Memory Maps

This appendix presents memory maps for selected product platforms, processors, and interface cards. Memory map information is useful for technically qualified users who understand concepts of low-level operating systems, bus structures, and address mapping in computer systems.

When using this appendix, be aware of the distinct difference between program counter values and operand addresses. The addresses that appear in this appendix are operand values and should not be confused with program counter values.

Note All memory addresses are in hexadecimal unless otherwise noted.

Memory Maps and Troubleshooting

Memory map information can be useful when you are determining whether a problem exists in the software or in the hardware. The system software can provide information about the reasons for a system crash. This information appears in the form of error messages issued by the ROM monitor when an exception is encountered.

This section consists of the following sections:

- Failure Types
- Error Addresses
- **show stacks** Command

Failure Types

When a system crashes, the ROM monitor reports a failure type. The failure type is important both in its own right and as a guide to interpreting the other information the system provides. Failure types are usually one of the following:

- Bus Error
- Address Error
- Watchdog Timeout
- Parity Error
- Emulator Trap

Bus Error

The system encounters a bus error when the processor tries to use a device or a memory location that either does not exist or does not respond properly. Bus errors typically indicate either a software bug or a hardware problem. The address the processor was trying to access when the system crashed provides a key as to whether the failure is due to software or hardware.

If the operand address is valid, the problem is probably in the hardware. The memory maps later in this chapter list addresses for selected hardware platforms.

Bus errors on an address not in the map usually indicate a software bug.

Address Error

Address errors occur when the software tries to access data on incorrectly aligned boundaries. For example, 2- and 4-byte accesses are allowed only on even addresses. An address error usually indicates a software bug.

Watchdog Timeout

Cisco processors have timers that guard against certain types of system hangs. The CPU periodically resets a watchdog timer. If the timer is not reset, a trap will occur. Failure to service the watchdog timer indicates either a hardware or a software bug.

Parity Error

Parity errors indicate that internal hardware error checks have failed. A parity failure is almost always due to a hardware problem. Use the memory maps later in this chapter to identify the affected hardware.

Emulator Trap

Emulator traps indicate that the processor has executed an illegal instruction. Emulator traps can be caused either by software taking illegal branches or by hardware failures, notably ROM failures.

Error Addresses

By observing the operand address, you can locate the general area of the router where the error occurred. Hardware problems can be inferred only from a bus error on a legal address, not from an emulator trap or illegal instruction trap. When looking at the bus error, the operand address—not the program counter address—provides the memory map location of the error.

show stacks Command

You can use the **show stacks** EXEC command to display data saved by the ROM monitor, which includes a failure type, an operand address, and a failure program counter. This data is overwritten when the system is reloaded, so you might want to check your configuration register settings and decide how you want to recover from system crashes. Stack traces can be used by qualified technical support representatives who have access to symbol tables, object files, and source code.

Figure B-1 shows an example of the **show stacks** output from a software failure. The message "Software forced crash" indicates that the software detected a condition it did not expect and from which it could not recover. A technical support representative can use the listed program counter as a trace to the code responsible for the failure.

Figure B-1 show stacks Command Output Showing the Software Program Counter Address

```
ROUTER> show stacks

Minimum process stacks:
Free/Size  Name
 972/1000  env delay init
 866/1000  Router Init
 556/1000  Init
 638/1000  RSRB Connector
1230/2000  Virtual Exec

Interrupt level stacks:
Level    Called Free/Size  Name
  1      306611  952/1000  env-flash
  3    22294573  496/1000  Multiport Communications Interfaces
  5        2986  968/1000  Console UART

System was restarted by error - Software forced crash, PC 0x4854E
GS Software (GS3-K), Version 9.1(4) [fc1], SOFTWARE
Compiled Thu 25-Mar-93 09:49 by daveu
Stack trace from system failure:
FP: 0x2B0424, RA: 0x3B04
FP: 0x2B0458, RA: 0xF39C2
FP: 0x2B046C, RA: 0xF4566
FP: 0X2B0490, RA: 0x112F0
FP: 0x2B04B0, RA: 0x2560
```

program counter address

S2530

Figure B-2 shows output from a hardware error and includes an example of a hardware operand address that can be used with the memory maps in this appendix. The operand address points to the register space for MCI unit 0 and indicates a hardware or microcode problem with that unit.

