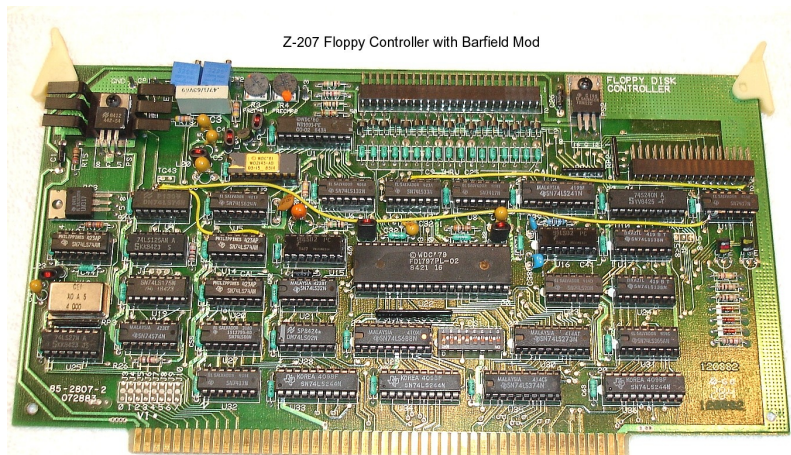




This article was originally published in issue #76, March 2020

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## Z-207 Floppy Controller Barfield Modification

by Steven Vagts  
"Z-100 LifeLine"

## Z-207 Floppy Controller Mods

### Background:

The Z-207 floppy disk controller has two physically different connectors for the standard density drives of the period:

- \* The large 8" drives using a 50-pin cable and a 500 KHz transfer rate, and
- \* The standard dual sided, double density (DSDD) 5-1/4" drive using a 34-pin cable with a 250 KHz transfer rate.

The two connectors on the Z-207 floppy controller had several other differences besides the number of pins.

- There are separate buffers and drive select decoders. The Z-207 has a density select signal labeled: 8"/5". A high logic level for this signal tells the board that it is using high density drives and enables the data buffers and decoders that go to the 50-pin connector. When the 8"/5" signal is low, the data buffers and decoders of the 34-pin connector are enabled.

- There is also circuitry on the Z-207 which determines the speed at which data transfer occurs. The 8"/5" signal is used to select this data transfer rate.

The standard Z-207 was capable of using 96 tpi or 48 tpi 5-1/4" drives by DIP switch selection, but the drives could not be mixed. And numerous new floppy disk types emerged over the years, leaving Z-100 owners asking for more capability.

Basically, with the stock Z-207 controller board, if you wanted to use the new high density drives, including 3-1/2" and a very wide selection of formats, some of which were very unique, you had to use "DiskPack" (a floppy disk device driver by William Flanagin and distributed by Paul F. Herman, Inc). A modified cable was necessary to adapt the 50-pin connector signals for the 34-pin drive connectors.

Then, MS-DOS version 4.x came on the scene, offering another option by providing the software support needed to accommodate the more popular drives of the period. And the hardware modifications needed were already developed. Our humble Z-207 Floppy Disk Controller, with modifications, is up to the task!

### Using Dual Density Drives on the Z-100:

Issue #13 of the Z-100 LifeLine published the first official modification to the floppy card. Called the "Hughes" Mod, after its developer, Jim Hughes of Houston, Texas, it made maximum use of Bill Flanagin's DiskPack program, which provided all the popular PC disk formats, plus a few of its own.

Essentially, it provided the means to use dual density floppy drives (i.e., 3-1/2" 1.4Mb/720Kb or 5-1/4" 1.2Mb/360Kb drives). It did have its limitations, however.

- \* The 50-pin connector was essentially disabled, therefore losing the capability to use 8" drives.
- \* You were limited to 4 drives per controller card.
- \* Some drive combinations would not work correctly. Some drives required that pin 2 of the 34-pin connector be converted to a density select signal, while some other drives would not allow that.

About the same time this modification was published, Travis Barfield also submitted a modification that used the 5" FASTEP signal (controllable by writing to a port) as a density select signal, allowing the 8"/5" signal to select the appropriate connector and continued use of the 8" drives.

At the time, this would have required a change to the DiskPack Software, which could not be done easily at that time.

Changes made to the Z-100 Monitor Rom and the new BIOS with MS-DOS v4.01 for the Z-100, provided the necessary software changes to support this better Z-207 modification.

