



DESIGNS DEPARTMENT

DESIGNS DEPARTMENT HANDBOOK

No. 3.260(81)

MX3/4 Clean Feed Mixer

BRITISH BROADCASTING CORPORATION  
ENGINEERING DIVISION

DESIGNS DEPARTMENT HANDBOOK

No. 3.260(81)

MX3/4 Clean Feed Mixer

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(W.T. Shelton)  
for Head of Designs Department

Written by: M.B. Dubenski

DESIGNS DEPARTMENT HANDBOOK

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MX3/4 Clean Feed Mixer

C O N T E N T S

1. INTRODUCTION
2. OPERATION
3. PERFORMANCE
4. CIRCUIT DESCRIPTION
5. MAINTENANCE AND ALIGNMENT

D R A W I N G S

Circuit	D 48598 A1
Parts List	D 48599 A4
P.B. Comp. Loc.	D 48604 A2

DESIGNS DEPARTMENT HANDBOOK

No. 3.260(81)

MX3/4 Clean Feed Mixer

1. INTRODUCTION

The MX3/4 is a 4U BMM P.C.B. designed to derive clean feeds. It was originally used in the EP5M/19 chassis; part of the EP10/18 Radio Continuity Equipment. There are 12 inputs designated 'A' to 'M' and 12 corresponding outputs designed 'not A' to 'not M'. There is also a 13th output (55C, 54C) which comprises the sum of all the inputs.

2. OPERATION

The MX3/4 has fixed gain and there are no operational controls.

3. PERFORMANCE

Gain (only one input driven)	0 dB $\pm$ 0.1 dB (-6 dB to output 55C/54C)
Frequency Response	40 Hz to 15 kHz, $\pm$ 0.1 dB relative to response at 1 kHz
Distortion	T.H.D. at 0 dBu and +16 dBu <0.1% (-60 dB) in the frequency range 40 Hz to 15 kHz
Peak Output	>18 dBu
Noise	<-77 dB, when inputs terminated with 300 $\Omega$ .
Input Impedance	>60 k $\Omega$ , T.E.R.
Output Impedance	94 $\Omega$ , T.E.R.
Power Requirements	$\pm$ 12.5 volts at 110 mA $\pm$ 10 mA
Crosstalk	>80 dB at 10 kHz between channels provided non-driven inputs are terminated with 300 $\Omega$ .

#### 4. CIRCUIT DESCRIPTION

The MX3/4 unit is intended for use as a clean feed mixer. There are 12 inputs designated 'A' to 'M' and 12 corresponding outputs designated 'not A' to 'not M'. There is also a 13th output (55C, 54C) which comprises the sum of all the inputs.

Input signals are applied to HA1-4741-S integrated circuit via a T.E.R. network (Transmitted Earth Reference). This circuitry has been designed to minimise the effect of stray pick-up of hum and noise in the input cables. By using a balanced network (signal at inverting and non-inverting inputs are equal in amplitude but of opposite polarity) interference signals tend to cancel out. The signal lead is connected to the non-inverting input.

Following the unity gain input stage, there is a phase-reverse IC1a (etc.) and following that virtual earth mixers which provide the required 'not outputs' and the combined output. These drive other equipment via T.E.R. sending resistors ( $2 \times 47 \Omega$ ) such as R162 and R161 etc. The output signals (pin 6) are in phase with the non-inverting pin of the input stage.

The MX3/4 circuit diagram is D 48598 A1.

