



Configuration Guide

Configuring Network Synchronization in AOS

This configuration guide describes the configuration and use of network synchronization (Network Sync) in AOS products. Included in this guide are an overview of the Network Sync feature, its operation and configuration in AOS products, configuration examples, and troubleshooting commands.

This guide contains the following sections:

- *Network Sync Overview on page 2*
- *Configuring Network Sync Using the CLI on page 2*
- *Network Sync Configuration Examples on page 9*
- *Network Sync Command Summary on page 9*
- *Troubleshooting on page 11*

Network Sync Overview

Network Sync is a networking feature that provides clock synchronization at the physical network layer through Ethernet or digital subscriber line (DSL) ports. The feature synchronizes clock frequency on a port by timing the interface's bit clock from clock signals received over the physical layer of the network. By using the physical layer, rather than an external time division multiplexed (TDM) circuit, remote network elements can receive reliable timing information through the packet network.

Network Sync uses messages through the Ethernet Synchronization Message Channel (ESMC) to provide clock information to remote network elements. The ESMC passes synchronization status messages (SSMs) that indicate the quality level of the clock synchronization signal. Synchronization information is transmitted to the network elements through an egress clock, and the ESMC communications indicate the most reliable sources. ESMC use is optional, but when enabled it provides a method for selecting the highest quality synchronization signal for the remote element.

Network Sync in AOS

In AOS, Network Sync is used to allow the remote network element to participate in distributing synchronization to other, adjacent network elements. Synchronization distribution is unidirectional and, in general, moves from a network-to-network interface (NNI) to a user-to-network interface (UNI). NNIs can be Symmetric High-Speed Digital Subscriber Line (SHDSL), Very High Speed Digital Subscriber Line (VDSL), or Gigabit Ethernet interfaces. Ethernet interfaces used for Network Sync must be Synchronous Ethernet (SyncE) compatible. UNIs are typically one or more Gigabit Ethernet interfaces. When a Gigabit Ethernet interface is configured to participate in synchronization distribution, it negotiates synchronous operation during link establishment. Otherwise, it operates asynchronously.

To configure Network Sync in AOS, a connection from which synchronization signals are recovered and a connection to which synchronization information is transmitted must be configured. Optionally, ESMC processes can also be configured.

Hardware and Software Requirements and Limitations

Network Sync is available on AOS products running AOS firmware release R10.11.0 or later, as outlined in the *AOS Feature Matrix*, available online at <https://supportforums.adtran.com>.

ESMC processes cannot be used on the interface unless it is a Network Sync capable interface.

Configuring Network Sync Using the CLI

Network Sync is configured in AOS by, at a minimum, configuring an NNI from which synchronization signals are recovered, and a UNI to which the signals are transmitted. Configuration is completed using the command line interface (CLI). Several optional configuration items are also available, including ESMC protocol data unit (PDU) processing, holdover settings, revertive switching options, SSM override settings, restoration delay intervals, and the T4 interface configuration. The configuration steps for Network Sync are as follows:

1. *[Accessing the AOS Product Using the CLI on page 3](#)*
2. *[Enabling Network Sync and Configuring Clock Interfaces on page 3.](#)*
3. *[Specifying EEC Options \(Optional\) on page 5](#)*

4. *Enabling ESMC PDU Processing (Optional) on page 5*
5. *Configuring Holdover Options (Optional) on page 5*
6. *Specifying Revertive Switching Options (Optional) on page 6*
7. *Enabling SSM Override (Optional) on page 6*
8. *Specifying the Wait-to-Restore Interval (Optional) on page 7*
9. *Configuring the T4 Interface (Optional) on page 7*

Accessing the AOS Product Using the CLI

To begin configuring Network Sync on the AOS product, access the CLI following these steps:

1. Boot up the unit.
2. Telnet to the unit (**telnet** <ip address>), for example: **telnet 10.10.10.1**.



If during the unit's setup process you have changed the default IP address (10.10.10.1), use the configured IP address.

