

featuring our *Postal Service Menu*
and our unique

Find-It-In-Front:
Dr. Pinball Section



NO NES END PREL QUIT E

SEGA™

11th

PINBALL, INC.

ANNIVERSARY



Joe Blackwell
Technical Support
Manager



Eric Winston
Technical Support
Engineer



Doug Lemons
Technical Support
Engineer



Jay Alfer
Technical Support
Documentation
Administrator



**Please call us at 1-800-542-5377 or
1-708-345-7700 for Technical Support.**

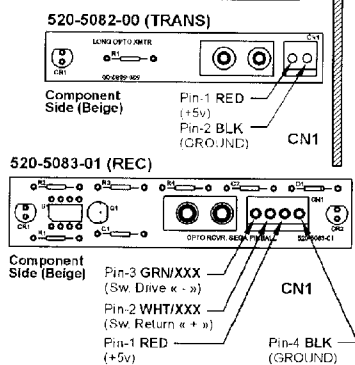
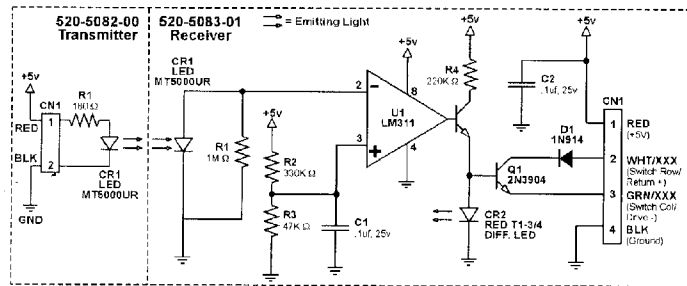
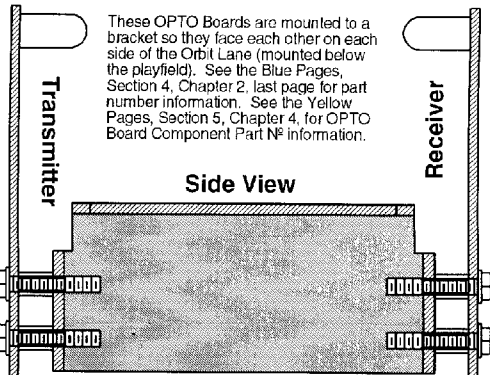
Sega Pinball, Inc. TM & © 1997.
All Rights Reserved. SPI Part N°
780-5059-00

Introducing Playfield Switch OPTO "Long-Hop" Boards

A *New* OPTO Board combination (Transmitter, 520-5082-00, and Receiver, 520-5083-01) was first introduced in our pinball games with ID4: Independence Day and The X-Files. In this game, Starship Troopers, the **OPTO Board combinations** are being used as Playfield Switches to recognize the Left (Sw. 47) & the Right (Sw. 48) Orbit Shots.

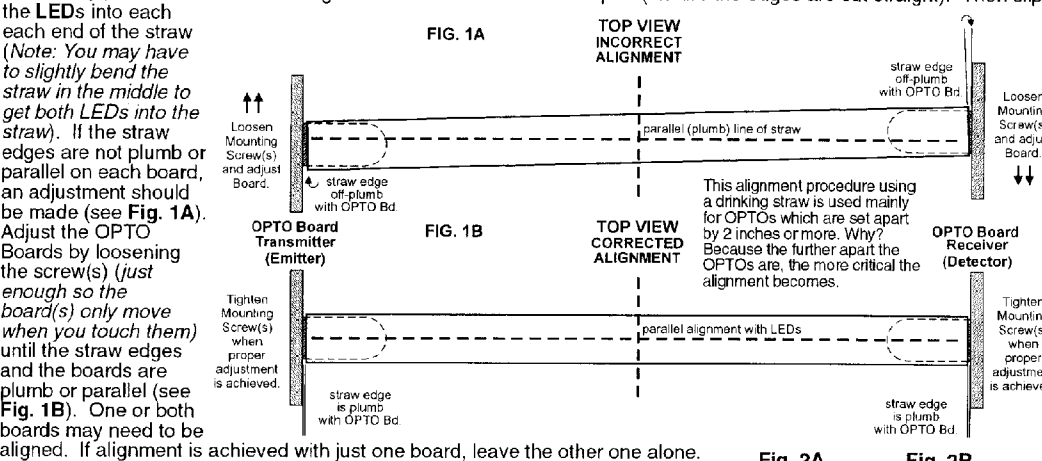
Playfield Switch OPTO Boards Theory of Operation & Schematic

The light falling on LED (CR1) generates a voltage which is applied to the input (Pin-2) of the **LM311 Comparator (U1)**. R1 bleeds off excess charge. At about a volt input from LED (CR1) the **Comparator (U1)** trips & drives either **Q1** (during switch line strobes) or the indicator LED (CR2) (in between strobes). If a switch line is being strobed, the emitter of **Q1** drops to the saturation voltage of the Switch Line Driver, about .3v. This plus the .7 volt drop on the base give a 1v forward bias voltage to **Q1**, which is lower than the 1.7v drop on LED (CR2) so the current flows through the **Transistor** during strobes. This drives **Q1** on and makes the switch. If the strobe line is high, then the 1.7v path through LED (CR2) is lower than **Q1**'s bias voltage so current flows through LED (CR2) and the indicator lights. **D1** prevents reverse bleed, **R2** and **R3** form the voltage divider for the trip point, **R4** is a current limiter for both **Q1** and **CR2**, **C1** and **C2** are general noise-filter caps.



OPTO Alignment Procedure Option

There is an easy way to align your OPTO Boards with a very cheap Tool: an ordinary, everyday *drinking straw!* Cut a clean, unused straw to the length that the OPTO Boards are apart (ensure the edges are cut straight). Then slip the LEDs into each



Before you attempt this adjustment procedure, ensure the OPTO Mounting Brackets are not bent and ensure the LEDs are sitting flush & perpendicular to the board (see Fig. 2A). If the LED appears not to be flush and/or is bent (see Fig. 2B) take the necessary action to correct it (desoldering / soldering is recommended; however, you can carefully bend the LED straight & add a dab of silicone to help stabilize the LED.)

