

Product: S/09 Computer System

Date: Nov. 14 1980 G.K./J.D.

Hardware Modifications for the UNIFLEX™ and FLEX™ Operating Systems

In order to use the UNIFLEX™ and FLEX™ operating systems on SWTPC S/09 computers, it is mandatory that the following modifications be made to the MP-MB motherboard, MP-ID interface driver and the MP-09A processor board in the S/09 computer. These modifications have already been made at the factory if the MP-MB board is a REV A or higher, the MP-ID board is a REV C or higher and the MP-09A board is a REV C or higher. Appropriate revision stickers are attached along the top edge of all boards updated by SWTPC.

Preparing the System

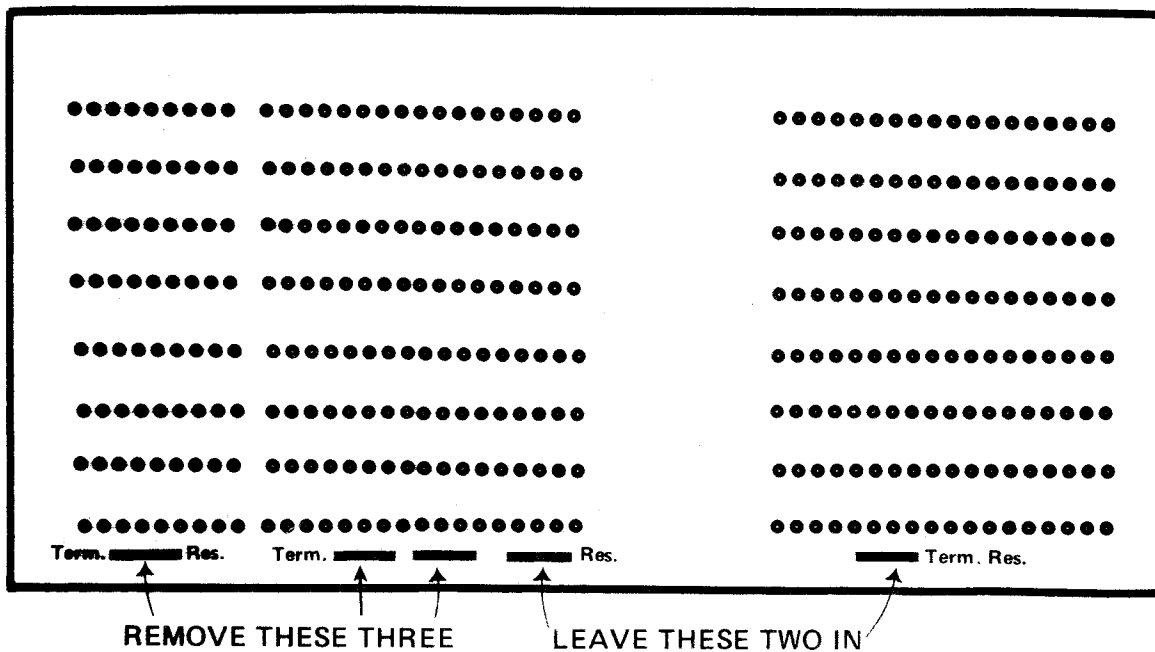
Before attempting any modifications to the system, power down the entire computer system. If located in a desk, carefully remove any attached interface cables while noting where each is connected. Remove the S/09 computer chassis from the desk where applicable and place it on a table top where it may easily be serviced. Remove the four screws which secure the cover to the chassis and remove the cover. Remove the two screws from the rear panel which hold the MP-ID board's trim strip to the rear panel. The MP-ID board has a single DB-25 connector and is located to the far left of the chassis as viewed from the front of the computer. Carefully remove the MP-ID interface driver board by alternately lifting up and pushing down on each end of the board. Carefully remove the MP-09 processor board by alternately lifting up on each end of the board. Modifications will also need to be made to the MP-MB motherboard but may be done without removing the motherboard from the chassis.

