



***GE Medical Systems***

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# **Technical Publications**

**Direction 46–305140**

**Revision 3**

## **Signa<sup>®</sup> 1.5T Breast Coil**

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**Operating Documentation**

## DAMAGE IN TRANSPORTATION

All packages should be closely examined at time of delivery. If damage is apparent, have notation "**damage in shipment**" written on **all** copies of the freight or express bill **before** delivery is accepted or "signed for" by a General Electric representative or a hospital receiving agent. Whether noted or concealed, damage **MUST** be reported to the carrier **immediately** upon discovery, or in any event, within **14** days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this **14** day period.

Call Traffic and Transportation, Milwaukee, WI (414) 785-5052/8\*323-5052 **immediately** after damage is found. At this time be ready to supply name of carrier, delivery date, consignee name, freight or express bill number, item damaged and extent of damage.

Complete instructions regarding claim procedure are found in Section "S" of the Policy & Procedure Bulletins.

3/12/92



*GE Medical Systems*

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**GE Medical Systems:**

**Telex 3797371**

**P.O. Box 414, Milwaukee, Wisconsin**

**WARNING**

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- DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.
- 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.

**AVISO**

- 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.
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**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 DESTE AVISO 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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### LIST OF EFFECTIVE PAGES

REVISION	DATE	PRIMARY REASON FOR CHANGE
REV 0	Sept. 27, 1992	Initial Release.
REV 1	Aug. 16, 1993	Parts Structure Change.
REV 2	June 16, 1998	Parts Structure Change. Correction of diagnostic procedures.
REV 3	Dec. 14, 1998	Parts Structure Change. Correction of diagnostic procedures.

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A	3								
i to ii	3								
1-1 to 1-4	3								
2-1	3								
2-2	0								
3-1 to 3-8	3								
3-9	0								
3-10	3								
3-11 to 3-15	0								
3-16 to 3-21	3								
3-22	-								
4-1 to 4-4	3								
5-1 to 5-4	3								
DT-1	0								
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## SECTION 1 – INTRODUCTION

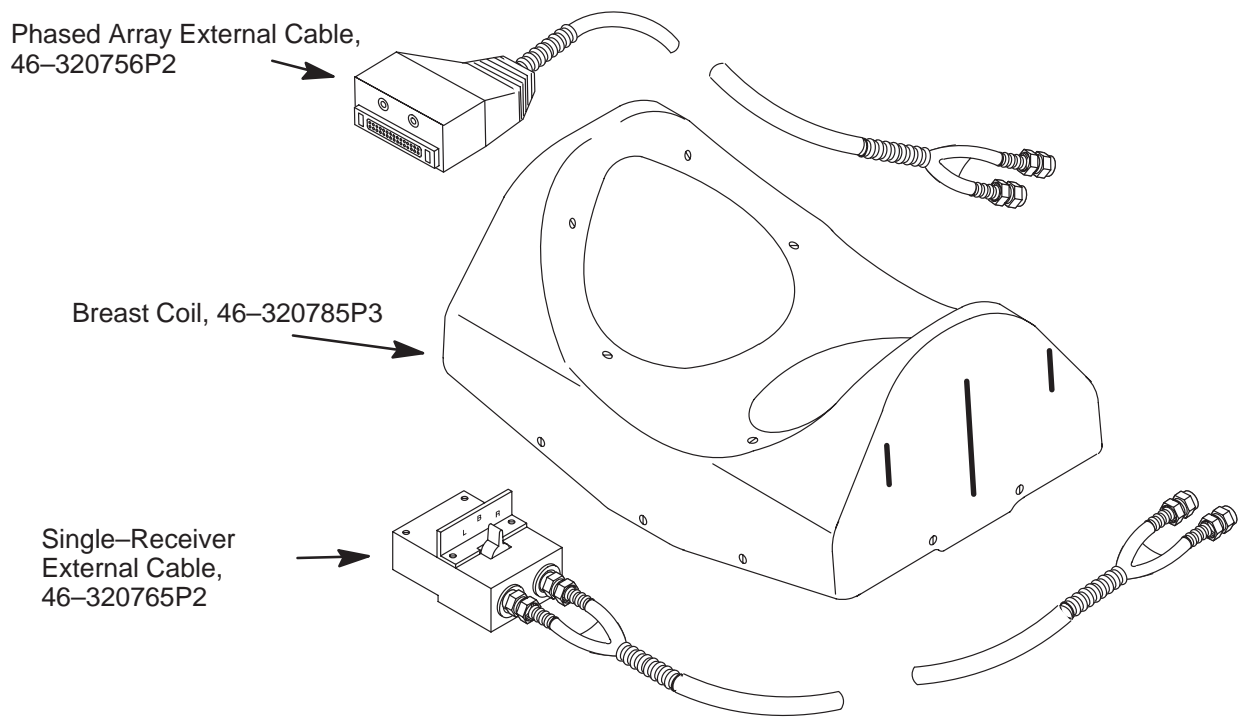
### 1-1 HOW THE BREAST COIL OPERATES

The Breast coil is a two element receive only antenna array which receives the RF signal from the body coil and sends it to the preamplifier. The coil is used to image the female breast. The coil has two main applications. First, the detection of breast pathology, in particular, breast cancer. Second, the examination of silicone breast implants.

The Breast coil can be used in two configurations (single-receiver or phased array) determined solely by which external cable is used. The coil is shipped with the single-receiver cable installed. A switch on the single-receiver cable allows the Breast coil to be used in three modes: unilateral left, bilateral, or unilateral right. A phased array cable is also shipped with each coil. If the coil is intended to be used as a phased array coil, or if the site purchases the phased array option in the future, the single-receiver coil cable can be removed and the phased array cable installed. Do not throw the extra cable away!

The small individual antenna loop elements (2 in total) provide excellent SNR across a 32cm FOV. The Breast coil is tuned to the 1.5T MR frequency, 63.86 MHz.

The Coil consists of three major assemblies: (See Illustration 1-1)



**BREAST COIL ASSEMBLIES**  
ILLUSTRATION 1-1

## 1–1 HOW THE BREAST COIL OPERATES (continued)

The 50 ohm phase shift network ensures a multiple of a half wavelength from the 20 (30 for phased array) pin connector to the coil input. The coils themselves are made up of an input blocking circuit, the antenna loop inductance and loss and the distributed capacitance. The geometry of the coil is chosen to optimize performance. This geometry dictates the loop inductance and loaded coil losses. The distributed capacitors are chosen to resonate with the loop inductance. The input capacitor of the coil ( $C_{in}$ ) is chosen such that the loaded coil looks like 50 ohms at the preamp input. The active blocking inductor is dictated by the value of  $C_{in}$  such that the blocking circuit resonates at 63.86 MHz.

Each individual loop element is capacitively loaded with lumped element chip capacitors to reduce patient loading effects. The total capacitance value of all the series chip capacitors combined is chosen in conjunction with the input capacitor  $C_{in}$  to allow for a matched impedance ( $Z_{in}=50\Omega$ ) at the antenna input. A tuning capacitor is placed in parallel with one of the lumped element chip capacitors to allow for final tuning of the loop input impedance.

The input circuitry for each antenna element in the Breast coil serves two functions. The first function is to match the input impedance of the individual antenna loop elements to the desired value of  $50\Omega$ . This is accomplished through the use of a simple matching network consisting of a series inductor  $L_{in}$  and shunt capacitor  $C_{in}$ .

The second function performed by the input circuitry on the Breast coil is that of active transmit blocking.

The active transmit blocking network (and input matching network) is a simple high impedance parallel resonant LC circuit tuned to resonate at  $f_o=63.86$  MHz. The resonant circuit is closed (or switched into the antenna loop) during transmit by forward biasing the PIN diode. This bias current is supplied from the Switch Driver board and is split equally between the two diodes (one for each network) for the single–receiver configuration.

For the phased array configuration, during receive, all PIN diodes are biased off. Magnetic coupling from nearby coils is reduced by using the low input impedance of the preamp. The electrical length of the system from the preamp to coil input transforms this low impedance (ie: short circuit) across the diode and the LC network once again blocks coil loop currents. This ensures that the individual signals picked up by the preamps are not contaminated.

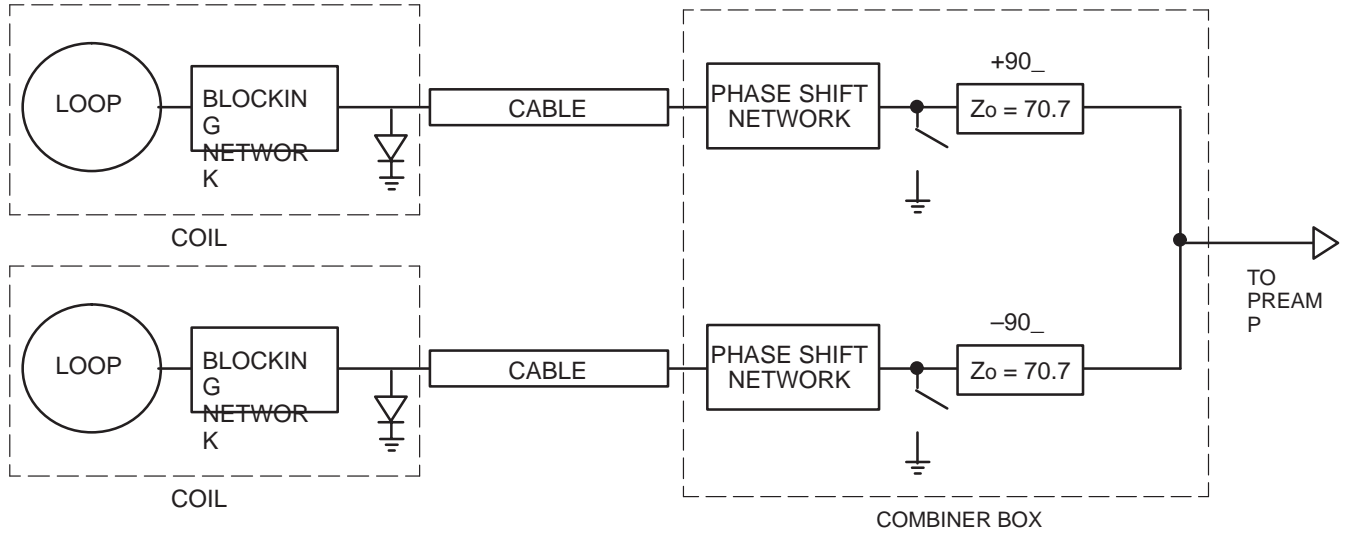
During transmit all PIN diodes are biased on. With the diode turned on, the LC blocking network resonates to form a high impedance at the input of the coil. This minimizes currents in the coil loop which eliminates the magnetic field produced by the coil. If a magnetic field were produced by the coil, the transmit field generated by the body coil would be affected and homogeneity would be lost, the resulting electric field could also cause patient warming.

In addition, the P3 version of the coil includes dual passive transmit blocking circuits. These are comprised of a pair of back–to–back 1N6638U switching diodes in series with an inductor. The series components are in parallel with an 82 pF capacitor on the loop elements. The passive transmit blocking circuits 'turn on' when the rf voltage across the diodes causes the diodes to conduct. This occurs only when the transmit pulse induces sufficient voltage across the diode pair.

