

TRIAC TOOLCHANGER - SEQUENCE OF OPERATION

27 JULY 1987

1. DATUM OPERATION
TRIAC

COMMANDS TC OUT/UP

WAITS FOR TC NOT RDY

WAITS TC RDY

TRIAC DATUMS

TRIAC MOVES TO TC POSN

COMMANDS TC 'DATUM'

WAITS TC NOT RDY

WAITS TC READY

TRIAC ASKS USER 'TOOL FITTED'?

IF '0' TRIAC COARSE ORIENTATES
SPINDLE USING SPDL SPEED DET THEN
COMMANDS TC 'FIT TOOL 1'

WAITS TC RDY

WAITS TC RDY

WAITS TC RDY

NORMAL OPERATION PROCEEDS

ON

TOOLCHANGER (TC)

SETS TC RDY AT POWER UP

CLRS TCRDY (RL 4)

ARM OUT (AUX1 OFF I/P 1)

ARM UP (AUX2 OFF I/P 4)

SETS TC RDY (RL 4)

CLRS TC RDY

DATUMS X AXIS

SETS TC RDY

TC FITS TOOL 1

CLRS TC RDY

FINE ORIENTATES SPINDLE (RL3,
TDAT)

ARM DOWN (AUX2, I/P 3)

ARM IN (AUX1, I/P 2)

ROTATE TO X=0 (TOOL 1 POSN)

DRAW BAR ON (RL3

1/2 SEC DELAY)

ARM UP (AUX2 OFF, I/P 4)

DRAW BAR OFF (RL3)

1/2 SEC DELAY

ARM OUT (AUX1 OFF I/P 1)

SETS TC RDY

ELSE IF 1-6

COMMANDS TC 'ROTATE TO TOOL
POSN'

WAITS TC NOT RDY CLRS TC RDY

MOVES X AXIS TO RELEVANT

TOOL NO BY ROTATING TOOL

HOLDER

SETS TC RDY

DELAYS 1/2 SEC AFTER D BAR ON

2. CHANGE TOOL OPERATION TRIAC

TOOLCHANGER

STOPS SPINDLE

MOVES TO TC POSN

COARSE ORIENTATES SPINDLE
USING SPDL SPEED DETECTOR

COMMANDS TC TO CHANGE TO
TOOL 1-6
WAITS TC NOT RDY

CLRS TC RDY. (RL4)
FINE ORIENTATES SPINDLE USING
(RL3, T DAT)
ARM IN (AUX1, I/P 2)
DRAW BAR ON (RL3)
1/2 SEC DELAY
ARM DOWN (AUX2, I/P 3)
ROTATES TO SELECTED TOOL POSN.
ARM UP (AUX2 OFF, I/P 4)
1/2 SEC DELAY
DRAW BAR OFF (RL3)
1/2 SEC DELAY
ARM OUT (AUX1 OFF, I/P 1)
SETS TC RDY (RL 4)

WAITS TC RDY

NORMAL OPERATION PROCEEDS

NOTES

AUX 1 USED AS IN/OUT CONTROL
AUX 2 USED AS DOWN/UP CONTROL
I/P 1 USED AS ARM OUT DETECTOR
I/P 2 USED AS ARM IN DETECTOR
I/P 3 USED AS ARM DOWN DETECTOR
I/P 4 USED AS ARM UP DETECTOR

1. IF A SYSTEM ERROR IS DETECTED BY TC IT'S ERROR RELAY (RL5) IS OPERATED.
2. TRIAC ONLY WAITS FOR TC FOR UP TO 15 SECS FOR OUT/UP,
30 SECS FOR DATUM,
45 SECS FOR MOVE TO TOOL AND CHANGE
TOOL.

IF TC NOT SET DURING THIS WAIT 'TOOL CHANGER ERROR' IS DISPLAYED.

FANUC TOOLCHANGER

USE OF OVERTRAVEL SIGNALS

BIT 5	4	3	2	1	0
Z+	Z-	Y+	Y-	X+	X-
CMD	DATUM	CMD TYPE	CMD TYPE	CMD TYPE	CMD TYPE
STROBE		BIT 3	BIT 2	BIT 1	BIT 0

CMD STROBE - HI GOING PULSE > 1 milllSEC STROBES BITS 0 TO 4 INTO TOOLCHANGER.

DATUM - IF 'LO' SELECTS DATUM (BITS 3 TO 0 IGNORED)

BITS 3 TO 0 (IF BIT 4 IS HI)

BIT 3	BIT 2	BIT 1	BIT 0	FUNCTION SELECTED
1	1	1	1	NOT ALLOWED-GIVES ERROR
1	1	1	0	MOVE TOOL ARM OUT, UP
1	1	0	1	MOVES TOOL HOLDER TO TOOL 1 POSN
1	1	0	0	MOVES TOOL HOLDER TO TOOL 2 POSN
1	0	1	1	MOVES TOOL HOLDER TO TOOL 3 POSN
1	0	1	0	MOVES TOOL HOLDER TO TOOL 4 POSN
1	0	0	1	MOVES TOOL HOLDER TO TOOL 5 POSN
1	0	0	0	MOVES TOOL HOLDER TO TOOL 6 POSN
0	1	1	1	FITS TOOL 1 INTO HEAD
0	1	1	0	CHANGES TOOL TO TOOL 1
0	1	0	1	CHANGES TOOL TO TOOL 2
0	1	0	0	CHANGES TOOL TO TOOL 3
0	0	1	1	CHANGES TOOL TO TOOL 4
0	0	1	0	CHANGES TOOL TO TOOL 5
0	0	0	1	CHANGES TOOL TO TOOL 6
0	0	0	0	NOT ALLOWED GIVES AN ERROR

NOTE A HI OR '1' LEVEL INDICATES TOOLCHANGER CONTROL I/P OPEN CIRCUIT, A LO OR '0' LEVEL INDICATES TOOLCHANGER CONTROL I/P SHORT CIRCUIT TO OVI.

9. PROBE POSITION - ('?')

When the external computer requires the position at which the last specified input closed during an axis movement (see 13, 14, 15, 16, above) the position is output as a string of an axis identifier followed by 8 decimal characters giving the absolute position in motorsteps of the relevant axis.

10. ECHOCHAR -

Characters are echoed when the ECHOCHAR command is being executed.

11. HEXCHAR -

Hexadecimal characters 0 to F are transmitted in response to a command or error condition. Only the least significant nibble is relevant and contains HEX data in bit form. The most significant nibble is '3' excluding the parity bit the level of which is determined by the internal switches.

c) Indicated System Errors

The SMCU unit includes an front panel indicator which has a number of uses.

At initial power up if the SMCU microprocessor is running the indicator repeatedly flashes ON for 1/4 second, OFF for 1/4 second until the first RS232 command is received (if RS232 operation is selected by SW 7) or until the optional Keypad is used (SW 7 OFF).

If the SMCU is operating in RS232 mode (SW-7 ON) the indicator changes from ON to OFF or vice-versa for each RS232 character received. In normal operation controlled by a host computer the indicator will glow dimly as RS232 characters are received then will remain OFF or ON for the period between receipt of characters. Any error conditions detected by the SMCU are transmitted to the host in a coded form (See section b).

If the SMCU is not operating in RS232 mode the initial flashing stops when the keyboard is operated. The indicator then changes from ON to OFF or vice-versa each time the Keyboard is operated. Additionally in this mode the indicator is used to indicate a number of error conditions as follows:-

<u>Error</u>	<u>Indicator Operation</u>
Overtravel Error	1 short flash ON then OFF for 2.5 seconds repeated.
Stepper Drive Fault	2 short flashes ON then OFF for 2.5 seconds repeated.
Datum Error	3 short flashes ON then OFF for 2.5 seconds repeated.
EXT, STOP pressed	4 short flashes ON then OFF 2.5 seconds repeated.
ROM, RAM DATA ERROR	5 short flashes ON then OFF 2.5 seconds repeated.
KEYBOARD COMMAND ERROR	6 short flashes ON then OFF 2.5 seconds repeated.

