CHAPTER 6

In-Band Management

The Catalyst 2820 and 1900 can be managed in-band through any SNMP-compatible workstation or through Telnet. They support standard SNMP MIB II objects as well as SNMP extensions designed to maximize the switches' manageability and configurability.

The complete set of objects are listed by function in the "Standard MIBs and MIB Extensions" section in this chapter. These MIB objects and other SNMP-based management techniques are described in a separate manual, the *Catalyst 2820 Series and Catalyst 1900 Series MIB Reference Manual*, available on the Documentation CD-ROM.

Using Telnet

You can use any Telnet TCP/IP package to invoke the management console. The Catalyst 2820 and 1900 support up to seven simultaneous Telnet sessions. See the "Out-of-Band Management" chapter for details on the use of the management console.

Before beginning, the Catalyst 2820 and 1900 must be configured for SNMP management. To do this, you must assign an IP address to the switch using the IP Configuration Menu, described in the "IP Configuration" section in the "Out-of-Band Management" chapter. You do not need to reset the switch the first time you assign an IP address. Changes to the IP address, however, must be followed by a reset for the change to take effect. You can also use the Bootstrap protocol (BOOTP) described in the "Configuring the Switch for SNMP Management with BOOTP" section in this chapter.

Configuring the Switch for SNMP Management with BOOTP

The switch must be configured with an IP address before it can make available any in-band management. You can assign an individual address to each Catalyst 2820 or 1900, or you can use the BOOTP protocol to maintain a centralized database of such addresses.

A host machine with a BOOTP server program is needed to use BOOTP. A database containing a list of physical MAC addresses and corresponding IP addresses must be set up on this host. Other information, such as the corresponding subnet masks, default gateway addresses, and host names, can also be stored in the database but are optional. The switch must be able to access the BOOTP server through one of its ports.

After a system reset, the switch looks into its non-volatile random access memory (NVRAM) for a configured IP address, and if that exists, looks for a default gateway address and IP subnet mask.

If an IP address has not been configured, the switch transmits a BOOTP broadcast request to all of its ports having a physical connection, requesting a mapping for its physical MAC address. A valid response includes the IP address, which is mandatory, along with the subnet mask, the default gateway, and the host name, which are all optional.

The reception of a valid BOOTP response immediately activates the rest of the system's protocol suite, without requiring a system reset. The information is also saved in the NVRAM so that the next reset will not have to redeploy BOOTP.

As long as its IP address remains undiscovered, the switch will re-send BOOTP requests for 30 minutes.

For more information about using BOOTP, refer to the BOOTP server documentation.

Standard MIBs and MIB Extensions

The following pages list the actions you use to manage and configure a Catalyst 2820 and 1900 and the MIB objects associated with each action.

Parameter changes take effect immediately. However, changed parameters might not be written to permanent storage for up to 30 seconds. If you turn off the switch before the new parameters are written to permanent storage, the change does not take effect the next time the system is reset.

The following MIBs are supported by the Catalyst 2820 and 1900 and are listed in Table 6-1 through Table 6-8:

- Catalyst 2820 and 1900 enterprise-specific MIB
- Module MIB (Catalyst 2820 only)
- Catalyst 2820 ATM MIB
- Bridge MIB – RFC 1493
- FDDI MIB – RFC 1512 (Catalyst 2820 only)
- RS-232 MIB – RFC 1317
- LANE Client MIB
- CDP MIB

Note The widely-used RMON MIB (RFC 1757) is supported but not documented.

