Product Manual

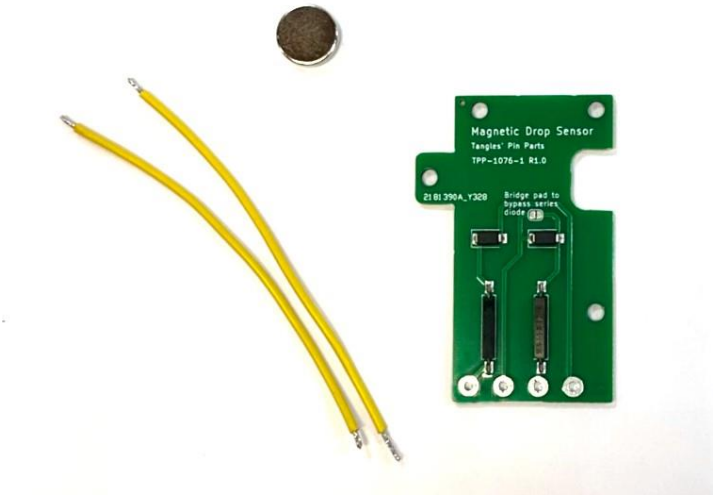
Magnetic Drop Sensor

P/N **TPP-1076**

A Replacement for Horseshoe Contacts On your Solid-State Williams Pinball

Tangles' Pin Parts

Experience a new dimension in drop target reliability on the old Williams machines.



Manual Revision 1.0

INTRODUCTION

Tangles Magnetic Drop Sensors are a replacement for the PCB and horseshoe-style drop target on old Williams machines. Original part numbers: A-7969-A, 1B-2001-124, 1B-2001-124-4, A-7969

These Magnetic Drop Sensor boards are suitable for use on the following machines:

> Algar, Alien Poker, Blackout, Contact, Disco Fever, Firepower, Flash, Gorgar, Hot Tip (EM and SS), Laser Ball, Lucky Seven, Phoenix, Pokerino, Scorpion, Stellar Wars, Time Warp and Tri Zone.

The original targets make use of a horseshoe-shaped copper leaf and an electrical wiping / contact action on the circuit board. These contacts attract dirt and are prone to wear as the wiping action wears on the circuit board and horseshoe contact.

The Magnetic Drop Sensor boards replace the horseshoe contact with a magnet on the drop target and a new PCB with a magnetic reed switch. In this design, there is no physical contact between the drop target and PCB, providing a reliable switch function that will not degrade over time.

DESIGN NOTES

The new boards provide two independent switch circuits: One circuit for the target scoring. The second is wired in series with others in the bank to provide a switch signal of the “all targets down” situation. In this arrangement, a three-target bank (for example) will need wiring to 4 switch circuits. One for each target score, and the fourth signals the CPU when all targets in the bank are down.

The original PCB has 4 solder points on each board. The outer two are used for the scoring switch and the inner two are used for the “series” switch. A diode is then wired into each scoring switch and a single series diode is wired into the “series”.

The same wiring concept has been kept with the Tangles MDS except the new boards have built-in diodes on both the score and “series” switches.

The “series” switches need only one diode for the target bank, so you must use a solder blob to bypass the diodes on all but one board. Further details given below.

INSTALLATION

Installing the MDS system involves the following steps:

- Plan the wiring of the new PCBs
- Remove wiring from the original drop target PCBs
- Optionally remove the drop target bank from the machine.
- Remove the original PCBs from the drop target assembly.
- Remove the horseshoe wiper from the drop target.
- Glue the MDS Magnet to the drop target.
- Install the MDS boards.
- Re-connect the game wiring.

The following section provides my suggestions and notes for each of these steps. This procedure should only be performed by someone with appropriate wiring and soldering experience.

