MRI DEVICES CORPORATION

Technical Report

4445 SW 35TH Terrace
Suite 350
Gainesville, FL 32608

TITLE: **GE MEDICAL SYSTEMS SERVICE MANUAL – OEM VERSION – PHASED ARRAY NEUROVASCULAR COIL - E8800L and E8800LA**

REPORT #: **TR0001S**

AUTHOR: G. Randy Duensing

PARENT PART:

APPROVED BY: _____**MRIDC Project Leader**

SCOPE: This is a service manual for the Phased Array Neurovascular Coil for 1.5T, E8800L and 1.0T, E8800LA.

REVISION HISTORY

Rev Level	Date	Change Description	
A	11/2/98	First issue	
1	4/1/99	Released to Workcenter	
1.1	4/30/99	Modification	

I. Scope

This is a service manual for the Phased Array Neurovascular Coil for 1.5T and 1.0T.

II. Reference Documents

2202492GSP	GE Medical Systems Surface Coil ECAT Requirements Specification
2111842DRS	GE Medical Systems Design Requirements Specification for Surface Coils
TR0001B	MRIDC OEM Design Specification – GE PA Neurovascular Coil
2124201-3	GE Service Documentation
2160623-3	GE Service Documentation

III. Products Included

MRIDC No.		GE Part No.
800001	1.5T Phased Array Neurovascular Coil	2225476
800002	1.0T Phased Array Neurovascular Coil	2225477

IV. Service Information

Theory of operation: (refer to block diagram)

The Phased Array Neurovascular coil consists of a top and bottom piece which must be securely fastened together for safe effective operation. The coil utilizes four channels of the multi-coil system. The head channel on S6 is a quadrature saddle coil which uses the combiner labeled (1). The neck coverage comes from three channels, one for the anterior neck and the other two for the posterior neck. The coils are tuned/matched and decoupled through the circuits labeled (2). Decoupling is actively controlled using the system bias current and trap circuits which produce high impedance in the coil loops when PIN diodes are forward biased. If bias current is not available due to a system failure, the traps will be activated passively by the RF power during transmission. These trap circuits ensure safe artifact free operation. Phase shift circuits (labeled (3)) are employed to improve inductive isolation using the system preamplifier impedance mismatch. Item 4 is the system interface which defines the pins associated with each coil channel.

Configuration file and setup/calibration information:

The configurations below are for programming soft keys for the *HNC Neurovascular Array Coil* on the plasma display console. The selections are NVHEAD and NVARRAY.

1. If not already in C Shell window touch **[UTILITIES]** then **[C Shell]** at operator's console to open up a tty window.

2. **Touch the Touch Screen** in the window to get input control, then perform the following in the window.

> **cd /w/config** enter
> **addcoil** enter

C O I L C O N F I G
Add A New Coil!

The computer will query you for the fourteen values that must be supplied to add a new coil to the CoilConfig.cfg file. Then, you will be asked whether or not to actually update the files. Enter ^c (control c) at any time to exit the program and cancel. Entering a blank line for a value gets you help information.

CoilName (8 characters or less): **NVHEAD**
korecName (4 characters or less): Enter a space return
CoilType (l-Head 2-Body 3-Surface): **3** enter
Extremity Coil (yes, no): **no**
Cable Loss (float): 1.5T System: **1.05**
1.0T System: **1.24**
Coil Loss (float): 1.5T System: 60 cm. bore **1.72,** 55 cm. bore **0.313**
1.0T System: 60 cm. bore **0.549,** 55 cm. bore -------
Recon Scale Factor: **1.0**
Linear vs Quadrature (0 or l): **1**
Multiple Receiver Coil? [yes, no]: **yes**
Number of Receivers: **1**
Starting Receiver ID (integer): **0**
Ending Receiver ID (integer): **0**
mcPortEnable (an integer): **4**
mcErrorEnable (an integer): **4**
XMITATTEN (An integer from 1 to 100, units are tenths of dB: **0**
NumFastRec: **0**
StartFastRec: **4**
End FastRec: **4**

(Coil values you have just entered are displayed.)
Write these values to the config files? (yes/no): **yes**
Config files updated.
You can add another coil or quit. Add another coil? (Y/N) **Y**

CoilName (8 characters or less): **NVARRAY**
korecName (4 characters or less): Enter a space return
CoilType (l-Head 2-Body 3-Surface): **3** enter
Extremity Coil (yes, no): **no**
Cable Loss (float): 1.5T System: **1.05**
1.0T System: **1.24**
Coil Loss (float): 1.5T System: 60 cm. bore **1.72,** 55 cm. bore **0.313**

1.0T System: 60 cm. bore **0.549,** 55 cm. bore -------
Recon Scale Factor: **1.0**
Linear vs Quadrature (0 or l): **1**
Multiple Receiver Coil? [yes, no]: **yes**
Number of Receivers: **4**
Starting Receiver ID (integer): **0**
Ending Receiver ID (integer): **3**
mcPortEnable (an integer): **6**
mcErrorEnable (an integer): **6**
XMITATTEN (An integer from 1 to 100, units are tenths of dB: **0**
NumFastRec: **0**
StartFastRec: **4**
End FastRec: **4**

