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Description - Provides an overview of the MRI System performance checks, along with manual prescan procedure.

1- INTRODUCTION

In order to obtain optimum image quality performance, the center frequency must be checked prior to running all Image Quality test scans (note, center frequency is automatically optimized when Auto Prescan is used).

The Performance Checks can be divided into two classifications: System Performance and Image Performance. The two classifications are defined as follows. Refer to Table 1 for the list of procedures, and a brief description of their use.

TABLE 1
SYSTEM AND IMAGE PERFORMANCE CHECKS

Classification	Title	Description
SYSTEM PERFORMANCE	Spike Noise Check	Used to detect small intermittent spike noise sources that may be present in either the RF Shielded Room and/or TPS.
	Carrier Leakage	Checks carrier leakage variation of transceivers.
	Correlated Noise Check	Verifies the presence of RF noise in either the RF Shielded Room or the TPS.
IMAGE PERFORMANCE	LVshim Check	Checks shim is in specification before doing image quality checks.
IMAGE PERFORMANCE	Signal To Noise Check	Estimates the Signal to Noise Ratio for the system.
	System Noise Floor Check	Measures the baseline system noise the receiver path.
	T2 Uniformity Check	Calculates Mean T2 value from four echo images.

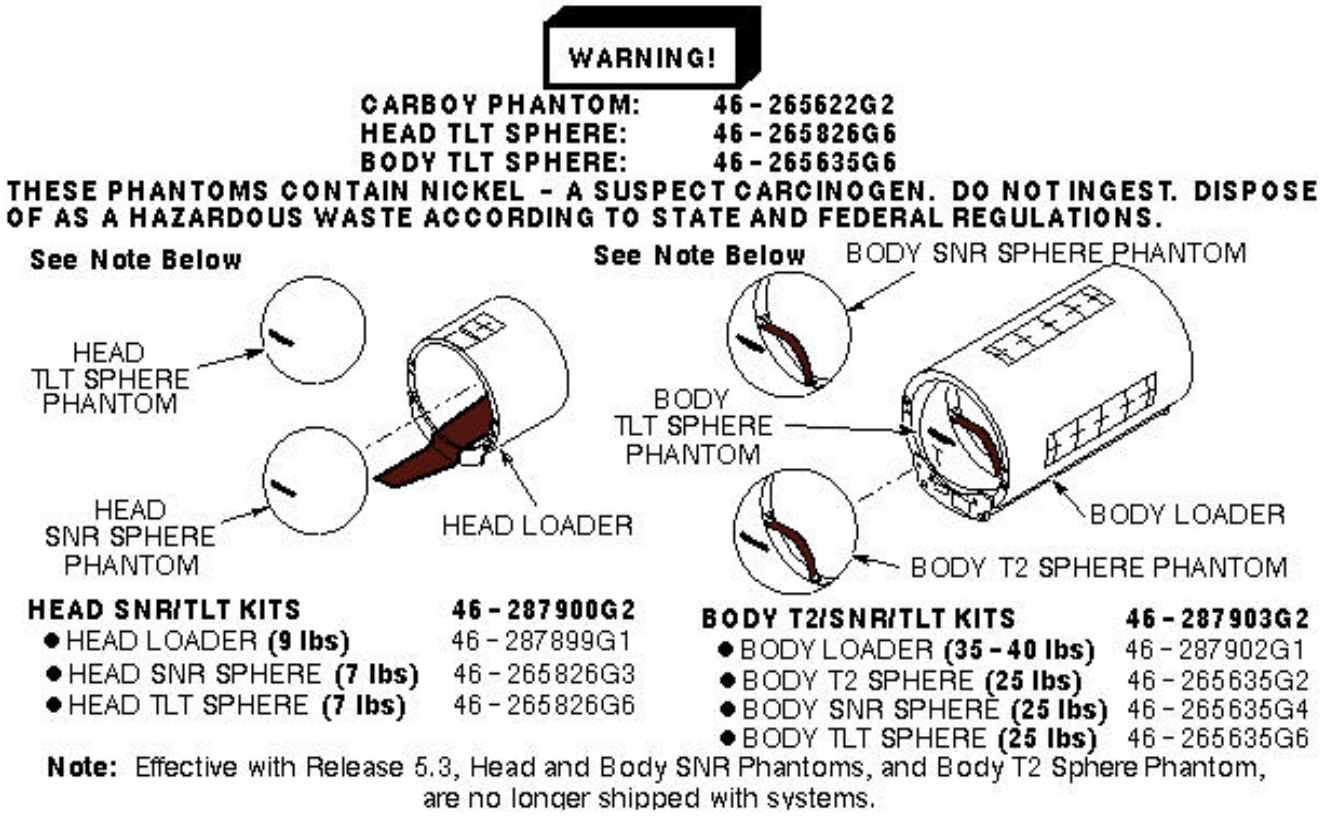
System Performance

System Performance procedures are to aid you in finding system hardware problems which can cause image artifact. The artifact seen in images may result from loose cable connections, dangling cables, defective electronic components, poor RF screen room integrity, or cross talk between digital buses to name a few.

The Receiver Spike Noise, Carrier Leakage, and Correlated Noise Check procedures found in this classification should be performed prior to doing Image Performance procedures, refer to Table 1. Any image artifact will have an impact on how well the Image Performance procedures work.

Image Performance

The image quality procedures are to be used to verify operation of the scanning hardware and its imaging performance. These tests require the use of several test phantoms. These phantoms are first scanned under selected protocols. The images are then analyzed using Image Quality Tools. See Illustration L2180A for identifying image quality phantoms. Refer to Table 1 for Image Quality Tools.



