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GE Medical Systems

Technical Publications

Direction 2346938
Revision 0

Signa® Horizon™ ... MultiCoil Receive Chain Troubleshooting Tool

DAMAGE IN TRANSPORTATION

All packages should be closely examined at time of delivery. If damage is apparent, have notation **"damage in shipment"** written on **all** copies of the freight or express bill **before** delivery is accepted or "signed for" by a General Electric representative or a hospital receiving agent. Whether noted or concealed, damage **MUST** be reported to the carrier **immediately** upon discovery, or in any event, within **14** days after receipt, and the contents and containers held for inspection by the carrier. A transportation company will not pay a claim for damage if an inspection is not requested within this **14** day period.

Immediately complete a "Damage Loss Claim Form", available via MS Exchange Mail, after the damage is found.

MS Exchange Path:

Outlook/Public Folder/All Public Folders/Medical Systems/!Global Initiatives/Information Management/Forms/Common Forms/DAMAGE LOSS CLAIM FORM.

Send the completed form to the email address listed in the form.

For more information about the Transportation Claim Procedure, access the GE Medical Systems Intranet and enter the following URL address (case sensitive):

ftp://3.87.40.2/globepro/qualsys/Docs/190016MF.PDF

Rev. 11/15/2000

Direction 2128126 - Language Policy For Service Documentation, Rev 0

W A R N I N G

- **THIS SERVICE MANUAL IS AVAILABLE IN ENGLISH ONLY.**
- **IF A CUSTOMER'S SERVICE PROVIDER REQUIRES A LANGUAGE OTHER THAN ENGLISH, IT IS THE CUSTOMER'S RESPONSIBILITY TO PROVIDE TRANSLATION SERVICES.**
- **DO NOT ATTEMPT TO SERVICE THE EQUIPMENT UNLESS THIS SERVICE MANUAL HAS BEEN CONSULTED AND IS UNDERSTOOD.**
- **FAILURE TO HEED THIS WARNING MAY RESULT IN INJURY TO THE SERVICE PROVIDER, OPERATOR OR PATIENT FROM ELECTRIC SHOCK, MECHANICAL OR OTHER HAZARDS.**

AVERTISSEMENT

- **CE MANUEL DE MAINTENANCE N'EST DISPONIBLE QU'EN ANGLAIS.**
- **SI LE TECHNICIEN DU CLIENT A BESOIN DE CE MANUEL DANS UNE AUTRE LANGUE QUE L'ANGLAIS, C'EST AU CLIENT QU'IL INCOMBE DE LE FAIRE TRADUIRE.**
- **NE PAS TENTER D'INTERVENTION SUR LES ÉQUIPEMENTS TANT QUE LE MANUEL SERVICE N'A PAS ÉTÉ CONSULTÉ ET COMPRIS.**
- **LE NON–RESPECT DE CET AVERTISSEMENT PEUT ENTRAÎNER CHEZ LE TECHNICIEN, L'OPÉRATEUR OU LE PATIENT DES BLESSURES DUES À DES DANGERS ÉLECTRIQUES, MÉCANIQUES OU AUTRES.**

WARNUNG

- **DIESES KUNDENDIENST-HANDBUCH EXISTIERT NUR IN ENGLISCHER SPRACHE.**
- **FALLS EIN FREMDER KUNDENDIENST EINE ANDERE SPRACHE BENÖTIGT, IST ES AUFGABE DES KUNDEN FÜR EINE ENTSPRECHENDE ÜBERSETZUNG ZU SORGEN.**
- **VERSUCHEN SIE NICHT, DAS GERÄT ZU REPARIEREN, BEVOR DIESES KUNDENDIENST-HANDBUCH NICHT ZU RATE GEZOGEN UND VERSTANDEN WURDE.**
- **WIRD DIESE WARNUNG NICHT BEACHTET, SO KANN ES ZU VERLETZUNGEN DES KUNDENDIENSTTECHNIKERS, DES BEDIENERS ODER DES PATIENTEN DURCH ELEKTRISCHE SCHLÄGE, MECHANISCHE ODER SONSTIGE GEFAHREN KOMMEN.**

AVISO

- **ESTE MANUAL DE SERVICIO SÓLO EXISTE EN INGLÉS**
- **SI ALGÚN PROVEEDOR DE SERVICIOS AJENO A GEMS SOLICITA UN IDIOMA QUE NO SEA EL INGLÉS, ES RESPONSABILIDAD DEL CLIENTE OFRECER UN SERVICIO DE TRADUCCIÓN.**
- **NO SE DEBERÁ DAR SERVICIO TÉCNICO AL EQUIPO, SIN HABER CONSULTADO Y COMPRENDIDO ESTE MANUAL DE SERVICIO.**
- **LA NO OBSERVANCIA DEL PRESENTE AVISO PUEDE DAR LUGAR A QUE EL PROVEEDOR DE SERVICIOS, EL OPERADOR O EL PACIENTE SUFRAN LESIONES PROVOCADAS POR CAUSAS ELÉCTRICAS, MECÁNICAS O DE OTRA NATURALEZA.**

ATENÇAO

- **ESTE MANUAL DE ASSISTÊNCIA TÉCNICA SÓ SE ENCONTRA DISPONÍVEL EM INGLÊS.**
- **SE QUALQUER OUTRO SERVIÇO DE ASSISTÊNCIA TÉCNICA, QUE NÃO A GEMS, SOLICITAR ESTES MANUAIS NOUTRO IDIOMA, É DA RESPONSABILIDADE DO CLIENTE FORNECER OS SERVIÇOS DE TRADUÇÃO.**
- **NÃO TENTE REPARAR O EQUIPAMENTO SEM TER CONSULTADO E COMPREENDIDO ESTE MANUAL DE ASSISTÊNCIA TÉCNICA.**
- **O NÃO CUMPRIMENTO DESTE AVISO PODE POR EM PERIGO A SEGURANÇA DO TÉCNICO, OPERADOR OU PACIENTE DEVIDO A' CHOQUES ELÉTRICOS, MECÂNICOS OU OUTROS.**

AVVERTENZA

- **IL PRESENTE MANUALE DI MANUTENZIONE È DISPONIBILE SOLTANTO IN INGLESE.**
- **SE UN ADDETTO ALLA MANUTENZIONE ESTERNO ALLA GEMS RICHIEDE IL MANUALE IN UNA LINGUA DIVERSA, IL CLIENTE È TENUTO A PROVVEDERE DIRETTAMENTE ALLA TRADUZIONE.**
- **SI PROCEDA ALLA MANUTENZIONE DELL'APPARECCHIATURA SOLO DOPO AVER CONSULTATO IL PRESENTE MANUALE ED AVERNE COMPRESO IL CONTENUTO.**
- **NON TENERE CONTO DELLA PRESENTE AVVERTENZA POTREBBE FAR COMPIERE OPERAZIONI DA CUI DERIVINO LESIONI ALL'ADDETTO ALLA MANUTENZIONE, ALL'UTILIZZATORE ED AL PAZIENTE PER FOLGORAZIONE ELETTRICA, PER URTI MECCANICI OD ALTRI RISCHI.**

警告

- このサービスマニュアルは英語版しかありません。
- GEMS以外でサービスを担当される業者が英語以外の言語を要求される場合、翻訳作業はその業者の責任で行うものとさせていただきます。
- このサービスマニュアルを熟読し、理解せずに装置のサービスを行わないでください。
- この警告に従わない場合、サービスを担当される方、操作員あるいは患者さんが、感電や機械的又はその他の危険により負傷する可能性があります。

注意:

- 本维修手册仅存有英文本。
- 非 GEMS 公司的维修员要求非英文本的维修手册时，客户需自行负责翻译。
- 未详细阅读和完全了解本手册之前，不得进行维修。
- 忽略本注意事项会对维修员，操作员或病人造成触电，机械伤害或其他伤害。

REVISION HISTORY

REV	DATE	PRIMARY REASON FOR CHANGE
0	May 21, 2002	Initial version for Release.

PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV
Title Page	0						
1-5	0						
6-35	0						

* This revision/letter corresponds to the indicated document's revision control system.

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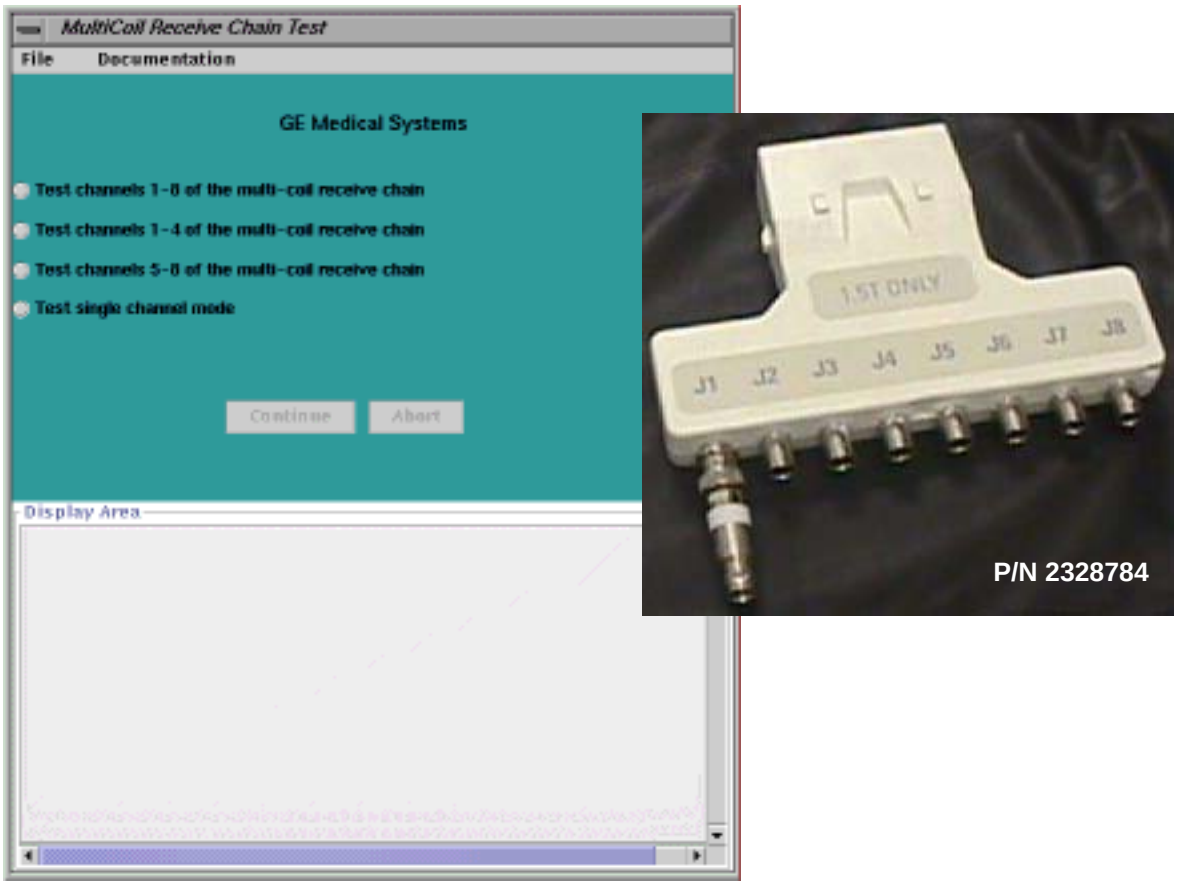
1- MULTICOIL RECEIVE CHAIN TOOL OVERVIEW



MULTICOIL RECEIVE CHAIN TOOL GUI AND HARDWARE
ILLUSTRATION1-1

The MultiCoil Receive Chain Tool (P/N 2328784) provides a method to diagnose problems in MultiCoil Receive (MCR) chain hardware, independent of any phased array coil. The tool sends the receive signal from the Head Coil down the individual paths to isolate specific channels in the receive chain.

