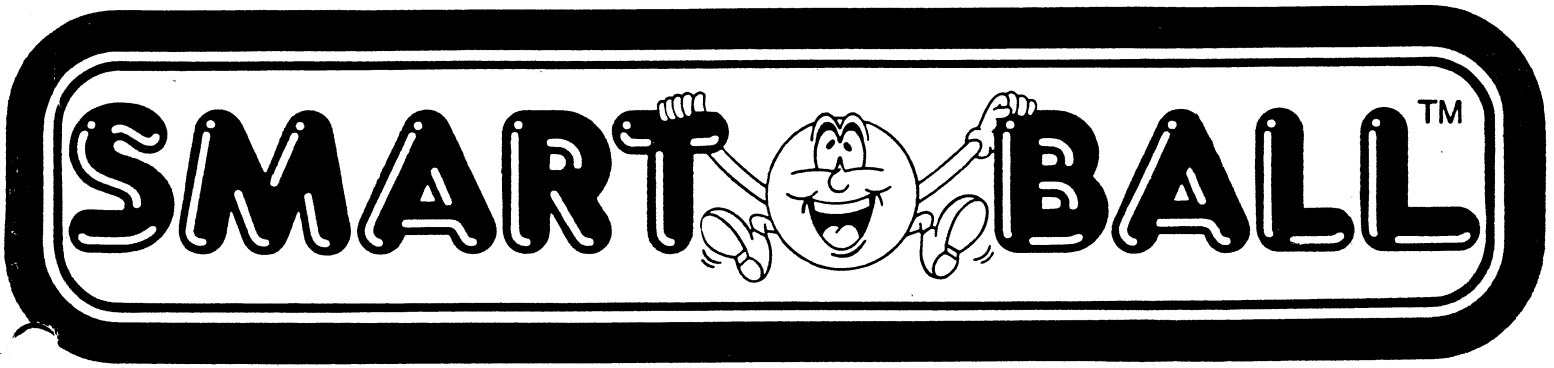
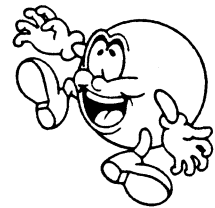




SMART
INDUSTRIES CORP., MFG.



SKILL ALLEY



MANUAL



SMART
INDUSTRIES CORP., MFG.

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02898



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WARNING SHOCK HAZARD

Connect this game only to a grounded 3 wire outlet. If you have only a 2 wire outlet, we recommend you hire a licensed electrician to install a grounded outlet for safety purposes.

Players could receive an electric shock if this game is not properly grounded!!!

GAME INSPECTION

Your careful inspection is needed to supply the final touch of quality control. Please follow these instructions to help us insure that your new game was delivered to you in good condition.

DO NOT PLUG IN AT THIS TIME.

1. Examine the exterior of the scoring cabinet and play field for dents, chips or broken parts.
2. Remove the Marque Plastic from the front of the scoring cabinet. Place the Marque in a safe location as it will not be re-installed until assembly is complete. Inspect the interior of the scoring cabinet for damage and/or loose parts. Perform visual inspection for loose wires and check all plug-in connectors to assure they are firmly seated. Check screw-in light bulbs for seating in sockets.

POWER REQUIREMENTS:

DOMESTIC - 120 V 60 HZ.
FOREIGN - 200 to 240 V 50 HZ
CONSUMPTION - Not to exceed .350 KVA
MAIN FUSE - 5 AMP.
STEP DOWN TRANSFORMER (FOREIGN) - .500 KVA with 3 AMP. SLO-BLOW FUSE.

ASSEMBLY KIT PARTS LIST AND TOOL REQUIREMENTS

The following items are included in the bolt bag received with your SMART BALL GAME:

2	1/2-13 x 3" Hex Head Machine Bolts
2	1/2" Split Lock Washers
2	1/2-13 Hex Nuts
4	5/16-18 x 2 1/2" Carriage Bolts
4	5/16" Split Lock Washers
4	5/16-18 Hex Nuts
6	#8 x 3/4" Particle Board Screws

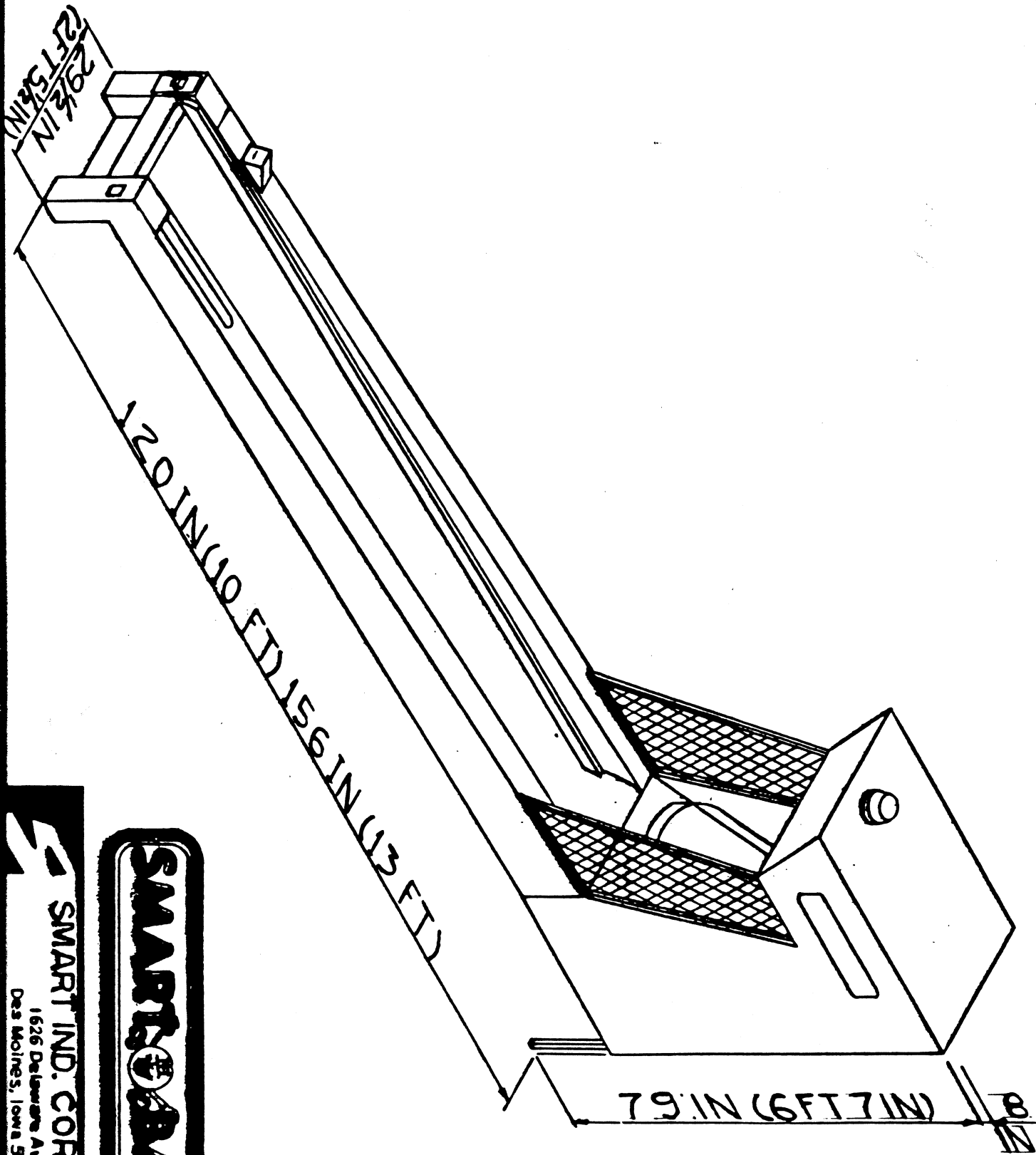
Recommended tools for the assembly of your SMART BALL GAME are:

1	1/2" Drive Ratchet Wrench with 1/2" and 3/4" sockets
1	3/4" Box End Wrench
1	#2 Phillips Screw Driver

Also recommended are (4) 4" x 4" Padded wooden blocks to lay the game on during assembly.

ASSEMBLY INSTRUCTIONS

1. Reposition the ball count microswitch mounting bracket. This is accomplished by removing the two 1/4-20 x 1" machine bolts from the mounting bracket and without removing the wire harness from the microswitch, rotate the microswitch bracket assembly 180 degrees and bolt it back to the cabinet face plate. When completed the ball counting bracket should protrude out through the ball return outlet.
2. Lay both the control console cabinet and the alley on their sides. NOTE: To prevent marring of the painted sides of the game, lay the game on carpet pieces or clean cardboard. Join the control console cabinet to the alley using two 1/2-13 x 3" machine bolts supplied.
3. Two harnesses are used in the Smart Ball game. The signal harness is routed on the left side of the alley while the "AC" harness is routed on the right side of the alley. The control console portion and the alley portion of these harnesses are joined with connectors approximately 18 inches from the alley face plate. For shipping purposes, the control console harnesses are restrained in the lower portion of the console with wire ties. Remove the shipping wire ties and dress both harnesses through the holes provided in the control console and alley face plates. Join the connectors on both harnesses.
4. Insert the two, 1 1/4" square steel, legs into the holes provided through the floor at the rear of the control console. Align the bolt holes with the holes through the sides of the control console and fasten with 5/16-18 x 2 1/2 carriage bolts. Install the bolts from the outside, positioning the nuts on the inside of the cabinet. For access to install the leg on the lower side, place 4" blocks under the assembly. Tighten the nuts VERY securely.
5. Set the game upright. FOR SAFETY IT IS RECOMMENDED TWO MEN BE UTILIZED TO SET THE GAME UP.
6. Install the side net frames. Use three #8 x 3/4" particle board screws to attach the frame to the control console. FRONT NET: The front net is an available option. Supplemental assembly instructions are supplied with this option.
7. This completes assembly. The POWER SWITCH is located in the left front corner of the upper portion of the control console. Plug the game into the power line source and turn the power switch on. Re-install the Marque Plastic.




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MASTER PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
0133	Microswitch bolt spacer	2
0348	Door latch ticket dispenser & rear door	2
11172	Screw #6 X 1/2" PPH wood	8
11178	Screw #4-40 X 3/4 PPH MS	8
1768	Bracket, fuse & toggle switch	2
2096	Bracket, score ring small	28 (36)
2097	Large score ring bracket	6
2098	Score ring connecting bracket	4 (6)
2099	DBA cover plate	1
2100	Speaker grill	1
2102	Inner cover - ball return	2
2104	Hinge plate - rear door	2
2105	T-brace assembly	1 (3)
2106	Leg	2
2107-02	Marque, retainer red	1
2108	Alley strap	1
2111	Coin slide assembly	1
2113	Coin mech slide	1
2114	Slide housing assembly	1
2115	Net frame assembly, left	1
2116	Net frame assembly, right	1
2124	Coin box assembly	1
2133	Light holder	2
2143	Alley edge, stainless steel	1
2144	Playfield light bracket	2
2155	DBA & coin mech housing assembly	1
2156	Connecting rod	1
2157	Solenoid bracket	1
2158	Adjustment pivot	1
2162	Rail - 13 foot	1
2165	Ball release	1
2166	Alley foot	2
2170	Alley rail guide	2
2173	Alley trim - 13 foot	2
2176	Alley trim - front	2
2188	Back door	1
2190	Ball return board	1
2200	Thermoform holder	2
2203	Scoring board w/bonus assembly	0 (1)
2204	Scoring board assembly	1 (0)
2207	Face plate cork	1
2210	Scoring cabinet back cork	1
2221	Ball release pivot assembly	1
2254	Connecting arm assembly	1
2264	Coinbox insert	1
2265	Cover plate	1
2270	Ball release stop assembly	1
2274	Ball release lock assembly	1
2278	Door, DBA	1
2279	Door, coin mechanism	1
2282	Display stop	2
2290	Bonus ball return, right	0 (1)
2291	Bonus ball return, left	0 (1)
2292-01	Lh bonus microswitch holder	0 (1)
2292-02	Rh bonus microswitch holder	0 (1)

MASTER PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
2296	Micro switch form	2
2300	Trough bumper	1
2306	Solenoid cover	1
2308	Assembly, ticket dispenser cover	1
2315	Front rh alley side cover	1
2317	Alley l/r side cover-front	1
2318	Rear rh alley side cover	1
2321	Rear lh alley side cover	1
2337	Front net, clip	4
2338	Front net, lexan	1
2339	Assembly, front net frame	1
2451	PCB assembly Control	1
2452	PCB assembly, One Player Display	1
2461	PCB assembly, Ticket Counter	1
2463	PCB assembly, Credit Counter	1
2471-03	PCB assembly, 2nd Gen 8031 Game Board	1
2496	Support, light bracket	1
2508	Net, top cosmetic front	1
2510	Top net assembly	1
2513	Latch, DBA & coin door	2
2514	Protector, light	2
2521	Vent grill	2
2525	Speaker grill	1
2526	Retainer, marque swivel	2
2532	Sand bag assembly, small (50)	1
2533	Sand bag assembly medium	1
2534	Sand bag assembly large	1
2535-2	Ball rail assembly	1
2556	Bumper, black PVC, 1" X 1/2" X 9"	2
2557	Cover, wire 24"	1
2558	Cover, wire 4"	1
2559	Trough, scoring	1 (0)
2559-01	Trough, bonus scoring assembly	0 (1)
2560	Trough, bottom, black abs pl	1
2561	"Hazard" label	1
2562	Decal, side	2
2563	Decal, face plate	1
2564	Decal, press start to begin	1
2574	Dispenser, ticket #2 plastic	1
2575	Net, "U" channel side	2
2579	Harness, alley ball release, 10 foot	1
2580	Harness, alley ball release, 13 foot	1
2581	Harness, alley signal, 10 foot	1
2582	Harness, alley signal, 13 foot	1
2583	Harness, cabinet ball release	1
2584	Harness, cabinet signal	1
2585	Harness, cabinet AC wiring	1
2586	Harness, ticket dispenser, 2000 series	1
2587	Harness, coin mechanism	1
2588	Harness, component board	1
2590	Harness, single player display	1
2591	Harness, four player display	1
2592	Cover, coin box	1
2626	Bumper, hose	1
2627	Bumper, wood dowel	1

MASTER PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
2648	Marque "T" molding 3/4"	2
2649	Marque "T" molding 13/16"	1
2656	Display, red lens single	1
2666	Decal, "TICKET"	1
2729	Harness, ticket dispenser, 4000 series	1
2751	Cabinet final assembly	1
2752	Alley assembly final 13 foot	1
2756-01	Non bonus target board assembly	1 (0)
2756-02	Bonus target board assembly	0 (1)
2757	Componant board assembly	1
2762	Scoring trough assembly, non bonus	1
2763	Bottom trough assembly	1
2764	Bumper, T-brace	1
2766	50 Pt. scoring ring	1
2767	40 Pt. scoring ring	1
2768	30 Pt. scoring ring	1
2769	20 Pt. scoring ring	1
2770	100 Pt. scoring ring	0 (2)
2771	10 Pt. scoring ring	1
2773-01	Ticket disp. final assembly 2000	1
2773-02	Ticket disp. final assembly 4000	1
2774	Front net final assembly	1
2775-01	Side net final assembly	1
2775-02	Side net final assembly	1
2779-01	Marque assembly, single player	1
2779-02	Marque assembly, four player	1
2782-01	Lh bonus microswitch assembly	0 (1)
2782-02	Rh bonus microswitch assembly	0 (1)
2783	Scoring trough assembly with bonus	0 (1)
2784	leg assembly	2
2865	Cover, fuse & switch	1
2866	Cover, control board	1
2867	Cover, EMI filter	1
2872	PCB, Four Player "A" Display	1
2886	PCB, Four Player "B" Display	1
2947	Ball count sensor bracket	1
2961	Display back subassembly	1
3043	Ball count sensor bracket assembly	1
3047	Display assembly, single player	1
3048	Display assembly, four player	1
3056	Harness, A-B display interconnect	1
50006	Terminal block	6
50011	Toggle Switch, 110V SPST	1
50012	Fuseholder, panel mount	2
50064	Transformer, 115V/14V 6 Ampere	1
50065	Filter, EMI, 120V/250V 5 Ampere	1
50066	Transorb 1.5KE220C	1
50067	Power cord, 10 foot, 18/3SJT	1
50252	Fuse, 5 Ampere AGC5	1
50287	Cluster socket, #22259	1
50289	Nut, hex, 9/16"-18 IP, steel	1
50294	Speaker, 8 Ohm, 30 Watt 6" X 9"	1
50295	Solenoid, ball release	1
50296	Push button switch, start	1
50297	Switch, scoring	5 (7)

