



OPEN BODY COIL

(Access 5000 Interventional Body Coil)

Service Manual

Part No. 780033 (Rev. C)








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Revision History

INTRODUCTION

1. How the Coil Operates

- This receive-only coil is designed to give optimum signal to noise and uniform coverage of the torso anatomy, including the chest, abdomen and hip regions. The block diagram of the coil is shown in Figure 1. The coil consists of two elements: (1) a loop coil and (2) a saddle coil. The open design allows access to the region of interest for any clinical interaction.
- Both the coil loop and the coil saddle have three decoupling RF chokes. A decoupling tank is switched on actively using a pin diode. The pin diode is turned on by a forwarding biasing DC current source supplied by the MRI system (active decoupling). When the pin diode is turned on, the impedance of the RF choking circuit becomes very high (typically above 2 kilo-ohms). These high impedance elements in the coil segregate the coil circuitry into two isolated electrical segments, preventing any current flow in the coil circuit.

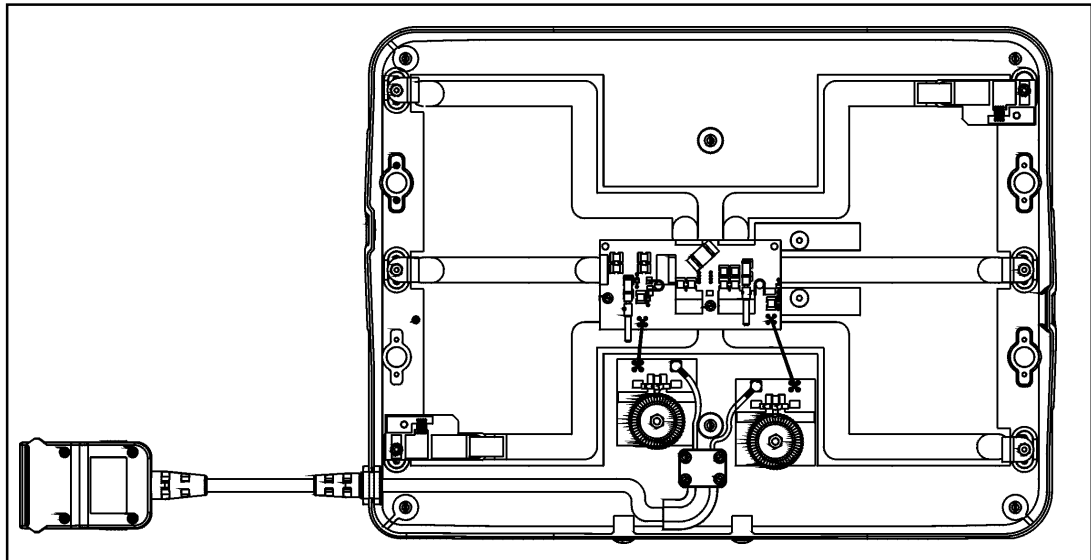


Figure 1: Block diagram of the coil.

INTRODUCTION (continued)

