

## Product Overview

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The AGS+ is a modular router chassis incorporating a nine-slot Multibus backplane and a five-slot high-speed backplane called the *ciscoBus*. Figure 1-1 shows the front of the chassis.

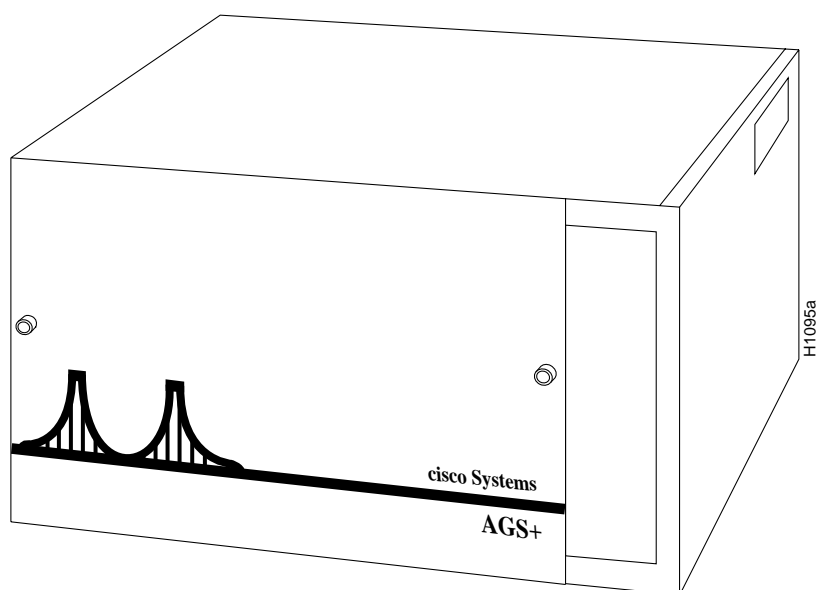


Figure 1-1 Router Chassis—Front View

External connections to the network are provided by interface appliques attached to the rear of the chassis. (See Figure 1-2.) The various types of interface cables and appliques are discussed in detail in Appendix A, “Cabling Specifications,” which includes pinouts of all of the different types of interface cables and appliques.

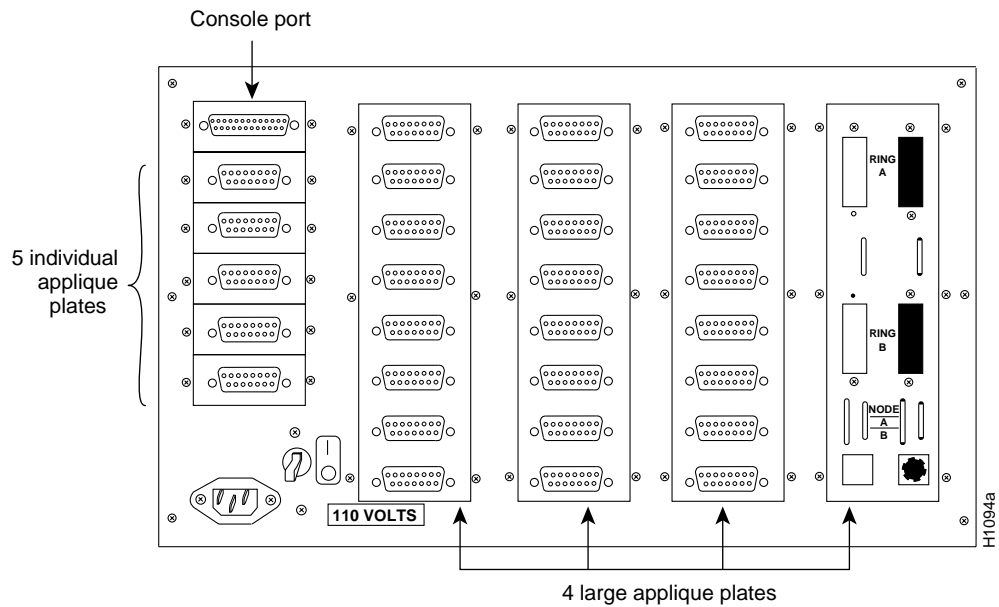


Figure 1-2 Router Chassis—Rear-Panel View

Your responsibilities for bringing the chassis on line will include installing the chassis in a rack (or elsewhere), making external connections to various networks by way of appropriate interface cables, and using the configuration software routines specified in the *Router Products Getting Started Guide*. This publication applies to hardware installation *only*; it will take you through the installation up to, but not including, the configuration software routines.

