# **OPERATOR MANUAL**

# Hand/Wrist MRI Coil

# 16 Channel Wrist Coil for GE 1.5 450/450W and 3.0T 750/750W MRI Systems



UDI: (01)00859193006340(21)xxx (1.5T) (01)00859193006654(21)xxx (3.0T)

Approved by:

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Date: September 13, 2023



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#### 0.0 LICENSES AND TRADEMARKS

The ScanMed® Logo is a registered trademark of ScanMed, LLC.

Signa HDx, MR 450 and 750, and the GE logo are registered trademarks of the General Electric (GE) Company.

Proper performance of this coil is warranted only on the system software for which it was specified at the time of purchase. Software or firmware upgrades may affect compatibility and performance. Please contact your GE representative and ScanMed representative prior to operating on new software, as failure to do so may void your warranty.

#### **CAUTION:**

This product contain may contain chemicals, including lead, known to the State of California to cause birth defects or other reproductive harm.

WASH HANDS AFTER HANDLING.

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#### 1.0 TRANSPORTATION & STORAGE CONDITIONS

Store the coil on a flat surface. Excessively tight bending of the cable can cause damage to the system cable.

Transport and store this product under the following environmental conditions only, for a period not exceeding two weeks:

-40 °C -40 °C	Ambient temperature of -40 °C to +50 °C
15%	Relative humidity of 15% to 95% (non-condensing)
76.5 kPa	Atmospheric pressure of 76.5 kPa to 101 kPa
Keep Dry	Protect from water
T Fragile	Fragile, handle with care

# 2.0 EXPLANATION OF SYMBOLS

<u> </u>	Caution/warning, consult accompanying documents
<u>(i)</u>	Attention, consult accompanying documents
<b>†</b>	Type BF applied part
	Class II ordinary equipment, suitable for continuous operation
((1))	For use on specified field strength
X	Dispose of the coil by returning to manufacturer or via facility equipped to handle electronic products
REF	Part number and revision
SN	Serial number
#	Model number
	Manufacturer name, address, and date of manufacture
EC REP	EU Authorized Representative Emergo Europe Westervoortsedijk 60 6827 AT Arnhem The Netherlands
NON	Non-sterile
MD	Medical device
<b>№</b>	Do not cross or loop cables. Arcing and patient burns could result.
	NOTE FOR THE OPERATOR:
<b>E</b>	There is a possibility of pinching one's fingers when working with this coil, particularly when opening and closing the coil.

#### 3.0 INTRODUCTION

This manual describes the safety precautions, features, use and care of the ScanMed LLC 16 Channel Hand/Wrist coil, compatible with GE 1.5T and 3.0T MR systems.

If you have any questions or comments about this manual, or need any assistance with the use of the product, please contact ScanMed, LLC:

(402) 934-2650

Email: CustomerService@scanmed.com

# Description

This Hand/Wrist coil interfaces with the GE 1.5T or 3.0T MRI systems and has been designed to collect image data throughout the region of wrist. This 16-channel design incorporates a set of unique antenna elements whose geometry has been optimized to image this anatomy. The design is recognized as a receive-only coil on the GE MRI system. The coil form geometry has been formed to facilitate close coupling of the imaging coil's region-of-sensitivity to the anatomy of interest.



Hand/Wrist Coil with Basic Base



Hand/Wrist Coil with Offset Base Vertically Positioned with Adapter



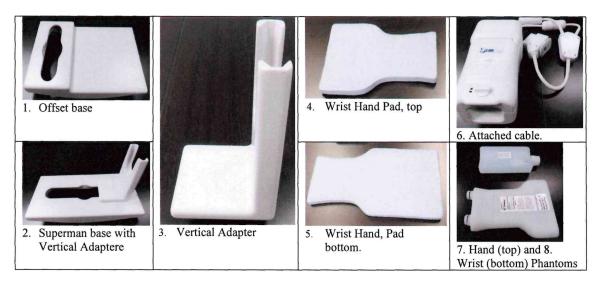
Hand/Wrist Coil with Offset Base



Hand/Wrist Coil with Offset Base showing Vertical Adapter

# 16-Channel Hand/Wrist Coil Parts List

The following photographs demonstrate the items that are shipped with your new coil. Please inspect upon receipt to make sure all parts have arrived and are in good order. Use this guide to refer to part names throughout this manual.



