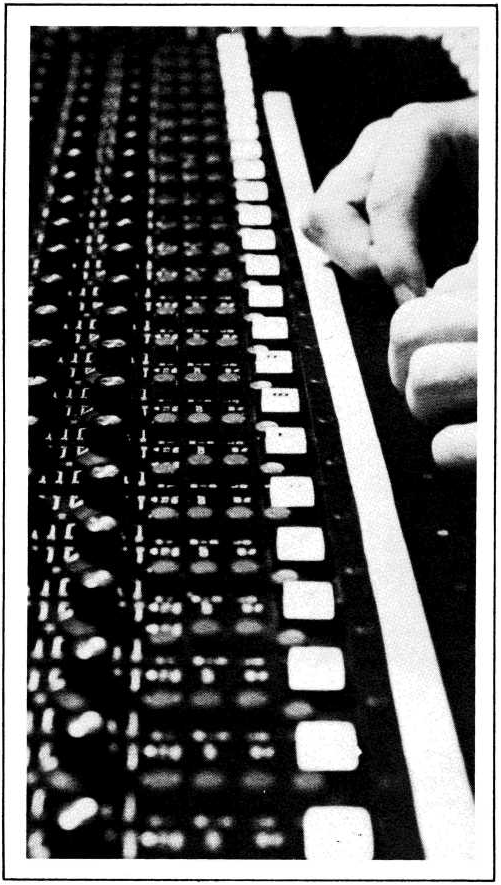
MCI JH-416 CONSOLE



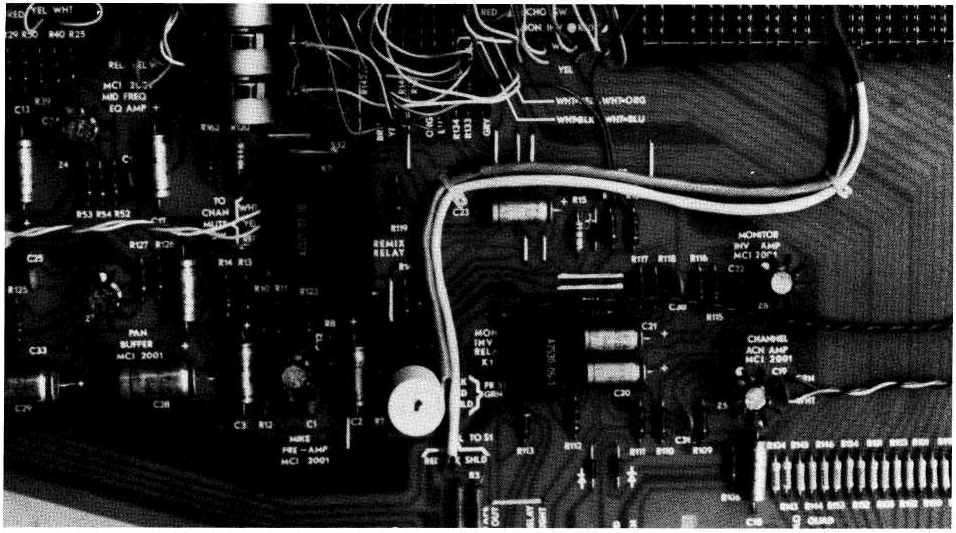
features

- 24 INPUT-OUTPUT CAPABILITY
- OPTIONAL 32 INPUT CONFIGURATION
- PENNY AND GILES FADERS
- OPTIONAL VCA GROUPING AND AUTOMATION FADER REPLACEMENT MODULE
- ILLUMINATED MUTE SWITCH WITH CHANNEL NUMBER
- FULL 3 RANGE 16 FREQUENCY RECIPROCAL EQUALIZER WITH UP TO 14 DB OF MIDRANGE BOOST OR CUT
- FULL QUAD X-Y PANNING ON EACH INPUT AND ECHO RETURN
- FULL 288 POINT PATCH FIELD WITH 84 TIE LINES
- NON-LOADING 20 DB MIKE PAD IN ADDITION TO ELECTRONIC GAIN CONTROL ACCOMMODATES THE FULL RANGE OF PROFESSIONAL MICROPHONES (IM DISTORTION LESS THAN .15% AT O DBM INPUT)
- WIRED FOR CENTRAL POWER DISTRIBUTION OF FET MICROPHONES
- SOLID STATE RELAY DRIVERS
- ALWAYS WIRED FOR 24 TRACK CAPABILITY
- PLUG-IN MODULES FOR EASY SERVICE
- MCI 2001 HIGH VOLTAGE, HIGH SLEW RATE, LOW NOISE OP AMP USED THROUGHOUT
- EXTREMELY VERSATILE ECHO AND CUE SYSTEM
- ATTRACTIVE STYLING
- TWO TOTALLY INDEPENDENT CONSOLES IN ONE HOUSING
- EXTREME SWITCHING FLEXIBILITY THROUGH INNOVATIVE DESIGN
- RELIABLE SPLICING BLOCKS
- FULL + 24 DBM OUTPUT CAPABILITY FROM EVERY AMPLIFICATION STAGE
- ISOLATED 600 OHM BALANCED OUTPUTS FROM ALL PROGRAM, ECHO, CUE, AND MONITOR FEEDS
- OPTIONAL LIGHT METER PACKAGE FOR ACCURATE VISUAL MONITORING WITH INDIVIDUALLY SELECTABLE BALISTICS
- SEPARATE SPEAKER MONITOR SOURCE AND MODE SELECTION
- QUICK ONE BUTTON REMIX AND PLAYBACK CAPABILITY
- FUNCTIONAL DESIGN
- ALL MIKES AND LINE INPUTS BALANCED AND FLOATING