Figure B-2 show stacks Command Output Showing the Hardware Address

```
Minimum process stacks:
Free/Size  Name
 970/1000  env delay init
 866/1000  Router Init
 554/1000  Init
1500/2000  Exec

Interrupt level stacks:
Level    Called Free/Size  Name
  1       16803  956/1000  env-flash
  3     4827380  772/1000  cBus Interfaces
  5        5627  968/1000  Console UART

System was restarted by bus error at PC 0x71EAE, address 0x210C008
GS Software (GS3-K), Version 9.1(5), RELEASE SOFTWARE
Compiled Wed 19-May-93 18:35 by daveu
Stack trace from system failure:
FP: 0x2B6BA0, RA: 0xF496
FP: 0x2B6BCC, RA: 0xABDFA
FP: 0x2B6C2C, RA: 0xABA2C
FP: 0x2B6C40, RA: 0xAB338
FP: 0x2B6C68, RA: 0x258C
```

Hardware address in the bus controller address space

S2531

Memory Maps

The following tables summarize memory map information for the various Cisco platforms:

- Table B-1 describes the Cisco 1000 memory map.
- Table B-2 describes the Cisco 2000 memory map.
- Table B-3 describes the Cisco 2500 memory map.
- Table B-4 describes the Cisco 3000 memory map.
- Table B-5 describes the memory map for the Cisco 3104 and Cisco 3204; Table B-6 describes the Cisco 3104 and Cisco 3204 memory map of onboard registers and chips.
- Table B-7 describes the Cisco 4000 memory map; Table B-8 describes the Cisco 4000 memory map of onboard resources.
- Table B-9 describes the Cisco 4500 memory map; Table B-10 describes the Cisco 4500 memory map of onboard resources.
- Table B-11 describes the Cisco 7000 memory map.
- Table B-12 describes the Cisco 7200 series (NPE-150) memory map for hardware.
- Table B-13 describes the Cisco 7200 series (NPE-150) memory map for software.
- Table B-14 describes the Cisco 500-CS memory map.
- Table B-15 describes the RP/Cisco 7000 series memory map.
- Table B-16 describes the Cisco RSP memory map.
- Table B-17 describes Multibus memory space assignment; Table B-18 describes Multibus I/O space assignment.
- Table B-19 describes the Cisco CSC/3 memory map.
- Table B-20 describes the Cisco CSC/4 memory map.
- Table B-21 describes the processor memory map for the Cisco CSC/2, CSC/3, CSC/4 cards, including the IGS and Cisco 3000.

Table B-1 Cisco 1000 Memory Map

Address	Size	Chip Select	Description
0000000 – 00FFFFF	1 MB	CS0	ROM
2000000 – 2FFFFFF	16 MB	CS1,2	DRAM up to 16 MB
6000000 – 600FFFF	64 Kb	CS6	PCMCIA I/O space
8000000 – 800FFFF	16 MB	CS5	PCMCIA/PC card attribute memory
8010000 – 8FFFFFF	16 MB	CS5	PCMCIA/PC card common memory
C0003E0 – C0003E1	64 Kb	CS4	PCMCIA controller index and data register
E000000 – E007FFF	32 Kb	CS7	NVRAM
FF00000 – FF00FFF	1 MB	360DPR	68360 dual port memory (top 1 MB)
CPU Space:			
003ff00 – 003ff03	4 bytes		MBAR for 68360

Table B-2 Cisco 2000 Memory Map

Address	Description	Comments
00000000 – 0017FFFF	CPU and packet memory (DRAM[1])	1.5 MB
01000000 – 011FFFFF	ROM monitor and system image code space (erasable programmable read-only memory [EPROM])	2 MB
02000000 – 02007FFF	Configuration RAM[2]	32 KB
02100000 – 0213FFFF	Control registers and I/O[3] devices	Details follow
02110000	Control register 1	–
02110002	Control register 2	–
02110040	PROM[4] cookie	–
02110100	Status register	–
02120040	Timer control register	–
02130000 – 02130003	Ethernet controller	–
02130000 – 0213000F	Token Ring controller	–
02130040 – 02130043	Serial controller	–
02130080	Serial control register 1	–
02130081	Serial control register 2	–

1. DRAM=dynamic random-access memory
2. RAM=random-access memory
3. I/O=input/output
4. PROM=programmable read-only memory

