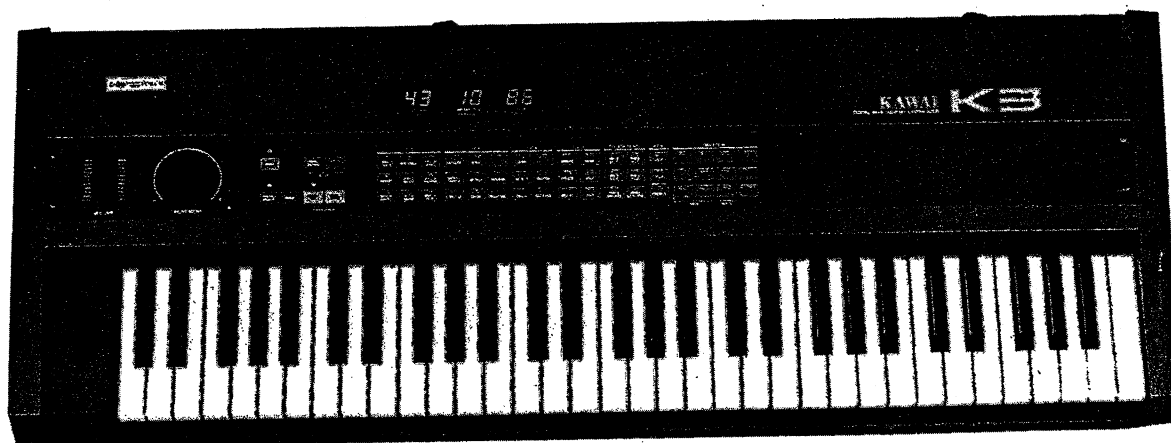


# KAWAI

DIGITAL WAVE MEMORY SYNTHESIZER

# KE

## Service Manual



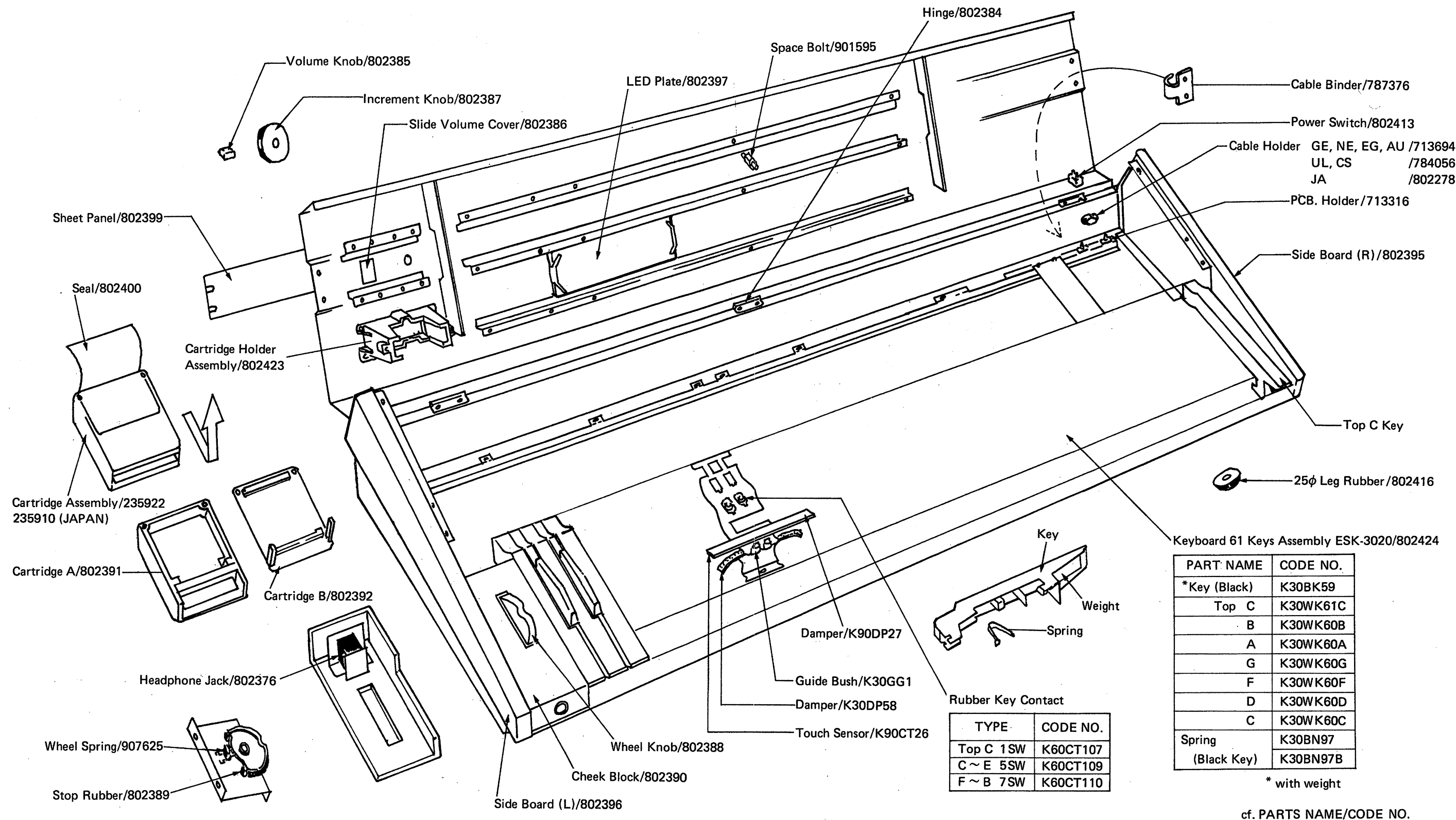
# KAWAI

Kawai Musical Instrument  
Manufacturing Co., Ltd.

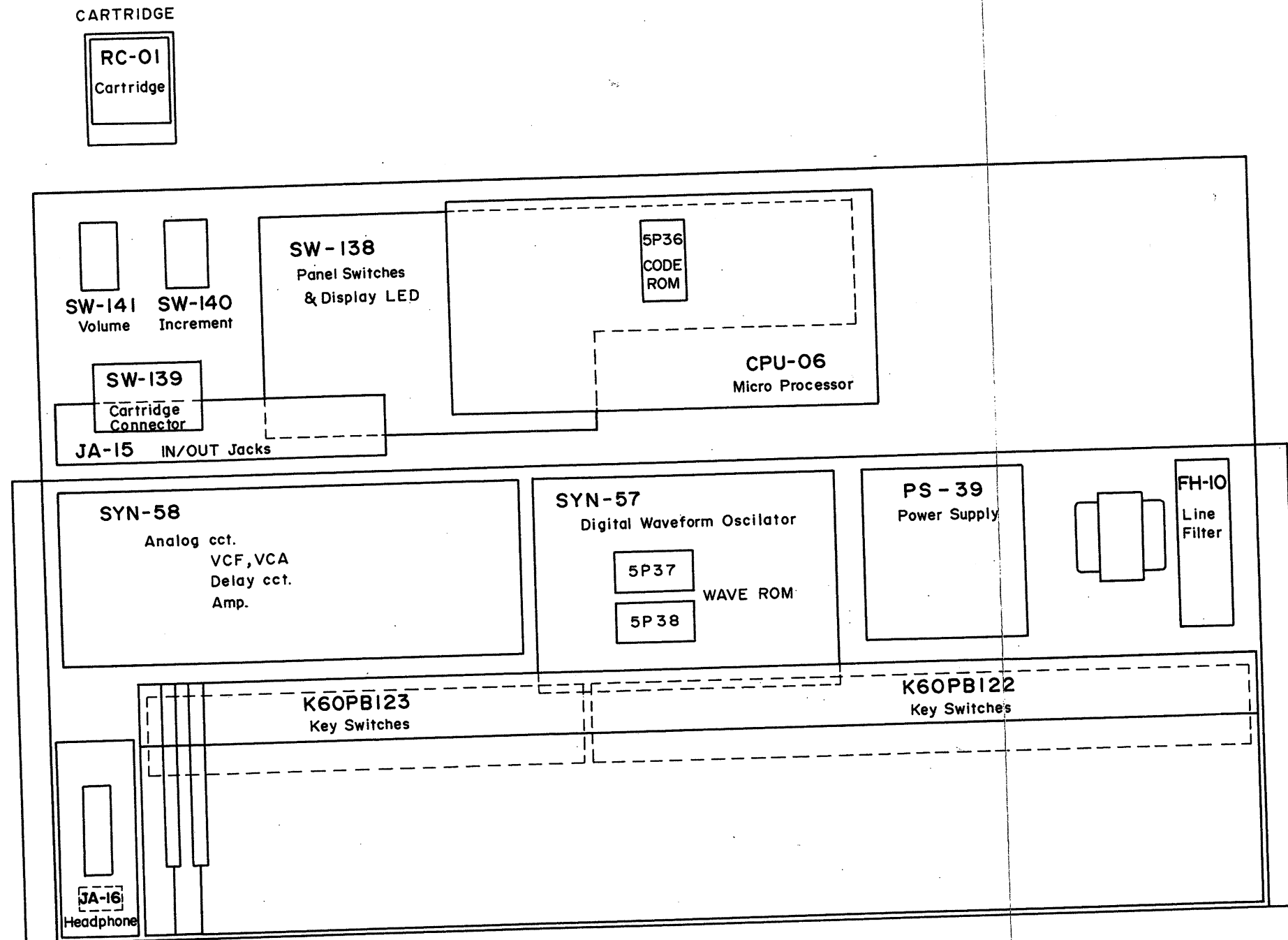
## CONTENTS

UNIT ASSEMBLY LAYOUT AND PARTS .....	1
P.C.B. LAYOUT .....	2
P.C.B. LIST .....	2
BLOCK DIAGRAM .....	3
TTL CIRCUITS PIN ASSIGNMENTS (TOP VIEWS) .....	4
CMOS LOGIC CIRCUITS PIN ASSIGNMENTS (TOP VIEWS) .....	7
HIGH-SPEED CMOS LOGIC CIRCUITS PIN ASSIGNMENTS (TOP VIEWS) .....	7
CPU-06, SW-139, SW-140 TERMINALS INFORMATION .....	8
CPU-06, SW-140 CIRCUIT DIAGRAM .....	9
SW-138 TERMINALS INFORMATION .....	10
SW-138 CIRCUIT DIAGRAM .....	11
SYN-57 TERMINALS INFORMATION .....	12
SYN-57 CIRCUIT DIAGRAM .....	13
SYN-58, SW-141, JA-16 TERMINALS INFORMATION .....	14
SYN-58, SW-141, JA-16 CIRCUIT DIAGRAM .....	15
JA-15 TERMINALS INFORMATION .....	16
RC-01, SW-139 TERMINALS INFORMATION .....	16
JA-15 CIRCUIT DIAGRAM .....	17
RC-01, SW-139 CIRCUIT DIAGRAM .....	17
PS-39, FH-10 TERMINALS INFORMATION .....	18
POWER SUPPLY INFORMATION AND PARTS LIST .....	18
PS-39, FH-10 CIRCUIT DIAGRAM .....	19
KEYBOARD CIRCUIT DIAGRAM .....	19
PARTS LIST .....	20
TEST TONE CHART .....	22
CREATION OF MEMORY CARTRIDGE FOR ADJUSTMENT .....	22
K3 ADJUSTMENT INSTRUCTIONS .....	23
K3 INSPECTION INSTRUCTIONS .....	27
DATA SETTING PROCEDURE AT FACTORY DELIVERY .....	28
CHECK POINTS FOR REPAIR .....	29
SPECIFICATION SHEET OF PERFORMANCE & FUNCTION .....	32

UNIT ASSEMBLY LAYOUT AND PARTS



# P.C.B. LAYOUT

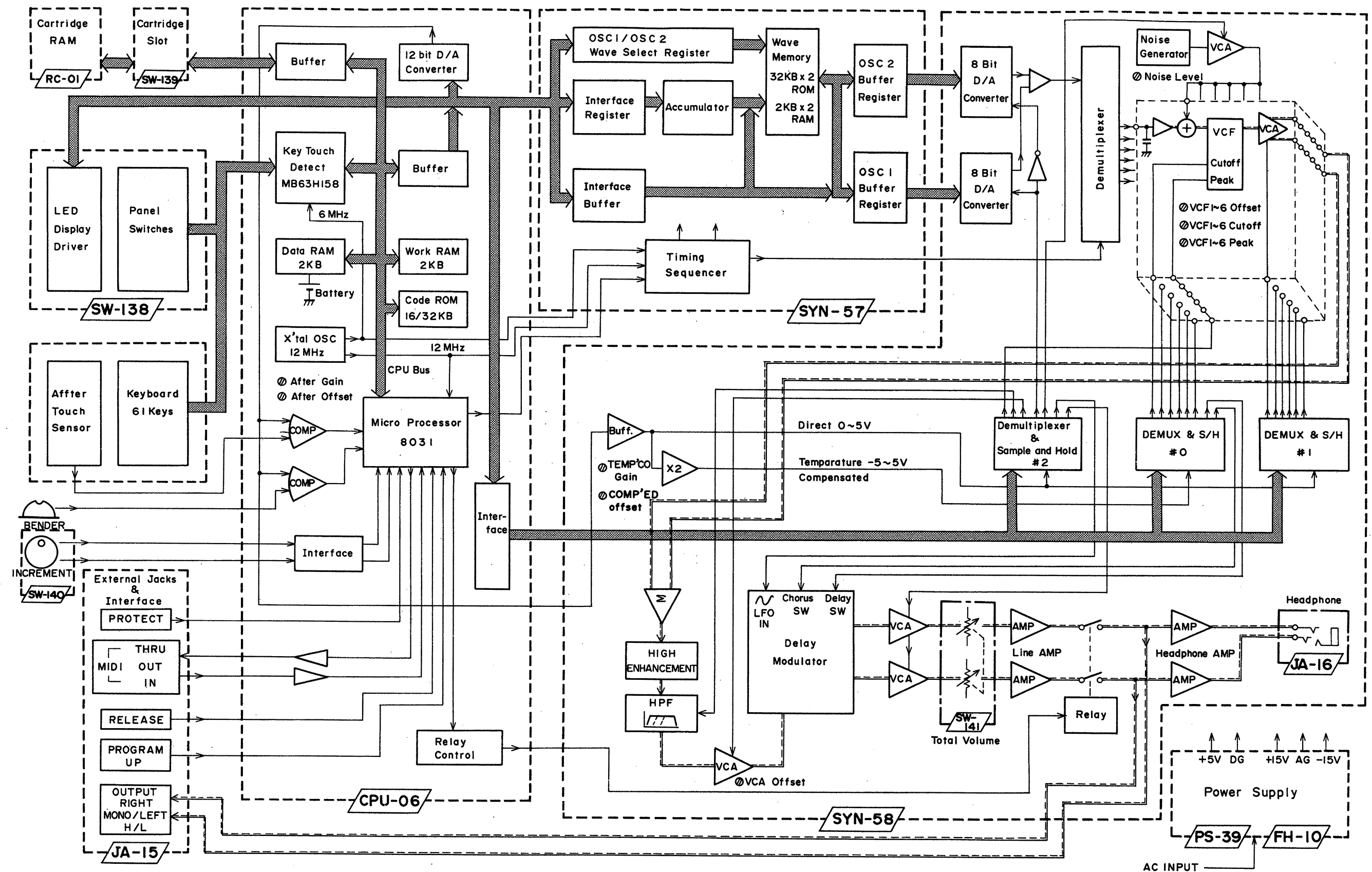


## P.C.B. LIST

DESCRIPTION	CODE NO.	REMARKS
SYN-57 PCB	907545	
SYN-57 Assembly	235904	
SYN-58 PCB	907550	
SYN-58 Assembly	235905	
CPU-06 PCB	907555	
CPU-06 Assembly	235906	
JA-16, SW-138, 139, 140, 141 PCB	907570	
JA-16, SW-138, 139, 140, 141, Assembly	235909	
RC-01 PCB	907560	
Cartridge Assembly	235922	
"	235910	Japan
"	907565	
FH-10, JA-15, PS-39 PCB	235911	General
FH-10, JA-15, PS-39 Assembly	235912	NE
"	235913	UL
"	235914	CS
"	235908	Japan
Key Switches	K60PB123	
"	K60PB122	



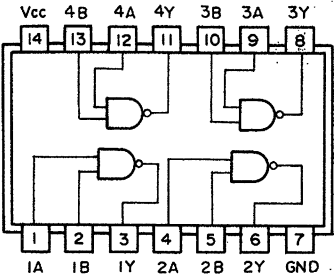
# BLOCK DIAGRAM



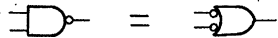
TTL CIRCUITS PIN ASSIGNMENTS (TOP VIEWS)

74LS00 (Code No. 800720)

QUADRUPLE 2-INPUT  
POSITIVE-NAND GATES

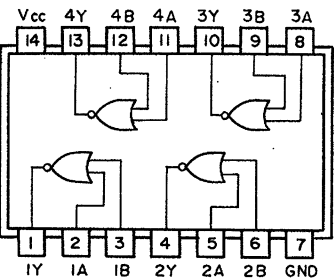


Positive logic:  
 $Y = \overline{AB}$



74LS02 (Code No. 800721)

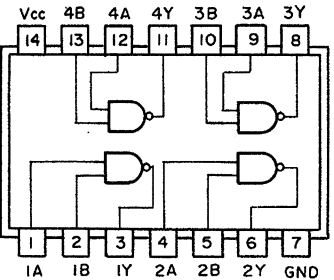
QUADRUPLE 2-INPUT  
POSITIVE-NOR GATES



Positive logic:  
 $Y = \overline{A+B}$

74LS03 (Code No. 706951)

QUADRUPLE 2-INPUT  
POSITIVE-NAND GATES  
WITH OPEN-COLLECTOR OUTPUTS

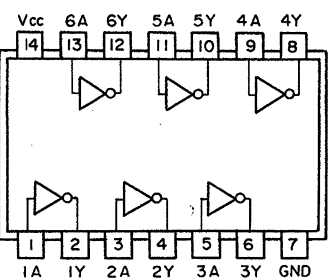


Positive logic:  
 $Y = \overline{AB}$



74LS04 (Code No. 706957)