Catalyst 2820 and 1900 Enterprise-Specific MIB

Table 6-1 Catalyst 2820 and 1900 MIB Objects

Action	Associated MIB Objects
View Self Test Results	sysInfoPOSTResult sysInfoPOSTPortFailedPostMap
View System Information	sysInfoFwdEngineRevision sysInfoBoardRevision sysInfoTotalNumberOfPorts sysInfoNumberOfSwitchPorts sysInfoNumberOfInstalledModules sysInfoNumberofSwitchPorts sysInfoNumberOfSharedPorts sysInfoAddrCapacity sysInfoRestrictedStaticAddrCapacity
View/Configure RS-232 Port for an Attached Modem	netMgmtModemInitString netMgmtModemAutoAnswer netMgmtModemDialString netMgmtModemDialDelay
View/Configure Management VLAN	NetMgmtVlan

Action	Associated MIB Objects
View/Configure Logon Security	netMgmtConsolePasswordThresh netMgmtConsoleSilentTime netMgmtConsoleInactTime
View/Configure Switching Mode	sysConfigSwitchingMode sysConfigMulticastStoreAndForward
View/Configure Network Port	sysConfigNetworkPort
View/Configure Port Monitoring Mode	sysConfigMonitor sysConfigMonitorPort sysConfigHigherProtocolMonitor swPortMonitoring
View/Configure Virtual LAN Information	vlanMaxSupported
View/Configure Virtual LAN Membership	vlanIndex vlanName vlanMemberPorts vlanMemberIndex vlanMemberPortIndex vlanMemberPortOfVlan
View/Configure Address Security	swPortAddressingSecurity swPortAddressTableSize swPortSecuredAddressViolations sysConfigAddressViolationAlert sysConfigAddressViolationAction
View/Configure Performance Information	sysInfoBuffersUsed sysInfoMaxBuffers sysInfoUtilDisplay swPortTxQueueFullDiscards swPortRxNoBufferDiscards bandwidthUsageCurrent bandwidthUsageMaxPeakEntries bandwidthUsagePeakInterval bandwidthUsagePeakRestart bandwidthUsageCurrentPeakEntry bandwidthUsagePeakIndex bandwidthUsageStartTime bandwidthUsagePeak bandwidthUsagePeakTime

Action	Associated MIB Objects
View/Configure Broadcast Storm Control	SysInfoBroadcastStormLastTime SysInfoPortExceedBroadcastStorm SysConfigBroadcastStormAction SysConfigBroadcastStormAlert SysConfigBroadcastThreshold SysConfigBroadcastReEnableThreshold
View RPS State	SysInfoRedundantPowerState SysInfoInternalPowerState
View/Configure Port Characteristics	swPortIndex swPortName swPortMediaCapability swPortControllerRevision swPortMtu swPortSpeed swPortSTPPortFastMode swPortConnectorType swPortFullDuplex swPortBroadcastStormControlBlocked
View/Configure Port Address Status	swPortNumberOfLearnedAddresses swPortNumberOfStaticAddresses swPortEraseAddresses swPortFloodUnregisteredMulticasts swPortFloodUnknownUnicasts
View/Configure Port Status	swPortStatus swPortAdminStatus swPortLastStatus swPortStatusChanges swPortLinkbeatStatus swPortLinkbeatLosses swPortJabberStatus swPortJabbers
View/Configure CDP	netMgmtCdpHoldTime netMgmtCdpTransmissionTime
View/Configure CGMP	netMgmtCgmpEnable netMgmtCgmpRouterHoldTime

Action	Associated MIB Objects
View/Configure Port Fast	swPortSTPPortFastMode
View Port Receive Statistics	swPortRxStatIndex swPortRxTotalOctets swPortRxTotalOctetsWraps swPortRxTotalFrames swPortRxUnicastFrames swPortRxUnicastOctets swPortRxUnicastOctetsWraps swPortRxBroadcastFrames swPortRxBroadcastOctets swPortRxBroadcastOctetsWraps swPortRxMulticastFrames swPortRxMulticastOctets swPortRxMulticastOctetsWraps swPortRxForwardedFrames swPortRxFilteredFrames swPortRxNoBufferDiscards swPortRxFCSErrors swPortRxAlignmentErrors swPortRxFrameTooLongs swPortRxRunts

