

## Overview

---

### SNMP Configuration

For information on configuring the VCO/4K for SNMP operation, including setting internet addresses, refer to the *Cisco VCO/4K Software Installation Guide*.

### SNMP Version Support

SNMP Version 1 (SNMPv1) is the initial implementation of the SNMP protocol. It is described in Request For Comments (RFC) 1157 and functions within the specifications of the Structure of Management Information (SMI).



Note

---

For detailed listings of RFCs, refer to the Internet Engineering Task Force web site at <http://www.ietf.org>.

---

SNMP Version 2 (SNMPv2) is an evolution of the initial version, and offers enhancements, such as additional protocol operations.

The VCO/4K SNMP agent supports only the SNMP Version 1 protocol. Support for SNMPv2 is not provided for the current release.

### VCO/4K MIB Structure

The Cisco Systems Management Information Base (MIB) for the VCO/4K is organized into thirteen functional groups. Within each group are one or more tables. Most of the tables in the MIB, such as the card and port tables, determine the configuration of the switch and are called *control tables*.

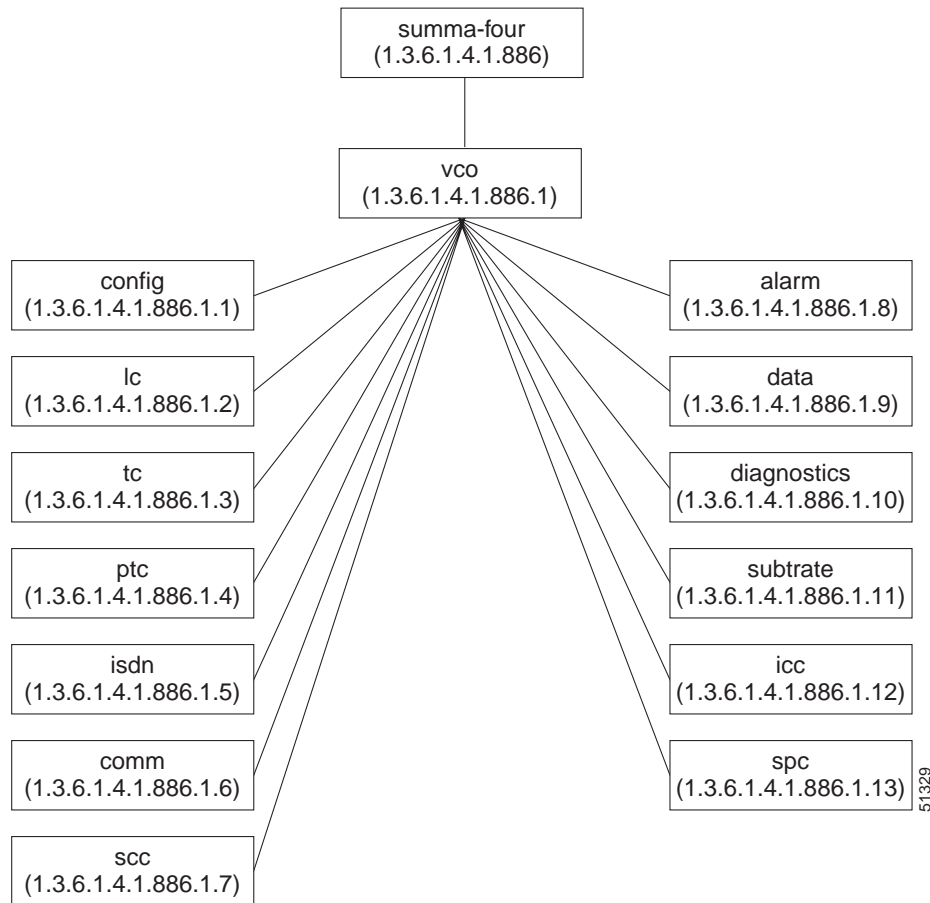
In the MIB, rows are added to tables when you configure a switch. The objects in a table row represent parameters for a specific resource in the system. For example, the lcPhyAdd object in the line card table (lcTable) represents the physical address of each line card in the table.