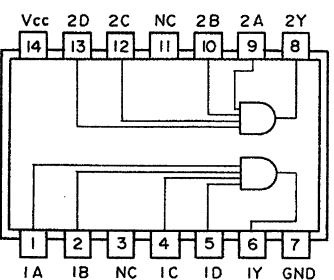
HEX. INVERTERS



Positive logic:  
 $Y = \overline{A}$

74LS21 (Code No. 802236)

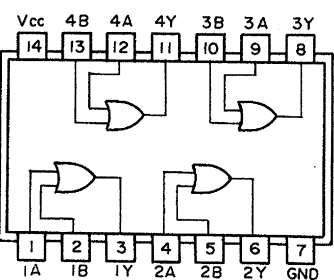
DUAL 4-INPUT  
POSITIVE-AND GATES



Positive logic:  
 $Y = ABCD$

74LS32 (Code No. 706914)

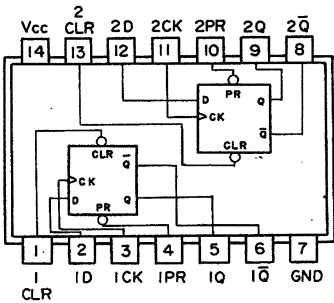
QUADRUPLE 2-INPUT  
POSITIVE-OR GATES



Positive logic:  
 $Y = A + B$

74LS74AN (Code No. 706927)

DUAL D-TYPE POSITIVE-EDGE-TRIGGERED  
FLIP-FLOPS WITH PRESET AND CLEAR

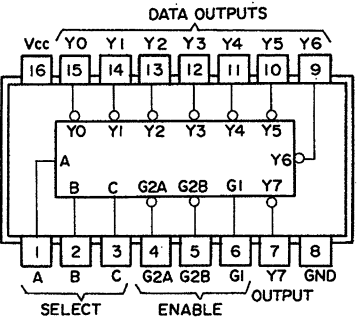


FUNCTION TABLE

INPUTS				OUTPUTS	
PRESET	CLEAR	CLOCK	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H°	H°
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q <sub>0</sub>	$\overline{Q}_0$

74LS138 (Code No. 706939)

3-TO 8-LINE DECODERS /MULTIPLEXERS



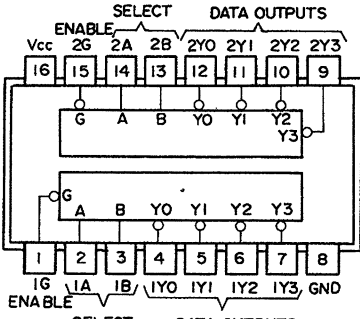
'LS138,  
FUNCTION TABLE

INPUTS					OUTPUTS							
ENABLE SELECT												
G1	G2*	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	L	H	H
H	L	H	H	L	H	H	H	H	L	L	L	H
H	L	H	H	H	H	H	H	H	H	L	L	L

\*G = G2A + G2B  
H = high level, L = low level, X = irrelevant

74LS139 (Code No. 800807)

DUAL 2-TO 4-LINE DECODERS /MULTIPLEXERS



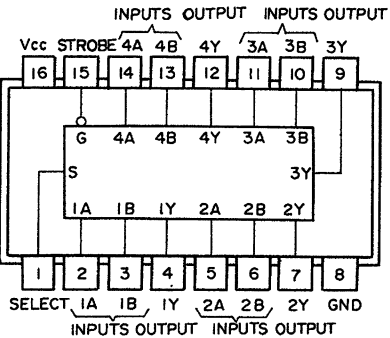
'LS139,  
(EACH DECODER/DEMULPLEXER)  
FUNCTION TABLE

INPUTS			OUTPUTS			
ENABLE	SELECT					
G	B	A	Y0	Y1	Y2	Y3
H	X	X	H	H	H	H
L	L	L	L	H	H	H
L	L	H	H	L	H	H
L	H	L	H	H	L	H
L	H	H	H	H	L	L

H=high level, L=low level, X=irrelevant

74LS158 (Code No. 802409)

INVERTED DATA OUTPUTS /MULTIPLEXERS  
QUAD 2-TO 1-LINE DATA SELECTORS



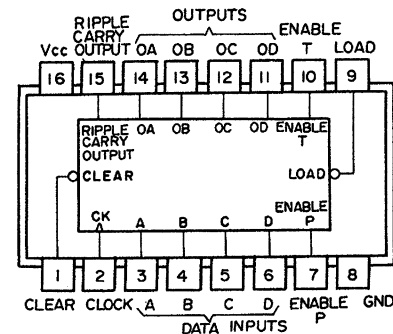
FUNCTION TABLE

INPUTS				OUTPUT Y
STROBE	SELECT	A	B	'LS158
H	X	X	X	H
L	L	L	X	H
L	L	H	X	L
L	H	X	L	H
L	H	X	H	L

H = high level, L = low level, X = irrelevant

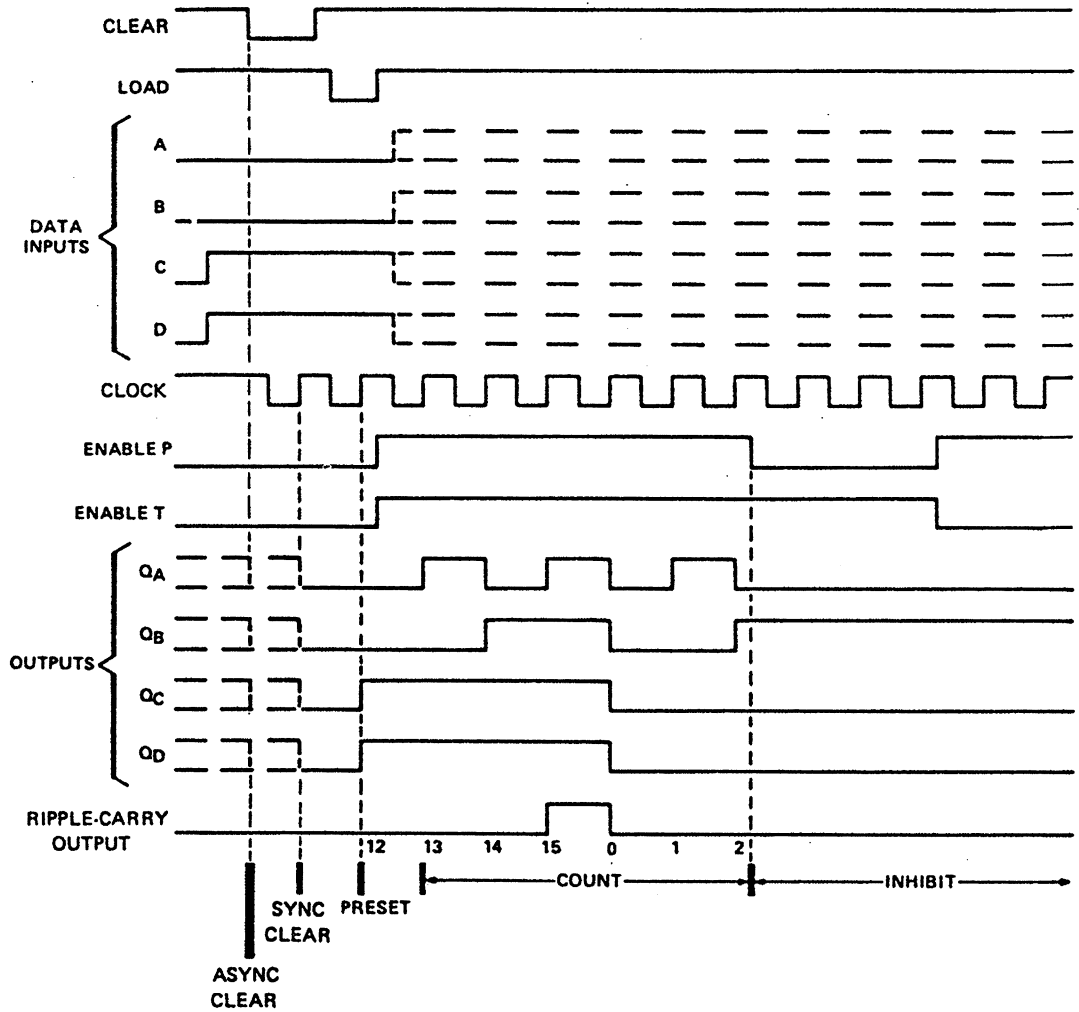
74LS161 (Code No. 800756)

SYNCHRONOUS 4-BIT COUNTERS BINARY, DIRECT CLEAR



typical clear, preset, count, and inhibit sequences

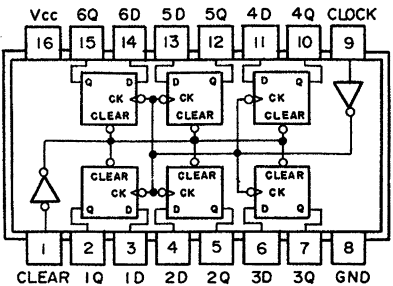
- Illustrated below is the following sequence:
1. Clear outputs to zero (asynchronous)
  2. Preset to binary twelve
  3. Count to thirteen, fourteen fifteen, zero, one, and two
  4. Inhibit



74LS174 (Code No. 707008)

HEX. D-TYPE FLIP-FLOPS

SINGLE RAIL OUTPUTS  
COMMON DIRECT CLEAR



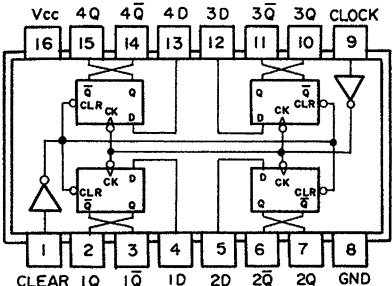
FUNCTION TABLE (EACH FLIP-FLOP)					
INPUTS			OUTPUTS		
CLEAR	CLOCK	D	Q	Q̄	†
L	X	X	L	H	
H	↑	H	H	L	
H	↑	L	L	H	
H	L	X	Q <sub>0</sub>	Q̄ <sub>0</sub>	

H = high level (steady state)  
L = low level (steady state)  
X = irrelevant  
↑ = transition from low to high level  
Q<sub>0</sub> = the level of Q before the indicated steady-state input conditions were established.  
† = 'LS175, only

74LS175 (Code No. 800719)

QUAD D-TYPE FLIP-FLOPS

COMPLEMENTARY OUTPUTS  
COMMON DIRECT CLEAR



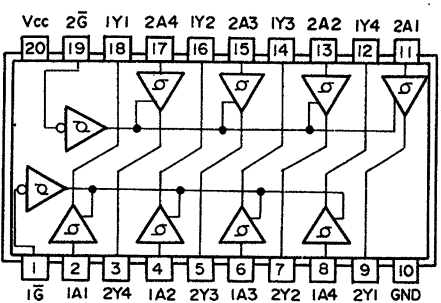
FUNCTION TABLE (EACH FLIP-FLOP)					
INPUTS			OUTPUTS		
CLEAR	CLOCK	D	Q	Q̄	†
L	X	X	L	H	
H	↑	H	H	L	
H	↑	L	L	H	
H	L	X	Q <sub>0</sub>	Q̄ <sub>0</sub>	

H = high level (steady state)  
L = low level (steady state)  
X = irrelevant  
↑ = transition from low to high level  
Q<sub>0</sub> = the level of Q before the indicated steady-state input conditions were established.  
† = 'LS175, only

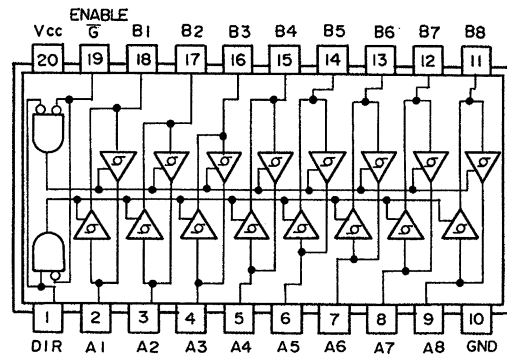
74LS244 (Code No. 800675)

OCTAL BUFFERS/LINE DRIVERS  
/LINE RECEIVERS

NONINVERTED 3-STATE OUTPUTS



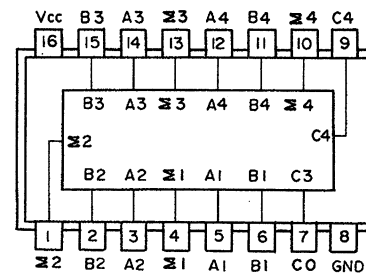
### NONINVERTED 3-STATE OUTPUTS



ENABLE G	DIRECTION CONTROL DIR	OPERATION
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

H=high level, L=low level, X=irrelevant

## 4-BIT BINARY FULL ADDERS



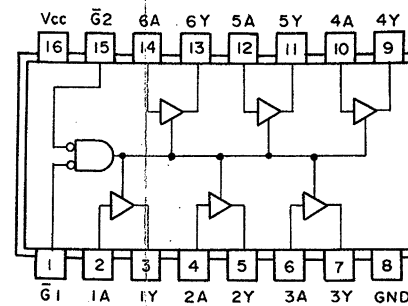
INPUT				OUPUT							
				WHEN C0=L				WHEN C0=H			
				WHEN C2=L				WHEN C2=H			
A1	B1	A2	B2	Σ1	Σ2	C2	Σ1	Σ2	C2		
A3	B3	A4	B4	Σ3	Σ4	C4	Σ3	Σ4	C4		
L	L	L	L	L	L	L	L	H	L	L	
L	L	L	L	L	H	L	L	L	H	L	
L	H	L	L	L	L	L	L	L	H	L	
H	H	L	L	L	L	H	L	H	H	L	
H	L	L	L	L	L	H	L	H	H	L	
H	L	H	L	L	L	H	L	L	L	H	
L	H	H	L	L	H	H	L	L	L	H	
L	H	H	L	L	L	L	H	H	H	H	
L	L	L	H	L	L	H	L	L	L	H	
L	L	L	H	L	H	H	L	L	L	H	
L	H	L	H	L	L	L	L	L	L	H	
L	H	L	H	L	H	L	L	L	L	H	
L	L	H	H	L	L	L	H	L	L	H	
L	L	H	H	L	L	H	H	L	L	H	
L	L	H	H	L	L	H	L	L	H	H	
L	H	H	H	L	H	H	L	H	H	H	
L	H	H	H	L	L	H	H	H	H	H	

H = high level, L = low level

**NOTE:** Input conditions at A1, B1, A2, B2, and C0 are used to determine outputs  $\Sigma 1$  and  $\Sigma 2$  and the value of the internal carry C2. The values at C2, A3, B3, A4, and B4 are then used to determine outputs  $\Sigma 3$ ,  $\Sigma 4$ , and C4.

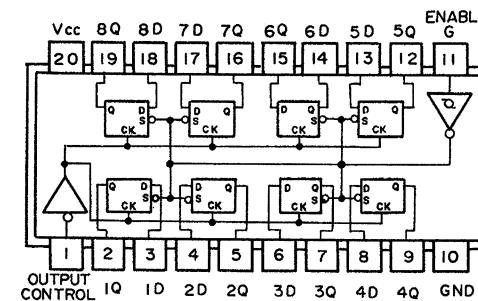
## HEX BUS DRIVERS

3-STATE OUTPUTS  
NONINVERTED DATA OUTPUTS  
GATED ENABLE INPUTS



## OCTAL D-TYPE LATCHES

3-STATE OUTPUTS  
COMMON OUTPUT CONTROL  
COMMON ENABLE



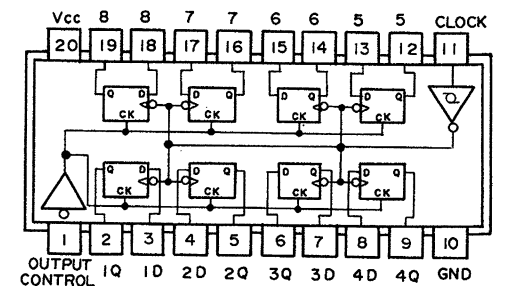
OUTPUT CONTROL	ENABLE		OUTPUT
	G	D	
L	H	H	H
L	H	L	L
L	L	X	$Q_0$
H	X	X	Z

## OCTAL D-TYPE FLIP-FLOPS

3-STATE OUTPUTS  
COMMON OUTPUT CONTROL  
COMMON CLOCK

### OCTAL D-TYPE EDGE-TRIGGERED FLIP-FLOPS

## ADVANCED LOW-POWER SCHOTTKY TRANSISTOR-TRANSISTOR LOGIC

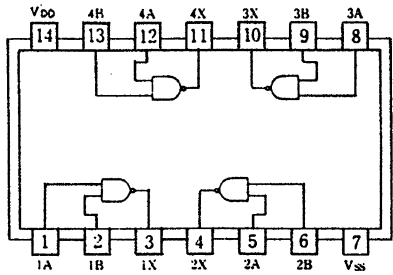


OUTPUT CONTROL	CLOCK	D	OUTPUT
L	↑	H	H
L	↑	L	L
L	L	X	Q <sub>0</sub>
H	X	X	Z

CMOS LOGIC CIRCUITS PIN ASSIGNMENTS (TOP VIEWS)

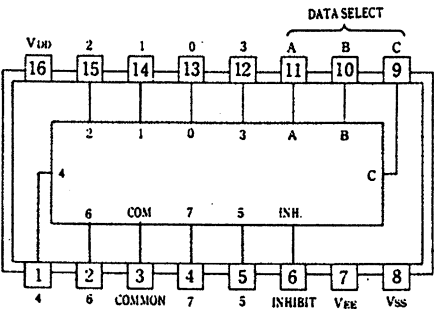
4011B (Code No. 706982)

QUAD 2-INPUT POSITIVE NAND GATE



4051B (Code No. 706984)

SINGLE 8-CHANNEL MULTIPLEXER /DEMULTIPLEXER



TRUTH TABLE

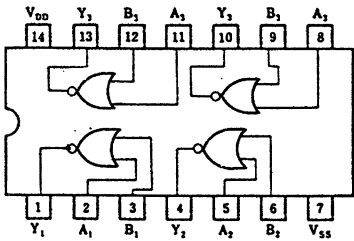
CONTROL INPUTS				"ON" CHANNEL
INHIBIT	C	B	A	4051B
L	L	L	L	0
L	L	L	H	1
L	L	H	L	2
L	L	H	H	3
L	H	L	L	4
L	H	L	H	5
L	H	H	L	6
L	H	H	H	7
H	*	*	*	NONE

