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American National Standard (ANSI)*

IEEE Std 802.1j-1996
(Supplement to IEEE Std 802.1D-1990
[ISO/IEC 10038: 1993])

Supplement to Information technology— Telecommunications and information exchange between systems—Local area networks—Media access control (MAC) bridges:

Managed objects for MAC bridges

IEEE Computer Society

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**LAN MAN Standards Committee
of the
IEEE Computer Society**

Approved 17 October 1996

IEEE Standards Board

Approved 12 March 1997

American National Standards Institute

Abstract: Managed object classes and their components that permit remote management of ISO/IEC 10038-conformant MAC bridges by means of suitable management protocols, including the services and protocols defined in ISO/IEC 15802-2: 1995, LAN/MAN Management; and those defined in ISO/IEC 9595: 1991, CMIS; and ISO/IEC 9596-1: 1991, CMIP; are defined. The managed object definitions are documented in the notation defined in ISO/IEC 10165-4: 1992, GDMO.

Keywords: data processing, layer-managed objects, layer management, local area networks, managed objects, metropolitan area networks, network interconnection

The Institute of Electrical and Electronics Engineers, Inc.
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ISBN 1-55937-900-6

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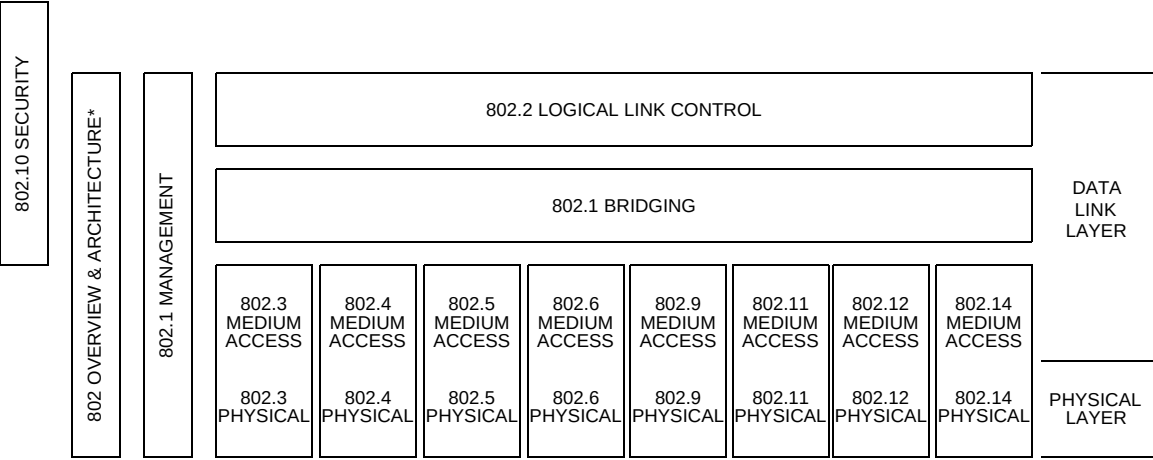
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Introduction

[This introduction is not part of IEEE Std 802.1j-1996, Supplement to Information technology—Telecommunications and information exchange between systems—Local area networks—Media access control (MAC) bridges: Managed objects for MAC bridges.]

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/International Electrotechnical Commission (ISO/IEC) Open Systems Interconnection Basic Reference Model (ISO/IEC 7498-1: 1994). The access standards define several 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 access technologies are as follows:

- IEEE Std 802 *Overview and Architecture.* This standard provides an overview to the family of IEEE 802 Standards. This document forms part of the 802.1 scope of work.
- ANSI/IEEE Std 802.1B and 802.1k [ISO/IEC 15802-2] *LAN/MAN Management.* Defines an Open Systems Interconnection (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] *MAC Bridging.* 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 802.2 [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 802.12 *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 groups have authorized standards projects under development:

- IEEE 802.11 *Wireless LAN Medium Access Control (MAC) Sublayer and Physical Layer Specifications*
- IEEE 802.14 *Standard Protocol for Cable-TV Based Broadband Communication Network*

The reader of this standard is urged to become familiar with the complete family of standards.