The tool provides a Graphical User Interface (GUI) that guides the user through the various steps involved in running the tool and troubleshooting the problem. The GUI has built-in instructions and detailed setup instructions, troubleshooting flowcharts and documents that will help facilitate rapid diagnosis of the problem. Copies of the block diagrams and troubleshooting flowcharts can also be found in Appendix C of this document.

The tool is operable in the following modes:

- Test channels 1-8 of the multi-coil receive chain

  "Test channels 1-8…" is the recommended test to begin with for identifying problems. Once the problem is narrowed down, choose from one of the appropriate selections that are listed below.

- Test channels 1-4 of the multi-coil receive chain
- Test channels 5-8 of the multi-coil receive chain
- Test single channel mode

The GUI also includes a Functional Check of the Head Receive Line. This will aid in determining the Head Receive Line at the head quick disconnect box, which is necessary for performing tests on the multi-coil receive chain. The steps required to perform the functional check are in Appendix B – Functional Test of Head Receive Line.

Software Requirements

Software Revision 9.1 or greater has the necessary software needed to run Multi-coil Receive Chain (MCR) tool. See Appendix A for instructions in loading the software (patch is included with the tool) for revision 9.0. If the S/W exists you will see **Build number for patch_90_M4_16 is 90.29F_M4_0139.z.PM** when you run getver.

For all versions of software it is necessary to add 2 new coils to the CoilConfig.cfg file before running this tool. See section, *A-1- Add 2 New Coils To The CoilConfig.cfg File* for instructions.

2- USING MCR

2-1 Running the Tool

If you are continuing with the tool from Appendix B, skip step 1.

1. To begin using the tool, launch the software from the Service Desktop by selecting.

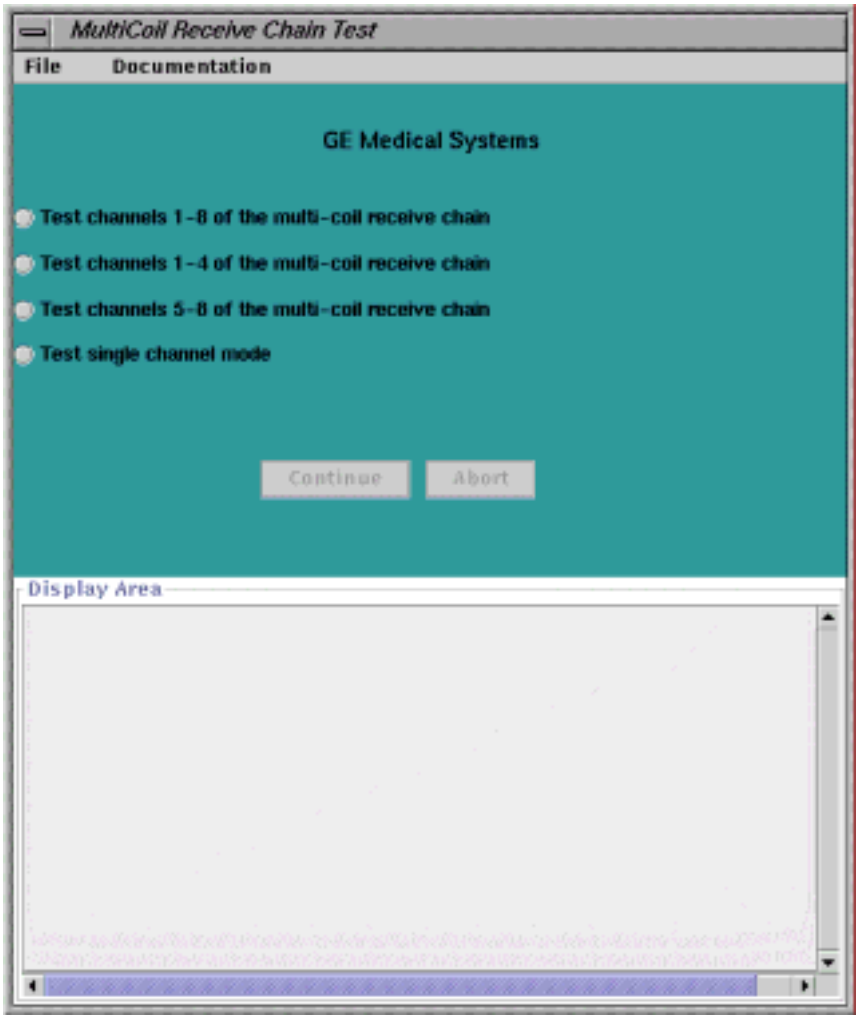
   For 9.0 Software: [Troubleshooting], [Multi Coil Receive Chain Tool] and [Start].

   For 9.1 Software: launch the tool interface by selecting:
   [Common Service Desktop Browser], click on **[Image Quality]** and then click on **[MultiCoil Receive Chain Tool]**.

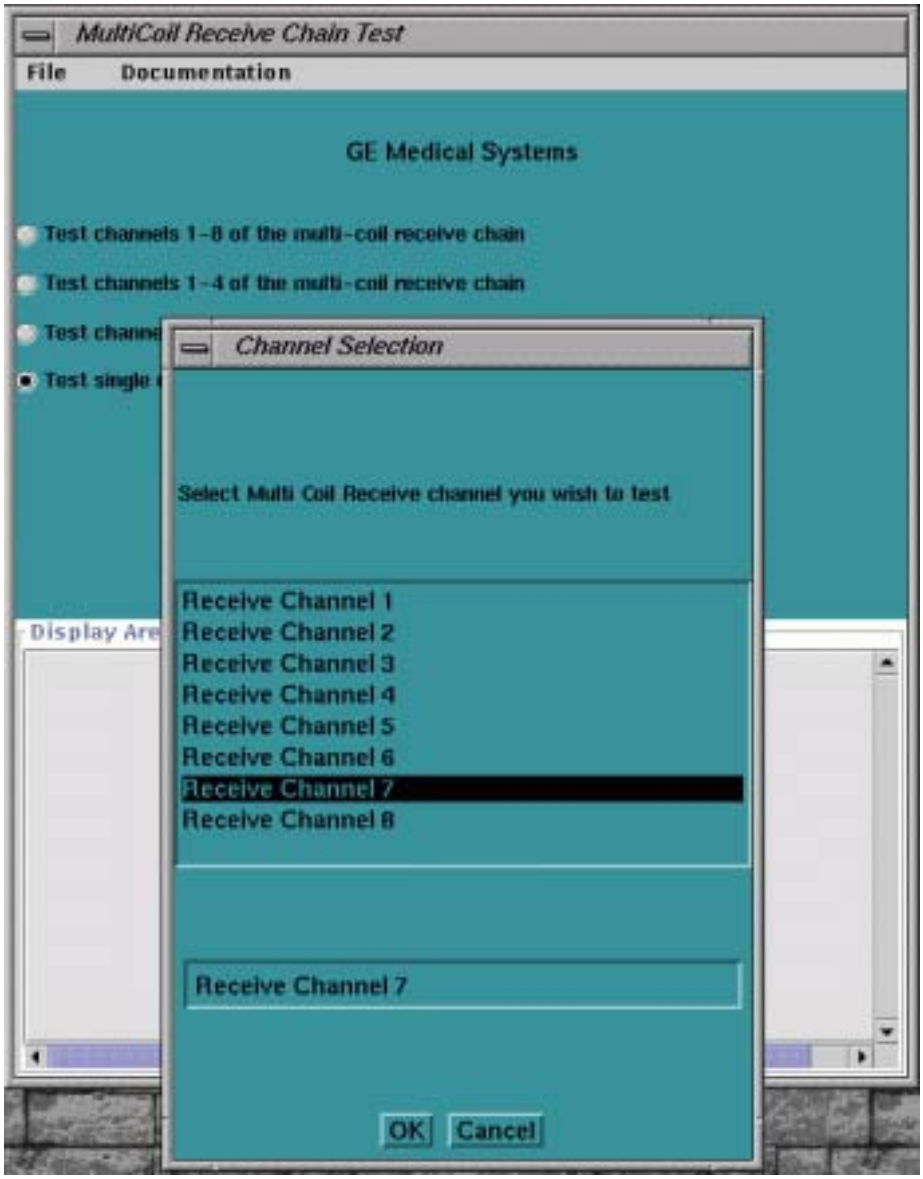
Or

[Troubleshooting], [Multi Coil Receive Chain Tool] and [Start].

The following screen will appear.



MULTICOIL RECEIVE CHAIN TEST MENU
ILUSTRATON 2-1



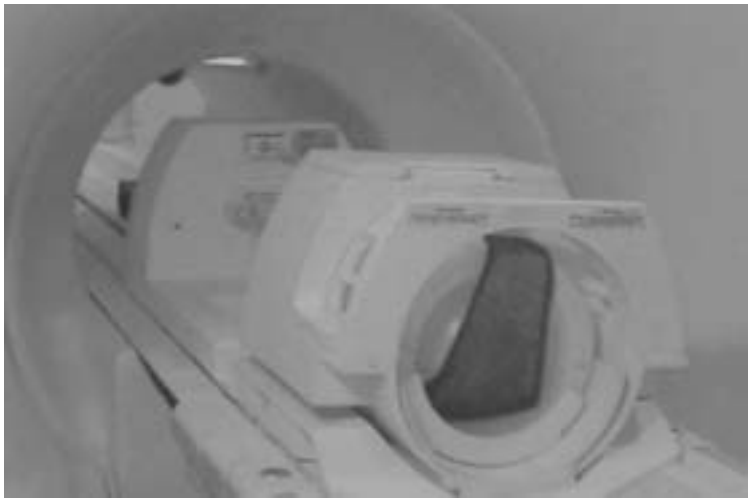
TEST SINGLE CHANNEL SCREENS
ILLUSTRATION 2-2

Note

It is suggested that for the first pass of this test, select the Test channels 1-8. In subsequent passes, it the problem is narrowed down to either the first or last 4 channels or a specific channel, choose the appropriate selection.

2. Make the appropriate test selection; see Illustration 2-1 & 2-2 for options. Click **[Continue]**.

3. Prepare for a head scan using the TLT phantom in the head loader by landmarking the phantom and advancing to scan. Do not use scan prescription, the tool will automatically prescribe the necessary scan. See Illustration 2-3.



TLT PHANTOM IN HEAD LOADER
ILUSTRATON 2-3

IMPORTANT !

It is very important that the initial Landmark setting is maintained through out the entire series of channel tests. The original landmark and scan provide the baseline SNR that is used for the tests performed on each channel.