3. Enter your user name and password at the prompt.



*The AOS default user name is **admin** and the default password is **password**. If your product no longer has the default user name and password, contact your system administrator for the appropriate user name and password.*

4. Enter Enable mode on your unit by entering **enable** at the prompt as follows:
>enable
5. Enter your Enable mode password at the prompt.
6. Enter the unit's Global Configuration mode as follows:
#configure terminal
(config)#

You can now begin configuring the Network Sync feature.

Enabling Network Sync and Configuring Clock Interfaces

Network Sync clock interfaces are configured by enabling Network Sync and specifying interfaces in the Network Sync Configuration mode. At a minimum, two interfaces must be configured for Network Sync functionality: an NNI interface (SHDSL, VDSL, or Gigabit Ethernet) for clock sourcing, and a UNI (Gigabit Ethernet or T4 interface) that receives clock information. In addition, additional UNI interfaces can be configured depending on how many remote network elements require the synchronization information.

To enable Network Sync, enter the Network Sync Configuration mode, and specify clock interfaces, follow these steps:

1. Enter the Network Sync Configuration mode using the **network-sync** command from the Global Configuration mode. Use the **no** form of this command to remove all Network Sync configurations. Enter the command as follows:

```
(config)#network-sync  
(config-ntwk-sync)#
```

2. Use the **connect [gigabit-ethernet | shdsl | vdsl] <slot/port> recover [primary | secondary] [ssm | no-ssm]** command to specify the interface from which clock information is recovered. This interface is typically the NNI. You can specify a Gigabit Ethernet interface (**gigabit-ethernet**), a SHDSL interface (**shdsl**), or a VDSL interface (**vdsl**). Specify the slot and port of the interface. Slots are numbered **0** to **1**, with **0** as the system controller slot, and ports are numbered **1** to **n**. The interface is specified as the primary or secondary source for clock timing using the **primary** or **secondary** keywords. The optional **ssm** and **no-ssm** keywords specify whether SSM are received (**ssm**) or not (**no-ssm**) on the interface. By default, SSM is enabled. Using the **no** form of this command removes the interface from the Network Sync configuration. To add an interface to Network Sync configuration as the primary clock source, enter the command as follows:

```
(config-ntwk-sync)#connect gigabit-ethernet 0/1 recover primary  
(config-ntwk-sync)#
```



SSMs cannot be used unless ESMC PDU processing is enabled. Refer to [Enabling ESMC PDU Processing \(Optional\)](#) on page 5.

3. Use the **connect [gigabit-ethernet | shdsl | vdsl] <slot/port> transmit [ssm | no-ssm]** command to specify the interface to which clock information is transmitted. This interface is typically the UNI. You can specify a Gigabit Ethernet interface (**gigabit-ethernet**), a SHDSL interface (**shdsl**), or a VDSL interface (**vdsl**). Specify the slot and port of the interface. Slots are numbered **0** to **1**, with **0** as the system controller slot, and ports are numbered **1** to **n**. The optional **ssm** and **no-ssm** keywords specify whether SSM are transmitted (**ssm**) or not (**no-ssm**) on the interface. By default, SSM is enabled. Using the **no** form of this command removes the interface from the Network Sync configuration. To specify Network Sync clock information is provided for the interface, enter the command as follows:

```
(config-ntwk-sync)#connect gigabit-ethernet 0/2 transmit  
(config-ntwk-sync)#
```



This step is optional if you only want to use the T4 interface and/or 1 part-per-second (PPS) output to transmit the received clock.



SSMs cannot be used unless ESMC PDU processing is enabled. Refer to [Enabling ESMC PDU Processing \(Optional\)](#) on page 5.

4. Use the **no shutdown** command to enable the Network Sync feature. Entering the command without the **no** parameter disables the feature. Network Sync is disabled by default. Enter the command as follows:

```
(config-ntwk-sync)#no shutdown
(config-ntwk-sync)#
```

Specifying EEC Options (Optional)

You can optionally specify which Ethernet equipment clock (EEC) option to use by entering the **eec-option [option-1 | option-2]** command from the Network Sync Configuration mode. Network equipment optimized for 2048 kbps uses EEC option 1; 1544 kbps equipment uses EEC option 2. By default, AOS uses **option-2**. Depending on the EEC option specified, available SSM override settings will differ. Using the **no** form of this command returns the EEC option to the default value. To change the EEC option, enter the command as follows:

```
(config-ntwk-sync)#eec-option option-1
(config-ntwk-sync)#
```