\* Don't Care

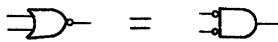
HIGH-SPEED CMOS LOGIC CIRCUITS PIN ASSIGNMENTS (TOP VIEWS)

74HC02 (Code No. 802354)

QUAD 2-INPUT NOR GATE

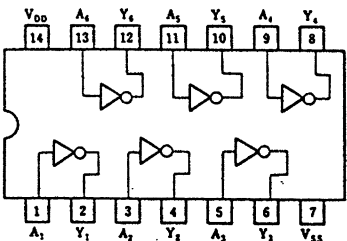


$$Y = \overline{A+B}$$



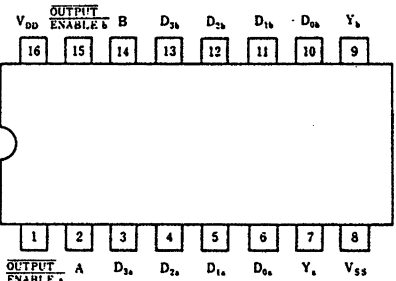
74HC04 (Code No. 802355)

HEX. INVERTER



74HC153 (Code No. 802046)

DUAL 4-INPUT DATA SELECTOR /MULTIPLEXER



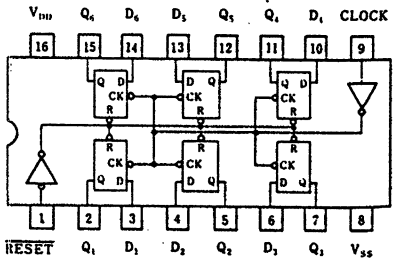
TRUTH TABLE

INPUT		OUTPUT ENABLE	OUTPUT
Select			
A	B		Y
x	x	H	L
L	L	L	D <sub>0</sub>
L	H	L	D <sub>1</sub>
H	L	L	D <sub>2</sub>
H	H	L	D <sub>3</sub>

H: High level L: Low level x: H or L

74HC174 (Code No. 802239)

HEX. D-TYPE FLIP-FLOP



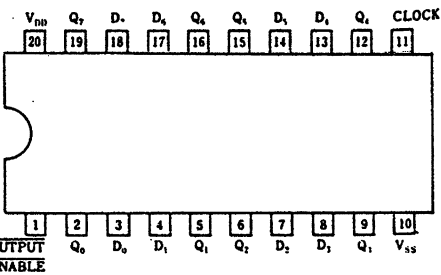
TRUTH TABLE

INPUT			OUTPUT
RESET	CLOCK	DATA (D)	
L	x	x	L
H	↑	H	H
H	↑	L	L
H	L	x	NO CHANGE

H: High level L: Low level x: H or L

74HC374 (Code No. 801928)

OCTAL D-TYPE FLIP-FLOP WITH 3-STATE

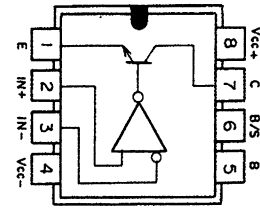


TRUTH TABLE

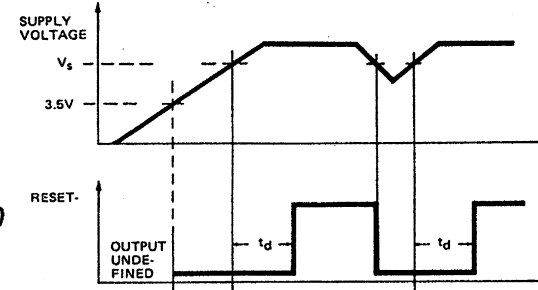
INPUT			OUTPUT
OUTPUT ENABLE	CLOCK	DATA D	
L	↑	H	H
L	↑	L	L
L	↑	x	No change
H	x	x	Z

H: High level L: Low level x: H or L Z: High impedance

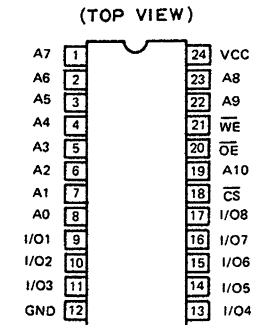
## LM311 DIFFERENTIAL COMPARATORS WITH STROBES



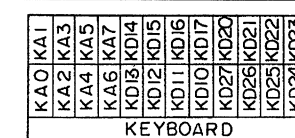
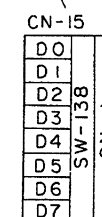
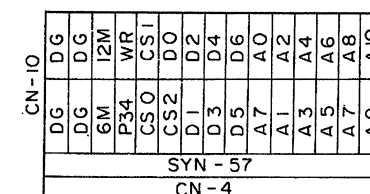
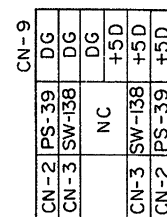
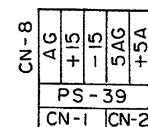
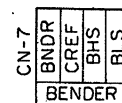
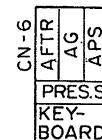
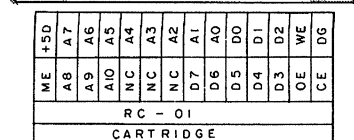
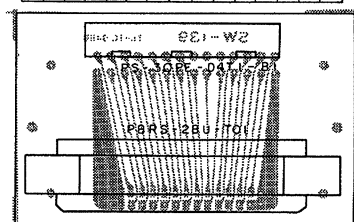
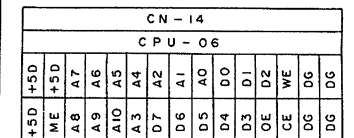
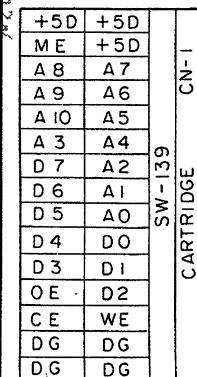
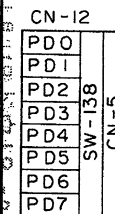
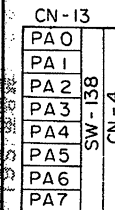
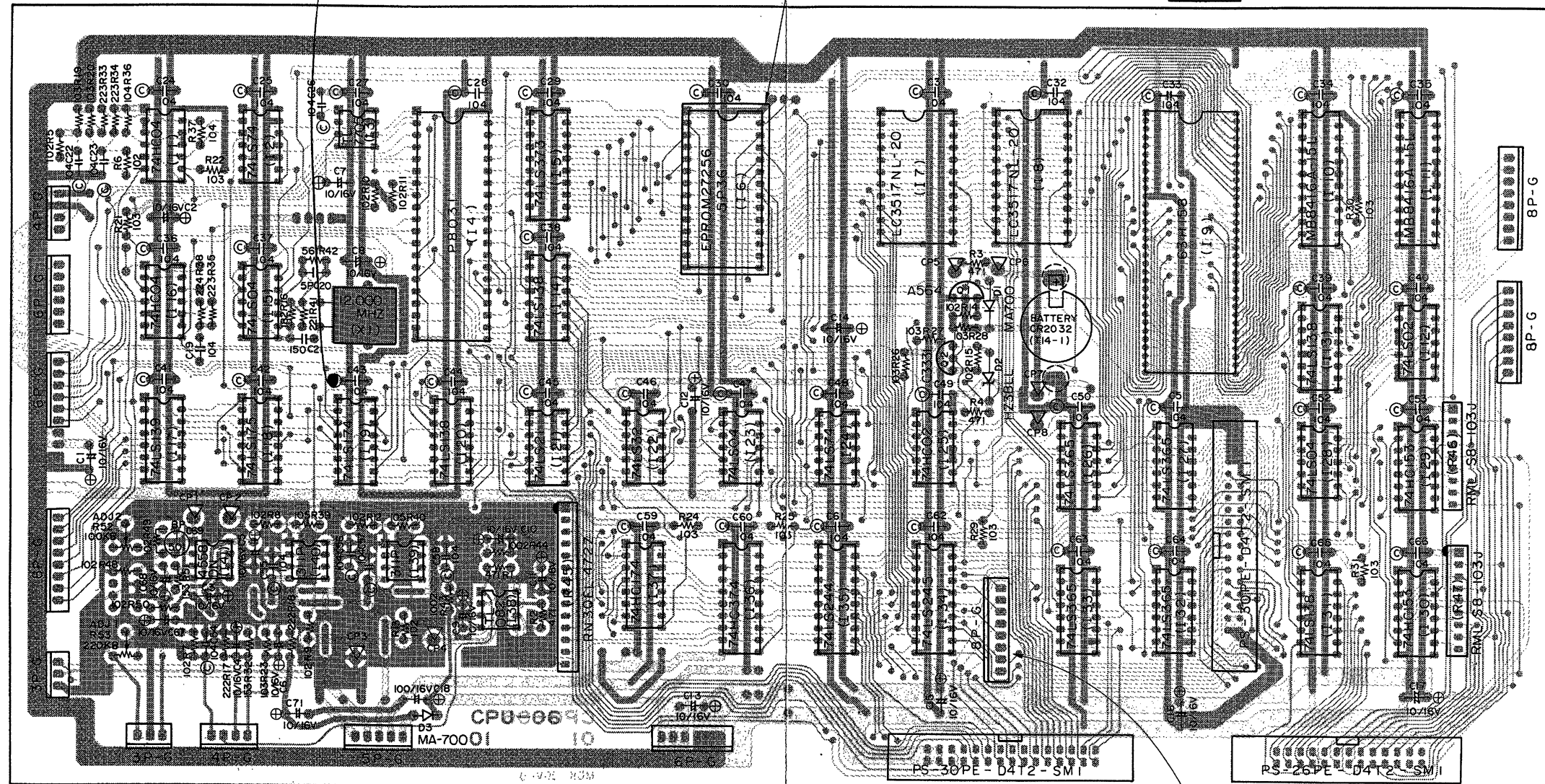
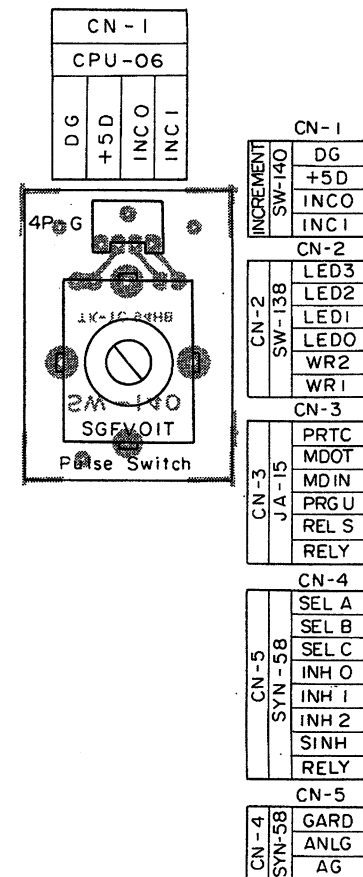
$V_{ref}$	1	8	$V_{cc}$
RESIN-	2	7	SENSE INPUT
$C_T$	3	6	RESET
GND	4	5	RESET-



IC Socket  
DICF-28C

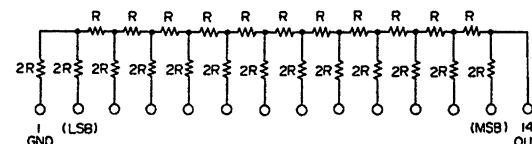
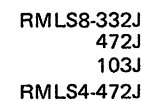


V <sub>PP</sub>	1	28	V <sub>CC</sub>
A12	2	27	A14
A7	3	26	A13
A6	4	25	A8
A5	5	24	A9
A4	6	23	A11
A3	7	22	OE
A2	8	21	A10
A1	9	20	$\overline{CE}$
A0	10	19	O7
O0	11	18	O6
O1	12	17	O5
O2	13	16	O4
GND	14	15	O3



Cf (C) Ceramic Capacitor

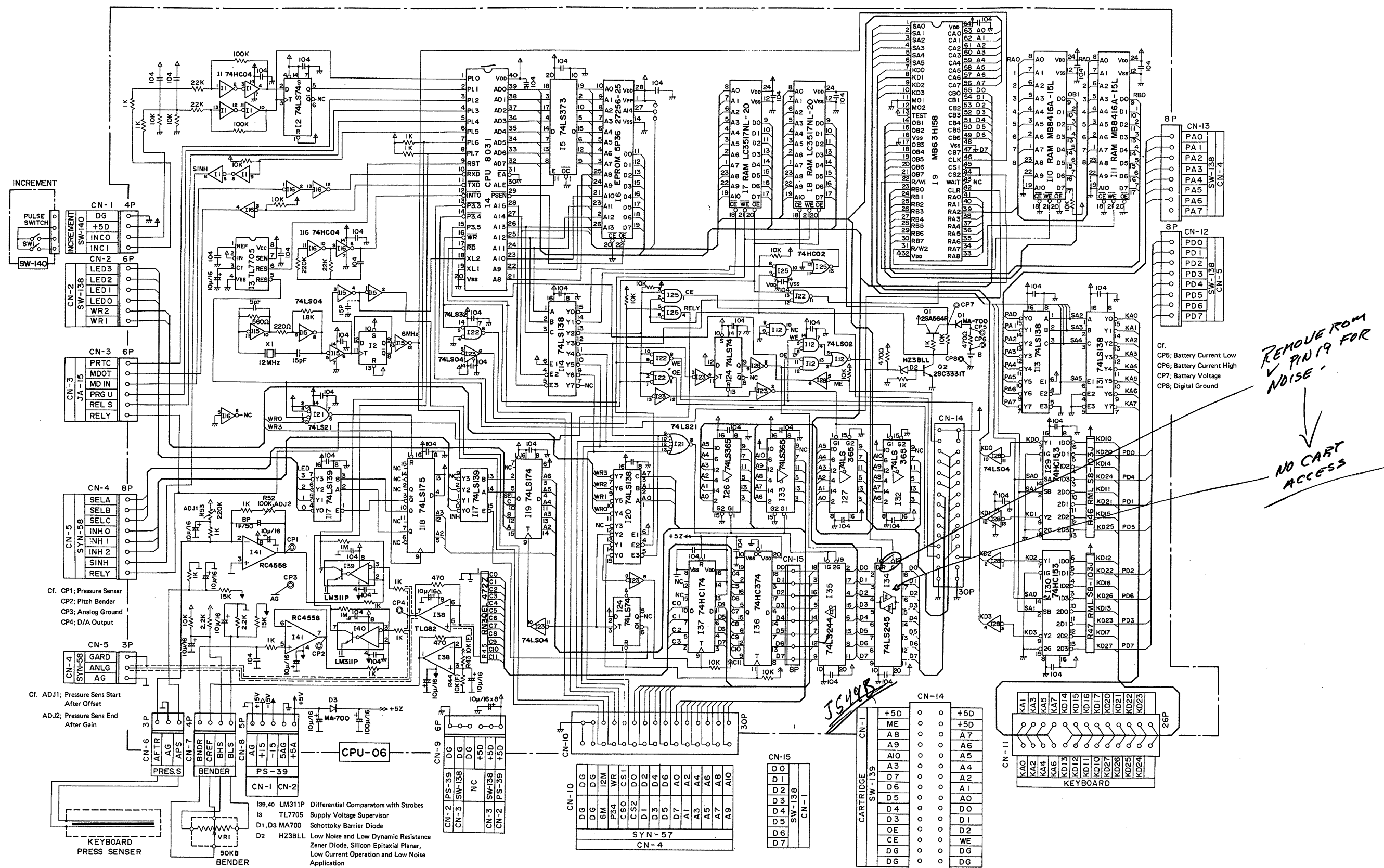
• RMLS



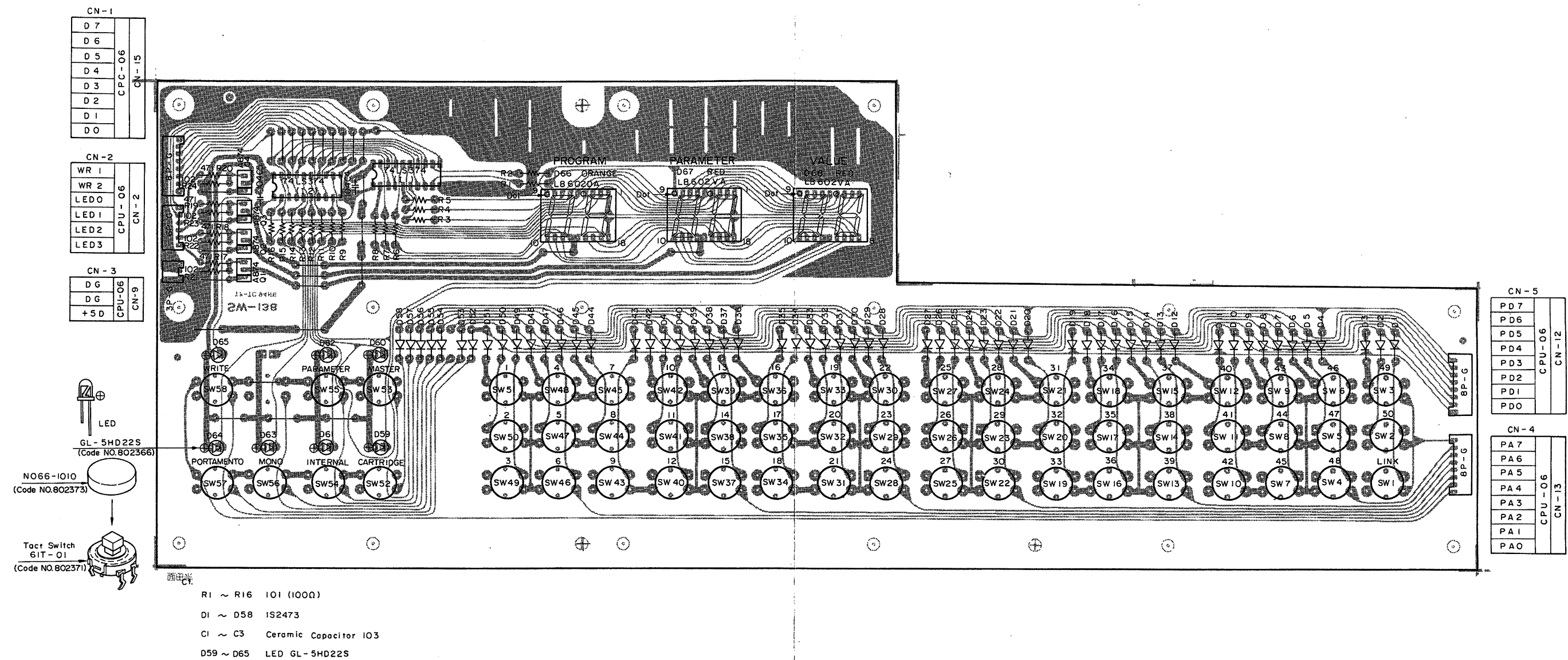
**Ladder Network Resistor Module**  
**RN3Q EL472Z**