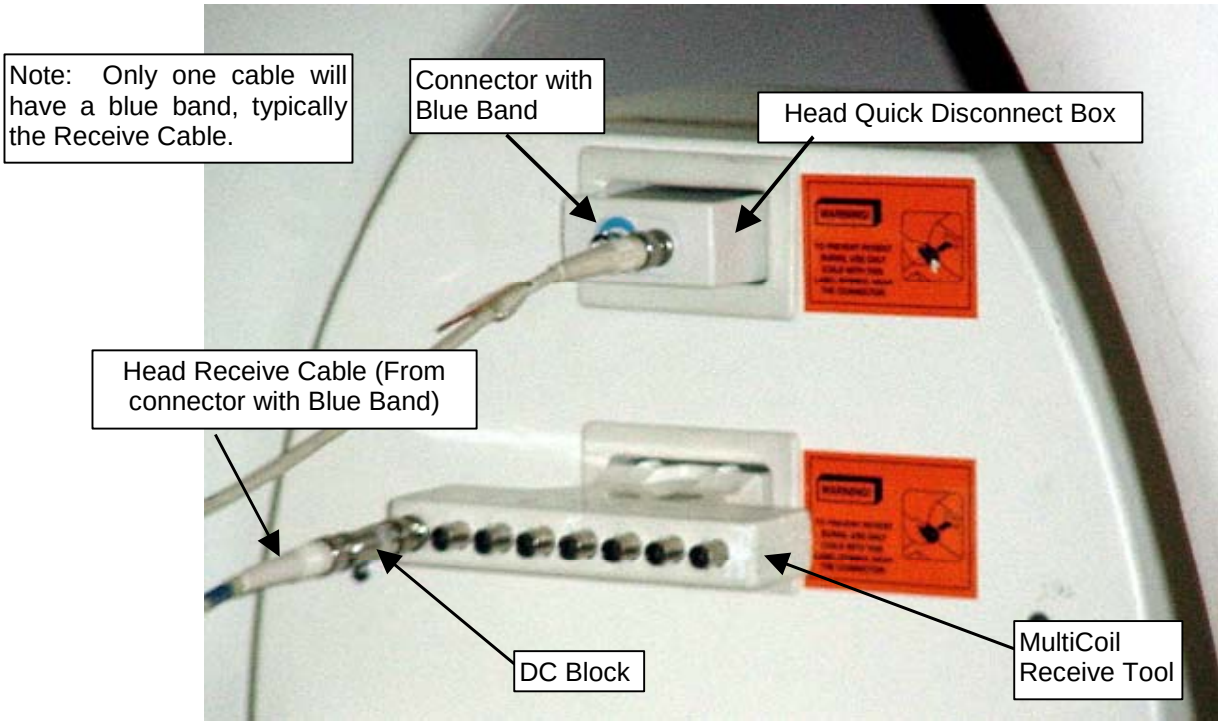
Note

The head scan is run only once at the beginning of the tests.

4. Click **[OK]** on the set-up window. The system performs a head scan and temperature compensation scan to create the baseline for all of the Multi Coil Receive Tests.

5. When the head data collection is complete, install the Multi Coil Receive Tool between insert the MCR H/W into the lower connector (Head Quick Disconnect Box) on the carriage cover. See Illustration 2-4.

6. Attach the receiver cable (with the DC block) to the connector directed in the Reconfigure Hardware window. Leave the transmit cable attached to the coil connector and install the head coil connector into the “Head Quick Disconnect Box” as shown in Illustration 2-4.



MULTICOIL RECEIVE TOOL
ILLUSTRATON 2-4

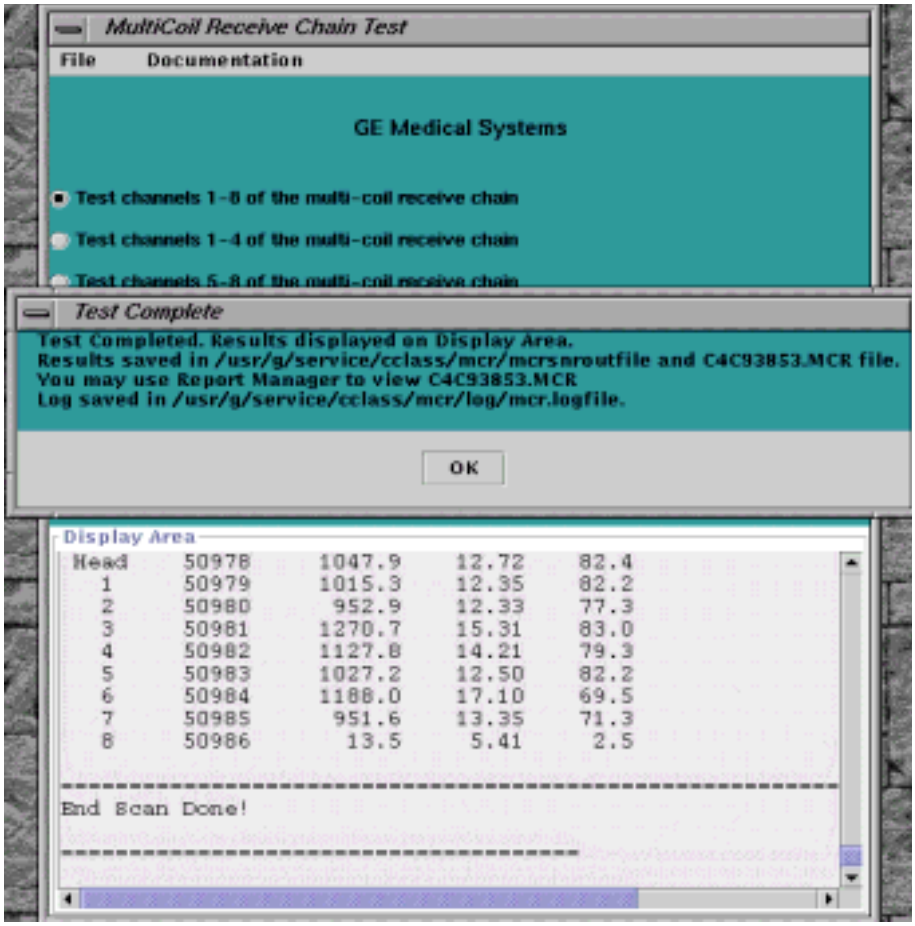
7. Click **[OK]** to continue test.

Note

If the blue band is missing from the Head Quick Disconnect Box or the tool is unable to detect signal, refer to Appendix B for the steps to perform a functional test. The Functional Test can also be accessed from the **[Documentation]** menu on the MCR GUI.

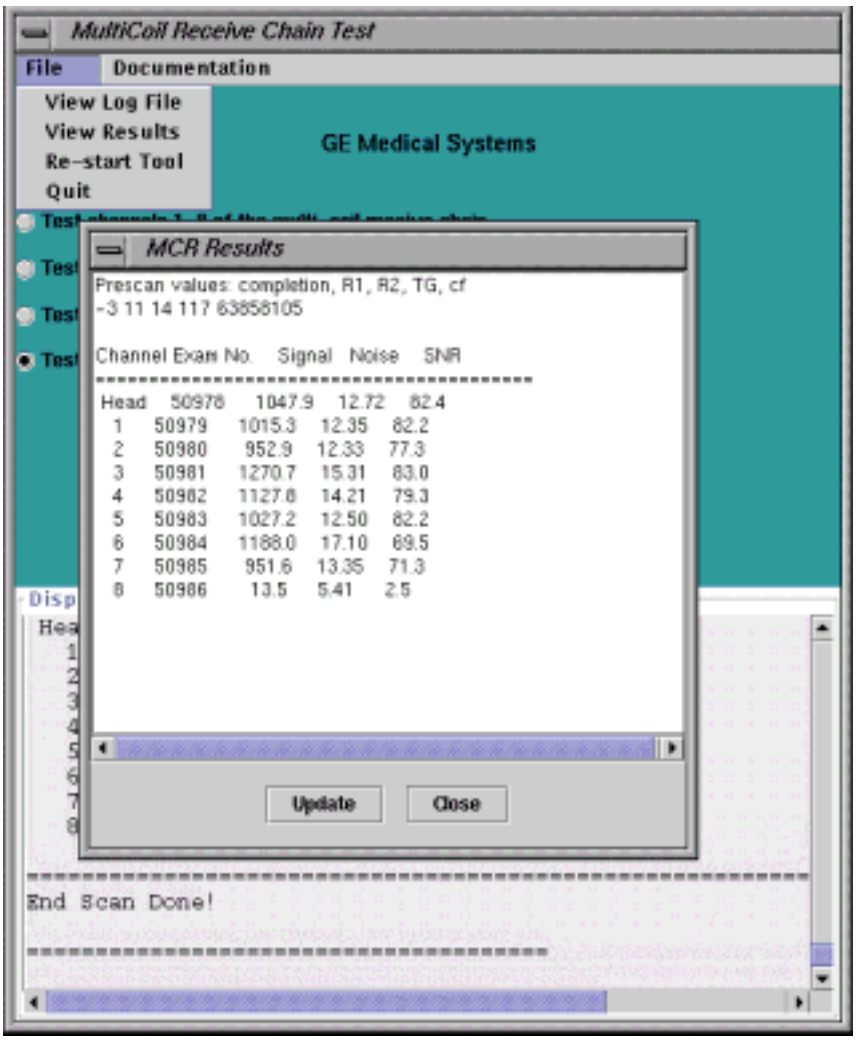
8. After the scan, continue to change the receive cable connections as directed on the screen.

9. After the completion of the test the individual channel SNR results are displayed, see Illustration 2-5. Review the data for discrepancies in SNR from channel-to-channel. See “Example Data” in Illustration 2-8. In this example you can see that SNR is very consistent from channel-to-channel (despite the gain variations) except for receive path 4. This indicates there is a single path failure that needs to be corrected. Refer to the T/S block diagrams available on the MCR **[Documentation]** menu (Appendix C in this document). These block diagrams can be used to identify which components to troubleshoot.



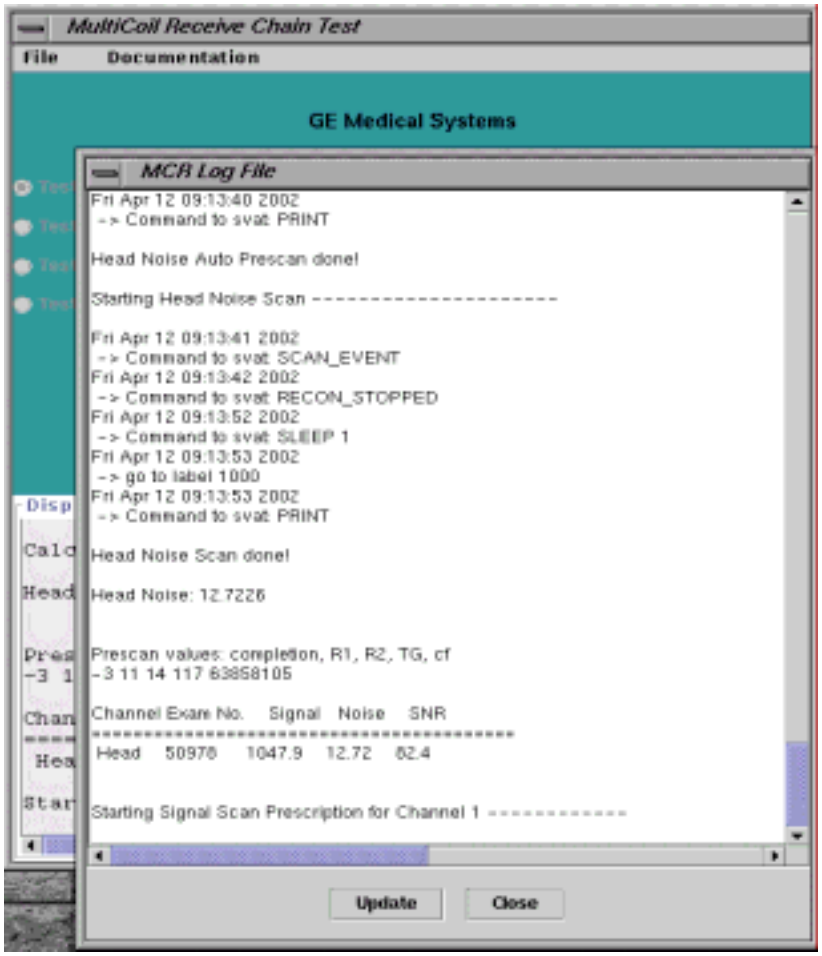
TEST RESULTS
ILLUSTRATION 2-5

10. To view the results of the test, select the following from the GUI, **File,** and **View Results**. The results will then be displayed in a separate window. See Illustration 2-6.



