GE MEDICAL SYSTEMS

Technical Publications

Direction 46-305115
Revision 1

Signa® 1.5T
Quadrature Cervical Spine Coil

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, nature, 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 (141) 785-5052/8*323-5052 **immediately** after damage is found. At this time be ready to describe name of carrier, delivery date, consignee name, freight or express bill number, item damaged, and extent of damage.

Complete instructions regarding claim procedures are found in section “S” of the Policy & Procedure Bulletins.

3/12/92

GE MEDICAL SYSTEMS

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GE Medical Systems - Europe: Telex 261794
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1-0 TOOLS AND EQUIPMENT

SPECIAL TOOLS

ITEM	PART #	DESCRIPTION	QTY
1	46-317048P2	DecouplingTest Phantom - 1 Liter	1
2	46-194427P49	Beckman 3030 DVM or Equilvalent	1
3	46-255836P40	Vector Impedance Meter	1
4	46-307307G1	Daniels Crimp Tool Kit including:	1
	46-255841P1	Crimp Tool	1
	46-255841P100	Die Insert RG58/59	1

2-0 QUAD CERVICAL SPINE COIL INSTALLATION INSTRUCTIONS

2-1 System Polarity

Before any quadrature coil can be used on the Signa® Advantage™ 1.5T System, the system polarity must be determined and the user coil adapted to reflect the same polarity.

2-1-1 Determining System Polarity

1. Select [**NEW EXAM**] to enable the patient table **LANDMARK** function. Locate the surface coil decoupling phantom on the patient table. Do not place the Quad C-Spine Coil under the decoupling phantom. Center the decoupling phantom; X, Y, Z using the positioning lights, **LANDMARK** and advance to isocenter. Set up a scan according to the parameters shown in ILLUSTRATION 2-1 for 3.X and 4.X systems or ILLUSTRATION 2-2 for 5.X systems. At the **PREVIEW SCREEN**, press **SCAN OPS. DO NOT SCAN AT THIS TIME.**

2. Press [**MODIFY CVS**]. Type **CF_XFULL** (3.x and 4.x) or **CFXFULL** (5.x) in the column under **CV Name.**

3. Observe the **Current Value** column across from **CF_XFULL** or **CFXFULL.** If there is a (-) sign in front of the number, the system polarity is **NEGATIVE**. If no sign appears in front of the number, the system polarity is **POSITIVE.**

4. Press [**ENTER**] to default to current value.

2-1-2 Checking Coil Polarity

Observe the polarity label on the cable exit or window under coil. See ILLUSTRATION 2-3. The coil polarity should be the same as the system polarity. If the coil polarity is different, perform Section 7-1 - Coaxial Cable Replacement. After performing step 7-1-4, remove the plug from the other access hole in the front of the coil. Connect the cable SMA connector to balun board in the desired polarity. Tighten firmly. Continue with the rest of the steps in Section 7-1. Replace the plug into the remaining polarity access hole.

MAIN MENU	[**NEW STUDY**]
PATIENT STUDY PARAMETERS	
ID:	**GESERVICE**
Patient Weight:	**111 LBS**
Monitor SAR?:	**Y**
	[**NEXT PAGE**]
PATIENT POSITION	
Patient Entry:	[**HEAD FIRST**]
Patient Position:	[**SUPINE**]
Coil Type:	[**BODY**]
Axial/Sag Landmark:	[**STERNAL NOTCH**]
	[**NEXT PAGE**]
IMAGING PARAMETERS	
Image mode:	[**MULTISCAN**]
Scan Mode:	[**AXIAL**]
Pulse Sequence:	[**MULTIPLE ECHO**]
Imaging Options:	[**NO FREQ WRAP**]
	or [**NONE**]
	[**NEXT PAGE**]
SCAN TIMING	
Number of Echos:	[**4**]
Echo Time (TE):	[**20 ms**]
Rep Time (TR):	[**600 ms**]
	[**NEXT PAGE**]
SCANNING RANGE	
Field of View:	[**OTHER**] **32** [**ENTER**]
Slice Thickness:	[**5 mm**]
Interslice Spacing:	[**0**]
Start Location:	**A0** [**ENTER**]
End Location:	**P0** [**ENTER**]
	[**NEXT PAGE**]
ACQUISITION TIME	
Acq. Matrix:	[**256 x 128**]
Imaging Time:	[**1 Nex**]
Freq. Dir:	[**R/L**]
Contrast:	[**NO**]
	[**NEXT PAGE**]
AUTO CENTER FREQUENCY	[**WATER**]
	[**NEXT PAGE**]
REVIEW	
	[**NEXT PAGE**]
SCAN OPERATIONS	

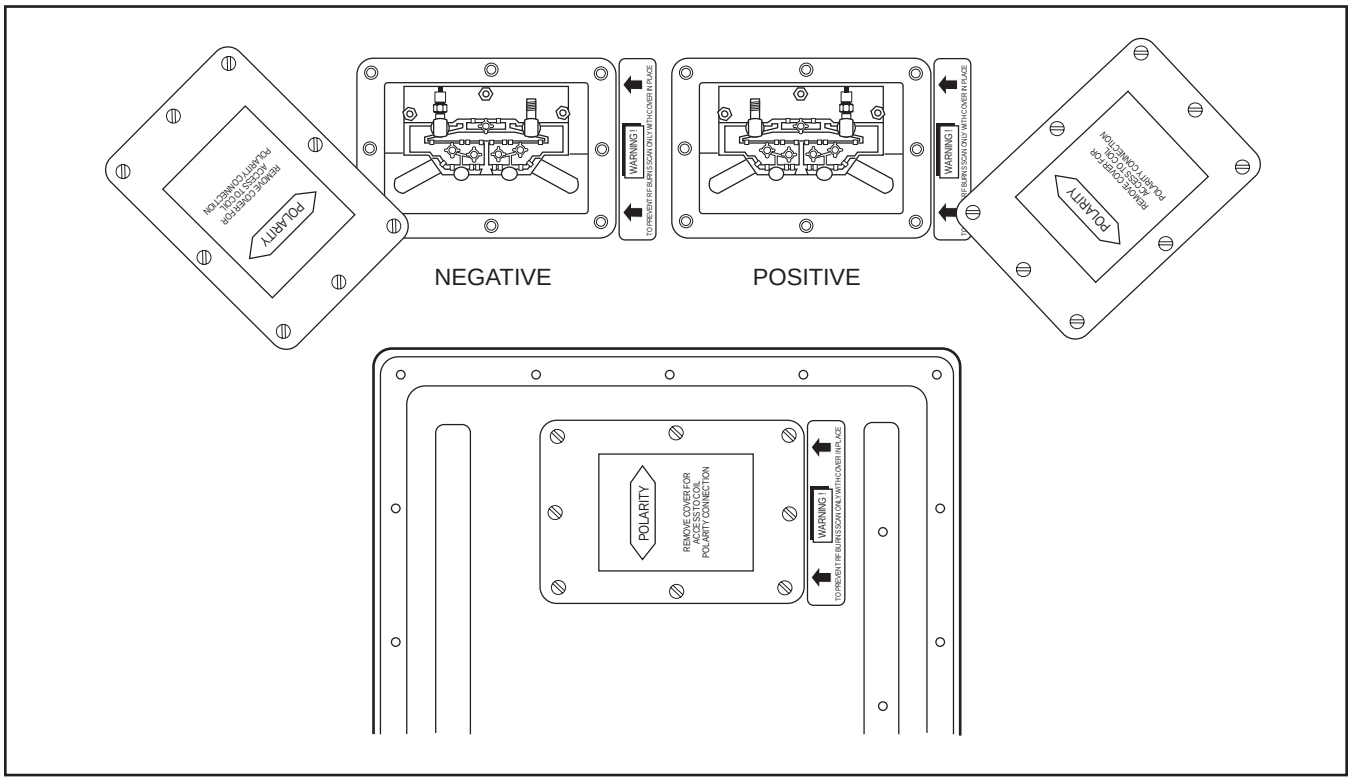
SYSTEM TEST SCAN PARAMETERS FOR 3.X AND 4.X SYSTEMS

