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1- DESCRIPTION

EPT combines the functionality of the current B_0 Dither Calibration, Group Delay Calibration and B_0 Image Test into a single tool with a simple user interface. The output is suitable for remote support access, trending, and automatic checking of results against acceptance limits. In addition, EPT automatically updates the EPI calibration files when authorized by the user. For ***TwinSpeed***, EPT is run for each **GradMode**, **Whole-Body** (WB) and **Zoom** (ZM). Both **GradModes** can be selected in a single pass, and both require calibration at least once per installation, and during any other routine system tests.

2- TOOLS REQUIRED

WARNING!

POISON HAZARD! THE PHANTOM CONTAINS NICKEL, A SUSPECT CARCINOGEN. DO NOT INGEST. DISPOSE OF AS A HAZARDOUS WASTE ACCORDING TO STATE AND FEDERAL REGULATIONS.

Item	Description	Part Number	Qty.
1.	100-mm Sphere Phantom	46-317586G1	2
2.	EPI Foam Positioner	2170481	2
3.	Grafidy Base Plate	46-317410G1	1

3- PROCEDURE

3-1 Startup

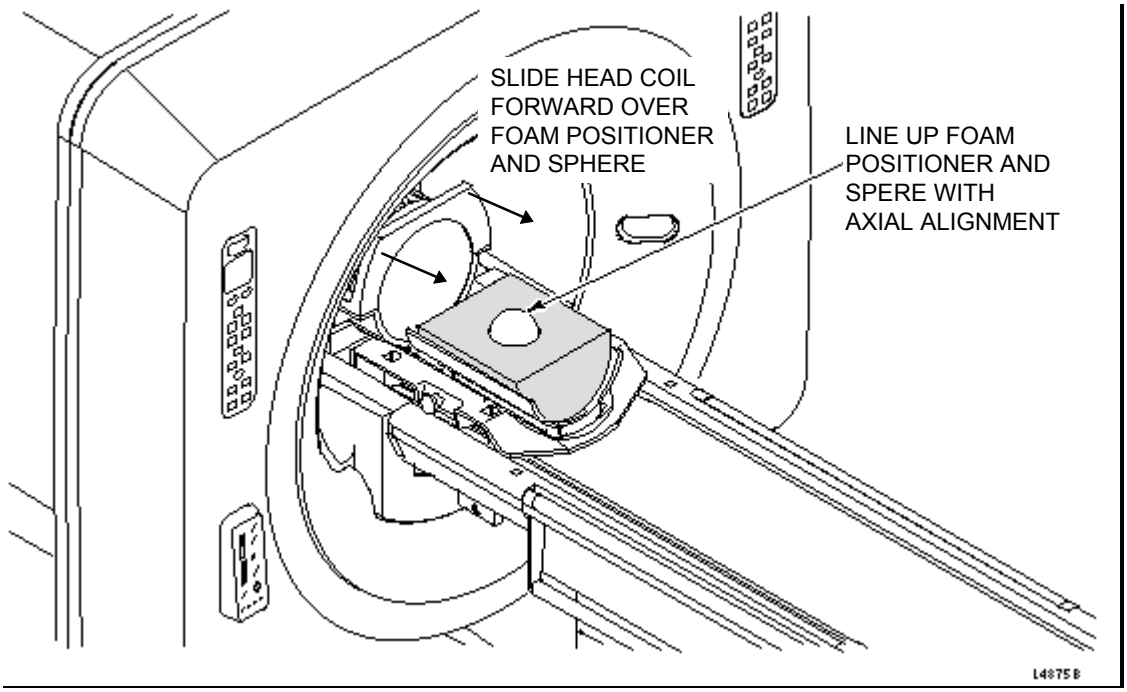
IMPORTANT!

Any time a change has been made to the RF Chain hardware and once per installation, perform the Bandpass Asymmetry Correction Characterization (BACC) procedure (refer to *System Cabinet: Troubleshooting: Bandpass Asymmetry Correction Test*) before running this calibration.