Table B-3 Cisco 2500 Memory Map

Address	Bit Width	Description	Comments
00000000 – 00FFFFFF	32	DRAM	2, 4, 8, or 16 MB
00000000 – 001FFFFF	32	DRAM 2 MB	–
00000000 – 003FFFFF	32	DRAM 4 MB	–
00000000 – 007FFFFF	32	DRAM 8 MB	–
00000000 – 00FFFFFF	32	DRAM 16 MB	–
00000000 – 001FFFFF	8/16	Boot Flash memory	1 or 2 MB, when Flash memory PCMCIA card is not installed
00000000 – 001FFFFF	16	Flash memory PCMCIA card	Boot Mode
01000000 – 011FFFFF	16	Boot EPROMs for ROM monitor and RXBOOT images	1 or 2 MB ROM; 2 MB Flash memory
01000000 – 011FFFFF	16	Flash memory PCMCIA card	When installed
02000000 – 0201FFFF	8	Configuration NVRAM[1]	32 or 128 KB
02000000 – 02007FFF	8	Configuration NVRAM (32 KB)	–
02000000 – 0201FFFF	8	Configuration NVRAM (128 KB)	–
02100000 – 0213FFFF	8/16	Onboard I/O registers and chips	–
03000000 – 03FFFFFF	32	Flash memory RAM (SIMMs[2])	4, 8, or 16 MB
03000000 – 033FFFFF	32	Flash memory RAM (4 MB)	–

Address	Bit Width	Description	Comments
03000000 – 037FFFFF	32	Flash memory RAM (8 MB)	–
03000000 – 03FFFFFF	32	Flash memory RAM (16 MB)	–
08000000 – 081FFFFF	8/16	Onboard boot EPROMs (remapped)	1 or 2 MB, when PCMCIA Flash memory card is installed

1. NVRAM=non-volatile random-access memory
2. SIMM=single in-line memory module

Table B-4 Cisco 3000 Memory Map

Address	Description	Comments
00000000 – 00FFFFFF	Main memory DRAM	–
01000000 – 011FFFFF	Secondary DRAM	–
02000000 – 0201FFFF	NVRAM	–
02100000 – 02100FFF	Channel B: 68302 registers	–
02101000 – 02101FFF	Channel B: 63802 RAM	–
02110000	System control register 1	–
02110002	System control register 2	–
02110100	System status register	–
02110040 – 0211005F	Cookie	–
02120000 – 02120003	Counter/timer (CNTR)	–
02120040	Counter control register (CCTL)	–
02120100 – 0212013F	Console ports	–
02130000 – 02130003	Channel A: LANCE chip	–
02130040 – 02130043	Channel B: LANCE/serial chip	–
02130080 – 02130083	Channel B: serial DTR register	–
03000000 – 03FFFFFF	Flash memory	–
04000000 – 042FFFFF	Secondary RAM	When main memory = 16 MB

Table B-5 Cisco 3104 and Cisco 3204 Memory Map

Address	Description	Comments
00000000 – 00FFFFFF	Main DRAM	1-, 4-, 8-, and 16-MB sizes
01000000 – 010FFFFF	Boot EPROMs for ROM monitor and bootstrap image	–
01000000 – 011FFFFF	Boot Flash memory for ROM monitor and bootstrap image	Onboard Flash memory or PCMCIA Flash memory card, 2 MB
02000000 – 0201FFFF	Configuration NVRAM	32 or 128 KB size
02100000 – 0213FFFF	Onboard registers and chips	–
03000000 – 03FFFFFF	Flash memory SIMM	Up to 16 MB
04000000 – 041FFFFF	I/O memory (packet memory)	512 KB or 2 MB sizes

Address	Description	Comments
08000000 – 081FFFFF	Remapped onboard boot Flash memory	Remapped when PCMCIA Flash memory card is installed

Table B-6 Cisco 3104 and Cisco 3204 Memory Map of Onboard Registers and Chips

Address	Description	Comments
021000F2 – 021000F3	Base address register for 68302	–
021000F4 – 021000F7	System control register for 68302	–
02101000 – 021013FF	System RAM for 68302	–
02101400 – 021017FF	Parameter RAM for 68302	–
02101800 – 02101FFF	Internal registers for 68302	–
02110000	System control register 1	–
02110002	System control register 2	–
02110004	System control register 3	–
02110006	System interrupt register	–
02110060	Serial NVRAM control register	–
02120000 – 02120003	Timer counter	–
02120040	Counter control register	–
02120100 – 0212013F	Console interfaces	–
02130000 – 0213003	Ethernet controller	–
02131000 – 0213100F	Token Ring controller	–
02131010 – 02131011	Hardware map register 0	–
02131012 – 02131013	Hardware map register 1	–
02132000 – 021320FF	Serial controller	–
02132100 – 02132101	Serial 0 device register	–
02132102 – 02132103	Serial 1 device register	–

Table B-7 Cisco 4000 Memory Map

Address	Bit Width	Description	Comments
00000000 – 0003FFFF	32	System SRAM[1]	256 KB, fixed; 0 wait read, 1 wait write
00040000 – 00FFFFFF	32	System DRAM memory (SIMMs)	8-, 16-, 32-bit unaligned access supported; 4, 8, 16, or 32[2] MB
00040000 – 003FFFFF		4 MB	–
00040000 – 00FFFFFF		16 MB	–
01000000 – 01FFFFFF	16	Boot EPROM	2 MB, fixed
01000000 – 010FFFFF		1 MB	–
01000000 – 011FFFFF		2 MB	–
01000000 – 013FFFFF		4 MB	–

