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DOLBY LABORATORIES
INSTRUCTION MANUAL

MPU-1 CINEMA MAGNETIC PRE-AMPLIFIER

Issue 2 - September 1979

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All requests for repairs or information should include the unit serial number to ensure rapid service.

S80/677/2789

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SECTION 1

INTRODUCTION AND SPECIFICATIONS

INTRODUCTION AND SPECIFICATIONS

1.1 Introduction

The MPU-1 Magnetic Pre-amplifier Unit is designed for use with the Dolby CP100 Cinema Processor; however, it can be used to upgrade any existing magnetic pre-amplifier rack. It provides pre-amplifiers for two 35 mm 4-track projectors (8 pre-amplifiers) and/or two 70 mm 6-track projectors (12 pre-amplifiers); each plug-in pre-amplifier module (Cat. No. 92) contains two pre-amplifiers. For 35 mm films whose surround channel contains 12 kHz switching tone, a surround switching module (Cat. No. 93) is available as an optional extra.

1.2 Specifications

Layout	Chassis frame construction requiring 3 units (5¼ inch) of 19 inch rack space. Plug-in modules behind front cover.
Signal connections	Screw-type terminal blocks. Solder-tag fanning strips supplied for each terminal block.
Signal inputs	For all standard low-impedance reproducing heads. Higher impedance heads can be accommodated by moving solder links on rear plane of unit.
Signal outputs	Normal output level 100 mV rms with 1 kohm output resistance (early installations were adjusted for output level of 300 mV). Clipping level 6 V rms approximately.
Controls	Each pre-amplifier module, Cat. No. 92, contains two pre-amplifiers, each with four screwdriver adjustable controls: gain, low frequency, middle frequency, and high frequency (gap loss). Surround switch module, Cat. No. 93, contains an internal switch selecting automatic (12 kHz) switching or manual (surround on). Front panel switch on switch module, Cat. No. 96, selects 35 or 70 mm projector outputs as required. (Cat. No. 96A also available with remote switching).
Projector changeover	Projector changeover is normally performed by the CP100 Cinema Processor. In this case all eight 35 mm pre-amplifiers or all twelve 70 mm pre-amplifiers, as required, are operating and the CP100 selects the appropriate set of outputs. Projector changeover within the MPU-1 is possible by moving a link on the switch module Cat. No. 96 or 96A. In this case applying a ground to a terminal on the rear of the MPU-1 will change from projector 1 to projector 2.

Power requirements	The MPU-1 normally draws its power from the CP100. However, when alternative power is necessary, the unit requires a dc supply between 18 and 24 volts with a noise and ripple of less than 100 mV. The current consumption is approximately 250 mA.
Dimensions	133 x 483 mm rack mounting (5¼ x 19 inch). Maximum projection behind mounting surface 225 mm (9 inch).
Weight	5.3 kg (12 lbs.)

SECTION 2

INSTALLATION AND OPERATION

INSTALLATION AND OPERATING INSTRUCTIONS

2.1 Introduction

The MPU-1 Magnetic Pre-amplifier Unit is designed to be used with the Dolby CP100 Cinema Processor Unit. Signal switching from projector to projector is accomplished either in the CP100 or in the MPU. DC power is supplied by the CP100.

2.2 Items Needed to Install the MPU-1

You will need the following:

a. One-conductor and two-conductor screened cables.

b. A wire-stripping tool; soldering iron; various screwdrivers including one with a small trimming blade for the printed circuit card preset controls.

c. A pink noise test film, either 35 mm or 70 mm depending on the format being installed. Alternatively a frequency response test film can be used, but this is not so convenient as the pink noise film.

d. A Dolby Level Set film or Level Set film (which may be part of (c)) with an accurately known flux level at 1 kHz or similar.

e. Millivoltmeter and Real Time Analyzer for pink noise analysis.

f. Extender card for magnetic pre-amplifier card (one supplied with each MPU-1).

2.3 Basic Installation Procedure with CP100/CP200

a. Remove ac line power to the CP unit and to the projector.

b. Install the MPU-1 in a suitable rack.

c. Using two-conductor cable, connect the +21 volt supply in the CP100 (SK38 pin 10) to the MPU-1 (SK19 pin 6) and connect the CP100 earth terminal (SK37 pin 1) to the MPU-1 (SK19 pin 7). (See Backplane connection diagram A2D1736 in Section 4.) For CP200, connect the unregulated supply from the CP200 connector JM7 'to mag preamps' the 2-connector barrier strip marked "+24 v unstab supply". **NOTE: The Cat. No. 206 regulator printed circuit card must be used in the MPU when the MPU is connected to a CP200; units not fitted with a position for this card will need field modification (contact Dolby Laboratories for information). Inspect 206 card to make sure pin 5 is joined to pins 3 and 4; early cards did not have this link which must be present or be added for correct operation.**

d. To protect operating personnel, the metalwork should be grounded. Check that a good ground connection is made to the MPU-1 either via the metal rack on which the unit is mounted or by a separate wire from SK19 pin 8 to power line ground. **NOTE: When powered from the CP200, the shorting strap connecting Chassis Ground and E (SK19 pins 7 and 8) must be removed; its function is carried out by a similar link on the rear of the CP200.**

e. Connect each magnetic head to the appropriate input using 2-conductor screened cables. Observe signal phasing of heads (either by wire color code or markings) at the heads and at the marked terminals on the rear of MPU-1. Connect the screen only at the MPU-1 end of the cable, except when the metal casing of the head is not grounded through the projector. In that case, connect one screen only to the casing (see diagrams on pages 2.7 and 2.8 for magnetic head connections). **NOTE: If the heads are far from the MPU, hum may be picked up in the long leads. Keep all leads as short as possible, and lay them in separate conduit from cables carrying ac power lines. In persistent cases of hum, connect heads with special cable such as National Wire Company type 691006, 7, 8 or 9 (12, 8, 4 and 2 way). This cable is available also from Peterson Theatre Supply.** For

f. Decide whether the changeover is to be carried out at the CP100 or at the MPU. If the two units are close, the CP100 changeover is preferred. If however the MPU is some distance from the CP100, economies in cabling can be made by using the MPU changeover.

g. CP100/CP200 projector changeover.