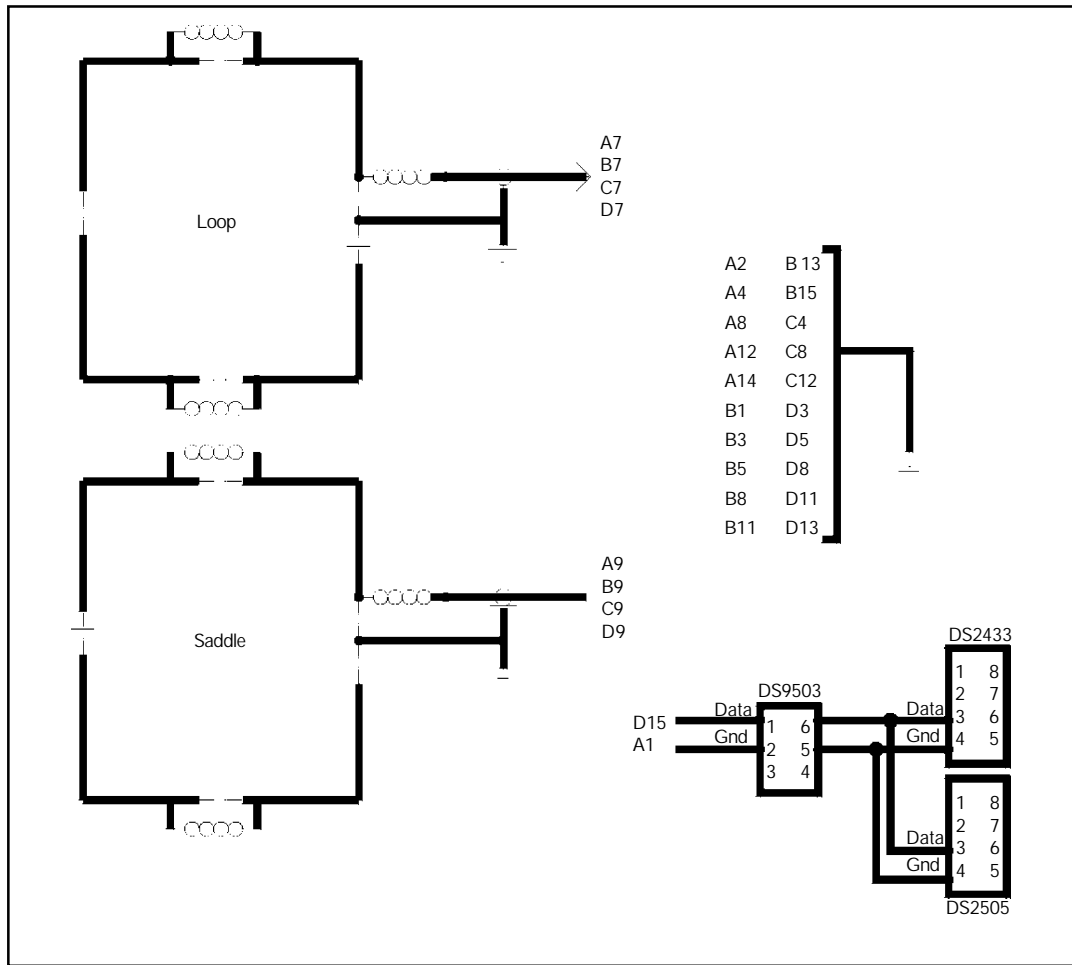


Figure 2: Block diagram of the circuit layout.

2. Compatibility

- The Access 5000 Interventional Body Coil (GE Part Number 2276953) is compatible with the Ovation 0.35T.

3. Coil Specification

Parameter	Characteristics
Coil Design	receive-only
Tuned Frequency	14.85 MHz (factory set)
Optimum FOV	approximately 19cm FOV
Operation and Storage Environment	operate and store the coil in the scanner room

Table 1: Coil specification.

4. Related Documents

- Operator's Guide (USAI Part Number 770052, GE Part Number 2282843)
- MR System Guide

SETUP AND CALIBRATION

1. Shipping List

Part Name	GE Part #	USAI Part #	Qty
Coil / Cable Assembly	2282853	100221	1
Patient Comfort Pad	2279952	150143	1
Operator's Guide	2282843	770052	1
Service Manual	2284559	780033	1

Table 2: Interventional Body Coil shipping list for the Ovation 0.35T.

2. Installing the Coil

- At the console, install a new coil configuration file and coil name. Refer to the system manuals for information on installing configuration files and use the coil configuration parameters shown in Table 3. The coil is ready for clinical use after proper installation of the configuration file and coil name. Refer to the Operator's Guide for instructions on use of the coil.

Coil Name	Open Body
Coil Code	OPENBODY
Coil Type	3
Extremity Coil	no
Cable Loss	1
Coil Loss	1.165
Recon Scale Factor	2.5
Linear vs. Quadrature	1
Multiple Receiver Coil	no
Number of Receivers	1
Starting Receiver ID	0
Ending Receiver ID	0
Multi-Coil Port Enable	0
Multi-Coil Port Error Enable	0
Additional Transmit Attenuation	0
Number of Fast Receivers	0
Starting Fast Receiver ID	4
Ending Fast Receiver ID	4
Fast TG Start TA	90
Fast TG Start RG	12
Multi Coil Recon Enable	0
Multi Coil Channel Selection	0
Attenuation - Q	2
Attenuation - I	0
Select Quadrature Shifter	1
Phased Array T/R Coil for Autoshim	-1
Head Default Freq Dir	0
QuadRcvCoil	1
Cfoption	1

Table 3: Coil configuration parameters.

VERIFICATION TEST (continued)

1. Tuning
 - The coil does not require matching or tuning on a per patient basis. The coil is initially tuned to the system frequency by USA Instruments and requires no additional tuning.
2. Quality Assurance (QA) Check
 - The clinical user should conduct a QA check on the coil on a weekly basis. The QA check consists of an image quality check, a calculation of the signal-to-noise ratio (SNR), and a visual inspection of the coil phantom image.
3. Image Quality Check
 - Select [New Pt] to set a new landmark.



Remove any other surface coil (if present) from the cradle. Position the coil near the top of the cradle. Place the TLT Body Sphere Phantom (GE Part #46-265635G6 or 2135650-2) on the coil (see Figure 3). Connect the coil connector to the coil port.

Align the laser with the "+" marks on the coil top. Position the coil at isocenter.



Figure 3: Positioning the phantom.