INSTALLATION DETAIL

REMOVE WIRING FROM THE ORIGINAL TARGET BOARDS

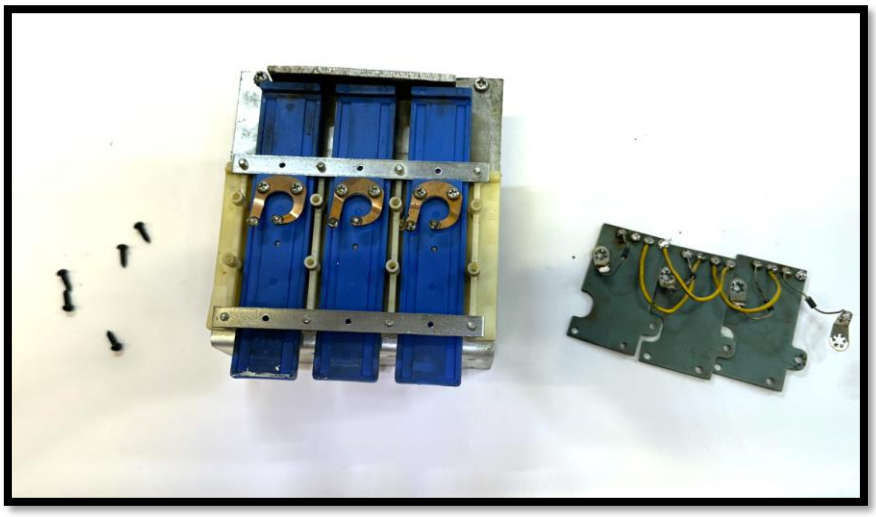
- Take several photographs of your original wiring for reference.
- Using a soldering iron, remove all wires from the solder terminals.
- Remove all jumper wires (typically yellow)
- Identify and remove the reset solenoid wiring taking note of the wire colour and their relationship to the pins on the solenoid (photograph)

REMOVE THE DROP TARGET BANK FROM PLAYFIELD

With the wiring removed from the bank, it is typically a simple four or five screws to remove the bank from the underside of the playfield.

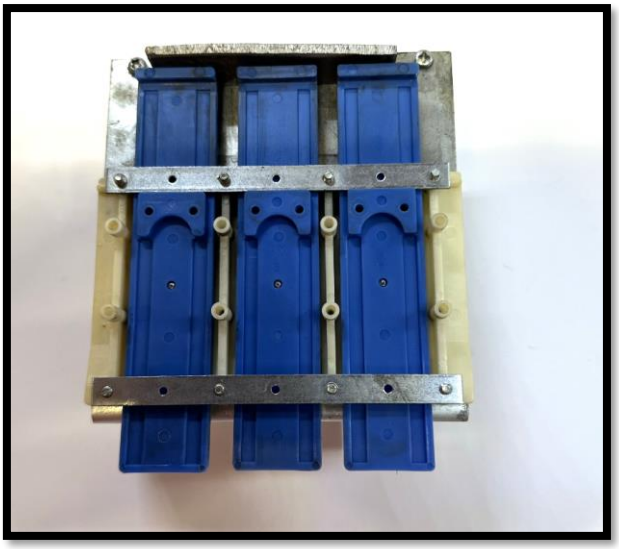
REMOVE THE ORIGINAL PCBS

- Removing the original PCBs from the back of the drop target bank. Each board is held on with two #4 screws. (Keep the screws)
- Remove the horse-shoe contacts from each drop target.



