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A1/General Introduction

There is no comparison between the early mechanical — and the new "microprocessor" controlled machines.

The new IGT Reel Slot is a modular built machine. All mechanisms and electronics are housed in a lowboy cabinet so that a top box and/or base can be added without any major alterations.

Infrared photo optics "read" winning combinations, making payarms and fingers obsolete. Coin input, anti string device and "coin in cashbox" are detected by means of photo optics. Walking the reels is a thing of the past.

Electro/mechanical counters are installed for audit purposes and electronic digital meters for the benefit of the players. They are used for verification, credit and in multicoin machines, validation. The field technician uses them for reel alignment when the machine is in a service mode.

A new type of friction handle gives the player the "feel" of the old machine he knows so well, but the machine starts when the handle mechanism actuates two micro switches.

A self checking Microprocessor Unit (MPU) controls the sequence of the operation of the game cycle and checks at specified points if the cycle has progressed correctly. A "Game Invalid" lamp shows the player when the game is not correct. The MPU has facilities for anti-cheat devices and contains a program for testing purposes. The MPU even produces a melody!

Two trickle charged batteries provide power to maintain memory for longer than one month. Should a power failure occur, credit ratings etc. are not lost.

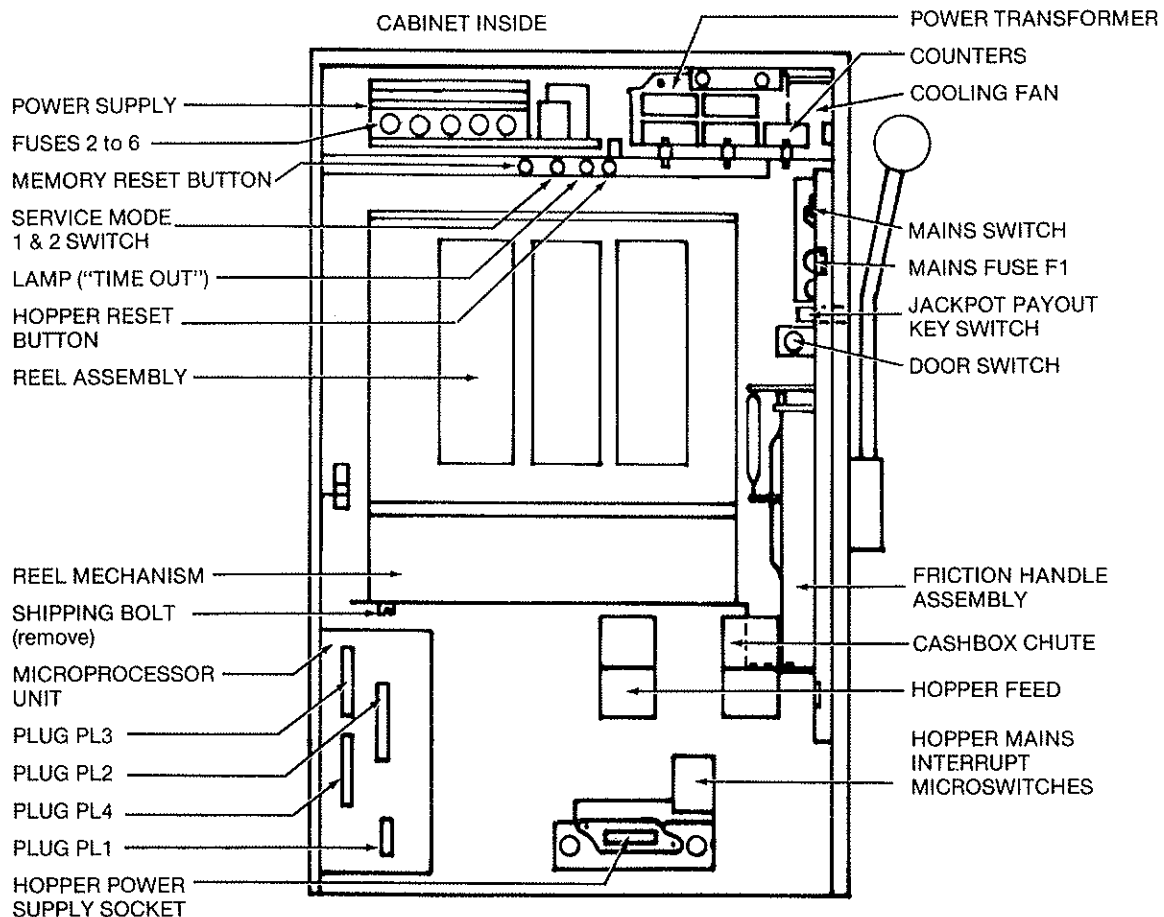
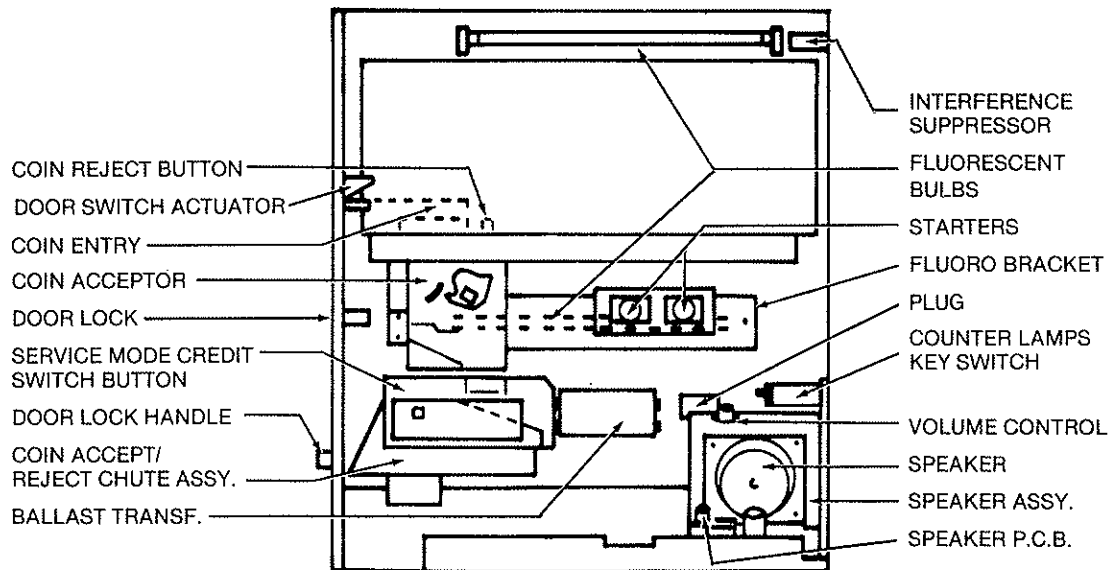
The coin acceptor rejects "false" coins. Weight, thickness, holes in coins, size and magnetic contents are checked before the coin is accepted.

The housing of the reels is of standard size and can be used to build up a three, four or five reel combination. The reels are manufactured in different widths to suit.

The hopper mechanism pays out up to 500 coins (300 Ike Dollars). Should it run empty, it will pay out the outstanding money after it has been refilled by the attendant.

A2 / Cabinet Sketch

(middle trim coin entry model)



A3/Purpose of Buttons, Keyswitches and Microswitches

Change Button	Activates "change" bulb.	Jackpot Key Switch	Used for J/P or payout over 300 (Ike) and 500 (All other denominations). Stops the melody and flashing of Jackpot bulb or Credit meter. Resets machine and cancels Credit meter reading. In Service Mode, tests hopper.
Collect Button	Pays out credit if under 500 (300 Ike Dollars), if over, Credit meter flashes. Attendant has to pay out from the book.	Counterbulb Keyswitch	Illuminates the counters which can be read from outside the cabinet.
Hopper Reset or Payout Security Button	In Play Mode: If the hopper runs out of coins during payout, it can be refilled. After pressing the button, it will continue paying the outstanding credit. In Service Mode 2: Changes binary readout from reel to reel on the Verification meter.	Service Mode 1 & 2 Switch (leave in S.M. for Play Mode)	1 — Normal playing of the machine with relaxed security. — Audit meters do not operate. — No "coin in" security timing. — No reel spin security, reels can be held to obtain credit. — No hopper pay out on "collect." 2 — Reel decoding and alignment check. — Blanks Credit meter.
Memory Reset Button	Press button, switch on machine and hold depressed until Mechanism motor stops. The machine will go through the homing cycle and RESETS the Credit meter to zero. All memory will be lost, so take note of credit before pressing the button!	Home Cam u/Switch	Defines end of game and correct starting point for next game.
Service Mode Credit Button	Increments the Credit meter by 1 for each time the button is pressed. It is located on photo optic P.C.B. on coin chutes.	Mains Interrupt Switch	Safety feature. Interrupts mains power supply to hopper plug when the hopper is taken out of the machine.
Door Switch Button	Program changes from Play Mode to Service Mode when the door is opened. Player credits are stored in memory which returns when the door is closed again.	Handle Switches A & B	"A" opens the path for "B" to operate the machine. Reason: The handle must be in rest position before the player can start another game.
		Hopper Coin Level Probe	Directs coin inflow from hopper to cashbox when reached by coin level in hopper bowl.

A4 Technical Data (1)

Machine Construction Units

- Modular built.
- Microprocessor Unit (MPU)
- Power supply
- Reel Mechanism
- Handle assembly
- Coin acceptor
- Coin chuting
- Set of counters, 6 elec/mechanical
- Set of meters, electronic/digital
- Speaker assembly

Micro-processor Unit

- Controller board with 4K PROM capacity and 2 batteries. (with optional Memory Extension board, plug in type, increasing capacity up to 8K)
 - Driver board
 - Mother board containing the above boards
- 3 Programs**
- 1 Play mode with full security
 - 2 Service mode 1
 - 3 Service mode 2 For testing purposes

Power Supply

DC regulated DC unregul'td AC

- Regulated and unregulated outputs.
- 5V and 12V.
- 14V and neg. 14V, 27V ~~27V~~ 10V
- 24V "floating." (approx. 19V DC / 0%

Pay Out System Hopper

Hopper.

Motor

Probe Security

- Pays out up to 500 coins (300 lke Dollars), MPU controlled.
- 110V AC, intermittent rated. Mechanical brake.
- Controls max. coin level in bowl.
- Motor stops after 12 to 15 sec. if no coin ejected.
- Counting and timing of coins.
- Motor stops after 1 sec. if count/timing switch stays closed.
- Motor power cut out if brake not released.

A5 / Technical Data (2)

Reel Mechanism	<ul style="list-style-type: none"> • Modular built 	Counters	<ul style="list-style-type: none"> • Electro/mechanical, for audit purposes and security.
Motor	<ul style="list-style-type: none"> • 24V AC, mechanical brake 	1 coins out	<ul style="list-style-type: none"> • Adds by 1 for each coin won, paid out or in credit.
Number of reels	<ul style="list-style-type: none"> • 3, 4 or 5. 	2 coins out	<ul style="list-style-type: none"> • Adds by 1 for each coin or credit played.
Width of reels	<ul style="list-style-type: none"> • 2.68", 2" or 1 1/2", to suit the above 	3 J/P Pymnts	<ul style="list-style-type: none"> • Adds by 1 for 10 coins of J/P win
Stops per reel	<ul style="list-style-type: none"> • 22 or 25. 	4 Cashbox	<ul style="list-style-type: none"> • Adds by 1 for each coin into cashbox.
Mode of reel firing	<ul style="list-style-type: none"> • Stopper arm released by solenoids. 	5 Credit pymnt	<ul style="list-style-type: none"> • Cancel CR payments cntr., adds credit book pay.
Reels stopped	<ul style="list-style-type: none"> • Random start of motor to stop reels 1 by 1. 	6 Stroke	<ul style="list-style-type: none"> • Adds by 1 for each handle pull.
Reel decoding	<ul style="list-style-type: none"> • Read out in binary from reels by photo optics. 	Meters	<ul style="list-style-type: none"> • Electronic/digital, for benefit of player.
Security	<ul style="list-style-type: none"> • Reels must stop in locked position. • If no reel spin, machine tilts. • Motor power cut out if brake not released. 	Credit meter Verification meter	<ul style="list-style-type: none"> • Shows credit situation of player. • Adds by 1 for each coin paid out. • Also used for testing purposes when machine in service mode.
Handle Assembly	<ul style="list-style-type: none"> • Friction type to simulate mechanical type. 	Coin validation meter	<ul style="list-style-type: none"> • Shows number of coins played last handle pull.
Action Security	<ul style="list-style-type: none"> • Micro switch acuated to start game. • Handle must be in rest position before a game can be played. 		
Coin Acceptors	<ul style="list-style-type: none"> • Cradle type. Denominational. 	Power	<ul style="list-style-type: none"> • 110V AC 60Hz.
Security	<ul style="list-style-type: none"> • Coin checked for diameter, thickness, holes, magnetic content and weight. • Rejects false coins. 	Filter	<ul style="list-style-type: none"> • 2.7 Amps. 300W max., 5A fuse.
Coin Chutes	<ul style="list-style-type: none"> • Direct coins from coin acceptor to payout unit, chip tray, or to cashbox if hopper is full. 	Retain memory when machine switched off	<ul style="list-style-type: none"> • General Purpose Interference filter.
Security	<ul style="list-style-type: none"> • Coins counted and timed by m/switch or photo optics. • Anti string device fitted, mechanical or photo optics. 	Lighting	<ul style="list-style-type: none"> • General Purpose Interference filter. • 2 nicad batteries. 1.25V ea. retain mem. for more than 1 month.
		Cooling	<ul style="list-style-type: none"> • Fluorescent bulbs, 110V AC 8W. • Festoon bulbs 24V, AC 3W. • Bayonet bulbs 24V, AC 3W.

A6 / Dimensions and Weights

Machines are shipped in:
Expendable polystyrene top, bottom and handle cover.
Carton over all sides.

Packed for Shipping

Type of Cabinet	Wide	Height	Deep	Weight
Lowboy	533mm (21")	914mm (36")	660mm (26")	87kg. (191 lbs.)
Casino Top	533mm (21")	1193mm (47")	660mm (26")	100kg. (220 lbs.)
Feature Top	533mm (21")	1524mm (60")	660mm (26")	110kg. (242 lbs.)

With Wooden Side Panels

Type of Cabinet	Wide	Height	Deep	Weight
Lowboy	510mm (20 1/16")	780mm (30 3/4")	470mm (18 1/2")	82kg. (181 lbs.)
Casino Top	510mm (20 1/16")	1053mm (41 1/2")	470mm (18 1/2")	92kg. (203 lbs.)
Feature Top	510mm (20 1/16")	1380mm (54 3/8")	470mm (18 1/2")	100kg. (220 lbs.)
Casino Top Box	no panels	270mm (10 3/4")	250mm (9 7/8")	48.5 kg (22 lbs.)
Feature Top Box	no panels	600mm (23 5/8")	265mm (10 3/8")	86 kg (39 lbs.)

A7 / Introduction to the Microprocessor

MPU

The Microprocessor Unit is basically a small computer and can be called the heart of the machine.

Basic functions of a computer are: To perform a sequential series of events and carry out mathematical operations. Act on incoming signals (input), translate those and send out signals (output) accordingly.

MPU's are instructed to do this by means of a built-in program, which is done with ROM's (Read Only Memory) and/or PROM's (Programmable ROM's).

As the name implies, ROMS and PROMS can only be "read." They contain a fixed series of instructions for the MPU as to *how* to act on incoming signals.

RAM'S (Random Access Memory) accept and store information and can release it again. A temporary storage which would be lost if the machine was switched off or a power cut out would occur. However, provisions are made to maintain that information.

Two nickel cadmium batteries are mounted on the Controller Board. They are "trickle" charged when the machine is "on" and provide power for more than one month when the machine is "off."

When power is restored, "memory" is there as it was before.

We use PROMS which we can pre-program to our specified requirements. Once programmed, they keep that information.

Incoming signals (input) come from microswitches, pushbuttons, photo optics etc. and merely define the difference of a voltage present or no voltage, ON or OFF. In binary: 1 or 0.

Outgoing signals (output) are voltages being supplied to meters, counters, solenoids, etc.

Self checks are carried out continuously inside the MPU and the next step in the game cycle can only occur if the previous one is completed. If not, instruction is given to light the "Game Invalid" bulb.

We can use 3 program modes. With the door closed, the machine is in the "Play Mode" with full security.

If the door is opened, we have a condition of "Service Mode." A switch inside the machine selects between Service Mode 1 and 2.

- S.M. 1**
- Normal playing of the machine with relaxed security.
 - Audit meters do not operate.
 - Service mode credit switch button operable.
 - No reel spin security. Reel can be held to obtain a "credit pay."
 - No hopper pay out on "collect."
- S.M. 2**
- Reel decoding and alignment check.
 - Blanks credit meter.

A8/MPU Boards Identification of Chips

Controller Board (With batteries and Memory Extension Board) Processes information from and transfers information to the Driver P.C.B.

Driver Board (input-output) Input/output board which collects information from the machine, i.e., coin input, reel decoding etc. It then transfers it to the Controller board. It translates processed signals and sends them into the machine, e.g., solenoids, meters, counters, speaker, segments of the digital display. But NOT the Reel Mechanism's motor.

Mother P.C. Board (incorporates the -5V DC regulator) Interconnects the main boards and plugs for the looms.

The MPU is housed in a perforated metal container. All plugs have locks to hold the loom sockets in place.

