



ENGINEERING SPECIFICATIONS

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30

30

30

40

40

40

40

40

35 Hz

45 Hz

70 Hz

100 Hz

140 Hz

2

3

4

5

6

JH-500 SERIES CONSOLE



MCI introduced the JH-500 Series consoles in 1976 as the most flexible consoles ever built. This is the console which is now leading the Professional Recording Industry into the age of Automation. The basic design incorporates Voltage Controlled Amplifiers (VCAs) in all the important circuit positions which need to be automated. Automation controls are already built into the panels of each JH-500 console. Thus no design changes are needed when Automation is added.

The JH-500 Consoles were designed from the start with the idea that this was to be the most advanced, the most adaptable mixing system that our present technology could build. Every advanced technique was used—regardless of cost. Every desirable feature agreed on by the industry was incorporated—regardless of the engineering difficulties.

The inside of the accompanying fold-out brochure shows details of the modules and their controls. The accompanying FLOW CHART shows the FUNCTIONS and how they relate to each other. In addition to the mechanical and electronic specifications, this section covers details of design and construction which can not be covered by the Flow Chart.

HEAD ROOM

One of the most important features of the JH-500 Console is its increased HEAD ROOM. MCI has designed this console to supply enough dynamic range for those who are experimenting with Digital Recording systems (80 db to 90 db dynamic range is predicted). Thus the HEAD ROOM is more than adequate for normal recording levels of +4db or elevated levels of +6db or +8db. There is a MINIMUM of 24db Head Room (above a +4db level) at all points in the console. The mike preamp circuit has 34 db Head Room above its nominal level of -6db.

This extended Head Room assures the studio that there will be no increased distortion when levels are high and that intermodulation distortion will be low at all times.

INPUT/OUTPUT MODULE

The JH-500 is an IN-LINE console. All of the circuits needed for one complete MIKE CHANNEL and one complete REMIX CHANNEL are contained in a single I/O module. Any number of I/O modules may be purchased—up to the maximum for each of the three frame sizes available. If additional channels are needed, they may be added simply by plugging in new I/O modules.

OUTPUT BUSES

The thirty-two channel buses are constructed so as to take advantage of the excellent common mode rejection of modern op-amps. The output of each I/O module is bused as a differential voltage and summed with the output of other I/O modules by a Differential Active Combining Network. Any RF, hum, or noise pickup in the bus structure is seen as COMMON MODE by the summing op-amp and is therefore rejected. This design achieves a wide-band "noise floor" as much as 20db lower than many competitive consoles.

MUTES

Muting is accomplished by shorting the signal line to ground through a relay contact. This system keeps the "noise floor" at the lowest possible level by removing all of the preceding circuit noise as well as the audio signal. In addition to the CHANNEL MUTE button, all Channel, Group, and Master Faders have a switch at the minimum gain end to activate the appropriate mute.

When the console is automated, the VCA and the Mute relay work together to provide a musically pleasing 40ms ramped "kill" to the noise floor followed by the relay action. When the channel is unmuted, the relay contact release is followed by a VCA ramp to the Fader level.

CUE SYSTEM

Two stereo Cue systems are provided. These systems may be fed from the Stereo Mix buses, the Sends, the Echo Returns, from any external source, or from a combination of any of these sources. The six SEND buses may also be used as additional CUE SENDS during taping sessions when Echo Sends are not needed. This arrangement allows great flexibility in feeding a specific channel or group of channels (such as the rhythm, or the vocal) into a Cue line, to be summed with the complete Stereo Mix at a lower level to produce a Cue signal tailored to the use of a particular musician. Several of these special Cue lines can be mixed at the same time. Stereo panning of the Echo Returns into the Cue lines adds realism to the Cue mix.

EQUALIZATION

MCI's precision EQ circuits may be used either in the Channel or in the Monitor. They are carefully designed to musical scales, not to mathematical relationships. The switch positions define exact sound control points which are easy to find and easy to recapture—or to reproduce on another module.

Instead of the usual Variable gain—fixed "Q" circuits which change the tonal value as the amplitude is adjusted; MCI has designed Variable gain—variable "Q" circuits to maintain the tonal balance as the amplitude is adjusted. The BANDPASS of each circuit remains relatively constant so that when the EQ is boosted or cut, the slope of the curve increases to emphasize ONLY the sound you are looking for. Thus you do not need to use excessive EQ to achieve the effects you want.

With over 140 million combinations to choose from, you can create the EXACT sound you want with all of the dramatic impact that you wish to use.

METERS

MCI's PLASMA DISPLAY system provides a new dimension in audio metering. It uses a 100 segment NEON GLOW TUBE to produce a lighted BAR GRAPH of the audio level. Cardinal scale markings on the Graph are shown by brighter bars. This unique scale marking system is produced by PROMs (Programmable Read Only Memories) in a different pattern for each mode of operation. Each Bar Graph is scanned (Refreshed) over 40 times a second for a highly readable, flicker-free display. Lighted scale numbers appear beside each Graph, providing quick identification of the scale being used and the values of the scale markings.

