



# MODEL CS 104 ENG / EFP AUDIO MIXER

## OPERATOR'S MANUAL

COOPER □ SOUND  
□ SONUS □ CLARUS □  
TM

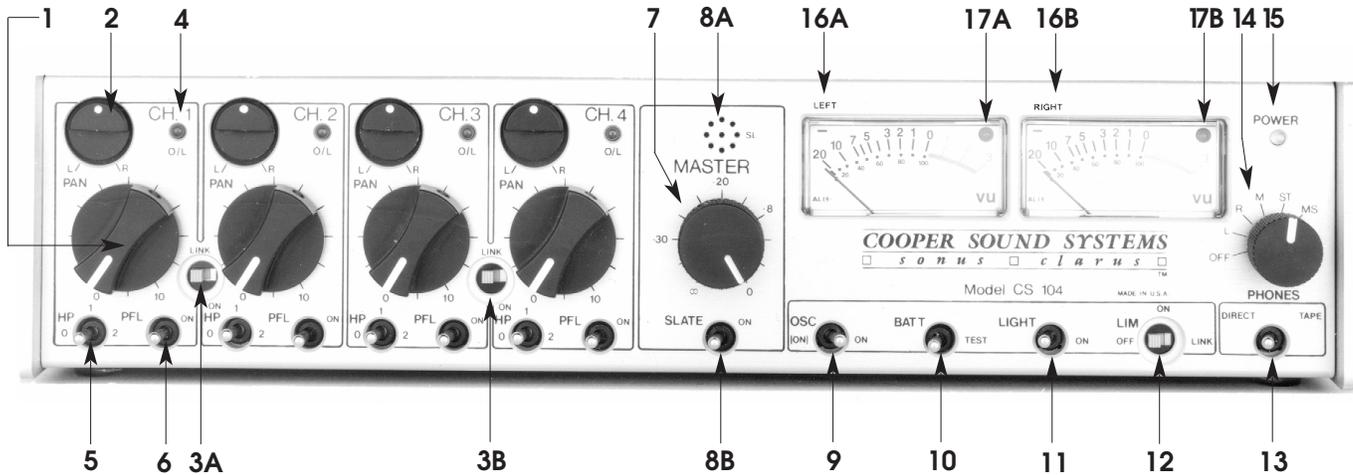


**MODEL CS 104**  
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# MODEL CS 104 FRONT PANEL

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## CHANNELS 1 THROUGH 4:

1. **Gain Pots:** Controls channel level. (Maximum gain selected by mic sensitivity switches on left panel.)
2. **Pan Pot:** Pans input signal to L,R outputs. (Flush with front panel to avoid accidental operation.) (see 'Link')
3. **A/B Channel Link Switch:**
  - 3A. Links Channels 1 and 2 - Channel 1 pot controls the gain of both Channels 1 and 2 inputs. (Channel 2 gain and pan pots become inactive.) Channel 1 pan pot controls the balance between the two linked channels.
  - 3B. Links Channels 3 and 4. (See above.)  
*Application: For use in stereo recordings requiring simple one pot operation and balance control.*
4. **O/L LED:** A symmetrical peak detector that warns you when the input level is approaching overload.  
*Application: If the LED is on, the input sensitivity should be reduced. (See Left Side Panel item no. 2.)*
5. **High Pass Filters:**
  - '0' = Flat
  - '1' = 70 HZ, 6 dB/octave
  - '2' = 140 HZ, 6 dB/octave
6. **Pre-Fade Listen:** A momentary switch that enables you to monitor the selected input channel, pre-fader.  
*Application: May be used to detect problems with a wireless microphone system or as a cue to check the program level prior to mixing.*

## MASTER SECTION

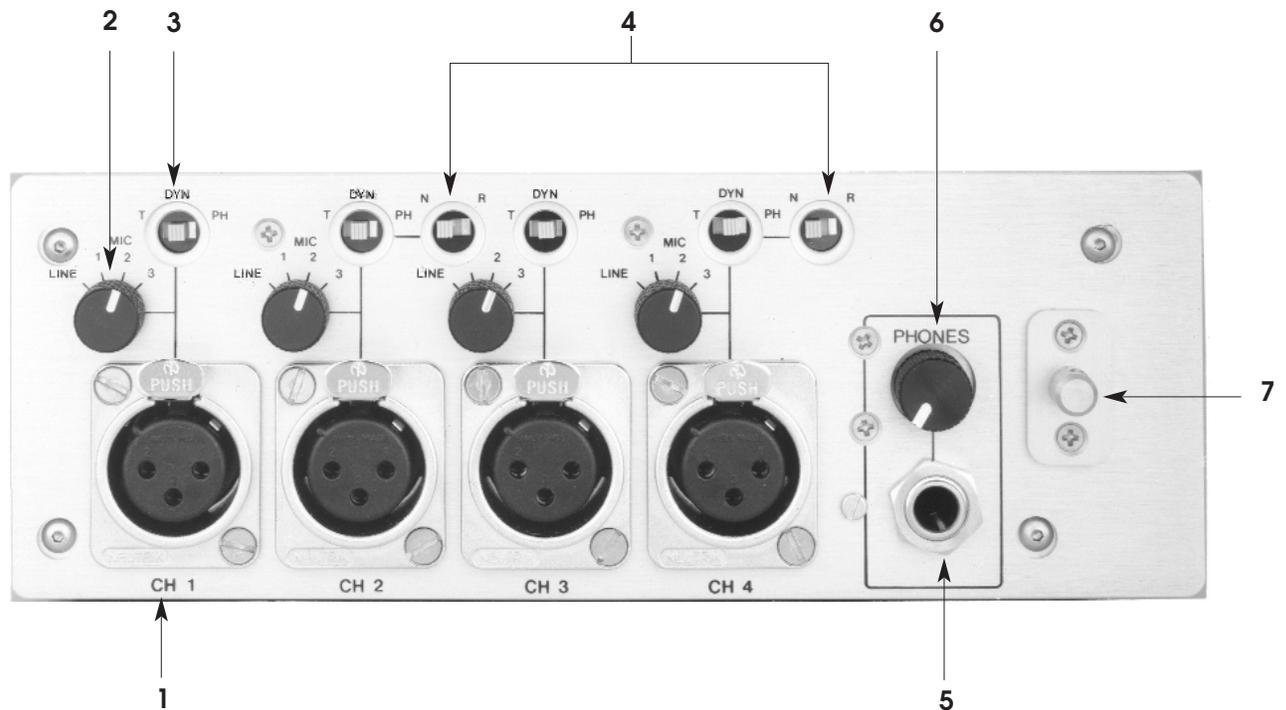
7. **Master Pot:** In most situations, the master pot is set at maximum ('0'). The oscillator and system gain is calibrated with the master set at '0'.
8. **A/B Slate Mic & Switch:** Momentary switch that allows you to announce and identify the scene and take numbers.  
Note: There is an internal trimmer to adjust the level.
9. **Osc. On:** 1 kHz tone for take identification and line up tone.  
Three-position switch - momentary 'on', off, on.
10. **Battery Test:** Left meter measures the level of the internal batteries:  