Identification of Chips

ARISTOCRAT PROM NUMBERING

The I.D. tag for the personality prom will take the form of:

1		2
3	4	5
6		7

The I.D. tag for the first two proms will take the form of:

		2
3	4	5
		7

1. Destination, Nevada = N; New Jersey = Q
2. Address of prom in the memory map.
3. Game, Aristocrat
4. Game Version/Model/I.C. Socket #
5. Denomination = B or to include all denominations
6. Personality prom version — percentage
7. Date

Alterations to any of the game modules except the modules containing changeable addresses create a new game version. Alterations to the changeable addresses create a new personality prom version.

A typical example of all the programs found in a game would be:

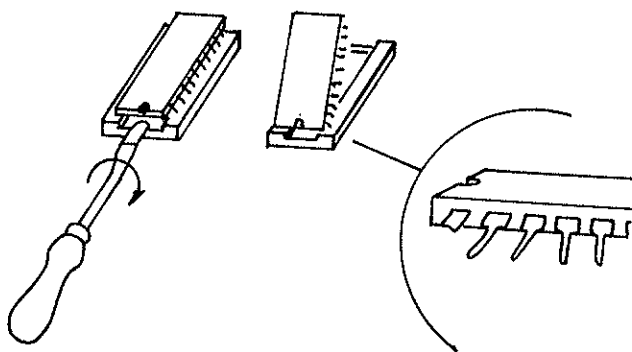
N A800-AFFF
ARIST 2X107/3-B
1-85.404 2-Oct-81

B000-B7FF
ARIST 2X107/2-B
2-Oct-81

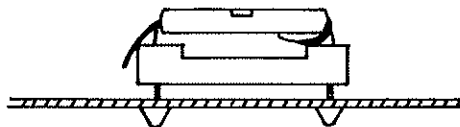
B800-BFFF
ARIST 2X107/1-B
2-Oct-81

How to Replace Chips

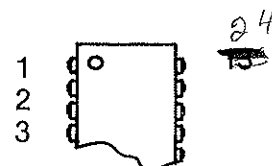
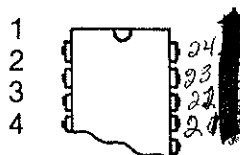
1. Fit screw driver under the chip, NOT under the socket.
2. Pry out slowly as shown. Hold a finger on top of the chip to prevent it from "jumping" out.
3. Avoid bending or breaking of pins.



4. On installing make sure that all pins are lined up and check that none are left out or folded under.



5. Check that the endmarking on the chip is on the correct side — it indicates pin 1 to the left on that side.



A10 / Meters and Counters

Digital Electronic Meters

Credit Meter

Shows the credit situation of the player. It increments by 1 for each "coin in" and decreases by 1 for each game played. Wins are added to the credit reading until the Collect button is pressed. On pay out, the meter decreases by 1 for each coin paid out. When the credit reading is over 500 (300 Ike Dollars), the meter will flash when the Collect button is pressed. The meter resets to zero and the flashing stops when the attendant turns the key. A book pay is made for the number of coins which were showing on the meter.

Verification Meter

In play mode — Adds by 1 for each coin paid out and resets when the machine is played again.

In S.M.1 — As in play mode.

In S.M.2 — Used for reel decoding.

Coin Validation Meter

Shows the number of coins used for the last game played.

Note

Digital Electronic readouts are called: METERS
Electro Mechanical readouts are called: COUNTERS

Electro Mechanical Counters

(for audit purposes only and not visible to the player)

Coins Out — Adds by 1 for each coin won (paid out or kept in credit)

Coins In — Adds by 1 for each coin or credit played.

Jackpot Payments Counter — Adds by 1 for every 10 coins of J/P win.

Stroke — Adds by 1 for each handle pull

Cashbox Counter — Adds by 1 each coin into the cashbox.

Cancel Credit Payments (an extra counter for security purposes) — Adds, when the attendant turns the key, the credit as shown on the credit meter, if over 500 coins (300 Ike Dollars). (book pay) (not for audit purposes)

Note

The counters are not activated when the machine is in ~~Service Mode~~.

*Door is open
should be obvious
Note*

A11 / Digital Display Boards

There are many types of digital display printed circuit boards. They contain the displays, sockets and/or plugs, 24V festoon bulbs, resistors, etc.

Held in place by two brackets at the rear and two screws to secure, it is easy to remove.

Handling

Before removing a board, always turn the power off. During testing, make sure that the board when hanging on wiring, can *not* make contact with the metal of the cabinet. It does not take much to ruin the displays due to a short circuit or blow fuses.

There is printed wiring on both sides of the boards. Bending or twisting can snap the delicate tracks. When the board straightens out again, the tracks may again make contact, but will produce faults or intermittent faults in the future.

Cracks in printed wiring are difficult to locate.

Displays

A display consists of seven segments, from A to G plus the decimal point. Each segment is a light emitting diode. All cathodes of the diodes are connected together, each anode is individually connected and can be switched on and off.

The voltage required to light each segment is in the order of 2 to 3.5V. D.C.

It is essential that plug and socket connections are free of electrical losses, a dirty pin or socket can cause the loss of a few volts.

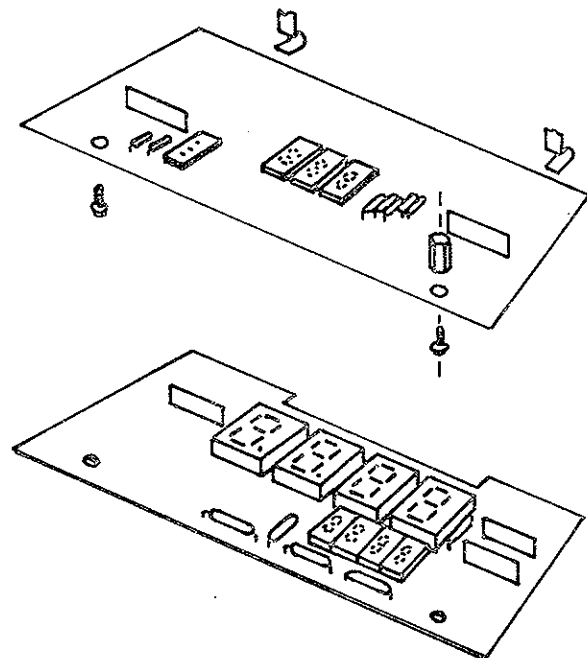
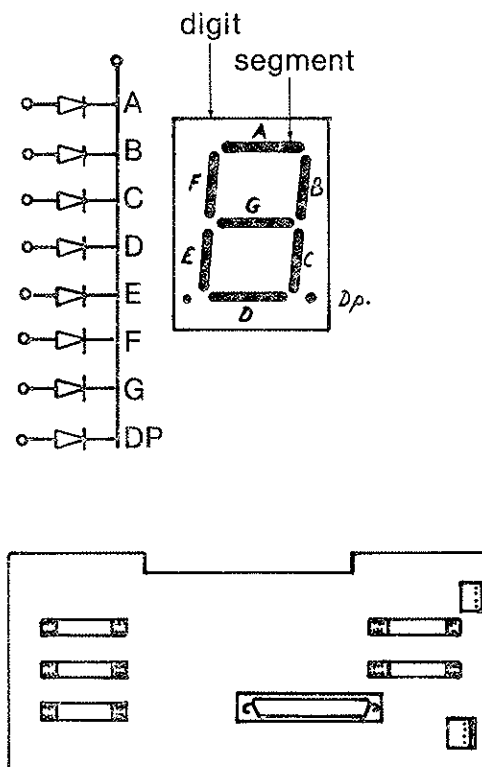
Faults

One or more different segments not working

Fault in wiring.

All the segments of the same letter, e.g., "F's"

Faulty MPU



PL7

6 10V~

F5 - 7

3

19V~

F4 - 4

1

15V~

F3 - 2

15

F2 - 12

24V~

8

9

10

10V~

F6 - 11

PL8

C1

1

2

C2

3

4

9

7 REEL MECH.

8 TRI - MECH. MOTOR

5 HOPPER

6

PL9

11 -14V DC

1 0V

12 +27V DC

2 0V

14 +12V DC reg.

3 0V

13 24VAC

9

8

10 +14V DC

15 +5V DC reg.

4 0V

5 0V

7 0V

6

Unreg. +12V DC

Component List:

F2— 7A
 F3— 1A5
 F4— 1A
 F5— 1A5 F6— 7A

Notes:

Voltages may vary $\pm 10\%$, except regulated voltages.

A14 / Voltages of the Power Supply

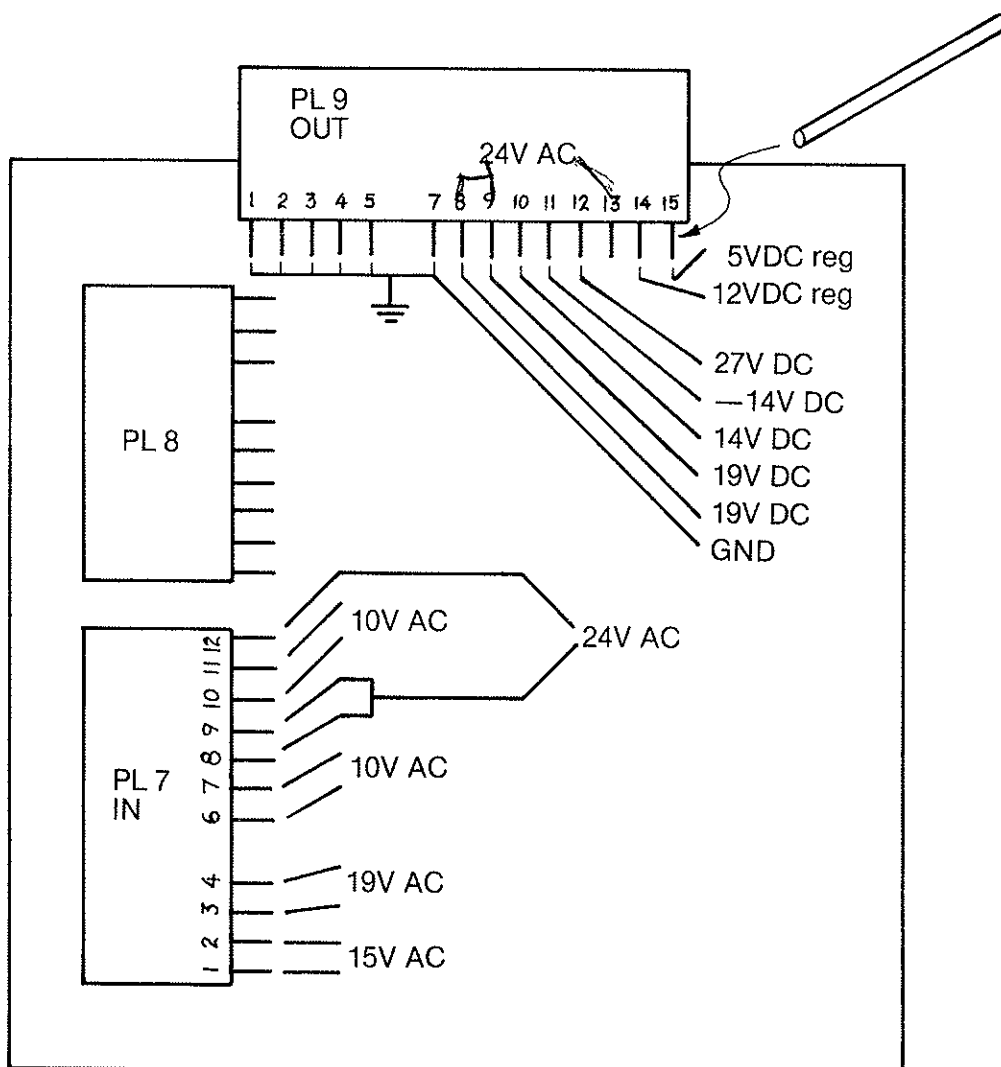
The actual voltage readings as shown below may vary — 10% either way. DC voltages are measured in respect to ground (Multimeter on DC scale, 50 V range. The black probe to GND). When measuring negative voltages, reverse the probes since "ground" is positive.

When testing the AC voltages, measure between the pins as shown. (Multimeter on AC scale, 50V range. Probes can be reversed, it makes no difference). The fuses on the power supply are fitted between the transformer and PL 7

A short length of "spaghetti" under the plug pins will prevent "shorting" with the meter probes to the 24V AC rail underneath.

- F2 — transf. to pin 12
- F3 — transf. to pin 2
- F4 — transf. to pin 4
- F5 — transf. to pin 7
- F6 — transf. to pin 11

Power Supply Board



Voltages measured under load. (all plugs connected)

A15 / Motors — How They Work

The Hopper motor is operated by 110V AC and is intermittently rated. This means that the motor is designed to run only for short periods. It should therefore NOT run for longer periods than five minutes continuously.

The Reel Mechanism motor is rated 24V AC, continuous.

In the rest position, the nylon dog is held under spring tension against the nylon clutch moulding. When switched on, the magnetic field in the motor attracts the brake pad. Its arm lifts the dog away from the clutch moulding and the motor is free to run. When stopped, the magnetic field collapses and the brake pad is pushed out by the dog under its spring tension. The dog now rests on the moulding.

Stopping is cushioned by a non-adjustable cork friction disc between the moulding and the rotor.

A cushion on the brake pad eliminates "sticking" due to residual magnetism.

A buzzing noise can occur when the brake pad is attracted by the motor, this can be ignored if not excessive.

The clutch area should be kept DRY, NO oil or grease!

Overplay may result if the brake or clutch is faulty in the Hopper motor.

The endplay of the rotor is kept to a minimum with Fiber washers. Don't oil the motor bearings, they are soaked in oil and need no attention. Any extra oil in that area could reach the clutch.

If the brake does not release on the Reel Mechanism motor, power will be switched off by the program and the "Game Invalid" bulb comes on. If the brake does not engage at the end of the game cycle when the motor is switched off, the next game could be expected to fail to spin reel 1 and will create a "Game Invalid."

It is MOST important that any adjustments made are done with great care to obtain trouble free service from motors.

Note As seen from the brake side, the Reel Mechanism motor turns counterclockwise.

A16 / Motors

Adjustments

Hopper

110V AC, intermittently rated. This means that the motor has been designed to run only for short periods. It should therefore NOT run continuously for more than 5 minutes

Mech

24V AC — continuous run

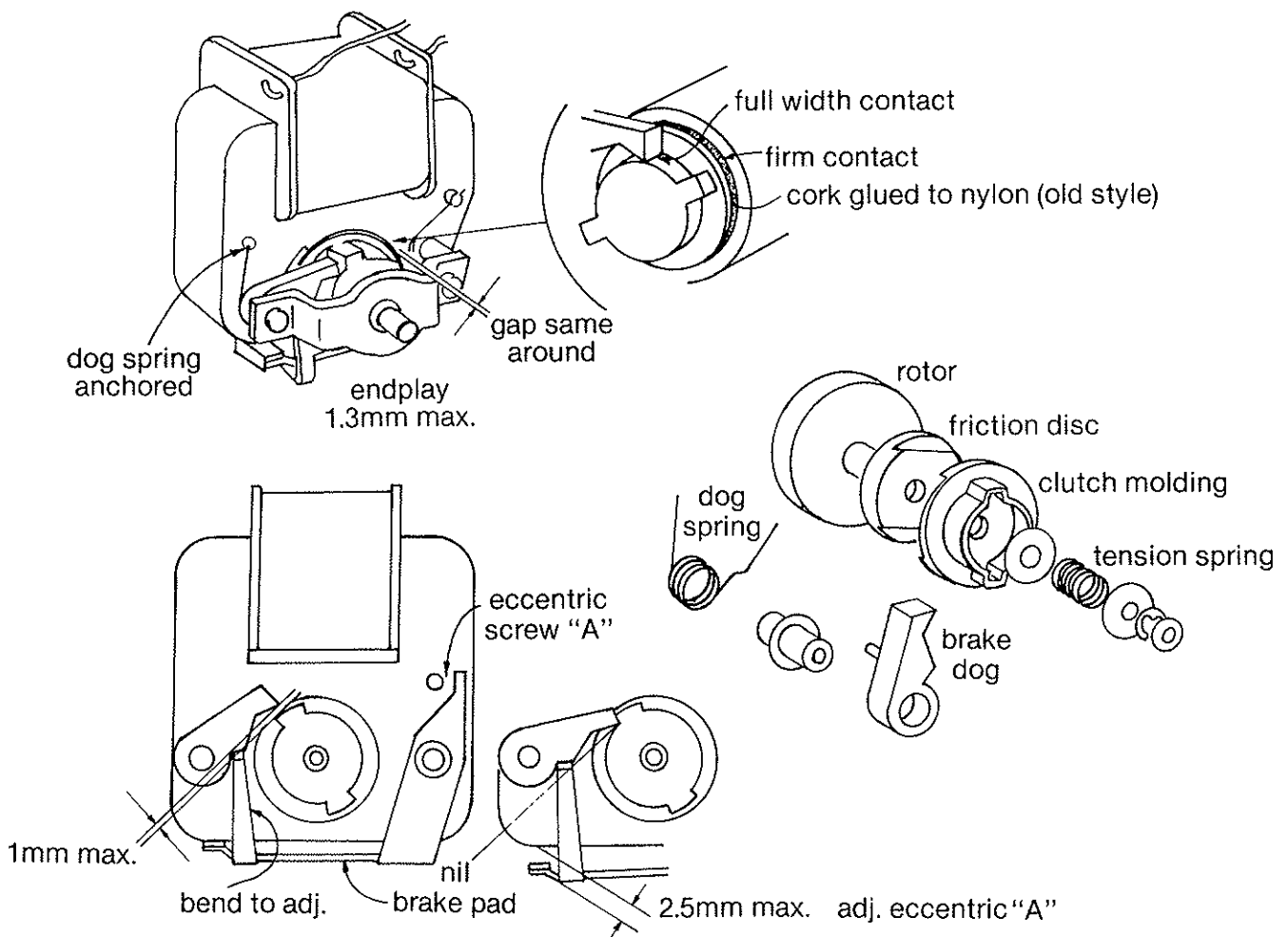
Adjustments

The same on all motors.