two consoles in one

The MCI JH-416 Console is in reality two totally separate consoles integrated into one housing for operational efficiency. The quad mixdown busses, outputs, master fader, echo send, quad panners, cue sends, etc., are entirely independent, and are not used in the process of recording original tracks. There is an entirely separate group of combining busses, output amps, sub masters, etc., which are used to route and mix microphone or other input signals to the multi-track machine.

What this means is that the MCI JH-416 console always has its quad mixdown circuits available intact to be used as a monitor mix console while recording and tracking. We believe that this is a far superior method of constructing high versatility consoles when you consider the alternative. That being to



build into a console a separate monitor mix section which is not used for any true signal processing functions, lacking the versatility, and usually falling short of the traditional technical performance specifications you expect in the normal mixing circuits.

We believe that this ability to have the full facility of the regular quad, 2T, and mono mixdown circuits available so that you can accurately synthesize what a legitimate mix will sound like as you record, while musicians are still in the studio, and creative judgments can be made, is critical. In some consoles the subtle variations in combining characteristics and technical performance specifications in a monitor mix section when compared with the normal mixing circuits make all the difference in the world in what you heard when recording and what you hear when mixing down.

This is only one of many features which makes the MCI JH-416 possibly the most popular and widely accepted mixing console ever offered to the industry.

light meter option

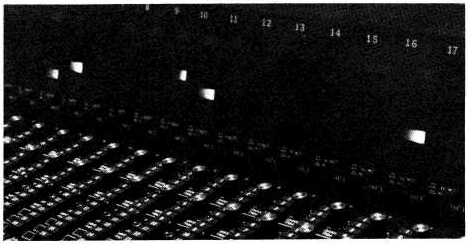
A light meter option with individually selectable VU or PPM characteristics offers a unique visual monitoring capability both while recording original tracks and when mixing down.

While recording the MCI light meters when set for VU characteristics give you the balistics and indications of a traditional VU meter. The difference is that the movement is indicated by a vertical column of 8 illuminated panels whose color changes with increased modulation. Blue and green for below normal, yellow indicating normal and red signaling over modulation.

As is the case with normal VU meters the MCI light meters when displaying VU characteristics cannot properly indicate the peak value of signals whose crest factors (peak to average ratios) are higher than average. The standard VU characteristics were originally designed to indicate levels on mixed programs whose crest factors are predictable, and not individual instruments or coherent groups of instruments whose peak energy content may be many times normal. Tamborines, snare drums, and close miked pianos are prime examples of these types of signals.

To facilitate monitoring of these signals each individual meter has a push button which when depressed changes the balistics to the European standard PPM characteristics. These balistics give very accurate indications

of the effective peak energy levels, which are the limiting factor in magnetic tape recording. The light meters can also be used when mixing down to indicate relative levels of inputs after the fader and equalizer, thereby giving an indication of their true level relationship in a final mix.