<u>Peak meter:</u>	+4 = 12 volts	<u>VU meter:</u>	+3 = 12 volts
	+2 = 10 volts		+1.5 = 10 volts
	0 = 8 volts		0 = 8 volts
	-1 = 7 volts		-1 = 7 volts

(Note: Batteries should be changed at or before 0)
11. **Light on:** Two options are available via an internal dip switch.
  1. Non-timed: Light is on or off as selected.
  2. Timed: Light has a 20 second delay before going out after the switch is turned off.
12. **Limiter 'Off-On-Link':** 'Limiter on': There is an independent limiter for each output stage.  
'Limiter Link': The two limiters are linked for stereo applications. Limiter activation on one channel will also cause the same attenuation on the other channel.  
See layout for Board D for threshold adjustment.
13. **Direct - Tape:** This switch controls both the phones and meters. In 'tape' the return from the recorder/camera is fed to phones and meters via the 10-pin connector and the monitor mini jack. Internal option - meter indicates direct signal only.
14. **Phones Select Switch:**
  - Off = No program to phones
  - L = Left, phones monitor left output only
  - R = Right, phones monitor right output only
  - M = Mono.
  - ST = Stereo, normal position
  - M/S = Mid-side, decoded to phones only
15. **Power 'On' LED**
16. **A/B Meters; Left/Right:** The left meter also indicates the battery level. If a peak reading meter is installed, Δ is the reference line up level  
For VU, '0' = reference level
17. **A/B Limiter LEDs:** Indicates limiter action

**MODEL CS 104**  
LEFT PANEL

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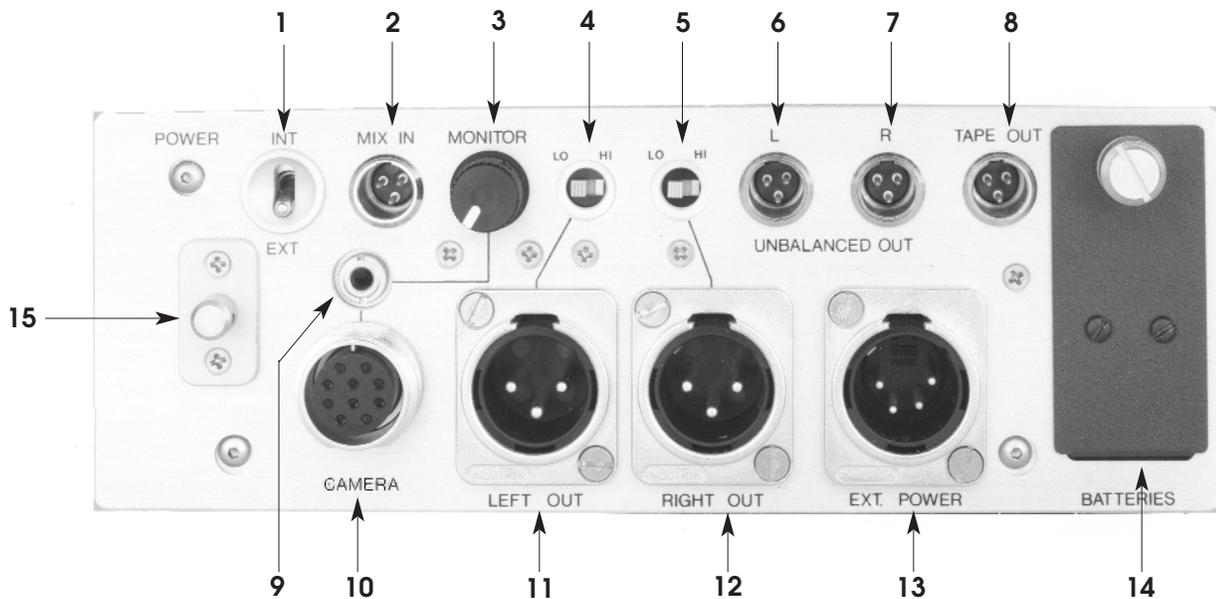


**CHANNELS 1 THROUGH 4:**

- 1. XLR Inputs:** Transformer balanced, Pin 2 is high
- 2. Line/Mic Sensitivity Select Switches:**
  - Line = Line level source
  - Mic 1 = High level condenser mic source
  - Mic 2 = Normal condenser mic source
  - Mic 3 = Dynamic microphone, Lavalier microphone
- 3. Mic Power Switches:** Independent for each channel
  - T = Tonader powering (A,B), Pin 2 is high
  - DYN = Dynamic, no powering
  - PH = Phantom 48 volt
- 4. Mic Phase:** Channels 2 & 4
  - N = Normal
  - R = Reverse
- 5. Phones Jack:** 1/4" stereo jack
- 6. Phones Level**
- 7. Strap Retainer**

**MODEL CS 104**  
RIGHT PANEL

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- 1. **Power Switch:** Int. = Internal batteries  
Center = Off  
Ext. = External power source via the 4-pin XLR (see specifications)
- 2. **Mix In:** Access to mixer busses - another mixer may be connected to this input to increase the number of channels. This is a current input, series resistors are required (see specifications)
- 3. **Monitor Pot:** Controls tape return level
- 4. / 5. **Lo/Hi:** Selects mic or line level to the left and right XLR connectors and the 10 pin camera connector
- 6. / 7. **Unbalanced Outputs:** Internally switchable mic/line levels. Nominally set at mic level  
(Application: Feeding transmitters to the camera.) (Pin 2 = Signal, Pin 1 = Ground)
- 8. **Tape Out:** Stereo output - low line level (Application: Feeding cassette recorders for transcription purposes.) Internal switch for a mono sum of the L, R channels  
(Pin 1 = Ground, Pin 2 = Left, Pin 3 = Right)
- 9. **Monitor Return:** 3.5 mm stereo mini-jack for tape return (in parallel with 10-pin connector returns).
- 10. **10 Pin Camera Connector:** Left and Right channel balanced outs and tape returns. A video camera may be connected with one cable to it's XLR inputs and headphone jack output
- 11. / 12. **XLR Outputs:** Balanced outputs for feeding a second camera, RDAT recorder, etc.
- 13. **External Power Connector:** For connecting an external battery supply and for charging internal batteries if rechargables are installed (see specifications)
- 14. **Battery Compartment:** 8 'AA' cells (see specifications)
- 15. **Strap Retainer**

