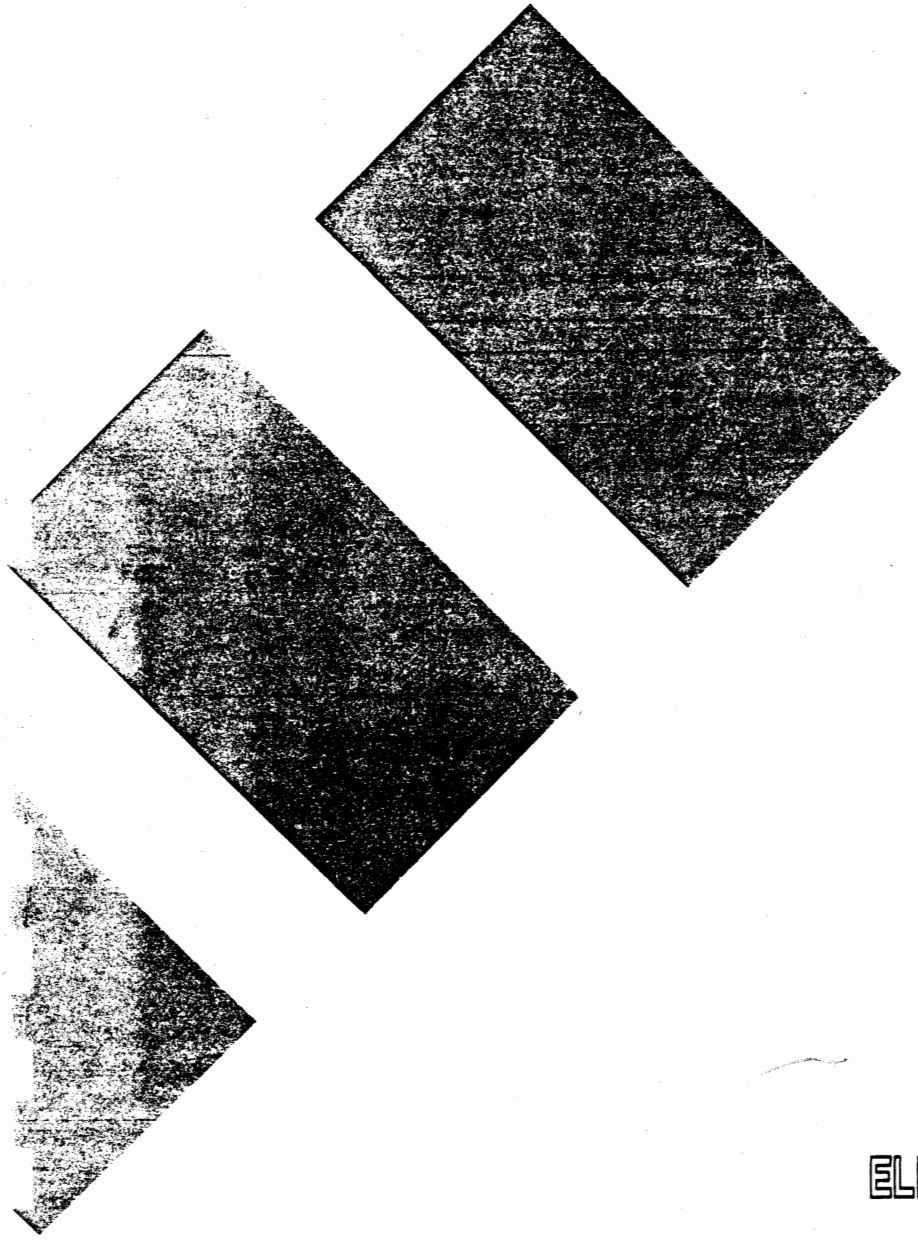
brother

JP-16XX ELECTRONIC TYPEWRITER
SERVICE MANUAL & PARTS REFERENCE LIST

MODEL ; EM411
CE650



ELECTRONIC PORTION

PARTS REFERENCE LIST

– PREFACE –

This Parts Reference List pertains to the "Electronic Typewriter" and the data of each models in reference to the Supply Parts which have been accumulated since the date (Feb. 1986). In order to accomplish the After-Service most efficiently, it is most essential to sufficiently grasp the general explanation of Parts Reference List usage and the ordering Procedures described on each items.

1. ABOUT THE REPAIR OF ELECTRONIC PARTS

This electronic typewriter may undergo some design change for improvement even after it is sent out to the market. Especially when there is some change on electronic parts, some Revision Numbers will be put on their circuit boards. Therefore you will have to try to repair electronic parts in reference to the following things.

1) Electronic parts on which Revision Numbers will be put

Ref. No.	Name
SQ, SR-102	Logic Control Circuit Board Unit
SM-103	Filter Circuit Board Unit
SN-104	Power Supply Circuit Board Unit
SQ-107	Keyboard Circuit Board Unit
SQ-108	LCD Display Circuit Board Unit

2) How the electronic parts list is prepared and how to see it

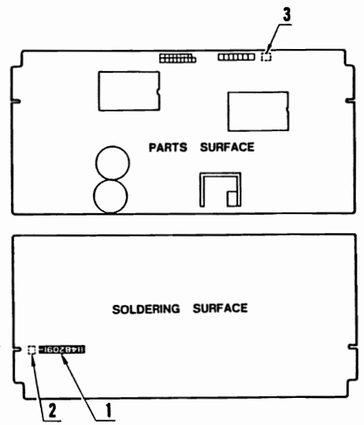
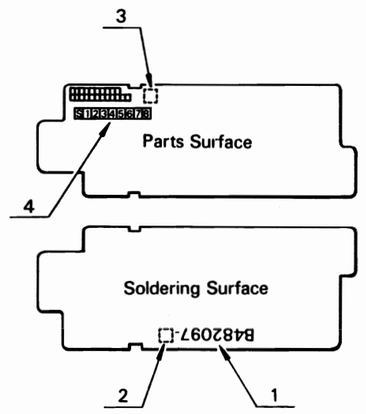
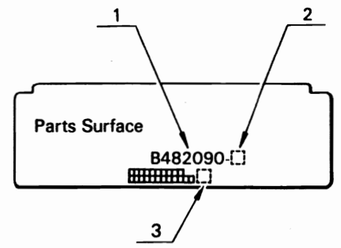
a) For the repair of electronic parts the Component Board and the Schematic Diagram are necessary, and they are issued always in set.

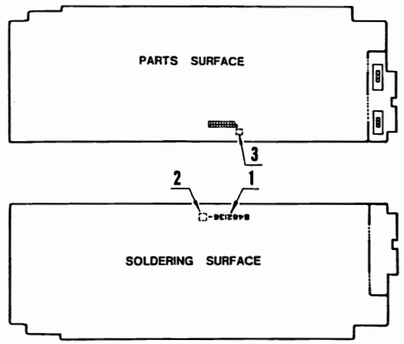
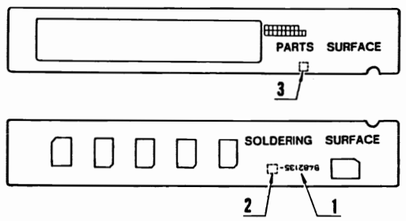
b) The Component Board and the Schematic Diagram are prepared by Revision Number.

c) Please make it a rule to check the REvision Number of an actual circuit board with the Revision Number of the Component Board and the Schematic Diagram before you start making repair.

Note) Please contact Service Center when there are no Component Board and Schematic Diagram Cop-responding to the Revision Number on the actual Circuit Board.

3) How the Rivision Number is indicated

Kind of Circuit Board	Way of Indication and Explanation of Each Item	Place of Indication on Actual Boards	Way of Indication of Component Board and Schematic Diagram
Logic Control Circuit Board	B482091- □ □ 1 2 3 1. Circuit board number 2. Circuit board pattern alteration number Renew in case circuit board pattern is altered indication by figures 1 – Up 3. Circuit board design change indication Renew in accordance with component board alteration indication by alphabet A – Up		MAIN-REF.NO. 8Q-102 NAME LOGIC CONTROL CIRCUIT BOARD X67 U17251... ASEMBLY CODE NO. U09719... REVISION NO. 1 2 4 3 B 4 8 2 0 9 1 - 1 THE DATE OF ISSUE: THE DATE OF ISSUE:
Filter Circuit Board	B42097- □ □ □ 1 2 4 3 1. Circuit board number 2. Circuit board pattern alteration number Renew in case circuit board pattern is altered indication by figures 1 – Up 3. Circuit board design change indication Renew in accordance with component board alteration Indication by alphabet A – Up 4. Specification number voltage ------ 100V ..... # 1 110V ..... # 2 200V ..... # 3 115V ..... # 4 220V ..... # 5 127V ..... # 6 240V ..... # 7		MAIN-REF.NO. 8M-103-4 NAME FILTER CIRCUIT BOARD 117V U17143001 ASEMBLY CODE.NO. U09434001 REVISION NO. 1 2 4 3 B 4 8 2 0 9 7 - 1 4 THE DATE OF ISSUE: THE DATE OF ISSUE:
Power Supply Circuit Board	B 482090- □ □ 1 2 3 1. Circuit board number 2. Circuit board pattern alteration number Renew in case circuit board pattern is altered indication by figures 1 – Up 3. Circuit board design change indication Renew is accordance with component board alteration indication by alphabet A – Up		MAIN-REF.NO. 8N-104 NAME POWER SUPPLY CIRCUIT BOARD (X62) U17210001 ASEMBLY CODE NO. U09449001 REVISION NO. 1 2 4 3 B 4 8 2 0 9 0 - 2 THE DATE OF ISSUE: THE DATE OF ISSUE:

Kind of Circuit Board	Way of Indication and Explanation of Each Item	Place of Indication on Actual Boards	Way of Indication of Component Board and Schematic Diagram
Keyboard Circuit Board	B482136- □ □ 1 2 3 1. Circuit board number 2. Circuit board pattern alteration number Renew in case circuit board pattern is altered indication by figures 1 – Up 3. Circuit board design change indication Renew is accordance with component board alteration indication by alphabet A – Up		MAIN-REF. NO. 8Q-107 NAME KEY BOARD CIRCUIT BOARD X67 U17254001 ASEMBLY CODE NO. U09450001 REVISION NO. 1 2 4 3 — B4821361-1 THE DATE OF ISSUE:
LCD Display Circuit Board	B 482135- □ □ 1 2 3 1. Circuit board number 2. Circuit board pattern alteration number Renew in case circuit board pattern is altered indication by figures 1 – Up 3. Circuit board design change indication Renew is accordance with component board alteration indication by alphabet A – Up		MAIN-REF. NO. 8Q-108 NAME LED DISPLAY CIRCUIT BOARD X67, X68 U17241001 ASEMBLY CODE NO. U09722001 REVISION NO. 1 2 4 3 — B4821351-1 THE DATE OF ISSUE:

4) Note on making repair of revision-up parts

Please put the revision-up under the design change indication of the Revision Number which is put on actual parts.

Revision number on actual circuit boards	Revision-up number
B 482091-1 [A]	B 4821091-1 [B]

B

– INDEX –

Component Board & Schematic Diagram Index

This is an index to show you schematic diagram No. and component board No. as well as page No. of the Parts reference list which you should refer to in inspecting and repairing circuit boards based on revision No. apperaing on each piece of circuit board. This index also serves as quick reference of each circuit board assembly Code No. which is useful for storage of the circuit boards at your premises.

Example. For inspection and/or repair of the circuit board bearing revision No. B482091 you should refer to schematic diagram No. U17261000 and component board No. U17251 . . . at page 16 and 14 of the parts reference list. Also from the index, you can get the code No. Ⓐ for the logic control circuit board assembly. If you keep the circuit board in storage with the code No. being shown conspicuously, it will be very convenient for quick identification of the circuit board.

LOGIC CONTROL CIRCUIT BOARD

Model: X67

Revision No.	Ref. No.	Schematic Diagram No. Component Board No.	Page No. Page No.	Keyboard Specification	Logic Control Circuit Board Assembly Code No. Ⓐ
B482091-1	SQ-102	U17261000 U17251 ...	16 14	American English for U.S.A.	U09719001
				Canadian English/French	U09719002
				King's English	U09719003
				German	U09719004
				Italian	U09719005

1. RELAY CIRCUIT BOARD

Model: X67, X68

Revision No.	Ref. No.	Schematic Diagrame No. Component Board No.	Page No. Page No.	Relay Circuit Board Assembly Code No.
B482081-2	SM-101	U17195000 U17214001	13 12	U17214001

2. LOGIC CONTROL CIRCUIT BOARD

Model: X67

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Keyboard Specification	Logic Control Circuit Board Assembly Code No. Ⓐ
B482091-1	SQ-102	U17261000 / U17251 ...	16 / 14	American English for U.S.A.	U09719001
				Canadian English/French	U09719002
				King's English	U09719003
				German	U09719004
				Italian	U09719005
				Japanese English	U09719006
				Kana/English Combination	U09719007
				Spanish-American D TAB	U09719008
				Spanish-American for Chile D TAB	U09719009
				Norwegian	U09719010
				Danish	U09719011
				French	U09719012
				Dutch	U09719013
				S-Spanish	U09719014
				Afrikaans	U09719015
				Swiss German/French	U09719016
				Swedish	U09719017
				Finnish	U09719018
				Portuguese	U09719019
				Latin/Greek	U09719020
				Icelandic	U09719021
				Turkish	U09719022
				Russian	U09719023
				American English for EC, others	U09719024
				Cypriot	U09719026
				Central Latin	U09719027

LOGIC CONTROL CIRCUIT BOARD

Model: X68

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Keyboard Specification		Logic Control Circuit Board Assembly Code No. Ⓐ
B482091-1	SR-102	U17261000 / U17283...	16 / 15	American English for U. S. A.		U09721001
				Canadian English/ French		U09721002
				King's English		U09721003
				German		U09721004
				Italian		U09721005
				Japanese English		U09721006
				Kana/English Combination		U09721007
				Spanish-American	D TAB	U09721008
				Spanish-American for Chile	D TAB	U09721009
				Norwegian		U09721010
				Danish		U09721011
				French		U09721012
				Dutch		U09721013
				S-Spanish		U09721014
				Afrikaans		U09721015
				Swiss German/French		U09721016
				Swedish		U09721017
				Finnish		U09721018
				Portuguese		U09721019
				Latin/Greek		U09721020
				Icelandic		U09721021
				Turkish		U09721022
				Russian		U09721023
				American English for EC, others		U09721024
				Cypriot		U09721026
				Central Latin		U09721027

3. FILTER CIRCUIT BOARD

Model: X67, X68

3-1 ..... Voltage (100V)

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Filter Circuit Board Assembly Code No. Ⓐ
B482097-11	SM-103-1	U17197000 / U17150001	26 / 17	U09435001

3-2 ..... Voltage (110V)

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Filter Circuit Board Assembly Code No. Ⓐ
B482097-12	SM-103-2	U17197000 / U17163001	26 / 18	U09438001

3-3 ..... Voltage (200V)

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Filter Circuit Board Assembly Code No. Ⓐ
B482097-13	SM-103-3	U17197000 / U17169001	26 / 19	U09440001

3-4 ..... Voltage (115V)

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Filter Circuit Board Assembly Code No. Ⓐ
B482097-14	SM-103-4	U17197000 / U17143001	26 / 20	U09434001

3-5 ..... Voltage (220V)

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Filter Circuit Board Assembly Code No. Ⓐ
B482097-15	SM-103-5	U17197000 / U17153001	26 / 21	U09436001

3-6 ..... Voltage (127V)

Revision No.	Ref. No.	Schematic Diagram No. Component Board No.	Page No. Page No.	Filter Circuit Board Assembly Code No. Ⓐ
B482097-16	SM-103-6	U17197000 U17166001	26 22	U09439001

3-7 ..... Voltage (240V)

Revision No.	Ref. No.	Schematic Diagram No. Component Board No.	Page No. Page No.	Filter Circuit Board Assembly Code No. Ⓐ
B482097-17	SM-103-7	U17197000 U17160001	26 23	U09437001

Revision No.	Ref. No.	Schematic Diagram No. Component Board No.	Page No. Page No.	Filter Circuit Board Assembly Code No. Ⓐ

Revision No.	Ref. No.	Schematic Diagram No. Component Board No.	Page No. Page No.	Filter Circuit Board Assembly Code No. Ⓐ

Revision No.	Ref. No.	Schematic Diagram No. Component Board No.	Page No. Page No.	Filter Circuit Board Assembly Code No. Ⓐ

4. POWER SUPPLY CIRCUIT BOARD

Model: X67, X68

4-1 ..... VDE (Germany and U.S.A. only)

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Power Supply Circuit Board Assembly Code No. Ⓐ
B482090-2	SN-104	U17197000 / U17319001	26 / 24	U09713001

4-2 ..... (Others)

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	Power Supply Circuit Board Assembly Code No. Ⓐ
B482090-2	SN-104	U17197000 / U17210001	26 / 25	U09449001

5. KEY BOARD CIRCUIT BOARD

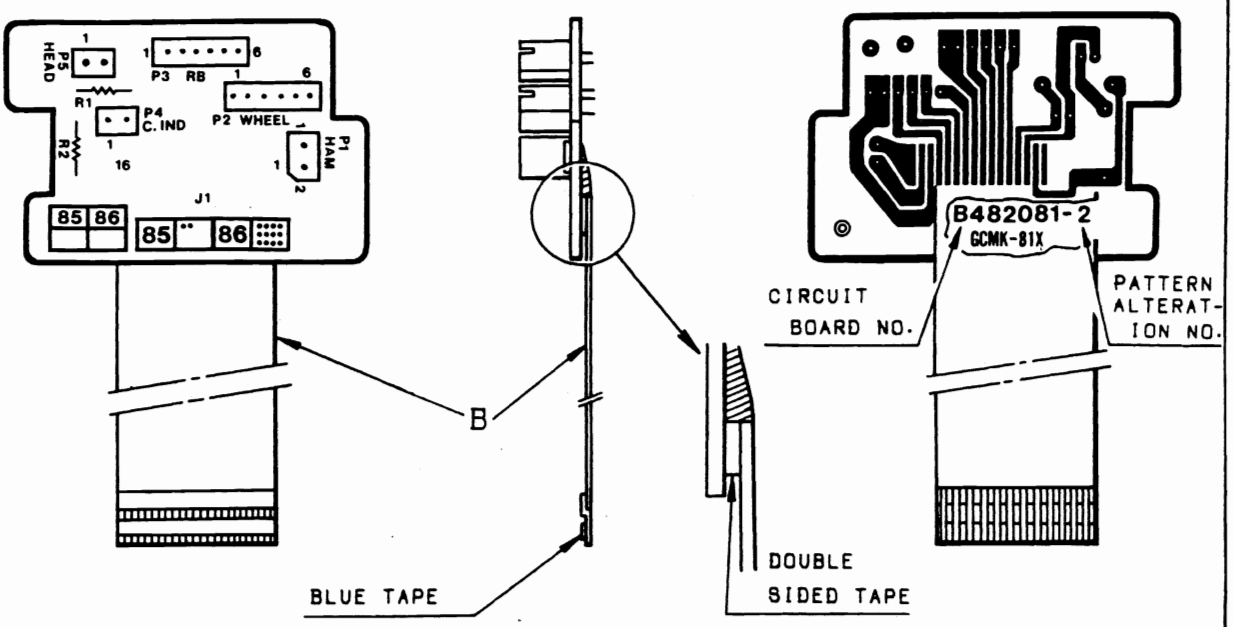
Model: X67, X68

Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	KB Circuit Board Assembly Code No. Ⓐ
B482136-1	SQ-107	U17262000 / U17254001	28 / 27	U09720001

6. LED DISPLAY CIRCUIT BOARD

Model: X67, X68.

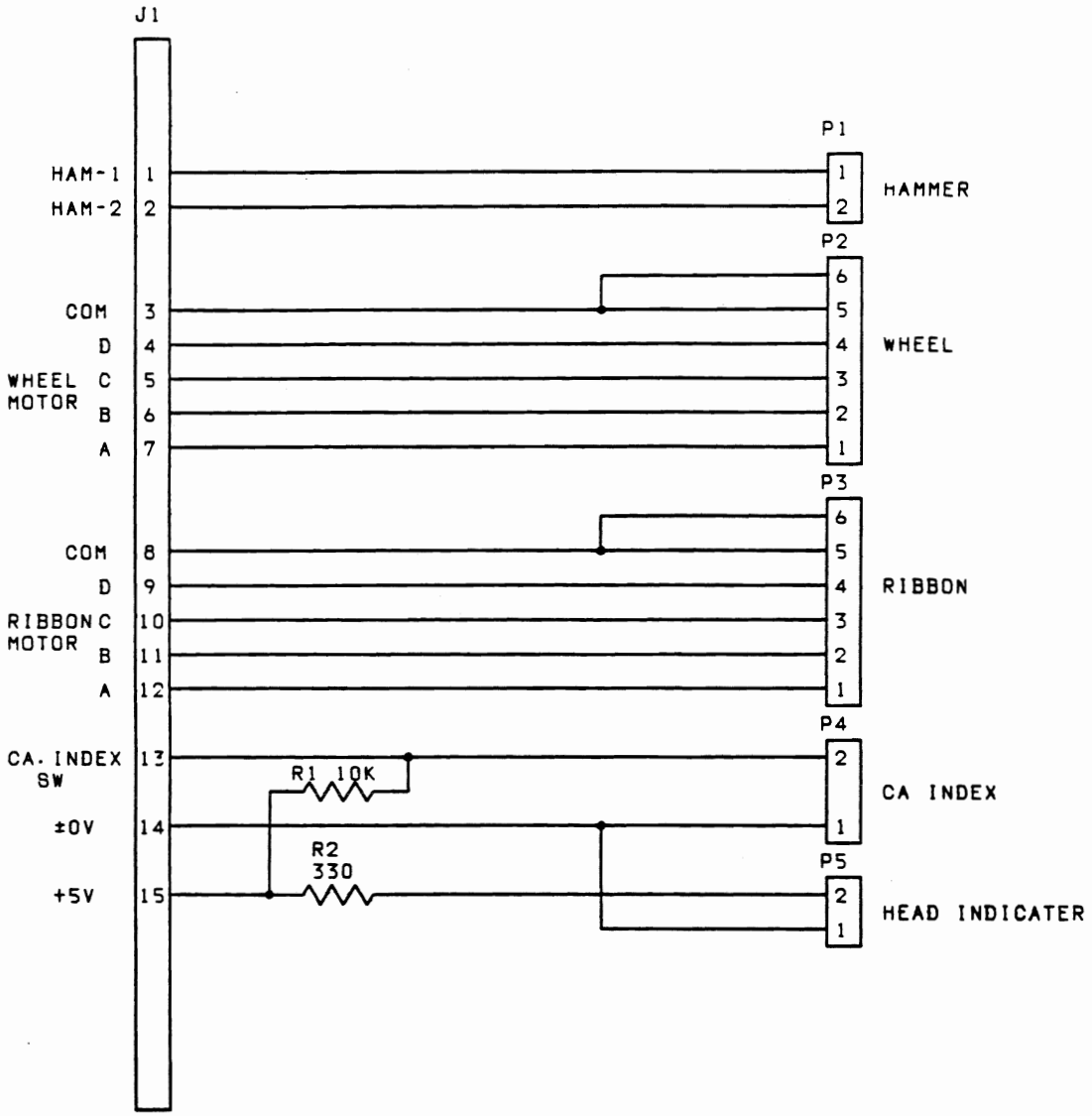
Revision No.	Ref. No.	Schematic Diagram No. / Component Board No.	Page No. / Page No.	LED Circuit Board Assembly Code No. Ⓐ
B482135-1	SQ-108	U17263000 / U17241001	30 / 29	U09722001



SYMBOL	CODE	NAME	Q'TY
B	U17215000	FLAT CABLE 16X600	1
R1	090103120	DR-A14YJ 103 R25	1
R2	090331120	DR-A14YJ 331 R25	1
P1	U15266000	CONNECTOR 5267-02A(WHITE)	1
P2	U17119000	CONNECTOR B6B-PH(WHITE)	1
P3	U17119002	CONNECTOR B6B-PH(BLACK)	1
P4	U17118000	CONNECTOR B2B-PH(WHITE)	1
P5	U17118002	CONNECTOR B2B-PH(BLACK)	1

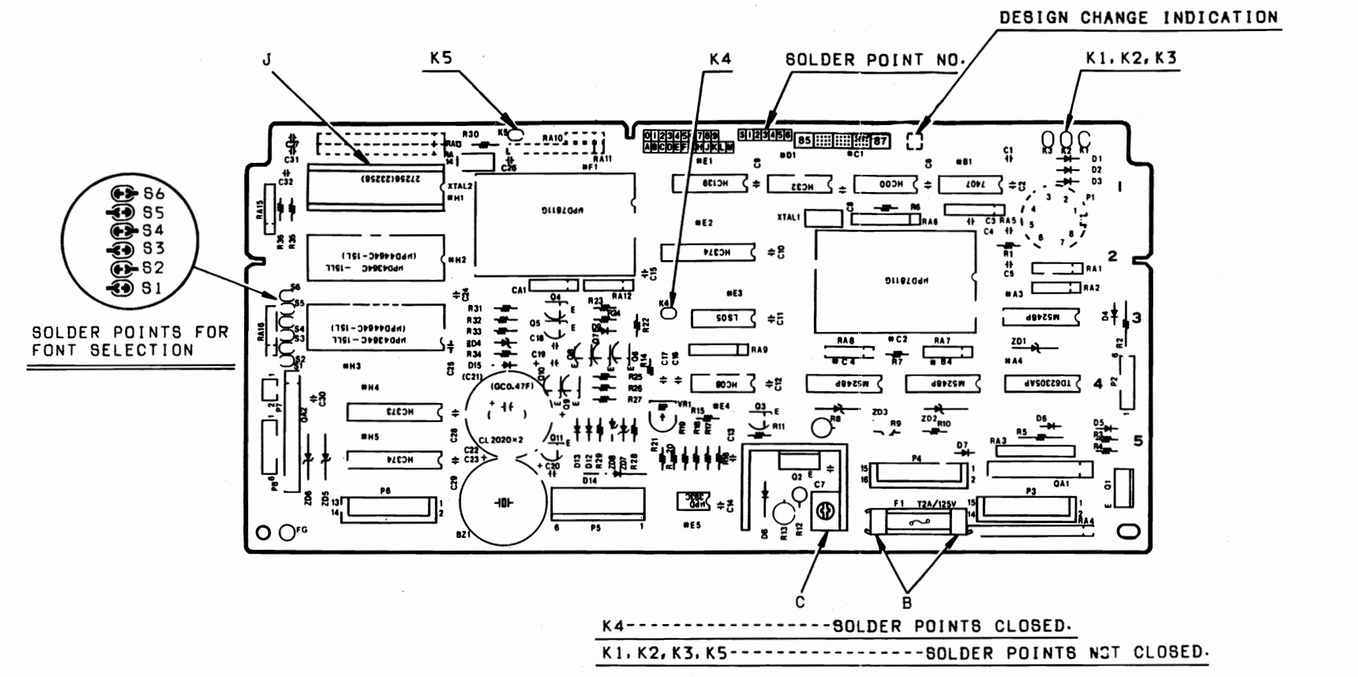
REVISION NO.			
1		2	4 3
B 4 8 2 0 8 1 - 2			
THE DATE OF ISSUE:			
	-		
THE DATE OF ISSUE:			

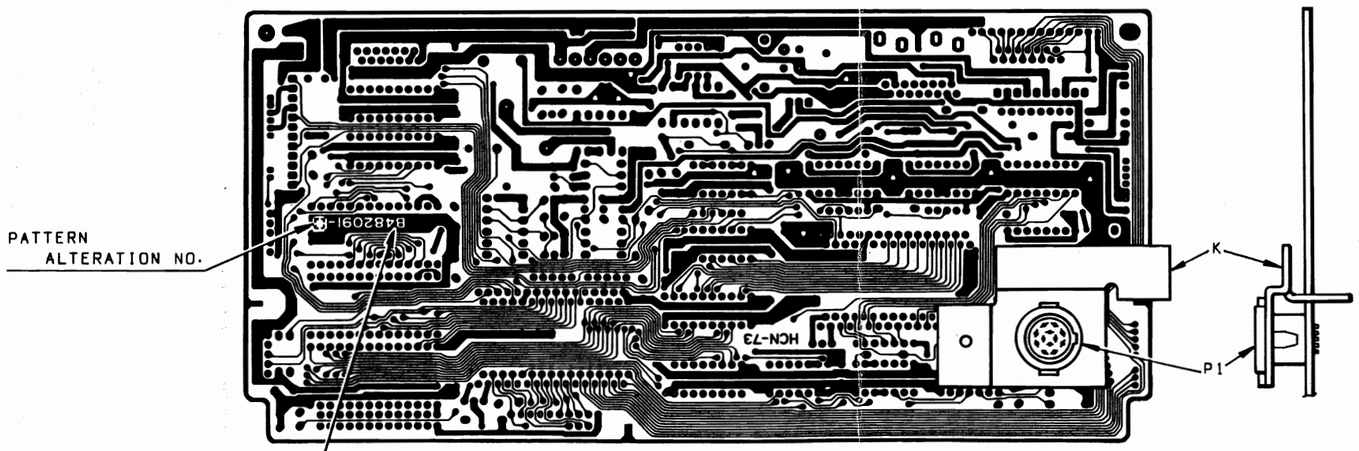
MAIN-REF. NO.	SN-101
NAME	RELAY CIRCUIT BOARD 600 U17214001
ASSEMBLY CODE. NO.	U17214001

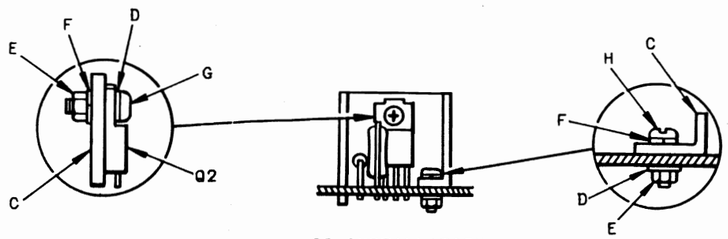


REVISION NO.				
1		2	4	3
B 4 8 2 0 8 1 - 2				
THE DATE OF ISSUE:				
		-		
THE DATE OF ISSUE:				

MAIN-REF. NO.	8M-101
NAME	RELAY CIRCUIT SCHEMATIC DIAGRAM
	U17195000







Q2 INSTALLATION

NOTE; D1, D2, D3, D21 AND FG ARE NOT ATTACHED.

SYMBOL	CODE	NAME	Q'TY
#F1	U73300000	LSI MPD7811G-186	1
#C2	U17228001	LSI MPD7811G-323	1
#H1	U17229001	PROM 65	1
#H3	U17106000	LSI MPD4364C15LL	1
#C1	093100000	CMOS IC74HC00P	1
#E4	093100008	CMOS IC74HC08P	
#D1	093100032	CMOS IC74HC32P	1
#E1	093100139	CMOS IC74HC139P	1
#H4	093100373	CMOS IC74HC373P	1
#E2, #H5	093100374	CMOS IC74HC374P	2
#E3	091100005	BIPIC 74LS05	1
#B1	091100007	BIPIC 7407	1
#E5	575851000	BIPIC MPC393C	1
#A3, #B4, #C4	U17108000	TR ARRAY M5248P	3
#A4	U17109000	TR ARRAY TD62305AP	1
QA1	U17172000	TR ARRAY TH3J10E	1
QA2	U73335000	TR ARRAY FT5763M	1
Q1	U17110000	SITR 2SB937	1
Q2	U32429000	SITR 2SB1099	1
Q3, Q4, Q5, Q9	U15058000	SITR 2SC2603	4
Q6, Q11	U15090000	SITR 2SA1115	2
Q7	571422000	SITR 2SA673	1
Q10	U17111000	SITR UN4212	1
Q8	U32058000	SITR UN4214	1
D9, D12, D13, D15	341786000	SID 1S2076	4
D4, D5, D6, D7	U15606000	SID EM01Z	4
D8	576253000	SID ERC47-02L6	1
D14	538328000	SID S2V10	1
ZD4	U73323000	ZDRD 15EB3	1
ZD7, ZD8	U17113000	ZDHZ3BLL	2
ZD1, ZD2, ZD3	U15331000	ZDRD 30FB3	3
ZD5, ZD6	U15305000	ZDRD 36FB2	2
C20	Y41011002	E-CAPACITOR 10B101	1
C19	Y41095202	E-CAPACITOR 50B10-1	1
C4	U15806000	C-CAPACITOR 50B300	1
C1	U15019000	C-CAPACITOR 50B331	1
C3, C13, C16, C17, C27, C30, C31	U15018000	C-CAPACITOR 25B102M	7
C2, C5, C6, C7, C8, C9, C10, C11, C12, C14, C15, C25, C26, C28, C29, C32	U73322000	C-CAPACITOR 16B1042	16
C18	U15150000	C-CAPACITOR 50B104	1
CA1	U30581000	C-ARRAY M102X4	1
XTAL1, XTAL2	U16910000	OSCILLATOR CST12.0M	2
BZ1	U17117000	BUZZER EFB-RD22	1
C22	U17115000	LITHIUM CL2020-1HF	1
C23	U17116000	LITHIUM CL2020-1HM	1
VR1	U17114000	CVR-1RLB502	1
R6, R9, R35	090101120	DR-A14YJ101R25	3
R22, R31	090471120	DR-A14YJ471R25	2
R1, R7, R10, R17, R21, R23, R24, R28, R29, R36	090102120	DR-A14YJ102R25	10
R15	090332120	DR-A14YJ332R25	1
R3, R27, R30	090472120	DR-A14YJ472R25	3
R11, R14, R26	090682120	DR-A14YJ682R25	3
R4, R16, R18, R19, R32, R33, R34	090103120	DR-A14YJ103R25	7
R25	090223120	DR-A14YJ223R25	2
R20	090104120	DR-A14YJ104R25	1
R2, R5	U15368000	GR-A12YJ560	1
R12	U15349000	GR-A1YJ24-2	1
R13	U15346000	GR-A2YJ100	1
R8	U17112000	GR-A2YJ101	1
RA9	Y61025041	R ARRAY J102X5	1
RA1, RA2, RA7, RA8, RA12, RA15, RA16	Y61034041	R ARRAY J103X4	7
RA10	Y62233041	R ARRAY J223X3	1
RA5	Y62235041	R ARRAY J223X5	1
RA11	Y61039041	R ARRAY J103X9	1
RA6	Y61036041	R ARRAY J103X6	1
RA4, RA13, RA14	Y61032041	R ARRAY J103X12	3
RA3	Y66824451	R ARRAY J682X4Y	1

SYMBOL	CODE	NAME	Q'TY
B	U16537000	F CLIP 8-ND578	2
F1	U15083000	G FUSE 2A	1
P7	U17118000	CONNECTOR B2B-PH	1
P8	U17119000	CONNECTOR B6B-PH	1
P2	U17119002	CONNECTOR B6B-PH	1
P5	U17203000	CONNECTOR B6P-VH	1
P3	U17231002	CONNECTOR ZC-015	1
P4	U17204002	CONNECTOR ZC-016	1
P6	U17232002	CONNECTOR ZC-014	1
P1	U17190002	CONNECTOR EMCU8C08	1
K	U09265000	IF HOLDER	1
C	U15341000	HEAT SINK #2	1
D	026030136	WASHER-3	2
E	021300106	NUT-3	2
F	028030245	TEETH WASHER-3	2
G	062301005	SCREW 3X10	1
H	062300805	SCREW 3X8	1
J	U15368000	IC SOCKET 28P	1

KEYBOARD FONT	SOLDER POINTS
AMERICAN ENGLISH FOR U.S.A.	S ● 2 3 4 5 6
CANADIAN ENGLISH/FRENCH	S ① 2 3 4 5 6
KING'S ENGLISH	S 1 2 3 ④ 5 6
GERMAN	S 1 ② 3 ④ 5 6
ITALIAN	S ① 2 3 ④ 5 6
JAPANESE ENGLISH	S 1 2 ③ 4 5 6
KANA/ENGLISH COMBINATION	S 1 ② ③ 4 5 6
SPANISH-AMERICAN	S ① 2 ③ 4 5 6
SPANISH-AMERICAN FOR CHILE	S 1 2 3 4 5 ⑥
NORWEGIAN	S 1 ② 3 4 5 ⑥
DANISH	S ① 2 3 4 5 ⑥
FRENCH	S 1 2 3 ④ 5 ⑥
DUTCH	S 1 ② 3 ④ 5 ⑥
S.SPANISH	S ① 2 3 ④ 5 ⑥
AFRIKAANS	S 1 2 ③ 4 5 ⑥
SWISS GERMAN/FRENCH	S 1 ② 3 4 5 ⑥
SWEDISH	S 1 2 3 4 ⑤ 6
FINNISH	S 1 ② 3 4 ⑤ 6
PORTUGUESE	S ① 2 3 4 ⑤ 6
LATIN/GREEK	S 1 ② 3 ④ ⑤ 6
ICELANDIC	S 1 2 ③ 4 ⑤ 6
TURKISH	S 1 ② ③ 4 ⑤ 6
RUSSIAN	S ① 2 ③ 4 ⑤ 6
AMERICAN ENGLISH FOR EC	S 1 ② 3 4 5 6
	S 1 2 3 ④ ⑤ 6
CYPRIOT	S ① 2 3 ④ ⑤ 6
CENTRAL LATIN	S ① 2 ③ 4 5 ⑥

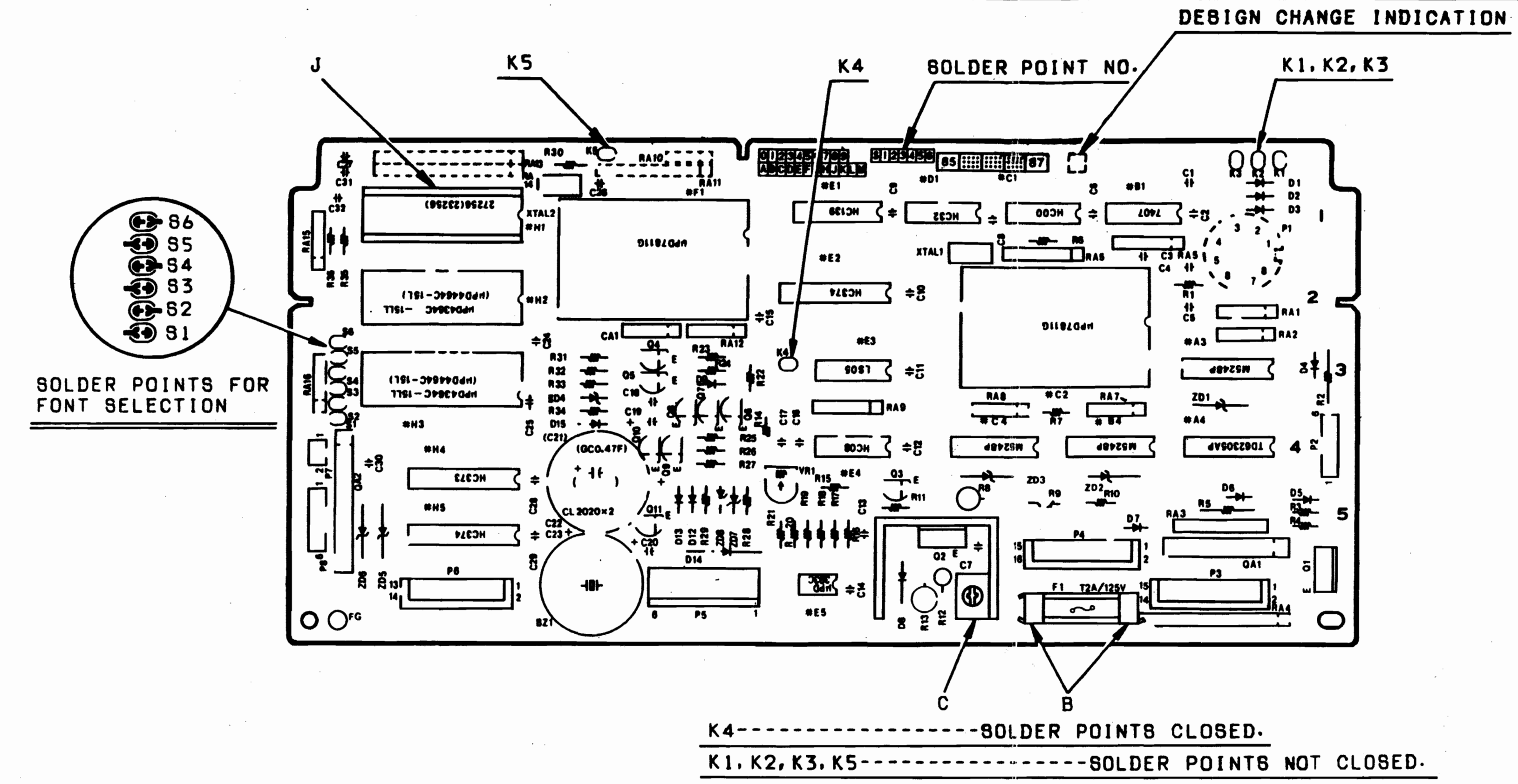
FONT SELECTION ●:SOLDER POINT CLOSED

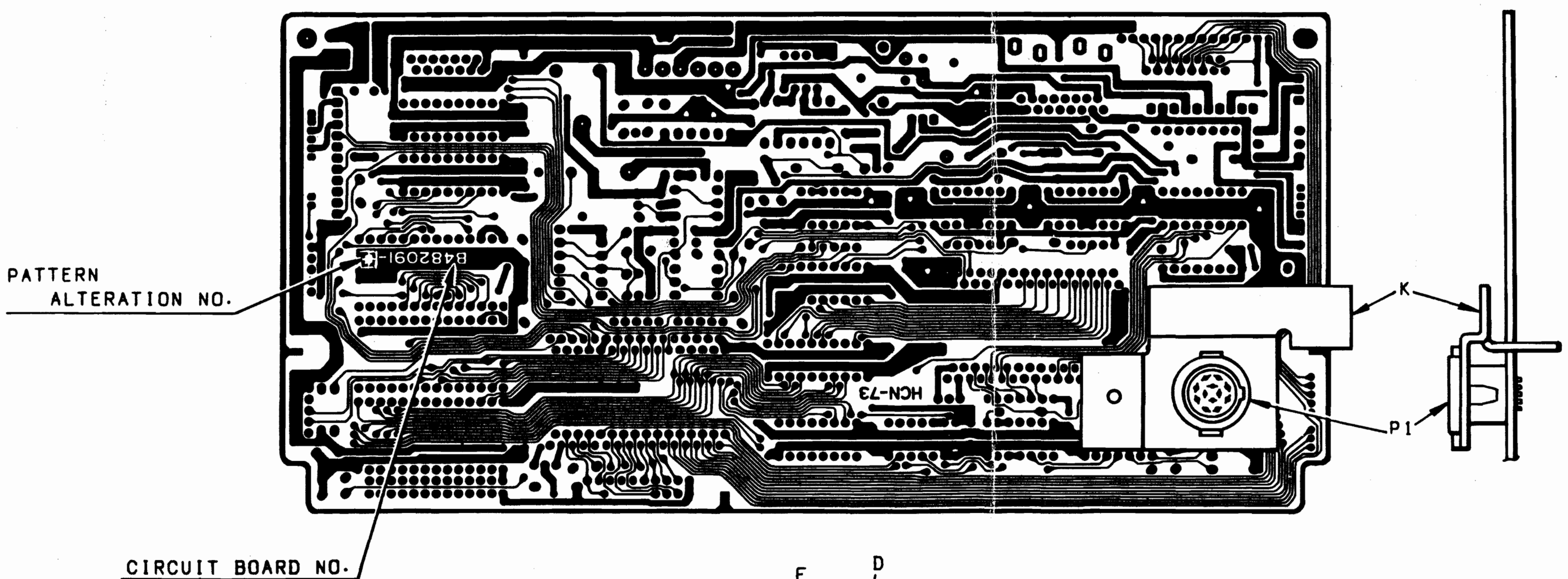
REVISION NO.	REVISION NO.
B48209	
THE DATE OF ISSUE DEC'85	THE DATE OF ISSUE:
THE DATE OF ISSUE:	THE DATE OF ISSUE:
THE DATE OF ISSUE:	THE DATE OF ISSUE:

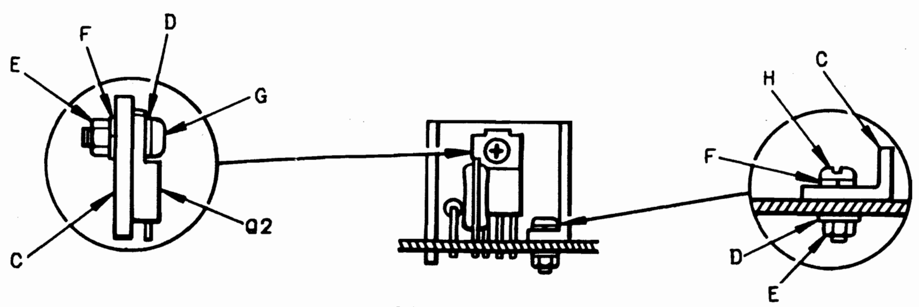
MAIN-REF. NO.	SQ-102
NAME	LOGIC CONTROL CIRCUIT BOARD X67 U17251...
ASSEMBLY CODE. NO.	U09719 . . .

Model: X68

REV. A86/01







Q2 INSTALLATION

NOTE: D1, D2, D3, D21 AND FG ARE NOT ATTACHED.