## Chassis Specifications

This section discusses the specifications of the components and power supply used in the chassis. Table 1-1 lists the general specifications for the router.

**Table 1-1 Chassis Physical, Power, and Cooling Specifications**

Description	Specifications
Multibus backplane	9 slots (due to CSC-ENVM and processor card requirements, 7 slots or less are available) <sup>1</sup>
ciscoBus backplane	5 slots (one is used by the CSC-CCTL or CSC-CCTL2 card)
Dimensions (H x W x D)	10" x 17.5" x 20" (25.4 cm x 44.45 cm x 50.8 cm)
Weight	56 lb (25.45 kg)
Power dissipation, maximum	Input: 750W (2562 Btu <sup>2</sup> /hr) Output: 500W (1708 Btu/hr)
Input voltage and frequency	U.S. 120 or 220 VAC <sup>3</sup> (standard), 50–60 Hz U.K. 240 VAC , 50–60 Hz
Current rating	U.S. 7A @ 110 VAC; 3A @ 240 VAC U.K. 4A @ 230 VAC
Current and DC voltages available	U.S. 55A @ +5V; 10A @ +12V; 6A @ -5V; 10A @ -12V U.K. 60A @ +5V; 10A @ +12V; 6A @ -12V; 6A @ -5V
Cooling	One 160 cfm <sup>4</sup> blower
Blower noise	63 dBa <sup>5</sup>
Rear panel connector areas	4 large plates and 5 individual plates <sup>6</sup>
Additional hardware	19" rack-mount kit

1. If ciscoBus interface cards are used, then the ciscoBus controller card will reduce this number by at least 1.

2. Btu = British thermal units.

3. VAC = Volts alternating current.

4. cfm = Cubic feet per minute.

5. dBa = Decibels, A-weighted.

6. The number of available individual plates is reduced by 1 if an auxiliary port is used.

## Processor, Controller, Memory, and Interface Cards

This section provides an overview of the following four types of printed circuit cards that can be used in the chassis:

- Processor cards
- ciscoBus controller cards
- Memory
- Network interface cards

The combination of network interface cards in a chassis determines its operation.

The chassis card cage (see Figure 1-3) has nine Multibus slots and five ciscoBus slots. (The five ciscoBus slots can accept Multibus cards if ciscoBus cards are not desired.) Because the chassis requires the CSC-ENVM card and a processor card at a minimum, seven Multibus slots are available. If ciscoBus cards are desired, the center ciscoBus slot (slot 7 in Figure 1-3) is used for the ciscoBus controller card (CSC-CCTL or CSC-CCTL2), leaving four slots available for ciscoBus interface cards. The various cards in each category are described in the following sections.

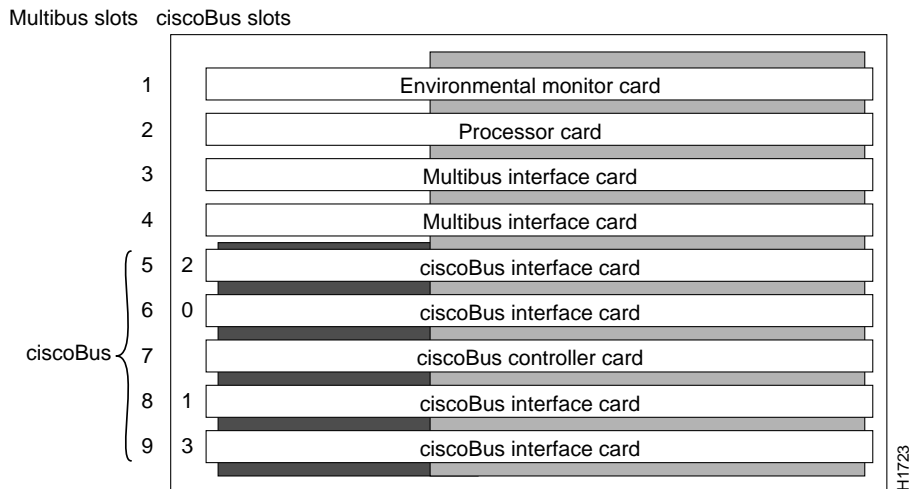


Figure 1-3 Chassis Card Cage—Front View

## Processor Cards

The processor card is the supervisor that contains and executes most of the software programs that control the system. Table 1-2 lists the specifications for processor cards that can be used in the chassis.