- Check all clearances as shown below.
- Free movement of the brake dog on the brass bushing. Test pivoting with gravity fall and check for burrs and dirt.
- Full width contact of dog on nylon clutch molding without side rubbing.

- Smooth contact area of brake arm to dog.
- Coil spring to dog should not be bent to increase its tension.
- Cork should be glued to the nylon clutch molding. NO oil/grease.
- Coil spring on rotor spindle should provide a strong pressure for the clutch and it should be very difficult to turn the motor by hand to overcome the clutch friction.
- Free movement of the rotor without rubbing with the brake off.
- With the motor in the Reel Mech, you should be able to turn the main shaft with two fingers.

*As seen from the brake side, the Reel Mech motor turns counter clockwise. The brake is fitted on the R.H. side instead of as shown here.



A17 / Reel Assembly

Description

The Reel Mechanism is designed for easy maintenance as is shown by its lift-off shroud, quickly removable reels and easy to adjust kicker-stopper arm assemblies. Photo optics are used to read the reels.

Reels separated by spacing bushings can be individually adjusted to allow for tolerances in the frame by means of spacing washers. This, without running the risk of interfering with the free spin of the reels.

The spring on the right hand side of the axle merely keeps the reels in place.

The plastic reels are all the same per assembly. Width varies with 3, 4 and 5 reel combinations.

Reels on 3 Reel Mechanism — 2.68" wide.

Reels on 4 Reel Mechanism — 2" wide.

Reels on 5 Reel Mechanism — 1.5" wide.

How It Works

When the upper handle switch "B" is switched by the handle pull, the solenoids are simultaneously energized. As described in "Stopper Arm Assy, How It Works," the latch is withdrawn and the stopper arm is released causing the reels to spin.

Governed by an electronic variator (under program control), the motor starts which causes the camshaft to turn. Cams reset the stopper arms which stop the spinning reels one by one from left to right. The Variator varies the length of time the reels will spin by varying the starting time of the motor.

After the reels are stopped, the motor continues to turn until the microswitch at the end of the camshaft is switched, indicating the end of the game cycle. The motor stops.

The MPU decodes the reading of the reels and the MPU searches for pay.

Maintenance

S.A.E. 30 oil for all gears, bearings and rollers.

GREASE — See stopper arm assembly.

FREQUENCY — Check once a month visually.

Removing the Reels

Check that the camshaft is in the "end of cycle" position. (rest position)

Press the solenoid plungers to drop the stopper arms. (Press the plunger, you won't "nip" your finger!)

Undo the knurled nuts at each end of the axle and remove the assy. If you have to remove the reels from the axle, mark the reels 1 2, 3, etc. The reels are the same, the reel strips are not! Note the position of spacing washers if any are used.

Assembling

Check that the "flats" at the end of the axle on each side fit into the slots and that the spindle is properly located, otherwise misplays can occur. NEVER force a reel around if the stopper block is not clear of the star-wheel. The tips of the teeth can be damaged, causing "percentage" problems, No Pays or Mispays.

A18 / Drive Axle

(4 reel type shown)

- Mech Motor** — 24V AC
- Gears** — Axle gear, steel. Intermediate gears, nylon.
- Lubrication** — 1 drop of S.A.E. 30 oil. All gears, 2 times per year.

Especially in mechs where the motor has a mechanical brake, too much oil on the gears will ultimately wet the brake and *that* area should stay dry.

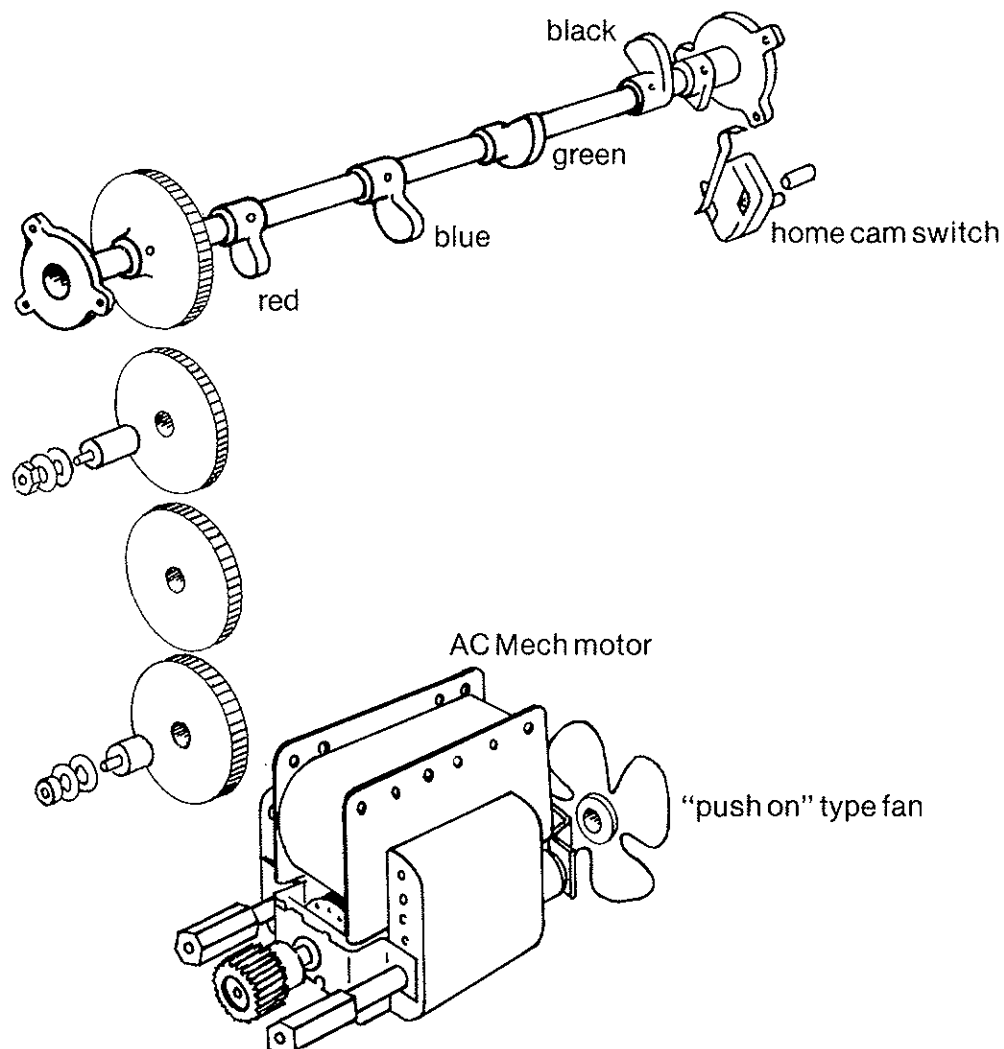
Note

It should be possible to turn the axle by hand when the brake pad is depressed.

Color Code of Motor Pinions

Pinion Teeth	Color	Part No.
25	green	308/667
23	yellow	308/666
20	natural	308/665
18	black	308/771
15	blue	308/770

USA only



A19 Stopper Arm Assembly

How It Works

In rest position, the stopper arm is latched on top of the stopper arm latch lever which can be actuated by a solenoid (1).

The stopper block is engaged in the starwheel on the side of the reel, locking it.

When the solenoid is fired, the latch lever clears and the stopper arm is pulled down by the stopper arm spring until the arm is stopped at (2). It then continues to move so that the block disengages from the starwheel. The reel spins, a spring loaded trip lever keeps the arm away (3) to allow free spinning of the reel.

The reel mech motor starts to turn causing the cam to rotate which pushes the arm upwards (4) until the

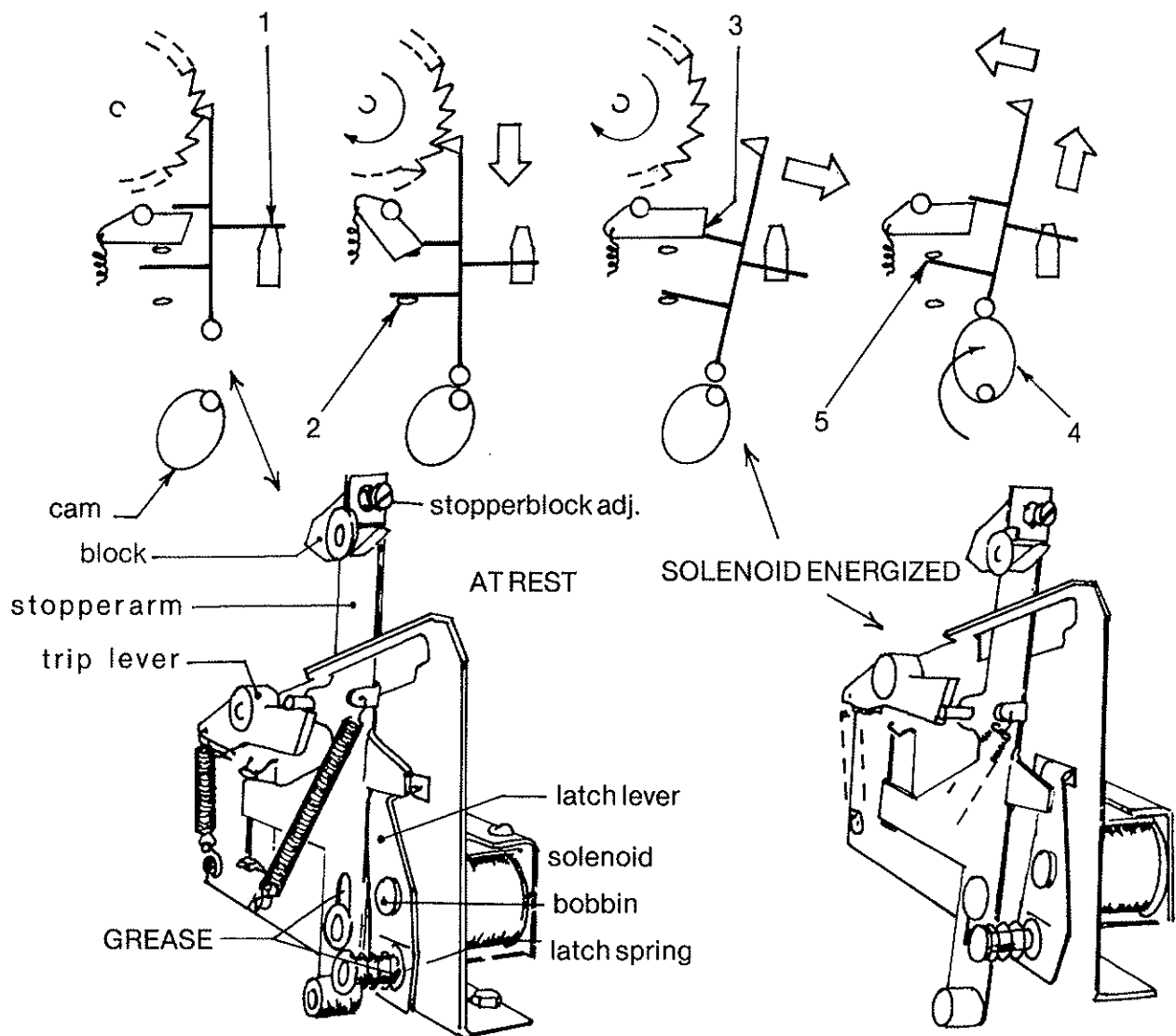
arm is stopped at (5). At that point, the stud clears the trip lever and the arm is pushed forward.

The still spinning wheel is stopped by the stopper block and the spring loaded latch lever resets.

The stopper block is spring loaded to prevent excessive wear.

Lubrication

Keep the solenoid free of oil, grease or dirt at ALL times. Grease the slot in the stopper arm and the lower end of the latch lever, stud, spring, etc. VERY LIGHT grease on the contact area at the top end of the latch lever and the stopper arm. Wipe on, wipe off!



A20/Mechanism

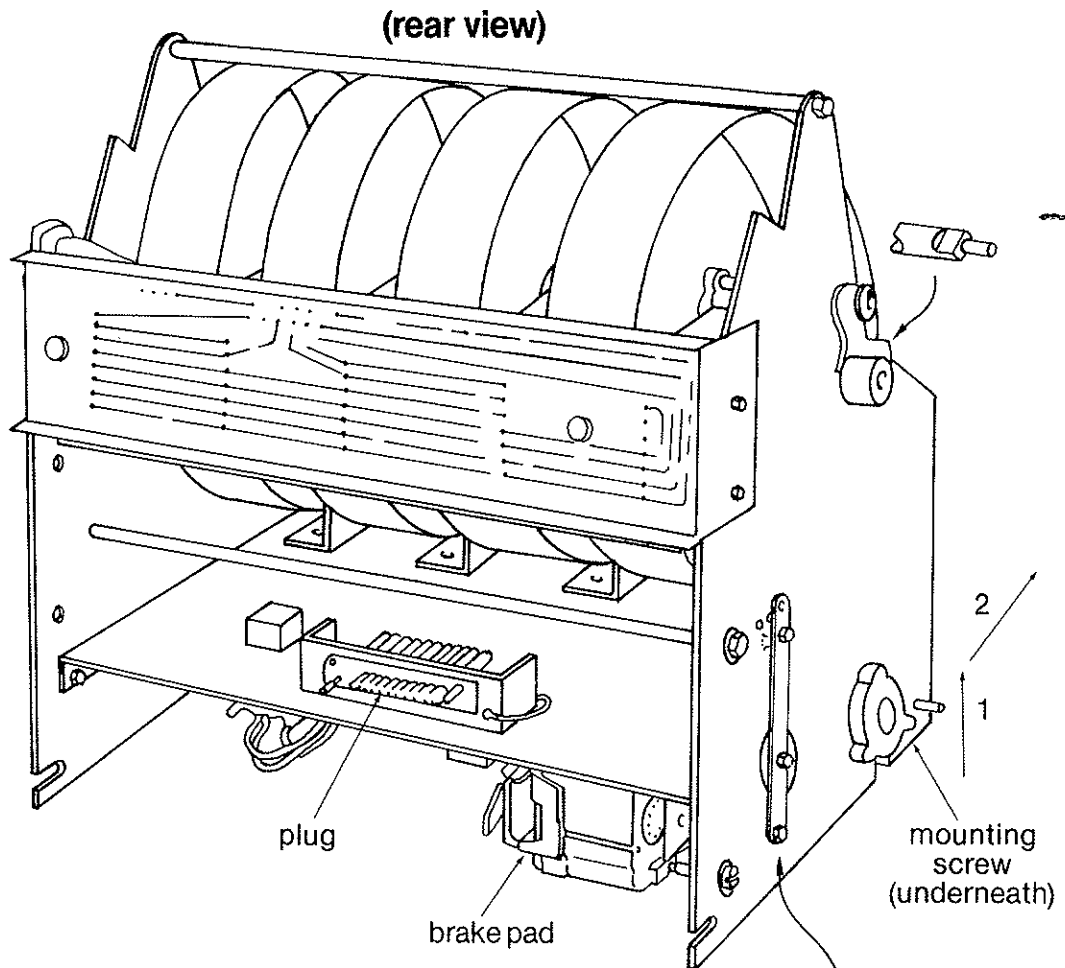
Mounting of Motor To Suit Different Pinions

To Remove From Cabinet

Remove the mountain screw, lift the frame and pull the assembly out as shown.

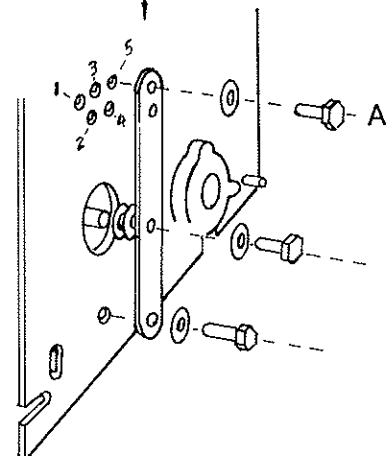
Note

The motor is mounted on an adjustable bracket to suit different color coded pinions which control the speed of the mechanism.