Modifying the MP-MB Motherboard

The three terminating resistor packs on the MP-MB motherboard nearest the front of the chassis must be removed. (See figure 1.) Remove them by grasping each with your fingers or pliers and slowly bending back and forth until each snaps off. If done properly they should break clean. The two terminating resistor packs nearest the rear of the chassis must be left intact.

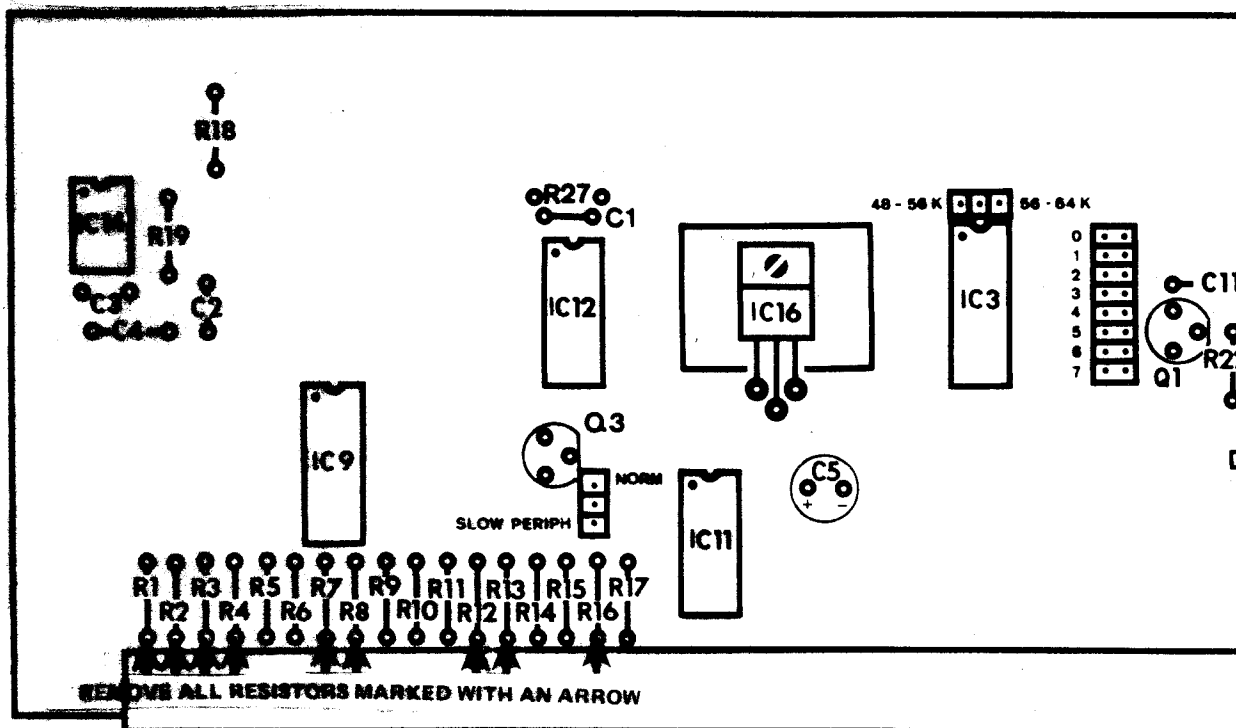
FIGURE 1

MP-MB



Modifying the MP-ID Interface Driver Board

Several of the pull up resistors on the lower left edge of the MP-ID interface driver board must be either removed or changed in value as per the component drawing and parts list below. Change where necessary the components to be as follows:



INTERFACE DRIVER BOARD MP-ID

Parts List

_____ R1	remove	_____ R9	470 ohm 1/4 watt
_____ R2	remove	_____ R10	470 ohm 1/4 watt
_____ R3	remove	_____ R11	330 " " "
_____ R4	remove	_____ R12	remove
_____ R5	470 ohm 1/4 watt	_____ R13	remove
_____ R6	470 " " "	_____ R14	6.8K 1/4 watt
_____ R7	remove	_____ R15	6.8K " "
_____ R8	remove	_____ R16	remove
		_____ R17	330 ohm 1/4 watt

Modifying the MP-09 Processor Board

Make the following modifications to the MP-09 processor board. Use the component drawing to aid in locating the parts. SWTPC has two slightly different versions of the processor board (MP-09 and MP-09A). The modifications shown below are applicable to both versions of the board. These modifications do not include those already given in SWTPC application note AN #104 for the MP-09 (not MP-09A) processor board.

