



# Configuring Synchronous Ethernet ESMC and SSM

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Synchronous Ethernet is an extension of Ethernet designed to provide the reliability found in traditional SONET/SDH and T1/E1 networks to Ethernet packet networks by incorporating clock synchronization features. The supports the Synchronization Status Message (SSM) and Ethernet Synchronization Message Channel (ESMC) for synchronous Ethernet clock synchronization.

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## Understanding Synchronous Ethernet ESMC and SSM

Synchronous Ethernet incorporates the Synchronization Status Message (SSM) used in Synchronous Optical Networking (SONET) and Synchronous Digital Hierarchy (SDH) networks. While SONET and SDH transmit the SSM in a fixed location within the frame, Ethernet Synchronization Message Channel (ESMC) transmits the SSM using a protocol: the IEEE 802.3 Organization-Specific Slow Protocol (OSSP) standard.

The ESMC carries a Quality Level (QL) value identifying the clock quality of a given synchronous Ethernet timing source. Clock quality values help a synchronous Ethernet node derive timing from the most reliable source and prevent timing loops.

When configured to use synchronous Ethernet, the Cisco ASR 920 Series Router synchronizes to the best available clock source. If no better clock sources are available, the router remains synchronized to the current clock source.

The router supports two clock selection modes: QL-enabled and QL-disabled. Each mode uses different criteria to select the best available clock source.



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**Note** The router can only operate in one clock selection mode at a time.

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## Clock Selection Modes

The Cisco ASR 920 Series Router supports two clock selection modes, which are described in the following sections.

### QL-Enabled Mode

In QL-enabled mode, the router considers the following parameters when selecting a clock source:

- Clock quality level (QL)
- Clock availability
- Priority

### QL-Disabled Mode

In QL-disabled mode, the router considers the following parameters when selecting a clock source:

- Clock availability
- Priority



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**Note** You can use override the default clock selection using the commands described in [Specifying a Clock Source, on page 3](#) and [Disabling a Clock Source, on page 5](#)

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## Managing Clock Selection

You can manage clock selection by changing the priority of the clock sources; you can also influence clock selection by modifying the following clock properties:

- **Hold-Off Time:** If a clock source goes down, the router waits for a specific hold-off time before removing the clock source from the clock selection process. By default, the value of hold-off time is 300 ms.
- **Wait to Restore:** The amount of time that the router waits before including a newly active synchronous Ethernet clock source in clock selection. The default value is 300 seconds.
- **Force Switch:** Forces a switch to a clock source regardless of clock availability or quality.
- **Manual Switch:** Manually selects a clock source, provided the clock source has a equal or higher quality level than the current source.

For more information about how to use these features, see [Specifying a Clock Source, on page 3](#) and [Disabling a Clock Source, on page 5](#).

# Restrictions and Usage Guidelines

The following restrictions apply when configuring synchronous Ethernet SSM and ESMC:

- To use the **network-clock synchronization ssm option** command, ensure that the router configuration does not include the following:
  - Input clock source
  - Network clock quality level
  - Network clock source quality source (synchronous Ethernet interfaces)
- The **network-clock synchronization ssm option** command must be compatible with the **network-clock eec** command in the configuration.
- To use the **network-clock synchronization ssm option** command, ensure that there is not a network clocking configuration applied to synchronous Ethernet interfaces, BITS interfaces, and timing port interfaces.
- SSM and ESMC are SSO-coexistent, but not SSO-compliant. The router goes into hold-over mode during switchover and restarts clock selection when the switchover is complete.
- It is recommended that you do not configure multiple input sources with the same priority as this impacts the TSM (Switching message delay).
- You can configure a maximum of 4 clock sources on interface modules, with a maximum of 2 per interface module. This limitation applies to both synchronous Ethernet and TDM interfaces.

## Configuring Synchronous Ethernet ESMC and SSM

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## Specifying a Clock Source

The following sections describe how to specify a synchronous Ethernet clock source during the clock selection process:

### Selecting a Specific Clock Source

To select a specific interface as a synchronous Ethernet clock source, use the `network-clock switch manual` command in global configuration mode.



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**Note** The new clock source must be of higher quality than the current clock source; otherwise the router does not select the new clock source.

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Command	Purpose
<b>network-clock switch manual external R0</b>  Router# network-clock switch manual external r0 crc4	Manually selects a synchronization source, provided the source is available and is within the range.
<b>network-clock clear switch {t0   external slot/card/port [10m   2m]}</b>  Router# network-clock clear switch t0	Disable a clock source selection.

## Forcing a Clock Source Selection

To force the router to use a specific synchronous Ethernet clock source, use the **network-clock switch force** command in global configuration mode.



**Note** This command selects the new clock regardless of availability or quality.



**Note** Forcing a clock source selection overrides a clock selection using the **network-clock switch manual** command.

Command	Purpose
<b>network-clock switch force external R0</b>  Router# network-clock switch force r0	Forces the router to use a specific synchronous Ethernet clock source, regardless of clock quality or availability.
<b>network-clock clear switch {t0   external slot/card/port [10m   2m]}</b>  Router# network-clock clear switch t0	Disable a clock source selection.

## Disabling Clock Source Specification Commands

To disable a **network-clock switch manual** or **network-clock switch force** configuration and revert to the default clock source selection process, use the **network-clock clear switch** command.

Command	Purpose
<b>network-clock clear switch {t0   external slot/card/port [10m   2m]}</b>  Router# <b>network-clock clear switch t0</b>	Disable a clock source selection.