VIEWING RESULTS
ILLUSTRATION 2-6

11. To view Log File, select the following on the GUI, **File,** and **View Log File.** See Illustration 2-7.



VIEWING LOG FILE
ILLUSTRATION 2-7

Example data from a site

	Signal	Noise	SNR
Head	1433.3	15.73	93.9
1	1338.2	14.97	92.0
2	1359.5	15.12	92.6
3	1731.5	19.22	92.8
4	**1794.1**	**137.38**	**13.5**
5	1474.8	16.46	92.3
6	1475.0	16.25	93.5
7	1384.1	15.41	92.5
8	1751.1	19.55	92.3

EXAMPLE DATA
ILLUSTRATION 2-8

12. To isolate the problem depicted in Illustration 2-6, select “Test single channel mode” from the MCR GUI and test channel 4. Using the block diagram as a guide, substitute components from a neighboring receive path until the failing component is identified.

    Tip: First view the images that were used in the SNR measurement before beginning the troubleshooting process. You may see something, such as a zipper artifact or something else, which makes it look like there is an SNR problem.

    If all the channels have similar SNR (MCR passes) troubleshoot the specific surface coils that are giving the problem. (Check the coil config, external and internal cables, pin diodes, etc.)

13. The results files can be reviewed later from the standard **Report Manager**. Choose file type *MCR* to recall these files.

APPENDIX A – LOADING THE SW FROM FROM CD-ROM (FOR 9.0 SOFTWARE ONLY)

1. With the system idle (not scanning, filming or archiving – reboot if unsure).

2. Inside a C Shell window, log in as the root user by typing the following:

   su <Enter>

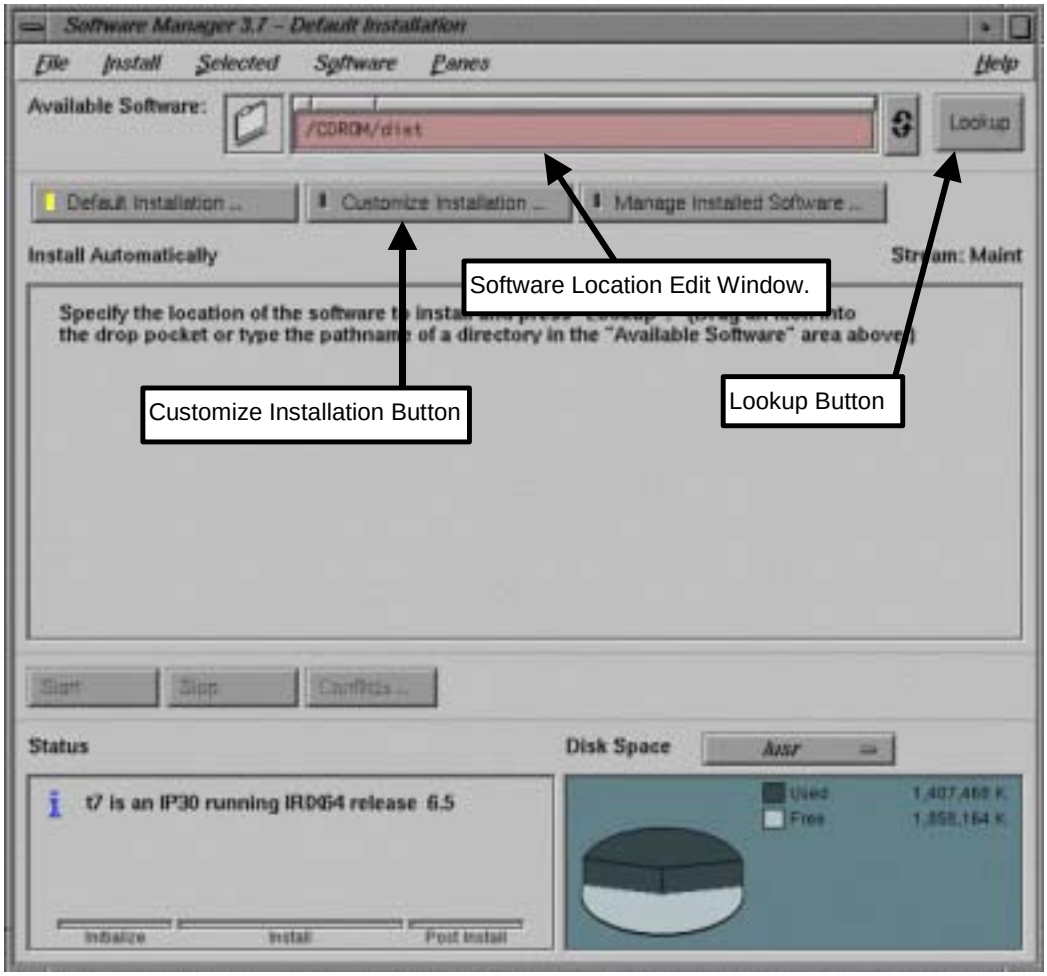
3. Password: **operator <Enter>** ("operator" is the system default root password. Use whatever password is appropriate for the system you are working on if it has been changed).

4. Place the Signa Patch CD for Multi-coil Receive Chain in the Host (not PC) CD drive. Wait 20 seconds for the system to see the CD, until the light on the front of the CD drive stops blinking.

5. Inside the C Shell, type the following:

   mediad <Enter> (This command mounts the CDROM.)

   swmgr <Enter> (This command starts the software manager which is used to load the patch.)



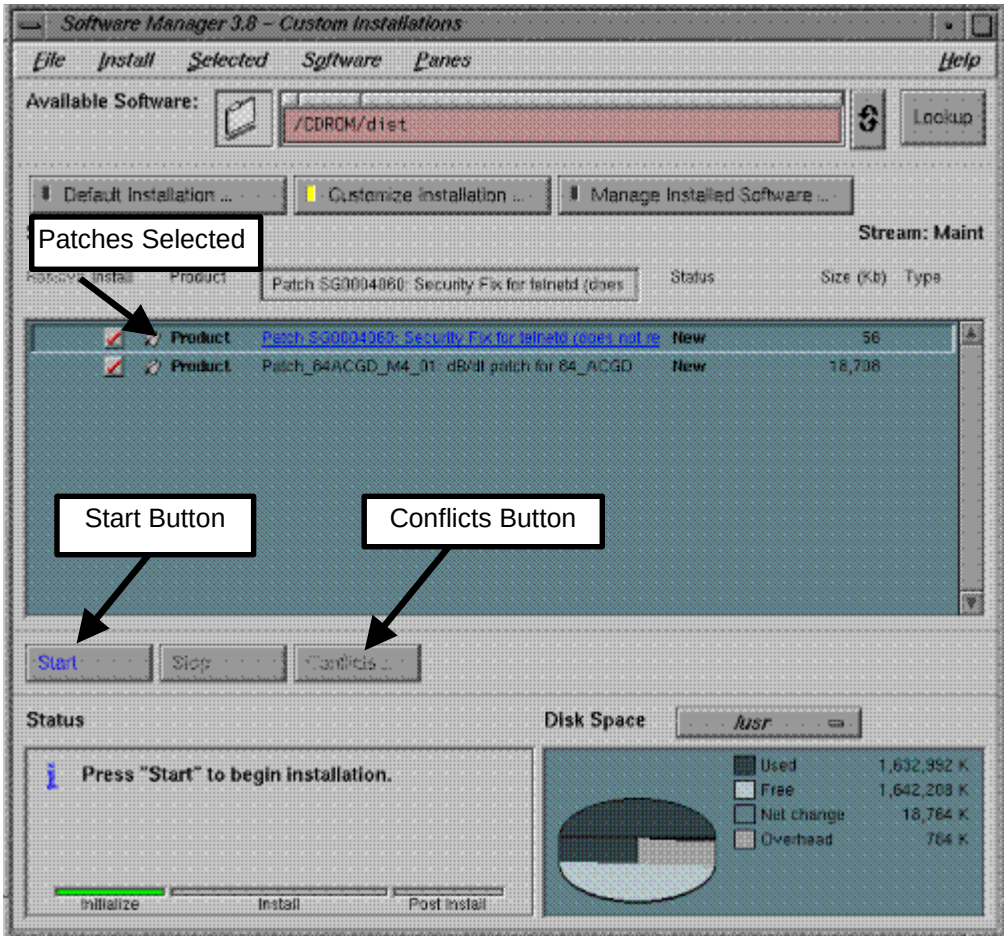
SOFTWARE MANAGER INITIALIZATION
ILLUSTRATION A-1

6. Once the Software Manager starts, begin typing the following (case sensitive) in the **[Software Location Edit Window]**. See Illustration A-1.

   /*CDROM** *(The system will automatically enter* "/*dist**" after you type /CDROM.)

7. Click the **[Lookup]** button found to the right of the **[Software Location Edit Window]**. See Illustration A-1.

8. Click the **[Customize Installation]** button at the top of the screen. See Illustration A-1.



SOFTWARE MANAGER CUSTOM INSTALLATION (EXAMPLE)
ILLUSTRATION A-2

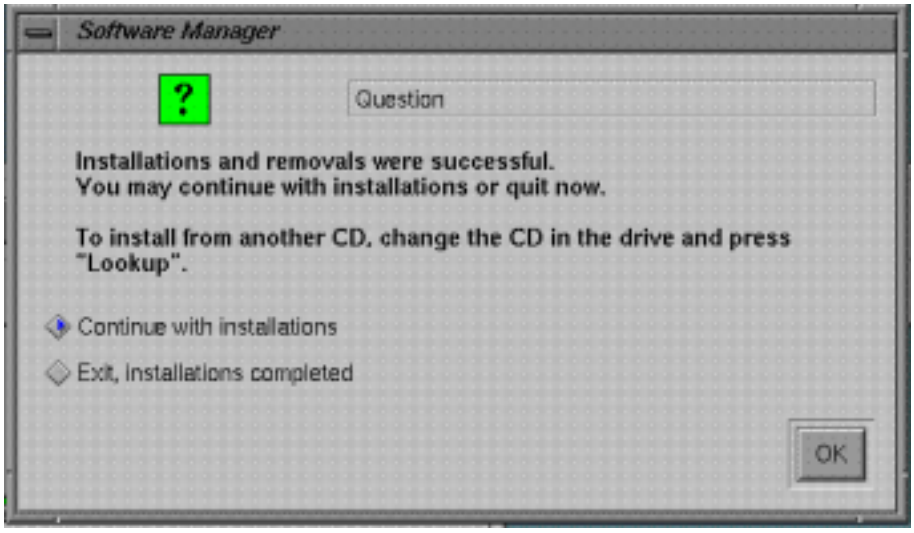
9. The MCR Patch for 9.0 M4 Release should be visible at this time in the selection window. If the patch applies to your system (this can only be loaded on systems with 9.0 M4 39.z S/W) and is not already loaded, it will be selected (check marked). See Illustration A-2. (Note: This illustration is only an example and does not the list the actual MCR patch).

10. If the **[Start]** button activates, proceed to step 10.a. If the **[Conflicts]** button activates proceed to step 10.b.

    a. The **[Start]** button will activate (The letters in "Start" will change colors or shades). If the **[Start]** button activates, push it and the patch load will begin. A progress bar will open and count up from 0 to 100%. The load takes less than 1 minute. When the progress bar goes away, a confirmation window will be displayed. Select **[Exit]** to quit the Software manager.

    b. After the patch is selected, if there is a problem, the **[Conflicts]** button will activate, (the letters in "Conflicts" change colors or shades). If this happens, this indicates that your system does not need this patch and the indicated patch will not be loaded. Push the **[Conflicts]** to view the error if desired.