Screw (A) should be located as follows:

Hole	Pinion Teeth	Color
1	25	green
2	23	yellow
3	20	natural
4	18	black
5	15	blue
(USA only)		



A21 / Reels

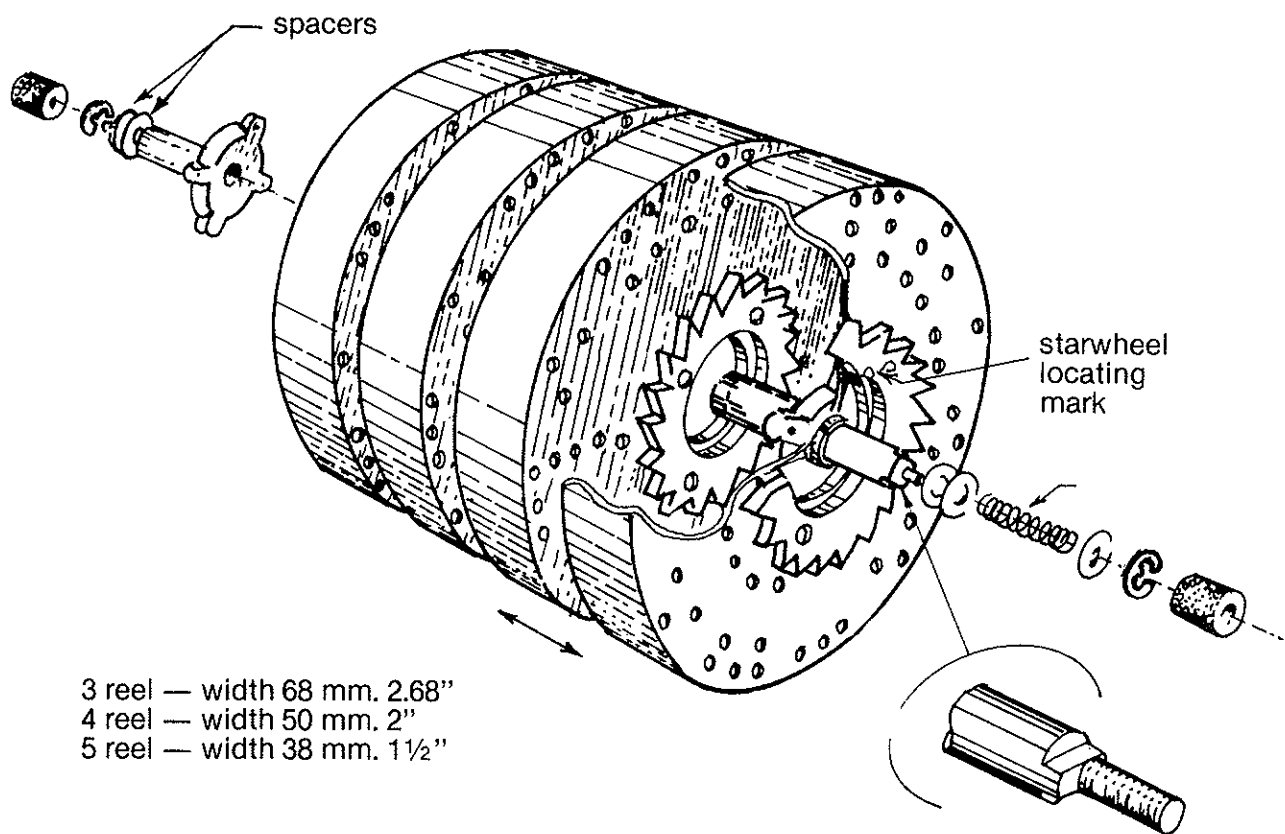
The reels are pressed against spacers by the spring. Use spacers to suit the individual assembly so that the reels are not rubbing against the stopper arms, etc.

Before taking the reels off the axle, number the reels from left to right, the reels are the same, the reel

strips are not!

The starwheel locating groove fits over a guide on the reel hub.

When assembling, make sure that the flats at the end of the axle fit in the slots of the casing.

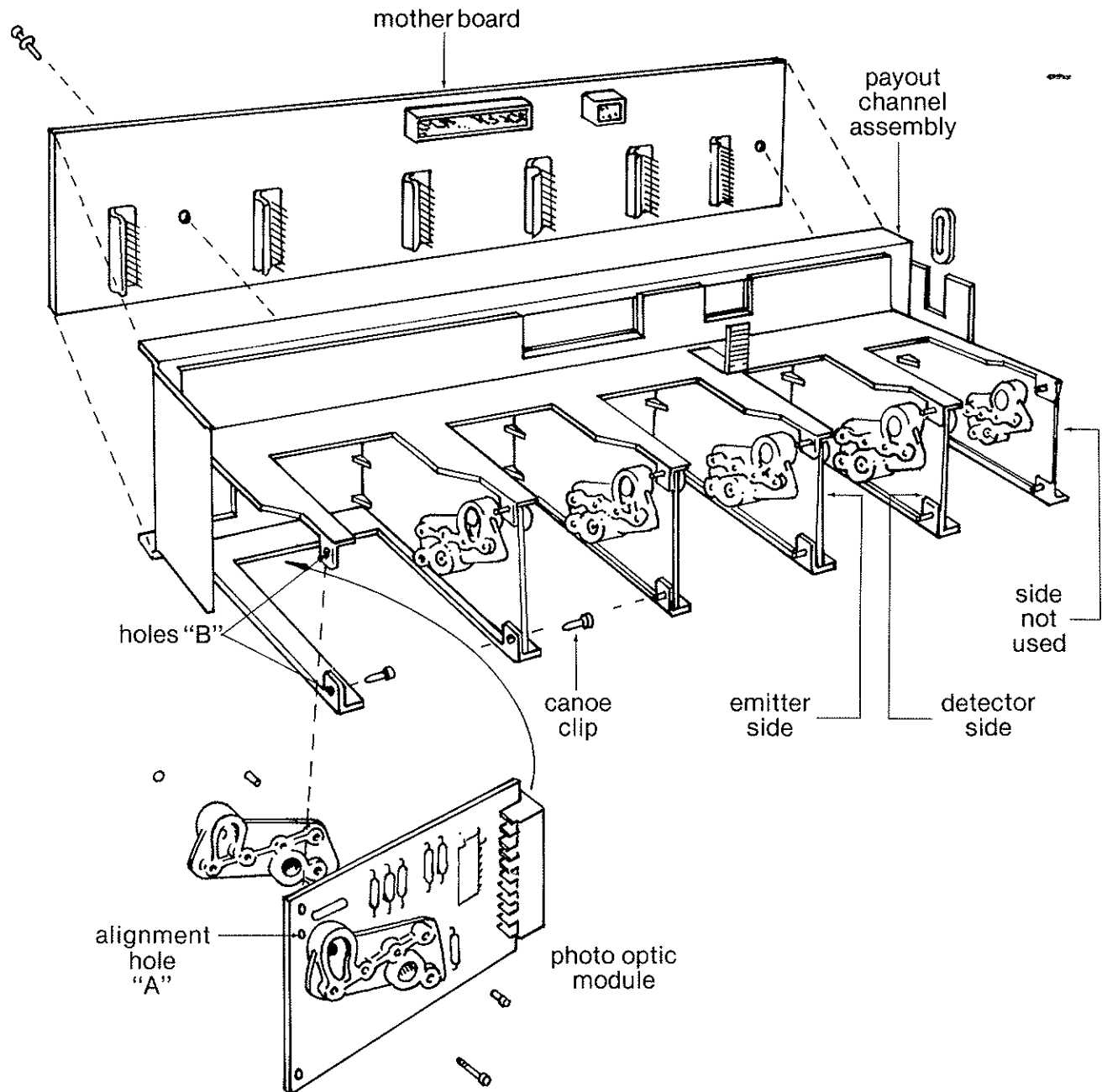


A22/Payout Channel Assembly

Basic Layout

To align the photo optics, look through the side frame and check if holes "A" are lined up.

To check the Channel Assembly, remove all canoe clips and photo modules. Look through the side frame and check if all the holes "B" are lined up.



A23/Introduction To Reel Decoding and Photo Optics

A photocell is a light sensitive transistor, called a DETECTOR. When we place a burning bulb opposite a photocell, current will flow and we create a "1" in binary.

Light emitting diodes are used instead of bulbs — EMITTERS. They emit infrared light which is invisible to us.

We use 5 emitters opposite 5 detectors in a "L" shaped row, mounted on small printed circuit boards. In between is the reel that has combinations of holes also in "L" shape. The holes represent in numerical order a binary readout from 2 to 23. The P.C.B. are double sided — the detectors are on the left side, the emitters on the right. Therefore, the extreme L.H. board uses only the emitters, the one on the right side of the machine only the detectors. Handy for a temporary changeover if one side of a P.C.B. is faulty. But **do** replace the faulty one as soon as possible.

The binary reading is decoded by the MPU and encoded for readout by the Verification meter when the

machine is in the Service Mode 2. The hopper reset button transfers it from reel to reel.

The light emitting diodes (LED's) are connected in series — if one goes open circuit, all are off. *not true*

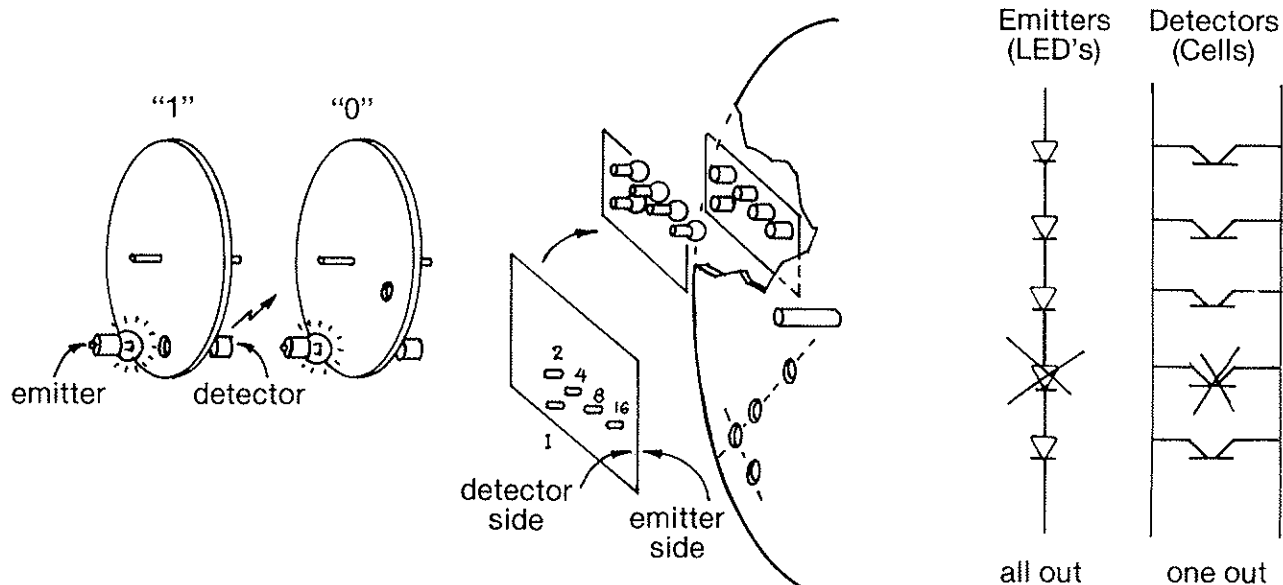
The photocells are connected in parallel — if one goes faulty, the others still work.

Summary

Loss of 1 emitter — Loss of all

Loss of 1 detector — Loss of one bit only

No light from emitters — "00" on the verification meter. Test position 8 and 23, it covers all the bits. Jackpot under the line will read No. 2 — turn the reel upwards for 3, 4, 5, etc. It means that if you set up the major J.P. (7's) on the center payline the verification meter should read no. 2 on all of the reels. If a bit is faulty, readout shows the difference. 23 reads out as 19, then you know that the "4" bit is faulty. If it shows 7, the "16" bit is faulty, etc.



NOTE! ON SOME MACHINES, LED'S ARE IN PARALLEL, NOT SERIES, EACH HAS ITS OWN RESISTOR

A24 / The Binary Code

How To Read It

To adjust the alignment of the reels in respect to the photo optics, it is necessary to understand the binary code.

Binary code as used in electronics is based on the fact that there IS a voltage or light or there is NO voltage or light. It is either YES Or NO, ON or OFF, or in binary 1 or 0.

BULB ON = 1

BULB OFF = 0

With a row of bulbs we can create combinations of ON or OFF and express this in binary. Example:

bulbs
1 0 1 0 0 binary

Each bulb has a specific value when ON, we only have to add up these values to find out what decimal number it represents. We read binary from right to left, the right hand value is the least significant number.

5 bulbs in a row with the decimal values given when on.

Values — 16 8 4 2 1
— Bulbs 0 0 0 0 0

Values when ON	16	8	4	2	1	note that: $1 = 2^0$
OFF, no values	•	•	•	•	•	$2 = 2^1$
ON, add up values	o	o	o	o	o	$4 = 2^2$
Combination	•	o	•	o	o	$8 = 2^3$
As seen in binary	0	1	0	1	1	$16 = 2^4$
Add values of bulbs "ON"	0 + 8 + 0 + 2 + 1 = 11					

How To Write It

When expressing a decimal number, e.g., 20 in binary, make up a combination of binary values that will add up to 20.

We start with 16, the nearest high binary value and "fill in" the rest with lower values. In this case that will be 4. $16 + 4 = 20$ or, in binary: 1 0 1 0 0

Other examples: $19 = 16 + 2 + 1 = 1 0 0 1 1$
 $13 = 8 + 4 + 1 = 0 1 1 0 1$
 $31 = 16 + 8 + 4 + 2 + 1 = 1 1 1 1 1$

We work with 5 photo optics, expressing 5 binary digits, or 5 bits. Binary is normally shown with 8 bits; 8 bits is called 1 byte.

Values of bits in a byte are: 128 64 32 16 8 4 2 1

The highest readout from a reel is 23; you can see why we only use 5 optics.

A25/Reel Alignment

Service Mode 2

Before you check the photo optics when wrong reading occurs, make sure that the reels and the photo optics are "lined up."

Remove the reels, look through hole 2 (with arrow) and check if the holes in the photo optic modules are "lined up."

If Not

Remove all the modules, check the line up of the channel assembly through holes 1 and 3 (arrowed).

If Not

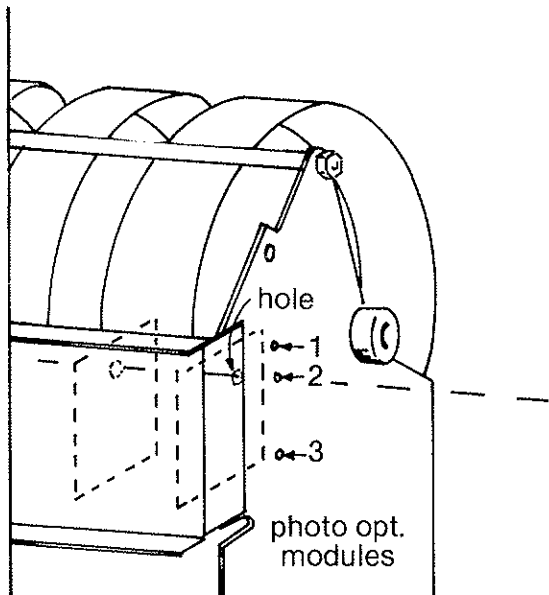
Adjust or replace the channel assembly.

If OK

Fit the reel assembly, and with the machine in Service Mode 2, check the sequential readout on the verification meter by turning the reel upwards, starting from J/P under the payline -2 and up to 23. Rock the reel gently up and down just enough to see the digits change, center with the stopper head adjustment screw.

"00" Read

Emitter side faulty (the L.H. side one). Replace it.



Wrong Readout

If the pos. 8 and 23 (they use all the bits) give the wrong reading, remove the reels. Place your hand between the modules to interrupt the (invisible) light and slowly pull your hand out. The following readout should show on the meter:

	verif. meter "00"
	verif. meter "01"
	verif. meter "03"
	"07"
	"15"
	"31"

Summary

No light — "00"

Loss of 1 emitter — Loss of all

Loss of 1 detector — Loss of 1 bit

All reels removed — Reads 31

If 23 reads as 19, the difference, 4, is the faulty bit.

Check the mother board for poss. faulty tracks.

(fault transfer)

bit values

2	4	8	16
●	●	●	●
1			
●			

A26/Reel Strips

Fitting Of

Opposite the locating groove in the starwheel are the perforations in the reel as shown below. The Jackpot card should be located approximately as indicated. The stopperheads are located opposite the screw and a shaft 43cm long (17") and 5.5mm dia. (217") is inserted through the larger hole underneath the holes marked with arrows in the side frame (See Reel Alignment). The stopperheads are now adjusted one by one until the shaft can be withdrawn without any of the reels rubbing. Providing the payout channel and photo optics are correctly aligned, this should be the correct setting of the reels. A measurement is taken from the base plate to the lower edge of the color on the card and marked on the side of the reel. All strips are then glued on, aligned on those markings.

In The Field

On most machines the reel strip starts with the Jackpot symbol. They are situated under the payline when the photo optic reads "2" from the reels displayed on the Verification meter when the machine is in Service Mode 2. If you have to replace a set of reels and fit the strips without alignment tools, use the following guidelines:

Centralize with the stopperhead adjustment screw the new reel(s) on number 2 on the Verification meter. Rock the reel(s) gently up and down just enough to see the digits change to verify this adjustment.