SYMBOL	CODE	NAME	Q'TY
#F1	U73300000	LSI MPD7811G-186	1
#C2	U17228001	LSI MPD7811G-323	1
#H1	U17229001	PROM 65	1
#H2, #H3	U74830000	LSI MPD4464C-20	2
#C1	093100000	CMOS IC74HC00P	1
#E4	093100008	CMOS IC74HC08P	
#D1	093100032	CMOS IC74HC32P	1
#E1	093100139	CMOS IC74HC139P	1
#H4	093100373	CMOS IC74HC373P	1
#E2, #H5	093100374	CMOS IC74HC374P	2
#E3	091100005	BIPIC 74LS05	1
#B1	091100007	BIPIC 7407	1
#E5	575851000	BIPIC MPC393C	1
#A3, #B4, #C4	U17108000	TR ARRAY M5248P	3
#A4	U17109000	TR ARRAY TD62305AP	1
QA1	U17172000	TR ARRAY TH3J10E	1
QA2	U73335000	TR ARRAY FT5763M	1
Q1	U17110000	SITR 2SB937	1
Q2	U32429000	SITR 2SB1099	1
Q3, Q4, Q5, Q9	U15058000	SITR 2SC2603	4
Q6, Q11	U15090000	SITR 2SA1115	2
Q7	571422000	SITR 2SA673	1
Q10	U17111000	SITR UN4212	1
Q8	U32058000	SITR UN4214	1
D9, D12, D13, D15	341786000	SID 1S2076	4
D4, D5, D6, D7	U15606000	SID EM01Z	4
D8	576253000	SID ERC47-02L6	1
D14	538328000	SID S2V10	1
ZD4	U73323000	ZDRD 15EB3	1
ZD7, ZD8	U17113000	ZDHZ3BLL	2
ZD1, ZD2, ZD3	U15331000	ZDRD 30FB3	3
ZD5, ZD6	U15305000	ZDRD 36FB2	2
C20	Y41011002	E-CAPACITOR 10B101	1
C19	Y41095202	E-CAPACITOR 50B10-1	1
C4	U15806000	C-CAPACITOR 50B300	1
C1	U15019000	C-CAPACITOR 50B331	1
C3, C13, C16, C17, C27, C30, C31	U15018000	C-CAPACITOR 25B102M	7
C2, C5, C6, C7, C8, C9, C10, C11, C12, C14, C15, C25, C26, C28, C29, C32	U73322000	C-CAPACITOR 16B104Z	16
C18	U15150000	C-CAPACITOR 50B104	1
CA1	U30581000	C-ARRAY M102X4	1
XTAL1, XTAL2	U16910000	OSCILLATOR CST12.0MT	2
BZ1	U17117000	BUZZER EFB-RD22	1
C22	U17115000	LITHIUM CL2020-1HF	1
C23	U17116000	LITHIUM CL2020-1HM	1
VR1	U17114000	CVR-1RLB502	1
R6, R9, R35	090101120	DR-A14YJ101R25	3
R22, R31	090471120	DR-A14YJ471R25	2
R1, R7, R10, R17, R21, R23, R24, R28, R29, R36	090102120	DR-A14YJ102R25	10
R15	090332120	DR-A14YJ332R25	1
R3, R27, R30	090472120	DR-A14YJ472R25	3
R11, R14, R26	090682120	DR-A14YJ682R25	3
R4, R16, R18, R19, R32, R33, R34	090103120	DR-A14YJ103R25	7
R25	090223120	DR-A14YJ223R25	2
R20	090104120	DR-A14YJ104R25	1
R2, R5	U15388000	GR-A12YJ560	1
R12	U15349000	GR-A1YJ24-2	1
R13	U15346000	GR-A2YJ100	1
R8	U17112000	GR-A2YJ101	1
RA9	Y61025041	R ARRAY J102X5	1
RA1, RA2, RA7, RA8, RA12, RA15, RA16	Y61034041	R ARRAY J103X4	7
RA10	Y62233041	R ARRAY J223X3	1
RA5	Y62235041	R ARRAY J223X5	1
RA11	Y61039041	R ARRAY J103X9	1
RA6	Y61036041	R ARRAY J103X6	1
RA4, RA13, RA14	Y61032041	R ARRAY J103X12	3
RA3	Y66824451	R ARRAY J682X4Y	1

SYMBOL	CODE	NAME	Q'TY
B	U16537000	F CLIP S-N0578	2
F1	U15083000	G FUSE 2A	1
P7	U17118000	CONNECTOR B2B-PH	1
P8	U17119000	CONNECTOR B6B-PH	1
P2	U17119002	CONNECTOR B6B-PH	1
P5	U17203000	CONNECTOR B6P-VH	1
P3	U17231002	CONNECTOR ZC-015	1
P4	U17204002	CONNECTOR ZC-016	1
P6	U17232002	CONNECTOR ZC-014	1
P1	U17190002	CONNECTOR EMCUBC01	1
K	U09265000	IF HOLDER	1
C	U15341000	HEAT SINK #2	1
D	026030136	WASHER-3	2
E	021300106	NUT-3	2
F	028030245	TEETH WASHER-3	2
G	062301005	SCREW 3X10	1
H	062300805	SCREW 3X8	1
J	U15368000	IC SOCKET 28P	1

KEYBOARD FONT	SOLDER POINTS					
AMERICAN ENGLISH FOR U.S.A.	S	1	2	3	4	5	6
CANADIAN ENGLISH/FRENCH	S	(1)	2	3	4	5	6
KING'S ENGLISH	S	1	2	3	(4)	5	6
GERMAN	S	1	(2)	3	(4)	5	6
ITALIAN	S	(1)	2	3	(4)	5	6
JAPANESE ENGLISH	S	1	2	(3)	4	5	6
KANA/ENGLISH COMBINATION	S	1	(2)	(3)	4	5	6
SPANISHI-AMERICAN	S	(1)	2	(3)	4	5	6
SPANISHI-AMERICAN FOR CHILE	S	1	2	3	4	5	(6)
NORWEGIAN	S	1	(2)	3	4	5	(6)
DANISH	S	(1)	2	3	4	5	(6)
FRENCH	S	1	2	3	(4)	5	(6)
DUTCH	S	1	(2)	3	(4)	5	(6)
S.SPANISH	S	(1)	2	3	(4)	5	(6)
AFRIKAANS	S	1	2	(3)	4	5	(6)
SWISS GERMAN/FRENCH	S	1	(2)	(3)	4	5	(6)
SWEDISH	S	1	2	3	4	(5)	6
FINNISH	S	1	(2)	3	4	(5)	6
PORTUGUESE	S	(1)	2	3	4	(5)	6
LATIN/GREEK	S	1	(2)	3	(4)	(5)	6
ICELANDIC	S	1	2	(3)	4	(5)	6
TURKISH	S	1	(2)	(3)	4	(5)	6
RUSSIAN	S	(1)	2	(3)	4	(5)	6
AMERICAN ENGLISH FOR EC	S	1	(2)	3	4	5	6
	S	1	2	3	(4)	(5)	6
CYPRIOT	S	(1)	2	3	(4)	(5)	6
CENTRAL LATIN	S	(1)	2	(3)	4	5	(6)

FONT SELECTION

○ : SOLDER POINT CLOSED

REVISION NO.		REVISION NO.	
B482091-1			
THE DATE OF ISSUE:	DEC '85	THE DATE OF ISSUE:	
THE DATE OF ISSUE:		THE DATE OF ISSUE:	
THE DATE OF ISSUE:		THE DATE OF ISSUE:	

MAIN-REF. NO.	SR-102	
NAME	LOGIC CONTROL CIRCUIT BOARD X68	U17283...
ASSEMBLY CODE. NO.	U09721...	

DB7	RA13-10
DB6	RA13-11
DB5	RA13-12
DB4	RA13-13
DB3	RA13- 9
DB2	RA14-13
DB1	RA14-12
DB0	RA14-11

AB14	RA13- 3
AB13	RA13- 4
AB12	RA14- 2
AB11	RA13- 7
AB10	RA13- 8
AB9	RA13- 6
AB8	RA13- 5
AB7	RA14- 3
AB6	RA14- 4
AB5	RA14- 5
AB4	RA14- 6
AB3	RA14- 7
AB2	RA14- 8
AB1	RA14- 9
AB0	RA14-10

DISPLAY

HAMMER

CR INDEX

RIBBON MOTOR

WHEEL MOTOR

CARRIAGE MOTOR

PAPER FEED MOTOR

μPD7811G

#C2

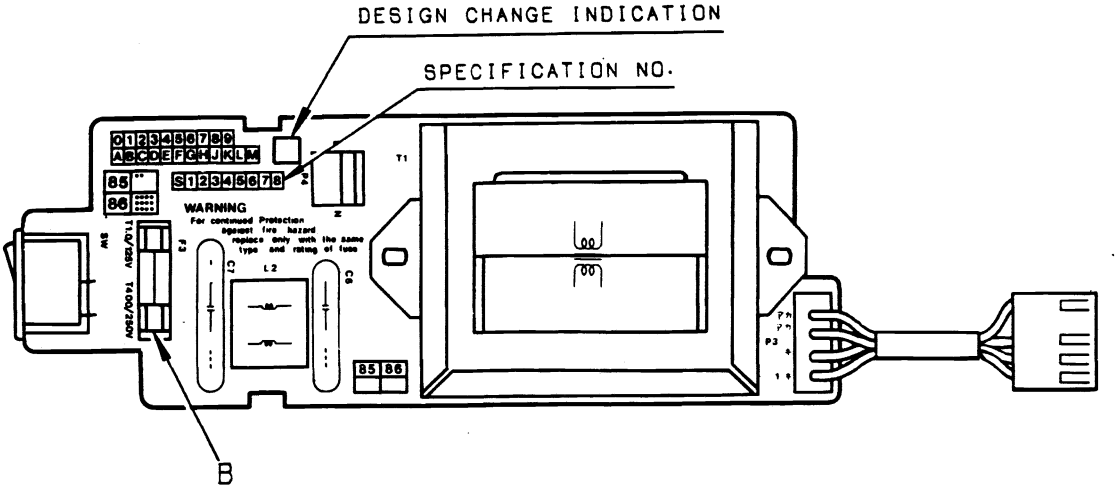
#F1

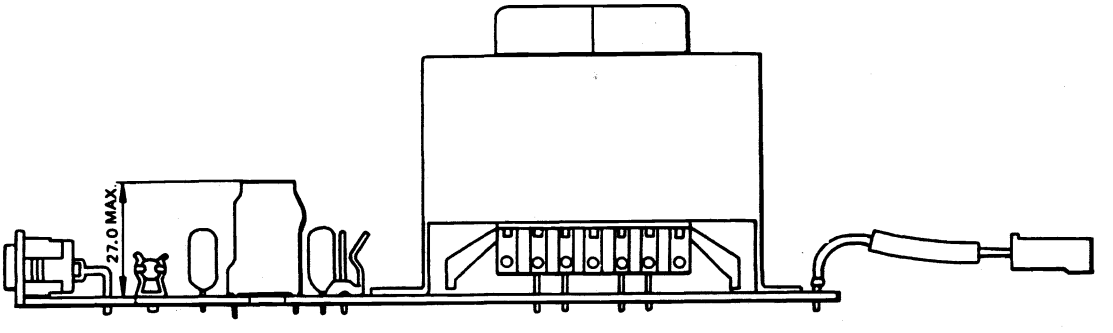
5) C21 is not attached.
4) In the case of CE650, #H2 is not attached.
3) Vcc should be connected to +5B only in the case of #F1.
2) When the internal ROM of #F1 is used, solder point K5 should be closed.
1) Solder point K4 should be closed.

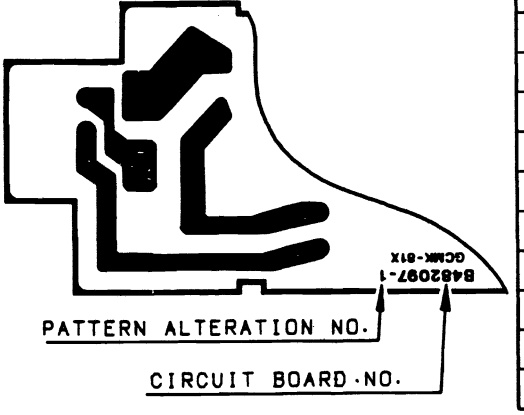
REVISION NO.	REVISION NO.
B48209 1 - 1	
THE DATE OF ISSUE DEC. '85	THE DATE OF ISSUE
THE DATE OF ISSUE	THE DATE OF ISSUE
THE DATE OF ISSUE	THE DATE OF ISSUE

MAIN-REF. NO. 8Q-102

NAME LOGIC CONTROL CIRCUIT SCHEMATIC DIAGRAM U17261000



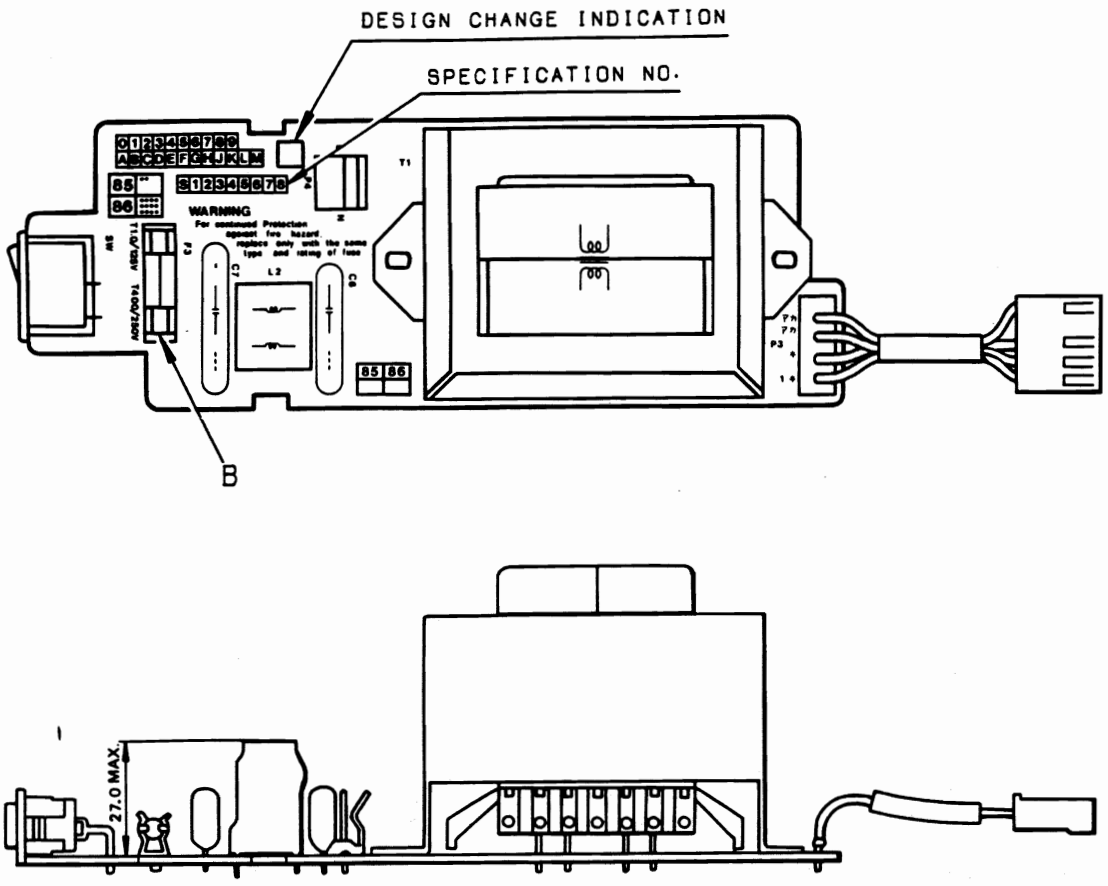


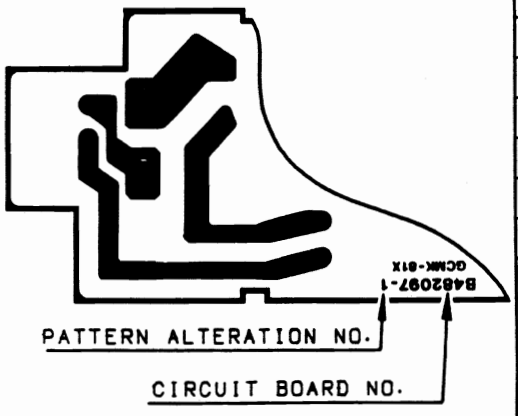


SYMBOL	CODE	NAME	Q'TY
L2	U17188000	COIL FKOB 163 MH01	1
C6, C7	U15286000	P-CAPACITOR 125B473	2
P3	U17146001	HARNESS 5196-04	1
B	U16537000	F CLIP 6-N 5057S	2
F3	U16558000	G FUSE 1A T8C	1
T1	U17151001	TRANSFORMER 100V	1
P4	U16194000	CONNECTOR 5289-2A	1
SW	U17200000	POWER SWITCH WK-837	1

REVISION NO.	
1 2 4 3	
B 4 8 2 0 9 7 - 1 1	
THE DATE OF ISSUE:	
THE DATE OF ISSUE:	

MAIN-REF. NO.	SM-103-1
NAME	FILTER CIRCUIT BOARD 100V U17150001
ASSEMBLY CODE. NO.	U09435001

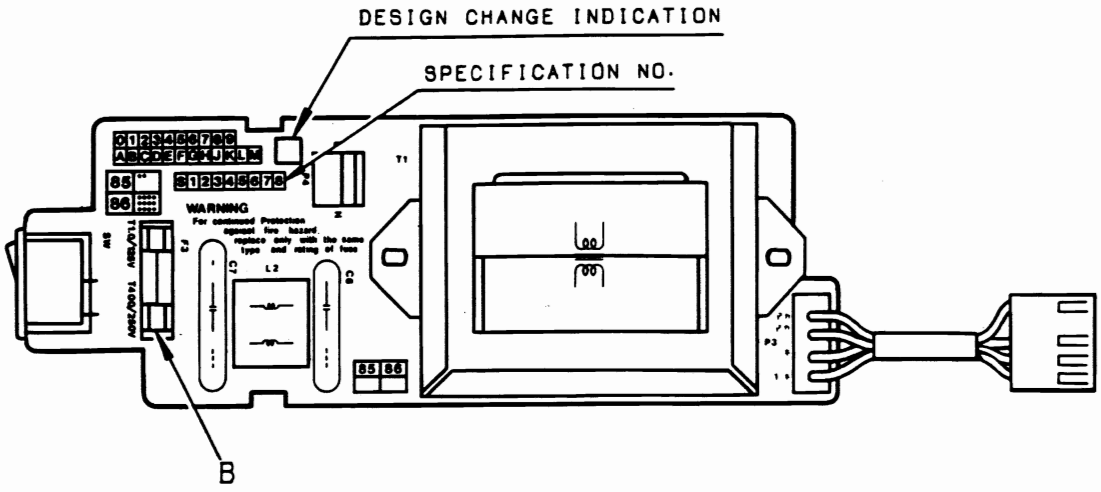


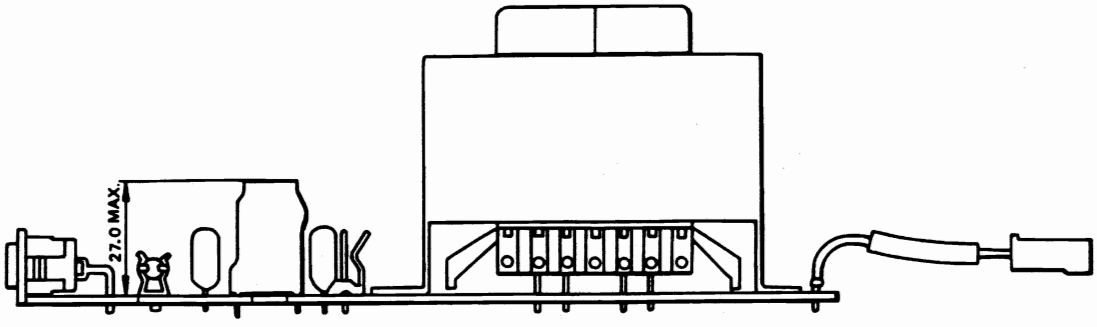


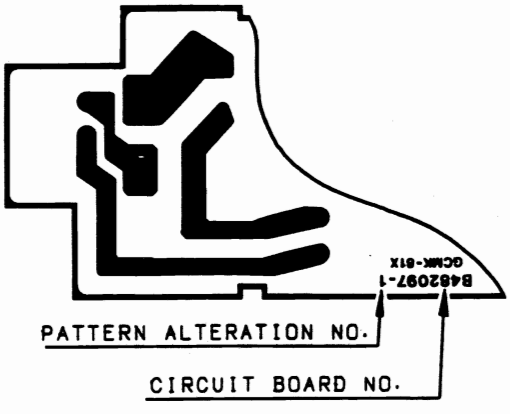
SYMBOL	CODE	NAME	Q'TY
L2	U17188000	COIL FKOB 163 MH01	1
C6, C7	U15286000	P-CAPACITOR 125B473	2
P3	U17146001	HARNESS 5196-04	1
B	U16537000	F CLIP S-N 50578	2
F3	W00168001	G FUSE 1A	1
T1	U17164001	TRANSFORMER 110V	1
P4	U16194000	CONNECTOR 5289-2A	1
SW	U17200000	POWER SWITCH WK-837	1

REVISION NO.	
1 2 4 3	
B 4 8 2 0 9 7 - 1 2	
THE DATE OF ISSUE:	
- -	
THE DATE OF ISSUE:	

MAIN-REF. NO.	SM-103-2
NAME	FILTER CIRCUIT BOARD 110V U17163001
ASSEMBLY CODE. NO.	U09438001



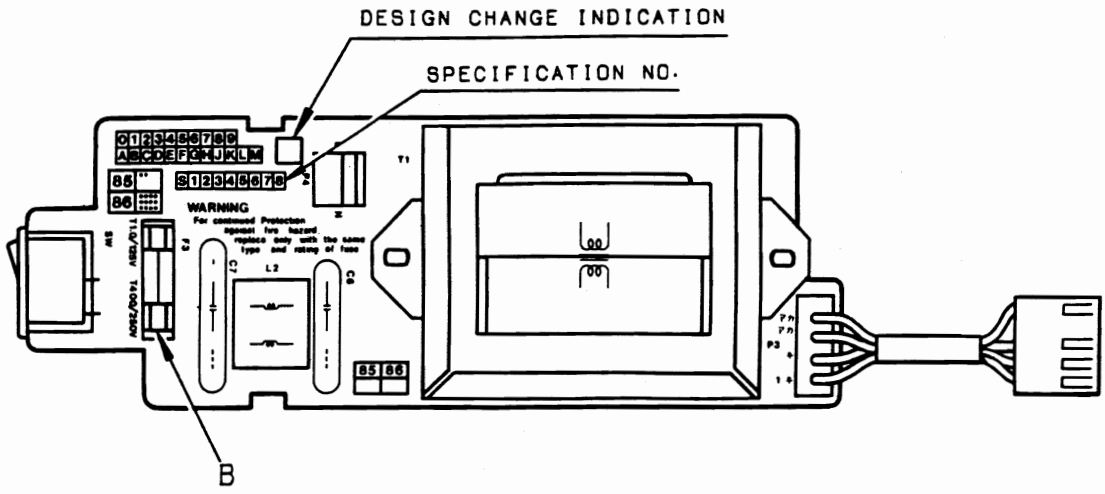


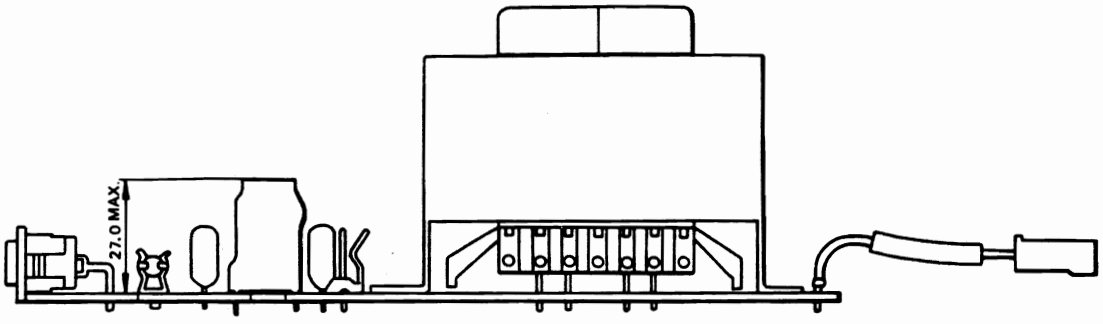


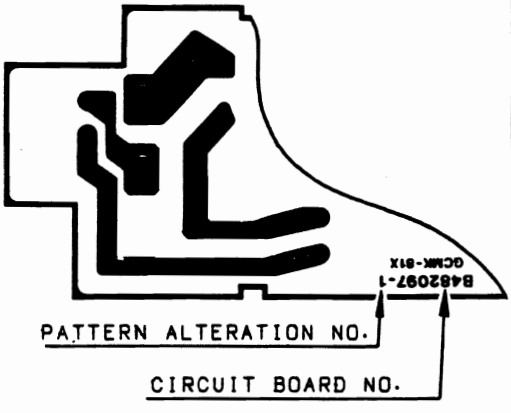
SYMBOL	CODE	NAME	Q'TY
L2	U17188000	COIL FKOB 163 MH01	1
C6, C7	U17157000	P-CAPACITOR 250B473UN	2
P3	U17146001	HARNESS 5196-04	1
B	U16537000	F CLIP S-N 50578	2
F3	U16553000	G FUSE SET 400MA	1
T1	U17170001	TRANSFORMER 200V	1
P4	U16194000	CONNECTOR 5289-2A	1
SW	U17200000	POWER SWITCH WK-837	1

REVISION NO.	
1 2 4 3	
B 4 8 2 0 9 7 - 1 3	
THE DATE OF ISSUE:	
-	
THE DATE OF ISSUE:	

MAIN-REF. NO.	SM-103-3
NAME	FILTER CIRCUIT BOARD 200V U17169001
ASSEMBLY CODE. NO.	U09440001



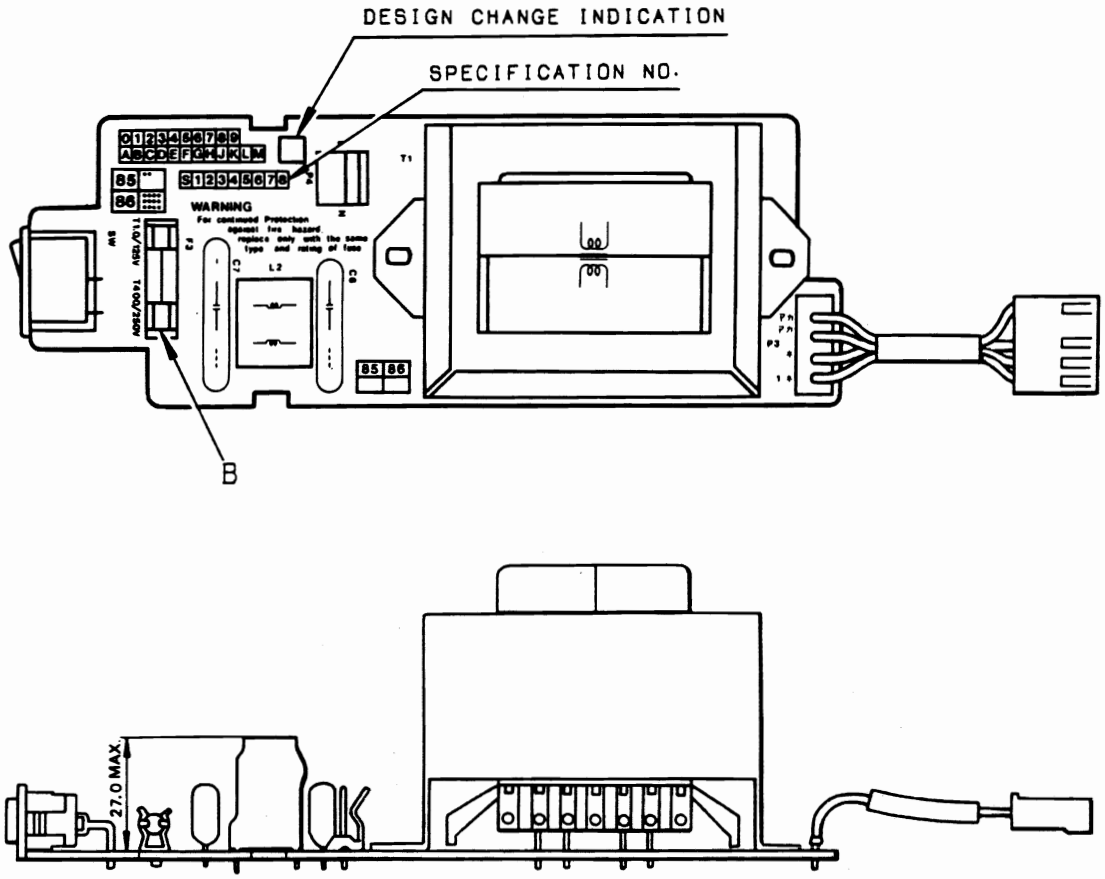




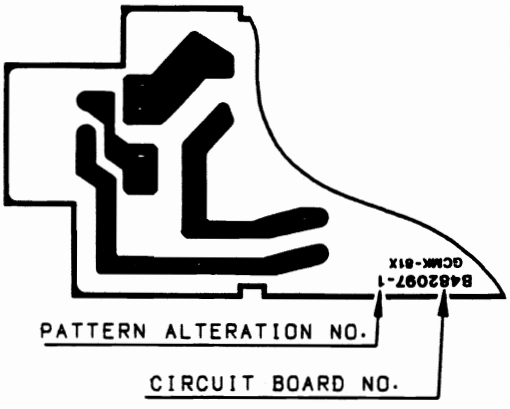
SYMBOL	CODE	NAME	Q'TY
L2	U17188000	COIL FKOB 163 MH01	1
C6, C7	U15286000	P-CAPACITOR 125B473	2
P3	U17146001	HARNESS 5196-04	1
B	U16537000	F CLIP S-N 50578	2
F3	W00168001	G FUSE 1A	1
T1	U17145001	TRANSFORMER 117V	1
P4	U16194000	CONNECTOR 5289-2A	1
SW	U17200000	POWER SWITCH WK-837	1

REVISION NO.				
1		2	4	3
B 4 8 2 0 9 7 -	1		4	
THE DATE OF ISSUE:				
		-		
THE DATE OF ISSUE:				

MAIN-REF. NO.	8M-103-4
NAME	FILTER CIRCUIT BOARD 117V U17143001
ASSEMBLY CODE. NO.	U09434001

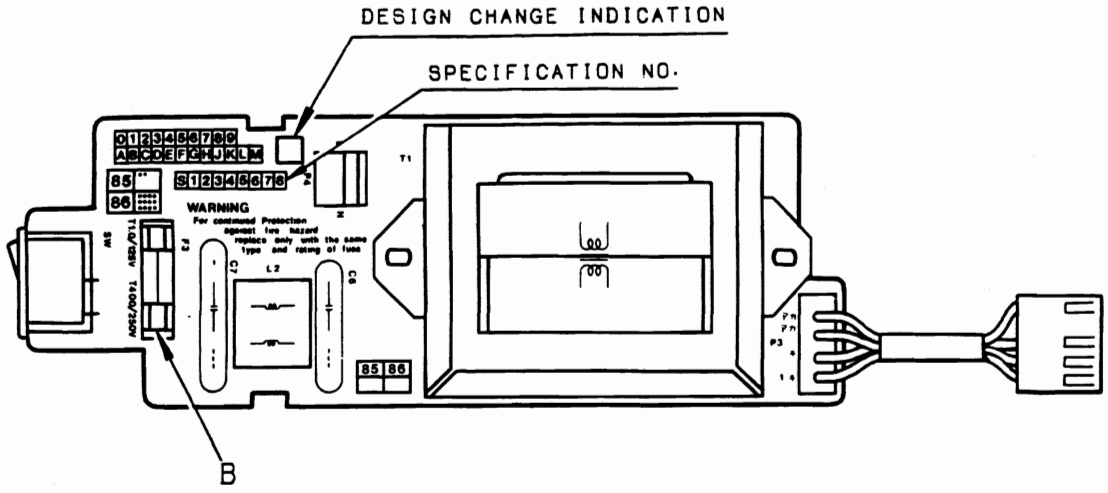


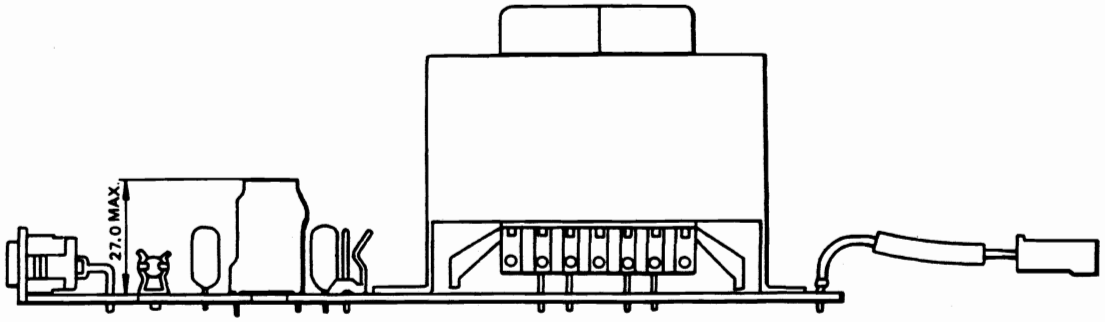
SYMBOL	CODE	NAME	Q'TY
L2	U17188000	COIL FKOB 163 MH01	1
C6, C7	U17157000	P-CAPACITOR 250B473UN	2
P3	U17146001	HARNESS 5196-04	1
B	U16537000	F CLIP S-N 50578	2
F3	U16553000	G FUSE SET 400MA	1
T1	U17154001	TRANSFORMER 220V	1
P4	U16194000	CONNECTOR 5289-2A	1
SW	U17200000	POWER SWITCH WK-837	1

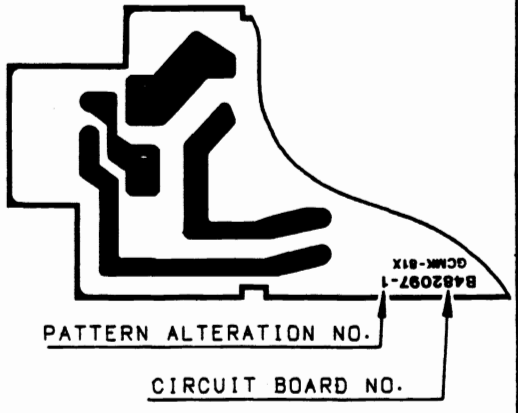


REVISION NO.	
1 2 4 3	
B 4 8 2 0 9 7 - 1 5	
THE DATE OF ISSUE:	
-	
THE DATE OF ISSUE:	

MAIN-REF. NO.	8M-103-5
NAME	FILTER CIRCUIT BOARD 220V U17153001
ASSEMBLY CODE. NO.	U09436001



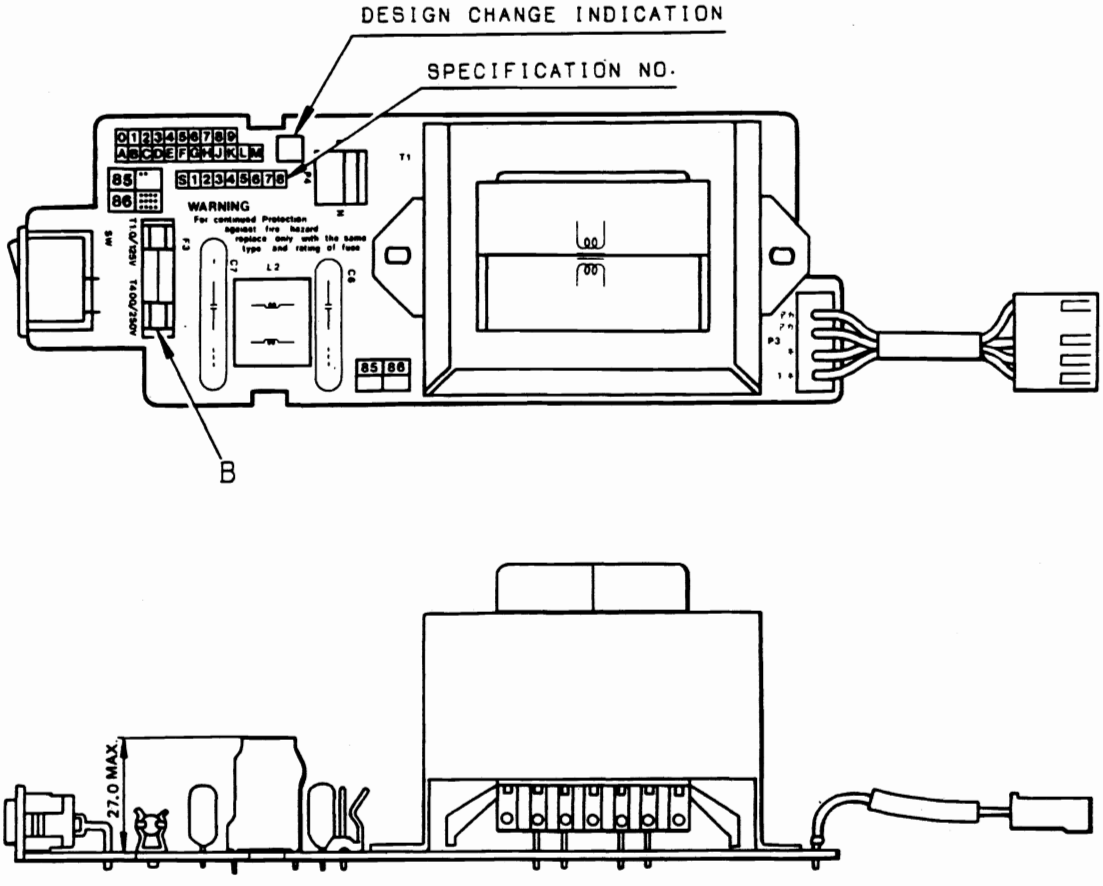


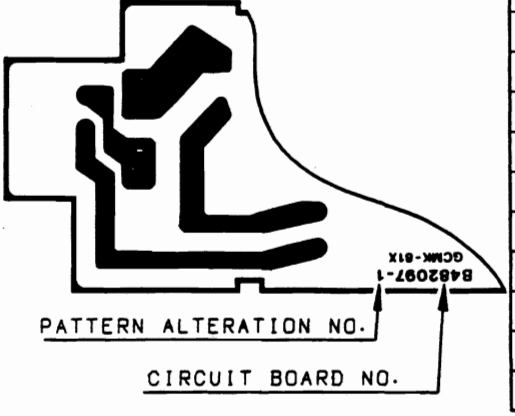


SYMBOL	CODE	NAME	Q'TY
L2	U17188000	COIL FKOB 163 MH01	1
C6, C7	U15157000	P-CAPACITOR 250B473UN	2
P3	U17146001	HARNESS 5196-04	1
B	U16537000	F CLIP S-N 50578	2
F3	W00168001	G FUSE 1A	1
T1	U17167001	TRANSFORMER 127V	1
P4	U16194000	CONNECTOR 5289-2A	1
SW	U17200000	POWER SWITCH WK-837	1

REVISION NO.			
1		2	4	3
B	4	8	2	0	9	7	-	1		6
THE DATE OF ISSUE:										
							-			
THE DATE OF ISSUE:										

MAIN-REF. NO.	SM-103-6
NAME	FILTER CIRCUIT BOARD 127V U17166001
ASSEMBLY CODE. NO.	U09439001

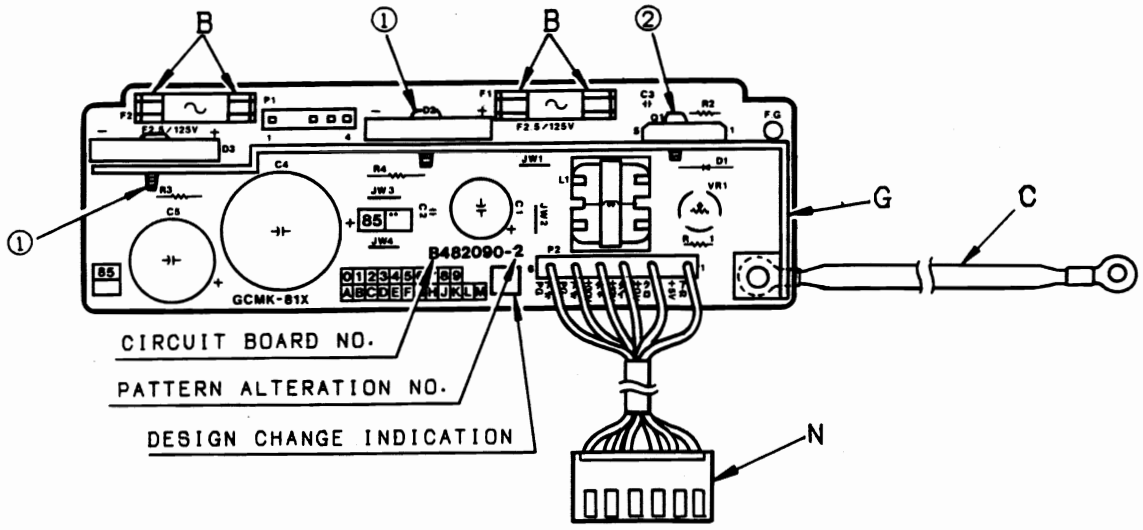




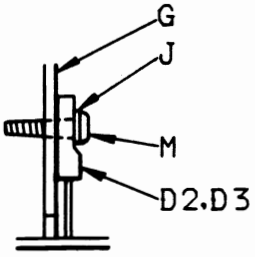
SYMBOL	CODE	NAME	Q'TY
L2	U17188000	COIL FKOB 163 MH01	1
C6, C7	U17157000	P-CAPACITOR 250B473UN	2
P3	U17146001	HARNESS 5196-04	1
B	U16537000	F CLIP S-N 5057S	2
F3	U16553000	G FUSE SET 400MA	1
T1	U17161001	TRANSFORMER 240V	1
P4	U16194000	CONNECTOR 5289-2A	1
SW	U17200000	POWER SWITCH WK-837	1

REVISION NO.			
1	2	4	3
B 4 8 2 0 9 7 - 1			7
THE DATE OF ISSUE:			
		-	
THE DATE OF ISSUE:			

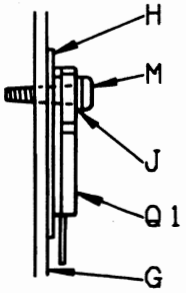
MAIN-REF. NO.	SM-103-7
NAME	FILTER CIRCUIT BOARD 240V U17160001
ASSEMBLY CODE. NO.	U09437001



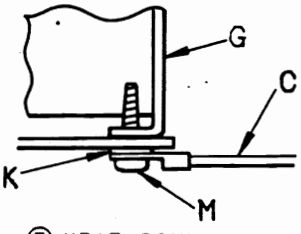
F CLIP INSTALLATION



① D2.D3 INSTALLATION



② Q1 INSTALLATION

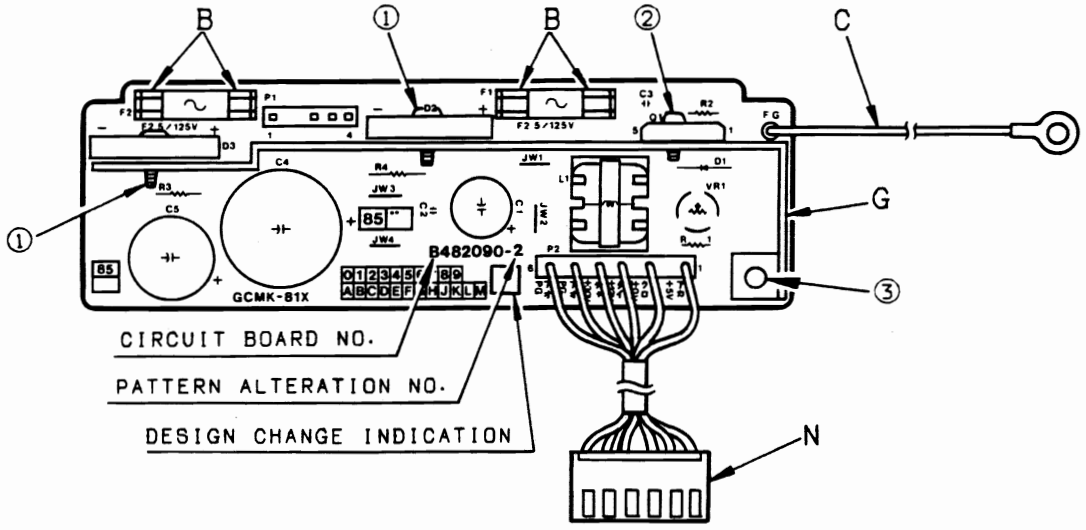


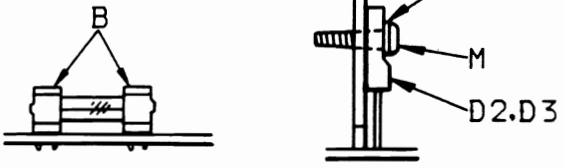
③ HEAT SINK INSTALLATION

SYMBOL	CODE	NAME	Q'TY	SYMBOL	CODE	NAME	Q'TY
				R2	090273120	DR-A14YJ 273 R25	1
Q1	U17178000	SWREGSTR 20005	1	C	U17317001	GROUND WIRE VDE	1
D2, D3	U17179000	SIBRD 38B10	2	B	U16537000	F CLIP S-N50578	4
D1	U16828000	SID RU3M	1	F1, F2	U17183000	G FUSE 2.5AMQ2	2
C4	U17196000	E-CAPACITOR 50B472T8U	1	P1	U17186000	CONNECTOR 5275-4A	1
C5	Y44723001	E-CAPACITOR 25B472	1	N	U17211001	POWER HARNESS 600	1
L1	U16914000	COIL FKEI 200MY01	1	VR1	U04240000	RVG-VR503M	1
C1	Y41022001	E-CAPACITOR 16B102	1	G	U17185000	HEAT SINK#1	1
R4	U15635001	GR-A2YJ 152	1	H	U16827000	INSULATOR STR20000	1
R3	U16749000	GR-A12YJ 102	1	J	026030136	WASHER 3	3
C3	U15150000	C-CAPACITOR 50B104	1	K	502677001	TEETH WASHER 3	1
C2	U15596000	C-CAPACITOR 25B104Z	1	M	U07620000	SCREW 3X12	4
R1	090103120	DR-A14YJ 103 R25	1				

