



Network Interface and Service Circuit Cards

VCO/4K systems have 15 slots available for network interface (ICC with ICC I/O and D+I with D+I I/O, SLIC, and LTC8) and service circuit cards (SPC with SRM, IPRC8, IPRC64, IPRC128, DTG, and SSC). Network interface cards (also known as port interface cards) require I/O Modules to connect to network interface cables.

The population rules for network and service circuit cards are as follows:

- Maximum number of cards is 15.
- Network interface and service circuit cards must be installed in slots 7 through 21. Slots 1 through 6 are reserved for the control circuit cards.
- I/O Modules for the port interface cards must be installed in slots 7 through 21 of the I/O Module rack at the back of the system. Slots 3 through 6 are reserved for the Storage/Control I/O Modules. Slots 1 and 2 are used for receiving BITS clock timing. (The BITS Clock Adapter Kit is required for BITS clock timing.)



Note

The instructions in this chapter require that you have determined the number of DS0 network channels and DS0 service circuit channels that you need. Traffic engineering processes and procedures determine these numbers for your installation. Appendix A, “Service Circuit Channel Requirements,” provides an overview of this process.

Interface Cards and I/O Modules

This section briefly describes each ICC interface card and I/O Module available for the VCO/4K system. For more information on the cards described in this section, refer to the *Cisco VCO/4K Card Technical Descriptions*.

Port Interface Cards

The digital port interface cards are the following:

- *Interface Controller Card (ICC) with T1 I/O Module*—Supports 4, 8, or 16 DS1 level network interface spans (depending on I/O Module).
- *Interface Controller Card (ICC) with E1 I/O Module*—Supports 4, 8, or 16 DS1 level network interface spans (depending on I/O Module).

Table 2-1 is the configuration table for the interface cards.

Table 2-1 Digital Trunk Interface Card Configuration Table

Digital Trunk Types	Type of Card	Max DS1 Spans per Card	I/O Cards Needed	Total DS1 Spans ¹ (or DS1 resources)
Interface Controller Card with T1 I/O Module	ICC-16 Span T1 I/O Module	16		
Interface Controller Card with T1 I/O Module	ICC-8 Span T1 I/O Module	8		
Interface Controller Card with T1 I/O Module	ICC-4 Span T1 I/O Module	4		
Interface Controller Card with E1 I/O Module	ICC-16 Span E1 I/O Module	16		
Interface Controller Card with E1 I/O Module	ICC-8 Span E1 I/O Module	8		
Interface Controller Card with E1 I/O Module	ICC-4 Span E1 I/O Module	4		
Total I/O Cards Needed				

1. Total Number of DS1 Resources added to the VCO/4K database (worst case) = ((Number of 16xT1 I/O cards) x 16) + ((Number of 8xT1 I/O cards) x 8) + ... ((Number of nxT1 I/O cards) x n).

To calculate the number of network interface cards required for your application, complete the steps in the following sections.

ICC with T1 I/O Module

Step 1 Divide the number of required DS0 network channels by 24 to calculate the number of DS1 spans required. Round up any fraction to the next whole number. Use the following formula:

$$\text{DS0 Network Channels} \div 24 = \text{No. of Spans}$$

Step 2 Divide the number of spans by 16 to establish the number of 16 Span I/O cards. (You can substitute a Four Span or Eight Span I/O Module.) Round up any fraction to the next whole number. Use the following formula:

$$\text{No. of spans} \div 16 = \text{No. of 16 Span I/O Cards}$$

ICC with E1 I/O Module

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- Step 1** Divide the number of required DS0 network channels by 30 to calculate the number of spans required. Round up any fraction to the next whole number.
- $$\text{DS0 Network Channels} \div 30 = \text{No. of Spans}$$
- Step 2** Divide the number of spans by 16 to establish the number of 16 Span I/O cards. (You can substitute a Four Span or Eight Span I/O Module.) Round up any fraction to the next whole number.
- $$\text{No. of spans} \div 16 = \text{No. of 16 Span I/O Cards}$$
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Drop and Insert (D+I) Card and I/O Module

One D+I card with one I/O module can support eight 56-kbps or 64-kbps SS7 data circuits. Use two D+I cards with two I/O modules to provide redundancy.



Note

No more than two D+I cards are needed in a system because the VCO/4K SS7 Subsystem can support only 16 SS7 data connections (or 8 redundant connections) to the STP.

