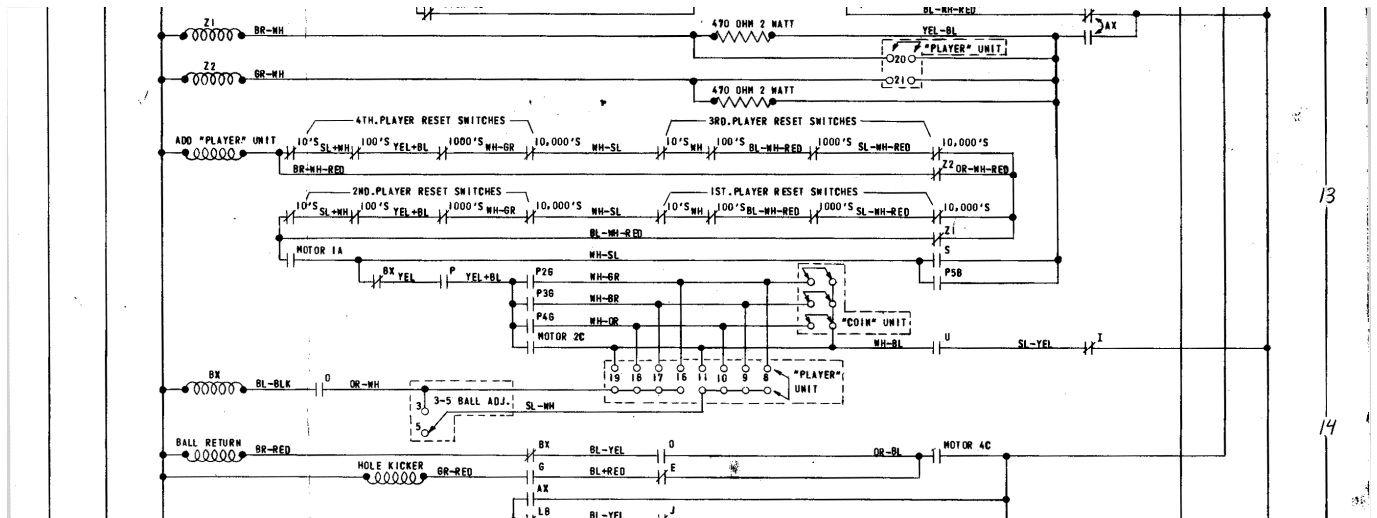


EM Pinball Troubleshooting – Testing Gottlieb Player Unit

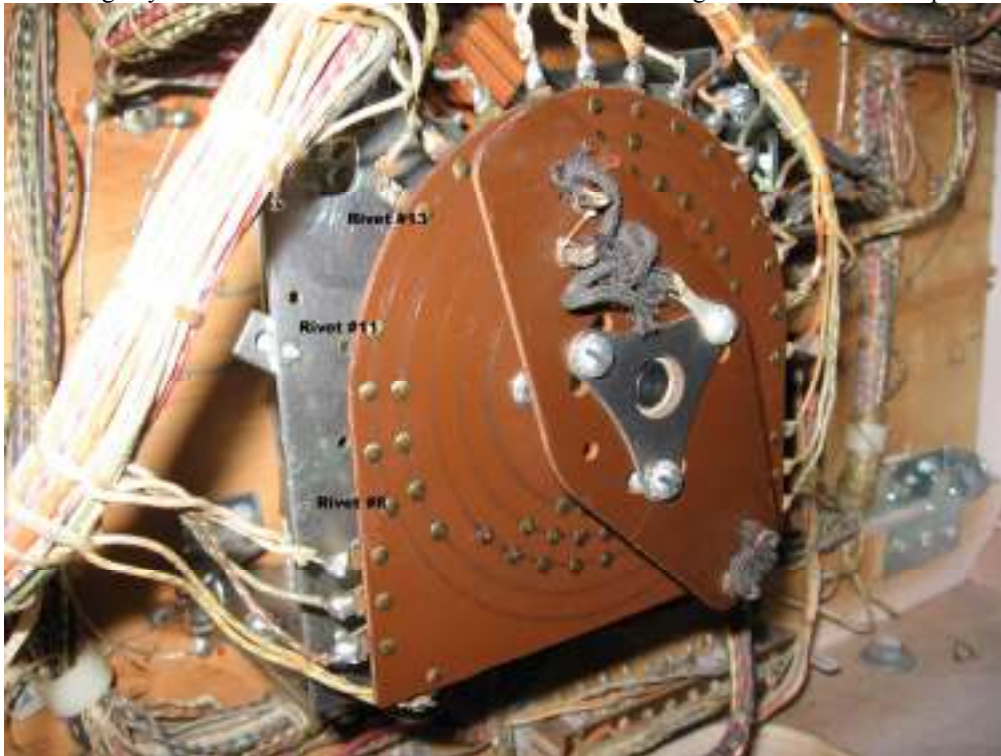
This write-up describes a test for the LAST BALL (BX) relay connections through the PLAYER UNIT. There have also been questions about the function of this circuit, so a “Theory of Operation” section has been added below.