CPU-06, SW-140 CIRCUIT DIAGRAM

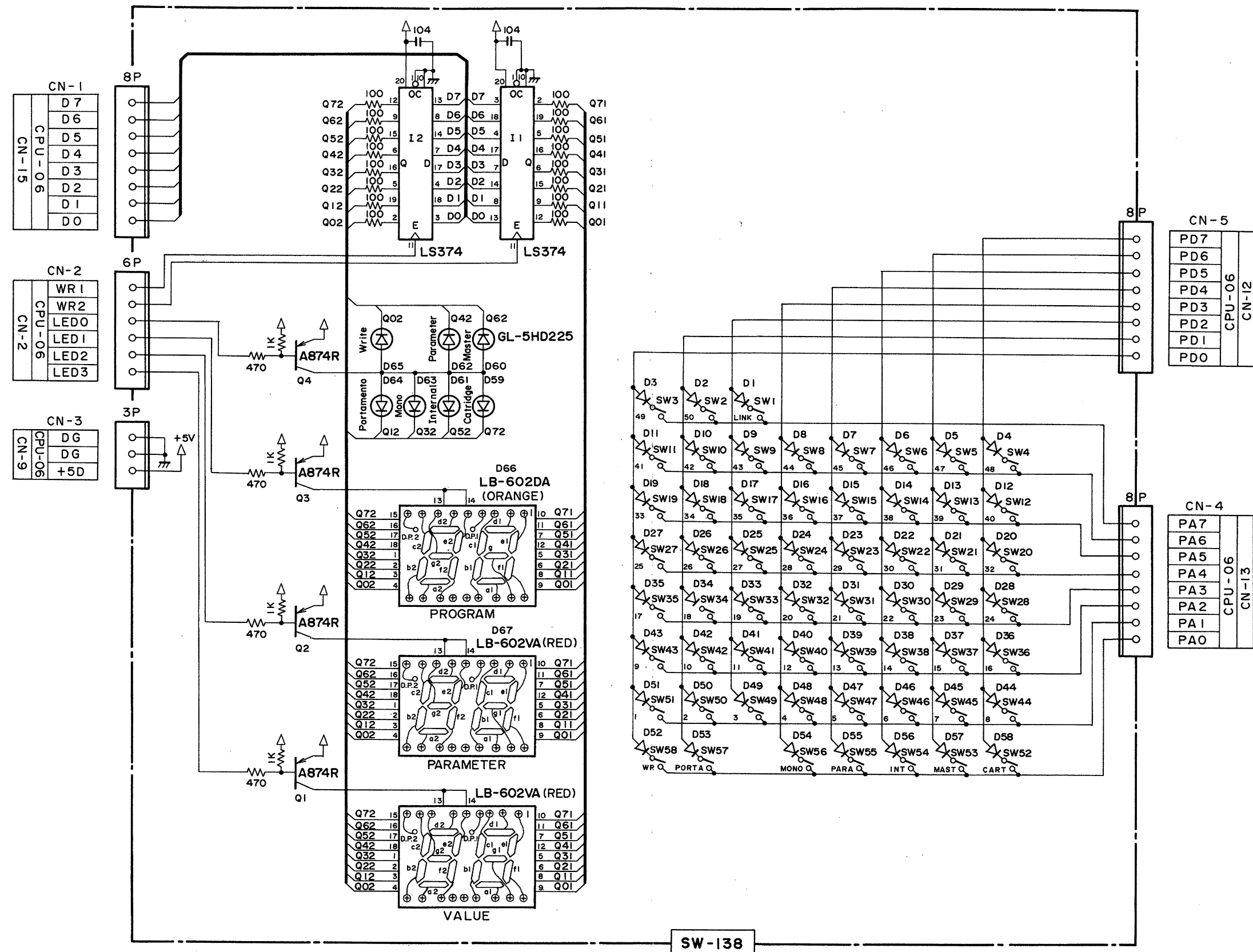


SW-138 TERMINALS INFORMATION

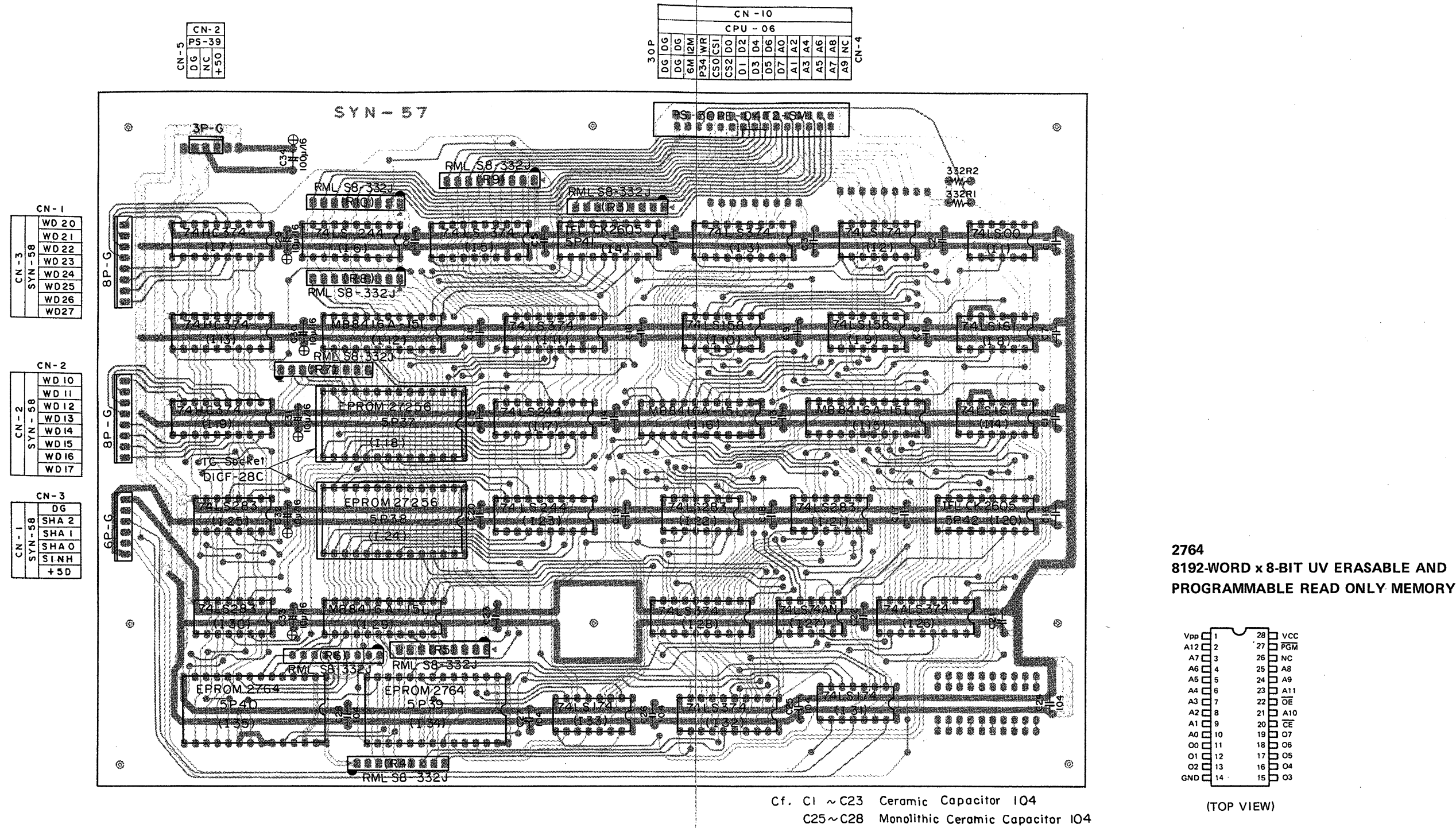




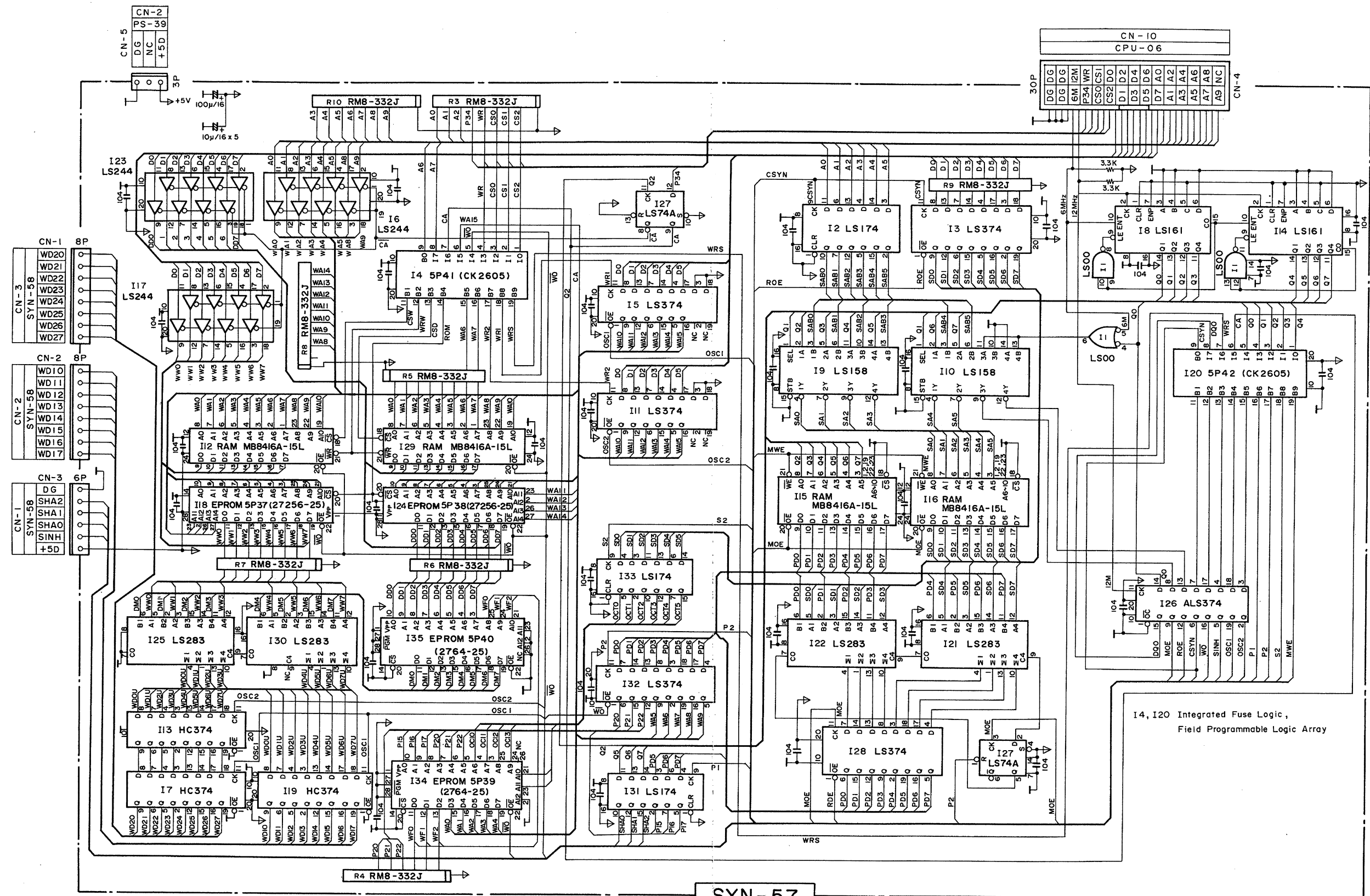
### SW-138 CIRCUIT DIAGRAM



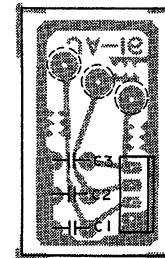
SYN-57 TERMINALS INFORMATION



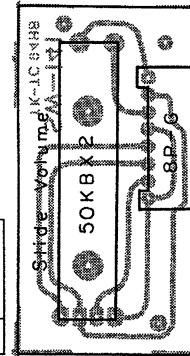
### SYN-57 CIRCUIT DIAGRAM



Cf. 1. D1 ~ D24 ISS133  
2. R271 ~ 274 Metal Graze Variable Resistor  
3. © Ceramic Capacitor



HP L	SYN-58	CN-7
DG		
HP R		
FRAME GROUND		



VR3R	SYN-58	CN-8
AG		
VR3L		
AG		
VR2R		
AG		
VR2L		
AG		

CN-7		
HPR	JA-16	HEAD- PHONE
DG		
HPL		

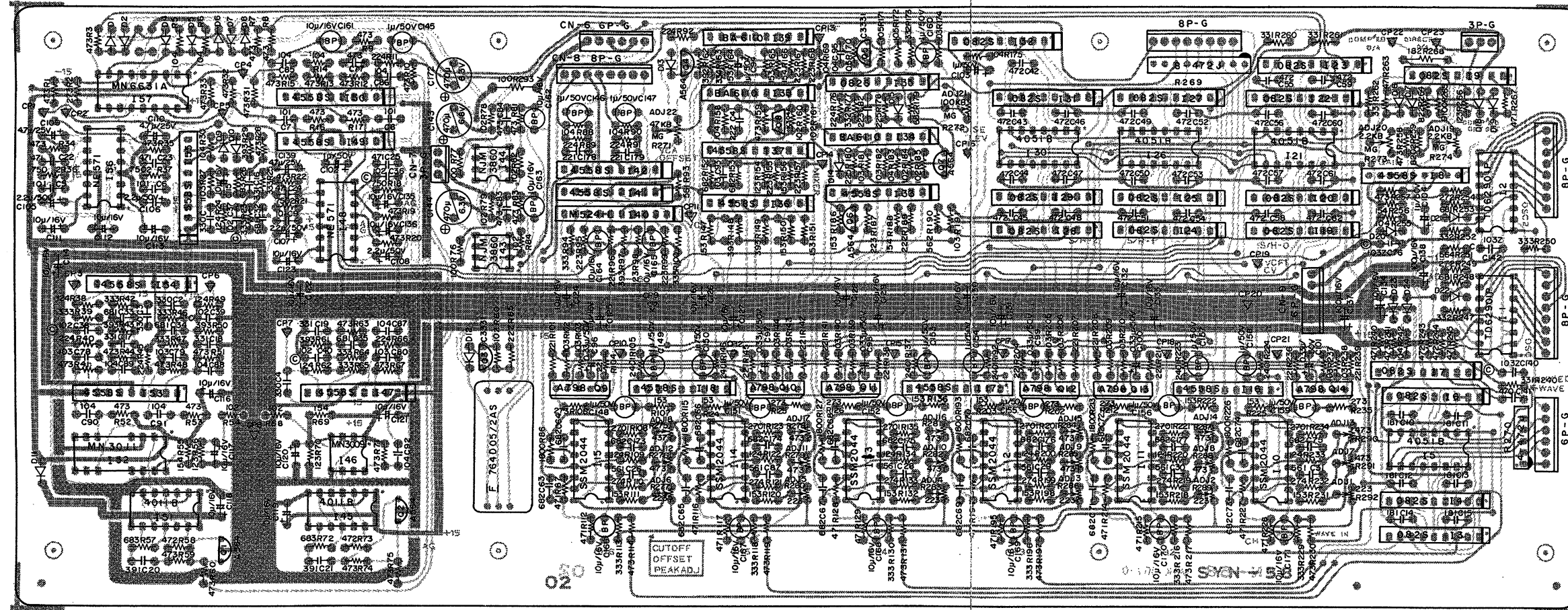
CN-8					
SW-141					
VOLUME					
AG	VR2L	AG	VR2R	VR3L	VR3R

CN-6					
CN-2		CN-1			
PS-39		JA-15			
+5	DG	AG	OUTL	AG	OUTR

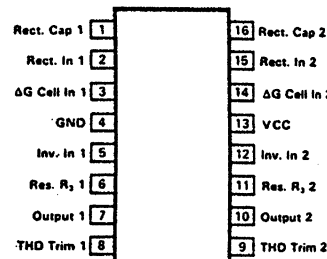
CN-5						
CN-4						
CPU-06						
RELY		INH2	INH1	INH0	SELC	SELB