## Disabling a Clock Source

The following sections describe how to manage the synchronous Ethernet clock sources that are available for clock selection:

### Locking Out a Clock Source

To prevent the router from selecting a specific synchronous Ethernet clock source, use the `network-clock set lockout` command in global configuration mode.

Command	Purpose
<pre><b>network-clock set lockout</b> {<b>interface</b> <b>interface_name slot/card/port</b>   <b>external R0</b></pre> <pre>Router# network-clock set lockout interface GigabitEthernet 0/0/0</pre>	Prevents the router from selecting a specific synchronous Ethernet clock source.
<pre><b>network-clock clear lockout</b> {<b>interface interface_name</b> <b>slot/card/port</b>   <b>external R0</b></pre> <pre>Router# network-clock clear lockout interface GigabitEthernet 0/0/0</pre>	Disable a lockout configuration on a synchronous Ethernet clock source.

### Restoring a Clock Source

To restore a clock in a lockout condition to the pool of available clock sources, use the `network-clock clear lockout` command in global configuration mode.

Command	Purpose
<pre><b>network-clock clear lockout</b> {<b>interface</b> <b>interface_name slot/card/port</b>   <b>external</b> <b>external R0</b></pre> <pre>Router# network-clock clear lockout interface GigabitEthernet 0/0/0</pre>	Forces the router to use a specific synchronous Ethernet clock source, regardless of clock quality or availability.

## Verifying the Configuration

You can use the following commands to verify your configuration:

- `show esmc`—Displays the ESMC configuration.
- `show esmc detail`—Displays the details of the ESMC parameters at the global and interface levels.
- `show network-clock synchronization`—Displays the router clock synchronization state.

- show network-clock synchronization detail—Displays the details of network clock synchronization parameters at the global and interface levels.

## Troubleshooting

The table below list the debug commands that are available for troubleshooting the SyncE configuration on the Cisco ASR 920 Series Router:



**Caution** We recommend that you do not use debug commands without TAC supervision.

**Table 1: SyncE Debug Commands**

Debug Command	Purpose
<code>debug platform network-clock</code>	Debugs issues related to the network clock, such as alarms, OOR, active-standby sources not selected correctly, and so on.
<code>debug network-clock</code>	Debugs issues related to network clock selection.
<code>debug esmc error</code>  <code>debug esmc event</code>  <code>debug esmc packet [interface &lt;interface name&gt;]</code>  <code>debug esmc packet rx [interface &lt;interface name&gt;]</code>  <code>debug esmc packet tx [interface &lt;interface name&gt;]</code>	Verify whether the ESMC packets are transmitted and received with proper quality-level values.

The table below provides the information about troubleshooting your configuration

**Table 2: Troubleshooting Scenarios**

Problem	Solution
<b>Clock selection</b>	<ul style="list-style-type: none"> <li>• Verify that there are no alarms on the interfaces using the show network-clock synchronization detail command.</li> <li>• Ensure that the nonrevertive configurations are in place.</li> <li>• Reproduce the issue and collect the logs using the debug network-clock errors, debug network-clock event, and debug network-clock sm commands. Contact Cisco Technical Support if the issue persists.</li> </ul>

Problem	Solution
<b>Incorrect QL values</b>	<ul style="list-style-type: none"> <li>• Ensure that there is no framing mismatch with the SSM option.</li> <li>• Reproduce the issue using the debug network-clock errors and debug network-clock event commands.</li> </ul>
<b>Alarms</b>	<ul style="list-style-type: none"> <li>• Reproduce the issue using the debug platform network-clock command. Alternatively, enable the debug network-clock event and debug network-clock errors commands.</li> </ul>
<b>Incorrect clock limit set or queue limit disabled mode</b>	<ul style="list-style-type: none"> <li>• Verify that there are no alarms on the interfaces using the show network-clock synchronization detail command.</li> <li>• Use the <b>show network-clock synchronization</b> command to confirm if the system is in revertive mode or nonrevertive mode and verify the non-revertive configurations.</li> <li>• Reproduce the current issue and collect the logs using the debug network-clock errors, debug network-clock event, and debug network-clock sm commands.</li> </ul>
<b>Incorrect QL values</b> when you use the <b>show network-clock synchronization detail</b> command.	<ul style="list-style-type: none"> <li>• Use the <b>network clock synchronization SSM</b> (<i>option 1 /option 2</i>) command to confirm that there is no framing mismatch. Use the <b>show run interface</b> command to validate the framing for a specific interface. For the SSM option 1, framing should be SDH or E1, and for SSM option 2, it should be T1.</li> <li>• Reproduce the issue using the debug network-clock errors and debug network-clock event commands.</li> </ul>

## Sample Configurations

### Input Synchronous Ethernet Clocking

The following example configures the router to use the BITS interface and two Gigabit Ethernet interfaces as input synchronous Ethernet timing sources. The configuration enables SSM on the BITS port.

```

!
Interface GigabitEthernet0/0
    synchronous mode
    network-clock wait-to-restore 720
!
Interface GigabitEthernet0/1
    synchronous mode
!
!
network-clock synchronization automatic
network-clock input-source 1 External R0 e1 crc4
network-clock input-source 1 gigabitethernet 0/0
network-clock input-source 2 gigabitethernet 0/1
network-clock synchronization mode QL-enabled

no network-clock revertive

```