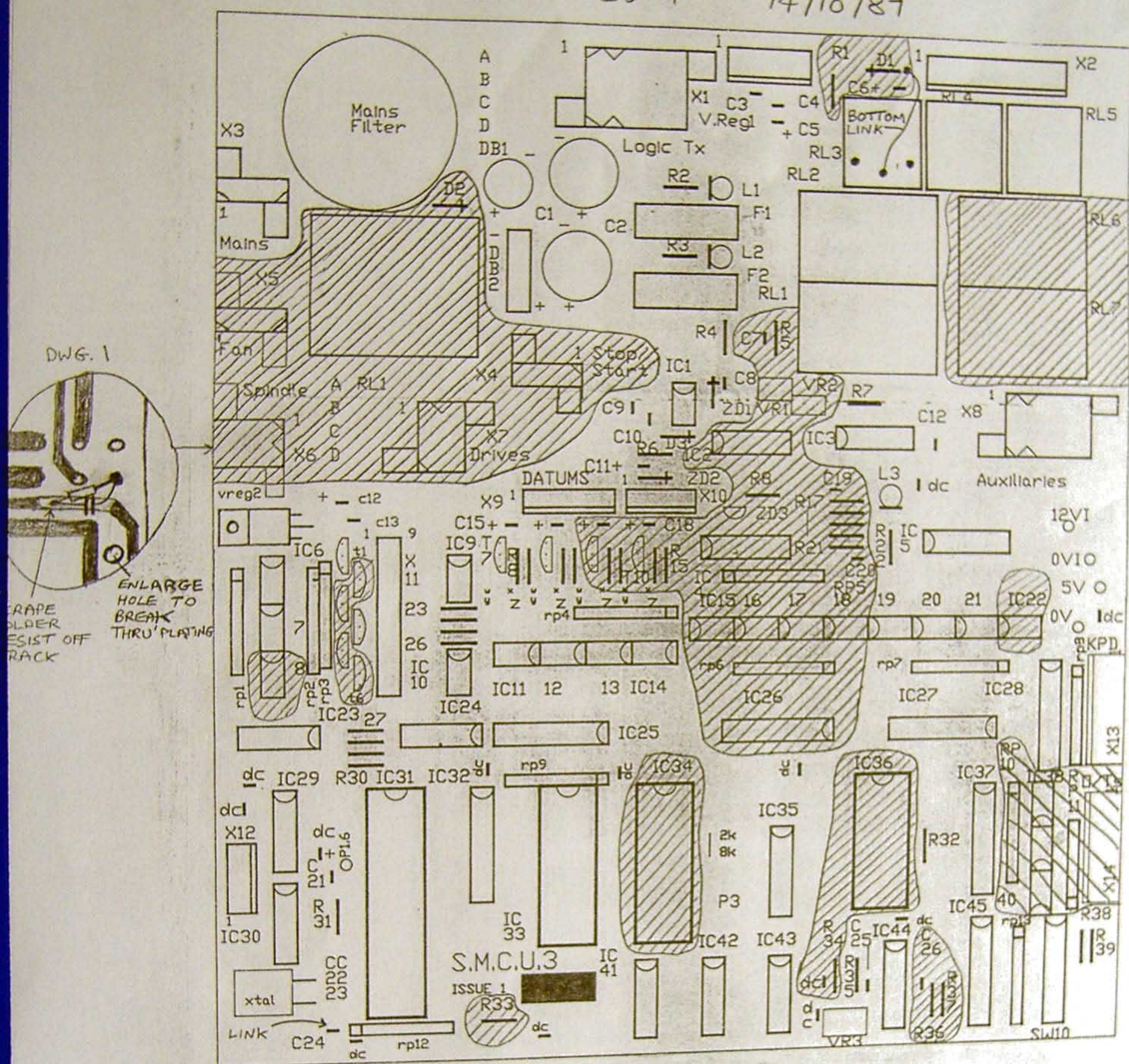
TRIAC JULY 86

Mods to fit TRIAC TOOLCHANGER system to TRIAC's with issue 2A main pcb's:-

Auxiliaries Section

1. Ensure RL5 is not fitted
2. Link IC4 pin 5 to track from RL5 to PLJ₅
3. Link R2 (P/S section) L.H.S. (OVI) to track from R15 to PLJ₆
4. Fit PLJ
5. Add 1K 1/4w resistor between PLJ₅ and PLJ₆ on relay base area.
6. Make conector: 5 pin DIN 60°
 - pin 3 to SKJ - 6
 - pin 5 to SKJ - 5
 - pin 2 POL

DENFORD
TRIAC AND FANUC AUTOTOOLCHANGER SYSTEMS
 PCB LAYOUT REV 9 14/10/87



DO NOT FIT THESE COMPONENTS

THESE COMPONENTS ONLY FITTED FOR FANUC CONTROLLERS.

IC38, IC39, IC40, RP10, RP11, X14

MODS.

1) ON TRIAC AND FANUC TOOLCHANGERS, ADD LINK FROM D1 (END NEXT TO CONNECTOR) TO RL3 COMMON (MIDDLE PIN OF 3 CONTACTS) ON BOTTOM OF BOARD.

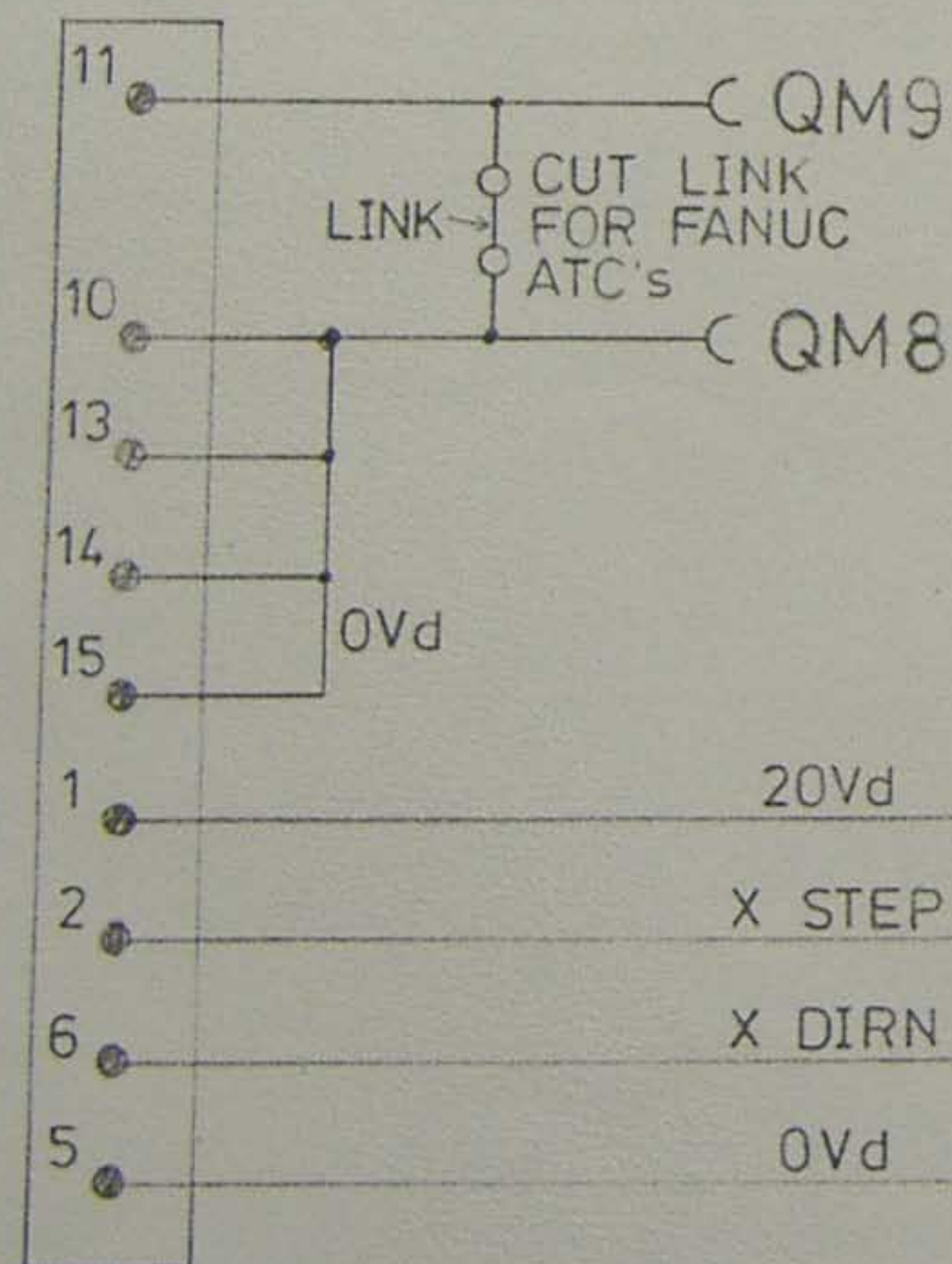
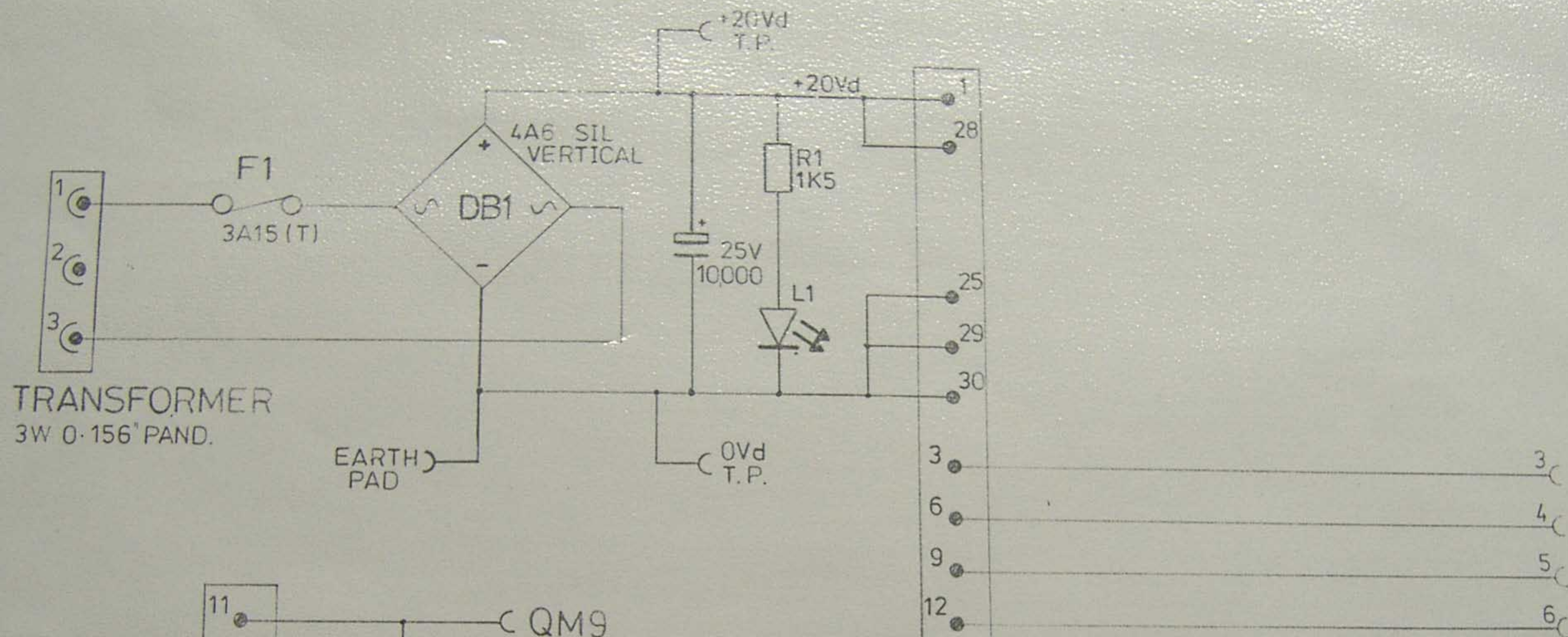
ADD LINK INSTEAD OF C24

