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GE Medical Systems

Technical Publications

Direction 2118706
Revision 5

Signa[®] Advantage[™]
Signa[®] Performance Plus[™]
Signa[®] Horizon[™]
Quadrature Neurovascular Coil

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Operating Documentation

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Rev. 11/15/2000

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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 SOLO EXISTE EN INGLES
- 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.
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- NÃO TENTE 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.

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- 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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REVISION HISTORY

<u>REVISION</u>	<u>DATE</u>	<u>PRIMARY REASON FOR CHANGE</u>
REV 0	01/95	Initial Release
REV 1	05/95	Phantom, wiring changes, text corrections, line-art changes
REV 2	02/97	Addition of new coil, RUN part numbers-descriptions
REV 3	05/97	Addition of Performance Plus and Horizon information, addition of 8.x SNR information
REV 4	11/97	Accommodate 1.5T and 1.0T Product Revisions
REV 5	10/01	Converted to Word and changed Damage page

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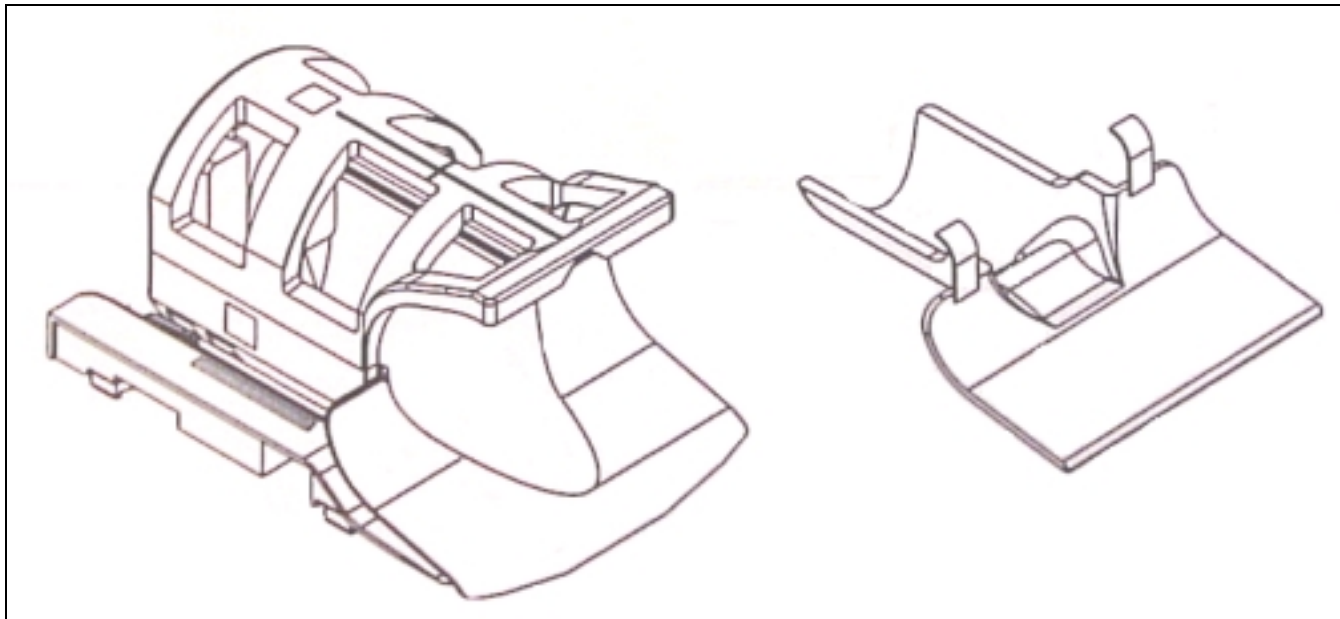
SECTION 1 – INTRODUCTION

1-1 HOW THE QUAD NEUROVASCULAR COIL OPERATES

The SIGNA QUADRATURE NEUROVASCULAR COIL is designed for HEAD and NECK imaging, including but not limited to MR Angiography, on Signa 4.X, 5.X, and 8.X platforms. The coil is a transmit/receive design. It operates as a quadrature coil in the receive mode for optimum signal to noise ratio performance. Part Number 2118138 operates in the linear mode in transmit; while Part Numbers 2118138-5 and 2118138-2 operate as modified Quadrature coils in transmit, for optimum transmit RF field uniformity. Compared with the standard Signa Head Coil, the SIGNA QUADRATURE NEUROVASCULAR COIL allows intracranial vasculature imaging with carotids in one coil vs. a Head Coil and Anterior Neck Coil combination. See ILLUSTRATION 1-1.

The coil consists of two single loop coil elements, one placed anterior and one placed posterior to the patient. Each of the coil loop elements has an additional conductor located along the sagittal plane of symmetry. The loops are used as a quasi-saddle coil creating a vertical RF field normal to the coronal plane. The RF feedpoints are at the joining point of the two coil loops, superior to the coil elements. The additional conductors allow the coil elements to be operated in a second independent mode sensitive to a horizontal RF field normal to the sagittal plane; the RF feedpoints for this coil are at the superior end of the coil elements, at the two additional conductors. Each coil element has identical RF circuitry, and drives a separate receive-mode output. The two modes of the coil operate independently of each other, and are orthogonal to each other in the plane normal to the B₀ main static magnetic field [axial plane]. Signals from the two coil modes can be combined in quadrature to increase the image signal to noise ratio. Quadrature isolation of the two modes of the coil pair is accomplished by adjusting the capacitances in series with each coil element conductor to cause the horizontal feedpoints to be at the exact balance point of the vertical mode coil, and the vertical feedpoints to be at the exact balance point of the horizontal mode coil.

Each coil element consists of a single loop coil with capacitors distributed in ten locations around the coil conductor to minimize RF electric field losses in the patient. The additional center conductor on each coil element has capacitors distributed in four locations along the conductor to minimize RF electric field losses in the patient from the horizontal mode. At gradient switching frequencies, these capacitors have a very high value of reactance to ensure that the circulating eddy currents induced in the coils from the MR system gradient coils are insignificant. At the signal output port of each coil element, a 180 degree coaxial cable balun is used to minimize electric field losses in the coil by operating the coil in a balanced mode relative to common ground, and to essentially eliminate RF currents on the outside of the output cable shield.



QUAD NEUROVASCULAR COIL
ILLUSTRATION 1-1

1-1 HOW THE QUAD NEUROVASCULAR COIL OPERATES – CONT'D

Part Number 2118138 Combiner: In the receive mode of the coil, quadrature operation is achieved by the use of a simple combining circuit. A 90 degree phase delay network in a low pass pi configuration is used to selectively delay one of the receive mode signals to obtain constructive summing of the signal from each coil mode. To set the quadrature polarity of the SIGNA QUADRATURE NEUROVASCULAR COIL, a switch is provided to select which end of the 90 degree network the receive signal is obtained.

Since the signals from the horizontal and vertical modes are combined using the selective phase delay, each coil must appear as a 100 ohm source in order to provide a 50 ohm coil output impedance. The 90 degree delay network must also be a 100 ohm network. To accomplish this, and isolate and decouple the receive signal line from the transmit RF power applied to the vertical mode of the SIGNA QUADRATURE NEUROVASCULAR COIL, two additional 90 degree low pass pi networks are employed. They are placed in series with the output of each of the coil modes and the 90 degree, 100 ohm combining network. Each of the two networks has a characteristic impedance of 70.7 ohm. This allows the networks to transform the 50 ohm outputs of the individual mode of the coil to 100 ohm to allow them to be combined. A PIN switching diode is located in shunt with the receive output end of each of the 70.7 ohm networks to isolate the system receiver from the transmit RF power on the coil. The PIN diodes are biased on in transmit, causing the two 70.7 ohm, 90 degree networks to appear as an essentially open circuit to the coil mode outputs. In the receive mode, the diodes are reverse biased, and have no effect on the coil operation.

Transmit RF power is applied to the vertical mode port of the coil through a series connected PIN diode. The diode is biased on in transmit, and provides a low loss RF path directly to the vertical mode of the coil. When the system is in the receive mode, this PIN diode is not biased and appears as an essentially open circuit, preventing receive signal from reaching the system transmit port. Bias for all PIN diodes is obtained from the SIGNA system TR BIAS DRIVER; the bias potentials are superimposed on the transmit and receive signal lines.

