



GE Medical Systems

Service Manual

Direction 2218805

Revision 2

Signa[®] Torso Phased Array Coil (1.0T and 1.5T)

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Immediately complete a "Damage Loss Claim Form", available via MS Exchange Mail, after the damage is found.

MS Exchange Path:

Outlook/Public Folder/All Public Folders/Medical Systems!/Global Initiatives/Information Management/Forms/ Common Forms/DAMAGE LOSS CLAIM FORM.

Send the completed form to the email address listed in the form.

For more information about the Transportation Claim Procedure, access the GE Medical Systems Intranet and enter the following URL address (case sensitive):

<FTP://3.87.40.2/GLOBEPRO/QUALSYS/DOCS/190016MF.PDF>

Rev. 11/15/2000

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- CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.
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- FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.
- VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.
- WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.

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- ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS
- SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.
- NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.
- LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.

ATENÇÃO

- ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.
- SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.
- NÃO TENHA TENTADO REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.
- O NÃO CUMPRIMENTO DESTES AVISOS PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.

AVVERTENZA

- IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.
- SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.
- SI PROCEDA ALLA MANUTENZIONE DELL'APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.
- NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL'ADDETTO ALLA MANUTENZIONE, ALL'UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.

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- 忽略本注意事项会对维修员，操作员或病人造成触电，机械伤害或其他伤害。

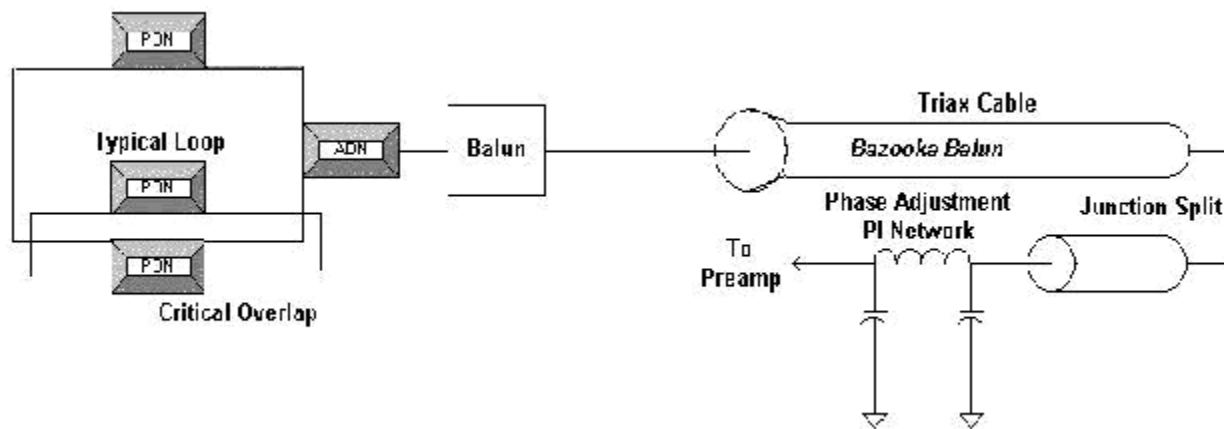
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SECTION 1- INTRODUCTION

1-1 How the Torso Phased Array Coil Operates

The coil consists of four loops. An anterior portion contains two critically overlapped loops, while a posterior portion contains another two critically overlapped loops. The primary application is the imaging of the abdomen and lower body. See Illustration 1-1.



TORSO ARRAY FUNCTIONAL BLOCK DIAGRAM
ILLUSTRATION 1-1

The torso multicoil is a four-loop array designed to obtain the higher SNR of smaller MRI surface coils and retain a large field of view. Also, because the array is split in two halves (one in the front and one in the back) there is a volume effect that increases the SNR at the center of the body. Each half consists of two individual loops that are approximately 12 inches (30.5 cm) by 8 inches (20.3 cm) with a 1.75-inch (4.5 cm) overlap. This translates to a coil area of approximately 14 inches (35.6 cm R/L) by 12 inches (30.5 cm S/I) overall for each half.

The array is intended to be used in one mode only, using all four coils.

The interface to Signa is a 30-pin Bendix connector with a double banana plug mechanical enhancement. This connection plugs into the multicoil port and is keyed for a specific field strength use only. The two halves are cabled to each other.

The array is designed for feet-first torso imaging. This implies a cable length of approximately 85 inches (216 cm).

The only active components, including the PIN diodes, are on the input boards via an access cover over the input circuitry of the coil. The PIN diodes may be replaced in the field.

Each coil loop must be turned off during transmit. This is accomplished by the active blocking network, which includes a tuned L-C network and a single PIN diode per coil element.

The input capacitor is chosen such that the transmit blocking impedance (at 250 mA DC bias to the diode) is greater than 1K ohm. The coil loop size is 12 inches (30.5 cm) X 8 inches (20.3 cm) which is 96 in*in (620 cm*cm).

The input capacitor is chosen for both matching and blocking circuitry. The blocking circuitry and matching circuit reside on the Torso Phased Array Input Board.

In addition to the active blocking components there are two passive decoupling networks (PDN) for each loop. These PDNs provide both heat distribution for UFI pulse sequence compatibility as well as improve the coil safety in case of an active network failure. The PDNs are not serviceable by field personnel.

A shielded resonant cable trap on each loop minimizes the ground currents on the shield due to its high impedance.

A 50-ohm phase shift network ensures a multiple of a half wavelength from the 30-pin connector to the coil input. This phase compensation network takes into account cable lengths and the balun circuit. The phase shift networks for all four loops reside on the Torso Phase Adjust Board located in the Quick Disconnect Enclosure which is sealed.

1-2 Compatibility

The Torso Phased Array Coil is compatible with the following hardware configurations:

- Signa® Horizon™ and Lx Horizon™ Systems with Phased Array
- Signa® CVMR (1.5T only)



BURN HAZARD! TO PREVENT PATIENT WARMING OR BURNS, DO NOT INSTALL THE TORSO PHASED ARRAY IN SIGNA® ADVANTAGE™ (1.5T ONLY) SYSTEMS. THE TORSO PHASED ARRAY IS NOT COMPATIBLE WITH THE LOWPASS BODY COIL ASSOCIATED WITH THE SIGNA® ADVANTAGE™ SYSTEMS. THIS INCLUDES SIGNA® ADVANTAGE™ SR-17 SYSTEMS.