(i) Connect the outputs of the MPU to the magnetic inputs of the CP unit, using one-conductor screened cables. Connect the screen at the CP unit end only to the ground terminals associated with each input.

(ii) Remove the Cat. No 96 Switch card in the MPU and check that the internal link is on the "Normal" or "remote" position. (For the Cat. No. 96A, link is labelled 'no c/o' and 'Remote c/o') In this mode both LEDs will remain on, showing that both outputs on the MPU are always selected (changeover occurring in the CP unit). Replace Cat. No. 96.

h. MPU projector changeover

(i) On the MPU, connect the two outputs in parallel (ie. strap "Projector 1 Left output" (SK20 pin 1) to "Projector 2 Left output" (SK21 pin 1) using normal unshielded stranded wire). Only strap signal pins; it is unnecessary to connect the ground (E) terminals. Repeat for all outputs.

(ii) Using one-conductor screened cables, connect the combined Left output to the CP100 "Projector 2 mag input, left input" (SK36, pin 4) and similarly for the remaining outputs. Connect the screen at the CP100 end only to the ground terminals associated with each input. (For CP200, refer to CP200 instruction manual.)

(iii) On the CP100, connect the magnetic inputs in parallel (ie. strap "Projector 1 Left input" (SK33 pin 4) to "Projector 2 Left input" (SK36 pin 4) using normal unshielded stranded wire). It is unnecessary to strap the ground (E) terminals. Repeat for all magnetic inputs.

(iv) Connect an unshielded control wire from the MPU "c/o control" (SK19 pin 5) to the CP100 "c/o information" (SK37 pin 3).

(v) Remove the Cat. No. 96 Switch card in the MPU and change the internal link to "Remote c/o". Note that the two LEDs on this card will follow the projector c/o operation of the CP100, thus showing which output of the MPU has been selected. Replace Cat. No. 96.

NOTE: Early CP100 units did not provide changeover information on pin 3 of SK37. This can be checked by measuring the voltage of pin 3 relative to any one of the rear 'earth' points; there should be +20 volts approximately when projector 1 is selected by the CP100 front panel switch (on the facilities module) and 0 V when projector 2 is selected. If the voltage change does not occur, remove rear panel of CP100 and connect a wire from SK37 pin 3 to SK13 pin 13 (on optical preamplifier edge connector).

i. 35/70 mm format changeover

(ii) On the Cat. No. 96A provision is made for remote operation, primarily for use with the CP200 although other systems can be used. The front panel 3-position switch selects 35 mm, 70 mm, or remote operation. In the remote position a ground connection to SK19/9 (on the rear of the MPU chassis) will switch the MPU unit into the 35 mm format. No connection or any positive voltage greater than 6 volts will switch the unit to the 70 mm format. LED's indicate format selected.

NOTE: Early MPU units were not internally wired for this facility. To use the Cat. No. 96A with these early units, modify backrack wiring by adding a link from SK19/9 to pin 7 of the Cat. No. 96A edge connector. A new front panel with appropriate cut-out and labelling is also required.

2.5 Calibration with CP100

a. Turn on power to projectors and CP100. Check that red LEDs on MPU switch card are operating. If changeover is controlled by CP100, then LEDs should follow CP100 changeover switch. If not, then both LEDs should be on.
b. Check the CP100 has a Cat. No. 135 (or a Cat. No. 84) Magnetic Format module in it; select Format corresponding to position of this Magnetic Format module; select NR off.

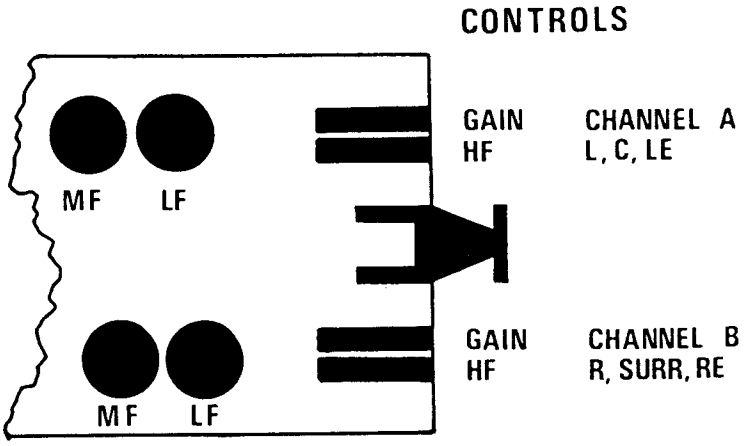
c. Set meter switches on CP100 modules to Dolby cal. Select 35 or 70 mm as appropriate on the MPU-1. Lace level set film on projector.

d. Select appropriate projector on CP unit changeover system or equivalent.

e. Play Dolby Level Set film and adjust gain controls on each MPU-1 magnetic pre-amplifier card to read about Dolby Level on CP unit meters. (If other level set film is used, measure the output voltage of each channel on the MPU-1. Remember Dolby level is defined as 185 nWb/m on the film, and make a suitable gain adjustment so that if a 185 nWb/m film were used, a signal level of 100 mV would leave the MPU-1). This adjustment is only approximate, and will be repeated accurately later in the calibration procedure. Repeat for all channels. (If a Cat. No. 84 is used in the CP100, the level is 300 mV.)

   Note: The MPU comes pre-wired by links on the rear mother board in a 'high' gain position. Occasionally high inductance high output heads are encountered; the symptoms are that the meters on the CP100 read above Dolby Level even with the MPU gain controls set at minimum. In this instance, remove the rear links and resolder them in the 'low' gain position.

f. Play pink noise test film or frequency response film, and adjust the h.f., m.f., and l.f. controls on each magnetic pre-amplifier card for best response (start with the l.f. controls set at maximum). (The m.f. and l.f. controls are situated on the top and bottom edges of the printed circuit card, thus requiring the use of the extender. Once set for a particular head, these controls require no further adjustment. The h.f. and gain controls may need adjustment from time to time, and are therefore located at the front of the printed circuit card.



g. After equalization, run level set film again to set calibration levels accurately, i.e. repeat step e).

