>Title:

Troubleshoot DRIVER MODULE

>Modality/Product:

MR450, MR450w, and MR450w GEM

MR750, MR750w, and MR750w GEM

>Example Symptoms:

1 Unable to Scan with driver module errors due to driver module.

2 System fails to boot with TPS reset failure

>Related Example Errors:

Error: 2252289 Driver Module is in Service Mode. A Cause is DD Fault Disable Switch. **PSDB 92913**

Error: 2224666 Auto Prescan failed, Scanning has failed because the driver module is in service mode and the patient ID is not 'geservice'.-> **PSDB 94774**

Error: 2252293 The Driver Module Has Detected a Fault. ^A Details of the Fault can be found in other error messages.-> **PSDB 88257**

Error: 2252312 DD Driver Fault Detected - High Voltage Fault. Source of Fault is BD2 (Dynamic Disable Boards at Front of Body Coil). Value = 213 V Limit: 425 V-> **PSDB 88257**

Error: 2218537 Scan stopped, Scan Stopped due to error : Driver Module error occurred. **PSDB 88257.**

Error: 2224666 Auto Prescan failed, possible data acquisition error. Try again or use Manual Prescan. **PSDB 88257.**

Error: 2218537 Host: Process: scn. File: MsaScanMgr.m Line: 3038, Scan stopped, Scan Stopped due to error : Driver Module error occurred. **PSDB 88257.**

Error 2252310 DD Driver Fault Detected - Open Circuit. Source of Fault is BD1 (Dynamic Disable Boards at Front of Body Coil). Value = 4985 mV Limit: 4833 mV-> **PSDB 97978**
Extended Error:
This usually indicates that a cable somewhere in the circuit path is not connected or one of the load diodes has failed open. Inspect the failing path. Use TR DD MC System Path diagnostic to troubleshoot.

In HD/HDx Systems,

BD1 is the Dynamic Disable Board at Front of Body Coil
BD4 is the Dynamic Disable Board at Back of Body Coil

In 20.0 and later systems, try running the TR DD System Path diagnostic to troubleshoot.

Error 2225526 Host: xx-xx Process: NSP, File: HPC_PORT_ID:spi_tr_mon Line: 6100, Inductive or Direct Drive fault, or Body TR switch fault due to impedance mismatch, path short Drive bias fault. Possibly a shorted diode in the driver switches, or a short circuit load. **PSDB** 90531

Error 2252375 Extended Error: Please refer to the troubleshooting documentation. Short-circuit load on affected DD line can cause this fault. Try unloading affected DD line. Try running the Driver Module Diagnostics, Power Supply Data. **PSDB** 90531

Error: 2252362 Host: Process: NSPFile: SCP:DCB Line: 1686DD Driver Fault Detected - Low Open Circuit Value.Possible loss of -15V supply at the DD output.Source of Fault is BD4 (Dynamic Disable Boards at Back of Body Coil).Value = 850 mV Limit: 1002 mV **PSDB 95061**

>Customer follow-up questions:

1 Asks the customer was an error reported? If Yes what was the error?

2 If the Error included 2252289, 2224666 with verbiage indicating "Driver Module is in Service Mode" ask the customer if service had been performed prior to the error? If Yes see **REMOTE Step 1**.

3 If the Error is any error **NOT** indicating **"Driver Module is in Service Mode"** but is one of the Related Example Errors indicating a Driver Module error occurred see **REMOTE Step 2.**

>Remote steps:

Remote Step 1: Connect to the system and verify Errors 2252289 and/or 2224666 with verbiage indicating "Driver Module is in Service Mode".

> 1.1 If the customer is willing and understands how to access the Driver Module in the Penetration Cabinet, instruct the customer to check the following front panel switches TR, HV, DD, MC and ensure they are all in the "ENABLE" position. If any are in the 'DISABLE' position have the customer switch to the "ENABLE" position. Have the customer confirm ALL front panel switches TR, HV, DD, MC are in the "ENABLE" position.

