



## MPMS Service Note 1014-812

# 17-Bit Digitizer Board Replacement and Use

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This service note explains how to replace the 17-Bit Digitizer board (rev. K0 and higher) that is used in the MPMS and MPMS-XL. All 17-Bit Digitizer boards with revision labels of “K0” or higher (letters are incremented at major revisions, numbers at minor revisions) have a new design and are the subjects of this service note.

In addition to instructions for replacing the 17-Bit Digitizer board inside the Model 1822 MPMS Controller, this service note also explains how to set the jumpers on the 17-Bit Digitizer board and the settings that the MPMS MultiVu software needs to make use of the new board.

### Introduction

The 17-Bit Digitizer board (also referred to as the voltmeter card) is used in the MPMS to measure the voltage of the following items:

- helium-level meter
- high- and low-resolution resistors in series with the output of the magnet power supply
- TC gauge
- longitudinal and transverse SQUIDs
- external input available to the user at connector JC-17 on the back panel of the Model 1822 MPMS Controller

You will use the following sequence of procedures to install the new 17-Bit Digitizer board (rev. K0 and higher):

1. Identify and set the correct jumper settings for the new board.  
**Note:** You might need to remove the CPU board inside the Model 1822 MPMS controller so that you can identify the correct jumper settings. Instructions for removing and replacing the CPU board are given in *Service Note 1014-804: 1822 CPU Board Replacement*.
2. Remove the old (currently installed) 17-Bit Digitizer board from the Model 1822 MPMS Controller.
3. Install the new (replacement) 17-Bit Digitizer board into the Model 1822 MPMS Controller.
4. Change the software settings in MPMS MultiVu so that you can use the new board.

## Identifying the Jumper Settings

Find the J5 dual-row header connector by looking at the component side of the 17-Bit Digitizer board (rev. K0 and higher) with the wording along the bottom edge right-side up (see Figure 1). The J5 dual-row header connector is close to the top left corner of the board. The J5 connector has two jumper settings and six test points. The test points are not used during normal operation.

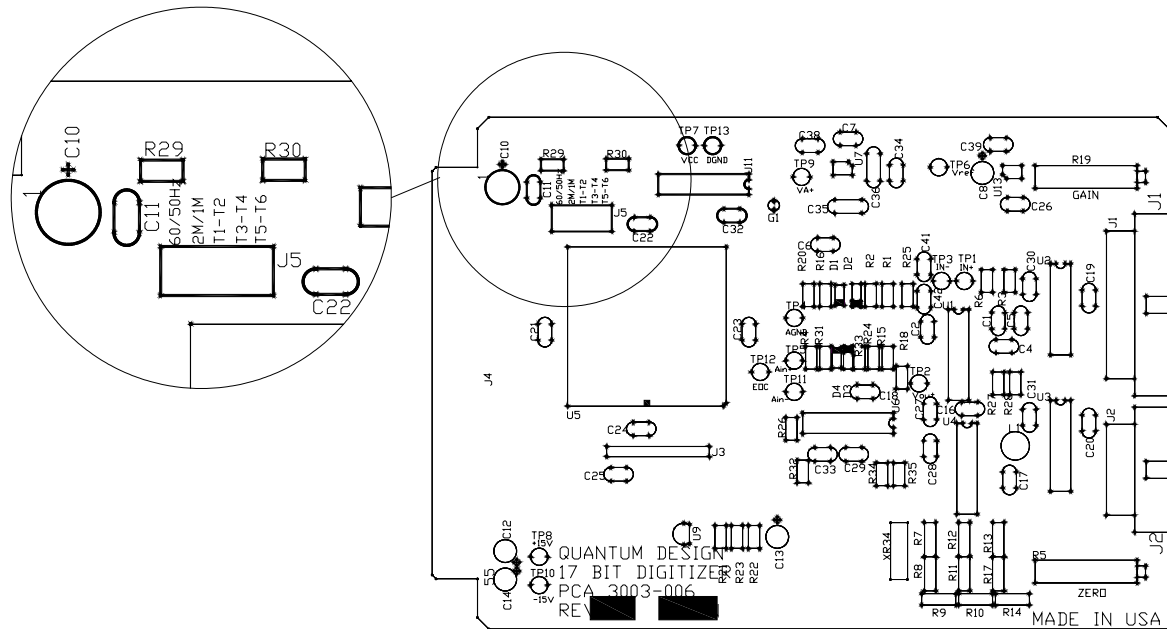


Figure 1. Component side of the 17-Bit Digitizer board with the wording right side up. Inset shows the J5 dual-row header with pin columns.

Now find the column of pins that is on the far left and labeled 60/50 Hz. You will use this column of pins to select the system power-line frequency.

- If you have a 60 Hz system, leave these pins as they are (unconnected).
- If you have a 50 Hz system, place a jumper across this column of pins.

Finally, find the column of pins that is second from the left and labeled 2M/1M. You will use these pins to set the speed of the CPU board that is present in the system. Most systems manufactured in 1992 and later will have a 2 MHz CPU board. To determine the speed of the CPU board present in your system, see the next section (Determining CPU Board Speed).

- If your system has a 2 MHz CPU board, leave the pins as they are (unconnected).
- If your system has a 1 MHz CPU board, place a jumper across this column of pins.

## Determining the CPU Board Speed

To determine the speed of the CPU board, remove the board from the Model 1822 Controller. Figures 3a and 3b show the location of the CPU board for the MPMS and MPMS XL systems. Refer to *Service Note 1014-804: 1822 CPU Board Replacement* for instructions on removing the CPU board.

Once the board is out of the Model 1822 Controller, find the J1 jumper on the component side of the board. This jumper is in the bottom right region of the board when the large EPROMS are oriented toward the top right corner (see Figure 2). The jumper from the center pin is soldered at the factory; it is soldered either to the left pin, marked “H”, or to the right pin, marked “L”.

- If the jumper is soldered to the “H” pin, it means that the board runs at 2 MHz.
- If the jumper is soldered to the “L” pin, it means that the board runs at 1 MHz.

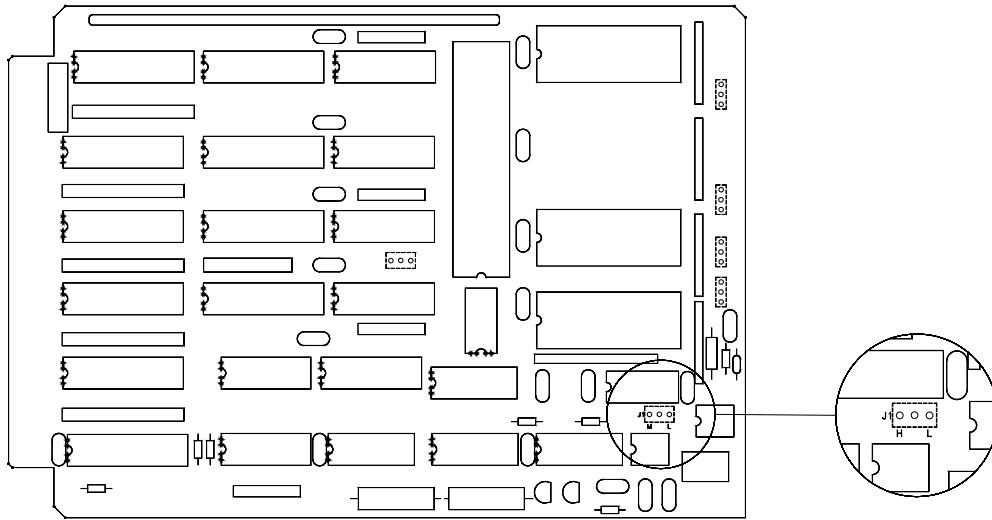


Figure 2. Component side of the CPU board for the Model 1822 Controller; the inset shows the location of the J1 jumper and the “H” and “L” pins.