The circuit in the following figure shows multiple circuit paths through the PLAYER UNIT based on the 3/5 ball adjustment and the number of players selected on the COIN UNIT.



Section of Schematic from 1976 Gottlieb “Spirit of 76”

The picture below shows the PLAYER UNIT after a new game is started. Note that the end of the rotating “disc” with three connections is rotated to where it’s on the first set of rivets after the gap. The other end (with two connections) is not contacting any rivets. The rivets are numbered clockwise starting at 8 as shown in the picture. There is no number 12.



1976 Gottlieb “Spirit of 76” PLAYER UNIT – After Reset: Player 1, Ball 1

Checks

Check the spring contacts on the rotating Bakelite piece. The springs should pull out easily and spring back to contact the rivet(s). On the end with three contacts, the outer two are connected together and the inner one is connected to the center metal hub. On the end with two contacts they are connected together.

Also check the wires around the outside to make sure there is a wire connected to each tab. Give each wire or wires a gentle tug to make sure they are firmly connected.

Measurements

After starting a new game, press the START/REPLAY button three more times to start a 4-player game. In a four-player game the COIN UNIT is advanced to where all three of the COIN UNIT connections shown in the schematic are OPEN. Power off the machine.

Check for continuity between the following points:

1. Rivet #8, Rivet #16, and the WHITE-GREEN wire connected at rivet #16
2. Rivet #9, Rivet #17, and the WHITE-BROWN wire connected at rivet #17
3. Rivet #10, Rivet #18, and the WHITE-ORANGE wire connected at rivet #18
4. Rivet #11, Rivet #19, and the WHITE-BLACK wire connected at rivet #19

Manually operate the STEP UP solenoid to advance the player unit 8 times. This will be Player 1, Ball 3. The spring contact at the bottom of the picture will have rotated to contact Rivet #8. Connect one lead of the continuity meter to the under playfield 3/5 ball adjustment switch SLATE-WHITE wire. Check for continuity:

1. To Rivet #13
2. To Rivet #16 and/or the WHITE-GREEN wire
3. Advance 1 step, to Rivet #17, and/or the WHITE-BROWN wire
4. Advance 1 step, to Rivet #18, and/or the WHITE-ORANGE wire
5. Advance 1 step, to Rivet #19, and/or the WHITE-BLACK wire

Advance the player unit 5 times. This will be Player 1, Ball 5. The spring contact will now have rotated to contact Rivet #16. Move the lead of the continuity meter to the BALL RETURN (O) relay ORANGE-WHITE wire. Check for continuity:

1. To Rivet #20
2. To Rivet #16 and/or the WHITE-GREEN wire
3. Advance 1 step, to Rivet #17, and/or the WHITE-BROWN wire
4. Advance 1 step, to Rivet #18, and/or the WHITE-ORANGE wire
5. Advance 1 step, to Rivet #19, and/or the WHITE-BLACK wire

Player Unit Theory of Operation

The Gottlieb PLAYER UNIT is the master controller of the reset sequence and player-up, ball number sequence in many of their EMs from the 70's. Although this instance is from Spirit of '76 the operation is similar in most of the four-player games.

