USA Instruments, Inc.

PROFILE 7000
PHASED ARRAY VOLUME NECK COIL

Service Manual

Part No. 780007
Rev. A

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INTRODUCTION

1. How the Coil Operates

- The block diagram of the Phased Array Volume Neck Coil is shown in *Figure 1*. The Phased Array Volume Neck Coil is a receive-only coil designed to give optimum signal to noise and uniform coverage of the neck region. The coil consists of two elements: (1) a loop coil and (2) a saddle coil. The coil has a split-top configuration which enables the scanning of patients with different neck sizes (fits 98 percent of subject population) and patients suffering from claustrophobia. The split-top design also facilitates easier handling and positioning for the user.

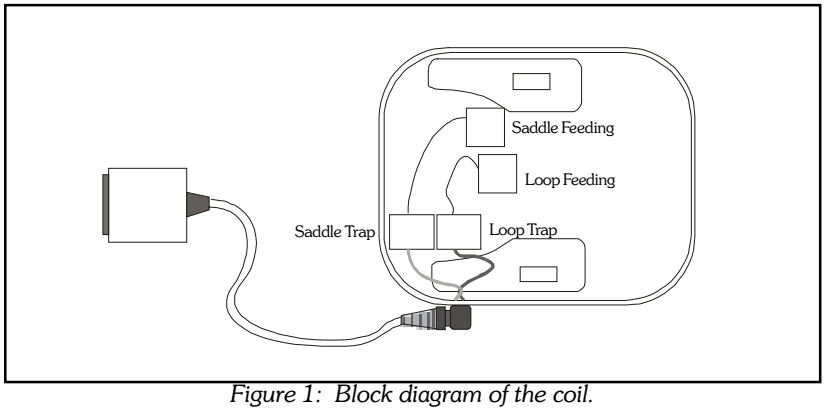

Figure 1: Block diagram of the coil.

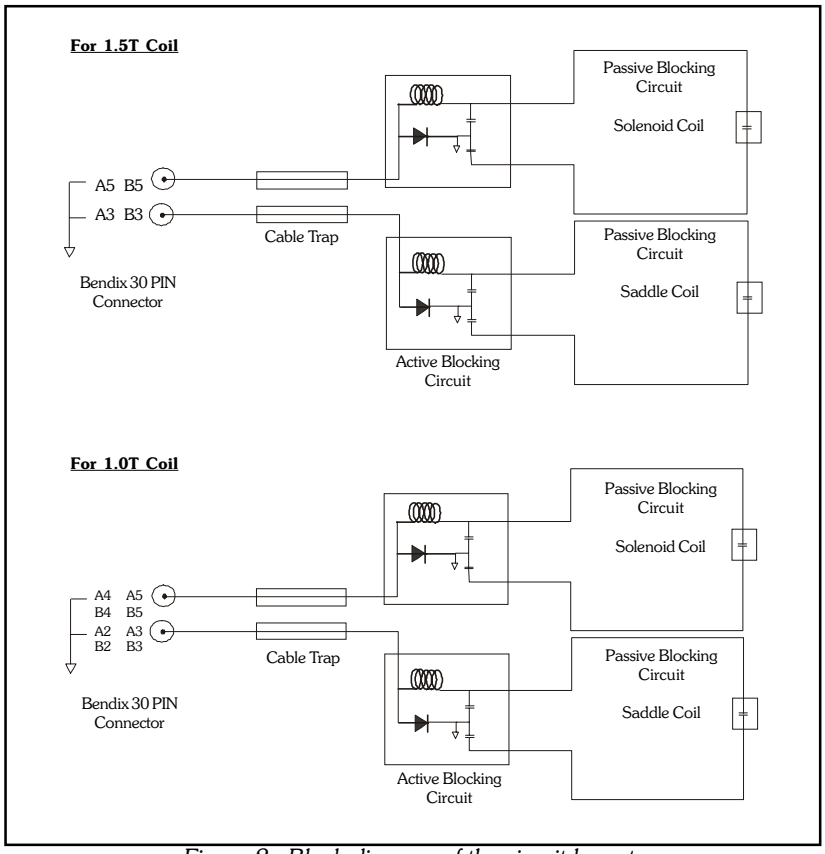

Figure 2: Block diagram of the circuit layout.

INTRODUCTION (continued)

- The Phased Array Volume Neck Coil is a receive-only coil. The coil is actively decoupled from the RF transmit coil during transmit by means of a RF choking circuit. The choking circuit elements are switched on and off by pin diodes. During body coil transmission, the pin diodes are turned on with a forward bias DC source (250mA) provided by the MR system. When the pin diodes are turned on, each of the RF choking elements becomes very high in impedance (typically above 2 kilo-ohm). These high impedance elements in the coil segregate the coil circuitry into several isolated electrical segments, preventing any current flow in the coil circuit. A 30 pin Bendix connector is used to mate the coil with the system's phased array port.