1. Click on **[New Pt]**, and enter the following:

   Id: **geservice**

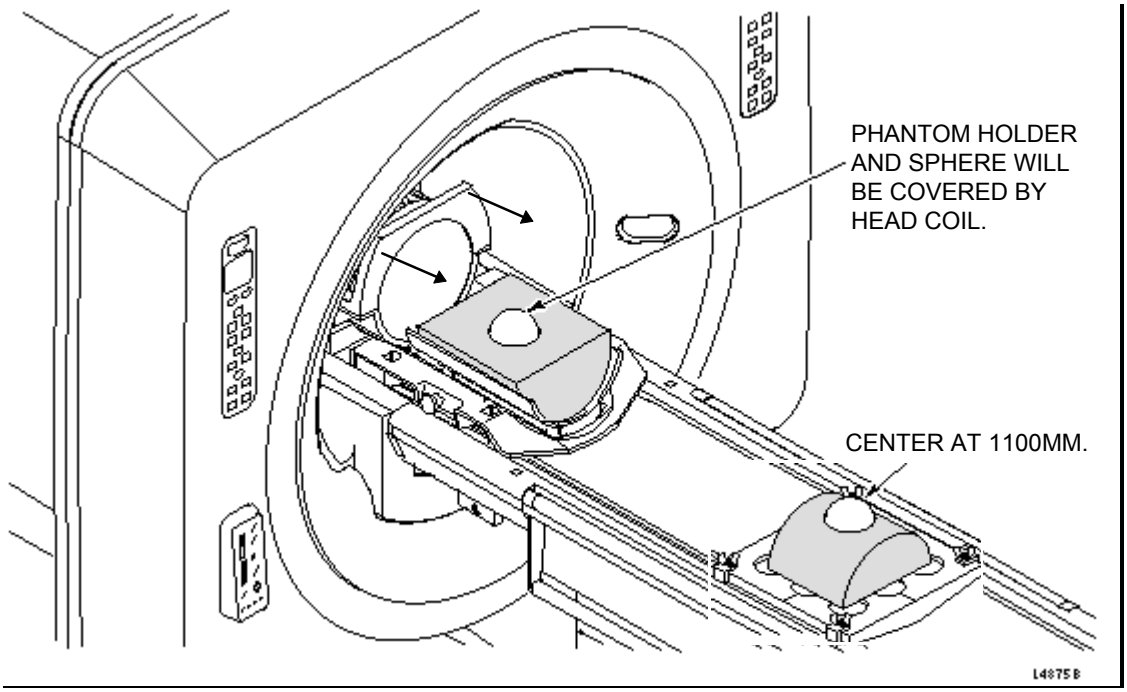
2. Place an EPI foam phantom holder and a 100-mm sphere phantom in the head coil, as shown in Illustration 3-1. Landmark on the center of the sphere.