While the modification was fully described in issue #29 and again in issue #76, I have updated this article for the "Z-100 LifeLine" Website because of its importance and for those who may not have either of those issues available.

To make use of this modification, BIOS modification, or BIOS v4.xx or later, is required!

## A Better Mousetrap!

In order to use this Z-207 Floppy Controller modification to support dual density drives, **you must use the new MS-DOS v4.01 or later** (Select the Barfield Z-207 Mod in DRIVECFG). Also, DiskPack is no longer required.

The modified Z-207 card will still work normally with earlier versions of DOS, and other operating systems like CP/M, but your dual density drives will not work correctly with those.

This modification is simple to perform, but some soldering skills are required. The only soldering to the board is at pin 2 of the 34-pin drive connector, so this modification is completely reversible.

You will need four (4) 14-pin DIP sockets, plus some small gauge insulated hook-up wire. If you do not have the sockets, the mod can be done by carefully soldering directly to the integrated circuits. The ICs involved are still readily available, if you need spares.

First we must perform the Z-207 Floppy Disk Controller 5.25" Faststep Modification to allow the controller to automatically switch between standard and high density modes.

### Figure Notes:

1. Pins shown with a box outside the IC outline are bent out and **MUST NOT** make contact with the existing socket pin.
2. Connections shown directly into the IC pin **MUST** insert into the existing IC socket pin.
3. If not using sockets, configure the IC itself the same way as the socket pins shown here.

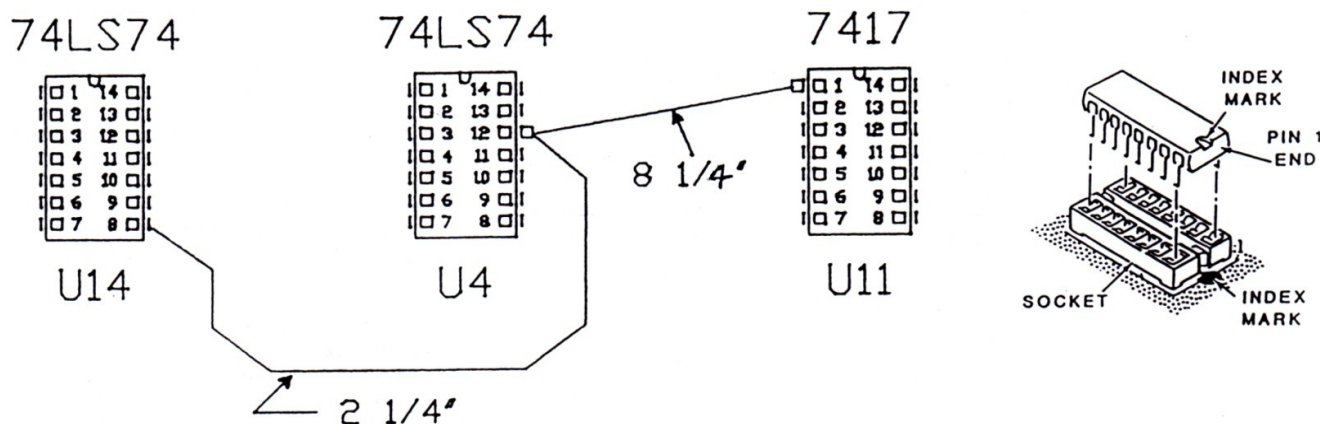
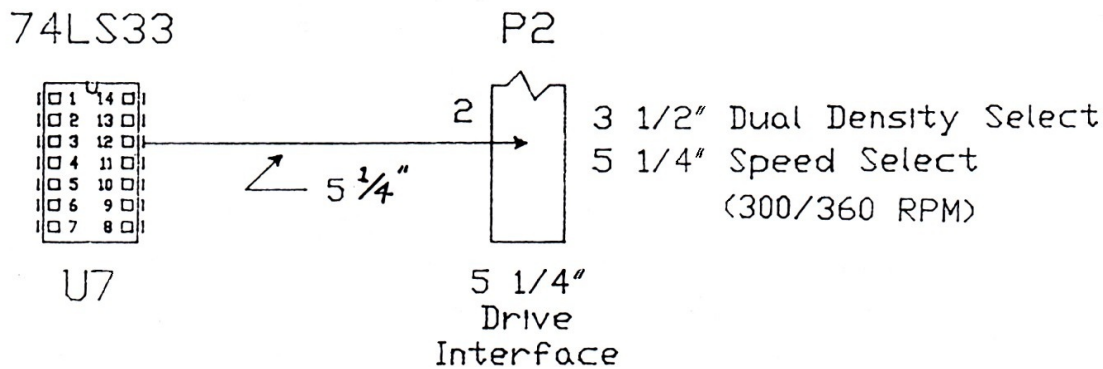


Figure 1.  
5.25" Faststep Modification



**Figure 2.**  
**3.5"/5.25" Dual Density Drive Select**

Remove the Z-207 floppy controller board from your Z-100, using the procedures provided in your User's Manual.