>> 1.1.1 if the customer found any of the Driver Module front panels switches "DISABLE" and they switched to "ENABLE", have the customer rescan a phantom. Does the scan complete without an error? If YES see **Remote Fix 1**

>> 1.1.2 If the customer is not willing to check the Driver Module front panel switches then an Onsite Action is required. See **Onsite Action 1.**

Remote Step 2: (FE responsibility to use the latest REV service Documentation) Reference: Discovery 1.5T 450/DIR 5670014: Troubleshooting/Diagnostics/System Function/RF/Driver Module Diagnostics/Power Supply Data and/or TR DD System Path Checks

(FE responsibility to use the latest REV service Documentation) Reference: Discovery 3.0T 750/3.0T 750w & Optima 1.5T 450w DIR 5670014: Troubleshooting/Diagnostics/System Function/RF/ TR DD System Path Checks **AND/ OR** Troubleshooting/Diagnostics/System Function/RF/Driver Module Diagnostics/Power Supply Data. **ALSO, FOR TROUBLESHOOTING FLOW** see Troubleshooting/Radio Frequency (RF)/Dynamic Disable TR Troubleshooting (Single Drive RF Amplifier) **OR** Dynamic Disable TR Troubleshooting (Dual Drive RF Amplifier).

2.1 If Connectivity is available confirm with customer they are not performing patient scanning. Connect to the system and run Driver Module diagnostics/Power Supply Data. Record any Failures and associated errors or Extended Error messages to assist FE with Onsite Action.

2.1.1 If Errors **2252293** and **2252312** are reported with high voltage supply output indicated in the error message as being low, don't automatically assume the problem is with the body hybrid reference **PSDB 88257** with the following troubleshooting steps:

a) Have FE to disconnect the TR, BD, and DD bias lines

b) Then cycle driver module power and disable RF output in PEN cabinet on Exciter.

c) Then again attempt to scan and see if the error message still appears indicating the actual voltage is still low. If so, this indicates that the high voltage power supply in the driver module has likely failed. Replace the driver module. See ONSITE Action 2

2.1.2 In the case of **Error 2252310** and **2252362** Intermittent or open DD Driver Open Circuit Fault Scan Aborts using Body or Surface Coils, Head Mode OK Reference **PSDB 97978, 95061** and the following steps.

a) Run Driver Module diagnostics remotely record any failures, error or extended errors. Have FE Use TR DD MC System Path diagnostic to troubleshoot. See ONSITE Action 2.

2.1.3 In the case of **Error 2225526** and **2252375** short Drive bias fault Reference **PSDB 90531** and following steps:

a) Please refer to the latest REV troubleshooting documentation. Short-circuit load on affected DD line can cause this fault. Try unloading affected DD line. Try running the Driver Module Diagnostics, Power Supply Data

b) Have FE disconnect the TR, BD, and DD bias lines

c) Then cycle driver module power and disable RF output on the front of the Front Panel I/O (FPIO) board in slots 4 and 5 on the front of the RRF chassis.

d) Have FE try running the Driver Module Diagnostics, Power Supply Data.

- Does the test results indicating a Driver, V1, V2, V3, V4, V5 has a Body_HV_(1,2,3or4) with low values of example: 0, 1, 0, 1, 4 instead of expected values in the approximate 551, 551, 551, 550, 550 range and in addition the DD HV V Fault Status has a FAULT for a particular Body_BD(1,2,3,or 4) 3 Fault?

- If YES, this indicates that the high voltage power supply in the driver module has likely failed. Replace the driver module. See **Onsite Action 2**

2.2 For **Onsite action,** FE troubleshooting, DV product add the following: (FE responsibility to use the latest REV service Documentation) Reference: Discovery 1.5T 450/DIR 5670014: Troubleshooting/Radio Frequency (RF)/Dynamic Disable TR Troubleshooting (Single Drive RF Amplifier) OR Dynamic Disable TR Troubleshooting (Dual Drive RF Amplifier)). **See also 4.3 Problem/Solution Table**

4.1 Troubleshooting Techniques

1 Dynamic disable - BD1 (J76) and BD4 (J76) output the same voltage and can be swapped to isolate a bad dynamic disable circuit. If drive lines are swapped during troubleshooting, make sure to swap them back after problem correction. Failure to do this may make future troubleshooting of a DD board malfunction very difficult.

2 At the rear of the driver module, the output marked DD (J74) provides direct drive bias to the hybrid splitter for the purpose of disconnecting the body coil transmit circuitry during head operation, and also disabling the body coil transmit circuitry during receive mode while the body coil is in operation. The actual bias voltage is the same as BD1 and BD4.

3 Never swap the drive lines and run dynamic disable drive calibration.

4 Never perform a dynamic disable drive calibration during a malfunction. The calibration process uses signal feedback to determine threshold values for error reporting. It is possible under certain failed conditions to erroneously calibrate a "circuit open" condition. This would make future troubleshooting very difficult.

5 Upon repair, perform dynamic disable drive calibration.

⚠️ **WARNING**

POSSIBLE PERSONAL INJURY!