Since the scale is divided into 100 divisions, it is possible to achieve remarkable resolution in the upper, expanded portion of the scales. Accuracy is better than ± 0.2 db from -10 db to full scale. The dynamic range of PEAK mode is 50 db, of VU mode is 36 db.

The PLASMA DISPLAY offers three modes of operation, VU, PEAK, and DC.

VU MODE

This scale has the familiar logarithmic markings. A 2-pole active filter adjusts the ballistics to ASA standard (matching the popular Triplet VU meter).

PEAK MODE

This mode is displayed in db on a linear scale. The Rise Time and the Fall Time are individually adjustable over a range wide enough so that the meter can be set to match ANY ballistic standard. Normally, the factory adjusts the ballistics to DIN standard 45406, which is:

- Rise time = -20db to 0 db in 10 ms.
- Fall time = 0 db to -20 db in 1.5 sec.

The range of adjustment possible in this mode is:

- Rise Time — 2 ms to 20 ms
- Fall Time — 0.5 sec. to 3 sec.

DC MODE

This is the mode used with Automation to display VCA control voltage on each channel. This type of display has been found to be a very important part of the working Automation System. Its continuous display of the VCA control voltage on each channel (adjusted to include Group and Master Faders) supplies Fader level information which can be read at a glance.

Softly-glowing LUMINESCENT PANELS are a standard feature of the PLASMA DISPLAY. They are both beautiful and useful. In addition to identifying the DISPLAY mode, they light up to show the modes of operation being used elsewhere in the console.

STANDARD VU METERS can be supplied as a lower cost option.

AUTOMATION

JH-500 Series Consoles were designed and built to be completely Automation-ready. System controls and VCAs are already installed. The JH-50/500 Automation system can be installed at any time.

The JH-50 System is MICROPROCESSOR-based. During MIXDOWN, it scans all of the FADER and MUTE functions (Plus Grouping and any other automated functions) at the rate of 9.8 times per second

and records their levels.

As the sound Engineer adjusts channel levels to achieve the best MIX, the Automation faithfully follows each change. Data accumulated by the Automation system is normally recorded on two unused tracks of the multitrack tape. Tape tracks are used in A—B—A—B—A sequence as UPDATES are made during Mixdown. A switching matrix is provided to control as many as 4 tracks for Data recording and playback.

All control movements are so simple that anyone capable of mastering the art of mixing a Multitrack tape is capable of operating an Automated Console after only a few minutes of instruction.

Three buttons (VCA WRT, VCA UPDT, & MUTE WRT) control the MODE SWITCHING for the entire console. An identical set of buttons is available for controlling each Group when a change is to be made on a Group of modules. Each I/O module, and each Echo Return circuit has its set of three buttons for use when ONLY that one circuit needs changing. All sets of buttons work alike, so the Engineer has to learn to operate ONLY THREE BUTTONS.

A single button stroke switches the whole console—or any section thereof—to WRITE mode, or to UPDATE mode. A single button stroke switches from WRITE or UPDATE mode back to READ mode. The complex manipulations needed to ensure a smooth transition between one mode and the next, between an old Data track and the new Updated track, are made AUTOMATICALLY by the MICROPROCESSOR:

NULLING

WHEN ENTERING UPDATE MODE the MICROPROCESSOR puts into memory the physical position of the Fader and equates that position to the Fader level being READ from the previous Data Track. UPDATES are recorded as the CHANGES made from the position of the Fader when UPDATE mode was initiated.

This means that BEFORE GOING INTO UPDATE MODE, you may set your Faders to ANY POINT YOU WISH, and your MIX will be UPDATED smoothly by any movements you make. You may use the upper—fine control—section of the Fader if you wish to make delicate adjustments. OR you may use the lower—coarse control—section of the Fader if you wish to make sweeping corrections.

WHEN LEAVING REWRITE MODE OR UPDATE MODE the MICROPROCESSOR automatically shifts into a temporary mode which allows the mode shift to occur ONLY when the levels are matched with the level in READ mode. You may override this automatic nulling circuit IF YOU WISH TO MAKE A STEP CHANGE IN LEVEL by an extra button stroke.

Thus NO MANUAL NULLING IS REQUIRED. With MCI Automation, you mix with your ears, not with null indicators.

MUTING

When a MUTE is recorded, the Fader level is stored and kept as part of the recorded Data track. Thus, if you ever wish to UNMUTE the channel, the Fader will return to the level it had before the channel was MUTED.