EPI PHANTOM POSITIONING - HEAD COIL
ILLUSTRATION 3-1

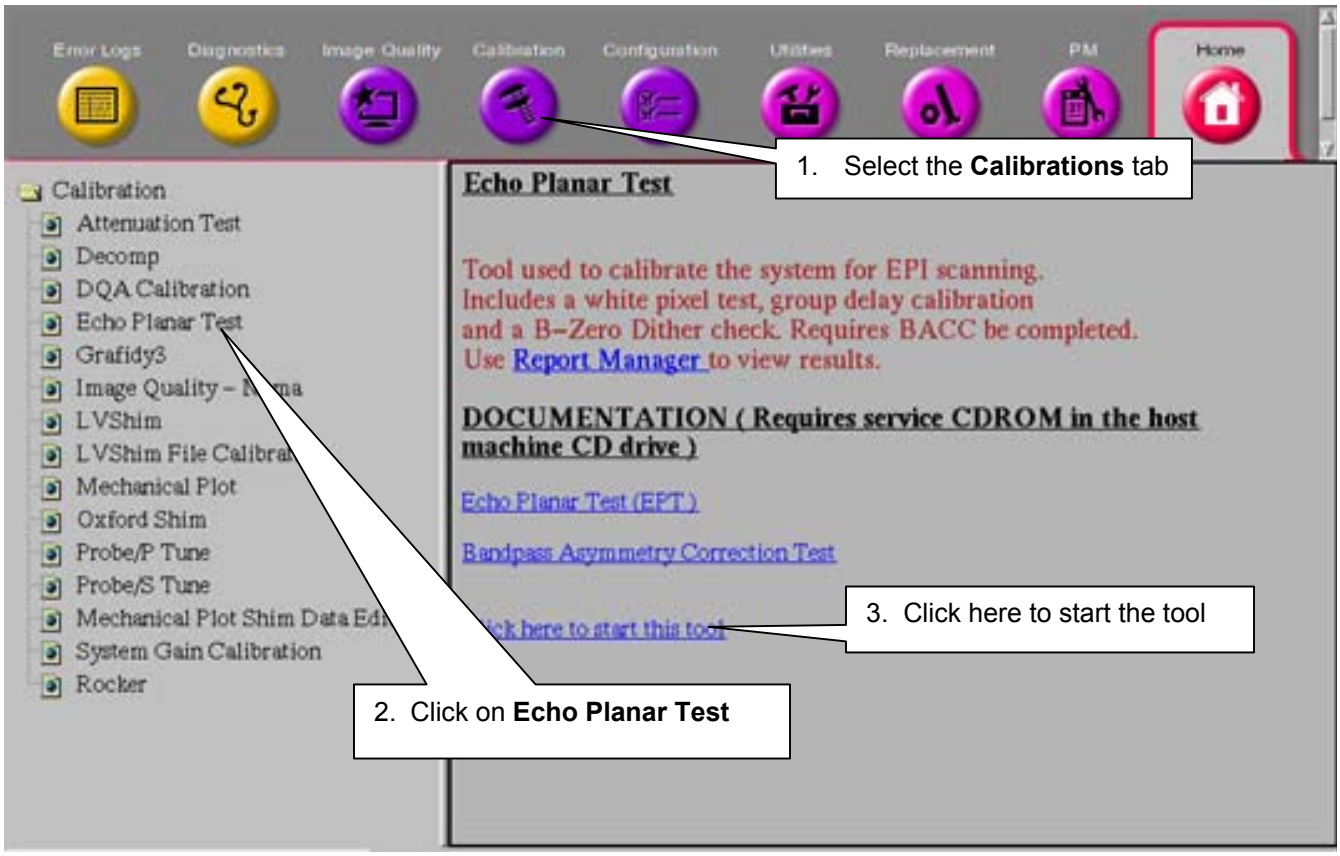
3-1 Start-up (continued)

3. Place an EPI foam phantom holder and a 100-mm sphere on the Grafidy base plate, as shown in Illustration 3-2. Move the table into the bore to **1100 mm from landmark**. Slide the Grafidy base plate so the center of the 100-mm sphere is at the axial alignment light, and then press the **MOVE TO SCAN** button.



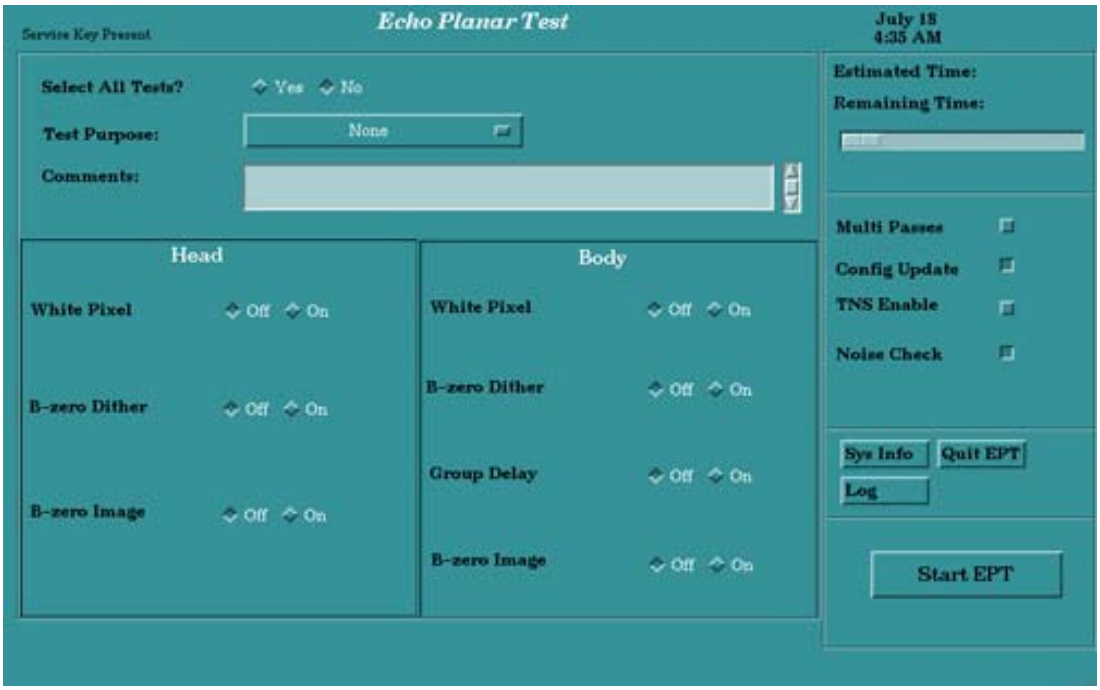
EPI PHANTOM POSITIONING - BODY COIL
ILLUSTRATION 3-2