#### 5. MAINTENANCE AND ALIGNMENT

In case of a fault condition check D.C. conditions without signal input:

##### Location

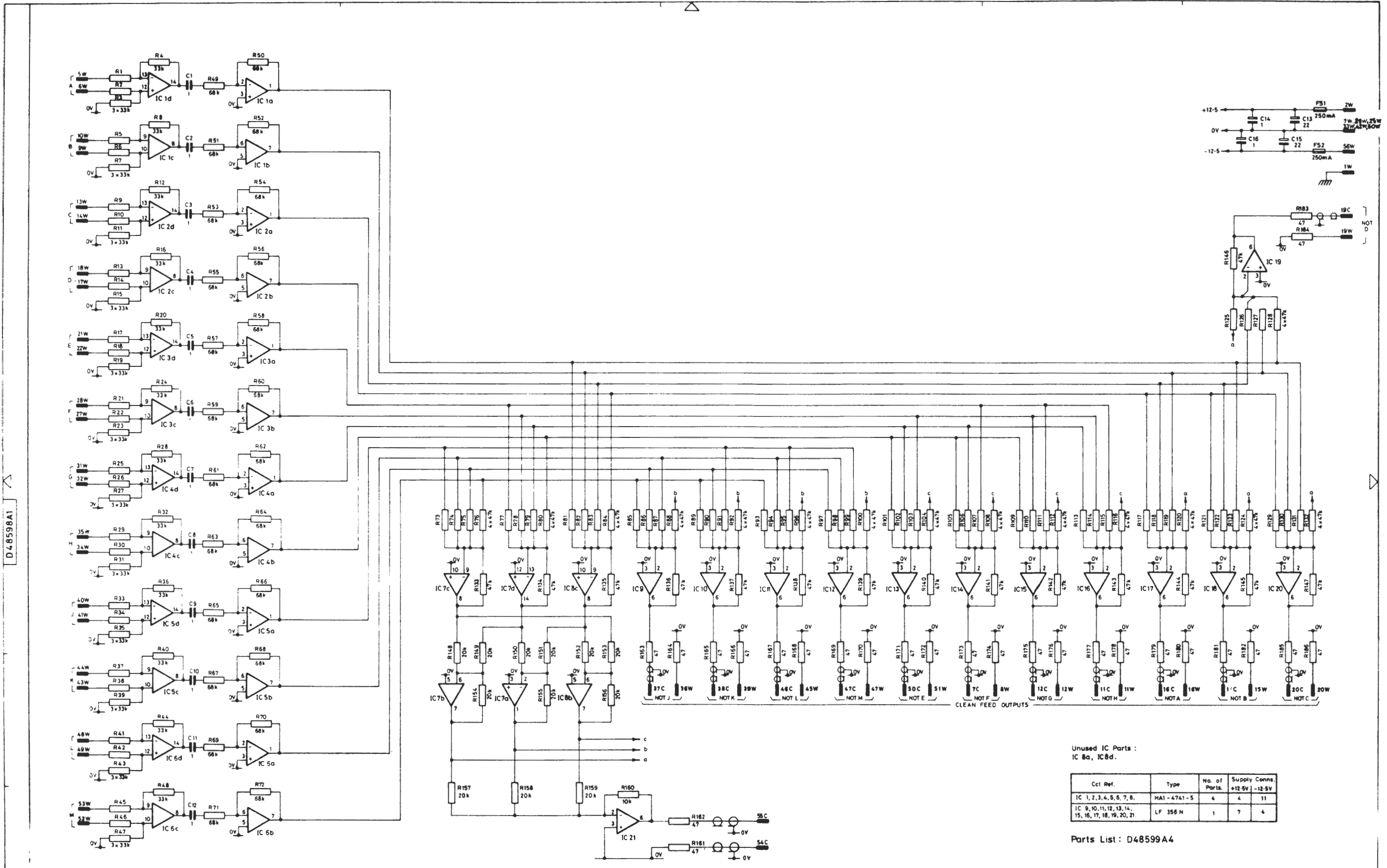
4741	pin 4	+12.5 volts
4741	pin 11	-12.5 volts
4741	output pins	0 volts $\pm 0.1$ volts
LF356	pin 4	-12.5 volts
LF356	pin 7	+12.5 volts
LF356	pin 6	0 volts $\pm 0.1$ volts