Enabling ESMC PDU Processing (Optional)

By default, ESMC PDU processing is disabled. To enable processing of ESMC PDUs, enter the **esmc-process** command from the Network Sync Configuration mode. The ESMC carries SSMs that indicate the quality level of a synchronization signal. When ESMC PDU processing is enabled, the quality levels of the recovered clocks are compared, and the highest one is selected. Using the **no** form of this command disables ESMC PDU processing. To enable ESMC PDU processing, enter the command as follows:

```
(config-ntwk-sync)#esmc-process
(config-ntwk-sync)#
```

Configuring Holdover Options (Optional)

The **holdover threshold eec** command is used when the ESMC process is active and when a recovered clock source is configured to receive SSMs. It affects operation when the received quality level is equal to that of an EEC. This is either QL-EEC1 or QL-EEC2, depending on whether EEC option 1 or EEC option 2 has been selected (refer to [Specifying EEC Options \(Optional\) on page 5](#)). By default, a source is considered DOWN when its received quality level is at EEC. If there is a need for the source to stay UP in that scenario, enter the **holdover threshold eec** command from the Network Sync Configuration mode as follows:

```
(config-ntwk-sync)#holdover threshold eec
(config-ntwk-sync)#
```

Below EEC, a source is always DOWN. Also, it is DOWN if the physical characteristics of its recovered clock are out of tolerance. When a source is DOWN, it is excluded from the network synchronization selection process. When all sources are DOWN, the unit goes into holdover mode.

By default, no holdover threshold is set. Using the **no** form of the **holdover threshold eec** command disables the holdover threshold.

Specifying Revertive Switching Options (Optional)

By default, Network Sync clock selection is revertive based on implied priority. This means that if a clock source with a higher quality clock recovers after going down, network sync transitions back to the higher quality clock source as opposed to remaining on the currently selected clock source. If the feature has been disabled, enter the **revertive priority** command from the Network Sync Configuration mode to enable it. Use the **no** form of this command to disable revertive clock selection based on priority.

Enter the command as follows:

```
(config-ntwk-sync)#revertive priority
(config-ntwk-sync)#
```

Enabling SSM Override (Optional)

SSM override settings can optionally be configured using the **ssm-override** *<input>* command. This command allows you to specify an SSM quality level value to be used in place of the value received by the currently selected recovered clock source. The *<input>* parameter specifies the SSM quality level set by the override. The various *<input>* options available for SSM override vary according to the EEC option selected (refer to *Specifying EEC Options (Optional) on page 5*). If you have not specified an EEC option, option 2 is used by default. *Table 1* and *Table 2* describe the various *<input>* parameters for the **ssm-override** command.

Table 1. SSM Override Parameters for EEC Option 1

SSM Override Parameter	Description
ql-dnu	Do Not Use for Synchronization (0xF)
ql-eec1	Synchronous digital hierarchy (SDH) Equipment Clock (0xB)
ql-prc	Primary Reference Clock (0x2)
ql-ssu-a	Primary Level Synchronization Supply Unit (0x4)
ql-ssu-b	Second Level Synchronization Supply Unit (0x8)
<i><input></i>	Enter SSM as a decimal or hexadecimal value

Table 2. SSM Override Parameters for EEC Option 2

SSM Override Parameter	Description
ql-dus	Do Not Use for Synchronization (0xF)
ql-eec2	Stratum 3 Traceable (0xA)
ql-prov	Provisioned by Network Operator (0xE)
ql-prs	Stratum 1 Traceable (0x1)
ql-smc	SONET Minimum Clock Traceable (0xC)
ql-st2	Stratum 2 Traceable (0x7)
ql-st3e	Stratum 3E Traceable (0xD)

Table 2. SSM Override Parameters for EEC Option 2 (Continued)

SSM Override Parameter	Description
ql-stu	Synchronized Traceability Unknown (0x0)
ql-tnc	Transit Node Clock Traceable (0x4)
<i><input></i>	Enter SSM as a decimal or hexadecimal value

To specify an SSM override for an EEC option 2 configuration, specifically that the clock source is provisioned by a network operator, enter the command as follows:

```
(config-ntwk-sync)#ssm-override ql-prov
(config-ntwk-sync)#
```



SSM override only applies to interfaces with SSM enabled. SSM override does not apply if the recovered SSM is below EEC.