11. After installation, select **Exit, Installations completed** checkbox, and select **[OK].** See Illustration A-3.



INSTALLATION DECISION WINDOW
ILLUSTRATION A-3

12. In the C Shell type the following (case sensitive) to eject the CD-ROM from the drive:

    umount /CDROM <Enter> (Un-mounts the CD from the system)
    eject /CDROM <Enter> (Opens the CD drawer)

13. If the patches were required and loaded, verify they are installed by typing in the C Shell:

    getver <Enter> You should see an entry for the MCR patch (patch_90_M4_16) as follows (example only –the actual getver output that you get may be different):

    Build number for MrpApps is 90.29F_M4_0139.z
    Build number for PostSdC is 90.29F_M4_0139.z
    Build number for cclass is 90.29F_M4_0139.z
    Build number for driverSupport is 90.29F_M4_0139.z
    Build number for insite is 2.3-mips
    Build number for install is 90.29F_M4_0139.z
    Build number for os_cd is 6_11.1.a
    Build number for os_u_cd is 6u11.6.a
    Build number for patch_90_M4_16 is 90.29F_M4_0139.z.PM
    Build number for pc is 90.29F_M4_0139.z
    Build number for z is Upgrade
    MR Software release: 9.0.0139z

A-1- Add 2 “New Coils” To The CoilConfig.cfg File

1. Start the Config File Manager tool.

2. On the Available Coils list you should see 2 new Coils TRPA1234 and TRPA5678. Select these 2 coils from the Available Coils list and add them to the Site Coils list.

3. Exit Config File Manager.

4. Reboot the machine.

5. Insure that the service key is inserted into the workspace cabinet.

APPENDIX B - FUNCTIONAL TEST OF HEAD RECEIVE LINE

1. To begin using the tool, launch the software from the Service Desktop by selecting from the following:

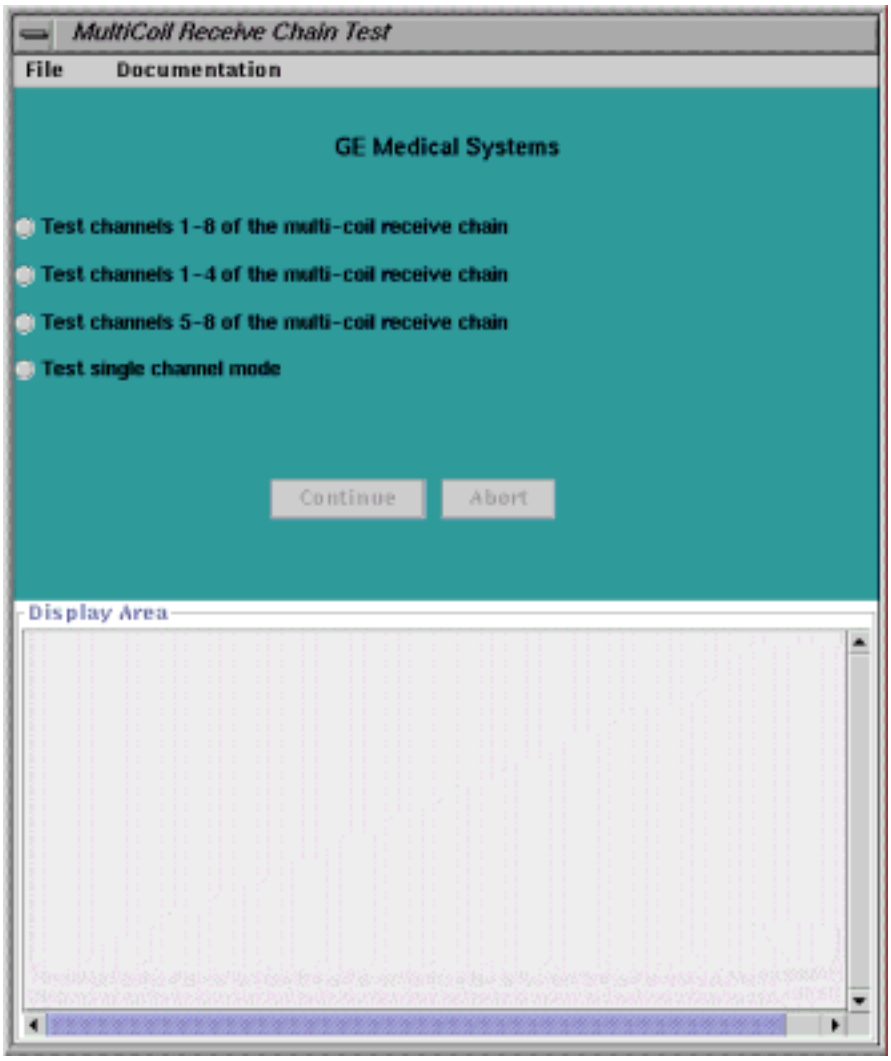
   For 9.0 Software: [Troubleshooting], [Multi Coil Receive Chain Tool] and [Start].

   For 9.1 Software: launch the tool interface by selecting:
   [Common Service Desktop Browser], click on **[Image Quality]** and then click on **[MultiCoil Receive Chain Tool]**.

Or

   [Troubleshooting], [Multi Coil Receive Chain Tool] and [Start].

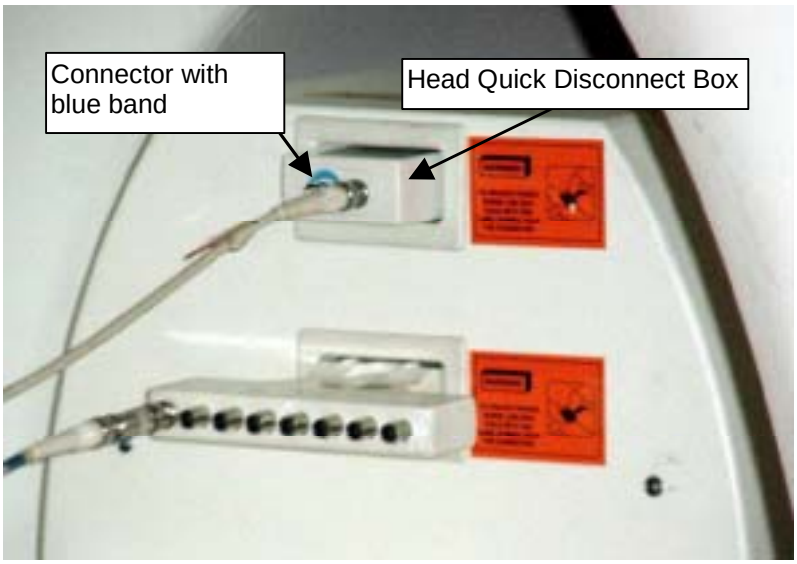
   The following screen will appear.



MULTICOIL RECEIVE CHAIN TEST MENU
ILUSTRATON B-1

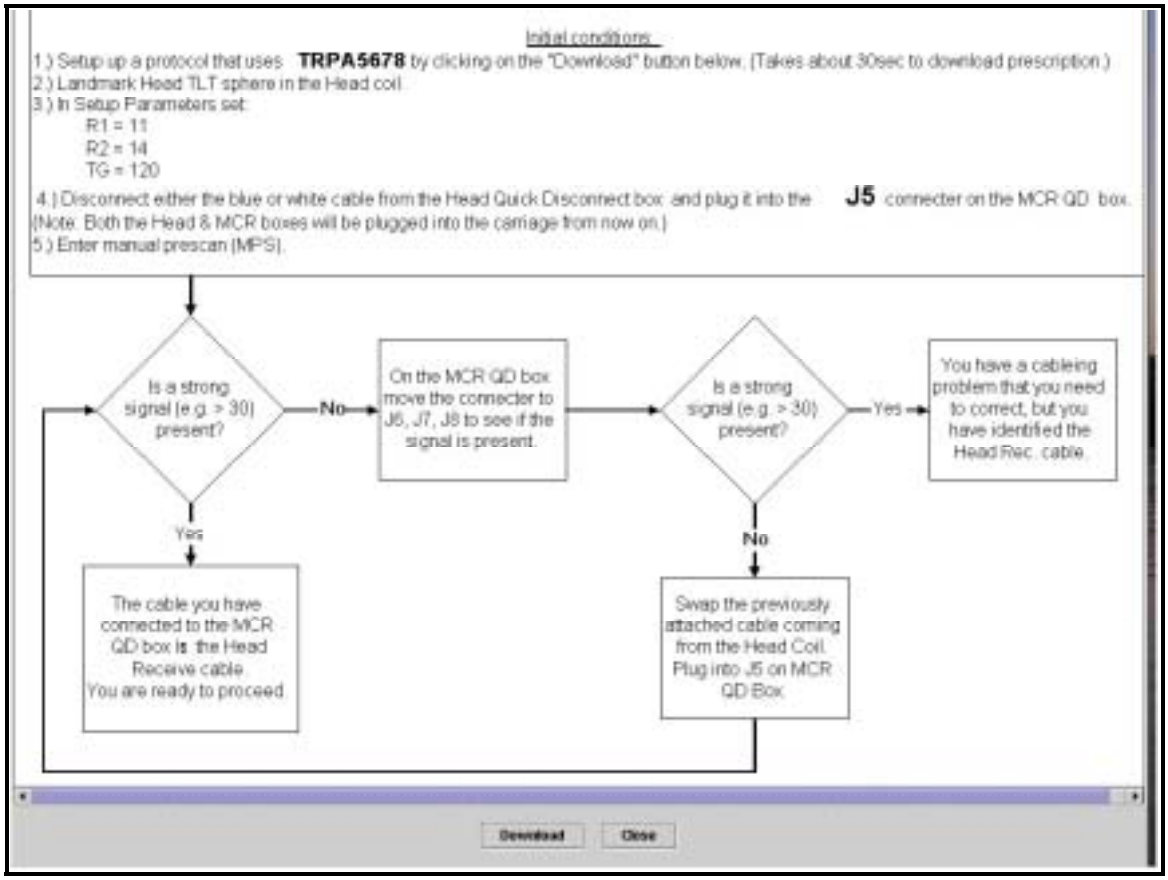
2. Identify the receive cable on the Head Coil. This cable is usually marked with a blue tape on the head quick disconnect box, but it can be confirmed by the following:

a. Insert the MCR H/W into the Multi-Coil (lower) connector on the carriage cover and attach one of the cables from the head coil (with the DC blocker bullet) to the connector with the blue band.



MULTI COIL TOOLS PLUGGED IN
ILUSTRATON B-2

b. From the **[Documentation]** menu on the tool's Graphical User Interface, select **[Functional Checks]** and then **[Verify Head Receive Line]**. See Illustration B-3.
c. Follow instructions on the flowchart and click on the **[Download]** button at the bottom of the screen. This will automatically download the protocol on the scan desktop. See Illustration B-3.
d. Go to the scan desktop. When download is complete, select manual prescan. If the selected cable is the receive line, then you should get signal on receiver 1. If there is no signal, repeat the step with the other cable from the head coil.
e. Once the correct cable has been identified as the receive cable, close the displayed flowchart document by clicking on the **[Close]** button. See Illustration B-3.



FUNCTIONAL CHECK SCREEN
ILLUSTRATION B-3

3. Select the appropriate test option.

For the first pass, it is suggested to run “Test Channels 1-8…”. In subsequent passes, if the problem is narrowed down to either the first or last 4 channels, or a specific channel, choose the appropriate selection.