4. In the Service Desktop, start the Service Browser if it's not already available. Follow the instructions on Illustration 3-3.

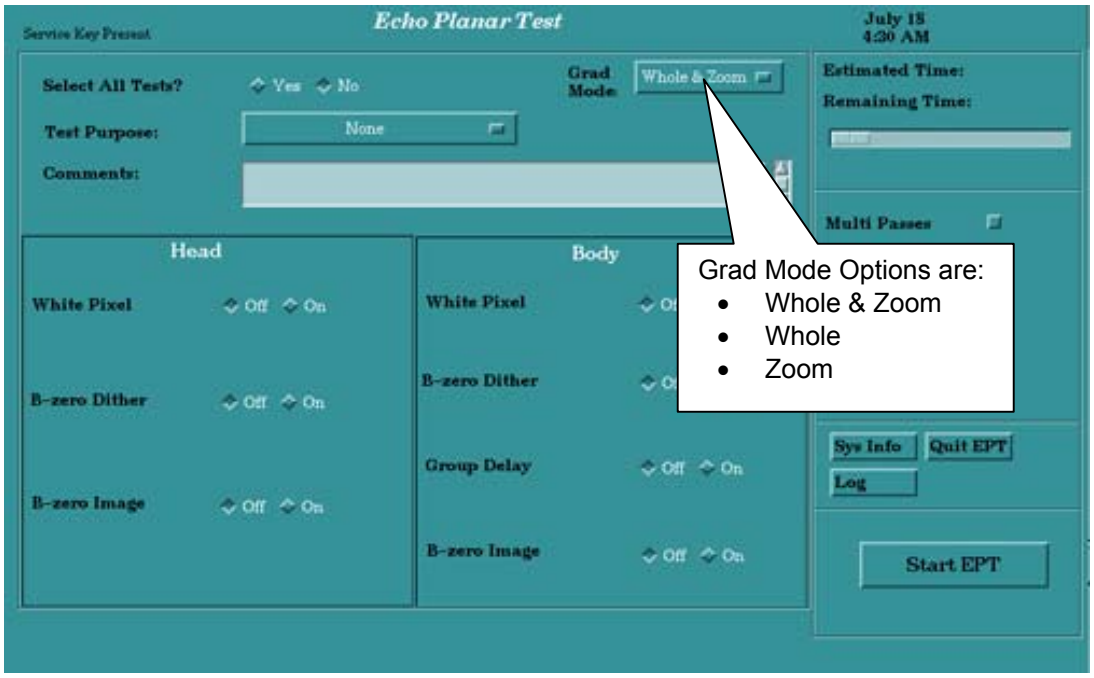


STARTING EPT
ILLUSTRATION 3-3

6. The Echo Planar Test Window will appear, as shown in Illustration 3-4. For ***TwinSpeed***, the **GradMode** will appear with three possible entries. See Illustration 3-5.



