The CM16a MultiSignal Processor is a key hardware component of QSControl, 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 QSControl 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 Preliminary Specifications

**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 RS232 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 updatable via network to add future upgrades
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

**DISTORTION:**
- < 0.01% THD+N @ +4 dBu out
- (page input <0.03%)

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- -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: 75 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 (inter-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: 600Ω min

**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 BUS 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: 10kΩ balanced
- Configuration: Active balanced, shield connected to chassis
- Common-mode rejection: Worst case, >54 dB at 20 Hz-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: 75Ω balanced
- Output load: 600Ω 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

**POWER SHORT DETECT:**
- Senses load < 1Ω for Stereo/Parallel modes; Threshold is adjustable in software
- < 2Ω Bridge Mono mode

**OUTPUT OPEN DETECT:**
- Senses load > 60Ω 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

**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 inputs
- Configuration: Single-ended input.
- Resistance for closure detect: <1kΩ max
- Resistance for open detect: >5kΩ min
- Input voltage limit: 7.000 VDC maximum
- Ground potential: Potential to case: 3V maximum
- (*" input terminal) Resistance to case: 100kΩ

**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: 100 m to hub
- Grounding: Floating

**TRANSPORT NETWORK:**
- TCP/IP
- Internetwork protocol: IP
- Transport protocol: UDP

**APPLICATION PROTOCOL:**
- QSC24
- Version: 1
- Revision: 7

**RS232 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 (5kg)
- 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, 0.5A RMS @ 230V
- Frequency: 47-440 Hz

Specifications subject to change

**ARCHITECT’S AND ENGINEER’S SPECIFICATIONS**

The CM16a 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 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 level monitoring 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 monitoring, 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 monitoring, amp gain settings (front panel knob position with respect to full output), over-temperature detection, stereo/parallel/bridge-mode 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 Closing. The CM16a shall provide one trigger contact-closure source 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 QSControl 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 RJ-45 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.