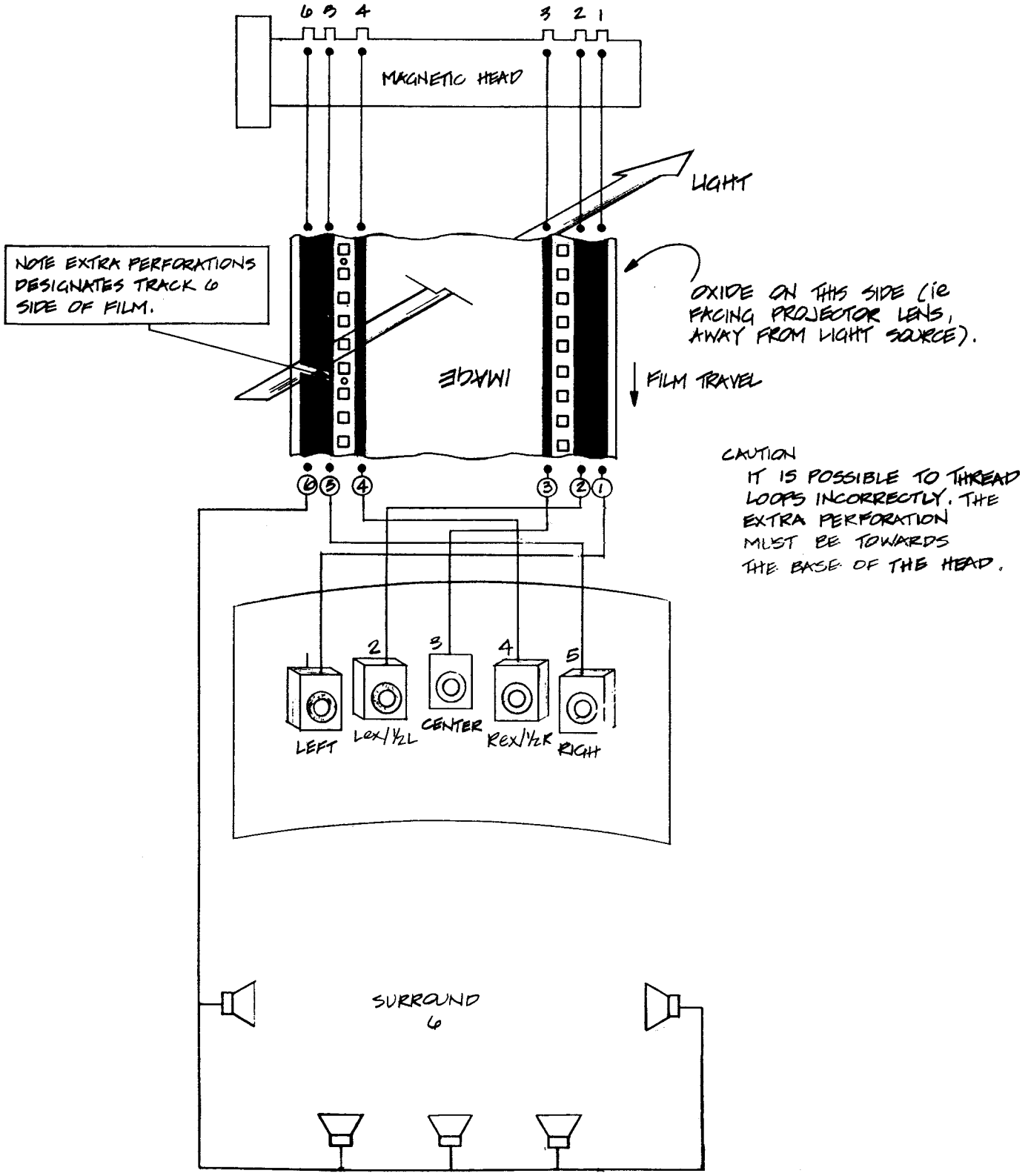
h. Certain 35 mm films use a 12 kHz tone signal to control the surround track on these films. To play these films, optional accessory Cat. No. 93 Surround Channel Switch card is used in place of normally supplied Cat. No. 134 Link card.