REVISION NO.			
1	2	4	3
B4820900-2			
THE DATE OF ISSUE:			
THE DATE OF ISSUE:			

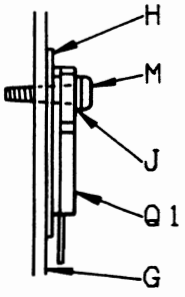
MAIN-REF. NO.	8N-104
NAME	POWER SUPPLY CIRCUIT BOARD (X62) VDE U17319001
ASSEMBLY CODE. NO.	U09713001



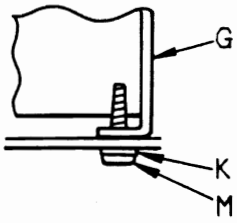


F CLIP INSTALLATION

① D2, D3 INSTALLATION



② Q1 INSTALLATION

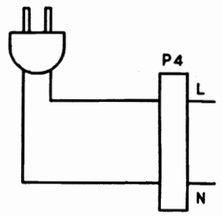


③ HEAT SINK INSTALLATION

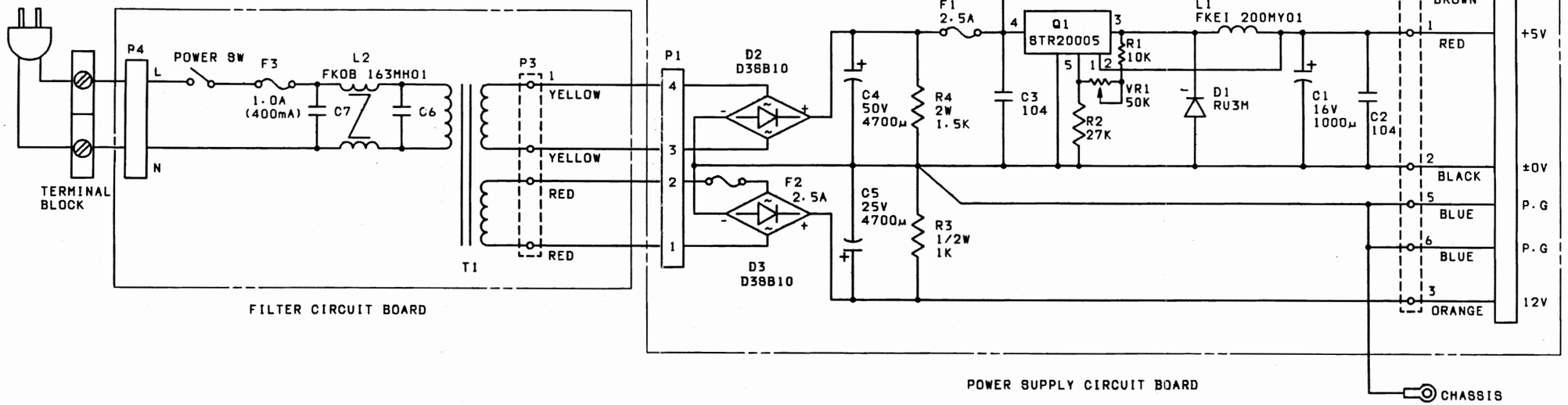
SYMBOL	CODE	NAME	Q'TY	SYMBOL	CODE	NAME	Q'TY
				R2	090273120	DR-A14YJ 273 R25	1
Q1	U17178000	SWREGSTR 20005	1	C	U17182001	GROUND WIRE	1
D2, D3	U17179000	SIBRD 38B10	2	B	U16537000	F CLIP S-N50578	4
D1	U16828000	SID RU3M	1	F1, F2	U17183000	G FUSE 2.5AMQ2	2
C4	U17196000	E-CAPACITOR 50B472TSU	1	P1	U17186000	CONNECTOR 5275-4A	1
C5	Y44723001	E-CAPACITOR 25B472	1	N	U17211001	POWER HARNESS 600	1
L1	U16914000	COIL FKEI 200MY01	1	VR1	U04240000	RVG-VR503M	1
C1	Y41022001	E-CAPACITOR 16B102	1	G	U17185000	HEAT SINK#1	1
R4	U15635001	GR-A2YJ 152	1	H	U16827000	INSULATOR STR20000	1
R3	U16749000	GR-A12YJ 102	1	J	0.26030136	WASHER 3	3
C3	U15150000	C-CAPACITOR 50B104	1	K	502677001	TEETH WASHER 3	1
C2	U15596000	C-CAPACITOR 25B104Z	1	M	U07620000	SCREW 3X12	4
R1	090103120	DR-A14YJ 103 R25	1				

REVISION NO.	
1 2 4 3	
B 4 8 2 0 9 0 - 2	
THE DATE OF ISSUE:	
-	
THE DATE OF ISSUE:	

MAIN-REF. NO.	SN-104
NAME	POWER SUPPLY CIRCUIT BOARD (X62) U17210001
ASSEMBLY CODE. NO.	U09449001



FOR VDE SPECIFICATION



VOLTAGE	F3	C7	C6	T1
AC100V	G FUSE 1AT8C U16558000	P-CAPACITOR 125B473 U15286000	P-CAPACITOR 125B473 U15286000	TRANSFORMER 100V U17151001
AC110V	G FUSE 1A W00168001	P-CAPACITOR 125B473 U15286000	P-CAPACITOR 125B473 U15286000	TRANSFORMER 110V U17164001
AC117V	G FUSE 1A W00168001	P-CAPACITOR 125B473 U15286000	P-CAPACITOR 125B473 U15286000	TRANSFORMER 117V U17145001
AC127V	G FUSE 1A W00168001	P-CAPACITOR 125B473 U15286000	P-CAPACITOR 125B473 U15286000	TRANSFORMER 127V U17167001
AC200V	G FUSE 8ET400MA U16553000	P-CAPACITOR 250B473UN U17157000	P-CAPACITOR 250B473UN U17157000	TRANSFORMER 200V U17170001
AC220V	G FUSE 8ET400MA U16553000	P-CAPACITOR 250B473UN U17157000	P-CAPACITOR 250B473UN U17157000	TRANSFORMER 220V U17154001
AC240V	G FUSE 8ET400MA U16553000	P-CAPACITOR 250B473UN U17157000	P-CAPACITOR 250B473UN U17157000	TRANSFORMER 240V U17161001

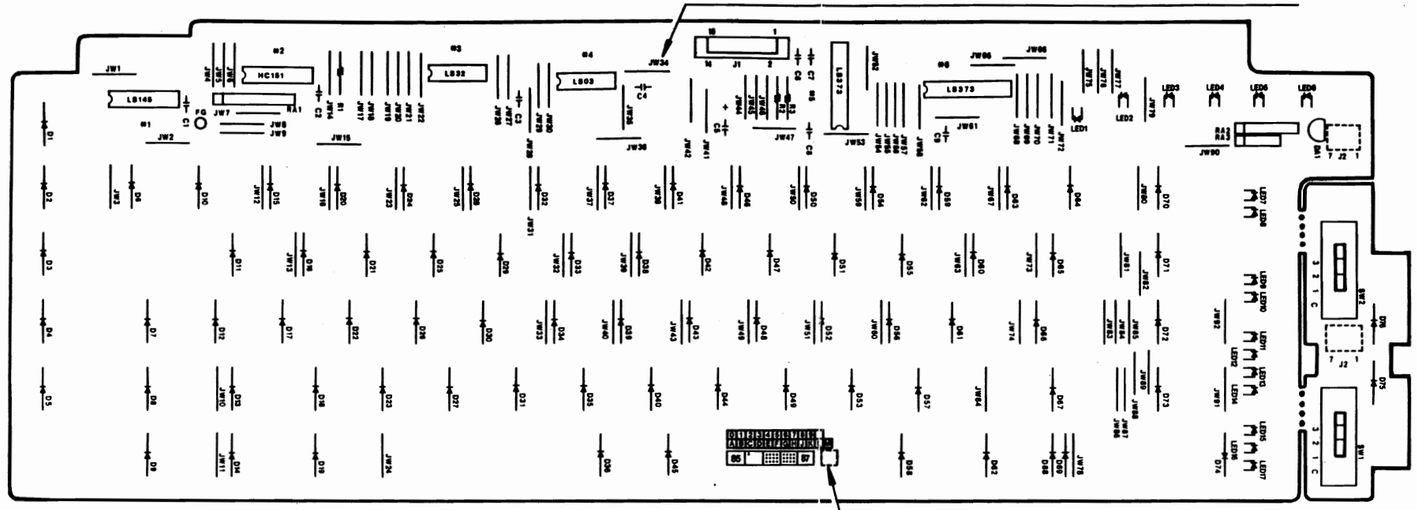
F1 G FUSE 2.5A MQ2 U17183000

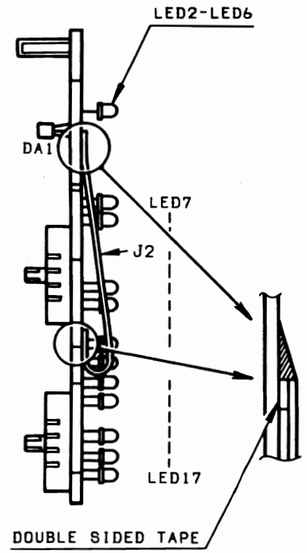
F2 G FUSE 2.5A MQ2 U17183000

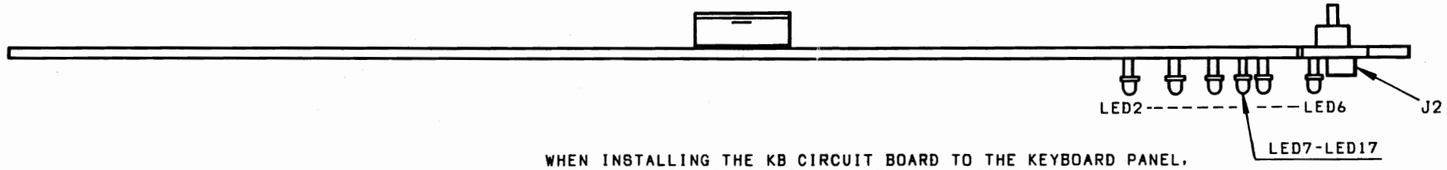
FILTER P.C.BOARD REVISION NO.	POWER SUPPLY P.C.BOARD REVISION NO.
1 2 4 3	1 2 4 3
B48209 7-1	B48209 0-2
THE DATE OF ISSUE:	THE DATE OF ISSUE:
THE DATE OF ISSUE:	THE DATE OF ISSUE:

MAIN-REF. NO.	SM-104
NAME	FILTER AND POWER SUPPLY CIRCUIT SCHEMATIC DIAGRAM
	U17197000

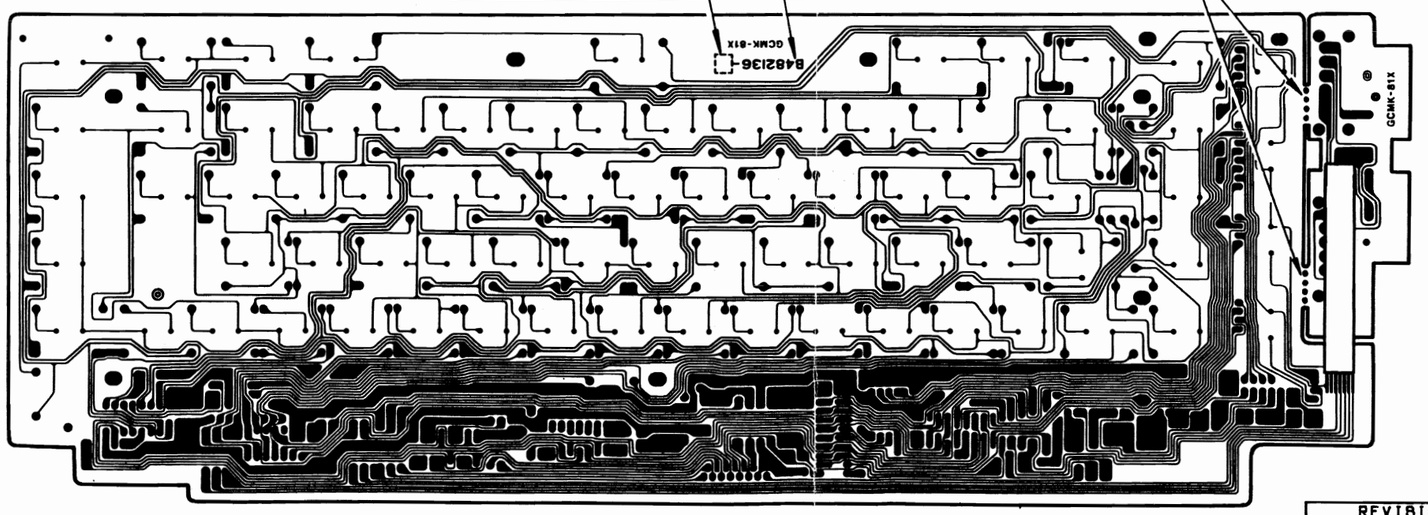
JUMP WIRE(JW1-JW89) SHOULD BE USED Ø0.6 TIN-PLATED WIRE.







WHEN INSTALLING THE KB CIRCUIT BOARD TO THE KEYBOARD PANEL, CRACK THE SEAM ON THE BOARD WITHOUT SALIENTS.



LED9 IS NOT ATTACHED.

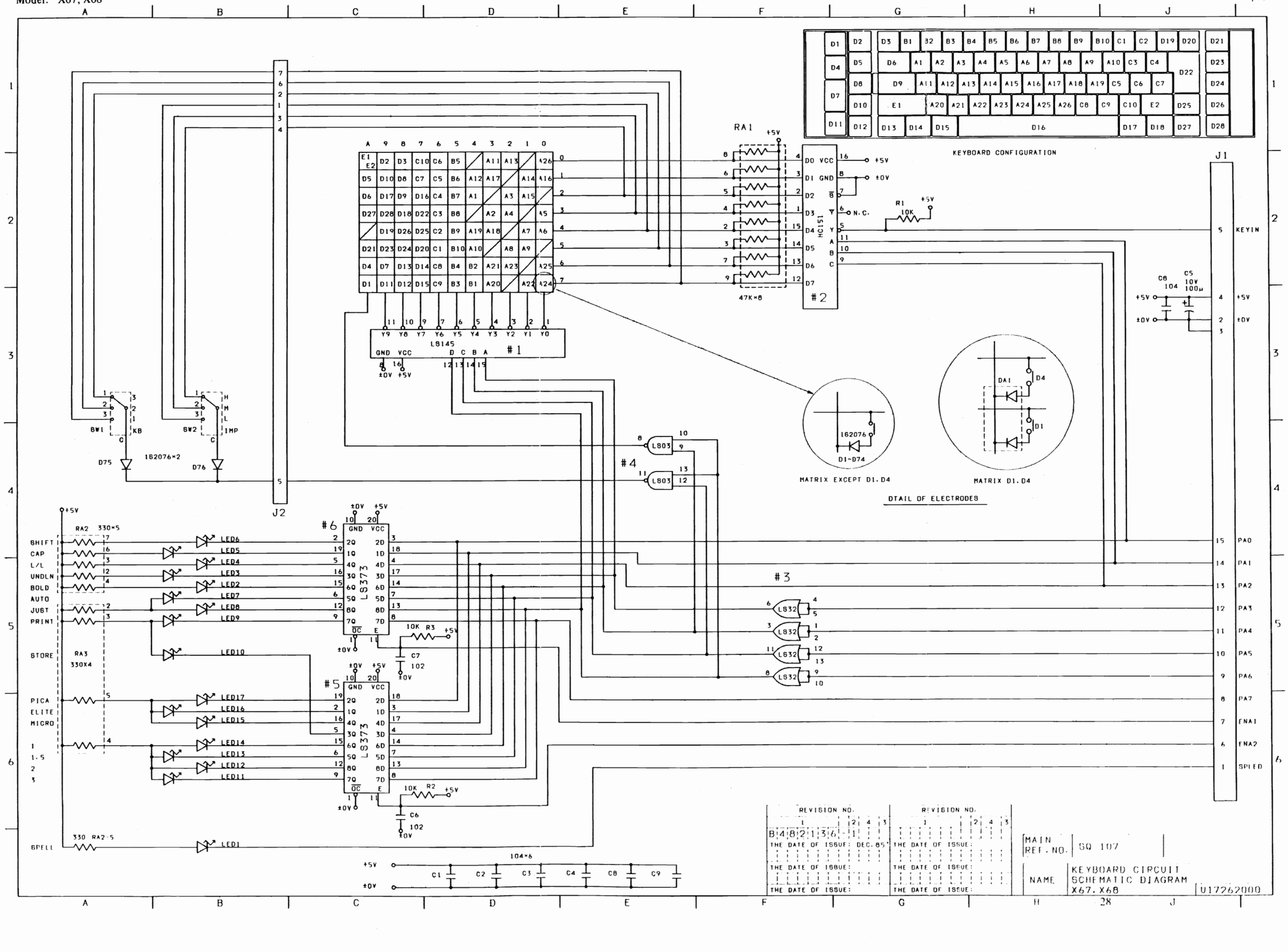
SYMBOL	CODE	NAME	Q'TY
#1	091100145	BIPIC 74L8145	1
#2	093100151	CMOSIC 74HC151P	1
#3	091100032	BIPIC 74L832	1
#4	091100003	BIPIC 74L803	1
#5, #6	091100373	BIPIC 74L8373	2
D1-D76	341786000	SID 182076	76
DA1	U15661000	D-ARRAY MC921	1
R1-R3	090103120	DR-A14YJ 103R25	3
C1, C2, C3 C4 D8, C9	U73322000	C-CAPACITOR 16B104Z	6
C5	Y41011002	E-CAPACITOR 10B 101	1
C6, C7	U15018000	C-CAPACITOR 25B102M	2
RA1	Y64738041	R ARRAY J473X8	1
RA2	Y63316041	R ARRAY J331X6	1
RA3	Y63314041	R ARRAY J331X4	1
LED2-LED17	U17133000	LED LN 28RP	16
SW1, SW2	U17134000	SLIDE SW SL106-3	2
J1	U17231002	CONNECTOR ZC-015	1
J2	U17256000	FLAT CABLE 7X90	1

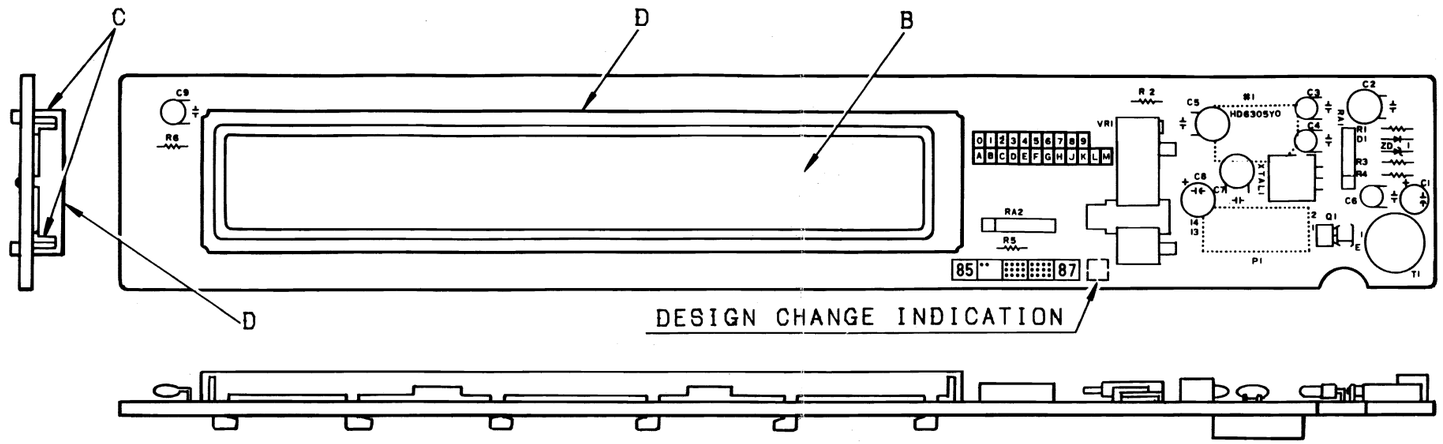
REVISION NO.	REVISION NO.
1 2 4 3	1 2 4 3
B48213G-1	
THE DATE OF ISSUE: DEC. '85	
THE DATE OF ISSUE:	
THE DATE OF ISSUE:	

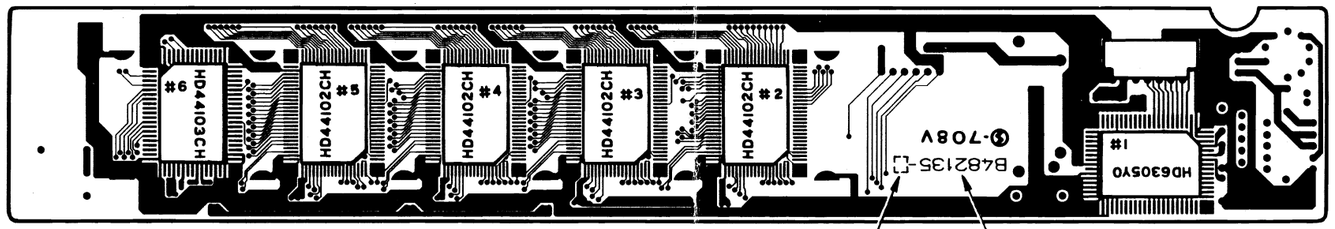
MAIN-REF. NO.	8Q-107
NAME	KEY BOARD CIRCUIT BOARD X67, X68 U17254001
ASEMBLY CODE NO.	U09722001

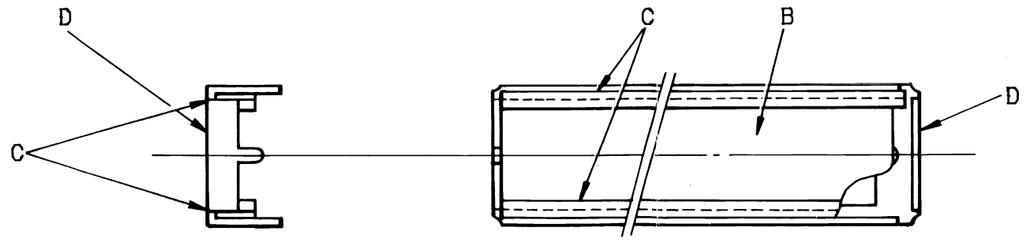
Model: X67, X68

REV. A86/01









SYMBOL	CODE	NAME	Q'TY
#1	U17243001	LSI HD6305 Y0A66F	1
#2-#5	U16009000	LSI HD44102CH	4
#6	U16008000	LSI HD44103CH	1
Q1	U15058000	SITR 2SC2603	1
D1	341786000	SID 1S2076	1
ZD1	U15496000	ZD HZ6C-1	1
T1	U15497000	TRANSFORMER LC-12-5V	1
R1	090472020	DR-A18YJ 472R10	1
R2	090221020	DR-A18YJ 221R10	1
R3	090153020	DR-A18YJ 153R10	1
R4	090101020	DR-A18YJ 101R10	1
R5	090272020	DR-A18YJ 272R10	1
R6	090683020	DR-A18YJ 683R10	1
RA1	Y62234041	R ARRAY J233X4	1
RA2	Y61025081	R ARRAY J102X5V	1
C1	Y44795301	E CAPACITOR 50B47-1	1
C2, C5 C7	U73322000	C CAPACITOR 16B104Z	3
C3, C4 C6	U15018000	C CAPACITOR 25B102M	3
C8	Y43302301	E CAPACITOR 16B330	1
C9	U15714000	C CAPACITOR 50B100	1
XTAL1	U16964000	OSCILLATOR CST4.00MG	1
VR1	U17244000	DVR-18LB502	1
P1	U17247002	CONNECTOR CF-114A	1
B	U17245000	LCD LR508C	1
C	U09263000	RUBBER CONNECTOR	2
D	U09264001	LCD HOLDER	1

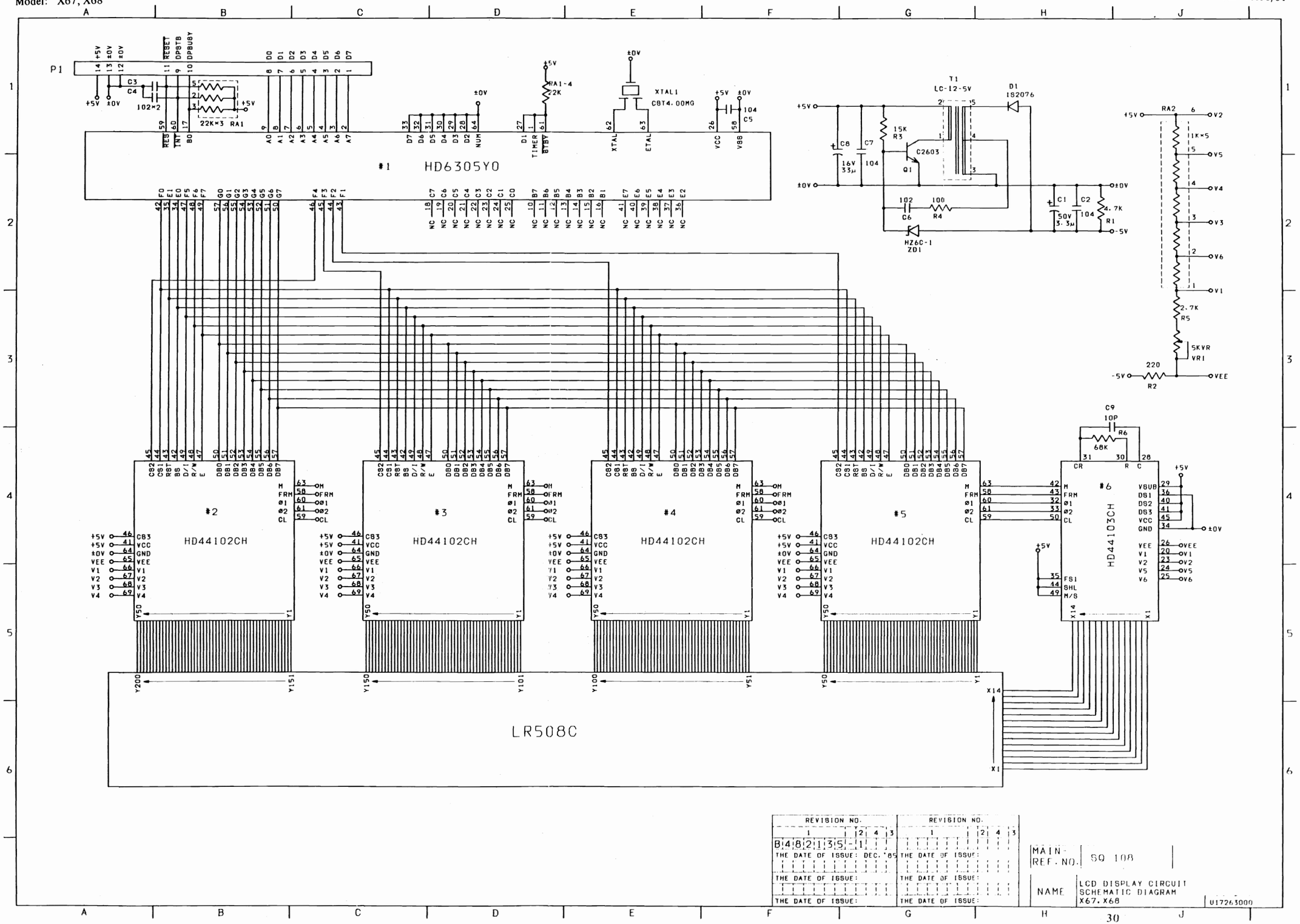
LED9 IS NOT ATTACHED.

REVISION NO. 1 2 4 3	REVISION NO. 1 2 4 3
B482135-1	
THE DATE OF ISSUE: DEC. '85	
THE DATE OF ISSUE:	
THE DATE OF ISSUE:	

MAIN-REF. NO.	8Q-108
NAME	LCD DISPLAY CIRCUIT BOARD X67, X68 U17241001
ASEMBLY CODE NO.	U09722001

Model: X67, X68

REV. A86/01



REVISION NO.				REVISION NO.			
	1	2	4	3	1	2	4	3
B4821351-1								
THE DATE OF ISSUE: DEC. '85				THE DATE OF ISSUE:				
THE DATE OF ISSUE:				THE DATE OF ISSUE:				
THE DATE OF ISSUE:				THE DATE OF ISSUE:				

MAIN-REF. NO. SQ 108

NAME LCD DISPLAY CIRCUIT SCHEMATIC DIAGRAM X67. X68

U17263000

SERVICE MANUAL

SERVICE MANUAL

ELECTRONIC PORTION

MODEL : X67, X68

INDEX

PRINCIPLE OF ELECTRONIC SYSTEM

PRINCIPLE OF ELECTRONIC SYSTEM

1. General

1-1 Electronic system composition

Fig. 1-a shows the electronic composition. The electronic system mainly consists of nine circuit boards, four motors, one solenoid and two position detecting switches.

1-2 Outline of circuit boards

a. Power supply circuit board

The input AC source voltage is stepped down by the power transformer and rectified to DC+5V (regulated), DC+12V (unregulated) and DC+30V (unregulated) in this circuit board. These three DC supply voltages are given to the logic control circuit board.

b. Filter circuit board

This circuit board prevents noises arising in the typewriter from leaking out, and external noises from entering the circuitry of the typewriter.

The power transformer is installed on the filter circuit board.

c. Logic control circuit board

This circuit board controls the LED (indicators), LCD display, motors, solenoid, keyboard and other functional devices of the typewriter.

The logic control circuit board has a CPU logic circuit and actuator (motor, solenoid, etc.) drive circuts.

d. Keyboard cirucit board

This circuit board converts key operation into electric signal, and sends that signal to the logic control circuit boards.

The keyboard circuit board is the single board and has the carbon contacts (key switch contacts) and the parts for control of the LED.

e. LCD circuit board

This circuit board consists of a LCD display, display driver and display controller, and visualizes various output information.

f. LCD relay circuit board

The signal circuits (cable) from the LCD display circuit board are connected to the logic control circuit board through this circuit board.

g. Relay circuit board

The wheel motor, ribbon motor, carriage index switch, hammer solenoid and head indicator are connected to the logic control circuit board through this relay circuit board.

h. Head indicator circuit board

This circuit board has the LED which indicates the current position of the print head.

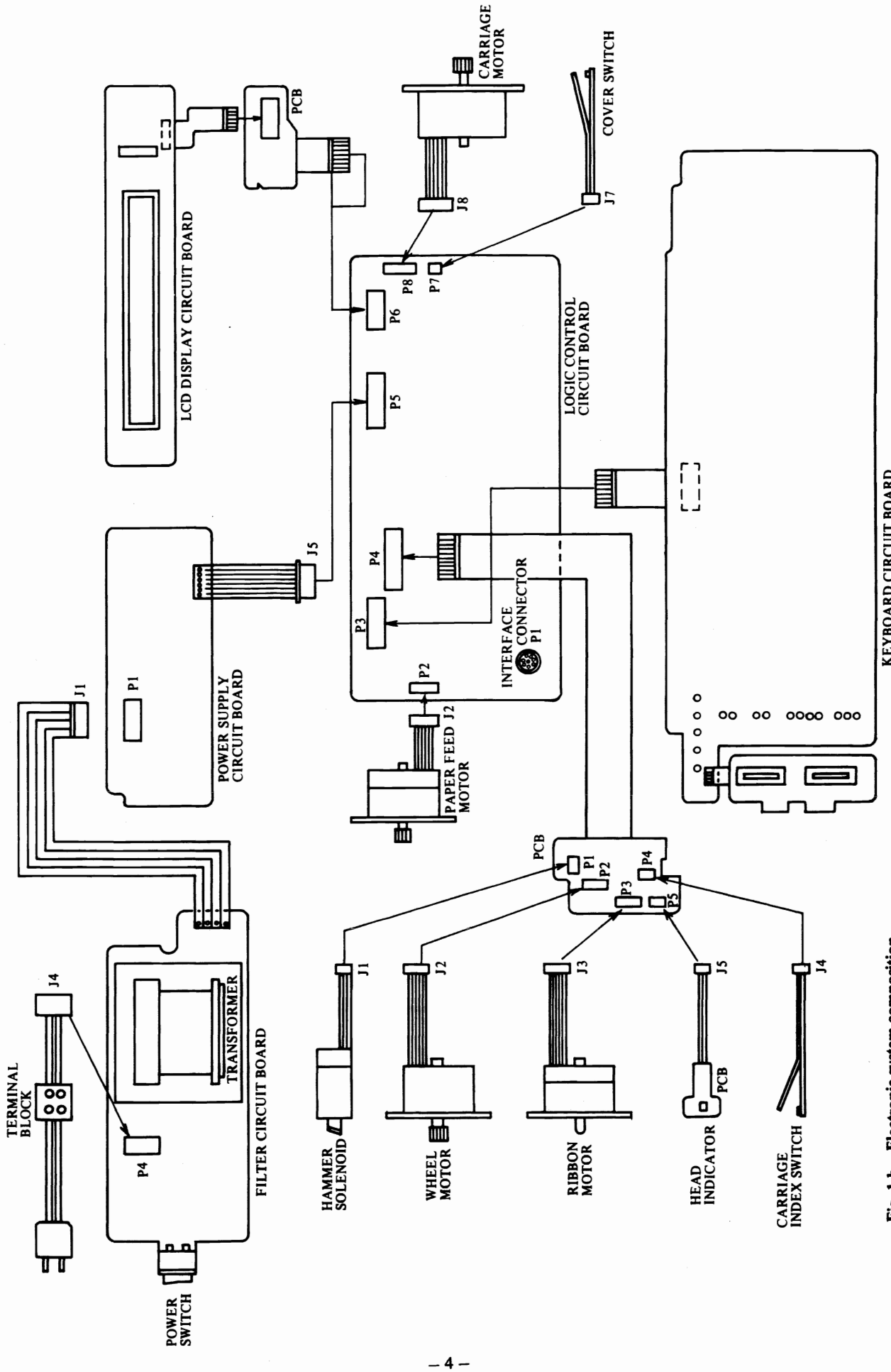


Fig. 1-b Electronic system composition

1-3 Outline of motors and solenoid

a. **Wheel motor (WH motor)**
The wheel motor is a PM type ϕ35 stepping motor, and rotates and indexes the print wheel.
To index the print wheel to its home position, the motor is operated in micro-stepping mode.

b. **Ribbon motor (RB motor)**
The ribbon motor moves the ribbon cassette vertically, and causes winding of the ink ribbon and the correction tape.
For the ribbon motor, a PM type ϕ42 stepping motor is used. To locate the ribbon cassette to its home position, the motor is operated in micro-stepping mode.

c. **Carriage motor (CA motor)**
This motor is a PM type ϕ57 stepping motor, and drives the print head on which the hammer and wheel motor are loaded. The print head home position (print start position) is detected by the carriage index switch.

d. **Line feed motor (LF motor)**
This motor is a PM type ϕ42 stepping motor, and advances a paper on the platen (that is, the platen is rotated).

e. **Hammer solenoid (HAM SOL)**
The hammer solenoid actuates the print hammer which in turn strikes the indexed character element of print wheel to print.

1-4 Outline of switches

– Leaf Switch –

a. **Carriage index switch (CA IND)**
This switch defines the print head home position.

b. **Cover switch (COVER SW)**
This is a cover interlock switch. When the cover is opened, the switch opens to disconnect the keyboard circuit and the motor driver circuit from the logic control circuit.
When the cover is closed and the switch closes, the carriage once returns to its home position and then moves to the position where it was located before the cover is opened.

– Slide Switch –

c. **Impact select switch**
Hammering intensity can be changed by this switch.

d. **Keyboard select switch**
This switch permits selection of font ("NORMAL", "INTERNATIONAL" or "SYMBOL").

3. Logic control circuit board

3-1 General

Fig. 3-a shows the block diagram of the logic control circuit.

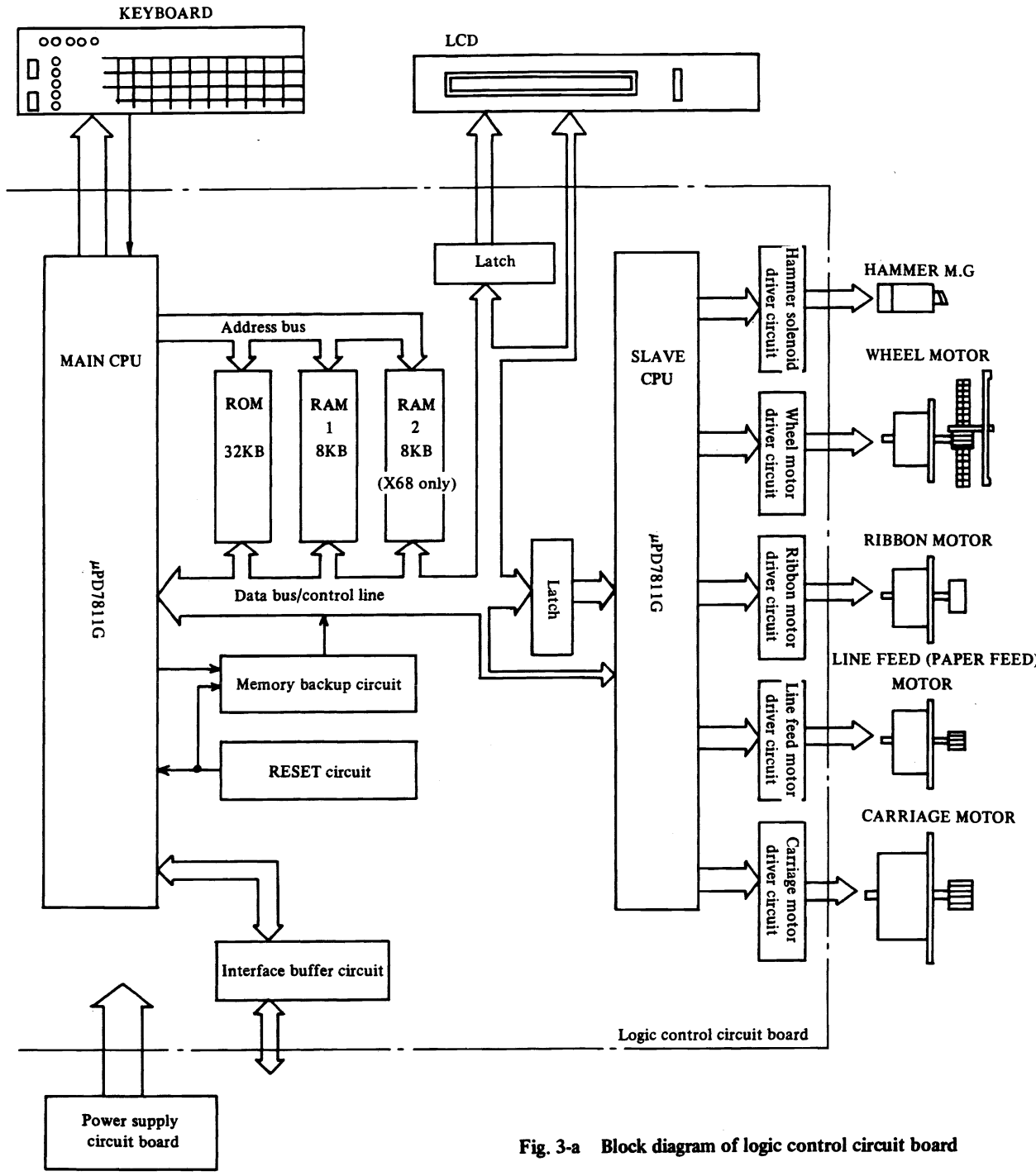


Fig. 3-a Block diagram of logic control circuit board

The logic control circuit board mainly consits of main CPU, ROM, RAM, slave CPU, driver circuit, "RESET" circuit, memory backup circuit and interface buffer circuit, as shown in Fig. 3-a.

The outline of each component is as follows:

1) **Main CPU**
As the word implies, this CPU (Central Processing Unit) serves as a center of the control system, that is, the entire electronic system of the typewriter is under the control of this CPU.

2) **ROM**
The system control program and various data tables are stored in this ROM.

3) **RAM**
In the case of X67, one RAM (8 KByte) is used.
As for X68, two RAM (total 16 KByte) are used, and provided the working area for the main CPU, as well as serves as the buffer for key operation, and the text storage, etc.

4) **Slave CPU**
This receives instructions from the main CPU, and controls the hammer solenoid and each motor.

5) **Driver circuits**
Each driver circuit controls the power supply to the respective actuator (solenoid, motor, etc.) in accordance with the instruction given by the slave CPU.

6) **$\overline{\text{RESET}}$ circuit**
This circuit resets the control circuits to prevent malfaunction of the CPU, actuators, buzzer and memory backup circuit when the power is turned on or off.

7) **Memory backup circuit**
This circuit has a lithium battery and holds the contents stored in the RAMs when power interruption occurs.

8) **Interface buffer circuit**
Data can be transmitted between an externally connected optional device and the typewriter through this buffer circuit.
The specification of the circuit conforms to "Brother serial interface system".

For optional device, "SPELL CHECK", "IF-50X" can be used.

3-2 Main CPU address map

The main CPU is capable of providing an memory area of maximum 64KByte. The specific addresses are assigned to each peripheral device (ROM, RAM and latches) in that memory area.
The main CPU starts data communication with access to the address of the mating peripheral device.
The main CPU (μPD7811G) has built-in ROM (4 KByte) and RAM (256 Byte). Addresses are also assigned to these internal ROM and RAM.