For single–receiver operation, a switch on the connector allows for unilateral or bilateral operation. Bilateral operation allows both breasts to be scanned. Unilateral operation allows the left or right breast to be selected. Unilateral scanning results in optimized SNR. The combiner consists of two  $90^\circ$   $70.7\Omega$  sections, one having a positive phase shift, one having a negative shift. The preamplifier sees two  $100\Omega$  sources in parallel, resulting in the desired  $50\Omega$  source. See Illustration 1–2.

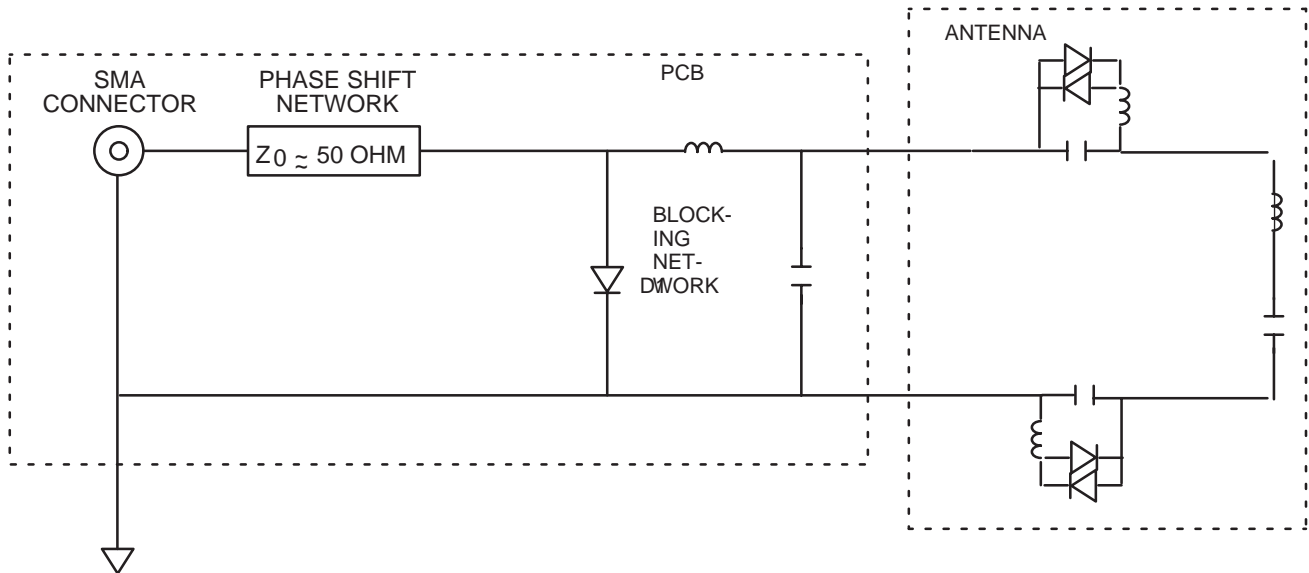
At the factory, the individual loop elements are tuned to provide the proper input impedance. On the circuit board, the only FRU is the PIN diode (D1).

1-1 HOW THE BREAST COIL OPERATES (continued)



BLOCK DIAGRAM FOR SINGLE-RECEIVER CONFIGURATION  
ILLUSTRATION 1-2

There are two circuit boards and two antennas in each Breast coil. See Illustration 1-3 for a simple block diagram.



BLOCK DIAGRAM FOR SINGLE COIL  
ILLUSTRATION 1-3

## 1-2 COMPATIBILITY

The Breast Array Coil is compatible with the following hardware configurations:

- Signa® Performance Plus (3.2 or higher)
- Signa® Advantage™ (4.5 or higher)
- Signa® Advantage™ 1.5T (1.5T only)
- Signa® Horizon™ and Horizon™ L.x 1.5T only
- Signa® MR/i 1.5T only

## 1-3 RELATED DOCUMENTS

- *Direction 15000, Signa® System*
- *Direction 15300, Signa® Advantage™ System*
- *Direction 15400, Signa® Advantage™ 1.5T & 0.5T System*
- *Direction 2124201–3, MR Signa® 5.X Service Methods*
- *Direction 2160623–3, MR Signa® Horizon Release 8.X Service Methods*

## 1-4 ORGANIZATION OF THIS DOCUMENT

This document is divided into the following sections:

Section 1, INTRODUCTION, describes how the Breast Coil operates and when and where the Breast Coil can be used.

Section 2, SET UP 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.

Appendix A, SCHEMATICS, assembly drawings and schematics.

## 1-5 ENVIRONMENTAL REQUIREMENTS

Operate and store the Breast Coil in the Scanner Room.

## SECTION 2 – SET UP AND CALIBRATION

### 2-1 CHECKING THE SHIPPING LIST

Table 2-1 lists the M1085BR Signa 1.5T Breast coil parts. Check that all parts have been shipped.

TABLE 2-1  
BREAST COIL SHIPPING LIST (46-320754G3)

QTY.	ITEM	PART NO.
1	Bilateral Breast Coil with Single-Receiver Cable	46-320755G3
1	Phased Array Cable Kit	46-320756P2
2	Arm Pad	46-320757P1
1	Chest Pad	46-320758P1
2	A-sized (3") Filler Pad	46-320759P1
2	B-sized (2") Filler Pad	46-320760P1
2	C-sized (1") Filler Pad	46-320761P1
1	Abdomen Pad	46-320762P1
1	Foot Pad	46-320763P1
1	Face Pad	46-320764P1
2	Cradle Attachment Strap	46-320766P1
5	Disposable Liner, Chest	46-320812P1
5	Disposable Liner, Face	46-320813P1
1	Operator Manual	2229975
1	Service Manual	46-305140

### 2-2 INSTALLING THE BREAST COIL

For systems with plasma screen, at the Boot Terminal, install new soft key to be used by the operator to select Breast imaging. Name the key "BREAST" for Breast single-receiver coil or "BREASTPA" for Phased Array Breast coil. Some proprietary software tools key off of the coil name, use the correct coil name to ensure these tools function.

Refer to the *Direction 15300, Signa Advantage System, Set-up & Calibration tab, Section 6, CONFIGURATION FILE*, or *Direction 15400, Signa Advantage 1.5T & 0.5T System, Set-up & Calibration tab, Section 6, CONFIGURATION FILE* for information on installing soft keys and configuring the Breast coil.

## 2-2 INSTALLING THE BREAST COIL (continued)

For 5.X or 8.X, refer to *Direction 2124201–3, MR Signa® 5.X Service Methods* or *Direction 2160623–3, MR Signa® Horizon Release 8.X Service Methods*, respectively, Configuration File, Adding a Surface Coil.

The Breast Coil is delivered with the single–receiver cable installed. Refer to Section 4–2, REPLACING THE EXTERNAL CABLE, for installing the Phased Array cable (46–320756P2).

## 2-3 FUNCTIONAL CHECKS

1. Perform a Body coil scan SNR verification. Refer to Section 3–1, BODY COIL SNR VERIFICATION.
2. Perform a Breast coil SNR Verification. Refer to Section 3–2, BREAST COIL SNR VERIFICATION.
3. Perform Spike Noise Analysis for the Breast Coil. Refer to *Direction 15300, Signa Advantage™ System*, Performance Checks tab, Section 2–1, SPIKE NOISE or *Direction 15400, Signa Advantage™ 1.5T & 0.5T System*, Performance Checks tab, Section 3, SPIKE NOISE.

## 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 Breast coil is operating properly with no appreciable degradation of image quality.

1. Perform a Breast coil SNR Verification. Refer to Section 3–2, BREAST COIL SNR VERIFICATION.
2. Record the date and value calculated in Section 3–3, SNR IMAGE ANALYSIS under “SNR Data QA Check” of the Data Table as is instructed.
3. As is instructed in the Data Table, divide the SNR value obtained in the periodic QA check by the original SNR value.
4. If this ratio is not greater than 85%, then there may be a problem with the Breast coil or the MR 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" calibration procedure located in Direction 15065, *Signa System Troubleshooting Guide*, or Direction 15491, *Signa Advantage 1.5T & 0.5T System Troubleshooting Guide*. The procedure can also be found in Direction 2187583–1, *MR Signa Service Methods Release 5.X/8.X*.

#### Phantom Required

- 100 mm TLT Phantom, 46–317586G1

#### Setup Procedure

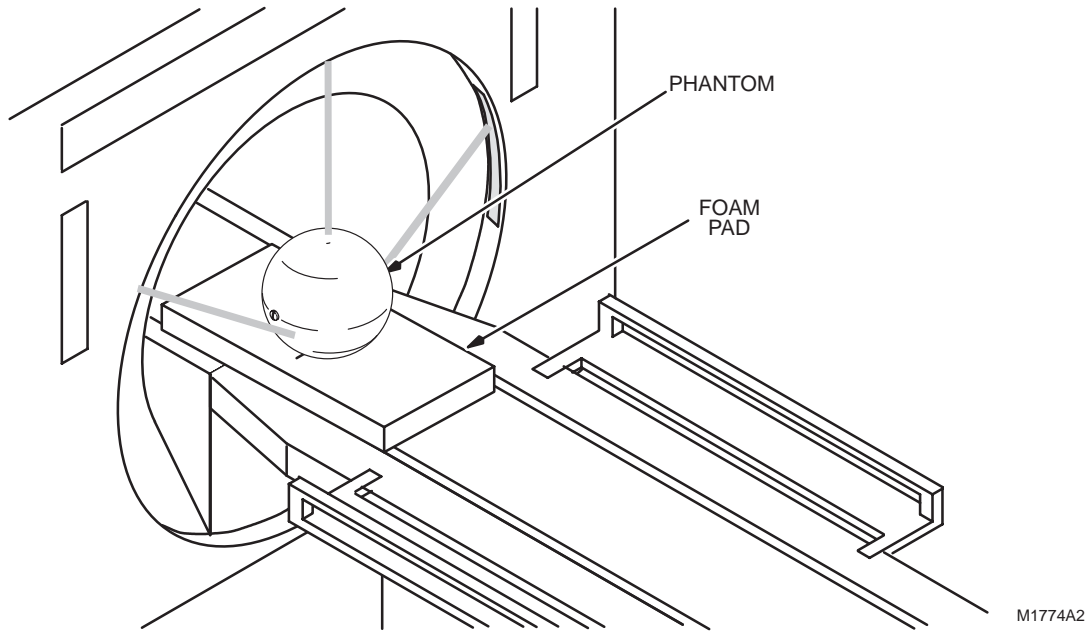


**The Quad Head Coil must be completely removed from the cradle before performing any body scans. Failure to do this may result in damage to the Head Coil T/R Network.**

1. Remove Quad Head Coil (if present) from cradle.
2. Select **[NEW STUDY]** (4.x) or **[New Exam]** (5.x or 8.x) to allow a new Landmark to be set.