VERIFICATION TEST (continued)

Enter "Openbody QA scan" for [Patient ID]. Enter "QA scan" for [Patient Name]. Enter "111" lbs for [Weight].

PATIENT INFORMATION

Accession Number

Patient ID

Patient Name

Birth Date Age

Sex Weight Lb Kg

Rad Refer

Operator Status

Exam Description

History

Select [Landmark]. Enter "Landmark" and "Table Entry" information as shown below.

PATIENT INFORMATION

Accession Number

Patient ID

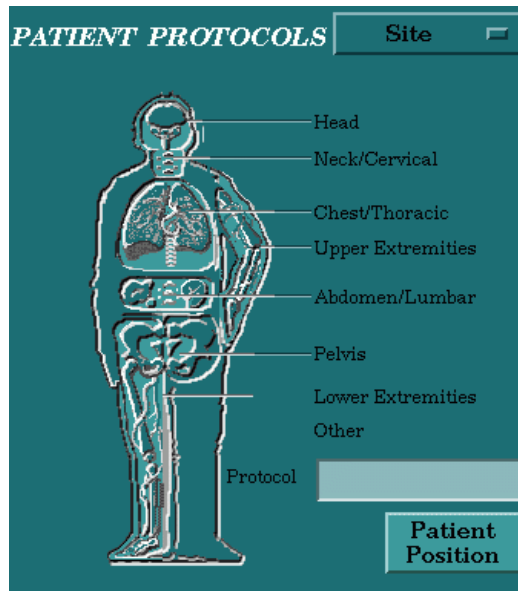
Patient Name

Landmark

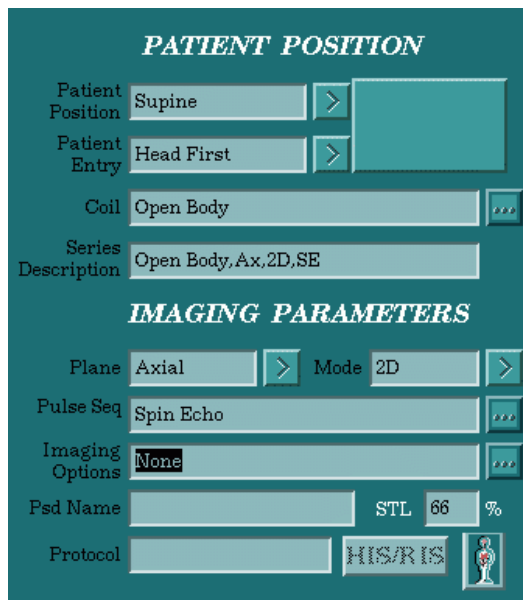
Table Entry

VERIFICATION TEST (continued)

Select [Patient Position] from Patient Protocols window.



Fill in the boxes as shown below. Coil and Series Description fields will be filled out automatically.



VERIFICATION TEST (continued)

Enter the following parameters:



Patient/Exam Information

Patient ID	Openbody QA Scan
Patient Name	QA Scan
Patient Weight	111 lbs.
Landmark	Nasion
Table Entry	Center

Patient Position

Patient Position	Supine
Patient Entry	Head First
Coil	Open Body
Series Description	leave blank

Imaging Parameters

Plane	Axial
Mode	2D
Pulse Seq	Spin Echo
Imaging Options	None
PSD Name	leave blank
Protocol	leave blank

Scan Timing

# of Echoes	1
TE	25.0
TR	500
Bandwidth	10.42

Additional Parameters

no entries required in this area

Acquisition Timing

Freq	256
Phase	128
NEX	1.0
Phase FOV	1.0
Freq DIR	R/L
Auto Center Freq	Peak
Autoshim	On
Contrast	Off

Scanning Range

FOV	35
Slice Thickness	5
Spacing	0

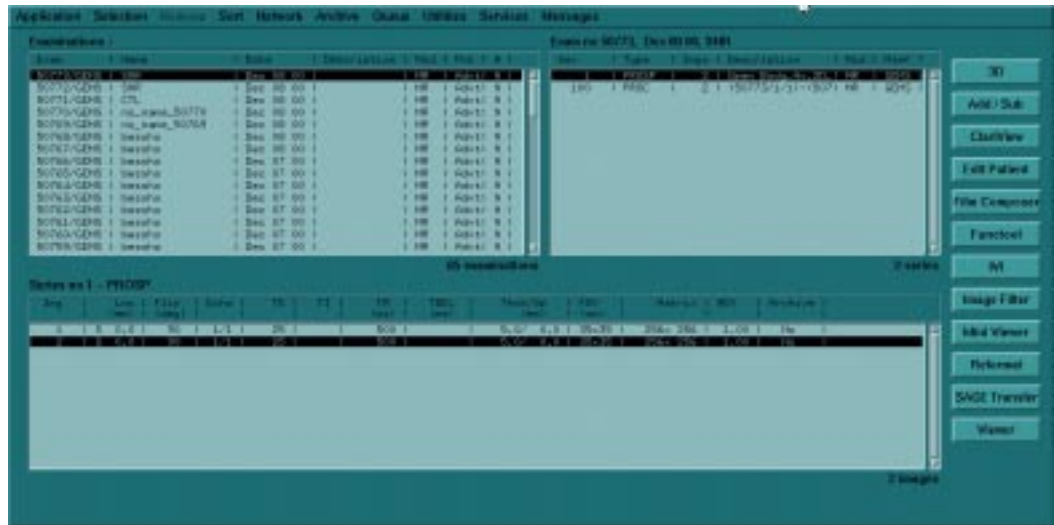
	I/S Center	P/A Center	R/L Center
Start	0	0	0
End	0		
# Slices	1		

