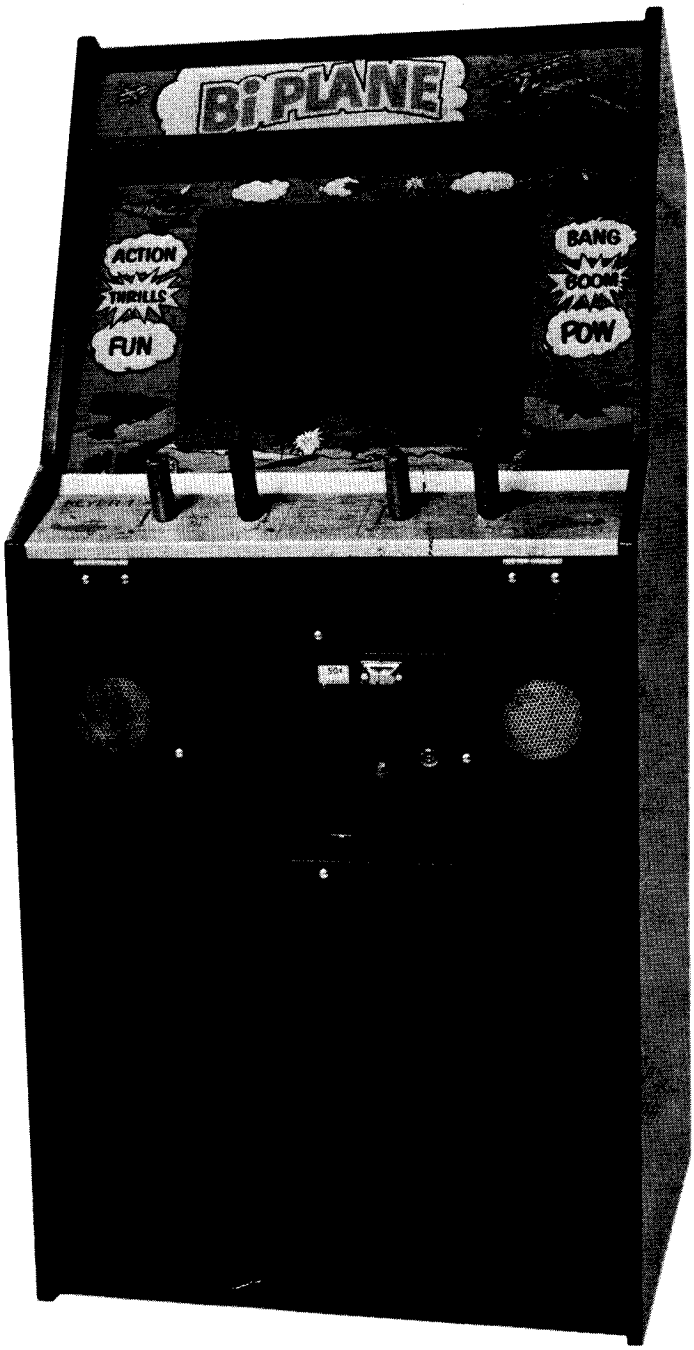


BIPLANE™

FUN GAMES INC.

INSTRUCTION MANUAL

JANUARY 1976

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Memory Boards Schematics . . . . . 13, 14 & 15

Sync Boards Schematics . . . . . 16, 17 & 18

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GENERAL INSTRUCTIONS

INSTALLATION:
Open back of cabinet and MAKE SURE ALL BOARDS ARE PROPERLY SEATED INTO CARD CAGE. Plug into AC Power.

PRICE PER GAME SWITCH:
Located at the top of the memory board is the price per game switch. Up is one coin per game and down is two coins per game.

GAME TIME POT:
Directly below the price per game switch is the game time pot.

WHITE PLANE SHOT RANGE POT:
Directly below the game time pot is the white plane shot range pot. Turning clockwise increases shot range. Range should be adjusted to be equal to black plane range.

VOLUME 2 POT (Location "2"):
Volume for white plane is controlled by the top pot on the *sync* board. Clockwise increases volume.

VOLUME 1 POT (Location "1"):
Directly below the volume 2 pot is the black plane volume. Operates same as volume 2 pot.

NOTE: FOLLOWING CONTROLS ARE FACTORY SET. QUALIFIED TECHNICAL PERSONNEL ONLY SHOULD ADJUST.

NOISE VOLUME:
Location #4 controls shot and boom plane relative volume.

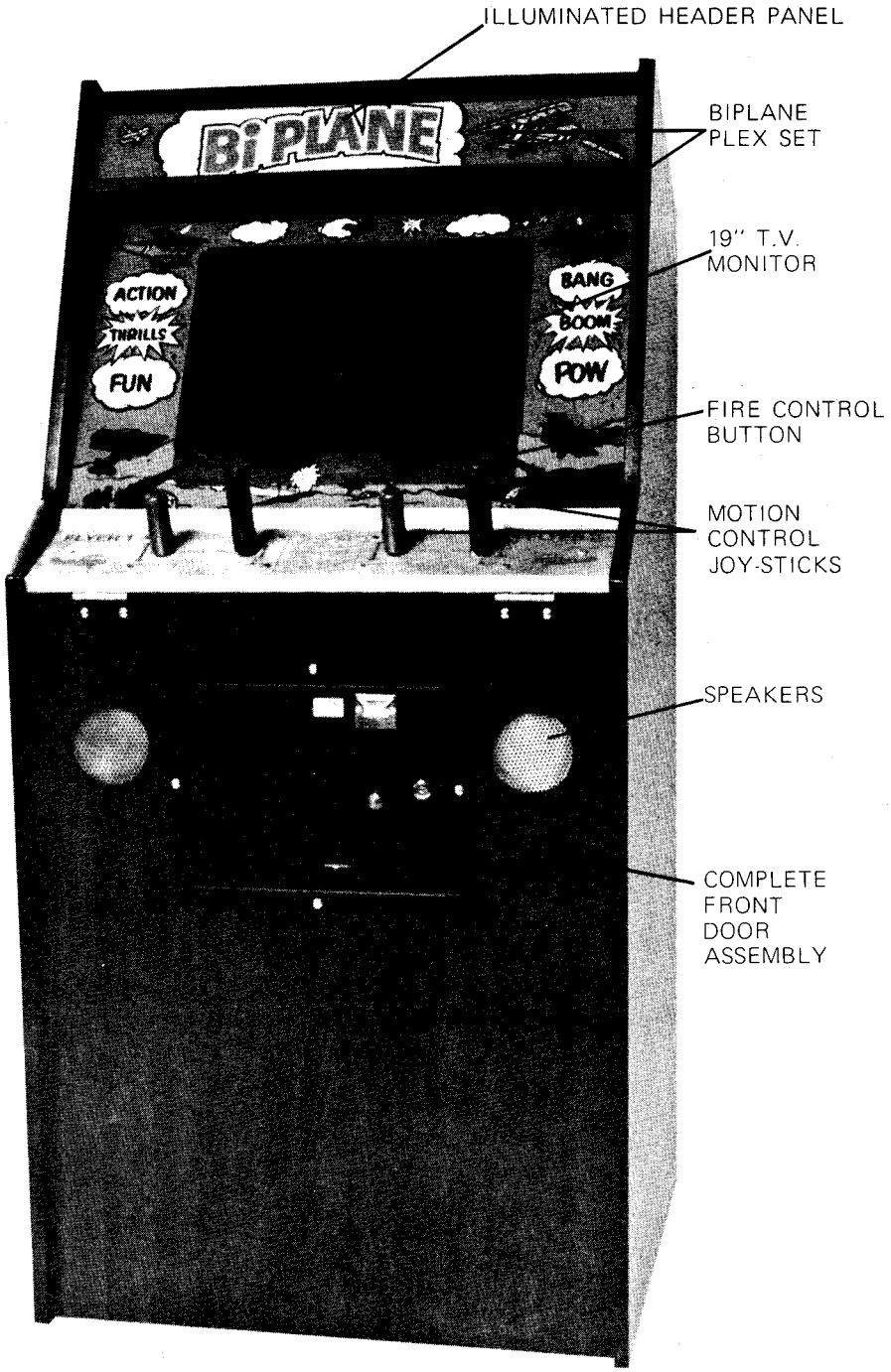
PITCH 2:
Controls pitch of black plane motor.

TONE 2:
Controls tone of black plane motor.

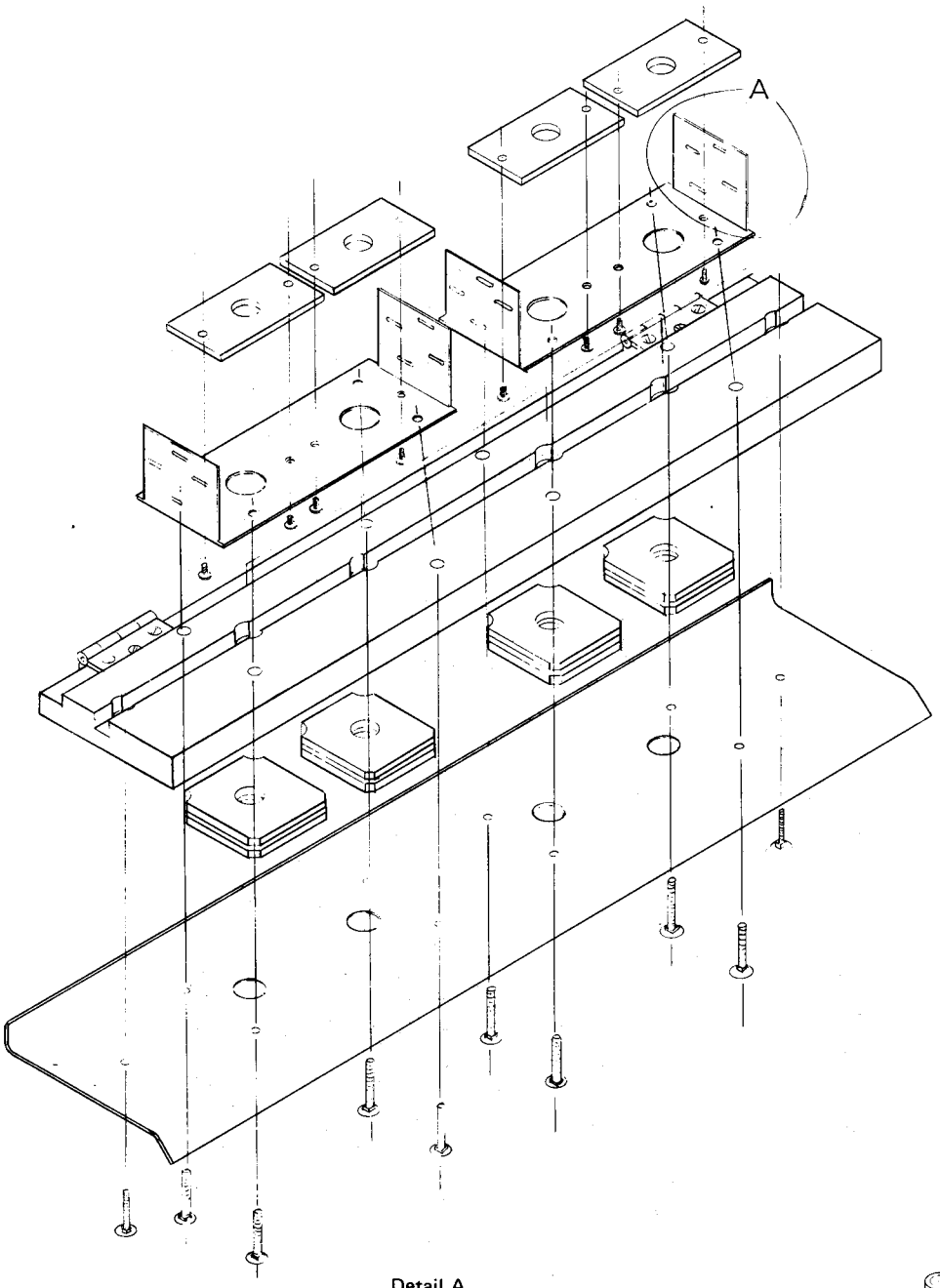
PITCH 1:
Same as pitch 2 for white plane.