CN-9		
+5	PS-39	CN-2
A G		CN-1
-15		
A G		
A G	JA-15	CN-1
+15	PS-39	CN-1

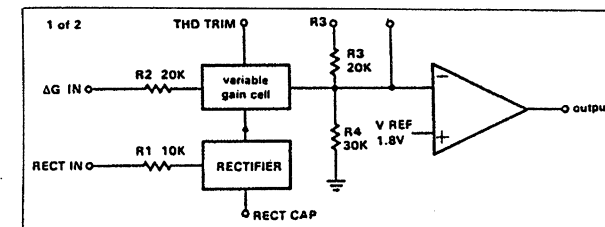
CN-4		
CN-5		
CPU-6		
	ANLG	



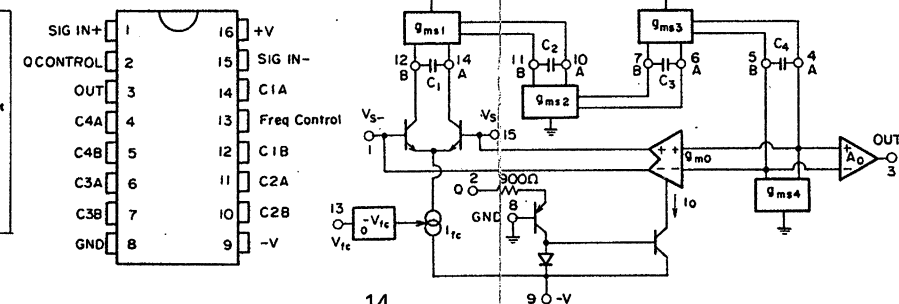
## COMPANDOR



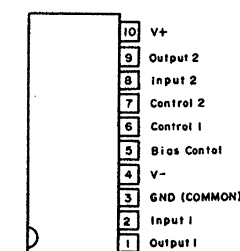
### BLOCK DIAGRAM



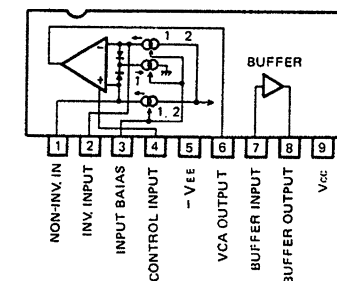
#### 4-POLE VOLTAGE CONTROLLED FILTER



## DUAL VOLTAGE CONTROLLED AMPLIFIER



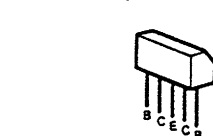
## VOLTAGE CONTROLLED OPERATIONAL AMPLIFIER



**2SC331 (Code No. 801798)**



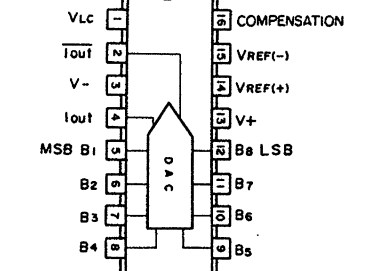
**2SA798 (Code No. 706124)**



**L → SW ON    L ≈ 0V    H ≈ 5V**

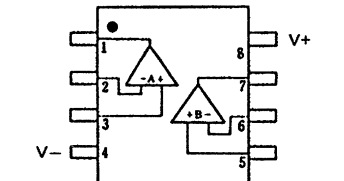
MODE	IS7	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	
		17 pin	9 pin	1 pin	8 pin	11 pin	I31 CHORUS LFO
0		H	H	L	H	H	Direct Signal
1		L	H	L	L	H	0.7Hz Triangle Wave
2		L	H	L	L	H	1.4Hz Triangle Wave
3		L	H	L	L	H	0.7Hz + 1.4Hz Triangle Wave
4		L	H	L	L	H	7Hz Triangle Wave
5		L	H	L	L	H	CV=5V LCH→ Direct +3.9ms Delay RCH→ Direct +1.9ms Delay
6		L	H	L	L	H	CV=0V LCH→ Direct +1.2ms Delay RCH→ Direct +6.5ms Delay
7		H	H	H	H	L	CV=0V LCH→ Direct RCH→ 53ms Delay

### Multiplying type Monolithic 8-bit High-speed Current-Output Digital-to-Analog Converter



**TL-082CP (Code No. 706069)**

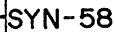
D, M Type  
(TOP VIEW)



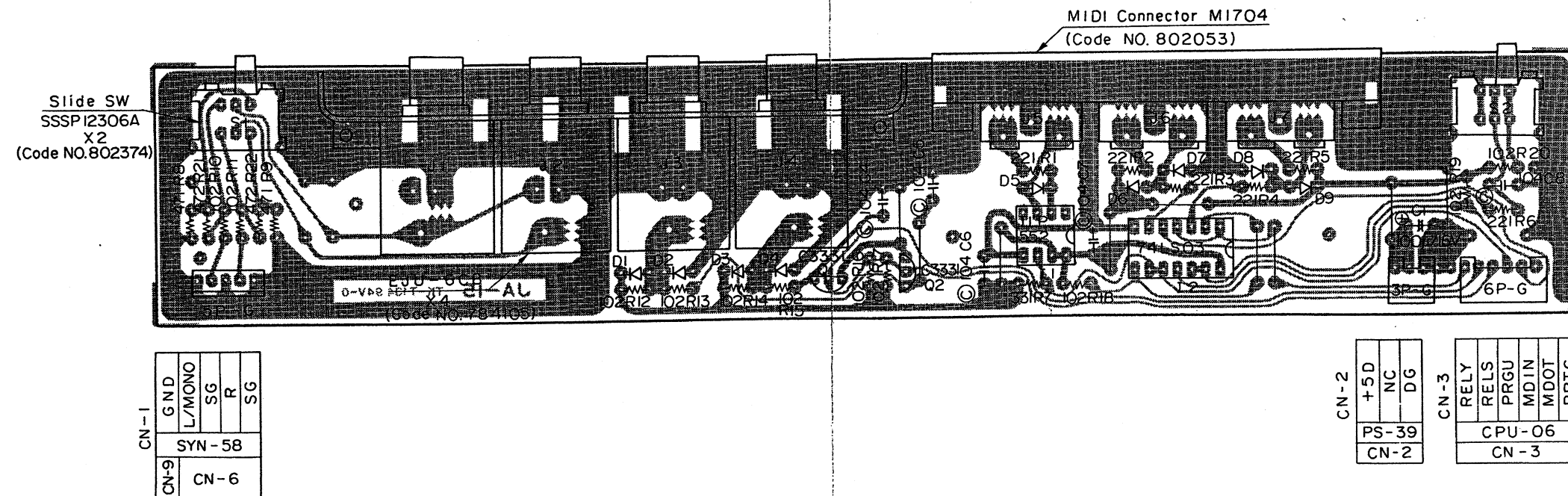
**TL-082S (Code No. 800743)**



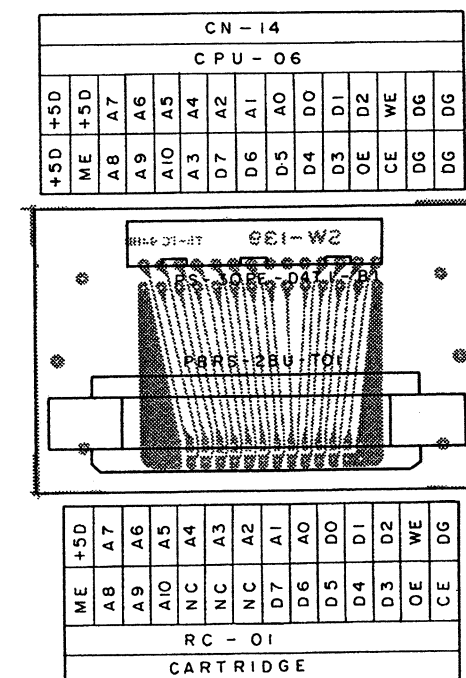
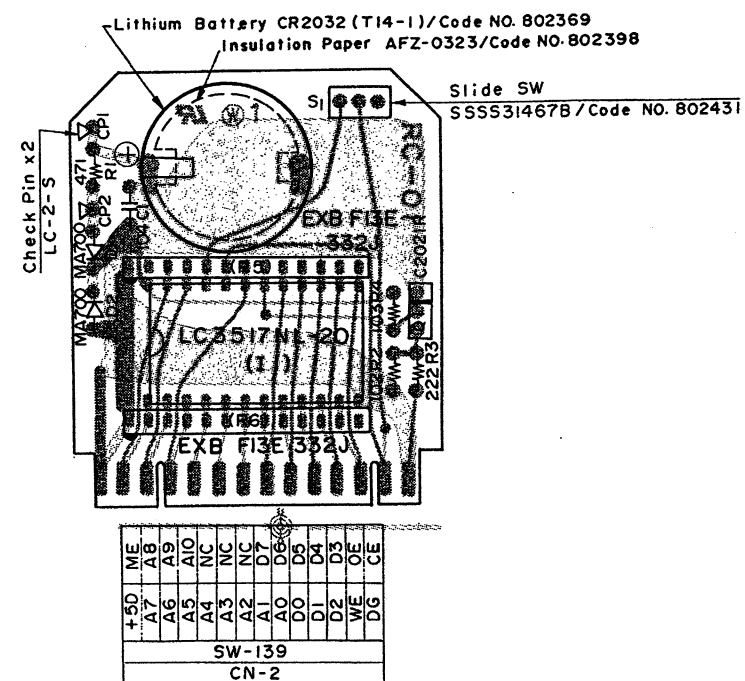
## SYN-58, SW-141, JA-16 CIRCUIT DIAGRAM



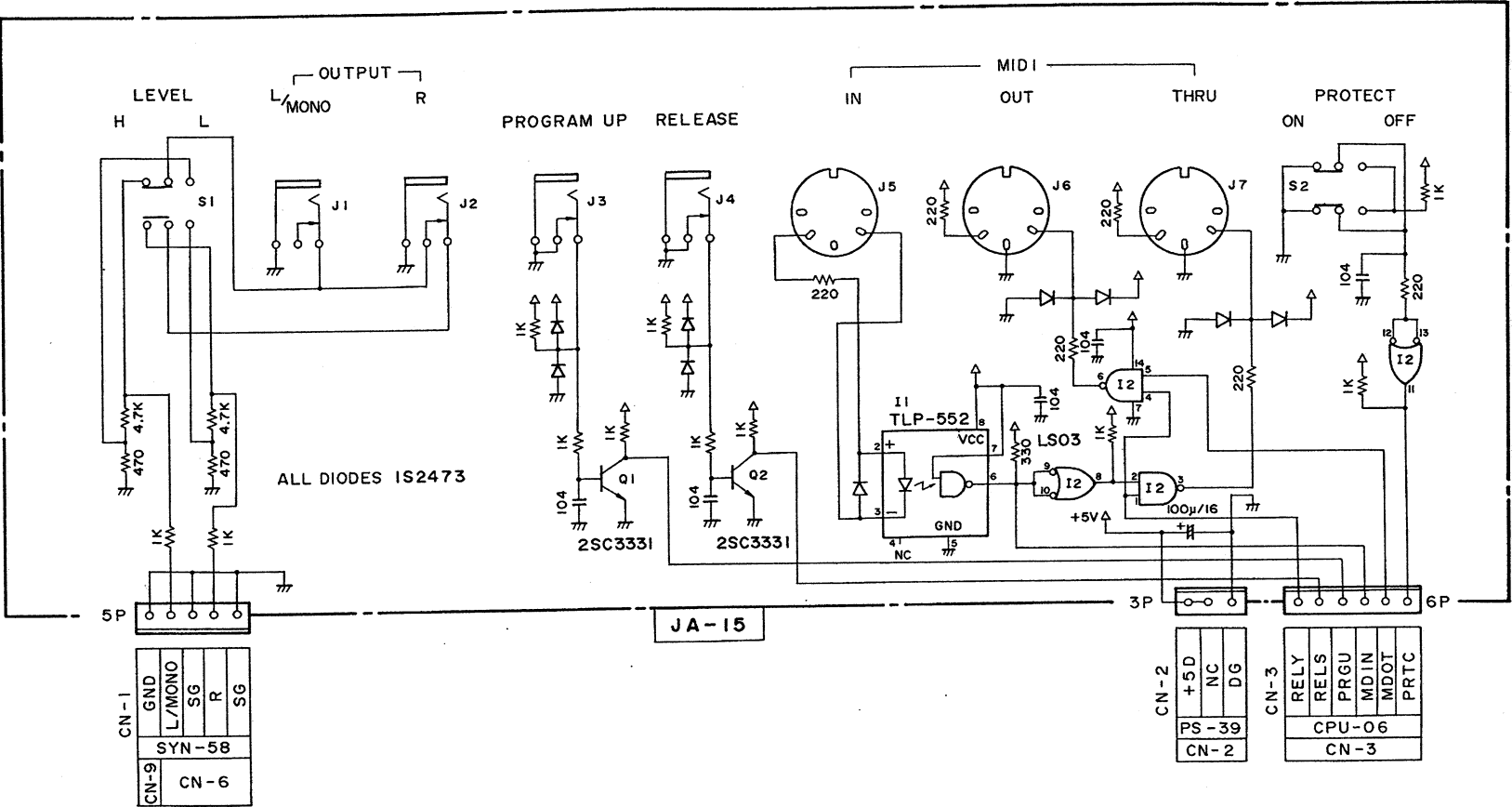
## JA-15 TERMINALS INFORMATION



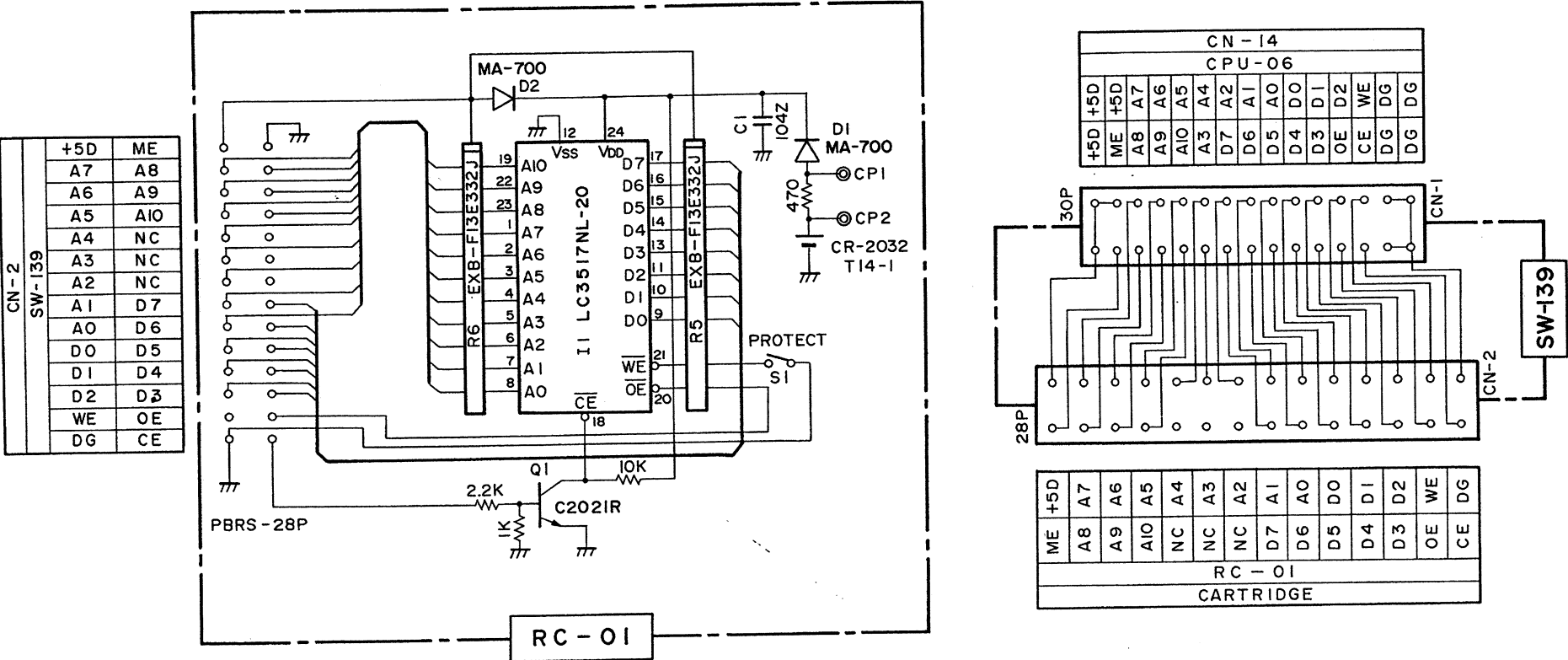
## RC-01, SW-139 TERMINALS INFORMATION



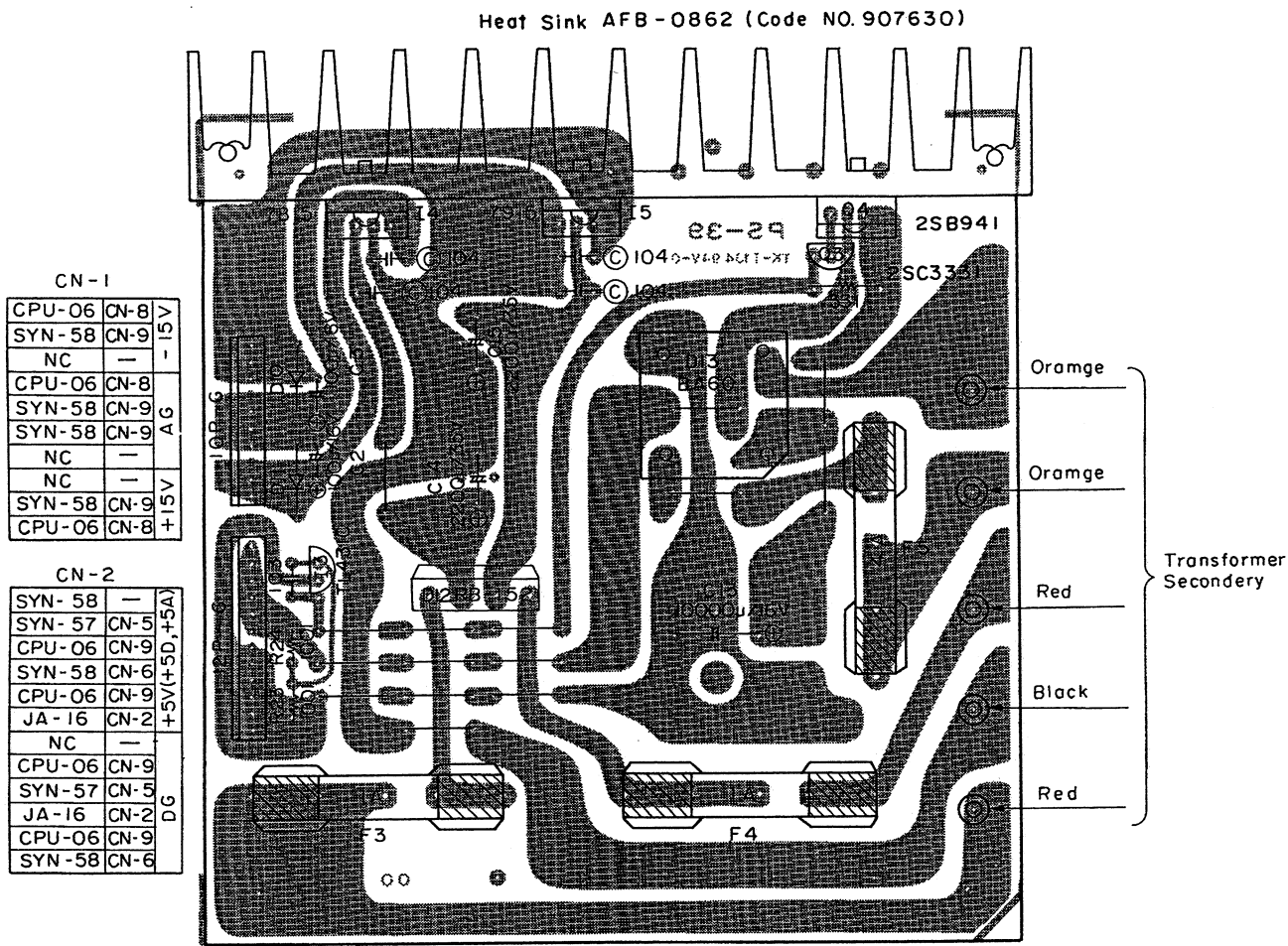
JA-15 CIRCUIT DIAGRAM



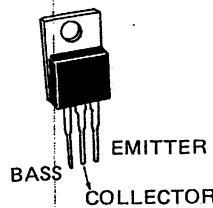
RC-01, SW-139 CIRCUIT DIAGRAM



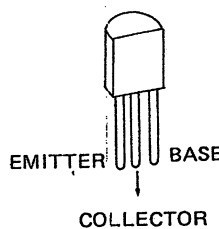
PS-39, FH-10 TERMINALS INFORMATION



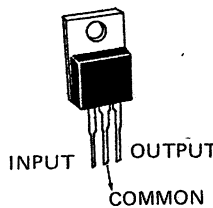
2SB941Q (Code No. 800064)  
Si PNP Epitaxial Planar