**3-1 BODY COIL SNR VERIFICATION (Continued)**

3. Position the 100 mm TLT phantom in the center of the cradle. Use foam pads to raise the phantom to the same height as in the Breast coil. Landmark the center of the phantom and advance the phantom to isocenter using the **[ADVANCE TO SCAN]** button. See Illustration 3-1.



**100 MM TLT PHANTOM LANDMARK SETUP FOR BODY COIL SNR**  
ILLUSTRATION 3-1

3-1 BODY COIL SNR VERIFICATION (continued)

- 4. Setup Scan Prescription as shown in Table 3-1 (4.x) or Table 3-2 (5.x or 8.x).

TABLE 3-1  
BODY COIL SNR – SCAN PROTOCOL (4.x)

SCAN PRESCRIPTION (4.x)	
<u>MAIN MENU</u>	<b>[NEW STUDY]</b>
<u>PATIENT STUDY PARAMETERS</u>	
ID:	<b>GESERVICE</b> See Note 1
Weight:	<b>111</b> (Release 4.8 only)
Monitor SAR?	<b>N</b> (Release 4.7 only) See Note 2 <b>[NEXT PAGE]</b> Once (Release 4.8) Twice (Release 4.7)
<u>PATIENT POSITION</u>	
Patient Entry	<b>[Head First]</b>
Patient Position	<b>[Supine]</b>
Coil Type	<b>[Body Coil]</b>
Axial/Sag. Landmark	<b>[Sternal Notch]</b> <b>[NEXT PAGE]</b>
<u>IMAGING PARAMETERS</u>	
Image Mode	<b>[Single Scan]</b>
Scan Plane	<b>[Sagittal]</b>
Pulse Sequence	<b>[Multiple Echo]</b>
Imaging Option	<b>[None]</b>
Enter PSD Filename:	<b>[NEXT PAGE]</b>
<u>SCAN TIMING</u>	
Number of Echoes	<b>[1]</b>
Echo Time (TE)	<b>[Other] 40 msec</b>
Rep Time (TR)	<b>[400 msec]</b> <b>[NEXT PAGE]</b>
<u>SCANNING RANGE</u>	
Field of View	<b>[Other] 32 cm</b>
Scan Thickness	<b>[3 mm]</b>
Scan Location	<b>(S/I) 0</b>
FOV Center	<b>(R/L) RO (A/P) A0</b> <b>[NEXT PAGE]</b>
<u>ACQUISITION TIME</u>	
Acq. Matrix	<b>[256 x 256]</b>
Imaging Time	<b>[1 NEX 1:47]</b>
Frequency Direction	<b>[R/L]</b>
Contrast	<b>[NO]</b>
Table Delta:	<b>0</b> <b>[NEXT PAGE]</b>
<u>FREQUENCY MODE</u>	<b>[PEAK]</b>
<u>REVIEW</u>	<b>[NEXT PAGE]</b>
<u>SCAN OPERATIONS</u>	
<b>Notes:</b> 1. GESERVICE ID automatically activates the research mode (Release 4.7 only). 2. The "Monitor SAR" prompt does not appear for Release 4.8.	

3-1 BODY COIL SNR VERIFICATION (continued)

TABLE 3-2  
BODY COIL SNR – SCAN PROTOCOL (5.x or 8.x)

SCAN PRESCRIPTION (5.x)	
<u>MAIN MENU</u>	<b>[New Exam]</b>
<u>PATIENT/EXAM INFORMATION</u>	
Id:	<b>geservice</b>
Name:	<b>body snr</b>
Patient Weight	<b>300</b>
	<b>[Patient Position]</b>
<u>PATIENT POSITION</u>	
Patient Entry	<b>[Head First]</b>
Patient Position	<b>[Supine]</b>
Axial/Sag. Landmark	<b>[Sternal Notch]</b>
Coil Type	<b>[Body Coil]</b>
Scan Plane	<b>[Sagittal]</b>
	<b>[Image Params]</b>
<u>IMAGING PARAMETERS</u>	
Image Mode	<b>[2D]</b>
(K SAR must be "On" K)	<b>[Monitor SAR]</b>
Pulse Sequence	<b>[Spin Echo]</b>
Imaging Options	<b>[None]</b>
or enter PSD Filename	<b>[Scan Timing] or [Next Screen]</b>
<u>SCAN TIMING</u>	
Number of Echoes	<b>[1]</b>
Echo Time (TE)	<b>[Other] 40 msec</b>
Rep Time (TR)	<b>[Other] 400 msec</b>
	<b>[Scan Set-Up] (Release 5.3)</b>
	<b>[Scanning Range] (Release 5.2)</b>
	<u>SCAN SET-UP (Release 5.3)</u>
	Auto CF <b>[Peak]</b>
	<b>[Scanning Range]</b>
	<u>SCANNING RANGE</u>
	Field of View <b>[Other] 32 cm</b>
	Scan Thickness <b>[3 mm]</b>
	Interscan Spacing <b>[Other] 0</b>
	Start Loc (I/S): <b>0</b>
	End Loc (I/S): <b>0</b>
	No. of Scan Locations: <b>1</b>
	FOV Center (L/R): <b>0 (P/A): 0</b>
	<b>#[Acq Time]</b>
	<u>ACQUISITION TIME</u>
	Acq. Matrix (freq.) <b>[256]</b>
	Acq. Matrix (phase) <b>[256]</b>
	Frequency Direction <b>[A/P]</b>
	Phase FOV <b>default (Release 5.3)</b>
	Imaging Time <b>[1 NEX 1:49]</b>
	Contrast <b>[No]</b>
	Table Delta: <b>0 mm</b>
	<b>[Scan Ops] (Release 5.3)</b>
	<b>[Scan Set-Up] (Release 5.2)</b>
	<u>SCAN SET-UP (Release 5.2)</u>
	Auto CF <b>[Peak]</b>
	<b>[Scan Ops]</b>
	<u>SCAN OPERATIONS</u>

5. Select **[Auto Prescan]** to properly calibrate the RF power level for the 90 degree and 180 degree pulses.
6. Select **[Scan]**. Observe the resulting image. Ensure that there are no artifacts of any sort in the resulting image. Record the Exam number and Series number for SNR Calculations.
7. Select **[Scan]** again. This second image will be used for determination of Body Coil mode SNR.
8. After completion of scan, select **[Cancel]**. Refer to Section 3-3 for SNR image analysis.

### 3-2 BREAST 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" calibration procedure located in Direction 15065, *Signa System Troubleshooting Guide*, or Direction 15491, *Signa Advantage 1.5T & 0.5T System Troubleshooting Guide*. The procedure can also be found in Direction 2187583–1, *MR Signa Service Methods Release 5.X/8.X*.

#### Phantom Required

- 100 mm TLT Phantoms (2), 46–317586G1

#### Setup Procedure

1. Select **[NEW STUDY]** (4.x) or **[New Exam]** (5.x or 8.x) to allow a new Landmark to be set.

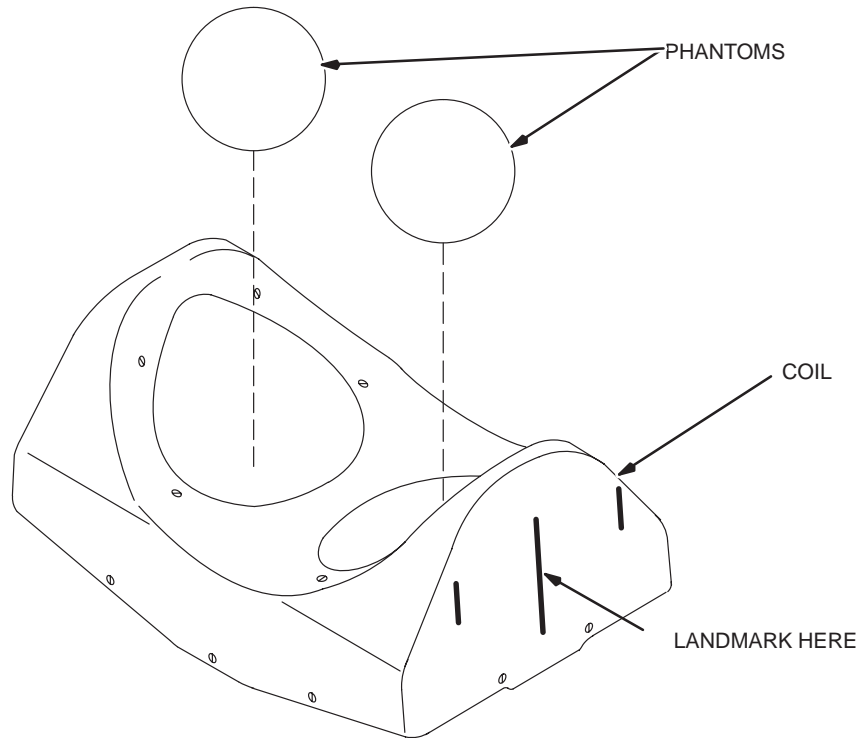


**The Quad Head Coil must be completely removed from the cradle before performing any body scans. Failure to do this may result in damage to the Head Coil T/R Network.**

2. Remove Quad Head Coil (if present) from cradle.
3. Place Breast coil to be tested onto table.
4. Connect Breast coil connector to its mating connector in the Carriage Assembly.

**3-2 BREAST COIL SNR VERIFICATION (continued)**

- 5. Place one phantom in each Breast coil well. See Illustration 3-2.
- 6. Landmark using vertical line on side of Breast coil and advance the coil to isocenter.



**BREAST COIL PHANTOM SETUP**  
ILLUSTRATION 3-2

3-2 BREAST COIL SNR VERIFICATION (continued)

7. Setup Scan Prescription as shown in Table 3-3 (4.x) or Table 3-4 (5.x or 8.x).

TABLE 3-3  
BREAST COIL SNR – SCAN PROTOCOL (4.x)

SCAN PRESCRIPTION (4.x)	
<u>MAIN MENU</u>	<b>[NEW STUDY]</b>
<u>PATIENT STUDY PARAMETERS</u>	
ID:	<b>GESERVICE</b> See Note 1
Weight:	<b>111</b> (Release 4.8 only)
Monitor SAR?	<b>N</b> (Release 4.7 only) See Note 2 <b>[NEXT PAGE]</b> Once (Release 4.8) Twice (Release 4.7)
<u>PATIENT POSITION</u>	
Patient Entry	<b>[Head First]</b>
Patient Position	<b>[Supine]</b>
Coil Type	<b>[Other Coils] [BREAST]</b> Note 3
Axial/Sag. Landmark	<b>[Sternal Notch]</b> <b>[NEXT PAGE]</b>
<u>IMAGING PARAMETERS</u>	
Image Mode	<b>[Single Scan]</b>
Scan Plane	<b>[Axial]</b>
Pulse Sequence	<b>[Multiple Echo]</b>
Imaging Option	<b>[None]</b>
Enter PSD Filename:	<b>[NEXT PAGE]</b>
<u>SCAN TIMING</u>	
Number of Echoes	<b>[1]</b>
Echo Time (TE)	<b>[Other] 40 msec</b>
Rep Time (TR)	<b>[400 msec]</b> <b>[NEXT PAGE]</b>
<u>SCANNING RANGE</u>	
Field of View	<b>[Other] 32 cm</b>
Scan Thickness	<b>[3 mm]</b>
Scan Location	<b>(S/I) 0</b>
FOV Center	<b>(R/L)0 (A/P) A0</b> <b>[NEXT PAGE]</b>
<u>ACQUISITION TIME</u>	
Acq. Matrix	<b>[256 x 256]</b>
Imaging Time	<b>[1 NEX 1:47]</b>
Frequency Direction	<b>[R/L]</b>
Contrast	<b>[NO]</b>
Table Delta:	<b>0</b> <b>[NEXT PAGE]</b>
<u>FREQUENCY MODE</u>	<b>[Peak]</b>
<u>REVIEW</u>	<b>[NEXT PAGE]</b>
<u>SCAN OPERATIONS</u>	
Note 1: GESERVICE ID automatically activates the research mode (Release 4.7 only). Note 2: The "Monitor SAR" prompt does not appear for Release 4.8. Note 3: Select <b>[BREASTPA]</b> for phased array configuration of Breast coil.	