# MODEL CS 104

## SPECIFICATIONS

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### GENERAL

**Dimensions of Chassis:** 10.9 x 6.8 x 2.5 inches 277 x 173 x 63.5mm  
**Weight without Batteries:** ≈ 5 lbs. ≈ 2.2kg

### POWER SUPPLY

**External Power:** nom. 12 to 24 v DC (min. 10 v DC, max. 30 v DC)  
**Internal Batteries:** (8) 'AA' cells

**Current Consumption:** 180 mA at 12 v DC (no powered microphones or 'light on')(<2.4 watts)  
 Light = +40 mA

**Battery Life (continuous use):** 10 to 12 hours, (Alkaline cells or NP1 battery)

**Battery Charge:** Maximum Voltage 15vDC

**Fuse:** 1.5 A 5 x 20 mm (fast acting)

**Overall Frequency Response:** 20-20 kHz +/-0.5 dB

**Overall Distortion:** THD + N (20-20 kHz) 0.01% (Typ. 0.005%)

**EIN:** (150Ω)(20-20 kHz) -128 dBu  
 (150Ω)"A" WT'D -130 dBu

### INPUT

	<u>Max. Input (1 kHz):</u>	<u>Gain (for '0' dBu out):</u>
<b>Line:</b>	+32 dBu	16 dB
<b>Mic 1:</b>	-12 dBu	60 dB
<b>Mic 2:</b>	-22 dBu	70 dB
<b>Mic 3:</b>	-32 dBu	80 dB

**Mix Bus Input:** -5 dBu for '0' VU (with 20k Ω inline resistors, +4 dBu with 56k Ω resistors)  
**Tape Return Min.:** -18 dBu

**PFL:** PFL = Gain pot, set at '1' o'clock

### OUTPUT

		<u>Maximum output:</u>
<b>XLRs &amp; 10 pin Camera:</b>	0 dBu, -46 dBu	+20 dBu
<b>TQG Unbalanced Outs:</b>	0 dBu, -46 dBu	+20 dBu
<b>Tape Out:</b>	-12 dBu	
<b>Phones:</b>	-6 dBu for '0' VU	

**Limiters:** Threshold, Nominal +11.75 dBu  
 (Minimum 0 dBu)

**MODEL CS 104**  
CONNECTOR PIN OUTS

10 pin 'Camera'

- |     |   |                    |
|-----|---|--------------------|
| 1.  | + |                    |
| 2.  | - | Left balanced out  |
| 3.  | + |                    |
| 4.  | - | Right balanced out |
| 5.  | + | Right return       |
| 6.  |   | N/C                |
| 7.  | + | Left return        |
| 8.  |   | N/C                |
| 9.  |   | Ground             |
| 10. |   | Ground             |

Power Connector (XLR-4 male)

1. Ground (-)
2. N/C
3. Battery charge
4. Ext. DC+

Mix Bus In (TQG male panel connector)

1. Ground
2. Left mix bus
3. Right mix bus

Channel Outs (TQG male panel connector)

- | <u>Left</u> | <u>Right</u> |
|-------------|--------------|
| 1. Ground   | 1. Ground    |
| 2. Left out | 2. Right out |
| 3. N/C      | 3. N/C       |

Tape Out (TQG)

1. Ground
2. Left
3. Right

Monitor Mini-Jack (3.5 mm)

- Tip - Left  
Ring - Right  
Sleeve - Ground

Audio XLRs

- Pin 2 high

# MODEL CS 104

TRIMMER & SWITCH LOCATION DIAGRAMS

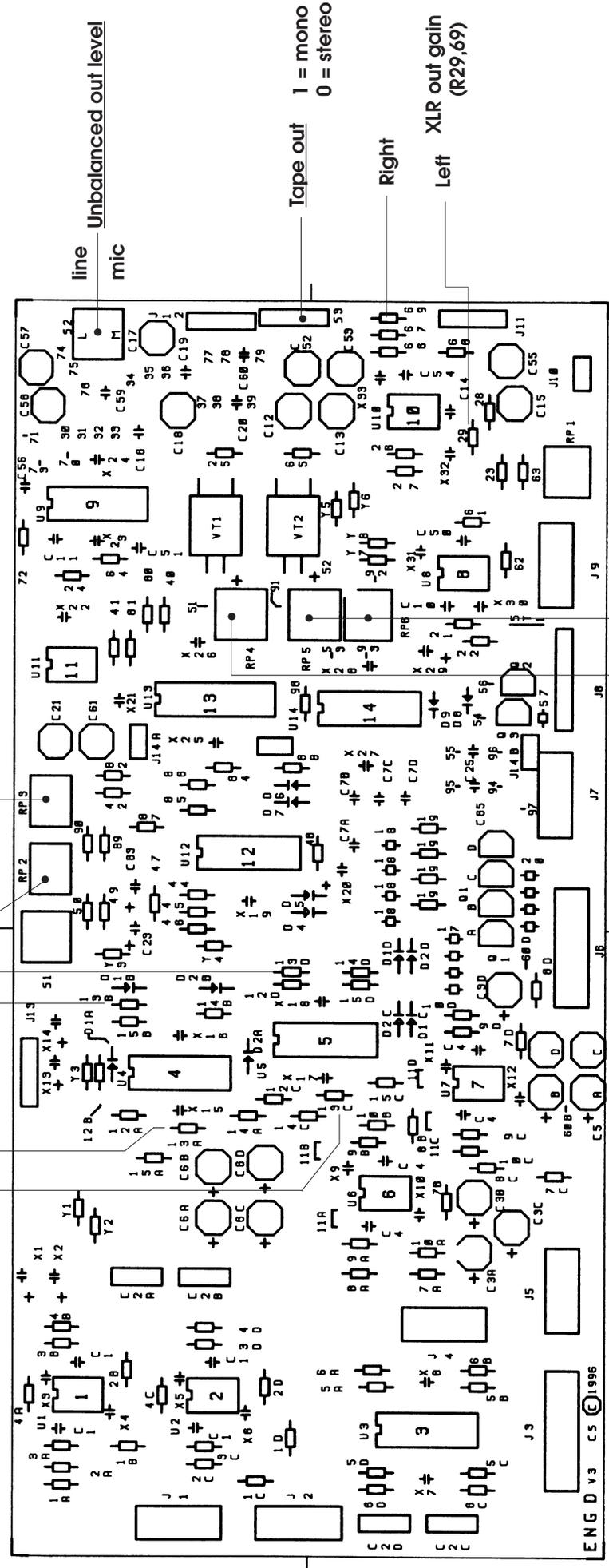
O/L LED adjust  
 R13A,B,C,D

Limiters Threshold

Left Right

(3) (1)