ECHO PLANAR TEST WINDOW
ILLUSTRATION 3-4



ECHO PLANAR TEST WINDOW, WITH GRAD MODE OPTION
ILLUSTRATION 3-5

Note
The “Select All Tests” default option is **No**.

6. For calibration, set the “Select All Tests” option to **Yes**.

Note

For troubleshooting, select individual tests as desired.

Note

When running EPT with Grad Mode = “Whole & Zoom” and **selecting run all tests**, two separate files (EPT.ZOOM and EPT.WHOLE) are created in /usr/g/service/cclass/etp when the scan is complete. But the results in the status box of the EPT test screen will only show the last coil mode run and not both. Therefore it is possible to have a failure in the first mode run that is not reported. To work around this problem, when running EPT tests, select one mode at a time. Run either Zoom or Whole and view the results, then run the remaining mode and view the results. The next option is to run “Whole & Zoom” mode at the same time and then use Report Manager to view the EPT.ZOOM and EPT.WHOLE result files.

7. There are four option buttons on the screen that must be chosen before starting EPT:

   a. Pressing the **Multi Passes** button and entering an integer in the text box can perform more than one pass of the tests.

   b. One or more of the selected tests can automatically update the config files with new calibration data if the new data is within specs. Select **Config Update** before starting EPT.

   c. The TNS can be disabled or enabled during the EPI white pixel test for troubleshooting purposes by pressing the **TNS Enable** button. EPT will post a message if the TNS is not connected. Run EPT with the TNS set the same as during normal operation.

   d. The baseline **Noise Check** should be enabled during the EPI white pixel test. This check is done by comparing the mean and standard deviation to set limits. If they are outside of the limits, the white pixel test will be aborted. This will prevent false results if the receive chain is disconnected or not functioning properly.

Note

During troubleshooting, you may want to enable or disable the TNS to illustrate the effect of the TNS on the system

Note

To use the software control for the TNS, set the HW switch to the **Disabled** position.

8. Select a **Test Purpose** from the pull-down menu.

9. Two lines of comments can be entered, if desired. If no comments are entered, the text “NO COMMENT” will be entered into the results file.

CAUTION

The test you are about to initiate will move the cradle. Please take appropriate precautions to ensure that no one will be in its path.

10. Select **[Start EPT].** Running all the tests takes about 1 hour and will thoroughly test the EPI performance of your system. This is the recommended mode for baseline, PM, and initial problem-finding. The single test mode is meant to be used while troubleshooting. If possible, run the full set of tests at the end of your troubleshooting to verify system performance. While EPT is running, each test will be displayed in the message window indicating the amount of time the test requires to run.

11. EPT will create many images. If necessary, a window will pop up to inform you that there is not enough space available.

12. When the tests are complete, one of four messages will appear:

```
Your tests completed successfully
```

or

```
A minor system problem has been detected. This problem is NOT
expected to affect image quality
```

or

```
A serious system problem has been detected. This problem IS
expected to impact image quality, however, this does not affect the
system's ability to scan
```

or

```
EPT was unable to determine PASS/FAIL status of the tests
```

13. Select **[QUIT EPT]** and confirm.

3-2 Test Termination Procedure

1. If **[Quit EPT]** is selected, a confirmation window appears.

2. If the EPT process is not shut down in an orderly manner, the service protocol directions may need to be reset. This can be done by opening a C-shell and typing the following:

   cd /usr/g/service/cclass/ept <ENTER>

   resetept <ENTER>

3. Return the TNS hardware switch to the clinical setting (usually Enabled).

4- EPT REPORT

4-1 Procedure

1. To view the EPT data and plots, refer to the report manager tool procedure. See Illustration 4-1 and 4-2 for file naming convention.

