/IEC 8802-5 : 1998 (for a classic token ring station) or 9.2 of this supplement (for a DTR Station). The TKP access protocol for data transmission requires the Station to operate as a classic token ring station while the C-Port operates as a modified classic token ring station as specified in 9.4. The TXI access protocol does not require the capture of a token to permit information transfer, and a Station may simultaneously transmit and receive frames when this protocol is in use.

From a protocol standpoint, the connection between the C-Port and a station is illustrated in figure 2.5-2. This standard defines the C-Port interfaces to the DTU, management routing interface (MRI), and management (MGT) entities. The MRI provides the interface between each C-Port and the DTR concentrator management function. The primitives that are transferred between each C-Port PMAC and management are defined in 9.1.13.2. The protocols for the C-Port PMAC and PPHY are specified in 9.3. The protocols for the station, either classic token ring or DTR, are specified in 4.3 or 9.2, respectively.

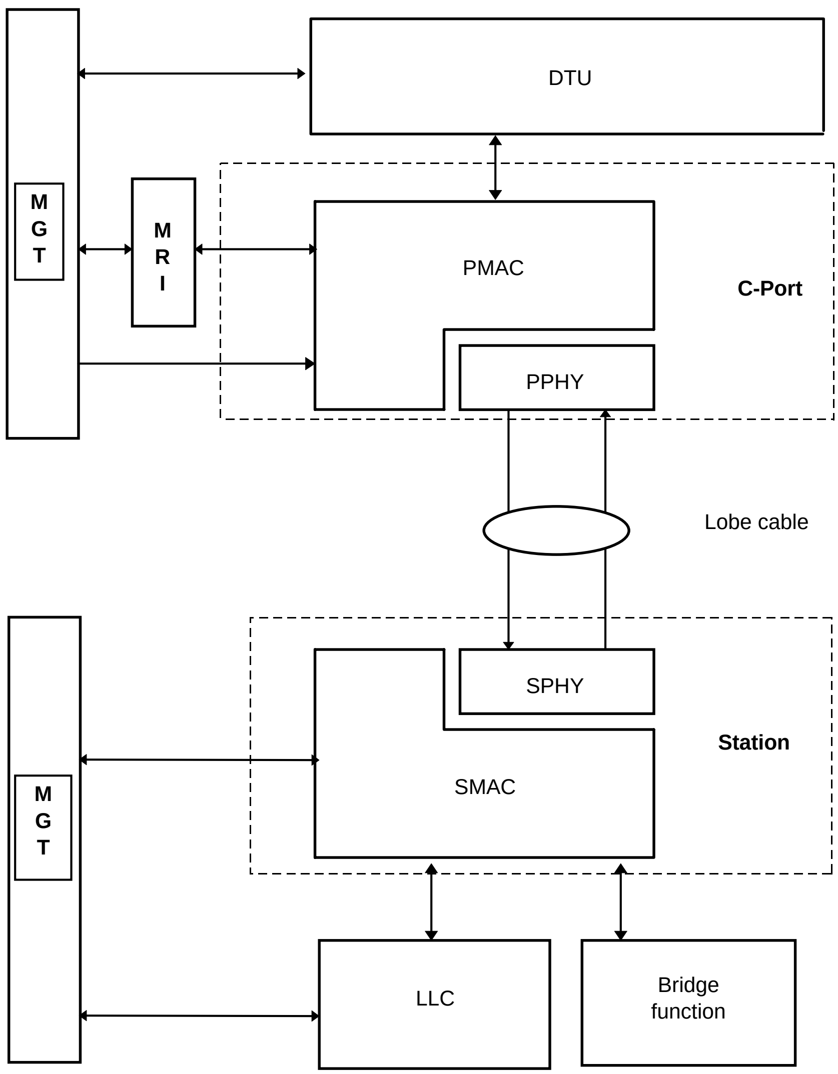


Figure 2.5-2—Architectural model of C-Port and DTR Station interfaces

2.6 Station and C-Port operating modes

2.6.1 Stations

The two Station types defined in the DTR environment are described in this subclause.

2.6.1.1 Classic token ring station

The protocol used by the classic token ring station is specified by clauses 3 and 4. The protocols and frame formats are unchanged for these stations when they are operating in the DTR environment. In figure 2.5-1 these stations are designated “A” and their connection to a DTR concentrator is illustrated by (2) and (5).

2.6.1.2 DTR Station

The DTR Station is specified in 9.2. These Stations are designated “B” in figure 2.5-1. A DTR Station shall include both the capability to perform registration by requesting the TXI access protocol in response to a Connect.SMAC command and the capability to operate as a classic token ring station. After registration, the resulting mode of operation [either the TKP access protocol as illustrated by connection (3) or the TXI access protocol as illustrated by connection (6)] will depend upon the Station’s policy flags (see clause 10), as well as the capabilities of the DTR concentrator C-Port to which the Station is connected. Connection of a DTR Station to a trunk coupling unit (TCU) (see clause 8) is illustrated by connection (7) in figure 2.5-1.

2.6.2 C-Ports

Two connectivity modes for the C-Ports are defined in the DTR environment. In the Port mode, the C-Port connects to the medium and awaits the connection of either a classic or DTR Station. In the Station Emulation mode, the C-Port emulates either a classic or DTR Station. In both modes, the C-Port is responsible for forwarding frames transmitted by the station to the DTU and MRI entities for processing. These specific cases are described in the following subclauses.

2.6.2.1 C-Port operation in Port mode

There are two different operating modes for the C-Port in Port mode, and the operating mode chosen is determined by the attaching station and C-Port policy flags. The possible operating modes (TKP access protocol or TXI access protocol) are as follows:

a) DTR Stations using the classic token ring station protocol. This is illustrated by connection (3) in figure 2.5-1.
b) DTR Stations requesting attachment using the TXI access protocol. This is illustrated by connection (6) in figure 2.5-1. When the C-Port does not allow the TXI access protocol, the connection may be rejected or default to the TKP access protocol.

2.6.2.2 C-Port operation in Station Emulation mode

The C-Port in Station Emulation mode emulates a station using either the TXI or TKP access protocol as listed below.

a) The C-Port in Station Emulation mode using the TXI access protocol is illustrated by connection (4) in figure 2.5-1 and is used for the connection of two DTR concentrators.
b) The C-Port in Station Emulation mode using the TKP access protocol is illustrated by connections (1) or (4) in figure 2.5-1 and is used for the connection of
    1) Two DTR concentrators as illustrated by connection (4) or
    2) A DTR concentrator to a classic concentrator as illustrated by connection (1).

Connection (4) in figure 2.5-1, when supporting either the TKP or TXI access protocol, requires one C-Port to be operating in the Port mode and the other C-Port to be operating in the Station Emulation mode.

2.6.2.3 Cut-through operation

The interface between a C-Port and a DTU may support the transfer of frame data before the actual frame length is known.

A DTU may use this facility to support cut-through operation, in which the DTU, receiving a frame, signals that frame for transmission before the frame has been fully received. The notation "FR_LTH=UNK" is used to represent the fact that the frame length is not known.

2.6.3 TXI caution for migration from classic token ring

The use of the DTR access protocol can affect classic token ring implementations as follows:

a) Implementors are cautioned that the lobe test repeat path may set the A/C bits of the repeated frame when using frames addressed to either a broadcast address or the C-Port's MAC address.
b) Frames transmitted using the TXI access protocol are not received by the transmitting entity, even if the address is one that would be recognized by the transmitter. This differs from classic token ring with shared media, where all frames transmitted may also be received by the transmitting entity if the destination address is recognized. The State Operation tables (table 9-5 for TXI Operation, REF 3508 and REF 3511) provide loopback explicitly rather than depending on PHY layer loopback.
c) The repeat path during lobe test provided by the DTR C-Port assumes that the station performs its lobe media test at the same ring speed that is intended to be used during operation.
d) Implementors are cautioned that if a C-Port is optionally configured to operate in TXI access protocol *only*, then the C-Port will not provide a reliable repeat path during the registration state. A classic station or DTR Station operating with TKP access protocol will therefore fail lobe test and will not be able to distinguish this failure from a connectivity or cable failure.

Add a new clause 9:

9. Dedicated token ring (DTR)

This clause contains the specifications for the DTR Station and C-Port while executing the TXI or TKP access protocols.

This introduction illustrates and defines the DTR configurations supported, and concludes by describing the structure of clause 9.

Figure 9-1 illustrates the DTR configurations based on the following operational modes of the C-Port:

- Configuration 1: C-Port in Port mode using the TXI access protocol
- Configuration 2: C-Port in Station Emulation mode using the TXI access protocol
- Configuration 3: C-Port in Port mode using the TKP access protocol
- Configuration 4: C-Port in Station Emulation mode using the TKP access protocol

Each entity within each of these configurations is labeled as to the type of support (C-Port in Port mode, C-Port in Station Emulation mode, Station, or Concentrator), the access protocol being used (TXI or TKP access protocol), and which clauses define the entity.

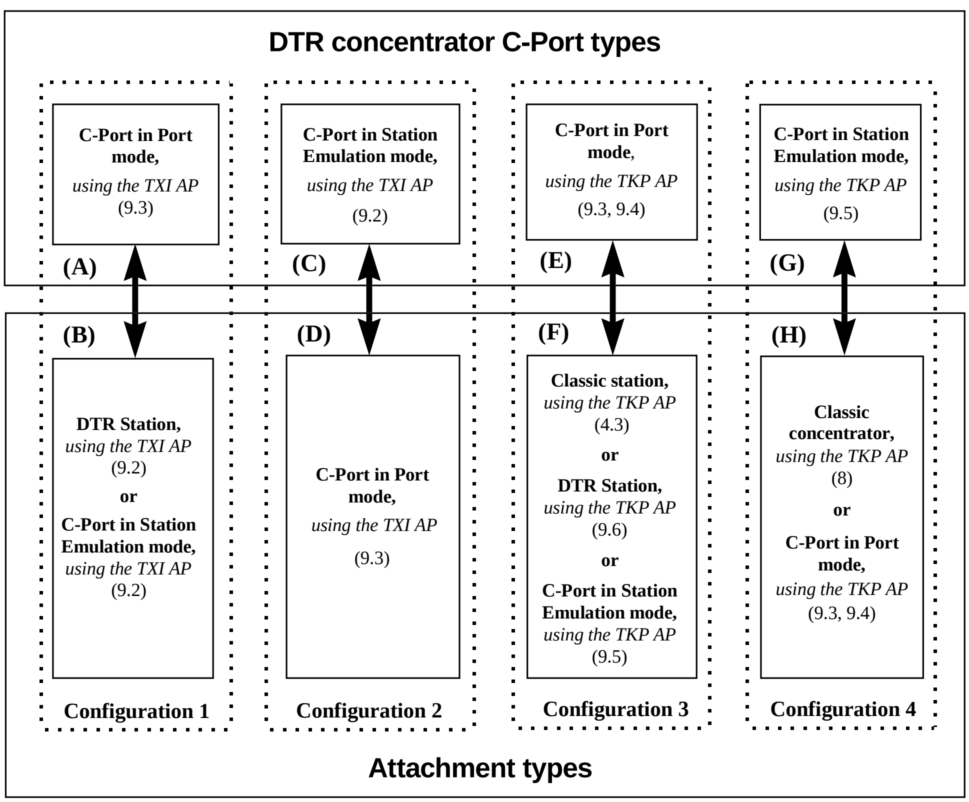


Figure 9-1—DTR Configurations 1 through 4

DTR Configurations

The following configurations are identified in figure 9-1:

— Configuration 1 consists of a C-Port in Port mode using the TXI access protocol (A) and an attached DTR Station (B) or C-Port in Station Emulation mode (B).

— Configuration 2 consists of a C-Port in Station Emulation mode using the TXI access protocol (C) and an attached C-Port in Port mode (D).

— Configuration 3 consists of a C-Port in Port mode using the TKP access protocol (E) and an attached classic Station (F), DTR Station (F), or C-Port in the Station Emulation mode (F).

— Configuration 4 consists of a C-Port in Station Emulation mode using the TKP access protocol (G) and an attached classic concentrator (H) or C-Port in Port mode (H).

Configuration functions

The functions used to support Configurations 1 and 2 are covered as follows:

— The DTR Station using the TXI access protocol is defined in 9.1 and 9.2.

— The C-Port in Port mode using the TXI access protocol is defined in 9.1, 9.3, and 9.7.

— The C-Port in Station Emulation mode using the TXI access protocol is defined in 9.1, 9.2, 9.3, and 9.7.

The functions used to support Configurations 3 and 4 are covered as follows:

— The DTR Station using the TKP access protocol is defined in 9.1 and 9.6.

— The C-Port in Port mode using the TKP access protocol is defined in 9.1, 9.3, 9.4, and 9.7.

— The C-Port in Station Emulation mode using the TKP access protocol is defined in 9.1, 9.3, 9.5, and 9.7.

— The classic station is defined in clause 4.

— The classic concentrator is defined in clause 8.

Clause 9 structure

The remainder of clause 9 is structured as follows:

— **Subclause 9.1** describes the common DTR Station and C-Port functions required to support the TXI and TKP access protocols.

The description of the classic station is found in clause 4 and is not covered in clause 9.

— **Subclause 9.2** specifies the DTR Station and the C-Port in Station Emulation mode using the TXI access protocol.

Annex L contains informative diagrams of the low-level finite state machines (FSMs) representing the SMAC contained in the Join, Transmit, and Monitor Station Operation tables defined in 9.2.

— **Subclause 9.3** specifies the C-Port in Port mode using the TXI or TKP access protocols.

Annex M contains informative diagrams of the low-level FSMs representing the PMAC contained in the Join, Transmit, and Monitor Port Operation tables defined in 9.3.

— **Subclause 9.4** specifies the C-Port in Port mode using the TKP access protocol. This clause defines the Transmit and Monitor functions, while the Join function is defined in 9.3.

  Annex N contains informative diagrams of the low-level FSMs representing the PMAC contained in the Transmit and Monitor Port Operation tables defined in 9.4.

— **Subclause 9.5** specifies the C-Port in Station Emulation mode using the TKP access protocol.

  Annex R contains informative diagrams of the low-level FSMs representing the PMAC contained in the Join, Transmit, and Monitor Port Operation tables defined in 9.5.

— **Subclause 9.6** specifies the DTR Station using the TKP access protocol.

  Annex Q contains informative diagrams of the low-level FSMs representing the MAC contained in the Join, Transmit, and Monitor Station Operation tables defined in 9.6.

— **Subclause 9.7** specifies the C-Port specific components and specifications used when supporting the TXI or TKP access protocols. The PHY requirements unique to the C-Port are defined by 9.7. The PHY requirements shared between classic concentrators and classic stations are defined in clauses 5, 7, and 8.

9.1 DTR TXI and TKP access protocol support

This clause provides an overview of the TKP and TXI access protocol for the DTR C-Port, DTR Station, and classic station supporting Configurations 1 through 4 shown in figure 9-1. The determination as to which configuration is being used is made by the Station and C-Port Join Operation tables defined in 9.2 and 9.3, respectively. This determination is based on policy flags, the results of the registration process, and phantom signaling detection by the C-Port.

This subclause contains an overview of the DTR Station and DTR C-Port when an implementation is using the TXI access protocol or the TKP access protocols as follows:

a) The TXI definitions used by the C-Port and Station are described in 9.1.1.
b) TXI access protocol functions used by the Station's SMAC as specified in 9.2 and the C-Port's PMAC as specified in 9.3 are discussed as follows:
   1) Protocol checking is described in 9.1.2.
   2) Error handling is described in 9.1.3.
   3) Registration is described in 9.1.4.
   4) Registration query is described in 9.1.5.
   5) Lobe media test is described in 9.1.6.
   6) Duplicate address check is described in 9.1.7.
   7) Transmit is described in 9.1.8.
   8) Heart beat is described in 9.1.9.
   9) Hard error recovery is described in 9.1.10.
   10) Soft error reporting is described in 9.1.11.
   11) Configuration control is described in 9.1.12.
   12) SMAC and PMAC service interfaces are described in 9.1.13.
c) Items 1)–12) are each described by covering the function's purpose and then, if required, covering the unique C-Port and Station support of the function.
d) The C-Port in Port mode using the TKP access protocol in support of Configuration 3 is discussed in 9.1.14. The C-Port's Port Operation tables needed to support this configuration are described in 9.4.
e) The C-Port in Station Emulation mode using the TKP access protocol in support of Configuration 4 is discussed in 9.1.15. The C-Port's Port Operation tables needed to support this configuration are specified in 9.5.

f) The DTR Station using the TKP access protocol in support of Configuration 3 is discussed in 9.1.16. The DTR Station's Station Operation tables needed to support this configuration are specified in 9.6.

9.1.1 TXI definitions

This subclause contains definitions used by the C-Port and Station, including FSM notations and interactions, PHY signal interpretation, frame identification, actions on frame errors, and C-Port/Station policy variables.

9.1.1.1 Finite state machine (FSM) notation

See 4.2.1 for the general rules controlling FSMs.

The C-Port Operation tables and Station Operation tables contain an abstract model of the DTR C-Port and Station access protocol machines. For all possible combinations of events and C-Port/Station states, the operation tables determine an unambiguous and consistent response by the C-Port or Station including the next state, if necessary, and the primitives used at the various service interfaces.

The C-Port's Port Operation tables in 9.3, 9.4, and 9.5, the Station's Station Operation tables in 9.2 and 9.6, and the FSMs defined in annexes L, M, N, and R are evaluated as follows:

a) A snapshot of the value of all event terms is taken at an instant in time.
b) All event statements are evaluated to TRUE or FALSE, depending on the truth of each element in the event statements.
c) The actions for all TRUE events are performed.
d) Actions are considered to occur simultaneously except for clock source changes, transmit sequences (e.g., SFS, EFS, or FCS), and the transmission of fill.
e) Clock source changes, transmit sequences, and the transmission of fill are started and performed as follows:

   NOTE—The notation FxTI is used to mean FPTI or FSTI, FxTXC is used to mean FPTXC or FSTXC, TS=xTXN is used to mean TS=PTXN or TS=STXN, and TS=xTXD is used to mean TS=PTXD or TS=STXD. After a clock source change, 5.7.1 requires the C-Port and Station to delay at least 1.5 ms before proceeding to allow the attached entity time to synchronize to the new clock source.

   1) When conditions cause the C-Port's Transmit Port Operation table or the Station's Transmit Station Operation table to transition from the Transmit Normal state (TS=xTXN) to the Transmit Data state (TS=xTXD), the following order is maintained prior to the transition:
      i) Change clock source.
      ii) Delay by at least 1.5 ms before proceeding.
      iii) Set FxTI=0.
      iv) Transmit sequences in the order presented in the FSM.
      v) State transition.
   2) When conditions cause the C-Port's Transmit Port Operation table or the Station's Transmit Station Operation table to transition from the Transmit Data state (TS=xTXD) to the Transmit Normal state (TS=xTXN), the following order is maintained prior to the transition:
      i) Transmit sequences in the order presented in the FSM.
      ii) Set FxTI=1.
      iii) Change clock source.
      iv) Delay by at least 1.5 ms before proceeding.
      v) State transition.
   3) When conditions cause the C-Port's Transmit Port Operation table to transition from the Repeat state (TS=PRPT) to the Transmit Normal state (TS=xTXN), the following order is maintained prior to the transition:

i) Set FxTI=1.
ii) Change clock source.
iii Delay by at least 1.5 ms before proceeding.
iv) State transition.

f) Evaluation is repeated beginning with Step a).

The C-Port and Station must have a way of ordering simultaneous external events that would otherwise cause contradictory actions, for example, simultaneous frame arrival and timer expiration. Except for the case of simultaneous events, the actions associated with the set of TRUE event statements in the FSM and C-Port and Station Operation table are never contradictory. The method that a C-Port and Station use to arbitrate simultaneous events is implementation dependent and not constrained by this standard. The C-Port and Station may act on simultaneous events in any order prior to considering subsequent events.

Actions do not affect the truth of event statements until the next snapshot.

Constants used in the tables are in hexadecimal notation unless otherwise indicated.

9.1.1.2 Special optional notation used in Port and Station Operation tables

When appropriate, some of the Port and Station Operation table transitions have an action/output column that includes the notation (optional), (optional-i), (optional-x), and (optional-unk). The terms that are optional are enclosed within brackets.

The standard provides the following guidance for this notation:

notation	Meaning of notation
(optional)	New implementations are allowed to include or exclude this option.
(optional-i)	New implementations are encouraged to include this option.
(optional-x)	New implementations are encouraged to exclude this option.
(optional-unk)	Implementations supporting any transition containing the “FR_LTH=UNK” term shall implement this option.

9.1.1.3 PMAC and SMAC protocol flags

C-Port and Station protocol flags use the notation FP(name of flag) and FS(name of flag), respectively. Protocol flags, which remember the occurrence of an event for a later action, are used internal to the Port Operation tables and Station Operation tables, and are not meant to imply any implementation requirements.

All C-Port and Station protocol flags are set to 0 by the “Set_initial_conditions” action.

In general, protocol flags are set to 1 when a condition occurs and set to 0 when the condition no longer exists or when the appropriate action is taken.

9.1.1.4 C-Port interface flags

The C-Port interface flags are used by the Join Port Operation table as a method of communication between the Port Operation tables in 9.2, 9.3, 9.4, and 9.5 as follows:

— Interface flags are set to 0 by the C-Port action “Set_initial_conditions.”

— Interface flags are set to 1 by the C-Port upon the detection of an appropriate condition.
— Interface flags do not represent any implementation requirements.

C-Port interface flags use the notation FIP [name in the form of Access Protocol, C-Port Operation, Condition Reported (optional)]. This notation is illustrated in figure 9-2.

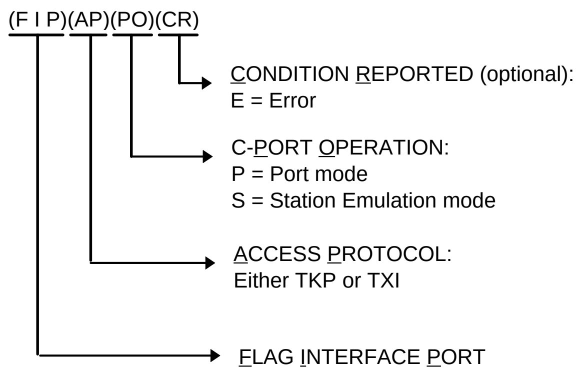


Figure 9-2—Interface flag overview

The following interface flags are defined to support Configurations 2, 3, or 4.

9.1.1.4.1 Interface flag support of the TXI access protocol

Flag, Interface C-Port TXI Station Emulation (FIPTXIS). The flag FIPTXIS is set to 1 by the Port Operation table in 9.3 when it recognizes the need to enter the C-Port in Station Emulation mode using the TXI access protocol. This flag is used by the Station Operation tables in 9.2 to activate transitions necessary to support the C-Port functions (e.g., MRI handling).

The flag FIPTXIS is used to support the Configuration 2 entity **(C)**.

9.1.1.4.2 Interface flag support of the TKP access protocol

Flag, Interface C-Port TKP Port Mode (FIPTKPP). The flag FIPTKPP is set to 1 by the Port Operation table in 9.3 when it recognizes the need to enter the C-Port in Port mode using the TKP access protocol. This flag is used by the Port Operation tables in 9.4 to activate transitions necessary to support the C-Port in this mode.

The flag FIPTKPP is used to support the Configuration 3 entity **(E)** or Configuration 4 entity **(H)**.

Flag, Interface C-Port TKP Port Mode Error (FIPTKPPE). The flag FIPTKPPE is set to 1 by the Monitor Port Operation table in 9.4 to inform the Join Port Operation table in 9.3 that the attached Station did not successfully complete its lobe media test during the Beacon Test state.

The flag FIPTKPPE is used to support Configuration 3 entity **(E)** and Configuration 4 entity **(H)**.

Flag, Interface C-Port TKP Station Emulation (FIPTKPS). The flag FIPTKPS is set to 1 by the Port Operation table in 9.3 when it recognizes the need to enter the C-Port in Station Emulation mode using the

TKP access protocol. This flag is used by the Port Operation tables in 9.5 to activate transitions necessary to support the C-Port in this mode.

The flag FIPTKPS is used to support Configuration 3 entity **(F)** and Configuration 4 entity **(G)**.

9.1.1.5 Join, Monitor, and Transmit FSM interaction

This subclause and its associated figure explain the interaction of the DTR C-Port and Station TXI access protocol Join, Monitor, and Transmit FSMs. Functions performed by these C-Port and Station FSMs are defined in the TXI access protocol specification defined in 9.2.5 and 9.3.4, respectively. The Join Ring FSM is parent to the Monitor FSM and the Transmit FSM. Figure 9-3 illustrates the interaction of the Join Ring (master), Transmit (slave), and Monitor (slave) FSMs.

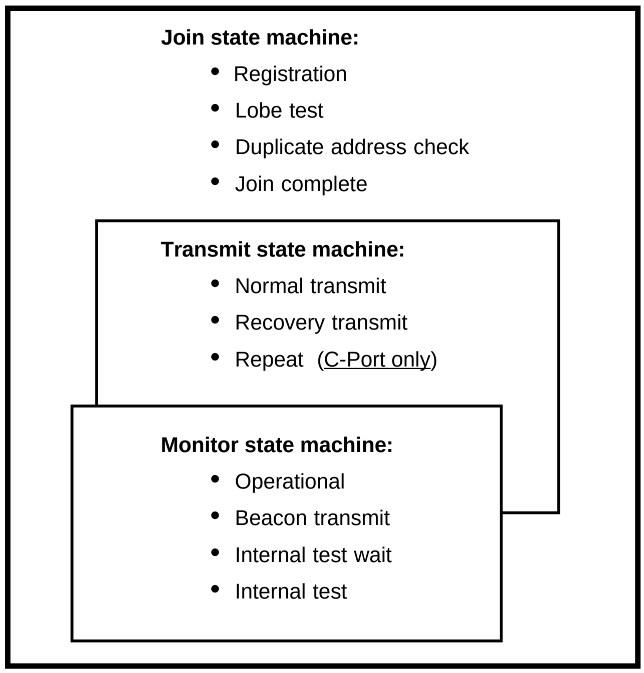


Figure 9-3—Join, Transmit, and Monitor FSM interaction

The starting state for the TKP access protocol and TXI access protocol is the Bypass state (JS=BP).

The Bypass state is the initial state of the Join FSM. A C-Port or Station completing a power-on reset sequence activates its Join FSM in this state. Entry into this state, when under FSM control, can occur due to local management action, network management action, or the detection of an uncorrectable error. Exit from this state is controlled by local management action (i.e., Connect.MAC or Connect.PMAC).

The Transmit and Monitor states (TS=x, MS=x) *are not* specified while the Join state machine is in the Bypass state (JS=BP).

The following starting conditions (i.e., power on) for the C-Port and Station FSMs are required to be established prior to leaving the Bypass state:

— Counters are set to 0.
— Event flags are set to 0.

— Stored values are set to 0.
— C-Port and Station policy flags, and C-Port and Station policy variables are set according to the C-Port and Station operational policies and are set *prior* to leaving the Bypass state (JS=BP). Policy flags and policy variables are examined, but are *never* changed by the Port Operation tables or Station Operation tables.
— Timers are not running (stopped, thus cannot expire).

9.1.1.6 Frame identification

Three frame identifications are used by the TXI Port Operation tables and Station Operation tables. They are frame (FR), frame with error (FR_WITH_ERR), and frame header (FR_FC). FR and FR_WITH_ERR are defined in 4.3.2. FR_FC is defined as follows:

frame header (FR_FC). A bit sequence that indicates a frame's SD, AC, and FC fields have been received that satisfy the following conditions:

A & K & L & M & E

where

A—Starts with valid SD.
K—Has no code violations in P and T, and optionally M, and optionally R.
L—T bit is equal to 1 indicating a frame.
M—Has no code violations in the FC field.
E—Has FF bits in FC field equal to 00 or 01.

9.1.1.7 Actions on frame error conditions

The following frame error conditions are covered:

a) **Frames received in error (FR_WITH_ERR).** When a frame is addressed to a C-Port or Station and has a frame with error (FR_WITH_ERR) condition, the frame is not processed other than to count the error condition (e.g., Line Error, etc.).
b) **Transmission errors.** Transmission errors occur when the C-Port or Station in the Transmit Frame Data state (TS=PTXD or TS=STXD) is unable to complete a requested transmission. The actions taken by the FSMs are dependent on the type of error and the options used by the implementation. All actions taken cause the receiving entity to either terminate reception of the frame or to discard the frame. Conditions and actions are as follows:
    1) If the transmission error is a correctable STATION_ERR or PORT_ERR, then the Abort Sequence shall be transmitted prior to entering the Transmit Normal state (TS=PTXN or TS=STXN).
    2) If the transmission error is an uncorrectable STATION_ERR or PORT_ERR, then the Abort Sequence is optionally transmitted prior to entering the Transmit Normal state (TS=STXN or TS=PTXN) and shall cause the Join function of the Station or C-Port to enter the Bypass state (JS=BP).
    3) If the transmission error is caused by exceeding the count allowed by the counter CPBTX or CSBTX (used by the C-Port in Port mode or the C-Port in Station Emulation mode, respectively, when transmitting frames of unknown length), then one of the following two actions shall be taken depending on the option flag FPASO:
        i) If FPASO=0, then the Abort Sequence is transmitted prior to entering the Transmit Normal state (TS=PTXN or TS=STXN).
        ii) If FPASO=1, then the transmission of the frame is terminated with an invalid FCS and an Ending Delimiter with the Error Detected bit (E) set to 1 prior to entering the Transmit Normal state (TS=PTXN or TS=STXN).

9.1.1.8 TXI policy flags and variables

TXI policy flags and variables are set *prior* to the Connect.SMAC or Connect.PMAC interface startup signals and cannot be changed by the C-Port's Port Operation tables or the DTR Station's Station Operation tables. The station and C-Port TXI policy flags and variables are defined in 10.5.1 and 10.5.2, respectively.

9.1.1.9 Interpreting the FSMs

The high-level FSMs contained in 9.2 through 9.6 and the low-level FSMs contained in annexes L, M, N, Q, and R use the following set of rules.

These FSMs illustrate only the Port and Station Join, Transmit, and Monitor Operation tables even though *all* Port and Station Operation tables defined are required for correct operation.

The Join, Transmit, and Monitor FSMs can operate simultaneously. Each FSM can have only *one* state active at a time.

Figure 9-4 illustrates states and transitions as follows:

a) STATES are shown as vertical lines with the state name at the top of the line.
b) TRANSITIONS are shown as horizontal lines. They always contain an arrowhead to show a connection to a STATE and may contain a number to indicate state/transition number (e.g., J12).
    1) When state/transition numbers are present within an FSM, the first character represents the FSM (J for Join, T for Transmit, and M for Monitor), the first digit is the state being exited, and the second digit is the state being entered.
    2) Occasionally multiple transitions with different actions occur between two states and the state/transition number ends with an additional letter (e.g., J13A and J13B).
c) Entry into a STATE occurs *only* when the transition ends at a STATE with an arrowhead.
d) Some transitions are awkward to illustrate because of location within the FSM. TRANSITION J31 exits STATE J3 and enters STATE J1 [e.g., J31 labeled (A)].
e) Some transitions cross a STATE without an arrowhead, which indicates the STATE is not entered. TRANSITION J31 exits STATE J3 and enters STATE J1 [e.g., J31 labeled (B)].
f) OPTIONAL conditions are enclosed in brackets (e.g., [Condition_6]).
g) OPTIONAL actions are enclosed in brackets (e.g., [Action_6]).

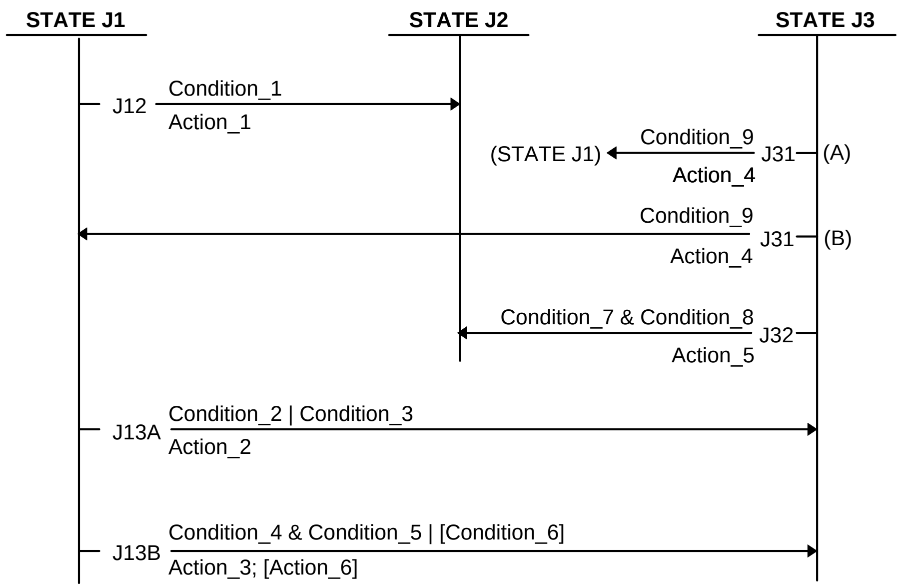


Figure 9-4—State/transitions (S/T) illustration

Figure 9-4 illustrates the following state transitions:

- STATE J1 to STATE J2 (transition J12) due to event of Condition_1, action of Action_1.
- STATE J1 to STATE J3 (transition J13A) due to event of Condition_2 OR Condition_3, action of Action_2.
- STATE J1 to STATE J3 (transition J13B) due to event of Condition_4 AND Condition_5 OR optional Condition_6, action of Action_3, or optional Action_6.
- STATE J3 to STATE J1—two different ways of illustrating the same transition.
  STATE J3 to STATE J1 (transition J31) due to event of Condition_9, action of Action_4.
  STATE J3 to STATE J1 (transition J31) due to event of Condition_9, action of Action_4.

The clause 9 Port and Station Operation tables Event/Condition column contains the current state, but this state is not shown in the low-level FSMs in annexes L, M, N, Q, or R since the current state is illustrated by the vertical line.

The clause 9 Port and Station Operation tables Action/Output column contains the state being entered, but this state is not shown in the low-level FSMs in annexes L, M, N, Q, or R since the state being entered is illustrated by the arrowhead connection to a vertical line.

Some of the clause 9 Port and Station Operation tables contain transitions without a state/transition entry (S/T) and, although these transitions are not shown in the FSMs in annexes L, M, N, Q, or R, they are required for proper operations.

9.1.2 TXI protocol checking

The Station and C-Port TXI *Protocol Checking* functions, when active, prevent TXI access protocol contamination. These functions are active when the Join FSM is in the following states: JS=SREG,

JS=SLT, JS=SDAC, JS=SJC, JS=PLT, JS=PDAC, and JS=PJCI. A TXI protocol check causes the C-Port or Station to

a) Return to the Bypass state (JS=BP), and
b) Notify the appropriate Management entity of this event.

9.1.3 TXI error handling

The Station or C-Port using the *TXI access protocol* can experience error conditions that are classified as either *hard errors* or *soft errors* as follows:

a) Hard errors, which are defined in 9.1.10, are faults that prevent the Station from receiving the C-Port's Heart Beat (PHB) MAC frames or the C-Port from receiving the Station's Heart Beat (SHB) MAC frames.
b) Soft errors, which are defined in 10.6, are faults that cause data corruption, but do not prevent frames from being exchanged between the C-Port and the Station.

Error detection, reporting, and recovery procedures require stations and C-Ports to identify and isolate fault conditions. In some cases, the Station and/or C-Port causing the fault condition is required to remove from the network and report the error condition to the appropriate Management entities.

All error conditions are isolated to the fault domain described in 9.1.3.1. The operational domain of the TXI access protocol, which includes the individual addresses of the station and C-Port, is established by the registration process described in 9.1.4. This operational domain is reported as the fault domain and is reported as described in 9.1.3.2 either by the Beacon MAC frame for hard errors or by the Error Report MAC frame for soft errors as follows.

— Recovery from hard error conditions is managed by Hard Error Recovery as described in 9.1.10.
— Reporting of soft error conditions is handled by the Station or C-Port as described in 9.1.11.

9.1.3.1 TXI fault domain

The C-Port and Station *fault domain* establishes a boundary around an error condition and identifies the location of the fault for the appropriate corrective action. The fault domain for the TXI access protocol consists of the following, as illustrated in figure 9-4:

a) The C-Port (A),
b) The Station (B), and
c) The components (e.g., medium, connectors, etc.) between the C-Port and the Station.

In this fault domain, error reporting is accomplished by

— The Station (B) detecting an error condition and reporting this fault condition as being downstream of the C-Port (A) or
— The C-Port (A) detecting an error condition and reporting this fault condition as being downstream of the Station (B).

9.1.3.2 TXI fault reporting

The TXI access protocol uses two reporting schemes, one for soft errors and one for hard errors. The following subclauses explain the handling of hard errors and soft errors using the fault domain illustrated by figure 9-5.

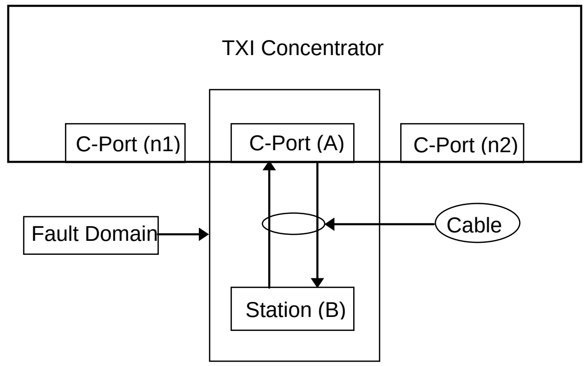


Figure 9-5—Fault domain illustration

9.1.3.2.1 Hard errors

The TXI access protocol uses the Hard Error Recovery process (see 9.1.10) in an attempt to recover from hard errors and restore normal operation. If recovery is not possible, the Beacon MAC frame identifies the fault domain for analysis by network management functions (Network Management and/or Station Management) as follows:

a) When the Station detects a hard error (e.g., broken cable) between the C-Port (A) and the Station (B), the fault domain is identified and reported by the Station (B) transmitting Beacon MAC frames. This Beacon MAC frame contains the source address of the detecting Station (B) and the address of its connected C-Port (A). This Beacon MAC frame allows the Station (B) to declare the fault domain and alert the C-Port (via the Beacon MAC frame) and its Station management that normal TXI access protocol is suspended until the hard error condition terminates or is removed. The nature of the hard error condition may make it impossible for the C-Port to receive the Station's Beacon MAC frame. When this occurs, the C-Port management will not be aware that the Station has detected an error condition.
b) When the C-Port detects a hard error (e.g., broken cable) between the Station (B) and the C-Port (A), the fault domain is identified and reported by the C-Port (A) transmitting Beacon MAC frames. The Beacon MAC frame contains the source address of the detecting C-Port (A) and the address of the Station (B). This Beacon MAC frame allows the C-Port (A) to declare the fault domain and alert the Station (via the Beacon MAC frame) and its management that normal TXI access protocol is suspended until the hard error condition terminates or is removed. The nature of the hard error condition may make it impossible for the Station to receive the C-Port's Beacon MAC frame. When this occurs, the Station management will not be aware that the C-Port has detected an error condition.

9.1.3.2.2 Soft errors

The C-Port's and Station's TXI access protocol detects and reports soft errors, and takes the following actions:

a) When the Station (B) detects a soft error (e.g., interference causing increased bit error rate) between the port (A) and the Station (B), it is reported by the Station (B) via the transmission of an

Error Report MAC frame containing the source address of the detecting Station (B), the address of its port (A), and the count of the errors detected (see 10.6). The Error Report MAC frame is sent to the REM functional address for analysis by a Management application designed for the TXI access protocol.

b) When the C-Port (A) detects a soft error (e.g., interference causing increased bit error rate) between the C-Port (A) and the Station (B), it is reported by the C-Port (A) via the transmission of an Error Report Management Status containing the source address of the detecting C-Port (A), the address of its Station (B), and the count of the errors detected (see 10.6). The Error Report is sent via a MRI status indication for analysis by a Management application designed for the TXI access protocol.

9.1.4 TXI registration

The C-Port and the Station join machines use the registration function to exchange the following information:

a) Station saves the C-Port’s source address (PMAC Address) in its stored upstream address (SUA).
b) C-Port saves the Station’s source address (SMAC Address) in its SUA.
c) C-Port saves the Station’s individual address count (IAC) in its stored individual address count (SIAC). The Station is required to support only the SMAC address, but may optionally support multiple individual addresses. The C-Port does not support multiple individual addresses.

In addition, the C-Port and the Station join machines use registration to determine whether the Station and C-Port are compatible (e.g., if they are capable of using the same access protocols). If they are not compatible, the Registration function causes the following actions:

— The C-Port notifies the Station of the incompatibility via the Registration Response (REG_RSP) MAC frame with an AP_RSP subvector value of X'0000' and remains in its Registration state.
— The Station returns to the Bypass state and notifies the appropriate Management function.

If they are compatible, the Registration function in the C-Port notifies the Station via the Registration Response (REG_RSP) MAC frame with an AP_RSP subvector with a value of X'0002' for the TXI access protocol.

9.1.4.1 Station support of registration

After a delay controlled by the timer TSIS, the registration function determines whether the C-Port can support the TXI access protocol by setting its request counter CSREQ to a value in the range of 4 through 12 (see 9.2.3.1), resetting the pacing timer TSREQ, and transmitting the Registration Request MAC frame defined in 10.3.5.1. The Station proceeds with one of the following actions:

a) If the Station receives a C-Port response (REG_RSP MAC frame) and its AP_RSP subvector value is equal to the requested AP_REQ subvector value, the C-Port has accepted the Station’s request and the Station, after delaying for a period controlled by TSLMTD, begins the TXI access protocol defined in 9.2 by entering the Station Lobe Test state (JS=SLT).
b) If the Station has not received the C-Port’s REG_RSP MAC frame prior to the expiration of TSREQ and CSREQ>0, then the Station retransmits the REG_REQ MAC frame, resets timer TSREQ, and decrements CSREQ.
c) If the Station has not received the C-Port’s REG_RSP MAC frame prior to the expiration of TSREQ and CSREQ=0, then the Station takes one of the following actions depending on the option flag FSOPO:
    1) If FSOPO=0, the Station attempts to join using the TKP access protocol by entering the Lobe Test state (JS=LT) defined in clause 4 for the classic station and in 9.6 for the DTR Station.

   2) If FSOPO=1, the Station does not allow selection of the TKP access protocol, enters the Bypass state (JS=BP), and reports this failure to Management.

d) If the Station receives a C-Port response (REG_RSP MAC frame) and its AP_RSP subvector value is X'0000' indicating the C-Port has denied the Station's request, then the Station takes one of the following actions depending on the option flag FSRDO:
   1) If FSRDO=0, the Station attempts to join using the TKP access protocol and enters the Lobe Test state (JS=LT) defined in clause 4 for the classic station and in 9.6 for the DTR Station.
   2) If FSRDO=1, the Station does not allow selection of the TKP access protocol, enters the Bypass state (JS=BP), and reports this failure to Management.

9.1.4.2 C-Port support of registration

The C-Port supports the registration function by entering the Registration state (JS=PREG). In the Registration state, a reliable repeat path is provided only if the C-Port is configured to support the TKP access protocol (AND(PPV(AP_MASK),0001)=0001). While in the Registration state, the C-Port waits for the Station's Registration Request (REG_REQ) MAC frame. Upon reception of the Station's Registration Request (REG_REQ) MAC frame, the C-Port examines the AP_REQ subvector value and takes one of the following actions:

— If the value of the Station's AP_REQ is not recognized by the C-Port as a valid AP_REQ value, then the C-Port denies the Station request by transmitting a registration Response (REG_RSP) MAC frame with an AP_RSP subvector value of X'000'. The C-Port remains in the Registration state (JS=PREG).
— If the value of the Station's AP_REQ when logically ANDed with the C-Port's PPV(AP_MASK) results in a value of X'0000', then the C-Port denies the Station request by transmitting a Registration Response (REG_RSP) MAC frame with an AP_RSP subvector value of X'0000'. The C-Port remains in the Registration state (JS=PREG).
— If the value of the Station's AP_REQ when logically ANDed with the C-Port's PPV(AP_MASK) results in a value of X'0002', then the C-Port accepts the Station request to use the TXI access protocol by transmitting a Registration Response (REG_RSP) MAC frame with an AP_RSP subvector value of X'0002', sets up the C-Port to support the Station's lobe test, and enters the C-Port Lobe Test state (JS=PLT).

9.1.5 Registration query protocol

The purpose of the registration query protocol is to allow two TXI capable entities connected by a dedicated lobe that have joined using the TKP access protocol to attempt to switch to the TXI access protocol. This situation could arise from a TXI capable station attempting registration before the C-Port is ready to respond.

The protocol is initiated by the C-Port completing neighbor notification and entering the Port Registration Query state (JS=PRQ). In this state, the C-Port will transmit up to five (5) Registration Query MAC frames to the attached station. If the Station is configured to respond to the Registration Query MAC frames, the Station drops phantom, delays for the time specified by TSRW (allows the C-Port to detect phantom loss and change states) and reenters the Registration state (JS=SREG) to begin the registration process. While in the Registration Query state (JS=PRQ), the C-Port responds to the loss of phantom by entering its Registration state (JS=PREG).

If the Station does not drop phantom while the C-Port is in JS=PRQ and CPRQ decrements to zero, the C-Port ends registration query and completes the Join process (JS=PJCP).

9.1.6 TXI lobe media test (LMT)

The station, with support of the C-Port, uses the LMT function to determine if the lobe is operating at an acceptable bit error rate (BER).

9.1.6.1 Station support of the LMT

The Station is responsible for the execution of the LMT function to determine if the lobe has an acceptable BER. The Station's LMT normally uses the TEST MAC frame to test the lobe. The Station's LMT may use other frames for testing, but shall not use the Ring Recovery MAC frames (BN, CT, and RP) nor the Neighbor Notification MAC frames (AMP and SMP). The Station transmits the frame and then checks this frame at its receiver for error conditions. The pass/fail criteria for BER calculations are specified in annex P.

9.1.6.2 C-Port support of the LMT

The C-Port is responsible for providing a repeat path (see 9.7) to allow the Station to test the lobe as stated in 9.1.6.1.

9.1.7 TXI duplicate address check (DAC)

The DTR Station and C-Port use DAC to determine whether the Station has an individual address acceptable to the DTR concentrator's data transfer unit (DTU) defined in annex K. It is intended that the scope of the DAC should be the set of MACs connected to the ports on a DTR concentrator that together comprise one logical ring (K.3.2.2). The DAC is completed when the C-Port's Insert Response (INS_RSP) MAC frame is sent as the result of the Station's transmitting an Insert Request (INS_REQ) MAC frame.

9.1.7.1 Station support of DAC

9.1.7.1.1 Start DAC function

The Station starts its DAC function by transmitting the Insert Request (INS_REQ) MAC frame and waits for the C-Port's INS_RSP MAC frame. The Station takes one of the following actions:

a) If the Station receives an INS_RSP MAC frame with a response code of X'8020' (indicating the Station's address is detected as a duplicate address), the Station does not remain attached to the DTR concentrator, enters the Bypass state (JS=BP) and notifies the appropriate Management functions.
b) If the Station receives an INS_RSP MAC frame with a response code of X'0000' (indicating the Station's address is not detected as a duplicate address), the Station enters the Join Complete state (JS=SJC).

9.1.7.1.2 Terminate DAC function

The Station's DAC function is terminated by the occurrence of the following events:

a) If the Station's timer TSJC expires prior to the reception of the C-Port's INS_RSP MAC frame, the Station enters the Bypass state (JS=BP) and notifies the appropriate Management functions.
b) If the Station's timer TSRHB expires while the station is in Duplicate Address Check (JS=SDAC), the Station enters the Bypass state (JS=BP) and notifies the appropriate Management functions.

9.1.7.2 C-Port support of DAC

The C-Port starts the DAC function during registration and completes DAC when it receives the Station's INS_REQ MAC frame and a response from the DTU interface [DTU_DAC.response(RC)] by transmitting the Insert Response (INS_RSP) MAC frame. The C-Port takes one of the following actions:

a) A C-Port transmits an INS_RSP MAC frame with a response code of X'8020' if a duplicate address is detected and terminates support of the Station by returning to the Bypass state (JS=BP).

b) A C-Port transmits an INS_RSP MAC frame with a response code of X'0000' if a duplicate address is not detected and completes Join by entering the Join Complete TXI state (JS=PJCI).

9.1.8 TXI Transmit function

The C-Port and Station TXI Transmit functions operate as shown figure 9-6. This figure illustrates the TXI Transmit functions allowing frames to be transmitted: first, by requiring the conditions to be met; and second, by allowing the selection of Transmit Immediate frames (TXI_REQ) for transmission prior to the transmission of any queued frames (QUE_PDU).

The C-Port and Station may support multiple transmit queues even though figure 9-6 does not illustrate multiple queues. If multiple queues are supported, the operation of these queues is not standardized other than to require the condition and selection capabilities.

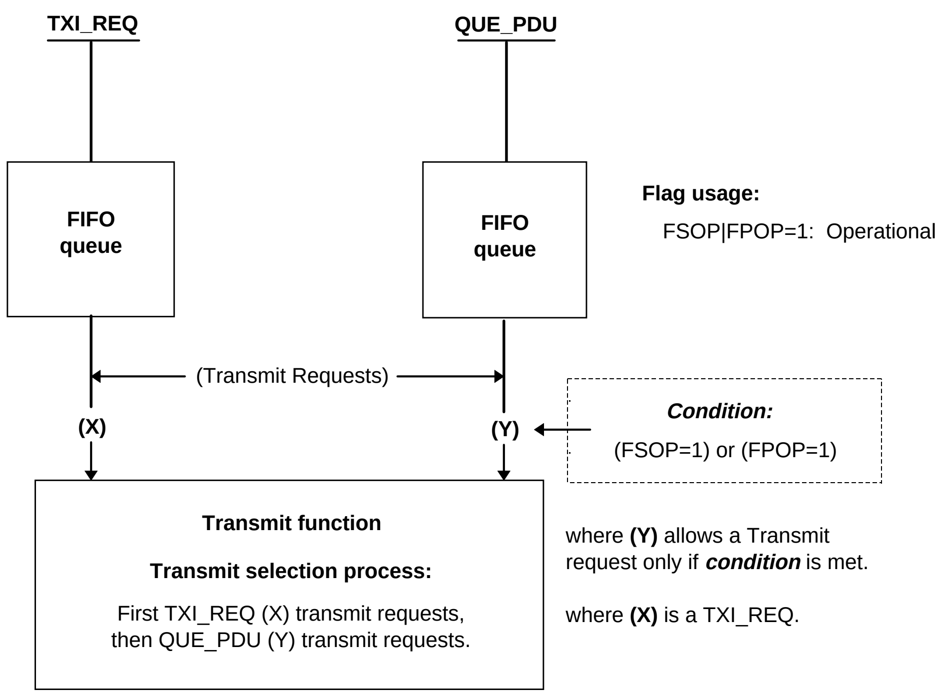


Figure 9-6—C-Port and Station Transmit function

9.1.8.1 Station TXI Transmit function

The Station's TXI Transmit function is supported by two states, Transmit Normal (TS=STXN) and Transmit Data (TS=STXD), as follows:

a) **Transmit Normal state (TS=STXN).** This is the normal state for the Station's TXI Transmit function. In this state, the Station is transmitting idles from either its crystal (FSTXC=1) or its recovered clock (FSTXC=0). Flag FSTXC is set by the join and monitor machines.

If a transmit request is made, the Station honors the condition and selection scheme identified in 9.1.8, provides the appropriate starting frame sequence, and enters the Transmit Data (TS=STXD) state.

b) **Transmit Frame Data state (TS=STXD).** This state is used by the Station or the C-Port in the Station Emulation mode to transmit the frame's data. The data is transmitted until one of the following conditions is detected:
   1) The Station or the C-Port in the Station Emulation mode has no more data to transmit (EOD reached), releases the end-of-frame sequence (EFS), and returns to the Transmit Normal state (TS=STXN).
   2) The Station or the C-Port in the Station Emulation mode detects a transmission error and takes one of the actions defined under 9.1.1.7b), Transmission error.

9.1.8.2 C-Port TXI Transmit function

The C-Port's TXI Transmit function is supported by three states, Transmit Normal (TS=PTXN), Transmit Frame Data (TS=PTXD), and Transmit Repeat (TS=PRPT).

a) **Transmit Normal state (TS=PTXN).** This is the normal state for the C-Port's TXI Transmit function. During this state, the C-Port is transmitting idles (FPTI=1). The clock source is dependent on the state of the Join FSM as follows: prior to entering JS=PDAC, the clock source is recovered from the input signal (FPTXC=0); after entering JS=PDAC and in JS=PJCI, the clock source is its crystal (FPTXC=1).

   When a transmit request is made (TXI_REQ or QUE_PDU) *and* a repeat request has not been made (FPRPT=0), the C-Port honors the condition and selection scheme identified in 0, turns off transmit idles (FPTI=0), transmits the appropriate starting frame sequence, and enters the Transmit Data state (TS=PTXD).

   When a repeat request is made (FPRPT=1), the C-Port turns off crystal transmit (FPTXC=0) so its transmit signal is derived from the recovered clock, repeats received data (FPTI=0), and enters the Transmit Repeat state (TS=PRPT).

b) **Transmit Frame Data state (TS=PTXD).** This state is used by the C-Port to transmit frame data. The data is transmitted until *one* of the following conditions is detected:
   1) The C-Port detects it has no more data to be transmitted (EOD), releases the end-of-frame sequence (EFS), and returns to the Transmit Normal state (TS=PTXN).
   2) The C-Port detects a transmission error and takes one of the actions defined under 9.1.1.7b), Transmission error.

c) **Transmit Repeat (TS=PRPT).** This state is used by the C-Port to provide a repeat path to support the Station's TXI LMT function defined in 9.1.6.

   This repeat path, which is activated by the Transmit Normal state (TS=PTXN) detecting the flag FPRPT=1, is not required to examine data being repeated, but the C-Port must receive any frame with a destination address equal to any of its addresses.

   This repeat path is deactivated upon detection of the flag FPRPT being set to 0. The C-Port starts transmitting idles (FPTI=1), changes its clock source to its crystal (FPTXC=1) if FPOP=1, and returns to the Transmit Normal state (TS=PTXN).

   The characteristics of the repeat path used by the C-Port are found in 9.7.

9.1.9 TXI Heart Beat

9.1.9.1 Function

The TXI Heart Beat function is used to determine if the link between the C-Port and Station is operative as follows:

a) If the C-Port detects the presence of the Station Heart Beat MAC frame or the Station detects the presence of the C-Port Heart Beat MAC frame, they each reset their respective Heart Heat timers (TPRHB or TSRHB), and the TXI Heart Beat function continues.

b) If the C-Port detects the absence of the Station Heart Beat MAC frame or the Station detects the absence of the C-Port Heart Beat MAC frame by the expiration of their respective Heart Heat timer (TPRHB or TSRHB), they each take one of the following actions:
   1) If Join has been completed, they enter hard error recovery (see 9.1.10).
   2) If Join has not been completed, they enter the Bypass state (JS=BP).

9.1.9.2 Activation/Deactivation

The TXI Heart Beat function is activated and deactivated by the Heart Beat Active flags, FPHBA and FSHBA, as follows:

a) When the flags FPHBA=0 or FSHBA=0, the C-Port and Station TXI Heart Beat function is inactive.
b) When the flags FPHBA=1 or FSHBA=1, the TXI Heart Beat function is active and the C-Port and the Station use their Queue Heart Beat timers (TPQBH or TSQHB) to pace the transmission of the C-Port Heart Beat MAC frames and Station Heart Beat MAC frames, respectively.

9.1.9.3 Station support of TXI Heart Beat

The Station’s TXI Heart Beat function is activated by setting flag FSHBA to 1 when it detects the successful completion (TEST_OK) of its LMT and by entering its DAC state (JS=SDAC).

If the Station receives a C-Port Heart Beat MAC frame prior to the expiration of its Receive Heart Beat timer TSRHB, then the Station resets TSRHB and the TXI Heart Beat function continues without interruption.

If the Station fails to receive a C-Port Heart Beat MAC frame before its Receive Heart Beat timer TSRHB expires (a TXI Heart Beat failure is detected), then the Station takes one of the following actions:

a) If Join is complete (FSJC=1), then the Station disables the TXI Heart Beat function by setting flag FSHBA to 0 and enters Hard Error Recovery (MS=STBN).
b) If Join is not complete (FSJC=0), then the Station enters its Bypass state (JS=BP) and notifies Management of the failure.

9.1.9.4 C-Port support of TXI Heart Beat

The C-Port’s TXI Heart Beat function is activated by setting flag FPHBA to 1 when the C-Port detects the completion of the Station’s LMT due to the reception of the Station’s Insert Request (INS_REQ) MAC frame. This event causes the C-Port to enter its Duplicate Address Check state (JS=PDAC).

If the C-Port receives a Station Heart Beat MAC frame prior to the expiration of its Receive Heart Beat timer TPRHB, then the C-Port resets TPRHB and the TXI Heart Beat function continues without interruption.

If the C-Port fails to receive a Station Heart Beat MAC frame before its Receive Heart Beat timer TPRHB expires (a TXI Heart Beat failure is detected), then the C-Port takes one of the following actions:

a) If Join is complete (FPJC=1), then the C-Port disables the TXI Heart Beat function by setting flag FPHBA to 0 and enters Hard Error Recovery (MS=PTBN).
b) If Join is not complete (FPJC=0), then the C-Port enters its Bypass state (JS=BP) and notifies Management of the failure.

9.1.10 TXI Hard Error Recovery

Hard Error Recovery is a simple function used by the TXI access protocol to recover from a C-Port, lobe, or Station failure that prevents communication between the Station and the C-Port. One of the major changes made to the TXI access protocol's support of Hard Error Recovery (from the TKP access protocol's support of Hard Error Recovery) is to always require the C-Port and station to execute the Station's lobe media test. This change eliminates the TKP access protocol's shortcoming of the beacon transmitter successfully completing beacon test even though the lobe is operating at an unacceptable BER.

A hard error is detected by the C-Port when Join has completed (FPJC=1) and one of the following conditions occurs:

- The C-Port's TXI Heart Beat function fails, causing entry into the Beacon Transmit state (MS=PTBN).
- The C-Port receives a Beacon MAC frame while in its Operational state (MS=POPT), causing entry into the Port Internal Test state (MS=PIT).

A hard error is detected by the station when Join has completed (FSJC=1) and one of the following conditions occurs:

- The Station's TXI Heart Beat function fails, causing entry into the Beacon Transmit state (MS=STBN).
- The Station receives a Beacon MAC frame while in its Operational state (MS=SOPT), causing entry into the Wire Fault Delay state (MS=SWFD).

The TXI Hard Error Recovery scheme, illustrated in figure 9-7, consists of the C-Port and Station Beacon Transmit states, the Station's Wire Fault Delay state, and the C-Port and Station Internal Test states. These states operate as described in the following subclauses.

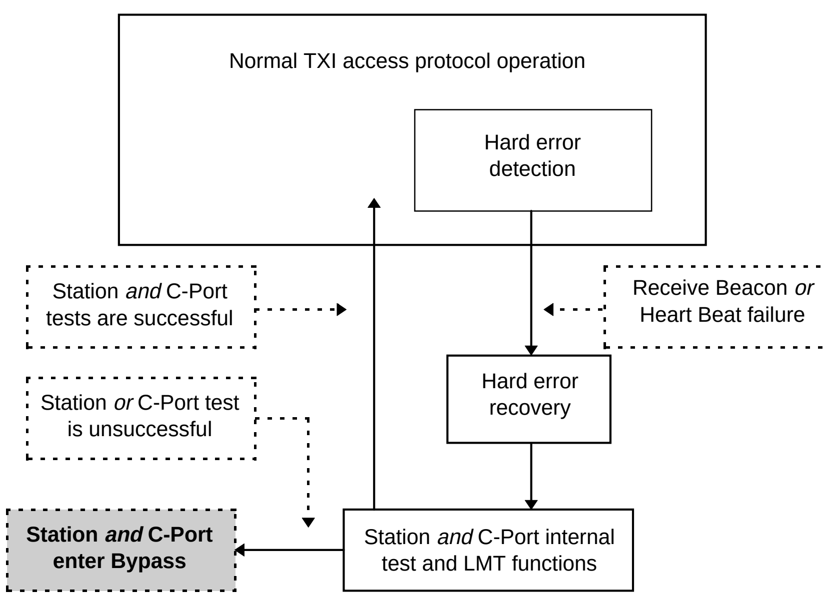


Figure 9-7—Hard error recovery

9.1.10.1 Beacon Transmit state (MS=STBN or MS=PBNT)

A TXI Heart Beat function (see 9.1.9) failure causes the C-Port and Station to enter the Beacon Transmit state (MS=PTBN and MS=STBN, respectively) and transmit a Beacon MAC frame containing the reason for Beaconing (Beacon Type) and the address of its upstream entity (UNA). Once the Beacon Transmit state has been entered, the C-Port and Station always execute their internal tests as follows:

— When the C-Port enters the Beacon Transmit state, it resets the timer TPIT. Expiration of TPIT causes the C-Port to enter its Internal Test state (MS=PIT).
— When the Station enters the Beacon Transmit state, it reset the timer TSIT. Expiration of the timer TSIT causes the Station to enter its Internal Test state (MS=SIT).

For Management reporting purposes, Hard Error Recovery relies on the Beacon MAC frame and its Beacon Type subvector. When the TXI Heart Beat fails, the C-Port's and/or Station's Beacon Transmit state sets the value of the beacon type subvector by examination of the flag, signal loss (FPSL or FSSL). Subsequent values of the beacon type subvector are dependent upon the value of the flag, signal loss (FPSL or FSSL). The following is an explanation of each beacon type used in Beacon Transmit.

— **Beacon Type 2.** The C-Port or Station *has* detected the presence of a long-term loss of signal by FPSL=1 or FSSL=1. An example of a Beacon Type 2 condition is a break in the medium causing either the Station or C-Port to be unable to detect receive signal.
— **Beacon Type 5.** The C-Port or Station *has* detected a Heart Beat failure, but *has not* detected the presence of a long-term loss of signal by FPSL=0 or FSSL=0. Beacon Type 5 may be caused by bit streaming (i.e., data received does not correspond to expected protocol). An example of a Beacon Type 5 condition is when the C-Port or Station is stuck transmitting fill.

9.1.10.2 Station Wire Fault Delay state (MS=SWFD)

The Station's Wire Fault Delay state is entered when the Station receives a Beacon MAC frame with SA=SUA indicating it is upstream from the fault. This delay allows the station enough time to detect a wire fault condition that may be the cause of C-Port's beaconing before attempting to continue with Hard Error Recovery.

Upon entry into the Wire Fault Delay state, the station causes its timers, TSIT and TSLMT, to be reset. When the timer TSIT expires and the Station has not detected a wire fault condition, the Station continues Hard Error Recovery by entry into its Internal Test state (MS=SIT). The timer TSLMT is used by the Station to start execution of its lobe test (JS=SLT).

9.1.10.3 Internal Test states (MS=SIT or MS=PIT)

The Station's Internal Test state (MS=SIT) is entered when the timer TSIT expires. The C-Port's Internal Test state (MS=PIT) is entered when the timer TPIT expires or when the C-Port receives a Beacon MAC frame (SA=SUA) while in the Operational state (MS=POPT) or the Beacon Transmit state (MS=PTBN). Internal testing begins on entry into the MS=PIT or MS=SIT states.

The exact requirements of the C-Port and Station internal tests are not specified by this standard. However, it is recommended that the Station and C-Port entities test as much of their internal circuitry as possible, since the Station or C-Port has determined that a fault condition exists. This prevents the Hard Error Recovery function from providing incorrect fault information to Management entities.

The C-Port and station internal test states operate as follows:

a) If the C-Port or Station internal tests are unsuccessful, the failing entity removes itself from the TXI lobe connection and reports to its Management entity.

It is possible for the C-Port to remove from the TXI lobe connection without the knowledge of the Station or the Station to remove from the TXI lobe connection without the knowledge of the C-Port. In order to diagnose the cause of such a failure, an external agent must coordinate the error reports from the C-Port and Station. The definition of the external agent is outside the scope of this standard.

b) If the C-Port and Station internal tests are successful, the Station and C-Port prepare their Join functions to execute the Station's LMT as follows.
   1) The Station waits for timer TSLMT to expire before causing the Station's Internal Test state to inform its join machine to reenter the Station's Lobe Test state (JS=SLT) by setting FSBNT=1 (see 9.2.3.2).
   2) The C-Port waits for the loss of Phantom Drive (FPINSD=0) before enabling its repeat path (see 9.7.1) by FPRPT=1 and informing its join machine to reenter the C-Port's Lobe Test state (JS=PLT) by setting FPBNT=1 (see 9.3.3.2).

9.1.11 TXI soft error reporting

When a C-Port or station detects a soft error condition (e.g., an FCS error), it increments the appropriate error counter (see 10.6). The expiration of TSER or TPER causes the value of the error counters to be reported using the Station's Error Report MAC frame or the C-Port's MRI. The error counters are reset after they have been reported. Persistent errors can be detected, isolated, and, if required, the necessary action can be taken by Management.

9.1.12 TXI configuration control

As part of the function of maintaining the network configuration, the CRS can alter the configuration of the network by requesting DTR Stations or C-Ports to remove themselves from the network. The CRS can also query DTR Stations or C-Ports for various status information. The CRS can also configure the DTR Station, and optionally the DTR C-Port, using the Change Parameters MAC frame.

9.1.13 DTR service interfaces

The following subclauses define the service interfaces supported by the Station's SMAC and the C-Port's PMAC.

9.1.13.1 TXI SMAC service interfaces

The LLC, Bridge, and Management interfaces are specified to provide the service required by other standards. These interfaces serve to specify operation and do not imply any particular implementation.

9.1.13.1.1 Service to LLC

On receipt of a MA_UNITDATA.request primitive from the local LLC entity, the SMAC shall compose a frame using the parameters supplied to create the FC, DA, SA, RI (if present), INFO (user data) fields and calculate the FCS field. The RII bit shall be set to 1 if and only if routing information is present. The value of the YYY bits shall be either the value of the User_priority parameter (recommended) or may optionally be set to B'000'. The frame is then queued for transmission. If the Destination_address parameter matches the Station's individual address, matches one of the Station's group addresses, matches an active functional address, or matches one of the broadcast addresses, then an MA_UNITDATA.indication is made to the local LLC entity.

If a valid LLC frame is received with a DA that matches the Station's individual address, matches one of the Station's group addresses, matches an active functional address, or matches one of the broadcast addresses, then an MA_UNITDATA.indication is made to the local LLC entity. The value of the User_priority parameter shall be equal to the value of the YYY bits in the FC field.

9.1.13.1.2 Service to the bridge

On receipt of an M_UNITDATA.request primitive from the local bridge entity, the SMAC shall compose a frame using the parameters supplied to create the FC, DA, SA, RI (if present), INFO (user data), and FCS fields. The RII bit shall be set to 1 if and only if routing information is present. The Access_priority parameter is not used and the User_priority parameter is encoded in the YYY bits of the FC field. If the FCS parameter is not specified, then the Station calculates the FCS value. The frame is then queued for transmission. If the Destination_address parameter matches the Station's individual address, matches one of the Station's group addresses, matches an active functional address, or matches one of the broadcast addresses, then an MA_UNITDATA.indication is made to the local LLC entity.

When a valid frame is received (independent of any address match), an M_UNITDATA.indication is made to the bridge entity. If the frame type is LLC, then the value for the User_priority parameter shall be the value of the YYY bits in the FC field; otherwise the value for the User_priority parameter is unspecified.

9.1.13.1.3 Service to Management

On receipt of an MGT_UNITDATA.request primitive from the local management entity, the SMAC shall compose a MAC frame using the parameters supplied to create the FC, DA, SA, RI (if present), and INFO (vector) fields and calculates the FCS field. The RII bit shall be set to 1 if and only if routing information is present. The frame is then queued for transmission.

If a valid MAC frame with a nonzero destination class is received with a DA that matches the Station's individual address, one of the group addresses, an active functional address, or one of the broadcast addresses, then an MGT_UNITDATA.indication is made to the local management entity.

9.1.13.2 PMAC service interfaces

The DTU and MRI interfaces are specified to provide the service required by the DTR concentrator. These interfaces serve to specify operation and do not imply any particular implementation.

9.1.13.2.1 Service to the management routing interface (MRI)

On receipt of an MRI_UNITDATA.request primitive from the MRI, the PMAC shall compose a MAC frame using the parameters supplied to create the FC, DA, SA, RI (if present), and INFO fields. The PMAC calculates the FCS field only if it is not present. The requested access priority (Pm) of the frame, defined only when the PMAC is operating the TKP access protocol, is specified as either 0, 3, or 7. The frame is then queued for transmission.

When a valid MAC frame is received, independent of any address match, where the destination class is neither 0 nor 3, then an MRI_UNITDATA.indication is made to the MRI.

9.1.13.2.2 Service to the data transfer unit (DTU)

On receipt of a DTU_UNITDATA.request primitive from the DTU, the PMAC shall compose a frame using the parameters supplied to create the FC, DA, SA, RI (if present), and INFO fields. The PMAC calculates the FCS field only if it is not present. The requested access priority (Pm) of the frame, defined only when the PMAC is operating the TKP access protocol, should be the greater of 4 or the User_priority if the Frame_type parameter indicates user_data. The frame is then queued for transmission.

When a valid frame is received, independent of any address match, a DTU_UNITDATA.indication is made to the DTU. If the frame type is LLC, then the value for the User_priority parameter shall be the value of the YYY bits in the FC field; otherwise the value of the User_priority parameter is unspecified.

During TXI registration, when a valid Registration Request MAC frame is received, a DTU_DAC.request is made to the DTU. The Station_address parameter is the SA of the received frame. The Individual_address_count (IAC) parameter is the value of the IAC subvector from the received frame. Flag FPDTUREQ is set to 1 indicating there is an outstanding DTU_DAC.request that requires a response.

On receipt of a DTU_DAC.response primitive from the DTU, the PMAC shall store the result in SDAC_RC and flag FPDTUREQ, which was set to 1 to indicate that an outstanding DTU_DAC.request required a response, is set to 0. The SDAC_RC is used to compose an Insert Response MAC frame when the C-Port Join Port Operation table is in the Duplicate Address Check state (JS=PDAC) in response to an Insert Request MAC frame.

9.1.14 C-Port in Port mode using the TKP access protocol

This subclause identifies the changes required in 4.3 to support the C-Port in Port mode using the TKP access protocol [Configuration 3, entity **(E)**, in figure 9-1] to provide for the attachment of the following:

— The classic station [Configuration 3, entity **(F)**].
— The DTR Station using the TKP access protocol [Configuration 3, entity **(F)**].
— The C-Port in Station Emulation mode using the TKP access protocol [Configuration 3, entity **(F)**].

These changes are specified in 9.4 and summarized as follows:

a) In the TKP access protocol, the Station’s Beacon Test state (MS=BNT) normally indicates the Station should perform Hard Error Recovery. The C-Port is not allowed to execute the Beacon Test function, but in its place provides a repeat path to allow the attached Station to perform its Beacon Test function.
b) Soft error conditions cause the C-Port to report these errors to the MRI.
c) The detection of the interface signal PM_STATUS.indication(INSERT=DETECTED) as the equivalent of the ISO/IEC 8802-5 : 1998 Beacon Test “TEST_OK” condition. This signal allows the C-Port in Port mode using the TKP access protocol to return to the state causing entry into the Beacon Test state (MS=BNT) [either the Repeat Beacon state (MS=RBN) or the Transmit Beacon state (MS=TBN)].
d) The detection of the attached Station’s failure to return to its Repeat Beacon state (MS=RBN) or the Transmit Beacon state (MS=TBN), indicating the Station has failed either its internal tests or LMT.

9.1.15 C-Port in Station Emulation mode using the TKP access protocol

This subclause identifies the changes required in 4.3 to support the C-Port in Station Emulation mode using the TKP access protocol [Configuration 4, entity **(G)**, in figure 9-1]. These changes allow the following attachments:

— The classic concentrator [Configuration 4, entity **(H)**].
— The C-Port in Port mode using the TKP access protocol [Configuration 4, entity **(H)**].

These changes are specified in 9.5 and summarized as follows:

a) The queuing transmission of frames with an unknown length (FR_LTH=UNK) is supported by adding a check that prevents the Transmit Data state (TS=DATA) from transmitting frames longer than allowed by PPV(MAX_TX).
b) The handling of soft error conditions is augmented by causing the C-Port in DTR Station Emulation mode to report these errors to the MRI.

9.1.16 DTR Station using the TKP access protocol

A DTR Station using the TKP access protocol [Configuration 3, entity **(F)**, in figure 9-1] is defined by reference to clauses 3 and 4, and modified by 9.6. In summary, when the DTR Station elects to use the TKP access protocol, the DTR Station transitions are specified in 9.6. These transitions are identical to the classic station except for the addition of the registration query protocol. The registration query protocol allows the C-Port to invite the DTR Station to change to the TXI access protocol if supported.

9.2 Station TXI access protocol specification

This subclause defines the TXI access protocol for

— The DTR Station (FIPTXIS=0) in support of Configuration 1 entity **(B)** (see figure 9-1), and
— The DTR C-Port in the Station Emulation mode (FIPTXIS=1) in support of Configuration 2 entity **(C)**.

The decision as to which configuration is being supported is made by

— The DTR Station's Join Station Operation table specified in this clause by table 9-1, or
— The DTR C-Port's Join Port Operation table specified in 9.3 by table 9-3.

For ease of reading, the DTR Station and the DTR C-Port in the Station Emulation mode is referred to as the "Station" in the explanatory portion of this clause.

Station support of the TXI access protocol is specified by six Station Operation tables as follows:

a) The Station Join Station Operation table, table 9-1.
b) The Station Transmit Station Operation table, table 9-2.
c) The Station Monitor Station Operation table, table 9-3.
d) The Station Error Handling Station Operation table, table 9-4.
e) The Station Interface Signals Station Operation table, table 9-5.
f) The Station Miscellaneous Frame Handling Station Operation table, table 9-6.

Low-level FSMs representing the state changes in the Join, Transmit, and Monitor Station Operation tables are presented in annex L.

In case of a discrepancy between the Station Operation tables, the FSM diagrams, or their supporting text, the Station Operation tables shall take precedence.

9.2.1 FSM overviews

This subclause provides a functional overview of the Join, Transmit, and Monitor Station Operation tables using three high-level FSM diagrams.

9.2.1.1 Station Join FSM overview

The Station Join FSM, shown in figure 9-8, is used to join the Station in the TXI access protocol to the C-Port. The Join FSM is specified by the Station Operation table, table 9-1.

The Station Join FSM enters the Registration state (JA) from

— The Bypass state (J0) as the result of detecting a Connect.SMAC to start the Station's TXI access protocol (per 9.2),

— The Bypass state (J0) as the result of entering the C-Port in Station Emulation mode using the TXI access protocol (per 9.3), or
— The Registration Wait state (J9), using the TKP access protocol responding to a Registration Query request from the C-Port (per 9.5 or 9.6 Station Operation tables).

The TXI access protocol is activated as the result of the registration process and uses the Station Operation tables specified in this subclause.

The TKP access protocol was activated as the result of the registration process as follows:

a) For the DTR Station, via an exit to the 9.6 Station Operation tables.
b) For the C-Port in Station Emulation mode, via an exit to the 9.5 Port Operation tables.

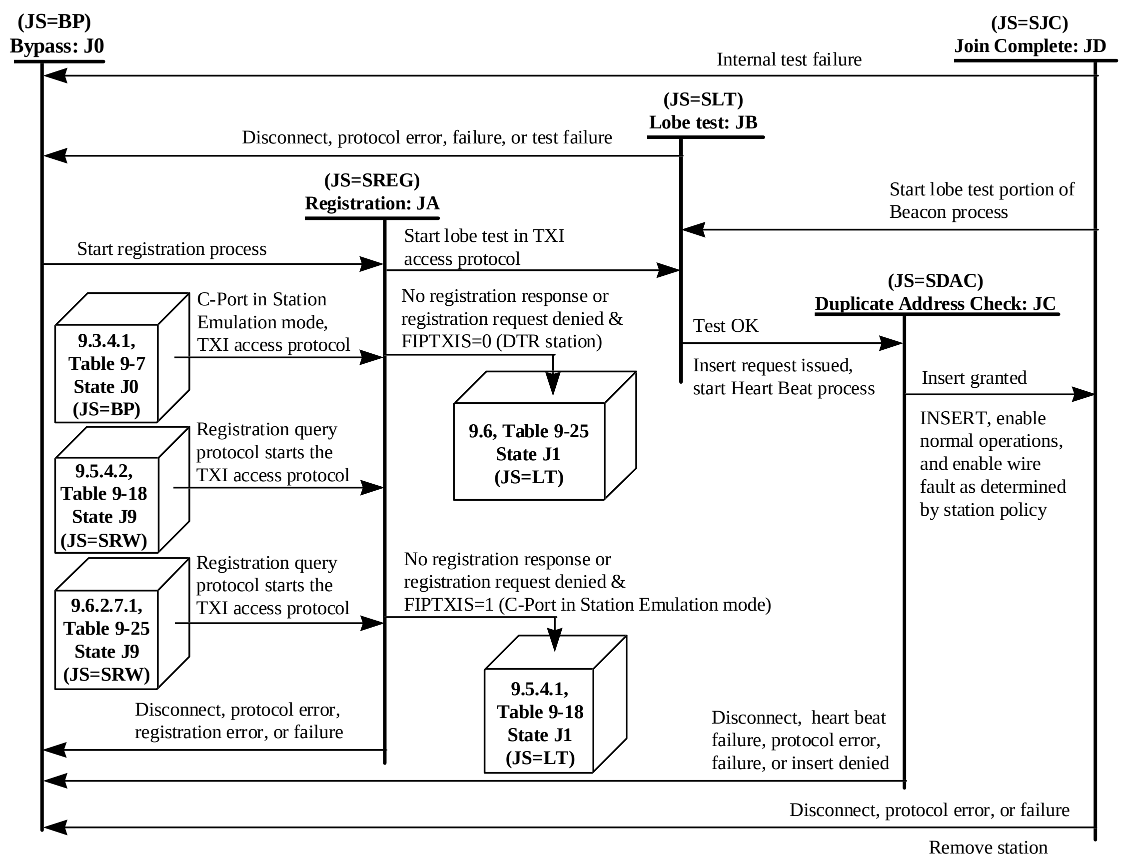


Figure 9-8—Station Join FSM overview

9.2.1.2 Station Transmit FSM overview

The Station Transmit FSM, shown in figure 9-9, is used to transmit frames using the TXI access protocol. This Transmit FSM is specified by the Station Operation table, table 9-2.

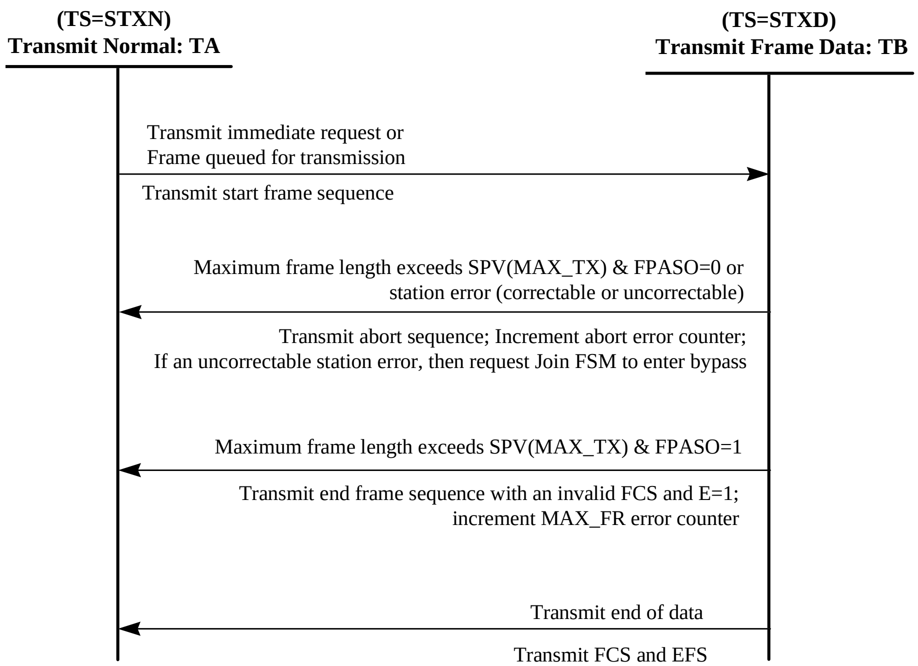


Figure 9-9—Station Transmit FSM overview

9.2.1.3 Station Monitor FSM overview

The Station Monitor FSM, shown in figure 9-10, supports the Heart Beat and Hard Error Recovery functions. The Monitor FSM is specified by the Station Operation table, table 9-3.

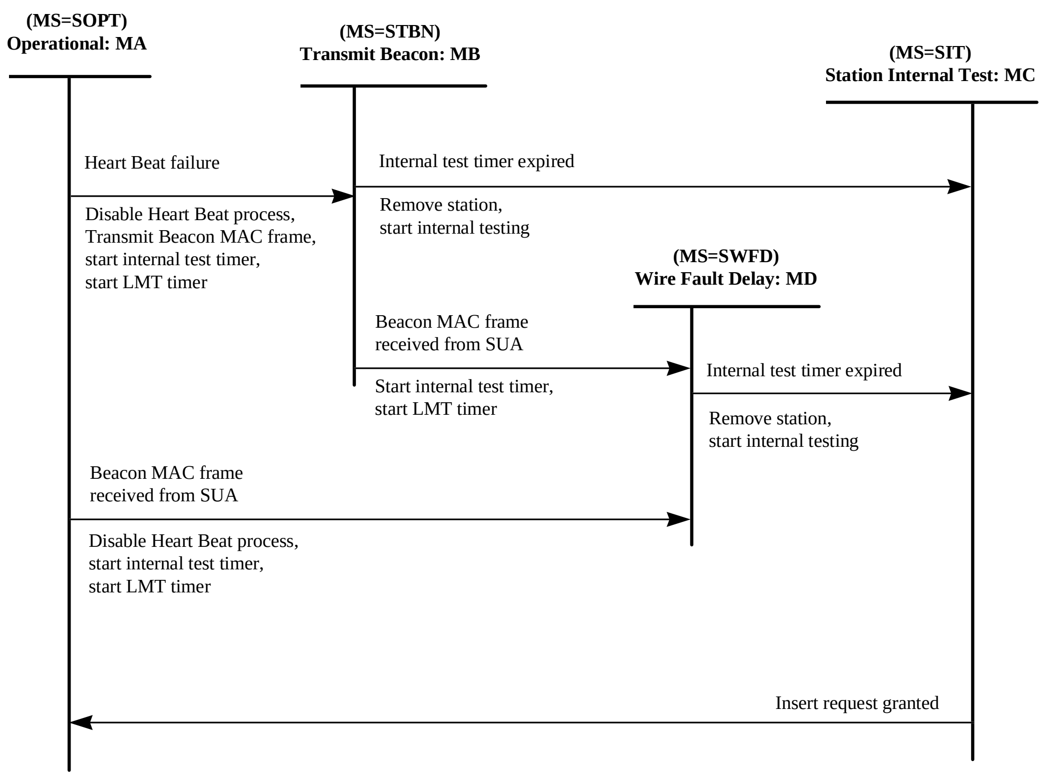


Figure 9-10—Station Monitor FSM overview

9.2.2 Station Operation table abbreviations and notations

The following abbreviations and notations are used in the Station Operation tables.

9.2.2.1 PMAC policy flag notations

FPASO = flag, C-Port abort sequence option

9.2.2.2 PMAC protocol flag notations

FPTX_LTH = flag, C-Port transmit length

9.2.2.3 SMAC policy flag notations

FSECO = flag, Station error counting option
FSMRO = flag, Station medium rate option
FSOPO = flag, Station open option
FSRDO = flag, Station registration denied option
FSREGO = flag, Station registration option
FSRRO = flag, Station reject remove option

9.2.2.4 SMAC Station policy variables notations

SPV(AP_MASK) = access protocol mask Station policy variable
SPV(IAC) = individual address count Station policy variable
SPV(MAX_TX) = maximum octets transmit count Station policy variable
SPV(PD) = phantom drive Station policy variable

9.2.2.5 SMAC C-Port interface flag notations

FIPTKPS = flag, interface C-Port TKP Station emulation
FIPTXIS = flag, interface C-Port TXI Station emulation

9.2.2.6 SMAC protocol flag notations

FSBNT = flag, Station beacon test
FSBPF = flag, Station bypass force
FSER = flag, Station error report
FSHBA = flag, Station heart beat active
FSIRD = flag, Station insert request delay
FSJC = flag, Station join process complete
FSOP = flag, Station operational
FSRC = flag, Station registration complete
FSRRC = flag, Station return to recovered clock
FSSL = flag, Station signal loss
FSSLD = flag, Station signal loss detected
FSTI = flag, Station transmit idles
FSTXC = flag, Station transmit from crystal
FSWF = flag, Station wire fault
FSWFA = flag, Station wire fault active
FTI = flag, transmit idles (clause 4 usage)

9.2.2.7 SMAC stored value notation

SUA = stored upstream address

9.2.2.8 SMAC join state notations

JS=BP = bypass
JS=SDAC = Station duplicate address check
JS=SJC = Station join complete
JS=SLT = Station lobe test
JS=SREG = Station registration

9.2.2.9 SMAC transmit state notations

TS=STXD = Station transmit frame data
TS=STXN = Station transmit normal

9.2.2.10 SMAC monitor state notations

MS=SIT = Station internal test
MS=SOPT = Station operational
MS=STBN = Station transmit beacon
MS=SWFD = Station wire fault delay

9.2.2.11 SMAC Station counters

CSBTX = counter, Station byte transmitted
CSREQ = counter, Station registration request
CSTFQ = counter, Station TXI frames queued

9.2.2.12 SMAC Station timer notations

TSER = timer, Station error report
TSIP = timer, Station insert process
TSIS = timer, Station initial sequence
TSIT = timer, Station internal test
TSJC = timer, Station join complete
TSLMT = timer, Station LMT
TSLMTC = timer, Station LMT complete
TSLMTD = timer, Station LMT delay
TSQHB = timer, Station queue heart beat
TSQP = timer, Station queue PDU
TSREQ = timer, Station registration request
TSRHB = timer, Station receive heart beat
TSSL = timer, Station signal loss
TSWF = timer, Station wire fault
TSWFD = timer, Station wire fault delay

9.2.2.13 SMAC error counter notations

CSABE = counter, Station abort error
CSBE = counter, Station burst error
CSFE = counter, Station frequency error
CSIE = counter, Station internal error
CSLE = counter, Station line error
CSRCE = counter, Station receive congestion error

9.2.3 State machine elements

The state machines use the error counters defined in 10.6 as well as the following counters, flags, and states to describe the operation of the Station. These are logical elements used solely to describe the operation and do not specify an implementation. The values of the flags and counters are only meaningful to the Station Operation tables. Conformance to this standard is based only on externally observable behavior.

9.2.3.1 SMAC counters

Unless otherwise specified, all counters are set to 0 by the “Set_initial_conditions” action.

A counter may be set to a value, counted up (increment), or counted down (decrement), as a result of an action specified in the Station Operation table.

9.2.3.1.1 Counter, Station byte transmitted (CSBTX)

The counter CSBTX is used by the Transmit FSM to limit the number of octets that can be transmitted. This counter shall be used when the C-Port in Station Emulation mode (interface flags FIPTKPS=1 or FIPTXIS=1) is supporting the FR_LTH=UNK (frame length unknown) condition. The counter CSBTX is optional if the Station does not support FR_LTH=UNK.

The counter CSBTX is compared against SPV(MAX_TX), and the Station takes one of the following actions:

a) If CSBTX>SPV(MAX_TX), then the frame being transmitted is larger than allowed by SPV(MAX_TX), and the frame is aborted using an abort sequence.
b) If CSBTX<=SPV(MAX_TX), the transmission of the frame continues.

The value of SPV(MAX_TX) is specified in 10.5.1.2.

9.2.3.1.2 Counter, Station registration request (CSREQ)

The counter CSREQ is used to control the number of times the REG_REQ MAC frame will be retransmitted (an assured delivery process) before registration fails. The Station sets counter CSREQ=n6 (see 9.2.5) when the first REG_REQ MAC frame is transmitted. Each time the Station retransmits the REG_REQ MAC frame, it decrements counter CSREQ by one.

When the counter CSREQ=0, the Station has not received a response to its REG_REQ MAC frame and takes one of the following actions:

a) If the flag FSOPO=0, the Station supports the TKP access protocol and enters the Lobe Test state (JS=LT) of the TKP Access Protocol Join FSM defined by 4.3.
b) If the flag FSOPO=1, the Station does not support the TKP access protocol and enters the Bypass state (JS=BP) and notifies Management of the error.

9.2.3.1.3 Counter, Station TXI frames queued (CSTFQ)

The counter CSTFQ is used by the Join FSM during JS=SDAC to track the number of frames currently in the TXI_REQ transmit queue (see 9.1.8). During JS=SDAC, this counter is incremented when a Station heart beat (TXI_SHB) or insert request (TXI_INS_REQ) is added to the TXI_REQ transmit queue. CSTFQ is decremented by the Transmit FSM when the Join FSM state is JS=SDAC and an EOD, a PORT_ERR(correctable) or a STATION_ERR(correctable) event is detected. CSTFQ is set to 1 when the Join FSM enters JS=SDAC.

9.2.3.2 Station protocol flags

The Station protocol flags, listed alphabetically, are defined in the following subclauses.

9.2.3.2.1 Flag, Station beacon test (FSBNT)

The flag FSBNT is used by the Monitor machine to signal the Join machine to enter the Lobe Test (JS=SLT) state in order to perform a lobe media test as part of the Hard Error Recovery process. The flag is set by the Monitor machine when TSLMT has expired. The flag is reset by the Join machine when entering the Lobe Test state.

9.2.3.2.2 Flag, Station bypass force (FSBPF)

When the Transmit Data state (TS=STXD) detects a “STATION_ERR(not_correctable)” condition, an abort sequence is optionally transmitted and the flag FSBPF is set to 1. The Join machine enters the Bypass state (JS=BP) upon detecting flag FSBPF=1 and TS=STXN.

9.2.3.2.3 Flag, Station error report (FSER)

The flag FSER is set to 1 when the first reportable error is detected and indicates that subsequent errors should not reset the error timer TSER. Flag FSER is set to 0 when the error timer expires and the Report Error MAC frame is transmitted.

9.2.3.2.4 Flag, Station heart beat active (FSHBA)

Flag FSHBA is set to 1 to activate the Heart Beat process and set to 0 to deactivate the Heart Beat process. Flag FSHBA is set to 1 when the Station enters the Duplicate Address Check state (JS=SDAC). While flag FSHBA is set to 1, loss of heart beat can be detected and Hard Error Recovery started. Flag FSHBA is set to 0 to deactivate the Heart Beat process when the Monitor exits the Operational state (MS=SOPT) to enter either the Beacon Transmit state (MS=STBN) or the Wire Fault Delay state (MS=SWFD).

9.2.3.2.5 Flag, Station insert request delay (FSIRD)

The flag FSIRD is used by the Station in the Duplicate Address Check state (JS=SDAC) to delay the changing from recovered clock to crystal clock as the result of the expiration of the timer, Station insert process (TSIP). The Station in the JS=SDAC state normally uses recovered clock, but when the expiration of the timer TSIP occurs, the Station is required to transmit the Insert Request MAC frame using crystal clock and the Station sets FSIRD=1. When the Transmit machine enters the Transmit Normal state (TS=TSXN) and FSIRD=1, the Station sets FSIRD=0, activates crystal clock, and transmits the Insert Request MAC frame.

9.2.3.2.6 Flag, Station join complete (FSJC)

The flag FSJC indicates whether the Station has completed join, with FSJC=0 meaning join is not complete and FSJC=1 meaning join is complete. FSJC is set to 1 upon successful completion of the Station’s Duplicate Address Check state (JS=SDAC). When FSJC=1, the Station is allowed, for example, to queue frames for transmission, and to activate the Hard Error Recovery and Error Counter functions.

9.2.3.2.7 Flag, Station operational (FSOP)

The flag FSOP indicates when the Station is operational. Flag FSOP is set to 1 when the Station enters join complete (JS=SJC) and becomes active in the network. Flag FSOP is set to 0 when the Station closes (JS=BP). FSOP is set to 0 when the Station enters the Hard Error Recovery process, and set to 1 when the Station inserts after successful completion of the Hard Error Recovery process.

9.2.3.2.8 Flag, Station registration complete (FSRC)

The flag FSRC is set to 1 when a valid Registration Response MAC frame is received during the Station Registration state (JS=SREG) to disable the registration process while waiting for timer, TSLMTD expiration.

9.2.3.2.9 Flag, Station return to recovered clock (FSRRC)

The flag FSRRC is used with the counter CSTFQ during JS=SDAC to cause the Station to change its clock source from crystal (FSTXC=1) to recovered clock (FSTXC=0). FSRRC is set to 1 when an insert request (TXI_INS_REQ) is added to the TXI_REQ transmit queue (see 9.1.7). FSRRC is set to 0 when CSTFQ decrements to 0 and FSRRC is set to 1.

9.2.3.2.10 Flag, Station signal loss (FSSL)

The flag FSSL indicates the presence or absence of a valid signal from the lobe as defined by 5.1.4.1. FSSL is set to 1 to indicate the absence of a valid signal when SMAC detects PM_STATUS.indication (Signal_detected=Signal_loss) for the entire period of timer TSSL (signal loss is filtered). FSSL is set to 0 to indicate the presence of a valid signal whenever SMAC detects PM_STATUS.indication (Signal_detected=Signal_acquired).

9.2.3.2.11 Flag, Station signal loss detected (FSSLD)

The flag FSSLD is used to determine if the SMAC Signal Loss Filtering process is active or inactive. The Signal Loss Filtering process is used to determine whether or not the PHY signal loss event is a steady-state condition. FSSLD is set to 1 to activate the Signal Loss Filtering process if not already active whenever the SMAC detects PM_STATUS.indication(Signal_detected=Signal_loss). FSSLD is set to 0 to deactivate the Signal Loss Filtering process whenever the SMAC detects PM_STATUS.indication (Signal_detected=Signal_acquired).

9.2.3.2.12 Flag, Station transmit from crystal (FSTXC)

The flag FSTXC is used to select the Station’s transmitter timing reference.

When FSTXC is 1, the Station’s clock is derived from crystal. When, FSTXC is 0, the Station’s clock is derived from recovered clock. The setting of FSTXC affects the PSC interface as follows:

- When FSTXC is 1, the PS_CONTROL.request(Crystal_transmit=Asserted) indicates that the Station’s SMAC is deriving clock from its crystal clock as the transmit timing reference. Implementations of this standard may include an elastic buffer (5.8.3) and a fixed latency buffer (5.8.2) with a latency of 24 symbols, thus allowing IEEE 802.5 TKP implementations to function without hardware modification.
- When FSTXC is 0, the PS_CONTROL.request(Crystal_transmit=Not_asserted) indicates that the Station’s SMAC transmit timing reference is derived from the Station’s clock recovery circuit. There shall be no elastic buffer (5.8.3) or fixed latency buffer (5.8.2) in the data path.

9.2.3.2.13 Flag, Station transmit idles (FSTI)

The flag FSTI is used to control the transmission of idles (fill). The TXI access protocol always has the flag FSTI is set to 1 [indicates PS_CONTROL.request(Repeat_mode=Idle)], which causes the Station to source fill at all times *except* when the Transmit FSM is transmitting frame data (TS=STXD).

When the Station closes or starts the TKP access protocol, flag FSTI is set to 0 [indicates PS_CONTROL.request (Repeat_mode=Repeat)] to support the TKP access protocol.

9.2.3.2.14 Flag, Station wire fault (FSWF)

Flag FSWF is set to 1 to indicate wire fault is present and set to 0 to indicate no wire fault is present. [See 5.1.4.1, PM_STATUS.indication(Wire_fault).]

9.2.3.2.15 Flag, Station wire fault active (FSWFA)

Flag FSWFA is set to 1 to activate wire fault detection and is set to 0 to deactivate wire fault detection.

9.2.3.2.16 Flag, transmit idles (FTI)

The flag FTI is a TKP access protocol flag, defined by ISO/IEC 8802-5 : 1998, 4.2.4.2, used to control the transmission of idles (fill). When flag FTI is set to 1, the MAC indicates PS_CONTROL.request (Repeat_mode=Fill), which causes the Station to source fill rather than to repeat the received data. When flag FTI is set to 0 the MAC indicates PS_CONTROL.request(Repeat_mode=Repeat), which causes the Station to repeat the received data.

9.2.4 SMAC states

There is a set of states for the Join Ring FSM, the Monitor FSM, and the Transmit FSM. An FSM can be in only one state at any instant in time.

9.2.4.1 Station join states

The Station join state (JS=) notation is used to identify the current state of the Station Join FSM. The TXI Station's join state values are Bypass, Registration, Lobe Test, Duplicate Address Check, and Join Complete. Join states, listed by state value, are defined as follows.

9.2.4.1.1 Join State J0, Bypass (JS=BP)

This state is the rest state of the TXI Station. The only events recognized are the start signals, Connect.SMAC, or Connect.PMAC and FPOTO=0, which causes the Station to examine the flag, FSREGO to determine whether this is a DTR capable Station.

9.2.4.1.2 Join State JA, Station Registration (JS=SREG)

This state is entered when the Bypass state (JS=BP) detects a Connect.SMAC and FSREGO=1, or Connect.PMAC and FPOTO=0. This state determines which mode the Station is to operate, supporting either the TXI or TKP access protocols. If the TXI access protocol is supported, this state sets certain parameters required by the TXI access protocol.

9.2.4.1.3 Join State JB, Station Lobe Test (JS=SLT)

This state is entered from either Station registration (JS=SREG) or Station join complete (JS=SJC) to perform the lobe test discussed in 9.1.6.1.

9.2.4.1.4 Join State JC, Station Duplicate Address Check (JS=SDAC)

This state is entered when the Lobe Test state (JS=SLT) successfully completes and causes the TXI Station to request insertion and start the TXI Heart Beat function. As a result of the Insert Request, the Station waits for the C-Port to respond with an Insert Response MAC frame. If the insert response indicates the Station's address is a duplicate to another Station within the DTR concentrator's address domain, then the Station enters the Bypass state (JS=BP). If the insert response indicates the Station's address is unique within the DTR concentrator's address domain, then the Station enters Join Complete (JS=SJC).

9.2.4.1.5 Join State JD, Station Join Complete (JS=SJC)

This state is entered when the Duplicate Address Check state (JS=SDAC) detects that the C-Port has determined the TXI Station has an unique address within the DTR concentrator's address domain and is the completion of the Join process.

9.2.4.2 Station monitor states

The monitor state (MS=) notation is used to identify the current state of the Station's monitor FSM. The monitor state values are operational, transmit beacon, wire fault delay, and internal test.

The Station's monitor states, listed by state value, are defined as follows.

9.2.4.2.1 Monitor State MA, Station Operational (MS=SOPT)

The Station Operational state is started when the Duplicate Address Check state (JS=SDAC) enters the Join Complete state (JS=SJC).

If, while in the Station Operational state, the Station detects a Heart Beat function failure and flag Station operational (FSOP) is a 1, the Station sets FSOP to a 0, resets the timers TSIT and TSLMT (synchronization for Hard Error Recovery), disables queued frame transmissions, and enters the Transmit Beacon state (MS=TSBN).

If, while in the Station Operational state, the Station receives a Beacon MAC frame from its C-Port (SA=SUA) and flag Station operational (FSOP) is a 1, the Station sets FSOP to a 0, resets the timers TSIT and TSLMT (synchronization for Hard Error Recovery), disables queued frame transmissions, and enters the Wire Fault Delay state.

9.2.4.2.2 Monitor State MB, Station Transmit Beacon (MS=STBN)

The Station Transmit Beacon state causes the Station to transmit Beacon MAC frames with a Beacon type set according to 9.1.10.1 until the timer, TSIT, expires, indicating the Station is ready to execute its internal test and to enter the Internal Test state (MS=SIT).

If, while in the Station Transmit Beacon state, the Station detects the reception of a Beacon MAC frame from its C-Port (SA=SUA), the Station resets its timers TSIT and TSLMT (synchronization for Hard Error Recovery), and enters the Wire Fault Delay state (MS=SWFD).

9.2.4.2.3 Monitor State MC, Station Internal Test (MS=SIT)

The Internal Test state is started when the monitor's Transmit Beacon state (MS=STBN) or Wire Fault Delay state (MS=SWFD) indicates the Station has not detected a wire fault and is ready to execute its internal tests.

This standard specifies only one requirement of this state, that the Station shall determine whether it is capable of continuing to operate the TXI access protocol or not. The internal test performs the following actions depending on its success or failure:

a) Upon successful completion of the Station's internal test, the Station waits for its timer TSLMT to expire before setting flag FSBNT to 1, causing the Join machine to execute its Lobe Test (JS=SLT) and Duplicate Address Check (JS=SDAC) states.
b) Upon failure of the Station's internal test, the Station's Join machine returns to the Bypass state (JS=BP).

If the Station's internal test were successful, the Internal Test state waits for the reception of the INS_RSP MAC frame indicating the C-Port has detected the successful completion of the Hard Error Recovery LMT and DAC functions, and then enters the Monitor's Operational state (MS=SOPT).

9.2.4.2.4 Monitor State MD, Station Wire Fault Delay State (MS=SWFD)

This state allows the Station's wire fault detection process to determine if a wire fault condition exists before entering its Internal Test state (MS=SIT). If a wire fault condition does exist, the Station removes from the link (JS=BP) and indicates to Management the wire fault condition.

This state is started when the SMAC in the Monitor Operational state (MS=SOPT) detects the reception of a Beacon MAC frame from its C-Port (SA=SUA) and the flag FSJC=1 (join complete) *or* when the Beacon Transmit state (MS=STBN) detects the reception of a Beacon MAC frame from its C-Port (SA=SUA). Either of these conditions causes the timers TSIT and TSLMT to be reset. The Station delays entry to the Internal Test state until timer TSIT expires (indicating the Station did not detect a wire fault condition).

9.2.4.3 Transmit states

The transmit state (TS=) notation is used to identify the current state of the transmit FSM. The transmit state values are transmit normal and transmit frame data. Transmit states, listed by state value, are defined in the following subclauses.

9.2.4.3.1 Transmit State TA, Transmit Normal (TS=STXN)

The Transmit State TS=STXN is set when the Transmit FSM enters its normal state of transmitting idles and is not transmitting (sourcing) frames.

9.2.4.3.2 Transmit State TB, Transmit Frame Data (TS=STXD)

The Transmit State TS=STXD is set when the Transmit FSM is transmitting the data portion of the frame (FC, DA, SA, RIF if present, the INFO if present, and FCS fields).

9.2.5 TXI access protocol SMAC specification

This subclause specifies the procedures used in the Station Medium Access Control (SMAC) in support of the Station using the TXI access protocol using Station Operation tables as follows:

a) The Station Join Station Operation table, table 9-1.
b) The Station Transmit Station Operation table, table 9-2.
c) The Station Monitor Station Operation table, table 9-3.
d) The Station Error Handling Station Operation table, table 9-4.
e) The Station Interface Signals Station Operation table, table 9-5.
f) The Station Miscellaneous Frame Handling Station Operation table, table 9-6.

These Station Operation tables use the term "optional" as defined in 9.1.1.2.

The DTR Station (FIPTXIS=0) supports the Bridge (M_UNITDATA), LLC (MA_UNITDATA) and Management (MGT_UNITDATA) interfaces defined in 9.1.13.1, but has *no access* to the DTU (DTU_UNITDATA) or MRI (MRI_UNITDATA) interfaces defined in 9.1.13.2.

The DTR C-Port in Station Emulation mode (FIPTXIS=1) supports the DTU and MRI interfaces defined in 9.1.13.2, but has *no access* to the Bridge, LLC, or Management interfaces defined in 9.1.13.1.

For the purpose of allowing flexibility among Stations, parameter n6 is used to represent the value of CSREQ when starting the registration process as follows:

Parameter	MIN	MAX	Used With	Description
n6	4	12	CSREQ	n6 is the initial setting of CSREQ that governs the maximum number of Registration Request frames retransmitted by the Station. The maximum number of frames sent is (n6+1).