2. Compatibility

- The Phased Array Volume Neck Coil (GE Part Number E8800PJ) is compatible with the Signa Horizon™ 1.5T system.
- The Phased Array Volume Neck Coil (GE Part Number E8800PK) is compatible with the Signa Horizon™ 1.0T system.

3. Coil Specifications

Parameter	Characteristics
Coil Design	phased array, receive-only coil
Tuned Frequency	63.86 MHz (factory set) for 1.5T; 42.68 MHz (factory set) for 1.0T
Optimum FOV	28cm

Table 1: Coil specifications.

	Transport and Storage	Operating Conditions
Barometric Pressure	645mm Hg to 795mm Hg	
Humidity	20% to 95% non-condensing	45% to 75% non-condensing
Temperature	-15 C° to 55 C°	15 C° to 35 C°
Storage Space Requirements	19" (L) x 17" (W) x 16" (H)	

Table 2: Environmental conditions.

4. Related Documents

- Operator's Guide (USAI Part Number 770013 for 1.5T, USAI Part Number 770014 for 1.0T).
- MR System Guide (GE Part Number 2124201-3 for Signa 5.X Service Methods, GE Part Number 2160623-3 for Signa 8.X Service Methods).

SETUP AND CALIBRATION

1. Shipping List

Part Name	GE Part #	USAI Part #	Qty
Coil / Cable Assembly, PA Volume Neck Coil, 1.5T	2254930-2	100125	1
Bridge, PA Volume Neck Coil, 1.5T	2254930-3	110042	1
Pad, PA Volume Neck Coil, 1.5T	E8800PF	150001	1
Wedge Pads (Set of 2), PA Volume Neck Coil, 1.5T	E8800PH	150030	1
Phantom Positioner, PA Volume Neck Coil, 1.5T	E8800PG	150033	1
Phantom, PA Volume Neck Coil, 1.5T	46-265826G6		1
Adapter Block, PA Volume Neck Coil, 1.5T	2254931-5	150031	1
Operator's Guide, PA Volume Neck Coil, 1.5T	2254931-6	770013	1
Service Manual, PA Volume Neck Coil, 1.5T	2254930-7	780007	1

Table 3: Phased Array Volume Neck Coil (GE Part Number E8800PJ) shipping list for Signa Horizon 1.5T system.

Part Name	GE Part #	USAI Part #	Qty
Coil / Cable Assembly, PA Volume Neck Coil, 1.0T	2254931-2	100127	1
Bridge, PA Volume Neck Coil, 1.0T	2254931-3	110043	1
Pad, PA Volume Neck Coil, 1.0T	E8800PF	150001	1
Wedge Pads (Set of 2), PA Volume Neck Coil, 1.0T	E8800PH	150030	1
Phantom Positioner, PA Volume Neck Coil, 1.0T	E8800PG	150033	1
Phantom, PA Volume Neck Coil, 1.0T	46-265826G6		1
Adapter Block, PA Volume Neck Coil, 1.0T	2254931-5	150037	1
Operator's Guide, PA Volume Neck Coil, 1.0T	2254931-6	770014	1
Service Manual, PA Volume Neck Coil, 1.0T	2254930-7	780007	1

Table 4: Phased Array Volume Neck Coil (GE Part Number E8800PK) shipping list for Signa Horizon 1.0T system.

2. Installing the Coil

- At the console, install a new soft key. This soft key will be used by the operator to select NECKPA. Refer to the system manuals for information on installing soft keys (use the phased array and coil default values shown below).

Coil Name	Number of Receivers	Start Receiver	Stop Receiver	Recon Enable Mask	Port Enable Mask	Error Enable Mask
NECKPA	2	0	1	0	3	3

Table 5: Phased array values.

SETUP AND CALIBRATION (continued)

Coil Name	Coil Type	Extremity Coil	Cable Loss	Coil Loss	Recon Scale Factor	Xmit Coil Type	Multi Coil
NECKPA	3	no	1.05	0.313	1.00	quad	yes

Table 6: Coil values for Signa Horizon 1.5T.

Coil Name	Coil Type	Extremity Coil	Cable Loss	Coil Loss	Recon Scale Factor	Xmit Coil Type	Multi Coil
NECKPA	3	no	1.24	0.103	1.00	quad	yes

Table 7: Coil values for Signa Horizon 1.0T.

