Configuring the 4xT 12in1 4-Port Serial SPA

This chapter provides information about configuring the 4xT 12in1 4-Port Serial Interface Shared Port Adapter (SPA) on the Cisco ASR9000 series router.

Configuration Tasks

This section describes how to configure the 4xT 12in1 Serial Interface SPA for the Cisco ASR9000 series router and includes information about verifying the configuration.

Configuring the 4xT 12-in-1 Serial Interface SPA

To perform the basic configuration of the 4xT 12in1 serial interface SPA, complete the following steps:

```
Router# configure terminal
/* Select the 4xT 12-in-1 serial interface to configure and enter interface
   configuration mode. rack/slot/subslot/port—Specifies the location of the 4xT 12in1 Serial

   interface SPA  port. */
Router(config)# interface serial rack/slot/subslot/port

/* Select the L2 encapsulation (hdlc, ppp, or frame-relay). Defaults to hdlc if not
configured. */
Router(config-if)# encapsulation l2-encapsulation
Router(config-if)# ipv4 address address mask
Router(config-if)# bandwidth kbps
Router(config-if)# serial
Router(config-if-serial)# clock rate bps
```

Note

- Before attempting the full configuration, connect each port to the appropriate cable. Some commands are enabled only based on the cable type that is connected to the port.

  Configure the following commands for all the 4xT 12-in-1 serial interfaces:

  - Interface bandwidth kbps - Specifies the interface data rate that is used for the packet scheduling. The value for bandwidth must be the same as specified for DCE clock rate. Specify the bandwidth in kbps (bps/1000) and clock rate in bps. If not specified, the bandwidth defaults to 8 Mbps.
  - Serial clock rate bps - Specifies the DCE clock rate (DCE only). For a DTE, DCE sets the clock rate. For a DCE, if not specified, the value defaults to 2 Mbps.

Verifying the configuration

```
RP/0/RSP0/CPU0:ASR9K-AG03-1#show running-config interface Serial0/2/1/1
Wed Mar 14 20:23:26.200 edt
interface Serial0/2/1/1
description X.21 DCE SPA-4xT connection to ASR1002-AG03-1 Serial0/1/1 X.21 DTE
bandwidth 2016
ipv4 address 40.1.0.2 255.255.255.0
encapsulation hdlc
bandwidth 2000
serial
  clock rate 2000000
!
!
```

Specifying the Interface Address on a SPA

To configure or monitor SPA interfaces, you must specify the physical location of the SIP, SPA, and the interface in CLI (Command Line Interface). The interface address format is *rack/slot/subslot/port*, where:

- *rack* - Is always 0 for the Cisco ASR9000 series router.
- *slot* - Specifies the chassis slot number in the Cisco ASR9000 series router where the SIP is installed.
- *subslot* - Specifies the secondary slot of the SIP where the SPA is installed. Range 0-3.
- *port* - Specifies the number of the individual interface port on an SPA. SPA interface ports numbering begins “0”, from left to right.

The following example shows how to specify the first interface (0) on an SPA. The SPA is installed on the second subslot of a SIP (1) installed on the chassis slot 2:

```
RP/0/RSP0/CPU0:ASR9K-AG03-1(config)#int Serial0/2/1/0
```

Optional Configurations

The following optional configurations are necessary to complete the configuration of your serial SPA:

- Configuring Timing Signals and Data Rate Options, on page 3

- Configuring Framing and Encoding Options, on page 6
- Configuring Interface Signal Control Options, on page 6
- Frame-Relay Configuration Guidelines, on page 8

Following are the two levels of interface configuration for serial interfaces:

- *interface* level
- *serial* submode under the interface

You can configure the basic interface features, such as an IP address, encapsulation, keepalive, service-policy, bandwidth, and so on, at the interface level. While at the interface serial submode level, you can configure the serial specific features.

You can enter a serial command directly from the interface mode by prefixing the command with the serial keyword, or by entering serial submode and then entering the serial commands. For example,

```
Router(config-if)# serial clock rate 20000000
 or
 Router(config-if)# serial
Router(config-if-serial)# clock rate bps
```

Under the interface serial submode, the following options are available for the 4xT 12in1 SPA interfaces:

clock rate <246-8064000>	DCE only
clock rate threshold <246-8064000>	DTE only
dce-terminal-timing-enable	DCE only
idle-char [flags | marks]	DCE or DTE
ignore [dcd | dcd dsr]	DTE only
invert-txclock	DCE or DTE
loopback	DCE or DTE
nrzi-encoding	DCE or DTE
carrier-delay [<0-60> | msec <0-1000>]	DCE or DTE
pulse-time [<0-60> | msec <0-60000>]	DCE or DTE
restart-delay <0-900>	DCE or DTE

Note Some of the commands are only applicable to or might have differing behaviour that are based on the interface mode (DCE vs. DTE) or cable type such as, X.21, V.35, RS-232, RS-449, RS-530, RS-530.