ID#	Part Number	Description	
1.	HOU00067+R	Offset Coil Base	
2.	HOU00066+R	Superman Base	
3.	HOU31X007+R	Vertical Adapter	
4.	PAD00015+R	Wrist Hand Pad, Top	
5.	PAD00016+R	Wrist Hand Pad, Bottom	
6.	CAB316GE00x+R	Cable (dependent on system)	
7.	PHA00018+R	Phantom, Hand	
8.	PHA00020+R	Phantom, Wrist	

If necessary, these items may be ordered for replacement by contacting ScanMed Customer Service at (402)934-2650.



Do not force the latched opening on the coil farther than it will smoothly open. It will snap if pushed too far, rendering the coil inoperable and in need of repair.

#### **Indications For Use**

The indications for use for this coil are as follows.

- Soft tissue and bone imaging of the hand and/or wrist as allowed by the MRI system.
- Magnetic resonance wrist angiography.

# **Compatibility**

This manual applies to the following models of the Hand/Wrist coil.

Model	MRI System Compatibility		
316GE1501	1.5T GE MR 450 and 450W		
316GE3001	3.0T GE MR 750 and 750W		

#### 4.0 PATIENT SAFETY

Training	This manual contains detailed information on the set-up, positioning and use of your Hand/Wrist coil. The instructions should be read carefully and thoroughly before attempting to scan patients with the coil.		
Quality Assurance	The procedure described in the Quality Assurance Section of this manual should be performed upon receipt of the coil to establish a baseline of coil performance. The procedure should be repeated at regular intervals.		
Indications	The coil is indicated for use, on the order of a physician, in conjunction with an MR scanner as an accessory to produce images of the wrist.		
Contra- Indications	The coil is indicated for use, on the order of a physician, in conjunction with an MR scanner as an accessory to produce images of the wrist.		
	Scanning is contraindicated for patients who have electrically, magnetically or mechanically activated implants (for example, cardiac pacemakers). The magnetic and electromagnetic fields produced by the MR System and coil may interfere with the operations of these devices.		
	Scanning patients with intracranial aneurysm clips is contraindicated.		

Precautions	The second secon	tions should be taken when scanning patients with the g conditions:	
		Greater than normal potential for cardiac arrest.	
		An increased likelihood for developing seizures or claustrophobia.	
	<u>^</u>	Unconscious, heavily sedated, or confused patients.	
		Patients with whom reliable communications cannot be maintained.	

Cautions	magnetic	The following general warning statements apply to scanning with a magnetic resonance system. For further details, review the warnings in your MR system Operator Manual.		
	Mannings MB Ø₀	Do not cross or loop cables. Arcing and patient burns could result. Route cables out of the magnet so that they do not touch the patient.		
		Ensure that the patient is not touching the bore. If necessary, place pads between the patient and the surface of the bore.		
	1	If the patient complaints of warming, tingling, stinging, or similar sensations, promptly stop the scan procedure, examine the patient, and contact the responsible physician before continuing the procedure. Pay special attention to very young, sedated, or other compromised patients who may not be able to communicate effectively.		
	<u> </u>	If the patient complaints of warming, tingling, stinging, or similar sensations, promptly stop the scan procedure, examine the patient, and contact the responsible physician before continuing the procedure. Pay special attention to very young, sedated, or other compromised patients who may not be able to communicate effectively.		
		Patients with ferromagnetic metal implants should not be scanned because the magnetic field may interact with implanted surgical slips or other ferromagnetic materials.		
		Persons with cardiac pacemakers or other implanted electronic devices should not enter the magnetic field zone delineated by the MR system manufacturer.		
		There is a risk to scanning feverish or decompensated cardiac patients.		