MASTER PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
50298	Revolving light, winner	1
50299	Lamp, light pilot holder	1
50300	Lens, RED for #50299	1
50301	Switch actuator, 2" wire	5 (7)
50302	Fan	1
50303	Bulb, flood, 50R20 Sylvania	2
50304	Socket, porcelain lamp	2
50305	Bulb, #912 miniature	4 (2)
50306	Bulb, #1895 miniature	3 (2)
50308	Socket, miniature bayonet	3 (2)
50320	1/2 Ampere slow blow fuse	1
50479	Lamp holder, wedge base	4 (2)
60000	Cotter pin, 1/16" X 3/4"	4
60001	Cotter pin, 1/8" X 1" steel	1
60003	Washer, lock, 5/16"	4
60004	Washer, flat, 5/16"	1
60005	Nut, hex, 5/16"-18	4
60007	Screw, PPH, #8-18 X 1/2"	7
60010	Screw, flat head, #8 X 1"	4
60016	Screw, PPH, #8 X 1/2"	49
60017	Screw, PPH, #6 X 1 1/4"	24
60018	Nut, hex 1/4"-20	1
60019	Washer, lock, 1/4" split	1
60021	Screw, PFH, #6 X 5/8"	12
60022	Screw, PPH, #8-18 X 3/4"	12
60046	Washer, lock, #10 split	19
60050	Screw, machine PPH, #4-40 X 3/4"	8
60057	Wire tie, 4" nylon	29
60058	Lock, 7/8" tubular with str cam	2
60062	Standoff, 1/2" X 1/2" nylon	35
60071	Washer, flat, 1/4"	1
60073	Nut, lock, #8-32 nylon insert	8
60074	Wire tie, 7 1/2" nylon	112
60082	Washer, flat, 3/8"	9
60091	Standoff, 3/8" OD X 1/8" ID X 1/4"	20
60106	Nut, hex, #10-24	1
60109	Nut, #4-40 nylock	25
60111	Washer, flat #4	22
60115	Washer, flat #8	18
60139	Lock, 1 1/8" cylinder with cam	1
60155	Screw, PPH, #8 X 2"	4
60156	Screw, machine, PPH #8-32 X 1/4"	2
60157	Screw, PPH, #6 X 3/4"	78
60158	Screw, machine, PPH, #8-32 X 1/2"	8
60165	Nut, hex, #8-32	4
60168	Nut, hex, #10-32	12
60170	Lock, 7/8" cylinder with cam	1
60198	Screw, machine, PPH, #8-32 X 1/2"	4
60202	Screw, PPH, #6 X 1/2"	19
60213	Screw, PPH, #8 X 3/4"	51
60219	Bolt, hex head, 1/2"-13 X 3"	2
60220	Nut, 1/2"-13 hex	2
60221	Washer, lock, 1/2" split	2
60225	Screw, machine, SHH, #4-40 X 1"	26
60234	Leveler 3/8"-16 X 3" #FB3348	2

MASTER PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
60239	Washer, lock, #8 split	2
60241	Coin mech channel, coin	1
60243	Bushing, flanged oilite, 1/4"	1
60245	Cam, lock, #7-602 hooking	2
60265	Bolt, hex head, 1/4"-20 X 1 1/4"	1
60273	Nutserts, P/N #4-40 AT52-440	20
60290	Bolt, 1/4"-20 X 1"	2
60297	Grounding clip #8182-84-00	1
60300	Bulb, 69 Watt stop light	2
60301	Nipple, pipe, NPT 1/2" X 1/2"	1
60303	Decal, Insert 25 Cents	1
60304	Ticket dispenser, narrow face	1
60308	Support, circuit board LCBS	6
60318	Bolt, hex head, 3/8"-16 X 1"	4
60320	Screw, phil pan head 1/4" M/S	2
60321	Screw, machine, PPH, #10-32 X 3/8"	8
60322	Solenoid return spring	1
60324	Coin mechanism	1
60325	Studs, clinch #10-32 X 3/8"	10
60326	Cup, coin return	1
60327	Coin meter 12 VDC	2
60328	Coin slot, top entry, plunge	1
60330	Turn buckle #10-24	1
60331	Bolt, eye #10-24 X 3 1/2"	1
60332	Speednut for actuating wire	7
60333	Rivet, steel split	8
60335	Number, 2" Black vinyl #0	16
60336	Number, 2" Black vinyl #1	5
60337	Number, 2" Black vinyl #2	2
60338	Number, 2" Black vinyl #3	2
60339	Number, 2" Black vinyl #4	2
60340	Number, 2" Black vinyl #5	2
60341	Washer, finish CTSK	41
60342	Screw, PPH, #8 X 1"	29
60343	Nut, lock, 1/2" tigergrip	2
60344	Screw, phil pan head #12 X 1/2"	8
60345	Bumper, tacky Black #E6512 BL	2
60346	Tickets, 1 5/32" X 2" Orange	1
60348	Wooden balls, 3" unfinished	10
60349	Clip, grater, 4 sided #565-4	2
60351	Adhesive wire tie MT 3/4" X 3"	10
60352	Bolt, step, 5/16"-18 X 2 1/2"	4
60379	Support, circuit board	14
60422	Tinnerman nut #10-32	2
60438	Bushing brass 3/8" ID 1/2" OD	4
70148	Manual, Smartball	1
70231	Tape Yellow 1"	

NOTE: Quantities shown in parenthesis reflect those required when the bonus option is purchased and/or differences required for Four Player Games as opposed to Single Player Games.

DIP SWITCH SETTINGS

SWITCH 1

<u>Position</u>		<u>OPTION</u>
<u>1</u>	<u>2</u>	Number of points between tickets (After first ticket dispense)
ON	ON	30
OFF	ON	40
ON	OFF	50
OFF	OFF	70
<u>3</u>	<u>4</u>	Number of tickets per dispense
ON	ON	0
OFF	ON	1
ON	OFF	2
OFF	OFF	3
<u>5</u>		Number of balls per game
ON		6
OFF		9
<u>6</u>	<u>7</u>	Price per game
ON	ON	\$0.25
OFF	ON	0.50
ON	OFF	0.75
OFF	OFF	1.00
<u>8</u>		Attract Mode (song & light)
ON		on
OFF		off

SWITCH 2

Winner Score - First ticket dis-
pense, winner light and song.

<u>1</u>	<u>2</u>	<u>3</u>	
ON	ON	ON	50 points
OFF	ON	ON	100
ON	OFF	ON	150
OFF	OFF	ON	200
ON	ON	OFF	350
OFF	ON	OFF	500
ON	OFF	OFF	700
OFF	OFF	OFF	900

High Score - Free game - Single Player
High Score Song - Four
Player

<u>4</u>	<u>5</u>	<u>6</u>	
ON	ON	ON	50 points
OFF	ON	ON	100
ON	OFF	ON	150
OFF	OFF	ON	200
ON	ON	OFF	350
OFF	ON	OFF	500
ON	OFF	OFF	700
OFF	OFF	OFF	900

<u>7</u>	
ON	song enabled
OFF	song disabled

8 RESERVED - MUST BE TURNED OFF!

*NOTE: Players points earned must exceed High Score points set by DIP
Switches for appropriate actions to occur.

The switch settings as pre-set at the factory are:

Switch 1

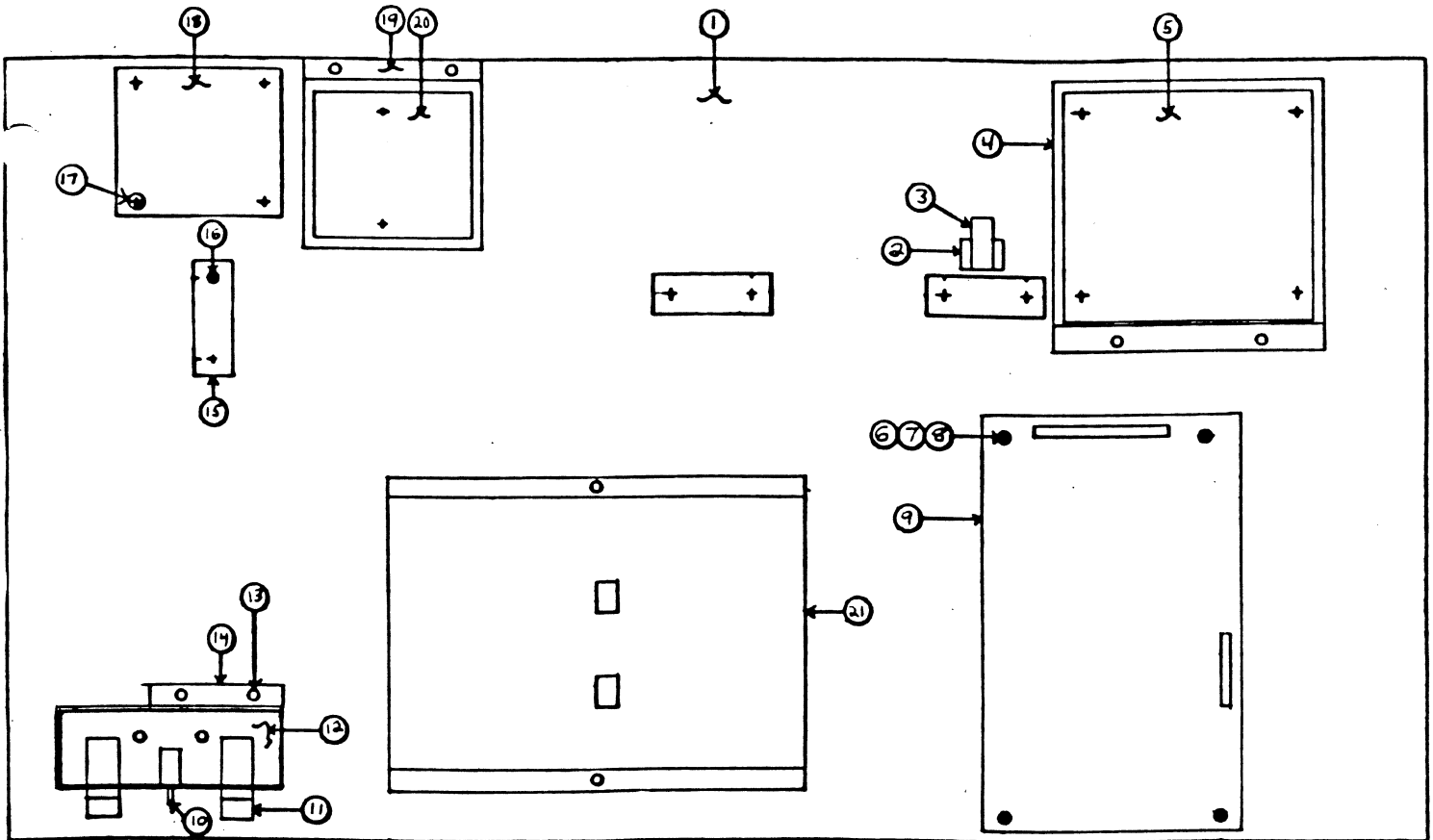
- 1 ON - 2 ON 30 point span for ticket dispense after first ticket.
- 3 OFF - 4 ON 1 ticket per dispense.
- 5 OFF 9 balls per game.
- 6 ON - 7 ON 25 cents per game.
- 8 ON Attract mode on

Switch 2

- 1 ON - 2 OFF - 3 ON 150 points for first ticket, winner song and winner light.
- 4 ON - 5 ON - 6 OFF Player score must exceed 350 points for:
 - SINGLE PLAYER - Free Game - Free Game Song and Free Game Light at end of present game.
 - FOUR PLAYER - High Score song and one ticket dispense.
- 7 ON Song plays during game
- 8 OFF THIS SWITCH MUST REMAIN IN THIS POSITION!

With these settings one ticket will be dispensed when 150 points have been scored and every 30 points thereafter. ie: 180, 210, 240, 270, 300, 330, 360, etc. Points earned on any specific ball which are in excess of those needed for the next ticket dispense will be accumulated and credited towards the next ticket.

COMPONENT BOARD ASSEMBLY



Item	Part #	Quantity	Description
1	2191	1	PCB Mounting Board
2	50195	1	Diode, KBL02 Bridge Rectifier
3	50339	1	Capacitor, 4700 uF @ 25 V
4	2866	1	Cover, Control Board
5	2450	1	PCB Assembly, Control Board
6	60017	8	Screw, #6 x 1 1/4" PPH
7	60091	8	Standoff, 3/8" x 1/8" x 1/4"
8	60062	8	Standoff, 1/2" x 1/2"
9	2471-3	1	PCB Assembly, 8031 Board
10	50011	1	Switch, Toggle, SPST 110V
11	50012	2	Fuse Holder, Panel Mount
12	1768	1	Bracket, Fuse & Panel Switch
13	60021	6	Screw, #6 x 5/8" Flathead PPB
14	2865	1	Cover, Fuse & Switch
15	50006	3	Terminal Block, 6 Position
16	60157	6	Screw, #6 x 3/4" PPH
17	60016	10	Screw, #8 x 1/2" PPH PB
18	50064	1	Transformer, 115V/14V - 6A
19	2867	1	Cover, Filter EMI
20	50065	1	Filter, EMI
21	2752	1	Option - DBA Controller
	50067	1	Power Cord, 18Ga, 3 Cond, 10'
	50252	1	Fuse, 5 Ampere
	50320	1	Fuse, 1/2 Ampere Slow Blow
	2588	1	Cable Harness, Control Board
	50066	1	Transorb

"8031" GAME BOARD PINOUT *

MAIN PLAYFIELD CONNECTOR

Pin #	Wire Color	Purpose
15	N/C	
14	N/C	
13	N/C	
12	Violet	Ball Counter Switch
11	Orange	Scoring Switches (5 in parallel)
10	Yellow	Operate signal to ticket dispenser
9	Blue	* 12 volt AC
8	Brown	* center tapped from
7	Blue	* transformer
6	White	Game Over signal to Control Board
5	Blue	Coin Mechanism Switch & Counter
4	Green	Bonus Scoring Switches (Optional)
3	Brown	Start Button Input
2	Black	Signal Ground
1	Red	+ 12 volt DC

MAIN DISPLAY CONNECTOR

PIN #	Wire Color	Purpose
A	Red	Unregulated DC - Approx. 18 volts
B	Yellow	Signal to Control Board - Four Player - Last Round Single Player - Extra Game
C	N/C	
D	Black	Signal Ground
E	Yellow	Select Line (A on Four Player)
F	Green	Select B - Four Player Blanking - Single Player
G	Blue	Clock Line
H	Violet	Reset Line
I	N/C	
J	N/C	

NOTE: Pins D through H are logic lines to the display board

MAIN DRIVER CONNECTOR

PIN #	Wire Color	Purpose
MC 1	Red	+12 volt to Control Board
MC 2	Black	Ground to Control Board
MC 3	Blue	Ball Release Signal to Control Board
MC 4	Orange	Winner Signal to Control Board

* NOTE: Pin #'s shown correspond to board markings, not to connector manufacturer designations.

CONTROL BOARD PINOUT

INPUT CONNECTOR

PIN #	Wire Color	Purpose
1	Blue	Ball Release Signal Input
2	Orange	Winner Signal Input
3	Yellow	Signal Input - Four Player - Last Round Single Player - Extra Game
4	White	Game Over Signal Input
5	Black	Ground
6	Red	+ 12 volt

OUTPUT CONNECTOR

PIN #	Wire Color	Purpose
1	Brown	+ 12 volt DC to flashing bulbs
2	Blue	# 1 flasher
3	Orange	# 2 flasher
4	Green	Last Round/Free Game Lamp
5	Yellow	Game Over Lamp
6	Red	Winner Lamp (Panel)
7	Black	12 v AC Common to panel lamps
8	Blue	* Twisted Pair -
9	Blue	* 12 volt AC
10	N/C	
11	Black	Winner Light (Top Bubble)
12	Red	Ball Release Solenoid
13	Black	120 volt AC (HOT)

THEORY OF OPERATION

The heart of the SMART BALL Game is the field tested and proven SMART INDUSTRIES "8031" Microcontroller board. The name "8031" is derived from the Intel P8031AH Microcomputer which is the on-board processing unit.

Game options and operation are determined by software programming which is stored in the M2764AF1 E-Prom (IC7).

Audio effects are generated by the AY-3-8910A Sound Generator (IC6) in accordance with programmed instructions and amplified by the LM383 (IC1).

Input information from external sources, ie: coin mechanism, dollar bill acceptor, sensing switches and/or other sources are de-bounced by IC10, a MC14490 Hex Contact Bounce Eliminator.

Eight output control signals are routed from the microcomputer through IC2, a ULN2803A 8 Channel Darlington Driver. Two outputs from IC2 are inverted through the use of NPN transistors. One additional output is taken directly from the microcomputer and inverted by transistor T4.

The operation of the microcomputer is monitored by the DS1232 (IC5). Monitored are the status of the 5 volt supply line and program operation. Program operation is evident by the presence of a strobe signal on pin 7 of IC5. Should this signal be absent for a period longer than 1 second, a reset signal will be transmitted from pin 5 of IC5 to pin 9 of the microcomputer, IC3. In the event the 5 volt supply line drops more than 5% from it's nominal value, processing by the microcomputer will be shut down and will remain shut down until 250 ms after the supply line has recovered.