9.2.5.1 Station join—Station Operation table

Table 9-1—Station Join Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1)

S/T	REF	Event/condition	Action/output
J0A	1001	**Connect.PMAC** & FPOTO=0 & FSREGO=1 & JS=BP << This transition is executed by 9.3.4.1. >> << One of the starting points for the C-Port in Station Emulation mode using the TXI access protocol. >>	JS=SREG; TS=STXN; Set_initial_conditions; FIPTXIS=1; FSTXC=FSTI=1; TSIS=R << For information only >>
J0A	3108	**Connect.SMAC** & FSREGO=1 & AND(SPV(AP_MASK),0002)=0002 & JS=BP << One of the starting points for the DTR Station using the TXI access protocol. >>	JS=SREG; TS=STXN; Set_initial_conditions; FSTXC=FSTI=1; TSIS=R
	3170	**CSTFQ=0** & FSRRC=1 & JS=SDAC	FSRRC=FSTXC=0 << Insert Request MAC frame has been transmitted, return to recovered clock >>
JC0	3133	**Disconnect.SMAC** & JS=SDAC << Station told by Station Management to remove from the network. >>	JS=BP << Station closed for unknown reason >>
JD0A	3149	**Disconnect.SMAC** & JS=SJC << After Join Complete, Station told by Station Management to remove from the network. >>	JS=BP; Remove_Station << Station closed for unknown reason >>
JB0	3123	**Disconnect.SMAC** & JS=SLT << Station told by Station Management to remove from the network. >>	JS=BP << Station closed for unknown reason >>
JA0	3109	**Disconnect.SMAC** & JS=SREG << Station told by Station Management to remove from the network. >>	JS=BP << Station closed for unknown reason >>
JB0	3164	**FR_AMP** & JS=SLT << A TXI access protocol error has been detected by the reception of a TKP AMP MAC frame prior to the activation of the TXI Heart Beat function. >>	JS=BP << OPEN ERROR = Protocol Error >>
JA0	3160	**FR_AMP** & JS=SREG << A TXI access protocol error has been detected by the reception of a TKP access protocol AMP MAC frame prior to the activation of the TXI Heart Beat function. >>	JS=BP << OPEN ERROR = Protocol Error >>
JC0	3134	**FR_BN** & JS=SDAC << TXI access protocol has detected the TKP access protocol is active by reception of a Beacon MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JA0	3110	**FR_BN** & JS=SREG << TXI access protocol has detected TKP access protocol is active by premature reception of a Beacon MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>

Table 9-1—Station Join Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
JB0	3124	**FR_BN(SA<>MA)** & JS=SLT << TXI access protocol has detected TKP access protocol is active by reception of a Beacon MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JC0	3135	**FR_CT** & JS=SDAC << TXI access protocol has detected the TKP access protocol is active by reception of a Claim Token MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JD0A	3151	**FR_CT** & JS=SJC << TXI access protocol has detected TKP access protocol is active by reception of a Claim Token MAC frame. >>	JS=BP; Remove_Station << Protocol Error >>
JA0	3111	**FR_CT** & JS=SREG << TXI access protocol has detected TKP access protocol active by reception of a Claim Token MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error>>
JB0	3125	**FR_CT(SA<>MA)** & JS=SLT << TXI access protocol has detected TKP access protocol is active by reception of a Claim Token MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JCD	3145	**FR_INS_RSP(DTR_RSP=0000)** & JS=SDAC << Response indicates C-Port has given permission for the TXI Station to complete Join. >>	JS=SJC; FSJC=FSOP=1; **If** FSECO=1 then (FSER=1; TSER=R); INSERT; FSWFA=FSWF=0; TSWFD=R << Start error report timer, Assert phantom drive, and Activate wire fault detection >>
JC0	3138	**FR_INS_RSP(DTR_RSP=8020)** & JS=SDAC	JS=BP << OPEN ERROR = DAC Failure >>
JC0	3112	**FR_MAC(SA<>MA & SA<>SUA & VC=00)** & JS=SDAC	JS=BP << OPEN ERROR = Protocol Error >>
JB0	3103	**FR_MAC(SA<>MA & SA<>SUA & VC=00)** & JS=SLT	JS=BP << OPEN ERROR = Protocol Error >>
JA0	3101	**FR_MAC(SA<>MA & SA<>SUA & VC=00)** & SUA<>0 & JS=SREG	JS=BP << OPEN ERROR = Protocol Error >>
JD0A	3146	**FR_MAC(SA<>SUA & VC=00)** & JS=SJC	JS=BP; Remove_Station << Protocol Error >>
JC0	3137	**FR_MAC(SA<>SUA & VC=03)** & JS=SDAC	JS=BP << OPEN ERROR = Protocol Error >>
JD0A	3148	**FR_MAC(SA<>SUA & VC=03)** & JS=SJC	JS=BP; Remove_Station << Protocol Error >>
JB0	3107	**FR_MAC(SA<>SUA & VC=03)** & JS=SLT	JS=BP << Protocol Error >>
JA0	3102	**FR_MAC(SA<>SUA & VC=03)** & SUA<>0 & JS=SREG	JS=BP << OPEN ERROR = Protocol Error >>

Table 9-1—Station Join Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
JC0	3136	**FR_PHB(SA<>SUA)** & JS=SDAC << A TXI access protocol error has been detected by the reception of a TXI Heart Beat or a TKP AMP MAC frame (SA<>SUA of the known C-Port). >>	JS=BP << OPEN ERROR = Protocol Error >>
JD0A	3152	**FR_PHB(SA<>SUA)** & JS=SJC << A TXI access protocol error has been detected by the reception of a TXI Heart Beat or TKP AMP MAC frame (SA<>SUA of the known C-Port). >>	JS=BP; Remove_Station << Station detects TXI access protocol error after Join Complete >>
JA1A	3105	**FR_REG_RSP(AP_RSP=0000)** & FSRDO=0 & FIPTXIS=0 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << The DTR Station's registration request is denied by the C-Port, but Management has enabled the DTR Station to use the TKP access protocol. >>	JS=LT; FSTXC=FSTI=0; FTI=x; Set_initial_conditions; TEST << The DTR Station starts the TKP access protocol and exits to 9.6. >>
JA1B	3158	**FR_REG_RSP(AP_RSP=0000)** & FSRDO=0 & FIPTXIS=1 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << The C-Port in Station Emulation mode Registration request is denied by the C-Port, but Management has enabled the C-Port in Station Emulation mode to use the TKP access protocol. >>	JS=LT; FSTXC=FSTI=0; FTI=x; FIPTXIS=0; FIPTKPS=1; Set_initial_conditions; TEST << The C-Port in Station Emulation Mode starts the TKP access protocol and exits to 9.5. >>
JA0	3113	**FR_REG_RSP(AP_RSP=0000)** & FSRDO=1 & JS=SREG << Response MAC frame indicates the C-Port has rejected the Station's TXI access protocol request. >>	JS=BP << OPEN ERROR = Protocol Error >>
	3106	**FR_REG_RSP(AP_RSP=0002)** & FSREGO=1 & JS=SREG << Response indicates C-Port is supporting the TXI access protocol. Station remains in this state until timer TSLMTD expires. >>	FSRC=1; TSLMTD=R; SUA=SA << Registration complete >>
JC0	3139	**FR_REMOVE(DA=Non_broadcast)** & FSRRO=0 & JS=SDAC << Station told by Network Management to remove from the network. >>	JS=BP << OPEN ERROR = Remove Station Received >>
JD0A	3153	**FR_REMOVE(DA=Non_broadcast)** & FSRRO=0 & JS=SJC << Station told by Network Management to remove from the network after Join complete. >>	JS=BP; Remove_Station << Remove Station Received >>
JB0	3126	**FR_REMOVE(DA=Non_broadcast)** & FSRRO=0 & JS=SLT << Station told by Network Management to remove from the network. >>	JS=BP << OPEN ERROR = Remove Station Received >>
JA0	3115	**FR_REMOVE(DA=Non_broadcast)** & FSRRO=0 & JS=SREG << Station told by Network Management to remove from the network. >>	JS=BP << OPEN ERROR = Remove Station Received >>

Table 9-1—Station Join Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
JC0	3140	**FR_RP** & JS=SDAC << TXI access protocol has detected TKP access protocol is active by reception of a Ring Purge MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JD0A	3154	**FR_RP** & JS=SJC << TXI access protocol has detected TKP access protocol is active by reception of a Ring Purge MAC frame. >>	JS=BP; Remove_Station << Protocol Error >>
JA0	3116	**FR_RP** & JS=SREG << TXI access protocol has detected TKP access protocol is active by reception of a Ring Purge MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JB0	3127	**FR_RP(SA<>MA)** & JS=SLT << TXI access protocol has detected TKP Access Protocol is active by reception of a Ring Purge MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JD0A	3163	**FR_SMP** & JS=SJC << TXI access protocol detects TKP access protocol is active by reception of an SMP MAC frame after Join complete. >>	JS=BP; Remove_Station << Protocol Error >>
JA0	3161	**FR_SMP** & JS=SREG << TXI access protocol detects TKP access protocol active by reception of an SMP MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JC0	3162	**FR_SMP(SA<>MA)** & JS=SDAC << TXI access protocol detects TKP access protocol active by reception of an SMP MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JB0	3165	**FR_SMP(SA<>MA)** & JS=SLT << TXI access protocol detects TKP access protocol is active by reception of an SMP MAC frame. >>	JS=BP << OPEN ERROR = Protocol Error >>
JDB	3114	**FSBNT=1** & MS=SIT & JS=SJC << Monitor requests Join to run the Station's LMT, and sets Beacon Test request flag inactive. >>	JS=SLT; FSBNT=0; FSTXC=1; TSLMTC=R; TXI_TEST
JC0	3142	**FSBPF=1** & TS=STXN & JS=SDAC	JS=BP << Station Fault, Transmit Error >>
JD0A	3156	**FSBPF=1** & TS=STXN & JS=SJC	JS=BP; Remove_Station << Station Fault, Transmit Error >>
JB0	3129	**FSBPF=1** & TS=STXN & JS=SLT	JS=BP << Station Fault, Transmit Error >>
JA0	3118	**FSBPF=1** & TS=STXN & JS=SREG	JS=BP << Station Fault, Transmit Error >>
	3166	**FSIRD=1** & TS=STXN & JS=SDAC << Insert Request MAC frame delayed until transmitter has no frames being transmitted (TS=STXN). >>	FSIRD=0; FSRRC=FSTXC=1; CSTFQ=(CSTFQ+1); TSIP=R; TXI_INS_REQ << Transmit an Insert Request MAC frame using crystal clock >>

Table 9-1—Station Join Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
JC0	3141	**INTERNAL_ERR(not_correctable)** & JS=SDAC	JS=BP << OPEN ERROR = Station fault, internal Station error >>
JD0A	3155	**INTERNAL_ERR(not_correctable)** & JS=SJC	JS=BP; Remove_Station << Station fault, internal Station error >>
JB0	3128	**INTERNAL_ERR(not_correctable)** & JS=SLT	JS=BP << OPEN ERROR = Station fault, internal Station error >>
JA0	3117	**INTERNAL_ERR(not_correctable)** & JS=SREG	JS=BP << OPEN ERROR = Station fault, internal error >>
JD0B	3147	**INTERNAL_TEST_FAILURE** & MS=SIT & JS=SJC	JS=BP << Station fault, internal test failure >>
JB0	3130	**TEST_FAILURE** & JS=SLT	JS=BP << OPEN ERROR = Lobe test failure >>
JBC	3132	**TEST_OK** & JS=SLT << TXI Station's LMT completed successfully and causes setup for TXI Station insertion. >>	JS=SDAC; If FSJC=0 then MS=SOPT; FSHBA=FSRRC=FSTXC=1; CSTFQ=1; TSIP=R; TSJC=R; TSQHB=R; TSRHB=R; TXI_INS_REQ
	3104	**TSIP=E** & JS=SDAC	FSIRD=1 << Remember the TSIP=E event and delay transmission of the Insert Request MAC frame until crystal clock is available. >>
	3119	**TSIS=E** & JS=SREG << DTR Station makes its first request for TXI access protocol setup by setting subvector values for the REG_REQ_MAC frame and then queues the frame for transmission. >>	CSREQ=n6; TSREQ=R; TXI_REG_REQ (AP_REQ=0002; IAC=SPV(IAC); PD=SPV(PD))
JC0	3143	**TSJC=E** & JS=SDAC	JS=BP << OPEN ERROR = Join Time-out Error >>
JB0	3131	**TSLMTC=E** & JS=SLT << Time allotted for Station's TXI LMT has been exceeded. >>	JS=BP << OPEN ERROR = Station fault, lobe test completion time exceeded >>
JAB	3121	**TSLMTD=E** & JS=SREG << Station's TXI LMT delay completed. C-Port is assumed ready for Station's TXI access protocol LMT. >>	JS=SLT; TSLMTC=R; TXI_TEST << Start Lobe Test Completion Timer >>
JA1A	3120	**TSREQ=E** & CSREQ=0 & FSRC=0 & FSOPO=0 & FIPTXIS=0 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << C-Port has failed to respond to multiple REG_REQ MAC frames and the TKP access protocol emulation is permitted by this Station. >>	JS=LT; FSTXC=FSTI=0; FTI=x; Set_initial_conditions; TEST << DTR Station starts the TKP access protocol and exits to 9.6. >>

Table 9-1—Station Join Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
JA1B	3159	**TSREQ=E** & CSREQ=0 & FSRC=0 & FSOPO=0 & FIPTXIS=1 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << Attached C-Port has failed to respond to multiple REG_REQ MAC frames and the TKP access protocol emulation is permitted by this C-Port. >>	JS=LT; FSTXC=FSTI=0; FTI=x; FIPTXIS=0; FIPTKPS=1; Set_initial_conditions; TEST << C-Port in Station Emulation mode starts the TKP access protocol and exits to 9.5. >>
JA0	3169	**TSREQ=E** & CSREQ=0 & FSRC=0 & FSOPO=1 & JS=SREG << C-Port has failed to respond to multiple REG_REQ MAC frames and TKP access protocol emulation is not permitted by this Station. >>	JS=BP << OPEN ERROR = Protocol Error >>
	3122	**TSREQ=E** & CSREQ>0 & FSRC=0 & JS=SREG << DTR Station makes another request for TXI access protocol setup by setting subvector values for the REG_REQ_MAC frame and then queues the frame for transmission. >>	CSREQ=(CSREQ-1); TSREQ=R; TXI_REG_REQ (AP_REQ=0002; IAC=SPV(IAC); PD=SPV(PD))
JC0	3144	**TSRHB=E** & JS=SDAC << TXI access protocol has detected absence of the Heart Beat MAC frame prior to Join complete. >>	JS=BP << OPEN ERROR = Protocol Error >>
J9A	6007	**TSRW=E** & JS=SRW & FIPTKPS=0 & FSREGO=1 << One of the starting points for the DTR Station using the TXI access protocol. >> << This transition is executed by 9.6.2.1. >> << DTR Station originally opened using the TKP access protocol and then recognizes the attached C-Port's request to use the TXI access protocol. >> << Registration query protocol >>	JS=SREG; TS=STXN; Set_initial_conditions; FSTXC=FSTI=1; TSIS=R << For information only >>
J9A	6006	**TSRW=E** & JS=SRW & FIPTKPS=1 & FSREGO=1 << One of the starting points for the C-Port in Station Emulation mode using the TXI access protocol. >> << This transition is executed by 9.5.4.2. >> << C-Port in Station Emulation mode originally opened using the TKP access protocol and then recognizes the attached C-Port's request to use the TXI access protocol. >> << Registration query protocol >>	JS=SREG; TS=STXN; Set_initial_conditions; FSTXC=FSTI=1; TSIS=R; FIPTKPS=0; FIPTXIS=1 << For information only >>
JD0A	3157	**TSWF=E** & FSWFA=1 & FSWF=1 & JS=SJC	JS=BP; Remove_Station << Wire fault detected—caused by: Station, lobe, or port fault >>

9.2.5.2 Station transmit—Station Operation table

Table 9-2—Station Transmit Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1)

S/T	REF	Event/condition	Action/output
TBAA	3207	**CSBTX>SPV(MAX_TX)** & FPASO=0 & FIPTXIS=1 & TS=STXD << C-Port in Station Emulation mode has detected maximum frame size has been exceeded. >>	[TS=STXN; TX_AB; FSTI=1 (optional-unk)] << Terminate the transmission of the frame by transmitting an abort sequence >>
TBAE	3204	**CSBTX>SPV(MAX_TX)** & FPASO=1 & FIPTXIS=1 & TS=STXD << C-Port in Station Emulation mode has detected maximum frame size has been exceeded. >>	[TS=STXN; FSTI=1; TX_INV_FCS; TX_EFS(I=0; E=1) (optional-unk)] << Terminate the transmission of the frame by transmitting an invalid FCS and setting the E bit to one >>
TBAF	3212	**DTU_UNITDATA-STATUS.request(Fail)** & FPTX_LTH=0 & FIPTXIS=1 & TS=STXD << Transmit FSM currently transmitting a frame of unknown length. This is an indication that a cut-through frame is being transmitted. >>	TS=STXN; TX_AB; FSTI=1 << The cut-through frame has completed with a fail status and the frame is aborted by transmitting an abort sequence. >>
	3208	**EOB** & TS=STXD & FIPTXIS=1 << Occurs once for each byte transmitted during the Transmit Data state (TS=STXD). >> << C-Port in Station Emulation mode support >>	[CSBTX=(CSBTX+1) (optional-unk)]
TBAB	3205	**EOD** & TS=STXD << The last octet of the frame's Information field has been transmitted. >>	TS=STXN; TX_FCS; TX_EFS(I=0); FSTI=1; **If** JS=SDAC then CSTFQ=(CSTFQ-1)
TABA	3203	**PDU_QUEUED** & FSBPF=0 & FSOP=1 & FIPTXIS=0 & TS=STXN << Queued frame is transmitted by the Station only when FSOP=1. >>	TS=STXD; FSTI=0; TX_SFS(P=x; R=0)
TABB	3210	**PDU_QUEUED** & FSBPF=0 & FSOP=1 & FIPTXIS=1 & TS=STXN << Queued frame is transmitted by the C-Port only when FSOP=1. >>	TS=STXD; FSTI=0; **If** FR_LTH<=PPV(MAX_TX) then FPTX_LTH=1; **If** FR_LTH=UNK then FPTX_LTH=0; **If** FSMRO=0 then CSBTX=9; **If** FSMRO=1 then CSBTX=D; TX_SFS(P=x; R=0) << The frame length of the queued frame is either unknown or a value less than PPV(MAX_TX) >>
TBAC	3216	**PORT_ERR(correctable)** & FIPTXIS=1 & TS=STXD << C-Port could not complete transmission of frame being transmitted—abort frame. >>	TS=STXN; TX_AB; FSTI=1 **If** JS=SDAC then CSTFQ=(CSTFQ-1) << Transmit abort sequence >>
TBAD	3217	**PORT_ERR(not_correctable)** & FIPTXIS=1 & TS=STXD << C-Port could not complete transmission of frame being transmitted. >>	TS=STXN; [TX_AB (optional)]; FSBPF=FSTI=1 << Transmit abort sequence—optional >>

Table 9-2—Station Transmit Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
TBAC	3206	**STATION_ERR(correctable)** & FIPTXIS=0 & TS=STXD << Station could not complete transmission of frame: enter the Transmit Normal state. >>	TS=STXN; TX_AB; FSTI=1; **If** JS=SDAC then CSTFQ=(CSTFQ-1) << Transmit abort sequence >>
TBAD	3209	**STATION_ERR(not_correctable)** & FIPTXIS=0 & TS=STXD << Station could not complete transmission of frame: enter the Transmit Normal state. >>	TS=STXN; [TX_AB (optional-i)]; FSBPF=FSTI=1 << Optionally transmit abort sequence. Force Join to enter the Bypass state. >>
TABA	3202	**TXI_REQ** & FIPTXIS=0 & FSBPF=0 & TS=STXN << SMAC TXI_(frame) is being transmitted. >>	TS=STXD; FSTI=0; TX_SFS(P=x; R=0) << Frame length for a frame in the TXI queue is always known. >>
TABC	3211	**TXI_REQ** & FIPTXIS=1 & FPBPF=0 & TS=PTXN << PMAC TXI_(frame) is being transmitted. >>	TS=STXD; FSTI=0; FPTX_LTH=1; **If** FSMRO=0 then CSBTX=9; **If** FSMRO=1 then CSBTX=D; TX_SFS(P=x; R=0) << Frame length for a frame in the TXI queue is always known. >>

9.2.5.3 Station monitor—Station Operation table

Table 9-3—Station Monitor Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1)

S/T	REF	Event/condition	Action/output
MAD	3316	**FR_BN(SA=SUA)** & FSJC=1 & MS=SOPT << Station received a Beacon MAC frame from its C-Port and starts Hard Error Recovery by entering the Wire Fault Delay state. >>	MS=SWFD; FSHBA=FSOP=0; TSIT=R; TSLMT=R
MBD	3318	**FR_BN(SA=SUA)** & MS=STBN << Station received a Beacon MAC frame from its C-Port and continues Hard Error Recovery by entering the Wire Fault Delay state. >>	MS=SWFD; TSIT=R; TSLMT=R
MCA	3319	**FR_INS_RSP(DTR_RSP=**0000**)** & MS=SIT << Station’s internal test was successful and it transmitted an insert request. This frame’s reception indicates the C-Port has authorized insertion. >>	MS=SOPT
	3323	**FR_PHB(SA=SUA)** & FSHBA=1 << C-Port Heart Beat MAC frame received. >>	TSRHB=R << Reset the Heart Beat timer. >>
MBC	3317	**TSIT=E** & MS=STBN << Station has completed waiting for wire-fault detection. >>	MS=SIT; Remove_Station; INT_TEST
MDC	3320	**TSIT=E** & MS=SWFD << Station has completed waiting for wire fault detection. >>	MS=SIT; Remove_Station; INT_TEST
	3322	**TSLMT=E** & MS=SIT << Lobe test to be executed by the Station. >>	FSBNT=1 << Request Join to execute JS=SLT >>
	3324	**TSQHB=E** & FSHBA=1 << Station’s Heart Beat timer causes transmission of SHB_PDU. >>	TSQHB=R; TXI_SHB **If** JS=SDAC then CSTFQ=(CSTFQ+1)
	3313	**TSQP=E** & MS=STBN << Pacing timer for Beacon MAC frames has expired, transmit another Beacon MAC frame. >>	TSQP=R; **If** FSSL=0 then TXI_BN(BN_TYPE=5); **If** FSSL=1 then TXI_BN(BN_TYPE=2)
MAB	3314	**TSRHB=E** & FSJC=1 & MS=SOPT << Heart Beat failure detected. Station starts hard error recovery by entering the Beacon Transmit state. >>	MS=STBN; FSHBA=FSOP=0; FSTXC=1; TSIT=R; TSLMT=R; TSQP=R; **If** FSSL=0 then TXI_BN(BN_TYPE=5); **If** FSSL=1 then TXI_BN(BN_TYPE=2)

9.2.5.4 Station error handling—Station Operation table

Table 9-4—Station Error Handling Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1)

S/T	REF	Event/condition	Action/output
	3401	**Burst5_error_event** & CSBE<255 & FSJC=1 & FSER=1 & MS=SOPT	CSBE=(CSBE+1)
	3402	**Burst5_error_event** & FSJC=1 & FSER=0 & MS=SOPT	FSER=1; TSER=R; CSBE=(CSBE+1)
	3407	**FR_NOT_COPIED** & CSRCE<255 & FSJC=1 & FSER=1 & MS=SOPT	CSRCE=(CSRCE+1)
	3408	**FR_NOT_COPIED** & FSJC=1 & FSER=0 & MS=SOPT	FSER=1; TSER=R; CSRCE=(CSRCE+1)
	3409	**FR_WITH_ERR** & CSLE<255 & FSJC=1 & FSER=1 & MS=SOPT	CSLE=(CSLE+1)
	3410	**FR_WITH_ERR** & FSJC=1 & FSER=0 & MS=SOPT	FSER=1; TSER=R; CSLE=(CSLE+1)
	3411	**INTERNAL_ERR(correctable)** & CSIE<255 & FSJC=1 & FSER=1 & MS=SOPT	CSIE=(CSIE+1)
	3412	**INTERNAL_ERR(correctable)** & FSJC=1 & FSER=0 & MS=SOPT	FSER=1; TSER=R; CSIE=(CSIE+1)
	3426	**PM_STATUS.indication (Signal_detection=signal_acquired)** & FSSLD=1	FSSL=FSSLD=0
	3427	**PM_STATUS.indication (Signal_detection=signal_loss)** & FSSLD=0	FSSLD=1; TSSL=R
	3428	**PM_STATUS.indication (Wire_fault=Detected)** & FSWFA=1 & FSWF=0	FSWF=1; TSWF=R
	3429	**PM_STATUS.indication (Wire_fault=Not_detected)** & FSWF=1	FSWF=0
	3417	**PORT_ERR(correctable)** & FIPTXIS=1 & TS=STXD & FSJC=1 & FSER=0 & MS=SOPT	FSER=1; TSER=R; CSABE=(CSABE+1)
	3418	**PORT_ERR(correctable)** & FIPTXIS=1 & TS=STXD & CSABE<255 & FSJC=1 & FSER=1 & MS=SOPT	CSABE=(CSABE+1)
	3431	**PS_STATUS.indication(Frequency_error)** & CSFE<255 & FSJC=1 & FSER=1 & MS=SOPT	CSFE=(CSFE+1)
	3430	**PS_STATUS.indication(Frequency_error)** & FSJC=1 & FSER=0 & MS=SOPT	FSER=1; TSER=R; CSFE=(CSFE+1)
	3420	**STATION_ERR(correctable)** & TS=STXD & FSJC=1 & FSER=0 & MS=SOPT	FSER=1; TSER=R; CSABE=(CSABE+1)
	3419	**STATION_ERR(correctable)** & TS=STXD & CSABE<255 & FSJC=1 & FSER=1 & MS=SOPT	CSABE=(CSABE+1)
	3432	**TSER=E** & ERR_SCNTR<>0 & FSJC=1 & FIPTXIS=0 << DTR Station is reporting errors. >>	**If** FSECO=0 then FSER=0; QUE_RPRT_ERR_PDU; SET ERR_SCNTR=0
	3433	**TSER=E** & ERR_SCNTR<>0 & FSJC=1 & FIPTXIS=1 << DTR C-Port is reporting errors. >>	**If** FSECO=0 then FSER=0; MRI_UNITDATA.indication (RPRT_ERR); [QUE_RPRT_ERR_PDU (optional-x)]; SET ERR_SCNTR=0

Table 9-4—Station Error Handling Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	3425	**TSER=E** & FSJC=1 & FSECO=1	TSER=R
	3423	**TSSL=E** & FSSLD=1	FSSL=1
	3424	**TSWFD=E** & FSJC=1 & FSWFA=0 & MS=SOPT	FSWFA=1

9.2.5.5 Station interface signals—Station Operation table

Table 9-5—Station Interface Signals Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1)

S/T	REF	Event/condition	Action/output
	3513	**DTU_UNITDATA-STATUS.request(Fail)** & FPTX_LTH=1 & FIPTXIS=1 & TS=STXD << Transmit FSM is currently transmitting a previously queued frame. This is an indication that frame cut-through is terminating with an error. >>	DISCARD_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	3516	**DTU_UNITDATA-STATUS.request(Fail)** & TS=STXN << Transmit FSM is currently in the normal state. This may occur between frame transmissions. >>	DISCARD_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	3512	**DTU_UNITDATA-STATUS.request(OK)** & FPTX_LTH=0 & FIPTXIS=1 & TS=STXD << Transmit FSM currently transmitting a frame of unknown length. This is an indication that a C-Port cut-through frame is being transmitted. >>	FPTX_LTH=1 << The cut-through frame has completed with an OK status: the frame length is now known. >>
	3530	**DTU_UNITDATA.request** & FSJC=1 & FSOP=1 & FR_LTH<=SPV(MAX_TX) & FIPTXIS=1 << C-Port in Station Emulation mode >> << A frame of known length is passed to this C-Port. >>	QUE_PDU
	3531	**DTU_UNITDATA.request** & FSJC=1 & FSOP=1 & FR_LTH=UNK & FIPTXIS=1 << C-Port in Station Emulation mode >> << A frame cut-through operation has started and its frame length is currently not known. The data is optionally placed into the transmit queue and made available for transmission. >>	[QUE_PDU (optional-unk)] << QUE_PDU action allows the PDU_QUEUED event to occur. >>
	3532	**FR** & FPFCO=0 & FSJC=1 & FSOP=1 & FIPTXIS=1 << C-Port in Station Emulation mode >>	DTU_UNITDATA.indication; DTU_UNITDATA-STATUS.indication (OK)
	3509	**FR** & FPFCO=1 & FSOP=1 & FSJC=1 & FIPTXIS=1 << Indicates that frame cut-through has successfully completed. >>	DTU_UNITDATA-STATUS.indication (OK)
	3501	**FR** & FSJC=1 & FSOP=1 & FIPTXIS=0 << DTR Station has received a frame. >>	M_UNITDATA.indication
	3539	**FR_FC** & FPFCO=1 & FSJC=1 & FSOP=1 & FIPTXIS=1 << C-Port in Station Emulation mode has received a frame. >>	DTU_UNITDATA.indication
	3502	**FR_LLC(DA=any_recognized_address)** & FSJC=1 & FSOP=1 & FIPTXIS=0 << DTR Station >>	MA_UNITDATA.indication

Table 9-5—Station Interface Signals Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	3534	**FR_MAC(DA<>any_recognized_address & SC<>0)** & FSJC=1 & FSOP=1 & FIPTXIS=1 << C-Port in Station Emulation mode >>	MRI_UNITDATA.indication
	3540	**FR_MAC(DA=any_recognized_address & DC=0 & VI=09)**	DISCARD_PDU
	3503	**FR_MAC(DA=any_recognized_address & DC<>0 & VI<>09)** & FSJC=1 & FSOP=1 & FIPTXIS=0 << DTR Station >>	MGT_UNITDATA.indication
	3533	**FR_MAC(DC<>0 & DC<>3 & SC=0)** & FSJC=1 & FSOP=1 & FIPTXIS=1 << C-Port in Station Emulation mode >>	MRI_UNITDATA.indication
	3510	**FR_WITH_ERR** & FPFCO=1 & FSOP=1 & FSJC=1 & FIPTXIS=1 << C-Port in Station Emulation mode >> << Indicates that frame cut-through has failed due to a frame error. >>	DTU_UNITDATA-STATUS.indication (fail)
	3504	**FSTI=0** & FIPTXIS=0 << DTR Station >>	PS_CONTROL.request (Repeat_mode=Repeat)
	3537	**FSTI=0** & FIPTXIS=1 << C-Port in Station Emulation mode >>	{PM_CONTROL.request (Repeat_mode=Repeat)} **or** {PS_CONTROL.request (Repeat_mode=Repeat)} ⇒ **An implementation shall take one of these two actions**
	3505	**FSTI=1** & FIPTXIS=0 << DTR Station >>	PS_CONTROL.request (Repeat_mode=Fill)
	3538	**FSTI=1** & FIPTXIS=1 << C-Port in Station Emulation mode >>	{PM_CONTROL.request (Repeat_mode=Fill)} **or** {PS_CONTROL.request (Repeat_mode=Fill)} ⇒ **An implementation shall take one of these two actions**
	3506	**FSTXC=0**	PS_CONTROL.request (Crystal_transmit=Not_asserted)
	3507	**FSTXC=1**	PS_CONTROL.request (Crystal_transmit=Asserted)
	3508	**M_UNITDATA.request** & FSJC=1 & FSOP=1 & FR_LTH<=SPV(MAX_TX)	QUE_PDU **If** (DA=any_recognized_address) then MA_UNITDATA.indication(PDU) << Support the Loop Back function in the DTR Station if necessary >>

Table 9-5—Station Interface Signals Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	3511	**MA_UNITDATA.request** & FSJC=1 & FSOP=1 & FR_LTH<=SPV(MAX_TX)	QUE_PDU **If** (DA=any_recognized_address) then MA_UNITDATA.indication(PDU) << Support the Loop Back function in the DTR Station if necessary >>
	3514	**MGT_UNITDATA.request(SC<>0)** & FSOP=1 & FR_LTH<=SPV(MAX_TX)	QUE_PDU
	3515	**MGT_UNITDATA.request(SC=0)**	DISCARD_PDU
	3535	**MRI_UNITDATA.request(SC<>0)** & FSJC=1 & FSOP=1 & FR_LTH<=SPV(MAX_TX) & FIPTXIS=1 << C-Port in Station Emulation mode >>	QUE_PDU
	3536	**MRI_UNITDATA.request(SC<>0)** & FSJC=1 & FSOP=1 & FR_LTH=UNK & FIPTXIS=1 << C-Port in Station Emulation mode >>	[QUE_PDU (optional-unk)]

9.2.5.6 Station miscellaneous frame handling—Station Operation table

Table 9-6—Station Miscellaneous Frame Handling Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1)

S/T	REF	Event/condition	Action/output
	3600	**FR_CHG_PARM**	SET APPR_PARMS
	3601	**FR_CHG_PARM(CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	3602	**FR_CHG_PARM(CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	3603	**FR_INIT**	SET APPR_PARMS
	3604	**FR_INIT(CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	3605	**FR_INIT(CORR_PRESENT)**	TXI_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	3608	**FR_MAC_INV (ERR_COND=SC_INVALID & SC<>RS & CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8004)
	3609	**FR_MAC_INV (ERR_COND=SC_INVALID & SC<>RS & CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8004)
	3610	**FR_MAC_INV (ERR_COND=SHORT**_MAC **& SC_NOT_PRESENT)**	[TXI_RSP_PDU(DC<>RS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001) (optional-x)]
	3630	**FR_MAC_INV (ERR_COND=SHORT**_MAC **& SC_PRESENT & SC<>RS)**	TXI_RSP_PDU (DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001)
	3612	**FR_MAC_INV (ERR_COND=SV_LTH_**ERR **& SC<>RS & CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8005)
	3613	**FR_MAC_INV (ERR_COND=SV_LTH_ERR & SC<>RS & CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8005)
	3614	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8007)
	3615	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8007)
	3618	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8002)
	3619	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8002)
	3606	**FR_MAC_INV(ERR_COND=LONG_MAC & SC<>RS & CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8009)

Table 9-6—Station Miscellaneous Frame Handling Station Operation table for the DTR Station using the TXI access protocol (FIPTXIS=0) or the C-Port in Station Emulation mode using the TXI access protocol (FIPTXIS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	3607	**FR_MAC_INV(ERR_COND=LONG_MAC & SC<>RS & CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8009)
	3616	**FR_MAC_INV(ERR_COND=SV_UNK & SC<>RS & CORR_NOT_PRESENT**)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8008)
	3617	**FR_MAC_INV(ERR_COND=SV_UNK & SC<>RS & CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8008)
	3620	**FR_MAC_INV(ERR_COND=VI_UNK & SC<>RS & CORR_NOT_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8003)
	3621	**FR_MAC_INV(ERR_COND=VI_UNK & SC<>RS & CORR_PRESENT)**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8003)
	3622	**FR_REMOVE(DA=Broadcast)**	[TXI_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A) (optional-x)]
	3623	**FR_REMOVE(DA=Non_broadcast)** & FSRRO=1	TXI_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A)
	3624	**FR_RQ_ADDR** & FIPTXIS=0 << DTR Station >>	TXI_RPRT_ADDR_PDU
	3627	**FR_RQ_ADDR** & FIPTXIS=1 << C-Port in Station Emulation mode >>	[TXI_RPRT_ADDR_PDU (optional-x)]
	3625	**FR_RQ_ATTACH** & FIPTXIS=0 << DTR Station >>	TXI_RPRT_ATTACH_PDU
	3628	**FR_RQ_ATTACH** & FIPTXIS=1 << C-Port in Station Emulation mode >>	[TXI_RPRT_ATTACH_PDU (optional-x)]
	3626	**FR_RQ_STATE** & FIPTXIS=0 << DTR Station >>	TXI_RPRT_STATE_PDU
	3629	**FR_RQ_STATE** & FIPTXIS=1 << C-Port in Station Emulation mode >>	[TXI_RPRT_STATE_PDU (optional-x)]

9.2.5.7 Precise specification of terms

This subclause provides precise specification of terms used in the “Event/condition” and the “Actions/output” columns of the Station Operation tables.

9.2.5.7.1 Precise specification of event/conditions

The expressions used in the Station Operation tables have the following meanings:

{flag}=0.	The specified flag is set to zero (false).
{flag}=1.	The specified flag is set to one (true).
{term1} < {term2}.	Term 1 is less than term 2.
{term1} <= {term2}.	Term 1 is less than or equal to term 2.
{term1} <> {term2}.	Term 1 is not equal to term 2.
{term1} = {term2}.	Term 1 is equal to term 2.
{term1} > {term2}.	Term 1 is greater than term 2.
{term1} >= {term2}.	Term 1 is greater than or equal to term 2.
{timer}=E.	The specified timer has expired.

& means “and.”

Unless otherwise specified, the following terms and operations are defined:

AND(x,y). Bitwise Logical AND function of binary objects x and y.

AP_RSP=value. The AP_RSP subvector, in the Registration Response MAC frame received, is equal to the hexadecimal value indicated.

Burst5_error_event. A PM_STATUS.indication(Burst5_error) has occurred. The conditions under which a Burst5_error is excluded are not uniquely specified by this standard (see Counter Burst Error in 3.6). At a minimum, the Station shall include the first Burst5_error following a valid MAC frame copied by the Station if the Burst5_error occurs within a frame. The Station may include every Burst5_error.

Connect.SMAC. The SMAC receives the command from Management to start the process to join the network.

CORR_NOT_PRESENT. The received frame did not contain a correlator subvector.

CORR_PRESENT. The received frame did contain a correlator subvector.

DA=any_recognized_address. The destination address (DA) of the received frame matches any of the Station’s addresses as follows:

a) Is one of the Station’s individual addresses, or
b) Is one of the Station’s group addresses, or
c) Is one of the Station’s functional addresses, or
d) Is one of the broadcast addresses defined in 3.2.4.1.

DA<>any_recognized_address. The destination address (DA) of the received frame does not match any of the Station’s addresses as follows:

a) Is not any of the Station’s individual addresses, or
b) Is not any of the Station’s group addresses, or
c) Is not any of the Station’s functional addresses, or
d) Is not any of the broadcast addresses defined in 3.2.4.1.

DA=MA. The destination address (DA) of the received frame is equal to the individual address of the Station. If the Station’s individual address is a universally administered address, then all 48 bits must match. If the Station’s individual address is a locally administrated address, then either a hierarchical address match or a 48-bit address match is allowed.

DA=Non_broadcast. The received frame was not sent to a broadcast address, but otherwise addressed to the Station.

DC<>0 & DC<>3. The destination class is not a Ring Station or a C-Port.

Disconnect.SMAC. The request from local management to remove the Station from the ring.

DTR_RSP=value. The DTR response subvector, contained in the Insert Response MAC frame, has the indicated hexadecimal value.

DTU_UNITDATA.request. The DTU requests a frame be transmitted.

DTU_UNITDATA-STATUS.request(Status_Code). Frame status is reported by the DTU to the PMAC. Status_Code may be one of the following:

a) OK: The frame has been successfully transferred to the PMAC without error.
b) Fail: Transfer of the frame to the PMAC has failed due to a frame error.

EOB. End of byte: This event occurs each time the last bit of an octet has been transmitted in the Transmit Data state (TS=STXD).

EOD. End of data: This event occurs when the last octet of the Information field has been transmitted in the Transmit Data state (TS=STXD).

ERR_COND=LONG_MAC. MAC frame too long—INFO field larger than maximum allowed VI value. See 10.3.6.5.

ERR_COND=SC_INVALID. Invalid source class. See 10.3.6.5.

ERR_COND=SHORT_MAC. MAC frame is not long enough to contain VL, VC, and VI fields. See 10.3.6.5.

ERR_COND=SV_LTH_ERR. Subvector length error. See 10.3.6.5.

ERR_COND=SV_MISSING. Missing required subvector. See 10.3.6.5.

ERR_COND=SV_SVV_ERR. A subvector contains an invalid subvector value. See 10.3.6.5.

ERR_COND=SV_UNK. Unknown subvector SVI value. See 10.3.6.5.

ERR_COND=VI_LTH_ERR. Vector length error. VL is not equal to the sum of all the SVLs plus the length of VL, VC, and VI fields, or VL does not agree with the length of the frame. See 10.3.6.5.

ERR_COND=VI_UNK. Unrecognized vector ID value. See 10.3.6.5.

ERR_SCNTR<>0. Any Station error counter is not equal to zero.

FR. A frame has been received and meets the frame receive criteria specified in 4.3.2.

FR_AMP. A verified Active Monitor Present MAC frame (10.3.3.3) is received.

FR_BN(criteria). A verified Beacon MAC frame (10.3.6) is received meeting the specified criteria.

FR_CHG_PARM(criteria). A verified Change Parameters MAC frame (10.3.6) is received meeting the specified criteria.

FR_COPIED(criteria). The SMAC successfully copied the received frame meeting the specified criteria.

FR_CT. A verified Claim Token MAC frame (10.3.6) is received.

FR_FC. A bit sequence that indicates a frame’s SD, AC, and FC fields have been received as specified in 9.1.1.6.

FR_INIT. A verified Initialize Station MAC frame (10.3.6) is received.

FR_INIT(criteria). A verified Initialize Station MAC frame (10.3.6) is received meeting the specified criteria.

FR_INS_RSP(criteria). A verified Insert Response MAC frame is received meeting the specified criteria.

FR_LLC(criteria). A valid LLC frame is received meeting the specified criteria.

FR_LTH. The length of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG).

FR_LTH<=MAX_TX. The frame length to be transmitted is less than or equal to the maximum allowed frame length by the selected media rate.

FR_LTH=UNK. The frame length to be transmitted is unknown.

FR_MAC(criteria). A valid MAC frame is received meeting the specified criteria.

FR_MAC_INV(reason). A valid MAC frame is received that fails verification (10.3.6) for the reason specified.

FR_NOT_COPIED. The Station detects a frame addressed to one of its recognized addresses, but does not copy the frame.

FR_PHB(criteria). A verified C-Port Heart Beat MAC frame (10.3.2.3) is received meeting the specified criteria.

FR_REG_RSP(criteria). A verified Registration Response MAC frame (10.3.2.13) is received meeting the specified criteria.

FR_REMOVE(criteria). A verified Remove MAC frame (10.3.6) is received meeting the specified criteria.

FR_RP. A verified Ring Purge MAC frame (10.3.6) is received.

FR_RQ_ADDR. A verified Request Address MAC frame (10.3.6) is received.

FR_RQ_ATTACH. A verified Request Attachment MAC frame (10.3.6) is received.

FR_RQ_STATE. A verified Request Station State MAC frame (10.3.6) is received.

FR_SHB. A verified Station Heart Beat MAC frame (10.3.2.4) is received.

FR_SMP. A verified Standby Monitor Present MAC frame (10.3.3.4) is received.

FR_WITH_ERR. A frame is received with errors (see 4.3.2).

FR_WITH_ERR(criteria). A frame is received with errors (see 4.3.2) meeting the specified criteria.

INTERNAL_ERR. Any internal error occurred that prevented the Station from following the established protocol (e.g., parity error, etc.).

INTERNAL_TEST_FAILURE. The Station failed during internal testing.

JS=state. The Join FSM is in the specified state.

M_UNITDATA.request. The bridge interface requests a frame be transmitted.

MA_UNITDATA.request. The LLC interface requests a frame be transmitted.

MGT_UNITDATA.request. The management interface requests a frame be transmitted.

MRI_UNITDATA.request. The management routing interface requests a frame be transmitted

MS=state. The Monitor FSM is in the specified state.

PDU_QUEUED. A frame is queued for transmission.

PM_STATUS.indication (Signal_detection=Signal_acquired). The PHY indicates valid receiver signal (see 5.1.4.1).

PM_STATUS.indication (Signal_detection=Signal_loss). The PHY indicates loss of valid receiver signal (see 5.1.4.1).

PM_STATUS.indication (Wire_fault=Detected). The PHY indicates the presence of a wire fault (see 5.1.4.1).

PM_STATUS.indication (Wire_fault=Not_detected). The PHY indicates the absence of a wire fault (see 5.1.4.1).

PORT_ERR(criteria). Any internal condition that prevents the successful completion of the PDU transmit operation. The criteria is either correctable (C-Port counts error) or not-correctable (C-Port closes).

PS_STATUS.indication (Frequency_error). The PHY indicates the frequency of the received data is out of tolerance (see 5.1.2.3).

SA=MA. The source address (SA) of a received frame is equal to the individual address of the Station.

SA<>MA. The source address (SA) of a received frame is not equal to the individual address of the Station.

SA=SUA. The source address (SA) of a received frame is equal to the stored upstream address (SUA).

SA<>SUA. The source address (SA) of a received frame is not equal to the Station's stored upstream address (SUA).

SC=0. The source class is a Ring Station.

SC=CRS. The source class is 4 (Configuration Report Server).

SC=RPS. The source class is 5 (Ring Parameter Server).

SC_NOT_PRESENT. The MAC frame is too short to contain the source class.

SC_PRESENT. The MAC frame is long enough to contain the source class.

SC<>RS. The source class is not a Ring Station (<>0).

SPV(AP_MASK)=value. The value of SPV(AP_MASK) is equal to the hexadecimal value indicated (see 10.5.1.2).

SPV(MAX_TX). SPV(MAX_TX) is defined in 10.5.1.2.

STATION_ERR. Any internal condition that prevents the successful completion of the PDU transmit operation.

SUA. The stored upstream address (SUA) value.

TEST_FAILURE. The Station failed its self test.

TEST_OK. The Station passed its self test.

TS=state. The Transmit FSM is in the specified state.

TXI_REQ. The SMAC requests a frame be transmitted.

9.2.5.7.2 Precise specification of action/output

The expressions used in the Station Operation tables have the following meanings:

{counter}=({counter}+1).	Increment the specified counter by one.
{counter}=({counter}-1).	Decrement the specified counter by one
{counter}=value.	Set the specified counter to the specified value.
{flag}=0.	Set the value of the specified flag to zero (false).
{flag}=1.	Set the value of the specified flag to one (true).
{timer}=R.	The specified timer is set to its initial value and started.
variable=value.	Set the variable to the specified value

; means "and."

Unless otherwise specified, the following terms and operations are defined:

AP_REQ=value. The AP_REQ subvector, in the REG_REQ MAC frame being transmitted, is set to the hexadecimal value indicated.

BN_TYPE=value. The value of the beacon type subvector to be transmitted.

CORR=RCV_CORR. The value of the correlator subvector will be the same value as the received correlator subvector.

CORR=UNK_VALUE (optional-x). The frame received did not contain a correlator subvector (3.3.4), thus the value of the correlator subvector to be transmitted is unspecified and the subvector may be omitted. The standard recommends that new implementations not transmit the correlator subvector when no correlator subvector was received.

CSBTX=value. The counter CSBTX is set to the hexadecimal value indicated.

DC=CRS. The value of the destination class is 4 (Configuration Report Server).

DC=RCV_SC. The destination class (DC) field shall contain the value of the source class field (SC) of the received frame.

DC<>RS. The destination class (DC) field shall not be 0. Note that the source class (SC) field of the received frame was not present and thus the DC of the response frame is not defined but shall not be the ring Station class.

DISCARD_PDU. Discard the PDU.

DTU_UNITDATA.indication. The frame is indicated to the DTU.

DTU_UNITDATA-STATUS.indication (Status_Code). Frame status is indicated by the PMAC to the DTU. Status_Code may be one of the following:

a) OK: The frame has been successfully transferred to the DTU without error.
b) Fail: Transfer of the frame to the DTU has failed due to a frame error.

FTI=x. The value of FTI is not specified.

IAC=SPV(IAC). The Station indicates the number of individual addresses supported as defined in the Station policy variable (IAC) in the REG_REQ MAC frame.

INSERT. Request the PHY to physically connect the Station to the network [5.1.4.2 PM_CONTROL.request(Insert_Station)].

INT_TEST. The Station starts its internal tests.

JS=state. The Join FSM transitions to the specified state.

M_UNITDATA.indication. The frame is indicated to the bridge interface.

MA_UNITDATA.indication. The frame is indicated to the LLC interface.

MGT_UNITDATA.indication. The frame is indicated to the management interface.

MS=state. The Monitor FSM transitions to the specified state.

P. The value of the P bits in the access control (AC) field.

PD=SPV(PD). The PD subvector, in REG_REQ MAC frame being transmitted, is set to the value of the Station policy variable SPV(PD).

Pm. The priority of the PDU being queued.

PM_CONTROL.request (Repeat_mode=Fill). The C-Port PMAC requests the PMC to start sourcing fill and stop repeat (see 9.7.2.2).

PM_CONTROL.request (Repeat_mode=Repeat). The C-Port PMAC requests the PMC to repeat and stop sourcing fill (see 9.7.2.2).

PS_CONTROL.request (Crystal_transmit=Asserted). The Station SMAC requests Crystal_transmit (see 5.1.2.4).

PS_CONTROL.request (Crystal_transmit=Not_asserted). The Station SMAC removes the Crystal_ transmit request (see 5.1.2.4).

PS_CONTROL.request (Repeat_mode=Fill). The Station SMAC or C-Port PMAC requests the PSC to start sourcing fill and stop repeat (see 5.1.2.4).

PS_CONTROL.request (Repeat_mode=Repeat). The Station SMAC or C-Port PMAC requests the PSC to repeat and stop sourcing fill (see 5.1.2.4).

QUE_PDU. Queue the PDU for transmission.

Remove_Station. Request the PHY to physically disconnect the Station from the link [5.1.4.2 PM_CONTROL.request(Remove_Station)].

RSP_TYPE=value. The response code subvector shall have the hexadecimal value specified.

SC=RS. The source class (SC) field shall contain the value zero (Ring Station).

SET APPR_PARMS. The Station shall set the Station's parameters to the values indicated in the received frame.

SET ERR_SCNTR=0. Set the values for all of the error counters reported in the Report Error MAC frame to zero.

Set_initial_conditions. The Station shall set all SMAC flags to zero, set all SMAC counters to zero, set all SMAC stored values to zero, and stop all SMAC timers. The Monitor and Transmit FSM states are not specified. The PS_CONTROL.request(Medium_rate) and PM_CONTROL.request(Medium_rate) shall indicate to the PHY the value of FSMRO.

SUA=SA. Store the value of the source address (SA) from the received frame as the stored upstream address (SUA).

TEST. Used by the 4.3 Station Operation table. See 4.3.5.2 for definition.

TS=state. The Transmit FSM transitions to the specified state.

TX_AB. The Station shall transmit an abort sequence.

TX_EFS(I=0). The Station shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The E, I, A, and C bits shall be zero.

TX_EFS(I=0, E=1). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The I, A, and C bits shall be zero. The E bit shall be one.

TX_FCS. The Station shall transmit frame check sequence for the frame as defined in 3.2.7.

TX_SFS(P=value; R=value). The Station shall transmit the start-of-frame sequence with the priority and reservation values as specified. The frame bit (T) shall be one and the monitor bit (M) shall be zero.

TXI_BN. The Station shall transmit a Beacon MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_INS_REQ. The Station shall transmit a Insert Request MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_INV_FCS. The C-Port shall transmit an invalid FCS.

TXI_REG_REQ(criteria). The Station shall transmit a Registration Request MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000 and the criteria specified. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_RPRT_ADDR_PDU. The Station shall transmit a Report Station Addresses MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_RPRT_ATTCH_PDU. The Station shall transmit a Report Station Attachment MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_RPRT_ERR_PDU. The Station shall transmit a Report Error MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_RPRT_STATE_PDU. The Station shall transmit a Report Station State MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_RSP_PDU(criteria). The Station shall transmit a Response MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000 and the criteria specified. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_SHB. The Station shall transmit a Station Heart Beat MAC frame with the access control (AC) field values of P=x, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event (see 9.1.8).

TXI_TEST. The Station shall perform a test of its transmit functions, its receive functions, and the medium between the Station and the C-Port. This test shall complete prior to the expiration of TSLMTC. It is recommended that the data path include the elastic buffer and the fixed latency buffer (5.8). A Station shall fail the test if the sustained bit error rate does not meet the criteria defined in annex P.

9.3 C-Port join and TXI access protocol specification

This subclause defines the DTR operation of a C-Port when operating in Port mode. This subclause supports the TXI access protocol and includes the Join process of the TKP access protocol.

The TXI access protocol is fully defined by this clause. The TKP access protocol is defined in this clause (Join) and in 9.4 (Monitor, Transmit, Error Handling, Interface, and Miscellaneous Frame Handling).

The following configurations (see figure 9-1) are supported by this clause:

— Configuration 1, Entity **(A)**; All tables in this clause are used.
— Configuration 3, Entity **(E)**; Join Operation is defined in this clause. Subclause 9.4 defines the Monitor, Transmit, Error Handling, Interface, and Miscellaneous Frame Handling Operation tables.

The C-Port's TXI access protocol is specified by six tables called C-Port Operation tables. The C-Port Operation tables are functionally divided into the Join, Transmit, and Monitor functions as well as their support functions.

The operation of the Join, Transmit, and Monitor functions is explained using high-level FSM diagrams in 9.3.1.1 through 9.3.1.3.

The C-Port Operation tables are presented as follows:

— The C-Port Join Port Operation table, table 9-7.
— The C-Port Transmit Port Operation table for the TXI access protocol, table 9-8.
— The C-Port Monitor Port Operation table for the TXI access protocol, table 9-9.
— The C-Port Error Handling Port Operation table for the TXI access protocol, table 9-10.

— The C-Port Interface Signals Port Operation table for the TXI access protocol, table 9-11.
— The C-Port Miscellaneous Frame Handling Port Operation table for the TXI access protocol, table 9-12.

Low-level FSM diagrams representing all state changes in the Join, Transmit, and Monitor Port Operation tables are presented in annex M.

9.3.1 FSM overview

This subclause and its figures provides an overview of the C-Port TXI access protocol Join, Monitor, and Transmit FSMs. Functions performed by these FSMs are defined in the C-Port Operation tables defined in 9.3.4. See 9.1.1.4 for discussion of the interaction between the Join, Transmit, and Monitor FSMs.

9.3.1.1 C-Port Join FSM overview

The C-Port Join FSM overview diagram is shown in figure 9-11. The Join FSM always begins in the Bypass state (JS=BP). C-Port policy flags, set prior to management issuing a Connect.PMAC command, determine the operational characteristics of the C-Port. The C-Port may operate in either Port mode or Station Emulation mode. Station Emulation mode operation is initiated in this subclause and defined in 9.2 and 9.5. Port mode operation is defined in this subclause. This Join FSM is used to support both the TKP and the TXI access protocols.

The C-Port participates in the registration process when it is initiated by the attached Station. The Join process continues with lobe test (JS=PLT), where the C-Port supports the Station's actions by providing a repeat path. Once the Station signals that the lobe test has completed, the C-Port reports to the Station the results of the duplicate address check (JS=PDAC). When the duplicate address check is successful, the C-Port completes the Join process by entering Join Complete TXI (JS=PJCI).

When supporting either a classic station, or a DTR Station using the TKP access protocol, the C-Port supports the Station's lobe media test while still in registration (JS=PREG). However, if the C-Port is configured by management to support only the TXI access protocol (PPV(AP_MASK)=0002), then the C-Port shall not supply a repeat path while in the registration state (JS=PREG). The C-Port exits registration when the Station's phantom drive is detected and starts a Claim Token cycle to minimize the time it will take for a Station to join. The Join FSM provides the registration query protocol (JS=PRQ) to permit a Station to modify its operational mode from TKP to TXI. This Join FSM is used to complete the join process, while the Monitor and Transmit FSMs are defined in 9.4.

The precise definition of the C-Port Join FSM is found in table 9-7.

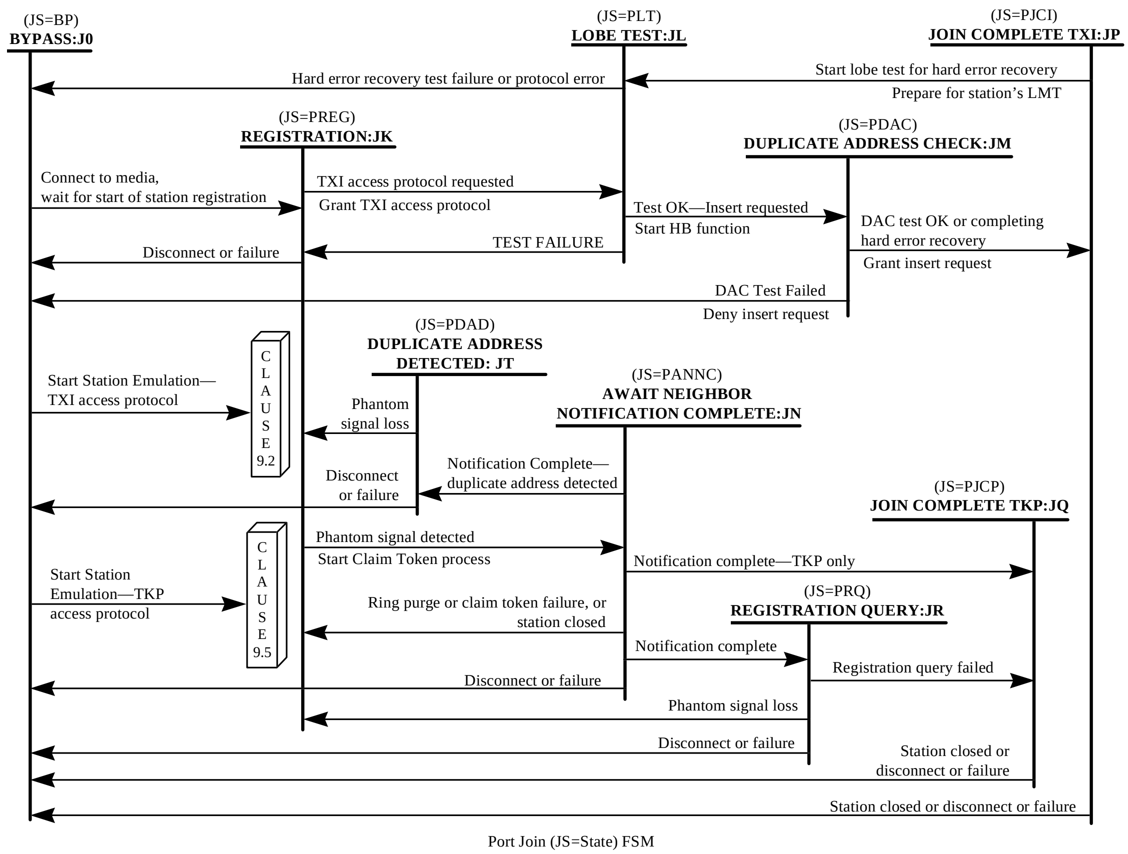


Figure 9-11—Overview C-Port Join FSM

9.3.1.2 C-Port Transmit FSM overview

The C-Port Transmit FSM is shown in figure 9-12. The transmit FSM is used to transmit frames as described in 9.1.7 and to supply a repeat path for use by the Station.

The precise definition of the Transmit FSM is found in table 9-8.

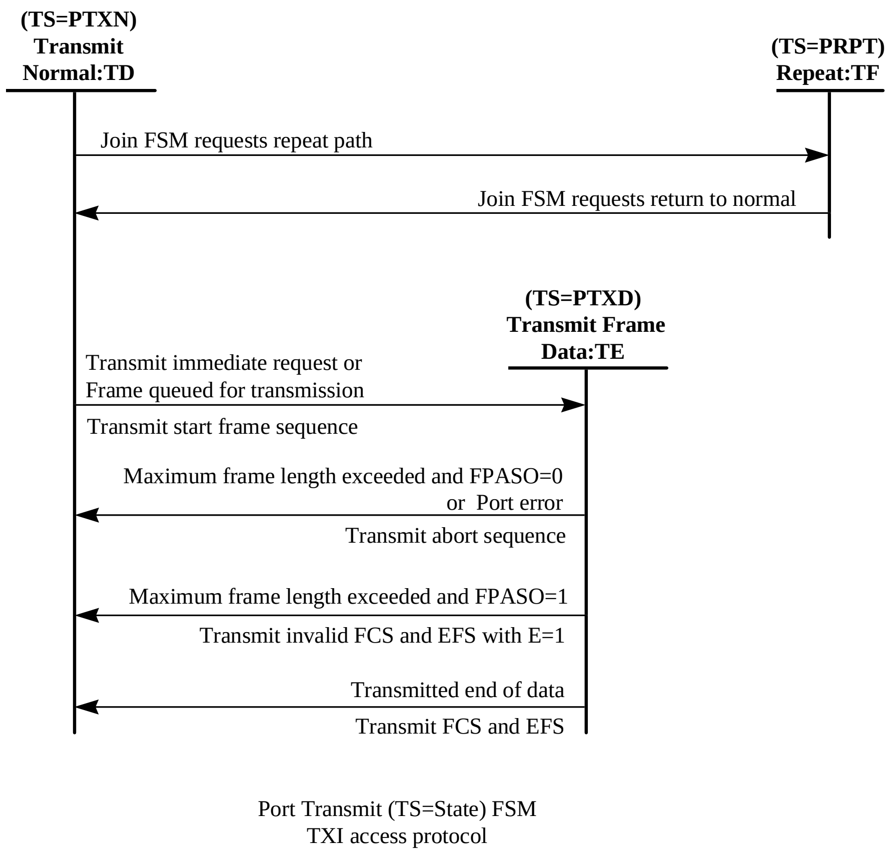


Figure 9-12—Overview C-Port Transmit FSM

9.3.1.3 C-Port Monitor FSM overview

The C-Port Monitor FSM is shown in figure 9-13. The monitor FSM supports the Heart Beat, Hard Error Recovery, and Error Reporting functions as described in 9.1.9, 9.1.10, and 9.1.11, respectively.

The precise definition of the Monitor FSM is found in tables 9-9 through 9-12.

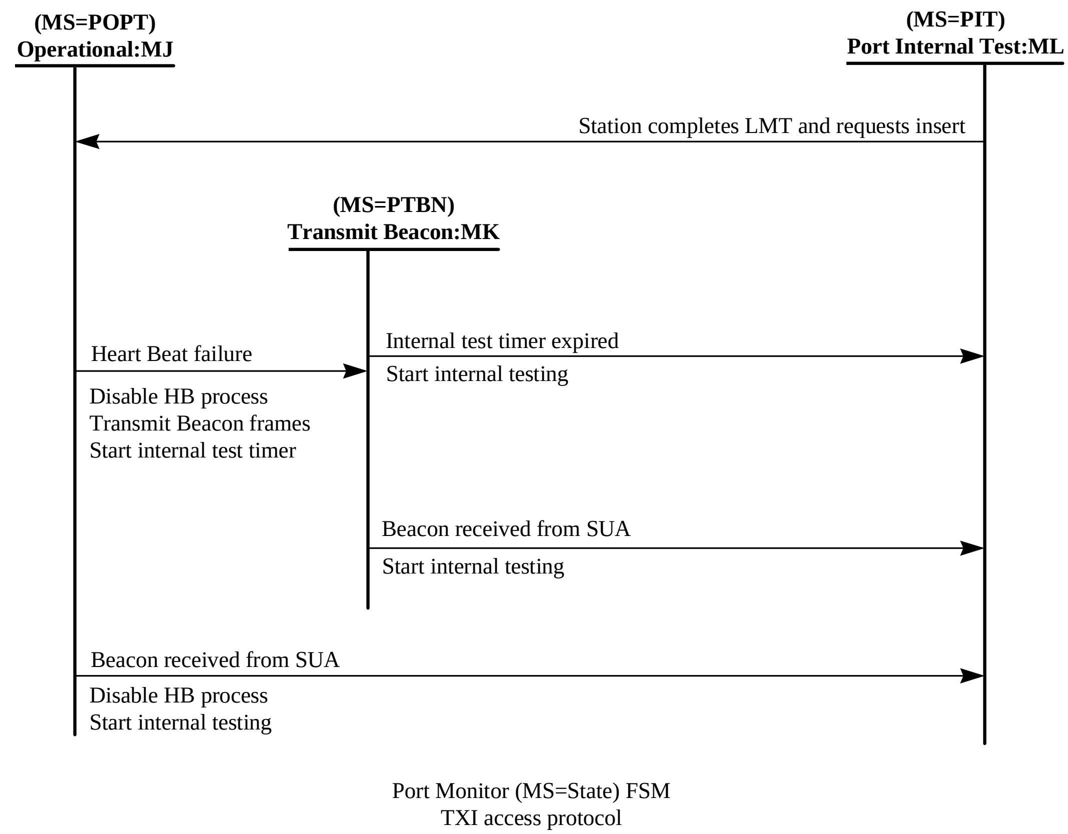


Figure 9-13—Overview C-Port Monitor FSM

9.3.2 Abbreviations and notations

The following list contains abbreviations and notations used in the C-Port Operational tables and State Machine descriptions. Additional terms may be found in 4.2.3 and 4.2.4.

9.3.2.1 TXI C-Port policy flag notations

FPACO = Flag, C-Port AC repeat path option
FPASO = Flag, C-Port abort sequence option
FPBHO = Flag, C-Port beacon handling option
FPECO = Flag, C-Port error counting option
FPFCO = Flag, C-Port frame control option
FPMRO = Flag, C-Port medium rate option
FPOTO = Flag, C-Port operation table option

9.3.2.2 PMAC policy variable notations

PPV(AP_MASK) = Access protocol mask
PPV(MAX_TX) = Maximum octets transmit
PPV(PD_MASK) = Phantom subvector value mask

9.3.2.3 PMAC interface flag notations

FIPTKPPE = Flag, interface C-Port TKP port mode error
FIPTKPP = Flag, interface C-Port TKP port mode
FIPTKPS = Flag, interface C-Port TKP Station emulation
FIPTXIS = Flag, interface C-Port TXI Station emulation

9.3.2.4 PMAC protocol flag notations

FPBNT = Flag, C-Port beacon test
FPBLT = Flag, C-Port break lobe test
FPBPF = Flag, C-Port bypass force
FPBPW = Flag, C-Port bypass wait
FPDLT = Flag, C-Port disrupt lobe test
FPDTUREQ = Flag, C-Port DTU request pending
FPEFS = Flag, C-Port ending frame sequence sent
FPER = Flag, C-Port error report
FPHBA = Flag, C-Port heart beat active
FPINSD = Flag, insert detected
FPINSLE = Flag, insert loss enabled
FPJC = Flag, C-Port join complete
FPOP = Flag, C-Port operational
FPRPT = Flag, C-Port repeat path enabled
FPSL = Flag, C-Port signal loss
FPSLD = Flag, C-Port signal loss detected
FPTI = Flag, C-Port transmit idles
FPTXC = Flag, C-Port transmit from crystal
FPTX_LTH = Flag, C-Port transmit length

9.3.2.5 PMAC error counter notations

CPABE = Counter, abort error
CPBE = Counter, burst error
CPFE = Counter, frequency error
CPIE = Counter, internal error
CPLE = Counter, line error
CPRCE = Counter, receive congestion error

9.3.2.6 PMAC counter notations

CPBTX = Counter, byte transmitted
CPRQ = Counter C-Port registration query

9.3.2.7 PMAC stored value notations

S_AP = Stored, access protocol
SDAC_RC = Stored duplicate address check return code
SIAC = Stored individual address count

SPD = Stored phantom subvector value
SUA = Stored upstream address

9.3.2.8 PMAC timer notations

TPBLT = Timer, C-Port break lobe test
TPDLT = Timer, C-Port disrupt lobe test
TPER = Timer, C-Port error report
TPIRD = Timer, C-Port insert response delay
TPIT = Timer, C-Port internal test
TPLMTR = Timer, C-Port LMT running
TPQHB = Timer, C-Port queue heart beat
TPQP = Timer, C-Port queue PDU
TPRHB = Timer, C-Port received heart beat
TPRQD = Timer, C-Port registration query delay
TPSL = Timer, C-Port signal loss

9.3.2.9 PMAC join state notations (JS=)

BP = Bypass
PANNC = C-Port await neighbor notification complete
PDAC = C-Port duplicate address check
PDAD = C-Port duplicate address detected
PJCI = C-Port join complete TXI
PJCP = C-Port join complete TKP
PLT = C-Port lobe test
PREG = C-Port registration
PRQ = C-Port registration query

9.3.2.10 PMAC transmit state notations (TS=)

PRPT = C-Port repeat
PTXD = C-Port transmit frame data
PTXN = C-Port transmit normal

9.3.2.11 PMAC monitor state notations (MS=)

POPT = C-Port operational
PIT = C-Port internal test
PTBN = C-Port transmit beacon

9.3.3 State machine elements

The state machines use the following counters, flags, and states to describe the operation of the C-Port. These are logical elements used solely to describe the operation and do not specify an implementation. The value of the flags and counters is only meaningful internally to the state machine definition. Conformance will be based only on the C-Port's ability to perform the protocol as specified by the C-Port Operation tables in 9.3, 9.4, and 9.5.

9.3.3.1 PMAC counters

Unless otherwise specified, all counters are set to 0 by the "Set_initial_conditions" action as the result of the Join FSM transition detecting the Connect.PMAC request.

A counter may be set to a value, incremented, or decremented as a result of an action specified in the C-Port Operation table.

The following C-Port counters are defined.

Counter, C-Port Bytes Transmitted (CPBTX). The counter CPBTX is used by the Transmit FSM to limit the number of octets that can be transmitted. The CPBTX is compared against PPV(MAX_TX). When CPBTX exceeds PPV(MAX_TX), the Transmit FSM terminates the transmission of the frame and transmits an abort sequence. See 10.5.2.2 for the definition of PPV(MAX_TX).

When PPV(MAX_TX) is assigned a value range, a single value within the range is used for the purpose of comparison. An implementation is not required to use the same value of PPV(MAX_TX) for each comparison.

Counter, C-Port Registration Query (CPRQ). The counter CPRQ is used by the registration query protocol to control the number of Registration Query MAC frames that are resent to the Station. The value is initially set to 4 on entry to the Registration Query state (JS=PRQ) and is decremented each time a registration query frame is sent.

9.3.3.2 PMAC protocol flags

The following C-Port flags, listed alphabetically, are defined.

Flag, C-Port Beacon Test (FPBNT). The flag FPBNT is used by the Monitor FSM to signal the Join FSM to enter the Lobe Test (JS=PLT) state in order to perform a lobe media test as part of the Hard Error Recovery process. The flag is set by the Monitor FSM when loss of phantom signal is detected by the C-Port. The flag is reset by the Join FSM when entering the Lobe Test state.

Flag, C-Port Break Lobe Test (FPBLT). If the C-Port is configured by Management to support the TXI AP only (AP_MASK=0002), this flag is set to 1 on the receipt of any frame, or optionally, token. FPBLT set to 1 indicates that the Join FSM is preparing to disrupt the attached Station’s lobe test.

Flag, C-Port Bypass Force (FPBPF). FPBPF is set to 1 when a “PORT_ERR(not_correctable)” event is detected. The Join FSM upon detecting FPBPF=1 and the Transmit Normal state (TS=PTXN) forces the Join FSM to enter the Bypass state (JS=BP).

Flag, C-Port Bypass Wait (FPBPW). FPBPW is set to 1 by the Join FSM to delay exit to the Bypass state (JS=BP) until the transmission of an Insert Response MAC frame with a DTR_RSP subvector value of 8020 has been completed. This prevents the C-Port from closing until the frame has transmitted.

Flag, C-Port Disrupt Lobe Test (FPDLT). At the expiration of timer TPBLT, this flag is set to 1, timer TPDLT is started, and the repeat path is broken (FPRPT=0). FPDLT set to 1 indicates to the FSM that the attached Station’s lobe test is in the process of being disrupted.

Flag, C-Port DTU Request Pending (FPDTUREQ). The flag FPDTUREQ is used by the Join FSM when making a request to the DTU for service (DTU_UNITDATA.indicate). This is used by the PMAC to pass address information during Join to the DTU and is part of the Duplicate Address function that occurs during the Join process. The value of FPDTUREQ is initially 0. It is set to 1 when a DTU_DAC.request request is issued by the PMAC. It is set to 0 by the Join FSM when a DTU_DAC.response is received by the PMAC.

Flag, C-Port Ending Frame Sequence Sent (FPEFS). The flag FPEFS is used by the Transmit FSM to signal the Join FSM that it has transmitted an ending frame sequence (EFS). The Join FSM sets up the signaling by setting FPEFS to 0 and queuing a frame for transmission. When the Transmit FSM has transmitted the frame (TX_EFS), it sets FPEFS to 1. The Join FSM detects the event FPEFS=1 and executes the appropriate actions.

Flag, C-Port Error Report (FPER). The flag FPER is set to 1 when the first reportable error is detected and indicates that subsequent errors should not reset the error timer TPER. Flag FPER is set to 0 when the error timer expires. When TPER expires, the C-Port issues a MRI_UNITDATA.indication containing a Report Error PDU.

Flag, C-Port Heart Beat Active (FPHBA). The flag FPHBA is used to control the Heart Beat process defined in 9.1.8. This flag is initially set to 0 and is set to 1 when the Join FSM enters the Duplicate Address Check (JS=PDAC) state. When this flag is set to 1, the Heart Beat process timers are started (TPQHB and TPRHB) and loss of heart beat can be detected. The flag is set to 0 when the Beacon process is started by the Monitor FSM due to either loss of heart beat, or receipt of a Beacon frame (SA=SUA).

Flag, C-Port Insert Detected (FPINSD). The flag FPINSD indicates the detection, or the lack thereof, of an insertion request from the phantom signaling channel. FPINSD is set to 1 upon receiving PM_ STATUS.indication(Insert=Detected). FPINSD is set to 0 upon receiving PM_STATUS.indication (Insert=Not_detected).

Flag, C-Port Insert Loss Enabled (FPINSLE). The flag FPINSLE is used by the PMAC in conjunction with FPINSD to determine that phantom signaling has changed from Insert=Detected to Insert=Not_detected once the C-Port is in Join Complete (JS=PJCI). The flag is set to 1 when the event PM_STATUS.indication(Insert=Detected) occurs. The flag is set to 0 on the transition from JS=PDAC to JS=PJCI.

Flag, C-Port Join Complete (FPJC). The flag FPJC is set to 1 upon successful completion of the Duplicate Address Check state (JS=PDAC) and entry into the Join Complete TXI state (JS=PJCI). This flag is used by the Join FSM to determine when the transition to Join Complete TXI (JS=PJCI) requires a completed duplicate address test; the difference between an initial joining of the Station and the recovery process.

Flag, C-Port Operational (FPOP). The flag FPOP is set to 1 when the C-Port enters the Join Complete TXI state (JS=PJCI). When FPOP is 0, the C-Port will not forward LLC and Management frames, and the Transmit FSM is unable to transmit queued frames (PDU_QUEUED). When FPOP is 1, the C-Port will forward LLC frames to the DTU, Management frames to the Management Routing Interface (MRI), and the Transmit FSM can transmit queued frames.

Flag, C-Port Repeat Path Enabled (FPRPT). The flag FPRPT is used to signal the Transmit FSM to configure into a repeat path. When FPRPT is set to 1, the Transmit FSM will set FPTI=FPTXC=0, creating a repeat path for use by the Station during a lobe media test. When FPRPT is set to 0, the Transmit FSM will set FPTI=FPTXC=1, returning the TRANSMIT FSM to its normal operating mode for the TXI access protocol. FPRPT is set and reset only by the Join FSM.

Flag, C-Port Signal Loss (FPSL). The flag FPSL indicates the presence or absence of a valid signal from the lobe as defined in 5.1.4.1. FPSL is set to 1 to indicate the absence of a valid signal when the PMAC detects PM_ STATUS.indication(Signal_detected=Signal_loss) for the entire period of timer TPSL (signal loss is filtered). FPSL is set to 0 to indicate the presence of a valid signal whenever PMAC detects PM_STATUS.indication(Signal_detected=Signal_acquired).

Flag, C-Port Signal Loss Detected (FPSLD). The flag FPSLD is used to determine whether the PMAC Signal Loss Filtering process is active or inactive. The Signal Loss Filtering process is used to determine whether or not the PHY signal loss event is a steady-state condition. FPSLD is set to 1 to activate the Signal Loss Filtering process if not already active whenever the PMAC detects PM_STATUS.indication

(Signal_detected=Signal_loss). FPSLD is set to 0 to deactivate the Signal Loss Filtering process whenever the PMAC detects PM_STATUS.indication(Signal_detected=Signal_acquired).

Flag, C-Port Transmit from Crystal (FPTXC). The flag FPTXC is used to control whether the C-Port is deriving its transmit timing reference from its crystal or from its received signal. When FPTXC is set to 1, the PMAC is using its crystal as the source of its transmit timing reference [indicates PS_ CONTROL.request(Crystal_transmit=Asserted)] and has added the elastic and latency buffers into the data path. When FPTXC is set to 0, the PMAC is using its receiver's clock recovery circuits as the source of its transmit timing reference [indicates PS_CONTROL.request(Crystal_transmit=Not_asserted)] and has removed the elastic and fixed latency buffers from the data path.

Flag, C-Port Transmit Idles (FPTI). The flag FPTI is used to control the transmission of idles (fill). The TXI access protocol normally has the flag FPTI set to 1 [indicates PS_CONTROL.request(Repeat_ mode=Fill)], which causes the C-Port to source fill. FPTI is set to 0 [indicates PS_ CONTROL.request (Repeat_mode=Repeat)]:

a) When the Transmit FSM is transmitting data (TS=PTXD), or
b) When the Transmit FSM is supporting LMT by providing a repeat path (TS=PRPT), or
c) When the PMAC exits to the TKP access protocol, or
d) When the PMAC closes by entering the Bypass state (JS=BP).

Flag, C-Port Transmit Length (FPTX_LTH). The flag FPTX_LTH is used by the PMAC to determine if the frame length of the currently transmitting frame is known. This flag is part of the notation used in describing cut-through support for a DTU. FPTX_LTH is set to 1 when the length of the currently transmitting frame is known. FPTX_LTH is set to 0 when the length of the currently transmitting frame is not known.

9.3.3.3 PMAC states

There are a set of states for the Join Ring FSM, the Monitor FSM, and the Transmit FSM. An FSM can be in only one state at any time.

9.3.3.3.1 C-Port join states

The C-Port join state (JS=) notation is used to identify the current state of the C-Port Join FSM. The C-Port join state values are Bypass, Registration, Await Neighbor Notification Complete, Lobe Test, Duplicate Address Check, Join Complete—TXI, Join Complete—TKP, Registration Query, and Duplicate Address Detected. During the Bypass state, normal operation is suspended and no assumptions can be made regarding the transmission or reception of data. Join states, listed by state value, are defined as follows.

Join State J0, Bypass (JS=BP). This is the idle state for the C-Port. In this state the C-Port waits for the connect request (Connect.PMAC) and is not required to perform any other functions. The setting of the policy flag FPOTO determines if the C-Port operates in Station Emulation mode (FPOTO=0), as defined in 9.2 and 9.5, or operates in Port mode (FPOTO=1), as defined in 9.3 and 9.4.

Join State JK, C-Port Registration (JS=PREG). In this state the C-Port waits for a Station to either send a registration frame or raise phantom. If the Station sends a Registration Request frame to the C-Port, the C-Port will process this frame and respond with a Registration Response frame. If the TXI access protocol is requested, the C-Port will enter the Lobe Test state (JS=PLT).

A Station signals that it is using the TKP access protocol by raising phantom. When phantom is detected by the C-Port, a Claim Token MAC frame is sent and the C-Port exits to the Await Neighbor Notification Complete state.

Join State JN, C-Port Await Neighbor Notification Complete (JS=PANNC). In this state, the C-Port waits until the Station has completed Neighbor Notification. If the C-Port times out waiting for Neighbor Notification to complete, it will return to Port Registration. During Neighbor Notification, the C-Port determines if the Station's address is a duplicate of the C-Port's address. If the Station's address is a duplicate, the C-Port enters the C-Port Duplicate Address Detected state (JS=PDAD).

If Neighbor Notification completes without a duplicate address being detected, the C-Port enters Registration Query (JS=PRQ) if the C-Port supports the TXI access protocol. Otherwise, the C-Port enters the Join Complete state (JS=PJCP).

Join State JL, C-Port Lobe Test (JS=PLT). In this state, the C-Port assists the Station in performing the test on the attached lobe by providing a simple repeat path capable of repeating either frames or tokens. The Station is responsible for determining if the lobe passes or fails this test. If the Station determines that the lobe passes the test, the Station will issue an insert request. If the C-Port times out during this state (TPLMTR=E), the Station has failed the test, and the C-Port enters the Registration state (JS=PREG).

Join State JM, C-Port Duplicate Address Check (JS=PDAC). In this state, the C-Port responds to the Insert Request frame sent by the Station at the end of the lobe media test. If the DTU has completed the duplicate address check and returned its response to the MAC, the C-Port will issue an insert response with the appropriate DTR Response Code subvector. If the duplicate address check passes, then the C-Port enters the Port Join Complete—TXI state (JS=PJCI). If the check fails, the C-Port enters the Bypass state (JS=BP).

Join State JP, C-Port Join Complete—TXI (JS=PJCI). In this state, the C-Port has completed the join process and is fully operational on a dedicated connection using the TXI access protocol. In this state, the C-Port may pass LLC frames to the DTU for forwarding.

Join State JQ, C-Port Join Complete—TKP (JS=PJCP). In this state, the C-Port has completed the join process and is fully operational on a dedicated connection using the TKP access protocol. In this state, the C-Port may pass LLC frames to the DTU for forwarding.

Join State JR, C-Port Registration Query (JS=PRQ). In this state, the C-Port transmits Registration Query MAC frames allowing the Station to decide if it wants to continue using the TKP access protocol, or to switch to the TXI access protocol. The Station acknowledges a requested change to the TXI access protocol by dropping the phantom signal to the C-Port. When phantom signal is lost, the C-Port returns to the Registration state (JS=PREG). The C-Port exits to Join Complete—TKP (JS=PJCP) if the Station does not drop phantom.

Join State JT, C-Port Duplicate Address Detected (JS=PDAD). In this state, the C-Port is waiting for a Station, whose address is a duplicate of the C-Port's, to drop its phantom signal. Once the Station drops its phantom signal, the C-Port enters the Registration state (JS=PREG).

9.3.3.3.2 C-Port monitor states

The monitor state (MS=) notation is used to identify the current state of the C-Port Monitor FSM. The monitor state values are Operational, Transmit Beacon, and Internal Test. Monitor states, listed by state value, are defined as follows.

Monitor State MJ, C-Port Operational (MS=POPT). This is the normal operating state for the C-Port Monitor FSM. In this state the link is operational and the Heart Beat function, described in 9.1.9, is used to inform the Station that the PMAC is running.

Monitor State MK, C-Port Transmit Beacon (MS=PTBN). The C-Port enters this state when it detects loss of heart beat on the link. There are two beacon types defined for TXI access protocol: loss of signal and loss of heart beat. The C-Port stays in this state until

— The C-Port receives a Beacon frame from the attached Station, or
— The Internal Test Timer (TPIT) has expired.

While in this state, the C-Port issues beacon frames with the appropriate beacon type indicated. The frames are paced by a timer (TPQP). Exit from this state is to internal test.

Monitor State ML, C-Port Internal Test (MS=PIT). The Internal Test state is entered from the Transmit Beacon state (MS=PTBN) when timer TPIT expires, or the Operational state (MS=POPT) when a Beacon frame is received. In this state, the C-Port performs its internal tests, which must be completed within 1.2 s. When the C-Port detects loss of phantom signal, the Internal Test state sets the flag FPBNT=1 to signal the Join FSM to support the Station during its lobe media test by providing a repeat path. When FPBNT=1, the Join FSM re-enters its Lobe Test state (JS=PLT) following the same sequence the Join FSM followed during the normal Join process by repeating the transitions from JS=PLT to JS=PDAC to JS=PJCI. The only exception is for the duplicate address check, which is not performed. When FPBNT=1 and the C-Port's internal test is successful, the C-Port always responds to the Station's insert request with a positive (DTR_RSP=0) Insert Response MAC frame. The Monitor FSM enters the Operational state (MS=POPT) when a valid Insert Request MAC frame is received from the attached Station (indicating the Station successfully recovered from its Hard Error Recovery process).

9.3.3.3.3 C-Port transmit states

The transmit state (TS=) notation is used to identify the current state of the transmit FSM. The transmit state values are Transmit Normal, Transmit Data (of a frame), and Repeat. Transmit states are defined as follows.

Transmit State TD, C-Port Transmit Normal (TS=PTXN). Transmit Normal is the rest state for the Transmit FSM. This state services transmit immediate and queued frame requests by first transmitting the SFS field and then entering the Transmit Frame Data state (TS=TPXD).

Queued frames will be serviced only if the C-Port is operational (FPOP=1).

The Join FSM can request that the Transmit FSM enter the Repeat state. This state is used to support lobe media test. The flag FPRPT is used to signal this request from the Join FSM.

Transmit State TE, C-Port Transmit Frame Data (TS=PTXD). In this state, the Transmit FSM transmits the data portion (FC, DA, SA, RI (if present), INFO (if present), and FCS fields) of the frame. It then sends the EFS field, sets FPEFS to 1, indicating to the Join FSM that the EFS has been transmitted (see 9.2.2.3), and enters the Transmit Normal state (JS=PTXN).

Transmit State TF, C-Port Repeat (TS=PRPT). The Repeat state is used by the C-Port to support the Station's lobe media test. Entry and exit to this state is controlled by the Join FSM by either directly forcing a state transition or by use of flag FPRPT.

9.3.4 C-Port Port Operation tables

This subclause specifies the procedures that are used in the PMAC for the C-Port operating in Port mode. The Join FSM supports both the TXI and the TKP access protocols. The remaining tables support only the TXI protocol. These Port Operation tables use the terms (optional), (optional-i), (optional-x) and (optional-unk) defined in 9.1.1.2.

9.3.4.1 C-Port Join Port Operation table

Table 9-7—C-Port Join Port Operation table for the TKP or TXI access protocol

S/T	REF	Event/condition	Action/output
J01	1002	**Connect.PMAC** & FPOTO=0 & FSREGO=0 & JS=BP << C-Port Emulation of a DTR Station using the TKP access protocol, exit to 9.5. >>	JS=LT; Set_initial_conditions; FTI=x; FTXC=1; FIPTKPS=1; TEST; [TLMTR=R (optional-i)]
J0A	1001	**Connect.PMAC** & FPOTO=0 & FSREGO=1 & JS=BP << C-Port Emulation of a DTR Station using the TXI access protocol, exit to 9.2. >>	JS=SREG; TS=STXN; Set_initial_conditions; FIPTXIS=1; FSTXC=FSTI=1; TSIS=R
J0K	1000	**Connect.PMAC** & FPOTO=1 & JS=BP << Starting point for C-Port Operation >>	JS=PREG; TS=PRPT; Set_initial_conditions; FPRPT=1 << TXI-only configured C-Port shall cause a lobe test failure in a Station opening with the TKP access protocol >>
JN0	1018	**Disconnect.PMAC** & JS=PANNC	JS=BP
JM0	1040	**Disconnect.PMAC** & JS=PDAC	JS=BP
JT0	1103	**Disconnect.PMAC** & JS=PDAD	JS=BP
JP0	1056	**Disconnect.PMAC** & JS=PJCI	JS=BP
JQ0	1061	**Disconnect.PMAC** & JS=PJCP	JS=BP
JL0	1026	**Disconnect.PMAC** & JS=PLT	JS=BP
JK0	1007	**Disconnect.PMAC** & JS=PREG	JS=BP
JR0	1010	**Disconnect.PMAC** & JS=PRQ	JS=BP
	1037	**DTU_DAC.response(RC)** & JS=PDAC	FPDTUREQ=0; SDAC_RC=RC
	1022	**DTU_DAC.response(RC)** & JS=PLT	FPDTUREQ=0; SDAC_RC=RC
	359	**FDC=1** & FNC=0 & MS=RPT & FAM=1	[FNC=1 (optional)]
	027	**FDC=1** & FNW=1 & FNC=0 & MS=RPT & FAM=0	FNC=1; QUE_SMP_PDU
	028	**FDC=1** & FNW=1 & FNC=0 & MS=RPT & FAM=1	FNC=1
JQ0	1068	**FIPTKPPE=1** & JS=PJCP << Error running Configuration 3, DTR C-Port in Port mode, TKP AP. >>	JS=BP
JNQ	1015	**FNC=1 & AND(PPV(AP_MASK),0002)=0000** & JS=PANNC << C-Port is not configured by Management to support the TXI access protocol and must bypass registration query. >>	JS=PJCP; FINS=FJR=FPJC=1 << C-Port Join complete using TKP access protocol on a dedicated link >>
JNR	1085	**FNC=1 & AND(PPV(AP_MASK),0002)=0002** & JS=PANNC << Neighbor notification complete, ready to start registration query protocol. >>	JS=PRQ; QUE_REG_QRY; CPRQ=4; TPQP=R; **If** FPBHO=0 then FINS=1
JPL	1051	**FPBNT=1** & JS=PJCI	JS=PLT; FPBNT=0; FPRPT=1; TPLMTR=R << Prepare for Station's LMT by providing a repeat path and start LMT duration timer >>

Table 9-7—C-Port Join Port Operation table for the TKP or TXI access protocol *(Continued)*

S/T	REF	Event/condition	Action/output
JM0	1046	**FPBPF=1 & TS=PTXN** & JS=PDAC	JS=BP
JP0	1058	**FPBPF=1 & TS=PTXN** & JS=PJCI	JS=BP
JL0	1032	**FPBPF=1 & TS=PTXN** & JS=PLT	JS=BP
JK0	1009	**FPBPF=1 & TS=PTXN** & JS=PREG	JS=BP
JN0	1021	**FPBPF=1 & TS=RPT** & JS=PANNC	JS=BP
JQ0	1063	**FPBPF=1 & TS=RPT** & JS=PJCP	JS=BP
JR0	1093	**FPBPF=1 & TS=RPT** & JS=PRQ	JS=BP
	1036	**FPEFS=1** & FPBPW=0 & FPRPT=0 & JS=PLT << Signaling from Transmit FSM that data has been transmitted. >>	FPRPT=1 << Signal Transmit FSM to enter Repeat state to support the Station's LMT >>
JM0	1075	**FPEFS=1** & FPBPW=1 & JS=PDAC	JS=BP << Station rejected by C-Port, which closes after INS_RSP has been transmitted >>
JL0	1083	**FPEFS=1** & FPBPW=1 & JS=PLT	JS=BP << Port closes after sending Registration Response MAC in response to an unexpected Registration Request frame while in hard error recovery. (See REF 1092) >>
	1072	**FPEFS=1** & FPRPT=0 & JS=PREG	FPRPT=1 << Reestablish repeat path after transmitting frame >>
JQ0	1066	**FPINSD=0** & FBR=1 & MS=RBN & JS=PJCP	JS=BP << Station drops phantom for a second time while in hard error recovery >>
JQ0	1069	**FPINSD=0** & FBT=1 & MS=TBN & JS=PJCP	JS=BP << Station drops phantom for a second time while in hard error recovery >>
JP0	1049	**FPINSD=0** & FPINSLE=1 & FPOP=1 & JS=PJCI	JS=BP << Station deinserted—normal condition >>
JNK	1017	**FPINSD=0** & JS=PANNC << Station closed—unknown reason >>	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FIPTKPP=0; FPRPT=1; SUA=0; FA(monitor)=0
JTK	1099	**FPINSD=0** & JS=PDAD	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FIPTKPP=0; FPRPT=1; SUA=0; FA(monitor)=0
JRK	1089	**FPINSD=0** & JS=PRQ << Registration query protocol >>	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FIPTKPP=0; FPRPT=1; FPTXC=0; SUA=0; FA(monitor)=0
JP0	1033	**FPINSD=0** & MS=PTBN & JS=PJCI	JS=BP << Station closed >>
JQ0	1012	**FPINSD=0** & MS=RCT & JS=PJCP	JS=BP << Station closed >>

Table 9-7—C-Port Join Port Operation table for the TKP or TXI access protocol *(Continued)*

S/T	REF	Event/condition	Action/output
JQ0	1071	**FPINSD=0 &** MS=RPT & JS=PJCP	JS=BP << Station closed >>
JQ0	1013	**FPINSD=0** & MS=TCT & JS=PJCP	JS=BP << Station closed >>
JQ0	1014	**FPINSD=0** & MS=TRP & JS=PJCP	JS=BP << Station closed >>
JKN	1006	**FPINSD=1** & AND(PPV(AP_MASK),0001)=0001 & JS=PREG << Classic station or DTR Station using TKP access protocol, where the C-Port supports a Station using TKP access protocol. >>	JS=PANNC; MS=TCT; TS=RPT; FPTI=0; FIPTKPP=1; << Flags used by the C-Port TKP Transmit FSM >> FDC=FTI=FOP=FTXC=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU) << C-Port starts up the TKP Access Protocol Monitor and Transmit FSMs. (See 9.4) >>
	1105	**FR_AC** & AND(PPV(AP_MASK),0001)=0000 & FPBLT=0 & JS=PREG	FPBLT=1; TPBLT=R << Start sequence to break attached Station's lobe test >>
	1101	**FR_AC** & FPDLT=1 & JS=PREG	TPDLT=R << Frame detected during lobe test disruption, extend disruption period by restarting TPDLT >>
JM0	1044	**FR_AMP** & JS=PDAC	JS=BP
JP0	1052	**FR_AMP** & JS=PJCI	JS=BP
JL0	1030	**FR_AMP** & JS=PLT	JS=BP
JNT	1097	**FR_AMP(SA=MA)** & FAM=0 & JS=PANNC	JS=PDAD; Set_initial_conditions << Duplicate Address Detected >>
JR0	1065	**FR_BN** & FPBHO=1 & JS=PRQ	JS=BP
JN0	1020	**FR_BN** & JS=PANNC	JS=BP
JM0	1041	**FR_BN** & JS=PDAC	JS=BP
JL0	1027	**FR_BN** & JS=PLT	JS=BP
JM0	1043	**FR_CT** & JS=PDAC	JS=BP
JP0	1053	**FR_CT** & JS=PJCI	JS=BP
JL0	1029	**FR_CT** & JS=PLT	JS=BP
	1074	**FR_INS_REQ(SA=SUA)** & FPJC=0 & FPDTUREQ=0 & JS=PDAC	TPIRD=R; << Start timer to send INS_RSP >> **If** SDAC_RC=8020 then FPHBA=0 << Disable Heart Beat since Join will not complete >>
	1077	**FR_INS_REQ(SA=SUA)** & FPJC=0 & FPDTUREQ=0 & SDAC_RC=0000 & JS=PLT	FPHBA=1; TPRHB=R; TPIRD=R; TPQHB=R << Heart Beat started, start timer to transmit INS_RSP >>

Table 9-7—C-Port Join Port Operation table for the TKP or TXI access protocol *(Continued)*

S/T	REF	Event/condition	Action/output
	1078	**FR_INS_REQ(SA=SUA)** & FPJC=0 & FPDTUREQ=0 & SDAC_RC=8020 & JS=PLT	TPIRD=R << Heart Beat not started since Join will not complete, start timer to transmit INS_RSP >>
	1079	**FR_INS_REQ(SA=SUA)** & FPJC=0 & FPDTUREQ=1 & JS=PLT	FPHBA=1; TPRHB=R; TPQHB=R << Heart Beat started, no response from DTU >>
JLMa	1023	**FR_INS_REQ(SA=SUA)** & FPJC=0 & JS=PLT << End of LMT—Success! >>	JS=PDAC; MS=POPT; FPRPT=0; FPTXC=1; << Clock change >>
JLMb	1073	**FR_INS_REQ(SA=SUA)** & FPJC=1 & JS=PLT << Successful completion of LMT after hard error recovery. >>	JS=PDAC; FPHBA=FPTXC=1; FPRPT=0; TPRHB=R; TPIRD=R; TPQHB=R << Clock change, Heart Beat started, start timer to transmit INS_RSP >>
	1050	**FR_INS_REQ(SA=SUA)** & FPOP=1 & JS=PJCI	TPIRD=R << Assured delivery of the Insert Response MAC frame >>
JM0	1060	**FR_MAC(DA=any_recognized_address & SA<>SUA & VC=00)** & JS=PDAC	JS=BP << Protocol check >>
JP0	1055	**FR_MAC(DA=any_recognized_address & SA<>SUA & VC=00)** & JS=PJCI	JS=BP << Protocol check >>
JL0	1059	**FR_MAC(DA=any_recognized_address & SA<>SUA & VC=00)** & JS=PLT	JS=BP << Protocol check >>
JM0	1082	**FR_MAC(DA=any_recognized_address & SA<>SUA & VC=30)** & JS=PDAC	JS=BP << Protocol check >>
JP0	1084	**FR_MAC(DA=any_recognized_address & SA<>SUA & VC=30)** & JS=PJCI	JS=BP << Protocol check >>
JL0	1090	**FR_MAC(DA=any_recognized_address & SA<>SUA & VC=30)** & JS=PLT	JS=BP << Protocol check >>
	1080	**FR_REG_REQ** & AND(PPV(PD_MASK),PD,)=0000 & JS=PREG << Access denied, unsupported out-of-band signaling. >>	FPBLT=FPEFS=FPRPT=0; TXI_REG_RSP_PDU(AP_RSP=0000)
	1004	**FR_REG_REQ** & AND(PPV(AP_MASK),AP_REQ,)=0000 & JS=PREG << Access denied by C-Port, unsupported protocol. >>	FPBLT=FPEFS=FPRPT=0; TXI_REG_RSP_PDU(AP_RSP=0000)
	1092	**FR_REG_REQ** & FPJC=1 & JS=PLT << Unexpected registration request received, possible Station error. >>	FPBPW=1; FPEFS=0; TXI_REG_RSP_PDU(AP_RSP=0000) << Reception of this frame may cause the Station to close >>
JLK	1034	**FR_REG_REQ(AP_REQ<>S_AP)** & FPJC=0 & JS=PLT	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FPRPT=1; SUA=0;
	1005	**FR_REG_REQ(AP_REQ=0001)** & JS=PREG << Invalid AP_REQ value. >>	FPBLT=FPEFS=FPRPT=0; TXI_REG_RSP_PDU(AP_RSP=0000)

Table 9-7—C-Port Join Port Operation table for the TKP or TXI access protocol *(Continued)*

S/T	REF	Event/condition	Action/output
JKL	1003	**FR_REG_REQ(AP_REQ=0002)** & AND(PPV(AP_MASK),AP_REQ,)=0002 & AND(PPV(PD_MASK),PD,)=0001 & JS=PREG << Station requesting TXI access protocol that is supported by this C-Port. >>	JS=PLT; FPDTUREQ=1; FPBLT=FPEFS=FPRPT=0; TPLMTR=R; SPD=PD; S_AP=AP_REQ; SIAC=IAC; SUA=SA; TXI_REG_RSP_PDU(AP_RSP=0002); DTU_DAC.request(SA, SIAC)
	1025	**FR_REG_REQ(AP_REQ=S_AP & PD=SPD)** & FPJC=0 & JS=PLT	FPEFS=FPRPT=0; TPLMTR=R; TXI_REG_RSP_PDU(AP_RSP=S_AP) << Assured delivery of Registration Response frame >>
	1067	**FR_REG_REQ(AP_REQ>0002)** & JS=PREG << Access denied by C-Port, invalid AP_REQ >>	FPBLT=FPEFS=FPRPT=0; TXI_REG_RSP_PDU(AP_RSP=0000)
JLK	1091	**FR_REG_REQ(PD<>SPD)** & FPJC=0 & JS=PLT	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FPRPT=1; SUA=0;
JM0	1042	**FR_RP** & JS=PDAC	JS=BP
JP0	1054	**FR_RP** & JS=PJCI	JS=BP
JL0	1028	**FR_RP** & JS=PLT	JS=BP
JNT	1098	**FR_SMP(SA=MA)** & FAM=1 & JS=PANNC	JS=PDAD; Set_initial_conditions << Duplicate address detected >>
JR0	1011	**INTERNAL_ERR(not_correctable)** & JS=PRQ	JS=BP
JN0	1019	**INTERNAL_ERR(not_correctable)** & JS=PANNC	JS=BP
JM0	1045	**INTERNAL_ERR(not_correctable)** & JS=PDAC	JS=BP
JT0	1104	**INTERNAL_ERR(not_correctable)** & JS=PDAD	JS=BP
JP0	1057	**INTERNAL_ERR(not_correctable)** & JS=PJCI	JS=BP
JQ0	1062	**INTERNAL_ERR(not_correctable)** & JS=PJCP	JS=BP
JL0	1031	**INTERNAL_ERR(not_correctable)** & JS=PLT	JS=BP
JK0	1008	**INTERNAL_ERR(not_correctable)** & JS=PREG	JS=BP
JP0	1064	**Internal_Test_Fail** & JS=PJCI & MS=PIT	JS=BP
JNK	1070	**TCT=E** & MS=RCT & JS=PANNC << Claim failed >>	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FIPTKPP=0; FPRPT=1; SUA=0; FA(monitor)=0 << C-Port enters registration as if the Station had not asserted its phantom signal. >>
JNK	1081	**TCT=E** & MS=TCT & JS=PANNC << Claim failed >>	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FIPTKPP=0; FPRPT=1; SUA=0; FA(monitor)=0 << C-Port enters registration as if the Station had not asserted its phantom signal. >>
	1094	**TK_AC** & AND(PPV(AP_MASK),0001)=0000 & FPBLT=0 & JS=PREG	[FPBLT=1; TPBLT=R] << Start sequence to break attached Station's lobe test. >>

Table 9-7—C-Port Join Port Operation table for the TKP or TXI access protocol *(Continued)*

S/T	REF	Event/condition	Action/output
	1100	**TK_AC** & FPDLT=1 & JS=PREG	[TPDLT=R] << Token detected during lobe test disruption, extend disruption period by restarting TPDLT. >>
	1095	**TPBLT=E** & FPBLT=1 & JS=PREG	FPRPT=0; FPDLT=1; TPDLT=R << Force the Transmit FSM to TS=PTXN, by setting FPRPT to zero, and an attached Station’s lobe test is disrupted. >>
	1096	**TPDLT=E** & FPBLT=1 & JS=PREG	FPRPT=1; FPBLT=FPDLT=0 << Stop transmitting idles by forcing the transmit FSM to TS=PRPT. >>
JMPa	1039	**TPIRD=E** & FPJC=0 & SDAC_RC=0000 & JS=PDAC	JS=PJCI; FPINSLE=0; FPJC=FPOP=1; TXI_INS_RSP_PDU(DTR_RSP=0000); **If** FPECO=1 then (FPER=1; TPER=R) << Station accepted by C-Port >>
	1038	**TPIRD=E** & FPJC=0 & SDAC_RC=8020 & JS=PDAC	FPBPW=1; FPEFS=0; TXI_INS_RSP_PDU(DTR_RSP=8020) << Station rejected by C-Port >>
JMPb	1047	**TPIRD=E** & FPJC=1 & JS=PDAC << Hard error recovery >>	JS=PJCI; FPOP=1; FPINSLE=0; TXI_INS_RSP_PDU(DTR_RSP=0000)
	1076	**TPIRD=E** & JS=PJCI	TXI_INS_RSP_PDU(DTR_RSP=0000)
JLK	1024	**TPLMTR=E** & FPJC=0 & JS=PLT << End of TXI Join LMT—Test Failed!! >>	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FPRPT=1; SUA=0
JL0	1035	**TPLMTR=E** & FPJC=1 & JS=PLT	JS=BP
	1088	**TPQP=E** & CPRQ=1 & JS=PRQ << Registration query protocol >>	TPRQD=R; QUE_REG_QRY; CPRQ=0
	1087	**TPQP=E** & CPRQ>1 & JS=PRQ << Registration query protocol >>	TPQP=R; QUE_REG_QRY; CPRQ=(CPRQ-1)
JM0	1048	**TPRHB=E** & FPHBA=1 & JS=PDAC << Heart Beat fails prior to join complete, or Heart Beat fails during hard error recovery. >>	JS=BP
JRQ	1086	**TPRQD=E** & JS=PRQ << Registration query protocol >>	JS=PJCP; FINS=FJR=FPJC=1
JNK	1016	**TRP=E** & MS=TRP & JS=PANNC << Ring purge failed. >>	JS=PREG; MS=x; TS=PRPT; Set_initial_conditions; FIPTKPP=0; FPRPT=1; SUA=0; FA(monitor)=0 << C-Port enters registration as if the Station had not asserted its phantom signal. >>

9.3.4.2 C-Port Transmit Port Operation table for the TXI access protocol

Table 9-8—C-Port Transmit Port Operation table for the TXI access protocol

S/T	REF	Event/condition	Action/output
TEDa	1203	**CPBTX>PPV(MAX_TX)** & FPASO=0 & TS=PTXD << Maximum frame size has been exceeded. >>	[TS=PTXN; TX_AB; FPTI=1 (optional-unk)] << Transmit abort sequence >>
TEDb	1210	**CPBTX>PPV(MAX_TX)** & FPASO=1 & TS=PTXD << Maximum frame size has been exceeded. >>	[TS=PTXN; FPIT=1; TX_INV_FCS; TX_EFS(I=0, E=1) (optional-unk)] << Transmit invalid FCS sequence >>
	1209	**DTU_UNITDATA-STATUS.request(Fail)** & FPTX_LTH=0 & TS=PTXD << Transmit FSM currently transmitting a frame of unknown length. This is an indication that a cut-through frame is being transmitted. >>	TS=PTXN; TX_AB; FPTI=1 << The cut-through frame has completed with a Fail status, the frame is aborted. >>
	1200	**EOB** & TS=PTXD << Occurs once per byte transmission. >>	[CPBTX=(CPBTX+1) (optional-unk)] << Byte count maintained for MAX_TX >>
TEDc	1204	**EOD** & TS=PTXD << End of frame transmission. >>	TS=PTXN; FPEFS=FPTI=1; TX_FCS; TX_EFS(I=0)
TFD	1207	**FPRPT=0** & TS=PRPT	TS=PTXN; FPTI=1; **If** FPOP=1 then FPTXC=1
TDF	1206	**FPRPT=1** & TS=PTXN	TS=PRPT; FPTI=FPTXC=0
	1211	**FR(DA=any_recognized_address) & FPACO=1** & TS=PRPT	Set A=1
	1212	**FR_COPIED(DA=any_recognized_address) & FPACO=1** & TS=PRPT	Set C=1
TDEa	1202	**PDU_QUEUED** & FPOP=1 & FPRPT=0 & TS=PTXN ⇒ Queued frames are sent only when FPOP=1	TS=PTXD; FPBPF=FPTI=0; **If** FR_LTH<=PPV(MAX_TX) then FPTX_LTH=1; **If** FR_LTH=UNK then FPTX_LTH=0; << The frame length of the queued frame is either unknown or a value less than PPV(MAX_TX). >> **If** FPMRO=0 then CPBTX=9; **If** FPMRO=1 then CPBTX=D; TX_SFS(P=x; R=0)
TEDe	1205	**PORT_ERR(Correctable)** & TS=PTXD << C-Port could not complete transmission of frame being transmitted—abort frame. >>	TS=PTXN; TX_AB; FPTI=1 << Transmit Abort sequence >>
TEDd	1208	**PORT_ERR(not_correctable)** & TS=PTXD << C-Port could not complete transmission of frame being transmitted. >>	TS=PTXN; [TX_AB (optional)]; FPBPF=FPTI=1 << Transmit Abort sequence—optional >>
TDEb	1201	**TXI_REQ** & FPRPT=0 & TS=PTXN	TS=PTXD; FPBPF=FPTI=0; FPTX_LTH=1; **If** FPMRO=0 then CPBTX=9; **If** FPMRO=1 then CPBTX=D; TX_SFS(P=x; R=0) << Frame length for a frame in the TXI queue is always known. >>

9.3.4.3 C-Port Monitor Port Operation table for the TXI access protocol

Table 9-9—C-Port Monitor Port Operation table for the TXI access protocol

S/T	REF	Event/condition	Action/output
	1406	**FPINSD=0** & FPBNT=0 & JS=PJCI & MS=PIT << Start up of LMT support. >>	FPBNT=1
MJL	1401	**FR_BN(SA=SUA)** & FPJC=1 & MS=POPT << Attached Station in Beacon Transmit, execute internal test. >>	MS=PIT; FPHBA=FPOP=0; INTERNAL_PTEST
MKL	1404	**FR_BN(SA=SUA)** & MS=PTBN << Attached Station Beacon received, execute internal test. >>	MS=PIT; INTERNAL_PTEST
MLJ	1405	**FR_INS_REQ(SA=SUA)** & MS=PIT	MS=POPT
	1408	**FR_SHB(SA=SUA)** & FPHBA=1	TPRHB=R << Heart Beat Detection >>
MKL	1403	**TPIT=E** & MS=PTBN	MS=PIT; INTERNAL_PTEST
	1409	**TPQHB=E** & FPHBA=1	TPQHB=R; TXI_PHB_PDU << Heart Beat Transmission uses TXI since this function operates prior to FPOP=1. >>
	1402	**TPQP=E** & MS=PTBN	TPQP=R; **If** FPSL=1 then TXI_BN_PDU(BN_TYPE=2); **If** FPSL=0 then TXI_BN_PDU(BN_TYPE=5)
MJK	1400	**TPRHB=E** & FPHBA=1 & FPJC=1 & MS=POPT << Loss of Heart Beat >>	MS=PTBN; FPHBA=FPOP=0; TPIT=R; TPQP=R; **If** FPSL=1 then TXI_BN_PDU(BN_TYPE=2); **If** FPSL=0 then TXI_BN_PDU(BN_TYPE=5)

9.3.4.4 C-Port Error Handling Port Operation table for the TXI access protocol

Table 9-10—C-Port Error Handling Port Operation table for the TXI access protocol

S/T	REF	Event/condition	Action/output
	1600	**Burst5_error_event** & CPBE<255 & FPJC=1 & FPER=1 & MS=POPT	CPBE=(CPBE+1)
	1601	**Burst5_error_event** & FPJC=1 & FPER=0 & MS=POPT	FPER=1; TPER=R; CPBE=(CPBE+1)
	1604	**FR_NOT_COPIED** & CPRCE<255 & FPJC=1 & FPER=1 & MS=POPT	CPRCE=(CPRCE+1)
	1605	**FR_NOT_COPIED** & FPJC=1 & FPER=0 & MS=POPT	FPER=1; TPER=R; CPRCE=(CPRCE+1)
	1606	**FR_WITH_ERR** & CPLE<255 & FPJC=1 & FPER=1 & MS=POPT	CPLE=(CPLE+1)
	1607	**FR_WITH_ERR** & FPJC=1 & FPER=0 & MS=POPT	FPER=1; TPER=R; CPLE=(CPLE+1)
	1608	**INTERNAL_ERR(correctable)** & CPIE<255 & FPJC=1 & FPER=1 & MS=POPT	CPIE=(CPIE+1)
	1609	**INTERNAL_ERR(correctable)** & FPJC=1 & FPER=0 & MS=POPT	FPER=1; TPER=R; CPIE=(CPIE+1)
	1610	**PM_STATUS.indication (Signal_detection=signal_acquired)** & FPSLD=1	FPSL=FPSLD=0
	1611	**PM_STATUS.indication (Signal_detection=signal_loss)** & FPSLD=0	FPSLD=1; TPSL=R
	1614	**PORT_ERR(correctable)** & TS=PTXD & CPABE<255 & FPJC=1 & FPER=1 & MS=POPT	CPABE=(CPABE+1)
	1617	**PORT_ERR(correctable)** & TS=PTXD & FPJC=1 & FPER=0 & MS=POPT	FPER=1; TPER=R; CPABE=(CPABE+1)
	1613	**PS_STATUS.indication(Frequency_error)** & CPFE<255 & FPJC=1 & FPER=1 & MS=POPT	CPFE=(CPFE+1)
	1612	**PS_STATUS.indication(Frequency_error)** & FPJC=1 & FPER=0 & MS=POPT	FPER=1; TPER=R; CPFE=(CPFE+1)
	1618	**TPER=E** & FPJC=1 & FPECO=1	TPER=R
	1616	**TPSL=E** & FPSLD=1	FPSL=1

9.3.4.5 C-Port Interface Signals Port Operation table for the TXI access protocol

Table 9-11—C-Port Interface Signals Port Operation table for the TXI access protocol

S/T	REF	Event/condition	Action/output
	1819	**DTU_UNITDATA-STATUS.request(Fail)** & FPTX_LTH=1 & TS=PTXD << Transmit FSM is currently transmitting a previously queued frame. This is an indication that frame cut-through is terminating with an error. >>	DISCARD_QUEUED_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	1820	**DTU_UNITDATA-STATUS.request(Fail)** & TS=PTXN << Transmit FSM is currently in the normal state. This may occur between frame transmissions. >>	DISCARD_QUEUED_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	1818	**DTU_UNITDATA-STATUS.request(OK)** & FPTX_LTH=0 & TS=PTXD << Transmit FSM currently transmitting a frame of unknown length. This is an indication that a cut-through frame is being transmitted. >>	FPTX_LTH=1 << The cut-through frame has completed with an OK status, the frame length is now known. >>
	1800	**DTU_UNITDATA.request** & FPJC=1 & FPOP=1 & FR_LTH<=PPV(MAX_TX) << A frame of known length is passed to the this C-Port. >>	QUE_PDU
	1801	**DTU_UNITDATA.request** & FPJC=1 & FPOP=1 & FR_LTH=UNK << A frame cut-through operation has started. The frame length is currently not known. The data is optionally placed into the transmit queue and made available for transmission (QUE_PDU action allows the PDU_QUEUED event to occur). >>	[QUE_PDU (optional-i)]
	1802	**FPTI=0**	{PM_CONTROL.request (Repeat_mode=Repeat)} ***or*** {PS_CONTROL.request (Repeat_mode=Repeat)} ⇒ **An implementation shall take one of these two actions.**
	1803	**FPTI=1**	{PM_CONTROL.request (Repeat_mode=Fill)} ***or*** {PS_CONTROL.request (Repeat_mode=Fill)} ⇒ **An implementation shall take one of these two actions.**
	1804	**FPTXC=0**	PS_CONTROL.request (Crystal_transmit=Not_asserted)
	1805	**FPTXC=1**	PS_CONTROL.request (Crystal_transmit=Asserted)

Table 9-11—C-Port Interface Signals Port Operation table for the TXI access protocol *(Continued)*

S/T	REF	Event/condition	Action/output
	1806	**FR** & FPFCO=0 & FPJC=1 & FPOP=1 << Indicates that a complete frame is passed to the DTU. >>	DTU_UNITDATA.indication; DTU_UNITDATA-STATUS.indication (OK)
	1816	**FR** & FPFCO=1 & FPOP=1 & FPJC=1 << Indicates that frame cut-through has completed. >>	DTU_UNITDATA-STATUS.indication (OK)
	1814	**FR_FC** & FPFCO=1 & FPJC=1 & FPOP=1 << Indicates that frame cut-through has started. >>	DTU_UNITDATA.indication
	1808	**FR_MAC(DA<>any_recognized_address & SC<>0)** & FPJC=1 & FPOP=1	MRI_UNITDATA.indication
	1807	**FR_MAC(DC<>0 & DC<>3 & SC=0)** & FPJC=1 & FPOP=1	MRI_UNITDATA.indication
	1815	**FR_RSP_PDU(SC=RS)**	MGT_UNITDATA.indication
	1817	**FR_WITH_ERR** & FPFCO=1 & FPOP=1 & FPJC=1 << Indicates that frame cut-through has failed due to a frame error. >>	DTU_UNITDATA-STATUS.indication (Fail)
	1809	**MRI_UNITDATA.request** & FPJC=1 & FPOP=1 & FR_LTH<=PPV(MAX_TX)	QUE_PDU
	1810	**MRI_UNITDATA.request** & FPJC=1 & FPOP=1 & FR_LTH=UNK	[QUE_PDU (optional-i)]
	1812	**PM_STATUS.indication(Insert=Detected)**	FPINSD=FPINSLE=1
	1813	**PM_STATUS.indication(Insert=Not_detected)**	FPINSD=0
	1811	**TPER=E** & FPOP=1 & ERR_PCNTR<>0	**If** FPECO=0 then FPER=0; MRI_UNITDATA.indication (RPT_ERR_PDU); SET_ERR_PCNTR=0

9.3.4.6 C-Port Miscellaneous Frame Handling Port Operation table for the TXI access protocol

Table 9-12—C-Port Miscellaneous Frame Handling Port Operation table for the TXI access protocol

S/T	REF	Event/condition	Action/output
	2000	**FR_CHG_PARM**	[SET APPR_PARMS (optional-x)]
	2001	**FR_CHG_PARM**(CORR_NOT_PRESENT)	[TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001) (optional-x)]
	2002	**FR_CHG_PARM**(CORR_PRESENT)	[TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001) (optional-x)]
	2003	**FR_INIT**	[SET APPR_PARMS (optional-x)]
	2004	**FR_INIT**(CORR_NOT_PRESENT)	[TXI_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001) (optional-x)]
	2005	**FR_INIT**(CORR_PRESENT)	[TXI_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001) (optional-x)]
	2006	**FR_MAC_INV**(ERR_COND=LONG_MAC & SC<>RS & CORR_NOT_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8009)
	2007	**FR_MAC_INV**(ERR_COND=LONG_MAC & SC<>RS & CORR_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8009)
	2008	**FR_MAC_INV**(ERR_COND=SC_INVALID & SC<>RS & CORR_NOT_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8004)
	2009	**FR_MAC_INV**(ERR_COND=SC_INVALID & SC<>RS & CORR_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8004)
	2010	**FR_MAC_INV**(ERR_COND=SHORT_MAC & SC_NOT_PRESENT)	[TXI_RSP_PDU(DC<>RS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001) (optional-x)]
	2011	**FR_MAC_INV**(ERR_COND=SHORT_MAC & SC_PRESENT & SC<>RS)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_ (optional-x)]; RSP_TYPE=8001)
	2012	**FR_MAC_INV**(ERR_COND=SV_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8005)
	2013	**FR_MAC_INV**(ERR_COND=SV_LTH_ERR & SC<>RS & CORR_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8005)
	2014	**FR_MAC_INV**(ERR_COND=SV_MISSING & SC<>RS & CORR_NOT_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8007)
	2015	**FR_MAC_INV**(ERR_COND=SV_MISSING & SC<>RS & CORR_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8007)
	2016	**FR_MAC_INV**(ERR_COND=SV_UNK & SC<>RS & CORR_NOT_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8008)

Table 9-12—C-Port Miscellaneous Frame Handling Port Operation table for the TXI access protocol *(Continued)*

S/T	REF	Event/condition	Action/output
	2017	**FR_MAC_INV**(ERR_COND=SV_UNK & SC<>RS & CORR_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8008)
	2018	**FR_MAC_INV**(ERR_COND=VI_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8002)
	2019	**FR_MAC_INV**(ERR_COND=VI_LTH_ERR & SC<>RS & CORR_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8002)
	2020	**FR_MAC_INV**(ERR_COND=VI_UNK & SC<>RS & CORR_NOT_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8003)
	2021	**FR_MAC_INV**(ERR_COND=VI_UNK & SC<>RS & CORR_PRESENT)	TXI_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8003)
	2022	**FR_REMOVE**	TXI_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A)
	2024	**FR_RQ_ADDR**	[TXI_RPRT_ADDR_PDU (optional-x)]
	2025	**FR_RQ_ATTACH**	[TXI_RPRT_ATTACH_PDU (optional-x)]
	2026	**FR_RQ_STATE**	[TXI_RPRT_STATE_PDU (optional-x)]

9.3.4.7 Precise specification of terms

This subclause defines the precise specifications of "Event/condition" and "Action/output" columns for the C-Port Operation tables.

9.3.4.7.1 Precise specification of events/conditions

The following expressions are applied to the terms used for events in the FSMs and C-Port Operation tables.

{term1} = {term2}.	Term 1 is equal to term 2.
{term1} < {term2}.	Term 1 is less than term 2.
{term1} <= {term2}.	Term 1 is less than or equal to term 2.
{term1} > {term2}.	Term 1 is greater than term 2.
{term1} >= {term2}.	Term 1 is greater than or equal to term 2.
{term1} <> {term2}.	Term 1 is not equal to term 2.
{flag}=0.	The specified flag is set to zero (false).
{flag}=1.	The specified flag is set to one (true).
{timer}=E.	The specified timer has expired.

Values are in hexadecimal notation unless otherwise indicated.

& means: "and."
| means: "or."

Unless otherwise specified, the following terms and operations are defined:

A=0. Both the A bits in the received frame's FS field (bits 0 and 4) are 0.

AND(x,y). Bitwise Logical AND function of binary objects x and y.

AP_MASK. Option mask for access protocol. Bit significant mask used by the C-Port. One bit is defined for each access protocol supported.

AP_REQ=value. Access Protocol Request subvector is received with the specified value.

Burst5_error_event. A PM_STATUS.indication(Burst5_error) has occurred. The conditions under which a Burst5_error is excluded are not uniquely specified by this standard (see Counter Burst Error in 10.6.2.2).

C=0. Both C bits in the received frame's FS field (bits 1 and 5) are 0.

Connect.PMAC. The PMAC receives this command from local management to start the process of joining the network.

DA<>any_recognized_address. The destination address (DA) of the received frame does not match any of the C-Port's addresses as follows:

a) Is not any of the C-Port's individual addresses, or
b) Is not any of the C-Port's group addresses, or
c) Is not any of the C-Port's functional addresses, or
d) Is not any of the broadcast addresses defined in 3.2.4.1.

DA=any_recognized_address. The destination address (DA) of the received frame matches any of the C-Port's addresses as follows:

a) Is one of the C-Port's individual address, or
b) Is one of the C-Port's group addresses, or
c) Is one of the C-Port's functional addresses, or
d) Is one of the broadcast addresses defined in 3.2.4.1.

DA=MA. The destination address (DA) of the received frame is equal to the individual address of the C-Port. If the C-Port's individual address is a universally administered address, then all 48 bits must match. If the C-Port's individual address is a locally administrated address, then either a hierarchical address match or a 48-bit address match is allowed.

DA=Non_broadcast. The received frame was not sent to a broadcast address, but was otherwise addressed to the C-Port.

DC<>0. The destination class is not MAC.

Disconnect.PMAC. The request from local management to close the C-Port.

DTU_DAC.response(RC). Response to the C-Port's request (DTU_DAC.request). RC uses the same values as the DTR_RSP subvector defined in table 10-6.

DTU_UNITDATA-STATUS.request (Status_Code). Frame status is reported by the DTU to the PMAC. The Status_Code may be one of the following:

a) OK: The frame has been successfully transferred to the PMAC without error.
b) Fail: Transfer of the frame to the PMAC has failed due to a frame error.

DTU_UNITDATA.request. The DTU requests a frame to be transmitted.

EOB. End of byte: The last bit of an octet has been transmitted, excluding octets representing SD, AC, FCS, ED, FS, and IFG.

EOD. End of data: The last octet of the Information field has been transmitted.

ERR_CNTR<>0. Any error counter not zero.

FR. A frame has been received that meets the criteria specified in 4.3.2.

FR(criteria). A frame has been received that meets the specified criteria and the criteria specified in 4.3.2.

FR_AMP. A verified Active Monitor Present frame (10.3.6) is received.

FR_BN(criteria). A verified Beacon frame (10.3.6) is received that meets the specified criteria.

FR_CHG_PARM(criteria). A verified Change Parameters MAC frame (10.3.6) is received that meets the specified criteria.

FR_COPIED(criteria). The PMAC successfully copied the received frame that meets the specified criteria.

FR_CT. A Claim Token MAC frame (3.3.5.2) is received.

FR_FC. A frame has been received through the FC field (see 9.1.1.5).

FR_INIT. A verified Initialize Station MAC frame (10.3.6) is received.

FR_INS_REQ(criteria). A verified Insert Request MAC frame (10.3.6) that meets the specified criteria is received.

FR_LLC(criteria). An LLC frame is received that meets the specified criteria and the criteria specified in 4.3.2.

FR_LTH. The length of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG).

FR_LTH<=PPV(MAX_TX). The length of the frame to be transmitted is less than or equal to the maximum allowed frame length.

FR_LTH=UNK. The length of the frame to be transmitted is unknown.

FR_MAC(criteria). A valid MAC frame is received that meets the specified criteria and the criteria specified in 10.3.6.

FR_MAC_INV(reason). FR_MAC_INV(reason). A valid (4.3.2) MAC frame is received that fails verification (10.3.6.5) for the reason specified.

FR_NOT_COPIED. The C-Port recognizes a valid frame to be copied, but is unable to copy the frame.

FR_REG_REQ(criteria). A verified Registration Request MAC frame (10.3.6) is received that meets the specified criteria.

FR_REMOVE(criteria). A verified Remove MAC frame (10.3.6) is received that meets the specified criteria.

FR_REQ_ADDR. A verified Request Address MAC frame (10.3.6) is received.

FR_RP. A verified Ring Purge MAC frame (10.3.6) is received.

FR_RQ_ATTACH. A verified Request Attachment MAC frame (10.3.6) is received.

FR_RQ_STATE. A verified Request Station State MAC frame (10.3.6) is received.

FR_RSP_PDU(criteria). A verified Response MAC frame (10.3.6) is received that meets the specified criteria.

FR_SHB(criteria). A verified SHB MAC frame (10.3.6) is received that meets the specified criteria.

FR_SMP. A verified SMP MAC frame (10.3.6) is received.

FR_WITH_ERR. A frame is received with errors (see 9.1.1.7).

INTERNAL_ERR. Any internal error occurred that prevented the C-Port from following the established protocol (i.e., parity error, etc.).

Internal_Test_Failure. The C-Port failed during internal testing.

JS=state. The Join FSM is in the specified state.

MRI_UNITDATA.request. The management routing interface requests a frame be transmitted.

MS=state. The Monitor FSM is in the specified state.

PDU_QUEUED(criteria). A frame is queued for transmission that meets the specified criteria.

PM_STATUS.indication(Insert=Detected). The PHY indicates an insert request is received via the phantom signaling channel (see 9.7.2).

PM_STATUS.indication(Insert=Not_detected). The PHY indicates the absence of an insert request on the phantom signaling channel (see 9.7.2).

PM_STATUS.indication(Signal_detection=Signal_acquired). The PHY indicates valid receiver signal (see 5.1.4.1).

PM_STATUS.indication(Signal_detection=Signal_loss). The PHY indicates loss of valid receiver signal (see 5.1.4.1).

PORT_ERR. Any internal C-Port condition that prevents the successful completion of the PDU transmit operation.

PS_STATUS.indication(Burst4_error). The C-Port indicates the received data contains a Burst4_error (see 5.1.2.3).

PS_STATUS.indication(Burst5_error). The C-Port indicates the received data contains a Burst5_error (see 5.1.2.3).

PS_STATUS.indication(Frequency_error). The C-Port indicates the frequency of the received data is out of tolerance (see 5.1.2.3).

SA=MA. The source address (SA) of the received frame is equal to the individual address of the C-Port.

SA<>MA. The source address (SA) of the received frame is not equal to the individual address of the C-Port.

SA=SUA. The source address (SA) of the received frame is equal to the stored upstream neighbor's address (SUA).

SA<>SUA. The source address (SA) of the received frame is not equal to the stored upstream neighbor's address (SUA).

SC<>0. Source class is not MAC.

SDAC_RC=value. The stored duplicate address check return code is equal to the designated value.

TK. A token is received that meets the criteria specified in 4.3.1.

TS=state. The Transmit FSM is in the specified state.

TXI_REQ. A frame is to be transmitted immediately.

UNA. The upstream neighbor's address (UNA) subvector in the received frame.

UNA=MA. The upstream neighbor's address (UNA) in the received frame is equal to the C-Port's individual address.

UNA<>MA. The upstream neighbor's address (UNA) in the received frame is not equal to the C-Port's individual address.

UNA=SUA. The upstream neighbor's address (UNA) is equal to the stored upstream neighbor's address (SUA).

UNA<>SUA. The upstream neighbor's address (UNA) in the received frame is not equal to the stored upstream neighbor's address (SUA).

9.3.4.7.2 Precise specification of actions/outputs

The expressions used for actions in the FSMs and C-Port Operation tables have the following meanings. Actions are separated by a semicolon (**;**).

{counter}=({counter}+1)	Increment the specified counter by one.
{counter}=({counter}-1)	Decrement the specified counter by one.
{counter}=value	Set the specified counter to the specified value.
{flag}=0	Set the value of the specified flag to zero (false).

{flag}=1	Set the value of the specified flag to one (true).
{timer}=R	The specified timer is set to its initial value and started.
variable = value	Set the variable to the specified value.

Values are in hexadecimal notation unless otherwise indicated.

; means: “and.”

Unless otherwise specified, the following terms and operations are defined:

AP_RSP=value. The AP_RSP subvector, in the Registration Response MAC frame being transmitted, takes on the indicated value.

BN_TYPE=value. The value of the beacon type subvector to be transmitted.

CORR=UNK_VALUE (optional-x). The frame received did not contain a correlator subvector (3.3.4), thus the value of the correlator subvector to be transmitted is unspecified and the subvector may be omitted. The standard recommends that new implementations not transmit the correlator subvector when no correlator subvector was received.

DISCARD_QUEUED_PDU. The C-Port removes from the transmit queue the frame that was the subject of the previous DTU_UNITDATA.request.

DTU_DAC.request(starting_address, individual_address_count). Indication to the DTU entity, requesting a check of the addressing of the connected Station.

DTU_UNITDATA.indication. The frame is indicated to the DTU interface.

DTU_UNITDATA-STATUS.indication(Status_Code). Frame status is indicated by the PMAC to the DTU. The Status_Code may be one of the following:

a) OK: The frame has been successfully transferred to the DTU without error.
b) Fail: Transfer of the frame to the DTU has failed due to a frame error.

FA(address)=0. Disable the indicated functional address.

FA(address)=1. Enable the indicated functional address.

FTI=x. The value of FTI is not specified.

INSERT. Request the PHY to physically connect the Station to the network [5.1.4.2 PM_CONTROL.request(Insert_Station)].

INTERNAL_PTEST. Internal C-Port diagnostic testing. Specification of this diagnostic test is beyond the scope of this standard.

JS=state. The Join FSM is changed to the specified state.

MRI_UNITDATA.indication. The frame is indicated to the Management Routing Interface.

MRI_UNITDATA.indication(RPT_ERR_PDU). A Report Error PDU is indicated to the Management Routing Interface.

MS=state. The Monitor FSM is changed to the specified state.

MS=x. The Monitor FSM state is changed to unspecified (not running).

P. The value of the P bits in the access control (AC) field.

PM_CONTROL.request(Repeat_mode=Fill). The C-Port PMAC requests the PMC to start sourcing fill and stop repeat (see 9.7.2.2).

PM_CONTROL.request(Repeat_mode=Repeat). The C-Port PMAC requests the PMC to repeat and stop sourcing fill (see 9.7.2.2).

PS_CONTROL.request(Crystal_transmit=Asserted). The C-Port PMAC requests Crystal_transmit (see 5.1.2.4).

PS_CONTROL.request(Crystal_transmit=Not_asserted). The C-Port PMAC removes the Crystal_transmit request (see 5.1.2.4).

PS_CONTROL.request(Repeat_mode=Fill). The C-Port PMAC requests the PSC to start sourcing fill.

PS_CONTROL.request(Repeat_mode=Repeat). The C-Port PMAC requests the PSC to repeat and stop sourcing fill.

QUE_PDU. Queue the PDU for transmission.

QUE_RPRT_ADDR_PDU. Queue a Report Station Address MAC PDU (3.3.5.1) for transmission.

QUE_RPRT_ATTACH_PDU. Queue a Report Station Attachment MAC PDU (3.3.5.1) for transmission.

QUE_RPRT_ERR_PDU. Queue a Report Error MAC PDU as defined in 3.3.5.1 for transmission

QUE_RPRT_STATE_PDU. Queue a Report Station State MAC PDU (3.3.5.1) for transmission.

QUE_RSP_PDU. Queue a Response MAC PDU as defined in 3.3.5.1 for transmission.

S_AP=AP_REQ. Store the value of the access protocol Request subvector (AP_REQ) from the received frame.

SDAC_RC=RC. Store the value of the DAC return code form the DTU_DAC.response.

Set A=1. Both A bits in the FS field shall be set to one as the frame is repeated.

Set C=1. Both C bits in the FS field shall be set to one as the frame is repeated.

SET_APPR_PARMS. The C-Port sets its parameters to the values indicated in the received frame.

SET_ERR_PCNTR=0. Set the values for all of the error counters reported in the Report Error MAC frame to zero.

Set_initial_conditions. The C-Port shall set all PMAC flags to zero, set all PMAC counters to zero, set all stored values to zero, and stop all timers. The states of the Monitor FSM and Transmit FSM are not specified. The PS_CONTROL.request(Medium_rate) and PM_CONTROL.request(Medium_rate) are asserted according to the value of FPMRO.

SIAC=IAC. Store the value of the individual address count subvector from the received frame.

SPD=PD. Store the value of the phantom subvector (PD) from the received frame.

SUA=SA. Store the value of the source address (SA) from the received frame as the C-Port's stored upstream neighbor address (SUA).

TEST. The C-Port shall perform a test of its transmit functions, its receive functions, and the medium between the C-Port and the TCU. It is recommended that the data path includes the elastic buffer and the fixed latency buffer (5.8). A C-Port shall fail the test if the sustained bit error rate does not meet the criteria specified in annex P. A C-Port shall only transmit valid frames, tokens, and fill during the test and shall only count errors in frames and tokens.

TS=state. The Transmit FSM is changed to the specified state.

TX_AB. The C-Port shall transmit an abort sequence.

TX_EFS(I=0). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The E, I, A, and C bits shall be zero.

TX_EFS(I=0, E=1). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The I, A, and C bits shall be zero. The E bit shall be one.

TX_FCS. The C-Port shall transmit frame check sequence for the frame as defined in 3.2.7.

TX_SFS(P=value; R=value). The C-Port shall transmit the start-of-frame sequence with the priority and reservation values as specified. The Frame bit (T) shall be one and the Monitor bit (M) shall be zero.

TXI_BN_PDU. The C-Port shall transmit a Beacon MAC frame. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event.

TXI_INS_RSP_PDU( ). The C-Port shall transmit an Insert Response MAC frame. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event.

TXI_INV_FCS. The C-Port shall transmit an invalid FCS.

TXI_PHB_PDU. The C-Port shall transmit a C-Port Heart Beat MAC frame. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event.

TXI_REG_RSP_PDU( ). The C-Port shall transmit a Registration Response MAC frame. The frame shall contain all of the required subvectors. The transmission of the frame occurs at the earliest opportunity. This action generates the TXI_REQ event.

TXI_RP_PDU. The Station shall transmit a Ring Purge MAC frame with the access control (AC) fields of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

9.4 C-Port in Port mode TKP access protocol specification

This subclause defines the DTR C-Port in Port mode using the TKP access protocol defined in clause 4 of ISO/IEC 8802-5 : 1998 [Configuration 3, entity **(E)**, of figure 9-1] necessary to support the following attachments [Configuration 3, entity **(F)**].

- A classic station as defined by clause 4 of ISO/IEC 8802-5 : 1998.
- A DTR Station using the TKP access protocol as defined by 9.6.
- A DTR C-Port in Station Emulation mode using the TKP access protocol as defined by 9.5.

The C-Port in Port mode using the TKP access protocol is covered as follows:

- Subclause 9.4.1 provides an overview of the interaction between the FSMs defined in 9.3 and 9.4.
- Subclause 9.4.2 provides an overview of the major FSMs used by this mode of operation.
- Subclause 9.4.3 defines the unique abbreviations, notations, state machine elements, and port operation table states used by this subclause.
- Subclause 9.4.3.1 specifies the PMAC specifications for the Join function used to establish and control this mode of operation.
- Subclause 9.4.3.2 specifies the PMAC specifications for the Transmit function used to establish this mode of operation.
- Subclause 9.4.4 specifies the PMAC specifications for the Transmit, Monitor, Error Handling, Interface, and Miscellaneous Frame Handling functions.

9.4.1 FSM interaction

Figure 9-14 illustrates the interaction of the C-Port's Join and Transmit FSMs as defined in 9.3.1, and the modified Classic station Transmit and Monitor FSMs defined in this subclause. The key points of this figure are as follows:

a) The C-Port's Join Port Operation table is used to set up and control this configuration.
b) The C-Port's Transmit Port Operation table for the TXI access protocol is used to set up this configuration.
c) The classic station's Transmit and Monitor Station Operation tables defined in 4.3 are replaced by the C-Port's Port Operation tables defined in tables 9-13 and 9-14, respectively.