	Facial makeup such as eyeliner and mascara should be removed before scanning because it may contain ferromagnetic material which can cause skin and eye irritation. Permanent eyeliner tattoos may cause eye irritation due to ferromagnetic particles.
	Patients who work in environments in which there is a risk of having embedded metallic fragments in or near the eye should be carefully screened before undergoing an MR scan or exam.
	Visually inspect the cable insulator jackets, strain reliefs and connector boxes before each use. If the insulation is broken, or if the cable is frayed, immediately discontinue use of the device.
	Use caution when lifting the coil base assembly from the patient table to storage.
	Advise the patient to remain still throughout the scan to avoid nausea.
<u> </u>	Patients must be supervised at all times during scans.
	The safety of scanning fetuses has not been established.

# **Emergency Procedures**

In the unlikely event that a coil creates smoke, sparks or makes an unusually loud noise, or if the patient requires emergency assistance:

- Stop the scan if one is in progress.
- Remove the patient from the scan room if medical treatment is needed.

Technical Considerations		The coil and accessories require special conditions regarding electromagnetic compatibility. The coil must be installed and used in a shielded scan room provided with the MR magnet and system. The user must ensure that the scan room door is closed during system use. Failure to do so may cause reciprocal interference with any portable or mobile RF communications equipment, affecting the performance of the MR coil and/or such equipment.  The coil should only be used with the accessories specified in the Operator Manual.
	<u> </u>	The use of accessories other than those specified in the Operator Manual may result in decreased ESD immunity of the coil or MR system, causing damage to the coil and/or system.
		The equipment should not be used with other coils or equipment present in the MR scanner except as specified in the Operator Manual.
	<u> </u>	Tampering with the cable pins and connector may damage the connector and affect coil or system performance. Please verify that connector and pins are not damaged before use.
		Do not force the latched opening on the coil farther than it will smoothly open. It will snap if pushed too far, rendering the coil in need of repair.
		Do not allow the cable to loop or contact the patient as this could create an RF burn hazard.
	<u>^</u>	Do not use the coil if it appears to be damaged, i.e., broken pieces, etc. Return the coil to the manufacturer for repair and/or replacement.
	<u>^</u>	Do not use the coil if the cable jacket is torn or ripped, or if metal or wiring is exposed. Return the coil to the manufacturer for repair and/or replacement.
		Remove any other coil or unused accessory device from the magnet before using the coil. Unconnected coils may cause patient burns.
		Do not attempt to scan with the coil disconnected or unplugged from the scanner. Patient burns may result. Unconnected coils may cause damage to the coils and cause patient burns.

#### 5.0 INSTALLATION, STORAGE AND MAINTENANCE

# Installation & Configuration

There is no installation of the MRI coil. ScanMed coils are engineered to be "plug and play" with the appropriate MRI scanner.

Contact ScanMed LLC for assistance or questions regarding the GE 1.5 and 3.0T 16 channel Hand/Wrist coil.

# Storage

Store the coil and baseplate in an air-conditioned scan room or equipment room.

To store the coil, cable and baseplates, a minimum storage space of 46cm/18" (width) x 50.8 cm/20" (depth) x 28 cm/11" (height) is required.

## Cleaning

The 1.5T and 3.0T Hand/Wrist coil, patient comfort pads and baseplate must be cleaned and stored using the following procedures:

- Wipe with a cloth that has been dampened in a solution of 10% bleach and 90% tap water, or 30% isopropyl alcohol and 70% tap water.
- Do not pour any cleaning solution directly on the coil or baseplate!
- Let the coil housing, base plate, and pads dry before use.
- Under no circumstances should the coil be placed into any type of sterilizer.

The GE Hand/Wrist coil is plug-and-play. It will be automatically recognized by the MRI system. No other installation procedures are required.

Please follow the QA procedure in Section 6 to verify the coil is working properly and establish the baseline SNR specific to your system and setup.

#### 6.0 OPERATION

## Set-Up and Use

Set-up of the coil is self-explanatory, as it is plug and play. Follow the information found below in "Positioning" for additional instructions.



No modification of this device is allowed. Do not modify this equipment without specific authorization from ScanMed.



Under NO circumstance should this coil ever be picked up, held, or maneuvered by the cable.

### Selecting the Coil Name

Ensure that the correct coil is chosen from the menu selection on the surface coil screen. Menu selections must be installed by your MR system service representative. Contact ScanMed LLC for assistance.