DELAYS

The accumulatable DELAY TIME for the JH-50 System is 1.2 milliseconds per UPDATE PASS. This tiny delay is the same whether you make a single change, or 100 changes on one pass. The NUMBER of changes being made AT THE SAME TIME does not increase the delay. The total DELAY TIME accumulated while working out a Mix is 1.2 ms multiplied by the number of times you rewrite the Data Track. (READ mode passes do not rewrite the Data Track). You may listen to your Mix as many times as you wish without adding any delay.

The average human reaction time between hearing and moving is about 200 milliseconds. You could make 160 UPDATE passes while working on a Mix before the total accumulated delay is 200ms.

Many Engineers are finding the JH-50 Automation so easy to use that they make their first Mix during a final taping session. The Data Track from this mix becomes the working Mix which they use to start their mixdown session.

When the Automation Power supply is turned OFF, FET switches automatically switch all controls back to the same functions they had in an UNAUTOMATED console. It is YOUR choice:

—with the Automation Power Supply ON, you can make an AUTOMATED MIX.

—With the Automation Power Supply OFF, you can use your console as if it were not Automated.

PATCH BAY FACILITIES

All of the Patch Points except the Mike Preamp output are at the standard level of +4 db. (The MIKE PREAMP OUTPUT is at -6 db). This unusual standardization of level is the result of the extended headroom available in this console. Having the same level available from all Patch points makes it easy to interface with all other Control Room equipment.

The following is a list of the Patch Points available for the JH-528 Console. Other frame sizes have the same facilities plus the additional jacks needed for the modules above #28.

PREAMP OUT/PREAMP RETURN #1 - #28 (Normalized pairs). Located before the PING-PONG (MIKE-LINE) switch.

PRE-POST EQ IN/PRE-POST EQ OUT #1 - #28 (Normalized pairs) A switch located on each 1/0 module determines whether this patch is located BEFORE the EQ or AFTER the EQ circuits.

CHANNEL LINE OUT/TAPE MACHINE INPUT #1 - #28 (Normalized pairs) Located AFTER the CHANNEL Output transformer.

TAPE MACHINE RETURN/CHANNEL LINE INPUT #1 - #28 (Normalized pairs) located BEFORE the Line Input transformer.

QUAD MIX OUT/TAPE 4 IN, TAPE 5 IN (4TRK Normalized pairs) Located AFTER the Quad Mix Output transformer.

2 MIX OUT/TAPE 1 IN, TAPE 2 IN, TAPE 3 IN located after the 2 Mix Transformer (2 Track normalized pairs).

CUE SENDS (2 pairs) Located AFTER the SEND Output transformer.

SENDS/CHAMBERS IN (6 Normalized pairs) Located AFTER the SEND Output transformers.

EQ IN/EQ OUT (For use with optional equipment)

CHAMBER RETURN/RETURN INPUTS (4 Normalized pairs) Located at the Echo Return circuit Inputs.

CHAMBER RETURN/RETURN INPUTS (8 Normalized pairs) Located at the Echo Return circuit Inputs.

MULTIPLE JACKS (In 5 sets of 4 each. These jacks have a tie switch between each set).

TIE LINES (84 lines in the standard JH-528 Console).
(160 lines in the standard JH-532 Console).
(132 lines in the standard JH-536 Console).
(218 lines in the standard JH-538 Console).
(176 lines in the standard JH-542 Console).

OPTIONS

JH-35 SPECTRA VUE

This option separates a Mix, or a Solo, into twenty-one 1/2 octave bands and displays the content of each band on a separate console meter. This AUDIO SPECTRUM ANALYSIS is made in "real time" so that you may see and hear your mix at the same time.

VCA-DC STATUS DISPLAY

This plug-in module adds the DC mode to any Plasma Display. It is particularly useful during Automated Mixdown operations.

JH-22 PHASE METER

This meter provides a quick and accurate Phase Comparison between any two Audio Signals. It reads directly in degrees, providing a ± 180 degree scale.

"SEND" VU METERS

These six meters are vertical display (1/2 in. wide, 1 1/2 in. high). (They are used with Plasma Display Consoles only).

ECHO RETURN AUXILIARY MODULE

This module contains 4 additional Echo Returns which feed into the Quad Mix Buses.

EQUALIZER AUXILIARY MODULE

This module contains 4 complete EQ systems similar to the EQ circuits in the 1/0 modules. Input is $10k\ \Omega$. Output is $600\ \Omega$.

FADER WRITING STRIPS

Two types of Writing strips are available. One is plastic and mounts above the Linear Fader. The second type is designed to hold 1 inch paper tape and mounts either above or below the Fader.

"MIKE" PATCHBAY

A "normalized" mike input patch point is installed for each 1/0 module.