Unlike other Serial SPAs, there is no controller-level configuration for the 4xT 12-in-1 serial interface.

Configuring Timing Signals and Data Rate Options

All interfaces support both DTE and DCE mode, depending upon the mode of the Smart Serial cable attached to the port. To use a port as a DTE interface, connect a DTE Smart Serial cable to the port. When the system detects the DTE mode cable, it automatically uses the external timing signal. To use a port in DCE mode,

connect a DCE Smart Serial cable and set the clock rate with the clock rate configuration command. Also, set the clock rate to perform a loopback test.

In addition to setting the clock rate for the external interface, you must also configure the bandwidth of the interface. Configuring the bandwidth defines the rate that is used for the packet transmit scheduling on the interface. This configuration requirement is specific to the 4xT 12-in-1 serial interface type. The value for bandwidth must be same as specified for the DCE clock rate. For a DTE type interface, if the external clock rate is not known, you can determine the clock rate after the interface is operational by looking at the Receive Clock Rate value. Use the show controller Serial command to determine the clock rate. The value for bandwidth must be same as specified for DCE clock rate. Specify the bandwidth in Kbps (bps/1000). If not specified, the bandwidth defaults to 8 Mbps.

Example: Determining the DTE clock rate by using the show controller command:

```
RP/0/RSP0/CPU0:ASR9K-AG03-1#show controller Serial0/2/1/1 | inc Receive Clock Rate
Fri Mar 16 10:18:29.948 edt
 Receive Clock Rate:    2015970 bps (Hardware)
```

Since bandwidth is defined in kbps, when you define the bandwidth, round the above bps rate to the next multiple of 1000 (example: 2016 kbps).

Use the following commands when configuring these options:

```
/* Enter the global configuration mode */
Router# configure terminal

/* Select the 4xT 12in1 Serial interface to configure and enters interface
   configuration mode.

   rack/slot/subslot/port—Specifies the location of the 4xT 12in1 Serial
   interface SPA  port.
*/

Router(config)# interface serial rack/slot/subslot/port

/* Configure the interface data rate (bandwidth) to be used for packet scheduling
   (in kbps)
*/

Router(config-if)# bandwidth kbps
/* Enter serial interface configuration sub-mode */
Router(config-if)# serial
/* For a DCE interfafce - configure the serial interface clock rate for the hardware.
   The DCE clock rate is specified in bits per second (bps).  Configurable ranges are
   from 1200 to 8064000. Note however that there are cable type specific limitations for
   RS-232 (max 128,000 bps) and X.21 (max 2,016,000 bps).  All others have 8064000 as the
   max bps.

   The default rate if not specified is 2M bps.  The no form of this command removes a
   clock rate that has been set (restores the default rate for DCE).

   When configuring the DCE clock rate, since the configuration is not cable type aware
   (cable might not even be plugged in at config time), invalid clock rates for a cable
   type will not be flagged during configuration.  Validation will be done when the
   config is being applied to the hardware.  If the clock rate is greater than what can
   be supported by the cable type an Alert notification will be posted to SysLog
   console and the clock rate will be defaulted to the max rate supported by the cable
   type.  You may also see a "bestfit" Alert posted as well.
*/

Router(config-if-serial)# clock rate bps
/* For a DTE interface (optional) - The DTE clock rate threshold specifies the minimum
   Rx clock rate that will be accepted for the interface.  If the Rx clock rate is less
```

```
   than the configured threshold, the interface state will be down and a Rx Clock alarm
   will be posted.  The alarm will clear after the Rx Clock rate increases at or above
   the threshold.

   Default value is 0 which implies disabled.  Default config is not displayed.

   The no form of this command or setting the bps rate to 0 removes the clock rate
   threshold that has been set.

   Note: Keep in mind that due to hardware, cables, and thermal variations the Rx Clock
   Rate may be slightly less than the configured Tx clock rate on the peer DCE
   device.  That being the case, the Rx clock rate threshold should be configured
   slightly less than the peer DCE Tx clock rate.
*/

Router(config-if-serial)# clock rate threshold bps
/* Invert the transmit clock signal. When the RS-232 interface is a DTE, the invert
   Tx Clock command inverts the TxC signal the DTE receives from the remote DCE. When
   the RS-232 interface is a DCE, the invert txclock command inverts the clock signal to
   the remote DTE port.

   The no form of this command changes the clock signal back to its original state.

   Systems that use long cables or cables that are not transmitting the TxC (clock)
   signal might experience high error rates when operating at higher transmission
   speeds.  If a Serial port is reporting a high number of error packets, a phase shift
   might be the problem; inverting the clock might correct this phase shift.
*/

Router(config-if-serial)# invert txclock
/* Invert the data signal.

   The no form of this command disables the inversion of the data signal.
*/

Router(config-if-serial)# invert data

/* When the interface is operating as a DCE and the DTE provides terminal timing (SCTE or
   TT), you can configure the DCE to use SCTE from the DTE. When running the line at high
   speeds and long distances, this strategy prevents phase shifting of the data with
   respect to the clock.  If Serial Clock Transmit External (SCTE) terminal timing is not
   available from the DTE, use the no form of this command; the DCE will use its own
   clock instead of SCTE from the DTE.
*/

Router(config-if-serial)# dce-terminal-timing-enable
```