The resGroupTable, impulseRuleTable, and the outpulseRuleTable contain parameters that describe data, called *data tables*. These tables form the generic *data group*.

You can refer to objects in another table through reference attributes. For example, impulseRuleIndex in the tcTable refers to an entry in the impulseRuleTable. Similarly, the lcPortTable has an index to entries in the lcTable (lcCardIndex), the resGroupTable (lcResGroupIndex) and the impulseRuleTable (lcImpulseRuleIndex).

The tree structure of the MIB is shown in Figure 1-1.

**Figure 1-1** Tree Structure of the MIB



- summa-four — Object Identifier = enterprises 886
- vco — Object Identifier = summa-four 1
- config — Object Identifier = vco 1
- lc — Object Identifier = vco 2
- tc — Object Identifier = vco 3
- ptc — Object Identifier = vco 4
- isdn — Object Identifier = vco 5
- comm — Object Identifier = vco 6
- scc — Object Identifier = vco 7
- alarm — Object Identifier = vco 8
- data — Object Identifier = vco 9

- diagnostics — Object Identifier = vco 10
- subrate — Object Identifier = vco 11
- icc — Object Identifier = vco 12
- spc — Object Identifier = vco 13

## Considerations for Using the MIB

A problem arises when more than one SNMP management station tries to set configuration information at the same time. This might occur during the addition of a new conceptual row in the same control table, or when more than one management station tries to modify the attributes of the same object. To guard against simultaneous access, each row contains a status object that permits arbitration by the management stations. If a management station attempts to create an already existing object, the system returns an error. Only the first management station succeeds in creating the row.

## Numbering

The MIB imports the following objects from standard RFCs:

<b>Objects</b>	<b>Definitions in RFC file</b>
enterprises	FROM RFC1155-SMI
Counter	FROM RFC1155-SMI
Gauge	FROM RFC1155-SMI
TimeTicks	FROM RFC1155-SMI
IpAddress	FROM RFC1155-SMI
OBJECT-TYPE	FROM RFC-1212
DisplayString	FROM RFC1213-MIB
TRAP-TYPE	FROM RFC-1215

## Definitions

The following sections list the definitions of the most commonly used table entries.

## OwnerString

Associated with each read-write table entry is an object where the value indicates the owner of that row. This object, which enables management stations to cooperate in determining the ownership of a row, is read-only and contains information about the management station that last modified or created this row.

Use the owner string data type to model an administratively assigned name of the resource owner. This information is taken from the ASCII character set. It is suggested that this name contain one or more of the following:

- IP address
- Management station name
- Network manager's name, location, or phone number

OwnerString does not act as a password or an access-control mechanism. Access to MIB objects is enforced in SNMP by way of the access clause. Therefore, if an object has read-write access, it is available for reading and writing by all management stations. In general, a table entry should be altered or deleted only by its owner and treated as read-only by other management stations.

## EntryStatus

The EntryStatus object contains the status of a table object and provides a locking and unlocking mechanism to prevent concurrent access to the elements in a particular row. This object is used in the creation, modification, and deletion of rows.

EntryStatus = INTEGER

where:

Entry Status Value	Meaning
1	valid
2	createRequest
3	underModification
4	invalid

When creating a new row, the management station sets the object to createRequest (2). Immediately after completing the create operation, the agent sets the object to underModification (3). Rows remain in underModification (3) until the management station finishes configuring the object and sets the object to valid (1), or cancels by setting the object to invalid (4). The attributes of a table entry are changed only when the object is set to underModification (3). If a management station attempts to create a new row and the row already exists, an error is returned.

When entries are set to invalid (4), the agent immediately removes the entry from the table.

The following subsections show the variations of the EntryStatus object.