proprietary equalizer

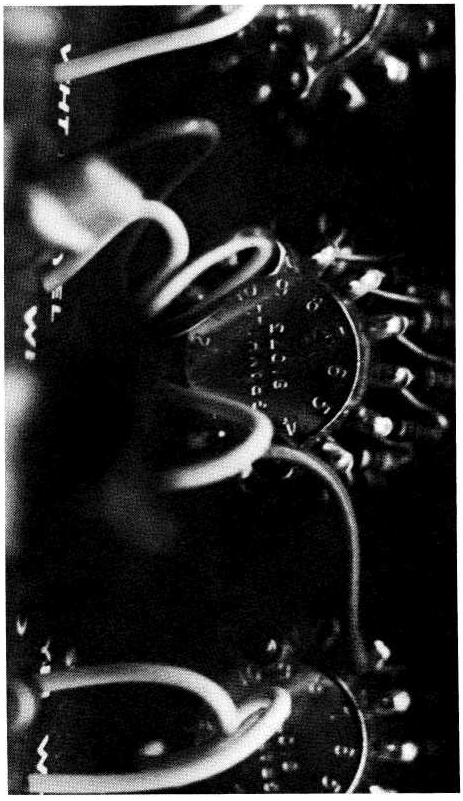
Frequency opectrum control is accomplished by a 16 frequency 3 range equalizer whose sophistication and effectiveness cannot fully be appreciated by a cursory examination of front panel features and controls.

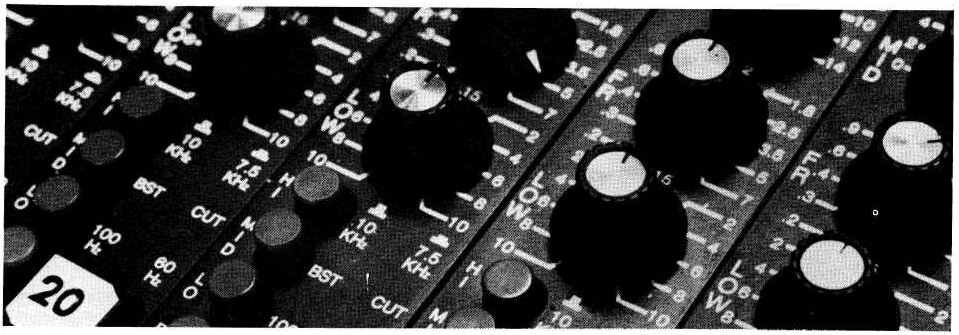
The mid range boost and cut are truly reciprocal functions which feature proprietary electronic circuitry. This special circuitry automatically changes the "Q" of the active tuned circuit as you change the boost and cut amounts on the equalizer giving you exactly optimum curves at each and every setting. This is a feature that has rarely been seen in equalizers and to our knowledge is not available in any other console equalizer offered today.

Equalizers traditionally used in the recording industry usually fall into one of two categories. Both of these involve the use of active or passive tuned circuits with preset band width or skirt characteristics.

The most common type of equalizer which we will call type **A** separates the incoming signal into two paths. One of these is allowed to pass through the equalizer unchanged. The other is fed through a bandpass filter with preset characteristics and added either in phase or out of phase to the unchanged signal to effect a cut or boost. The falacy of this method is that at small boost amounts (2db-4db) the effective band width of the boosted portion of the spectrum is so narrow that you must add excessive equalization (6db-10db) to obtain the desired amount of presence. This excessive equalization disrupts transient response and creates problems in disk and cassette production which may require the modification of the dynamic spectrual characteristics of your finished product in the mastering process.

The other traditional equalizer design which we will call type **B** also uses a tuned circuit (or band pass filter) of preset characteristics. The difference in this case is how that tuned circuit is used. In a type **B** equalizer the tuned





circuit is always in the signal path but its peak action is attenuated either actively or passively. This at small amounts of equalization gives you a broad boosted spectrum with rather short up and down slopes and a flat top lacking the peaking characteristics desired. Once again as before, to get what the ear wants to hear excessive equalization with its attendant problems is necessary.

The multiplicity of frequencies available on the MCI JH-416 equalizer makes its 3 band design the optimum choice for the experienced mixer who desires maximum creative control. The 16 frequencies are arranged to fall at exact half octave musical intervals whereas most equalizers have curves which either are not musically related or are arranged at full octave intervals and lack the required versatility.

As an answer to this problem some designers have added a second mid range section, chosen to overlap frequencies between bands, or offered a graphic type control. This is truly counter productive because if your ear wants to hear a boost or cut which peaks at a specific point it is necessary on those devices with a limited number of frequencies to use the combined effect of 2 or 3 bands to approximate that curve, which for all practical purposes defeats the flexibility of the 4 band, graphic, or overlap equalizer whose frequency points are either poorly chosen or too few for accurate musical control.

