TABLE OF CONTENTS

1- INTRODUCTION

Image intensity is generally not uniform from system to system, due to variations in the RF cable losses, preamplifier gain/noise, receiver gain/noise, RF coils, and other factors. Furthermore, image intensity is dependent upon the phantom and pulse sequences used. Window and level controls are manually adjusted for the desired image intensity. To provide automatic uniform image intensity from system to system, perform the System Gain Calibration procedure. Doing so does not affect the system SNR.

The Recon Scale Factors are calculated with the System Gain Calibration tool, then the new values are automatically set by the tool. This is done in software by changing the Recon Scale Factors based on the result of the ratio shown below:

$$\frac{\text{1100 (Desired image intensity)}}{\text{Present image intensity}} \times \text{Present Recon Scale Factor} = \text{New Recon Scale Factor}$$

2- INITIAL CONDITIONS

- Signa software fully operational
- Gradient calibration completed
- No image artifacts

3- BODY CALIBRATION

3-1 Tools Required

- Body TLT Sphere, 46-265635G6
- Long Body Loader, 46-287902G1 or SPT Body Loader, 2135652-2

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

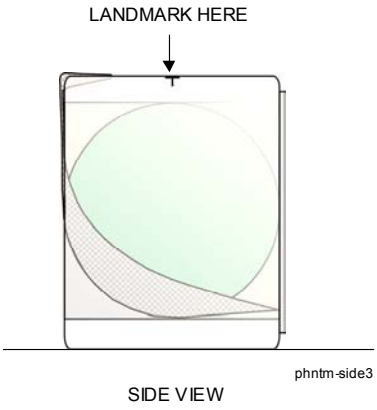
3-2 Body Scan

Possible equipment damage. Completely remove the quad head coil from the cradle before performing any body scans. Failure to do so may damage the head coil T/R network.

1. Remove quad head coil (if present) from cradle.

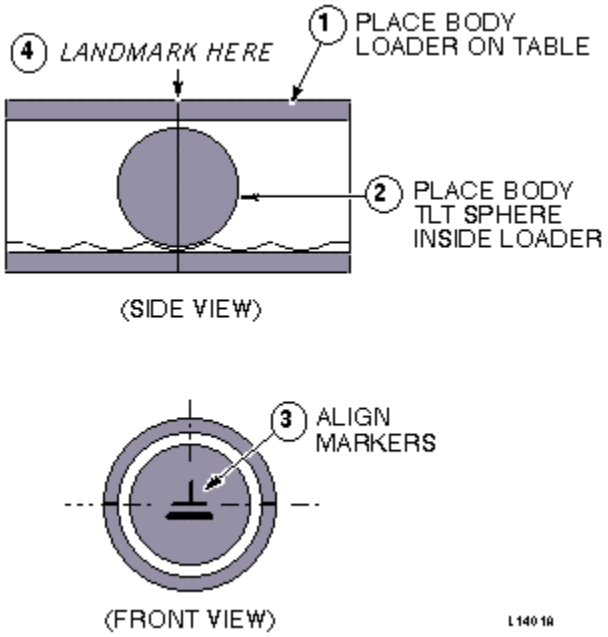
3-2 Body Scan (continued)

2a. SPT Loader. Position the SPT body loader and TLT sphere on the table and landmark per Illustration 3-1A.



SPT BODY LOADER AND TLT PHANTOM SETUP
ILLUSTRATION 3-1A

2b. Long Loader. Position the body TLT sphere in the long body loader, and landmark per Illustration 3-1B.



BODY TLT PHANTOM SETUP
ILLUSTRATION 3-1B

3. At the keypad on the front magnet enclosure, press LANDMARK, then MOVE TO SCAN.

4. At the operator work space, prepare the system for a System Gain Cal, Body scan using the "Service Protocols" procedure located on the service methods CD-ROM, or for the alternate proprietary procedure, see below.

   This alternate proprietary procedure is available for GE use, and to sites with a valid Advanced Service Package Limited License.

a. Click on **[New Pt]**, and enter
   Id: **geservice**
   Name: **sys gain cal**
   Weight (Lb): **111**
   Set Patient Protocols to **Service**.
b. In the Protocol field, type **o.24.1** (o=Other, 1=series number) to load the protocol.
c. **[Save Series]**.