To verify the applied clock rate (DCE) or detected clock rate (DTE), use the show controller command. Valid clock rates are any configurable value between the cable type min and max however the standard rates below are supported base rates that will avoid “bestfit” rounding for the hardware.

Note

- Standard Clock rates supported for RS-232: 1.2K, 2.4K, 4.8K, 9.6K, 14.4K, 19.2K, 28.8K, 32K, 38.4K, 56K, 64K, and 128K.
- Standard Clock rates supported for RS-530, RS-530A, RS-449, V.35: 1.2K, 2.4K, 4.8K, 9.6K, 14.4K, 19.2K, 28.8K, 32K, 38.4K, 56K, 64K, 72K, 115.2K, 2.048M, 2.341M, 2.731M, 3.277M, 4.09M, 5.461M, and 8.064M.
- Standard Clock rates supported for X.21: 1.2K, 2.4K, 4.8K, 9.6K, 14.4K, 19.2K, 28.8K, 32K, 38.4K, 56K, 64K, 72K, 115.2K, and 2.016M.

-

Configuring Framing and Encoding Options

For the serial interface there are several options available to control framing and encoding. Use the following commands when configuring these options:

```
/* Enter the global configuration mode */
Router# configure terminal

/* Select the 4xT 12in1 Serial interface to configure and enters interface configuration
mode. rack/slot/subslot/port—Specifies the location of the 4xT 12in1 Serial interface SPA
 port.*/
Router(config)# interface serial rack/slot/subslot/port


/* Enter serial interface configuration sub-mode */
Router(config-if)# serial

/* Define the CRC type attached to the L2 frame (16-bit or 32-bit).  The default is CRC
16.*/
Router(config-if-serial)# crc <16 | 32>

/* NRZ and NRZI are line-coding formats that are required for serial connections in some
environments. The default configuration for all serial interfaces is NRZ format (no
nrzi-encoding).
*/
Router(config-if-serial)# nrzi-encoding

/* The flags option sends hdlc flag (0x7E) characters between frames.  The marks option
sends mark characters (0xFF) between frames. The default is flags.*/
Router(config-if-serial)# idle-character <flags | mark>

/* The configurable value specifies the number of HDLC flag sequences (idle characters)
that you can insert between the frames. The maximum number of flags for the 4xT 12in1
interface is 15. Default is 0 (disabled).*/

Router(config-if-serial)# transmit-delay <0-15>
```