Specifying the Wait-to-Restore Interval (Optional)

You can optionally specify the wait-to-restore interval for Network Sync using the **wait-to-restore** *<value>* command. The wait-to-restore value is the time that a recovered clock source has to be UP before it is allowed to contribute to the selection process. The *<value>* parameter is the time, in minutes, that Network Sync waits to restore the interface. Valid range is **0** to **31** minutes. By default, the wait-to-restore timer is set to **3** minutes. Using the **no** form of this command returns the wait-to-restore timer to the default value. To change the wait-to-restore interval, enter the command as follows:

```
(config-ntwk-sync)#wait-to-restore 10
(config-ntwk-sync)#
```

Configuring the T4 Interface (Optional)

The T4 interface is used to supply synchronous clock output from Network Sync using a configurable format. You can configure the output format and the output squelch threshold for the interface. To configure the T4 interface, follow these steps:

1. Use the **interface t4** *<slot/port>* command to create the T4 interface and enter the T4 Interface Configuration mode. Enter the command from the Global Configuration mode as follows:

```
(config)#interface t4 0/1
(config-t4 0/1)#
```
2. Use the **format** [**ds1** [**d4** | **esf**] | **e12** [**cas** | **ccs**] | **t12**] command to specify the output format for the clock. The **ds1 d4** option specifies a 1544 kbps synchronization interface with D4/superframing (DS1-D4/DS1-SF), the **ds1 esf** option specifies a 1544 kbps synchronization interface with extended superframe framing (DS1-ESF), the **e12** option specifies a 2048 kbps synchronization interface (E12) with either channel associated signaling pulse code modulation 30 (CAS PCM30) framing (**cas**) or common channel signaling pulse code modulation 31 (CCS PCM31) framing (**ccs**), and the **t12** option specifies a 2048 kHz synchronization interface (T12). By default, the format is set to **t12**. Use the **no**

form of this command to return to the default format. To change the format, enter the T4 Interface Configuration mode and enter the command as follows:

```
(config-t4 0/1)#format e12
(config-t4 0/1)#
```

- Use the **minimum-ssm-ql** *<value>* command to specify a squelch level for the T4 interface output. When the quality level (QL) of the SSM received by the network ESMC process is below this level, the output is squelched. The *<value>* parameters outlined below the example are available based on the EEC option selected (refer to *Specifying EEC Options (Optional) on page 5*). By default, EEC Option 2 is used. If the option has not been specified at the time the T4 interface is configured, you can choose to enter SSM as a decimal or hexadecimal value. By default, the output squelch threshold is disabled, causing the output to always be active. Use the **no** form of this command to disable the squelch threshold, which results in the output never being squelched. To enable and configure the threshold, enter the command as follows:

```
(config-t4 0/1)#minimum-ssm-ql ql-eec1
(config-t4 0/1)#
```

Table 3 and *Table 4* explain the *<value>* parameters for the **minimum-ssm-ql** command.

Table 3. SSM QL Threshold Parameters for EEC Option 1

SSM Override Parameter	Description
ql-eec1	Synchronous digital hierarchy (SDH) Equipment Clock (0xB)
ql-prc	Primary Reference Clock (0x2)
ql-ssu-a	First Level Synchronization Supply Unit (0x4)
ql-ssu-b	Second Level Synchronization Supply Unit (0x8)
<i><input></i>	Enter SSM as a decimal or hexadecimal value

Table 4. SSM QL Threshold Parameters for EEC Option 2

SSM Override Parameter	Description
ql-eec2	Stratum 3 Traceable (0xA)
ql-prs	Stratum 1 Traceable (0x1)
ql-st2	Stratum 2 Traceable (0x7)
ql-st3e	Stratum 3E Traceable (0xD)
ql-stu	Synchronized Traceability Unknown (0x0)
ql-tnc	Transit Node Clock Traceable (0x4)
<i><input></i>	Enter SSM as a decimal or hexadecimal value