VERIFICATION TEST (continued)

Select [Save Series]. Wait to activate [Auto Prescan] button. Select [Auto Prescan]. Wait to finish Auto Prescan.

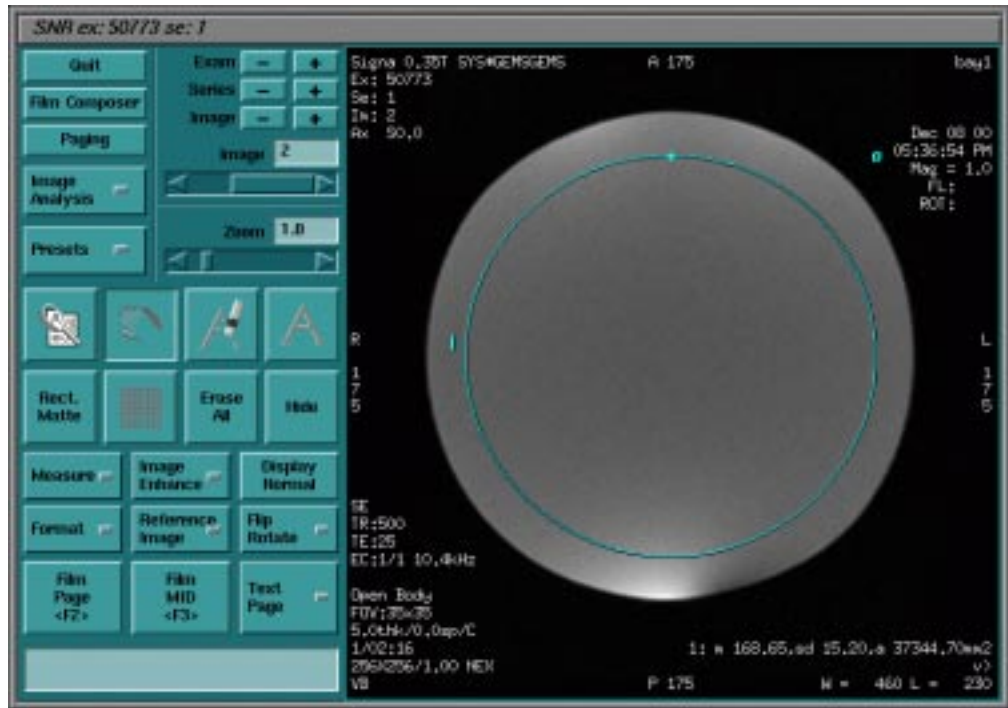


Select [Scan]. Wait to finish scan. Select [Scan] again. Wait to finish scan. Select [Display Icon] to display the browser. Select the exam name "QA Scan SNR". Select "Ser. 1 Image 1" and select [Mini Viewer].

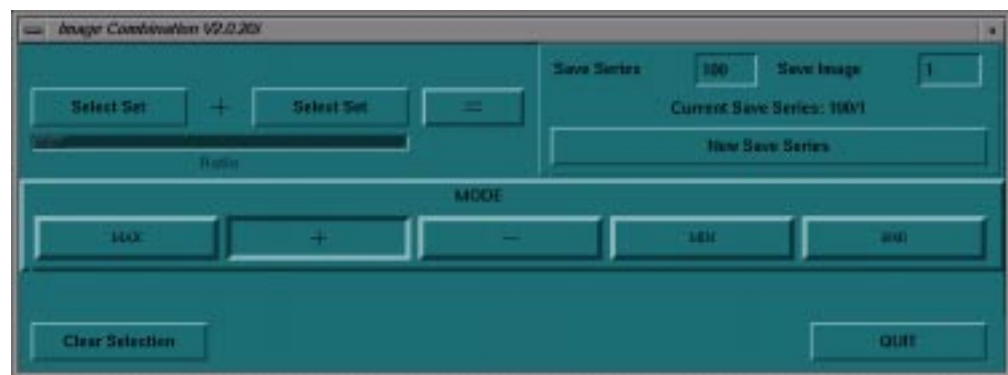


VERIFICATION TEST (continued)

Select [Measure]. Select the circle cursor. The diameter of the cursor should be set to $38012\text{mm}^2 \pm 1000\text{mm}^2$ (diameter 22cm). Set the cursor on the center of the phantom. Record mean value in the SNR Worksheet. In the example, mean value is 168.65. Record the two mean values from Image 1 and Image 2.

