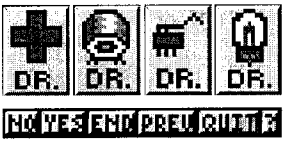
featuring our Portals Service Menu and our unique

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



SEGA™ PINBALL, INC.

11th ANNIVERSARY

STARSHIP TROOPERS

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.

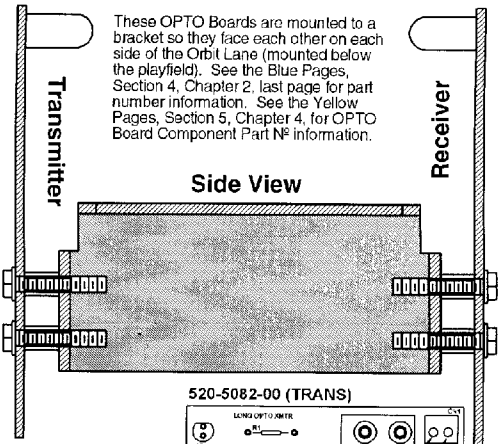
 SPI Part N°:
780-5059-00

Introducing Playfield Switch OPTO "Long-Hop" Boards

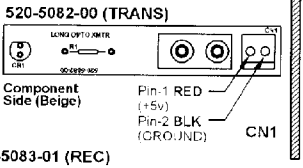
A *New* **OPTO Board combination** (**Trans**mitter, 520-5082-00, and **Rec**eiver, 520-5083-01) was first introduced in our pinball games with ID4: Independence Day and The X-Files. In this game, Starship Troopers, the **OPTO Board combinations** are being used as Playfield Switches to recognize the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

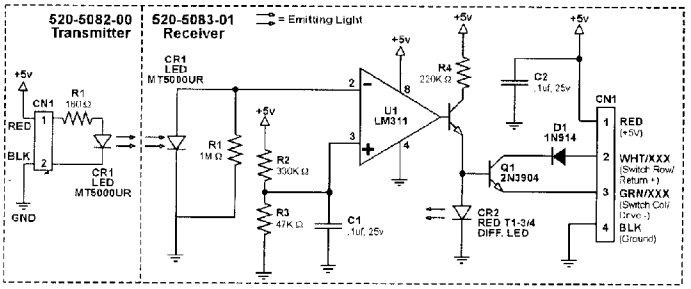
Playfield Switch OPTO Boards Theory of Operation & Schematic

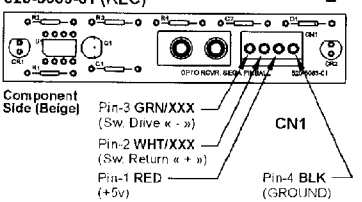
The light falling on **LED** (**CR1**) generates a voltage which is applied to the input (Pin-2) of the **LM311 Comparator** (**U1**). **R1** bleeds off excess charge. At about a volt input from **LED** (**CR1**) the **Comparator** (**U1**) trips & drives either **Q1** (during switch line strobes) or 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.



These OPTO Boards are mounted to a bracket so they face each other on each side of the Orbit Lane (mounted below the playfield). See the Blue Pages, Section 4, Chapter 2, last page for part number information. See the Yellow Pages, Section 5, Chapter 4, for OPTO Board Component Part № information.

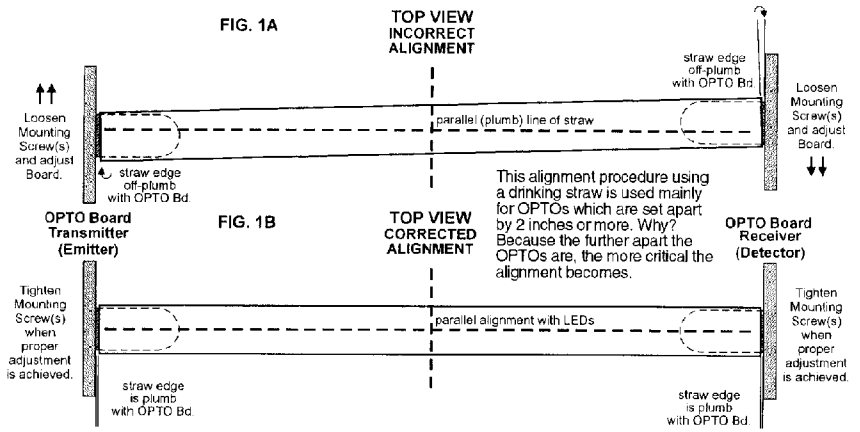






OPTO Alignment Procedure Option

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 **LED**s into each each end of the straw (*Note: You may have to slightly bend the straw in the middle to get both LEDs into the straw*). If the straw edges are not plumb or parallel on each board, an adjustment should be made (see **Fig. 1A**). Adjust the OPTO Boards by loosening the screw(s) (*just enough so the board(s) only move when you touch them*) until the straw edges and the boards are plumb or parallel (see **Fig. 1B**). One or both boards may need to be aligned. If alignment is achieved with just one board, leave the other one alone.



Before you attempt this adjustment procedure, ensure the OPTO Mounting Brackets are not bent and ensure the **LED**s 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**.)