1-3 Related Documents

- Direction 2187583-3, MR Release 5.x/8.x Signa® Horizon Service Methods
- Direction 2124201-3, MR Release 5.x Signa® Service Methods
- Direction 2160623-3, MR Release Signa® Horizon 8.x Service Methods

1-4 Organization of this Document

This manual is divided into the following sections:

Section 1, Introduction, describes how the Torso Phased Array Coil operates, and when and where it can be used.

Section 2, Setup and Calibration, describes installation procedures.

Section 3, Functional Checks, describes the normal power-up sequence.

Section 4, Replacement / Maintenance, describes field maintenance procedures.

Section 5, Renewal Parts, lists field replaceable parts.

1-5 Environmental Requirements

Transport and store the Torso PA coil under the following environmental conditions only, for a period not exceeding 4 weeks:

- Ambient temperature of –40 degrees C to +60 degrees C with a relative humidity of 10% to 100%. (Non-Condensing)
- Atmospheric pressure of 765 hPa to 1011 hPa.

Operate the coil in the scanner room only.

SECTION 2 – SETUP AND CALIBRATION

2-1 Checking the Shipping List - Preliminary

Table 2-1 lists the M1087TB Signa 1.5T Torso Phased Array Coil parts. Check that all parts have been shipped.

TABLE 2-1
1.5T TORSO PHASED ARRAY COIL SHIPPING LIST

<u>QTY.</u>	<u>ITEM</u>	<u>PART NUMBER</u>
1	1.5T Torso Phased Array Flex Coil	2215261
1	Service Direction	2218805
1	Operator Manual	2218411
2	Coil Positioning Strap	2211425
1	Pad - Foot End	2213746
1	Pad - Coil End	2218115

Table 2-2 lists the M1887TB Signa 1.0T Torso Phased Array Coil parts. Check that all parts have been shipped.

TABLE 2-2
1.0T TORSO PHASED ARRAY COIL SHIPPING LIST

<u>QTY.</u>	<u>ITEM</u>	<u>PART NUMBER</u>
1	1.0T Torso Phased Array Flex Coil	2215261-2
1	Service Direction	2218805
1	Operator Manual	2218411
2	Coil Positioning Strap	2211425
1	Pad - Foot End	2213746
1	Pad - Coil End	2218115

2-2 Installing the Torso Phased Array Coil

For 5.x, at the terminal, install a new soft key. This key is used by the operator to select TORSOPA (elements 1-4) imaging. Name the key TORSOPA. See Illustration 2-1.



TORSO ARRAY COIL

ILLUSTRATION 2-1

For 5.x and 8.x, refer to the Signa Configuration File procedure for information on installing a new coil (use Coil/Phased Array default values in Table 2-4, 2-5, 2-6).

TABLE 2-4
COIL VALUES

<u>SYSTEM</u>	<u>COIL NAME</u>	<u>COIL TYPE</u>	<u>EXTREMITY COIL</u>	<u>CABLE LOSS</u>	<u>COIL LOSS</u>	<u>RECON SCALE FACTOR</u>	<u>XMIT COIL</u>	<u>MULTI-COIL</u>
1.5T	TORSOPA	SURF.	NO	1.05 & 1.20 @	1.720 & 0.952 @	Head Coil Recon Scale Factor x 1.00	QUAD	YES
1.0T	TORSOPA	SURF.	NO	1.24 \$ 1.24 &	0.103 \$ 0.549 &	Head Coil Recon Scale Factor x 1.00	QUAD	YES

(Note: \$ = 55-cm Bore & = 60-cm Bore @-CRM)

TABLE 2-5
1.0T AND 1.5T PHASED ARRAY VALUES

<u>MULTICOIL NAME</u>	<u>NUMBER OF RECEIVERS</u>	<u>START RECEIVER</u>	<u>STOP RECEIVER</u>	<u>PORT ENABLE MASK</u>	<u>ERROR ENABLE MASK</u>
TORSOPA	4	0	3	15	15

TABLE 2-6
1.0T AND 1.5T TG VALUES

<u>START TA VALUE</u>	<u>START RG VALUE</u>
90	12

2-3 Functional Checks

1. Perform a body coil scan SNR verification. Refer to Section 3-1, BODY COIL SNR VERIFICATION.
2. Perform a Torso Phased Array coil SNR verification. Refer to Section 3-2, TORSO PHASED ARRAY COIL SNR VERIFICATION.

2-4 Periodic Quality Assurance Check

On a periodic basis, such as during planned maintenance, perform the quality assurance checks outlined below to ensure that the coil is operating properly:

1. Check the external cable and coil foam for cracks or breaks once a week. Refer to Section 4-5, CHECKING THE CABLES.
2. Perform a coil SNR verification. Refer to Section 3-2, TORSO ARRAY COIL SNR VERIFICATION.
3. Record the date and value calculated in Section 3-3, SNR IMAGE ANALYSIS in column 2 under "SNR Data QA Check" of the Data Table as instructed.
4. As is instructed in the Data Table, divide the SNR value obtained in the periodic QA check by the original SNR value and record in column 6 of the Data Table.
5. If this ratio is not greater than 85%, then there may be a problem in the coil system. Contact your local GE Service Representative.

SECTION 3 – FUNCTIONAL CHECKS

3-1 Body Coil SNR Verification

Note

An alternate proprietary procedure is available for GE use, and to customers with a valid Advanced Service Package Limited License. Refer to TLT PROCEDURE located on appropriate proprietary Service Methods CD-ROM, navigate to *System: Troubleshooting*.