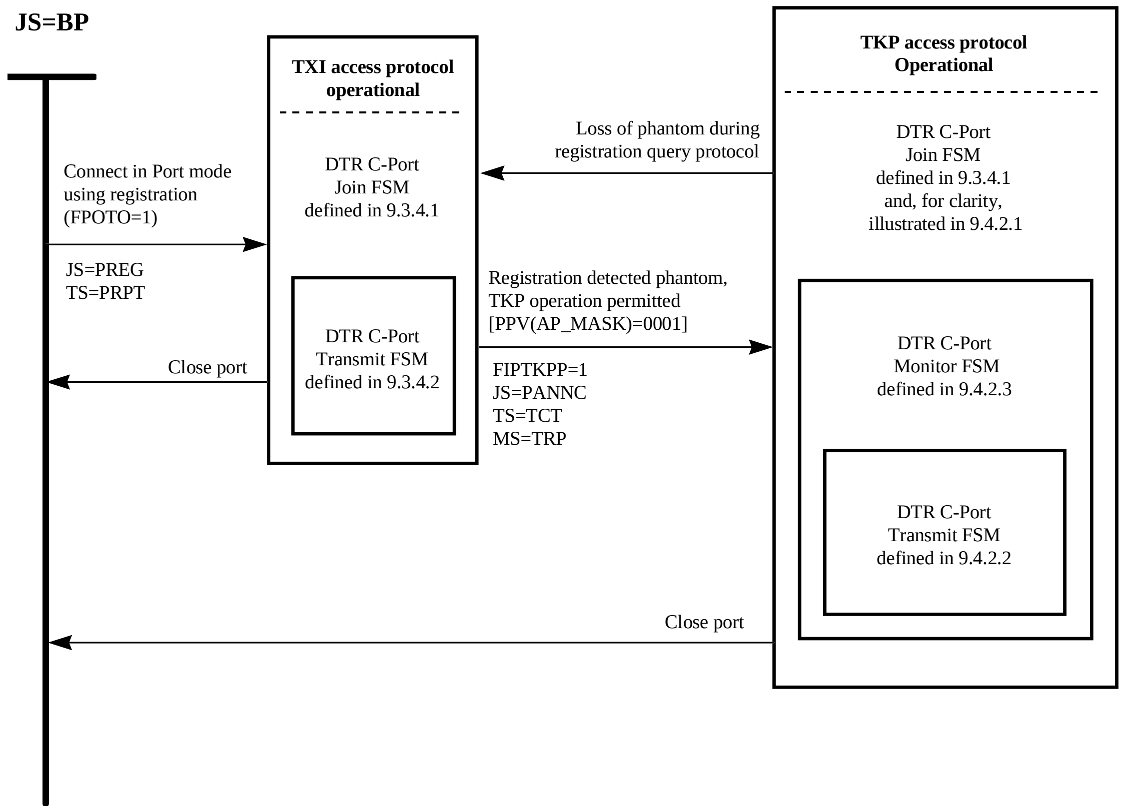


Figure 9-14—FSM interaction when supporting the C-Port in Port mode using the TKP access protocol

9.4.2 FSM overviews

This subclause contains FSM overviews of the C-Port's Transmit and Monitor functions used to support the Port mode when using the TKP access protocol. These C-Port FSMs have their roots in the classic station's FSMs, which are specified in clause 4 with the changed events or actions in bold print.

9.4.2.1 Join FSM: C-Port in Port mode using the TKP access protocol

The C-Port's Join Port Operation table defined in 9.3.4.1, using the Transmit Port Operation table defined in 9.3.4.2, determines it is supporting Configuration 3 when phantom signaling is detected while in JS=PREG. The Join FSM then

a) Sets the interface flag FIPTKPP=1,
b) Deactivates the C-Port's TXI Access Protocol Transmit FSM defined by 9.3.4.2,
c) Activates the C-Port's TKP Access Protocol Transmit and Monitor FSMs defined by 9.4.4.2 and 9.4.4.3, respectively, and
d) Starts the Monitor's Claim Token process and enters its Await Neighbor Notification state (JS=PANNC) defined in 9.3.4.1.

An overview of the C-Port's Join function used to support the Port mode using the TKP access protocol is illustrated by figure 9-15. The Join FSM is specified by the Join Port Operation table found in 9.3.4.1, table 9-7.

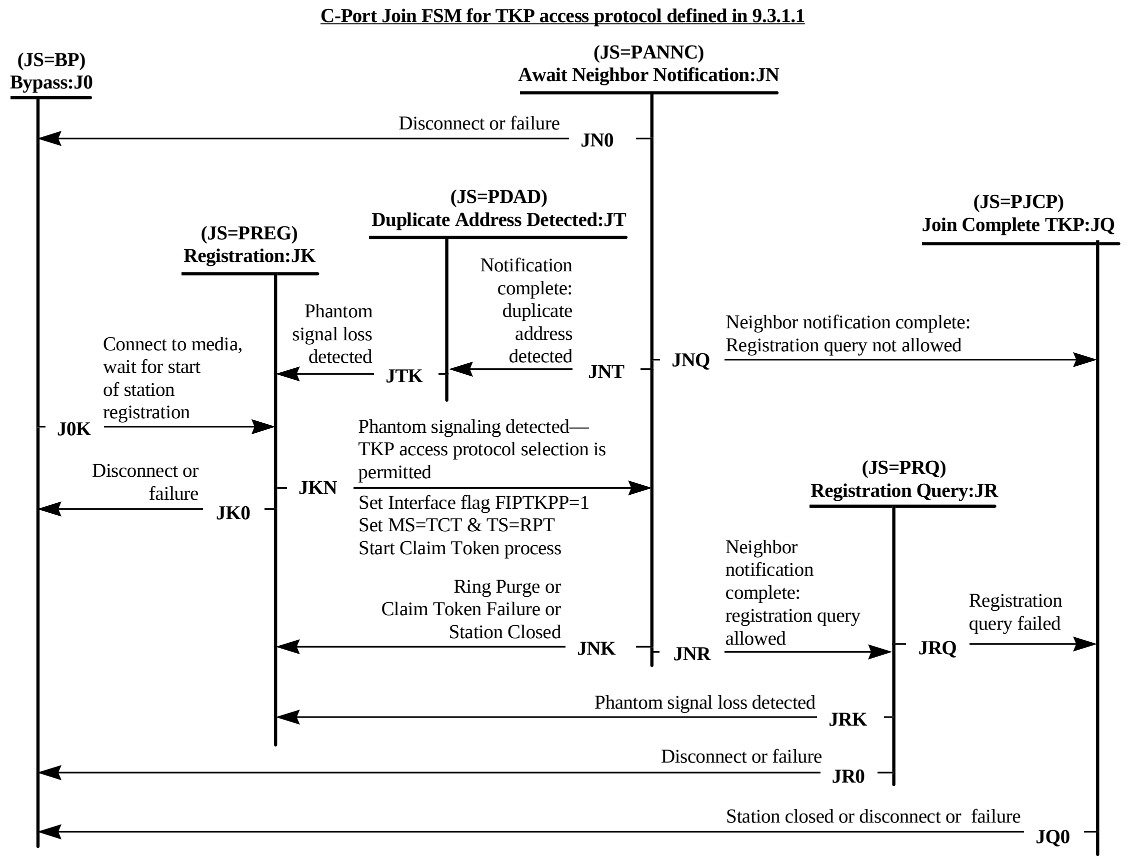


Figure 9-15—Join FSM: C-Port in Port mode using the TKP access protocol

9.4.2.2 Transmit FSM: C-Port in Port mode using the TKP access protocol

The Transmit FSM defined for a C-Port in Port mode using the TKP access protocol makes the following modifications to the classic station (defined in clause 4) Station Operation tables by the setting of the interface flag FIPTKPP=1.

a) The Transmit state optionally supports the transmission of frames with an unknown length (FR_LTH=UNK condition).
b) When the FR_LTH=UNK condition is supported, the Transmit state shall detect frames whose length will exceed PPV(MAX_TX). The action taken by the Transmit state to terminate the frame is controlled by the option flag FPASO. The following changes are made to support this condition:
   1) The Repeat state (TS=RPT) allows transmission of frames with FR_LTH=UNK condition (the transitions identified as REFs 4205, 4206, 4208, 4502, and 4513). These references indirectly or directly set counter CPBTX to a value appropriate for the media speed.
   2) The Transmit Data state (TS=DATA) supports a Transmit Byte counter to prevent frames from being transmitted that are greater than the PPV(MAX_TX) value. The counter CPBTX is incremented each time a byte is transmitted (EOB condition).
   3) When FPASO is set to 0 and if the counter CPBTX is incremented to a value *equal* to PPV(MAX_TX), the Station transmitter aborts the frame's transmission by transmitting an abort sequence as defined in clause 3. The purpose of transmitting the abort sequence is to inform the receiving entity to terminate reception of the frame and to ignore the data received.

4) When FPASO is set to 1 and if the counter CPBTX is incremented to a value *equal* to PPV(MAX_TX), the Station transmitter terminates the transmission of the frame by generating an invalid FCS and setting the E bit in the ED to one. The purpose of this termination sequence is to create a frame that is discarded when received and not counted as a line error.

These transmit changes are illustrated by using a bold type font in figure 9-16. The Transmit FSM is specified by the Transmit Port Operation table, table 9-13.

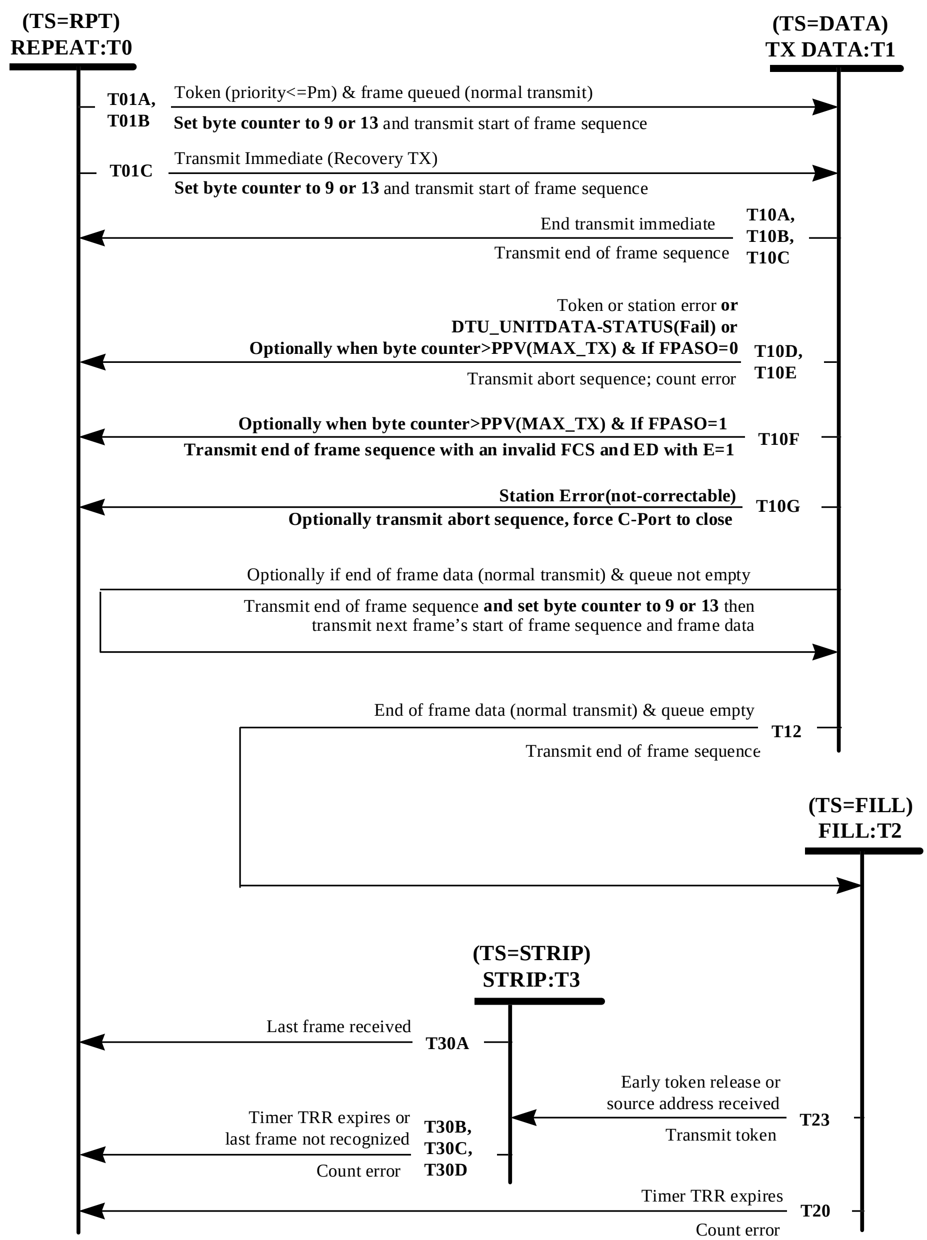


Figure 9-16—Transmit FSM: C-Port in Port mode using the TKP access protocol

9.4.2.3 Monitor FSM: C-Port in Port mode using the TKP access protocol

The Monitor FSM defined for a C-Port in Port mode using the TKP access protocol makes the following modifications to the classic station (clause 4) Station Operation tables by the setting of the interface flag FIPTKPP=1.

a) The following Station Operation table flags, timers, and actions are removed from 4.3 because they support wire fault, deinsertion timing, and lobe testing, which cannot be performed by the C-Port in Port mode.
   1) The following flags were removed:
      i) Flag, Remove Hold—FRH
      ii) Flag, Test Wait—FTW
      iii) Flag, Wire Fault—FWF
      iv) Flag, Wire Fault Active—FWFA
   2) The Timer, Remove Hold—TRH was removed.
   3) The following actions were removed:
      i) The action “Remove_Station,” which causes phantom drive to be deasserted.
      ii) The action “TEST,” which causes Station lobe test to be executed.
b) The C-Port in Port mode using the TKP access protocol (FIPTKPP=1) provides access to the DTU and MRI interfaces defined in 9.1.13.2, but *no access* to the Bridge, LLC, or Management Interfaces defined in 9.1.13.1.
c) The DTR C-Port in Port mode (FIPTKPP=1) does not use the Assured Delivery function.
d) The Beacon process defined in 4.3 is changed as follows:
   1) The Beacon Test state (MS=BNT) is entered from either the Transmit Beacon state (MS=TBN) or the Repeat Beacon state (MS=RBN) when the C Port detects the interface signal “PM_STATUS.indication(Insert=Not_detected).” The C-Port must provide the repeat path defined in 9.7 for the attached Station’s LMT within 190 ms of the Station dropping phantom. Upon entry into the C-Port’s Beacon Test state, the timer TRW is reset and the C-Port may perform its internal self tests until the expiration of timer TRW. When timer TRW expires, the C-Port resets the timer TPLMTF. The Timer TPLMTF is used by the C-Port to determine whether the attached Station LMT has passed or failed as follows:
      i) The C-Port assumes the Station LMT has been successful when it detects the attached Station’s INSERT signal [PM_STATUS.indication(INSERT=Detected)] *prior* to the expiration of timer TPLMTF and enters either the Beacon Transmit state (MS=TBN) or the Beacon Repeat state (MS=RPT).
      ii) The C-Port assumes the attached Station’s LMT has failed when the timer TPLMTF expires and enters its Bypass state (JS=BP).
   2) The Transmit Beacon state (MS=TBN) is entered when the C-Port in the Beacon Test state (MS=BNT) detects the interface signal “PM_STATUS.indication(INSERT=Detected)” and the flag FBT=1 indicates the attached Station successfully completed its Beacon Test function.
   3) The Receive Beacon state (MS=RBN) is entered when the C-Port in the Beacon Test state (MS=BNT) detects the interface signal “PM_STATUS.indication(INSERT=Detected)” and the flag FBR=1 indicates the attached Station successfully completed its Beacon Test function.

These monitor changes are illustrated by using a bold type font in figure 9-17. The Monitor FSM is specified by the Port Operation table, table 9-14.

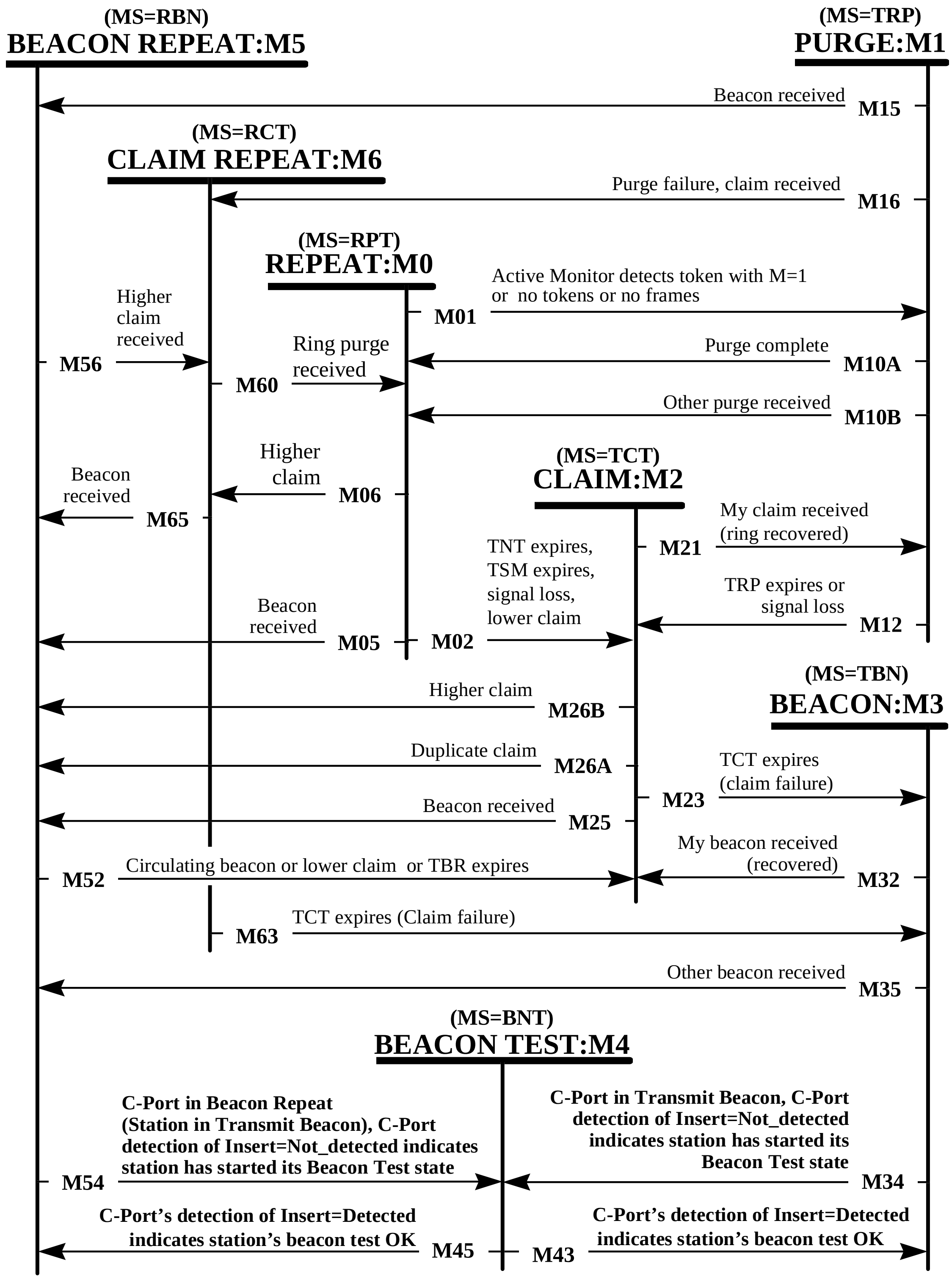


Figure 9-17—Monitor FSM: C-Port in Port mode using the TKP access protocol

9.4.3 Abbreviations, notations, state machine elements and port operation table states

The terms used by the C-Port's Port Operation tables are defined in 4.2.3, 4.2.4, and 9.3.3. This clause defines the unique abbreviations and notations, flag definitions, and state definitions required to support the C-Port's Port mode when the TKP access protocol is used.

9.4.3.1 Abbreviations and notations

The following notation is used in the state machine descriptions in addition to those defined in 9.2 and 9.3:

PMAC timer notation

TPLMTF = Timer, C-Port lobe media test failure

9.4.3.2 State machine elements

The state machines use the following counters, flags, and states to describe the operation of the C-Port's Port Operation tables when supporting the Port mode using the TKP access protocol.

These are logical elements used solely to describe the operation and do not specify an implementation. The value of the flags and counters is only meaningful internal to the state machine definition. Conformance will be based only on the port's ability to perform the protocol as specified by the Port Operation tables.

9.4.3.2.1 Counters

The counters used by the Port Operation tables are defined in 4.2.4.2 and 9.3.3.1.

9.4.3.2.2 Protocol flags

Protocol flags are used to remember occurrence of an event for later action by the Port Operation tables and are not meant to imply any implementation requirements. In general, a flag is set to 1 when a condition occurs and set to 0 when the condition no longer exists or the appropriate action is taken.

All Station protocol flags are defined in 4.2.4.2 while the C-Port protocol flags are defined in 9.3.3.2.

9.4.3.3 C-Port's Port Operation table states

When the C-Port in Port mode is using the TKP access protocol, there is a set of states for the C-Port's Port Operation tables.

A Port Operation table can be in only one state at any instant in time.

9.4.3.3.1 Join states

The join states for this mode of operation are defined in 9.3.3.3.1.

9.4.3.3.2 Transmit states

The transmit state (TS=) notation is used to identify the current state of the transmit FSM. The transmit state values are Repeat, Transmit Frame Data, Transmit Fill, and Transmit Fill and Strip.

The transmit states for this mode of operation are defined in 4.2.4.3.3.

9.4.3.3.3 Monitor states

The monitor state (MS=) notation is used to identify the current state of the monitor FSM. The monitor state values are Repeat, Repeat Beacon, Repeat Claim Token, Transmit Beacon, Transmit Claim Token, Transmit Ring Purge, and Beacon Test. During the Beacon Test state, no assumptions can be made regarding the transmission or reception of data.

The monitor states for the C-Port in Port mode using the TKP access protocol are defined in 4.2.4.3.2 with the exception of the Beacon Test state, which is defined as follows:

Monitor State M4, Beacon Test (MS=BNT). The monitor state MS=BNT is set when the monitor FSM enters the beacon test state (M4). The Station has removed itself from the ring and is performing a self test. During the Beacon Test state, the C-Port should execute a self test while its timer TRW is running. When timer TRW expires, the C-Port terminates any self test being executed, starts the timer TPLMTF, and activates its repeat path (TS=RPT) to allow the Station to test the lobe and takes one of the following actions:

a) If the INSERT signal is detected prior to timer TPLMTF expiration, then the attached Station has successfully executed its Beacon Test. The C-Port enters the Transmit Beacon state (MS=TBN) if the flag FBT=1 or the Beacon Repeat (MS=RBN) state if the flag FBR=1.
b) If timer TPLMTF expires prior to the detection of INSERT signal, then the C-Port’s join machine is informed that the attached Station’s Beacon Test has failed by the setting of the Interface flag FIPTKPPE to 1. The flag FIPTKPPE=1 causes the C-Port to close by entering the Bypass state (JS=BP).

9.4.4 Port Operation tables for the C-Port in the Port mode using the TKP access protocol

This subclause specifies the Port Operation tables necessary to support the C-Port in Port mode using the TKP access protocol (Configuration 3).

The C-Port’s Join function is defined by the C-Port Join Port Operation table in 9.3.4.1, table 9-7, and is not included in this subclause.

This subclause specifies the Port Operation tables for the C-Port in Port mode using the TKP access protocol as follows:

a) C-Port Transmit Port Operation table
b) C-Port Monitor Port Operation table
c) C-Port Error Handling Port Operation table
d) C-Port Interface Signals Port Operation table
e) C-Port Miscellaneous Frame Handling Port Operation table

These Port Operation tables use the term “optional” as defined in 9.1.1.2.

The C-Port’s Port Operation tables take precedence in case of a discrepancy between their supporting text or the FSM diagrams in this subclause or in annex N.

The three-digit reference numbers are copies of the transition defined in ISO/IEC 8802-5 : 1998, 4.3, table 7. The four-digit reference numbers are transitions unique to the C-Port in Port mode using the TKP access protocol (e.g., 4nnn).

The transmit and monitor Station operation table event/action transitions in 4.3 added or modified by this subclause are clearly identified in the Port Operation tables while any deleted event/action transitions are identified in annex S.1.

9.4.4.1 Interface flag FIPTKPP

The interface flag FIPTKPP, defined in 9.1.1.3, is set to 1 when these Port Operation tables are active.

9.4.4.2 C-Port Transmit Port Operation table

Table 9-13—C-Port Transmit Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1)

S/T	REF	Event/condition	Action/output
T10G	4201	**CPBTX>PPV(MAX_TX)** & TS=DATA & FPASO=0 & FIPTKPP=1 << Maximum frame size exceeded >> << New to DTR >>	[TS=RPT; TX_AB (optional-unk)]
T10F	4210	**CPBTX>PPV(MAX_TX)** & TS=DATA & FPASO=1 & FIPTKPP=1 << Maximum frame size exceeded >> << New to DTR >>	[TS=RPT; TX_INV_FCS; TX_EFS(I=0; E=1) (optional-unk)]
T10D	4211	**DTU_UNITDATA-STATUS.request(Fail)** & FPTX_LTH=0 & FIPTKPP=1 & TS=DATA << New to DTR >>	TS=RPT; TX_AB
	4202	**EOB &** TS=DATA & FIPTKPP=1 << New to DTR >>	[CPBTX=(CPBTX+1) (optional-unk)]
	013	**EOD** & TS=DATA & FED=0 & FTXI=0	FED=1; [FSD=1 (optional-i)]
	4203	**EOD** & TS=DATA & FTXI=0 & FIPTKPP=1 & QUE_NOT_EMPTY & FR_LTH<>UNK & (CTO-FR_LTH)>=0 & Pm>=Pr & FMFTO=0 & Pm>Rr << Replaces REF 018 in ISO/IEC 8802-5 : 1998 >>	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
	4204	**EOD** & TS=DATA & FTXI=0 & FIPTKPP=1 & QUE_NOT_EMPTY & FR_LTH<>UNK & (CTO-FR_LTH)>=0 & Pm>=Pr & FMFTO=1 << Replaces REF 019 in ISO/IEC 8802-5 : 1998 >>	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
T12A	4205	**EOD** & TS=DATA & FTXI=0 & FIPTKPP=1 & QUE_NOT_EMPTY & FR_LTH=UNK & Pm>=Pr & FMFTO=0 & Pm>Rr << Based on REF 018 in ISO/IEC 8802-5 : 1998, supports frames of unknown length >>	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	4206	**EOD** & TS=DATA & FTXI=0 & FIPTKPP=1 & QUE_NOT_EMPTY & FR_LTH=UNK & Pm>=Pr & FMFTO=1 << Based on REF 019 in ISO/IEC 8802-5 : 1998, supports frames of unknown length >>	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	014	**EOD** & TS=DATA & FTXI=0 & QUE_EMPTY	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)

Table 9-13—C-Port Transmit Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) *(Continued)*

S/T	REF	Event/condition	Action/output
T12A	016	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm<Pr	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	017	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=0 & Pm<Rr	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	015	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH<0)	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T10A	020	**EOD** & TS=DATA & FTXI=1 & MS=RBN	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10A	021	**EOD** & TS=DATA & FTXI=1 & MS=RCT	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10A	022	**EOD** & TS=DATA & FTXI=1 & MS=RPT	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10B	023	**EOD** & TS=DATA & FTXI=1 & MS=TBN	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0)
T10B	024	**EOD** & TS=DATA & FTXI=1 & MS=TCT	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0)
T10C	025	**EOD** & TS=DATA & FTXI=1 & MS=TRP	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0); TRR=R
T30B	036	**FNMA=1** & CFR=1 & TS=STRIP	TS=RPT; FTI=0; FLF=1
	040	**FR(DA=any_recognized_address)** & FTI=0 & TS=RPT	SET A=1
	043	**FR(P<Sx)**	[CLEAR_STACKS (optional-i)]
	054	**FR_AC(R<Pm)** & PDU_QUEUED & FTI=0 & TS=RPT & FOP=1	SET R=Pm
	103	**FR_COPIED** **(DA=any_recognized_address)** & FTI=0 & TS=RPT	SET C=1
	203	**FR_WITH_ERR** & FTI=0 & TS=RPT	SET E=1
T10D	4213	**PORT_ERR(correctable)** & TS=DATA << Replaces REF 254 in ISO/IEC 8802-5 : 1998 >>	TS=RPT; TX_AB
T10E	4212	**PORT_ERR(not_correctable)** & TS=DATA << Replaces REF 363 in ISO/IEC 8802-5 : 1998 >>	TS=RPT; [TX_AB (optional-i)]; FPBPF=1 << Transmit Abort sequence—optional >>
T10D	4214	**PORT_ERR(tx-underrun)** & FTUBO=0 & TS=DATA << Replaces REF 364 in ISO/IEC 8802-5 : 1998 >>	TS=RPT; TX_AB
T12B	4215	**PORT_ERR(tx-underrun)** & FTUBO=1 & TS=DATA << Replaces REF 365 in ISO/IEC 8802-5 : 1998 >>	TS=FILL; FED=FTI=1; TRR=R; TX_AB
	044	**RCV(SA<>LTA)** & CFR=1	FNMA=1
	045	**RCV(SA=LTA)** & CFR=1	FMA=1
	246	**RCV_AC**	STORE(Pr;Rr)

Table 9-13—C-Port Transmit Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
	247	**RCV_ED**	FMA=FNMA=FSD=0
	250	**RCV_ED** & FSD=1 & FED=1 & CFR>1	CFR=(CFR-1)
T30B	249	**RCV_ED** & FSD=1 & FMA=0 & CFR=1 & TS=STRIP	TS=RPT; FTI=0; FLF=1
T30A	248	**RCV_ED** & FSD=1 & FMA=1 & CFR=1 & TS=STRIP	TS=RPT; FTI=0
	251	**RCV_SD**	FMA=FNMA=0; FSD=1
T01A	4207	**TK**(P<=Pm) & PDU_QUEUED & FIPTKPP=1 & FIT=0 & FOP=1 & FR_LTH<>UNK & TS=RPT << Replaces REF 293 in ISO/IEC 8802-5 : 1998 >>	TS=DATA; FED=FMA=FSD=FTXI=0; FIPTX_LTH=1; CFR=1; CTO=[PPV(MAX_TX)-FR_LTH]; TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
T01B	4208	**TK**(P<=Pm) & PDU_QUEUED & FIPTKPP=1 & FIT=0 & FOP=1 & FR_LTH=UNK & TS=RPT << Based on REF 293 in ISO/IEC 8802-5 : 1998, supports frames of unknown length >>	TS=DATA; FED=FMA=FSD=FTXI=0; FIPTX_LTH=0; CFR=1; CTO=0; << Setting CTO=0 disables multiframe transmit on a single token >> TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
	294	**TK(P<>Sx)** & PDU_QUEUED(P>Pm>R) & FTI=0 & TS=RPT & FOP=1	SET R=Pm
	300	**TK(P>0 & M=0)** & FAM=1 & FTI=0 & TS=RPT	SET M=1
	295	**TK_AC(P<Sx)**	CLEAR_STACKS
	297	**TK_AC(P=Sx) & Sr<Px** & QUE_EMPTY & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
	296	**TK_AC(P=Sx) & Sr<Px** & PDU_QUEUED(Pm<Sx) & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
	298	**TK_AC(P=Sx) & Sr>=Px** & PDU_QUEUED(Pm<Sx) & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
	299	**TK_AC(P=Sx) & Sr>=Px** & QUE_EMPTY & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T10D	301	**TK_ERR** & FTXI=0 & TS=DATA	TS=RPT; TX_AB
	307	**TK_WITH_ERR** & FTEO=0 & FTI=0 & TS=RPT	SET E=1
T20	323	**TRR=E** & TS=FILL	TS=RPT; FTI=0; FLF=1
T30B	324	**TRR=E** & TS=STRIP	TS=RPT; FTI=0; FLF=1
T23A	327	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr=Sx & Sr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)

Table 9-13—C-Port Transmit Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) *(Continued)*

S/T	REF	Event/condition	Action/output
T23B	328	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr=Sx & Sr>=Px	TS=STRIP; TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T23C	329	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr>Sx & Pr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); STACK(Sx=Px; Sr=Pr)
T23D	330	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr>Sx & Pr>=Px	TS=STRIP; TX_TK(P=Pr; M=0; R=Px)
T23A	331	**TS=FILL** & FMA=1 & Pr=Sx & Sr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
T23B	332	**TS=FILL** & FMA=1 & Pr=Sx & Sr>=Px	TS=STRIP; TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T23C	333	**TS=FILL** & FMA=1 & Pr>Sx & Pr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); STACK(Sx=Px; Sr=Pr)
T23D	334	**TS=FILL** & FMA=1 & Pr>Sx & Pr>=Px	TS=STRIP; TX_TK(P=Pr; M=0; R=Px)
T01C	4209	**TXI_REQ** & FIPTKPP=1 & TS=RPT << Replaces REF 352 in ISO/IEC 8802-5 : 1998 >>	TS=DATA; FTI=0; FTXI=1; TX_SFS(P=0; R=0); **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D

9.4.4.3 C-Port Monitor Port Operation table

Table 9-14—C-Port Monitor Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1)

S/T	REF	Event/condition	Action/output
M54	4301	**FPINSD=0** & MS=RBN & FBR=0 & FIPTKPP=1 Replaces REF 003 in ISO/IEC 8802-5 : 1998 << Monitor detects the attached Station has deinserted by absence of INSERT signal. >>	MS=BNT; FTXC=FTI=FOP=0; FBR=1; TRW=R << The Beacon Repeat function has detected the need for Beacon Test and enters the Beacon Test state >>
M34	4302	**FPINSD=0** & MS=TBN & FINS=1 & FBT=0 & FIPTKPP=1 Replaces REF 264 in ISO/IEC 8802-5 : 1998 << Monitor detects the attached Station has deinserted by absence of INSERT signal. >>	MS=BNT; FTXC=FTI=FOP=0; FBT=1; TRW=R
M45	4303	**FPINSD=1** & FIPTKPP=1 & FBR=1 & MS=BNT Replaces REF 279 in ISO/IEC 8802-5 : 1998 << C-Port detects the attached Station's INSERT signal (LMT successful). >>	MS=RBN; FTI=FTXC=0; FBT=FID=FOP=1; TID=R
M43	4304	**FPINSD=1** & FIPTKPP=1 & FBT=1 & MS=BNT Replaces REF 280 in ISO/IEC 8802-5 : 1998 << C-Port detects the attached Station's INSERT signal (LMT successful). >>	MS=TBN; FTI=0; FTXC=FBR=FID=FOP=1; TID=R
M52A	038	**FR(DA=any_recognized_address)** & FID=1 & MS=RBN	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
	039	FR(DA=any_recognized_address**) & FID=1** & MS=TBN	FID=0; FTI=1; TQP=R; TXI(BN_PDU)
	046	**FR_AC** & FAM=0 & FPT=1 & FGTO=0	TNT=R; FPT=0
	048	**FR_AC(M=0)** & FAM=1 & FTHO=0	TVX=R
	049	**FR_AC(M=0)** & FAM=1 & FTHO=1	FAT=1
	047	**FR_AC(M=0)** & FAM=1 & FTI=0 & TS=RPT	SET M=1
	050	**FR_AC(M=0)** & MS=RBN & CBC=0 & FTI=0 & TS=RPT	[SET M=1 (optional-i)]
M01	051	**FR_AC(M=1)** & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	055	**FR_AMP** & CNNR<>0	CNNR=(CNNR-1)
	057	**FR_AMP** & FAM=0 & FINS=1	TSM=R
	056	**FR_AMP** & FAM=1	[TSM=R (optional-i)]
	059	**FR_AMP(A=0 & C=0)** & FAM=0 & FOP=1	FSMP=1; TQP=R
	060	**FR_AMP(A|C<>0)** & FAM=0	FSMP=0

Table 9-14—C-Port Monitor Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
	061	**FR_AMP(SA<>MA)** & FAM=1	QUE_ACT_ERR_PDU(EC=2); FAM=0; FA(monitor)=0
	062	**FR_AMP(SA<>MA)** & FAM=1 & FINS=1	TNT=R
	063	**FR_AMP(SA<>MA)** & FAM=1 & TS=RPT	FTXC=FTI=0
	064	**FR_AMP(SA<>SUA & A=0 & C=0)** & FOP=1	CSC=1; SUA=SA ; QUE_SUA_CHG_PDU
	065	**FR_AMP(SA=MA & A=0 & C=0)** & FAM=1	FNN=FNW=1; LMP=NULL
	066	**FR_AMP(SA=MA & A|C<>0)** & FAM=1	LMP=SA
	072	**FR_BN** & MS<>TBN & MS<>BNT & FINS=1	TBR=R
M65	073	**FR_BN** & MS=RCT & FINS=1	MS=RBN
	074	**FR_BN** & MS=RPT & FAM=1 & TS=RPT	FTXC=0
M05	075	**FR_BN** & MS=RPT & FINS=1	MS=RBN; FAM=0; FA(monitor)=0
M25	076	**FR_BN** & MS=TCT & FINS=1	MS=RBN
	077	**FR_BN** & MS=TCT & FINS=1 & TS=RPT	FTXC=FTI=0
M15	078	**FR_BN** & MS=TRP & FINS=1	MS=RBN; FAM=0; FA(monitor)=0
	079	**FR_BN** & MS=TRP & FINS=1 & TS=RPT	FTXC=FTI=0
M32	080	**FR_BN(M=0 & SA=MA)** & MS=TBN & FID=0	MS=TCT; FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
	083	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FID=0 & FINS=1 & TS=RPT	FTXC=FTI=0
M35	082	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FID=0 & FINS=1	MS=RBN; TBR=R
	094	**FR_BN(SA<>MA & UNA=MA & BN_TYPE<>1)** & FBR=0 & MS<>RBN & MS<>BNT	CBR=7
	084	**FR_BN(SA<>SUA)**	CBC=2
	087	**FR_BN(SA=SUA & UNA<>MA)** & CBC=0 & MS=RBN	CBC=1
	090	**FR_BN(SA=SUA & UNA<>MA)** & FBR=0 & CBC>0 & MS=RBN	CBC=(CBC-1)
	086	**FR_BN(SA=SUA & UNA<>MA)** & MS<>RBN & FBR=0 & MS<>BNT	CBC=1
	085	**FR_BN(SA=SUA & UNA=MA)** & FBR=0	CBC=2
	088	**FR_BN(SA=SUA)** & FBR=1 & MS<>RBN & MS<>BNT	CBC=1
	089	**FR_BN(SA=SUA)** & FBR=1 & CBC=0 & MS=RBN	CBC=1
	091	**FR_BN(SA=SUA)** & FBR=1 & CBC>0 & MS=RBN	CBC=(CBC-1)

Table 9-14—C-Port Monitor Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
	092	**FR_BN(UNA<>MA)**	CBR=8
	095	**FR_BN(UNA=MA & BN_TYPE<>1)** & FBR=0 & MS=RBN	CBR=(CBR-1)
	093	**FR_BN(UNA=MA & BN_TYPE=1)**	CBR=8
M52C	096	**FR_BN_CIR** & MS=RBN & CBC<>2 & FINS=1	[MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU) (optional-i)]
M26A	109	**FR_CT (M=0 & SA=MA & UNA<>SUA)** & MS=TCT	MS=RCT; TCT=R; QUE_ACT_ERR_PDU(EC=3)
	110	**FR_CT (M=0 & SA=MA & UNA<>SUA)** & MS=TCT & TS=RPT	FTXC=FTI=0
	104	**FR_CT** & FAM=1	FAM=0; QUE_ACT_ERR_PDU(EC=1); FA(monitor)=0
	105	**FR_CT** & FAM=1 & TS=RPT	FTXC=FTI=0
	107	**FR_CT** & MS<>TBN & FCT=0	FCT=1
M16	108	**FR_CT** & MS=TRP	MS=RCT; TCT=R
M21	111	**FR_CT(M=0 & SA=MA & UNA=SUA)** & CCT>=n1 & CCR>=n1 & MS=TCT	MS=TRP; FAM=1; TRP=R; TXI(RP_PDU); QUE_NEW_MON_PDU; FA(monitor)=1
	112	**FR_CT(M=0 & SA=MA & UNA=SUA)** & MS=TCT	CCR=(CCR+1)
M56	113	**FR_CT(SA<MA)** & MS=RBN & FCCO=0 & FID=0	MS=RCT; TCT=R
M52B	114	**FR_CT(SA<MA)** & MS=RBN & FCCO=1 & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M06	116	**FR_CT(SA<MA)** & MS=RPT & FCCO=0 & FOP=1	MS=RCT; TCT=R
M02B	117	**FR_CT(SA<MA)** & MS=RPT & FCCO=1 & FAM=0 & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M06	118	**FR_CT(SA<MA)** & MS=RPT & FINS=0 & FOP=1	MS=RCT; TCT=R
M06	115	**FR_CT(SA<MA)** & MS=RPT & FAM=1	MS=RCT; TCT=R
M56	119	**FR_CT(SA>MA)** & MS=RBN & FID=0	MS=RCT; TCT=R
M06	120	**FR_CT(SA>MA)** & MS=RPT & FOP=1	MS=RCT; TCT=R
	122	**FR_CT(SA>MA)** & MS=TCT	[TXI(RCV_CT_PDU) (optional-i)]
M26B	121	**FR_CT(SA>MA)** & MS=TCT	MS=RCT; TCT=R
	123	**FR_CT(SA>MA)** & MS=TCT & TS=RPT	FTXC=FTI=0
	163	**FR_RP**	CNNR=n5
M60	169	**FR_RP** & MS=RCT	MS=RPT
	166	**FR_RP** & MS=RCT & FINS=1	FBR=FBT=0
	170	**FR_RP** & MS=RCT & FINS=1	TNT=R; TSM=R

Table 9-14—C-Port Monitor Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
	171	**FR_RP** & MS=RPT & FAM=1	FAM=0; QUE_ACT_ERR_PDU(EC=2); FA(monitor)=0
	173	**FR_RP** & MS=RPT & FAM=1 & FINS=1	TNT=R; [TSM=R (optional-i)]
	172	**FR_RP** & MS=RPT & FAM=1 & TS=RPT	FTXC=FTI=0
	167	**FR_RP** & MS=RPT & FINS=1	FBR=FBT=0
	168	**FR_RP** & MS=TRP & FINS=1	FBR=FBT=0
	174	**FR_RP(SA<>MA)** & FAM=0 & FINS=1	[TNT=R (optional-x)]
M10B	175	**FR_RP(SA<>MA)** & MS=TRP	MS=RPT; FAM=0; QUE_ACT_ERR_PDU(EC=2); FA(monitor)=0
	176	**FR_RP(SA<>MA)** & MS=TRP & TS=RPT	FTXC=FTI=0
M10A	177	**FR_RP(SA=MA & R=0)** & MS=TRP	MS=RPT; FAT=FTI=FNN=0; FMP=1; TVX=R; TAM=R; TX_TK(P=0; M=0; R=0); CLEAR_STACKS; QUE_AMP_PDU; LMP=(MA|NULL); [TSM=R (optional-i)]
M10C	178	**FR_RP(SA=MA & R>0)** & MS=TRP	MS=RPT; FAT=FTI=FNN=0; FMP=1; TVX=R; TAM=R; TX_TK(P=Rr; M=0; R=0); RESET_STACKS(Sx=Rr; Sr=0); QUE_AMP_PDU; LMP=(MA|NULL); [TSM=R (optional-i)]
	192	**FR_SMP(A=0 & C=0)** & FAM=1	FNN=FNW=1; LMP=NULL
	193	**FR_SMP(A=0 & C=0)** & FSMP=0 & FAM=0 & FOP=1	FSMP=1; TQP=R
	198	**FR_SMP(A|C<>0)** & FAM=1	LMP=SA
	199	**FR_SMP(SA<>SUA & A=0 & C=0)** & FAM=0 & FOP=1	CSC=1; SUA=SA; QUE_SUA_CHG_PDU
	200	**FR_SMP(SA<>SUA & A=0 & C=0)** & FAM=1 & FNN=0 & FOP=1	CSC=1; SUA=SA; QUE_SUA_CHG_PDU
	201	**FR_SUA_CHG (SA=MA & E=0 & A=1 & C=0)** & CSC<n3 & FOP=1	CSC=(CSC+1); QUE_SUA_CHG_PDU
	202	**FR_SUA_CHG (SA=MA & E=1 & C=0)** & CSC<n3 & FOP=1	CSC=(CSC+1); QUE_SUA_CHG_PDU
	207	**FSL=0** & MS=TBN & TX_BN_TYPE=2	TX_BN_TYPE=3
	208	**FSL=1** & FID=1 & MS=TBN	FID=0; FTI=1; TQP=R; TX_BN_TYPE=2; TXI(BN_PDU)
M52A	212	**FSL=1** & FINS=1 & MS=RBN	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M62	213	**FSL=1** & FINS=1 & MS=RCT	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M02C	214	**FSL=1** & FINS=1 & MS=RPT	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M12A	215	**FSL=1** & FINS=1 & MS=TRP	MS=TCT; FAM=FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0

Table 9-14—C-Port Monitor Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	216	**FSL=1** & MS=TBN	TX_BN_TYPE=2
	260	**TAM=E** & FNN=0 & FAM=1 & MS=RPT	TAM=R; QUE_NN_INCMP_PDU; QUE_AMP_PDU; LMP=(MA|NULL)
	261	**TAM=E** & FNN=1 & FAM=1 & MS=RPT	FNN=0; TAM=R; QUE_AMP_PDU; LMP=(MA|NULL)
M52B	262	**TBR=E** & MS=RBN & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M63	266	**TCT=E** & MS=RCT & FNC=1	MS=TBN; FTXC=FTI=1; TBT=R; TQP=R; TX_BN_TYPE=4; TXI(BN_PDU)
M23B	271	**TCT=E** & MS=TCT & FNC=1 & FCT=0 & FSL=0	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=3; TXI(BN_PDU)
M23A	273	**TCT=E** & MS=TCT & FNC=1 & FCT=1 & FSL=0	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=4; TXI(BN_PDU)
M23C	272	**TCT=E** & MS=TCT & FNC=1 & FSL=1	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=2; TXI(BN_PDU)
M52A	282	**TID=E** & MS=RBN & FID=1	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
	283	**TID=E** & MS=TBN & FID=1	FID=0; FTI=1; TQP=R; TXI(BN_PDU)
M01	290	**TK(M=1)** & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	304	**TK_GOOD** & FAM=0 & FGTO=1	TNT=R
	305	**TK_GOOD(P=0)** & FAM=0 & FGTO=0	TNT=R; FPT=0
	306	**TK_GOOD(P>0)** & FAM=0 & FGTO=0	FPT=1
M02B	310	**TNT=E** & FAM=0 & FINS=1 & MS=RPT	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
	4305	**TPLMTF=E** & FIPTKPP=1 & MS=BNT << New to DTR >> << Beacon Test state failed to detect attached Station's INSERT signal before timer TPLMTF expired (LMT failed). >>	FIPTKPPE=1 << Monitor signals the C-Port Join function the attached Station has failed Beacon Test. >>
	311	**TQP=E** & MS=RPT & FDC=0 & FAM=0	FNW=1
	312	**TQP=E** & MS=RPT & FDC=1 & FAM=0	FNC=1; QUE_SMP_PDU
	313	**TQP=E** & MS=TBN & FID=0	TQP=R; TXI(BN_PDU)
	314	**TQP=E** & MS=TCT	TQP=R; CCT=(CCT+1); TXI(CT_PDU)
M12B	322	**TRP=E** & MS=TRP & FINS=1	MS=TCT; FAM=FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); QUE_ACT_ERR_PDU(EC=1); FA(monitor)=0
	4306	**TRW=E** & MS=BNT & FIPTKPP=1 << Replaces REF 326 in ISO/IEC 8802-5 : 1998 >>	TPLMTF=R << C-Port resets timer TPLMTR to allow time for the attached Station Beacon Test. >>
	335	**TSL=E** & FSLD=1	FSL=1
M02C	336	**TSM=E** & MS=RPT & FINS=0 & FAM=1	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0

Table 9-14—C-Port Monitor Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
M02C	337	**TSM=E** & MS=RPT & FINS=1	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M01	338	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
M01	341	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	344	**TVX=E** & FTHO=1 & FAT=1 & FAM=1	FAT=0; TVX=R
	346	**TWFD=E** & FWFA=0	FWFA=1
	348	**TX_ERR(RP)** & MS=TRP	TXI(RP_PDU)
	351	**TX_ERR(SUA_CHG)** & CSC<n3 & FOP=1	QUE_SUA_CHG_PDU; [CSC=CSC+1 (optional)]

9.4.4.4 C-Port Error Handling Port Operation table

Table 9-15—C-Port Error Handling Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1)

S/T	REF	Event/condition	Action/output
	001	**Burst5_error_event** & MS=RPT & FINS=1 & FER=0	TER=R; FER=1; CBE=(CBE+1)
	002	**Burst5_error_event** & MS=RPT & FINS=1 & FER=1 & CBE<255	CBE=(CBE+1)
	004	**CER=n3** & FECO=0	FER=FLF=0; CER=0; SET ERR_CNTR to 0;
	005	**CER=n3** & FECO=1	FLF=0; CER=0; SET ERR_CNTR to 0;
	030	**FJR=1** & FBHO=1 & FINS=0 & FECO=1	TER=R; FER=1
	032	**FLF=1** & MS=RPT & FINS=1 & FER=1 & CLFE<255	FLF=0; CLFE=(CLFE+1)
	031	**FLF=1** & MS=RPT & FINS=1 & FER=0	FLF=0; FER=1; TER=R; CLFE=(CLFE+1)
	034	**FNC=1** & FBHO=0 & FINS=0 & FECO=1	FER=1; TER=R
	052	**FR_AC(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	053	**FR_AC(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	361	**FR_LLC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=0	[FER=1; TER=R; CFCE=(CFCE+1) (optional-x)]
	362	**FR_LLC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=1 & CFCE<255	[CFCE=(CFCE+1) (optional-x)]
	041	**FR_MAC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CFCE=(CFCE+1)
	042	**FR_MAC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=1 & CFCE<255	CFCE=(CFCE+1)
	152	**FR_NOT_COPIED** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CRCE=(CRCE+1)
	153	**FR_NOT_COPIED** & MS=RPT & FINS=1 & FER=1 & CRCE<255	CRCE=(CRCE+1)
	179	**FR_RPRT_ERR (SA=MA & A=1 & C<>0)** & CER<n3 & FECO=0 & FOP=1	FER=FLF=0; CER=0; SET ERR_CNTR to 0
	181	**FR_RPRT_ERR (SA=MA & E=0 & A=0)** & CER<n3 & FECO=0 & FOP=1	FER=FLF=0; CER=0; SET ERR_CNTR to 0
	182	**FR_RPRT_ERR (SA=MA & E=0 & A=0)** & CER<n3 & FECO=1 & FOP=1	FLF=0; CER=0; SET ERR_CNTR to 0
	183	**FR_RPRT_ERR (SA=MA & E=0 & A=1 & C=0)** & CER<n3 & FOP=1	CER=(CER+1); QUE_RPRT_ERR_PDU
	184	**FR_RPRT_ERR (SA=MA & E=1 & C=0)** & CER<n3 & FOP=1	CER=(CER+1); QUE_RPRT_ERR_PDU

Table 9-15—C-Port Error Handling Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	180	**FR_RPRT_ERR** **(SA=MA & A=1 & C<>0)** & CER<n3 & FECO=1 & FOP=1	FLF=0; CER=0; SET ERR_CNTR to 0
	194	**FR_SMP(A=0 & C=0)** & FSMP=1 & MS=RPT & FINS=1 & FAM=0 & CNNR=0 & FER=0	FER=1; TER=R; CACE=(CACE+1)
	195	**FR_SMP(A=0 & C=0)** & FSMP=1 & MS=RPT & FINS=1 & FAM=0 & CNNR=0 & FER=1 & CACE<255	CACE=(CACE+1)
	196	**FR_SMP(A=0 & C=0)** & MS=RPT & FINS=1 & FAM=1 & FNN=1 & CNNR=0 & FER=0	FER=1; TER=R; CACE=(CACE+1)
	197	**FR_SMP(A=0 & C=0)** & MS=RPT & FINS=1 & FAM=1 & FNN=1 & CNNR=0 & FER=1 & CACE<255	CACE=(CACE+1)
	204	**FR_WITH_ERR(E=0)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CLE=(CLE+1)
	205	**FR_WITH_ERR(E=0)** & MS=RPT & FINS=1 & FER=1 & CLE<255	CLE=(CLE+1)
	222	**INTERNAL_ERR(correctable)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CIE=(CIE+1)
	223	**INTERNAL_ERR(correctable**) & MS=RPT & FINS=1 & FER=1 & CIE<255	CIE=(CIE+1)
	4402	**PORT_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=0 << Replaces REF 252 in ISO/IEC 8802-5 : 1998 >>	FER=1; TER=R; CABE=(CABE+1)
	4403	**PORT_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255 << Replaces REF 253 in ISO/IEC 8802-5 : 1998 >>	CABE=(CABE+1)
		PORT_ERR(tx-underrun) & TS=DATA & FINS=1 & MS=RPT & FER=0 << Replaces REF 366 in ISO/IEC 8802-5 : 1998 >>	[FER=1; TER=R; CABE=(CABE+1) (optional-x)]
		PORT_ERR(tx-underrun) & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255 << Replaces REF 367 in ISO/IEC 8802-5 : 1998 >>	[CABE=(CABE+1) (optional-x)]
	4401	**TER=E** & FINS=1 & ERR_CNTR<>0 & FIPTKPP=1 << Replaces REF 274 in ISO/IEC 8802-5 : 1998 >>	CER=n3; MRI_UNITDATA.indication (ERR_RPRT_PDU); **If** FECO=0 then FER=0; [QUE_RPRT_ERR_PDU (optional-x)] << CER=n3 is used since Assured Delivery is not supported by the C-Port in Port mode. >>

Table 9-15—C-Port Error Handling Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	275	**TER=E** & FINS=1 & FECO=1	TER=R
	291	**TK(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	292	**TK(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	303	**TK_ERR** & TS=DATA & FINS=1 & FER=1 & CABE<255	CABE=(CABE+1)
	302	**TK_ERR** & TS=DATA & FINS=1 & FER=0	FER=1; TER=R; CABE=(CABE+1)
	308	**TK_WITH_ERR(E=0)** & FTEO=0 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CLE=(CLE+1)
	309	**TK_WITH_ERR(E=0)** & FTEO=0 & MS=RPT & FINS=1 & FER=1 & CLE<255	CLE=(CLE+1)
	339	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	340	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	343	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	342	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	349	**TX_ERR(RPRT_ERR)** & CER<n3 & FOP=1	QUE_RPRT_ERR_PDU; [CER=(CER+1) (optional)]

9.4.4.5 C-Port Interface Signals Port Operation table

Table 9-16—C-Port Interface Signals Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1)

S/T	REF	Event/condition	Action/output
	4509	**DTU_UNITDATA-STATUS.request(Fail)** & FIPTKPP=1 & TS=RPT << New to DTR >>	DISCARD_QUEUED_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	4507	**DTU_UNITDATA-STATUS.request(OK)** & FIPTKPP=1 & FPTX_LTH=0 & TS=DATA << Transmit FSM is currently transmitting a frame of unknown length. This is an indication that a cut-through frame is being transmitted. >> << New to DTR >>	FPTX_LTH=1 << The cut-through frame has completed with OK status. The frame length is now known. >>
	4508	**DTU_UNITDATA-STATUS.request(Fail)** & FIPTKPP=1 & FPTX_LTH=1 & TS=DATA << Transmit FSM is currently transmitting a previously queued frame. This is an indication that a cut-through frame is terminating with an error. >> << New to DTR >>	DISCARD_QUEUED_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	4501	**DTU_UNITDATA.request** & FPJC=1 & FOP=1 & FIPTKPP=1 & FR_LTH<=PPV(MAX_TX) << New to DTR >>	QUE_PDU
	4502	**DTU_UNITDATA.request** & FPJC=1 & FOP=1 & FIPTKPP=1 & FR_LTH=UNK << C-Port transmitting a frame using the FR_LTH=UNK condition >> << New to DTR >>	[QUE_PDU (optional-unk)]
	4503	**FR** & FPFCO=0 & FPJC=1 & FOP=1 & FIPTKPP=1 & TS=RPT << New to DTR >>	DTU_UNITDATA.indication; DTU_UNITDATA-STATUS.indication(OK)
	4516	**FR** & FPFCO=1 & FPJC=1 & FOP=1 & FIPTKPP=1 & TS=RPT << New to DTR >>	DTU_UNITDATA-STATUS.indication(OK)
	4504	**FR_FC** & FPFCO=1 & FPJC=1 & FOP=1 & FIPTKPP=1 & TS=RPT << New to DTR >>	DTU_UNITDATA.indication
	4506	**FR_MAC (DA<>any_recognized_address & SC<>0)** & FPJC=1 & FOP=1 & FIPTKPP=1 & TS=RPT << New to DTR >>	MRI_UNITDATA.indication

Table 9-16—C-Port Interface Signals Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	4505	**FR_MAC(DC<>0 & DC<>3 & SC=0)** & FPJC=1 & FOP=1 & FIPTKPP=1 & TS=RPT << New to DTR >>	MRI_UNITDATA.indication
	4517	**FR_WITH_ERR** & FPFCO=1 & FPJC=1 & FOP=1 & FIPTKPP=1 & TS=RPT << New to DTR >>	DTU_UNITDATA-STATUS.indication(Fail)
	4510	**FTI=0** & FIPTKPP=1 << Replaces REF 217 in ISO/IEC 8802-5 : 1998 >>	PM_CONTROL.request(Repeat_mode=Repeat) **or** PS_CONTROL.request(Repeat_mode=Repeat) ⇒ **An implementation shall take one of these two actions**
	4511	**FTI=1** & FIPTKPP=1 << Replaces REF 218 in ISO/IEC 8802-5 : 1998 >>	PM_CONTROL.request(Repeat_mode=Fill) **or** PS_CONTROL.request(Repeat_mode=Fill) ⇒ **An implementation shall take one of these two actions**
	220	**FTXC=0**	PS_CONTROL.request (Crystal_transmit=Not_asserted)
	221	**FTXC=1**	PS_CONTROL.request (Crystal_transmit=Asserted)
	4512	**MRI_UNITDATA.request** & FPJC=1 & FOP=1 & FIPTKPP=1 & FR_LTH<=PPV(MAX_TX) << New to DTR >>	QUE_PDU
	4513	**MRI_UNITDATA.request** & FPJC=1 & FOP=1 & FIPTKPP=1 & FR_LTH=UNK << C-Port transmitting a frame using the FR_LTH=UNK condition >> << New to DTR >>	[QUE_PDU (optional-unk)]
	4515	**PM_STATUS.indication(Insert=Detected)**	FPINSD=1
	4514	**PM_STATUS.indication (Insert=Not_detected)**	FPINSD=0
	239	**PM_STATUS.indication (Signal_detection= Signal_acquired)** & FSLD=1	FSL=FSLD=0
	240	**PM_STATUS.indication (Signal_detection= Signal_loss)** & FSLD=0	FSLD=1; TSL=R
	244	**PS_STATUS.indication(Frequency_error)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CFE=(CFE+1)
	245	**PS_STATUS.indication(Frequency_error)** & MS=RPT & FINS=1 & FER=1 & CFE<255	CFE=(CFE+1)
	243	**PS_STATUS.indication(Burst4_error)**	[FSD=0 (optional-i)]
	288	**TK(M=0)** & FAM=1 & FTHO=0	TVX=R; PS_EVENT.response(Token_received)
	289	**TK(M=0)** & FAM=1 & FTHO=1	FAT=1; PS_EVENT.response(Token_received)

9.4.4.6 C-Port Miscellaneous Frame Handling Port Operation table

Table 9-17—C-Port Miscellaneous Frame Handling Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1)

S/T	REF	Event/condition	Action/output
	098	**FR_CHG_PARM (DA=broadcast & A|C<>1 & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	099	**FR_CHG_PARM (DA=broadcast & A|C<>1 & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	101	**FR_CHG_PARM (DA=Non_broadcast & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	102	**FR_CHG_PARM (DA=Non_broadcast & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	097	**FR_CHG_PARM** & FOP=1	SET APPR_PARMS
	129	**FR_INIT (DA=broadcast & A|C<>1 & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	130	**FR_INIT (DA=broadcast & A|C<>1 & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	132	**FR_INIT (DA=Non_broadcast & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	133	**FR_INIT (DA=Non_broadcast & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	128	**FR_INIT** & FOP=1	SET APPR_PARMS
	136	**FR_MAC_INV (ERR_COND=LONG_MAC & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8009)
	137	**FR_MAC_INV (ERR_COND=LONG_MAC & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8009)
	138	**FR_MAC_INV (ERR_COND=SC_INVALID & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8004)
	139	**FR_MAC_INV (ERR_COND=SC_INVALID & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8004)
	141	**FR_MAC_INV (ERR_COND=SHORT_MAC & SC_PRESENT & SC<>RS)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001)
	140	**FR_MAC_INV (ERR_COND=SHORT_MAC) & SC_NOT_PRESENT)** & FOP=1	[QUE_RSP_PDU(DC<>RS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001 (optional-x)]

Table 9-17—C-Port Miscellaneous Frame Handling Port Operation table for the C-Port in Port mode using the TKP access protocol (FIPTKPP=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
	142	**FR_MAC_INV (ERR_COND=SV_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8005)
	143	**FR_MAC_INV (ERR_COND=SV_LTH_ERR & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8005)
	144	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8007)
	145	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8007)
	146	**FR_MAC_INV (ERR_COND=SV_UNK & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8008)
	147	**FR_MAC_INV (ERR_COND=SV_UNK & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8008)
	148	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8002)
	149	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8002)
	150	**FR_MAC_INV (ERR_COND=VI_UNK & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8003)
	151	**FR_MAC_INV (ERR_COND=VI_UNK & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8003)
	4601	**FR_REMOVE** << Replaces REFs 154, 155, and 162 in ISO/IEC 8802-5 : 1998 >>	QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A)
	185	**FR_RQ_ADDR** & FOP=1	QUE_RPRT_ADDR_PDU
	186	**FR_RQ_ATTACH** & FOP=1	QUE_RPRT_ATTACH_PDU
	190	**FR_RQ_STATE** & FOP=1	QUE_RPRT_STATE_PDU

9.4.4.7 Precise specification of terms

This subclause defines the precise specifications of “Event/condition” and “Action/output” columns for the Port Operation tables.

9.4.4.7.1 Precise specification of events/conditions

{flag}=0.	The specified flag is set to zero (false).
{flag}=1.	The specified flag is set to one (true).
{term1} = {term2}.	Term 1 is equal to term 2.
{term1} < {term2}.	Term 1 is less than term 2.
{term1} <= {term2}.	Term 1 is less than or equal to term 2.
{term1} > {term2}.	Term 1 is greater than term 2.
{term1} >= {term2}.	Term 1 is greater than or equal to term 2.
{term1} <> {term2}.	Term 1 is not equal to term 2.
{timer}=E.	The specified timer has expired.

The following additional items of relevance are used in the tables.

Items in parentheses **( )** are grouped to show relevance.
& means: “and.”
| means: “or.”

Unless otherwise specified, the following terms and operations are defined.

A=0. Both the A bits in the received frame’s FS field (bits 0 and 4) were 0.
A=1. Both the A bits in the received frame’s FS field (bits 0 and 4) were 1.
A<>1. Either or both A bits in the received frame’s FS field (bits 0 and 4) were 0.
A|C<>0. At least one of the frame status bits in the received frame’s FS field (bits 0, 1, 4, or 5) is 1.
A|C<>1. At least one of the frame status bits in the received frame’s FS field (bits 0, 1, 4, or 5) is 0.
AP_MASK. Option mask for access protocol. Bit significant mask used by the C-Port. Each bit is defined for each access protocol supported.
AP_REQ=value. Access Protocol Request subvector is received with the specified value.
BN_TYPE. The value of the beacon type subvector received.
Burst5_error_event. A conditional PM_STATUS.indication(Burst5_error) has occurred. The conditions under which a Burst5_error is excluded are not uniquely specified by this standard (see Counter Burst Error in 3.6). At a minimum, the C-Port in Port mode shall include the first Burst5_error following a valid MAC frame copied by the Station if the Burst5_error occurs within a frame. The C-Port may include every Burst5_error.
C=0. Both the C bits in the received frame’s FS field (bits 1 and 5) were set to 0.
C<>0. Either or both C bits in the received frame’s FS field (bits 1 and 5) were set to 1.
C=1. Both the C bits in the received frame’s FS field (bits 1 and 5) were set to 1.
Connect.PMAC. The PMAC receives the command from management to join the network.
CORR_NOT_PRESENT. The received frame did not contain a correlator subvector.
CORR_PRESENT. The received frame did contain a correlator subvector.
CPBTX>PPV(MAX_TX). The frame being transmitted is longer than allowed by PPV(MAX_TX).
CTO-FR_LTH<0. The value of the Transmit Octet counter is less than the next frame length to be transmitted.
CTO-FR_LTH>=0. The value of the Transmit Octet counter is greater than, or equal to, the next frame length to be transmitted.
DA<>any_recognized_address. The destination address (DA) of the received frame does not match any of the C-Port’s addresses as follows:

- Is not any of the C-Port’s individual addresses, or
- Is not any of the C-Port’s group addresses, or

- Is not any of the C-Port's functional addresses, or
- Is not any of the broadcast addresses defined in 3.2.4.1.

DA=any_recognized_address. The destination address (DA) of the received frame matches any of the C-Port's addresses as follows:

- Is the C-Port's individual address (DA=MA), or
- Is one of the C-Port's group addresses, or
- Is one of the C-Port's functional addresses, or
- Is one of the broadcast addresses as defined in 3.2.4.1.

DA=MA. The destination address (DA) of the received frame is equal to the individual address of the C-Port. If the C-Port's individual address is an universally administered address, then all 48 bits must match. If the C-Port's individual address is a locally administrated address, then either a hierarchical address match or a 48-bit address match is allowed.

DA=Non_broadcast. The received frame was not sent to a broadcast address, but otherwise addressed to the C-Port.

Disconnect.PMAC. The request from local management to close the C-Port.

DTU_UNITDATA.request. The DTU interface requests a frame to be transmitted.

DTU_UNITDATA-STATUS.request(Status_Code). Frame status is reported by the DTU to the PMAC. Status_Code may be one of the following:

- OK: The frame has been successfully transferred to the PMAC without error.
- Fail: Transfer of the frame to the PMAC has failed due to a frame error.

E=0. The error bit in the received ED field is zero.

E=1. The error bit in the received ED field is one.

EOB. End of byte: The last bit of an octet within the Information field has been transmitted.

EOD. End of data: The last octet of the Information field has been transmitted.

ERR_CNTR<>0. Any error counter not zero.

ERR_COND=LONG_MAC. MAC frame too long—INFO field larger than maximum allowed VL value.

ERR_COND=SC_INVALID. Invalid source class.

ERR_COND=SHORT_MAC. MAC frame not long enough to contain VL, VC, and VI fields.

ERR_COND=SV_LTH_ERR. Subvector length error.

ERR_COND=SV_MISSING. Missing required subvector.

ERR_COND=SV_UNK. Unknown subvector SVI value.

ERR_COND=VI_LTH_ERR. Vector length error. VL is not equal to the sum of all the SVLs plus the length of VL, VC, and VI fields, or VL does not agree with the length of the frame.

ERR_COND=VI_UNK. Unrecognized vector ID value.

FR. A frame has been received that meets the criteria specified in 4.3.2.

FR(criteria). A frame has been received that meets the specified criteria and the criteria specified in 4.3.2.

FR_AC(criteria). A frame's access control field has been received that meets the specified criteria and the criteria specified in 4.3.2.

FR_AMP(criteria). A verified Active Monitor Present frame (3.3.5.2) is received that meets the specified criteria.

FR_BN(criteria). A verified Beacon frame (3.3.5.2) is received that meets the specified criteria.

FR_BN_CIR. A frame's access control field has been detected with the M bit set to 1 indicating a circulating frame. The method used to detect this condition is outside the scope of this standard, but reception of a valid beacon frame (3.3.5.2) with the M bit set to 1 shall satisfy this condition.

FR_CHG_PARM(criteria). A verified Change Parameters MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_COPIED(criteria). The MAC successfully copied the received frame that meets the specified criteria.

FR_CT(criteria). A verified Claim Token MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_DAT(criteria). A verified DAT MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_INIT(criteria). A verified Initialize Station MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_INS_REQ(criteria). A verified Insert Request MAC frame that meets the specified criteria is received.

FR_LLC(criteria). An LLC frame is received that meets the specified criteria and the criteria specified in 4.3.2.

FR_LTH. The length of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG).

FR_LTH<=PPV(MAX_TX). The length of the frame to be transmitted is less than or equal to the maximum allowed frame length.

FR_LTH<>UNK. The length of the frame to be transmitted is known.

FR_LTH=UNK. The length of the frame to be transmitted is unknown.

FR_MAC(criteria). A valid MAC frame is received that meets the specified criteria and the criteria specified in 10.3.6.

FR_MAC_INV(reason). A valid MAC frame is received that fails verification (10.3.6) for the reason specified.

FR_NOT_COPIED. The C-Port in Port mode sets the A bits (REF 040 or 234), but does not copy the frame.

FR_REG_REQ(criteria). A verified Registration Request MAC frame is received that meets the specified criteria.

FR_REMOVE(DA=Non_broadcast). A verified Remove MAC frame (3.3.5.2) is received, not sent to a broadcast address, but otherwise addressed to the C-Port.

FR_RP(criteria). A verified Ring Purge MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_RPRT_ERR(criteria). A Report Error MAC frame (3.3.5.1) is received that was transmitted by the Station without error (4.3.3) and that meets the specified criteria.

FR_RQ_ADDR. A verified Request Address MAC frame (3.3.5.2) is received.

FR_RQ_ATTACH. A verified Request Attachment MAC frame (3.3.5.2) is received.

FR_RQ_INIT(criteria). A Request Initialization MAC frame (3.3.5.1) is received that was transmitted by the Station without error (4.3.3) and that meets the specified criteria.

FR_RQ_STATE. A verified Request Station State MAC frame (3.3.5.2) is received.

FR_SMP(criteria). A verified SMP MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_SUA_CHG(criteria). A Report SUA Change MAC frame (3.3.5.1) is received that was transmitted by the Station without error (4.3.3) and meets the specified criteria.

FR_WITH_ERR. A frame is received with errors (see 4.3.2).

FR_WITH_ERR(criteria). A frame is received with errors (see 4.3.2) that meets the specified criteria.

INTERNAL_ERR(criteria). Any internal error occurred preventing the Station from following the established protocol (i.e., parity error, etc.). The criteria is either correctable (C-Port counts error) or not-correctable (C-Port closes).

JS=state. The Join FSM is in the specified state.

LTA. The stored SA field from the last transmitted frame.

M=0. The Monitor bit in the access control (AC) field is received as zero.

M=1. The Monitor bit in the access control (AC) field is received as one.

MA_UNITDATA.request. The LLC interface requests a frame be transmitted.

MGT_UNITDATA.request. The management interface requests a frame be transmitted.

MRI_UNITDATA.request. The management routing interface requests a frame be transmitted.

MS=state. The Monitor FSM is in the specified state.

P. The value of P bits in the access control (AC) field.

P>Pm>R. A token or frame is received and the priority of the PDU queued for transmission is greater than the received reservation (R) but less that the current service priority (P).

PDU_QUEUED. A frame is queued for transmission.

PDU_QUEUED(criteria). A frame is queued for transmission that meets the specified criteria. Note that a queued PDU is transmitted when a token is received with a priority less than or equal to the priority of the queued PDU (Pm). Frames that do not wait for a token are not queued but are indicated by TXI_REQ.

Pm. The priority of the queued PDU. If no PDU is queued, Pm is assumed to have a value of zero.

PM_STATUS.indication (Signal_detection=Signal_acquired). The PHY indicates valid receiver signal (see 5.1.4.1).

PM_STATUS.indication(Signal_detection=Signal_loss). The PHY indicates loss of valid receiver signal (see 5.1.4.1).

PORT_ERR(criteria). Any internal condition that prevents the successful completion of the PDU transmit operation. The criteria is either correctable (C-Port counts error) or not-correctable (C-Port closes).

PPV(MAX_TX). The maximum number of octets that may be transmitted (including fill) after capturing the token as specified in 4.2.4.1.

PS_STATUS.indication(Burst4_error). The C-Port indicates the received data contains a Burst4_error (see 5.1.2.3).

PS_STATUS.indication(Frequency_error). The C-Port indicates the frequency of the received data is out of tolerance (see 5.1.2.3).

Px. A priority value representing the higher value of either a) the received reservation or b) the priority of the frame queued for transmission. If PDU_QUEUED and Pm>Rr then Px=Pm Else Px=Rr.

QUE_EMPTY. No frames are queued for transmission.

QUE_NOT_EMPTY. Another PDU is queued for transmission.

R. Value of R bits in access control (AC) field.

RCV(SA<>LTA). The source address (SA) of the received frame is not equal to the source address of the last frame transmitted by the C-Port. This condition requires that no code violations are present in the SA field and optionally any of the preceding fields.

RCV(SA=LTA). The source address (SA) of the received frame is equal to the source address of the last frame transmitted by this Station. The C-Port is not required to, but may check for code violations in the SA or any preceding field to determine the validity of this event.

RCV_AC. The access control (AC) field is received.

RCV_ED. An Ending Delimiter (PS_STATUS.indication(Ending_delimiter) (see 5.1.2.3) is received.

RCV_SD. A Starting Delimiter (PS_STATUS.indication(Starting_delimiter) (see 5.1.2.3) is received.

SA=MA. The source address (SA) of the received frame is equal to the individual address of the C-Port.

SA>MA. The value of the source address (SA) of the received frame is numerically greater than the individual address of the C-Port. For purpose of comparison, the first bit received is most significant.

SA<>MA. The value of the source address (SA) of the received frame is not equal to the individual address of the C-Port.

SA<MA. The value of the source address (SA) of the received frame is numerically less than the individual address of the C-Port. For purpose of comparison, the first bit received is most significant.

SA=SUA. The source address (SA) of the received frame is equal to the address stored as the stored upstream neighbor's address (SUA).

SA<>SUA. The source address (SA) of the received frame is not equal to the address stored as the stored upstream neighbor's address (SUA).

SC<>RS. The source class is not 0 (Ring Station).

SC=CRS. The source class is 4 (Configuration Report Server).

SC=RPS. The source class is 5 (Ring Parameter Server).

SC_NOT_PRESENT. The MAC frame is too short to contain the source class.

SC_PRESENT. The MAC frame does contain the source class.

TEST_FAILURE. The C-Port in Port mode failed its self test.

TEST_OK. The C-Port in Port mode passed its self test.

TK. A token is received that meets the criteria specified in 4.3.1.

TK(criteria). A token is received that meets the specified criteria and the criteria specified in 4.3.1.

TK_AC(criteria). A token is received that meets the specified criteria and the criteria specified in 4.3.1.

TK_ERR. The token is not valid (see 4.3.1).

TK_GOOD. A good token is received that meets the criteria specified in 4.3.1.

TK_GOOD(criteria). A good token is received that meets the specified criteria and the criteria specified in 4.3.1.

TK_WITH_ERR. A token is received that contains errors (see 4.3.1).

TK_WITH_ERR(criteria). A token is received that contains errors (see 4.3.1) that meets the specified criteria.

TS=state. The Transmit FSM is in the specified state.

TX_BN_TYPE. The value of the beacon type subvector being transmitted.

TX_ERR(DAT). During the transmission of the DAT MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(RP). During the transmission of the Ring Purge MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(RPRT_ERR). During the transmission of the RPRT_ERR MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(RQ_INIT). During the transmission of the Request Initialization MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(SUA_CHG). During the transmission of the Report SUA Change MAC frame, a transmission error is encountered (see 4.3.3).

TXI_REQ. A frame is requested to be transmitted without waiting for a token. This request is generated by the TXI(frame_type) action [e.g., TXI(BN_PDU)].

UNA. The upstream neighbor's address (UNA) subvector in the received frame.

UNA=MA. The reported upstream neighbor's address (UNA) in the received frame is equal to the C-Port's individual address.

UNA<>MA. The reported upstream neighbor's address (UNA) in the received frame is not equal to the C-Port's individual address.

UNA=SUA. The value of the received reported upstream neighbor's address is equal to the stored upstream neighbor's address (SUA).

UNA<>SUA. The value of the reported upstream neighbor's address (UNA) in the received frame is not equal to the stored upstream neighbor's address (SUA).

9.4.4.7.2 Precise specification of action/outputs

The expressions used in the Station Operation tables have the following meanings:

{counter}={counter}+1.	Increment the specified counter.
{counter}={counter}-1.	Decrement the specified counter.
{flag}=0.	Set the value of the specified flag to zero (false).
{flag}=1.	Set the value of the specified flag to one (true).
{timer}=R.	The specified timer is set to its initial value and started.
variable = value.	Set the variable to the specified value.

Items in parentheses **( )** are grouped to show relevance.
; means: "and."

Unless otherwise specified, the following terms and operations are defined:

A=0. Both A bits in the FS field shall be transmitted as zero.

A=1. Both A bits in the FS field shall be set to one as the frame is repeated.

C=0. Both C bits in the FS field shall be transmitted as zero.

C=1. Both C bits in the FS field shall be set to one as the frame is repeated.

CLEAR_STACKS. The C-Port in Port mode shall clear all stacked values for Sx and Sr (i.e., the list is empty and the effective value of Sx and Sr is –1). The Station shall no longer be responsible for lowering the ring priority.

CORR=RCV_CORR. The value of the correlator subvector will be the same value as the received correlator subvector.

CORR=UNK_VALUE (optional-x). The frame received did not contain a correlator subvector (3.3.4), thus the value of the correlator subvector to be transmitted is unspecified and the subvector may be omitted. The standard recommends that new implementations not transmit the correlator subvector when no correlator subvector was received.

CPBTX=value. The counter CPBTX is set to the hexadecimal value indicated.

CTO=(PPV(MAX_TX)-FR_LTH). The value of the Transmit Octet counter is set to the value of the maximum frame length in octets less the number of octets (frame length) of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG).

CTO=CTO-FR_LTH. The value of the Transmit Octet counter is decreased by the number of octets (frame length) of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG). This correlates to the counter CTO being decremented every 8 bits after the capture of the token.

DC<>RS. The destination class (DC) field shall not be 0. Note that the source class (SC) field of the received frame was not present, and thus the destination class of the response frame is not defined but shall not be the ring Station class.

DC=CRS. The value of the destination class is 4 (Configuration Report Server).

DC=RCV_SC. The destination class (DC) field shall contain the value of the source class (SC) field of the received frame.

DC=RPS. The value of the destination class is 5 (Ring Parameter Server).

DISCARD_QUEUED_PDU. The C-Port removes from the transmit queue the frame that was the subject of the previous DTU_UNITDATA.request.

DTU_UNITDATA-STATUS.indication(Status_Code). Frame status is indicated by the PMAC to the DTU. Status_Code may be one of the following:

a) OK: The frame has been successfully transferred to the DTU without error.
b) Fail: Transfer of the frame to the DTU has failed due to a frame error.

E=0. The Error (E) bit in the ending delimiter (ED) field shall be transmitted as zero.

E=1. The E bit in the ending delimiter (ED) field shall be set to one as the frame is repeated.

FA(monitor)=0. Disable the functional address corresponding to the active monitor function.

FA(monitor)=1. Enable the functional address corresponding to the active monitor function.

FTI=x. The value of FTI is not specified.

INSERT. Request the PHY to physically connect the Station into the ring [5.1.4.2 PM_CONTROL.request(Insert_Station)].

JS=state. The Join FSM is changed to the specified state.

LMP=(MA|NULL). The address for the Last Monitor Present frame (X'0A' subvector 3.3.4) is set to either the Station’s address or the null address.

LMP=NULL. The address for the Last Monitor Present frame (X'0A' subvector 3.3.4) is the null address.

LMP=SA. The source address (SA) is saved for reporting the address of the Last Monitor Present frame (X'0A' subvector 3.3.4).

LTA=TX_SA. Capture the source address of the last transmitted frame as variable LTA.

M=0. The C-Port shall transmit the monitor bit (M) in the access control (AC) field as a zero.

M=1. The C-Port shall set the monitor bit (M) in the received access control (AC) field to one as the access control (AC) field is repeated.

MA_UNITDATA.indication. The frame is indicated to the LLC interface.

MGT_UNITDATA.indication. The frame is indicated to the management interface.

MRI_UNITDATA.indication. The frame is indicated to the management routing interface.

MS=state. The Monitor FSM is changed to the specified state.

P. The value of the P bits in the access control (AC) field.

Pm. The priority of the PDU being queued.

PM_CONTROL.request(Repeat_mode=Repeat). The C-Port PMAC requests the PMC to repeat and stop sourcing fill (see 9.7.2.2).

PM_CONTROL.request(Repeat_mode=Fill). The C-Port PMAC requests the PMC to start sourcing fill and stop repeat (see 9.7.2.2).

Pr. The value of the P bits in the last received access control (AC) field.

PS_CONTROL.request(Crystal_transmit=Asserted). The MAC requests Crystal_transmit (see 5.1.2.4).

PS_CONTROL.request(Crystal_transmit=Not_asserted). The MAC removes the Crystal_transmit request (see 5.1.2.4).

PS_CONTROL.request(Repeat_mode=Fill). The MAC requests the Station sources fill (see 5.1.2.4).

PS_CONTROL.request(Repeat_mode=Repeat). The MAC requests the Station repeat (see 5.1.2.4).

PS_EVENT.response(Token_received). The MAC indicates token received (see 5.1.2.5).

QUE_ACT_ERR_PDU(EC=value). Queue a Report Active Monitor Error MAC PDU as defined in 3.3.5.1 for transmission with the specified error code (EC).

QUE_AMP_PDU. Queue an Active Monitor Present MAC PDU as defined in 3.3.5.1 for transmission.

QUE_DAT_PDU. Queue a Duplicate Address Test (DAT) MAC PDU as defined in 3.3.5.1 for transmission.

QUE_NEW_MON_PDU. Queue a Report New Active Monitor MAC PDU as defined in 3.3.5.1 for transmission.

QUE_NN_INCMP_PDU. Queue a Report Neighbor Notification Incomplete MAC PDU as defined in 3.3.5.1 for transmission.

QUE_PDU. Queue the PDU for transmission.

QUE_RPRT_ADDR_PDU. Queue a Report Station Addresses MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RPRT_ATTCH_PDU. Queue a Report Station Attachment Report Attachment MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RPRT_ERR_PDU. Queue a Report Error MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RPRT_STATE_PDU. Queue a Report Station State MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RQ_INIT_PDU. Queue a Request Initialization MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RSP_PDU. Queue a Response MAC PDU as defined in 3.3.5.1 for transmission. This PDU is not required to be queued if the received frame initiating the response was sent to a broadcast address and the address recognized and frame copied bits in the frame status field were all ones.

QUE_SMP_PDU. Queue a Standby Monitor Present MAC PDU as defined in 3.3.5.1 for transmission.

QUE_SUA_CHG_PDU. Queue a SUA Change MAC PDU as defined in 3.3.5.1 for transmission.

R. The value of the R bits in the access control (AC) field.

R=Pm. Set the reservation bits (R) in the access control (AC) field to the value of the queued PDU.

Remove_Station. Request the PHY to physically disconnect the Station from the ring [5.1.4.2 PM_CONTROL.request(Remove_Station)].

RESET_STACKS(Sx=P;Sr=0). The C-Port clears all stacked values for Sx and Sr and then adds the new Sx and Sr values.

RESTACK(Sx=Px). Replace the last value of stack Sx with Px (the value of P bits of the token to be transmitted).

Rr. The value of the R bits in the last received access control (AC) field.

RSP_TYPE=value. The Response Code subvector shall have the hexadecimal value specified.

SC=RS. The source class (SC) field shall contain the value zero (Ring Station).

SET <field> = <value>. When the MAC repeats the field, it will set the field to the specified value (see M=1, R=Pm, E=1, A=1, and C=1).

SET APPR_PARMS. The C-Port shall set the its parameters to the values indicated in the received frame.

SET ERR_CNTR to 0. Set the values for all of the error counters reported in the Report Error MAC frame to zero.

STACK(Sx=Px;Sr=Pr). Add the new Sx and Sr values to the list of stacked priorities on the Sx and Sr stacks.

STORE(Pr;Rr). Save the value of P and R in the received access control (AC) field as Pr and Rr, respectively.

SUA=0. Store the null address as the Station’s stored upstream neighbor’s address (SUA).

SUA=SA. Store the value of the source address (SA) from the received frame as the Station’s stored upstream neighbor’s address (SUA).

TEST. The C-Port in Port mode shall perform a test of its transmit functions, its receive functions, and the medium between the Station and the TCU. It is recommended that the data path includes the elastic buffer and the fixed latency buffer (5.8). A C-Port shall fail the test if the sustained bit error rate is greater than specified by annex P. A C-Port shall only transmit valid frames, tokens, and fill during the test and shall only count errors in frames and tokens.

TS=state. The transmit FSM is changed to the specified state.

TX_AB. The C-Port shall transmit an abort sequence.

TX_BN_TYPE. The value of the beacon type subvector to be transmitted.

TX_EFS(I=0). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The E, I, A, and C bits shall be zero.

TX_EFS(I=0, E=1). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The I, A, and C bits shall be zero. The E bit shall be one.

TX_EFS(I=x). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The I bit may be zero or one, and the E, A, and C bits shall be zero.

TX_FCS. The C-Port shall transmit frame check sequence for the frame as defined in 3.2.7.

TX_SFS(P=value; R=value). The C-Port shall transmit the start-of-frame sequence with the priority and reservation values as specified. The token bit (T) shall be one and the monitor bit (M) shall be zero.

TX_TK(P=value; M=0; R=value). The C-Port shall transmit a token with the priority and reservation fields as specified. The monitor bit (M) and the token bit (T) shall be transmitted as zero.

TXI(BN_PDU). The C-Port shall transmit a Beacon MAC frame with the access control (AC) field values of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI(CT_PDU). The C-Port shall transmit a Claim Token MAC frame with the access control (AC) field values of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI(RCV_CT_PDU). The C-Port shall transmit the received Claim Token MAC frame as received with the access control (AC) field values of P=000, T=1, M=0, R=000. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI(RP_PDU). The C-Port shall transmit a Ring Purge MAC frame with the access control (AC) field values of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI_AMP_PDU. The C-Port shall transmit a Active Monitor Present MAC frame with the access control (AC) fields of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI_INV_FCS. The C-Port shall transmit an invalid FCS.

TXI_REG_RSP. The C-Port shall transmit a Registration Response MAC frame with the access control (AC) fields of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

9.5 C-Port Station Emulation mode TKP access protocol specification

This subclause defines the DTR C-Port in Station Emulation mode using the TKP access protocol defined in clause 4 of ISO/IEC 8802-5 : 1998 [Configuration 4, entity **(G)** in figure 9-1] necessary to support the following attachments [Configuration 4, entity **(H)**].

— A classic concentrator as defined by clause 8 of ISO/IEC 8802-5 : 1998.
— A DTR C-Port in Port mode using the TKP access protocol as defined by 9.4.

The C-Port in Station Emulation mode using the TKP access protocol is covered as follows:

Subclause 9.5.1 provides an overview of the interaction between the FSMs defined in 9.2 and 9.5.
Subclause 9.5.2 provides an overview of the major FSMs used by this mode of operation.
Subclause 9.5.3 defines the unique abbreviations, notations, state machine elements, and port operation table states used by this clause.
Subclause 9.5.3.1 specifies the PMAC specifications for the Join function used to establish this mode of operation.
Subclause 9.5.3.2 specifies the PMAC specifications for the Transmit function used to establish this mode of operation.
Subclause 9.5.4 specifies the PMAC specifications for the C-Port's Station Emulation mode.

9.5.1 FSM interaction

Figure 9-18 illustrates the interaction of the C-Port's Port Operation tables defined in 9.3, the Station's Station Operation table defined in 9.2, and the C-Port's Port Operation tables defined in this subclause.

Key to understanding this interaction is recognition of the following points:

a) The Bypass state (JS=BP) is shared by all Join FSMs defined in this standard (clauses 4 and 9).
b) The C-Port's Join FSM (directly from the Bypass state) or the Station's Join and Transmit FSMs (failed registration attempt while emulating a Station) establishes this mode of operation. The C-Port's Join and Transmit FSM defined in 9.3 are deactivated when the C-Port causes activation of the C-Port's Join, Transmit, and Monitor FSMs defined in this subclause.
c) The classic station's Join, Transmit, and Monitor Station Operation tables defined in 4.3 are replaced by the Port Operation tables defined by tables 9-18, 9-19, and 9-20, respectively.

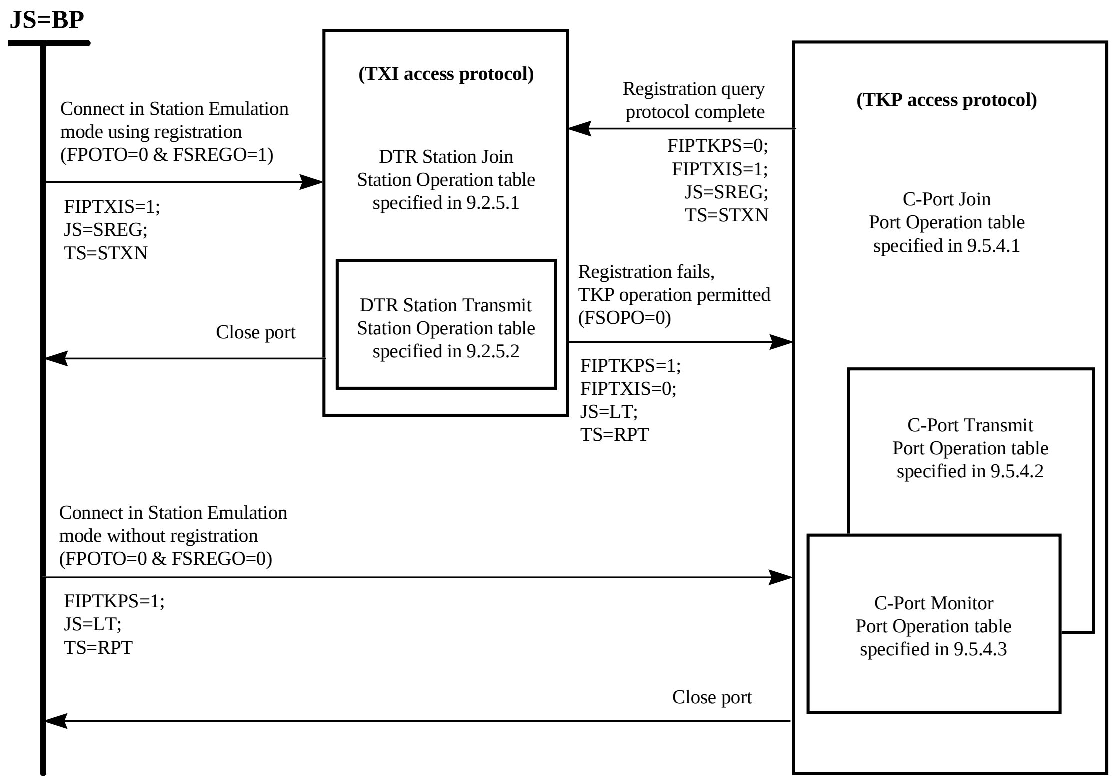


Figure 9-18—FSM Interaction: C-Port in Station Emulation mode using TKP access protocol

9.5.2 FSM overviews

This subclause contains FSM overviews of the C-Port's Join, Transmit, and Monitor functions used to support the C-Port in Station Emulation mode using the TKP access protocol. These FSMs have their roots in the Classic station's FSMs, which are specified in clause 4.

Changes are marked within the high-level FSMs as follows:

a) The changed events or actions are in **boldface** type.
b) The changed events or actions have change bars in the left column (double vertical lines), where possible.

9.5.2.1 Join FSM: C-Port in Station Emulation mode using the TKP access protocol

The C-Port's Join function (9.3.1.1) or the Station's Registration function (9.2.1.1) determines the C-Port needs to support the C-Port in Station Emulation mode using the TKP access protocol, sets the interface flag FIPTKPS=1, and then enters the Lobe Test state (JS=LT) as illustrated by the high-level FSM in figure 9-19.

The Join FSM is specified by the Port Operation table, table 9-18.

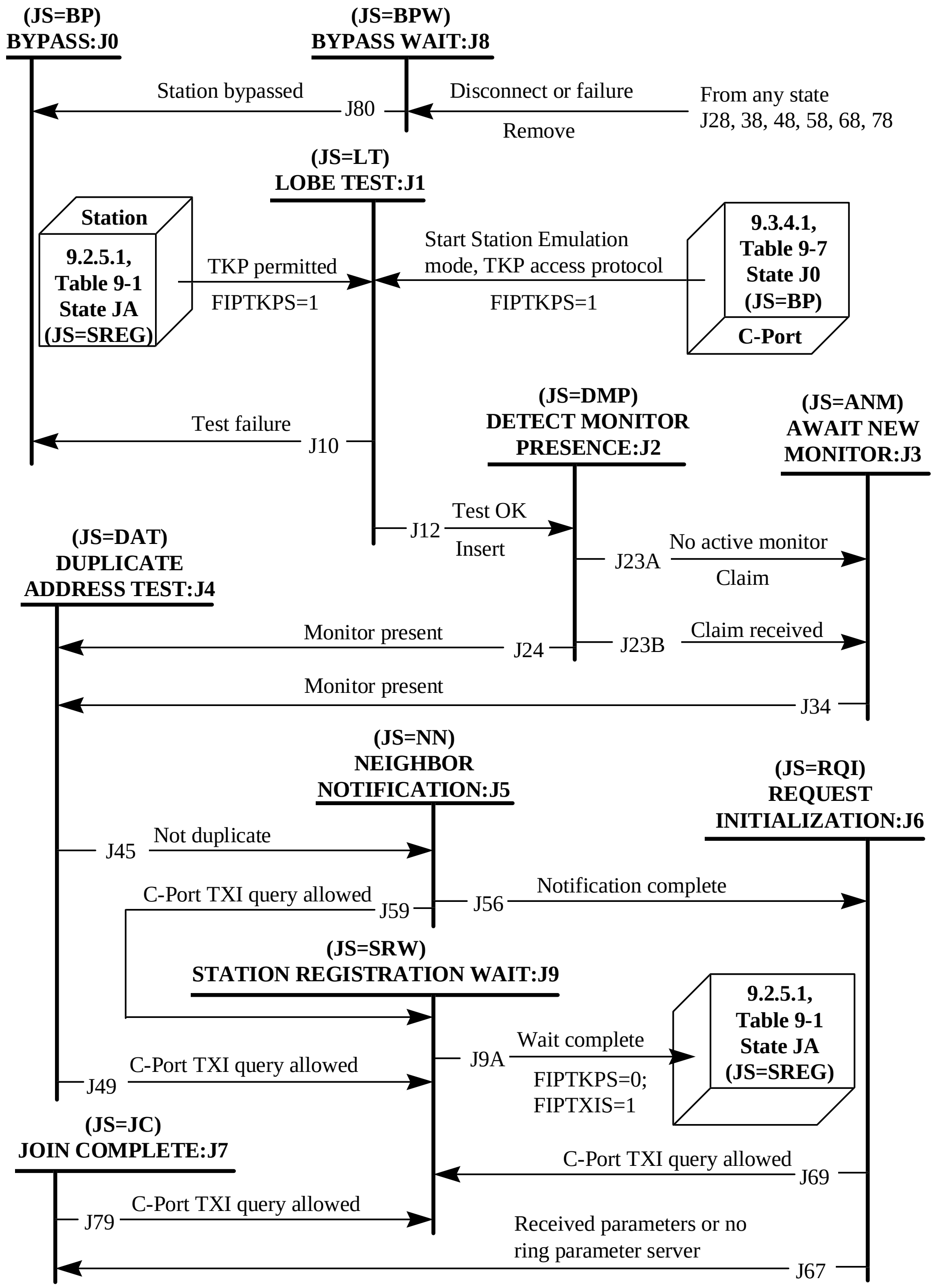


Figure 9-19—Join FSM: C-Port in Station Emulation mode using the TKP access protocol

9.5.2.2 Transmit FSM: C-Port in Station Emulation mode using the TKP access protocol

The Transmit FSM defined for a C-Port in Station Emulation mode using the TKP access protocol makes the following modifications to the Classic station (clause 4) Station Operation tables by the setting of the interface flag FIPTKPS=1.

a) The Transmit state *optionally* supports the FR_LTH=UNK condition.
b) When the FR_LTH=UNK condition is supported, the Transmit state *shall* detect frames whose length will exceed PPV(MAX_TX). The action taken by the Transmit state to terminate the frame is controlled by the option flag FPASO. The following changes are made to support this condition:
    1) The Repeat state (TS=RPT) allows transmission of frames with FR_LTH=UNK condition (REFs 5205, 5207, 5209, 5502, and 5513 are supported). These references indirectly or directly set counter CPBTX to a value appropriate for the media speed.
    2) The Transmit Data state (TS=DATA) supports a Transmit Byte counter to prevent frames from being transmitted that are greater than the PPV(MAX_TX) value. The counter CPBTX is incremented each time a byte is transmitted (EOB condition).
    3) When FPASO is set to 0 and if the counter CPBTX is incremented to a value *equal* to PPV(MAX_TX), the Station transmitter aborts the frame's transmission by transmitting an abort sequence as defined in clause 3. The purpose of transmitting the abort sequence is to inform the receiving entity to terminate reception of the frame and to ignore the data received.
    4) When FPASO is set to 1 and if the counter CPBTX is incremented to a value *equal* to PPV(MAX_TX), the Station transmitter terminates the transmission of the frame by generating an invalid FCS and setting the E bit in the ED to one. The purpose of this termination sequence is to create a frame that is discarded when received and not counted as a line error.

These transmit changes are illustrated by using a **boldface** type in figure 9-20. The Transmit FSM is specified by the Port Operation table, table 9-19.

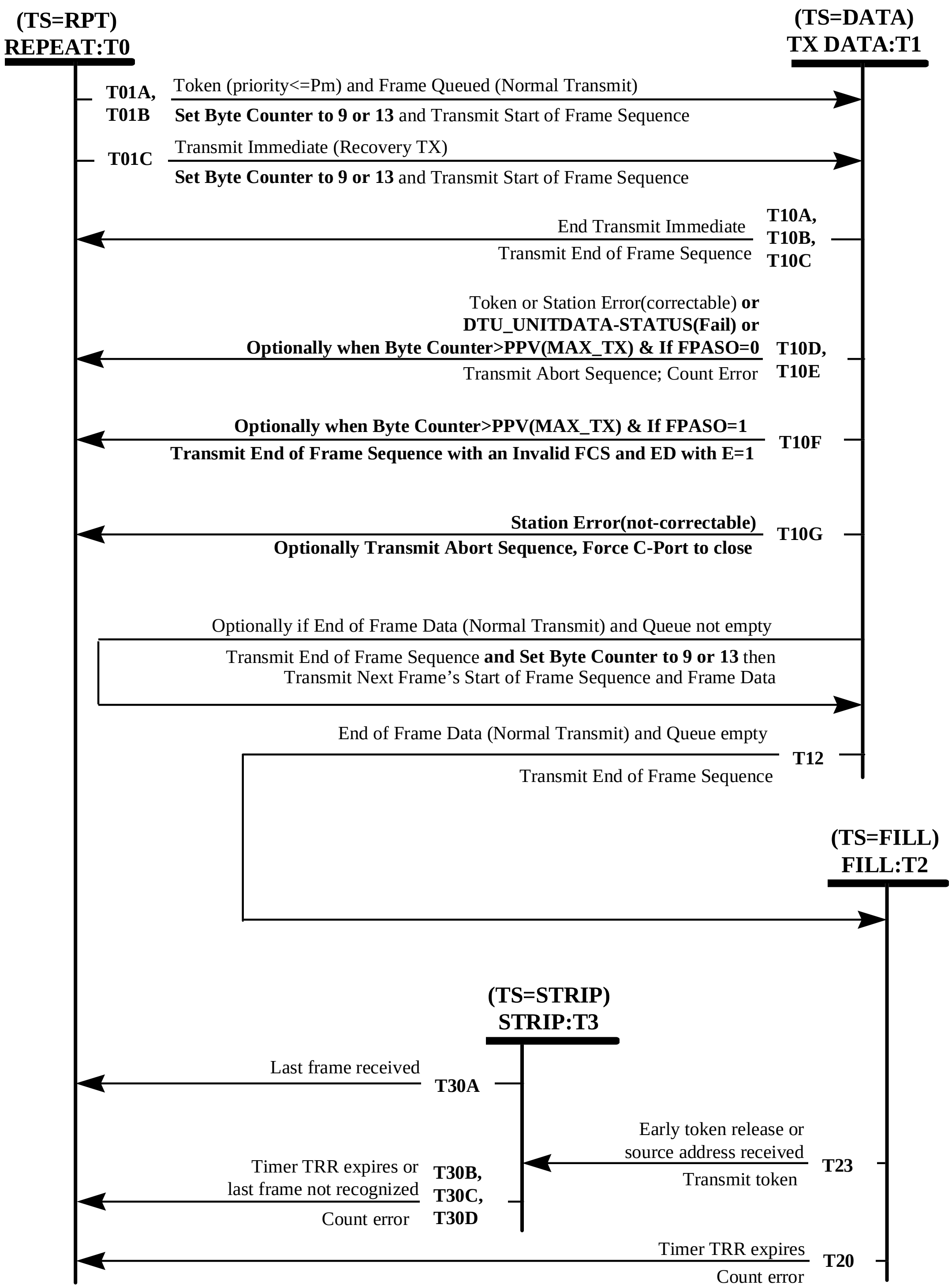


Figure 9-20—Transmit FSM: C-Port in Station Emulation mode using the TKP access protocol

9.5.2.3 Monitor FSM: C-Port in Station Emulation mode using the TKP access protocol

The Monitor FSM defined for a C-Port in Station Emulation mode using the TKP access protocol makes the following modifications to the classic station (clause 4) Station Operation tables by the setting of the interface flag FIPTKPS=1.

The timer TLMTR is used when the C-Port in Station Emulation mode is using the TKP access protocol to prevent the Station’s lobe test or beacon test functions from exceeding the time allowed by the C-Port. When timer TLMTR expires in either the Lobe Test state (JS=LT) or the Beacon Test state (MS=BNT), the C-Port in Station Emulation mode using the TKP access protocol returns to the Bypass state (JS=BP).

The high-level Monitor FSM for the C-Port in the Station Emulation mode using the TKP access protocol is illustrated by figure 9-21. The events changed in the Monitor FSM do not cause changes to the interaction between Monitor states, thus no changes are visible in the high-level FSM.

The Monitor FSM is specified by the Port Operation table, table 9-20.

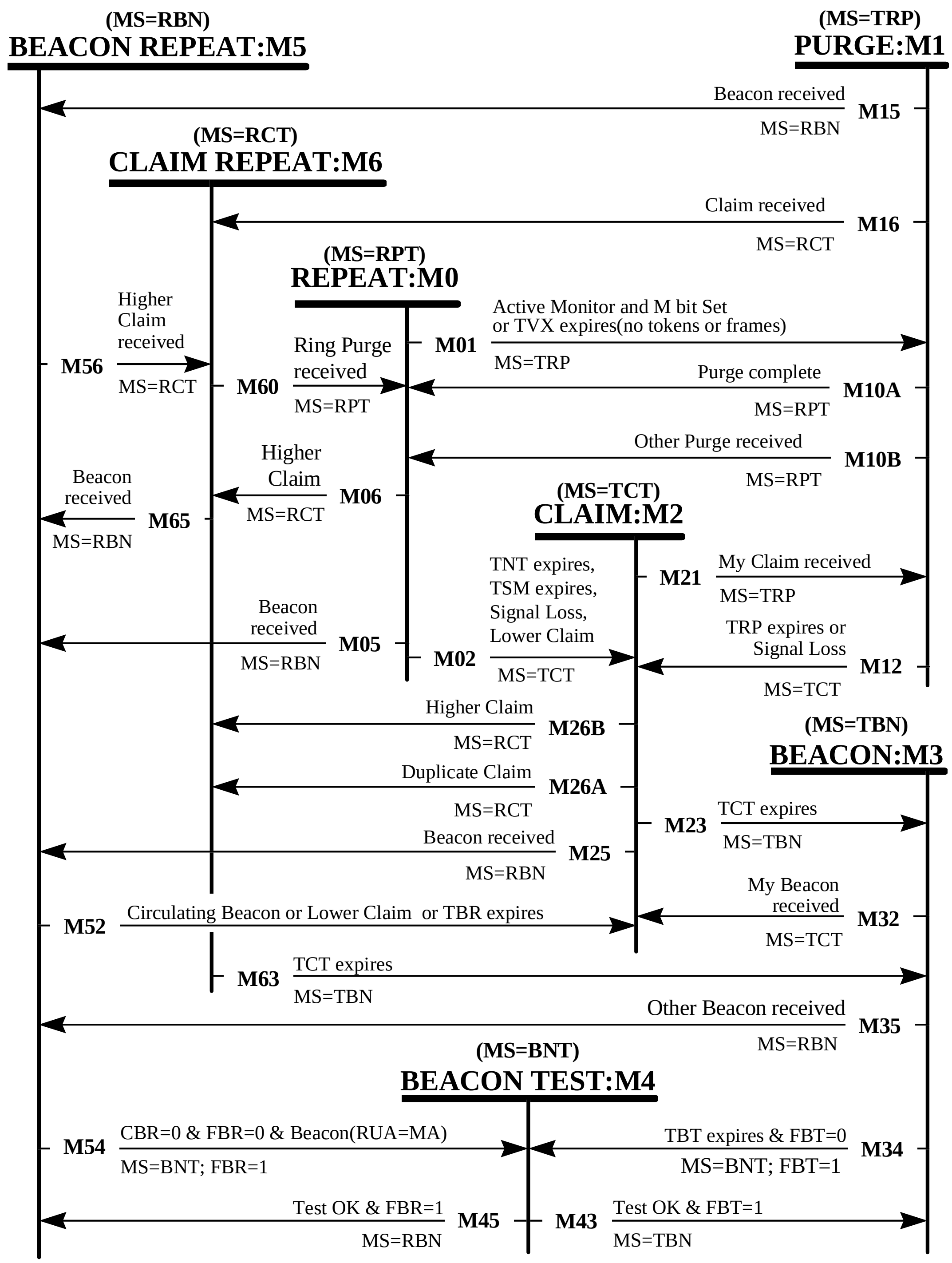


Figure 9-21—Monitor FSM: C-Port in Station Emulation mode using the TKP access protocol

9.5.3 Abbreviations, notations, state machine elements, and port operation table states

Most of the terms used by the Port Operation tables are defined in 4.2.3, 4.2.4, 9.3.2, and 9.3.3. This subclause defines the unique abbreviations and notations, flag definitions, and state definitions required to support Station Emulation mode when using the TKP access protocol.

9.5.3.1 Abbreviations and notations

When the C-Port in the Station Emulation mode is using the TKP access protocol, the following abbreviations and notations are used in the C-Port's Port Operation tables and state machine descriptions:

9.5.3.1.1 Join state notations

JS=SRW = Station registration wait

9.5.3.1.2 SMAC policy flag notations

FSRQO = Flag, Station registration query option

9.5.3.1.3 SMAC timer notations

TLMTR = Timer, Station LMT running
TSRW = Timer, Station registration wait

9.5.3.2 State machine elements

The state machines use the following counters, flags, and states to describe the operation of the C-Port's Port Operation tables when supporting the Station Emulation mode using the TKP access protocol.

These are logical elements used solely to describe the operation and do not specify an implementation. The value of the flags and counters are only meaningful internal to the state machine definition. Conformance will only be based on the Station's ability to perform the protocol as specified by the Port Operation tables.

9.5.3.2.1 Counters

The counters used in these tables are defined in 4.2.4.1 and 9.3.3.1.

9.5.3.2.2 Protocol flags

Flags are used to remember occurrence of an event for later action by the C-Port's Port Operation tables and are not meant to imply any implementation requirements. In general, a flag is set to 1 when a condition occurs, and set to 0 when the condition no longer exists or the appropriate action is taken.

All protocol flags (not policy flags) are set to 0 by the "Set_initial_conditions."

The protocol flags are defined in 4.2.4.2.

9.5.3.3 C-Port's Port Operation table states

When the C-Port in Station Emulation mode is using the TKP access protocol, there is a set of states for the C-Port's Join, Transmit, and Monitor Port Operation tables.

A Port Operation table can be in only one state at any instant in time.

9.5.3.3.1 Join states for C-Port in Station Emulation mode

The join state (JS=) notation is used to identify the current state of the join ring FSM.

The join state values are Bypass, Lobe Test, Await New Monitor, Detect Monitor Presence, Duplicate Address Test, Neighbor Notification, Request Initialization, Station Registration Wait, Join Complete, and Bypass Wait. During the Bypass and Bypass Wait states, normal operation is suspended and no assumptions can be made regarding the transmission or reception of data.

Join State J9, Station Registration Wait (JS=SRW). The DTR registration query protocol, which is described in 9.1.5, is used by the Join FSM to allow the C-Port in Station Emulation mode using the TKP access protocol to switch to the TXI access protocol.

The join state JS=SRW is entered when the join FSM receives a Registration Query MAC frame from the C-Port, the monitor FSM is in the Repeat state (MS=RPT) and FSRQO=1. Entry into this state causes the C-Port in Station Emulation mode using the TKP access protocol to reset TSRW and to signal the attached C-Port by dropping phantom.

The Station Registration Wait state is used to delay entry into the DTR Station’s Registration state (JS=SREG) until the C-Port in Port mode using the TKP access protocol has had enough time to detect phantom signal loss and return to its Registration state (JS=PREG). When TSRW expires, the DTR Station using the TXI access protocol enters the Registration state (JS=SREG) defined in 9.2.4.

The remaining join states for this mode of operation are defined in 4.2.4.3.1.

9.5.3.3.2 Transmit states

The transmit state (TS=) notation is used to identify the current state of the transmit FSM. The transmit state values are Repeat, Transmit Frame Data, Transmit Fill, and Transmit Fill and Strip.

The transmit states for this mode of operation are defined in 4.2.4.3.3.

9.5.3.3.3 Monitor states

The monitor state (MS=) notation is used to identify the current state of the monitor FSM. The monitor state values are Repeat, Repeat Beacon, Repeat Claim Token, Transmit Beacon, Transmit Claim Token, Transmit Ring Purge, and Beacon Test. During the Beacon Test state, no assumptions can be made regarding the transmission or reception of data.

The monitor states for this mode of operation are defined in 4.2.4.3.2.

9.5.4 C-Port’s Station Emulation mode Port Operation tables for the TKP access protocol

This subclause specifies the C-Port’s Port Operation tables necessary to support the Station Emulation mode (Configuration 4) using the TKP access protocol.

This subclause specifies the Port Operation tables for the C-Port in Station Emulation mode using the TKP access protocol as follows:

a) C-Port Join Port Operation table
b) C-Port Transmit Port Operation table
c) C-Port Monitor Port Operation table
d) C-Port Error Handling Port Operation table
e) C-Port Interface Signals Port Operation table
f) C-Port Miscellaneous Frame Handling Port Operation table

These Port Operation tables use the term “optional” as defined in 9.1.1.2.

The Port Operation tables specified in this subclause take precedence in case of a discrepancy between their supporting text or the FSM diagrams in this subclause or in annex R.

The three-digit reference numbers are copies of the transition defined in ISO/IEC 8802-5 : 1998, 4.3, table 7. The four-digit reference numbers are transitions unique to the C-Port in Station Emulation mode using the TKP access protocol (e.g., 5nnn).

The 4.3 Join, Transmit, and Monitor Station Operation table event/action transitions added or modified by this subclause are clearly identified in the Port Operation tables, while any deleted event/action transitions are identified in annex S.

9.5.4.1 Interface flag FIPTKPS

Interface flag FIPTKPS, defined in 9.1.1.3, is set to 1 when these C-Port Port Operation tables are active.

9.5.4.2 Join Port Operation table: C-Port in Station Emulation mode using the TKP access protocol

This table is activated as follows:

a) The Station’s Station Operation table (table 9-8) reference (REF) 3159 (TSREQ=E & CSREQ=0 & FSRC=0 & FSOPO=0 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG) and the Station’s Join operation were started by the C-Port with FIPTXIS=1.
b) The Station’s Station Operation table (table 9-8) reference (REF) 3158 (FR_REG_RSP(AP_RSP=0000) & FSRDO=0 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG) and the Station’s Join operation were started by the C-Port with FIPTXIS=1.
c) The C-Port’s Port Operation table (table 9-11) reference (REF) 1002 (Connect.PMAC & FPOTO=0 & FSREGO=0 & JS=BP).