After you have determined the speed of the CPU board, replace the CPU board inside the Model 1822 Controller as described in *Service Note 1014-804*.

### ***Removing the Currently Installed 17-Bit Digitizer Board***

**Note:** The following procedure can be performed while the MPMS system is cold. However, you should set the system temperature to 300 K to prevent air from cryopumping into the sample space.

1. Turn off all power to the Model 1822 Controller by using the switch on the front panel of the console.
2. Remove the panel that covers the front of the Model 1822 Controller.

**For MPMS systems:** Remove the front panel of the Model 1822 Controller by removing the faceplate screws and disconnecting the Power and Heater Protect Override switches (Figure 3a).

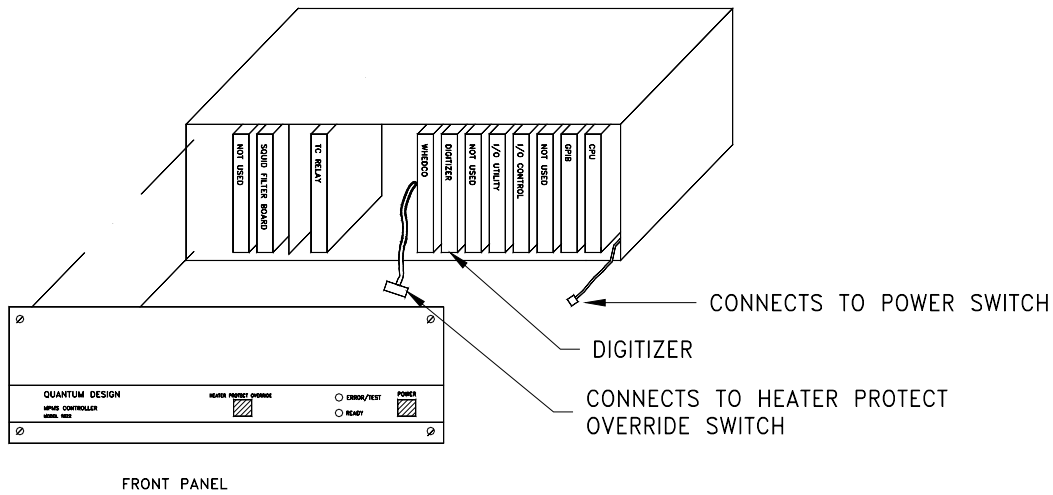


Figure 3a. The 1822 MPMS Controller with the front panel removed.

**For MPMS XL systems:** Flip the front panel of the cabinet down after turning the front panel fasteners one-quarter turn with a Phillips-head screwdriver (Figure 3b).

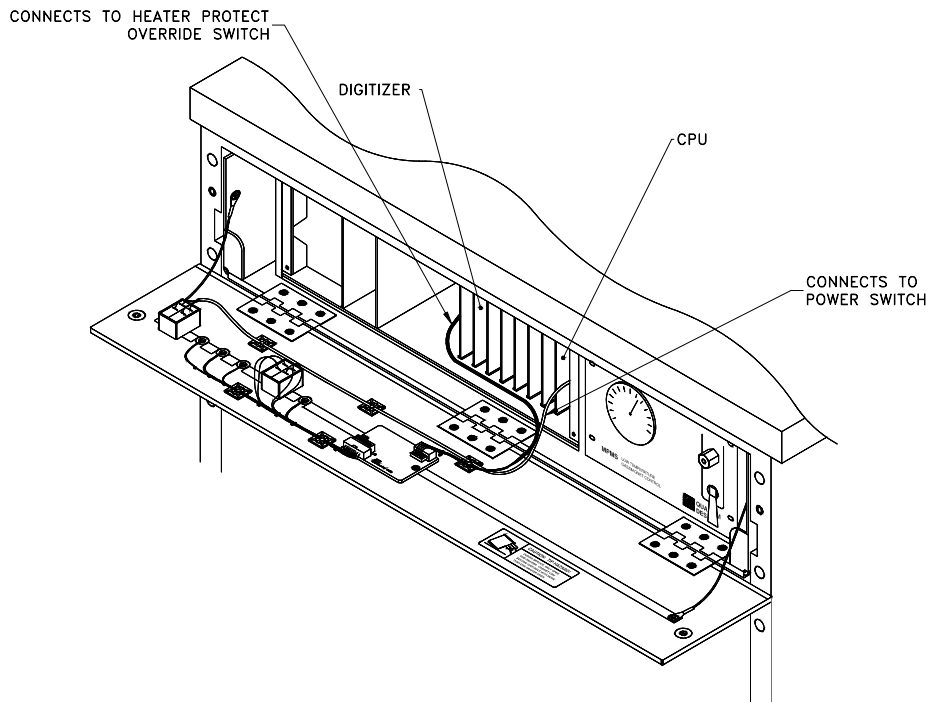


Figure 3b. The front of the 1822 Controller for MPMS XL systems with the front panel lowered.

3. Locate the 17-Bit Digitizer board that is currently installed in the Model 1822 Controller, using Figures 4a and 4b for reference. The board will be near the center of the 1822 Controller, just to the right of the WHEDCO board.

The configuration and appearance of the 1822 Controller depend on whether the AC measurements option is installed. Figure 4a illustrates the controller's appearance without the AC option; Figure 4b illustrates the controller's appearance with the AC option.

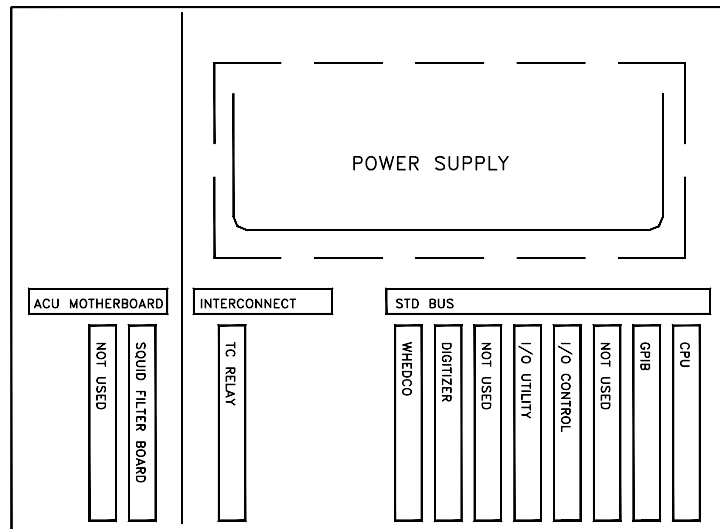


Figure 4a. Top view of the Model 1822 MPMS controller (without the cabinet). This 1822 controller does *not* have the AC option installed.

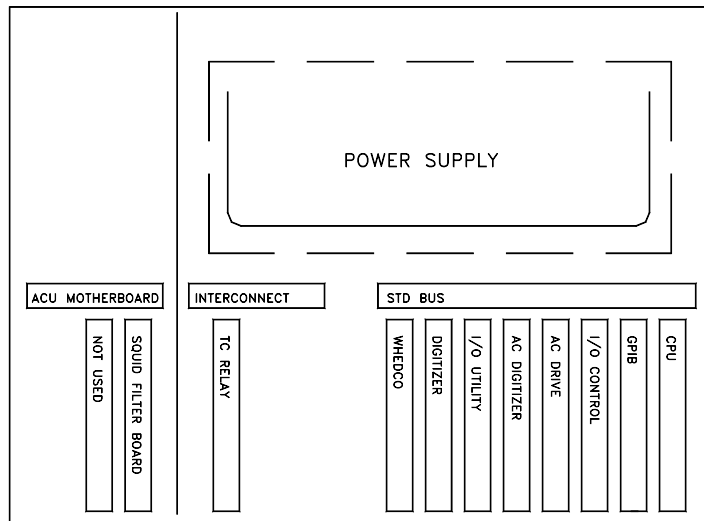


Figure 4b. Top view of the Model 1822 MPMS controller (without the cabinet). This 1822 controller *does* have the AC option installed.