TONE 1:
Same as tone 2 for white plane.

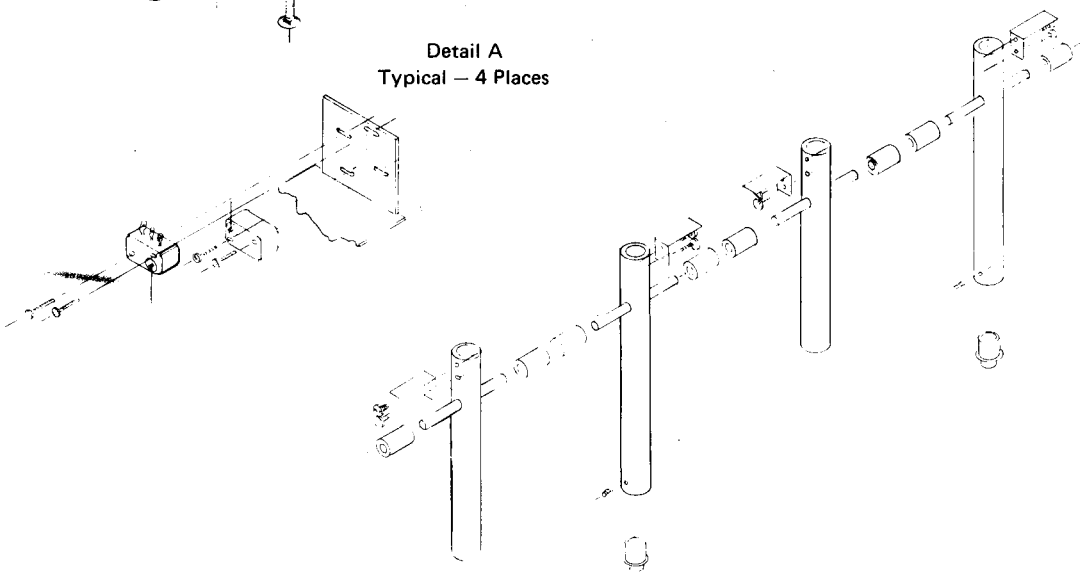
NOTE: BE SURE ALL BOARDS ARE PROPERLY SEATED, INCLUDING INTERCONNECT BOARDS IN HARNESS CONNECTOR.

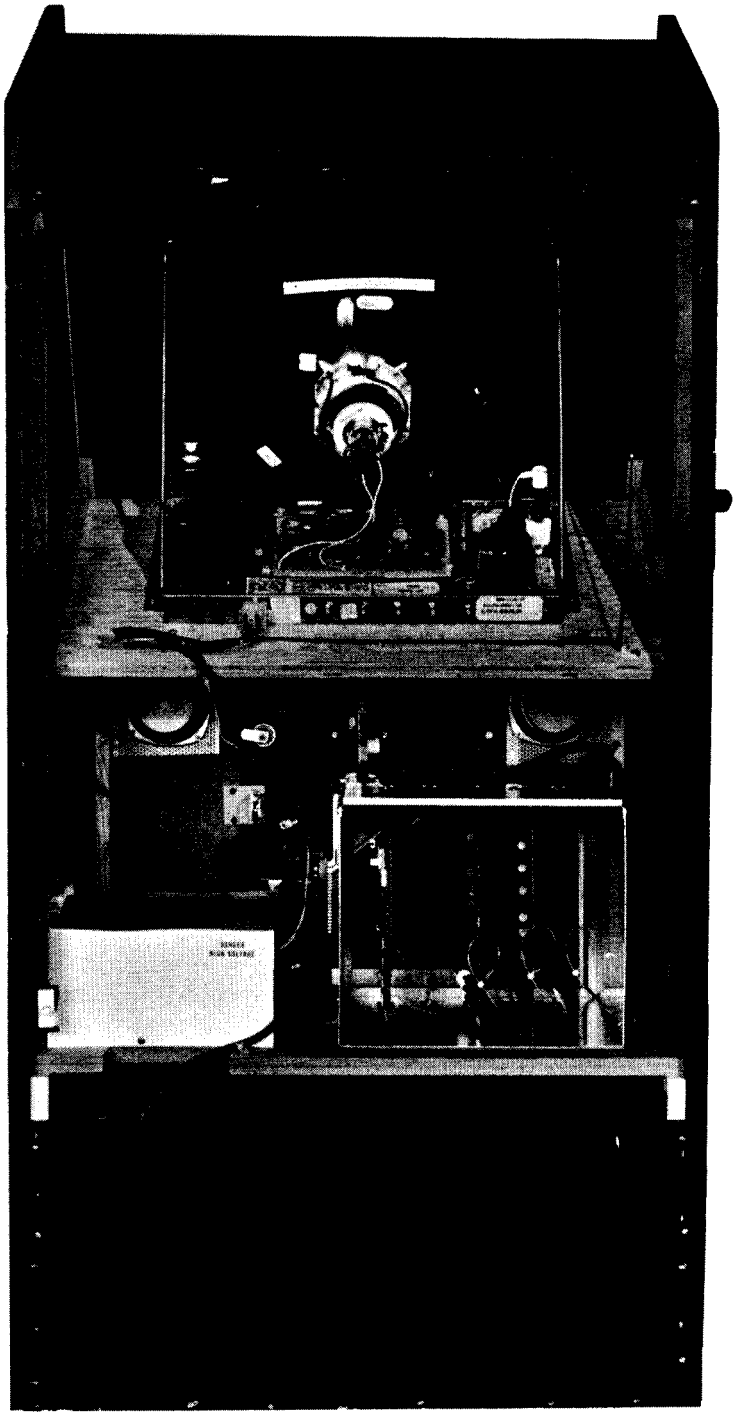

ILLUMINATED HEADER PANEL
BIPLANE
PLEX SET
19" T.V.
MONITOR
FIRE CONTROL
BUTTON
MOTION
CONTROL
JOY-STICKS
SPEAKERS
COMPLETE
FRONT
DOOR
ASSEMBLY
BiPLANE
ACTION
THRILLS
FUN
BANG
BOOM
POW

COMPONENTS AND DESCRIPTION

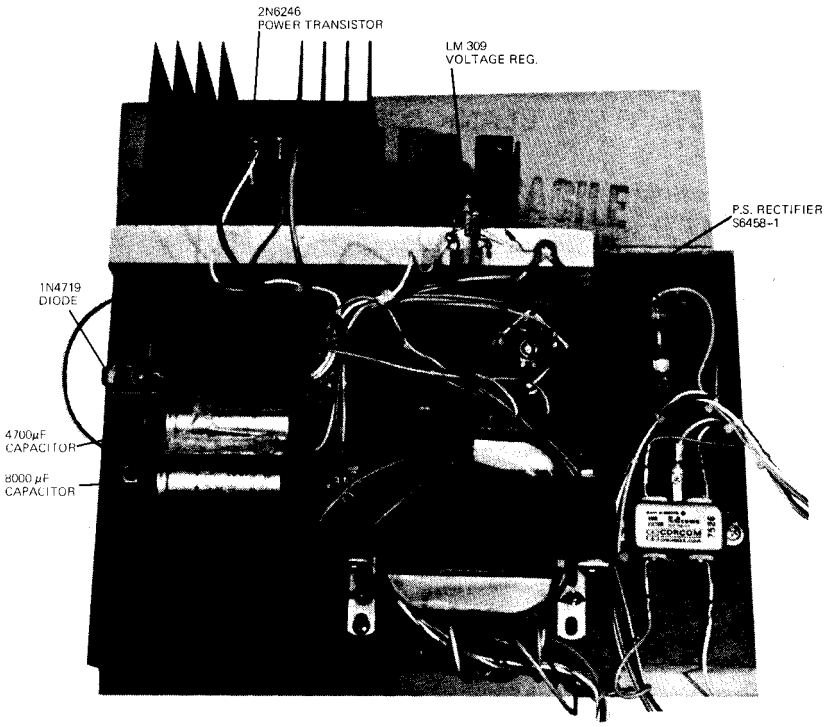


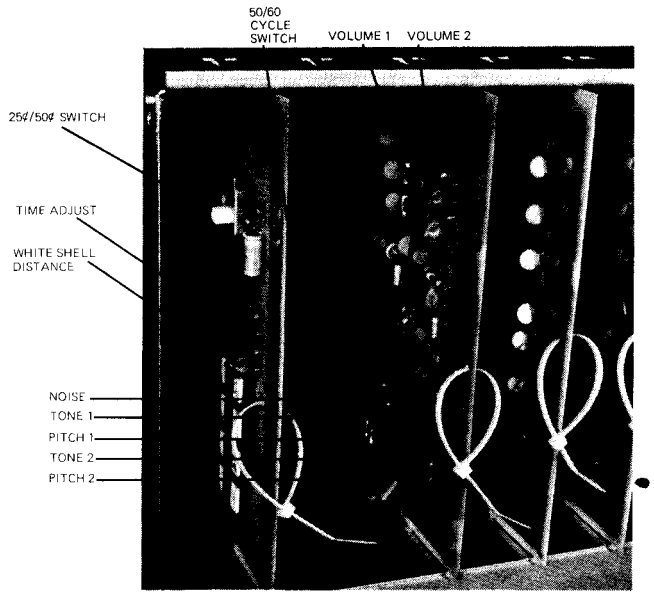
Detail A
Typical – 4 Places





COMPONENTS AND DESCRIPTION





TROUBLESHOOTING

TROUBLESHOOTING GUIDE

AUDIO

1. Check speakers and connections
2. Adjust audio controls on synch board
3. Change synch board

VIDEO (RIPPLE, DISTORTION, BLANK SCREEN)