(2) (4)

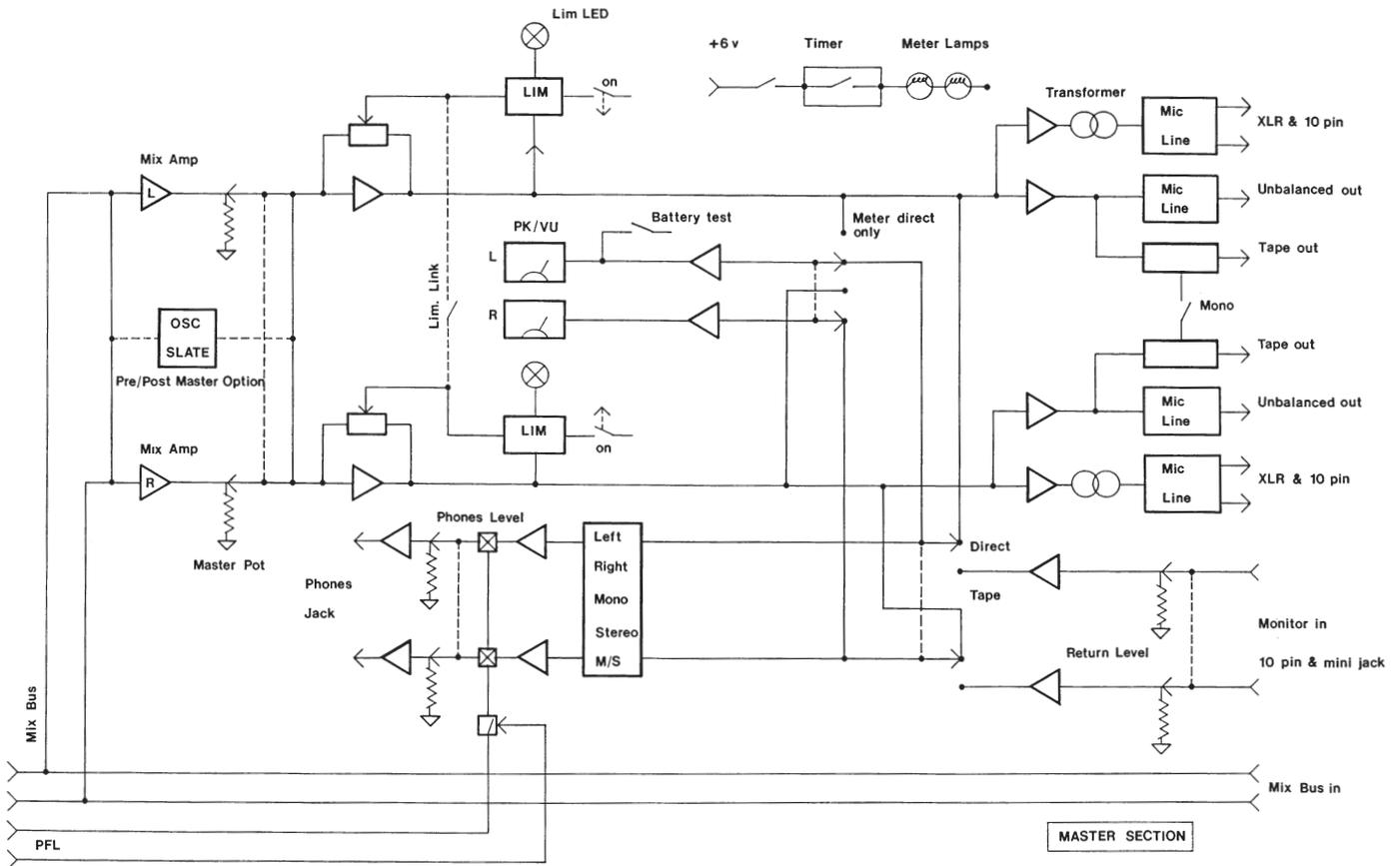
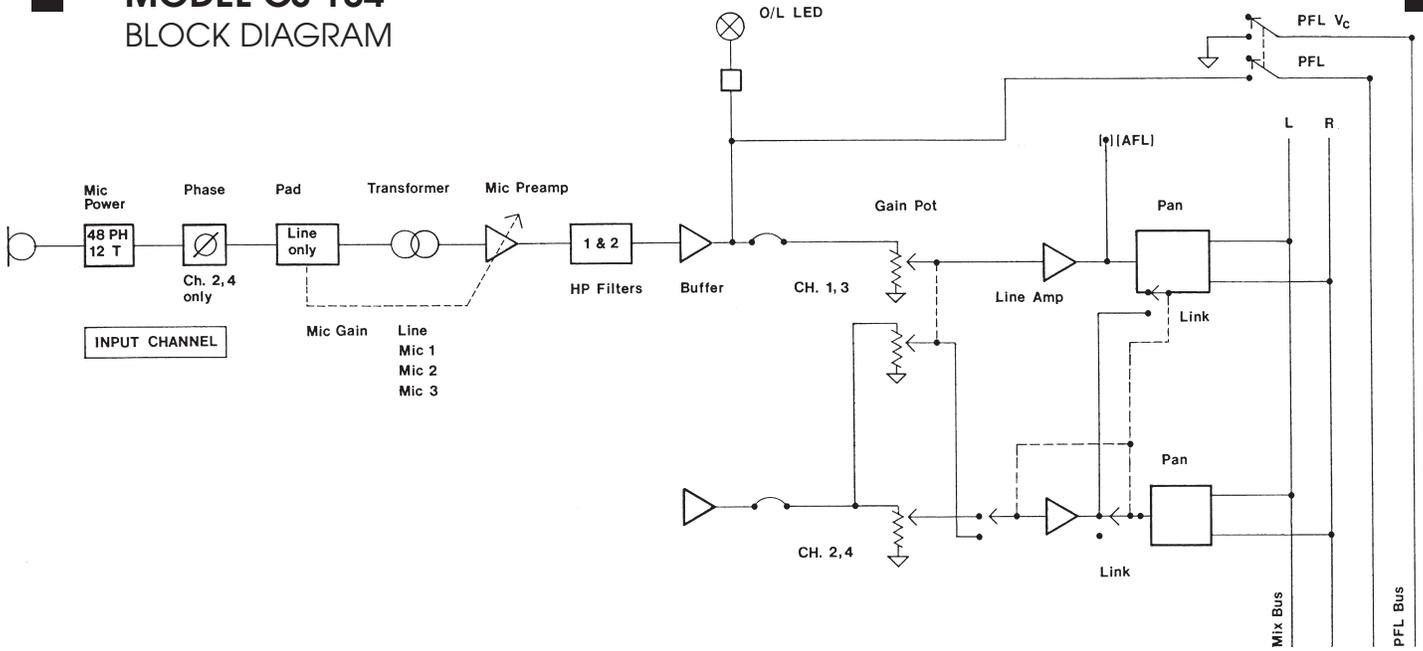