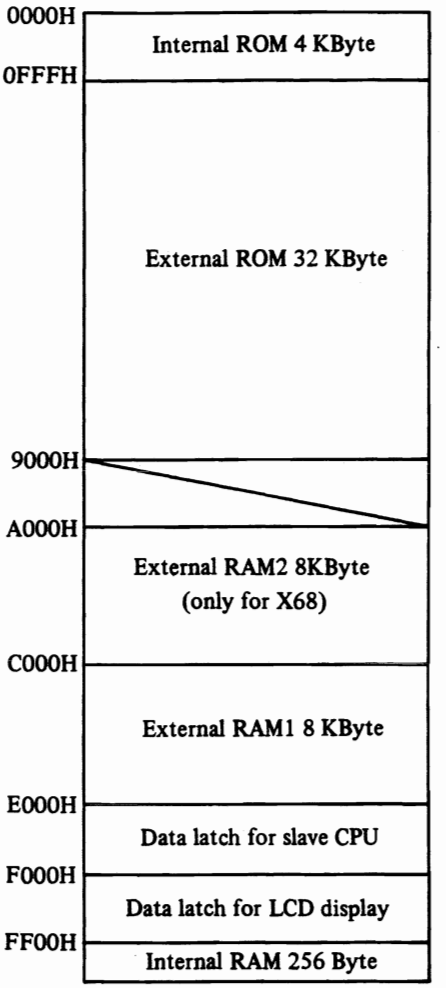


Fig. 3-b Address map

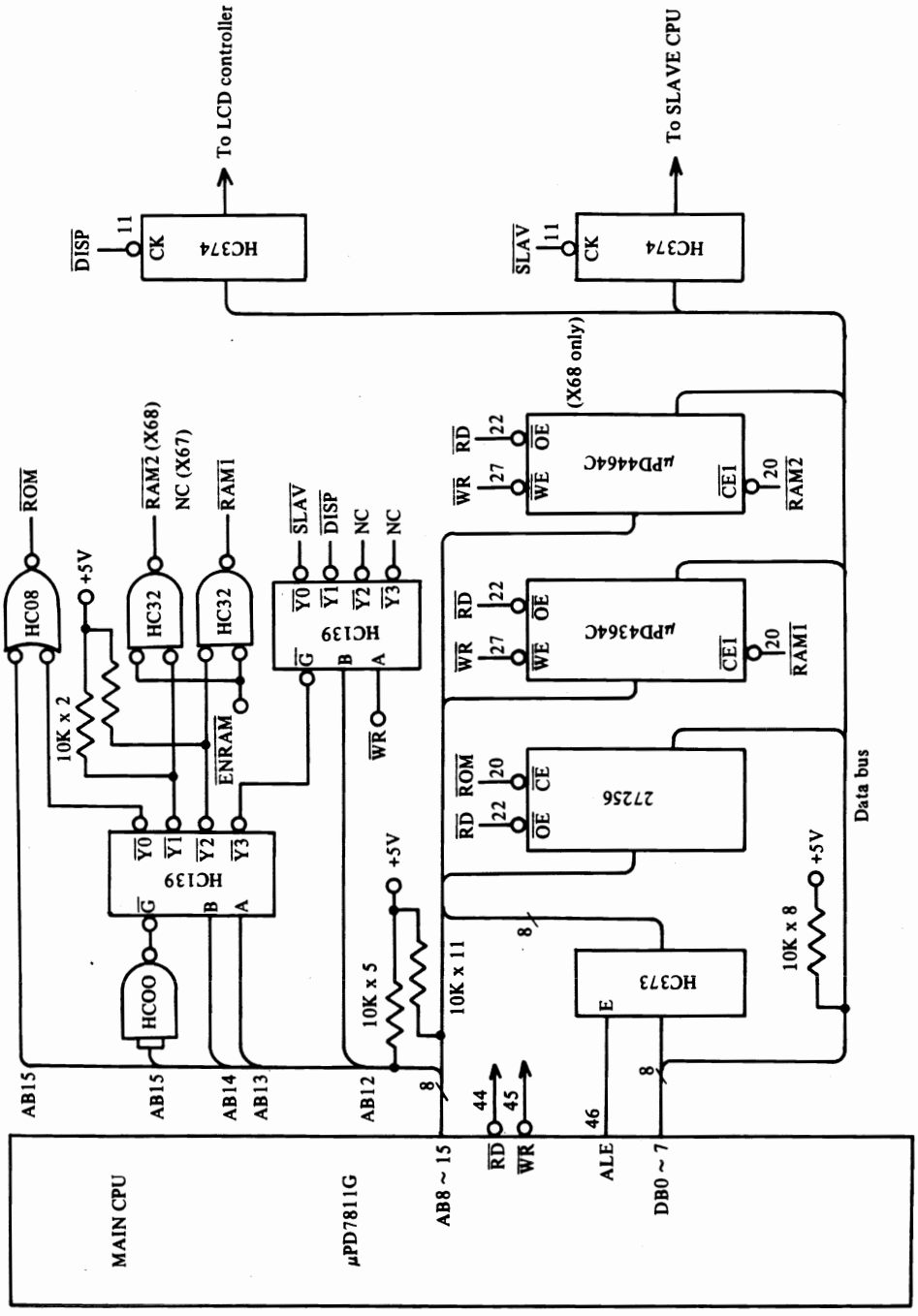


Fig. 3-c Main CPU and Peripheral chips

3-3 Main CPU and slave CPU I/O ports lists

Main CPU I/O ports list

Terminal (Pin No.)	Signal name	I/O	Active level	Function
				(ENA1 = ENA2 = L) (Latched with ↘ (fall edge) of ENA1 or ENA2)
PA0 (1)	KEYD0	O	D	3 KEY SCAN line select
PA1 (2)	KEYD1	O	D	
PA2 (3)	KEYD2	O	D	
PA3 (4)	KEYD3	O	D	4 KEY SCAN column select
PA4 (5)	KEYD4	O	D	
PA5 (6)	KEYD5	O	D	
PA6 (7)	KEYD6	O	D	
PA7 (8)	KEYD7	O	D	———
				8 LED drive data
PB0 (9)	$\overline{ENA1}$	O	↘	Strobe signal "1" for latching KEYD signal to drive LED
PB1 (10)	$\overline{ENA2}$	O	↘	Strobe signal "2" for latching KEYD signal to drive LED
PB2 (11)	$\overline{KEYIN}$	I	L	"L" when key-in signal is input.
PB3 (12)	SRST, CHECK	O	H	Resets the slave CPU and prevents the backup battery, from being charged.
PB4 (13)	$\overline{DPSTB}$	O	↘	Interrupt strobe signal for "data ENABLE" to the LCD controller
PB5 (14)	$\overline{C}$/D	O	D	Flag for discrimination whether the data sent to the slave CPU is $\overline{COMMAND}$ or DATA.
PB6 (15)	$\overline{STB}$	O	↘	Interrupt strobe signal for "data ENABLE" to the slave CPU
PB7 (16)	$\overline{ERR}$	I	L	"Error request" from the slave CPU
PC0 (17)	T x D	O	D	Serial data output
PC1 (18)	R x D	I	D	Serial data input
PC2 (19)	$\overline{SCK}$	I	↗	Synchronous clock input for serial data transfer
PC3 (20)	$\overline{ACK}$	I	↘	"ACKNOWLEDGE" signal from the slave CPU
PC4 (21)	KBRQ	O	H	Serial data output request
PC5 (22)	KBACK	O	L	Serial data "ACKNOWLEDGE" signal
PC6 (23)	BUZ	O	↗	Buzzer drive pulse output
PC7 (24)	DPBUSY	I	H	"BUSY" input from the LCD controller
PD0 (55)	DB0	I O	D	8 Data bus Lower-order 8 bits of address bus is multiplexed (selection by ALE)
PD1 (56)	DB1	I O	D	
PD2 (57)	DB2	I O	D	
PD3 (58)	DB3	I O	D	
PD4 (59)	DB4	I O	D	
PD5 (60)	DB5	I O	D	
PD6 (61)	DB6	I O	D	
PD7 (62)	DB7	I O	D	

Terminal (Pin No.)	Signal name	I/O	Active level		Function
PF0 (47)	AB8	O	D	8	Upper-order address bus (8 digits)
PF1 (48)	AB9	O	D		
PF2 (49)	AB10	O	D		
PF3 (50)	AB11	O	D		
PF4 (51)	AB12	O	D		
PF5 (52)	AB13	O	D		
PF6 (53)	AB14	O	D		
PF7 (54)	AB15	O	D		
AN0 (34)	——	I	——		
AN1 (35)	$\overline{\text{COVSW}}$	I	L		Cover interlock switch "ON"
AN2 (36)	——	I	——		
AN3 (37)	+5BCHK	I	A		Memory backup battery voltage input
AN4 (38)	MODEL	I	D		Selection of model
AN5 (39)	SEL1	I	A	3	Font selection (three steps in each port 3 x 3 x 3 = 27 settings)
AN6 (40)	SEL2	I	A		
AN7 (41)	SEL3	I	A		

"ACTIVE LEVEL" symbols

D : Data
L : Active "LOW"
H : Active "HIGH"
↘ : Fall edge
↘↗ : Continuous pulses
A : Analog value

Slave CPU I/O ports list

Terminal (Pin No.)	Signal name	I/O	Active level	Function
PA0 (1)	RBM-A	O	L	Ribbon motor, A phase "ON"
PA1 (2)	——	O	——	
PA2 (3)	RBM-B	O	L	Ribbon motor, B phase "ON"
PA3 (4)	——	O	——	
PA4 (5)	RBM-C	O	L	Ribbon motor, C phase "ON"
PA5 (6)	——	O	——	
PA6 (7)	RBM-D	O	L	Ribbon motor, D phase "ON"
PA7 (8)	——	O	——	
PB0 (9)	$\overline{\text{WHM-A}}$	O	L	Wheel motor, A phase "ON"
PB1 (10)	WH12V	O	L	12V applied to wheel motor
PB2 (11)	$\overline{\text{WHM-B}}$	O	L	Wheel motor, B phase "ON"
PB3 (12)	WH30V	O	L	30V applied to wheel motor
PB4 (13)	$\overline{\text{WHM-C}}$	O	L	Wheel motor, C phase "ON"
PB5 (14)	———	O		
PB6 (15)	$\overline{\text{WHM-D}}$	O	L	Wheel motor, D phase "ON"
PB7 (16)	CRINDEX	I	H	Carriage index switch "ON"
PC0 (17)	$\overline{\text{C}}$/D	I	D	Flag for discrimination whether the data sent from the main CPU is $\overline{\text{COMMAND}}$ or DATA
PC1 (18)	$\overline{\text{ERR}}$	O	L	"Error request" to the main CPU
PC2 (19)	$\overline{\text{ACK}}$	O	⌐↘	"ACKNOWLEDGE" signal output to the main CPU
PC3 (20)	$\overline{\text{STB}}$	I	⌐↘	Interrupt strobe signal for "data ENABLE" from the main CPU
PC4 (21)	$\overline{\text{HAM}}$	O	L	Hammer solenoid "ON"
PC5 (22)	$\overline{\text{RB30V}}$	O	L	30V applied to the ribbon motor
PC6 (23)	$\overline{\text{CR30V}}$	O	L	30V applied to the carriage motor
PC7 (24)	$\overline{\text{PF30V}}$	O	L	30V applied to the line feed motor
PD0 (55)	D0	I	D	8 Data input from the main CPU
PD1 (56)	D1	I	D	
PD2 (57)	D2	I	D	
PD3 (58)	D3	I	D	
PD4 (59)	D4	I	D	
PD5 (60)	D5	I	D	
PD6 (61)	D6	I	D	
PD7 (62)	D7	I	D	

Terminal (Pin No.)	Signal name	I/O	Active level	Function
PF0 (47)	CRM-A	O	L	Carriage motor, A phase "ON"
PF1 (48)	PFM-A	O	L	Line feed motor, A phase "ON"
PF2 (49)	CRM-B	O	L	Carriage motor, B phase "ON"
PF3 (50)	PFM-B	O	L	Line feed motor, B phase "ON"
PF4 (51)	CRM-C	O	L	Carriage motor, C phase "ON"
PF5 (52)	PFM-C	O	L	Line feed motor, C phase "ON"
PF6 (53)	CRM-D	O	L	Carriage motor, D phase "ON"
PF7 (54)	PFM-D	O	L	Line feed motor, D phase "ON"
AN0 (34)	——	I		
AN1 (35)	——	I		
AN2 (36)	MODEL	I	D	Selection of model
AN3 (37)	30VLEV	I	A	Checking of 30V supply
AN4 (38)	——	I		
AN5 (39)	RIB UP	I	L	Ribbon motor, torque margin increased
AN6 (40)	WH UP	I	L	Wheel motor, torque margin increased
AN7 (41)	CR UP	I	L	Carriage motor, torque margin increased

"ACTIVE LEVEL" symbols

D : Data
L : Active "LOW"
H : Active "HIGH"
↘ : Fall edge
A : Analog value

3-4 Data transmission

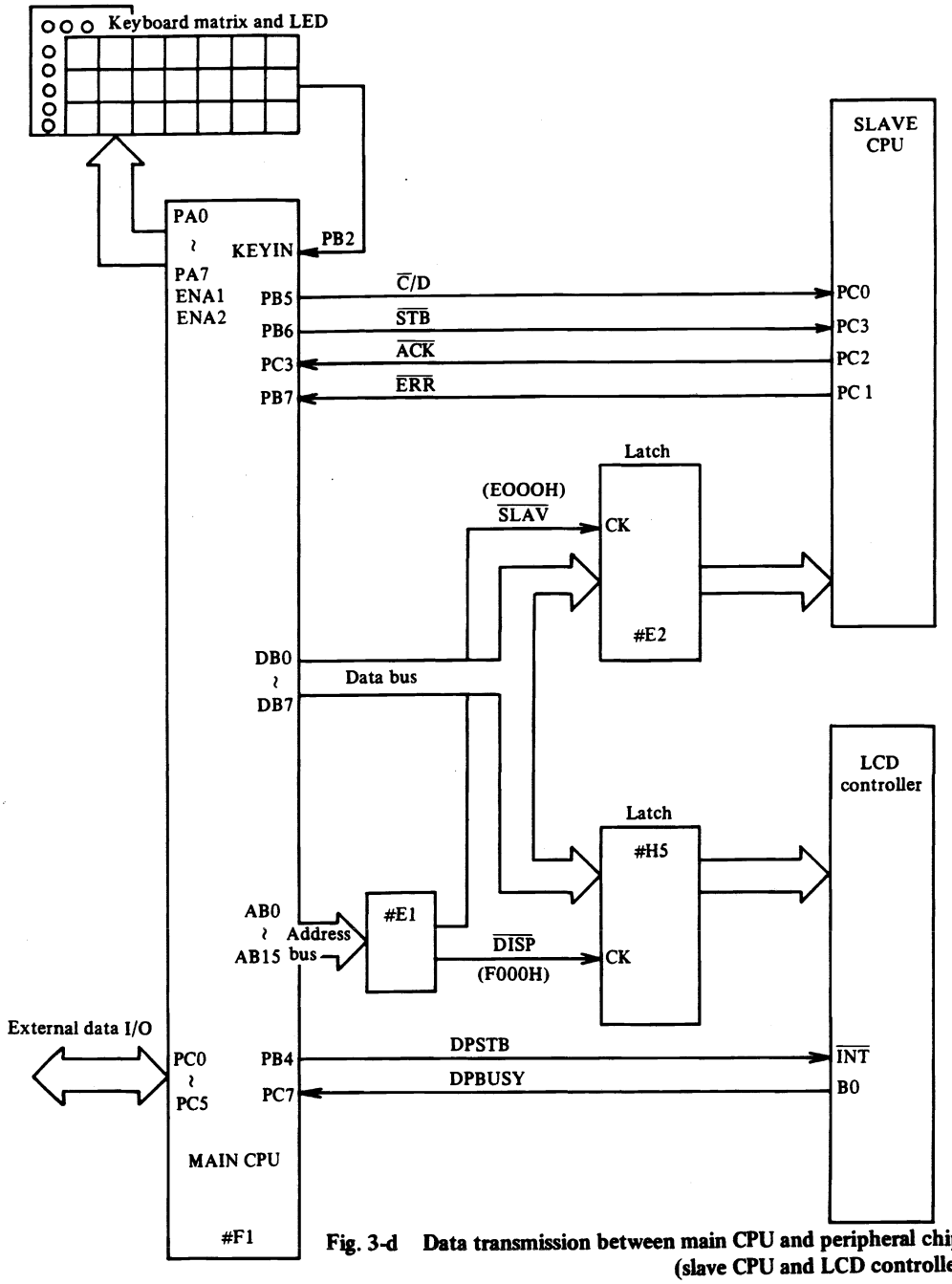


Fig. 3-d Data transmission between main CPU and peripheral chips (slave CPU and LCD controller)

Fig. 3-d shows the block diagram of the data transmission between the main CPU and the two peripheral devices (slave CPU and LCD controller).

3-5 Data transmission between main CPU and slave CPU

To control the wheel motor, carriage motor, line feed motor, hammer solenoid and cover interlock circuit, the main CPU sends a command (that specifies the actuator and its action) and a data (that specifies the movement distance, or magnitude of commanded action) to the slave CPU.
The slave CPU processes the command and the data to cause the commanded action to the actuator motor, solenoid, etc., or reset the circuits (when cover interlock switch "OPEN" command is given), or initialize the system for home position detection.
Before the main CPU sends a command to the slave CPU, it verifies that the command is acceptable to the slave CPU (the slave CPU is not "busy"), and selects the address "E000H". The command is entered in the latch #E2.
Next, PB5 of main CPU is pulled down to "LOW" to cause output of "LOW" (⌐⌐) signal from PB6 ($\overline{STB}$) to the slave CPU.
The slave CPU itself takes in the command from the latch #E2, and outputs "LOW" (⌐⌐) signal from its port PC2 ($\overline{ACK}$) to the main CPU to inform the main CPU that the command has been received and the next command and data are acceptable.

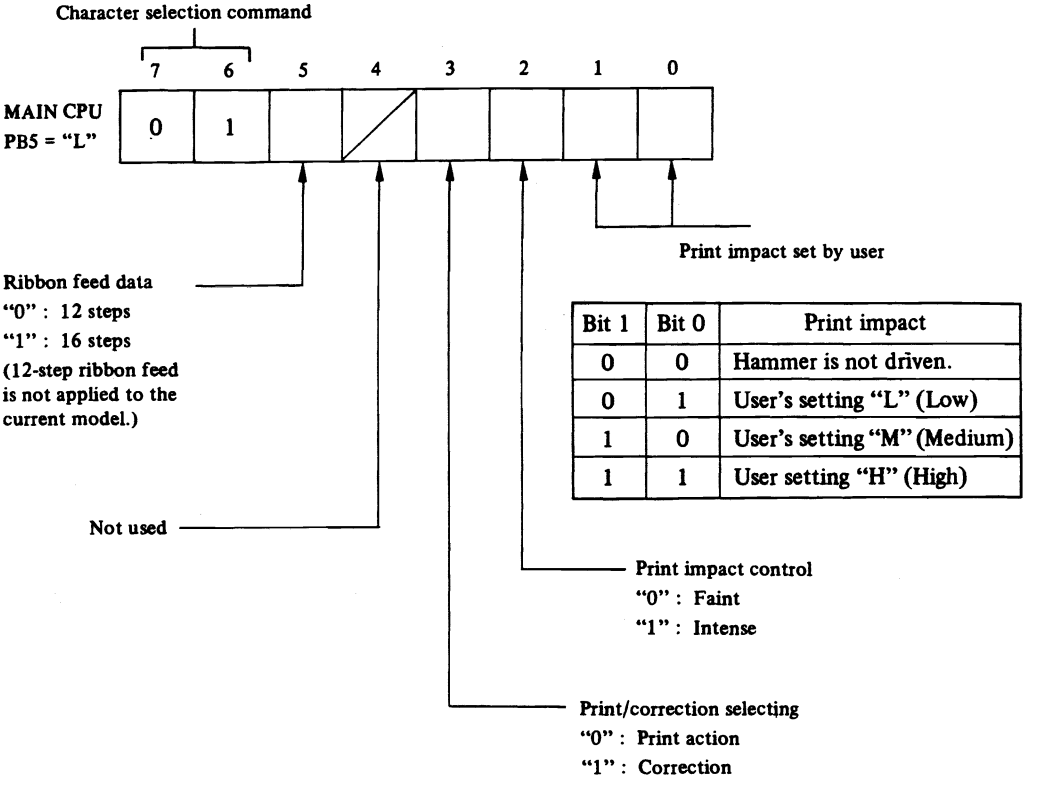
As for data, before the main CPU sends it to the slave CPU, the main CPU verifies that the data is acceptable to the slave CPU, and enters the data into the latch #E2.
Then PB5 of main CPU is pulled up to "HIGH" to cause output of "LOW" (⌐⌐) signal from PB6 ($\overline{STB}$) to the slave CPU.
With this "LOW" signal, the slave CPU takes in the data from the latch #E2.
When the data has been taken into the slave CPU, the slave CPU outputs "LOW" (⌐⌐) signal form PC2 ($\overline{ACK}$) to the main CPU.
The slave CPU processes the received command and data to control the actuator.
If the command or the data is false, or error occurs in connection with detection of home position, the slave CPU pulls down its PC1 output to "LOW" level to inform the main CPU of occurrence of error.

The commands and data sent from the main CPU to the slave CPU are as follows:

(1) Print command and data

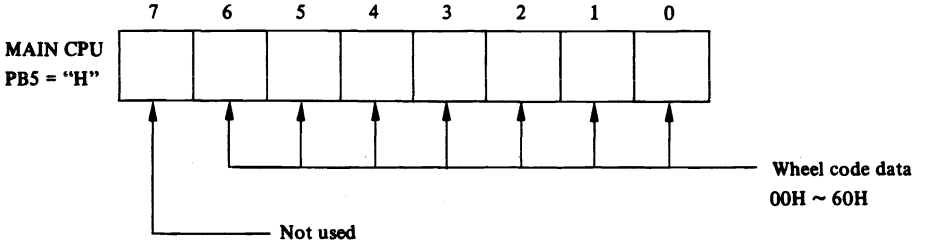
a) Print command

The main CPU sends the character selection command together with the ribbon feed data, impact control data and print/correction selecting data.



Bit 1	Bit 0	Print impact
0	0	Hammer is not driven.
0	1	User's setting "L" (Low)
1	0	User's setting "M" (Medium)
1	1	User setting "H" (High)

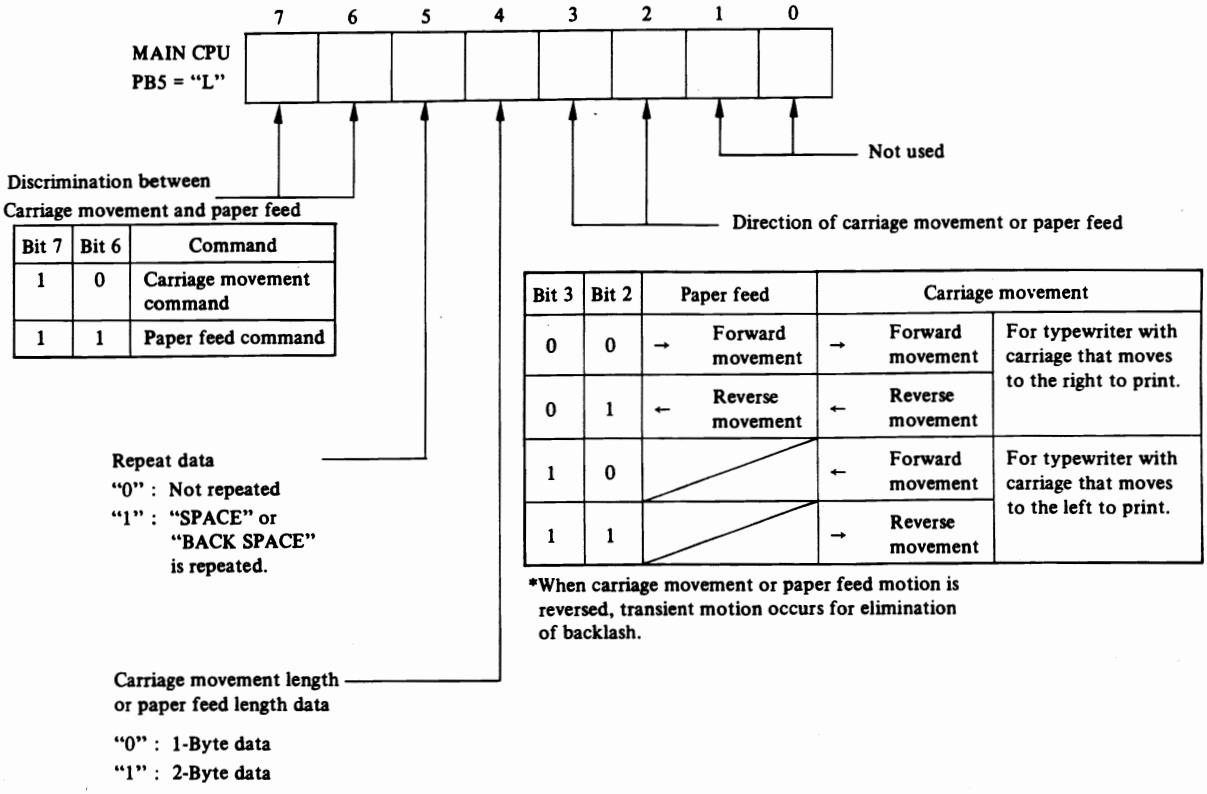
b) Print data



The above-mentioned command and data from a set of slave CPU drive data.

(2) Carriage movement and paper feed (line feed) commands and data

a) Carriage movement and paper feed commands

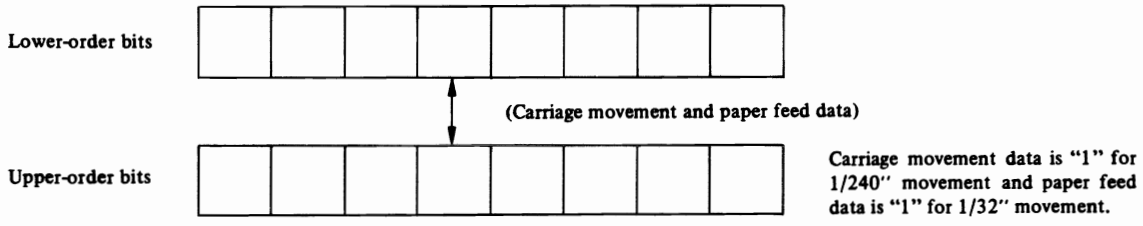


Bit 7	Bit 6	Command
1	0	Carriage movement command
1	1	Paper feed command

Bit 3	Bit 2	Paper feed	Carriage movement	
0	0	→ Forward movement	→ Forward movement	For typewriter with carriage that moves to the right to print.
0	1	← Reverse movement	← Reverse movement	
1	0		← Forward movement	For typewriter with carriage that moves to the left to print.
1	1		→ Reverse movement	

*When carriage movement or paper feed motion is reversed, transient motion occurs for elimination of backlash.

b) Carriage movement and paper feed (line feed) data



Note:

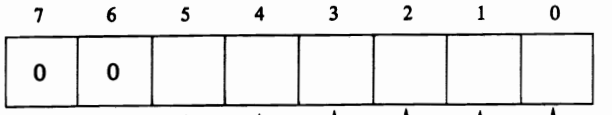
When the 4th bit of command is "0", only the lower-order data is sent to the slave CPU.

When the 4th bit of command is "1", the lower-order data as well as the upper-order data are sent to the slave CPU.

Therefore, two bytes or three bytes are sent at once to the slave CPU for command and data.

(3) Cover interlock, paper feed motor excitation and PA command and data

a) Cover interlock, paper feed motor excitation and PA commands



Cover interlock (cover switch "OPEN/CLOSE") command

Bit 1	Bit 0	Command
1	0	Cover is closed. Return to home position is commanded.
1	1	Cover is opened. Turning off the motor excitation is commanded.

The initial paper feed motor excitation phases immediately after the power is turned on and the cover is closed are determined.

Bit 3	Bit 2	Command
1	0	The initial motor excitation phases are "C-D" phases.
1	1	The initial motor excitation phases are "A-B" phases.

Port A (bit 5, 4) control command

Bit 5	Bit 4	Command
1	0	PA set to "L"
1	1	PA set to "H"

Discrimination between bit 5 and bit 4 is made by data.

b) PA command data (data is sent only for Port A set command)

	7	6	5	4	3	2	1	0
For PA5	0	0	1	0	0	0	0	0
For PA3	0	0	0	0	1	0	0	0

The slave CPU functions with these commands and data.
The main CPU⇔slave CPU interface protocols are shown in Fig. 3-e, f and g, where actual signal transmission sequences are exemplified.

Main CPU↔slave CPU interface protocol

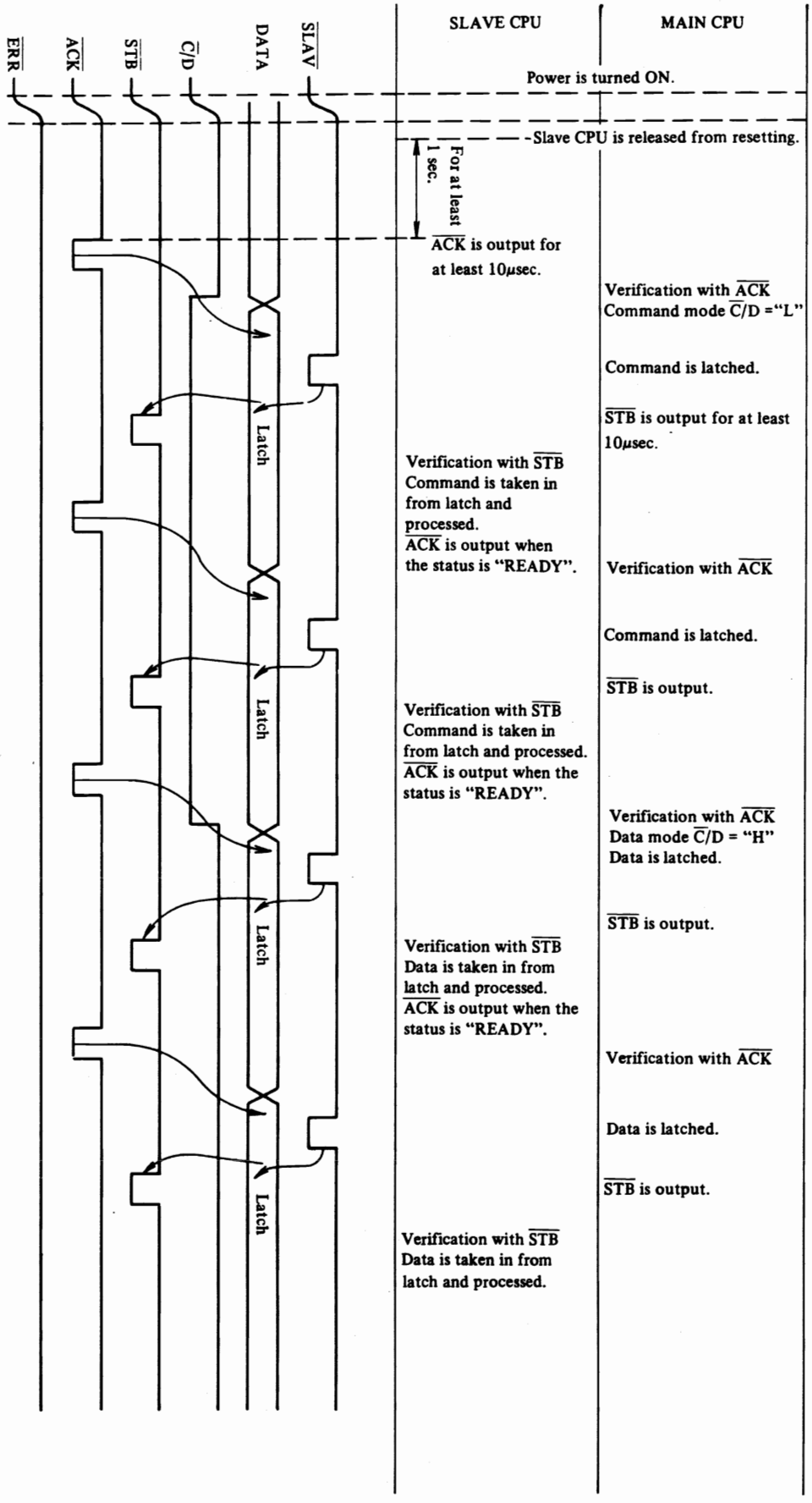


Fig. 3-e Main CPU↔slave CPU interface protocol – 1

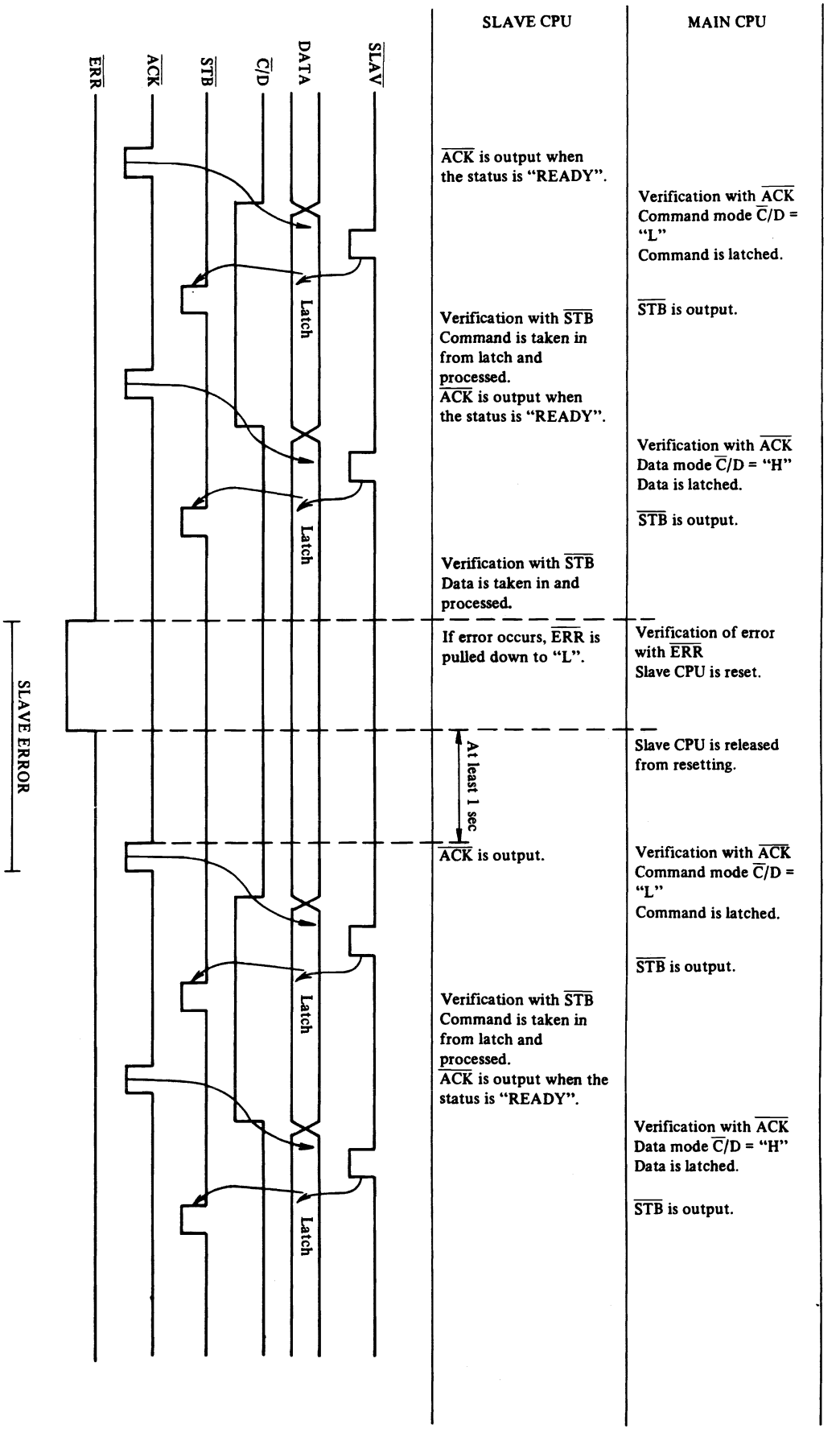


Fig. 3-f Main CPU←→slave CPU interface protocol – 2

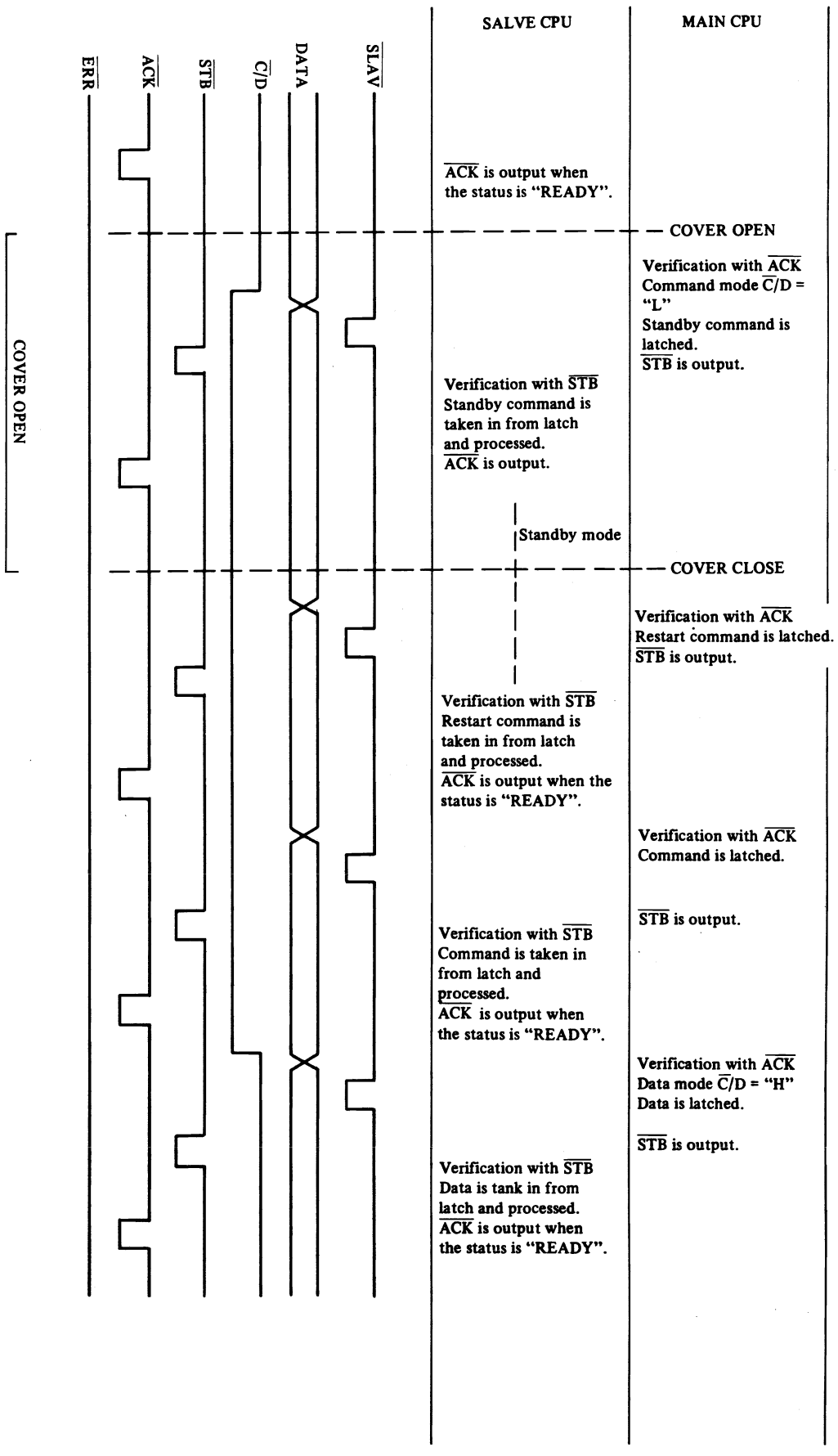


Fig. 3-g Main CPU↔slave CPU interface protocol – 3

3-6 Outline of operation

(a) Outline of print operation

Fig. 3-h shows the flowchart which presents one cycle of operation starting from the keyboard scanning by the main CPU and ending with printing of character.

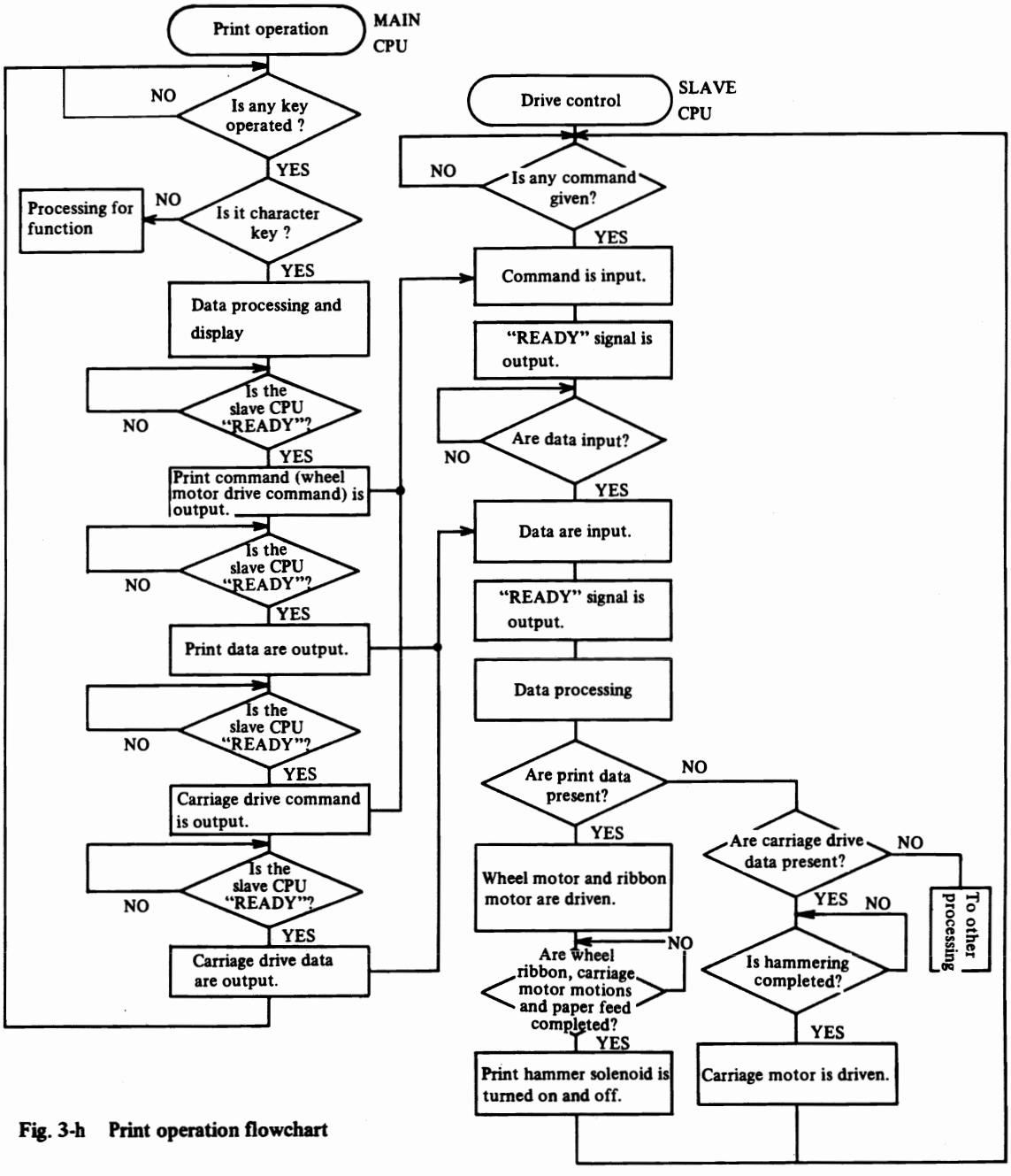


Fig. 3-h Print operation flowchart

b) Outline of correcting operation

For erasure of a false character, hammering occurs 4 times successively.
The outline of data/signal transmission between the main CPU and the slave CPU for correction is shown in Fig. 3-i in the form of flowchart.

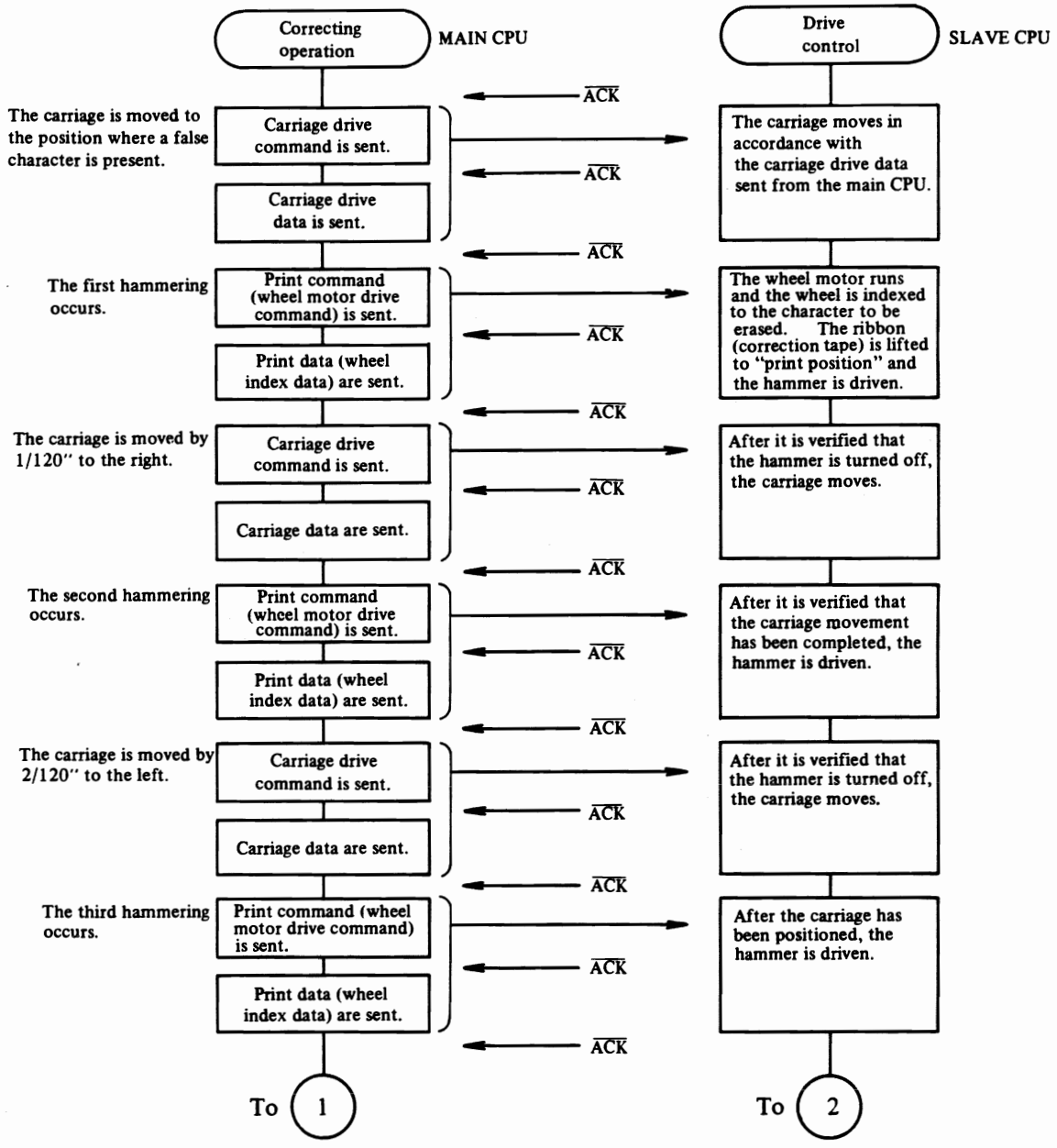


Fig. 3-i Correcting operation flowchart

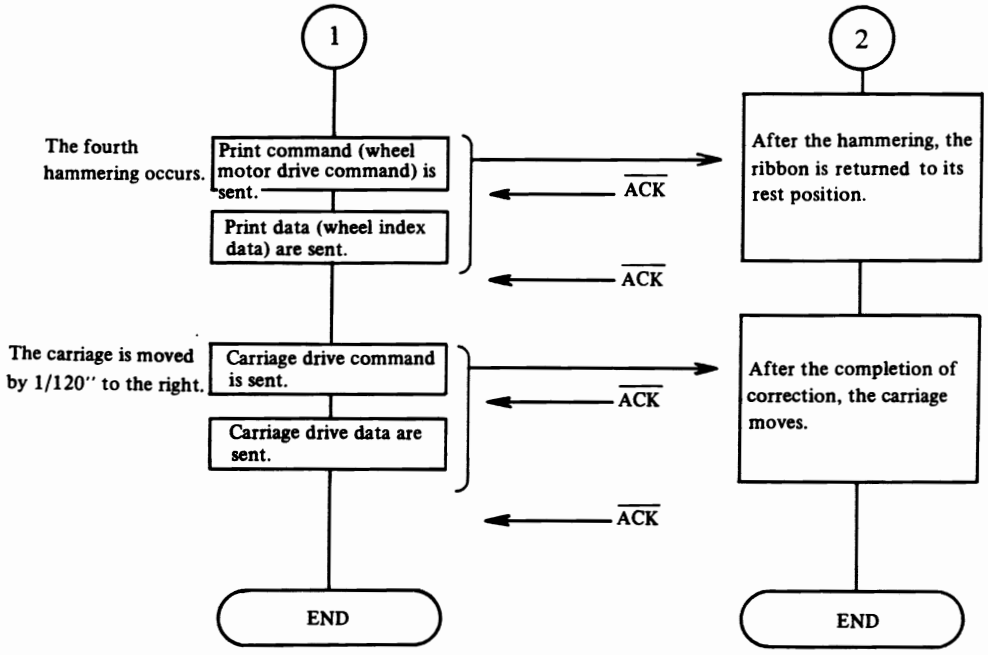
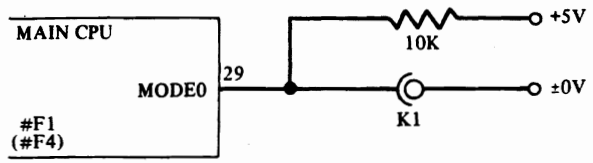


Fig. 3-i Correcting operation flowchart

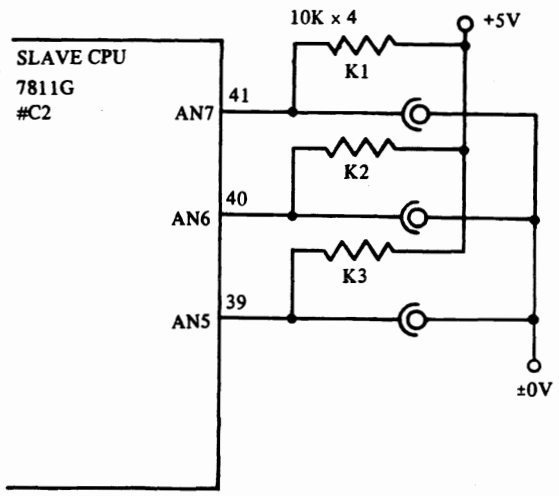
When the slave CPU becomes ready for accepting the next command and/or data, it sends $\overline{ACK}$ signal to the main CPU and the main CPU sends, in reply to the $\overline{ACK}$ signal, the command and data to the salve CPU.