Address	Bit Width	Description	Comments
01000000 – 017FFFFF		8 MB	–
02000000 – 02FFFFFF	8 or 32	Onboard resources	–
02020000		System I/O	–
03000000 – 03FFFFFF	32	Flash memory EPROM or EPROM	32 bit read/write access
03000000 – 031FFFFF		2 MB	–
03000000 – 033FFFFF		4 MB	–
03000000 – 037FFFFF		8 MB[3]	–
05000000		System DRAM	Upper 16 MB of 32 MB configuration
06000000 – 06FFFFFF	32	Shared (I/O) memory	8-, 16-, 32-bit unaligned access supported; 1–16 MB
06000000 – 060FFFFF		1 MB	–
06000000 – 063FFFFF		4 MB	–
06000000 – 067FFFFF		8 MB	–
04000000 – 05FFFFFF		Undefined	–
07000000 – 07FFFFFF		Undefined	–
08000000 – 08FFFFFF	32	I/O expansion	NIM[4] slots
08000000 – 080FFFFF	16	NIM at I/O expansion slot 1	16-bit aligned access only
08100000 – 081FFFFF	16	NIM at I/O expansion slot 2	16-bit aligned access only
08200000 – 082FFFFF	16	NIM at I/O expansion slot 3	16-bit aligned access only

1. SRAM=static random-access memory
2. Only the Cisco 4000-M supports 32-MB DRAM. The 32-MB configuration is split into two discontiguous pieces, with the upper 16 MB mapped to begin at location 05000000.
3. Only the Cisco 4000-M supports 8-MB Flash memory.
4. NIM=network interface module

Table B-8 Cisco 4000 Memory Map of Onboard Resources

Address	Bit Width	Description	Comments
02000000 – 0201FFFF	8	NVRAM battery backed up CMOS SRAM	128 KB, fixed; also accommodates 32 KB x 8 and 8 KB x 8
02110000	32	System status and control registers	–
02110002		Hardware revision	–
02110040 – 0211005F	8	System ID PROM cookie	24 bytes
02110100	32	Shared memory control register	–
02120000	8	Counter timer	–
02120040	8	Counter interrupt control register	–
02120100 – 0212013F	8	Control serial I/O	–

Table B-9 Cisco 4500 Memory Map

Address	Bit Width	Description	Comments
60000000 – 61FFFFFF	64	System DRAM	Capable of 8–64 bit access, cached
60000000 – 607FFFFF		8 MB	–
60000000 – 60FFFFFF		16 MB	–
60000000 – 61FFFFFF		32 MB	–
BFC00000 – BFC7FFFF	8	Boot EPROM	–
BFC00000 – BFC1FFFF		128 KB	–
BFC00000 – BFC7FFFF		512 KB	–
3E000000 – 3EFFFFFF	8	Onboard resources	–
30000000 – 30FFFFFF	32	System Flash memory EPROM	–
30000000 – 303FFFFF		4 MB	–
30000000 – 307FFFFF		8 MB	–
30000000 – 30FFFFFF		16 MB	–
38000000 – 387FFFFF	32	Boot Flash memory EPROM	–
38000000 – 383FFFFF		4 MB	–
38000000 – 387FFFFF		8 MB	–
40000000 – 40FFFFFF	32	Shared memory	8-, 16-, 32-bit access
40000000 – 403FFFFF		4 MB	–
40000000 – 40FFFFFF		16 MB	–

Table B-10 Cisco 4500 Memory Map of Onboard Resources

Address	Bit Width	Description	Comments
3E000000 – 3E07FFFF	8	NVRAM	Battery backed up SRAM
3E000000 – 3E01FFFF	8	128 KB	–
3E000000 – 3E07FFFF	8	512 KB	–
3E000000	8	Time of day clock	–
3E800400	8	System ID PROM cookie	–

Table B-11 Cisco 7000 Memory Map

Address	Description	Comments
11110100	System status register	–
11110400	Flash memory card status	–
11110C00	I/O address base	SwitchBus address space. Each unit occupies 64 bytes (0x40).
11120040	Timer control register	–
11120200	Environmental monitor control	16 bits
11120300	Environmental monitor status	32 bits

