

Technical Specifications

General System Specifications

This section lists general technical specifications for all VCO/4K systems.

Port Capacity	4,096 maximum
System Call Capacity	Contact the Cisco Systems Technical Assistance Center (TAC) for detailed system capacity information.

Switch Bus Parameters

Voice Encoding Scheme	PCM, -law 255, A-Law, to A and A to conversion A-law with -law to A-law conversion
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Measurements of Components

Combined Controller	15.6 in. (39 cm) high 12.1 in. (30.73 cm) deep 1.58 in. (3.95 cm) wide
Power Supply Module	3.0 in. (7.5 cm) high 17.0 in. (42.5 cm) deep 8.0 in. (20 cm) wide
VCO/4K System Enclosure	26.13 in. (67.73 cm) high 22.5 in. (58.57 cm) deep 17.5 in. (45.33 cm) wide Footprint — 22.50 x 17.5 in. (57.15 x 45.33 cm)

Subrack	15.75 in. (40.00 cm) high 13.25 in. (33.70 cm) deep 19.00 in. (48.30 cm) wide
Fan Unit	3.50 in. (8.75 cm) high 7.00 in. (17.50 cm) deep 17.50 in. (43.75 cm) wide

Recommended Clearances

Front — 36.00 in. (90.00 cm)
Rear — 6.00 in. (15.00 cm)
Top — 12.00 in. (30.50 cm)
Side — 12.00 in. (30.00 cm)

Operating Environment

Temperature	40 to 100 F 10 to 40 C
Temperature Gradient	15F (10C) per hour
Relative Humidity	20 to 80 percent (%), noncondensing
Altitude	0 to 10,000 ft 0 to 3,048 m

Shipping Environment

Temperature	–40 to 140F (–40 to 60C)
Temperature Gradient	Below condensing
Relative Humidity	5 to 90%, noncondensing
Altitude	0 to 30,000 ft (0 to 9,144 m)

Storage Environment

Temperature	–4 to 113F (–20 to 45C)
Temperature Gradient	Below condensing
Relative Humidity	5 to 90%, noncondensing
Altitude	0 to 10,000 ft (0 to 3,048 m)

FCC Registration Information

Part 68 Registration Number	B4RUSA-23298-PF-E
Ringer Equivalence	018B

Facility Interface Codes

E+M	TC11M or E	Tie trunk, conventional terminal set, 2-wire, Type I, E+M interface, provides battery on M-lead or ground on M-lead
E+M	TC31M or E	Tie trunk, conventional terminal set, 4-wire, Type I, E+M interface, provides battery on M-lead or ground on M-lead
	TC12M or E	Tie trunk, conventional terminal set, 2-wire, Type II, E+M interface, provides battery on M-lead or ground on M-lead
	TC32M or E	Tie trunk, conventional terminal set, 4-wire, Type II, E+M interface, provides battery on M-lead or ground on M-lead

4xT1	N/A (XD Device)	1.544 Mbps D4F framing format
ICC T1 I/O	04DU9-BN/1SN	1.544 Mbps D4F framing format

Combined Controller Specifications

This section lists specifications for the Combined Controller.

Central Processing Unit Card

Microprocessor	MC68030 (4 MHz)
Memory	16 MB DRAM
Features	Real-time clock with battery backup VME bus master SCSI bus interface for storage subsystem access/control
Front Panel Switches	RESET — Resets on-board MC68030 ABORT — Interrupts MC68030
Front Panel Indicators	RUN LED — Normal operation FAIL LED — Board failure STATUS LED — Microprocessor halt condition SCON LED — CPU is system controller
Power Dissipation	20 watts, typical

Switch Interface Card

Memory	64 KB DRAM
DMA Controller	MC68450 (4 MHz)
Power Dissipation	10 watts, typical

Floppy Disk Drive

Formatted Capacity	1.44 megabytes (MB)
Signal Interface	SCSI
Recording Method	MFM
Media Requirement	3.5-in., high-density micro floppy diskettes
Rotational Speed	300 rpm
Read/Write Heads	2 heads
Track Density	135 tracks per in.
Data Transfer Rate	500 kbps
Power Dissipation	15 watts, typical
Form Factor	Half-height

Specifications for Storage/Control I/O Module Assembly

This section lists specifications for the Storage/Control I/O module assembly.