1. Measure +5V
2. Check interlock switches
3. Shorted diode in P.S. rectifier
4. Change synch board

VIDEO (SHAKE)

1. Adjust T.V. controls
2. Change crystal/4024 I.C. on synch board

MOTION

1. Check control panel switches
2. Switch motion boards — if problem persists on same side (ie. black or white plane) change memory board

SCORING

1. Change memory board

Important: Severe damage will occur if any board but the synch board is inserted in synch board socket.

1. Check control panel switches
2. Switch motion boards — if problem persists on same side (i.e., black or white plane) change memory board

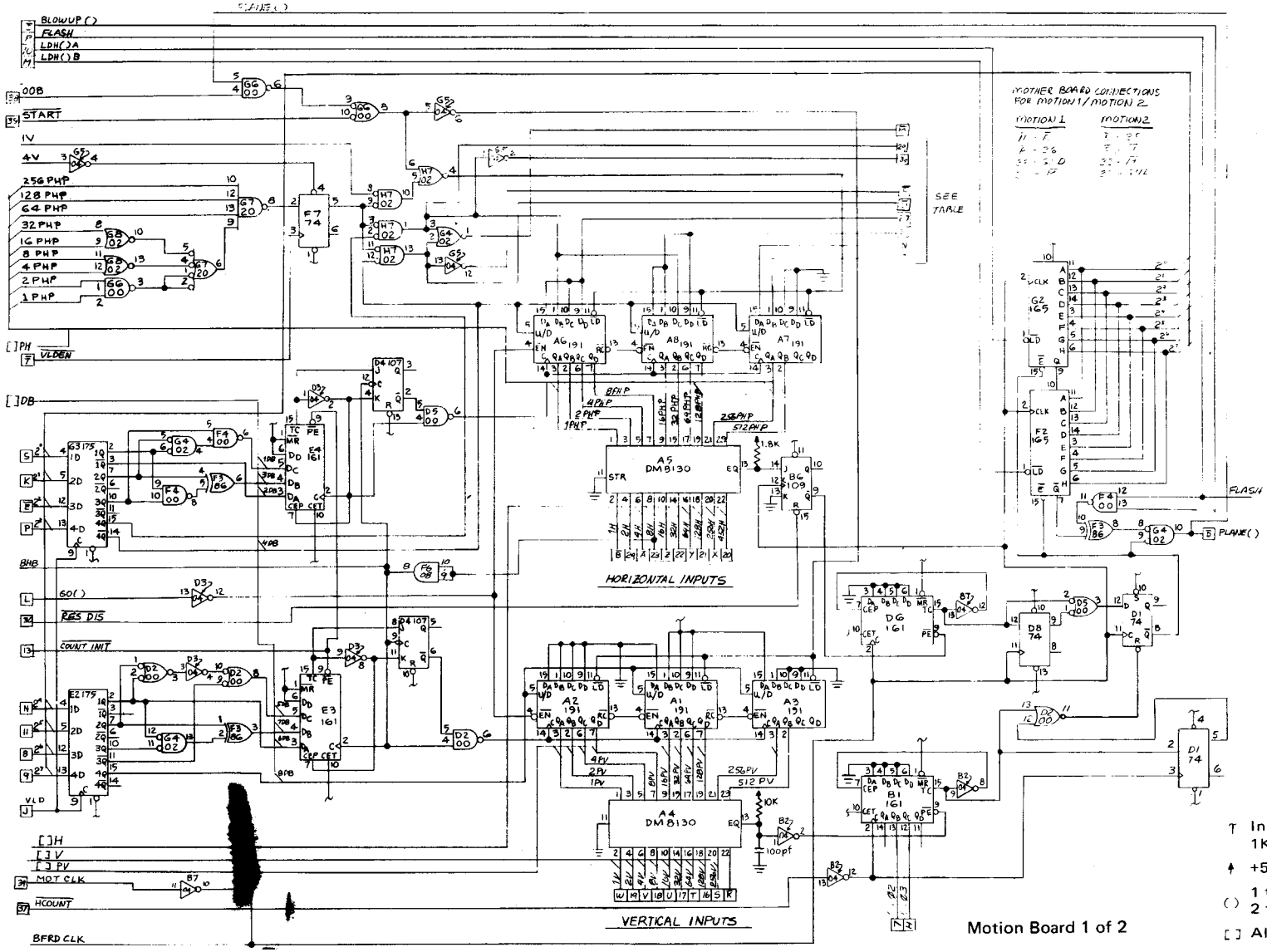
PARTS LIST

PART #	DESCRIPTION	UNIT PRICE
300–200	Power Supply	75.00
500–206	Mother Board	75.00
500–201	Motion Board	250.00
500–202	Synch Board	250.00
500–204	Memory Board	250.00
500–200	Set of PC Boards w/Cage	750.00
600–200	Control Panel	75.00
400–100	Coin Door Assembly	55.00
34–64581	P.S. Rectifier	10.29
36–LM309	P.S. Voltage Regulator	3.54
42–0019	19" Monitor, Motorola	295.00
41–5006	Speakers	5.70
46–0051	Switch, Cherry, E51	2.82
46–0903	Fire Button, Switch	1.59
47–0001	Coin Counter	9.72
82–0001	P.S. Transformer	42.75
35–14318	Crystal 14.318 MHZ	5.04
37–4024	4024 I.C.	6.69
32–2N6246	2N6246 Power Transistor	3.69

Minimum Order – $25.00

PRICE LIST

SCHEMATICS



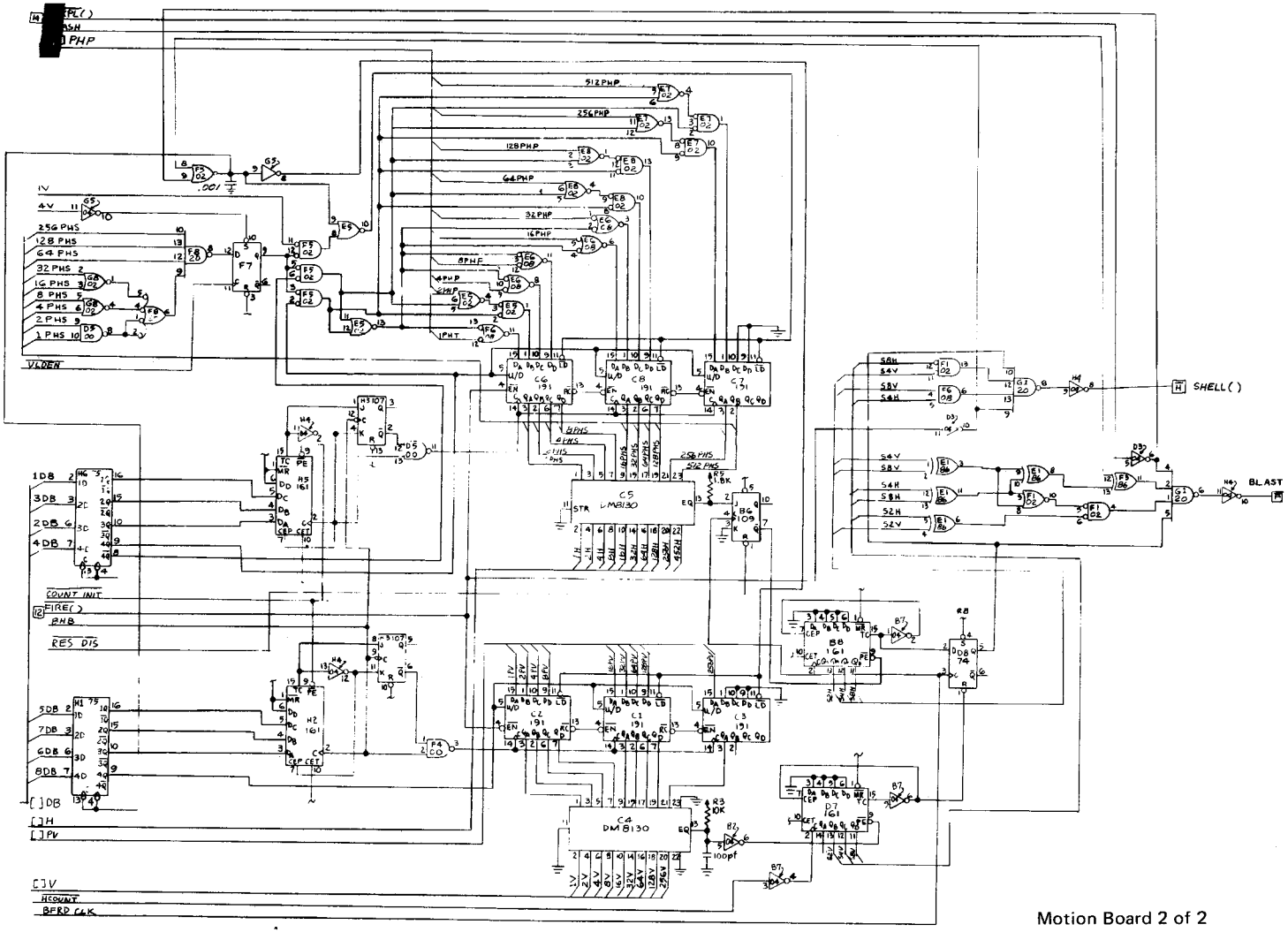
Motion Board 1 of 2

T Indicates pull up to +5 thru 1K RES.