Configuring Interface Signal Control Options

For the 4xT 12-in-1 serial interface, there are several options available to control handling of the various interface signals to and from the modem/CSU/DSU. Use the following commands when configuring these options:

```
/* Enter the global configuration mode */
```

```
Router# configure terminal

/* Select the 4xT 12in1 Serial interface to configure and enters interface configuration
mode.
  rack/slot/subslot/port—Specifies the location of the 4xT 12in1 Serial interface SPA
port.*/
Router(config)# interface serial rack/slot/subslot/port


/* Enter serial interface configuration sub-mode */
Router(config-if)# serial

/* The restart delay value specified in seconds. The restart-delay defaults to 60 seconds
if not configured.
The restart-delay specifies the amount of time that the router waits before trying to bring
 up a serial interface when it goes down.

When the interface connection with the peer device is down, the router resets the hardware
 each time the serial restart timer expires.  This command is often used with the dial
backup feature and with the pulse-time command, which sets the amount of time  to wait
before redialing when a DTR dialed device fails to connect.

When the restart-delay is set to 0, the hardware is not reset when it goes down. In this
way, if the interface is used to answer a call, it does not cause DTR to drop, which can
cause a communications device to disconnect. */

Router(config-if-serial)# restart-delay <0-900>

/* To enable pulsing data terminal ready (DTR) signal intervals on the serial interfaces,
use the pulse-time command in interface configuration mode. Default value is 0 second
(disabled).

When the serial line protocol goes down (for example, because of loss of synchronization),
 the interface hardware is reset and the DTR signal is held inactive
for at least the specified pulse-time interval. This function is useful for handling
encrypting or other similar devices that use the toggling of the DTR signal to resynchronize.


   If restart-delay is manually configured to 0 (disabled) and pulse-time is enabled,
   restart-delay will be set to 60 seconds behind the scenes as restart-delay is needed
   when using pulse-time.  This override will not appear in the running config.
*/

Router(config-if-serial)# pulse-time <<0-60 sec> | msec 0-60000>>

/* Time to wait for the router to be notified of interface state changes (i.e. debounce).

   If a link goes down and comes back up before the carrier delay timer expires, the down
   state is effectively filtered, and the rest of the software on the router is not aware
   that a link-down event occurred. Therefore, a large carrier delay timer results in
   fewer link-up/link-down events being detected. Setting the carrier delay time to 0
   (default) means that every link-up/link-down event is detected.

   Triggers for carrier-delay include a LOS (Loss of Signal) or Rx Clock Threshold alarm.
*/

Router(config-if-serial)# carrier-delay <<0-60 sec> | msec 0-1000>>

/* The ignore dcd option ignores data carrier detect signal (dcd) on the DTE
   interface.  The ignore dcd dsr option ignores both dcd and data set ready signal (dsr)
   on DTE interface.*/

Router(config-if-serial)# ignore <dcd | dcd dsr>
```

Note The acronyms are defined as follows: RTS (Request to Send); CTS (Clear To Send); DTR (Data Transmit Ready); DCD (Data Carrier Detect); DSR (Data Set Ready).

Frame-Relay Configuration Guidelines

For FRF.12, note the following:

- The fragmentation is configured at the main interface.
- Any fragmentation size is available.
- FRF.12 is not supported with 4xT 12-in-1 Serial Interface SPA on Cisco ASR9000 SIP.

For information on configuring FRF.12 on the Cisco SIP, see: https://www.cisco.com/c/en/us/td/docs/routers/asr9000/software/asr9k_r5-1/interfaces/configuration/guide/hc51xasr9kbook/hc51fram.html.

For LFI that uses FRF.12, note the following:

- The fragmentation is configured at the main interface.
- Any fragmentation size is available.

Note FRF.12 LFI is not supported with 4xT 12in1 Serial Interface SPA on Cisco ASR9000 SIP-400.

Verifying the Configuration

After configuring the new interface, use the show commands to display the status of the new interface or all interfaces, and use the ping and loopback commands to check connectivity.

Show Commands

The table below explains the show commands you can use to verify the operation of the 4xT 12in1 Serial Interface SPA. Sample displays of the output of selected show commands appear in the section that follows.

Note The outputs that appear in this document may not match the output you receive when you run these commands. The outputs in this document are only examples.

Command	Purpose

`Router# show version`
`or`
`Router# show hardware`
	Displays system hardware configuration, the number of each interface type installed, Cisco IOS software version, names and sources of configuration files, and boot images.

`Router# show controllers serial` `Router# show controllers serial-T`	Displays serial line statistics.

Command	Purpose
`Router# show diag [detail | summary ]`	Displays all the hardware in the box, such as serial number.
`Router# show interfaces type rack/slot/subslot/port`	Displays status information about a specific type of interface (for example, serial) in a Cisco ASR9000 series router.
`Router# show protocols`	Displays protocols configured for the entire system and for specific interfaces.
`Router# show running-config`	Displays the running configuration file.
`Router# show inventory`	Displays the available hardware in the box, such as serial numbers of the cards.