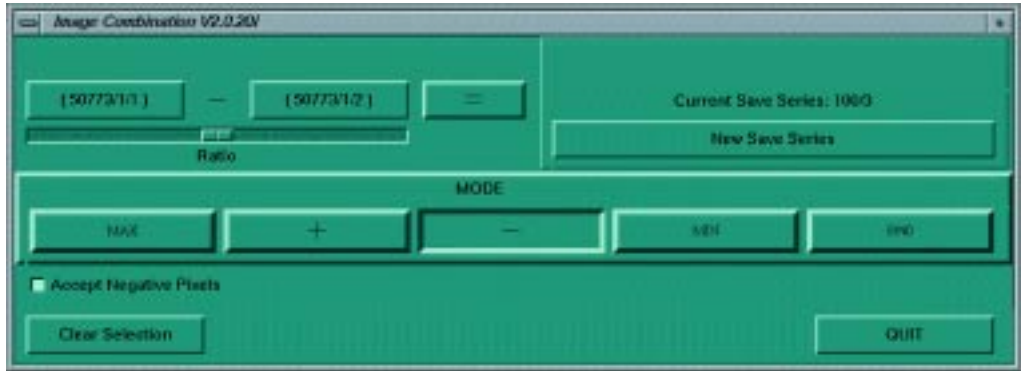


Select [Add / Sub] from browser.

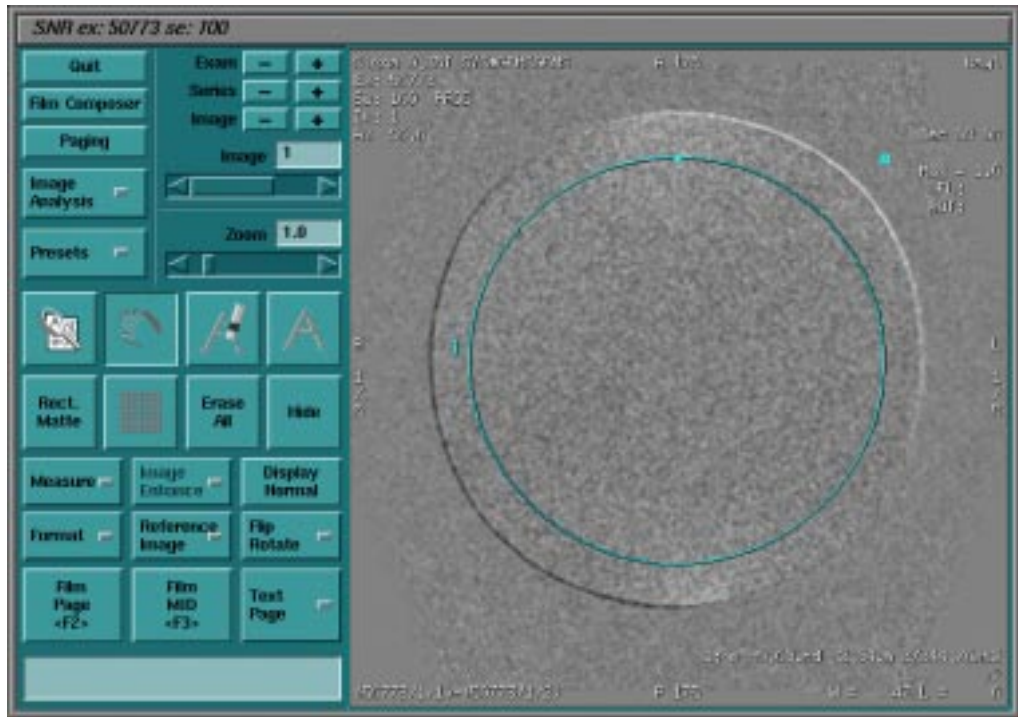


VERIFICATION TEST (continued)

As shown below, select browser Image 1. Select Image Combination [Select Set] (left button). Select browser Image 2. Select Image Combination [Select Set] (right button). Select MODE [-]. Select [Accept Negative Pixels]. Select [=]. Select [QUIT].



Select browser series 100. Select [Mini View] from the browser. Record the standard deviation value using the same diameter ROI on the SNR worksheet. In the example, standard deviation is 2.64.