The clock signal for the microcomputer is an internal function controlled by an external 12 MHZ crystal.

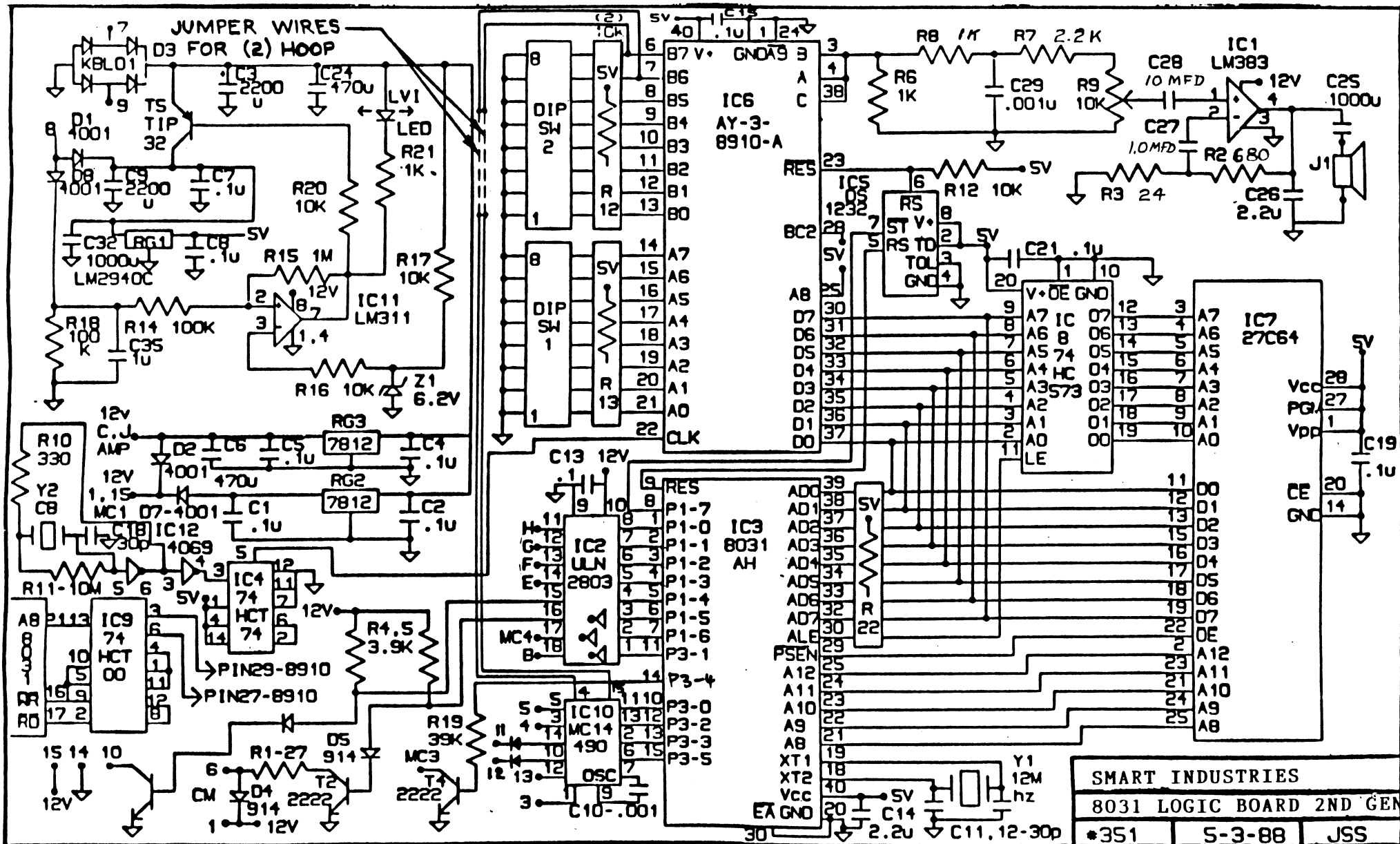
The clock signal for the sound generator is a 2 MHZ square wave signal. This signal is generated by a 4 MHZ crystal controlled oscillator formed from two sections of the 4069 (IC12) Hex Inverter. This signal is divided by IC4, the 74HCT74 Dual D Flip Flop before being input to pin 22 of IC6.

IC8, the 74HC573 Data Latch, latches the address information from the E-Prom while pertinent data information is being transferred.

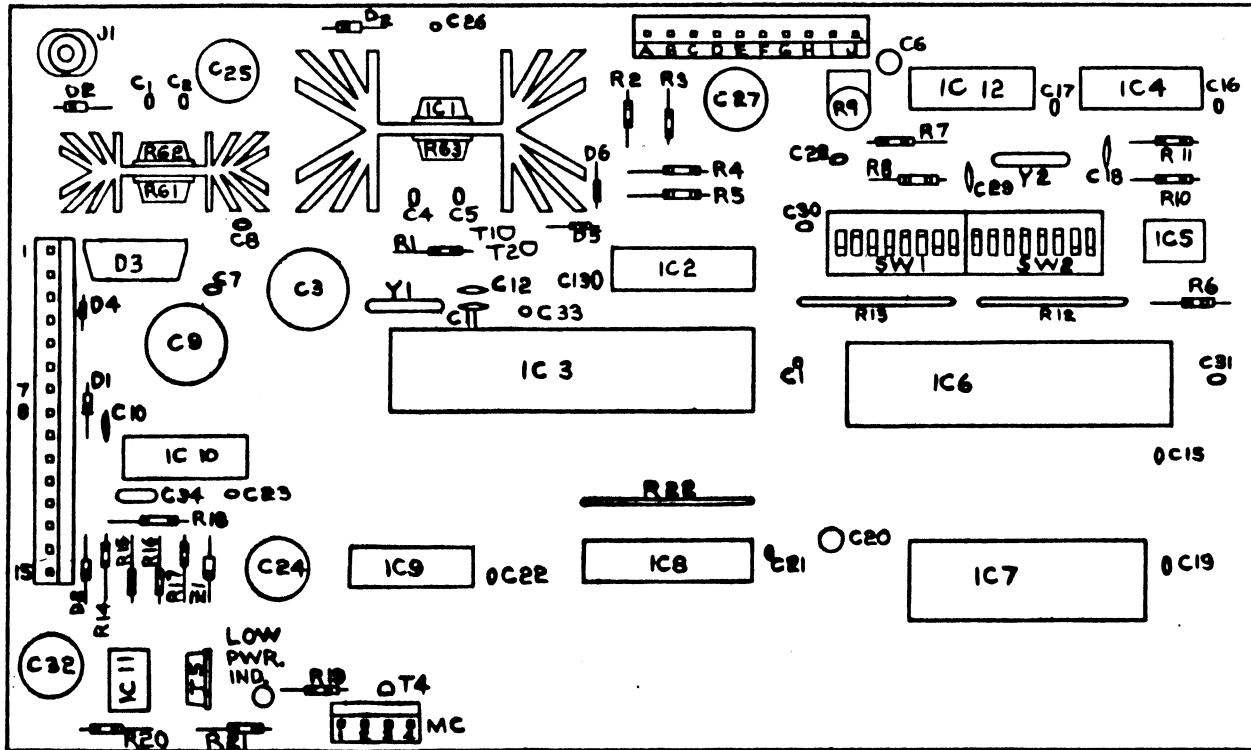
Two 8 position DIP Switches are included on board to provide up to sixteen program options. Also provided on board are provisions for the installation of two jumper wires. When installed, these jumpers permit the utilization of two additional input signals, HOWEVER, this results in two LESS switchable program options. When these jumpers are installed and the inputs utilized, position 7 and 8 of DIP Switch 2 MUST BE TURNED OFF. The "8031" as used in the SMART BALL Game has these jumpers installed however the input associated with DIP Switch 2, position 7 is not utilized and this position is used for an additional option.

Three voltage regulators are utilized on the "8031". Two 12 volt regulators are used to supply the operating voltage for peripherals, the 8 channel darlington driver, ULN2803A (IC2) and the audio amplifier. A diode arrangement is used to provide boost current from RG3 to the load on RG2. As a result of these diodes, these loads will receive a voltage of approximately 11.2 volts instead of the full 12 volts. Logic circuit power is provided by the 5 volt regulator RG1, a LM2940C. This is a special regulator which requires a very small forward voltage differential to remain operational. This differential is typically .5 volt at 1 Ampere output current.

As further protection against operational problems when low line voltage is encountered, IC11, a LM311 voltage comparator is included. The AC input from pin 8 is rectified by D8, filtered by C35 and compared by IC11 against a 6.2 volt zener reference, Z1. Should the input voltage drop below the reference level, IC11 will turn on the LED indicator (LV1) and also T5, a TIP32 PNP transistor. T5 passes current from the rectified AC source for the 12 volt regulators to the 5 volt regulator circuit to maintain the logic power source.



SMART INDUSTRIES
 8031 LOGIC BOARD 2ND GEN
 *351 5-3-88 JSS



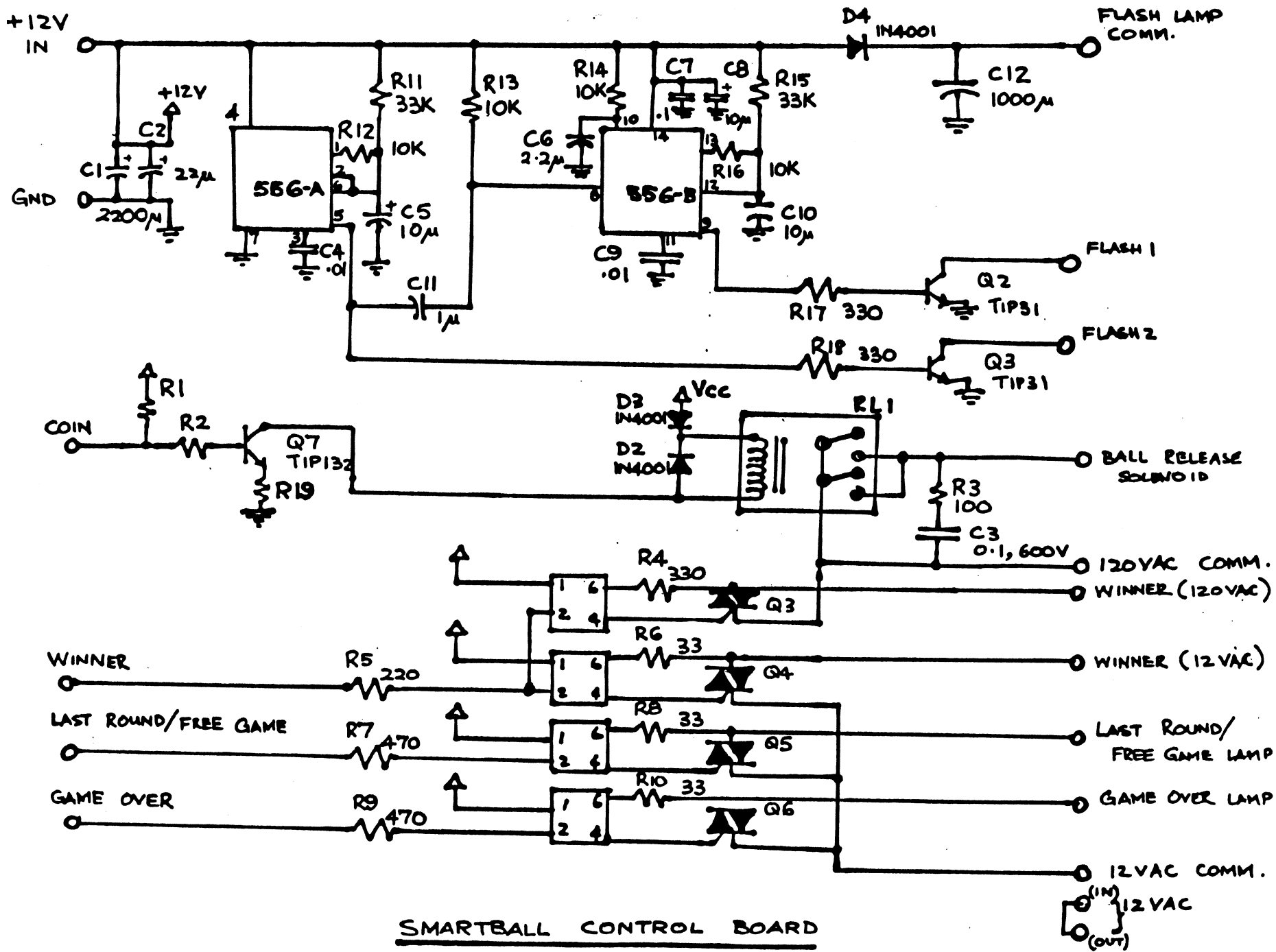
(23)

REVISIONS:		
SMART INDUSTRIES CORPORATION 1626 Delaware Ave. Des Moines, Iowa 50317		
MACHINE:		
PART DESCRIPTION: 2ND GENERATION 8031 GAME BOARD		
UNSPEC. TOL:	DRAWN BY:	CHECKED BY:
3 PL:	GRAY	
2 PL:	4-25-88	
FRACTION:	SCALE:	PART NO.
ANGULAR:	NONE	

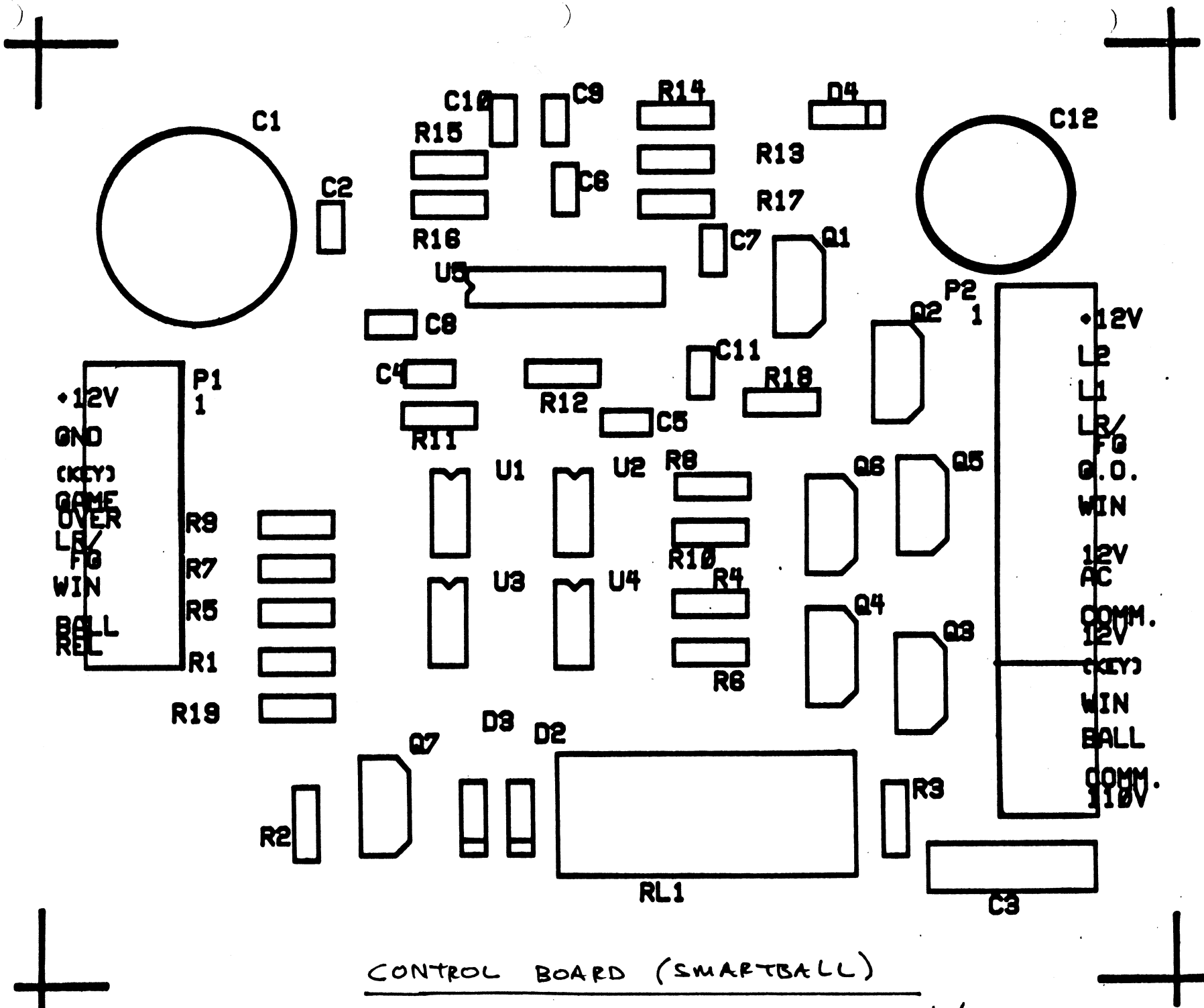
8031 2ND Gen PARTS LIST

QTY	COMPONENT	DESCRIPTION	SYMBOL	SM PN
3	CAPACITOR	33 PFD +/-10% CERAMIC	C11, C12, C18	50186
2	CAPACITOR	.001 MFD DISK CERAMIC	C10, C29	50128
16	CAPACITOR	.1 MFD Ceramic	C1,2,4,5,7,8,13	50094
1	CAPACITOR	1 MFD 50 Volt Elect.	15,16,17,19,21,22,23,30,31	50192
3	CAPACITOR	2.2 MFD 16 Volt TANTALUM	C14,C26,C33	50130
2	CAPACITOR	10 MFD 25 Volt Elec.	C20,28	50131
1	CAPACITOR	47 MFD 25 Volt Elec.	C35	
1	CAPACITOR	470 MFD 25 Volt Elec.	C27	50132
2	CAPACITOR	1000 MFD 16 Volt Elec.	C25, C32	50053
2	CAPACITOR	2200 MFD 25 Volt Elec.	C3, C9	50127
1	CONNECTOR	PHONO JACK, RCA TYPE		50138
1	CONNECTOR	4 PIN LOCKING HEADER		50137
1	CONNECTOR	10 PIN LOCKING HEADER		50136
1	CONNECTOR	15 PIN LOCKING HEADER		50135
1	CRYSTAL	3.579545 MHZ TYPE MP-1		50148
1	CRYSTAL	12 MHZ TYPE MP-1		50147
5	DIODE	1N914	D4,D5,D6,D9,D10	50082
4	DIODE	1N4001	D1, D2, D7, D8	50048
1	DIODE	1N4735A ZENER 6.2 V. 1 W.	Z1	50112
1	HEAT SINK	ALUM. BLACK ANODIZED	1/2 X 1 3/8	50151
1	HEAT SINK	ALUM. BLACK ANODIZED	1 X 1 5/8	50152
1	IC	LM311N COMPARATOR	IC11	50118
1	IC	LM383T AUDIO POWER AMP.	IC1	50100
1	IC	DS1232 MICRO MONITOR	IC5	50213
1	IC	M2764AF1 E-PROM	IC7	50106
1	IC	ULN2803A DISPLAY DRIVER	IC2	50101
1	IC	CD4069CN/MM74C04N HEX INV.	IC12	50080

