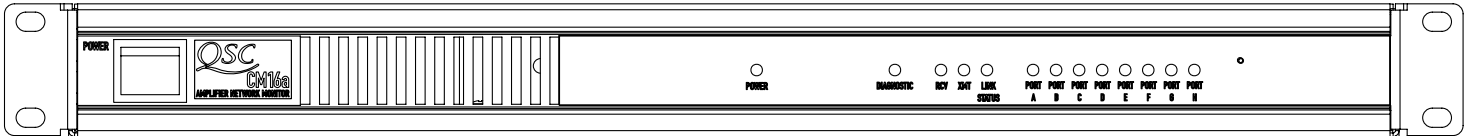
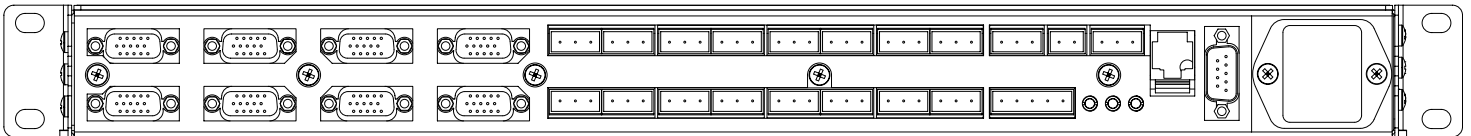


Front View



Rear View



The CM16a Amplifier Network Monitor is a key hardware component of QSCControl, QSC's Ethernet based audio network. The CM16a provides sixteen channels of gain control, monitoring, and amplifier management for DataPort-equipped QSC amplifiers. The CM16a is operated remotely by a Pentium-based PC or QSC System Controller running QSCControl application software. Control and monitoring data is communicated between the Pentium-based PC or QSC System Controller and CM16a via an Ethernet network. The CM16a, located in the amplifier rack, is linked to each amplifier via a DataPort.

CM16a Input / Output Control & Monitoring

- Input sensitivity selection: 1V or 3V
- Input source select: Normal/Page
- Gain control
- Pre-/Post-fader audio signal monitoring
- Mute control
- Signal polarity control
- Signal level metering

Amplifier Output Monitoring

- Output voltage and current metering
- Amplifier output power in watts
- Output clip detection monitoring
- Amplifier headroom metering
- Output signal (speaker terminal) audio monitoring

Load Monitoring

- Open / shorted load detection
- Programmable threshold for detecting load opens and shorts
- Real-time load impedance measurement

Amplifier Management

- AC standby/operate mode selection
- AC mode indication (off/standby/operate)
- Amplifier protect status monitoring
- Amplifier operating temperature metering
- Amplifier gain control monitoring
- Amplifier model ID indication
- Bridge Mono/Parallel/Stereo mode indication