- The coil is ready for clinical use after proper installation of the soft key. Refer to the Operator's Guide for instructions on use of the coil.

3. Quality Assurance

- Tuning -- The Phased Array Volume Neck Coil does not require matching or tuning on a per patient basis. The coil is initially tuned to the system frequency by USA Instruments' service engineers and requires no additional tuning.

- QA Check -- It is recommended that the clinical user conduct a QA check on the Phased Array Volume Neck Coil on a weekly basis. The QA check consists of a QA scan, a calculation of the signal-to-noise ratio (SNR) and a visual inspection of the coil phantom image.

- QA Setup -- Select [New Study], [New Exam] or [New Pt] to set a new landmark. Remove any other surface coil (if present) from the cradle. Place the Phased Array Volume Neck Coil near the top of the cradle. Place the Head TLT Sphere with Nickel Chloride Phantom (GE Part # 46-265826G6) on the positioner in the coil *(see Figure 3)*. Connect the Phased Array Volume Neck Coil connector to the phased array port. Align the laser with the marks on the coil bridge and with the cross marks on the coil sides. Position the coil at isocenter. The critical parameters for the QA scan protocol are listed on the next page. Select [Scan]. Scan the phantom. Observe the resulting image of the phantom which should be similar to *Figure 4*. Check to see that there are no artifacts in the image. This image will be used for determination of the coil's SNR.

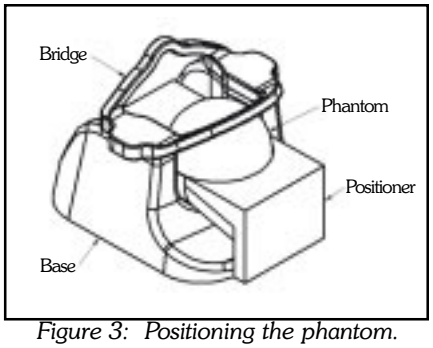

Figure 3: Positioning the phantom.

SETUP AND CALIBRATION (continued)

Patient/Exam Information	
ID	QA
Name	C-Spine
Patient Weight	111 lbs / 50 Kgs
Patient Position	
Patient Entry	Head First
Patient Position	Supine
Axial/Sag Landmark	
Coil Type	USVOLNECK
Scan Plane	Sagittal
Imaging Parameters	
Image Mode	2D
Pulse Sequence	Fast Spin Echo
Imaging Options	Fast
Scan Timing	
Number of Echoes	1
Echo Time (TE)	28 msec
Rep Time (TR)	300 msec
Scan Time	22 sec
Echo Train Length (ETL)	4
Scanning Range	
Field of View (FOV)	26 cm
Scan Thickness	3 mm
Interscan Spacing	0 mm
Start Loc	0
End Loc	0
Number of Scan Locations	1
FOV Center	0 LR, 0 AP
Acquisition Time	
Acq Matrix (Frequency)	256
Acq Matrix (Phase)	256
Frequency Direction	A/P
NEX	1
Phase FOV	1.00
Autoshim	On
Auto CF	Peak

Table 8: QA scan parameters.

SETUP AND CALIBRATION (continued)

- SNR Measurement -- Select the phantom image. Select the circular cursor. Size the cursor so that it represents a circular region of interest (ROI) of 600mm^2 (approximate). Position the center of this circle at approximately 60mm **from the edge of the phantom** *(see Figure 4)*. Record the phantom mean pixel value. Reposition or recreate the same circular ROI in the background region *(see Figure 4)*. Check to see that the background is free of any artifact. Record the background mean pixel value. Calculate the image's signal-to-noise ratio (SNR = phantom mean pixel divided by background mean pixel). SNR should be greater than _____ (for 1.5T) or _____ (for 1.0T).

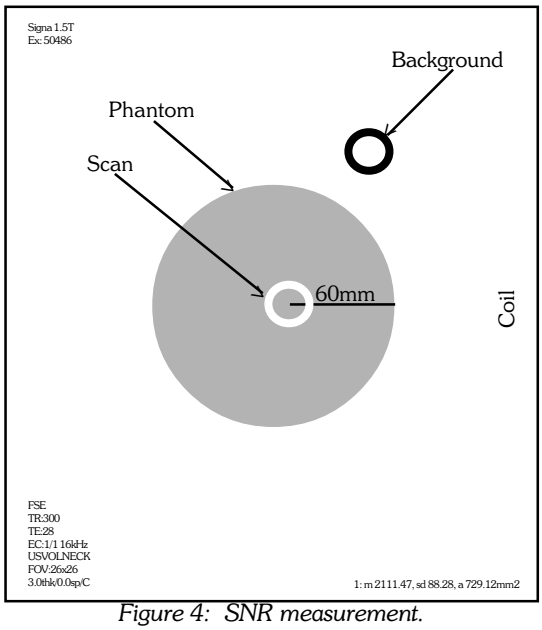

Figure 4: SNR measurement.

