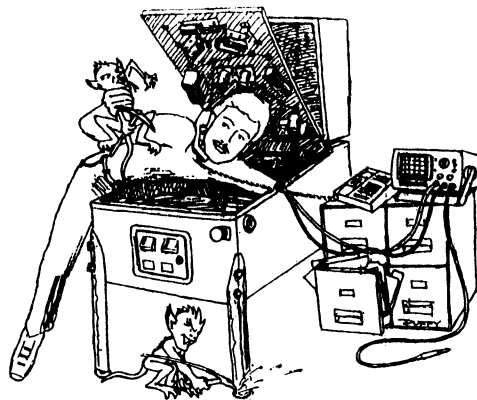




Data East Pinball, Inc.  
1990 Janice Avenue  
Melrose Park, IL 60160  
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## Technical Support

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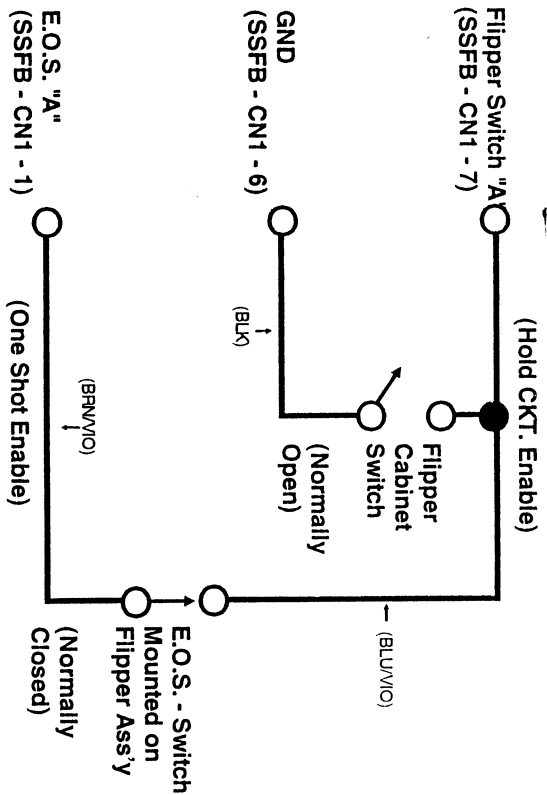
TO: Service Managers  
FROM: Joe Blackwell  
DATE: November 16, 1993  
RE: Solid State Flipper - Theory of Operation

We put this package together to try and eliminate some of the mystery surrounding the solid state flipper circuit and the addition of the end of stroke switch.

The following pages contain Flipper Switch Wiring Diagram, Theory of Operation and Solid State Flipper Board Schematic.

If you have any questions please feel free to call our technical support line.

(Fig 1) **Solid State Flipper Switch Wiring Diagram**



**Theory of Operation for the Solid State Flippers**

The Solid State Flipper Board is a Multiple Flipper Solenoid Driver Circuit. Each solenoid driver circuit contains a One Shot Timer, a 50V Driver, and an 8V Driver.

Looking at one circuit, Schmidt NAND gates U1A, U1b, and U1D make up the One Shot Timer. The timer length is controlled by R10, R33 and C2. The output of the timer is gated at U1C with the buffered switch input from Q6. The output of U1C controls the 50V driver circuit consisting of Q4, Q1, Q2, Q3, and D1. As long as the flipper button is activated, Q6 will keep the 8V driver circuit, SR1, on.

The 50 volts provides the actuation power to the flipper solenoid while the 8 volts provides the holding power.

**E.O.S. Switch Theory of Operation**

The End of Stroke (E.O.S.) Switch used in our flipper circuit is a Gold Peened Contact: Blade Switch Assembly, mounted on the flipper assembly.

Electrically, it is connected in series with the Cabinet Flipper Switch and the Flipper E.O.S. input on the Solid State Flipper Board (S.S.F.B.) connector CN1 which enables the 50 Volt DC Drive Circuit.

Referring to Fig. 1, one side of the Flipper Cabinet Switch is connected to ground (BLK-wire), the other side (BLU-VIO Wire) is connected to the flipper switch input on the S.S.F.B. connector CN1 which enables your 9 Volt DC holding voltage and is connected in series to the E.O.S. switch which is a normally closed switch.

The function of the E.O.S. switch is to prevent the flipper bat from being knocked back by a high velocity shot on the playfield. If while holding the flipper in the up position, the bat is moved back 1/16" or more, the E.O.S. switch will close giving the coil another 50 Volt pulse.