Storage Control I/O Module Interfaces

- 4 EIA/TIA-232 serial ports (master console and remote maintenance modem)
- 1 Ethernet transceiver interface
- 1 Centronics-type parallel interface (system printer)
- 1 SCSI connector (on CPU-TM front panel—not used)

Hard Disk Drive

Formatted Capacity	270 MB/512 bytes per sector
Signal Interface	SCSI
Recording Method	RLL (2,7)
Spindle Speed	3,600 rpm (0.5%)
Read/Write Heads	6 heads
Disks	3 disks
Track Density	824 tracks per in.
I/O Data Transfer Rate	12 Mbps
Auto Head Park	Yes
Power Dissipation	20 watts, typical
Form Factor	Half-height

Alarm Arbiter Card Specifications

Watchdog Timer Parameters After reset – 5 to 7 minutes

Normal operation – 5 to 10 seconds

Alarms:

Types	Major, Minor, Aux 1, Aux 2 Visual indicators on AAC front panel
External	NO and NC relay contacts provided for each alarm
External Contacts	Type — 2 Form C Rating — 0.5A @ 24 VDC, 0.25A @ 120 VAC Resistive load only
Front Panel Switches	A-RESET — Resets left system controller (Side A) B-RESET — Resets right system controller (Side B) SELECT A — Side A system controller always active AUTO — Either system controller can be active SELECT B — Side B system controller always active

Front Panel Indicators	Active A — Side A is active (LED on)
	Active B — Side B is active (LED on)
	ALARMS-MAJOR — Major alarm condition
	ALARMS-MINOR — Minor alarm condition
	ALARMS-AUX1 — Auxiliary alarm 1 condition
	ALARMS-AUX2 — Auxiliary alarm 2 condition
Power Dissipation	24 watts, typical
Form Factor	Eurocard 2

Network Bus Controller (NBC3) Specifications

Microprocessor	MC68360 (25 MHz)
Memory	4 MB DRAM
	256 Kb EPROM
System Synchronization	Clock Input (Ext. or Bus) = 1.544 MHz \pm 75 Hz
External Reference Clock (Bitsclk)	64.0 KHz \pm 3 Hz (Front panel 9-pin male D-sub connector)
Internal Reference Clock	1.544 MHz \pm 50 Hz (complies with Stratum 4 requirements)
Phase Lock Loop	1.544 MHz
Center Frequency	32.768 MHz

Digital Trunk Card Specifications

E1-PRI

Integrated Multipurpose (MP) Processor

Microprocessor MC68302 (16 MHz)

Memory 64 KB EPROM
256 KB SRAM

Input E1-PRI Stream Specifications:

Format Common Channel Signaling (CCS) on Time Slot 16
Frame Alignment Signaling on Time Slot 0
Time Slots 1 to 15 and 17 to 31 switchable

Data Transparency HDB3

Frequency 2.048 MHz 200 Hz

Impedance 75 ohms 10 ohms

Output E1-PRI Stream Specifications:

Format Common Channel Signaling (CCS) on Time Slot 16
Frame Alignment Signaling on Time Slot 0
Time Slots 1 to 15 and 17 to 31 switchable

Data Transparency HDB3

Frequency 2.048 MHz 200 Hz

Impedance 75 ohms 10 ohms

E1-CAS

CAS Processor:

Microprocessor Intel 8032 (12 MHz)

Memory 64 KB EPROM
256 KB SRAM

E1 Stream Specifications:

Format	G.703 & G.732 with CRC framing
Ones Density	HDB3 coding
Frequency	2.048 MHz \pm 200 Hz
Impedance	75 ohms 10 ohms unbalanced 120 ohms 10 ohms balanced
Jitter & Wander	Complies with CCITT G.823

T1

Applications Interface with D3/D4 digital loop carrier systems, including Channel Sender Units (CSUs), digital channel banks and digital switches

I/O Module 15-pin, D-type, male or RJ-45

Packet Processor:

Microprocessor	8031 (12 MHz)
Memory	8 KB EPROM 2 KB DRAM

Auxiliary Processor:

Microprocessor	8031 (12 MHz)
Memory	8 KB EPROM
Power Dissipation	10 watts, typical
T1 Interfaces Per Card	1
VF Channels Per Card	24 (1 incoming, 1 outgoing stream)

Input Stream Specifications:

Format	Bipolar, D3/D4, DS-1
Drive Capability	0 to 655 ft (0 to 200 m) (22 AWG ABAM cable)
Impedance	100 ohms 10 ohms

Output Stream Specifications:

Format	Bipolar, D3/D4, DS-1
Drive Capability	0 to 655 ft (0 to 200 m) (22 AWG ABAM cable)
Impedance	100 ohms 10 ohms
Line Equalization	Switch selectable pre-emphasis

Programmable Four Span T1

Microprocessor	(4) MC68302, (1) MC68340
Memory	256K per processor SRAM 64K/68302 EPROM 128K/68340 EPROM

Input T1 Stream:

Format	D4 or ESF
Data Encoding	Alternate Mark Inversion (AMI)
Data Transparency	Selectable bipolar with 8 zero substitution (B8ZS), Bit 7 zero suppression, or none
Frequency	1.544 MHz 76 Hz
Impedance	100 ohms 10 ohms

Output T1 Stream:

Format	D4 or ESF
Data Encoding	AMI
Data Transparency	B8ZS, Bit 7 zero suppression, or none
Frequency	1.544 MHz 76 Hz
Drive Capability	0 to 655 ft (0 to 200 m) (22AWG ABAM cable)
Impedance	100 ohms 10 ohms
Line Equalization	Switch selectable pre-emphasis

Programmable Four Span E1

Microprocessor (4) MC68302, (1) MC68340

Memory 256K per processor SRAM

64K/68302 EPROM

128K/68340 EPROM

Input E1 Stream:

Format CAS/MER
CAS/R2
CRC4
CCS/31B

Data Encoding Alternate Mark Inversion (AMI)

Data Transparency HDB3

Frequency 2.048 MHz 100 Hz

Impedance 75 ohms 7.5 ohms or 120 ohms 12 ohms

Output E1 Stream:

Format CAS/MER
CAS/R2
CRC4
CCS/31B

Frequency 2.048 MHz 100 Hz

Impedance 75 ohms 7.5 ohms or 120 ohms 12 ohms

Drive Capability CCITT Recommendation G.703 for
75 ohm Coax 120 ohm twisted pair

PRI/N Card

Applications	Interface with North American -law Primary Rate (23B+D) stream. Supports D-channel protocol handling of the user side and user side symmetrical. Also supports NFAS. Compatible with Northern Telecom DMS-100 and DMS 250, and AT&T 4ESS and 5ESS implementations.
Microprocessor	MC68032 (16 MHz)
Memory	32KB EPROM 4 MB DRAM
Input Stream Specifications:	
Format	D3/D4 or ESF
Data Transparency	B8ZS
Frequency	1.544 MHz \pm 200 Hz
Impedance	100 ohms \pm 10 ohms
Output Stream Specifications:	
Format	D3/D4 or ESF
Data Transparency	B8ZS
Drive Capability	0 to 655 ft
Impedance	100 ohms \pm 10 ohms

ICC with 16 Span T1 I/O Module

Microprocessor	Power PC, MPC 860, 50 MHz
Memory	16 MB 8 MB FLASH
Input T1 Stream:	
Format	D4 or ESF
Data Encoding	Alternate Mark Inversion (AMI)
Data Transparency	Selectable bipolar with 8 zero substitution (B8ZS), Bit 7 zero stuff, or none
Frequency	1.544 MHz 76 Hz
Impedance	100 ohms 10 ohms
Output T1 Stream:	
Drive Capability	0 to 655 ft (0 to 200 m) (22 AWG ABAM cable)
Line Equalization	Programmable pre-emphasis