(Coil values you have just entered are displayed.)
Write these values to the config files? (yes/no): **yes**
Config files updated.
You can add another coil or quit. Add another coil? (Y/N) **Y**

CoilName (8 characters or less): **NVFASTHD**
korecName (4 characters or less): Enter a space return
CoilType (l-Head 2-Body 3-Surface): **3** enter
Extremity Coil (yes, no): **no**
Cable Loss (float): 1.5T System: **1.05**
1.0T System: **1.24**
Coil Loss (float): 1.5T System: 60 cm. bore **1.72,** 55 cm. bore **0.313**
1.0T System: 60 cm. bore **0.549,** 55 cm. bore -------
Recon Scale Factor: **1.0**
Linear vs Quadrature (0 or l): **1**
Number of Receivers: **1**
Starting Receiver ID (integer): **0**
Ending Receiver ID (integer): **0**
mcPortEnable (an integer): **4**
mcErrorEnable (an integer): **4**
mcReconEnable: **0**
XMITATTEN (An integer from 1 to 100, units are tenths of dB: **0**
NumFastRec: **1**
StartFastRec: **4**
End FastRec: **4**
fastTGstartTA: **90**
fastTGstartRG: **12**
multiCoil: **yes**

(Coil values you have just entered are displayed.)
Write these values to the config files? (yes/no): **yes**
Config files updated.
You can add another coil or quit. Add another coil? (Y/N) **N**

Signa software of release 5.4 and below **does not** currently support **AUTOSHIM** for a coil with more than 2 channels. The operator may circumvent this restriction by autoshimming using the **BODY COIL** selection after having prescribed the proper offsets and FOV for the patient. Once **AUTOSHIM** has been completed, continue the same patient study now selecting the NVARRAY coil selection.

Signa software of release 5.5 and newer supports the **AUTOSHIM** feature using a 4 channel coil by defaulting to the body coil for shimming. Once the operator has prescribed the proper offsets and FOV for the patient, **AUTOSHIM** using the NVARRAY coil selection, and proceed with the scan.

Scanner and coil verification testing procedures:

General tests: Be sure that you choose the correct coil, and activate the desired coils from the menu selection on the surface coil screen. The coil chosen must be **NVARRAY.**

Position the Array Coil at the head end of the patient cradle. Place the 16 cm diameter head phantom in the head portion of the HNC coil. Activate the NVARRAY coil from the soft key on your operator's console.

Scan using Auto Pre-scan. If Auto Pre-scan does not complete successfully, do not use the coil clinically. Upon completion of pre-scan, execute the scan. Window the scan as you normally would (window levels vary from system to system depending upon your hardware revision level). The scan should appear uniform.

If the image has signal voids, distortions, or black streaks, discontinue use of the coil. If the image is excessively noisy, repeat the scan using the **GE 5 inch general purpose coil for 1.5T or alternate coil for 1.0T** supplied with your system. If the 5 inch coil image or alternate coil image exhibits similar artifacts, the problem likely lies with the MRI system.

Reverse Polarity check: If the polarity on the system is uncertain, then use the following procedure to test coil operation. Position the Array Coil at the head end of the patient cradle. Place the 16 cm diameter head phantom in the head portion of the HNC coil. Activate the NVHEAD coil from the soft key on your operator's console. Choose a sequence used for SNR preventative maintenance with the GE Head coil, if possible.

Scan using Auto Pre-scan. If Auto Pre-scan does not complete successfully, due to low signal, manual pre-scan. A reverse polarity system would cause the SNR to be substantially lower than (less than 75%) the same sequence using the GE Head Coil. If this is observed the coil should be

replaced with a reverse polarity version of the HNC Neurovascular coil.

Scanner and digital multimeter diagnostic procedure:

A digital multimeter can be used to measure the PIN diode drop in each of the four elements. A single PIN diode drop of ~0.7 volts should be seen according to the block diagram at each of the inputs for S3, S4, and S5. The positive lead should go to the signal pins, S3-S6, and the negative lead should go to any of the ground pins, GND. Reversing the leads should read ~2.4 volts. For S6, which drives two loops, the typical forward drop is ~0.6 volts, while the reverse measurement is ~1.9 volts. If either reading is a short circuit, the diode(s) or the cable is shorted and a replacement cable should be used to retest the coil. If forwarding biasing the diode results in an open circuit or voltage over 1 volt, the diode(s) or cable is open and the coil must be replaced. The scanner will typically detect open and shorted channels and display a scan error.

List of applicable FRUs:

MRIDC No.		GE Part No.
100137	1.5T Neurovascular Array	2225476-2
100138	1.0T Neurovascular Array	2225477-2
100014	1.5T Cable Assembly	2225476-3
100015	1.0T Cable Assembly	2225477-3
1000163	Neurovascular Pad	E88800LD

Block Diagram: