S E R V I C E N O T E

SUPERSEDES: 3070-43D-S

3070 / 79000 Board Test Systems

Serial Numbers: 0000A00000 / 9999Z99999

Notification of Potential Operator Safety Hazards

Applies to Series I systems with software revisions A.01.00 to A.08.00, Series II systems with software revisions B.01.00 to B.02.86 and Series 3 systems with Software Revisions B.03.00 to B.03.13.

WARNING

Possible Shock Hazard

Agilent has identified potential safety hazards that may cause death or serious injury to operators of 3070 / 3079 / 79000 board test systems. To help our customers protect the safety of their employees, we are notifying you of the safety hazards and offering solutions.

To Be Performed By: Agilent-Qualified Personnel or Customer

Continued

DATE: February 1999

ADMINISTRATIVE INFORMATION

SERVICE NOTE CLASSIFICATION: **PRIORITY SAFETY**			
ACTION CATEGORY:	IMMEDIATELY	STANDARDS: LABOR 1.0 Hours	
LOCATION CATEGORY:	■ ON-SITE □ SERVICE CENTER	SERVICE INVENTORY: □ RETURN □ SCRAP ■ SEE TEXT	USED PARTS: □ RETURN □ SCRAP ■ SEE TEXT
AVAILABILITY:	ALWAYS	AGILENT RESPONSIBLE UNTIL: ALWAYS	
AUTHOR: CP	ENTITY: 0980	ADDITIONAL INFORMATION:	

Agilent Technologies

Parts Required:

P/N	Description	Quantity
E9900-97003	B.03.10 Software Install Kit	1
E9900-97008	B.03.10 Software Patch Kit	1
E9900-19413	B.03.13 Software Patch Tape	1
E9900-96113	B.03.13 Install Instructions	1
E9900-97315	B.03.15 Software Patch Kit	1
E4000-97279	B.02.79 Software Patch Kit	1
E4000-97287	B.02.87 Software Patch Kit	1

Contact your local Board Test service representative for availability.

A Series I solution is being investigated. Agilent will issue a subsequent Service Note when a Series I solution is available.

What are the hazards?

The hazards to the operator of testing printed circuit boards include electrical shock and hot or exploding devices. In accordance with the International Electrotechnical Commission publication 61010-1, voltage is hazardous if it exceeds 60 volts dc, 42 volts peak, or 30 volts rms. Furthermore, when voltage is applied to a board, it may remain stored on the board in charged capacitors even after the test voltage has been removed. These are known as "trapped charges." Agilent System software looks for trapped charges and discharges them at the completion of the board test. In addition, some devices can get very hot during testing. Others, such as large electrolytic capacitors, solenoids, motors and other electro-mechanical devices, can explode if they are mis-loaded or defective.

The HP 3070 software provides a Safety Disable feature which HP has always strongly recommended be used with any test fixture in which the above hazards may exist. HP has recently identified some defects in the system software that prohibit the safety procedures associated with this feature from operating properly, possibly exposing operators to these hazards. This service note details the identified defects and the actions to take to ensure the safest operation of HP 3070 systems.

What can you do about these hazards?

1.) HP has always strongly recommended that users add an interlocked safety shroud (plastic cover) to any test fixture in which the above hazards may exist. A shroud provides protection from hot or exploding devices and, when the interlock switch is wired to the Control Card's Safety Disable pins, opening the shroud will activate the Safety Disable feature and disable hazardous voltages. An interlocked shroud must be in place to utilize the Safety Disable feature. Complete instructions for building a safety shroud and wiring the interlock can be found in Chapter 1 of the Building Board Test Fixtures Manual (HP P/N 44200-90022). If a safety shroud is implemented, the hazard should be marked on the shroud in accordance with local safety regulations. It is the customer's responsibility to implement the safety shroud as needed.

2.) Install the latest software patch immediately to ensure proper operation of the Safety Disable feature.

To determine the current software revision installed on your machine type 'version' at a shell window prompt. This will return the installed version.

For systems running Series 3 revision software:

(HP-UX 'version' command returns B.03.xx where xx is variable)

- Immediately install software patch B.03.15. The B.03.15 patch includes the fixes from B.03.07 and B.03.10 and makes available additional fixes not covered in B.03.07 and B.03.10. The B.03.13 software patch must be installed prior to installing the B.03.15 software patch. At B.03.15 the system will respond significantly differently to detection of a safety disable event. See the following section *A summary of the conditions discovered that could pose safety hazards* for details on the hazards and which revisions address specific hazards. See the following section *A summary of system response to detection of a safety disable event at software revisions B.02.79, B.02.87 and B.03.15* for details on system behavior when a safety disable event is detected at B.02.79, B.02.87 and B.03.15.