Address	Description	Comments
11130000	Diagnostic bus	–
11131000	ID PROM	–
11140000	NVRAM	–
1115FC00	Environmental monitor NVRAM base address	–
1115FFFF	Real time calendar bit	–
11200000 – 11FFFFFF	Reserved	14 Mb reserved
12000000	Onboard Flash memory	–
14000000	External Flash memory	–

Table B-12 Cisco 7200 Series (NPE-150) Memory Map – Hardware

Memory Base	Memory Limit	Size	Device
0x0 0000 0000	0x0 07FF FFFF	128 MB	System DRAM
0x0 0800 0000	0x0 0FFF FFFF	128 MB	System DRAM (reserved)
0x0 1000 0000	0x0 13FF FFFF	62 MB	Reserved
0x0 1400 0000	0x0 141F FFFF	2 MB	GT-64010 registers
0x0 1420 0000	0x0 19FF FFFF	94 MB	Reserved
0x0 1A00 0000	0x0 1A3F FFFF	4 MB	Internal Flash SIMM
0x0 1A40 0000	0x0 1BFF FFFF	28 MB	Larger Flash SIMM (reserved)
0x0 1C00 0000	0x0 1DFF FFFF	32 MB	Reserved
0x0 1E00 0000	0x0 1E1F FFFF	2 MB	NVRAM (TOD)
0x0 1E20 0000	0x0 1E7F FFFF	6 MB	Reserved
0x0 1E80 0000	0x0 1E9F FFFF	2 MB	I/O Registers
0x0 1EA0 0000	0x0 1EFF FFFF	6 MB	Reserved
0x0 1F00 0000	0x0 1FBF FFFF	12 MB	Read/write null
0x0 1FC0 0000	0x0 1FDF FFFF	2 MB	Boot EPROM
0x0 1FE0 0000	0x0 3FFF FFFF	x MB	Reserved
0x0 4000 0000	0x0 43FF FFFF	64 MB	PCI-to-PCMCIA interface (top slot)
0x0 4400 0000	0x0 47FF FFFF	64 MB	PCI-to-PCMCIA interface (bottom slot)
0x0 4800 0000	0x0 487F FFFF	8 MB	Fast Ethernet—memory-mapped I/O
0x0 4880 0000	0x0 48FF FFFF	8 MB	PA1—memory-mapped I/O
0x0 4900 0000	0x0 497F FFFF	8 MB	PA3—memory-mapped I/O
0x0 4980 0000	0x0 49FF FFFF	8 MB	PA5—memory-mapped I/O
0x0 4A00 0000	0x0 4A7F FFFF	8 MB	PA7—memory-mapped I/O (reserved)
0x0 4A80 0000	0x0 4AFF FFFF	8 MB	PA9—memory-mapped I/O (reserved
0x0 4B00 0000	0x0 4B0F FFFF	1 MB	PCI PM, first 1M, no byte swap
0x0 4B10 0000	0x0 4B7F FFFF	7 MB	PCI PM, larger PM, no swap (reserved)
0x0 4B80 0000	0x0 4B8F FFFF	1 MB	PCI PM, first 1M, byte swap

Memory Base	Memory Limit	Size	Device
0x0 4B90 0000	0x0 4BFF FFFF	7 MB	PCI PM, larger PM, byte swap (reserved)
0x0 4C00 0000	0x0 4C0F FFFF	1 MB	PCI Alias PM, first 1M, no byte swap
0x0 4C10 0000	0x0 4C7F FFFF	7 MB	PCI Alias PM, larger PM, no swap (reserved)
0x0 4C80 0000	0x0 4C8F FFFF	1 MB	PCI Alias PM, first 1M, byte swap
0x0 4C90 0000	0x0 4CFF FFFF	7 MB	PCI Alias PM, larger PM, byte swap (reserved)
0x0 4D00 0000	0x0 4D7F FFFF	8 MB	PA2—memory-mapped I/O
0x0 4D80 0000	0x0 4DFF FFFF	8 MB	PA4—memory-mapped I/O
0x0 4E00 0000	0x0 4E7F FFFF	8 MB	PA6—memory-mapped I/O
0x0 4E80 0000	0x0 4EFF FFFF	8 MB	PA8—memory-mapped I/O (reserved)
0x0 4F00 0000	0x0 4F7F FFFF	8 MB	PA10 memory-mapped I/O (reserved)
0x0 4F80 0000	0x0 4FFF FFFF	8 MB	I/O assy memory-mapped I/O (reserved)
0x0 5000 0000	0x0 FFFF FFFF	x MB	Reserved
0x1 0000 0000	0x0 001F FFFF	2 MB	PCI I/O address space
0x1 0020 0000	0x1 4B7F FFFF	~1 GB	Reserved
0x1 4B00 0000	0x1 4B0F FFFF	1 MB	CPU PM, first 1M, no byte swap
0x1 4B10 0000	0x1 4B7F FFFF	7 MB	CPU PM, larger PM, no swap (reserved)
0x1 4B80 0000	0x1 FFFF FFFF	~0 GB	Reserved
0x2 0000 0000	0x3 FFFF FFFF	8 GB	L2 cache is disabled (alias) for low 8 GB
0x4 0000 0000	0x7 FFFF FFFF	16 GB	Cache Controller Tag Op 0
0x8 0000 0000	0xF FFFF FFFF	32 GB	Cache Controller Tag Op 1