When squelch is active, the output depends on the selected format, as follows:

Format:	Output:
format ds1 d4	T1 AIS (unframed, all ones)
format ds1 esf	T1 AIS (unframed, all ones)
format e12 cas	E1 AIS (unframed, all ones)
format e12 ccs	E1 AIS (unframed, all ones)
format t12	none

4. Use the **no shutdown** command to enable the interface. By default, the interface is disabled. Enter the command as follows:

```
(config-t4 0/1)#no shutdown
(config-t4 0/1)#
```

Network Sync Configuration Examples

The following section provides sample configuration of Network Sync using the CLI. The configuration parameters entered in these examples are sample configurations only. You should configure this feature in a manner consistent with the needs of your particular network. CLI prompts have been removed from the configuration examples to provide you with a method of copying and pasting directly from this guide into the CLI. You should make the necessary adjustments to these configurations before adding them to your configuration to ensure they will function properly in your network.

Basic Network Sync Configuration

The following example is a basic configuration of Network Sync, in which two Metro Ethernet Network (MEN) ports are configured as the primary and secondary interfaces from which Network Sync recovers clock information (**gigabit-ethernet 0/1** and **gigabit-ethernet 0/2**). In addition, two UNI interfaces (**gigabit-ethernet 0/4** and **gigabit-ethernet 0/5**) are configured as the interfaces to which Network Sync provides clock information. The T4 interface is enabled and configured with a format output of **ds1-esf**.

```
network-sync
connect gigabit-ethernet 0/1 recover primary ssm
connect gigabit-ethernet 0/2 recover secondary ssm
connect gigabit-ethernet 0/4 transmit ssm
connect gigabit-ethernet 0/5 transmit ssm
no shutdown
!
interface t4 0/1
format ds1-esf
no shutdown
!
```

Network Sync Command Summary

Table 5 on page 10 and *Table 6 on page 11* summarize the commands associated with configuring and using Network Sync on an AOS product.

Network Sync Configuration Commands

The following table summarizes the commands used to configure Network Sync.

Table 5. Network Sync Configuration Commands

Prompt	Command	Description
(config)#	[no] network-sync	Enters the Network Sync Configuration mode.
(config-ntwk-sync)#	[no] connect [gigabit-ethernet shdsl vdsl] <slot/port> recover [primary secondary] [ssm no-ssm]	Specifies the interface from which clock information is recovered. The interface is specified as the primary or secondary clock source using the primary and secondary keywords. The optional ssm and no-ssm keywords specify whether SSM are received or not on the interface. By default, SSM is enabled.
(config-ntwk-sync)#	[no] connect [gigabit-ethernet shdsl vdsl] <slot/port> transmit [ssm no-ssm]	Specifies the interface to which clock information is transmitted. The optional ssm and no-ssm keywords specify whether SSM are transmitted or not on the interface. By default, SSM is enabled.
(config-ntwk-sync)#	[no] eec-option [option-1 option-2]	Specifies the EEC option used by Network Sync. By default, option-2 is used. Network equipment optimized for 2048 kbps uses EEC option 1; 1544 kbps equipment uses EEC option 2.
(config-ntwk-sync)#	[no] esmc-process	Enables ESMC PDU processing. By default, ESMC PDU processing is disabled.
(config-ntwk-sync)#	[no] holdover threshold eec	Specifies the threshold for holdover mode. By default, no holdover threshold is set. When enabled, holdover is activated when the clock source quality is not greater than either QL-EEC1 or QL-EEC2, depending on whether EEC option 1 or EEC option 2 is used.
(config-ntwk-sync)#	[no] revertive priority	Specifies that Network Sync clock selection is revertive based on priority. Enabled by default.
(config-ntwk-sync)#	[no] ssm-override <input>	Specifies the SSM quality level used for SSM override settings. Refer to Table 1 on page 6 and Table 2 on page 6 for the <input> parameters of this command.

Table 5. Network Sync Configuration Commands (Continued)

Prompt	Command	Description
(config-ntwk-sync)#	[no] wait-to-restore <value>	Specifies the wait-to-restore interval for Network Sync. The <value> parameter is the time, in minutes, that Network Sync waits to restore the interface. Valid range is 0 to 31 minutes, with a default value of 3 minutes.
(config-ntwk-sync)#	no shutdown	Enables the Network Sync feature.

