

INSTALLATION AND GENERAL GAME OPERATION INSTRUCTIONS

INSTALLATION

On all games there are certain items that should be checked after shipment. These are visual inspections which may avoid time consuming service work later. Minor troubles caused by abusive handling in shipment are unavoidable. Cable plugs and sockets may be loosened, switches (especially tilt switches) may go out of adjustment. Plumb bob tilt switch should always be adjusted after game is set on location and leg levelers are adjusted.

Visual inspections before plugging in line cord;

1. Check that all cable plugs are firmly seated in proper sockets.
2. Check that cables are clear of all moving parts and relays.
3. Check for any wires that may have become disconnected.
4. Check switches for loose solder or other foreign material that may have come loose in shipment and could cause shorting of contacts.
5. Check wires on relay coils for proper soldering, especially the bare (common) wire connecting a row of relay coils. Cold solder connections may not show up in factory inspection, but vibration in shipment may break contact.
6. Check that fuses are firmly seated and making good contact.
7. Check (manually) the stepping and resetting of all step-up units. The wiper action should not be sluggish.
8. Check transformer for any foreign material shoring across wiring lugs.
9. Check wiring of transformer to correspond to location voltage. (Transformer wiring card in front cabinet).

Before line cord is plugged in: -

Check all plugs and sockets and dress cables:

- (A) Plugs in correct sockets.
- (B) Plugs securely seated in sockets.
- (C) Dress cables away from relays.

Check Adjustment of the three (normally open) tilt switches:

- (A) Panel tilt on bottom of playfield panel.
- (B) Plumb-bob tilt on left side of cabinet near front door.
- (C) Ball tilt above plumb-bob tilt.

Insert one of the two balls into ball tilt assembly and adjust bracket so ball will roll over switch blade if front of cabinet is raised.

Check adjustment of the kick-off and slam switches:

Check adjustment of the normally open kick-off switch on cabinet mounting board. Check adjustment of the normally open slam switch, on front door. These switches energize the delay relay.

GENERAL GAME OPERATION

Place ball onto playfield by out hole.

Plug in line cord.

Coin Game:

If the coin should be rejected, move on-off master switch at the bottom right front corner of cabinet to "on" position, then coin game. The coin lock-out device rejects all coins when power (master switch) is off.

- 1A. If the coin is inserted in the 1st (nickel) coin chute and the game is set for 1 play-5¢, it will energize the coin relay. If game is set for 1 play-10¢, the first coin inserted will advance the 2-coin unit, then the second coin inserted will energize the coin relay thru the 2-coin unit switch.
(See 1st coin chute adjustment plug positions on game adjustments Sheet).
- 1B. If the coin is inserted in the 2nd (dime) coin chute and the game is set for 1 play-10¢, it will energize the coin relay. If game is set for 2 plays-10¢, it will energize the 2nd coin chute relay and the 2nd coin chute relay will advance the credit unit (2 or more steps) thru the coin credit circuit.
(See 2nd coin chute adjustment plug positions on game adjustments sheet. Also the 3rd coin chute adjustment plug for the number of credits).
- 1C. If the coin is inserted in the 3rd (quarter) coin chute and the game is set for 2-3-4-5 or 6 plays-25¢, it will energize the 3rd coin chute relay and the 3rd coin chute relay will advance the credit unit 2-3-4-5-6 steps thru the coin credit circuit.
(See 3rd coin chute adjustment plug positions on game adjustments sheet).
- 1D. When the credit unit has been advanced from the 2nd or 3rd coin chute, (as described in section 1B and 1C) the front door credit button switch will energize the credit relay and then the credit relay will energize coin relay.

- 2A. The coin relay, when energized by any of the ways described, (in sections 1A thru 1D) will stay energized thru its own hold-in switch and normally closed # 8 score motor switch.
- 2B. The coin relay will energize the lock relay which stays energized thru its own hold-in switch and a normally closed switch on the delay relay.
- 2C. The coin relay will operate the reset motor to reset all trip relays, and will start the score motor.
- 2D. The coin relay will energize the reset relay which will stay energized thru it's own switch until all drum unit zero switches are open and # 8 score motor cam switch is open. The socre reset relay will pulse thru # 2 score motor cam switch as long as the reset relay is energized. The score reset relay provides the pulses to advance the drum units until the individual drum unit reads zero.
- 2E. The coin relay thru a normally closed # 1 score motor cam switch will latch the game relay if the ball count unit is in index position or it will trip the game relay if the ball count unit is not in index position. If the game relay is tripped, it will lock in the coin relay and thru the combination of the two relays and the # 2 score motor cam switch, they will reset the ball count unit to index position. With the ball count unit in zero position, the coin relay will latch the game relay when the score motor is back in index position. The coin relay is still locked in thru the # 8 score motor cam switch. When the game relay is latched and the coin relay is energized, the ball count unit will advance twice for a 3-ball game thru # 4 & # 5 score motor cam switches or four steps for a 5-ball game thru # 4 and # 9 score motor cam switches. (# 5 score motor cam pluse is cancelled out by the # 9 score motor cam switch).
- 2F. If the game is adjusted to register game over when the game is tilted, the coin relay will latch the tilt relay thru the # 3 score motor cam switch.
- 2G. A coin relay switch thru a normally open # 3 score motor switch will advance the total play meter; if a credit was used to start the game, it will reset the credit unit one step.
- 3A. A ball on the out hole switch will energize the out hole relay thru a normally closed # 1 score motor switch; and it will stay energized thru its own hold-in switch and normally closed # 10 score motor switch.