- Visual Check of the Phantom Images -- The user should study the sagittal image of the phantom that was obtained for the SNR analysis to spot any large dark signal voids or significant signal non-uniformity. Signal voids and signal non-uniformity may indicate potential problems with an individual coil or coils. Contact your service engineer for troubleshooting.

REPLACEMENT AND MAINTENANCE

1. Checking the Protection Pin Diodes and Output Cable with DMM

- Select the DIODE TEST function on the DMM. Connect the negative lead to the connector pin on Row A. Connect the positive lead to the pin on Row B. Refer to the table and illustration above. A reading of 0.50 volts to 0.55 volts should be observed. If a reading below 0.40 volts is observed, either the output cable is shorted or one of the pin diodes on the feeding board is defective. If a reading above 0.65 is observed, either the output cable or the jumper is open.

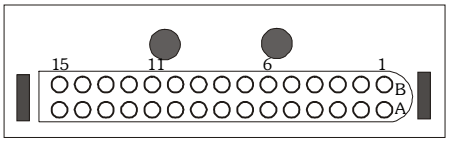

Figure 5: Pin locations for Bendix 30 pin phased array connector.

Coil Number	Positive Lead Connection	Negative Lead Connection	Voltage Reading
1	3B	3A	0.51 (+/-.10)
2	5B	5A	0.51 (+/-.10)

Table 9: Pin diodes and output cable with DMM for Signa Horizon 1.5T.

Coil Number	Positive Lead Connection	Negative Lead Connection	Voltage Reading
1	3B, 3A	2B, 2A	0.51 (+/-.10)
2	5B, 5A	4B, 4A	0.51 (+/-.10)

Table 10: Pin diodes and output cable with DMM for Signa Horizon 1.0T.

REPLACEMENT AND MAINTENANCE (continued)

2. Field Replacement Unit List

Part Name	GE Part #	USAI Part #	Qty
Coil, PA Volume Neck Coil, 1.5T	2254930-2	100125	1
Bridge, PA Volume Neck Coil, 1.5T	2254930-3	110042	1
Cable Assembly, PA Volume Neck Coil, 1.5T	2254930-4	110037	1
Pad, PA Volume Neck Coil, 1.5T	E8800PF	150001	1
Wedge Pads (Set of 2), PA Volume Neck Coil, 1.5T	E8800PH	150030	1
Phantom Positioner, PA Volume Neck Coil, 1.5T	E8800PG	150033	1
Phantom, PA Volume Neck Coil, 1.5T	46-265826G6		1
Adapter Block, PA Volume Neck Coil, 1.5T	2254930-5	150031	1
Operator's Guide, PA Volume Neck Coil, 1.5T	2254930-6	770013	1
Service Manual, PA Volume Neck Coil, 1.5T	2254930-7	780007	1

Table 11: Phased Array Volume Neck Coil field replacement unit list for Signa Horizon 1.5T.

Part Name	GE Part #	USAI Part #	Qty
Coil, PA Volume Neck Coil, 1.0T	2254931-2	100127	1
Bridge, PA Volume Neck Coil, 1.0T	2254931-3	110043	1
Cable Assembly, PA Volume Neck Coil, 1.0T	2254931-4	110038	1
Pad, PA Volume Neck Coil, 1.0T	E8800PF	150001	1
Wedge Pads (Set of 2), PA Volume Neck Coil, 1.0T	E8800PH	150030	1
Phantom Positioner, PA Volume Neck Coil, 1.0T	E8800PG	150033	1
Phantom, PA Volume Neck Coil, 1.0T	46-265826G6		1
Adapter Block, PA Volume Neck Coil, 1.0T	2254931-5	150037	1
Operator's Guide, PA Volume Neck Coil, 1.0T	2254931-6	770014	1
Service Manual, PA Volume Neck Coil, 1.0T	2254930-7	780007	1

Table 12: Phased Array Volume Neck Coil field replacement unit list for Signa Horizon 1.0T.

REPLACEMENT AND MAINTENANCE (continued)

3. Replacing the External Cable

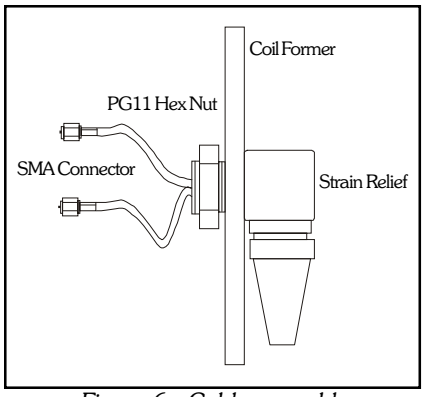

Figure 6: Cable assembly.