## PortEntryStatus

This type defines valid values for some EntryStatus objects. Some port tables may use this type in the SYNTAX clause of their EntryStatus objects. The possible values and their meanings are:

Value	Meaning
1	valid
3	underModification

Ports are created or deleted automatically when the associated card is created or deleted.

## NonTabEntryStatus

This type defines valid values for some EntryStatus objects. Some nontabular groups of objects may use this type in the SYNTAX clause of their EntryStatus objects. The possible values and their meanings are:

Value	Meaning
1	valid
3	underModification

## FixedTabEntryStatus

This type defines valid values for some EntryStatus objects. Some fixed size tables may use this type in the SYNTAX clause of their EntryStatus objects. The possible values and their meanings are:

Value	Meaning
1	valid
3	underModification

## Last Modified

This object is associated with each table in the MIB. Last modified tracks the time, in hundredths of a second, since the last modification on that table.

You cannot create or delete nontabular groups and fixed-table entries, but you still have advisory locking capability.

## Card Index

When using the MIB to perform card maintenance functions, you must know the location of the card and then translate that information into an index value. Card locations are designated by Rack, Level, and Slot. The Rack and Level, however, were used only in systems prior to the VCO/4K, and are included as values in the VCO/4K system software only to maintain compatibility with legacy systems. For all VCO/4K systems, the Rack and Level values are always set to 1 (one). The Slot refers to the physical location of the card in the system. Slot values range from 1 to 21. Table 1-1 shows how rack, level, and slot values translate to index values. Only the first entry in the table applies to VCO/4K systems.

**Table 1-1 Rack, Level, and Slot to Index Mapping**

RLS	Index Value
1, 1, 1-21	001 to 021
1, 2, 1-21	022 to 042
1, 3, 1-21	043 to 063
2, 0, 1-21	064 to 084
2, 1, 1-21	085 to 105
2, 2, 1-21	106 to 126
2, 3, 1-21	127 to 147



### Note

Certain Rack, Level, and Slot positions are not available for certain cards. Refer to the specific technical description in the *Cisco VCO/4K Card Technical Descriptions* for further information.

To confirm the card population or slot placement rules that might restrict where you can configure cards, refer to the *Cisco VCO/4K Hardware Planning Guide* or contact your Cisco Systems sales representative for more detailed information.

## Formula for Determining Index Value

The formula for determining the index in Table 1-1 is:

$$\text{index} = (\text{rack} - 1) * 84 + (\text{level} - 1) * 21 + \text{slot}$$

## Port States

The following subsections provide values for VCO/4K port states, including ISDN port states. Further information and descriptions of these states are provided in the *Cisco VCO/4K Extended Programming Reference* and *Cisco VCO/4K Standard Programming Reference*. These states are also viewable at the VCO/4K Master Console from the Diagnostic Menu/Port Display screen.

## Call Processing Major Port States

Table 1-2 lists the major port states. These states are used in the following objects:

- lcPortMajorState
- tcPortMajorState
- progPortMajorState
- isdnPortMajorState
- dtgPortMajorState
- rcPortMajorState

**Table 1-2 Major Port States**

Value	State	Description
1	CP_IDLE	No activity on the port
2	CP_WAIT	Waiting for an answer within an outpulse rule
3	CP_WWINK	Waiting for a wink within an outpulse rule
4	CP_DIAL	Dialing state uses substate — An Fdig was received
5	CP_STAB	Stable state
6	CP_WANS	Call routed waiting for answer
7	CP_DCON	Call disconnect state
8	CP_GARD	Port in GUARD timing state
9	CP_FEXC	Call was passed to Final Exception Handling
10	CP_WTIM	Waiting for unspecified period of time
11	CP_MBUSY	Port is in maintenance busy state
12	CP_MFWT	Port is collecting MF digits
13	CP_SETUP	Port is off-hook and waiting
14	CP_PRIMARY	Waiting for primary ringback completion
15	CP_RDR	Waiting for reorder completion
16	CP_MF	Waiting for MF receiver to be available
17	CP_ATT	Resource is attached to a TNK
18	CP_DIAG	Port is in DIAGNOSTIC state
19	CP_DISC	Port is in PSC timing state after physical release
20	CP_HOST	Port is under direct host control for inpulsing — is awaiting host response
21	CP_FDIG	DTMF port is waiting for first digit
22	CP_DIG	DTMF or MF port is collecting digits
23	CP_INPULSE	Port is in inpulse rule processing
24	CP_DTMF	Port is collecting DTMF digits
25	CP_TALK	Port is speaking announcement
26	CP_TONE	OPC is outpulsing