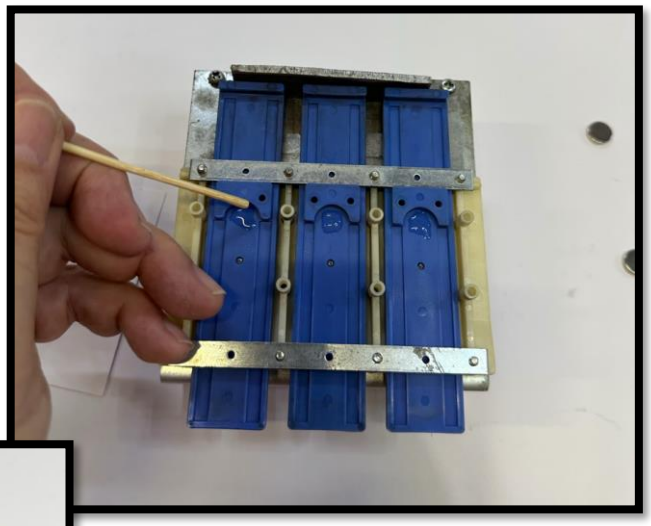
CLEAN THE TARGETS

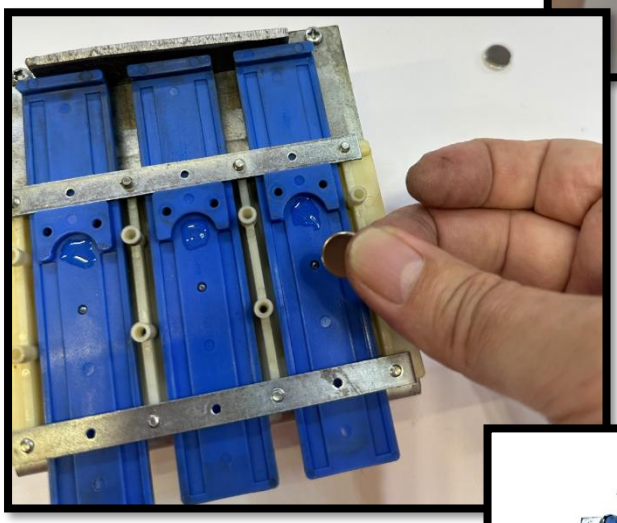
- Thoroughly clean the plastic drop targets. I use kitchen cleaner and cotton buds to clean. The targets do not need to be removed from the housing.
- If a thorough cleaning is desired then removing the target plastics from the mechanism is not too difficult a task.

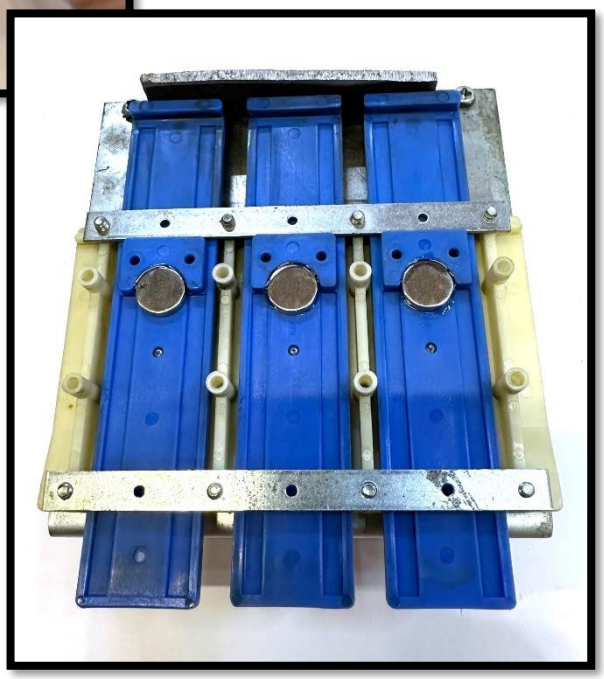


GLUE IN THE MAGNETS

- I recommend a 5-minute epoxy be used to glue a magnet (supplied) onto each of the drop targets.
- Do not use an excessive amount of glue.
- Glue each magnet into the circular cove on the rear of the plastic drop target.