Referring to Figure 1, please follow these steps:

[ ] 1. Cut a piece of wire 2-1/4" long and strip 1/8" of insulation from each end. Solder one end of this wire to pin 8 of one of the new 14-pin sockets. Keep the wire on the leg as close to the socket body as possible.

[ ] 2. Remove IC U14 (74LS74) from the Z-207 board. In its place install the new IC socket you prepared in step #2. Reinstall the 74LS74 chip back into the piggy-backed socket. Check the proper orientation of pin #1 for both the socket and the IC.

[ ] 3. Bend out pin 12 of one of the new 14-pin sockets. Remove IC U4 (74LS74) from the Z-207 board and install the new socket in its place, leaving pin 12 sticking out to the side.

[ ] 4. Connect the other end of the wire coming from pin 8 of U14 to the bent out pin 12 of the U4 socket. Do not solder this connection yet.

[ ] 5. Cut a piece of wire 8-1/2" long and strip 1/8" of insulation from each end. Connect one end of this wire to pin 12 of the U4 socket. Now solder both wires at pin 12.

[ ] 6. Reinstall the 74LS74 chip back into the piggy-backed socket at U4. Recheck the proper orientation of pin #1 for both the socket and the IC.

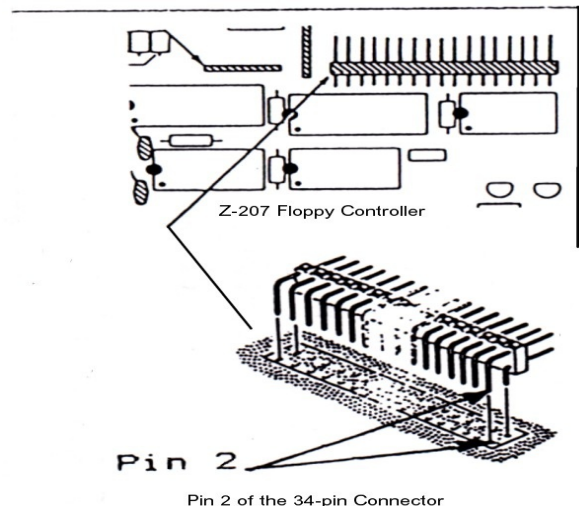
[ ] 7. Bend out pin 1 on one of the new 14-pin sockets. Remove IC U11 (7417) from the Z-207 board and install the new socket in its place,

leaving pin 1 bent out to the side.

[ ] 8. Solder the other end of the 8-1/2" wire coming from pin 12 of U4 to the bent out pin 1 of the U11 socket.

[ ] 9. Reinstall the 7417 chip back into the piggy-backed socket at U11. Recheck the proper orientation of pin #1 for both the socket and the IC.

Next we must perform the Z-207 Floppy Disk Controller Board 3.5"/5.25" Dual Density Select Modification. This will allow the controller to notify the respective drive that it should use standard or high density mode, based on the level of pin 2 of the 34-pin drive connector. It also signals 5-1/2" dual density drives to switch speeds between 300 rpm and 360 rpm.



**Figure 3.**  
**Pin 2 of the 34-Pin Connector**

[ ] 10. With a sharp knife or razor blade, carefully whittle away the plastic around pin 2 of the 34-pin connector. See Figure 3.

[ ] 11. Cut a piece of wire 5-1/4" long. Strip 1/8" of insulation from one end and 1/4" from the other.

[ ] 12. Carefully solder the 1/4" stripped end of the 5" wire to this prepared pin 2 of the 34-pin connector.

[ ] 13. Solder the other end of the 5" wire coming from pin 2 to pin 12 of the remaining new 14-pin socket. Keep the wire on the leg as close to the socket body as possible.

[ ] 14. Remove IC U7 (74LS33) from the Z-207 board. In its place install the new socket you just prepared. Plug the same 74LS33 chip into

the piggy-backed socket at U7. Recheck the proper orientation of pin #1 for both the socket and the IC.