3-2 BREAST COIL SNR VERIFICATION (continued)

TABLE 3-4  
BREAST COIL SNR – SCAN PROTOCOL (5.x or 8.x)

SCAN PRESCRIPTION (5.x)	
<p><b>MAIN MENU</b>                    <b>[New Exam]</b></p> <p><b>PATIENT/EXAM INFORMATION</b></p> <p>                                  Id: <b>geservice</b>                                   Name: <b>coil snr</b>                                   Patient Weight: <b>300</b>                                   <b>[Patient Position]</b></p> <p><b>PATIENT POSITION</b></p> <p>                                  Patient Entry: <b>[Head First]</b>                                   Patient Position: <b>[Supine]</b>                                   Axial/Sag. Landmark: <b>[Sternal Notch]</b>                                   Coil Type: <b>[Other Coils] [BREAST] Note 1</b>                                   Scan Plane: <b>[Sagittal]</b>                                   <b>[Image Params]</b></p> <p><b>IMAGING PARAMETERS</b></p> <p>                                  Image Mode: <b>[2D]</b>                                   (K SAR must be "On" K): <b>[Monitor SAR]</b>                                   Pulse Sequence: <b>[Spin Echo]</b>                                   Imaging Options: <b>[None]</b>                                   or enter PSD Filename: <b>[Scan Timing] or [Next Screen]</b></p> <p><b>SCAN TIMING</b></p> <p>                                  Number of Echoes: <b>[1]</b>                                   Echo Time (TE): <b>[Other] 40 msec</b>                                   Rep Time (TR): <b>[Other] 400 msec</b>                                   <b>[Scan Set-Up] (Release 5.3)</b>                                   <b>[Scanning Range] (Release 5.2)</b></p>	<p><b>SCAN SET-UP (Release 5.3)</b></p> <p>                                  Auto CF: <b>[Peak]</b>                                   <b>[Scanning Range]</b></p> <p><b>SCANNING RANGE</b></p> <p>                                  Field of View: <b>[Other] 32 cm</b>                                   Scan Thickness: <b>[3 mm]</b>                                   Interscan Spacing: <b>[Other] 0</b>                                   Start Loc (I/S): <b>0</b>                                   End Loc (I/S): <b>0</b>                                   No. of Scan Locations: <b>1</b>                                   FOV Center (L/R): <b>0 (P/A): 0</b>                                   <b>[#] [Acq Time]</b></p> <p><b>ACQUISITION TIME</b></p> <p>                                  Acq. Matrix (freq.): <b>[256]</b>                                   Acq. Matrix (phase): <b>[256]</b>                                   Frequency Direction: <b>[A/P]</b>                                   Phase FOV: <b>default (Release 5.3)</b>                                   Imaging Time: <b>[1 NEX 1:49]</b>                                   Contrast: <b>[No]</b>                                   Table Delta: <b>0 mm</b>                                   <b>[Scan Ops] (Release 5.3)</b>                                   <b>[Scan Set-Up] (Release 5.2)</b></p> <p><b>SCAN SET-UP (Release 5.2)</b></p> <p>                                  Auto CF: <b>[Peak]</b>                                   <b>[Scan Ops]</b></p> <p><b>SCAN OPERATIONS</b></p>
<p>Note 1: Select <b>[BREASTPA]</b> for phased array configuration of Breast Coil.</p>	

8. Select **[Auto Prescan]** to properly calibrate the RF power level for the 90 degree and 180 degree pulses.
9. Select **[Scan]**. Observe the resulting image of the spheres. See Illustration 3-3. Ensure that there are no artifacts of any sort in the sphere images. Record the Exam number and Series number for SNR Calculations.
10. Select **[Scan]** again. This second image of the spheres will be used for determination of BREAST mode SNR.
11. After scan is complete, select **[Cancel]**. Check image for indications of coupling, see Illustration 3-3. Refer to Section 3-3 for SNR image analysis.

3-2 BREAST COIL SNR VERIFICATION (continued)



PROPERLY DE-COUPLED IMAGE



IMPROPERLY COUPLED IMAGE

**NOTE:** IF COUPLING IS PRESENT, NOTIFY YOUR GEMS SERVICE REPRESENTATIVE.

BREAST COIL IMAGES  
ILLUSTRATION 3-3

**3-3 SNR IMAGE ANALYSIS**

**3-3-1 SNR Image Analysis (Release 4.X)**

**Note**

See 3-3-2 For Release 5.X or 3-3-3 for Release 8.X SNR Image Analysis

**Description**

The CLIPS macro will ask for the first image in the series to analyze. The macro assumes you have done two back-to-back scans, and will take the designated image and the next image in the series (i.e. if you give it image 3, it will take 3 and 4). It will also ask you to designate three points on the border of the phantom image to use in positioning the analysis ROI. If your image is too big, too small, or the three points were selected too close together, the macro will inform you.

**Procedure**

1. Touch **[UTILITIES]**, then **[Clips]**.

CLIPS

-----

- 1 Run CLIPS
- 2 Save files
- 3 Restore files
- 4 Remove files
- 5 Exit

Enter the number of your selection **1** **(ENTER)**

- 1 = Operator console
- 2 = Remot1
- 3 = Remote2
- 4 = Exit

Which image processor would you like to use (1 2 or 3) ? **1** **(ENTER)**

IP selected is at the operator console.

Do you wish to boot the Image Processor? (Y or N)

**Y** **(ENTER)**

You do not have to reboot the IP each time you enter.

Welcome to the Command Line Image Processing System (CLIPS)

CLIPS > **LIST(STUDY);** **(ENTER)**

3-3-1 SNR Image Analysis (Release 4.X)(continued)

STUDY LIST

```
=====
                                     ===
STUDY #          PATIENT NAME          PATIENT I.D.          DATE
-----
00001            BDY_SNR                GESERVICE            9-JULY-89
00002            HD_SNR                GESERVICE            9-JULY-89
-----
```

CURRENT DEFAULTS --- PATIENT ID = / /

- N - NEXT PAGE
- P - PREVIOUS PAGE
- S - SELECT STUDY
- C - CANCEL

choice ?

S

ENTER STUDY NUMBER --

1

Enter appropriate study number.

CLIPS > LIST(SERIES);

SERIES LIST

```
=====
                                     ===
SERIES #          # OF IMAGES          SERIES TYPE          PULSE TYPE
-----
001                002                AXIAL                ME
002                002                SAG                  ME
003                002                COR                  ME
-----
```

CURRENT DEFAULTS --- PATIENT ID = SNR 0000S/00S/001

- N - NEXT PAGE
- P - PREVIOUS PAGE
- S - SELECT SERIES
- C - CANCEL

choice ?

S

ENTER SERIES NUMBER --

1

Enter appropriate series number.

CLIPS > DIS;

or you could LIST(IMAGE); to select the image you want.

3-3-1 SNR Image Analysis (Release 4.X)(continued)

CLIPS > EXECUTE(SNR); **ENTER** or just EXE(SNR); **ENTER**.

THIS MACRO CALCULATES THE SNR USING THE GE HEAD OR BODY PHANTOM.

ENTER THE NUMBER OF THE FIRST IMAGE OF THE TWO-IMAGE SET AND !

EXAMPLE INPUT> 1!

Please start entering data. Type an ! to end input mode.

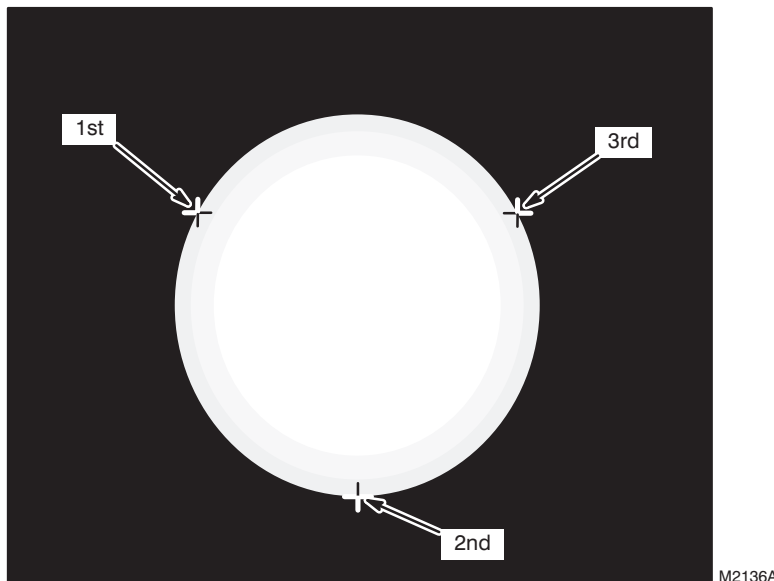
CLIPS INPUT> **1!** **ENTER**

CORRECT POSITIONING OF THE SNR ANALYSIS ROI DEPENDS ON FINDING THE CENTER OF THE PHANTOM. YOU WILL BE PROMPTED TO IDENTIFY THREE POINTS AT THE EDGE OF THE PHANTOM. CARE SHOULD BE TAKEN TO PICK THREE POINTS AS FAR AWAY FROM EACH OTHER AS POSSIBLE (I.E. 2, 6, AND 10 O CLOCK) AND AVOID FLAT SPOTS AND IRREGULARITIES ON THE EDGE.

See Illustration 3-4.

Note

The order of cursor placement must be 10, 6, then 2 o'clock positions. Using a different order may give an error.



SNR CURSOR POSITIONS  
ILLUSTRATION 3-4

POSITION CURSOR AT FIRST POINT AND ENTER !

Place cursor at 10:00 position on edge of image.

Please start entering data. Type an ! to end input mode.

CLIPS INPUT> **!** **ENTER**

POSITION CURSOR AT SECOND POINT AND ENTER !

Place cursor at 6:00 position.

Please start entering data. Type an ! to end input mode.

CLIPS INPUT> **!** **ENTER**

3-3-1 SNR Image Analysis (Release 4.X)(continued)

POSITION CURSOR AT THIRD POINT AND ENTER ! Place cursor at 2:00 position.

Please start entering data. Type an ! to end input mode.

CLIPS INPUT> ! ENTER

PHANTOM POINTS AND RADIUS OK. BEGIN ANALYSIS.