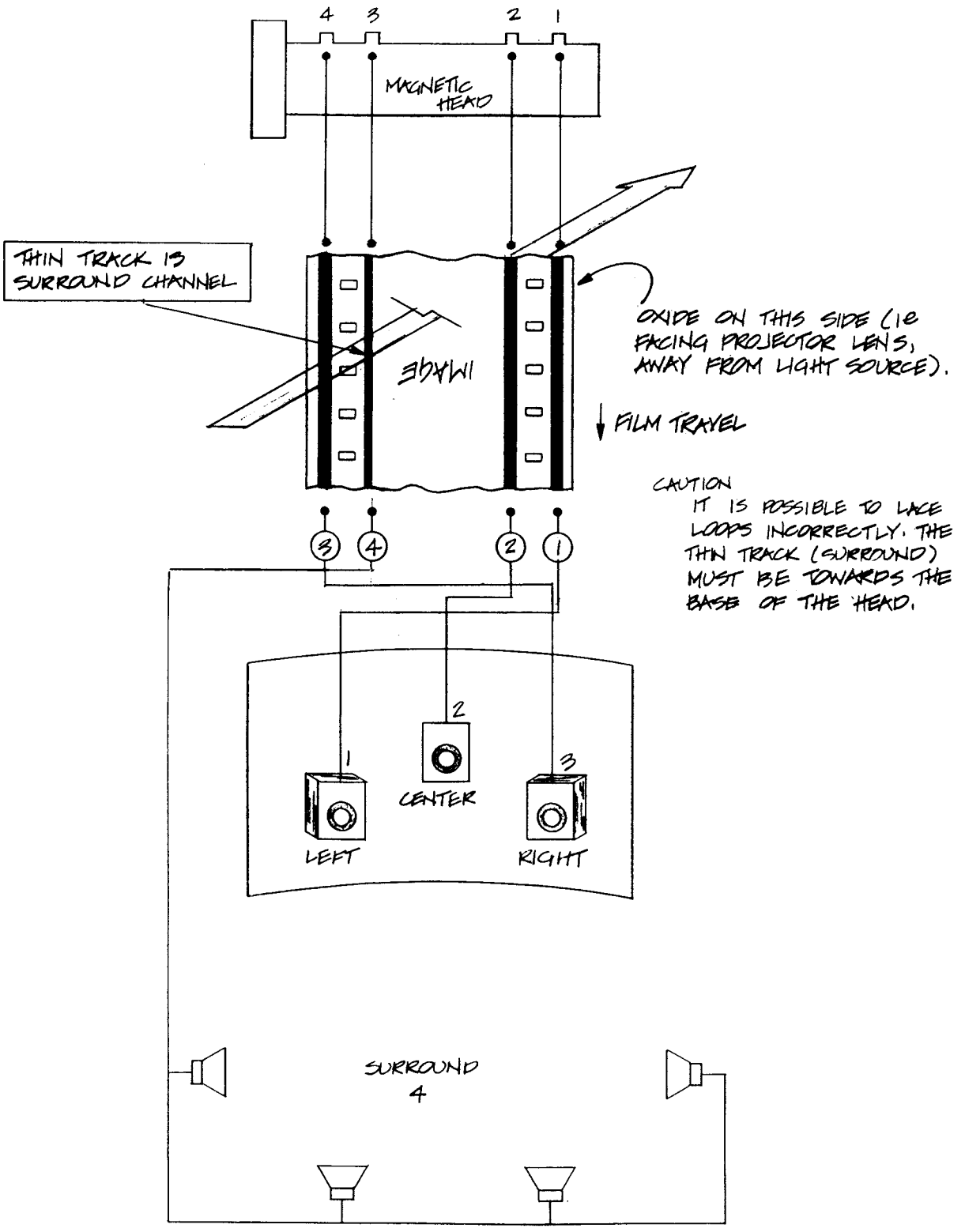
j. For systems using a surround sensor track, extract sensor module Cat. No. 93 and place internal switch to "Test" position to close channel switch normally activated by 12 kHz tone. Note this channel has a low-pass filter to remove the 12 kHz switching tone from the output, and its frequency response is thus about -3dB at 8 kHz. Remember to change switch to Normal position when channel has been aligned. Note also that the surround track is not metered in the CP100. Use an external voltmeter to measure the MPU-1 outputs for these channels, and adjust the gain controls on the magnetic preamplifier cards for 100 mV for Dolby Level. (If the earlier high level Magnetic Format module Cat. No. 84 is used, adjust gain controls for 500 mV output.)

2.7 Non-Standard Installations

a. The MPU-1 unit may be used independently of the CP100. It requires a supply of between +18 and +24 V at 250 mA, which should be regulated with a ripple and noise content of less than 100 mV. Drawing A2B 1575 shows the block diagram of the unit, which read in conjunction with the circuit diagrams of the Cat. No. 92 Magnetic Pre-amplifier card (A2C 1427), the Cat. No. 93 Surround Channel Switch card (A2C 1431), and the backplane connection diagram (A2D 1736) will enable the unit to be connected appropriately.

b. The Cat. No. 96 Switch card (A3C 1720) has provision to allow projector switching to be remotely controlled. A ground (earth) connection to a rear terminal on the MPU (SK19, pin 5) switches the circuitry in the MPU to Projector 2. No connection (or a positive voltage between 10 and 24 volts) will cause the unit to switch to Projector 1.


6 5 4
3 2 1
MAGNETIC HEAD
LIGHT
NOTE EXTRA PERFORATIONS DESIGNATES TRACK 6 SIDE OF FILM.
OXIDE ON THIS SIDE (ie FACING PROJECTOR LENS, AWAY FROM LIGHT SOURCE).
IMAGE
FILM TRAVEL
CAUTION
IT IS POSSIBLE TO THREAD LOOPS INCORRECTLY. THE EXTRA PERFORATION MUST BE TOWARDS THE BASE OF THE HEAD.
6 5 4
3 2 1
2
3
4
5
LEFT
Lex/½L
CENTER
Rex/½R
RIGHT
SURROUND
6



35 mm Track Locations

SECTION 3

CIRCUIT DESCRIPTION

CIRCUIT DESCRIPTION

3.1 Magnetic Pre- amplifier card

The circuit is shown on drawing A2C 1427 in Section 4. The card comprises two independent amplifiers.

Signals from the magnetic head are coupled into the amplifier through a transformer mounted on the printed circuit card. Links to change the taps on this transformer are provided on the backplane; these are normally supplied fixed into the high gain position. Transistors Q101/102 comprise an input amplifier whose gain is adjusted by trimpot RV101 mounted at the front edge of the board. Integrated circuit IC 101a provides the necessary playback equalization, with the required 6 dB fall in gain per octave being provided by capacitor C107. The turn-over frequencies are produced at the low frequency end by C107 and (R109 + RV103), where increasing the resistor values increases the bass response, and at the high frequency end by C107 and R108, where increasing the resistance increases the treble response.

Integrated circuit IC 101b provides a gap-loss correction circuit, producing a high frequency boost which compensates for the playback head losses; the frequency of this boost is adjustable by RV102.

The dc potential in all amplifiers is set by the potential divider R301 + R302, which sets the dc voltage on pin 1 of IC 101b at approximately half the power supply.

3.2 Switch card

3.2.1 Cat. No. 96

The circuit is shown on drawing A3C 1720. Each set of magnetic preamplifiers has its output relay controls brought separately to this card; grounding the appropriate line switches in the correct set of preamplifiers.

With the board link in the 'normal' position, the switch grounds either the 35 or 70 mm preamplifier control lines, and both projector 1 and projector 2 outputs are available at the same time. Both LEDs are on.

With the link in the 'remote c/o' position, a ground applied to pin 15 causes Q1 to turn off, Q2 to therefore turn on, grounding only projector 2 control lines; removing the ground on pin 15 grounds only projector 1 control lines. If the MPU outputs are paralleled, projector changeover is thus accomplished.

3.2.2 Cat. No. 96A

The circuit is shown on drawing A2C 2049. Each set of magnetic preamplifiers has its output relay controls brought separately to this card; grounding the appropriate line switches in the correct set of preamplifiers.