- (1) Attach and solder a 6.8K 1/4 watt resistor between the R/W line and +5 VDC on the back side of the processor board. Keep the leads short and the component close to the board. Locate the component as shown in the pictorial below.
- (2) Remove the ROM or EPROM in IC4's socket. Carefully cut the land going to pin 18 on the top side of the board underneath the socket right at pin 18. Most boards use an open frame socket where the trace can be cut without removing the socket. If the socket is not an open frame type, it will be necessary to very carefully remove the socket, cut the land and then reinstall the socket. Now attach and solder a piece of wire wrap wire between pin 18 and pin 12 of IC4 on the back side of the board as shown in the pictorial below. Reinstall the ROM or EPROM.
- (3) IC8 on the MP-09 processor board must be a 74S189 (not 74LS189). The integrated circuit is installed in a socket and may be easily changed.
- (4) Eight 470 ohm 1/4 watt resistors must be installed on all four outputs of both IC8 and IC11. The MP-09A board has provisions for all of the eight with resistors R9, R10, R13, R14, R21-R24, however the value of the resistors installed will need to be checked. The MP-09 board (not MP-09A) has component locations for only four of the eight resistors, R9, R10, R13, R14. The remaining resistors must be attached and soldered from the back side of the board while making sure the leads are short and the resistors are kept close to the board. Remember, all eight resistors must be 470 ohm 1/4 watt.
- (5) Using a hobby knife or pointed object, cut the PC foil on the bottom edge of the back side of the board as shown in the

pictorial below. Now solder a piece of light gauge hookup wire along the back side of the board from the M.RDY bus connection to pin 11 of IC20. Now solder another piece of light gauge hookup wire along the back side of the board from pin 9 of IC20 to pin 36 of IC14.

- (6) It is suggested but not mandatory that a 74LS132 be used in place of a 74LS00 for IC21. However, if your board already has a 74LS00 soldered in place, we recommend that you not replace it.
- (7) Cut the PC foil trace going to pin 2 of IC20. This cut should be made on the BOTTOM side of the board. Be careful to cut only the trace that runs between pin 2 and the heavier ground foil. Do not cut the heavy ground foil.



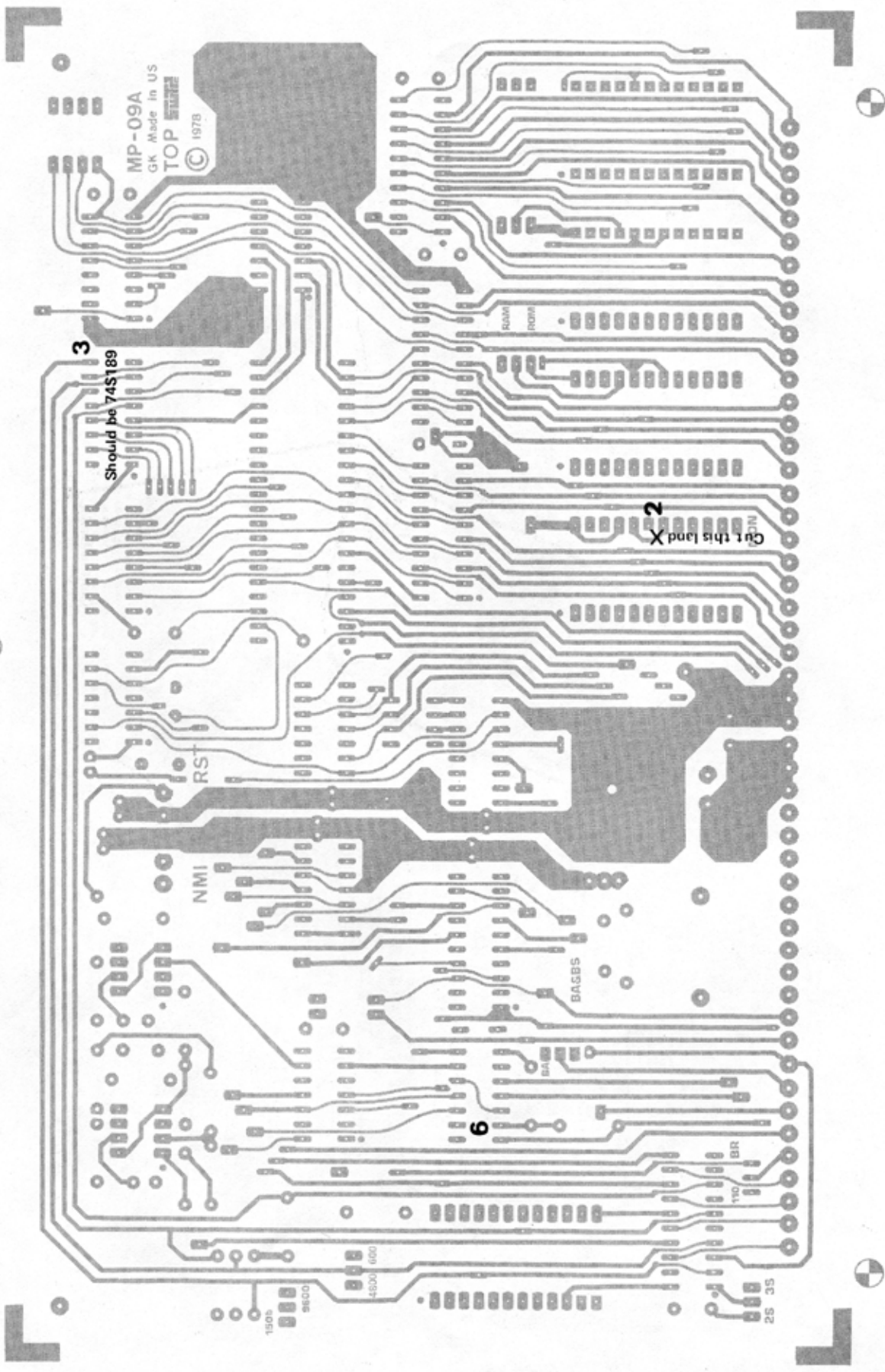
- (8) Solder a piece of light gauge wire along the back side of the board from pin 2 of IC20 to pin 4 of IC6.
- (9) UNIFLEX™ systems cannot be booted with the S-BUG-E monitor ROM. This ROM will have to be changed to a UNIFLEX™ compatible ROM.

Completing Modifications

This completes modifications to the SWTPC S/09 computer circuit boards. Check to make sure that your DMAF2 controller board has been modified as per Application Notice AN #114A.

Reinstall the modified PC boards in the computer in their original locations and secure the MP-ID board's trim strip to the rear panel using #6-32 screws. Attach any removed cables, install the cover and secure with four screws. It is suggested that you reattach any removed interface cables and check the computer before reinstalling it in the desk (where applicable).

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MP-09A
GK Made in US
TOP
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3
Should be 74S189