5. Click on **[Auto Prescan]**. After auto prescan is complete, verify that R_1 = 11 and R_2 = 14. If not, perform a manual prescan and set R_1 = 11 and R_2 = 14. Record the R_1, R_2, TG, and system frequency (AX) values on the "System Gain Calibration Data" Data Sheet in Appendix A (also located on the Service Methods CD-ROM under **[Data Sheets]**).

6. Click on **[Scan]**.

3-3 Body Scan Analysis

1. Select **System Gain Calibration** from the **[Cal/Checks]** menu on the Service Desktop, then click on **[START]**. Continue per Table 3-1.

TABLE 3-1
BODY SCAN ANALYSIS

OUTPUT/PROMTS	INPUT/COMMENTS

`---------- System Gain Calibration ----------`
`Coil Coil name Recon scale factor`
`-------- --------- ------------------`
`1) coil1 HEAD 2.000000`
`2) coil2 BODY 5.000000`
	Default Recon Scale Factors shown. Values may differ if System Gain Cal was previously run or if Config File has been edited.

`Select a coil entry (s or q to Stop)(1..2)[1]: ...`	**2**
`Enter the exam number (0..63500)[x]: .....`	Type desired exam number or **<Enter>** for default.
`Enter the series number (0..999)[x]: .....`	Type desired series number or **<Enter>** for default.
`Enter the image number (0.999) [x]: .....`	Type desired image number or **<Enter>** for default.
`Enter current value of recon scale factor [x]: ...`	**<Enter>** for default.
`The desired average pixel intensity should be between 1050.00 and 1150.00.`	
`The current average : xxxx.xx <------` `The standard deviation : xx.xx`	**Record in Data Sheet.**
If the average pixel intensity is between 1050 and 1150, then recon scale factor is acceptable and the following is displayed.	
`Exit System Gain Calibration?(Y,N) [Y]: .....`	**Y <Enter>** to exit program. Proceed to Section 4, Head Calibration.
If the average pixel intensity is not between 1050 and 1150 the following is displayed:	
`The current recon scale factor is : X.XX`	
`Modify the recon scale factor to : x.xx <---`	**Record in Data Sheet.**

`-- then do [Download], [Auto Prescan] and [Scan].`
`Press <return> key (s to stop) when the scan`
`is complete ...[ ] .....`
	Do not enter any key at this time. Proceed to step 2.

2. To change the Recon Scale Factor, right click on **[Research Operations]** and select **Display CVs.** Enter CV name **cfcgain** (must be lower case) followed by **<Enter>**. Type the new Recon Scale Factor (which is sometimes referred to as the coil gain factor), followed by **<Enter>** and **[Accept]**.

3-3 Body Scan Analysis (continued)

3. Right click on **[Research Operations]** and select **Download**, then **[Auto Prescan]**. After auto prescan, verify that R_1 = 11 and R_2 = 14. If not, perform manual prescan and set R_1 = 11 and R_2 = 14. Record the R_1, R_2, TG, and system frequency (AX) values in Data Sheet.

IMPORTANT

The download is needed for the system to recognize the modified Recon Scale Factor for the next scan.

4. Click on **[Scan]**. After the scan is completed return to System Gain Calibration and press **<Enter>** to continue (place cursor within the "System Gain Cal" window to activate input in this window). The tool executes using the scan just performed and displays more values (see Table 3-2).

TABLE 3-2
FINAL BODY SCAN ANALYSIS

OUTPUT/PROMTS	INPUT/COMMENTS
`The desired average pixel intensity should be between 1050.00 and 1150.00.`	
`The current average : xxxx.xx <------`	**Record in Data Sheet.**
`The standard deviation : xx.xx`	
`Do you want to save recon scale factor(Y,N)[Y]: ..`	**Y <Enter>** saves the new Recon Scale Factor into the Config File.
`Exit System Gain Calibration? (Y,N) [Y]: .....`	**Y<Enter>** to exit program; **N <Enter>** to run analysis again.

5. If the Recon Scale Factor value was changed, the Signa software must be restarted for the new values to be recognized for all future body scans.

Note

If also performing the Head System Gain Calibration, do not restart the Signa software at this time.