## Coil and Phantom Setup

The 1.5T and 3.0T 16 Channel GE Hand/Wrist coil is equipped with a baseplate to support the coil. The baseplate is designed to rest directly on the patient table for stability. The coil cable should exit away from the patient's wrist.

Position the baseplate toward the magnet end of the patient table. Center as illustrated.



Unlock the latch and lift to open the coil.



# NOTE FOR THE OPERATOR:

There is a possibility of pinching one's fingers when opening and closing the coil.

Latch. Refer to latch lock label.

**CAUTION:** Do not force the latched opening on the coil farther than it will smoothly open. It will snap if pushed too far, rendering the coil inn need of repair.

Insert the hand phantom first, pushing it into the hand portion of the coil. Then insert the wrist phantom into the coil as illustrated.

Hand Phantom.
Wrist Phantom.
Close coil for testing with
phantoms inserted.



Connector varies by scanner. Photo is not included here.

# **Connecting** the Cable

Connect the coil to the scanner by plugging the coil connector into the coil interface.

**NOTE:** Run the cable in the most direct way to the coil connector port.

**CAUTION:** Do not allow the cable to loop or contact the patient as this could create an RF burn hazard.

**CAUTION:** Do not use the coil if the able jacket is torn or ripped, or if metal or wiring is exposed. Return the coil to the manufacturer for repair and/or replacement.

## Selecting the Coil Name

Ensure that the correct coil is chosen from the menu selection on the surface coil screen. Menu selections must be installed by your MR system service representative. Contact ScanMed LLC for assistance.

# Coil Landmark

Advance the coil into the magnet and landmark the coil using the reference marks on the top of the Hand/Wrist coil.



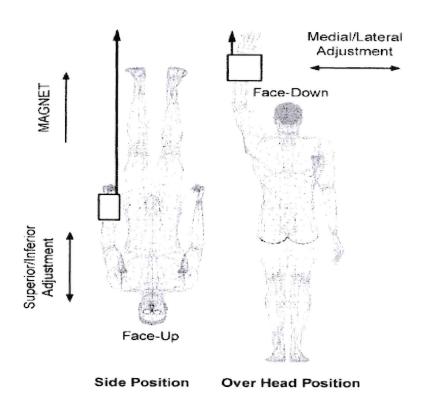
# Explanation of QA Prescan and Scan

If pre-scan does not compete successfully, do not use the coil clinically. Upon completion of pre-scan, execute the scan. Window the scan as usual (window levels vary from system to system depending upon the hardware revision level). The scan should appear uniform.

If the phantom image shows voids or striations, the coil is malfunctioning. Discontinue use of the coil and contact ScanMed LLC for assistance.

#### 7.0 POSITIONING

Choosing the Best Coil Position



The 16-Channel Hand/Wrist coil package includes a Vertical Adapter for scans performed at the patient's side. Patient size, comfort and scan preference will dictate which position you use.

To ensure the coil cable will reach the coil port, over-head scans are performed head-first, while side scans are performed feet-first.

The patient will be in the prone position (Over-head position), head-first into the magnet. The orientation of the coil is such that the cable end of the coil enters the bore first (do not loop the cable to connect to the scanner).

Extend the arm above the patient's head and insert the wrist/hand into the coil. Use MRI table base to secure and position the coil in place.

**Patient Positioning** 



For Side Imaging

Unlatch the 16-Channel Hand/Wrist coil and open the housing. Have the patient position the wrist into the small of coil. The coil may be placed in the base side rail prior to patient positioning.

This figure shows right side positioning.

Close the coil and latch securely. Use pads to ensure the patient is comfortable.





#### NOTE FOR THE OPERATOR:

There is a possibility of pinching one's fingers when opening and closing the coil.



For Over-Head Imaging

For head-first over head imaging of the hand and/or wrist, use the baseplate as shown.



One the coil has been slid into the base as shown, the coil can be moved to the right or left depending on the wrist being scanned.

The coil is closed once the patient's hand and wrist have been place appropriately and the patient is comfortable.



#### NOTE FOR THE OPERATOR:

There is a possibility of pinching one's fingers when opening and closing the coil.