1	IC	MC14490P DE-BOUNCE CIRCUIT	IC10	50221
1	IC	P8031AH MICROPROCESSOR	IC3	50102
1	IC	AY-3-8910A SOUND GENERATOR	IC6	50105
1	IC	LM2940CT VOLTAGE REG. 5 V.	RG1	50114
2	IC	LM340T12 VOLTAGE REG. 12 V.	RG2, RG3	50216
1	IC	MC74HCT00N QUAD NAND GATE	IC9	50218
1	IC	CD74HCT74E DUAL FLIP FLOP	IC4	50220
1	IC	M74HCT573B1 OCTAL DATA LATCH	IC8	50211
1	L.E.D.	Red Emitter T-1 3/4 PACKAGE	LV1	50149
1	POTENTIOMETER	10K ohms .5 Watt Cermet	R9	50123
1	RECTIFIER	KBL01 Bridge	D3	50146
1	RESISTOR	24 ohm 5% 1/4 Watt Carbon	R3	
1	RESISTOR	27 ohm 5% 1/4 Watt Carbon	R1	50116
1	RESISTOR	330 ohm 5% 1/4 Watt Carbon	R10	50117
4	RESISTOR	1000 ohm 5% 1/4 Watt Carbon	R6, R8, R20, R21	50120
2	RESISTOR	2200 ohm 5% 1/4 Watt Carbon	R2, R7	50238
2	RESISTOR	3900 ohm 5% 1/4 Watt Carbon	R4, R5	50119
2	RESISTOR	10K ohm 5% 1/4 Watt Carbon	R16, R17	50124
1	RESISTOR	39K ohm 5% 1/4 Watt Carbon	R19	50121
2	RESISTOR	100K ohm 5% 1/4 Watt Carbon	R14, R18	50087
1	RESISTOR	1 Meg ohm 5% 1/4 Watt Carbon	R15	50126
1	RESISTOR	10 Meg ohm 5% 1/4 Watt Carbon	R11	50125
3	RESISTOR PAK	10K ohm Network	R12, R13, R22	50124
1	SOCKET, I.C.	28 PIN		50154
2	SOCKET, I.C.	40 PIN		50153
2	SWITCH	DIP SW. 8 Pos. Slide SPST	SW1, SW2	50150
3	TRANSISTOR	PN2222	T1, T2, T4	50084
1	TRANSISTOR	TIP32	T5	50134



SMARTBALL CONTROL BOARD



(27)

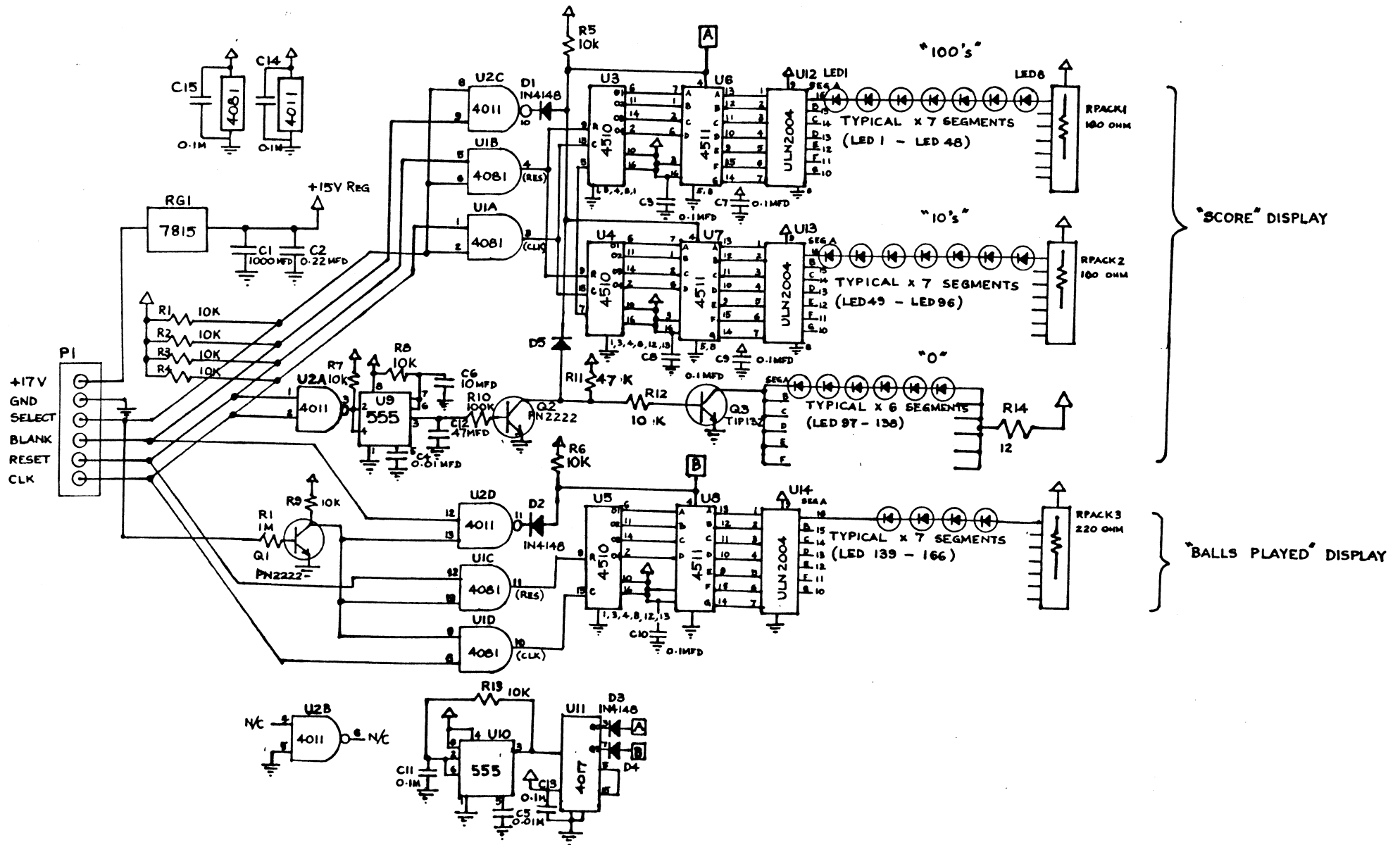
CONTROL BOARD (SMARTBALL)

5/1/90

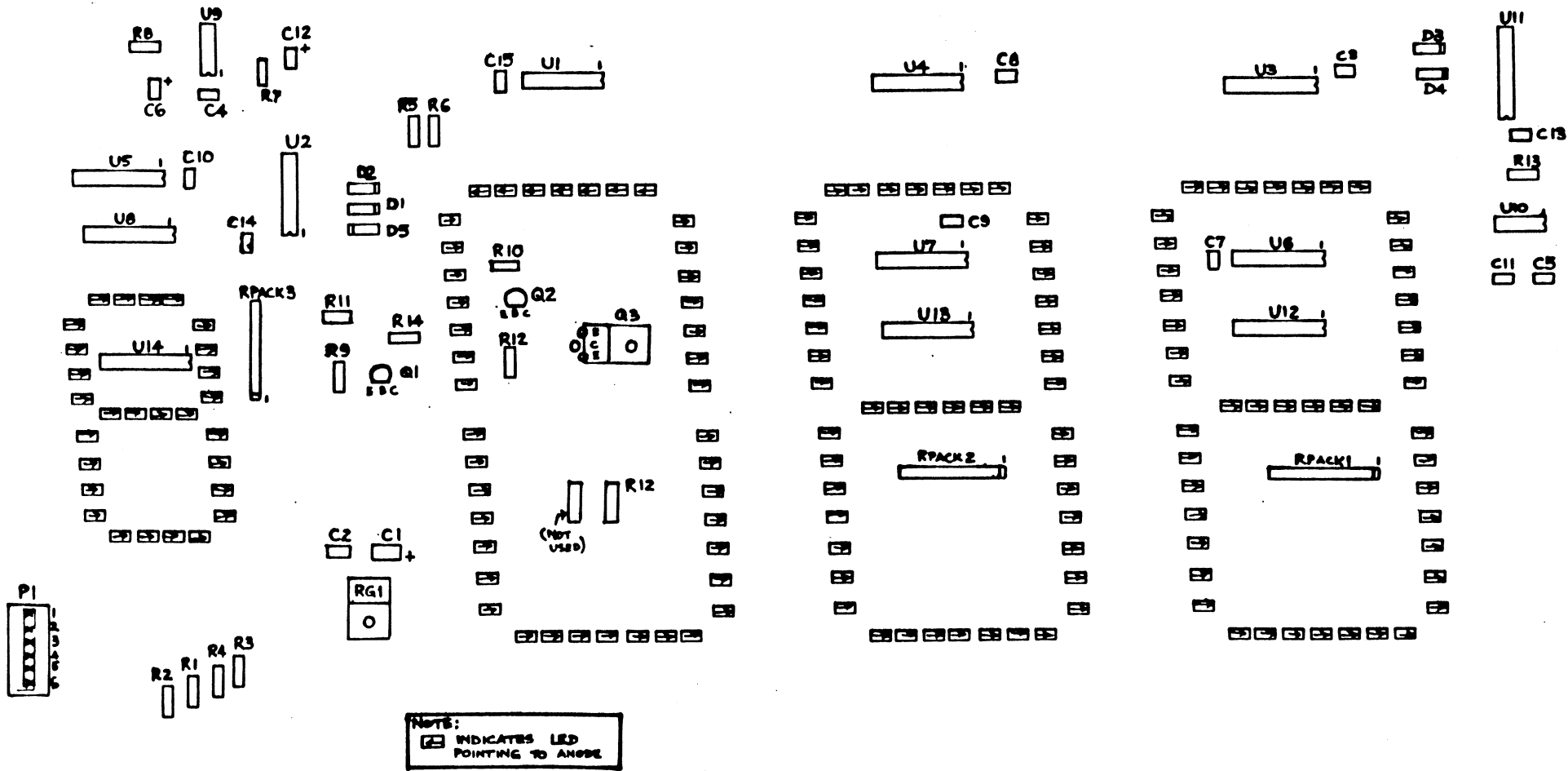
CONTROL BOARD PARTS LIST

QTY	COMPONENT	DESCRIPTION	SYMBOL	SM PN
2	CAPACITOR	.01 MFD 50 Volt Ceramic	C4,9	50191
1	CAPACITOR	.1 MFD 50 Volt Ceramic	C7	50094
1	CAPACITOR	.1 MFD 630 Volt Polyester	C3	50133
1	CAPACITOR	1 MFD 50 Volt Electrolytic	C11	50192
1	CAPACITOR	2.2 MFD 16 Volt Tantalum	C6	50130
3	CAPACITOR	10 MFD 16 Volt Elec.	C5,8,10	50096
1	CAPACITOR	22 MFD 16 Volt Tantalum	C2	50092
1	CAPACITOR	1000 MFD 16 Volt Elec.	C12	50053
1	CAPACITOR	2200 MFD 25 Volt Elec.	C1	50127
1	CONNECTOR	7 PIN LOCKING HEADER	P1	
1	CONNECTOR	13 PIN LOCKING HEADER	P2	50205
3	DIODE	1N4001	D2,3,4	50048
1	IC	556 TIMER	U5	
4	IC	MOC3010 OPTOCOUPLER	U1,2,3,4	50222
1	RELAY	DPDT, 12 Volt Coil	RL1	50085
1	RESISTOR	18 Ohm 5% 1/4 Watt	R19	
3	RESISTOR	33 Ohm 5% 1/4 Watt	R6,8,10	50240
2	RESISTOR	100 ohm 5% 1/4 Watt	R2,3	50091
1	RESISTOR	220 ohm 5% 1/4 Watt	R5	
3	RESISTOR	330 ohm 5% 1/4 Watt	R4,17,18	50117
2	RESISTOR	470 ohm 5% 1/4 Watt	R7,9	
5	RESISTOR	10K ohm 5% 1/4 Watt	R1,12,13,14,16	50050
2	RESISTOR	33K ohm 5% 1/4 Watt	R11,15	
2	TRANSISTOR	TIP31A	Q1,2	50236
1	TRANSISTOR	TIP132 NPN DARLINGTON	Q7	
4	TRIAC	BTB08-400B 8 A. 400 V.	Q3,4,5,6	

(29)



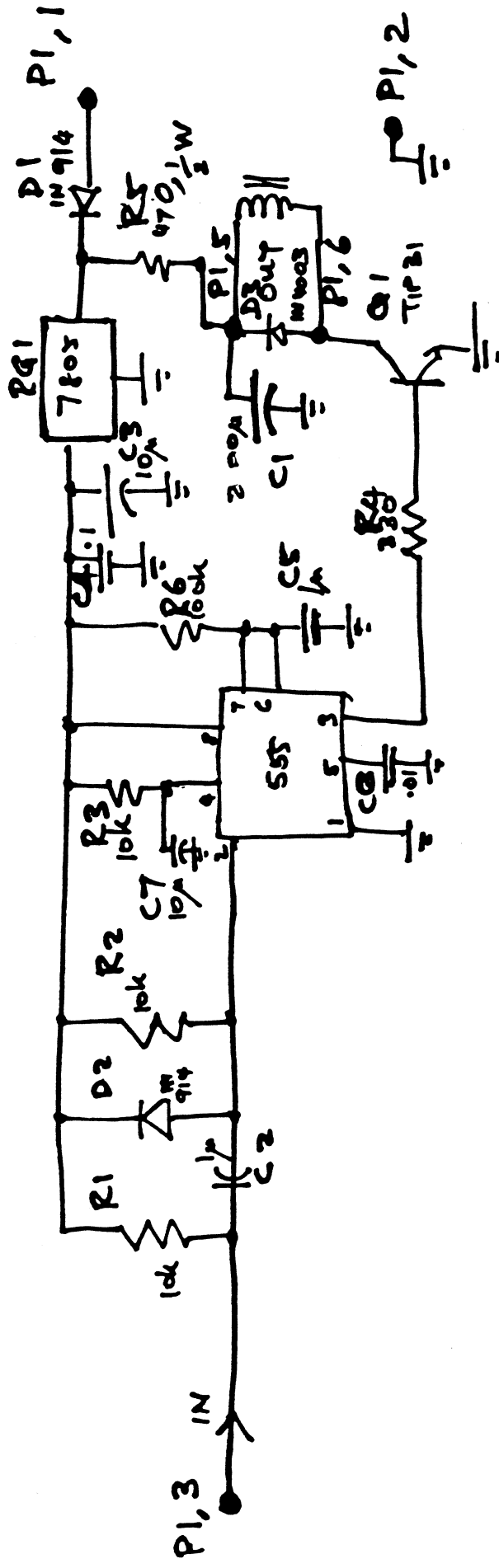
DISPLAY BOARD SCHEMATIC - SINGLE PLAYER



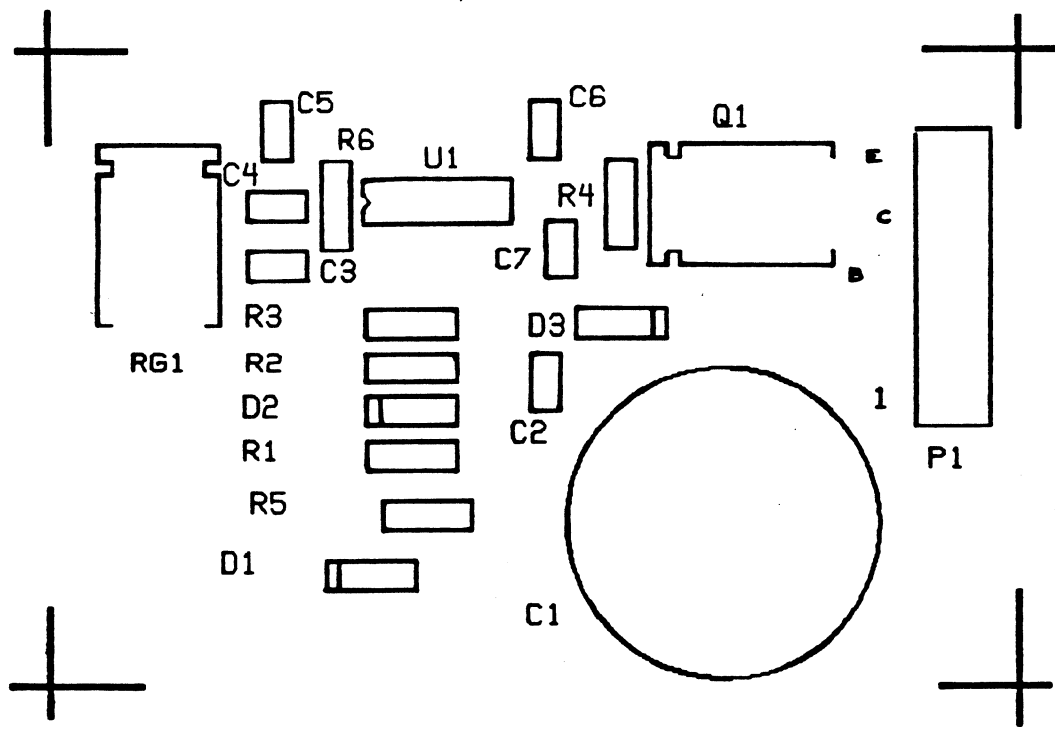
DISPLAY BOARD PARTS LAYOUT - SINGLE PLAYER