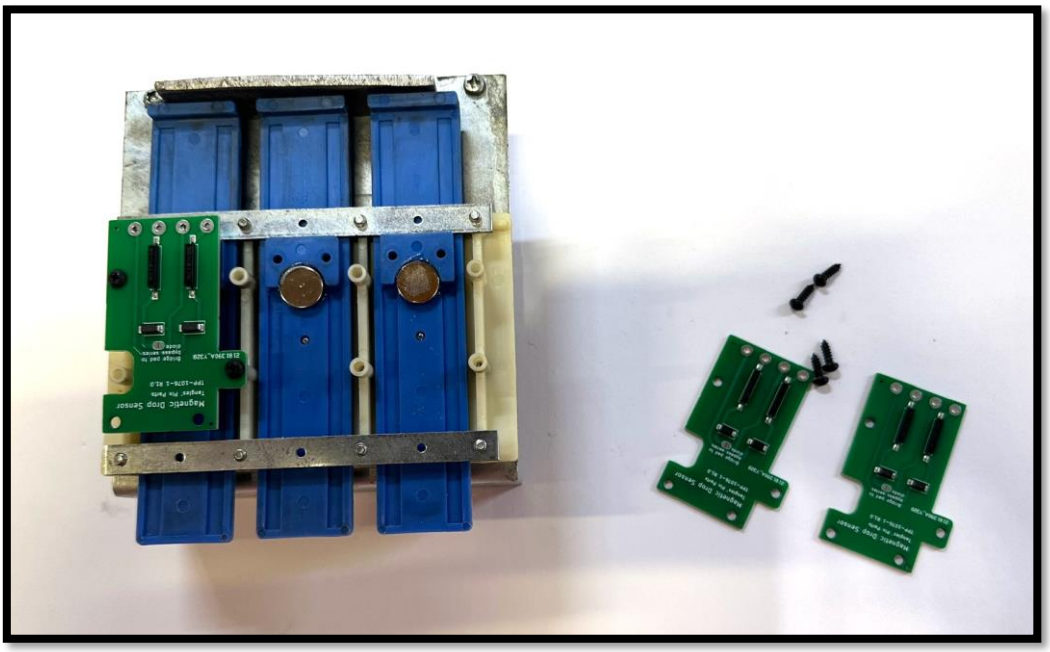


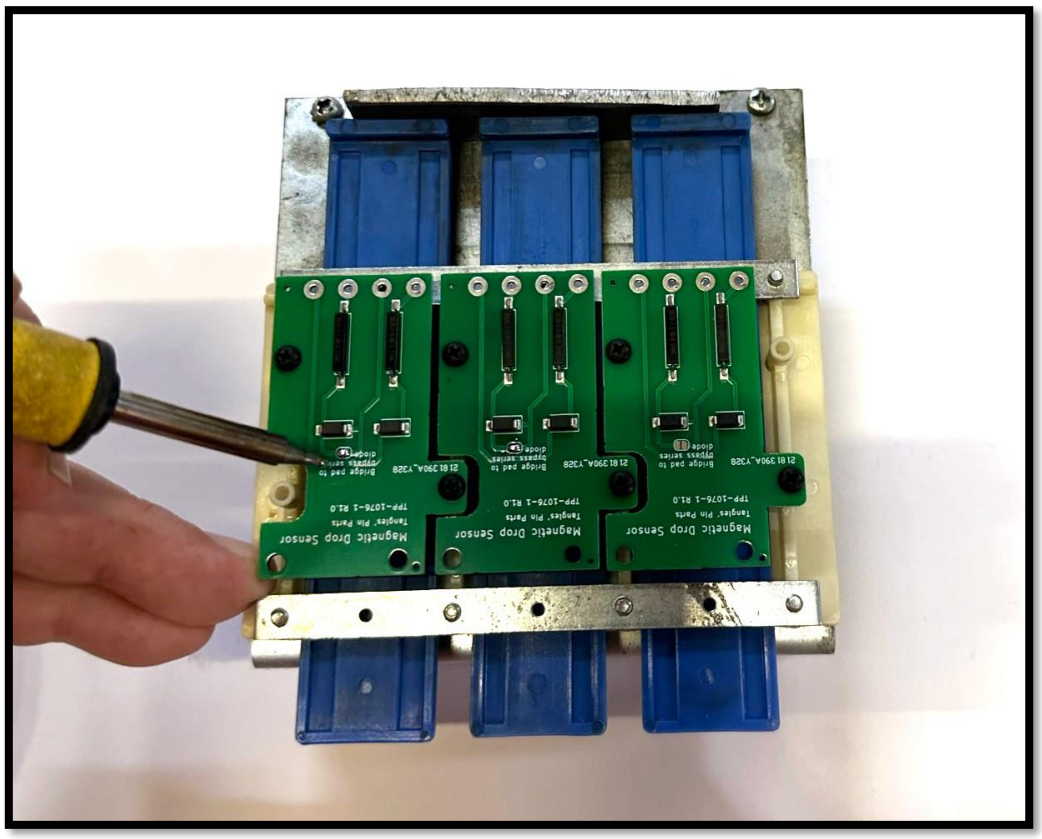




INSTALL THE MAGNETIC DROP PCBS

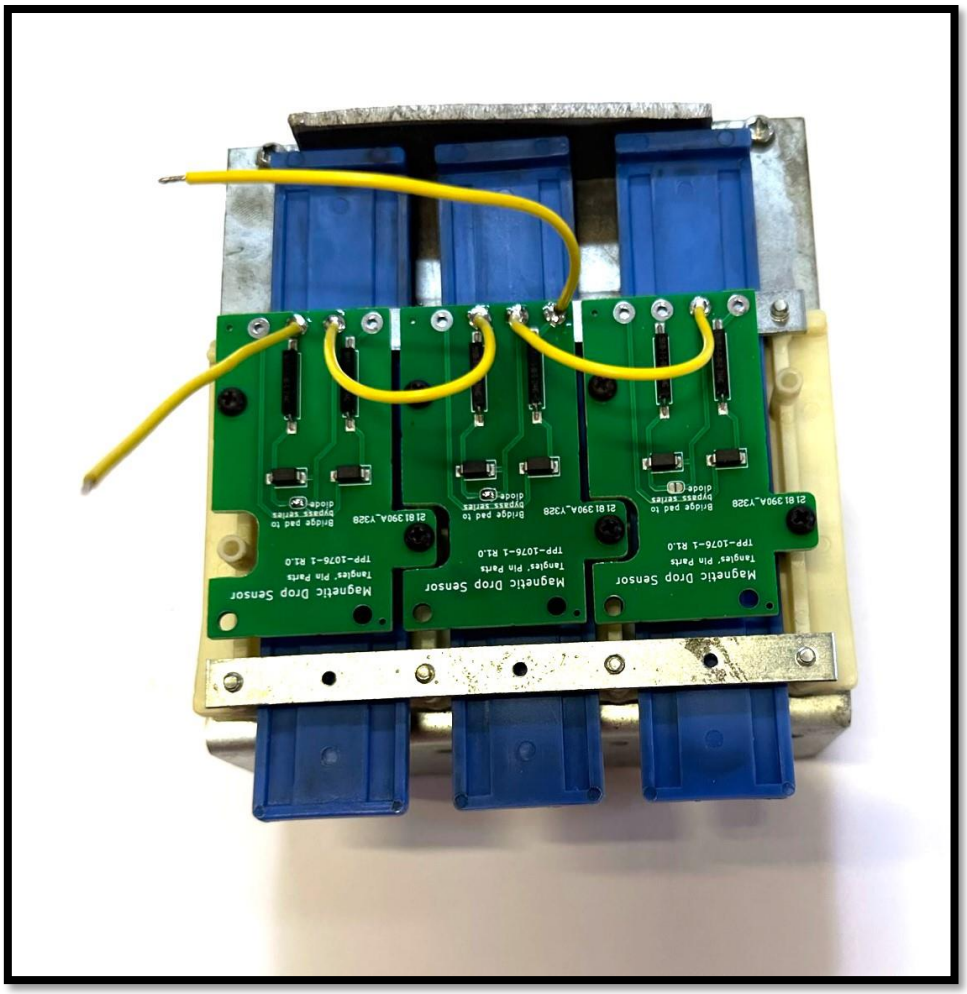
- When the glue has dried… install all the drop target boards onto the frame.
- Use 2 x #4 screws to secure each board
- Apply a solder bridge to all but one of the targets in the bank. This bridge will bypass the “series” diode on the board. Diode bypassing is done on all but one board on the bank as the “series” switches need only a single diode for the bank.