**Table 1-2 Major Port States (continued)**

Value	State	Description
27	CP_CONF	Port is active in a conference
28	CP_MON	Port is active in a monitor
29	CP_OUTPULSE	Port is processing outpulse rule
30	CP_WTTONE	Port is waiting for a tone
31	CP_SPEECH	Port is collecting spoken digit information
32	CP_SELFTEST	Port is performing its diagnostic self test
33	CP_WTFSUP	Port is waiting for final answer supervision
34	CP_ANALYZE	CPA port is analyzing
35	CP_RECORD	IIRC port is recording
36	CP_CPAMON	CPA port monitoring for end of call tone
37	CP_DONECOLLECT	Receiver port is finished collecting
38	CP_DELAY	DTMF Collection is delayed for an event
39	CP_WAITACK	DTMF Collection is waiting for setup acknowledgment

## Call Processing Supplemental Port States

Table 1-3 lists the supplemental port states. These states are used in the following objects:

- IcPortSuppState
- tcPortSuppState
- progPortSuppState
- isdnPortSuppState
- dtgPortSuppState
- rcPortSuppState

**Table 1-3 Supplemental Port States**

Value	State	Description
0	NONE	No supplementary state
1	RDR_FBUSY	Sending fast busy signal
2	RDR_QUIET	Sending quiet tone
3	RDR_DONE	Sending quiet — psc report sent
4	WT_DTMF	Waiting for DTMF receiver
5	DIALING	Waiting for DTMF digits
6	WT_DIAL	Waiting for receive, then will attach
7	WT_SPC	Attach SPC
8	WT_ANNC	Waiting for announcement channel
9	WT_BEEP	TNK is sending BEEP tone down
10	SPC_ATT	SPC is currently attached



*Table 1-3 Supplemental Port States (continued)*

Value	State	Description
11	WT_TALK	Waiting for announcement to complete
12	WT_PSC	PSC timing pending
13	WT_TIM	Waiting on timer — CP_INPULSE major
14	WT_MF	Waiting for MF receiver — CP_INPULSE
15	GD_NORMAL	Normal guard processing
16	GD_WTRLS	Port put into service from card maintenance, wait release
17	GD_WTRLSH	Port put into service by host command, wait release
18	DIAG_IDLE	Maintenance busy, reason unknown
19	DIAG_CMAINT	Maintenance busy from card maintenance
20	DIAG_PATH	Maintenance busy from diagnostic set path
21	DIAG_OEND	Maintenance busy from far end
22	DIAG_AUTO	Maintenance busy auto error condition
23	DIAG_INTRN	Maintenance busy internally on card
24	DIAG_TEST	Maintenance busy for self tests
25	CF_1WAY	One-way voice path
26	CF_2WAY	Two-way voice path
27	CF_SET	Port has been sent A3 command
28	CF_ACK	Port has responded with A5
29	CF_RSRV	Port has been reserved
30	DLY_TIME	Wait time, then enable SRC
31	DLY_TONE	Play tone, then enable SRC
32	DLY_WINK	Wait for a wink, then enable SRC
33	DLY_ANS	Wait for answer, then enable SRC
34	DLY_ANN	Play voice announcement, then enable SRC
35	D_UNK	Unknown dialing state
36	DIAL_DIG	Outpulsing digits substate
37	WAIT_SUP	Waiting for supervision
38	WAIT_TM	Waiting for specified time

## ISDN Port States

Table 1-4 lists ISDN port states.