SINGLE PLAYER DISPLAY BOARD PARTS LIST

QTY	COMPONENT	DESCRIPTION	SYMBOL	SM PN
2	CAPACITOR	.01 MFD 50 Volt Ceramic	C4,5	50191
9	CAPACITOR	.1 MFD 50 Volt Ceramic	C3,7,8,9,10, 11,13,14,15	50094
1	CAPACITOR	.22 MFD 50 Volt Ceramic	C2	50133
1	CAPACITOR	10 MFD 16 Volt Elec.	C6	50096
1	CAPACITOR	47 MFD 16 Volt Elec.	C12	50193
1	CAPACITOR	1000 MFD 35 Volt Elec.	C1	
1	CONNECTOR	6 PIN RT.ANGLE HEADER	P1	
5	DIODE	1N914 DIODE	D1,2,3,4,5	
2	IC	555 TIMER	U9, 10	
3	IC	ULN2004A ARRAY DRIVER	U12,13,14	
1	IC	4011 QUAD "NAND" GATE	U2	
1	IC	4017	U11	
1	IC	4081 QUAD "AND" GATE	U1	
3	IC	4510	U3,4,5	
3	IC	4511	U6,7,8	
1	IC	7815 REGULATOR	RG1	
166	L.E.D.	Red Emitter	LED1 thru LED166	
11	RESISTOR	10K ohm 5% 1/4 Watt	R1,2,3,4,5,6, 7,8,9,12,13	50050
1	RESISTOR	47K ohm 5% 1/4 Watt	R11	
1	RESISTOR	100K ohm 5% 1/4 Watt	R10	
1	RESISTOR	1 Meg Ohm 5% 1/4 Watt	R14	
1	RESISTOR	11 Ohm 1 Watt Carbon	R15	
2	RESISTOR PAK	100 Ohm Network	Rpack 1,2	
1	RESISTOR PAK	220 Ohm Network	Rpack 3	
2	TRANSISTOR	PN2222A	Q1,2	
1	TRANSISTOR	TIP132A	Q3	



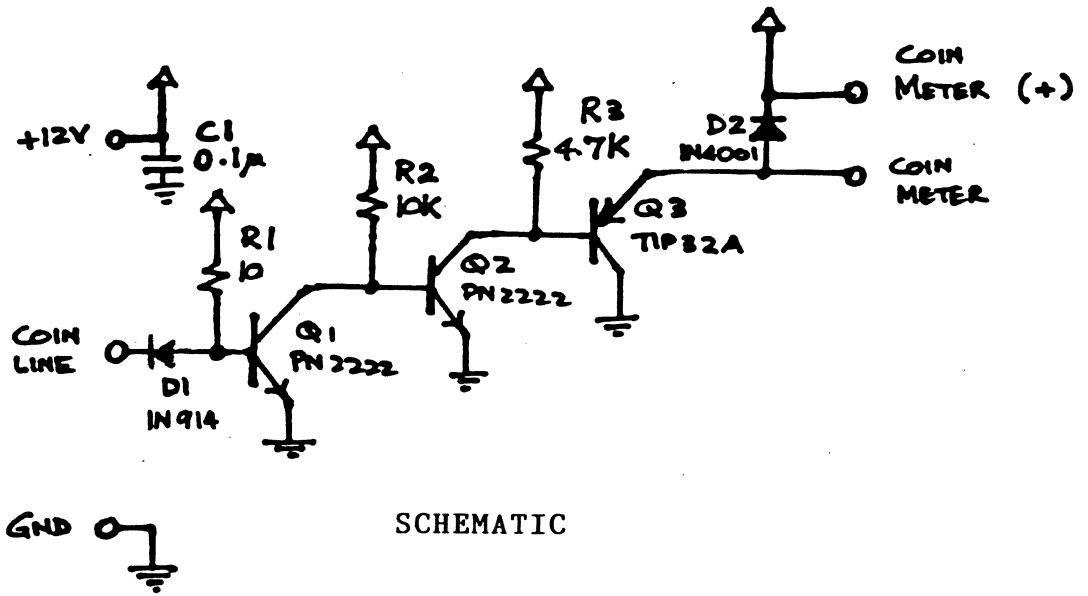
TICKET COUNTER DRIVER BOARD SCHEMATIC



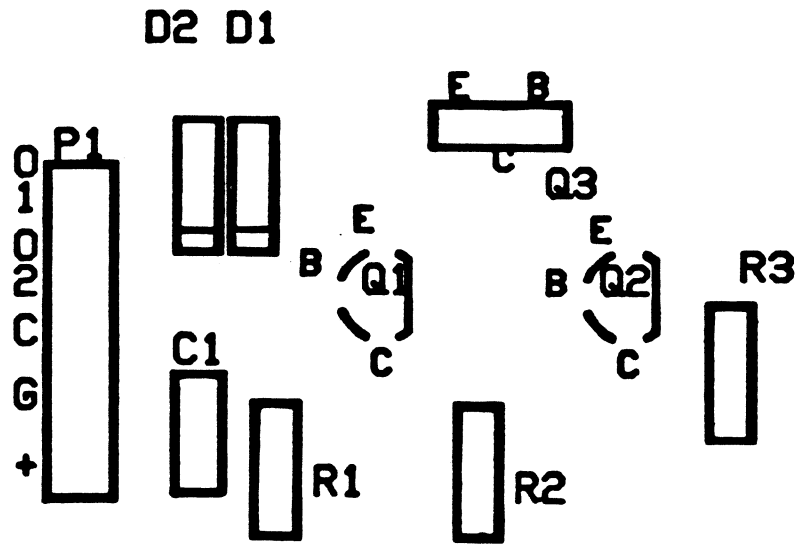
TICKET COUNTER DRIVER BOARD LAYOUT

TICKET COUNTER DRIVER BOARD PARTS LIST

QTY	COMPONENT	DESCRIPTION	SYMBOL	SM PN
1	CAPACITOR	.01 MFD 50 Volt Ceramic	C6	50191
1	CAPACITOR	.1 MFD 50 Volt Ceramic	C4	50094
2	CAPACITOR	1 MFD 16 Volt Tantalum 10%	C 2, 5	
2	CAPACITOR	10 MFD 16 Volt Tantalum	C 3, 7	
1	CAPACITOR	2200 MFD 25 Volt Elec.	C1	50127
1	CONNECTOR	6 PIN LOCKING HEADER	P1	50206
1	DIODE	1N914	D2	50082
2	DIODE	1N4001	D 1, 3	50048
1	IC	555 TIMER	U1	50081
1	IC	7805 REGULATOR	RG1	50046
1	RESISTOR	330 Ohm 5% 1/4 Watt	R4	50117
3	RESISTOR	10K ohm 5% 1/4 Watt	R1,2,3	50124
1	RESISTOR	100K ohm 5% 1/4 Watt	R6	50087
1	RESISTOR	470 ohm 1/2 Watt	R5	
1	TRANSISTOR	TIP31	Q1	50236



SCHMATIC



PARTS LAYOUT

CREDIT COUNTER DRIVER BOARD

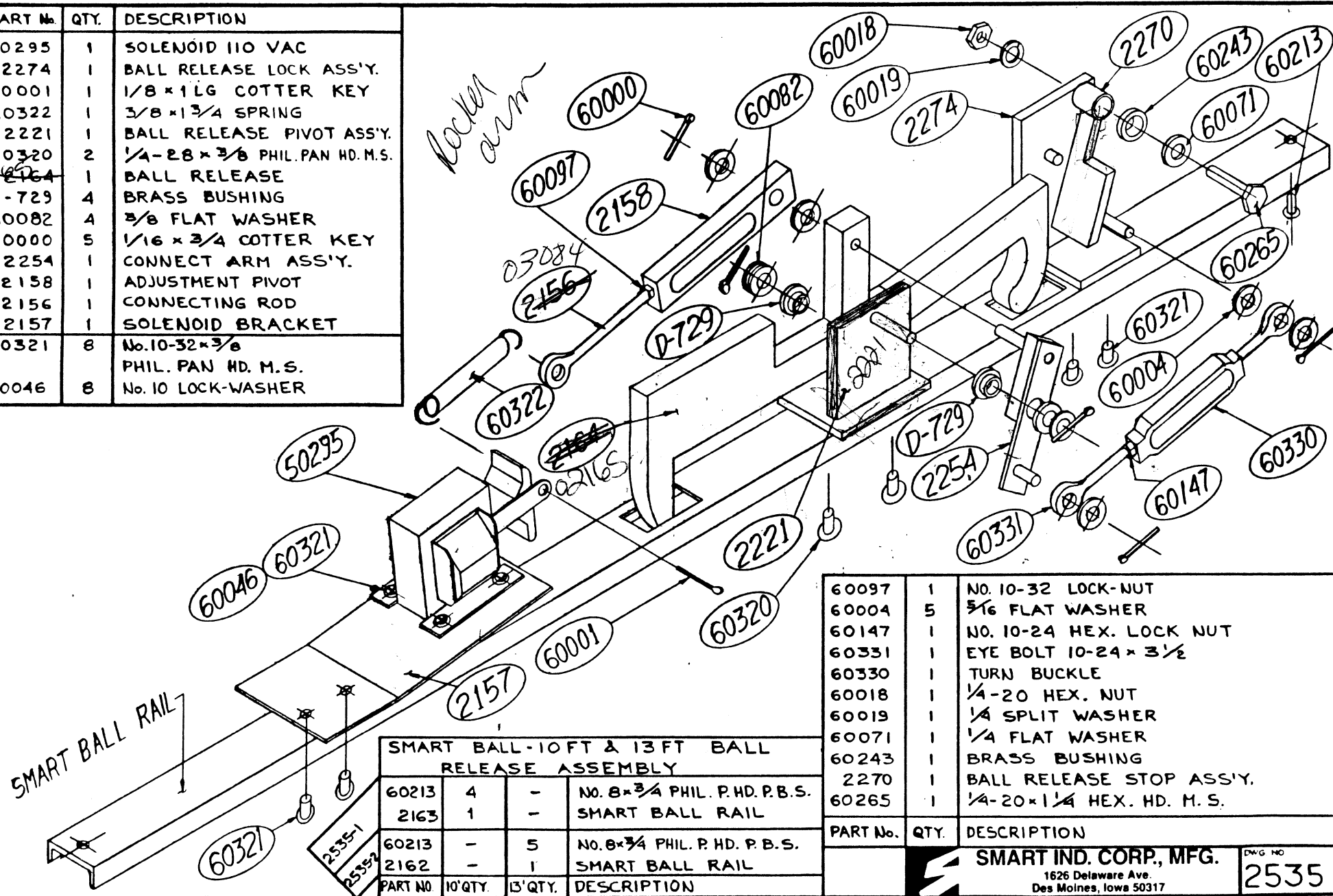
CREDIT COUNTER DRIVER BOARD PARTS LIST

QTY	COMPONENT	DESCRIPTION	SYMBOL	SM PN
1	CAPACITOR	.1 MFD 50 Volt Ceramic	C1	50094
1	CONNECTOR	5 PIN LOCKING HEADER	P1	50203
1	DIODE	1N914	D1	50082
1	DIODE	1N4001	D2	50048
1	RESISTOR	4.7K ohm 5% 1/4 Watt	R3	50086
2	RESISTOR	10K ohm 5% 1/4 Watt	R1,2	50124
2	TRANSISTOR	PN2222A	Q1,2	50084
1	TRANSISTOR	TIP32A	Q3	50134

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PART No.	QTY.	DESCRIPTION
50295	1	SOLENOID 110 VAC
2274	1	BALL RELEASE LOCK ASS'Y.
60001	1	1/8 x 1 LG COTTER KEY
60322	1	3/8 x 1 3/4 SPRING
2221	1	BALL RELEASE PIVOT ASS'Y.
60320	2	1/4-28 x 3/8 PHIL. PAN HD. M.S.
2157	1	BALL RELEASE
D-729	4	BRASS BUSHING
60082	4	3/8 FLAT WASHER
60000	5	1/16 x 3/4 COTTER KEY
2254	1	CONNECT ARM ASS'Y.
2158	1	ADJUSTMENT PIVOT
2156	1	CONNECTING ROD
2157	1	SOLENOID BRACKET
60321	8	No. 10-32 x 3/8 PHIL. PAN HD. M.S.
60046	8	No. 10 LOCK-WASHER

Rocking arm



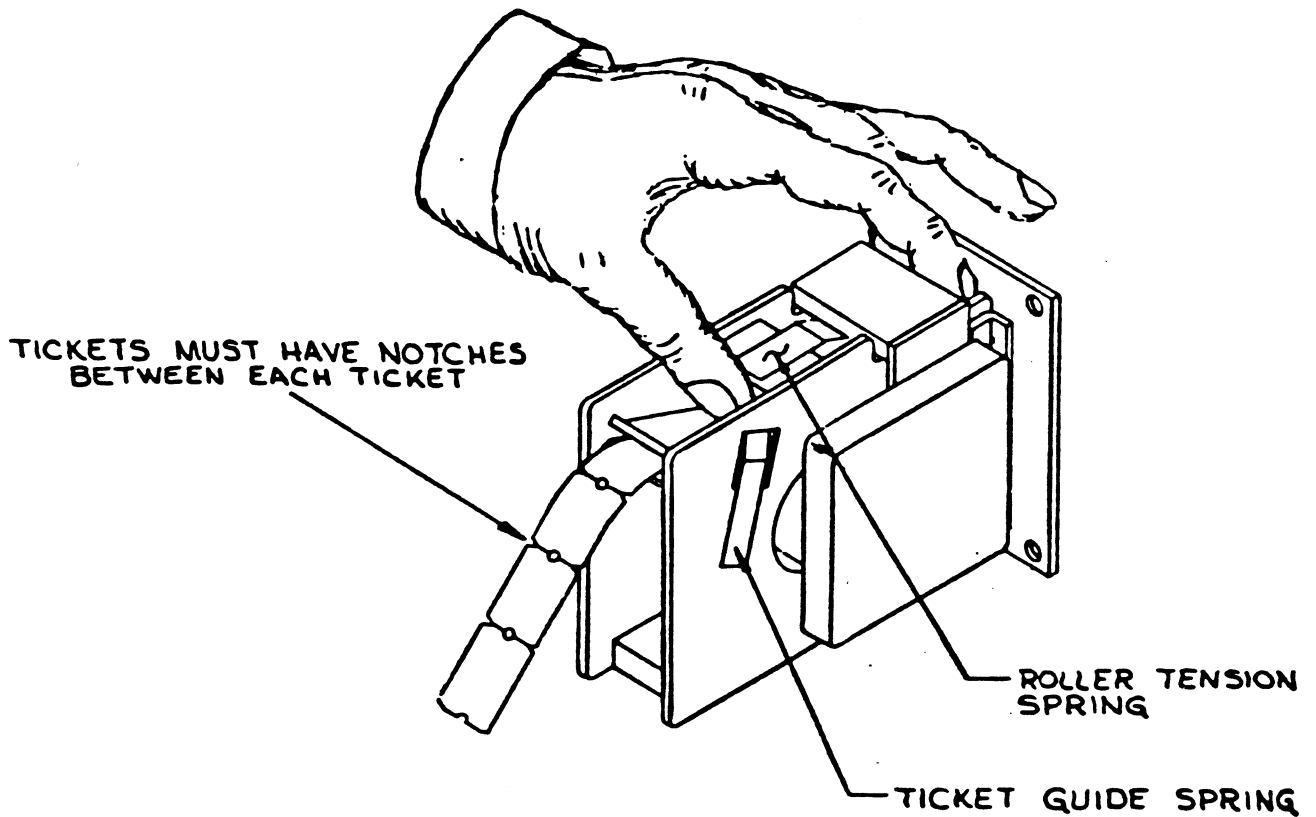
SMART BALL-10FT & 13FT BALL RELEASE ASSEMBLY			
PART NO.	10' QTY.	13' QTY.	DESCRIPTION
60213	4	-	No. 8 x 3/4 PHIL. P. HD. P. B. S.
2163	1	-	SMART BALL RAIL
60213	-	5	No. 8 x 3/4 PHIL. P. HD. P. B. S.
2162	-	1	SMART BALL RAIL

60097	1	NO. 10-32 LOCK-NUT
60004	5	5/16 FLAT WASHER
60147	1	NO. 10-24 HEX. LOCK NUT
60331	1	EYE BOLT 10-24 x 3 1/2
60330	1	TURN BUCKLE
60018	1	1/4-20 HEX. NUT
60019	1	1/4 SPLIT WASHER
60071	1	1/4 FLAT WASHER
60243	1	BRASS BUSHING
2270	1	BALL RELEASE STOP ASS'Y.
60265	1	1/4-20 x 1 1/4 HEX. HD. M. S.