Part Number 2118138-5 and 2118138-2 Combiner: The coil contains a quadrature hybrid combiner, employing four lumped element, 90 degree networks. Two of these networks contain 35.4 ohm impedance components in a low-pass pi configuration and remain in series with either the horizontal or vertical mode signals. The two remaining networks contain 50 ohm impedance components in a high-pass pi configuration. The four junction nodes of the four networks contain net lumped capacitance to signal common.

Part Number 2118138-5 and 2118138-2: The transmitted signal is split into two orthogonal components available at the horizontal and vertical connection nodes of the quadrature hybrid combiner. The vertical mode signal is applied to the vertical coil feedpoints. The horizontal mode signal travels through a series-resonant LC network to reach the horizontal coil feedpoints. During transmission, a PIN diode switch connected to the LC junction is activated by the Signa system positive DC bias, connecting a resistive load to signal common. This switched load is effectively in shunt with the horizontal coil load, attenuating the transmission signal to the horizontal coil. This is the modified quadrature transmission operation. During signal reception, the PIN diode switch is reverse-biased, so the horizontal receive signal is not attenuated.

The external cable of the coil mates to the system HEAD COIL PORT via a Quick Disconnect assembly terminating in a 20 pin Bendix connector. The cable contains two coaxial conductors; one is the transmit line, connecting the system head mode transmit output from pins 2A and 2B to the TRANSMIT SMA mounted on the combiner board in the coil. The second cable connects the receive output from the RECEIVE SMA selected by the POLARITY switch to pin 9A and 9B of the Quick Disconnect assembly.

Part Number 2118138-5 and 2118138-2: The coil cable contains additional internal connections from the transmit and receive pins to the switched 50 ohm resistors in the Signa Head T/R Assembly. Transmit pins 2A, 2B are connected to 4A, 4B and Receive pins 9A, 9B are connected to 7A, 7B. This connection allows these resistors to provide switched 50 ohm reference for the unused receive port during transmission, and the unused transmit port during reception. This stabilizes appropriate nodes of the quadrature hybrid network in the new Combiner.

NOTE: Part Number 2118138-5 coil cable may replace the 2118138 cable, but the 2118138 cable will degrade the operation of the 2118138-5 combiner and cannot be used to replace a 2118138-5 cable.

1-2 COMPATIBILITY

CATALOG NUMBER M1085HN: SIGNA 1.5 T systems:

- Signa Performance Plus [3.2 or higher]
- Signa Advantage [4.5 or higher] (1.5 T only)
- Signa Horizon (1.5 T only)

CATALOG NUMBER M1885HN: SIGNA 1.0 T systems:

- Signa 1.0T Systems (all)

1-3 RELATED DOCUMENTS

Direction 2187583-3, MR Signa Service Methods Release 5.x/8.x

Direction 15000, Signa System

Direction 15300, Signa Advantage System

Direction 15400, Signa Advantage 1.5T, 1.0T, and 0.5 T System

1-4 ORGANIZATION OF THIS DOCUMENT

This document is divided into the following sections:

- Section 1: INTRODUCTION; describes the operation, when, and where used.
- Section 2: SETUP AND CALIBRATION; describes installation procedures.
- Section 3: FUNCTIONAL CHECKS; describes performance verification.
- Section 4: REPLACEMENT / MAINTENANCE; describes field maintenance procedures.
- Section 5: RENEWAL PARTS; lists field replaceable parts.

1-5 ENVIRONMENTAL REQUIREMENTS

Operate and store the SIGNA QUADRATURE NEUROVASCULAR COIL in the Magnet Enclosure Room.

1-6 SPECIFICATIONS

- Size: 24"L x 16.5"w x 14"H (61.44 cm x 42.24 cm x 35.84 cm)
- Weight: 29 lbs. (13.18 Kg)

SECTION 2 - SET UP AND CALIBRATION

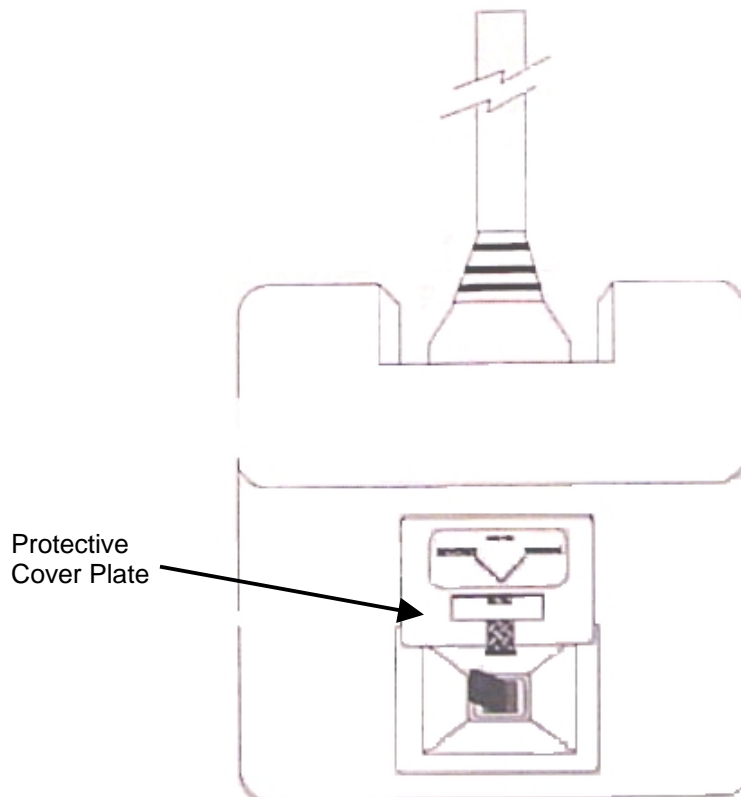
2-1 CHECKING THE SHIPPING LIST

TABLE 2-1
M1085HN - 1.5T / M1885HN - 1.0T NEUROVASCULAR COIL SHIPPING LIST

QTY.	ITEM	PART NO.
1	Quadrature Neurovascular Coil	2118138-5 (1.5T) / 2118138-2 (1.0T)
1	Neurovascular Coil Accessory Kit (comfort pad and head strap)	E8801 MF
1	Instruction Manual	2118706
1	Operator Manual	2201598
1	Applications Video	Medrad # 907-6305-100
1	Technical Tips	Medrad # 87305-47-FI-01
2	Head Wedge	P9330GR - (2118138-2 (1.0T) only)
1	Head Holder Wedge	P9140TJ - (2118138-2 (1.0T) only)

2-2 INSTALLING THE QUADRATURE NEUROVASCULAR COIL

- Refer to the Signa system CONFIG file, and note the polarity of the value of CXFULL. If no polarity is noted, the system magnet polarity is POSITIVE. If a negative sign is present, the system magnet polarity is NEGATIVE. An alternate means is to inspect the existing Quadrature Head Coil Quick Disconnect Box; on 1.5 and 1.0 Tesla systems, NORMAL polarity is POSITIVE, for 0.5 Tesla systems, the NORMAL polarity is NEGATIVE. If the Head Coil Quick Disconnect Box is marked REVERSE polarity, for 1.5 and 1.0 Tesla systems the polarity is NEGATIVE, for 0.5 Tesla systems, the polarity is POSITIVE. Lift the protective Cover Plate on the back of the SIGNA QUADRATURE NEUROVASCULAR COIL just below the cable exit, and set the POLARITY SWITCH to the appropriate polarity. See ILLUSTRATION 2-1. Replace the cover plate.