One frequent point of confusion is the function of the PLAYER UNIT and COIN UNIT. The COIN UNIT controls the number of players. Historically, this was the number of coins that were inserted, hence the somewhat confusing name since the later games can accumulate credits. The COIN UNIT advances one step for each press of the start button; it does not advance during game play. The PLAYER UNIT controls the sequencing of player-up and ball number.

To try to keep things in order I'll start the description at the ADD PLAYER UNIT coil at 13E.

Tracing to the right, the first group of switches is the player 4 and player 3 score reel ZERO position switches. During play these switches are bypassed by the Z2 reset control relay. During reset this Z2 switch opens which prevents the player unit from advancing until player 3 & 4 score reels have advanced to zero.

Continuing on, the following group is the player 2 and player 1 ZERO position switches. This is a duplication of the player 3 & 4 circuit. These switches are bypassed by the Z1 reset control relay which opens during reset to allow the player 1 & 2 score reels to reset.

The Z1 and Z2 relays function to break the reset sequence into two phases so that all the score reel coils don't fire at the same time which could draw too much current. Again, during game play the score reel switches are shorted by Z1 and Z2, so for normal operation the control starts at the next switch, SCORE MOTOR switch 1A.

SCORE MOTOR switch 1A pulses five times every 1/3 of a score motor rotation and thus the PLAYER UNIT can advance five steps every time the score motor runs. This operation is qualified by the upcoming switches that enable the player unit advance.

At this point the circuit splits into two separate functions which will be covered separately. First is the reset function (switches S and P5B) and the other is the game, or "start of ball" function.

Reset Function:

On the reset leg of the circuit switches S or P5B will advance the PLAYER UNIT while the AX relay is in the reset position. The START (S) relay will cause at least one step of the player unit. P5B is the PLAYER UNIT "home" switch and will advance the PLAYER UNIT until it is in the "home" or "zero" position.

Game Function:

The first switch on this leg of the circuit is the LAST BALL (BX) relay. That switch opens AFTER the last ball of the last player enters the outhole. This prevents the PLAYER UNIT from advancing after the end of the game. The next switch is the ADD PLAYER UNIT (P) relay. The P relay is the control that triggers a player unit advance when the trough switch is closed by the ball being kicked into the shooter lane. This is where things start to get complicated, so first let's skip past the PLAYER/COIN UNIT interaction to cover the last two switches. The 1ST BALL (U) relay switch blocks the PLAYER UNIT from advancing if the player's first ball drains with no score. The EXTRA BALL (I) relay switch blocks the PLAYER UNIT from advancing if the player earns an extra ball.

Finally, the last function is the PLAYER/COIN UNIT interaction. Gottlieb EM schematics show the switch positions for a one player game with the first ball in the shooter lane. For each additional player you have to picture the COIN UNIT switches all shifted down one step. This means that for a four-player game the COIN UNIT switches are all open.

For a one-player game the P relay will close and SCORE MOTOR switch 2C will advance the PLAYER UNIT one step. Switch 2C operates with a timing that only allows a single switch 5A pulse. When the PLAYER UNIT advances to the player 2 position switch P2G will close, causing another advance of the PLAYER UNIT. Now switch P3G advances it again and then P4G advances it the fourth time. The PLAYER UNIT is now back to Player 1, but now ball 2.

For a two-player game the COIN UNIT switches (rivets) will block the P2G switch operation and the PLAYER UNIT will stop in the player 2 position. Normally this works in a very orderly manner, but if the P2G, P3G, P4G, or the COIN UNIT rivets are not making good contact the player/ball sequence can skip or add players and/or balls.

The last function of the PLAYER UNIT is the triggering of the LAST BALL (BX) relay. This function is controlled by rivets on the PLAYER UNIT and is much simpler than it looks. Rivets 8-11 correspond to ball 3 on players 1 through 4 respectively. Likewise, rivets 16-19 correspond to ball 5 on players 1 through 4. The BX relay is triggered when the PLAYER UNIT is in position for the last player, last ball and the ball goes into the outhole.

Comments, Questions? Contact Kerry Imming, kcimming@pobox.com