Phantom Required

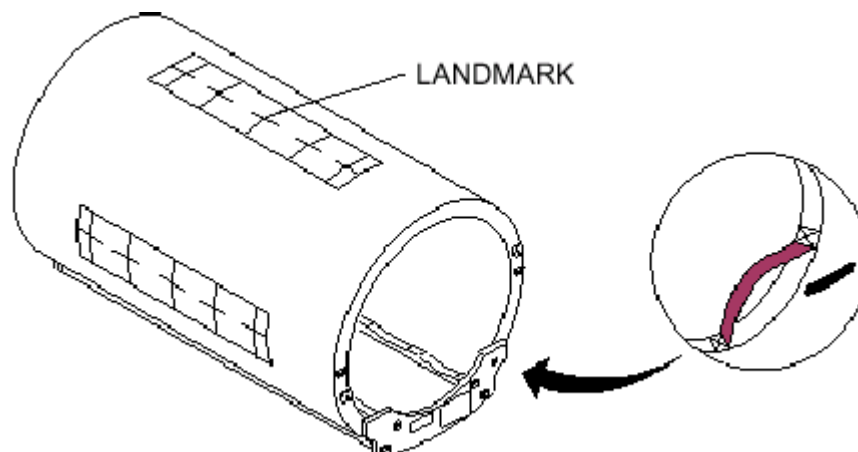
- Body TLT Phantom, 46-265635G6 or Body SPT Phantom, 2298119
- Body Loader, 46-287902G1 or SPT Short Loader, 2125244

Setup Procedure

CAUTION

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.
2. Select **[New Exam] (5.x and 8.x)** to allow a new landmark to be set.
3. Position the Body Phantom in the center of the Body Loader at the center of the cradle. Landmark the center of the phantom and advance to isocenter using the **[ADVANCE TO SCAN]** button. See Illustration 3-1.



BODY PHANTOM/LOADER LANDMARK SETUP
ILLUSTRATION 3-1

4. **For 5.x and 8.x:** Setup Scan Prescription as shown in Table 3-1.

TABLE 3-1
BODY COIL SNR - SCAN PROTOCOL (5.X AND 8.X)

Id: Name: Patient Weight: Patient Entry: Patient Position: Axial/Sag. Landmark: Coil Type: Scan Plane: Image Mode: Pulse Sequence: Imaging Options: or enter PSD Filename Number of Echoes: Echo Time (TE):	geservice body snr 300 [Head First] [Supine] [Sternal Notch] [Body Coil] [Axial] [2D] [Spin Echo] [None] [1] [20 msec]	Rep Time (TR): Auto CF: Field of View: Scan Thickness: Interscan Spacing: Start Loc (I/S): No. of Scan Location: FOV Center (L/R): Acq. Matrix (freq.): Acq. Matrix (phase): Frequency Direction: Imaging Time: Contrast: Table Delta:	[500 msec] [Peak] [48 cm] [3 mm] [Other] 0 0 End Loc (I/S): 0 1 0 (A/P) 0 [256] [256] [A/P] [1 NEX 2:15] [No] 0 mm
--	---	---	---

5. Select **[Auto Prescan]** to properly calibrate the RF power level for the 90-degree and 180-degree pulses.
6. Select **[Scan]**. Observe the resultant images. Ensure that there are no artifacts of any sort in the image. Record the Exam number and Series number for SNR Calculations.
7. Select **[Scan]** again. Use this second image to determine of body coil mode SNR.
8. Select **[Cancel]**. Refer to Section 3-3 for SNR image analysis.

3-2 Torso Phased Array Coil SNR Verification

Note

An alternate proprietary procedure is available for GE use, and to customers with a valid Advanced Service Package Limited License. Refer to "TLT PROCEDURE" located on appropriate proprietary Service Methods CD-ROM, navigate to *System:Troubleshooting*.

Phantom Required

- Body TLT Phantom, 46-265635G6 or Body SPT Phantom, 2298119
- Body Loader, 46-287902G1 or SPT Short Loader, 2125244

Setup Procedure

1. Select **[New Exam] (5.x and 8.x)** to allow a new landmark to be set.

CAUTION

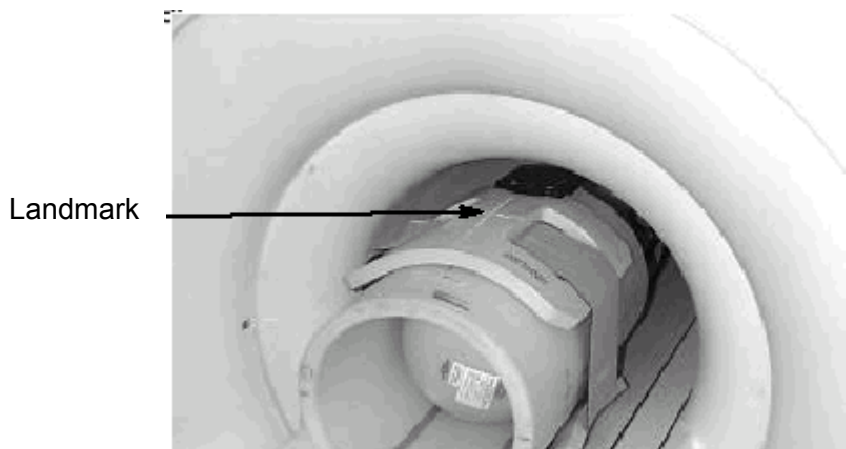
COMPLETELY REMOVE THE QUAD HEAD COIL FROM THE CRADLE BEFORE PERFORMING ANY BODY SCANS. FAILURE TO DO SO MAY DAMAGE THE HEAD COIL T/R NETWORK.

2. Remove Quad Head Coil (if present) from cradle.
3. Place Torso Phased Array Coil to be tested around the body loader/body phantom with the torso coils placed on the top and bottom side of loader. See Illustration 3-2. Use positioning straps provided with Torso Phased Array Coil.
4. Connect Torso Phased Array Coil connector to its mating connector in the Carriage Assembly.