Table 9-18—C-Port Join Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1)

S/T	REF	Event/condition	Action/output
J01	1002	**Connect.PMAC** & FPOTO=0 & FSREGO=0 & JS=BP << This is one of the starting points for this Join Port Operation table. >> << This transition is executed by 9.3 and is shown for reference only. >>	JS=LT; Set_initial_conditions; FTI=x; FTXC=1; FIPTKPS=1; TEST; [TLMTR=R (optional-i)] << This is a starting point for the C-Port in Station Emulation mode using the TKP access protocol. >>
J38	5101	**Disconnect.PMAC** & FIPTKPS=1 & JS=ANM << Replaces REF 007 in ISO/IEC 8802-5 : 1998 >>	JS=BPW
J48	5102	**Disconnect.PMAC** & FIPTKPS=1 & JS=DAT << Replaces REF 008 in ISO/IEC 8802-5 : 1998 >>	JS=BPW
J28	5103	**Disconnect.PMAC** & FIPTKPS=1 & JS=DMP << Replaces REF 009 in ISO/IEC 8802-5 : 1998 >>	JS=BPW
J78	5104	**Disconnect.PMAC** & FIPTKPS=1 & JS=JC << Replaces REF 010 in ISO/IEC 8802-5 : 1998 >>	JS=BPW; FINS=FJR=FDC=FNC=0
J58A	5105	**Disconnect.PMAC** & FIPTKPS=1 & JS=NN << Replaces REF 011 in ISO/IEC 8802-5 : 1998 >>	JS=BPW; FDC=0
J68A	5106	**Disconnect.PMAC** & FIPTKPS=1 & JS=RQI << Replaces REF 012 in ISO/IEC 8802-5 : 1998 >>	JS=BPW; FINS=FDC=FNC=0
J38	255	**FBPF=1** & TS=RPT & JS=ANM	JS=BPW
J48	256	**FBPF=1** & TS=RPT & JS=DAT	JS=BPW
J78	257	**FBPF=1** & TS=RPT & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58A	258	**FBPF=1** & TS=RPT & JS=NN	JS=BPW; FDC=0
J68A	259	**FBPF=1** & TS=RPT & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	359	**FDC=1** & FNC=0 & MS=RPT & FAM=1	[FNC=1 (Optional)]
	027	**FDC=1** & FNW=1 & FNC=0 & MS=RPT & FAM=0	FNC=1; QUE_SMP_PDU
	028	**FDC=1** & FNW=1 & FNC=0 & MS=RPT & FAM=1	FNC=1
	029	**FJR=1** & FBHO=1 & FINS=0	FLF=0; FINS=1
	033	**FNC=1** & FBHO=0 & FINS=0	FLF=0; FINS=1
J56	035	**FNC=1** & JS=NN	JS=RQI; TJR=R; TRI=R; CRI=1; CRIN=1; QUE_RQ_INIT_PDU

Table 9-18—C-Port Join Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) ***(Continued)***

S/T	REF	Event/condition	Action/output
J24	058	**FR_AMP** & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0;CDG=0; QUE_DAT_PDU
J38	067	**FR_BN** & JS=ANM	JS=BPW
J48	068	**FR_BN** & JS=DAT	JS=BPW
J28	069	**FR_BN** & JS=DMP	JS=BPW
J58A	070	**FR_BN** & JS=NN	JS=BPW; FDC=0
J68B	071	**FR_BN** & JS=RQI & MS<>TBN & FINS=0	JS=BPW; FDC=FNC=0
J68B	081	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J67	100	**FR_CHG_PARM(DA=MA)** & JS=RQI	JS=JC; FJR=1; **If** FWFDO=1 then (FWFA=FWF=0; TWFD=R)
J23B	106	**FR_CT** & JS=DMP	JS=ANM
	124	**FR_DAT(SA=MA & A=0 & C=0)** & CDG<(n2-1) & JS=DAT	CDG=(CDG+1); QUE_DAT_PDU
J45	125	**FR_DAT(SA=MA & A=0 & C=0)** & CDG=(n2-1) & JS=DAT	JS=NN; FDC=1; TJR=R
	126	**FR_DAT(SA=MA & A|C<>0)** & CDF<(n2-1) & JS=DAT	CDF=(CDF+1); QUE_DAT_PDU
J48	127	**FR_DAT(SA=MA & A|C<>0)** & CDF=(n2-1) & JS=DAT	JS=BPW
J67	131	**FR_INIT(DA=MA)** & JS=RQI	JS=JC; FJR=1; **If** FWFDO=0 then (FWFA=FWF=0; TWFD=R)
J49	6002	**FR_REG_QRY** & FSRQO=1 & JS=DAT << Registration query protocol >> << New to DTR >>	JS=SRW; FOP=0; Remove_Station; TSRW=R
J79	6003	**FR_REG_QRY** & FSRQO=1 & JS=JC << Registration query protocol >> << New to DTR >>	JS=SRW; FDC=FINS=FJR=FNC=FOP=0; Remove_Station; TSRW=R
J59	6004	**FR_REG_QRY** & FSRQO=1 & JS=NN << Registration query protocol >> << New to DTR >>	JS=SRW; FDC=FOP=0; Remove_Station; TSRW=R
J69	6005	**FR_REG_QRY** & FSRQO=1 & JS=RQI << Registration query protocol >> << New to DTR >>	JS=SRW; FDC=FINS=FNC=FOP=0; Remove_Station; TSRW=R
JA1B	3158	**FR_REG_RSP(AP_RSP=0000)** & FSRDO=0 & FIPTXIS=1 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << This is one of the starting points for this Join Port Operation table. >> << This transition is executed by 9.2 and is shown for reference only. >>	JS=LT; FSTXC=FSTI=0; FTI=x; FIPTXIS=0; FIPTKPS=1; Set_initial_conditions; TEST << The C-Port in Station Emulation mode starts the TKP access protocol. >>

Table 9-18—C-Port Join Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
J38	156	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=ANM	JS=BPW
J48	157	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=DAT	JS=BPW
J28	158	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=DMP	JS=BPW
J78	159	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58A	160	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=NN	JS=BPW; FDC=0
J68A	161	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=RQI	JS=BPW; FINS=FDC=FNC=0
J34	164	**FR_RP** & JS=ANM	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
J24	165	**FR_RP** & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
	187	**FR_RQ_INIT(SA=MA & A<>1)** & CRIN<n4 & JS=RQI	TRI=R; CRIN=(CRIN+1); QUE_RQ_INIT
J67	188	**FR_RQ_INIT(SA=MA & A<>1)** & CRIN=n4 & JS=RQI	JS=JC; FJR=1; **If** FWFDO=0 then (FWFA=FWF=0; TWFD=R)
	189	**FR_RQ_INIT(SA=MA & A=1)** & CRI<n4 & JS=RQI	TRI=R
J24	191	**FR_SMP** & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
	206	**FRH=0** & JS=BPW	MS=RPT; FAM=FOP=0; FRH=1; TRW=R; Remove_Station; FA(monitor)=0
J48	210	**FSL=1** & FAM=0 & JS=DAT	JS=BPW
J58A	211	**FSL=1** & FAM=0 & JS=NN	JS=BPW; FDC=0
J68B	209	**FSL=1** & FINS=0 & FAM=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	224	**INTERNAL_ERR(not_correctable)** & JS=ANM	JS=BPW
J48	225	**INTERNAL_ERR(not_correctable)** & JS=DAT	JS=BPW
J28	226	**INTERNAL_ERR(not_correctable)** & JS=DMP	JS=BPW
J78	227	**INTERNAL_ERR(not_correctable)** & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58A	228	**INTERNAL_ERR(not_correctable)** & JS=NN	JS=BPW; FDC=0
J68A	229	**INTERNAL_ERR(not_correctable)** & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	230	**JS=BPW** & FAM=1	[FAM=0; FA(monitor)=0 (optional)]
	231	**JS=BPW** & FOP=1	[FOP=0 (optional)]
	232	**JS=BPW** & MS<>RPT	[MS=RPT (optional)]

Table 9-18—C-Port Join Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
J28	238	**PM_STATUS.indication (Medium_rate_error)** & JS=DMP	JS=BPW
J68B	263	**TBT=E** & MS=TBN & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	265	**TCT=E** & JS=ANM	JS=BPW
J48	267	**TCT=E** & MS=RCT & JS=DAT	JS=BPW
J58A	268	**TCT=E** & MS=RCT & JS=NN	JS=BPW; FDC=0
J48	269	**TCT=E** & MS=TCT & JS=DAT	JS=BPW
J58A	270	**TCT=E** & MS=TCT & JS=NN	JS=BPW; FDC=0
J10	276	**TEST_FAILURE** & JS=LT	JS=BP
J70	277	**TEST_FAILURE** & MS=BNT & JS=JC	JS=BP
J60	278	**TEST_FAILURE** & MS=BNT & JS=RQI	JS=BP
J12	281	**TEST_OK** & JS=LT	JS=DMP; MS=RPT; TS=RPT; FTI=FTXC=0; FOP=FRH=1; TJR=R; TRH=R; SUA=0; INSERT; **If** FWFDO=1 then (FWFA=FWF=0; TWFD=R)
J48	284	**TJR=E** & JS=DAT	JS=BPW
J23A	287	**TJR=E** & JS=DMP	JS=ANM; FANM=1
J58A	285	**TJR=E** & JS=NN	JS=BPW; FDC=0
J68A	286	**TJR=E** & JS=RQI	JS=BPW; FINS=FDC=FNC=0
J10	5107	**TLMTR=E** & FIPTKPS=1 & JS=LT << C-Port in Station Emulation mode has detected its LMT has exceeded the time allowed by the C-Port. >> << New to DTR >>	[JS=BP (optional-i)] << C-Port optionally enters the Bypass state (JS=BP). >>
J70	5108	**TLMTR=E** & FIPTKPS=1 & MS=BNT & JS=JC << C-Port in Station Emulation mode has detected its LMT has exceeded the time allowed by the C-Port. >> << New to DTR >>	[JS=BP (optional-i)] << C-Port optionally enters the Bypass state (JS=BP). >>
	315	**TRH=E**	FRH=0
	316	**TRI=E** & JS=RQI & CRI<n4	TRI=R; CRI=(CRI+1); QUE_RQ_INIT_PDU
J68A	317	**TRI=E** & JS=RQI & CRI=n4	JS=BPW; FINS=FDC=FNC=0
J68B	321	**TRP=E** & MS=TRP & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	318	**TRP=E** & MS=TRP & JS=ANM	JS=BPW
J48	319	**TRP=E** & MS=TRP & JS=DAT	JS=BPW
J58A	320	**TRP=E** & MS=TRP & JS=NN	JS=BPW; FDC=0
J80	325	**TRW=E** & JS=BPW	JS=BP; FTI=x

Table 9-18—C-Port Join Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
JA1B	3159	**TSREQ=E** & CSREQ=0 & FSRC=0 & FSOPO=0 & FIPTXIS=1 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << This is one of the starting points for this Join Port Operation table. >> << This transition is executed by 9.2 and is shown for reference only. >>	JS=LT; FSTXC=FSTI=0; FTI=x; FIPTXIS=0; FIPTKPS=1; Set_initial_conditions; TEST << This is a starting point for the C-Port in Station Emulation mode using the TKP access protocol. >>
J9A	6006	**TSRW=E** & JS=SRW & FSREGO=1 & FIPTKPS=1 << The C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) accepted the attatched C-Port's request to use the TXI access protocol. >> << New to DTR >>	JS=SREG; TS=STXN; Set_initial_conditions; FSTXC=FSTI=1; TSIS=R; FIPTKPS=0; FIPTXIS=1 << C-Port in Station Emulation mode starts the TXI access protocol and exits to 9.2. >>
J38	368	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=ANM	JS=BPW
J48	369	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=DAT	JS=BPW
J28	370	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=DMP	JS=BPW
J78	345	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58B	371	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=NN	JS=BPW; FDC=0; FNC=0
J68A	372	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	347	**TX_ERR(DAT)** & JS=DAT	QUE_DAT_PDU
	350	**TX_ERR(RQ_INIT)** & JS=RQI & FOP=1	QUE_RQ_INIT_PDU

9.5.4.3 Transmit Port Operation table: C-Port in Station Emulation mode using the TKP access protocol

Table 9-19—C-Port Transmit Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1)

S/T	REF	Event/condition	Action/output
T10G	5201	**CPBTX>PPV(MAX_TX)** & FPASO=0 & TS=DATA & FIPTKPS=1 << Maximum Frame Length exceeded >> << New to DTR >>	[TS=RPT; TX_AB (optional-unk)] << Transmit abort sequence >>
T10F	5206	**CPBTX>PPV(MAX_TX)** & FPASO=1 & FIPTKPS=1 & TS=DATA << Maximum Frame Length exceeded >> << New to DTR >>	[TS=RPT; TX_INV_FCS; TX_EFS(I=0, E=1) (optional-unk)]
T10D	5211	**DTU_UNITDATA-STATUS.request(Fail)** & FPTX_LTH=0 & FIPTKPS=1 & TS=DATA << Transmit FSM is currently transmitting a frame of unknown length. This is an indication that a cut-through frame is being transmitted. >>	TS=RPT; TX_AB
	5202	**EOB** & TS=DATA & FIPTKPS=1 << New to DTR >>	[CPBTX=(CPBTX+1) (optional-unk)]
	013	**EOD** & TS=DATA & FED=0 & FTXI=0	FED=1; [FSD=1 (optional-i)]
	5203	**EOD** & TS=DATA & FTXI=0 & FIPTKPS=1 & QUE_NOT_EMPTY & FR_LTH<>UNK & (CTO-FR_LTH)>=0 & Pm>=Pr & FMFTO=0 & Pm>Rr << Replaces REF 018 in ISO/IEC 8802-5 : 1998 >>	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
	5204	**EOD** & TS=DATA & FTXI=0 & FIPTKPS=1 & QUE_NOT_EMPTY & FR_LTH<>UNK & (CTO-FR_LTH)>=0 & Pm>=Pr & FMFTO=1 << Replaces REF 019 in ISO/IEC 8802-5 : 1998 >>	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
T12A	5205	**EOD** & TS=DATA & FTXI=0 & FIPTKPS=1 & QUE_NOT_EMPTY & FR_LTH=UNK & Pm>=Pr & FMFTO=0 & Pm>Rr << Based on REF 018 in ISO/IEC 8802-5 : 1998 >> << Supports frames of unknown length >>	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)

Table 9-19—C-Port Transmit Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
T12A	5207	**EOD** & TS=DATA & FTXI=0 & FIPTKPS=1 & QUE_NOT_EMPTY & FR_LTH=UNK & Pm>=Pr & FMFTO=1 << Based on REF 019 in ISO/IEC 8802-5 : 1998 >> << Supports frames of unknown length >> << New to DTR >>	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	014	**EOD** & TS=DATA & FTXI=0 & QUE_EMPTY	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	016	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm<Pr	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	017	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=0 & Pm<Rr	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	015	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH<0)	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T10A	020	**EOD** & TS=DATA & FTXI=1 & MS=RBN	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10A	021	**EOD** & TS=DATA & FTXI=1 & MS=RCT	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10A	022	**EOD** & TS=DATA & FTXI=1 & MS=RPT	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10B	023	**EOD** & TS=DATA & FTXI=1 & MS=TBN	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0)
T10B	024	**EOD** & TS=DATA & FTXI=1 & MS=TCT	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0)
T10C	025	**EOD** & TS=DATA & FTXI=1 & MS=TRP	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0); TRR=R
T30B	036	**FNMA=1** & CFR=1 & TS=STRIP	TS=RPT; FTI=0; FLF=1
	040	**FR(DA=any_recognized_address)** & FTI=0 & TS=RPT	SET A=1
	043	**FR(P<Sx)**	[CLEAR_STACKS (optional-i)]
	054	**FR_AC(R<Pm)** & PDU_QUEUED & FTI=0 & TS=RPT & FOP=1	SET R=Pm
	103	**FR_COPIED (DA=any_recognized_address)** & FTI=0 & TS=RPT	SET C=1
	203	**FR_WITH_ERR** & FTI=0 & TS=RPT	SET E=1
T10D	5213	**PORT_ERR(correctable)** & TS=DATA << Replaces REF 254 in ISO/IEC 8802-5 : 1998 >>	TS=RPT; TX_AB
T10E	5212	**PORT_ERR(not-correctable)** & TS=DATA << Replaces REF 363 in ISO/IEC 8802-5 : 1998 >>	TS=RPT; [TX_AB (optional-i)]; FBPF=1 < Optionally Transmit Abort sequence >

Table 9-19—C-Port Transmit Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
T10D	5214	**PORT_ERR(tx-underrun)** & FTUBO=0; TS=DATA << Replaces REF 364 in ISO/IEC 8802-5 : 1998 >>	TS=RPT; TX_AB
T12B	5215	**PORT_ERR(tx-underrun)** & FTUBO=1; TS=DATA << Replaces REF 365 in ISO/IEC 8802-5 : 1998 >>	TS=FILL; FED=FTI=1; TRR=R; TX_AB
	044	**RCV(SA<>LTA)** & CFR=1	FNMA=1
	045	**RCV(SA=LTA)** & CFR=1	FMA=1
	246	**RCV_AC**	STORE(Pr;Rr)
	247	**RCV_ED**	FMA=FNMA=FSD=0
	250	**RCV_ED** & FSD=1 & FED=1 & CFR>1	CFR=(CFR-1)
T30B	249	**RCV_ED** & FSD=1 & FMA=0 & CFR=1 & TS=STRIP	TS=RPT; FTI=0; FLF=1
T30A	248	**RCV_ED** & FSD=1 & FMA=1 & CFR=1 & TS=STRIP	TS=RPT; FTI=0
	251	**RCV_SD**	FMA=FNMA=0; FSD=1
T01B	5208	**TK**(P<=Pm) & PDU_QUEUED & FIPTKPS=1 & FTI=0 & FOP=1 & FR_LTH<>UNK & TS=RPT << Replaces REF 293 in ISO/IEC 8802-5 : 1998 >>	TS=DATA; FED=FMA=FSD=FTXI=0; FPTX_LTH=1; CFR=1; CTO=(PPV(MAX_TX)-FR_LTH); TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
T01A	5209	**TK**(P<=Pm) & PDU_QUEUED & FIPTKPS=1 & FTI=0 & FOP=1 & FR_LTH=UNK & TS=RPT << Based on REF 293 in ISO/IEC 8802-5 : 1998 >> << Supports frames of unknown length >> << New to DTR >>	TS=DATA; FED=FMA=FSD=FTXI=0; FPTX_LTH=0; CFR=1; CTO=0; << Setting CTO=0 disables multiframe transmit on a single token >> TX_SFS(P=Pr; R=0); LTA=TX_SA; **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D
	294	**TK(P<>Sx)** & PDU_QUEUED(P>Pm>R) & FTI=0 & TS=RPT & FOP=1	SET R=Pm
	300	**TK(P>0 & M=0)** & FAM=1 & FTI=0 & TS=RPT	SET M=1
	295	**TK_AC(P<Sx)**	CLEAR_STACKS
	297	**TK_AC(P=Sx) & Sr<Px** & QUE_EMPTY & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
	296	**TK_AC(P=Sx) & Sr<Px** & PDU_QUEUED(Pm<Sx) & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)

Table 9-19—C-Port Transmit Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	298	**TK_AC(P=Sx) & Sr>=Px** & PDU_QUEUED(Pm<Sx) & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
	299	**TK_AC(P=Sx) & Sr>=Px** & QUE_EMPTY & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T10D	301	**TK_ERR** & FTXI=0 & TS=DATA	TS=RPT; TX_AB
	307	**TK_WITH_ERR** & FTEO=0 & FTI=0 & TS=RPT	SET E=1
T20	323	**TRR=E** & TS=FILL	TS=RPT; FTI=0; FLF=1
T30B	324	**TRR=E** & TS=STRIP	TS=RPT; FTI=0; FLF=1
T23A	327	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr=Sx & Sr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
T23B	328	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr=Sx & Sr>=Px	TS=STRIP; TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T23C	329	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr>Sx & Pr<Px	TS=STRIP; TX_TK(P=Px;M=0;R=0); STACK(Sx=Px; Sr=Pr)
T23D	330	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr>Sx & Pr>=Px	TS=STRIP; TX_TK(P=Pr; M=0; R=Px)
T23A	331	**TS=FILL** & FMA=1 & Pr=Sx & Sr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
T23B	332	**TS=FILL** & FMA=1 & Pr=Sx & Sr>=Px	TS=STRIP; TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T23C	333	**TS=FILL** & FMA=1 & Pr>Sx & Pr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); STACK(Sx=Px; Sr=Pr)
T23D	334	**TS=FILL** & FMA=1 & Pr>Sx & Pr>=Px	TS=STRIP; TX_TK(P=Pr; M=0; R=Px)
T01C	5210	**TXI_REQ** & FIPTKPS=1 & TS=RPT << Replaces REF 352 in ISO/IEC 8802-5 : 1998 >>	TS=DATA; FTI=0; FTXI=1; FPTX_LTH=1; TX_SFS(P=0; R=0); **If** FMRO=0 then CPBTX=9; **If** FMRO=1 then CPBTX=D

9.5.4.4 Monitor Port Operation table: C-Port in Station Emulation mode using the TKP access protocol

Table 9-20—C-Port Monitor Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1)

<table>
<tr><th>S/T</th><th>REF</th><th>Event/condition</th><th>Action/output</th></tr>
<tr><td>M54</td><td>5305</td><td>CBR=0 & MS=RBN & FBR=0 & FIPTKPS=1
<< Replaces REF 003 in ISO/IEC 8802-5 : 1998 >></td><td>MS=BNT; FBR=FTW=1</td></tr>
<tr><td>M02A</td><td>026</td><td>FANM=1 & MS=RPT & JS=ANM</td><td>MS=TCT; FANM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT _PDU)</td></tr>
<tr><td>M52A</td><td>038</td><td>FR(DA=any_recognized_address) & FID=1 & MS=RBN</td><td>MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)</td></tr>
<tr><td></td><td>039</td><td>FR(DA=any_recognized_address) & FID=1 & MS=TBN</td><td>FID=0; FTI=1; TQP=R; TXI(BN_PDU)</td></tr>
<tr><td></td><td>046</td><td>FR_AC & FAM=0 & FPT=1 & FGTO=0</td><td>TNT=R; FPT=0</td></tr>
<tr><td></td><td>048</td><td>FR_AC(M=0) & FAM=1 & FTHO=0</td><td>TVX=R</td></tr>
<tr><td></td><td>049</td><td>FR_AC(M=0) & FAM=1 & FTHO=1</td><td>FAT=1</td></tr>
<tr><td></td><td>047</td><td>FR_AC(M=0) & FAM=1 & FTI=0 & TS=RPT</td><td>SET M=1</td></tr>
<tr><td></td><td>050</td><td>FR_AC(M=0) & MS=RBN & CBC=0 & FTI=0 & TS=RPT</td><td>[SET M=1 (optional-i)]</td></tr>
<tr><td>M01</td><td>051</td><td>FR_AC(M=1) & FAM=1 & MS=RPT</td><td>MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)</td></tr>
<tr><td></td><td>055</td><td>FR_AMP & CNNR<>0</td><td>CNNR=(CNNR-1)</td></tr>
<tr><td></td><td>057</td><td>FR_AMP & FAM=0 & FINS=1</td><td>TSM=R</td></tr>
<tr><td></td><td>056</td><td>FR_AMP & FAM=1</td><td>[TSM=R (optional-i)]</td></tr>
<tr><td></td><td>059</td><td>FR_AMP(A=0 & C=0) & FAM=0 & FOP=1</td><td>FSMP=1; TQP=R</td></tr>
<tr><td></td><td>060</td><td>FR_AMP(A|C<>0) & FAM=0</td><td>FSMP=0</td></tr>
<tr><td></td><td>061</td><td>FR_AMP(SA<>MA) & FAM=1</td><td>QUE_ACT_ERR_PDU(EC=2); FAM=0; FA(monitor)=0</td></tr>
<tr><td></td><td>062</td><td>FR_AMP(SA<>MA) & FAM=1 & FINS=1</td><td>TNT=R</td></tr>
<tr><td></td><td>063</td><td>FR_AMP(SA<>MA) & FAM=1 & TS=RPT</td><td>FTXC=FTI=0</td></tr>
<tr><td></td><td>064</td><td>FR_AMP(SA<>SUA & A=0 & C=0) & FOP=1</td><td>CSC=1; SUA=SA ; QUE_SUA_CHG_PDU</td></tr>
<tr><td></td><td>065</td><td>FR_AMP(SA=MA & A=0 & C=0) & FAM=1</td><td>FNN=FNW=1; LMP=NULL</td></tr>
<tr><td></td><td>066</td><td>FR_AMP(SA=MA & A|C<>0) & FAM=1</td><td>LMP=SA</td></tr>
<tr><td></td><td>072</td><td>FR_BN & MS<>TBN & MS<>BNT & FINS=1</td><td>TBR=R</td></tr>
<tr><td>M65</td><td>073</td><td>FR_BN & MS=RCT & FINS=1</td><td>MS=RBN</td></tr>
<tr><td></td><td>074</td><td>FR_BN & MS=RPT & FAM=1 & TS=RPT</td><td>FTXC=0</td></tr>
<tr><td>M05</td><td>075</td><td>FR_BN & MS=RPT & FINS=1</td><td>MS=RBN; FAM=0; FA(monitor)=0</td></tr>
<tr><td>M25</td><td>076</td><td>FR_BN & MS=TCT & FINS=1</td><td>MS=RBN</td></tr>
</table>

Table 9-20—C-Port Monitor Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	077	**FR_BN** & MS=TCT & FINS=1 & TS=RPT	FTXC=FTI=0
M15	078	**FR_BN** & MS=TRP & FINS=1	MS=RBN; FAM=0; FA(monitor)=0
	079	**FR_BN** & MS=TRP & FINS=1 & TS=RPT	FTXC=FTI=0
M32	080	**FR_BN(M=0 & SA=MA)** & MS=TBN & FID=0	MS=TCT; FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M35	082	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FID=0 & FINS=1	MS=RBN; TBR=R
	083	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FID=0 & FINS=1 & TS=RPT	FTXC=FTI=0
	094	**FR_BN(SA<>MA & UNA=MA & BN_TYPE<>1)** & FBR=0 & MS<>RBN & MS<>BNT	CBR=7
	084	**FR_BN(SA<>SUA)**	CBC=2
	087	**FR_BN(SA=SUA & UNA<>MA)** & CBC=0 & MS=RBN	CBC=1
	090	**FR_BN(SA=SUA & UNA<>MA)** & FBR=0 & CBC>0 & MS=RBN	CBC=(CBC-1)
	086	**FR_BN(SA=SUA & UNA<>MA)** & MS<>RBN & FBR=0 & MS<>BNT	CBC=1
	085	**FR_BN(SA=SUA & UNA=MA)** & FBR=0	CBC=2
	088	**FR_BN(SA=SUA)** & FBR=1 & MS<>RBN & MS<>BNT	CBC=1
	089	**FR_BN(SA=SUA)** & FBR=1 & CBC=0 & MS=RBN	CBC=1
	091	**FR_BN(SA=SUA)** & FBR=1 & CBC>0 & MS=RBN	CBC=(CBC-1)
	092	**FR_BN(UNA<>MA)**	CBR=8
	095	**FR_BN(UNA=MA & BN_TYPE<>1)** & FBR=0 & MS=RBN	CBR=(CBR-1)
	093	**FR_BN(UNA=MA & BN_TYPE=1)**	CBR=8
M52C	096	**FR_BN_CIR** & MS=RBN & CBC<>2 & FINS=1	[MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU) (optional-i)]
M26A	109	**FR_CT (M=0 & SA=MA & UNA<>SUA)** & MS=TCT	MS=RCT; TCT=R; QUE_ACT_ERR_PDU(EC=3)
	110	**FR_CT (M=0 & SA=MA & UNA<>SUA)** & MS=TCT & TS=RPT	FTXC=FTI=0
	104	**FR_CT** & FAM=1	FAM=0; QUE_ACT_ERR_PDU(EC=1); FA(monitor)=0
	105	**FR_CT** & FAM=1 & TS=RPT	FTXC=FTI=0
	107	**FR_CT** & MS<>TBN & FCT=0	FCT=1

Table 9-20—C-Port Monitor Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
M16	108	**FR_CT** & MS=TRP	MS=RCT; TCT=R
M21	111	**FR_CT(M=0 & SA=MA & UNA=SUA)** & CCT>=n1 & CCR>=n1 & MS=TCT	MS=TRP; FAM=1; TRP=R; TXI(RP_PDU); QUE_NEW_MON_PDU; FA(monitor)=1
	112	**FR_CT(M=0 & SA=MA & UNA=SUA)** & MS=TCT	CCR=(CCR+1)
M56	113	**FR_CT(SA<MA)** & MS=RBN & FCCO=0 & FID=0	MS=RCT; TCT=R
M52B	114	**FR_CT(SA<MA)** & MS=RBN & FCCO=1 & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M06	116	**FR_CT(SA<MA)** & MS=RPT & FCCO=0 & FOP=1	MS=RCT; TCT=R
M02B	117	**FR_CT(SA<MA)** & MS=RPT & FCCO=1 & FAM=0 & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M06	118	**FR_CT(SA<MA)** & MS=RPT & FINS=0 & FOP=1	MS=RCT; TCT=R
M06	115	**FR_CT(SA<MA)** & MS=RPT & FAM=1	MS=RCT; TCT=R
M56	119	**FR_CT(SA>MA)** & MS=RBN & FID=0	MS=RCT; TCT=R
M06	120	**FR_CT(SA>MA)** & MS=RPT & FOP=1	MS=RCT; TCT=R
M26B	121	**FR_CT(SA>MA)** & MS=TCT	MS=RCT; TCT=R
	122	**FR_CT(SA>MA)** & MS=TCT	[TXI(RCV_CT_PDU) (optional-i)]
	123	**FR_CT(SA>MA)** & MS=TCT & TS=RPT	FTXC=FTI=0
	163	**FR_RP**	CNNR=n5
M60	169	**FR_RP** & MS=RCT	MS=RPT
	166	**FR_RP** & MS=RCT & FINS=1	FBR=FBT=0
	170	**FR_RP** & MS=RCT & FINS=1	TNT=R; TSM=R
	171	**FR_RP** & MS=RPT & FAM=1	FAM=0; QUE_ACT_ERR_PDU(EC=2); FA(monitor)=0
	173	**FR_RP** & MS=RPT & FAM=1 & FINS=1	TNT=R; [TSM=R (optional-i)]
	172	**FR_RP** & MS=RPT & FAM=1 & TS=RPT	FTXC=FTI=0
	167	**FR_RP** & MS=RPT & FINS=1	FBR=FBT=0
	168	**FR_RP** & MS=TRP & FINS=1	FBR=FBT=0
	174	**FR_RP(SA<>MA)** & FAM=0 & FINS=1	[TNT=R (optional-x)]
M10A	175	**FR_RP(SA<>MA)** & MS=TRP	MS=RPT; FAM=0; QUE_ACT_ERR_PDU(EC=2); FA(monitor)=0
	176	**FR_RP(SA<>MA)** & MS=TRP & TS=RPT	FTXC=FTI=0
M10B	177	**FR_RP(SA=MA & R=0)** & MS=TRP	MS=RPT; FAT=FTI=FNN=0; FMP=1; TVX=R; TAM=R; TX_TK(P=0; M=0; R=0); CLEAR_STACKS; QUE_AMP_PDU; LMP=(MA|NULL); [TSM=R (optional-i)]
M10C	178	**FR_RP(SA=MA & R>0)** & MS=TRP	MS=RPT; FAT=FTI=FNN=0; FMP=1; TVX=R; TAM=R; TX_TK(P=Rr; M=0; R=0); RESET_STACKS(Sx=Rr; Sr=0); QUE_AMP_PDU; LMP=(MA|NULL); [TSM=R (optional-i)]

Table 9-20—C-Port Monitor Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	192	**FR_SMP(A=0 & C=0)** & FAM=1	FNN=FNW=1; LMP=NULL
	193	**FR_SMP(A=0 & C=0)** & FSMP=0 & FAM=0 & FOP=1	FSMP=1; TQP=R
	198	**FR_SMP(A|C<>0)** & FAM=1	LMP=SA
	199	**FR_SMP(SA<>SUA & A=0 & C=0)** & FAM=0 & FOP=1	CSC=1; SUA=SA; QUE_SUA_CHG_PDU
	200	**FR_SMP(SA<>SUA & A=0 & C=0)** & FAM=1 & FNN=0 & FOP=1	CSC=1; SUA=SA; QUE_SUA_CHG_PDU
	201	**FR_SUA_CHG(SA=MA & E=0 & A=1 & C=0)** & CSC<n3 & FOP=1	CSC=(CSC+1); QUE_SUA_CHG_PDU
	202	**FR_SUA_CHG(SA=MA & E=1 & C=0)** & CSC<n3 & FOP=1	CSC=(CSC+1); QUE_SUA_CHG_PDU
	207	**FSL=0** & MS=TBN & TX_BN_TYPE=2	TX_BN_TYPE=3
	208	**FSL=1** & FID=1 & MS=TBN	FID=0; FTI=1; TQP=R; TX_BN_TYPE=2; TXI(BN_PDU)
M52A	212	**FSL=1** & FINS=1 & MS=RBN	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M62	213	**FSL=1** & FINS=1 & MS=RCT	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M02C	214	**FSL=1** & FINS=1 & MS=RPT	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M12A	215	**FSL=1** & FINS=1 & MS=TRP	MS=TCT; FAM=FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
	216	**FSL=1** & MS=TBN	TX_BN_TYPE=2
	219	**FTW=1** & FRH=0 & MS=BNT	FOP=FTW=0; TRW=R; Remove_Station
	260	**TAM=E** & FNN=0 & FAM=1 & MS=RPT	TAM=R; QUE_NN_INCMP_PDU; QUE_AMP_PDU; LMP=(MA|NULL)
	261	**TAM=E** & FNN=1 & FAM=1 & MS=RPT	FNN=0; TAM=R; QUE_AMP_PDU; LMP=(MA|NULL)
M52B	262	**TBR=E** & MS=RBN & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M34	5301	**TBT=E** & MS=TBN & FINS=1 & FBT=0 & FIPTKPS=1 << Replaces REF 264 in ISO/IEC 8802-5 : 1998 >>	MS=BNT; FOP=0; FBT=1; TRW=R; Remove_Station
M63	266	**TCT=E** & MS=RCT & FNC=1	MS=TBN; FTXC=FTI=1; TBT=R; TQP=R; TX_BN_TYPE=4; TXI(BN_PDU)
M23B	271	**TCT=E** & MS=TCT & FNC=1 & FCT=0 & FSL=0	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=3; TXI(BN_PDU)
M23A	273	**TCT=E** & MS=TCT & FNC=1 & FCT=1 & FSL=0	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=4; TXI(BN_PDU)
M23C	272	**TCT=E** & MS=TCT & FNC=1 & FSL=1	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=2; TXI(BN_PDU)

Table 9-20—C-Port Monitor Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
M45	5302	**TEST_OK** & FIPTKPS=1 & FBR=1 & MS=BNT << Replaces REF 279 in ISO/IEC 8802-5 : 1998 >>	MS=RBN; FTI=FTXC=FWFA=FWF=0; FBT=FID=FOP=FRH=1; TWFD=R; TRH=R; TID=R; INSERT
M43	5303	**TEST_OK** & FIPTKPS=1 & FBT=1 & MS=BNT << Replaces REF 280 in ISO/IEC 8802-5 : 1998 >>	MS=TBN; FTI=FWFA=FWF=0; FBR=FID=FOP=FRH=FTXC=1; TID=R; TRH=R; TWFD=R; INSERT
M52A	282	**TID=E** & MS=RBN & FID=1	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
	283	**TID=E** & MS=TBN & FID=1	FID=0; FTI=1; TQP=R; TXI(BN_PDU)
M01	290	**TK(M=1)** & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	304	**TK_GOOD** & FAM=0 & FGTO=1	TNT=R
	305	**TK_GOOD(P=0)** & FAM=0 & FGTO=0	TNT=R; FPT=0
	306	**TK_GOOD(P>0)** & FAM=0 & FGTO=0	FPT=1
M02B	310	**TNT=E** & FAM=0 & FINS=1 & MS=RPT	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R ; CCT=1; CCR=1; TXI(CT_PDU)
	311	**TQP=E** & MS=RPT & FDC=0 & FAM=0	FNW=1
	312	**TQP=E** & MS=RPT & FDC=1 & FAM=0	FNC=1; QUE_SMP_PDU
	313	**TQP=E** & MS=TBN & FID=0	TQP=R; TXI(BN_PDU)
	314	**TQP=E** & MS=TCT	TQP=R; CCT=(CCT+1); TXI(CT_PDU)
M12B	322	**TRP=E** & MS=TRP & FINS=1	MS=TCT; FAM=FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); QUE_ACT_ERR_PDU(EC=1); FA(monitor)=0
	5304	**TRW=E** & FIPTKPS=1 & MS=BNT << Replaces REF 326 in ISO/IEC 8802-5 : 1998 >>	FTXC=1; FTI=x; [TLMTR=R (optional-i)]; TEST << DTR Station resets TLMTR to ensure the Station’s LMT does not exceed the time allowed by the C-Port. >>
	335	**TSL=E** & FSLD=1	FSL=1
M02C	336	**TSM=E** & MS=RPT & FINS=0 & FAM=1	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M02C	337	**TSM=E** & MS=RPT & FINS=1	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M01	338	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
M01	341	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	344	**TVX=E** & FTHO=1 & FAT=1 & FAM=1	FAT=0; TVX=R
	346	**TWFD=E** & FWFA=0	FWFA=1
	348	**TX_ERR(RP)** & MS=TRP	TXI(RP_PDU)
	351	**TX_ERR(SUA_CHG)** & CSC<n3 & FOP=1	QUE_SUA_CHG_PDU; [CSC=CSC+1 (optional)]

9.5.4.5 Error Handling Port Operation table: C-Port in Station Emulation mode using the TKP access protocol

Table 9-21—C-Port Error Handling Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1)

S/T	REF	Event/condition	Action/output
	001	**Burst5_error_event** & MS=RPT & FINS=1 & FER=0	TER=R; FER=1; CBE=(CBE+1)
	002	**Burst5_error_event** & MS=RPT & FINS=1 & FER=1 & CBE<255	CBE=(CBE+1)
	004	**CER=n3** & FECO=0	FER=FLF=0; CER=0; SET ERR_CNTR to 0;
	005	**CER=n3** & FECO=1	FLF=0; CER=0; SET ERR_CNTR to 0;
	030	**FJR=1** & FBHO=1 & FINS=0 & FECO=1	TER=R; FER=1
	032	**FLF=1** & MS=RPT & FINS=1 & FER=1 & CLFE<255	FLF=0; CLFE=(CLFE+1)
	031	**FLF=1** & MS=RPT & FINS=1 & FER=0	FLF=0; FER=1; TER=R; CLFE=(CLFE+1)
	034	**FNC=1** & FBHO=0 & FINS=0 & FECO=1	FER=1; TER=R
	052	**FR_AC(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	053	**FR_AC(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	361	**FR_LLC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=0	[FER=1; TER=R; CFCE=(CFCE+1) (Optional-x)]
	362	**FR_LLC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=1 & CFCE<255	[CFCE=(CFCE+1) (Optional-x)]
	041	**FR_MAC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CFCE=(CFCE+1)
	042	**FR_MAC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=1 & CFCE<255	CFCE=(CFCE+1)
	152	**FR_NOT_COPIED** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CRCE=(CRCE+1)
	153	**FR_NOT_COPIED** & MS=RPT & FINS=1 & FER=1 & CRCE<255	CRCE=(CRCE+1)
	179	**FR_RPRT_ERR (SA=MA & A=1 & C<>0)** & CER<n3 & FECO=0 & FOP=1	FER=FLF=0; CER=0; SET ERR_CNTR to 0
	181	**FR_RPRT_ERR (SA=MA & E=0 & A=0)** & CER<n3 & FECO=0 & FOP=1	FER=FLF=0; CER=0; SET ERR_CNTR to 0
	182	**FR_RPRT_ERR (SA=MA & E=0 & A=0)** & CER<n3 & FECO=1 & FOP=1	FLF=0; CER=0; SET ERR_CNTR to 0
	183	**FR_RPRT_ERR (SA=MA & E=0 & A=1 & C=0)** & CER<n3 & FOP=1	CER=(CER+1); QUE_RPRT_ERR_PDU
	184	**FR_RPRT_ERR (SA=MA & E=1 & C=0)** & CER<n3 & FOP=1	CER=(CER+1); QUE_RPRT_ERR_PDU

Table 9-21—C-Port Error Handling Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	180	**FR_RPRT_ERR (SA=MA & A=1 & C<>0)** & CER<n3 & FECO=1 & FOP=1	FLF=0; CER=0; SET ERR_CNTR to 0
	194	**FR_SMP(A=0 & C=0)** & FSMP=1 & MS=RPT & FINS=1 & FAM=0 & CNNR=0 & FER=0	FER=1; TER=R; CACE=(CACE+1)
	195	**FR_SMP(A=0 & C=0)** & FSMP=1 & MS=RPT & FINS=1 & FAM=0 & CNNR=0 & FER=1 & CACE<255	CACE=(CACE+1)
	196	**FR_SMP(A=0 & C=0)** & MS=RPT & FINS=1 & FAM=1 & FNN=1 & CNNR=0 & FER=0	FER=1; TER=R; CACE=(CACE+1)
	197	**FR_SMP(A=0 & C=0)** & MS=RPT & FINS=1 & FAM=1 & FNN=1 & CNNR=0 & FER=1 & CACE<255	CACE=(CACE+1)
	204	**FR_WITH_ERR(E=0)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CLE=(CLE+1)
	205	**FR_WITH_ERR(E=0)** & MS=RPT & FINS=1 & FER=1 & CLE<255	CLE=(CLE+1)
	222	**INTERNAL_ERR(correctable)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CIE=(CIE+1)
	223	**INTERNAL_ERR(correctable**) & MS=RPT & FINS=1 & FER=1 & CIE<255	CIE=(CIE+1)
	5402	**PORT_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=0 << Replaces REF 252 in ISO/IEC 8802-5 : 1998 >>	FER=1; TER=R; CABE=(CABE+1)
	5403	**PORT_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255 << Replaces REF 253 in ISO/IEC 8802-5 : 1998 >>	CABE=(CABE+1)
		PORT_ERR(tx-underrun) & TS=DATA & FINS=1 & MS=RPT & FER=0 << Replaces REF 366 in ISO/IEC 8802-5 : 1998 >>	[FER=1; TER=R; CABE=(CABE+1) (optional-x)]
		PORT_ERR(tx-underrun) & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255 << Replaces REF 367 in ISO/IEC 8802-5 : 1998 >>	[CABE=(CABE+1) (optional-x)]
	5401	TER=E & FINS=1 & ERR_CNTR<>0 & FIPTKPS=1 << Replaces REF 274 in ISO/IEC 8802-5 : 1998 >>	CER=1; QUE_RPRT_ERR_PDU; MRI_UNITDATA.indication (ERR_RPRT_PDU) << DTR C-Port reports soft errors to the MRI interface >>
	275	**TER=E** & FINS=1 & FECO=1	TER=R
	291	**TK(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)

Table 9-21—C-Port Error Handling Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	292	**TK(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	303	**TK_ERR** & TS=DATA & FINS=1 & FER=1 & CABE<255	CABE=(CABE+1)
	302	**TK_ERR** & TS=DATA & FINS=1 & FER=0	FER=1; TER=R; CABE=(CABE+1)
	308	**TK_WITH_ERR(E=0)** & FTEO=0 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CLE=(CLE+1)
	309	**TK_WITH_ERR(E=0)** & FTEO=0 & MS=RPT & FINS=1 & FER=1 & CLE<255	CLE=(CLE+1)
	339	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	340	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	343	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	342	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	349	**TX_ERR(RPRT_ERR)** & CER<n3 & FOP=1	QUE_RPRT_ERR_PDU; [CER=(CER+1) (optional)]

9.5.4.6 Interface Signals Port Operation table: C-Port in Station Emulation mode using the TKP access protocol

Table 9-22—C-Port Interface Signals Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1)

S/T	REF	Event/condition	Action/output
	5508	**DTU_UNITDATA-STATUS.request(Fail)** & FIPTKPS=1 & FPTX_LTH=1 & TS=DATA << Transmit FSM is currently transmitting a previously queued frame. This is an indication that frame cut-through is terminating with an error. >> << New to DTR >>	DISCARD_QUEUED_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	5509	**DTU_UNITDATA-STATUS.request(Fail)** & FIPTKPS=1 & TS=RPT << New to DTR >>	DISCARD_QUEUED_PDU << The PDU discarded is the frame that was the subject of the previous DTU_UNITDATA.request. >>
	5507	**DTU_UNITDATA-STATUS.request(OK)** & FIPTKPS=1 & FPTX_LTH=0 & TS=DATA << Transmit FSM is currently transmitting a frame of unknown length. This is an indication that a cut-through frame is being transmitted. >> << New to DTR >>	FPTX_LTH=1 << The cut-through frame has completed with OK status. The frame length is now known. >>
	5501	**DTU_UNITDATA.request** & FJR=1 & FOP=1 & FIPTKPS=1 & FR_LTH<=PPV(MAX_TX) << New to DTR >>	QUE_PDU
	5502	**DTU_UNITDATA.request** & FJR=1 & FOP=1 & FIPTKPS=1 & FR_LTH=UNK << C-Port transmitting a frame using the FR_LTH=UNK condition >> << New to DTR >>	[QUE_PDU (optional-unk)]
	5503	**FR** & FJR=1 & FPFCO=0 & FOP=1 & FIPTKPS=1 & TS=RPT << New to DTR >>	DTU_UNITDATA.indication; DTU_UNITDATA-STATUS.indication(OK)
	5516	**FR** & FJR=1 & FPFCO=1 & FOP=1 & FIPTKPS=1 & TS=RPT << New to DTR >>	DTU_UNITDATA-STATUS.indication(OK)
	5504	**FR_FC** & FJR=1 & FPFCO=1 & FOP=1 & FIPTKPS=1 & TS=RPT << New to DTR >>	DTU_UNITDATA.indication
	5506	**FR_MAC (DA<>any_recognized_address & C<>0)** & FJR=1 & FOP=1 & FIPTKPS=1 & TS=RPT << New to DTR >>	MRI_UNITDATA.indication
	5505	**FR_MAC(DC<>0 & DC<>3 & SC=0)** & FJR=1 & FOP=1 & FIPTKPS=1 & TS=RPT << New to DTR >>	MRI_UNITDATA.indication

Table 9-22—C-Port Interface Signals Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	5517	**FR_WITH_ERR** & FJR=1 & FPFCO=1 & FOP=1 & FIPTKPS=1 & TS=RPT << New to DTR >>	DTU_UNITDATA-STATUS.indication(Fail)
	5510	**FTI=0** &FIPTKPS=1 << Replaces REF 217 in ISO/IEC 8802-5 : 1998 >>	PM_CONTROL.request(Repeat_mode=Repeat) **or** PS_CONTROL.request(Repeat_mode=Repeat) ⇒ **An implementation shall take one of these two actions**
	5511	**FTI=1** &FIPTKPS=1 << Replaces REF 218 in ISO/IEC 8802-5 : 1998 >>	PM_CONTROL.request(Repeat_mode=Fill) **or** PS_CONTROL.request(Repeat_mode=Fill) ⇒ **An implementation shall take one of these two actions**
	220	**FTXC=0**	PS_CONTROL.request (Crystal_transmit=Not_asserted)
	221	**FTXC=1**	PS_CONTROL.request (Crystal_transmit=Asserted)
	5512	**MRI_UNITDATA.request** & FJR=1 & FOP=1 & FIPTKPS=1 & FR_LTH<=PPV(MAX_TX) << New to DTR >>	QUE_PDU
	5513	**MRI_UNITDATA.request** & FJR=1 & FOP=1 & FIPTKPS=1 & FR_LTH=UNK << C-Port transmitting a frame using the FR_LTH=UNK condition >> << New to DTR >>	[QUE_PDU (optional-unk)]
	239	**PM_STATUS.indication (Signal_detection= Signal_acquired)** & FSLD=1	FSL=FSLD=0
	240	**PM_STATUS.indication (Signal_detection= Signal_loss)** & FSLD=0	FSLD=1; TSL=R
	241	**PM_STATUS.indication (Wire_fault=Detected)** & FWFA=1 & FWF=0 & FIPTKPS=1	FWF=1; TWF=R
	242	**PM_STATUS.indication (Wire_fault=Not_detected)** & FWF=1 & FIPTKPS=1	FWF=0
	244	**PS_STATUS.indication (Frequency_error)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CFE=(CFE+1)
	245	**PS_STATUS.indication (Frequency_error)** & MS=RPT & FINS=1 & FER=1 & CFE<255	CFE=(CFE+1)
	243	**PS_STATUS.indication(Burst4_error)**	[FSD=0 (optional-i)]
	288	**TK(M=0)** & FAM=1 & FTHO=0	TVX=R; PS_EVENT.response(Token_received)
	289	**TK(M=0)** & FAM=1 & FTHO=1	FAT=1; PS_EVENT.response(Token_received)

9.5.4.7 Miscellaneous Frame Handling Port Operation table: C-Port in Station Emulation mode using the TKP access protocol

Table 9-23—C-Port Miscellaneous Frame Handling Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1)

S/T	REF	Event/condition	Action/output
	098	**FR_CHG_PARM** **(DA=broadcast & A|C<>1 &** **CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	099	**FR_CHG_PARM** **(DA=broadcast & A|C<>1 &** **CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	101	**FR_CHG_PARM** **(DA=Non_broadcast &** **CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	102	**FR_CHG_PARM** **(DA=Non_broadcast &** **CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	097	**FR_CHG_PARM** & FOP=1	SET APPR_PARMS
	129	**FR_INIT** **(DA=broadcast & A|C<>1 &** **CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	130	**FR_INIT** **(DA=broadcast & A|C<>1 &** **CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	132	**FR_INIT** **(DA=Non_broadcast &** **CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)
	133	**FR_INIT** **(DA=Non_broadcast &** **CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)
	128	**FR_INIT** & FOP=1	SET APPR_PARMS
	136	**FR_MAC_INV** **(ERR_COND=LONG_MAC &** **SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8009)
	137	**FR_MAC_INV** **(ERR_COND=LONG_MAC &** **SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8009)
	138	**FR_MAC_INV** **(ERR_COND=SC_INVALID &** **SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8004)
	139	**FR_MAC_INV** **(ERR_COND=SC_INVALID &** **SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8004)
	141	**FR_MAC_INV** **(ERR_COND=SHORT_MAC &** **SC_PRESENT & SC<>RS)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001)

Table 9-23—C-Port Miscellaneous Frame Handling Port Operation table for the C-Port in Station Emulation mode using the TKP access protocol (FIPTKPS=1) *(Continued)*

S/T	REF	Event/condition	Action/output
	140	**FR_MAC_INV (ERR_COND=SHORT_MAC) & SC_NOT_PRESENT & SC<>RS)** & FOP=1	[QUE_RSP_PDU(DC<>RS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001 (optional-x)]
	142	**FR_MAC_INV (ERR_COND=SV_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8005)
	143	**FR_MAC_INV (ERR_COND=SV_LTH_ERR & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8005)
	144	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8007)
	145	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8007)
	146	**FR_MAC_INV (ERR_COND=SV_UNK & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8008)
	147	**FR_MAC_INV (ERR_COND=SV_UNK & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8008)
	148	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8002)
	149	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8002)
	150	**FR_MAC_INV (ERR_COND=VI_UNK & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8003)
	151	**FR_MAC_INV (ERR_COND=VI_UNK & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8003)
	154	**FR_REMOVE (DA=broadcast & A<>1)** & FOP=1	[QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A) (optional-i)]
	155	**FR_REMOVE(DA=broadcast & A=1)** & FOP=1	[QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A) (optional-x)]
	162	**FR_REMOVE(DA=Non_broadcast)** & FRRO=1 & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A)
	185	**FR_RQ_ADDR** & FOP=1	QUE_RPRT_ADDR_PDU
	186	**FR_RQ_ATTACH** & FOP=1	QUE_RPRT_ATTACH_PDU
	190	**FR_RQ_STATE** & FOP=1	QUE_RPRT_STATE_PDU

9.5.4.8 Precise specification of terms

This subclause provides the precise specifications of events/conditions and actions/outputs for the Port Operation tables used to support the C-Port in Station Emulation mode using the TKP access protocol.

9.5.4.8.1 Precise specification of events/conditions

The expressions used for events/conditions in the FSMs and Port Operation tables have the following meanings:

{flag}=0.	The specified flag is set to zero (false).
{flag}=1.	The specified flag is set to one (true).
{term1} = {term2}.	Term 1 is equal to term 2.
{term1} < {term2}.	Term 1 is less than term 2.
{term1} <= {term2}.	Term 1 is less than or equal to term 2.
{term1} > {term2}.	Term 1 is greater than term 2.
{term1} >= {term2}.	Term 1 is greater than or equal to term 2.
{term1} <> {term2}.	Term 1 is not equal to term 2.
{timer}=E.	The specified timer has expired.

& means: “and.”
| means: “or.”

Unless otherwise specified, the following terms and operations are defined:

A=0. Both the A bits in the received frame’s FS field (bits 0 and 4) were 0.
A=1. Both the A bits in the received frame’s FS field (bits 0 and 4) were 1.
A<>1. Either or both A bits in the received frame’s FS field (bits 0 and 4) were 0.
A|C<>0. At least one of the frame status bits in the received frame’s FS field (bits 0, 1, 4, or 5) is 1.
A|C<>1. At least one of the frame status bits in the received frame’s FS field (bits 0, 1, 4, or 5) is 0.
AND(x,y). Bitwise Logical AND function of the binary objects x and y.
AP_MASK. Option mask for access protocol. Bit significant mask used by the C-Port. Each bit is defined for each access protocol supported.
AP_REQ=value. Access protocol request subvector is received with the specified value.
BN_TYPE. The value of the beacon type subvector received.
Burst5_error_event. A conditional PM_STATUS.indication(Burst5_error) has occurred. The conditions under which a Burst5_error is excluded is not uniquely specified by this standard (see Counter, burst error in 3.6.3). At a minimum, the C-Port in Station Emulation mode shall include the first Burst5_error following a valid MAC frame copied by the Station if the Burst5_error occurs within a frame. The C-Port may include every Burst5_error.
C=0. Both the C bits in the received frame’s FS field (bits 1 and 5) were set to 0.
C<>0. Either or both C bits in the received frame’s FS field (bits 1 and 5) were set to 1.
C=1. Both the C bits in the received frame’s FS field (bits 1 and 5) were set to 1.
Connect.PMAC. The PMAC receives the command from management to join the network.
CORR_NOT_PRESENT. The received frame did not contain a correlator subvector.
CORR_PRESENT. The received frame did contain a correlator subvector.
CPBTX>PPV(MAX_TX). The frame being transmitted is longer than allowed by PPV(MAX_TX).
CTO-FR_LTH<0. The value of the Transmit Octet counter is less than the next frame length to be transmitted.
CTO-FR_LTH>=0. The value of the Transmit Octet counter is greater than, or equal to, the next frame length to be transmitted.
DA<>any_recognized_address. The destination address (DA) of the received frame does not match any of the following types of Station addresses:

a) Is not the Station's individual addresses.
b) Is not the Station's group addresses.
c) Is not the Station's functional addresses.
d) Is not the broadcast addresses defined in 3.2.4.1.

DA=any_recognized_address. The destination address (DA) of the received frame matches any of the C-Port's addresses as follows:

a) Is the C-Port's individual address (DA=MA), or
b) Is one of the C-Port's group addresses, or
c) Is one of the C-Port's functional addresses, or
d) Is one of the broadcast addresses as defined in 3.2.4.1.

DA=MA. The destination address (DA) of the received frame is equal to the individual address of the C-Port. If the C-Port's individual address is an universally administered address, then all 48 bits must match. If the C-Port's individual address is a locally administrated address, then either a hierarchical address match or a 48-bit address match is allowed.

DA=Non_broadcast. The received frame was not sent to a broadcast address, but otherwise addressed to the C-Port.

Disconnect.PMAC. The request from local management to close the C-Port.

DTU_UNITDATA-STATUS.request(Status_Code). Frame status is reported by the DTU to the PMAC. Status_Code may be one of the following:

a) OK: The frame has been successfully transferred to the PMAC without error.
b) Fail: Transfer of the frame to the PMAC has failed due to a frame error.

DTU_UNITDATA.request. The DTU interface requests a frame to be transmitted.

E=0. The error bit in the received ED field is zero.

E=1. The error bit in the received ED field is one.

EOB. End of byte: The last bit of an octet within the information field has been transmitted.

EOD. End of data: The last octet of the Information field has been transmitted.

ERR_CNTR<>0. Any error counter not zero.

ERR_COND=LONG_MAC. MAC frame too long—INFO field larger than maximum allowed VL value.

ERR_COND=SC_INVALID. Invalid source class.

ERR_COND=SHORT_MAC. MAC frame not long enough to contain VL, VC, and VI fields.

ERR_COND=SV_LTH_ERR. Subvector length error.

ERR_COND=SV_MISSING. Missing required subvector.

ERR_COND=SV_UNK. Unknown subvector SVI value.

ERR_COND=VI_LTH_ERR. Vector length error. VL is not equal to the sum of all the SVLs plus the length of VL, VC, and VI fields, or VL does not agree with the length of the frame.

ERR_COND=VI_UNK. Unrecognized vector ID value.

FR. A frame has been received that meets the criteria specified in 4.3.2.

FR(criteria). A frame has been received that meets the specified criteria and the criteria specified in 4.3.2.

FR_AC(criteria). A frame's access control field has been received that meets the specified criteria and the criteria specified in 4.3.2.

FR_AMP(criteria). A verified Active Monitor Present frame (3.3.5.2) is received that meets the specified criteria.

FR_BN(criteria). A verified Beacon frame (3.3.5.2) is received that meets the specified criteria.

FR_BN_CIR. A frame's access control field has been detected with the M bit set to 1 indicating a circulating frame. The method used to detect this condition is outside the scope of this standard, but reception of a valid beacon frame (3.3.5.2) with the M bit set to 1 shall satisfy this condition.

FR_CHG_PARM(criteria). A verified Change Parameters MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_COPIED(criteria). The MAC successfully copied the received frame that meets the specified criteria.

FR_CT(criteria). A verified Claim Token MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_DAT(criteria). A verified Duplicate Address Test MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_INIT(criteria). A verified Initialize Station MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_INS_REQ(criteria). A verified Insert Request MAC frame is received that meets the specified criteria.

FR_LLC(criteria). An LLC frame is received that meets the specified criteria and the criteria specified in 4.3.2.

FR_LTH. The length of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG).

FR_LTH<=PPV(MAX_TX). The length of the frame to be transmitted is less than or equal to the maximum allowed frame length.

FR_LTH<>UNK. The length of the frame to be transmitted is known.

FR_LTH=UNK. The length of the frame to be transmitted is unknown.

FR_MAC(criteria). A valid MAC frame is received that meets the specified criteria and the criteria specified in 10.3.6.

FR_MAC_INV(reason). A valid MAC frame is received that fails verification (10.3.6) for the reason specified.

FR_NOT_COPIED. The C-Port in Station Emulation mode sets the A bits (REF 040 or 234), but does not copy the frame.

FR_REG_REQ(criteria). A verified Registration Request MAC frame is received that meets the specified criteria.

FR_REMOVE(DA=Non_broadcast). A verified Remove MAC frame (3.3.5.2) is received, not sent to a broadcast address, but otherwise addressed to the C-Port.

FR_RP(criteria). A verified Ring Purge MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_RPRT_ERR(criteria). A Report Error MAC frame (3.3.5.1) is received that was transmitted by the Station without error (4.3.3) and that meets the specified criteria.

FR_RQ_ADDR. A verified Request Address MAC frame (3.3.5.2) is received.

FR_RQ_ATTACH. A verified Request Attachment MAC frame (3.3.5.2) is received.

FR_RQ_INIT(criteria). A Request Initialization MAC frame (3.3.5.1) is received that was transmitted by the Station without error (4.3.3) and that meets the specified criteria.

FR_RQ_STATE. A verified Request Station State MAC frame (3.3.5.2) is received.

FR_SMP(criteria). A verified SMP MAC frame (3.3.5.2) is received that meets the specified criteria.

FR_SUA_CHG(criteria). A Report SUA Change MAC frame (3.3.5.1) is received that was transmitted by the Station without error (4.3.3) and meets the specified criteria.

FR_WITH_ERR. A frame is received with errors (see 4.3.2).

FR_WITH_ERR(criteria). A frame is received with errors (see 4.3.2) that meets the specified criteria.

INTERNAL_ERR(criteria). Any internal error occurred preventing the Station from following the established protocol (i.e., parity error, etc.). The criteria is either correctable (C-Port counts error) or not-correctable (C-Port closes).

JS=state. The Join state is in the specified state.

LTA. The stored source address (SA) field from the last transmitted frame.

M=0. The Monitor bit in the access control (AC) field is received as zero.

M=1. The Monitor bit in the access control (AC) field is received as one.

MA_UNITDATA.request. The LLC interface requests a frame be transmitted.

MGT_UNITDATA.request. The management interface requests a frame be transmitted.

MRI_UNITDATA.request. The management routing interface requests a frame be transmitted.

MS=state. The Monitor state is in the specified state.

P. Value of P bits in the access control (AC) field.

P>Pm>R. A token or frame is received and the priority of the PDU queued for transmission is greater than the received reservation (R) but less that the current service priority (P).

PDU_QUEUED. A frame is queued for transmission.

PDU_QUEUED(criteria). A frame is queued for transmission that meets the specified criteria. Note that a queued PDU is transmitted when a token is received with a priority less than or equal to the priority of the queued PDU (Pm). Frames that do not wait for a token are not queued but are indicated by TXI_REQ.

Pm. The priority of the queued PDU. If no PDU is queued, Pm is assumed to have a value of zero.

PM_STATUS.indication(Medium_rate_error). The C-Port indicates the frequency of the received data is not the selected rate (see 5.1.2.3).

PM_STATUS.indication(Signal_detection=Signal_acquired). The PHY indicates valid receiver signal (see 5.1.4.1).

PM_STATUS.indication(Signal_detection=Signal_loss). The PHY indicates loss of valid receiver signal (see 5.1.4.1).

PM_STATUS.indication(Wire_fault=Not_detected). The PHY indicates no wiring fault (see 5.1.4.1).

PORT_ERR(criteria). Any internal condition that prevents the successful completion of the PDU transmit operation. The criteria is either correctable (C-Port counts error) or not-correctable (C-Port closes).

PPV(MAX_TX). The maximum number of octets that may be transmitted (including fill) after capturing the token as specified in 4.2.4.1, Counter, Transmitted Octets (CTO).

PS_STATUS.indication(Burst4_error). The C-Port indicates the received data contains a Burst4_error (see 5.1.2.3).

PS_STATUS.indication(Frequency_error). The C-Port indicates the frequency of the received data is out of tolerance (see 5.1.2.3).

QUE_NOT_EMPTY. Another PDU is queued for transmission.

R. Value of R bits in the access control (AC) field.

RCV(SA=LTA). The source address (SA) of the received frame is equal to the source address of the last frame transmitted by this Station. The C-Port is not required to, but may check for code violations in the SA or any preceding field to determine the validity of this event.

RCV(SA<>LTA). The source address (SA) of the received frame is not equal to the source address of the last frame transmitted by the C-Port. This condition requires that no code violations are present in the SA field and optionally any of the preceding fields.

RCV_AC. The access control (AC) field is received.

RCV_ED. An Ending Delimiter (PS_STATUS.indication(Ending_delimiter) (see 5.1.2.3) is received.

RCV_SD. A Starting Delimiter (PS_STATUS.indication(Starting_delimiter) (see 5.1.2.3) is received.

SA=MA. The source address (SA) of the received frame is equal to the individual address of the C-Port.

SA>MA. The value of the source address (SA) of the received frame is numerically greater than the individual address of the C-Port. For purpose of comparison, first bit received is most significant.

SA<>MA. The value of the source address (SA) of the received frame is not equal to the individual address of the C-Port.

SA<MA. The value of the source address (SA) of the received frame is numerically less than the individual address of the C-Port. For purpose of comparison, the first bit received is most significant.

SA=SUA. The source address (SA) of the received frame is equal to the address stored as the stored upstream neighbor's address (SUA).

SA<>SUA. The source address (SA) of the received frame is not equal to the address stored as the stored upstream neighbor's address (SUA).

SC=CRS. The source class is 4 (Configuration Report Server).

SC=RPS. The source class is 5 (Ring Parameter Server).

SC<>RS. The source class is not 0 (Ring Station).

SC_NOT_PRESENT. The MAC frame is too short to contain the source class.

SC_PRESENT. The MAC frame does contain the source class.

SPV(AP_MASK)=value. The value of SPV(AP_MASK) is equal to the hexadecimal value indicated (see 10.5.1.2).

TEST_FAILURE. The C-Port in Station Emulation mode failed its self test.

TEST_OK. The C-Port in Station Emulation mode passed its self test.

TK. A token is received that meets the criteria specified in 4.3.1.

TK(criteria). A token is received that meets the specified criteria and the criteria specified in 4.3.1.

TK_AC(criteria). A token is received that meets the specified criteria and the criteria specified in 4.3.1.

TK_ERR. The token is not valid (see 4.3.1).

TK_GOOD. A good token is received that meets the criteria specified in 4.3.1.

TK_GOOD(criteria). A good token is received that meets the specified criteria and the criteria specified in 4.3.1.

TK_WITH_ERR. A token is received that contains errors (see 4.3.1).

TK_WITH_ERR(criteria). A token is received that contains errors (see 4.3.1) that meets the specified criteria.

TS=state. The transmit state is in the specified state.

TX_BN_TYPE. The value of the beacon type subvector being transmitted.

TX_ERR(DAT). During the transmission of the Duplicate Address Test (DAT) MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(RP). During the transmission of the Ring Purge MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(RPRT_ERR). During the transmission of the RPRT_ERR MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(RQ_INIT). During the transmission of the Request Initialization MAC frame, a transmission error is encountered (see 4.3.3).

TX_ERR(SUA_CHG). During the transmission of the Report SUA Change MAC frame, a transmission error is encountered (see 4.3.3).

TXI_REQ. A frame is requested to be transmitted without waiting for a token. This request is generated by the TXI(frame_type) action (e.g., TXI(BN_PDU)).

UNA. The upstream neighbor’s address subvector in the received frame.

UNA=MA. The reported upstream neighbor’s address (UNA) in the received frame is equal to the C-Port’s individual address.

UNA<>MA. The reported upstream neighbor’s address (UNA) in the received frame is not equal to the C-Port’s individual address.

UNA=SUA. The value of the received reported upstream neighbor’s address (UNA) is equal to the stored upstream neighbor’s address (SUA).

UNA<>SUA. The value of the reported upstream neighbor’s address (UNA) in the received frame is not equal to the stored upstream neighbor’s address (SUA).

9.5.4.8.2 Precise specification of actions/outputs

The expressions used for actions in the FSMs and Port Operation tables have the following meanings. Actions are separated by a semicolon (**;**).

{counter}={counter}+1.	Increment the specified counter.
{counter}={counter}-1.	Decrement the specified counter.
{flag}=0.	Set the value of the specified flag to zero (false).
{flag}=1.	Set the value of the specified flag to one (true).
{timer}=R.	The specified timer will be set to its initial value and started.
variable = value.	Set the variable to the specified value.

The following additional items of relevance are used in the tables.

; means: “and.”

Unless otherwise specified, the following terms and operations are defined:

A=0. Both A bits in the FS field shall be transmitted as zero.

A=1. Both A bits in the FS field shall be set to one as the frame is repeated.

C=0. Both C bits in the FS field shall be transmitted as zero.

C=1. Both C bits in the FS field shall be set to one as the frame is repeated.

CLEAR_STACKS. The C-Port in Station Emulation mode shall clear all stacked values for Sx and Sr (i.e., the list is empty and the effective value of Sx and Sr is –1). The Station shall no longer be responsible for lowering the ring priority.

CORR=RCV_CORR. The value of the correlator subvector will be the same value as the received correlator subvector.

CORR=UNK_VALUE (optional-x). The frame received did not contain a correlator subvector (3.3.4), thus the value of the correlator subvector to be transmitted is unspecified and the subvector may be omitted. The standard recommends that new implementations not transmit the correlator subvector when no correlator subvector was received.

CPBTX=value. Counter CPBTX is set to the hexadecimal value indicated.

CTO=(PPV(MAX_TX)-FR_LTH). The value of the Transmit Octet counter is set to the value of the maximum frame length in octets less the number of octets (frame length) of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG).

CTO=CTO-FR_LTH. The value of the Transmit Octet counter is decreased by the number of octets (frame length) of the frame to be transmitted. The value for the frame length includes all of the frame format fields beginning with the starting delimiter (SD) and including the interframe gap (IFG). This correlates to the counter CTO being decremented every 8 bits after the capture of the token.

DC=CRS. The value of the destination class is 4 (Configuration Report Server).

DC=RCV_SC. The destination class (DC) field shall contain the value of the source class (SC) field of the received frame.

DC=RPS. The value of the destination class is 5 (Ring Parameter Server).

DC<>RS. The destination class (DC) field shall not be 0. Note that the source class (SC) field of the received frame was not present, thus the destination class of the response frame is not defined but shall not be the ring Station class.

DISCARD_QUEUED_PDU. The C-Port removes from the transmit queue the frame that was the subject of the previous DTU_UNITDATA.request.

DTU_UNITDATA-STATUS.indication (Status_Code). Frame status is indicated by the PMAC to the DTU. Status_Code may be one of the following:

- OK: The frame has been successfully transferred to the DTU without error.
- Fail: Transfer of the frame to the DTU has failed due to a frame error.

E=0. The Error (E) bit in the Ending Delimiter (ED) field shall be transmitted as zero.

E=1. The E bit in the Ending Delimiter (ED) field shall be set to one as the frame is repeated.

FA(monitor)=0. Disable the functional address corresponding to the active monitor function.

FA(monitor)=1. Enable the functional address corresponding to the active monitor function.

FTI=x. The value of FTI is not specified.

INSERT. Request the PHY to physically connect the Station into the ring [5.1.4.2 PM_ CONTROL.request(Insert_Station)].

JS=state. The join state is changed to the specified state.

LMP=(MA|NULL). The address for the Last Monitor Present frame (X'0A' subvector 3.3.4) is set to either the Station’s address or the null address.

LMP=NULL. The address for the Last Monitor Present frame (X'0A' subvector 3.3.4) is the null address.

LMP=SA. The source address (SA) is saved for reporting the address of the Last Monitor Present frame (X'0A' subvector 3.3.4).

LTA=TX_SA. Capture the source address (SA) of the last transmitted frame as variable LTA.

M=0. The C-Port shall transmit the monitor bit (M) in the access control (AC) field as a zero.

M=1. The C-Port shall set the monitor bit (M) in the received access control (AC) field to one as the AC field is repeated.

MA_UNITDATA.indication. The frame is indicated to the LLC interface.

MGT_UNITDATA.indication. The frame is indicated to the management interface.

MRI_UNITDATA.indication. The frame is indicated to the management routing interface.

MS=state. The monitor state is changed to the specified state.

P. The value of the P bits in the access control (AC) field.

Pm. The priority of the PDU being queued.

PM_CONTROL.request(Repeat_mode=Fill). The C-Port PMAC requests the PMC to start sourcing fill and stop repeat (see 9.7.2.2).

PM_CONTROL.request(Repeat_mode=Repeat). The C-Port PMAC requests the PMC to repeat and stop sourcing fill (see 9.7.2.2).

POP(Sx; Sr). Remove the last values of Sx and Sr from the list of stacked priorities on the Sx and Sr stacks.

Pr. The value of the P bits in the last received access control (AC) field.

PS_CONTROL.request(Crystal_transmit=Asserted). The MAC requests Crystal_transmit (see 5.1.2.4).

PS_CONTROL.request(Crystal_transmit=Not_asserted). The MAC removes the Crystal_transmit request (see 5.1.2.4).

PS_CONTROL.request(Repeat_mode=Fill). The MAC requests the Station sources fill (see 5.1.2.4).

PS_CONTROL.request(Repeat_mode=Repeat). The MAC requests the Station repeat (see 5.1.2.4).

PS_EVENT.response(Token_received). The MAC indicates token received (see 5.1.2.5).

QUE_ACT_ERR_PDU(EC=value). Queue a Report Active Monitor Error MAC PDU as defined in 3.3.5.1 for transmission with the specified error code (EC).

QUE_AMP_PDU. Queue an Active Monitor Present MAC PDU as defined in 3.3.5.1 for transmission.

QUE_DAT_PDU. Queue a Duplicate Address Test MAC PDU as defined in 3.3.5.1 for transmission.

QUE_NEW_MON_PDU. Queue a Report New Active Monitor MAC PDU as defined in 3.3.5.1 for transmission.

QUE_NN_INCMP_PDU. Queue a Report Neighbor Notification Incomplete MAC PDU as defined in 3.3.5.1 for transmission.

QUE_PDU. Queue the PDU for transmission.

QUE_RPRT_ADDR_PDU. Queue a Report Station Addresses MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RPRT_ATTCH_PDU. Queue a Report Station Attachment Report Attachment MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RPRT_ERR_PDU. Queue a Report Error MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RPRT_STATE_PDU. Queue a Report Station State MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RQ_INIT_PDU. Queue a Request Initialization MAC PDU as defined in 3.3.5.1 for transmission.

QUE_RSP_PDU. Queue a Response MAC PDU as defined in 3.3.5.1 for transmission. This PDU is not required to be queued if the received frame initiating the response was sent to a broadcast address and the address recognized and frame copied bits in the Frame Status field were all ones.

QUE_SMP_PDU. Queue a Standby Monitor Present MAC PDU as defined in 3.3.5.1 for transmission.

QUE_SUA_CHG_PDU. Queue an SUA Change MAC PDU as defined in 3.3.5.1 for transmission.

R. The value of the R bits in the access control (AC) field.

R=Pm. Set the reservation bits (R) in the access control (AC) field to the value of the queued PDU.

Remove_Station. Request the PHY to physically disconnect the Station from the ring [5.1.4.2 PM_CONTROL.request(Remove_Station)].

RESET_STACKS(Sx=P;Sr=0). The C-Port clears all stacked values for Sx and Sr and then adds the new Sx and Sr values.

RESTACK(Sx=Px). Replace the last value of stack Sx with Px (the value of P bits of the token to be transmitted).

Rr. The value of the R bits in the last received access control (AC) field.

RSP_TYPE=value. The Response Code subvector shall have the hexadecimal value specified.

SC=RS. The source class (SC) field shall contain the value zero (Ring Station).

SET <field> = <value>. When the MAC repeats the field, it will set the field to the specified value (see M=1, R=Pm, E=1, A=1, and C=1).

SET APPR_PARMS. The C-Port shall set the its parameters to the values indicated in the received frame.

SET ERR_CNTR to 0. Set the values for all of the error counters reported in the Report Error MAC frame to zero.

Set_initial_conditions. The C-Port shall set all PMAC flags to zero, set all PMAC counters to zero, set all stored PMAC values to zero and stop all PMAC timers. The Monitor FSM and Transmit FSM are not specified. The PS_CONTROL.request(Medium_rate) or the PM_CONTROL.request(Medium_rate) shall indicate to the PHY the value of FPMRO.

STACK(Sx=Px; Sr=Pr). Add the new Sx and Sr values to the list of stacked priorities on the Sx and Sr stacks.

STORE(Pr; Rr). Save the value of P and R in the received access control (AC) field as Pr and Rr, respectively.

SUA=0. Store the null address as the Station's stored upstream neighbor's address (SUA).

SUA=SA. Store the value of the source address (SA) from the received frame as the Station's stored upstream neighbor's address (SUA).

TEST. The C-Port in Station Emulation mode shall perform a test of its transmit functions, its receive functions, and the medium between the Station and the TCU. It is recommended that the data path includes the elastic buffer and the fixed latency buffer (5.8). A C-Port shall fail the test if the sustained bit error rate is greater than specified by annex P. A C-Port shall only transmit valid frames, tokens, and fill during the test and shall only count errors in frames and tokens.

TS=state. The Transmit State is changed to the specified state.

TX_AB. The C-Port shall transmit an abort sequence.

TX_BN_TYPE. The value of the beacon type subvector to be transmitted.

TX_EFS(I=0). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The E, I, A, and C bits shall be zero.

TX_EFS(I=0, E=1). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The I, A, and C bits shall be zero. The E bit shall be one.

TX_EFS(I=x). The C-Port shall transmit an end-of-frame sequence composed of ED, FS, and IFG fields. The I bit may be zero or one, and the E, A, and C bits shall be zero.

TX_FCS. The C-Port shall transmit frame check sequence for the frame as defined in 3.2.7.

TX_SFS(P=value; R=value). The C-Port shall transmit the start-of-frame sequence with the priority and reservation values as specified. The token busy bit (T) shall be one and the monitor bit (M) shall be zero.

TX_TK(P=value; M=0; R=value). The C-Port shall transmit a token with the priority and reservation fields as specified. The Monitor bit (M) and the Token bit (T) shall be transmitted as zero.

TXI(BN_PDU). The C-Port shall transmit a Beacon MAC frame with the access control (AC) field values of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI(CT_PDU). The C-Port shall transmit a Claim Token MAC frame with the access control (AC) field values of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI(RCV_CT_PDU). The C-Port shall transmit the received Claim Token MAC frame as received with the access control (AC) field values of P=000, T=1, M=0, R=000. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI(RP_PDU). The C-Port shall transmit a Ring Purge MAC frame with the access control (AC) field values of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI_AMP_PDU. The C-Port shall transmit a Active Monitor Present MAC frame with the access control (AC) fields of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

TXI_INV_FCS. The C-Port shall transmit an invalid FCS.

TXI_REG_RSP. The C-Port shall transmit a Registration Response MAC frame with the access control (AC) fields of P=000, T=1, M=0, R=000. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity (after completion of any transmission in progress) and not wait for a token. This action generates the TXI_REQ event.

9.6 DTR Station TKP access protocol specification

This subclause defines the DTR Station using the TKP access protocol (FIPTKPS=0) in support of configuration 3, entity (F).

NOTE—This subclause does not support the C-Port in Station Emulation mode using the TKP access protocol (see 9.5).

This subclause is used by the DTR Station when

— the Join Station Operation table detects the Connect.MAC signal *or*
— the Join Station Operation table is entered from the Join Station Operation table in 9.2 because the Join Station Operation table failed to receive a Registration Response *and* the Station allows the TKP access protocol operation [SPV(AP_MASK)= 0001 or 0003].

The basis of this subclause is the specification for the TKP access protocol found in clause 4 and includes the additions required to allow the DTR Station to respond to the registration query protocol described in 9.1.5 and specified by the Join Station Operation table, table 9-24.

The DTR Station's TKP access protocol is specified by six Station operation tables that cover all the standardized events/conditions and the resulting actions/outputs. The Station operation tables in 4.3.4 were functionally divided into the Join, Transmit, and Monitor functions and their support functions.

The Join function, which is modified to support the registration query protocol, is explained using a high-level FSM contained in figure 9-22. The Transmit and Monitor functions are unchanged and are explained using high-level FSM diagrams in 4.2.2.2 and 4.2.2.3, respectively.

The normative part of this specification has been divided into the following Station operation tables:

— The Station Join Station Operation table, table 9-24.
— The Station Transmit Station Operation table, table 9-25.
— The Station Monitor Station Operation table, table 9-26.
— The Station Error Handling Station Operation table, table 9-27.
— The Station Interface Signals Station Operation table, table 9-28.
— The Station Miscellaneous Frame Handling Station Operation table, table 9-29.

Low-level FSMs representing all of the state changes in the contained in the Join, Transmit, and Monitor Station Operation tables are presented in annex Q.

9.6.1 Additions to ISO/IEC 8802-5 : 1998

This subclause defines the additions necessary to the classic station defined in clause 4 of 8802-5 : 1998 in order to produce a DTR Station using the TKP access protocol.

9.6.1.1 DTR registration query for the TKP access protocol

The DTR registration query protocol, which is described in 9.1.5, is used by the Join Station Operation table 9-24. It provides the DTR Station, which opens using the TKP access protocol, the capability to switch to the TXI access protocol.

9.6.1.2 Vector descriptions

The following vector description is used in addition to those specified in 3.3.3:

X'15'—Registration Query (REG_QRY). The Registration Query MAC frame is transmitted by the C-Port to request the DTR capable classic station using the TKP access protocol to close and use the TXI access protocol. The Registration Query MAC frame is defined by 10.3.2.16.

9.6.1.3 MAC frame reception

In addition to the frames shown in table 5 (3.3.5.2), a DTR Station using the TKP access protocol Station shall support reception of the Registration Query MAC frame defined in the following table:

Addition to ISO/IEC 8802-5 : 1998: Table 5—MAC frame receive definitions

Vector (VI)/Name	FC	VC		Subvector (SVI)/Name
X15' Registration Query	X'00'	X'03'		none

9.6.1.4 Timers

A DTR Station using the TKP access protocol shall support the following timer in addition to the timers specified in 3.4.2:

Timer, Station Registration Wait (TSRW). The timer TSRW is used to start the DTR Station using the TXI Access Protocol Station Registration state (JS=SREG) defined in 9.2.4. The timer TSRW, which is defined by 10.4.1.13, is used to allow the C-Port in Port mode using the TKP access protocol enough time to detect the loss of the phantom signal.

9.6.1.5 Station policy flags

A DTR Station using the TKP access protocol shall support the following Station policy flag in addition to the Station policy flags specified in 3.5:

Flag, Station Registration Query Option (FSRQO). The flag FSRQO is an option flag that determines whether the Station is capable of supporting the registration query protocol. The flag FSRQO is defined by 10.5.1.1.6.

9.6.1.6 Join Ring FSM overview

The DTR Station using the TKP access protocol is based on the Join Ring FSM defined in 4.2.2.1 and illustrated by figure 23. The DTR Station modifies figure 23 by adding the Station Registration Wait state (JS=SRW) to support of the registration query protocol defined in 9.1.5. The modifications made to this figure are shown in figure 9-22 using italicized state definitions, transition numbers, and transition cause statements.

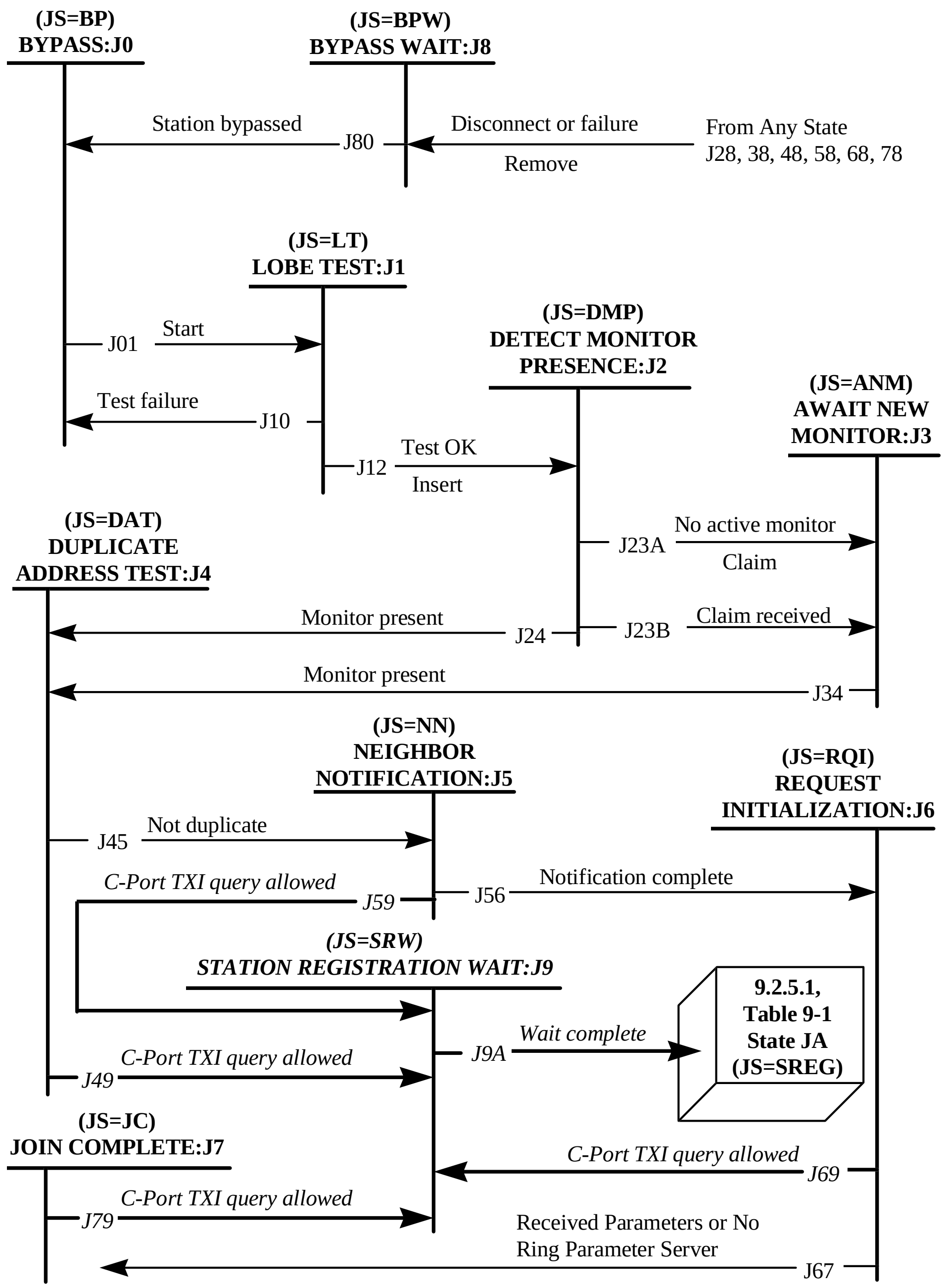


Figure 9-22—Join Ring FSM diagram

9.6.1.7 Join states

In addition to the join states defined in 4.2.4.3.1, a DTR Station using the TKP access protocol shall support the Station Registration Wait state as follows:

Join State J9, Station Registration Wait (JS=SRW). The Join state JS=SRW is entered when the Join FSM receives a Registration Query MAC frame from the C-Port, the Monitor FSM is in the Repeat state (MS=RPT), and FSRQO=1. Entry into this state causes the DTR Station using the TKP access protocol to reset TSRW and to signal *ring bypass* to the C-Port.

The Station Registration Wait state is used to delay entry into the DTR Station’s Registration state (JS=SREG) until the C-Port in Port mode using the TKP access protocol has had enough time to detect phantom signal loss and return to its Registration state (JS=PREG). When TSRW expires, the DTR Station using the TXI access protocol enters the Registration state (JS=SREG) defined in 9.2.4.

9.6.2 Station operation tables

The Station operation tables necessary to support the DTR Station using the TKP access protocol are specified in this subclause. Each starting point has its event/condition shaded and each exit to 9.2 has its action/output shaded.

These Station operation tables were derived from 4.3.4 and include the transitions introduced by the DTR registration query protocol defined in 9.1.5.

The DTR registration query protocol changes are shown in italics.

9.6.2.1 DTR Station Join using TKP access protocol

Table 9-24—DTR Station Join Station Operation table

S/T	REF	Event/condition	Action/output
J01	006	**Connect.MAC** & JS=BP << This is one of the starting points for this Join Station Operation table. >>	JS=LT; Set_initial_conditions; FTI=x; TEST; FTXC=x << This is a starting point for the DTR Station when using the TKP access protocol. >>
J38	007	**Disconnect.MAC** & JS=ANM	JS=BPW
J48	008	**Disconnect.MAC** & JS=DAT	JS=BPW
J28	009	**Disconnect.MAC** & JS=DMP	JS=BPW
J78	010	**Disconnect.MAC** & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58A	011	**Disconnect.MAC** & JS=NN	JS=BPW; FDC=0
J68A	012	**Disconnect.MAC** & JS=RQI	JS=BPW; FINS=FDC=FNC=0
J38	255	**FBPF=1** & TS=RPT & JS=ANM	JS=BPW
J48	256	**FBPF=1** & TS=RPT & JS=DAT	JS=BPW
J78	257	**FBPF=1** & TS=RPT & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58A	258	**FBPF=1** & TS=RPT & JS=NN	JS=BPW; FDC=0
J68A	259	**FBPF=1** & TS=RPT & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	359	**FDC=1** & FNC=0 & MS=RPT & FAM=1	[FNC=1 (optional)]
	027	**FDC=1** & FNW=1 & FNC=0 & MS=RPT & FAM=0	FNC=1; QUE_SMP_PDU
	028	**FDC=1** & FNW=1 & FNC=0 & MS=RPT & FAM=1	FNC=1
	029	**FJR=1** & FBHO=1 & FINS=0	FLF=0; FINS=1
	033	**FNC=1** & FBHO=0 & FINS=0	FLF=0; FINS=1
J56	035	**FNC=1** & JS=NN	JS=RQI; TJR=R; TRI=R; CRI=1; CRIN=1; QUE_RQ_INIT_PDU
J24	058	**FR_AMP** & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0;CDG=0; QUE_DAT_PDU
J38	067	**FR_BN** & JS=ANM	JS=BPW
J48	068	**FR_BN** & JS=DAT	JS=BPW
J28	069	**FR_BN** & JS=DMP	JS=BPW
J58A	070	**FR_BN** & JS=NN	JS=BPW; FDC=0
J68B	071	**FR_BN** & JS=RQI & MS<>TBN & FINS=0	JS=BPW; FDC=FNC=0
J68B	081	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J67	100	**FR_CHG_PARM(DA=MA)** & JS=RQI	JS=JC; FJR=1; **If** FWFDO=0 then (FWFA=FWF=0; TWFD=R)
J23B	106	**FR_CT** & JS=DMP	JS=ANM
	124	**FR_DAT(SA=MA & A=0 & C=0)** & CDG<(n2-1) & JS=DAT	CDG=(CDG+1); QUE_DAT_PDU

Table 9-24—DTR Station Join Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
J45	125	**FR_DAT(SA=MA & A=0 & C=0)** & CDG=(n2-1) & JS=DAT	JS=NN; FDC=1; TJR=R
	126	**FR_DAT(SA=MA & A|C<>0)** & CDF<(n2-1) & JS=DAT	CDF=(CDF+1); QUE_DAT_PDU
J48	127	**FR_DAT(SA=MA & A|C<>0)** & CDF=(n2-1) & JS=DAT	JS=BPW
J67	131	**FR_INIT(DA=MA)** & JS=RQI	JS=JC; FJR=1; **If** FWFDO=0 then (FWFA=FWF=0; TWFD=R)
J49	*6002*	**FR_REG_QRY** & FSRQO=1 & MS=RPT & JS=DAT << Registration query protocol >> << New to DTR >>	JS=SRW; FOP=0; Remove_Station; TSRW=R
J79	*6003*	**FR_REG_QRY** & FSRQO=1 & MS=RPT & JS=JC << Registration query protocol >> << New to DTR >>	JS=SRW; FDC=FINS=FJR=FNC=FOP=0; Remove_Station; TSRW=R
J59	*6004*	**FR_REG_QRY** & FSRQO=1 & MS=RPT & JS=NN << Registration query protocol >> << New to DTR >>	JS=SRW; FDC=FOP=0; Remove_Station; TSRW=R
J69	*6005*	**FR_REG_QRY** & FSRQO=1 & MS=RPT & JS=RQI << Registration query protocol >> << New to DTR >>	JS=SRW; FDC=FINS=FNC=FOP=0; Remove_Station; TSRW=R
JA1A	3105	**FR_REG_RSP(AP_RSP=0000)** & FSRDO=0 & FIPTXIS=0 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << This is one of the starting points for this Join Station Operation table. >> << This transition is executed by 9.2 and is shown for reference only. >>	JS=LT; FSTXC=FSTI=0; FTI=x; Set_initial_conditions; TEST << This is a starting point for the DTR Station when 9.2 failed to start the TXI access protocol and the Station allows the TKP access protocol. >>
J38	156	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=ANM	JS=BPW
J48	157	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=DAT	JS=BPW
J28	158	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=DMP	JS=BPW
J78	159	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58A	160	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=NN	JS=BPW; FDC=0
J68A	161	**FR_REMOVE(DA=Non_broadcast)** & FRRO=0 & JS=RQI	JS=BPW; FINS=FDC=FNC=0
J34	164	**FR_RP** & JS=ANM	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU

Table 9-24—DTR Station Join Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
J24	165	**FR_RP** & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
	187	**FR_RQ_INIT(SA=MA & A<>1)** & CRIN<n4 & JS=RQI	TRI=R; CRIN=(CRIN+1); QUE_RQ_INIT
J67	188	**FR_RQ_INIT(SA=MA & A<>1)** & CRIN=n4 & JS=RQI	JS=JC; FJR=1; **If** FWFDO=0 then (FWFA=FWF=0; TWFD=R)
	189	**FR_RQ_INIT(SA=MA & A=1)** & CRI<n4 & JS=RQI	TRI=R
J24	191	**FR_SMP** & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
	206	**FRH=0** & JS=BPW	MS=RPT; FAM=FOP=0; FRH=1; TRW=R; Remove_Station; FA(monitor)=0
J48	210	**FSL=1** & FAM=0 & JS=DAT	JS=BPW
J58A	211	**FSL=1** & FAM=0 & JS=NN	JS=BPW; FDC=0
J68B	209	**FSL=1** & FINS=0 & FAM=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	224	**INTERNAL_ERR(not_correctable)** & JS=ANM	JS=BPW
J48	225	**INTERNAL_ERR(not_correctable)** & JS=DAT	JS=BPW
J28	226	**INTERNAL_ERR(not_correctable)** & JS=DMP	JS=BPW
J78	227	**INTERNAL_ERR(not_correctable)** & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58	228	**INTERNAL_ERR(not_correctable)** & JS=NN	JS=BPW; FDC=0
J68A	229	**INTERNAL_ERR(not_correctable)** & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	230	**JS=BPW** & FAM=1	[FAM=0; FA(monitor)=0 (optional)]
	231	**JS=BPW** & FOP=1	[FOP=0 (optional)]
	232	**JS=BPW** & MS<>RPT	[MS=RPT (optional)]
J28	238	**PM_STATUS.indication (Medium_rate_error)** & JS=DMP	JS=BPW
J68B	263	**TBT=E** & MS=TBN & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	265	**TCT=E** & JS=ANM	JS=BPW
J48	267	**TCT=E** & MS=RCT & JS=DAT	JS=BPW
J58A	268	**TCT=E** & MS=RCT & JS=NN	JS=BPW; FDC=0
J48	269	**TCT=E** & MS=TCT & JS=DAT	JS=BPW
J58A	270	**TCT=E** & MS=TCT & JS=NN	JS=BPW; FDC=0
J10	276	**TEST_FAILURE** & JS=LT	JS=BP
J70	277	**TEST_FAILURE** & MS=BNT & JS=JC	JS=BP
J60	278	**TEST_FAILURE** & MS=BNT & JS=RQI	JS=BP
J12	281	**TEST_OK** & JS=LT	JS=DMP; MS=RPT; TS=RPT; FTI=FTXC=0; FOP=FRH=1; TJR=R; TRH=R; SUA=0; INSERT; **If** FWFDO=1 then (FWFA=FWF=0; TWFD=R)

Table 9-24—DTR Station Join Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
J48	284	**TJR=E** & JS=DAT	JS=BPW
J23A	287	**TJR=E** & JS=DMP	JS=ANM; FANM=1
J58A	285	**TJR=E** & JS=NN	JS=BPW; FDC=0
J68A	286	**TJR=E** & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	315	**TRH=E**	FRH=0
	316	**TRI=E** & JS=RQI & CRI<n4	TRI=R; CRI=(CRI+1); QUE_RQ_INIT_PDU
J68A	317	**TRI=E** & JS=RQI & CRI=n4	JS=BPW; FINS=FDC=FNC=0
J68B	321	**TRP=E** & MS=TRP & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	318	**TRP=E** & MS=TRP & JS=ANM	JS=BPW
J48	319	**TRP=E** & MS=TRP & JS=DAT	JS=BPW
J58A	320	**TRP=E** & MS=TRP & JS=NN	JS=BPW; FDC=0
J80	325	**TRW=E** & JS=BPW	JS=BP; FTI=x
JA1	3120	**TSREQ=E** & CSREQ=0 & FSRC=0 & FSOPO=0 & FIPTXIS=0 & AND(SPV(AP_MASK),0001)=0001 & JS=SREG << This is one of the starting points for this Join table. >> << The C-Port has failed to respond to multiple DTR Station TXI access protocol REG_REQ MAC frames and switching to the TKP access protocol is permitted by the DTR Station. >> << This transition is executed by 9.2. >>	JS=LT; FSTXC=FSTI=0; FTI=x; Set_initial_conditions; TEST << For information only. >>
J9A	*6007*	**TSRW=E** & FSREGO=1 & FIPTKPS=0 & JS=SRW << Registration query protocol >> << New to DTR >>	JS=SREG; TS=STXN; Set_initial_conditions; FSTXC=FSTI=1; TSIS=R << Start the TXI access protocol and exit to 9.2 >>
J38	368	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=ANM	JS=BPW
J48	369	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=DAT	JS=BPW
J28	370	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=DMP	JS=BPW
J78	345	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58B	371	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=NN	JS=BPW; FDC=0; [FNC=0 (optional)]
J68A	372	**TWF=E** & FWFA=1 & FWF=1 & MS<>BNT & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	347	**TX_ERR(DAT)** & JS=DAT	QUE_DAT_PDU
	350	**TX_ERR(RQ_INIT)** & JS=RQI & FOP=1	QUE_RQ_INIT_PDU

9.6.2.2 DTR Station Transmit using TKP access protocol

Table 9-25—DTR Station Transmit Station Operation table

S/T	REF	Event/condition	Action/output
	013	**EOD** & TS=DATA & FED=0 & FTXI=0	FED=1; [FSD=1 (optional-i)]
T12A	014	**EOD** & TS=DATA & FTXI=0 & QUE_EMPTY	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	016	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm<Pr	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T12A	017	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=0 & Pm<Rr	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
	018	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=0 & Pm>=Rr	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr;R=0); LTA=TX_SA
	019	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=1	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr;R=0); LTA=TX_SA
T12A	015	**EOD** & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH<0)	TS=FILL; FTI=1; TRR=R; TX_FCS; TX_EFS(I=0)
T10A	020	**EOD** & TS=DATA & FTXI=1 & MS=RBN	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10A	021	**EOD** & TS=DATA & FTXI=1 & MS=RCT	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10A	022	**EOD** & TS=DATA & FTXI=1 & MS=RPT	TS=RPT; FTXI=FTXC=0; TX_FCS; TX_EFS(I=0)
T10B	023	**EOD** & TS=DATA & FTXI=1 & MS=TBN	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0)
T10B	024	**EOD** & TS=DATA & FTXI=1 & MS=TCT	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0)
T10C	025	**EOD** & TS=DATA & FTXI=1 & MS=TRP	TS=RPT; FTXI=0; FTI=1; TX_FCS; TX_EFS(I=0); TRR=R
T30B	036	**FNMA=1** & CFR=1 & TS=STRIP	TS=RPT; FTI=0; FLF=1
	040	**FR(DA=any_recognized_address)** & FTI=0 & TS=RPT	SET A=1
	043	**FR(P<Sx)**	[CLEAR_STACKS (optional-i)]
	054	**FR_AC(R<Pm)** & PDU_QUEUED & FTI=0 & TS=RPT & FOP=1	SET R=Pm
	103	**FR_COPIED (DA=any_recognized_address)** & FTI=0 & TS=RPT	SET C=1
	203	**FR_WITH_ERR** & FTI=0 & TS=RPT	SET E=1
	044	**RCV(SA<>LTA)** & CFR=1	FNMA=1
	045	**RCV(SA=LTA)** & CFR=1	FMA=1
	246	**RCV_AC**	STORE(Pr;Rr)
	247	**RCV_ED**	FMA=FNMA=FSD=0
	250	**RCV_ED** & FSD=1 & FED=1 & CFR>1	CFR=(CFR-1)

Table 9-25—DTR Station Transmit Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
T30B	249	**RCV_ED** & FSD=1 & FMA=0 & CFR=1 & TS=STRIP	TS=RPT; FTI=0; FLF=1
T30A	248	**RCV_ED** & FSD=1 & FMA=1 & CFR=1 & TS=STRIP	TS=RPT; FTI=0
	251	**RCV_SD**	FMA=FNMA=0; FSD=1
T10D	254	**STATION_ERR(correctable)** & TS=DATA	TS=RPT; TX_AB
T10E	363	**STATION_ERR(not-correctable)** & TS=DATA	TS=RPT; [TX_AB (optional)]; FBPF=1
T10D	364	**STATION_ERR(tx-underrun)** & FTUBO=0; TS=DATA	TS=RPT; TX_AB
T12B	365	**STATION_ERR(tx-underrun)** & FTUBO=1; TS=DATA	TS=FILL; FED=FTI=1; TRR=R; TX_AB
T01B	293	**TK(P<=Pm)** & PDU_QUEUED & FTI=0 & FOP=1 & TS=RPT	TS=DATA; FED=FMA=FSD=FTXI=0; CFR=1; CTO=(MAX_TX-FR_LTH); TX_SFS(P=Pr;R=0); LTA=TX_SA
	294	**TK(P<>Sx)** & PDU_QUEUED(P>Pm>R) & FTI=0 & TS=RPT & FOP=1	SET R=Pm
	300	**TK(P>0 & M=0)** & FAM=1 & FTI=0 & TS=RPT	SET M=1
	295	**TK_AC(P<Sx)**	CLEAR_STACKS
	297	**TK_AC(P=Sx)** & Sr<Px & QUE_EMPTY & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
	296	**TK_AC(P=Sx)** & Sr<Px & PDU_QUEUED(Pm<Sx) & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
	298	**TK_AC(P=Sx)** & Sr>=Px & PDU_QUEUED(Pm<Sx) & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
	299	**TK_AC(P=Sx)** & Sr>=Px & QUE_EMPTY & FTI=0 & FOP=1 & TS=RPT	TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T10D	301	**TK_ERR** & FTXI=0 & TS=DATA	TS=RPT; TX_AB
	307	**TK_WITH_ERR** & FTEO=0 & FTI=0 & TS=RPT	SET E=1
T20	323	**TRR=E** & TS=FILL	TS=RPT; FTI=0; FLF=1
T30B	324	**TRR=E** & TS=STRIP	TS=RPT; FTI=0; FLF=1
T23A	327	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr=Sx & Sr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
T23B	328	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr=Sx & Sr>=Px	TS=STRIP; TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T23C	329	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr>Sx & Pr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); STACK(Sx=Px; Sr=Pr)

Table 9-25—DTR Station Transmit Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
T23D	330	**TS=FILL** & FMA=0 & FETO=1 & FMRO=1 & Pr>Sx & Pr>=Px	TS=STRIP; TX_TK(P=Pr; M=0; R=Px)
T23A	331	**TS=FILL** & FMA=1 & Pr=Sx & Sr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); RESTACK(Sx=Px)
T23B	332	**TS=FILL** & FMA=1 & Pr=Sx & Sr>=Px	TS=STRIP; TX_TK(P=Sr; M=0; R=Px); POP(Sx; Sr)
T23C	333	**TS=FILL** & FMA=1 & Pr>Sx & Pr<Px	TS=STRIP; TX_TK(P=Px; M=0; R=0); STACK(Sx=Px; Sr=Pr)
T23D	334	**TS=FILL** & FMA=1 & Pr>Sx & Pr>=Px	TS=STRIP; TX_TK(P=Pr; M=0; R=Px)
T01A	352	**TXI_REQ** & TS=RPT	TS=DATA; FTI=0; FTXI=1; TX_SFS(P=0; R=0)

9.6.2.3 DTR Station Monitor using TKP access protocol

Table 9-26—DTR Station Monitor Station Operation table

S/T	REF	Event/condition	Action/output
M54	003	**CBR=0** & MS=RBN & FBR=0	MS=BNT; FBR=FTW=1
M02A	026	**FANM=1** & MS=RPT & JS=ANM	MS=TCT; FANM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT _PDU)
M52A	038	**FR(DA=any_recognized_address)** & FID=1 & MS=RBN	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
	039	**FR(DA=any_recognized_address)** & FID=1 & MS=TBN	FID=0; FTI=1; TQP=R; TXI(BN_PDU)
	046	**FR_AC** & FAM=0 & FPT=1 & FGTO=0	TNT=R; FPT=0
	048	**FR_AC(M=0)** & FAM=1 & FTHO=0	TVX=R
	049	**FR_AC(M=0)** & FAM=1 & FTHO=1	FAT=1
	047	**FR_AC(M=0)** & FAM=1 & FTI=0 & TS=RPT	SET M=1
	050	**FR_AC(M=0)** & MS=RBN & CBC=0 & FTI=0 & TS=RPT	[SET M=1 (optional-i)]
M01	051	**FR_AC(M=1)** & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	055	**FR_AMP** & CNNR<>0	CNNR=(CNNR-1)
	057	**FR_AMP** & FAM=0 & FINS=1	TSM=R
	056	**FR_AMP** & FAM=1	[TSM=R (optional-i)]
	059	**FR_AMP(A=0 & C=0)** & FAM=0 & FOP=1	FSMP=1; TQP=R
	060	**FR_AMP(A|C<>0)** & FAM=0	FSMP=0
	061	**FR_AMP(SA<>MA)** & FAM=1	QUE_ACT_ERR_PDU(EC=2); FAM=0; FA(monitor)=0
	062	**FR_AMP(SA<>MA)** & FAM=1 & FINS=1	TNT=R
	063	**FR_AMP(SA<>MA)** & FAM=1 & TS=RPT	FTXC=FTI=0
	064	**FR_AMP(SA<>SUA & A=0 & C=0)** & FOP=1	CSC=1; SUA=SA ; QUE_SUA_CHG_PDU
	065	**FR_AMP(SA=MA & A=0 & C=0)** & FAM=1	FNN=FNW=1; LMP=NULL
	066	**FR_AMP(SA=MA & A|C<>0)** & FAM=1	LMP=SA
	072	**FR_BN** & MS<>TBN & MS<>BNT & FINS=1	TBR=R
M65	073	**FR_BN** & MS=RCT & FINS=1	MS=RBN
	074	**FR_BN** & MS=RPT & FAM=1 & TS=RPT	FTXC=0
M05	075	**FR_BN** & MS=RPT & FINS=1	MS=RBN; FAM=0; FA(monitor)=0
M25	076	**FR_BN** & MS=TCT & FINS=1	MS=RBN
	077	**FR_BN** & MS=TCT & FINS=1 & TS=RPT	FTXC=FTI=0
M15	078	**FR_BN** & MS=TRP & FINS=1	MS=RBN; FAM=0; FA(monitor)=0
	079	**FR_BN** & MS=TRP & FINS=1 & TS=RPT	FTXC=FTI=0

Table 9-26—DTR Station Monitor Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
M32	080	**FR_BN(M=0 & SA=MA)** & MS=TBN & FID=0	MS=TCT; FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M35	082	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FID=0 & FINS=1	MS=RBN; TBR=R
	083	**FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE)** & MS=TBN & FID=0 & FINS=1 & TS=RPT	FTXC=FTI=0
	094	**FR_BN(SA<>MA & UNA=MA & BN_TYPE<>1)** & FBR=0 & MS<>RBN & MS<>BNT	CBR=7
	084	**FR_BN(SA<>SUA)**	CBC=2
	087	**FR_BN(SA=SUA & UNA<>MA)** & CBC=0 & MS=RBN	CBC=1
	090	**FR_BN(SA=SUA & UNA<>MA)** & FBR=0 & CBC>0 & MS=RBN	CBC=(CBC-1)
	086	**FR_BN(SA=SUA & UNA<>MA)** & MS<>RBN & FBR=0 & MS<>BNT	CBC=1
	085	**FR_BN(SA=SUA & UNA=MA)** & FBR=0	CBC=2
	089	**FR_BN(SA=SUA)** & FBR=1 & CBC=0 & MS=RBN	CBC=1
	091	**FR_BN(SA=SUA)** & FBR=1 & CBC>0 & MS=RBN	CBC=(CBC-1)
	088	**FR_BN(SA=SUA)** & FBR=1 & MS<>RBN & MS<>BNT	CBC=1
	092	**FR_BN(UNA<>MA)**	CBR=8
	095	**FR_BN(UNA=MA & BN_TYPE<>1)** & FBR=0 & MS=RBN	CBR=(CBR-1)
	093	**FR_BN(UNA=MA & BN_TYPE=1)**	CBR=8
M52C	096	**FR_BN_CIR** & MS=RBN & CBC<>2 & FINS=1	[MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU) (optional-i)]
	104	**FR_CT** & FAM=1	FAM=0; QUE_ACT_ERR_PDU(EC=1); FA(monitor)=0
	105	**FR_CT** & FAM=1 & TS=RPT	FTXC=FTI=0
	107	**FR_CT** & MS<>TBN & FCT=0	FCT=1
M16	108	**FR_CT** & MS=TRP	MS=RCT; TCT=R
M26A	109	**FR_CT(M=0 & SA=MA & UNA<>SUA)** & MS=TCT	MS=RCT; TCT=R; QUE_ACT_ERR_PDU(EC=3)
	110	**FR_CT(M=0 & SA=MA & UNA<>SUA)** & MS=TCT & TS=RPT	FTXC=FTI=0
M21	111	**FR_CT(M=0 & SA=MA & UNA=SUA)** & CCT>=n1 & CCR>=n1 & MS=TCT	MS=TRP; FAM=1; TRP=R; TXI(RP_PDU); QUE_NEW_MON_PDU; FA(monitor)=1
	112	**FR_CT(M=0 & SA=MA & UNA=SUA)** & MS=TCT	CCR=(CCR+1)

Table 9-26—DTR Station Monitor Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
M56	113	**FR_CT(SA<MA)** & MS=RBN & FCCO=0 & FID=0	MS=RCT; TCT=R
M52B	114	**FR_CT(SA<MA**) & MS=RBN & FCCO=1 & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M06	116	**FR_CT(SA<MA)** & MS=RPT & FCCO=0 & FOP=1	MS=RCT; TCT=R
M02B	117	**FR_CT(SA<MA)** & MS=RPT & FCCO=1 & FAM=0 & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M06	118	**FR_CT(SA<MA)** & MS=RPT & FINS=0 & FOP=1	MS=RCT; TCT=R
M06	115	**FR_CT(SA<MA)** & MS=RPT & FAM=1	MS=RCT; TCT=R
M56	119	**FR_CT(SA>MA)** & MS=RBN & FID=0	MS=RCT; TCT=R
M06	120	**FR_CT(SA>MA**) & MS=RPT & FOP=1	MS=RCT; TCT=R
M26B	121	**FR_CT(SA>MA)** & MS=TCT	MS=RCT; TCT=R
	122	**FR_CT(SA>MA)** & MS=TCT	[TXI(RCV_CT_PDU) (optional-i)]
	123	**FR_CT(SA>MA)** & MS=TCT & TS=RPT	FTXC=FTI=0
	163	**FR_RP**	CNNR=n5
M60	169	**FR_RP** & MS=RCT	MS=RPT
	166	**FR_RP** & MS=RCT & FINS=1	FBR=FBT=0
	170	**FR_RP** & MS=RCT & FINS=1	TNT=R; TSM=R
	171	**FR_RP** & MS=RPT & FAM=1	FAM=0; QUE_ACT_ERR_PDU(EC=2); FA(monitor)=0
	173	**FR_RP** & MS=RPT & FAM=1 & FINS=1	TNT=R; [TSM=R (optional-i)]
	172	**FR_RP** & MS=RPT & FAM=1 & TS=RPT	FTXC=FTI=0
	167	**FR_RP** & MS=RPT & FINS=1	FBR=FBT=0
	168	**FR_RP** & MS=TRP & FINS=1	FBR=FBT=0
	174	**FR_RP(SA<>MA)** & FAM=0 & FINS=1	[TNT=R (optional-x)]
M10B	175	**FR_RP(SA<>MA)** & MS=TRP	MS=RPT; FAM=0; QUE_ACT_ERR_PDU(EC=2); FA(monitor)=0
	176	**FR_RP(SA<>MA)** & MS=TRP & TS=RPT	FTXC=FTI=0
M10A	177	**FR_RP(SA=MA & R=0)** & MS=TRP	MS=RPT; FAT=FTI=FNN=0; FMP=1; TVX=R; TAM=R; TX_TK(P=0; M=0; R=0); CLEAR_STACKS; QUE_AMP_PDU; LMP=(MA|NULL); [TSM=R (optional-i)]
M10C	178	**FR_RP(SA=MA & R>0)** & MS=TRP	MS=RPT; FAT=FTI=FNN=0; FMP=1; TVX=R; TAM=R; TX_TK(P=Rr; M=0; R=0); RESET_STACKS(Sx=Rr; Sr=0); QUE_AMP_PDU; LMP=(MA|NULL); [TSM=R (optional-i)]
	192	**FR_SMP(A=0 & C=0)** & FAM=1	FNN=FNW=1; LMP=NULL
	193	**FR_SMP(A=0 & C=0)** & FSMP=0 & FAM=0 & FOP=1	FSMP=1; TQP=R
	198	**FR_SMP(A|C<>0)** & FAM=1	LMP=SA

Table 9-26—DTR Station Monitor Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
	199	**FR_SMP(SA<>SUA & A=0 & C=0)** & FAM=0 & FOP=1	CSC=1; SUA=SA; QUE_SUA_CHG_PDU
	200	**FR_SMP(SA<>SUA & A=0 & C=0)** & FAM=1 & FNN=0 & FOP=1	CSC=1; SUA=SA; QUE_SUA_CHG_PDU
	201	**FR_SUA_CHG(SA=MA & E=0 & A=1 & C=0)** & CSC<n3 & FOP=1	CSC=(CSC+1); QUE_SUA_CHG_PDU
	202	**FR_SUA_CHG(SA=MA & E=1 & C=0)** & CSC<n3 & FOP=1	CSC=(CSC+1); QUE_SUA_CHG_PDU
	207	**FSL=0** & MS=TBN & TX_BN_TYPE=2	TX_BN_TYPE=3
	208	**FSL=1** & FID=1 & MS=TBN	FID=0; FTI=1; TQP=R; TX_BN_TYPE=2; TXI(BN_PDU)
M52A	212	**FSL=1** & FINS=1 & MS=RBN	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M62	213	**FSL=1** & FINS=1 & MS=RCT	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)
M02C	214	**FSL=1** & FINS=1 & MS=RPT	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M12A	215	**FSL=1** & FINS=1 & MS=TRP	MS=TCT; FAM=FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
	216	**FSL=1** & MS=TBN	TX_BN_TYPE=2
	219	**FTW=1** & FRH=0 & MS=BNT	FOP=FTW=0; TRW=R; Remove_Station
	260	**TAM=E** & FNN=0 & FAM=1 & MS=RPT	TAM=R; QUE_NN_INCMP_PDU; QUE_AMP_PDU; LMP=(MA|NULL)
	261	**TAM=E** & FNN=1 & FAM=1 & MS=RPT	FNN=0; TAM=R; QUE_AMP_PDU; LMP=(MA|NULL)
M52B	262	**TBR=E** & MS=RBN & FINS=1	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R ; CCT=1; CCR=1; TXI(CT_PDU)
M34	264	**TBT=E** & MS=TBN & FINS=1 & FBT=0	MS=BNT; FOP=0; FBT=1; TRW=R; Remove_Station
M63	266	**TCT=E** & MS=RCT & FNC=1	MS=TBN; FTXC=FTI=1; TBT=R; TQP=R ; TX_BN_TYPE=4; TXI(BN_PDU)
M23B	271	**TCT=E** & MS=TCT & FNC=1 & FCT=0 & FSL=0	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=3; TXI(BN_PDU)
M23A	273	**TCT=E** & MS=TCT & FNC=1 & FCT=1 & FSL=0	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=4; TXI(BN_PDU)
M23C	272	**TCT=E** & MS=TCT & FNC=1 & FSL=1	MS=TBN; TBT=R; TQP=R; TX_BN_TYPE=2; TXI(BN_PDU)
M45	279	**TEST_OK** & FBR=1 & MS=BNT	MS=RBN; FTI=FTXC=FWFA=FWF=0; FBT=FID=FOP=FRH=1; TWFD=R; TRH=R; TID=R; INSERT
M43	280	**TEST_OK** & FBT=1 & MS=BNT	MS=TBN; FTI=FWFA=FWF=0; FBR=FID=FOP=FRH=FTXC=1; TID=R; TRH=R; TWFD=R; INSERT
M52A	282	**TID=E** & MS=RBN & FID=1	MS=TCT; FCT=FID=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU)

Table 9-26—DTR Station Monitor Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
	283	**TID=E** & MS=TBN & FID=1	FID=0; FTI=1; TQP=R; TXI(BN_PDU)
M01	290	**TK(M=1)** & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	304	**TK_GOOD** & FAM=0 & FGTO=1	TNT=R
	305	**TK_GOOD(P=0)** & FAM=0 & FGTO=0	TNT=R; FPT=0
	306	**TK_GOOD(P>0)** & FAM=0 & FGTO=0	FPT=1
M02B	310	**TNT=E** & FAM=0 & FINS=1 & MS=RPT	MS=TCT; FCT=0; FTXC=FTI=1; TCT=R; TQP=R ; CCT=1; CCR=1; TXI(CT_PDU)
	311	**TQP=E** & MS=RPT & FDC=0 & FAM=0	FNW=1
	312	**TQP=E** & MS=RPT & FDC=1 & FAM=0	FNC=1; QUE_SMP_PDU
	313	**TQP=E** & MS=TBN & FID=0	TQP=R; TXI(BN_PDU)
	314	**TQP=E** & MS=TCT	TQP=R; CCT=(CCT+1); TXI(CT_PDU)
M12B	322	**TRP=E** & MS=TRP & FINS=1	MS=TCT; FAM=FCT=0; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); QUE_ACT_ERR_PDU(EC=1); FA(monitor)=0
	326	**TRW=E** & MS=BNT	FTXC=1; FTI=x; TEST
	335	**TSL=E** & FSLD=1	FSL=1
M02C	336	**TSM=E** & MS=RPT & FINS=0 & FAM=1	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M02C	337	**TSM=E** & MS=RPT & FINS=1	MS=TCT; FAM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT_PDU); FA(monitor)=0
M01	338	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
M01	341	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT	MS=TRP; FTI=1; TRP=R; TXI(RP_PDU)
	344	**TVX=E** & FTHO=1 & FAT=1 & FAM=1	FAT=0; TVX=R
	346	**TWFD=E** & FWFA=0	FWFA=1
	348	**TX_ERR(RP)** & MS=TRP	TXI(RP_PDU)
	351	**TX_ERR(SUA_CHG)** & CSC<n3 & FOP=1	QUE_SUA_CHG_PDU; [CSC=CSC+1 (optional)]

9.6.2.4 DTR Station Error Handling using TKP access protocol

Table 9-27—DTR Station Error Handling Station Operation table

S/T	REF	Event/condition	Action/output
	001	**Burst5_error_event** & MS=RPT & FINS=1 & FER=0	TER=R; FER=1; CBE=(CBE+1)
	002	**Burst5_error_event** & MS=RPT & FINS=1 & FER=1 & CBE<255	CBE=(CBE+1)
	004	**CER=n3** & FECO=0	FER=FLF=0; CER=0; SET ERR_CNTR to 0;
	005	**CER=n3** & FECO=1	FLF=0; CER=0; SET ERR_CNTR to 0;
	030	**FJR=1** & FBHO=1 & FINS=0 & FECO=1	TER=R; FER=1
	032	**FLF=1** & MS=RPT & FINS=1 & FER=1 & CLFE<255	FLF=0; CLFE=(CLFE+1)
	031	**FLF=1** & MS=RPT & FINS=1 & FER=0	FLF=0; FER=1; TER=R; CLFE=(CLFE+1)
	034	**FNC=1** & FBHO=0 & FINS=0 & FECO=1	FER=1; TER=R
	052	**FR_AC(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	053	**FR_AC(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	361	**FR_LLC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=0	[FER=1; TER=R; CFCE=(CFCE+1) (optional-x)]
	362	**FR_LLC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=1 & CFCE<255	[CFCE=(CFCE+1) (optional-x)]
	041	**FR_MAC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CFCE=(CFCE+1)
	042	**FR_MAC(DA=MA & A=1)** & MS=RPT & FINS=1 & FER=1 & CFCE<255	CFCE=(CFCE+1)
	152	**FR_NOT_COPIED** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CRCE=(CRCE+1)
	153	**FR_NOT_COPIED** & MS=RPT & FINS=1 & FER=1 & CRCE<255	CRCE=(CRCE+1)
	179	**FR_RPRT_ERR(SA=MA & A=1 & C<>0)** & CER<n3 & FECO=0 & FOP=1	FER=FLF=0; CER=0; SET ERR_CNTR to 0
	180	**FR_RPRT_ERR(SA=MA & A=1 & C<>0)** & CER<n3 & FECO=1 & FOP=1	FLF=0; CER=0; SET ERR_CNTR to 0
	181	**FR_RPRT_ERR(SA=MA & E=0 & A=0)** & CER<n3 & FECO=0 & FOP=1	FER=FLF=0; CER=0; SET ERR_CNTR to 0
	182	**FR_RPRT_ERR(SA=MA & E=0 & A=0)** & CER<n3 & FECO=1 & FOP=1	FLF=0; CER=0; SET ERR_CNTR to 0
	183	**FR_RPRT_ERR(SA=MA & E=0 & A=1 & C=0)** & CER<n3 & FOP=1	CER=(CER+1); QUE_RPRT_ERR_PDU
	184	**FR_RPRT_ERR(SA=MA & E=1 & C=0)** & CER<n3 & FOP=1	CER=(CER+1); QUE_RPRT_ERR_PDU
	194	**FR_SMP(A=0 & C=0)** & FSMP=1 & MS=RPT & FINS=1 & FAM=0 & CNNR=0 & FER=0	FER=1; TER=R; CACE=(CACE+1)

Table 9-27—DTR Station Error Handling Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
	195	**FR_SMP(A=0 & C=0)** & FSMP=1 & MS=RPT & FINS=1 & FAM=0 & CNNR=0 & FER=1 & CACE<255	CACE=(CACE+1)
	196	**FR_SMP(A=0 & C=0)** & MS=RPT & FINS=1 & FAM=1 & FNN=1 & CNNR=0 & FER=0	TER=R; FER=1; CACE=(CACE+1)
	197	**FR_SMP(A=0 & C=0)** & MS=RPT & FINS=1 & FAM=1 & FNN=1 & CNNR=0 & FER=1 & CACE<255	CACE=(CACE+1)
	204	**FR_WITH_ERR(E=0)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CLE=(CLE+1)
	205	**FR_WITH_ERR(E=0)** & MS=RPT & FINS=1 & FER=1 & CLE<255	CLE=(CLE+1)
	222	**INTERNAL_ERR(correctable)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CIE=(CIE+1)
	223	**INTERNAL_ERR(correctable)** & MS=RPT & FINS=1 & FER=1 & CIE<255	CIE=(CIE+1)
	252	**STATION_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=0	FER=1; TER=R; CABE=(CABE+1)
	253	**STATION_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255	CABE=(CABE+1)
	366	**STATION_ERR(tx-underrun)** & TS=DATA & FINS=1 & MS=RPT & FER=0	[FER=1; TER=R; CABE=(CABE+1) (optional-x)]
	367	**STATION_ERR(tx-underrun)** & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255	[CABE=(CABE+1) (optional-x)]
	274	**TER=E** & FINS=1 & ERR_CNTR<>0	CER=1; QUE_RPRT_ERR_PDU
	275	**TER=E** & FINS=1 & FECO=1	TER=R
	291	**TK(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	292	**TK(M=1)** & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	302	**TK_ERR** & TS=DATA & FINS=1 & FER=0	FER=1; TER=R; CABE=(CABE+1)
	303	**TK_ERR** & TS=DATA & FINS=1 & FER=1 & CABE<255	CABE=(CABE+1)
	308	**TK_WITH_ERR(E=0)** & FTEO=0 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CLE=(CLE+1)
	309	**TK_WITH_ERR(E=0)** & FTEO=0 & MS=RPT & FINS=1 & FER=1 & CLE<255	CLE=(CLE+1)
	339	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	340	**TVX=E** & FTHO=0 & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)

Table 9-27—DTR Station Error Handling Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
	343	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT & FINS=1 & FER=1 & CTE<255	CTE=(CTE+1)
	342	**TVX=E** & FTHO=1 & FAT=0 & FAM=1 & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CTE=(CTE+1)
	349	**TX_ERR(RPRT_ERR)** & CER<n3 & FOP=1	QUE_RPRT_ERR_PDU; [CER=(CER+1) (optional)]

9.6.2.5 DTR Station Interface Signals using TKP access protocol

Table 9-28—DTR Station Interface Signals Station Operation table

S/T	REF	Event/condition	Action/output
	037	**FR(RI_NOT_PRESENT)** & FJR=1 & MS<>BNT & TS=RPT	M_UNITDATA.indication
	360	**FR(RI_PRESENT)** & FJR=1 & MS<>BNT	M_UNITDATA.indication
	134	**FR_LLC (DA=any_recognized_address)** & FJR=1 & MS<>BNT	MA_UNITDATA.indication
	135	**FR_MAC (DA=any_recognized_address** & DC<>0) & FJR=1 & MS<>BNT	MGT_UNITDATA.indication
	217	**FTI=0**	PS_CONTROL.request(Repeat_mode=Repeat)
	218	**FTI=1**	PS_CONTROL.request(Repeat_mode=Fill)
	220	**FTXC=0**	PS_CONTROL.request (Crystal_transmit=Not_asserted)
	221	**FTXC=1**	PS_CONTROL.request(Crystal_transmit=Asserted)
	233	**M_UNITDATA.request** & FJR=1 & FR_LTH<=MAX_TX	QUE_PDU
	235	**M_UNITDATA.response** & FR_COPIED & FTI=0 & TS=RPT	SET C=1
	234	**M_UNITDATA.response** & FTI=0 & TS=RPT	SET A=1
	236	**MA_UNITDATA.request** & FJR=1 & FR_LTH<=MAX_TX	QUE_PDU
	237	**MGT_UNITDATA.request (SC<>RS)** & FJR=1 & FR_LTH<=MAX_TX	QUE_PDU
	239	**PM_STATUS.indication (Signal_detection= Signal_acquired)** & FSLD=1	FSL=FSLD=0
	240	**PM_STATUS.indication (Signal_detection= Signal_loss)** & FSLD=0	FSLD=1; TSL=R
	241	**PM_STATUS.indication (Wire_fault=Detected)** & FWFA=1 & FWF=0	FWF=1; TWF=R
	242	**PM_STATUS.indication (Wire_fault=Not_detected)** & FWF=1	FWF=0
	244	**PS_STATUS.indication (Frequency_error)** & MS=RPT & FINS=1 & FER=0	FER=1; TER=R; CFE=(CFE+1)
	245	**PS_STATUS.indication (Frequency_error)** & MS=RPT & FINS=1 & FER=1 & CFE<255	CFE=(CFE+1)
	243	**PS_STATUS.indication(Burst4_error)**	[FSD=0 (optional-i)]
	288	**TK(M=0)** & FAM=1 & FTHO=0	TVX=R; PS_EVENT.response(Token_received)
	289	**TK(M=0)** & FAM=1 & FTHO=1	FAT=1; PS_EVENT.response(Token_received)

9.6.2.6 DTR Station Miscellaneous Frame Handling using TKP access protocol

Table 9-29—DTR Station Miscellaneous Frame Handling Station Operation table

<table>
<tr><th>S/T</th><th>REF</th><th>Event/condition</th><th>Action/output</th></tr>
<tr><td></td><td>097</td><td>FR_CHG_PARM & FOP=1</td><td>SET APPR_PARMS</td></tr>
<tr><td></td><td>098</td><td>FR_CHG_PARM(DA=Broadcast & A|C<>1 & CORR_NOT_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>099</td><td>FR_CHG_PARM(DA=Broadcast & A|C<>1 & CORR_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>101</td><td>FR_CHG_PARM(DA=Non_broadcast & CORR_NOT_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>102</td><td>FR_CHG_PARM(DA=Non_broadcast & CORR_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>128</td><td>FR_INIT & FOP=1</td><td>SET APPR_PARMS</td></tr>
<tr><td></td><td>129</td><td>FR_INIT(DA=Broadcast & A|C<>1 & CORR_NOT_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>130</td><td>FR_INIT(DA=Broadcast & A|C<>1 & CORR_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>132</td><td>FR_INIT(DA=Non_broadcast & CORR_NOT_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RPS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>133</td><td>FR_INIT(DA=Non_broadcast & CORR_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RPS; SC=RS; CORR=RCV_CORR; RSP_TYPE=0001)</td></tr>
<tr><td></td><td>136</td><td>FR_MAC_INV (ERR_COND=LONG_MAC & SC<>RS & CORR_NOT_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8009)</td></tr>
<tr><td></td><td>137</td><td>FR_MAC_INV (ERR_COND=LONG_MAC & SC<>RS & CORR_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8009)</td></tr>
<tr><td></td><td>138</td><td>FR_MAC_INV (ERR_COND=SC_INVALID & SC<>RS & CORR_NOT_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8004)</td></tr>
<tr><td></td><td>139</td><td>FR_MAC_INV (ERR_COND=SC_INVALID & SC<>RS & CORR_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8004)</td></tr>
<tr><td></td><td>140</td><td>FR_MAC_INV (ERR_COND=SHORT_MAC & SC_NOT_PRESENT) & FOP=1</td><td>[QUE_RSP_PDU(DC<>RS; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001) (optional-x)]</td></tr>
<tr><td></td><td>141</td><td>FR_MAC_INV (ERR_COND=SHORT_MAC & SC_PRESENT & SC<>RS) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8001)</td></tr>
<tr><td></td><td>142</td><td>FR_MAC_INV (ERR_COND=SV_LTH_ERR & SC<>RS & CORR_NOT_PRESENT) & FOP=1</td><td>QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8005)</td></tr>
</table>

Table 9-29—DTR Station Miscellaneous Frame Handling Station Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
	143	**FR_MAC_INV (ERR_COND=SV_LTH_ERR & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8005)
	144	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8007)
	145	**FR_MAC_INV (ERR_COND=SV_MISSING & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8007)
	146	**FR_MAC_INV (ERR_COND=SV_UNK & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8008)
	147	**FR_MAC_INV (ERR_COND=SV_UNK & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8008)
	148	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8002)
	149	**FR_MAC_INV (ERR_COND=VI_LTH_ERR & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8002)
	150	**FR_MAC_INV (ERR_COND=VI_UNK & SC<>RS & CORR_NOT_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; [CORR=UNK_VALUE (optional-x)]; RSP_TYPE=8003)
	151	**FR_MAC_INV (ERR_COND=VI_UNK & SC<>RS & CORR_PRESENT)** & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; CORR=RCV_CORR; RSP_TYPE=8003)
	154	**FR_REMOVE (DA=Broadcast & A<>1)** & FOP=1	[QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A) (optional-i)]
	155	**FR_REMOVE (DA=Broadcast & A=1)** & FOP=1	[QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A) (optional-x)]
	162	**FR_REMOVE(DA=Non_broadcast)** & FRRO=1 & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A)
	185	**FR_RQ_ADDR** & FOP=1	QUE_RPRT_ADDR_PDU
	186	**FR_RQ_ATTACH** & FOP=1	QUE_RPRT_ATTACH_PDU
	190	**FR_RQ_STATE** & FOP=1	QUE_RPRT_STATE_PDU

9.6.2.7 Precise specification of terms

9.6.2.7.1 Precise specifications of events/conditions

In addition the precise specifications of events/conditions defined in 4.3.5.1, the following new event/ condition terms are specified.

