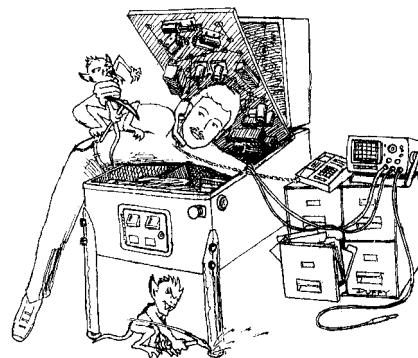


Service Bulletin N° 89



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TO: Parts & Service Managers

DATE: November 19, 1996

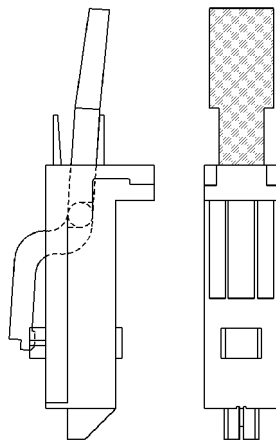
SUBJ: FYI: Switches...Look what's new at Sega Pinball!



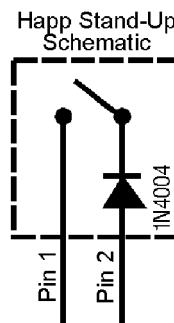
We continually strive to decrease the amount of maintenance required on the playfield like improving the reliability of playfield switches and the accuracy of switch closures during game play. This of course, satisfies both the needs of the operator and the player!

How do we do this?!

Simplify, simplify, simplify... — how many times have we said this and found that it really works! In **Apollo 13**, we introduced the first Switch Membrane Switch Assembly used in the 8-Ball Trough Assembly and since then, have had almost no failures.



In **Golden Eye** we had introduced the **Happ Controls Modular Stand-Up Target with a built-in diode.**



In **Space Jam** we are introducing the New Reed Switch Ball Sensor. All three are being used with great success!

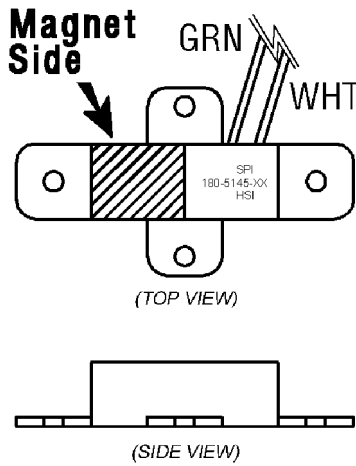
The Reed Switch Ball Sensor

Shown on page 2 is the *Overview & Theory of Operation* for this *new sensor* which can be used in any Roll-Over or Roll-Under Switch application. In **Space Jam** we are utilizing them on the Plastic & Steel Ramp Assemblies as Ramp Enter and Exit Switches and to sense if a Basket Shot was made from the Steel Ramp.

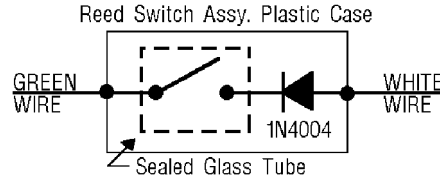
The advantage is that this sensor has much greater accuracy than *standard switches*, has a built-in Diode (1N4004) and requires no adjustments or maintenance at all. The only special requirement is the use of **non-magnetic fasteners**. We are currently using **non-magnetic stainless steel screws** but brass and aluminum will also work. The reason for this is, a fastener that is **not** made of *non-magnetic material* can become magnetized and affect the balanced magnetic field within the sensor of the Reed Switch Assembly. This can affect the accuracy with which it senses the ball.

Continued on the next page.

Overview of the Reed Switch Ball Sensor:

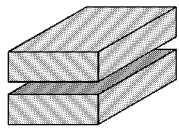


Consists of a Diode (1N4004) and a HSR-042 Reed Switch. The Cable Wiring Harness has the Green Wire going to the switch and the White Wire going to the Anode side of the Diode. The Contact Rating is 100 Volts AC/DC, 0.2 Amps AC/DC, 4 Watts (Resistance Load) & 2 Watts (Inductive Load). The Temperature Operation Range: 0-150° F.



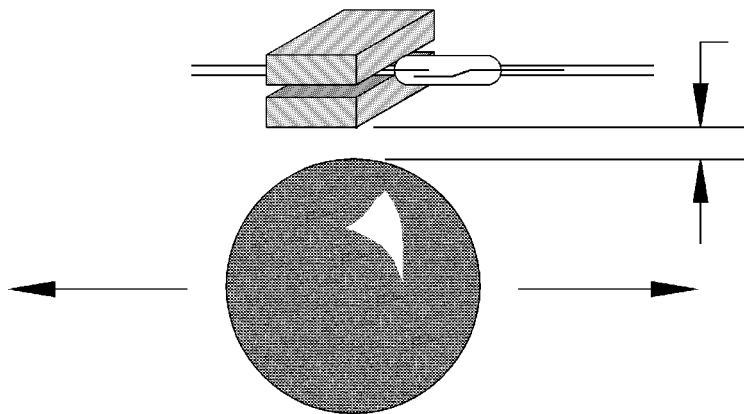
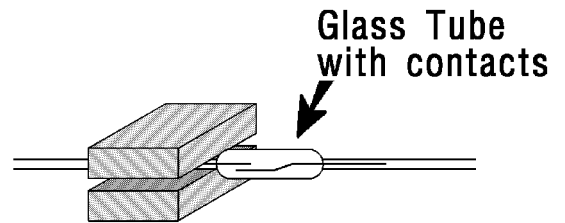
Reed Switch Ball Sensor Theory of Operation

Here's how it works:



Two magnets of equal strength creating a balanced magnetic field.

The Reed Switch is positioned in the balanced field.



As a pinball passes in close proximity to the bottom magnet, it disturbs the balanced field. The lower magnet is strengthened by the presence of the pinball, thus operating the Reed Switch contacts.

The Reed Switch contacts are hermetically sealed in a glass tube, filled with inert gas to provide long life with stable electrical and operating characteristics. The magnets, the glass tube (with contacts), the Green & White Wires & Diode are sealed in the Plastic Reed Switch Housing in soft epoxy.

Please call or fax with more questions or voice your concerns at the below phone numbers.