POLARITY SELECTION
ILLUSTRATION 2-1

2. At the Boot Terminal, install a new soft key to be used by the operator to select NEUROVASCULAR imaging. The name of the coil key is "NEUROVAS".
3. Refer to Direction 15300, Section 6, CONFIGURATION FILE; or Direction 15400, Section 6 CONFIGURATION FILE for information on installing soft keys and configuring the SIGNA QUADRATURE NEUROVASCULAR COIL.
4. Use the following values to set up the SIGNA QUADRATURE NEUROVASCULAR COIL in the Config. File:

**TABLE 2-2
COIL VALUES**

SYSTEM	COIL NAME	COIL TYPE	EXTREMITY COIL	CABLE LOSS	COIL LOSS	RECON SCALE FACTOR	XMIT COIL TYPE	XMIT ATTN	MULTI-COIL.
1.5T	NEURO-VAS	head	yes	1.3	0.04	Head Coil Recon Scale Fctr.x 1.0	Quad	0	NO
1.0T	NEURO-VAS	head	yes	1.3	0.04	Head Coil Recon Scale Fctr.x 1.0	Quad	0	NO

2-3 FUNCTIONAL CHECKS

1. Perform a Head Coil scan performance verification. Refer to Section 3-1; SIGNA ADVANTAGE 1.0T/1.5T SCANNER VERIFICATION.
2. Perform a SIGNA QUADRATURE NEUROVASCULAR COIL scan performance verification. Refer to Section 3-2; SIGNA QUAD NEUROVASCULAR COIL IMAGING PERFORMANCE VERIFICATION
3. Perform an SNR Image analysis. Refer to Section 3-3, SNR IMAGE ANALYSIS FOR 4.X SYSTEMS, Section 3-4, SNR IMAGE ANALYSIS FOR 5.X SYSTEMS, or Section 3-5, SNR IMAGE ANALYSIS FOR 8.X SYSTEMS.
4. Record the Original SNR value in the SNR QA DATA TABLE.

2-4 PERIODIC QUALITY ASSURANCE CHECK

On a periodic basis, such as during planned maintenance, perform the quality assurance check outlined below to ensure that the SIGNA QUADRATURE NEUROVASCULAR COIL is operating properly with no appreciable degradation of image quality.

1. Check the external cable for cracks or breaks once each week.
2. Perform a SIGNA QUADRATURE NEUROVASCULAR COIL performance verification. Refer to Section 3-2, QUADRATURE NEUROVASCULAR COIL IMAGING PERFORMANCE VERIFICATION.
3. Record the date and value calculated in SNR QA DATA TABLE.
4. As instructed in the Data Table, divide the SNR value obtained in the periodic QA check by the original SNR value.
5. If this ratio is not greater than 85%, then there may be a problem with the SIGNA QUADRATURE NEUROVASCULAR COIL or the MR system. Contact the GE Service Representative.

SECTION 3 - FUNCTIONAL CHECKS

3-1 SIGNA ADVANTAGE 1.0T/1.5T SCANNER VERIFICATION

NOTE: An alternative proprietary procedure is available for GE use and to customers with a valid Advanced Service Package Limited License. Refer to "TLT PROCEDURE" located in Direction 2124201-1, MR Release 5.x Signa Service Methods.

1. A Head Coil and TLT Phantom Loader with sleeve is to be used as reference scan. Scanner performance in the Head Coil mode should be verified.
2. Select **[NEW STUDY]** (4.x), or **[New Exam]** (5.x and 8.x) for a new Landmark to be set. Place the TLT Phantom loader and sleeve in the Head Coil and place in the center of the cradle.
3. **[LANDMARK]** the center of the phantom, and advance the patient table to isocenter using the **[ADVANCE TO SCAN]** button.
4. Set up Scan Prescription as shown in TABLE 3-1 (4.x), or TABLE 3-2 (5.x and 8.x). Coil Type:**[Head Coil]** and Number of Echos:**[4]** should be inserted. Perform an **[Auto Prescan]** to calibrate the RF power level. Record the value for TG, R1, and R2.
5. Select **[Scan]**. Observe the resulting images. Ensure that there are no artifacts of any sort on any of the images.
6. Select **[Cancel]**, **[New Series]**, to perform SNR comparisons. Acquire two identical images after inserting Number of Echos:**[1]**. Select **[Scan]**. After acquiring the first image, select **[Scan]** to obtain a second. Note the series number.

TABLE 3-1
SCAN PARAMETERS (4.X)

ID:	GESERVICE	Frequency Mode:	[Peak]
Name:		Receive Bandwidth:	[16kHz]
Weight (lb):	111	Field of View:	[24 cm]
Patient Entry:	[Head First]	Slice Thickness:	[3 mm]
Patient Position:	[Supine]	Scan Location	(S/I) 0
Axial/Sag Landmark:	[Sternal Notch]	No of Scan Locations:	1
Coil Type:	[++] See Note	FOV Center (L/R):	(R/L) 0(P/A): A0
Scan Plane:	[Axial]	Acq. Matrix:	[256 x 128]
Image mode:	[Single Scan]	Frequency Direction:	[R/L]
Pulse Sequence:	[Spin Echo]	Phase FOV:	default
Imaging Options:	[None]	Imaging Time:	[1 Nex]
Number of Echos:	[*] See Note	Contrast:	[No]
Echo Time (TE):	[Other][40 ms]	Table Delta	0
Rep Time (TR):	[Other][400 ms]		

NOTE: * **[4]** for Section 3-1 step 4 **[1]** for Section 3-1 step 6
 ++ **[Head]** for Section 3-1 step 4

TABLE 3-2
SCAN PARAMETERS (5.X AND 8.X)

ID:	geservice	Auto CF:	[Peak]
Name:		Receive Bandwidth:	[16kHz]
Weight (lb):	111	Field of View:	[24 cm]
Patient Entry:	[Head First]	Slice Thickness:	[3 mm]
Patient Position:	[Supine]	Interscan Spacing:	[0]
Axial/Sag Landmark:	[Sternal Notch]	Start Location (I/S):	0
Coil Type:	[++] See Note	End Location (I/S):	0
Scan Plane:	[Axial]	No of Scan Locations:	1
Image mode:	[Single Scan]	FOV Center (L/R):	0 (P/A): 0
Pulse Sequence:	[Spin Echo]	Acq. Matrix: (freq.)	[256]
Imaging Options:	[None]	Acq. Matrix: (phase)	[128]
Number of Echos:	[*] See Note	Frequency Direction:	[R/L]
Echo Time (TE):	[Other][40 ms]	Phase FOV:	default
Rep Time (TR):	[Other][400 ms]	Imaging Time:	[1 Nex]
		Contrast:	[No]
		Table Delta	0

NOTE: * [4] for Section 3-1 step 24 [1] for Section 3-1 step 6
 ++ [Head] for Section 3-1 step 2

3-2 QUADRATURE NEUROVASCULAR COIL IMAGING PERFORMANCE VERIFICATION

1. Set up the Quad Neurovascular coil and Head Phantom as shown in ILLUSTRATION 3-1. Connect the Neurovascular Coil cable to the **HEAD COIL PORT**. Landmark to the center of the Phantom.
2. Select [**Cancel**], [**New Series**], and repeat the scan using the parameters in TABLE 3-3 or 3-4. Coil Type:[**Other**][**Neurovas**] Number of Echos:[4] should be used. Use **Auto Prescan** to determine the values of R1 and R2.

TABLE 3-3
SCAN PARAMETERS (4.X)