ILLUSTRATION 2-1

PATIENT STUDY PARAMETERS	
ID:	**GESERVICE**
Name:	
Patient Weight:	**111 LBS**
	[**PATIENT POSITION**]
PATIENT POSITION	
Patient Entry:	[**HEAD FIRST**]
Patient Position:	[**SUPINE**]
Axial/Sag Landmark:	[**STERNAL NOTCH**]
Coil Type:	[**BODY**]
Scan Plane:	[**AXIAL**]
	[**IMAGING PARAMETERS**]
IMAGING PARAMETERS	
Image mode:	[**2D**]
(* SAR must be "On" *)	[**MONITOR SAR**] Rel. 5.2
Pulse Sequence:	[**SPIN ECHO]**
Imaging Options:	[**NONE**]
Enter PSD Filename:	
Monitor SAR?:	[**YES**] Rel. 5.1
	[**NEXT SCREEN**
	[**SCAN TIMING**]
	or [**NEXT SCREEN**]
SCAN TIMING	
Number of Echos:	[**4**]
Echo Time (TE):	[**20 ms**]
Rep Time (TR):	[**OTHER**] [**600 ms**]
	[**SCANNING RANGE**]
SCANNING RANGE	
Field of View:	[**32**]
Slice Thickness:	[**5 mm**]
Interscan Spacing:	[**0**]
Start Location:	**0**
End Location:	**0**
No of Scan Locations	**1**
FOV Center (L/R)	**0** (P/A) **0**
	[**<**] [**ACQUISITION TIME**]
ACQUISITION TIME	
Acq. Matrix: (freq.)	[**256**] Rel. 5.2
Acq. Matrix: (phase)	[**256**] Rel. 5.2
Acq. Matrix:	[**256 x 128**] Rel. 5.1
Frequency Direction:	[**R/L**]
Imaging Time:	[**1 Nex**]
Contrast:	[**NO**]
Table Delta	**0 mm**
	[**SCAN SETUP**]
SCAN SETUP	
Auto CF:	[**WATER**]
Primary Arch. Node:	Default
	[**REVIEW SCREEN**]
REVIEW	
	[**SCAN OPS**]
SCAN OPERATIONS	

SYSTEM TEST SCAN PARAMETERS FOR 5.X SYSTEMS

ILLUSTRATION 2-2



COIL POLARITY

ILLUSTRATION 2-3

3-0 SIGNA® ADVANTAGE™ 1.5T SCANNER VERIFICATION

3-1 Scanner performance in the body coil mode should be verified. The RF power level calibration from the body coil mode is used to verify the surface coil decoupling.

NOTE

The surface coil decoupling phantom must be filled with distilled water and the supplied cupric sulfate prior to use for any imaging tests. To properly prepare the phantom, completely fill the supplied one liter Nalgene bottle with distilled water while mixing in the vial of cupric sulfate. Ensure that all of the cupric sulfate has dissolved, and there are no air bubbles when the cap is replaced on the bottle.

3-2 The parameters have been loaded in step 2-1-1. Perform an [**AUTO PRESCAN**] to properly calibrate the RF power level. Record the value for TG. This value will be needed in step 4-2.

3-3 Run the scan. Observe the resulting images. Ensure that there are no artifacts of any sort on any of the images.

3-4 For the SNR comparisons, select [**CANCEL**], [**NEW SERIES**], and acquire two identical images using the scan parameters in ILLUSTRATION 3-1 for 3.X/4.X systems or ILLUSTRATION 3-2 FOR 5.X systems. After acquiring the first image, select [**SCAN]** to obtain a second. Note the series number for future reference.

Refer to Section 5—*SNR IMAGE Analysis*, for surface coil SNR Analysis procedures.

MAIN MENU [**NEW STUDY**]

PATIENT STUDY PARAMETERS
- ID: **GESERVICE**
- Patient Weight: **111LBS**
- Monitor SAR?: **Y**

[**NEXT PAGE**]

PATIENT POSITION
- Patient Entry: [**HEAD FIRST**]
- Patient Position: [**SUPINE**]
- Coil Type: [**BODY**]
- Axial/Sag Landmark: [**STERNAL NOTCH**]

[**NEXT PAGE**]

IMAGING PARAMETERS
- Image mode: [**MULTISCAN**]
- Scan Mode: [**SAGITTAL**]
- Pulse Sequence: [**MULTIPLE ECHO**]
- Imaging Options: [**NO FREQ WRAP**] or [**NONE**]

[**NEXT PAGE**]

SCAN TIMING
- Number of Echos: [**1**]
- Echo Time (TE): [**20 ms**]
- Rep Time (TR): [**600 ms**]

[**NEXT PAGE**]

SCANNING RANGE
- Field of View: **32**
- Slice Thickness: [**5 mm**]
- Interslice Spacing: [**0**]
- Start Location: **I0** [**ENTER**]
- End Location: **S0** [**ENTER**]

[**NEXT PAGE**]

ACQUISITION TIME
- Acq. Matrix: [**256 x 128**]
- Imaging Time: [**1 Nex**]
- Freq. Dir: [**R/L**]
- Contrast: [**NO**]

[**NEXT PAGE**]

AUTO CENTER FREQUENCY [**WATER**]
[**NEXT PAGE**]

REVIEW

[**NEXT PAGE**]

SCAN OPERATIONS

BODY COIL SNR SCAN PARAMETERS FOR 3.X AND 4.X SYSTEMS

ILLUSTRATION 3-1

PATIENT STUDY PARAMETERS
- ID: **GESERVICE**
- Name:
- Patient Weight: **111 LBS**

[**PATIENT POSITION**]

PATIENT POSITION
- Patient Entry: [**HEAD FIRST**]
- Patient Position: [**SUPINE**]
- Axial/Sag Landmark: [**STERNAL NOTCH**]
- Coil Type: [**BODY**]
- Scan Plane: [**SAGITTAL**]

[**IMAGING PARAMETERS**]

IMAGING PARAMETERS
- Image mode: [**2D**]
- (* SAR must be "On" *) [**MONITOR SAR**] Rel. 5.2
- Pulse Sequence: [**SPIN ECHO]**
- Imaging Options: [**NONE**]
- Enter PSD Filename:
- Monitor SAR?: [**YES**] Rel. 5.1

[**NEXT SCREEN**
[**SCAN TIMING**]
or [**NEXT SCREEN**]

SCAN TIMING
- Number of Echos: [**1**]
- Echo Time (TE): [**20 ms**]
- Rep Time (TR): [**OTHER**] [**600 ms**]

[**SCANNING RANGE**]

SCANNING RANGE
- Field of View: [**32**]
- Slice Thickness: [**5 mm**]
- Interscan Spacing: [**0**]
- Start Location: **0**
- End Location: **0**
- No of Scan Locations **1**
- FOV Center (L/R) **0** (P/A) **0**

[**<**] [**ACQUISITION TIME**]

ACQUISITION TIME
- Acq. Matrix: (freq.) [**256**] Rel. 5.2
- Acq. Matrix: (phase) [**256**] Rel. 5.2
- Acq. Matrix: [**256 X 128**] Rel. 5.1
- Frequency Direction: [**R/L**]
- Imaging Time: [**1 Nex**]
- Contrast: [**NO**]
- Table Delta **0 mm**

[**SCAN SETUP**]

SCAN SETUP
- Auto CF: [**WATER**]
- Primary Arch. Node: Default

[**REVIEW SCREEN**]

REVIEW

[**SCAN OPS**]

SCAN OPERATIONS

BODY COIL SNR SCAN PARAMETERS FOR 5.X SYSTEMS

ILLUSTRATION 3-2

4-0 QUAD C-SPINE COIL IMAGING PERFORMANCE 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 Troubleshooting Guide,* or Direction 15491, *Signa Advantage 1.5T & 0.5T System Troubleshooting Guide.*

4-1 Select [**CANCEL**] and [**NEW SERIES**] to enable the patient table **LANDMARK** function. Set up the surface coil and decoupling phantom on the patient table as shown in ILLUSTRATION 4-1.