AND(x,y). Bitwise Logical AND function of binary objects x and y.
FR_REG_QRY. A verified Registration Query MAC frame has been received (10.3.2.16).

9.6.2.7.2 Precise specifications of actions/outputs

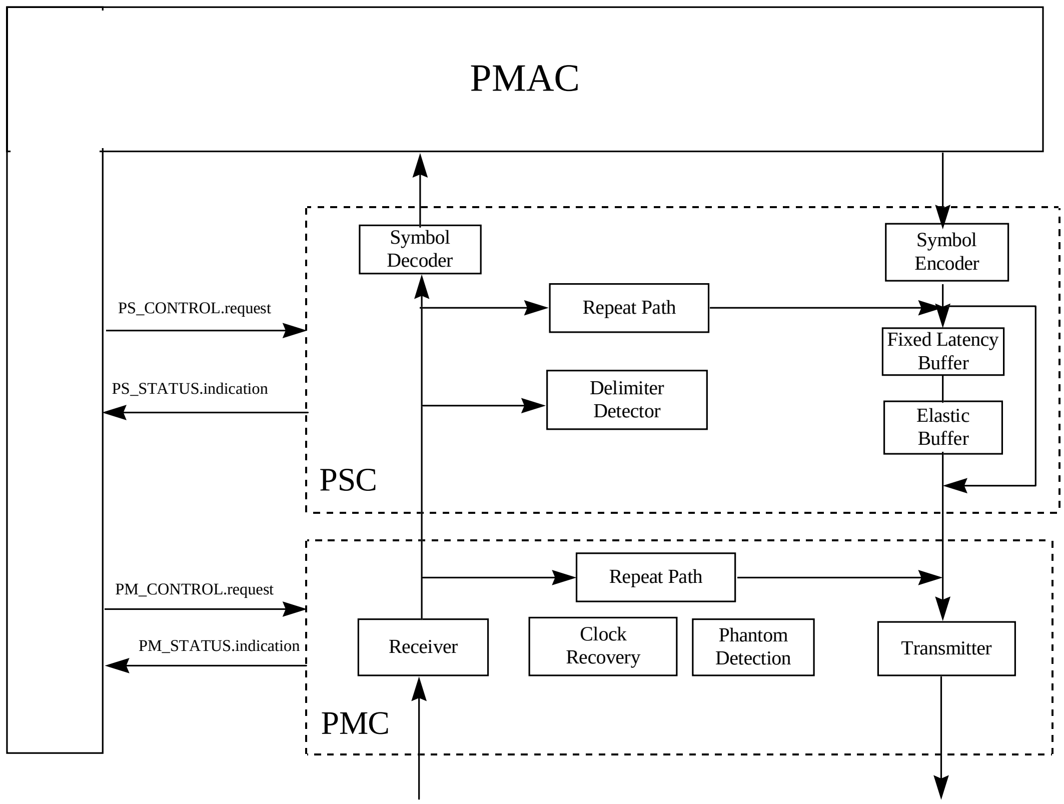
In addition the Precise specifications of actions/outputs defined in 4.3.5.2, the following change to the “Set_initial_conditions” is specified.

Set_initial_conditions. The Station shall set all MAC flags to zero, set all MAC counters to zero, set all MAC stored values to zero, and stop all MAC timers. The monitor and transmit FSM states are not specified. The PS_CONTROL.request(Medium_rate) and PM_CONTROL.request(Medium_rate) shall indicate to the PHY the value of FMRO.

9.7 C-Port specific components and specifications

9.7.1 C-Port repeat path

Implementors of the C-Port shall be permitted to select the type of repeat path that is made available to the Station when supporting a lobe media test. Figure 9-23 illustrates two repeat paths, one repeat path in the PSC and one in the PMC. When repeat paths are available in both the PSC and the PMC, one and only one repeat path shall be active at any time. A disabled repeat path shall neither repeat symbols nor insert fill into the transmit path. Availability of any repeat path when the C-Port is in the Bypass state (JS=BP) is not defined.



NOTE—One shall be supplied to support Station LMT.

Figure 9-23—C-Port repeat paths

A C-Port provides a repeat path with the following characteristics:

a) A C-Port repeat path shall include a transmitter, including all circuitry in the transmission path between the data retiming (latching) mechanism and the MIC transmit connections.
b) A C-Port repeat path shall include a receiver, including all circuitry between the MIC connections and the recovered clock used to latch the data.
c) A C-Port repeat path shall repeat DATA_ZEROs and DATA_ONEs unaltered between the SD and the ED field inclusive when repeating a frame.
d) A C-Port repeat path shall use the recovered clock.
e) To ensure that C-Ports do not introduce excessive latency, the average repeat path latency should not exceed 100 symbols.
f) A C-Port repeat path shall modify the A and C bits only if the frame’s destination address is recognized by the C-Port MAC and FPACO is set to 1.
g) A C-Port repeat path may optionally set the E bit, when a frame with an error is detected.
h) A C-Port repeat path may optionally correct a Burst-5 error to Burst-4.
i) A C-Port repeat path may optionally cause a polarity inversion of the data stream.

9.7.2 MAC interface service specification

The following service primitives specify the required information that is passed between the PMAC and the PMC. This service specification is solely for the purpose of explaining C-Port operation and does not imply any particular implementation. This service specification is in addition to the service specification defined for Stations in 5.1.2 and 5.1.3.

9.7.2.1 PM_STATUS.indication

This primitive is used by the PMC to inform the PMAC of the state of the phantom signaling channel, of errors and of significant status changes. This primitive is in addition to the service specification found in 5.1.4.1.

PM_STATUS.indication [Insert]

Insert indicates the state of the phantom signaling channel and is specified as one of the following:

Detected
Not_detected

When generated: Upon detection of any of the conditions, the PMC generates a PM_STATUS.indication.

Effect of receipt: These signals are processed by the PMAC protocol.

9.7.2.2 PM_CONTROL.request

This primitive is used by the PMAC to request certain actions of the PMC.

PM_CONTROL.request [Insert_Station (5.9),
Remove_Station (5.9),
Medium_Rate (5.2)
Repeat_Mode (5.4.1)]

Medium_Rate is specified as one of the following:

4 Mbit/s
16 Mbit/s

Repeat_Mode specified is one of the following:

Repeat
Fill

When generated: The PMAC generates a PM_CONTROL.request for each action request.

Effect of receipt: The PHY performs the appropriate action.

9.7.3 C-Port PMC specification

When the PMAC option flag, FPOTO, is set to 0, the C-Port is emulating a Station, and shall provide a PMC with the characteristics defined in clause 7.

When the PMAC option flag, FPOTO is set to 1, the C-Port shall provide a PMC with the characteristics defined in clause 7, with the following modifications:

a) Phantom signaling and wire fault detection are not included (7.2.1).
b) MIC contact specifications for a concentrator are used (8.1).
c) Phantom channel signal detection, defined for the RAC (8.3), may optionally be included.
d) Station confirmation of TCU presence and support of Station detection of an open wire condition and certain short circuit conditions in the lobe cabling (8.3.3) are provided for.
e) A repeat path for Station LMT use within 190 ms of the detection of Insert dropping during Beacon Test while supporting the TKP access protocol (8.3.2) is provided.

10. DTR formats and facilities

This clause defines the formats (10.1), field descriptions (10.2), MAC frames (10.3), system timers (10.4), policy flags and variables (10.5), and error counters (10.6) used by the DTR TXI access protocol. Also defined are any differences from the classic token ring formats and facilities, specified in ISO/IEC 8802-5 : 1998, clause 3.

10.1 Formats

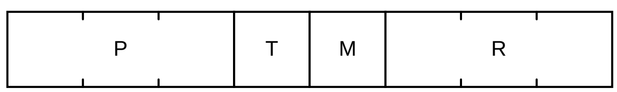
The symbol sequences used in the DTR TXI access protocol are the frame, the abort sequence, and fill. These formats are the same as those described in 3.1 of ISO/IEC 8802-5 : 1998. The token, as described in 3.1 of ISO/IEC 8802-5 : 1998, is not used by the TXI access protocol.

10.2 Field descriptions

The following subclauses are a detailed description of the individual fields used for the abort sequence and frames, where they differ from classic token ring (as defined in ISO/IEC 8802-5 : 1998).

10.2.1 Access control (AC)

The AC field is defined in figure 10-1.



P = priority (3 bits)
T = token (1 bit)
M = monitor (1 bit)
R = reservation (3 bits)

Figure 10-1—Access control fields

10.2.1.1 Priority (P) bits

The priority bits transmitted in the TXI access protocol are unspecified and shall be ignored on receipt.

10.2.1.2 Token (T) bit

The token bit shall be transmitted as 1. The value of 0 is not used in the TXI access protocol.

10.2.1.3 Monitor (M) bit

The monitor bit shall be transmitted as 0. The monitor bit is not used in the TXI access protocol.

10.2.1.4 Reservation (R) bits

The reservation bits shall be transmitted as B'000'. The reservation bits are not used in the TXI access protocol.

10.2.2 Functional address (FA)

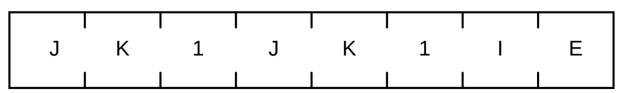
The functional addresses defined in the TXI access protocol are detailed in table 10-1.

Table 10-1—MAC functional addresses

Functional address (FA)	Function name	Six-octet address
B'xxx xxxx xxxx xxxx xxxx xxxx xxxx xx1x'	Ring Parameter Server (RPS)	X'C0 00 00 00 00 02'
B'xxx xxxx xxxx xxxx xxxx xxxx xxxx 1xxx'	Ring Error Monitor (REM)	X'C0 00 00 00 00 08'
B'xxx xxxx xxxx xxxx xxxx xxxx xxx1 xxxx'	Configuration Report Server (CRS)	X'C0 00 00 00 00 10'
B'xxx xxxx xxxx xxxx x1xx xxxx xxxx xxxx'	Lobe Media Test (TEST)	X'C0 00 00 00 40 00'

10.2.3 Ending delimiter (ED)

The transmitting entity shall transmit the ending delimiter as shown in figure 10-2. The receiving entity shall consider the ending delimiter valid if the first six symbols (J K 1 J K 1) are received correctly.



J = Non_Data_J symbol (1 bit)
K = Non_Data_K symbol (1 bit)
1 = Data_one symbol (1 bit)
I = Intermediate frame (1 bit)
E = Error detected (1 bit)

Figure 10-2—Ending delimiter

10.2.3.1 Intermediate frame (I) bit

The intermediate frame bit shall be transmitted as 0. The intermediate frame bit is not used in the TXI access protocol.

10.2.3.2 Error-detected (E) bit

The error-detected bit is not used by a Station operating the TXI access protocol, and shall be transmitted as 0.

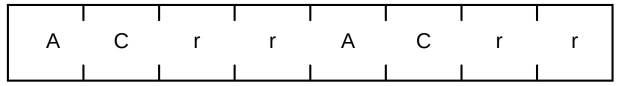
The C-Port shall transmit the error-detected bit as follows:

a) If the option flag FPASO=0, then the C-Port shall transmit the error detected bit as 0.
b) If the option flag FPASO=1 and a normal frame transmit completion occurs, then the C-Port shall transmit the error-detected bit as 0.
c) If the option flag FPASO=1 and an over-length frame transmit is terminated with an invalid FCS, then the C-Port shall transmit the error-detected bit as 1.

When the C-Port is repeating data (TS=PRPT) in support of the Station's Lobe Media Test state (JS=SLT), the C-Port may optionally set the error detected bit to 1 when an FR_WITH_ERR is detected.

10.2.4 Frame status (FS)

The FS field is defined in figure 10-3.



A = Address recognized (1 bit)
C = Frame copied (1 bit)
r = reserved

Figure 10-3—Frame status field

10.2.4.1 Address recognized (A) bits and frame copied (C) bits

The A and C bits shall be transmitted as 0. Any frame transmitted by the Station to the C-Port while the C-Port's Transmit FSM is in TS=PRPT is repeated to the Station. The A bits of the repeated frame shall be set to 1 if the policy flag FPACO is set to 1 and the DA is any address recognized by the C-Port. The C bits of the repeated frame shall be set to 1 if the policy flag FPACO is set to 1 and the frame is copied by the C-Port.

10.2.4.2 Reserved (r) bits

The reserved bits are reserved for future standardization. They shall be transmitted as 0 and ignored on receipt.

10.3 MAC frames

This clause defines the MAC frames recognized by the TXI access protocol.

10.3.1 MAC frame information field format

The following is a description of the individual fields where they differ from classic token ring (defined in ISO/IEC 8802-5 : 1998).

10.3.1.1 Vector class (VC)

A one-octet code point that identifies the function class of both the source and destination entities. The function classes are defined in table 10-2.

Table 10-2—Function classes

Function class	Class value
Ring Station (RS)	X'0'
Concentrator port (C-Port)	X'3'
Configuration report server (CRS)	X'4'
Ring parameter server (RPS)	X'5'
Ring error monitor (REM)	X'6'
Network management (NM)	X'8'

10.3.2 TXI access protocol vector descriptions

The following TXI access protocol vectors are used by DTR Stations and C-Ports using the TXI access protocol, arranged in numerical order of their respective vector identifier values.

10.3.2.1 X'00'—Response (RSP)

The RSP MAC frame is sent by a C-Port or Station as specified by the MAC protocol to acknowledge receipt of, or to report an error in, a received MAC frame. The RSP MAC frame is never sent to destination class 0 (Ring Station).

10.3.2.2 X'02'—Beacon (BN)

The BN MAC frame is transmitted by the C-Port or Station when a continuing interruption to the data flow on the link is detected.

10.3.2.3 X'05'—C-Port Heart Beat (PHB)

The PHB MAC frame is used by the C-Port in Port mode to indicate to the attached Station that its PMAC is active. The pacing of this frame is controlled by timer TPQHB. The PHB MAC frame is checked by the Station to ensure that SA=SUA and its absence is detected by the expiration of timer TSRHB.

The VI value of the PHB MAC frame is the same as that of the AMP MAC frame (10.3.3.3) used by the TKP access protocol.

10.3.2.4 X'06'—Station Heart Beat (SHB)

The SHB MAC frame is used by the Station to indicate to the attached C-Port in Port mode that its SMAC is active. The pacing of this frame is controlled by timer TSQHB. The SHB MAC frame is checked by the C-Port in Port mode to ensure that SA=SUA and its absence is detected by the expiration of timer TPRHB.

The VI value of the SHB MAC frame is the same as that of the SMP MAC frame (10.3.3.4) used by the TKP access protocol.

10.3.2.5 X'08'—Lobe Media Test (TEST)

The TEST MAC frame is used by a Station while in the Lobe Media Test state (JS=SLT) to test its lobe connection prior to completing its insertion into the network or at any time that the Station needs to test the lobe, such as during hard error recovery. The Ring Recovery MAC frames (BN, CT, and RP) and the Neighbor Notification MAC frames (AMP and SMP, PHB, and SHB) shall not be used during the TXI lobe test. The TEST MAC frame is addressed to the TEST functional address or to the NULL address. The Station determines the quality of the transmission path by inspecting the received frame for errors. Refer to annex P for lobe media test recommendations.

10.3.2.6 X'0B'—Remove DTR Station (REMOVE)

The REMOVE MAC frame is sent to any of the Station’s non-broadcast addresses to force its removal from the network. The REMOVE MAC frame is sent by a configuration report server (CRS) or optionally by Network Management (NM).

10.3.2.7 X'0C'—Change Parameters (CHG_PARM)

The CHG_PARM MAC frame is sent by the configuration report server (CRS) to the C-Port or Station to set its operating parameters. The C-Port or Station normally replies with a RSP MAC frame if the SET APPR_PARMS action is taken.

10.3.2.8 X'0D'—Initialize Station (INIT)

The INIT MAC frame is sent by the Ring Parameter Server (RPS) to a C-Port or a Station to initialize its operating parameters. The C-Port or Station normally replies with a RSP MAC frame if the SET APPR_PARMS action is taken.

10.3.2.9 X'0E'—Request Station Addresses (RQ_ADDR)

The RQ_ADDR MAC frame is sent by any management entity with a non-zero function class (such as CRS) to the C-Port or Station to request its active addresses.

10.3.2.10 X'0F'—Request Station State (RQ_STATE)

The RQ_STATE MAC frame is sent by any management entity with a non-zero function class (such as CRS) to the C-Port or Station to request information on its operating state.

10.3.2.11 X'10'—Request Station Attachments (RQ_ATTCH)

The RQ_ATTCH MAC frame is sent by any management entity with a non-zero function class (such as CRS) to the C-Port or Station to request information on its active functions.

10.3.2.12 X'11'—Registration Request (REG_REQ)

The REG_REQ MAC frame is used by a Station to register its requested operating parameters for the current session with the C-Port in Port mode. The frame provides the C-Port with information regarding the requested access protocol, phantom signaling, and wire fault detect method, and optionally the individual address count. The C-Port in Port mode accepts or rejects the request via its Registration Response (REG_RSP) MAC frame.

The Station’s individual address, along with the optional individual address count, can be used by the DTU to determine if there is any address duplication between the Station and the Concentrator Relay function of the DTR concentrator.

10.3.2.13 X'12'—Registration Response (REG_RSP)

The REG_RSP MAC frame is transmitted by a C-Port in Port mode in response to a REG_REQ MAC frame to indicate if the registration request has been accepted or rejected.

10.3.2.14 X'13'—Insert Request (INS_REQ)

The INS_REQ MAC frame is used by the Station using the TXI access protocol to request the C-Port in Port mode to complete the insertion process after the lobe media test has successfully completed.

10.3.2.15 X'14'—Insert Response (INS_RSP)

The INS_RSP MAC frame is used by the C-Port in Port mode to indicate to the Station whether the Station’s insert request has been accepted or rejected.

10.3.2.16 X'15'—Registration Query (REG_QRY)

The Registration Query MAC frame is used by the C-Port to indicate to a Station using the TKP access protocol, that the C-Port is capable of supporting the TXI access protocol. The registration query protocol is described in 9.1.5.

10.3.2.17 X'22'—Report Station Addresses (RPRT_ADDR)

The RPRT_ADDR MAC frame is sent by the C-Port or Station in response to a RQ_ADDR MAC frame.

10.3.2.18 X'23'—Report Station State (RPRT_STATE)

The RPRT_STATE MAC frame is sent by the C-Port or Station in response to a RQ_STATE MAC frame.

10.3.2.19 X'24'—Report Station Attachments (RPRT_ATTCH)

The RPRT_ATTCH MAC frame is sent by the C-Port or Station in response to a RQ_ATTCH MAC frame.

10.3.2.20 X'29'—Report Error (RPRT_ERR)

The RPRT_ERR MAC frame is sent to the REM functional address to report C-Port or Station errors detected since the last error report as follows:

a) The RPRT_ERR MAC frame shall be transmitted by
   1) A Station using either the TKP or TXI access protocols or
   2) A C-Port in Station Emulation mode using the TKP access protocol.
b) The RPRT_ERR MAC frame may optionally be transmitted by
   1) A Station using the TXI access protocol,
   2) A C-Port in Station Emulation mode using the TXI access protocol, or
   3) A C-Port in Port mode using the TKP access protocol.

The RPRT_ERR MAC frame shall not be transmitted by the C-Port in Port mode using the TXI access protocol.

10.3.3 TKP access protocol vector descriptions

If any of the following TKP vectors are received by a Station or C-Port while they are operating in the TXI access protocol, an access protocol mismatch has occurred. These vector descriptions are arranged in numerical order of their respective vector values and include a short definition of the action taken by the DTR C-Port or Station using the TXI access protocol.

10.3.3.1 X'03'—Claim Token (CT)

The CT MAC frame is recognized by the TXI access protocol, but indicates that the C-Port and Station have a protocol mismatch that causes the Station and the C-Port to return to the Bypass state (JS=BP).

10.3.3.2 X'04'—Ring Purge (RP)

The RP MAC frame is recognized by the TXI access protocol, but indicates that the C-Port and Station have a protocol mismatch that causes the Station and the C-Port to enter the Bypass state (JS=BP).

10.3.3.3 X'05'—Active Monitor Present (AMP)

The AMP MAC frame is recognized by the C-Port in the TXI access protocol, but indicates that the C-Port and Station have a protocol mismatch that causes the C-Port to return to the Bypass state (JS=BP).

10.3.3.4 X'06'—Standby Monitor Present (SMP)

The SMP MAC frame is recognized by the Station in the TXI access protocol, but indicates that the C-Port and Station have a protocol mismatch that causes the Station to return to the Bypass state (JS=BP).

10.3.4 Subvector descriptions

The following is a description of the subvectors used in the TXI access protocol, arranged in numerical order of their respective subvector identifier values. The lengths specified are only for the SVV field and do not include the length of SVL and SVI fields.

10.3.4.1 X'01'—Beacon Type (BN_TYPE)

This subvector has a value field 2 octets long and is used to indicate the type of fault detected. The values are defined in table 10-3.

Table 10-3—Beacon type definition

Value	Definition
X'0002'	Signal loss has been detected
X'0005'	TSRHB or TPRHB has expired indicating TXI Heart Beat protocol failure

10.3.4.2 X'02'—Upstream Neighbor's Address (UNA)

This subvector has a value field 6 octets long and contains the address of the upstream neighbor of the transmitting C-Port or Station. When the value of this subvector is stored by the PMAC or SMAC, it is referred to as the stored upstream address (SUA).

10.3.4.3 X'03'—Local Ring Number

This subvector has a value field 2 octets long. It indicates the local ring number of the sending C-Port or Station. This value is assigned to the Station by the CHG_PARM and INIT MAC frames and is used in the subvector field of appropriate report frames. This value does not affect the individual address assigned to the Station.

10.3.4.4 X'04'—Assign Physical Drop Number

This subvector has a value field 4 octets long. It specifies the physical location of the target C-Port or Station. The value of this subvector is not defined by this standard. This value is assigned to the C-Port or Station by the CHG_PARM and INIT MAC frames and is transmitted in the Physical Drop Number subvector (X'0B') of appropriate MAC frames.

10.3.4.5 X'05'—Error Report Timer Value

This subvector has a value field 2 octets long. It states the value of a Station’s TSER timer, or a C-Port’s TPER timer in multiples of 10 ms.

10.3.4.6 X'06'—Authorized Function Classes

This subvector has a value field 2 octets long. It indicates the function classes that are allowed to be active in the C-Port or Station. The valid range is B'0000 0000 0000 0000' to B'1111 1111 1111 1111', where each bit 0 to 15 corresponds to a function class X'0' to X'F'. Function classes are defined in table 10-4. Other function classes are reserved for future standardization.

Table 10-4—Function classes

Subvector value	Function class	Class value
B'xxxx 1xxx xxxx xxxx'	Configuration report server (CRS)	X'4'
B'xxxx x1xx xxxx xxxx'	Ring parameter server (RPS)	X'5'
B'xxxx xx1x xxxx xxxx'	Ring error monitor (REM)	X'6'
B'xxxx xxxx 1xxx xxxx'	Network management (NM)	X'8'

10.3.4.7 X'07'—Authorized Access Priority

When operating in the TXI access protocol, the value of the Authorized Access Priority subvector is unspecified for transmission in the Report Station Attachment MAC frame. It shall be ignored upon receipt of a Change Parameters MAC frame.

10.3.4.8 X'09'—Correlator

This subvector has a value field 2 octets long and is used to associate responses with requests. The value of the correlator subvector for a frame sent in response to a received frame shall be the value of the received correlator subvector. If the received frame does not contain a correlator, the SMAC or PMAC may omit the correlator subvector or send any value in the transmitted frame.

10.3.4.9 X'0B'—Physical Drop Number

This subvector has a value field 4 octets long. It reports the physical location of the transmitting C-Port or Station (see 10.3.4.4, X'04'—Assign Physical Drop Number).

10.3.4.10 X’0C’—Phantom (PD)

This subvector has a value field 2 octets long and indicates to the C-Port what phantom signaling and wire fault detection method is supported by the Station. The methods are defined in table 10-5. All other values are reserved for future standardization.

Table 10-5—Phantom subvector definition

Value	Definition
X'0001'	The Station supports the phantom signaling and wire fault detection method described in 7.2.1 in ISO/IEC 8802-5 : 1998.

10.3.4.11 X'0D'—DTR Response Code (DTR_RSP)

This subvector has a value field 2 octets long and is used by the C-Port in Port mode in the Insert Response MAC frame in response to the Insert Request MAC frame. This subvector's value indicates to the Station whether the insert request has been accepted or denied. The response codes are defined in table 10-6. All other values are reserved for future standardization.

Table 10-6—DTR response code definition

Value	Definition
X'0000'	Positive response. The insert request has been accepted.
X'8020'	Duplicate Address Check (DAC) error. The insert request has been denied because the C-Port's DAC has failed. Upon receiving this DTR response code, the Station enters the Bypass state (JS=BP).

10.3.4.12 X'0E'—Access Protocol Request (AP_REQ)

This subvector has a value field 2 octets long and is used by the Station in the Registration Request MAC frame to indicate to the C-Port which access protocol is being requested. As defined in table 10-7, the Station can only request one access protocol permitting the C-Port to use the mask PPV(AP_MASK) to determine if the Station is requesting an acceptable access protocol. All other values are reserved for future standardization.

Table 10-7—Access protocol request subvector definition

Value	Definition
X'0002'	Transmit Immediate (TXI) access protocol requested.

10.3.4.13 X'0F'—Access Protocol Response (AP_RSP)

This subvector has a value field 2 octets long and is used by the C-Port in Port mode in the Registration Response MAC frame in response to the Registration Request MAC frame. This subvector's value indicates whether the requested access protocol, phantom signaling, and wire fault support method have been accepted or denied as defined in table 10-8. All other values are reserved for future standardization.

Table 10-8—Access protocol response subvector definition

Value	Definition
X'0000'	Access denied. The access protocol or the phantom signaling and wire fault support method is unsupported by the C-Port in Port mode either by design or by management.
X'0002'	Transmit Immediate (TXI) access protocol and phantom signaling and wire fault support method accepted.

10.3.4.14 X'20'—Response Code (RSP_TYPE)

This subvector has a value field 4 or 6 octets long and is used in the Response MAC frame. It consists of a 2-octet response code followed by the 1-octet vector class (VC) and the 1 or 3 octet vector identifier (VI) from the received MAC frame that caused the Station to send the Response MAC frame. The response code values are defined in table 10-9. All other values are reserved for future standardization.

Table 10-9—Response code definitions

Response code	Name	Meaning of response code
X'0001'	OK	Positive acknowledgment. The MAC frame was accepted by the C-Port or Station.
X'8001'	SHORT_MAC	MAC frame information field is incomplete. The MAC frame was too short to contain the vector length, vector class, and vector ID.
X'8002'	VI_LTH_ERR	Vector length error. Vector length does not agree with the length of the frame or a subvector was found that did not fit within the vector.
X'8003'	VI_UNK	Unrecognized vector ID. The vector ID is not recognized by the C-Port or Station.
X'8004'	SC_INVALID	Inappropriate source class. The source class is not valid for the VI.
X'8005'	SV_LTH_ERR	Subvector length error. The length of a recognized subvector conflicts with its expected length or is less than 2.
X'8006'		Reserved
X'8007'	SV_MISSING	Missing subvector. A subvector required to process the MAC frame is not present in the MAC frame.
X'8008'	SV_UNK	Subvector unknown. A subvector received in the MAC frame is not known by the C-Port or Station.
X'8009'	LONG_MAC	MAC frame too long. The received frame was rejected because it exceeded maximum length.
X'800A'	FUNCTION_DISABLED	Function requested was disabled. The received MAC frame was rejected because the function requested was disabled.

10.3.4.15 X'21'—Individual Address Count (IAC)

This subvector has a value field 2 octets long. The default value of X'0000' means that more than one individual address is not supported. A non-zero value specifies the number of individual addresses in use by this Station.

The Station transmits the value of SPV(IAC) in this subvector.

10.3.4.16 X'22'—Product Instance ID

This subvector's value is used by a Station manufacturer to identify a Station's characteristics, such as serial number, machine type, model number, plant of manufacture, etc. The length of this subvector is not defined by this standard. It is recommended that this subvector be the "ResourceTypeID" managed object specified by ISO/IEC 10742 : 1994.

10.3.4.17 X'23'—Ring Station Version Number

This subvector is used in the Request Initialization and Report Station State MAC frames. The length and value of this subvector are not defined by this standard.

10.3.4.18 X'26'—Wrap Data

The length and function of this subvector are not specified by this standard. This subvector is used in the Lobe Media Test MAC frame.

10.3.4.19 X'28'—Station Identifier

This subvector has a value field 6 octets long and is used in the Report Station State MAC frame. It should uniquely identify the Station. It is recommended that this value be a universally administered individual address.

10.3.4.20 X'29'—Ring Station Status

This subvector is used in the Report Station State MAC frame. The length and contents of this subvector are not specified by this standard. However, an application receiving this subvector may be able to determine its format by examination of the Product Instance ID subvector (X'22').

10.3.4.21 X'2B'—Group Address

This subvector has a value field 4 or 6 octets long. The 6-octet form is recommended. It contains a group address of the reporting Station. When 4 octet values are used, the field will contain the low-order 4 octets of the address and no assumptions can be made about the first 2 octets of the address. A value of all zeros is used to denote that a C-Port or Station does not support a group address or that a group address is not assigned. If more than one group address is recognized, any of those addresses may be reported.

10.3.4.22 X'2C'—Functional Addresses

This subvector has a value field 4 octets long and specifies the functional addresses that are active in the reporting C-Port or Station.

10.3.4.23 X'2D'—Isolating Error Counts

This subvector has a value field 6 octets long containing the error counters shown in table 10-10 and defined in 10.6. The values of the error counters indicate the number of errors of each type detected since the last error report was transmitted by the Station or C-Port. If an error counter has not been incremented, is marked as not used by the TXI access protocol, or is marked reserved, then its value shall be reported as X'00'.

The second character of the counter’s name specifies whether it is a C-Port (P) counter or a Station (S) counter.

The distinction made in clause 3 of ISO/IEC 8802-5 : 1998 between isolating and non-isolating errors is not relevant in the DTR environment where the error domain is limited to a Station, a C-Port, and the media between them (lobe).

Table 10-10—Isolating error counts definition

Octet 0	Octet 1	Octet 2	Octet 3	Octet 4	Octet 5
Line error S: (CSLE) P: (CPLE)	Internal error S: (CSIE) P: (CPIE)	Burst error S: (CSBE) P: (CPBE)	AC error Not used	Abort sequence transmitted S: (CSABE) P: (CPABE)	Reserved

10.3.4.24 X'2E'—Non-isolating Error Counts

This subvector has a value field 6 octets and contains the error counters shown in table 10-11 and defined in 10.6. The values of the error counters indicate the number of errors of each type detected since the last error report was transmitted by the Station or C-Port. If an error counter has not been incremented, is marked as not used by the TXI access protocol, or is marked reserved, then its value shall be reported as X'00'.

The second character of the counter’s name specifies whether it is a C-Port (P) counter or a Station (S) counter.

The distinction made in clause 3 between isolating and non-isolating errors is not relevant in the DTR environment where the error domain is limited to a Station, C-Port, and the media between them (lobe).

Table 10-11—Non-isolating error counts definition

Octet 0	Octet 1	Octet 2	Octet 3	Octet 4	Octet 5
Lost frame error Not Used	Receive congestion error S: (CSRCE) P: (CPRCE)	Frame copied error Not Used	Frequency error S: (CSFE) P: (CPFE)	Token error Not Used	Reserved

10.3.5 MAC frames transmitted

The following subclauses specify the MAC frame transmit requirements for the TXI access protocol. The transmission of MAC frames shall take priority over the transmission of LLC frames.

10.3.5.1 Station MAC frames transmitted

A Station shall support the transmission of the frames shown in table 10-12 as required by the Station Operation tables. Frames that are shown in table 10-12, but are not required by the Station Operation tables, may be optionally transmitted by the Station MAC.

The Beacon and Station Heart Beat MAC frames shall be transmitted as shown. Other frames may be transmitted with additional subvectors.

Table 10-12—Station MAC frame transmit definitions

Vector (VI, Name)	FC	DA	VC	Designator[a]	Subvectors (SVI, Name)
X'00' Response	X'00'	SA of received frame	X'*0'		X'09' Correlator[b] X'20' Response Code
X'02'[c] Beacon	X'02'	Broadcast	X'00'		X'01' Beacon Type X'02' UNA X'0B' Physical Drop Number
X'06'[c] Station Heart Beat	X'06'	Broadcast	X'00'		X'02' UNA X'0B' Physical Drop Number
X'08' Lobe Media Test	X'00'	FA(TEST) or Null	X'00'		X'26' Wrap Data
X'11'[c] Registration Request	X'00'	Broadcast	X'30'	 op_tx	X'0C' Phantom X'0E' access protocol Request X'21' Individual Address Count
X'13'[c] Insert Request	X'00'	Broadcast	X'30'		none
X'22' Report Station Addresses	X'00'	SA of request	X'*0'	 op_tx op_tx	X'09' Correlator[b] X'02' UNA X'2B' Group Address X'2C' Functional Address(s) X'21' Individual Address Count X'0B' Physical Drop Number
X'23' Report Station State	X'00'	SA of request	X'*0'	 op_tx op_tx	X'09' Correlator[b] X'28' Station Identifier X'29' Ring Station Status X'23' Ring Station Version Number
X'24' Report Station Attachments	X'00'	SA of request	X'*0'	 op_tx op_tx	X'09' Correlator[b] X'06' Authorized Function Classes X'07' Authorized Access Priority X'2C' Functional Addresses X'21' Individual Address Count X'22' Product Instance ID
X'29'[c] Report Error	X'00'	FA(REM)	X'60'	 op_tx	X'2D' Isolating Error Count X'2E' Non-isolating Error Count X'02' UNA X'0B' Physical Drop Number
Legend VC=X'*0' Indicates the destination class of the requesting entity. op_tx Indicates the subvector is optional and may be omitted.					

[a] Subvectors with no preceding designator shall be transmitted.
[b] See 10.3.4.8 for exception to X'09' Correlator subvector.
[c] Shall not be transmitted with an RI field.

10.3.5.2 C-Port MAC frames transmitted

A C-Port shall support the transmission of the frames shown in table 10-13 as required by the C-Port Operation tables. Frames that are shown in table 10-13, but are not required by the C-Port Operation tables, may be optionally transmitted by the C-Port MAC.

The Beacon, Claim Token, Ring Purge, Active Monitor Present, Standby Monitor Present, and C-Port Heart Beat MAC frames shall be transmitted as shown. Other frames may be transmitted with additional subvectors.

Table 10-13—C-Port MAC frame transmit definitions

Vector (VI, Name)	FC	DA	VC	Designator[a]	Subvectors (SVI, Name)
X'00' Response	X'00'	SA of received frame	X'*0'		X'09' Correlator[b] X'20' Response Code
X'02'[c] Beacon	X'02'	Broadcast	X'00'		X'01' Beacon Type X'02' UNA X'0B' Physical Drop Number
X'03'[c] Claim Token	X'03'	Broadcast	X'00'		X'02' UNA X'0B' Physical Drop Number
X'04'[c] Ring Purge	X'04'	Broadcast	X'00'		X'02' UNA X'0B' Physical Drop Number
X'05'[c] C-Port Heart Beat	X'05'	Broadcast	X'00'		X'02' UNA X'0B' Physical Drop Number
X'05'[c] Active Monitor Present	X'05'	Broadcast	X'00'		X'02' UNA X'0B' Physical Drop Number
X'06'[c] Standby Monitor Present	X'06'	Broadcast	X'00'		X'02' UNA X'0B' Physical Drop Number
X'12'[c] Registration Response	X'00'	Broadcast	X'03'		X'0F' access protocol Response
X'14'[c] Insert Response	X'00'	Broadcast	X'03'		X'0D' DTR Response Code
X'15'[c] Registration Query	X'00'	Broadcast	X'03'		None
X'22' Report Station Addresses	X'00'	SA of request	X'*0'	 op_tx op_tx	X'09' Correlator[b] X'02' UNA X'2B' Group Address X'2C' Functional Address(s) X'21' Individual Address Count X'0B' Physical Drop Number
X'23' Report Station State	X'00'	SA of request	X'*0'	 op_tx op_tx	X'09' Correlator[b] X'28' Station Identifier X'29' Ring Station Status X'23' Ring Station Version Number
X'24' Report Station Attachments	X'00'	SA of request	X'*0'	 op_tx op_tx	X'09' Correlator[b] X'06' Authorized Function Classes X'07' Authorized Access Priority X'2C' Functional Addresses X'21' Individual Address Count X'22' Product Instance ID
Legend VC=X'*0' Indicates the destination class of the requesting entity. op_tx Indicates the subvector is optional and may be omitted.					

[a] Subvectors with no preceding designator shall be transmitted.
[b] See 10.3.4.8 for exception to X'09' Correlator SV.
[c] Shall not be transmitted with an RI field.

10.3.6 MAC frames received

This subclause defines the MAC frame reception requirements of the Station and C-Port, the receive MAC frame processing used by the Station, and C-Port and the reasons for rejection of an invalid MAC frame.

The phrase “ignore MAC frame” as used in this subclause means the Station or C-Port has received a MAC frame, but the Station or C-Port Operation tables ignore the MAC frame as it is not successfully verified as a correctly formatted MAC frame destined for an address recognized by the Station.

10.3.6.1 Station MAC frame reception

A DTR Station or a C-Port in Station Emulation mode shall support the reception of the frames defined in table 10-14 as required by the Station Operation tables in 9.2.5.

A Station may also optionally support the reception of frames not specified in table 10-14.

Table 10-14—Station MAC frame receive definitions

Vector (VI, Name)	FC	VC	Designator[a]	Subvectors (SVI, name)
X'02' Beacon	X'02'	X'00'	req req op_req	X'01' Beacon Type X'02' UNA X'0B' Physical Drop Number
X'03' Claim Token	X'03'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'04' Ring Purge	X'04'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'05' C-Port Heart Beat	X'05'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'05' Active Monitor Present	X'05'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'06' Standby Monitor Present	X'06'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'0B' Remove Ring Station	X'01'	X'04'[b]		none
X'0C' Change Parameters	X'00'	X'04'[b]		X'09' Correlator X'03' Local Ring Number X'04' Assign Physical Drop Number X'05' Error Timer Value X'06' Authorized Function Classes X'07' Authorized Access Priority
X'0D' Initialize Station	X'00'[c]	X'05'		X'09' Correlator X'03' Local Ring Number X'04' Assign Physical Drop Number X'05' Error Timer Value
X'0E' Request Station Addresses	X'00'	X'0*'		X'09' Correlator
X'0F' Request Station State	X'00'	X'0*'		X'09' Correlator
X'10' Request Station Attachments	X'00'	X'0*'		X'09' Correlator
X'12' Registration Response	X'00'	X'03'	req	X'0F' access protocol Response
X'14' Insert Response	X'00'	X'03'	req	X'0D' DTR Response Code
X'15' Registration Query	X'00'	X'03'		none
Legend VC=X'0*' Indicates a source class that shall not be 0 or 3. req Indicates the subvector is required to be present for the frame to be considered valid. op_req Indicates that the Station may optionally require this subvector to be present.				

[a] Subvectors with no preceding designator may or may not be present within the received vector, and are not required for verification.
[b] A Station may optionally receive this MAC frame with an VC value of X'08'.
[c] A Station may optionally receive the Initialize Station MAC frame with an FC value of X'01'. Management servers transmitting this frame are advised to use FC values of both X'00' and X'01'.

10.3.6.2 C-Port MAC frame reception

A C-Port in Port mode shall support the reception of the frames defined in table 10-15 as required by the Port Operation tables in 9.3.4.

A C-Port may also optionally support the reception of frames not specified in table 10-15.

Table 10-15—C-Port MAC frame receive definitions

Vector (VI, Name)	FC	VC	Designator[a]	Subvectors (SVI, name)
X'00' Response	X'00'	X'30'		X'09' Correlator X'20' Response Code
X'02' Beacon	X'02'	X'00'	req req op_req	X'01' Beacon Type X'02' UNA X'0B' Physical Drop Number
X'03' Claim Token	X'03'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'04' Ring Purge	X'04'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'05' Active Monitor Present	X'05'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'06' Station Heart Beat	X'06'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'06' Standby Monitor Present	X'06'	X'00'	req op_req	X'02' UNA X'0B' Physical Drop Number
X'0B' Remove Ring Station	X'01'	X'04'[b]		None
X'0C' Change Parameters	X'00'	X'04'[b]		X'09' Correlator X'03' Local Ring Number X'04' Assign Physical Drop Number X'05' Error Timer Value X'06' Authorized Function Classes X'07' Authorized Access Priority
X'0D' Initialize Station	X'00'[c]	X'05'		X'09' Correlator X'03' Local Ring Number X'04' Assign Physical Drop Number X'05' Error Timer Value
X'0E' Request Station Addresses	X'00'	X'0*'		X'09' Correlator
X'0F' Request Station State	X'00'	X'0*'		X'09' Correlator
X'10' Request Station Attachments	X'00'	X'0*'		X'09' Correlator
X'11' Registration Request	X'00'	X'30'	req req	X'0C' Phantom X'0E' access protocol Request X'21' Individual Address Count
X'13' Insert Request	X'00'	X'30'		none
Legend VC=X'0*' Indicates a source class that shall not be 0 or 3. req Indicates the subvector is required to be present for the frame to be considered valid. op_req Indicates that the C-Port may optionally require this subvector to be present.				

[a] Subvectors with no preceding designator may or may not be present within the received vector, and are not required for verification.
[b] A C-Port may optionally receive this MAC frame with an VC value of X'08'.
[c] May optionally be received with an FC value of X'01'.

10.3.6.3 Station MAC frame processing

When a valid (4.3.2) MAC frame is received by a Station, it is processed according to figure 10-4.

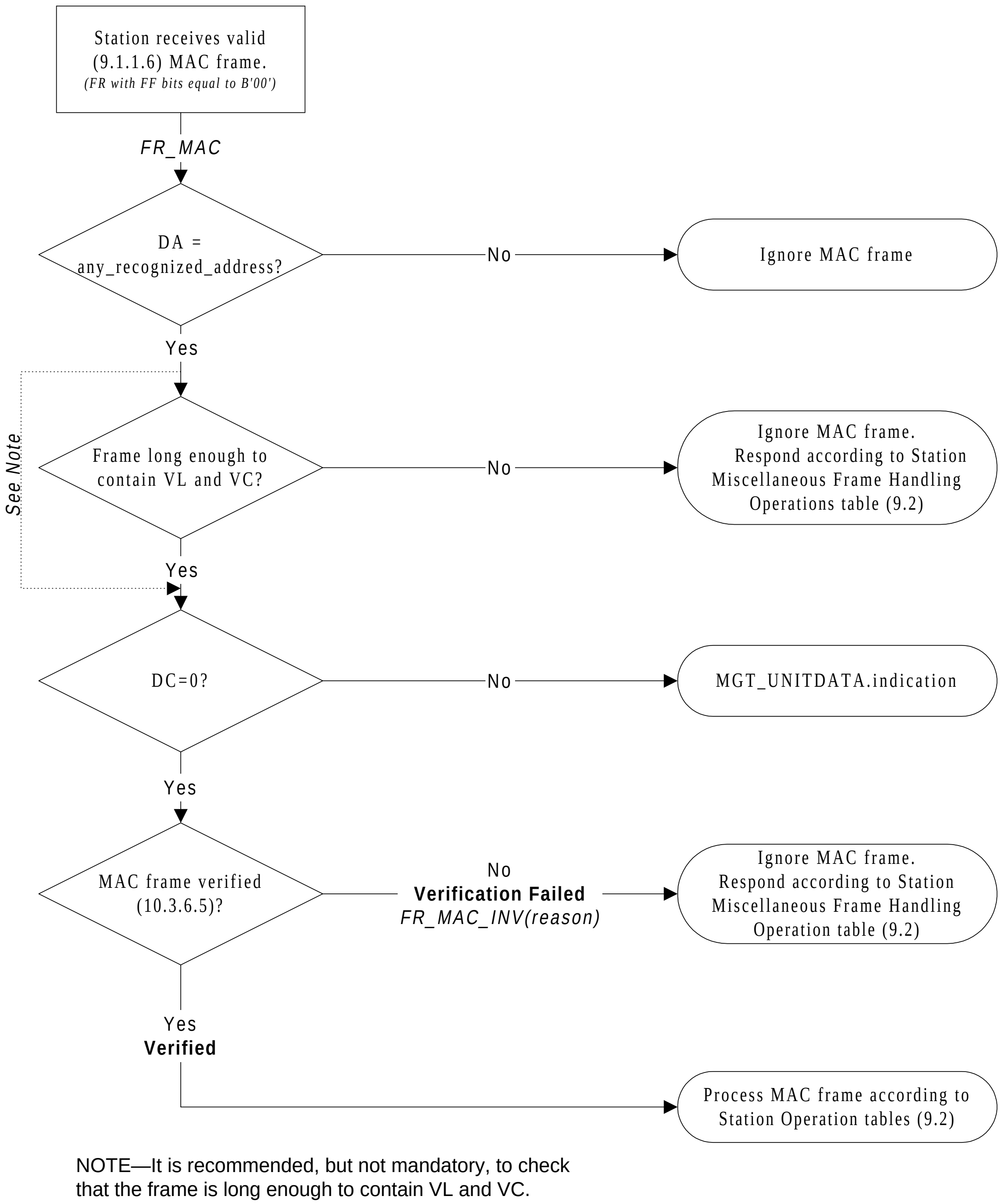


Figure 10-4—Station MAC frame processing

10.3.6.4 C-Port MAC frame processing

When a valid (4.3.2) MAC frame is received by a C-Port, it is processed according to figure 10-5.

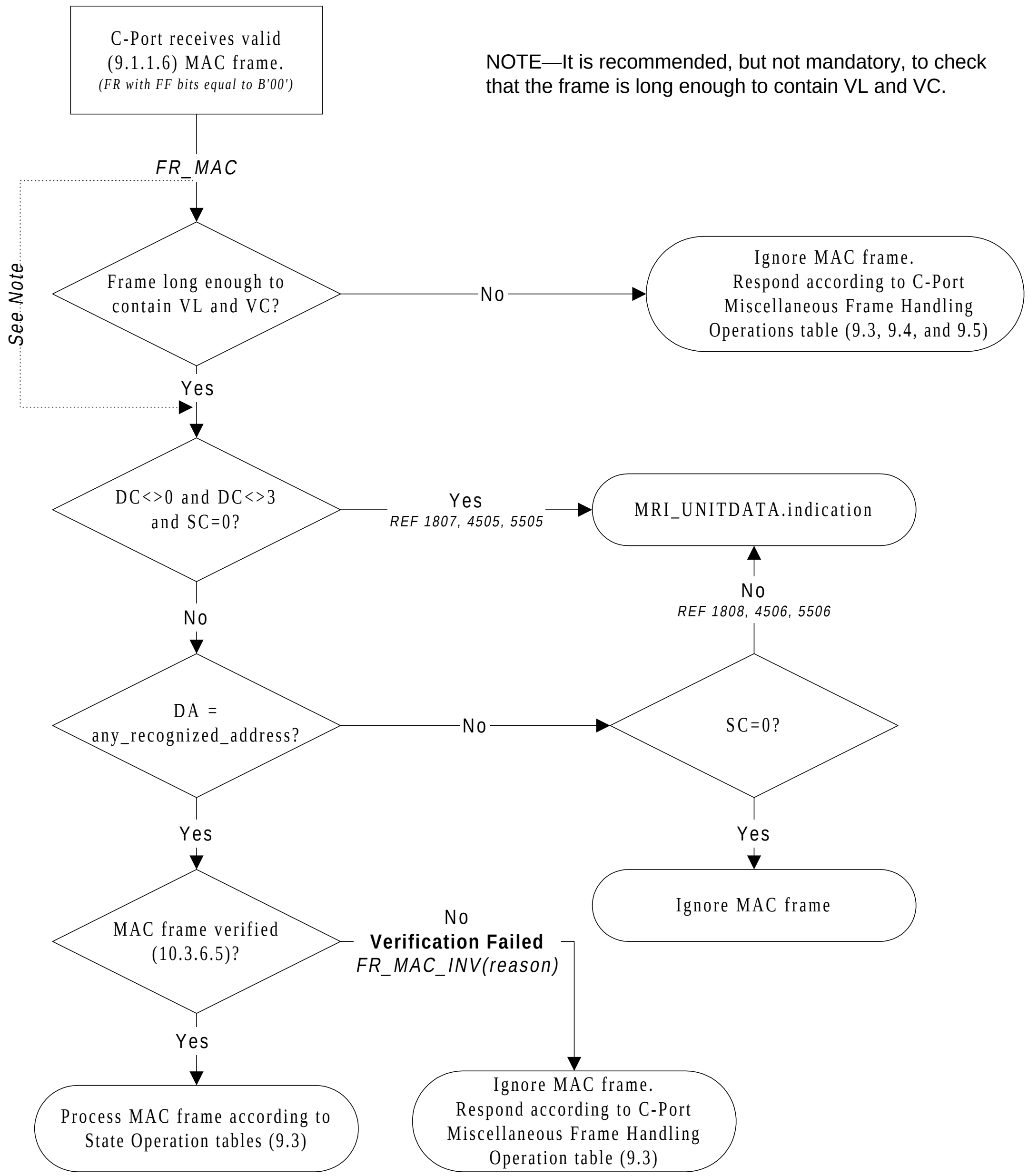


Figure 10-5—C-Port MAC frame processing

10.3.6.5 Invalid MAC frames

MAC frames shall fail verification by a Station or C-Port for the following reasons:

RI_INVALID: The receiving entity may ignore any MAC frame containing an RI field.

VI_UNK: Unrecognized Vector ID value. The receiving entity shall reject the frame if the VI value is not known by the receiving entity. The receiving entity may reject or ignore the frame if the FC field does not match the value specified for the VI in tables 10-14 and 10-15. Validity checking of the FC field is not required by this standard.

VI_LTH_ERR: Vector length error. The receiving entity shall reject the frame if the VL does not agree with the length of the frame, or if the VL is not equal to the sum of all the SVLs plus the length of VL, VC, and VI fields.

SHORT_MAC: MAC frame information field is incomplete. The MAC frame is too short to contain the vector length, vector class, and vector ID.

LONG_MAC: MAC frame too long. The receiving entity may reject the frame if the VL indicates a size larger than that needed for all allowed subvectors.

SV_MISSING: Missing one or more required subvectors. Based on the VI, the receiving entity shall reject a frame that does not contain a subvector listed as “req” in tables 10-14 and 10-15. The receiving entity may additionally reject the frame if it does not contain a subvector listed as “op_req” in tables 10-14 and 10-15. The receiving entity shall not require subvectors that are not listed in tables 10-14 and 10-15.

SV_UNK: SVI value is unknown. The receiving entity may reject the frame if the SVI value is not known by the receiving entity. The receiving entity shall recognize all SVI values given in tables 10-14 and 10-15.

SV_LTH_ERR: Subvector length error. The receiving entity shall reject the frame if the subvector length is less than the minimum or greater than the maximum specified in 10.3.4.

SC_INVALID: Invalid source class. The receiving entity shall reject the frame if the VC does not match the value specified in tables 10-14 and 10-15.

FUNCTION_DISABLED: The requested function is disabled by Management.

The order of parsing received frames is not specified by this standard. Annex H in ISO/IEC 8802-5 : 1998 has been provided as an example of frame verification parsing.

As specified in 9.2 and 9.3, certain MAC frames require a response frame to be generated if the frame is rejected.

10.4 System timers

In general, timers control the maximum period of time that a particular condition may exist. All timers are stopped when the Bypass state (JS=BP) of the Join state machine is entered and do not start until the first time they are reset.

Each timer is described in the following subclauses with detailed operation specified in 9.2, 9.3, 9.5, and 9.6.

10.4.1 Station timers

The timers in the following subclauses are used by DTR Stations and C-Ports in Station Emulation mode.

10.4.1.1 Timer, Station Error Report (TSER)

Each Station shall have a timer TSER. This timer is used to report errors that have been detected by the Station. When an error counter is incremented, TSER, if not already running, is reset. The Station queues a Report Error MAC frame when TSER expires. The frame is transmitted using the assured delivery process, and the error counters are reset to zero once assured delivery is complete. The default value of TSER shall be between 2.0 s and 2.2 s. The value can be changed by the Change Parameters MAC frame or the Initialize Station MAC frame.

10.4.1.2 Timer, Station Insert Process (TSIP)

Each Station shall have a timer TSIP. This timer is used as a pacing timer for the Insert Request MAC frame during the Join Duplicate Address Check state (JS=SDAC). The value of TSIP shall be between 150 ms and 250 ms. A value of 200 ms is recommended.

10.4.1.3 Timer, Station Initial Sequence (TSIS)

Each Station shall have a timer TSIS. This timer is reset on entering the Registration state (JS=SREG) at the same time as the Station begins to transmit idles. The Station transmits its first Registration Request MAC frame when TSIS expires. The delay between starting to transmit idles and the transmission of the first frame allows time for the C-Port PPHY to achieve phase lock to the idle stream before the frame is received. The value of TSIS shall be between 20 ms and 60 ms. A value of 40 ms is recommended.

10.4.1.4 Timer, Station Internal Test (TSIT)

Each Station shall have a timer TSIT. This timer is used to delay the Station’s entry into the Internal Test (MS=SIT) state to allow a wire fault condition, if any, to be detected. It is reset on entering either the Transmit Beacon (MS=STBN) or Wire Fault Delay (MS=SWFD) states. The value of TSIT shall be between 6.8 s and 7.2 s. A value of 7.0 s is recommended.

10.4.1.5 Timer, Station Join Complete (TSJC)

Each Station shall have a timer TSJC. This timer is reset on entering the Duplicate Address Check state (JS=SDAC) at the same time as the Insert Request MAC frame is transmitted by the Station. If the timer expires while the Station is in the Duplicate Address Check state (JS=SDAC), the Join process is deemed to have failed, because an Insert Response MAC frame was not received from the C-Port, and the Station enters the Bypass state (JS=BP). The value of TSJC shall be between 17.8 s and 18.0 s.

10.4.1.6 Timer, Station Lobe Media Test (TSLMT)

Each Station shall have a timer TSLMT. This timer is used by the Station during the Hard Error Recovery process to determine when the lobe media test shall begin. It is reset on entering either the Transmit Beacon (MS=STBN) or the Wire Fault Delay (MS=SWFD) states. The value of TSLMT shall be between 9.8 s and 10.2 s. A value of 10.0 s is recommended.

10.4.1.7 Timer, Station Lobe Media Test Complete (TSLMTC)

Each Station shall have a timer TSLMTC. This timer is used to limit the duration of the lobe media test in the Lobe Test state (JS=SLT). The value of TSLMTC shall be in the range of 2.3 s and 2.5 s. The duration of the Station’s lobe test shall be less than the time value specified by TSLMTC.

10.4.1.8 Timer, Station Lobe Media Test Delay (TSLMTD)

Each Station shall have a timer TSLMTD. This timer, used during Registration (JS=SREG) to delay entry into Lobe Test (JS=SLT), is reset upon reception of a Registration Response MAC frame from the C-Port. It is used to ensure that the C-Port has time to configure its repeat path for the LMT. The value of TSLMTD shall be between 200 ms and 250 ms.

10.4.1.9 Timer, Station Queue Heart Beat (TSQHB)

Each Station shall have a timer TSQHB. This timer is used by the TXI Heart Beat function to stimulate the transmission of an SHB MAC frame. The value of TSQHB shall be between 0.8 s and 1.2 s. A value of 1.0 s is recommended.

10.4.1.10 Timer, Station Queue PDU (TSQP)

Each Station shall have a pacing timer TSQP. This timer is used to schedule the transmission of a Beacon MAC frame when in the Transmit Beacon state (MS=STBN). The value of TSQP shall be between 10 ms and 30 ms. A value of 20 ms is recommended.

10.4.1.11 Timer, Station Registration Request (TSREQ)

Each Station shall have a timer TSREQ. This timer is used as a pacing timer for the Registration Request MAC frame in the Join Registration state (JS=SREG). The value of TSREQ shall be between 20 ms and 60 ms. A value of 40 ms is recommended.

10.4.1.12 Timer, Station Receive Heart Beat (TSRHB)

Each Station shall have a timer TSRHB. This timer is used by the TXI Heart Beat function to detect the absence of a C-Port Heart Beat MAC frame. While the Heart Beat Process is active (FSHBA=1), this timer is reset each time a C-Port Heart Beat MAC frame is received. If this timer expires while the Heart Beat process is active, the Station begins its Hard Error Recovery process by entering the Transmit Beacon state (MS=STBN). The value of TSRHB shall be between 4.8 s and 5.2 s. A value of 5.0 s is recommended.

10.4.1.13 Timer, Station Registration Wait (TSRW)

The timer TSRW is used to control the length of time a Station remains in the Station Registration Wait Join state (JS=SRW), in order to allow sufficient time for the attached C-Port to re-enter the Registration State (JS=PREG). The timer shall be a minimum of 200 ms.

10.4.1.14 Timer, Station Signal Loss (TSSL)

Each Station shall have a timer TSSL. This timer is used to determine whether or not the SPHY “signal_loss” condition is in a steady state. The value of TSSL shall be between 200 ms and 250 ms.

10.4.1.15 Timer, Station Wire Fault (TSWF)

Each Station that supports the detection of the SPHY “Wire_fault” condition shall have a timer TSWF. This timer is used to provide a sampling time for filtering wire fault. The value of TSWF shall be between 0 s and 10 s. A value of 5 s is recommended.

10.4.1.16 Timer, Station Wire Fault Delay (TSWFD)

Each Station that supports the detection of the SPHY “Wire_fault” condition shall have a timer TSWFD. This timer is used to delay the detection of wire fault after Join Completion (JS=SJC) or after the Station inserts following the testing phase of the Hard Error Recovery process. The value of TSWFD shall be between 5.0 s and 10.0 s. The sum of TSWFD + TSWF shall be a minimum of 7.0 s.

10.4.2 C-Port timers

The timers in the following subclauses are used by C-Ports in Port mode.

10.4.2.1 Timer, C-Port Break Lobe Test (TPBLT)

Each C-Port, capable of being configured in TXI-only mode, shall have a timer TPBLT. This timer is used to schedule the breaking of the repeat path by the C-Port, maintained during registration (JS=PREG), to disrupt the attaching classic station’s lobe test. This timer is only used when the C-Port is configured in TXI-only mode. The value of TPBLT shall be between 10 ms and 30 ms.

10.4.2.2 Timer, C-Port Disrupt Lobe Test (TPDLT)

Each C-Port, capable of being configured in TXI-only mode, shall have a timer TPDLT. This timer is used to control the duration of the break induced in the repeat path by the C-Port. During the break, the C-Port transmits idles to disrupt the attaching classic station’s lobe test. This timer is only used when the C-Port is configured in TXI-only mode. The value of TPDLT shall be between 2.6 s and 2.8 s.

10.4.2.3 Timer, C-Port Error Report (TPER)

Each C-Port shall have a timer TPER. This timer is used to determine when to report errors that have been detected by the C-Port. When an error counter is incremented, TPER, if not already running, is reset. The C-Port issues an Error Report MAC frame to the MRI when the timer expires. The default value of TPER shall be between 2.0 s and 2.2 s. This value may optionally be changed by the Change Parameters MAC frame or the Initialize Station MAC frame.

10.4.2.4 Timer, C-Port Insert Request Delay (TPIRD)

Each C-Port shall have a timer TPIRD. This timer is used to delay the C-Port’s response to an Insert Request MAC frame. The delay allows the Station to change from using the crystal clock source to using the recovered clock. The value of TPIRD shall be between 10 ms and 30 ms.

10.4.2.5 Timer, C-Port Internal Test (TPIT)

Each C-Port shall have a timer TPIT. This timer is used to specify the length of time a C-Port remains in the Transmit Beacon (MS=PTBN) state. When this timer expires, the C-Port enters the Internal Test (MS=PIT) state. The default value of TPIT shall be between 500 ms and 700 ms. A value of 600 ms is recommended.

10.4.2.6 Timer, C-Port Lobe Media Test Failure (TPLMTF)

Each C-Port shall have a timer TPLMTF. This timer is used when the C-Port in Port mode is using the TKP access protocol to detect the attached TKP Station’s failure to complete its lobe media test or beacon test in the time allotted by the C-Port. The timer is reset when the C-Port detects the Station has de-asserted phantom signaling and the TKP timer TRW expires. If timer TPLMTF expires prior to the detection of the attached Station’s phantom signal, the C-Port returns to its Bypass state (JS=BP). The value of TPLMTF shall be between 15 s and 18 s.

10.4.2.7 Timer, C-Port Lobe Media Test Running (TPLMTR)

Each C-Port shall have a timer TPLMTR. This timer is used in the Lobe Test state (JS=PLT) to determine if the Station's LMT has failed. If this timer expires before an Insert Request MAC frame is received from the attached Station, the C-Port changes state as follows. The C-Port enters the Registration state if Join has not already been completed during the current session (FPJC=0). The C-Port enters the Bypass state (JS=BP) if Join has already been completed during the current session (FPJC=1). The value of TPLMTR shall be between 6.0 s and 7.4 s. It is recommended that a low value from this range be used.

10.4.2.8 Timer, C-Port Queue Heart Beat (TPQHB)

Each C-Port shall have a timer TPQHB. This timer is used by the TXI Heart Beat function to stimulate the transmission of a PHB MAC frame. The value of TPQHB shall be between 0.8 s and 1.2 s. A value of 1.0 s is recommended.

10.4.2.9 Timer, C-Port Queue PDU (TPQP)

Each C-Port shall have a pacing timer TPQP. This timer is used to schedule the transmission of Beacon MAC frames when in the Transmit Beacon state (MS=PTBN). The value of TPQP shall be between 10 ms and 30 ms. A value of 20 ms is recommended.

10.4.2.10 Timer, C-Port Received Heart Beat (TPRHB)

Each C-Port shall have a timer TPRHB. This timer is used by the TXI Heart Beat function to detect the absence of a Station Heart Beat MAC frame. While the Heart Beat Process is active (FPHBA=1), this timer is reset each time a Station Heart Beat MAC frame is received. If this timer expires while the Heart Beat Process is active, the C-Port Monitor state machine begins the Hard Error Recovery process by entering the Transmit Beacon state (MS=PTBN). The value of TPRHB shall be between 4.8 s and 5.2 s. A value of 5.0 s is recommended.

10.4.2.11 Timer, C-Port Registration Query Delay (TPRQD)

Each C-Port shall have a timer TPRQD. This timer is used to allow the C-Port sufficient time to detect loss of phantom signaling after the last transmission of the Registration Query MAC frame. The value of TPRQD shall be between 20 ms and 200 ms, and the timer should be set to a value greater than the time required by the C-Port to detect the loss of phantom signaling.

10.4.2.12 Timer, C-Port Signal Loss (TPSL)

Each C-Port shall have a timer TPSL. This timer is used to determine whether or not the PPHY "Signal_loss" condition is in a steady state. The value of TPSL shall be between 200 ms and 250 ms.

10.4.3 Optional timers

10.4.3.1 Timer, Station Lobe Media Test Running (TLMTR)

The timer TLMTR is used by the C-Port in Station Emulation mode using the TKP access protocol. TLMTR prevents the C-Port in Station Emulation Mode Lobe Media Test or Beacon Test functions from exceeding the time allowed by the C-Port in Port mode. When timer TLMTR expires in either the Lobe Test state (JS=LT) or the Beacon Test state (MS=BNT), the C-Port returns to the Bypass state (JS=BP).

The value of TLMTR is the maximum time required for the Station to accomplish

a) The LMT (JS=LT) or
b) The Internal Test and LMT (MS=BNT).

10.5 Policy flags and variables

10.5.1 Station policy flags and variables

The Station policy flags and variables defined in this subclause are used by both a DTR Station and a C-Port in Station Emulation mode using the TXI access protocol.

10.5.1.1 Station policy flag definitions

The Station policy flags ("O"-suffix acronym) are set externally to the SMAC (see clause 11) and are not changed by the SMAC FSMs.

10.5.1.1.1 Flag, Station Error Counting Option (FSECO)

A Station accumulates errors for a period determined by the Station error report timer (TSER) and reports all errors that occurred during that period. If FSECO is set to 0, the Station resets TSER when the first error is received and, when TSER expires, transmits a Report Error MAC frame. If FSECO is set to 1, each time TSER expires the Station resets TSER and, if any of the error counters are not zero, transmits a Report Error MAC frame.

10.5.1.1.2 Flag, Station Medium Rate Option (FSMRO)

The flag FSMRO is used to indicate the operating speed of the Station as follows. If flag FSMRO is set to 1, the Station shall operate at 16 Mbit/s. If flag FSMRO is set to 0, the Station shall operate at 4 Mbit/s.

10.5.1.1.3 Flag, Station Open Option (FSOPO)

The flag FSOPO is used to control the actions of the Station when a REG_RSP MAC frame is not received during the Registration process (TSREQ=E & CSREQ=0). If FSOPO is set to 0, the Station switches from supporting the TXI access protocol and shall attempt to support the TKP access protocol as defined by clause 4 (Classic station) or 9.6 (DTR Station) by entering the Lobe Test state (JS=LT). If FSOPO is set to 1, the Station is not allowed to switch access protocols and enters the Bypass state (JS=BP).

10.5.1.1.4 Flag, Station Registration Denied Option (FSRDO)

The flag FSRDO determines the Station's action when the C-Port's Registration Response MAC frame indicates that the Station's registration request to use the TXI access protocol has been denied. If FSRDO is set to 0, then the Station shall attempt to Join using the TKP access protocol by entering the Lobe Test state (JS=LT). If FSRDO is set to 1, the Station shall not attempt to use the TKP access protocol and enters the Bypass state (JS=BP).

10.5.1.1.5 Flag, Station Registration Option (FSREGO)

The flag FSREGO controls whether the Station or the C-Port in Station Emulation mode registers with the C-Port to request use of an access protocol and a method of phantom signaling and wire fault detection. If the value of FSREGO is 0, then registration does not take place, and Stations join using the Join FSM in clause 4 or 9.6. If the value of FSREGO is 1, then registration does take place. A Station joins using the Join FSM in 9.2.

10.5.1.1.6 Flag, Station Registration Query Option (FSRQO)

The flag FSRQO is used to indicate whether the Station supports the registration query protocol. If FSRQO is set to 1, the Station shall support the registration query protocol. If FSRQO is set to 0, the Station shall ignore any received Registration Query MAC frames.

10.5.1.1.7 Flag, Station Reject Remove Option (FSRRO)

The flag FSRRO controls how the Station responds to a Remove Ring Station MAC frame. If the value of FSRRO is 0, the Station will remove from the ring. If the value of FSRRO is 1, the Station will send a Response MAC frame indicating that the function is disabled.

10.5.1.2 Station policy variable definitions

Station policy variables are similar to policy flags. They are set by Management prior to Connect.SMAC and are not altered by the SMAC. The permitted values are specified in table 10-16.

Table 10-16—Station policy variables

Variable	Permitted values	Description
SPV(AP_MASK)	A value of X'0001' shall indicate the TKP access protocol is being supported. A value of X'0002' shall indicate the TXI access protocol is being supported. A value of X'0003' shall indicate that both the TKP and TXI access protocols are supported. The Station shall not use any other value of SPV(AP_MASK).	The Station policy variable SPV(AP_MASK) represents the mask used to indicate which access protocols are being supported.
SPV(IAC)	A value of X'0000' shall be used by a Station, indicating that only the Station's SMAC address is being supported.	The Station policy variable SPV(IAC) represents the number of individual addresses supported by the Station.
SPV(MAX_TX)	At 4 Mbit/s, the maximum permitted value is 4550. At 16 Mbit/s, the maximum permitted value is 18 200.	The Station policy variable SPV(MAX_TX) represents the maximum octet transmit count the Station can support. A Station may support a value or a value range for this variable, provided these values do not exceed the maximum frame size permitted by the medium rate. When a Station is assigned a value range, a single point within the range is used during magnitude comparisons. An implementation is not required to use same point for each comparison.
SPV(PD)	A value of X'0001' indicates that the Station supports phantom signaling and wire fault detection as described in ISO/IEC 8802-5 : 1998. All other values of SPV(PD) are reserved for future standardization.	The Station Policy Variable SPV(PD) describes which method of phantom signaling and wire fault detection is in use by the Station. The value is a bit mask, and only a single bit shall be set.

10.5.1.3 Allowable Station policy flag and variable settings

The Station policy flags and variables defined in the previous two subclauses have interdependencies that implementors should take into account. The following assertions shall be true in a Station implementation.

FSOPO=0	⇒	AND(SPV(AP_MASK), X'0001') = X'0001'
FSREGO=0	⇒	AND(SPV(AP_MASK), X'0001') = X'0001'
FSREGO=1	⇒	AND(SPV(AP_MASK), X'0002') = X'0002'
FSRDO=0	⇒	AND(SPV(AP_MASK), X'0001') = X'0001'
FSRQO=1	⇒	AND(SPV(AP_MASK), X'0002') = X'0002' and FSREGO=1

10.5.2 C-Port policy flags and variables

The following subclauses define the C-Port policy flags and policy variables. The C-Port protocol flags are defined in 9.3. The C-Port interface flags are defined in 9.1.

10.5.2.1 C-Port policy flag definitions

The C-Port policy flags ("O"-suffix acronym) are set externally to the PMAC (see clause 12) and are not changed by the PMAC FSMs.

10.5.2.1.1 Flag, C-Port AC Repeat Path Option (FPACO)

When an FPACO is set to 1, a C-Port repeat path shall set the A bits to 1 when a non-null destination address is recognized by the C-Port and shall set the C bits to 1 when the flame is copied. When FPACO is set to 0, a C-Port repeat path shall not set the A and C bits to 1 when a non-null destination address is recognized by the C-Port.

10.5.2.1.2 Flag, C-Port Abort Sequence Option (FPASO)

This flag is used to control the ending sequence for over-length frames when cut-through operation is supported by the PMAC. When FPASO is set to 0, an over-length frame is ended with an abort sequence. When FPASO is set to 1, an over-length frame is ended with an invalid FCS and by setting the Error Detected bit (E) in the Ending Delimiter field.

10.5.2.1.3 Flag, C-Port Beacon Handling Option (FPBHO)

The flag FPBHO is used to indicate how the C-Port handles participation in beaconing prior to the C-Port completing the Join process (JS=PJCP) while using the TKP access protocol. The C-Port may begin to participate in the beaconing process as follows:

a) If FPBHO is set to 0, upon completion of neighbor notification;
b) If FPBHO is set to 1, upon entry to the Join Complete State (JS=PJCP).

10.5.2.1.4 Flag, C-Port Error Counting Option (FPECO)

The C-Port accumulates errors for a period determined by the error report timer (TPER) and reports all errors that occurred during that period. If FPECO is set to 0, the C-Port resets TPER when the first error is detected and, when TPER expires, issues an Error Report MAC frame to the MRI. If FPECO is set to 1, each time TPER expires the C-Port resets TPER and, if any of the error counters are not zero, sends an Error Report MAC frame to the MRI.

10.5.2.1.5 Flag, C-Port Frame Control Option (FPFCO)

The flag FPFCO is used to control the forwarding of frames to the DTU interface. When FPFCO is set to 1, the event FR_FC causes the frame currently being received to be indicated to the DTU. When FPFCO is set to 0, the event FR causes the received frame to be indicated to the DTU. A C-Port using cut-through operation requires FPFCO to be set to 1.

10.5.2.1.6 Flag, C-Port Medium Rate Option (FPMRO)

The flag FPMRO is used to indicate the operating speed of the C-Port as follows: If flag FPMRO is set to 1, the C-Port shall operate at 16 Mbit/s. If flag FPMRO is set to 0, the C-Port shall operate at 4 Mbit/s.

10.5.2.1.7 Flag, C-Port Operation Table Option (FPOTO)

The flag FPOTO is used to determine whether the C-Port operates in Port mode or in Station Emulation mode. If the value of FPOTO is 1, then the C-Port operates in Port mode. If the value of FPOTO is 0, then the C-Port operates in Station Emulation mode.

10.5.2.2 C-Port policy variable definitions

C-Port policy variables are similar to policy flags. They are set by Management prior to Connect.PMAC and are not altered by the PMAC. The permitted values are specified in table 10-17.

Table 10-17—C-Port policy variables

Variable	Permitted values	Description
PPV(AP_MASK)	A value of X'0001' shall indicate the TKP access protocol is supported. A value of X'0002' shall indicate the TXI access protocol is supported. A value of X'0003' shall indicate that both the TKP and TXI access protocols are supported. The C-Port shall not use any other value of PPV(AP_MASK).	The C-Port policy variable PPV(AP_MASK) represents the mask used to indicate which access protocols are being supported. The C-Port uses the variable to determine whether it can support the Station's access protocol request. The details on how the C-Port determines if the AP request is acceptable are provided in 9.1.4.2.
PPV(MAX_TX)	At 4 Mbit/s, the maximum permitted value is 4550. At 16 Mbit/s, the maximum permitted value is 18 200.	The C-Port policy variable PPV(MAX_TX) represents the maximum octet transmit count the C-Port can support. A C-Port may support a value or a value range for this variable, provided these values do not exceed the maximum frame size permitted by the medium rate. When a C-Port is assigned a value range, a single point within the range is used during magnitude comparisons. An implementation is not required to use same point for each comparison.
PPV(PD_MASK)	A 2-octet mask, where bits that are permitted to be set are defined by SPV(PD). All other bit positions are reserved for future standardization.	The C-Port policy variable PPV(PD_MASK) represents a bit mask of phantom signaling and wire fault detection methods supported by the C-Port. Multiple bits may be set in PPV(PD_MASK) representing all the methods supported by the C-Port.

10.6 Error counters

An error counter ("E"-suffix acronym) is incremented when a particular error condition occurs and is set to zero (0) when the value of the error counter is reported. These counters have a range of 0 to 255. When the count reaches 255 (X'FF'), the count freezes until its value is reported.

10.6.1 Station error counters for the TXI access protocol

The following error counters are used by the Station while operating using the TXI access protocol.

10.6.1.1 Counter, Station Abort Error (CSABE)

The counter CSABE is incremented when the Station prematurely ends a transmission by transmitting an abort sequence.

10.6.1.2 Counter, Station Burst Error (CSBE)

A Burst5_error is indicated when the Station detects the absence of transitions at the receiver input (see 5.4.2). During a single period of signal interruption, multiple burst errors are often indicated due to random noise. To aid in problem determination, the counter CSBE is only required to be incremented once during each interval of signal disruption. The counter may be inhibited after a Burst5_error has been indicated until an event occurs that indicates the Station is receiving a valid signal. At a minimum, the reception of a MAC frame addressed to the Station shall enable the counting of CSBE. Alternative events include the reception of an SD, the reception of an ED, or either. A Station may count every Burst5_error.

10.6.1.3 Counter, Station Frequency Error (CSFE)

The counter CSFE is incremented when a frequency error is indicated by the Station PHY.

10.6.1.4 Counter, Station Internal Error (CSIE)

The counter CSIE is incremented when the Station recognizes a recoverable internal error. Reports of this error may be used to identify a Station in marginal operating condition.

10.6.1.5 Counter, Station Line Error (CSLE)

The counter CSLE is incremented when a frame with error (FR_WITH_ERR) is received by the Station.

10.6.1.6 Counter, Station Receive Congestion Error (CSRCE)

The counter CSRCE is incremented when a frame addressed to the Station is not copied.

10.6.2 C-Port Error Counters for the TXI access protocol

The following error counters are used by the C-Port while operating using the TXI access protocol.

10.6.2.1 Counter, C-Port Abort Error (CPABE)

The counter CPABE is incremented when the C-Port ends a transmission by transmitting an abort sequence.

10.6.2.2 Counter, C-Port Burst Error (CPBE)

A Burst5_error is indicated when the C-Port detects the absence of transitions at its receiver input (see 5.4.2). During a single period of signal interruption, multiple burst errors are often indicated due to random noise. To aid in problem determination, the counter CPBE is only required to be incremented once during each interval of signal disruption. The counter may be inhibited after a Burst5_error has been indicated until an event occurs that indicates the C-Port is receiving a valid signal. At a minimum, the reception of a MAC frame copied by the C-Port shall enable the counting of CPBE. Alternative events include the reception of an SD, the reception of an ED, or either. A C-Port may count every Burst5_error.

10.6.2.3 Counter, C-Port Frequency Error (CPFE)

The counter CPFE is incremented when a frequency error is indicated by the C-Port PHY.

10.6.2.4 Counter, C-Port Internal Error (CPIE)

The counter CPIE is incremented when the C-Port recognizes a recoverable internal error. Reports of this error may be used to identify a C-Port in marginal operating condition.

10.6.2.5 Counter, C-Port Line Error (CPLE)

The counter CPLE is incremented when a frame with error (FR_WITH_ERR) is received by the C-Port.

10.6.2.6 Counter, C-Port Receive Congestion Error (CPRCE)

The counter CPRCE is incremented when a frame addressed to the C-Port is not copied.

11. DTR Station and C-Port management

This clause specifies the Layer Management for DTR Stations and C-Ports (in Port mode and in Station Emulation mode) when operating using the TXI or TKP access protocol specified in clause 9. This clause supplements the information provided in clause 6.

The relationship between the SMAC, PMAC, and other layer entities is illustrated in figure 11-1. The boxed numbers in the figure give the subclause number or annex letter specifying the interface between adjacent sublayers. The circled numbers in the figure give the subclause specifying that sublayer's management definitions.

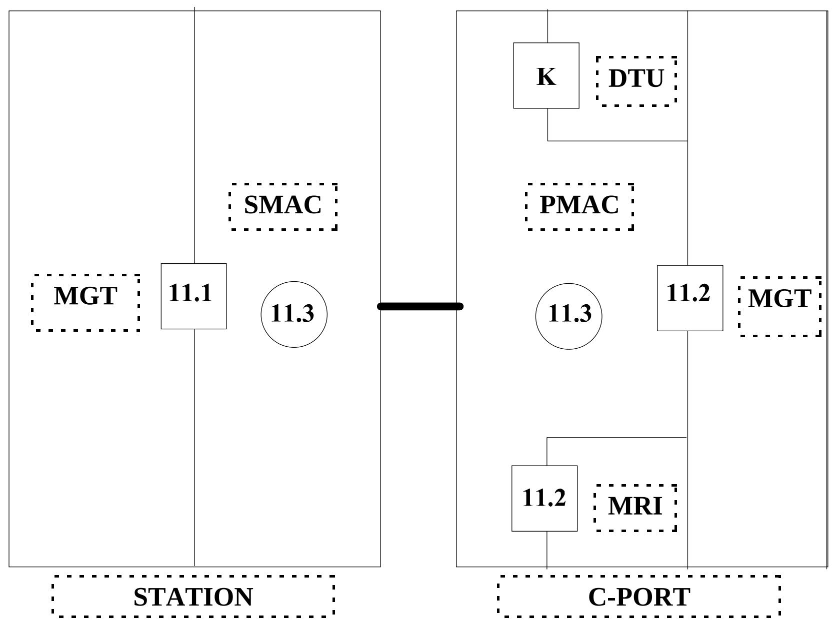


Figure 11-1—Layer Management organization

11.1 DTR Station management

11.1.1 Introduction

DTR Station management specifies the interface between the SMAC sublayer and the system management entity (MGT). The interface between the SMAC and MGT is defined using service primitives that specify management operations used to configure and monitor the operation of the SMAC. The parameters associated with each service primitive allow the exchange of information between the SMAC and MGT. Together, the services and parameters are defined in an SNMP management information base (MIB), using the notation and guidelines specified in IETF RFC1902.

11.1.2 DTR Station services

This subclause specifies the management services provided by the SMAC, which are categorized into operational services and notification services.

Operational services are specified in terms of primitives and can be regarded as commands to the SMAC to perform a specific function. The operational services specified in this subclause are as follows:

— MGT_ACTION
— MGT_SET
— MGT_GET

Notification services are used by the SMAC to notify management when an event has occurred. The notification services specified in this subclause are as follows:

— MGT_EVENT_REPORT
— MGT_UNITDATA

Management services operate in either a confirmed or non-confirmed mode. When management services operate in a confirmed mode, a reply is expected by the requester. The requester expects no reply to non-confirmed services. Table 11-1 specifies the confirmation mode of the services specified for a DTR SMAC.

Table 11-1—DTR services confirmation mode

Service	Confirmed mode
MGT_ACTION	YES
MGT-SET	YES
MGT_GET	YES
MGT_EVENT_REPORT	NO
MGT_UNITDATA	NO

The SMAC is required to implement the MGT_ACTION and MGT_UNITDATA services. Remaining services and parameters are defined only for interoperability with other standards, and are required only as specified by other applications.

Service primitives can optionally pass parameters when invoked. Parameters for service primitives are sets of elements, with each parameter set containing either a null, single, or multiple elements. Elements in a parameter set are specified as either mandatory or conditional.

11.1.2.1 MGT_ACTION

An MGT_ACTION.request service is invoked by the management entity when requesting the SMAC to either start the Join FSM or enter into the Bypass state. This service is always confirmed with an MGT_ACTION.response action.

11.1.2.1.1 MGT_ACTION.request

The semantics for the MGT_ACTION.request service primitives are defined as follows:

```
MGT_ACTION.request {  actionRequestType,
                      actionRequestParameters }
```


The parameters for MGT_ACTION.request are defined below.

actionRequestType

The values for the actionRequestType parameter are defined as follows:

- **Open.** The Open action is used by management to request the SMAC to start the Join FSM. This action issues the Connect.MAC event to the SMAC.
- **Close.** The Close action is used by the management to request the SMAC to enter into the Bypass state. This action issues the Disconnect.MAC event to the SMAC.

The actionRequestType is a mandatory parameter.

actionRequestParameters

Table 11-2 specifies the set of elements of the actionRequestParameters.

Table 11-2—actionRequestParameters

actionRequestParameters	Mandatory/conditional
RequestAccessProtocol	Conditional
RequestIndividualAddress	Conditional
RequestMediumRate	Conditional
RequestAccessProtocolMask	Conditional

RequestAccessProtocol

The RequestAccessProtocol parameter specifies the access protocol to be requested during the SMAC registration process. The only value of this parameter is TXI. This parameter determines the value of the access protocol request subvector X'0E' transmitted in the Registration Request MAC frame. The AccessProtocolRequest parameter can only be set using the MGT_ACTION.request(Open) primitive; this parameter cannot be changed while the SMAC is active.

The RequestAccessProtocol parameter is a conditional parameter and is not required when invoking MGT_ACTION.request(Open) service. When this parameter is not specified, the SMAC determines which access protocol is requested during the registration process.

When the MGT_ACTION.request(Open) service is successful, the MGT_ACTION.response(Open) service primitives includes the ResponseStatus parameter indicating success and the ResponseAccessProtocol parameter indicating TXI access protocol. When the MGT_ACTION.request(Open) is unsuccessful, the MGT_ACTION.response(Close) service primitive includes the ResponseStatus parameter indicating the reason for failure.

RequestIndividualAddress

The RequestIndividualAddress parameter specifies the individual address to be used in the source address field of MAC frames originated by the SMAC. The individual address may be a locally administered address assigned by a system administrator or a UniversallyAdministeredAddress assigned by a manufacturer. This parameter may only be set by the MGT_ACTION.request(Open) primitive and cannot be changed while the SMAC is active.

The Request Individual Address parameter is a conditional parameter whose use is not required to be specified when this service is invoked. When this is not used, the SMAC will use the UniversallyAdministeredAddress MAC address, if one has been assigned by the manufacturer.

If the action completes successfully, the individual address in use by the SMAC will be returned by the MGT_ACTION.response service primitive in the ResponseIndividualAddress parameter.

RequestMediumRate

The RequestMediumRate parameter specifies the medium data rate to be used by the SMAC as either 4 Mbit/s or 16 Mbit/s. This parameter may be set only by the MGT_ACTION.request(Open) service and is used to set the value of the FSMRO flag. This parameter cannot be changed while the SMAC is active.

The RequestMediumRate parameter is a conditional parameter and is not required to be specified when invoking the MGT_ACTION.request(OPEN) service.

When the MGT_ACTION.request(OPEN) service completes successfully, the value returned in the MGT_ACTION.response parameter ResponseMediumRate indicates the current value of the FSMRO flag.

RequestAccessProtocolMask

The RequestAccessProtocolMask parameter specifies the access protocols allowed to be registered by the SMAC. This parameter is used to set the value of the SPV(AP_MASK) variable. The value of this parameter is either TKP, TXI, or TKPAndTXI as defined in 11.3. The RequestAccessProtocolMask parameter can only be set by the MGT_ACTION.request(Open) service and cannot be changed while the SMAC is active. The RequestAccessProtocolMask parameter is a conditional parameter and is not required to be specified when invoking this service, and, when not supplied, the SMAC will select the access protocol to be used.

When the MGT_ACTION.request(Open) service completes successfully, the value of the access protocol mask used by the SMAC will be returned by the MGT_ACTION.response service primitive in the ResponseAccessProtocolMask parameter.

11.1.2.1.2 MGT_ACTION.response

This service is invoked by the SMAC to notify management that a MGT_ACTION.request has completed.

The semantics for the MGT_ACTION.response service primitives are defined as follows:

```
MGT_ACTION.response { actionResponseType,
                      actionResponseParameters }
```

The parameters for MGT_ACTION.response are defined below.

actionResponseType

The values for the actionResponseType parameter are defined as follows:

- **Open.** The Open action is used to indicate that this is a response to a MGT_ACTION.request(Open) service request. This action is indicated after the SMAC has completed the Join process and is in the Join Complete state.
- **Close.** This action indicates that this is a response to a MGT_ACTION.request(Close) service request. This action is indicated after the SMAC has entered into the Bypass state.

The actionResponseType parameter is a mandatory parameter.

actionResponseParameters

Table 11-3 specifies the set of elements of the actionResponseParameters.

Table 11-3—actionResponseParameters

actionResponseParameters	Mandatory/conditional
ResponseStatus	Mandatory
ResponseAccessProtocol	Conditional
ResponseIndividualAddress	Conditional
ResponseMediumRate	Conditional
ResponseUNA	Conditional
ResponseAccessProtocolMask	Conditional

ResponseStatus

The values for the ResponseStatus parameter are defined in table 11-4. The ResponseStatus parameter is mandatory and must always be present. The return value of the ResponseStatus when ResponseAction is Close is always sSuccess.

Table 11-4—ResponseStatus parameter

Status	Table 9-1 REF	Definition
sSuccess	3145	Successful
sInvalidAddress	n/a	MAC address is invalid (group or not specified)
sRateNotSupported	n/a	The requested data rate is not supported
sStandbyReceived	3161, 3162, 3165	Standby frame received
sBeaconReceived	3110, 3124, 3134	Beacon frame received
sClaimReceived	3111, 3125, 3135	Claim frame received
sProtocolNotSupported	3113	Requested access protocol rejected
sRemoveReceived	3115, 3126, 3139	Remove frame received
sPurgeReceived	3116, 3127, 3140	Purge frame received
sInternalError	3117, 3128, 3141	Internal error
sStationError	3118, 3129, 3142	Station error
sRegistrationTimeout	3120, 3169	Registration request timeout, TSREQ=E
sLobeTestFailure	3130	Lobe test failure
sLobeTestTimeout	3131	Lobe test timeout, TSLMC=E
sHeartBeatReceived	3136, 3160, 3164	Premature or SA<>SUA Heart Beat frame received
sDuplicateAddressFailure	3138	Duplicate address check failure
sJoinTimeout	3143	Join complete timeout, TSJC=E
sHeartBeatTimeout	3144	No heart beat, TSRHB=E
sInvalidSourceAddress	3101, 3102, 3103, 3107, 3112, 3137	Protocol check—SUA mismatch (see 9.1.2)

ResponseAccessProtocol

The ResponseAccessProtocol parameter is a conditional parameter that is returned only when the value of the ResponseStatus parameter is either sSuccess or sProtocolNotSupported. The values defined for AccessProtocolResponse are TXI or access denied. The ResponseAccessProtocol parameter can be set only by the SMAC and contains the same value as the access protocol response subvector X'0F' in the Registration Response MAC frame received by the SMAC.

When the ResponseStatus is sSuccess, the ResponseAccessProtocol parameter value indicates the TXI access protocol, the phantom signaling, and wire fault support method were accepted. If the ResponseStatus is sProtocolNotSupported, then the ResponseAccessProtocol parameter value indicates the access protocol was rejected during registration.

ResponseIndividualAddress

The ResponseIndividualAddress parameter is a conditional parameter that may be returned only when the value of the ResponseStatus parameter is sSuccess. The value of this parameter may be a locally administered address assigned by a system administrator or a UniversallyAdministeredAddress assigned by a manufacturer. This parameter specifies the individual address used in the source address field of MAC frames originated by the SMAC.

If a locally administered address was specified in the RequestIndividualAddress parameter of the MGT_ACTION.request service, the same value is returned in the ResponseIndividualAddress parameter.

When the address specified in the RequestIndividualAddress in the MGT_ACTION.request is not a locally administered address, then the value returned in the ResponseStatus parameter is sInvalidAddress.

When the RequestIndividualAddress parameter is not specified in the MGT_ACTION.request service and a universal address has been assigned by the manufacturer, the value returned in the ResponseIndividualAddress is the universally assigned address. When no universal address has been assigned by the manufacturer, then the value returned in the ResponseStatus parameters is sInvalidAddress.

ResponseMediumRate

The ResponseMediumRate parameter is a conditional parameter that may be returned only when the value of the ResponseStatus parameter is sSuccess. This parameter specifies the medium rate as either 4 Mbit/s or 16 Mbit/s. When returned, the value of the ResponseMediumRate parameter indicates the current operating data rate of the SMAC.

When the value of the ResponseStatus parameter is sSuccess and no RequestMediumRate was specified in the MGT_ACTION.request service, then the value returned in the ResponseMediumRate is the current operating data rate.

When the RequestMediumRate specified in the MGT_ACTION.request service is not supported by the SMAC, then the status returned in the MGT_ACTION.response is sRateNotSupported.

ResponseUNA

The ResponseUNA parameter is a conditional parameter that may be returned only when the value of the ResponseStatus parameter is sSuccess. When returned, the value of the ResponseUNA parameter indicates the SMAC upstream neighbor's address (UNA) and is derived from the source address of the Registration Response MAC frame received by the SMAC. The value of this parameter is stored by the SMAC as the stored upstream address.

ResponseAccessRequestMask

The ResponseAccessRequestMask parameter is a conditional parameter that may be returned only when the value of the ResponseStatus parameter is sSuccess. When the MGT_ACTION.request(Open) service completes successfully, the value of the access protocol mask used by the SMAC will be returned by the MGT_ACTION.response service primitive in the ResponseAccessProtocolMask parameter.

11.1.2.2 MGT_EVENT_REPORT

This service is invoked by the SMAC to notify management that a significant change in the operational state of the SMAC has occurred. This service operates as a non-confirmed service.

11.1.2.2.1 MGT_EVENT_REPORT.request

The semantics for the MGT_EVENT_REPORT.request service primitive are defined as follows:

MGT_EVENT_REPORT.request { eventRequestType,
eventRequestParameters }

eventRequestType

The eventRequestType parameter is a mandatory parameter. The values for the eventRequestType parameter are defined as follows:

— **StationOperational.** This event is indicated when the SMAC transitions from a non-operational to an operational state.
— **StationNonOperational.** This event is indicated when the SMAC transitions from an operational to a non-operational state. When this event occurs, the SMAC is attempting to recover from an operational error.
— **StationFailure.** This event is indicated by the SMAC to notify Management that a fault has occurred causing the Station to return to the Bypass state.
— **ProtocolError.** This event is indicated by the SMAC to notify Management that the Station, while operating using the TXI access protocol, has detected a MAC frame that is only used by the TKP access protocol.

eventRequestParameters

Table 11-5 specifies the set of elements of the eventRequestParameters.

Table 11-5—eventRequestParameters

eventRequestParameters	Mandatory/conditional
EventStatus	Mandatory
BeaconInfo	Conditional
ErrorCounters	Conditional

EventStatus

The values for the EventStatus parameter are defined in Table 11-6.

Table 11-6—EventStatus parameter

EventStatus	Table 9-1 REF	Definition
sMACInsertRSPReceived	3145, 3319	nStationOperational
sReportError	3432, 3433	nStationOperational
sHeartBeatLost	3314 (FSSL=0)	nStationNonOperational
sSignalLoss	3314 (FSSL=1)	nStationNonOperational
sBeaconReceived	3316, 3318	nStationNonOperational
sRemove	3153	nStationFailure
sInternalError	3155, 3147	nStationFailure
sStationError	3156	nStationFailure
sWireFault	3157	nStationFailure
sClaimReceived	3151	nProtocolError
sPurgeReceived	3154	nProtocolError
sStandbyReceived	3163	nProtocolError
sInvalidSourceAddress	3146, 3148, 3152	nProtocolError

BeaconInfo

The BeaconInfo parameter is a conditional parameter, used only when the value of the EventStatus parameter is either sHeartBeatLost, sSignalLoss, or sBeaconReceived and contains the information provided in table 11-7.

Table 11-7—BeaconInfo parameter

BeaconInfo parameter	Mandatory/conditional
BeaconSA	Mandatory
BeaconType	Mandatory
BeaconUNA	Mandatory
BeaconPDN	Mandatory

When the EventStatus is sHeartBeatLost or sSignalLoss, the values in the BeaconInfo parameter represent those of the last transmitted Beacon MAC frame.

If the EventStatus is sBeaconReceived, the values in the BeaconInfo parameter represent those contained in the last received Beacon MAC frame.

This parameter indicates the following information contained in the last Beacon MAC frame transmitted or received.

— The SA used in the Beacon MAC frame.
— The value of the Beacon Type subvector X'01' used in the Beacon MAC frame.
— The value of the UNA subvector X'02' used in the Beacon MAC frame.
— The value of the Physical Drop Number subvector X'0B' used in the Beacon MAC frame.

ErrorCounters

The ErrorCounters parameter is a conditional parameter that is used only when the value of the EventStatus parameter is sReportErrors. This parameter contains the sequence of information depicted in table 11-8.

Table 11-8—ErrorCounters parameter

ErrorCounters parameter	Mandatory/conditional
AbortErrorCounter	Mandatory
BurstErrorCounter	Mandatory
FrequencyErrorCounter	Mandatory
InternalErrorCounter	Mandatory
LineErrorCounter	Mandatory
ReceiveErrorCounter	Mandatory
OverlengthFrameCounter	Mandatory

11.1.2.3 MGT_SET

The MGT_SET service modifies variable values. The parameters used with this service indicate the variables to be changed and the desired values of the variables. Conditional variables specified as read-write may not be present and therefore may not change. This service always operates in a confirmed mode.

11.1.2.3.1 MGT_SET.request

The semantics for the MGT_SET.request service primitive are defined as follows:

MGT_SET.request { objectName, objectValue }

objectName

The objectName parameter specifies the object name to be modified. The object names and values that can be specified as parameters are defined in 11.3.1.

objectValue

The objectValue parameter contains the object value following the modification. The object names and values that can be specified as parameters are defined in 11.3.1.

11.1.2.3.2 MGT_SET.response

The MGT_SET.response is issued in reply to a MGT_SET.request.

The semantics for the MGT_SET.response service primitive are defined as follows:

MGT_SET.response{ objectName, objectValue }

objectName

The objectName parameter contains the object name that was modified. The object names and values that can be specified as parameters are defined in 11.3.1.

objectValue

The objectValue parameter contains the object value following the modification. The object names and values that can be specified as parameters are defined in 11.3.1.

11.1.2.4 MGT_GET

The MGT_GET service requests the value of an variable. The parameters used with this service indicate the variables whose values are to be returned in the response. Conditional parameters specified as read-only may not be present and therefore may not be returned. This service always operates in a confirmed mode.

11.1.2.4.1 MGT_GET.request

The semantics for the MGT_GET.request service primitive are defined as follows:

MGT_GET.request { objectNameList }

objectNameList

The objectNameList parameter specifies the set of object names for which variable values are to be returned. The object names that can be specified as parameters are defined in 11.3.1.

11.1.2.4.2 MGT_GET.response

The MGT_GET.response is issued in reply to a MGT_GET.request.

The semantics for the MGT_GET.response service primitive are defined as follows:

MGT_GET.response { objectList }

objectList

The objectList parameter contains the set of object names and values that are returned in response to a MGT_GET.request service. The object names and values that can be specified as parameters are defined in 11.3.1.

11.1.2.5 MGT_UNITDATA

The MGT_UNITDATA service primitive specifies the services and interfaces provided by the SMAC to the management entity for transmitting and receiving management MAC frames.

11.1.2.5.1 MGT_UNITDATA.request

This service is invoked by the management entity to request the SMAC to compose and transmit a MAC frame using the information provided in the parameters. The SMAC will only transmit frames through this interface that have a source class not equal to zero (REF 3514). When the source class is zero, the SMAC will discard the frame, not transmitting it (REF 3515).

The semantics for the MGT_UNITDATA.request service primitive are defined as follows:

```
MGT_UNITDATA.request {  macFrameControl,
                        destinationAddress,
                        sourceAddress,
                        routingInformation,
                        macInformation,
                        frameCheckSequence }
```

macFrameControl

The macFrameControl parameter specifies the value to be used in the frame control field by the SMAC when composing the MAC frame for transmission. The structure and content of this field shall conform to the FC field specified in 3.2.3.

destinationAddress

The destinationAddress parameter is any valid individual, group, functional, or broadcast address. The structure and contents of this parameter shall conform to the DA field specified in 3.2.4.1.

sourceAddress

The sourceAddress parameter specifies the individual address to be used in the source address field by the SMAC when composing the MAC frame for transmission. The structure and contents of this parameter shall conform to the SA field specified in 3.2.4.2.

routingInformation

The routingInformation parameter is optional and used only when the routing information indicator is set in the sourceAddress parameter. When used, the structure and contents of this parameter shall conform to the RI field specified in 3.2.5.

macInformation

The structure and contents of the macInformation parameter shall conform to the MAC frame information field format specified in 3.3.2 as modified by 10.3.

frameCheckSequence

The frameCheckSequence parameter is optional. When used, the frameCheckSequence parameter specifies the value to be used in the FCS by the SMAC when composing the MAC frame for transmission. When unspecified, the SMAC shall calculate and transmit a valid FCS field as specified in 3.2.7.

11.1.2.5.2 MGT_UNITDATA.indication

This service is invoked by the SMAC to notify the management entity that it has received a MAC frame that has a destination address that matches either an individual address, group address, or functional address active in the SMAC and has a destination class not equal to zero in the Vector Class field (REF 3503).

The semantics for the MGT-EVENT.indication service primitive are defined as follows:

```
MGT_UNITDATA.indication { macFrameControl,
                          destinationAddress,
                          sourceAddress,
                          routingInformation,
                          macInformation,
                          frameCheckSequence }
```

macFrameControl

The macFrameControl parameter indicates the value of the frame control field of the received MAC frame. The structure and content of this field shall conform to the FC field specified in 3.2.3.

destinationAddress

The destinationAddress parameter is any valid individual, group, functional, or broadcast address. The structure and contents of this parameter shall conform to the DA field specified in 3.2.4.1.

sourceAddress

The sourceAddress parameter is the individual address of the MAC that originated the frame. The structure and contents of this parameter shall conform to the SA field specified in 3.2.4.2.

routingInformation

The routingInformation parameter is optional and used only when the routing information indicator is set in the sourceAddress parameter. When used, the structure and contents of this parameter shall conform to the RI field specified in 3.2.5.

macInformation

The structure and contents of the macInformation parameter shall conform to the MAC frame information field format specified in 3.3.2 as modified by 10.3.

frameCheckSequence

The frameCheckSequence parameter specifies the frame-check sequence value of the received MAC frame. The structure and content of this parameter shall conform to the FCS field specified in 3.2.7.

11.2 C-Port management

11.2.1 Introduction

C-Port management specifies the management objects and interfaces between the PMAC sublayer, and the system management entity (MGT) and management routing interface entity (MRI). The interface between the PMAC and other sublayer entities is defined using service primitives. Service primitives define management operations used to configure and monitor the operation of the PMAC. Associated with each service primitive are parameters that allow the exchange of information between entities. Together, the services and parameters are defined in an SNMP MIB, defined using the notation and guidelines specified in IETF RFC1902.

11.2.2 C-Port services

The management services provided by the PMAC are specified in this subclause. Management services are categorized into operational services and notification services.

Operational services are specified in terms of primitives and can be regarded as commands to the PMAC to perform a specific function. The operational services specified in this subclause are as follows:

— MGT_ACTION
— MGT_SET
— MGT_GET

Notification services are used by the PMAC to notify management when an event has occurred. The notification services specified in this subclause are as follows:

— MGT_EVENT_REPORT
— MRI_UNITDATA

Management services operate in either a confirmed or non-confirmed mode. When the service is operating as a confirmed service, a reply is expected by the requester. The services MGT_ACTION, MGT_GET, and MGT_SET always operate in a confirmed mode, while MGT_EVENT_REPORT and MRI_UNITDATA always operate in a non-confirmed mode. Table 11-9 specifies the confirmation mode of the services specified for a DTR PMAC.

Table 11-9—DTR services confirmation mode

Service	Confirmed mode
MGT_ACTION	YES
MGT-SET	YES
MGT_GET	YES
MGT_EVENT_REPORT	NO
MRI_UNITDATA	NO

The MGT_ACTION service is the only service required to be implemented by the PMAC. The remaining services, and the objects associated with their parameters, are only defined for interoperability with other standards and are required only as specified by other applications.

Service primitives can optionally pass parameters when invoked. Each parameter in a service primitive specifies a set of parameters to be used in the operation. Each parameter set can contain either the null element, a single element, or multiple elements. Each element in a parameter set is specified as either mandatory or conditional.

11.2.2.1 MGT_ACTION

A MGT_ACTION.request service is invoked by the management entity when requesting the PMAC to either start the Join FSM or enter the Bypass state. This service is always confirmed with a MGT_ ACTION.response action.

11.2.2.1.1 MGT_ACTION.request

The semantics for the MGT_ACTION.request service primitives are defined as follows:

MGT_ACTION.request { actionRequestType,
actionRequestParameters }

The parameters for MGT_ACTION.request are defined below.

actionRequestType

The values for the actionRequestType parameter are defined as follows:

— **Open.** The Open action is used by Management to request the PMAC to start the Join FSM. This action issues the Connect.PMAC event to the PMAC.
— **Close.** The Close action is used by Management to request the PMAC to enter into the Bypass state. This action issues the Disconnect.PMAC event to the PMAC.

The actionRequestType is a mandatory parameter.

actionRequestParameters

Table 11-10 specifies the set of elements of the actionRequestParameters:

Table 11-10—actionRequestParameters

ActionRequestParameters	Mandatory/conditional
RequestAccessProtocolMask	Conditional
RequestIndividualAddress	Conditional
RequestMediumRate	Conditional

RequestAccessProtocolMask

The RequestAccessProtocolMask parameter specifies the access protocols allowed to be registered by the PMAC. This parameter is used by the PMAC to set the value of the PPV(AP_MASK) variable. The value of this parameter is either TKP, TXI, or TKPAndTXI. The RequestAccessProtocolMask parameter cannot be set by Management.

The RequestAccessProtocolMask parameter is a conditional parameter and is not required to be specified when invoking the MGT_ACTION.request(Open) service. When this parameter is not specified, the PMAC determines the access protocol mask.

If the MGT-ACTION.request(Open) service is successful, the MGT_ACTION.response(Open) service primitive includes the ResponseStatus parameter indicating success and the ResponseAccessProtocolMask parameter indicating the selected access protocol. When the MGT_ACTION.request(Open) is unsuccessful, the MGT_ACTION.response(Close) service primitive includes the ResponseStatus parameter indicating the reason for failure.

RequestIndividualAddress

The RequestIndividualAddress parameter specifies the individual address to be used in the SA field of MAC frames originated by the PMAC. The individual address may be a locally administered address assigned by a system administrator or a UniversallyAdministeredAddress assigned by a manufacturer. This parameter may only be set by the MGT_ACTION.request(Open) primitive and cannot be changed while the PMAC is active.

The RequestIndividualAddress parameter is a conditional parameter whose use is not required to be specified when invoking this service. When this is not used, the PMAC uses the UniversallyAdministeredAddress MAC address, if one has been assigned by the manufacturer.

If the action completes successfully, the individual address in use by the PMAC will be returned by the MGT_ACTION.response service primitive in the ResponseIndividualAddress parameter.

RequestMediumRate

The RequestMediumRate parameter specifies the medium data rate to be used by the PMAC as either 4 Mbit/s or 16 Mbit/s. This parameter may only be set by the MGT_ACTION.request(Open) service and is used to set the value of the FPMRO flag. This parameter cannot be changed while the PMAC is active.

The RequestMediumRate parameter is a conditional parameter and is not required to be specified when the MGT_ACTION.request(OPEN) service is invoked.

When the MGT_ACTION.request(OPEN) service completes successfully, the value returned in the MGT_ACTION.response parameter ResponseMediumRate indicates the current value of the FPMRO flag.

11.2.2.1.2 MGT_ACTION.response

This service is invoked by the PMAC to notify Management that a MGT_ACTION.request has completed.

The semantics for the MGT_ACTION.response service primitives are defined as follows:

```
MGT_ACTION.response { actionResponseType,
                      actionResponseParameters }
```

The parameters for MGT_ACTION.response are defined below.

actionResponseType

The values for the actionResponseType parameter are defined as follows:

- **Open.** The Open action is used to indicate that this is a response to a MGT_ACTION.request(Open) service request. This action is indicated after the PMAC has completed the Join process and is in a Join Complete state.
- **Close.** This action indicates that this is a response to a MGT_ACTION.request(Close) service request. This action is indicated after the PMAC has entered the Bypass state.

The actionResponseType parameter is a mandatory parameter.

actionResponseParameters

Table 11-11 specifies the set of elements of the actionResponseParameters:

Table 11-11—actionResponseParameters

ActionResponseParameters	Mandatory/conditional
ResponseStatus	Mandatory
ResponseAccessProtocolMask	Conditional
ResponseIndividualAddress	Conditional
ResponseMediumRate	Conditional
ResponseUNA	

ResponseStatus

The values for the ResponseStatus parameter are defined in table 11-12. The ResponseStatus parameter is mandatory and must always be present. The return value of the ResponseStatus when ActionResponseType = Close is always sSuccess.

Table 11-12—ResponseStatus parameter

Status	Table 9-7 REF	Definition
sSuccess	1039, 1015, 1086, 1091	Successful
sInvalidAddress	n/a	MAC address is invalid (group or not specified)
sRateNotSupported	n/a	The requested data rate is not supported
sBeaconReceived	1020, 1041, 1027, 1065	Beacon frame received
sClaimReceived	1043, 1029	Claim frame received
sPurgeReceived	1042, 1028	Purge frame received
sInternalError	1019, 1045, 1031, 1008, 1011	Internal error
sCPortError	1046, 1021, 1032, 1009, 1093	C-Port error
sActiveMonitorReceived	1044, 1030	Active monitor present frame received
sInvalidSourceAddress	1060, 1059, 1082, 1090	SA<>SUA prior to Join complete
sHeartBeatTimeout	1048	No heart beat, TPRHB=E

ResponseAccessProtocolMask

The ResponseAccessProtocol parameter is a conditional parameter that is returned only when the value of the ResponseStatus parameter is sSuccess.

When the ResponseStatus is sSuccess, the value returned in the ResponseAccessProtocolMask parameter indicates the access protocol mask that will be used by the PMAC.

ResponseIndividualAddress

The ResponseIndividualAddress parameter is a conditional parameter that may be returned only when the value of the ResponseStatus parameter is sSuccess. The value of this parameter may be a locally administered address assigned by a system administrator or a UniversallyAdministeredAddress assigned by a manufacturer. This parameter specifies the individual address that is used in the SA field of MAC frames originated by the PMAC.

If a locally administered address was specified in the RequestIndividualAddress parameter of the MGT_ ACTION.request service, the same value is returned in the ResponseIndividualAddress parameter.

If the address specified in the RequestIndividualAddress in the MGT-ACTION.request is not a locally administered address, then the value returned in the ResponseStatus parameter is sInvalidAddress.

When the RequestIndividualAddress parameter is not specified in the MGT_ACTION.request service and a universal address has been assigned by the manufacturer, the value returned in the ResponseIndividualAddress is the universally assigned address. When no universal address has not been assigned by the manufacturer, then the value returned in the ResponseStatus parameters is sInvalidAddress.

ResponseMediumRate

The ResponseMediumRate parameter is a conditional parameter that may be returned only when the value of the ResponseStatus parameter is sSuccess. This parameter specifies the medium rate as either 4 Mbit/s or 16 Mbit/s. When returned, the value of the ResponseMediumRate parameter indicates the current operating data rate of the PMAC.

When the value of the ResponseStatus parameter is sSuccess and no RequestMediumRate was specified in the MGT_ACTION.request service, then the value returned in the ResponseMediumRate is the current operating data rate.

When the RequestMediumRate specified in the MGT_ACTION.request service is not supported by the PMAC, then the status returned in the MGT_ACTION.response is sRateNotSupported.

ResponseUNA

The ResponseUNA parameter is a conditional parameter that may be returned only when the value of the ResponseStatus parameter is sSuccess. When returned, the value of the ResponseUNA parameter indicates the PMAC upstream neighbor's address (UNA) and is derived from the source address of the Registration Request MAC frame received by the PMAC. The value of this parameter is stored by the PMAC as the stored upstream neighbor's address (SUA).

11.2.2.2 MGT_EVENT_REPORT

This service is invoked by the PMAC to notify management that a significant change in the operational state of the PMAC has occurred. This service operates as a non-confirmed service.

11.2.2.2.1 MGT_EVENT_REPORT.request

The semantics for the MGT_EVENT_REPORT.request service primitive are defined as follows:

```
MGT_EVENT_REPORT.request { eventRequestType,
                           eventRequestParameters }
```

eventRequestType

The eventRequestType parameter is a mandatory parameter. The values for the eventRequestType parameter are defined as follows:

- **CPortOperational.** This event is indicated when the PMAC transitions from a non-operational to an operational state.
- **CPortNonOperational.** This event is indicated when the PMAC transitions from an operational to a non-operational state. When this event occurs, the PMAC is attempting to recover from an operational error.
- **CPortFailure.** This event is indicated by the PMAC to notify management that a fault has occurred, causing the C-Port to return to the Bypass state.
- **ProtocolError.** This event is indicated by the PMAC to notify management that the C-Port has detected a MAC frame that is used only when operating under the TKP access protocol.

eventRequestParameters

Table 11-13 specifies the set of elements of the eventRequestParameters:

Table 11-13—eventRequestParameters

eventRequestParameters	Mandatory/conditional
EventStatus	Mandatory
BeaconInfo	Conditional
ErrorCounters	Conditional

EventStatus

The values for the EventStatus parameter are defined in table 11-14.

Table 11-14—EventStatus parameter

EventStatus	Table 9-7 REF	Definition
sMACInsertREQReceived	1405	nCPortOperational
sReportError	1811	nCPortOperational
sHeartBeatLost	1400 (FPSL=0)	nCPortNonOperational
sSignalLoss	1400 (FPSL=1)	nCPortNonOperational
sBeaconReceived	1401	nCPortNonOperational
sInvalidSourceAddress	1055, 1084	nCPortNonOperational
sInternalError	1057, 1062, 1064	nCPortFailure
sCPortError	1058, 1063	nCPortFailure
sClaimReceived	1053	nProtocolError
sPurgeReceived	1054	nProtocolError
sActiveMonitorReceived	1052	nProtocolError
sPhantomLoss	1012, 1013, 1014, 1033, 1066, 1069	nCPortNonOperational
sDuplicateAddressDetected	1097, 1098	nCPortNonOperational

BeaconInfo

The BeaconInfo parameter is a conditional parameter that may be used only when the value of the EventStatus parameter is either sHeartBeatLost, sSignalLoss, or sBeaconReceived and contains the information in table 11-15.

Table 11-15—BeaconInfo parameter

BeaconInfo parameter	Mandatory/conditional
BeaconSA	Mandatory
BeaconType	Mandatory
BeaconUNA	Mandatory
BeaconPDN	Mandatory

When the EventStatus is sHeartBeatLost or sSignalLoss, the values in the BeaconInfo parameter represent those of the last transmitted Beacon MAC frame.

If the EventStatus is sBeaconReceived, the values in the BeaconInfo parameter represent those contained in the last received Beacon MAC frame.

This parameter specifies the following information contained in the last Beacon MAC frame transmitted or received:

- The SA used in the Beacon MAC frame.
- The value of the Beacon Type subvector X'01' used in the Beacon MAC frame.
- The value of the UNA subvector X'02' used in the Beacon MAC frame.
- The value of the Physical Drop Number subvector X'0B' used in the Beacon MAC frame.

ErrorCounters

The ErrorCounters parameter is a conditional parameter that may be used only when the value of the EventStatus parameter is sReportErrors. This parameter contains the sequence of information shown in table 11-16.

Table 11-16—ErrorCounters parameter

ErrorCounters parameter	Mandatory/conditional
AbortErrorCounter	Mandatory
BurstErrorCounter	Mandatory
FrequencyErrorCounter	Mandatory
InternalErrorCounter	Mandatory
LineErrorCounter	Mandatory
ReceiveErrorCounter	Mandatory
OverlengthFrameCounter	Mandatory

11.2.2.3 MGT_SET

The MGT_SET service modifies variable values. The parameters used with this service indicate the variables to be changed and the desired values of the variables. Conditional variables specified as read-write may not be present and therefore may not change. This service always operates in a confirmed mode.

11.2.2.3.1 MGT_SET.request

The semantics for the MGT_SET.request service primitive are defined as follows:

MGT_SET.request { objectName, objectValue }

objectName

The objectName parameter specifies the object name to be modified. The object names and values that can be specified as parameters are defined in 11.3.1.

objectValue

The objectValue parameter contains the requested value of the object name. The object names and values that can be specified as parameters are defined in 11.3.1.

11.2.2.3.2 MGT_SET.response

The MGT_SET.response is issued in reply to a MGT_SET.request.

The semantics for the MGT_SET.response service primitive are defined as follows:

MGT_SET.response{ objectName, objectValue }

objectName

The objectName parameter specifies the object name to be modified. The object names and values that can be specified as parameters are defined in 11.3.1.

objectValue

The objectValue parameter contains the object value that was modified. The object names and values that can be specified as parameters are defined in 11.3.1.

11.2.2.4 MGT_GET

The MGT_GET service requests the value of an variable. The parameters used with this service indicate the variables whose values are to be returned in the response. Conditional variables specified as read-only may not be present and therefore may not be returned. This service always operates in a confirmed mode.

11.2.2.4.1 MGT_GET.request

The semantics for the MGT_GET.request service primitive are defined as follows:

MGT_GET.request { objectNameList }

objectNameList

The objectNameList parameter contains the set of object names for which values are to be returned. The object names that can be specified as parameters are defined in 11.3.1.

11.2.2.4.2 MGT_GET.response

The MGT_GET.response is issued in reply to a MGT_GET.request.

The semantics for the MGT_GET.response service primitive are defined as follows:

MGT_GET.response { objectList }

objectList

The objectList parameter contains the set of object names and values that are returned in response to a MGT_GET.request service. The object names and values that can be specified as parameters are defined in 11.3.1.

11.2.3 MRI management

11.2.3.1 MRI services

The management routing interface (MRI) specifies the services and interfaces provided by the DTR concentrator for routing management MAC frames to management servers, such as the CRS, REM, or RPS.

The service primitives required to exchange information between the PMAC and the MRI sublayers are defined in this subclause. These service primitives are MRI_UNITDATA.request and MRI_ UNITDATA.indication.

11.2.3.1.1 MRI_UNITDATA.request

This service is invoked by the MRI to request the PMAC to compose and transmit a MAC frame using the information provided in the parameters.