Conformance test methodology

An additional standards series, identified by the number 1802, was established in 1990 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. ISO has reserved 18802 to number conformance test standards for 8802 standards.

ANSI/IEEE Std 802.1j-1996

The MAC Bridge standardization activities that resulted in IEEE Std 802.1D-1990 (ISO/IEC 10038: 1993) included the specification of managed objects upon which operations could be performed that would facilitate the management of various aspects of a MAC bridge. At the time of the development of this material, the technology for describing managed objects and for conveying operations in OSI management protocol was under development, so the text made use of the techniques and protocols described in an early draft of IEEE Std 802.1B (LAN/MAN Management, now ISO/IEC 15802-2: 1995). Subsequent developments in OSI Management standards and in IEEE Std 802.1B have resulted in the notational and encoding techniques used in Section 7 of ISO/IEC 10038: 1993 being rendered obsolete; both ISO/IEC 9596-1: 1991 (CMIP) and ISO/IEC 15802-2: 1995 (IEEE Std 802.1B, 1995 Edition) work with management information defined using the notational tools defined in ISO/IEC 10165-4: 1992, Guidelines for the Definition of Managed Objects

(GDMO). Fortunately, Section 6 of ISO/IEC 10038: 1993 contains semantic descriptions of the bridge managed objects that make use of the concepts of managed objects and operations that are now embodied in the OSI management standards; it is therefore a straightforward process to replace the protocol- and notation-dependent text using the GDMO “template” notation, while maintaining the existing management semantics. The purpose of this supplement to IEEE Std 802.1D-1990 (amendment to ISO/IEC 10038: 1993) is therefore to provide appropriate replacement and additional text in order to permit standard-conformant MAC Bridges to be managed using CMIP or ISO/IEC 15802-2: 1995, or other suitable protocols, as the management protocol. The structure chosen for these managed object class definitions is compatible with ISO/IEC 10742: 1994, which defines the general structure of management information for the Data Link layer.

This supplement defines:

- a) Managed object classes for ISO/IEC 10038-conformant MAC Bridges, documented using the notation defined by ISO/IEC 10165-4: 1992, Guidelines for the Definition of Managed Objects.
- b) Changes to the text of ISO/IEC 10038: 1993 that are necessitated by the addition of the managed object class definitions.
- c) Additions to the PICS Proforma for ISO/IEC 10038: 1993 to provide for the managed object class definitions.

These items are defined as a series of changes and additions to the existing text of ISO/IEC 10038: 1993; the text therefore assumes all material, including references, abbreviations, definitions, services, and protocols contained in the base text.

This standard contains state-of-the-art material. The area covered by this standard is undergoing evolution. Revisions are anticipated within the next few years to clarify existing material, to correct possible errors, and to incorporate new related material. Information on the current revision state of this and other IEEE 802 standards may be obtained from