ICC With 16-Span E1 I/O Module

Microprocessor	PowerPC, MPC 860, 50 MHz
Memory	16 MB DRAM 8 MB FLASH
Input E1 Stream:	
Format	CAS/MER CAS/R2 CRC4 CCS/31B Plus Programmable Protocols
Data Encoding	Alternate Mark Inversion (AMI)

Data Transparency	HDB3
Frequency	2.048 MHz 100 Hz
Impedance	120 ohms 12 ohms (75 ohms with optional balun)

Drop and Insert Card

Microprocessor	MC68360
Memory:	1MB DRAM, 72-pin SIMM 256Kb x 8 EPROM 2Kb x 8 EEPROM
Data Ports	(Eight identical ports) Connector: DB-9 female Signals: XMT Clock and Data, RCV Clk and Data Levels: EIA/TIA-449/V.35 compatible
Data Options	(Selected per port) Speed: Synchronous 56 Kbps or 64 Kbps Configuration: DTE or DCE Bit Ordering: Normal, Reverse modes Test: Loop Back mode Operation: Slip and Loss of Clock Detection in DTE mode

Service Circuit Card Specifications

Integrated Prompt and Record Card (IPRC)

Microprocessor	MC68340 (16 MHz)
SCSI Interface	NCR53C94 SCSI Controller
Memory	128 KB EPROM 2-16 MB DRAM 7 KB SRAM
Voice Playback/ Record Channels	8 playback/4 record ports 64 playback/32 record ports 128 playback/32 record ports
Max Prompt Time	35 minutes
Voice Encoding Method	64 Kbps Pulse Code Modulation (PCM)

Service Platform Card (SPC)

Microprocessor	PowerPC, MPC 860, 50 MHz
Memory	16 MB DRAM
SRM Location	4
Bandwidth	504 per SRM or 2012 per SPC

Service Resource Module (SRM)

Microprocessor	(8) T1 TMS320C548 (66 MHz)
Memory	(8) 96K SRAM
SRM Location	4
Algorithms	DTMF Detection, Tone Generation, Conferencing, Call Progress Analysis, MF Reception, MFCR2 Processing

Power Supply Module Specifications

Input Voltages	–48 VDC, Dual –48 VDC, 120 VAC, or 240 VAC (50/60 Hz)
Output Voltages	+5 VDC
	+15 VDC
	–15 VDC
	+12 VDC
	+24 VDC
	–48 VDC
Spare Fuse Kit	Two replaceable 25-amp fuses for the power supply module Four replaceable 30-amp fuses for the power entry module
Power LED	Power switch off—LED not illuminated Power switch on—LED turns green (normal operation) Power switch on—LED turns red (replace power supply module) Power switch on—LED not illuminated (replace a fuse or the power supply module)

Signaling

The following tables list basic signal and tone information for VCO/4K. For further information, refer to the appropriate country tone feature package for your VCO/4K system or contact your Cisco Systems sales representative.

Table 4-1 Tone Plan for North American Digital Tone Generation

Frequencies	Level ¹	Tone
941 Hz + 1336 Hz	–7 dBm/freq	DTMF 0
697 Hz + 1209 Hz	–7 dBm/freq	DTMF 1
697 Hz + 1336 Hz	–7 dBm/freq	DTMF 2
697 Hz + 1447 Hz	–7 dBm/freq	DTMF 3
770 Hz + 1209 Hz	–7 dBm/freq	DTMF 4
770 Hz + 1336 Hz	–7 dBm/freq	DTMF 5
770 Hz + 1447 Hz	–7 dBm/freq	DTMF 6
852 Hz + 1209 Hz	–7 dBm/freq	DTMF 7
852 Hz + 1336 Hz	–7 dBm/freq	DTMF 8
852 Hz + 1447 Hz	–7 dBm/freq	DTMF 9

Table 4-1 Tone Plan for North American Digital Tone Generation (continued)