Verification Examples

Show version example

The following is an example of a show version command with the 4xT 12-in-1 Serial Interface SPA. The show hardware command may also be used to obtain the same information:

```
RP/0/RSP0/CPU0:ASR9K-AG03-1#show version
Wed Mar 14 13:55:10.228 edt

Cisco IOS XR Software, Version 6.4.1.30I[Default]
Copyright (c) 2018 by Cisco Systems, Inc.

ROM: System Bootstrap, Version 0.76(c) 1994-2012 by Cisco Systems,  Inc.

ASR9K-AG03-1 uptime is 5 weeks, 6 days, 23 hours, 6 minutes
System image file is "disk0:asr9k-os-mbi-6.4.1.30I/0x100305/mbiasr9k-rsp3.vm"

cisco ASR9K Series (Intel 686 F6M14S4) processor with 6291456K bytes of memory.
Intel 686 F6M14S4 processor at 2126MHz, Revision 2.174
ASR 9006 4 Line Card Slot Chassis with V1 AC PEM

2 Management Ethernet
1 FastEthernet
20 GigabitEthernet
4 TenGigE
4 DWDM controller(s)
4 WANPHY controller(s)
4 Serial-T 12in1 controller
4 Serial network interface(s)
2 T3
2 Serial network interface(s)
503k bytes of non-volatile configuration memory.
6143M bytes of hard disk.
11817968k bytes of disk0: (Sector size 512 bytes).
11817968k bytes of disk1: (Sector size 512 bytes).

Configuration register on node 0/RSP0/CPU0 is 0x102
Boot device on node 0/RSP0/CPU0 is disk0:
Package active on node 0/RSP0/CPU0:
asr9k-fpd, V 6.4.1.30I[Default], Cisco Systems, at disk0:asr9k-fpd-6.4.1.30I
    Built on Wed Jan 10 23:21:36 edt 2018
   By iox-lnx-076 in /auto/iox-lnx-076-san2/production/6.4.1.30I.SIT_IMAGE/asr9k-px/workspace
```

```
 for pie

asr9k-fpd-px, V 6.4.1.30I[Default], Cisco Systems, at disk0:asr9k-fpd-px-6.4.1.30I
    Built on Wed Jan 10 23:22:04 edt 2018
   By iox-lnx-076 in /auto/iox-lnx-076-san2/production/6.4.1.30I.SIT_IMAGE/asr9k-px/workspace
 for pie

iosxr-infra-6.4.1.30I.CSCvh71809, V 0.0.2.i[SMU], Cisco Systems, at
disk0:iosxr-infra-6.4.1.30I.CSCvh71809-0.0.2.i
    Built on Mon Jan 29 15:34:50 edt 2018
    By sjc-ads-8322 in /nobackup/SMU_BLD_WS/CSCvh71809.180129110940 for pie
```

Note Please be informed that this output is just an example and not a complete output.

Show running-config serial example

The following is an example of the show running-config serial command with the 4xT 12-in-1 Serial Interface SPA:

```
RP/0/RSP0/CPU0:ASR9K-AG03-1#show running-config interface serial *
Fri Mar 16 13:36:39.699 edt
interface Serial0/2/1/0
 description V.35 DCE SPA-4xT connection to ASR1002-AG03-1 Serial0/1/0 V.35 DTE
 bandwidth 2000
 mtu 2000
 ipv4 address 40.0.0.2 255.255.255.0
 serial
  crc 32
  clock rate 2000000
  pulse-time 20
  transmit-delay 7
  nrzi-encoding
  restart-delay 30
  idle-character marks
  invert-txclock
 !
!
interface Serial0/2/1/1
 description X.21 DTE SPA-4xT connection to ASR1002-AG03-1 Serial0/1/1 X.21 DCE
 bandwidth 2016
 ipv4 address 40.1.0.2 255.255.255.0
 encapsulation hdlc
 serial
  clock rate threshold 2000000
 !
!
interface Serial0/2/1/2
 description RS-232 DCE SPA-4xT connection to ASR1002-AG03-1 Serial0/1/2 RS-232 DTE
 bandwidth 128
 ipv4 address 40.2.0.2 255.255.255.0
 encapsulation hdlc
 serial
  clock rate 128000
 !
!
interface Serial0/2/1/3
 description V.35 DTE SPA-4xT connection to ASR1002-AG03-1 Serial0/1/3 V.35 DCE
 bandwidth 8064
 ipv4 address 40.3.0.2 255.255.255.0
 encapsulation hdlc
```

```
 serial
  clock rate threshold 8000000
 !
!
```

Note You can also use the show interfaces serial and the show controllers serial commands to get detailed information on a per-port basis for your 4xT 12-in-1 Serial.