Service Circuit Cards

The following service circuit cards are available:

- *Integrated Prompt/Record Card (IPRC)*—Plays and records digitized voice prompt information. The following versions of the IPRC card are available:

Card Name	Number of service circuit channels to play pre-recorded voice information to the network
IPRC84	8
IPRC64	64
IPRC128	128

All channels can operate at the same time.

- *Subrate Switch Card (SSC)*—Allows the system to switch voice and data calls at $N \times 8$ kbps rates (where N equals the number of service circuit channels), improving trunk efficiency up to eight times by packing eight subrate channels within a traditional 64-kbps channel. The SSC enables the VCO/4K to be used as Base Station Controllers (BSCs) in wireless telephone networks or other networks that carry compressed audio.

- *Service Platform Card (SPC) with Service Resource Module (SRM) daughter cards with 8 DSPs per SRM*—Provides a flexible platform for software-controlled services including: DTMF generation and reception; call progress analysis (tone reception); conferencing; MF and MFCR2 reception, (DT).
- *DTG-2*—DTMF, and static tone generation.
- *SPC-TONE*—DTMF, and static tone generation.

Appendix A, “Service Circuit Channel Requirements,” contains some guidelines for determining the type and number of service circuit channels required for your application.

Table 2-2 Service Circuit Card Configuration Table

Card Maintenance Screen Name (Resource Name)	Function	Max Number of Service Circuits per Resource	Total Number of Service Circuits Needed (From Appendix A) Divided by the Max Number of Service Circuits per Resource	Total Resources Needed (Round to Next Whole Number)
Tone Generator (DTG-2 or SPC-TONE)	Static tone generation and outpulses DTMF, MF, or MFCR2 digits ¹	63		2 ²
SPC-OUTPL	Outpulses DTMF, MF, or MFCR2 digits	63		
SPC-DTMF	Collects DTMF digits	32		
SPC-MFR1 ³	Collects MF digits	32		
SPC-MFR2	Collects MFCR2 digits	24		
8 Port Prompt/Record	Plays pre-recorded voice messages to the network	8		
64 Port Prompt/Record		64		
128 Port Prompt/Record		128		
Subrate Switch Card		varies ⁴		

1. You can use SPC-OUTPL for outpulsing digits and the tone generator solely for generating static tones.
2. Two tone generator resources are needed for redundant systems but you then have only 63 maximum circuit ports, not 128.
3. Displays as SPC-MFRC.
4. Allocated by the system in increments of 8, depending how you first configure the Subrate Configuration screen. All increments allocated fall within the “licensed time slot pool,” not the “free time slot pool.” See the *Cisco VCO/4K System Administrator’s Guide* to help you determine the working number you need to use.

Calculating Required Resources

DTG-2 or SPC-TONE

Every system requires one DTG-2 card. You must have two DTG-2 cards or one SPC-TONE for redundant systems.

SRMs and SPC

Calculate the number of SRMs required using the following formula:

Minimum Number of SRMs = (Total number of SPC=OUTPL, SPC-DTMF, SPC-MFR1, and SPC-MFCR2 resources) ÷ 8

Round up to the next whole number.

Calculate the number of SPCs required using the following formula:

Minimum Number of SPCs = (Minimum number of SRMs) ÷ 4

Round up to the next whole number.

To provide for card redundancy, multiply the minimum number of SRMs by 2 and multiply the minimum number of SPCs by 2.



Note

Distribute the SRMs evenly over the SPCs.

IPRC Cards

Obtain the total number of Port Prompt/Record resources needed from Table 2-2.

Calculate the minimum number of IPRC cards required based on card capacity (128, 64, or 8) and the total number of resources needed.

To provide for card redundancy, multiply the minimum number of IPRCs by 2.



Note

The total number of IPRC cards (of any type) cannot exceed 8 for redundant systems (4 for nonredundant systems).

SSC Cards

You will need one SSC card; two for redundancy.

Licensed Time Slot Capacity Assessment

The total number of licensed time slots (channels) cannot exceed 3960 (4088 total channels – 128 channels reserved for the DTG-2).

With the exception of the SPCs providing DTMF, CPA, and MF services, each channel on the VCO/4K must have a licensed time slot allocated to it in order to operate. Time slots are allocated to channels when resources (network interface spans and service circuit resources) are added to the system database and are not deallocated until these resources are removed. Time slot allocation associated with the spans and resources are shown in Table 2-3.