'D' Audio  
 CS 104 ENG/EFP Mixer  
 Run 2 - May '96

RP5 Left  
 Limiters LED threshold  
 RP6 Right  
 RP4 Limiters balance



# MODEL CS 104 BLOCK DIAGRAM



**MODEL CS 104**  
GENERAL NOTES

**CABLES:** Available from: Engh Pro Audio  
1011 West 43rd Street  
Minneapolis, MN 5409  
(612) 827-7992 FAX (612) 827-0198

Trew Audio Services  
240 Great Circle Drive, Suite 339  
Nashville, TN 37228  
(615) 256-3542 FAX (615) 259-2699

or your favorite audio supplier.

**CONNECTORS:** Hirose 10-pin cable plug  
Some sources for: Marshall Electronics  
Part #CP-10-RM  
(310) 390-6608 FAX (310) 391-8926

Digi-Key Corporation  
Part #HR-106-ND  
(800) 344-4539

Comprehensive Video Group  
Part #(E1AJ) E10P (video plug)  
(800) 526-0242 FAX (201) 229-0025

Valient  
(800) 631-0867 FAX (201) 814-0510

Switchcraft (TQG connector) TA 3F (plug)  
Mouser Electronics  
Part #502-TA 3F  
(800) 346-6873

Headphone caution: The monitor outputs of this mixer are capable of driving low-impedance headphones at a very high level. Before headphones are in use, set all monitor levels at '0' (i.e.; 'off'). Prolonged listening at high volumes might affect your hearing.

To remove lid: Remove the six top screws and slide out from the rear. Note: Reinstall with counter bored holes on top.

Fuse: Located on the vertical board next to the battery compartment.

## MODEL CS 104

### COOPER SOUND SYSTEMS, INC. LIMITED WARRANTY

1. Warranty registration must be completed and mailed to Cooper Sound Systems, Inc. within 30 days of the date of purchase.
2. Cooper Sound Systems, Inc. warrants the materials and workmanship of this product for a period of one year from the original date of purchase. If any defects are found in the materials or workmanship, or if the product fails to function properly (as per the specifications out-lined in the Operator's Manual) within the specified warranty period, Cooper Sound Systems, Inc. will repair or replace the product, at its option. Please note the following:
  1. Modifications made by the customer or a non-authorized service center will invalidate the warranty.
  2. Damage caused to the unit by incorrect or improper usage (eg; utilization of incorrect power supply or other improper connections) is not covered under this warranty.
3. To obtain factory service, call Cooper Sound Systems, Inc. (805) 782-9750 or FAX (805) 782-9752. All returns and service requests must have prior authorization.
4. Cooper Sound Systems, Inc. reserves the right to inspect any products which may be the subject of any warranty claim, before repair or replacement is carried out. Cooper Sound Systems, Inc. may, at its option, require proof of the original date of purchase (dated copy of original retail dealer's invoice). Final determination of warranty coverage lies solely with Cooper Sound Systems, Inc. Products which do not meet the terms of this warranty will be repaired and returned C.O.D. with billing for labor, materials, return freight and insurance. Products repaired under warranty will be returned via U.P.S. ground, freight prepaid, by Cooper Sound Systems, Inc. to any location within the boundaries of the U.S.A. Outside the U.S.A., the products will be returned freight collect.
5. This warranty is extended to the original purchaser, and to anyone who may subsequently purchase this product within the specified warranty period.
6. Cooper Sound Systems, Inc. does not authorize any third party, including any dealer or sales representative to assume any liability on behalf of Cooper Sound Systems, Inc. or to make any warranty for Cooper Sound Systems, Inc.
7. The above warranty is the only warranty given by Cooper Sound Systems, Inc. and is in lieu of all other warranties. All implied warranties, including warranties of merchantability or fitness for any particular purpose shall be strictly limited in duration to one year from the date of original purchase. Upon the expiration of the warranty period (one year), Cooper Sound Systems, Inc. shall have no further warranty obligation of any kind, expressed or implied. Cooper Sound Systems, Inc. shall in no event be obligated for any incidental or consequential damages that may result from any defect, or warranty claim of any kind, expressed or implied.
8. Cooper Sound Systems, Inc. reserves the right to modify the design of the equipment and to amend specifications without prior notice.

### METERING OPTIONS

VU: Slow rise and fall times. ( $\approx$  300 mS, 300 mS)

Peak: Fast rise and slow fall times. ( $\approx$  10 mS, 500 mS)

VU meters were designed to indicate the average program level. They are useful for indicating the relative 'loudness' of program material. However, as they do not respond to 'peaks', there is the possibility of overloading the recorder circuitry (peaks can be 8-15 dB higher than the average level). This is not so much of a problem with professional analog audio recorders but with today's digital audio recorders and video cameras, peak levels need to be accurately monitored.