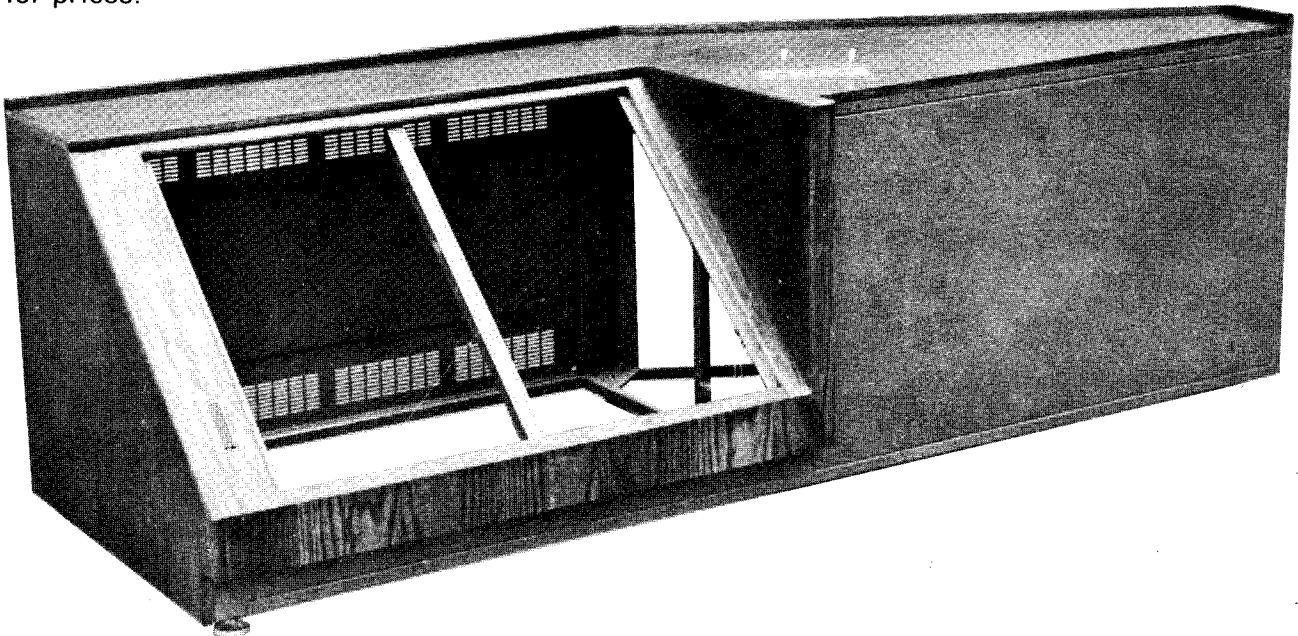
ADDITIONAL TIE LINES

All Consoles can be supplied with additional tie lines installed in the Patch Bay. The additional lines available for each console are: JH-528 = 56, JH-532 = 72, JH-542 = 84.

PRODUCER'S DESKS

The standard Desk matches the JH-500 Console and bolts to the console on either the right end or the left end. Stereo power amplifiers and speakers are mounted into a panel which matches either the VU or the LM meter housing. Twelve (12) remote function control switches are installed and recessed space for mounting a standard commercial turntable is provided. (Turntable not provided by MCI).

Another line of matching desks is available which provides mounting room for auxiliary equipment. A brochure is available which describes these desks. Contact your dealer for additional information and for prices.



SPECIFICATIONS

Since all circuitry within the console provides a low impedance source, and loads on the output lines are of the "Bridging" type, it is no longer practical to specify gains, noise, etc. in terms of dBm - which is a POWER measurement. MCI now specifies these parameters in dBv. This makes it possible to use a HP 400FL or other dBm reading meter for direct level measurement.

FREQUENCY RESPONSE

The frequency response of the JH-500 Series Console is rolled off at 20 Hz to minimize room rumble and at 20 kHz to minimize RF interference.

Any INPUT to any OUTPUT

will measure better than: $+1/4$ db or $-1/2$ db from 20 Hz to 20 kHz

INPUT AND OUTPUT IMPEDANCES

Mike Preamp Input - 1200 Ω @ .1 kHz

Line Input - 10 k Ω @ 1 kHz

Line Output - 120 Ω @ 1kHz

Unbalanced Patch Points - Input 10 k Ω , Output 2 Ω @ 1 kHz

HEAD ROOM

Head room is defined as the number of db between normal level and the maximum 1 kHz sine wave level with no more than 0.5% Total Harmonic Distortion.

	MAXIMUM LEVEL	HEAD ROOM
Mike Preamp	+28 dBv	+34 dBv
Equalizers	+28 dBv	+24 dBv
Quad Mix Buses (before Fader)	+28dBv	+24 dBv
Channel Line Output	+28dBv	+24 dBv
Mix Outputs	+28dBv	+24 dBv

OVERALL GAIN (Input impedance is 50 Ω , Output impedance is 10 k Ω .)

Gain measured from

Mike input to Channel line output — 77db

LINE TO MIKE CROSSTALK

Module in LINE INPUT mode. 150 Ω termination of Mike Input. +4 dBv signal into Channel Line Input.