Table B-13 Cisco 7200 Series (NPE-150) Memory Map – Software

Memory	CPU Physical	CPU Virtual	Attributes
Non Packet DRAM	0x00000000 – 0x015fffff	0x60000000 – 0x615fffff	Cached, write back, L2 cached
I/O DRAM (packet)	0x01600000 – 0x01ffffff	0x01600000 – 0x01ffffff	Uncached
		0x61600000 – 0x61ffffff	Cached, write back, L2 cached
	0x2,01600000 – 0x2, 01ffffff	0x31600000 – 0x31ffffff	Cached, write through, no L2 cache
I/O SRAM (packet), direct access by CPU	0x4b000000 – 0x4b0fffff	0x4b000000 – 0x4b0fffff	Uncached
	0x2,4b000000 – 0x2, 4b0fffff	0x7b000000 – 0x7b0fffff	Cached, write through, no L2 cache

Table B-14 Cisco 500-CS Memory Map

Address	Description	Comments
000000 - 3FFFFF	ROM	4 MB or less
400000 - 407FFF	EEPROM[1] (NVRAM)	32 KB
420000 - 427FFF	LCD registers (not used)	–
428000 - 42FFFF	Future hardware	–
430000 - 440000	Reserved	–
460000 - 460004	LANCE registers	Ethernet controller registers
500000 - 50007F	Octal UART[2] 0	–
500400 - 50047F	Octal UART 1	–
600000 - 7FFFFF	Onboard RAM	–
800000 - BFFFFF	2-MB SIMM expansion	–
800000 - FFFFFF	8-MB SIMM expansion	–

1. EEPROM=electronically erasable programmable read-only memory
2. UART=Universal Asynchronous Receiver/Transmitter

Table B-15 RP/Cisco 7000 Series Memory Map

Address	Bit Width	Description	Comments
00000000 – 0FFFFFFF		DRAM	–
10000000 – 100FFFFF		ROML	–
10400000 – 104FFFFF		ROMU	–
11000000 – 110FFFFF		Multibus memory	–
11100000 – 1110FFFF		Multibus I/O	–
11110000 – 1112FFFF		Local I/O	–
11130000 – 11130FFF		Diagnostic bus	–
11131000 – 111314FF		ID PROM	–
11140000 – 1115FFFF		NVRAM	–
12000000 – 13FFFFFF		Internal Flash memory	–
14000000 – 15FFFFFF		External Flash memory card	–
11110000	16	System control	–
11110100	32	System status register	–
11110400		Flash memory card status	–
11110C00		I/O address base	SwitchBus address space. Each unit occupies 64 bytes (0x40).
11120000	8	Counter timer	–
11120040	8	Counter control register	–
11120100 – 1112013F	8	Serial I/O ports	–
11120200		Environmental monitor control	16 bits
11120300		Environmental monitor status	32 bits
11130000		Diagnostic bus	–

Address	Bit Width	Description	Comments
11131000		ID PROM	–
11140000		NVRAM	–
1115FC00		Environmental monitor NVRAM base address	–
1115FFFF	1	Real time calendar bit	1 bit (bit 0)
11200000 – 11FFFFFF		Reserved	14 Mb reserved
12000000		Onboard Flash memory	–
14000000		External Flash memory	–

Table B-16 RSP Memory Map

Address	Bit Width	Description
80000000 – FFFFFFFF		Available for expansion
60000000 – 77FFFFFF		Main memory Common
40000000 – 5FFFFFFF		Packet memory canonical address bit ordering Bits in byte-swapped packet memory Common
38000000 – 3FFFFFFF		Boot EPROM and I/O space
30000000 – 37FFFFFF		System Flash memory
20000000 – 2FFFFFFF		Reserved platform specific address space
18000000 – 1FFFFFFF		Boot EPROM and I/O space
10000000 – 17FFFFFF		System Flash memory
08000000 – 0FFFFFFF		Packet memory
00000000 – 07FFFFFF		Main memory
Individual Addresses:		
11110000	16	System control
11110100	32	System status
11120000	8	Counter timer
11120040	8	Counter control register
11120100 – 1112013F	8	Serial I/O ports
11120200	16	Environmental monitor control
11120300	32	Environmental monitor status
1115FFFF	1	Calendar (1 bit “bit 0”)
111104000	8	Flash card status
Virtual Address:		
E00000		Slot 0
E20000		Slot 1
E40000		Slot 2
E60000		Slot 3