This update is free. B.03.15 can be downloaded from the HP web site:

http://www.hp.com/key/boardtest.

The B.03.13 software patch must be installed prior to installing the B.03.15 software patch. B.03.13 is a very large software patch to the B.03.10 software revision. B.03.13 is not available on the web.

If you don't have access to this web site, or need B.03.13 software then contact your local HP Board Test service representative.

For systems running Series II revision software:

(HP-UX 'version' command returns B.01.xx or B.02.xx where xx is variable)

There are two tapes available, B.02.79 and B.02.87. These contain the same safety content, but for flexibility are designed to load on a different revision of Series II software.

- Install software patch B.02.79 if the current Series II revision software is B.02.78 or less. B.02.79 is a patch designed to load on software revision B.02.7X. If the current Series II revision software is less than B.02.7X then the software must be upgraded to B.02.75 before loading B.02.79. At B.02.79 the system will respond significantly differently to detection of a safety disable event. See the following section *A summary of system response to detection of a safety disable event at software revisions B.02.79, B.02.87 and B.03.15* for details on system behavior when a safety disable event is detected at B.02.79, B.02.87 and B.03.15.

This update will be free. B.02.79 can be downloaded from the HP web site:

http://www.hp.com/key/boardtest.

If you don't have access to this web site or need materials to update to B.02.7X contact your local HP Board Test service representative.

- Install software patch B.02.87 if the current Series II revision software is B.02.85 or B.02.86. At B.02.87 the system will respond significantly differently to detection of a safety disable event. See the following section *A summary of system response to detection of a safety disable event at software revisions B.02.79, B.02.87 and B.03.15* for details on system behavior when a safety disable event is detected at B.02.79, B.02.87 and B.03.15.

This update will be free. B.02.87 can be downloaded from the HP web site:

http://www.hp.com/key/boardtest.

If you don't have access to this web site contact your local HP Board Test service representative.

For systems running Series I revision software:

(HP-UX 'version' command returns A.xx.xx where xx.xx is variable)

- HP will issue a subsequent service note when a Series I solution is available.

A summary of the conditions discovered that could pose safety hazards:

This section will provide a detailed description of each of the hazard conditions identified. This will be followed by a description of the safety content of each of the software revisions B.03.07, B.03.10, B.03.15, B.02.79 and B.02.87. B.03.13 will also be described because it must be installed to install B.03.15.

DUT Power Supply Voltages - Activation of the Safety Disable feature should cause the relays on the ASRU card connecting the DUT power supply voltages to open. Software revisions B.03.00 to B.03.05 when used with a ControlXT card, do not open these relays.

Functional Ports - Activation of the Safety Disable feature should cause the functional ports on the ASRU card to be disconnected. Software revisions B.03.00 to B.03.05 when used with a ControlXT card, do not disconnect these functional ports.

Time Delay - Certain digital tests and tests using the digitizer can last up to several minutes. If a Safety Disable interrupt occurs during a digital test, the interrupt is ignored until the test is completed. Depending on the length of the test, the interrupt may be lost. If a Safety Disable interrupt occurs during a digitizer test, the interrupt is ignored until the test is completed. The interrupt is processed upon completion of the digitizer test. So, depending on the type of test running when a Safety Disable interrupt occurs, the Safety Disable feature may operate only after a long time delay or not at all. This condition exists on software revisions A.01.00 to A.08.00, B.01.00 to B.02.86 and B.03.00 to B.03.06.

AccessPlus Card - The AccessPlus Card may be used to route signals from external test equipment to the board under test. Because these signals could create an electrical shock hazard, the relays on the AccessPlus Card should be opened by the Safety Disable interrupt. These relays are not opened on software revisions A.01.00 to A.08.00, B.01.00 to B.02.86 and B.03.00 to B.03.06.

Serial Test Card - The Serial Test Card processes signals presented to it through the fixture. These can be high voltage. The external connections are usually only used for loopback purposes. The connect relays on the Serial Test Card are not opened when the Safety Disable feature is activated on software revisions A.01.00 to A.08.00, B.01.00 to B.02.86 and B.03.00 to B.03.06.

'connect keep' Feature - The BT-Basic statements 'connect keep' and 'clear connect keep' can cause relays on the AccessPlus card to be closed immediately after a Safety Disable interrupt has occurred. Because these relays may be used to route hazardous voltages from external equipment these relays should remain open when a Safety Disable interrupt has occurred. The 'connect keep' and 'clear connect keep' statements were made available at B.02.85 and later software revisions. This condition exists on software revisions B.02.85 to B.02.86 and B.03.00 to B.03.13.

loop|single test|loop Construct - The use of the BT-Basic loop construct to execute a single test repeatedly can cause the Safety Disable interrupt to not be recognized by BT-Basic. The Safety Disable interrupt is always recognized, but occasionally (between 1 out of 20 and 1 0ut of 100 events) BT-Basic may continue to execute the test in the loop. The continued execution of this test may allow hazardous voltages to be reconnected after the Safety Disable interrupt actions have completed. Loop constructs with at least two tests being repeated in the loop have never exhibited this behavior. This condition exists on software revisions A.01.00 to A.08.00, B.01.00 to B.02.86 and B.03.00 to B.03.13.