Other Features

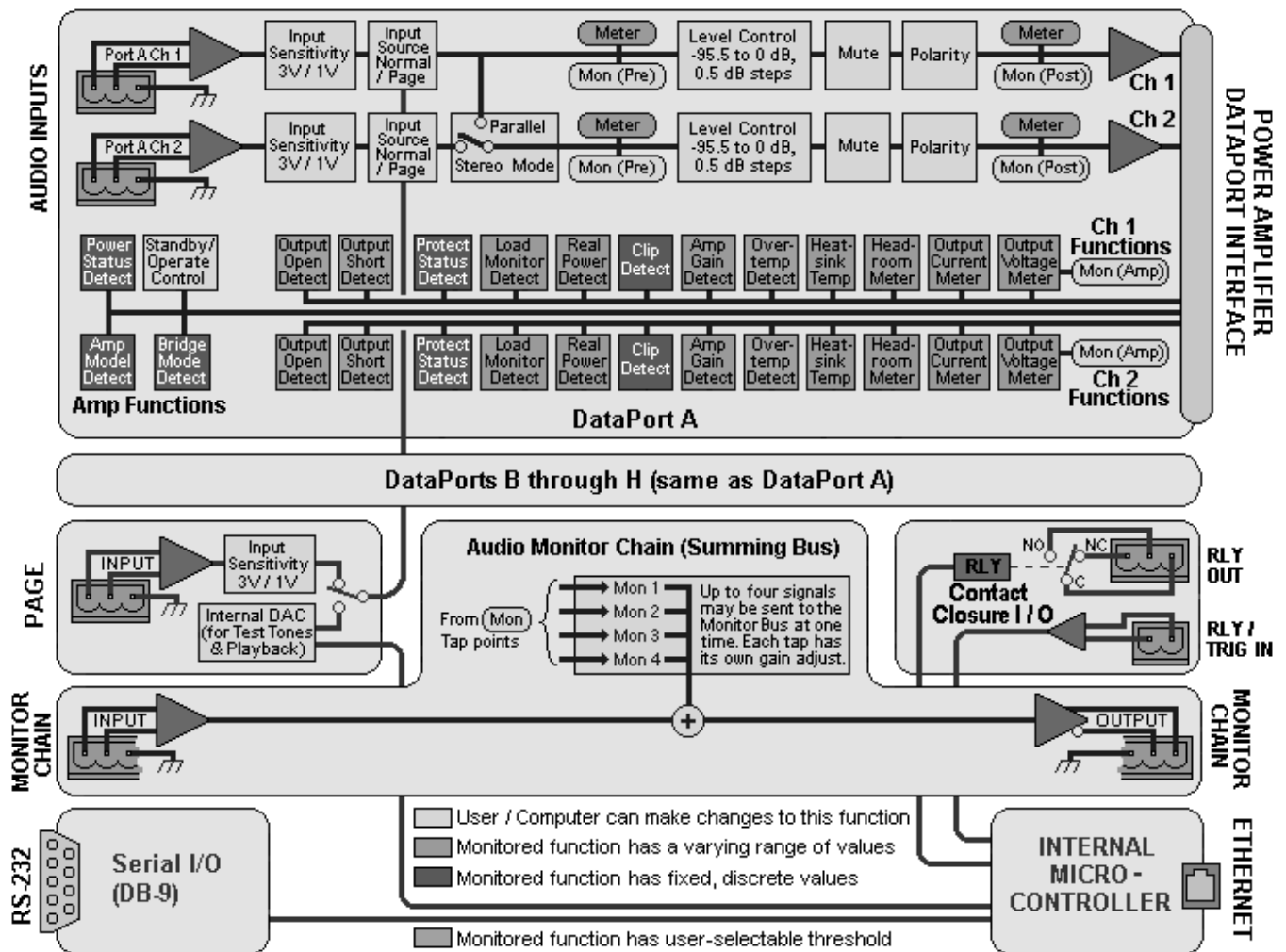
- Sixteen configuration presets
- External RS-232 port for diagnostics and preset control
- Internal Audio DAC (Digital to Analog Converter) for system diagnostics, load impedance measurement, or playback of audio files
- Contact closure input
- Page input with selectable 1V or 3V sensitivity
- One floating dry-contact SPDT relay output
- Single-line balanced summing audio monitor bus
- Front-panel bypass switch
- Firmware updateable via network to add future upgrades