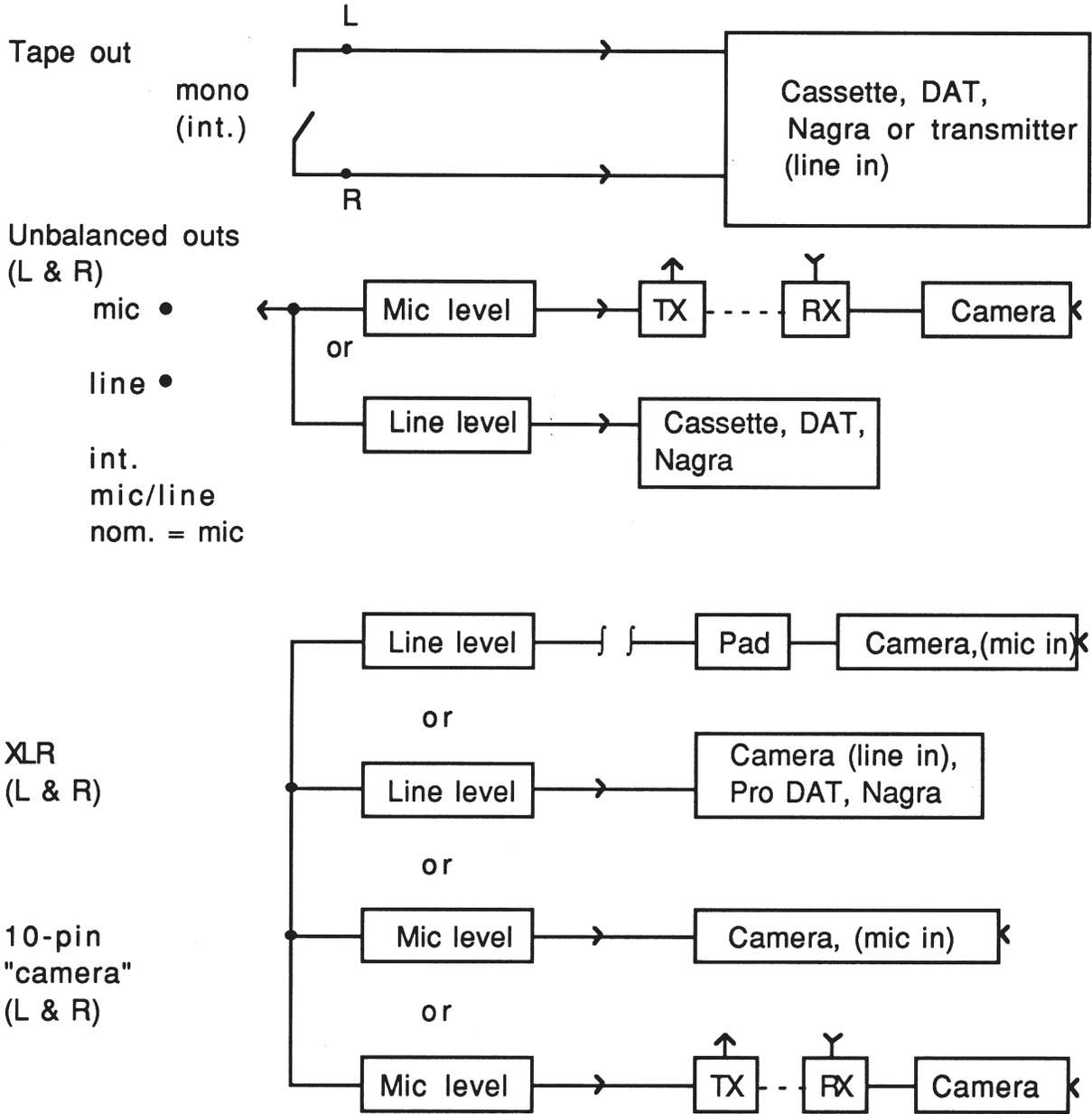
The peak reading meters, on the CS 104 & CS 106+1, will fully display peaks of longer than 10 mS. Their ballistics are similar to the Nagra modulometer and the BBC spec for PPM meters (however, with a shorter fall time). The reference tone on the mixer is set a -8 dB below 0, therefore, peaks of 8 dB above the average level will be displayed at 0 dB.

When using a recorder with a VU meter, the tone should still be sent at -8 dB and the recorder input adjusted for 0 VU. The two meters will then react approximately the same to program material.

CS 104 - v.2 - Meter dial = VU:	Tone at 0 vu	(full scale +3)
Meter dial = CSS (peak):	Tone at -8 (at the $\Delta$ )	(full scale +4)

**MODEL CS 104**  
APPLICATION NOTES

**CS 104 OUTPUTS**



## **BASIC SET UP**

<u>Input sensitivity switches (on left panel)</u>		<u>Maximum Gain</u>
Line	Line inputs (-10 dBu, +4 dBu)	16dB
Mic 1	High output condenser mics, radio mic receivers, lavalier mics	60dB
Mic 2	Standard output condenser mics, radio mic receivers, lavalier mics	70dB
*Mic 3	Dynamic microphones	80dB

\*This position provides 80 dB of gain - always try position 1 or 2 first; adjust receiver output level if necessary. For optimum S/N ratio and headroom, the lower gain settings should be used. For most sources, position 1 or 2 should provide sufficient gain with the channel gain pots being operated around 12 o'clock to 3 o'clock.

### \*Master Pot (Version 2) Serial Number below 40311

Should always be at the maximum position; if set at a lower position, the headroom and S/N ratio will be compromised. As the meters and phones are after the master pot, the input gain would need to be increased to compensate for the lower setting. Adjust the camera/recorder input control for lower program level if necessary. The master pot provides a means of group fading the inputs for tone and slate purposes.

### Summary

- \*1. Master pot at maximum; '0'.
2. Channel gain pot between 12 o'clock and 3 o'clock
3. Adjust mic sensitivity switch for suitable gain. Select lowest gain possible; adjust receiver output if necessary.

\*See Application note Aug. '97 "Master Pot & Mute v.3"

**MASTER POT; VERSION 3 & MUTE S/N 40311+**

The master pot now controls only the main outputs (balanced & unbalanced), not the level to the monitors (phones and meters). This enables the output level to be reduced, to allow for the decreased headroom on certain recorders. The level to the phones and meters remain the same, so the mixer gain structure is not affected.

Note: When the oscillator or slate is activated, the inputs are automatically muted. Therefore the input gain pots do not need to be turned down.

Camera example:

Set the master pot at maximum '0'.

Turn oscillator on and adjust camera input controls for '0' VU (or -20 dB if digital).

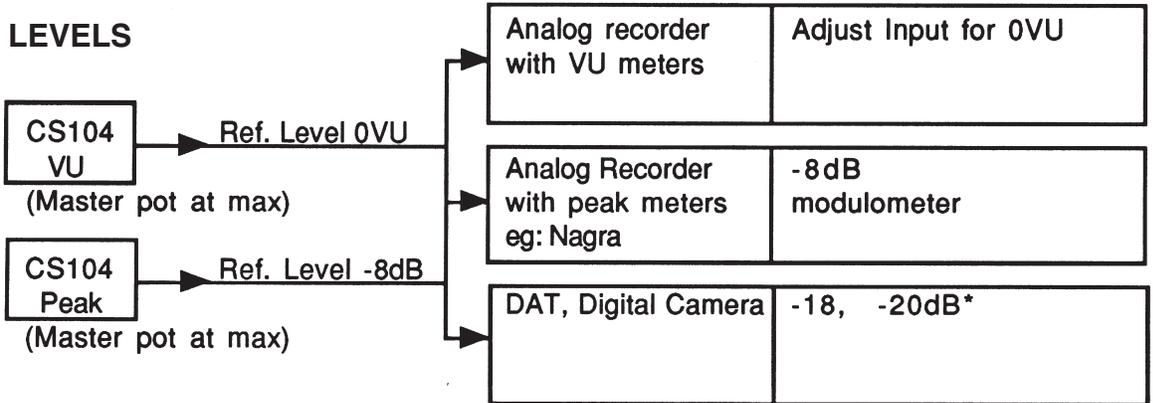
Reduce master pot on mixer 3 to 6 dB (3 o'clock) for program.