The program will then perform the analysis and display the final values on the image monitor. Record Signal, Noise and Signal to Noise in Data Table.

DO YOU WANT TO SAVE THIS DATA?

ENTER A 1! FOR YES, A 0! FOR NO.

Please start entering data. Type an ! to end input mode.

CLIPS INPUT> 0! ENTER

DATA NOT SAVED

CLIPS > LIST(SERIES); ENTER

Select the next series and repeat the above analysis for each image pair. Type BYE; ENTER when completed to exit CLIPS.

- 2. When all analyses are complete, reset Auto Center Frequency mode by touching [SCAN MODES], [Default Auto CF], then [EXECUTE].

Note

You do not have to reset the Auto Center Frequency mode if you are proceeding on to more image quality scans.

- 3. Record the date and value calculated in the appropriate column under "SNR Data QA Check" of the Data Table on page DT-1 (following Section 5, RENEWAL PARTS) as is instructed.

3-3-2 SNR Image Analysis (Release 5.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.

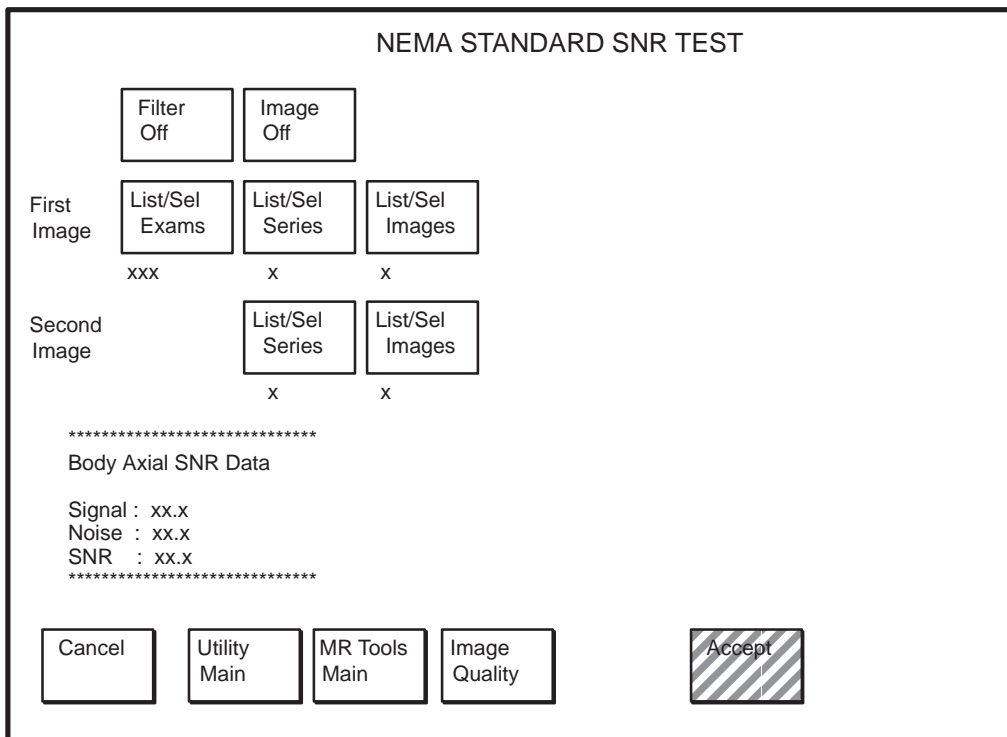
Procedure


1. Touch [UTILITIES], [MR Tools], [Image Quality], then [SNR Test]. The SNR Test screen is displayed; see Illustration 3-5.
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.

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. Enter second image series and image numbers. If series or image numbers are not known, select [List Series] or [List Images] to display list to choose from. The second image Exam Number is defaulted to the same as first image.



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

SNR TEST SCREEN  
ILLUSTRATION 3-5

**3–3–2 SNR Image Analysis (Release 5.X) (continued)**

4. If high pass filtering is desired to be performed on data, touch **[Filter Off]** which will highlight and change to **[Filter On]**.
5. If the difference image annotated with data is to be created, touch **[Image Off]** which will highlight and change to **[Image On]**.
6. Touch **[Accept]** to begin analysis. The final values are displayed on the touch screen, see Illustration 3–5.
7. Touch **[Continue]** then select the next exam and repeat the above analysis for each image pair.
8. Record the date and value calculated in the appropriate column under “SNR Data QA Check” of the Data Table on page DT–1 (following Section 5, RENEWAL PARTS) as is instructed.

3-3-3 SNR Image Analysis (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 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], [Image Quality], then [Start].

<<< 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.)

3-3-3 SNR Image Analysis (Release 8.X) (continued)

=====  
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*)

3-3-3 SNR Image Analysis (Release 8.X) (continued)

\*\*\*\*\*
\* 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 \*
\*\*\*\*\*

**3-3-3 SNR Image Analysis (Release 8.X) (continued)**

<<< 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]**

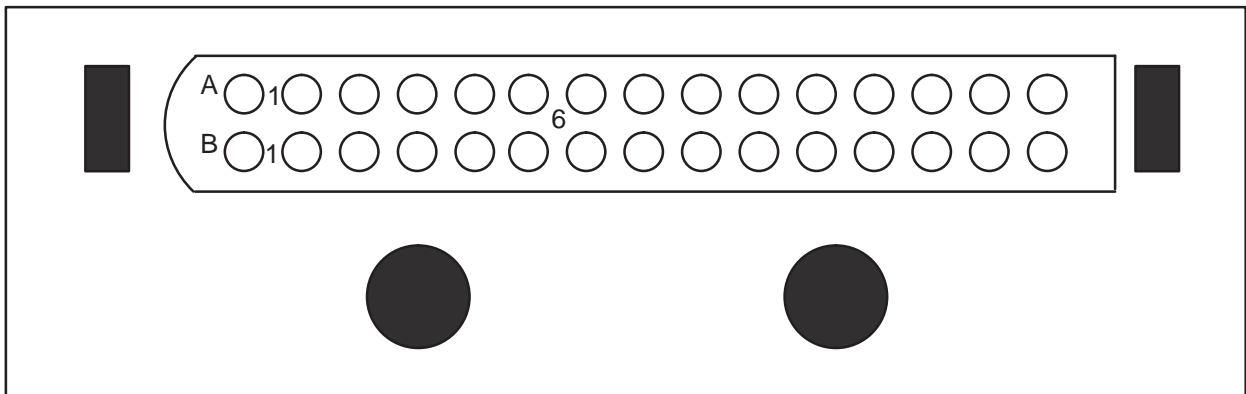
2. Record the date and value calculated in the appropriate column under "SNR Data QA Check" of the Data Table ( following Section 5, RENEWAL PARTS) as is instructed.

**3-4 CHECKING THE PROTECTION PIN DIODES WITH DIGITAL MULTIMETER (DMM)**

1. Select the DIODE TEST function on the Digital Multimeter (DMM).
2. Connect the NEGATIVE lead of the DMM to the external cable connector ground pin. Connect the POSITIVE lead to the external cable connector signal pin. Refer to Table 3-5 and Illustration 3-6 (Phased Array) or Table 3-6 and Illustration 3-7 (Single-Receiver).
3. A reading of +0.400 to +0.900 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 bad PIN diode.
5. If a reading above +0.900 is observed in step 2, the PIN diode is defective.
6. Connect the NEGATIVE lead of the DMM to the external cable connector signal pin. Connect the POSITIVE lead to the external cable connector ground pin. Refer to Table 3-5 and Illustration 3-6 (Phased Array) or Table 3-6 and Illustration 3-7 (Single-Receiver).
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, replace the PIN diode. Refer to Section 4-3, REPLACING THE PROTECTION/COUPLING PIN DIODES.

TABLE 3-5  
DIODE TEST CONNECTIONS (phased array COIL)

COIL NUMBER	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 6	FOR STEP 2	FOR STEP 6
1	B11	A11	A11	B11
2	B9	A9	A9	B9

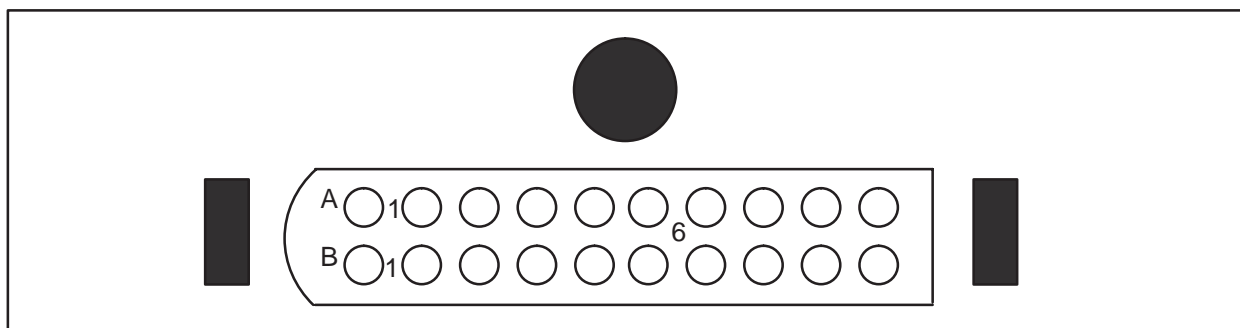


PIN LOCATIONS FOR PHASED ARRAY CONNECTOR  
ILLUSTRATION 3-6

**3-4 CHECKING THE PROTECTION PIN DIODES WITH DIGITAL MULTIMETER (DMM) (continued)**

TABLE 3-6  
DIODE TEST CONNECTIONS (single-receiver)

COIL NUMBER	POSITIVE LEAD CONNECTION		NEGATIVE LEAD CONNECTION	
	FOR STEP 2	FOR STEP 6	FOR STEP 2	FOR STEP 6
1	A2, B2	A1, B1	A1, B1	A2, B2
2	A9,B9	A10, B10	A10, B10	A9, B9



PIN LOCATIONS FOR SINGLE-RECEIVER CONNECTOR  
ILLUSTRATION 3-7

**3-5 CHECKING THE EXTERNAL CABLE**

1. Select the DIODE TEST function on the Digital Multimeter (DMM).
2. Connect the NEGATIVE lead of the DMM to the external cable connector ground pin. Connect the POSITIVE lead to the external cable connector signal pin. Refer to Table 3-5 and Illustration 3-6 (Phased Array) or Table 3-6 and Illustration 3-7 (Single-Receiver).
3. Flex the external cable, especially near the connectors and the strain relief, and observe that a reading of +0.400 to +0.900 should remain on the DMM, with no instability or fluctuations.
4. Connect the NEGATIVE lead of the DMM to the external cable connector signal pin. Connect the POSITIVE lead to the external cable connector ground pin. Refer to Table 3-5 and Illustration 3-6 (Phased Array) or Table 3-6 and Illustration 3-7 (Single-Receiver).
5. Flex the 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.
6. If the cable fails any of the above tests, it should be replaced. Refer to Section 4-2, REPLACING THE EXTERNAL CABLE.