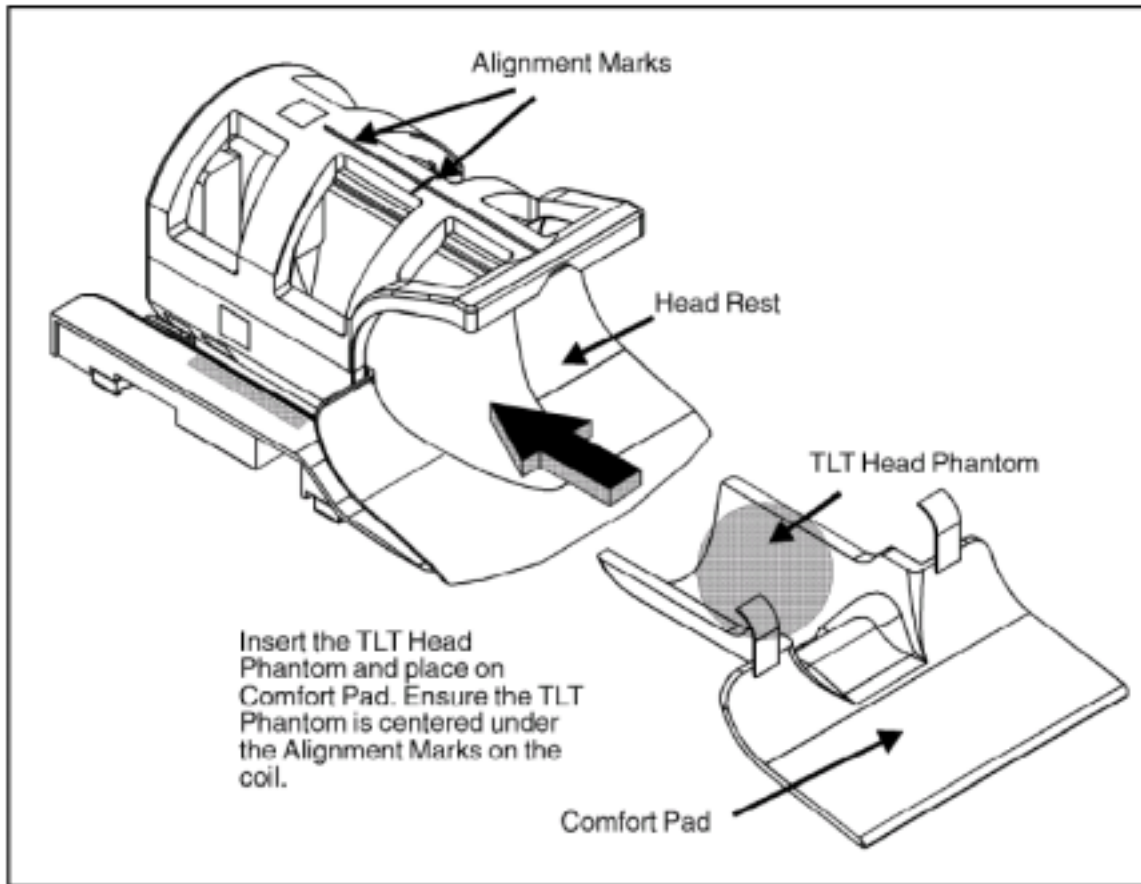
ID:	GESERVICE	Frequency Mode:	[Peak]
Name:		Receive Bandwidth:	[16kHz]
Weight (lb):	111	Field of View:	[24 cm]
Patient Entry:	[Head First]	Slice Thickness:	[3 mm]
Patient Position:	[Supine]	Scan Location	(S/I) 0
Axial/Sag Landmark:	[Sternal Notch]	No of Scan Locations:	1
Coil Type:	[++] See Note	FOV Center (L/R):	(R/L) 0(P/A): A0
Scan Plane:	[Axial]	Acq. Matrix:	[256 x 128]
Image mode:	[2D]	Frequency Direction:	[R/L]
	[Monitor SAR]	Phase FOV:	default
Pulse Sequence:	[Spin Echo]	Imaging Time:	[1 Nex]
Imaging Options:	[None]	Contrast:	[No]
Number of Echos:	[*] See Note	Table Delta	0
Echo Time (TE):	[Other][40 ms]		
Rep Time (TR):	[Other][400 ms]		

NOTE: * [4] for Section 3-2 step 2 [1] for Section 3-2 step 4
 ++ [Neurovas] for Section 3-2 step 2

TABLE 3-4
 SCAN PARAMETERS (5.X AND 8.X)

ID:	geservice	Auto CF:	[Peak]
Name:		Receive Bandwidth:	[16kHz] (default)
Weight (lb):	111	Field of View:	[24 cm]
Patient Entry:	[Head First]	Slice Thickness:	[3 mm]
Patient Position:	[Supine]	Interscan Spacing:	[0] (interleave)
Axial/Sag Landmark:	[Sternal Notch]	Start Location (I/S):	0
Coil Type:	[++] See Note	End Location (I/S):	0
Scan Plane:	[Axial]	No of Scan Locations:	1
Image mode:	[2D]	FOV Center (L/R):	0 (P/A): 0
	[Monitor SAR]	Acq. Matrix: (freq.)	[256]
Pulse Sequence:	[Spin Echo]	Acq. Matrix: (phase)	[128]
Imaging Options:	[None]	Frequency Direction:	[R/L]
Number of Echos:	[*] See Note	Phase FOV:	default
Echo Time (TE):	[Other][40 ms]	Imaging Time:	[1 Nex]
Rep Time (TR):	[Other][400 ms]	Contrast:	[No]
		Table Delta	0
<p>NOTE: * [4] for Section 3-2 step 2 [1] for Section 3-2 step 4 ++ [Neurovas] for Section 3-2 step 2</p>			

- Run the scan. Ensure that there are no artifacts of any sort on any of the images. Study the image using a **Window Width** and **Window Level** to obtain good contrast. A properly functioning coil will produce an image with a smooth uniform signal pattern. Inspect the images for visible ghosting (similar in appearance to motion artifact) in the phase encoding direction. If images contain ghosting artifacts, suspect an intermittent cable or connection. Refer to Section 3-5 to 3-6 for troubleshooting information
- Repeat step 2 with Number of Echos:[1] inserted. Select **[Scan]**. Immediately after acquiring the first image, select **[Scan]** to obtain a second.
NOTE: In 8.x, Select Prepare to Scan after changing Number of Echos:[1].
- Compute the SNR using the procedure described in Section 3-3, SNR IMAGE ANALYSIS FOR 4.X SYSTEMS, Section 3-4, SNR IMAGE ANALYSIS FOR 5.X SYSTEMS or Section 3-5, SNR IMAGE ANALYSIS FOR 8.X SYSTEMS.



TLT PHANTOM PLACEMENT IN QUAD NEUROVASCULAR COIL
ILLUSTRATION 3-1

3-3 SNR IMAGE ANALYSIS FOR 4.X SYSTEMS

1. On the left touch screen, touch the **UTILITIES** soft key. When the next screen appears, touch the **CLIPS** key.
2. Type **1** and **ENTER** on the next screen to run CLIPS.
3. Select the image processor at the Operator Console by typing **1** and **ENTER** at the next screen. It is not necessary to boot the image processor, so select **N** and **ENTER** when asked at the next screen.
4. It will take several seconds for the **CLIPS>** prompt to appear. When it does, type **LIST(STUDY)**; and **ENTER**. A screen listing the available studies will appear. Type **S** and **ENTER** to enable the **SELECT STUDY** function. Enter the study number of the Body Coil SNR scans.
5. At the **CLIPS>** prompt, type **LIST(SERIES)**; and **ENTER**. A list of the available series will appear. Type **S** and **ENTER** to select the proper series. Generally, the desired series will be the first one. Type "1" and **ENTER** to select the series.
6. To view several images at one time, type **VIEW(2,2)**; at the **CLIPS>** prompt. This will display images in a pattern of four images; the upper left image will be #1, the upper right image will be #2, the lower left will be #3, and the lower right will be #4. No images are displayed at this time.
7. At the **CLIPS>** prompt, type **LIST(IMAGE)**; and **ENTER**. Type **2** and **ENTER** to select image by number. Type **A** to select all images. Type **E** to exit the image selection.
8. It is necessary to load the images to be analyzed to the **DISPLAY** function of CLIPS. Type **DIS(ALL)**;
9. To obtain a mean signal value for the signal to noise ratio calculation, type **ROI**; at the **CLIPS>** prompt. A menu will appear allowing a selection of cursor types. Choose the elliptical cursor by typing **2** and **ENTER**.
10. Adjust the size of the cursor using the **[CURSOR POSITION/SIZE]** keys on the console and the trackball to an area covering approximately 80% of the phantom image in the upper left corner **[Display 1]**. Adjust the position of the cursor circle to center it on the phantom. Press the **ENTER** key on the keyboard to allow CLIPS to calculate the ROI parameters. Record the **MEAN SIGNAL** value for later use in the signal to noise ratio calculation.
11. Type **#3=#1-#2**; at the **CLIPS>** prompt. This will subtract the two images, creating a noise image in Display 3.
12. Type **#1=#3**; at the **CLIPS>** prompt. This action moves the image to the upper left display window to allow ROI calculations to be made.
13. At the **CLIPS>** prompt, type **ROI**; to select the image analysis function. Type **2** and select an elliptical cursor. Size and position the cursor to the same conditions as in step 10. Press the **ENTER** key, and record the Standard Deviation value for later use in the signal to noise ratio calculation.
14. Use the following formula to calculate the signal to noise ratio $SIGNAL\ TO\ NOISE\ RATIO = 1.414 * MEAN\ SIGNAL\ (from\ 10) / SD\ (from\ step\ 13)$ Record the value determined for the signal to noise ratio and the coil type [surface or body] of the measurement on the SNR QA DATA TABLE.
15. Repeat steps 5 to 14 using the surface coil images to determine the signal to noise ratio for the surface coil scans.
16. Determine the relative performance of the Neurovascular Coil against the Head Coil reference by dividing the Neurovascular Coil signal to noise ratio value by the Head Coil signal to noise ratio value.
17. To end the CLIPS utility when all image calculations are completed, type **BYE**; and **ENTER** at the **CLIPS>** prompt.
18. Select the exit function by typing **5** at the select function screen. Touch the **CANCEL** soft key on the screen to exit the **UTILITIES** functions and return to normal system operation.
19. Upon exiting CLIPS, reset the **AUTO CENTER FREQUENCY** mode by touching the **SCAN MODES** key, and then **DEFAULT AUTO CF** followed by the **EXECUTE** key.
20. Record the data and value calculated in the appropriate column under QA SNR Value.