6. To restart Signa software, right click on SGI desktop wallpaper and select System Shutdown from the Service Tools menu, or click **[System Shutdown]** in the Service Desktop Manager area. Due to a bug in the software you must wait 15 seconds before logging back in. Failure to wait 15 seconds will cause a “Host Monitor timeout in 50 secs” error. At the login screen, double click on the Signa icon and type the password **adw2.0 <Enter>** to restart Signa software.

4- HEAD CALIBRATION

4-1 Tools Required

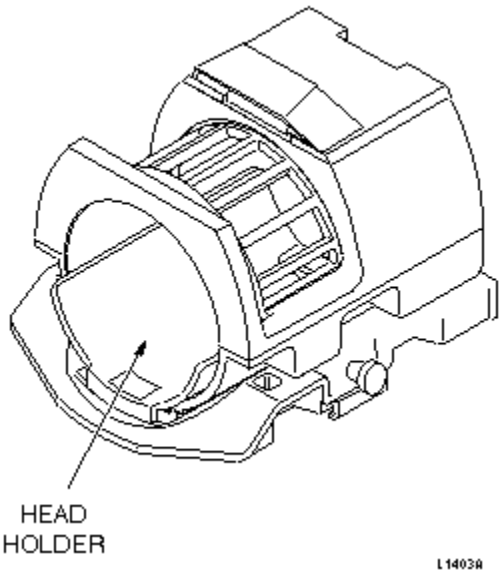
- NiCl TLT Head Sphere, 46-265826G6
- Head Loader, 46-287899G1

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.

4-2 Head Scan

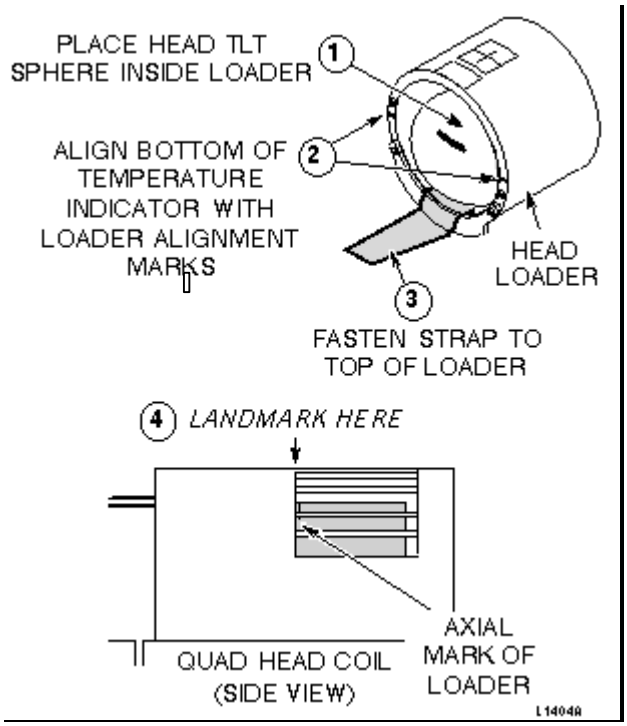
1. Install head holder. See Illustration 4-1.



HEAD HOLDER PLACEMENT IN HEAD COIL
ILLUSTRATION 4-1

2. Place head TLT sphere in head loader and landmark per Illustration 4-2.

4-2 Head Scan (continued)



HEAD TLT PHANTOM SETUP
ILLUSTRATION 4-2

3. At the keypad on the front magnet enclosure, press LANDMARK, then MOVE TO SCAN.
4. At the operator work space, prepare the system for a System Gain Cal, Head scan using the "Service Protocols" procedure located on the service methods CD-ROM, or for the alternate proprietary procedure, see below.
   This alternate proprietary procedure is available for GE use, and to sites with a valid Advanced Service Package Limited License.
   a. Click on **[New Pt]**, and enter
      Id: **geservice**
      Name: **sys gain cal**
      Weight (Lb): **111**
      Set Patient Protocols to **Service**.
   b. In the Protocol field, type **o.24.2** (o=Other, 2=series number) to load the protocol.
   c. **[Save Series]**.