The semantics for the MRI_UNITDATA.request service primitive are defined as follows:

```
MRI_UNITDATA.request {  macFrameControl,
                        destinationAddress,
                        sourceAddress,
                        routingInformation,
                        macInformation,
                        frameCheckSequence }
```

macFrameControl

The macFrameControl parameter specifies the value to be used in the frame control field by the PMAC when composing the MAC frame for transmission. The structure and content of this field shall conform to the FC field format specified in 3.2.3.

destinationAddress

The destinationAddress parameter is any valid individual, group, functional, or broadcast address. The structure and contents of this parameter shall conform to the DA field specified in 3.2.4.1.

sourceAddress

The sourceAddress parameter specifies the individual address to be used in the source address field by the PMAC when composing the MAC frame for transmission. The structure and contents of this parameter shall conform to the SA field specified in 3.2.4.2.

routingInformation

The routingInformation parameter is optional and used only when the routing information indicator is set in the sourceAddress parameter. When used, the structure and contents of this parameter shall conform to the RI field specified in 3.2.5.

macInformation

The structure and contents of the macInformation parameter shall conform to the MAC frame information field format specified in 3.3.2 as modified by 10.3.

frameCheckSequence

The frameCheckSequence parameter is optional and may not be specified. When used, the frameCheckSequence parameter specifies the value to be used in the FCS by the PMAC when composing the MAC frame for transmission. When unspecified, the PMAC shall calculate and transmit a valid FCS as specified in 3.2.7.

11.2.3.1.2 MRI_UNITDATA.indication

This service is invoked by the PMAC to notify the MRI that it has received a MAC frame that has a destination class of neither 0 or 3 when the source class is 0 (REF 1807), or when the source class is not zero (REF 1808). This service is also invoked by the PMAC when an error report must be forwarded to the REM function (REF 1811).

The semantics for the MRI_UNITDATA.indication service primitive are defined as follows:

```
MRI_UNITDATA.indication {   macFrameControl,
                            destinationAddress,
                            sourceAddress,
                            routingInformation,
                            macInformation,
                            frameCheckSequence }
```


macFrameControl

The macFrameControl parameter indicates the value of the FC field of the received MAC frame. The structure and content of this field shall conform to the FC field specified in 3.2.3.

destinationAddress

The destinationAddress parameter is any valid individual, group, functional, or broadcast address. The structure and contents of this parameter shall conform to the DA field specified in 3.2.4.1.

sourceAddress

The sourceAddress parameter is the individual address of the MAC that originated the frame. The structure and contents of this parameter shall conform to the SA field specified in 3.2.4.2.

routingInformation

The routingInformation parameter is optional and used only when the routing information indicator is set in the sourceAddress parameter. When used, the structure and contents of this parameter shall conform to the RI field specified in 3.2.5.

macInformation

The structure and contents of the macInformation parameter shall conform to the MAC frame information field format specified in 3.3.2 as modified by 10.3.

frameCheckSequence

The frameCheckSequence parameter specifies the FCS value of the received MAC frame. The structure and content of this parameter shall conform to the FCS field specified in 3.2.7.

11.3 Management information definitions

11.3.1 DTR MAC MIB definitions

Editor's note on special word usage in the MIB definitions:

The terms "shall," "mandatory," and "required" in the MIB definition are constrained within the definition of the MIB itself. Implementation of the MIB is optional by this standard.

```
DtrMacMIB DEFINITIONS ::= BEGIN

IMPORTS
        transmission
                FROM RFC1213-MIB
        MODULE-IDENTITY, OBJECT-TYPE, Counter32, NOTIFICATION-TYPE
                FROM SNMPv2-SMI
        InterfaceIndex
                FROM IF-MIB
        MODULE-COMPLIANCE, OBJECT-GROUP, NOTIFICATION-GROUP
                FROM SNMPv2-CONF
        TruthValue, DisplayString, MacAddress, TimeStamp
                FROM SNMPv2-TC;

dtrMacMIB MODULE-IDENTITY
        LAST-UPDATED "9606121045Z"
        ORGANIZATION "IEEE 802.5"
        CONTACT-INFO
                        "Katie D. Lee
                        IBM
                        CNMA/664
                        RTP, NC 27709
                        kdlee@vnet.ibm.com
                        (919) 254-7507

                        Trevor Warwick
                        Madge Networks,
                        Sefton Park,
                        Bells Hills,
                        Stoke Poges,
                        Slough SL2 4JS
                        UK
                        twarwick@madge.com
                        44-1753-661401"

        DESCRIPTION
                "The MIB module for dedicated token ring MACs."
        ::= {transmission 86 }

dtrMacObjects   OBJECT IDENTIFIER ::= { dtrMacMIB 1 }
dtrMacTraps    OBJECT IDENTIFIER ::= { dtrMacMIB 2 }
dtrMacConformance OBJECT IDENTIFIER ::= { dtrMacMIB 3 }

--**********************************************************
```

```
-- This SNMP MIB module contains definitions for management
-- of both the DTR Station (SMAC) and the DTR C-Port (PMAC).
--
-- A DTR Station using TXI protocol has an entry in the
-- following tables:
--     txiProtocolTable
--     dtrStationTable
--
-- A DTR Station using TKP protocol shall implement RFC 1748
-- IEEE 802.5 token ring MIB, as well as the following table:
--     dtrStationTable
--
-- A C-Port in Port mode using TXI protocol has an entry in each of the
-- following tables:
--     txiProtocolTable
--     dtrCportTable
--
-- A C-Port in Port mode using TKP protocol shall implement RFC 1748 IEEE 802.5
-- token ring MIB, as well as the following table:
--     dtrCportTable
--
-- A C-Port in Station Emulation mode using TXI protocol has an
-- entry in each of the following tables:
--     txiProtocolTable
--     dtrStationTable
--     dtrCportTable
--
-- A C-Port in Station Emulation mode using TKP protocol shall implement
-- RFC 1748 IEEE 802.5 token ring MIB, as well as the following tables:
--     dtrCportTable
--     dtrStationTable
--
--*******************************************************

-- Relationship to RFC 1573

-- Layering model
--  For the typical usage of this IEEE 802.5 DTR MIB module, there will
--  be no sublayers "above" or "below" the 802.5 DTR interface. However,
--  this MIB module does not preclude such layering.

-- Virtual circuits
--  802.5 DTR does not support virtual circuits.

-- ifTestTable
--  This MIB module does not define tests.

-- ifRcvAddressTable
--  The ifRcvAddressTable is defined to contain all MAC addresses,
--  unicast, multicast (group), and broadcast, for which an interface
--  will receive packets. For 802.5 DTR interfaces, its use includes
--  functional addresses. The format of the address, contained in
--  ifRcvAddressAddress, is the same as for ifPhysAddress.
```

```
--  For functional addresses on a particular 802.5 DTR interface, only
--  one ifRcvAddressTable entry is required. That entry is the one for
--  the address that has the functional address bit ANDed with the bit
--  mask of all functional address for which the interface will accept
--  frames.

-- ifPhysAddress
--  For an 802.5 DTR interface, ifPhysAddress contains the interface's IEEE
--  MAC address, stored as an octet string of length 6, in IEEE 802.1
--  "canonical" order, i.e., the Group Bit is positioned as the low-order
--  bit (0x01) of the first octet.

-- ifType
--  The objects defined in this MIB module apply to each interface for which
--  the ifType has the value:
--    iso88025Dtr = 86

--**********************************************************
-- TXI Protocol
--  This table provides information about an 802.5 TXI MAC.
--  A managed system will have one entry in this table
--  for each of its TXI MAC interfaces. It is mandatory
--  that systems having TXI interfaces implement this
--  table in addition to the generic interfaces table and
--  its generic extensions, defined in RFC 1573.
-- *********************************************************
txiProtocolTable   OBJECT-TYPE
 SYNTAX       SEQUENCE OF TxiProtocolEntry
 MAX-ACCESS     not-accessible
 STATUS       current
 DESCRIPTION
    “This table contains TXI interface characteristics.
    There is one entry for each TXI interface in the
    managed system.”
::= { dtrMacObjects 1 }

txiProtocolEntry   OBJECT-TYPE
 SYNTAX       TxiProtocolEntry
 MAX-ACCESS     not-accessible
 STATUS       current
 DESCRIPTION
    “A list of characteristics for an 802.5 TXI interface.”
 INDEX
   { txiProtocolIfIndex }
::= { txiProtocolTable 1 }

TxiProtocolEntry ::= SEQUENCE {
  txiProtocolIfIndex                    InterfaceIndex,
  txiProtocolMacType                    INTEGER,
  txiProtocolFunctionalAddress          MacAddress,
  txiProtocolUpstreamNeighborAddress    MacAddress,
  txiProtocolMicrocodeLevel             OCTET STRING,
  txiProtocolProductInstanceId          OCTET STRING,
  txiProtocolAuthorizedFunctionClasses  OCTET STRING,
```

```
  txiProtocolErrorReportTimer           INTEGER,
  txiProtocolPhysicalDropNumber         OCTET STRING,
  txiProtocolRingNumber                 OCTET STRING,
  txiProtocolRingStatus                 INTEGER,
  txiProtocolJoinState                  INTEGER,
  txiProtocolMonitorState               INTEGER,
  txiProtocolBeaconSA                   MacAddress,
  txiProtocolBeaconType                 INTEGER,
  txiProtocolBeaconUNA                  MacAddress,
  txiProtocolBeaconPDN                  OCTET STRING,
  txiProtocolEventStatus                INTEGER  }

txiProtocolIfIndex         OBJECT-TYPE
 SYNTAX        InterfaceIndex
 MAX-ACCESS      not-accessible
 STATUS        current
 DESCRIPTION
    "This object identifies the interface for which this entry contains
    management information. The value of this object for a particular
    interface has the same value as the ifIndex object, defined in
    RFC 1573, for the same interface."
::= { txiProtocolEntry 1 }

txiProtocolMacType     OBJECT-TYPE
 SYNTAX        INTEGER{ Station(1), cPortPortMode(2), cPortStnEmulation(3) }
 MAX-ACCESS      read-only
 STATUS        current
 DESCRIPTION
    "This objects indicates whether this MAC interface is a Station, a
    C-Port in Port mode, or a C-Port in Station Emulation mode."
::= { txiProtocolEntry 2 }

txiProtocolFunctionalAddress  OBJECT-TYPE
 SYNTAX            MacAddress
 MAX-ACCESS          read-write
 STATUS            current
 DESCRIPTION
    "This object specifies the value of the Functional Addresses
    subvector X'2C' used in the Report Station Addresses and Report Station
    Attachments MAC frames. The value of this object can be set by
    management."
::= { txiProtocolEntry 3 }

txiProtocolUpstreamNeighborAddress  OBJECT-TYPE
 SYNTAX            MacAddress
 MAX-ACCESS          read-only
 STATUS            current
 DESCRIPTION
    "This object specifies the individual address of the nearest
    upstream neighbor. The value of this object is derived
    from the Heart Beat frame."
::= { txiProtocolEntry 4 }
```

```
txiProtocolMicrocodeLevel   OBJECT-TYPE
 SYNTAX           OCTET STRING (SIZE(1..32))
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies the value of the Ring Station Version
    Number subvector X'23' used in the Report Station State MAC frame.
    The value of this object cannot be set by management.”
::= { txiProtocolEntry 5 }

txiProtocolProductInstanceId OBJECT-TYPE
 SYNTAX           OCTET STRING (SIZE(1..31))
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies the value of the Product Instance ID subvector
    X'22' used in the Report Station Attachment and Report New Active
    Monitor MAC frames. The value of this object cannot be set by
    management.”
::= { txiProtocolEntry 6 }

txiProtocolAuthorizedFunctionClasses  OBJECT-TYPE
 SYNTAX           OCTET STRING(SIZE(2))
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies the value set by the Authorized
    Function Classes subvector X'06' of the Change Parameters
    MAC frame.”
::= { txiProtocolEntry 7 }

txiProtocolErrorReportTimer  OBJECT-TYPE
 SYNTAX           INTEGER (0..65535)
 UNITS            "1/100 second"
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies the value of the timer TSER as set by
    the Error Timer Value subvector X'05' from the Change Parameters
    or the Initialize Station MAC frame. This object indicates the
    value in .01 s increments.”
::= { txiProtocolEntry 8 }

txiProtocolPhysicalDropNumber OBJECT-TYPE
 SYNTAX           OCTET STRING(SIZE(4))
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies the value set by the Assign Physical Drop
    Number subvector X'04' of the Change Parameters or the Initialize
    Station MAC frame.”
::= { txiProtocolEntry 9 }
```

```
txiProtocolRingNumber     OBJECT-TYPE
 SYNTAX           OCTET STRING(SIZE(2))
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies the value set by the Local Ring Number
    subvector X'03' from the Change Parameters or Initialize Station
    MAC frame.”
::= { txiProtocolEntry 10 }

txiProtocolRingStatus     OBJECT-TYPE
 SYNTAX           INTEGER (0..262143)
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “The current interface status that can be used to diagnose
    fluctuating problems that can occur on token rings, after
    a Station has successfully been added to the ring.

    Before an open is completed, this object has the value for
    the ‘no status’ condition. The txiProtocolRingStatus objects
    provide for debugging problems when the Station cannot even
    enter the ring.

    The object's value is a sum of values, one for each currently
    applicable condition. The following values are defined for
    various conditions:
             0 = No problems detected
            32 = Ring Recovery
           256 = Remove Received
           512 = reserved
          1024 = Auto-Removal Error
          2048 = Lobe Wire Fault
          4096 = Transmit Beacon
          8192 = Soft Error
         16384 = Hard Error
         32768 = Signal Loss
        131072 = no status, open not completed.”
::= { txiProtocolEntry 11 }

txiProtocolJoinState     OBJECT-TYPE
 SYNTAX   INTEGER{
                    notSpecified(1),
                    bypass(2),
                    registration(3),
                    lobeTest(4),
                    duplicateAddrCheck(5),
                    duplicateAddrDetected(6),
                    joinCompleteTXI(7),
                    awaitNotification(8) }
 MAX-ACCESS    read-only
 STATUS       current
```

```
 DESCRIPTION
    "This object specifies the present state of the Join FSM. The value will
    be one of the following:
             (1) notSpecified,
             (2) bypass (JS=BP),
             (3) registration (JS=PREG or JS=SREG),
             (4) lobeTest (JS=PLT or JS=SLT),
             (5) duplicateAddrCheck (JS=PDAC or JS=SDAC),
             (6) duplicateAddrDetected (JS=PDAD)
             (7) joinComplete TXI (JS=PJCI or JS=SJC),
             (8) awaitNotification (JS=PANNC)"
::= { txiProtocolEntry 12 }

txiProtocolMonitorState    OBJECT-TYPE
 SYNTAX          INTEGER{notSpecified(1),
                             operational(2),
                             beaconTransmit(3),
                             wireFaultDelay(4),
                             internalTest(5) }
 MAX-ACCESS        read-only
 STATUS          current
 DESCRIPTION
    "This object specifies the present state of the Monitor FSM.
    The value will be one of the following:
         (1) notSpecified,
         (2) Operational (MS=POPT or MS=SOPT),
         (3) TransmitBeacon (MS=PTBN or MS=STBN),
         (4) wireFaultDelay (MS=PITW or MS=SITW)
         (5) Internal Test Wait (MS=PIT or MS=SIT)."
::= { txiProtocolEntry 13 }

txiProtocolBeaconSA      OBJECT-TYPE
 SYNTAX          MacAddress
 MAX-ACCESS        read-only
 STATUS          current
 DESCRIPTION
    "This object specifies the source address used in the last Beacon MAC
    frame transmitted or received."
::= { txiProtocolEntry 14 }

txiProtocolBeaconType  OBJECT-TYPE
 SYNTAX         INTEGER{type1(1),
                          type2(2),
                          type3(3),
                          type4(4),
                          type5(5) }
 MAX-ACCESS       read-only
 STATUS          current
 DESCRIPTION
    "This object specifies the value of the Beacon Type subvector X'01'
    used in the last Beacon MAC frame transmitted or received as follows:
       (1) notSpecified
       (2) signalLoss
       (3) notUsed
```



```
       (4) notUsed
       (5) heartBeatFailure
       .”
::= { txiProtocolEntry 15 }

txiProtocolBeaconUNA  OBJECT-TYPE
 SYNTAX        MacAddress
 MAX-ACCESS      read-only
 STATUS        current
 DESCRIPTION
    “This object specifies the value of the UNA subvector X'02' used in
    the last Beacon MAC frame transmitted or received.”
::= { txiProtocolEntry 16 }

txiProtocolBeaconPDN  OBJECT-TYPE
 SYNTAX        OCTET STRING (SIZE(4))
 MAX-ACCESS      read-only
 STATUS        current
 DESCRIPTION
    “This object specifies the value of the Physical Drop Number subvector
    X'0B' used in the last Beacon MAC frame transmitted or received.”
::= { txiProtocolEntry 17 }

txiProtocolEventStatus OBJECT-TYPE
 SYNTAX  INTEGER {
                    macInsertREQReceived(1),
                    macInsertRSPReceived(2),
                    reportError(3),
                    heartBeatLost(4),
                    signalLoss(5),
                    beaconReceived(6),
                    remove(7),
                    internalError(8),
                    StationOrCPortError(9),
                    wireFault(10),
                    claimReceived(11),
                    purgeReceived(12),
                    standbyReceived(13),
                    invalidSourceAddress(14),
                    activeMonitorReceived(15),
                    phantomLoss (16),
                    duplicateAddressDetected(17)
                     }
 MAX-ACCESS      accessible-for-notify
 STATUS        current
 DESCRIPTION
    “This object specifies the latest event status of the TXI interface.”
::= { txiProtocolEntry 18 }

-- ********************************************************
-- Station Protocol Characteristics Table
--  This table contains protocol information for DTR Stations
--  and C-Ports in Station Emulation mode (both TKP and TXI).
```

```
--  There is an entry in this table for each Station
--  in a managed system.
-- *******************************************************

dtrStationTable   OBJECT-TYPE
 SYNTAX       SEQUENCE OF DtrStationEntry
 MAX-ACCESS     not-accessible
 STATUS       current
 DESCRIPTION
    "This table contains characteristics for each DTR Station.
    There is one entry for each interface in the managed system."
::= { dtrMacObjects 2 }

dtrStationEntry    OBJECT-TYPE
 SYNTAX       DtrStationEntry
 MAX-ACCESS     not-accessible
 STATUS       current
 DESCRIPTION
    "A list of Station characteristics."
 INDEX
    { dtrStationIfIndex }
::= { dtrStationTable 1 }

DtrStationEntry ::= SEQUENCE {
  dtrStationIfIndex              InterfaceIndex,
  dtrStationStationType            INTEGER,
  dtrStationCurrentAccessProtocol     INTEGER,
  dtrStationRequestedAccessProtocol OCTET STRING,
  dtrStationAccessProtocolResponse  OCTET STRING,
  -- policy variables
  dtrStationAccessProtocolMask     OCTET STRING,
  dtrStationIndividualAddressCount   OCTET STRING,
  dtrStationMaxFrameSize         INTEGER,
  dtrStationPhantomDriveSupport    OCTET STRING,
  -- policy flags
  dtrStationAdminErrorCountingOption INTEGER,
  dtrStationAdminOpenOption          INTEGER,
  dtrStationAdminRegistrationOption     INTEGER,
  dtrStationAdminRejectRemoveOption    INTEGER,
  dtrStationAdminMediumRateOption     INTEGER,
  dtrStationAdminRegistrationQueryOption  INTEGER,
  dtrStationAdminRegistrationDeniedOption INTEGER,

  dtrStationOperErrorCountingOption  INTEGER,
  dtrStationOperOpenOption          INTEGER,
  dtrStationOperRegistrationOption      INTEGER,
  dtrStationOperRejectRemoveOption     INTEGER,
  dtrStationOperMediumRateOption    INTEGER,
  dtrStationOperRegistrationQueryOption  INTEGER,
  dtrStationOperRegistrationDeniedOption  INTEGER

   }
```



```
dtrStationIfIndex    OBJECT-TYPE
 SYNTAX        InterfaceIndex
 MAX-ACCESS      not-accessible
 STATUS        current
 DESCRIPTION
    "This object identifies the interface for which this entry contains
    management information. The value of this object for a particular
    interface has the same value as the ifIndex object, defined in RFC 1573,
    for the same interface."
::= { dtrStationEntry 1 }

dtrStationStationType  OBJECT-TYPE
 SYNTAX        INTEGER { dtrStation(1), cPortInStnEmulation(2) }
 MAX-ACCESS      read-only
 STATUS        current
 DESCRIPTION
    "This object specifies whether this entry is a DTR Station or a C-Port
    in Station Emulation mode."
::= { dtrStationEntry 2 }

dtrStationCurrentAccessProtocol OBJECT-TYPE
 SYNTAX        INTEGER { tKP(1), tXI(2) }
 MAX-ACCESS      read-only
 STATUS        current
 DESCRIPTION
    "This object specifies which access protocol is currently in use by the
    MAC. The value of this object is either (1) TKP or (2) TXI.
    This object cannot be set by management."
::= { dtrStationEntry 3 }

dtrStationRequestedAccessProtocol  OBJECT-TYPE
 SYNTAX              OCTET STRING (SIZE(2))
 MAX-ACCESS            read-only
 STATUS              current
 DESCRIPTION
    "This object specifies the value of the access protocol Request subvector
    X'0E' transmitted in the Registration Request MAC frame. The value
    X'0002' indicates TXI access protocol. If the Station is running
    TKP protocol, the value is X'FFFF'. All other values are reserved for
    future standardization."
::= { dtrStationEntry 4 }

dtrStationAccessProtocolResponse  OBJECT-TYPE
 SYNTAX              OCTET STRING(SIZE(2))
 MAX-ACCESS            read-only
 STATUS              current
 DESCRIPTION
    "This object specifies the value of the access protocol Response subvector
    X'0F' received from the Registration Response MAC frame. The value
    X'0000' means access denied and the value X'0002' indicates TXI and
    phantom and wire fault support method accepted."
::= { dtrStationEntry 5 }
```

```
dtrStationAccessProtocolMask    OBJECT-TYPE
 SYNTAX              OCTET STRING(SIZE(2))
 MAX-ACCESS            read-write
 STATUS              current
 DESCRIPTION
    “This object specifies which access protocols can be supported by the
    Station. This object indicates the value of the SPV(AP_MASK)
    variable. The value of this object is either: X'0001' (TKP),
    X'0002'(TXI), or X'0003' (TKPAndTXI).”
::= { dtrStationEntry 6 }

dtrStationIndividualAddressCount  OBJECT-TYPE
 SYNTAX              OCTET STRING(SIZE(2))
 MAX-ACCESS            read-write
 STATUS              current
 DESCRIPTION
     “This object specifies the number of individual addresses supported
     by the MAC. This object is used to set the value of the Individual
     Address Count subvector X'21'. A value of X'0000' means
     that more than one individual address is not supported. A non-zero value
     specifies the number of individual address in use by this MAC.”
::= { dtrStationEntry 7 }

dtrStationMaxFrameSize   OBJECT-TYPE
 SYNTAX          INTEGER(133..18200)
 MAX-ACCESS        read-write
 STATUS          current
 DESCRIPTION
    “This object specifies the maximum frame size that a MAC
    will transmit and indicates the value of the SPV(MAX_TX) variable.
    At 4 Mbit/s, the maximum permitted value is 4550. At 16 Mbit/s, the
    maximum permitted value is 18 200.”
::= { dtrStationEntry 8 }

dtrStationPhantomDriveSupport OBJECT-TYPE
 SYNTAX           OCTET STRING(SIZE(2))
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies the MAC's support of Phantom Drive
    and Wire Fault detection. This object indicates the value of the
    SPV(PD) variable and the value of the Phantom subvector
    X'0C' used in the Registration Request MAC frame. There is
    currently only one value defined for PhantomDriveSupport and
    that value is X'0001' (PhantomDriveAndWireFault).”
::= { dtrStationEntry 9 }

dtrStationAdminErrorCountingOption OBJECT-TYPE
 SYNTAX           INTEGER {triggered(1), freeRunning(2)}
 MAX-ACCESS         read-write
 STATUS           current
 DESCRIPTION
    “This object specifies how the MAC manages the error report timer.
    If set to triggered(1), the MAC resets TSER when the first error is
```

```
    received and, when TSER expires, sends an error report MAC frame.
    If set to freeRunning(2), each time TSER expires the MAC resets TSER
    and, if any of the error counters are not zero, sends the error
    report MAC frame. This object is used to set the value of the
    FSECO flag to be used at the next Connect.SMAC event. A write
    operation to this object will not change the operational value
    reflected in dtrStationOperErrorCountingOption until the next
    Connect.SMAC event."
::= { dtrStationEntry 10 }

dtrStationAdminOpenOption  OBJECT-TYPE
 SYNTAX        INTEGER{ exitToClause4(1), enterBypass(2) }
 MAX-ACCESS      read-write
 STATUS        current
 DESCRIPTION
    "This object specifies the action of the Station when a response is
    not received during the registration process.  If set to exitToClause4(1),
    then SMAC attempts to use the TKP access protocol by exits to clause 4.
    If set to enterBypass(2), then SMAC enters Bypass. This object indicates
    the value of the FSEPO flag to be used at the next Connect.SMAC
    event. A write operation to this object will not change the
    operational value reflected in dtrStationOperOpenOption until the next
    Connect.SMAC event."
::= { dtrStationEntry 11 }

dtrStationAdminRegistrationOption OBJECT-TYPE
 SYNTAX           INTEGER{ noRegistration (1), dtrRegistration(2) }
 MAX-ACCESS         read-write
 STATUS           current
 DESCRIPTION
    "This object specifies if the Station or C-Port in Station Emulation mode
    registers with the C-Port to request the use of an access protocol and a
    method of phantom drive and wire fault detection. If the value is
    noRegistration(1), then the Station does not register and uses the Join FSM
    defined in clause 4. If the value is dtrRegistration(2), then the Station
    uses the registration process by using the Join FSM defined in
    9.2. This object indicates the value of the FSREGO flag to be
    used at the next Connect.SMAC event. A write
    operation to this object will not change the operational value
    reflected in dtrStationOperRegistrationOption until the next
    Connect.SMAC event."
::= { dtrStationEntry 12 }

dtrStationAdminRejectRemoveOption OBJECT-TYPE
 SYNTAX           INTEGER{ removes(1), rejects(2) }
 MAX-ACCESS         read-write
 STATUS           current
 DESCRIPTION
    "This object specifies how the Station responds to a REMOVE
    MAC frame. If set to removes(1), then the SMAC deinserts upon
    receiving a REMOVE MAC frame. If set to rejects(2), then the
    SMAC rejects the REMOVE MAC frame and transmits a Response
    MAC frame indicating function disabled. This object indicates
    the value of the FSRRO flag to be used at the next Connect.SMAC
```

```
    event. A write operation to this object will not change the
    operational value reflected in dtrStationOperRejectRemoveOption
    until the next Connect.SMAC event."
::= { dtrStationEntry 13 }

dtrStationAdminMediumRateOption  OBJECT-TYPE
 SYNTAX           INTEGER{ rate4Mbps(1), rate16Mbps(2) }
 MAX-ACCESS         read-write
 STATUS           current
 DESCRIPTION
    "The value of this object specifies the medium rate as either 4 Mbps or
    16 Mbps. If set to rate4Mbps(1), then SMAC operates the medium at 4
    Mbit/s. If set to rate16Mbps(2), then SMAC operates the medium at 16
    Mbit/s. This object indicates the value of the FSMRO flag
    to be used at the next Connect.SMAC event. A write
    operation to this object will not change the operational value
    reflected in dtrStationOperMediumRateOption until the next
    Connect.SMAC event."
::= { dtrStationEntry 14 }

dtrStationAdminRegistrationQueryOption OBJECT-TYPE
 SYNTAX            INTEGER{ support(1), ignore(2) }
 MAX-ACCESS          read-write
 STATUS            current
 DESCRIPTION
    "The value of this object indicates if the registration query protocol is
    supported by MAC when using the TKP access protocol. If set to
    support(1), then MAC recognizes the Registration Query MAC frame.
    If set to ignore(2), then MAC ignores the Registration Query MAC frame.
    This object indicates the value of FSRQO flag to be used at the next
    Connect.SMAC event. A write operation to this object will not change
    the operational value reflected in dtrStationOperRegistrationQueryOption
    until the next Connect.SMAC event."
::= { dtrStationEntry 15 }

dtrStationAdminRegistrationDeniedOption OBJECT-TYPE
 SYNTAX              INTEGER{ tkpJoin(1), close(2) }
 MAX-ACCESS            read-write
 STATUS              current
 DESCRIPTION
    "The value of this object specifies how the Station acts upon receiving a
    denied registration request. If set to tkpJoin(1), then SMAC attempts to
    Join using the TKP access protocol. If set to close(2), then the SMAC
    closes. This object indicates the value of FSRDO flag to be used
    at the next Connect.SMAC event. A write operation to this object
    will not change the operational value reflected in
    dtrStationOperRegistrationDeniedOption until the next
    Connect.SMAC event."
::= { dtrStationEntry 16 }

dtrStationOperErrorCountingOption OBJECT-TYPE
 SYNTAX           INTEGER {triggered(1), freeRunning(2)}
 MAX-ACCESS         read-only
 STATUS           current
```



```
 DESCRIPTION
    "This object specifies how the MAC manages the error
    report timer.  If set to triggered(1), the MAC resets TSER
    when the first error is received and, when TSER expires,
    transmits a Report Error MAC frame. If set to freeRunning(2),
    each time TSER expires the MAC resets TSER and, if any of the
    error counters are not zero, transmits the Report Error MAC
    frame. This object is used to set the value of the FSECO
    flag at which the Station is currently operating."
::= { dtrStationEntry 17 }

dtrStationOperOpenOption  OBJECT-TYPE
 SYNTAX        INTEGER{ exitToClause4(1), enterBypass(2) }
 MAX-ACCESS      read-only
 STATUS        current
 DESCRIPTION
    "This object specifies the action of the Station when a response is
    not received during the registration process.  If set to exitToClause4(1),
    then SMAC attempts to use the TKP access protocol and exits to clause 4.
    If set to enterBypass(2), then SMAC enters Bypass. This object indicates the
    value of the FSOPO flag at which the Station is currently operating."
::= { dtrStationEntry 18 }

dtrStationOperRegistrationOption OBJECT-TYPE
 SYNTAX           INTEGER{ noRegistration (1), dtrRegistration(2) }
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    "This object specifies if the Station or C-Port in Station Emulation
     mode registers with the C-Port to request the use of an access protocol
    and a method of phantom drive and wire fault detection. If the
    value is noRegistration(1), then the Station does not register and
    uses the Join FSM defined in clause 4. If the value is dtrRegistration(2),
    then the Station uses the registration process by using the Join FSM
    defined in 9.2. This object indicates the value of the FSOPO flag
    at which the Station is currently operating."
::= { dtrStationEntry 19 }

dtrStationOperRejectRemoveOption OBJECT-TYPE
 SYNTAX           INTEGER{ removes(1), rejects(2) }
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    "This object specifies how the Station responds to a REMOVE
    frame. If set to removes(1), then the SMAC deinserts upon
    receiving a REMOVE MAC frame. If set to rejects(2), then the
    SMAC rejects the REMOVE MAC frame and transmits a Response
    MAC frame indicating function disabled. This object indicates
    the value of the FSRRO flag at which the Station is currently operating."
::= { dtrStationEntry 20 }

dtrStationOperMediumRateOption  OBJECT-TYPE
 SYNTAX           INTEGER{ rate4Mbps(1), rate16Mbps(2) }
 MAX-ACCESS         read-only
```



```
 STATUS           current
 DESCRIPTION
    "The value of this object specifies the medium rate as either 4 Mbps or
    16 Mbps. If set to rate4Mbps(1), then SMAC operates the medium at
    4 Mbit/s. If set to rate16Mbps(2), then SMAC operates the medium at
    16 Mbit/s. This object indicates the value of the FSMRO flag at which the
    Station is currently operating."
::= { dtrStationEntry 21 }

dtrStationOperRegistrationQueryOption OBJECT-TYPE
 SYNTAX            INTEGER{ support(1), ignore(2) }
 MAX-ACCESS          read-only
 STATUS            current
 DESCRIPTION
    "The value of this object indicates if the registration query protocol
     is supported by MAC when using the TKP access protocol. If set to
     support(1), then MAC recognizes the Registration Query MAC frame.
     If set to ignore(2), then MAC ignores the Registration Query MAC frame.
     This object indicates the value of FSRQO flag at which the
     Station is currently operating."
::= { dtrStationEntry 22 }

dtrStationOperRegistrationDeniedOption OBJECT-TYPE
 SYNTAX              INTEGER{ tkpJoin(1), close(2) }
 MAX-ACCESS            read-only
 STATUS              current
 DESCRIPTION
    "The value of this object specifies how the Station acts upon receiving a
    denied registration request. If set to tkpJoin(1), then SMAC attempts to
    Join using the TKP access protocol. If set to close(2), then the
    SMAC closes. This object indicates the value of FSRDO at which the
    Station is currently operating."
::= { dtrStationEntry 23 }

-- *******************************************************
-- C-Port Protocol Characteristics Table
--  This table contains Protocol information for C-Ports (both TKP and TXI).
--  There is an entry in this table for each C-Port in this managed
--  system.
-- *******************************************************

dtrCportTable   OBJECT-TYPE
 SYNTAX     SEQUENCE OF DtrCportEntry
 MAX-ACCESS   not-accessible
 STATUS     current
 DESCRIPTION
    "This table contains information for C-Port interfaces. There is
    one entry in this table for each C-Port interface in a managed
    system."
::= { dtrMacObjects 3 }

dtrCportEntry   OBJECT-TYPE
 SYNTAX     DtrCportEntry
 MAX-ACCESS   not-accessible
```



```
 STATUS     current
 DESCRIPTION
    "A list of characteristics of a C-Port."
 INDEX
    { dtrCportIfIndex }
::= { dtrCportTable 1 }

DtrCportEntry ::= SEQUENCE {
  dtrCportIfIndex        InterfaceIndex,
  dtrCportCurrentAccessProtocol INTEGER,
  -- policy variables
  dtrCportAccessProtocolMask  OCTET STRING,
  dtrCportMaxFrameSize     INTEGER,
  dtrCportPhantomDriveMask   OCTET STRING,
  -- policy flags
  dtrCportAdminErrorCountingOption  INTEGER,
  dtrCportAdminMediumRateOption   INTEGER,
  dtrCportAdminOperationOption    INTEGER,
  dtrCportAdminRepeatPathOption   INTEGER,
  dtrCportAdminAbortSequenceOption  INTEGER,
  dtrCportAdminBeaconHandlingOption INTEGER,
  dtrCportAdminFrameControlOption  INTEGER,

  dtrCportOperErrorCountingOption  INTEGER,
  dtrCportOperMediumRateOption   INTEGER,
  dtrCportOperOperationOption    INTEGER,
  dtrCportOperRepeatPathOption   INTEGER,
  dtrCportOperAbortSequenceOption  INTEGER,
  dtrCportOperBeaconHandlingOption INTEGER,
  dtrCportOperFrameControlOption  INTEGER
   }

dtrCportIfIndex  OBJECT-TYPE
 SYNTAX     InterfaceIndex
 MAX-ACCESS   not-accessible
 STATUS     current
 DESCRIPTION
    "This object identifies the interface for which this entry contains
    management information. The value of this object for a particular
    interface has the same value as the ifIndex object, defined in RFC 1573,
    for the same interface."
::= { dtrCportEntry 1 }

dtrCportCurrentAccessProtocol OBJECT-TYPE
 SYNTAX           INTEGER { tKP(1), tXI(2) }
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    "This object specifies which access protocol is currently in use by
    the MAC. The value of this object is either (1) TKP or (2) TXI.
    This object cannot be set by management."
::= { dtrCportEntry 2 }
```



```
dtrCportAccessProtocolMask  OBJECT-TYPE
 SYNTAX           OCTET STRING(SIZE(2))
 MAX-ACCESS         read-write
 STATUS           current
 DESCRIPTION
    "This object specifies which access protocols can be supported by the
    PMAC. This object indicates the value of the PPV(AP_MASK)
    The value of this object is either: X'0001' (TKP), X'0002'(TXI),
    or X'0003' (TKPAndTXI)."
::= { dtrCportEntry 3 }

dtrCportMaxFrameSize OBJECT-TYPE
 SYNTAX       INTEGER(133..18200)
 MAX-ACCESS     read-write
 STATUS       current
 DESCRIPTION
    "This object specifies the maximum frame size that a PMAC
    will transmit and indicates the value of the PPV(MAX_TX) variable.
    At 4 Mbit/s, the maximum permitted value is 4550. At 16 Mbit/s, the
    maximum permitted value is 18 200."
::= { dtrCportEntry 4 }

dtrCportPhantomDriveMask  OBJECT-TYPE
 SYNTAX          OCTET STRING (SIZE(2))
 MAX-ACCESS        read-only
 STATUS          current
 DESCRIPTION
    "The object indicates the value of the C-Port policy variable PPV(PD_MASK).
    It represents a bit mask of phantom drive and wire fault detection methods
    supported by the C-Port."
::= { dtrCportEntry 5 }

dtrCportAdminErrorCountingOption  OBJECT-TYPE
 SYNTAX           INTEGER {triggered(1), freeRunning(2)}
 MAX-ACCESS         read-write
 STATUS           current
 DESCRIPTION
    "This object specifies how the MAC manages the error report timer.
    If set to triggered(1), the MAC resets TSER when the first error is
    received and, when TSER expires, transmits the Report Error PMAC frame.
    If set to  freeRunning(2), each time TSER expires the PMAC resets TSER
    and, if any of the error counters are not zero, transmits the  Report
    Error MAC frame. This object indicates the value of the FPECO flag.
    A write operation to this object will not change the operational
    value reflected in dtrCportOperErrorCountingOption until the
    next Connect.PMAC event."
::= { dtrCportEntry 6 }

dtrCportAdminMediumRateOption   OBJECT-TYPE
 SYNTAX           INTEGER{ rate4Mbps(1), rate16Mbps(2) }
 MAX-ACCESS         read-write
 STATUS           current
```



```
 DESCRIPTION
    "The value of this object specifies the medium rate as either 4 Mbps or
    16 Mbps. If set to rate4Mbps(1), then PMAC operates the medium at
    4 Mbit/s. If set to rate16Mbps(2), then PMAC operates the medium at
    16 Mbit/s. The SMAC uses this object to set the value of the FPMRO
    flag to be used at the next Connect.PMAC event. A write operation to this
    object will not change the operational value reflected in
    dtrCportOperMediumRateOption until the next Connect.PMAC event."
::= { dtrCportEntry 7 }

dtrCportAdminOperationOption  OBJECT-TYPE
 SYNTAX          INTEGER{ portMode(1),
                                   StationEmulationMode(2) }
 MAX-ACCESS        read-write
 STATUS          current
 DESCRIPTION
    "This object specifies whether the C-Port is in Port mode or Station
    Emulation mode. If set to portMode(1), then PMAC is operating in the
    Port mode. If set to StationEmulationMode(2), then PMAC is operating
    in the Station Emulation mode. This object indicates the value of the
    FPOTO flag to be used at the next Connect.PMAC event. A write
    operation to this object will not change the operational
    value reflected in dtrCportOperOperationOption until the next
    Connect.PMAC event."
::= { dtrCportEntry 8 }

dtrCportAdminRepeatPathOption  OBJECT-TYPE
 SYNTAX          INTEGER{ repeatsACBits (1), setsACBits(2) }
 MAX-ACCESS        read-write
 STATUS          current
 DESCRIPTION
    "When this object is set to repeatsACBits(1), the C-Port repeat path
    will not set the A and C bits to 1, when an address is
    recognized by the C-Port. When set to setsACBits(2), the C-Port repeat
    path will set the A bit to 1 when a destination address is recognized
    by the C-Port and the C bit to 1 if the frame is copied. This object
    indicates the value of the FPACO flag to be used at the next Connect.PMAC
    event. A write operation to this object will not change the operational
    value reflected in dtrCportOperRepeatPathOption until the next
    Connect.PMAC event."
::= { dtrCportEntry 9 }

dtrCportAdminAbortSequenceOption OBJECT-TYPE
 SYNTAX          INTEGER{ abortSequence (1), invalidFCS(2)}
 MAX-ACCESS        read-write
 STATUS          current
 DESCRIPTION
    "This object specifies the method used by the PMAC to control the ending
    sequence for over-length frames when a cut-through design is supported.
    When set to abortSequence(1), an over-length frame is ended with an
    abort sequence. When set to invalidFCS(2), an over-length frame is ended
    with an invalid FCS and by setting the E bit to 1 in the Ending Delimiter
    field. This object indicates the value of the FPASO flag to be
    used at the next Connect.PMAC event. A write operation to this object
```

```
    will not change the operational value reflected in
    dtrCportOperAbortSequenceOption until the next
    Connect.PMAC event.”
::= { dtrCportEntry 10 }

dtrCportAdminBeaconHandlingOption  OBJECT-TYPE
 SYNTAX            INTEGER{ afterNeighborNotification (1),
                                atJoinCompleteStateEntry(2) }
 MAX-ACCESS          read-write
 STATUS            current
 DESCRIPTION
    “This object indicates how a PMAC participates in the beaconing process
    prior to the C-Port completing the joining process while operating in the
    TKP access protocol.  If set to afterNeighborNotification(1), then
    beacon process operates when Neighbor Notification completes. If set
    to atJoinCompleteStateEntry(2), then the beacon process operates when
    PMAC has completed Join. This object indicates the value of the FPBHO
    flag to be used at the next Connect.PMAC event. A write operation to this
    object will not change the operational value reflected in
    dtrCportOperBeaconHandlingOption until the next Connect.PMAC event."
::= { dtrCportEntry 11 }

dtrCportAdminFrameControlOption   OBJECT-TYPE
 SYNTAX            INTEGER{ fr_FC(1), fr(2) }
 MAX-ACCESS          read-write
 STATUS            current
 DESCRIPTION
    “This object indicates the value of the FPFCO flag, which is used to
    control the forwarding of frames to the DTU interface. If set to fr_FC(1),
    then PMAC causes the received FR_FC event to be indicated to the DTU.
    If set to fr(2), then PMAC cause the received FR event to be indicated to
    the DTU. This object specifies the value of the FPFCO flag to be used at the
    next Connect.PMAC event. A write operation to this object will not
    change the operational value reflected in dtrCportOperFrameControlOption
    until the next Connect.PMAC event.”
::= { dtrCportEntry 12 }

dtrCportOperErrorCountingOption  OBJECT-TYPE
 SYNTAX           INTEGER {triggered(1), freeRunning(2)}
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    “This object specifies how the MAC manages the error report timer.
    This object indicates the value of the FPECO flag. If set to triggered(1),
    the MAC resets TSER when the first error is received and, when TSER
    expires, transmits a Report Error MAC frame. If set to freeRunning(2), each
    time TSER expires the MAC resets TSER and, if any of the error counters are
    not zero, transmits the Report Error MAC frame. This object indicates the
    value of the FPECO flag at which the C-Port is currently operating.”
::= { dtrCportEntry 13 }

dtrCportOperMediumRateOption   OBJECT-TYPE
 SYNTAX           INTEGER{ rate4Mbps(1), rate16Mbps(2) }
 MAX-ACCESS         read-only
```



```
 STATUS            current
 DESCRIPTION
    "The value of this object specifies the medium rate as either 4 Mbps or
    16 Mbps. If set to rate4Mbps(1), then PMAC operates the medium at
    4 Mbit/s. If set to rate16Mbps(2), then PMAC operates the medium at
    16 Mbit/s. The PMAC uses this object during a MGT ACTION.request(OPEN).
    This object specifies the value at which the C-Port is currently operating."
::= { dtrCportEntry 14 }

dtrCportOperOperationOption  OBJECT-TYPE
 SYNTAX           INTEGER{ portMode(1),
                        StationEmulationMode(2) }
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    "This object specifies whether the C-Port is in Port mode or Station
    Emulation mode. If set to portMode(1), then PMAC is operating in the
    Port mode. If set to StationEmulationMode(2), then PMAC is operating
    in the Station Emulation mode. This object indicates the value of the FPOTO
    flag at which the C-Port is currently operating."
::= { dtrCportEntry 15 }

dtrCportOperRepeatPathOption  OBJECT-TYPE
 SYNTAX           INTEGER{ repeatsACBits (1), setsACBits(2) }
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    "When this object is set to repeatsACBits(1), the C-Port repeat path
    will not set the A and C bits to 1 when an address is recognized by
    by the C-Port. When set to setsACBits(2), the C-Port repeat
    path will set the A bit to 1 when a destination address is recognized
    by the C-Port and the C bit to 1 if the frame is copied. This object
    indicates the value of the FPACO flag at which the C-Port is
    currently operating."
::= { dtrCportEntry 16 }

dtrCportOperAbortSequenceOption OBJECT-TYPE
 SYNTAX           INTEGER{ abortSequence (1), invalidFCS(2)}
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    "This object specifies the method used by the PMAC to control the ending
    sequence for over-length frames when a frame of unknown length is
    supported. When set to abortSequence(1), an over-length frame is ended
    with an abort sequence. When set to invalidFCS(2), an over-length frame is
    ended with an invalid FCS and by setting the Error Detected bit in the
    Ending Delimiter field. This object indicates the value of the FPASO flag
    at which the C-Port is currently operating."
::= { dtrCportEntry 17 }

dtrCportOperBeaconHandlingOption  OBJECT-TYPE
 SYNTAX             INTEGER{ afterNeighborNotification (1),
                          atJoinCompleteStateEntry(2) }
 MAX-ACCESS           read-only
```

```
 STATUS            current
 DESCRIPTION
     "This object indicates how a PMAC participates in the beaconing process
     prior to the C-Port completing the joining process while operating in the
     TKP access protocol.  If set to afterNeighborNotification(1), then
     beacon process operates when Neighbor Notification completes. If set
     to atJoinCompleteStateEntry(2), then the beacon process operates when
     PMAC has completed Join. This object indicates the value of the FPBHO
     flag at which the C-Port is currently operating."
::= { dtrCportEntry 18 }

dtrCportOperFrameControlOption   OBJECT-TYPE
 SYNTAX            INTEGER{ fr_FC(1), fr(2) }
 MAX-ACCESS          read-only
 STATUS            current
 DESCRIPTION
    "This object indicates the value of the FPFCO flag that is used to
    control the forwarding of frames to the DTU interface. If set to fr_FC(1),
    then PMAC causes the received FR_FC event to be indicated to the DTU.
    If set to fr(2), then PMAC causes the received FR event to be indicated to
    the DTU. This object indicates the value of the FPFCO flag at which the
    C-Port is currently operating."
::= { dtrCportEntry 19 }

-- ********************************************************
-- TXI Statistics
--  This table contains statistics for TXI MACs. There
--  is one entry in this table for each TXI MAC in
--  a managed system.
-- ********************************************************

txiStatisticsTable    OBJECT-TYPE
 SYNTAX         SEQUENCE OF TxiStatisticsEntry
 MAX-ACCESS       not-accessible
 STATUS         current
 DESCRIPTION
  "This table contains statistics for each TXI MAC in a managed system."
::= { dtrMacObjects 4 }

txiStatisticsEntry    OBJECT-TYPE
 SYNTAX           TxiStatisticsEntry
 MAX-ACCESS    not-accessible
 STATUS           current
 DESCRIPTION
  "A list of statistics"
 INDEX
    { txiStatsIfIndex }
::= { txiStatisticsTable 1 }

TxiStatisticsEntry ::= SEQUENCE {
  txiStatsIfIndex           InterfaceIndex,
  txiStatsAbortErrorCounter      Counter32,
  txiStatsBurstErrorCounter      Counter32,
  txiStatsInternalErrorCounter     Counter32,
```



```
  txiStatsLineErrorCounter       Counter32,
  txiStatsFrequencyErrorCounter    Counter32,
  txiStatsRcvCongestionErrorCounter  Counter32,
  txiStatsOverlengthFrameCounter    Counter32
  txiStatsTimeStamp          TimeStamp   }

txiStatsIfIndex  OBJECT-TYPE
 SYNTAX     InterfaceIndex
 MAX-ACCESS   not-accessible
 STATUS     current
 DESCRIPTION
    "This object identifies the interface for which this entry contains
    management information. The value of this object for a particular
    interface has the same value as the ifIndex object, defined in RFC 1573,
    for the same interface."
::= { txiStatisticsEntry 1 }

txiStatsAbortErrorCounter OBJECT-TYPE
 SYNTAX          Counter32
 MAX-ACCESS        read-only
 STATUS          current
 DESCRIPTION
    "This counter is incremented when the PMAC or SMAC prematurely ends
    a transmission by transmitting an abort sequence. A Network Management
    Station can detect discontinuities in this counter by monitoring the
    txiStatsTimeStamp object."
::= { txiStatisticsEntry 2 }

txiStatsBurstErrorCounter OBJECT-TYPE
 SYNTAX         Counter32
 MAX-ACCESS       read-only
 STATUS         current
 DESCRIPTION
    "This counter is incremented when a PMAC or SMAC detects the absence
    of transitions at the receiver input. The counter is only required to be
    incremented once during each interval of signal disruption. The counter
    may be inhibited after a burst5_error has been indicated until an event
    occurs that indicates the MAC is receiving a valid signal. A MAC may
    count every burst5_error. A Network Management Station can detect
    discontinuities in this counter by monitoring the txiStatsTimeStamp object."
 REFERENCE "Subclause 5.4.2 in ISO/IEC 8802-5 : 1998"
::= { txiStatisticsEntry 3 }

txiStatsInternalErrorCounter OBJECT-TYPE
 SYNTAX           Counter32
 MAX-ACCESS         read-only
 STATUS           current
 DESCRIPTION
    "This counter is incremented when the MAC recognizes a recoverable internal
    error. A Network Management Station can detect discontinuities in this
    counter by monitoring the txiStatsTimeStamp object."
::= { txiStatisticsEntry 4 }
```

```
txiStatsLineErrorCounter  OBJECT-TYPE
 SYNTAX          Counter32
 MAX-ACCESS        read-only
 STATUS          current
 DESCRIPTION
    “This counter is incremented when a frame with error
    (FR_WITH_ERR) is received by the Station or C-Port.
    A Network Management Station can detect discontinuities
    in this counter by monitoring the txiStatsTimeStamp object.”
 REFERENCE “Subclause 4.3.2 in ISO/IEC 8802-5 : 1998”
::= { txiStatisticsEntry 5 }

txiStatsFrequencyErrorCounter OBJECT-TYPE
 SYNTAX            Counter32
 MAX-ACCESS          read-only
 STATUS            current
 DESCRIPTION
    “This counter is incremented when a frequency error is indicated
    by the Station or C-Port PHY. A Network Management
    Station can detect discontinuities in this counter by monitoring the
    txiStatsTimeStamp object.”
 REFERENCE “Subclause 5.7.2 in ISO/IEC 8802-5 : 1998”
::= { txiStatisticsEntry 6 }

txiStatsRcvCongestionErrorCounter  OBJECT-TYPE
 SYNTAX              Counter32
 MAX-ACCESS            read-only
 STATUS              current
 DESCRIPTION
    “This counter is incremented when a frame addressed to the MAC is
    not copied. A Network Management Station can detect discontinuities
    in this counter by monitoring the txiStatsTimeStamp object.”
::= { txiStatisticsEntry 7 }

txiStatsOverlengthFrameCounter  OBJECT-TYPE
 SYNTAX              Counter32
 MAX-ACCESS            read-only
 STATUS              current
 DESCRIPTION
    “This counter is incremented when the PMAC prematurely
    ends a transmission due to an over-length frame. The
    value of this counter is 0 for SMACs. A Network Management
    Station can detect discontinuities in this counter by monitoring the
    txiStatsTimeStamp object.”
::= { txiStatisticsEntry 8 }

txiStatsTimeStamp OBJECT-TYPE
 SYNTAX           TimeStamp
 MAX-ACCESS         read-only
 STATUS             current
 DESCRIPTION
    “This object indicates the time of the last discontinuity. Counters
    have defined initial value, and thus, a single value of a counter has
    no information content. Discontinuities on the monotonically increasing
```



```
value can occur at reinitialization and possibly at other times. This
time-stamp indicates to a management Station that some discontinuity
in counting has occurred.”
::= (txiStatisticsEntry 9}

-- Traps

dtrMacNonOperational    NOTIFICATION-TYPE
  OBJECTS {
           txiProtocolEventStatus,
           txiProtocolBeaconSA,
            txiProtocolBeaconType,
           txiProtocolBeaconUNA,
            txiProtocolBeaconPDN }
  STATUS  current
  DESCRIPTION
    “This notification indicates the Station or C-Port is in
    a non operational state. If the eventStatus is
    heartBeatLost or signalLoss, the value in the beacon
    objects represent those of the last transmitted Beacon
    MAC frame. If the eventStatus is beaconReceived, the
    values in the beacon objects represent those contained
    in the last received Beacon MAC frame.”
::= { dtrMacTraps 1}

dtrMacFailure    NOTIFICATION-TYPE
  OBJECTS {txiProtocolEventStatus }
  STATUS  current
  DESCRIPTION
    “This notification indicates that a fault has occurred,
    causing the Station to return to the Bypass state. This trap is
    sent if eventStatus is remove, internalError, StationorCPortError,
    or wireFault.”
::= { dtrMacTraps 2}

dtrMacProtocolFailure  NOTIFICATION-TYPE
  OBJECTS {txiProtocolEventStatus }
  STATUS  current
  DESCRIPTION
    “This notification indicates the PMAC or SMAC using the
    TXI access protocol detected a MAC frame that is only used by the
    TKP access protocol.”
::= { dtrMacTraps 3}

-- Conformance Statement
-- *******************************************************************
-- Conformance information
-- *******************************************************************

dtrMacCompliances  OBJECT IDENTIFIER ::= { dtrMacConformance 1 }
dtrMacGroups     OBJECT IDENTIFIER ::= { dtrMacConformance 2 }

-- Compliance statements
dtrMacCompliance   MODULE-COMPLIANCE
```

```
STATUS current
DESCRIPTION
  “The compliance statement for the SNMPv2 entities that implement
  the dtrMacMIB.”
MODULE  -- this module

GROUP  txiProtocolGroup
DESCRIPTION
  “The txiProtocolGroup is mandatory for those DTR MAC entities that
  implement the TXI protocol.”

GROUP  dtrStationGroup
DESCRIPTION
  “The dtrStationGroup is optional.”

GROUP  dtrCportGroup
DESCRIPTION
  “The dtrCportGroup is optional.”

GROUP  dtrMacNotificationsGroup
DESCRIPTION
  “The dtrMacNotificationGroup is optional.”

OBJECT   txiProtocolFunctionalAddress
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationAccessProtocolMask
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationIndividualAddressCount
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationMaxFrameSize
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationAdminErrorCountingOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationAdminOpenOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”
```

```
OBJECT   dtrStationAdminRegistrationOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationAdminRejectRemoveOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationAdminMediumRateOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationAdminRegistrationQueryOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrStationAdminRegistrationDeniedOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrCportAccessProtocolMask
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrCportMaxFrameSize
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrCportAdminErrorCountingOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrCportAdminOperationOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrCportAdminRepeatPathOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”

OBJECT   dtrCportAdminAbortSequenceOption
MIN-ACCESS read-only
DESCRIPTION
  “Write access is not required.”
```

```
  OBJECT   dtrCportAdminBeaconHandlingOption
  MIN-ACCESS read-only
  DESCRIPTION
    "Write access is not required."

  OBJECT   dtrCportAdminFrameControlOption
  MIN-ACCESS read-only
  DESCRIPTION
    "Write access is not required."

 ::= {dtrMacCompliances 1}

-- Group definitions
txiProtocolGroup     OBJECT-GROUP
  OBJECTS {
       txiProtocolMacType,
       txiProtocolFunctionalAddress,
       txiProtocolUpstreamNeighborAddress,
       txiProtocolMicrocodeLevel,
       txiProtocolProductInstanceId,
       txiProtocolAuthorizedFunctionClasses,
       txiProtocolErrorReportTimer,
       txiProtocolPhysicalDropNumber,
       txiProtocolRingNumber,
       txiProtocolRingStatus,
       txiProtocolJoinState,
       txiProtocolMonitorState,
       txiProtocolBeaconSA,
       txiProtocolBeaconType,
       txiProtocolBeaconPDN,
       txiProtocolBeaconUNA,
       txiProtocolEventStatus          }
  STATUS current
  DESCRIPTION
    "A collection of objects providing information for IEEE 802.5 TXI
    interface."
::= { dtrMacGroups 1}

dtrCportGroup    OBJECT-GROUP
  OBJECTS {
       dtrCportCurrentAccessProtocol,
       dtrCportAccessProtocolMask,
       dtrCportMaxFrameSize,
       dtrCportPhantomDriveMask,
       dtrCportAdminErrorCountingOption,
       dtrCportAdminMediumRateOption,
       dtrCportAdminOperationOption,
       dtrCportAdminRepeatPathOption,
       dtrCportAdminAbortSequenceOption,
       dtrCportAdminBeaconHandlingOption,
       dtrCportAdminFrameControlOption,
       dtrCportOperErrorCountingOption,
       dtrCportOperMediumRateOption,
       dtrCportOperOperationOption,
```



```
        dtrCportOperRepeatPathOption,
        dtrCportOperAbortSequenceOption,
        dtrCportOperBeaconHandlingOption,
        dtrCportOperFrameControlOption }
  STATUS  current
  DESCRIPTION
    "A collection of objects providing protocol characteristics of
    for a DTR C-Port."
::= { dtrMacGroups 2 }

dtrStationGroup    OBJECT-GROUP
  OBJECTS {
        dtrStationStationType,
        dtrStationCurrentAccessProtocol,
        dtrStationRequestedAccessProtocol,
        dtrStationAccessProtocolResponse,
        dtrStationAccessProtocolMask,
        dtrStationIndividualAddressCount,
        dtrStationMaxFrameSize,
        dtrStationPhantomDriveSupport,
        dtrStationAdminErrorCountingOption,
        dtrStationAdminOpenOption,
        dtrStationAdminRegistrationOption,
        dtrStationAdminRejectRemoveOption,
        dtrStationAdminMediumRateOption,
        dtrStationAdminRegistrationQueryOption,
        dtrStationAdminRegistrationDeniedOption,
        dtrStationOperErrorCountingOption,
        dtrStationOperOpenOption,
        dtrStationOperRegistrationOption,
        dtrStationOperRejectRemoveOption,
        dtrStationOperMediumRateOption,
        dtrStationOperRegistrationQueryOption,
        dtrStationOperRegistrationDeniedOption }
  STATUS  current
  DESCRIPTION
    "A collection of objects providing protocol characteristics of
    a DTR Station."
::= { dtrMacGroups 3 }

txiStatisticsGroup   OBJECT-GROUP
  OBJECTS {
        txiStatsAbortErrorCounter,
        txiStatsBurstErrorCounter,
        txiStatsInternalErrorCounter,
        txiStatsLineErrorCounter,
        txiStatsFrequencyErrorCounter,
        txiStatsRcvCongestionErrorCounter,
        txiStatsOverlengthFrameCounter,
        txiStatsTimeStamp  }
  STATUS  current
  DESCRIPTION
    "A collection of objects providing statistics for 802.5 TXI
    interfaces."
```



```
::= { dtrMacGroups 4 }

dtrMacNotificationGroup NOTIFICATION-GROUP
  NOTIFICATIONS {
       dtrMacNonOperational,
       dtrMacFailure,
       dtrMacProtocolFailure }
  STATUS  current
  DESCRIPTION
    "DTR MAC notifications."
       ::= {dtrMacGroups 5 }
```

12. DTU interface

12.1 DTU—PMAC interface service specification

The following service primitives specify the required information that is passed between the PMAC and the DTU. This service specification is solely for the purpose of explaining C-Port and DTU operation and does not imply any particular implementation.

12.1.1 DTU_DAC.request

This primitive is used by the PMAC to request a check of the attached Station's addresses. See K.3.2.1 for recommendations on using the DTU_DAC.request information.

DTU_DAC.request (Station_address,
Individual_address_count)

Station_address is specified as the address of the attached Station. This is the source address found in the Registration Request MAC frame during the registration process.

Individual_address_count is specified as the value from the IAC subvector found in the Registration Request MAC frame during the registration process.

When generated: During registration, the PMAC requests the DTU to check that the address presented by the attached Station is not a duplicate of any other currently attached Station. See K.3.2.1 for recommendations on how this test is performed within the DTU.

Effect of receipt: The DTU performs the appropriate check and generates a DTU_DAC.response.

12.1.2 DTU_DAC.response

This primitive is used by the DTU to indicate to the PMAC the results of its DTU_DAC.request for a duplicate address check.

DTU_DAC.response(Response_Code)

Response_Code is specified as one of the following:

X'0000', indicating a positive response.
X'8020', indicating a negative response and DAC failure.

When generated: The DTU has completed its duplicate address check of the address presented in the previous DTU_DAC.request.

Effect of receipt: The PMAC stores this value and sets an internal indication that the result of the check has been received.

The DTU and PMAC UNITDATA service interfaces are illustrated by figure 12-1.

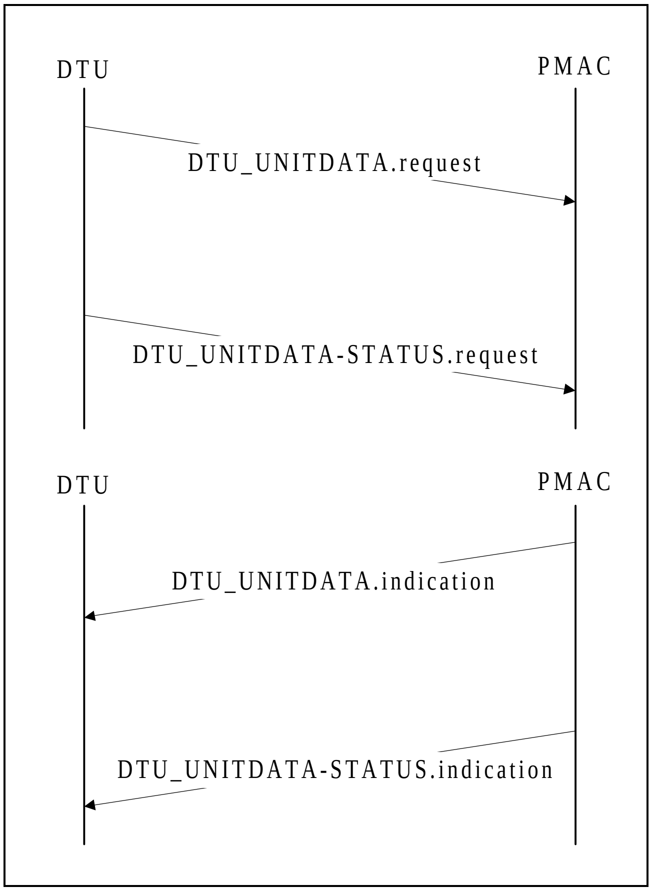


Figure 12-1—DTU and PMAC UNITDATA service interfaces

12.1.3 DTU_UNITDATA.request

This primitive is used by the DTU to pass frames to the PMAC for transmission. When the PMAC receives this request and frame transmission is allowed, the frame is queued for transmission.

```
DTU_UNITDATA.request( Frame_type,
                      Access_priority,
                      User_priority,
                      Destination_address,
                      Source_address,
                      MAC_service_data,
                      Frame_check_sequence)
```

Frame_type is specified as the FF bits in the frame control (FC) field. The value of this field is 01 indicating user data.

Access_priority, if specified, is the requested priority for transmission of this frame. This is used by the PMAC only when connected to a shared medium.

User_priority is specified as the YYY bits of the FC field.

Destination_address is specified as the destination address of the MAC frame.

Source_address is specified as the source address of the MAC frame.

MAC_service_data_unit is specified as the INFO field of the MAC frame. This field contains the vector class, and is used by the MRI to determine where to forward the frame.

Frame_check_sequence is specified as the FCS field of the MAC frame.

When generated: The DTU has a frame to transfer to the PMAC.

Effect of receipt: The PMAC queues the frame for transmission.

12.1.4 DTU_UNITDATA.indication

This primitive is used by the PMAC to pass frames to the DTU for forwarding.

DTU_UNITDATA.indication(Frame_type,
User_Priority,
Destination_address,
Source_address,
MAC_service_data_unit,
Frame_check_sequence)

Frame_type is specified as the FF bits in the FC field. The value of this field is 01 indicating user data.

User_priority is specified as the YYY bits of the FC field.

Destination_address is specified as the destination address of the MAC frame.

Source_address is specified as the source address of the MAC frame.

MAC_service_data_unit is specified as the INFO field of the MAC frame.

Frame_check_sequence is specified as the FCS field of the MAC frame.

When generated: The PMAC has received a frame for transfer to the DTU.

Effect of receipt: The DTU performs the appropriate action on the frame.

12.1.5 DTU_UNITDATA-STATUS.request(Status_Code)

This primitive is used by the PMAC to inform the DTU that a frame transfer from the DTU to the PMAC has completed. The Status_Code indicates the status of the frame.

DTU_UNITDATA-STATUS.request(Status_Code)

Status_Code is specified as one of the following:

OK: The frame has been successfully transferred to the PMAC without error.
Fail: Transfer of the frame to the PMAC has failed due to a frame error.

When generated: The DTU completes transfer of a frame to the PMAC. This primitive will either be generated concurrently with the corresponding DTU_UNITDATA.request, if cut-through operation is not being used, or subsequent to the corresponding DTU_UNITDATA.request, if cut-through operation is being used.

Effect of receipt: The PMAC performs the appropriate action on the frame associated with the status presented. In the case of a Fail Status_Code, this might include for example deleting or aborting the frame.

12.1.6 DTU_UNITDATA-STATUS.indication(Status_Code)

This primitive is used by the PMAC to inform the DTU that a frame transfer from the PMAC to the DTU has completed. The Status_Code indicates the status of the frame.

DTU_UNITDATA-STATUS.indication(Status_Code)

Status_Code is specified as one of the following:

OK: The frame has been successfully transferred to the DTU without error.
Fail: Transfer of the frame to the DTU has failed due to a frame error.

When generated: The PMAC completes the transfer of a received frame to the DTU. This primitive will either be generated concurrently with the corresponding DTU_UNITDATA.indication, if cut-through operation is not being used, or subsequent to the corresponding DTU_UNITDATA.indication, if cut-through operation is being used.

Effect of receipt: The DTU performs the appropriate action on the frame associated with the status presented.

Add a new clause 13:

13. Fibre optic media

13.1 Clause numbering

Within this clause, the first subclause number refers back to the relevant primary clause within the base standard that provides corresponding specifications for copper based operation. For example, in 13.7, Station attachment specifications, the .7 provides reference that clause 7 of the base token ring standard specifies the requirements for station attachment.

13.2 Overview

The use of optical fibres to attach a station to a ring requires a new definition of media interface. In particular, the term fibre optic medium interface (FMI) is defined as encompassing the following functions:

a) It provides optical signal characteristics on transmit and receive ports (Q1 and Q2 in figure 13-1) of a fibre optic station (FODTE) that include the electrical to optical and optical to electrical conversions of the original DTE electrical signals.
b) It provides cable medium (fibre) reference for specification of the FMI signals.
c) It provides remote signaling requirements of both the station and channel, including the FOTCU, to facilitate station insertion and removal on the ring.
d) It provides physical attachment of the station to the medium, via a fibre optic medium interface connector, or FMIC.

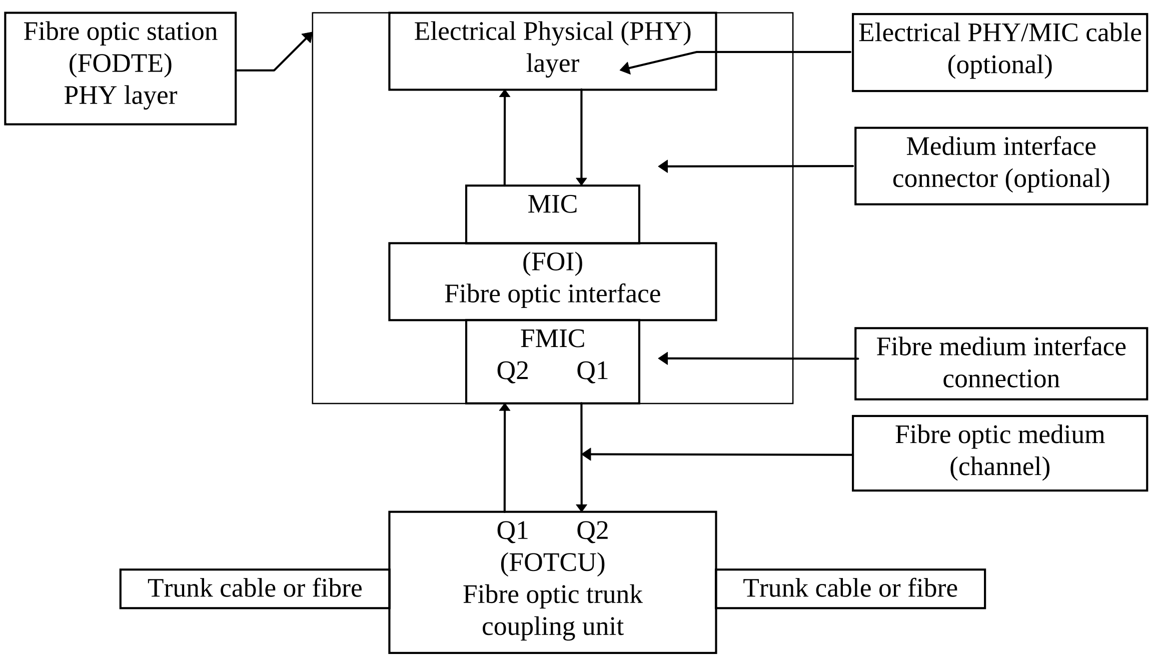


Figure 13-1—Partitioning of the PHY into electrical and fibre optic elements

The FMI specified in this clause contains two ports, an optical transmitter and an optical receiver, and uses a separate fibre for each path. The following subclauses specify characteristics of the transmit and receive active interfaces, as measured through a reference channel, as well as mechanical, environmental, and system behavior characteristics. Parameters are specified to promote interoperability and conformance testability of both the baseband data channel, including critical timing attributes, and the Insert/Bypass command signaling. Specifications for both data and Insert/Bypass command signaling are based on the FMI operating into a pair of characterized 62.5/125 µm multimode optical fibres acting as a reference fibre optic cable medium.

The fibre optic lobe cabling and the fibre optic trunk coupling unit (FOTCU) are indirectly specified by the requirement to interoperate with an attaching fibre optic station (DTE) whose FMI signaling characteristics conform to the specifications in this clause.

Since the fibre media cannot pass the station phantom destination class (DC) ring access signals specified in 7.2.1, an out-of-band signaling method compatible with fibre is defined for the access control functions. The signaling method specifies on/off “keying” or toggling of the optical signal from the station to the FOTCU. The FOTCU is required to recognize this keying for station insertion and removal, and convey the keyed signal back to the station that the station may use as an acknowledgment. Beyond this keying function and the requirement to support data traffic in Insert and Bypass states, the FOTCU is not further defined.

It should be noted that this clause allows for stations with a single exposed interface at the FMIC, as well as devices with both exposed MIC and exposed FMIC interfaces, i.e., modem-like wire-to-fibre converters. *Copper to fibre converters shall ensure when the fibre link is not operational that stations attempting insertion via the converter will fail with wire fault or lobe test bad indications*. For devices with both MIC and FMIC, the signal characteristics at the MIC shall meet the specifications set forth in 7.2, while the signaling requirements at the FMIC shall meet the specifications set forth in this clause. A manufacturer may want to consider restricting the lobe length conditions under which the unit is used. If so, the basic requirement to be met is interoperability with all other stations on the ring when the units are operating within the specified restrictions.

NOTE—A manufacturer could not claim general conformance to the standard in such a case, but only conformance under the specified conditions of usage. It may be necessary to implement a jitter reduction device between media domains (e.g., shielded twisted pair to fibre) to ensure interoperability with some older equipment. In figure 13-1, the PHY/MIC cable is optional and unspecified.

13.3–13.6

Not used in this clause; see 13.1.

13.7 Station attachment specifications

This subclause defines the physical medium components (PMC) of the fibre optic station attachment PHY layer as well as restrictions on the jitter accumulation in a ring caused by any fibre optic station PHY or FOTCU.

13.7.1 Media independent PHY specifications

13.7.1.1 Accumulated jitter

The fibre optic station PHY shall meet the AJ and FAPS specifications of 7.1.1.

13.7.1.2 Accumulated uncorrelated jitter

The fibre optic station PHY shall meet the AUJA specifications of 7.1.2.

13.7.1.3 PHY net delay

The fibre optic station PHY shall meet the net delay specifications of 7.1.3.

13.7.2 Media dependent PMC specifications

This subclause describes the media dependent specifications for fibre optic station PMCs.

13.7.2.1 Coupling of the station to the ring

Connection of the FOI to the lobe fibre optic medium shall be via an FMIC. The fibre is a waveguide suitable for baseband data transmission at 4 or 16 Mbit/s (Manchester-encoded) using optical sources at 850 nm nominal center wavelength. Using the reference fibre, channel lengths (Q1 at the FMIC to Q2 at the FOTCU or Q2 at the FMIC to Q1 at the FODTU) of 0 to 2000 m are supported. See 13.7.2.5 and annex 13.A.

When devices are used in the channel between two adjacent stations, the active devices shall meet the delay and distortion limits of the Insertion Key, Bypass Key, and Insertion Key Echo functions of 13.7.2.2.4.

The insertion of the station into the ring at the trunk and the removal of the station from the ring are requested by the station. The mechanism for effecting the insertion or bypass of the station resides in the FOTCU. The station exercises control of the mechanism via the fibre optic cabling using an “insertion key” signal and a “bypass key” or low light-level signal. Mechanisms are also provided for the echo of insertion and bypass keys to the station FOI to allow confirmation of requested ring insertion and de-insertion, and notification of unsolicited deinsertion.

When the station’s attachment into the ring is in the Bypass state, the FOTCU shall provide a repeat path for the optical signal from the station, to allow the station to complete the lobe test prior to requesting insertion into the ring.

13.7.2.2 Ring insertion and ring bypass

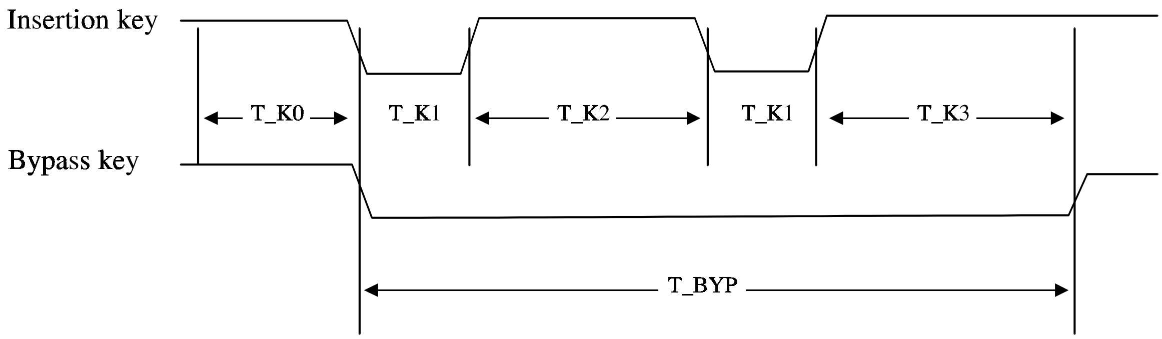
13.7.2.2.1 Insertion key

The insertion key is a specific pattern presented to the FOI’s transmitter enable function when a station desires to attach to the ring. The transmitter, when enabled, converts the continuous input stream from the MAC to suitable optical waveforms with average optical power Po, as defined in 13.7.2.3. The maximum time that the input stream remains at either logic state without a transition during keying will not exceed 2 bit times. When disabled, the transmitter emits a low light-level, less than or equal to Po_OFF. The insertion key, therefore, is an envelope of optical power that shall meet the signal level specifications of 13.7.2.3 and the timing specifications of figure 13-2, as controlled by the transmitter enable function. Po shall be greater than Po_OFF for 5000 µs(T_K0) prior to sending an insertion key.

The insertion key pattern, measured at the Po_Off threshold crossings of the average optical power at the FMIC-TX port, shall maintain the typical values of figure 13-2 parameters T_K0, T_K1, T_K2, and T_K3 within the accuracy specified.

The optical data stream with its blanked or disabled regions is delivered via the channel to a detector at the FOTCU, which decodes the envelope via a receive signal detect function. The detector yields an electrical logic signal representing True for received signals above an optical power detection threshold, PrDET, and False for signals of weaker power. PrDET is derived from SNR and error performance, but is always greater than Po_OFF. Pr is the optical power detected at the receiver. The optical characteristics of the receiver are defined in 13.7.2.4.

When the insertion key is recognized, the FOTCU shall initiate the switching action that causes the insertion of the station into the ring. The attachment enters the INSERT state.



Parameter	Description	Min	Typical	Max	Units
T_K0[a]	Key element #0 (Po > Po_OFF)	5000			µs
T_K1[a]	Key element #1 (Po < Po_OFF)	808	833	858	µs
T_K2[a]	Key element #2 (Po > Po_OFF)	1616	1667	1717	µs
T_K3[a]	Key element #3 (Po > Po_OFF)	1616	1667		µs
T_BYP[a]	Bypass element (Po < Po_OFF)	4850	5000		µs
T_BYPDET	Time of Pr < PrDET,Min before detecting Bypass Key	4000	4500		µs
T_E1[b]	Key echo at FMIC-RX (from T_K1)	766	833	900	µs
T_E2[b]	Key echo at FMIC-RX (from T_K2)	1533	1667	1800	µs
T_E3[b]	Key echo at FMIC-RX (from T_K3)	1533	1667		µs

[a] The transmitted envelope at the FMIC-TX port consists of the Typical T_Kn or T_BYP values, plus the key time base uncertainty of the Transmit Enable function (due to source clock inaccuracies for the electrical keying signal), and asymmetries of the Optical Enable function (due to distortions in converting the electrical keying signals into an optical envelope). The total envelope timing asymmetry measured optically at the TX port (at the Po_OFF transitions of average power) is about ±3%.

[b] The optical envelope as seen at the FMIC-RX port may contain the original transmitted asymmetry plus distortions of the envelope due to the channel, including the FOTCU. The total allowed envelope timing asymmetry measured optically at the RX port (also at the Po_OFF transitions of average power) is ±8%. This is derived from an estimated ±2% timing asymmetry in detecting the optical envelope's average power transition between Pr >PrDET, Min and Pr <PrDET, Min, and a total allowable key asymmetry (end-to-end, electrical) of ±10%.

Figure 13-2—Insertion and bypass keying patterns

13.7.2.2.2 Bypass key

When a fibre optic station decides to leave the ring ("Token Ring PHYAction = remove"), it signals the FOTCU via the outbound optical fibre using the bypass key. In this function the FOI transmitter is disabled and an average power of less than or equal to Po_OFF is presented to the FMIC-TX port. This condition is maintained for a sufficient time (T_BYP) to force the FOTCU to detect loss of signal (no signal detected for a time > T_BYPDET) and revert to the Bypass state. The bypass key shall meet the level specifications of 4.1 and the timing specifications shown in figure 13-2. An FOTCU receiving a key not meeting the level specifications of 13.7.2.2.2 or the timing specifications shown in figure 13-2 shall not cause the FOTCU to revert to the Bypass state.

13.7.2.2.3 Bypass key echo

The bypass key echo is designed so the station may detect the FOTCU deinserting due to a momentary break in the transmit fiber from the station. A Bypass Key Acknowledge function is accomplished by receiving the bypass key back at the station that sent it. The FOTCU on receipt of the bypass key shall transmit a bypass key as specified in 13.7.2.2.2 or repeat the received bypass key. The bypass key echo shall be a requirement when operating in DTR or TRUNK modes and is a recommended practice for TKP modes of station operation. If the station supports receipt of bypass key echo, then, on receipt of a bypass key echo when the station has not transmitted a bypass key, the station shall transmit a bypass key to deinsert itself from the FOTCU, and the station MAC shall return to the Bypass state.

13.7.2.2.4 Insertion key echo

The attachment is designed such that the station may detect faults in the optical connection path. An Insertion Key Acknowledge function is accomplished by receiving the insertion key back at the station that sent it. The transitions that mark the beginnings of the T_En intervals shall not glitch for more than 20 ms. Failure to receive the insertion key at the FMIC via a receiver Signal Detect function indicates a problem in the optical interconnection or FOTCU. If the acknowledgment fails, it is recommended that the station assert the bypass key to ensure that the FOTCU is in fact in the Bypass state.

In order to allow full interoperability between stations that do and do not implement acknowledgments, the channel and FOTCU shall provide echo of the envelope keying pattern while in the Bypass state. The total optical envelope key timing parameters T_En of figure 13-2 shall be provided at the station input FMIC-RX port under all transmit conditions at FMIC-TX satisfying the parameters of figure 13-2.

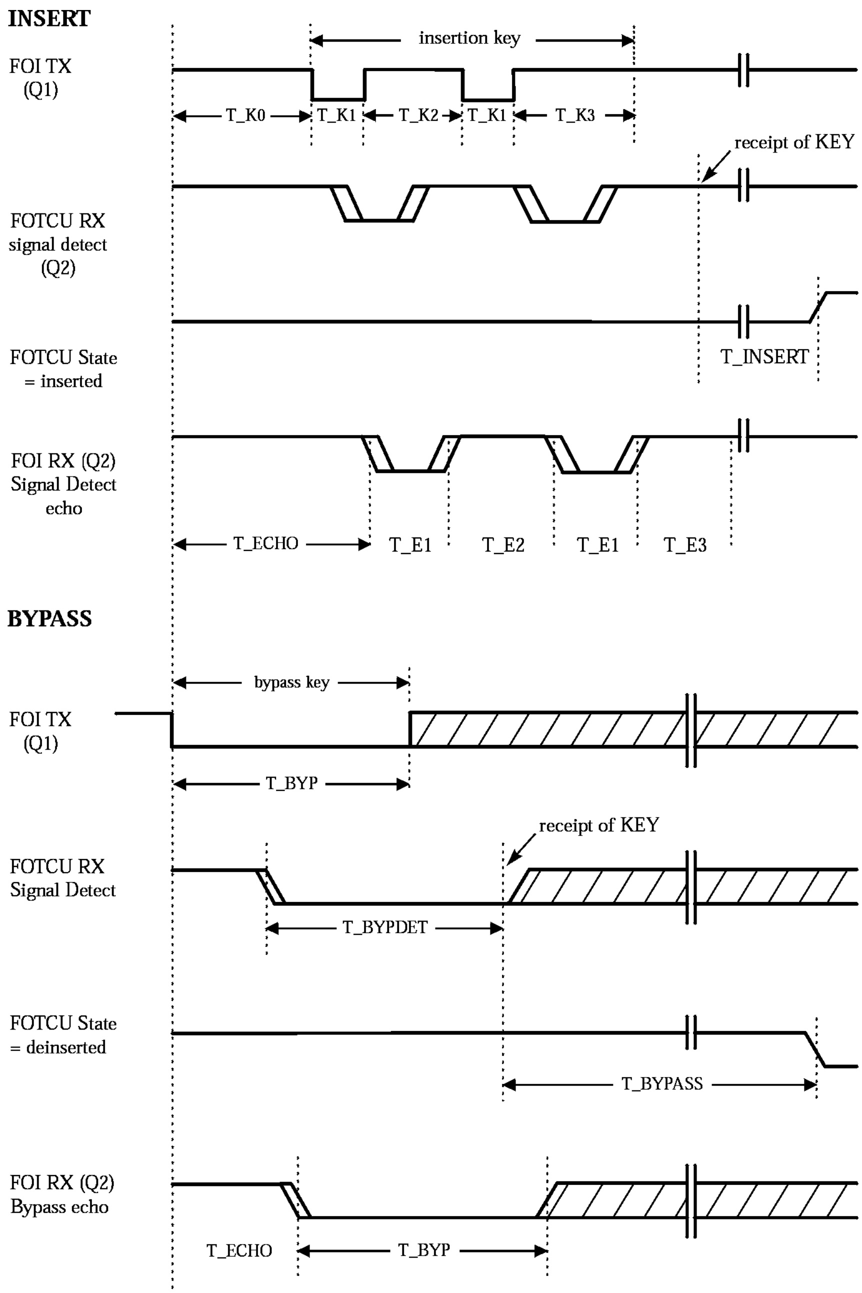
13.7.2.2.5 Operational (system) timing

Figure 13-3 summarizes the system operational timing requirements of the keying, detection, and insert/bypass switching of the lobe. The propagation delay limit is large to accommodate active devices such as repeaters in the link, or state machine logic in the FOTCU.

The detection of the insertion key at the FOTCU, within the timing parameters of figure 13-2 (T_Kn), shall cause the station to be inserted in the ring within T_INSERT, max, of the receipt of the end of the insertion key. The insertion key or the bypass key for DTR and TRUNK modes shall return to the FOI within T_ECHO, max, within the timing parameters of figure 13-2 (T_En).

The detection of the bypass key at the FOTCU, that is, loss of signal for greater than T_BYPDET, max, shall cause the station to be deinserted from the ring, or bypassed, within T_BYPASS, max, of the receipt of the bypass key.

The maximum time that the ring trunk circuit is open, including the break caused by the bypass key, shall not exceed 10 ms.



Parameter	Description	Min	Max	Units
T_INSERT	Entering of insert from receipt of end of insertion key at FOTCU	0	1000	ms
T_BYPASS	Entering of BYPASS from receipt of bypass key at FOTCU	0	5	ms
T_ECHO	Propagation delay from FOI transmit enable to echo at Q2 (through FOTCU)	0	100	ms

Figure 13-3—Keying operational time lines

13.7.2.3 Optical transmitter (OTX) specification

All parameters are specified at the fibre optic medium interface connection. The transmitted signal shall have the optical characteristics shown in table 13-1. The optical signal shall track the input electrical signal from the PHY whenever the transmitter is enabled. When the transmitter is disabled, the light from the transmitter source is brought to a level less than or equal to Po_OFF.

Table 13-1—Transmitted signal optical characteristics

Parameter	Min	Max	Units
Center wavelength	800	910	nm
Spectral width, FWHM		75	nm
Average power, Po, lifetime[a,b]	–19	–12	dBm
Average power, Po_OFF, disabled[b]		–38	dBm
Extinction ratio (Data)	13		dB
Rise/Fall time, 10–90% at 4 Mbit/s		25	ns
Rise/Fall time, 10–90% at 16 Mbit/s		6	ns
Overshoot[c]		25	%

[a] The minimum average power, Po, lifetime specification includes 3 dB for end-of-life degradation.
[b] Measured with a calibrated fibre optic power meter at the end of 10 m of reference fibre [4.2], terminated with the FMIC specified in clause 8. This test shall be performed using a 4 Mbit/s and a 16 Mbit/s all-zeros test pattern so as to achieve a 50% duty cycle.
[c] Test equipment shall not limit bandwidth so as to minimize actual overshoot.

Data-Path asymmetry requirements are a function of the entire link, but are budgeted among the various elements in the interest of interoperability.

13.7.2.3.1 Optical transmit asymmetry

Optical transmit asymmetry (OTA) is defined with respect to any valid Manchester data stream. The stream consists of periods of high optical power (greater than the average optical power) alternating with periods of low optical power (less than the average optical power), with the high and low times each nominally one or two unit intervals long. OTA, defined only where adjacent up and down times are the same number of unit intervals, is one half the maximum time difference between the adjacent high and low periods measured at the average power (ac zero) crossings.

Optical transmit asymmetry

Data rate	=	4	16	Mbit/s
|OTA|	<=	4.0	2.5	ns

The transmitter waveform shall have the characteristics of a square wave transmitter, as described above.

13.7.2.4 Optical receiver (ORX) specifications

All parameters are specified at the FMIC RX port. The received signal shall have the optical characteristics shown in the table 13-2. The output electrical signal to the PHY shall track the input optical signal as long as the signal detect threshold is exceeded. The fibre optic receiver shall output a constant polarity signal when the signal detect threshold is not exceeded. The BER shall conform to that specified in clause 7 when measured between two FMICs for all combinations of valid optical transmit and receive parameters.

Signal detect shall be asserted for any power level of Pr, min, or higher. The minimum allowed power level for signal detect deassertion shall be the power that gives PrDET min. The Signal Detect function shall respond within the timing constraints imposed by the insertion and bypass keys as described in clause 3.

Table 13-2—Received signal optical characteristics

Parameter	Minimum	Maximum	Units
Average received power, Pr, operating	–32	–12	dBm
Signal detect threshold	–38	–32	dBm
Signal detect hysteresis	0.3		dB
Input extinction ratio, operating	10		dB
Input rise fall time, 10–90%,operating at 4 Mbit/s		60	ns
Input rise/fall time, 10–90%,operating at 16 Mbit/s		27	ns

13.7.2.4.1 Receiver jitter tolerance

The receiver shall meet the JTOL specifications in 7.2.3.1. A conformant transmitter on the active monitor station is utilized, with nominal optical characteristics as defined in 13.7.2.3 (OTX). The test channel is a short length (10 m) of the referenced 62.5/125 multimode graded-index glass fibre. The frequency error deviation (ns/ns) of the active monitor clock source is increased until frame or token errors occur on the ring.

The JTOLX tests in 7.2.3.1 need not be performed.

13.7.2.5 The fibre optic channel specifications

Requirements on the fibre optic channel are defined by the FMIC transmit and receive port characteristics. In practice, the fibre optic channel may include sections of multimode fibre, connectors, splices, and active trunk coupling units. The fibre optic channel is defined from the FMIC's transmitter port (Q1) to the downstream FMIC's receiver port (Q2). Active and passive devices within the channel may be a source of link jitter and other signal impairments, requiring allocation in the link budget.

Active devices may also be a source of accumulated jitter requiring allocation against the maximum allowable station count. Manufacturers are encouraged to refer to annex C.

The channel is treated as a two-port device, the ports being at the station FMIC and the FOTCU. The fibre used in the test for transmitter and receiver operation is described as follows: The optical fibre is 62.5 µm nominal core diameter, 125 µm nominal cladding diameter, multimode graded-index optical waveguide media. This optical fibre is also utilized by ISO/IEC 9314-3 : 1990. It complies with the IEC 60793-2 type A1b, specification (REF 10) with the following modifications to Table III, Transmission parameters at 850 nm (NA=numerical aperture):

Max. theoretical NA	=	0.31
Nominal NA	=	0.275 ± 0.015
Modal bandwidth	=	160 MHz · km minimum

The cabled fibre transmission performance specification at 850 nm center wavelength shall be

Attenuation	=	3.75 dB/km maximum
Modal bandwidth	=	160 MHz · km minimum

Alternative fibre types may be used (for example, 50/125 µm core/ cladding). Care must be exercised in the maintenance of system bandwidth and loss budgets. See annex 13.A for more details on alternate fibres.

13.7.2.5.1 Noise environment

The station shall transfer data from the FMIC receive port to the FMIC transmit port with an acceptable error rate as specified in clause 7. This error rate shall be maintained over the input power range and rise/fall times specified in 13.7.2.2 and in the presence of broadband jitter. The broadband jitter shall have a Gaussian density function with zero mean and 3.4 ns for 4 Mbit/s and 0.9 ns for 16 Mbit/s standard deviation. The spectral density of the broadband jitter shall be equivalent to white noise passed through a single pole filter. The 3 dB cutoff frequency of the filter shall be 4 MHz for 4 Mbit/s stations and 16 MHz for 16 Mbit/s stations.

13.7.2.6 Conformance test interface connector (CTIC)

In order to provide a single interface for conformance testing, a conformance test interface connector (CTIC) is defined below. A cable or other device to connect the FMIC to a CTIC socket shall be provided. Implementors may, but are not required to, use the CTIC as their FMIC.

Conformance test equipment shall provide two fibres terminated with a duplex SC connector, as specified in ISO/IEC 11801 : 1997 and IEC/SC 86B. The corresponding mating connector socket shall be the conformance test interface, also known as the CTIC.

13.7.2.7 FMIC connector losses

The FMIC optical loss under operating conditions is not directly specified. The trade-offs between connector/fibre precision and source/detector performance (as well as other factors) are implementation issues. Imperfections in the FMIC receptacle are included in the power and sensitivity requirements of 13.7.2.3 and 13.7.2.4 for active interfaces. Imperfections in the FMIC plug are included in the channel (cable plant) loss.

13.7.2.8 Attachment to generic cabling

ISO/IEC 11801 : 1997 specifies a generic fibre optic cabling infrastructure that may be used for interconnecting devices as specified in this part of ISO/IEC 8802. The primary specified fibre optic interface as specified in ISO/IEC 11801 is the duplex SC (SC-D) connector. Patch cords terminated in the appropriate connector type are required to connect to established cabling systems.

13.7.3 Station count limit (informative)

The station count limit on a single token ring is determined by a combination of MAC timers and accumulated jitter. A token ring configuration may contain a combination of stations and retimers (that contain a PHY but no MAC). Examples of retimers are repeaters, the retimed active TCU port in a retimed concentrator, and external fibre retimed converters. The station count will in general include a mixture of MAC/PHY stations (NODES) and retiming elements (RETS) in the ring. Both stations and retimers in the same ring shall meet the same specifications for mFCJ. Manufacturers are encouraged to refer to annex C.

Non-Retimed FOTCU specification				
Data rate	=	4	16	Mbit/s
NODES	<=	250	250	number
RETS	<=	14	14	number
mFCJ	<	1.9	2.8	ns

Retimed FOTCU specification				
Data rate	=	4	16	Mbit/s
NODES	<=	132	132	number
RETS	<=	132	132	number
mFCJ	<	1.9	2.8	ns

Annex 13.A

(normative)

Alternate fibres

13.A.1 Additional optical fibres for token ring

The body of this standard references a single fibre type (in 13.7.2.5) to facilitate interoperability and conformance testing. Other fibres may also meet the requirements of token ring fibre optic station attachment, with certain restrictions, and their use is not precluded.

13.A.2 Physical parameters

Subclause 13.7.2.5 specifies an optical fibre with a nominal core diameter of 62.5 µm. Table 13.A-1 gives the physical parameters of two other acceptable optical fibres.

Table 13.A-1— Alternate optical fibres

Parameter	Other acceptable optical fibres	
	50/125	**100/140**
Core diameter	50 µm	100 µm
Cladding diameter	125 µm	140 µm
Numerical aperture (NA)	0.20 ± 0.02	0.29 ± 0.02

13.A.3 System considerations when using alternate fibres

The use of an alternate fibre type with a particular implementation may have the following consequences. At the optical transmitter (OTX) active output interface, more or less light may be launched into the fibre depending on whether the launch optics are optimized for a core size and NA that are smaller or larger than those of the alternate sized fibre. At the optical receiver (ORX) active input interface, the sensitivity may be increased or decreased depending on the optimization of the collecting optics. Table 13.A-2 summarizes the potential effects of an alternate fibre size on loss budget relative to an implementation using 62.5 µm core fibre.

Table 13.A-2—Alternate fibre flux variations

Fibre size (core/clad)	Coupled transmit power (relative)	Receive sensitivity	Loss budget adjustment
50/125 (NA=0.20)	0.0 to –5.0 dB	–1.0 to +1.0 dB	–6.0 to +1.0 dB
100/140 (NA=0.29)	+2.0 to +4.0 dB	0.0 to –1.0 dB	+1.0 to +4.0 dB

This table is intended to indicate the wide range of flux variations possible when using various fibre sizes. In utilizing any of the alternate fibres, it is the responsibility of the network designer to assure that the required overall system optical loss budgets are maintained. It should also be noted that alternate fibres offer differing loss figures, modal bandwidths, and chromatic bandwidths that must also be accommodated.

Annex 13.B

(informative)

FOTCU trunk signaling recommendations

13.B.1 Scope

This annex defines a recommended trunk signaling method for fibre optic TCUs.

13.B.2 Ring access control

The Ring In FMIC asserts insertion or bypass keys and detects bypass keys as a station using the keys specified in 13.7.2.1.1 and shall contain the states listed in figure 13.B-1. Ring In asserts the insert key when link is established, i.e., (Po > Po_off) at the Ring In FMIC receiver and continues to send TK_0 through TK_3 as in 13.7.2.2.1 until the insert key echo is received. The Ring Out FMIC detects insertion or bypass keys and asserts bypass keys as an FOTCU using the keys specified in 13.7.2.1.1 and shall contain the states listed in figure 13.B-2. Prior to detection of the insert key, the Ring Out will transmit a valid Manchester data stream resulting in optical power Po > Po_off. The insert and bypass echo keys shall be provided for Trunk modes.

13.B.3 Optical interconnect components

The optical connector and cable specifications should follow those listed in the body of clause 13.

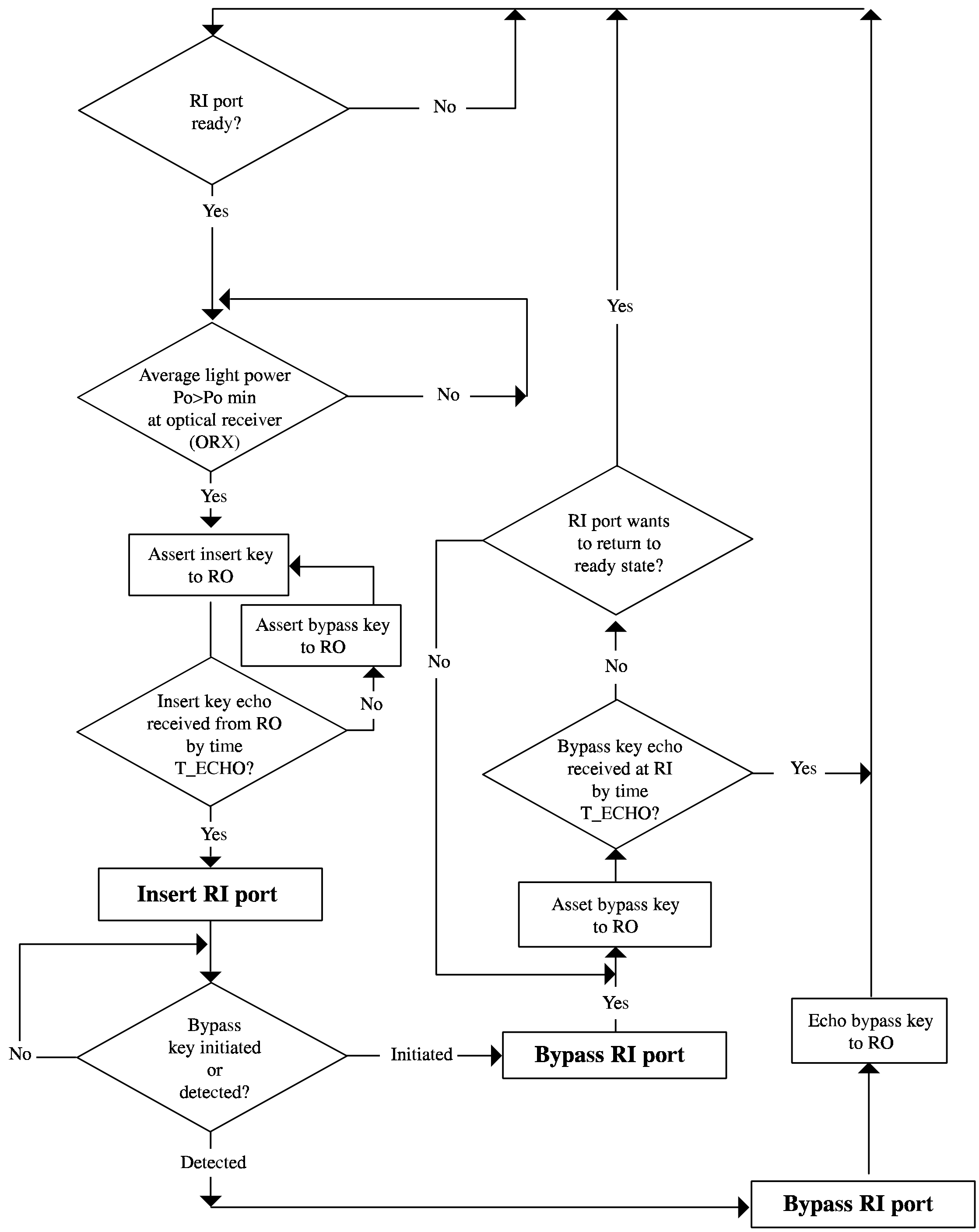


Figure 13.B-1—Ring In signaling

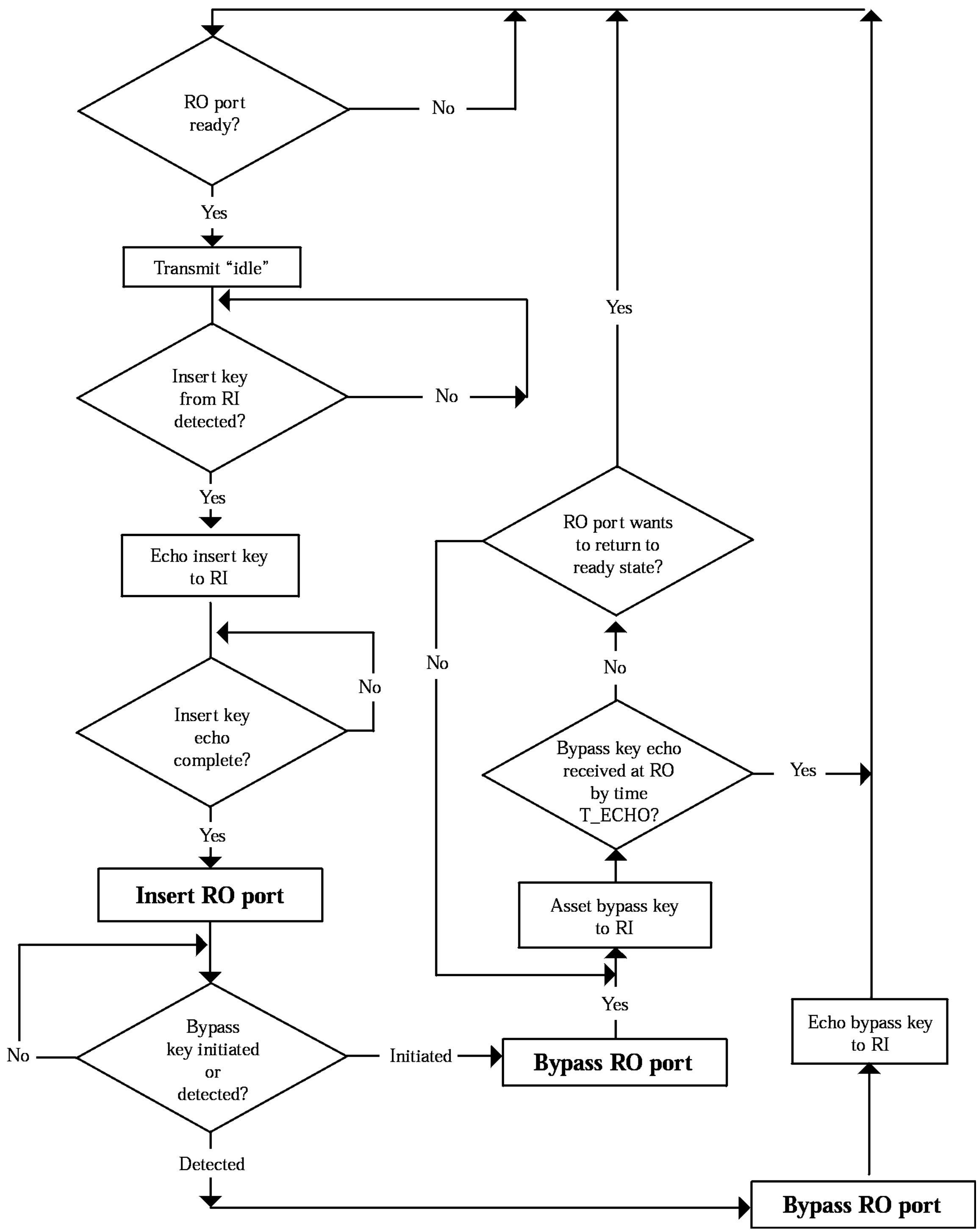


Figure 13.B-2—Ring Out signaling

A.5 Major capabilities

Add the following additional major capabilities to A.5. The first two are for DTR, and the third is for fibre optic media.

Item	Feature	Reference	Status	Support
*DTRS	Dedicated token ring Station	9.2	O.4	Yes [] No []
*DTRP	Dedicated token ring concentrator C-Port	9.3	O.4	Yes [] No []
*FIB	Fibre attachment	13.2	O.3	Yes [] No []
NOTES O.3: Support for at least one of the options (*STP, *UTP, or *FIB) is required. **[*This note will be deleted upon incorporation into the base standard.*]** O.4: Support for at least one of the options is required.				

Add the following two subclauses:

A.5.1 Operational modes for DTR Station—DTRS::M

The operational modes for the DTR Station are as follows:

Mode	Operational feature	Reference	Status	Support
DTRSTXI	DTR Station operates with TXI access protocol	9.2	M	Yes []
DTRSTKP	DTR Station operates with TKP access protocol	9.2, 9.6	M	Yes []

The transition from DTRSTXI to DTRSTKP is described by the registration process (9.1.4). The transition from DTRSTKP to DTRSTXI may occur if a TXI capable station has joined using the TKP protocol (DTRSTKP) when the Station responds to the C-Port's registration query process (9.1.5), resulting in the Station re-entering its registration process and starting the TXI protocol (DTRSTXI). The following DTR Station Policy flags control the operation between the TKP and the TXI access protocol.

NOTE—The flags listed below as FSxx_0 or FSxx_1 designate a flag setting of zero or one, respectively.

Item	Feature	Reference	Status	Support
FSOPO_0	Station open option	10.5.1.1.3	O	Yes [] No []
FSOPO_1	Station open option	10.5.1.1.3	M	Yes []
FSREGO_0a	Station registration option (FSOPO_0 not supported)	10.5.1.1.5	M	Yes []
FSREGO_0b	Station registration option (FSOPO_0 is supported)	10.5.1.1.5	O	Yes [] No []
FSREGO_1	Station registration option	10.5.1.1.5	M	Yes []
FSRDO_0	Registration denied option	10.5.1.1.4	O.24	Yes [] No []

Item	Feature	Reference	Status	Support
FSRDO_1	Registration denied option	10.5.1.1.4	O.24	Yes [] No []
FSRQO_0	Station registration query option	10.5.1.1.6	O.24a	Yes [] No []
FSRQO_1	Station registration query option	10.5.1.1.6	O.24a	Yes [] No []
NOTE—O.24 and O.24a: At least one of the options must be supported.				

A.5.2 Operation modes for DTR concentrator—DTRP::M

The operational modes for C-Ports are as follows:

Mode	Operational feature	Reference	Status	Support
DTRPTXI	Port mode: Operates with TXI access protocol	9.3	M	Yes []
DTRPTKP	Port mode: Operates with TKP access protocol	9.3, 9.4	M	Yes []
DTRPSETXI	Station Emulation mode: Operates with TXI access protocol	9.3, 9.2	O	Yes [] No []
DTRPSETKP	Station Emulation mode: Operates with TKP access protocol	9.3, 9.5	O	Yes [] No []

Replace A.6.3 as follows:

A.6.3 Transitions relating to MAC frames—DS::M

Does the data station implement the following MAC Frame Station Operation table transitions?

Item	Feature	Reference	Status	Support
DSM	Transitions relating to MAC frames	3.3, 4	M	Yes []

Replace A.6.4 as follows:

A.6.4 MAC frame subvectors—DS::M

This subclause is replaced by A.6.3.

***In A.7.4, change the text under the subclause heading from* DS::M** Does the data station support the following access control? ***to* DS::M, DS::UTP, DS::STP** Does the data station support the following access control?

Add two additional tables to A.7.4 as follows:

DS::M and DS::FIB Does the data station support the following access control?

Mode	Operational feature	Reference	Status	Support
FIBRA1	Ring insertion	13.7.2.2	M	Yes []
FIBRA2	Ring bypass	13.7.2.2	M	Yes []

DS::M and DS::FIB Does the concentrator support the following access control?

Mode	Operational feature	Reference	Status	Support
FIBCRAC1	Ring insertion	13.7.2.2	M	Yes []
FIBCRAC2	Ring bypass	13.7.2.2	M	Yes []

Add the following additional attachment tables to A.8:

A.8.1.1 Accumulated correlated jitter—DS::M, ACON::M, FIB::M

Same as A.8.1.

A.8.2.1 Transmitter specification—DS::M, ACON::M, FIB::M

Do the data station and the active concentrator support the following specifications?

Item	Feature	Reference	Status	Support
FIBTR1a	Optical transmit asymmetry	13.7.2.3.1	DR4: M	N/A [] Yes []
FIBTR1b	Optical transmit asymmetry	13.7.2.3.1	DR16: M	N/A [] Yes []
FIBTR2a	Average optical power	13.7.2.3	DR4: M	N/A [] Yes []
FIBTR2b	Average optical power	13.7.2.3	DR16: M	N/A [] Yes []
FIBTR3	Average optical power off	13.7.2.3	M	Yes []
FIBTR4a	Rise/fall time	13.7.2.3	DR4: M	N/A [] Yes []
FIBTR4b	Rise/fall time	13.7.2.3	DR16: M	N/A [] Yes []
FIBTR5	Overshoot	13.7.2.3	M	Yes []

A.8.3 Receiver specification—DS::M, ACON::M

Add a new subclause before the existing table in A.8.3:

A.8.3.1 Receiver specification—DS::M, ACON::M (copper)

Add a new subclause and table as follows:

A.8.3.2 Receiver specification—DS::M, ACON::M (fibre)

Item	Feature	Reference	Status	Support
FIBRC1	Average received power, Pr, operating	13.7.2.4	M	Yes []
FIBRC2	Signal detect threshold	13.7.2.4	M	Yes []
FIBRC3a	Input rise/fall time	13.7.2.4	DR4: M	N/A [] Yes []
FIBRC3b	Input rise/fall time	13.7.2.4	DR16: M	N/A [] Yes []
FIBRC4a	Rcvr jitter tolerance (no noise)	7.2.3.1	DR4: M	N/A [] Yes []
FIBRC4b	Rcvr jitter tolerance (no noise)	7.2.3.1	DR16: M	N/A [] Yes []

A.8.4 Connector specification

Add three additional major capabilities to the first table in A.8.4:

Item	Feature	Reference	Status	Support
MI3A	Fibre media interface connector Duplex SC	13.7.2	FIB: O.4	N/A [] Yes []
MI3B	Fibre media interface connector BFOC/2,5	13.7.2	FIB: O.4	N/A [] Yes []
MI3C	Fibre media interface connector Other	13.7.2	FIB: O.4	N/A [] Yes []
NOTE—O.4: Support for at least one of the options (Duplex SC, BFOC/2,5, or other) is required.				

Add the following additional clauses:

A.10 PICS proforma for DTR Station using the TXI access protocol DTRSTXI::M

The DTR Station (DTRSTXI) using the TXI access protocol supports the following:

A.10.1 Transmission and receive frame formats—DTRSTXI::M

Does the DTR Station operating with TXI access protocol support the following frame formats?

Item	Feature	Reference	Status	Support
DTRSTXIFF1	MAC frame transmit	3.1.2	M	Yes []
DTRSTXIFF1A	MAC frame receive	3.1.2	M	Yes []
DTRSTXIFF2	LLC frame transmit	3.1.2	M	Yes []
DTRSTXIFF2A	LLC frame receive	3.1.2	M	Yes []
DTRSTXIFF3	Abort sequence transmit	3.1.3	M	Yes []
DTRSTXIFF3A	Abort sequence receive	3.1.3	M	Yes []
DTRSTXIFF4	Fill transmit	3.1.4	M	Yes []
DTRSTXIFF4A	Fill receive	3.1.4	M	Yes []

A.10.2 Frame transmit and receive parameters—DTRSTXI::M

Does the DTR Station (DTRSTXI) using the TXI access protocol support the following frame parameters?

Item	Feature	Reference	Status	Support
DTRSTXIFP1	Starting delimiter transmit	3.2.1	M	Yes []
DTRSTXIFP1A	Starting delimiter receive	3.2.1	M	Yes []
DTRSTXIFP2	Access control transmit	10.2.1	M	Yes []
DTRSTXIFP2A	Access control receive	10.2.1	M	Yes []
DTRSTXIFP3	Frame control transmit	3.2.3	M	Yes []
DTRSTXIFP3A	Frame control receive	3.2.3	M	Yes []
DTRSTXIFP4	Destination address transmit	3.2.4.1, 10.2.2	M	Yes []
DTRSTXIFP4A	Destination address receive	3.2.4.1, 10.2.2	M	Yes []
DTRSTXIFP5	Source address transmit	3.2.4.2, 10.2.2	M	Yes []
DTRSTXIFP5A	Source address receive	3.2.4.2, 10.2.2	M	Yes []
DTRSTXIFP6	Routing information indicator transmit	3.2.4.2	M	Yes []
DTRSTXIFP6A	Routing information indicator receive	3.2.4.2	M	Yes []
DTRSTXIFP7	Routing information field transmit	3.2.5	O	Yes [] No []
DTRSTXIFP7A	Routing information field receive	3.2.5	M	Yes []
DTRSTXIFP8	RI field length bits transmit	3.2.5	FP7:M[a]	Yes [] N/A[]
DTRSTXIFP8A	RI field length bits receive	3.2.5	M	Yes []
DTRSTXIFP9	MAC frame, info field transmit	3.2.6.2	M	Yes []
DTRSTXIFP9A	MAC frame, info field receive	3.2.6.2	M	Yes []
DTRSTXIFP10	LLC frame, info field transmit (133 octets min)	3.2.6.3	M	Yes []
DTRSTXIFP10A	LLC frame, info field receive (133 octets min)	3.2.6.3	M	Yes []
DTRSTXIF11	Frame check sequence transmit	3.2.7	M	Yes []
DTRSTXIF11A	Frame check sequence receive	3.2.7	M	Yes []
DTRSTXIF12	Ending delimiter transmit	3.2.8, 10.2.3	M	Yes []
DTRSTXIF12A	Ending delimiter receive	3.2.8, 10.2.3	M	Yes []
DTRSTXIF13	Frame status transmit	3.2.9, 10.2.4	M	Yes []
DTRSTXIF13A	Frame status receive	3.2.9, 10.2.4	M	Yes []

[a] If DTRSTXIFP7 is implemented, this transmit parameter is mandatory.

A.10.3 Transitions relating to MAC frames—DTRSTXI::M

Does the DTR Station (DTRSTXI) using the TXI access protocol implement the following MAC Frame Station Operation table transitions?

Item	Feature	Reference	Status	Support
DTRSTXIM	Transitions relating to MAC frames	3.3, 9.2, 9.6, and 10.3	M	Yes []

A.10.4 Station timers—DTRSTXI::M

Does the DTR Station operating with TXI access protocol support the following timers?

Item	Feature	Reference	Status	Support
TSER	Station error report	10.4.1.1	M	Yes []
TSIP	Station insert process	10.4.1.2	M	Yes []
TSIS	Station initial sequence	10.4.1.3	M	Yes []
TSIT	Station internal test	10.4.1.4	M	Yes []
TSJC	Station join complete	10.4.1.5	M	Yes []
TSLMT	Station lobe media test	10.4.1.6	M	Yes []
TSLMTC	Station lobe media test complete	10.4.1.7	M	Yes []
TSLMTD	Station lobe media test delay	10.4.1.8	M	Yes []
TSQHB	Station queue heart beat	10.4.1.9	M	Yes []
TSQP	Station queue PDU	10.4.1.10	M	Yes []
TSREQ	Station registration request	10.4.1.11	M	Yes []
TSRHB	Station receive heart beat	10.4.1.12	M	Yes []
TSSL	Station signal loss	10.4.1.13	M	Yes []
TSWF	Station wire fault	10.4.1.14	M	Yes []
TSWFD	Station wire fault delay	10.4.1.15	M	Yes []

A.10.5 Station Policy flags—DTRSTXI::M

The DTR Station (DTRSTXI) using the TXI access protocol supports the same Policy flags specified in A.6.5 for DS::M, the Station Policy flags specified in A.5.1 for determining the access protocol, and the Station Policy flags listed below.

NOTE—The flags listed below as FSxx_0 or FSxx_1 designate a flag setting of zero or one, respectively.

Item	Feature	Reference	Status	Support
FSECO_0	Station error counting option	10.5.1.1.1	O.22	Yes [] No []
FSECO_1	Station error counting option	10.5.1.1.1	O.22	Yes [] No []
FSMRO_0	Station media rate option (4 Mbit/s)	10.5.1.1.2	O.23	Yes [] No []
FSMRO_1	Station media rate option (16 Mbit/s)	10.5.1.1.2	O.23	Yes [] No []
FSRRO_0	Station reject remove option	10.5.1.1.7	O.25	Yes [] No []
FSRRO_1	Station reject remove option	10.5.1.1.7	O.25	Yes [] No []
NOTES—O.22, O.23, and O.25: At least one of the options must be supported.				

A.10.6 Station counters—DTRSTXI::M

Does the DTR Station (DTRSTXI) using the TXI access protocol support the following counters?

Item	Feature	Reference	Status	Support
CSABE	Station abort error	10.6.1.1	M	Yes []
CSBE	Station burst error	10.6.1.2	M	Yes []
CSFE	Frequency error	10.6.1.3	M.25a	Yes []
CSIE	Internal error	10.6.1.4	M.25a	Yes []
CSLE	Station line error	10.6.1.5	M	Yes []
CSRCE	Station receive congestion error	10.6.1.6	M	Yes []
NOTE—The CSFE and CSIE counters are mandatory, but the indication for counters CSFE(M.25a) and CSIE(M.25a) are optional.				

A.10.7 Station protocol operation—DTRSTXI::M

Does the DTR Station (DTRSTXI) using the TXI access protocol support the following Station Operation tables?

Item	Feature	Reference	Status	Support
DTRSTXIJOIN	TXI station join	9.2.5.1	M	Yes []
DTRSTXIXMT	TXI station transmit	9.2.5.2	M	Yes []
DTRSTXIMON	TXI station monitor	9.2.5.3	M	Yes []
DTRSTXIERR	TXI station error handling	9.2.5.4	M	Yes []
DTRSTXIIF	Station interface signals	9.2.5.5	M	Yes []
DTRSTXIMISC	Station miscellaneous frame handling	9.2.5.6	M	Yes []

A.10.8 Station PHY layer—DTRSTXI::M

Does the DTR Station (DTRSTXI) using the TXI access protocol support the following PHY layer parameters?

A.10.8.1 Symbol timing

Same as A.7.1 for DS::M.

A.10.8.2 Symbol encoding and decoding

Same as A.7.2 for DS::M.

A.10.8.3 Station latency

Not applicable.

A.10.8.4 Access control

Same as A.7.4 for DS::M.

A.10.8.5 Accumulated correlated jitter

Same as A.8.1 for DS::M.

A.10.8.6 Transmitter specification

Same as A.8.2 for DS::M.

A.10.8.7 Receiver specification

Same as A.8.3 for DS::M.

A.10.8.8 Connector specification

Same as A.8.4 for DS::M.

A.11 PICS proforma for DTR Station using the TKP access protocol DTRSTKP::M

The DTR Station (DTRSTKP) using the TKP access protocol shall support the following:

A.11.1 Transmission and receive frame formats—DTRSTKP::M

The DTR Station (DTRSTKP) operating with TKP access protocol supports the same transmission formats as specified in A.6.1 for DS::M.

A.11.2 Frame transmit and receive parameters—DTRSTKP::M

The DTR Station (DTRSTKP) using the TKP access protocol supports the same frame transmit and receive parameters as specified in A.6.2 for DS::M.

A.11.3 Transitions relating to MAC frames—DTRSTKP::M

Does the DTR Station (DTRSTKP) using the TKP access protocol implement the following MAC Frame Station Operation table transitions?

Item	Feature	Reference	Status	Support
DTRSTKPM	Transitions relating to MAC frames	3.3, 9.6, and 10.3	M	Yes []

A.11.4 Station timers—DTRSTKP::M

The DTR Station (DTRSTKP) using the TKP access protocol supports the same timers as specified in A.6.4 for DS::M and the following:

Item	Feature	Reference	Status	Support
TSRW	Station registration wait	10.4.1.13	M	Yes []
TLMTR	Station lobe media test running	10.4.3.1	O	Yes [] No []

A.11.5 Station Policy flags—DTRSTKP::M

The DTR Station (DTRSTKP) using the TKP access protocol supports the same policy flags specified in A.6.5 for DS::M, the Station Policy flags specified in A.5.1 for determining the access protocol, and the Station Policy flags in A.10.6.