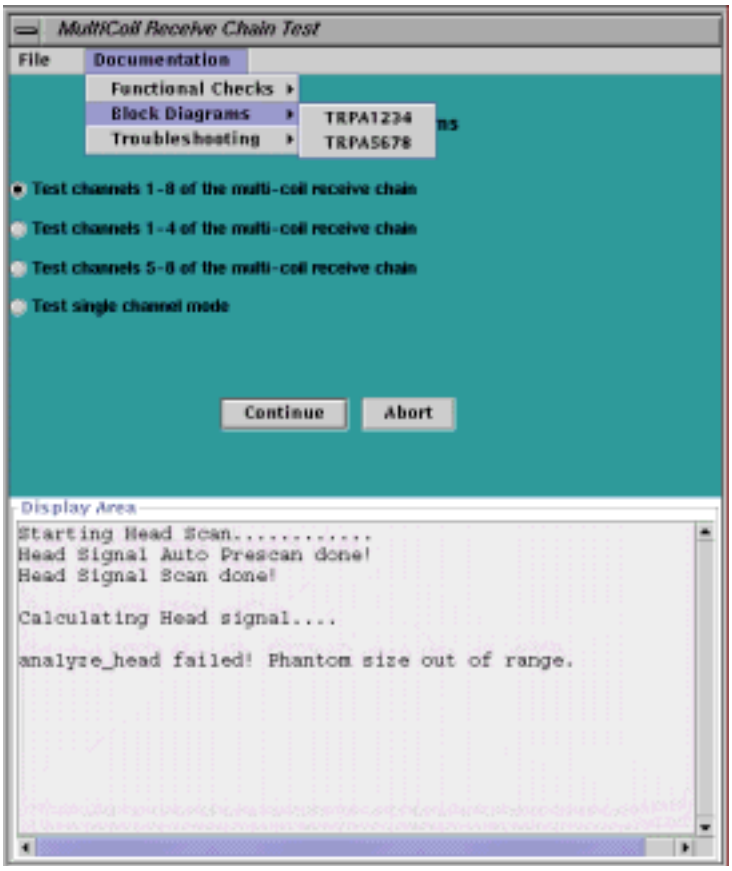
4. Click **[Continue]**.

APPENDIX C – TROUBLESHOOTING DIAGRAMS

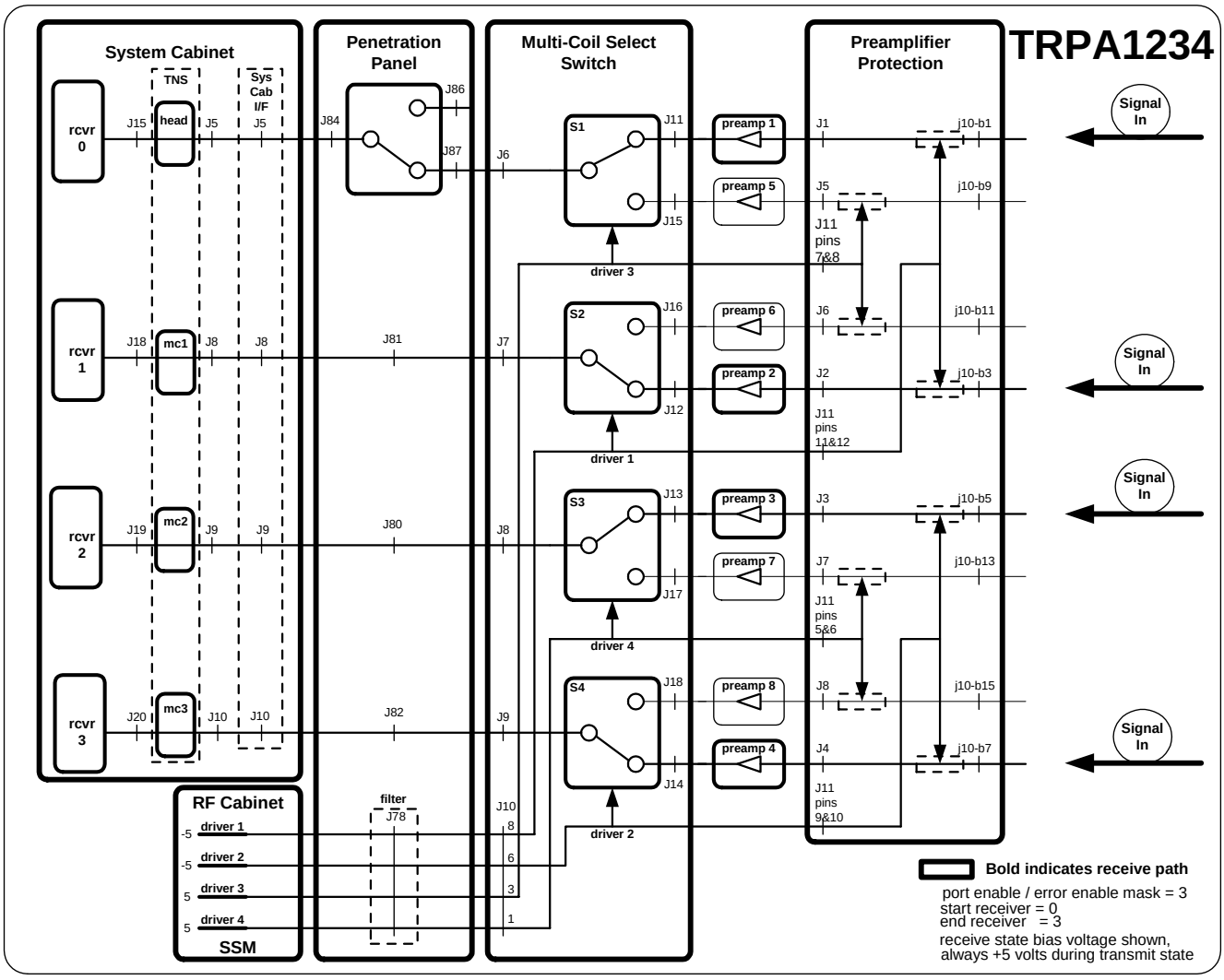
The MultiCoil Receive Chain Tool software interface includes block diagrams and troubleshooting flow charts to aid in isolating hardware failures.

C-1 Accessing the Block Diagrams

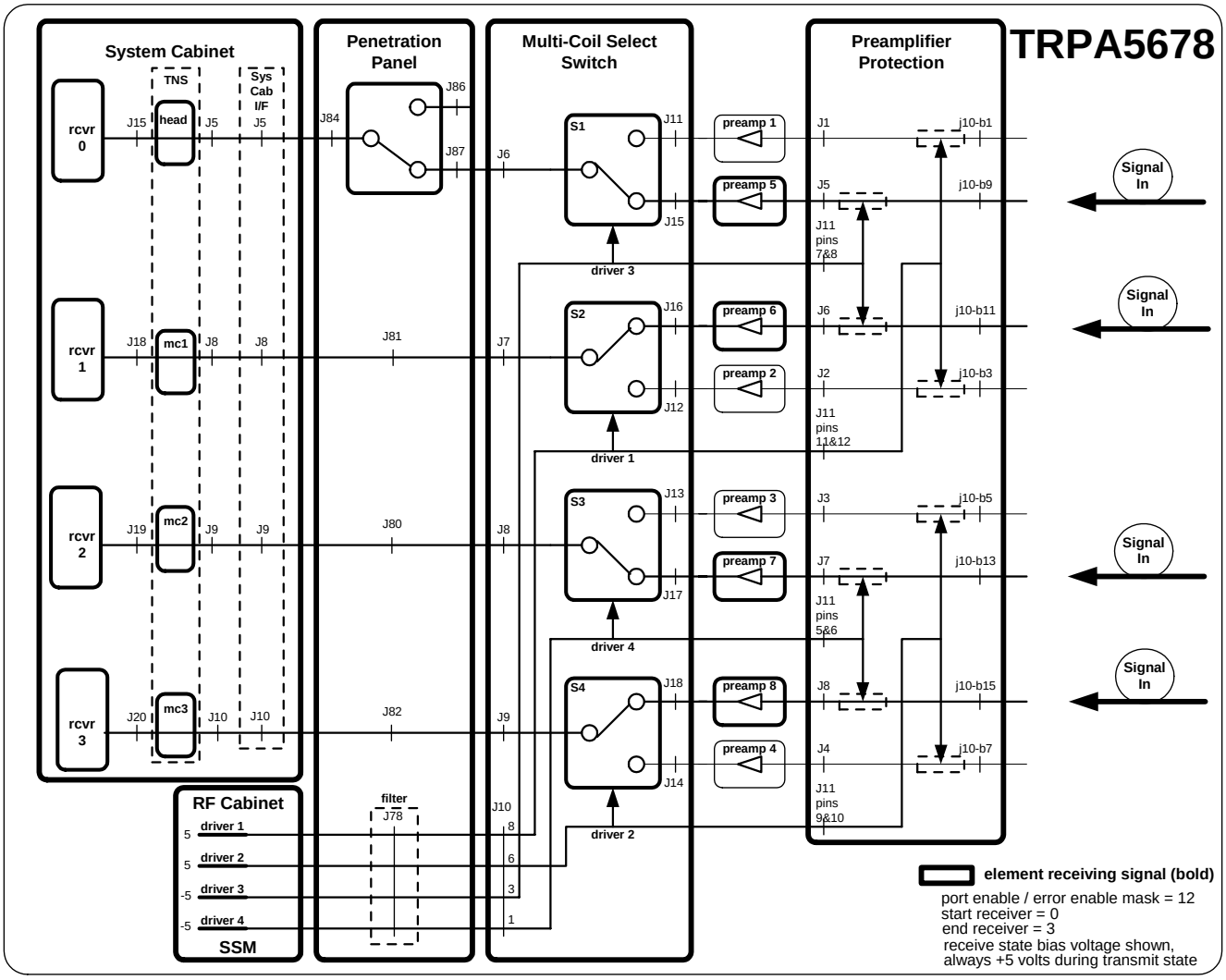
1. To access the block diagrams, select the **Documentation** menu on the MCR Tool screen and then **Block Diagrams**, see Illustration C-1.