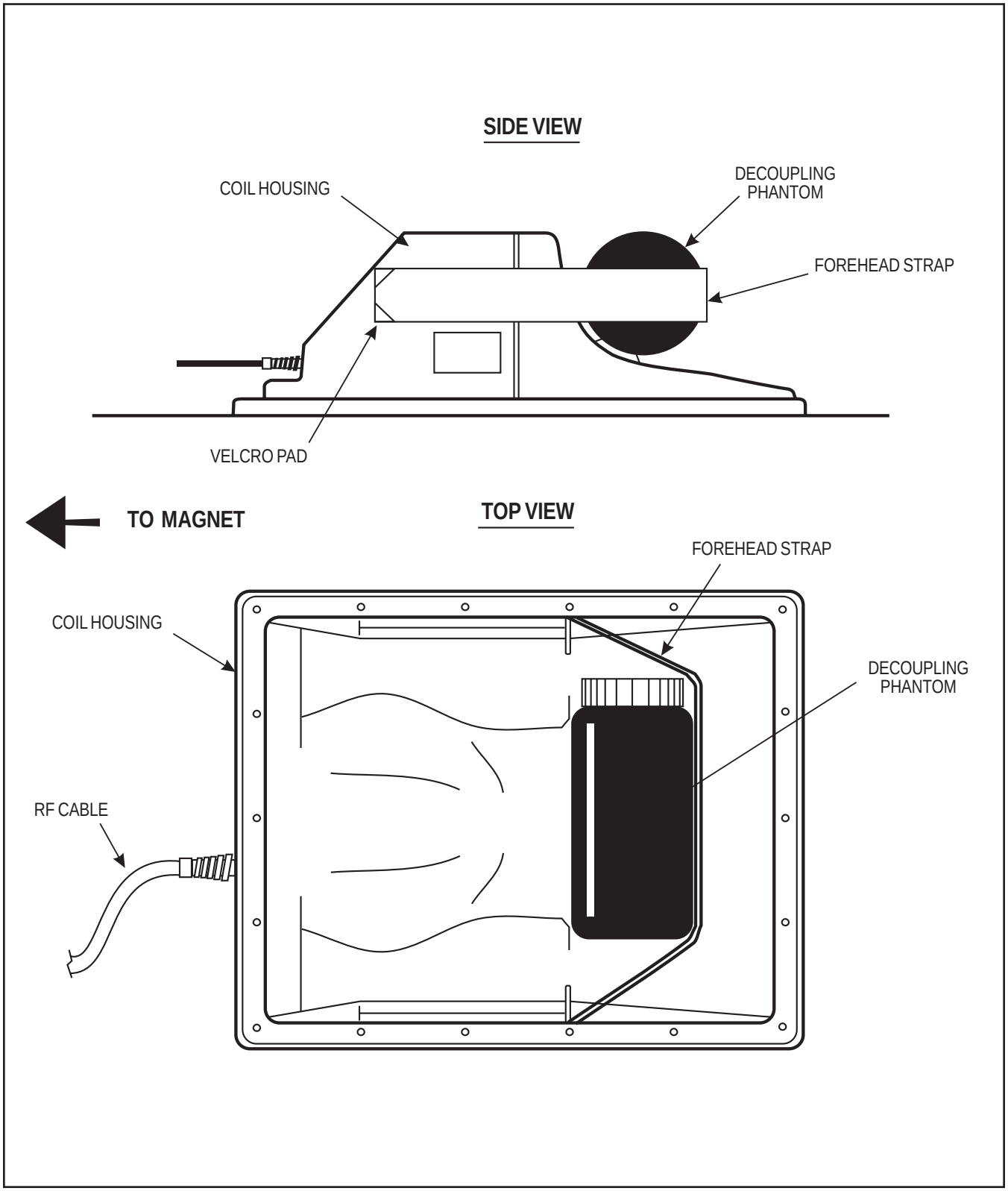
4-2 Set up the scan using the parameters in ILLUSTRATION 4-2 for 3.X/4.X systems, or ILLUSTRATION 4-3 for 5.X systems. Select [**AUTO PRESCAN**]. If the value obtained for TG is different than that obtained in step 3-3, enter **MANUAL PRESCAN** mode and set the value of TG to the value found in step 3-2.

4-3 Observe the resulting images. Ensure that there are no artifacts of any sort on any of the images. Study the third and fourth echoes using a **WINDOW WIDTH** and **WINDOW LEVEL** that give good image contrast. A properly functioning coil will produce an image with a smooth signal pattern, gradually dropping in intensity as the distance from the coil increases, as shown in ILLUSTRATION 4-4. A decoupling failure will cause holes, distortions, or striped patterns in the image as seen in ILLUSTRATION 4-5**.** Refer to Section 5-0 to troubleshoot decoupling failures.

4-4 Select [**CANCEL**], [**NEW SERIES**], and acquire two sets of images using the scan parameters in ILLUSTRATION 4-6 for 3.X/4/X systems or ILLUSTRATION 4-7 for 5.X systems. After acquiring the first set of images, select **SCAN** to acquire a second.

4-5 Compute the SNR using the procedure described in Section 5-0, *SNR Image Analysis.* Compare the signal to noise ratio of the two echos of the Cervical Spine Coil image from step 4-4 with the signal to noise ratio of the first echo of the body coil scan of step 3-4. The C-Spine coil scans should display a SNR greater than 2.5 times the Body coil scans.

4-6 Inspect the images for visible ghosting [similar in appearance to motion artifacts] in the phase encoding direction. If images contain ghosting artifacts, an intermittent cable or connection is suspected. Refer to Section 6-0 for troubleshooting information.



DECOUPLING PHANTOM PLACEMENT

ILLUSTRATION 4-1

MAIN MENU [**NEW STUDY**]

PATIENT STUDY PARAMETERS
- ID: **GESERVICE**
- Patient Weight: **111 LBS**
- Monitor SAR?: **Y**
- [**NEXT PAGE**]

PATIENT POSITION
- Patient Entry: [**HEAD FIRST**]
- Patient Position: [**SUPINE**]
- Coil Type: [**SURFACE**] or [**OTHER**]
- Coil Type: [**CSPINE**]
- Axial/Sag Landmark: [**STERNAL NOTCH**]
- [**NEXT PAGE**]

IMAGING PARAMETERS
- Image mode: [**MULTISCAN**]
- Scan Mode: [**AXIAL**]
- Pulse Sequence: [**MULTIPLE ECHO**]
- Imaging Options: [**NO FREQ WRAP**] or [**NONE**]
- [**NEXT PAGE**]

SCAN TIMING
- Number of Echos: [**4**]
- Echo Time (TE): [**20 ms**]
- Rep Time (TR): [**600 ms**]
- [**NEXT PAGE**]

SCANNING RANGE
- Field of View: **32**
- Slice Thickness: [**5 mm**]
- Interslice Spacing: [**0**]
- Start Location: **A0** [**ENTER**]
- End Location: **P0** [**ENTER**]
- [**NEXT PAGE**]

ACQUISITION TIME
- Acq. Matrix: [**256 x 128**]
- Imaging Time: [**1 Nex**]
- Freq. Dir: [**R/L**]
- Contrast: [**NO**]
- [**NEXT PAGE**]

AUTO CENTER FREQUENCY [**WATER**]
[**NEXT PAGE**]

REVIEW

[**NEXT PAGE**]

SCAN OPERATIONS

SURFACE COIL DECOUPLING SCAN PARAMETERS FOR 3.X AND 4.X SYSTEMS

ILLUSTRATION 4-2

PATIENT STUDY PARAMETERS
- ID: **GESERVICE**
- Name:
- Patient Weight: **111 LBS**
- [**PATIENT POSITION**]

PATIENT POSITION
- Patient Entry: [**HEAD FIRST**]
- Patient Position: [**SUPINE**]
- Axial/Sag Landmark: [**STERNAL NOTCH**]
- Coil Type: [**OTHER**][**CSPINE**]
- Scan Plane: [**AXIAL**]
- [**IMAGING PARAMETERS**]

IMAGING PARAMETERS
- Image mode: [**2D**]
- (* SAR must be "On" *) [**MONITOR SAR**] Rel. 5.2
- Pulse Sequence: [**SPIN ECHO]**
- Imaging Options: [**NONE**]
- Enter PSD Filename:
- Monitor SAR?: [**YES**] Rel. 5.1
- [**NEXT SCREEN**
- [**SCAN TIMING**]
- or [**NEXT SCREEN**]

SCAN TIMING
- Number of Echos: [**4**]
- Echo Time (TE): [**20 ms**]
- Rep Time (TR): [**OTHER**] [**600 ms**]
- [**SCANNING RANGE**]

SCANNING RANGE
- Field of View: [**32**]
- Slice Thickness: [**5 mm**]
- Interscan Spacing: [**0**]
- Start Location: **0**
- End Location: **0**
- No of Scan Locations **1**
- FOV Center (L/R) **0** (P/A) **0**
- [**<**] [**ACQUISITION TIME**]

ACQUISITION TIME
- Acq. Matrix: (freq.) [**256**] Rel. 5.2
- Acq. Matrix: (phase) [**256**] Rel. 5.2
- Acq. Matrix: [**256 x128**] Rel. 5.1
- Frequency Direction: [**R/L**]
- Imaging Time: [**1 Nex**]
- Contrast: [**NO**]
- Table Delta **0 mm**
- [**SCAN SETUP**]