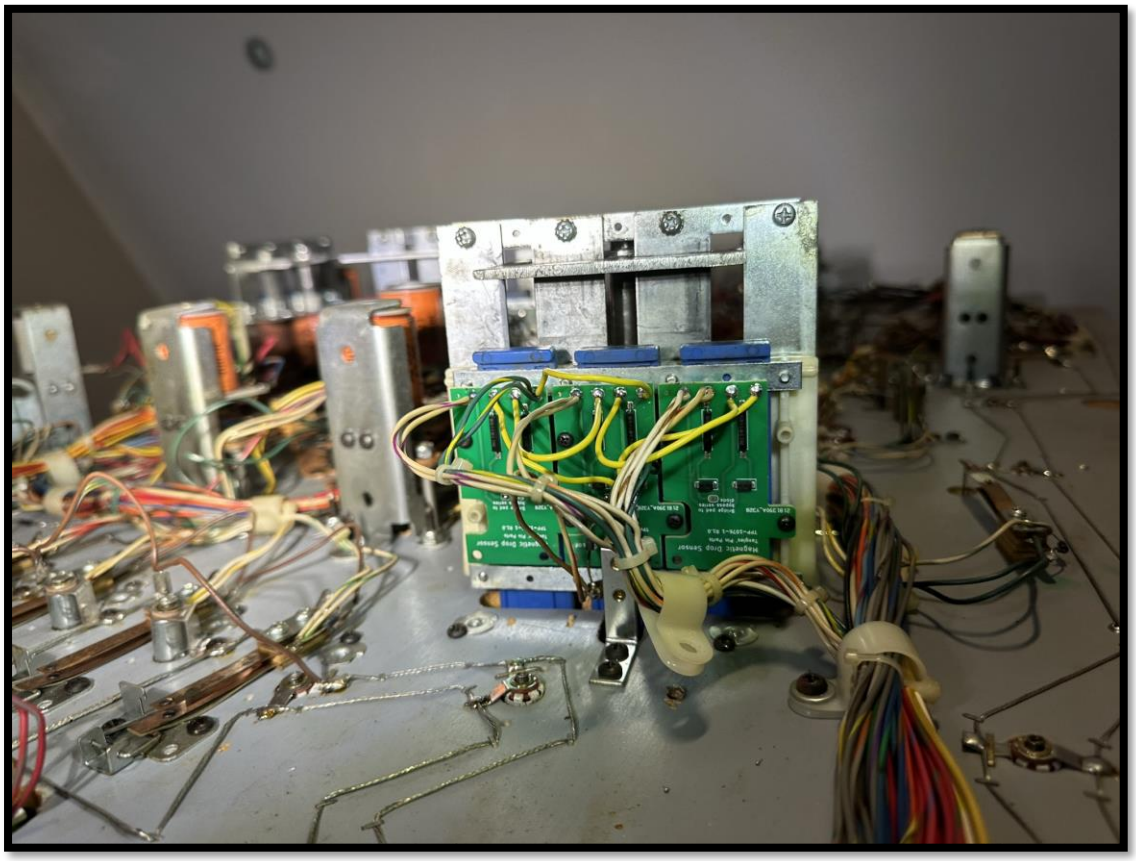
INSTALL YELLOW JUMPER WIRES

- Consult your photos, the Williams manual and your design notes. I like to install the yellow jump wires before re-installing the drop target bank back into the machine.



RE-INSTALL THE DROP BANK BACK INTO THE MACHINE

- Re-install the drop target bank into the machine.
- Reconnect all the wires taking careful note of the diode orientation.
- Take careful note of the “series” wiring ensuring the diode orientation is correct.