TORSO ARRAY/BODY LOADER SETUP
ILLUSTRATION 3-2

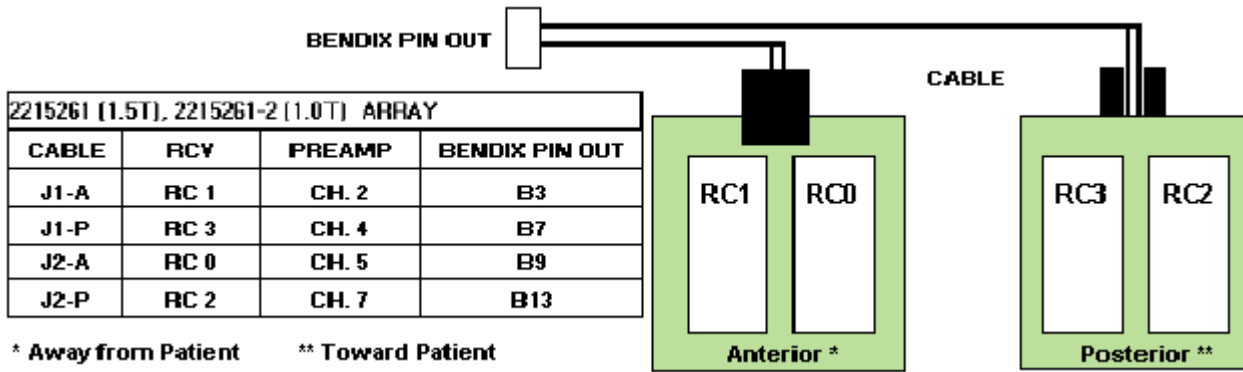
6. Position the Torso Array/loader in the center of the cradle. Landmark for center of head phantom and advance to isocenter using the **[ADVANCE TO SCAN]** button. See Illustration 3-3.



TORSO ARRAY/BODY LOADER LANDMARK
ILLUSTRATION 3-3

Phased Array Coil Receiver Paths

The Phased Array Coils have multiple individual antenna loop elements inside the assembly; the TPS chassis has multiple receivers (RCV0-RCV3). See Illustration 3-4.



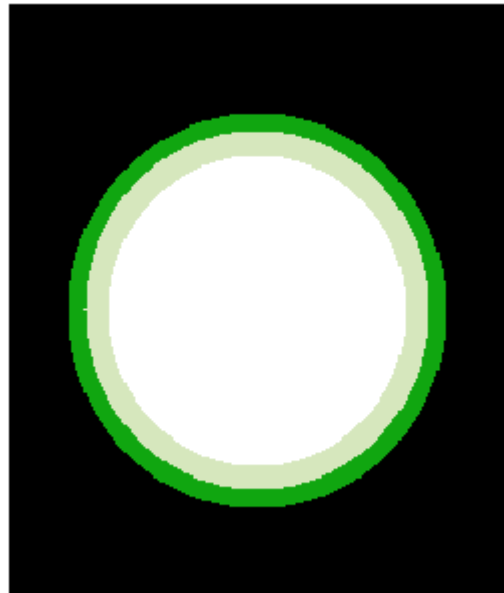
TORSO ARRAY COIL TO TPS RECEIVER CORRESPONDENCE
ILLUSTRATION 3-4

7. For 5.x and 8.x: Setup Scan Prescription as shown in Table 3-4.

TABLE 3-4
TORSO ARRAY COIL SNR - SCAN PROTOCOL (5.X AND 8.X)

Id:	geservice	Rep Time (TR):	[500 msec]
Name:	body snr	Auto CF:	[Peak]
Patient Weight:	300	Field of View:	[48 cm]
Patient Entry:	[Head First]	Scan Thickness:	[3 mm]
Patient Position:	[Supine]	Interscan Spacing:	[Other] 0
Axial/Sag. Landmark:	[Sternal Notch]	Start Loc (I/S):	0 End Loc (I/S): 0
Coil Type:	[Body Coil]	No. of Scan Location:	1
Scan Plane:	[Axial]	FOV Center (L/R):	0 (A/P) 0
Image Mode:	[2D]	Acq. Matrix (freq.):	[256]
Pulse Sequence:	[Spin Echo]	Acq. Matrix (phase):	[256]
Imaging Options:	[None]	Frequency Direction:	[A/P]
or enter PSD Filename		Imaging Time:	[1 NEX 2:15]
Number of Echoes:	[1]	Contrast:	[No]
Echo Time (TE):	[20 msec]	Table Delta:	0 mm

8. Select **[Auto Prescan]** to properly calibrate the RF power level for the 90-degree and 180-degree pulses.
9. Select **[Scan]**. Observe the resultant image of the sphere. See Illustration 3-5 (normal image). Ensure that there are no artifacts of any sort in the sphere image. Record the Exam number and Series number for SNR Calculations.
10. Select **[Scan]** again. This second image of the sphere will be used for determination of torso mode SNR.
11. Select **[Cancel]**. Refer to Section 3-3 for SNR image analysis.



TORSO ARRAY COIL IMAGE
ILLUSTRATION 3-5

3-3 SNR Image Analysis

3-3-1 SNR Image Analysis (Release 5.x)

(See Section 3-3-2 for Release 8.x)

Description

The SNR tool retrieves two operator-selected images. Signal value is computed as the mean pixel value in a ROI covering 80% of the image. The image is analyzed to determine the center of the image for positioning the ROI. A difference image is created by subtracting the second image from the first and the same ROI is used to calculate noise from the subtracted image. The signal value, noise value, and signal to noise ratio are reported. There is an option to save the difference image with the results annotated.

Procedure

1. Touch [UTILITIES], [MR Tools], [Image Quality], then [SNR Test]. The SNR Test screen is displayed; see Illustration 3-7.
2. Enter image exam, series, and image numbers. If exam, series, or image numbers are not known, select [List Exams], [List Series], or [List Images] to display list to choose from.

Note

Image number selection must be back lit (highlighted) to be able to enter information. Use Switch key on keyboard to transfer control from left to right side of touch screen.

3-3-2 SNR IMAGE ANALYSIS FOR 8.X SYSTEMS

Description

The SNR Tool retrieves two operator-selected images. Signal value is computed as the mean pixel value in a ROI covering 80% of the image. The image is analyzed to determine the center for positioning the ROI. A difference image is created by subtracting the second image from the first and to calculate noise from the subtracted image. Signal value, noise value, and SNR are reported.

Procedure

1. Select [Service Desktop], [Calibration/Checks], then [Image Quality].

<<< NEMA Image Quality Analysis >>>

1. Signal To Noise Check
2. Slice Offset Checks
3. Slice Thickness/Resolution Check
4. T2 Uniformity Check
5. Full Field Distortion Check
6. Exit NEMA test

Select Test:1 [Enter]

* Select First Image *

=====
Image Selection Menu
=====

Current Selection:

Exam_No = 50210, Series_No = 1, Image_No = 1

- A. Select Exam
- B. Select Series
- C. Select Images
- D. List/Select Exam
- E. List/Select Series
- F. List/Select Image
- X. Execute the selected test

YOUR CHOICE : A [Enter] (Enter appropriate selection, A-F to choose image.)

Exam No. ?50201 [Enter] (Enter appropriate number.)

(Iterate image selection process until Current Selection is correct.)

=====
Image Selection Menu
=====

Current Selection:

Exam_No = 50201, Series_No = 1, Image_No = 1

- A. Select Exam
- B. Select Series
- C. Select Images
- D. List/Select Exam
- E. List/Select Series
- F. List/Select Image
- X. Execute the selected test

YOUR CHOICE :

Invalid Entry (Invalid Entry, *always occurs here.*)

=====
Image Selection Menu
=====

Current Selection:

Exam_No = 50201, Series_No = 2, Image_No = 1

- A. Select Exam
- B. Select Series
- C. Select Images
- D. List/Select Exam
- E. List/Select Series
- F. List/Select Image
- X. Execute the selected test

YOUR CHOICE : **X [Enter]** (*Perform this step when Current Selection is correct.*)

* Select Second Image *

=====
Image Selection Menu
=====

Current Selection:

Exam_No = 50210, Series_No = 1, Image_No = 1

- A. Select Exam
- B. Select Series
- C. Select Images
- D. List/Select Exam
- E. List/Select Series
- F. List/Select Image
- X. Execute the selected test

YOUR CHOICE : **A [Enter]** (*Enter appropriate selection, A-F to choose image.*)

Exam No. ? **50201 [Enter]** (*Enter appropriate number.*)

(*Iterate image selection process until Current Selection is correct.*)

=====
Image Selection Menu
=====

Current Selection:

Exam_No = 50201, Series_No = 2, Image_No = 2

- A. Select Exam
- B. Select Series
- C. Select Images
- D. List/Select Exam
- E. List/Select Series
- F. List/Select Image
- X. Execute the selected test

YOUR CHOICE : X [Enter] (Perform this step when Current Selection is correct.)

* SNR results *
* *
* Signal = 801.040222 Noise = 10.062437 snr = 79.606979 *

<<< NEMA Image Quality Analysis >>>

- 1. Signal To Noise Check
- 2. Slice Offset Checks
- 3. Slice Thickness/Resolution Check
- 4. T2 Uniformity Check
- 5. Full Field Distortion Check
- 6. Exit NEMA test

Select Test: 6 [Enter]

2. Record the date and value calculated in the appropriate column under "SNR Data QA Check" of the Data Table (following Section 5, RENEWAL PARTS) as is instructed.

3-4 Checking the PIN Diodes with Digital Multimeter

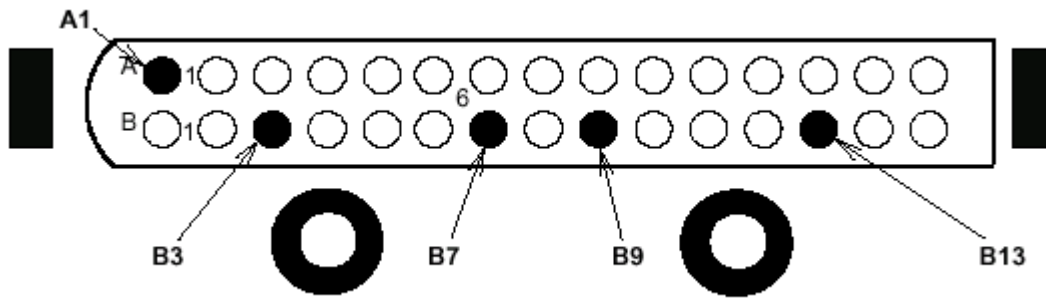
Note

There is one PIN diode for each antenna element. This procedure indicates if the PIN diode is defective.

1. Select the DIODE TEST function on the digital multimeter (DMM).
2. Refer to Table 3-5 or 3-6 and Illustrations 3-8 or 3-9. Perform the FOR STEP 2 procedures.

TABLE 3-5
DIODE TEST CONNECTIONS FOR 1.5T PART 2215261

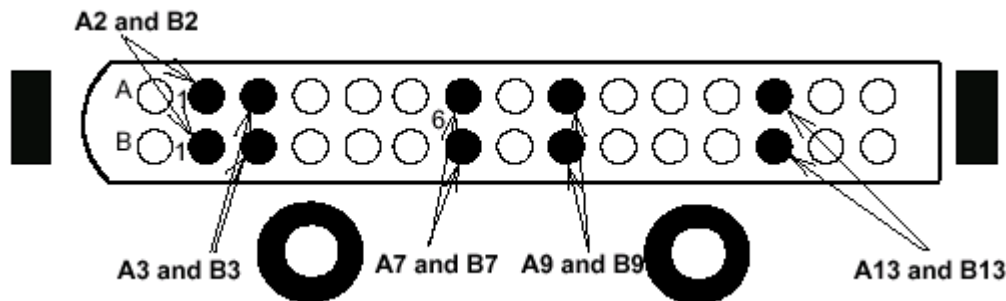
CABLE	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 6	FOR STEP 2	FOR STEP 6
J1-A	B3	A1	A1	B3
J1-P	B7	A1	A1	B7
J2-A	B9	A1	A1	B9
J2-P	B13	A1	A1	B13



1.5T TORSO ARRAY - TEST POINTS
ILLUSTRATION 3-8

TABLE 3-6
DIODE TEST CONNECTIONS FOR 1.0T, PART 2215261-2

CABLE	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 4	FOR STEP 2	FOR STEP 4
J1-A	A3 or B3	A2 or B2	A2 or B2	A3 or B3
J1-P	A7 or B7	A2 or B2	A2 or B2	A7 or B7
J2-A	A9 or B9	A2 or B2	A2 or B2	A9 or B9
J2-P	A13 or B13	A2 or B2	A2 or B2	A13 or B13



