# MCI JH-416B Console Description (black module, wood grain frame)

The MCI JH-416 is a master recording console of modular design. The main frame and housing of the console contains a full 24x10 patch bay, 22 VU meters, (or options of a light meter for each input and 6VU meters – (4) masters and 2 – aux meters.), a mother board completely wired for all modules, quick connect splicing blocks, and all wiring for full 24 track operation. **NO** matter how many modules the console is supplied with it is always wired for a full complement. This means that it can be expanded to its maximum capability in the field with only a screwdriver.

***Module descriptions follow:***

## INPUT/OUTPUT

Each input/output module contains all circuitry, switching, and control for a microphone input as well as a board track out. A three-way relay switching function controlled from an external buss provides simultaneous signal routing in all input/output modules.

In the first signal routing condition, the microphone signal is routed through an extremely low noise preamplifier with balanced transformer input (Beyer or Jensen on some JH428's and most JH428B's). Its gain is variable over a range of 24db to 50db through use of a front panel trim pot.

The preamp out passes through the mix down relay, then through the patch bay to a fader (P&G conductive plastic fader on 'B' input modules, or API faders on 'A' input modules), which feeds the equalizer booster.

The equalizer booster is of a novel design providing equalization simultaneously in three ranges. ***In early*** '**A**' consoles the equalizer had boost and cut in the high and low bands, boost only in the mid-band. The later "B" modules {black} had boost and cut in all 3 bands.

The equalizer range is as follows for the **JH416B, JH428, and JH428B** consoles:
High band is: **+/- 10db** at either 7.5khz or 10 kHz (shelving equalizer)
(Frequency shift can be changed with capacitor value changes.)
Low band is: **+/- 10db** at either 60hz or 100 hz (shelving equalizer)
(Frequency shift can be changed with capacitor value changes.)
Mid band is: **+/- 14db** at 150, 200, 300, 400, 600, 900, 1.2k, 1.8k, 2.5k, 3.5k, 5k and 7k.
(Peak equalizer)

Additionally it provides 20 to 40 db of booster gain as well as, phase pre-inversion to pre-correct for the inversion of the summing amplifiers used for active mixing.

Following the equalizer booster is a solo button, a direct button, and sixteen assignment buttons to the 16 busses (in all **JH416** consoles both **A** and **B** & some **JH428** consoles, assignment of any modules #1-24 could be assigned to tracks 1-16, and all modules had a direct assign switch so input #1 went to Track #1 etc- thru input #24 going to track #24. Later **JH428**'s and **JH428B**'s had split buss assignment so that input modules 1-16 would assign to tracks 1-16 and input modules 17-28 would assign to tracks 9-24).

The solo button routes the selected signal to the control room monitor without disturbing program circuits. It can be freely used at any time during recording.



The assignment buttons feed the summing busses on the motherboard which program back to the proper input/output modules where the summing amplifiers are located.
(I.e. summing buss #1 programs on the motherboard back into module #1, buss #2 to module #2, etc.)

The direct button feeds the summing amplifier on the same module with it to provide feeds for tracks #17-#24.

Alternately the motherboard may be programmed to allow the 16 assignment buttons on module #17 - #24 to feed any 16 of the 24 possible tracks.

The track summing amplifiers have sub-master controls associated with their feedback loops to provide emergency attenuation during recording when many mikes are mixed together and the mix must be held while attenuation of the group is necessary. (The summing amplifier is a unity gain device so this is an attenuation control only. It is suggested that gain be returned upward to unity as soon as practical and attenuation be accomplished with the faders. Headroom is decreased in direct relation to attenuation.)

In addition to being fed by way of the patch bay to the master recorder input, the track feed is routed by way of a status relay to a rotary fader, which is called the monitor pot. Its output feeds a 20db-inverting booster. These two components synthesize the functions of the main fader and the equalizer booster for the track feed and the tape return while recording live mikes through the normal circuits. This allows a mix to be set up while recording using all the other normal mixing circuits. The booster out, by way of another status relay, feeds a two-channel pan pot, two independent echoes send pots, and two cue send pots. The pan pot outs go to a three-position switch {if the input module is an "A"} and it feeds the front pair of the quad mix. In the rear position it feeds the rear pair and is provided with a center off for muting. On the later JH416B,
JH428 and JH428B input modules the pan pot feeds an other pot which routes the signal to
the front quad mix busses {1-3} or the rear quad mix busses {2-4} or a mixture of the two.