4. SNR Calculation

SNR should be greater than or equal to 132. To calculate SNR:

$$SNR = \frac{\text{mean value 1} + \text{mean value 2}}{\text{standard deviation} \times 1.414}$$

REPLACEMENT AND MAINTENANCE

1. Field Replacement Unit List

Part Name	GE Part #	USAI Part #
Coil	2282853	100221
Cable Assembly with QD Box	2284558	110166
Anterior Connector and Latch Set	2281933	155015

Table 4: Interventional Body Coil field replacement unit list for Ovation 0.35T.

2. Replacement Accessories

Part Name	GE Part #	USAI Part #
Patient Comfort Pad	2279952	150143
Operator's Guide	2282843	770052
Service Manual	2284559	780033

Table 5: Interventional Body Coil replacement accessories for Ovation 0.35T.

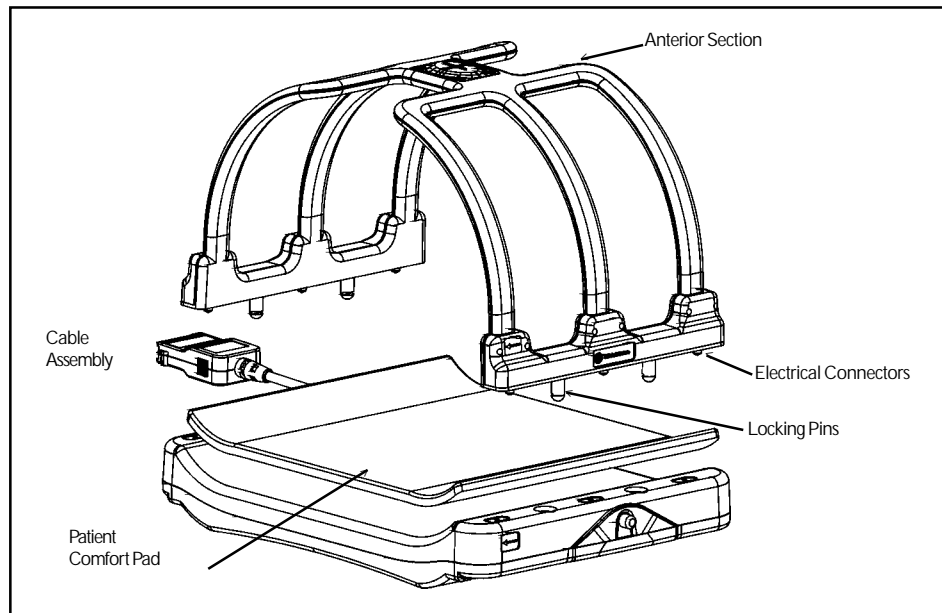


Figure 4: Parts of the coil.

REPLACEMENT AND MAINTENANCE (continued)

3. Troubleshooting

Symptom #1: The system reports a coil fault during prescan or does not recognize the coil connection to the system when selected in the software.

Probable Cause	Suggested Actions	Resolution
The coil connector has become disconnected from the system interface.	Check to make sure the coil connector is fully engaged.	Engage connector and try the scan again. Make sure the indicator light on the patient table turns green with the proper coil selected on the console.
One or more PIN diodes have failed.	Try another similar QD coil to see if the same problem exists. If the fault continues, then the problem is elsewhere in the system.	Troubleshoot system coil ID electronics.
	The PIN diodes may be checked without opening the coil by using a multimeter. To check the "I" channel PIN diodes, place the black probe on D8 (ground) and red probe on D7 (I channel). The multimeter should read about 1.0V (the biasing voltage of the two diodes). When the probes are reversed, the multimeter should read an open. The "Q" channel PIN diodes are checked the same way. The black probe is on D8 (ground) and the red probe is on D9 (Q channel).	Replace the coil.
There is a DC short or open somewhere within the DC bias path inside the coil.	Check the cable and associated DC paths with a DVM, in both diode check and resistance modes.	If a short or open is observed, check the output cable by itself (see below). If the cable and PIN diodes are okay, then replace the coil.
The output cable has a short or an open.	Disconnect the cable at the coil and check each coaxial line with a DVM (resistance). Try moving and twisting the cable as you watch the meter to find any intermittent connections. Inspect the center pins of the SMB and Bendix connectors for wear and proper engagement into the mating connector.	Replace the cable.
There is a problem with the DC bias from the system interface or the coil ID circuitry.	Check to ensure the correct DC bias is being provided to the coil during transmit and receive per GEMS System Service Manual. Try a similar QD coil to see if the same problem occurs.	Correct MRI system problem.

REPLACEMENT AND MAINTENANCE (continued)

Symptom #2: The coil does not pass SNR tests or exhibits poor image quality on patient scans.