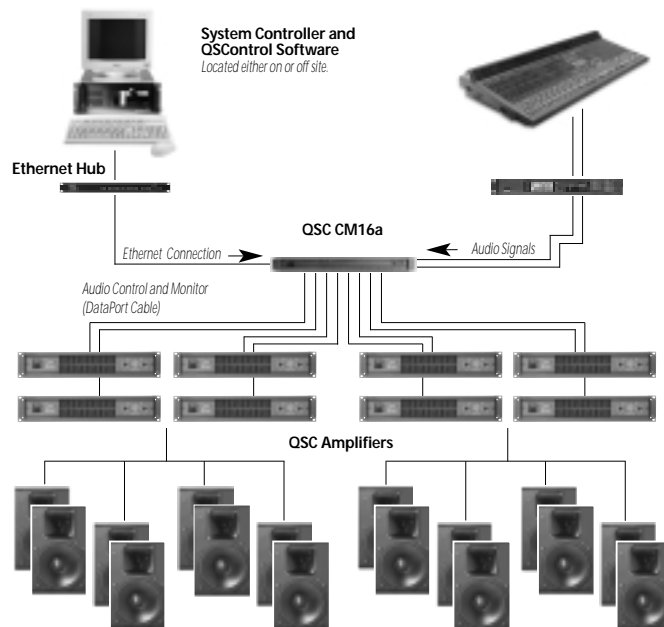
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BLOCK DIAGRAM OF THE CM 16



Typical QSControl Network



INPUT SIGNAL

FREQUENCY RESPONSE:	20 Hz to 20 kHz, ± 0.5 dB 10 Hz to 80 kHz ± 3 dB
DISTORTION:	< 0.01% THD+N @ +4 dBu out (page input < 0.03%)
DYNAMIC RANGE:	> 110 dB unweighted (20 Hz–20 kHz) (page input > 100 dB)
POLARITY:	In-phase or reversed
LEVEL CONTROL RANGE:	-95.5 to 0 dB in 0.5 dB steps
PRECISION ATTENUATOR	
TRANSIENTS ("Zipper Noise"):	better than 112 dB below maximum output
MUTE:	> 90 dB attenuation
INPUTS:	
Program inputs	16
Paging input	1
Monitor bus input	1
Connector type	"Phoenix-style" (a.k.a. "Euro-style") detachable terminal blocks
Type	Electronically balanced
Grounding	All shield terminals connected to chassis
Nominal level	1V/3V rms selectable
Maximum level	+21 dBu
Impedance	25 k Ω balanced
Common-mode rejection	Typical, >50 dB, 20 Hz–20 kHz Worst Case, >40 dB at 20 kHz rolling off to >40 dB at 20 kHz
Crosstalk (inter-channel within Data Port pair)	> 75 dB separation (20 Hz–20 kHz)
Crosstalk (intra-channel between Data Ports)	> 90 dB separation, 20 Hz–20 kHz measured with all inputs and outputs terminated

OUTPUTS:

Program outputs	16 (via HD-15)
Connector type	8 HD-15 data port connections
Monitor output	1
Cable type	VGA monitor cable
Qualified length	2 meters
Monitor output	1
Connector	"Phoenix-style" (a.k.a. "Euro-style") detachable terminal blocks
Type	Electronically balanced
Grounding	Shield terminal connected to chassis
Nominal level	+4 dBu
Maximum level	+21 dBu
Output impedance	75 Ω balanced
Output load	600 Ω min

POWER AMPLIFIER OUTPUT MONITORING

OUTPUT SHORT DETECT:*	Senses load < 1 Ω for Stereo/Parallel modes; < 2 Ω Bridge Mono mode Threshold is adjustable in software
OUTPUT OPEN DETECT:*	Senses load > 60 Ω Threshold is adjustable in software
OUTPUT VOLTAGE METER:	Range automatically matches to amplifier model used
OUTPUT CURRENT METER:	Range automatically matches to amplifier model used

*Signal level must be higher than -32 dB, referenced to maximum output of amplifier

POWER AMPLIFIER MANAGEMENT

POWER AMPLIFIER INTERFACE:

Compatibility	QSC Data Port equipped amps
Connector and cable	HD-15 VGA cable, 2 meters length qualified (for longer runs, contact QSC's Technical Services Department)

AMPLIFIERS:

Up to eight 2-channel amplifiers or four
4-channel amplifiers (or some combination
thereof)

AC POWER CONTROL:

AC mode control	Switches amplifier between normal and standby mode
AC power indicator	Indicates operate, standby, or power-down mode