THIS PROCEDURE REQUIRES THE USE OF FERROUS MATERIAL IN CLOSE PROXIMITY TO THE MAGNET.

USE EXTREME CAUTION WHEN USING THE DIGITAL MULTIMETER CLOSE TO THE MAGNET BORE.

6 Dynamic disable board function can be checked under voltage with a digital multimeter in the bore. To do this, you must use the scanner to select a head or body sequence before checking that particular mode's function.

NOTE: If an ER/DD board is the problem, the entire body coil must be replaced.

7 If the voltage detected is greater than the limit set during calibration, a dynamic disable open error will appear in the log.

These values in the error are reported as positive (+) values even though they are negative.

8 During DD calibration, a dynamic disable open error will appear in the log if the calibration limit goes over 7000 mv (7.0 V). (This generates an open DD circuit error in the log).

9 At the rear of the driver module, the (TR) transmit receive bias outputs are J6, J7 and J8.

10 The configuration file name and its location for the driver module is: **/w/config/DcbConfig.cfg**. Under **NO** circumstances should this file be changed unless you are directed by Support, after expert analysis. Consult OLC and Service Engineering.

11 Reading error message:

source of Fault %s   %s = will refer to Head, Body or MNS subsystem
Value: xxxx mA
Limit: xxxx mA   Normal Limit = Head = 300mA Body = 300mA

4.2 Diagnostics

See *TR DD System Path Check*. **(See Onsite Action 2)**

>**Remote Fix 1:** Auto Prescan fails with Errors 2252289 and/or 2224666 with verbiage indicating "Driver Module is in Service Mode".

#Problem Found: Driver One or more of the following Driver Module front-panel switches were set to "DISABLE": TR, HV, DD, MC.

#Action Taken: customer was willing to switch one or more of the Driver Module Front panel switches from "DISABLE" to "ENABLE"

#Verification Test: Customer performed a phantom scan without errors

#Cause: Last service performed FE left one or more Driver Module front panel switches in "DISABLE" position.

Recommended On-site Action:

Mandatory gameplan items:

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<<<<< Powered by GE analytics as part of our GEHC Service Digital Transformation>>>>>
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>**Onsite Action 1:** Return one or more of Driver Module front panel switches, TR, HV, DD, MC to the "ENABLE" position

#**Recommended Action:**

All Driver Module Front Panel switches must be in the "ENABLE" Position for Clinical scanning.

#PSDB: [92913, 94774]

#ASM: [5670014] FE responsibility to use the latest REV service Documentation Discovery 1.5T 450/3.0T 750/3.0T 750w & Optima 1.5T 450w DIR 5670014: /Replacements/System/Penetration (PEN) Cabinet/Driver Module Replacement

#**Recommended Parts:** N/A

#**Special Tools:** N/A

#**Number of FEs:** 1

#**FE Proficiency:** Proficient

#**FE Labor Hours:** .5 hour

>**Onsite Action 2:**

#**Recommended Action:**

Troubleshoot and/ or Replace the driver module

#PSDB: [88257, 97978, 95061, 90531]

#ASM: See #Special Tools for detailed service methods path (FE responsibility to use the latest REV service Documentation)

#**Recommended Parts:** 5160446-2 - Driver Module NMR DVMR (NON-RoHS)

5446983 - Driver module FRU (RoHS)

#**Special Tools:** 5196226 - Hoist Service Kit (Tool)

Detailed service methods path:

#ASM: (FE responsibility to use the latest REV service Documentation) Reference: Discovery 1.5T 450/DIR 5670014: Troubleshooting/Diagnostics/System Function/RF/Driver Module Diagnostics/Power Supply Data and/or TR DD System Path Checks

Reference: Discovery 3.0T 750/3.0T 750w & Optima 1.5T 450w DIR 5670014: Troubleshooting/Diagnostics/System Function/RF/ TR DD System Path Checks **AND/OR** Troubleshooting/Diagnostics/System Function/RF/Driver Module Diagnostics/Power Supply Data. **ALSO, FOR TROUBLESHOOTING FLOW** see Troubleshooting/Radio Frequency (RF)/Dynamic Disable TR Troubleshooting (Single Drive RF Amplifier) **OR** Dynamic Disable TR Troubleshooting (Dual Drive RF Amplifier).

Reference: Discovery 1.5T 450/3.0T 750/3.0T 750w & Optima 1.5T 450w DIR 5670014: /Replacements/System/Penetration (PEN) Cabinet/Driver Module Replacement.

#Number of FEs: 1

#FE Proficiency: Proficient

#FE Labor Hours: 3.0 hours