Address	Bit Width	Description
E80000		Slot 4
EA0000		Slot 5
EC0000		Slot 6
EE0000		Slot 7
F00000		Slot 8
F20000		Slot 9
F40000		Slot 10
F60000		Slot 11
F80000		Slot 12

Table B-17 Multibus Memory Space Assignment

Address	Description	Comments
20000000 – 2000FFFF	Memory card	64 KB
20010000 – 2002FFFF	CSC-R16 card	Unit 0 address, 128 KB
20030000 – 2004FFFF	CSC-R16 card	Unit 1 address, 128 KB
20050000 – 2006FFFF	CSC-R16 card	Unit 2 address, 128 KB
20070000 – 2008FFFF	CSC-R16 card	Unit 3 address, 128 KB
20090000 – 200AFFFF	CSC-R16 card	Unit 4 address, 128 KB
200B0000 – 200BFFFF	NVRAM	64 KB
200C0000 – 200DFFFF	CSC-R16 card	Unit 5 address, 128 KB
200E0000 – 200FFFFF	CSC-R16 card	Unit 6 address, 128 KB (shared)

Table B-18 Multibus I/O Space Assignment

Address	Description	Size (in hex)	Comments
20100000	ENVM[1] card	2	Environmental monitor
20100002 – 2010008F	Unused		
20100090		2	CSC-R16M Ethernet mailbox, Unit 0
20100092		2	CSC-R16M Ethernet mailbox, Unit 1
20100098	CSC-R16 card	2	Unit 0
2010009A	CSC-R16 card	2	Unit 1
201000A0	CSC-R card	4	Unit 0
201000A4	CSC-R card	4	Unit 1
201000A8	CSC-R card	4	Unit 2
201000AC	CSC-R card	4	Unit 3
201000B0	CSC-R16M card	2	Unit 0

Address	Description	Size (in hex)	Comments
201000B2	CSC-R16M card	2	Unit 1
201000B4	CSC-R16M card	2	Unit 2
201000B6	CSC-R16M card	2	Unit 3
201000B8	CSC-R16M card	2	Unit 4
201000BA	CSC-R16M card	2	Unit 5
201000BC	CSC-R16M card	2	Unit 6
201000BE	CSC-R16M card	2	Unit 7
201000C0	MLP	20	Unit 0
201000E0	MLP	20	Unit 1
20100100	3MB	100	Unit 0
20100200	3MB	100	Unit 1
20100300	3MB	100	Unit 2
20100400	3MB	100	Unit 3
20100500	Interlan	10	Unit 0
20100510	Interlan	10	Unit 1
20100520	Interlan	10	Unit 2
20100530	Interlan	10	Unit 3
20100540	Interlan	10	Unit 4
20100550	Interlan	10	Unit 5
20100560	Interlan	10	Unit 6
20100570 – 201005FF	Unused		
20100600	ACC	100	Unit 0
20100700	ACC	100	Unit 1
20100800	ACC	100	Unit 2
20100900	ACC	100	Unit 3
20100A00	HUB	100	Unit 0
20100B00	HUB	100	Unit 1
20100C00 – 20101FFF	Unused		
20102000	3COM	2000	Unit 0
20104000	3COM	2000	Unit 1
20106000	3COM	2000	Unit 2
20108000	3COM	2000	Unit 3
2010A000	3COM	2000	Unit 4
2010C000	CSC-MCI card	40	Unit 0
2010C040	CSC-MCI card	40	Unit 1
2010C080	CSC-MCI card	40	Unit 2

Address	Description	Size (in hex)	Comments
2010C0C0	CSC-MCI card	40	Unit 3
2010C100	CSC-MCI card	40	Unit 4
2010C140	CSC-MCI card	40	Unit 5
2010C180	CSC-MCI card	40	Unit 6
2010D000 – 2010 FFFF	Unused	–	–

1. ENVM=Environmental Monitor

Table B-19 CSC/3 Memory Map

Address	Bit Width	Description	Comments
00000000 – 003FFFFF		RAM	–
01000000 – 0107FFFF		ROML	–
0108FFFF – 010FFFFF		ROMH	–
02000000 – 020FFFFF		Multibus memory	–
02100000 – 0210FFFF		Multibus I/O	–
02110000 – 02110001	16	System control register	–
02110100 – 02110103	32	System status register	–
02120000	8	Counter timer	–
02120040	8	Counter control register	–
02120100 – 0212013F		Serial ports	–
020B0000 – 020B7FFF		NVRAM	Over Multibus