Table 1-2 Processor Card Descriptions

Processor Card	Description
CSC/4	25-MHz clock speed MC68EC040 microprocessor (CPU) and 16 MB of RAM
CSC/3	30-MHz clock speed MC68020 microprocessor and 4 MB of RAM

## ciscoBus Controller Cards

The ciscoBus controller cards, CSC-CCTL and CSC-CCTL2, provide the following two functions for the chassis:

- Connect the Multibus and the ciscoBus for routing packets from interfaces on the ciscoBus to interfaces on the Multibus bus
- Perform packet-switching functions on the ciscoBus using an onboard processor, rather than the Multibus processor

The ciscoBus system controller cards are required for operation with all high-speed network interface cards that reside in the ciscoBus. The ciscoBus controller cards are installed in the center ciscoBus slot. (See Figure 1-3.)

Table 1-3 lists the ciscoBus interface cards that are compatible with the CSC-CCTL and CSC-CCTL2 ciscoBus controller cards.

**Table 1-3 ciscoBus Controller Card and ciscoBus Interface Card Compatibility**

Controller Cards	Interface Cards	Limitations and Prerequisites
CSC-CCTL	CSC-HSCI/Ultra	–
	CSC-FCI	–
	CSC-MEC	–
CSC-CCTL2 <sup>1</sup>	CSC-C2HSCI/Ultra	Requires Microcode Version 10.0 or later
	CSC-C2FCI	Requires Microcode Version 10.0 or later
	CSC-C2FCIT <sup>2</sup>	–
	CSC-C2CTR <sup>2</sup>	–
	CSC-C2MEC	Requires Microcode Version 10.0 or later

1. The C2 designator in the interface card name identifies ciscoBus interface cards that are compatible with the CSC-CCTL2 ciscoBus controller card.

2. The C2FCIT and C2CTR cards ship (by default) with Microcode Version 10.0 or later, and can be used only with the CSC-CCTL2 controller card.

The CSC-CCTL2 card works with the CSC-C2FCIT and CSC-C2CTR cards by default. The CSC-FCI, CSC-HSCI, and CSC-MEC cards become the CSC-C2FCI, CSC-C2HSCI, and CSC-C2MEC cards, respectively, when their microcode is upgraded to Version 10.0 or later. (See Table 1-3.) The designator C2 refers to the CSC-CCTL2 card.

## Memory Cards

Memory cards provide long-term, nonvolatile random-access memory (NVRAM) storage for configuration and data. Table 1-4 lists the memory cards available for the chassis.

**Table 1-4 Memory Cards**

Memory Card	Description
CSC-MC+	Optional memory card with a combination of 4 MB of Flash memory and 32 KB of NVRAM. Allows remote loading and storage of multiple software images. Installs on the top of the card cage. Requires a NVRAM connection to the CSC-MCI, CSC-1R, or CSC-2R card, or a connection to the CSC-ENVM card. CSC-MC+ NVRAM is superseded by the CSC-ENVM NVRAM.
CSC-ENVM <sup>1</sup>	Monitors the chassis interior environment. Provides 64 KB of NVRAM and 64 KB of shared buffer (Multibus) memory for the chassis. Installs in the top chassis slot. Provides an optional connection for the Flash memory card. CSC-ENVM NVRAM supersedes the CSC-MC+ NVRAM.

1. The CSC-ENVM card is not an optional card. It is the default NVRAM card for the AGS+ and is required in the chassis. The new CSC-ENVM card installed in your AGS+ chassis uses nonvolatile random-access memory (NVRAM) devices with built-in lithium batteries. These combination NVRAM/battery devices replace the multiple NVRAM devices and three separate nickel-cadmium batteries on previous CSC-ENVM cards; otherwise, the CSC-ENVM cards are identical. The three spaces in the CSC-ENVM card are where the nickel-cadmium batteries were installed, and are intentionally left empty. The performance and memory capacity of both cards is the same in every respect.

## Network Interface Cards

Network interface cards connect your chassis to one or more networks. Table 1-5 lists the ciscoBus network interface cards, and Table 1-6 lists the Multibus network interface cards. With the CSC-FCI, CSC-MEC, and CSC-HSCI interface cards, the CSC-CCTL ciscoBus controller card is required. With the CSC-C2FCI, CSC-C2FCIT, CSC-C2HSCI, and CSC-C2MEC interface cards, the CSC-CCTL2 ciscoBus controller card is required.