**Patient** Hearing **Protection**  Provide ear plugs for the patient after all instructions have been given.

Hearing protection is required for all people in the scan room during a scan to prevent hearing impairment. Acoustic levels may exceed 99 dB(A).

Hearing protection must have a Noise Reduction Rating (MRR) of 29 dB or better (e.g., 30 dB, 32 dB, etc.)

#### 8.0 SCANNING

#### Autoshim

Generally, when the coil is used at the patient's side, image quality is often improved by enabling autoshim. AUTOSHIM is a feature of the GE HDx MRI System to improve image quality. It does this by improving the magnetic field homogeneity within the OV selected. The improvement in image quality is often dramatic when the selected FOV is far off center, and when acquiring FSE or T2 weighted scans.

#### Localizing

The 3.0T HDx 16 Channel Hand/Wrist coil is designed to allow the body coil to be used while the coil is in the scanner. This allows use of a large FOV (40 cm) body coil localizer, which is helpful in determining the left or right offset required for imaging the wrist or hand.

You may scan using the body coil at any time, but the coil must be connected.

# Fat Saturation Techniques

Off-center FOV imaging is a more difficult technique since it is dependent upon the homogeneity of the magnetic field, and a definite fat peak signal. A small wrist on the edge of the imageable field may produce poor fat saturation.

For best fat saturation results, position the patient with his hand over his head and position the coil as close to the isocenter as possible.

For axial imaging, use an axial localizer but before prescribing slices, localize using the same FOV you intend to use in your study, or localized explicitly. Use of graphic prescription from large FOV localizer sometimes results in software miscues producing blank slices, shifted slices, or both.

#### Scan Protocols

ScanMed LLC recommends that you select imaging protocol that have been established by your radiologist or radiology department.

## 9.0 QUALITY ASSURANCE

# **Quality Assurance Procedures**

Arrange the specific hand/wrist phantom as shown below. Landmark at the center of the coil for a 3-plane localizer and perform an initial QA of the coil assembly. Run the sequence as follows, prescribing 3 slices as outlined in Figure 9:

Scan Plane: Axial Base Resolution: 256

NEX: 1

Slice Thickness: 5 FOV: 300 mm

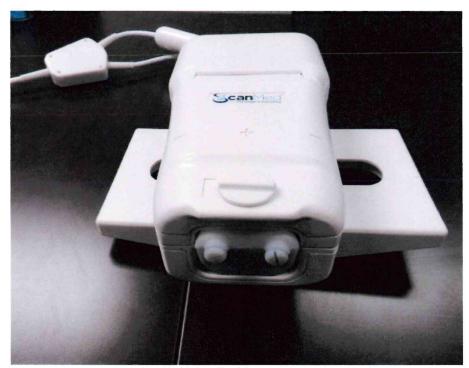
Phase Direction: A/P

ETL: 2

Pulse Sequence: FSE-XL Phase Resolution: 192 TR/TE: 600/Min Full

Slice Groups: 1 BW: 15.63 kHz

No Filters or Normalizing



Hand/Wrist Coil with Superman Base

Run an axial sequence through the center of the coil.

After the acquisition, perform the following steps.

- 1) Place a 3-square centimeter ROI in the center of the phantom. Record the Signal mean below
- 2) Place another 3-square centimeter ROI in the top right corner of the image. And record the Standard deviation below
- 3) Calculate the SNR by completing Table 2

ROI	Parameter	Value	
1	Signal Mean (m)		Box A
2	Standard Deviation (sd)		Box B

Table 1: Initial Measurement Values

ROI	Calculation	Calculated Value (SNR Ratio)	Specification Value
1	Box A divided by Box B	•	

Table 2: Initial SNR Values

Refer to these numbers and periodically repeat the measurement as a quality assurance test or if you suspect problems with the coil. If QA test results produce a value less than the specification value, call ScanMed® Technical Support at (402) 934-2650 for further instructions.

Periodic QA Checks				
Date	SNR Value	Percent Deviation (Column 2 ÷ C)		
		a a constant of the constant o		

#### 10.0 PREVENTIVE MAINTENANCE AND CLEANING

#### **QA Test**

Perform a system quality assurance phantom test as outlined in this manual. If the values you obtain do not fall within normal operating parameters, then there may be a problem with the coil. Contact ScanMed service department for assistance.