2
Cut this land X

NMI
RS+

BASBS

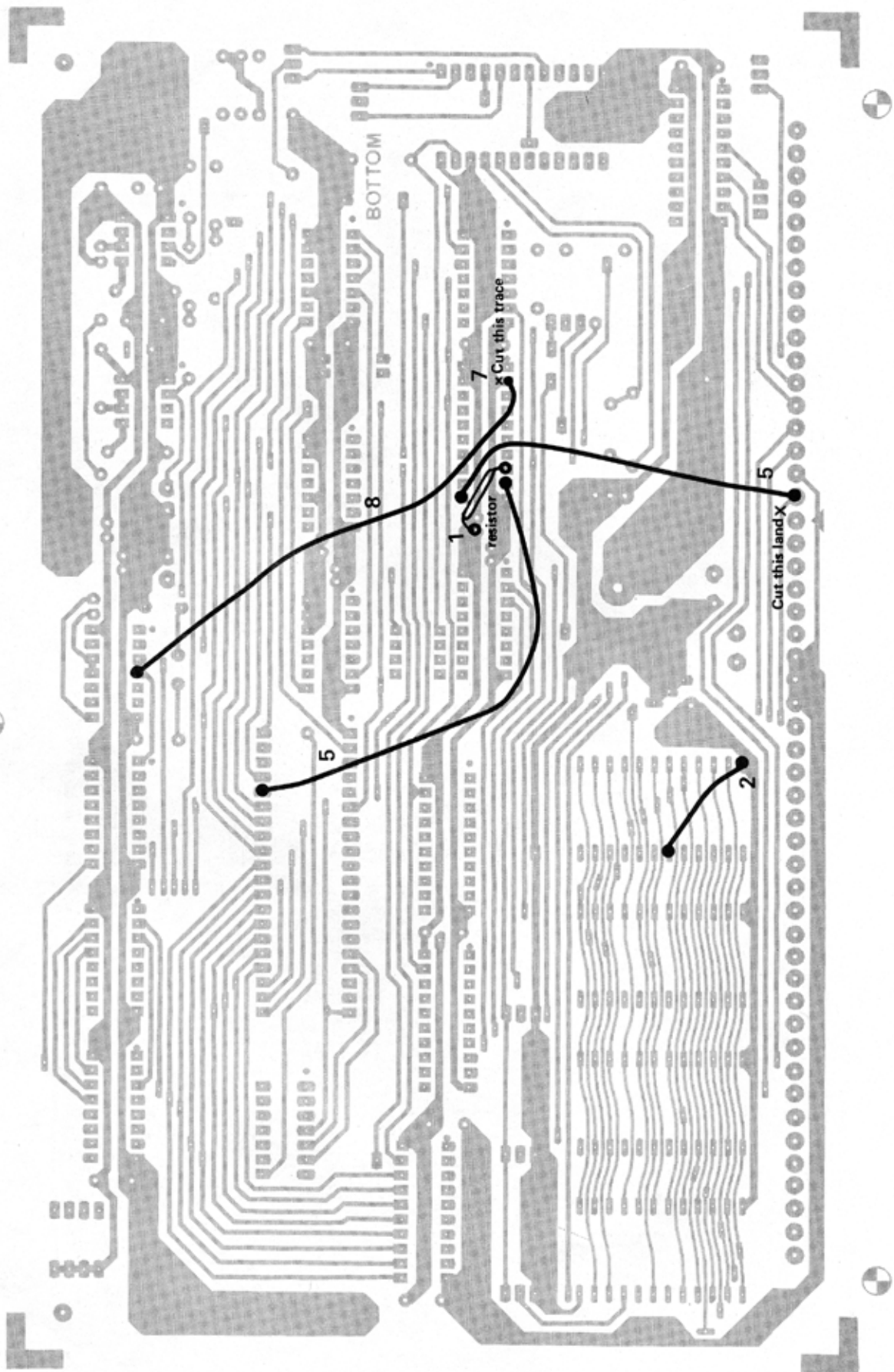