**E.O.S. Switch Adjustment**

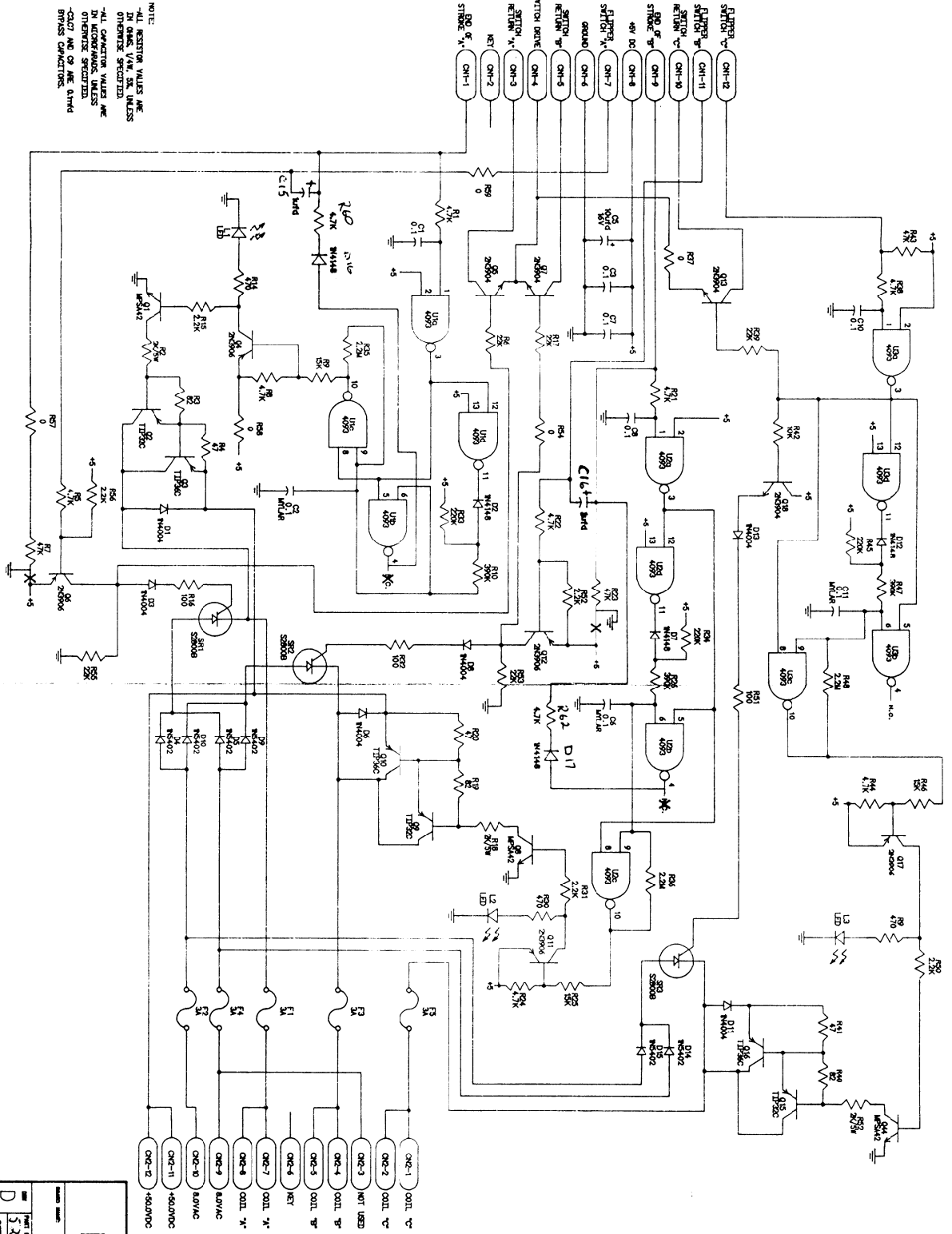
The switch contacts should be adjusted so that when the solenoid is energized, the contacts stay closed for almost the full travel of the plunger. The contacts should open 1/16" before the plunger bottoms out or reaches maximum travel.

**Troubleshooting Tips**

If the switch contacts are not making, then the series circuit to the 50 Volt Drive Circuit Enable will be broken causing the flipper not to work at all. This is also indicated by the L.E.D. on the S.S.F.B. not flashing when the cabinet flipper switch is closed. This can be easily determined by taking a jumper wire and shorting the switch. If proper adjustment of the switch does not resolve the problem, then replacement will be necessary.

Note: You may solder the two wires together going to the switch and bypass it completely, until a replacement is installed.