3-4 SNR IMAGE ANALYSIS FOR 5.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. The difference image can be saved with the results annotated (option).

Procedure

1. Touch **[Utilities]**, **[MR Tools]**, **[Image Quality]**, then **[SNR Test]**. The SNR Test screen is displayed. See ILLUSTRATION 3-2.
2. Enter first 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. Enter second image series and image number. The second image exam number is defaulted to the same as first image.
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. Select **[Filter Off]** and **[Image Off]**. Touch **[Accept]** to begin analysis. The final values are displayed on the screen.
4. Place Signal to Noise Ratio on SNR QA DATA TABLE. Touch **[Continue]**, select the next exam and repeat for each pair.

NEMA STANDARD SNR TEST

	Filter	Image		
	Off	Off		
First Image	List/Sel Exams	List/Sel Series	List/Sel Images	
Second Image		List/Sel Series	List/Sel Images	

Cancel
Utility Main
MR Tools Main
Image Quality
Accept



Note: Accept changes to continue only after an analysis has been performed.

SNR TEST SCREEN
ILLUSTRATION 3-2

3-5 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

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.)

3-5 SNR IMAGE ANALYSIS FOR 8.X SYSTEMS – CONT'D

=====
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 *

3-5 SNR IMAGE ANALYSIS FOR 8.X SYSTEMS – CONT'D

=====
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.

3-6 CHECKING THE TRANSMIT/RECEIVE PIN DIODES WITH DIGITAL MULTIMETER (DMM)

3-6-1 Part Number 2118138 Coil

TRANSMIT ISOLATION DIODES

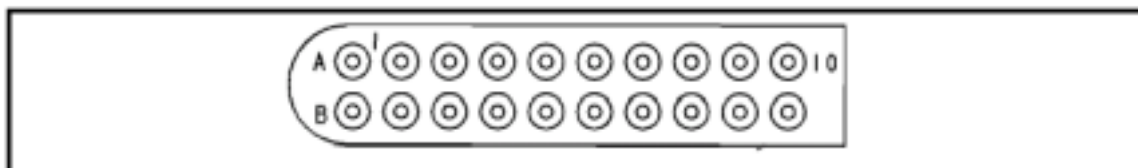
1. Select the **DIODE TEST** function on the Digital Multimeter (DMM).
2. Connect the positive and negative leads of the DMM as detailed in TABLE 3-5-**TRANSMIT** and ILLUSTRATION 3-3. A reading of between 0.750 and 1.400 volts should be obtained.
3. If a reading of less than 0.750 volt is obtained, the Transmit Isolation PIN diode or the coil transmit cable is likely to be shorted. If a reading above 1.400 volt is obtained, the Transmit Isolation PIN diode or one/both conductors of the External Cable are likely to be open.
4. Connect the Positive/Negative leads as detailed in TABLE 3-5-**TRANSMIT** and ILLUSTRATION 3-3. An Infinity(Overrange) reading should be indicated.
5. If a finite reading is obtained, the Transmit Isolation PIN diode is shorted or leaky or the coil transmit line in the External Cable is shorted.

TABLE 3-5
DIODE TEST CONNECTIONS

COIL TYPE	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 4	FOR STEP 2	FOR STEP 4
TRANSMIT	2A or 2B	3A or 3B	3A or 3B	2A or 2B
RECEIVE	9A or 9B	8A or 8B	8A or 8B	9A or 9B

RECEIVE ISOLATION DIODES

1. Select the **DIODE TEST** function on the Digital Multimeter (DMM).
2. Connect the positive and negative leads of the DMM as detailed in TABLE 3-5-**RECEIVE** and ILLUSTRATION 3-3. A reading of between 0.400 and 0.800 volts should be obtained.
3. If a reading of less than 0.400 volt is obtained, the Transmit Isolation PIN diode or the receive line in the External Cable is likely to be shorted. If a reading above 0.800 volt is obtained, both Receive Isolation PIN diodes or the receive line in the External Cable are likely to be open.
4. Connect the positive and negative leads as detailed in TABLE 3-5-**RECEIVE** and ILLUSTRATION 3-3. An Infinity(Overrange) reading should be indicated.
5. If a finite reading is obtained, one of the Receive Isolation PIN diodes is shorted or leaky or the receive line in the External Cable is shorted.



PIN LOCATIONS FOR CONNECTOR
ILLUSTRATION 3-3

3-6 CHECKING THE TRANSMIT/RECEIVE PIN DIODES WITH DIGITAL MULTIMETER (DMM) (CONT'D)

3-6-2 Part Number 2118138-5 and 2118138-2 Coils

TRANSMIT CIRCUIT AND DIODE

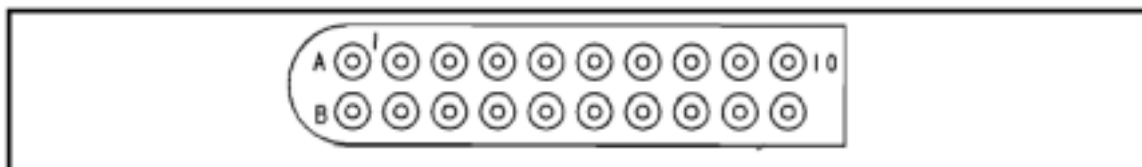
1. Select the **DIODE TEST** function on the Digital Multimeter (DMM).
2. Lift the protective cover plate and operate the Polarity Switch in Normal position for this test. Connect the positive and negative leads of the DMM as detailed in TABLE 3-6-**TRANSMIT** and ILLUSTRATION 3-4. A reading of between 0.400 and 0.800 volts should be obtained with the Polarity Switch in Normal position.
3. If a reading of less than 0.400 volt is obtained, the Transmit PIN diode or the coil transmit cable is likely to be shorted. If a reading above 0.800 volt is obtained, the Transmit PIN diode, Polarity Switch, or one/both conductors of the External Cable are likely to be open.
4. Connect the Positive/Negative leads as detailed in TABLE 3-6-**TRANSMIT** and ILLUSTRATION 3-4. An Infinity (Overrange) reading should be indicated with the Polarity Switch in either position.
5. If a finite reading is obtained, the Transmit PIN diode is shorted or leaky, the Polarity Switch is damaged, or the coil transmit line in the External Cable is shorted.

TABLE 3-6
DIODE TEST CONNECTIONS

COIL TYPE	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 4	FOR STEP 2	FOR STEP 4
TRANSMIT	2A or 2B 4A or 4B	3A or 3B	3A or 3B	2A or 2B 4A or 4B
RECEIVE	9A or 9B 7A or 7B	8A or 8B	8A or 8B	9A or 9B 7A or 7B

RECEIVE CIRCUIT AND DIODE

1. Select the **DIODE TEST** function on the Digital Multimeter (DMM).
2. Lift the protective cover plate and operate the Polarity Switch in Reverse position for this test. Connect the positive and negative leads of the DMM as detailed in TABLE 3-6-**RECEIVE** and ILLUSTRATION 3-4. A reading of between 0.400 and 0.800 volts should be obtained with the Polarity Switch in Reverse position.
3. If a reading of less than 0.400 volt is obtained, the Transmit PIN diode or the receive line in the External Cable is likely to be shorted. If a reading above 0.800 volt is obtained, the Transmit PIN diode, Polarity Switch, or the receive line in the External Cable is likely to be open.
4. Connect the positive and negative leads as detailed in TABLE 3-6-**RECEIVE** and ILLUSTRATION 3-4. An Infinity(Overrange) reading should be indicated with the Polarity Switch in either position.
5. If a finite reading is obtained, the Transmit PIN diode is shorted or leaky, the Polarity Switch is damaged, or the receive line in the External Cable is shorted.