ADD 270K RESISTOR AND 100n CAPACITOR FROM SPINDLE EARTH TO ON BELOW X6 AS IN DWG 1. - ALSO DRILL OUT VREG MTG HOLE TO BREAK TOP/BOTTOM CONTACT.

LINK IC29 PIN 9 TO IC29 PIN 10, AND IC29 PIN 12 TO IC29 PIN 13
 FAN CONNECTOR NOT FITTED ON PCB.

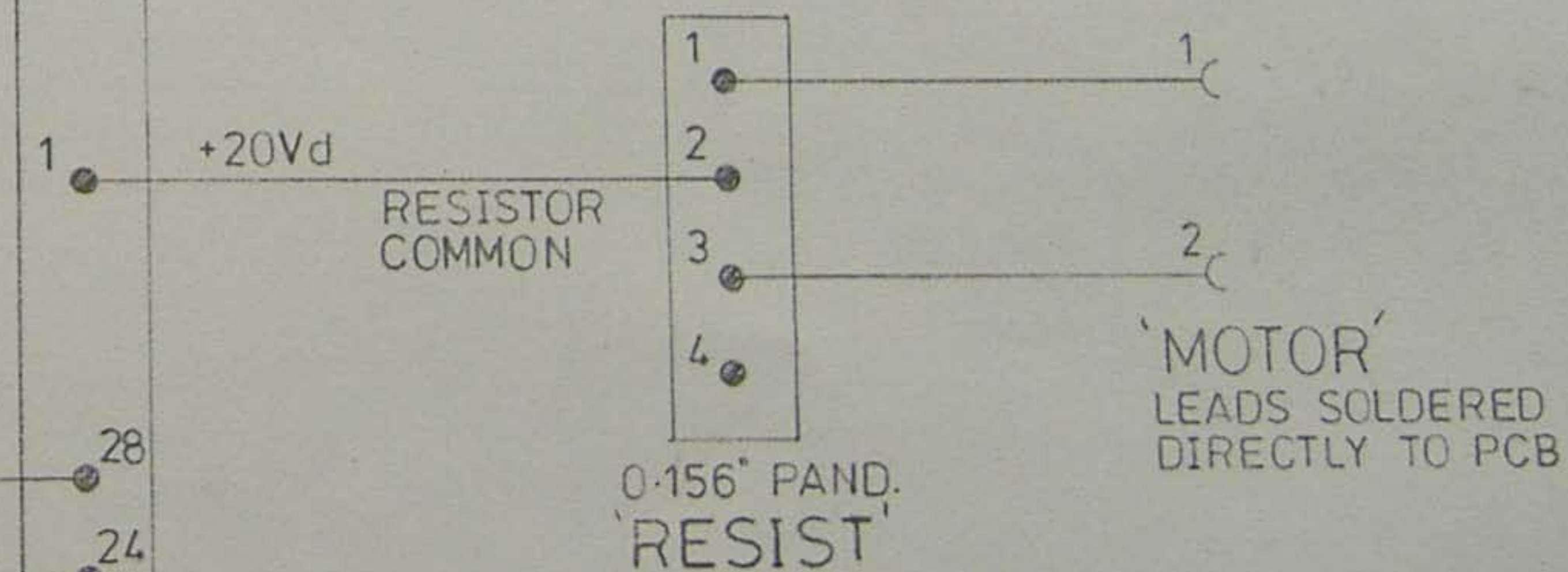
2) ON TRIAC TOOLCHANGERS ONLY, ADD LINKS FROM PIN 5 TO PIN 6, AND FROM PIN 7 TO PIN 8 OF IC38, IC39 AND IC40
 LINK IC31 PIN 13 TO IC31 PIN 20

3) ON FANUC TOOLCHANGERS ONLY, ADD LINK FROM IC37 PIN 6 TO IC31 PIN 13.