Precision detented switches with highly accurate metal film resistors have been chosen as the equalizer control elements. The rotary pot controls, as used in some equalizers, have many inherent disadvantages when compared with the MCI approach. On some rotary pot equalizers there is no individual in out switch on each band meaning that if you are equalizing in one band and want no equalization from another you must relay on the finite accuracy of knob alignment and pot accuracy to be assured that there is no undesired effect. Even when accurately adjusted for Odb boost or cut most designs have the equalizing circuits still connected which even though ineffective response wise can still have undesirable phase, noise, and distortion characteristics. When switched to the Odb position the MCI JH-416 equalizer physically and electrically **totally** removes the equalizing elements from the signal path thereby assuring the unaltered passage of unequalized program.

The advent of quad recording and mixing with its multiple mike techniques reinforces the necessity of being able to exactly match equalizer characteristics between microphones when recording and tracks when mixing. The matching is only possible on a reliable basis when a detented control with precise electrical characteristics is implemented.

The sound of the MCI console is hard to characterize because it is what you want it to be, and under your control. But at all times it is transparent, open, and effectively free of internally generated characteristics, particularly as far as noise and distortion, which could seriously limit your ability to accurately record and faithfully reproduce the studio performance, or limit your options in manipulating, and changing that performance into product that exhibits the highest order of creativity.

proprietary amplifier

The sound of the MCI JH-416 console can be attributed to many of its design elements including its equalizer. But perhaps the most important single element is the MCI 2001 amplifier coupled with a gain and level structure carefully designed to have the only restriction on dynamic range be the magnetic recording medium itself.

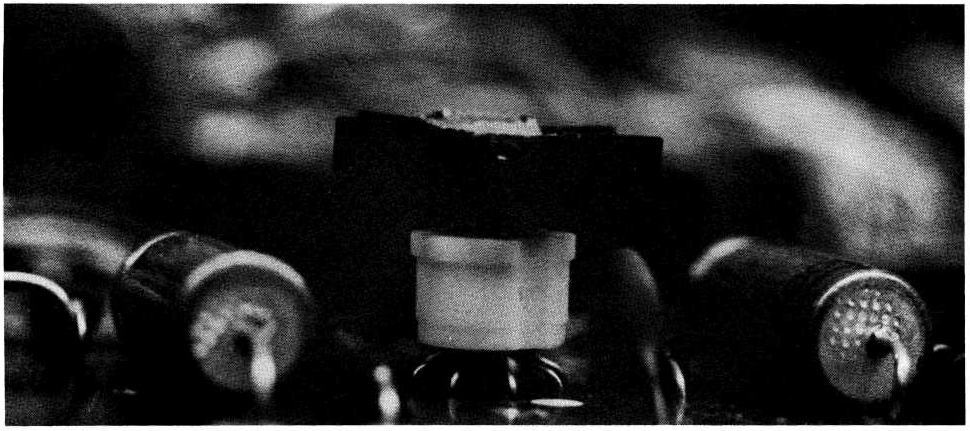
The 2001 amplifier is a high voltage, high slewrate, low distortion, low noise operational amplifier of proprietary design made especially for MCI.

Much has been said about the character of the distortion of an op-amp when driven into clipping. While an op-amp exhibits abrupt overload characteristics when clipping (generating a predictable distribution of odd order harmonics) the name of the game today is to prevent overload in the console and have the magnetic recording medium whose overload characteristics are predictable, gentle, and relatively pleasant be the only limiting factor.

The high voltage swing capabilities (in excess of 40 volts or + 24 dbm) and low noise characteristics of the 2001 op-amp have made possible a gain structure that at **all points** in the console, **internally** and at the **external interfaces** have a minimum of 6 db head room above the **absolute** saturation of today's high output tapes.

While some consoles today still have + 18 dbm output most have + 24 dbm capabilities. But this can be misleading if this output capability does not exist in each and every amplifing stage, from mike pre-amp on. Many consoles and mixing devices today are using garden variety op amps (709, LM301, 741, 748, N5556) operating from bi-polar 15 or 18 volt supplies which cannot deliver this + 24 dbm headroom capability except with discrete transistor current stages and step-up transformers.

Today's tapes are capable of magnetizing levels of around 900 nanowebers or about 14 db above the 185 nanoweber level normally used. If the tape machine is aligned so that a + 4 dbm signal from the console results in 185 nanoweber levels on the tape as is standard practice then it is readily apparent that saturation (14 db above + 4 dbm) of the tape if it were a linear relationship would require the full + 18 dbm capability of the system. In practice the relationship is not linear. The waveform compression characteristics of today's magnetic tape require more than that + 18 dbm level to achieve full saturation. Therefore we feel that the + 24 dbm capabilities found in each and every amplifying stage of the JH-416 console are not a luxury but an absolute necessity to make certain that the dynamic range of the magnetic medium is fully exploited.



input module

Each input/output module contains all circuitry, switching and control for a microphone input as well as a multi-track feed. A three way 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 preamplifer with balanced transformer input. 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 patch bay to a conductive plastic fader which feeds the equalizer. A switchable 20 db nonterminating pad allows line level inputs.