+5

( ) 1 for board one. 2 for board two.

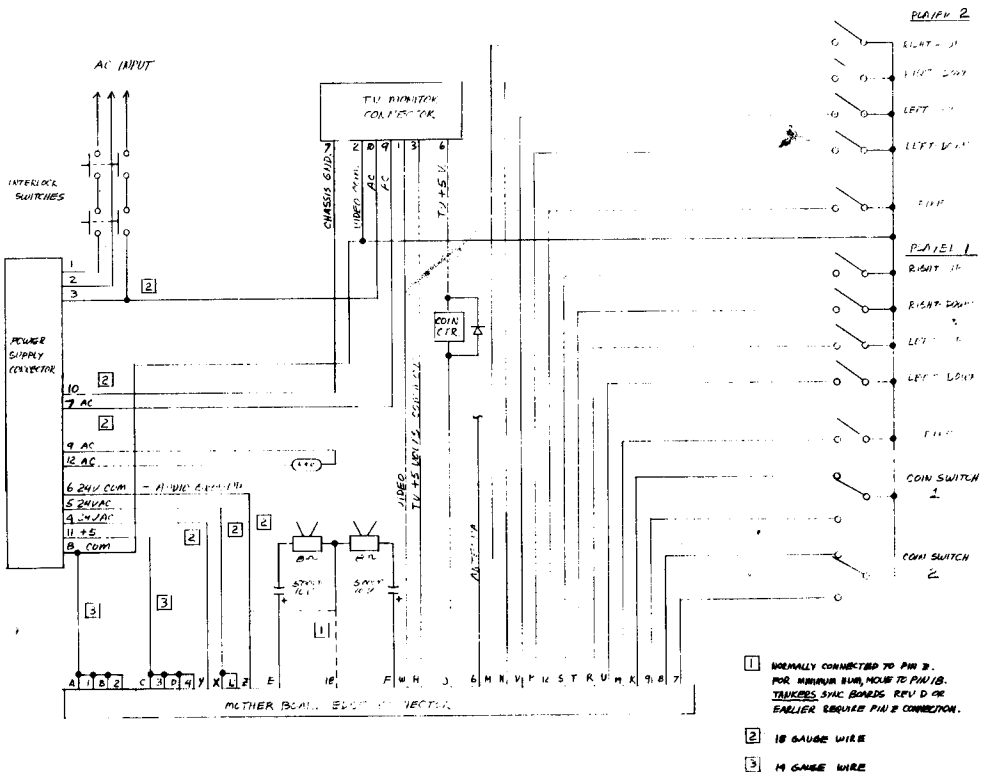
[ ] All signals of similar name



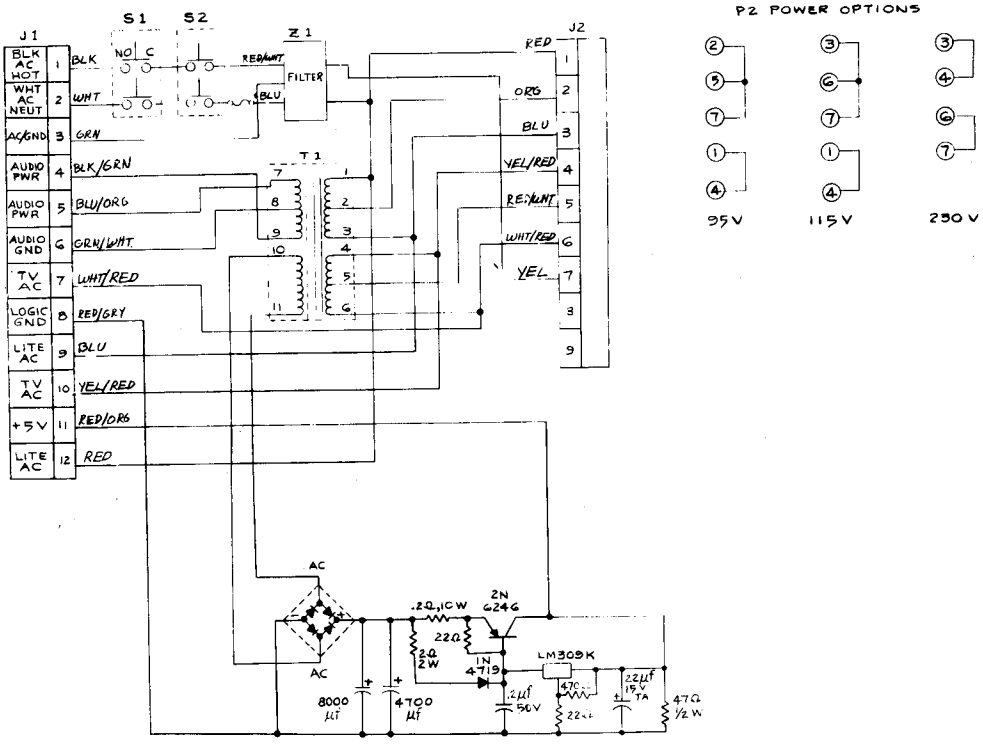
Motion Board 2 of 2

SCHEMATICS

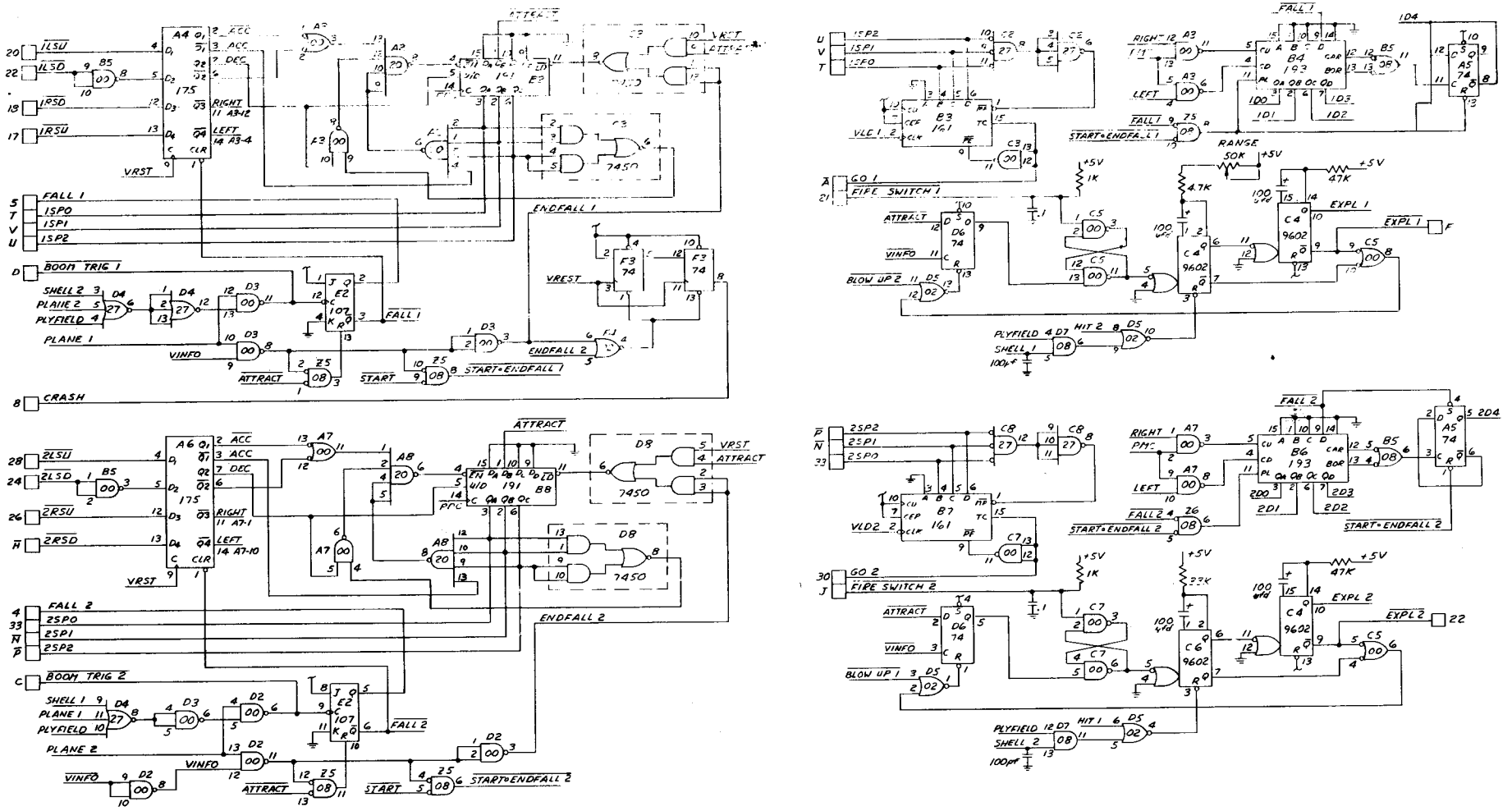
SCHEMATICS



Cabinet Interconnections



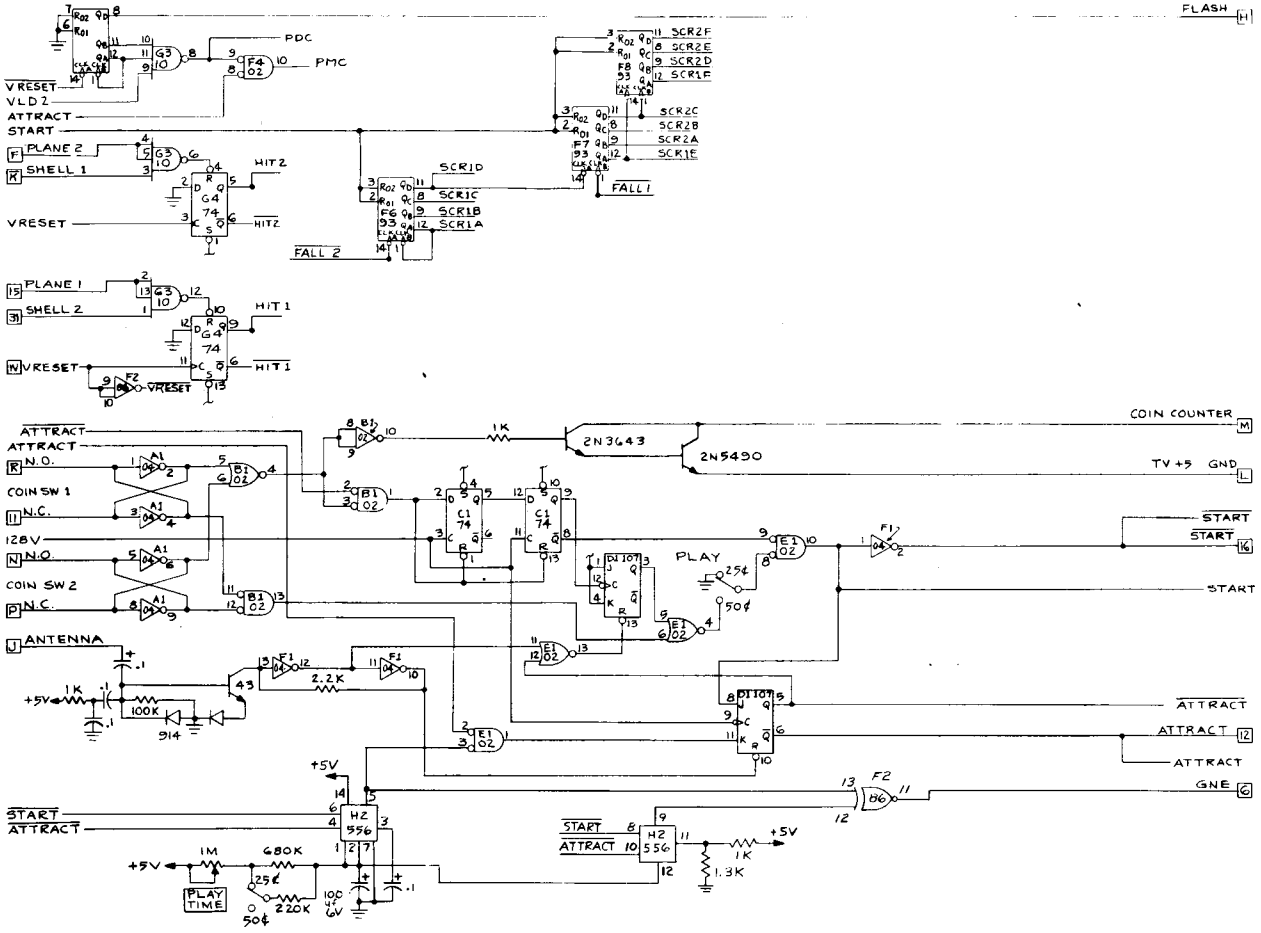
Power Supply



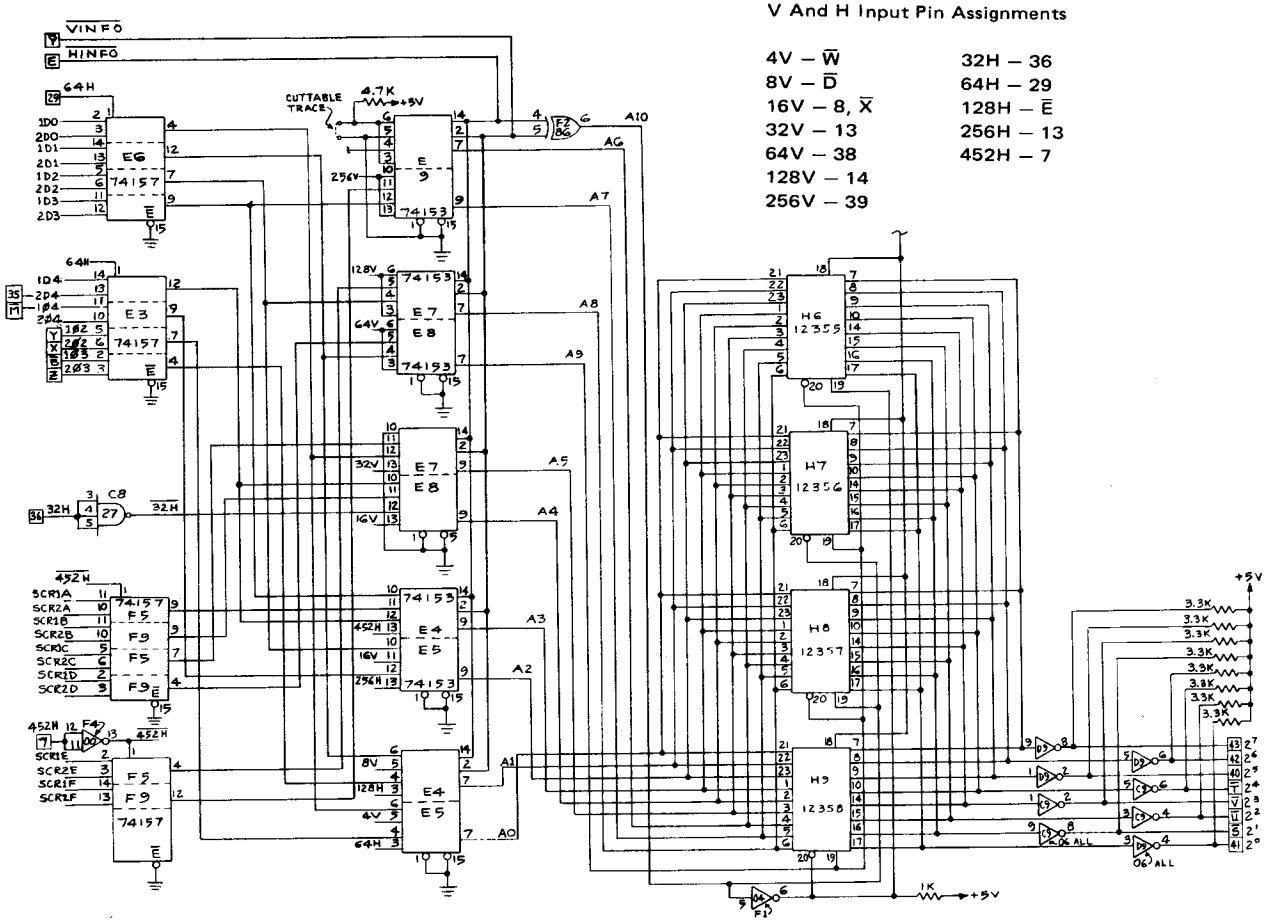
Memory Board 1 of 3

SCHEMATICS

SCHEMATICS



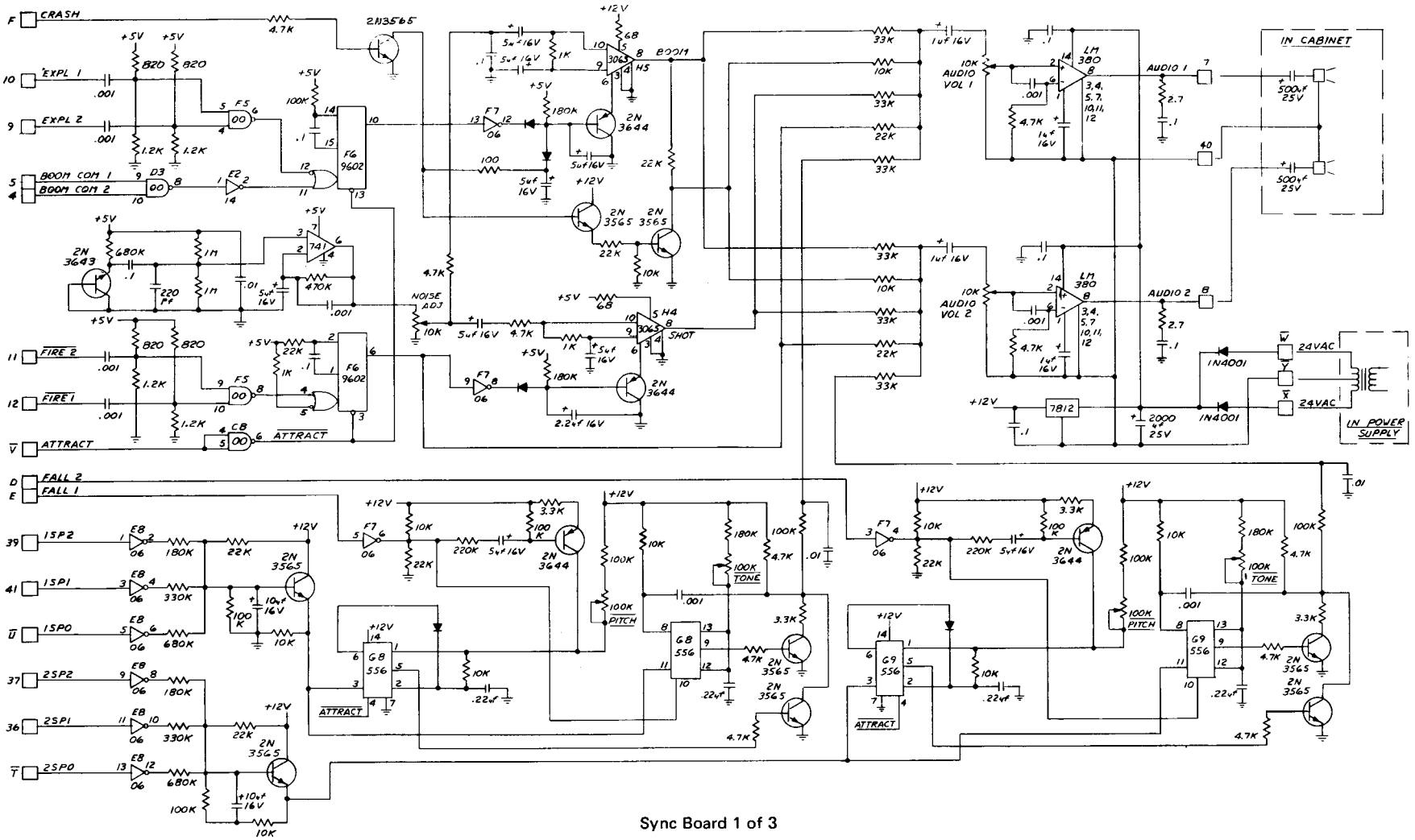
Memory Board 2 of 3



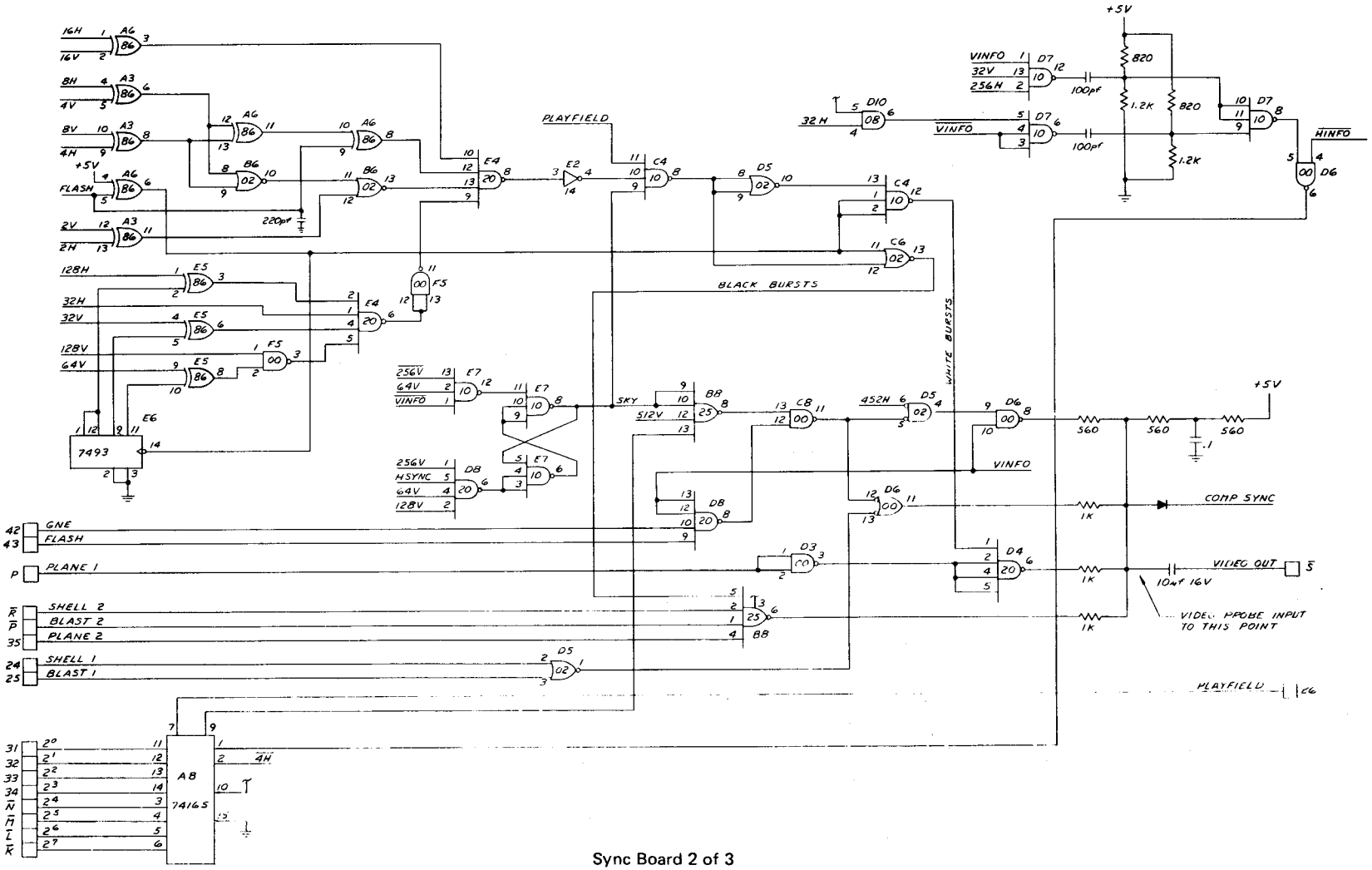