Action	Associated MIB Objects
View Port Transmit Statistics	swPortTxStatIndex swPortTxTotalOctets swPortTxTotalOctetsWraps swPortTxTotalFrames swPortTxUnicastFrames swPortTxUnicastOctets swPortTxUnicastOctetsWraps swPortTxBroadcastFrames swPortTxBroadcastOctets swPortTxBroadcastOctetsWraps swPortTxMulticastFrames swPortTxMulticastOctets swPortTxMulticastOctetsWraps swPortTxDeferrals swPortTxSingleCollisions swPortTxMultipleCollisions swPortTxLateCollisions swPortTxExcessiveCollisions swPortTxExcessiveDeferrals swPortTxExcessiveCollisions16s swPortTxExcessiveCollisions4s swPortTxQueueFullDiscards swPortTxErrors
View/Configure Collision Histograms	swPortTxCollIndex swPortTxCollCount swPortTxCollFrequencies
View/Configure Spanning-Tree Protocol	sysConfigEnableSTP
View/Configure for In-Band Management	netMgmtIpAddress netMgmtDefaultGateway netMgmtIpSubnetMask
View/Configure Set Clients	netMgmtSetClientIndex netMgmtSetClientAddr netMgmtSetClientStatus

Action	Associated MIB Objects
View/Configure Trap Clients and Traps	netMgmtTrapClientIndex netMgmtTrapClientAddr netMgmtTrapClientComm netMgmtTrapClientStatus netMgmtEnableLinkTraps netMgmtEnableAuthenTraps
View/Configure Firmware Upgrades	upgradeFlashSize upgradeFlashBankStatus upgradeTFTPServerAddress upgradeTFTPLoadFilename upgradeTFTPInitiate upgradeTFTPAccept
Reset System	sysConfigReset sysConfigDefaultReset
Clear Port Statistics	sysConfigClearPortStats swPortClearStatistics

Module MIB

This MIB applies to the Catalyst 2820 only.

Table 6-2 Module MIB Objects

Action	Associated MIB Objects
View/Configure High-Speed Modules	esModuleCapacity esModuleIndex esModuleStatus esModuleAdminStatus esModuleBootCodeVersion esModuleFlashStatus esModuleResetToFactoryDefaults esModuleDescr esModuleID esModuleVersion esModuleObjectID esModulePortCapacity esModuleReset esModuleLastStatusChange esModuleCollisionPeriods esModulePortTable esModulePortIndex esModulePortDescr esModulePortAdminStatus esModulePortAutoPartitionState esModulePortOperStatus esModulePortLinkbeatStatus esModulePortConnectorType esModulePortReceivePeriods

Action	Associated MIB Objects
View FDDI POST Results	fmCfgPOSTResult fmCfgPOSTTest fmCfgPOSTLoopbackResult
Reset FDDI Module	fmCfgResetToFactoryDefaults fmCfgResetModule
View/Configure FDDI to Ethernet Frame Translation	fmCfgNovellFDDISNAPTranslation fmCfgUnmatchedSNAPDestination
View/Configure SMT Authorization	fmCfgAuthorizationChecking fmCfgAuthorizationString
View FDDI Module Firmware Status	fmCfgFirmwareVersion fmCfgBOOTCodeVersion fmCfgFlashStatus
View FDDI Translation to FDDI	fmXlateToFDDIIndex fmXlateToFDDINovellRaw8023ToSnapFrames fmXlateToFDDINovellEthIIToSnapFrames fmXlateToFDDINovellSnapToSnapFrames fmXlateToFDDIEthIIToBridgeTunnelFrames fmXlateToFDDIEthIIToSnapFrames fmXlateToFDDIOtherSnapToSnapFrames fmXlateToFDDI8022To8022Frames

View FDDI Frame Filtering Statistics	fmFilterIndex fmFilterFcsInvalidFrames fmFilterDataLengthFrames fmFilterErrorIndFrames fmFilterFddiFifoOverrunFrames fmFilterFddiInternalErrorFrame fmFilterNoEndDelimitFrames fmFilterNoBufferSpaceFrames fmFilterNoLlcHeaderFrames fmFilterSourceRouteFrames fmFilterNoSnapHeaderFrames fmFilterTooLargeFrames fmFilterNovellSnapFilteredFrames fmFilterCantFragmentFrames fmFilterBadIpHeaderFrames fmFilterRingDownDiscards fmFilterNovellOtherFilteredFrames
View FDDI Performance Information	fmFilterNoBufferSpaceFrames fmCfgUnmatchedSNAPDestination
View FDDI Translation to Ethernet Statistics	fmXlateToEthIndex fmXlateToEthNovellSnapToRaw8023Frames fmXlateToEthNovellSnapToEthIIFrames fmXlateToEthNovellSnapToSnapFrames fmXlateToEthAppleTalkSnapToSnapFrames fmXlateToEthIpSnapForFragmentationFrames fmXlateToEthIpSnapFragmentedFrames fmXlateToEthBridgeTunnelToEthIIFrames fmXlateToEthOtherSnapToEthIIFrames fmXlateToEthOtherSnapToSnapFrames fmXlateToEth8022To8022Frames