1.0T TORSO ARRAY - TEST POINTS
ILLUSTRATION 3-9

3. A reading of 0.400 to 0.600 should be observed on the DMM.
4. If a reading below 0.400 is observed in either direction, either the output cable is shorted, or it's a bad PIN diode.
5. If a reading above 0.600 is observed in step 2, the PIN diode is defective.
6. Refer to Table 3-5 or 3-6 and Illustration 3-8 or 3-9. Perform the FOR STEP 6 procedures.
7. A reading of INFINITY should be observed on the DMM.
8. If a reading of INFINITY is observed in both directions, either the output cable is open or the PIN diode is open.
9. If any of the above conditions fails, refer to **Section 4-3, Replacing the PIN Diodes.**

3-5 Checking the External Cable with Digital Multimeter

1. Select the DIODE TEST function on the DMM.

- Refer to Table 3-8 or 3-9 and Illustration 3-8 or 3-9. Perform the FOR STEP 2 procedures.

TABLE 3-8
EXTERNAL CABLE TEST CONNECTIONS FOR 1.5T, PART 2213261

CABLE	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 4	FOR STEP 2	FOR STEP 4
J1-A	B3	A1	A1	B3
J1-P	B7	A1	A1	B7
J2-A	B9	A1	A1	B9
J2-P	B13	A1	A1	B13

TABLE 3-9
EXTERNAL CABLE TEST CONNECTIONS FOR 1.0T, PART 2213261-2

CABLE	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 4	FOR STEP 2	FOR STEP 4
J1-A	A3 or B3	A2 or B2	A2 or B2	A3 or B3
J1-P	A7 or B7	A2 or B2	A2 or B2	A7 or B7
J2-A	A9 or B9	A2 or B2	A2 or B2	A9 or B9
J2-P	A13 or B13	A2 or B2	A2 or B2	A13 or B13

- Flex the appropriate external cable, especially near the connectors and the strain relief, and observe that a reading of 0.400 to 0.600 should remain on the DMM, with no instability or fluctuations.
- Refer to Table 3-8 or 3-9 and Illustration 3-8 or 3-9. Perform the FOR STEP 4 procedures.
- Flex the appropriate external cable, especially near the connectors and the strain relief, and observe that a reading of INFINITY should remain on the DMM, with no instability or fluctuations.
- If either cable fails any of the above tests, replace them. Refer to **Section 4-2, Replacing the External Cable**.

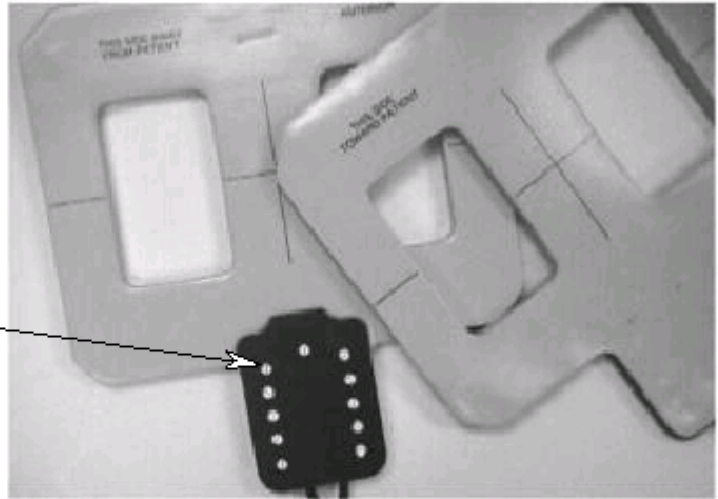
SECTION 4 – REPLACEMENT AND MAINTENANCE

4-1 Disassembly/Reassembly of Torso Array

The cable assemblies and diodes are accessed through the access covers.

Cables J1-P and J2-P are in the Posterior Assembly. Cables J1-A and J2-A are in the Anterior Assembly

- 1 Remove 11 screws (46-230008P14) from each affected access cover.
- 2 When reassembling the access cover, compress the cover against the coil foam and tighten the screws until they are snug. Do not tighten more than 1.3 inch-lbs (.147 N-m) torque.

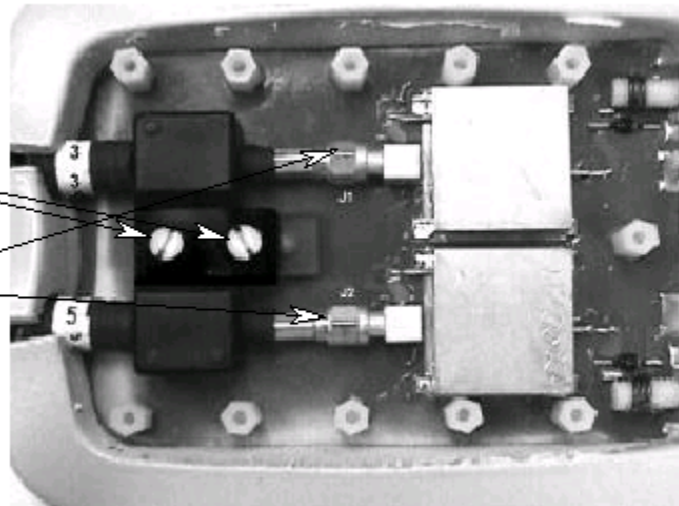


TORSO ARRAY
ILLUSTRATION 4-1

TORSO ARRAY
ILLUSTRATION 4-1

4-2 Replacing the External Cable

- 1 Remove strain relief screws. 2 places. (46-208922P5)
- 2 Remove SMA connectors using 5/16" open-ended wrench. 2 places.
- 3 Repeat Steps 1 and 2 for other Assembly.