PART No.	QTY.	DESCRIPTION
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SMART IND. CORP., MFG.
 1626 Delaware Ave.
 Des Moines, Iowa 50317

DWG NO
2535

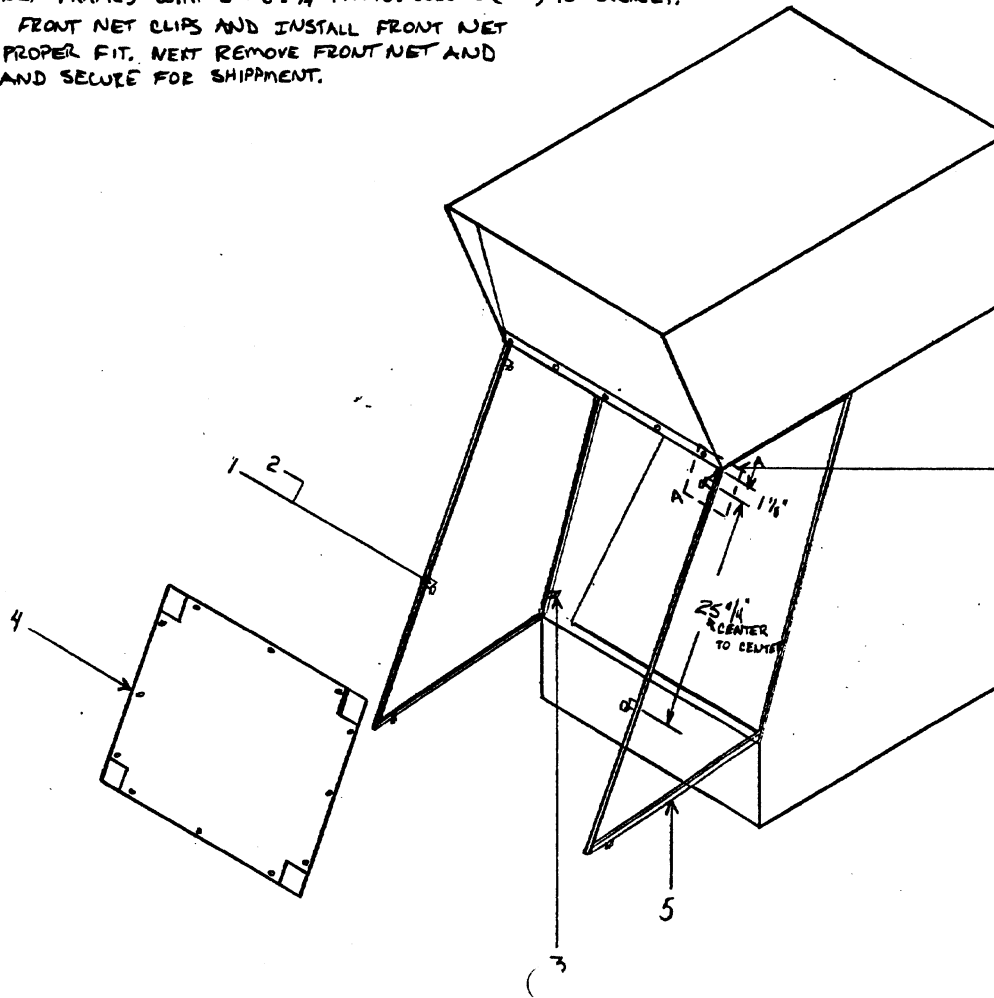


TICKET LOADING DIRECTIONS:

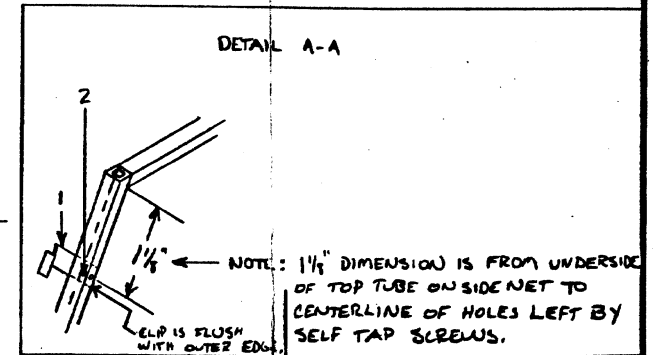
1. ENTER TICKETS AS INDICATED AND FEED TICKETS PAST THE TICKET GUIDE SPRING UNTIL THEY STOP.
2. PLACE FINGERS AS INDICATED AND SQUEEZE, THIS OPENS THE FEED ROLLERS.
3. FEED TICKETS UNTIL THE FIRST TICKET PROTRUDES APPROX. 1/16" BEYOND THE DISPATCH SLOT.
4. RELEASE ROLLERS, TICKET DISPENSER IS NOW LOADED AND READY FOR USE.

2100

NOTE: ATTACH SIDENET FRAMES WITH 3 #8 x 3/4" PH. ST. SCREWS (EACH) TO CABINET.
 THEN ATTACH FRONT NET CLIPS AND INSTALL FRONT NET
 TO ENSURE PROPER FIT. NEXT REMOVE FRONT NET AND
 SIDE NETS AND SECURE FOR SHIPPMENT.



ITEM	PART #	QTY.	DESCRIPTION
1	2357	4	FRONT NET CLIP
2	60007	8	#8 x 1/2" PH. ST. SCREW
3	60213	6	#8 x 3/4" PH. PB. SCREW
4	2774	1	FRONT NET ASS'Y
5	2775	2	SIDE NET ASS'Y



B					
A					
REV	DATE	EC #	CHANGE	BY	CHK
SMART IND. CORP., MFG. 1626 Delaware Ave. Des Moines, Iowa 50317					
UNLESS OTHERWISE SPEC: ALL DIMENSIONS IN INCHES TOL: FRACTIONAL ± 1/32 ANGULAR: ± 1° DECIMAL: .XX ± .03 .XXX ± .010			DRAWN JAR	6-13-90	
			CHK []		
			APRVD []		
THIS DRAWING IS THE EXCLUSIVE PROPERTY OF SMART IND.					
DO NOT SCALE THIS PRINT		TITLE SMARTBAL FRONT NET INSTALLATION ASS'Y			
B	1	1			2785

ASSEMBLY INSTRUCTIONS

1. The "alley" shipping skid has been designed to perform as an assembly fixture. The first step in assembly is to prepare the control console cabinet. Move the control console cabinet to the area of desired final location. Uncrate the control console cabinet and lay it on it's back. Insert the two, 1 1/4" square steel legs into the holes provided through the floor at the rear of the control console. Align the bolt holes with the holes through the sides of the control console and fasten with 5/16-18 x 2 1/2 carriage bolts. Install the bolts from the outside, positioning the nuts on the inside of the cabinet. Tighten very securely.

2. Move the alley into position approximately five feet in front of the control console cabinet. Remove the plastic wrap. Remove all upright supports, side and top crating from the alley shipping skid. Unload all items placed on the alley for transit. **VERY IMPORTANT:** Beneath the front end of the alley, centered between the two black front alley supports, a 2 x 4 has been nailed to the skid. Pry this 2 x 4 from the skid. Remove the steel banding straps securing the rear end of the alley to the skid. (Refer to the accompanying illustrations to clarify instructions.) Slide the alley forward, approximately 1 1/2 inches, until the Rear Alley Support (on skid) is 1/2 exposed. Pick the control console cabinet up, rotating it over the legs and place the front edge on the exposed area of the Rear Alley Support. Join the control console cabinet to the alley using two 1/2-13 x 3" machine bolts supplied.

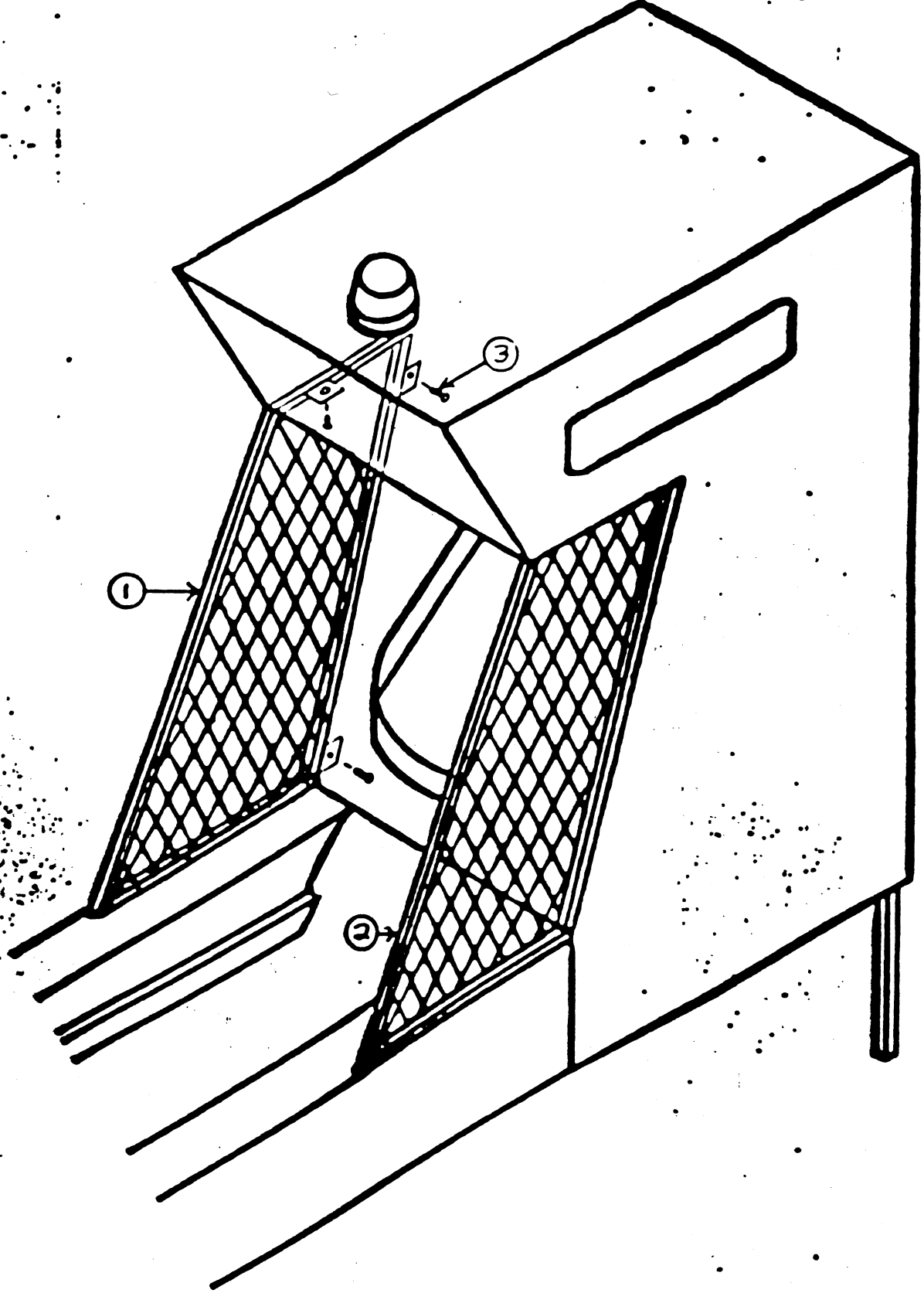
3. Three harness connections are required to make your Smart Ball game operational. A three pin MOLEX connector is utilized to connect the Ball Count Switch. This connection is located beneath the playing field on the right side of the control console. The signal harness is routed on the left side of the alley while the "AC" harness is routed on the right side of the alley. The control console portion and the alley portion of these harnesses are joined with connectors approximately 18 inches from the alley face plate. For shipping purposes, the control console harnesses are restrained in the lower portion of the console with wire ties. Remove the shipping wire ties and dress both harnesses through the holes provided in the control console and alley face plates. Join the connectors on both harnesses.

4. Install the side net frames. Use three #8 x 3/4" particle board screws to attach the frame to the control console.

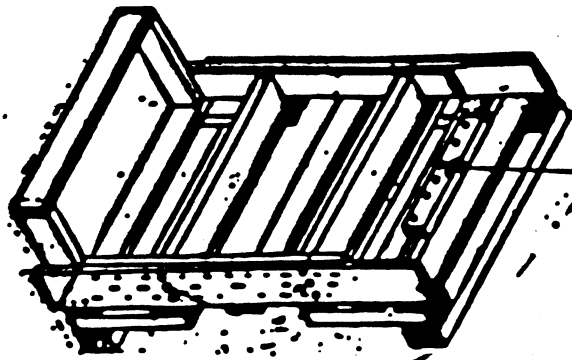
FRONT NET: The front net is an available option. Assembly instructions for this option are included in this manual.

5. This completes assembly. The POWER SWITCH is located in the left front corner of the upper portion of the control console. Plug the game into the power line source and turn the power switch on. Re-install the Marque Plastic.

DUE TO AN UPDATE IN DESIGN, THE BALL COUNT MICROSWITCH IS MOUNTED ON A BRACKET INSIDE THE ALLEY. NO ADJUSTMENTS OR PART ROTATION IS REQUIRED AS PER MANUAL INSTRUCTIONS. BEFORE BOLTING CABINET AND ALLEY TOGETHER, STRING HARNESS FROM CABINET INTO ALLEY AND CONNECT. NEXT, TAKE THE SHORT, 2 WIRE, HARNESS LOCATED ABOVE BALL RETURN RAIL ON THE BACK END OF THE ALLEY AND CONNECT IT TO THE HARNESS IN THE CABINET. (STRING HARNESS THRU BALL RETURN OPENING IN CABINET).



Item	Quant.	Description
1	1	Side Net, Left
2	1	Side Net, Right
3	6	Screw, #8 x 3/4, PPH. P.B.