**Table 1-5 CiscoBus Network Interface Cards**

Cards	Description
CSC-C2CTR	2- or 4-port ciscoBus Token Ring card. 4- or 16-Mbps rate for each port is user-selectable by way of software.
CSC-FCI or CSC-C2FCI <sup>1</sup>	FDDI communications interface card. Provides up to 100-Mbps transmission rates. Port can connect to single-mode or multimode fiber.
CSC-C2FCIT	FDDI communications interface with translational bridging capability. Provides up to 100-Mbps transmission rates. Port can connect to single-mode or multimode fiber.
CSC-HSCI or CSC-C2HSCI <sup>1</sup>	1 HSSI communications interface card with 1 HSSI port. Complies with the EIA/TIA-613 electrical specification. Provides transmission rates of up to 52-Mbps duplex with HSSI interface, or up to 125-Mbps duplex with the UltraNet interface.
CSC-MEC or CSC-C2MEC <sup>1</sup>	2, 4, or 6-port high-speed Ethernet interface card. Provides transmission rates of up to 10 Mbps on each port.

1. The CSC-FCI, CSC-HSCI, and CSC-MEC cards become the CSC-C2FCI, CSC-C2HSCI, and CSC-C2MEC cards, respectively, when their microcode is upgraded to Version 10.0 or later. The C2 designator indicates that these cards are compatible with the CSC-CCTL2 ciscoBus controller card. The CSC-C2CTR and CSC-C2FCIT cards are shipped (by default) with Microcode Version 10.0 or later.

**Table 1-6 Multibus Network Interface Cards**

Cards	Description
CSC-1R	Single-port Token Ring interface card. 4- or 16-Mbps rate is user-selectable by way of software.
CSC-2R	Dual-port version of the CSC-1R Token Ring interface card. 4- or 16-Mbps rate for each port is user-selectable by way of software.
CSC-MCI	2 Ethernet and 2 synchronous serial interface ports. Transmission rates up to 4 Mbps for serial and 10 Mbps for Ethernet. Serial ports configurable as DCE or DTE <sup>1</sup> , Ethernet as Version 1 or 2.
CSC-R16M	Single-port Token Ring interface card. 4- or 16-Mbps rate is user-selectable by way of a jumper.
CSC-SCI	4 synchronous serial interface ports. Transmission rates up to 4 Mbps for each port. Ports can be configured as DCE or DTE.

1. DCE = Data communications equipment. DTE = Data terminal equipment.

## Card and Port Limitations

Table 1-7 provides a complete list of the interface card and port types and the quantities of each that can be installed in the chassis. The ports attach to the network by way of rear-panel appliques.

**Table 1-7 Card and Port Limits for the Chassis**

No. of Cards	Card Type	Interface/Port Type	Maximum No. of Ports
1	CSC-ENVM (required)	Connection for the CSC-MC+ Flash memory card	1
1	CSC/3 or CSC/4 processor (one or the other required)	Console Auxiliary <sup>1</sup>	1 1
6(7) <sup>2</sup>	CSC-1R	Multibus Token Ring	6(7)
6(7) <sup>3</sup>	CSC-2R	Multibus Token Ring	12(14)
6(7)	CSC-MCI-2E2T or 2E2S	Ethernet and serial (any type) <sup>4</sup>	12(14) 12(14)
6(7)	CSC-MCI-2E	Ethernet only	12(14)
6(7)	CSC-R16M	Token Ring	6(7)
6(7)	CSC-SCI-4S, 4T, or 2S2T	RS-232 (and RS-232 SDLC) or HD V.35	24(28)
3 <sup>5</sup>	CSC-SCI-4S, 4T, or 2S2T	RS-449	12
1	CSC-MCI-2S or 2T	RS-449	2
1	CSC-CCTL or CSC-CCTL2 <sup>6</sup>	–	–
2	CSC-C2CTR	ciscoBus Token Ring	8
4 <sup>7</sup>	CSC-C2FCI	FDDI multimode and/or single mode	4
4	CSC-C2FCIT (with translational bridging capability)	FDDI multimode and/or single mode	4
2	CSC-FCI	FDDI multimode and/or single mode	2
4	CSC-HSCI and CSC-C2HSCI with APP-LHS	HSSI <sup>8</sup>	4
2	CSC-HSCI with APP-ULA	HSSI <sup>6</sup>	2 <sup>9</sup>
4	CSC-MEC 6 or CSC-C2MEC6 (plus 2 CSC-MCI 2E cards)	Ethernet	28

1. If installed, the auxiliary port is located directly below the console port.
2. All numbers in parentheses refer to the maximum numbers of cards and interfaces allowed when no ciscoBus card is needed.
3. Fewer CSC-2R cards must be used when any other Multibus cards are present.
4. If RS-449 appliques are desired, only eight serial interfaces are possible with the maximum number of 14 Ethernet interfaces listed.
5. Because the RS-449 applique is larger than other serial appliques, only 14 can be used on the chassis. Also, because no fewer than four serial ports can be used per CSC-SCI card, one additional CSC-MCI is required to meet this RS-449 configuration.
6. One or the other is required if ciscoBus cards are desired.
7. This number of CSC-C2FCI cards and interfaces is possible only if Microcode Version 10.0 or later is installed on the card.
8. Also referred to as the *EIA-TIA-613 interface*.
9. If any other ciscoBus slots are occupied with a card other than a CSC-HSCI card connected to an UltraNet interface, only one UltraNet interface is supported.