There is a pushbutton switch, which connects echo send #2 to the output of the equalizer booster rather than the monitor pot booster. This allows echo to be put on the multi-track master.

The **second** signal routing condition **[aka TAPE MODE]** is identical to the first with one exception. The tape return signal is routed to the monitor pot by a status relay thereby replacing the track feed. This allows the multi-track master to be played through the same mix circuits that were to monitor the track feeds during recording.

Additionally the module contains a button which defeats buss relay command and places it in condition one (live track monitor) for tracking purposes. A red light indicated this condition to prevent accidental defeat of status programming.

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The **third** signal routing condition **[aka REMIX MODE]** routes the tape return by way of the patch bay through the main fader to the equalizer booster. The status relay feeds the pan pot, cue sends and echo sends from the output of the equalizer booster in this condition. This is the status used for mix downs.

All described circuitry is contained in each and every module. This makes each virtually a miniature single in; single out console, which can be assembled in multiples to create a console of a magnitude of versatility that is seldom achieved even in custom consoles costing many times as much.

**HIGH LEVEL RETURN**

While designed as an echo return module for the tracks and cue, this may be used as a high level input ((+4dbm) 1.23 vac) for many purposes. It consists of a rotary fader feeding a solo button; two cue buttons, and sixteen assignment buttons. Access is from the patch bay.

**MASTER MODULE**

Containing fifteen separate amplifiers this is the most complex individual module. It contains the summing amplifiers for the two cue sends, the two echo sends, and the quad mixing busses. Output amplifiers are provided for the quad feed, the stereo feed, and the mono feed. A four channel conductive plastic fader is used as a mix down master. There are four echo returns, each fitted with a level set, quad positioning switch, pan pot, and solo button. A compatible button gives the option of diagonally reduced separation that drastically reduces level errors in the phantoms when combining for mono.

## CONTROL ROOM MONITOR

A nine-station push button switch selects the monitor feed from seven normal or two quad sources. These include one, two, and four channel machine returns as well as two and four channel mix, cue sends, echo sends, etc. A mono button displays any source as a combined phantom between the two front speakers. Normal monitoring of all sources as a two-channel presentation. Pushing the quad button when one of the quad sources has been selected borrows the studio feeds for the rear speaker pair. The control room monitor also contains the solo summing amplifier and switching circuits.

## STUDIO MONITOR

As in the control room monitor module, a nine-station switch selects monitor source and a mono switch displays the source as a mono combination phantom between the two speakers. There is no quad button, as quad monitoring requires both modules and control for this state originates in the control room monitor. A button actuates the talk back mike and level is set by a front panel control.
Provisions are made for connection of external talkback mikes and buttons. Automatic studio muting is provided making possible one-button playbacks as well as reducing annoying feedbacks.

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## RELAY CONTROL MODULE

A nine-station switch directs a pair of VU meters to any of the monitor sources. A three-station switch controls the state of the relay status buss thereby programming the whole console for one of the three operating conditions. Selective switching is provided to direct the slate or oscillator feed to the first sixteen tracks, the mixing busses, and/or the cue feeds. A slate level is provided and the oscillator over rides the slate so that communications need not be disturbed while alignment tones are being recorded.
ll relays in the JH-416 recording console are driven from solid-state drivers on a slope preventing transient generation. All amplification and mixing is accomplished by an operational amplifier of discrete component design. It is not rendered unserviceable by encapsulation or any use of uncommon components. It consists of six high quality silicon transistors and associated resistors and capacitors. First and second states are differential and the output is cascade offering extremely low source impedance. Open loop gain is 96db typically. Harmonic distortion is below the residual of the measuring oscillator (.025% at 1khz). Headroom is plus 24dbm. Track, mix, and monitor feeds are transformer coupled as well as the master tape returns.

***The MCI JH-400 series was designed as a complete recording system that requires only machines, monitors, mikes, and chambers be connected for use.***

## CONNECTION INTERFACE

All 400 series including 416A, 416B, 428, 428B, all had connections to the outside world (tape machines, mic lines, and outboard equipment are made by using telephone style punch blocks. The connections are made by using a punch block tool, soldering directly to the contact or by using needle nose pliers and side cut pliers.)