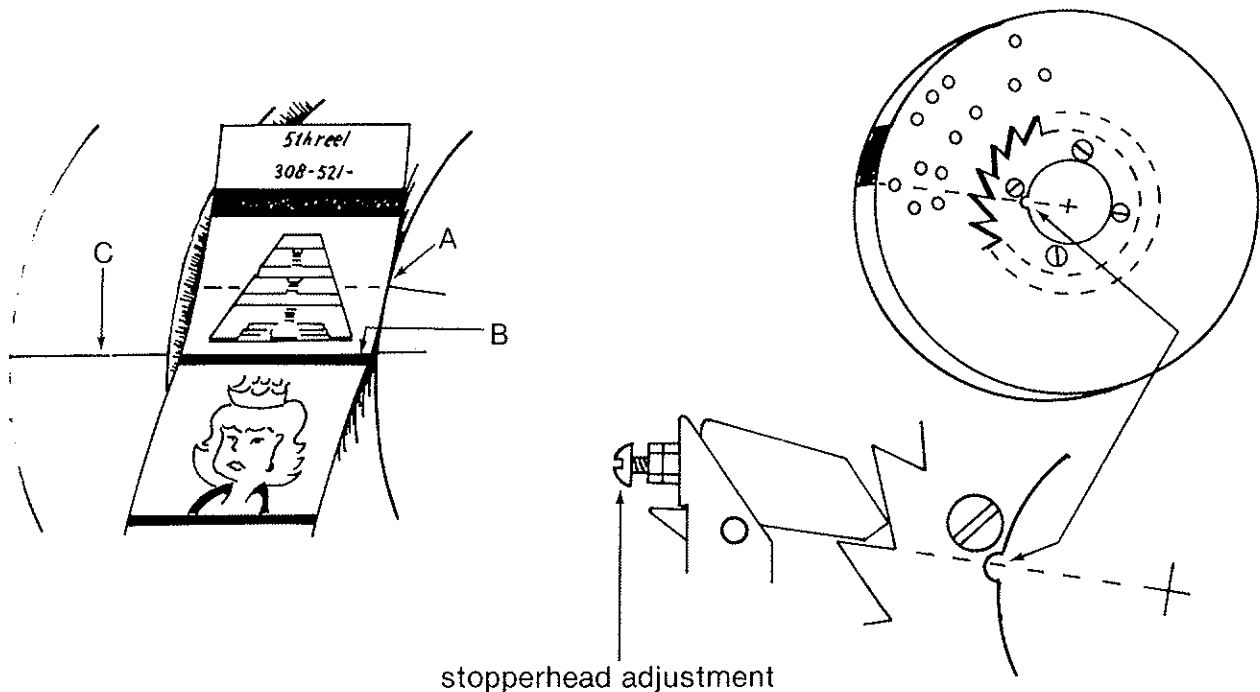
When you are satisfied that all reels are properly aligned, fit the front panel and reel mask.

Tighten the panel after you have made sure that the mask is located directly over the reels without rubbing, etc.

The mask is now your alignment tool. Draw a short line on the outer reels with pencil, directly under the payline (A).

Remove the mask, centralize the first card of a strip over the pencil mark and draw a line on the side of the reel corresponding with the bottom edge of the color on that card (B). The dividing lines on the strips can vary slightly in thickness, so use the edge of the color! By using a ruler, you can now draw a line across all reels showing a very uniform starting line for all strips (C).

As long as all cards are in line next to each other, the mask can be readjusted to centralize the payline to overcome a minor error.



A27/Reel Assembly Performance

Percentage Checks

Where MPU machines are not operating to carded percentage, check ALL the following points:

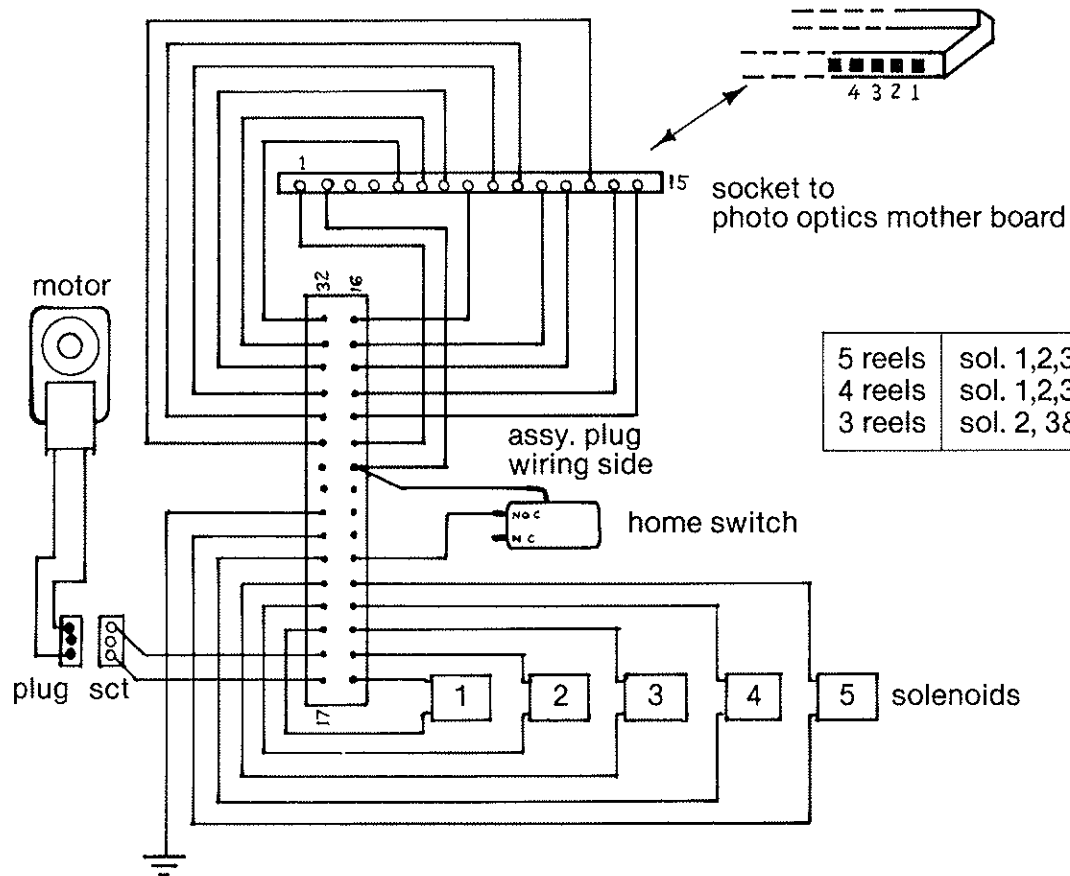
- 1 Condition of starwheels — broken or chipped teeth, bolts loose.
- 2 Sloppy, loose or worn stopper arm assembly.
- 3 Solenoids sticking in — look for dirt, oil, sticky plungers or worn parts.
- 4 Check if reels spin freely on axle, are reel bearings OK? Ensure that the reels are not touching the solenoid wiring, photo optics, stopper arms or reel cover.
- 5 Reel positions are centrally located and give correct reading on the verification meter.
- 6 Adjustment and position of the home cam switch and loom plug.
- 7 Correct adjustment of the Reel Mech motor (critical).
- 8 Condition of the Amphenol plug and socket, penetration, cracked, broken or bent.
- 9 Check carding on the reels,
 - Check carding matches program fitted to the processor.
 - Check if reels are in the correct positions.
- 10 Plastic retaining pins missing on the photo optics.
- 11 Check for oil on the sides of the reels and optic cards — it can reflect the infrared light causing incorrect reading.
- 12 Are the holes in the reel clear and not blocked? And are the optics clean and free from foreign matter.

It can be difficult to determine why a machine does not operate to its carded percentage. Seemingly good starwheels can well be the problem. Replace them if all the above checks fail to show any faults.

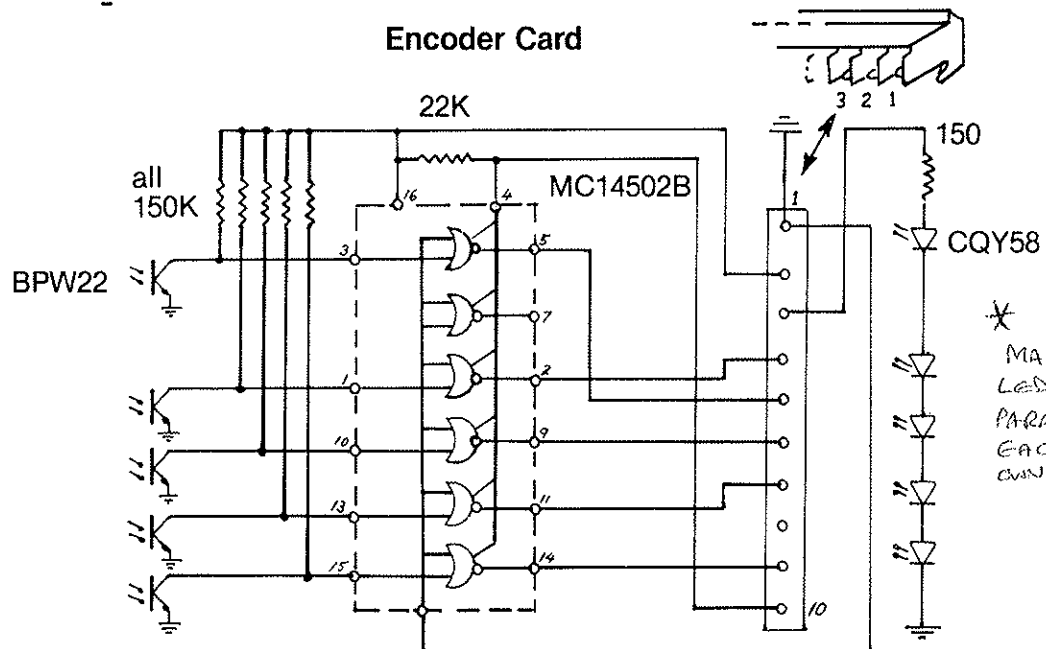
NEVER force a reel around if the stopper block is not clear of the teeth of the starwheel as it can very slightly bend the tips of the teeth or, of course, break them.

A28/Mechanism Wiring and Schematic

Reel Mechanism



Encoder Card



A29/Hopper

Introduction

This unit can pay out up to 500 coins (300 Ike Dollars) automatically. It is mounted in the cash drawer with four screws and is easy to remove if necessary.

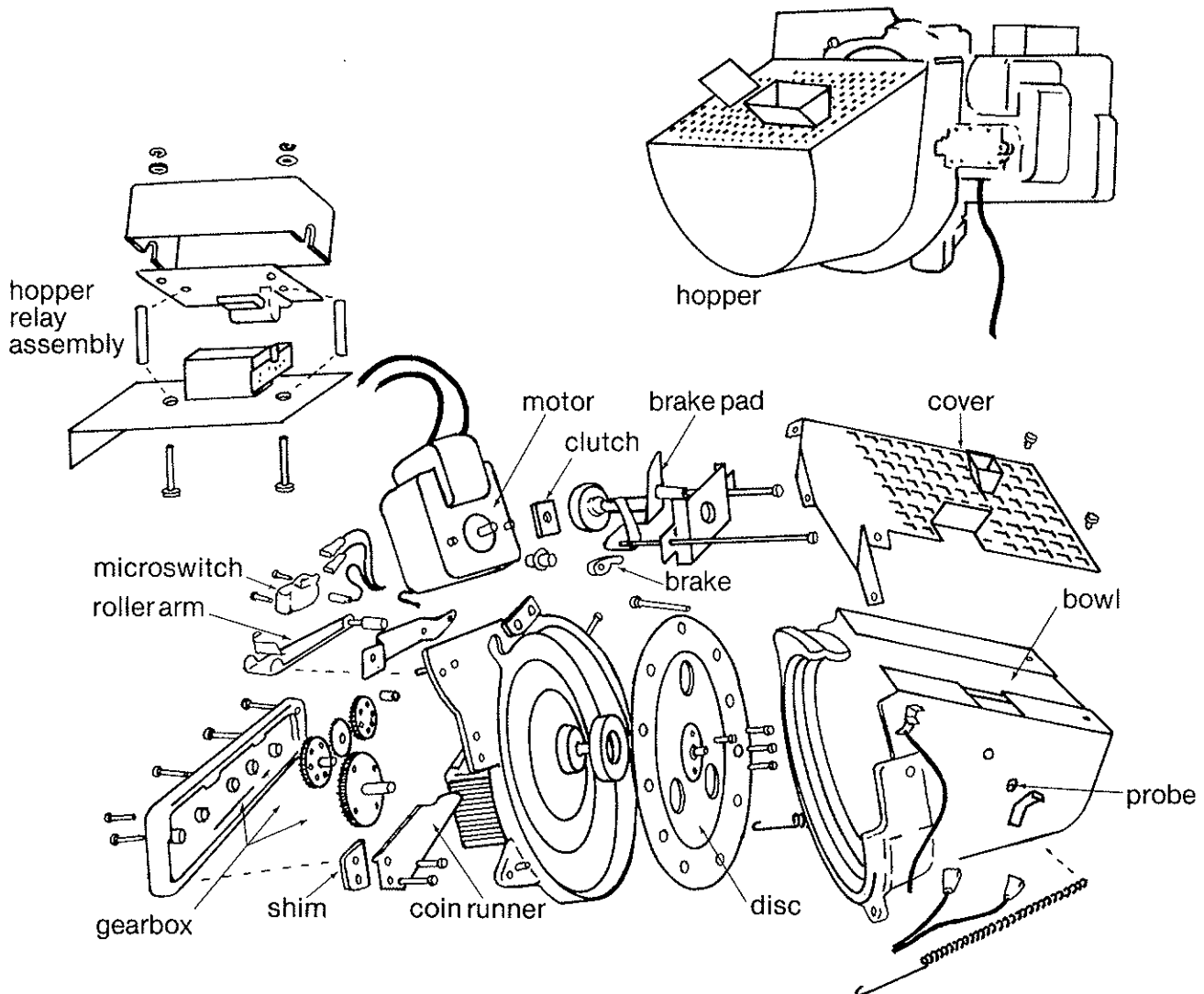
Electrical connections are via a plug at the rear of the drawer, which is pushed into a socket, mounted at the back of the cabinet. The plug is guided in place by two conical shaped rods. The R.H. rod actuates a microswitch which disconnects the mains from the socket for safety when the drawer is taken out of the machine.

A 24V DC relay assembly, mounted on top of the motor, switches the 110V AC voltage to start the motor.

The motor, designed to run only for short periods, should not be "ON" for longer than five minutes.

A small gear at the end of the rotor spindle fits into the gearbox. There should be some backlash between this pinion and the mating gear to ensure a nonbinding contact. The gearbox is greased packed and should not need servicing.

The bowl cover may vary in shape to suit the type of machine. A coin level probe is fitted. When the level of the coins reaches the probe, electrical contact is made which results in activating the coin divert solenoid in the coin chute, directing the coins into the cashbox.



A30 / Hopper

Description

Hoppers are available in various denominations. Each denomination has its own size disc (8) and runner (1). The disc can be removed by unscrewing four screws (6) in the center. It is operated via a gearbox by a 110V AC motor, intermittently rated, (thus only short runs). The hopper bowl is located by two pins (12) underneath and is held in place by two springs (11) and a spring loaded clamp (10). This is to allow the bowl to move outwards for the coins to clear which would cause jams. Three conical pins (9) on the rotating disc keep the coins moving in the bowl.

Rod or plate stirrers are added for large coins (Dollar hoppers). The coins will settle against the disc and are scooped up by the coin driving pins (7). They are carried to the coin runner and actuate a microswitch in the process (5), via roller arm (4).

Coin counting, "time out" and "no coins passing" are detected by the switch. On the down stroke of the arm, the coins are counted. If the arm stays up due to a coin sticking or a "cheat" wire, the motor stops after one second, called "short time out." The arm not being pushed up could indicate that the bowl is empty. This so called "long time out" will also stop the motor. In both instances the hopper reset button has to be pressed before the motor will start again. Keep that in mind when testing!

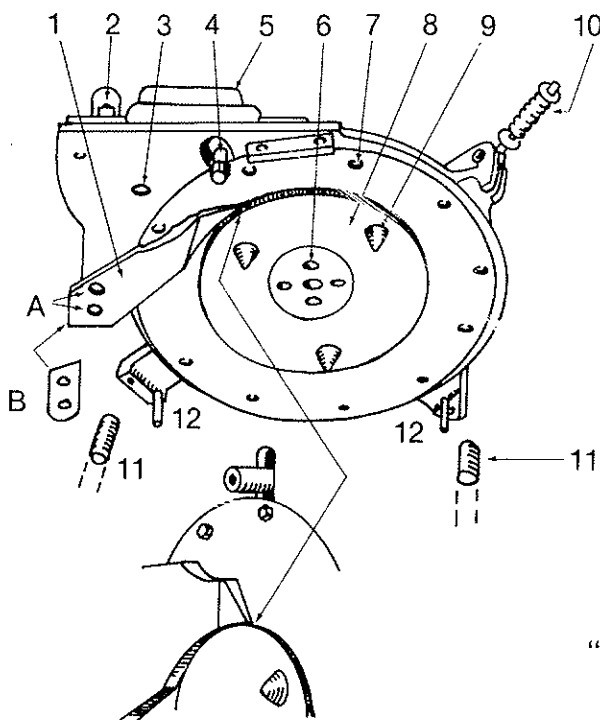
Adjustments of the microswitch and the coin runner are critical. The roller torsion spring causes the coin to eject vigorously. The roller should not rest on the disc. A steel ball (3) protrudes slightly, .3 to .13mm, from the casting near the hopper exit. Dirty coins could leave a sticky deposit and cause the coins to slow down or stop there. It also prevents wear on the casting.

Coin Runner Adjustment (critical)

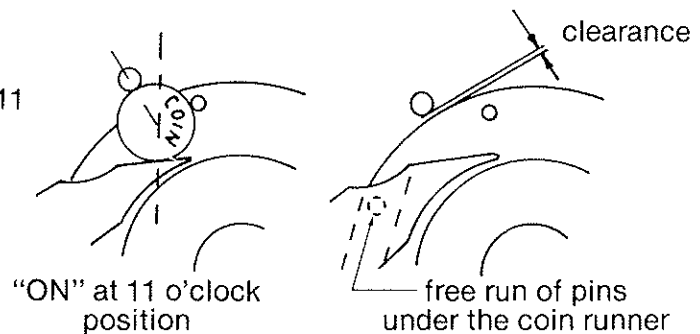
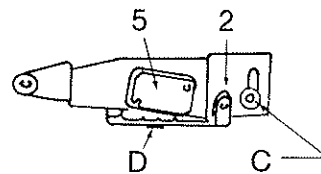
Locate the tip of the runner close into the sheif wheel, as shown below, without rubbing against the disc. Tighten screws A and use shims B as required. Check for free movement of the coin driving pins (7) under the runner (1) by turning the disc clockwise by hand.