PIN LOCATIONS FOR CONNECTOR
ILLUSTRATION 3-4

3-7 CHECKING THE EXTERNAL CABLE

3-7-1 Part Number 2118138 Coil

1. Remove the cover from the rear of the Quad Neurovascular Coil. See Section 4-1, DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL, step 1.
2. Remove the two cables from the Combiner Card by unscrewing the SMA fittings. The cable on the right of the card is coded with a red band. See Section 4-1, step 2.
3. Select the **OHMMETER** function on the Digital Multimeter (DMM).
4. Connect the leads as detailed in Table 3-7 step 4.
5. Verify continuity of the cable. Flex the cable at both ends while monitoring the continuity to check for intermittent open conductors.
6. Connect the leads as detailed in Table 3-7 step 6.
7. Verify an open circuit between the cable shield and center conductors. Flex the cable at both ends while checking to test for intermittent shorting within the cable.
8. If the cable fails any of the above test, replace the cable assembly. See Section 4-1, DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL, steps 2, 3, and 4.
9. If the cable passes the tests, attach the SMA connectors, See Section 4-1, DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL, steps 4 and 5.

TABLE 3-7
CABLE TEST CONNECTIONS - PART NUMBER 2118138 COIL

CABLE	STEP 4, FROM:	STEP 4, TO:
TRANSMIT	PINS 2A, 2B	RED-BAND SMA CENTER PIN
TRANSMIT	PINS 3A, 3B	RED-BAND SMA SHELL
RECEIVE	PINS 9A, 9B	NO-BAND SMA CENTER PIN
RECEIVE	PINS 8A, 8B	NO-BAND SMA SHELL
CABLE	STEP 6 FROM:	STEP 6 TO:
TRANSMIT	RED-BAND SMA SHELL	RED-BAND SMA CENTER PIN
RECEIVE	NO-BAND SMA SHELL	NO-BAND SMA CENTER PIN

3-7-2 Part Number 2118138-5 and 2118138-2 Coils

1. Remove the cover from the rear of the Quad Neurovascular Coil. See Section 4-1, DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL, step 1.
2. Remove the two cables from the Combiner Card by unscrewing the SMA fittings. The cable on the right of the card is coded with a red band. See Section 4-1, step 2.
3. Select the **OHMMETER** function on the Digital Multimeter (DMM).
4. Connect the leads as detailed in Table 3-8 step 4.
5. Verify continuity of the cable. Flex the cable at both ends while monitoring the continuity to check for intermittent open conductors.
6. Connect the leads as detailed in Table 3-8 step 6.
7. Verify an open circuit between the cable shield and center conductors. Flex the cable at both ends while checking to test for intermittent shorting within the cable.
8. If the cable fails any of the above test, replace the cable assembly. See Section 4-1, DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL, steps 2, 3, and 4.
9. If the cable passes the tests, attach the SMA connectors, See Section 4-1, DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL, steps 4 and 5.

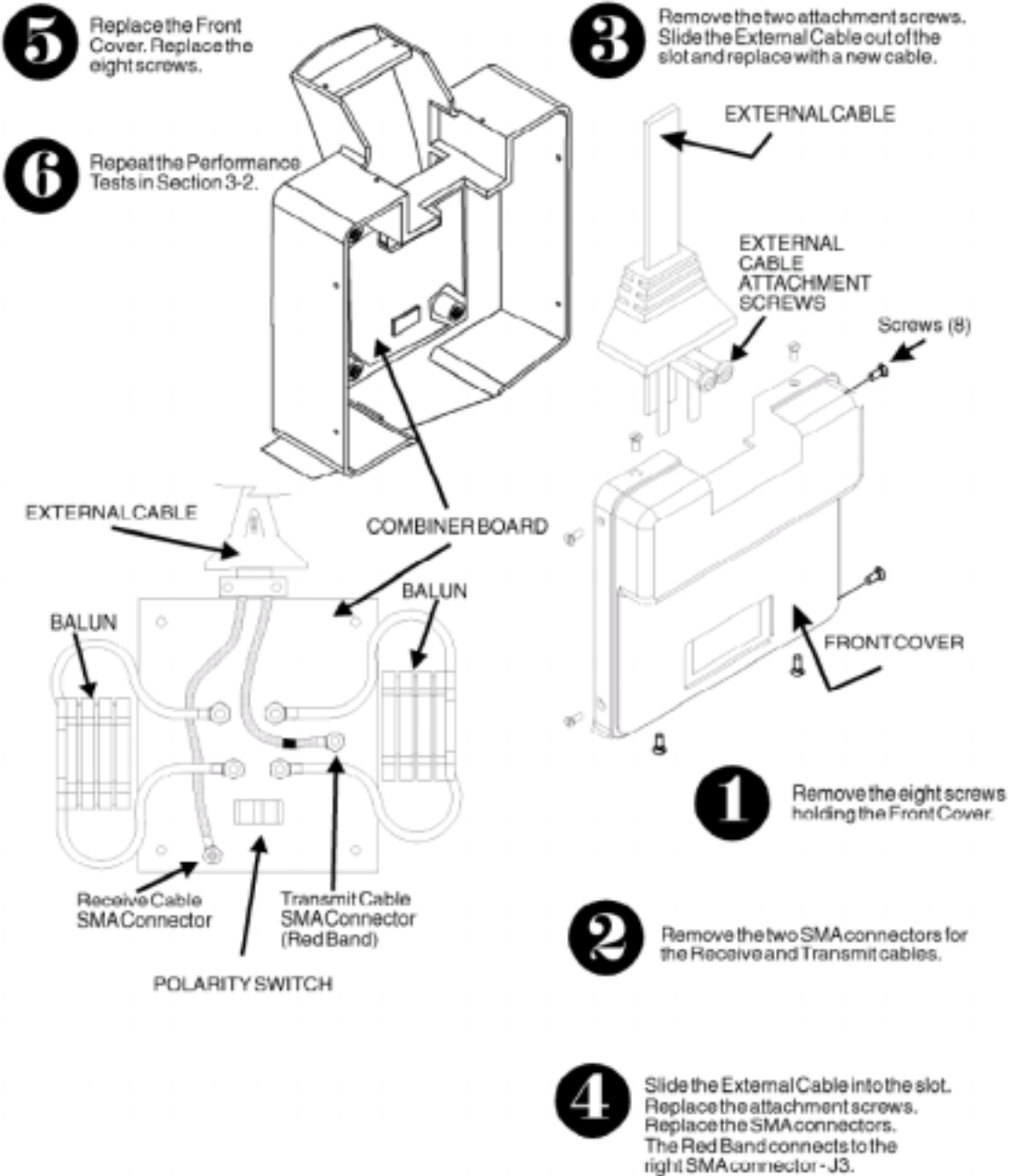
TABLE 3-8
CABLE TEST CONNECTIONS - PART NUMBER 2118138-5 COIL

CABLE	STEP 4, FROM:	STEP 4, TO:
TRANSMIT	PINS 2A, 2B, 4A, 4B	RED-BAND SMA CENTER PIN
TRANSMIT	PINS 3A, 3B	RED-BAND SMA SHELL
RECEIVE	PINS 9A, 9B, 7A, 7B	NO-BAND SMA CENTER PIN
RECEIVE	PINS 8A, 8B	NO-BAND SMA SHELL
CABLE	STEP 6 FROM:	STEP 6 TO:
TRANSMIT	RED-BAND SMA SHELL	RED-BAND SMA CENTER PIN
RECEIVE	NO-BAND SMA SHELL	NO-BAND SMA CENTER PIN