SCAN SETUP
- Auto CF: [**WATER**]
- Primary Arch. Node: Default
- [**REVIEW SCREEN**]

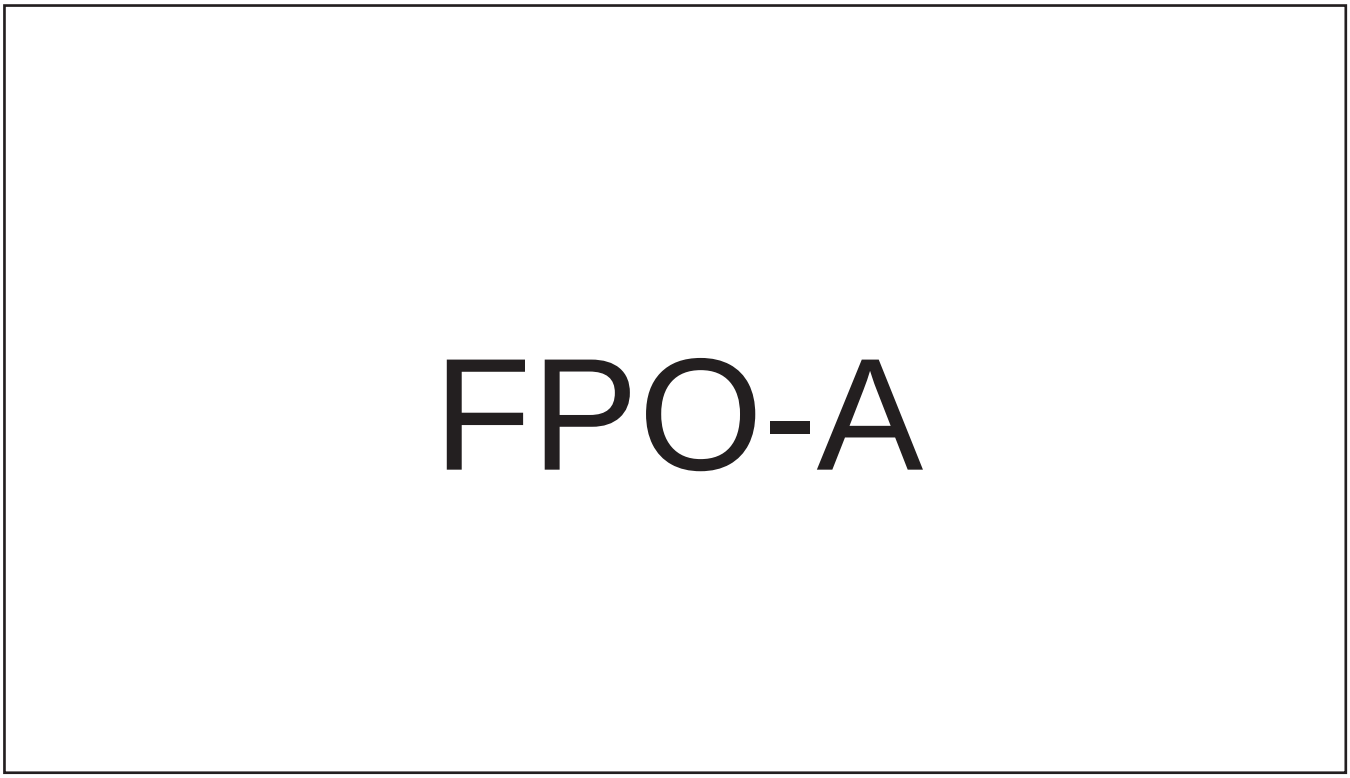
REVIEW

[**SCAN OPS**]

SCAN OPERATIONS

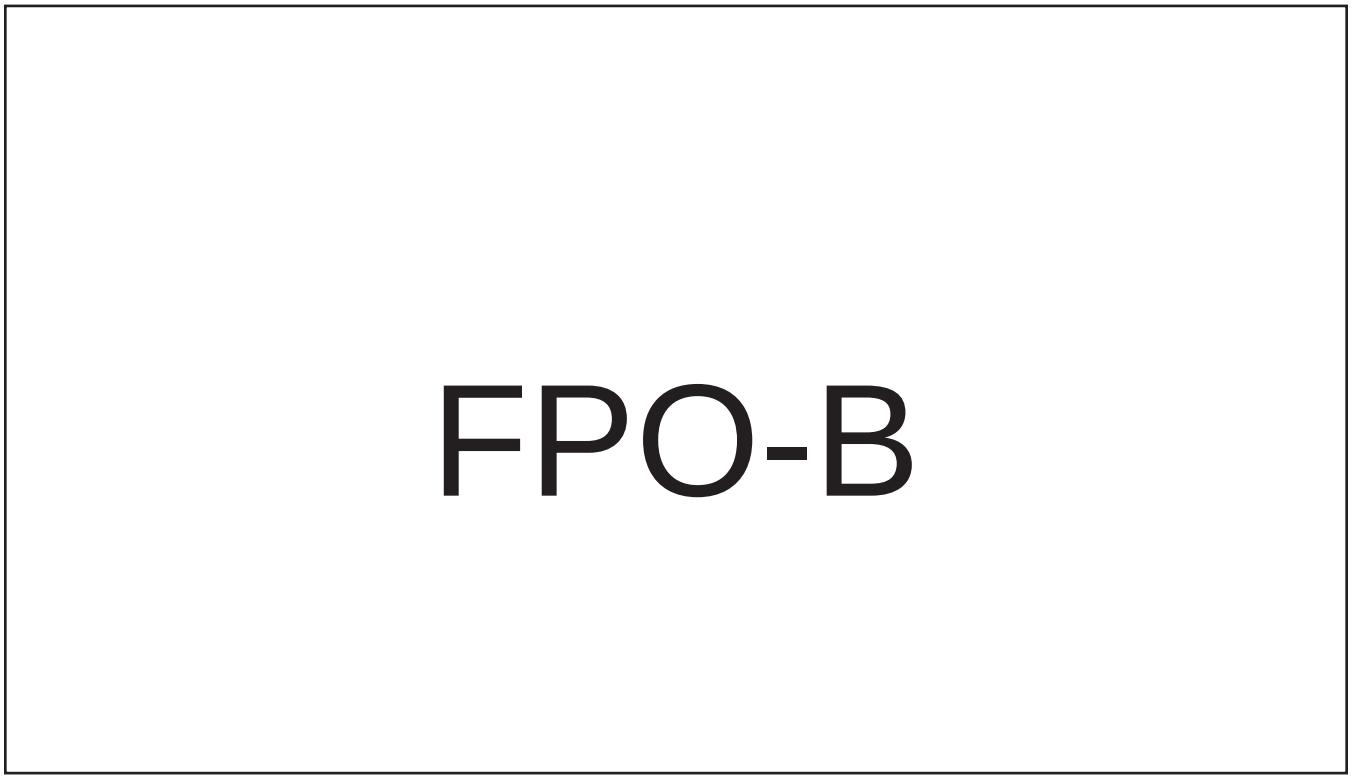
SURFACE COIL DECOUPLING SCAN PARAMETERS FOR 5.X SYSTEMS

ILLUSTRATION 4-3



NORMAL DECOUPLING

ILLUSTRATION 4-4



DECOUPLING FAILURE

ILLUSTRATION 4-5

MAIN MENU [**NEW STUDY**]

PATIENT STUDY PARAMETERS
- ID: **GESERVICE**
- Patient Weight: **111 LBS**
- Monitor SAR?: **Y**
- [**NEXT PAGE**]

PATIENT POSITION
- Patient Entry: [**FEET FIRST**]
- Patient Position: [**SUPINE**]
- Coil Type: [**SURFACE**] or [**OTHER**]
- Coil Type: [**CSPINE**]
- Axial/Sag Landmark: [**STERNAL NOTCH**]
- [**NEXT PAGE**]

IMAGING PARAMETERS
- Image mode: [**MULTISCAN**]
- Scan Mode: [**SAGITTAL**]
- Pulse Sequence: [**MULTIPLE ECHO**]
- Imaging Options: [**NO FREQ WRAP**] or [**NONE**]
- [**NEXT PAGE**]

SCAN TIMING
- Number of Echos: [**1**]
- Echo Time (TE): [**20 ms**]
- Rep Time (TR): [**600 ms**]
- [**NEXT PAGE**]

SCANNING RANGE
- Field of View: **32**
- Slice Thickness: [**5 mm**]
- Interslice Spacing: [**0**]
- Start Location: **A0** [**ENTER**]
- End Location: **P0** [**ENTER**]
- [**NEXT PAGE**]