4. To remove the board you must disconnect several ribbon cables that obstruct your access to the 17-Bit Digitizer board. The cables and disconnection sequence that you use will vary depending on whether the controller *does* or *does not* have the AC option installed. Use the appropriate sequence below and Figure 4a or Figure 4b for guidance to ensure that you disconnect the correct cables.

## CAUTION!

Be sure to note the orientation and position of each connector before you disconnect it so that you will be able to reconnect it properly—the 1822 Controller will be damaged if the wrong cables are connected to the boards.

**Important:** Use care while disconnecting the cables so that you do not damage the cables or connectors. The cables are removed by gripping the short (top and bottom) edges of the connector and alternately pulling from the top and bottom (see Figure 5). As with any electronic connector, only pull on the connector, do not pull on the cable.

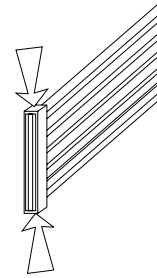


Figure 5. Ribbon cable and connector

### SEQUENCE 1: CONTROLLER WITHOUT AC OPTION

- a. First, disconnect the one ribbon cable that is attached to the I/O Control board; the cable is labeled P2(J2) IO Control.
- b. Second, remove two cables from the I/O Utility board; the cables are labeled P2(J2) IO Util and P3(J3) IO Util.
- c. Finally, remove two cables from the 17-Bit Digitizer board: one cable is labeled P1(J1) Vltmtr AC DIGIT, the other cable has three ends—remove the end that is labeled P2(J2) Vltmtr and the end labeled P1(J2) AC Digitizer (you can ignore the other end).
- d. Go to Step 5.

### SEQUENCE 2: CONTROLLER WITH AC OPTION

- a. First, disconnect the one ribbon cable that is attached to the I/O Control board; the cable is labeled P2(J2) IO Control.
  - b. Second, remove one cable from the AC Drive board; this cable is labeled P3(J3) AC Drive.
  - c. Third, remove one cable from the AC Digitizer board; this cable is labeled P1(J2) AC Digitizer.
  - d. Fourth, remove two cables from the I/O Utility board in the following order: the cable labeled P2(J2) IO Util, then the cable labeled P3(J3) IO Util.
  - e. Finally, remove two cables from the 17-Bit Digitizer board: one cable is labeled P1(J1) Vltmtr AC DIGIT, the other cable has three ends—remove the end that is labeled P2(J2) Vltmtr and the end labeled P1(J2) AC Digitizer (you can ignore the other end).
  - f. Go to Step 5.
5. Remove the old 17-Bit Digitizer board by pulling it out of its socket (see Figure 6 for the location of the board). It may be seated quite tightly. Grip the board by the top and bottom edges, being careful not to contact any of the board components. Use care not to bend any

components during the removal process. You will have the best results if you ease the board out by pushing it up and down a little as you pull it away from the slot.