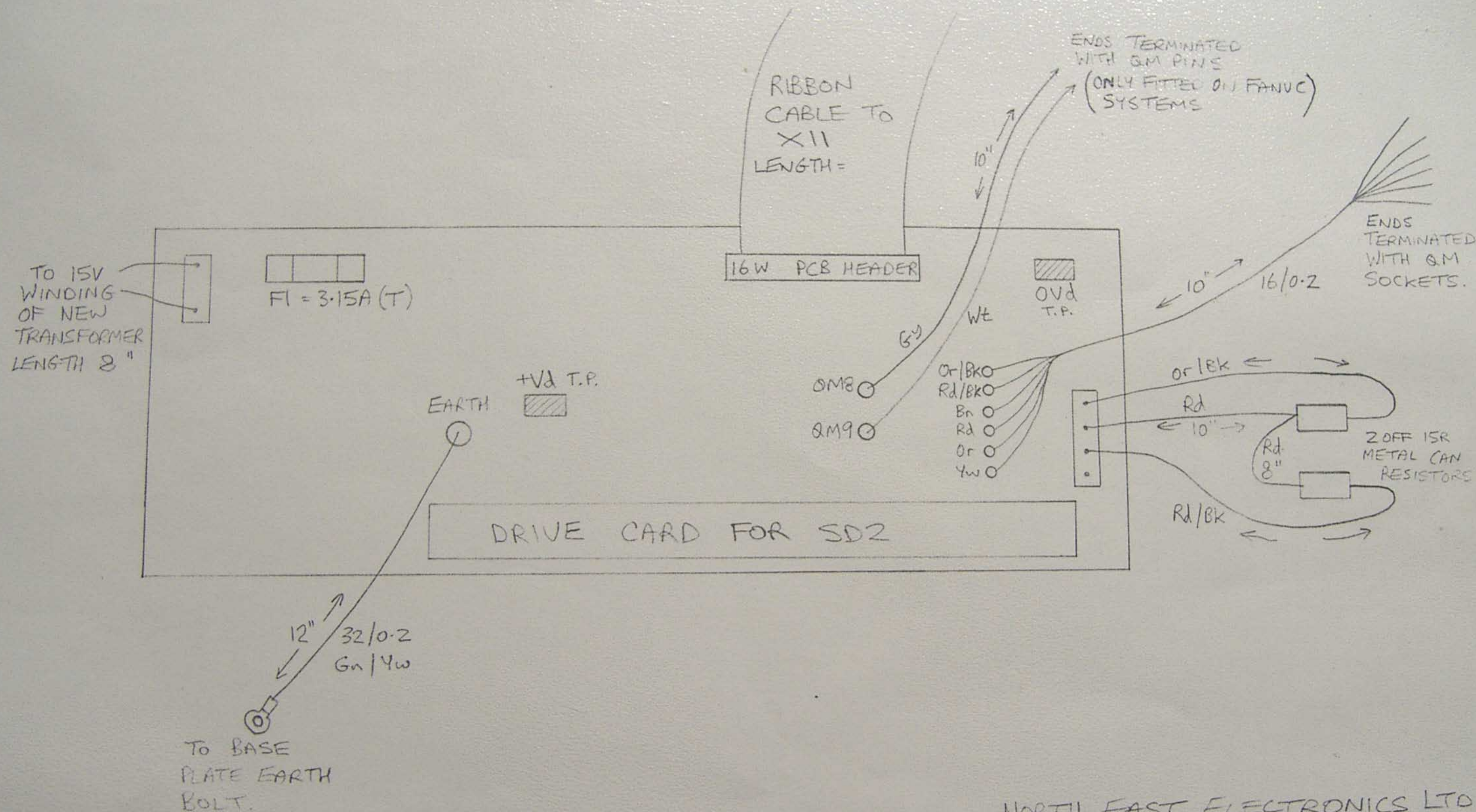


16 WAY
PCB RIBBON
HEADER
(TO X11)

DRIVE
CARD
CONNECTOR

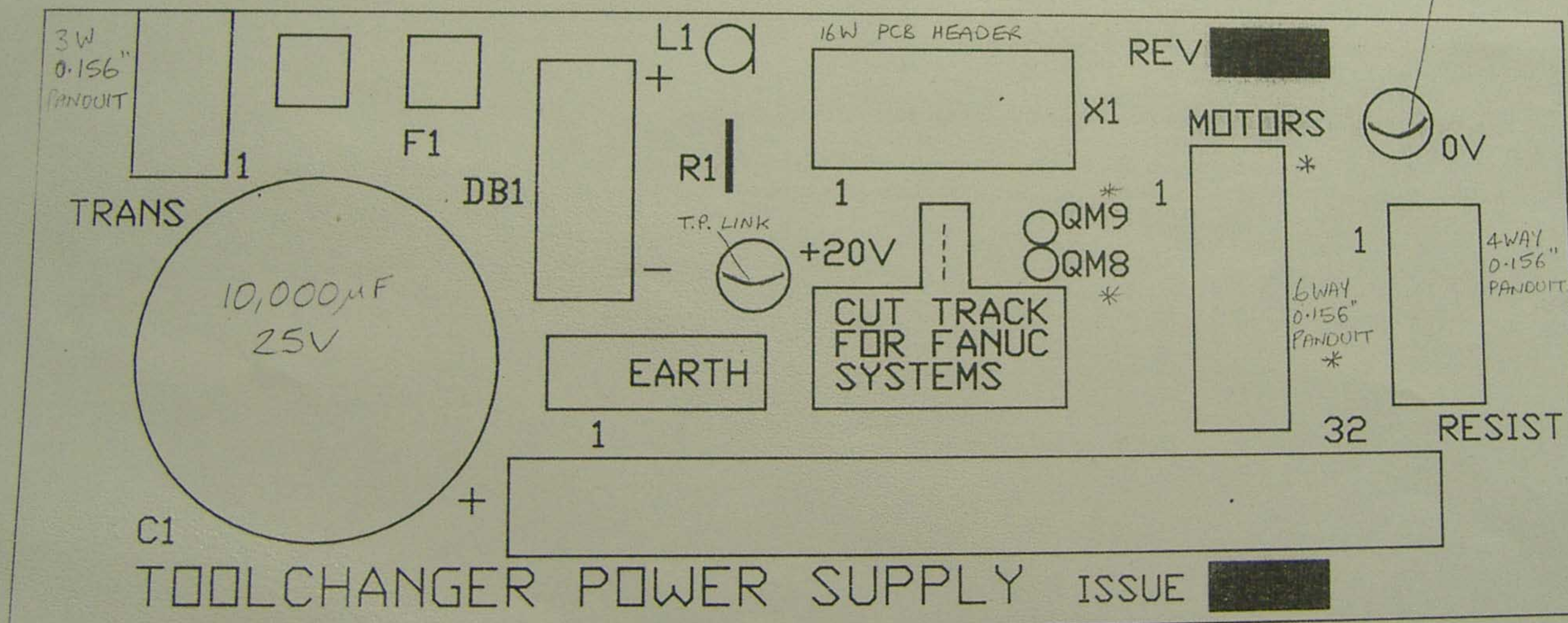


NORTH EAST ELECTRONICS LTD.			
NOTES:	AUTO TOOLCHANGER		
	POWER SUPPLY BD.		
	SHEET 1 OF 4 12/10/87		
REV1	C.E.		