40 Hz	better than	-60 db	below +4 dBv
1 kHz	better than	-65 db	below +4 dBv
18 kHz	better than	-50 db	below +4 dBv

CHANNEL TO CHANNEL CROSSTALK

Module in REMIX mode, +4 dBv input, +4 dBv output. An adjacent module is measured with shorted input and Fader at unity gain.

40 Hz	better than	-80 db	below +4 dBv
1 kHz	better than	-80 db	below +4 dBv
18 kHz	better than	-68 db	below +4 dBv

BUS CROSSTALK

The LEFT FRONT QUAD MIX BUS is fed a +4 dBv level. Readings are averaged to the three remaining buses.

40 Hz	better than	-70 db	below +4 dBv
1 kHz	better than	-78 db	below +4 dBv
18 kHz	better than	-45 db	below +4 dBv

MIKE PREAMP DISTORTION

Nominal level (-40 dBv In, -6 dBv out) less than .01% IM

High level (0 dBv In, +24dBv out) less than .04% IM

CHANNEL DISTORTION (VCA switched into channel)

VCA is adjusted for unity gain (+8 on the Channel Fader). Line input adjusted for desired Output level.

Nominal output level (-4 dBv In, +4 dBv out) less than .05% IM

High output level (+18 dBv In, +26 dBv out) less than .12%IM

Note:

When measuring VCA distortion using I.M., it is necessary to be sure that no hum exists. ANY hum which modulates the VCA level will appear as I.M. distortion.

MONITOR DISTORTION (Line input to Mix Bus) (VCA switched into Channel)

Nominal output level (-4 dBv In, +4 dBv out) less than .02% IM

High output level (+18 dBv In, +26 dBv out) less than .04% IM

TIM DISTORTION

Transient Intermodulation Distortion is measured by using a 3.36 kHz square wave as the fundamental and a 18 kHz sine wave mixed in a 4:1 ratio. The square wave is filtered to 3 db down at 40 kHz.

Nominal level is -40 dBv In, -6 dBv out for Mike preamp, others are -4 dBv In, +4 dBv out. High level output is -10 dBv In, +20 dBv out for all measurements. In the following measurements, the VCA is switched into Channel.

	MIKE PREAMP	CHANNEL	MONITOR
Nominal level	.02% TIM	.07% TIM	.03% TIM
High level	.05% TIM	.1% TIM	.1% TIM

NOISE MEASUREMENTS (Notes apply to all measurements)

1. NOISE OUT (in dBv) - GAIN (in db) = EQUIVALENT NOISE (in dBv)
2. All measurements are made with a 20 Hz HP filter and a 20 kHz LP filter. Both filters have a 6 db per octave rolloff.
3. Terminations for all noise measurements are: Mike Input = 150 Ω , Line Input = 50 Ω , Line output = 10 k Ω .
4. Noise measurements made on a HP 400FL meter have been corrected by 1.05 db. This adjustment is required when reading Gaussian noise on any meter which reads average voltage for rms value.

MIKE PREAMP (Equivalent input noise at full gain) -128dBv

CHANNEL BUS OUTPUT (no channels assigned) (Test channel at unity gain)

Signal to Noise ratio better than 75 db (reference +4 dBv)

QUAD MIX BUS OUTPUT (all channels muted at Pan mute). (Quad Mix Fader set at "0").

Signal to Noise ratio better than 85 db (Reference +4 dBv)

AUTOMATION SPECIFICATIONS

INFORMATION STORAGE SYSTEM

Any two or more tracks of an Audio recording system which meets the following criteria:

1. is able to sync with the Master tape
2. is able to record and play back a 14kHz signal
3. has at least 15dB isolation between tracks at 10kHz

FADERS, CONTROL BUTTONS AND LEDs

Built into all models of JH-500 Consoles

EXCEPT FOR

Recording Track Selectors and System Clear Button

RECORDING TRACK SELECTORS AND SYSTEM CLEAR BUTTON

Built into either:

1. Auto-Remote Aux module
2. Writing Surface near Patch Bay
3. Separate Remote Wrap

SYSTEM RESOLUTION

100db Fader range is divided into 250 steps of .4db/step. This translates into full 8-bit resolution.

SYSTEM ACCURACY

A-to-D and D-to-A is adjustable to better than System Resolution. System Resolution (0.4db) becomes System Accuracy when this adjustment is properly made.

DITHER (exclusive of system 0.4 db maximum resolution)

0.4db maximum.

CUMULATIVE SYSTEM ERROR (unlimited passes)

Total error is 0.4db. This error does NOT accumulate. (READ mode ONLY. Other modes are subject to operator changes.)

SCAN TIME

102 milliseconds

The SCAN TIME is NOT a delay, and does NOT accumulate.

BOUNCE DELAY

1.2ms per pass

The BOUNCE DELAY IS a delay which accumulates with each UPDATE PASS.