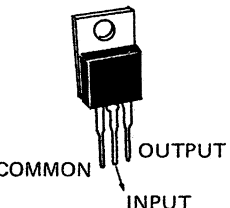
2SC3331 (Code No. 801798)  
Si NPN Epitaxial Planar



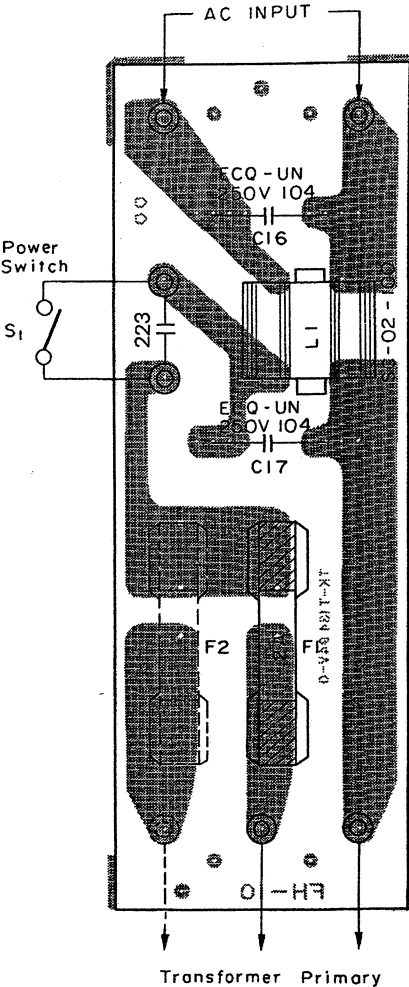
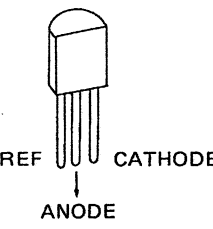
7815 (Code No. 706097)  
POSITIVE-VOLTAGE  
REGULATORS



7915 (Code No. 706098)  
NEGATIVE-VOLTAGE  
REGULATORS



TL431C (Code No. 800063)  
ADJUSTABLE PRECISION SHUNT REGULATORS



POWER SUPPLY INFORMATION AND PARTS LIST

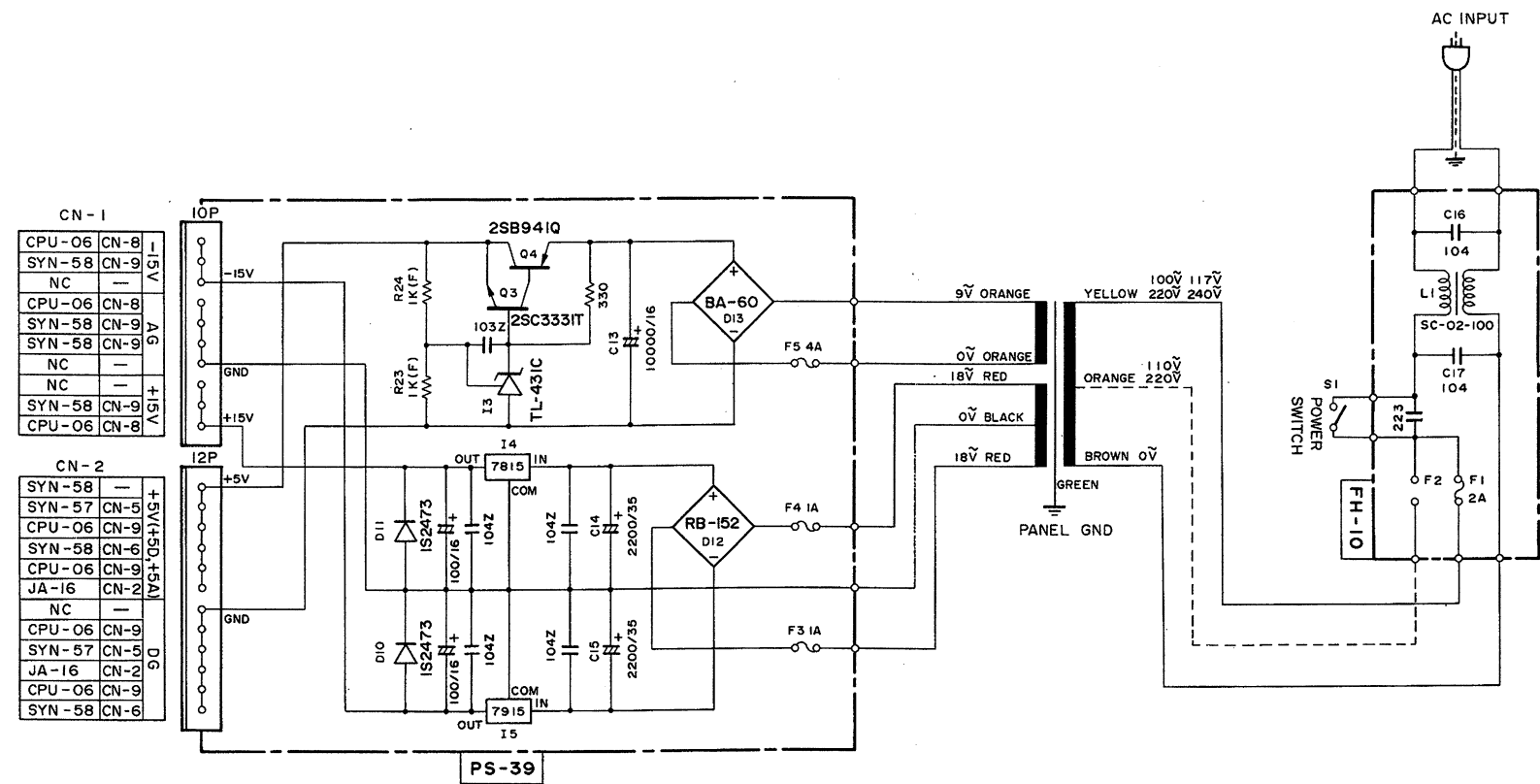
	POWER CABLE		TRANSFORMER		FUSE							
	TYPE	CODE NO.	TYPE	CODE NO.	F1	CODE NO.	F2	CODE NO.	F3, 4	CODE NO.	F5	CODE NO.
U.S.A.	UL-CSA SJT	789349	TSE-239-U	802346	2A	713422			1A	713587	4A	713586
CANADA												
AUSTRALIA	SAA CLASS-2	789346	TSE-239-I	802345	1A	713344	(1A)	713344	1A	713344	4A	713585
GREAT BRITAIN	BS CLASS-2	789347										
EUROPE	CEE CLASS-2	789345										
OTHERS	SPT-2	789332	TSE-239-E	802344	2A	713350	(2A)	713350	1A	713349	4A	713357
JAPAN		802017	TSE-239-D	802343	2A	713350			1A	713349	4A	713357

POWER SUPPLY PARTS LIST PS-39, FH-10

NAME	PART NO.	TYPE	CODE NO.
POWER SWITCH	S1	SDDJA1	802413
IC	I4	μPC7815	706097
	I2	μPC7915	706098
	I3	TL431	800063
TRANSISTOR	Q4	2SB941Q	800064
	Q3	2SC3331	801798
DIODE	D12	RB-152	706319
	D13	DBA-60C-K15	706548
	D10, D11	1S2473	706317
COIL	L1	SC-02-100	800058
C (JAPAN, Others) CAPACITOR	C16, C17	ECQ-E-1000V104M	800711
	C16, C17	ECQ-UN250V104	802342
	C13	10000μF16V	801556
	C14, C15	2200μF35V	802421
RESISTOR	R23, R24	CRB20FX1001	800766



PS-39, FH-10 CIRCUIT DIAGRAM



PARTS LIST

RC-01

NAME	PART NO.	TYPE	CODE NO.
IC	I1	LC3517NL-20	802356
TRANSISTOR	Q1	2SC2021R	802363
DIODE	D1	MA-700	802364
RESISTOR	R5, R6	EXB-F13E332J	802377
BATTERY		CR2032(T14-1)	802369
CAPACITOR	C1	50V104Z	800663
CONNECTOR		PBRS-28P	802347
SLIDE SW.	S1	SSSS31467B	802431

SW-139

NAME	PART NO.	TYPE	CODE NO.
CONNECTOR	CN-2	PBRS-28U-T01	802348
	CN-1	PS-30PE-D4T1-B1	802351

JA-15

NAME	PART NO.	TYPE	CODE NO.
IC	I2	SN74LS03N	706951
	I1	TLP552	802361
TRANSISTOR	Q1, Q2	2SC3331	801798
DIODE		1S2473	706317
SHORT JACK	J1, J2, J3, J4	EJU6C8	784105
MIDI CONNECTOR	J5, J6, J7	M1704	802053
SLIDE SWITCH	S1, S2	SSSP12306A	802374

SW-138

NAME	PART NO.	TYPE	CODE NO.
IC	I1, I2	74LS374	800714
TRANSISTOR	Q1, Q2, Q3, Q4	2SA874R	802362
DIODE	D1 ~ 58	1S2473	706317
LED	D59 ~ 65	GL-5HD22S	802366
NUMERAL LED	D66	LB602DA2	802367
	D67, D68	LB602VA2	802368
TACT SW.	SW1 ~ 58	61T-01	802371
KEYTOP		N066-1010	802372

SYN-57

NAME	PART NO.	TYPE	CODE NO.
16KEPROM	I18	5P37/EPROM 27256	907505
(for Japan)	I24	5P38/EPROM 27256	907510
8KEPROM	I34	5P39/EPROM 2764	907515
	I35	5P40/EPROM 2764	907520
IFL	I4	5P41	907525
	I20	5P42	907530
2K RAM	I12, 15, 16, 29	MB8416A-15L-SK	802043
IC	I1	74LS00	800720
	I27	74LS74AN	706927
	I9, I10	74LS158	802409
	I8, I14	74LS161	800756
	I2, I31, I33	74LS174	707008
	I6, I17, I23	74LS244	800675
	I21, 22, 25, 30	74LS283	802352
	I3, 5, 11, 28, 32	74LS374	800714
	I7, I13, I19	TC74HC374	801928
	I26	74ALS374	802353
RESISTOR	R3, 4, 5, 6, 7, 8, 9, 10	RMLS8-332J	800044
IC SOCKET	I18, I24	DICF-28C	800224
CONNECTOR	CN-4	PS-30PE-D4T2-SM1	802350

CPU-06

NAME	PART NO.	TYPE	CODE NO.
IC/TTL	I12	74LS02	800721
	I15, I23, I28	74LS04	706957
	I21	74LS21	802236
	I22	74LS32N	706914
	I2, I24	74LS74AN	706927
	I13, I14, I20, I31	74LS138	706939
	I17	74LS139	800807
	I19	74LS174	707008
	I18	74LS175	800719
	I35	74LS244	800675
	I34	74LS245N	706948
	I26, I27, I32, I33	74LS365	800793
	I5	74LS373N	706929
IC/HCMOS	I25	74HC02	802354
	I1, I16	74HC04	802355
	I29, I30	74HC153	802046
	I37	74HC174	802239
	I36	74HC374	801928
CPU	I4	P8031	800046
GATE ARRAY	I9	MB63H158	802042
2K RAM	I7, I8	LC3517NL-20	802356
2K RAM	I10, I11	MB8416A-15L-SK	802043
32K EPROM	I6	5P36/ EPROM 27256	907500
LINEAR IC	I41	RC-4558DN	706016
	I38	TL082CP	706069
	I3	TL7705CP-B	800666
	I39, I40	LM311P	800050
TRANSISTOR	Q1	2SA564R	706102
	Q2	2SC3331	801798
Schottoky Barrier Diode	D1, D3	MA-700	802364
ZENER DIODE	D2	HZ38LL	802365
RESISTOR	ADJ1	H1021A220KB	802422
	ADJ2	H1021A100KB	710147
	R46, R47	RMLS8-103J	802050
	R45	RN3QEL472Z	802430
	R43, R44	CRB20FX1001	800766
CRYSTAL	X1	HC18/U 12.000MHZ	800053
CONNECTOR	CN-11	PS-26PE-D4T2-SM1	802349
	CN-10, CN-14	PS-30PE-D4T2-SM1	802350
BATTERY	B	CR2032(T14-1)	802369

SW-140

NAME	PART NO.	TYPE	CODE NO.
PULSE SWITCH	SW1	SGFV01T	800036
BENDER VOLUME	VR1	RK1631110	802375

SYN-58

NAME	PART NO.	TYPE	CODE NO.
BBD	I46	MN3009	706071
	I52	MN3011	802359
VCA	I34, 38, 39	BA6110	706937
VCF	I10, 11, 12, 13, 14, 15	SSMT2044	800056
LINEAR IC	I43, I44	NJM-386D	707005
	I48, I56	NE571	800062
	I40	M5241L	802358
	I3, 4, 6, 7, 9, 19, 20, 22, 23, 24, 25, 27, 28, 29, 31, 32, 35	TL-082S	800743
	I8, 16, 17, 18, 33, 36, 37, 41, 42, 47, 49, 50, 53, 54, 55	RC-4558S	800744
IC	I45, 51	MB84011B	706982
	I5, 21, 26, 30	MB84051B	706984
	I57	MN6631A	802360
	I1, I2	TD62901P	802357
TRANSISTOR	Q9, 10, 11, 12, 13, 14	2SA798F	706124
	Q1, 2, 3, 4, 6, 7	2SA564R	706102
	Q3, Q5	2SC3331	801798
FET	Q8	2SK-304E	706537
DIODE		1SS133	800625
RESISTOR		1.8K+3600PPM/°C	710013
		CRB20FX1800Ω	800745
		CRB20FX2401	802379
		CRB20FX2701	802380
		CRB20FX7502	802381
		CRB20FX1103	802382
		CRB20FX9100	802404
		CRB20FX8202	802405
		RMLS4-472J	710014
		RMLS8-472J	710015
VR	ADJ20	H1021A 2.2KB	710151
	ADJ19	H1021A 22KB	710152
	ADJ22	H1021A 47KB	710145
	ADJ21	H1021A 100KB	710147
	ADJ1, 2, 3, 4, 5, 6	22KBH0651A015	800029
REED RELAY	ADJ13, 14, 15, 16, 17, 18	47KBH0651A017	800030
		764D05/2AS	802370

SW-141

NAME	PART NO.	TYPE	CODE NO.
SLIDE VOLUME		S3028PC02M-50KB2	800706

JA-16

NAME	PART NO.	TYPE	CODE NO.
HEADPHONE JACK		HLJ0606-01-020	802376

TEST TONE CHART

TEST TONE NO. PROGRAM		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DESCRIPTION		BASIC WORK	OFFSET ADJUST	PEAK ADJUST	CUTOFF ADJUST	COMPED. GAIN	VCF OFFSET	OSC1	OSC2	BALANCE (1)	BALANCE (2)	PITCH BEND	VCF-KCV	VCF-ENV (1)	VCF-ENN (2)	LOW CUT	VCA LEVEL	LFO-VCF	LFO-VCA	VELO-VCF	VELO-VCA	PRES-VCF	CHORUS	LEVEL MAX (1)	LEVEL MAX (2)
No.	PARAMETER																								
1	OSC1 WAVE	1	0	0	0	0	1	(32)	0	0	1	1	0	0	0	32	1	0	1	0	1	0	1	0	0
2	RANGE	8	8	8	8	8	8	4	4	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
3	PORTA. SP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	BALANCE	0	0	0	0	0	0	-15	15	(-15)	(+15)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	PITCH BEND	1	1	1	1	1	1	1	0	1	1	(7)	1	1	1	1	1	1	1	1	1	1	1	1	1
6	AUTO BEND	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	OSC2 WAVE	1	0	0	0	0	1	0	(32)	1	0	0	0	0	0	32	1	1	1	0	1	0	1	0	0
8	COARSE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	FINE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	VCF CUTOFF	(99)	60	60	(60)	(99)	99	99	99	99	99	99	(50)	30	50	99	99	60	99	60	99	40	99	50	50
11	RESONANCE	0	(0)	(30)	31	31	0	0	0	0	0	0	31	31	31	0	0	31	0	31	0	31	0	31	31
12	LOW CUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(31)	0	0	0	0	0	0	0	0	0
13	ENV	0	0	0	0	0	0	0	0	0	0	0	(31)	(31)	0	0	0	0	0	0	0	0	0	0	0
14	ATTACK	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0
15	DECAY	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0
16																									
17	SUSTAIN	31	31	31	31	31	31	31	31	31	31	31	31	0	0	31	31	31	31	31	31	31	31	31	31
18	RELEASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	VCA LEVEL	31	31	31	31	31	31	31	31	31	31	31	31	31	31	(31)	31	31	31	31	31	31	(31)	(31)	(31)
20	ATTACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	DECAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22																									
23	SUSTAIN	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31
24	RELEASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	LFO SHAPE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
26	SPEED	50	50	50	50	50	99	50	50	50	50	50	50	50	50	50	50	80	99	50	50	50	50	50	50
27	DELAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	OSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	VCF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(8)	0	0	0	0	0	0	0
30	VCA	0	0	0	0	0	(31)	0	0	0	0	0	0	0	0	0	0	0	(31)	0	0	0	0	0	0
31	TOUCH VELO VCF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(15)	0	0	0	0	0
32	VELO VCA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(15)	0	0	15	15
33	PRES OSC BAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	PRES VCF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(15)	0	0	0	0
35	PRES VCA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15
36	PRES LFO OSC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
37	KCV VCF	0	0	0	0	0	0	0	0	0	0	0	14	14	0	0	0	0	0	0	0	0	0	14	14
38	VCA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	-15	-15
39	CHORUS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	(7)	0	0	0
	PORTAMENTO	ALL OFF																							
	MONO	ALL OFF																							

CREATION OF MEMORY CARTRIDGE FOR ADJUSTMENT

Use each test tone for adjustment and check.