Microswitch Adjustment (critical)

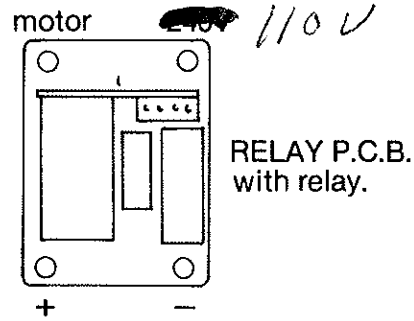
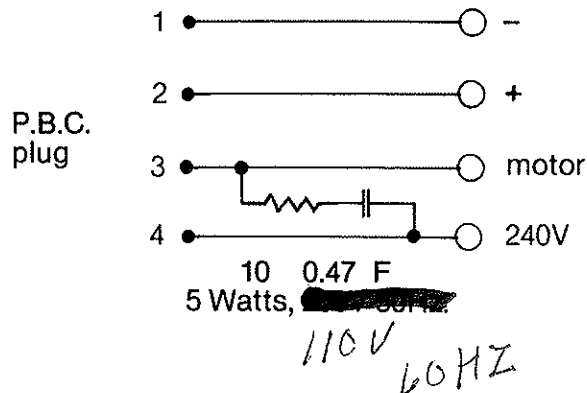
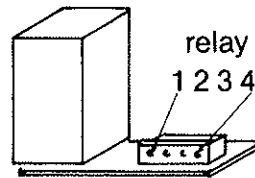
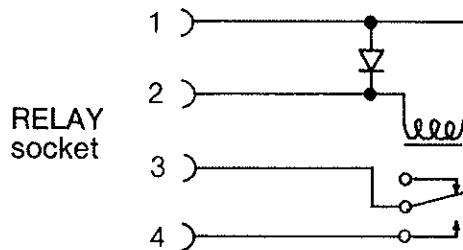
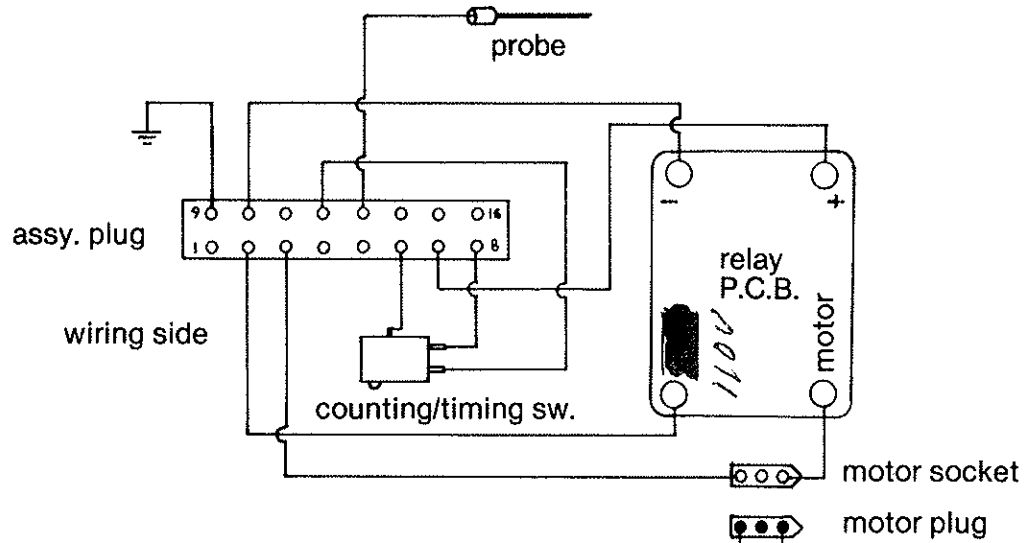
Switching should occur at the approx. 11 o'clock position (audible click). Adjust with the hex. screw C. When released, it should switch off. The roller should not touch the disc when in rest position, adjust D by bending. A length of "spaghetti" from ear to the switch can be helpful in noisy surroundings to detect the "click" of the switch.



RUN THE MOTOR FOR NO LONGER THAN 5 MINUTES



A31 / Hopper Wiring and Schematics



A32 / Friction Handle Assembly

Introduction

The friction handle assembly has been designed to give the player the "feel" of the old type handle he has been used to. In reality it actuates two microswitches that start the game. Microswitches A and B. A solenoid locks the assembly when there is no credit, but once a coin has been inserted, it is activated and the player can pull the handle. When switch B is switched on, the solenoid de-energizes and remains off during the game cycle. At the end of the cycle, it will remain de-activated unless there is still credit in the machine.

This assembly is a low maintenance mechanism. Grease between the ramps, the ratches, pawls and contact areas of the microswitch fingers. Apply a drop of oil at pivot points, but keep the solenoid DRY.

Switch A should be in "closed" position when the handle is at rest and "open" when the handle is pulled.

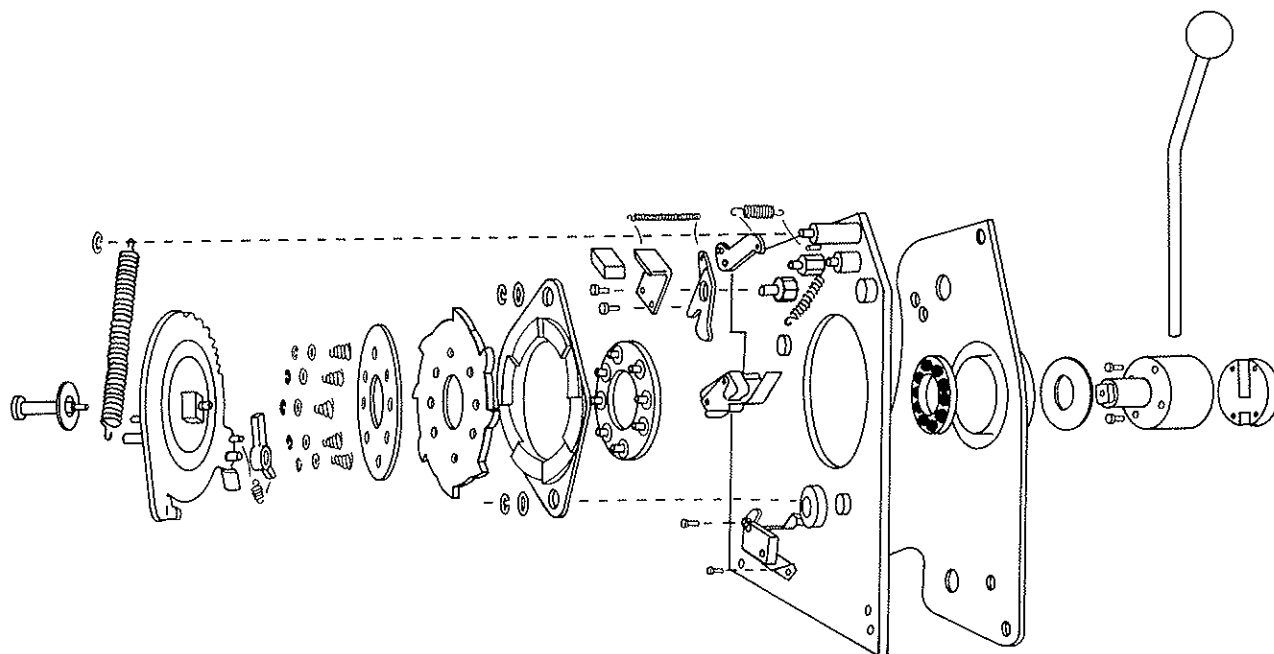
Switch B should be in "open" position and "closed" just before the end of the pull.

The reason for the two switches is that the handle has to be in the rest position before the game can be started.

It is important that all 4 mounting screws are used to hold this unit in place in the cabinet.

Special knurled screws are available to keep the assembly together when the handle has to be removed before taking the assembly out of the cabinet.

PART No. 339/47 (2 only required)



A33 / Friction Handle Assembly

Tools

2 knurled screws, part number 339/47

Dismantle

- 1 Fit the above screws in holes (C) to hold the assembly together.
- 2 Disconnect plug/socket.
- 3 Unhook grounding spring (D) and spring (E).
- 4 Put an elastic band around pawl (G) and the solenoid to keep the pawl clear from the ratchet.
- 5 Remove hex. screw (F), take out the handle.
- 6 Remove the 4 mounting screws (I) and take out the assembly.

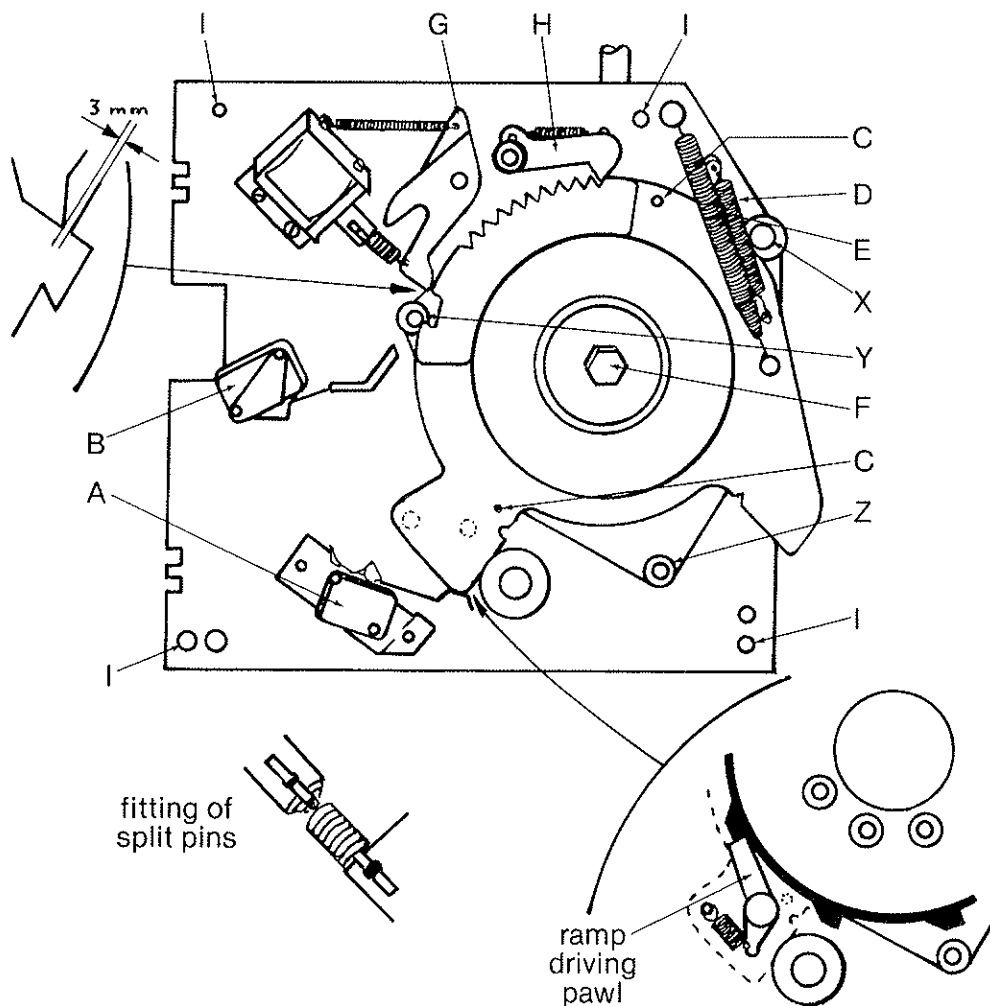
To remove the arm assembly from the plate assembly, remove spring clips X, Y and Z. When you assemble it again, make sure to keep the driving pawl clear of the ramp as shown in the insert below AND the microswitch lever.

Assembling

Do this in reverse order. Locktite on F and I. Don't forget to remove the 2 screws from holes (C)!

Checks

Microswitch (A) should be in the "closed" position with the handle at rest. Switch (B) should "close" near the end of the handle pull. The split pins on the solenoid and pawl fitted as shown. The ramp driving pawl not jamming.



A34 / Coin Acceptors

Transfer cradles are used to test the size of the coins. Undersize diameter coins will pass between the legs of the cradle. Oversize diameter coins will fail to pass between the cradle and wiper. Oversize in thickness is checked by the magnet housing. The magnetic properties of the coins are checked by the magnet itself. Copper is slowed down and rolls off short of the "accept" entrance. Brass and zinc will overshoot and be returned. Underweight coins will not actuate the cradle. A solenoid (coin lockout coil) causes coin reject if de-energized.

We use different brands of coin acceptors that fit in the selector mounting brackets of our machines. They are not always interchangeable. They are all factory adjusted and should therefore not be touched. However, somebody's screwdriver may have slipped and the following checks should be made.

It is important to keep coin acceptors very clean. Spilled drinks, etc. can cause problems.

ADJUSTMENTS

Magnet

Adjust magnet for minimum clearance of new coins with screw.

Separator

Start with the separator on the right. Test with coins while moving the separator bit by bit to the left until all coins are accepted.

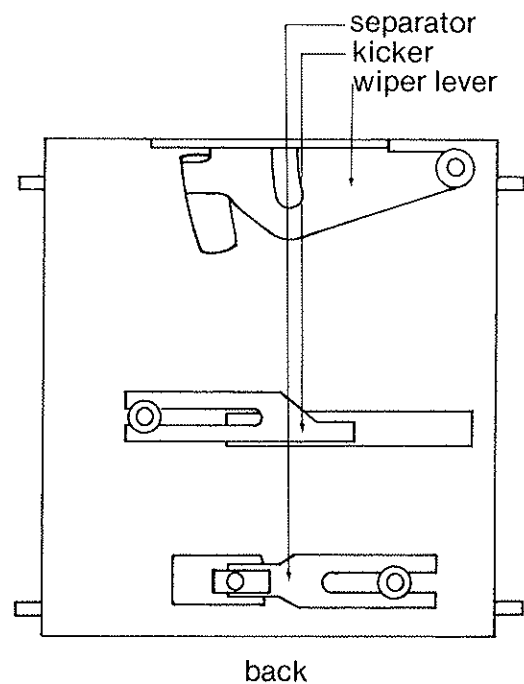
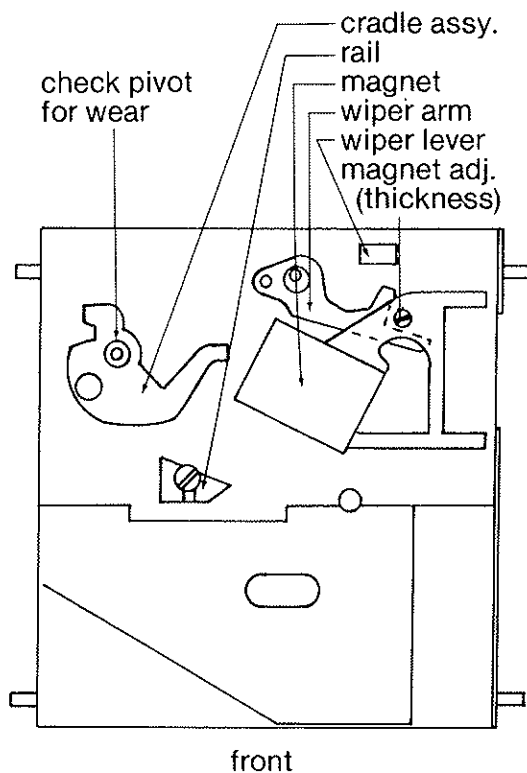
Kicker

Start with the kicker on the left. Test with coins and move it to the right until all coins are accepted.

There is no fixed setting and adjustments are made by trial and error.

Maintenance

Clean with methylated spirits. Keep DRY — NO oil or grease. Free movement of the cradle. Clean bearing and spindle, lubricate with graphite or lead pencil. Check magnet for filings.



A35 / Coin Chutes with Photo Optics

A compact system with photo optic coin detection is utilized. Safety features, such as timing (between 40 and 80m/sec) and anti-string are incorporated.

This is done by placing two sets of photo optics side by side as shown. Coins pass between the first set of emitter/detector, blocking the infrared lightbeam, which is registered by the MPU. Then the second light is blocked.

Only in this sequence will the MPU initiate a game. If the situation reverses (yo-yo), the MPU will not accept it as a valid coin entry.

Timing and counting are sensed during the moment that both light-beams are blocked by the coin.

Two systems of photo optic detection are used.