- 3B. The out hole relay will operate the score motor and then energize the out hole kicker solenoid thru a normally open # 7 score motor switch. The 1st ball is kicked thru the ball trough to the shooter alley and the game is now ready to play.
- 4A. This game has an add-a-ball circuit which is described under heading add-a-ball scoring. This game also has a tilt adjustment for ball-to-ball tilt or game over tilt.

Sequence of operation

- 1A. When a ball is played, the ball index relay will be energized by the 10 point relay, 100 point relay or 1000 point relay, and it will stay energized thru its own hold-in switch, normally closed outhole relay switch and normally closed # 6 score motor switch.
- 1B. When the ball played returns to the outhole, the outhole relay is energized thru a normally closed # 1 score motor switch, and it stays energized thru its own hold-in switch and a normally closed # 10 score motor switch.
- 1C. The outhole relay will operate the score motor and thru a ball index relay switch and a normally open # 5 score motor switch it will reset the ball count unit one step. Another outhole relay switch thru a normally open # 7 score motor switch will operate the out-hole kicker solenoid to return ball to the shooter alley.
- 1D. When 1 ball to play lite is lit, and the ball is played and returns to the outhole, the game over trip relay is tripped thru a series of switches on the outhole relay, ball index relay, ball count unit zero and a normally open # 4 score motor switch.

Add-A-Ball Scoring

- 1A. The game was completed before starting a new game:
The game over trip relay is tripped.
The ball count unit is in zero position.
The game relay is tripped.
- 1B. A coin relay switch will latch the game relay thru a normally closed # 1 score motor switch. Another coin relay switch will step up the ball count unit, 2 steps for 3 ball game or 4 steps for 5 ball game thru score motor switches.
- 1C. Unlike regular replay games, the ball count unit is reset one step at the end of each play, and extra balls are registered by stepping up the ball count unit. The "ball in play" lites now become "balls to play" lites. The game starts with either 3 balls to play or 5 balls to play. When an add-a-ball has been earned, the ball count unit steps up, adds another ball to play, up to 9 maximum. The game ends when 1 ball to play is lit and the game over lights.
- 1D. The first ball played will trip the game relay.
- 2A. If the game is started before the game is completed:
The ball count unit is off the zero position.
The game relay may or may not be tripped.
- 2B. A coin relay switch will trip the game relay thru a normally closed # 1 score motor switch and a ball count unit zero switch. Another coin relay switch will trip the game over trip relay thru a normally closed # 1 score motor switch and resets the ball count unit thru a normally open # 2 score motor switch. When the ball count unit has been reset to zero position the game relay is latched thru a normally closed # 1 score motor switch. The coin relay remains energized for another half cycle during which time the ball count unit is stepped up as described under 1C.

981 "HI-LO ACE

FEATURE OPERATION AND SCORING

CARDS LITES FEATURE:

The card lites are located in the lower section of the playfield. They are lit by the targets and roll-overs as indicated on the playfield.

Lighting ace - king - queen - jack - ten - nine - eight card lites will lite the left or right lanes, alternately. They will also lite the three targets in the middle of the playfield with the left and right targets lighting alternately.

Lighting ace - 2 - 3 - 4 - 5 - 6 - 7 cards lites will lite the left or right out lanes alternately. They will also lite the three targets in the middle of the playfield with the left and right targets lighting alternately.

The ball going over left or right lane roll-over or left or right out roll-over will score a "special" when lit. They must be lit before the ball goes over the roll-over. The game is adjustable for the "special" to award a credit, add-a-ball or 5000 score.

All above alternating is thru the alternating relay which operates thru the 00-90 unit disc.

All card targets and roll-overs score 5000 when the individual targets or roll-over is lit or 500 when not lit.

THUMPER-BUMPER LITE FEATURE:

The thumper-bumper score 10 points or 100 points when lit.

Yellow and blue thumper-bumper lites alternately thru the # 12 score motor cam switch.

GAME ADJUSTMENTSHI-SCORE ADJUSTMENT PLUG:

Located on back box lite insert. This plug provides a wide range of coverage at which hi-score credits or add-a-ball can be scored. (see score adjustment card in back box for plug positions).

BALLS PER GAME ADJUSTMENT PLUG:

Located on back box lite insert. This plug provides positions to turn match feature "on" or "off".

1ST COIN CHUTE ADJUSTMENT PLUG:

Located on the 2 coin unit, on the front cabinet mounting board. This plug provides positions to give 1 play for 1 coin or 1 play for 2 coins thru the 1st (nickel) coin chute.