SECTION 4 - REPLACEMENT/MAINTENANCE

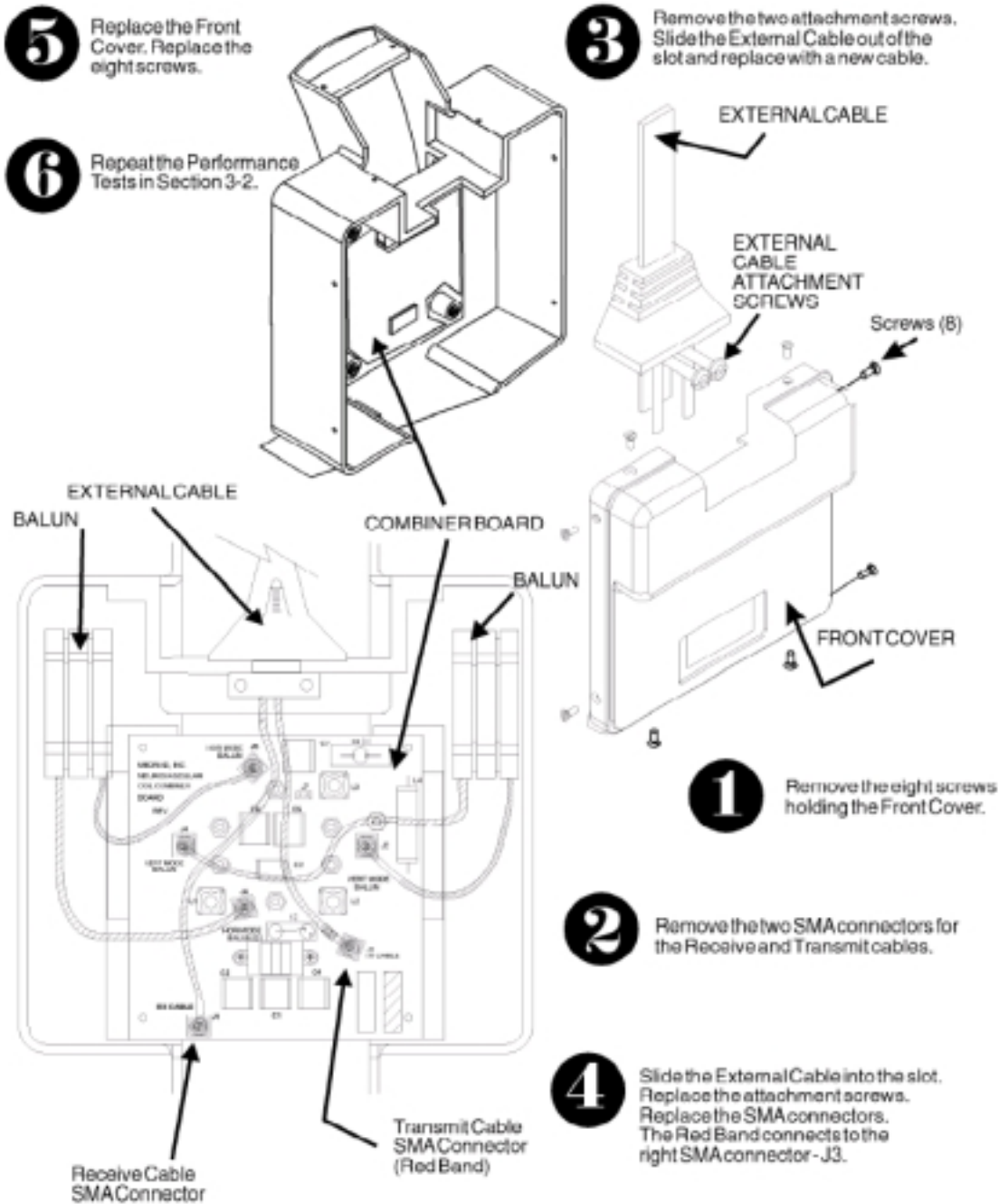
4-1 DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL

4-1-1 Part Number 2118138 Coil.



4-1 DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL Cont'd

4-1-2 Part Number 2118138-5 and 2118138-2 Coils.



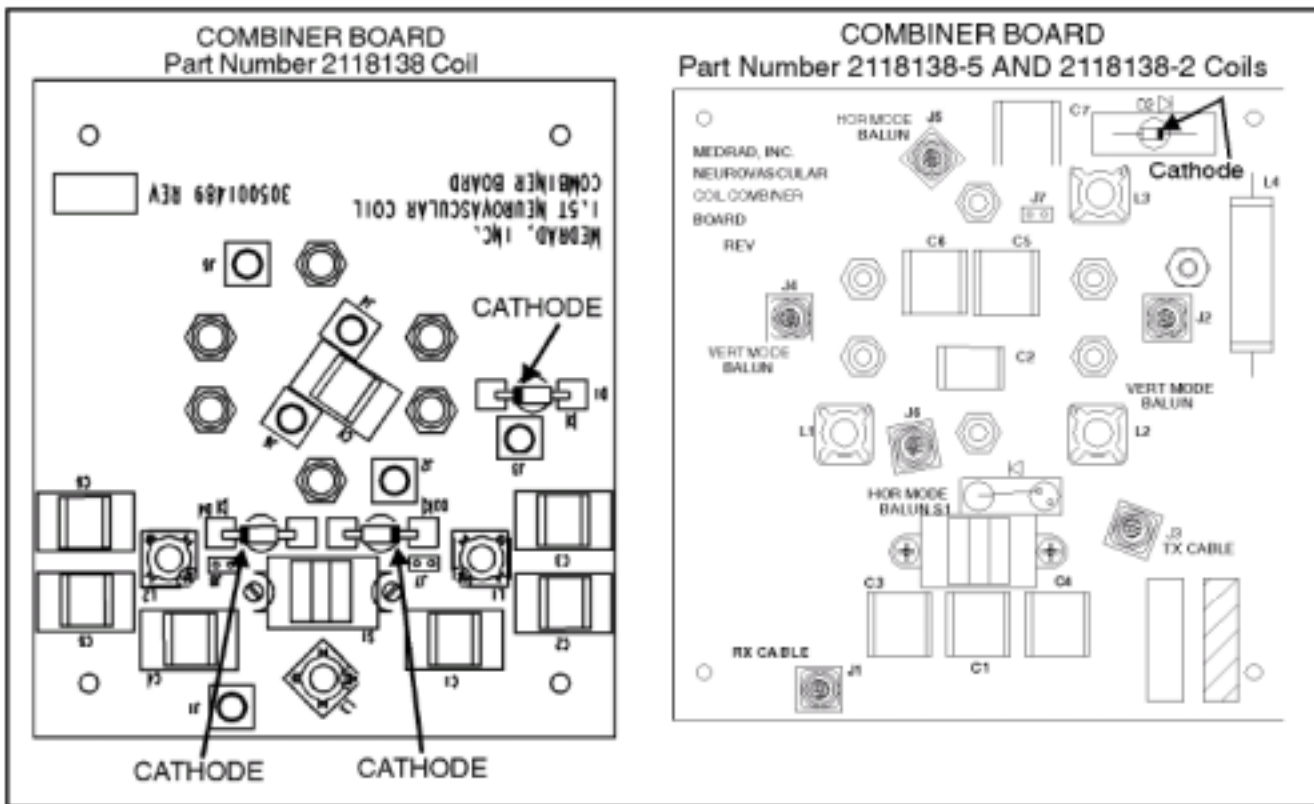
4-2 REPLACING THE TRANSMIT/RECEIVE PIN DIODES

CAUTION

Use a 25W solder iron and protect the circuit board from static electricity. Be careful not to damage the circuit board by overheating.

NOTE: Each antenna loop element is tuned at the factory to provide the proper input impedance. Circuit boards are not field replaceable. The PIN diodes are the only field replaceable component on the circuit boards.

1. Remove the Front Cover. Refer to Section 4-1, DISASSEMBLY/REPLACING EXTERNAL CABLE OF QUAD NEUROVASCULAR COIL, step 1.
2. Use an anti-static wrist band when touching the circuit board.
3. Replace the PIN diodes only with exact replacement diodes - 46-221735P1. **OBSERVE POLARITY.** See ILLUSTRATION 4-1. **NOTE:** Part Number 2118138-5 Coil has one diode.



4-3 CHECKING THE CABLES

1. Check the external cable for cracks or breaks once each week. Replace the external cable if any damage or wear is found.

4-4 CLEANING THE QUAD NEUROVASCULAR COIL

CAUTION

Avoid damaging sensitive electronic parts. Do not spray or pour dishwashing solution directly onto the Quad Neurovascular coil, or external cable. Do not use alcohol to clean the Quad Neurovascular coil. Never submerge the Quad Neurovascular coil in any liquid.

1. Clean the Quad Neurovascular coil and external cable with a mild dishwashing liquid and water solution. Wet a soft cloth with the solution and proceed to clean.
2. Before returning the coil for servicing, thoroughly clean the coil, cable, and connector with a 10% bleach in water solution.