# SERVICE BULLETIN 49



NOTE:  
 -ALL RESISTOR VALUES ARE IN OHMS UNLESS OTHERWISE SPECIFIED  
 -ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED  
 -C407 AND Q1 ARE 5V1MFD BRASS CAPACITORS

**DATA EAST**

SOLID STATE FLIPPER BOARD

REV. 1

DATE: 1-20-74

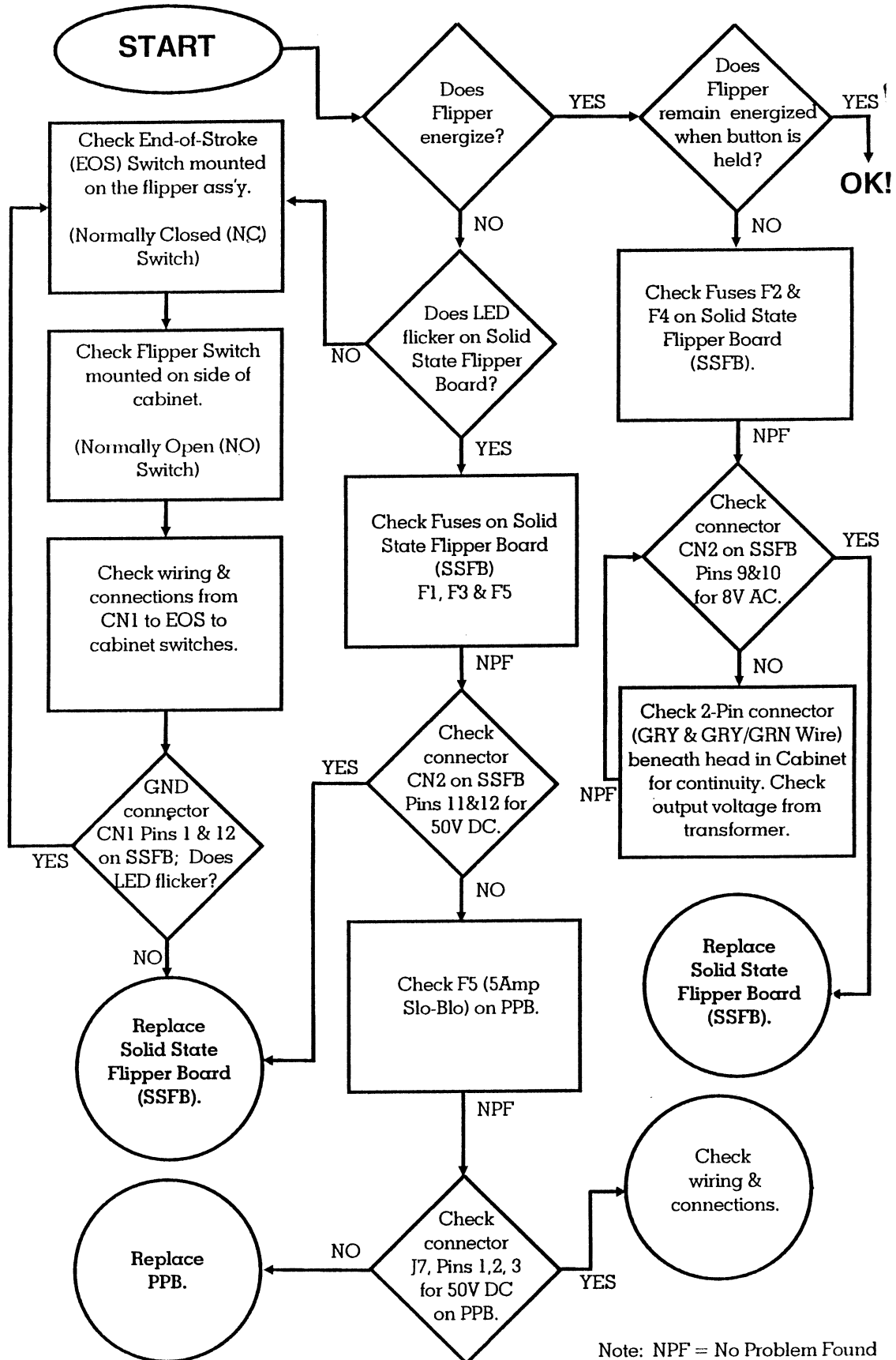
DESIGNED BY: G.E.S., INC.

TESTED BY: TTF/ASL-3004

REV. D

REV.	DESCRIPTION	DATE	APPROVED
1	TRIAL CHANGE OF NETWORK	1-1-73	
2	ADD 80 STROBE CIRCUITS	4-20-73	
3	REVISED R1 & R2 VALUES	9-2-73	

### Solid State Flipper Circuit Troubleshooting Flowchart



Note: NPF = No Problem Found