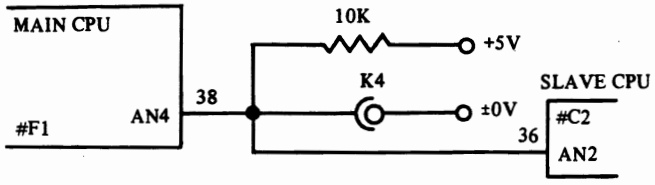
3-7 Change of specification (1)

Many patterns ( ) are provided on the logic control circuit board (B482091). They are called "solder point", and selectively closed by soldering to change specification. That is, the system program that the main CPU executes depends on setting of each solder point.

<table>
<tr><td rowspan="2">B482091
solder point
address</td><td colspan="2">Circuit configuration</td></tr>
<tr><td>Solder point not closed</td><td>Solder point closed</td></tr>
<tr><td>K 5</td><td colspan="2"> 
</td></tr>
<tr><td></td><td>The program stored in the main CPU internal ROM (4 Kbytes) is not executed.</td><td>The program stored in the main CPU internal ROM (4 Kbytes) is executed.</td></tr>
<tr><td>K1

K2

K3</td><td colspan="2"> 
</td></tr>
</table>

B482091 solder point address	Circuit configuration	
	Solder point not closed	Solder point closed
	When K4 of AN5 is not closed, the normal ribbon motor drive program is used.	When K4 of AN5 is closed, the ribbon motor runs at lower speed, but with larger torque.
	When K2 of AN6 is not closed, the normal paper feed motor drive program is executed (speed fixed to 397 PPS).	When K2 of AN6 is closed, the paper feed motor runs at speed higher than the programmed speed.
	When K1 of AN7 is not closed, the normal carriage drive program is used.	When K1 of AN7 is closed, the carriage motor runs at lower speed, but with larger torque.
K4		
		The program specified for X67 and X68 are used.

*For products, only K4 has been closed.

3-8 Change of specification (2)

Font can be changed by selectively closing solder points S1 ~ S6.

Each font and the solder point settings required for that font are shown in Fig. 3-l.

Is is also possible to select "NORMAL", "INTERNATIONAL" or "SYMBOL" by changing the setting of KB switch (SW1) on the keyboard circuit board.

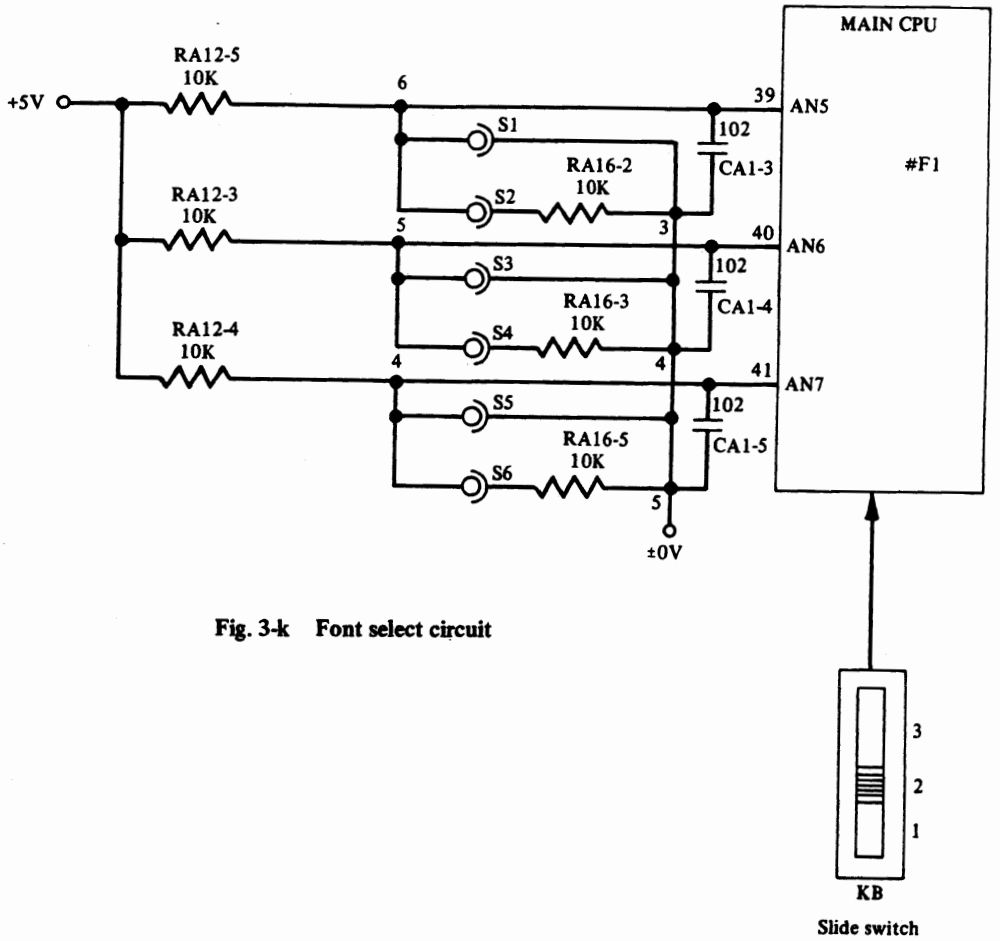


Fig. 3-k Font select circuit

KB

Slide switch

Font	S1	S2	S3	S4	S5	S6
American English for U.S.A.						
American English for EC		O				
Canadian English/French	O					
King's English				O		
German		O		O		
Italian	O			O		
Japanese English			O			
Kana/English combination		O	O			
Spanish-American	O		O			
Spanish-American for Chile						O
Norwegian		O				O
Danish	O					O
French				O		O
Dutch		O		O		O
S. Spanish	O			O		O
Afrikaans			O			O
Swiss German/French		O	O			O
–	O		O			O
Swedish					O	
Finnish		O			O	
Portuguese	O				O	
Katakana				O	O	
Latin/Greek		O		O	O	
Cypriot	O			O	O	
Icelandic			O		O	
Turkish		O	O		O	
Russian	O		O		O	

Notes: 1. "O" shows that the solder point is closed.

Fig. 3-1 Font setting table

3-9 Analog input (voltage regulation)

Among the power supply voltages used in the unregulated 30V and 12V on which the motors and the solenoid are operated.
Voltage change of the 30V and 12V supplies, caused by change of the line power source voltage, adversely affects performance of motors and solenoid.
To solve such a problem, an A/D converter incorporated in the slave CPU is used to measure the 30V supply (AN3), and to control the motors and the hammer in accordance with the measured result.

The following variables are under the control of the A/D converter (slave CPU).

1. 30V/12V duty ratio during wheel motor operation.
2. 30V/12V duty ratio during carriage motor operation.
   (only when the carriage motor is driven in "1-2" phase excitation)
3. Hammer energizing time

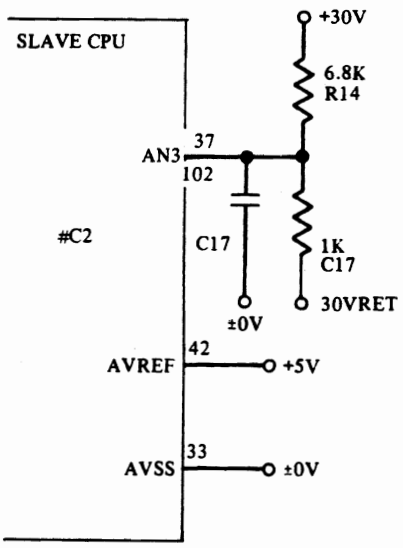


Fig. 3-m Voltage regulation circuit

The +30V supply is divided by resistors of 8Kohm and 1Kohm and the divided voltage is input to the main CPU through AN2. The main CPU compares the input voltage with the reference voltage AVREF to measure the input voltage and assigns the result to any one of the five levels (voltage ranges) for control of the above-listed three variables.

Level	Input voltage range
1	0 ~ 25.9 V
2	26 ~ 29.9 V
3	30 ~ 33.9 V
4	34 ~ 37.9 V
5	38 ~

Fig. 3-n List of voltage levels

When the measured voltage is cross to a boundary, error by one level may occur.
However, such an error may not cause a problem.

4. Motors and solenoid

4-1 Control of wheel motor

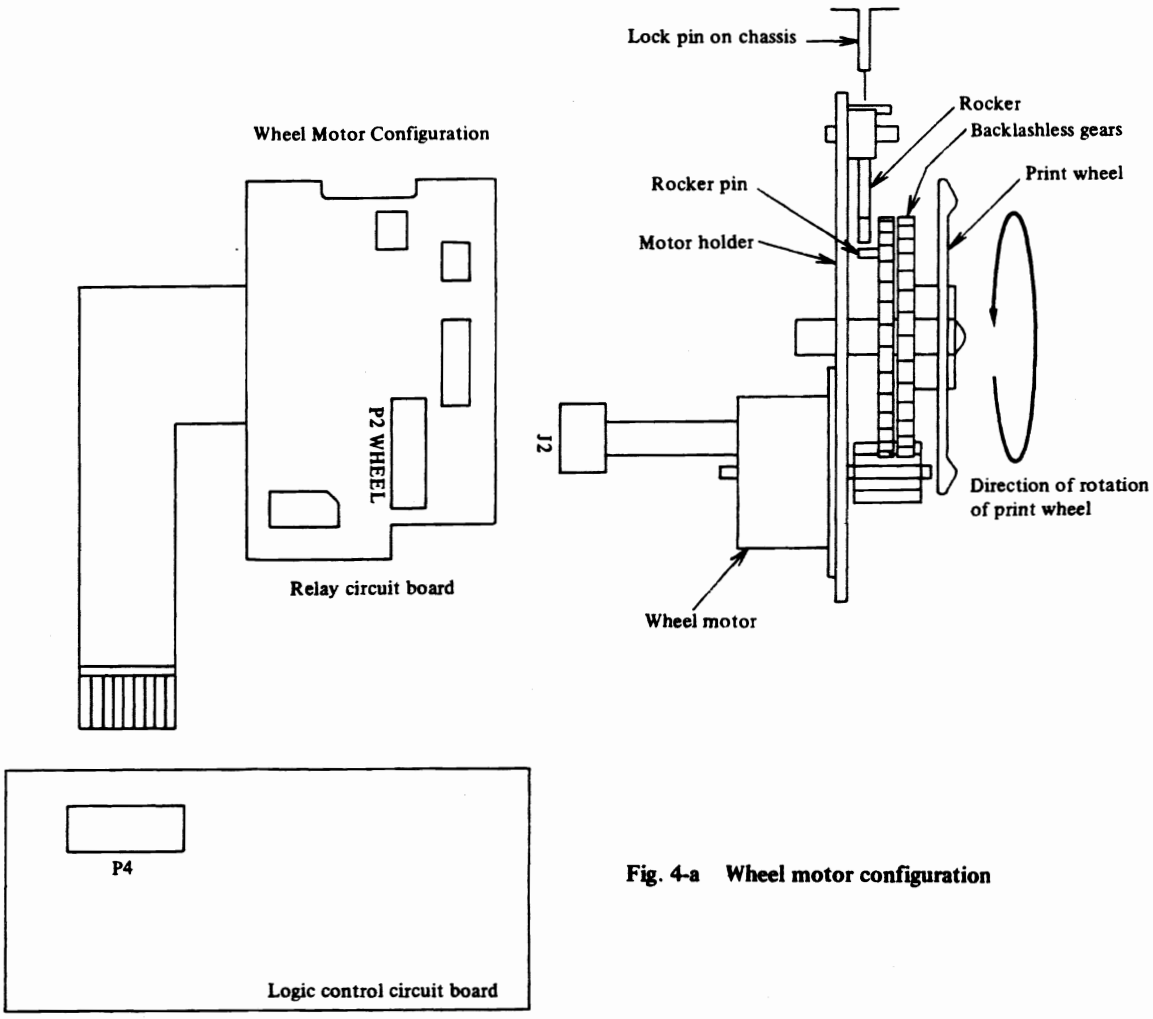


Fig. 4-a Wheel motor configuration

Fig. 4-a shows the wheel motor configuration. The wheel motor is indexed to the home position (print start position) as follows:

When the power is turned on, the carriage moves to the left, viewed from the front, and the rocker strikes against the lock pin, whereby the rocker is levered up by the lock pin. When the wheel motor starts rotating clockwise with the rocker levered up, the rocker pin strikes against the rocker and forcedly locks the motor. Then the motor starts rotating counterclockwise (in "1-2" phase excitation). When the motor stops in 24 steps, the wheel motor is indexed with the print wheel character element "," positioned at the top (just behind the hammer).

The wheel motor drive pulses are transmitted from the logic control circuit board to the wheel motor through the relay circuit board.

4-2 Wheel motor driver circuit

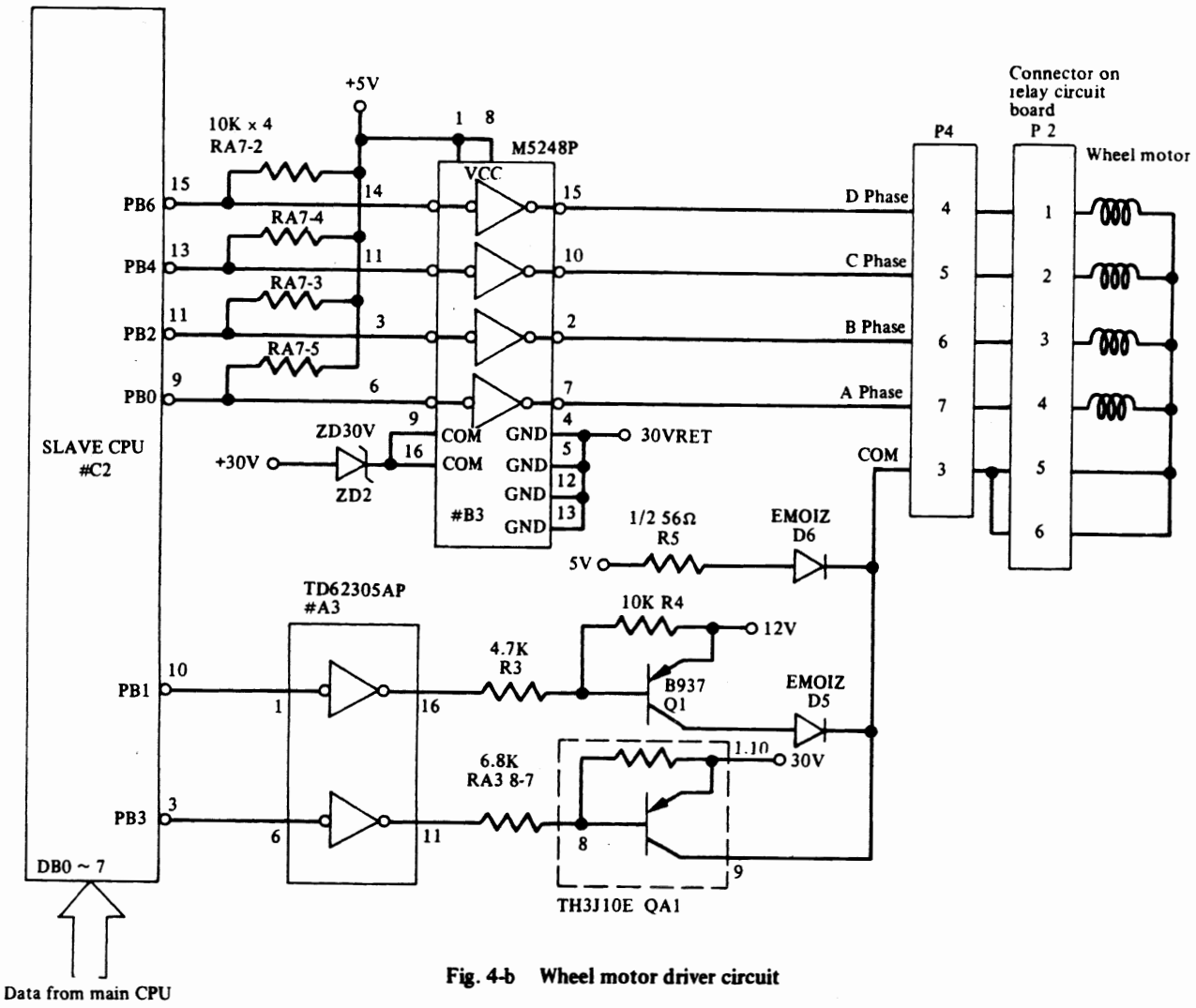


Fig. 4-b Wheel motor driver circuit

For wheel motor, a 4-phase PM type (Permanent Magnetic type) stepping motor is used.
The slave CPU is receives the data sent form the main CPU, and converts the data into the drive signals which are given to the phases of wheel motor through the driver array to drive the motor.
Two power supplies, DC+30V and +12V, are used to drive the wheel motor. When the motor is not running, +5V is applied to the motor through a resistor of 56 ohms for faint excitation of the motor.
Switching of the power supply is under the control of the slave CPU.

While the wheel motor is on standby, the slave CPU pulls up PB1 and PB3 outputs to "H" (5V).
TD62305 is a buffer that converts the PB1 and PB3 outputs into 12V and 30V, and sends these voltages to B937 and TH3J10E.
Since B937 and TH3J10E are "active LOW", the 12V and 30V supplies are turned off, while the wheel motor is on standby, and the 5V supply connected to "COM" terminal of motor through resistor R5 is applied to the motor phases being excited.

To run the wheel motor, the data of required rotational angle is sent from the main CPU to the slave CPU which in turn processes that data to drive the wheel motor.
The wheel motor operates on the 30V and 12V supplies under "overvoltage" control.
The duty ratio of 30V supply to 12V supply is determined by the slave CPU when the 30V is input to the slave CPU (refer to the description about analog signal input).

The data of excitation phases of hweel motor is given to the motor through driver array M5248P.
The drive array M5248P is "active LOW". Therefore its output falls to "L" when the corresponding input (from the slave CPU) is "L". When an output of M5248P falls to "L", the current flows from the COM terminal to the phase connected to that output line and the motor phase is excited.

When the motor is operated on the 30V supply, the slave CPU pulls down PB3 to "L" to turn on TH-3J10E, thus the 30V is applied to the "COM" terminal of motor.
When the motor is operated on the 12V supply, the slave CPU pulls down PB1 to "L" to turn on B937, thereby the 12V is applied to the "COM" terminal of motor.

Each one diode EM01Z is inserted in the 5V line and the 12V line to prevent voltage of higher than 5V or 12V, if arises in each line, from being applied to the respective power supplies.

The phase excitation sequence depends on number of motor motion steps (i.e. wheel rotational distance) as follows:

For wheel rotation up to 14 characters → "1-2" phase excitation

For wheel rotation over 14 characters → "2-2" phase excitation

The motor energizing time is prolonged to enhance the motor torque if the real voltage of the 30V supply applied to the motor is lower than 30V, and shortened to suppress temperature rise of the motor if the real voltage is higher than 30V (refer to 3.5 "Analog input").
To change the motor energizing time in accordance with the input voltage, a duty ratio is selected from five duty ratios which differ from each to other in voltage waveform.
The description is given here with an example to explain how the voltage waveform is changed to change the motor energizing time.
In this example, three waveforms are shown and the motor is operated in "2-2" phase excitation.
The waveforms shown below will be observed when an oscilloscope is applied to the COM terminal (pin No. 3 of head connector P4).
From the waveforms, it is obvious that the width of pulse at each phase does not basically differ even when voltage level changes. However, the duty ratios at 30V and 12V are changed in accordance with the input voltage change.

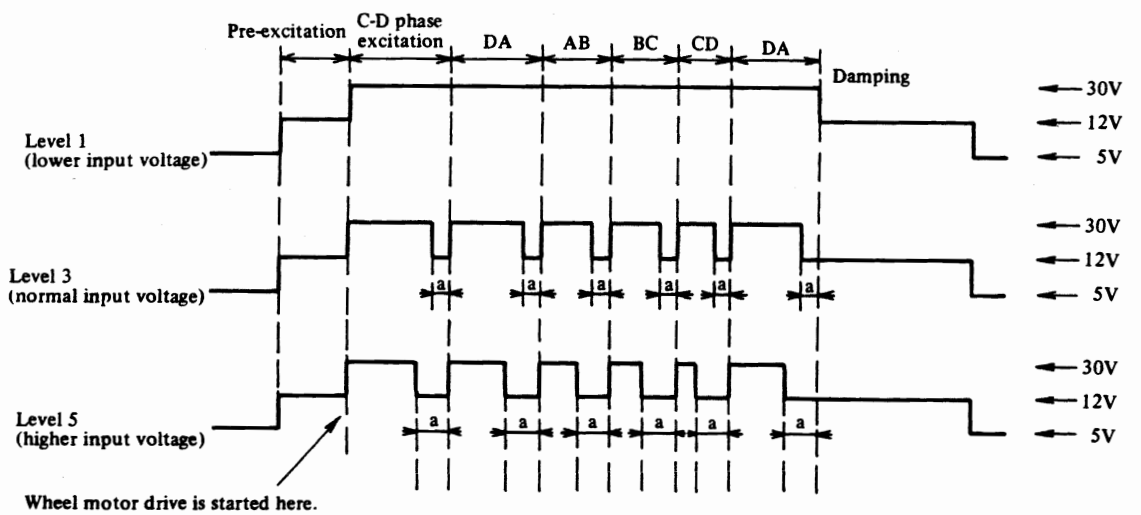


Fig. 4-c Change of voltage waveform in accordance with input voltage change

4-6 Carriage motor drive circuit

The excitation method of the carriage motor depends on the carriage traverse distance.
"2-2" phase excitation is adapted when carriage movement is larger than 33/120". Otherwise, "1-2" phase excitation is adapted.
In the case of "2-2" phase excitation, one pulse causes 1/60" carriage movement.
Fig. 4-ℓ shows the carriage motor driver circuit and the carriage index switch circuit.
To drive the carriage motor, the main CPU sends the data to the slave CPU.
The carriage motor operates on DC+30V and DC+12V supplies.
The +30V is applied to the carriage motor when the slave CPU pulls down PC6 to "L" to turn on TH-3J10E. When PC6 is "H", TH3J10E turns off and the +12V is applied to the motor through diode S2V-10.

If the next key-in data is given within about 500msec after the preceding carriage movement has been completed, all phases of carriage motor are cut off from the excitation.
The excitation phases (A phase, B phase, C phase and D phase) of carriage motor are connected to PF0, 2, 4 and 6 of slave CPU respectively. When any one of outputs (PF0, 2, 4 and 6) falls to "L", the internal semiconductor or FT5763, connected to that outport, turns on and the current flows from the "COM" terminal of motor to the FT5763, thereby the corresponding phase is excited.

In the case of "2-2" phase excitation, the carriage motor operated only on the +30V supply.
When the carriage motor is operated in "1-2" phase excitation sequence, it is under "overvoltage" control and the duty ration of +30V to +12V is determined in accordance with the voltage change of the input 30V supply, and read by the main CPU (refer to the description about analog input value), like the case with the wheel motor.

In the case of the carriage motor, the width of 30V pulse is changed with change of the input voltage.

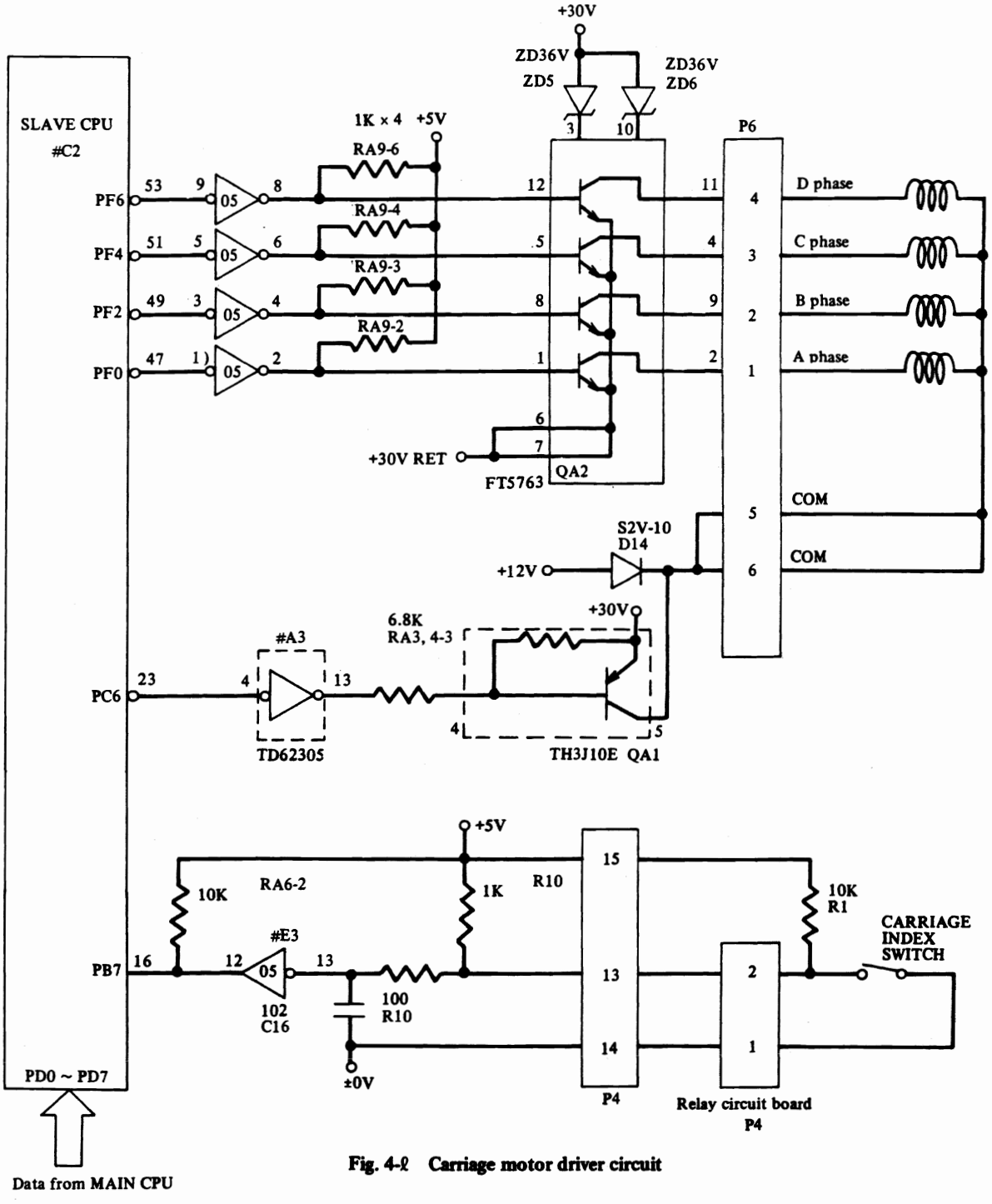
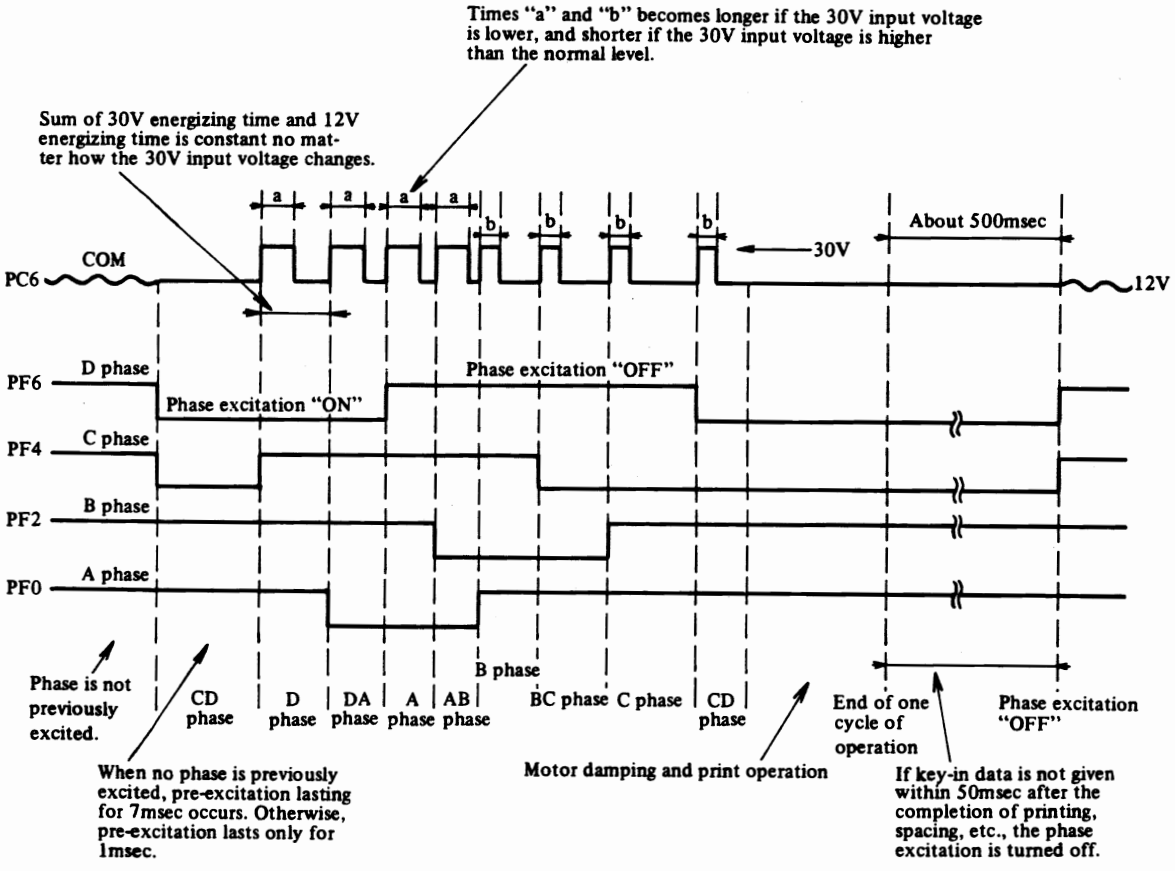


Fig. 4-ℓ Carriage motor driver circuit

If the input 30V voltage is lower than the normal level, the 30V motor energizing time (pulse width of 30V supply) is prolonged to enhance the motor turque.
If the input 30V voltage is higher than the normal level, the 30V motor energizing time is shortened to suppress temperature rise of the motor.
The motor is gradually accelerated for smooth start, and gradually decelerated for smooth stop both in the "1-2" and "2-2" phase excitations.
Fig. 4-m shows an example of "1-2" phase excitation for Micron-pitch movement of the carriage motor and Fig. 4-n shows an example of "2-2" phase excitation for tabulation.



Note: Micron-pitch (8 steps) print operation is exemplified here.

Fig. 4-m "1-2" phase excitation Micron-pitch movement of carriage motor

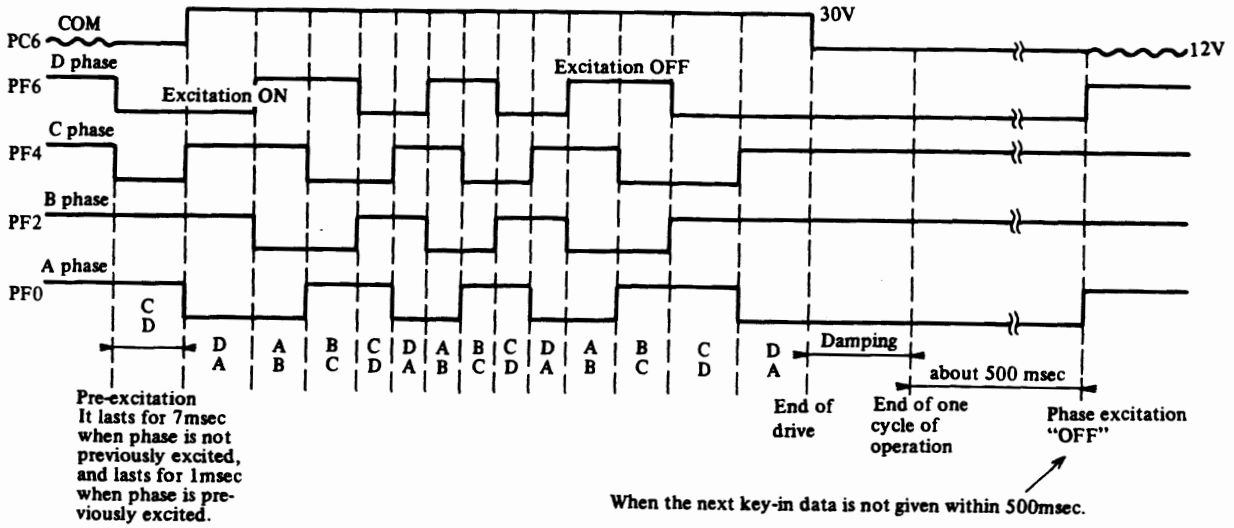


Fig. 4-n "2-2" phase excitation for tabulation

4-7 Function of carriage index switch

When the print head goes on moving to the left, the carriage index switch (micro switch) is closed at the left end. When the switch closes, the input of 74LS05, #E3, is pulled down to "L" and the PB7 of slave CPU is pulled up to "H", whereby the print start position is determined.

4-8 Control of line feed motor

(1) Line feed motor configuration

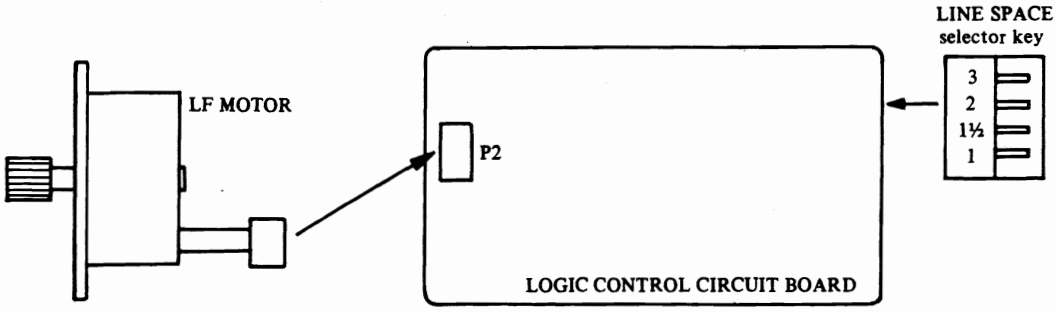


Fig. 4-o Line feed motor configuration

The line feed motor is driven on the 30V power supply in "1-2" phase excitation alone.
The minimum length of line feed is equal to 1/6". The line feed motor rotates by 32 steps for line feed of 1/6". The line feed length varies depending on the setting of the LINE space selector key and key operation, as shown below.

LINE space selector key setting	Line feed length	Number of pulses	Time necessary for line feed
1	1/6"	32	80.97 msec
1½	1/4"	48	121.29 msec
2	1/3"	64	161.56 msec
3	1/2"	96	242.2 msec
Key operation setting	**Line feed length**	**Number of pulses**	**Time necessary for line feed**
⇑ or ⇓	1/12"	16	40.6 msec
CODE + ⇑ or ⇓	1/48"	4	10.36 msec

Note: 1 step for acceleration ..... 3.42 msec (292pps)
Regular speed ..... 2.52 msec (397pps)
1 step for deceleration ..... 1.95 msec (637pps)

Fig. 4-p Line feed data table

4-9 Line feed motor driver circuit

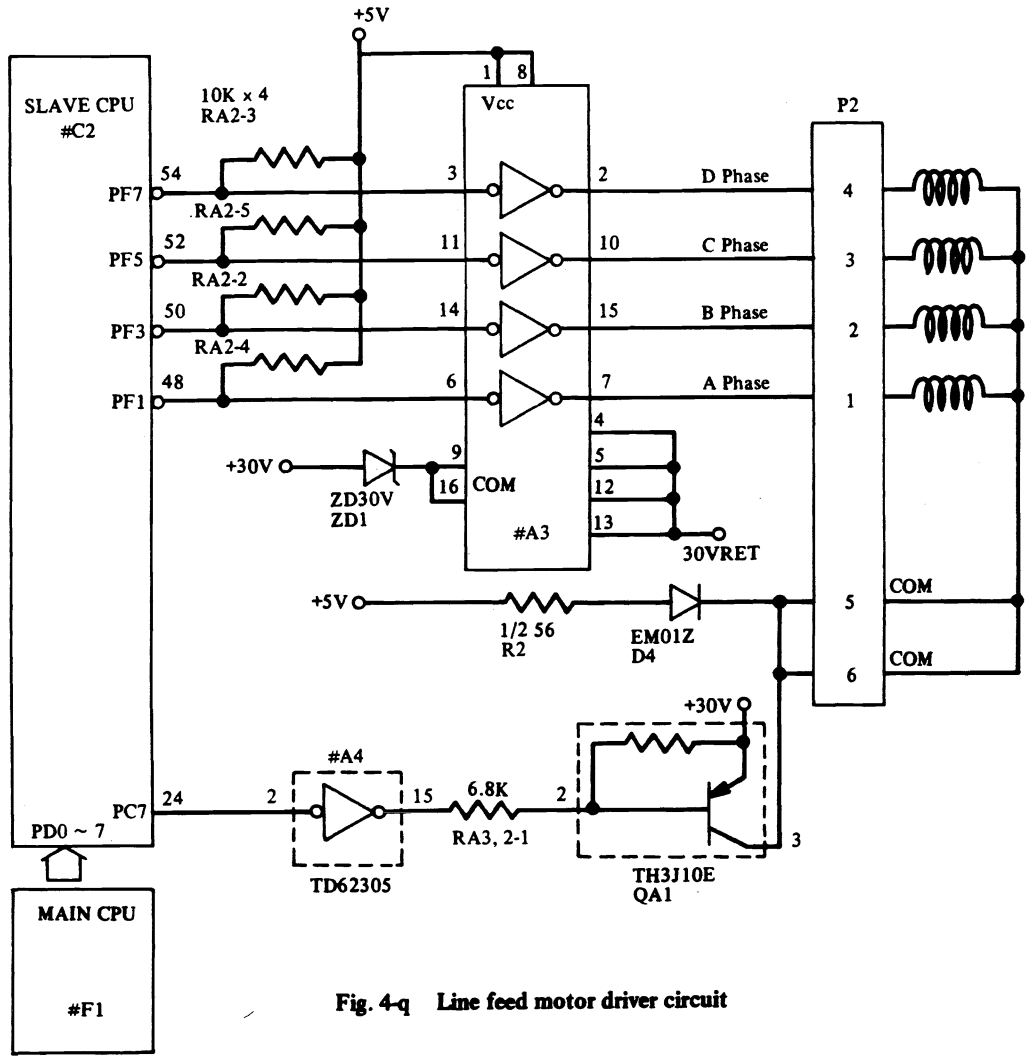


Fig. 4-q Line feed motor driver circuit

Fig. 4-q shows the line feed (paper feed) motor driver circuit.

The excitation phases (A, B, C and D phases) of the motor are connected to PF1, 3, 5 and 7 pins of slave CPU respectively and the excitation phase sequence is controlled in accordance with the data from the main CPU by the slave CPU.

To drive the motor, the output on PC7 of slave CPU is pulled down to "L" and therefore QA1 turns on permitting the current to flow from the "COM" terminal into the motor.

When the motor is stopped, QA1 turns off and the 5V supply is applied to the motor through the resistor R2 and the diode D4. With the 5V supply, the current flows into the phases connected to the "L" outputs of slave CPU, and holds the motor under standby condition.

When the paper feed motor shaft is indexed to its home position, the motor is excited in C-D phases or A-B phases.

Under "memory down" condition, the C-D phases are the initial excitation phases. When the memory is active, (backed up by battery), however, the phases that were excited before the top cover is open, or before the power is turned off, are the excitation phases (that is, the phases being excited before the motor is stopped are hold).

The following chart shsows an exemple of phase excitation sequence, where paper is fed by 1/6" with the line feed selection "1" and the RETURN key is pressed to advance the paper.