Probable Cause	Suggested Actions	Resolution
One or more of the coil channels has a high noise level.	Verify the noise levels of several other coils by running SNR scans to determine if the problem is isolated to a single coil. Run several scans in a row to verify the results.	Resolve system noise problem.
	Check the noise standard deviation against the results obtained when the coil was first installed. If it is 10% or more higher than it was previously, then the problem is in the coil.	Replace the coil.
One or more of the coil channels has low signal.	Verify the signal levels of several other coils by running SNR scans to determine if the problem is isolated to a single coil.	Resolve system signal problem.
	Compare signal mean measurements between channels and system performance logs. If it is 10% lower than previous results, the problem may be in the coil. Run several scans in a row to verify the results.	Replace the coil.
The anterior section of the coil is not fully engaging with the posterior section.	Check the tightness of fit between the anterior and posterior sections of the coil. Make sure that the connections are clean and free of debris. Make sure that the latch is securing the coil firmly.	Clean the connector contacts. Replace the latch mechanisms and electrical contactors as required. If the problem persists, replace the coil.
There is excessive ghosting, causing the noise standard deviation measurements to be artificially high.	Window and level the images down to look at the background for signs of ghosting. Try padding the phantom in the holder. Try running the scan without the phantom holder to see if the ghosting diminishes.	If padding or changing the phantom position can minimize the ghosting, then the problem is caused by excessive vibration elsewhere in the system. If the ghosting is not symptomatic of phantom positioning or padding, then replace the coil.
There is a problem with the DC bias from the system interface or the coil ID circuitry.	Check to ensure the correct DC bias is being provided to the coils during transmit and receive per GEMS System Service Manual.	Correct MRI system DC bias problem.

REPLACEMENT AND MAINTENANCE (continued)

4. Replacing the External Cable

- Note: Before ordering a replacement cable, have the serial number ready for coil identification matching purposes.
- Step 1 -- Unscrew the bottom cover of the coil.
- Step 2 -- Unscrew the cable lock by removing the four screws.
- Step 3 -- Detach the two SMB connectors from the feed board.
- Step 4 -- Remove the cable.
- Step 5 -- Install the new cable and replace the cable lock.
- Step 6 -- Connect the two SMB connectors to the feed board.
- Step 7 -- Reassemble the bottom of the coil with screws.

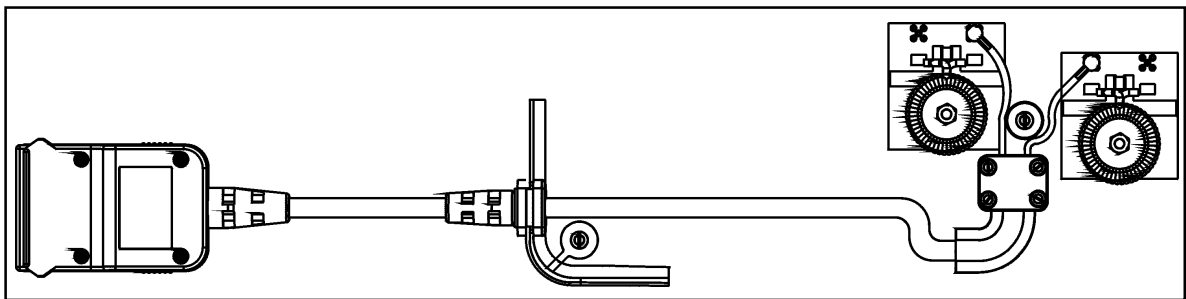


Figure 5: Cable assembly.

REPLACEMENT AND MAINTENANCE (continued)

5. Replacing the Anterior Electrical Connectors and Latch Parts

- Step 1 -- Remove the side covers of the anterior coil using a small flat head screwdriver.
- Step 2 -- Using an 11/32 nut driver and the pliers around the electrical pin (#1; color is gold), remove all of the 8-32 nuts (#5) from the pins. Use the screwdriver and remove the plastic flat head screws (#7) from all the electrical connector assemblies.
- Step 3 -- Replace the electrical pins and contact barrels (#12) and place the assemblies back onto the anterior coil. Replace the 8-32 nut (#5) and lock washer (#6). Place the pin through the hole in the copper extension of the anterior coil. Place new lock washers on top of the artwork and install new nuts on the electrical pins. Use the 11/32 nut driver to tighten the nuts. Caution: Overtightening will damage the connector; tighten half to one turn more than finger tight.
- Step 4 -- Replace the plastic screws (#7) to reattach the electrical assembly to the coil.
- Step 5 -- Using the screwdriver, loosen the brass screws (#9) that hold the mechanical latching pins (#8).
- Step 6 -- Replace the pin, making sure the slot faces the inside of the coil. Reattach new washers and lockwashers to the screws and tighten them down in the slots on the coil.
- Step 7 -- Test the anterior bridge on the coil to see if it latches and unlatches. If there is a latching problem, check that the slots on the mechanical latch are facing the interior of the coil. If it still does not latch, return to USAI for evaluation.
- Step 8 -- Replace the side covers.