Multiple Module Safety-Slaves - In a multiple module configuration (2-4 modules), one module is selected as the safety-master and the other modules are designated as safety-slaves. After a Safety Disable interrupt has occurred the safety-slave modules are allowed to finish executing any unexecuted tasks stored in those modules. These tasks may reconnect hazardous voltages after the Safety Disable interrupt actions have completed. This condition exists on software revisions A.01.00 to A.08.00, B.01.00 to B.02.86 and B.03.00 to B.03.13.

Trapped Charges - To discharge trapped charges, the board must be connected to the fixture so that resistors on the ASRU Card can discharge the board. Since the board may be released from the fixture by the operator at any time (by lifting the safety shroud ,which invokes the Safety Disable interrupt), charges may be trapped in capacitors on the board which cannot be discharged. The customer may need to provide additional protection for the operator such as an electro-mechanical lock for the shroud or shielding over the capacitor's terminals and traces, or a means of discharging the capacitor after vacuum has been released. As with the implementation of the safety shield, the implementation of these additional protection methods for trapped charge is the customer's responsibility.

Hot Parts - If the operator opens the safety shield while the test is in progress there may be parts on the board that remain hot for a period of time. It is the customer's responsibility to assure that hot parts on the device under test do not cause injury to the operator. A mechanism for locking the safety shield until the cool-down period has expired may be required.

Refer to IEC 61010-1 *Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use* for limits on accessible Voltage, charge, current, and temperature.

With the exception of trapped charges and hot parts, all of the hazards described above will be addressed with the B.03.15 software patch for Series 3 and the B.02.79 and B.02.87 software patches for Series II.

The B.03.07 patch and B.03.10 release made available the fixes for the following hazards described above:

-DUT Power Supply Voltages
-Functional Ports
-Time Delay
-AccessPlus Card
-Serial Test Card

B.03.07 and B.03.10 do NOT address the following hazards described above:

-'connect keep' Feature
-loop|single test|loop Construct
-Multiple Module Safety-Slaves
-trapped charges -hot parts

The B.03.13 patch does not make any additional safety improvements beyond what is available in B.03.10. However, the B.03.13 software patch must be installed on the system to be able to install the B.03.15 software patch. B.03.13 is a very large patch to software revision B.03.10 and it is NOT downloadable over the web. You must be at software revision B.03.10 to load the B.03.13 patch. Please contact your local HP Board Test service representative if you need B.03.13 software and have not received it.

The B.03.15 patch makes available the following additional fixes not covered in B.03.07 and B.03.10:

-'connect keep' Feature
-loop|single test|loop Construct
-Multiple Module Safety-Slaves

The B.03.13 patch must be installed first to successfully install the B.03.15 patch.

B.03.15 does NOT address the following hazards described above:

-trapped charges
-hot parts

The B.02.79 and B.02.87 patches made available the fixes for the following hazards described above:

-DUT Power Supply Voltages
-Functional Ports
-Time Delay
-AccessPlus Card
-Serial Test Card
-'connect keep' Feature
-loop|single test|loop Construct
-Multiple Module Safety-Slaves

B.02.79 and B.02.87 do NOT address the following hazards described above:

-trapped charges
-hot parts

A summary of system response to detection of a safety disable event at software revisions B.02.79, B.02.87 and B.03.15:

As always, safety disable monitoring is activated after issuing either of the following BT-Basic commands:

powered
auxconnect

Each of these commands has a respective converse command to deactivate safety disable monitoring:

unpowered
auxdisconnect

If safety disable monitoring has been made active, then it will remain active until the converse command for each activating command that was used is issued.

At software revision B.02.79, B.02.87 and B.03.15, **the system will respond significantly differently to detection of a safety disable event.** The system will now power down the testhead when a safety disable event is detected while the system's safety disable monitoring is active. Detection of a safety event will open all relays within each module and disconnect the module power units (MPUs). These actions will occur within 1 second of the safety disable event. A critical testhead alarm message will be posted to the operator console when this event occurs. This alarm message will describe what happened and the actions necessary to return to board testing. The detection of a safety disable event will also be indicated on the System Card with alternate flashing of the red LEDs 6 and 7. The red LEDs 6 and 7 will flash alternately until the testhead is rebooted. Returning to board testing will require a testhead reboot which can be done with the BT-Basic command 'testhead power on'. This command is available to the operator through the standard operator interface softkeys.