COMPATIBILITY

Tapes made on a standard Automated JH-400 or JH-500 Console may be played back on any other standard Automated JH-400 or JH-500 console.

POWER REQUIREMENTS

3 amps +15v DC (from Console supply)

3 amps -15v DC (from Console supply)

1 amp max 115v AC 50/60Hz (+5v Automation supply)

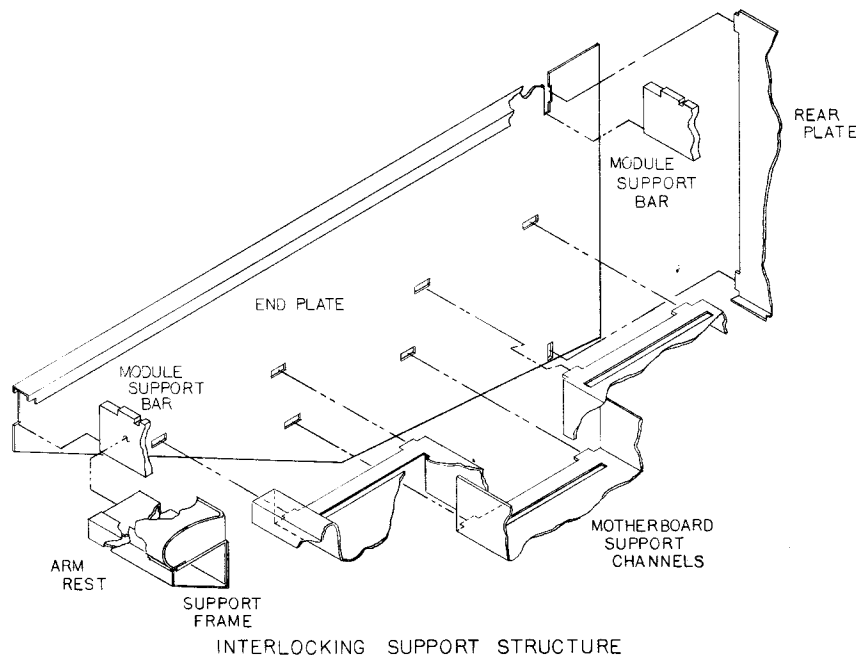
MCI reserves the right to make product improvements and changes which may affect specifications and performance without obligation or prior notice.

DATA RATE

9600 Baud (14kHz bandwidth).

MECHANICAL CONSTRUCTION

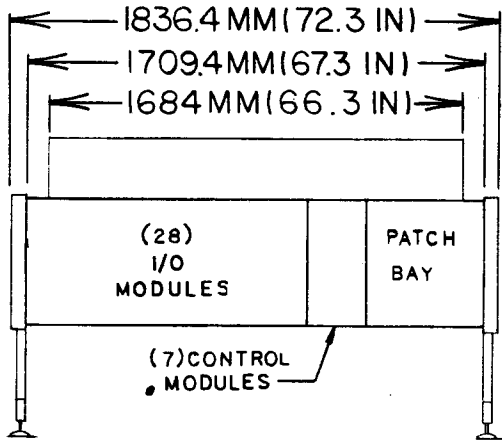
A completely new concept in mechanical construction holds all motherboard sockets in precise alignment so that connections within the console are always secure. Numerically controlled automatic machinery guarantees that each location tab or slot is accurate within ± 0.003 inches. This locks the heavy steel motherboard support channels into exact alignment with the module support rails.



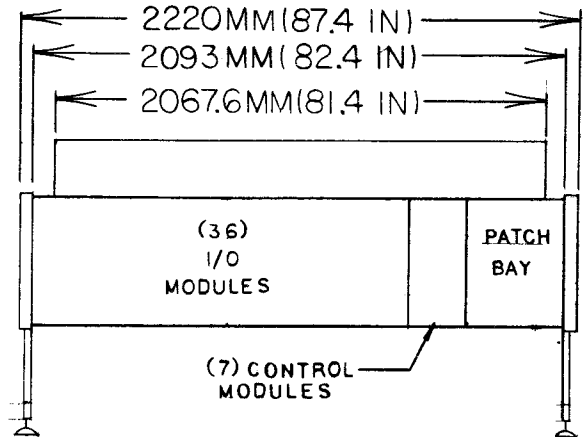
The comfortable, attractive arm rest conceals a 2¼ x 3 inch triangular support frame which runs the full length of the console. This type of construction allows very little flexing in either a horizontal or a vertical direction at the center of the console.