*Table 1-4 ISDN Port States*

Value	State	Description
0	PT_ACTIVE	Active
1	PT_OOS_NE	Near end out of service

*Table 1-4 ISDN Port States (continued)*

Value	State	Description
2	PT_OOS_FE	Far end out of service
3	PT_MAINT_NE	Near end maintenance
4	PT_MAINT_FE	Far end maintenance
5	PT_DCHAN	Specified port is the D-channel
6	PT_OOS_FE_MAINT_NE	Far end out of service and near end in maintenance
253	PT_NON_CNTRLD	Port is not ISDN controlled
254	PT_OOS_STATE	Card containing services is out of service
255	PT_NOT_INDB	Port is not associated with any card

## ISDN Supplemental Port States

Table 1-5 lists ISDN supplemental port states.

*Table 1-5 ISDN Supplemental Port States*

Value	State	Description
0	ISDN_IDLE	Channel is free
1	O_INITED	Outgoing call initiated
2	O_OVRLP	Outgoing overlap sending established
3	O_PRCEED	Outgoing call proceeding
4	O_ACTIVE	Call active/stable
5	O_DELIVRD	Call delivered
11	I_CPRSNT	Incoming call present (setup received)
12	I_OVRLP	Incoming overlap sending established
13	I_PRCEED	Incoming call proceeding
14	I_CONNECT	Incoming call connected
15	I_DELIVRD	Incoming call delivered
16	I_ACTIVE	Incoming call active/stable
20	DISC_IND	Call disconnect indication
21	DISC_REQ	Call disconnect request
22	DISC_RLS	Call disconnect release
128	ISDN_WAIT	Waiting at template for message
253	PORT_NON_CNTRLD	Port is not ISDN controlled
254	PORT_OOS	Card containing services is out of service
255	PORT_NOT_INDB	Port is not associated with any card

## Upgrade State

This type defines valid values for some UpgradeState objects. Some UpgradeState objects may use this type in their SYNTAX clause. Table 1-6 describes the possible values and their meanings.

*Table 1-6 Upgrade State*

Value	State	Description
1	swUpgradeRequired	Software upgrade is required
2	fwUpgradeRequired	Firmware upgrade is required
3	swFwUpgradeRequired	Both software and firmware upgrade are required
4	hwUpgradeRequired	Hardware upgrade is required
5	swHwUpgradeRequired	Both software and hardware upgrade are required
6	fwHwUpgradeRequired	Both firmware and hardware upgrade are required
7	swFwHwUpgradeRequired	Software, firmware, and hardware upgrade are required
8	noUpgradeRequired	No upgrade is required
9	unknownUpgradeState	The upgrade state cannot be determined

## PriAccessMode

INTEGER

*Table 1-7 PriAccessMode*

PriAccessMode Number	Value	Meaning
1	usrmd	user mode
2	symmd	user sym mode
3	netmd	network mode
4	usrnfamd	user nfas mode
5	symnfamd	user sym nfas mode
6	netfamd	network nfas mode
7	nfamd	nfas mode
8	userA	side of Qsig
9	userB	side of Qsig

## PriSwitchType

INTEGER

*Table 1-8 PriSwitchType*

PriSwitchType Number	Value	Meaning
1	ATT5MD	ATT5ESS
2	NTMD	NTICDMS100
3	ATT4MD	ATT4ESS
4	DPNSSAX	PBXA, Call Collision X
5	DPNSSAY	PBXA, Call Collision Y
6	DPNSSBX	PBXB, Call Collision X
7	DPNSSBY	PBXB, Call Collision Y
8	DASS2ET	DASS2 configured as exchange termination
9	DASS2NT	DASS2 configured as network termination
10	DSS1	Q.931 Digital Subscriber Sig. System #
11	NET5_AUS	NET5 Austria
12	NET5_BEL	Belgium
13	NET5_DEN	Denmark
14	NET5_FIN	Finland
15	NET5_FRA	France
16	NET5_GER	Germany
17	NET5_GRC	Greece
18	NET5_ICE	Iceland
19	NET5_IRE	Ireland
20	NET5_NED	Netherlands
21	NET5_NOR	Norway
22	NET5_POR	Portugal
23	NET5_SPA	Spain
24	NET5_SWE	Sweden
25	NET5_SWI	Switzerland
26	NET5_UK	United Kingdom
27	NET5_LUX	Luxembourg
28	NET5_ITA	Italy
29	NTT	NTT Japanese ISDN
30	NI2	National ISDN-2
31	TS014	TS014