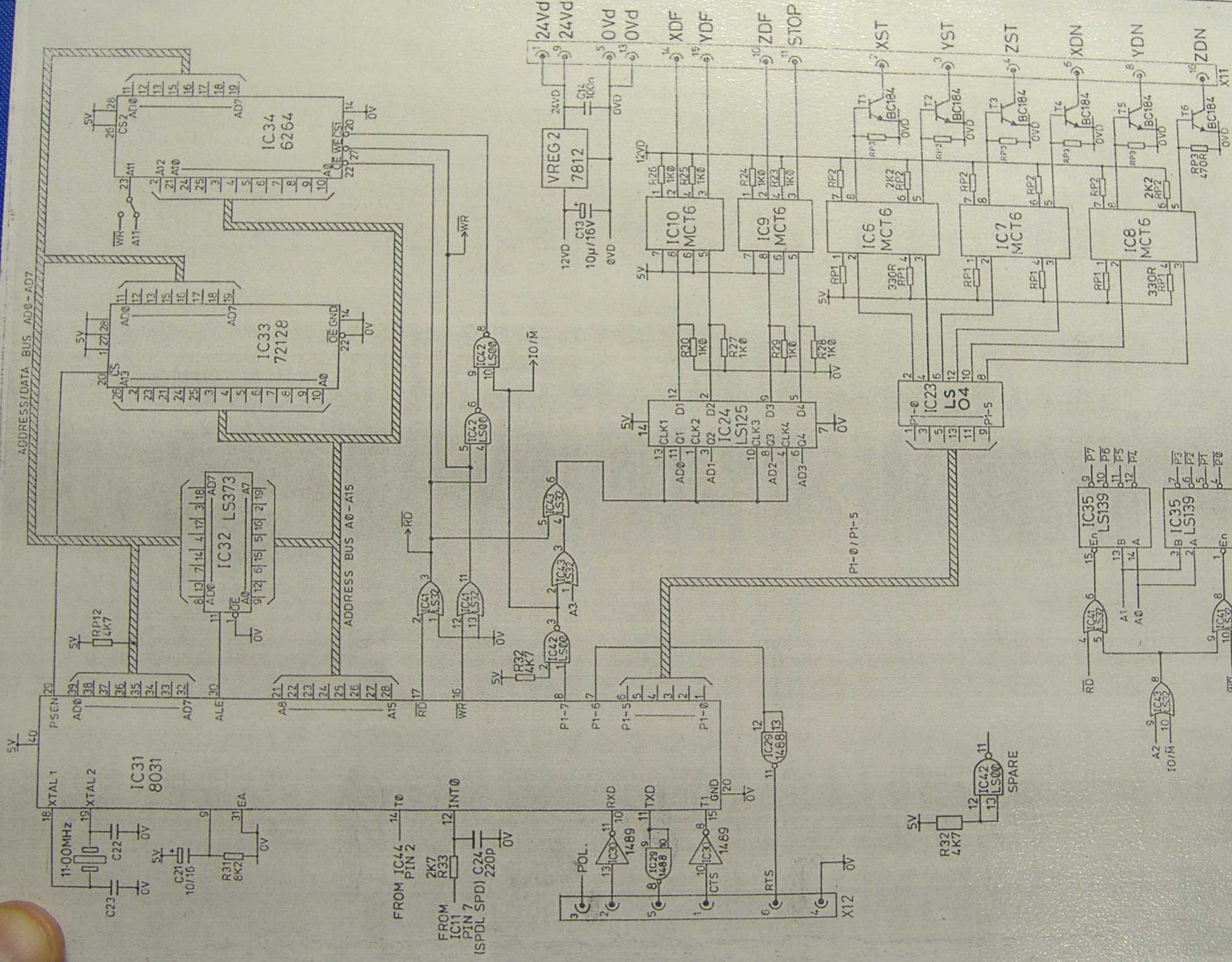


NORTH EAST ELECTRONICS LTD.
 DENFORD TOOLCHANGER
 POWER SUPPLY WIRING
 SHEET 2 OF 4
 ISSUE 1 REV. 1

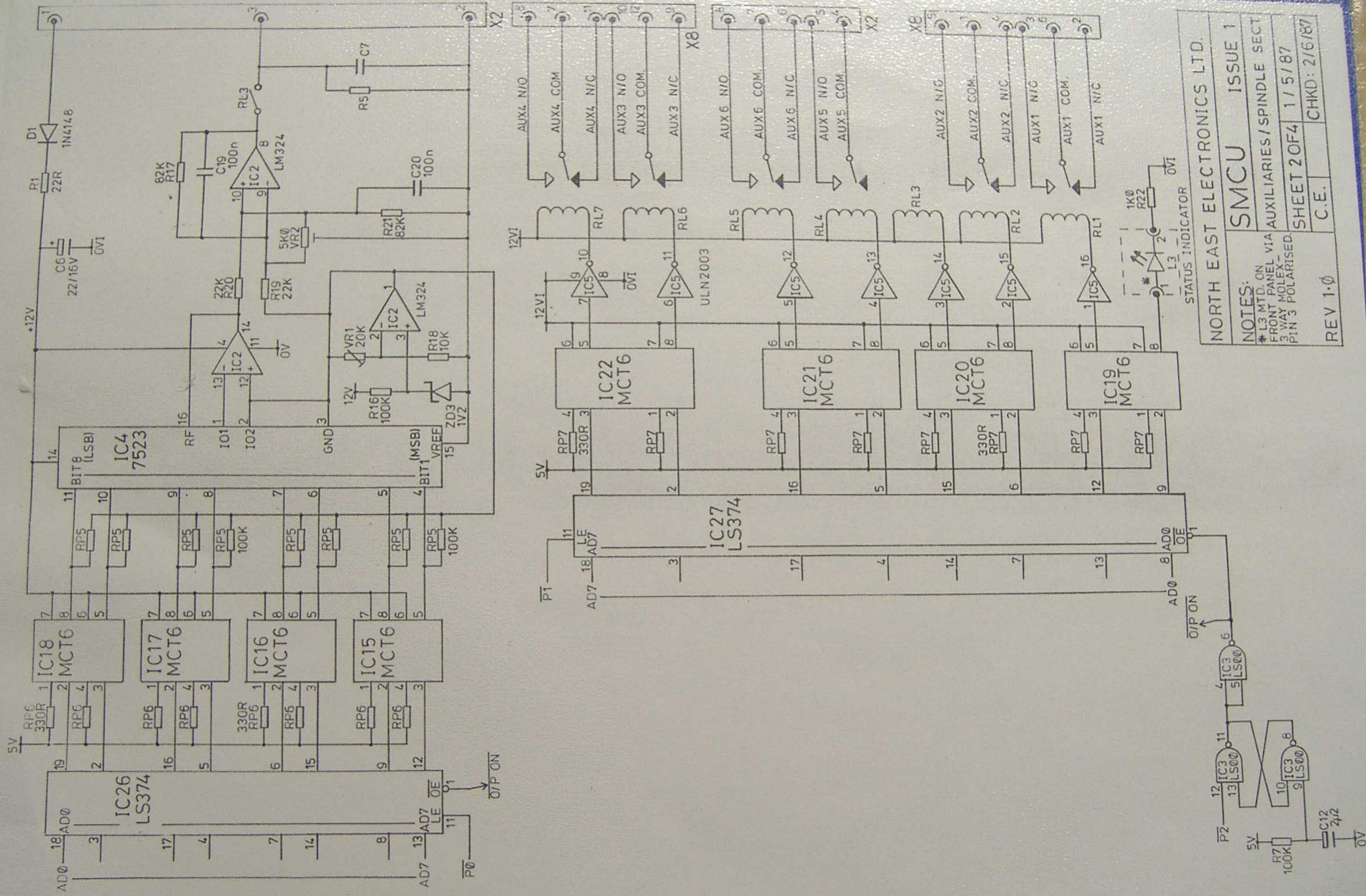
NORTH EAST ELECTRONICS LTD.	
TITLE: TOOLCHANGER POWER SUPPLY	
ISSUE 1	
ANNOTATION	SCALE 2:1
VIEW FROM THIS SIDE	
9/10/87	
SHEET 3 OF 4	REV 2



