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1- DESCRIPTION

Grafidy3 uses Grafidy psd (pulse sequence) and Grafidy coil fixture, and has an improved user interface to provide more flexibility and ease of use. Grafidy3 will adjust and compensate for short, long, and very long time constants eddy currents, both linear and B_0 terms.

Currently, Grafidy3 can be performed on sites with 9.0, 9.1 and 10 software revisions.

1-1 Basics of Grafidy3

The basic steps required for Grafidy3 are:

1. Set up the standard two-coil Grafidy kit.

2. Place a rotary attenuator set for 20dB of attenuation between exciter output and RFI.

3. Manual Prescan and get “enough signal” to make sure both the setup and coils are good. Then Auto Prescan.

4. Start the Garfidy3 tool. Select the components that are going to be calibrated and zero out their calibration values.

5. **Auto Mode:** One coil axis at a time. Make sure the physical coil axis and the axis selected on the tool’s user interface are the same, and then scan.

6. **Manual Mode:** If auto mode does not make all components under spec (still in “red” in the user interface’s result table), go to manual mode to do some “touching up.”

7. Repeat steps 5-6 for the other coil axes.

2- TIME, TOOLS, AND PREREQUISITE PROCEDURES REQUIRED

2-1 Time Requirements

The estimated time to perform this procedure is three hours for BRM or six hours for Whole and Zoom mode on Twin*Speed*. Individual plans can be run to "touch up" calibrations at significantly less time, depending on the number of planes adjusted.

WARNING!

POISON HAZARD! THE PHANTOM CONTAINS $CUSO_4$. DO NOT INGEST. DISPOSE OF AS A HAZARDOUS WASTE ACCORDING TO STATE AND FEDERAL REGULATIONS.

2-2 Required Tools

- Rotary attenuator (10db/step), 46-255838P2
- Grafidy kit - There are several variations in the field as listed below:
  - 46-271417G1 – 1.5T
  - 46-307164G1 – 1.5T
  - 46-307164G2 – 1.5T
  - 46-307164G3 – 1.0T, 1.5T
  - 46-307164G4 – 1.0T, 1.5T
  - 46-307164G6 – 1.0T

Verify that you have the proper kit for your magnet's field strength.

2-3 Prerequisites for Grafidy

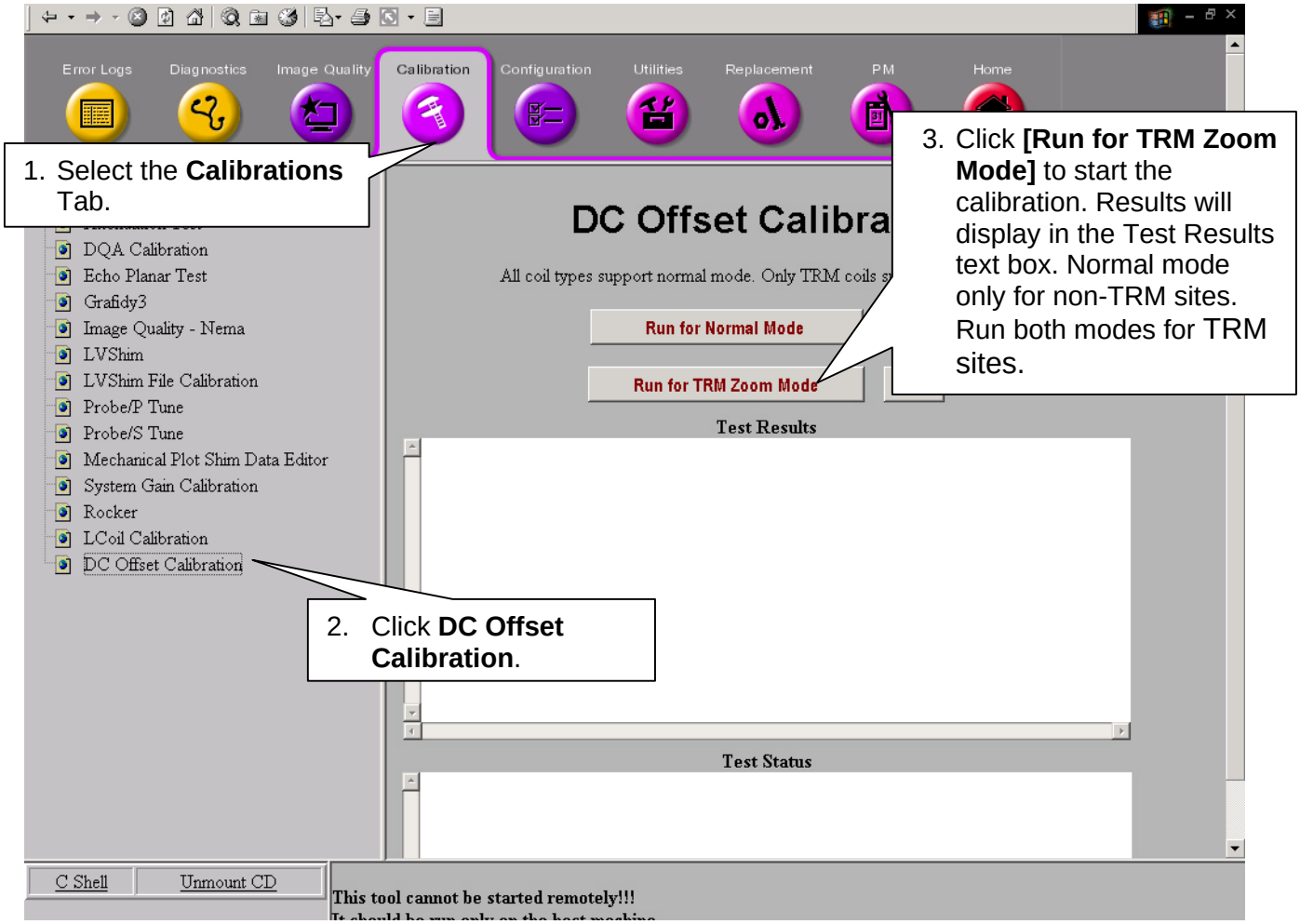
The following procedures should be performed prior to Grafidy.

- Electrical isocenter calibration
- Geometry verification
- DC offsets
- Lcoil (Lcoil only needs to be run on new systems that have never had Lcoil run, or after major hardware upgrades)

3- GRAM DC OFFSET ADJUSTMENT

3-1 Gram DC Offset for 9.1 and 10.x Software

1. From the Service Desktop Manager, open the Service Browser. See Illustration 3-1 for further instructions.



SELECTING DC OFFSET CALIBRATION IN THE SERVICE BROWSER
ILLUSTRATION 3-1

2. Whole and Zoom will run. After completion, the results will be displayed in the Test Results box.

3. The calibration values are stored in the */usr/g/caldir/gram_tune.dat.WHOLE* for Whole Body coil *(or gram_tune.dat.ZOOM for Zoom coil)* file. (Do not touch the offset pots on the SGA's.)

3-2 Gram DC Offset for 9.0 Software

1. Select **[Diagnostics]** from the Service Desktop and select **[Start]**.

2. Select **[IPG]**, **[Manual]**, **[Digital DC Offset]** (for Twin*Speed*, select **Whole**)**,** then **[Close]**.

3. Click **[Close]** on the *IPG* window. Select **[Run Diagnostics]**.

   TPS should download and you should see the words “DC OFFSET” on IPG boards with a display.

4. For Twin*Speed* sites, repeat the same process for **[Digital DC Offset (Zoom)]**.

5. Exit Diagnostics by closing the *Results* window, then select **[Quit]** in the *Diagnostics* window. TPS will then download.

6. The calibration values are stored in */usr/g/caldir/gram_tune.dat.WHOLE* for Whole Body coil *(or gram_tune.dat.ZOOM for Zoom coil)* file. For BRM sites, the calibration files are stored in */usr/g/caldir/gram_tune.dat.*

Note

You do not have to touch the offset pots on the SGA’s.

4- AUTO LCOIL ADJUSTMENT PROCEDURE

4-1 Auto Lcoil for 9.1 and 10.x Software

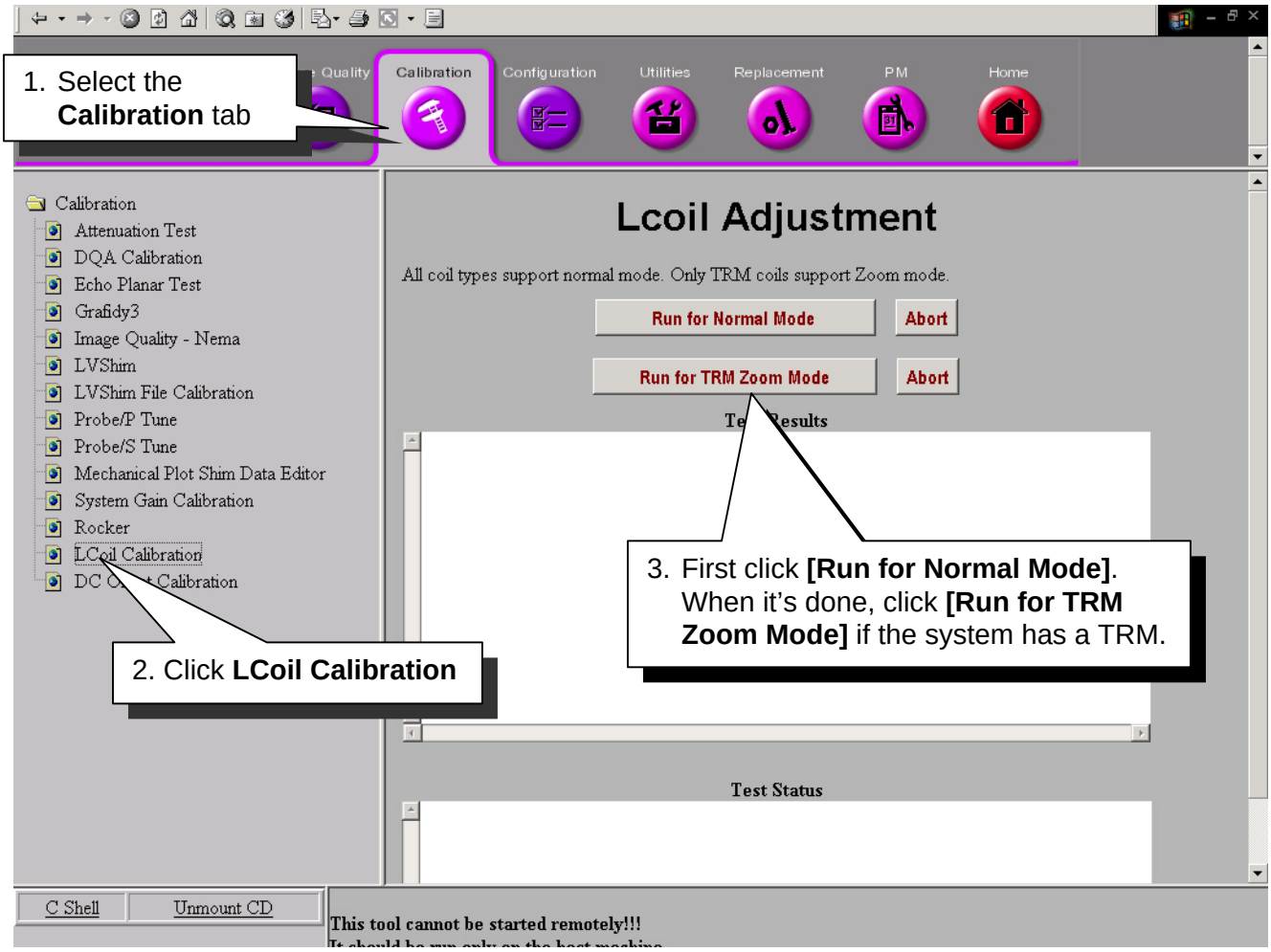
IMPORTANT!

Auto Lcoil should be executed on a Twin*Speed* system with 9.1 and 10.x software. Auto Lcoil should not be executed on a Twin*Speed* system with 9.0 software.

Note

Auto Lcoil should only need to be run if it has never been run on this system, or if this is a new install or a major hardware replacement.

On the Service Desktop Manager, select the **[Service Browser]** button. Continue by following the instructions on Illustration 4-1.



STARTING LCOIL FROM THE SERVICE BROWSER
ILLUSTRATION 4-1

4-2 Auto Lcoil for 9.0 Software

IMPORTANT

Auto Lcoil should be executed on a Twin*Speed* system with 9.1 and 10.x software. Auto Lcoil should not be executed on a Twin*Speed* system with 9.0 software.

4-2-1 BRM and CRM Systems

Note

Auto Lcoil should only need to be run if it has never been run on this system, or if this is a new install or a major hardware replacement.

1. Select **[Diagnostics]** from the Service Desktop Manager.
2. Click **[Start]**.
3. Select **[Board Level Tests - IPG]**.
4. Click **[Manual]**.
5. Select **[LCoil Adjust]**. Close the *Manual* and *IPG* windows.
6. Select **[Run Diags]**.
7. Exit diags when diagnostics are complete by closing the *Results* window and clicking on **[Quit]** in the *Diagnostics* window.

4-2-2 Twin*Speed* Systems

1. Open a C-shell.
2. Change directory to **/usr/g/caldir** (that is, type **cd /usr/g/caldir** and then press **<Enter>**).
3. Type **more gram_tune.dat.WHOLE <Enter>**.

   You should receive the following:

```
 73   73   0  172   62   25  142  143
410   41   0    5  843  500    0 3500

 73   73   0  103   84   26  241   63
328  205   0  249  707  326    0 3200

100  128   0   94   35  119  165   77
  0   82   0  848   59    0    1 2900
```

The numbers underlined must be set to the values noted. Other numbers are not important.

4. Repeat for the Zoom mode by typing **more gram_tune.dat.ZOOM**

   You should receive the following:

112	86	60	52	83	21	14	155
2028	639	3	22	439	150	7	3300
100	73	0	213	127	36	35	49
983	369	0	353	393	12	0	3300
125	80	32	183	91	15	208	76
1120	307	5	125	1	0	0	3300

   Numbers underlined must be set to the values noted, others are not important.

5. If necessary, use **jot** to edit the files.

5- GRAFIDY3 PROCEDURE

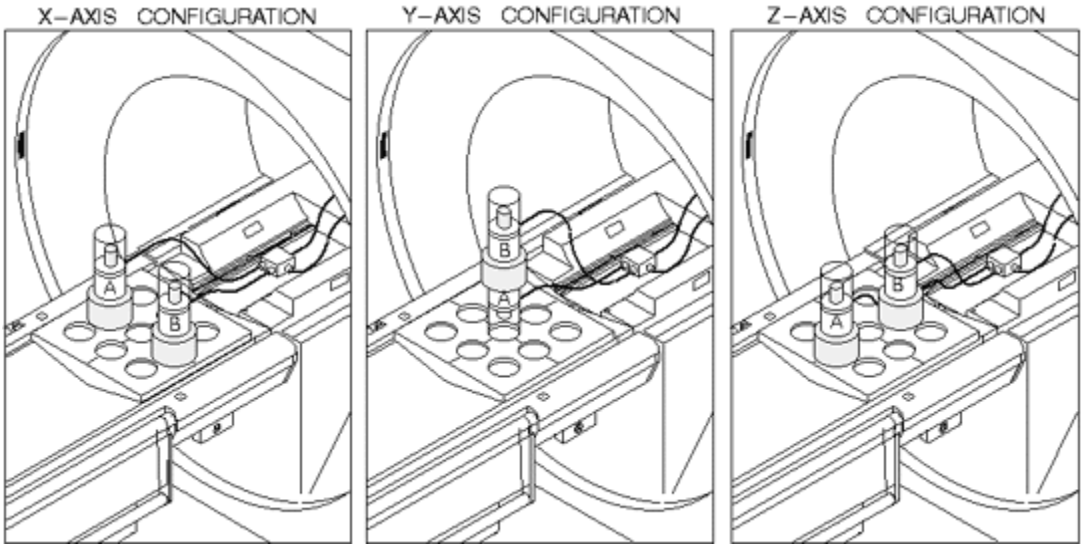
5-1 Setup

Set up the Grafidy Kit for the first axis to be calibrated, by following these steps:

1. Remove the head coil and holder from the cradle.

2. Select the 1.5T or 1.0T coils from the kit, depending on your system type.

3. Place the coil baseplate on the cradle. Configure the Grafidy coil/samples and collars appropriately for the first axis on which you will perform Grafidy. See Illustration 5-1.

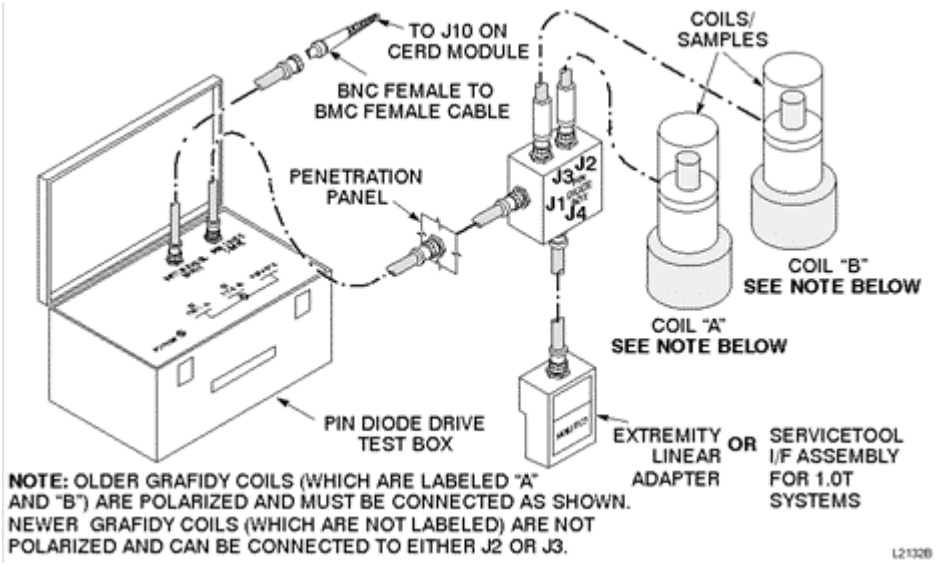


GRAFIDY PHANTOM CONFIGURATIONS
ILLUSTRATION 5-1

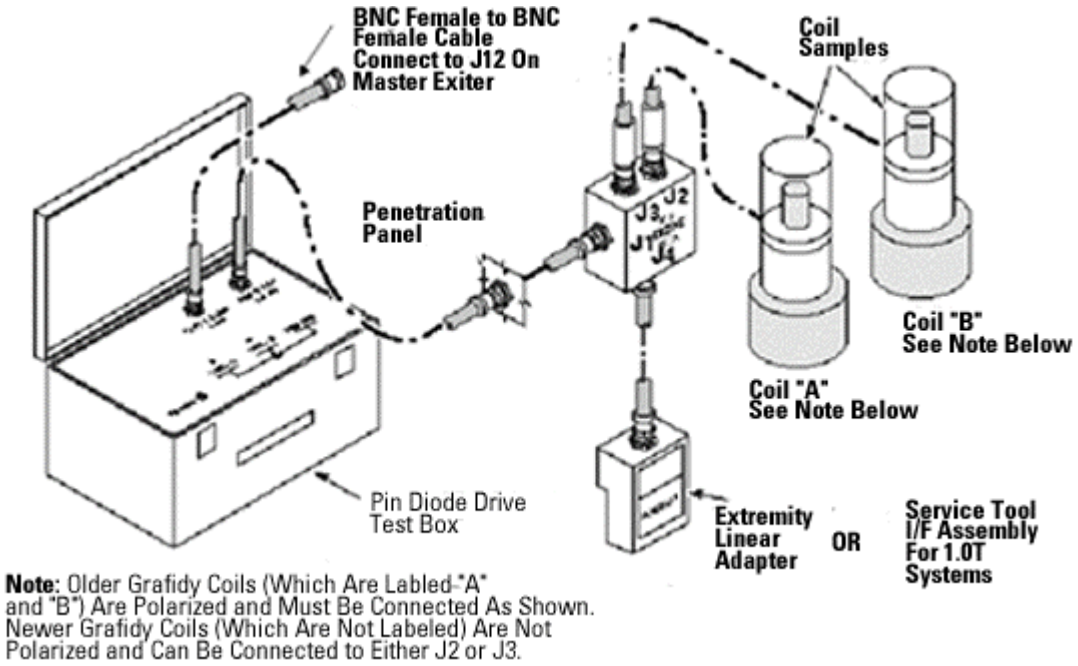
Note

In the x and z configurations, the coil/sample is placed with the sample at the top. In the y configuration, the top coil/sample is placed with the sample on top, while the lower coil/sample is inverted so that the sample is on the bottom. Also in the y configuration, no collars are used beneath the bottom sample.

Refer to Illustration 5-2A for Signa systems 9.x and below, or Illustration 5-2B for Signa systems 10.x or above, to complete steps 4 through 12.



GRAFIDY KIT SETUP FOR SIGNA 9.1 AND BELOW
ILLUSTRATION 5-2A



GRAFIDY KIT SETUP FOR SIGNA 10.X OR ABOVE
ILLUSTRATION 5-2B

4. Plug the extremity/linear adapter into the quad head coil carriage assembly. Connect a 2-ft. coaxial cable from the extremity/linear adapter BNC to J4 on the pin diode box.

Note

There are multiple lengths of cables used for this portion of the procedure. The short cable is the 2-ft. cable. The medium length cable is either an 8-ft. or a 5-ft. cable. The long cable is any cable length that will accommodate the long cable runs: the 90-ft. cable, a combination of 30-ft. cables, or a custom cable that you may have created.

5. Connect the cable as follows, depending on the system type:

   a. Connect the long coaxial cable from J1 on the pin diode box to a SERVICE coaxial feed-through on the Penetration Panel (exam room side). The cable must be routed through the bore of the magnet, exiting at the rear.

Note

It is not necessary to use a 90-ft. cable. This length is usually supplied in some Grafidy kits. Other kits contain three 30-ft cables. Use the length of cable that best suits your particular site.

   b. **For mobile systems:** Disconnect the cable at J8 of the Penetration Panel (this is the body receive line, which is not needed for this procedure). Connect the long coaxial cable from J1 on the pin diode box to J8 on the Penetration Panel.

CAUTION

Equipment damage possibility. Do not run the coaxial cable under the RF door. The RF door can cut the outer cable jacket, exposing the braided shield and grounding it to the RF door. These two grounds are not at the same potential and will adversely affect your calibration.

WARNING!

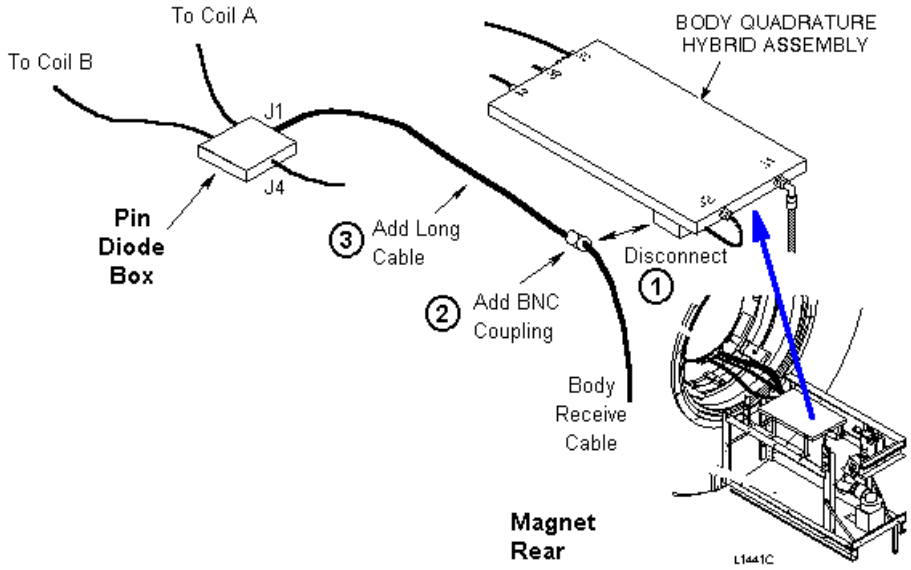
SHOCK HAZARD! THE PIN DIODE DRIVE TEST BOX SENDS 60-VOLT SIGNALS TO THE PIN DIODE BOX. VERIFY THAT THE POWER SWITCH FOR THE PIN DIODE DRIVE BOX IS OFF (IN THE DOWN POSITION) BEFORE CONNECTING THE CABLES.

6. Landmark on the centerline of the Grafidy coil baseplate (not the coils). At the keypad on the front magnet enclosure, press LANDMARK then MOVE TO SCAN.

Note

if any difficulty is encountered with the primary method provided in the main procedure, an alternate method for steps 7 and 8 follows.

7. Disconnect run #262 body receive cable (this signal is not needed for this procedure) from the body hybrid splitter at the rear of the magnet, and place a BNC coupling (not provided) on the cable end. See Illustration 5-3.



PIN DIODE DRIVE HOOKUP - MAGNET END
ILLUSTRATION 5-3

Alternate method: Connect the first long coaxial cable from J1 on the pin diode box to the BNC coupling on the body receive cable. This cable must be routed through the bore and out the rear of the magnet.

8. On the lower rear panel of the systems cabinet, disconnect the existing coaxial cable from J2 (this is the other end of the body receive line run #231T) and place a BNC coupling (not provided) on the cable end.

   Alternate method: Connect a second long cable between the BNC coupling and the pin diode drive connector on the pin diode drive test box.

9. Verify that the switch on the pin diode drive test box is in the Remote position.

10. Connect a BNC cable from the TRIGGER INPUT (called PATCH PANEL INPUT on some older boxes) connector on the pin diode drive test box to J10 (DAB Out 6) on the Master Exciter board on 9.1 systems and below, or J12 on the Master Exciter on the front I/O board of 10.0 systems and above.

11. Plug in the power cord for the pin diode drive test box.

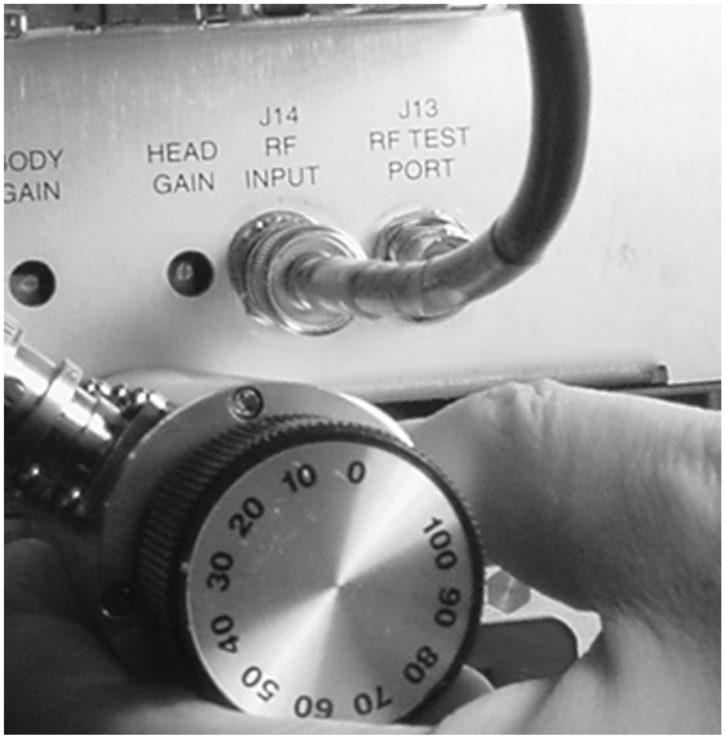
12. Place the power switch for the pin diode drive test box in the *on* position (referred to as **1** on the pin diode drive test box).

CAUTION

Equipment damage possibility. The coils used in the Grafidy phantoms require low RF power and can be damaged if the appropriate attenuation is not used!

RF/PDU (SRFD), SRF and SRF2 Cabinets. Install a rotary step attenuator set to 20dB between J1 on the rear of the system cabinet (exciter output) or J14 on the fiber-optic bracket at the rear of the RF. See Illustration 5-4A.

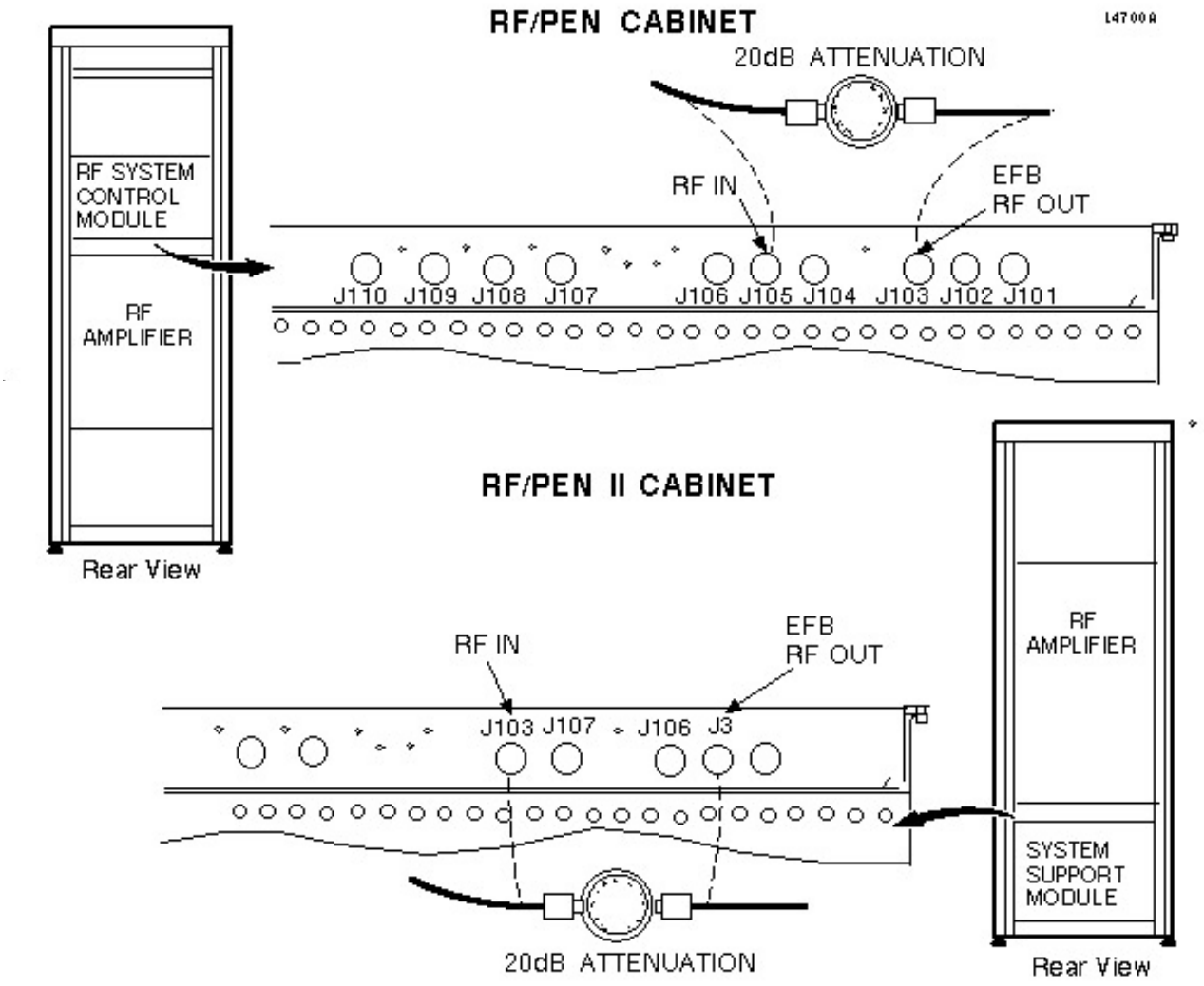
Bottom Rear of SRF2 Cabinet



J14 on the SRF RF Deck

SRF AND SRF2 ATTENUATOR POINTS
ILLUSTRATION 5-4A

RF/PEN and RF/PEN II: Install an attenuator to bypass envelope feedback circuitry at the RF amplifier. Disconnect the BNC from EFB RF Out, and disconnect the BNC from RF In. Add a rotary step attenuator (set to 20dB) in-line between the 2 BNCs. See Illustration 5-4B.



ADDING ATTENUATOR TO RF/PEN 1 AND 2
ILLUSTRATION 5-4B

RF/PDU (SRFD): Although envelope feedback is not employed on the RF/PDU cabinet, attenuation is still required. Install a rotary step attenuator set to 20dB in series with the cable connected to J14 “RF INPUT” on the front of the RFI module.

5-2 Prescan Checks

1. Center the laser crosshairs on the top of the coil assembly and landmark the system. Advance to Scan to 0 mm.

2. Begin a new patient scan and enter **geservice** as the Patient ID.

3. Enter a patient weight of **111** lbs.

4. Ensure the that the Patient Protocols selection is **Service**.

5. Click the **[Other]** button and choose **Grafidy**.

6. Click on **[Accept]**.

7. Click on **[Save Series]**.

8. Right-click on **[Research Operations]** and select **Setup Params** (this may result in a pause of a few seconds). Once it opens, enter:

   Number of frames **4**
   Window one frame **1** frame **0**
   Window two frame **3** frame **0**

   Note

   Be sure to press **<Enter>** after typing each number or the system will not store the values.

9. Select **[Done]** to close the frames window.

10. Select **Display CVs** (control variables) and set the "mode" to **1** (default is 0). This will make prescan much faster.

11. Press the **[Accept]** button, and then select **Download**.

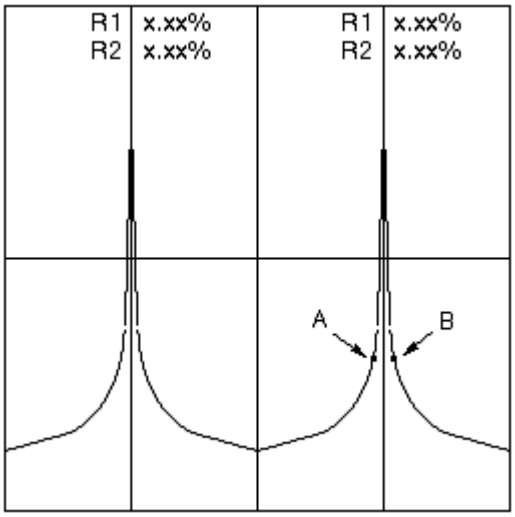
12. Select **[Manual Prescan]**. The Center Frequency Coarse Check begins.

13. Select **Display Two Windows** from the Window Menu. A double window appears. You should see "enough signal," as is shown in Illustration 5-4, or else either the physical connection or the coil is bad.

14. Click **[Done]**.

15. Select **[Auto Prescan]**.

16. If auto prescan fails, adjust the rotary step attenuator to 30db (from 20 db). Occasionally, it may need to be adjusted to 10db (from 20 db) instead. Then re-auto prescan until the auto prescan is successful. See Illustration 5-5.



TYPICAL GRAFIDY PRESCAN
ILLUSTRATION 5-5

5-3 Startup and Zeroing Values

1. This procedure documents using the Service Browser, but this tool is still accessible from the Tool menu. Go to the Service Desktop Manager and start the Service Browser, if it is not already started, by clicking the **[Service Browser]** button.

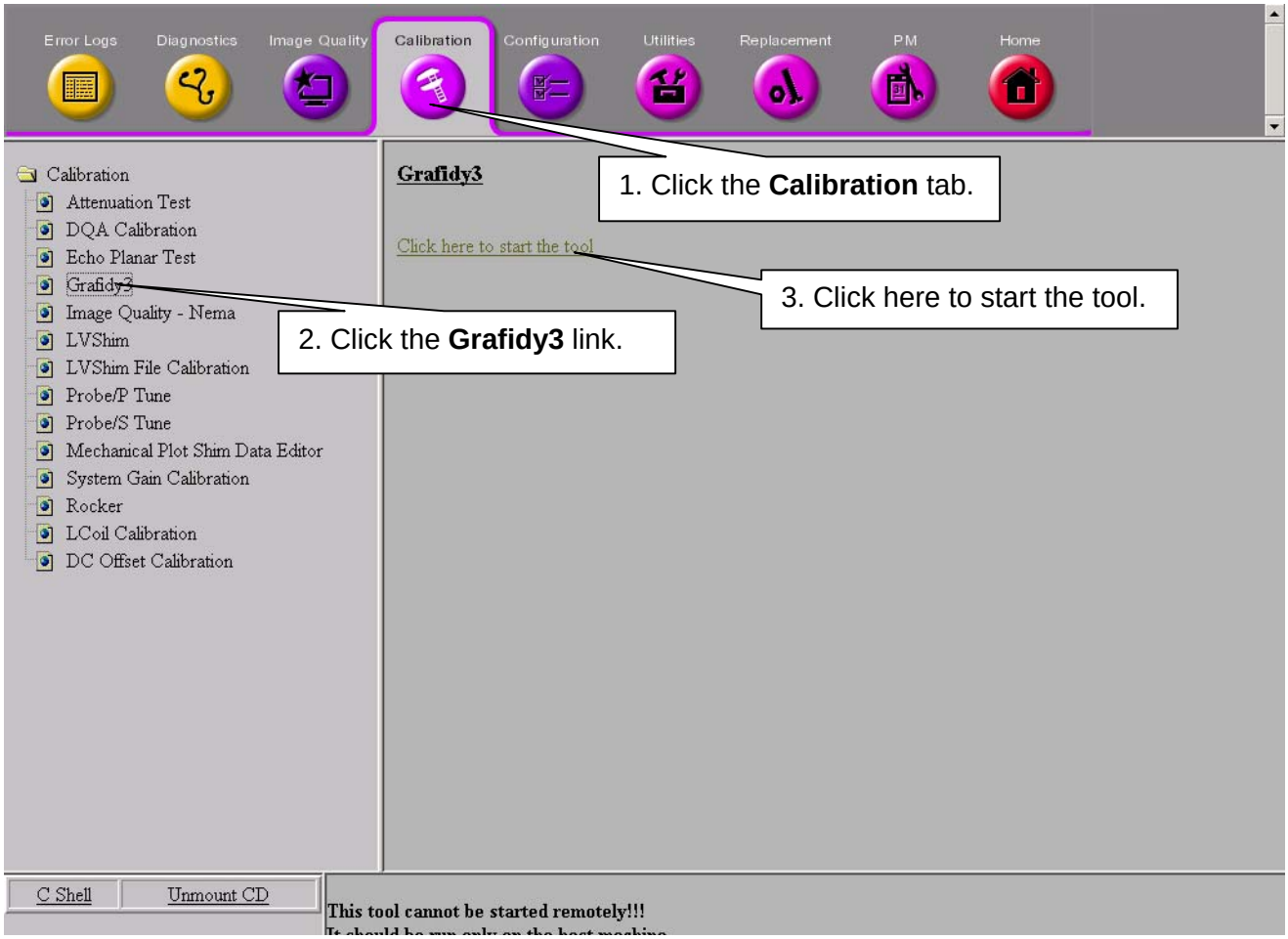
2. For sites with 9.0 software, start Grafidy3 by opening a C-shell.

   Type **cd /usr/g/bin/graf3** and press **<Enter>**.

   To start Grafidy3, type **rungraf3** and press **<Enter>**.

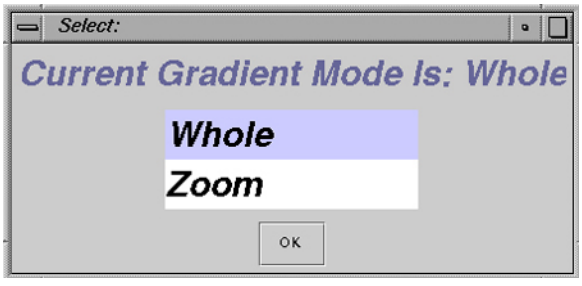
   For 9.1 and 10.x sites, continue on with step 3.

3. On the Service Browser, start the Grafidy3 calibration. See Illustration 5-6 for instructions.



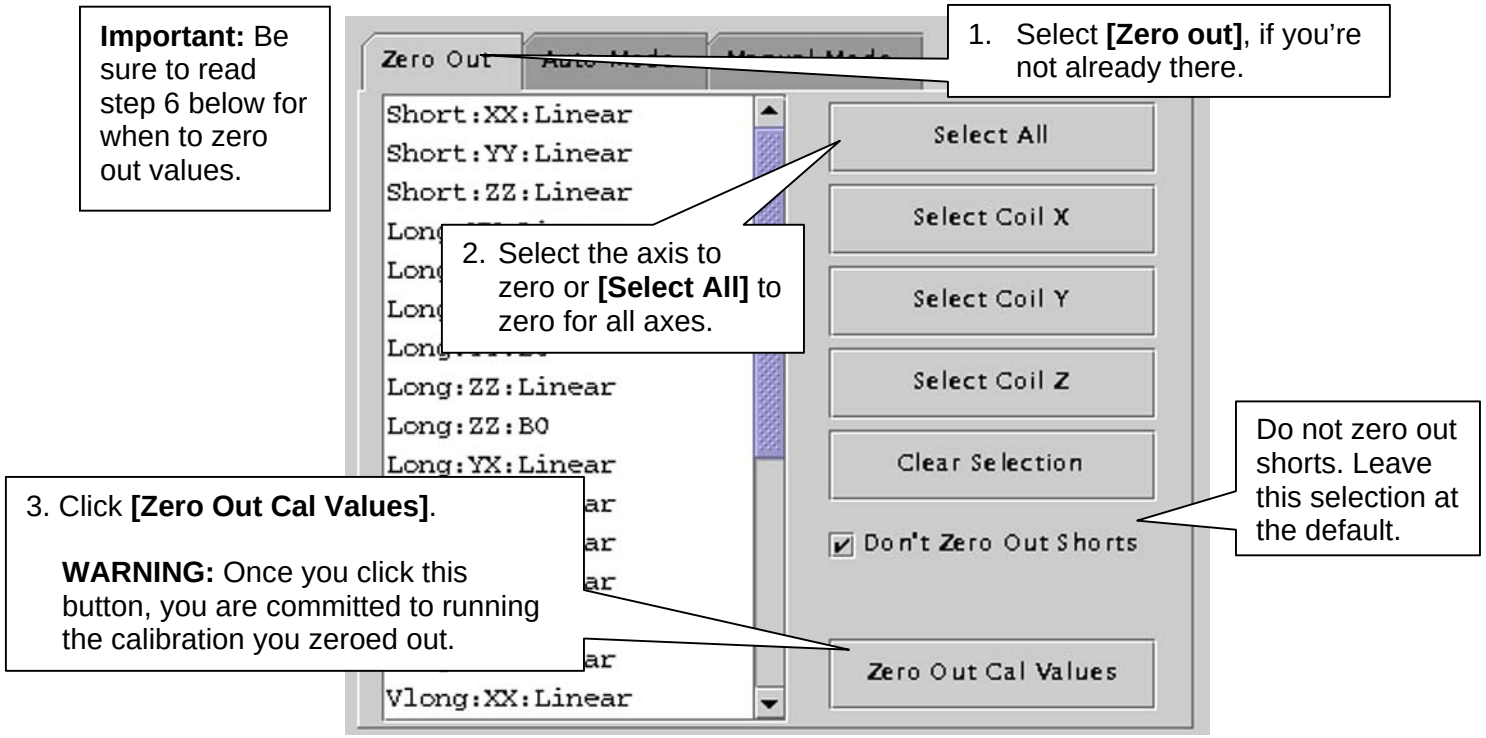
STARTING THE GRAFIDY3 TOOL
ILLUSTRATION 5-6

4. The Grafidy3 window will first open with a prompt to set the gradient mode for Grafidy 3 if the system is a twin gradient system (TRM). Select either Whole or Zoom, then click **[OK]**. See Illustration 5-7. For systems with a TRM, both Whole and Zoom have to be calibrated. To switch mode, exit Grafidy 3, and then restart it and select the next mode to calibrate.



SELECTING GRADIENT MODE
ILLUSTRATION 5-7

5. In the next window that opens, go to the Zero Out tab. See Illustration 5-7.



ZEROING OLD CAL FILES
ILLUSTRATION 5-7

To select all (components), click the **[Select All]** button, or to select the coil X axis only (xx, yx, zx linear and xx b_0 for long and very long), or the coil Y axis only, or the coil z axis only. You can also clear selections.

To select an individual component (for example, long xx linear) or components (e.g. long xx linear, and long xx b_0) by holding down the **Ctrl** key on the keyboard while clicking each component you want to select.

The selected components are highlighted. The selection itself will not zero out anything. You must click the **[Zero Out Cal Values]** button to actually zero out cal values in cal files (**grafidyx/y/z.cal**).

The naming convention for a component is as follows:

- The 1st letter refers to the gradient axis
- The 2nd letter refers to coil axis. For example, **yx** means gradient is on the y axis, but the coils should be placed on the x axis.

6. You're not always required to zero cal values. It is advisable (and less time-consuming) to touch up values when possible. If any of the following bulleted options apply to you, click the axis button that need to be cleared out, or click the **[Select All]** button and then click the **[Zero Out Cal Values]**:

    - If you are working with a new system or new system upgrade, zero out the cal values.

- If the previous eddy current calibration was done using ECMT, zero out the cal values.
- If the previous eddy current calibration was done prior to Signa software revision 9.0, zero out the cal values.
- If, after attempting to touch up calibrated eddy current without zeroing out the cal values, the values did not converge or the specifications were not met, zero out the cal values.

7. It is advised that you use default short time constant cal values rather than calibrating short TC on a system-by-system basis. When you click either **Auto mode** or **Manual mode** (the first time the tool is invoked), the tool will check whether the short TC cal values are the same as the default values or not. If not, a pop-up message will appear, asking if you want to use Default Short Cal Values. It is recommended you answer **Yes**. See Illustration 5-8.

DEFAULT SHORT CAL VALUES POPUP

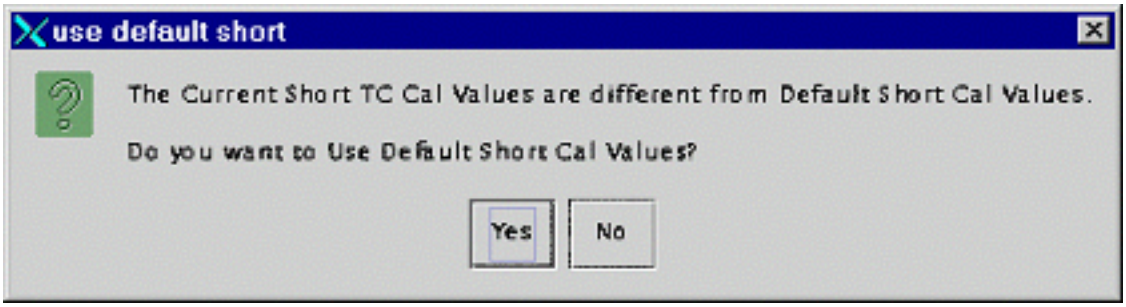
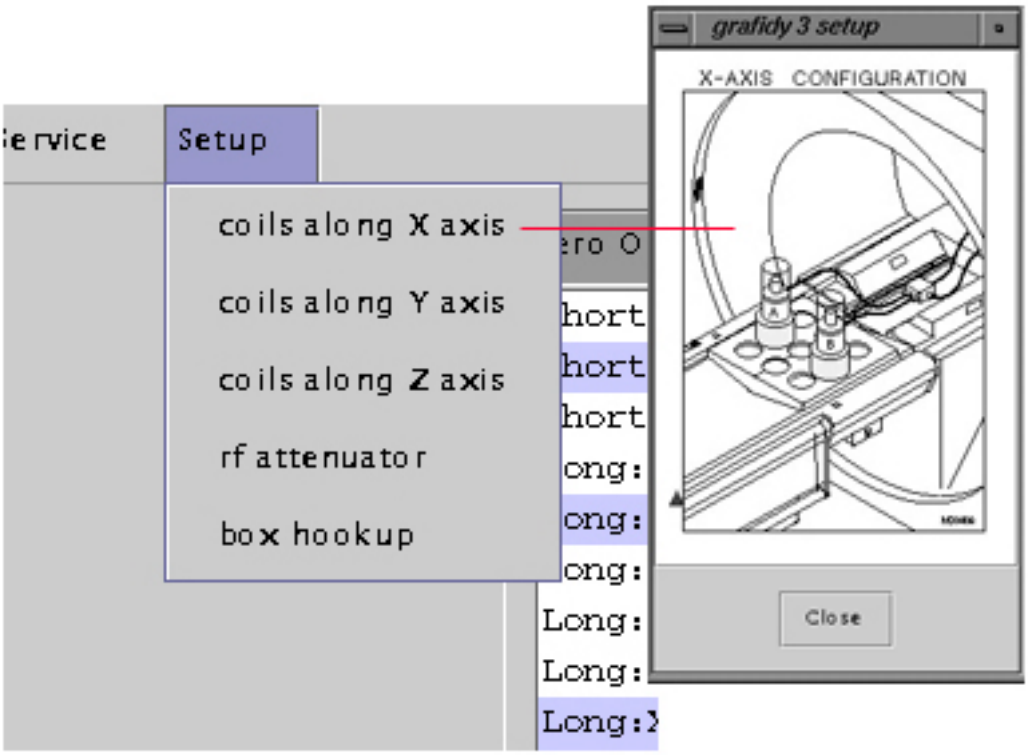


ILLUSTRATION 5-8

By default, short time constant eddy currents are not calibrated. A set of default calibration values are used instead. Those values depend on the gradient coil (brm/crm/trm_whole/ trm_zoom) and gradient driver (8645_gram/sgd/acgd/acgd_lite) combination. Grafidy3 will check and load the proper short TC cal values based on the system configuration.

5-4 Calibration Scans

1. Set the coils in the magnet bore in the axis to be calibrated, as shown in Section 5-1. Or. the coil positions can be viewed from the menu bar under Setup by selecting the axis that will be calibrated. See Illustration 5-9.

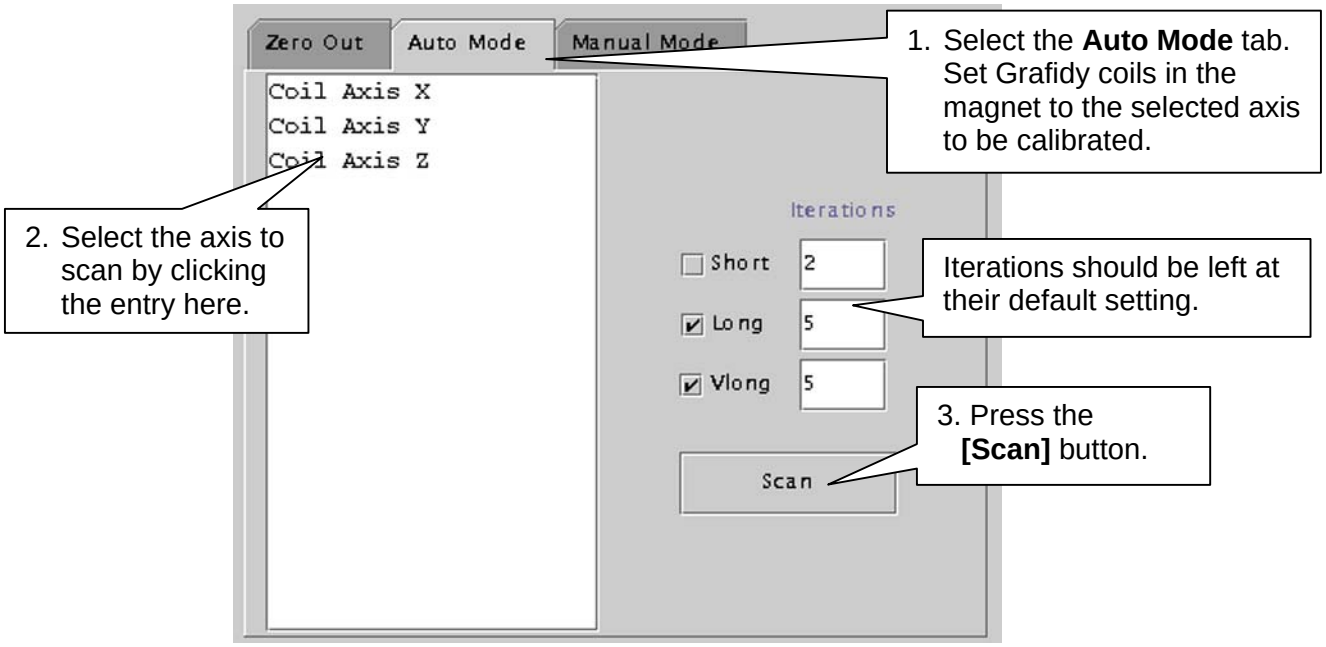


SETTING AXIS TO CALIBRATE
ILLUSTRATION 5-9

2. Click on the **Auto Mode** tab.

3. Select an axis that is consistent with the coil's setup in the magnet, then click the **Scan** button. The **Scan** button will be grayed and the **Abort** button will be activated until the scan is finished (or aborted).

Only one plane can be calibrated at a time. After the completion of a plane, the Grafidy coils must be switched to the next plane to be calibrated and the scan must be started again. Refer to Illustration 5-1 for coil plane configurations. It will take approximately 60 minutes to complete each axis. See Illustration 5-10.

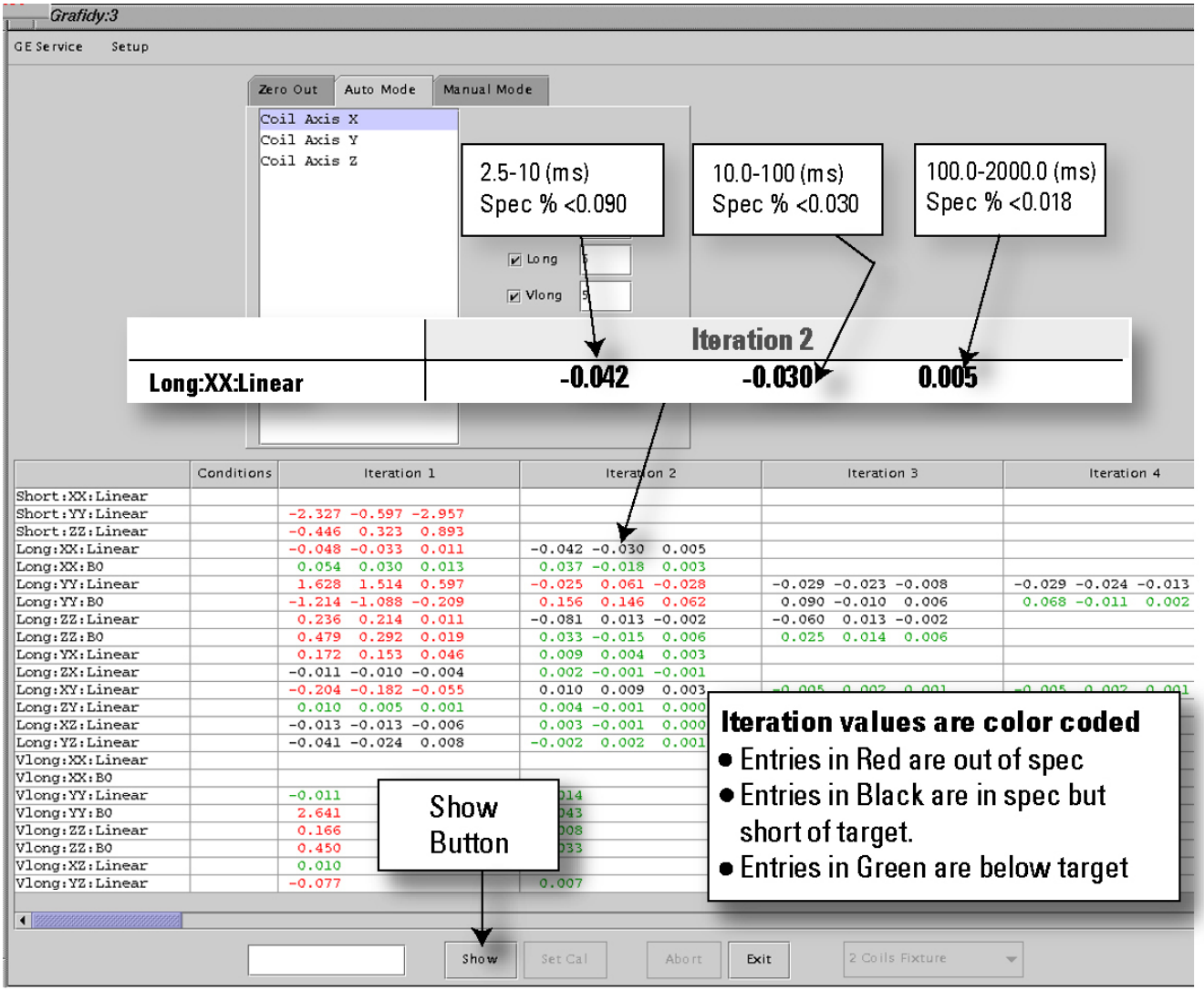


AUTO MODE SETUP
ILLUSTRATION 5-10

4. Each component of the axis (e.g., long:xx, long:yx, long:zx, vlong:xx) will run a maximum number of iterations: 5 iterations for long, and 5 for very long, by default. Also, by default, short TC is not selected, and therefore will not be calibrated. If a target (about half of the spec for long on-axis) is reached before the maximum number of iterations is reached, the system will stop doing iterations for the component.

5. After each component finishes one iteration of scan and analysis, the residual of the eddy current of the measurement will show up in the results table. The output of the results will be color-coded. Red text indicates values above spec. Black indicates values below spec, but above the target. Green indicates values below target.

6. Review the numeric output values from the auto-mode scan. Verify that the results of the final iteration for each component are below specification (black) or below target (green). See Illustration 5-11 for help in reading the output values.

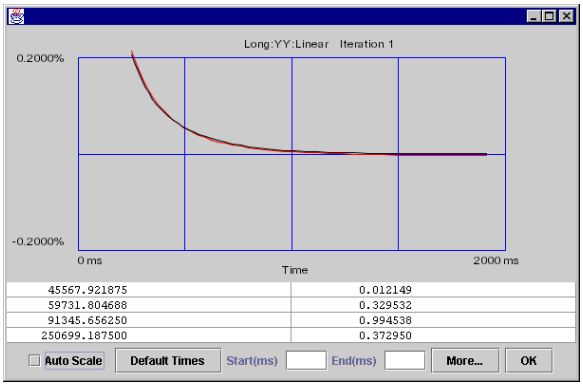


READING OUTPUT
ILLUSTRATION 5-11

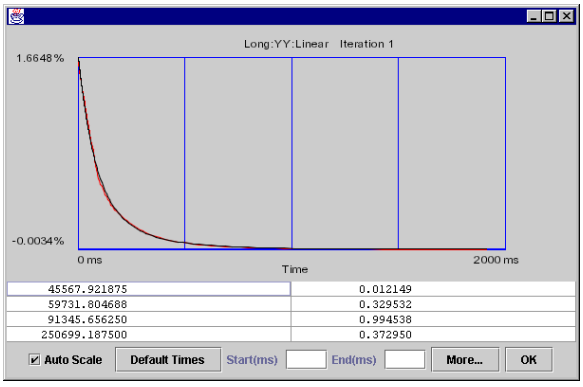
7. You can check the eddy current measurement and fitting by clicking in any cell that has a value in it. Then click the **[Show]** button. Refer to Illustration 5-12 for interpreting graphical data.

In the left column with auto scale turned off (so they have the same vertical scales) from 1^{st}→2^{nd}→3^{rd} iteration, the residual eddy current become smaller and smaller.

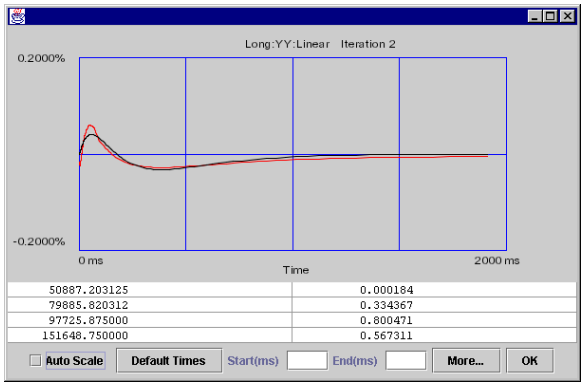
In the right column from 1^{st}→2^{nd}→3^{rd} iteration, view the data in Auto-Scale to spread the plot views out (the plot is scaled from minimum values to maximum values, for the 1^{st} iteration the scale is ~1.8, 2^{nd} iteration ~0.06, 3^{rd} iteration ~0.015 in this example). While the residual eddy current becomes smaller while iterations are going on, the quality of the fit between measured curve and fitted curve (goodness of fit) becomes poorer. When those two curves have little in common, which is shown in iteration 3, it is not likely that any further iterations will improve much, and it is time to stop iteration because the system limit has been reached.



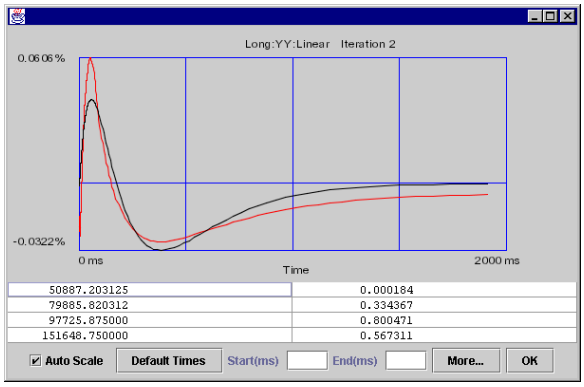
1ST ITERATION, NO AUTO SCALE



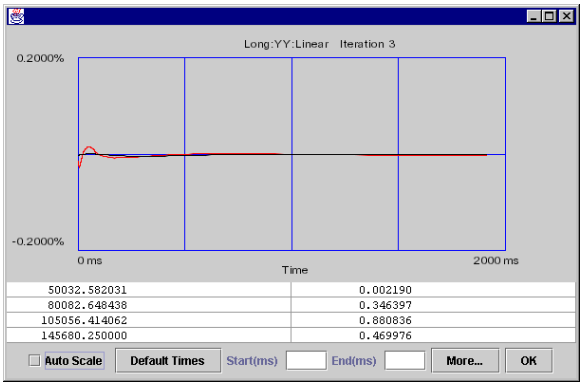
1ST ITERATION, AUTO SCALE



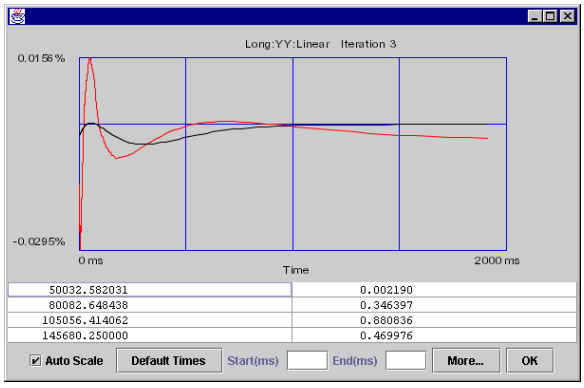
2ND ITERATION, NO AUTO SCALE



2ND ITERATION, AUTO SCALE



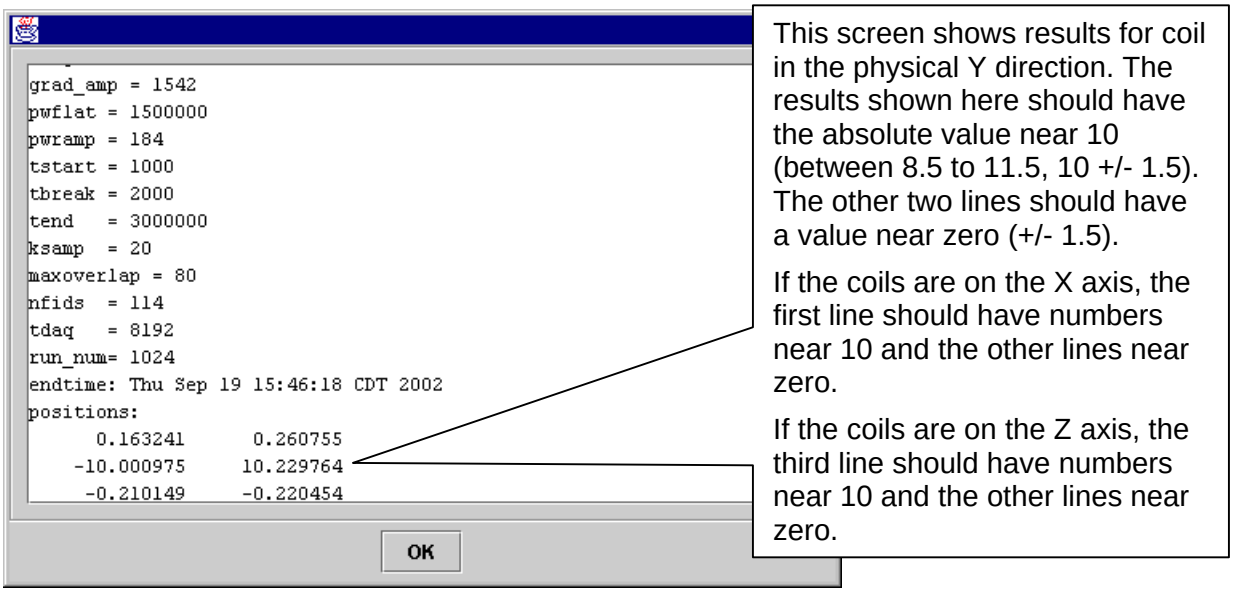
3RD ITERATION, NO AUTO SCALE



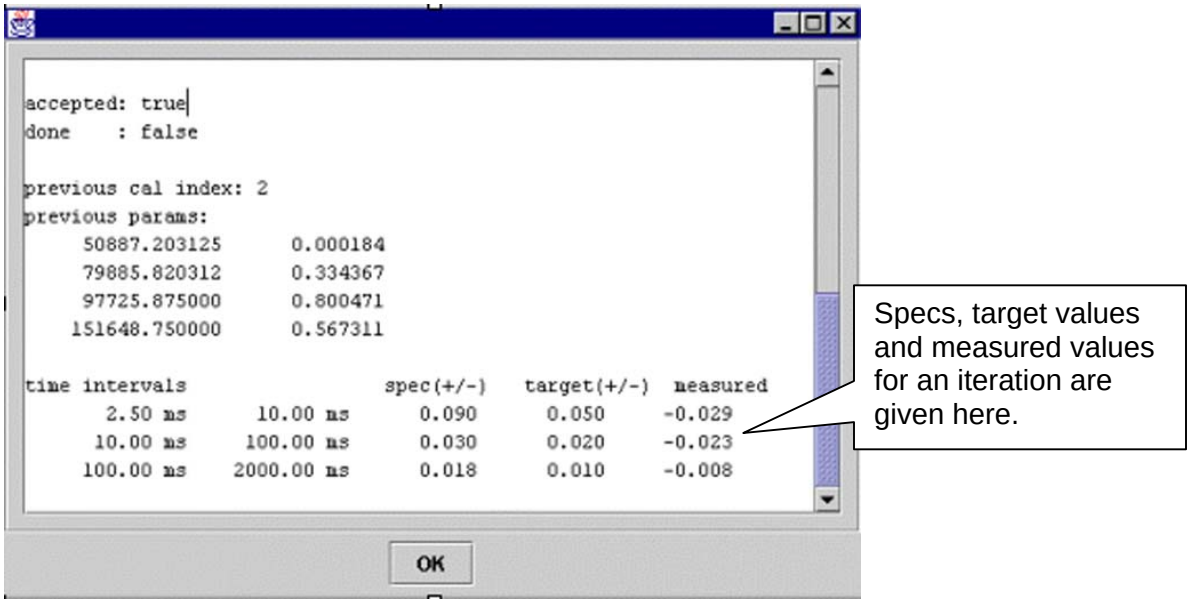
3RD ITERATION, AUTO SCALE

INTERPRETING GRAFIDY PLOTS
ILLUSTRATION 5-12

8. Click **[More]** to show coil positions, spec values, target values and measured values. See Illustration 5-13 and 5-14. You will need to scroll UP to get to the position values.



COIL POSITION
ILLUSTRATION 5-13



SYSTEM SPECS, TARGET AND MEASURED VALUES
ILLUSTRATION 5-14

9. If, after a maximum number of iterations, a component is not in spec, use the manual mode in Section 6 of this manual to work with that component.

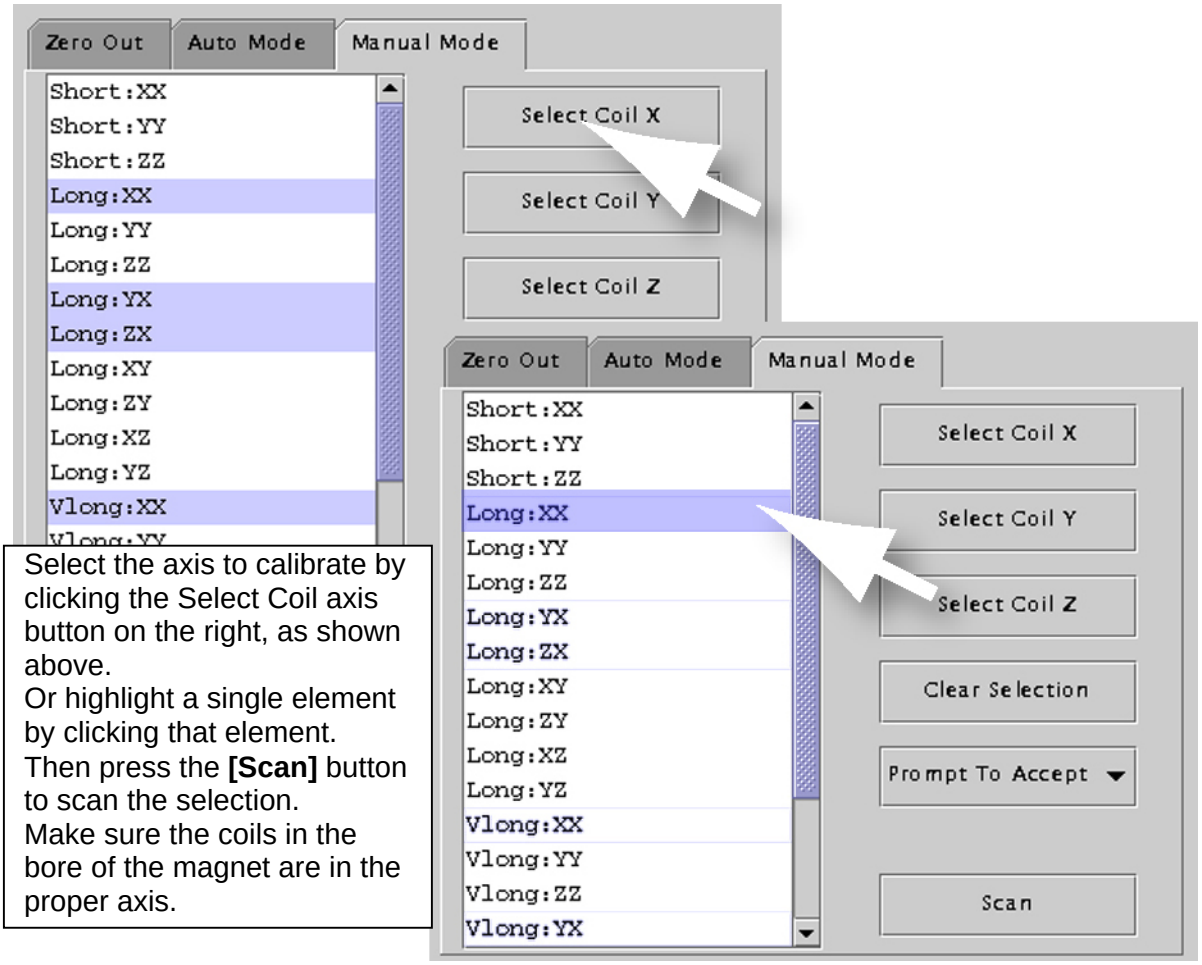
10. Repeat the calibration procedure for all three axes. Always ensure that the physical coil axis matches the selected scan axis or errors will result.

11. After all three axes are done, re-position the coils and re-scan long on-axis components other than the last scanned on-axis component. For example, if the order of the axes scanned is x,y,z, after you've finished the last axis (z), you'll need to re-scan long xx and long yy. Long xx b_0 and long yy b_0 may be out of spec again (due to cross terms). If this is the case, do another scan until they are in spec again.

    Step 10 is best suited to manual mode, which is in the next section.

6- PROCEDURE - MANUAL MODE

If for some reason the Auto Mode procedure does not bring any of the numeric output final values of your system completely into specification, you may continue adjusting the out-of-specification values by using Manual Mode. After the Auto Mode scanning is complete, choose the Manual Mode tab (see Illustration 6-1).



MANUAL MODE TAB
ILLUSTRATION 6-1

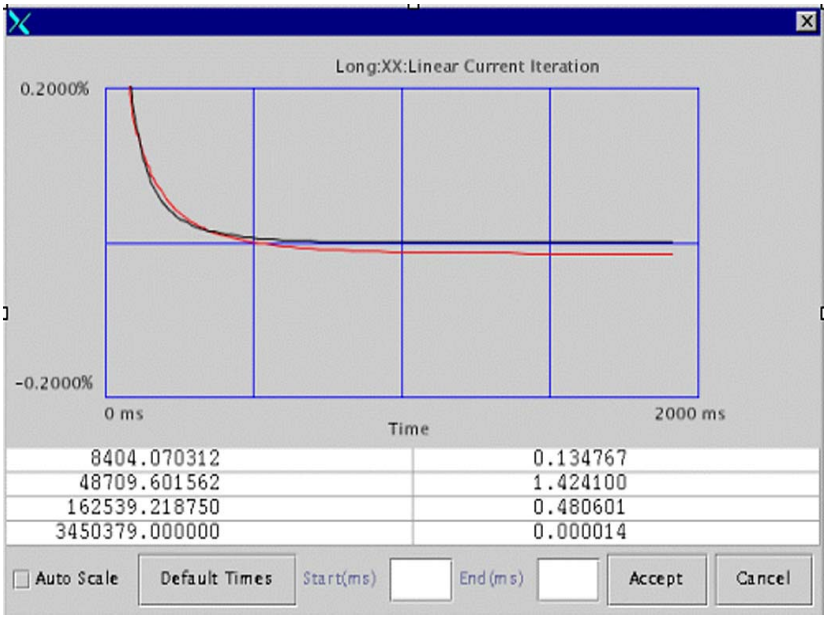
1. Set the coil in the magnet on the scan axis desired, then highlight the scan components that you would like to perform (i.e., click on **Long XX**, or, alternatively, click **select coil X** for xx, yx, zx of long and very long) and select **Scan**. See Illustration 6-1.

   The naming convention for a component is as follows:

   - The 1st letter refers to the gradient axis
   - The 2nd letter refers to the coil axis. For example, yx means gradient is on the y axis, but the coils should be placed on the x axis.

   Make sure the coil axis in the magnet and the selection are consistent.

2. After the scan is complete, a plot window similar to the one in Illustration 6-2 will pop up. Notice there are two buttons in the lower right corner labeled **[Accept]** and **[Cancel]**. Verify whether the plot appears to be a "good fit" (i.e., the next scan will likely improve the output numbers) or a "bad fit" (i.e., continued scanning is not likely to improve the output numbers). You must select either **[Accept]** to save the value to the calibration file, or select **[Cancel]**.



RESULTS WINDOW WITH ACCEPT/CANCEL BUTTONS
ILLUSTRATION 6-2

3. Choosing **[Accept]** will overwrite the previously-stored values in the calibration files (grafidyx.cal, grafidyy.cal and grafidyz.cal). Either **[Accept]** and scan again, or **[Cancel]** to leave the values in the cal file/hardware from the last accepted iteration and stop.

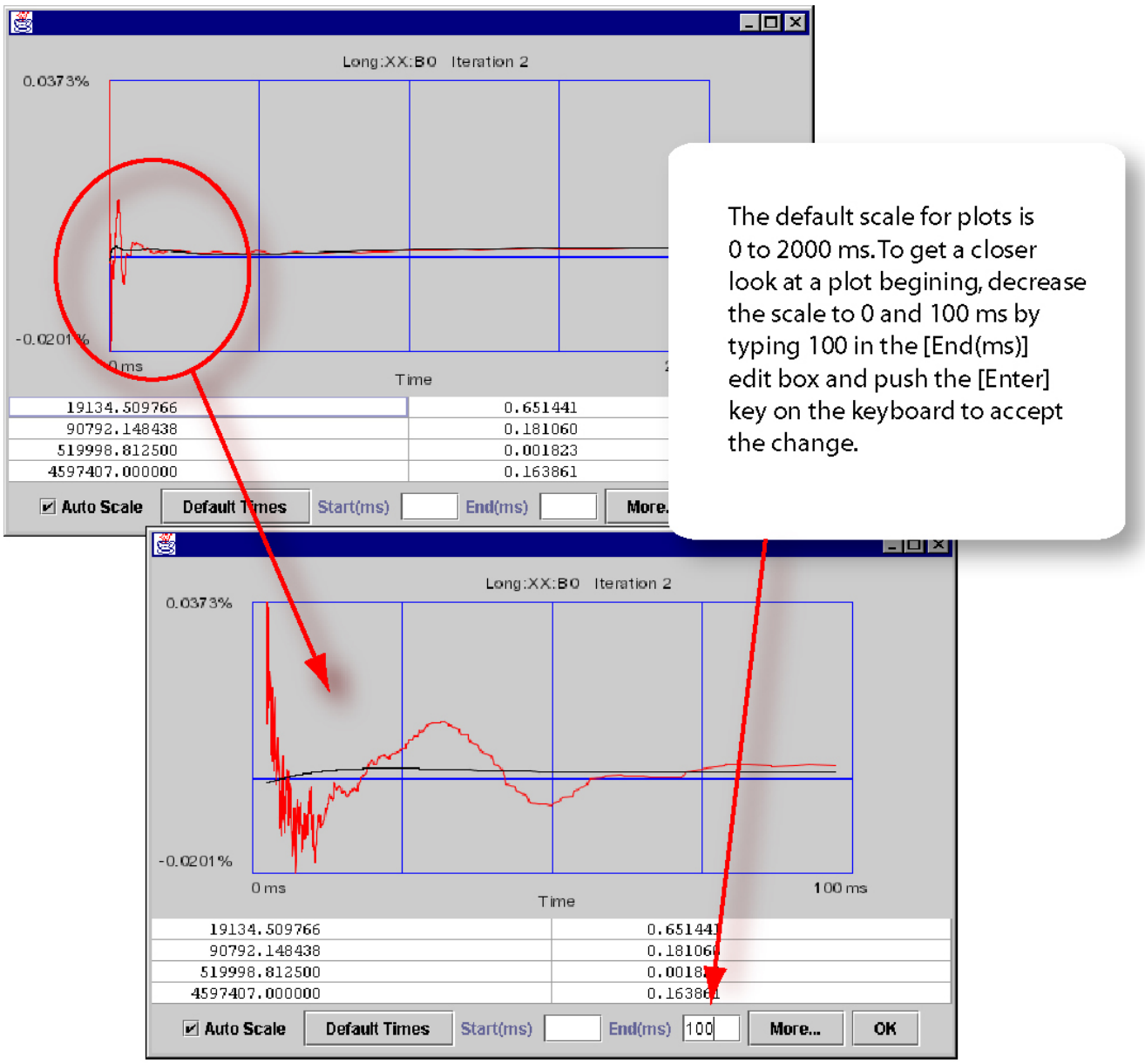
4. If a "good fit" is shown (i.e. residual eddy currents are getting smaller), you should click the **[Accept]** button to accept the output calibration parameters, and do another scan. The next measurement will likely get rid of much of the residual eddy current present in this measure and improve output/result numbers.

5. If a "bad fit" is shown (i.e., residual eddy currents are increasing), click the **[Cancel]** button because a bad fit is not likely to improve output numbers for the next measurement.

6. The last iteration for any component should be a check only and therefore should not be accepted (the fitting cal parameters).

6-1 Examining a Fit

Refer to Illustration 6-3. If the two lines plotted appear to be similar in shape, the fit is probably good. To get a closer look at any one plot, you can choose the Auto-Scale function (though the auto-scaled fit may appear to worsen as the display scale changes). To focus on the front of the plot only, choose an end point (for example, 100 ms). The default is 2000 ms.

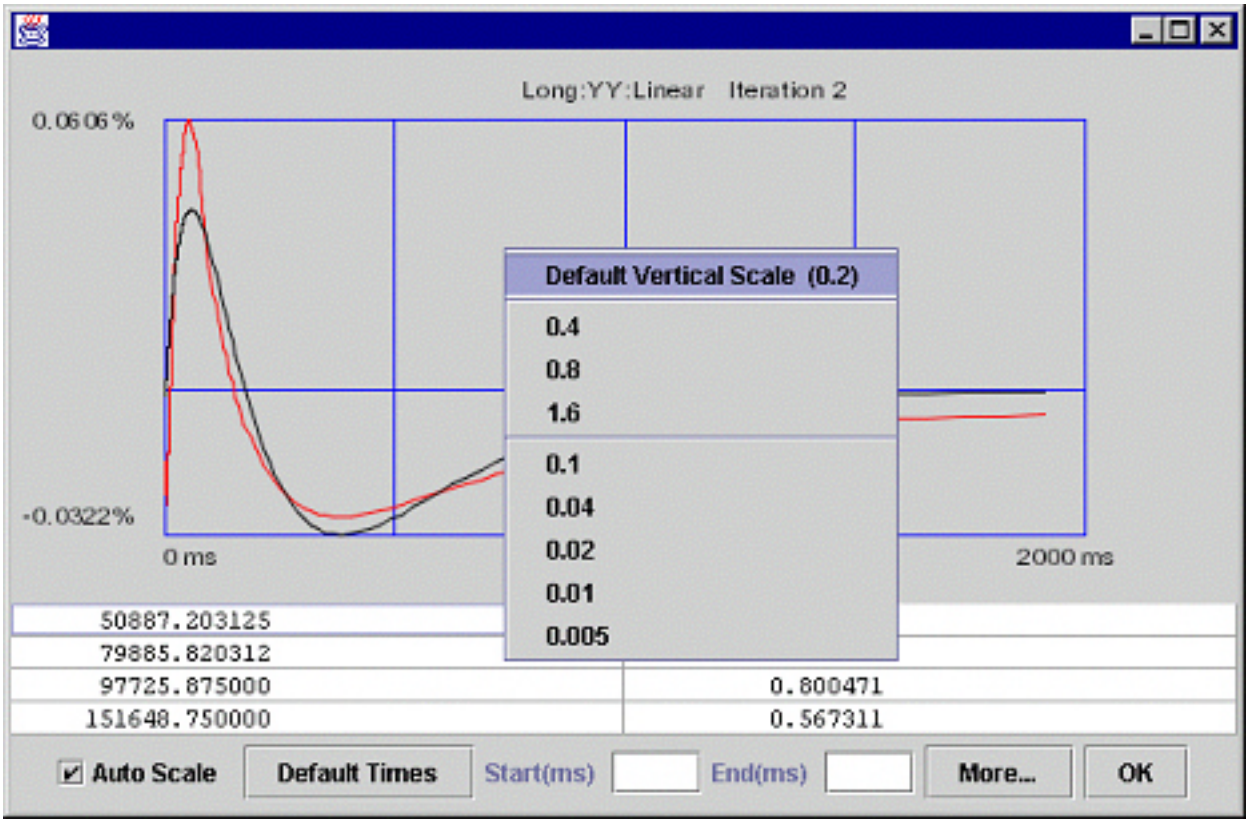


EXAMINING A FIT
ILLUSTRATION 6-3

Illustration 6-3 has the same plots, but the first one uses the default time scale (0 → 2000 ms) and the second one uses a time scale of (0 → 100 ms).

It is interesting to note that the measured curve (red) and fitted curve (black) in Illustration 6-3 example have very little in common (especially at the first 100 ms, where the fitted curve is cutting through the measured curve). So, it is very unlikely that any further iteration will improve eddy current compensation and get rid of the “oscillatory” stuff of the start portion of the plot. In this case, system limits have been reached. If the curve of the black line more closely matched that of the red, then another iteration would most likely improve eddy current compensation.

You can set a vertical scale in “non-auto scale mode” for a set of values in addition to the default value, 0.2. To do this, right-click the drawing area of the popup and then select the scale you want. This is useful when you want to do a side-by-side comparison on the same scale other than default. See Illustration 6-4.



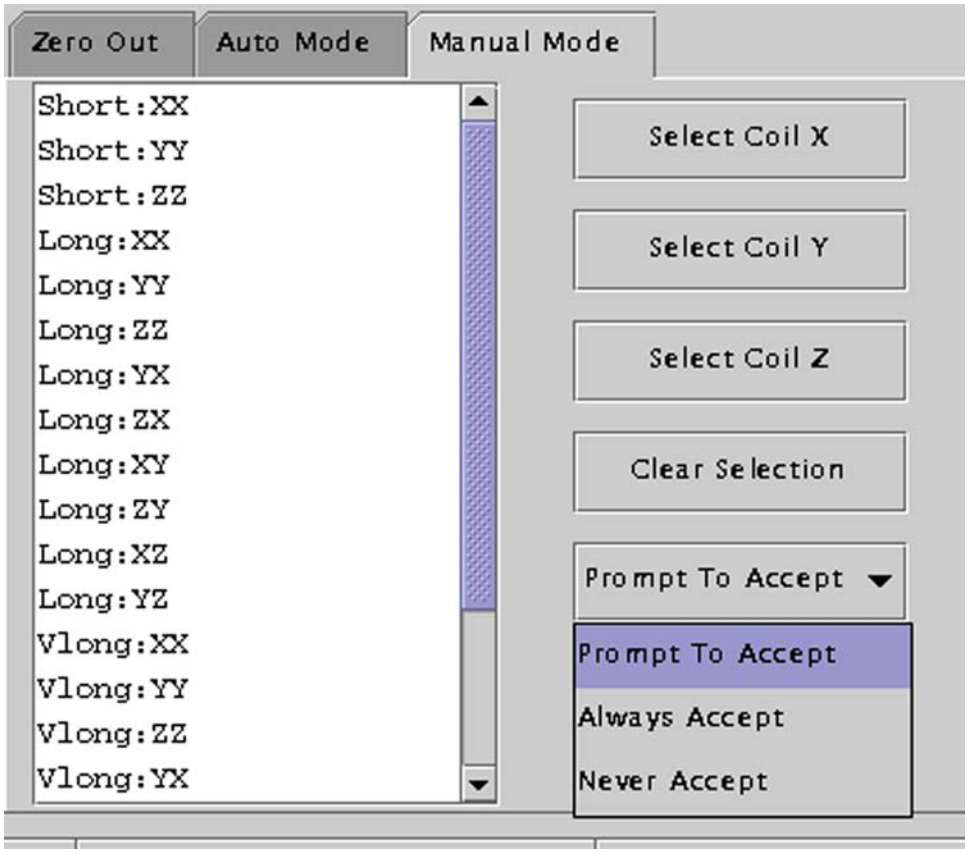
SETTING AUTO SCALE MODE
ILLUSTRATION 6-4

6-2 Accept Policies

There are three accept policies in manual mode:

- Prompt to accept (default)
- Always accept
- Never accept

See Illustration 6-5.



PROMPT TO ACCEPT
ILLUSTRATION 6-5

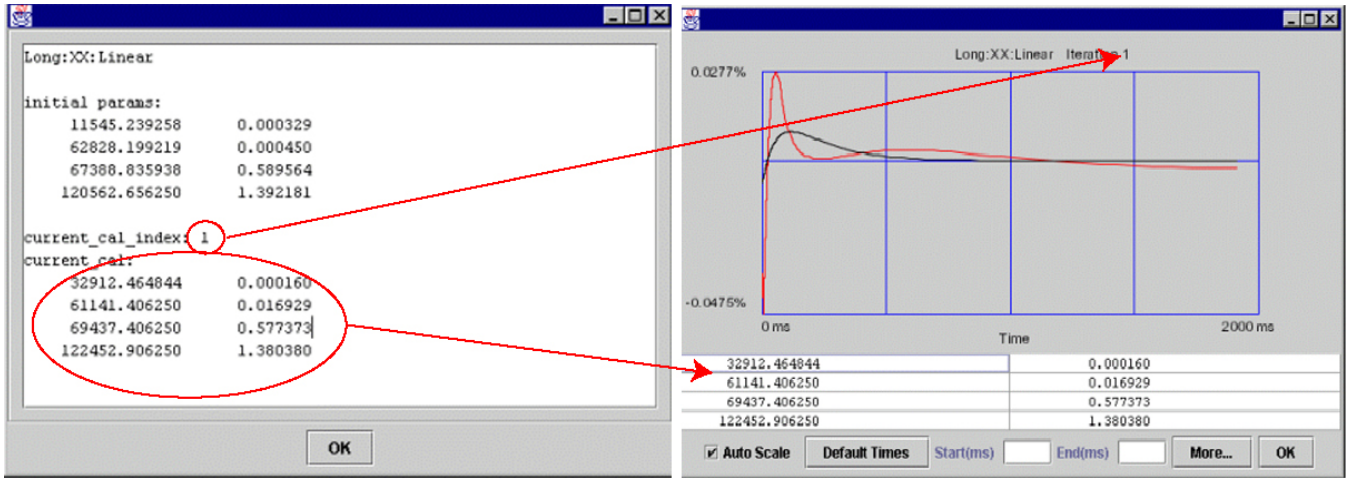
Prompt to accept will show you what the fit looks like. Based on the goodness of the fit, you can decide whether to accept or not.

Always accept will always accept the fitted cal values. This is useful when you expect you will accept the cal values but you may walk away from the computer (e.g., you have another system to take care of next door, or you go to lunch while it is scanning).

Never accept will never accept the fitted cal values. This is useful when you are doing “check only.”

6-3 Popup From a Cell In “Conditions” Column

If a cell in the Conditions column is selected (long xx linear, in this example), and you select the **[Show]** button, a popup along with first iteration’s popup, will appear as shown in Illustration 6-6.



CONDITIONS CELL [SHOW] EXAMPLE POPUP
ILLUSTRATION 6-6

The popup window lists:

- Initial cal values or parameters of the component, which in this case is long xx linear, when Grafidy 3 was invoked. See Section 7-1-1 for more information.
- The current cal index = 1, which means that the current cal values in the cal file (gafidyx.cal) and in the hardware/pre-emphasis file were generated by iteration 1, and
- Those current cal values are also listed.

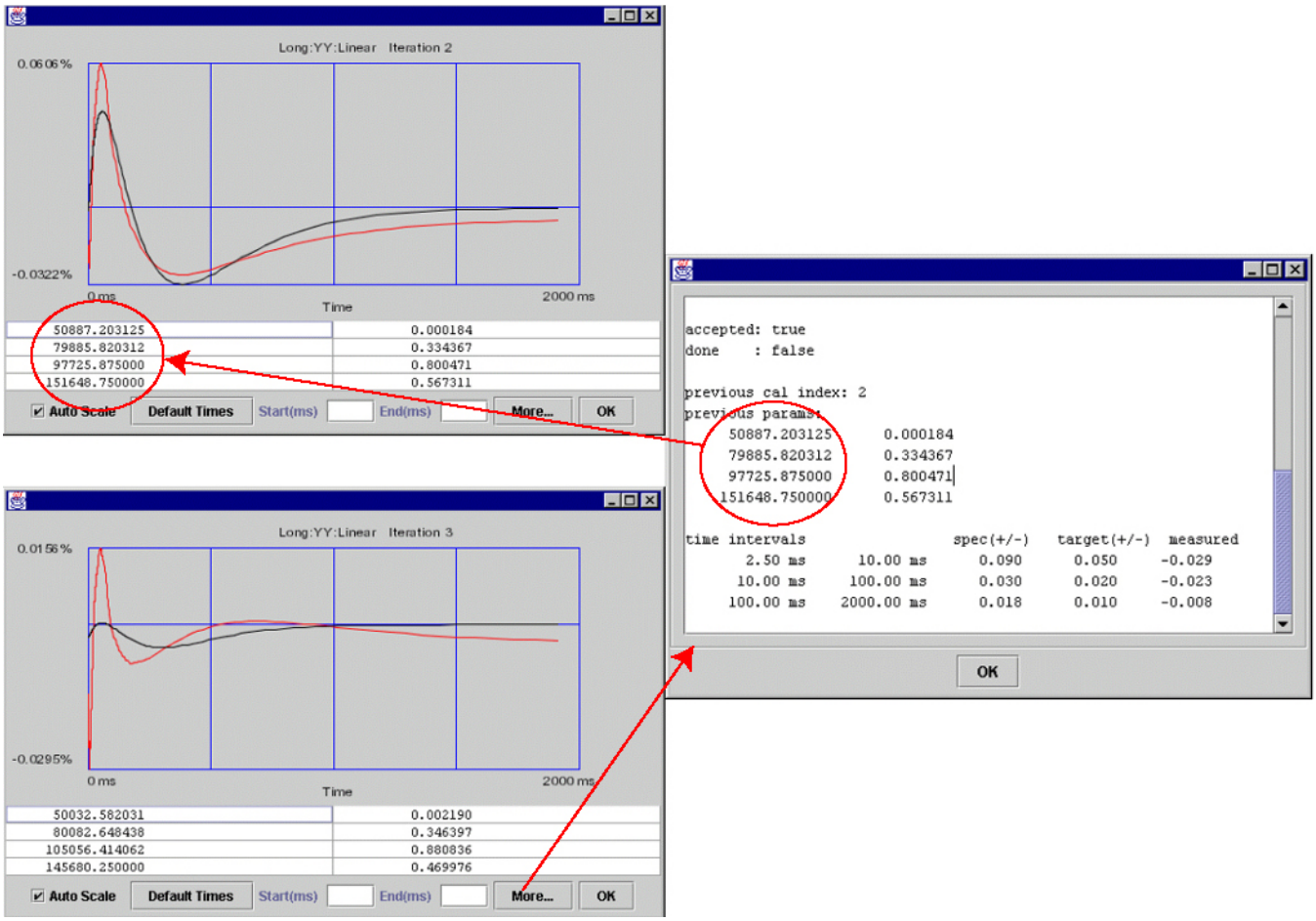
When a component's iteration (iteration 1 in this example) is finished, and if the cal values are accepted into the cal file/hardware, you'll see that the current_cal_index is equal to the last iteration number, and current_cal will be the same as that contained in the popup of the last iteration (iteration 1 in this example) of the component.

Special cases:

- Current cal index = 0: initial cal values are in the cal file/hardware
- Current cal index = -1: cal values are set to zero for the component
- Current cal index = -2: cal values are set to the default (short time constant only)

7- SELECTING PREVIOUS ITERATIONS

To explain the relationship of iterations to calibration values, refer to Illustration 7-1.



SCAN ITERATION RELATIONSHIPS
ILLUSTRATION 7-1

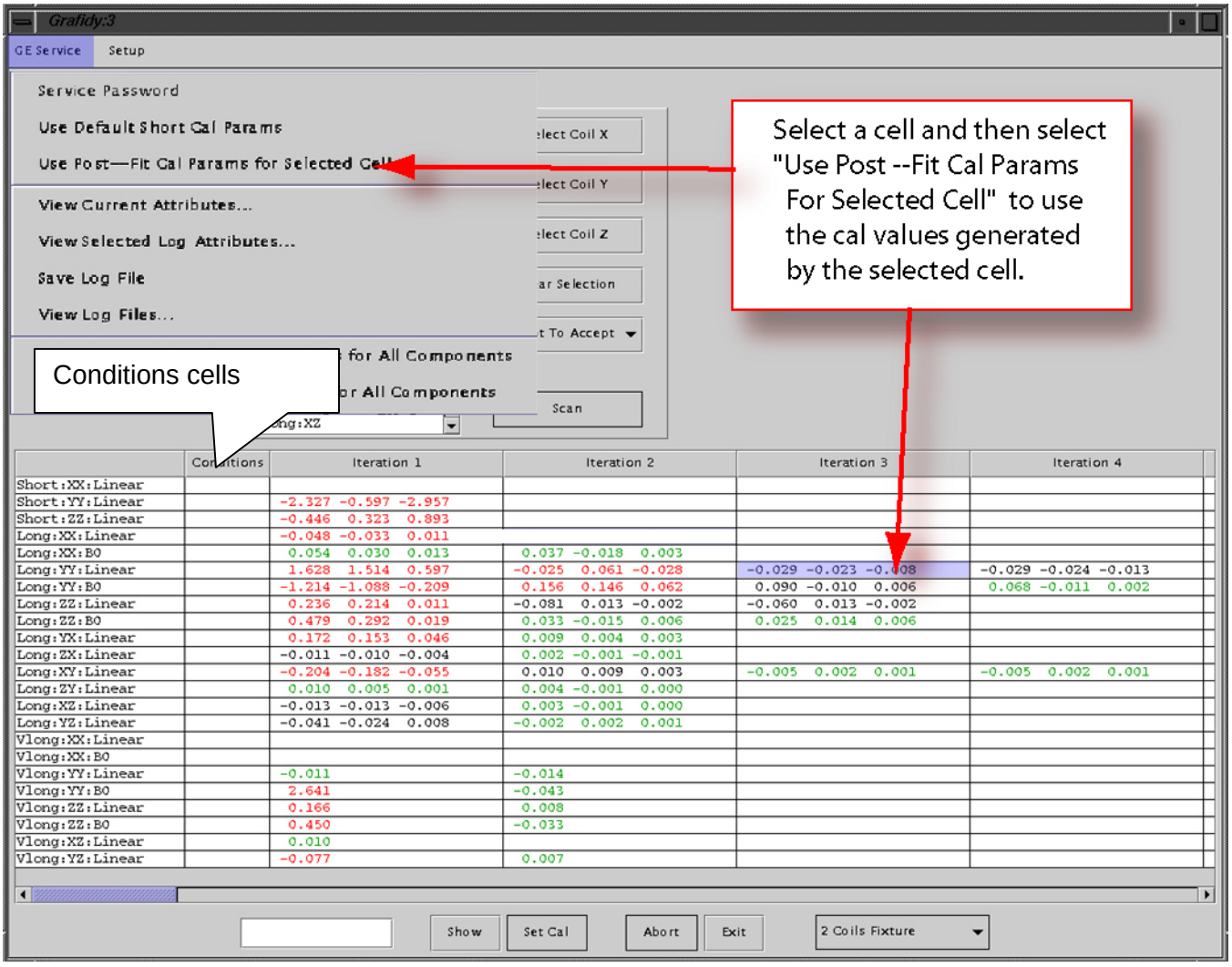
The circled cal values above were generated by the 2nd iteration (by fitting the 2nd iteration measured curve into the set of cal values (tau/alpha's or time constant/amplitudes). If accepted (as is the case here), these cal values went into the cal files grafidy(x/y/z).cal, gram_tune.dat, ecccoeif.dat and hardware (pre-emphasis) to compensate eddy current for the next iteration (the 3rd iteration in this example).

The measurement of the 3rd iteration is based on the compensation of the cal values "dialed-in" at the end of the 2nd iteration. Click the **[More]** button (of the 3rd iteration popup) to show the cal values (previous parameters) used in the hardware/pre-emphasis when the 3rd iteration was scanned. The "previous cal index" (2 in this example) shows that the cal values used were generated by the 2nd iteration.

There may be times when selecting the cal values from the previous iterations may be desirable. Sections 7-1 and 7-2 describes each way.

7-1 Using Cal Values of a Particular Iteration

Refer to illustration 7-2.



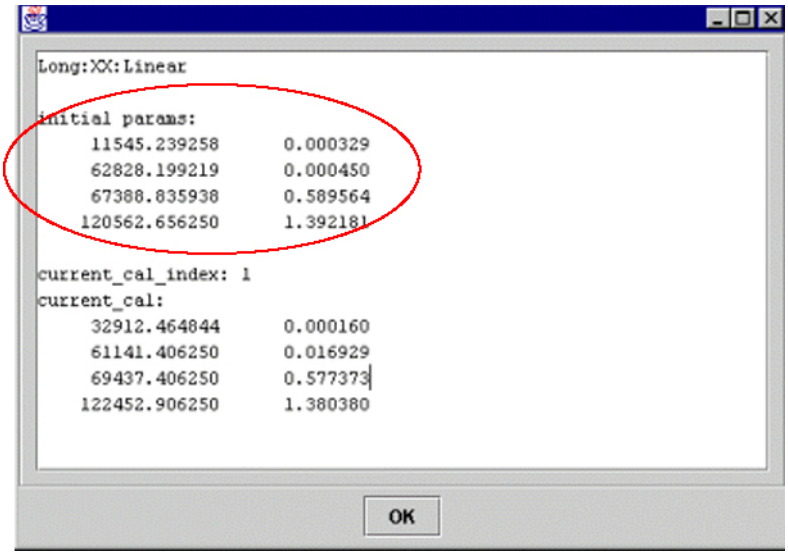
USING CAL VALUES GENERATED BY A GIVEN ITERATION
ILLUSTRATION 7-2

- The method shown in Illustration 7-2 will load the cal values (to cal files and hardware) generated by the iteration selected (the 3rd iteration in this example).
- **When to use:** If you did not accept the cal values generated from an iteration (in particular, the last iteration), or you accepted the cal values but further iteration overwrote them and you want to put the cal values generated from the selected iteration back into the cal files and hardware.

7-1-1 Using Initial Cal Values

If you select a component or cell in the Conditions column and select the menu item **[Use Post-Fit Cal Parameters for Selected Cell]**, then the initial cal values (before any scan for the component to modify them) will be put back into the cal file.

A popup from Section 6-3 is duplicated below to show the initial cal values (initial params) before the menu item **[Use Post-Fit Cal Parameters for Selected Cell]** is selected. This selection will put the initial cal values into the cal file.