##### Signal Conditions

Typical reading of one channel

Input (5W-6W)	0 dB
IC1d, pin 14	0 dB
IC1a, pin 1	0 dB
IC8c, pin 8	0 dB
IC8b, pin 7	0 dB
IC7a, pin 1	0 dB
IC9 to IC16 pin 6	0 dB
IC18 to IC20 pin 6	0 dB
IC21 pin 6	-6 dB

The output of IC1a also drives IC18 and IC19, and via IC8b and IC7a all other mixers except the 'NOT A'. Similarly, the signal paths can be traced from all other inputs to their respective outputs. In case of signal loss check for inner to screen shorts of the screened cables under the screen plate. There are no alignment controls on this unit.



D48598A1

Unused IC Parts :  
IC 8a, IC 8d.

Ckt Ref.	Type	No. of Parts.	Supply Conns.
IC 1, 2, 3, 4, 5, 6, 7, 8.	HA1-4741-5	4	4 11
IC 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21.	LF 356 N	1	7 4

Parts List : D48599A4

THIRD ANGLE PROJECTION

ORIGINAL FRAME SIZE  
574mm x 821mm

CHANGE  
87-3-81

**BBC**  
BS AV1

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**MX 3/4**  
**CLEAN FEED CARD.**  
**CIRCUIT.**

All dimensions in millimetres unless otherwise stated  
Nominal tolerances  
no dim'd plus  
no dim'd plus  
100 dim'd all round

DESIGNS DEPT.  
**D48598 A1**

DATE: 8.1.70

CHANGE  
27-2-81

		DESCRIPTION	BBC REF OR DRW NO
<u>DRAWING NUMBERS</u>			
		CIRCUIT	D48598A1
		PARTS LIST	D48599A4
		ASSEMBLY & WIRING	D48600A1
		DETAILS	D48601A3
		P.B. WIRING	D48602A2
		P.B. COMP. SIDE WIRING	D48603A2
		P.B. COMP. LOCATION	D48604A2
		P.B. DRILLING	D48605A3
<u>FURTHER INFORMATION REQUIRED FOR MANUFACTURE</u>			
		UNIT ASSEMBLY INFORMATION	EA104B4
		UNIT WIRING INFORMATION	EA10139, EA10140
1	1	PRINTED BOARD MANUFACTURED TO	D48602A2, D48603A2 D48604A2, D48605A3
2	1	CODING PLATE, 4U MODIFIED TO :-	552238 - 0326593 D48601A3 DET.1
3	1	SCREEN PLATE ASSY	552255 - 0367162
4	1	HANDLE, NATURAL, VERO 21-1884E	553922 - 0388150
5	2	SPACER, 5mm Ø X 5mm LG, TAPPED M2.5	558285 - 0207406
6	1	SPACER, INSULATING, 5mm Ø X 5mm LG, TAPPED M2.5	558287 - 0325667
7			
8			
9	5	SCREEN	D48601A3 DET.2
10	6	SCREEN	D48601A3 DET.3
11			
12	2	FUSEHOLDER, PRINTED WIRING	522252 - 0345142