ACQUISITION TIME
- Acq. Matrix: [**256 x 128**]
- Imaging Time: [**1 Nex**]
- Freq. Dir: [**R/L**]
- Contrast: [**NO**]
- [**NEXT PAGE**]

AUTO CENTER FREQUENCY [**WATER**]
- [**NEXT PAGE**]

REVIEW
- [**NEXT PAGE**]

SCAN OPERATIONS

CERVICAL SPINE COIL SNR SCAN PARAMETERS FOR 3.X AND 4.X SYSTEMS

ILLUSTRATION 4-6

PATIENT STUDY PARAMETERS
- ID: **GESERVICE**
- Name:
- Patient Weight: **111 LBS**
- [**PATIENT POSITION**]

PATIENT POSITION
- Patient Entry: [**FEET FIRST**]
- Patient Position: [**SUPINE**]
- Axial/Sag Landmark: [**STERNAL NOTCH**]
- Coil Type: [**OTHER**][**CSPINE**]
- Scan Plane: [**SAGITTAL**]
- [**IMAGING PARAMETERS**]

IMAGING PARAMETERS
- Image mode: [**2D**]
- (* SAR must be "On" *) [**MONITOR SAR**] Rel. 5.2
- Pulse Sequence: [**SPIN ECHO]**
- Imaging Options: [**NONE**]
- Enter PSD Filename:
- Monitor SAR?: [**YES**] Rel. 5.1
- [**NEXT SCREEN**
- [**SCAN TIMING**]
- or [**NEXT SCREEN**]

SCAN TIMING
- Number of Echos: [**1**]
- Echo Time (TE): [**20 ms**]
- Rep Time (TR): [**OTHER**] [**600 ms**]
- [**SCANNING RANGE**]

SCANNING RANGE
- Field of View: [**32**]
- Slice Thickness: [**5 mm**]
- Interscan Spacing: [**0**]
- Start Location: **0**
- End Location: **0**
- No of Scan Locations **1**
- FOV Center (L/R) **0** (P/A) **0**
- [**<**] [**ACQUISITION TIME**]

ACQUISITION TIME
- Acq. Matrix: (freq.) [**256**] Rel. 5.2
- Acq. Matrix: (phase) [**256**] Rel. 5.2
- Acq. Matrix: [**256 x 128**] Rel. 5.1
- Frequency Direction: [**R/L**]
- Imaging Time: [**1 Nex**]
- Contrast: [**NO**]
- Table Delta **0 mm**
- [**SCAN SETUP**]

SCAN SETUP
- Auto CF: [**WATER**]
- Primary Arch. Node: Default
- [**REVIEW SCREEN**]

REVIEW
- [**SCAN OPS**]

SCAN OPERATIONS

CERVICAL SPINE COIL SNR SCAN PARAMETERS FOR 5.X SYSTEMS

ILLUSTRATION 4-7

5-0 SNR IMAGE ANALYSIS

5-1 SNR IMAGE ANALYSIS FOR 3.X AND 4.X SYSTEMS

5-1-1 On the left touch screen, touch the **UTILITIES** soft key. When the next screen appears, touch the **CLIPS** key.

5-1-2 Type "**1**" and **ENTER** on the next screen to run CLIPS.

5-1-3 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.

5-1-4 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.

5-1-5 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.

5-1-6 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.

5-1-7 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.

5-1-8 It is necessary to load the images to be analyzed to the **DISPLAY** function of CLIPS. Type "**DIS(ALL);**" and **ENTER**. Two images should now be displayed, both in the top row.

5-1-9 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**.

5-1-10 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.

5-1-11 Type "**#3=#1-#2;**" at the **CLIPS>** prompt. This will subtract the two images, creating a noise image in **Display 3**.

5-1-12 If the system is using **3.XX** software, type "**#1=#3+1024;**" at the **CLIPS>** prompt. If the system is using **4.XX** software, 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. In the case of 3.XX level software, it also reinstates the 1024 offset needed to properly display the image.

5-1-13 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 4-20. Press the **ENTER** key, and record the **Standard Deviation** value for later use in the signal to noise ratio calculation.

5-1-14 For systems with **4.XX** software, use the following formula to calculate the signal to noise ratio:

SIGNAL TO NOISE RATIO = 1.414 * MEAN SIGNAL (from 4-20) / SD (from step 5-1-13)

For systems with 3.XX software, use the following formula to calculate the signal to noise ratio:

SIGNAL TO NOISE RATIO = 1.414 * [MEAN SIGNAL (from 4-20) - 1024] / SD (from step 5-1-13)

Record the value determined for the signal to noise ratio and the coil type [surface or body] of the measurement in ILLUSTRATION 5-2.

5-1-15 Repeat steps 5-1-5 to 5-1-14 using the surface coil images to determine the signal to noise ratio for the surface coil scans.

5-1-16 Determine the relative performance of the surface coil against the body coil reference by dividing the surface coil signal to noise ratio value by the body coil signal to noise ratio value.

5-1-17 To end the CLIPS utility when all image calculations are completed, type "**BYE**" and **ENTER** at the **CLIPS>** prompt.

5-1-18 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.

5-1-19 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.

5-2 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 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.

5-2-1 Touch [**UTILITIES**], [**MRTools**], [**Image Quality**], then [**SNRTest**]. The SNR Test screen is displayed. See ILLUSTRATION 5-1.

5-2-2 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.

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.

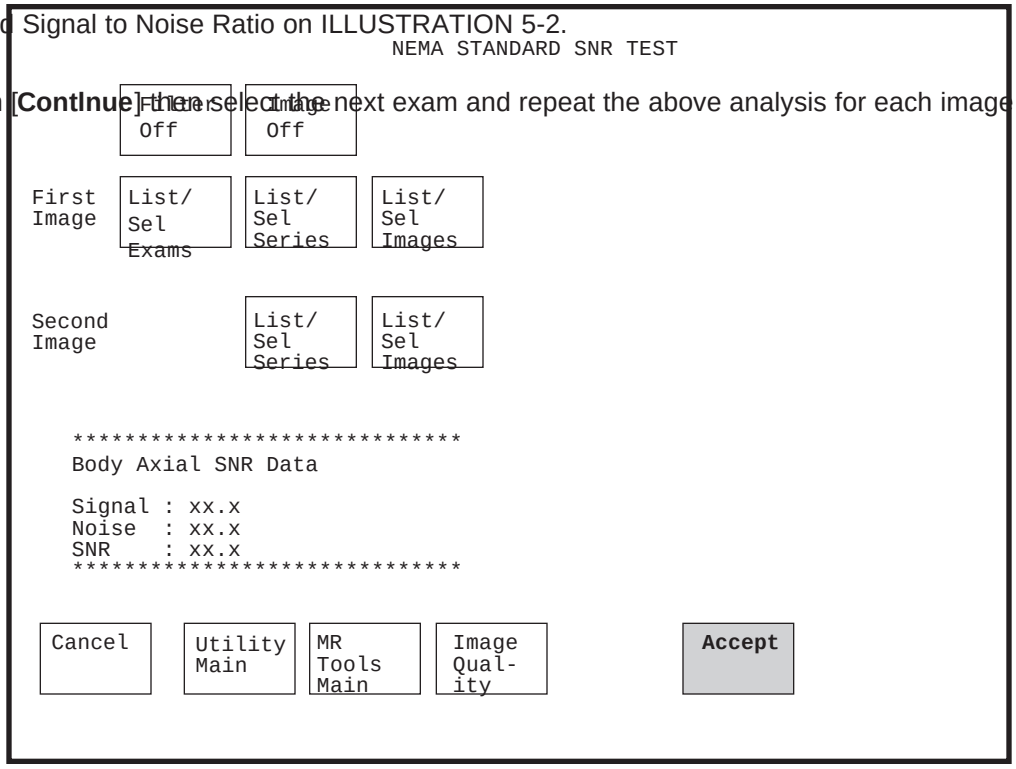
5-2-3 Enter second image series and image numbers. If series or image numbers are not known, select [**List Series**] or [**List Images**] to display list. The second image Exam Number is defaulted to the same as first image.

5-2-4 Select [**Filter Off**] and [**Image Off**].

5-2-5 Touch [**Accept**] to begin analysis. The final values are displayed on the screen. See ILLUSTRATION 5-1.

5-2-6 Record Signal to Noise Ratio on ILLUSTRATION 5-2.