#### Storage

Coils should be stored lying flat and used at the same room temperature as your MR system.

#### Inspection

Visually inspect the coil cover and cable assembly for cracks or missing insulation about the copper conductors of either assembly. Check the cable connector for secure fit within the coil housing and also check the electrical contacts on the cable end to ensure that they appear straight. Check the connector to ensure the pins are not bent.



Do not use a damaged coil on a patient.

Return the coil to ScanMed for repair if the coil is damaged.

#### Cleaning

The coil cover is not completely impermeable. Safeguards should be put in place to minimize its contamination when required.

Surface cleaning of the material is the only action allowed using the solutions specified below. If the coil is damaged during cleaning, contact ScanMed for repair. This product contains no user replaceable or serviceable parts.

NOTE: Do not remove the coil cover, as this will void the coil warranty.

The cleaning solutions listed below have been tested and are recommended for cleaning the coil(s) and pad(s). Spray or pour the cleaning liquid onto a soft cotton cloth and proceed to gently clean.

- Warm water: Safe for all areas of the coil or pads.
- Commercial dishwashing liquid solution 1oz/gallon (30ml/liter) of water: Safe for all areas of the coil.
- Alcohol solution (70% isopropyl / 30% water): Do not apply to adhesive backed materials such as labels, decals or Velcro<sup>®</sup> fasteners.

• <u>Cydex/Lysol:</u> Do not apply to adhesive backed materials such as labels, decals or Velcro® fasteners.



Do not spray or pour cleaning liquid directly onto the coil or cables. Apply cleaning solution to a soft cotton cloth and proceed to clean.

#### 11.0 TROUBLESHOOTING

The following is a list of common problems and solutions for those problems. If you cannot solve a problem by following the procedures in the manual, contact ScanMed between the hours of 7:30 AM and 5:30 PM (CT), Monday through Friday to arrange for service/repair. There are no user-serviceable components. All service must be performed by ScanMed or an authorized representative.

#### **ScanMed Customer Service**

9840 South 140th Street, Suite 8 Omaha, NE 68138 USA

Tel: +1 (402) 934-2650

Email: CustomerService@scanmed.com

#### 1. Receiving No Signal

Problem: You are scanning and yet receiving no signal.

Solutions:

- 1. Verify that you are transmitting with the body coil and receiving with the imaging coil.
- 2. Verify that you have the appropriate coil selected for your scanner (see Section 3-2).
- Verify that the cable is correctly connected to the system. The coil cable should be connected to the coil port.
- 4. If all of the above check out and you still cannot get a signal, try to scan (transmit and receive) with the body coil. For this test, be sure to remove the imaging coil from the magnet bore before you scan with the body coil. If you still receive no signal the problem probably lies with the MR system. If the body coil scan is satisfactory, there is probably a problem with the ScanMed coil. Contact ScanMed for assistance.

#### 2. Image Quality

Problem:

The SNR percentage obtained in the periodic quality assurance check is not greater than 85%, or the image quality is not what you expected it should be, given the parameters selected.

Solutions:

- 1. Review the selected protocol.
- 2. Verify that there are no loops in the cables.
- 3. Verify that there are no metal or magnetic objects close to the coil, patient or magnet (e.g., safety pin, hair pin).
- 4. Verify that the coil is properly positioned.
- 5. Verify that your center frequency is within the frequency adjustment range for your system.

#### 3. Artifacts

Problem:

There is a black line or signal void on the image (similar to an artifact seen when metal is present in the scanned area).

Solutions:

- Verify that there is no metal present in the area being scanned.
- 2. If the above checks out, it is possible the coil has failed. Call ScanMed.

#### 12.0 DISPOSAL

Dispose of the coil by returning to ScanMed LLC or through a disposal facility equipped to handle electronic products.



Dispose of RF coil properly.



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#### Manufacturer Location:



ScanMed®
ScanMed LLC
9840 S 140 Street, Suite 8
Omaha, NE 68138



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