- 1 An emitter shining THROUGH the slot in the chan-

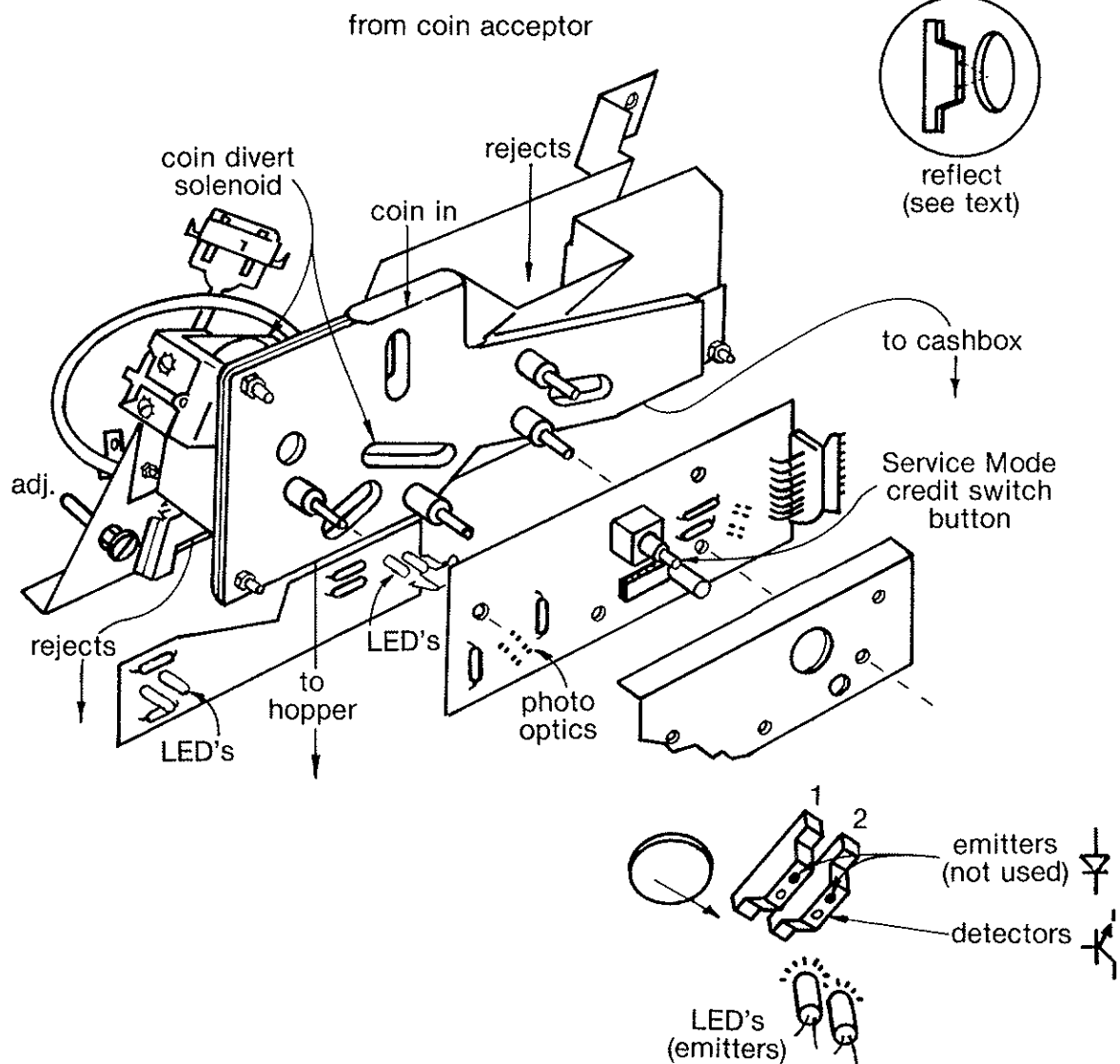
nel (as shown), the beam continuously "activating" the detector until interrupted by a coin.

- 2 An emitter shining INTO a slot until the infrared light is reflected by a coin and "activates" the detector. This eliminates the use of a second P.C.B.

The solenoid, 24V DC, opens the path to the cashbox when the probe in the hopper makes electrical contact with the coins.

Accepted coins will cause the Verification meter to go up by 1. The "Play Now" bulb will come on if no credit exists. If the solenoid diverts the coins into the cashbox, the Cashbox Counter goes up by 1 as well.

The adjusting screw should be set for correct transfer of coins from the chute.



A36/Bulbs

Fluorescent tubes used are all 110V AC, 8 Watts.

Starters are PEMSOC 2. (May be replaced with FS-5)

In case of failure, try the starter first before you attempt to remove the bulb.

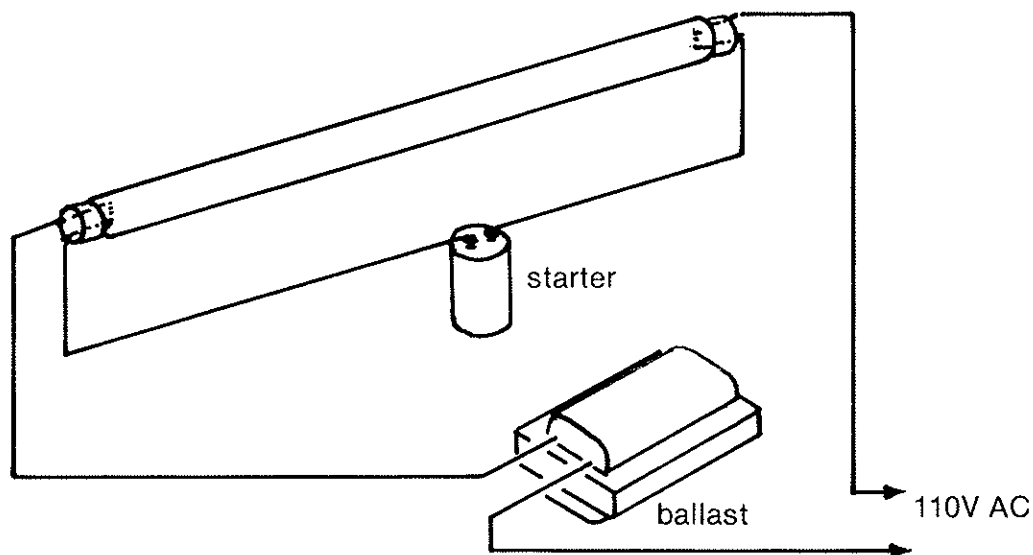
Check if the tube is fully engaged in the sockets, the two pins should slide in sideways and when in, turned 90 degrees for good electrical contact.

Festoon bulbs, tubular, with a contact on each end. 24 V AC 3W. Most of the holders are fitted on printed

board. To remove a bulb, the best way is to pry one side out first with a small screwdriver and then withdraw it. Printed tracks can be damaged if you try it any other way. Support the board when you put one back in. Clip it in, one end at a time.

Bayonet type bulbs, 24 V AC 3W (Philips 10- 13829) are used for counters illumination and "time out" of the pay out unit. The holders are pushed into rubber grommets and can be pulled out when a bulb has to be replaced.

Wiring of Fluorescent Bulb



A37/Game Cycle

Sequence of Operation

When the power is applied, the processor does a self-check on its own program and the Game Invalid bulb comes on.

The motor rotates the Reel Mechanism until the cam switch is actuated. The motor stops, the Insert Coin lights up and the Coin Lockout solenoid is energized.

When a coin has been inserted, a beep can be heard. The handle solenoid is energized, the handle can now be pulled. The Play Now bulb is lit.

The coin has to be checked for size, etc. and the time it took to pass a set of photo optics in the coin chute.

On the forward stroke of the handle, switch "A" switches off and "B" goes on. Switch "B" gives the command to the MPU to fire the reel solenoids to spin the reels. After a program controlled delay, the Reel Mechanism motor starts.

Insert Coin and Play Now bulbs go off, the handle and Coin Lockout solenoids are de-energized.

On the return stroke of the handle, switch "B" goes off and "A" switches on, indicating to the MPU that the handle is in rest position.

The resetting stopper arms stop the reels one by one, from left to right, releasing the latch levers in the process.

Back in the home position, the switch at the cam-shaft indicates to the MPU that the game cycle is completed.

The Reel Mechanism motor stops, the MPU searches for a paying combination by decoding the photo optic reading (in binary) of the reels.

If No Win on CREDIT MACH. (with credit)

The coin Lockout and handle solenoids are energized. Play Now and Insert Coin lamps on.

If No Win on CREDIT MACH. (NO credit)

The Coin Lockout solenoid energizes and the Insert Coin bulb comes on. Credit meter to zero.

If Win on CREDIT MACHINE (under 500 [300 Ike Dollars] coins)

Credit meter up by 1 for each coin won. Credit Win counter up by 1 for each coin won. Melody played. Coin Lockout and handle solenoids are energized. Play Now and Insert Coin bulbs come on.

Pay Out On The Above

Press the Collect button, the handle and Coin Lockout solenoids de-energize. The machine cannot be played.

Hopper relay "on", the Hopper motor starts. On payout, the Hopper microswitch pulses, counting the passing coins on the downstroke of the switch actuator. (Full details in "Introduction of the Hopper"). Credit

meter 1 down for each coin paid out and the Verification meter 1 up per coin paid out. The latter is cancelled at the next game.

Win on Credit Machine

OVER 500 COINS (300 Ike Dollars)

Can not be paid out by the pay out mechanism, the attendant has to pay from the book.

Press the Collect Button, the Credit meter will flash. The attendant turns the key in the lock on the side of the machine. This will reset the Credit meter, stops the flashing and energizes the Coin lockout solenoid. Insert Coin bulb comes on. The last Credit meter reading will be added to the Cancel Credit Payment Counter.

Jackpot on Credit Machine

Melody can be heard, Jackpot light flashing. Coin Lockout and handle solenoids de-activated and the machine can not be played. The attendant turns the key. Melody stops, so does the flashing. Credit meter resets.

Jackpot counter increments by 1 for every 10 coins won, or as stated on the counter.

Coin Lockout solenoid is energized and the Insert Coin bulb comes on.

Non Credit Machines

WIN UNDER 500 COINS (300 Ike Dollars)

Insert Coin bulb off. Handle and Coin Lockout solenoids de-energize.

The hopper pays out. After pay out, the Insert Coin bulb comes on and the Coin Lockout solenoid is energized.

WIN OVER 500 coins (300 Ike Dollars)

Jackpot Win bulb will flash. Insert Coin bulb off, Coin Lockout solenoid de-energized. The attendant has to make a book pay. When he turns the key, the flashing stops and the Insert Coin bulb comes on. Coin Lockout solenoid is now energized.

Note

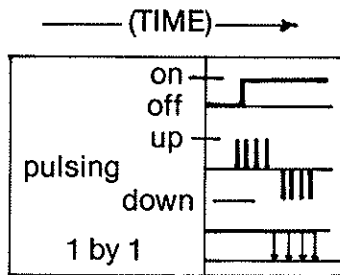
The game cycle may vary slightly between different machines. Validation meters are used in Multiple Coin Machines where more than one coin is used for a game. There are other variants, but the basic steps as described may give you a better understanding of "what goes on."

Unlike the mechanical machines from the past where a distinct sequence of operation could be followed and the machine could be stopped at almost any of those steps, the MPU machine is different.

A lot of things seem to happen at the same time, but when analyzed, the above can be of great help.

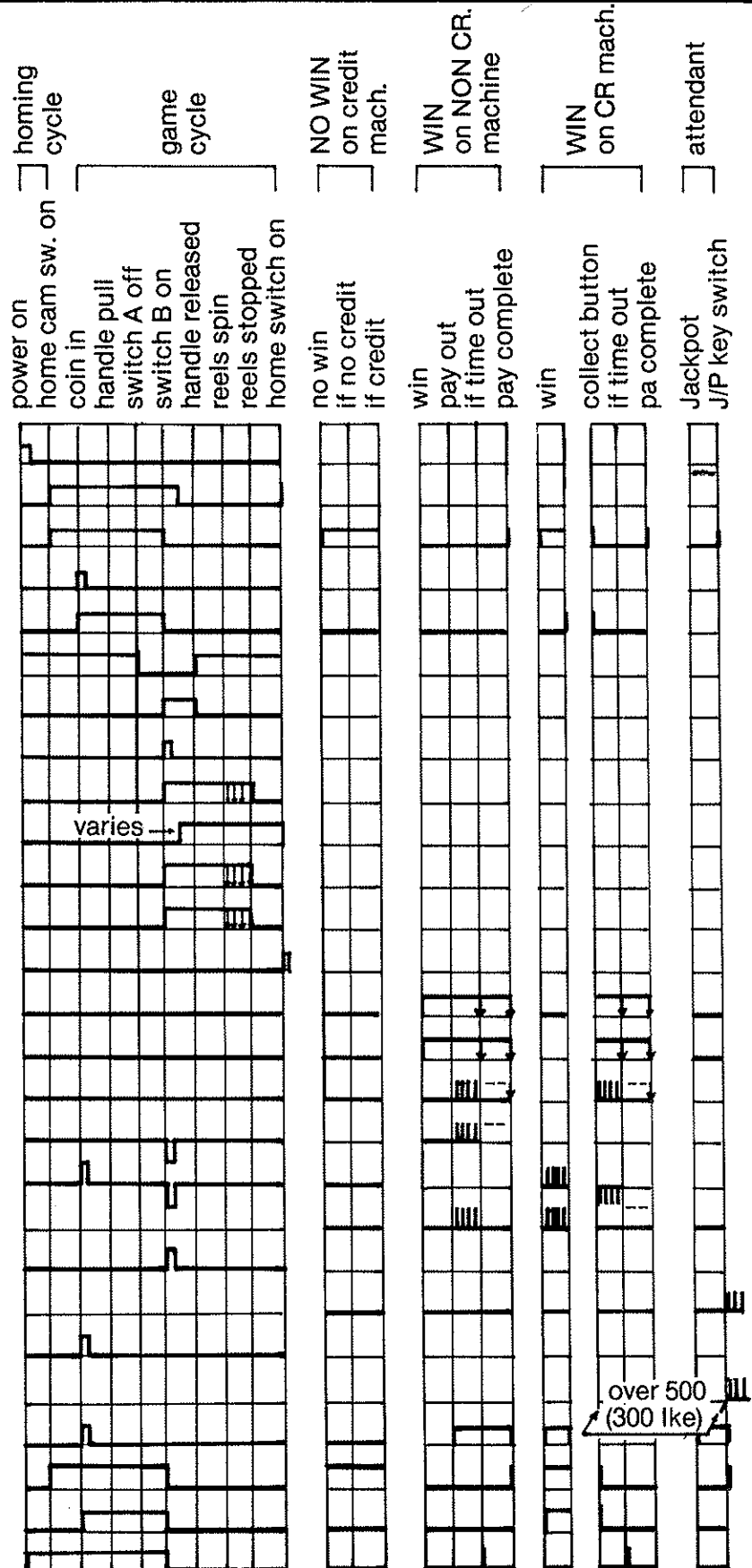
A38 / Linear Sequence Chart

Cycle Sequence



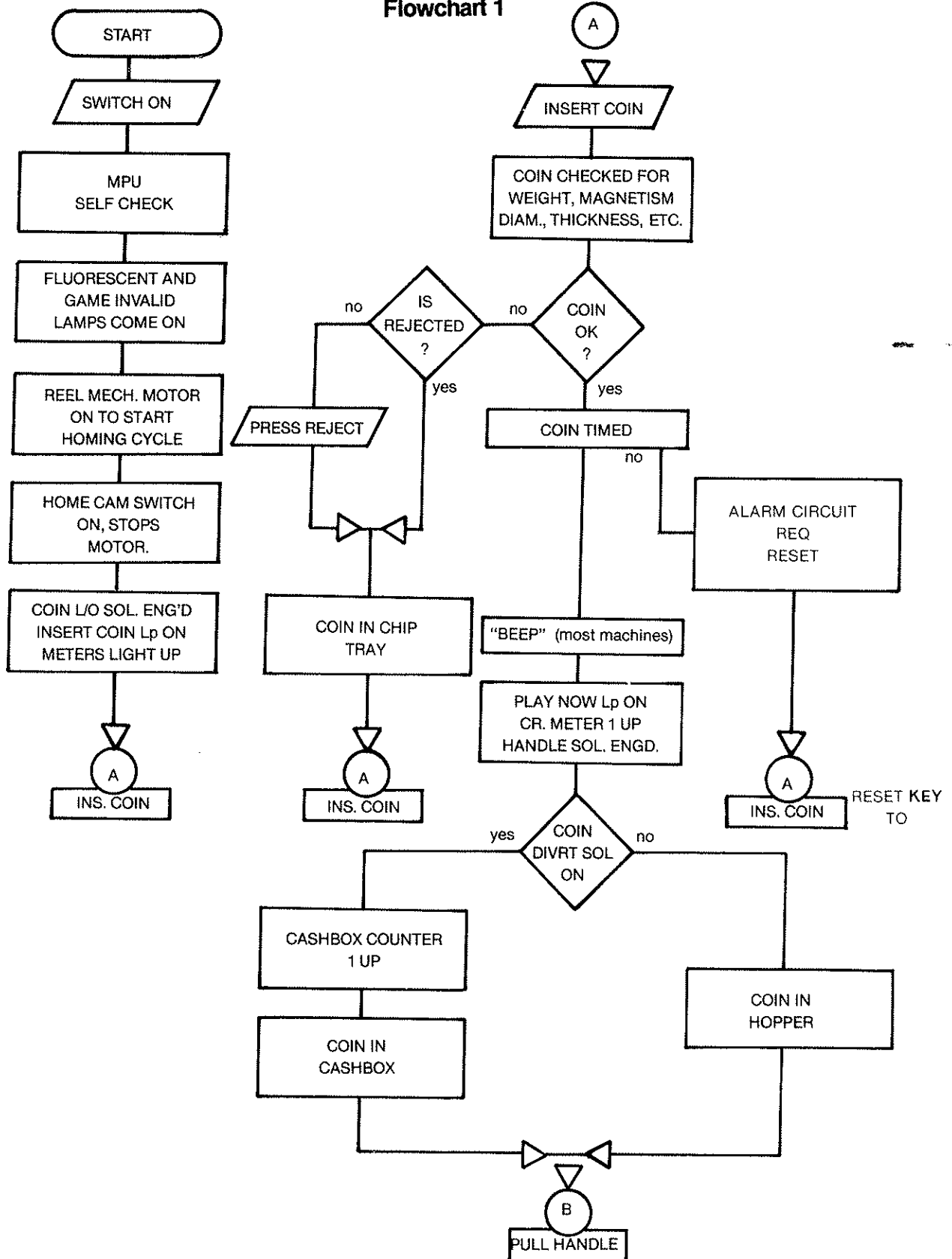
ITEMS
ENERGIZE or
ACTIVATE

MPU self check
 home switch
 coin lockout solenoid
 coin check and timing
 handle solenoid
 handle switch A
 handle switch B
 fire reel solenoids
 reels spin
 reel mech. motor
 stopper arms
 reel solenoids
 MPU search for pay
 hopper relay
 hopper motor
 hopper coin count sw.
 verification meter
 credit meter
 credit win counter
 total games counter
 J/P pay counter
 cashbox counter
 (hopper probe on)
 cancel credit pay cnt.
 speaker
 Insert coin bulb
 Play now bulb
 Game invalid bulb