The grounding is accomplished by transistors Q1-4, which in turn are driven by 2 CMOS Quad 2 input NOR gates. Logic signals for 35/70 mm and Proj 1/Proj 2 are interpreted by the gates and switching signals are routed to the current transistor switch.

With the board link LK1 in the 'no c/o' position, both the logic outputs from IC1B are held low; this holds one pair of projector switches on permanently. The choice of 70 mm or 35 mm is controlled by IC1A, acting on information from the switch S1 or from an external ground connection to Pin 7.

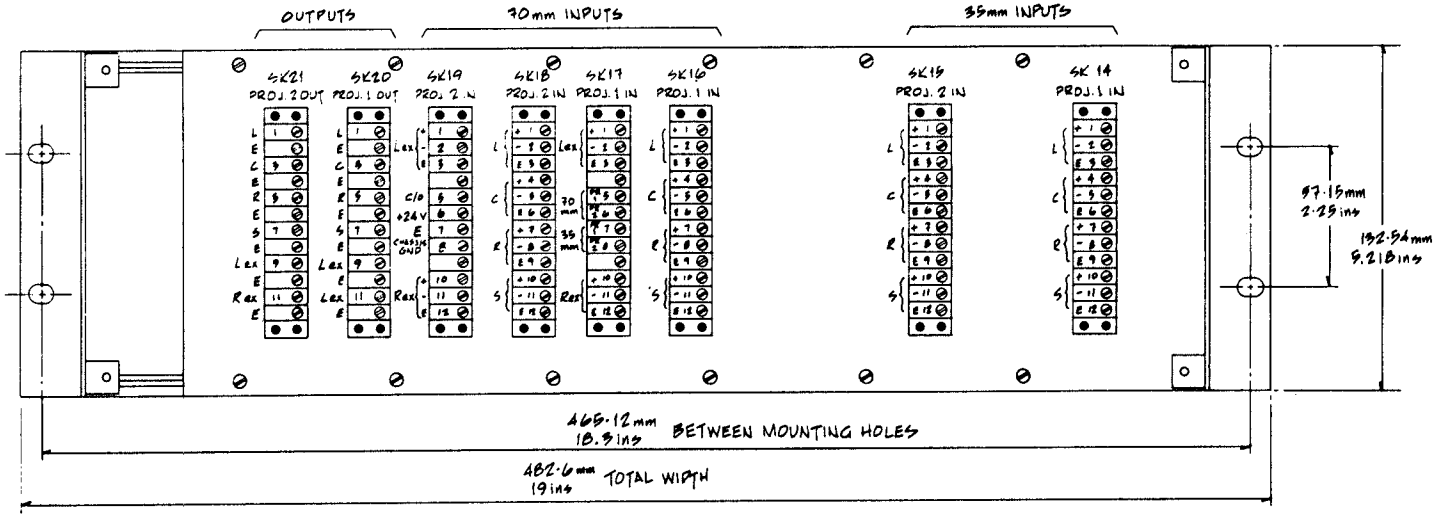
With link LK1 in the remote c/o, a ground applied to pin 15 causes the logic circuits to switch from Projector 1 to Projector 2; again the choice of 70 mm or 35 mm is controlled by IC1A as before. If the two outputs of the MPU are paralleled, projector changeover in the MPU is accomplished.

3.3 Surround Channel Switch card

Some 4-track magnetic prints utilize a 12 kHz tone present on the surround track when surround sound effects are required. The absence of this tone is used to switch off the output of the surround track when no effects are present, so removing any tape noise which otherwise would be obtrusive (the noise level from the surround track is much greater than that of the main tracks as the track width is much less). The Cat. No. 93 contains the necessary circuitry shown in drawing A3C 1431. Incoming audio (from the appropriate magnetic preamplifier) is buffered by IC 101a; the 12 kHz tone is extracted by tuned filter L101, L102, and further amplified by IC 101b. The signal is then detected by D101, D102 and used to turn on field effect transistor Q101 allowing the audio signal to pass through an 8 kHz filter, Q102 a, b, to the output. If no 12 kHz tone is present, then Q101 is turned off. Manual control is provided by S1 to turn on Q101 for initial calibration or when a surround film is played which does not have the 12 kHz automatic switching tone.