INITIAL CAL VALUES
ILLUSTRATION 7-3

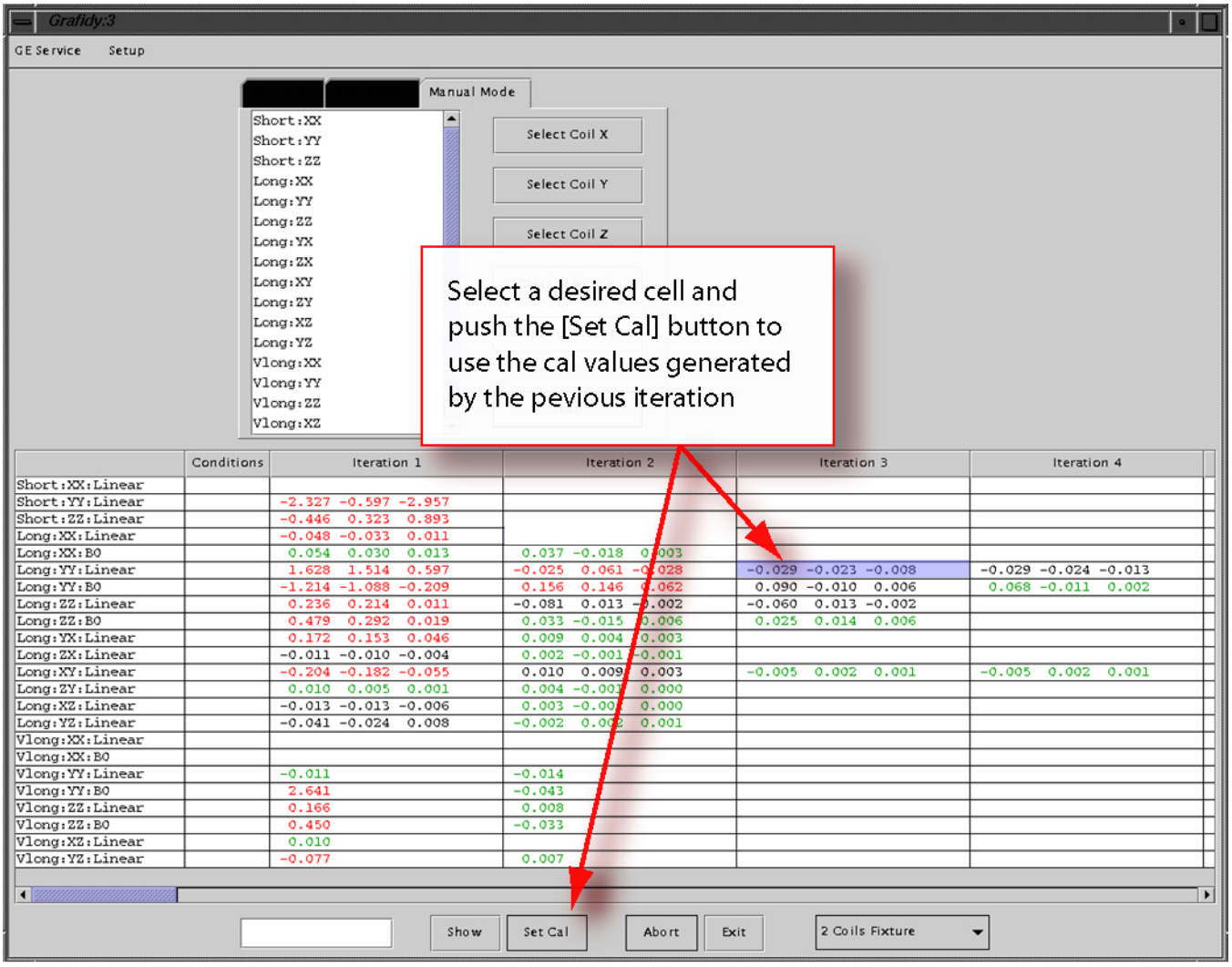
After clicking the **[Show]** button, assuming the cell selection in the Conditions column has not changed, you'll see that the initial parameters have not changed. The current cal index changed to 0 (zero) and the current cal parameters are the same as the initial parameters.

7-1-2 Using Default Short Cal Params

If you select a cell in the Conditions column with a short TC (short xx, yy, zz linear) and then select the menu item **[Use Default Short Cal Params]**, the tool will load the default short cal values for the selected component (short xx linear, for example) into the cal file. It has the same effect as Section 5-3, step 6, except it is on a component-by-component basis here. If you want to load all xx, yy, zz shorts, you'll need to do this three times for each of the three cells, rather than just selecting **[Yes]** to load the default values for all short TC components, as shown in Section 5-3, step 6.

7-2 Using Cal Values From a Previous Iteration

Refer to Illustration 7-3.



USING CAL VALUES FROM A PERVIOUS ITERATION
ILLUSTRATION 7-3

The method shown in Illustration 7-3 will load the cal values (to calibration files and hardware) used during the scan of the selected iteration (Iteration 3, in this example), which was generated during the previous iteration (Iteration 2, in this example) as the result of fitting the measured curve with these cal values. These cal values were downloaded to the hardware at the end of the previous iteration.

When to use: If the further iteration produced worse EC results than the previous iteration and you wish to go back to the cal values which produced the better EC results (of the selected iteration).

8- ABORT AND EXIT

[Abort]

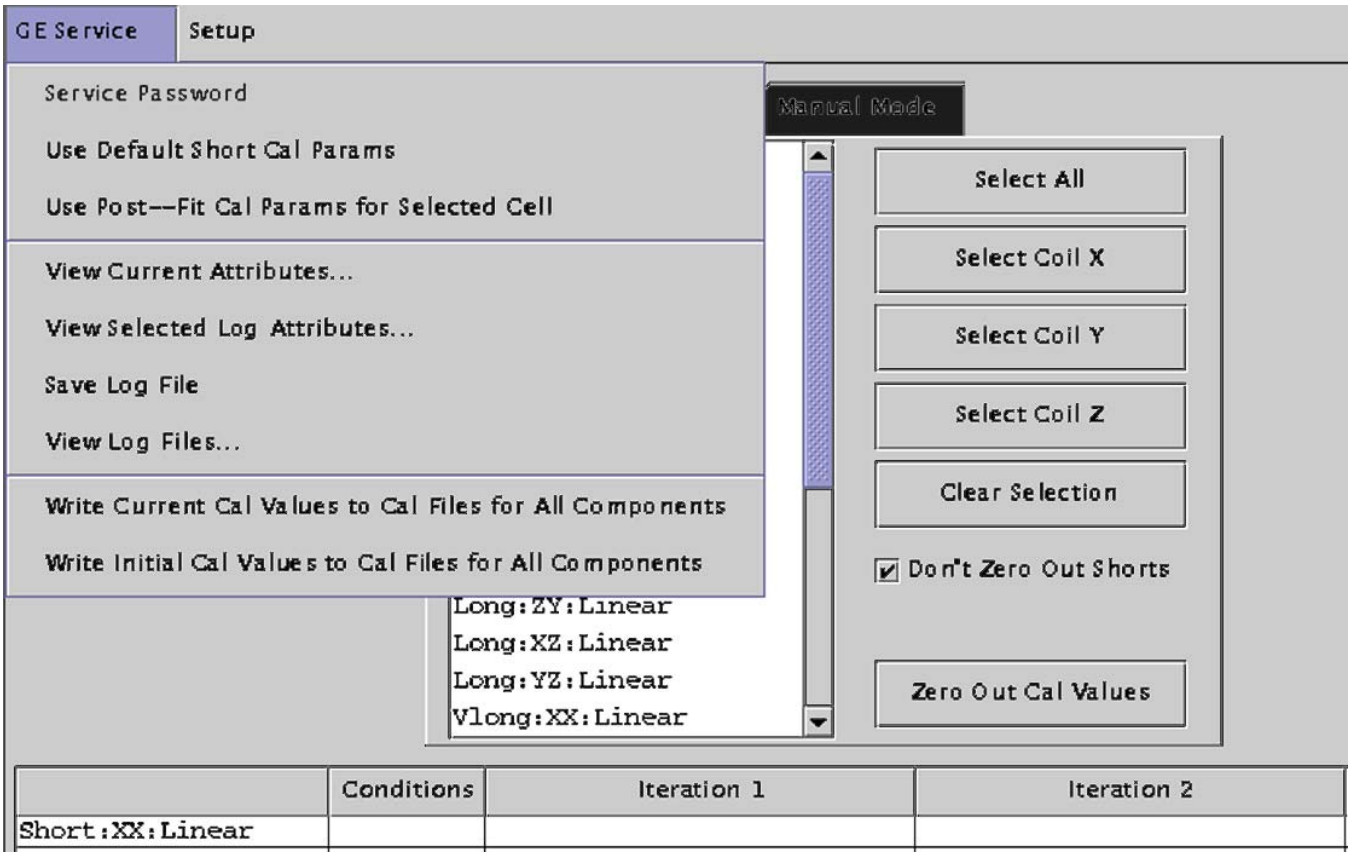
If for some reason you want to abort the scan, click the **[abort]** button, then select the **<Stop Scan>** key on the keyboard to stop the scan. After 10-20 seconds, the grayed Scan button will become active again, allowing you to continue with what you were doing.

[Exit]

Click the **[exit]** button to close Grafidy3. There will be a short delay as the tool writes new entries to the log file.

9- GE SERVICE PULL-DOWN EXPLANATION

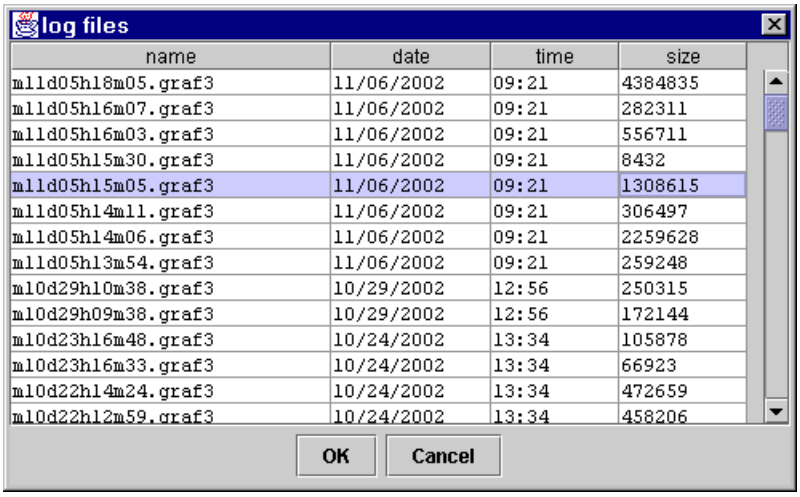
Refer to Illustration 9-1.



VIEWING A LOG FILE
ILLUSTRATION 9-1

If the service key is not present, many of the options will be unavailable. If the key is not available and you have a GEMS service contract, you can activate all options by selecting **[Service Password]** and entering the service password.

If you want to view a previous log file, click on **[GE Service]** and choose **View Log Files**. See Illustration 9-1. After the list of log files is displayed, click on the log file you want to view and click **[OK]**. See Illustration 9-2. The result table will be filled with eddy current measurement numbers.



CHOOSING A LOG FILE
ILLUSTRATION 9-2

Important

For twin gradient systems only: Due to a software error in the current 91/10.0 build for SDM (Service Desktop Manager) and CSD (Common Service Desktop), if, while you are running a gradient-sensitive tool (such as spt) in Zoom mode, you start Grafidy 3 to look at a log file, the SDM or CSD will automatically switch the gradient mode from Zoom to Whole before Grafidy3 really gets started.

Do not start Grafidy3 from the SDM or the CSD when you are running another tool for a TRM system. While no one will start Grafidy3 to calibrate the system while another tool is running (scanning), do not start Grafidy3 from SDM or CSD just to look at log files while you are running another tool in Zoom mode. If you really want to look at the log files while another tool is running, in a shell window, type **/usr/g/bin/graf3/rungraf3** to bypass the SDM and CSD to avoid having the gradient mode switched from Zoom to Whole without your knowledge.

[Write current cal values to cal files for all components]

If you open a log file, you may want to write the “current” cal values to the cal files for all components. “Current” cal values for a component means the last “accepted” cal values for the component. “Accepted” cal values means those fitted parameters which are accepted by the cal files grafidy(x/y/z).cal and downloaded to the hardware/pre-emphasis for future scans.

Current cal values are normally generated from the next-to-last iteration and used by the last iteration during scan. However, after the generation of the current cal values, several scan/iterations may follow; for example, linear component of say long xx was within specification before the b_0 component, so while b_0 is experiencing more iterations (that is, cal value changes), the linear component does not change its cal values. The last “accepted” cal values are generated not from the next-to-last iteration for linear but from a few iterations ago.

This menu is useful when you know that, for example, a few days ago you performed a good eddy current calibration, and today while you were re-doing it for some reason, you made some errors in eddy current compensation, and, worse, forgot to save the grafidy(x/y/z).cal files beforehand. Fortunately, you can load the log file you generated a few days ago, and select this menu option to load the “good” cal values back to the cal files (and the hardware).

[Write initial cal values to cal files for all components]

You may want to write the initial cal values to the cal files for all components, either after some iterations for some components and you decided you would rather discard your new results (back to the initial cal values instead), or you may load a log file to write the initial values (of the log file, whatever in the cal files at that time when this log file was generated when Grafidy3 was invoked).

[Save log file]

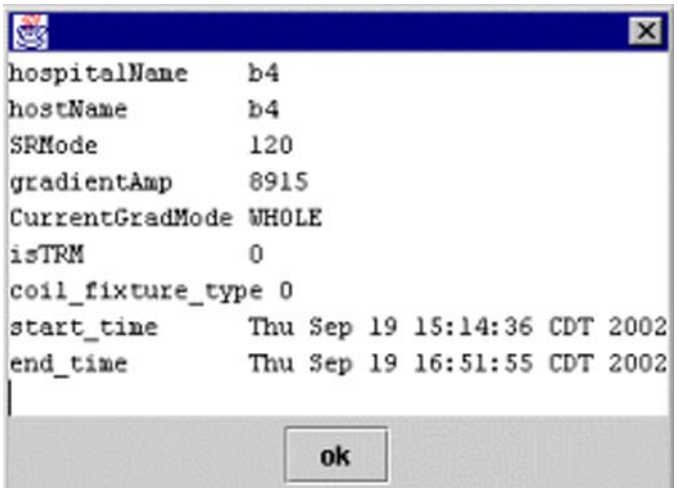
Generally, the log file is saved when you exit, though you may choose to save it more often. You can save the calibration result/log (more than just grafidy(x/y/z).cal files, which are always saved) by selecting the **[Save log file]** menu option. This is useful in case of a system crash; at least a partial result/log will be saved.

[View current attributes]

This menu option will show current scanner and system information, such as the hospital name, slew rate, gradient driver, gradient mode (Whole or Zoom), and the time Grafidy 3 was invoked.

[View selected log attributes]

This menu option will show the scanner and system information of the system on which this log file was generated. It could be a different system than the one you’re currently using, or it could have a different gradient mode (Whole or Zoom). It will certainly display a different start and end time.



VIEW SELECTED LOG ATTRIBUTES
ILLUSTRATION 9-3

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
A	April 10, 2002	Hawthorne	Initial build
0	April 15, 2002	Hawthorne	Initial Release
1	Oct, 2002	Hawthorne	Working to rev 1 Updates for 9.x and 10.x
2	Dec 5, 2002	Hawthorne	Final Release
3	Dec 12, 2002	Kargard	Added functionality for running on 9.0 software
4	Feb. 24, 2003	C. MacDonald	Corrections and additions per Pete Kargard. Minor text edits, style changes.
5	Feb 06, 2007	Stetz	Updated 10 db Step Attenuator Part Number