Frequencies	Level ¹	Tone
697 Hz + 1633 Hz	-7 dBm/freq	DTMF A
770 Hz + 1633 Hz	-7 dBm/freq	DTMF B
852 Hz + 1633 Hz	-7 dBm/freq	DTMF C
941 Hz + 1633 Hz	-7 dBm/freq	DTMF D
941 Hz + 1209 Hz	-7 dBm/freq	DTMF *
941 Hz + 1477 Hz	-7 dBm/freq	DTMF #
1300 Hz + 1500 Hz	-7 dBM/freq	MF 0
700 Hz + 900 Hz	-7 dBM/freq	MF 1
700 Hz + 1100 Hz	-7 dBM/freq	MF 2
900 Hz + 1100 Hz	-7 dBM/freq	MF 3
700 Hz + 1300 Hz	-7 dBM/freq	MF 4
900 Hz + 1300 Hz	-7 dBM/freq	MF 5
1100 Hz + 1300 Hz	-7 dBM/freq	MF 6
700Hz + 1500 Hz	-7 dBM/freq	MF 7
900 Hz + 1500 Hz	-7 dBM/freq	MF 8
1100 Hz + 1500 Hz	-7 dBM/freq	MF 9
1100 Hz + 1700 Hz	-7 dBM/freq	MF KP
1500 Hz + 1700 Hz	-7 dBM/freq	MF ST
700 Hz + 1700 Hz	-7 dBM/freq	MFSTP3P
900 Hz + 1700 Hz	-7 dBM/freq	MFSTP
1300 Hz + 1700 Hz	-7 dBM/freq	MFST2P
-	-	Quiet
350 Hz + 440 Hz	-19 dBm/freq	Dial tone
440 Hz + 480 Hz	-19 dBm/freq	Ringback (steady)
480 Hz + 620 Hz	-24 dBm/freq	Busy tone
380 Hz	-10 dBm	Digit trip
440 Hz	-13 dBm	
480 Hz	-17 dBm	High tone
920 Hz	-13 dBm	
1400 Hz	-24 dBm	
1760 Hz	-10 dBm	Pay phone trigger tone
1000 Hz	0 dBm	CCITT tone
1000 Hz	Max output	Test tone
404 Hz	0 dBm	Test tone
1004 Hz	0 dBm	Test tone
2804 Hz	0 dBm	Test tone

Table 4-1 Tone Plan for North American Digital Tone Generation (continued)

Frequencies	Level ¹	Tone
440 Hz + 480 Hz	-19 dBm/freq	Ringback (2 sec ON/4 sec OFF)
480 Hz + 620 Hz	-24 dBm/freq	Busy (.5 sec ON/.5 sec OFF)
480 Hz + 620 Hz	-24 dBm/freq	Reorder (.25 sec ON/.25 sec OFF)
380 Hz		NAK (1 sec ON/1 sec OFF)
-	-10 dBm/freq starting level	Cyclic bong tone (repeated every 3.25 sec)
1780 Hz	-12 dBm	ISUP continuity test tones
2010 Hz	-12 dBm	ISUP continuity test tones

1. All levels are relative to system 0 TPL.

Table 4-2 CCITT, Q.441-R2 Signaling Group I Forward Signals

Comb.	Desig.	Frequencies	Meaning ¹	Meaning ²
1	I-1	1380 + 1500 Hz	Language Digit: French	Digit 1
2	I-2	1380 + 1620 Hz	Language Digit: English	Digit 2
3	I-3	1500 + 1620 Hz	Language Digit: German	Digit 3
4	I-4	1380 + 1740 Hz	Language Digit: Russian	Digit 4
5	I-5	1500 + 1740 Hz	Language Digit: Spanish	Digit 5
6	I-6	1620 + 1740 Hz	Language Digit: (Spare)	Digit 6
7	I-7	1380 + 1860 Hz	Language Digit: (Spare)	Digit 7
8	I-8	1500 + 1860 Hz	Language Digit: (Spare)	Digit 8
9	I-9	1620 + 1860 Hz	Spare: (Discriminating Digit)	Digit 9
10	I-10	1740 + 1860 Hz	Discriminating Digit	Digit 0
11	I-11	1380 + 1980 Hz	Country Code Indicator, outgoing half-echo suppressor required	Access to incoming operator (Code 11).
12	I-12	1500 + 1980 Hz	Country Code Indicator, no echo suppressor required	Access to delay operator (Code 12). Request not accepted.
13	I-13	1620 + 1980 Hz	Test Call Indicator (Call by automatic test equipment)	Access to test equipment (Code 13). Satellite link not included.
14	I-14	1749 + 1980 Hz	Country Code Indicator, outgoing half-echo suppressor required	Incoming half-echo suppressor required. Satellite link included.
15	I-15	1860 + 1980 Hz	Not used	End-of-pulsing (Code 15). End of identification.