Show controllers serial-T example

The following is an example of the show controllers serial-T command with the 4xT 12-in-1 Serial Interface SPA.

- This command displays a combination of the interface/controller configuration, alarm status, modem signal status, and packet Rx/Tx counters.
- The format and contents of the show controller output might differ based on the cable or interface type (i.e. DCE vs. DTE.)
- Use of the '*" as in "show controller serial-t *" displays the data for ALL Serial-T controllers .
- You can clear the Rx and Tx counters by using the clear counters Serial-T <r/s/b/p> command. The short name Serial works with this command as well. Clearing these counters via "clear counters Serial-T…" does not affect show interface counts. They must be cleared via "clear counter".
- The system generates the following alarms for the 4xT 12in1 Serial interface:
  - LOS (Loss of Signal) implies that DSR, CTS, DCD are not being received from the DCE or DTR, RTS is not being seen from the DTE.
  - Rx Clock Threshold implies that the clock rate received from the DCE is less than the configured (minimum) Clock Rate Threshold. This is a DTE only alarm.

  If either of these alarms are active, they can be seen via the Alarms: line in the show command output.
- The system displays the state of the individual modem signals via the RTS/CTS/DTR/DSR/DCD/LL line.
- The system displays several clock rate related entries.
  - DCE
    - Clock Rate (configured) – This is the user configured (or default) Tx Clock Rate. Default clock rate is 2016000 bps.
    - Bestfit Clock Rate (Calculated) – This is what software has determined as the bestfit clock rate for the hardware based on the user configured (or default) value. Note that if there is a mis-match between the configured clock rate and the max clock rate allowed by the cable type, bestfit will also indicate the rate adjusted due to cable type.
    - Transmit Clock Rate (Hardware) – This is the clock rate programmed into the hardware. This should match the Bestfit Clock Rate.
  - DTE

- Clock Rate Threshold (Configured) – This is the minimum Receive Clock Rate that must be received before the interface will be enabled. If ZERO, the threshold check is ignored.
- Receive Clock Rate (Hardware) – This is the Rx clock rate as seen by the DTE. This is also the Tx clock rate to the DCE (i.e. DCE provides the clock source).

- DTE and DCE
  - Transmit Data Rate (Queuing Effective Bandwidth) – This is the interface bandwidth as indicated by the "interface bandwidth" user configuration. Default is 8,064,000 bps if not configured by the user. Ideally this should match the DCE Bestfit Clock Rate or the DTE Receive Clock Rate.

```
DCE Example:

RP/0/RSP0/CPU0:ASR9K-AG03-1# show controller Serial0/2/1/2
Tue Sep 19 15:06:06.736 edt

Serial-T 0/2/1/2 is up
 Alarms: No alarms detected
 Port Name: Serial-T 0/2/1/2
 Cable Type:            RS-232 DCE
 Encapsulation:         HDLC (14)
 Loopback:              disabled
 MTU:                   1504
 CRC Mode:              CRC16
 NRZI Mode:             NRZ
 Idle Character:        flags
 Invert Data:           disabled
 Invert Transmit Clock: disabled
 Tx Delay:              0 (flags)
 Restart Delay:         60000 msec
 Pulse Time:            0 msec
 Carrier Delay:         0 msec
 DCE Terminal Timing:   disabled
 Clock Rate:            128000 bps (Configured)
 Bestfit Clock Rate:    128000 bps (Calculated)
 Transmit Clock Rate:   128000 bps (Hardware)
 Transmit Data Rate:    128000 bps (Queuing Effective Bandwidth)
 RTS Up, CTS Up, DTR Up, DSR Up, DCD Up, LL Down
 Rx CRC Errors:    0, Rx MTU Errors:    0, Rx Runts:    0, Rx Drops:    0
 Rx Aborts:        0, Rx Packets:     186, Rx Bytes:     4464
 Tx Aborts:        0, Tx Packets:     185, Tx Bytes:     4062

DTE Example:

RP/0/RSP0/CPU0:ASR9K-AG03-1# show controller Serial0/2/1/3
Tue Sep 19 15:06:11.379 edt

Serial-T 0/2/1/3 is up
 Alarms: No alarms detected
 Port Name: Serial-T 0/2/1/3
 Cable Type:            V.35 DTE
 Encapsulation:         HDLC (14)
 Loopback:              disabled
 MTU:                   1504
 CRC Mode:              CRC16
 NRZI Mode:             NRZ
 Idle Character:        flags
 Invert Data:           disabled
 Invert Transmit Clock: disabled
```

```
 Tx Delay:              0 (flags)
 Restart Delay:         60000 msec
 Pulse Time:            0 msec
 Carrier Delay:         40000 msec
 Ignore Signals:        disabled
 Clock Rate Threshold:  8000000 bps (Configured)
 Receive Clock Rate:    8063815 bps (Hardware)
 Transmit Data Rate:    8064000 bps (Queuing Effective Bandwidth)
 RTS Up, CTS Up, DTR Up, DSR Up, DCD Up, LL Down
 Rx CRC Errors:    0, Rx MTU Errors:    0, Rx Runts:    0, Rx Drops:    0
 Rx Aborts:        0, Rx Packets:     189, Rx Bytes:     4500
 Tx Aborts:        0, Tx Packets:     189, Tx Bytes:     4138
```