Write suitable test tones into the memory cartridge according to the Test Tone Chart as follows:

1. Insert a cartridge in which to store test tones and set the PROTECT switch to OFF.
2. Set the PWR switch to ON.
3. Set the INTERNAL switch to ON and the INTERNAL PROTECT switch to OFF.
4. Set the PARAMETER switch to ON then input each parameter value according to the Test Tone Chart.
5. Write all parameters of a single program, display each parameter marked with a circle in the Test Tone Chart, set the WRITE switch to ON, and set a test tone program number. Thus, writing data into the internal memory is completed.
6. Repeat step 5 the number of times equal to all test tones stored into the internal memory successfully.
7. Set the MASTER and SAVE switches to ON to save the internal data into the memory cartridge.

Thus, a test tone program cartridge has been created. This cartridge is used for adjustment and inspection.

## K3 ADJUSTMENT INSTRUCTIONS

### Measuring Instruments:

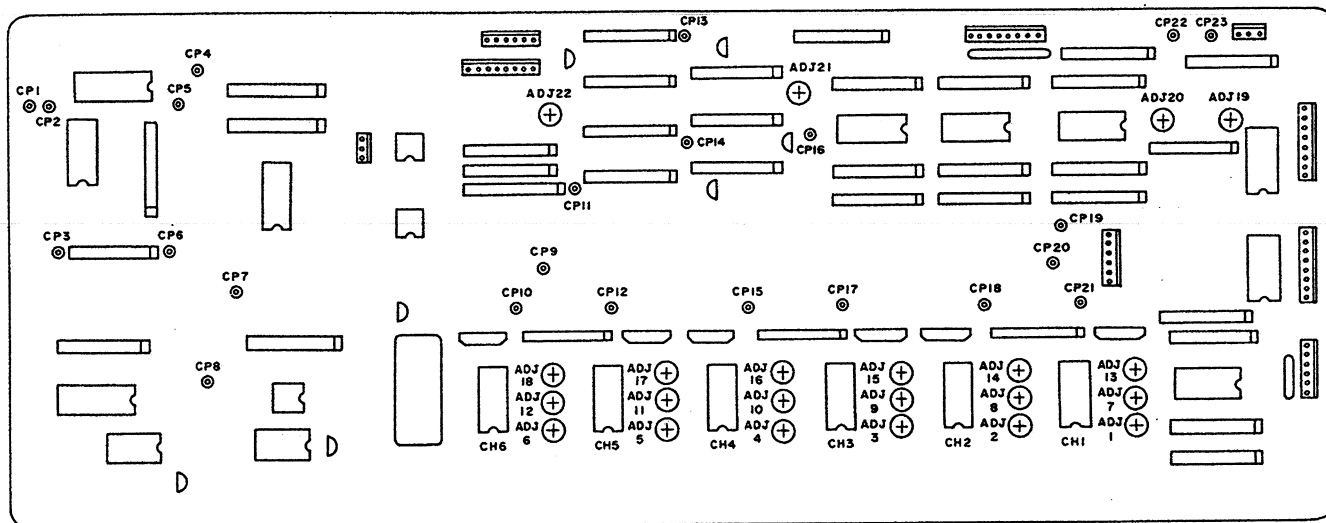
- Digital voltmeter
- Oscilloscope (dual-beam)
- Frequency counter
- VTVM
- Weights (600g and 1500g)
- Adjustable memory cartridge
- Monitor amplifier and 8-ohm headphones

### 1. ROUGH PERFORMANCE CHECK (TEST-TONE 1)

Connect the monitor amplifier to MONO-OUT with volume control VR at the full position, the LEVEL switch set to H, and the PROTECT switch set to OFF. Then, switch the power on and check the following items:

- Sounds are made at proper musical intervals with all keys on the keyboard.
- Proper indications are obtained in operating all switches on the panel.
- Values correctly vary with increments.
- Upper and lower semitones are properly made by rotating the bender wheel.
- Sounds fade when volume control VR is minimized.

## SYN-58 Checking Points and Adjusting Points



CP1	Delay Out
CP2	Chorus Out Right
CP3	Delay Filter Out
CP4	Chorus Out Direct
CP5	Chorus Out Left
CP6	Chorus Filter Out Left
CP7	Chorus Filter Out Right
CP8	Analog Ground
CP9	Analog Ground
CP10	CH6 VCF Output
CP11	Total VCA1 Output
CP12	CH5 VCF Output
CP13	HPF Output

CP14	Mixer Output
CP15	CH4 VCF Output
CP16	Noise Output
CP17	CH3 VCF Output
CP18	CH2 VCF Output
CP19	VCF1 Control Voltage
CP20	Analog Ground
CP21	CH1 VCF Output
CP22	Temperature Compensated D/A
CP23	Direct D/A

ADJ1	CH1 Peak
ADJ6	CH6 Peak
ADJ7	CH1 Offset Null
ADJ12	CH6 Offset Null
ADJ13	CH1 Cutoff
ADJ18	CH6 Cutoff
ADJ19	Temperature Compensated D/A Offset
ADJ20	Temperature Compensated D/A Gain
ADJ21	Noise Level
ADJ22	Total VCA1 Offset

## 2. ANALOG SOUND SOURCE SYSTEM ADJUSTMENT

- Make the following adjustments 5 or more minutes after power is switched on.
- Insert the adjustable memory cartridge and load timbres into the mainframe.

### 2-1 Noise Level Adjustment

- Connect GND probe of the VTVM to the AG terminal of the SYN-58 and the other probe to CP16 NOISE LEV.
- Adjust the ADJ21 NOISE LEV on the SYN-58 so that the meter reads -4 dBm irrespective of the timbres.

### 2-2 COMPÉD OFFSET Adjustment

- Set the timbre to TEST-TONE 2.
- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP19 VCF1CV.
- Adjust the ADJ19 COMPÉD OFFSET on the SYN-58 so that the reading on the screen is  $0V \pm 20$  mVDC.

### 2-3 CHANNEL VCF OFFSET Adjustment (TEST-TONE 2)

- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ7 OFFSET 1 on the SYN-58 so that the reading on the screen is  $0V \pm 50$  mVDC.
- Adjust the remaining five channels as follows:  
Adjust ADJ8 OFFSET2 on the SYN-58 with the other probe connected to CP18 VCF2.  
Adjust ADJ9 OFFSET 3 with the other probe connected to CP17 VCF3.  
Adjust ADJ10 OFFSET4 with the other probe connected to CP15 VCF4.  
Adjust ADJ11 OFFSET5 with the other probe connected to CP12 VCF5.  
Adjust ADJ12 OFFSET6 with the other probe connected to CP10 VCF6.

### 2-4 Channel VCF Peak Adjustment

- Set the timbre to TEST-TONE 3.
- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ1 PEAK1 on the SYN-58 to the threshold of oscillation, with the voltage range of the oscilloscope minimized.
- Adjust the remaining five channels as follows:  
Adjust ADJ2 PEAK2 on the SYN-58 with the other probe connected to CP18 VCF2.  
Adjust ADJ3 PEAK3 on the SYN-58 with the other probe connected to CP17 VCF3.  
Adjust ADJ4 PEAK4 on the SYN-58 with the other probe connected to CP15 VCF4.  
Adjust ADJ5 PEAK5 on the SYN-58 with the other probe connected to CP12 VCF5.

Adjust ADJ6 PEAK6 on the SYN-58 with the other probe connected to CP10 VCF6.

- In the above state, check that no oscillation tones sound when six keys are pressed in arbitrary order.

### 2-5 Channel VCF1 Cutoff Adjustment

- Set the timbre to TEST-TONE 4.
- In this state, check that oscillation tones sound when six keys are pressed in arbitrary order.
- Connect the GND probe of the frequency counter to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ13 CUTOFF1 on the SYN-58 so that the frequency is  $800 \pm 2$  Hz.

### 2-6 Channel VCF2-6 Cutoff Adjustment (TEST-TONE 4)

- Place the oscilloscope to the X-Y mode, then connect the GND probe to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Connect the other probe to CP18 VCF2 on the SYN-58.
- Draw Lissajou's figures on the screen and adjust ADJ14 CUTOFF2 on the SYN-58 so that the frequency difference is within 2 Hz.
- Adjust the remaining four channels as follows:  
Adjust ADJ15 CUTOFF3 with the other probe connected to CP17 VCF3 on the SYN-58.  
Adjust ADJ16 CUTOFF4 with the other probe connected to CP15 VCF4 on the SYN-58.  
Adjust ADJ17 CUTOFF5 with the other probe connected to CP12 VCF5 on the SYN-58.  
Adjust ADJ18 CUTOFF6 with the other probe connected to CP10 VCF6 on the SYN-58.

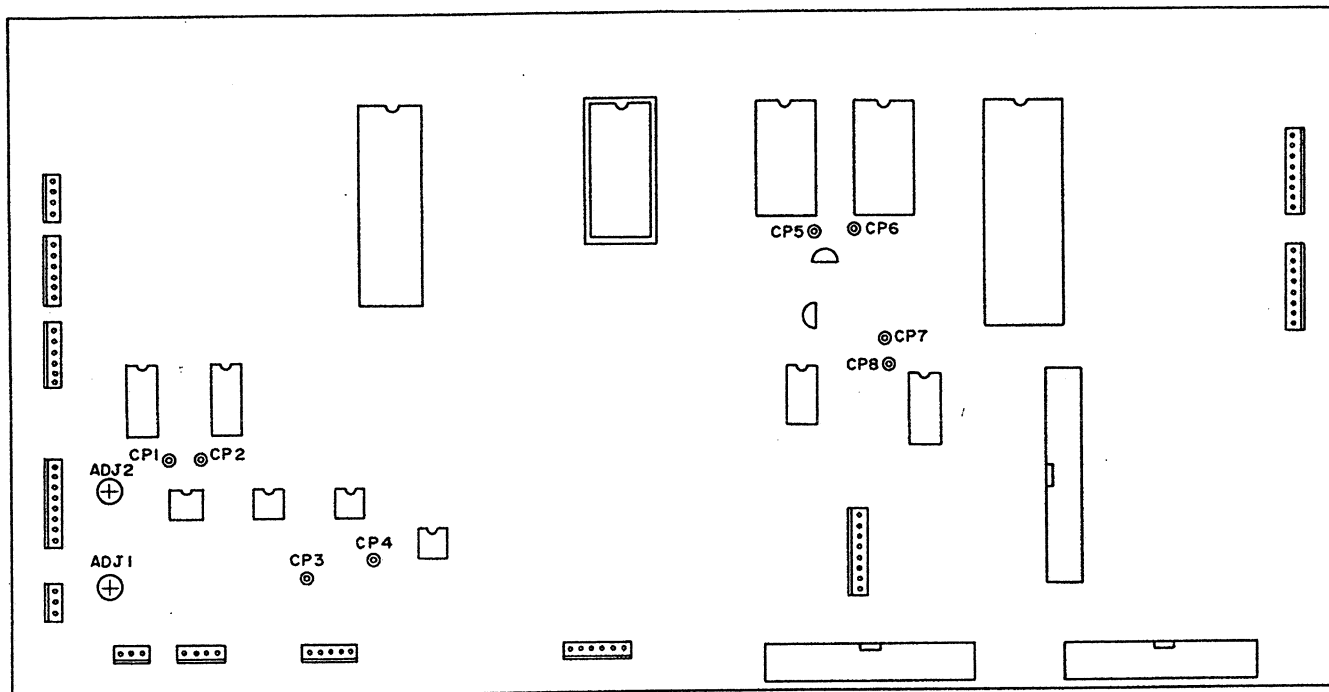
### 2-7 COMPÉD GAIN Adjustment

- Set the timbre to TEST-TONE 5.
- Connect the GND probe of the frequency counter to the AG terminal of the SYN-58 and the other probe to CP21 VCF1.
- Adjust ADJ20 COMPÉD GAIN on the SYN-58 so that the frequency is  $17 \text{ kHz} \pm 40$  Hz.

### 2-8 VCA OFFSET Adjustment

- Set the timbre TEST-TONE 6.
- Connect the GND probe of the oscilloscope to the AG terminal of the SYN-58 and the other probe to CP11 VCA.
- Adjust ADJ22 VCA OFFSET on the SYN-58 so that the AC component is minimized with the voltage range minimized.

## CPU-06 Checking Points and Adjusting Points



CP1	Pressure Sensor
CP2	Pitch Bender
CP3	Analog Ground
CP4	D/A Output
CP5	Battery Current Low
CP6	Battery Current High
CP7	Battery Voltage
CP8	Digital Ground

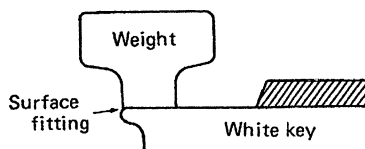
ADJ1	Pressure Sens Start
ADJ2	Pressure Sens End

### 3. AFTER SENSOR ADJUSTMENT (CPU-06)

- Connect the GND probe of the oscilloscope to the AG terminal of the CPU-06 and the other probe to the CP1 pressure sensor.
- Softly place a 600g weight jig on a white key with the greatest white key pressure resistance of the pressure sensor at a light load of 600g, then adjust ADJ1 Pressure Sense Start to cause 0 VDC on the oscilloscope.
- Softly place a 1500g weight jig on a white key with the lowest white key pressure resistance of the pressure sensor at a heavy load of 1500g, then adjust the ADJ2 Pressure Sense End to cause 5 VDC on the oscilloscope.

**Note:** Finish your work quickly because the resistance may fluctuate if you leave a weight on a key for a long time.

Application of weight jig



### 4. BATTERY MOUNTING AND CHECK

- Switch the power off, then set a battery insulation sheet and solder a battery with the legs cut.
- Connect the GND probe of the digital voltmeter to CP8 DG on the CPU-06 and the other probe to CP7 Battery Volt, then check that the potential difference is 3.0 VDC or more (battery voltage).
- Connect the GND probe of the digital voltmeter to CP6 Battery Current High on the CPU-06 and the other probe to CP5 Battery Current Low, then check that the potential difference is 0.2 mVDC or less (battery current).

**Note:** The battery current for detecting patterns and IC defects will normally fall within a measurable range.

## 5. OUTPUT LEVEL AND RESIDUAL NOISE

- Load the data in the adjustable memory cartridge with the power switched on.
- Set the timbre to TEST-TONE 1.
- With a VTVM (Noise meter), measure the signal level at the maximum sound volume, and MONO OUT.
- The output level shall be  $+4 \text{ dBm} \pm 2 \text{ dB}$  when six keys (C5, G4, C4, E3, G3, and C2) are pressed.
- It shall be  $-71 \text{ dBm}$  DIRECT or less when all keys are released and  $-71 \text{ dBm}$  DIN AUDIO or less when all keys are released.

Thus, adjustment is completed.

### Remarks:

How to fix the allocation of keys and channels (depending on kinds of key allocation):

- Set the MONO switch to ON.
- Press, then release any one key.
- Reset the MONO switch to OFF.
- Then, press and release keys C4, D3, E3, F3, G3, and A3 in sequence; the following correspondences will be established between the above keys and the channels unless another key is pressed:

C4	→	CH1
D3	→	CH2
E3	→	CH3
F3	→	CH4
G3	→	CH5
A3	→	CH6



## K3 INSPECTION INSTRUCTIONS

### Required Instruments and Materials:

- Finished K3 product: 1 unit (SX-240 can be used as an alternate.)  
Used to check MIDI.
- Monitor amplifiers: 2
- 8-ohm headphones: 1 set
- Memory cartridge for inspection: 1
- Cables

## 1. PARAMETER FUNCTION CHECK

### 1-1 OSC1

- Set the timbre to TEST-TONE 7.
- Check that all the keys on the keyboard are free from abnormal musical intervals and timbres.
- Check that OSC1 WAVES 0 to 33 are free from abnormal timbres when several tones are keyed in over each octave.

#### Notes:

- Assure normality of the lowest tone (C).
- Assure that WAVE 0 is soundless.
- Check WAVE 32 for needless higher harmonics because it is set to "sine wave" by the user.

### 1-2 OSC2

- Set the timbre to TEST-TONE 8.
- Check that all the keys on the keyboard are free from abnormal musical intervals and timbres.
- Check that OSC2 WAVES 0 to 33 are all free from abnormal timbres. Wave 0 shall be soundless.

### 1-3 BALANCE (1)

- Set the timbre to TEST-TONE 9.
- Check that little sound leaks even if a key is pressed in the above state.
- Check that sound volume varies smoothly over the range from -15 to +15 of movement of the OSC BALANCE.

### 1-4 BALANCE (2)

- Set the timbre to TEST-TONE 10.
- Check that little sound leaks even if a key is pressed in the above state.
- Check that sound volume varies smoothly over the range from -15 to +15 of movement of the OSC BALANCE.