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BBC  
DS PLA4

MX3/4  
CLEAN FEED CARD  
PARTS LIST

DRN	GRB
TRD	
CFD	
APPD	REL

DESIGNS DEPARTMENT  
**D48599 A4**



CHANGE  
27-2-81

PARTS LIST

MX 3/4

ITEM NO.	QTY	DESCRIPTION	BBC REF OR DRG NO.
13	150	TERMINAL PIN, SEAELECTRO A0013620G/T	0239341
14			
15	A/R	WIRE, PUN1/1M, BLACK	
16	25M	CABLE, SINGLE-CORE, SCREENED, WHITE PSN1/1M	
17			
18	28	SLEEVE, CABLE BINDING, HELLERMAN TH20 X 12.5mm LG	519768 - 0051969
19			
20			
21			
22			
23			
		<u>SCREWS</u>	<u>FOR FIXING ITEMS</u>
24	2	M2.5 X 12 LG, CSK HD, M.S. ZnP	2, 5
25			
26	1	M2.5 X 6 LG, CSK HD, M.S. ZnP	6
27	6	M2.5 X 6 LG, PAN HD, M.S. ZnP	3
28			
29			
30			
		<u>NUTS</u>	
31	2	M2.5, HEX, FULL, M.S. ZnP	2
32			
33			
		<u>WASHERS</u>	
34	8	M2.5, PLAIN, M.S. ZnP	2, 3
35			
36			
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ITEM No.	Qty	DESCRIPTION AND CIRCUIT REFERENCE	BBC REF. or DRG.No.
101			
102			
103			
104			
CAPACITORS			
105	12	* 1.0uF, 20%, 100V dc, Capacitor, Ceramic Film C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12	S20648-0389313
106	2	* 22uF, -10+50%, 25V dc, Capacitor, Min. Elect. C13, C15	S20714-020491X
107	2	* 1.0uF, 20%, 35V dc, Capacitor, Solid Tantalum. C14, C16	S21125-0085220
108			
109			
110			
RESISTORS			
111	26	* 47 ohm, 2%, Resistor, Metal Film, 0.4W. R161, R162, R163, R164, R165, R166, R167, R168, R169, R170, R171, R172, R173, R174, R175, R176, R177, R178, R179, R180, R181, R182, R183, R184, R185, R186	S26877-0099291
112	1	* 10kohm, 2%, Resistor, Metal Film, 0.4W. R160	S26877-0099224
113	12	* 20kohm, 2%, Resistor, Metal Film, 0.4W. R148, R149, R150, R151, R152, R153, R154, R155, R156, R157, R158, R159	S26877-02280
114	48	* 33kohm, 2%, Resistor, Metal Film, 0.4W. R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16, R17, R18, R19, R20, R21, R22, R23, R24, R25, R26, R27, R28, R29, R30, R31, R32, R33, R34, R35, R36, R37, R38, R39, R40, R41, R42, R43, R44, R45, R46, R47, R48	S26877-0049259

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ITEM No.	Qty	DESCRIPTION AND CIRCUIT REFERENCE	BBC REF. or DRG.No.
115	75	* 47kohm, 2%, Resistor, Metal Film, 0.4W. R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94, R95, R96, R97, R98, R99, R100, R101, R102, R103, R104, R105, R106, R107, R108, R109, R110, R111, R112, R113, R114, R115, R116, R117, R118, R119, R120, R121, R122, R123, R124, R125, R126, R127, R128, R129, R130, R131, R132, R133, R134, R135, R136, R137, R138, R139, R140, R141, R142, R143, R144, R145, R146, R147	S26877-0099267
116	24	* 68kohm, 2%, Resistor, Metal Film, 0.4W. R49, R50, R51, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72	S26877-0099520
117			
118			
119			
INTEGRATED CIRCUITS			
120	8	* HA1-4741-5 IC1, IC2, IC3, IC4, IC5, IC6, IC7, IC8	0124061
121	13	* LF356N IC9, IC10, IC11, IC12, IC13, IC14, IC15, IC16, IC17, IC18, IC19, IC20, IC21	0194940
122			
123			
124			
FUSES			
125	2	* Fuse, Cartridge, Anti-Surge, Glass, 250mA FS1, FS2	S224254044477