Memory Board 3 of 3

SCHEMATICS

SCHEMATICS



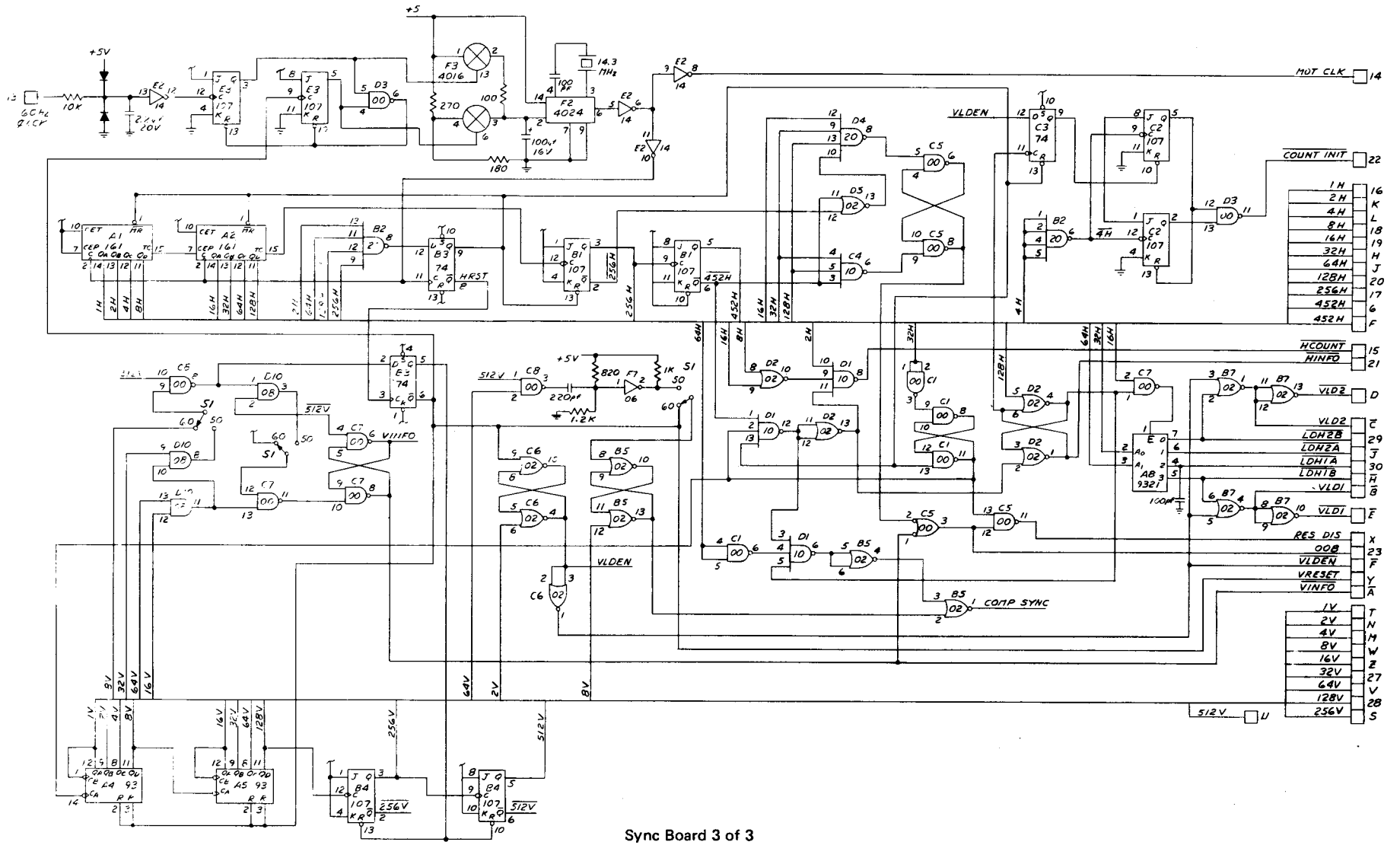
Sync Board 1 of 3



Sync Board 2 of 3

SCHEMATICS

SCHEMATICS



Sync Board 3 of 3

FUN GAMES INC.
8410 AMELIA ST., OAKLAND, CA 94621 (415) 568-5225

7	6	5	4	3	2	1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

TANK( )
BLOWUP( )
FLASH
LDH( )A
LDH( )B
00B
START
1V
4V
256 PHT
128 PHT
64 PHT
32 PHT
16 PHT
8 PHT
4 PHT
2 PHT
1 PHT
[ ]PHT
VLDEN
[ ]DB
[ ]H
[ ]V
[ ]PV
MDT CLK
HCOUNT
BFRD CLK
8MB
GO( )
RES DIS
COUNT INIT
VLL
4DB
2DB
1DB
SEE TABLE

MOTHER BOARD CONNECTIONS FOR MOTION 1 / MOTION 2

MOTION 1	MOTION 2
N - R	D - 29
P - 36	P - U
32 - GND	32 - M
27 - M	27 - GND

HORIZONTAL INPUTS
VERTICAL INPUTS

SYMBOLS

⌜ INDICATES PULLUP TO +5 THRU 1K RES
↑ = +5
( ) = 1 FOR BOARD ONE, 2 FOR BOARD TWO
[ ] = ALL SIGNALS OF SIMILAR NAME

QTY REQ'D	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES °
MATERIAL
FINISH
NEXT ASSY | USED ON
APPLICATION
DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN	10-1-75
CHECKED	10-22-75