AMPLIFIER STATUS MONITOR:

Clip indicator	Senses channel clip status
Protect indicator	Senses amplifier protect status
Temperature meter	Reports amplifier operating temperature (above 50°C)
Over-temp. alert	Software adjustable threshold

CONTROL ROOM FOLDBACK MONITORING

NUMBER OF SIGNAL

MONITORING BUSES PER CM16a: 1

NUMBER OF CHANNELS PER CM16a: 4

INTERNAL SIGNAL MONITOR POINTS

(EACH WITH AN ATTENUATOR):

Pre-fader input signal	16
Post-fader input signal	16
Power amplifier output	16

MONITOR INPUT:

Mixed with tap point signal at unity gain	
Nominal level	+4 dBu
Maximum level	+21 dBu
Input impedance	10k Ω balanced
Configuration	Active balanced, shield connected to chassis
Common-mode rejection	Worst case, >54 dB at 20 Hz rolling off to >40 dB at 20 kHz Typical case, >50 dB 20 Hz–20 kHz

OUTPUT:

Sum of monitor input and signals from internal monitor tap point	
Frequency response:	20 Hz–20 kHz ± 0.5 dB
Distortion:	< .05% THD @ +4 dBu out
Dynamic range	> 90.5 dB unweighted, 22 Hz–22 kHz
Noise floor:	-90.5 dB
Nominal level:	+4 dBu
Maximum level:	+21 dBu
Output impedance:	75 Ω balanced
Output load:	600 Ω min
Configuration:	Active balanced

LEVEL:

Adjusts amplitude of signal from tap point	
Monitor in to monitor out	0 dB, ± 1 dB
Control range	-95.5 to 0 dB in .5 dB steps

INTERNAL DIGITAL TO ANALOG CONVERTER (DAC)

Internally generated test signals or pre-stored .WAV files can be routed to any/all inputs. This preempts the paging input. .WAV files are network downloadable and can be stored to CM16a internal memory.

CONTACT CLOSURE INPUTS AND OUTPUTS

INPUTS:	1 discrete input
Configuration	Single-ended input.
Resistance for closure detect	< 1k Ω max
Resistance for open detect	> 5k Ω min
Input voltage limit	7.000 VDC maximum
Ground limits (*- input terminal)	Potential to case: 3V maximum Resistance to case:100 Ω
OUTPUT:	1 discrete output
Configuration	Electromechanical relay, dry contacts, floating, C, NC, NO
Maximum steady-state current	0.5A
Maximum switched current	0.25A
Ground isolation	70V maximum
CONNECTOR:	"Phoenix-style" (a.k.a. "Euro-style") detachable terminal block connectors

NETWORK INTERFACE

PHYSICAL NETWORK:	Ethernet
Raw data rate	10 megabits per second
Frame format	D.I.X. (Ethernet)
Connector	RJ-45 female
Ethernet type	10BASE-T: (via RJ-45)
Cable type	10BASE-T: CAT-3 (or better) twisted pair
Max cable length	10BASE-T: 100 m to hub
Grounding	Floating
TRANSPORT NETWORK:	TCP/IP
Internetwork protocol	IP
Transport protocol	UDP
APPLICATION PROTOCOL:	QSC24
Version	1
Revision	7

RS-232 PORT

CABLE TYPE	Null-Modem (a.k.a. Laplink)
PORT SETTINGS	Bits per Second 9600
	Data Bits 8
	Parity none
	Stop Bits 1
	Flow Control Xon/Xoff

GENERAL

PHYSICAL	
Height:	1.72" (1RU)
Width:	19" (standard rack mount)
Depth:	14.84" (37.7 cm), including rear supports
Weight	11 lbs. (5 kg)
Mounting:	Rear support recommended for portable or mobile use
Operating Temp.:	0 to 50° C
AC POWER:	
Voltage	100-240 VAC (Universal Supply)
Current	1A RMS @ 120V, 1.1A RMS @ 100V, 0.5A RMS @ 230V
Frequency	47-440 Hz

Specifications subject to change

ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

The CM16a Amplifier Network Monitor shall provide input, output, and status control for Data Port equipped QSC power amplifiers in an Ethernet-TCP/IP based network audio system. Sixteen independent channels shall be provided, grouped in pairs to support up to sixteen power amplifier channels.