1. When the signal is the first transmitted on an international link terminating in the destination country of the call.
2. When the signal is other than the first signal on an international link.

Table 4-3 CCITT, Q.441-R2 Signaling Group II Forward Signals

Comb.	Designation	Frequencies	Meaning	Notes
1	II-1	1380 + 1500 Hz	Subscriber without priority	National Use Only
2	II-2	1380 + 1620 Hz	Subscriber with priority	
3	II-3	1500 + 1620 Hz	Maintenance equipment	
4	II-4	1380 + 1740 Hz	Spare	
5	II-5	1500 + 1740 Hz	Operator	
6	II-6	1620 + 1740 Hz	Data transmission	

Table 4-3 CCITT, Q.441-R2 Signaling Group II Forward Signals (continued)

Comb.	Designation	Frequencies	Meaning	Notes
7	II-7	1380 + 1860 Hz	Subscriber (or operator without forward transfer facility)	International Use Only
8	II-8	1500 + 1860 Hz	Data transmission	
9	II-9	1620 + 1860 Hz	Subscriber without priority	
10	II-10	1740 + 1860 Hz	Operator with forward transfer facility	
11	II-11	1380 + 1980 Hz	Spare for National Use	
12	II-12	1500 + 1980 Hz		
13	II-13	1620 + 1980 Hz		
14	II-14	1749 + 1980 Hz		
15	II-15	1860 + 1980 Hz		

Table 4-4 CCITT, Q.441-R2 Signaling Group A Backward Signals

Comb.	Designation	Frequencies	Meaning
1	A-1	1140 + 1020 Hz	Send next digit ($n+1$)
2	A-2	1140 + 900 Hz	Send last but one digit ($n-1$)
3	A-3	1020 + 900 Hz	Address-complete, change over to reception of Group B signals
4	A-4	1140 + 780 Hz	Congestion in the national network
5	A-5	1020 + 780 Hz	Send calling party's category
6	A-6	900 + 780 Hz	Address-complete, charge, set-up speech conditions
7	A-7	1140 + 660 Hz	Send last but two digit ($n-2$)
8	A-8	1020 + 660 Hz	Send last but three digit ($n-3$)
9	A-9	900 + 660 Hz	Spare (<i>for national use</i>)
10	A-10	780 + 660 Hz	Spare (<i>for national use</i>)
11	A-11	1140 + 540 Hz	Send country code indicator
12	A-12	1020 + 540 Hz	Send language or discriminating digit
13	A-13	900 + 540 Hz	Send nature of circuit
14	A-14	780 + 540 Hz	Request for information on use of echo suppressor
15	A-15	660 + 540 Hz	Congestion in an international exchange or at its output

Table 4-5 CCITT, Q.441-R2 Signaling Group B Backward Signals

Comb.	Designation	Frequencies	Meaning
1	B-1	1140 + 1020 Hz	Spare (for national use)
2	B-2	1140 + 900 Hz	Send special information tone
3	B-3	1020 + 900 Hz	Subscriber line busy
4	B-4	1140 + 780 Hz	Congestion (encountered after change over from Group A to Group B signals)
5	B-5	1020 + 780 Hz	Unallocated number
6	B-6	900 + 780 Hz	Subscriber's line free, charge
7	B-7	1140 + 660 Hz	Subscriber's line free, no charge
8	B-8	1020 + 660 Hz	Subscriber's line out of order
9	B-9	900 + 600 Hz	Spare (for national use)
10	B-10	780 + 660 Hz	
11	B-11	1140 + 540 Hz	
12	B-12	1020 + 540 Hz	
13	B-13	900 + 540 Hz	
14	B-14	780 + 540 Hz	
15	B-15	660 + 540 Hz	