5-2-7 Touch [**ContInue**] then select the next exam and repeat the above analysis for each image pair



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

SNR TEST SCREEN
ILLUSTRATION 5-1

Coil	Signal to Noise Ratio	Date
Body Coil		
C-Spine Coil		

SNR VALUES
ILLUSTRATION 5-2

6-0 TEST AND TROUBLESHOOTING PROCEDURES

6-1 Coil Impedance Measurements

6-1-1 Detach the patient table and remove it from the scan room to an area where the magnetic field from the SIGNA ADVANTAGE 1.5T magnet is less than 5 Gauss. Position the surface coil on the patient table. Load the surface coil with a human subject. Follow the procedure in the OPERATION MANUAL to properly locate the patient and surface coil.

6-1-2 Connect the surface coil output cable to the vector impedance meter probe using an appropriate adapter. Use the vector impedance meter to measure the coil impedance at 63.86 MHz. Ensure that the cable does not touch or pass close to the coil housing while making this measurement.

6-1-3 The impedance magnitude should nominally be 50 ohms under loaded conditions. It should fall within the range of 37.5 to 62.5 ohms under test conditions.

6-1-4 The phase angle should nominally be -10 degrees. It should fall within the range of -25 to +25 degrees under test conditions.

NOTE

Quadrature surface coils cannot be tuned in the field. If the coil falls outside of the measurement limits in steps 6-1-3 and 6-1-4, signal to noise ratio may be degraded. Go to Section 6-2.

6-2 Cable Integrity Tests

6-2-1 Repeat the steps in 6-1 while flexing the surface coil cable, especially at the fitting and the coil housing strain relief. Note any erratic fluctuations in the coil impedance using the **HIGH SPEED** mode on the vector impedance meter. Any erratic or unstable readings may indicate a defective cable or connector. See Section 7-0.

6-3 Protection Diode Tests

6-3-1 Use the digital multimeter on the diode test range to measure across the coil connector. With the negative lead to the connector shell and the positive to the connector center pin, the reading should be between 0.5 and 1.0. Reversing the leads should cause the reading to be infinity [overrange].

6-3-2 An open reading in both directions indicates two open diodes, or an open cable. Refer to Section 6-5 to check the cable. Refer to Section 7-4 to replace protection diodes.

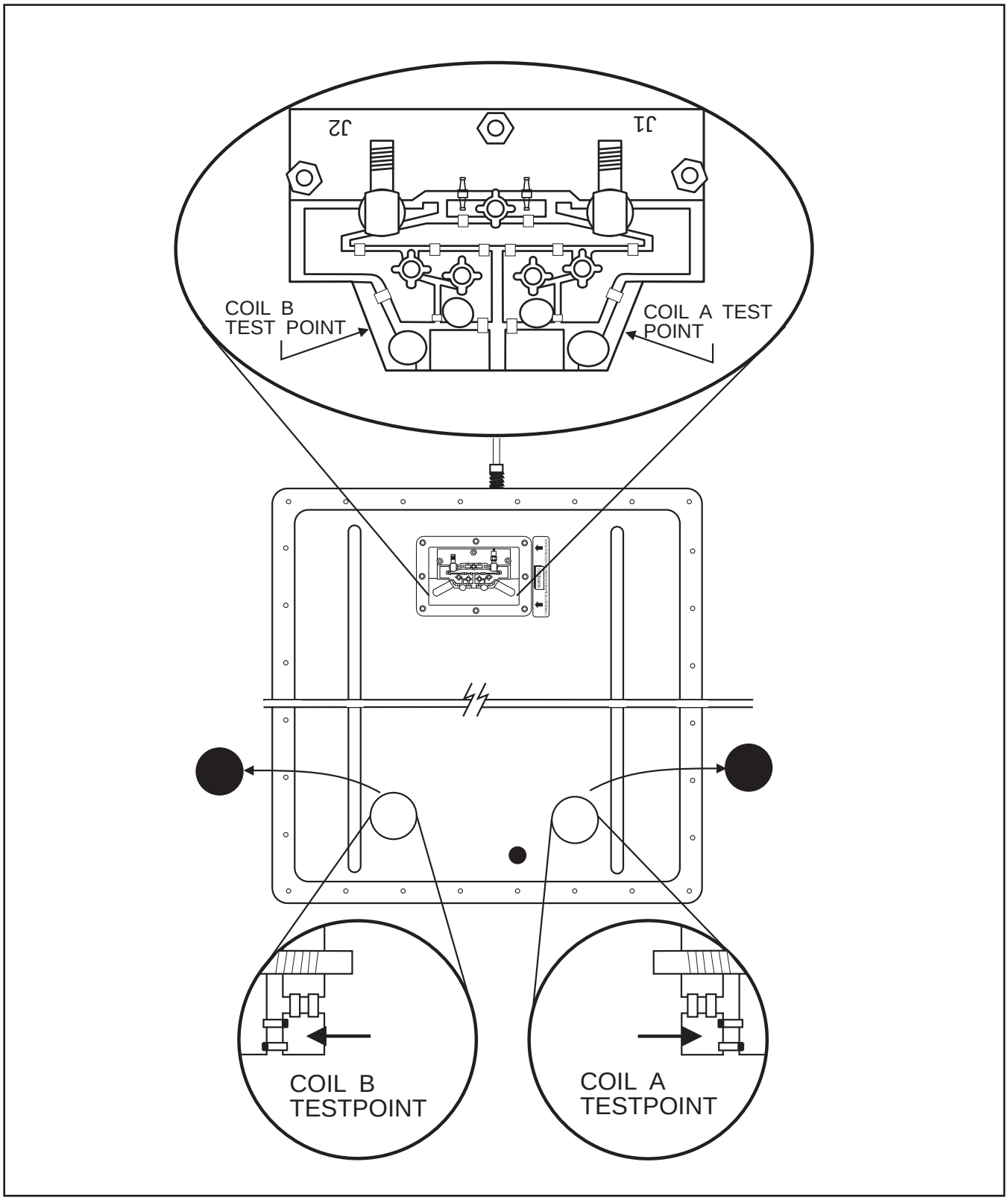
6-3-3 A short circuit or excessively low reading indicates one or more shorted diodes or a shorted cable. Refer to Section 6-5 to check the cable. Refer to Section 7-4 to replace protection diodes.

6-4 Decoupling Diode Tests

WARNING

Do not move the balun board components when making these measurements. Any movement of the components may detune the coil circuitry.

NOTE



COAXIAL CABLE TEST, TEST POINTS FOR DIODE CHECKS

ILLUSTRATION 6-1

Decoupling diodes are not field replaceable. Coils with decoupling diode failures must be replaced with a new coil assembly.

6-4-1 Remove the service access cover by removing the eight brass screws. Unscrew the two decoupling diode access plugs. See ILLUSTRATION 6-1.

6-4-2 Locate the two pairs of test points for the decoupling diodes labeled **COIL A TEST POINTS** and **COIL B TEST POINTS** in the illustration.

6-4-3 Using the diodes test function on the digital multimeter, measure across each pair of points in sequence, first across the pair marked **A**. A reading between 0.5 and 1.0 should be obtained. Reverse the leads on the same test points to reverse the polarity of the multimeter. A similar reading should be obtained.

6-4-4 An overrange in both directions indicates that both diodes of a pair are open. This condition causes a portion of the decoupling circuitry to be inoperative, and the coil must not be used clinically.

6-4-5 A reading near zero indicates one or more shorted diodes. While decoupling is not affected, the signal to noise ratio of the coil will be degraded.

6-5 Cable Tests

6-5-1 If the surface coil passes the tests in Sections 6-1, 6-2, and 6-3, the cable can be assumed to be functional.

6-5-2 If a short or open circuit was discovered in Section 6-3, the cable may be tested by disconnecting the cable at the Balun Board via the service access cover, as shown in ILLUSTRATION 6-1. The cable may then be tested for continuity of the center conductor and shield, and for shorts between the center conductor and shield using the multimeter continutity test function.

7-0 SERVICE PROCEDURES

7-1 Coaxial Cable Replacement - See ILLUSTRATION 7-1 for ordering information.

7-1-1 Remove the service access cover by removing the eight brass screws around the perimeter of the cover as shown in ILLUSTRATION 7-2.

7-1-2 Disconnect the cable SMA connector from the connector on the Balun Board.

7-1-3 Loosen and remove the strain relief body from the strain relief base. Slide the strain relief body away from the strain relief base.