FUN GAMES INC
OAKLAND CALIF

SCHEMATIC
MOTION BOARD
BI-PLANE

SIZE D | CODE IDENT NO. | DRAWING NO. 201 | A

SCALE | SHEET 1 OF 2

EXPL( )
FLASH
[ ]PHT
.001
512PHT
256PHT
128PHT
64PHT
32PHT
16PHT
8PHT
4PHT
2PHT
1PHT
1V
4V
256 PHS
128 PHS
64 PHS
32 PHS
16 PHS
8 PHS
4 PHS
2 PHS
1 PHS
VLDEN
F7
C6 191
C8 191
C7 191
8PHS
4PHS
2PHS
1PHS
16PHS
32PHS
64PHS
128PHS
256PHS
512PHS
1.8K
C5 DM8130
BG 109
R8
DB 74
B6 161
P7 161
R3 10K
100pf
C4 DM8130
C2 191
C1 191
C3 191
H2 161
H3 161
1DB
3DB
2DB
4DB
5DB
7DB
6DB
8DB
[ ]DB
[ ]H
[ ]PV
[ ]V
COUNT INIT
FIRE( )
BHB
RES DIS
HCOUNT
BPRD CLK
S8H
S4V
S8V
S4H
S4H
S8H
S2H
S2V
SHELL( )
BLAST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±	CONTRACT NO.	FUN C' ES INC OAKLAND. CALIF
MATERIAL	APPROVALS / DRAWN JB / CHECKED	DATE 10-9-75
FINISH		SCHEMATIC MOTION BOARD BI- PLANE
DO NOT SCALE DRAWING		SIZE D · CODE IDENT NO. · DRAWING NO. 201 · A · SCALE · SHEET 2 OF 2

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

F CRASH 4.7K

+5V +5V

10 EXPL 1. .001 820 820

9 EXPL 2 .001 1.2K 1.2K

5 F5 00 6 4

100K .1 14 15 FG 9602 10 12 11 13

5 BOOM COM 1 9 D3 00 8

4 BOOM COM 2 10

1 E2 2 14

ALTERNATE: BASE CUT OFF RED DOT FACES LM380's

21. 3643

+5V 680K .1 220 PF 1M 1M .01 5uf 16V

+5V H3 3 7 2 741 6 4 470K .001

+5V 820 820

11 FIRE 2 .001 1.2K

12 FIRE 1 .001 1.2K

9 F5 00 8 10

+5V 22K 2 1K .1 1 FG 9602 6 4 5 3

1 ATTRACT 4 CB 5 OC 6 ATTRACT

+12V 68 5 H4 10 9 8 SHOT 306 3 4 6

+5V 180K 2N 3644 5uf 16V

9 F7 8 06

2.2uf 16V

+12V 68 5 306 8 BOOM 10 9 3 4 6 HS

5uf 16V .1 5uf 16V 1K

+5V 180K 2N 3644 5uf 16V

13 F7 12 06

100 5uf 16V

+12V 2N 3565 2N 3565 22K 10K

22K

4.7K NOISE ADJ 10K 5uf 16V 4.7K 1K 5uf 16V

33K 10K 33K 22K 33K

1uf 16V 10K AUDIO VOL 1

.1 14 2 LM 380 8 6 1 3,4, 5,7, 10,12 .001 4.7K 1uf 16V

AUDIO 1 7 2.7 .1 40

IN CABINET 500uf 25V 500uf 25V

33K 10K 33K 22K 33K

1uf 16V 10K AUDIO VOL 2

.1 14 2 LM 380 8 6 1 3,4, 5,7, 10,14, 12 .001 4.7K 1uf 16V

AUDIO 2 8 2.7 .1

+12V 7812 .1 2000uf 25V

1N4001 1N4001

24VAC 24VAC

IN POWER SUPPLY

D FALL 2

E FALL 1

39 1SP2 EB 1 2 06 180K 22K 2N 3565

41 1SP1 EB 3 4 06 330K 100K 10uf 16V 10K

1SP0 EB 5 6 06 680K

2SP2 EB 06 180K 2N 3565

36 2SP1 EB 11 10 06 330K 22K 100K 10uf 16V 10K

2SP0 EB 13 12 06 680K

+12V 10K 3.3K 100K 220K 5uf 16V 2N 3644

F7 5 6 06 22K

+12V 100K 10K 100K PITCH 180K 100K TONE 100K 4.7K .01

.001 8 13 GB 556 9 12 11 10 .22uf 3.3K 4.7K 2N 3565 2N 3565 4.7K

+12V 14 6 GB 556 1 5 2 3 4 7 ATTRACT 10K .22uf

+12V 3.3K 100K 220K 5uf 16V 2N 3644

F7 3 4 06 10K 22K

+12V 14 6 G9 556 1 5 2 3 4 7 ATTRACT 10K .22uf

+12V 10K 100K 100K PITCH 180K 100K TONE 100K 4.7K .01

.001 8 13 G9 556 9 12 11 10 .22uf 3.3K 4.7K 2N 3565 2N 3565 4.7K

2. ALL RESISTORS ARE IN OHMS 1/4 W, 5%, CC

1. ALL DIODES ARE IN914

NOTE: UNLESS OTHERWISE NOTED

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO

APPROVALS	DATE
DRAWN JBlack	10-1-75
CHECKED RK	10-22-75

FUN GAMES INC
OAKLAND CALIF

SCHEMATIC
SYNC BOARD
BI-PLANE

SIZE	CODE IDENT NO.	DRAWING NO.	
D		202	A

SCALE — SHEET 1 OF 3

7 6 5 4 3 2 1

D C B A

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

+5V
820
1.2K
820
1.2K
VINFO 1
32V 13
256H 2
D7 12
10
100pf
5
D7 6
4
10
3
100pf
10
11
9
D7
10
8
HINFO
5
4
00
D6
6
32H 5
D10
08
6
4
VINFO
PLAYFIELD
E4
20
8
E2
3
4
14
C4
11
10
10
9
8
D5
02
10
9
C4
13
1
2
10
12
C6
11
02
13
12
BLACK BURSTS
WHITE BURSTS
16H 1
16V 2
A6
86
3
BH 4
4V 5
A3
86
6
8V 10
4H 9
A3
86
8
+5V
A6
86
4
FLASH 5
6
2V 12
2H 13
A3
86
11
220pf
12
B6
02
10
9
12
B6
02
13
11
10
9
12
13
E4
20
8
128H
E5
86
1
3
2
32H
32V
E5
86
4
6
5
12EV
64V
E5
86
9
8
10
F5
00
1
3
2
11
F5
00
12
13
E4
20
2
1
4
6
5
E6
7493
1
12
9
11
14
2
3
256V 13
64V 12
VINFO 1
E7
10
12
11
10
9
8
E7
10
5
4
3
6
256V 1
HSYNC 5
64V 4
128V 2
D8
20
6
SKY
B8
25
9
10
12
13
8
512V
13
CB
00
12
11
452H 6
D5
02
5
4
9
D6
00
10
8
VINFO
+5V
560
560
.1
560
COMP SYNC
1K
13
12
10
9
D8
20
8
12
D6
00
11
13
1K
1
2
4
5
D4
20
6
D3
00
1
3
2
1K
VIDEO OUT
5
10uf 16V
VIDEO PROBE INPUT
TO THIS POINT
5
2
1
3
B8
25
6
4
BB
D5
02
2
1
3
42 GNE
43 FLASH
P 1-PLANE 1
R 35 SHELL 2
BLAST 2
PLANE 2
24 SHELL 1
25 BLAST 1
PLAYFIELD 26
31 2^0
32 2^1
33 2^2
34 2^3
$\overline{N}$ 2^4
$\overline{F}$ 2^5
$\overline{L}$ 2^6
R 2^7
7
9
11
12
13
14
3
4
5
6
A8
74165
1
2 $\overline{4N}$
10
15

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN	9-25-25
CHECKED RE	10-27-25

FUN GAMES INC
OAKLAND CALIF

SCHEMATIC
SYNC BOARD
BI-PLANE

SIZE D | CODE IDENT NO | DRAWING NO. 202

SCALE | SHEET 2 OF 3

PART NUMBER	USED ON

APPLICATION

7 6 5 4 3 2 1

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

60Hz ΦLCK
MOT CLK
VLDEN
COUNT INIT
HCOUNT
HINFO
VLD2
LDH2B
LDH2A
LDH1A
LDH1B
VLD1
RES DIS
OCB
VLDEN
VRESET
VINFO
COMP SYNC
512V
HRST
VINFO