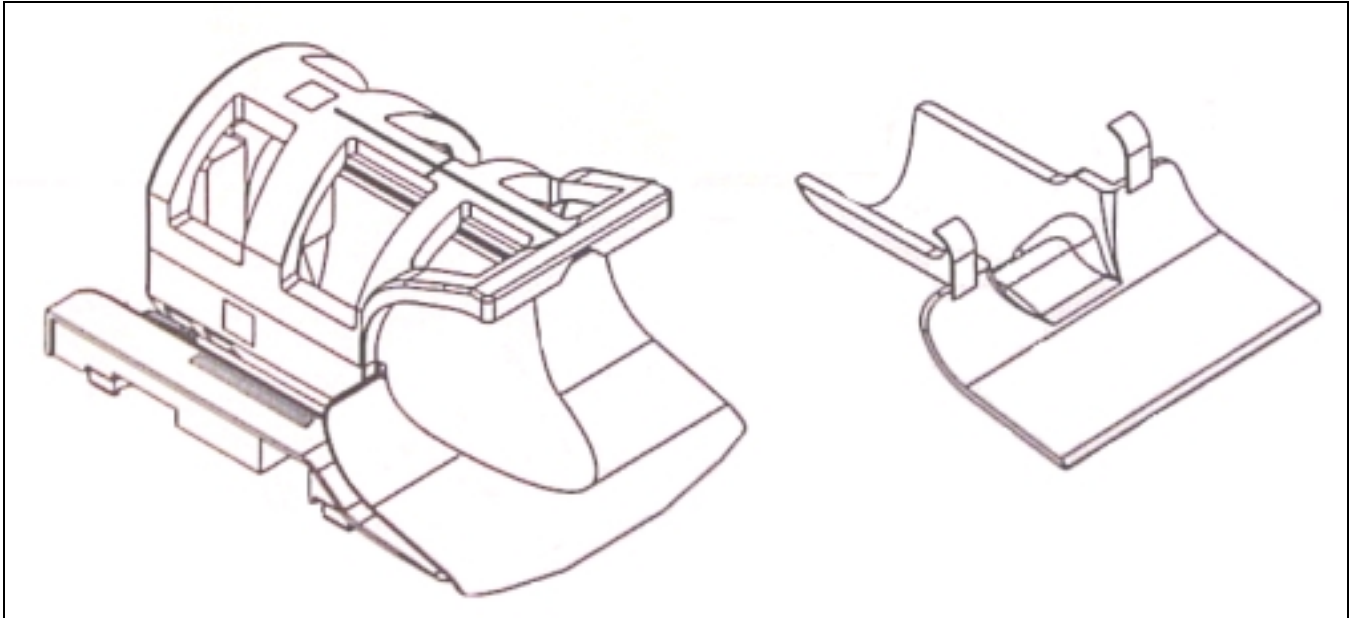
SECTION 5 - RENEWAL PARTS

WARNING

BIO HAZARD! EQUIPMENT BEING RETURNED FROM USE IN A CLINICAL SETTING MUST BE CLEAN AND FREE OF BLOOD AND OTHER INFECTIOUS SUBSTANCES. THE DEPARTMENT OF TRANSPORTATION (DOT) HAS RULED THAT ITEMS THAT WERE SATURATED AND/OR DRIPPING WITH HUMAN BLOOD THAT ARE NOW CAKED WITH DRIED BLOOD; OR WHICH WERE USED OR INTENDED FOR USE IN PATIENT CARE ARE REGULATED MEDICAL WASTE FOR TRANSPORTATION PURPOSES AND MUST BE TRANSPORTED AS A HAZARDOUS MATERIAL. UNDER NO CIRCUMSTANCES SHOULD A PART OR EQUIPMENT WITH VISIBLE BODY FLUIDS BE TAKEN OR SHIPPED FROM A CLINIC OR SITE (FOR EXAMPLE, SURFACE COILS).

1. Employees shall follow proper decontamination procedures for clean up of bloodborne pathogens. Refer to Section 4-4, Cleaning The Coil. It is the responsibility of the GEMS employee to insure the part/equipment has been properly decontaminated prior to shipment.

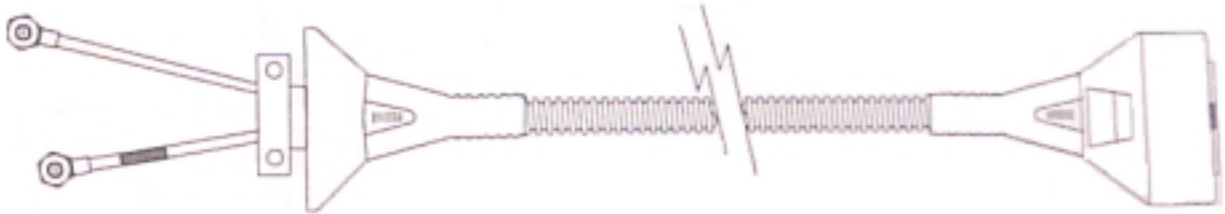
QUAD NEUROVASCULAR COIL



<u>Item</u>	<u>Part Number</u>	<u>FRU</u>	<u>Name</u>	<u>Quantity</u>	<u>Description/Remarks</u>
1	2118138-5	1	Quad Neurovascular Coil	1	Quad Neurovascular Coil, 1.5T
2	2118138	1	Quad Neurovascular Coil	1	Quad Neurovascular Coil, 1.5T
3	2118138-2	1	Quad Neurovascular Coil	1	Quad Neurovascular Coil, 1.0T

When ordering Renewal Parts for the Neurovascular Coil with retrofit kit 2100937-24 installed, refer to the 2118138-5 Coil Renewal Parts only.

CABLE



<u>Item</u>	<u>Part Number</u>	<u>FRU</u>	<u>Name</u>	<u>Quantity</u>	<u>Description/Remarks</u>
1	2100937-22	1	Signa NV 1.5T Cable Kit	1	Cable NOTE: Can be used for both Part Number 2118138 and 2118138-5 Coils
2	2100937-12	1	Signa NV 1.5T Cable Kit	1	Cable NOTE: For Part Number 2118138 ONLY . Deplete existing stock of this cable kit and order Part Number 2100937-22 kit from that time forward.
3	2100937-13	1	Signa NV 1.0T Cable Kit	1	Cable

DIODE

<u>Item</u>	<u>Part Number</u>	<u>FRU</u>	<u>Name</u>	<u>Quantity</u>	<u>Description/Remarks</u>
1	46-221735P1	2	Diode	4	UM9415 PIN Diode

MISC

<u>Item</u>	<u>Part Number</u>	<u>FRU</u>	<u>Name</u>	<u>Quantity</u>	<u>Description/Remarks</u>
1	2100937-23	2	Screw	1	Base locking screw FRU

SNR QA DATA TABLE

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 below and the date in column 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:

Head Coil SNR Value: _____

Quad Neurovascular SNR value: _____

Date: _____

SNR DATA QA (QUALITY ASSURANCE) CHECK:

1	2	3
Date	Quad Neurovascular Coil QA SNR-	Is new value divided by original value >85%?
_____	_____	_____ 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.

DEFECTIVE SURFACE COIL RETURN FORM

NOTE

For proper assessment of defective returned coils, both sides of this form should be completely filled out and accompany all returned coils. Include films or prints of any image quality complaints with a description of the scan prescription used.

DATE: _____

SITE NAME: _____

SITE ADDRESS: _____

SERVICE ENGINEER: _____

COIL SERIAL NUMBER: _____

DATE COIL INSTALLED: _____

DESCRIPTION OF COIL PROBLEM: _____

(Please be descriptive; "Broken" is not enough) _____

TLT TABLES

NOTE: An alternate proprietary procedure is available to GE use and to customers with a valid Advanced Service Package Limited License. Refer to "TLT PROCEDURE" located in Direction 2124201-1, MR Release 5.x Signa Service Methods. Use the table to record the TLT results of the defective coil.

TABLE DR-1
TLT DATA FOR DEFECTIVE SURFACE COIL

SITE:	NAME:	DATE:
TLT FILE NUMBER:		
SNR: NOISE		
SNR MEAN		
SNR SIGNAL		
SNR AREA		
TRMAP: 89-91	%	%
85-95	%	%
65-115	%	%
FLIP MEAN		
FLIP SDV		
RCV MEAN		
RCV SDV		
DIFF MEAN		
DIFF SDV		