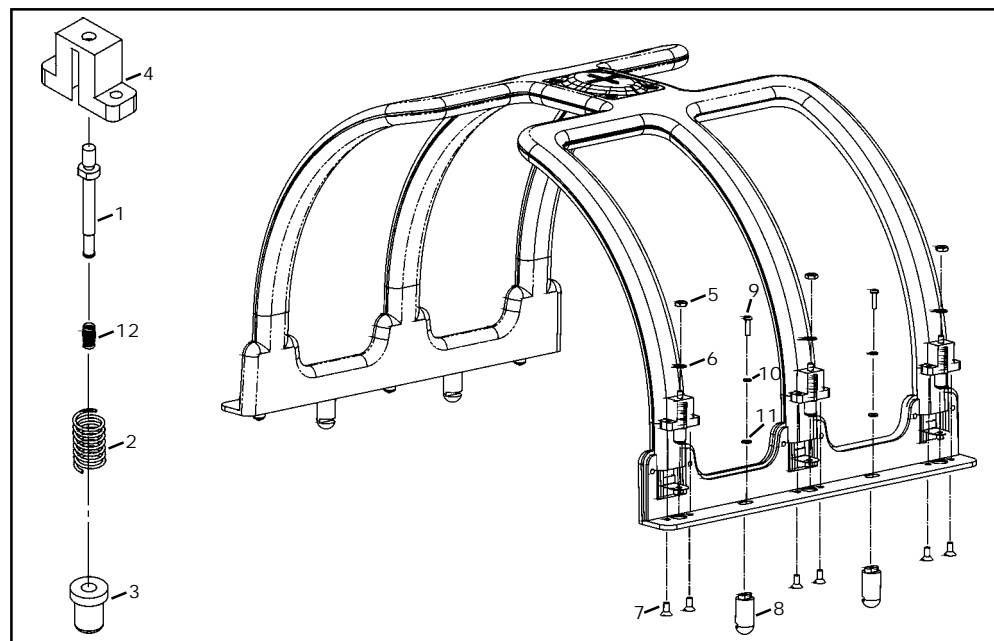


Figure 6: Replacing the anterior electrical connectors and latch parts.

REPLACEMENT AND MAINTENANCE (continued)

6. Coil Care

- Before Cleaning -- Detach the coil connector from the scanner before attempting to clean the coil. Do not touch the connectors with bare fingers. Never press a sharp object against the surface of the connector.



- Caution! Do not pour or spray cleaning liquid directly onto the coil or cable. Do not allow any moisture to come in contact with the connector or cable. Do not immerse the coil in any cleaning liquid.
- Cleaning the Coil -- The following solutions are recommended for the coil and pad surfaces: (1) warm water, (2) one ounce commercial dishwashing liquid mixed with one gallon of water or (3) a ten percent bleach solution (some discoloration may occur). Apply cleaning solution to a soft cotton cloth and proceed to clean. The user should place a cotton sheet over the coil before positioning the patient to prevent soiling of the coil. If the coil is soiled, clean the coil as described above.
- Cleaning the Electrical Connectors -- Detach the coil from the scanner. Using a cotton swab and alcohol (preferred) or dishwashing liquid, gently clean the inside surfaces of the female electrical connector (on the main base) and the surface of the male connector on the anterior section. After cleaning, take care to remove any cotton residue that may be present. Cleaning of the electrical connectors should be performed after at least 10 uses to ensure good coil performance.
- Prior to returning a coil for service, use a ten percent bleach solution (as described above) to eliminate risk of exposure to potentially infectious materials.
- Carrying the Coil -- The coil should be supported from underneath using both hands. The coil should never be lifted by the anterior section.

APPENDIX -- SNR WORKSHEET

Date Tested	Signal Mean	Noise Std. Dev.	SNR	Limit	Comments
				≥132	

TG FREQ

R1 R2

Date Tested	Signal Mean	Noise Std. Dev.	SNR	Limit	Comments
				≥132	

TG FREQ

R1 R2

Date Tested	Signal Mean	Noise Std. Dev.	SNR	Limit	Comments
				≥132	

TG FREQ

R1 R2

Date Tested	Signal Mean	Noise Std. Dev.	SNR	Limit	Comments
				≥132	

TG FREQ

R1 R2

REVISION HISTORY

Revision	Date	Changes	Changed Pages
Revision A	01/01	First Issue	
Revision B	11/01	Added SNR Spec; Modified Coil Configuration Table; Added Revision History	6, 13, 20, 21
Revision C	12/01	Addition to Coil Configuration Table	6