**3-6 CHECKING THE PASSIVE TRANSMIT BLOCKING DIODES**

Refer to Section 4-5, in REPLACEMENT / MAINTENANCE.

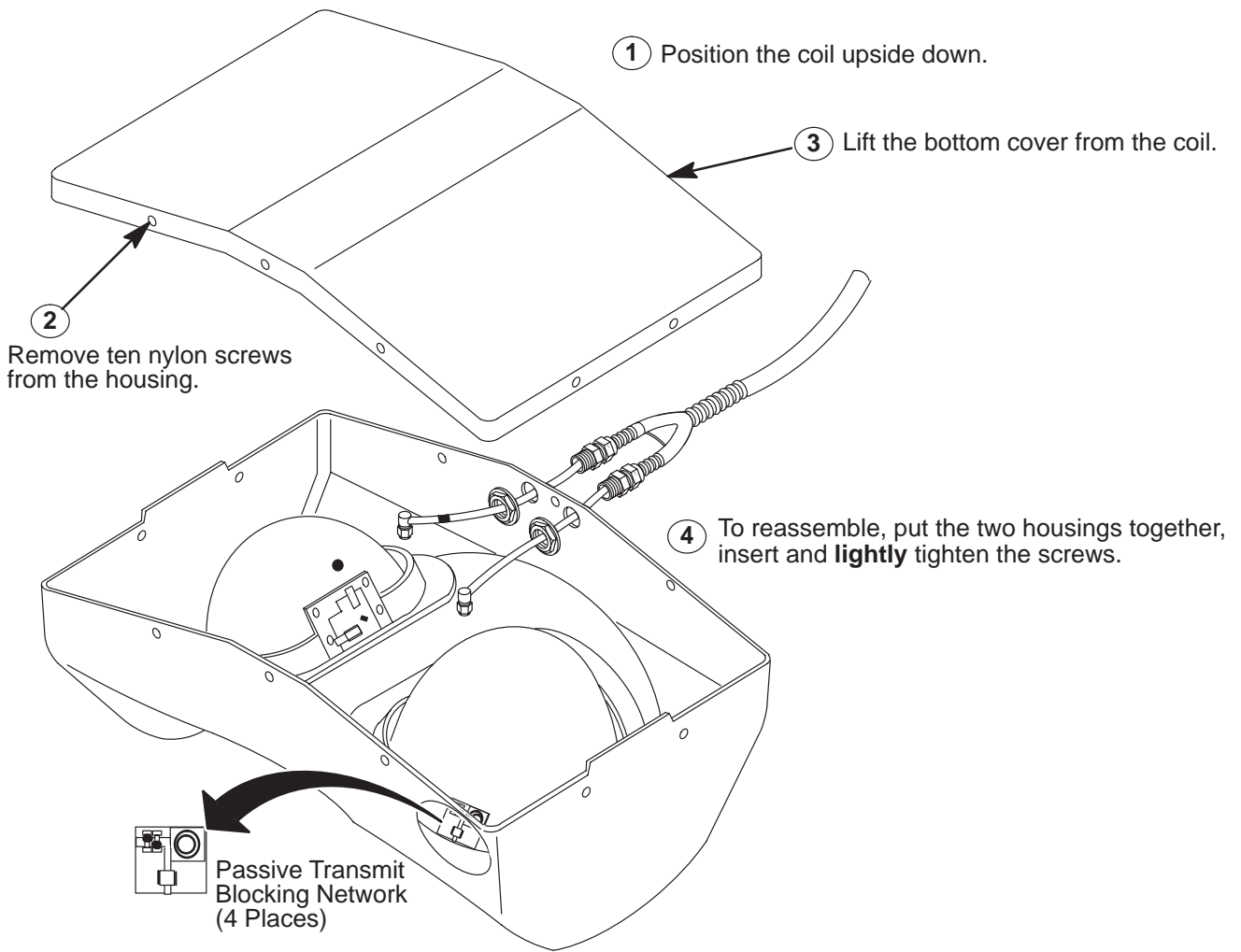
---

Blank

DIRECTION 46-305140

## SECTION 4 – REPLACEMENT/MAINTENANCE

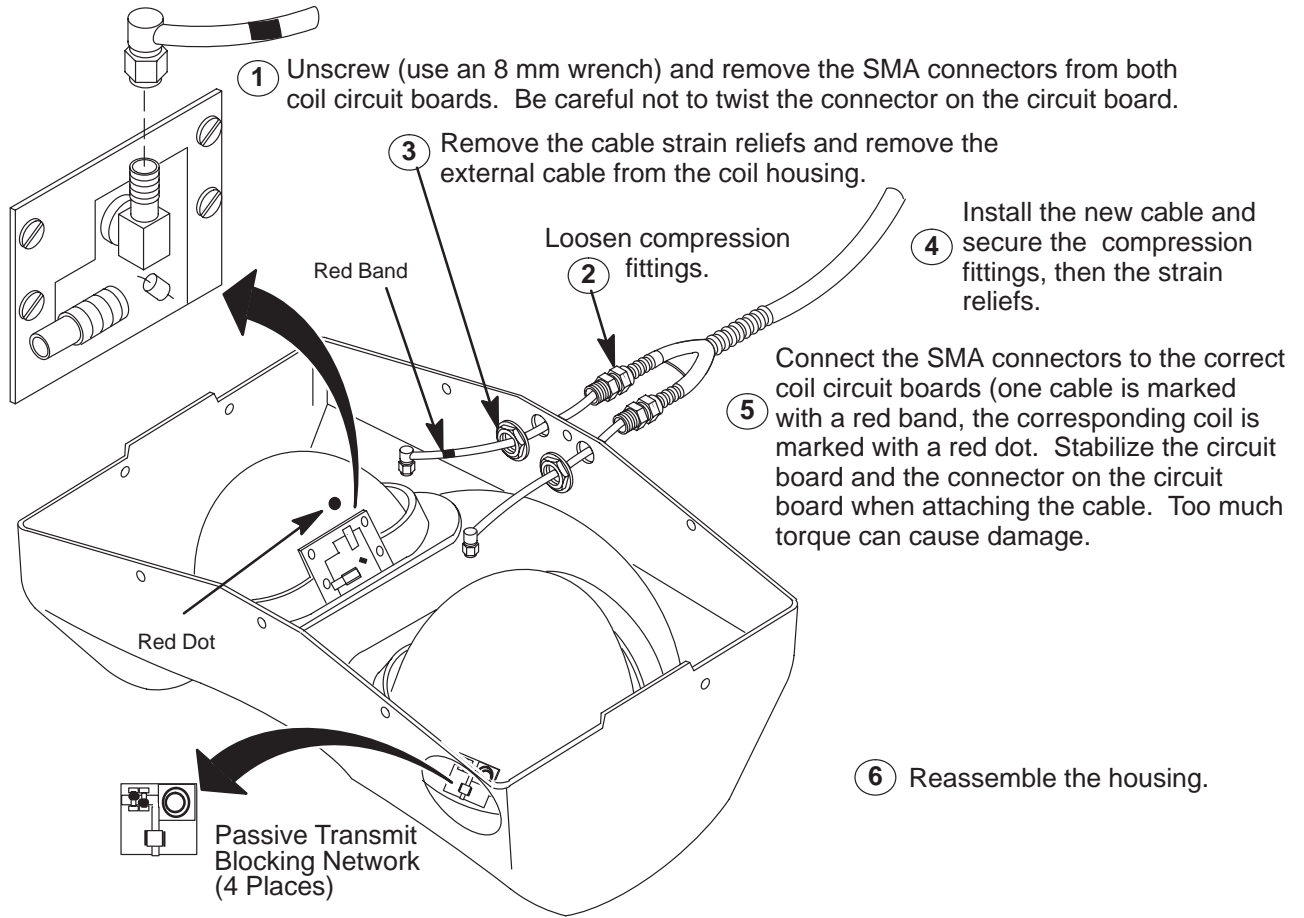
### 4-1 DISASSEMBLY/ASSEMBLY OF BREAST COIL



DISASSEMBLY/ASSEMBLY OF BREAST COIL

ILLUSTRATION 4-1

4-2 REPLACING THE EXTERNAL CABLE



REPLACING THE EXTERNAL CABLE  
ILLUSTRATION 4-2

4-3 REPLACING THE PROTECTION/DE-COUPLING PIN DIODES

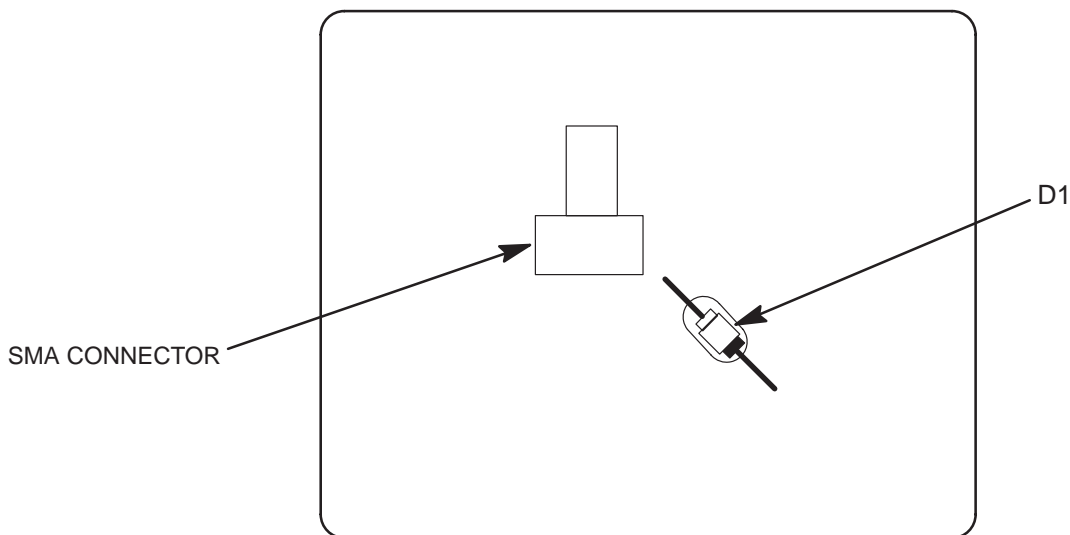


Use a 25W solder iron and protect the circuit board from static electricity. Be careful not to damage the circuit board by overheating the solder.

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. Disassemble the top and bottom housings, if necessary. Refer to Section 4-1. See Illustration 4-1.
2. Use an anti-static wrist band when touching the circuit board.
3. Replace the PIN diode (D1) only with an exact replacement diode (see Renewal Parts). See Illustration 4-3.



NOTE: NOT ALL COMPONENTS ARE SHOWN

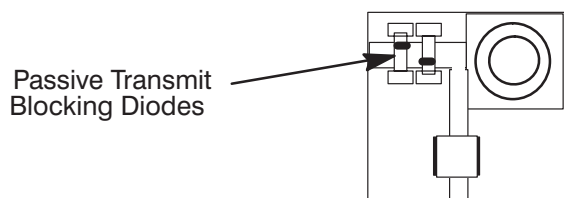
COIL PCB  
ILLUSTRATION 4-3

**4-4 CHECKING THE CABLES**

Check the external cable for cracks or breaks once each week. Replace the external cable if any damage or wear is found. Refer to Section 4-2, Illustration 4-2, REPLACING THE EXTERNAL CABLE, for external cable replacement procedure.