### 1-5 PITCH BEND

- Set the timbre to TEST-TONE 11.
- Check that the pitch changes by 5 degrees upwards and downwards even if little force is applied after giving the bender wheel full swing vertically.
- Check that a slight void of musical interval change appears at either end when the bender wheel is swung up and down slightly.

### 1-6 VCF KCV

- Set the timbre to TEST-TONE 12.
- Check that proper musical scales are formed with all the keys on the keyboard.

### 1-7 VCF ENV (1) (Slow)

- Set the timbre to TEST-TONE 13.
- Check that little unpleasant step noise sounds even when six or more keys are pressed and released in sequence on either (upper or lower) side of the musical intervals.

### 1-8 VCF ENV (2) (Fast)

- Set the timbre to TEST-TONE 14.
- Check that the timbres are free from dispersion even when six or more keys are pressed and released on either (upper or lower) side of the musical intervals.

### 1-9 LOW CUT

- Set the timbre to TEST-TONE 15.
- Check that low-band sounds go lower, then go out when more than one key is pressed at the same time.
- Check that no distortion or needless sounds appear over the range from LOW CUT 0 to LOW CUT 31.

### 1-10 VCA

- Set the timbre to TEST-TONE 16.
- Check that sound volume varies smoothly and little step noise sounds over the range from VCA LEVEL 0 to VCA LEVEL 31.

## 2. MODULATING COMPONENT CHECK

### 2-1 LF0-VCF

- Set the timbre to TEST-TONE 17.
- Check that no extraordinary noise sounds when six or more keys are pressed and released on either (upper or lower) side of the musical intervals.

### 2-2 LF0-VCA

- Set the timbre to TEST-TONE 18.
- Check the effect by pressing several keys.
- Check that no modulation noise sounds when all keys are released.

### 2-3 VELO-VCF

- Set the timbre to TEST-TONE 19.
- Check all the keys on the keyboard for changes in timbre between high and low key pressure. Also check that the keys are free from dispersion in timbre.

### 2-4 VELO-VCA

- Set the timbre to TEST-TONE 20.
- Check six or more keys for changes in sound volume between high and low key pressure.

### 2-5 PRES-VCF

- Set the timbre to TEST-TONE 21.
- Check any one key for setting key pressure, resetting key pressure, and smoothness.
- Try pressing several keys with your right hand and check that no extreme difference in key pressure is felt as against the above one-key pressing.

## 2-6 CHORUS

- Set the timbre to TEST-TONE 22.
- Shall be free from soundless single or double channels when correct sounds are made on both (left and right) sides within the range from CHORUS 0 to CHORUS 7. Also check the effect.
- Check that sounds flow rightwards at CHORUS 7.
- With a headphone check that sounds flow rightwards similarly to the above.
- Check that "monoral" is set with the R CHANNEL output removed. In other words, both direct and indirect tones shall be issued from the same amplifier.

## 3. MAXIMUM VOLUME CHECK

### 3-1 KCV = "15"

- Set the timbre to TEST-TONE 23.
- Set the LEVEL on the rear panel to L.
- Tap, then press hard six high-tone keys on the keyboard at the same time. Repeat the above action several times and check that both (right and left) sides of the output develop the same sound volume and are free from distortion.

### 3-2 KCV = "-15"

- Set the timbre to TEST-TONE 24 with the LEVEL on the rear panel set to L.
- Repeat the action outlined in Section 3-1 several times at lower tones on the keyboard to check for distortion.

## 4. POWER ON/OFF NOISE AND TUNING CHECK

- Switch the power on and off repeatedly to check that little unpleasant noise is generated.
- Switch the power on about 10 seconds after switching it off to check the musical intervals against standard K3.

- Notes:**
1. Do not touch the bender wheel on this occasion.
  2. Do not connect the MIDI cable on this occasion.

## 5. REAR PANEL COMPONENT CHECK

### 5-1 PROTECT Switch

- Set the PROTECT switch to ON.
- Press the WRITE and 1 keys with the INTERNAL indicator lamp on and check that PROTECT is indicated.

### 5-2 MIDI-THRU, -OUT, and -IN

- Connect MIDI-OUT to MIDI-IN and MIDI-THRU to a standard K3.
- Press the numeric switches on the panel in sequence to confirm that their corresponding numbers are indicated in the standard K3.
- Switch the power on and off repeatedly to check that either K3 is free from abnormality.
- Disconnect all MIDI connections.

## 5-3 RELEASE and PROG-UP

- Connect a pedal to RELEASE to check performance.
- Connect a pedal to PROG-UP to check performance.

## 6. INTERNAL TIMBRES

- Check that CtrGER is indicated when the MASTER and 50/LOAD keys are pressed.
- Insert the cartridge containing the timbre data set at factory delivery, then load it by pressing the MASTER and 50/LOAD keys.
- Remove the cartridge, then switch the power off and on.
- Insert an unwritten memory cartridge and save its contents by pressing the MASTER and 49/SAVE keys.
- Check that a cartridge of the same timbre is copied by pressing the CARTRIDGE key. But WAVE 32 is not copied in this case, therefore the timbre made from WAVE32 is difference timbre probably.
- Conduct an overall test on 1 to 50 by pressing INTERNAL and check momentary changes of the sound volume variable resistor as well. The variable resistor should normally be set to its maximum.

## DATA SETTING PROCEDURE AT FACTORY DELIVERY

Switch the power on when the lowest three keys \*(C, C# and D) are pressed at the same time.

Thus, data setting at factory delivery into the internal memory is completed. \*(F, F# and G) for Japan.

Parameter	Preset Value	Details
1 ~ 50		Internal timbres at factory delivery
40/RCV CH	1	MIDI Receive CH1
41/OMNI	1	MIDI OMNI ON
42/FUNCTION	6	
43/SEND CH	1	MIDI Send CH1
45/EXCLUSIVE 2	0	
LINK	1-4-7-10-13-17	
TUNE	0	Tuning frequency: 440Hz

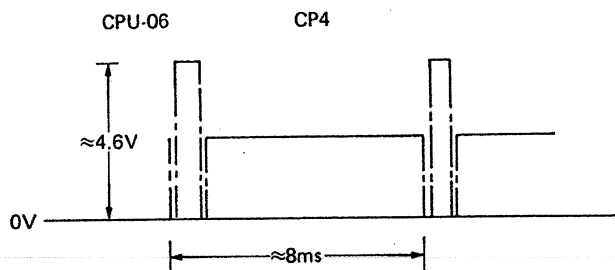
## CHECK POINTS FOR REPAIR

→ N : No  
→ Y : Yes

### Check Points

A. No indication or sound is output.

- Is PC board CPU-06 supplied with 5V?  
→ N: PS-39, CPU-06, SYN-57,  
SYN-58, JA-15, SW-138  
Check each power supply.
  - Is the quartz oscillator on PC board CPU-06 operating?  
→ N: CPU-06
  - Is the CPU on PC board CPU-06 operating?  
→ N: CPU-06, PS-39
- (Are analog voltage waveforms developing at CP4 of the CPU-06 repeatedly? →



B. Nothing responds to switch operations and no sounds are output, though some indication appears.

→ Y: CPU-06  
Key-Touch-Detect Circuit

C. Sounds are output, but indications are abnormal.

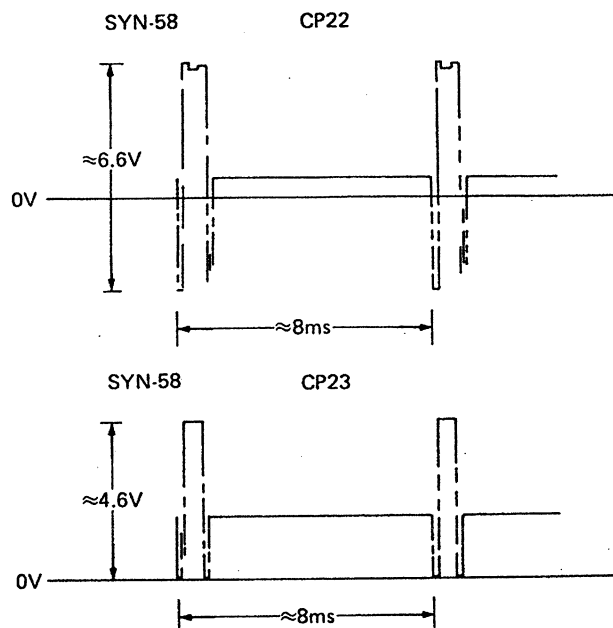
→ Y: CPU-06, SW-138

D. No programs could be written into INTERNAL.

→ Y: CPU-06, JA-15

E. No sounds are output, though panel operations are proper.

- Is PC board SYN-58 supplied with +5V and ±15V?  
→ N: SYN-58, PS-39
- Are white noises made at TEST-TONE 1 and OSC 1 WAVE 33?  
→ Y: SYN-57 See item F.  
SYN-58 17, 18, 15
- Are analog voltage waveforms developing at CP22 and CP23 of the SYN-58 repeatedly?  
→ N: SYN-58 17, 19  
CPU-06



- Are pulses developing at pins SELA, SELB, SELC, INH0, INH1, and INH2 of connector CN-5 on the SYN-58?  
→ N: CPU-06

- Does the voltage at CP19 of the SYN-58 fluctuate depending on programs?  
→ N: SYN-58 I21

- Are audio signals developing at CP27 of the SYN-58?  
→ N: SYN-58  
Circuits before VCF

- Are audio signals developing at CP14 of the SYN-58?  
→ N: SYN-58  
Circuits before MIXER  
SYN-58 I26  
CPU-06  
Key Touch Detect Circuit

- Are audio signals developing at CP11 of the SYN-58?  
→ N: SYN-58  
Circuits before TOTAL VAC1  
SYN-58 I28 ~ I32

- Are audio signals developing at I42 of the SYN-58?  
→ N: SYN-58  
Circuits before LINE OUT  
AMP  
SW-141 VOLUME

- Other than above? → Y: SYN-58 RELAY JA-15

F. No sounds are output over the range from WAVE 1 to WAVE 32 for OSC 1 and OSC 2, though white noises and VCF oscillation noises sound.

- Are SYN-57 clock pulses being input?  
→ N: CPU-06  
Quartz oscillation circuit  
SYN-57 I1, I8, I14, I20, I26
- Are SYN-57 channel separation signals developing at pins SINH, SHA0, SHA1, and SHA2 of connector CN-1 to the SYN-58?  
→ N: SYN-57 I14, I31, etc.
- Are waveform addresses being issued from pins 1 to 8, 22, and 23 of I29 of the SYN-57?  
→ N: SYN-57 I15, I28, I32, I34, etc.
- Are waveforms being issued from pins WD10 to WD17 and WD20 to WD27 of connectors CN-1 and CN2 to the SYN-58 with the SYN-57 set to TEST-TONE 1?  
→ N: SYN-57 I1, I8, I14, I20, I26, etc.
- Other than above? → Y: SYN-58 I1, I2, I7, I8, I9, I29, I30
- G. Improper WAVE musical interval?  
→ Y: SYN-57 I1, I2, I3, I8, I9, I10, I14, I15, I16, I20, I21, I22, I26, I27, I28
- H. Improper WAVE musical interval common to OSC1 and OSC2
- Are all WAVES improper?  
→ Y: SYN-57 I1, I4, I8, I14, I20, I26, I31, I32, I33, I18, I24, I25, I30, I34, I35
- Is a particular compass improper?  
→ Y: SYN-57 I1, I8, I14, I20, I26, I31, I32, I33, I34, I35, I25, I30, I12, I18, I24, I29
- Is a particular WAVE improper in timbre?  
→ Y: SYN-57 I4, I5, I11, I12, I18, I29, I24, I6, I17, I23
- Is only white noise characteristic improper for WAVE 33?  
→ Y: SYN-58 I33, I34, I35, 2SC3331T, I30, I31
- I. There is a soundless channel among the six channels:
- Are waveforms being input to VCF?  
(Check W1 to W6 of 47Kohm connecting to pin 1st of I10 to I15 of the SYN58?) → N: SYN-58 I3, I4, I5, I6  
SYN-57 I1, I8, I14, I20, I31

- Are audio signals developing at all channels (CP1 to CP6) of the SYN-58?  
→ N: SYN-58 I10 ~ I15, I19 ~ I23
- Other than above? → Y: SYN-58 I24 ~ I27  
2SA798 (Any of six components)

#### J. Invalid parameters and their key points.

1. OSC1 (See the preceding item if common with OSC2.)  
→ Y: SYN-57 I20, I26, I11, I7, I13  
SYN-58 I1, I8
4. BALANCE → Y: SYN-58 I1, I2, I8, I29, I30
5. PITCH SEND → Y: CPU-06 RC-4558, LM311P  
PITCH-BEND VR
7. OSC2 (See the preceding item if common with OSC1.)  
→ Y: SYN-57 I20, I26, I5, I19  
SYN-58 I2, I8

#### 10. VCF OUTOFF

- Is the frequency higher or lower than normal?  
→ Y: SYN-58 Adjust ADJ-19  
I9, I21
- Is there a channel higher or lower in frequency than usual?  
→ Y: SYN-58 ADJ13 ~ 18  
I10 ~ I15, I19, I20, I22

#### 11. Resonance

- Improper resonance characteristic with all channels?  
→ Y: SYN-57 I30, I28
- Is there a timbre-irregular channel?  
→ Y: SYN-57 ADJ1 1 ~ 6  
I10 ~ I15

12. LOW CUT → Y: SYN-57 I30, I28, I38, 2SK304E, 2SA564R

#### 13. VCF ENV

- Irregular timbre? → Y: SYN-57 I10 ~ I15, I19 ~ I22
- Is there a program ineffective throughout the channels?  
→ Y: SYN-57 I8, I9, I21

#### 19. VCA LEVEL

- No sound volume change?  
→ Y: SYN-57 I39, 2SA564R, I29, I30

#### 30. LF0 VCA

- Does modulation noise leak even if no keys are pressed?  
→ Y: SYN-57 ADJ22, I38, I39, 2SK304E

#### 31. VELO VCF

#### 32. VELO VCA

- Improper velocity effect?  
→ Y: CPU-06 MB63H158, 6116ALSP-15x2, 74HC153x2, 74LS09

#### KEYBOARD

33. PRESS OSC BAL
34. PRESS VCF
35. PRESS VCA

### 36. PRESS LF0-OSC

- Improper PRESS effect?
  - Y: CPU-06
    - ADJ1: Setting pressure  
(Weight at the first stage)
    - ADJ2: Resetting pressure  
(Weight at the final stage)
    - I39, I40, I41
    - Keyboard

### 37. VCF-KCV

- Improper cutoff frequency variation with all channels
  - SYN-58 ADJ20, I7, I9, I21

(If a certain musical scale is obtained under the following conditions, as well as the TEST-TONE condition, it may be regarded as normal:)

1. OSC1 WAVE = 0
7. OSC2 WAVE = 0
10. CUTOFF = 50
11. RESONANCE = 31
37. KCV VCF = 14

- There is a channel with a different cutoff frequency variation.
  - SYN-58 I10 ~ I15

### 39. CHORUS

- Ineffective?
  - Y: SYN-58 I21, I23, I30, I31, I45, I46, I47, I48, I49, I50, I51, I53, I54, I55, I56, I57
- Distortion at CHORUS 0?
  - Y: SYN-58 I46, I48, I52, I56

**Note:** Locate a defective channel among channels 1 to 6 as follows:

1. Set the MONO switch to ON
2. Press and release any one key.
3. Set the MONO switch to OFF
4. Irrespective of octaves

CH1 is located by pressing and releasing the C key.  
CH2 is located by pressing and releasing the D key.  
CH3 is located by pressing and releasing the E key.  
CH4 is located by pressing and releasing the F key.  
CH5 is located by pressing and releasing the G key.  
CH6 is located by pressing and releasing the A key.

The above key assignment to channels is fixed unless another key is pressed or a switch is operated.

## SPECIFICATION SHEET OF PERFORMANCE & FUNCTION

### 1. TYPE

6-Voice  
Programmable  
Digital Wave Memory Synthesizer

### 2. KEYBOARD

61 keys (5 octaves), C to C

### 3. PROGRAM

INTERNAL (1 ~ 50)  
CARTRIDGE (1 ~ 50)  
LINK (max. 31)

### 4. EDIT

#### 4.1 PARAMETER

##### OSC:

OSC 1 WAVE, RANGE, PORTA SPEED,  
BALANCE, PITCH BEND, AUTO BEND,  
OSC 2 WAVE, OSC 2 COARSE,  
OSC 2 FINE

##### VCF:

CUTOFF, RESONANCE, LOW CUT, ENV,  
ATTACK, DECAY, SUSTAIN, RELEASE

##### VCA:

LEVEL, ATTACK, DECAY, SUSTAIN,  
RELEASE

##### LFO:

SHAPE, SPEED, DELAY, OSC, VCF, VCA

##### TOUCH SENS:

VELO VCF, VELO VCA, PRES OSC BAL,  
PRES VCF, PRES VCA, PRES LFO-OSC

##### KCV:

VCF, VCA,

##### CHORUS

#### 4.2 MASTER

##### MIDI:

RCV CH, OMNI, FUNCTION, SEND CH,  
EXCLUSIVE 1, EXCLUSIVE 2

##### WAVE:

HARMON/INTEN, COPY, ERASE

##### General:

SAVE, LOAD, TUNE

### 5. FUNCTION

WRITE, PORTAMENTO, MONO

### 6. ACCESSORY JACK

##### OUTPUT:

L/MONO, R

##### MIDI:

IN, OUT, THRU

##### HEADPHONE

##### FOOT SWITCH:

RELEASE, PROGRAM UP

### 7. OTHERS

##### VOLUME

##### INCREMENT

PROTECT switch: ON/OFF

LEVEL select switch: H/L

Memory Cartridge (with Protect Sw)

### 8. DISPLAY

double figures LED (x3)

PROGRAM/COUNT

PARAMETER/HARMONIC

VALUE/INTENSITY

### 9. RATING

AC	100	Volts
	117	
	110	
	220	
	240	
	50/60	Hertz
	38	Watts

# KAWAI

Kawai Musical Instruments Manufacturing Co., Ltd.  
200 Terajima-cho, Hamamatsu, Japan