SECTION 4

DRAWINGS



MPU-1 REAR VIEW AND INSTALLATION DETAILS

issue/date	checked by	remarks
1.29DEC77	CAP	ORIGINAL

All dimensions are in MILLIMETRES unless stated

material/specification

finish

projection is THIRD ANGLE | scale 3/4 | drawn

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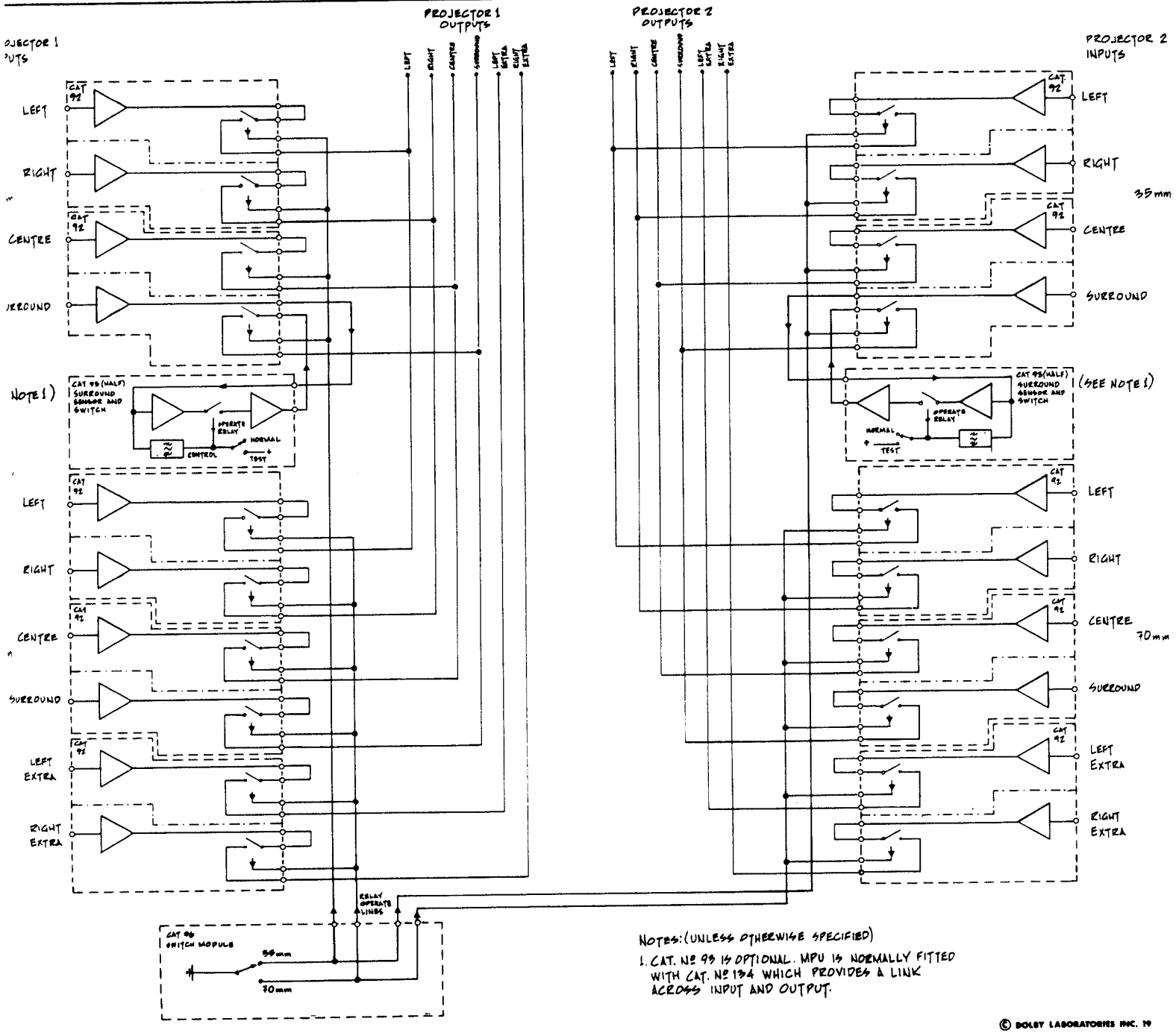
title MPU-1 REAR VIEW & INSTALLATION DETAILS

sheet 1 of 1 A2D1736



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. CAT. Nº 98 IS OPTIONAL. MPU IS NORMALLY FITTED WITH CAT. Nº 134 WHICH PROVIDES A LINK ACROSS INPUT AND OUTPUT.

issue/date	checked by	remarks
1 15 June 76	JRR	

All dimensions are in **MILLIMETRES** unless stated

material/specification

finish

projection is **THIRD ANGLE** | scale | drawn

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title: MPU-1 MAGNETIC PRE-AMPLIFIER UNIT BLOCK DIAGRAM

sheet 1 of 1 A281575

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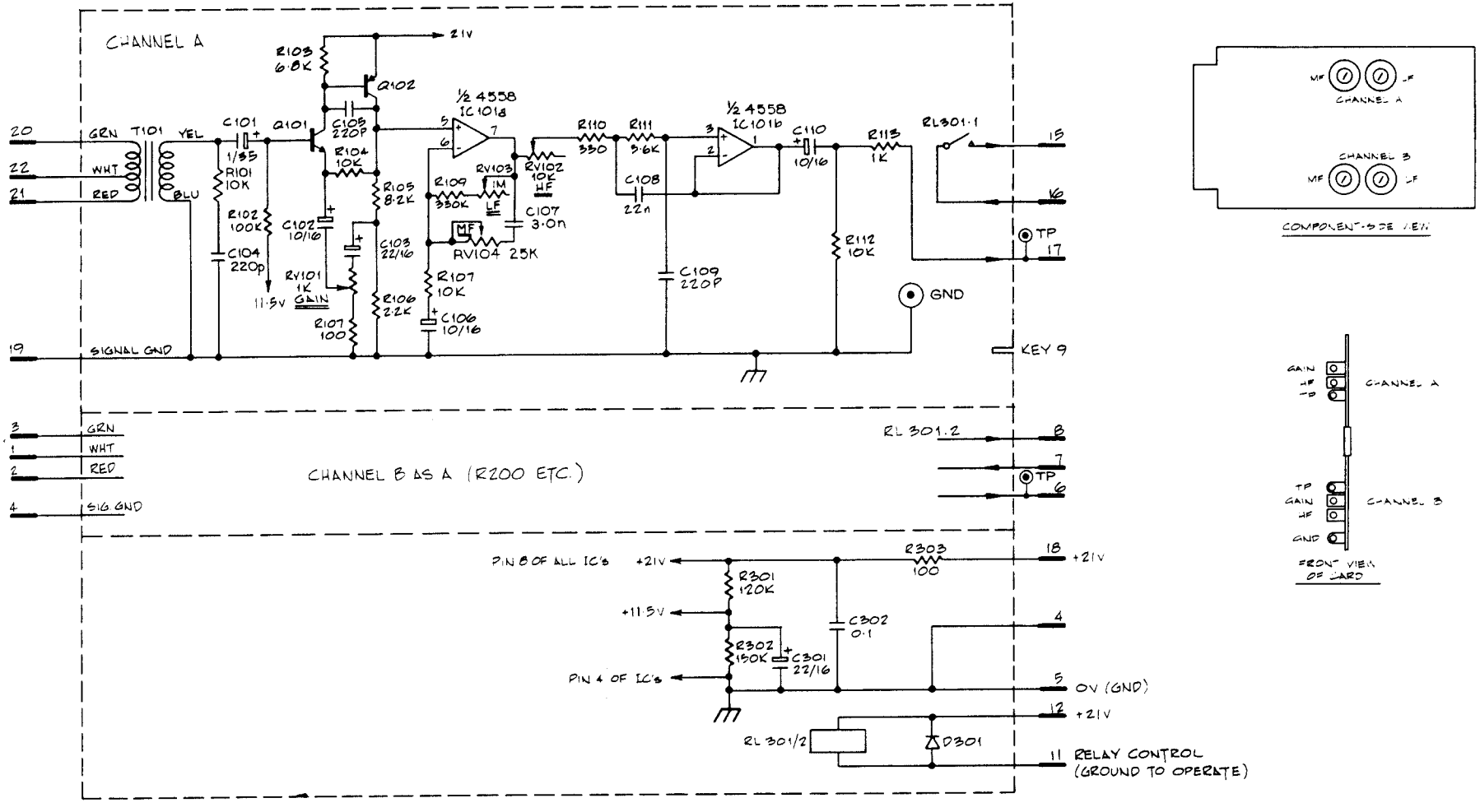