**4-5 CHECKING THE PASSIVE TRANSMIT BLOCKING DIODES**

1. Disassemble the top and bottom housings, if necessary. Refer to Section 4-1, Illustration 4-1.
2. Using a Digital Multimeter, measure the diode voltage drop across the passive diode pairs. See Illustration 4-4.
3. A measurement between 0.5 and 1.0 volts, in both directions, indicates a good diode pair.
4. A measurement below 0.5 volts indicates a shorted diode. Replace the coil.
5. A measurement above 1.0 volts indicates an open diode. Replace the coil.



**PASSIVE PCB**  
ILLUSTRATION 4-4

**4-6 CLEANING THE BREAST COIL**



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

Clean the Breast Coil and external cable with a mild dishwashing liquid and water solution. Wet a soft cloth with the solution and proceed to clean.

## SECTION 5 – RENEWAL PARTS

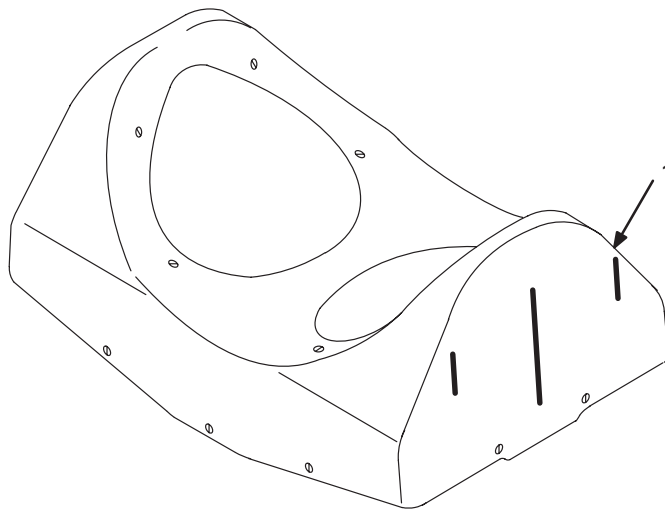
**WARNING!**

**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 4-5, CLEANING THE BREAST COIL. It is the responsibility of the GEMS employee to insure the part/equipment has been properly decontaminated prior to shipment.

BREAST COIL WITHOUT CABLE

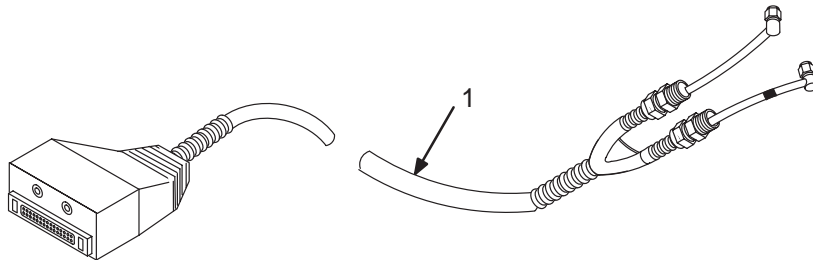
46-320785P2/P3



Item	Part Number	FRU	Name	Quantity	Description (Remarks)
1	46-320785P2/P3	1	BREAST COIL	1	BREAST COIL WITHOUT CABLE

PHASED ARRAY CABLE REPAIR KIT

46-320756P1/P2



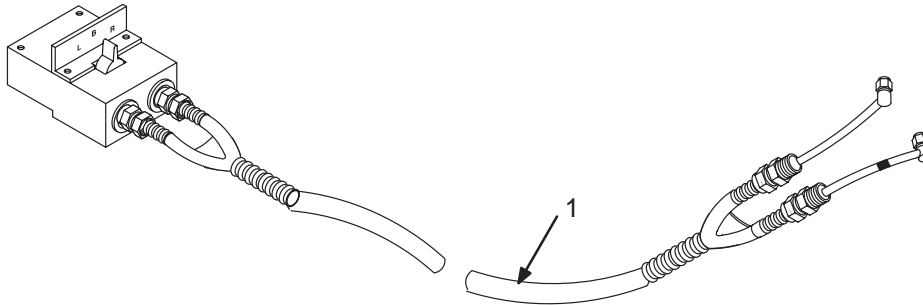
Item	Part Number	FRU	Name	Quantity	Description (Remarks)
1	46-320756P1	1	CABLE KIT	1	PHASED ARRAY CABLE REPAIR KIT*
2	46-320756P2	1	CABLE KIT	1	PHASED ARRAY CABLE REPAIR KIT, UFI COMPATIBLE**

\* For coils which have not had FMI60413; ie, part number 46-320785P1. Please also order FMI60413 for this site.

\*\* For coils which have had FMI60413 or are already part number 46-320785P2 or P3.

**SINGLE-RECEIVER CABLE REPAIR KIT**

**46-320765P1/P2**



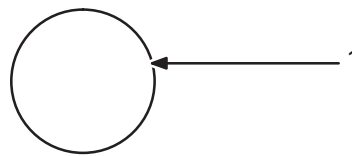
Item	Part Number	FRU	Name	Quantity	Description (Remarks)
1	46-320765P1	1	CABLE KIT	1	SINGLE-RECEIVER CABLE REPAIR KIT*
2	46-320765P2	1	CABLE KIT	1	SINGLE-RECEIVER CABLE REPAIR KIT, UFI COMPATIBLE**

\* For coils which have not had FMI60413; ie, part number 46-320785P1. Please also order FMI60413 for this site.

\*\* For coils which have had FMI60413 or are already part number 46-320785P2 or P3.

**PHANTOM**

**46-317586G1**



Item	Part Number	FRU	Name	Quantity	Description (Remarks)
1	46-317586G1	2	PHANTOM	1	100mm TLT PHANTOM

**PIN DIODE**

**46-221735P1**

Item	Part Number	FRU	Name	Quantity	Description (Remarks)
1	46-221735P1	2	DIODE	1	UM9415 PIN DIODE

# 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 – 4 (for single-receiver coil) or column 5 (for phased array coil) 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: \_\_\_\_\_

Breast coil SNR Value:    Unilateral Left \_\_\_\_\_    Both \_\_\_\_\_    Unilateral Right \_\_\_\_\_

OR Phased Array Coil \_\_\_\_\_

Date: \_\_\_\_\_

### SNR DATA QA (QUALITY ASSURANCE) CHECK:

1	2	3	4	5	6	
Date:	Unilateral Left QA SNR Value:	Both QA SNR Value:	Unilateral Right QA SNR Value:	Phased Array Coil QA SNR Value:	Are new values divided by original values > 85%?	
_____	_____	_____	_____	_____	_____	Y/N
_____	_____	_____	_____	_____	_____	Y/N
_____	_____	_____	_____	_____	_____	Y/N
_____	_____	_____	_____	_____	_____	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 is needed.

# DEFECTIVE COIL RETURN FORM

### Note

To allow for proper assessment of defective returned coils, this form must be completely filled out and 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 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

### IMAGE QUALITY CHECKS

SNR Test
Body Coil SNR
Breast Coil SNR

### ELECTRICAL CHECKS

Pin Diode Test
Diode Drop Forward Bias
Diode Drop Reverse Bias

**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" calibration procedure located in Direction 15065, *Signa System Troubleshooting Guide*, or Direction 15491, *Signa Advantage 1.5T & 0.5T System Troubleshooting Guide*. The procedure can also be found in Direction 2187583-1, *MR Signa Service Methods Release 5.X/8.X*. Use Table DR-1 to record the TLT results of the defective coil.

TABLE DR-1  
TLT DATA FOR DEFECTIVE PHASED ARRAY COIL

SITE:		NAME:	DATE:
TLT FILE NUMBER:			
SNR:	NOISE (0)		
	NOISE (1)		
	NOISE (C)		
	SNR MEAN (0)		
	SNR MEAN (1)		
	SNR MEAN (C)		
TR MAP: (Combined Results)	89-91 (C)	%	%
	85-95 (C)	%	%
	65-115 (C)	%	%
	FLIP MEAN (C)		
	FLIP SDV (C)		
	RCV MEAN (C)		
	RCV SDV (C)		
	DIFF MEAN (C)		
	DIFF SDV (C)		

TABLE DR-2  
TLT DATA FOR DEFECTIVE SURFACE COIL

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

## APPENDIX A – SCHEMATICS

### A-1 SCHEMATICS

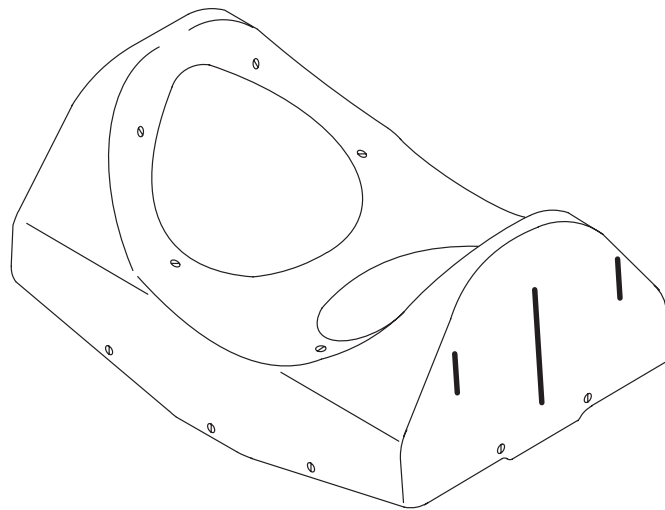
- Breast Coil 46-320785P3 (P1 and P2, see notes in schematic)
- Input/Decoupling Circuit
- Bilateral Combiner Circuit