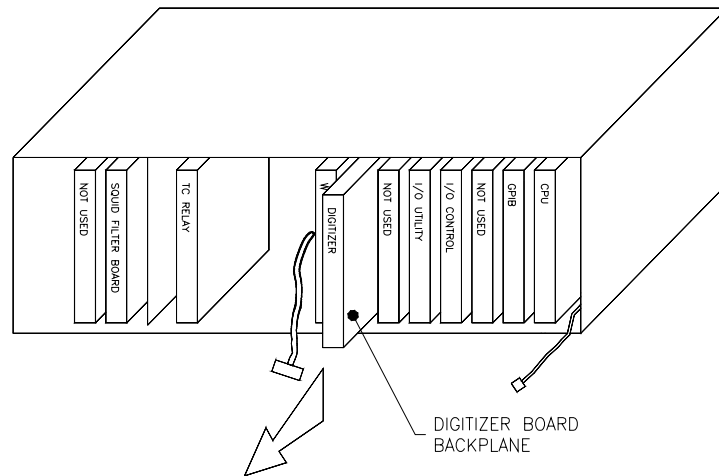


Figure 6. An 1822 MPMS Controller (without AC option) with the faceplate removed to show the boards. The callout shows the location and orientation of the digitizer board.

6. Confirm that you have removed the 17-Bit Digitizer board: its part number is 3003-006. To find the part number, hold the board with the component side facing up. The part number is along the bottom edge of the board toward the left side.

### ***Installing the Replacement 17-Bit Digitizer Board***

1. To install the new 17-Bit Digitizer board in the 1822 Controller, place the board so that the component side faces to your left. See Figures 4a and 4b to guide the correct placement of the 17-Bit Digitizer board. The board goes into the slot that is to the right of the WHEDCO board, which is near the middle of the 1822 Controller.
  - o On systems without the AC option, place the digitizer board between the WHEDCO board and an empty slot.
  - o On systems with the AC option, place the digitizer board between the WHEDCO board and the I/O Utility board.

Insert the board by sliding it into the socket at the rear panel. Be sure to push the board until it seats firmly into the socket at the far edge of the board.

2. Reconnect the ribbon cables that you removed in Step 4 above, connecting them in exactly the opposite order that is given for their removal (Sequence 1—Steps c, b, a; Sequence 2—Steps e, d, c, b, a).

**Important:** Be certain that you connect the cables to their original positions and their original orientations, referring to the cable labels as you go. You will damage the 1822 Controller if you connect the wrong cables to the boards.

3. (MPMS only) Reconnect the Power switch and the Heater Protect Override switch.
4. Replace the faceplate on the front of the 1822 Controller (MPMS) or flip up the front panel of the cabinet and secure the panel fasteners by rotating them one-quarter turn with a Phillips-head screwdriver (MPMS XL).
5. Turn on the 1822 Controller.

6. Send the old 17-Bit Digitizer board back to Quantum Design at the address below:

Customer Service  
Quantum Design  
11568 Sorrento Valley Road, Suite 13  
San Diego, CA 92121

### ***Changing the Software Settings***

The filter on the 17-Bit Digitizer board (rev. K0 and higher) requires slightly longer SQUID settling times than the board it replaces; this settling time prevents measurements from being affected by previous readings. The SQUID settling times are set in the **Calibration** dialog, which is found under the **Utilities** menu in MPMS MultiVu. To change the SQUID settling times

- Select **Utilities >> Calibration**. The **Calibration Factors** dialog box will open for you to change the settings.
- Click on the plus (+) sign in front of SQUID settle times.
- Double click on the first filter frequency (20000 Hz).
- When the dialog box for that frequency opens, set the appropriate settle time, as shown in Table 1.
- Click on the **OK** button to close that dialog box.
- Continue to set the settle time for each filter frequency, using the times shown in Table 1, until they have all been set to the new times.
- Click on the **Close** button to shut the **Calibration Factors** dialog box.

Table 1. SQUID filter frequencies and settling times for the new 17-Bit Digitizer board (rev. K0 and higher)

<b>FILTER FREQUENCY</b>	<b>SETTLE TIME</b>
20000 Hz	0.100 s
5000 Hz	0.100 s
1200 Hz	0.100 s
80 Hz	0.100 s
10 Hz	0.130 s
5 Hz	0.850 s
Elliptical	0.850 s
None	0.100 s

The replacement 17-Bit Digitizer board has now been installed and your MPMS system is ready to use.