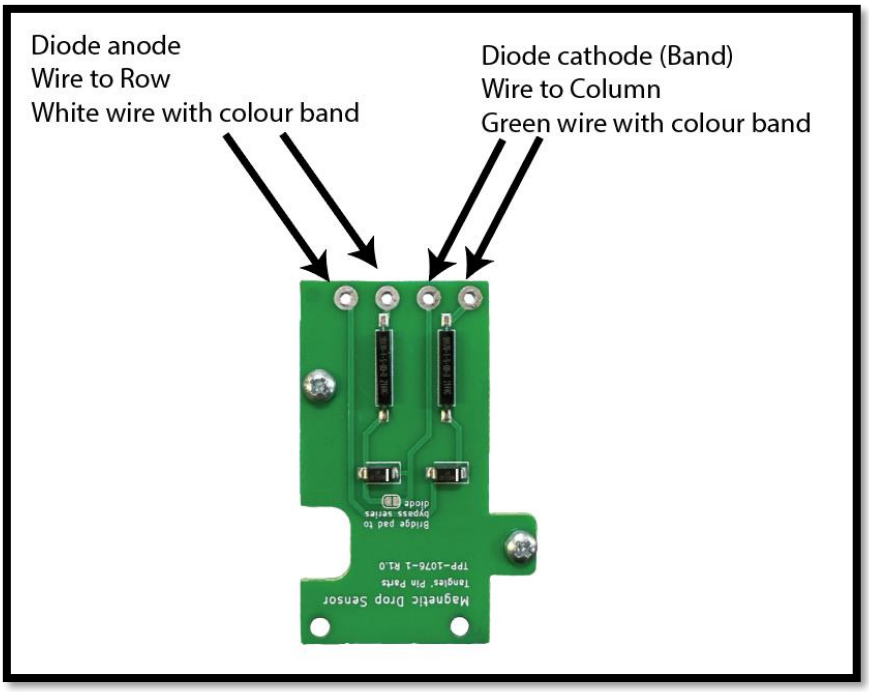
DIODE ORIENTATION

The Magnetic Drop Sensor PCBs have diodes built onto each board. One must make a careful note of diode orientation when planning the installation. You cannot necessarily wire these boards in the same pad-for-pad configuration as the original boards which had externally mounted diodes.

You must wire the PCBs so the diodes are oriented correctly:

- Cathode (Diode band) to Column (GRN-XXX wire)
- Anode to Row (WHT-XXX wire)

I recommend using the manufacturer's manual to document how you will wire the new drop target boards. I recommend making a table of the switch wiring, referring to your photos and the machine manual. It is important to understand how each Row and Column will be wired to ensure the pre-installed diodes are in the correct orientation.



An example planning table is given here for the FLASH machine's 3 target bank (example):

Bank Name	Switch No	Switch Name	Column Colour	Row Colour
3-BANK	28	Right Drop	GRN-YEL	WHT-YEL
	29	Centre Drop	GRN-YEL	WHT-GRN
	30	Left Drop	GRN-YEL	WHT-BLU
	31	3-Bank-Series	GRN-YEL	WHT-VIO

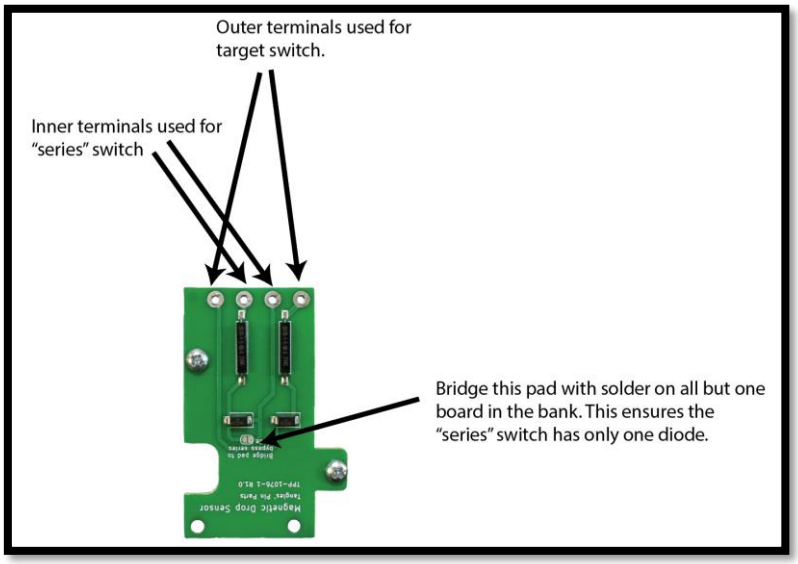
SERIES SWITCH

Williams drop targets typically have between 2 and 4 targets in a bank. The “Series” switch is a chaining of switches in all of these targets to give an activation when all targets in the bank are down. The wiring of the “Series” switches is chained from one to the next using the inner two pads of the drop target PCB. At the end of the chain (or series) a single diode is installed and the switches are wired to the appropriate matrix row and column.

The target PCBs are wired so the inner two pads are for the “Series” switch and the outer two pads are used for each individual target switch.

A solder bridge should be applied to all but one of the boards in the bank so that the looped switched in the series have only one diode. (See example below)

Row / Col and Anode Cathode considerations are not important for a board with the series diode bridged out.



This picture shows a simplified wiring diagram of the “series” for Flash 3-Bank.