YEAR	MONTH	DAY		HOUR		MINUTES, SECONDS
0 = 1990 1 = 1991 2 = 1992 3 = 1993 4 = 1994 5 = 1995 6 = 1996 7 = 1997 8 = 1998 9 = 1999 A = 2000 B= 2001 : Z= 2026	1 = JAN. 2 = FEB. 3 = MAR. 4 =APR. 5 = MAY 6 = JUN. 7 = JUL. 8 = AUG. 9 = SEP. A = OCT. B = NOV. C = DEC.	1 = 01 2 = 02 3 = 03 4 = 04 5 = 05 6 = 06 7 = 07 8 = 08 9 = 09 A = 10 B = 11 C = 12 D = 13 E = 14 F = 15 G = 16	H = 17 I = 18 J = 19 K = 20 L = 21 M = 22 N = 23 O = 24 P = 25 Q = 26 R = 27 S = 28 T = 29 U = 30 V = 31	0 = 00:00 1 = 01:00 2 = 02:00 3 = 03:00 4 = 04:00 5 = 05:00 6 = 06:00 7 = 07:00 8 = 08:00 9 = 09:00 A = 10:00 B = 11:00 C = 12:00	D = 13:00 E = 14:00 F = 15:00 G = 16:00 H = 17:00 I = 18:00 J = 19:00 K = 20:00 L = 21:00 M = 22:00 N = 23:00 O = 24:00	0 to 59

DATA FILE NAMING CONVENTION
ILLUSTRATION 4-1

**EXAMPLE FILE CREATED:*
AUGUST 15, 2000 at 12:12:22

EPT REPORT FILE IDENTIFICATION EXPLANATION
ILLUSTRATION 4-2

2 For TwinSpeed, the file names have the suffix _WHOLE or _ZOOM, such that the following are both valid names:

17FG4003_WHOLE.EPT 17FG4003_ZOOM.EPT

The reports will always be separate, even when both GradModes are run together

.

4-2 List of EPT Report Screens

Following is a list of data reports that you may refer to, depending on how you wish to use the EPT Report.

TABLE 4-1
EPT HEADER PARAMETERS

SITENAME	Site Name	Raw Header
USN	Unique System Number (GECares issued)	Config File
MLN	Mobile Location Number (9999 = Nonmobile)	MR Config File
SRVCONFIG	Date/Time SRV CONFIG File last changed	SRV Config File "SYSCONFIG"
TIME	YY/MM/DD HH:MM:SS	Raw Header
SOFTREV	Software Revision	"mrswrev" Script

EPT Scan Header Sample:

```
69OF5806.EPT/0 Header Info RDF/GRP Revision: /40
============================================================
SITENAME     = B05X_OC0
USN          = 123456
MLN          = 9999
SRVCONFIG    = 08/29/96 20:35:01
TIME         = 09/24/96 14:31:56
SOFTREV      = 5.5
GRADMOD      = WHOLE or ZOOM     (For TwinSpeed only)
PASS         = 1 of 1 (If multiple passes were selected)
```

EPT Summary Screen Sample:

```
============================================================
Body Whit Pixel                          PASS
Body X B0 Dither    (constant phase)     PASS
Body X B0 Dither    (linear phase)       PASS
Body Y B0 Dither    (constant phase)     PASS
Body Y B0 Dither    (linear phase)       PASS
Body Z B0 Dither    (constant phase)     PASS
Body Z B0 Dither    (linear phase)       PASS
X Group Delay       (constant phase)     PASS
X Group Delay       linear phase)        PASS
Y Group Delay       (constant phase)     PASS
Y Group Delay       linear phase)        PASS
Z Group Delay       (constant phase)     PASS
Z Group Delay       linear phase)        PASS
Body B0 Image                            PASS
Head White Pixel                         PASS
Head X B0 Dither    (constant phase)     PASS
Head X B0 Dither    (linear phase)       PASS
Head Y B0 Dither    (constant phase)     PASS
Head Y B0 Dither    (linear phase)       PASS
Head Z B0 Dither    (constant phase)     PASS
Head Z B0 Dither    (linear phase)       PASS
Head B0 Image                            PASS
```

4-2 List of EPT Report Screens (continued)

EPT Detail Screens Sample:

69OF5806.EPT/3 Body B0 Dither Exam Number 52201

(usec) Echo Spacing	(degrees) X dither	Y dither	Z dither	(usec) Echo Spacing	(degrees) X dither	Y dither	Z dither
768	-1.378	8.368	5.011	1728	-0.868	16.352	8.474
832	-1.452	9.279	5.360	1792	-0.879	16.518	8.809
896	-1.392	10.342	5.744	1856	-1.034	16.722	8.617
960	-1.232	10.921	6.317	1920	-0.642	16.862	8.806
1024	-1.255	11.494	6.643	1984	-0.364	17.601	8.938
1088	-0.920	12.144	6.709	2048	-0.401	17.630	8.987
1152	-1.198	13.063	7.222	2112	-0.287	18.332	9.165
1216	-1.057	13.387	7.317	2176	-0.378	18.426	9.276
1280	-1.166	13.920	7.494	2240	-0.266	18.318	9.253
1344	-0.954	14.459	7.635	2304	-0.284	18.074	9.428
1408	-0.796	14.003	7.855	2368	-0.435	18.604	9.560
1472	-0.693	14.639	8.093	2432	-0.364	18.744	9.414
1536	-0.622	15.212	8.082	2496	-0.289	17.876	9.697
1600	-0.943	15.493	8.351	2560	-0.169	18.031	9.654
1664	-1.129	15.877	8.268	2624	-0.286	18.507	9.798

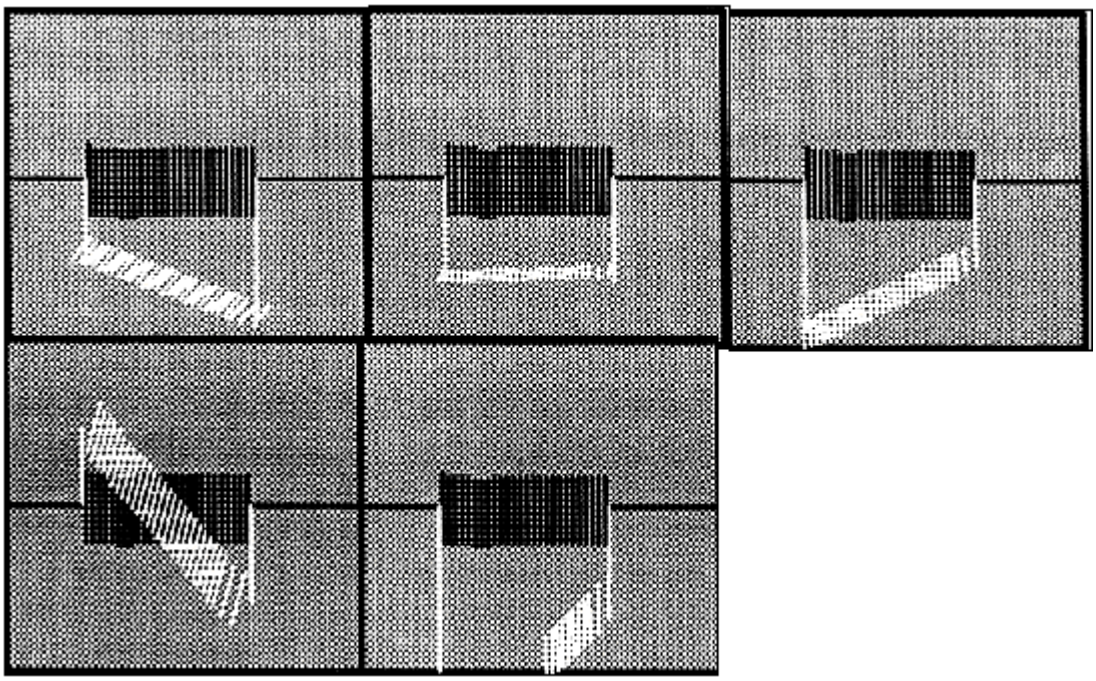
Data OK	Update Auth.	Updated	TNS	Connected	Overflow	Counts This Test
yes	yes	yes		yes	no	4

4-3 EPT Calibration Plot Examples

Note

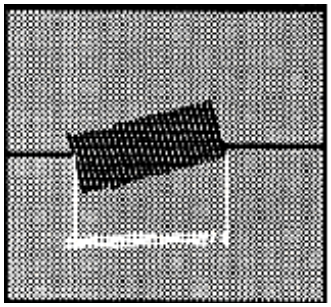
It's a good idea to photograph and label the EPT calibration graph mode plots for future comparison. Future calibration plots may not look identical to these, but they can be a good indicator of historical system tuning and performance.