Following the equalizer is a solo button, a direct button, and sixteen assignment buttons. The solo button routes the selected signal to the control room monitor without disturbing program circuits. It can be freely used at any time even during recording.

The direct button feeds the summing amplifier on the same module with it to provide feeds for tracks #17—#24. Alternately the mother board 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 looks 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.

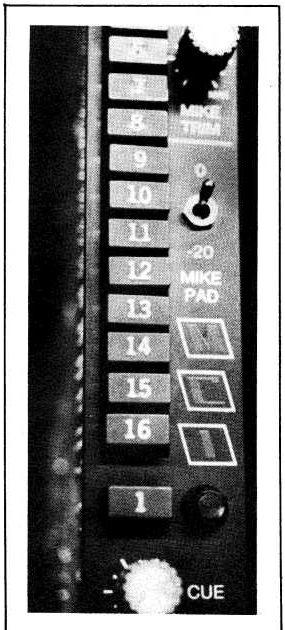
In addition to being fed by way of the patch bay to the master recorder input, the track feed is routed to a rotary fader which is called the monitor pot. Its output feeds a booster. These two components synthesize the functions of the main fader and the equalizer for the track feed and the tape return 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, feeds the quad pan pot, two independent echo send pots, and two cue send pots.

The second signal routing condition is identical to the first with one exception. The tape return signal is routed to the monitor pot thereby replacing the track feed. This allows the multi-track master to be played through the same mix circuits that monitor the track feeds during recording.

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

The third signal routing condition routes the tape return by way of the patch bay through the main fader to the equalizer booster. The status relay feeds the quad pan, cue sends and echo sends from the output of the equalizer in this condition. This is the status used for mixdowns.

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.



1-16 Seperate push on push off switches for recording buss assignment.

DIR Direct Assignment Button.

CHANNEL Sub-master for each track with click down calibrated normal position.

MIKE TRIM Microphone pre-amp gain control changes gain electrically in pre-amp.

20 DB MIKE PAD Resistive mike pad in front of transformer to prevent overload from line levels.

CUE Two independent cue send pots may be used as additional echo send when mixing.

ECHO Two independent echo send pots.

ECHO Transfers send #1 to mike circuit facilitating wet recording. In re-mix acts as pre post switch.

O-DUB Button defeats mix-down or monitor position to permit live buss monitoring on selected tracks. There is a light to warn when button is depressed.

SOLO Effects monitor only and displays selected source on two front speakers. Does not effect normal recording.

MUTE Mutes feed to monitor without effecting channel outputs.

FRONT REAR PAN POT

LEFT RIGHT PAN POT

MONITOR POT Is used in monitor modes to control buss & tape mixes not used in mix-down mode.

EQ HF ± 10 DB (7.5 or 10 KHZ) Reciprocal in 2db steps (detented)

EQ MID 0-14 DB Boos or CVI in 2db Detented steps

EQ MID Freq.—12 Frequencies in equal half octive steps from 150 HZ to 7 KHZ (detented)

LO Freq.—± 10 DB reciprocal in 2db steps (detented)