COMPONENT-SIDE VIEW

FRONT VIEW OF CARD

4.4

e in MILLIMETRES unless otherwise specified	scale N/A	
	drawn by C. PERALTA	
	checked by CAP	

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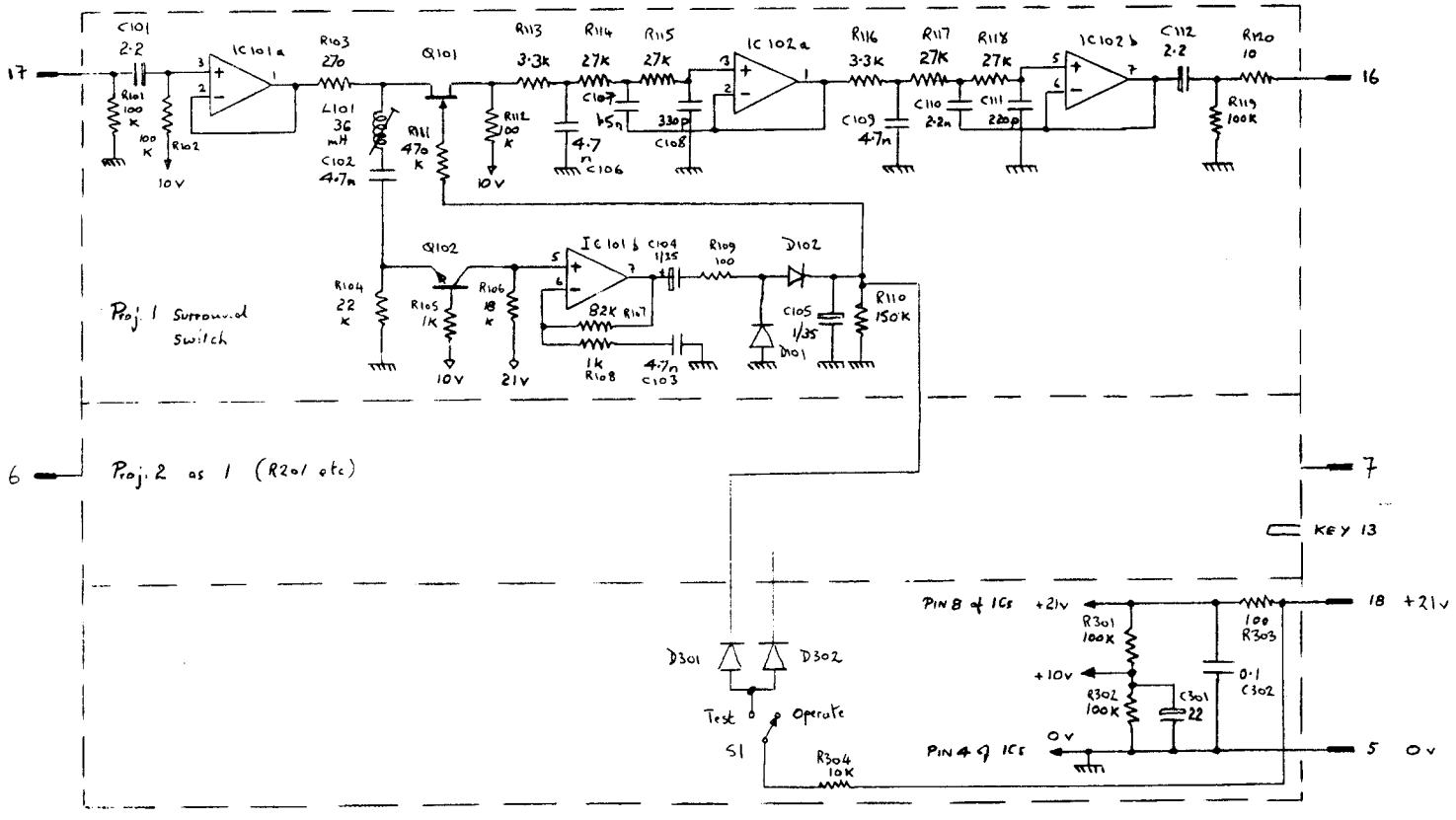
346 Clapham Road London SW9 9AP England

title CAT. 92
MAGNETIC PRE-AMPLIFIER

sheet 1 of 1 **A2 C1427**



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/specification

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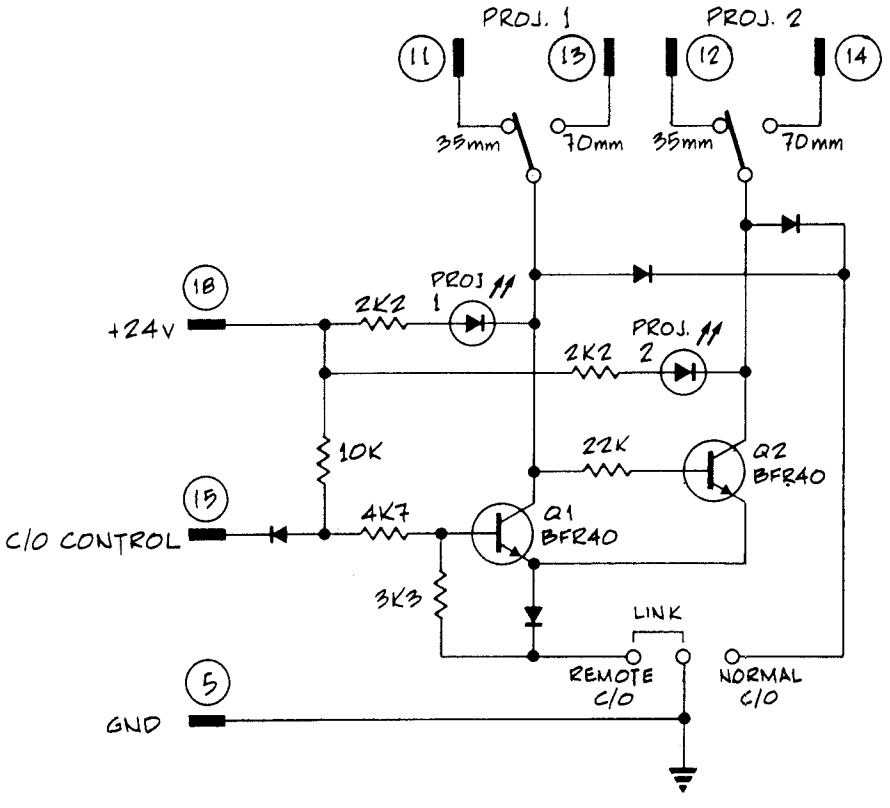
U.S.A. 1133 Avenue of the Americas New York NY 10036