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CIRCUIT REFERENCE INDEX

C1 105	R30 114	R76 115	R122 115	R168 111
C2 105	R31 114	R77 115	R123 115	R169 111
C3 105	R32 114	R78 115	R124 115	R170 111
C4 105	R33 114	R79 115	R125 115	R171 111
C5 105	R34 114	R80 115	R126 115	R172 111
C6 105	R35 114	R81 115	R127 115	R173 111
C7 105	R36 114	R82 115	R128 115	R174 111
C8 105	R37 114	R83 115	R129 115	R175 111
C9 105	R38 114	R84 115	R130 115	R176 111
C10 105	R39 114	R85 115	R131 115	R177 111
C11 105	R40 114	R86 115	R132 115	R178 111
C12 105	R41 114	R87 115	R133 115	R179 111
C13 106	R42 114	R88 115	R134 115	R180 111
C14 107	R43 114	R89 115	R135 115	R181 111
C15 106	R44 114	R90 115	R136 115	R182 111
C16 107	R45 114	R91 115	R137 115	R183 111
	R46 114	R92 115	R138 115	R184 111
R1 114	R47 114	R93 115	R139 115	R185 111
R2 114	R48 114	R94 115	R140 115	R186 111
R3 114	R49 116	R95 115	R141 115	
R4 114	R50 116	R96 115	R142 115	IC1 120
R5 114	R51 116	R97 115	R143 115	IC2 120
R6 114	R52 116	R98 115	R144 115	IC3 120
R7 114	R53 116	R99 115	R145 115	IC4 120
R8 114	R54 116	R100 115	R146 115	IC5 120
R9 114	R55 116	R101 115	R147 115	IC6 120
R10 114	R56 116	R102 115	R148 115	IC7 120
R11 114	R57 116	R103 115	R149 115	IC8 120
R12 114	R58 116	R104 115	R150 115	IC9 121
R13 114	R59 116	R105 115	R151 115	IC10 121
R14 114	R60 116	R106 115	R152 115	IC11 121
R15 114	R61 116	R107 115	R153 115	IC12 121
R16 114	R62 116	R108 115	R154 115	IC13 121
R17 114	R63 116	R109 115	R155 115	IC14 121
R18 114	R64 116	R110 115	R156 115	IC15 121
R19 114	R65 116	R111 115	R157 115	IC16 121
R20 114	R66 116	R112 115	R158 115	IC17 121
R21 114	R67 116	R113 115	R159 115	IC18 121
R22 114	R68 116	R114 115	R160 115	IC19 121
R23 114	R69 116	R115 115	R161 115	IC20 121
R24 114	R70 116	R116 115	R162 115	IC21 121
R25 114	R71 116	R117 115	R163 115	
R26 114	R72 116	R118 115	R164 115	FS1 125
R27 114	R73 115	R119 115	R165 115	FS2 125
R28 114	R74 115	R120 115	R166 115	
R29 114	R75 115	R121 115	R167 115	

END OF CIRCUIT REFERENCE INDEX.

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ORIGINAL  
FRAME SIZE  
190mm x 277 mm