CABLE ACCESS
ILLUSTRATION 4-2

- ④ Replacement cable should be mounted with the bevelled side facing up.
- ⑤ Attach SMA connectors using 5/16" open ended wrench. Do not tighten beyond 8 inch-lbs (.147 N-m) torque.
- ⑥ Reattach strain relief screws, 2 places. Tighten until snug. Do not tighten beyond 1.3 inch-lbs. (.904 N-m) torque.
- ⑦ Reassemble per Section 4-1.



**CABLE, BEVELLED
SIDE UP**
ILLUSTRATION 4-2

CABLE, BEVELLED SIDE UP
ILLUSTRATION 4-2

4-3 Replacing the PIN Diodes

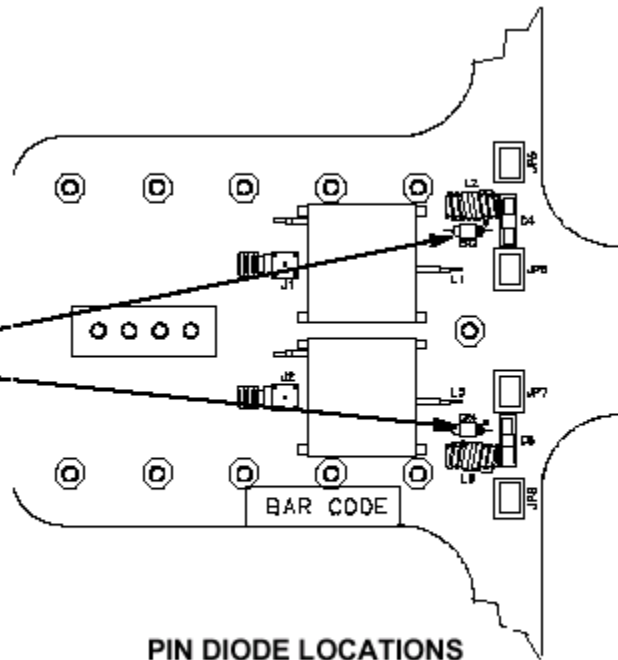
CAUTION

USE A 25W SOLDER IRON AND PROTECT THE CIRCUIT BOARD FROM STATIC ELECTRICITY. BE CAREFUL NOT TO DAMAGE THE CIRCUIT BOARD BY OVERHEATING THE SOLDER. AVOID CONTACT WITH FOAM, STANDOFFS, OR COMPONENTS OTHER THAN PIN DIODES.

Note

Antenna is tuned at the factory to provide the proper input impedance. Circuit board is not field replaceable. PIN diodes are the only field replaceable components on the circuit board.

- ① Disassemble the coil as per **Section 4-1 Disassembly/Reassembly of Torso Array Coil.**
- ② Use an anti-static wrist band when touching the circuit board.
- ③ Replace the PIN diode only with an exact replacement diode (see **Section 5, Renewal Parts**). Observe the orientation of the Cathode stripe.
- ④ Reassemble the coil as per **Section 4-1 Disassembly/Assembly of Torso Array Coil.**



PIN DIODE LOCATIONS
ILLUSTRATION 4-3

PIN DIODE LOCATIONS
ILLUSTRATION 4-3

4-4 Replacing the Mechanical Hardware

Refer to **Section 5, Renewal Parts**, for Torso Phased Array Coil part numbers. Cable Screws, Hexagonal Standoffs, Access Cover, Access Cover Screws, and Standoff Screws can all be replaced.

See **Section 4-1** for the **Disassembly/Reassembly of Torso Array**. To replace the Hexagonal Standoffs, 46-136375P23, and Standoff Screws, 46-208922P23, carefully pull back foam from around Torso Phased Array Input Board to expose the Standoff Screws. Remove any broken pieces and replace with new components. Tighten until snug. Do not tighten beyond 1.3 inch-lbs. (.147 N-m) torque.

See **Section 4-1** for the **Disassembly/Reassembly of the Torso Array**.

4-5 Checking the External Cable

Check the external cables for cracks or breaks once each week. Replace the external cable per **Section 4-2, Replacing the External Cable** if any damage or wear is found.

See **Section 5, Renewal Parts**, for the cable part number.

4-6 Cleaning the Coil

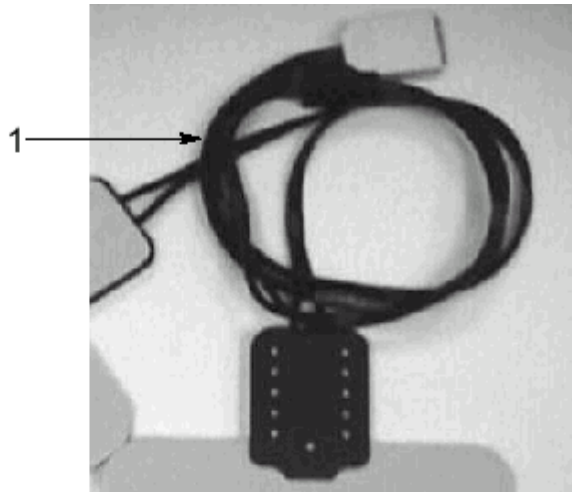
CAUTION

AVOID DAMAGING SENSITIVE ELECTRONIC PARTS. DO NOT SPRAY OR POUR DISHWASHING SOLUTION DIRECTLY ONTO THE TORSO ARRAY COIL, OR EXTERNAL CABLE. NEVER SUBMERGE THE TORSO ARRAY COIL IN ANY LIQUID.