Blank

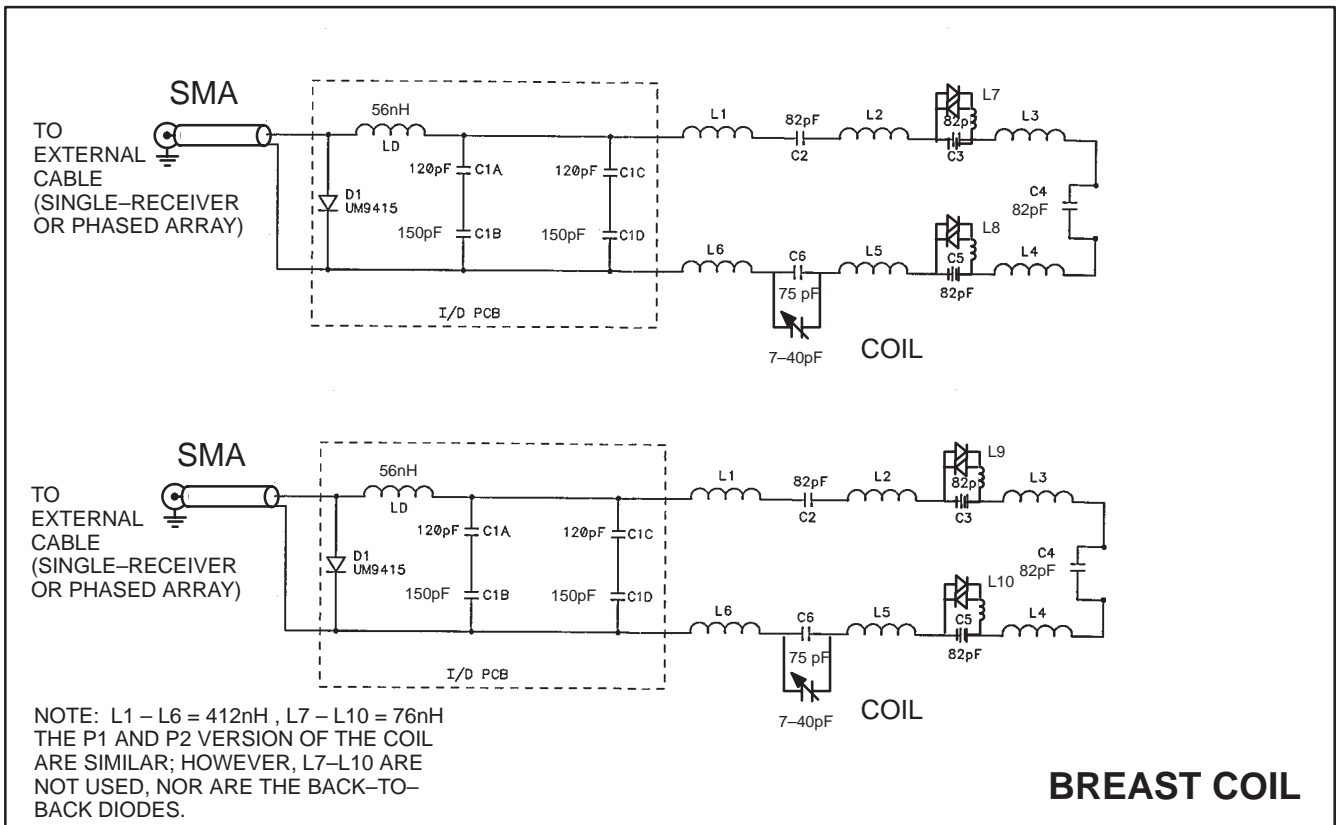
DIRECTION 46-305140

**MG2 A16 A16  
BREAST COIL**

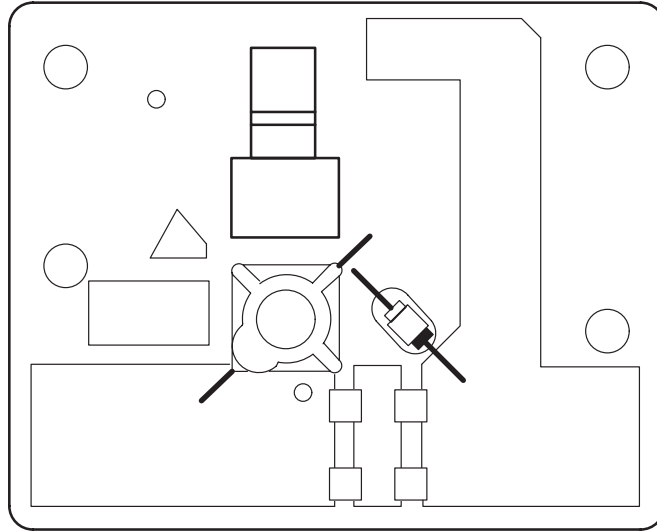
46-320785P2/P3

**Description**

The Breast Coil is a receive only coil composed of two integral linear coils. The coil can function as a bilateral coil which can image the right, left, or both breasts when selected by an external combiner switch, 46-320765P2. The coil can also function as a phased array coil if the system has the phased array option, when used with a phased array external cable, 46-320756P2.

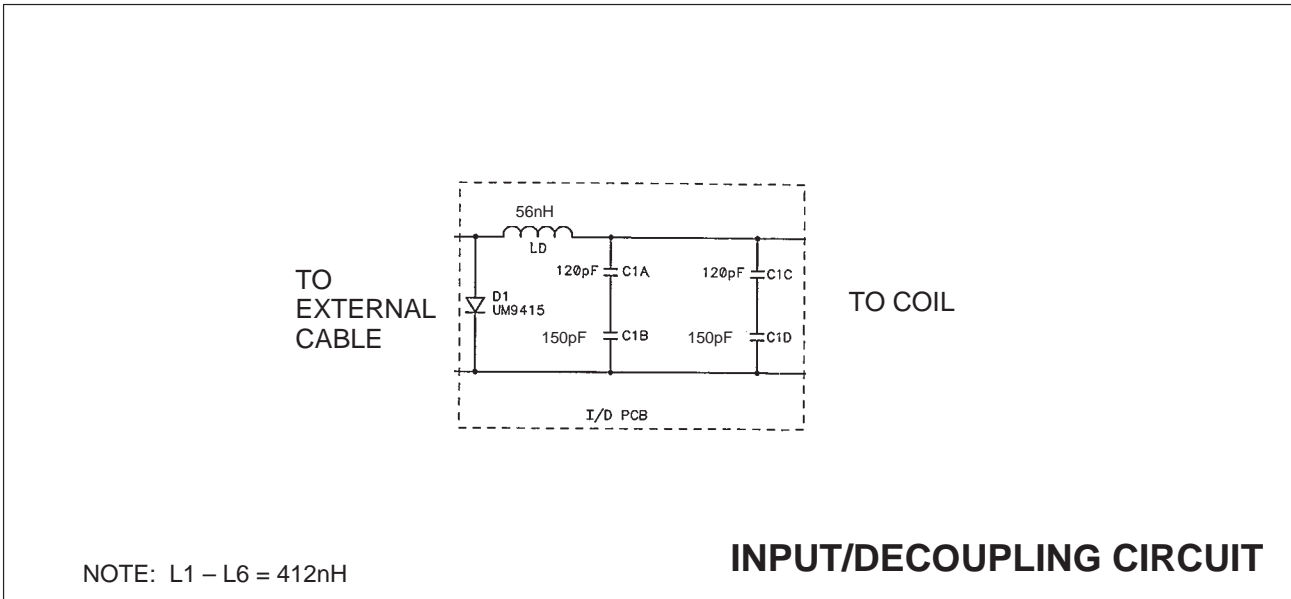


**MG2 A16 A16 A1  
INPUT/DECOUPLING CIRCUIT**

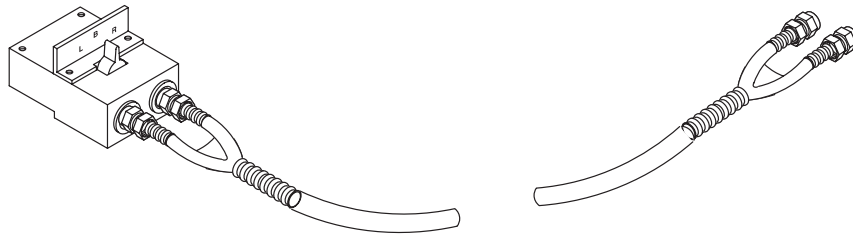


**Description**

The decoupling of the Breast coil from the transmit RF excitation field shall be accomplished by blocking resonant networks. These networks are switched in series with the closed loops of the coils by means of active PIN RF switching diodes. The diodes are activated by the DC bias supplied at the Carriage Cover surface coil port.

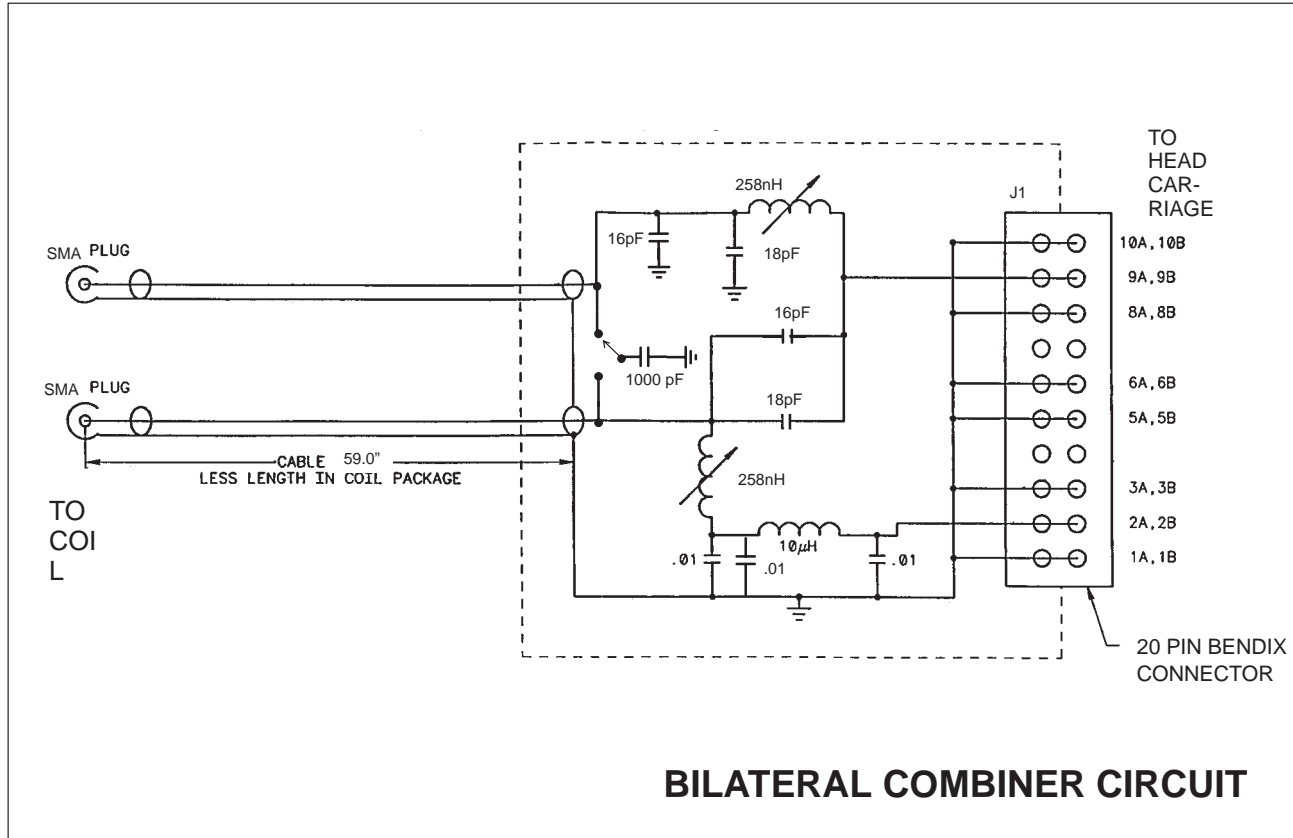


# MG2 A16 A16 A2 BILATERAL COMBINER CIRCUIT



## Description

This bilateral combiner allows the Breast coil to function as a bilateral or unilateral coil when selected by the external switch on the combiner. The combiner provides an interface to add together the signals from the two coils with the proper phase relationship to eliminate artifacts within the total image.





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