MODELS AVAILABLE

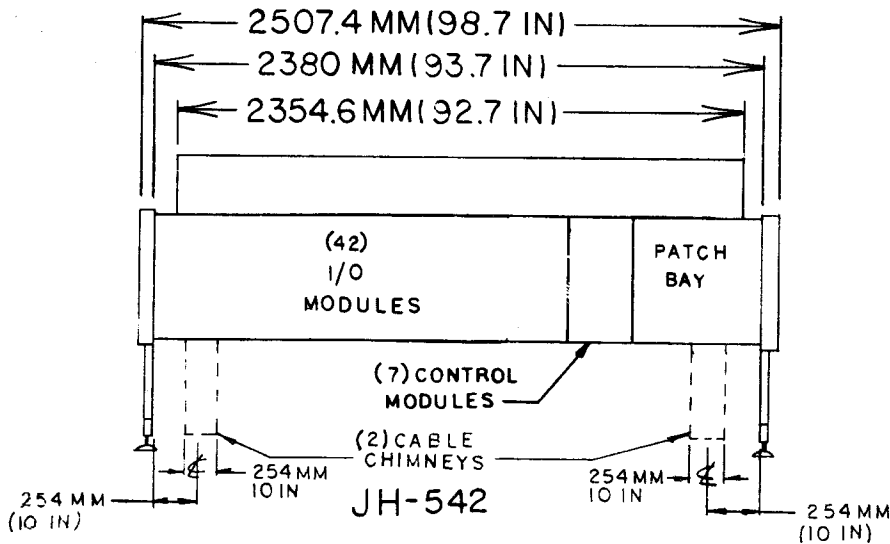
Three frame sizes are available as shown below. The JH-528 is wired and tested for up to 28 I/O modules. The JH-536 is wired and tested for up to 36 I/O modules. The JH-542 is wired and tested for up to 42 I/O modules. In addition, each console contains seven (7) control modules: A Communications module, a Master module, a Control Room Monitor module, A Studio Monitor module, and three (3) Auxiliary modules which contain the Group controls and optional equipment.



JH-528



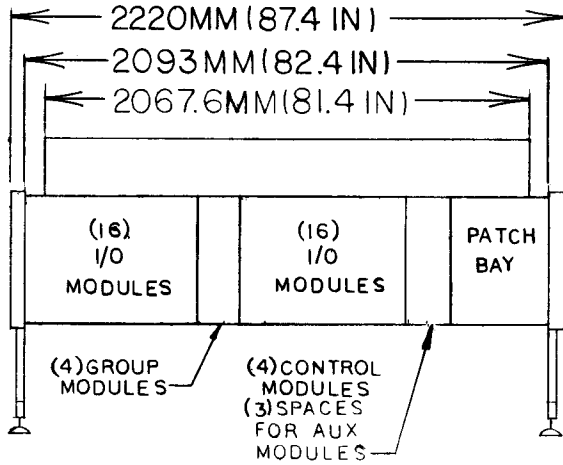
JH-536



JH-542

Each console has two cable chimneys as shown on the JH-542. The center of each chimney is 25.4mm (10 in.) from the end of the metal frame. The chimney is 254mmx63.5mm (10 in.x2.5 in.). The front-to-back positioning is shown on the Console End drawing on page 12. The rear of the chimney is 12.7mm (.5 in.) forward from the console rear panel.

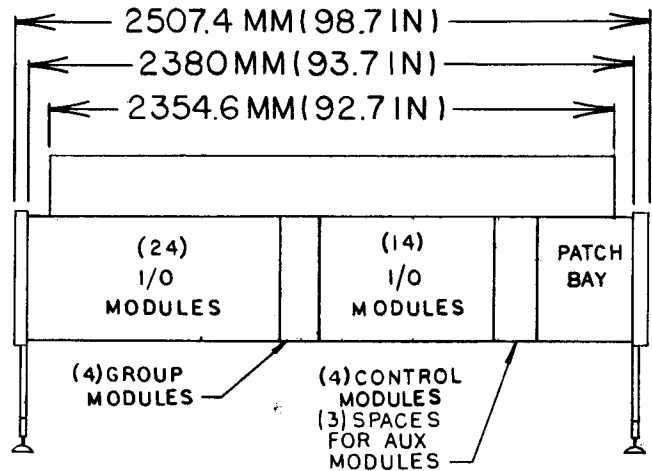
The JH-532 Console uses the same frame as the JH-536. In this version, the redesigned Group Control modules have been moved from their original position at the right end of the console to a new position in the center of the I/O modules.



JH-532

The Comm module, the Master module, the Control Room Monitor module, and the Studio Monitor module remain in their original positions. Three spaces are available for Auxiliary modules which contain optional circuits. The maximum number of I/O modules is 32.