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Contents

SECTION	PAGE
1.1 Scope.....	1
1.2 References.....	1
1.3 Definitions	2
1.4 Abbreviations.....	2
1.5 Conformance.....	2
1.6 Recommendations.....	2
1.6.2 Remote Management	2
3.1.3 Bridge Management.....	2
7. Management Protocol	3
7.1 Mapping Of Operations Onto LMMS Services	3
7.2 Managed Object Containment Structure.....	12
7.3 MAC Bridge DLE Managed Object Class Definition	14
7.3.1 Bridge Address Attribute Definition.....	15
7.3.2 Bridge Name Attribute Definition	15
7.3.3 Bridge Number Of Ports Attribute Definition	15
7.3.4 Bridge Port Addresses Attribute Definition.....	15
7.3.5 Uptime Attribute Definition.....	16
7.3.6 Bridge Identifier Attribute Definition.....	16
7.3.7 Time Since Topology Change Attribute Definition	16
7.3.8 Topology Change Count Attribute Definition	16
7.3.9 Topology Change Attribute Definition.....	17
7.3.10 Designated Root Attribute Definition.....	17
7.3.11 Root Path Cost Attribute Definition	17
7.3.12 Root Port Attribute Definition	17
7.3.13 Max Age Attribute Definition.....	18
7.3.14 Hello Time Attribute Definition	18
7.3.15 Forward Delay Attribute Definition	18
7.3.16 Bridge Max Age Attribute Definition.....	18
7.3.17 Bridge Hello Time Attribute Definition	19
7.3.18 Bridge Forward Delay Attribute Definition.....	19
7.3.19 Hold Time Attribute Definition	19
7.3.20 Bridge Priority Attribute Definition	19
7.3.21 Read Or Discover Bridge Attribute Group Definition.....	20
7.3.22 Read Bridge Protocol Parameters Attribute Group Definition.....	20
7.3.23 Reset Bridge Action Definition	20
7.4 Port Managed Object Class Definition	21
7.4.1 Port Number Attribute Definition.....	22
7.4.2 Port Name Attribute Definition	22
7.4.3 Port Type Attribute Definition.....	22
7.4.4 Frames Received Attribute Definition.....	22
7.4.5 Discard Inbound Attribute Definition.....	23
7.4.6 Forward Outbound Attribute Definition	23
7.4.7 Discard Lack Of Buffers Attribute Definition.....	23
7.4.8 Discard Transit Delay Exceeded Attribute Definition.....	23
7.4.9 Discard On Error Attribute Definition.....	24

SECTION	PAGE
7.4.10 Discard On Error Detail Attribute Definition	24
7.4.11 Outbound User Priority Attribute Definition	24
7.4.12 Outbound Access Priority Attribute Definition	24
7.4.13 Port Uptime Attribute Definition	25
7.4.14 State Attribute Definition.....	25
7.4.15 Port Identifier Attribute Definition	25
7.4.16 Port Priority Attribute Definition.....	25
7.4.17 Path Cost Attribute Definition	26
7.4.18 Port Designated Root Attribute Definition	26
7.4.19 Designated Cost Attribute Definition	26
7.4.20 Designated Bridge Attribute Definition.....	26
7.4.21 Designated Port Attribute Definition	27
7.4.22 Topology ChangeAck Attribute Definition	27
7.4.23 Read Port Attribute Group Definition	27
7.4.24 Read Forwarding Port Counters Attribute Group Definition	27
7.4.25 Read Transmission Priority Attribute Group Definition	28
7.4.26 Read Port Parameters Attribute Group Definition.....	28
7.4.27 Force Port State Action Definition	28
7.5 Selective Translation Table Entry Managed Object Class Definition.....	29
7.5.1 Type Value Attribute Definition.....	29
7.6 Permanent Database Managed Object Class Definition	30
7.6.1 Database Name Attribute Definition	30
7.6.2 Database Size Attribute Definition	31
7.6.3 Number Of Entries Attribute Definition	31
7.6.4 Read Database Attribute Group Definition	31
7.7 Filtering Database Managed Object Class Definition	32
7.7.1 Number Of Dynamic Entries Attribute Definition	32
7.7.2 Ageing Time Attribute Definition	33
7.8 Database Entry Managed Object Class Definition	33
7.8.1 Address Attribute Definition	34
7.8.2 Port Number Or Map Attribute Definition	34
7.8.3 Entry Type Attribute Definition	34
7.8.4 Entry Index Attribute Definition.....	35
7.8.5 Read Database Entry Attribute Group Definition.....	35
7.9 ASN.1 Definitions	36
ANNEX	
Annex A (normative) PICS Proforma	38
Annex E (normative) Allocation Of Object Identifier Values.....	39

Supplement to Information technology— Telecommunications and information exchange between systems—Local area networks— Media access control (MAC) bridges: Managed objects for MAC bridges

Supplement to IEEE Std 802.1D-1990 [ISO/IEC 10038:1993 (ANSI/IEEE Std 802.1D, 1993 Edition)]

The contents of this supplement will be incorporated into IEEE Std 802.1D in a future edition. The sections of this supplement are ordered to parallel the order of sections in the base standard. This supplement is intended to be used in conjunction with IEEE Std 802.1D-1990. Editing instructions necessary to incorporate this supplement into IEEE Std 802.1D are provided in **bold italics**. The style of this supplement also matches that of the base document. When the contents of this supplement are incorporated into IEEE Std 802.1D in a future edition, the style will be updated to match current practices.