ALL DIMENSIONS IN MILLIMETRES UNLESS  
OTHERWISE STATED

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SHT.	ISS.	DETAILS OF CHANGE	SHT.	ISS.	DETAILS OF CHANGE

**BBC**

DESIGNS DEPARTMENT

CODE:- MX3/4

PARTS LIST CHANGE RECORD, ISSUE:-1

**D 48599**

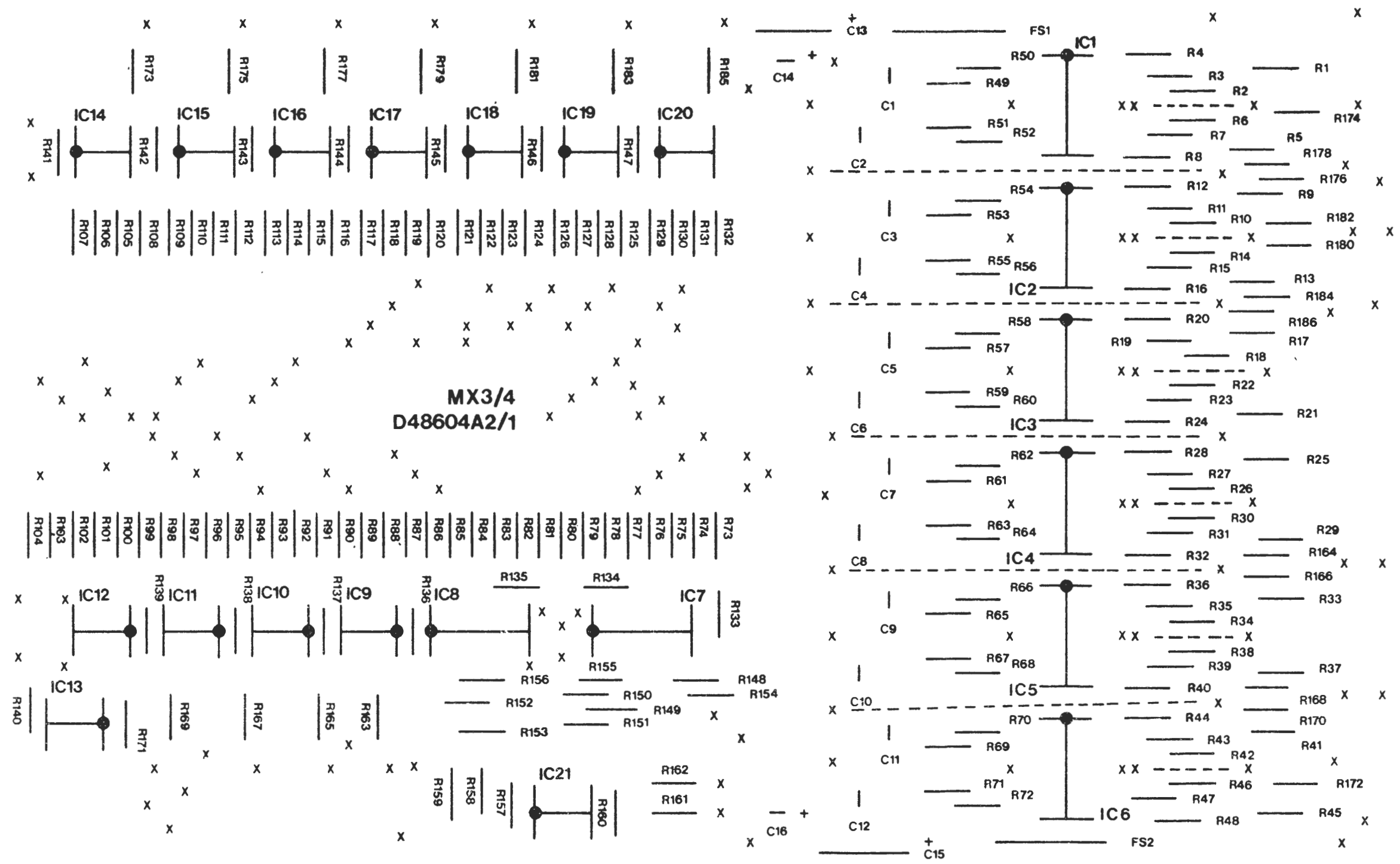
**A4**

SHEET 6

YM 418/A4

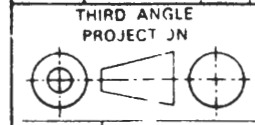
D48604A2

TOP



MINIMUM SIZE TO CUT NEGATIVE SCALE 2:1

SCALE:-



THIRD ANGLE  
PROJECT JN

ORIGINAL  
FRAME SIZE  
400mm x 574mm

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DS/A2/1

CHANGE	08-6-71
SS	1

Characters and lines to be printed in black.  
Printed wiring on this side of board is D48603A2  
Printed wiring on reverse side of board is D48602A2

<b>MX3/4</b>		DESIGNS DEPT.	
PRINTED BOARD COMPONENT LOCATION		<b>D48604A2</b>	
All dimensions in millimetres unless otherwise stated Normal tolerances		DRN	
no decimal place	- 1 mm unless	TCD	28
one decimal place	- 0.3 mm otherwise	CKD	
two decimal places	- 0.1 mm stated	APPD	9/2