T4 Interface Configuration Commands

The following table outlines the commands used to configure the T4 interface for Network Sync.

Table 6. T4 Interface Configuration Commands

Prompt	Command	Description
(config)#	interface t4 <slot/port>	Enters the T4 Interface Configuration mode.
(config-t4 0/1)#	[no] format [ds1 [d4 esf] e12 [cas ccs] t12]	Specifies the output format for the interface. By default, the format is set to t12 .
(config-t4 0/1)#	[no] minimum-ssm-ql <value>	Specifies the output squelch threshold for the interface. The <value> parameters are as outlined in Table 3 on page 8 and Table 4 on page 8 . By default, the output squelch threshold is disabled.
(config-t4 0/1)#	no shutdown	Enables the interface. By default, the interface is disabled.

Troubleshooting

Troubleshooting of Network Sync can be completed using various commands from the Enable mode prompt of the CLI. These commands include **clear**, **show**, and **debug** commands that can be used to verify Network Sync configuration and operation. In addition, Network Sync provides an application-level command set that can be used to troubleshoot Network Sync functionality. The various commands and the application-level command set are detailed in the following sections.

Clear Commands

The **clear network-sync info** command is used to clear Network Sync related information from the AOS unit's configuration. The **info** parameter specifies that all Network Sync statistical information is cleared. To clear Network Sync information from the unit's configuration, enter the command as follows from the Enable mode prompt:

```
>enable
#clear network-sync info
```

Show Commands

The **show** commands are used to display current configurations and states of the various Network Sync components. The **show** command output includes the health of the clock interfaces, the frequency offset, the current clock source, the revertive mode, the EEC option selection, and the ESMC process setting. Reviewing the configuration of these items allows you to verify item configurations as a first step in troubleshooting functionality issues. The **show** commands are entered from the Enable mode prompt.

Use the **show network-sync [detail]** command to display the status of Network Sync. The optional **detail** parameter to display detailed status. Enter the command from Enable mode as follows:

```
>enable
#show network-sync
Network Sync Status
```

Primary Source	gigabit-ethernet 0/1
Health	Down
Secondary Source	gigabit-ethernet 0/2
Health	Down
Current Source	Holdover
Revertive Mode	Priority
EEC Option	EEC Option 1
ESMC Process	Enabled
Holdover Threshold	Holdover when clock source SSM <= QL-EEC1

When the **detail** parameter is entered, the wait-to-restore timer status (if running) and system frequency offset are displayed, and any application-level overrides are displayed. The output of the **show network-sync** command follows these parameters:

- Health is displayed as **Up** or **Down**.
- Primary Source, Secondary Source, and Tx System Frequency Offset display one of the following: **Out of Range**, **+XXX.X ppm**, **-XXX.X ppm** (where X is a digit in the offset value).
- Current Source displays one of the following: **Internal**, **Holdover**, **Primary**, or **Secondary**.
- Revertive Mode displays **Priority** or **None**.
- EEC Option displays **EEC Option 1** or **EEC Option 2**.
- ESMC Process displays **Enabled** or **Disabled**.

- Holdover Threshold displays **Holdover when clock source SSM <= QL-EECx** or **Holdover when clock source SSM < QL-EECx** (where x is 1 or 2 depending on the configured EEC option).
- If the primary wait-to-restore timer is running, then **Primary Wait-To-Restore Timer: Running** is displayed. If the secondary wait-to-restore timer is running, then **Secondary Wait-To-Restore Timer: Running** is displayed.
- If the **network-sync source-override** command has been issued from the Network Sync Application Mode, then Source Override displays one of the following: **Primary**, **Secondary**, or **Internal**.
- If the **network-sync transmit-ssm-override** command has been issued from the Network Sync Application Mode, then **Force TX SSM Override ACTIVE** is displayed.