High Freq. Select 7.5 or 10 KNZ

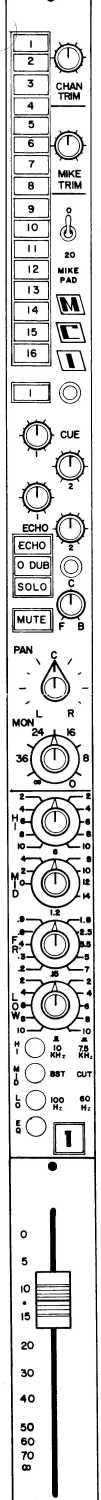
Mid Select Cut or boost

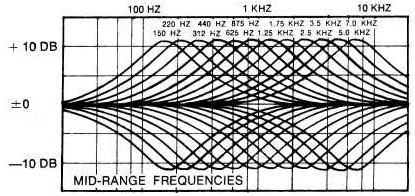
Low Freq. Select 60 or 100 HZ

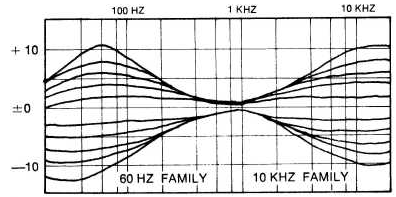
EQ in Out EQ Bypass

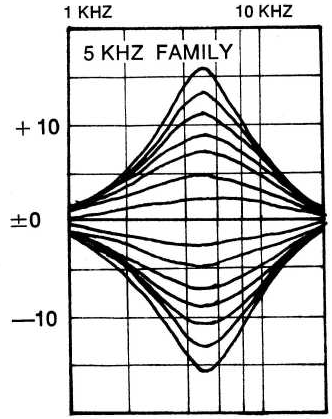
FADER MUTE Turns fader on or off. Push on—push off switch (illumated).
on—push off switch (illuminated).

FADER High quality conductive plastic fader with two stage illumination.









16 FREQUENCY — 3 RANGE COMPREHENSIVE EQUALIZER produces these and many more curves, plus an infinite variety of combinations. Not illustrated but available are the 100 HZ and 7 KHZ shelving curves.

master

The master module contains the summing amplifiers for the cue sends, the echo sends, and the quad mixing busses. Output amplifiers are provided for the quad mix, two track mix, and the mono mix as well as boosters for the echo return. A four channel conductive plastic fader is used as a mixdown and monitor mix master fader. Four sophisticated echo return channels are provided as well as submasters for the cue and echo sends.

SUBMASTERS are provided for both cue feeds as well as the two echo sends.

FOUR ECHO RETURNS allow extreme flexibility in any mixdown or monitor mode.

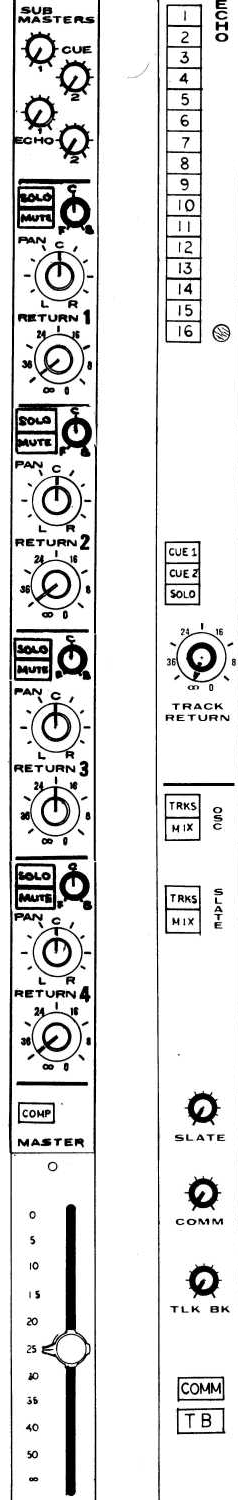
SOLO routes return to monitor along with any other selected source without disturbing program circuits. May be freely pushed at any time.

Left-right and front-back QUAD PAN POTS offer extremely flexible positioning for sophisticated mixing.

LEVEL sets gain of echo return channel for optimizing chamber drive and balancing return levels.

COMP automatically sets up a reduced separation quad and 2 track stereo mixing situation preferred by many mixers. Reduces compatability problems between the different formats. (Quad, 2 track, mono.) Has no effect unless depressed.

MASTER fades all mixdown feeds simultaneously without affecting the multitrack master feeds.



hi level return

While designed as an echo return module for the tracks and cue, this may be used as a high level input 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.

In addition the return module contains the talk-back, slate and communicate functions.

1-16 push to lock—push to release button switches provide echo return routing for wet recording.

CUE buttons can return echo to the cue bussed alone, a sometimes desirable feature.

SOLO for this echo return disturbs only the monitor and not program. May be freely pushed at any time.

OSC switches route oscillator to all recording busses (tracks) simultaneously and/or all mixdown feeds (Mix).

SLATE switches provide for slating the recording busses (Tracks) and/or mixdown feeds (Mix).

