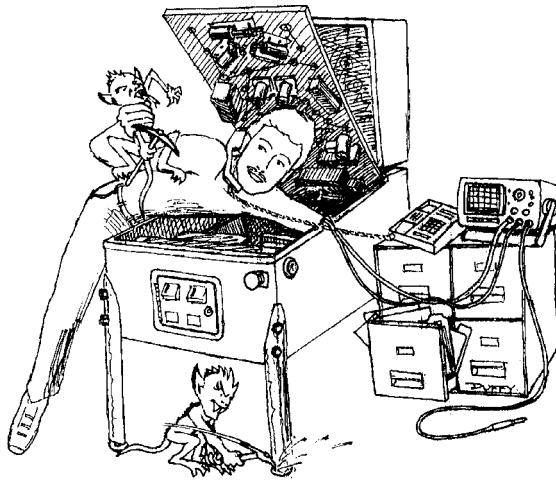# Service Bulletin Nº 85

SEGA™
PINBALL, INC.

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Technical Support

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TO: Parts & Service Managers

DATE: May 15, 1996

SUBJ: *New* **2-Flipper Theory of Operation & Schematic**

## ...why can't a flipper coil be flipped or energized like any other coil?

It can, it should...and now it is!
NEW FLIPPER DESIGN - NO FLIPPER BOARD!

One of the objectives in going to the **White Star Board System**™ was to simplify the system for the Operator. We have taken this line of thinking one step farther by simplifying our flipper circuit. Our pinballs were the first to utilize a **Solid State Flipper System**. This required more complex circuitry in the form of the Solid State Flipper Board but reduced the overall amount of service calls on the pinball by a good 25% due to increased reliability.

The **White Star Board System**™ has allowed us to *simplify* the flipper circuit to the point where we have *eliminated the flipper board* altogether. The flipper circuit is now configured the same as any other solenoid drive circuit.
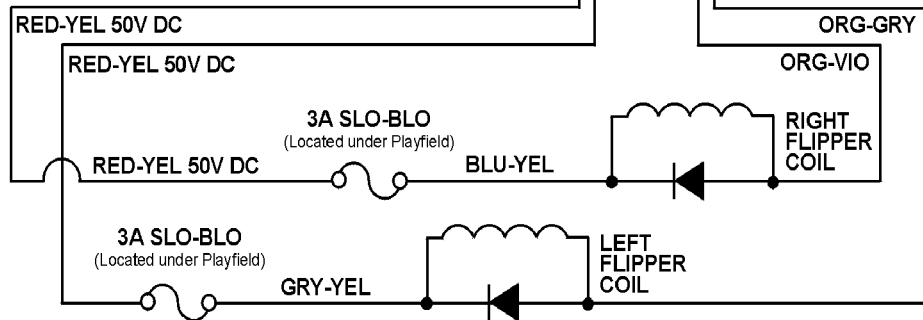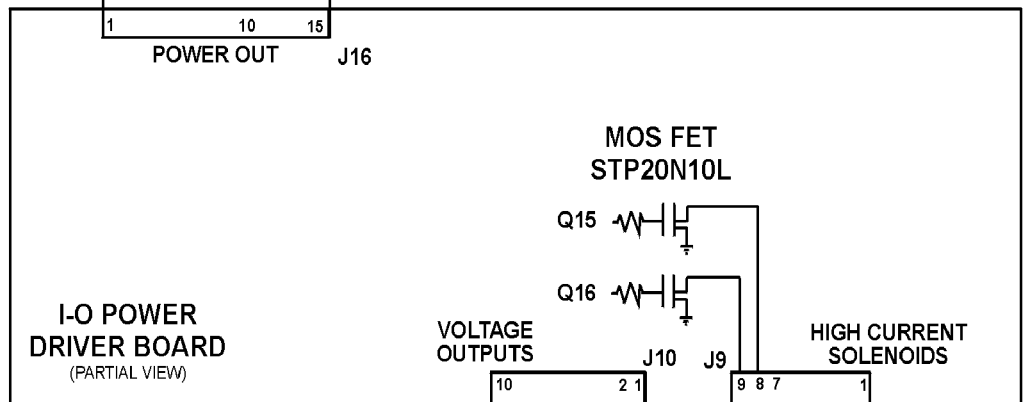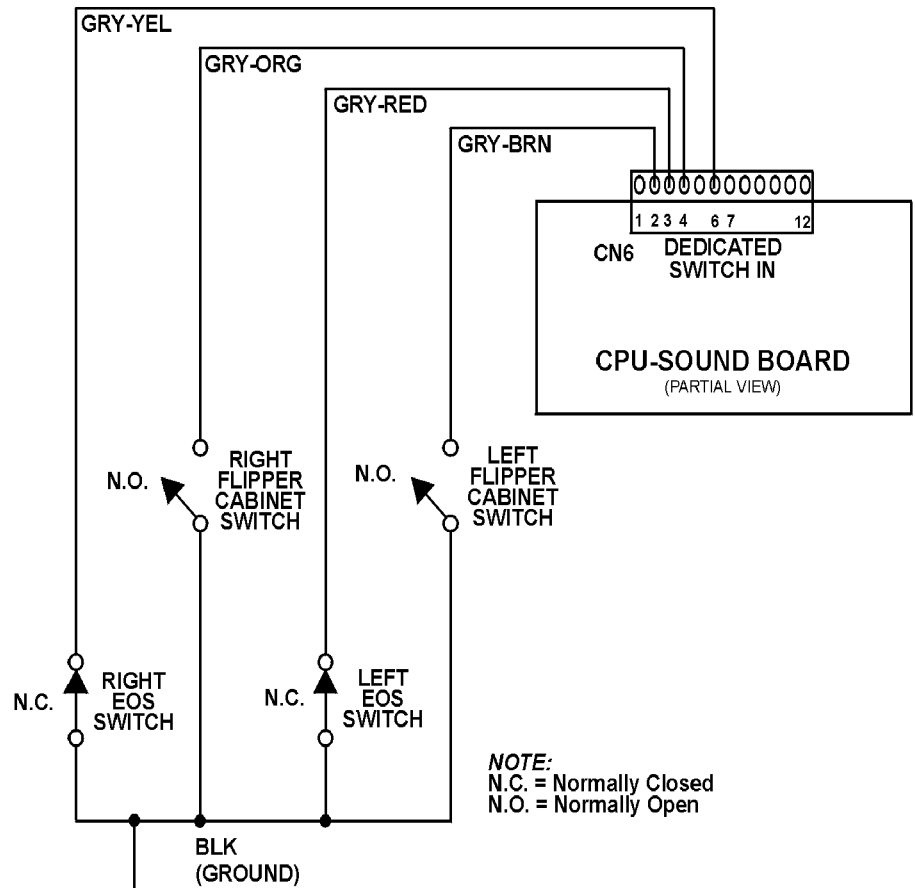
Technical Overview
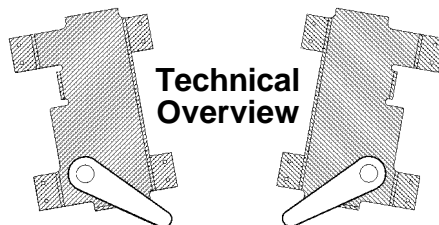
Our **New Flipper System** uses one supply voltage (50v DC) for both kick and hold. Once the **Game CPU** detects a flipper cabinet switch closure (during game play) it applies a 40 msec pulse to the gate of the flipper drive transistor (STP20N10L). If it continues to detect a flipper cabinet switch closure (the player holding the button in) it will continue to pulse the flipper drive transistor 1 msec every 12 msecs for the duration of the hold cycle.