[ ] 15. Carefully inspect the ICs and sockets to ensure that all pins, except pin #12 of U4 and pin #1 of U11 are properly seated and not bent under.

[ ] 16. Carefully dress the wires close to the board and around the other ICs. Secure with tape or daps of glue.

[ ] 17. Correct your Z-207 schematics to reflect the changes. See Figures 4 and 5.

[ ] 18. This completes the 5" Faststep Dual-Density Select modification.

### Z-207 Dual Density Circuit Changes

Please modify your Z-207 schematic to reflect the following changes:

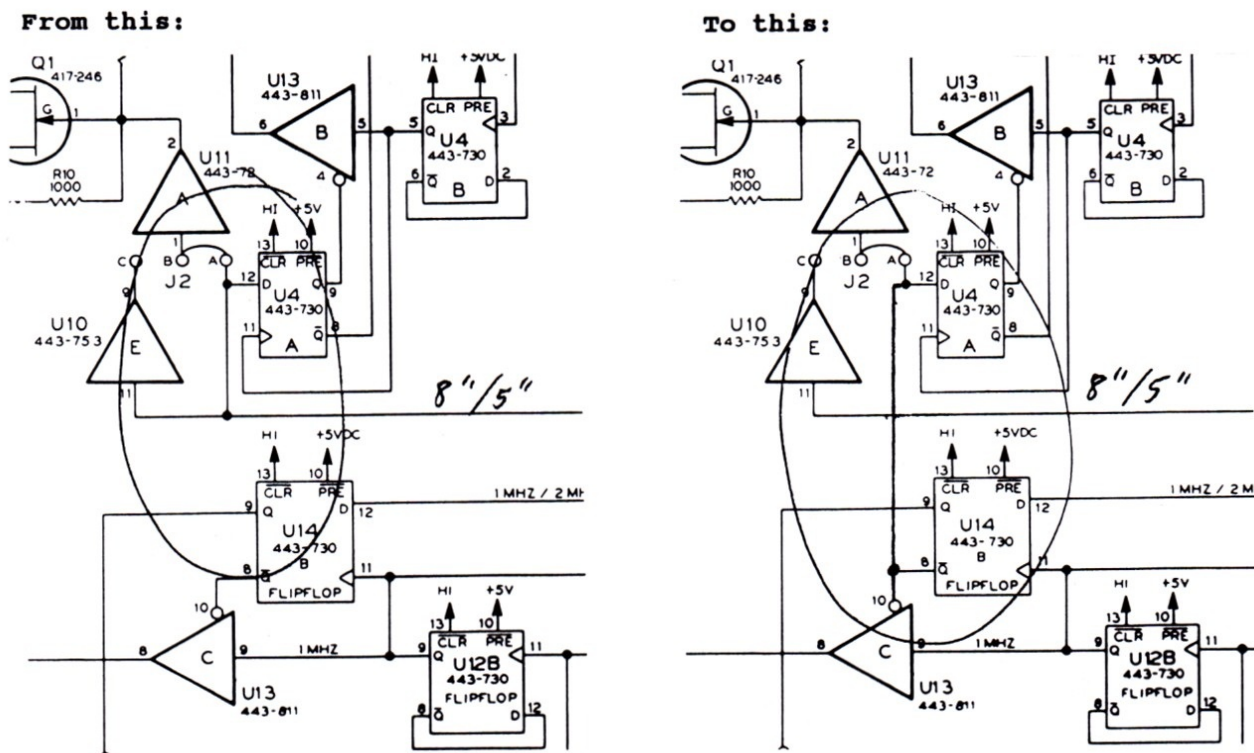
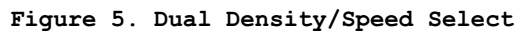


Figure 4.  
5" Faststep Modification





Please NOTE:

- \* Dual Density Drives count as High Density for these settings.
- \* By design, the High or Dual Density drives must occupy the lowest drive select numbers! This could leave your primary Boot 360 Kb drive set as DS4! But, this drive could still be set by DRIVECFG to Drive A:!

\* **Hint:** To avoid having special Boot disks for each of your different computer configurations, set DRIVECFG on your 360 Kb Boot floppies so all your floppy drives are Low Density. This allows Booting your Low Density 360 Kb floppy from any of your low density drives.