1.1 Scope.

Replace the text of bullet (8) on page 17 as follows:

- (8) Specifies, using the notation defined in ISO/IEC 10165-4, how the management operations are made available to a remote manager using the protocol provided by ISO/IEC 15802-2 or ISO/IEC 9596-1, or other suitable management protocol.

1.2 References.

Delete the reference to IEEE Std 802.1B-1992 on page 18, and replace by:

IEEE Std 802.1F-1993, Common Definitions and Procedures for IEEE 802 Management Information.
IEEE Std 802.1H-1995, Media Access Control (MAC) Bridging of Ethernet V2.0 in 802 Local Area Networks.

Update the references to CMIS/CMIP on page 19 as follows:

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

Add the following references on page 19:

ISO/IEC 9646-7:1995, Information technology—Open Systems Interconnection—Conformance testing methodology and framework: Implementation Conformance Statements.

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

ISO/IEC 10742:1994, Information technology—Telecommunications and information exchange between systems—Elements of management information related to OSI Data Link Layer standards.

ISO/IEC 15802-2:1995 (IEEE Std 802.1B, 1995 Edition), Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Common specifications—Part 2: LAN/MAN Management.

1.3 Definitions.

Add the following text on page 19:

This Standard uses the following terms defined in ISO/IEC 9646-7:

- (1) protocol implementation conformance statement (PICS)
- (2) protocol implementation conformance statement (PICS) proforma

1.4 Abbreviations.

Add the following abbreviations on page 19:

GDMO. Guidelines for the Definition of Managed Objects

LMMP. LAN/MAN Management Protocol

LMMS. LAN/MAN Management Service

PICS. Protocol Implementation Conformance Statement

1.5 Conformance.

Replace item (20) on page 20 as follows:

- (20) May support remote management by means of ISO/IEC 15802-2 or ISO/IEC 9596-1, or by means of some other specified management protocol. Bridges claiming to support remote management
 - (a) May conform to ISO/IEC 15802-2 or ISO/IEC 9596-1; and
 - (b) Shall support instantiation of, and remote management of, the managed object classes defined in Section 7.

1.6 Recommendations.

Add the following as 1.6.2 on page 20:

1.6.2 Remote Management. Support of the managed object classes defined in Section 7, and support of remote management of instances of those classes by means of the management protocols defined in ISO/IEC 15802-2 or ISO/IEC 9596-1, or by other suitable management protocol, are highly recommended.

3.1.3 Bridge Management.

Add the following sentence on page 30:

The managed object class definitions that define how management information related to bridge management may be communicated by means of the management protocols defined in ISO/IEC 15802-2 or ISO/IEC 9596-1 are documented in Section 7.

Replace the current Section 7, pages 115 through 127, as follows:

7. Management Protocol

This section specifies how the management facilities provided by MAC Bridges and specified in Section 6 are realized through the use of:

- (1) The LAN/MAN Management services (LMMS), provided by means of the LAN/MAN Management protocol (LMMP) and the Convergence Protocol Entity (CPE), as specified in ISO/IEC 15802-2; or
- (2) The Common Management Information Service (CMIS), provided by means of the Common Management Information Protocol (CMIP) and Presentation P-DATA services, as specified in ISO/IEC 9595 and ISO/IEC 9596-1; or
- (3) Other management protocol(s) capable of conveying equivalent information.