**Caution** The chassis allows for a maximum of 16 Token Ring interfaces, which is a combination of four CSC-2R Multibus cards and two CSC-C2CTR ciscoBus cards. Two ciscoBus slots are used as Multibus slots. Because the slower Multibus interfaces always have higher priority than ciscoBus interfaces, traffic on the Multibus may degrade performance of the ciscoBus Token Ring interfaces for nonautonomously switched interfaces. Therefore, we do not recommend the combination ciscoBus and Multibus Token Ring configurations for performance-sensitive applications.



## Rear Panel Configurations

External network connections to the chassis are provided through a variety of rear-panel connector plates and appliques. Table 1-8 provides a list of the available connector plates, their relative sizes, the maximum number of appliques per plate, and where the appliques can be positioned on the rear panel of the chassis. Plates are listed from left to right with the rear panel of the chassis facing you.

**Table 1-8 Chassis Connector Plates**

Connectors <sup>1</sup> /Appliques <sup>2</sup>	Individual Plates	Large Plate 1	Large Plate 2	Large Plate 3	Large Plate 4
Token Ring	5 <sup>3</sup>	4	4	4	4
Token Ring (C2CTR)	–	–	–	4	4
Ethernet	5 <sup>2</sup>	8	8	8	8
10BaseT	4	8	8	8	8
FDDI <sup>4</sup>	–	–	–	2	2
HSSI (APP-LHS)	–	–	–	2	2
UltraNet (APP-ULA)	–	–	–	2	2
RS-232 <sup>5</sup>	4	4	8	8	8
RS-449	–	2	4	4	4
V.35 high density (HD)	4	4	8	8	8
V.35 high density (HD) NRZI	4	4	8	8	8
X.21	4	8	8	8	8
G.703	4	6	6	6	6

1. The connectors per plate are the maximum numbers per plate and should not be combined as totals for the chassis.

2. The appliques shown in this table do not match the appliques shown in Figure 1-2.

3. A fifth individual Token Ring or Ethernet applique can be used in the lowest individual plate position, only if there is no auxiliary port installed on the chassis. (The auxiliary port occupies the individual plate area directly below the console connector.) Serial appliques cannot be used in the lowest individual plate position because of applique size limitations.

4. Includes APP-LMM, APP-LMS, APP-LSM, and APP-LSS.

5. This includes the RS-232 SDLC applique.

## Chassis Power Budget

If your future configuration needs change, use the following information (see Table 1-9) to help you choose chassis components based on their power consumption. The chassis has a total power budget of 300W; therefore, the total power dissipation of the individual interface and processor cards must not exceed 300W. Following is an example calculation. (All values are in watts.)

One CSC-ENVM card	1 x 10 = 10
One CSC/4 processor card	1 x 35 = 35
One CSC-CCTL2 card	1 x 34 = 34
Two CSC-C2MEC6 cards	2 x 22 = 44
One CSC-MCI card	1 x 28 = 28
14 Ethernet transceivers	14 x 4 = 56
Power requirement of present system	207
Available power budget	300 – 207 = 93
Two CSC-C2FCIT cards	2 x 36 = 72
New cards within power budget	72 < 93

**Table 1-9 Power Requirements for Individual Components**

Card/Applique Assemblies	Power Requirement (in Watts)
CSC/4	35
CSC/3	31
CSC-ENVM	10
CSC-MC+	3
CSC-MCI <sup>1</sup>	28
CSC-SCI	20
CSC-R16M	34
CSC-1R and -2R	30
CSC-CCTL2	34
CSC-C2FCIT with applique	36
CSC-CSFCI with applique	50
CSC-C2MECx <sup>2</sup>	22
CSC-CSHSCI	48
CSC-C2CTR-2 with applique	30
CSC-C2CTR-4 with appliques	42
CSC-CCTL	29
CSC-FCI with applique	50
CSC-MECx <sup>2</sup>	22
CSC-HSCI with applique	48

1. Up to a maximum of 2 transceivers is required.  
Each transceiver dissipates 4W (8W total).

2. Up to a maximum of 6 transceivers is required.  
Each transceiver dissipates 4W (24W total).