Catalyst 2820 ATM MIB

This MIB applies to the Catalyst 2820 only.

Table 6-3 Catalyst ATM MIB Objects

Action	Associated MIB Objects
View Interface Configuration Parameters	atmInterfaceConfTable atmInterfaceConfEntry atmInterfaceMaxVpcs atmInterfaceMaxVccs atmInterfaceConfVpcs atmInterfaceConfVccs atmInterfaceMaxActiveVpiBits atmInterfaceMaxActiveVciBits atmInterfaceIlmiVpi atmInterfaceIlmiVci atmInterfaceAddressType atmInterfaceAdminAddress atmInterfaceMyNeighborIpAddress atmInterfaceMyNeighborIfName
View Configuration and State Parameters	atmInterfaceDs3PlcpTable atmInterfaceDs3PlcpEntry atmInterfaceDs3PlcpSEFSs atmInterfaceDs3PlcpAlarmState atmInterfaceDs3PlcpUASs

Action	Associated MIB Objects
View Virtual Channel Links	atmVclTable atmVclEntry atmVclVpi atmVclVci atmAdminStatus atmVclOperStatus atmVclLastChange atmVclReceiveTrafficDescrIndex atmVclTransmitTrafficDescrIndex atmVccAalType atmVccAal5CpcsTransmitSduSize atmVccAal5CpcsReceiveSduSize atmVccAal5EncapsType atmVclCrossConnectIdentifier atmVclRowStatus
View Virtual Channel	atmVpCrossConnectL2HOperStatus atmVpCrossConnectH2LOperStatus atmVpCrossConnectL2HLastChange atmVpCrossConnectH2LLastChange atmVpCrossConnectRowStatus atmVcCrossConnectIndexNext atmVcCrossConnectTable atmVcCrossConnectEntry atmVcCrossConnectIndex atmVcCrossConnectLowIfIndex atmVcCrossConnectLowVpi atmVcCrossConnectLowVci atmVcCrossConnectHighIfIndex atmVcCrossConnectHighVpi atmVcCrossConnectHighVci atmVcCrossConnectAdminStatus atmVcCrossConnectL2HOperStatus atmVcCrossConnectH2LOperStatus atmVcCrossConnectL2HLastChange atmVcCrossConnectH2LLastChange atmVcCrossConnectRowStatus

Action	Associated MIB Objects
View Performance Statistics	aal5VccTable aal5VccEntry aal5VccVpi aal5VccVci aal5VccCrcErrors aal5VccSarTimeOuts aal5VccOverSizedSDUs

LANE Client MIB

This MIB applies to the Catalyst 2820 only.

Table 6-4 LANE Client MIB Objects

Action	Associated MIB Objects
View ATM Address Information	lecAtmAddressTable lecAtmAddressEntry lecAtmAddress lecAtmAddressStatus
View Mac Address Information	lecMacAddressTable lecMacAddressEntry lecMacAddress lecMacAddressAtmBinding
View Cache Address Information	leArpTable leArpEntry leArpMacAddress leArpAtmAddress leArpIsRemoteAddress leArpEntryType leArpRowStatus
View Mapping Information	lecMappingTable lecMappingEntry lecMappingIndex