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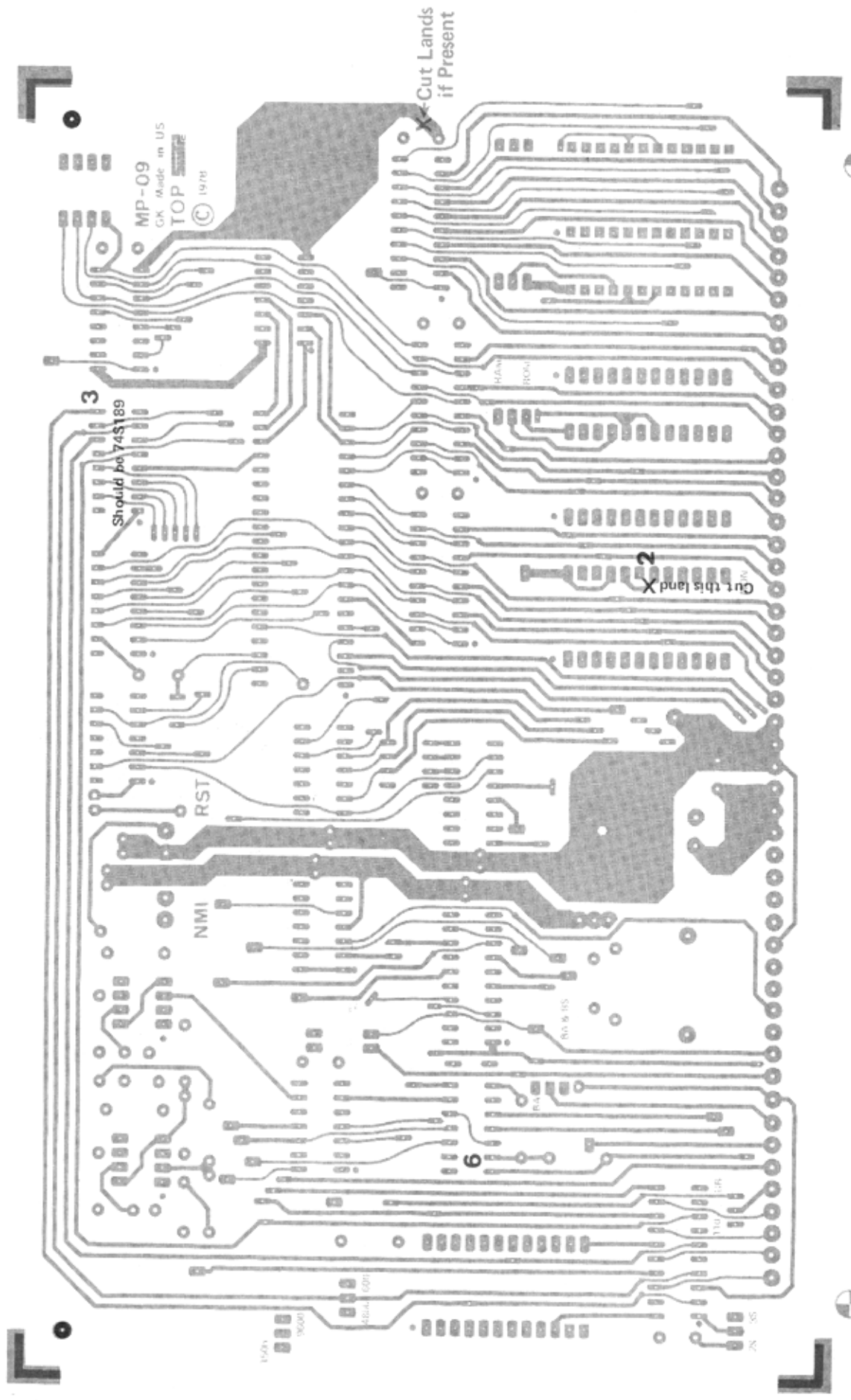
150s
9800