LLUSTRATION L2180AHOTWORDSTYLE=BOOKDEFAULT;
IMAGE QUALITY PHANTOMS

1-1 General Information

All the scans run in the Performance Checks procedures should be identifiable by the specified information to be entered on the scan set-up screens. This includes the data entered for Patient ID, Patient Name, and various other operator notations made at the time a scan is initiated. The operator must enter the prescribed information listed in the scan protocol sections of each procedure.

It is assumed that the person performing the procedures is already familiar with Signa Horizon system operating procedures; in particular, the Operator's Console scan and display controls. If this is not the case, the Signa Horizon Operator's Manual should be thoroughly reviewed and understood prior to starting the performance procedures.

For many of the tests, it is imperative that the phantom be precisely located at magnet isocenter. If the phantom is not properly located at isocenter, this may be the primary reason why a test fails. Furthermore, when using an SNR or T2 sphere, the temperature reading on the sphere temperature indicator must be 22 ºC ± 2º. If a sphere is too warm or too cold, SNR or T2 will be higher or lower than it should be:

- If an SNR sphere is too warm, SNR will be lower than it should be; if an SNR sphere is too cold, SNR will be higher than it should be.

- If a T2 sphere is too warm, T2 will be higher than it should be; if a T2 sphere is too cold, T2 will be lower than it should be.

1-2 Manual Prescan Calibration Instructions

Most of the scans in the System manual procedures are run after performing an Auto Prescan. A manual Prescan must be performed when using PSDs which do not work with Auto Prescan or if the Auto Prescan mode fails. The Manual Prescan calibration procedure detailed in this section is to be used for phantom imaging only. Do not use this procedure on patients. Refer to Signa Horizon Operator Manual for proper Manual Prescan procedures.

During manual prescan, the video monitor on the operator console will display a R1 value (% of full-scale A/D) and a R2 value (% of full-scale of DAB). These values are set by alternately adjusting the Prescan transmit and receive gains as described below.

Note

Current SIGNA Horizon software will NOT abort a scan when a data overrange occurs; however, the system displays on the screen that an overrange was detected. IMAGES PRODUCED IN WHICH AN OVERRANGE HAS BEEN REPORTED CANNOT BE USED FOR ANALYSIS. These scans must be rerun with a lower receive gain setting.

Note

Best receiver signal to noise is obtained with R1 set to 11, R2 set to 15 and no display of an overrange detected.

In Prescan mode, all settings are adjustable through the graphic interface or pull-down menu selections. Prescan parameter variables are listed in Table 2.

TABLE 2
PRESCAN COMMANDS

Parameter	Function	Default	Remarks
R1	Sets The Receive 1 Gain To Value Entered (1 step = ~3 db).	11	Range 1 to 13
R2	Sets The Receive 2 Gain To Value Entered (1 step = 6 db).	15	Range 1 to 30
TG	Sets The Transmit Gain To Value Entered (1 step = 1/10 db).	0	Range 0 to 200
AX	Sets The Absolute System Frequency To Value Entered.		
DX	Changes The System Frequency By The Delta Amount Entered. (Value May Be + Or -).		
Type	Plot Type (single or twin plot mode)	P. Spect	See Note - 1
Rec	Receiver (single or twin plot mode) Specifies the receiver profile being monitored (Multi-coil)	1	Range 1 to 4
Gain	Plot Gain (single or twin plot mode)	1	Range 1 to 15

Note

P. Spect (Power Spectrum), I Channel (Digitally processed I Channel Signal), Q Channel (Digitally Processed Q Channel Signal), Magnitude (Square root of I squared + Q squared), Phase, and Absorption are available display options.

The Manual Prescan calibration procedure detailed below is to be used for phantom imaging only. Do not use this procedure on patients. Refer to Signa Horizon Operator Manual for proper Manual Prescan procedures on patients.

A manual Prescan is done by following five basic steps, in order:

1. Click on **[Manual Prescan]**.

2. Set the R1 value to **11** and the R2 value to **15**.

Note

Best receiver signal to noise is obtained with R1 set to 11, R2 set to 15 and no display of an overrange detected.

3. Click on **[Center Freq Coarse].** Verify the presence of a waveform on the console profile display. If a waveform is not present or centered in the right window of the display, adjust system frequency by using the DX command and a delta frequency value. Continue to perform this step until a signal is found. For more information refer to refer to User Interface Tutorial.

4. Click on **[Transmit Gain]** then adjust the Transmit Gain (TG) setting up or down until the highest peak is found *on the response curve*.

Note

The transmit gain should not be increased by more than 50 dB at a time.

It may be necessary to adjust the R2 setting to maintain the peak of the waveform approximately mid-screen for easy viewing.

Note

When the transmit gain is changed to find the highest peak, do not use the numeric value printed on the Prescan display screen. Instead, use the Horizontal Hairline cursor under the [Markers] pulldown menu, by dragging with the mouse to determine the actual peak on the prescan response curve.

5. If R2 gain was decreased in step 4 then increase the gain up to 15. If over range condition occurs then reduce R2 gain one step at a time until the over range condition clears. Remember, the optimum setting is 15, but the type of phantoms used will have a great effect on the final gain setting.

REVISION HISTORY

REV	DATE	AUTHOR	PRIMARY REASONS FOR CHANGE
0	August 5, 1998	M. Whitlow	Initial conversion from Toolbook to Word.