*(This means that the recorded program level will be lower, to avoid headroom problems.)*

# MODEL CS 104

## APPLICATION NOTES

### OPERATING GUIDELINES



\*refer to manufacturers specifications

### PROGRAM LEVELS

1. Many camera's have limited headroom and non-standard VU meters. It is suggested that the proper level be reduced (eg: -6dB) to compensate for these problems.

Editors like to see 0VU as a reference, so it does mean the level will need to be reduced after the line input tone is recorded.  
(See App. note June 1997A, and August 1997A)

2. Camera Meters  
Due to some cameras having non standard "VU" meters (some are very slow), the peak LED (if available) would serve as a more accurate reference for the camera input controls.

Simplified Guidelines  
Digital Camera-(LCD meters typ.) Full scale is 0dB (typ. reference -20dB)  
Analog Camera-Full scale is greater than 0. (reference 0VU)

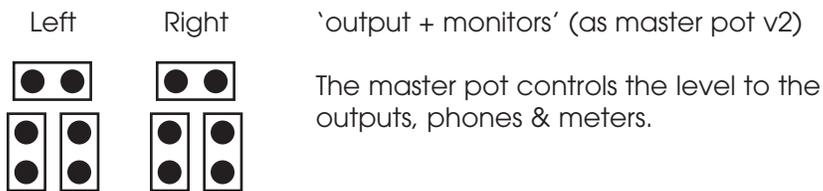
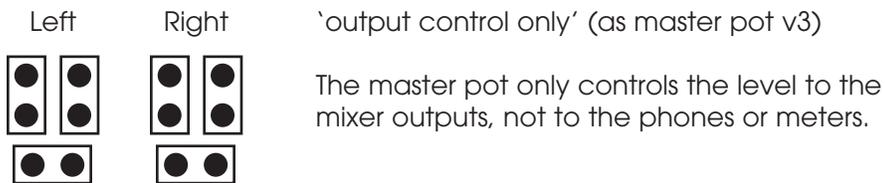
- 3a. Camera Headroom  
I do suggest that a test is made whenever you encounter a camera that you are not accustomed to working with. Various levels should be applied to optimize the gain setting on the camera (ie; to allow sufficient headroom and provide as much signal to noise ratio as possible). Always keep an eye on the peak LEDs if they are available.

- 3b. Some cameras actually have reduced headroom when switched to line input due to the design of the input stage.

If this is the case, and you are finding headroom problems, you could try switching to mic input. A disadvantage is that the signal from the mixer will be at mic level and therefore the signal to noise ratio will be reduced.

**MASTER POT & MUTE OPTIONS S/N 40339-40519**

The board (E4v2) includes mechanical jumpers (shunts) to change between two modes of operation.



Both positions include the mute function.  
(Board E4v2 is installed on board E)

**ADDITIONAL HIGH PASS FILTERING S/N 40367+**

Pre-input transformer filtering is now included for each channel. The filters are switched via DIP switches on the transformer board "C".

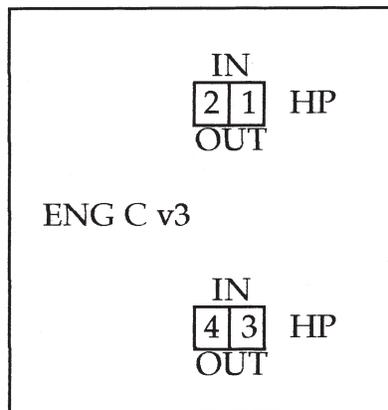
The turnover frequency is 90Hz @6dB per octave.

These provide additional filtering of low frequency signals, especially useful to reduce wind and handling noise from boom mics.

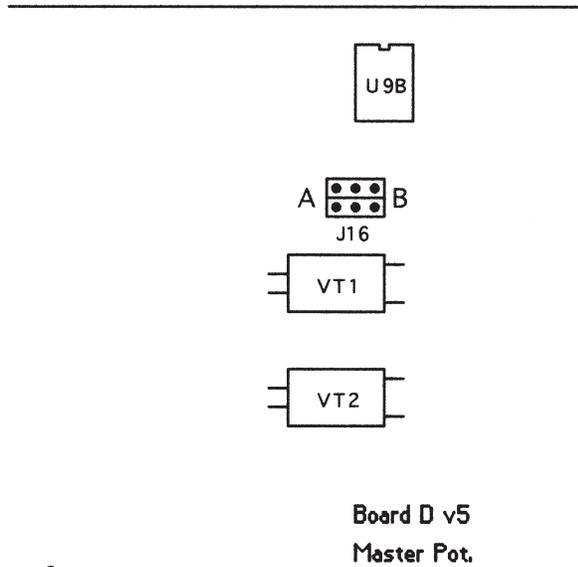
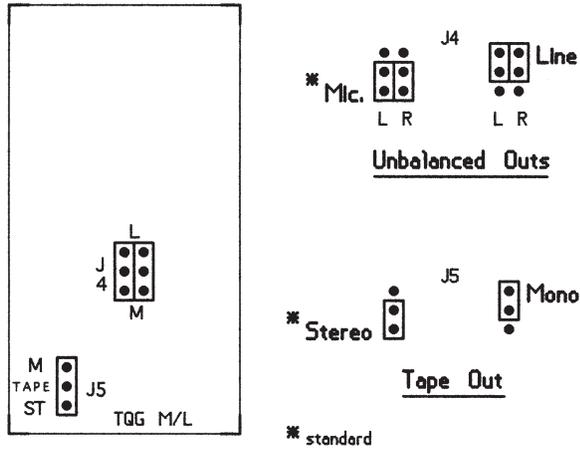
The pre-transformer filter combined with HP1 & 2 filters produce the following results:

HP - Pre + HP1	130Hz	(HP1 alone=70Hz)
HP - Pre + HP2	190Hz	(HP2 alone=140Hz)

(Standard factory configuration for the filters is OFF)



**UNBALANCED OUTS & MASTER POT OPTIONS S/N 40520+**

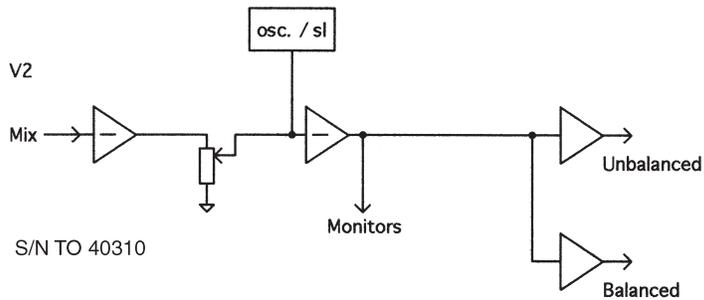


A= standard (audio output can be decreased without affecting monitors)