Note The acronyms are defined as follows: RTS (Request to Send); CTS (Clear To Send); DTR (Data Transmit Ready); DCD (Data Carrier Detect); DSR (Data Set Ready).

The following is an example of the show interfaces serial command with the 4xT 12-in-1 Serial Interface SPA:

- If you configure the interface bandwidth, it will appear in the BW <rate> Kbit section of show interface.
- If you configure loopback on the Serial interface or at the peer device, the system indicates loopback status in the line protocol section of show interface provided keepalives are enabled. If keepalives are disabled, the protocol has no way of detecting the loopback condition.

```
RP/0/RSP0/CPU0:ASR9K-AG03-1#show interface Serial0/2/1/3
Tue Sep 19 14:36:12.452 edt
Serial0/2/1/3 is up, line protocol is up
  Interface state transitions: 2
  Hardware is Serial network interface(s)
  Description: V.35 DTE SPA-4xT connection to ASR1002-AG03-1 Serial0/1/3 V.35 DCE
  Internet address is 40.3.0.2/24
  MTU 1504 bytes, BW 8064 Kbit (Max: 8064 Kbit)
     reliability 255/255, txload 0/255, rxload 0/255
  Encapsulation HDLC, crc 16, keepalive set (10 sec)
  Last link flapped 00:00:52
  Scrambling is disabled,  Invert data is disabled
  Last input 00:00:03, output 00:00:03
  Last clearing of "show interface" counters never
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     6 packets input, 144 bytes, 0 total input drops
     0 drops for unrecognized upper-level protocol
     Received 0 runts, 0 giants, 0 throttles, 0 parity
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     7 packets output, 146 bytes, 0 total output drops
     0 output errors, 0 underruns, 0 applique, 0 resets
     0 output buffer failures, 0 output buffers swapped out
```

The following are examples of the show platform command with the 4xT 12in1 Serial Interface SPA:

```
RP/0/RSP0/CPU0:ASR9K-AG03-1#show platform
Tue Sep 19 14:47:22.312 edt
Node  Type    State     Config State
--------------------------------------------------------------------------------
0/RSP0/CPU0     A9K-RSP440-TR(Active)     IOS XR RUN       PWR,NSHUT,MON
0/0/CPU0        A9K-MOD80-TR              IOS XR RUN       PWR,NSHUT,MON
0/0/0           A9K-MPA-4X10GE            OK               PWR,NSHUT,MON
```

```
0/0/1           A9K-MPA-20X1GE            OK               PWR,NSHUT,MON
0/2/CPU0        A9K-SIP-700               IOS XR RUN       PWR,NSHUT,MON
0/2/1           SPA-4XT-SERIAL            OK               PWR,NSHUT,MON
0/2/3           SPA-2XT3/E3               OK               PWR,NSHUT,MON
```