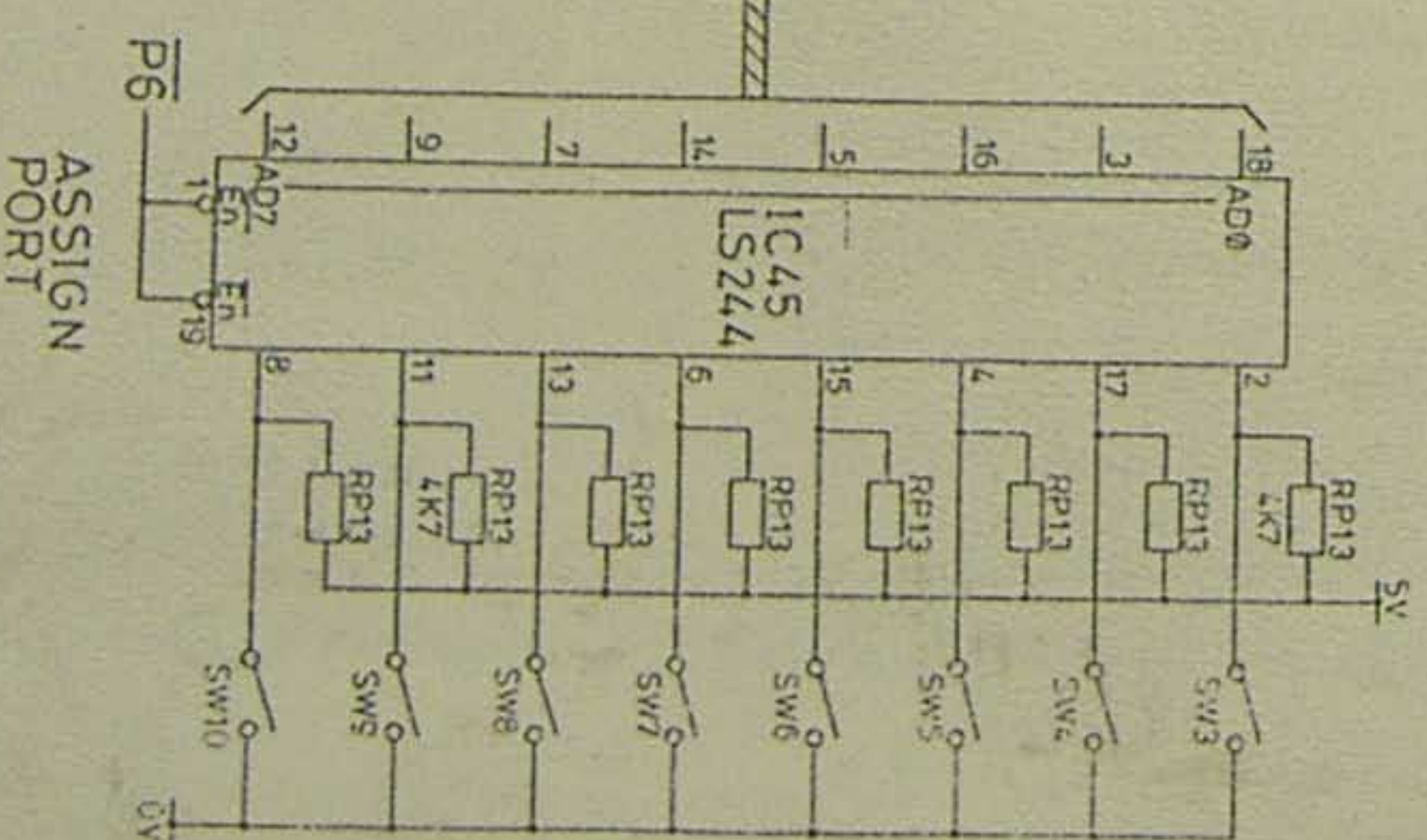
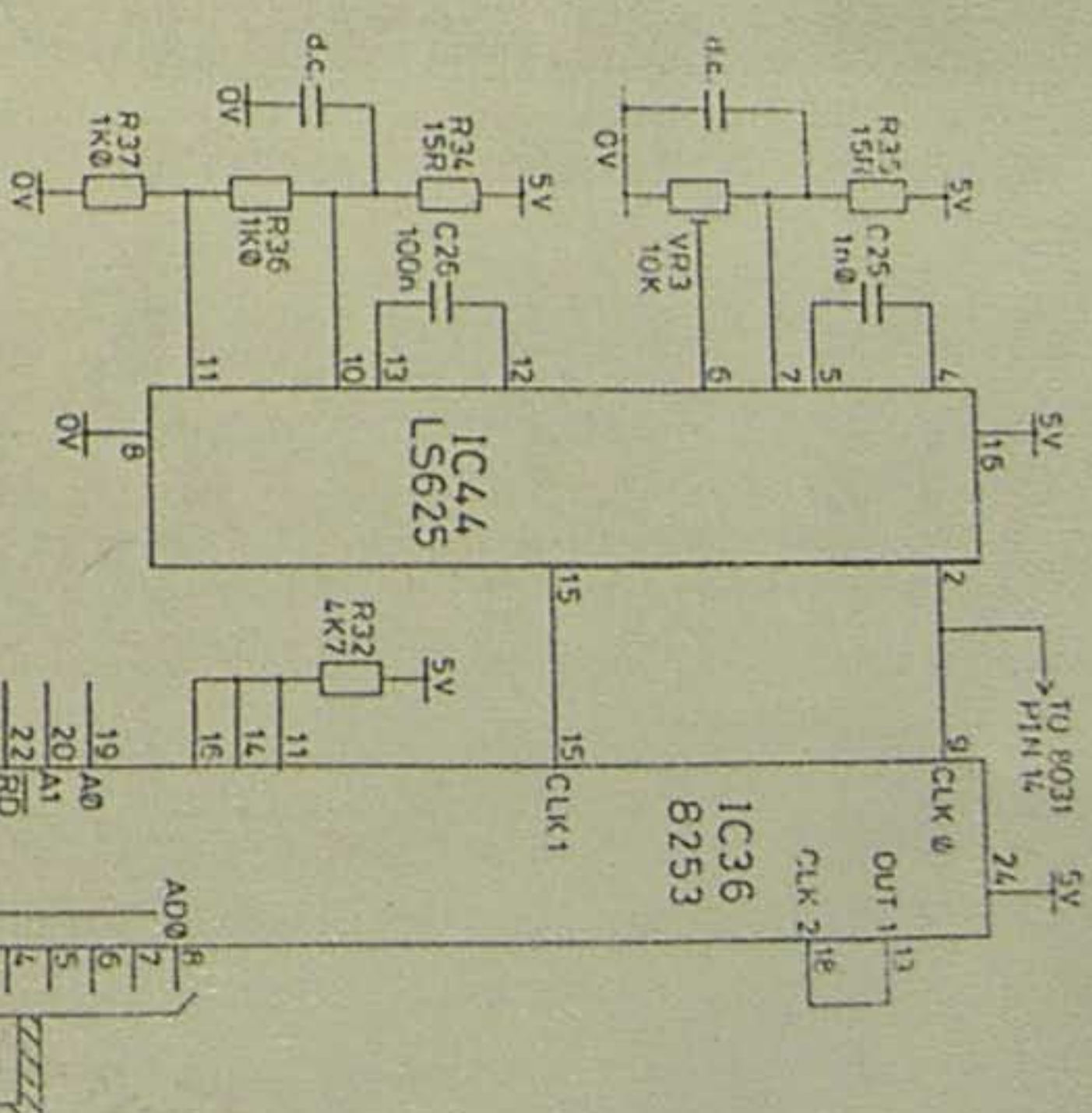
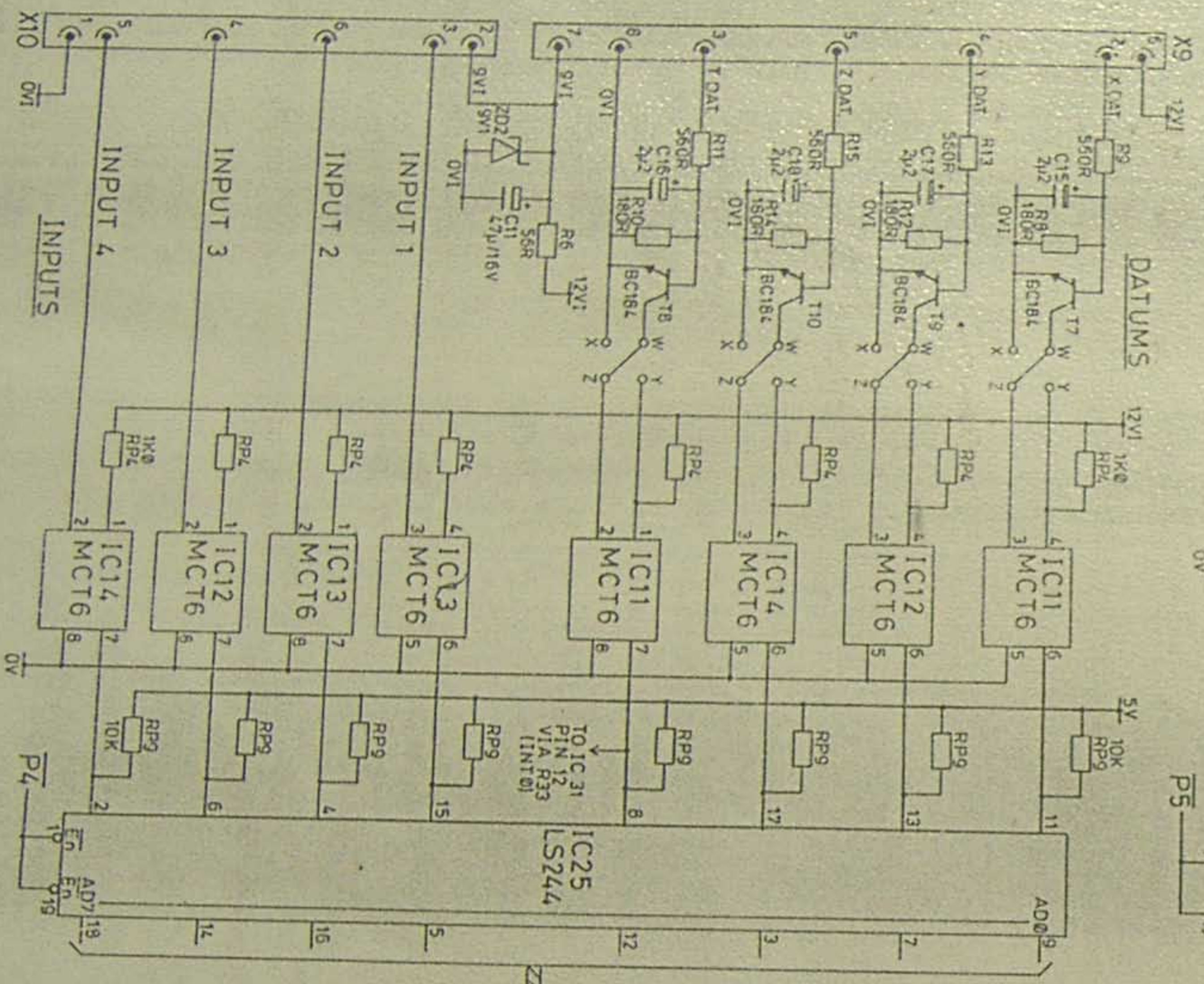