5. Click on **[Auto Prescan]**. After auto prescan, verify that R_1 = 11 and R_2 = 14. If not, perform a Manual Prescan and set R_1 = 11 and R_2 = 14. Record the R_1, R_2, TG, and system frequency (AX) values in “System Gain Calibration Data” Data Sheet in Appendix A (or located on the Service Methods CD-ROM under **[Data Sheets]**).

6. Click on **[Scan]**.

4-3 Head Scan Analysis

1. Select **System Gain Calibration** from the **[Cal/Checks]** menu on the Service Desktop, then click on **[START]**. Continue per Table 4-1.

TABLE 4-1
HEAD SCAN ANALYSIS

OUTPUT/PROMTS	INPUT/COMMENTS
---------- System Gain Calibration ---------- Coil Coil name Recon scale factor -------- --------- ------------------ 1) coil1 HEAD 2.000000 2) coil2 BODY 5.000000	Default Recon Scale Factors shown. Values may differ if System Gain Cal was previously run or if Config File has been edited.
Select a coil entry (s or q to Stop)(1..2)[1]: ...	**1**
Enter the exam number (0..63500)[x]:	Type desired exam number or **<Enter>** for default.
Enter the series number (0..999)[x]:	Type desired series number or **<Enter>** for default.
Enter the image number (0.999) [x]:	Type desired image number or **<Enter>** for default.
Enter current value of recon scale factor [x]: ...	**<Enter>** for default.
The desired average pixel intensity should be between 1050.00 and 1150.00.	
The current average : xxxx.xx <------ The standard deviation : xx.xx	**Record in Data Sheet.**
If the average pixel intensity is between 1050 and 1150, then recon scale factor is acceptable and the following is displayed.	
Exit System Gain Calibration? (Y,N) [Y]:	**Y <Enter>** to exit program. Proceed to Section 5, Surface Coil Calibration.
If the average pixel intensity is not between 1050 and 1150 the following is displayed:	
The current recon scale factor is : X.XX	
Modify the recon scale factor to : x.xx <---	**Record in Data Sheet.**
-- then do [Download], [Auto Prescan] and [Scan]. Press <return> key (s to stop) when the scan is complete ...[ ]	Do not enter any key at this time. Proceed to step 2.

4-3 Head Scan Analysis (continued)

2. To change the Recon Scale Factor, right click on **[Research Operations]** and select **Display CVs.** Enter CV name **cfcgain** (must be lower case) followed by **<Enter>**. Type the new Recon Scale Factor (which is sometimes referred to as the coil gain factor), followed by **<Enter>** and **[Accept]**.

3. Right click on **[Research Operations]** and select **Download**, then **[Auto Prescan]**. After auto prescan, verify that R_1 = 11 and R_2 = 14. If not, perform a manual prescan and set R_1 = 11 and R_2 = 14. Record the R_1, R_2, TG, and system frequency (AX) values in the Data Sheet.

IMPORTANT

The download is needed for the system to recognize the modified Recon Scale Factor for the next head scan.

4. Click on **[Scan]**. After the scan is completed return control to System Gain Calibration screen and press **<Enter>** to continue (place cursor within the "System Gain Cal" window to activate input in this window). The tool executes using the scan just performed and displays more values (see Table 4-2).

TABLE 4-2
FINAL HEAD SCAN ANALYSIS

OUTPUT/PROMTS	INPUT/COMMENTS
The desired average pixel intensity should be between 1050.00 and 1150.00.	
The current average : xxxx.xx <------	**Record in Data Sheet.**
The standard deviation : xx.xx	
Do you want to save recon scale factor(Y,N)[Y]: ..	**Y <Enter>** saves the new Recon Scale Factor into the Config File.
Exit System Gain Calibration? (Y,N) [Y]:	**Y<Enter>** to exit program; **N <Enter>** to run analysis again.

5. If the Recon Scale Factor value was changed, the Signa software must be restarted for the new values to be recognized for <u>all</u> future body scans.

Note

If also performing the Body System Gain Calibration, do not restart the Signa software at this time.

6. To restart Signa software, right click on SGI desktop wallpaper and select System Shutdown, or click **[System Shutdown]** in the Service Desktop Manager area. Due to a bug in the software you must wait 15 seconds before logging back in. Failure to wait 15 seconds will cause a “Host Monitor timeout in 50 secs” error. At the login screen, double click on the Signa icon and type the password **adw2.0 <Enter>** to restart Signa software.