show diag [detail | summary] example

The following are examples of the show diag [detail | summary] command with the 4xT 12in1 Serial Interface SPA:

```
RP/0/RSP0/CPU0:ASR9K-AG03-1# show diag detail
<snip…>
SPA 0/2/1 : 4-port 12in1 Serial Shared Port Adapter

  MAIN:  board type 055a
         68-4305-02 rev D0
         dev N/A
         S/N SAL204705BA
  PCA:   73-13702-02 rev C0
  PID:   SPA-4XT-SERIAL
  VID:   V05
  CLEI:  IPUIA0BRAE
  Board State : OK
  FPD Software Revision:

RP/0/RSP0/CPU0:ASR9K-AG03-1# show diag summary
Tue Sep 19 14:49:09.052 edt

NODE module 0/RSP0/CPU0  ASR9K Route Switch Processor with 440G/slot Fabric and 6GB

NODE module 0/0/CPU0  80G Modular Linecard, Packet Transport Optimized

MPA 0/0/0 : ASR 9000 4-port 10GE Modular Port Adapter

NODE module 0/2/CPU0  Cisco ASR 9000 Series SPA Interface Processor-700

SPA 0/2/1 : 4-port 12in1 Serial Shared Port Adapter

SPA 0/2/3 : 2-port T3/E3 Serial Shared Port Adapter
```

show inventory example

The following are examples of the show inventory command with the 4xT 12-in-1 Serial Interface SPA:

```
RP/0/RSP0/CPU0:ASR9K-AG03-1# show inventory location 0/2/1
Tue Sep 19 14:51:58.871 edt
NAME: "module 0/2/1", DESCR: "4-port 12in1 Serial Shared Port Adapter"
PID: SPA-4XT-SERIAL, VID: V05, SN: SAL204705BA
```

Clear Commands

The following commands may be used to clear the various statistics counters displayed via the show commands:

- **clearing interface counters** - The interface counts displayed via show interface are cleared via the clear counters CLI. This command does not affect the Serial-T controller counters.
- clearing Serial-T controller counts - The Rx and Tx counters displayed via show controller Serial-t can be cleared using the following commands. This command does not affect the show interface counters.

  clear counters Serial-t <rack/slot/bay/port>

  clear controller Serial-t <rack/slot/bay/port>

Using the Ping Command to Verify Network Connectivity

Using the ping command, you can verify that an interface port is functioning properly. This section provides a brief description of this command.

The ping command sends echo request packets out to a remote device at an IP address that you specify. After sending an echo request, the system waits a specified time for the remote device to reply. Each echo reply is displayed as an exclamation point (!) on the console terminal; each request that is not returned before the specified timeout is displayed as a period (.). A series of exclamation points (!!!!!) indicates a good connection; a series of periods (.....) or the messages [timed out] or [failed] indicate a bad connection or an over sub-scribed interface.

Following is an example of a successful ping command to a remote server with the address 10.0.0.10:

```
Router# ping 10.0.0.10
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echoes to 10.0.0.10, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 1/15/64 ms
Router#
```

If the connection fails, verify that you have the correct IP address for the destination and that the device is active (powered on), and repeat the ping command.

The loopback commands helps you to finish checking network connectivity.

Using the Loopback Commands

With the loopback test, you can detect and isolate equipment malfunctions by testing the connection between the 4xT 12in1 Serial Interface SPA and a remote device such as a modem or a channel service unit (CSU) or a data service unit (DSU). The loopback command places an interface in loopback mode, which enables test packets that are generated from the ping command to loop through a remote device or Smart Serial cable. If the packets complete the loop, the connection is good. If not, you can isolate a fault to the remote device or Smart Serial cable in the path of the loopback test.

Note You must configure a clock rate on the port before performing a loopback test. However, if no cable is attached to the port, the port is administratively up, and the port is in loopback mode; you do not have to configure a clock rate on the port before performing a loopback test.

Depending on the mode of the port, issuing the loopback command checks the following path:

- When no Smart Serial cable is attached to the 4xT 12in1 Serial Interface SPA port, or if a data circuit-terminating equipment (DCE) cable is attached to a port that is configured as line protocol up, the loopback command tests the path between the network processing engine and the interface port only (without leaving the network processing engine and port adapter).
- When a data terminal equipment (DTE) cable is attached to the port, the loopback command tests the path between the network processing engine and the near (network processing engine) side of the DSU or modem to test the 4xT 12in1 Serial Interface SPA and Smart Serial cable. (The X.21 DTE interface cable does not support this loopback test; see the following Note.)

Note The X.21 interface definition does not include a loopback definition. On the 4xT 12in1 Serial Interface SPA port adapter, the X.21 DTE interface does not support the loopback function. Because of the internal clock signal present on the 4xT 12in1 Serial Interface SPAs, loopback will function on an X.21 DCE interface.

If loopback is configured on the Serial interface or at the peer device, loopback status will be indicated in the line protocol section of show interface provided keepalives are enabled. If keepalives are disabled, the protocol has no way of detecting the loopback condition.