title CAT 93 SURROUND CHANNEL SWITCH MODULE CIRCUIT

sheet 1 of 1

A3C 1431



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3/11 JAN 77	CAP	UPDATED
4/25 MAY 79	CAP	UPDATED

All dimensions are in **MILLIMETRES** unless stated

material/specification

finish

projection is **THIRD ANGLE**

scale

drawn

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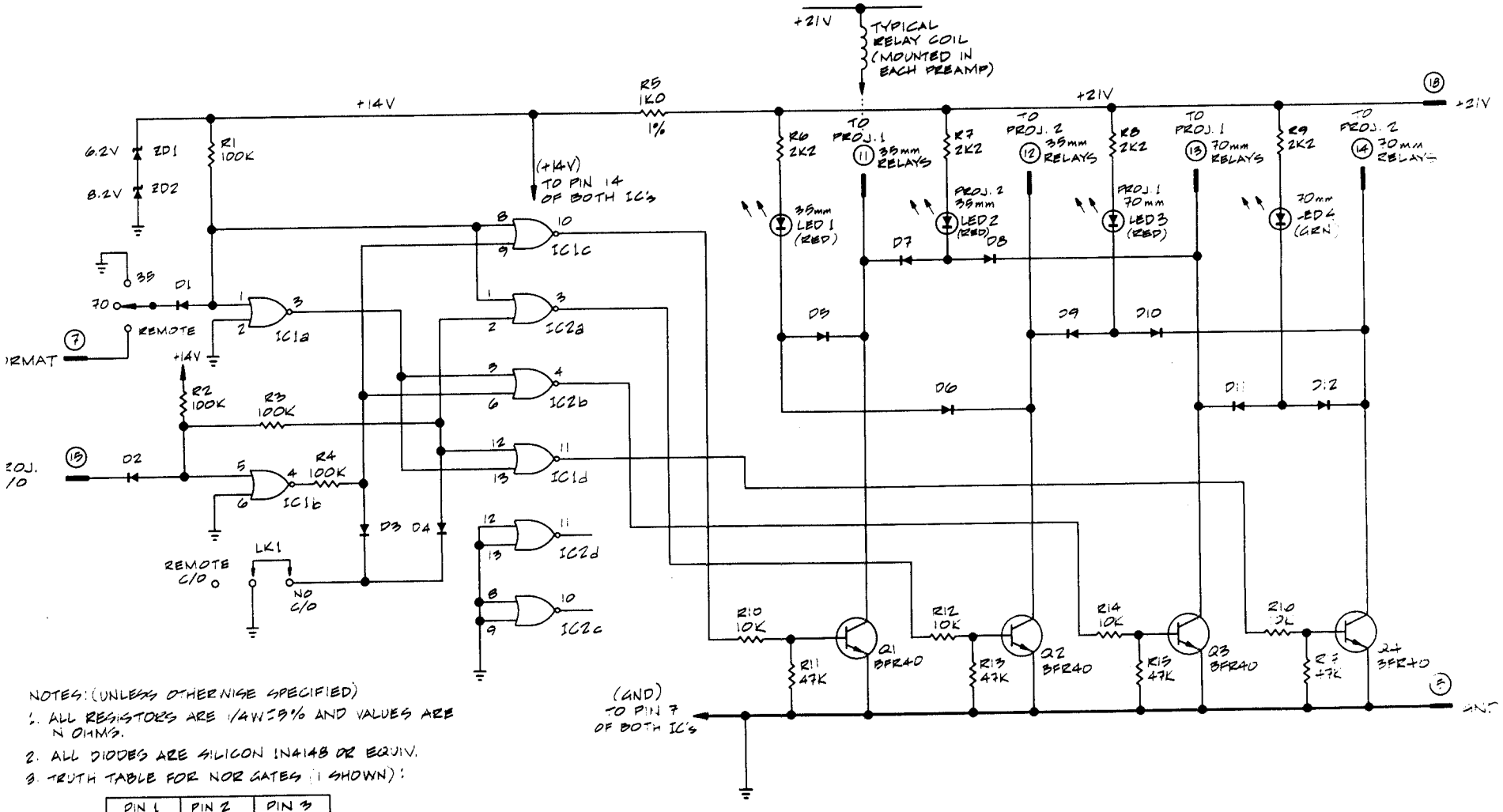
title CAT. Nº 96-2
SWITCH CARD (MPU)

sheet 1 of 1 **A3** C1720



NOTES: (UNLESS OTHERWISE SPECIFIED)

1. ALL RESISTORS ARE 1/4W ±5% AND VALUES ARE IN OHMS.
2. ALL DIODES ARE SILICON IN4148 OR EQUIV.
3. TRUTH TABLE FOR NOR GATES (1 SHOWN):

PIN 1	PIN 2	PIN 3
L	L	H
L	H	H
H	L	H
H	H	L

4. IC1 & IC2 ARE CD4001B.
5. PIN CONNECTIONS FOR BFR40 (AS VIEWED FROM THE BOTTOM):

A2C2049