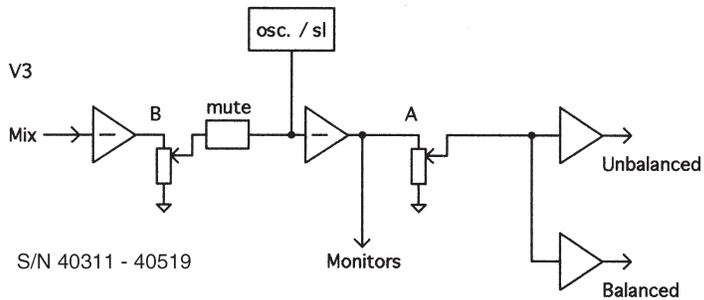


B= option (monitors=master pot)

**MASTER POT BLOCK DIAGRAM**

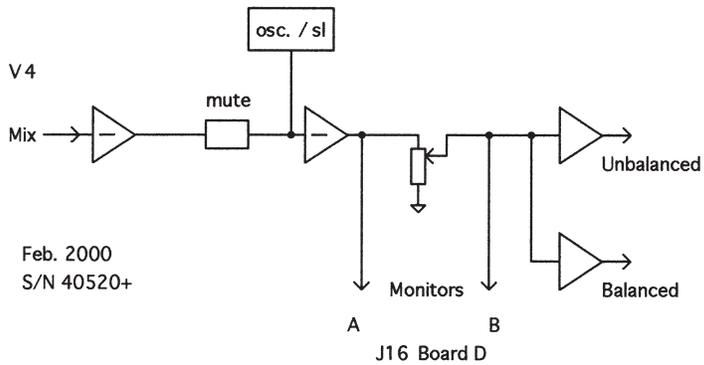


Tone fixed  
Monitors = Master Pot  
No Mute



A. Standard\* Tone variable  
Audio can be decreased  
without affecting Monitors

B. Option Tone fixed ( as V2 )  
Monitors = Master Pot



A. Standard\* Tone variable  
Audio can be decreased  
without affecting Monitors  
( as V3 A )

B. Option Tone variable  
Monitors = Master Pot

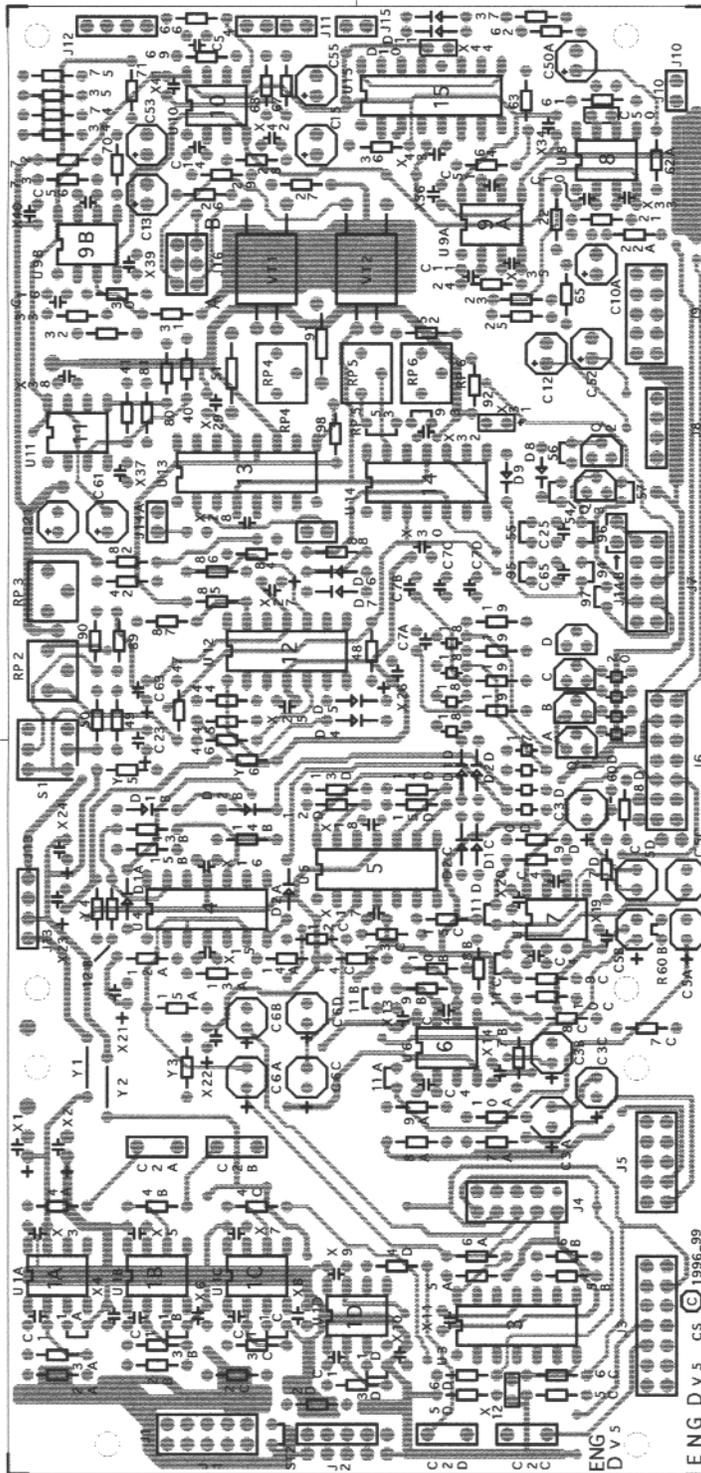
\* Camera headroom compensation

CS 104 - Master Pot.  
Cooper Sound Systems Inc.

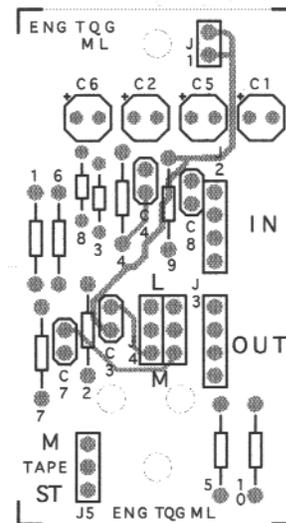
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S/N 40520+



**CS104 Board D v5**  
Feb. 2000 S/N 40520+  
Cooper Sound Systems Inc.



**CS 104 Board TQG M/L**  
Feb. 2000 S/N 40520+  
Cooper Sound Systems Inc.