The **E.O.S.** (End-Of-Stroke) **Switch** serves the same function as before as it prevents foldback when the player has the flipper energized to capture balls. The **E.O.S. Switch** is a normally closed switch which opens approximately a 1/16" when the flipper is energized. The **Game CPU** will detect a switch closure if the flipper bat is forced back by a high velocity shot or rebound on the playfield and will apply another 40 msec pulse of 50v DC to the coil.

If you have any questions or concerns, please feel free to call us at 1-800-542-5377 or 708-345-7700.

The *New* 2-Flipper Wiring Schematic

GRY-YEL

GRY-ORG

GRY-RED

GRY-BRN

CN6 DEDICATED
SWITCH IN
1 2 3 4 6 7   12

CPU-SOUND BOARD
(PARTIAL VIEW)

N.O.
RIGHT
FLIPPER
CABINET
SWITCH

N.O.
LEFT
FLIPPER
CABINET
SWITCH

N.C.
RIGHT
EOS
SWITCH

N.C.
LEFT
EOS
SWITCH

NOTE:
N.C. = Normally Closed
N.O. = Normally Open

BLK
(GROUND)

POWER OUT   J16
1   10   15

"...No more
need for a
solid state
flipper board!"

**MOS FET
STP20N10L**

Q15

Q16

**I-O POWER
DRIVER BOARD**
(PARTIAL VIEW)

VOLTAGE
OUTPUTS   J10   J9
10   2 1

HIGH CURRENT
SOLENOIDS
9 8 7   1

RED-YEL 50V DC

ORG-GRY

RED-YEL 50V DC

ORG-VIO

3A SLO-BLO
(Located under Playfield)

RIGHT
FLIPPER
COIL

RED-YEL 50V DC   BLU-YEL

3A SLO-BLO
(Located under Playfield)

LEFT
FLIPPER
COIL

GRY-YEL