

# CM16 Power Amplifier Controller

## F U N C T I O N S



The CM16 Power Amplifier Controller is an input, output, and status management system for QSC power amplifiers in a network audio system. Operated via a standard Ethernet-TCP/IP control and monitoring network, the CM16 supports up to eight QSC Data Port-equipped power amplifiers. The CM16 provides gain, mute and

polarity control, audio signal monitoring, input and output metering and amplifier audio output monitoring, and presents a variety of amplifier controls and status indicators to the control and monitor network. The unit also features a set of contact-closure inputs and outputs, and a page input.

The CM16 has sixteen identical independent analog signal processing channels, each of which provides the following network controllable control and monitoring functions:

### CM16 INPUT/OUTPUT CONTROL & MONITORING

- Input sensitivity selection: +4dBu/-10dBV
- Input source select: Normal/Page
- Gain control
- Pre-/Post-fader audio signal monitoring
- Mute control
- Signal polarity control
- Signal level metering

### AMPLIFIER OUTPUT MONITORING

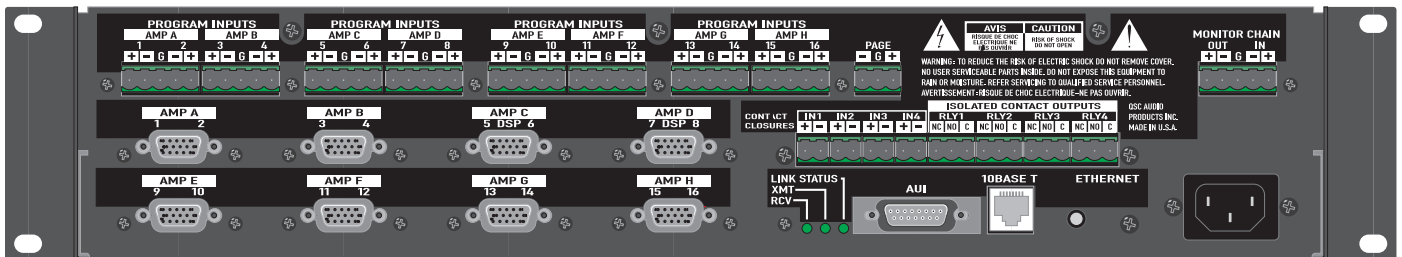
- Output voltage and current metering
- Output clip detection monitoring
- Output signal (speaker terminal) audio monitoring
- Open/shorted load detection

### AMPLIFIER MANAGEMENT

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

### OTHER FEATURES

- Four contact-closure inputs
- Page input with selectable +4 dBu/-10 dBV sensitivity
- Four floating dry-contact SPDT outputs
- Single-line balanced summing audio monitor bus



## SIGNAL PROCESSING

FREQUENCY RESPONSE:	20 Hz to 20 kHz, $\pm 0.5$ dB
DISTORTION:	< .002% THD @ +4 dBu out
DYNAMIC RANGE:	>112 dB unweighted (22 Hz-22 kHz)
DATA PORT NOISE FLOOR:	-90.5 dBu
<b>INPUTS:</b>	
Program inputs	16
Paging input	1
Monitor bus input	1
Connector type	Phoenix-type detachable barrier strips
Type	Electronically balanced
Grounding	All shield terminals connected to chassis
Nominal level	+4 dBu/- 10dBV selectable
Maximum level	+21 dBu
Impedance	25 k $\Omega$ balanced
Common-mode rejection	>75 dB (20-20kHz)
Crosstalk (inter-channel within Data Port pair)	> 75 dB separation (20-20kHz)
Crosstalk (intra-channel within Data Port pair)	> 108 dB separation (20-20kHz)
POLARITY:	In-phase or reversed

PRECISION ATTENUATOR RANGE: 0 to -86 dB in 0.5 dB steps

PRECISION ATTENUATOR TRANSIENTS ("zipper"): <112 dB below maximum output

MUTE: > 86 dB attenuation

<b>OUTPUTS:</b>	
Program outputs	16
Connector type	HD-15 female ("VGA" connector)
Monitor output	1
Connector type	"Euro-style" depluggable
Type	Electronically balanced
Grounding	Shield terminal connected to chassis
Nominal level	+4 dBu
Maximum level	+21 dBu
Output impedance	75 $\Omega$ balanced
Output load	600 $\Omega$ min

## POWER AMPLIFIER OUTPUT MONITORING

OUTPUT SHORT DETECT\*: Senses load < 1 $\Omega$  for Stereo/Parallel modes; < 2 $\Omega$  Bridge Mono mode

OUTPUT OPEN DETECT\*: Senses load > 60 $\Omega$

OUTPUT VOLTAGE METER: Range automatically matches power amplifier model used

OUTPUT CURRENT METER: Range automatically matches power amplifier model used

## POWER AMPLIFIER MANAGEMENT

<b>POWER AMPLIFIER INTERFACE:</b>	
Compatibility	Data Port compatible amps
Connector & Cable	HD-15 VGA cable, 2 meters length (qualified), maximum length TBD
<b>CHANNELS:</b>	
	16 discrete channels (sufficient for 8 dual amps)
<b>AC POWER CONTROL:</b>	
AC Mode Control	Switches power amplifier between normal and standby mode (only available for PowerLight amplifiers)
<b>AMPLIFIER STATUS MONITOR:</b>	
Clip indicator	Senses channel clip status
Protect indicator	Senses amplifier protect status
Temperature meter	Reports amplifier operating temperature (above 50°C)
AC power indicator	Indicates operate, standby, or power-down mode
Bridge, parallel, stereo mode sensing	