REMOVE THIS
2x4

FIG. #1

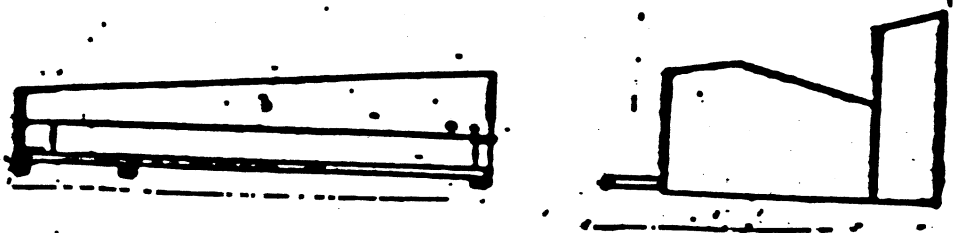


FIG. #2

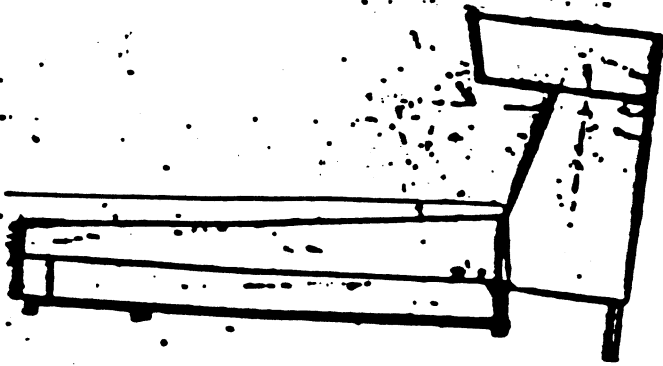
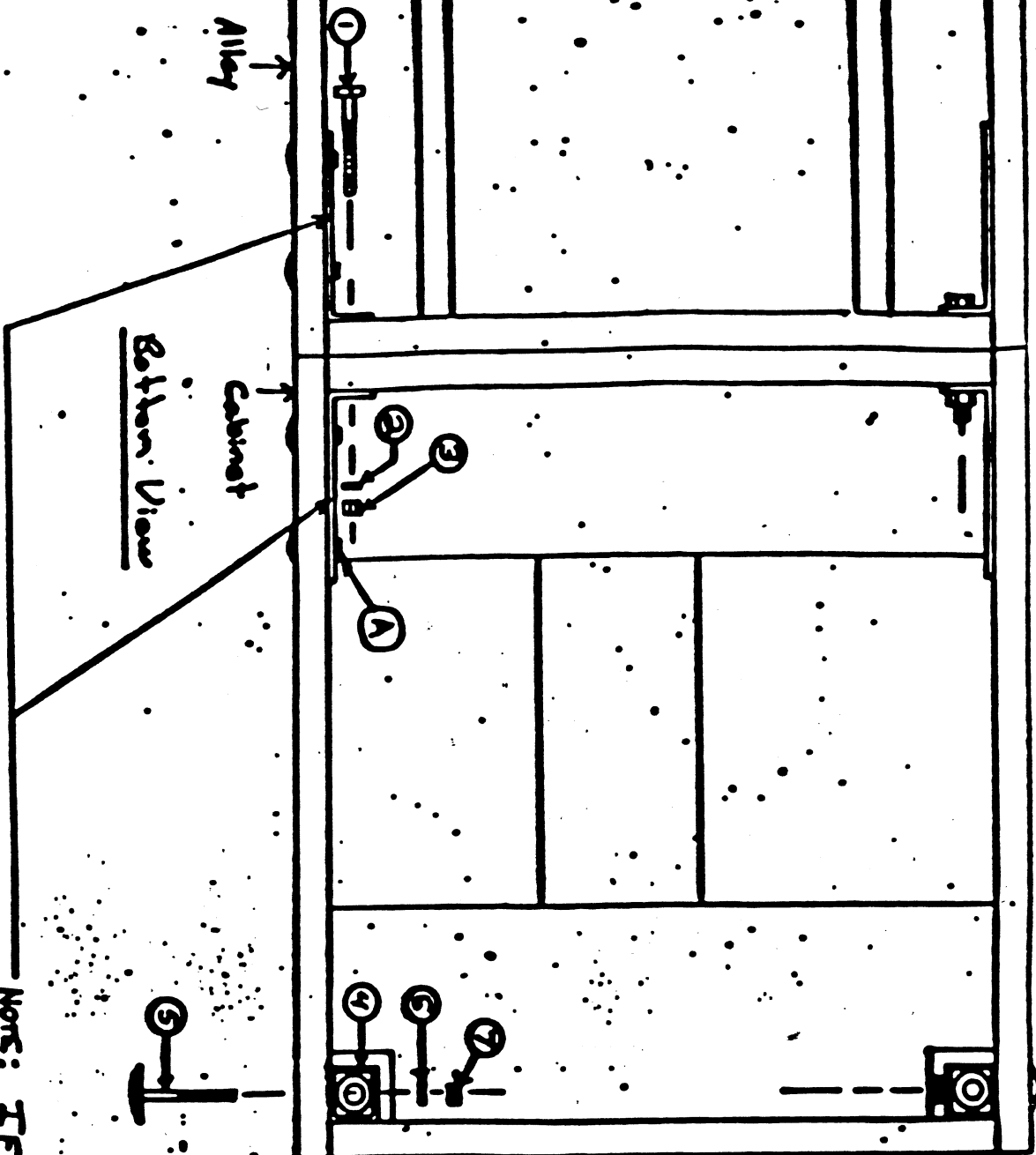


FIG. #3



1	2	1/2-13 x 3 Hex Bolt
2	2	1/8" Lock Washer
3	2	1/2-13 Hex Nut
4	2	Rear Log Leveler
5	4	1/2-18 x 2 1/2 Cup Bolt
6	4	5/16 Lock Washer
7	4	5/16-18 Hex Nut

NOTE: IF FOR SOME REASON, YOU ARE HAVING TROUBLE INSERTING THE 1/2-13 X 3" HEX BOLTS THROUGH HOLES IN ALLEY AND CABINET SUPPORT BRACKETS, LOOSEN NUTS MARKED (A) (on DRAWING), INSERT 1/2" BOLT; TIGHTEN NUTS MARKED (A), THEN TIGHTEN 1/8" BOLTS.

SMARTBALL SCORING MODIFICATION INSTALLATION

MECHANICAL CHANGES

- 1) Slide the Scoring Board out of the Scoring Cabinet and set away from game.
- 2) Remove the wires which are connected to the Scoring microswitches.
- 3) Pull the Thermal Scoring Trough out of the game. (Figure 1)
- 4) The Thermal Scoring Trough needs to be moved 1" to the left. Draw a line on the the right side of both Trough Mounting Boards marking the position of the Thermal Scoring Trough. Remove 4 screws from the boards and slide the Trough to the left until it measures 1" to the left of the lines. Reinstall the screws firmly. (Figure 2)

NOTE: If the game has the BONUS OPTION, part of the Left Bonus Scoring Trough must be trimmed off to allow the Thermal Scoring Trough space for movement to the left. Measure 2" in from the center on the front side of the Left Bonus Scoring Trough. Trim off the wood piece from the trough at a 45 degree angle toward the center/rear of the Scoring Cabinet. (Figure 1 and Figure 3)
MAKE NO MODIFICATION TO THE RIGHT BONUS SCORING TROUGH!

- 5) Place the Thermal Scoring Trough back in the game.
- 6) Set the Scoring Board so the top is facing up and the front is facing away. Mount the Scoring Microswitch Bracket so the right edge of the bracket is flush with tapered edge of the Scoring Holes and 3/4" from the bottom. This should allow the Microswitch Actuator Wires to align in the center of the Scoring Holes. If the wires are not centered, make the adjustments to accomplish this task. (Figure 4a)

ELECTRONIC CHANGES

- 1) Remove the Plastic Marque, Back Door and Back Cover from the game. (Figure 5)
- 2) Remove the 2 screws holding the Display Assembly. Pull the Display Assembly out of the game and let the assembly hang in front of the game. This provides access to the Component Board Assembly.
- 3) Mount the Scoring Interface Board next to the 8031 Game Board with the connector towards the rear of the game. (Figure 6 and Figure 8)

- 4) Remove the existing microswitches from the Thermal Scoring Trough.
- 5) Trace the microswitch cable until a 9 pin molex connector, located in the rear of the Scoring Cabinet, is found. Unplug the connector and remove the following cables from the game: (Figure 7)
 - 1) The cable for the Scoring microswitches.
 - 2) The cable for the Ball Counter microswitch.
 - 3) The cables for the Bonus microswitches if the game has the Bonus Option.

All of these cables are attached to the 9 pin connector. Leave the other end of the connector for hookup later in the installation of the revision.

- 7) Route the supplied cable through the hole in the back of the game. Complete the following connections: (Figure 7)
 - 1) Plug the 12 pin connector into Scoring Interface Board.
 - 2) Plug the 9 pin connector into the connector left during removal of the old cables.
 - 3) Plug the 3 pin connector into the Ball Count microswitch connector.
 - 4) Connect the Bonus microswitches if applicable.
- 8) Wire tie the cables together.
- 9) Reinstall the Display Assembly.
- 10) Route the Scoring cable down the right side of the Scoring Cabinet. Rest the Scoring Board on the Alley and connect the Scoring cable to the microswitches mounted on the Scoring Board in the following manner: (Figure 4b)
 - 1) 1 Black wire to each microswitch.
 - 2) The Brown wire to the 50 point switch.
 - 3) The Yellow wire to the 40 point switch.
 - 4) The Green wire to the 30 point switch.
 - 5) The Blue wire to the 20 point switch.
 - 6) The Violet wire to the 10 point switch.
- 11) Reinstall the Plastic Marquee, Back Door and Back Cover.
- 12) Reinstall Scoring Board. CAUTION MUST BE USED TO PREVENT DAMAGE TO THE SCORING MICRO-SWITCHES.

PARTS LIST

<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>PART NUMBER</u>
1	Cable Assembly	3441
1	Scoring Interface Board	3419
1	Scoring Switch Bracket	3423
5	Micro-switch actuators	3424
5	Micro-switches	50297
3	#8 x 3/4" screws	60213
4	White circuit board standoffs	60062
4	Black circuit board standoffs	60091
4	Circuit board mounting screws	60017
20	5 1/4" wire ties	60112

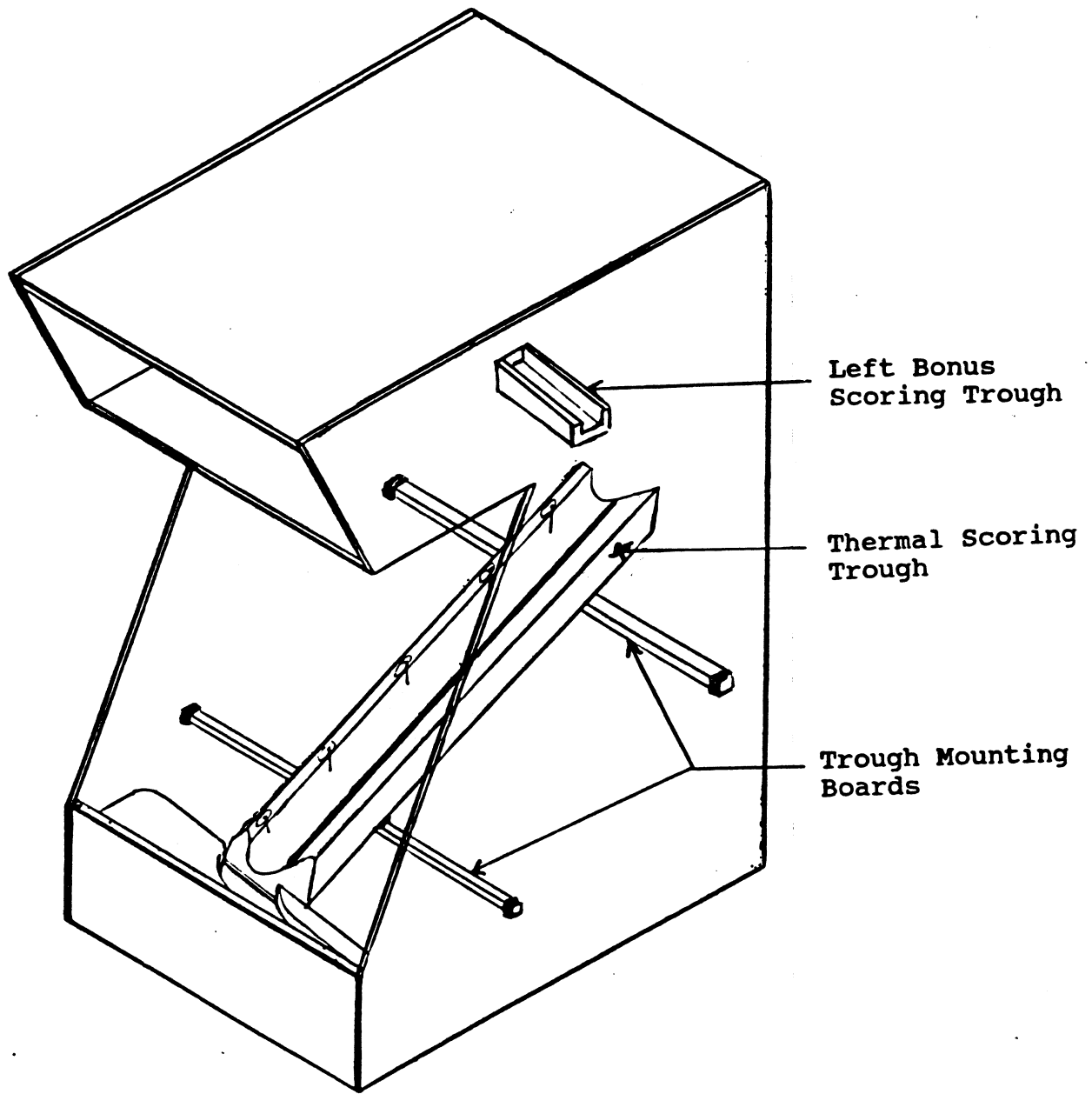


Figure 1

assy,
Scoring
02559 trough

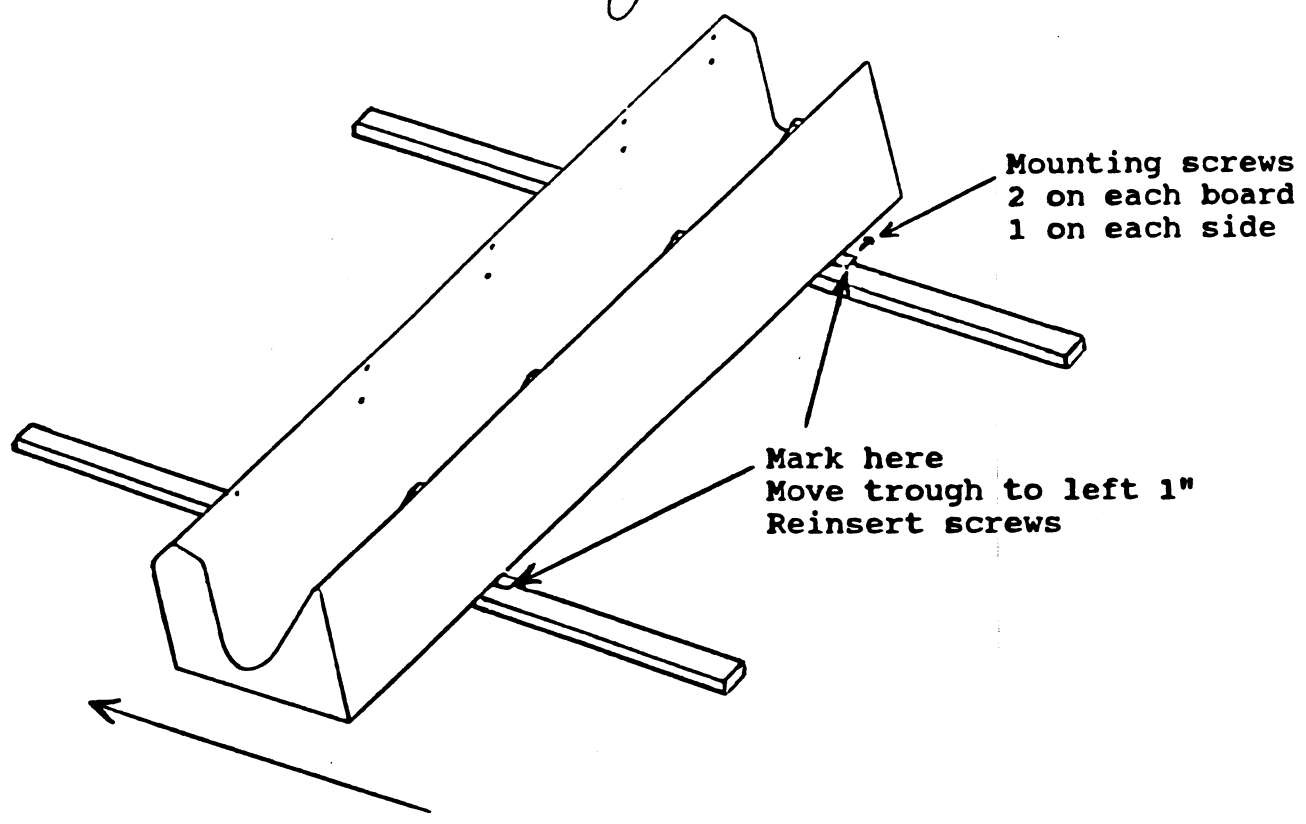
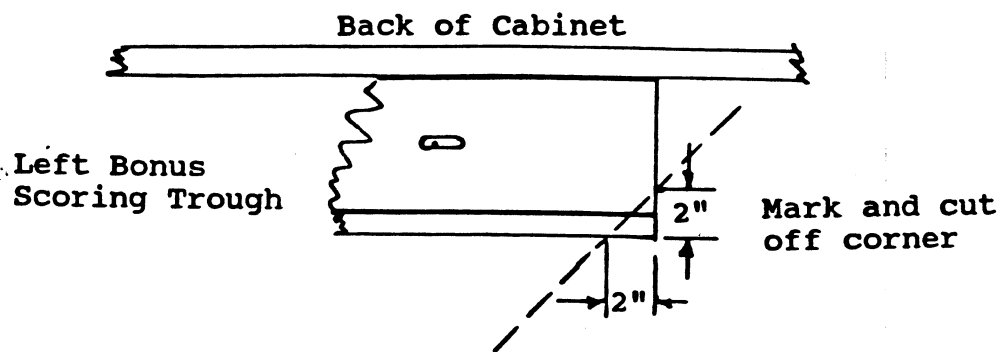