A.11.6 Station counters—DTRSTKP::M

The DTR Station (DTRSTKP) using the TKP access protocol supports the same counters as specified in A.6.7 for DS::M.

A.11.7 Station protocol operation—DTRSTKP::M

Does the DTR Station (DTRSTKP) using the TKP access protocol support the following Station Operation tables?

Item	Feature	Reference	Status	Support
DTRSTKPJOIN	TKP Station join	9.2.5.1, 4.3.4	M	Yes []
DTRSTKPXMT	TKP Station transmit	4.3.4	M	Yes []
DTRSTKPMON	TKP Station monitor	4.3.4	M	Yes []
DTRSTKPERR	TKP Station error handling	4.3.4	M	Yes []
DTRSTKPIF	Station interface signals	4.3.4	M	Yes []
DTRSTKPMISC	Station miscellaneous frame handling	4.3.4	M	Yes []

A.11.8 Station PHY layer—DTRSTKP::M

Does the DTR Station (DTRSTKP) using the TKP access protocol support the following PHY layer parameters?

A.11.8.1 Symbol timing

Same as A.7.1 for DS::M.

A.11.8.2 Symbol encoding and decoding

Same as A.7.2 for DS::M.

A.11.8.3 Station latency

Same as A.7.3 for DS::M.

A.11.8.4 Access control

Same as A.7.4 for DS::M.

A.11.8.5 Accumulated correlated jitter

Same as A.8.1 for DS::M.

A.11.8.6 Transmitter specification

Same as A.8.2 for DS::M.

A.11.8.7 Receiver specification

Same as A.8.3 for DS::M.

A.11.8.8 Connector specification

Same as A.8.4 for DS::M.

A.12 PICS proforma for C-Port in Port mode using the TXI access protocol DTRPTXI::M

The DTR C-Port (DTRPTXI) using the TXI access protocol supports the following:

A.12.1 Transmission and receive frame formats—DTRPTXI::M

The DTR C-Port (DTRPTXI) using the TXI access protocol supports the same transmission formats as specified in A.10.1 for DTRSTXI::M.

A.12.2 Frame transmit and receive parameters—DTRPTXI::M

The DTR C-Port (DTRPTXI) using the TXI access protocol supports the same frame transmit and receive parameters as specified in A.10.2 for DTRSTXI::M.

A.12.3 Transitions relating to MAC frames—DTRPTXI::M

Does the DTR C-Port in Port mode (DTRPTXI) using the TXI access protocol implement the following MAC Frame Station Operation table transitions?

Item	Feature	Reference	Status	Support
DTRPTXIM	Transitions relating to MAC frames	3.3, 9.3, and 10.3	M	Yes []

A.12.4 C-Port timers—DTRPTXI::M

Does the DTR C-Port (DTRPTXI) using the TXI access protocol support the following timers?

Item	Feature	Reference	Status	Support
TPER	C-Port error report	10.4.2.1	M	Yes []
TPIRD	C-Port insert request delay	10.4.2.2	M	Yes []
TPIT	C-Port internal test	10.4.2.3	M	Yes []

Item	Feature	Reference	Status	Support
TPLMTR	C-Port lobe media test running	10.4.2.5	M	Yes []
TPQHB	C-Port queue heart beat	10.4.2.6	M	Yes []
TPQP	C-Port queue PDU	10.4.2.7	M	Yes []
TPRHB	C-Port received heart beat	10.4.2.8	M	Yes []
TPRQD	C-Port registration query delay	10.4.2.9	M	Yes []
TPSL	C-Port signal loss	10.4.2.10	M	Yes []

A.12.5 C-Port Policy flags—DTRPTXI::M

Does the DTR C-Port (DTRPTXI) using the TXI access protocol support the following Policy flags?

NOTE—The flags listed below as FPxx_0 or FPxx_1 designate a flag setting of zero or one, respectively.

Item	Feature	Reference	Status	Support
FPACO_0	C-Port AC repeat path option	10.5.2.1.1	O.27	Yes [] No []
FPACO_1	C-Port AC repeat path option	10.5.2.1.1	O.27	Yes [] No []
FPASO_0	C-Port abort sequence option	10.5.2.1.2	O.28	Yes [] No []
FPASO_1	C-Port abort sequence option	10.5.2.1.2	O.28	Yes [] No []
FPASO_1FCS	Invalid FCS	10.5.2.1.2	FPASO_1:M[a]	Method___
FPBHO_0	C-Port beacon handling option	10.5.2.1.3	O.29	Yes [] No []
FPBHO_1	C-Port beacon handling option	10.5.2.1.3	O.29	Yes [] No []
FPECO_0	C-Port error counting option	10.5.2.1.4	O.30	Yes [] No []
FPECO_1	C-Port error counting option	10.5.2.1.4	O.30	Yes [] No []
FPFCO_0	C-Port frame control option	10.5.2.1.5	O.31	Yes [] No []
FPFCO_1	C-Port frame control option	10.5.2.1.5	O.31	Yes [] No []
FPMRO_0	C-Port media rate option (4 Mbit/s)	10.5.2.1.6	O.32	Yes [] No []
FPMRO_1	C-Port media rate option (16 Mbit/s)	10.5.2.1.6	O.32	Yes [] No []
FPOTO_0	C-Port operation table option	10.5.3.3	M	Yes []
FPOTO_1	C-Port operation table option	10.5.3.3	O	Yes [] No []
NOTE—O.27, O.28, O.29, O.30, O.31, and O.32: At least one of the options must be supported.				

[a]If FPASO_1 is supported, the method for ensuring the invalid FCS must be stated.

A.12.6 C-Port counters—DTRPTXI::M

Does the DTR C-Port (DTRPTXI) using the TXI access protocol support the following counters?

Item	Feature	Reference	Status	Support
CPABE	C-Port abort error	10.6.2.1	M	Yes []
CPBE	C-Port burst error	10.6.2.2	M	Yes []
CPFE	C-Port frequency error	10.6.2.3	M.25a	Yes []
CPIE	C-Port internal error	10.6.2.4	M.25a	Yes []
CPLE	C-Port line error	10.6.2.5	M	Yes []
CPRCE	C-Port receive congestion error	10.6.2.6	M	Yes []
NOTE—The CPFE and CPIE counters are mandatory, but the indication for counters CPFE (M.25a) and CPIE (M.25a) are optional.				

A.12.7 C-Port protocol operation—DTRPTXI::M

Does the DTR C-Port (DTRPTXI) using the TXI access protocol support the following Port Operation tables?

Item	Feature	Reference	Status	Support
DTRPTXIJOIN	TXI C-Port join	9.3.4.1	M	Yes []
DTRPTXIXMT	TXI C-Port transmit	9.3.4.2	M	Yes []
DTRPTXIMON	TXI C-Port monitor	9.3.4.3	M	Yes []
DTRPTXIERR	TXI C-Port error handling	9.3.4.4	M	Yes []
DTRPTXIIF	C-Port interface signals	9.3.4.5	M	Yes []
DTRPTXIMISC	C-Port miscellaneous frame handling	9.3.4.6	M	Yes []

A.12.8 C-Port PHY layer—DTRSTXI::M

Does the DTR C-Port (DTRPTXI) using the TXI access protocol support the following PHY layer parameters?

A.12.8.1 Symbol timing

Same as A.7.1 for DS::M.

A.12.8.2 Symbol encoding and decoding

Same as A.7.2 for DS::M.

A.12.8.3 Station latency

Not applicable.

A.12.8.4 Access control

Same as A.7.4 for DS::M.

A.12.8.5 Accumulated correlated jitter

Same as A.8.1 for DS::M.

A.12.8.6 Transmitter specification

Same as A.8.2 for DS::M.

A.12.8.7 Receiver specification

Same as A.8.3 for DS::M.

A.12.8.8 Connector specification

Same as A.8.4 for DS::M.

A.13 PICS proforma for C-Port in Port mode using the TKP access protocol DTRPTKP::M

The DTR C-Port (DTRPTKP) using the TKP access protocol supports the following:

A.13.1 Transmission and receive frame formats—DTRPTKP::M

The DTR C-Port (DTRPTKP) using the TKP access protocol supports the same transmission formats as specified in A.6.1 for DS::M.

A.13.2 Frame transmit and receive parameters—DTRPTKP::M

The DTR C-Port (DTRPTKP) using the TKP access protocol supports the same frame transmit and receive parameters as specified in A.6.2 for DS::M.

A.13.3 Transitions relating to MAC frames—DTRPTKP::M

Does the DTR C-Port in Port mode (DTRPTKP) using the TKP access protocol implement the following MAC Frame Station Operation table transitions?

Item	Feature	Reference	Status	Support
DTRPTKPM	Transitions relating to MAC frames	3.3, 9.3, 9.4, and 10.3	M	Yes []

A.13.4 C-Port timers—DTRPTKP::M

The DTR C-Port (DTRPTKP) using the TKP access protocol supports the same timers as specified in A.6.4 for DS::M.

A.13.5 C-Port policy flags—DTRPTKP::M

The DTR C-Port (DTRPTKP) using the TKP access protocol supports the same policy flags as specified in A.12.6 for DTRPTXI::M.

A.13.6 C-Port counters—DTRPTKP::M

The DTR C-Port (DTRPTKP) using the TKP access protocol supports the same counters as specified in A.6.7 for DS::M.

A.13.7 C-Port protocol operation—DTRPTKP::M

Does the DTR C-Port (DTRPTKP) in Port mode using the TKP access protocol support the following Port Operation tables?

Item	Feature	Reference	Status	Support
DTRPTKPJOIN	TKP C-Port join	9.3.4.1	M	Yes []
DTRPTKPXMT	TKP C-Port transmit	9.4.6.1	M	Yes []
DTRPTKPMON	TKP C-Port monitor	9.4.6.2	M	Yes []
DTRPTKPERR	TKP C-Port error handling	9.4.6.3	M	Yes []
DTRPTKPIF	C-Port interface signals	9.4.6.4	M	Yes []
DTRPTKPMISC	C-Port miscellaneous frame handling	9.4.6.5	M	Yes []

A.13.8 C-Port PHY layer—DTRPTKP::M

Does the DTR C-Port (DTRPTKP) using the TKP access protocol support the following PHY layer parameters?

A.13.8.1 Symbol timing

Same as A.7.1 for DS::M.

A.13.8.2 Symbol encoding and decoding

Same as A.7.2 for DS::M.

A.13.8.3 Station latency

Same as A.7.3 for DS::M.

A.13.8.4 Access control

Same as A.7.4 for DS::M.

A.13.8.5 Accumulated correlated jitter

Same as A.8.1 for DS::M.

A.13.8.6 Transmitter specification

Same as A.8.2 for DS::M.

A.13.8.7 Receiver specification

Same as A.8.3 for DS::M.

A.13.8.8 Connector specification

Same as A.8.4 for DS::M.

A.14 PICS proforma for DTR C-Port in Station Emulation mode using the TXI access protocol DTRPSETXI::M

The DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol supports the following:

A.14.1 Transmission and receive frame formats—DTRPSETXI::M

The DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol supports the same frame formats as A.10.1 for DTRSTXI::M.

A.14.2 Frame transmit and receive parameters—DTRPSETXI::M

The DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol supports the same frame transmit and receive parameters as A.10.2 for DTRSTXIS::M.

A.14.3 Transitions relating to MAC frames—DTRPSETXI::M

Does the DTR C-Port in Station Emulation mode (DTRPTXI) using the TXI access protocol implement the following MAC Frame Station Operation table transitions?

Item	Feature	Reference	Status	Support
DTRPSETXIM	Transitions relating to MAC frames	3.3, 9.2, 9.5, and 10.3	M	Yes []

A.14.4 Station timers—DTRPSETXI::M

The DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol supports the same timers as A.10.5 for DTRSTXIS::M.

A.14.5 Station policy flags—DTRPSETXI::M

The DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol supports the station policy flags as A.10.6 for DTRSTXIS::M.

A.14.6 Station counters—DTRPSETXI::M

The DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol supports the same timers as A.10.7 for DTRSTXIS::M.

A.14.7 Station protocol operation—DTRPSETXI::M

Does the DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol support the following Port Operation table and Station Operation tables?

Item	Feature	Reference	Status	Support
DTRSTXIJOIN	TXI Station join	9.3.4.1, 9.2.5.1	M	Yes []
DTRSTXIXMT	TXI Station transmit	9.2.5.2	M	Yes []
DTRSTXIMON	TXI Station monitor	9.2.5.3	M	Yes []
DTRSTXIERR	TXI Station error handling	9.2.5.4	M	Yes []
DTRSTXIIF	Station interface signals	9.2.5.5	M	Yes []
DTRSTXIMISC	Station miscellaneous frame handling	9.2.5.6	M	Yes []

A.14.8 Station PHY layer—DTRSTXI::M

Does the DTR C-Port in Station Emulation mode (DTRPSETXI) using the TXI access protocol support the following PHY layer parameters?

A.14.8.1 Symbol timing

Same as A.7.1 for DS::M.

A.14.8.2 Symbol encoding and decoding

Same as A.7.2 for DS::M.

A.14.8.3 Station latency

Not applicable.

A.14.8.4 Access control

Same as A.7.4 for DS::M.

A.14.8.5 Accumulated correlated jitter

Same as A.8.1 for DS::M.

A.14.8.6 Transmitter specification

Same as A.8.2 for DS::M.

A.14.8.7 Receiver specification

Same as A.8.3 for DS::M.

A.14.8.8 Connector specification

Same as A.8.4 for DS::M.

A.15 PICS proforma for C-Port operating in Station Emulation mode using the TKP access protocol DTRPSETKP::M

The DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol supports the following:

A.15.1 Transmission and receive frame formats—DTRPSETKP::M

The DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol supports the same transmission formats as specified in A.6.1 for DS::M.

A.15.2 Frame transmit and receive parameters—DTRPSETKP::M

The DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol supports the same frame transmit and receive parameters as specified in A.6.2 for DS::M.

A.15.3 Transitions relating to MAC frames—DTRPSETKP::M

Does the DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol implement the following MAC Frame Station Operation table transitions?

Item	Feature	Reference	Status	Support
DTRPSETKPM	Transitions relating to MAC frames	3.3, 9.5, and 10.3	M	Yes []

A.15.4 C-Port Timers—DTRPSETKP::M

The DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol supports the same timers as specified in A.11.5 for DS::M.

A.15.5 C-Port Policy flags—DTRPSETKP::M

The DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol supports the same Policy flags as specified in A.11.6 for DTRSTKP::M.

A.15.6 C-Port Counters—DTRPSETKP::M

The DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol supports the same counters as specified in A.6.7 for DS::M.

A.15.7 C-Port Protocol Operation—DTRPSETKP::M

Does the DTR C-Port in Station Emulation mode (DTRPSETKP) using the TKP access protocol support the following Port Operation tables?

Item	Feature	Reference	Status	Support
DTRPSETKPJOIN	TKP C-Port Station emulation join	9.3.4.1, 9.5.4.1	M	Yes []
DTRPSETKPXMT	TKP C-Port Station emulation transmit	9.5.4.2	M	Yes []
DTRPSETKPMON	TKP C-Port monitor	9.5.4.3	M	Yes []
DTRPSETKPERR	TKP C-Port Station emulation error handling	9.5.4.4	M	Yes []
DTRPSETKPIF	C-Port Station emulation interface signals	9.5.4.5	M	Yes []
DTRPSETKPMISC	C-Port Station emulation misc. frame handling	9.4.4.6	M	Yes []

A.15.8 C-Port Station Emulation PHY layer—DTRPSETKP::M

Does the DTR C-Port in Station Emulation mode (DTRPTKP) using the TKP access protocol support the following PHY layer parameters?

A.15.8.1 Symbol timing

Same as A.7.1 for DS::M.

A.15.8.2 Symbol encoding and decoding

Same as A.7.2 for DS::M.

A.15.8.3 Station latency

Same as A.7.3 for DS::M.

A.15.8.4 Access control

Same as A.7.4 for DS::M.

A.15.8.5 Accumulated correlated jitter

Same as A.8.1 for DS::M.

A.15.8.6 Transmitter specification

Same as A.8.2 for DS::M.

A.15.8.7 Receiver specification

Same as A.8.3 for DS::M.

A.15.8.8 Connector specification

Same as A.8.4 for DS::M.

Annex K

(informative)

DTR concentrator functional description

K.1 Overview

Familiarity with the following documents is necessary to understand the concepts presented in this annex: ISO/IEC 10038 : 1993 for MAC bridges and Source Routing Transparent bridges and ISO/IEC 8802-2 : 1998 for Source Routing and RDE.

This annex describes the organization of the DTR concentrator, defines the concentrator relay function and its spanning tree participation, the optional bridge relay function, and the DTR concentrator management. The purpose of this annex is to assure interoperability between DTR concentrators from different manufacturers and MAC bridges. The definitions and requirements for the concentrator relay function are based on ISO/IEC 10038 : 1993.

K.1.1 Terms used in this annex

bridge number (BN). A bridge is administratively assigned this value. Attached bridge numbers are learned by examination of All Route Explorer and Spanning Tree Explorer frames.

bridging relay function (BRF). This is an alternative relay function within the DTR concentrator’s DTU, which adheres to ISO/IEC 10038 : 1993 SRT compliant bridge.

concentrator relay function’s domain. The set of stations connected to a single concentrator relay function via C-Ports.

concentrator relay function (CRF). This is an alternative relay function within the DTR concentrator’s DTU that applies to this informative annex. It is used to forward frames based on a filtering database that uses MAC addresses for forwarding in a manner similar to transparent MAC bridging, and uses destination route descriptors learned from specifically routed frames.

concentrator relay function port (CRFP). This is the point of connection between the concentrator relay function and either a connected C-Port or an internal bridge port.

destination route descriptor (DRD). When determining the path a source-routed frame travels, each bridge examines the routing information field looking for a match on LIN-BN-LOUT for this bridge (BN) and two ports. A concentrator relay function forwards a source-routed frame based on a *destination route descriptor*, made up of BN-LOUT. The destination route descriptor uniquely identifies a bridge attached to a CRFP (via an internal connection or a C-Port) that has a port on LOUT.

internal bridge port. Within a DTU, this is a bridging relay function point of connection to a concentrator relay function.

LAN In (LIN). This is the LAN ID of the ring associated with a single concentrator relay function. It may be learned by examining All Route Explorer or Spanning Tree Explorer frames. It may be administratively set by management action.

LAN Out (LOUT). As viewed from a ring, this is the LAN ID of a ring associated with an attached bridge port that is not on this LAN.

K.1.2 DTR concentrator functional organization and data flow

Figure K.1 illustrates the architectural model of the interfaces associated with a DTR concentrator's DTU. The user data frame forwarding functions are contained in the bridge relay function (BRF) and the concentrator relay function (CRF). The BRF is defined as an ISO/IEC 10038: 1993 SRT compliant bridge whose ports may be both internal and external to the DTU. External bridge ports are not discussed in this annex. The BRF is an optional function for a DTR concentrator. The CRF, a required function, is a frame-forwarding function that relays frames based on MAC addresses and destination route descriptor fields in source-routed frames. The concentrator relay function is described in detail in this annex.

Management for the DTR concentrator is provided by a Management entity (MGMT in figure K.1) and is supported by the management routing interface (MRI), which is used by the C-Ports attached to the concentrator relay functions.

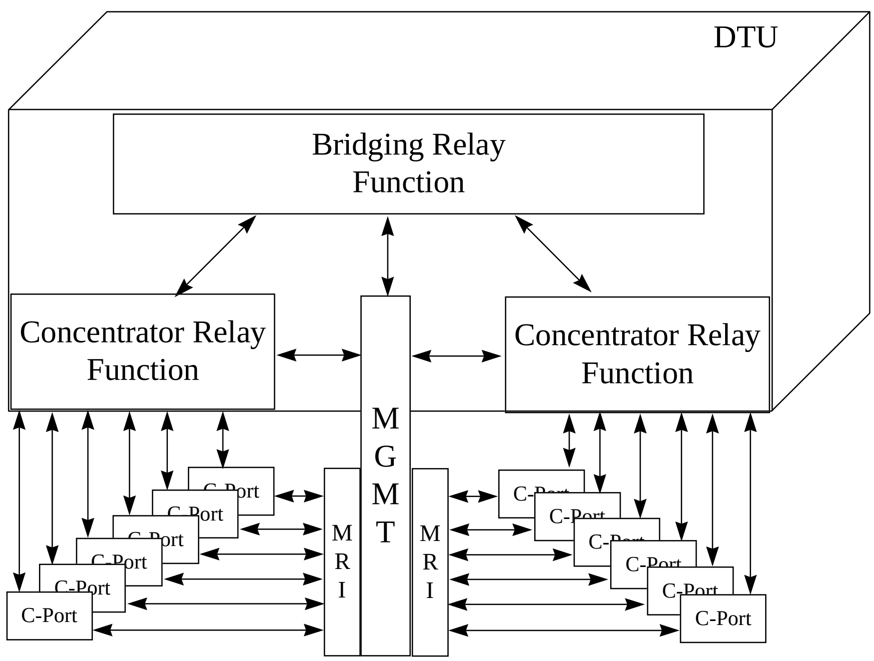


Figure K.1—DTR concentrator functional organization

Figure K.2 illustrates the management interfaces defined by this annex for the attached C-Port(s) and the DTU.

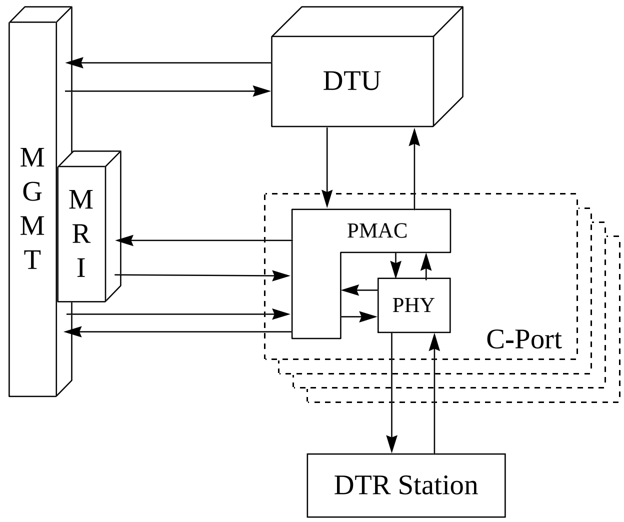


Figure K.2—Detail functional organization showing the C-Port and DTU interfaces to Management

K.2 CRF support of the MAC service

CRFs interconnect separate ring segments that comprise a LAN by relaying frames between separate MACs on separate ring segments. The position of the CRF within the MAC sublayer is shown in figure K.3.

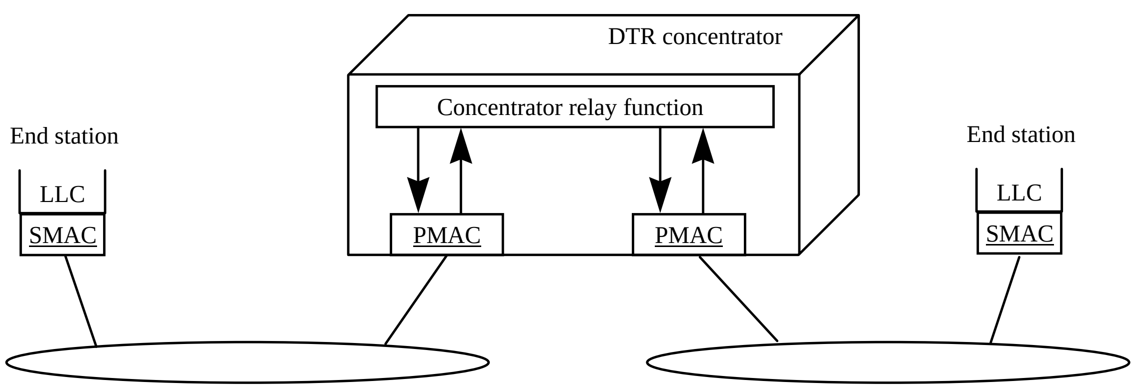


Figure K.3—Internal organization of the MAC sublayer

K.2.1 CRF quality of service maintenance

The quality of MAC service provided by the CRF should not be significantly inferior to that provided by a single LAN. The quality of service parameters to be considered are as follows:

a) Service availability
b) Frame loss
c) Frame misordering
d) Frame duplication
e) The transit delay experienced by frames
f) The undetected frame error rate
g) Maximum service data unit size supported
h) User priority
i) Throughput

K.2.1.1 Service availability

The MAC sublayer provides the MAC service to end stations attached to a LAN. Service availability is measured as that fraction of some total time during which the service is provided. The operation of a CRF can increase or lower the service availability.

The service availability can be increased by automatic reconfiguration of the LAN in order to avoid the use of a failed component (e.g., repeater, cable, or connector) in the data path. The service availability can be lowered by failure of a CRF itself, through denial of service by the CRF, or through frame filtering by the CRF.

A CRF may deny service and discard frames in order to preserve other aspects of the MAC service when automatic reconfiguration takes place. Service may be denied to end stations that do not benefit from the reconfiguration; hence, the service availability is lowered for those end stations. CRFs may filter frames in order to localize traffic in the LAN. Should an end station move, it may then be unable to receive frames from other end stations until the filtering information held by the CRFs is updated.

To maximize the service availability, no loss of service provision should be caused by CRFs, except as a consequence of a failure, removal, or insertion of a LAN component, or as a consequence of the movement of an end station. These are regarded as extraordinary events. The operation of any additional protocol necessary to maintain the quality of the MAC service is thus limited to the configuration of the LAN, and is independent of individual instances of service provision.

K.2.1.2 Frame loss

The service provided by the MAC sublayer does not guarantee the delivery of service data units. Frames transmitted by a source station arrive, uncorrupted, at the destination station with high probability. The operation of a CRF introduces minimal additional frame loss.

A frame transmitted by a source station can fail to reach its destination station as a result of the following:

a) Frame corruption during Physical Layer transmission or reception.
b) Frame discard by a CRF for any of the following reasons:
    1) A CRF is unable to continue to store the frame due to exhaustion of internal buffering capacity as frames continue to arrive at a rate in excess of that at which they can be transmitted.
    2) The size of the service data unit carried by the frame exceeds the maximum supported by the MAC procedures employed on the LAN to which the frame is to be relayed.

3) The size of the service data unit carried by the frame exceeds the internal capabilities of the CRF.
4) Changes in the connected topology of the LAN necessitate frame discard for a limited period of time to maintain other aspects of quality of service.

K.2.1.3 Frame misordering

The service provided by the MAC sublayer does not permit the reordering of frames transmitted with a given user priority between a given pair of MAC service access points. At a receiving end station, MA_UNITDATA indication primitives with the same requested priority and the same source and destination MAC addresses occur in the same order as the corresponding MA_UNITDATA request primitives at the sending end station.

Where CRFs in a LAN are capable of connecting the individual MACs in such a way that multiple paths between any source station to destination station pairs exist, the operation of a protocol is required to ensure that multiple paths do not occur.

K.2.1.4 Frame duplication

The service provided by the MAC sublayer does not permit the duplication of frames. The operation of CRFs does not introduce the delivery of duplicate user data frames to a destination on the LAN.

The potential for frame duplication in a LAN arises through the possibility of duplication of received frames on subsequent transmission within a CRF, or through the possibility of multiple paths between source and destination end stations.

K.2.1.5 Transit delay

The service provided by the MAC sublayer introduces a frame transit delay that is dependent on the particular media and media access control method employed. Frame transit delay is the elapsed time between an MA_UNITDATA. request primitive and the corresponding MA_UNITDATA.indication primitive. Elapsed time values are calculated only on service data units that are successfully transferred.

Since the MAC service is provided at an abstract interface within an end station, it is not possible to specify precisely the total frame transit delay. It is, however, possible to measure those components of the delay associated with media access and with transmission and reception; and the transit delay introduced by an intermediate system, in this case a CRF, can be measured.

The minimum additional transit delay introduced by a CRF is the time taken to receive the destination address field of a frame plus that taken to access the media onto which the frame is to be relayed. If the frame check sequence (FCS) is to be calculated and the frame discarded if in error, the frame must be completely received before it is relayed.

K.2.1.6 Undetected frame error rate

The service provided by the MAC sublayer introduces a very low undetected frame error rate in transmitted frames. Undetected errors are protected against by the use of an FCS that is appended to the frame by the MAC sublayer of the source station prior to transmission, and checked by the destination station on reception. Since a CRF can connect only stations utilizing the media access control protocol defined in IEEE 8802-5 : 1998 and this amendment, the FCS shall be maintained on all frames from source MAC sublayer to the destination MAC sublayer. This ensures an undetected frame error rate equivalent to that of the media access protocol.

K.2.1.7 Maximum service data unit size

The maximum service data unit size that can be supported by an IEEE 802 LAN varies with the media access control method and its associated parameters (speed, etc.). It may be constrained by the CRF implementation or the owner of the LAN.

The maximum service data unit supported by a CRF between two ring segments is the smaller of that supported by the ring segments or the CRF. If the frame is larger than the maximum service data unit size, the CRF shall either ensure that the frame is invalid for reception by the destination or not relay the frame.

K.2.1.8 User priority

The service provided by the MAC sublayer includes user priority as a quality of service parameter. MA_UNITDATA.request primitives with a higher priority may be given precedence over other request primitives made at the same station, or at other stations attached to the same LAN, and can give rise to earlier MA_UNITDATA.indication primitives.

The MAC sublayer maps the requested user priorities onto the access priorities supported by the individual medium access control method. The requested user priority may be conveyed to the destination station.

Since a CRF shall not reorder frames originating from MA_UNITDATA.request primitives of the same user priority, the mapping of priority must be static.

K.2.1.9 Throughput

The total throughput provided by a CRF can be significantly greater than that provided by an equivalent single LAN. CRFs may localize traffic within ring segments by filtering frames.

The throughput between end stations on individual ring segments, communicating through a CRF, can be lowered by frame discard in the CRF due to the inability to transmit at the required rate on the ring segment forming the path to the destination for an extended period.

K.3 Support of PMAC services

The DTR concentrator provides PMAC services to the C-Ports within the DTR concentrator.

K.3.1 Management routing interface (MRI)

The MRI is an interface between the PMAC and the DTR concentrator management. This interface is used to route management MAC frames between one instance of the PMAC within the concentrator to either DTR concentrator management or a C-Port within the DTR concentrator that is within the same CRF. The MRI–PMAC interface service specification is found in 11.2.3.

The PMAC makes the following assumptions on how the management frames are routed once passed to the MRI:

- When a C-Port, operating with the TKP access protocol, indicates a management frame to the MRI, the frame is returned to the transmitter as a function of the TKP access protocol. Such frames are not forwarded to the originating C-Port.
- When a C-Port, operating with the TXI access protocol, indicates a management frame to the MRI, the frame is not returned to the transmitter of the frame. Such frames are forwarded to the originating C-Port (request), allowing the frame to be returned to the transmitter.

The forwarding of a frame to a C-Ports not originating the frame is controlled by the managed objects found in K.6.

K.3.2 DTU interface

The DTU interface is the interface between the DTU and the PMAC. This interface is used to pass frames and duplicate address checking requests and results between the DTU and the PMAC. Since this interface is normative in nature, this interface definition is found in clause 12.

K.3.2.1 Duplicate address check (DAC)

The intent of the DAC is to ensure that there are no stations with duplicate addresses within the domain of a single CRF. The domain of the CRF is defined as the set of stations connected to the CRF via C-Ports. The stations may be connected in either a dedicated or shared fashion.

When the DTU receives a DTU_DAC.request, the DTU examines entries in the filtering database of the attached CRF. If there is an address match, then the requesting station has a duplicate address within the CRF domain and the station's insert request shall be denied by the C-Port. The DTU uses the DTU_DAC.response to indicate the results of the test.

It is recommended that implementations test the filtering database "multiple times," similar to the method used in classic token ring when sending out multiple DAT frames, in order to detect possible duplicate addresses caused by stations recently attaching to the DTR concentrator. "Multiple times" is a recommendation for testing the database in such a fashion as to detect stations that may be simultaneously attempting to join. The mechanism for testing multiple times (code loop, clock interrupt, etc.) is not specified.

Implementors should note the SMAC places a requirement for a maximum duration of 18 s on a DAC. Therefore, it is recommended the DTU complete the DAC in less than 18 s to accommodate this requirement.

Implementors should note the examination of the filtering database does not provide a comprehensive check of stations that are attached to a CRF. A station's address may have been aged out and the station may still be active, may not have started transmitting LLC traffic (where the addresses are learned), or may be the address of a station no longer reachable through the CRF whose address has not been aged out.

K.4 Principles of operation

The principal elements of DTU concentrator operation are as follows:

- Concentrator Relay Function (mandatory for the purpose of discussion in this annex)
- Bridge relay function (optional)

The principal elements of concentrator relay function operation are as follows:

- Relay and filtering of frames
- Maintenance of the information required to make frame filtering and relaying decisions
- Management of the above

The principal elements of the bridge relay function are defined in ISO/IEC 10038 : 1993.

K.4.1 CRF

CRF is an alternative relay function within the DTR concentrator's DTU for use with this informative annex. It is used to forward frames based on a filtering database that uses both MAC addresses for forwarding in a manner similar to transparent MAC bridging, and destination route descriptors learned from specifically routed frames. The model of CRF operation consists of the following:

a) Frame reception, which receives frames from either a C-Port or an internal bridge port. MAC service layer primitives (DTU_UNITDATA.indication and M_UNITDATA.indication) are used to receive frames.
b) Port state database, which is updated by the spanning tree algorithm, is used by frame reception as part of the determination to forward the frame to the relay process and the learning process.
c) Filtering database, which holds filtering information, is either explicitly configured by management action or automatically updated by the learning process. The filtering database supports queries from the relay process as to whether frames with given MAC addresses or destination route descriptors (DRDs) should be relayed to a CRF port (CRFP). The filtering database is used by the DAC function as described in K.3.2.1.
d) Relay process, which forwards frames to other CRFPs and filters frames based on information from the filtering database and the state of the CRFP.
e) Learning process, which, by observing SAs for frames without routing information, and DRDs of source-routed frames, updates the filtering database.
f) Frame transmission, which transmit frames to either a C-Port or an internal bridge port. MAC service layer primitives, DTU_UNITDATA.request and M_UNITDATA.request, are used to transmit frames.

Figure K.4 illustrates a single instance of frame relay between a pair of CRFPs in a CRF.

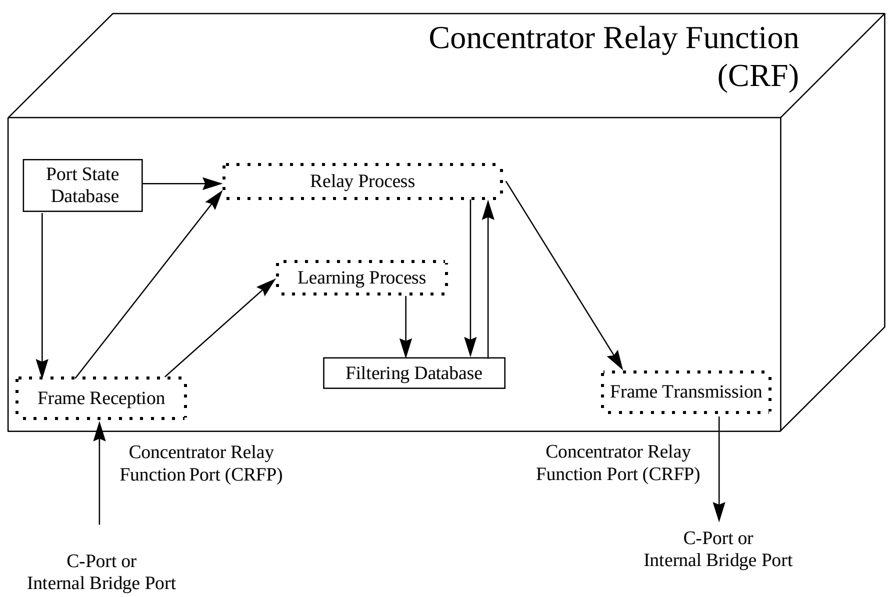


Figure K.4—Concentrator relay function

K.4.1.1 Frame reception

Frame reception examines all frames sent to it by either an attached C-Port or internal bridge port. A C-Port presents data to frame reception using the DTU_UNITDATA.indicate primitive. An internal bridge port presents data to frame reception using M_UNITDATA.request primitive. Frames with a Frame_type of user data are forwarded to the Learning and the relay process when frames meet the additional criteria below. Frames with other values of Frame_type are discarded.

Frame reception forwards frames to the learning process when the CRFP state, as defined by the Port state database, is either forwarding or learning. Frames forwarded do not have an FCS error.

Frame reception forwards frames to the relay process when the CRFP is in the forwarding state as defined by the Port state database. Frames forwarded may have an FCS error.

Frames that are not forwarded to either the relay process or the learning process are discarded.

K.4.1.2 Port state database

The CRF participates in a spanning tree algorithm that reduces the topology of the LAN to a simply connected active topology for the purpose of forwarding frames without routing information and spanning tree explorer (STE) frames.

The port state database contains the state of each CRFP within a single CRF. The following states are defined:

disabled. The CRFP in this state does not relay frames and does not participate in the spanning tree protocol. Frames received by frame reception are discarded.

blocking. A CRFP in this state does not relay frames to any other CRFP in order to prevent frame duplication caused by multiple paths existing in the active topology of interconnected CRFs. Frames received by frame reception are discarded. MAC addresses and destination route descriptors are not sent to the learning process. A CRFP in this state is included in the calculation of the active topology. BPDUs received are processed as required by the spanning tree algorithm and protocol.

listening. A CRFP in this state is preparing to relay frames. The relay process is temporarily disabled in order to prevent temporary loops, which may occur in a topology of interconnected CRFs that is currently reconfiguring. Frames received by Frame Reception are discarded. MAC addresses and destination route descriptors are not sent to the learning process since the topology changes may cause the acquired information to become invalid. A CRFP in this state is included in the calculation of the active topology. BPDUs received are processed as required by the spanning tree algorithm and protocol. BPDUs can be submitted for transmission.

learning. A CRFP in this state is preparing to relay frames. The relay process is temporarily disabled in order to prevent temporary loops, which may occur in a topology of interconnected CRFs that is currently reconfiguring. MAC addresses and destination route descriptor information can be added to the filtering database by the learning process. A CRFP in this state is included in the calculation of the active topology. BPDUs received are processed as required by the spanning tree algorithm and protocol. BPDUs can be submitted for transmission.

forwarding. A CRFP in this state is relaying frames. MAC addresses and destination route descriptor information can be added to the filtering database by the learning process. Frames can be relayed to other CRFPs whose port state is forwarding. A CRFP in this state is included in the calculation of the active topology. BPDUs received are processed as required by the spanning tree algorithm and protocol. BPDUs can be submitted for transmission.

Figure K.5 illustrates the transitions a CRFP undergoes while supporting the spanning tree algorithm. The events causing transitions are defined as

a) CRFP enabled by management or initialization,
b) CRFP disabled, by management or failure,
c) Spanning tree algorithm selects CRFP as designated or root port,
d) Spanning Tree algorithm selects CRFP as not designated or root port, and
e) Protocol timer expires (forwarding timer).

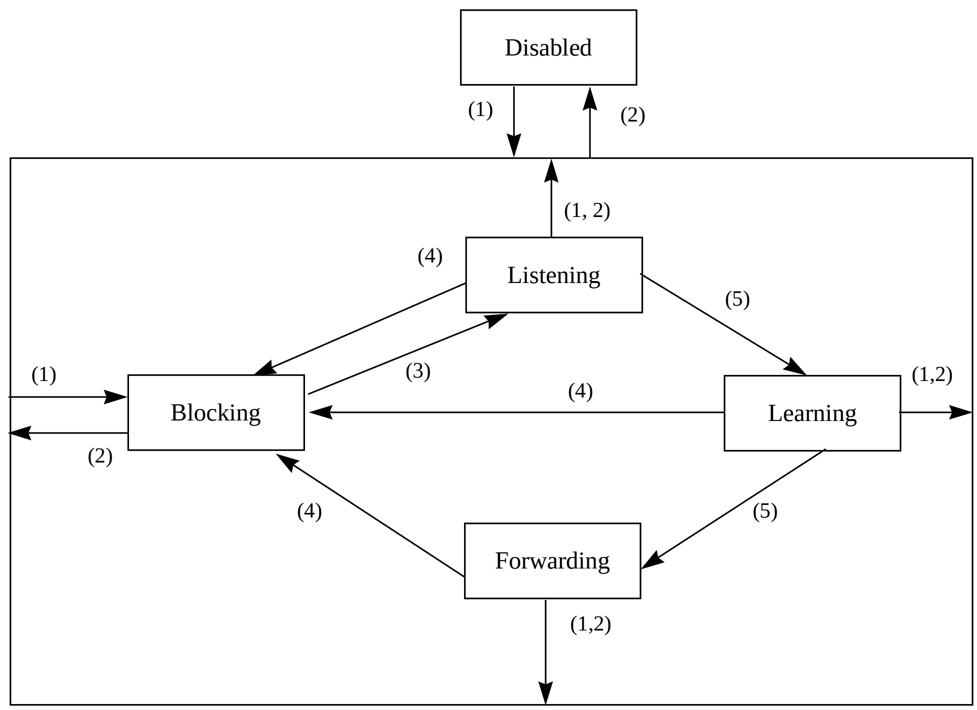


Figure K.5—Concentrator relay function port (CRFP) states

K.4.1.3 Reserved addresses

Frames containing any of the group addresses specified in table K.1 in their destination field shall not be relayed by the CRF. They shall be configured in the filtering database as static entries and management shall not provide the capability to remove these addresses from the filtering database. These group addresses are listed in ISO/IEC 10038: 1993, 3.12.6, and are duplicated here using the format for hexadecimal values defined in clause 3.

Table K.1—Reserved addresses

Assignment	Value
Bridge Group Address	80 01 43 00 00 00
Reserved for future standardization	80 01 43 00 00 10
Reserved for future standardization	80 01 43 00 00 20
Reserved for future standardization	80 01 43 00 00 30
Reserved for future standardization	80 01 43 00 00 40
Reserved for future standardization	80 01 43 00 00 50
Reserved for future standardization	80 01 43 00 00 60
Reserved for future standardization	80 01 43 00 00 70
Reserved for future standardization	80 01 43 00 00 80
Reserved for future standardization	80 01 43 00 00 90
Reserved for future standardization	80 01 43 00 00 A0
Reserved for future standardization	80 01 43 00 00 B0
Reserved for future standardization	80 01 43 00 00 C0
Reserved for future standardization	80 01 43 00 00 D0
Reserved for future standardization	80 01 43 00 00 E0
Reserved for future standardization	80 01 43 00 00 F0

K.4.1.4 Filtering database

The filtering database consists of two entry types: MAC address entries and destination route descriptor entries.

MAC address entries are used to relay frames that do not use Source Routing (RII=0). In addition, these MAC address entries are used to relay source-routed frames when the frame arrives at the final destination ring.

Destination route descriptor entries are used to relay frames that use source routing.

K.4.1.4.1 MAC address entries

There are two types of MAC address entries: static and dynamic.

The static MAC address entries in the filtering database are not aged out (removed). Each static MAC address entry contains the following fields:

- MAC address. This MAC address is compared with the DA of frames received from the frame receive process. A match identifies the static MAC address entry used for forwarding. Addresses that can be specified in the MAC address field include group addresses and broadcast addresses.
- CRFP In Mask. This mask identifies the CRFPs that may forward a frame containing a DA equal to the MAC address field. The CRFPs may forward this frame to the port or ports identified in the CRFP Out Mask.
- CRFP Out Mask. This mask identifies one or more CRFPs to which frames containing a DA equal to the MAC address field are forwarded as permitted by the contents of the CRFP In Mask described above.

The dynamic MAC address entries in the filtering database are aged out (removed) after a specified time has elapsed since the entry was created or last referenced. Each dynamic MAC address entry contains the following fields:

— MAC address. This MAC address is compared with the DA of frames received from the frame receive process. A match identifies the dynamic MAC address entry used for forwarding. The MAC address may be any individual MAC address.
— CRFP Out Mask. This field identifies the single CRFP to which frames matching the MAC address field are forwarded.

The time-out value for dynamic MAC addresses (aging time) may be set by management. A recommended default value for this timer is 300 s. If management has the capability to set values for the aging time, the CRF has the capability to use values in the range of 10 s to 10^6 s.

To improve the effectiveness of the DAC, it is recommended to remove the addresses associated with CRFPs when the associated C-PORT goes to the Bypass state (JS=BP). As this would be accomplished by management interaction with the filtering database, the specifics of this are not described in this informative annex.

K.4.1.4.2 Destination route descriptor entries

There are two types of destination route descriptor entries: Static and dynamic.

Static entries contain destination route descriptor information for internal bridge ports. These entries are entered as part of the initialization of the DTR concentrator when an internal bridge relay function is enabled. Static entries are not aged out.

Dynamic destination route descriptor entries are aged out (removed) after a specified time has elapsed since the entry was created or last referenced.

Static and dynamic entries contain the following information:

a) BN–LOUT. This is the Bridge Number (BN) and LAN ID defined as a destination route descriptor (DRD).
b) CRFP Out. The name of the CRFP to which the frames with this DRD are relayed.

The DRD or entries do not include LIN since this value is the same for all CRFPs connected to a single CRF.

To understand how the DRD entries are learned, refer to figure K.6. A source-routed frame traveling from Station A to Station B must have a route information field that contains the path LIN-BN-LOUT. LIN is the LAN ID of the ring local to Station A, the attached CRF, and one port of the bridge identified as BN. BN is the bridge number assigned to the bridge connecting LIN and LOUT. LOUT is the LAN ID of the ring local to Station B and one port of bridge BN.

The filtering database contains the DRD, and associates it to CRFP-1, the CRFP on which the bridge BN, that has a bridge port to LOUT, is attached (via the C-Port).

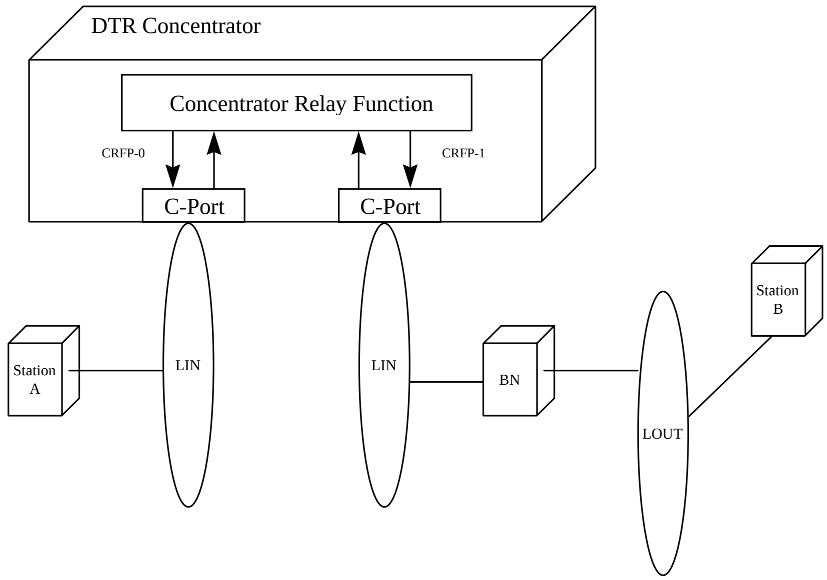


Figure K.6—CRF in a source-routed network

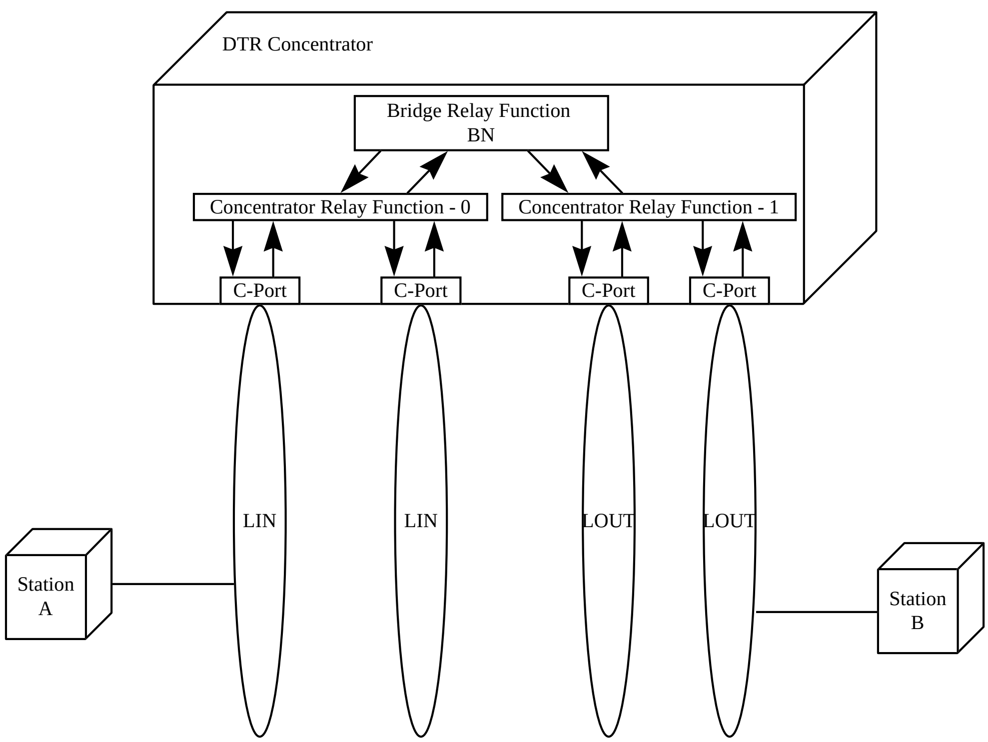


Figure K.7—DTR concentrator with internal BRF and CRF

An example of DRD entries when the DTR concentrator contains an internal BRF is shown in figure K.7. A DRD entry is used to relay a frame from Station A, through the CRF 0 to the internal BRF. The internal BRF uses the route information field to forward the frame to CRF 1. CRF 1 will use the destination MAC address to determine which CRFP should relay the frame to Station B.

K.4.1.5 Relay process

The relay process forwards frames to other CRFPs by filtering frames based on information contained in the filtering database and the state of the CRFP.

K.4.1.5.1 Frames without routing information (RII=0)

Frames without routing information are routed using the MAC address entries in the filtering database. Entries in the filtering database are searched for a match with the frame's DA. When the search is completed, one of the following actions occurs:

a) If there is no match, the frame is forwarded to all CRFPs that are in the forwarding state of the concentrator function excluding the CRFP where the frame was received.
b) If there is a match, and the entry is static, the CRFP In Mask is examined. If the CRFP In Mask permits frames of this address from this source CRFP to be forwarded, then the frame is forwarded to all CRFPs indicated by the CRFP Out Mask that are in the forwarding state, excluding the CRFP where the frame was received.
c) If there is a match, and the entry is dynamic, the frame is forwarded to the CRFP indicated by the CRFP Out field if the indicated CRFP is in the forwarding state, excluding the CRFP where the frame was received. The reference time stamp for the entry, used by the aging process, is updated.

K.4.1.5.2 Frames with routing information (RII=1)

Frames with routing information are routed using the routing information (RI) field and the destination address (DA) in the following manner:

a) If the frame is an explorer (RT=1XX), then the frame is forwarded to all CRFPs on this CRF whose port state is forwarding, excluding the CRFP where the frame was received. A valid explorer frame has the direction bit set to zero (D=0) and the Routing Information field length (RI_LTH) is not zero, four, or odd. If the explorer frame is not valid based on these criteria, the frame is discarded.
b) If the frame is specifically routed (RT=0XX), the LIN is known, and the DA is a group or broadcast address, then the frame is forwarded to all CRFPs that are in the forwarding state on this CRF excluding the CRFP where the frame was received.
c) If the frame is specifically routed (RT=0XX), the length of the RI field is examined to determine if the frame carries any routing information.
    1) If RI_LTH=2, the frame is forwarded in the same manner as frames without routing information described above.
    2) If RI_LTH=4 or odd, the frame is discarded (Increment InvalidRi).
d) If RI_LTH> 4, and this is a specifically routed frame (RT=0XX), then the RI field is searched for the first occurrence of LIN that matches the LAN ID of this CRF. The direction of the search is controlled by the direction bit (D) as defined in ISO/IEC 10038: 1993, C.3.3.2.
    1) If the LIN is not known, the frame is discarded. This action will force stations to send explorer frames to determine a new route (the old route will appear broken). The CRF will learn the LIN from the first explorer frame received.
    2) If there is no match with LIN, the frame is discarded (Misdirected frame[1]).
    3) If the match occurs in the last RD (D=0) or first RD (D=1) of the RI field, then the frame is forwarded in the same manner as frames without routing information described above.
    4) If the match does not occur in the last RD (D=0) or first RD (D=1) of the RI field, the value of BN-LOUT is extracted from the RI field, and the filtering database is searched for a match. Based on an evaluation of the RI field and the result of the search, the actions described in table K.2 are taken.

[1] There is no defined counter for this type of error event.

Table K.2—Specifically Routed Frame Forwarding State table when LIN is not found in the last examined RD

Condition	Action
(BN-LOUT match is not found) & (RI_LTH>4) & (RI_LTH = even number)	Forward frame to all CRFPs in the forwarding state on this CRF, excluding the CRFP where the frame was received.
(BN-LOUT match) & (RI_LTH>4) & (RI_LTH = even number) & (DA=individual)	Forward frame to CRFP out indicated by the matched filtering database record when the state of the CRFP out is in the forwarding state. (Increment SRFs forwarded)

K.4.1.6 The learning process

The learning process in the CRF learns MAC addresses for frames without routing information, and destination route descriptors for frames with routing information. The following subclauses describe two learning processes that place frame forwarding information into the filtering database.

K.4.1.6.1 Frames without routing information (RII=0)

The learning process observes the source address of frames without routing information to associate the address with the CRFP where the frame was received. It shall create or update a dynamic MAC address entry in the filtering database with the source MAC address and the CRFP, if and only if

a) The CRFP on which the frame was received is in a state that allows learning, and
b) A MAC address static entry for the associated MAC address does not already exist, and
c) The resulting number of entries would not exceed the capacity of the filtering database.

If the filtering database is already filled up to its capacity, but a new entry would otherwise be made, then an existing entry may be removed to make room for the new entry.

K.4.1.6.2 Frames with routing information (RII=1)

The learning process examines all source-routed frames in order to associate DRDs with the CRFP where the frame was received. The learning process determines that a source-routed frame originated from a locally attached station in order to associate the SA with the CRFP where the frame was received. This learning process for frames with routing information creates or updates either dynamic MAC address entries or dynamic DRD entries. The learning process may also determine the LAN ID that the CRFP (through the attached C-Port) is connected to (LIN) from All Route Explorer or Spanning Tree Explorer frames. The creation or update of a dynamic DRD entry occurs if and only if

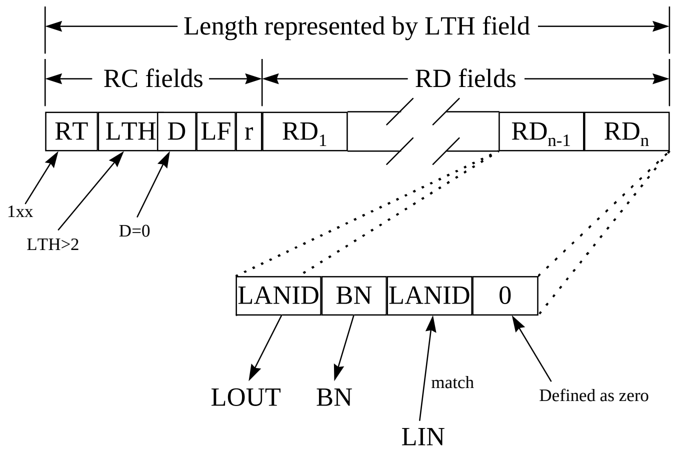
a) A DRD static entry does not already exist, and
b) The resulting number of entries would not exceed the capacity of the filtering database.

If the filtering database is already filled up to its capacity, but a new entry would otherwise be made, then an existing entry may be removed to make room for the new entry.

Table K.3 describes the action taken by the learning process when examining frames.

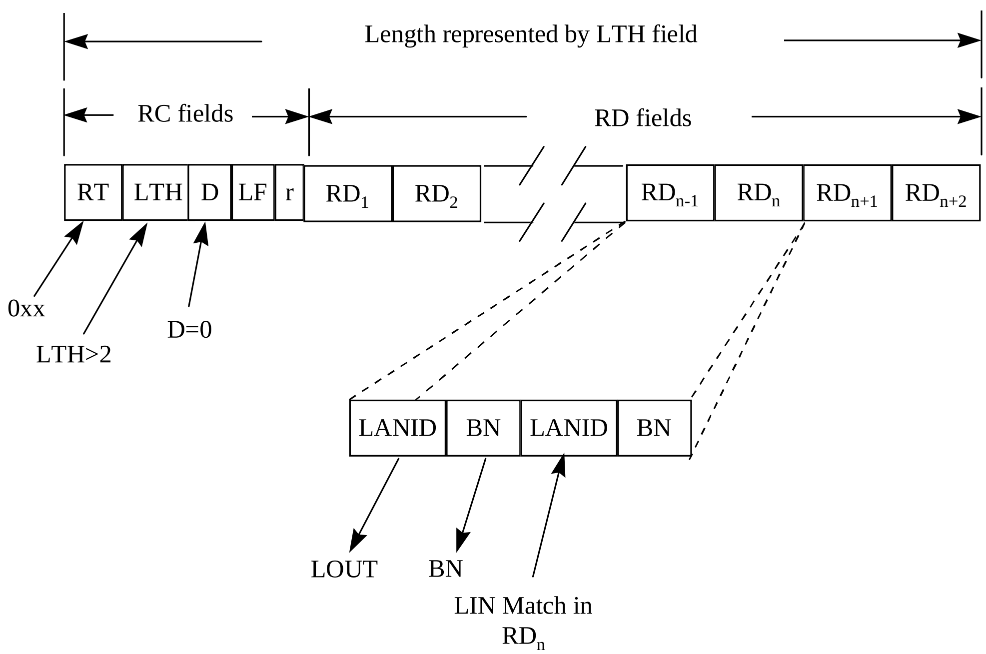
Table K.3—Learning Process State table

Routing information condition	Learning process action
RI_LTH=2	Learning process creates or updates a dynamic MAC address entry as described in K.4.1.5.1.
RI_LTH=4	Learning process discards the frame.
RT=1XX & D=1	Learning process discards the frame.
(RI_LTH>2) & (RI_LTH=odd number)	Learning process discards the frame.
(RI_LTH>4) & (RI_LTH=even number) & RT=0xx & (LIN match not found)	Learning process discards the frame (Misdirected frame).
(RI_LTH>4) & (RI_LTH=even number) & RT=1xx & D=0	From the explorer frame extract last 2 RDs contained in the RI. From the last RD, extract the LAN ID that is equal to the LAN to which this concentrator function is connected (LIN). This value is learned if LIN is not already known. If the LIN is known and there is a mismatch with the extracted value, the frame is discarded. From the second to last RD, extract the LAN ID and BN to create or update a dynamic DRD entry in the filtering database. See figure K.8 for an illustration of the mapping of the fields in the RI and the filtering database entry.
(RI_LTH>4) & (RI_LTH=even number) & RT=0xx & (LIN match found in RD$_{n=1}$) & D=0	Learning process creates or updates a dynamic MAC address entry as described in K.4.1.5.1.
(RI_LTH>4) & (RI_LTH=even number) & RT=0xx & (LIN match found in Rd$_{n<>1}$) & D=0	From RD$_{n-1}$, extract the LAN ID and the BN to create or update a dynamic DRD in the filtering database. See figure K.9 for an illustration of the mapping of the fields on the RI and the filtering database entry.
(RI_LTH>4) & (RI_LTH=even number) & RT=0xx & (LIN match found in RD$_{n=Last}$) & D=1	Learning process creates or updates a dynamic MAC address entry as described in K.4.1.5.1.
(RI_LTH>4) & (RI_LTH=even number) & RT=0xx & (LIN match found in Rd$_{n<>Last}$) & D=1	From RD$_{n+1}$, extract the LAN ID and the BN to create or update a dynamic DRD in the filtering database. See figure K.10 for an illustration of the mapping of the fields on the RI and the filtering database entry.



Learning a DRD filtering database entry from an explorer frame

Figure K.8—Diagram showing the fields in an explorer frame RI that are examined and how they are mapped into the filtering database



Learning a DRD filtering database entry from a specifically routed frame with D=0

Figure K.9—Diagram showing the fields in a specifically routed frame RI that are examined and how they are mapped into the filtering database when D=0

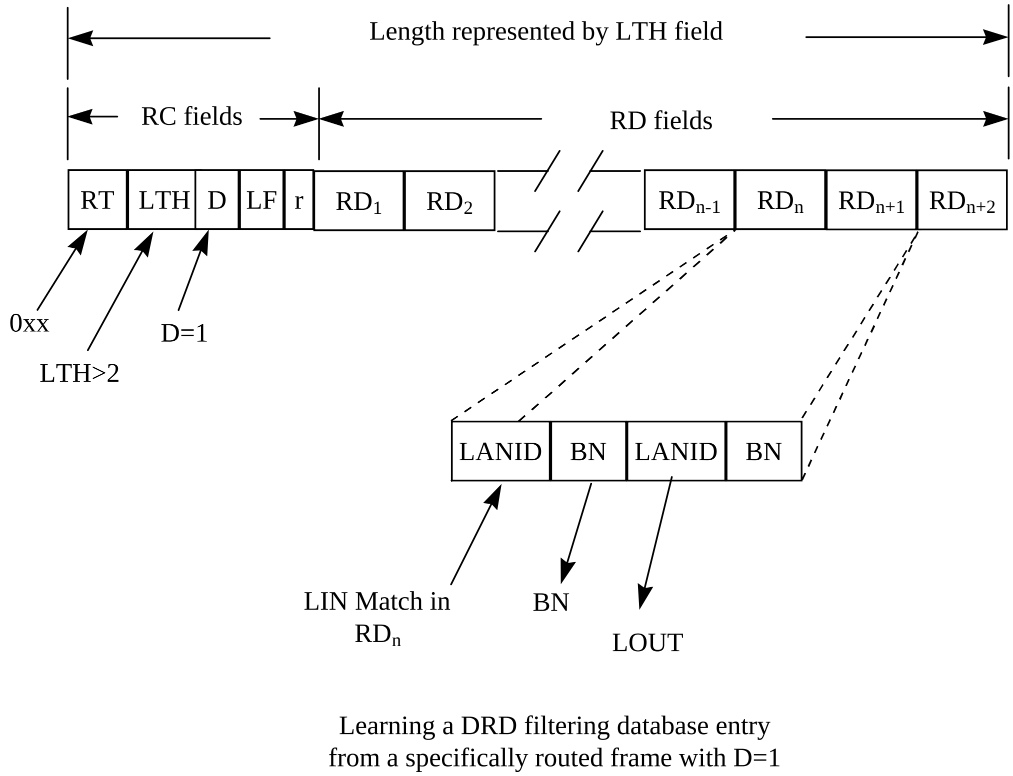


Figure K.10—Diagram showing the fields in a specifically routed frame RI that are examined and how they are mapped into the filtering database when D=1

K.4.2 Bridge relay function

The bridge relay function definition is identical to the bridge relay definition defined in ISO/IEC 10038: 1993 for a Source-Routing Transparent (SRT) bridge.

K.5 The spanning tree algorithm and protocol

The spanning tree algorithm used is identical to the algorithm defined in ISO/IEC 10038: 1993, clause 4. When reviewing ISO/IEC 10038: 1993, clause 4, for application to a CRF, replace “Bridge” with “CRF” and “port” with “CRFP.” Each CRF and internal bridge relay function within a DTR concentrator participates in the spanning tree protocol as a separate entity with its own set of timers and port parameters.

K.5.1 CRFP identifier

This replaces the port identifier defined in ISO/IEC 10038: 1993, clause 4.

This parameter is used as the value of the port identifier parameter of all configuration BPDUs transmitted on the associated CRFP.

This parameter comprises two parts. One part bears a fixed relationship to the attached C-Port. CRFPs are identified by small integers from one upwards. This part of the identifier assures uniqueness of the CRFP identifier among the CRFPs of a single CRF. The other part of the parameter allows the adjustment of the priority of the CRFP and is taken as the more significant part in priority comparisons. The priority part of this parameter may be updated by management action.

K.5.2 CRF identifier

This replaces the bridge identifier defined in ISO/IEC 10038: 1993, clause 4.

This parameter comprises two parts, one of which is derived from a unique CRF address, the other of which allows the adjustment of the priority of the CRF identifier and is taken as the more significant part in the priority comparisons. The priority part of this parameter may be updated by management action.

The unique CRF address assigned shall be globally unique (Universally Administered Address), and it is recommended that this address be the specific MAC address of the lowest numbered attached C-Port.

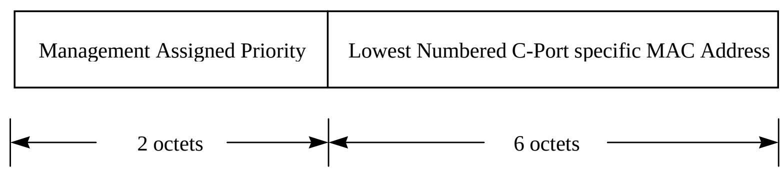


Figure K.11—CRF identifier

K.5.3 Bridge relay function (BRF) identifier

The bridge relay function participates in the spanning tree algorithm as defined in ISO/IEC 10038: 1993, clause 4. The assignment of the bridge identifier requires some clarification since there are no external bridge ports.

This parameter comprises two parts, one of which is derived from a unique BRF address, the other of which allows the adjustment of the priority of the BRF identifier and is taken as the more significant part in the priority comparisons. The priority part of this parameter may be updated by management action.

The unique BRF address assigned shall be globally unique (Universally Administered Address), and it is recommended that this address be the specific MAC address of the highest numbered C-Port attached to the CRF with the highest CRF identifier.

The recommended selection process does not yield unique identifiers if the selected CRF has only two ports (one to the bridge, the other to a C-Port), since the CRF ID would be the same as the BRF ID. This also fails if all CRFs are two port CRFs. In these situations, a unique MAC address is required to be assigned to the BRF.

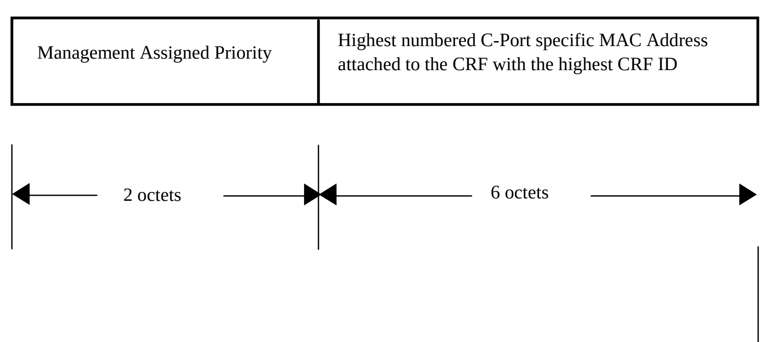


Figure K.12—BRF identifier

K.6 DTR concentrator management

The purpose of this subclause is to define the objects used in the management of the DTR concentrator.

K.6.1 Managed objects

The DTR concentrator MIB is defined to control all entities contained within the DTR concentrator. It is recommended that these management objects be used to manage the C-Ports instead of relying on the use of management MAC frames that may optionally control the state of the C-Ports.

Editor's note on special word usage in the MIB definitions:
The terms "shall," "mandatory," and "required" in the MIB definition are constrained within the definition of the MIB itself. Implementation of the MIB is optional by this standard.

```
DTRConcentratorMIB DEFINITIONS ::= BEGIN

IMPORTS
   enterprises
      FROM RFC1155-SMI
   MODULE-IDENTITY, OBJECT-TYPE, Counter32, Integer32, TimeTicks
      FROM SNMPv2-SMI
   InterfaceIndex
      FROM IF-MIB
   MODULE-COMPLIANCE, OBJECT-GROUP
      FROM SNMPv2-CONF
   IANAifType
      FROM IANAifType-MIB
   TruthValue, DisplayString, RowStatus, TEXTUAL-CONVENTION, MacAddress
      FROM SNMPv2-TC;

dtrConcMIB        MODULE-IDENTITY
   LAST-UPDATED   "9510121200Z"
   ORGANIZATION   "IEEE 802.5"
   CONTACT-INFO
      "Katie D. Lee
      IBM
      E87/664
      RTP, NC
      kdlee@vnet.ibm.com
      (919) 254-7507"

   DESCRIPTION
      "The MIB Module for DTR concentrators."
   ::= { ieee8025dtr 2 }

ieee8025  OBJECT IDENTIFIER ::= { enterprises 2043 }
ieee8025dtr OBJECT IDENTIFIER ::= { ieee8025 1 }

dtrConcMIBObjects          OBJECT IDENTIFIER ::= { dtrConcMIB 1 }
dtrConcMIBBase             OBJECT IDENTIFIER ::= { dtrConcMIBObjects 1 }
dtrConcMIBSpTree           OBJECT IDENTIFIER ::= { dtrConcMIBObjects 2 }
dtrConcMIBForwarding       OBJECT IDENTIFIER ::= { dtrConcMIBObjects 3 }
dtrConcMIBMRI              OBJECT IDENTIFIER ::= { dtrConcMIBObjects 4 }
dtrConcMIBStats            OBJECT IDENTIFIER ::= { dtrConcMIBObjects 5 }

--*******************************************************************
--  This SNMP MIB Module contains definitions for management of a DTR
--  concentrator. The MIB consists of the following groups:
--     Base DTR concentrator information (mandatory)
--     DTR concentrator spanning tree information (optional)
--     DTR concentrator forwarding information (optional)
--     DTR concentrator MRI information (optional)
--     DTR concentrator statistics information (optional)
--*******************************************************************
```



```
-- Relationship to RFC 1493

-- RFC 1493 is not used for management of any CRF object. However, if
-- a Bridge Relay function is defined for the DTR concentrator, the bridge
-- MIB is used for the Bridge Relay function.

-- Relationship to RFC 1573

-- Layering model

-- This MIB describes the Concentrator Relay Function (CRF), which operates
-- based on addressing and other information supplied by the “lower-layer” data
-- frame. For the purposes of RFC 1573, the CRF constitutes an “upper-layer”
-- protocol, which operates by aggregating several physical C-Ports (interfaces)
-- and at most one logical interface to an optional internal Bridge Relay function
-- (interface) into a logical entity. The same CRF can be defined as the upper layer
-- for multiple interfaces. A given C-Port or internal Bridge Relay function
-- interface will provide data to only a single CRF.

-- Virtual circuits

-- The CRF does not support virtual circuits.

-- ifTestTable

--The CRF does not implement tests via SNMP.

-- ifRcvAddressTable

-- For interfaces that correspond to a C-Port: The C-Port operates in
-- promiscuous mode, hence this table will contain only the all station
-- broadcast address, functional address bit mask (if any are enabled),
-- and the C-Port individual address. Note that MAC traffic targeted
-- to this C-Port entry is not forwarded to the CRF.

-- Bridge Relay function interfaces are not implemented in this table.

-- ifType

-- Additional IANAifType enumerated values are required for this MIB.
-- These enumerated values correspond to the following:

--  C-Port Interface (86)
--  Internal Bridge Relay interface (98)

-- This MIB maps dtrCRFPortType to ifType in RFC1573.

-- Textual Conventions
BridgeId ::= TEXTUAL-CONVENTION
   STATUS    current
   DESCRIPTION
      “The bridge identifier used in the spanning tree and defined in
      ISO/IEC 10038 : 1993, clause 4.”
   SYNTAX    OCTET STRING (SIZE(8))
```

```
DynamicAddrFdbStatus ::= TEXTUAL-CONVENTION
   STATUS    current
   DESCRIPTION
      "Status of an Dynamic MAC address entry in the CRF filtering database.
            Other (1) indicates that some other MIB object (not the
            corresponding instance of dtrFdbDynamicAddrPortNumber,
            nor an entry in the dtrFdbStaticAddrTable) is being used to
            determine if and how frames addressed to the value of the
            corresponding instance of dtrFdbDynamicAddrStnAddress are
            forwarded.
            Invalid(2) indicates this entry is no longer valid, but has not
            been flushed from the table.
            Learned(3) indicates that dtrFdbDynamicAddrPortNumber for
            this entry was learned, and is being used.
            Self(4) indicates this instance of dtrFdbDynamicAddrStnAddress
            represents one of the CRF addresses. The corresponding instance of
            dtrFdbDynamicPortNumber indicates which CRF Port has this address.
            Mgmt(5) indicates that the corresponding instance of
            dtrFdbDynamicAddrStnAddress is also a value of an existing
            DtrFdbStaticAddrStnAddress."
   SYNTAX    INTEGER {other(1), invalid(2), learned(3), self(4),
             mgmt(5) }

DynamicRDFdbStatus ::= TEXTUAL-CONVENTION
   STATUS  current
   DESCRIPTION
      "Status of this entry. Other (1) indicates that some other
      MIB object is being used to determine how/if a frame
      containing this destination route descriptor (DRD)is
      forwarded. Invalid (2) indicates this entry is no longer
      valid, but has not been flushed from the table. Learned (3)
      indicates that dtrFdbDynamicRDPortNumber for this entry
      was learned. internalBridgeRelayFunction(4) indicates
      dtrFdbDynamicRDRouteDesc represents a relay across the Bridge
      Relay function of this DTR concentrator. Mgmt(5) indicates
      dtrFdbDynamicRDRouteDesc is also a value of an existing
      dtrFdbStaticRDRouteDesc in the dtrFdbStaticRDTable."
   SYNTAX    INTEGER {other(1), invalid(2), learned(3),
             internalBridgeRelayFunction(4), mgmt(5) }

StaticFdbStatus ::= TEXTUAL-CONVENTION
   STATUS    current
   DESCRIPTION
      "Status of an entry in the CRF filtering database. Other(1) indicates
      this entry is currently in use under conditions different from the
      available status definitions that follow. Invalid(2) indicates this
      entry is no longer valid, but has not been flushed from the table.
      Writing this value to the object removes the entry. Permanent(3)
      indicates that the entry is currently in use and will remain so after
      the next reset. DeleteOnReset(4) indicates the entry is currently in
      use and will remain so until the next reset."
   SYNTAX    INTEGER {other(1), invalid(2), permanent(3), deleteOnReset(4) }
```

```
DestinationRouteDescriptor ::= TEXTUAL-CONVENTION
   STATUS    current
   DESCRIPTION
      "The Destination Route Descriptor (DRD) consists of 2 parts: a 4-bit
      Bridge Number and a 12-bit LAN ID. This identifies a bridge (BN) that has
      a port on the local LAN and a port connected to the indicated LAN ID.
      This object consists of 3 octets. The first octet contains the BN in the
      4 least significant bits. The second octet contains the most significant
      octet of the LAN ID, and the final octet contains the least significant
      4 bits of the LAN ID in the 4 most significant bits of the octet."
   SYNTAX    OCTET STRING (SIZE(3))

Timeout  ::= TEXTUAL-CONVENTION
   STATUS    current
   DESCRIPTION
      "timer in 1/100 of sec"
   SYNTAX    INTEGER(0..65535)

--*************************************************************************
--  Base DTR Concentrator Information
--*************************************************************************

-- ******* General DTR Concentrator Information *****************
dtrConcentratorAddress     OBJECT-TYPE
   SYNTAX                  MacAddress
   MAX-ACCESS              read-only
   STATUS                  current
   DESCRIPTION
      "MAC address used by DTR concentrator for uniqueness. It must
      be unique."
   ::= { dtrConcMIBBase 1 }

dtrNumberOfCrfs     OBJECT-TYPE
   SYNTAX           INTEGER(1..255)
   MAX-ACCESS       read-only
   STATUS           current
   DESCRIPTION
      "Number of CRFs within the DTR concentrator. Min value is 1."
   ::= { dtrConcMIBBase 2 }

dtrNumberOfBridgeRelays    OBJECT-TYPE
   SYNTAX                  INTEGER(0|1)
   MAX-ACCESS              read-write
   STATUS                  current
   DESCRIPTION
      "Number of Bridge Relay functions within the DTR concentrator.
      Value of 0 or 1 is permitted. Writing this object sets the number of
      bridge relay functions within the DTR concentrator."
   ::= { dtrConcMIBBase 3 }


-- ***************** Concentrator Relay Function Table ****************
--  (one entry for each Concentrator Relay Function)
```

```
dtrCRFTable         OBJECT-TYPE
   SYNTAX           SEQUENCE OF DtrCRFEntry
   MAX-ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      “This table contains information for each concentrator relay
      function in the DTR concentrator.”
   ::= { dtrConcMIBBase 6 }

dtrCRFEntry         OBJECT-TYPE
   SYNTAX           DtrCRFEntry
   MAX-ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      " "
   INDEX     {dtrCRFIndex }
   ::= { dtrCRFTable 1 }

DtrCRFEntry  ::= SEQUENCE {
   dtrCRFIndex                  INTEGER,
   dtrCRFNumberOfPorts          INTEGER,
   dtrCRFPortMask               OCTET STRING,
   dtrCRFName                   DisplayString,
   dtrCRFMaxInfo                INTEGER,
   dtrCRFMacAddress             MacAddress,
   dtrCRFLocalLanId             INTEGER,
   dtrCRFAdminLocalLanId        INTEGER,
   dtrCRFFdbAgingTime           INTEGER,
   dtrCRFMRIEnable              INTEGER,
   dtrCRFLearnedEntryDiscards   Counter32,
   dtrCRFRowStatus              RowStatus
}

dtrCRFIndex         OBJECT-TYPE
   SYNTAX           INTEGER(1..255)
   MAX-ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      “The CRF number identifying this instance of CRF.”
   ::= { dtrCRFEntry 1 }

dtrCRFNumberOfPorts OBJECT-TYPE
   SYNTAX           INTEGER(1..255)
   MAX-ACCESS       read-only
   STATUS           current
   DESCRIPTION
      “The number of CRF ports controlled by this CRF.”
   ::= { dtrCRFEntry 2 }

dtrCRFPortMask      OBJECT-TYPE
   SYNTAX           OCTET STRING
   MAX-ACCESS       read-write
   STATUS           current
```

```
    DESCRIPTION
        “The set of ports that are associated with this instance of a CRF.
        Each octet within the value of this object specifies a set of eight
        ports, with the first octet specifying ports 1 through 8, the second
        octet specifying ports 9  through 16, and so on. Within each octet,
        the most significant bit represents the lowest numbered port and
        the least significant bit represents the highest number port.
        Writing this variable will modify the CRF configuration and
        update the value contained in dtrCRFNumberOfPorts.”
    ::= { dtrCRFEntry 3 }

dtrCRFName          OBJECT-TYPE
    SYNTAX          DisplayString
    MAX-ACCESS      read-write
    STATUS          current
    DESCRIPTION
        “The textual name of the CRF. The value of this object should be the
        name of the CRF as assigned by the DTR concentrator and should
        be suitable for use in commands entered at the DTR concentrator
        ‘console.’”
    ::= { dtrCRFEntry 4 }

dtrCRFMaxInfo       OBJECT-TYPE
    SYNTAX          INTEGER(516..18200)
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        “The maximum size of the INFO field that the CRF can
        transmit/receive.”
    ::= { dtrCRFEntry 5 }

dtrCRFMacAddress    OBJECT-TYPE
    SYNTAX          MacAddress
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        “The MAC address used with the dtrCRFSpTreePriority to form
        the CRF identifier used in the spanning tree protocol. This
        address must be unique and it is recommended that this
        address be the specific MAC address of the lowest numbered
        C-Port.”
    ::= { dtrCRFEntry 6 }

dtrCRFLocalLanId    OBJECT-TYPE
    SYNTAX          INTEGER(0..65535)
    MAX-ACCESS      read-only
    STATUS          current
    DESCRIPTION
        “This is the value of the local LAN ID used by the CRF. This value
        may be assigned or may be learned by the CRF learning process.
        Valid values range from 0 to 4095. The value of 65 535
        indicates that the LAN ID value has not been assigned or learned."
    ::= { dtrCRFEntry 7  }
```



```
dtrCRFAdminLocalLanId      OBJECT-TYPE
   SYNTAX                  INTEGER(0..65535)
   MAX-ACCESS              read-write
   STATUS                  current
   DESCRIPTION
      “Write to this object to assign the value of the local LAN ID used by the
      CRF. Valid values range from 0 to 4095. The value of 65 535 indicates
      that the LAN ID value has not been assigned."
   ::= { dtrCRFEntry 8 }

dtrCRFFdbAgingTime  OBJECT-TYPE
   SYNTAX           INTEGER(10..1000000)
   MAX-ACCESS       read-write
   STATUS           current
   DESCRIPTION
      “The timeout period in seconds for aging out dynamic entries from
      the filtering database. Recommended default is 300 s.”
   DEFVAL {300}
   ::= { dtrCRFEntry 9 }

dtrCRFMRIEnable     OBJECT-TYPE
   SYNTAX           INTEGER{ enable(1), disable(2) }
   MAX-ACCESS       read-write
   STATUS           current
   DESCRIPTION
      “This object enables/disables the MRI function in the CRF.”
   ::= { dtrCRFEntry 10 }

dtrCRFLearnedEntryDiscards    OBJECT-TYPE
   SYNTAX                     Counter32
   MAX-ACCESS                 read-only
   STATUS                     current
   DESCRIPTION
      “The total number of CRF filtering database entries, which
      have been or would have been learned, but have been discarded
      due to a lack of space to store them in the filtering
      database.”
   ::= { dtrCRFEntry 11 }

dtrCRFRowStatus     OBJECT TYPE
   SYNTAX           RowStatus
   MAX-ACCESS       Read-Create
   STATUS           Current
   DESCRIPTION
      “Allows creation and deletion of CRF entries.”
   ::= {dtrCRFEntry 12 }


-- **************************** CRF Port Table **************************
dtrCRFPortTable     OBJECT-TYPE
   SYNTAX           SEQUENCE OF DtrCRFPortEntry
   MAX-ACCESS       not-accessible
   STATUS           current
```



```
   DESCRIPTION
      “This table contains information for each CRF port in a CRF.”
   ::= { dtrConcMIBBase 7 }

dtrCRFPortEntry     OBJECT-TYPE
   SYNTAX           DtrCRFPortEntry
   MAX-ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      "  "
   INDEX            { dtrCRFPortCRFIndex, dtrCRFPortNumber }
   ::= { dtrCRFPortTable 1 }

DtrCRFPortEntry  ::= SEQUENCE {
   dtrCRFPortCRFIndex               INTEGER,
   dtrCRFPortNumber                 INTEGER,
   dtrCRFPortifIndex                InterfaceIndex,
   dtrCRFPortEnable                 INTEGER, -- enumeration
   dtrCRFPortType                   IANAifType,
   dtrCRFPortMtuExceededDiscards    Counter32,
   dtrCRFPortDelayExceededDiscards  Counter32
   }

dtrCRFPortCRFIndex  OBJECT-TYPE
   SYNTAX           INTEGER(1..255)
   MAX-ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      “The CRF number identifying an instance of CRF.”
   ::= { dtrCRFPortEntry 1 }

dtrCRFPortNumber    OBJECT-TYPE
   SYNTAX           INTEGER(1..2048)
   MAX-ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      “The CRF port number for which this entry contains CRF management
      information. There is a one-to-one correspondence between a bit position
      in the dtrCRFPortMask and the value of a CRF port number. This
      correspondence is defined in the description of dtrCRFPortMask.”
   ::= { dtrCRFPortEntry 2 }

dtrCRFPortifIndex   OBJECT-TYPE
   SYNTAX           InterfaceIndex
   MAX-ACCESS       read-only
   STATUS           current
   DESCRIPTION
      “A unique value, greater than zero that corresponds to the
      interface this CRF port is assigned (corresponds to ifIndex).
      Writing this object defines the correspondence between the
      CRF port and the interface (C-Port or Bridge Relay function
      interface as determined by dtrCRFPortType).”
   ::= { dtrCRFPortEntry 3 }
```

```
dtrCRFPortEnable    OBJECT-TYPE
   SYNTAX           INTEGER{enable(1), disable(2)}
   MAX-ACCESS       read-write
   STATUS           current
   DESCRIPTION
      “The enable/disable status of the CRF port. This control can be
      used to disable a port.”
   ::= { dtrCRFPortEntry 4 }

dtrCRFPortType      OBJECT-TYPE
   SYNTAX           IANAifType
   MAX-ACCESS       read-write
   STATUS           current
   DESCRIPTION
      “Indicates the type of interface to which this CRF port is assigned.
      Only two types are permitted, a C-Port (86) and an internal bridge
      relay function (98). Write this object to set the type of interface."
   ::= { dtrCRFPortEntry 5 }

dtrCRFPortMtuExceededDiscards    OBJECT-TYPE
   SYNTAX                        Counter32
   MAX-ACCESS                    read-only
   STATUS                        current
   DESCRIPTION
      “The number of frames discarded by the CRF port due to excessive
      size (exceeds CrfMaxInfo).”
   ::= { dtrCRFPortEntry 6  }

dtrCRFPortDelayExceededDiscards  OBJECT-TYPE
   SYNTAX                        Counter32
   MAX-ACCESS                    read-only
   STATUS                        current
   DESCRIPTION
      “The number of frames discarded by the CRF port due to excessive
      delay through the CRF.”
   ::= { dtrCRFPortEntry 7 }

--**************************************************************************
-- Spanning Tree Information
--**************************************************************************

-- General DTR Concentrator Spanning Tree information
dtrSpanningTreeHoldTime    OBJECT-TYPE
   SYNTAX                  Integer32
   MAX-ACCESS              read-only
   STATUS                  current
   DESCRIPTION
      "The minimum time period, in seconds, elapsing between the
      transmission of Configuration PDUs through a given port (CRFP
      or internal bridge). This is a fixed parameter of the DTR
      concentrator used by all member CRF and bridge entities. The
      value specified by ISO/IEC 10038 : 1993 is 1 s.”
   ::= { dtrConcMIBSpTree 1 }
```



```
dtrSpanningTreeProtocolSpecification    OBJECT-TYPE
   SYNTAX                               INTEGER{unknown(1), ieee8021d(3) }
   MAX-ACCESS                           read-only
   STATUS                               current
   DESCRIPTION
      "An indication of what version of the spanning tree protocol is
      being run on the DTR concentrator."
::= { dtrConcMIBSpTree 2 }

dtrSpanningTreeTimeSinceTopoChange   OBJECT-TYPE
   SYNTAX                            TimeTicks
   MAX-ACCESS                        read-only
   STATUS                            current
   DESCRIPTION
      "The time (in 1/100ths of a second) since the last topology
      change was detected by the CRF or bridge entities within the
      DTR concentrator."
   ::= { dtrConcMIBSpTree 3 }

dtrSpanningTreeTopologyChanges       OBJECT-TYPE
   SYNTAX                            Counter32
   MAX-ACCESS                        read-only
   STATUS                            current
   DESCRIPTION
      "The total number of topology changes detected by this
      concentrator since the management entity was last reset or
      initialized."
   ::= { dtrConcMIBSpTree 4 }

dtrSpanningTreeBridgeForwardDelay    OBJECT-TYPE
   SYNTAX                            Timeout(400..3000)
   MAX-ACCESS                        read-write
   STATUS                            current
   DESCRIPTION
      "The value that all spanning tree protocol entities
      (CRF or bridge) use for ForwardDelay when this spanning tree
      protocol entity is acting as the root. The range
      for this parameter is related to the value of
      dtrSpanningTreeBridgeMaxAge. See ISO/IEC 10038 : 1993
      and the relationship between dot1dStpBridgeMaxAge
      and dot1dStpBridgeForwardDelay. The granularity of this
      timer is specified to be 1 s. An agent may return
      a badValue error if a set is attempted to a value
      that is not a whole number of seconds."
   ::= { dtrConcMIBSpTree 5 }

dtrSpanningTreeBridgeHelloTime   OBJECT-TYPE
   SYNTAX                        Timeout(100..1000)
   MAX-ACCESS                    read-write
   STATUS                        current
   DESCRIPTION
      "The value that all spanning tree protocol entities
      (CRF or bridge) use for HelloTime when this spanning tree
      protocol entity is acting as the root. The granularity of this
```

```
      timer is specified to be 1 s. An agent may return a badValue
      error if a set is attempted to a value that is not a whole
      number of seconds."
   ::= { dtrConcMIBSpTree 6 }

dtrSpanningTreeBridgeMaxAge      OBJECT-TYPE
   SYNTAX                        Timeout(600..4000)
   MAX ACCESS                    read-write
   STATUS                        current
   DESCRIPTION
      "The value that all spanning tree protocol entities
      (CRF or bridge) use for MaxAge when this spanning tree
      protocol entity is acting as the root. The range
      for this parameter is related to the value of
      dtrSpanningTreeBridgeHelloTime. See ISO/IEC 10038 : 1993
      and the relationship between dot1dStpBridgeMaxAge
      and dot1dStpBridgeHelloTime.The granularity of this
      timer is specified to be 1 s. An agent may return
      a badValue error if a set is attempted to a value
      that is not a whole number of seconds."
   ::= { dtrConcMIBSpTree 7 }

--********************** CRF Spanning Tree Table ********************
dtrCRFSpTreeTable   OBJECT-TYPE
   SYNTAX           SEQUENCE OF DtrCRFSpTreeEntry
   MAX ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      "This table contains the spanning tree information for each CRF."
   ::= { dtrConcMIBSpTree 9 }

dtrCRFSpTreeEntry   OBJECT-TYPE
   SYNTAX           DtrCRFSpTreeEntry
   MAX ACCESS       not-accessible
   STATUS           current
   DESCRIPTION
      " "

   INDEX            {dtrCRFSpTreeCRFIndex }
   ::= { dtrCRFSpTreeTable 1 }

DtrCRFSpTreeEntry                ::= SEQUENCE {
   dtrCRFSpTreeCRFIndex          INTEGER,
   dtrCRFSpTreePriority          INTEGER, --(0..65535)
   dtrCRFSpTreeDesignatedRoot    BridgeId,
   dtrCRFSpTreeRootCost          Integer32,
   dtrCRFSpTreeRootPort          Integer32,
   dtrCRFSpTreeMaxAge            Timeout, --1/100 s
   dtrCRFSpTreeHelloTime         Timeout,
   dtrCRFSpTreeForwardDelay      Timeout} --1/100 s

dtrCRFSpTreeCRFIndex   OBJECT-TYPE
   SYNTAX              INTEGER(1..255)
   MAX ACCESS          not-accessible
```



```
   STATUS              current
   DESCRIPTION
      “The CRF number identifying this instance of CRF.”
   ::= { dtrCRFSpTreeEntry 1 }

dtrCRFSpTreePriority   OBJECT-TYPE
   SYNTAX              INTEGER(0..65535)
   MAX ACCESS          read-write
   STATUS              current
   DESCRIPTION
      “The value of the write-able portion of the CRF identifier (The
      first two octets of the CRF identifier. The last 6 octets of the
      CRF ID are given by the value of dtrCRFMacAddress).”
   ::= { dtrCRFSpTreeEntry 2 }

dtrCRFSpTreeDesignatedRoot    OBJECT-TYPE
   SYNTAX                     BridgeId
   MAX ACCESS                 read-only
   STATUS                     current
   DESCRIPTION
      “The bridge identifier of the root of the spanning tree as
      determined by the spanning tree protocol executed at this node.”
   ::= { dtrCRFSpTreeEntry 3 }

dtrCRFSpTreeRootCost   OBJECT-TYPE
   SYNTAX              Integer32
   MAX ACCESS          read-only
   STATUS              current
   DESCRIPTION
      “The cost of the path to the root as seen from this CRF.”
   ::= { dtrCRFSpTreeEntry 4 }

dtrCRFSpTreeRootPort   OBJECT-TYPE
   SYNTAX              Integer32
   MAX ACCESS          read-only
   STATUS              current
   DESCRIPTION
      “The CRF port number of the CRF port that offers the lowest cost
      path from this CRF to the root."
   ::= { dtrCRFSpTreeEntry 5 }

dtrCRFSpTreeMaxAge     OBJECT-TYPE
   SYNTAX              Timeout
   MAX ACCESS          read-only
   STATUS              current
   DESCRIPTION
      “The maximum age of spanning tree protocol information learned
      from the network on any port (CRF or bridge within the DTR
      concentrator) before it is discarded. Units are in 1/100th of
      a second. This is the actual value currently in use."
   ::= { dtrCRFSpTreeEntry 6 }
```

```
dtrCRFSpTreeHelloTime      OBJECT-TYPE
   SYNTAX                  Timeout
   MAX ACCESS              read-only
   STATUS                  current
   DESCRIPTION
      "The amount of time between transmission of configuration bridge
      PDUs used by a CRF that is attempting to become the root or is
      the root. This is the value currently in use."
   ::= { dtrCRFSpTreeEntry 7 }

dtrCRFSpTreeForwardDelay   OBJECT-TYPE
   SYNTAX                  Timeout
   MAX ACCESS              read-only
   STATUS                  current
   DESCRIPTION
      "This time value, measured in 1/100th of a second, is used to
      control the amount of time spent in the Listening state when
      moving from the Blocking state to the Listening state and the
      amount of time in the Learning state when moving from the
      Learning state to the Forwarding state. This time value is used
      for aging dynamic entries in the filtering database while the
      Topology Change flag is set in protocol messages received from
      the root. This is the value the CRF is currently using."
   ::= { dtrCRFSpTreeEntry 8 }

-- **** Port Spanning Tree ************************

dtrCRFPortSpTreeTable   OBJECT-TYPE
   SYNTAX               SEQUENCE OF DtrCRFPortSpTreeEntry
   MAX ACCESS           not-accessible
   STATUS               current
   DESCRIPTION
      "This table contains spanning tree information for each CRF port."
   ::= { dtrConcMIBSpTree 10 }

dtrCRFPortSpTreeEntry   OBJECT-TYPE
   SYNTAX               DtrCRFPortSpTreeEntry
   MAX ACCESS           not-accessible
   STATUS               current
   DESCRIPTION
      " "
   INDEX                {dtrCRFPortSpTreeCRFIndex, dtrCRFPortSpTreeNumber }
   ::= { dtrCRFPortSpTreeTable 1 }

DtrCRFPortSpTreeEntry                 ::= SEQUENCE {
   dtrCRFPortSpTreeCRFIndex           INTEGER,
   dtrCRFPortSpTreeNumber             INTEGER,
   dtrCRFPortSpTreePriority           INTEGER, --(0..255)
   dtrCRFPortSpTreeState              INTEGER, -- enumerated
   dtrCRFPortSpTreePathCost           INTEGER, --(1..65535)
   dtrCRFPortSpTreeDesignatedRoot     BridgeId,
   dtrCRFPortSpTreeDesignatedCost     Integer32,
   dtrCRFPortSpTreeDesignatedBridge   BridgeId,
   dtrCRFPortSpTreeDesignatedPort     OCTET STRING (SIZE(2)),
```



```
    dtrCRFPortSpTreeForwardTransitions Counter32 }

dtrCRFPortSpTreeCRFIndex   OBJECT-TYPE
    SYNTAX                 INTEGER(1..255)
    MAX ACCESS             not-accessible
    STATUS                 current
    DESCRIPTION
        “The CRF number identifying this instance of CRF."
    ::= { dtrCRFPortSpTreeEntry 1 }

dtrCRFPortSpTreeNumber     OBJECT-TYPE
    SYNTAX                 INTEGER(1..255)
    MAX ACCESS             not-accessible
    STATUS                 current
    DESCRIPTION
        "The CRF port number for which this entry contains CRF
        management information.”
    ::= { dtrCRFPortSpTreeEntry 2 }

dtrCRFPortSpTreePriority   OBJECT-TYPE
    SYNTAX                 INTEGER(0..255)
    MAX ACCESS             read-write
    STATUS                 current
    DESCRIPTION
        “The value of the priority field that is contained in the
        first byte of the CRF port identifier. The second byte of
        the CRF port identifier is given by the value of CRF port as
        identified by dtrCRFPortSpTreeNumber."
    ::= { dtrCRFPortSpTreeEntry 3 }

dtrCRFPortSpTreeState      OBJECT-TYPE
    SYNTAX                 INTEGER{disabled(1), blocking(2), listening(3),
                           learning(4), forwarding(5), broken(6)}
    MAX ACCESS             read-only
    STATUS                 current
    DESCRIPTION
        “The CRF Port state as defined by the operation of the
        spanning tree protocol. If the DTR concentrator detects that
        a port is malfunctioning, it will place that port into the
        broken(6) state. The states are defined as: disabled(1),
        blocking(2), listening(3), learning(4), forwarding(5), and
        broken(6).”
    ::= { dtrCRFPortSpTreeEntry 4 }

dtrCRFPortSpTreePathCost   OBJECT-TYPE
    SYNTAX                 INTEGER(1..65535)
    MAX ACCESS             read-write
    STATUS                 current
    DESCRIPTION
        “The contribution of the path through this CRF port, identified
        by dtrCRFPortSpTreeNumber when the CRF port is the root port,
        to the total cost of the path to the root for this CRF.”
    ::= { dtrCRFPortSpTreeEntry 5 }
```

```
dtrCRFPortSpTreeDesignatedRoot   OBJECT-TYPE
   SYNTAX                        BridgeId
   MAX ACCESS                    read-only
   STATUS                        current
   DESCRIPTION
      "The unique bridge identifier of the bridge recorded as the root
      in the root identifier parameter of the configuration PDUs
      transmitted by the designated bridge for the LAN to which the
      CRF port is attached."
   ::= { dtrCRFPortSpTreeEntry 6 }

dtrCRFPortSpTreeDesignatedCost   OBJECT-TYPE
   SYNTAX                        Integer32
   MAX ACCESS                    read-only
   STATUS                        current
   DESCRIPTION
      "The cost of the path to the root offered by the designated port
      on the LAN to which this CRF port is attached."
   ::= { dtrCRFPortSpTreeEntry 7 }

dtrCRFPortSpTreeDesignatedBridge OBJECT-TYPE
   SYNTAX                        BridgeId
   MAX ACCESS                    read-only
   STATUS                        current
   DESCRIPTION
      "The unique bridge or CRF identifier of the bridge or CRF believed to
      be the designated bridge for the LAN associated with the CRF port."
   ::= { dtrCRFPortSpTreeEntry 8 }

dtrCRFPortSpTreeDesignatedPort   OBJECT-TYPE
   SYNTAX                        OCTET STRING (SIZE(2))
   MAX ACCESS                    read-only
   STATUS                        current
   DESCRIPTION
      "The port identifier of the bridge or CRF port believed to be the
      designated port for the LAN associated with the CRF port."
   ::= { dtrCRFPortSpTreeEntry 9 }

dtrCRFPortSpTreeForwardTransitions   OBJECT-TYPE
   SYNTAX                            Counter32
   MAX ACCESS                        read-only
   STATUS                            current
   DESCRIPTION
      "The number of times this CRF port, as identified by
      dtrCRFPortSpTreeNumber, has transitioned from the Learning
      state to the Forwarding state."
   ::= { dtrCRFPortSpTreeEntry 10 }

--*************************************************************************
-- CRF Forwarding Information
--*************************************************************************

-- The data contained within the filtering database tables is affected by
-- actions to configure the CRF.
```



```
-- When a CRF is modified, such as;

-- 1. CRF Ports are added or deleted, or
-- 2. Moved (change of correspondence to the ifIndex)

-- entries in dtrFdbDynamicAddrTable and dtrFdbDynamicRDTable
-- that correspond to the CRF are marked invalid and flushed from the table.

-- When a CRF is destroyed, entries in dtrFdbDynamicAddrTable,
-- dtrFdbDynamicRDTable, dtrFdbStaticAddrTable, and dtrFdbStaticRDTable
-- that correspond to the CRF, are marked invalid and flushed from the
-- table.


-- ************** Dynamic Address Filtering Database Table *******************
dtrFdbDynamicAddrTable     OBJECT-TYPE
   SYNTAX                  SEQUENCE OF DtrFdbDynamicAddrEntry
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      "This table contains information about specific dynamic MAC address
      entries in the CRF filtering database."
   ::= { dtrConcMIBForwarding 1 }

dtrFdbDynamicAddrEntry     OBJECT-TYPE
   SYNTAX                  DtrFdbDynamicAddrEntry
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      "CRF Filtering Database Dynamic MAC address entry."
   INDEX                   { dtrFdbDynamicAddrCRFIndex,
      dtrFdbDynamicAddrStnAddress }
   ::= { dtrFdbDynamicAddrTable 1 }

DtrFdbDynamicAddrEntry        ::= SEQUENCE {
dtrFdbDynamicAddrCRFIndex     INTEGER,
dtrFdbDynamicAddrStnAddress   MacAddress,
dtrFdbDynamicAddrPortNumber   INTEGER,
dtrFdbDynamicAddrStatus       DynamicAddrFdbStatus
}

dtrFdbDynamicAddrCRFIndex     OBJECT-TYPE
   SYNTAX                     INTEGER(1..255)
   MAX ACCESS                 not-accessible
   STATUS                     current
   DESCRIPTION
      "The CRF number identifying this instance of CRF."
   ::= { dtrFdbDynamicAddrEntry 1 }

dtrFdbDynamicAddrStnAddress   OBJECT-TYPE
   SYNTAX                     MacAddress
   MAX ACCESS                 not-accessible
   STATUS                     current
```



```
   DESCRIPTION
      “A unicast MAC address for which the CRF has forwarding
      information. This object is updated by the learning process in
      the CRF.”
   ::= { dtrFdbDynamicAddrEntry 2 }

dtrFdbDynamicAddrPortNumber   OBJECT-TYPE
   SYNTAX                     INTEGER(0..255)
   MAX ACCESS                 read-only
   STATUS                     current
   DESCRIPTION
      “The CRF port number of the CRF port that a frame with an
      address matching dtrFdbDynamicAddrStnAddress in this
      dtrFdbDynamicAddrTable Entry has been seen. A value of zero
      is assigned when dtrFdbDynamicAddrStnAddress is known, but
      the CRF port number (dtrFdbDynamicAddrPortNumber) has not
      been learned.”
   ::= { dtrFdbDynamicAddrEntry 3 }

dtrFdbDynamicAddrStatus    OBJECT-TYPE
   SYNTAX                  DynamicAddrFdbStatus
   MAX ACCESS              read-only
   STATUS                  current
   DESCRIPTION
      “Status of this entry. Other (1) indicates that some
      other MIB object (not the corresponding instance of
      dtrFdbDynamicAddrPortNumber, nor an entry in the
      dtrFdbStaticAddrTable ) is being used to determine if and how
      frames addressed to the value of the corresponding instance of
      dtrFdbDynamicAddrStnAddress are forwarded.

      Invalid(2) indicates this entry is no longer valid, but has
      not been flushed from the table.

      Learned(3) indicates that dtrFdbDynamicAddrPortNumber for
      this entry was learned, and is being used.

      Self(4) indicates this instance of dtrFdbDynamicAddrStnAddress
      represents one of the CRF addresses. The corresponding instance
      of dtrFdbDynamicPortNumber’s indicates which CRF port has
      this address.

      Mgmt(5) indicates that the corresponding instance of
      dtrFdbDynamicAddrStnAddress is also a value of an
      existingDtrFdbStaticAddrStnAddress.”
   ::= { dtrFdbDynamicAddrEntry 4 }

--************** Static Address Filtering Database Table *******************

dtrFdbStaticAddrTable  OBJECT-TYPE
   SYNTAX              SEQUENCE OF DtrFdbStaticAddrEntry
   MAX ACCESS          not-accessible
   STATUS              current
   DESCRIPTION
      “This table contains information about specific static MAC address
      entries in the CRF filtering database.”
   ::= { dtrConcMIBForwarding 2 }
```



```
dtrFdbStaticAddrEntry        OBJECT-TYPE
   SYNTAX                    DtrFdbStaticAddrEntry
   MAX ACCESS                not-accessible
   STATUS                    current
   DESCRIPTION
      "CRF filtering database static MAC address entry."
   INDEX                   { dtrFdbStaticAddrCRFIndex,
      dtrFdbStaticAddrStnAddress }
   ::= { dtrFdb1StaticAddrTable 1 }

DtrFdbStaticAddrEntry            ::= SEQUENCE {
   dtrFdbStaticAddrCRFIndex      INTEGER,
   dtrFdbStaticAddrStnAddress    MacAddress,
   dtrFdbStaticAddrRowStatus     RowStatus,
   dtrFdbStaticAddrInMask        OCTET STRING,
   dtrFdbStaticAddrOutMask       OCTET STRING,
   dtrFdbStaticAddrStatus        StaticFdbStatus
   }

dtrFdbStaticAddrCRFIndex     OBJECT-TYPE
   SYNTAX                    INTEGER(1..255)
   MAX ACCESS                not-accessible
   STATUS                    current
   DESCRIPTION
      "The CRF number identifying this instance of CRF."
   ::= { dtrFdbStaticAddrEntry 1 }

dtrFdbStaticAddrStnAddress   OBJECT-TYPE
   SYNTAX                    MacAddress
   MAX ACCESS                not-accessible
   STATUS                    current
   DESCRIPTION
      "The destination MAC address in a frame to which this entry's filtering
      information applies. This object can take the value of a group or
      broadcast address."
::= { dtrFdbStaticAddrEntry 2 }

dtrFdbStaticAddrRowStatus    OBJECT-TYPE
   SYNTAX                    RowStatus
   MAX ACCESS                read-create
   STATUS                    current
   DESCRIPTION
      "Allows creation and deletion of static entries."
::= { dtrFdbStaticAddrEntry 3 }

dtrFdbStaticAddrInMask       OBJECT-TYPE
   SYNTAX                    OCTET STRING
   MAX ACCESS                read-create
   STATUS                    current
   DESCRIPTION
      "The set of CRF ports that receive frames with a
      destination address matching the address specified by the
      DtrFdbStaticAddrStnAddress in this entry that may forward
      this frame to any output CRF port indicated by
```

```
        DtrFdbStaticAddrOutMask. Each octet within the value of this
        object specifies a set of eight ports, with the first octet
        specifying CRF ports 1 through 8, the second octet specifying
        CRF ports 9 through 16, and so on. Within each octet, the
        most significant bit represents the lowest-numbered port,
        and the least significant bit represents the highest-numbered
        port. The default value of this object is a string of ones of
        appropriate length.”
    ::= { dtrFdbStaticAddrEntry 4 }

dtrFdbStaticAddrOutMask    OBJECT-TYPE
    SYNTAX                 OCTET STRING
    MAX ACCESS             read-create
    STATUS                 current
    DESCRIPTION
        “The set of CRF ports to which frames with a destination
        address matching the address specified by the
        DtrFdbStaticAddrStnAddress in this entry may be forwarded.
        Each octet within the value of this object specifies a set of
        eight ports, with the first octet specifying CRF ports 1
        through 8, the second octet specifying CRF ports 9 through 16,
        and so on. Within each octet, the most significant bit
        represents the lowest-numbered port, and the least
        significant bit represents the highest-numbered port. The default
        value of this object is a string of ones of appropriate length.”
    ::= { dtrFdbStaticAddrEntry 5 }

dtrFdbStaticAddrStatus     OBJECT-TYPE
    SYNTAX                 StaticFdbStatus
    MAX ACCESS             read-only
    STATUS                 current
    DESCRIPTION
        “Status of this entry. Other(1) indicates this entry is currently
        in use under conditions different from the available status
        definitions that follow. Invalid(2) indicates this entry is no
        longer valid, but has not been flushed from the table. Writing
        this value to the object removes the entry. Permanent(3) indicates
        that the entry is currently in use and will remain so after the
        next reset. DeleteOnReset(4) indicates the entry is currently in
        use and will remain so until the next reset.”
    ::= { dtrFdbStaticAddrEntry 6 }

--******* Dynamic Destination Route Descriptor Filtering Database Table *******

dtrFdbDynamicRDTable       OBJECT-TYPE
    SYNTAX                 SEQUENCE OF DtrFdbDynamicRDEntry
    MAX ACCESS             not-accessible
    STATUS                 current
    DESCRIPTION
        "This table contains information about a DRD entry in the
        CRF filtering database.”
    ::= { dtrConcMIBForwarding 3 }
```



```
dtrFdbDynamicRDEntry       OBJECT-TYPE
   SYNTAX                  DtrFdbDynamicRDEntry
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      " "
   INDEX                   { dtrFdbDynamicRDCRFIndex,
      dtrFdbDynamicRDRouteDesc }
   ::= { dtrFdbDynamicRDTable 1 }

DtrFdbDynamicRDEntry           ::= SEQUENCE {
   dtrFdbDynamicRDCRFIndex     INTEGER,
   dtrFdbDynamicRDRouteDesc    DestinationRouteDescriptor,
   dtrFdbDynamicRDPortNumber   INTEGER,
   dtrFdbDynamicRDStatus       DynamicRDFdbStatus
   }

dtrFdbDynamicRDCRFIndex    OBJECT-TYPE
   SYNTAX                  INTEGER(1..255)
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      "The CRF number identifying this instance of CRF."
   ::= { dtrFdbDynamicRDEntry 1 }

dtrFdbDynamicRDRouteDesc   OBJECT-TYPE
   SYNTAX                  DestinationRouteDescriptor
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      "A destination route descriptor (DRD) for which the CRF has
      forwarding information. The DRD consists of 2 parts: a 4-bit
      bridge number and a 12-bit LAN ID. This identifies a bridge
      (BN) that has a port on the local LAN and a port connected to the
      indicated LAN ID. This object consists of 3 octets. The first
      octet contains the BN in the 4 least significant bits. The
      second octet contains the most significant octet of the LAN ID,
      and the final octet contains the least significant 4 bits of the
      LAN ID in the 4 most significant bits of the octet."
   ::= { dtrFdbDynamicRDEntry 2 }

dtrFdbDynamicRDPortNumber  OBJECT-TYPE
   SYNTAX                  INTEGER(1..255)
   MAX ACCESS              read-only
   STATUS                  current
   DESCRIPTION
      "The CRF port number of the CRF port that a frame with a DRD
      matching dtrFdbDynamicRDRouteDesc in this DtrFdbDynamicRDEntry
      has been seen. A value of zero is assigned when
      dtrFdbDynamicRDRouteDesc is known, but the CRF port number
      has not been learned."
   ::= { dtrFdbDynamicRDEntry 3 }
```

```
dtrFdbDynamicRDStatus      OBJECT-TYPE
   SYNTAX                  DynamicRDFdbStatus
   MAX ACCESS              read-only
   STATUS                  current
   DESCRIPTION
      “Status of this entry. Other(1) includes the case where some
      other MIB object is being used to determine how/if a frame
      containing this DRD is forwarded. Invalid(2) indicates this
      entry is no longer valid, but has not been flushed from the
      table. Learned(3) indicates that dtrFdbDynamicRDPortNumber
      for this entry was learned. internalBridgeRelayFunction(4)
      indicates dtrFdbDynamicRDRouteDesc represents a relay across
      the Bridge Relay function of this DTR concentrator. Mgmt(5)
      indicates dtrFdbDynamicRDRouteDesc is also a value of an
      existing dtrFdbStaticRDRouteDesc in the dtrFdbStaticRDTable.”
   ::= { dtrFdbDynamicRDEntry 4 }

-- ******* Static Destination Route Descriptor Filtering Database Table *******

dtrFdbStaticRDTable        OBJECT-TYPE
   SYNTAX                  SEQUENCE OF DtrFdbStaticRDEntry
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      “A table containing information about specific static route
      descriptor entries in the CRF filtering database.”
   ::= { dtrConcMIBForwarding 5 }

dtrFdbStaticRDEntry        OBJECT-TYPE
   SYNTAX                  DtrFdbStaticRDEntry
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      “ ”
   INDEX                   { dtrFdbStaticRDCRFIndex,
      dtrFdbStaticRDRouteDesc }
   ::= { dtrFdbStaticRDTable 1 }

DtrFdbStaticRDEntry            ::= SEQUENCE {
   dtrFdbStaticRDCRFIndex      INTEGER,
   dtrFdbStaticRDRouteDesc     DestinationRouteDescriptor,
   dtrFdbStaticRDRowStatus     RowStatus,
   dtrFdbStaticRDPortNumber    INTEGER,
   dtrFdbStaticRDStatus        StaticFdbStatus
   }

dtrFdbStaticRDCRFIndex     OBJECT-TYPE
   SYNTAX                  INTEGER(1..255)
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      “The CRF number identifying this instance of CRF.”
   ::= { dtrFdbStaticRDEntry 1 }
```

```
dtrFdbStaticRDRouteDesc    OBJECT-TYPE
   SYNTAX                  DestinationRouteDescriptor
   MAX ACCESS              not-accessible
   STATUS                  current
   DESCRIPTION
      “Static Entries contain DRD information for internal bridge ports.
      These entries are added as part of the initialization of the DTR
      concentrator when an internal Bridge Relay function is enabled
      (dtrOperNumberOfBridgeRelays=1). The DRD consists of 2 parts: a
      4-bit bridge number and a 12-bit LAN ID. This identifies a
      bridge (BN) that has a port on the local LAN and a port
      connected to the indicated LAN ID. This object consists of 3
      octets. The first octet contains the BN in the 4 least
      significant bits. The second octet contains the most
      significant octet of the LAN ID and the final octet contains
      the least significant 4 bits of the LAN ID in the 4 most
      significant bits of the octet.”
   ::= { dtrFdbStaticRDEntry 2 }

dtrFdbStaticRDRowStatus    OBJECT-TYPE
   SYNTAX                  RowStatus
   MAX ACCESS              read-create
   STATUS                  current
   DESCRIPTION
      “Allows creation and deletion of static entries.”
   ::= { dtrFdbStaticRDEntry 3 }

dtrFdbStaticRDPortNumber   OBJECT-TYPE
   SYNTAX    INTEGER(1..255)
   MAX ACCESS       read-create
   STATUS    current
   DESCRIPTION
      “The CRF port number of the CRF port to which a frame with a DRD
      matching dtrFdbStaticRDRouteDesc in this DtrFdbStaticRDEntry is
      forwarded.”
   ::= { dtrFdbStaticRDEntry 4 }

dtrFdbStaticRDStatus       OBJECT-TYPE
   SYNTAX                  StaticFdbStatus
   MAX ACCESS              read-create
   STATUS                  current
   DESCRIPTION
      “Status of this entry. Other(1) indicates this entry is currently
      in use under conditions different from the available status
      definitions that follow. Invalid(2) indicates this entry is no
      longer valid, but has not been flushed from the table. Writing
      this value to the object removes the entry. Permanent(3) indicates
      that the entry is currently in use and will remain so after the next
      reset. DeleteOnReset(4) indicates the entry is currently in use and
      will remain so until the next reset.”
   ::= { dtrFdbStaticRDEntry 5 }
```

```
--*********************************************************************
-- MRI Information
--*********************************************************************

--********************** MRI Table *************************************

dtrMRITable          OBJECT-TYPE
   SYNTAX            SEQUENCE OF DtrMRIEntry
   MAX ACCESS        not-accessible
   STATUS            current
   DESCRIPTION
      "This table contains information about the CRF port out
      mask for specific management functions."
   ::= { dtrConcMIBMRI 1 }

dtrMRIEntry          OBJECT-TYPE
   SYNTAX            DtrMRIEntry
   MAX ACCESS        not-accessible
   STATUS            current
   DESCRIPTION
      " "
   INDEX             { dtrMRICRFIndex,
      dtrMRIMgmtType }
   ::= { dtrMRITable 1 }

DtrMRIEntry          ::= SEQUENCE {
   dtrMRICRFIndex    INTEGER,
   dtrMRIMgmtType    INTEGER,
   dtrMRIOutMask     OCTET STRING
   }

dtrMRICRFIndex       OBJECT-TYPE
   SYNTAX            INTEGER(1..255)
   MAX ACCESS        not-accessible
   STATUS            current
   DESCRIPTION
      "The CRF number identifying this instance of CRF."
::= { dtrMRIEntry 1 }

dtrMRIMgmtType       OBJECT-TYPE
   SYNTAX            INTEGER(0..15)
   MAX ACCESS        not-accessible
   STATUS            current
   DESCRIPTION
      "Identifies the function class for this entry. The MRI
      forwards frames with a destination class equal to
      dtrMRIMgmtType using the corresponding mask entry
      (dtrMRIOutMask). When the destination class is 0 and the
      source class is not 0, the destination address in the MAC
      frame is used to forward the frame. MAC frames with a
      destination class not found in this table are not forwarded
      by the MRI."
   ::= { dtrMRIEntry 2 }
```

```
dtrMRIOutMask       OBJECT-TYPE
   SYNTAX           OCTET STRING
   MAX ACCESS       read-write
   STATUS           current
   DESCRIPTION
      “The set of CRF ports to which frames with a destination
      class matching the function class specified by the
      dtrMRIMgmtType in this entry may be forwarded. Each octet
      within the value of this object specifies a set of eight
      ports, with the first octet specifying CRF ports 1 through 8,
      the second octet specifying CRF ports 9 through 16, and so on.
      Within each octet, the most significant bit represents the
      lowest-numbered port, and the least significant bit
      represents the highest-numbered port.”
::= { dtrMRIEntry 3 }

--************************************************************************
-- Statistics Information
--************************************************************************

--*********************** CRF Port Statistics Information *****************
dtrCRFPortStatsTable      OBJECT-TYPE
   SYNTAX                 SEQUENCE OF DtrCRFPortStatsEntry
   MAX ACCESS             not-accessible
   STATUS                 current
   DESCRIPTION
      “This table contains the counters for each CRF Port.”
   ::= { dtrConcMIBStats 1 }

dtrCRFPortStatsEntry      OBJECT-TYPE
   SYNTAX                 DtrCRFPortStatsEntry
   MAX ACCESS             not-accessible
   STATUS                 current
   DESCRIPTION
      " "
   INDEX                  { dtrCRFPortStatsCRFIndex, dtrCRFPortStatsPortNumber }
   ::= { dtrCRFPortStatsTable 1 }

DtrCRFPortStatsEntry              ::= SEQUENCE {
   dtrCRFPortStatsCRFIndex       INTEGER,
   dtrCRFPortStatsPortNumber     INTEGER,
   dtrCRFPortStatsAreInFrames    Counter32,
   dtrCRFPortStatsAreOutFrames   Counter32,
   dtrCRFPortStatsInFrames       Counter32,
   dtrCRFPortStatsOutFrames      Counter32,
   dtrCRFPortStatsSrfInFrames    Counter32,
   dtrCRFPortStatsSrfOutFrames   Counter32,
   dtrCRFPortStatsSteInFrames    Counter32,
   dtrCRFPortStatsSteOutFrames   Counter32,
   dtrCRFPortStatsInvalidRI      Counter32,
   dtrCRFPortStatsInMisdirected  Counter32,
   dtrCRFPortStatsInDiscards     Counter32
   }
```

```
dtrCRFPortStatsCRFIndex      OBJECT-TYPE
   SYNTAX                    INTEGER(1..255)
   MAX ACCESS                not-accessible
   STATUS                    current
   DESCRIPTION
      “The CRF number identifying this instance of CRF.”
::= { dtrCRFPortStatsEntry 1 }

dtrCRFPortStatsPortNumber    OBJECT-TYPE
   SYNTAX                    INTEGER(1..255)
   MAX ACCESS                not-accessible
   STATUS                    current
   DESCRIPTION
      “The CRF port number for which this entry contains CRF
      management information.”
   ::= { dtrCRFPortStatsEntry 2 }

dtrCRFPortStatsAreInFrames   OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      “The number of ARE frames received at this CRF port. This
      count does not include ARE frames that have been misdirected
      [final LAN ID does not match the local LAN ID maintained by
      the CRF (dtrCRFLocalLanId)].”
   ::= { dtrCRFPortStatsEntry 3 }

dtrCRFPortStatsAreOutFrames  OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      “The number of ARE frames transmitted by this CRF port.
      This count does not include ARE frames that have been
      misdirected [final LAN ID does not match the local LAN ID
      maintained by the CRF (dtrCRFLocalLanId)].”
   ::= { dtrCRFPortStatsEntry 4 }

dtrCRFPortStatsInFrames      OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      “The number of valid frames received by this CRF port.”
   ::= { dtrCRFPortStatsEntry 5 }

dtrCRFPortStatsOutFrames     OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      “The number of frames that have been transmitted by this CRF port.”
   ::= { dtrCRFPortStatsEntry 6 }
```

```
dtrCRFPortStatsSrfInFrames   OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      "The number of SRF frames that have been received by this
      CRF port and forwarded to another port on the CRF."
   ::= { dtrCRFPortStatsEntry 7 }

dtrCRFPortStatsSrfOutFrames  OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      "The number of SRF frames that have been transmitted by this
      CRF port."
   ::= { dtrCRFPortStatsEntry 8 }

dtrCRFPortStatsSteInFrames   OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      "The number of STE frames received at this CRF port. This
      count does not include STE frames that have been misdirected
      [final LAN ID does not match the local LAN ID maintained by
      the CRF (dtrCRFLocalLanId)]."
   ::= { dtrCRFPortStatsEntry 9 }

dtrCRFPortStatsSteOutFrames  OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      "The number of STE frames transmitted by this CRF port.
      This count does not include STE frames that have been
      misdirected [final LAN ID does not match the local LAN ID
      maintained by the CRF (dtrCRFLocalLanId)]."
   ::= { dtrCRFPortStatsEntry 10 }

dtrCRFPortStatsInvalidRI     OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      "Count of frames that were discarded due to a formatting error
      (i.e., an odd RI length, or 0 RI length) (see ISO/IEC 10038 : 1993,
      C4.2.1.1.3)."
   ::= { dtrCRFPortStatsEntry 11 }

dtrCRFPortStatsInMisdirected OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
```

```
   DESCRIPTION
      "This is a count of source-routed frames that have been
      received at this CRF port where the local LAN ID
      (dtrCRFLocalLanId) is not present or is not last (explorer
      frame). Explorer frames (ARE and STE) are broadcast to all
      forwarding CRF ports. SRF frames are discarded if the DA is
      specific and they are broadcast if the DA is multicast."
   ::= { dtrCRFPortStatsEntry 12 }

dtrCRFPortStatsInDiscards    OBJECT-TYPE
   SYNTAX                    Counter32
   MAX ACCESS                read-only
   STATUS                    current
   DESCRIPTION
      "The number of frames that have been discarded by the forwarding
      process. This count may include frames that are discarded by the
      frame reception process."
   ::= { dtrCRFPortStatsEntry 13 }

-- **********************************************************************
-- Conformance information
-- **********************************************************************

dtrConcConformance    OBJECT IDENTIFIER ::= { dtrConcMIB 2 }
dtrConcCompliances    OBJECT IDENTIFIER ::= { dtrConcConformance 1 }
dtrConcGroups         OBJECT IDENTIFIER ::= { dtrConcConformance 2 }

-- Compliance statements
dtrConcCompliance MODULE-COMPLIANCE
  STATUS     current
  DESCRIPTION
   "The compliance statement for the SNMPv2 entities that implement
   the dtrConc MIB."

  MODULE -- this module
   MANDATORY-GROUPS { dtrConcBaseGroup }

  -- Optional groups
   GROUP     dtrConcSpanningTreeGroup
   DESCRIPTION
      "Implementation of this group is optional."

   GROUP     dtrConcFdbDynamicAddrGroup
   DESCRIPTION
      "Implementation of this group is optional."

   GROUP     dtrConcFdbStaticAddrGroup
   DESCRIPTION
      "Implementation of this group is optional."

   GROUP     dtrConcFdbDynamicRDGroup
   DESCRIPTION
      "Implementation of this group is optional."
```

```
GROUP      dtrConcFdbStaticRDGroup
DESCRIPTION
   "Implemenation of this group is optional."

GROUP      dtrConcMRIGroup
DESCRIPTION
   "Implemenation of this group is optional."

GROUP      dtrConcCRFPortStatsGroup
DESCRIPTION
   "Implementation of this group is optional."

-- Refined OBJECT requirements
OBJECT           dtrNumberOfCrfs
MIN-ACCESS       read-only
DESCRIPTION
   "Write access is not required."

OBJECT           dtrNumberOfBridgeRelays
MIN-ACCESS       read-only
DESCRIPTION
   "Write access is not required."

OBJECT           dtrCRFPortMask
MIN-ACCESS       read-only
DESCRIPTION
   "Write access is not required."

OBJECT           dtrCRFAdminLocalLanId
MIN-ACCESS       read-only
DESCRIPTION
   "Write access is not required."

OBJECT           dtrCRFMRIEnable
MIN-ACCESS       read-only
DESCRIPTION
   "Write access is not required."

OBJECT           dtrCRFName
MIN-ACCESS read-only
DESCRIPTION
   "Write access is not required."

OBJECT           dtrCRFPortType
MIN-ACCESS       read-only
DESCRIPTION
   "Write access is not required."

OBJECT           dtrCRFRowStatus
MIN-ACCESS       read-only
DESCRIPTION
   "Write access is not required."
```



```
    OBJECT          dtrFdbStaticAddrRowStatus
    SYNTAX          INTEGER { active(1) }
    MIN-ACCESS      read-only
    DESCRIPTION
       "Write access is not required and only one of the six
       enumerated values for the RowStatus textual convention
       needs be supported, specifically active(1)."

    OBJECT          dtrFdbStaticAddrInMask
    MIN-ACCESS      read-only
    DESCRIPTION
       "Write access is not required."

    OBJECT          dtrFdbStaticAddrOutMask
    MIN-ACCESS      read-only
    DESCRIPTION
       "Write access is not required."

    OBJECT          dtrFdbStaticRDRowStatus
    SYNTAX          INTEGER { active(1) }
    MIN-ACCESS      read-only
    DESCRIPTION
       "Write access is not required and only one of the six
       enumerated values for the RowStatus textual convention
       needs be supported, specifically active(1)."

    OBJECT          dtrFdbStaticRDPortNumber
    MIN-ACCESS      read-only
    DESCRIPTION
       "Write access is not required."

::= { dtrConcCompliances 1 }

-- Units of conformance
dtrConcBaseGroup    OBJECT-GROUP
    OBJECTS { dtrConcentratorAddress, dtrNumberOfCrfs,
       dtrNumberOfBridgeRelays, dtrCRFNumberOfPorts,
       dtrCRFPortMask, dtrCRFName, dtrCRFMaxInfo, dtrCRFMacAddress,
       dtrCRFLocalLanId, dtrCRFAdminLocalLanId,
       dtrCRFFdbAgingTime, dtrCRFMRIEnable,
       dtrCRFLearnedEntryDiscards, dtrCRFPortEnable,
       dtrCRFPortType, dtrCRFPortifIndex,
       dtrCRFRowStatus,
       dtrCRFPortMtuExceededDiscards, dtrCRFPortDelayExceededDiscards
       }
    STATUS    current
    DESCRIPTION
       "A collection of objects providing information about the DTR
       concentrator."
::= { dtrConcGroups 1}

dtrConcSpanningTreeGroup   OBJECT-GROUP
    OBJECTS { dtrSpanningTreeHoldTime,
       dtrSpanningTreeProtocolSpecification,
```



```
        dtrSpanningTreeTimeSinceTopoChange,
        dtrSpanningTreeTopologyChanges, dtrSpanningTreeBridgeForwardDelay,
        dtrSpanningTreeBridgeHelloTime, dtrSpanningTreeBridgeMaxAge,
        dtrCRFSpTreePriority, dtrCRFSpTreeDesignatedRoot,
        dtrCRFSpTreeRootCost, dtrCRFSpTreeRootPort, dtrCRFSpTreeMaxAge,
        dtrCRFSpTreeHelloTime, dtrCRFSpTreeForwardDelay,
        dtrCRFPortSpTreePriority, dtrCRFPortSpTreeState,
        dtrCRFPortSpTreePathCost, dtrCRFPortSpTreeDesignatedRoot,
        dtrCRFPortSpTreeDesignatedCost, dtrCRFPortSpTreeDesignatedBridge,
        dtrCRFPortSpTreeDesignatedPort, dtrCRFPortSpTreeForwardTransitions }
    STATUS    current
    DESCRIPTION
        "A collection of objects providing information on the spanning tree
        operation of a DTR concentrator."
    ::= { dtrConcGroups 2 }

dtrConcFdbDynamicAddrGroup OBJECT-GROUP
    OBJECTS { dtrFdbDynamicAddrPortNumber,
        dtrFdbDynamicAddrStatus}
    STATUS    current
    DESCRIPTION
        "A collection of objects providing information about dynamic
        MAC address entries in the CRF filtering database."
    ::= { dtrConcGroups 3 }

dtrConcFdbStaticAddrGroup  OBJECT-GROUP
    OBJECTS    { dtrFdbStaticAddrRowStatus, dtrFdbStaticAddrInMask,
        dtrFdbStaticAddrOutMask, dtrFdbStaticAddrStatus }
    STATUS    current
    DESCRIPTION
        "A collection of objects providing information about static
        MAC address entries in the CRF filtering database."
    ::= { dtrConcGroups 4 }

dtrConcFdbDynamicRDGroup   OBJECT-GROUP
    OBJECTS    { dtrFdbDynamicRDPortNumber, dtrFdbDynamicRDStatus }
    STATUS    current
    DESCRIPTION
        "A collection of objects providing information about dynamic
        DRDs in the CRF filtering database."
    ::= { dtrConcGroups 5 }

dtrConcFdbStaticRDGroup    OBJECT-GROUP
    OBJECTS    { dtrFdbStaticRDRowStatus,
        dtrFdbStaticRDPortNumber, dtrFdbStaticRDStatus }
    STATUS    current
    DESCRIPTION
        "A collection of objects providing information about dynamic
        DRDs in the CRF filtering database."
    ::= { dtrConcGroups 6 }

dtrConcMRIGroup     OBJECT-GROUP
    OBJECTS    { dtrMRIOutMask }
    STATUS    current
```



```
    DESCRIPTION
        "A collection of objects providing information on the CRF port
        out mask for specific management functions."
    ::= { dtrConcGroups 7 }

dtrConcCRFPortStatsGroup   OBJECT-GROUP
    OBJECTS   { dtrCRFPortStatsAreInFrames, dtrCRFPortStatsAreOutFrames,
        dtrCRFPortStatsInFrames, dtrCRFPortStatsOutFrames,
        dtrCRFPortStatsSrfInFrames, dtrCRFPortStatsSrfOutFrames,
        dtrCRFPortStatsSteInFrames, dtrCRFPortStatsSteOutFrames,
        dtrCRFPortStatsInvalidRI, dtrCRFPortStatsInMisdirected,
        dtrCRFPortStatsInDiscards }
    STATUS    current
    DESCRIPTION
        "A collection of objects providing protocol characteristics of
        for a DTR C-Port."
    ::= { dtrConcGroups 8 }

END
```

K.6.2 DTR concentrator management entity

K.6.2.1 DTR concentrator management addressing

A DTR concentrator management entity for a specific DTR concentrator is addressed by one or more specific MAC addresses in conjunction with a higher-layer protocol identifier. It shares all points of attachment to the network with all the C-Ports that are connected to the DTU.