ACCESSING BLOCK DIAGRAMS
ILLUSTRATION C-1



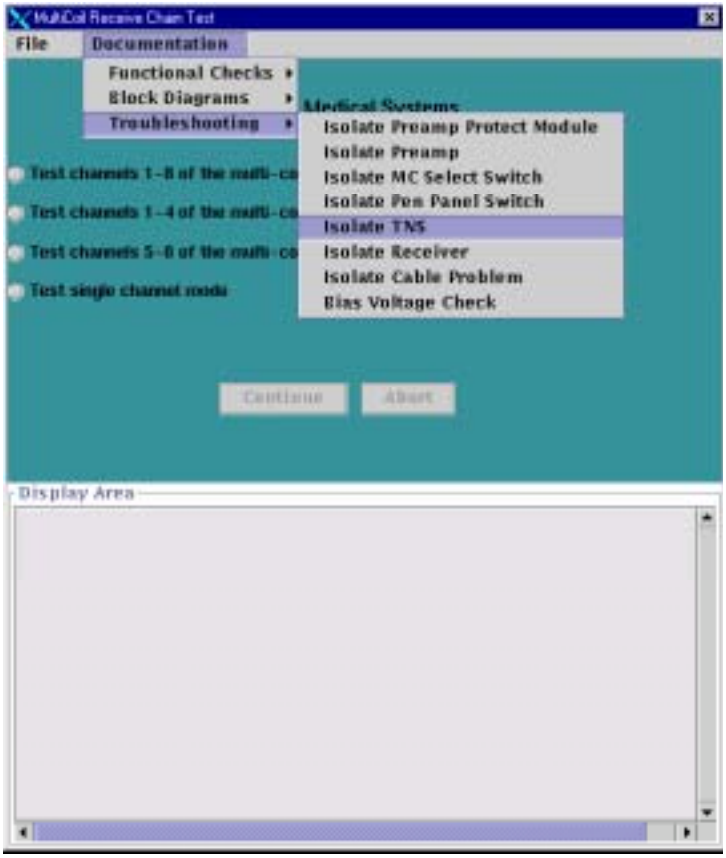
BLOCK DIAGRAM TRPA1234
ILLUSTRATION C-2



BLOCK DIAGRAM TRPA5678
ILLUSTRATION C-3

C-2 Troubleshooting the MultiCoil Receive Chain

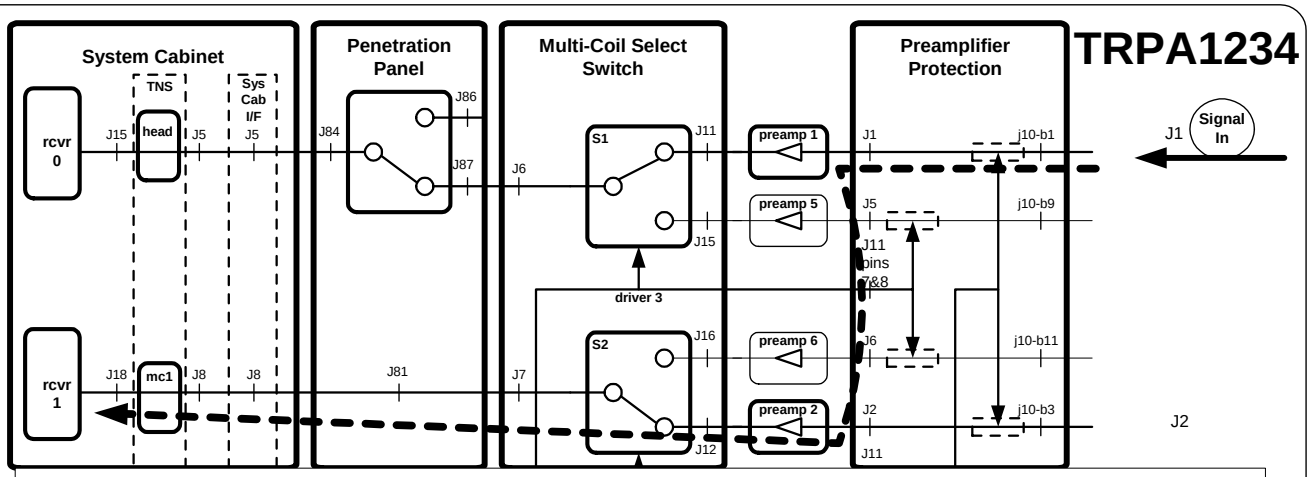
1. To access the troubleshooting documents, select **Documentation**, **Troubleshooting**, and then the hardware being isolated. See Illustration C-4.



ACCESSING TROUBLESHOOTING FLOWCHARTS
ILLUSTRATION C-4

The screens that are accessible from the software interface are as follows:

- Preamp Protect Module, Illustration C-5
- Preamp, Illustration C-6
- Select Switch, Illustration C-7
- Penetration Panel Switch, Illustration C-8
- TNS, Illustration C-9
- Receiver, Illustration C-10
- Cable Problems, Illustration C-11
- Bias Voltage Check, Illustration C-12



Isolate Preamp Protect Module

Assumption: At least one channel has a failure to be isolated, and other channels are passing.

Plan: Divert the signal through a section of the Preamp Protect known to be good.

Refer to block diagrams TRPA1234 or TRPA5678 for troubleshooting options.

For example, if receive channel connected to the MCR adaptor J2 is failing and the channel connected to J1 is passing then:

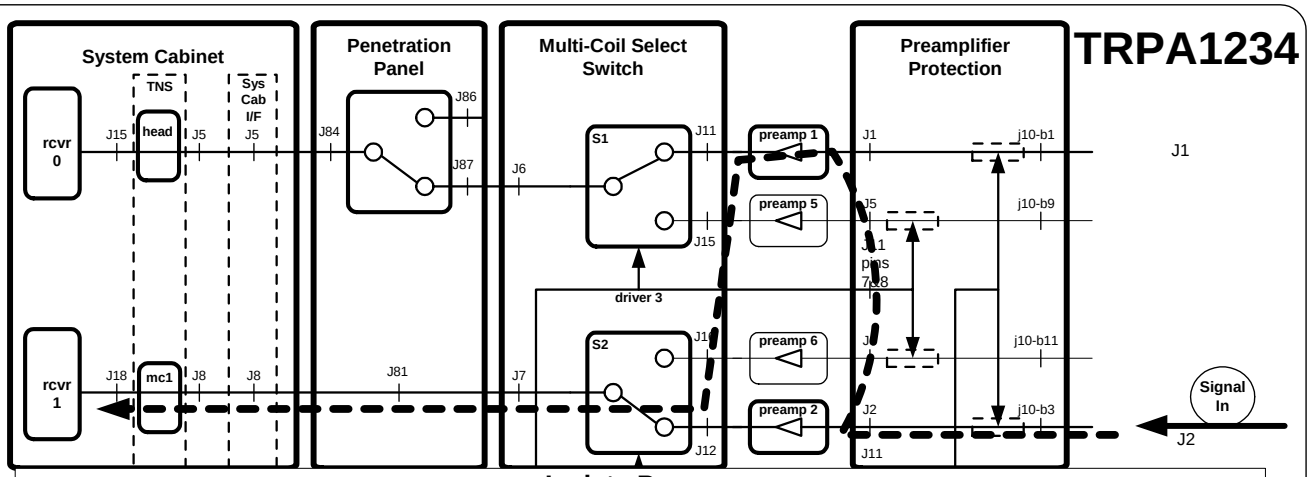
1. Plug input of preamp 2 into J1 of the Preamp Protect Module
2. Plug Head Coil receive cable into J1 of MCR adaptor
3. Under the Single Channel Test - select Channel 2
4. Run Test

If test fails - then Preamp Protect is OK.

If test passes - then Preamp Protect was the problem.

Note:
If troubleshooting a dead channel, you can save time by viewing Manual Prescan rather then running the actual scans.

PREAMP PROTECT
ILLUSTRATION C-5



Isolate Preamp

Assumption: At least one channel has a failure to be isolated, and other channels are passing.

Plan: Divert the signal through a known good Preamp

Refer to block diagrams TRPA1234 or TRPA5678 for troubleshooting options.

For example, if receive channel connected to the MCR adaptor J2 is failing and the channel connected to J1 is passing then:

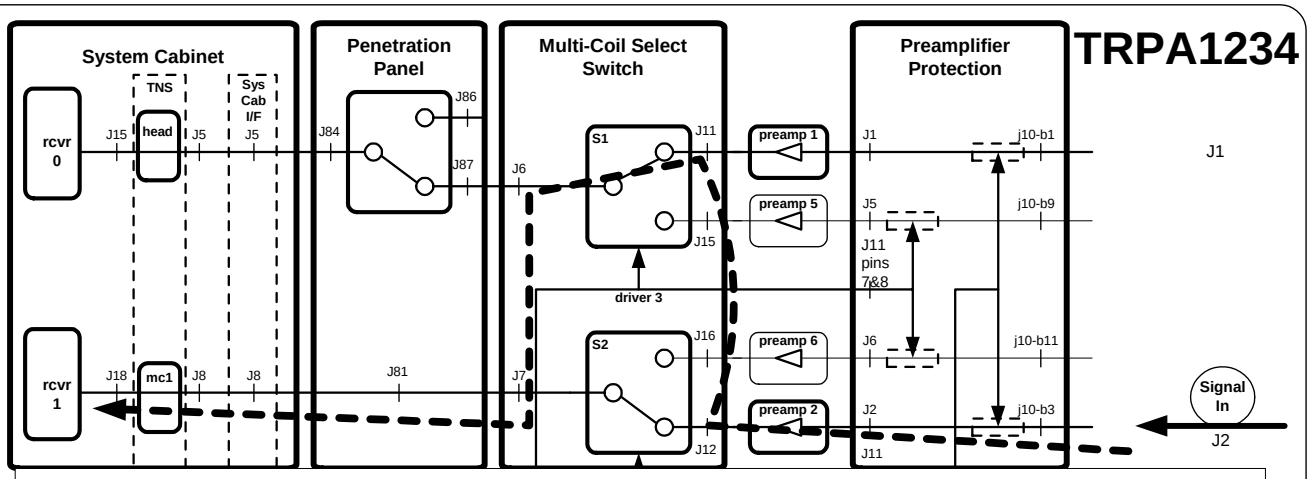
1. Swap Preamp 1 with Preamp 2
2. Plug Head Coil receive cable into J2 of MCR adaptor
3. Under the Single Channel Test - select Channel 2
4. Run Test

I f test fails - then Preamp is OK

I f test passes - then Preamp was the problem.

Note:
If troubleshooting a dead channel, you can save time by viewing Manual Prescan rather then running the actual scans.

PREAMP
ILLUSTRATION C-6



Isolate Multicoil Select Switch

Assumption: At least one channel has a failure, and other channels are passing.

Plan: Divert the signal through a section of the MC Select Switch known to be good.

Refer to block diagram for TRPA1234 or TRPA5678 for available options.

For example, if receive channel connected to the MCR adaptor J2 is failing and the channel connected to J1 is passing then:

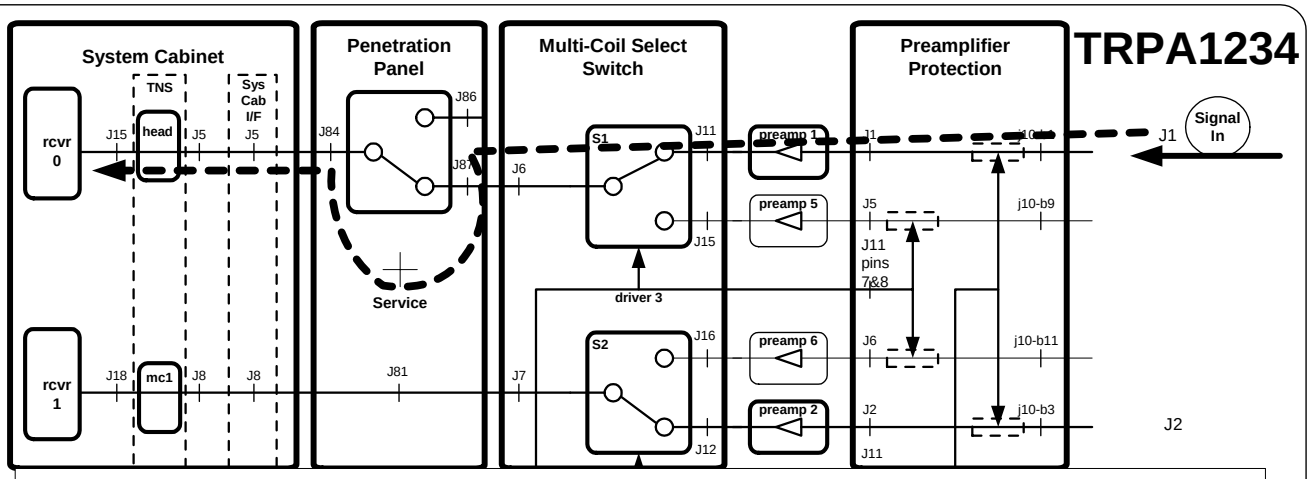
1. Move cable from input of MC Select Switch J12 to J11
2. Also Move cable from output of MC Select Switch J7 to J6
3. Plug Head Coil receive cable into J2 of MCR adaptor
4. Under the Single Channel Test - select Channel 2
5. Run Test

If test fails - then Select Switch is OK

If test passes - then Select Switch was the problem

Note:
If troubleshooting a dead channel, you can save time by viewing Manual Prescan rather then running the actual scans.