## AUDIO SIGNAL MONITOR CHAIN

NUMBER OF SIGNAL MONITORING BUSSES PER CM16: 1

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 internal monitor point signal at unity gain

Nominal level	+4 dBu
Maximum level	+21 dBu
Input impedance	25k $\Omega$ balanced
Configuration	Active balanced, shield connected to chassis
Common-mode rejection	>75 dB 20-20kHz

OUTPUT: Sum of Monitor input and signals from internal monitor points

FREQUENCY RESPONSE: 20-20kHz  $\pm 0.5$  dB

DISTORTION: < .05% THD @ +4 dBu out

DYNAMIC RANGE: > 112 dB unweighted, 22 Hz-22 kHz

NOISE FLOOR: -90.5 dB

Nominal level	+4 dBu
Maximum level	+21 dBu
Output impedance	75k $\Omega$ balanced
Output load	600 $\Omega$ min
Configuration	Active balanced

GAIN: Adjusts amplitude of signal at each monitor point

Monitor in to monitor out Control range	0 $\pm 1$ dB 0 to -86 dB in 0.5 dB steps
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\*Signal level must be greater than -32 dB below maximum output of amplifier

## CONTACT CLOSURE INPUTS AND OUTPUTS

<b>INPUTS:</b>	4 discrete inputs
Configuration	Single-ended open/closed contact input. TTL signal compatible
Resistance for closure detect	< 10 $\Omega$ max
Resistance for open detect	> 1k $\Omega$ min
Sense current	1.5 mA
Ground limits ("-" input terminal)	Potential to chassis: 3V max Resistance to chassis: 100 $\Omega$
<b>OUTPUTS:</b>	4 discrete inputs
Configuration	Electromechanical relay contacts, floating
Maximum steady-state current	0.5A
Maximum switched current	0.25A
Ground isolation	70V max
<b>CONNECTOR:</b>	Phoenix-type barrier strip module

## NETWORK INTERFACE

<b>PHYSICAL NETWORK:</b>	Ethernet
Raw data rate	10 megabits per second
Frame format	D.I.X. (Ethernet)
Connectors	(1) RJ-45 (1) AUI
Ethernet types	10BASE-T via RJ-45 Media Attachment Unit (MAU) via AUI
Cable type	10BASE-T: twisted pair MAU (including but not limited to): 10BASE-F: optical fiber 10BASE2: 50 $\Omega$ coax
Cable length (Media dependent)	10BASE-T: 100m to hub 10BASE-F: 5 km 10-BASE2: 635 m total
Grounding	floating
<b>TRANSPORT NETWORK:</b>	TCP/IP family
Internetwork protocol	IP
Transport protocol	UDP
<b>APPLICATION PROTOCOL:</b>	QSC24

## GENERAL

<b>HEIGHT:</b>	3.5" (2RU)
<b>WIDTH:</b>	19" (standard rack mount)
<b>DEPTH:</b>	16.75" plus 1" rear supports and 1.25" handles
<b>WEIGHT:</b>	22 lbs. (10 kg)
<b>MOUNTING:</b>	Rear support recommended for portable use
<b>OPERATING TEMP.:</b>	0 to 50° C
<b>POWER:</b>	
Voltage	95-135 VAC (US)
Current	1A RMS (US)
Frequency	50-60 Hz

## ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

The CM16 Power Amplifier Controller 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 eight dual-channel power amplifiers.

**Amplifier Input Control and Monitoring.** For each of the sixteen power amplifier input signals, the CM16 shall provide gain, mute and polarity control, pre- and post-fade signal level metering and audio monitoring, and selectable +4 dBu/-10 dBV input sensitivity.

The CM16 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 sensitivity.

**Amplifier Output Monitoring.** For each of the sixteen power amplifier outputs, the CM16 shall provide clip detect monitoring, short open circuit detect, voltage and current metering, and audio monitoring of the voltage signal.

**Amplifier Management.** For each of the eight dual-channel power amplifiers, the CM16 shall provide AC standby/operate mode control, AC power state indication, temperature metering, and protect status detection (subject to the capabilities of each amplifier).

**Audio Monitoring Chain.** For each of the sixteen program channels, the CM16 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 CM16's monitor output connector shall be the sum of the signal at its monitor input connector and the sixteen channel monitor signals. 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 CM16 shall provide four trigger contact-closure sense inputs which shall also be TTL signal compatible, and four dry-contact floating SPOT relay outputs.

**Data Network.** All CM16 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, and an Ethernet AUI (Attachment Unit Interface) connector shall also be provided to interface with other Ethernet media. Other than the AC power switch and a network media type selector switch, the CM16 shall have no manual controls.

**Amplifier Interface.** The CM16'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.

## BLOCK DIAGRAM OF THE CM16