2ND COIN CHUTE ADJUSTMENT PLUG:

Located on the front cabinet mounting board. This plug provides positions to give 1 play for 1 coin or 2 plays for 1 coin thru the 2nd (dime) coin chute. NOTE: When this plug is set for 2 plays - 1 coin, brown-white (male plug) wire on 3rd coin chute adjustment must be in position 2.

3RD COIN CHUTE ADJUSTMENT PLUG:

Located on the front cabinet mounting board. This plug provides positions to give 2 to 6 plays for 1 coin thru the 3rd (quarter coin chute, orange-white (male plug) wire. See 2nd coin chute note above for use of brown-white (male plug) wire.

HI-SCORE SPECIAL FEATURE ADJUSTMENT PLUG:

Located on front cabinet mounting board. This plug provides positions to award credits, add-a-ball or 5000 points for special award.

TILT ADJUSTMENT PLUG:

Located on the front cabinet mounting board. This plug provides for ball-to-ball tilt or game tilt adjustment.

CARD FEATURE ADJUSTMENT PLUG:

Located on the bottom of the playfield panel. This plug provides for varying degrees of liberal - conservative adjustment by the coupling of card trio relays.

981 "HI-LO ACE"

PARTS LISTMISCELLANEOUS

Transformer	E-122-95
Score Motor (Domestic)	E-119-354
Score Motor (Export)	E-119-411
Reset Motor (Domestic)	E-119-362
Reset Motor (Export)	E-119-385
Meter (Total play)	E-32-1700

INTERLOCK RELAYS

Game (Trip)	G-31-2000
Game (Latch)	G-31-2000
Tilt (Trip)	G-31-2000
Tilt (Latch)	G-31-2000

TRIP RELAYS

All Trip Relay Coils	D-28-500
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"G" Relays

Delay	G-31-1600
Coin	G-31-2000
2nd Coin Chute	G-31-2000
3rd Coin Chute	G-31-2000
Credit	G-31-2000
Lock	G-33-2800
Reset	G-31-2000
Score Reset	G-30-1500
Outhole	G-31-2000
Ball Index	G-32-2500
Alternator	G-32-2500
Special	G-31-2000
5000	G-31-2000
500	G-31-2000
Triple Target	G-31-2000
1000 Point	G-31-2000
100 Point	G-31-2000
10 Point	G-31-2000
Thumper-Bumper (4)	G-31-2000

ASSEMBLY COILS

Coin Lock-out	FC-33-2600
Knocker	C-27-1000
Chimes (3)	CC-31-2000
Thumper-Bumpers (4)	A-25-1000
Outhole Kicker	A-25-950
Sling-Shots (2)	A-26-1200
Flippers (2)	AF-26-650/28-800

UNIT COILS

2-Coin (Step Up)	CD-29-1600
Score Drums (Step Up)	CD-29-1600
00-90 (Step Up)	B-27-1300
Credit (Step Up)	B-26-1100
Credit (Reset)	C-28-1100
Ball Count (Step Up)	B-26-1100
Ball Count (Reset)	C-28-1100

UNIT CONTACT DISC

00-90	W-1034-12
Ball Count	W-1043-19

UNITS WIPER ASS'Y

00-90	AS-1046-627
Ball Count	AS-1046-681

A	R-115-4	REBOUND	
B	R-521-2	1-1/2"	(2)
C	R-521-3	2"	(2)
D	R-521-1	1"	(2)
E	R-521-5	3"	(2)
F	R-406-3	FLIPPER	(2)
G	R-243	5/16	(20)

PANEL TOP PARTS

1	TOP ARCH	P-5839-68
2	BOTTOM ARCH	P-5871-43
3	SHOOTER GAGE	P-6359-10
4	SIDE RAIL (RIGHT)	CA-1208-1
5	SIDE RAIL (LEFT)	CA-1208-2
6	INSIDE RAIL	CA-1208-14
7	BALL REBOUND	AS-493-3
8	BALL GATE	A-1475-1
9	BALL GATE COVER	P-2998-5
10	LIGHT SHIELDS	A-2890-92
11	PLASTIC GUIDE	C-695-1
12	PLASTIC GUIDE	C-696-1
13	BUMPER CAP (BLUE)	A-3713-11
14	BUMPER CAP (YELLOW)	A-3713-12
15	BALL GUIDE WIRE (1)	M-121-43
16	BALL GUIDE WIRE (1)	M-121-44
17	BALL GUIDE WIRE (3)	M-121-45
18	BALL GUIDE WIRE (2)	M-121-46
19	GUIDE RAIL (L)	P-6244-57
20	GUIDE RAIL (R)	P-6244-56
21	ROLLOVER WIRE (9)	M-1336
22	ROLLOVER WIRE (2)	M-1336-1
23	TARGET ASSEMBLY (3)	AS-982-723
24	TARGET ASSEMBLY (4)	AS-982-752
25	BALL GATE ASSEMBLY	AS-2250-11
26	FLIPPER & PIN	AS-2214-19

● INDICATES MOVABLE POSTS
FOR SCORING ADJUSTMENTS