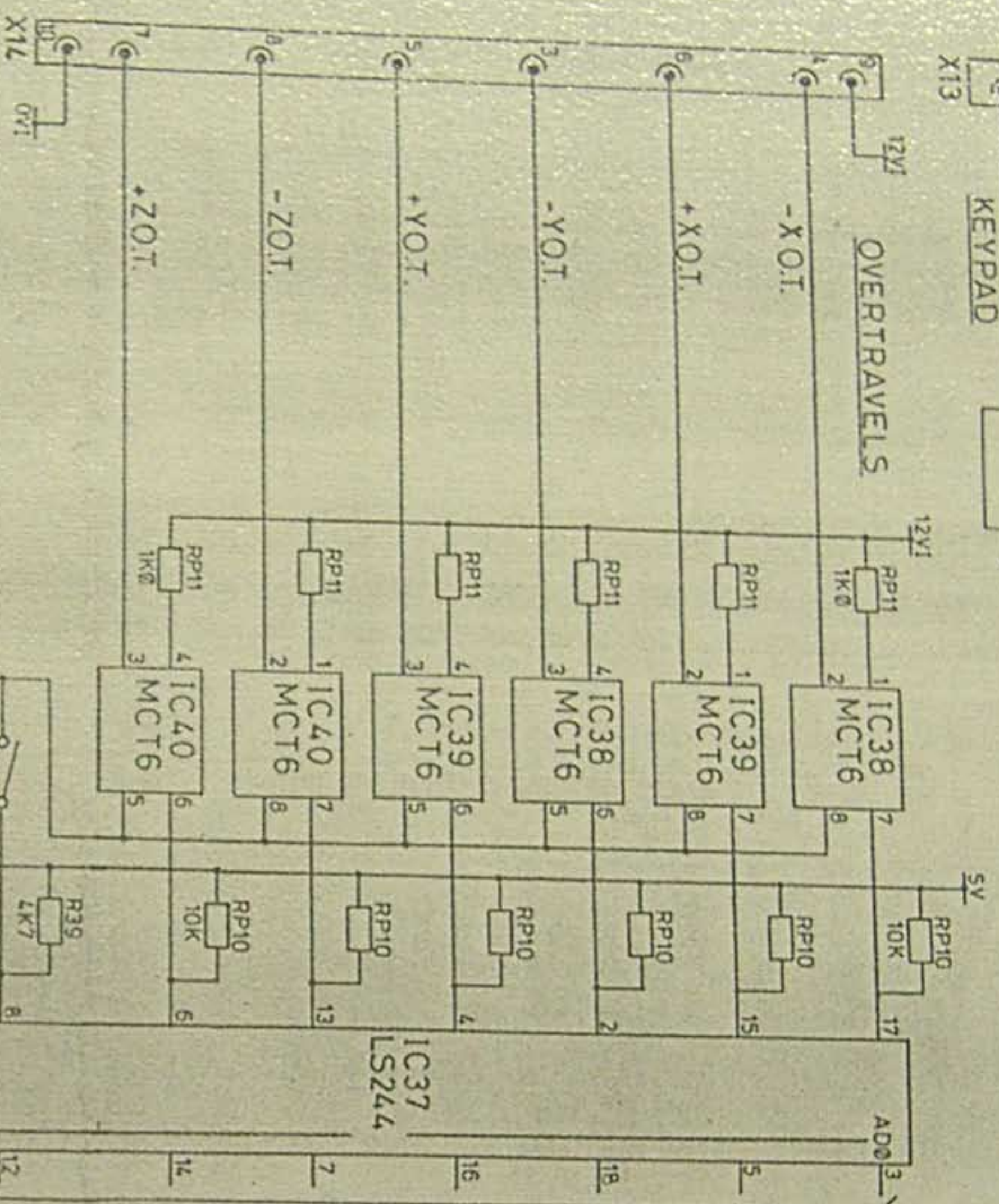
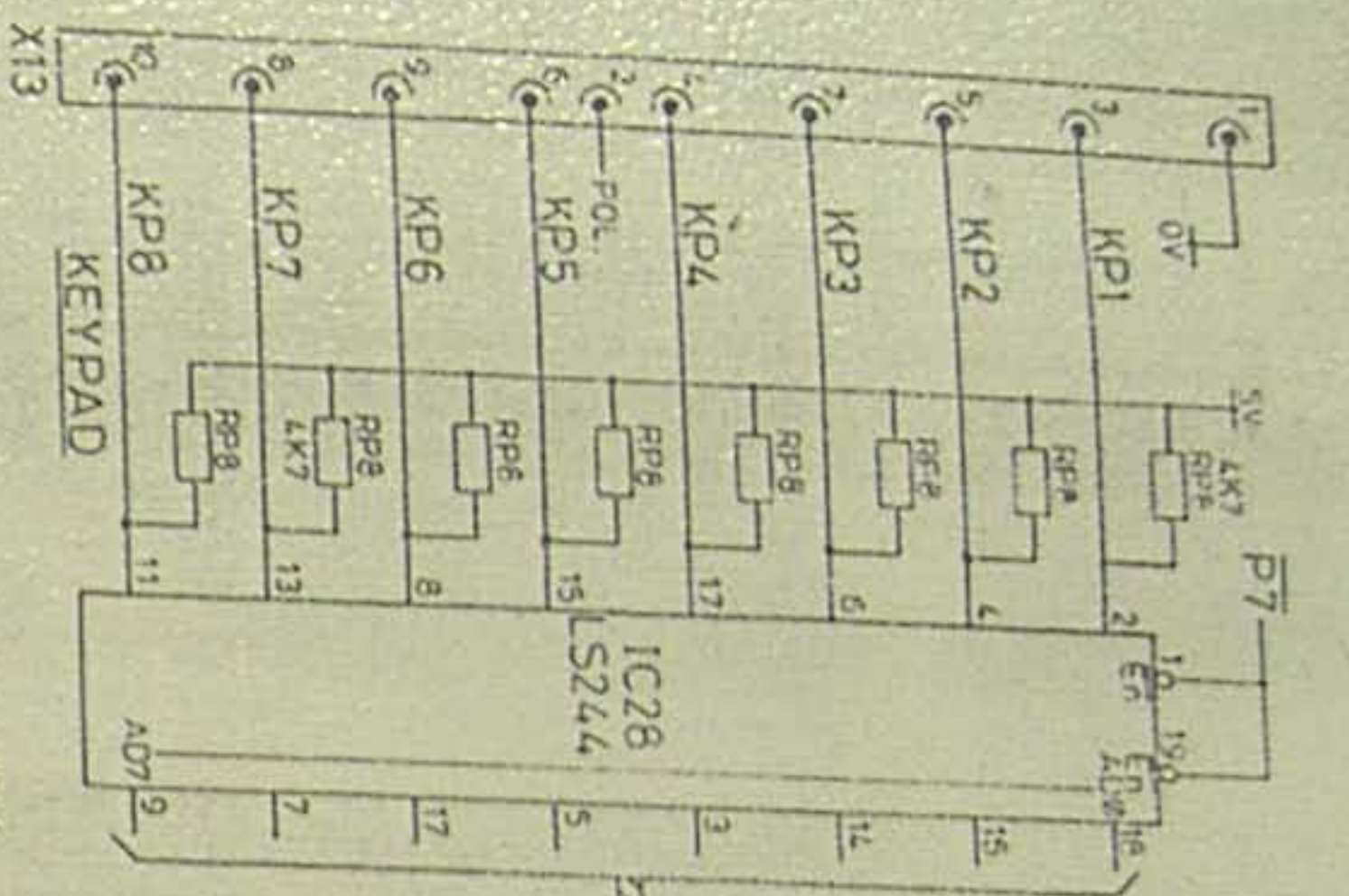
* 'MOTORS' LEADS ARE SOLDERED DIRECTLY ONTO PCB, AS ARE QM8 AND QM9 IF FITTED.



NORTH EAST ELECTRONICS LTD.		
NOTES:	SMCU	ISSUE 1
	PROCESSOR SECTION	
	SHEET 10F4 18/7/87	
REV 2	CE	CHKD:18/2/87



NORTH EAST ELECTRONICS LTD.	
SMCU	ISSUE 1
NOTES:	
* L3 MTD. ON FRONT PANEL VIA 3-WAY MOLEX - PIN 3 POLARISED.	
REV 1.0	CHKD: 2/6/87
C.E.	1/5/87
SHEET 2 OF 4	
AUXILIARIES / SPINDLE SECT.	



NORTH EAST ELECTRONICS LTD

NOTES:

SMCU

ISSUE 1

DATUMS/OVERTRAVELS/
INPUTS KEYPAD PORTS

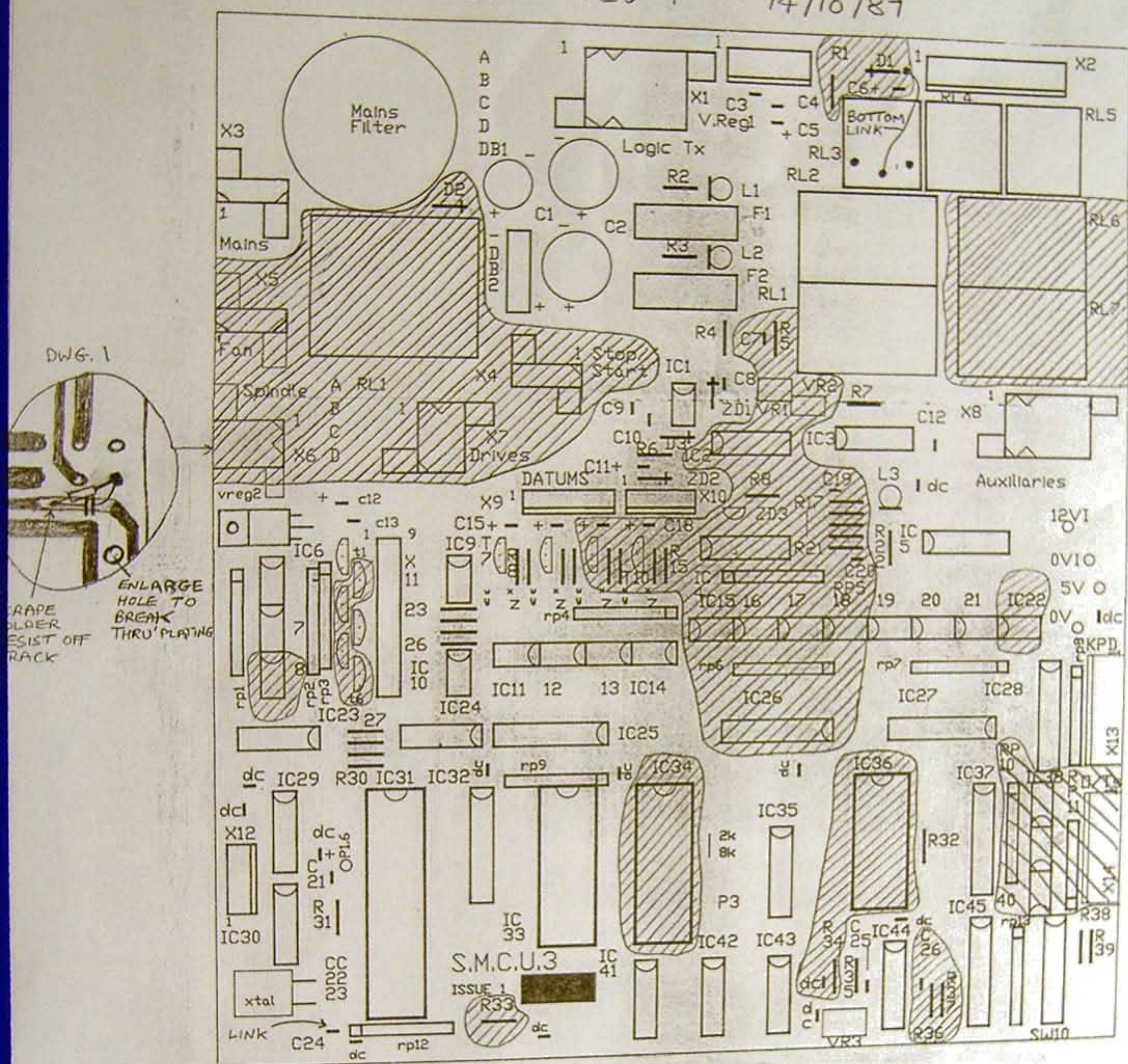
REV 1.0

C.E.

SHEET 3 OF 4

18/2/87

DENFORD
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 PCB LAYOUT REV 9 14/10/87



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TRIAC JULY 86

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TRIAC TOOLCHANGER - SEQUENCE OF OPERATION

27 JULY 1987

1. DATUM OPERATION TRIAC

COMMANDS TC OUT/UP

WAITS FOR TC NOT RDY

WAITS TC RDY

TRIAC DATUMS

TRIAC MOVES TO TC POSN

COMMANDS TC 'DATUM'

WAITS TC NOT RDY

WAITS TC READY

TRIAC ASKS USER 'TOOL FITTED'?

IF '0' TRIAC COARSE ORIENTATES
SPINDLE USING SPDL SPEED DET THEN
COMMANDS TC 'FIT TOOL 1'

WAITS TC RDY

WAITS TC RDY

WAITS TC RDY

NORMAL OPERATION PROCEEDS

ON

TOOLCHANGER (TC)

SETS TC RDY AT POWER UP

CLRS TCRDY (RL 4)

ARM OUT (AUX1 OFF I/P 1)

ARM UP (AUX2 OFF I/P 4)

SETS TC RDY (RL 4)

CLRS TC RDY

DATUMS X AXIS

SETS TC RDY

TC FITS TOOL 1

CLRS TC RDY

FINE ORIENTATES SPINDLE (RL3,
TDAT)

ARM DOWN (AUX2, I/P 3)

ARM IN (AUX1, I/P 2)

ROTATE TO X=0 (TOOL 1 POSN)

DRAW BAR ON (RL3

1/2 SEC DELAY)

ARM UP (AUX2 OFF, I/P 4)

DRAW BAR OFF (RL3)

1/2 SEC DELAY

ARM OUT (AUX1 OFF I/P 1)

SETS TC RDY

ELSE IF 1-6

COMMANDS TC 'ROTATE TO TOOL
POSN'

WAITS TC NOT RDY CLRS TC RDY

MOVES X AXIS TO RELEVANT

TOOL NO BY ROTATING TOOL

HOLDER

SETS TC RDY

DELAYS 1/2 SEC AFTER D BAR ON

2. CHANGE TOOL OPERATION
TRIAC

TOOLCHANGER

PAGE 2

STOPS SPINDLE

MOVES TO TC POSN

COARSE ORIENTATES SPINDLE
USING SPDL SPEED DETECTOR

COMMANDS TC TO CHANGE TO
TOOL 1-6
WAITS TC NOT RDY

WAITS TC RDY

CLRS TC RDY. (RL4)
FINE ORIENTATES SPINDLE USING
(RL3, T DAT)
ARM IN (AUX1, I/P/ 2)
DRAW BAR ON (RL3)
1/2 SEC DELAY
ARM DOWN (AUX2, I/P 3)
ROTATES TO SELECTED TOOL POSN.
ARM UP (AUX2 OFF, I/P 4)
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DRAW BAR OFF (RL3)
1/2 SEC DELAY
ARM OUT (AUX1 OFF, I/P 1)
SETS TC RDY (RL 4)

NORMAL OPERATION PROCEEDS

NOTES

AUX 1 USED AS IN/OUT CONTROL
AUX 2 USED AS DOWN/UP CONTROL
I/P 1 USED AS ARM OUT DETECTOR
I/P 2 USED AS ARM IN DETECTOR
I/P 3 USED AS ARM DOWN DETECTOR
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TOOL.

IF TC NOT SET DURING THIS WAIT 'TOOL CHANGER ERROR' IS DISPLAYED.

FANUC TOOLCHANGER

USE OF OVERTRAVEL SIGNALS

BIT 5	4	3	2	1	0
Z+	Z-	Y+	Y-	X+	X-
CMD	DATUM	CMD TYPE	CMD TYPE	CMD TYPE	CMD TYPE
STROBE		BIT 3	BIT 2	BIT 1	BIT 0

CMD STROBE - HI GOING PULSE > 1 milllSEC STROBES BITS 0 TO 4 INTO TOOLCHANGER.

DATUM - IF 'LO' SELECTS DATUM (BITS 3 TO 0 IGNORED)

BITS 3 TO 0 (IF BIT 4 IS HI)

BIT 3	BIT 2	BIT 1	BIT 0	FUNCTION SELECTED
1	1	1	1	NOT ALLOWED-GIVES ERROR
1	1	1	0	MOVE TOOL ARM OUT, UP
1	1	0	1	MOVES TOOL HOLDER TO TOOL 1 POSN
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0	1	1	1	FITS TOOL 1 INTO HEAD
0	1	1	0	CHANGES TOOL TO TOOL 1
0	1	0	1	CHANGES TOOL TO TOOL 2
0	1	0	0	CHANGES TOOL TO TOOL 3
0	0	1	1	CHANGES TOOL TO TOOL 4
0	0	1	0	CHANGES TOOL TO TOOL 5
0	0	0	1	CHANGES TOOL TO TOOL 6
0	0	0	0	NOT ALLOWED GIVES AN ERROR

NOTE A HI OR '1' LEVEL INDICATES TOOLCHANGER CONTROL I/P OPEN CIRCUIT, A LO OR '0' LEVEL INDICATES TOOLCHANGER CONTROL I/P SHORT CIRCUIT TO OVI.

9. PROBE POSITION - ('?')

When the external computer requires the position at which the last specified input closed during an axis movement (see 13, 14, 15, 16, above) the position is output as a string of an axis identifier followed by 8 decimal characters giving the absolute position in motorsteps of the relevant axis.

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The SMCU unit includes an front panel indicator which has a number of uses.

At initial power up if the SMCU microprocessor is running the indicator repeatedly flashes ON for 1/4 second, OFF for 1/4 second until the first RS232 command is received (if RS232 operation is selected by SW 7) or until the optional Keypad is used (SW 7 OFF).

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Error

Indicator Operation

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1 short flash ON then OFF for 2.5 seconds repeated.

Stepper Drive Fault

2 short flashes ON then OFF for 2.5 seconds repeated.

Datum Error

3 short flashes ON then OFF for 2.5 seconds repeated.

EXT, STOP pressed

4 short flashes ON then OFF 2.5 seconds repeated.

ROM, RAM DATA ERROR

5 short flashes ON then OFF 2.5 seconds repeated.

KEYBOARD COMMAND ERROR

6 short flashes ON then OFF 2.5 seconds repeated.