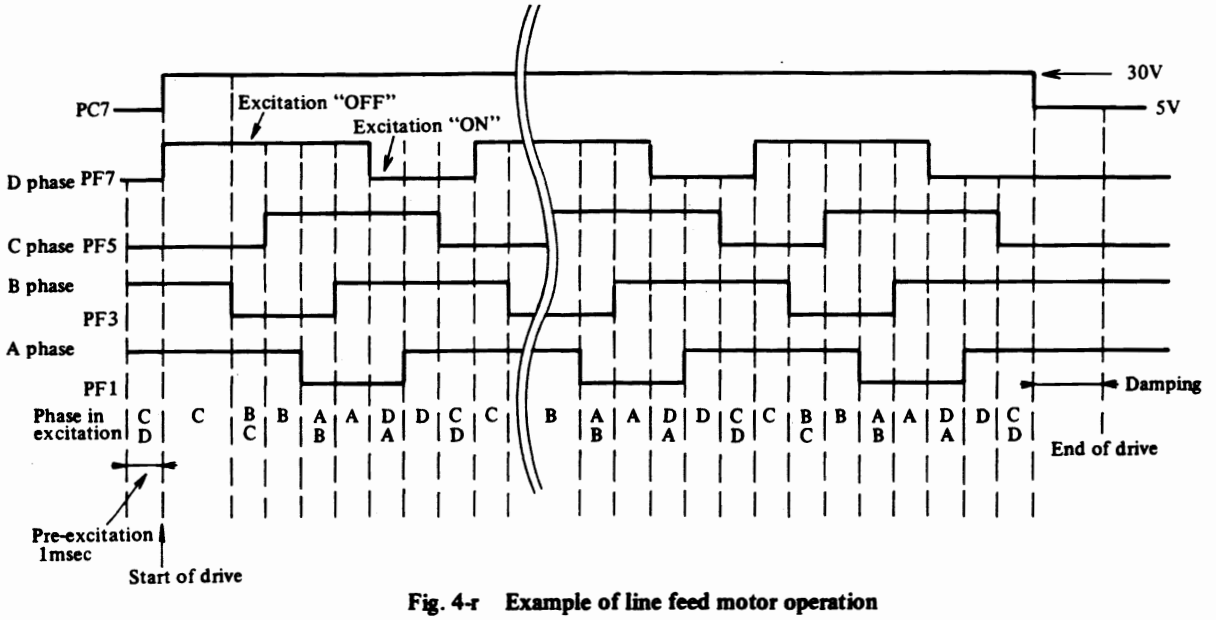


Fig. 4-r Example of line feed motor operation

4-10 Control of ribbon motor

Ribbon motor configuration

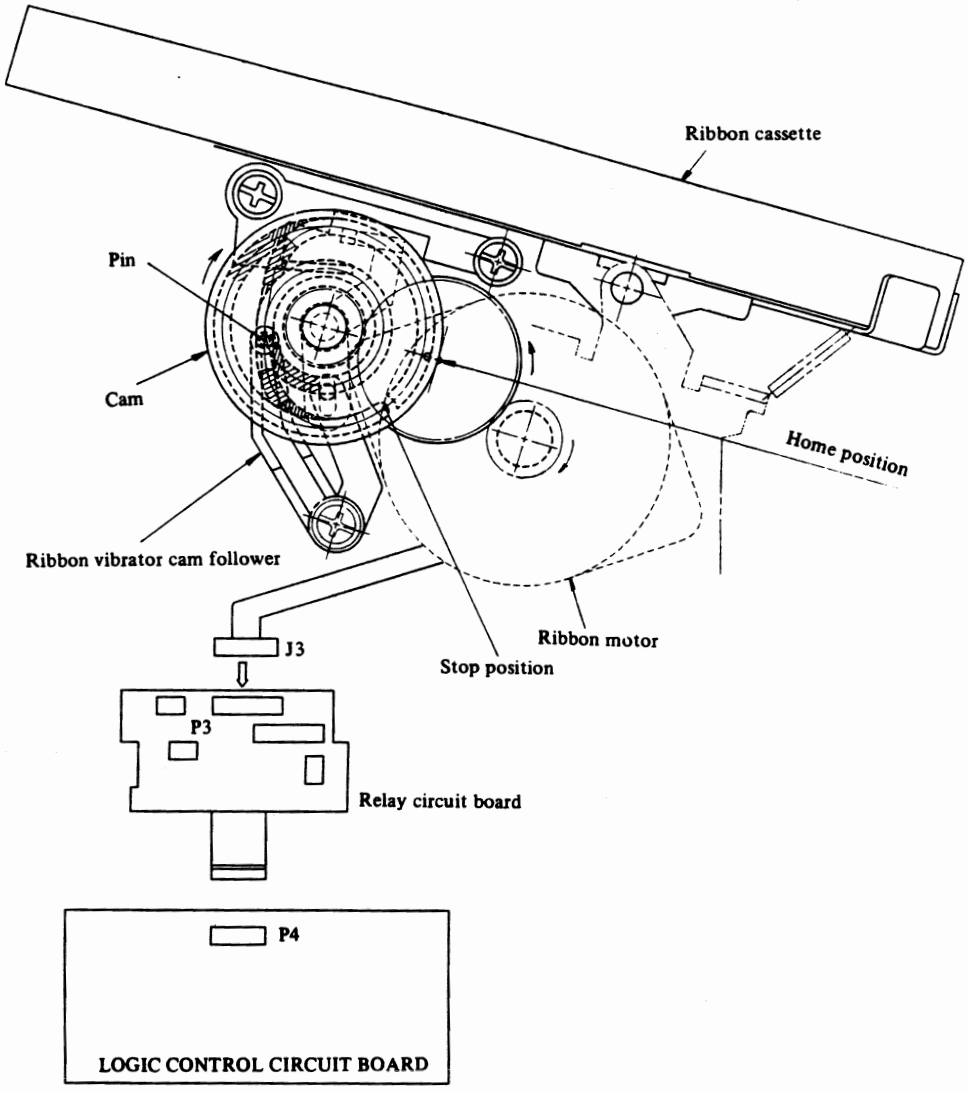


Fig. 4-s Ribbon motor configuration

Fig. 4-s shows the ribbon motor configuration.

When the ribbon motor rotates clockwise, viewed from the motor front, the vibrator cam rotates in the direction revers to that for normal printing (vibrator "DOWN" direction), and stops when the pin of the vibrator cam follower comes to the stop position on the cam (the ribbon motor comes to stall).
The ribbon motor shaft is indexed with the A-B phases nearest to the stall position.
The vibrator itself is indexed to its home position when the ribbon motor is rotated by 34 steps counter-clockwise from the ribbon motor shaft home position and then returned by 20 steps.
When the motor is on standby, the ribbon motor and the vibrator rest at the respective home positions.

The ribbon motor is driven in "2-2" phase excitation except when it is indexed to its home position (the motor is excited in "1-2" phase sequence when it is indexed).

When key in data is given, the ribbon motor rotates by 20 steps (in "2-2" phase excitation), no matter what is the size of character to be printed, to lift the vibrator to the print position.
When the next key-in data is succesively given, the motor rotates by 16 steps, no matter what is the size of character to be printed, to hold the vibrator at the print position.

However, if the next key-in data is not given within 120msec after the first printing, the vibrator automatically returns to its home position.

For correction, the motor rotates by 12 steps to let down the ribbon, and then rotates by 42 step to lift the vibrator so that the correction tape is located to the print position.
After the correction, the motor rotates by 30 steps to lower the vibrator to the home position.

When the vibrator goes down the correction tape is wound.
In the case of printing, the ink ribbon is wound when the vibrator goes up.

4-11 Ribbon motor driver circuit

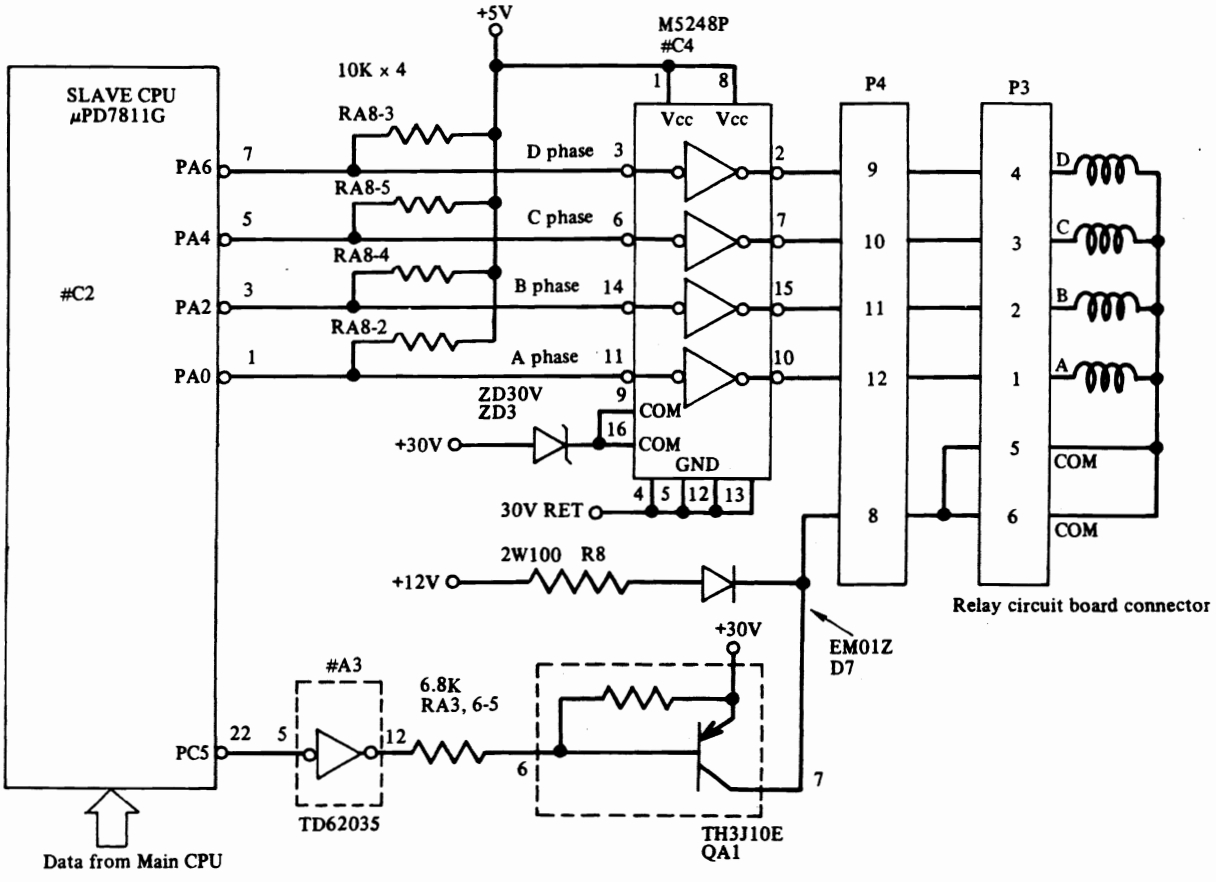


Fig. 4-t Ribbon motor driver circuit

Fig. 4-t shows the ribbon motor driver circuit.

The ribbon motor is driven under the control of the slave CPU and the transistor array #C4.
The motor operates on the +30V supply.
To drive the motor, PC5 of slave CPU is held "L" to turn on the TH3J10E which in turn permits the current to flow into the motor.
When the motor is on standby, PC5 of slave CPU is held "H" and the TH3J10E is turned on, thereby the +12V supply is applied to the motor through resistor of 100 ohms (2W).
This resistor is provided to suppress temperature rise of the motor on standby.
The motor phase excitation sequence is controlled by the outputs from PA0, PA2, PA4 and PA6 of slave CPU.
The phase connected to "L" output is excited.

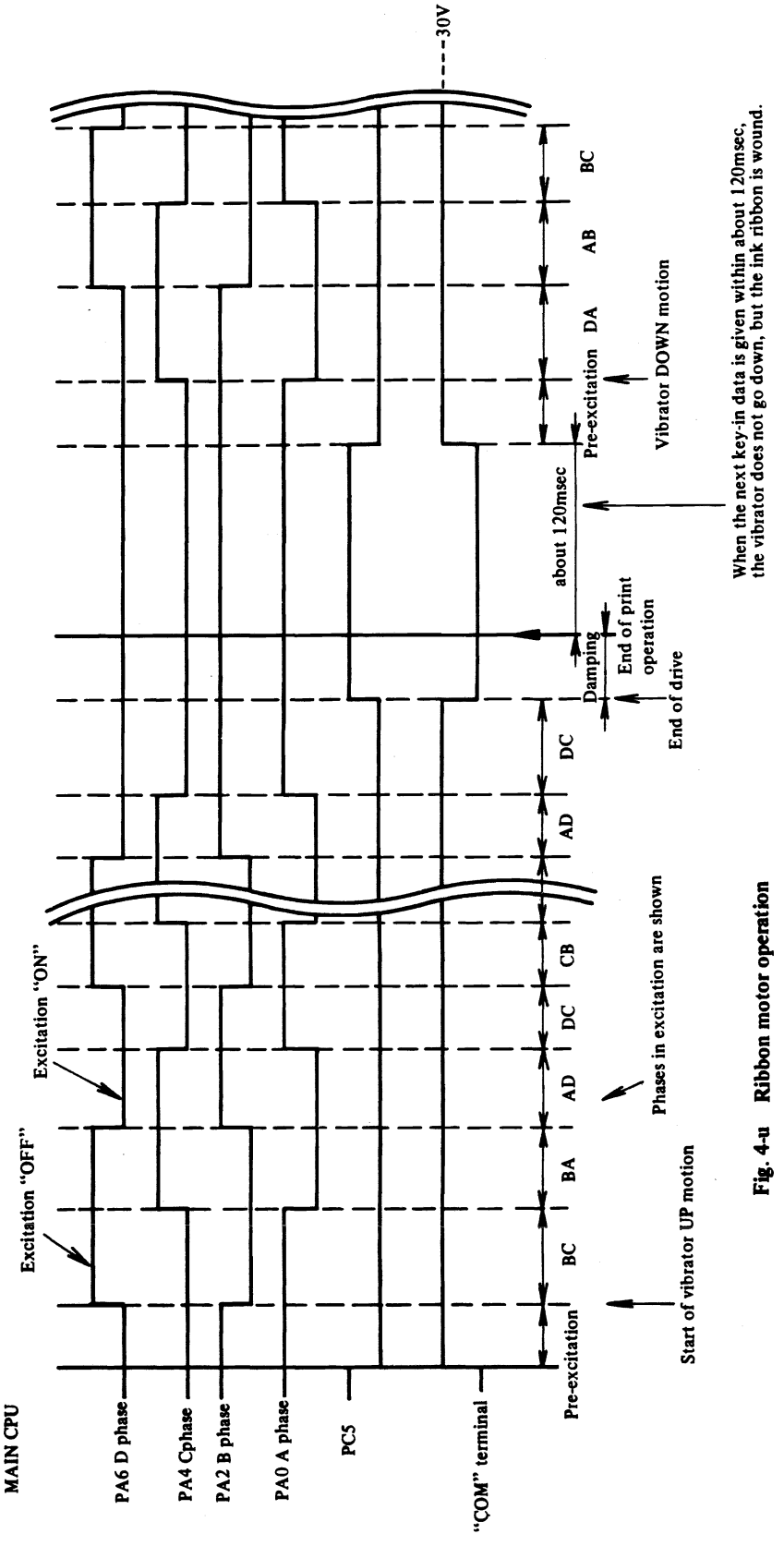


Fig. 4-u Ribbon motor operation

5. Keybaord

5-1 Keyboard configuration

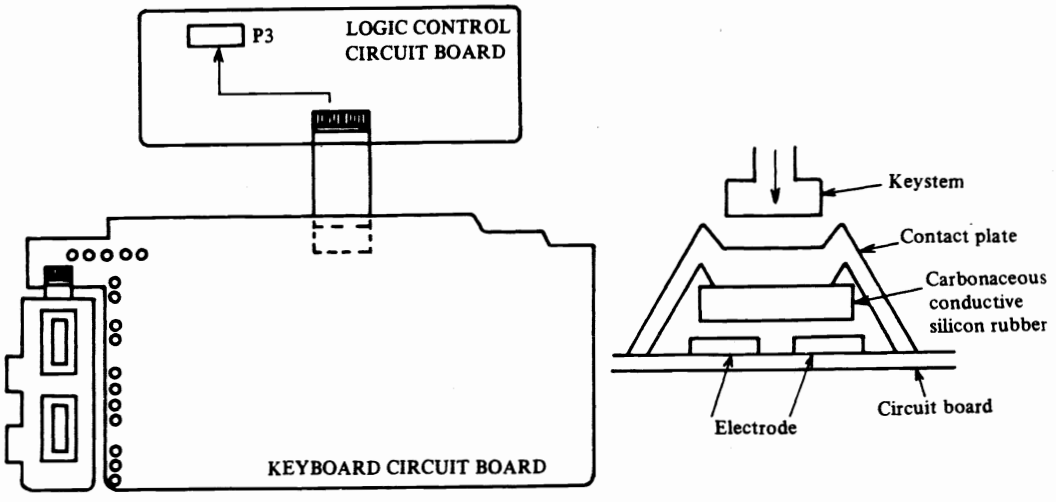


Fig. 5-a Keyboard configuration

Fig. 5–a shows the keyboard configuration.

The keyboard circuit board which mainly consists of keyboard control circuit, slide switch control cirucit and LED display is connected to the logic control circuit board, and is under the control of the main CPU.

When a key is pressed, the conductive silicone rubber attached to the contact plate is pushed down and comes into contact with a pair of electrodes (X-line electrode and Y-line electrode in the key switch matrix), and produces the key-in data which is then input to the main CPU.

The keyboard uses a "N" key roll-over system, that is, each key electrodes are provided with diodes for prevention of concurrence of plural key-in data when two or more keys are pressed at the same time.

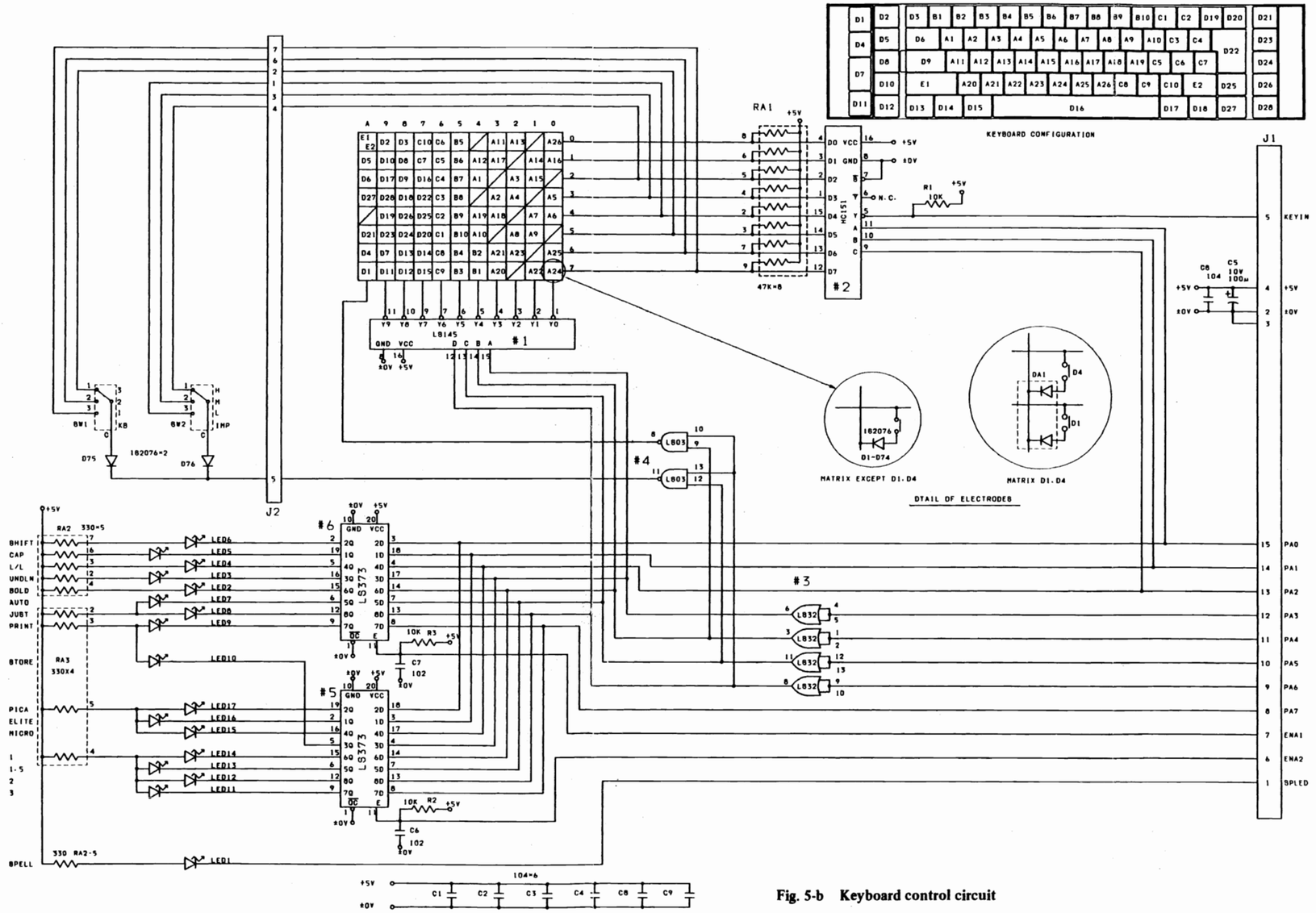
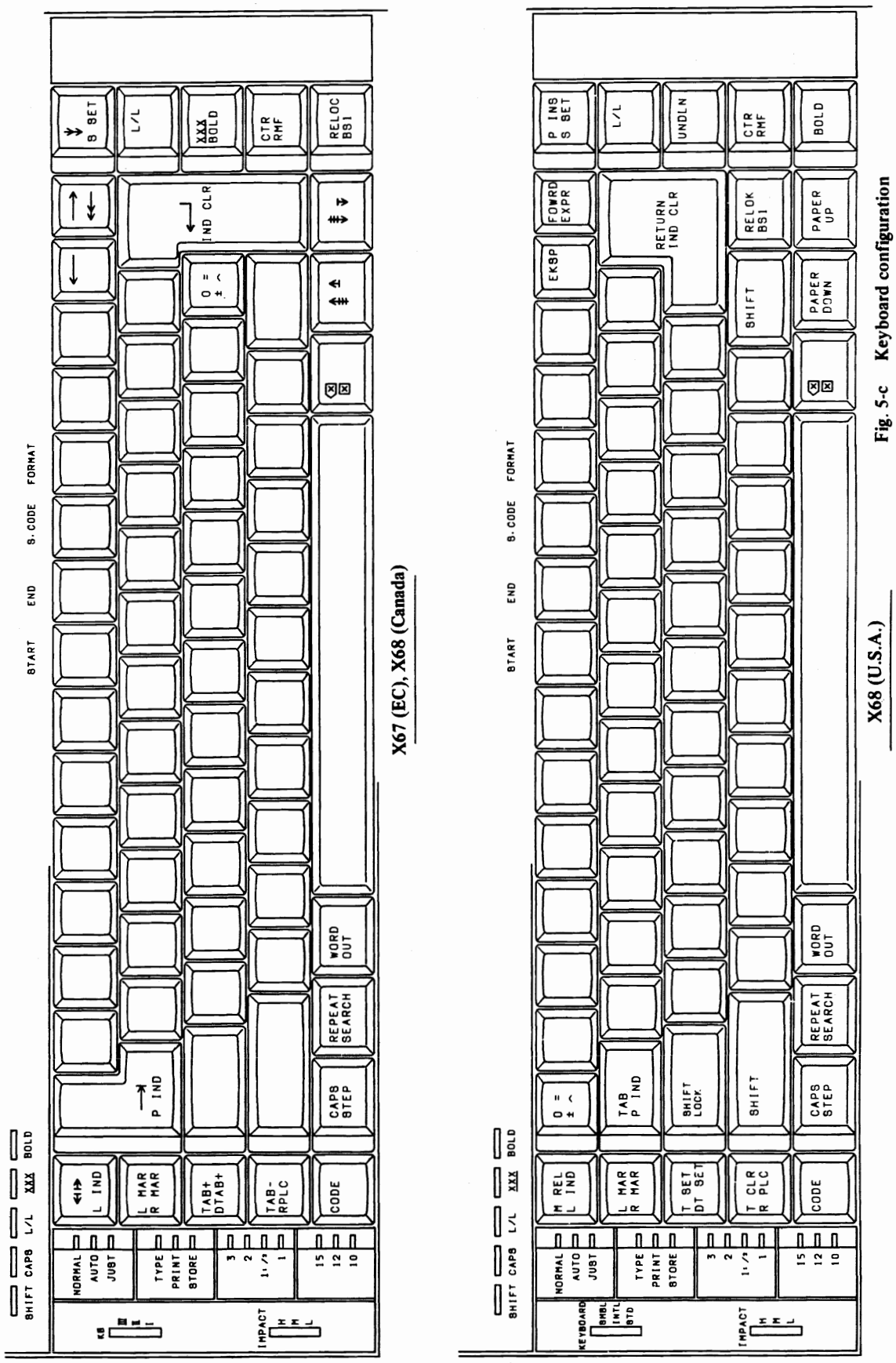


Fig. 5-b Keyboard control circuit



X67 (EC), X68 (Canada)

X68 (U.S.A.)

Fig. 5-c Keyboard configuration

5-2 Keyboard, LED and slide switch circuits

The keyboard, LED and slide switch control circuits are shown in Fig. 5-b.

The principle of the keyboard control, or key scanning, is as follows:

The 74LS145 receives four Y-line key scanning signals ("A", "B", "C" and "D") from the main CPU, and pulls down one of its 10 outputs ("Y0" to "Y9") to "L" according to the key scanning sequence informed by the key scanning signals.

On the other hand, the HC151 receives three X-line key scanning signals ("A", "B" and "C") from the main CPU. and connects one in 8 of its outputs ("0" to "7") to the common terminal "Y" according to the Key scanning sequence.

In Fig. 5-d, when key [A26] is pressed and all 74LS145 inputs "A", "B", "C" and "D" are set to "0" by the main CPU, for example, the "Y0" output is pulled down.

On the other hand, when all HC151 inputs "A", "B" and "C" are set to "0" by the main CPU, the line X0 is connected to the terminal "Y0".

Consequently, when the key is pressed and its electrodes are closed, the "L" signal is output as key-in data from the terminal "Y0".

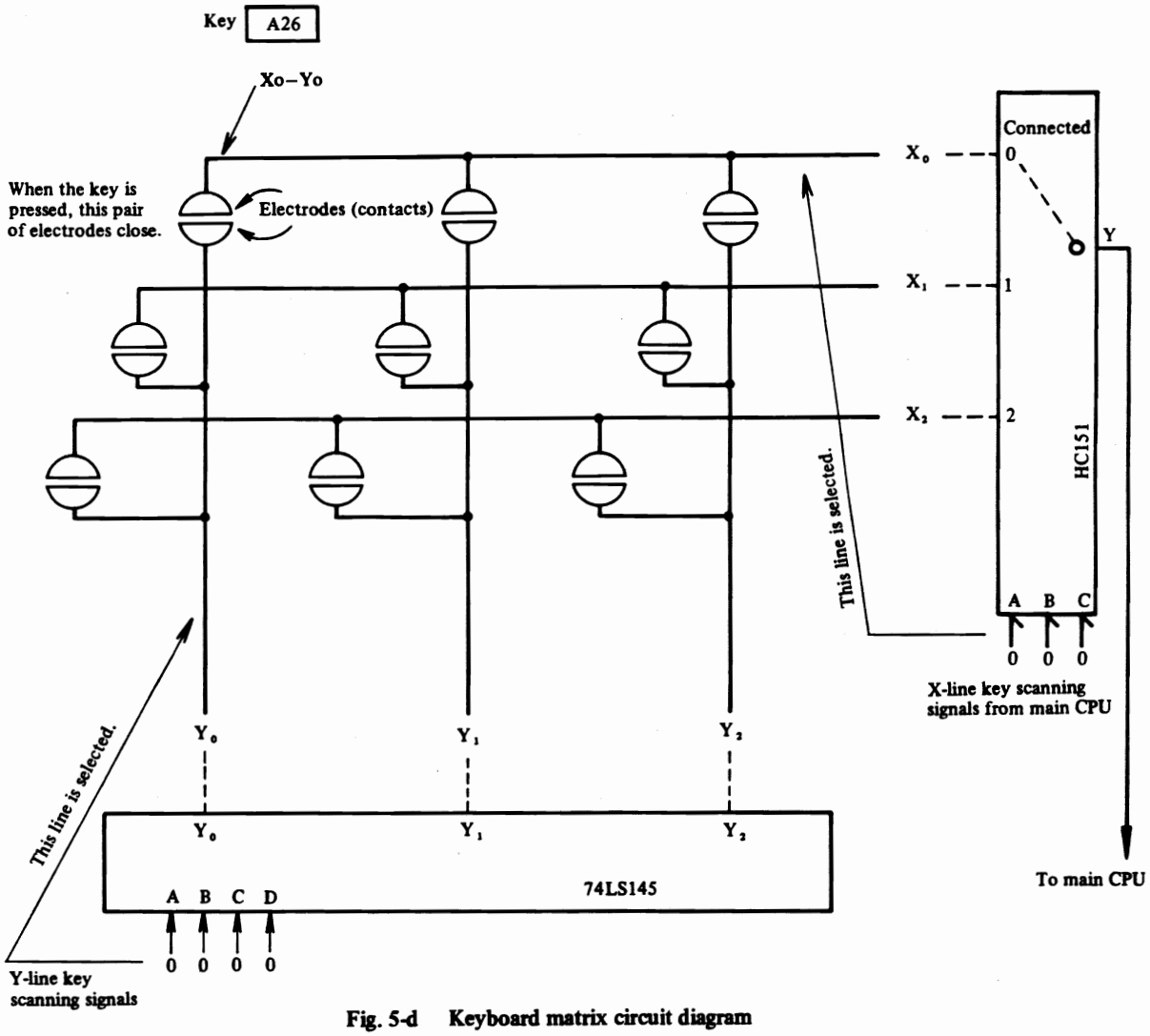
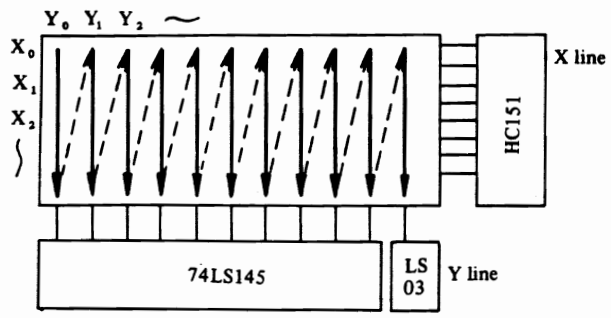


Fig. 5-d Keyboard matrix circuit diagram

Thus the main CPU sends Y-line key scanning signal and X-line key scanning signals to the 74LS145 and the HC151 respectively in the predetermined sequence to identify the key pressed.



In a certain line, 74LS03 is used instead of 74LS145.
The 74LS03 does the same function as does the 74LS145.
The key scanning sequence is in the order of X0-Y0, X1-Y0, X2-Y0 and so on.

Fig. 5-e Key scanning sequence

5-3 Slide switch setting scanning

After the completion of one cycle of key scanning, the main CPU scans setting of the slide switches (SW1 and SW2).
In this scanning again, 74LS03 is used and one of the outputs (1 ~ 7) of HC151 is selectively connected to the common terminal "Y" when the scanned line is found closed.
The slide switch "IMP" (print impact setting) is scanned first and then the slide switch "KB" is scanned.
The scanning is made each time one cycle of keyboard scanning is completed.

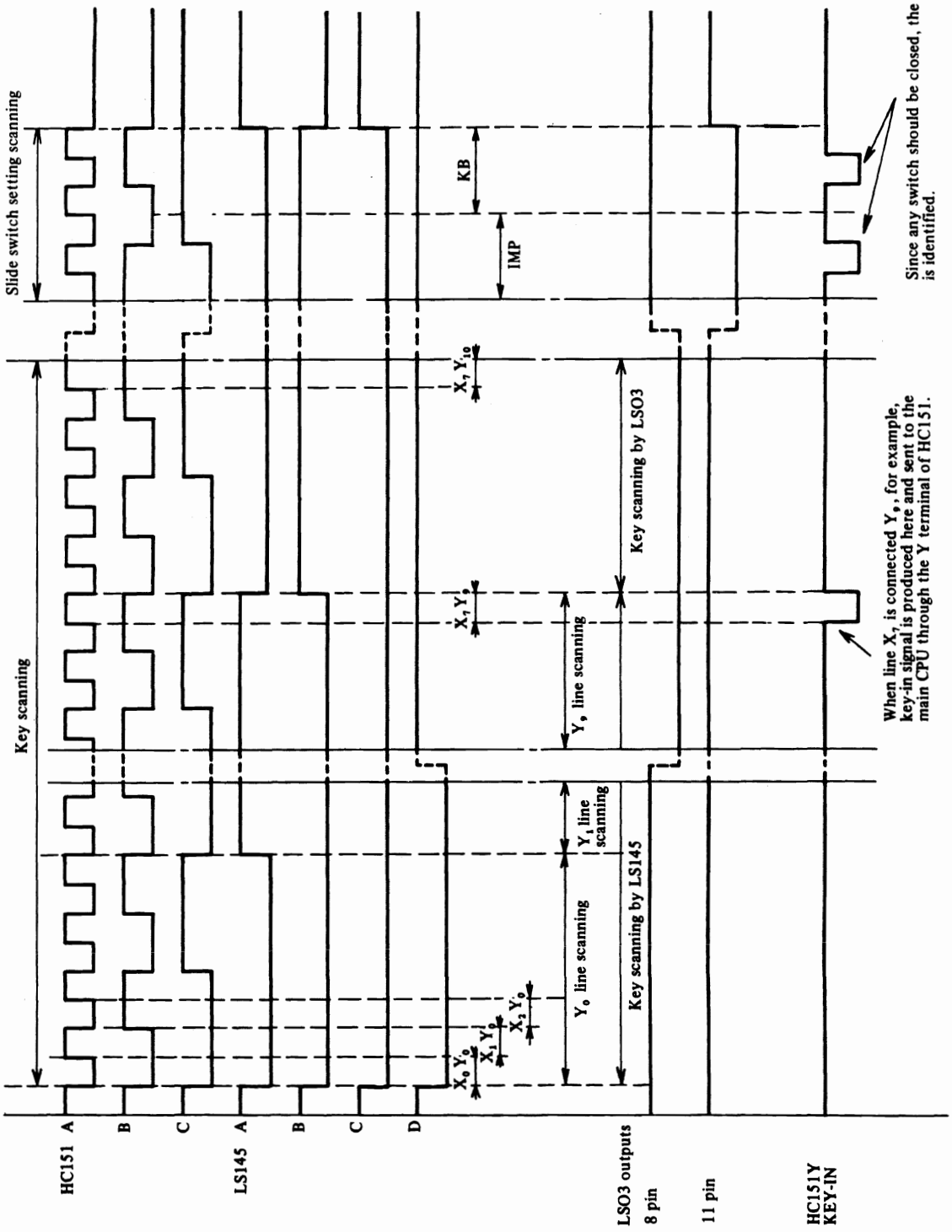


Fig. 5-f Keyboard line signals

5-4 Control of LEDs

The LEDs are connected to the respective ports of PA0 through PA7 of main CPU, and controlled by the main CPU (LED "SHIFT" Is connected to PA0, for example).
After the completion of key scanning and slide switch setting scanning, the main CPU sets each output port (PA0 ~ PA7) according to the scanning results.

When a fall edge signal ("L" signal) is input to "ENA1" or "ENA2" of LED latch #6 or #5, the data (status on output ports PA0 ~ PA7) is entered in the selected latch, causing turning on or off of the corresponding LED.

When it is desirous to turn on only "UNDLN", for example, the main CPU pulls down only the output PA4 to "L", and outputs the fall edge signal to the ENA1 to enter the data into the latch #6. When the data is latched, the current flows from the +5V supply to the latch and the LED "UNDLN" lights.
Thus, LED lights only when the corresponding latch output is "L". To turn off LED, the main CPU pulls up the corresponding output port to "H".

6. RESET/BACKUP

6-1 Control of RESET/BACKUP

RESET/BACKUP circuits

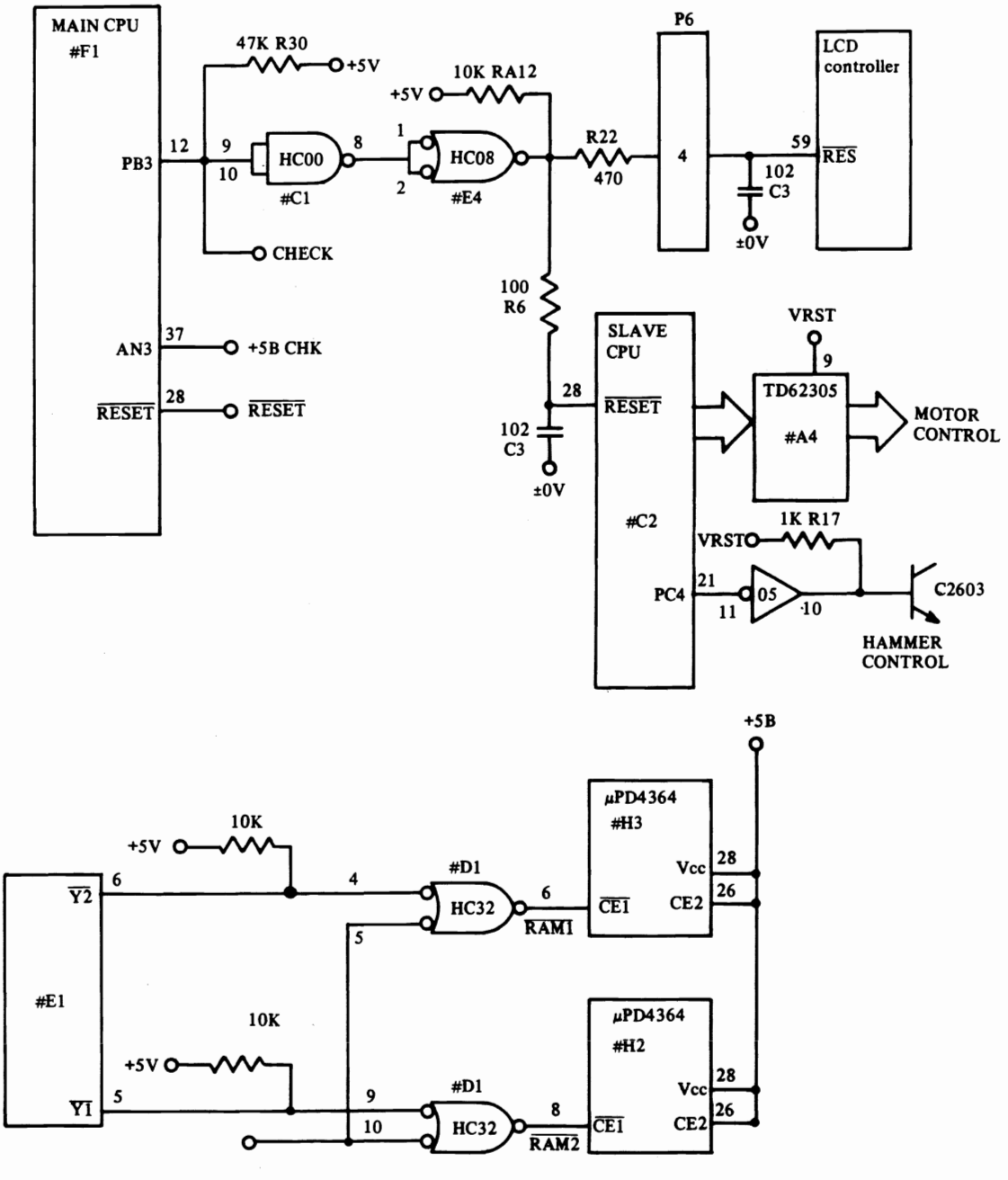


Fig. 6-a RESET/BACKUP circuit block diagram

6-2 $\overline{\text{RESET}}$ and MEMORY BACKUP circuits

1) $\overline{\text{RESET}}$ circuit

The $\overline{\text{RESET}}$ circuit resets and sets (initializes) the main CPU, when the power is turned off and on, to prevent malfunction of the slave CPU, LCD controller, hammer, motors and buzzer.
The resetting of the slave CPU and the LCD controller is controlled by the main CPU.

2) MEMORY BACKUP circuit

The MEMORY BACKUP circuit is provided to hold the setting information stored in the memory after the power has been turned off.
The settings such as left margin position and TAB position settings are stored in the memory backed by this circuit.
In the case of X67, phrases of maximum size of 7 KByte can be stored in the backed up memory.
As for X68, phrases of maximum size 15 KByte can be stored in the backed up memory.
The contents (settings) are stored in the 8 KByte RAM (two RAMs are used in the case of X68).

When the power supply is interrupted, the memory (RAM) is fed with the power supply from the carbon lithium battery, instead of the +5V supply, for retention of the memory contents.
The battery voltage is checked by the circuit consisting of the line from the CHECK pin of main CPU, and the +5B CHK.

The signals related to the memory backup function are as follows:

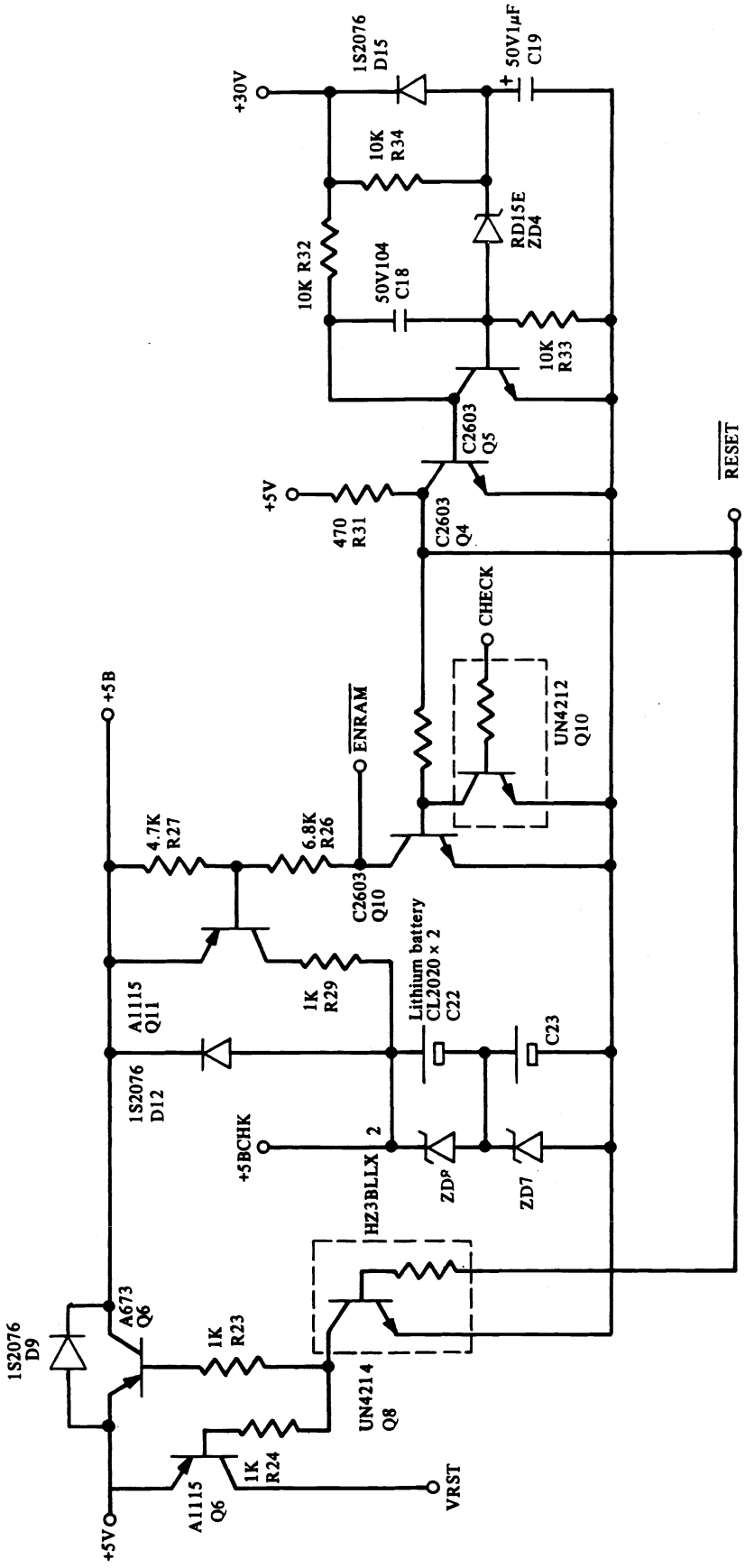


Fig. 6-b RESET circuit and MEMORY BACKUP circuit

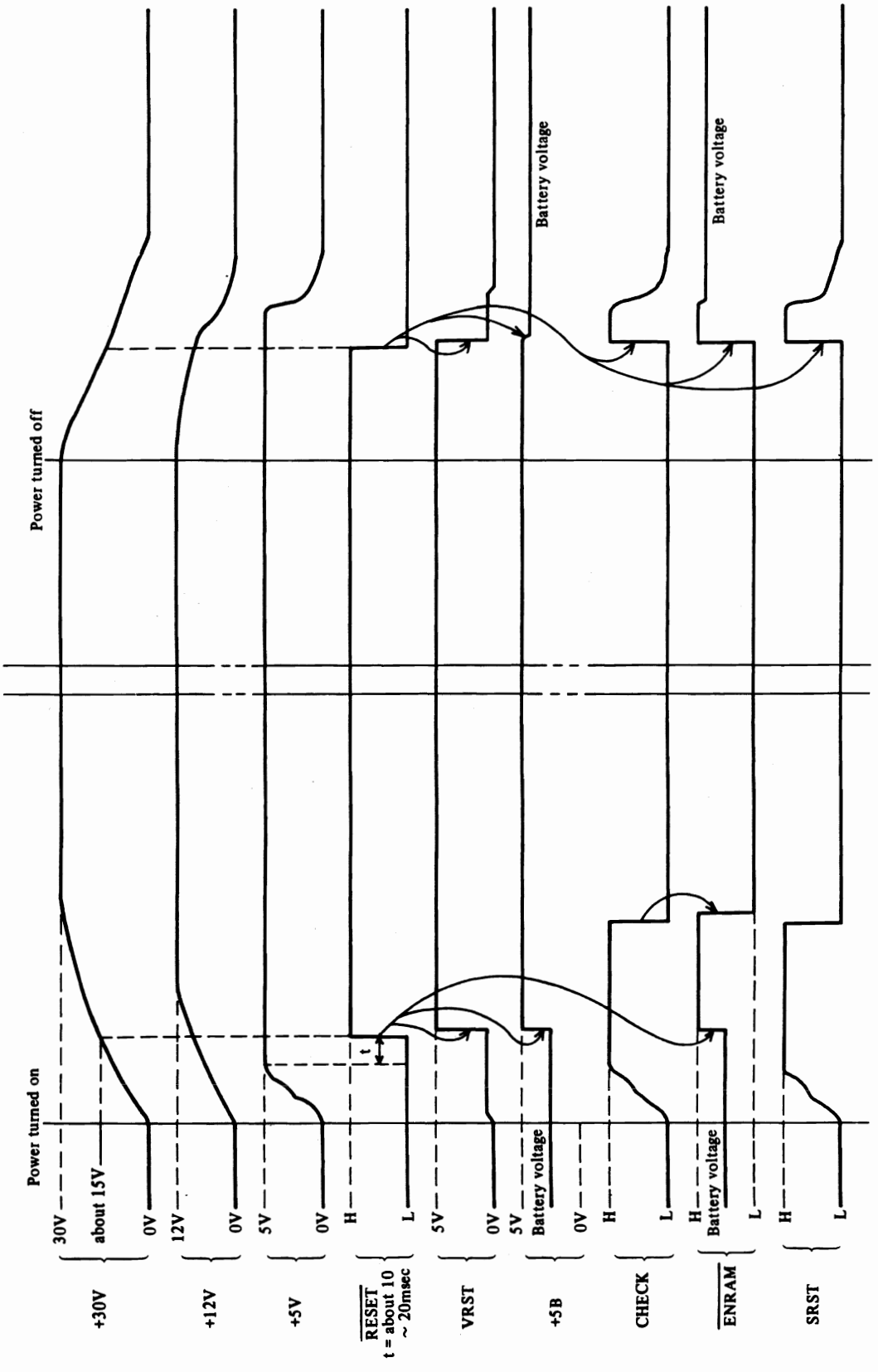


Fig. 6-c Waveforms of memory backup signal at power turning on and off

a) $\overline{\text{RESET}}$

This signal presents the status of the +30V and +5V supplies at the time the power is turned on.