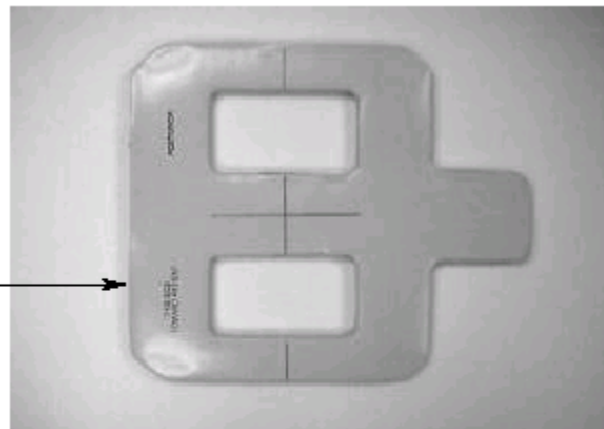
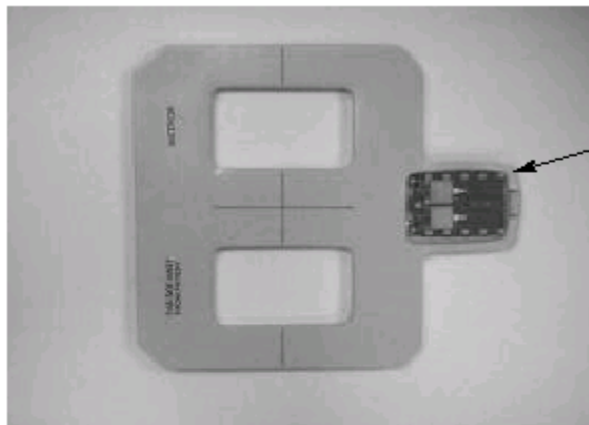
Clean the Torso Array Coil and external cable with a mild dishwashing liquid and water solution. Wet a soft cloth with the solution and proceed to clean. The Torso Array Coil can be cleaned with a 10% bleach solution. Wet a soft cloth with the solution and proceed to clean.

The coil should be cleaned before and after shipping, during planned maintenance, and as determined by the field engineer or customer.

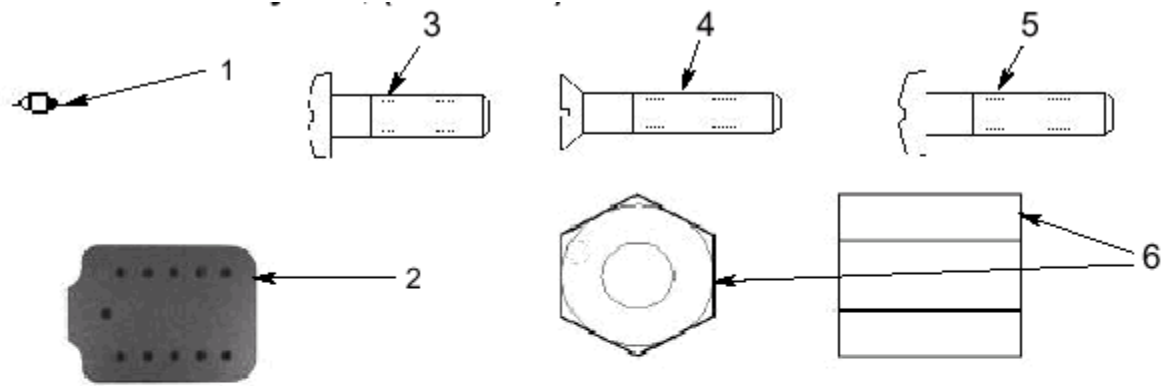
Torso Phased Array Coil



<u>Item</u>	<u>Part Number</u>	<u>FRU</u>	<u>Name</u>	<u>Qty.</u>	<u>Description (Remarks)</u>
1	2215748	1	CABLE	1	1.5T ARRAY COIL CABLE
	2215748-3	1	CABLE	1	1.0T ARRAY COIL CABLE



<u>Item</u>	<u>Part Number</u>	<u>FRU</u>	<u>Name</u>	<u>Qty.</u>	<u>Description (Remarks)</u>
3	2215141 (1.5T)	1	ANTERIOR	1	1.5T TORSO ARRAY ASM - ANTERIOR
	2215141-3 (1.0T)	1	ANTERIOR	1	1.0T TORSO ARRAY ASM - ANTERIOR
4	2215141-2 (1.5T)	1	POSTERIOR	1	1.5T TORSO ARRAY ASM - POSTERIOR
	2215141-4 (1.0T)	1	POSTERIOR	1	1.0T TORSO ARRAY ASM - POSTERIOR



<u>Item</u>	<u>Part Number</u>	<u>FRU</u>	<u>Name</u>	<u>Qty.</u>	<u>Description (Remarks)</u>
1	46-221735P1	2	PIN DIODE	4	UM9415B PIN DIODE
2	2196521	2	COVER	2	TORSO ARRAY COVER
3	46-208922P23	2	SCREW	22	NYLON BINDING HEAD 6-32 X 5/16
4	46-230008P14	2	SCREW	26	NYLON FLAT HEAD 6-32 X 7/16
5	46-208922P5	2	SCREW	4	NYLON BINDING HEAD 6-32 X 1/2
6	46-136375P23	2	STANDOFF	22	.250 X .562 LONG HEX. NYLON

Use the space provided below to record the calculated signal to noise ratio (SNR) data obtained from Section 3, Functional Checks. After recording the SNR data obtained during the initial coil installation, record subsequent SNR data in column 2-4 below and the date they were obtained in column number 1 as a periodic QA check. If the ratio of any of the coils found is not greater than 85%, then there is a problem in the coil or the MR system.

Original SNR data obtained at initial coil installation:

Body Coil SNR Value: _____

Torso Coil SNR Value: Anterior _____ Posterior _____
Both _____

Date: _____

SNR Data QA (Quality Assurance) Check:

1	2	3	4	5
<u>Date:</u>	<u>Posterior</u>	<u>Anterior</u>	<u>Both</u>	<u>Are new Values Divided by Original Values > 85%?</u>
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N
_____	_____	_____	_____	_____ Y/N

Make additional copies of this document as needed.

Note

To allow for proper assessment of defective returned coils, this form must be completely filled out and must accompany all returned coils. Include films or prints of any image quality related complaints with a description of scan protocol used.

Date _____
 Site Name _____
 Site Address _____
 Service Engineer _____
 Coil Serial Number _____
 Date Coil Installed _____
 Description of Coil Problem _____

ELECTRICAL CHECKS

PIN Diode Test

Diode Drop Forward Bias _____

Diode Drop Reverse Bias _____

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
A	5/29/98		Initial Release
0	09/10/98		Revision 0
1	Oct. 25, 2001	K. LaBarge	Updated procedure for SPT phantom and loader
2	Dec. 12, 2002	K. Zeller	Sec. 1-5, 4-6 updated in response to ITS report.