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION

PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN	10-2-75
CHECKED	10-22-75

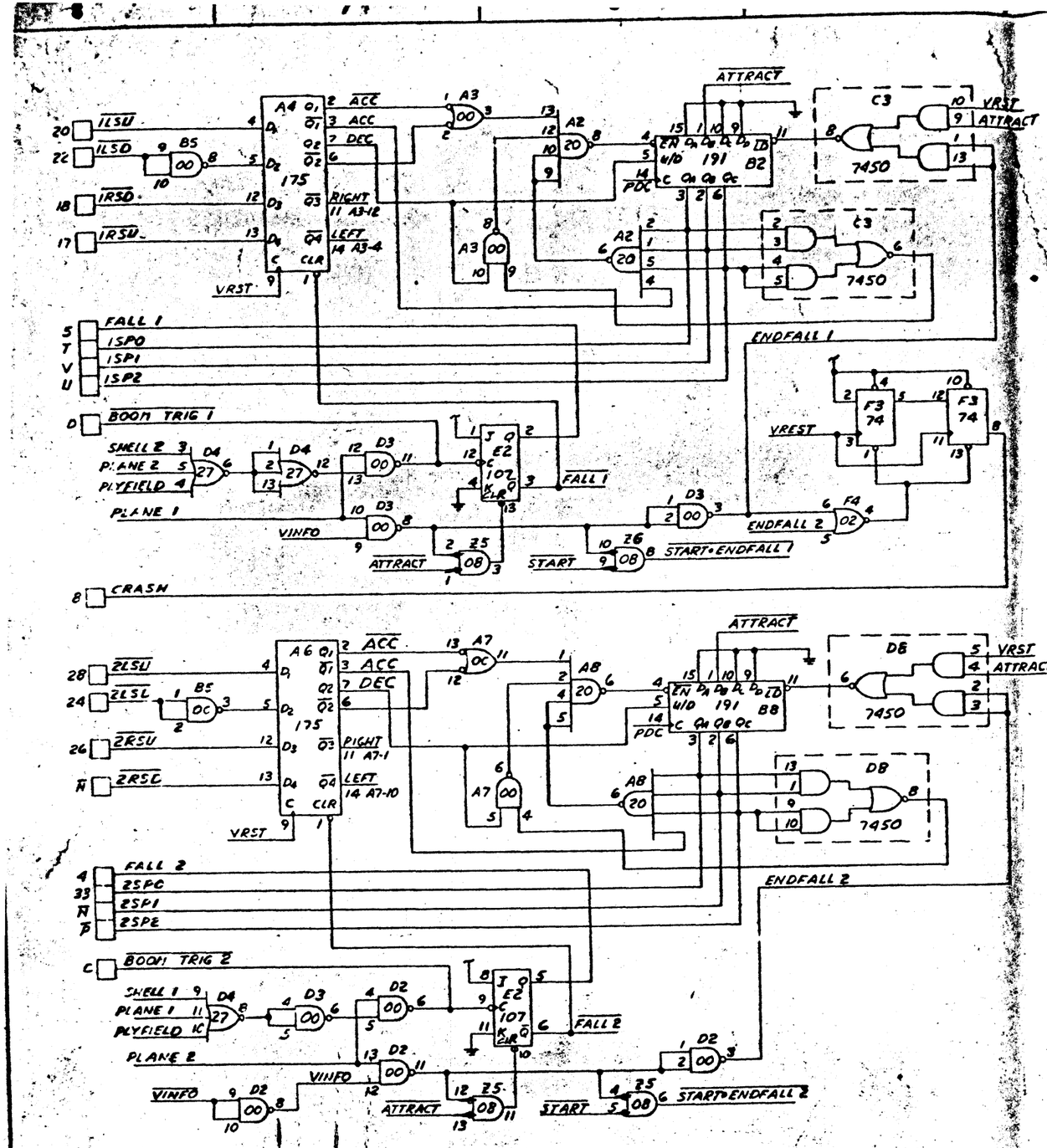
NEXT ASSY | USED ON
APPLICATION

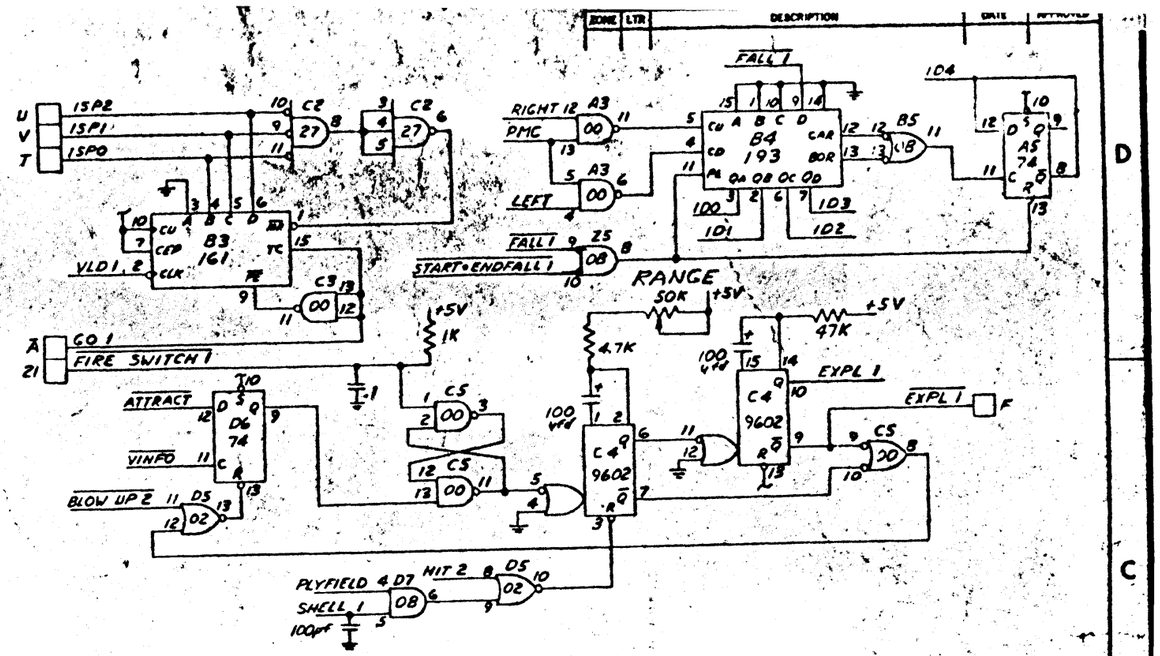
FUN GAMES INC
OAKLAND CALIF

SCHEMATIC
SYNC BOARD
BI-PLANE

SIZE	CODE IDENT NO.	DRAWING NO.
D		202

SCALE | SHEET 3 OF 3





QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
		PARTS LIST	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN 78	10-8-75
CHECKED DE	10-22-75

FUN GAMES INC
OAKLAND CALIF

SCHEMATIC
MEMORY BOARD
B1 PLANE

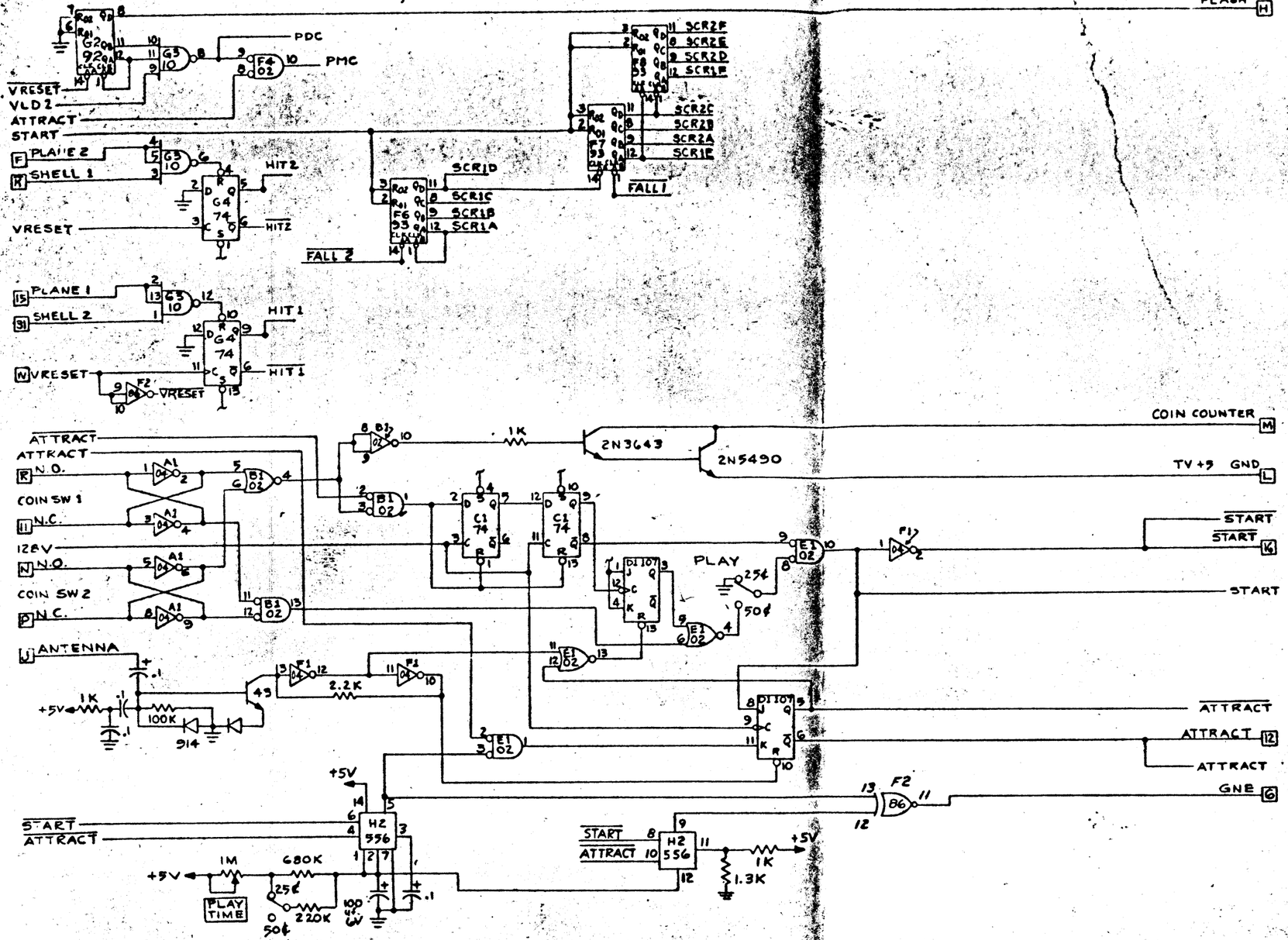
SIZE D | CODE IDENT NO. | DRAWING NO. 204 | A

SCALE | SHEET 1 OF 3

NEXT ASSY | USED ON
APPLICATION

ZONE | LTR | DESCRIPTION | DATE | APPROVED

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED



QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
		PARTS LIST	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS .XX ± .XXX ± ANGLES ±

MATERIAL

FINISH

NEXT ASSY | USED ON
APPLICATION

DO NOT SCALE DRAWING

CONTRACT NO.

APPROVALS	DATE
DRAWN	11-8-75
CHECKED	11-8-75

FUN GAMES INC.
OAKLAND CALIF

SCHEMATIC
MEMORY BOARD
BI-PLANE

SIZE	CODE IDENT NO.	DRAWING NO.	
D		204	A

SCALE

SHEET 2 OF 2

8 7 6 5 4 3 2 1
D C B A

REVISIONS				
ZONE	LTR	DESCRIPTION	DATE	APPROVED

VIH INPUT PIN ASSIGNMENTS

4V - 10
8V - 9
16V - 8
32V - 18
64V - 28
128V - 19
256V - 29

32 H - 36
64 H - 29
128 H - 27
256H - 13
452H - 7

VINFO
HINFO
64H
CUTTABLE TRACE
4.7K
+5V
E6 74157
E3 74157
F5 F9 74157
E5 74153
E7 E8 74153
E4 E5 74153
F3 F9 74157
H6 12355
H7 12356
H8 12357
H9 12358
3.3K
1K
+5V
OC ALL

QTY REQD	CODE IDENT	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
			PARTS LIST

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES
TOLERANCES ARE:
FRACTIONS ± DECIMALS ± ANGLES ±
.XX ± .XXX ±

CONTRACT NO.

FUN GAMES INC
OAKLAND CALIF

APPROVALS	DATE
DRAWN	
CHECKED	8-22-75

MATERIAL

FINISH

NEXT ASSY | USED ON

APPLICATION

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SIZE	CODE IDENT NO.	DRAWING NO.	
D		204	A

SCALE

SHEET 3 OF 3