5- SURFACE COILS CALIBRATION

Description

The System Gain Value for each coil type is determined by the Recon Scale Factor for that coil type in the configuration file.

Procedure (Pre-Configured Coils)

The "Configuration File Manager" tool provides pre-configured Surface coils parameters for most coils, and **scan automatically multiplies the Surface Coil Recon Scale Factor times the Head Coil Recon Scale Factor**.) Therefore, no calibration changes are required for surface coils.

Note

Do not update the Recon Scale Factors for any surface coils! Only the Head and Body coils are updated.

Procedure (Non-Configured Coils)

1. For surface coils which are not contained (pre-configured) in the Configuration File Manager, use/enter the recon scale factor provided with the vendor service manual for the coil. **Do <u>not</u> multiply the Surface Coil Recon Scale Factor times the Head Coil Recon Scale Factor!**

3. After modifying the Recon Scale Factors, restart the Signa software so that the new Recon Scale Factors are used for all future scans.

4. To restart Signa software, right click on SGI desktop wallpaper and select System Shutdown, or click **[System Shutdown]** in the Service Desktop Manager area. Due to a bug in the software you must wait 15 seconds before logging back in. Failure to wait 15 seconds will cause a "Host Monitor timeout in 50 secs" error. At the login screen, double click on the Signa icon and type the password **adw2.0 <Enter>** to restart Signa software.

APPENDIX A - SYSTEM GAIN DATA SHEET

Site Name:_____
Date: _____

System Gain Data Sheet - Body Coil

BODY AXIAL SCAN DATA

$$\frac{1100}{\text{AVERAGE PIXEL INTENSITY}} \times \text{CURRENT RECON SCALE FACTOR} = \text{NEW RECON SCALE FACTOR}$$

EXAM/ SERIES/ IMAGE	CURRENT RECON SCALE FACTOR	R1/R2/TG	SYSTEM FREQUENCY	PIXEL INTENSITY		NEW RECON SCALE FACTOR
				AVERAGE	STD. DEV.	
____/ __/ __		__11__ / __14__ / ___				
____/ __/ __		__11__ / __14__ / ___				
____/ __/ __		__11__ / __14__ / ___				

ACCEPTANCE SPECIFICATIONS:
Average pixel intensity between 1050.00 and 1150.00

System Gain Data Sheet - Head Coil

HEAD AXIAL SCAN DATA

$$\frac{1100}{\text{AVERAGE PIXEL INTENSITY}} \times \text{CURRENT RECON SCALE FACTOR} = \text{NEW RECON SCALE FACTOR}$$

EXAM/ SERIES/ IMAGE	CURRENT RECON SCALE FACTOR	R1/R2/TG	SYSTEM FREQUENCY	PIXEL INTENSITY		NEW RECON SCALE FACTOR
				AVERAGE	STD. DEV.	
____/ __/ __		__11__ / __14__ / ___				
____/ __/ __		__11__ / __14__ / ___				
____/ __/ __		__11__ / __14__ / ___				

ACCEPTANCE SPECIFICATIONS:
Average pixel intensity between 1050.00 and 1150.00

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	June 22, 1998	M. Keber	Initial version converted from Toolbook to Microsoft Word. Also updated Surface coil tables, added CV1 Release information and data sheet.
1	Oct. 14, 1998	M. Keber	Added Release 8.2.5 references.
2	February 15, 1999	K. Keshena	Updated per Engineering Bay validation.
3	Sept. 27, 1999	G. Boerner	Added SPT body phantom info/illustration (per SPR MRIge55143). Also updated per 8.3 bay validation.
4	May 1, 2000	M. Keber	Updated Surface Coil Section 5 for Release 8.3 and 8.4 (removed old Release 8.2 and 8.2.5 references).
5	August 16, 2000	M. Jones	Deleted step 6-1, integrated remainder of Section 6 into Section 5, other minor fixes.
6	Oct. 20, 2000	M. Jones	Deleted all references to head coil tuning ring. Added/modified alternate system shutdown method in Sec. 3-3, step 6, Sec.4-3, step 6, and Sec 5- , step 4.
7	Oct 18, 2002	P. Kargard	Stressed importance of downloading after modifying CV's