Table B-20 CSC/4 Memory Map

Address	Bit Width	Description	Comments
00000000 – 00FFFFFF		RAM	–
01000000 – 013FFFFF		ROML	–
01400000 – 017FFFFF		ROMH	–
02000000 – 020FFFFF		Multibus memory	–
02100000 – 0210FFFF		Multibus I/O	–
02110000 – 02110001	16	System control register	–
02110100 – 02110103	32	System status register	–
02120000	8	Counter timer	–
02120040	8	Counter control register	–
02120100 – 0212013F		Serial ports	–
020B0000 – 020B7FFF		NVRAM	Over Multibus

Table B-21 Processor Memory Map for CSC/2, CSC/3, and CSC/4 Cards, Including IGS and Cisco 3000

Address	Description	Comments
D0D0D0D	"Poisoned free" address	Used by the "poisoned free" code to make sure the system is not accessing freed memory. An error at or near this location usually indicates a software bug.
2100000 – 21FFFFF	Multibus I/O space	Not all I/O space is occupied by interface cards. Bus errors that do not correspond to a real interface card are probably software bugs.
210C000 – 210C200	MCI and ciscoBus controllers (CSC-CCTL and CSC-CCTL2)	Common failures result from attempts to access the command and argument registers that occupy the first 4 bytes of the address space of each board.
21000A0 – 21000AF	Netrionix 4-Mbps Token Ring card	Each card occupies 4 bytes.
21000B0 – 21000BD	CSC-C2CTR card	Each card occupies 2 bytes.
2100000 – 2100003	Control register for the ENVM	Environmental monitor card.
2000000 – 20FFFFF	Multibus memory space	Used by interface cards and by shared Multibus memory.
20C0000 – 20FFFFF	Shared memory on CSC-R16 cards	Token Ring units 5 and 6. Each card has 0x20000 bytes of memory.
20B0000 – 20BFFFF	Multibus NVRAM (CSC/2, CSC/3, CSC/4 cards)	Cards with 32 KB RAM only go through 0x20B7FFF.
2040000 – 20405FF	CSC-16 card asynchronous lines (CSC/2, CSC/3, CSC/4 cards)	Each UART is 0x20 bytes; there are two lines per UART.
2010000 – 20AFFFF	Shared memory on CSC-R16 cards	Units 0–4. Each card has 0x20000 bytes of memory.
2000000 – 2007FFF	Shared Multibus memory primarily used by CSC-R Token Ring cards	Each card has a system control area within this memory, but the address of each area is decided at runtime and is difficult to predict.
–	System ROM address space	The ROM monitor starts at the bottom of ROM and is followed by the system image. The location of the system image is not always known and is important only for images that are run from ROM. A bus error in valid ROM space might indicate bad ROMs, a bad processor card, or in the case of run-from-ROM images, a software bug in which the software tries to write into ROM.
1000000 – 107FFFF	System ROM address space	512-KB system ROMs on the CSC/2, CSC/3, and CSC/4 cards, IGS, CS-3000. Run from ROM, system images exist only on the CSC/2 card.
1000000 – 10FFFFF	System ROM address space	1-MB system ROMs on the CSC/2, CSC/3, and CSC/4 cards, IGS, CS-3000. Run from ROM, system images exist only on the CSC/2 card.
1000000 – 11FFFFF	System ROM address space	2-MB system ROMs on the CSC/2, CSC/3, and CSC/4 cards and the IGS. Run from ROM, system images exist only on the CSC/2 card.

Address	Description	Comments
–	Main processor RAM	Bus errors here are usually caused by a hardware failure on the processor card.
0000 – 0FFFFF	Main processor RAM	CSC/2 card and IGS with 1 MB. On the IGS, the top 0.5 MB is shared packet memory.
0000 – 17FFFF	Main processor RAM	IGS with 1.5 MB. The top 0.5 MB is shared packet memory.
0000 – 3FFFFF	Main processor RAM	CSC/3 card
0000 – FFFFFF	Main processor RAM	CSC/4 card
0000 – 47FFFF	Main processor RAM	IGS with 4.5 MB. The top 0.5 MB is shared packet memory.
0000 – 0FFF	System page	The system page contains several processor and ROM monitor data structures, primarily the trap and interrupt vectors. If the low page gets corrupted, the system might hang rather than crash.