A standard group address for public use is assigned, which serves to convey management requests to all DTR concentrator management entities associated with all C-Ports attached to a network.

Table K.4—Addressing DTR concentrator management

Assignment	Value
All DTR concentrator management group address	80-01-43-00-00-78

Annex L

(informative)

DTR Station and C-Port in Station Emulation mode using the TXI access protocol—Join, Transmit, and Monitor low-level FSMs

This annex contains the FSMs of 9.2 illustrated by figures 9-9 through 9-10, but with the level of detail found in the Station Operation tables of 9.2.

— Figure L.1 contains the Join FSM with the state transition detail of 9.2, table 9-1.

— Figure L.2 contains the Transmit FSM with the state transition detail of 9.2, table 9-2.

— Figure L.3 contains the Monitor FSM with the state transition detail of 9.2, table 9-3.

The rules for these FSMs are identified in 9.1.1.9.

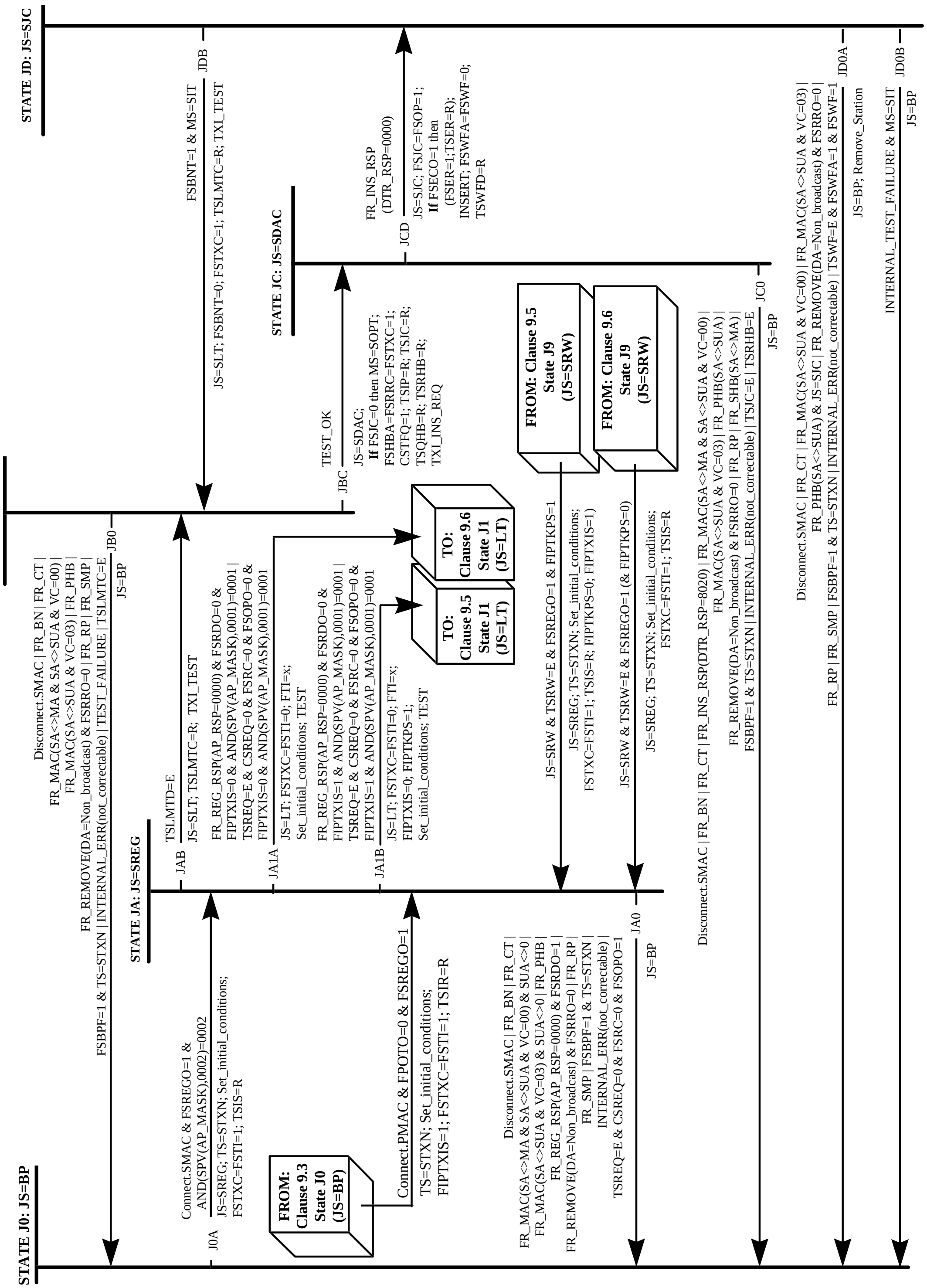


Figure L.1—Join FSM

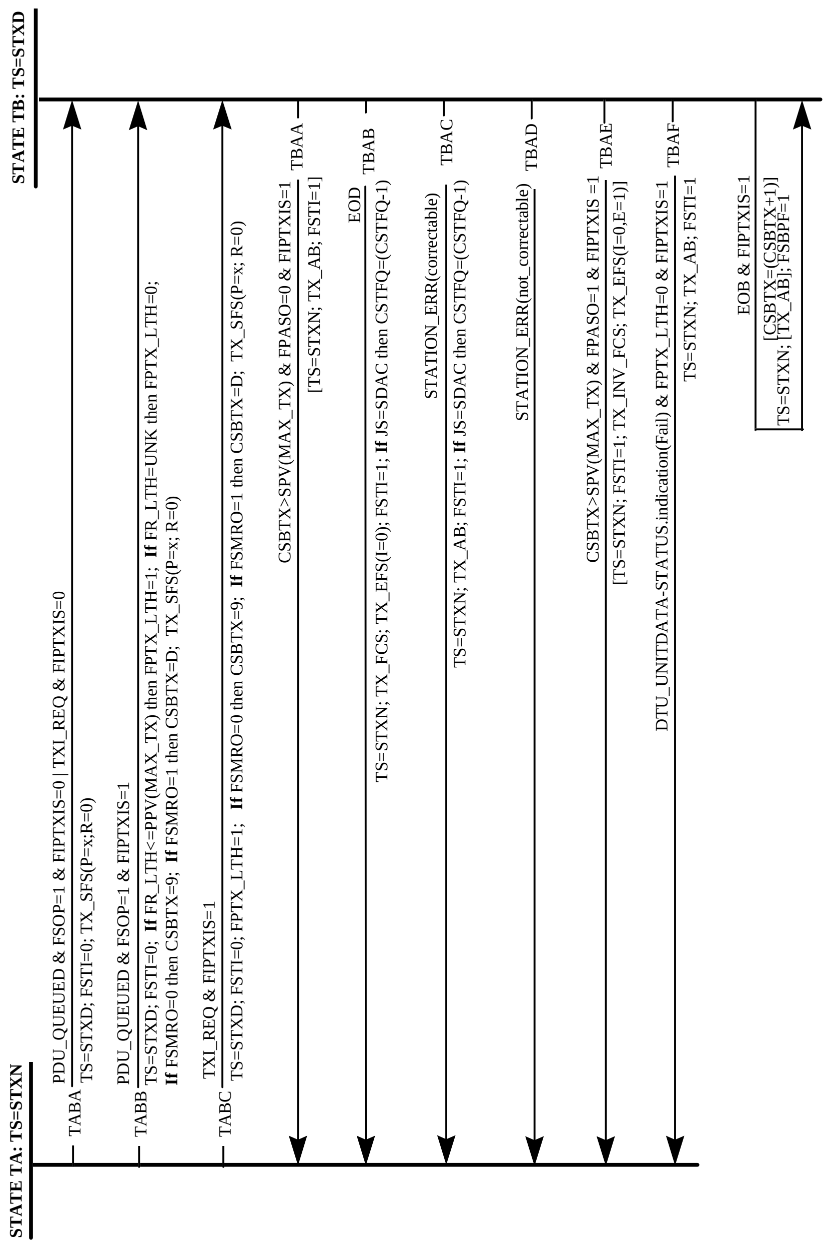


Figure L.2—Transmit FSM

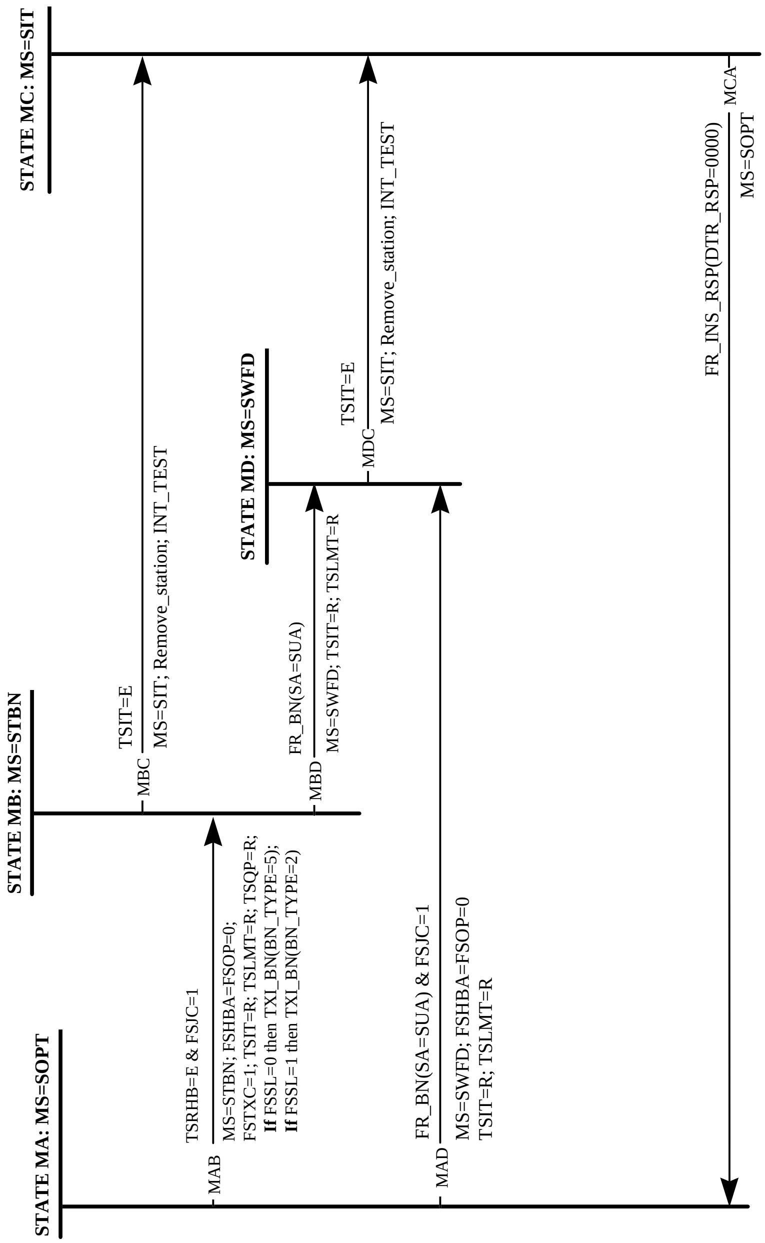


Figure L.3—Monitor FSM

Annex M

(informative)

C-Port in Port mode using the TXI and TKP access protocol—C-Port Join, Transmit, and Monitor low-level FSMs

This annex presents the FSMs of 9.3 contained in figures 9-11 through 9-13 with the same level of detail that can be found for state transitions in the C-Port Port Operation tables found in tables 9-7 through 9-9.

- Figure M.1 contains the C-Port Join FSM for TXI support with the state transition detail of 9.3, table 9-7.
- Figure M.2 contains the C-Port Join FSM for TKP support with the state transition detail of 9.3, table 9-7.
- Figure M.3 contains the C-Port Transmit FSM with the state transition detail of 9.3, table 9-8.
- Figure M.4 contains the C-Port Monitor FSM with the state transition detail of 9.3, table 9-9.

The rules for these FSMs are identified in 9.1.1.9.

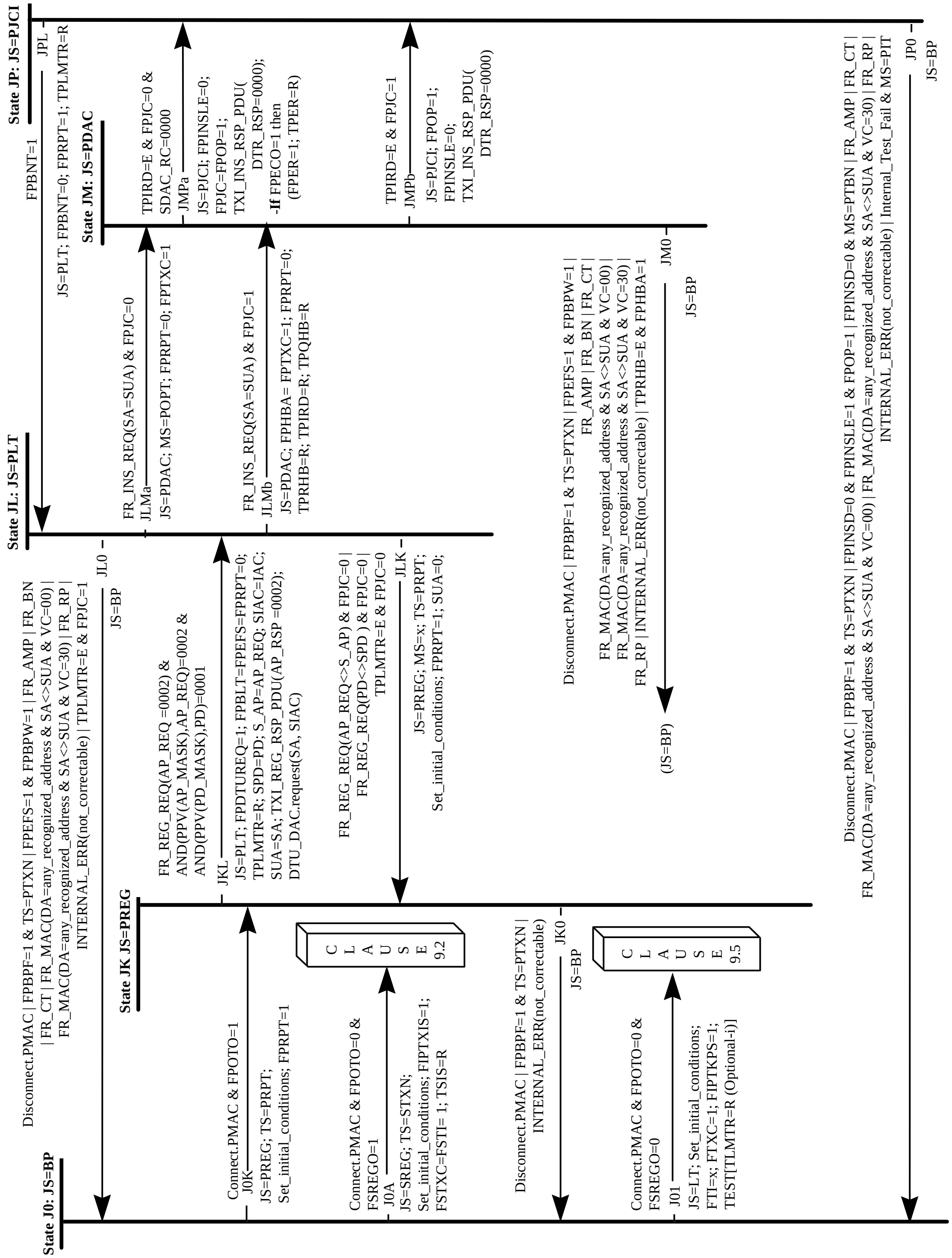


Figure M.1—C-Port Join (JS=State) FSM (TXI support)

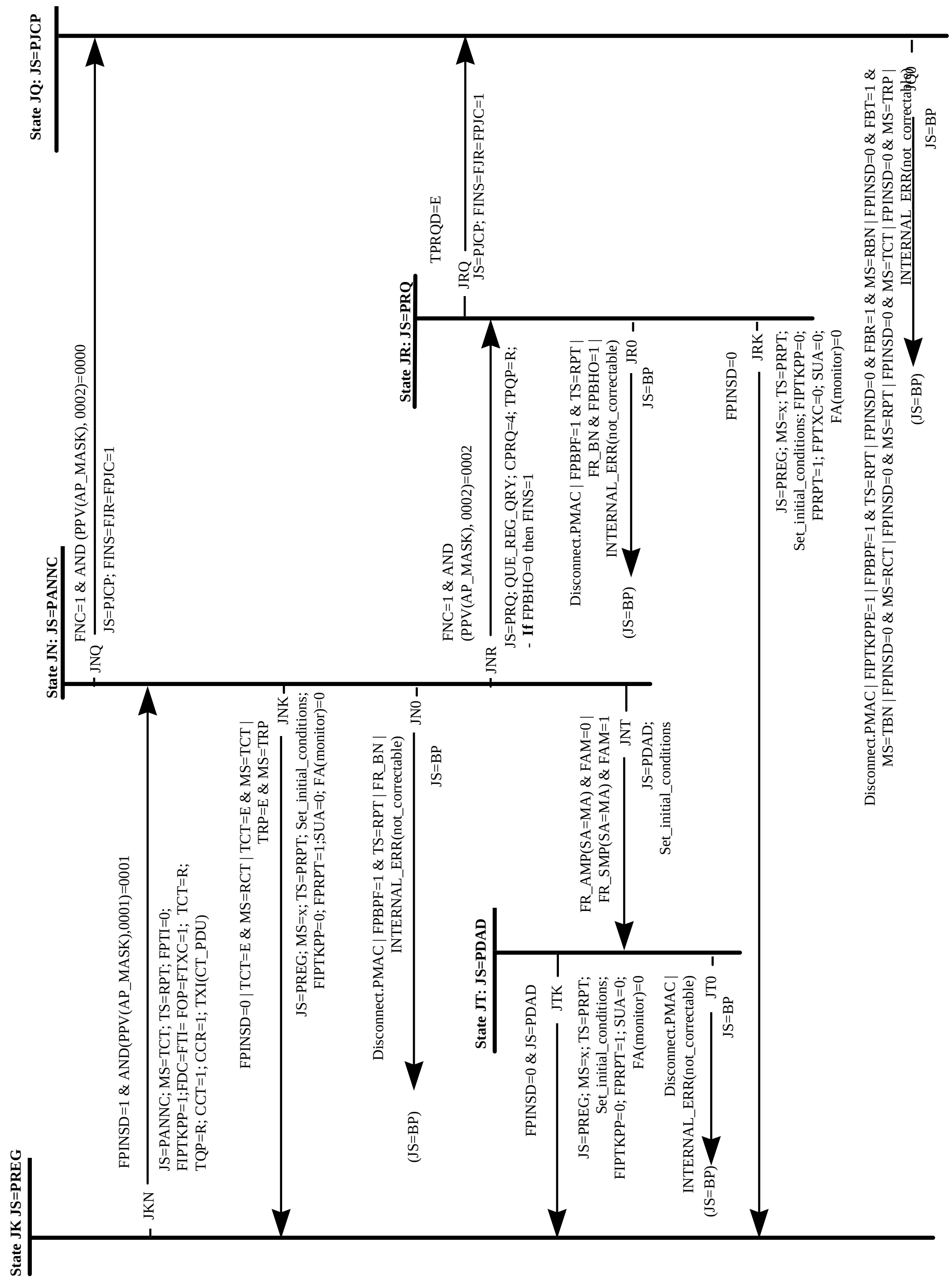


Figure M.2—C-Port Join (JS=State) FSM (TKP support)

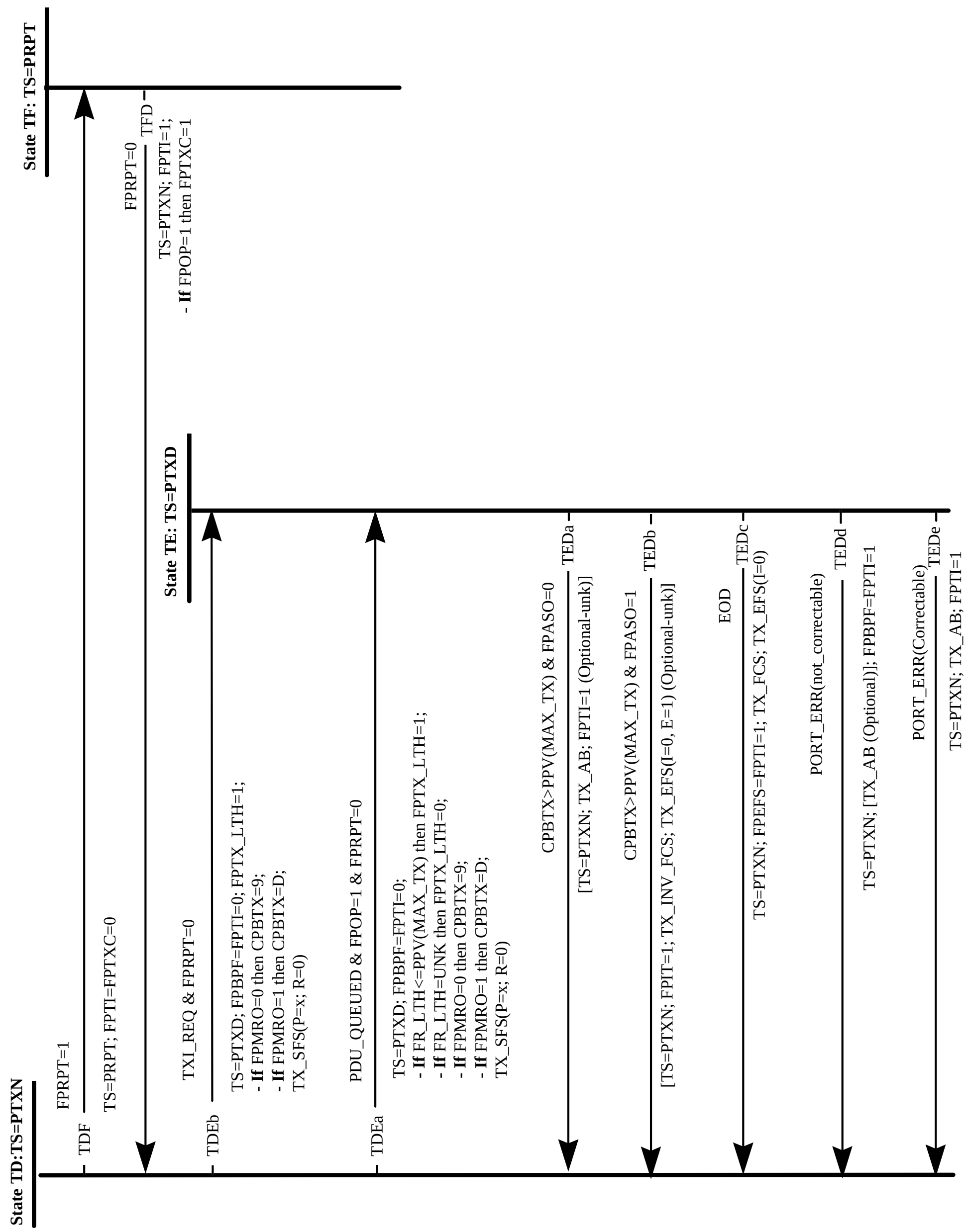


Figure M.3—C-Port Transmit (TS=State) FSM, TXI access protocol

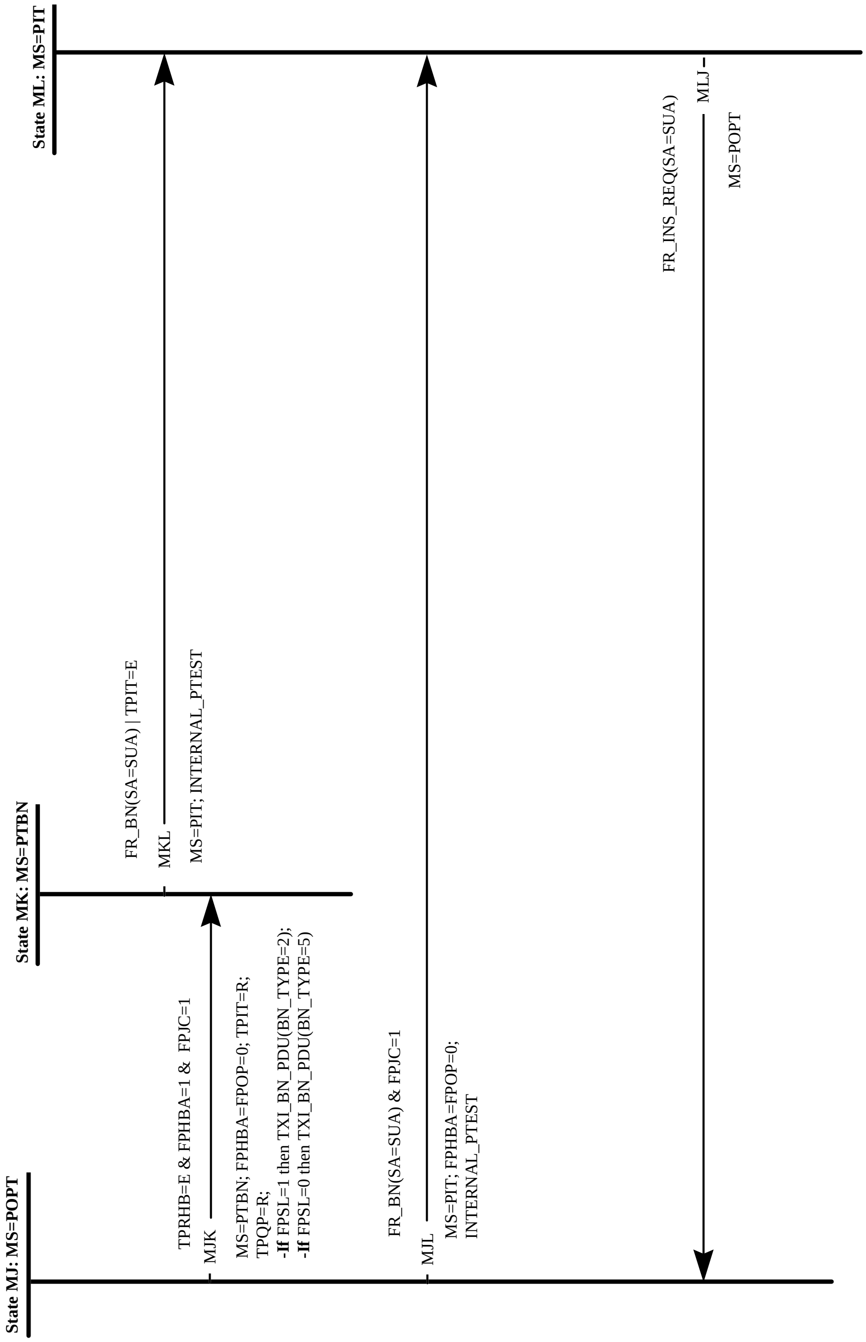


Figure M.4—C-Port Monitor (MS=State) FSM, TXI access protocol

Annex N

(informative)

C-Port in Port mode using the TKP access protocol—Transmit and Monitor low-level FSMs

This annex contains the FSMs of 9.4 illustrated by figures 9-16 and 9-17, but with the level of detail found in the Port Operation tables of 9.4.

- Figure N.1 contains the Transmit FSM with the state transition detail of 9.4, table 9-13.
- Figure N.2 contains the Monitor FSM with the state transition detail of 9.4, table 9-14.

The low-level Join FSM for the C-Port in Port mode using the TKP access protocol is contained within figure M.2 of annex M.

The rules for these FSMs are identified in 9.1.1.9.

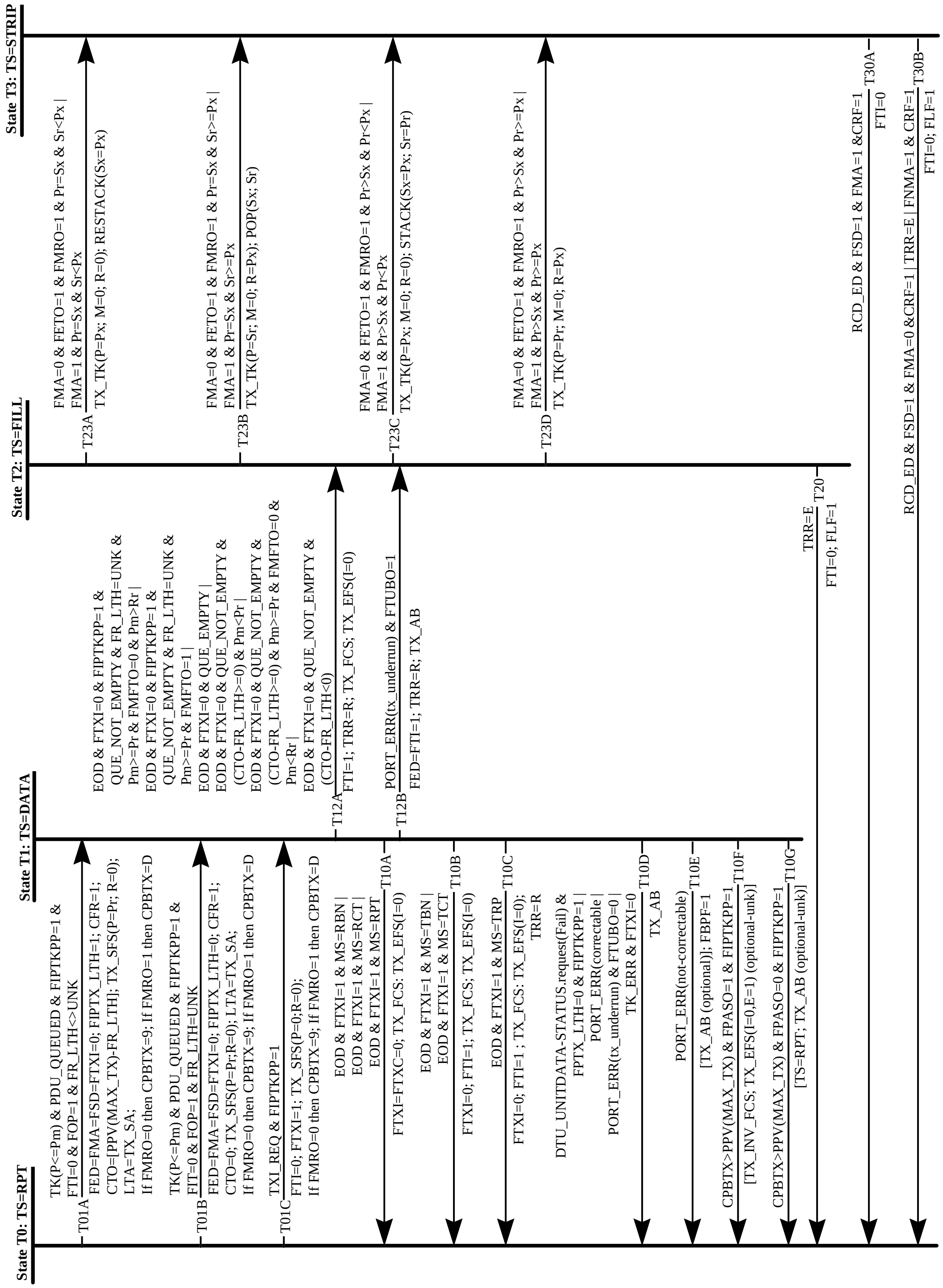


Figure N.1—Transmit FSM (TS=State): C-Port in Port mode using the TKP access protocol

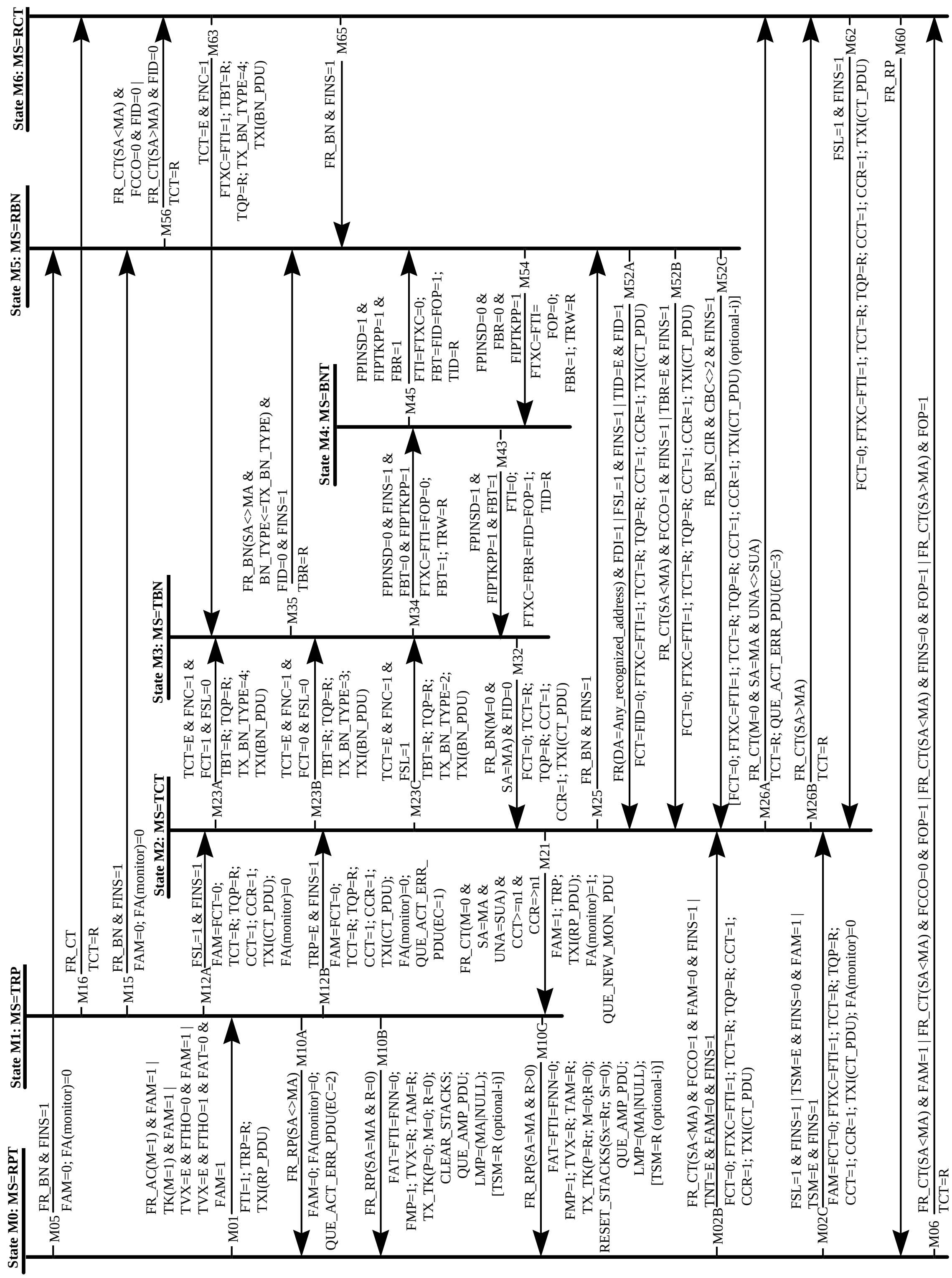


Figure N.2—Monitor FSM (MS=State): C-Port in Port mode using the TKP access protocol

Annex O

(informative)

Channel considerations for 16 Mbit/s DTR

This annex contains an analysis that shows the reduction in tracking error outweighs the additional crosstalk caused by the longer lengths of Category 3 cable, and that DTR using the TXI access protocol can comfortably support 100 m lobe lengths. Thus, C-Ports and DTR Stations should be designed to take advantage of this increased capability.

Jitter considerations perform a significant role in limiting the supportable lobe lengths in token ring networks. The channel specification in 7.2.4 was derived using the jitter budgets and jitter analysis described in annex C. Based on this channel specification, annex B shows that 16 Mbit/s token ring requires cabling with characteristics somewhat better than the specifications for a cabling standards-compliant Category 3 installation at maximum length. Specifically, a 100 m lobe installation would have to have crosstalk that is at least 6 dB better than a Category 3 installation is required to have. Similarly, an installation with crosstalk at Category 3 specified limits could only support a 61 m lobe length rather than 100 m.

The performance necessary to drive 100 m on Category 3 can be calculated similarly to the active channel design example in annex B. Category 3 has an insertion loss of 13.1 dB for 100 m, and a composite NEXT loss of cables/cords and connectors of 22 dB. The NIR is thus 22 – 13.1 = 8.9 dB. Since the UTP transmitter has a 2 dB variation, the station must function with a signal-to-crosstalk noise ratio (SCNR) of 6.9 dB. Using a sinusoidal model, the 6.9 dB SCNR corresponds to 9.32 ns of eye closure, or 4.66 ns of half-eye closure, rather than the 3 ns of half eye closure (equation 31 in annex C—Third edition) caused by the 12 dB signal-to-crosstalk ratio (NIR = 14 dB – 2 dB transmitter power variation).

For DTR in Transmit Immediate mode, a major contributor to jitter, tracking error, is minimized. Tracking error builds as a function of the number of retiming devices that derive their timing from a recovered clock. The maximum number of such devices for DTR in Transmit Immediate mode is 2, rather than 250. The decrease in tracking error can be translated into a decrease in the required channel NEXT loss to insertion loss ratio (NIR), as defined in clause 7, and used in annex B. The decrease in required NIR can be used to support all standards-compliant Category 3 installations. The following analysis demonstrates this new capability for 16 Mbit/s DTR using transmit immediate signaling.

Support for these longer lengths of Category 3 cable can be demonstrated by noting that the increase in eye-closure caused by the less favorable signal-to-crosstalk ratio is smaller than the reduction in tracking error caused by the loss of the phase slope. A comparison between the classic token ring and dedicated token ring is presented in O.1 and O.2 below, where it is assumed that the clock-recovery circuit in the hub has a similar bandwidth to that in the station.

O.1 Classic token ring

In classic token ring, the tracking error is shown in annex C to be typically 7.6 ns.

Tracking error = **7.6** ns

The effects of crosstalk to narrow the eye at this link, assuming a signal-to-crosstalk ratio of 12 dB, is given in annex C to be

Crosstalk eye-narrowing = 6.0 ns

Therefore, crosstalk eye-narrowing in one half eye = **3.0** ns

This effect considers only the crosstalk of one link. In a real network, the effects of crosstalk at all previous links must be considered, but for the purposes of this comparison only the previous link need be examined. This effect can be treated as increasing the correlated jitter at the upstream station, which will contribute to tracking error approximately a factor of 1/e of the additional correlated jitter caused.

Additional tracking error due to upstream crosstalk = 6.0/e

= **2.2** ns

Total effects of correlated jitter and crosstalk at this node in one half of the eye = **7.6** + **3.0** + **2.2** or

= **12.8** ns

O.2 Dedicated token ring

In dedicated token ring, the tracking error is zero, since the phase slope is removed.

Tracking error = **0.0** ns

In this case, the lower signal-to-crosstalk ratio results in a larger eye closure:

Crosstalk eye-narrowing = 9.4 ns

Therefore, crosstalk eye-narrowing in one half eye = **4.7** ns

Again this considers only the crosstalk of one link, and the tracking error caused by crosstalk at the previous link must also be included.

Additional tracking error due to upstream crosstalk = 9.4/e

= **3.5** ns

Total effects of correlated jitter and crosstalk at this node in one half of the eye = **0.0** + **4.7** + **3.5** or

= **8.2** ns

The results of this analysis show that DTR using the TXI access protocol can comfortably support 100 m lobe lengths when using Category 3 cable. C-Ports and DTR Stations should be designed to take advantage of this increased capability.

Annex Q

(informative)

DTR Station using the TKP access protocol—Join, Transmit, and Monitor low-level FSMs

The following FSMs show the operation of the DTR Station Operation tables in 9.6 that support the DTR Station using the TKP access protocol. These FSMs are based on the FSMs contained in annex F of ISO/IEC 8802-5 : 1998.

— Figure Q.1 contains the Join FSM with the state transition detail of 9.6, table 9-24.

The Join state (JS=SRW) supports the DTR registration query protocol and is marked in figure Q.1 as a bold state. Transitions entering or exiting the JS=SRW state are the changes to the classic station specified in clause 4 required to support the DTR registration query protocol.

— Figure Q.2 contains the Transmit FSM with the state transition detail of 9.6, table 9-25.
— Figure Q.3 contains the Monitor FSM with the state transition detail of 9.6, table 9-26.

The rules for these FSMs are identified in 9.1.1.9.

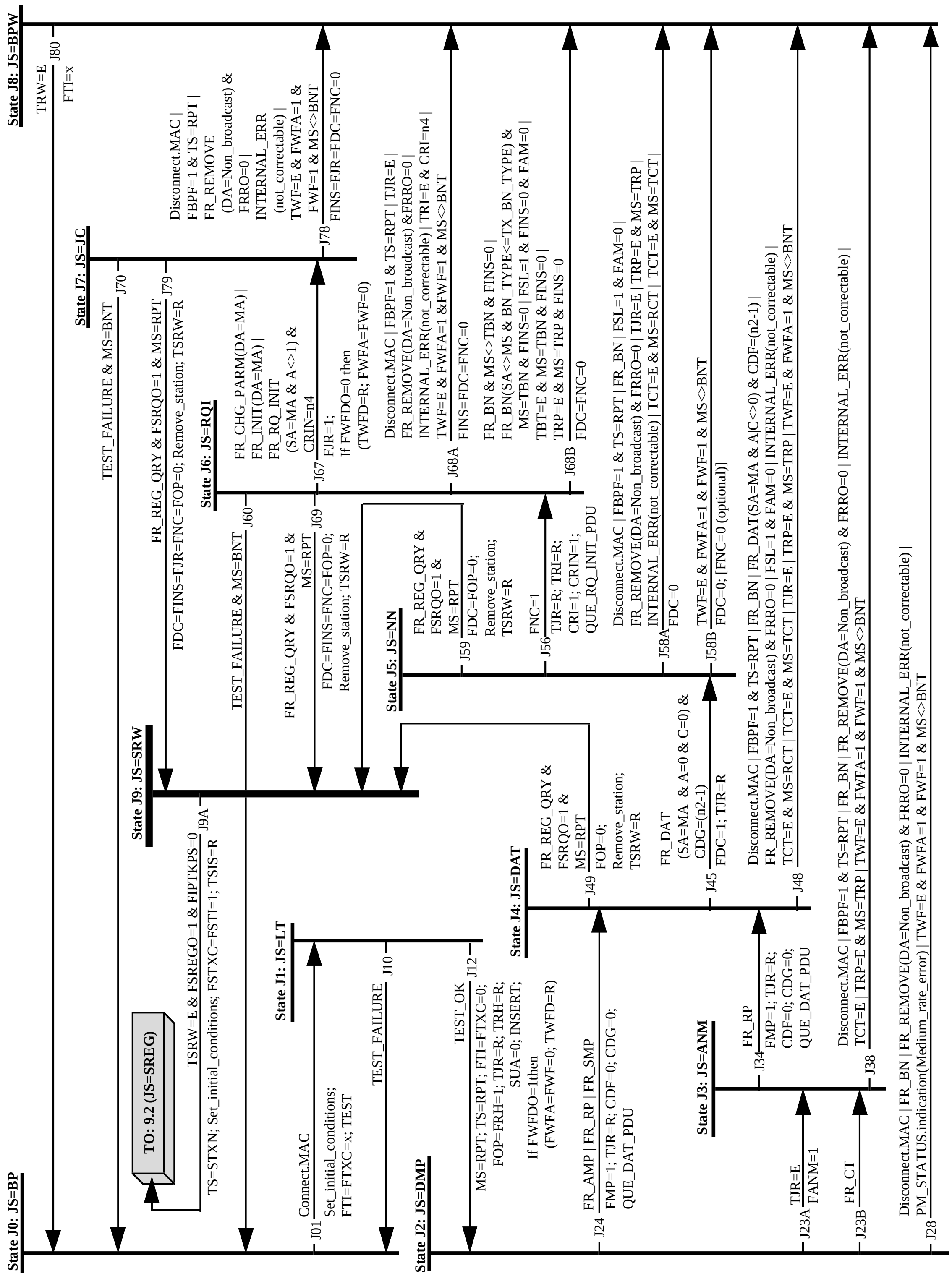


Figure Q.1—Join FSM (JS=state): DTR Station using the TKP access protocol

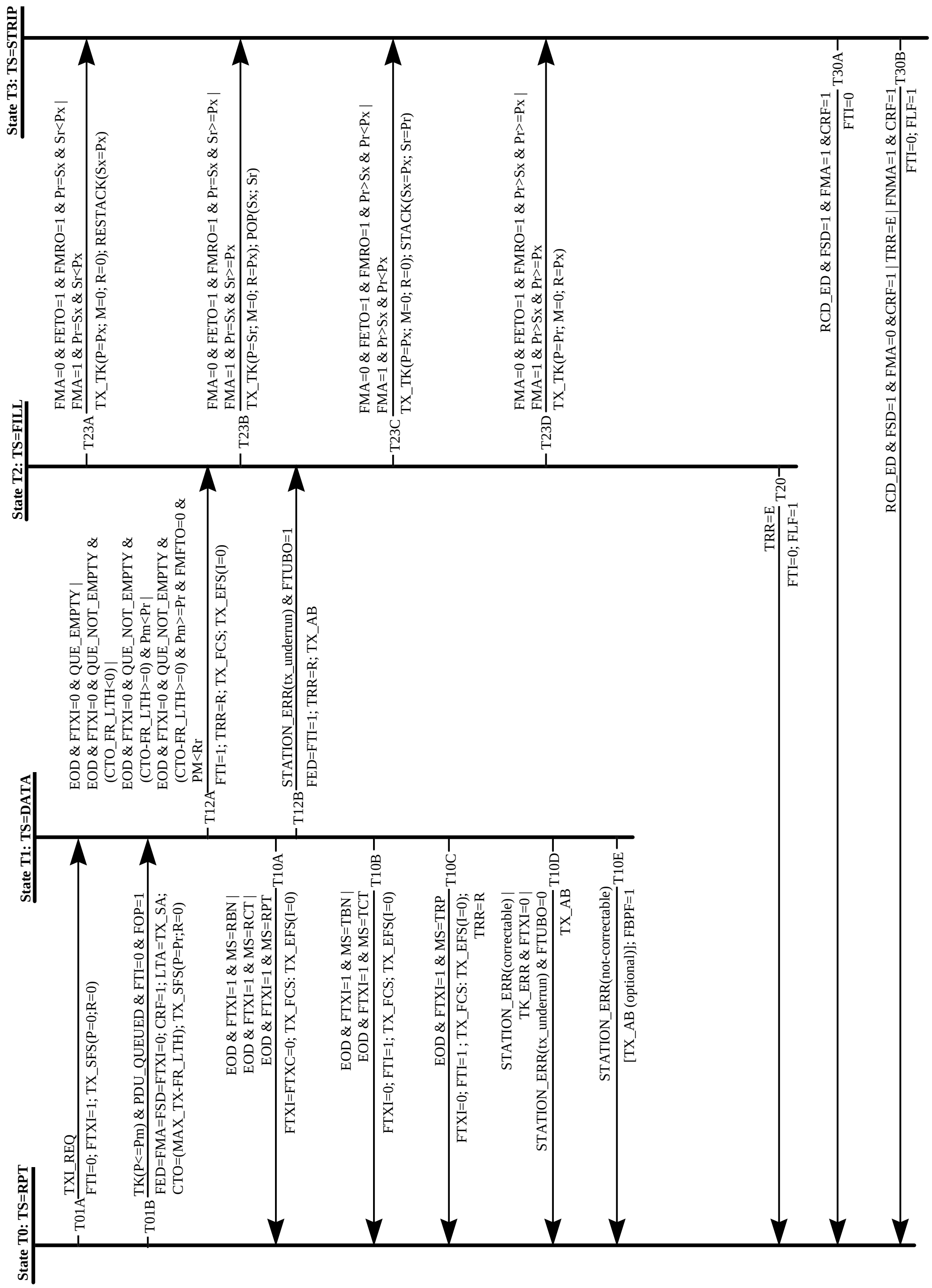


Figure Q.2—Transmit FSM (TS=state): DTR Station using the TKP access protocol

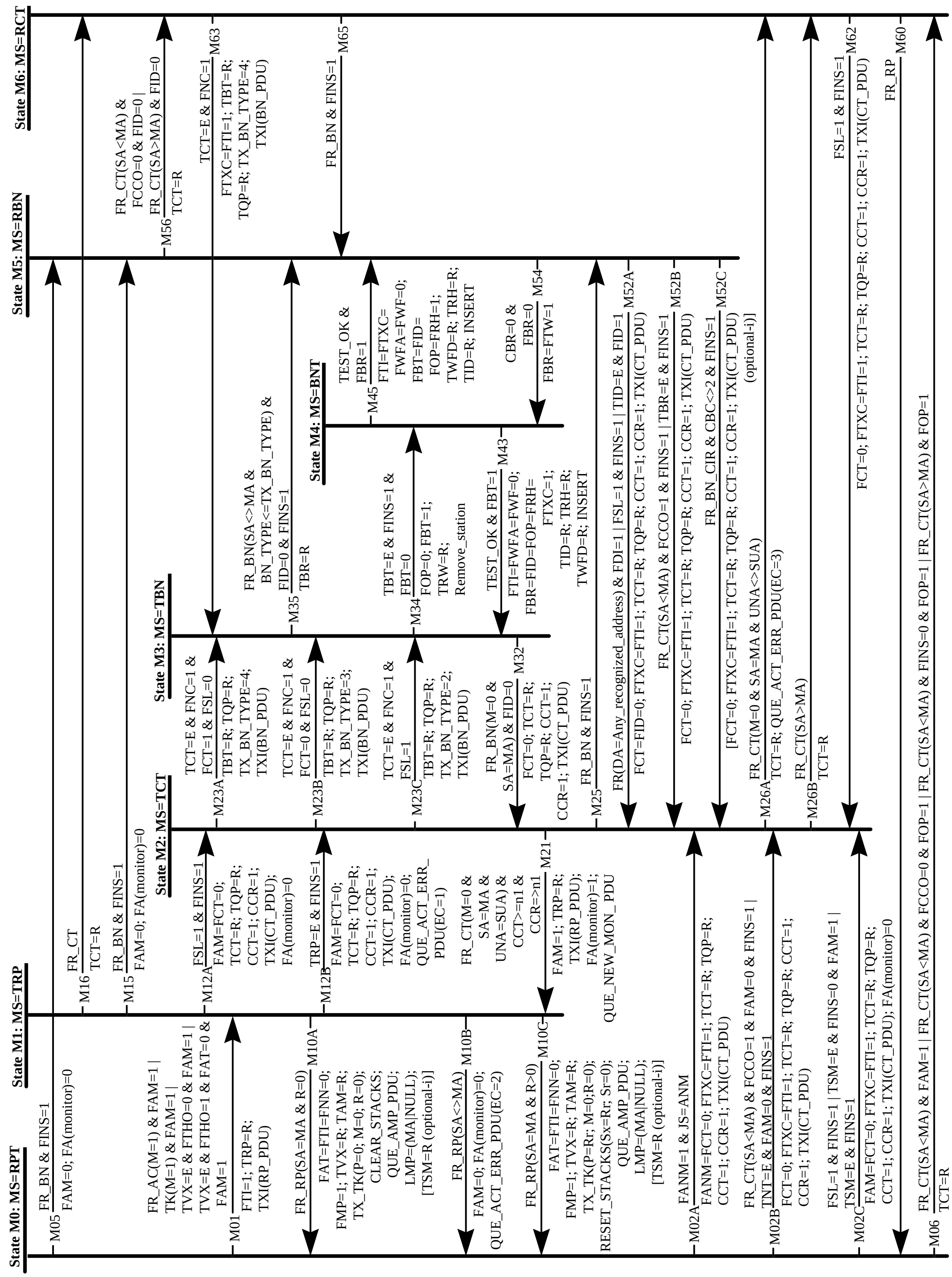


Figure Q.3—Monitor FSM (MS=state): DTR Station using the TKP access protocol

Annex R

(informative)

C-Port in Station Emulation mode using the TKP access protocol—Join, Transmit, and Monitor low-level FSMs

This annex contains the FSMs of 9.5 illustrated by figures 9-19 through 9-21, but with the level of detail found in the Port Operation tables of 9.5.

— Figure R.1 contains the Join FSM with the state transition detail of 9.5, table 9-18.
— Figure R.2 contains the Transmit FSM with the state transition detail of 9.5, table 9-19.
— Figure R.3 contains the Monitor FSM with the state transition detail of 9.5, table 9-20.

The rules for these FSMs are identified in 9.1.1.9.

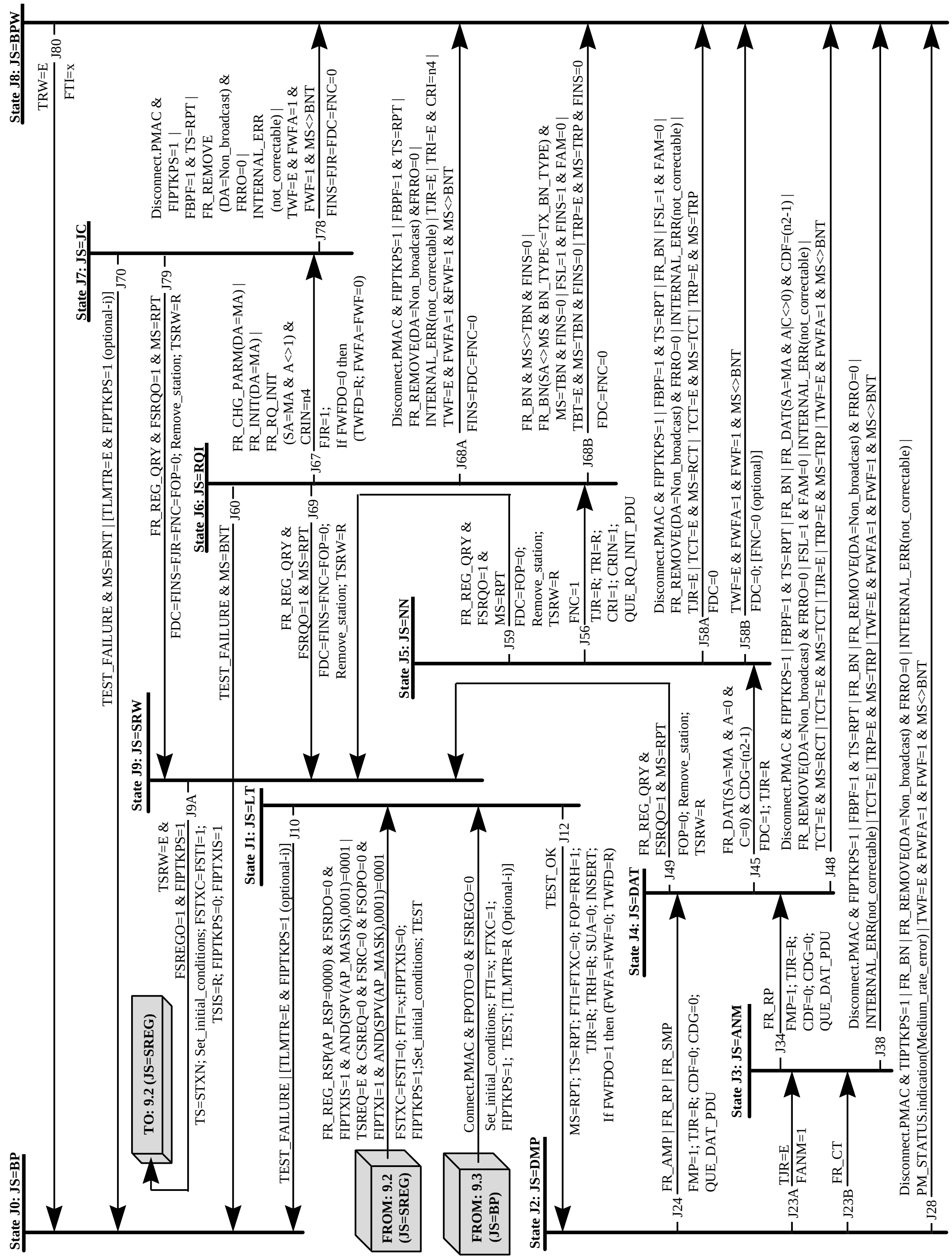


Figure R.1—C-Port in Station Emulation mode Join (JS=State) FSM, TKP access protocol

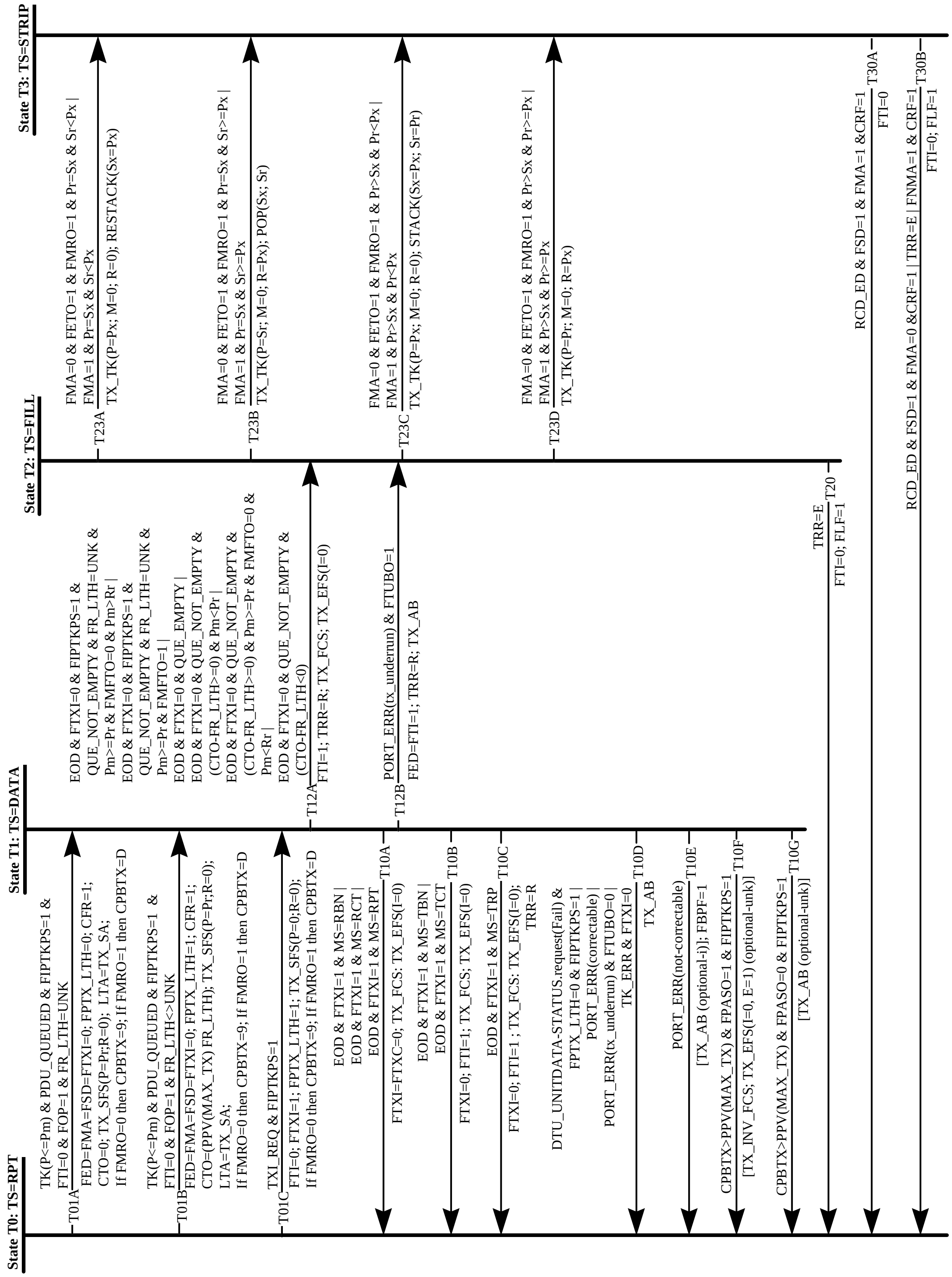


Figure R.2—C-Port in Station Emulation mode Transmit (TS=State) FSM, TKP access protocol

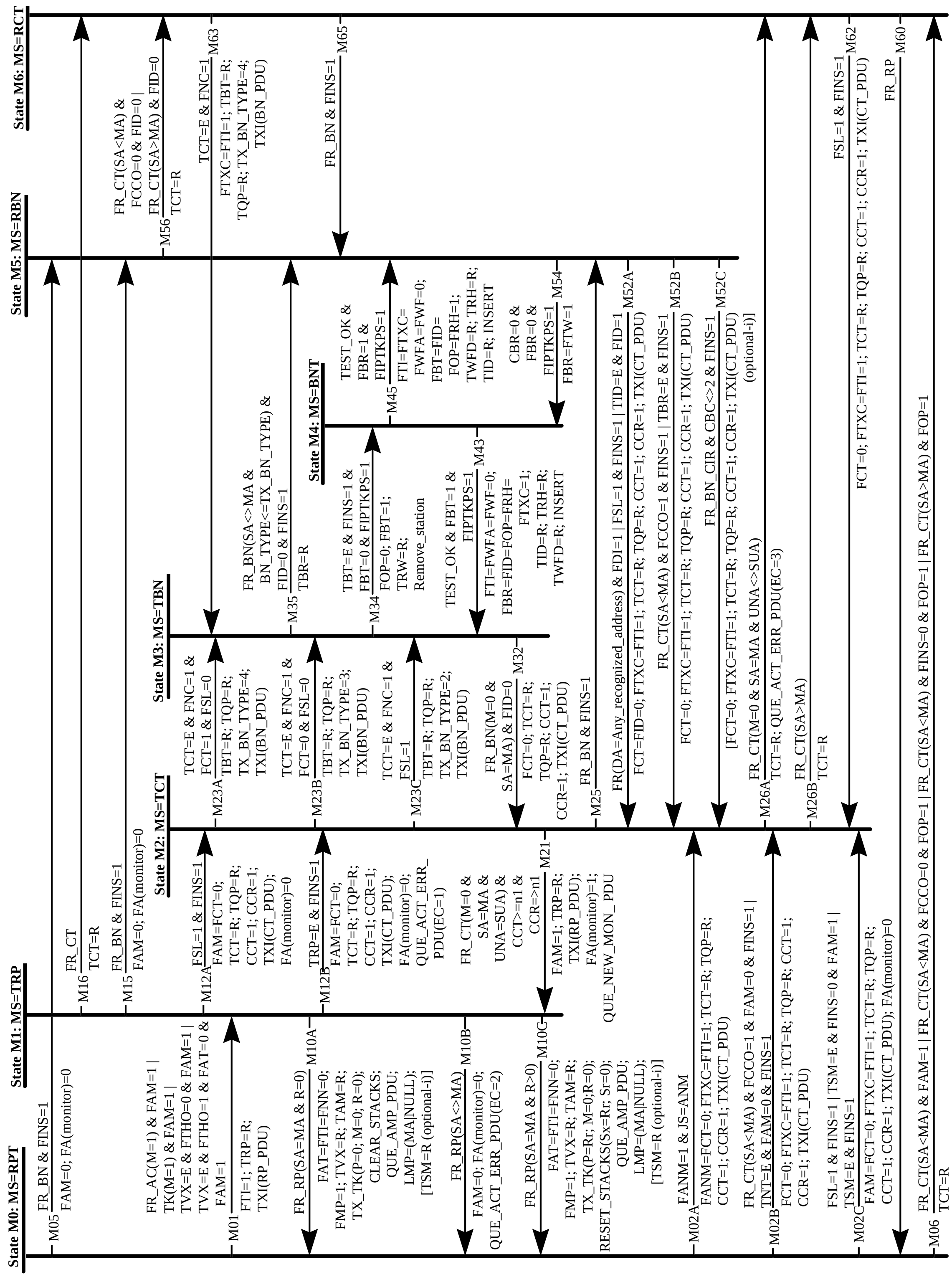


Figure R.3—C-Port in Station Emulation mode Monitor (MS=State) FSM, TXI access protocol

Annex S

(informative)

Clause 4 TKP access protocol deletions—C-Port in Port mode and in Station Emulation mode using the TKP access protocol

The purpose of this annex is to identify deletions from the clause 4 Station Operation table (table 7) as a basis for the creation of

— The Port Operation tables for the C-Port in Port mode using the TKP access protocol (9.3 and 9.4) and defined in S.1, and
— The Port Operation tables for the C-Port in Station Emulation mode using the TKP access protocol (9.5) and defined in S.2.

S.1 C-Port in Port mode (9.3 and 9.4)

This part of annex S identifies the deletions made to clause 4, table 7, in ISO/IEC 8802-5 : 1998 to support the C-Port in Port mode using the TKP access protocol. Table 7 has been divided into the six Port Operation tables as specified in 9.3, the Port Operation table for the Join FSM, and 9.4, the Port Operation tables for all the remaining FSMs.

S.1.1 Join Station Operation table

Table S.1 contains the transitions deleted from the clause 4, table 7.1 Station Operation table to support the Join function for the C-Port in Port mode using the TKP access protocol specified in 9.3.

Table S.1—Join Station Operation table transitions deleted for 9.3

S/T	REF	Event/condition	Action/output
J01	006	Connect.MAC & JS=BP	JS=LT; Set_initial_conditions; FTI=x; TEST; FTXC=x
J38	007	Disconnect.MAC & JS=ANM	JS=BPW
J48	008	Disconnect.MAC & JS=DAT	JS=BPW
J28	009	Disconnect.MAC & JS=DMP	JS=BPW
J78	010	Disconnect.MAC & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58	011	Disconnect.MAC & JS=NN	JS=BPW; FDC=0
J68A	012	Disconnect.MAC & JS=RQI	JS=BPW; FINS=FDC=FNC=0
J38	255	FBPF=1 & TS=RPT	JS=BPW

Table S.1—Join Station Operation table transitions deleted for 9.3 *(Continued)*

S/T	REF	Event/condition	Action/output
J48	256	FBPF=1 & TS=RPT	JS=BPW
J78	257	FBPF=1 & TS=RPT	JS=BPW; FINS=FJR=FDC=FNC=0
J58	258	FBPF=1 & TS=RPT	JS=BPW; FDC=0
J68	259	FBPF=1 & TS=RPT	JS=BPW; FINS=FDC=FNC=0
	029	FJR=1 & FBHO=1 & FINS=0	FLF=0; FINS=1
	033	FNC=1 & FBHO=0 & FINS=0	FLF=0; FINS=1
J56	035	FNC=1 & JS=NN	JS=RQI; TJR=R; TRI=R; CRI=1; CRIN=1; QUE_RQ_INIT_PDU
J24	058	FR_AMP & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0;CDG=0; QUE_DAT_PDU
J38	067	FR_BN & JS=ANM	JS=BPW
J48	068	FR_BN & JS=DAT	JS=BPW
J28	069	FR_BN & JS=DMP	JS=BPW
J58	070	FR_BN & JS=NN	JS=BPW; FDC=0
J68B	071	FR_BN & JS=RQI & MS<>TBN & FINS=0	JS=BPW; FDC=FNC=0
J68B	081	FR_BN(SA<>MA & BN_TYPE<=TX_BN_TYPE) & MS=TBN & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J67	100	FR_CHG_PARM(DA=MA) & JS=RQI	JS=JC; FJR=1; **If** FWFDO=0 then TXI access protocol (FWFA=FWF=0; TWFD=R)
J23B	106	FR_CT & JS=DMP	JS=ANM
	124	FR_DAT(SA=MA & A=0 & C=0) & CDG<(n2-1) & JS=DAT	CDG=(CDG+1); QUE_DAT_PDU
J45	125	FR_DAT(SA=MA & A=0 & C=0) & CDG=(n2-1) & JS=DAT	JS=NN; FDC=1; TJR=R
	126	FR_DAT(SA=MA & A|C<>0) & CDF<(n2-1) & JS=DAT	CDF=(CDF+1); QUE_DAT_PDU
J48	127	FR_DAT(SA=MA & A|C<>0) & CDF=(n2-1) & JS=DAT	JS=BPW
J67	131	FR_INIT(DA=MA) & JS=RQI	JS=JC; FWFA=FWF=0; FJR=1; TWFD=R; **If** FWFDO=0 then TXI access protocol (FWFA=FWF=0; TWFD=R)
J38	156	FR_REMOVE(DA=Non_broadcast) & FRRO=0 & JS=ANM	JS=BPW
J48	157	FR_REMOVE(DA=Non_broadcast) & FRRO=0 & JS=DAT	JS=BPW
J28	158	FR_REMOVE(DA=Non_broadcast) & FRRO=0 & JS=DMP	JS=BPW
J78	159	FR_REMOVE(DA=Non_broadcast) & FRRO=0 & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58	160	FR_REMOVE(DA=Non_broadcast) & FRRO=0 & JS=NN	JS=BPW; FDC=0

Table S.1—Join Station Operation table transitions deleted for 9.3 *(Continued)*

S/T	REF	Event/condition	Action/output
J68A	161	FR_REMOVE(DA=Non_broadcast) & FRRO=0 & JS=RQI	JS=BPW; FINS=FDC=FNC=0
J34	164	FR_RP & JS=ANM	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
J24	165	FR_RP & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
	187	FR_RQ_INIT(SA=MA & A<>1) & CRIN<n4 & JS=RQI	TRI=R; CRIN=(CRIN+1); QUE_RQ_INIT
J67	188	FR_RQ_INIT(SA=MA & A<>1) & CRIN=n4 & JS=RQI	JS=JC; FJR=1; **If** FWFDO=0 then TXI access protocol (FWFA=FWF=0; TWFD=R)
	189	FR_RQ_INIT(SA=MA & A=1) & CRI<n4 & JS=RQI	TRI=R
J24	191	FR_SMP & JS=DMP	JS=DAT; FMP=1; TJR=R; CDF=0; CDG=0; QUE_DAT_PDU
	206	FRH=0 & JS=BPW	MS=RPT; FAM=FOP=0; FRH=1; TRW=R; Remove_station; FA(monitor)=0
J48	210	FSL=1 & FAM=0 & JS=DAT	JS=BPW
J58	211	FSL=1 & FAM=0 & JS=NN	JS=BPW; FDC=0
J68A	209	FSL=1 & FINS=0 & FAM=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	224	INTERNAL_ERR(not_correctable) & JS=ANM	JS=BPW
J48	225	INTERNAL_ERR(not_correctable) & JS=DAT	JS=BPW
J28	226	INTERNAL_ERR(not_correctable) & JS=DMP	JS=BPW
J78	227	INTERNAL_ERR(not_correctable) & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58	228	INTERNAL_ERR(not_correctable) & JS=NN	JS=BPW; FDC=0
J68A	229	INTERNAL_ERR(not_correctable) & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	230	JS=BPW & FAM=1	[FAM=0; FA(monitor)=0 (optional)]
	231	JS=BPW & FOP=1	[FOP=0 (optional)]
	232	JS=BPW & MS<>RPT	[MS=RPT (optional)]
J28	238	PM_STATUS.indication (Medium_rate_error) & JS=DMP	JS=BPW
J68B	263	TBT=E & MS=TBN & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	265	TCT=E & JS=ANM	JS=BPW
J48	267	TCT=E & MS=RCT & JS=DAT	JS=BPW
J58	268	TCT=E & MS=RCT & JS=NN	JS=BPW; FDC=0
J48	269	TCT=E & MS=TCT & JS=DAT	JS=BPW
J58	270	TCT=E & MS=TCT & JS=NN	JS=BPW; FDC=0
J10	276	TEST_FAILURE & JS=LT	JS=BP

Table S.1—Join Station Operation table transitions deleted for 9.3 *(Continued)*

S/T	REF	Event/condition	Action/output
J70	277	TEST_FAILURE & MS=BNT & JS=JC	JS=BP
J60	278	TEST_FAILURE & MS=BNT & JS=RQI	JS=BP
J12	281	TEST_OK & JS=LT	JS=DMP; MS=RPT; TS=RPT; FTI=FTXC=0; FOP=FRH=1; TJR=R; TRH=R; SUA=0; INSERT; **If** FWFDO=1 then TXI access protocol (FWFA=FWF=0; TWFD=R)
J48	284	TJR=E & JS=DAT	JS=BPW
J23A	287	TJR=E & JS=DMP	JS=ANM; FANM=1
J58	285	TJR=E & JS=NN	JS=BPW; FDC=0
J68A	286	TJR=E & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	315	TRH=E	FRH=0
	316	TRI=E & JS=RQI & CRI<n4	TRI=R; CRI=(CRI+1); QUE_RQ_INIT_PDU
J68A	317	TRI=E & JS=RQI & CRI=n4	JS=BPW; FINS=FDC=FNC=0
J68B	321	TRP=E & MS=TRP & FINS=0 & JS=RQI	JS=BPW; FDC=FNC=0
J38	318	TRP=E & MS=TRP & JS=ANM	JS=BPW
J48	319	TRP=E & MS=TRP & JS=DAT	JS=BPW
J58	320	TRP=E & MS=TRP & JS=NN	JS=BPW; FDC=0
J80	325	TRW=E & JS=BPW	JS=BP; FTI=x
J38	368	TWF=E & FWFA=1 & FWF=1 & MS<>BNT & JS=ANM	JS=BPW
J48	369	TWF=E & FWFA=1 & FWF=1 & MS<>BNT & JS=DAT	JS=BPW
J28	370	TWF=E & FWFA=1 & FWF=1 & MS<>BNT & JS=DMP	JS=BPW
J78	345	TWF=E & FWFA=1 & FWF=1 & MS<>BNT & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58?	371	TWF=E & FWFA=1 & FWF=1 & MS<>BNT & JS=NN	JS=BPW; FDC=FNC=0
J68A	372	TWF=E & FWFA=1 & FWF=1 & MS<>BNT & JS=RQI	JS=BPW; FINS=FDC=FNC=0
	347	TX_ERR(DAT) & JS=DAT	QUE_DAT_PDU
	350	TX_ERR(RQ_INIT) & JS=RQI & FOP=1	QUE_RQ_INIT_PDU

S.1.2 Transmit Station Operation table

Table S.2 contains the transitions deleted from the clause 4, table 7.2 Station Operation table to support the Transmit function for the C-Port in Port mode using the TKP access protocol specified in 9.4.

Table S.2—Transmit Station Operation table transitions deleted for 9.4

S/T	REF	Event/condition	Action/output
	018	EOD & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=0 & Pm>=Rr	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr;R=0); LTA=TX_SA
	019	EOD & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=1	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr;R=0); LTA=TX_SA
T10D	254	STATION_ERR(correctable) & TS=DATA	TS=RPT; TX_AB
T10E	363	STATION_ERR(not-correctable) & TS=DATA	TS=RPT; [TX_AB (optional)]; FBPF=1
T10D	364	STATION_ERR(tx_underrun) & FTUBO=0 & TS=DATA	TS=RPT; TX_AB
T12B	365	STATION_ERR(tx_underrun) & FTUBO=1 & TS=DATA	TS=FILL; FED=FTI=1; TRR=R; TX_AB
T01B	293	TK(P<=Pm) & PDU_QUEUED & FTI=0 & FOP=1 & TS=RPT	TS=DATA; FED=FMA=FSD=FTXI=0; CFR=1; CTO=(MAX_TX-FR_LTH); TX_SFS(P=Pr;R=0); LTA=TX_SA
T01A	352	TXI_REQ & TS=RPT	TS=DATA; FTI=0; FTXI=1; TX_SFS(P=0;R=0)

S.1.3 Monitor Station Operation table

Table S.3 contains the transitions deleted from the clause 4, table 7.3 Station Operation table to support the Monitor function for the C-Port in Port mode using the TKP access protocol specified in 9.4.

Table S.3—Monitor Station Operation table transitions deleted for 9.4

S/T	REF	Event/condition	Action/output
M54	003	CBR=0 & MS=RBN & FBR=0	MS=BNT; FBR=FTW=1
M02A	026	FANM=1 & MS=RPT & JS=ANM	MS=TCT; FANM=FCT=0; FTXC=FTI=1; TCT=R; TQP=R; CCT=1; CCR=1; TXI(CT _PDU)
	219	FTW=1 & FRH=0 & MS=BNT	FOP=FTW=0; TRW=R; Remove_station
M34	264	TBT=E & MS=TBN & FINS=1 & FBT=0	MS=BNT; FOP=0; FBT=1; TRW=R; Remove_station
M45	279	TEST_OK & FBR=1 & MS=BNT	MS=RBN; FTI=FTXC=FWFA=FWF=0; FBT=FID=FOP=FRH=1; TWFD=R; TRH=R; TID=R; INSERT
M43	280	TEST_OK & FBT=1 & MS=BNT	MS=TBN; FTI=FWFA=FWF=0; FBR=FID=FOP=FRH=FTXC=1; TID=R; TRH=R; TWFD=R; INSERT
	326	TRW=E & MS=BNT	FTXC=1; FTI=x; TEST

S.1.4 Error Handling Station Operation table

Table S.4 contains the transitions deleted from the clause 4, table 7.4 Station Operation table to support the Error Handling function for the C-Port in Port mode using the TKP access protocol specified in 9.4.

Table S.4—Error Handling Station Operation table transitions deleted for 9.4

S/T	REF	Event/condition	Action/output
	252	STATION_ERR(correctable) & TS=DATA & FINS=1 & MS=RPT & FER=0	FER=1; TER=R; CABE=(CABE+1)
	253	STATION_ERR(correctable) & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255	CABE=(CABE+1)
	366	STATION_ERR(tx-underrun) & TS=DATA & FINS=1 & MS=RPT & FER=0	[FER=1; TER=R; CABE=(CABE+1) (optional-x)]
	367	STATION_ERR(tx-underrun) & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255	[CABE=(CABE+1) (optional-x)]
	274	TER=E & FINS=1 & ERR_CNTR<>0	CER=1; QUE_RPRT_ERR_PDU

S.1.5 Interface Signals Station Operation table

Table S.5 contains the transitions deleted from clause 4, table 7.5 Station Operation table to support the Interface Signals function for the C-Port in Port mode using the TKP access protocol specified in 9.4.

Table S.5—Interface Signals Station Operation table transitions deleted for 9.4

S/T	REF	Event/condition	Action/output
	037	FR(RI_NOT_PRESENT) & FJR=1 & MS<>BNT & TS=RPT	M_UNITDATA.indication
	360	FR(RI_PRESENT) & FJR=1 & MS<>BNT	M_UNITDATA.indication
	134	FR_LLC(DA=Any_recognized_address) & FJR=1 & MS<>BNT	MA_UNITDATA.indication
	135	FR_MAC(DA=Any_recognized_address & DC<>0) & FJR=1 & MS<>BNT	MGT_UNITDATA.indication
	217	FTI=0	PS_CONTROL.request(Repeat_mode=Repeat)
	218	FTI=1	PS_CONTROL.request(Repeat_mode=Fill)
	234	M_UNITDATA.response & FTI=0 & TS=RPT	SET A=1
	236	MA_UNITDATA.request & FJR=1 & FR_LTH<=MAX_TX	QUE_PDU
	237	MGT_UNITDATA.request (SC<>RS) & FJR=1 & FR_LTH<=MAX_TX	QUE_PDU
	241	PM_STATUS.indication (Wire_fault=Detected) & FWFA=1 & FWF=0	FWF=1; TWF=R
	242	PM_STATUS.indication (Wire_fault=Not_detected) & FWF=1	FWF=0

S.1.6 Miscellaneous Frame Handling Station Operation table

Table S.6 contains the transitions deleted from the clause 4, table 7.6 Station Operation table to support the Miscellaneous Frame Handling function for the C-Port in Port mode using the TKP access protocol specified in 9.4.

Table S.6—Miscellaneous Frame Handling Station Operation table transitions deleted for 9.4

S/T	REF	Event/condition	Action/output
	154	**FR_REMOVE (DA=broadcast & A<>1)** & FOP=1	[QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A) (optional-i)]
	155	**FR_REMOVE(DA=broadcast & A=1)** & FOP=1	[QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A) (optional-x)]
	162	**FR_REMOVE(DA=Non_broadcast)** & FRRO=1 & FOP=1	QUE_RSP_PDU(DC=RCV_SC; SC=RS; RSP_TYPE=800A)

S.2 C-Port in Station Emulation mode (9.5)

This part of annex S identifies the deletions made to clause 4, table 7, in ISO/IEC 8802-5 : 1998 to support the C-Port in Station Emulation mode using the TKP access protocol. Table 7 has been divided into the six Port Operation tables as specified in 9.5.

S.2.1 Join Station Operation table

Table S.7 contains the transitions deleted from the clause 4, table 7.1 Station Operation table to support the Join function for the C-Port in Station Emulation mode using the TKP access protocol specified in 9.5.

Table S.7—Join Station Operation table transitions deleted for 9.5

S/T	REF	Event/condition	Action/output
J01	006	Connect.MAC & JS=BP	JS=LT; Set_initial_conditions; FTI=x; TEST
J38	007	Disconnect.MAC & JS=ANM	JS=BPW
J48	008	Disconnect.MAC & JS=DAT	JS=BPW
J28	009	Disconnect.MAC & JS=DMP	JS=BPW
J78	010	Disconnect.MAC & JS=JC	JS=BPW; FINS=FJR=FDC=FNC=0
J58	011	Disconnect.MAC & JS=NN	JS=BPW; FDC=0
J68	012	Disconnect.MAC & JS=RQI	JS=BPW; FINS=FDC=FNC=0

S.2.2 Transmit Station Operation table

Table S.8 contains the transitions deleted from the clause 4, table 7.2 Station Operation table to support the Transmit function for the C-Port in Station Emulation mode using the TKP access protocol specified in 9.5.

Table S.8—Transmit Station Operation table transitions deleted for 9.5

S/T	REF	Event/condition	Action/output
	018	EOD & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=0 & Pm>=Rr	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr;R=0); LTA=TX_SA
	019	EOD & TS=DATA & FTXI=0 & QUE_NOT_EMPTY & (CTO-FR_LTH>=0) & Pm>=Pr & FMFTO=1	CFR=(CFR+1); CTO=(CTO-FR_LTH); TX_FCS; TX_EFS(I=x); TX_SFS(P=Pr;R=0); LTA=TX_SA
T10D	254	STATION_ERR(correctable) & TS=DATA	TS=RPT; TX_AB
T10E	363	STATION_ERR(not-correctable) & TS=DATA	TS=RPT; [TX_AB (optional)]; FBPF=1
T10D	364	STATION_ERR(tx_underrun) & FTUBO=0 & TS=DATA	TS=RPT; TX_AB
T12B	365	STATION_ERR(tx_underrun) & FTUBO=1 & TS=DATA	TS=FILL; FED=FTI=1; TRR=R; TX_AB
T01B	293	TK(P<=Pm) & PDU_QUEUED & FTI=0 & FOP=1 & TS=RPT	TS=DATA; FED=FMA=FSD=FTXI=0; CFR=1; CTO=(MAX_TX-FR_LTH); TX_SFS(P=Pr;R=0); LTA=TX_SA
T01A	352	TXI_REQ & TS=RPT	TS=DATA; FTI=0; FTXI=1; TX_SFS(P=0;R=0)

S.2.3 Monitor Station Operation table

Table S.9 contains the transitions deleted from the clause 4, table 7.3 Station Operation table to support the Monitor function for the C-Port in Station Emulation mode using the TKP access protocol specified in 9.5.

Table S.9—Monitor Station Operation table transitions deleted for 9.5

S/T	REF	Event/condition	Action/output
M54	003	CBR=0 & MS=RBN & FBR=0	MS=BNT; FBR=FTW=1
M34	264	TBT=E & MS=TBN & FINS=1 & FBT=0	MS=BNT; FOP=0; FBT=1; TRW=R; Remove_station
M45	279	TEST_OK & FBR=1 & MS=BNT	MS=RBN; FTI=FTXC=FWFA=FWF=0; FBT=FID=FOP=FRH=1; TWFD=R; TRH=R; TID=R; INSERT
M43	280	TEST_OK & FBT=1 & MS=BNT	MS=TBN; FTI=FWFA=FWF=0; FBR=FID=FOP=FRH=FTXC=1; TID=R; TRH=R; TWFD=R; INSERT
	326	TRW=E & MS=BNT	FTXC=1; FTI=x; TEST

S.2.4 Error Handling Station Operation table

Table S.10 contains the transitions deleted from the clause 4, table 7.4 Station Operation table to support the Error Handling function for the C-Port in Station Emulation mode using the TKP access protocol specified in 9.5.

Table S.10—Error Handling Station Operation table transitions deleted for 9.5

S/T	REF	Event/condition	Action/output
	252	**STATION_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=0	FER=1; TER=R; CABE=(CABE+1)
	253	**STATION_ERR(correctable)** & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255	CABE=(CABE+1)
	366	**STATION_ERR(tx-underrun)** & TS=DATA & FINS=1 & MS=RPT & FER=0	[FER=1; TER=R; CABE=(CABE+1) (optional-x)]
	367	**STATION_ERR(tx-underrun)** & TS=DATA & FINS=1 & MS=RPT & FER=1 & CABE<255	[CABE=(CABE+1) (optional-x)]
	274	TER=E & FINS=1 & ERR_CNTR<>0	CER=1; QUE_RPRT_ERR_PDU

S.2.5 Interface Signals Station Operation table

Table S.11 contains the transitions deleted from the clause 4, table 7.5 Station Operation table to support the Interface Signals function for the C-Port in Station Emulation mode using the TKP access protocol specified in 9.5.

Table S.11—Interface Signals Station Operation table transitions deleted for 9.5

S/T	REF	Event/condition	Action/output
	037	**FR(RI_NOT_PRESENT)** & FJR=1 & MS<>BNT	M_UNITDATA.indication
	360	**FR(RI_PRESENT)** & FJR=1 & MS<>BNT	M_UNITDATA.indication
	134	FR_LLC(DA=Any_recognized_address) & FJR=1 & MS<>BNT	MA_UNITDATA.indication
	135	FR_MAC(DA=Any_recognized_address & DC<>0) & FJR=1 & MS<>BNT	MGT_UNITDATA.indication
	217	FTI=0	PS_CONTROL.request(Repeat_mode=Repeat)
	218	FTI=1	PS_CONTROL.request(Repeat_mode=Fill)
	234	M_UNITDATA.response & FTI=0 & TS=RPT	SET A=1
	236	MA_UNITDATA.request & FJR=1 & FR_LTH<=MAX_TX	QUE_PDU
	237	MGT_UNITDATA.request (SC<>RS) & FJR=1 & FR_LTH<=MAX_TX	QUE_PDU

S.2.6 Miscellaneous Frame Handling Station Operation table

There are no transitions deleted from the clause 4, table 7.6 Station Operation table to support the Miscellaneous Frame Handling function for the C-Port in Station Emulation mode using the TKP access protocol specified in 9.5.

Annex T

(informative)

Autodetection protocol

The purpose of this informative annex is to provide an optional method for DTR concentrators to dynamically determine the operational mode (Port mode or Station Emulation mode) of each of its C-Ports. Using this method, manufacturers can develop products that are interoperable

— With any 8802-5/802.5 compliant products that have this capability and adhere to these recommendations,
— With classic token ring stations[2],
— With DTR Stations, and
— With classic concentrators.

T.1 C-Port Autodetection FSM overview

The Autodetection FSM, shown in figure T.1, is started when the C-Port Join FSM is active and in the Bypass state (JS=BP). All other C-Port FSMs are inactive.

The Autodetection FSM is a “supervisory” FSM that modifies the C-Port Policy Flag FPOTO and issues a Connect.PMAC to the Join FSM once it has determined the type of connection to be made. In order to accomplish this, the Autodetection FSM makes use of state machine elements and FSMs that are defined in clauses 4 and 9. The Autodetection FSM manipulates the interface flags FIPTXIS and FIPTKPS, activates and deactivates the wire fault process, and activates and deactivates the TXI Transmit FSM defined in 9.3 and the TKP Transmit FSM defined in 9.5. When the Autodetection FSM is active, the Interface Signals FSM defined in this annex is active. Monitor, Error Handling, and Miscellaneous Frame Handling FSMs defined in clauses 4 and 9 are inactive. Monitor, Error Handling, and Miscellaneous Frame Handling FSMs are not defined for the Autodetection FSM.

The end result of the Autodetection process is to start the C-Port Join FSM with the proper value of the option flag FPOTO to allow the C-Port to start its operation in Port mode (FPOTO=1) or Station Emulation mode (FPOTO=0). The access protocol to be used by the C-Port is determined by the C-Port Join FSM defined in 9.3 as the result of the Connect.PMAC issued by the Autodetection FSM.

The Autodetection FSM defined in this annex assumes that the C-Port is enabled to run the TKP and the TXI access protocols in both Station Emulation mode and Port mode. In addition, this method requires a repeat path to be available from any attached C-Port.

[2] During Active Detection state (AS=ADET, see T.1.3.3) there is a possibility that a directly attached station, attempting to join at that time, may fail its lobe media test.

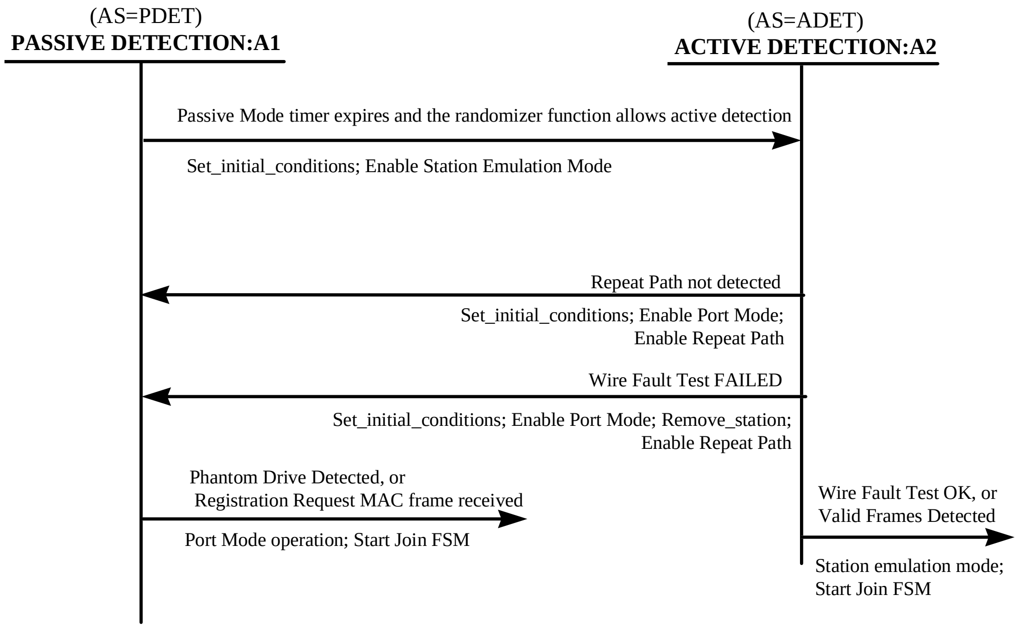


Figure T.1—Overview autodetection FSM

T.1.1 Finite state notation

In addition to the rules outlined in 4.2.1 and 9.1.1.1, the following additional rules are used when evaluating the FSMs in this annex:

a) Actions are considered to occur simultaneously except for changes to the PMC_Mode (see T.2.1).
b) When conditions cause a change to the PMC_Mode (see T.2.1), a delay should be introduced to permit the PMC to respond and the electronics to settle. This delay will vary based on the particular implementation used by the manufacturer. The following order is maintained when an action requires a change in the PMC_Mode:
    1) PMC_Mode change.
    2) Delay to permit the PMC to respond and the electronics to settle.
    3) Perform all other actions.

T.1.2 Abbreviations and notations

The following list contains abbreviations and notations used in the Autodetection Operation tables and State Machine Descriptions.

Autodetection C-Port policy flag notations

FPOTO = Flag, C-Port operation table option

PMAC interface flag notations

FIPTKPS = Flag, interface C-Port TKP Station emulation
FIPTXIS = Flag, interface C-Port TXI Station emulation

Autodetection MAC protocol entity (AMAC) flag notations

FAFTST = Flag, AMAC frame transmit test
FARH = Flag, AMAC remove hold
FARS = Flag, AMAC remove station
FAWF = Flag, AMAC wire fault
FAWFA = Flag, AMAC wire fault active
FAWTST = Flag, AMAC wire fault test

PMAC protocol flag notations

FPINSD = Flag, C-Port insert detected
FPRPT = Flag, C-Port repeat path enabled

SMAC protocol flag notations

FSTI = Flag, Station transmit idles
FSTXC = Flag, Station transmit from crystal

MAC protocol flag notations

FTI = Flag, transmit idles
FTXC = Flag, transmit from crystal

AMAC timer notations

TAACT = Timer, AMAC active detection
TAPAS = Timer, AMAC passive detection
TARH = Timer, AMAC remove hold
TARW = Timer, AMAC remove wait
TAWF = Timer, AMAC wire fault
TAWFD = Timer, AMAC wire fault delay
TAWTST = Timer, AMAC wire fault test

AMAC autodetection state notations (AS=)

ADET = Active detection
PDET = Passive detection

PMAC Join state notations (JS=)

BP = Bypass

MAC Transmit state notations (TS=)

DATA = Transmit frame data
FILL = Transmit fill and release token
RPT = Repeat
STRIP = Strip transmitted frames and transmit fill

SMAC Transmit state notations (TS=)

STXD = Station transmit frame data
STXN = Station transmit normal

PMAC Transmit state notations (TS=)

PRPT = C-Port repeat
PTXD = C-Port transmit frame data
PTXN = C-Port transmit normal

T.1.3 State machine elements

SMAC, PMAC, and MAC machine elements defined in previous clauses are not repeated in this annex. New state machine elements, unique to the AMAC, are defined in this subclause. Timers, while normally defined in clauses 3 and 10, are defined for the AMAC in this annex.

T.1.3.1 AMAC timers

Timer, AMAC Active Detection (TAACT). This timer is used to control the amount of time spent during the frame transmit test in the Active Detection state (AS=ADET). The value of the timer is in the range of 20 ms to 40 ms.

Timer, AMAC Passive Detection (TAPAS). This time is used to control the amount of time spent the Passive Detection state (AS=PDET). The value of the timer is in the range of 2.8 s to 3.2 s.

Timer, AMAC Remove Hold (TARH). This timer is used delay the AMAC FSM when attempting to drop phantom within 5 s of asserting it. This allows compatibility with older concentrator implementations that require phantom signaling for a minimum period to ensure successful deinsertion when phantom is dropped. The value of TARH is in the range of 5 s to 7 s.

Timer, AMAC Remove Wait (TARW). This timer is used by the AMAC FSM to assure repeat path availability when dropping phantom. This allows compatibility with concentrator implementations that exhibit a delay between the deinsert request and when the lobe is removed from the ring. The value of the timer is a minimum of 200 ms.

Timer, AMAC Wire Fault (TAWF). This timer is used to provide a sampling time to filter the detection of wire fault. The value of the timer is in the range of 0 s to 10 s. A value of 5 s is recommended.

Timer, AMAC Wire Fault Delay (TAWFD). This timer is used to delay the start of wire fault testing. It ensures that the asserted phantom signal has had time to stabilize. The value of the timer is in the range of 5 s to 10 s. An additional requirement for the selection of this timer value for an implementation is that the sum of TAWFD + TAWF be a minimum of 7 s.

Timer, AMAC Wire Fault Test (TAWTST). This timer is used to control the time spent performing a wire fault test. The value of the timer is in the range of 7 s to 20 s. An additional requirement for the selection of this timer value for an implementation is that the value of TAWTST is greater than or equal to the sum of TAWFD + TAWF.

T.1.3.2 AMAC protocol flags

Flag, AMAC Frame Transmit Test (FAFTST). This flag is used during the Active Detection state (AS=ADET) and indicates that a frame transmit test is in progress.

Flag, AMAC Remove Hold (FARH). This flag indicates that a minimum waiting time has elapsed before a Remove_station action is allowed to occur. This flag is set to 0 when an INSERT action is required as part of the wire fault test. This flag is set to 1 when a minimum waiting time has elapsed (TARH=E).

Flag, AMAC Remove Station (FARS). This flag indicates that a Remove_station action is being requested. The flag is used with FARH to determine if a Remove_station action may occur. This flag is set to 1 when a frame is received (FR) while performing the wire fault test in the Active Detection state (AS=ADET).

Flag, AMAC Wire Fault (FAWF). This flag indicates that an unfiltered wire fault detection event has occurred. This flag is set to 1 when the PMC detects a wire fault. This flag is set to 0 when the PMC detects that the wire fault condition no longer exists.

Flag, AMAC Wire Fault Active (FAWFA). This flag is used to indicate that wire fault checking is operational. This flag is set to 1 when the timer TAWFA expires, indicating that the phantom signal has stabilized and wire fault checking is operational. It is set to zero to disable wire fault checking.

Flag, AMAC Wire Fault Test (FAWTST). This flag is used during the Active Detection state (AS=ADET) and indicates that a wire fault test is in progress.

T.1.3.3 AMAC states

Active Detection (ADET). In this state, the Autodetection FSM performs up to two active tests to determine if the C-Port is connected to a concentrator. The Autodetection FSM sets the C-Port Policy flag FPOTO to 0, which causes the PMC to configure to Station Emulation mode. In this state, the Autodetection FSM activates the Station TXI Transmit (9.3) and the Station TKP Transmit FSM (9.5). Only one transmit FSM is active at a time.

The first test performed is a frame transmit test. A Duplicate Address Test (DAT) frame is transmitted using the Station TXI Transmit FSM. A timer, TAACT, is used to control the duration of this test. If the timer TAACT expires before the frame is received, then the Autodetection FSM transitions to the Passive Detection state (AS=PDET). If the DAT frame is received by the C-Port before the timer expires, then the second test, wire fault, is started.

The wire fault test is used by the Autodetection FSM to determine if a wire fault can be detected. The Autodetection FSM starts the Station TKP Transmit FSM and asserts the phantom signal to start this test. The duration of this test is controlled by the timer TAWTST. If a wire fault is detected before TAWTST expires, then the Autodetection FSM transitions to the Passive Detection state (AS=PDET).

If a frame is received (FR) before TAWTST expires, or if TAWTST expires without a wire fault being detected, the Autodetection FSM issues a Connect.PMAC to the Join FSM and shuts down the Autodetection FSM.

Passive Detection (PDET). In the Passive Detection state (AS=PDET), the Autodetection FSM is waiting for a station or a C-Port in Station Emulation mode to either send a Registration Request MAC frame or to raise the phantom signal. The Autodetection FSM sets the C-Port Policy flag FPOTO to 1, which causes the PMC to configure the C-Port in Port mode. In this state, the Autodetection FSM supplies a repeat path, uses recovered clock (FPTXC=0), and activates the C-Port TXI Transmit FSM defined in 9.3.

When either a Registration Request MAC frame or the phantom signal is detected, the Autodetection FSM issues a Connect.PMAC to the Join FSM and shuts down the Autodetection FSM.

The duration of the Passive Detection state is controlled by the timer TAPAS. When this timer expires, the FSM transitions to the Active Detection state (AS=ADET). TAPAS is restarted during the Passive Detection state when a frame is received (FR) or when TAPAS expires and the randomizer function, PRND() (see T.1.4.5), returns with a 0 value.

T.1.4 Autodetection Operation tables

T.1.4.1 C-Port Join Port Operation table additions

Table T.1—C-Port Join Port Operation table additions

S/T	REF	Event/condition	Action/output
	1199	**Connect.ADP** & JS=BP << Connect using the Autodetection protocol >>	AS=PDET; Set_initial_conditions; FPOTO=1; TS=PRPT; FPRPT=1; TAPAS=R << Start in Port mode, enable repeat path. TXI C-Port Transmit machine is operational; all others are not running. >>

T.1.4.2 Autodetection Port Operation table

Table T.2—Autodetection Port Operation table

S/T	REF	Event/condition	Action/output
	2201	**FARS=1 & FARH=1** & AS=ADET	FARS=0; TARW=R; Remove_station << Remove station, hold repeat path until the TCU is able to respond to the deinsert request. >>
A1x	2202	**FPINSD=1** & AS=PDET << Classic station detected >> << This transition is functionally equivalent to REF 1006 found in 9.3. >>	AS=x; Connect.PMAC << Shut down Autodetection FSM; Start up the Join FSM. >> << Port mode >>
	2203	**FR** & AS=PDET	TAPAS=R << The receipt of a frame, even if not DA=Any_recognized_address, causes an extension of the Passive Detection state. >>
	2204	**FR** & FAWTST=1 & AS=ADET << Frame received during wire-fault test >>	FAWFA=0; FARS=1
	2205	**FR_DAT(SA=MA)** & FAFTST=1 & AS=ADET	TS=RPT; FIPTXIS=0; FIPTKPS=1; FAFTST=0; FAWTST=1; FARH=FAWFA=FAWF=FTI=FTXC=0; TARH=R; TAWFD=R; TAWTST=R; INSERT << Start up TKP Station Emulation Transmit machine >> << Repeat path detected, start up wire fault test to determine if connection to a valid port or a short. >>
A1x	2206	**FR_REG_REQ** & AS=PDET	AS=x; Connect.PMAC << Shut down Autodetection FSM; Start up the Join FSM. >> << Port mode >>

Table T.2—Autodetection Port Operation table *(Continued)*

S/T	REF	Event/condition	Action/output
A21a	2207	**TAACT=E** & FAFTST=1 & AS=ADET << Repeat path not detected >>	AS=PDET; Set_initial_conditions; FPOTO=1; TS=PRPT; FPRPT=1; TAPAS=R << Start in Port mode, enable repeat path. TXI C-Port Transmit machine is operational; all others are not running. >>
	2208	**TAPAS=E** & PRND()=0 & AS=PDET << Passive detection time out >>	TAPAS=R << Skip active detection due to randomizer >>
A12	2209	**TAPAS=E** & PRND()=1 & AS=PDET << Passive detection time out >>	AS=ADET; Set_initial_conditions FIPTXIS=1; FPOTO=0; TS=STXN; FSTI=FSTXC=1; FAFTST=1; TAACT=R; TXI_DAT_PDU << Change to Station Emulation mode. Start up the Station Transmit machine; all others are not running. Start Active Detection timer. Transmit a DAT PDU. >>
	2210	**TARH=E** & AS=ADET	FARH=1 << Remove hold period over >>
A2xa	2211	**TARW=E** & AS=ADET	AS=x; FIPTKPS=0; Connect.PMAC << Shut down Autodetection FSM; Start up the Join FSM. >> << Station Emulation mode >>
A21b	2212	**TAWF=E** & FAWFA=1 & FAWF=1 & AS=ADET << Wire fault detected >>	AS=PDET; Remove_station; Set_initial_conditions; FPOTO=1; TS=PRPT; FPRPT=1; TAPAS=R << Start in Port mode, enable repeat path. TXI C-Port Transmit machine is operational; all others are not running. >>
	2213	**TAWFD=E** & FARS=0 & AS=ADET	FAWFA=1 << Phantom has stabilized and the hardware is ready for wire-fault detection. >>
A2xb	2214	**TAWTST=E** & AS=ADET << Wire Fault not detected >>	AS=x; FIPTKPS=0; Remove_station; Connect.PMAC << Shut down Autodetection FSM; Start up the Join FSM. >> << Station Emulation mode >>

T.1.4.3 Autodetection Interface Signals Port Operation table

Table T.3—Autodetection Interface Signals Port Operation table

S/T	REF	Event/condition	Action/output
	2401	**FPOTO=0**	PM_CONTROL.request TXI access protocol(PMC_Mode=Station_emulation_mode)
	2402	**FPOTO=1**	PM_CONTROL.request TXI access protocol(PMC_Mode=Port_mode)
	2403	**PM_STATUS.indication TXI access protocol(Wire_fault=Not_detected)** & FAWF=1 << Wire fault no longer indicated >>	FAWF=0
	2405	**PM_STATUS.indication(Insert=Detected)**	FPINSD=1
	2406	**PM_STATUS.indication(Insert=Not_detected)**	FPINSD=0
	2404	**PM_STATUS.indication(Wire_fault=Detected)** & FAWFA=1 & FAWF=0 << Wire fault indicated, start sample period >>	FAWF=1; TAWF=R

T.1.4.4 Precise specification of terms

This subclause provides precise specification of terms used by the Autodetection Operation tables. These specifications are for the *Event/condition* and *Action/output* columns.

T.1.4.5 Precise specification of events/conditions

The expressions used for events in the FSMs and Autodetection Operation tables have the following meanings:

{term1}= {term2}.	Term 1 is equal to term 2.
{term1} < {term2}.	Term 1 is less than term 2.
{term1} <= {term2}.	Term 1 is less than or equal to term 2.
{term1} > {term2}.	Term 1 is greater than term 2.
{term1} >= {term2}.	Term 1 is greater than or equal to term 2.
{term1}<> {term2}.	Term 1 is not equal to term 2.
{flag} = 0.	The specified flag is set to zero (false).
{flag} = 1.	The specified flag is set to one (true).
{timer} = E.	The specified timer has expired.

& means “and.”
| means “or.”
Values are in hexadecimal notation unless otherwise indicated.

Unless otherwise specified, the following terms and operations are defined:

AS=state. The Autodetection is in the specified state.

Connect.ADP. The C-Port receives this command from Management to start the Autodetection FSM that determines the proper setting of FPOTO. The Autodetection FSM is permitted to act as a management proxy and issue a Connect.PMAC command once the value of FPOTO has been determined.

FR. A frame has been received that meets the criteria specified in 4.3.2.

FR_DAT(criteria). A verified Duplicate Address Test (DAT) MAC frame with the specified criteria is received.

FR_REG_REQ. A verified Registration Request MAC frame is received.

PM_STATUS.indication TXI access protocol(Wire_fault=Detected). The PHY indicates a wiring fault (see T.2).

PM_STATUS.indication TXI access protocol(Wire_fault=Not_detected). The PHY indicates no wiring fault (see T.2).

PM_STATUS.indication TXI access protocol(Insert=Detected). The PHY indicates an insert request is received via the phantom signaling channel (see 9.7.2).

PM_STATUS.indication TXI access protocol(Insert=Not_detected). The PHY indicates the absence of an insert request on the phantom signaling channel (see 9.7.2).

PRND()=value. This is the randomizer function used to control when the Active Detection state (AS=ADET) is entered from the Passive Detection state (AS=PDET). Valid values are 0 and 1. Implementations of PRND() should assure that

- The function returns with a value of 1 at least 25% of the time in order to reduce the time it takes for the Autodetection FSM to detect a connection to a concentrator.
- Two C-Ports using the same randomizer function do not remain synchronized for an extended period of time.

T.1.4.6 Precise specification of actions

The following expressions are used for actions in the FSMs and Autodetection Operation tables. Actions are separated by a semicolon (**;**).

variable = value.	Set the variable to the specified value.
{counter}=({counter}+1).	Increment the specified counter by one.
{counter}=({counter}–1).	Decrement the specified counter by one.
{counter}=value.	Set the specified counter to the specified value.
{flag}=0.	Set the value of the specified flag to zero (false).
{flag}=1.	Set the value of the specified flag to one (true).
{timer}=R.	The specified timer is set to its initial value and started.

; means: “and.”
Values are in hexadecimal notation unless otherwise indicated.

Unless otherwise specified, the following terms and operations are defined:

AS=state. The Autodetection FSM changes to the indicated state.

AS=x. The Autodetection FSM changes to unspecified state (not running).

Connect.PMAC. The C-Port receives this command from the Autodetection FSM to start the process to join the network.
The Autodetection FSM is permitted to act as a management proxy and issue a Connect.PMAC command once the value of FPOTO has been determined.

INSERT. Request the PHY to physically connect the station to the network [5.1.4.2 PM_CONTROL.request(Insert_station)].

PM_CONTROL.request TXI access protocol(PMC_Mode=Port_mode). Request the PHY to change the PMC to support Port mode operation (see T.2.1 and 9.7.3).

PM_CONTROL.request TXI access protocol(PMC_Mode=Station_emulation_mode). Request the PHY to change the PMC to support Station Emulation mode (see T.2.1 and 9.7.3).

Remove_station. Request the PHY to physically disconnect the station from the network [5.1.4.2 PM_CONTROL.request(Remove_station)].

Set_initial_conditions. The C-Port shall set all PMAC flags to zero, set all PMAC counters to zero, and stop all timers. The Monitor FSM and Transmit FSM are not specified. The PS_CONTROL.request(Medium_rate) and PM_CONTROL.request(Medium_rate) shall indicate to the PHY the value of FPMRO.

TXI_DAT_PDU. The C-Port shall transmit a Duplicate Address Test (DAT) MAC frame. The frame shall contain all of the required subvectors. The transmission of the frame shall occur at the earliest opportunity. This action generates the TXI_REQ event.

T.2 MAC interface service specification

The following service primitives specify the required information that is passed between the AMAC and the PMC. This service specification is solely for the purpose of explaining Autodetection Operation tables operation and does not imply any particular implementation. This service specification is in addition to the service specification defined in 5.1.2, 5.1.3, and 9.7.

T.2.1 PM_CONTROL.request

This primitive is used by the AMAC to request certain actions of the PMC.

```
PM_CONTROL.request [    Insert_station (5.9),
                        Remove_station (5.9),
                        Medium_rate (5.2),
                        Repeat_mode (5.4.1),
                        PMC_Mode (9.7.3) ]
```

Medium_rate is specified as one of the following:
- 4 Mbit/s
- 16 Mbit/s

Repeat_mode specified is one of the following:
- Repeat
- Fill

PMC_mode is specified as one of the following:
- Port_mode
- Station_emulation_mode

When generated. The AMAC generates a PM_CONTROL.request for each action request.

Effect of receipt. The PHY performs the appropriate action.

T.3 Recommendations for ring speed detection

In 5.2 of ISO/IEC 8802-5 : 1998, as part of the discussion on implementation of the Medium_rate_error function, the standard cautions that “certain ring conditions, such as circulating BURST4 data patterns, may create an incorrect frequency determination.”

This annex recommends that the mechanism used to determine ring speed be based on the reception of tokens or frames.