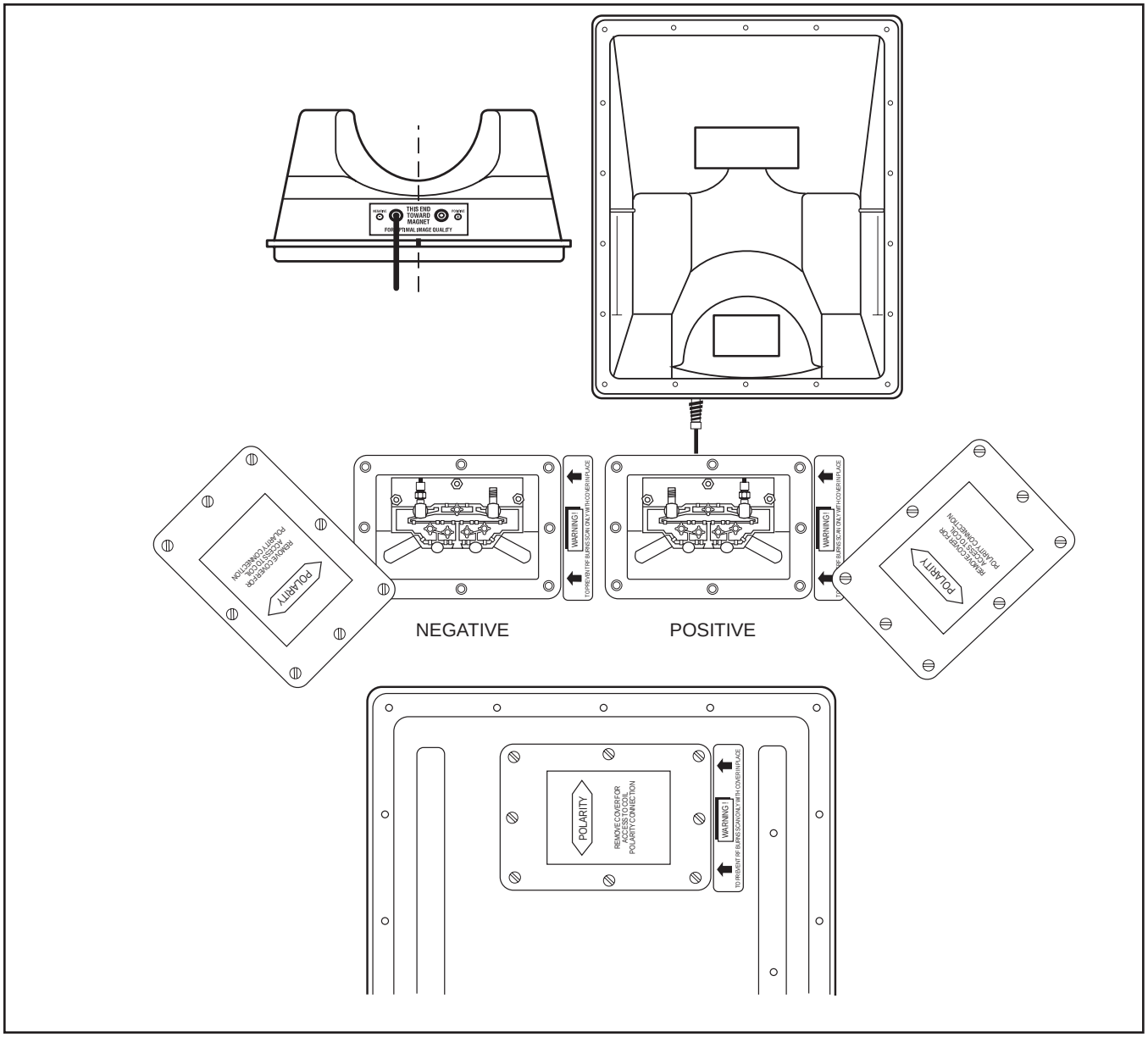
7-1-4 Remove the strain relief base from the threaded hole in the front of the coil.

7-1-5 Remove the retaining nut from the new cable assembly. Insert the SMA end of the cable through the strain relief mounting hole in the coil front.

CABLE SERVICE KIT 46-328361P1 SUPPLIER PART NUMBER 30523C30001	COIL WITH CABLE REPLACEMENT KIT 46-320422P1 SUPPLIER PART NUMBER 305000878

SERVICE KITS

ILLUSTRATION 7-1



COAXIAL CABLE REPLACEMENT

ILLUSTRATION 7-2

7-1-6 Connect the cable SMA connector to the Balun Board. Tighten firmly.

7-1-7 Attach the strain relief base into the threaded hole in the front of the coil. Tighten 1/4 turn beyond initial contact.

7-1-8 Install and tighten the strain relief body to the base - 8 inch-pounds.

7-1-9 Assemble the service access cover to the coil housing using the eight brass screws.

7-1-10 Repeat the tests in Sections 3-0, 4-0, and 5-0 to verify proper coil operation.

7-2 Output Connector Replacement

7-2-1 If the cable will be shortened to less than 39-3/4 inches by a repair, it is recommended that the entire cable be replaced in the event of a connector or connector-end cable failure.

7-2-2 Replace the connector using ILLUSTRATION 7-3 as a guide. Use a new BNC coaxial fitting - part number 46-271494P1, and crimp tool - part number 46-255841, with insert - part number 46-255841P100, to install the replacement connector on the cable.

7-2-3 Repeat the tests in Sections 3-0, 4-0, and 5-0 to verify proper coil operation.

7-3 Decoupling Diode Replacement

7-3-1 As coil tuning, orthogonality, and decoupling may be affected by diode replacement, decoupling diodes are not field replaceable. Coils with decoupling diode failures must be replaced.

7-4 Protection Diode Replacement

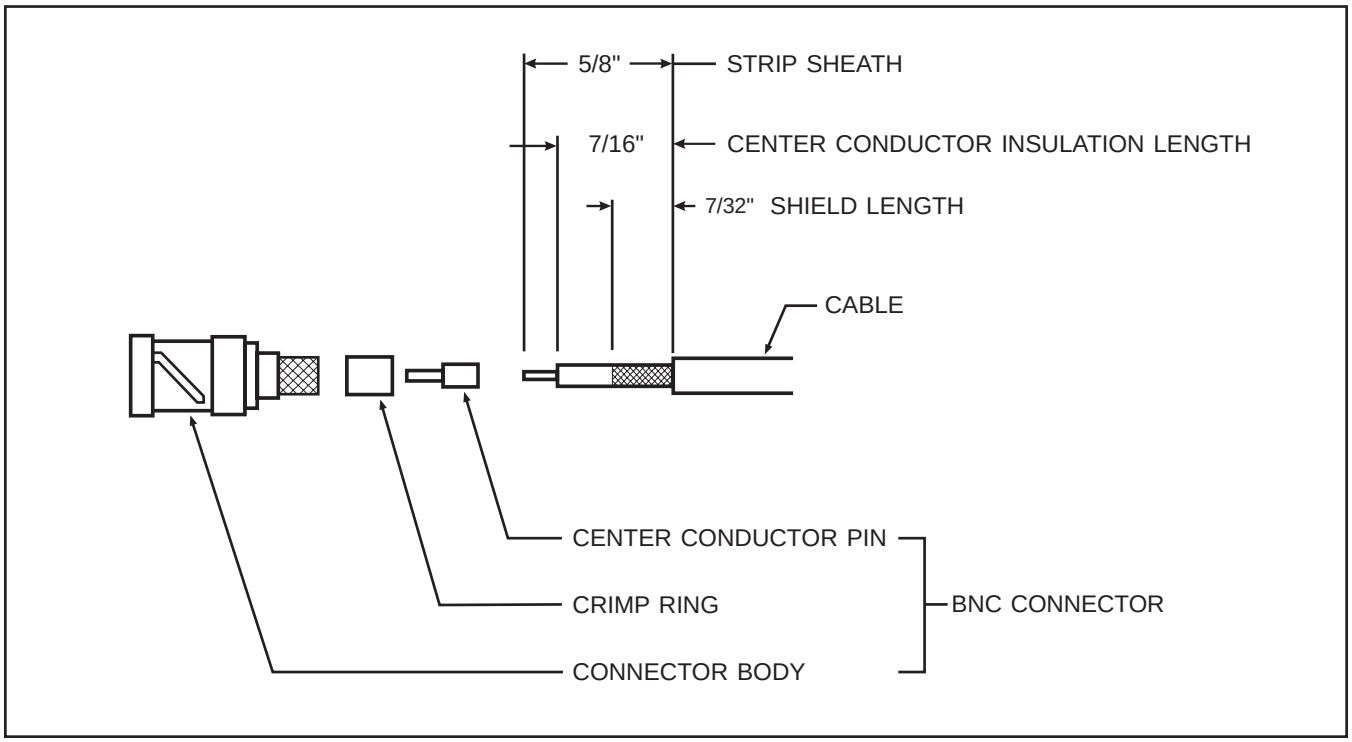
7-4-1 If it has been determined in Section 6-3, that a Protection Diode should be replaced, remove the access cover - see ILLUSTRATION 7-2.