Use the **show running-config network-sync [verbose]** command to display the current running configuration of Network Sync. The optional **verbose** parameter includes parameters that are set to their default value. Enter the command from the Enable mode as follows:

```
>enable
```

```
#show running-config network-sync
```

Use the **show interfaces t4 <slot/port> [realtime]** command to display the T4 interface clock status. Use the optional **realtime** parameter to display the output in realtime. Enter the command from the Enable mode as follows:

```
>enable
```

```
#show interface t4 0/1
```

```
t4 0/1 is UP
```

```
Format: e12
```

```
Output: Squelched
```

Debug Commands

The **debug** commands are used to enable debug messaging for specific Network Sync processes. Their output can provide helpful insight for troubleshooting Network Sync. The **debug** commands available for Network Sync are outlined in the following section.



Turning on a large amount of debug information can adversely affect the performance of your unit.

Use the **debug network-sync** command to enable debug messages for Network Sync. This command allows Network Sync events to be monitored. Enter the command from the Enable mode as follows:

```
>enable
```

```
#debug network-sync
```

Use the **debug network-sync clock [defects | status]** command to enable debug messages for the Network Sync clock. This command allows Network Sync clock events to be monitored. The optional **defects** parameter specifies that clock defect event messages are displayed, and the optional **status** parameter specifies that clock status event messages are displayed.

Enter the command from the Enable mode as follows:

```
>enable
#debug network-sync clock
```

Use the **debug network-sync ssm [events] [rx | tx]** command to enable debug messages for the Network Sync SSM configuration. The optional **events** parameter specifies that only Network Sync SSM events generate a debug message. Without the **events** parameter, any SSM will generate a debug message. The optional **rx** and **tx** parameters specify that received or transmitted SSMs generate debug messages. Enter the command from the Enable mode as follows:

```
>enable
#debug network-sync ssm
```

Use the **debug esmc-packets** command to display raw ESMC packet dumps. Enter the command from the Enable mode as follows:

```
>enable
#debug esmc-packets
```

Application-Level Network Sync Commands

In addition to troubleshooting commands from Enable mode, Network Sync also contains application-level commands useful in troubleshooting. These commands do not affect the configuration of the AOS unit, and they do not persist between reboots. These commands are executed from the application command prompt, and are accessed as follows:

```
>enable
#application
(app)#
```

Use the **network-sync source-override [primary | secondary] [force]** command to override the primary or secondary clock source. Use the optional **force** parameter to indicate that the specified clock source (**primary** or **secondary**) should be selected as the current clock source even if it is down. Use the **no** form of this command to cancel the clock source override. When the clock source override is activated, there is a line displayed in the **show network-sync** command output to indicate this. To override the clock source, enter the command from the application mode as follows:

```
>enable
#application
(app)#network-sync source-override secondary
Clock source override (secondary) applied.
```

Use the **network-sync source-override internal** command to specify that the internal oscillator is selected as the current clock source. Use the **no** form of this command to cancel the clock source override. Enter the command from the application mode as follows:

```
>enable
#application
(app)#network-sync source-override internal
Clock source override (internal) applied.
```

Use the **network-sync source-override cancel** command to cancel the clock source override. This command is equivalent to using the **no** forms of the **network-sync source-override [primary | secondary] [force]** and **network-sync source-override internal** commands. Enter the command from the application mode as follows:

```
>enable
#application
(app)#network-sync source-override cancel
Clock source override canceled.
```

Use the **network-sync transmit-ssm-override <input>** command to create an unconditional override of the SSM configuration. The various *<input>* options available for SSM override vary according to the EEC option selected (refer to *Specifying EEC Options (Optional) on page 5*). If you have not specified an EEC option, option 2 is used by default. *Table 1 on page 6* and *Table 2 on page 6* describe the various *<input>* parameters for the **network-sync transmit-ssm-override** command. This command is used primarily for testing purposes. To create an unconditional SSM override, enter the command from the application mode as follows:

```
>enable
#application
(app)#network-sync transmit-ssm-override ql-dnu
```

Use the **network-sync wait-to-restore clear [primary | secondary]** command to clear the wait-to-restore timers. The **primary** and **secondary** parameters specify that the primary or secondary timers are cleared. Enter the command from the application mode as follows:

```
>enable
#application
(app)#network-sync wait-to-restore clear primary
```