Illustration 4-3 contains typical EPT calibration plots. Note that when looking at the plots, one of the most important characteristics is that the top and bottom borders of the plot appear virtually parallel. Width is not as important as the absence of bow tie or conical plots (see Illustration 4-4).

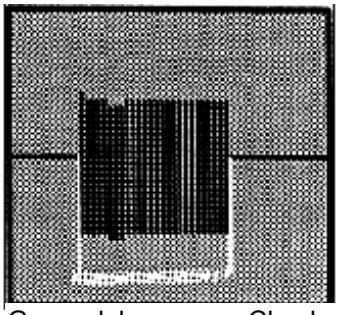


TYPICAL EPT CALIBRATION PLOTS
ILLUSTRATION 4-3

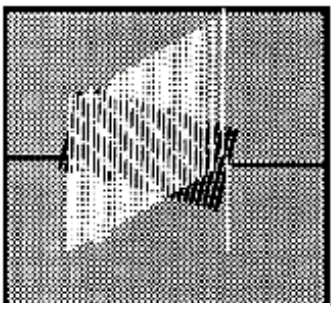
4-3 EPT Calibration Plot Examples (continued)



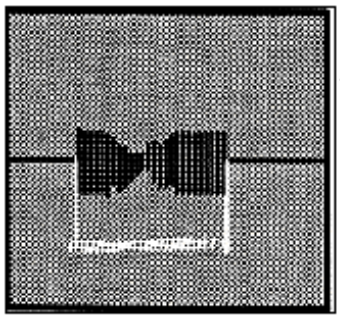
Shim is off. Check shim and or autoshim.



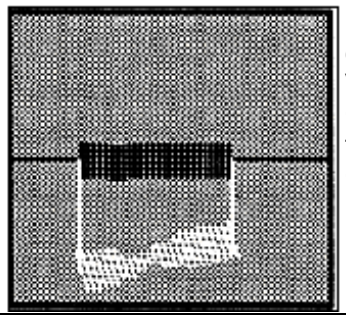
Group delay wrong. Check psd_grd_wait or warp b0.



Excessive Dither. Verify that GRAMS are tuned and Grafidy B0 is in spec.



Bow-tie in linear. Verify that GRAMs are tuned and Grafidy B0 is in spec.



Bow-tie in constant. Verify that GRAMs are tuned and Grafidy B0 is in spec.

EXAMPLE OF (BAD B_0) PLOTS WITH TROUBLESHOOTING TIPS
ILLUSTRATION 4-4

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	Oct 7, 1997	K. L-P	Initial release.
1	Feb 18, 1998	K. L-P	Updated per clinical feedback.
2	Mar 30, 1998	F. Fiore	Updated illustrations.
3	July 8, 1998	M. Keber	Added statement that EPI cals may not be optimized if BACC isn't run.
4	Oct 5, 1998	M. Keber	Updates per style guide and made illustration text more readable.
5	February 15, 1999	K. Keshena	Updated per engineering bay validation.
6	May 21, 1999	S.M.Atladottir	Updated Procedure References for New GUI
7	Sept. 27, 1999	G. Boerner	Updated per 8.3 validation.
8	Sep 10, 2000	J.Gerber	Updated for TwinSpeed
9	July 25, 2001	J.Gerber	Updated for TwinSpeed scanner with Leo1 release.
10	Aug. 8, 2001	J. Wolak	Merged in changes from Milwaukee previously published revs 8 and 9 versions that included: M. Jones Fixed/updated Ill. 4-2. and M. Jones Changed test running time (Section 3-1, step 9) to 45 minutes. Deleted reference to confirmation message in Section 3-2, step 1
11	March 8, 2002	Hawthorne	Refined step instructions in section 3 per validation
12	July 12, 2002	Hawthorne	Added a note in section 3.1 concerning running all tests in grad mode "Whole & Zoom"
13	Oct. 24, 2002	C. MacDonald	Replaced Ill. 3-3 for Service Desktop interface