- Step 1 -- Unscrew the bottom cover of the coil.
- Step 2 -- Detach the two SMA connectors from the baluns.
- Step 3 -- Loosen and detach the PG11 hex nut and pull the cable assembly out from the coil.
- Step 4 -- Install the new cable assembly and tighten the hex nut.
- Step 5 -- Connect the two SMA connectors on the cable to the baluns.
- Step 6 -- Reassemble the bottom of the coil with screws.

4. Replacing the Anterior Bridge Assembly

- The anterior bridge assembly is a field replaceable unit and can be simply interchanged with the original assembly. However, to ensure correct fit and ease of engagement of the anterior assembly to the coil, it is strongly recommended that the service engineer follow the following procedure (see *Figure 7* for guidance).
- Step 1 -- Unscrew the top cover from the bridge assembly and loosen (using an 11/32 inch nut driver) both nuts that secure the connector pins.
- Step 2 -- Place the bottom portion of the bridge assembly on the C-Spine section of the Volume Neck Coil. Then tighten both nuts.
- Step 3 -- Remove the bottom portion of the bridge assembly from the Volume Neck Coil. Then tighten down the connector pin and nut assembly by using the 11/32 inch driver to torque the nut and a 1/4 inch driver to keep the connector pin from rotating.

REPLACEMENT AND MAINTENANCE (continued)

- Step 4 -- Place the bottom portion of the bridge assembly back on the Volume Neck Coil to check that the alignment of the connector pins is correct. If the bridge does not install smoothly on the Volume Neck Coil, loosen the nuts and pin assemblies. Repeat Steps 2 and 3 to realign the pins. If the assembly of the bridge and coil continues to be a problem after repeating the procedures, return the coil for evaluation.

- Step 5 -- If the bridge engages correctly, then reassemble the top and bottom portions of the bridge.

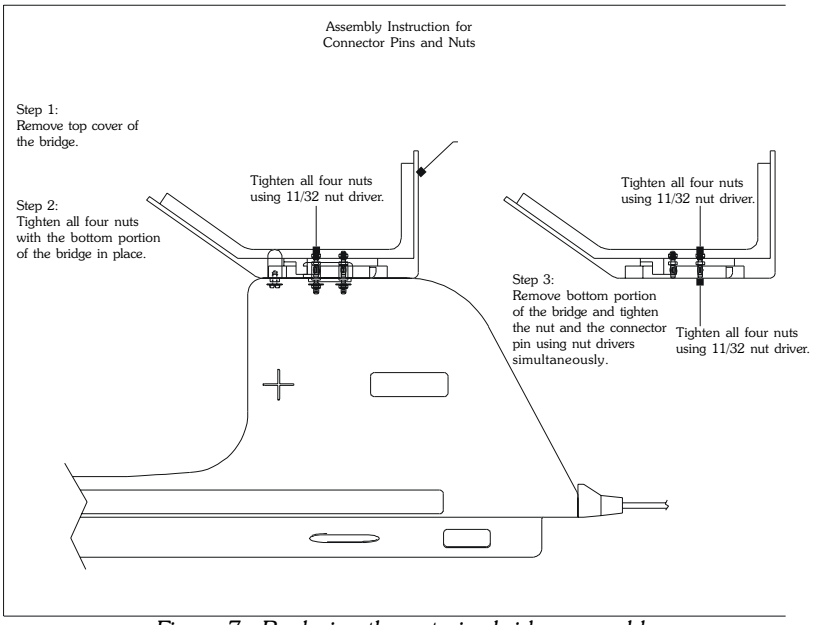

Figure 7: Replacing the anterior bridge assembly.

5. Coil Care

- Before Cleaning -- Detach the coil connector from the scanner before attempting to clean. Prevent touching the connectors with bare fingers. Prevent pressing 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 following solutions are recommended for the coil and pad surfaces: (1) warm water, (2) one ounce commercial dishwashing liquid mixed with one gallon water or (3) a ten percent bleach solution (some discoloration may occur). Apply cleaning solution to a soft cotton cloth and proceed to clean. It is recommended that the user place a cotton sheet over the coil before positioning the patient to prevent soiling of the coil. In the event the coil is soiled, clean the coil as described above.

- Carrying the Coil -- The coil should be supported from underneath using both hands. The coil should never be lifted by the anterior section.