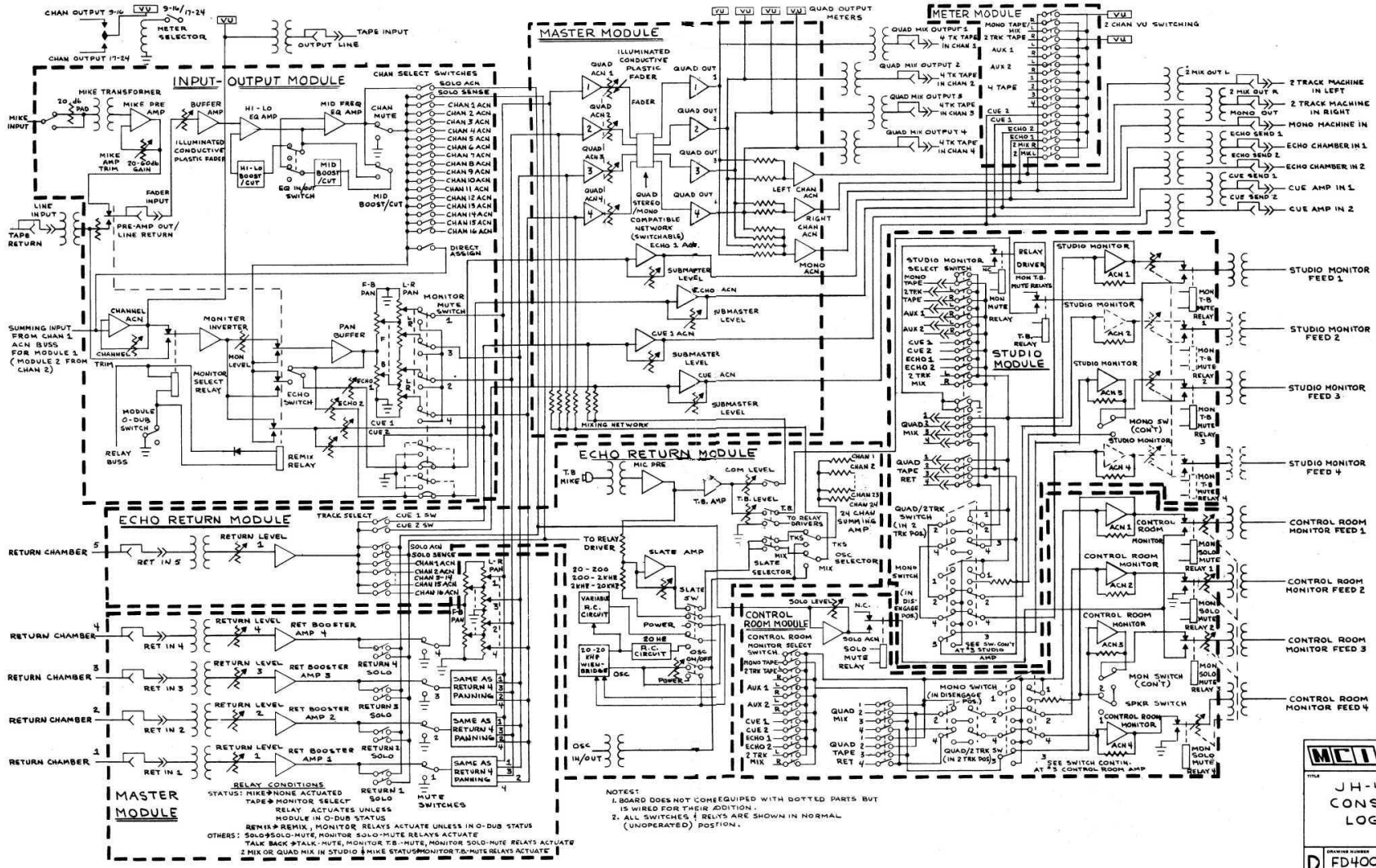
SLATE controls level of both slate feeds.

COMM controls level of communicate (talk back to headphones.)

TALK BACK sets level of all talk back functions.

COMM button provides for talk back to headphone system only.

TALK BACK button routes talk back into studio speakers, headphones, and all slating functions selected.