NOTE: With the exception of the support of association control services, the definitions of the service primitives for LMMS and CMIS are identical, and the PDU formats and procedures specified for LMMP and CMIP are identical. The difference between these two options therefore lies in the complexity of the protocol stack that is required in order to support LMMP (the CPE plus LLC, MAC and PHY) or CMIP (presentation service carried over a “full OSI stack”), not in the definition of the services or the information that they convey. For simplicity, the remainder of this section will therefore refer only to LMMS and LMMP.

It specifies:

- (1) The mapping between the management operations on objects as defined in Section 6 and the LMMS services that the LMMP provides;
- (2) The managed object classes (and their components) that are instantiated in order to provide the managed objects defined in Section 6. These managed object class definitions are documented using the template notation specified in ISO/IEC 10165-4; other aspects of the documentation are in accordance with the further guidance provided by IEEE Std. 802.1F.
- (3) The name-bindings that are necessary in order to specify how the managed object classes may be named and what the permitted containment relationships between them are. A name-binding is also provided in order to correctly position the MAC Bridge object containment within the containment hierarchy defined for management of the Data Link layer in ISO/IEC 10742.

7.1 Mapping Of Operations Onto LMMS Services. The operations on objects defined in Section 6 are carried out by means of the following LMMS services:

- (1) M-GET
- (2) M-SET
- (3) M-ACTION
- (4) M-CREATE
- (5) M-DELETE
- (6) M-CANCEL-GET

Tables 7-1 through 7-4 show how the management operations defined in Section 6 correspond to LMMS service primitives (defined in ISO/IEC 15802-2) and managed object classes (defined in 7.3 through 7.9). Table 7-5 shows the operations available for manipulation of the Selective Translation Table, as defined in IEEE Std 802.1H.

Table 7-1
Mapping of Bridge Management Entity Operations to LMMS Services

Management Operation	LMMS Service Element(s)	Managed Object Class
Discover Bridge	M-GET	MAC Bridge DLE
Read Bridge	M-GET	MAC Bridge DLE
Set Bridge Name	M-SET	MAC Bridge DLE
Reset Bridge	M-ACTION	MAC Bridge DLE
Read Port	M-GET	Port
Set Port Name	M-SET	Port

Table 7-2
Mapping of Forwarding Process Operations to LMMS Services

Management Operation	LMMS Service Element(s)	Managed Object Class
Read Forwarding Port Counters	M-GET	Port
Read Transmission Priority	M-GET	Port
Set Transmission Priority	M-SET	Port

Table 7-3
Mapping of Filtering Database Operations to LMMS Services

Management Operation	LMMS Service Element(s)	Managed Object Class
Read Filtering Database	M-GET	Filtering Database
Set Filtering Database Ageing Time	M-SET	Filtering Database
Read Permanent Database	M-GET	Permanent Database
Create Filtering Entry	M-CREATE	Database Entry
Delete Filtering Entry	M-DELETE	Database Entry
Read Filtering Entry	M-GET	Database Entry
Read Filtering Entry Range	M-GET, M-CANCEL-GET	Database Entry

Table 7-4
Mapping of Bridge Protocol Entity Operations to LMMS Services

Management Operation	LMMS Service Element(s)	Managed Object Class
Read Bridge Protocol Parameters	M-GET	MAC Bridge DLE
Set Bridge Protocol Parameters	M-SET	MAC Bridge DLE
Read Port Parameters	M-GET	Port
Force Port State	M-ACTION	Port
Set Port Parameters	M-SET	Port

Table 7-5
Mapping of Selective Translation Table Operations to LMMS Services

Management Operation	LMMS Service Element(s)	Managed Object Class
Read Selective Translation Table Entry Range	M-GET, M-CANCEL-GET	Selective Translation Table Entry

Tables 7-6 through 7-27 specify the detailed mapping of the Management Operation parameters to the parameters of the LMMS service primitives.

The set of Management Operations identified in Tables 7-1 through 7-5, along with the mappings in Tables 7-6 through 7-27, define a Functional Unit Package that may be negotiated between manager and agent stations, as described in Annex A.3.2 of ISO/IEC 10040.