Table 1-8 PriSwitchType (continued)

PriSwitchType Number	Value	Meaning
32	QSIG	QSIG
33	NTT_CS	NTT Continuous SABME

## LawType

INTEGER

Table 1-9 Law Type

LawType Value	Meaning	
1	MU	mu-law
2	A	a-law
3	SYS	system (law)

## RuleIndex

RuleIndex represents an integer value corresponding to the relevant inpulse or outpulse rule to address. Valid values for this integer range from 0 to 255, with 0 representing the default inpulse or outpulse rule. (For more information, refer to the *Cisco VCO/4K Extended Programming Reference* or *Cisco VCO/4K Standard Programming Reference*.)

Variations to RuleIndex include InpulseRuleIndex and OutpulseRuleIndex.

## ResGroupIndex

This type defines valid values for some ResGroupIndex objects. Some ResGroupIndex objects may use this type in their SYNTAX clause. The possible values range from 0 to 224. Values 1 to 224 identify a resource group in the resource group table. A value of 0 indicates that there is no associated resource group.

The following subsections show the variations of the ResGroupIndex object.

### MessageTempIndex

This type identifies a message template in the ISDN message template table. Valid values range from 1 to 96.

### TempInstructionIndex

This type identifies an instruction within a message template in the ISDN message template table. Valid values range from 1 to 15.

## SupTempIndex

This type identifies an ISDN supervision template number. Valid values range from 1 to 24.

## GroupPortCnt

This type indicates the current number of circuits in a resource group. Valid values range from 0 to 1920.

## CardAlarmBitMap

This type defines valid values for some CardAlarmBitMap objects. Some CardAlarmBitMap objects may use this type in their SYNTAX clause. Possible values range from 0 to 524,287 (7fff hexadecimal). This type is a bitmap consisting of 19 bits that shows which alarms are active on a card. The meanings of the various bits are shown in Table 1-10 (bit 0 is the least significant bit).

*Table 1-10 CardAlarmBitMap*

Bit	Meaning
0	Card failure - minor
1	Port failure - minor
2	T1/PRI carrier failure - major
3	T1/PRI remote carrier failure - minor
4	T1/PRI card failure - major
5	T1 Signaling Bit - minor
6	PRI Bipolar Violations max limit reached
7	T1/PRI Out Of Frame max limit reached - minor
8	T1 Slip Maintenance limit reached - minor
9	T1 Blue Alarm - minor
10	T1/PRI OOF condition - minor
11	PRI D-Channel failure - major
12	All ports deactivated
13	Unused
14	Unused
15	CRC4 error - minor
16	Wrong hardware installed
17	Interface hardware failed/not installed
18	Module hardware failed/not installed

## CardType

This type is an integer value representing a specific VCO/4K network, service, or control card. Table 1-11 provides a list of card types and corresponding integer values.