48000 (000)

150
ERR

25 35





MP-09
GK Made in US
TOP
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Should be 74S189

X-Cut Lands if Present

Cut this land X

RST

NMI

6

PA

PA & BS

Y10

Y11

Y12

15V

5V

GND

VCC

VDD

VSS

VSS1

VSS2

VSS3

VSS4

VSS5

VSS6

VSS7

VSS8

VSS9

VSS10

VSS11

VSS12

VSS13

VSS14

VSS15

VSS16

VSS17

VSS18

VSS19

VSS20

VSS21

VSS22

VSS23

VSS24

VSS25

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VSS39

VSS40

VSS41

VSS42

VSS43

VSS44

VSS45

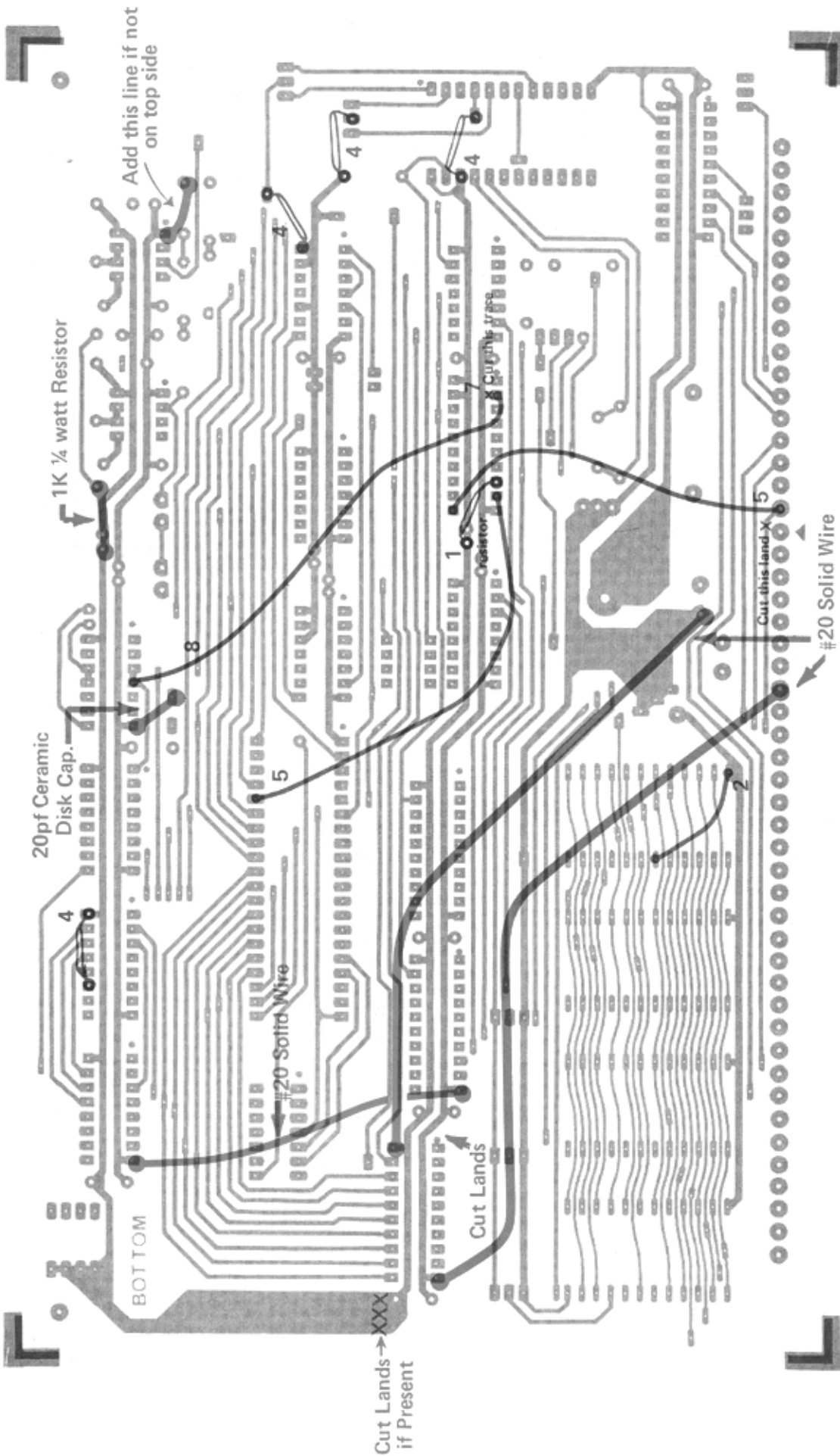
VSS46

VSS47

VSS48

VSS49

VSS50



1K 1/4 watt Resistor

20pf Ceramic Disk Cap.

20 Solid Wire

Resistor

Capacitor

Cut Lands

Cut this land X

#20 Solid Wire

Add this line if not on top side

Cut Lands -> XXX if Present

BOTTOM