This standard assigns the following object identifier value:

{iso(1) member-body(2) us(840) ieee802dot1D(10009) functionalUnitPackage(1) bridgeManagementFunctionalUnit(0)}

as a value of the functionalUnitPackageId field of the ASN.1 type FunctionalUnitPackage defined in ISO/IEC 10040 to use for negotiating the use of this set of Management Operations.

The Bridge Functional Unit Package consists of two Functional Units, which are identified in the managerRoleFunctionalUnit and agentRoleFunctionalUnit fields of the ASN.1 type FunctionalUnitPackage:

- Bit 0: Identifies support (value 1) or non-support (value 0) of the set of Management Operations defined in Tables 7-1 through 7-4, and their mappings onto LMMS as described in Tables 7-6 through 7-26;
- Bit 1: Identifies support (value 1) or non-support (value 0) of the Management Operation defined in Table 7-5, and its mapping onto LMMS as described in Table 7-27.

NOTE: When using the service mappings described in Tables 7-6 through 7-27 in conjunction with the LAN/MAN Management Protocol defined in IEEE Std. 802.1B, the Management Operations can be performed upon single Bridges, by addressing the bridge by use of its individual MAC address, or upon sets of bridges by use of group MAC addresses. In particular, the All LANs Bridge Management Group Address identified in Table 3-6 can be used to address Management Operations to all bridges in a bridged LAN. The use of group addressing is not available when using ISO/IEC 9596-1 (CMIP) over a full OSI stack.

Tables 7-6 through 7-27 show only the LMMS service parameters for which this standard requires values to be assigned in specific ways. Any LMMS parameters not specifically identified are present, absent, optional, or conditional as described in the definitions of the LMMS service primitives themselves.

Table 7-6
Mapping of Discover Bridge Operation Parameters (see 6.4.1.1)

M-GET Parameter Name	Req/Ind (Operation Inputs)	Rsp/Conf (Operation Outputs)
Base object class	Data Link Subsystem (see ISO/IEC 10742)	—
Base object instance	Name of Data Link Subsystem managed object	—
Scope	1st level subordinates	—
Filter	Managed object class = MAC Bridge DLE AND Bridge Address attribute value is within inclusion range AND Bridge Address attribute value is not within exclusion list	—
Attribute identifier list	Read or Discover Bridge attribute group name	—
Managed object class		MAC Bridge DLE
Managed object instance		Name of MAC Bridge DLE managed object
Attribute list	—	Names/values of all attributes that are members of the Read Or Discover Bridge attribute group (7.3.21)

Table 7-7
Mapping of Read Bridge Operation Parameters (see 6.4.1.2)

M-GET Parameter Name	Req/Ind (Operation Inputs)	Rsp/Conf (Operation Outputs)
Base object class	MAC Bridge DLE	—
Base object instance	Name of MAC Bridge DLE managed object	—
Scope	Base object alone	—
Filter	Not required	—
Attribute identifier list	Read or Discover Bridge attribute group name	—
Managed object class	—	MAC Bridge DLE
Managed object instance	—	Name of MAC Bridge DLE managed object
Attribute list	—	Names/values of all attributes that are members of the Read Or Discover Bridge attribute group (7.3.21)

Table 7-8
Mapping of Set Bridge Name Operation Parameters (see 6.4.1.3)

M-SET Parameter Name	Req/Ind (Operation Inputs)
Base object class	MAC Bridge DLE
Base object instance	Name of MAC Bridge DLE managed object
Scope	Base object alone
Filter	Not used
Modification list	Bridge Name attribute name and desired replacement value

Table 7-9
Mapping of Reset Bridge Operation Parameters (see 6.4.1.4)

M-ACTION Parameter Name	Req/Ind (Operation Inputs)
Base object class	MAC Bridge DLE
Base object instance	Name of MAC Bridge DLE managed object
Scope	Base object alone
Filter	Not required
Action Type	Reset Bridge
Action Information	Not used
Action Reply	Not used