Figure 2

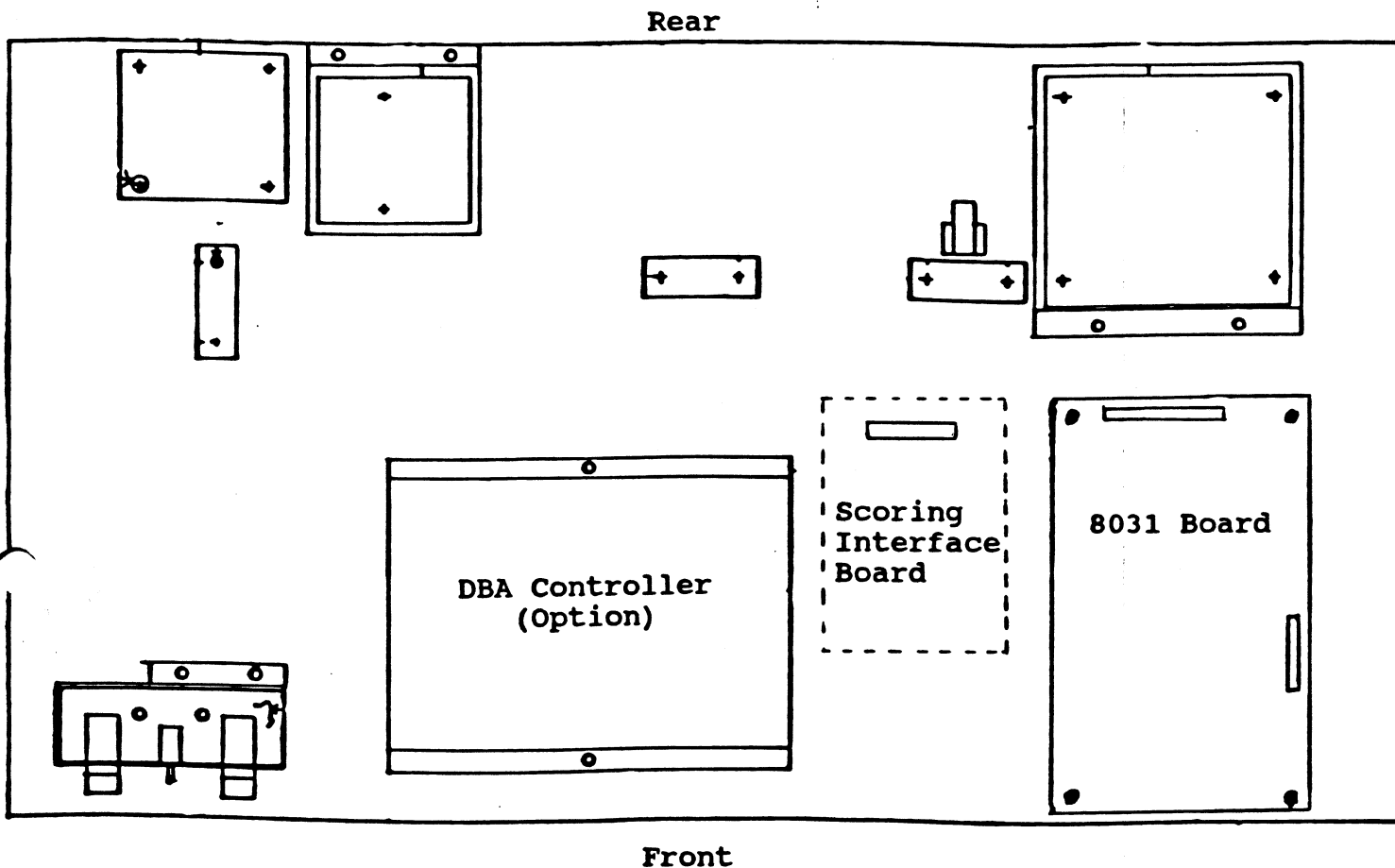


TOP VIEW

NOTE: Right Bonus Scoring Trough
requires no modification.

Figure 3

COMPONENT BOARD ASSEMBLY



Place the Scoring Interface Board between the 8031 Game Board and the DBA Controller with the connector facing toward the rear of the game.

Figure 6

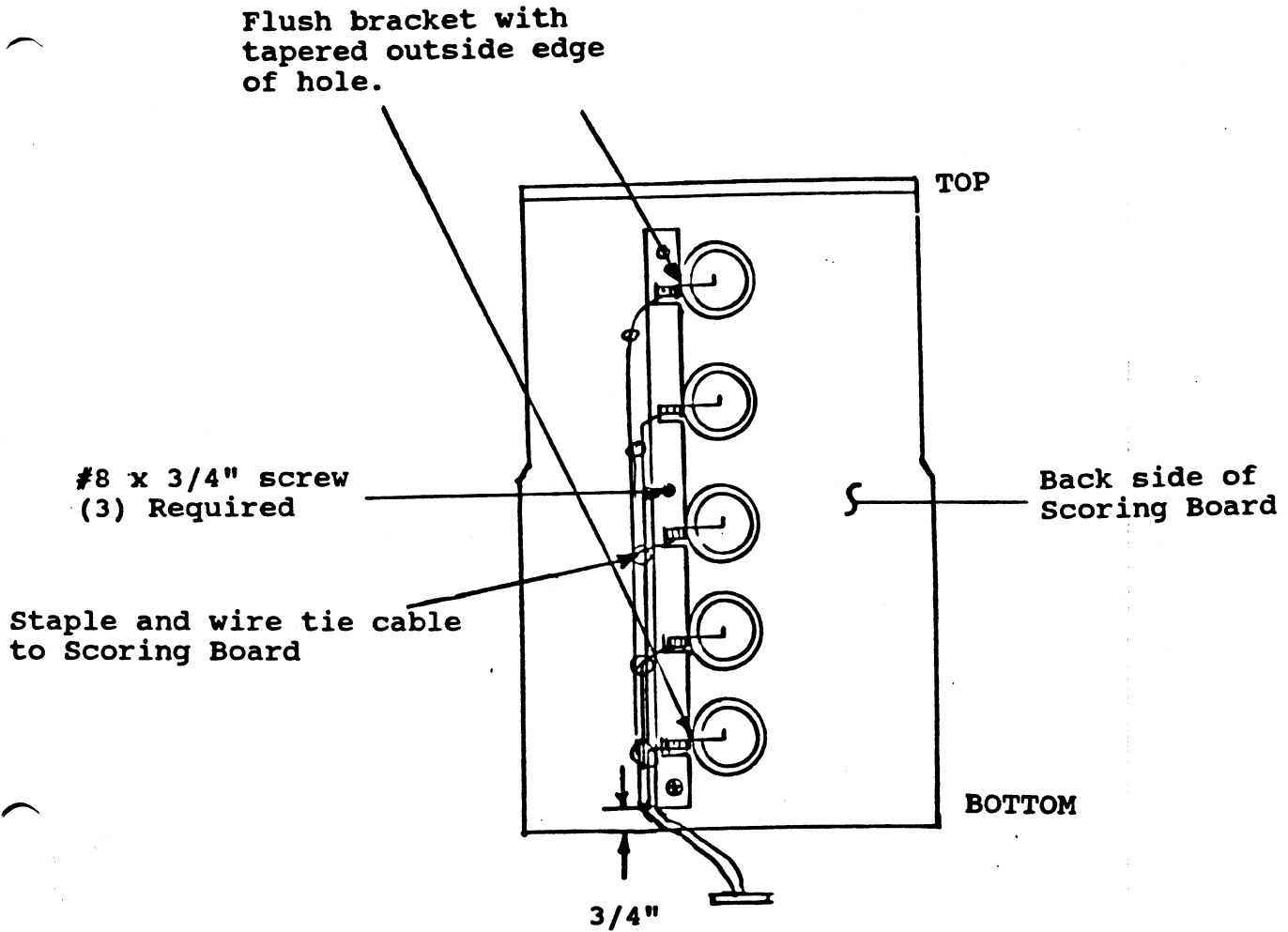


Figure 4a

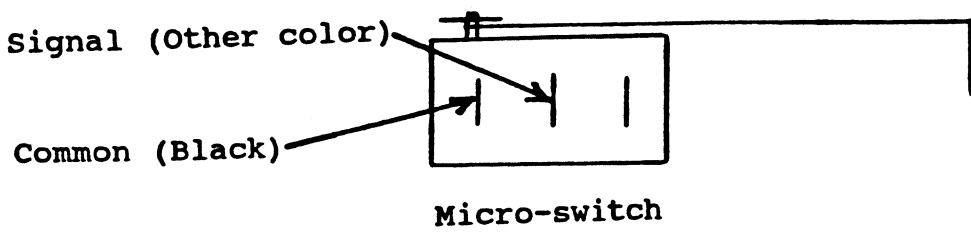


Figure 4b

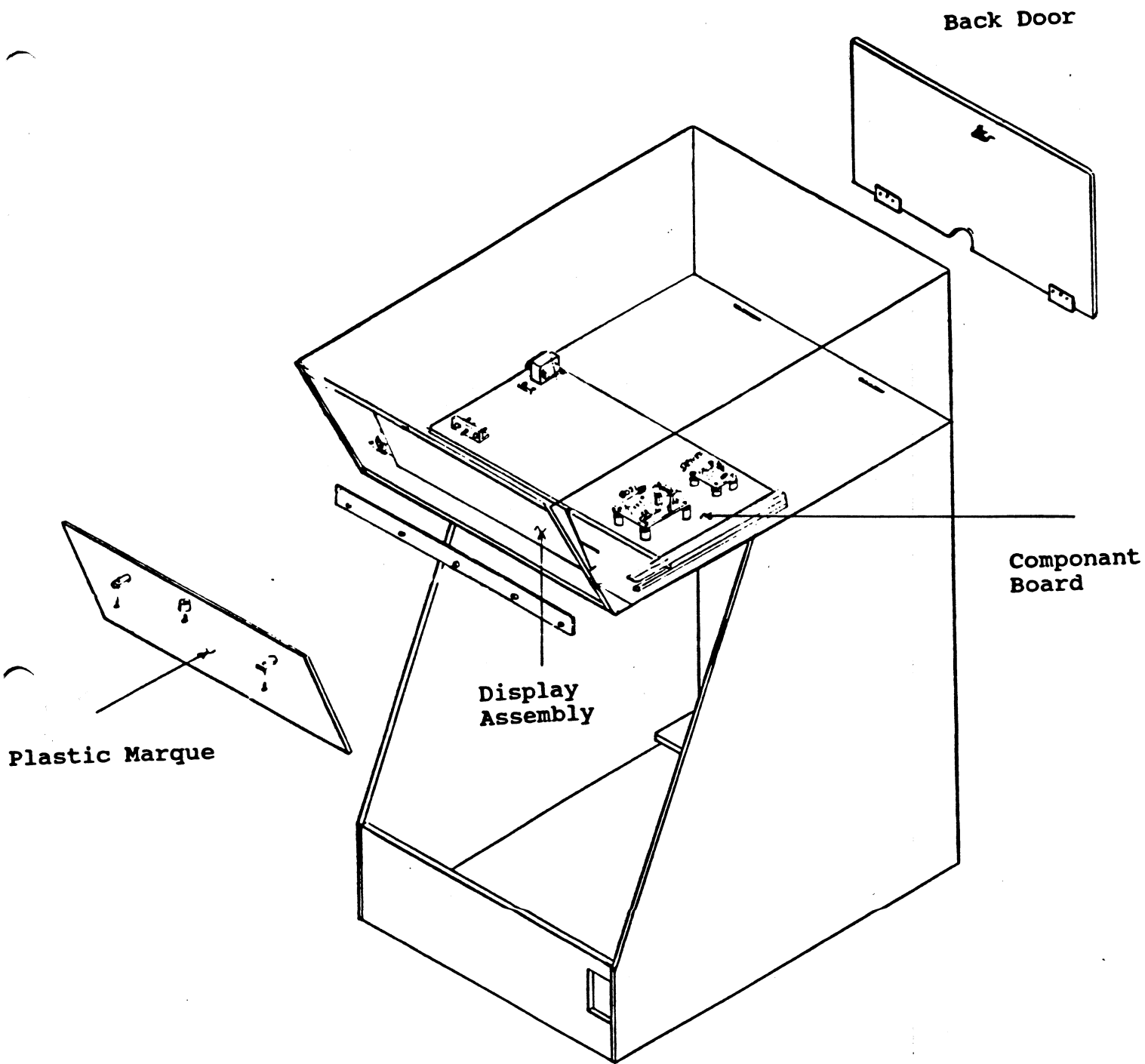


Figure 5

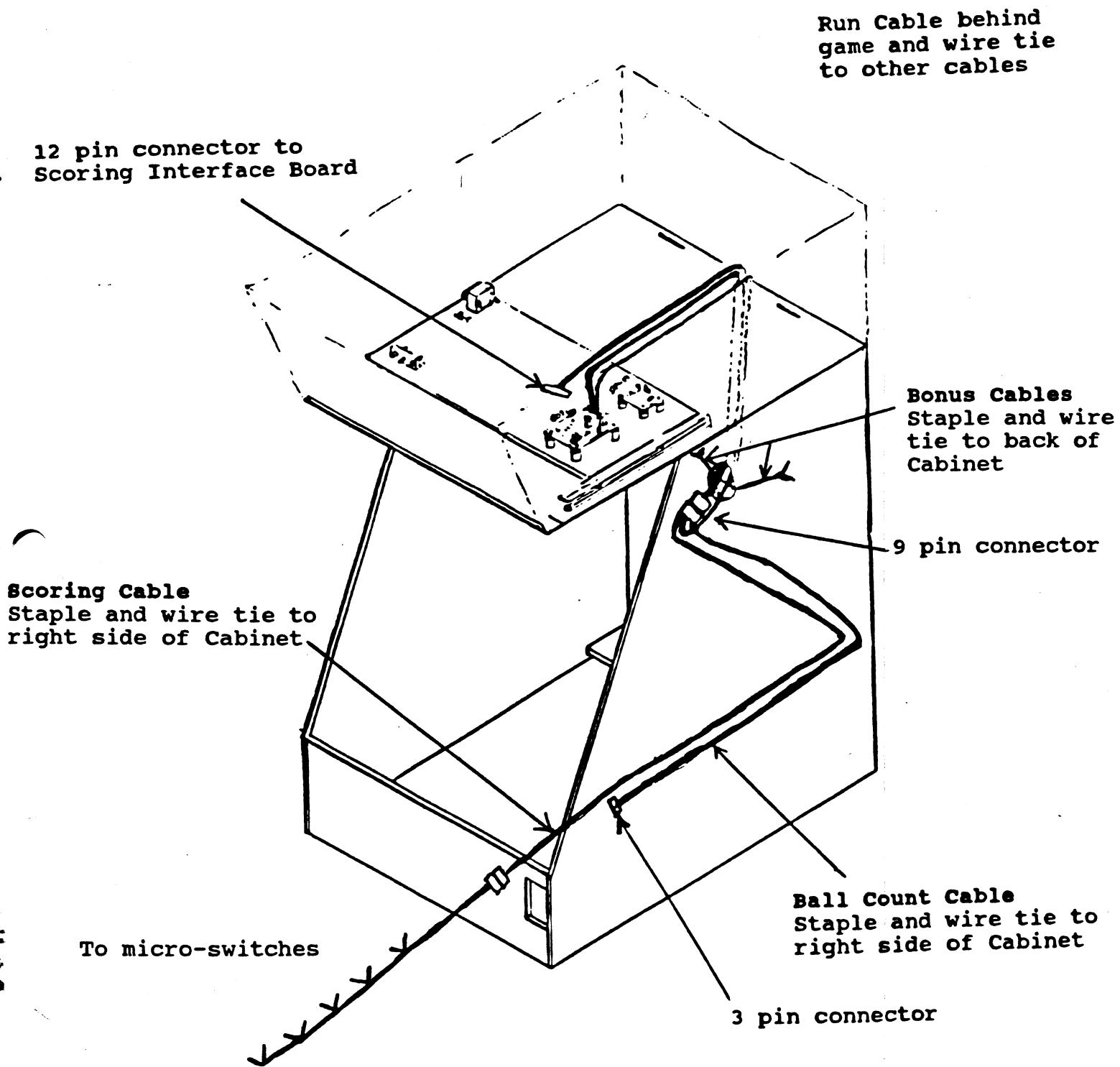


Figure 7