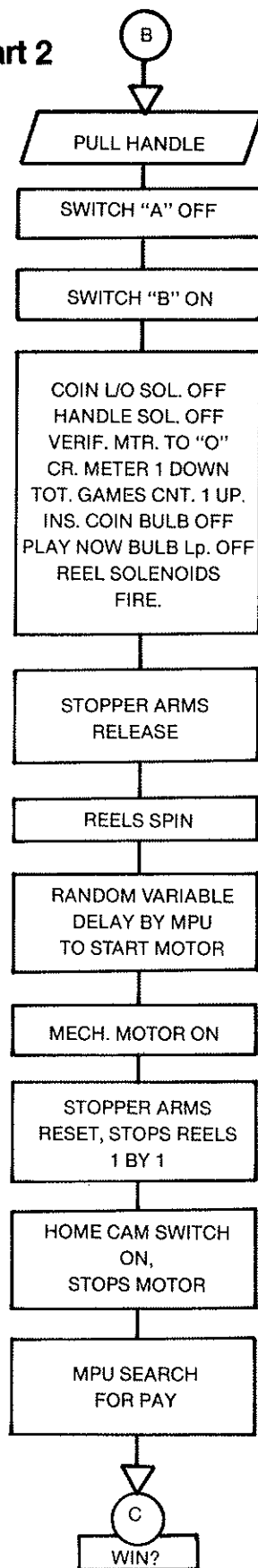
A39/Game Cycle

Flowchart 1



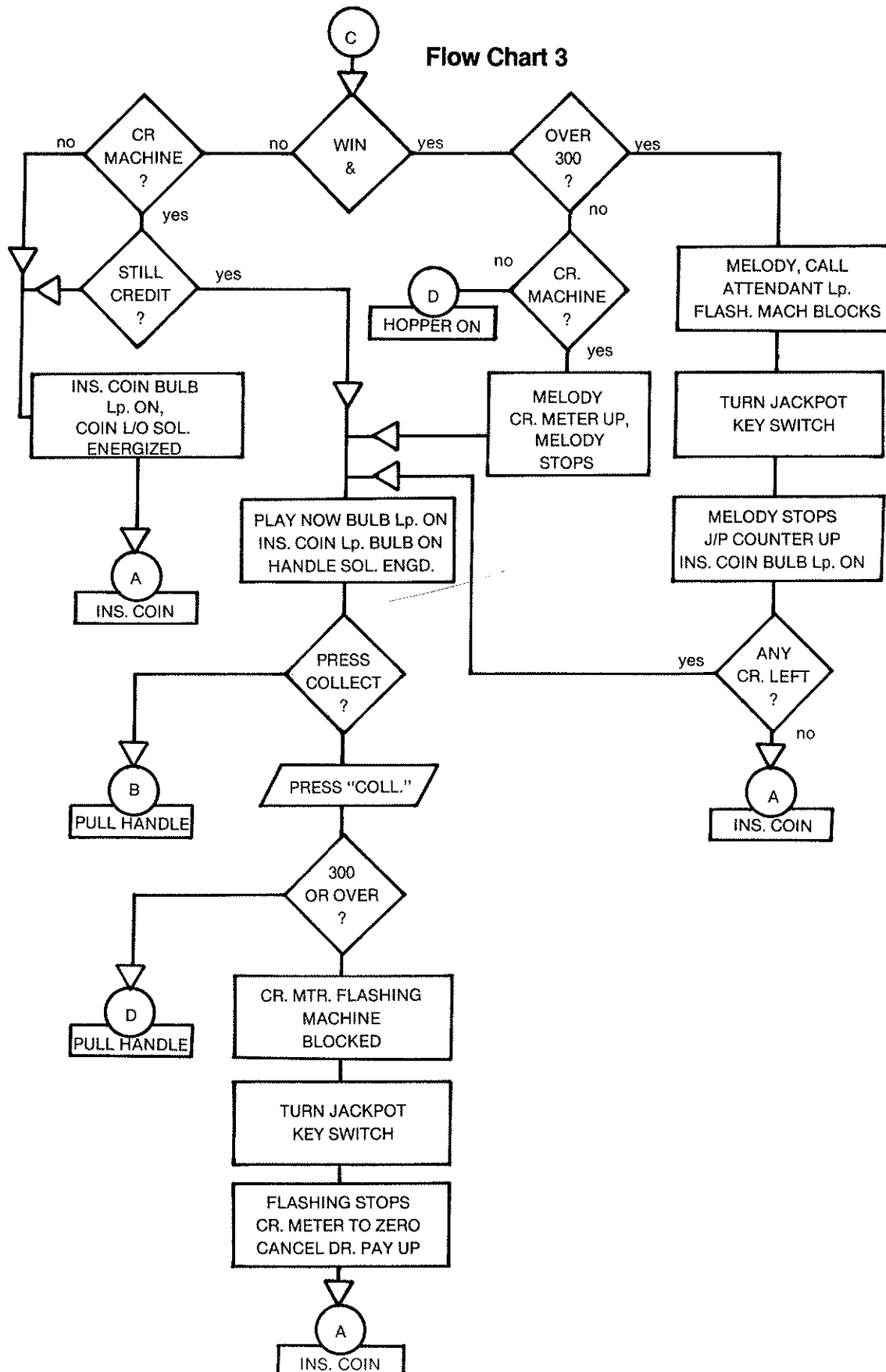
A40/Game Cycle

Flowchart 2



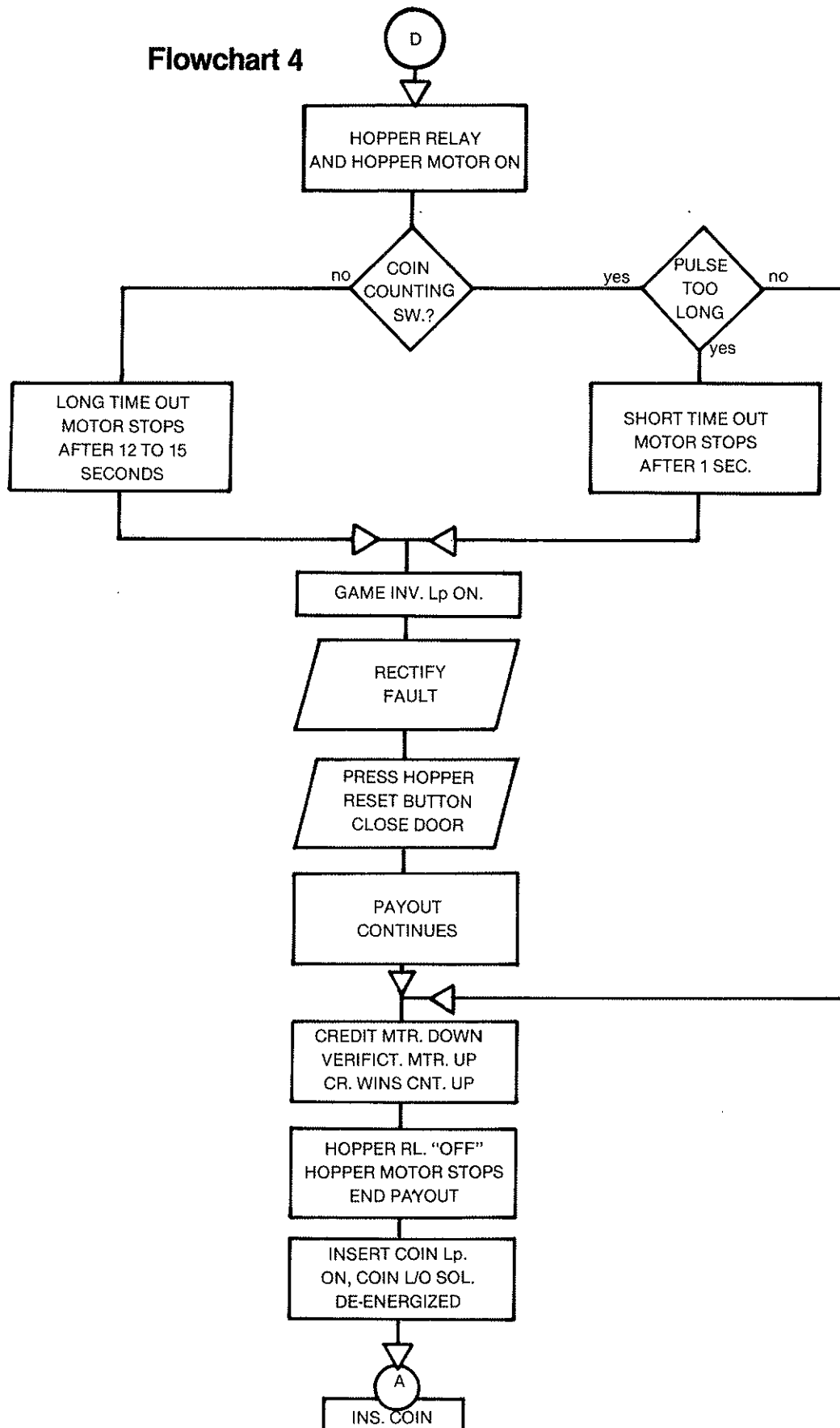
A41/Game Cycle

Flow Chart 3



A42/Game Cycle

Flowchart 4



A43/Introduction To Electronic Faultfinding

Since the machine acts on commands given by the MPU, it is important to understand the purpose of all switches, buttons and photo optics which give instructions to the MPU.

Technology, however advanced, has not reached the stage of making individual components foolproof. We endeavor to use the best quality components available for our microprocessors and have designed circuits to prevent microelectronic overload. However, breakdowns do occur causing the machine to malfunction.

We use a multimeter to measure the various AC and DC voltages and use the OHM scale to check bulbs, solenoids, relays, fuses, diodes, etc. Internal batteries provide the voltage necessary to make OHM tests. This voltage can be fatal to the MPU during testing. Therefore, DISCONNECT AT ALL TIMES THE MPU before you use the OHM meter.

A logical approach to find the reason for failure is necessary. Understanding of the sequence of events during the game cycle is important.

Is the part faulty?

Can it be reached by the MPU via wiring, plugs, sockets, etc.

Has the MPU been given instructions by means of that switch, wiring?

Is the MPU malfunctioning?

Let's assume a reel solenoid does not fire, the fault can be:

- 1 Dirty, oily or jamming solenoid.
- 2 Coil can be open circuit.
- 3 Coil can be short circuit.
- 4 No voltage or low voltage present.
- 5 Wiring can be broken.
- 6 Plugs and sockets not making contact.
- 7 The triac is faulty.
- 8 The triac is not triggered.
- 9 Controller board faulty.
- 10 Driver board faulty.
- 11 Mother board faulty.
- 12 The program can be out of its cycle.
- 13 Switch "B" on the handle assembly at fault.

A logical approach would be:

1. Check the solenoid by operating it manually and check it visually.
- 2 Is the fuse OK?
- 3 Is the reel assembly pushed home correctly?
- 4 Check for possible damage to the plug and socket at the back of the reel assembly.
- 5 See that all the plugs are pushed home and locked at the power supply.
- 6 Does switch "B" work OK?
- 7 Check the power supply voltages.
- 8 If all in order, disconnect the MPU and check continuity of the coil, wiring, etc. Failing that, remove the MPU and visually check if the boards are

pushed home and other obvious signs that could lead to problems. Only as a last resort, borrow the MPU from another machine identical and test your machine.

Many parts of the machine can be disconnected to eliminate possible fault areas. These are, in the main, devices which are of an output nature and do not provide signals TO the MPU. These are:

- a Audit counters.
- b Hopper
- c Handle solenoid.
- d Cashbox diverter solenoid.
- e Credit meter assembly
- f Coin lockout coil
- g Top panel illumination (if any).
- h All or any fluorescent bulbs can be removed.

There are intermittent and permanent faults. Obviously the permanent ones are easier to repair. With intermittent ones, find out the following first:

- 1 Are bulbs, credit and verification meters lit?
- 2 Are adjacent machines affected in a similar way?
- 3 Was the machine being played when it malfunctioned or did it happen during "switch on"?
- 4 Has there been an interruption in the power supply?
- 5 Has the machine been moved?
- 6 Are the facts reported from a reliable source?
- 7 Is the machine actually working correctly, but the complaining person does not comprehend?

When you are convinced that there is a fault, check the following:

- 1 Ascertain who worked on the machine last.
- 2 Is the problem referred to covered by a Technical Bulletin?
- 3 Are all the fuse holders tightly screwed in and the power connected correctly?
- 4 Are all units pushed home and all plugs and sockets firmly pushed together?
- 5 Are the correct program PROMS in the MPU and pressed firmly into the sockets with the endmarking the correct way?
- 6 Do the PROMS match the reels for the particular percentage?

If all seems correct, change the most likely suspected parts or exchange them with another machine and leave a note with the details and date inside the machine. Your colleague may have to go back to it!

**Disconnect the Microprocessor
Before Making Ohm Tests
and Don't "Waggle" Plugs or Sockets**

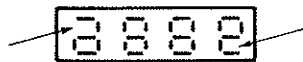
A44 / Fault Finding Guide

Fault	Possible Cause	Fault	Possible Cause
1 No power to the machine	<ul style="list-style-type: none"> • power source • plug, cable • fuse • on/off switch • line filter 	11 Coins locked out	<ul style="list-style-type: none"> • coin lockout coil • wiring, plugs, sockets • machine timed out
2 Electric shock from machine	<ul style="list-style-type: none"> • faulty power source • no ground connection • loose connection in power plug • damaged cable 	12 Coins rejected	<ul style="list-style-type: none"> • coin acceptor out of adjustment or dirty
3 Fluorescent bulbs not working	<ul style="list-style-type: none"> • faulty starter • faulty bulb or contact to holder • plug or socket connection • break in wiring 	13 Coins accepted but fails to credit for game	<ul style="list-style-type: none"> • coin chute P.C.B. • photo optics • wiring, plugs, sockets • MPU
4 Fluorescent bulbs working but the machine does not operate	<ul style="list-style-type: none"> • faulty fuse(s) • plug or socket • motor brake (not lifting, causing power cut out to motor) • power supply • PROMS faulty or incorrectly fitted 	14 Coins not diverting to cashbox	<ul style="list-style-type: none"> • hopper probe wire loose • solenoid in coin chute • wiring, plugs or socket • MPU
5 Continuous cycling without reel spin	<ul style="list-style-type: none"> • home cam switch • switch adjustment • plug, socket • power supply • MPU 	15 "Play Now" bulb on but handle can't be pulled	<ul style="list-style-type: none"> • free play lockout of adjustment • handle solenoid • machine timed out • wiring, plugs, socket • MPU
6 Reels spin when machine first switched on	<ul style="list-style-type: none"> • faulty power supply 	16 Failing to pay on any winning combination	<ul style="list-style-type: none"> • photo optic reading incorrect • reel alignment • stopper arm adjustment • faulty reel spin • wiring, plugs or sockets • MPU
7 Reels do not spin when handle is pulled	<ul style="list-style-type: none"> • plug, socket • 24V AC fuse blown • handle switches A or B 	17 Failing to pay on some winning combinations	<ul style="list-style-type: none"> • 1 or more photo optics • reel(s) binding • rubbing or wiring against reel • stopper head adjustment • wrong program for reels
8 One or more reels firing after a game cycle	<ul style="list-style-type: none"> • reel solenoid(s) sticking • MPU • Mechanism motor brake sticking 	18 Pay out on a non-winning combination	<ul style="list-style-type: none"> • wrong program for reels • photo optics (wrong binary decoding) • reel surface reflecting • stopperhead adjustment • wiring, plugs or sockets
9 One or more reels fail to spin	<ul style="list-style-type: none"> • break in wiring to solenoid • faulty solenoid • reel latch lever jammed • stopper arm not reset 	19 No payout	<ul style="list-style-type: none"> • hopper • brake • relay or contact points • microswitch or its adjustment • fuse • timed out • wiring, plugs or sockets
10 Reels free wheeling	<ul style="list-style-type: none"> • adjustments on Reel Mechanism motor • power supply • plug, socket 		

A45/Fault Finding Guide

(continued)

Fault	Possible Cause	YOUR NOTES:
20 Hopper pays 1 coin too many	<ul style="list-style-type: none"> • motor brake sticking, drive pin defective 	
21 Hopper pays out until empty	<ul style="list-style-type: none"> • microswitch or adjustment • relay contacts sticking • wiring, plugs, sockets • MPU 	
22 Hopper pays out part of win	<ul style="list-style-type: none"> • "timed out" (empty hopper) • coin jam • microswitch out of adjustment • wiring, plugs or sockets intermittent 	
23 Fuse blowing — 12 V DC unregulated	<ul style="list-style-type: none"> • burnt out handle solenoid • short circuit in 24V AC line, supplies lamps, solenoids • power supply 	
24 Fuse blowing intermittently 24V AC	<ul style="list-style-type: none"> • burnt out coin divert solenoid 	
25 Segments of electronic display, 1 or more not working	<ul style="list-style-type: none"> • display board • wiring, plugs, sockets 	



- 26 Segments of all figures of the display not working • MPU



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