Action	Associated MIB Objects
View Configuration Information	lecConfigTable lecConfigEntry lecIndex lecRowStatus lecOwner ecConfigMode lecConfigLanType lecConfigMaxDataFrameSize lecConfigLanName lecConfigLesAtmAddress lecControlTimeout lecMaxUnknownFrameCount lecMaxUnknownFrameTime lecVccTimeoutPeriod lecMaxRetryCount lecAgingTime lecForwardDelayTime lecExpectedArpResponseTime lecFlushTimeTimeOut lecPathSwitchingDelay lecLocalSegmentID lecMulticastSendType lecMulticastSendAvgRate lecMulticastSendPeakRate lecConnectionCompleteTimer

Action	Associated MIB Objects
View Client Status	lecStatusTable lecStatusEntry lecIfIndex lecPrimaryAtmAddress lecID lecInterfaceState lecLastFailureRespCode lecLastFailureState lecProtocol lecVersion lecTopologyChange lecConfigServerAtmAddress lecConfigSource lecActualLanType lecActualMaxDataFrameSize lecActualLanName lecActualLesAtmAddress lecProxyClient
View Performance Statistics	lecStatisticsTable lecStatisticsEntry lecArpRequestsOut lecArpRequestsIn lecArpRepliesOut lecArpRepliesIn lecControlFramesOut lecControlFramesIn lecSvcFailures

Bridge MIB (RFC 1493)

Table 6-5 Bridge MIB Objects

Action	Associated MIB Objects
View Spanning-Tree Protocol Status	dot1dStpTimeSinceTopologyChange dot1dStpTopChanges dot1dStpDesignatedRoot dot1dStpMaxAge dot1dStpHelloTime dot1dStpHoldTime dot1dStpFowardDelay dot1dStpProtocolSpecification dot1dStpRootCost dot1dStpRootPort
View/Configure Spanning-Tree Protocol Parameters when this Bridge is Acting as Root	dot1dBridgeHelloTime dot1dBridgeMaxAge dot1dBridgeForwardDelay
View/Configure Spanning-Tree Protocol Parameters	dot1dStpPriority
View/Configure Per Port Spanning-Tree Protocol Status	dot1dStpPortPriority dot1dStpPortState dot1dStpPortEnable dot1dStpPortPathCost dot1dStpPortDesignatedRoot dot1dStpPortDesignatedCost dot1dStpPortDesignatedBridge dot1dStpPortDesignatedPort dot1dStpPortForwardTransitions
View/Configure Address Aging Parameters	dot1dTpLearnedEntryDiscards dot1dTpAgingTime
View/Configure the Forwarding Database of the Bridge	dot1dTpFdbAddress dot1dTpFdbPort dot1dTpFdbStatus

View/Configure the Static Address Table	dot1dStaticAddress dot1dStaticReceivePort dot1dStaticAllowedToGoTo dot1dStaticStatus

FDDI MIB (RFC 1512)

This MIB applies to the Catalyst 2820 only.

Table 6-6 FDDI MIB Objects

Action	Associated MIB Objects
View SMT Information	fddimibSMTStationId fddimibSMTOpVersionId fddimibSMTMIBVersionId fddimibSMTMACCts fddimibSMTNonMasterCts fddimibSMTConnectionPolicy fddimibSMTBypassPresent fddimibSMTECMState fddimibSMTCFState fddimibSMTRemoteDisconnectFlag fddimibSMTStationStatus
View MAC Traffic Statistics	fddimibMACFrameCts fddimibMACCopiedCts fddimibMACTransmitCts fddimibMACErrorCts fddimibMACLostCts fddimibMACTokenCts fddimibMACTvxExpiredCts fddimibMACNotCopiedCts fddimibMACLateCts fddimibMACRingOpCts fddimibMACNotCopiedRatio fddimibMACNotCopiedFlag

View PORT Information	fddimibPORTMyType fddimibPORTNeighborType fddimibPORTConnectionPolicies fddimibPORTCurrentPath fddimibPORTAvailablePaths fddimibPORTPMDClass fddimibPORTLCTFailCts fddimibPORTLemRejectCts fddimibPORTLemCts fddimibPORTPCMState
View/Configure SMT Information	fddimibSMTNotify
View MAC Information	fddimibMACFrameStatusFunctions fddimibMACAvailablePaths fddimibMACUpstreamNbr fddimibMACDownstreamNbr fddimibMACOldUpstreamNbr fddimibMACOldDownstreamNbr fddimibMACDownstreamPORTType fddimibMACTReq fddimibMACTNeg fddimibMACFrameErrorThreshold