Amplifier Input Control and Monitoring. For each of the sixteen power amplifier input signals, the CM16a shall provide gain, mute and polarity control, pre- and post-fade signal level metering and audio monitoring, and selectable +4 dBu/-10 dBV (3V/1V) input sensitivity.

The CM16a shall provide a page input, separate from the normal program inputs, whose signal may preempt the program signal of any or all of the sixteen program channels. This input shall have selectable +4 dBu/-10 dBV (3V/1V) sensitivity.

The CM16a shall provide an internal Digital to Analog converter circuit. Such circuit shall be used for generating test signals and for playback of pre-recorded .WAV files. These .WAV files shall be network downloadable and storable in the CM16a's on-board memory. As with the page input, this DAC circuit may preempt any or all of the sixteen program channels.

The CM16a shall provide for the storage and recall of up to sixteen different presets, numbered 0 through 15. Each preset shall be a "snapshot" of all of the CM16a functions and settings. Preset #0 shall be the default boot-up preset.

Amplifier Output Monitoring. For each of the sixteen power amplifier outputs, the CM16a shall provide clip detect monitoring, short/open circuit detect, voltage and current metering, amplifier headroom, load impedance, real output power to load, and audio monitoring of the voltage signal.

Amplifier Management. For each of the eight dual-channel power amplifiers, the CM16a shall provide AC standby/operate mode control, AC power state indication, temperature metering, amp gain settings (front panel knob position with respect to full output), over-temperature detection, stereo/parallel/bridge-mono indication, amplifier model detection, and protect status detection (subject to the capabilities of each amplifier).

Audio Monitoring Chain. For each of the sixteen program channels, the CM16a shall provide three monitor points as follows: (1) pre fader gain control, (2) post fader gain control, or (3) post power amplifier output. A channel's monitor output may be selected from one of these three signals, or it may be switched off. The signal at the CM16a's monitor output connector shall be the sum of the signal at its monitor input connector and as many as four of the sixteen channel monitor signals at one time per CM16a. A monitor gain control shall be provided for each monitor tap point to adjust the individual levels of the channel monitor signals prior to their being mixed with the monitor input signal.

Contact Closure I/O. The CM16a shall provide one trigger contact-closure sense input which shall also be TTL signal compatible, and one dry-contact floating SPDT relay output. These shall be under software control, with functions definable by the QSCControl custom software application.

Data Network. All CM16a functions shall be controlled and monitored via an Ethernet digital control network using the TCP/IP transport protocol and the QSC24 control and monitoring application protocol. Rear-panel connections shall be provided for 10BASE-T Ethernet utilizing a standard RJ45 Unshielded Twisted Pair Category-5 connection. Other than the AC power switch, the CM16a shall have no manual controls. A 9-pin, "D" subminiature connector shall be provided to allow interfacing to an RS-232 connection. This connector shall be used for firmware upgrades as well as device testing and diagnosis via a computer's COM port.

Amplifier Interface. The CM16a's interface to each power amplifier Data Port shall be via a miniature HD-15 connector. The amplifier interface shall use a standard personal computer Video Graphics Adapter (VGA) CRT monitor cable. This interface shall transmit two amplifier input audio signals as well as all control and monitoring signals. Special signal conditioning and grounding techniques shall be used in this interface to ensure negligible levels of noise and crosstalk.

General. All audio inputs and outputs shall be balanced with a nominal input level of +4 dBu and maximum level of +21 dBu. Input connectors shall be of the "Euro-style" depluggable barrier strip type.