7-4-2 Diode placement is shown on ILLUSTRATION 7-4, with the schematic of the Balun Board shown in ILLUSTRATION 7-5.

7-4-3 Unsolder both diodes and replace with part number 46-221735P1. Place the cathodes to ground.

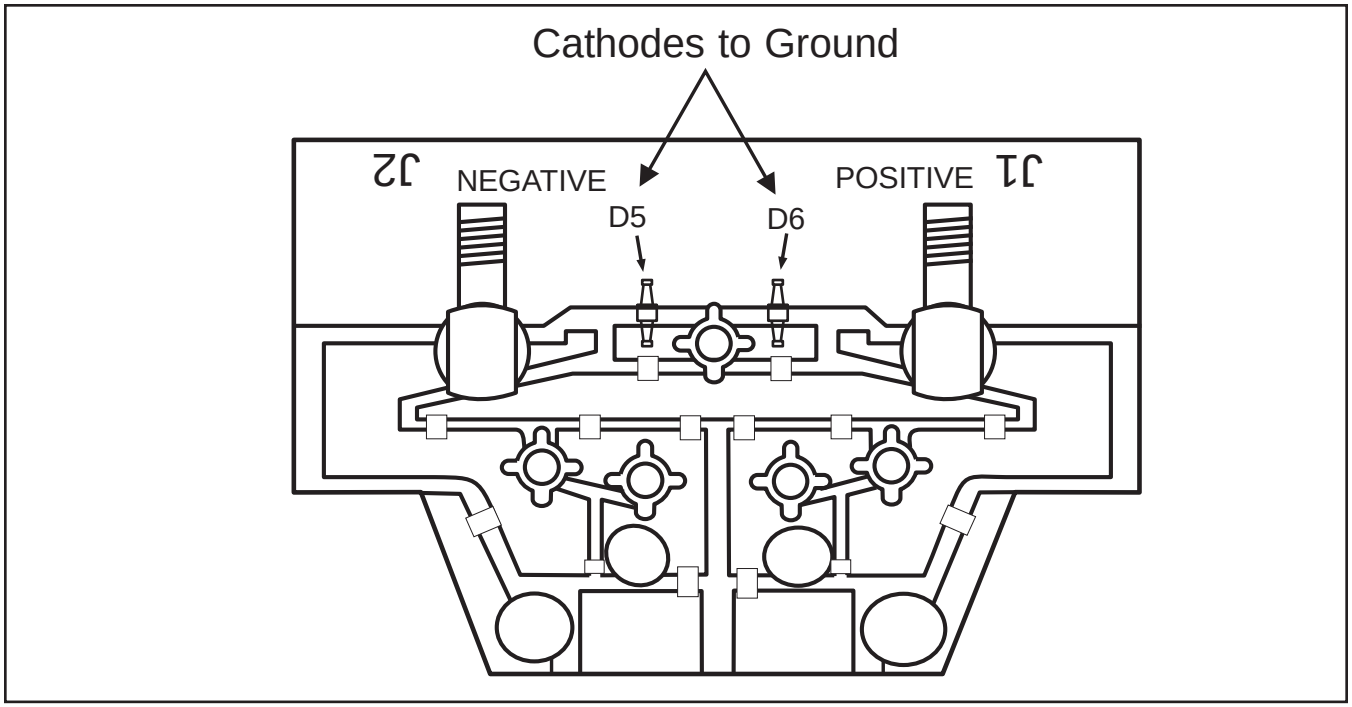
7-5 Complete Coil Replacement - See ILLUSTRATION 7-1 for ordering information.

7-5-1 The complete Quadrature Cervical Spine Coil with cable can be replaced, if necessary.



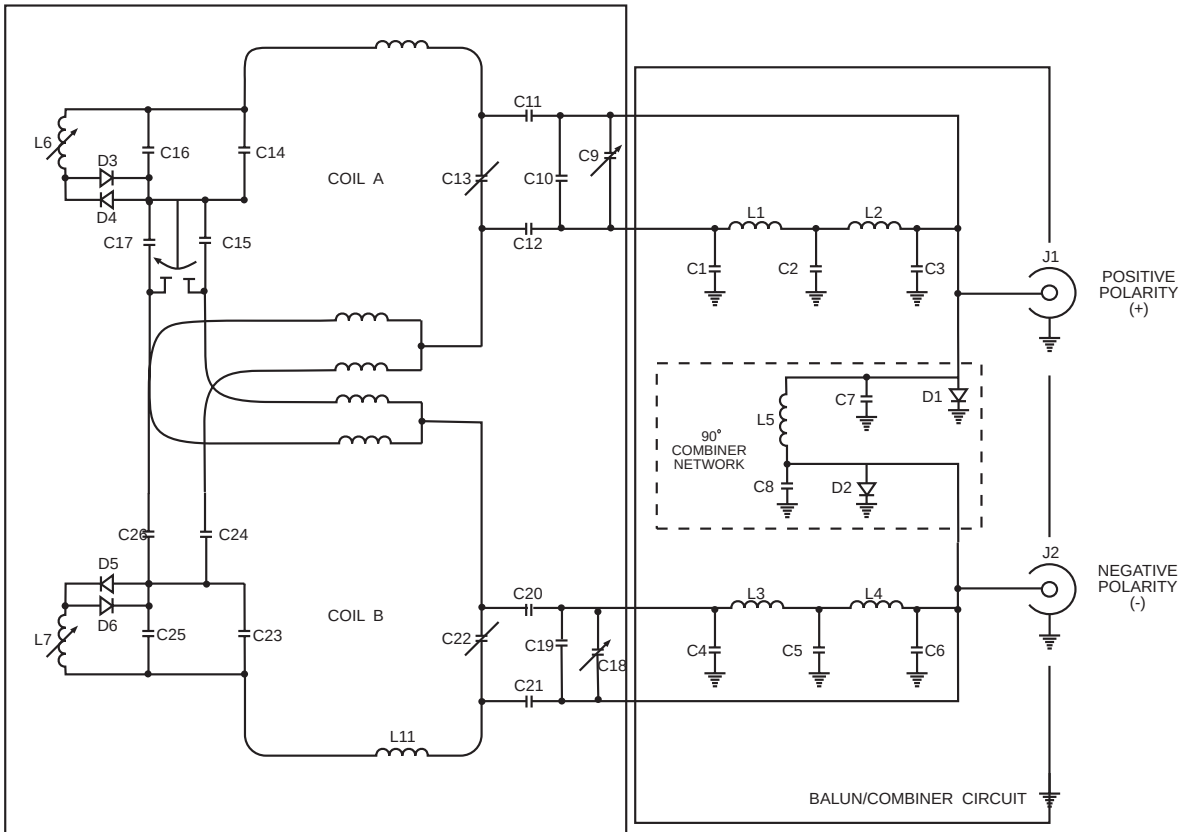
OUTPUT CONNECTOR REPLACEMENT

ILLUSTRATION 7-3



PROTECTION DIODE REPLACEMENT ON BALUN BOARD

ILLUSTRATION 7-4



COIL SCHEMATIC

ILLUSTRATION 7-5

DEFECTIVE SURFACE COIL RETURN FORM

NOTE

To allow for proper assessment of defective returned coils, both sides of this form must 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.

REFERENCE SECTION 6-1

ELECTRICAL CHECKS VECTOR IMPEDANCE METER TEST - COIL LOADED WITH HUMAN SUBJECT IN FREE SPACE	
MAGNITUDE AT 63.86 MHz	[50 OHMS]
PHASE AT 63.86 MHz	[-10°]

VECTOR IMPEDANCE METER TEST - COIL UNLOADED IN FREE SPACE	
MAGNITUDE AT 63.86 MHz	
PHASE AT 63.86 MHz	

REFERENCE SECTION 6-3

Protection Diode Test
Diode Drop Forward Bias
Diode Drop Reverse Bias

REFERENCE SECTION 6-4

Decoupling Diode Test
Diode Drop Test #1
Diode Drop Test #2

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 Troubleshooting Guide,* or Direction 15491, *Signa Advantage 1.5T & 0.5T System Troubleshooting Guide.* Use the table to record the TLT results of the defective 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		