*Table 1-11 CardType Values*

Value	Card Type
1	Subscriber line interface card
2	2W trunk card
3	E&M trunk card
4	T1 trunk card
5	Tone generator card
6	Voice announcement card
7	Bus controller
8	DTMF receiver card
10	MF receiver card
11	DID
12	Universal trunk card
13	Network bus controller
14	Bus repeater card
15	Conference card
16	Aspect Instrument Card
17	Speech Recognition Card
18	Call Progress Analyzer
19	PRI Card
20	CCITT E1 Trunk type
21	MFCR2 transceiver type
22	DRC
23	DRC
24	Integrated Play/Record
25	Primary Rate Interface/NFAS
26	DPNSS PRI
27	DASS2
28	DASS2
29	DSS1 PRI
30	Four Span T1
31	Four Span E1
32	8-port IPRC
33	128-port IPRC
34	MVDC running T1 protocol
35	MVDC running PRI protocol
36	NET5 ISDN (Europe)
39	Drop & Insert

*Table 1-11 CardType Values (continued)*

Value	Card Type
40	Subrate Switch Card
41	NTT PRI (JISDN)
43	8-line Test Card
70	ICC-T1
71	ICC-E1
80	SPC-DTMF
81	SPC-CPA
82	SPC-MFRC
83	SPC-MFCR2
84	SPC-TONE
85	SPC-OUTP
86	SPC-CNF
96	ICC ISDN NI-2
97	ICC ISDN - AT&T 5ESS
98	ICC ISDN - AT&T 4ESS
99	ICC ISDN - Nortel DMS100
100	ICC ISDN - Japanese ISDN
112	ICC ISDN - NET5
113	ICC ISDN - QSIG
114	ICC ISDN - TS014

## MIB Tables and Common Object Name Prefixes

Table 1-12 shows the tables in the MIB and the common object name prefixes for the objects in the table.



*Table 1-12 MIB Table Names and Common Object Name Prefixes*

Group Names	Table Names	Common Object Name Prefixes
System Configuration Group Short Name: config	Password Table	passwd
	Master Timing Link	mas
	Clock/Calendar	sys
	Active to Standby Table	actsby
	License Configuration	sysLicense
	System Feature Table	feature
	Firmware Version Table	firmware
	Firmware Executable Table	firmwareExe
	Firmware Download Table	firmwareDwnld
	File System Table	filesystem
	Peripheral Configuration Table	peripheral
Line Card Group Short Name: lc	Line Card Table	lc
	Line Card Port Configuration	lcPort
Trunk Card Group Short Name: tc	Trunk Card Configuration	tc
	Trunk Port Configuration	tcPort
Programmable Trunk Card Group Short Name: ptc	Programmable Trunk Card Table	ptcSpan
	Programmable T1, E1, MVDCT1 Port Configuration Table	progPort
ISDN Card Configuration Group Short Name: isdn	ISDN Card Table	isdnCard
	PRI Port Configuration	isdnPort
	ISDN Message Template Table	isdnMessageTemp
	ISDN Template Instructions	isdnTempInstruction
Communication Card Group Short Name: comm	BRC Card Table	brc
	NBC Card Table	nbc
Service Circuit Card Configuration Group Short Name: scc	DTG Configuration Table	dtgCard
	DTG Port Table	dtgPort
	Resourcible Card Table	rc
	Resourcible Port Table	rcPort
	IPRC Card Configuration	iprc
	Prompt Library Table	pmptLib
Prompt Library File Table	pmpFile	

*Table 1-12 MIB Table Names and Common Object Name Prefixes (continued)*

Group Names	Table Names	Common Object Name Prefixes
Subrate Switching Group	Subrate Switching Card	ssc
	Subrate Configuration and Storage	subrate
Generic Data Group Short Name: data	Resource Group Table	resGroup
	Resource Group Port Table	resGroupPort
	Inpulse Rule Table	inpulseRule
	Inpulse Rule Instruction Table	inpulseRuleInstruction
	Outpulse Rule Table	outpulseRule
	Outpulse Rule Instruction Table	outpulseRuleInstruction
	NFAS	nfasGroup
	NFAS Interface Table	nfasInterface
	Answer Supervision Templates	ansSupTemp
	Routing Table Group	routeGrp
	Exception Routing Table	exrte
	Route Table	route
Card Diagnostic Group Short Name: diagnostics	Card Diagnostic Group	diagSession
	Diagnostic Test Argument Table	diagTestArg
	Diagnostic Test Result Table	diagTestResult