INPUT- OUTPUT MODULE
MASTER MODULE
METER MODULE
STUDIO MODULE
ECHO RETURN MODULE
CONTROL ROOM MODULE
MASTER MODULE
CHAN OUTPUT 9-16
CHAN OUTPUT 17-24
METER SELECTOR
TAPE INPUT
OUTPUT LINE
MIKE INPUT
MIKE TRANSFORMER
MIKE PRE AMP
BUFFER AMP
HI-LO EQ AMP
MID FREQ EQ AMP
CHAN MUTE
CHAN SELECT SWITCHES
ILLUMINATED CONDUCTIVE PLASTIC FADER
LINE INPUT
TAPE RETURN
FADER INPUT
PRE-AMP OUT/ LINE RETURN
SUMMING INPUT FROM CHAN 1 ACN BUSS FOR MODULE 1 (MODULE 2 FROM CHAN 2)
CHANNEL ACN
MONITOR INVERTER
PAN BUFFER
MONITOR MUTE SWITCH
MODULE O-DUB SWITCH
RELAY BUSS
MONITOR SELECT RELAY
ECHO SWITCH
REMIX RELAY
TRACK SELECT
RETURN CHAMBER
RET IN 5
RETURN LEVEL
RET BOOSTER AMP 4
RET BOOSTER AMP 3
RET BOOSTER AMP 2
RET BOOSTER AMP 1
RETURN 4 SOLO
RETURN 3 SOLO
RETURN 2 SOLO
RETURN 1 SOLO
SAME AS RETURN 4 PANNING
MUTE SWITCHES
RELAY CONDITIONS
STATUS: MIKE→NONE ACTUATED
TAPE→MONITOR SELECT RELAY ACTUATES UNLESS MODULE IN O-DUB STATUS
REMIX→REMIX, MONITOR RELAYS ACTUATE UNLESS IN O-DUB STATUS
OTHERS: SOLO→SOLO-MUTE, MONITOR SOLO-MUTE RELAYS ACTUATE
TALK BACK→TALK-MUTE, MONITOR T.B.-MUTE, MONITOR SOLO-MUTE RELAYS ACTUATE
2 MIX OR QUAD MIX IN STUDIO→MIKE STATUS MONITOR T.B.-MUTE RELAYS ACTUATE
QUAD OUTPUT METERS
ILLUMINATED CONDUCTIVE PLASTIC FADER
QUAD STEREO /MONO COMPATIBLE NETWORK (SWITCHABLE)
ECHO 1 AUX.
SUBMASTER LEVEL
MIXING NETWORK
QUAD MIX OUTPUT 1 4 TK TAPE IN CHAN 1
QUAD MIX OUTPUT 2 4 TK TAPE IN CHAN 2
QUAD MIX OUTPUT 3 4TK TAPE IN CHAN 3
QUAD MIX OUTPUT 4 4 TK TAPE IN CHAN 4
2 CHAN VU SWITCHING
MONO TAPE/ MIX
2 TRK TAPE
AUX 1
AUX 2
4 TAPE
CUE 1
CUE 2
ECHO 1
ECHO 2
2 MIX
MIC
2 MIX OUT L
2 MIX OUT R
MONO OUT
ECHO SEND 1
ECHO SEND 2
CUE SEND 1
CUE SEND 2
2 TRACK MACHINE IN LEFT
2 TRACK MACHINE IN RIGHT
MONO MACHINE IN
ECHO CHAMBER IN 1
ECHO CHAMBER IN 2
CUE AMP IN 1
CUE AMP IN 2
STUDIO MONITOR SELECT SWITCH
RELAY DRIVER
MON T-B MUTE RELAYS
MON MUTE RELAY
T-B. RELAY
STUDIO MONITOR FEED 1
STUDIO MONITOR FEED 2
STUDIO MONITOR FEED 3
STUDIO MONITOR FEED 4
MONO SW (CON'T)
QUAD/2 TRK SWITCH (IN 2 TRK POS.)
QUAD TAPE RET
CONTROL ROOM MONITOR
CONTROL ROOM MONITOR FEED 1
CONTROL ROOM MONITOR FEED 2
CONTROL ROOM MONITOR FEED 3
CONTROL ROOM MONITOR FEED 4
MON SOLO MUTE RELAY
MON SWITCH (IN DISENGAGE POS.)
MON SWITCH (CON'T)
SPKR SWITCH
SEE SW. CON'T AT #3 STUDIO AMP
SEE SWITCH CONTIN. AT #3 CONTROL ROOM AMP
T.B. MIKE
T.B. AMP
COM LEVEL
T.B. LEVEL
TO RELAY DRIVERS
2N CHAN SUMMING AMP
OSC SELECTOR MIX
SLATE AMP
SLATE SELECTOR
SLATE SW.
VARIABLE R.C. CIRCUIT
20 HZ R.C. CIRCUIT
20-20 KHZ WIEN-BRIDGE OSC
OSC ON/OFF
OSC IN/OUT
SOLO LEVEL
SOLO MUTE RELAY
NOTES:
1. BOARD DOES NOT COME EQUIPED WITH DOTTED PARTS BUT IS WIRED FOR THEIR ADDITION.
2. ALL SWITCHES & RELYS ARE SHOWN IN NORMAL (UNOPERATED) POSTION.
MCI
FT. LAUDERDALE, FLORIDA
TITLE
JH-416 CONSOLE LOGIC
DRAWING NUMBER
FD4000D0112
REV
A
SIZE
D
SHEET
OF