Hardware and Software Installation—Extender Electronics Module: MultiMode™ AFM

205.1 Introduction

This Support Note provides instructions for the installation of Extender Electronic module hardware used to provide MFM and EFM capabilities to Digital Instruments' scanning probe microscopes (SPMs). Hardware installation for MultiMode AFM models is normally done by DI technical support personnel or representatives; however, instructions are provided here for customer reference.

For instructions related to operation of SPMs after installation of electronic hardware, the reader is referred to Support Notes No. 229 and 231. These documents provide detailed instructions for conducting MFM and EFM imaging using the Extender Electronics module with MultiMode systems.

CAUTION: These instructions assume some familiarity with electronics, and with basic electrical safety practices. If the reader is unfamiliar with the handling of electronic components and/or safety practices, please contact Digital Instruments for assistance. Please observe static discharge precautions whenever handling electronic boards. Customers may ship their SPM to Digital Instruments or its representatives for prompt installation of the hardware, or schedule a service call.

*Document Revision History: Support Note***: 205**

Rev.	Date	Section(s) Affected	Ref. DCR	Approval
Rev. D	01-20-2011	Re-branded		CCF rad
Rev. C	22JUL97	New Section 205.3; New Figures 205-1 to 205-7	N/A	BkD
Rev. B	14JUN96	Minor text corrections	N/A	DB
Rev. A	10OCT94	Initial Release	N/A	

205.2 Hardware Installation—MultiMode AFM Models

1. Power down the MultiMode microscope, NanoScope Controller electronics and computer. Unplug the MultiMode from the controller, then remove the MultiMode's optical head and any samples. Place the MultiMode on a workbench, preferably on a soft pad to prevent scratching plated surfaces.

2. Turn the MultiMode upside-down and rest it on its scanner support ring. Using a 1/16-inch allen wrench, remove the four screws securing the bottom plate to the base (Figure 205-1).

Remove screws (4 places)

Figure 205-1 Remove four screws securing the bottom plate to the base.

3. With the bottom plate removed, the main board will be visible as shown in Figure 205-2. Use a 1/16-inch allen wrench to remove the buttonhead screw securing the main board to the standoff beneath.

Remove buttonhead screw

Figure 205-2 Remove the button head screw securing the main board to the base (above).

4. Gently slide the main board sideways in the direction of the screw hole (away from the DB-25 plug on the side of the base); the board should disconnect from the DB-25 plug connector. Remove board from base and save.
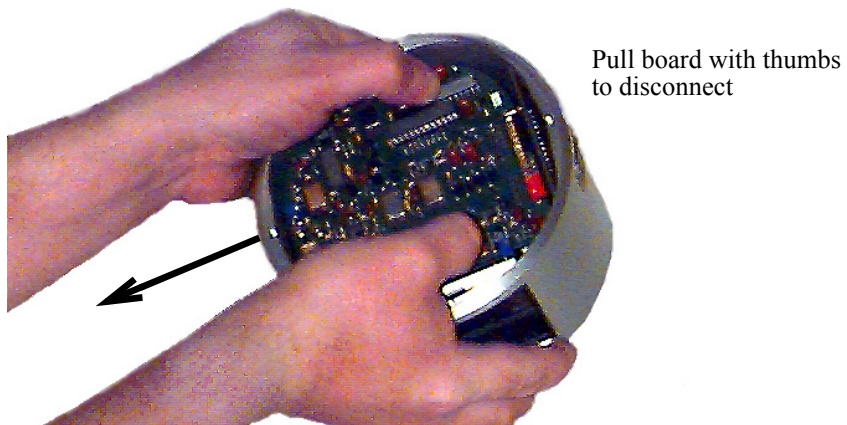

Pull board with thumbs to disconnect

Figure 205-3 Gently slide the main board's edge connector away from the DB-25 plug. Remove the board from the base.

5. With the main board removed, the interconnect and meter boards will be visible, mounted on the inner wall of the base. Unplug all four cables connecting the motor mounting plate to the interconnect and meter boards (Figure 205-4.)
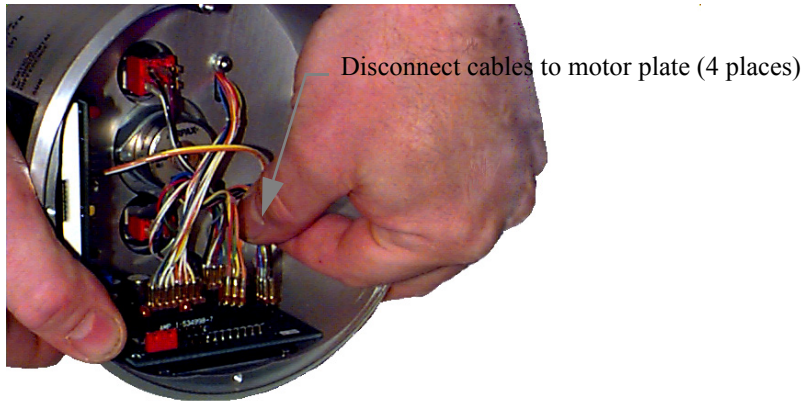

Disconnect cables to motor plate (4 places)

Figure 205-4 Unplug cables between the motor mounting plate and electrical boards.

6. Set the MultiMode on its side, then loosen the two side screws on the edge of the base (motor housing) to release the motor mounting plate (Figure 205-5).

Loosen screws (2 places)

Figure 205-5 Loosen screws on the edge of the MultiMode base to separate the motor plate from the housing.

7. Carefully separate the motor mounting plate from the housing—do not strain the LED cable between the motor mounting plate and base housing. Disconnect the 10-wire ribbon cable bridging the meter and interconnect boards at the interconnect side. Remove the but-

tonhead screw securing the interconnect board to the inner wall of the base (Figure 205-6). Also remove two screws securing the DB-25 plug.
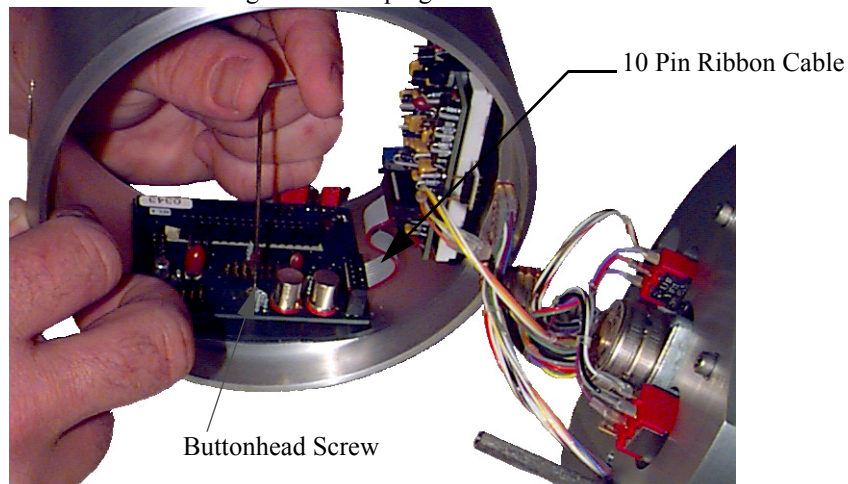

Figure 205-6 Carefully separate the motor mounting plate from the base, then disconnect the 10-wire ribbon connector between the meter and interconnect boards. Remove the buttonhead screw securing the interconnect board to the inner wall of the base.

8. Remove the old interconnect board and save. Install the new Phase Extender version of the board (P/N PFE-INT-C213) in the same position, then reinstall the buttonhead screw to secure. Reinstall two screws used to mount the DB-25 plug.

9. Reassemble the motor mounting plate to the base, then retighten two retaining screws to secure. Reconnect all cables as before. Before reconnecting ribbon cables, verify that each cable is properly oriented to each plug (Figure 205-7). Cables feature colored wires which should orient to each connector pin as shown below.
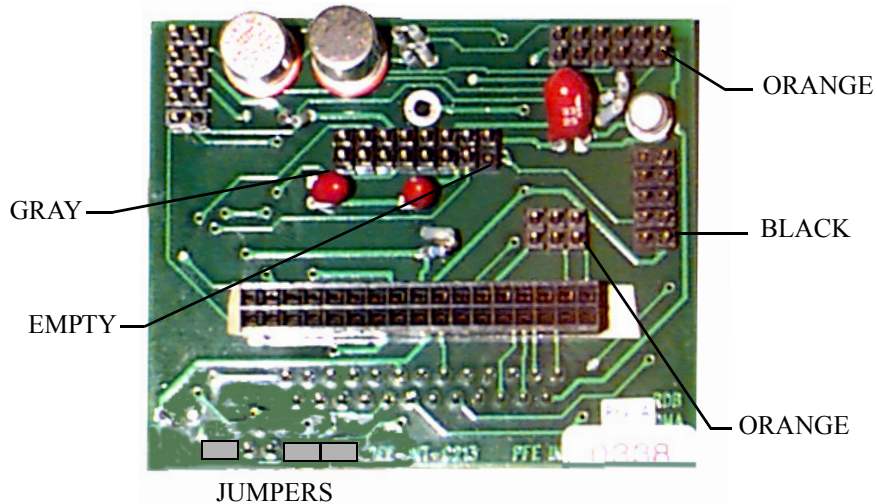

Figure 205-7 Replace the old interconnect board with the new Extender Electronics module version (P/N PFE-INT-C213). When reconnecting cables, verify they are properly oriented before connecting.

10. Install the new Extender Electronics version of the main board (P/N MMD-PFE-2154) by gently sliding it into place (the reverse of removal). Re-secure the board using the buttonhead screw.

11. Reinstall the base plate (the reverse of removal), then secure using four countersunk screws.

205.3 Installation of Software for the Phase Extender

205.3.1 Setting the Extender Electronics for Dimension or MultiMode

The Extender Electronics box is equipped with a slider switch for switching internal electronics between Dimension-series and MultiMode SPM signals. This switch may be accessed through a hole on the underside of the box. In the drawing below, the switch is set to "**MultiMode**".

<div align="center">

Dimension

MultiMode

</div>
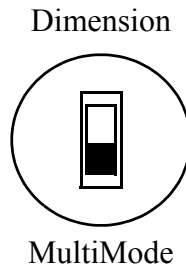
For MultiMode SPMs, it should always be set to "**MultiMode**". Use a pencil to access the switch through the hole. For the Dimension-series SPM's, the switch should always be set to "**Dimension**."

WARNING: Do not insert a conducting object (e.g., screwdriver) into the Phase Extender box while it is engergized.

ATTENTION: Ne pas insérer d' objet conducteur (par exemple: un tournevis) dans le boîtier d'extension de phase (Phase Extender Box) quand celui-ci est sous tension.

WARNUNG: Stecken Sie keine leitfähigen Teile (zum Beispiel Schraubenzieher) in die Phase Extender Box, während diese eingeschaltet ist.
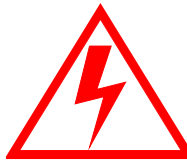
205.3.2 Microscope parameter files.

There are two parameter (par) file contexts that are used with the Extender Box: Extended AFM and Extended STM. The former of these two contexts is used for the following operational modes: contact AFM, TappingMode AFM, LFM, MFM, force modulation, electric field measurement and others. The latter context is for use only with STM.

For each scanner intended to be used with the Extender, there must be a PAR file for the context required. For example, if there are three scanners, all intended for both STM and AFM use, a total of six PAR files are required.

Notes

- Due to the many Digital Instruments' microscope systems available, the variety of scanners, purchase date, and the system's history of software updates, not all systems will have `PAR` files with the same name or naming scheme. You can determine the exact name of the `PAR` file to be modified by using the `DOS EDIT` file editor to list the contents of the file `/SPM/SYSTEM.PAR`. The name of the most recent `PAR` file in use will be on the line that starts with the words `\Microscope file:`.

CAUTION: When closing the `System.par` file after viewing it, if you are asked to SAVE the file or to SAVE CHANGES, be sure to say **No**.

ATTENTION: A la fermeture du fichier `System.par`, lorsque l'ordinateur demande `SAUVEGARDER (SAVE)` ou `SAUVEGARDER LES CHANGEMENTS (SAVE CHANGES)`, répondre toujours **NON**.

WARNHINWEIS: Falls Sie sich mit einem Editor die Datei „system.par" anschauen und beim Verlassen des Editors gefragt werden, ob Sie die Datei speichern („SAVE") bzw. die Änderungen speichern wollen („SAVE CHANGES"), antworten Sie bitte mit **„Nein"** (**„No"**).

To modify the `PAR` files on a MultiMode or Dimension system, locate the proper `PAR` file in the `/SPM/EQUIP` directory on your computer. Use a text editor to modify the file. The text must be saved as plain ASCII (standard DOS text). DI recommends using the DOS EDIT file editor. (Microsoft Word® or other similar desk-top-editors normally save files with embedded formatting commands causing the par files to be unreadable by the NanoScope software.) Using the EDIT program, modify the file to include a new line at the bottom of the file. For example:

If the line

```
\Is FM: No
```

is present in the file, then change the line to read:

```
\Is FM: Yes
```

If the line

```
\Is FM: No
```

is not present, add the line:

```
\Is FM: Yes
```

Then locate the line:

```
\In Polarity: Reverse
```

and change it to read:

```
\In Polarity: Forward
```

Then locate the line:

```
\In Polarity: AUX D: Reverse
```

Change it to read:

```
\In Polarity AUX D: Forward
```

Repeat the above procedure for each scanner (i.e. PAR file) in use. After the cables are connected, power up the NanoScope controller and start the microscope control program.

205.3.3 Important points.

1. Extender-compatible microscope electronics are required to permit operation of the phase detection extender option. Standard electronics on these microscopes require hardware upgrades. Consult your Digital Instruments sales representative for details.

2. Turn off the power to the NanoScope controller whenever connecting or disconnecting the Extender.

3. In **LiftMode**, the best performance is obtained if the RMS amplitude is kept below 7.0 volts, the limit of the RMS output's linear operation.