Note that disconnecting the MPUs in response to a safety disable event occurring will cause a lost heartbeat error to occur and a lost heartbeat message to be posted to the operator console 30 to 60 seconds after the safety disable event testhead alarm message has been posted. During the time period between the appearance of the testhead alarm message and the appearance of the lost heartbeat message, the operator console will be inaccessible while it attempts to communicate with the testhead. Once the lost heartbeat message appears, the operator console will be accessible and the testhead can be rebooted from the operator console.

If the safety shroud is open at the time that the safety disable is activated with a powered or auxconnect statement , then a testhead warning alarm message will be posted and the testplan will be halted without disconnecting module power. The safety shroud can be closed and board testing resumed without having to reboot the testhead.

Alternate solution suggestions for hazardous voltage:

One solution to the hazardous voltage problem is to add interlock switches to the safety shroud and wire any hazardous voltages through these interlocks. Another solution is to add an electro-mechanical lock to the shroud to prevent it from being opened until the test is completed and trapped charges are discharged or hot parts have cooled down. In some countries, local laws and safety regulations may require you to add these interlock switches even though the Safety Disable feature is present.

Precautions for ALL systems:

While HP develops solutions and until the solution is installed on your system you must abide by the following precautions:

DO NOT connect DUT supplies in series to produce a hazardous voltage unless the appropriate software revision or an alternative method for removing hazardous voltages is used.

DO NOT use high-voltage supplies where the voltage could reach a hazardous level unless the appropriate software revision is installed or an alternative method for removing hazardous voltages is used.

DO NOT bring hazardous voltage through the Functional Ports unless the appropriate software revision is installed or an alternative method for removing hazardous voltages is used.

DO NOT bring hazardous voltages through the AccessPlus Card unless the appropriate software revision is installed or an alternative method for removing hazardous voltages is used.

Precautions for Telecom systems:

Be careful using the Kikusui supply in the POTS bay. The POTS bay is not controlled by the Safety Disable interrupt. The voltages from the Kikusui supply are routed through the AccessPlus Card. The AccessPlus card is controlled by the Safety Disable interrupt on software revisions B.02.79 and B.02.87 (for Series II) and B.03.15 or later (for Series 3). B.03.07 and B.03.10 provide disconnection of the AccessPlus Card relays, but do not address the reconnection of these relays by the 'connect keep' and 'clear connect keep' feature. **Do NOT** program the Kikusui supply to hazardous levels unless the appropriate software revision is installed, or an alternate method for removing hazardous voltages if a safety shield is opened is implemented.

Precautions for Performance Port:

Performance Port is used to route signals in and out of the test fixture. If Performance Port is used to route hazardous voltages from the DUT supplies then the appropriate revision software must be installed or an alternate solution used to remove the hazardous voltage when safety shielding is opened. Externally routed voltages should conform to the specifications in the HP Performance Port Manual (HP P/N E3700-90000).

Precautions for custom uses of auxiliary relays:

The auxiliary relays are system card relays that provide 24 Volts for powering vacuum solenoids and pneumatic fixture hardware. These relays will be disconnected when a safety disable event occurs. Note that auxiliary connections can be kept across board test cycles for controlling pneumatic fixtures using the "wait for Start" command with the "keep auxconnect" option. If these 24 Volt auxiliary relays are used to control routing of hazardous voltage to the fixture, then the "keep auxconnect" command must not be used or an alternate solution must be used to remove the hazardous voltage when the safety shielding is opened in the unpowered mode.

This document supersedes the HP 3070 Test and Fixture Development Manual (Rev. E), Sections 3.7.1.5 and 3.7.3.2; and the HP 3070 Building Board Test Fixtures Manual (Rev. M), Chapter 1.

HP Board Test representatives logistics:

CEs PLEASE NOTE: HP Board Test representatives (CEs) filling out a Customer Service Order (CSO) for tape installation supporting this service note MUST write the service note number in the detail section. In addition , 02G (extension of normal warranty) MUST be used in the type field. If this procedure is not followed, the CSO will not be accepted. Questions concerning support procedures should be directed to the MTD On Line Support manager, John Herczeg T-670-3700.

SEs PLEASE NOTE: HP Board Test representatives (SEs) charging the authorized time to MTD for actions against this service note shall use the PLUS system with the following information:

Entry section:	Hb
Customer Name:	3070-43E-S PSSN
Other Org:	MTD
Location Billed:	0980511035630000
Requester Name:	John Herczeg

An EID number will still be required for the SEs.

Questions concerning support procedures should be directed to the MTD On Line Support manager, John Herczeg T-670-3700.