SELECT SWITCH
ILLUSTRATION C-7



Isolate Penetration Panel Switch

Assumption: Both Channels 1 & 5 are failing and the Receiver has already been ruled out.

Plan: Divert the signal around the Penetration Panel Switch.

Refer to block diagrams TRPA1234 or TRPA5678 for troubleshooting options.

For example, if receive channel connected to the MCR adaptor J2 is failing and the channel connected to J1 is passing then:

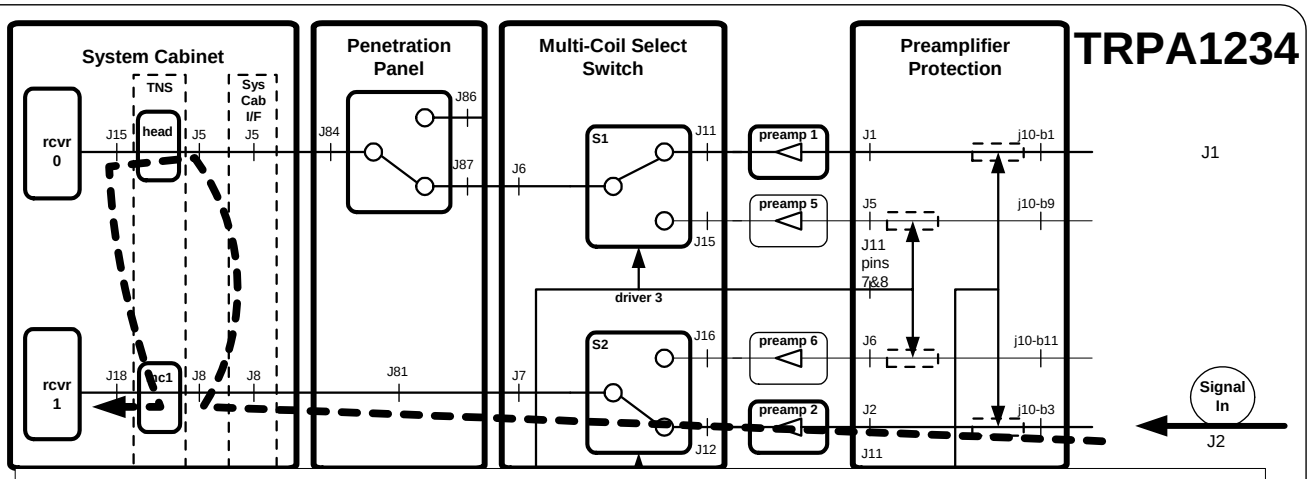
1. Move cable from input of Penetration Panel Switch J87 to BNC feed-through labled Service.
2. Also Move cable from output of Pen. Panel Switch J84 to to BNC feed-through labled Service.
3. Plug Head Coil receive cable into J1 of MCR adaptor
4. Under the Single Channel Test - select Channel 1
5. Run Test

If test fails - then Penetration Panel Switch is OK

If test passes - then Penetration Panel Switch was the problem

Note:
If troubleshooting a dead channel, you can save time by viewing Manual Prescan rather then running the actual scans.

PENETRATION PANEL SWITCH
ILLUSTRATION C-8



Isolate TNS

Assumption: At least one channel has a failure, and other channels are passing.

Plan: Divert the signal through a section of the TNS known to be good. (Or by-pass with BNC bullet)

Refer to block diagrams TRPA1234 or TRPA5678 for troubleshooting options.

For example, if receive channel connected to the MCR adaptor J2 is failing and the channel connected to J1 is passing then:

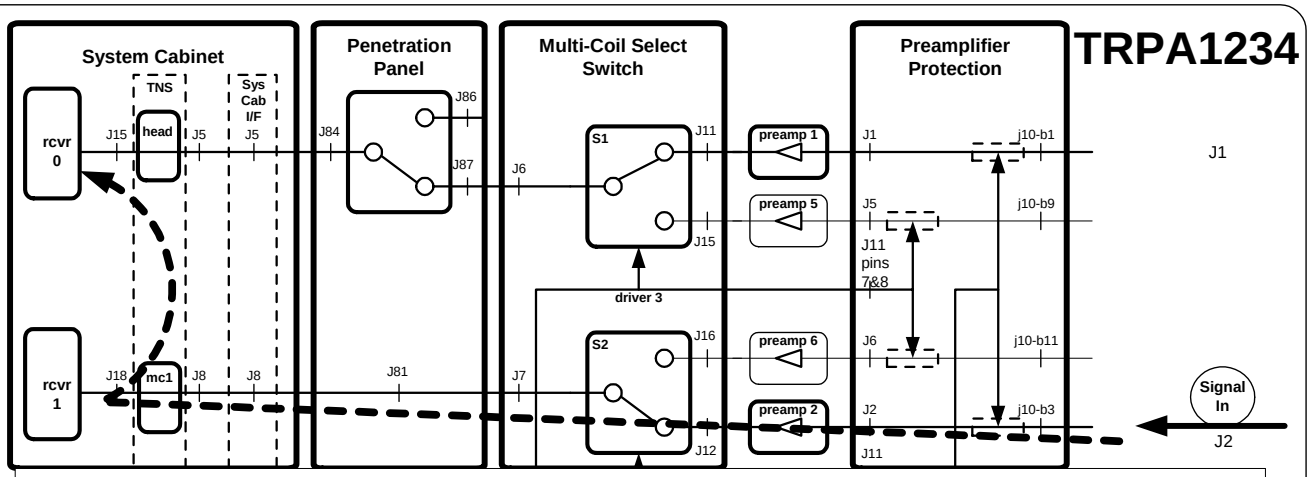
1. Move cable from input of TNS J8 to J5
2. Also Move cable from output of TNS J18 to J15
3. Plug Head Coil receive cable into J2 of MCR adaptor
4. Under the Single Channel Test - select Channel 2
5. Run Test

I**f test fails - then TNS is OK.**

If test passes - then TNS was the problem.

Note:
If troubleshooting a dead channel, you can save time by viewing Manual Prescan rather then running the actual scans.

TNS
ILLUSTRATION C-9



Isolate Receiver

Assumption: At least one channel has a failure, and other channels are passing.

Plan: Divert the signal to a Receiver known to be good.

Refer to block diagrams TRPA1234 or TRPA5678 for troubleshooting options.

For example, if receive channel connected to the MCR adaptor J2 is failing and the channel connected to J1 is passing then:

1. Move cable from output of head TNS module J15 to J18
2. Plug Head Coil receive cable into J2 of MCR adaptor
3. Under the Single Channel Test - select Channel 1
4. Run Test

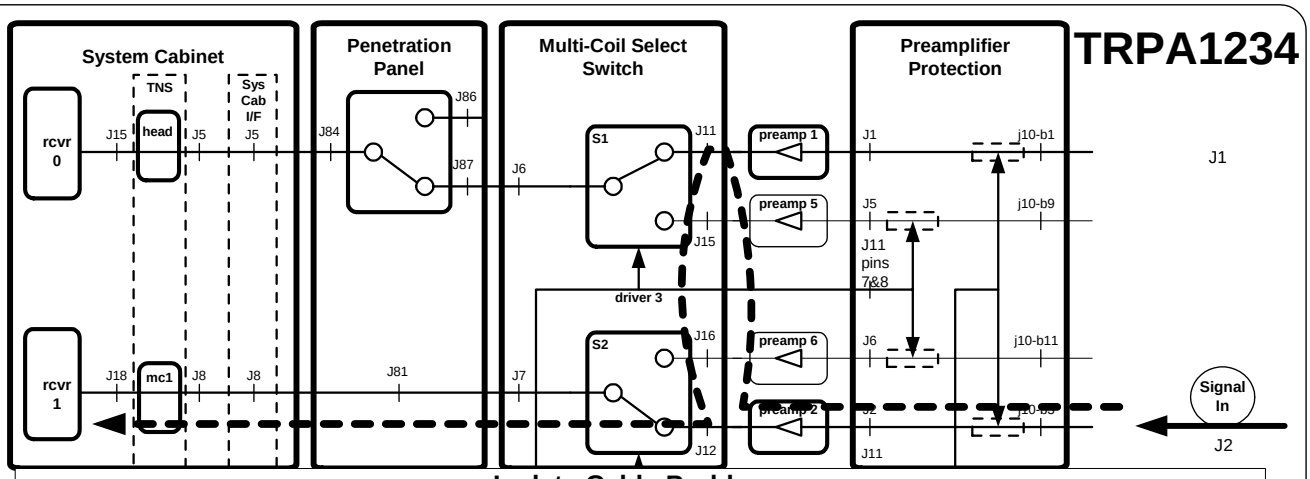
Note:
If troubleshooting a dead channel, you can save time by viewing Manual Prescan rather then running the actual scans.

I**f test fails - then Receiver is OK .**

If test passes - then Receiver was the problem.

Note: Signals passed from the Exciter to Receiver (e.g. LO1) can make it look like the Receiver is bad. Physically swap a suspected bad Receiver with a good one within the (U)CERD. If the known good Receiver now looks bad, it may be due to an Exciter problem.

RECEIVER
ILLUSTRATION C-10



Isolate Cable Problems

Assumption: At least one channel has a failure, and the electronic components have been ruled out.

Plan: Divert the signal through a section of the MC Select Switch known to be good.

Refer to block diagram for TRPA1234 or TRPA5678 for available options.

For example, if receive channel connected to the MCR adaptor J2 is failing and the channel connected to J1 is passing then:
and you suspect the cable between the Preamp 2 and the Select Switch is faulty:

1. Move cable from output of Preamp 1 to the output of Preamp2
2. Also, move cable from input of MC Select Switch J11 to J12
3. Plug Head Coil receive cable into J2 of MCR adaptor
4. Under the Single Channel Test - select Channel 2
5. Run Test

I**f test fails - then the cable is OK**

If test passes - then the cable was the problem

Note:
If troubleshooting a dead channel, you can save time by viewing Manual Prescan rather then running the actual scans.

CABLE PROBLEMS
ILLUSTRATION C-11

Bias Volatage Checks

Purpose: Functional Check to verify proper bias voltage can be delivered to a multicoil.

Plan: Measure bias voltages at the MCR adaptor.

Refer to block diagrams TRPA1234 or TRPA5678 for troubleshooting options.

1. From the Documentation pull-down menu select; Functional Check ->Verify Head Receive Line.
2. At the bottom of the flowchart click on "Download".
3. Move to the Scan Desktop and select a series that uses TRPA1234 and then Prep to Scan.
   Note: Do NOT connect the DC Block when checking bias voltages.
4. Measure the MCR Adaptor BNC inputs with a Digital Voltmeter (red - center pin, black - ground)
5. Channels 1-4 should be around -4.5V and, Channels 5-8 should be around 4.5V.

6. Next select a series that uses TRPA5678 and then Prep to Scan.
7. Measure the MCR Adaptor BNC inputs with a Digital Voltmeter (red - center pin, black - ground)
8. Channels 1-4 should be around 4.5V and, Channels 5-8 should be around -4.5V.

If any of the voltages are incorrect:
Refer to the block diagrams TRPA1234 & TPPA5678for troubleshooting options.

BIAS VOLTAGE CHECKS
ILLUSTRATION C-12