When the power is turned on, the +5V supply immediately rises to +5V, but the +30V supply does not immediately reaches +30V.

Until the +30V supply reaches about 15V, the transistor Q5 is off and the transistor Q4 is on.

Consequently, the $\overline{\text{RESET}}$ signal is "L" and the main CPU remains reset immediately after the power is turned on.

When the +30V supply goes up about 15V, the transistor Q5 turns on and the transistor Q4 turns on, thereby the $\overline{\text{RESET}}$ is pulled up to "H" and makes active the main CPU.

When the power is turned off, the main CPU becomes inactive in the reverse steps.

b) VRST

The VRST signal is used to control the power supplies to the motor driver (30V) TD62035 and the hammer control circuit.

It prevents the power supply from being given to each actuator before the main CPU becomes active at the time the power is turned on, and after the main CPU becomes inactive as the power is turned off.

c) SLAVE CPU RESET and LCD CONTROLLER RESET

After the main CPU becomes active, "L" signal is output from PB3 of main CPU to set (initialize) the slave CPU and the LCD controller.

While the main CPU is inactive, the slave CPU and the LCD controller is reset.

d) +5B

This is a power supply given to the RAM.

When the power is off, the RAM is fed with the power supply from the lithium battery memory backup).

When the power is on, the regular +5V supply is applied to the RAM.

e) CHEK, +5B CHK, $\overline{\text{ENRAM}}$

These signals are used to check the +5B supply voltage (while the power is on) to see if the voltage is high enough to back up the RAM.

When the main CPU becomes active, it takes the +5V supply from the +5B CHK with the CHECK (PB3) kept "H" and measures the backup battery voltage through the A/D converter built in the main CPU to check.

If the battery voltage is found below the specified level, all contents in the RAM are cleared.

After the completion of the battery check, the CHECK signal is pulled down to "L" to turn on the transistor Q10.

When the transistor Q10 turns on, the $\overline{\text{ENRAM}}$ signal falls to "L" and the $\overline{\text{RAM1}}$, $\overline{\text{RAM2}}$ that has been input to the RAM becomes accessible with the "CHIP ENABLE" signal from the main PCU.

At the same time, the transistor Q11 turns on and the lithium battery is charged.

The output from PB3 controls the slave CPU and the LCD controller.

The slave CPU and the LCD controller remain reset while this output is "H", and are initialized when the output is set to "L".

7. Main CPU peripheral circuits

7-1 Cover switch circuit

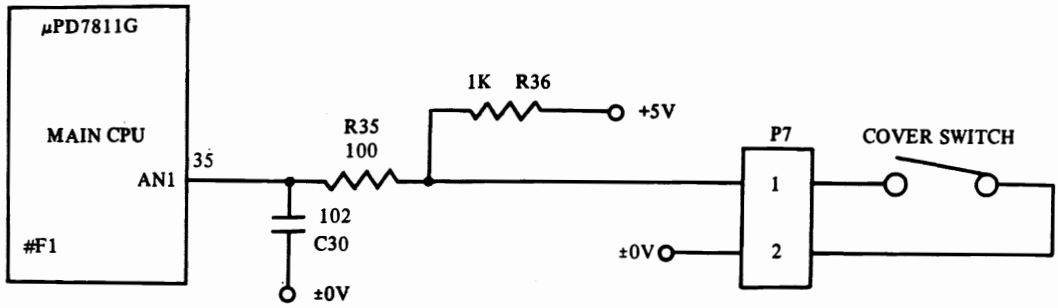


Fig. 7-a Cover switch circuit

When the cover is opened, the cover switch opens and the main CPU input terminal AN1 falls to "H". When the AN1 falls to "H", the main CPU turns off excitation current to all motors except for the line feed motor and suspends key scanning.
When the cover is closed, the actuators are turned on and return to the respective home positions.

7-2 Clock circuit

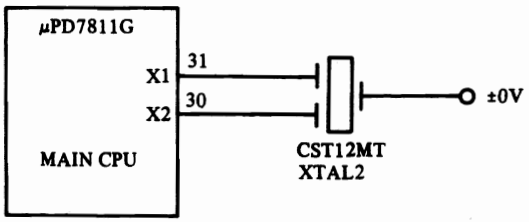


Fig. 7-b Clock circuit

A 12 MHz ceramic oscillator is used to provide clock for the main CPU. With this clock, the main CPU operation is synchronized.
The slave CPU also has a clock circuit same as that for the main CPU.

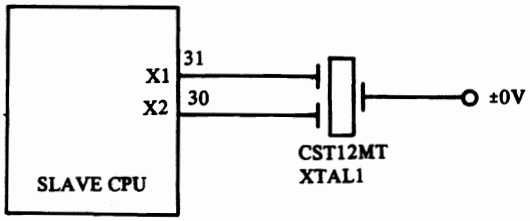


Fig. 7-c SLAVE CPU clock circuit

7-3 Buzzer driver circuit

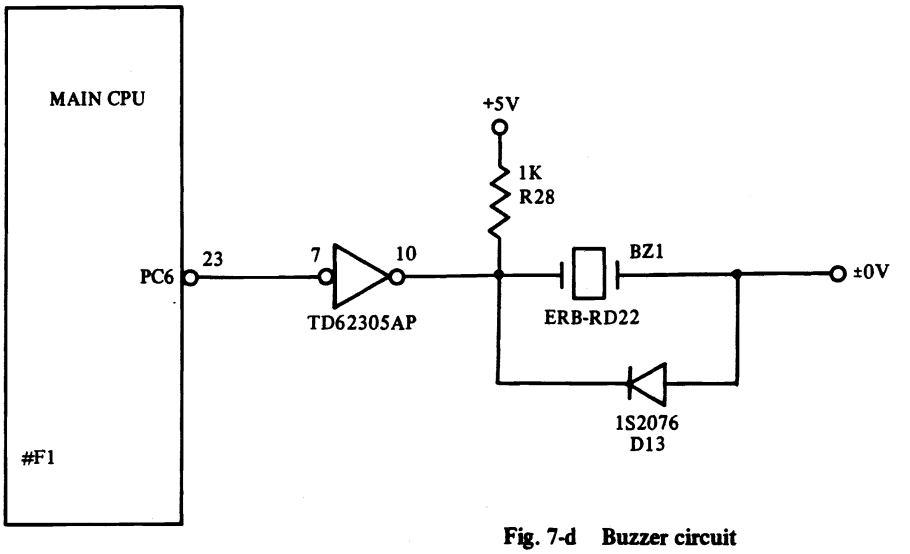


Fig. 7-d Buzzer circuit

The main CPU produces and outputs switching signal at a frequency of about 4 KHz from PC6 for buzzing.
For switching, "timer 1" incorporated in μPD7811G is used.
One cycle of buzzer lasts for about 100msec.

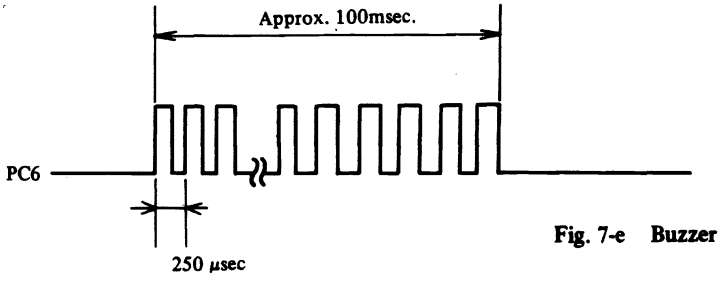


Fig. 7-e Buzzer signal waveform

8. LCD display

8-1 LCD circuit board configuration

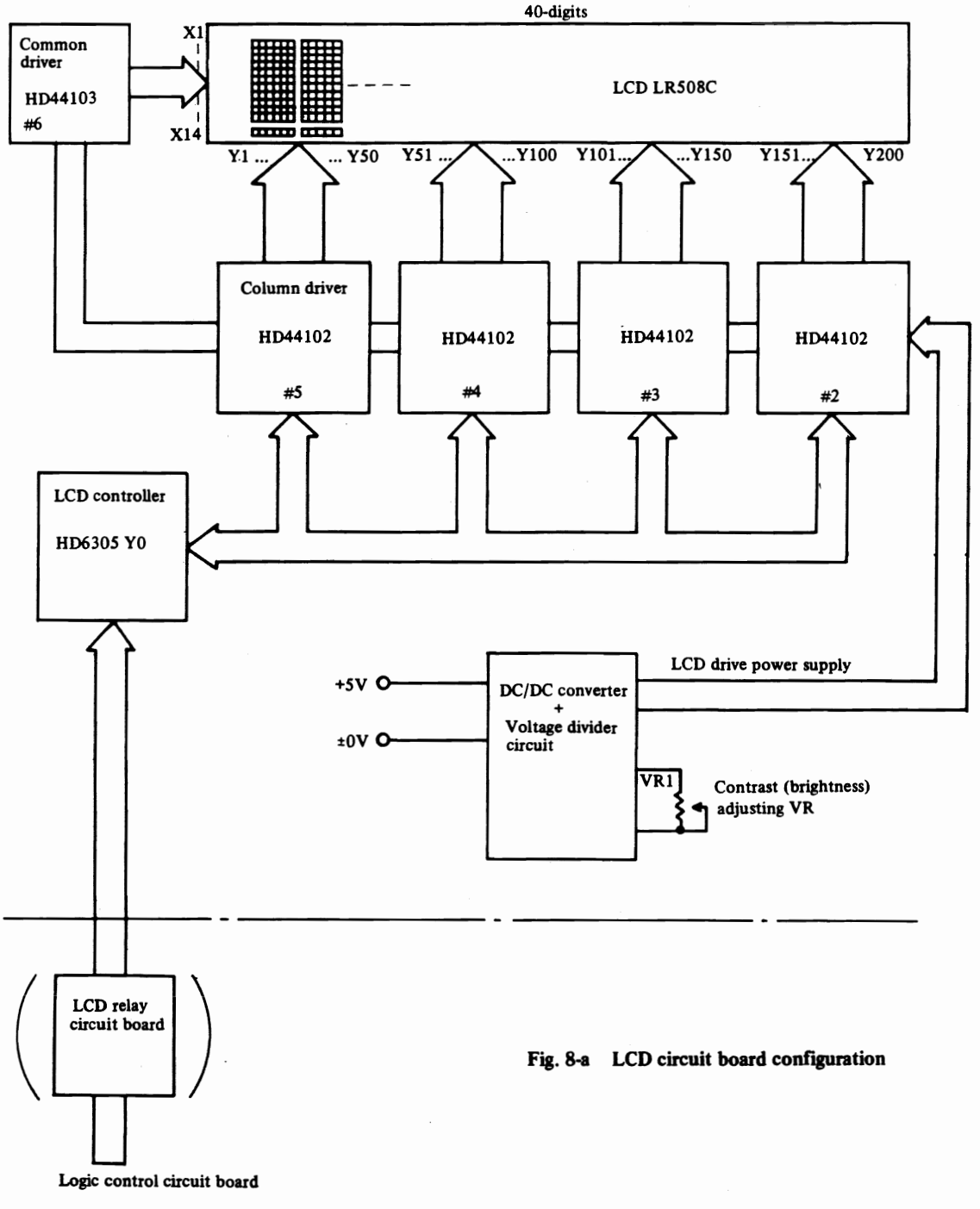


Fig. 8-a LCD circuit board configuration

Fig. 8-a shows the LCD circuit board configuration in the form of block diagram.

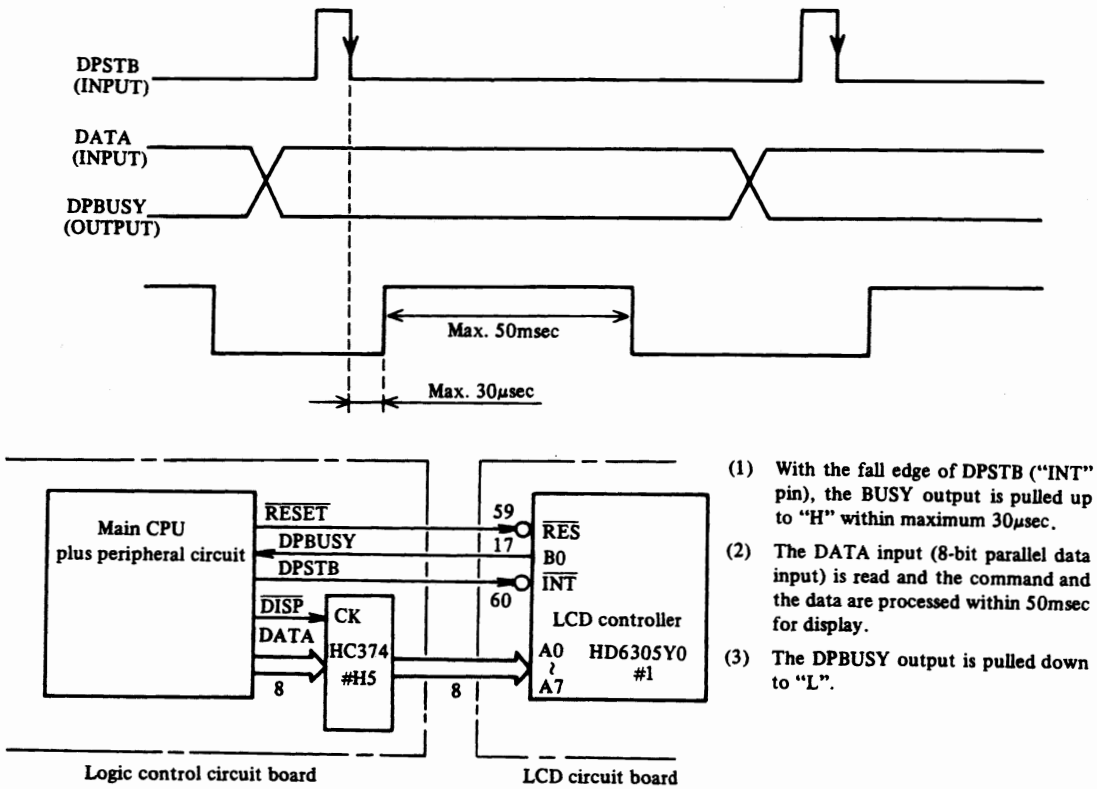
The 40-digit LCD display unit is driven by four column drivers (#2 ~ #5) and one common driver (#6). The total number of dots is equal to [5 x 11 dots (for character display) + 5 x 1 dot (for underline display)] x 40 digits.

The LCD display unit is controlled by the LCD controller #1 (HD6305Y0), and with command/data sent from the main CPU.

1) LCD controller #1

This is a single-chip CPU (HD6305Y0) in which the LCD control program and the character/symbol font are mask-programmed.

It receives display commands and character data from the main CPU, and rewrites the display RAM in the column drivers HD44102 (#2 ~ #5) with the received commands and character data to control the LCD display.



(1) With the fall edge of DPSTB ("INT" pin), the BUSY output is pulled up to "H" within maximum 30μsec.

(2) The DATA input (8-bit parallel data input) is read and the command and the data are processed within 50msec for display.

(3) The DPBUSY output is pulled down to "L".

Fig. 8-b LCD controller data transmission timing chart

2) LCD common driver #6 (HD44103)

The incorporated oscillator produces various timing signals necessary to drive the LCD.
The LCD common driver sends these timing signals to the column drivers #2 ~ #5 (HD44102), and gives the LCD drive signals to the LCD through the common pins X1 ~ X14 of the LCD panel (LR508-C).
Since the common pins X1 and X14 are "NC", the pins ranging from X2 to X13 are actually used for LCD display drive.
The drive duty ration is 1/16.

3) LCD column drivers #2 ~ #5 (HD44102)

Each LCD column driver has the internal 8-bit RAM for 50 dot columns. The given display data are writen in the RAM, and output to the LCD panel (LR508-C).

When RAM bit is "1", LCD segment lights.
When RAM bit is "0", LCD segment does not light.

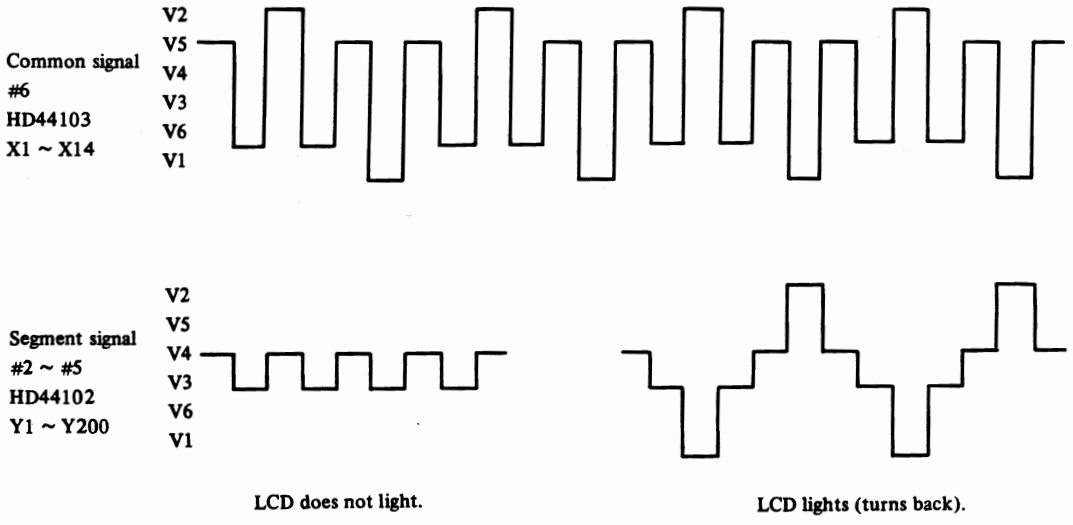


Fig. 8-c Example of LCD drive signal waveforms (V1, V2: Selectable levels)

4) 40-column LCD panel (LR508-C)

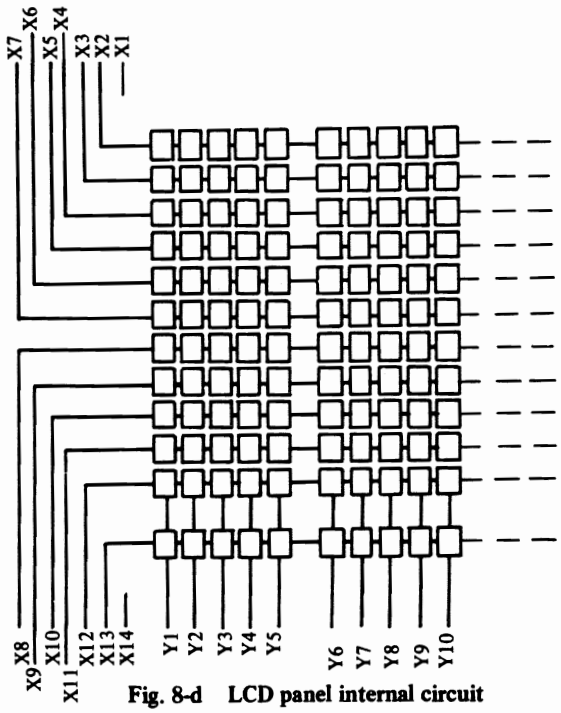


Fig. 8-d shows a part of internal circuit of LCD panel.

The pins X1 through X14 are connected to the common driver and the pins Y1 through Y200 are connected to the column drivers.

To drive each LCD segment, pulse voltages are given to the LCD segments through the X lines and the Y lines.

The dot (segment) to which voltage larger than the threshold voltage of LCD is applied across X line and Y line turns black.

A character or symbol is displayed by controlling voltage in each Y line in association with scanning voltage in each X line.

Fig. 8-d LCD panel internal circuit

55 dots (5 by 11 dots) are used to display one character and 5 dots (5 by 1 dots) are used to display the underline.

The LCD panel is capable of displaying total 40 digits of characters with underline.

5) DC/DC converter and voltage divider circuit

This circuit prepares −5V from the +5V supply, and provides 6 difference voltage by dividing the +5V and the −5V. These 6 voltages are used to drive the LCD panel.

The DC/DC converter has an oscillator circuit consisting of Q1, T1, R3, C6 and R4, and rectifies the AC voltage on the secondary of T1 by D1 and C1 to prepare the −5V.

ZD1 is used to regulate the −5V.

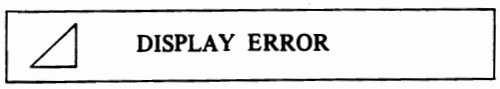
The voltage range from the −5V to +5V is divided by RA2, R5 and VR1 into six voltages V1 ~ V6.

VR1 is provided to adjust the contrast of the LCD.

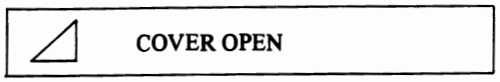
8-2 Error/alarm display

(1) Error display

If failure occurs in the display function itself, the following error message appears and the display is hung up.



(2) Cover open

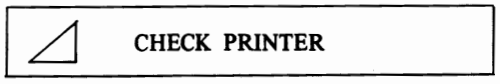


When the top cover is opened, the message shown above appears in the LCD display and key operation becomes unacceptable (electrical key lock).
When the top cover is closed, teh carriage motor, wheel motor, and other actuators are once reset and then return to the previous positions (where they were located before the top cover is opened).
(The keyboard remains locked until the status is restored.)

(3) Trouble with functional part or component

(3-1) Trouble that is not likely to damage any part or component of typewriter

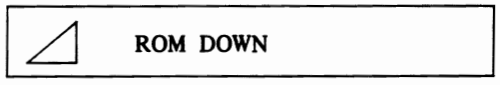
If command or data from the main CPU is faulty, the slave CPU turns off all phase excitation and the message shown below appears in the display.



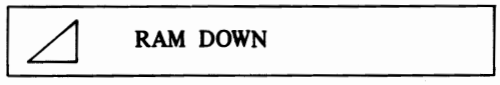
The keyboard is electrically locked.

(3-2) Trouble that may cause damage to any part or component of typewriter.

A) If the sum of the entire contents of ROM does not result in "zero", the ROM contents are deemed to be out of order and the keyboard is electrically locked. In this case, the following display appears:



B) If any one of bits of RAM is not "0", though all bits must be "0", the keyboard is electrically locked and the following display appears:



C) If the carriage in-position signal is not output within 8 sec. at initializing, an error code is sent from the carriage CPU to the main CPU and the following message is displayed (the keyboard is electrically locked).

D) If the display controller does not become ready for reception of data within 0.1 sec after the initializing, the keyboard is electrically locked and the LEDs (except for the head indicator LED) flicker.

9. Interface

9-1 Interface composition

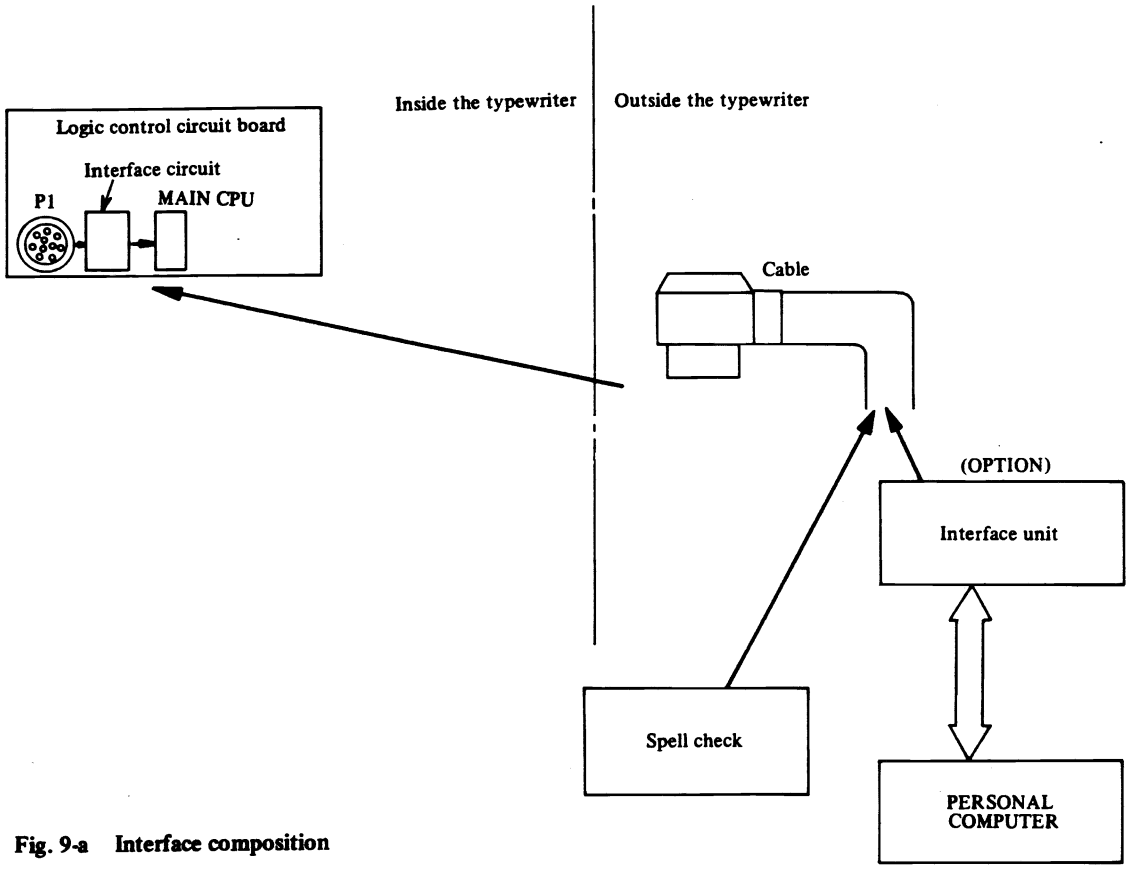


Fig. 9-a Interface composition

The typewriter can be connected to an external device such as personal computer through the interface circuit and an interface unit, as shown in Fig. 9-a.

9-2 Interface circuit

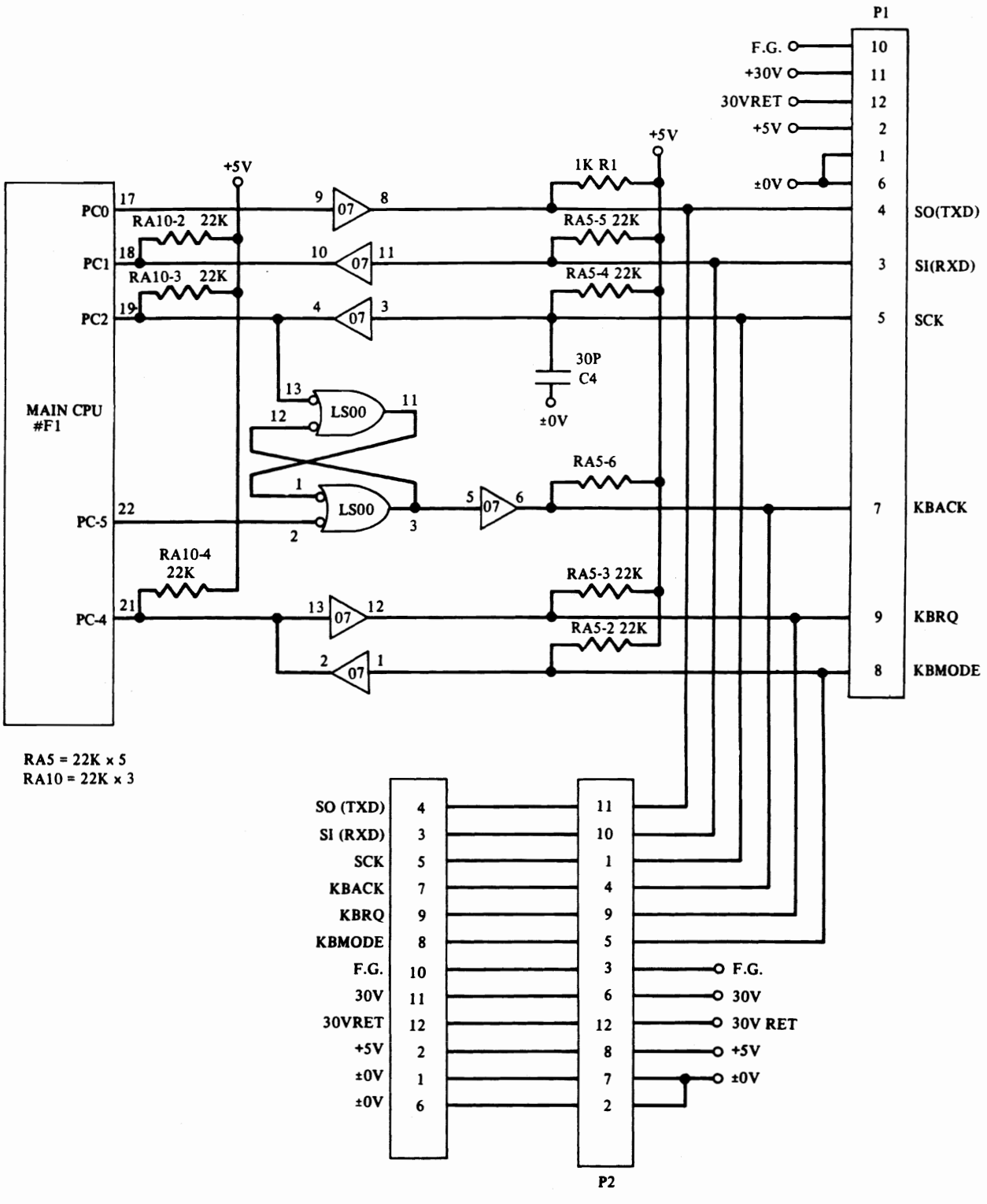


Fig. 9-b Interface circuit

The interface circuit itself simply servers as a buffer and the data input and output are controlled by the main CPU.
In Fig. 9-b, "SI (RXD)" is an abbreviation of serial input and "SO (TXD)" is an abbreviation of serial output. Data are serially output and input through these lines. Details of each signal shown in Fig. 9-b are as follows:

a) SI (RXD)
Signals that are output from the associated external device, and input to the typewriter through the interface unit.

b) SO (TXD)
Signals that are output from the typewriter, and input to the associated external device through the interface unit.

c) SCK
Signal used to synchronize data input and output .

d) KBACK
Signal that informs the interface unit that the typewriter outputs data.

e) KBMODE
Signal that informs the typewriter that the interface unit (external device) outputs data.

f) KBRQ
ECHO signal sent from the typewriter to the interface unit in replay to KBMODE.

The interface unit is fed with the power supply from the typewriter.

9-3 Interface cable connector pin assignment

Fig. 9-c shows the pin assignment of interface cable connector (P26).

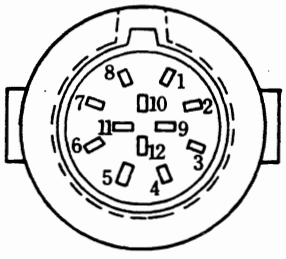


Fig. 9-c Interface cable connector pin assignment

Pin No.	Signal name
1	± 0V
2	+5V
3	Si
4	So
5	$\overline{SCN}$
6	± 0V
7	KBACK
8	READY
9	KBRQ
10	± 0V
11	+30V
12	+30V RET

10. Other circuit boards

10-1 Head indicator circuit board

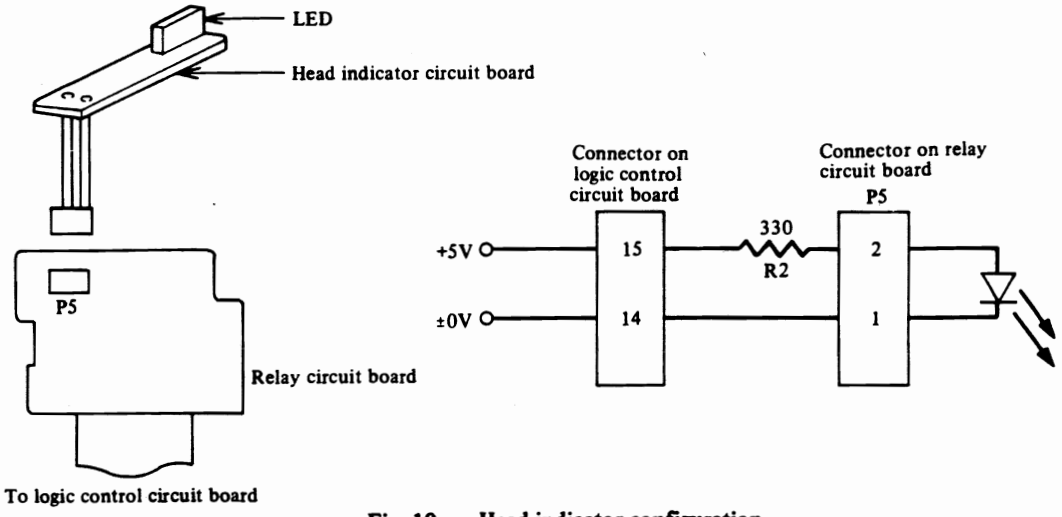
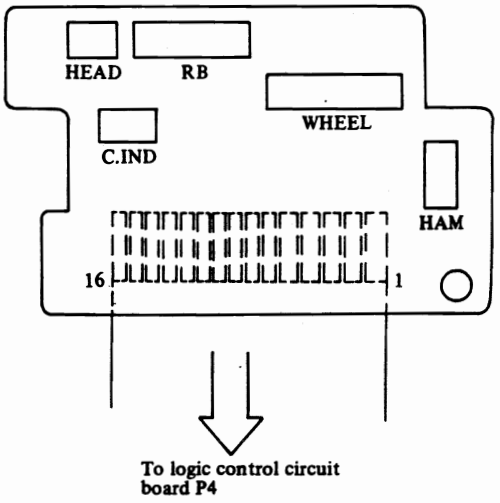


Fig. 10-a Head indicator configuration

The LED installed on the head indicator serves as the power pilot lamp, as well as indicating the current position of the print head.

The LED is fed with the power supply coming from the power supply circuit board through the logic control circuit board and the relay circuit board.

10-2 Relay circuit board



The relay circuit board provides the junction to transfer various signals to and from the logic control circuit board, each motor, micro switches, etc., and is built in the print head.

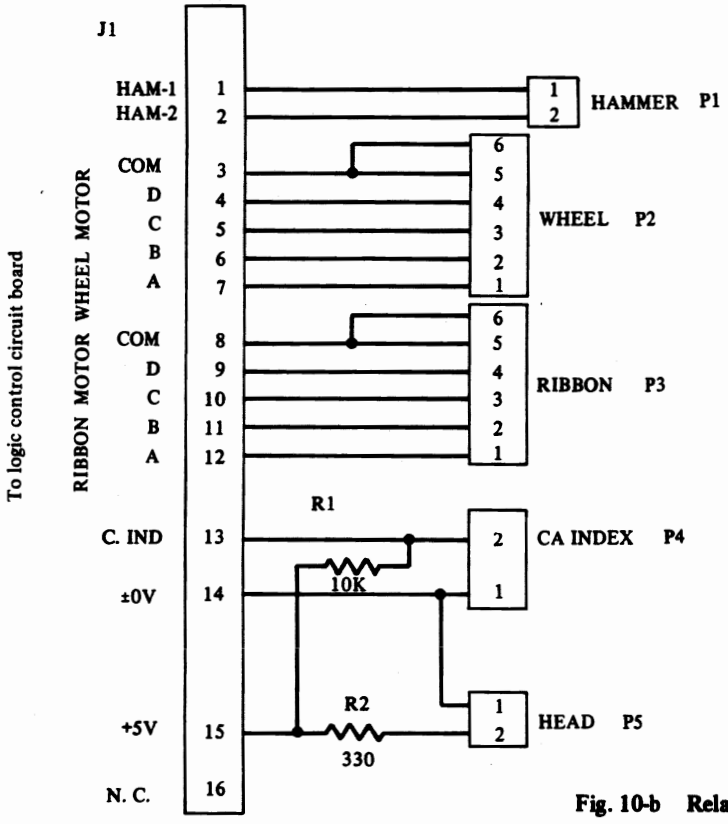


Fig. 10-b Relay circuit board circuit diagram

10-3 Power supply circuit board and filter circuit board

Power supply unit configuration

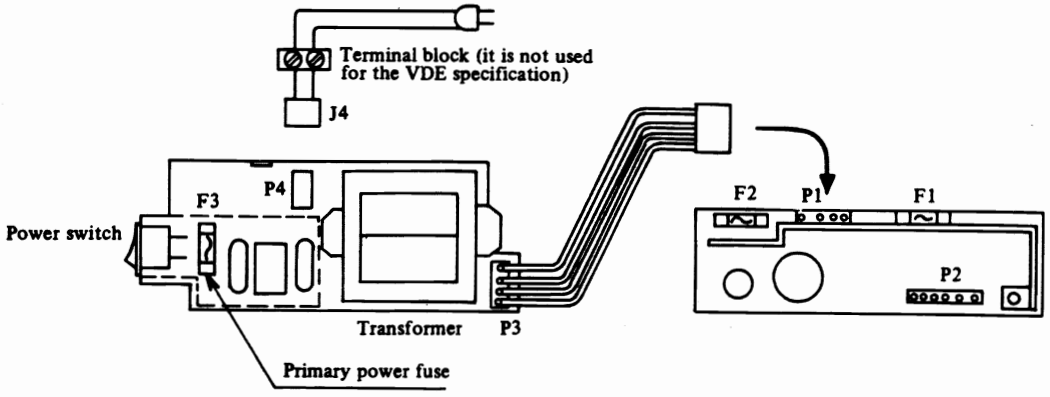


Fig. 10-c Power supply unit configuration

Fig. 10-c shows the power supply unit configuration. The AC line power source is input to the filter circuit board, and to the transformer.
The output from the transformer is given to the power supply circuit board which converts the transformer output voltage (AC) into DC+5V (regulated), DC+12V (unregulated) and DC+30V (unregulated). These DC supplies are then given to the logic control circuit board through the connector P2.

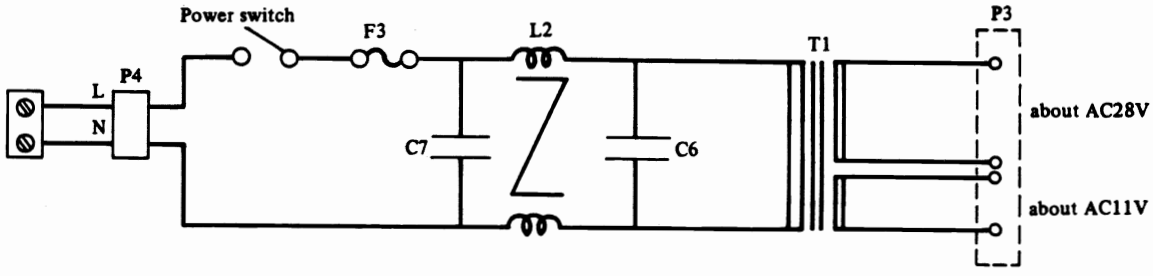


Fig. 10-d Primary circuit (including transformer)

Fig. 10-d shows the primary circuit (filter circuit board).
The filter consisting of capacitors (C6 and C7) and coil (L2) prevents entrance of external noises into the typewriter, and leakage of internal noises to the outside.
The capacitors (C6 and C7) and the fuse (F3) used in the interface circuit differ with AC line power sources used. Fig. 10-f shows the applicable capacitors and the fuse for each AC line power source.

Fig. 10-g shows the secondary circuit. The input AC power source is stepped down to AC28 ~ 26V and AC11 ~ 10V by the transformer.
These stepped down voltages are rectified to DC voltage at about 35V by the rectifier bridge (D2) and the capacitor (C4), and to DC voltage at about 13V by the rectifier bridge (D3) and the capacitor (C5). These DC voltages are used to drive the stepping motors.
(Since the DC35V supply and 13V supply are not regulated, they vary with change of the input AC voltage and load condition. Therefore, they are shown as +30V and +12V supplies in the circuit diagrams.)
The +30V supply is also used for the chopper type switch regulator (Q1) to provide the regulated +5V supply. The +5V supply can be finely adjusted by the variable resistor (VR1) (it is adjusted to +5.1V when the output current is 0.5A).

Power supply	Rating	Condition
+ 5V	5.1 V ± 50mV	The typewriter is
+12V	*About 13V	on standby (the
+30V	*About 35V	power is on).

*The +12V and +30V supplies are not regulated.

Fig. 10-e Standard power supply voltages

AC line power source	C7	C6	F3
AC 100V	125V AC 0.047 μF	125V AC 0.047 μF	1.0A (in compliance with the Electric Law)
AC110, 117V	125V AC 0.047 μF	125V AC 0.047 μF	1.0A (Approved by UL and CSA)
AC127V	250V AC 0.047 μF	250V AC 0.047 μF	1.0 A (Approved by UL and CSA)
AC200 ~ 240V	250V AC 0.047 μF	250V AC 0.047 μF	400 mA (Approved by SEMCO)

Fig. 10-f Filter circuit components (not including L2 and T1)

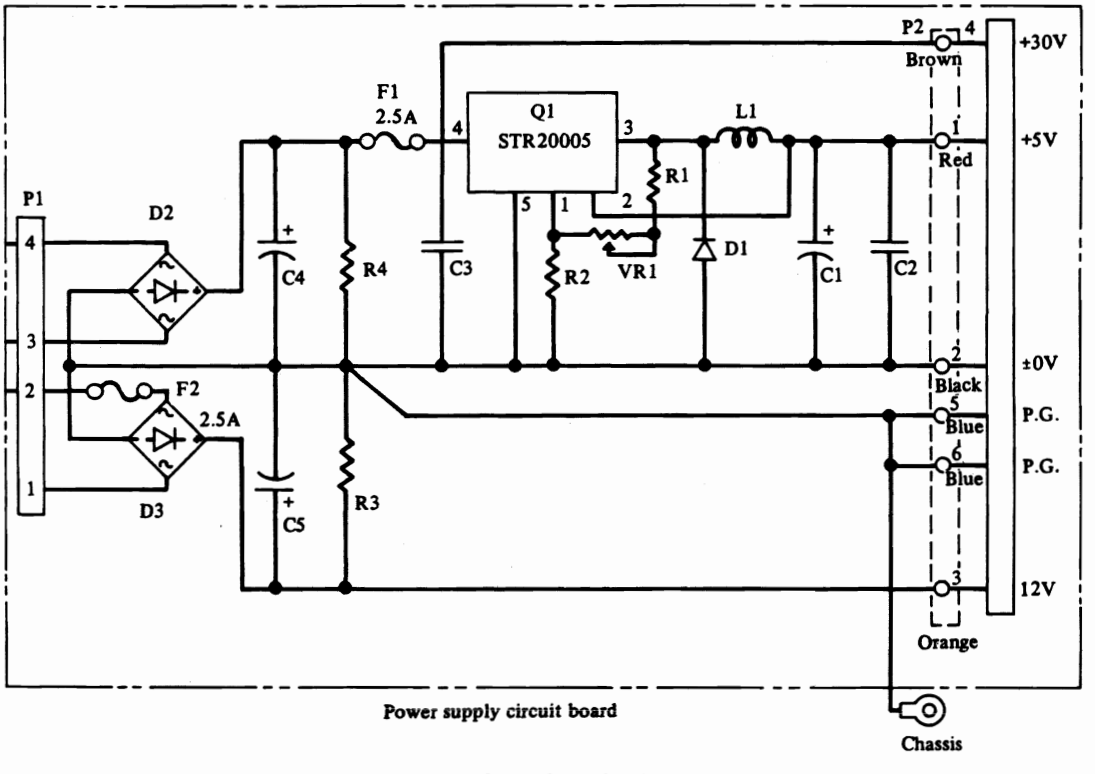


Fig. 10-g Secondary circuit

11. Troubleshooting

11-1 General

This section describes the generally applicable troubleshooting for typewriter X62, X57 and X60.
Since trouble or failure differs from case to case, it is impossible to establish a troubleshooting procedure that is applicable to all possible troubles or failures.
For practical and effective troubleshooting, therefore, it is very important that you make yourself familiar with the principle and functions of each block or section, and have good knowledges of analysing eventual troubles or failures.

11-2 Cautions on troubleshooting

For safety, you should follow the following cautions when troubleshooting is done.

1. When covers are removed to adjust mechanisms or remove circuit boards, the power cord should have been unplugged from the wall socket.
2. Before applying a multimeter to check continuity of circuit, the power cord should be unplugged from the wall socket without fail.
3. When a connector plug is disengaged from the receptacle, force should be uniformly excerted on the cable. For a connector with lock device, the connector should be unlocked before disengagement.

11-3 After the remedy

When the trouble was traced back to the cause, and remedied, be sure to perform test operation to make sure the typewriter has been completely remedied.
It is recommended to record the troubleshooting actually done. The records will be a great help if trouble occurs in the future.

11-4 Preliminary checking

Before starting the regular troubleshooting, the following preliminary checking should be made.

1. Checking the input AC power source and each power supply
   Make sure the input AC power source and each power supply (DC+30V, DC+12V and DC+5V) are at the specified voltages.
2. Checking the setting of each cable connector
   Make sure each cable connector is securely engaged.
3. Checking the fuses
   Make sure no fuse is blown out.

11-5 Reset

"RESET, RESETTING OR RESET OPERATION"
The typewriter can be reset in two ways.

① Resetting at the time the power is turned on

② Resetting caused by open and close of the top cover
(resetting also occurs in case of "error" or "alarm")

The former resetting is caused by the reset circuit, and the latter is by the main CPU.
The difference between these resettings is that the line feed motor phase excitation is not turned off in the latter case.

11-6 Signal waveforms

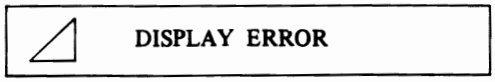
Some examples of signal waveforms are shown on the last pages of this manual for your reference. It is recommended that you refer to them during troubleshooting.

TROUBLESHOOTING

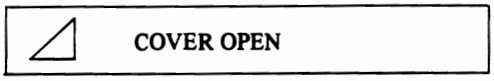
Error code dispplay that can be understood from the display of LED, LCD

1) Error by LCD

If failure occurs in the display function itself, the following error message appears and the display is hung up.



(2) Cover open



When the top cover is opened, the message shown above appears in the LCD display and key operation becomes unacceptable (electrical key lock).
When the top cover is closed, teh carriage motor, wheel motor, and other actuators are once reset and then return to the previous positions (where they were located before the top cover is opened).
(The keyboard remains locked until the status is restored.)

(3) Trouble with functional part or component

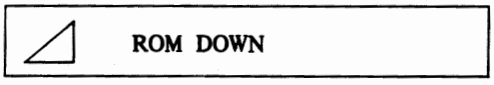
(3-1) Trouble that is not likely to damage any part or component of typewriter

If command or data from the main CPU is faulty, the slave CPU turns off all phase excitation and the message shown below appears in the display.

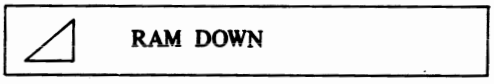
The keyboard is electrically locked.

(3-2) Trouble that may cause damage to any part or component of typewriter.

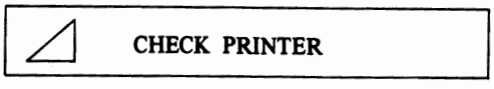
A) If the sum of the entire contents of ROM does not result in "zero", the ROM contents are deemed to be out of order and the keyboard is electrically locked. In this case, the following display appears:



B) If any one of bits of RAM is not "0", though all bits must be "0", the keyboard is electrically locked and the following display appears:



C) If the carriage in-position signal is not output within 8 sec. at initializing, an error code is sent from the carriage CPU to the main CPU and the following message is displayed (the keyboard is electrically locked).



D) If the display controller does not become ready for reception of data within 0.1 sec after the initializing, the keyboard is electrically locked and the LEDs (except for the head indicator LED) flicker.

TROUBLESHOOTING (1)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Nothing occurs when the power is turned on (the head indicator does not light.) (LCD does not light)	Are the power cord, AC wire assembly and secondary power cord properly connected ?	Connector setting improper			10-3 Power supply circuit board and filter circuit board
	Is fuse F1, F2 or F3 not blown out ?	Fuse blown out	Replace the fuse.		
	Is the specified voltage applied to the connector P4 or filter circuit board ?	Circuit before AC wire opended	Replace the AC power cord or AC wires. (Check continuity using a multimeter.)		
	Is the power voltage applied to the capacitor C7 on the filter circuit board ?	Power switch defective	Replace the filter circuit board	After checking contiuity, replace the power switch.	
	Is the power voltage input to the transformer primary ?	Coil on filter circuit board broken		After checking continuity, replace the coil L2.	
	Is the transformer secondary voltage proper ?	Transformer defective •Winding broken •Thermal fuse blown out		After checking continuity replace the transformer.	
	Is the transformer secondary voltage applied to the connector P1 of power supply unit (secondary) ? Voltage across pins 1 and 2 .... About AC 10V Voltage across pins 3 and 4 .... About AC 25V	Harness assembly used to connect filter circuit board to power circuit board defective •Harness broken •Connector defective		After checking continuity, replace the harness assembly.	
	Are voltages across each pins of connector P2 on the power supply unit are proper ?		Replace the power supply circuit board.		
	(a) Across pins 4 and 5 .... 30V	Rectifier bridge D2 defective		Replace the rectifier bridge D2.	
	(b) Across pins 3 and 6 .... 12V	Rectifier bridge D3 defective		Replace the rectifier bridge D3.	
	(c) Across pins 1 and 2 .... 5V				
	1) Is the output from the switch regulator Q1 (pin 3) 5V ?	Switch regulator Q1 defective		Replace the switch regulator Q1.	
	2) Is 5V output from the coil L1 ?	Coil L1 broken		Replace the coil L1.	

TROUBLESHOOTING (2)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Nothing occurs when the power is turned on (the head indicator does not light.) (LCD does not light.)	Is the logic control circuit board fed with the specified power supply ? (Check voltage on each pin of connector P5.)	Power harness disconnected Connector defective	Replace the power supply circuit board.	After checking continuity, replace the power harness assembly.	Logic control circuit diagram
	*The fuse F1 on the power supply circuit board is blown out again, or the logic control circuit board is not fed with the power supplies at the specified voltages, though no defect is found after the completion of the above-mentioned checking.	Circuit after logic control circuit board shorted	Check the circuit boards after the logic control circuit board and replace defective one.		Logic control circuit diagram
Nothing moves, but the head indicator lights when the power is turned on.	Is any LSI or IC on the logic control circuit board too hot to touch it with fingers ?	LSI or IC defective	Replace the logic control circuit board.	Replace the defective LSI or IC.	
	Does signal on the pin 28 of LSI μPD7811 #F1 not turn to "H" ?	Reset circuit defective		Check the reset circuit for function and remedy.	6. $\overline{\text{RESET}}$/BACK-UP circuits
	Is pulse signal output from pin 46 of LSI #F1 (use a synchroscope to check) ?	#F1 defective		Replace the #F1.	3-2 Main CPU address map
	Is +5V applied to pin 28 of RAM #H2, H3 ?	Backup circuit defective		Check the backup circuit for function and remedy if necessary.	6. $\overline{\text{RESET}}$/BACK-UP circuits
	Does the input to pin 28 of slave CPU (#C2) remain "L" ?	HC00 #C1 defective		If the input does not change to "H" while PB3 output of main CPU is pulled up to "H", replace the HC00.	6. $\overline{\text{RESET}}$/BACK-UP circuit
	Check if the trouble occurs though "H" signal is input to pin 28 of slave CPU.	Slave CPU (#C2) defective		Replace the slave CPU.	6. $\overline{\text{RESET}}$/BACK-UP circuit

TROUBLESHOOTING (3)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Although the print head moves toward its home position, it cannot be indexed to the home position Error message "CHECK PRINTER" appears in the LCD display and port C-1 of slave CPU remains "L".	Is the carriage index switch tripped ?	Carriage index switch actuator improperly adjusted	Adjust the actuator properly.		4-5 Control of carriage 4-6 Carriage motor driver circuit 4-7 Function of carriage index switch
	Is signal on the pin 13 of IC #E3 not pulled down to "L" when the carriage index switch is tripped by hand (check continuity of the switch assembly) ?	Carriage index switch defective	Replace the carriage index switch assembly.		
	Is signal on the pin 16 of LSI #C2 not pulled up when the carriage index switch is tripped by hand ?	IC #E3 or LSI #C2 defective	Replace the logic control circuit board.	Replace the IC #E3, and LSI #C2 if necessary.	
		LSI #C2 defective if the signal on the pin 13 is "H".		Replace the LSI #C2.	
	Is the resistance measured between the excited phase of carriage motor and the COM terminal 3623 ohms ?	Carriage motor damaged or connector improperly set	Replace the carriage motor or the logic control circuit board.	If the motor winding is in good condition, check the circuit board. If the motor itself is defective, replace the motor.	
	Is the signal on PC1 of slave CPU not "L" (does "CHECK PRINTER" appear in the LCD display) ?	Interface (Slave CPU ⟷ Main CPU protocol) error	Turn off and then on the power to reset.	Check the interface (between the slave CPU and the main CPU.	

TROUBLESHOOTING (4)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Nothing occur when a key is pressed. (Message "COVER OPEN" appear in the LCD display.)	Is the top cover closed ?	Top cover opened	Close the top cover.		9-1 Cover switch circuit
	Does the AN1 of CPU #F1 on the logic control circuit not fall to "L" when the cover switch is opened by hand ?	Cover switch disconnected or connector not engaged properly.	Engage the connector. properly. Replace the cover switch if necessary.		
	Is the cover switch not opened though the top cover is closed ?	Cover switch installed improperly	Properly locate teh cover switch.		
	Does resetting not occur through the AN1 of #F1 is pulled down to "L" ?	#F1 defective	Replace teh logic control circuit board.	Replace the #F1.	
	Does message "CHECK PRINTER" not appear in the LCD display ?	Carriage not indexed to its home position properly	(Refer to the description about the carriage index switch.)		
Nothing occur when a key is pressed (Message "COVER OPEN" does not appear in the LCD display).	Does nothing occur when the return key is pressed (is special mode not selected) ? Does the condition remain same when the END key is pressed (during memory mode) and when the mode is changed to type mode ? Is only the LCD display in good condition ?	If key operation becomes effective after the return key operation or the change of mode, the typewriter is in good condition.			"User's manual"
		Keyboard, or logic control circuit board, or LED/ switch control circuit board defective	Perform the checking described on the next pages.		
	Is the data protocol between the main CPU and the slave CPU proper ?	Logic control circuit board defective	Replace the logic control circuit board.	Check the continuity of the data lines between the main CPU and the slave CPU and remedy if necessary.	
	Are data on PD0 ~ 7 of slave CPU properly latched ? Is the status on pin E of #E2 proper ?	Latch #E2 on logic control circuit board defective		Replace the latch #E2.	

TROUBLESHOOTING (5)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Nothing occurs when a key is pressed . (Message "COVER OPEN" does not appear in the LCD display.)	Is the cable between the logic control circuit board and the keyboard connected properly (is any line of the cable not disconnected) ?	Cable between logic control circuit board and keyboard connected improperly, or	Replace the cable if necessary.		5. Keyboard
	Does any one of outputs of the #1 on the keyboard circuit board fall to "L" with signals A, B, C and D input (for keys other than E1, E2, D1, 4, 5, 6, 21 and D27) ?	#1 defective	Replace the keyboard circuit board.	Replace the #1.	
	Is signal on pin 11 of #4 on the keyboard circuit board normal ? (When signals E1, E2, D1, D4 , D5, D6, D21 and D27 on the keyboard matrix are improper.	#4 defective	Replace the keyboard circuit board.	Replace the #4.	
	Is the LCD unit connected properly ?	LCD unit connected improperly.	Properly connect the LCD unit.		1-1 Electronic system composition
	Is the protocol between the main CPU and the LCD controller proper ? Does nothing appear in the LCD display, nor printing occur, even when "H" signal is momentarily input to DPSTB ?	Protocol lines (between main CPU and LCD controller) connected improperly	Replace the logic control circuit board, or LCD relay circuit board (if necessary).	Remedy the defective line(s).	8. LCD display
	Does DPBUSY signal in the protocol remain "H" ?	LCD controller defective	Replace the LCD control control circuit board	Replace the LCD controller.	8. LCD display
	Does print motion not occur even when the PB2 line of main CPU #F1 is momentarily connected to ±0V ?	#F1 defective	Replace the logic control circuit board.	Replace the #F1.	5. Keyboard
	Is the waveform of signal output from the #2 on the keyboard not likely to fall to "L" when key-in data is given, or does print motion occur when the PB2 line of #F1 is momentarily connected to ±0V ?	#2 defective	Replace the keyboard circuit board.	Replace the #2.	

TROUBLESHOOTING (6)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Key operation becomes ineffective from time to time, or any specific key becomes inoperative.	Are the contact plates installed properly ?	Contact plate installed improperly	Replace the keyboard circuit board.	Install all contact plates properly.	5. Keyboard
	Is the key matrix circuit (pattern) not short-circuited at any portion ?	Key matrix circuit short-circuited	Replace the keyboard circuit board.	Remove the short circuit ing.	
Key operation is ineffective in some specific keys.	Check the key matrix for continuity of X lines and Y lines. (a) Y line in failure (b) X line in failure	(a) #1 defective (b) #2 defective, or (a) and (b) defective (poor contact)	Replace the keyboard circuit board (LED/switch control circuit board).	(a) Replace the #1. (b) Replace the #2. (after checking the flat cable for continuity)	5. Keyboard
Printing is possible, but nothing is displayed in the LCD display.	Does nothing appear even when the VR1 (contrast) setting is changed ?	If it becomes possible to display, the VR1 setting is improper.	Properly set the VR1.		8. LCD display
		If the condition is not improved even though the VR1 setting is changed, proceed to the next step.			
	Is the –5V properly (on the LCD circuit board ?	Q1 on LCD circuit board defective	Replace the LCD circuit board.	Replace the Q1.	
Printing is possible, but display is improper.	Is display improper in horizontal line ?	Common driver defective or contact trouble	Replace the LCD circuit board.	Replace the common driver (#6).	8. LCD display
	Is display improper in vertical line (column) ?	Column driver defective or contact trouble	Replace the LCD circuit board.	Replace the column driver (#2 ~ #5).	
	Is any one of dots not displayed properly ?	Column driver defective or contact trouble	Replace the LCD circuit board.	Replace the column driver (#2 ~ #5).	
	Are adjacent two or more dots not displayed properly ?	Adjacent pins short-circuited each other	Replace the LCD circuit board.	Remedy to remove short-circuiting.	

TROUBLESHOOTING (7)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Printing and display are possible, but font selection (on keyboard), or impact selection is impossible.	Does continuity exist between pin 7 of main CPU and each pin #3, 9 and 10, and pin 6 of main CPU and each pin #3, 12 and 13 ?	Poor connection between logic circuit board and keyboard circuit board	Replace the keyboard circuit board.	Check the connection and remedy.	5. Keyboard
	Are the slide switches connected to the keyboard circuit board properly ?	Poor connection, or contact trouble	Replace the keyboard circuit board.	Check the connection and remedy.	
	Does the output on pin 5 of J2 fall to "L" when "H" signal is input to pins 9 and 10 of J1 of keyboard circuit board ?	#3 or #4 of keyboard circuit board defective	Replace the keyboard circuit board.	Check the waveform of the output signal and replace the #3 or #4 if necessary.	
Font selection is possible, but impact selection is impossible, or vice versa.	Is the cable between the keyboard circuit board and the slide switch not broken ?	Slide switch cable on keyboard circuit board defective	Replace the keyboard circuit board.	Replace the cable.	
"SHIFT" key and "SHIFT LOCK" key are effective, but these LEDs do not turn on.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Do the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "CAPS" key is pressed, its LED does not light.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LED not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	

TROUBLESHOOTING (8)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
When "L/L" key is pressed, its LED does not light.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "UNDLN" key is pressed, its LED does not light.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "BOLD" key is pressed, its LED does not light.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	

TROUBLESHOOTING (9)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
When "AUTO" key is pressed, its LED does not light.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "JUST" key is pressed, its LED does not light.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "PRINT" mode is selected, its indicator LED does not light.	Are the signal lines from the main CPU to #6 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #6 ?	#6 defective	Replace the keyboard circuit board.	Replace the #6.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	

TROUBLESHOOTING (10)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
When "STORE" mode is selected, its indicator LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "PICA" pitch is selected, its indicator LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "ELITE" pitch is selected, its indicator LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	

TROUBLESHOOTING (11)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
When "MICRON" pitch is selected, its indicator LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "LINE SELECT" is set to "1", its indicator LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "LINE SELECT" is set to "1.5", its indicaotr LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	

TROUBLESHOOTING (12)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
When "LINE SELECT" is set to "2", its indicator LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	
When "LINE SELECT" is set to "3", its indicator LED does not light.	Are the signal lines from the main CPU to #5 in good condition ?	Signal line broken	Replace the keyboard circuit board.	Replace the cable (harness) if it is found broken. If printed circuit pattern is found disconnected, remedy.	5. Keyboard
	Does the LEDs not turn on and off when "L" signal is forcedly input to pin 11 of #5 ?	#5 defective	Replace the keyboard circuit board.	Replace the #5.	
	Is each anode and cathode of LED connected properly ?	LED connected improperly	Replace the keyboard circuit board.	Properly set each LED.	

TROUBLESHOOTING (13)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Wrong character is printed. (1)	Is the print wheel properly set ?		Properly set the print wheel.		
	Is any spoke of print wheel not deformed ?	Print wheel deflective	Replace the print wheel.		
	Does frictional sound not occur during rotation of the print wheel (is the print wheel not in contact with a part of print head or ribbon guide) ?	Paper meter or ribbon guide adjusted improperly	Adjust the paper meter or ribbon guide properly.		
	Is the print wheel not indexed to its home position properly ?	Wheel flange gear pawl damaged	Replace the flange gear.		
	Is the wheel flange gear not locked when the print wheel is indexed to its home position ?	Print head position adjustment improper.	Adjust the print position properly.		
Wrong character is printed. (2)	Are the wheel motor drive signals output from the pin 9, 11, 13 and 15 of #C2 properly ? properly ?	#C2 or #B4 defective		When the waveforms of the output signals #C2, measured with the #B4 disconnected, are normal, the #B4 is defective and must be replaced. Otherwise, #C2 must be replaced.	4-1 Control of wheel motor 4-2 Wheel motor or driver circuit Waveforms examples: 1, 2, 3 and 4
	Is Vcc of #A4 5V ?	Q6 defective		Replace the Q6.	
	Is 30V applied to the pin 3 of print head connector P4 ?	QA1 or #A4 or #C2 defective	Replace the logic control circuit board.	When the output from the #A4, measured without the QA1, is normal, replace the QA1. When the output from the PB3 of #C2, measured without the #A4, is normal, replace the #A4. Otherwise, replace the #C2.	

TROUBLESHOOTING (14)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Wrong character is printed. (2)	Is the 12V supply given to the pin 3 of print head character P4 ?	Q1 or #A4 or #C2 defective	Replace the logic control circuit board	When the output from the #A4, measured without the Q1, is normal, replace the Q1. When the output from the PA3 of #C2, measured without the #A4, is normal, replace the #A4. Otherwise, replace the #C2.	4-1 Control of wheel motor. 4-2 Wheel motor or driver circuit Waveform examples: 1, 2, 3 and 4
	Is the winding resistance at each phase of the wheel motor 60 ± 3 ohm ?	Wheel motor winding opened	Replace the wheel motor.	Check contact condition between each motor contact and the harness and retighten if necessary.	
	Is each pin of the wheel connector on the relay circuit board securely connected to the harness ?	Relay circuit board defective	Replace the relay circuit board.		10-2 Relay circuit board.
The print hammer does not operate.	Is the fuse (FUSE-1) on the logic control circuit board not blown out ?	Fuse (FUSE-1) blown out	Replace the fuse.		4-3 Control of hammer
	Is the hammer solenoid resistance (2.4 ± 0.05 ohm) normal ?	Hammer solenoid defective	Replace the hammer solenoid.		
	Is the circuit of the relay circuit board not opened ?	Relay circuit board defective	Replace the relay circuit board.		10-2 Relay circuit board
	Is the output PC4 of #C2 pulled down to "L" when the hammer solenoid is turned on, or does it remain "L" even after the hammering ends ?	#C2 or #E3 defective	Replace the logic control circuit board.	When the output PC4 with the #E3 is normal, replace the #E3. Otherwise, replace the #C2.	4-4 Hammer driver circuit

TROUBLESHOOTING (15)

Trouble	Check-Up	Possible Cause	Remedy I	Remedy II	Refer To
The print hammer does not operate. (Cont'd)	Is the output of #E3 "H" when the hammer solenoid is turned on, or does it remain "L" even after the completion of hammering ?	#E3 defective or VRST defective if the output is not "H".	Replace the logic control circuit board.	When Q6 turns on, replace #E3. Otherwise, replace Q6.	4-4 Hammer driver circuit
		#E3 defective if the output remains "H" even after the completion of hammering		Replace the #E3.	4-3 Control of hammer
	Does the Q3 operate in accordance with its base voltage ?	Q3 defective		Replace the Q3.	
	Does the Q2 operate in accordance with its base voltage ?	Q2 defective		Replace the Q2.	
Print is too thick or thin.	Is the current to the hammer solenoid adjusted to about 3.4A ?	Hammer solenoid current adjusted improperly	Set the VR1 on the logic control circuit board properly.		
	Does chopping occur ?	#E5 defective or or hammer solenoid current adjusted improperly	Set the VR1 so that chopping occur. If the adjustment is impossible, replace the logic control circuit board.	Replace the #E5.	
The ink ribbon does not go up, or the correction tape does not go up, or malfunction occurs. (1)	Is the home position of ribbon vibrator set properly ?	Ribbon vibrator home position adjusted improperly	Adjust the home position again.		
	Does the correction tape or ink ribbon not run out ?	Correction tape or ink ribbon run out, or defective	Replace the correction tape or ink ribbon.		
	Is the correction tape or ink ribbon not caught on any part of the print head ?	Correction tape or ink ribbon loaded improperly	Properly load it.		

TROUBLESHOOTING (17)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
The ink ribbon does not go down.	Is the ribbon lift cam follower pin not disengaged ?	Ribbon lift cam follower pin installed improperly ?	Properly install.		
The carriage becomes out of control. (1)	Is the carriage not caught ?	Print head drive gear back-lash adjusted improperly	Properly adjsut the gear backlash.		
The carriage becomes out of control. (2)	Are the carriage drive signals output from the pins 2, 4, 9 and 11 of QA2 properly ?	QA2 or #E3 or #C2 defective	Replace the logic control circuit board.	When the waveforms of signals from the #E3, measured with the QA2 disconnected, are normal, replace the QA2. When the waveforms of signals from the #C2, measured with the #E3, are normal, replace the #E3. Otherwise, replace the #C2.	4-6 Control of carriage motor 4-7 Carriage motor driver circuit Waveform examples: 5, 6, 7 and 8
	Is Vcc of #A4 5V ?	Q6 defective		Replace the Q6.	
	Is the 30V supply applied to the pins 5 and 6 of connector P8, or does it remain applied at all times ?	QA1 or #A4 or #C2 defective		When the output from the #A4, measured without the QA1, is normal, replace the QA1. When the output from the PC6 of #C2, measured without the #A4, is normal, replace the #A4. Otherwise, replace the #C2.	
	Is the carriage motor winding resistance at at each phase 30Ω ± 10% ?	Carriage motor winding opened	Replace the carriage motor.	Check contact condition between each motor contact and the harness and retighten if necessary.	

TROUBLESHOOTING (16)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
The ink ribbon does not go up, or the correction tape does not go up, or malfunction occurs. (2)	Are the ribbon motor driver signals output from the pins 1, 3, 5 and 7 of #C2 properly ?	#C2 or #C4 defective	Replace the logic control circuit board	When the waveforms of the output signals #C2, measured with the #C4 disconnected, are normal, the #C4 is defective and must be replaced. Otherwise, #C2 must be replaced.	4-10 Control of ribbon motor 4-11 Ribbon motor driver circuit Waveforms examples: 9 and 10
	Is Vcc #A4 5V ?	Q6 defective		Replace the Q6.	
	Is the 30V supply applied to the 3 pin of head connector P4, or does it remain applied at all times ?	QA1 or #A4 or #C2 defective		When the output from the #A4, measured without the QA1, is normal, replace the QA1. When the output from the PC5 of #C2, measured without the #A4, is normal, replace the #A4. Otherwise, replace the #C2.	
	Is the ribbon motor winding resistance at each phase 70Ω ± 10% ?	Ribbon motor winding opened	Replace the ribbon motor	Check contact condition between each motor contact and the harness and retighten if necessary. Replace the carriage motor if necessary.	
	Is each pin of ribbon motor connector on the relay circuit board connected to the harness securely ?	Relay circuit board defective	Replace the relay circuit board.		10-2 Relay circuit board

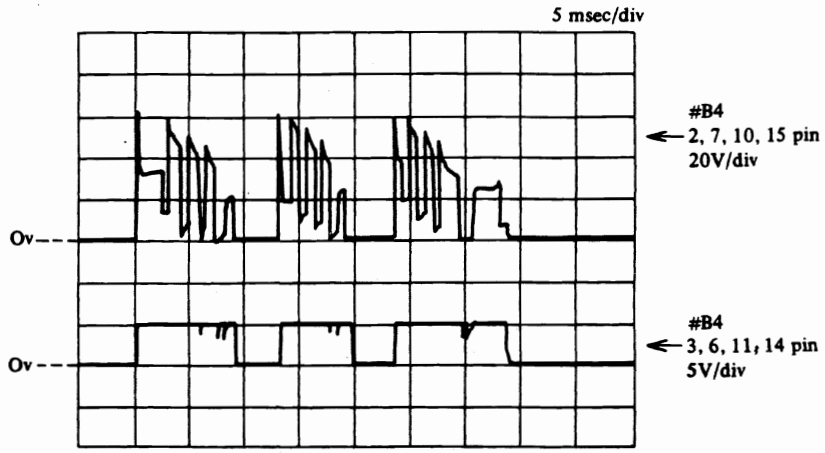
TROUBLESHOOTING (19)

Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
The print head indicator does not light.	Is the connector properly set to the relay circuit board ?	Connector set improperly			10-2 Relay circuit board
	Is the relay circuit board fed with the 5V supply ?	Relay circuit board defective	Replace the relay circuit board.		
	Does carriage index switch function properly ?	Head indicator circuit board defective	Replace the head indicator circuit board.		10-1 Head indicator
The buzzer does not sound.	Does the output from the PC6 of #F1 osicllate at about 4KHz ?	#F1 (#F4) or #G1 (#H4) defective	Replace the logic control circuit board	When oscillation occurs even when the #A4 is disconnected, replace the #A4.	7-3 Buzzer circuit
Optional device connected to the interface does not work at all ?	Is the connector of optional device securely set to the typewriter ?	Connector defective	Securely set the connector.		
					9. Interface
	Does the typerwriter itself function when the optional device is connected to the typewriter in operation ?	+5V circuit on optional device shorted	Relace the optional device (circuit board or power supply board.)	Check the +5V supply line on the optional device. Check the fuses (F1) on the power supply circuit board.	

TROUBLESHOOTING (18)

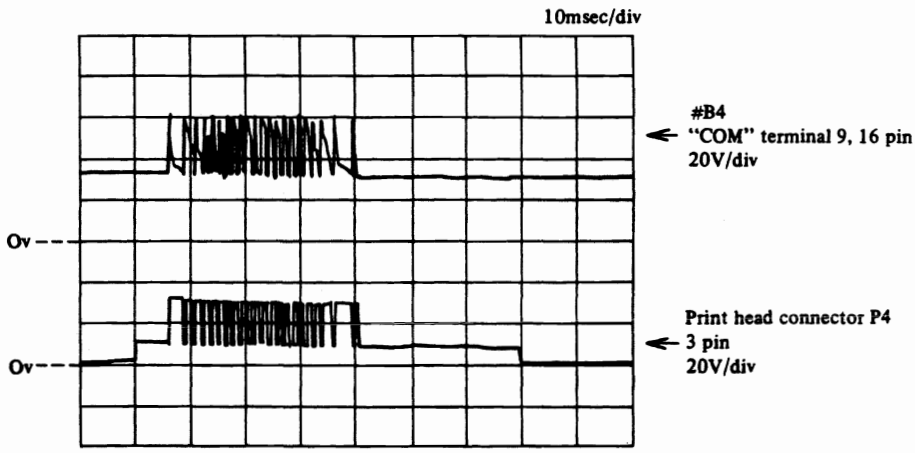
Trouble	Check-Up	Possible Cause	Remedy		Refer To
			I	II	
Line feed is improper (line feed length is not exact). (1)	Are the platen knobs instaled properly ?	Platen knobs installed improperly			
	Is platen rotation smooth when the platen is turned by hand ?	Backlash on line feed gear improper	Adjust the line feed gear properly.		
Line feed is improper. (2)	Are the line feed motor drive signals output from the pins 2, 7, 10 and 15 of #A3 properly ?	#A3 or #C2 defective	Replace the logic control circuit board	When the waveforms of the output signals #C2, measured with the #A3 disconnected, are normal, the #A3 is defective and must be replaced. Otherwise, #C2 must be replaced.	4-8 Control of line feed motor 4-9 Line feed motor driver circuit Waveform examples: 11 and 12
	Is Vcc of #A4 5V ?	Q6 defective		Replace the Q6.	
	Is the 30V supply applied to the pins 5 and 6 of connector P2, or does it remain applied at all times ?	QA1 or #A4 or #C2 defective		When the output from the #A4, measured without the QA1, is normal, replace the QA1. When the output from the PC3 of #C2, measured without the #A4, is normal, replace the #A4. Otherwise, replace the #C2.	
	Is the line feed motor winding resistance at each phase 70Ω ± 10% ?	Line feed motor winding opened	Replace the line feed motor.	Check contact condition between each motor contact and the harness and retighten if necessary. Replace the line feed motor if necessary.	

Waveform example – 1



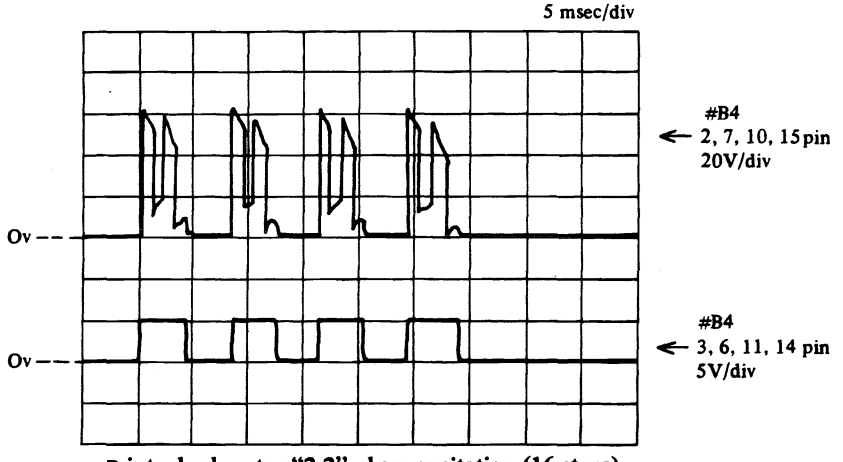
Print wheel motor "1-2" phase excitation (22 steps)

Waveform example – 2



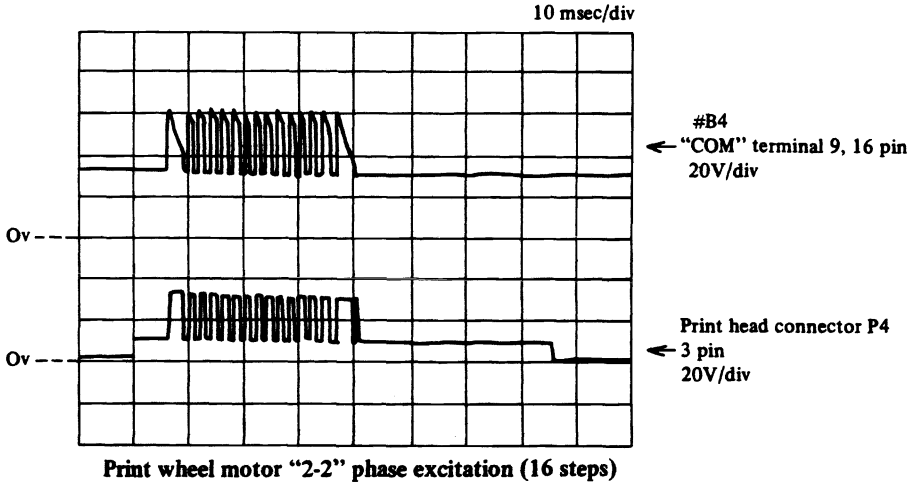
Print wheel motor "1-2" phase excitation (22 steps)

Waveform example – 3



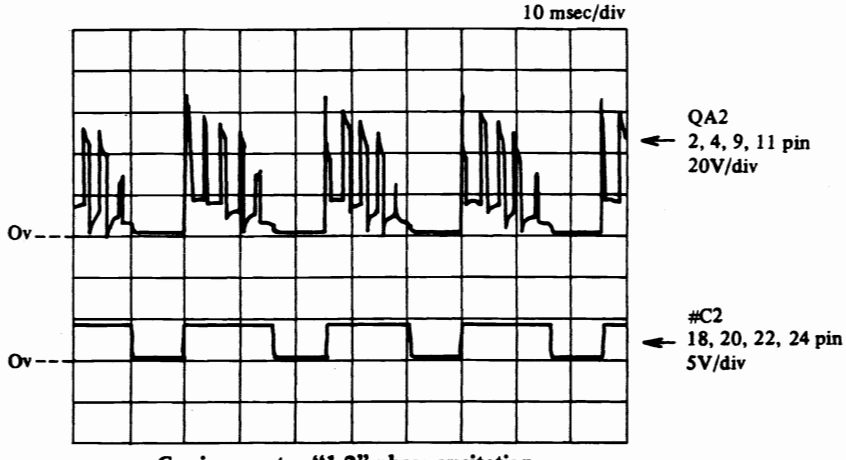
Print wheel motor "2-2" phase excitation (16 steps)

Waveform example – 4



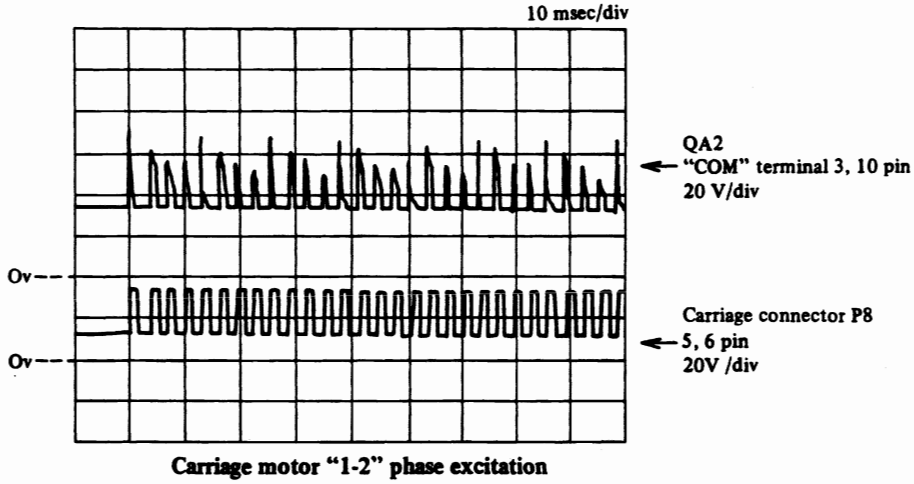
Print wheel motor "2-2" phase excitation (16 steps)

Waveform example – 5



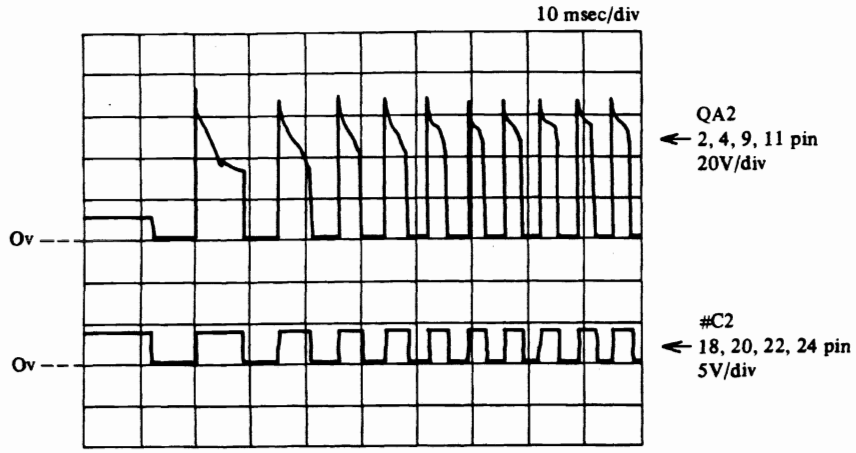
Carriage motor "1-2" phase excitation

Waveform example – 6



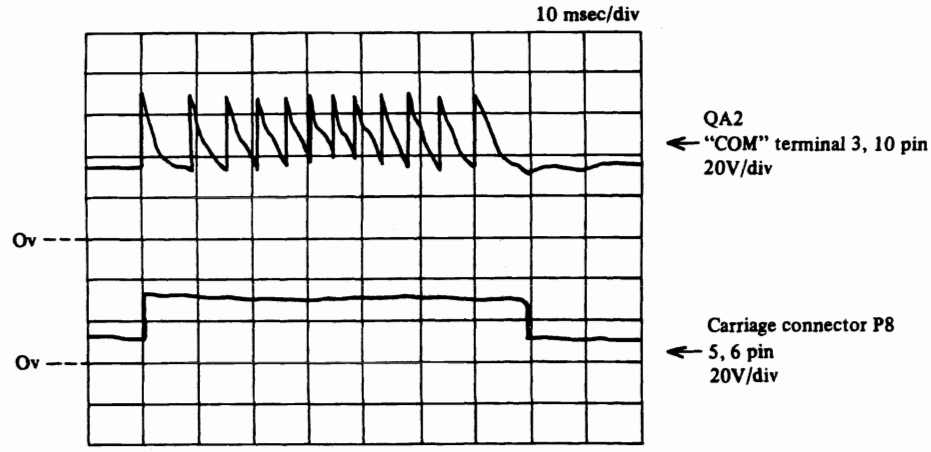
Carriage motor "1-2" phase excitation

Waveform example – 7



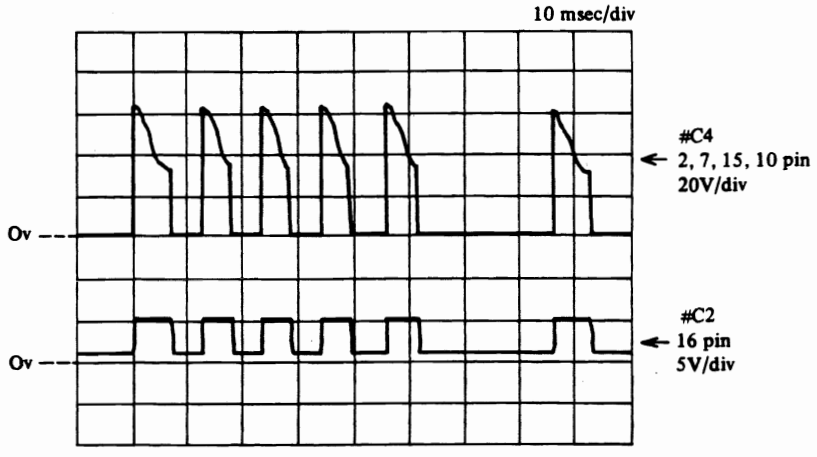
Carriage motor "2-2" phase excitation

Waveform example – 8



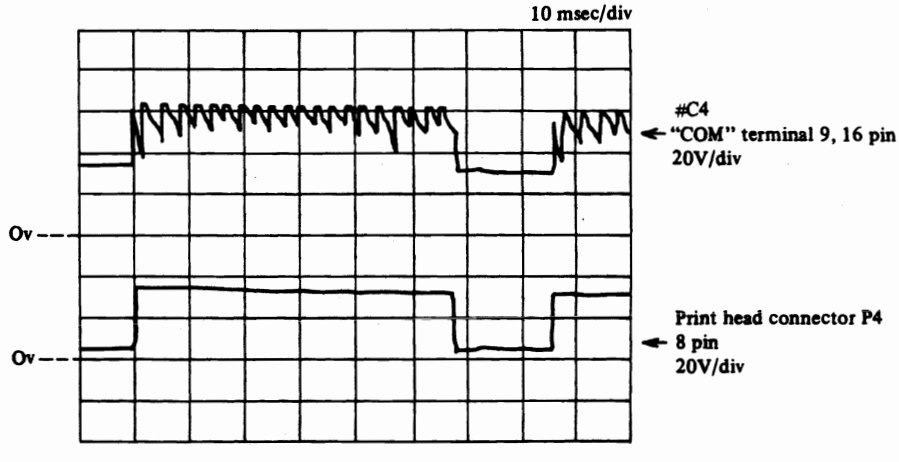
Carriage motor "2-2" phase excitation

Waveform example – 9



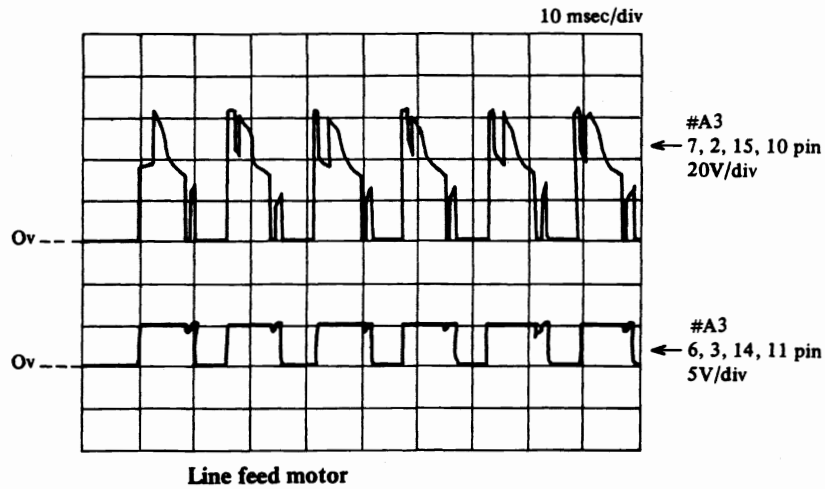
Ribbon motor

Waveform example – 10



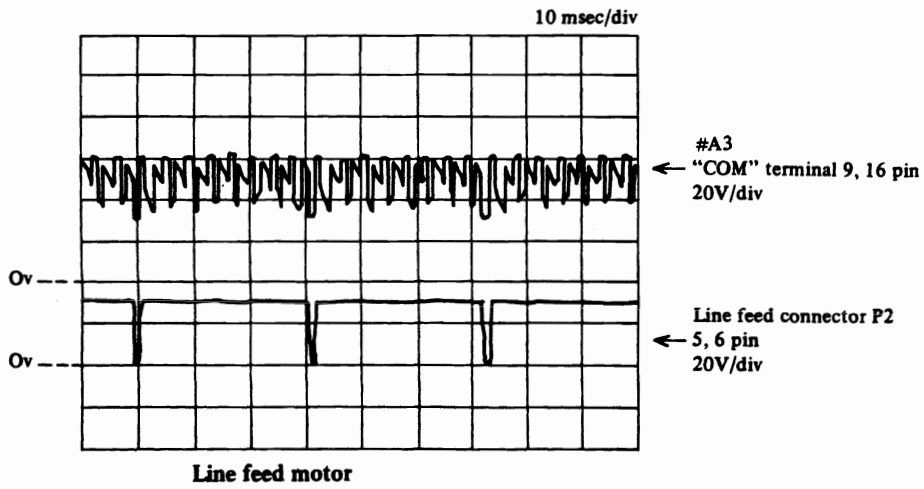
Ribbon motor

Waveform example – 11



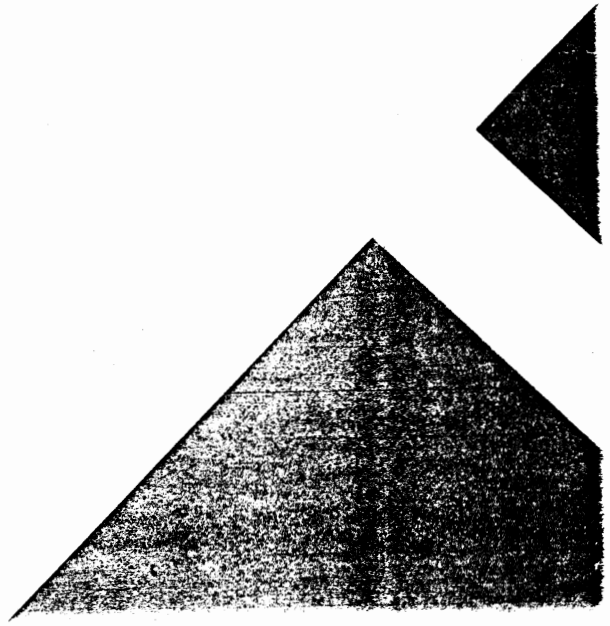
Line feed motor

Waveform example – 12



Line feed motor

brother®



Feb. '86
536043BE0
P