RS-232 MIB (RFC 1317)

Table 6-7 RS-232 MIB Objects

Action	Associated MIB Objects
View RS-232 Port Input/Output Signals	rs232InSigPortIndex rs232InSigName rs232InSigState rs232InSigChanges rs232OutSigPortIndex rs232OutSigName rs232OutSigState rs232OutSigChanges
View/Configure RS-232 Port Characteristics	rs232Number rs232PortIndex rs232PortType rs232PortInSigNumber rs232PortOutSigNumber rs232PortInSpeed rs232PortOutSpeed
View/Configure RS-232 Async Port Characteristics	rs232AsyncPortIndex rs232AsyncPortBits rs232AsyncPortStopBits rs232AsyncPortParity rs232AsyncPortAutobaud
View RS-232 Async Port Statistics	rs232AsyncPortParityErrs rs232AsyncPortFramingErrs rs232AsyncPortOverrunErrs

CDP MIB

Table 6-8 CDP MIB Objects

Action	Associated MIB Objects
View/Configure CDP	cdpInterfaceEnable cdpInterfaceMessageInterval
View CDP Neighbor Information	cdpCacheAddressType cdpCacheAddress cdpCacheVersion cdpCacheDeviceID cdpCacheDevicePort cdpCachePlatform cdpCacheCapabilities

Trap Clients and Traps

A trap client is a management workstation configured to receive and process traps. The Catalyst 2820 or 1900 supports up to four trap clients with separate community strings. At least one trap client must be defined before any traps are generated. See the “Network Management (SNMP) Configuration” section in the “Out-of-Band Management” chapter for instructions on defining trap clients. See the “Standard MIBs and MIB Extensions” section in this chapter for the MIB objects to use.

The Catalyst 2820 or 1900 can generate the following traps:

warmStart Generated when the switch is reset or after the completion of a firmware upgrade where the new firmware is immediately selected for execution. This could be performed in-band or out-of-band with the management console.

coldStart Generated upon a power-on reset.

linkDown	Generated whenever a port changes to a suspended or disabled state due to spanning-tree blocking of a redundant path, secure address violation, loss of linkbeat, jabber error, or by management intervention. The trap frame carries the index value of the port.
linkUp	Generated when a port changes status from disabled or suspended to enabled.
authenticationFailure	Generated when the switch receives an SNMP message that is not accompanied by a valid community string.
newRoot	The switch generates this bridge-standard trap when it becomes the new root of the spanning tree.
topologyChange	From the bridge MIB, this trap is generated by the switch when any of its ports change from the learning to the forwarding state, from the forwarding state to the blocking state, or when a new root is elected.
logonIntruder	An enterprise-specific trap generated whenever the management console receives repeated logon failures due to invalid passwords. You can define the number of invalid passwords permitted before this trap is generated.
switchDiagnostic	The switch generates this enterprise-specific trap when it does not pass all of the POST tests. Some POST failures are fatal and could prevent the generation of this trap.
AddressViolation	The switch generates this trap when an address violation is detected on a secured port. It can be enabled or suppressed using the object sysConfigAddressViolationAlert.

BroadcastStormControl	This enterprise-specific trap is generated when the number of broadcast packets received from a port is higher than the broadcast threshold defined for the switch. This trap is generated no more than once every 30 seconds. This trap is disabled by default. You can enable it using the object sysConfigBroadcastStormAlert.
rpsFailed	This enterprise-specific trap is generated whenever the redundant power supply connected to the switch fails. It is generated no more than once a minute.
risingAlarm	This trap is generated when an alarm entry specified through the RMON MIB crosses its rising threshold and triggers an event that is configured to send an SNMP trap.
fallingAlarm	This trap is generated when an alarm entry specified through the RMON MIB crosses its falling threshold and generates an event that is configured for sending SNMP traps.