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, ±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  

#### INPUTS:
- 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 kΩ 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  

#### MUTE:
- <112 dB below maximum output  
- >86 dB attenuation  

#### OUTPUTS:
- Program outputs: 16  
- Connector type: HD-15 female (“VGA” connector)  
- Connector 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: 75Ω balanced  
- Output load: 600Ω min  

### POWER AMPLIFIER OUTPUT MONITORING

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

### POWER AMPLIFIER MANAGEMENT

**POWER AMPLIFIER INTERFACE:**  
- Compatibility: Data Port compatible amps  
- Connector & Cable: HD-15 VGA cable, 2 meters length (qualified), maximum length TBD  

**CHANNELS:** 16 discrete channels  

**AC POWER CONTROL:** Switches power amplifier between normal and standby mode (only available for PowerLight amplifiers)  

**AMPLIFIER STATUS MONITOR:**  
- 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  

### 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: 25kΩ 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 ±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: 75kΩ balanced  
- Output load: 600Ω min  
- Configuration: Active balanced  

**GAIN:** Adjusts amplitude of signal at each monitor point  
- Monitor in to monitor out: 0 ±1 dB  
- Control range: 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

Inputs:
- Configuration: Single-ended open/closed contact input.
- TTL signal compatible
- Resistance for closure detect: <10Ω max
- Resistance for open detect: >1kΩ min
- Sense current: 1.5 mA
- Ground limits: Potential to chassis: 3V max; Resistance to chassis: 100Ω

Outputs:
- Configuration: Electromechanical relay contacts, floating
- Maximum steady-state current: 0.5A
- Maximum switched current: 0.25A
- Ground isolation: 70V max

Connector: Phoenix-type barrier strip module

NETWORK INTERFACE

Physical Network:
- 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: 50Ω coax
- Cable length: 10BASE-T: 100m to hub; 10BASE-F: 5 km; 10-BASE2: 635 m total
- Grounding: floating

Transport Network:
- Internetwork protocol: IP
- Transport protocol: UDP

Application Protocol: QSC24

GENERAL

Height: 3.5" (2RU)
Width: 19" (standard rack mount)
Depth: 16.75" plus 1" rear supports and 1.25" handles
Weight: 22 lbs. (10 kg)
Mounting: Rear support recommended for portable use
Operating Temp.: 0 to 50°C
Power:
- Voltage: 95-135 VAC (US)
- Current: 1A RMS (US)
- Frequency: 50-60 Hz

ARCHITECT'S AND ENGINEER'S SPECIFICATIONS

The CM 16 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 CM 16 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 CM 16 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 CM 16 shall provide clip detect monitoring, short open circuit detection, voltage and current metering, and audio monitoring of the voltage signal.

Amplifier Management. For each of the eight dual-channel power amplifiers, the CM 16 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 CM 16 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 CM 16'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 CM 16 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 CM 16 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 CM 16 shall have no manual controls.

Amplifier Interface. The CM 16'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.