If you have any questions or comments, please contact me at: [z100lifeline@swvagts.com](mailto:z100lifeline@swvagts.com)

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**DIP Switch #      Drive Types Connected      Note: 0=Off, 1=On  
DS = Drive Select**

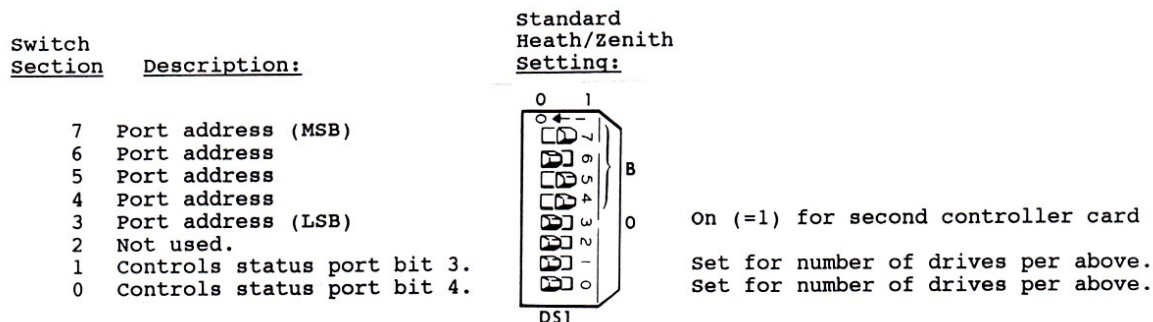
1      0

0 (Off) 0 (Off) 4 - 48 TPI drives (standard 360 Kb drives) (DS0 - DS3)  
 0 (Off) 1 (On) 1 - 96 TPI drive (DS0), 3 - 48 TPI drives (DS1 - DS3)  
 1 (On) 0 (Off) 2 - 96 TPI drives (DS0, DS1), 2 - 48 TPI drives (DS2, DS3)  
 1 (On) 1 (On) 3 - 96 TPI drives (DS0 - DS2), 1 - 48 TPI drive (DS3)

2 (don't care) Not used.

3      LSB port address  
 0 (Off) = Primary Controller LSB port address (0)  
 1 (On) = Secondary Controller port address (8)

4 (On)      MSB port address (0Bxh). The x indicates the LSB setting  
 5 (On)      MSB port address  
 6 (Off)      MSB port address  
 7 (On)      MSB port address



**Figure 6.**  
**Setting the Z-207 Controller DIP Switches**  
**For ZROM version 3.x and ZDOS v4.01 ONLY**

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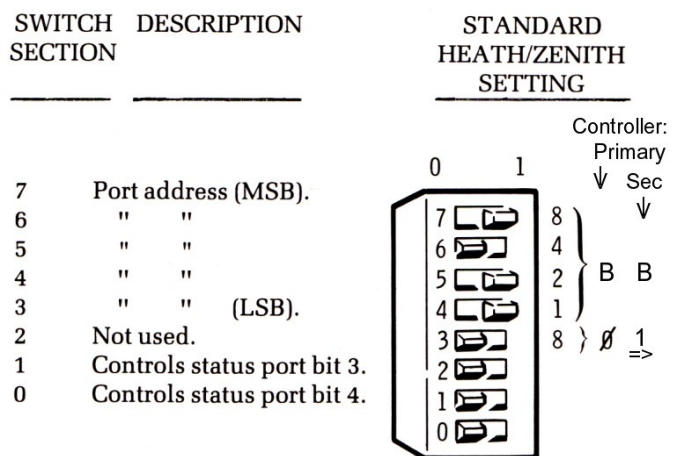
For ALL other versions of ZROM (MTR-ROM) and operating systems, including ZDOS and CP/M, use the original settings as given in the User's Manual. These are:

Sect: Description:

- 0 This section selects the 5.25" disk drive type. Position the switch section to ON (1), if you use 96 tpi drives or to OFF (0), if you use 48 tpi drives. The default is **OFF (0)**.
- 1 This section selects pre-compensation for 5.25" disk drives. Position to ON (1), if you want pre-compensation or to OFF (0), if you do not it. The default is **OFF (0)**.
- 2 This section is not used.
- 3-7 These sections are used to establish the port base address of the floppy disk controller board(s). Normally, for the first Z-207 Controller, the switches are:

(3) (4) (5) (6) (7)
 OFF ON ON OFF ON

For two Z-207 Controllers, the switches become:



Cheers,

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