Table 2-3 Time Slot Allocation

Hardware Name (for reference)	Resource Name Displayed on the Card Maintenance Screen	Licensed Time Slots per Resource Name Used
DTG-2	Tone Generator	128 ^{1 2}
IIRC8	8 Port Prompt/Record	008
IIRC64	64 Port Prompt/Record	064
IIRC128	128 Port Prompt/Record	128
SSC	Subrate Switch Card	varies/ programmable ³
D+I	Drop and Insert Card	008
ICC	ICC-T1	024
ICC	ICC-E1	032
LTC-8	8-Line Test Card	008
ICC	ICC-T1 PRI/NI2	024
ICC	ICC-T1 PRI/5ESS	024
ICC	ICC-T1 PRI/4ESS	024
ICC	ICC-T1 PRI/NTI	024
ICC	ICC-T1 PRI/NTT	024
ICC	ICC-E1 PRI/NET5	032
ICC	ICC-E1 PRI/QSIG	032
ICC	ICC-E1 PRI/TS014	032
SPC	SPC-DTMF	none ⁴
SPC	SPC-CPA	none ⁴
SPC	SPC-MFR1	none ^{4 5}
SPC	SPC-MFCR2	024
SPC	SPC-OUTP	064
SPC	SPC-CONF	032
—	virtual ports	none ^{4 6}
SPC-TONE	SPC-TONE	64

- Whether one or two DTG-2 cards are active, only 128 ports will be allocated by the system.
- All resources listed below the DTG-2 card in this table, and which fall within the “licensed time slot pool”, can be added to the system provided that the total number of time slots added does not exceed 3960.
- Allocated by the system in increments of 8, depending how you first configure the Subrate Configuration screen. All increments allocated fall within the “licensed time slot pool”, not the “free time slot pool”.
- The resource indicated uses time slots from the “free time slot pool”, not the “licensed time-slot pool”.
- SPC-MFR1 is displayed to the user as SPC-MFRC.
- Virtual ports are an integral part of the system but are not displayed from the Card Maintenance screen nor can the user allocate them. Virtual ports can be viewed from the Diagnostic menu / Port Display screen.

Calculating Needed Licensed Time Slots

Calculate the number of licensed time slots you need using this formula:

$$\begin{aligned} \text{Licensed Time Slots Needed } (\leq 3960) = & \\ & ((\text{No. of Resources of type 1}) \times (\text{licensed time slots used per that resource})) \\ & +((\text{No. of Resources of type 2}) \times (\text{licensed time slots used per that resource})) \\ & \cdot \\ & \cdot \\ & \cdot \\ & +((\text{No. of Resources of type n}) \times (\text{licensed time slots used per that resource})) \end{aligned}$$

Assessing Resource Capacity

The system permits no more than 240 resource IDs (0 to 239) in total.

A resource ID is assigned to every resource added to the database from the Card Maintenance screen. A single-span card is assigned a single ID, a multispan card is assigned an ID for each span. For example: a 4xT1 would be assigned four IDs, an ICC card with 16 spans would be assigned 16 IDs. An SPC card is assigned an ID for each DSP configured. Therefore, an SPC card with a full complement of SRMs and DSPs would be assigned 32 IDs (4 SRMs x 8 DSPs/SRM). All resources require a resource ID, but not all resources added to a VCO/4K take up licensed resource time slots. SPC-DTMF, SPC-MF, and SPC-CPA resources do not draw from the licensed resource time slot pool, but rather draw from the nonlicensed time slot pool.

The number of IDs assigned can become an issue if, for example, a system needs to be configured with 160 T1s (that is, 160 IDs) and it also needs 12 SRMs (configured for DTMF, MF, and CPA and that is 96 IDs). This results in a total of 256 IDs for these resources, and the system is then exhausted of IDs before all the resources can be added, because the total number of IDs cannot exceed 240.

In most system configurations, as resources are added which take up licensed time slots, the system will run out of licensed time slots (i.e., reach the licensed time slot limit of 3960) before the ID limit of 240 is reached.

DTMF, MF, and CPA do not take up licensed time slots but are nevertheless assigned resource IDs. Adding a large number of DTMF, MF, or CPA resources could result in a configuration where a system could run out of IDs before reaching the licensed time slot limit of 3960.

Once you have determined the number of network resources needed and service circuit resources needed, ensure that the total does not exceed 240.

Resources are listed by displayed name in Table 2-3.