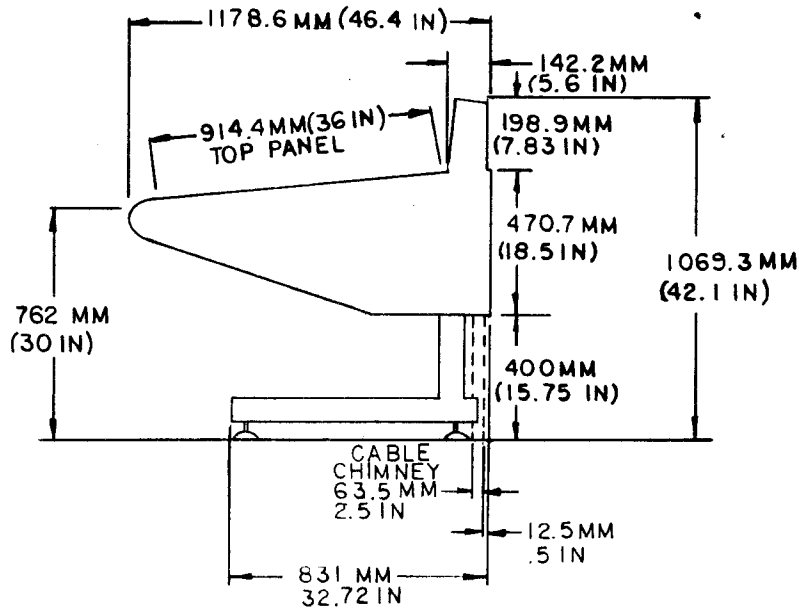
The JH-538 Console is similar to the JH-532, but uses the same frame as the JH-542. The maximum number of I/O modules is 38.



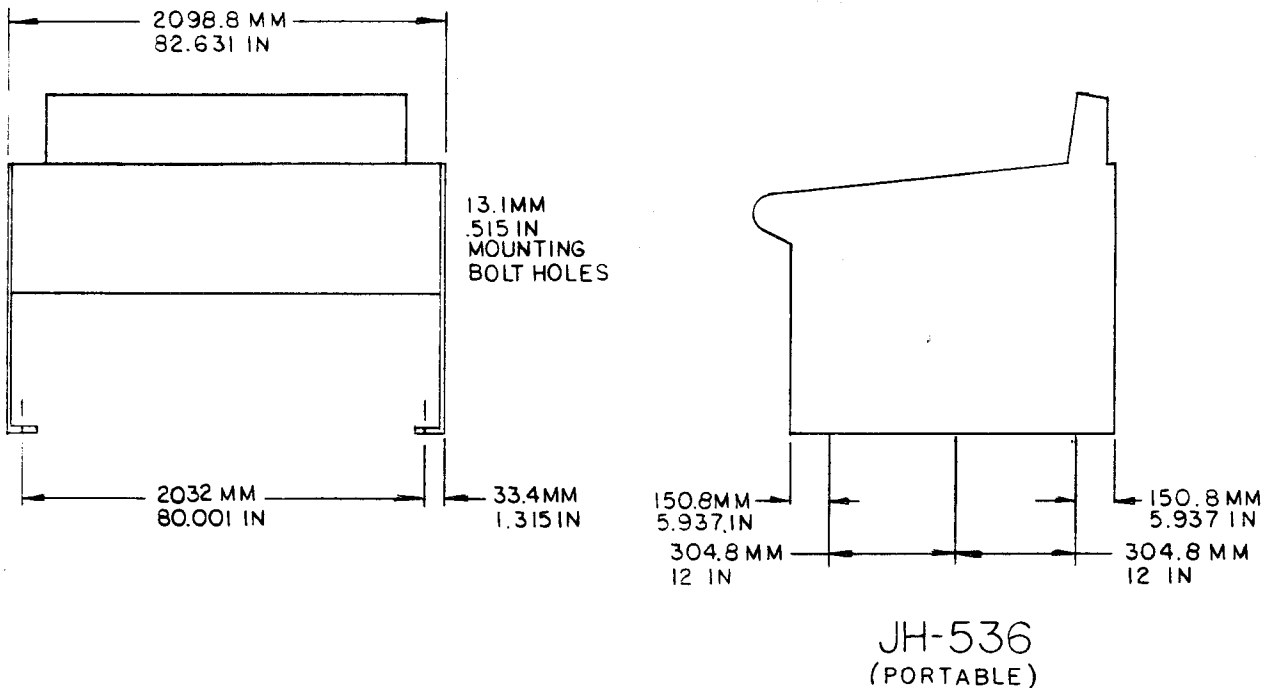
JH-538

The Group modules which are used on the center positions are redesigned for this use. They include an Echo Return circuit with Channel Assignment buttons and a complete EQ circuit. The EQ is similar to the one used in each I/O module except that there is a single MIDRANGE Boost-Cut circuit. The standard Comm and Master modules furnished with the JH-532 and the JH-538 Consoles do not contain Echo Return circuits. (These may be added as an option.)

All Consoles have the profile shown on the right when equipped with Plasma Displays. When VU meters are ordered, the meter housing is 69.8mm (2.747 in.) taller.



A ruggedized version of the JH-536 is available for mounting into trucks or buses for portable use. Instead of the decorative wooden ends which are used on all other models, this Console is equipped with a heavy steel end-plate. Mounting dimensions are shown below.



Specifications subject to change without prior notification.

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