## COLOR SCHEME AND DATES OF MANUFACTURE

JH416A – 1971-72, JH416B – 1972-74, JH428A – 1974-77, JH428B – 1977-78
(These dates are approximate only)

All **JH416A** and **JH416B** consoles are black with wood grain metal frames – **JH428**'s, **JH440**'s were called sugar maple (yellow) and and had wood grain metal frames. **JH428B**'s and **JH440B**'s were Seahawk gray with Vandyke brown frames and metal legs.

Note*: Most recently these consoles have been in high demand due to the 70's sound of input, output, and microphone transformer circuits. This "warms" up the sound from the more sterile or non-coloring digital devices of today.*

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## MCI JH-416-B (Black Modules) CONSOLE SPECIFICATIONS

### PATCH BAY FACILITIES – WIRED INTO CONSOLE:

These are normalized pairs where applicable:

| | |
|---|---|
| Preamp out/line return, fader input | Mono mix out, mono tape in |
| Channel line output, tape machine input | Quad output, quad return |
| Tape machine return, channel line input | 2 Track ouput, 2 Track return |
| 84 tie lines | Mono output, mono return |
| 3 mults | Auxiliary 1, 2 send and return |
| Quad mix out, quad tape in | Cue In, cue Send |
| 2 track mix, out, 2-track tape in | Chamber In, echo Send |

### CONSOLE DIMENSIONS:

| | | | |
|---|---|---|---|
| Overall Width: | 63.60" **JH416 series** | 74.75" | **JH428 /JH428B series** |
| Overall Depth: | 39.65" | same | |
| Height to Arm Rest: | 29.75" | same | |
| Overall Height: (above floor) | 38.45" | same | |
| Net Weight: (approximately) | 488 Lbs. | 500 lbs approx. | |
| Shipping Weight: | 513 Lbs. | 530 lbs approx. | |

### CONSOLE POWER REQUIREMENTS:

LAMPS: 21V DC Bipolar @ 1.5 Amps
RELAYS: 24V DC Bipolar @ 2.3 Amps
AUDIO: 24V DC Bipolar @ 1.4 Amps
*EXTERNAL POWER SUPPLY:* 48V PHANTOM POWER SUPPLY USED FOR CONDENSER MICROPHONES OR ACTVE DIRECT BOXES (not originally supplied by the factory)
LIGHT METERS: 15V DC Bipolar, 5V DC for logic circuits (light meters were optional from the factory, no field conversions were available)

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**PROGRAM OUTPUT SPECIFICATIONS:**

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All applicable specifications taken with faders in normal operation position and +4DBM output at all outputs. Signal flow from line input to quad outputs.

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| HEAD ROOM: | +24DBM Above O |
| NOISE: | Below +4DBM at Program |
| | Output exceeds – 75DBM |
| OVERALL GAIN: | In mike mode: 80DB |
| CROSS TALK: | Less Than – 65DB channel to |
| | Channel at 10 KC + 4DBM output |
| | All channels assigned to themselves. |
| DISTORTION: | With –50DBM input into mike preamp |
| | IM: Less than .1% |
| | THD: Less than .05% |
| COOLING: | Convection |

**LIGHT METER SPECIFICATIONS**

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|---|---|
| 8 Segments: | Indication +2, 0, -1.5, -3, -6, -10, -15, -20DB |
| V.U. Balistics: | Matched to A.S.A. V.U. Specifications. |
| Peak Balistics: | 10 M.S. Integration Time: 2 Seconds Fall time. |
| Tracking Error Between Meters: | ± . 1DB Accomplished by Use of a single reference For all meters. |

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|---|---|
| Frequency Response: | 5Hz to 18.5 kHz. |
| Power: | Separate logic supply of +5V DC and ±15V DC. |
| Audio Electronics Specifications: | Same as JH-416 Metered console. |

The following information is provided by BLEVINS AUDIO Nashville,Tn. 615-242-0596
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## POWER SUPPLY SPECIFICATIONS

ELECTRICAL:
Three interchangeable power supplies are used.
Voltage outputs are determined by connecting
Appropriate power cable from console.

VOLTAGE: ±21V DC or ±24V DC Bipolar
Regulated to Less than ±1% for Inputs of 95-135V AC and outputs up to 3 Amps less than 1 mv ripple.
CURRENT: 3 Amps normal output. Current limited to 3.4 Amps – at this point the Output voltage goes to zero.
COOLING: Forced air (fan)

**MECHANICAL:**
Width of front panel: 19.00”
Height of front panel: 5.20”
Depth behind front panel: 7.40”
Width behind front panel: 17.00”