HP 3070 Board Test Systems
Fixture Interface Pin (MINT Pin) Maintenance

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Eliminating Contact Problems

Fixture Interface Pins (MINT pins) used in production testing will eventually get dirty enough to cause contact problems. The following three steps will eliminate contact problems caused by dirty Fixture Interface Pins:

1. Practice preventive maintenance on fixtures, test boards, and the test environment to prolong Fixture Interface Pin life.
2. Use techniques approved by the Fixture Interface Pin and fixture manufacturers to clean the Fixture Interface Pin contacts.
3. Develop a maintenance program that defines intervals at which Fixture Interface Pins are cleaned or replaced. Alternatively, if Diagnostic test number 3991 or confirmation test number 3023 falls, then clean or replace Fixture Interface Pins, not just failing contacts.

Preventive Maintenance Recommendations

Test Environment - The test environment is one of the largest contributors to Fixture Interface Pin contamination. Minimize airborne contamination such as dust, concrete dust, clothing fibers or particles from a nearby wave-solder machine to improve contact reliability.

Circuit Boards - Printed circuit boards that are being tested should be as clean as possible. 11' testing boards coated with no-clean flux, choose low-solids fluxes and fine-tune process controls to minimize the amount of flux applied to the board. Testing contaminated boards will not only cause poor contact on new fixture probes, but will leave residues behind on the fixture probe tips that impede the next test as well.

Dust Covers - Use dust covers over idle test modules not in use to prevent airborne contaminants from settling on the Fixture Interface Pins. In the case of vacuum fixtures, dust which settles on the board test area, depending on which way the air flows, will be drawn directly onto the Fixture Interface Pins when the fixture is used. Make sure dust cover gasket is installed on top plate of system. This will help sea] the Dust Cover and Fixtures so that contamination will not be deposited on Fixture Interface Pins.

NOTE This will change after installing the new fall upgrade kit.

Air Filter - When a vacuum fixture is released, room air rushes into the fixture around the test probes. Protect the probes from airborne contamination by installing an air filter in the release port.

Testhead Modules - Like the probes in test fixtures, Fixture Interface Pins which are exposed on a test system's module should also be protected. Keep modules covered with either a **dust cover or a test fixture,** and maintain clean electrical contact surfaces on all fixtures.

Fixture Interface Pin Cleaning

In some cases, especially in high volume production (where the Fixture Interface Pins see many cycles over a short time), it may be practical to clean the contacts of the Fixture Interface Pins.

CAUTION Virtually all manufacturers of low-resistance, long-life pins use some sort of lubricant to prolong the life of the pin's internal sliding contact surfaces. Cleaning a Fixture Interface Pin by bathing it in Freon or other solvent will remove this important lubricant. Even spot cleaning the pin tips with solvent can wash particles down into the critical internal surfaces where they can drastically affect performance.

HP RECOMMENDS THE FOLLOWING PROCEDURE.

To clean Fixture Interface Pin contacts, remove lint, fibers, flux and other contaminants by gently brushing the pin tips with a small brush and vacuuming or **blowing to where you are above the pins** the dislodged particles. If the facility has oil free and filtered air, that's acceptable for blowing off Fixture Interface Pins. Unfiltered air will produce excessive ESD and should not be used.

A brush with natural bristles (goat or horse hair) works well. Metallic bristles may damage the contact plating and are not recommended. Synthetic brushes are too stiff and will not get into the valleys of the mint pins, and have a very high ESD factor.

Most brushes generate several kilovolts of ESD; the natural bristles are less susceptible to ESD voltage. The brushes HP recommends could have 400 volts ESD and dissipate within 10 seconds. This brush is set up at SMO (part number 5041-6209).

Maintenance Programs

A periodical maintenance program for fixtures and Fixture Interface Pins can save considerable time and money by making testing become more reliable. It reduces the chance of false failures and it decreases rework expense. Diagnosing contact problems as they arise and replacing Fixture Interface Pins one at a time are more expensive than replacing Fixture Interface Pins on regular intervals. Use cycle counters on test fixtures to help establish a maintenance program that calls for cleaning or replacing Fixture Interface Pins after a predetermined number of cycles.

Developing a Maintenance Program
A program requires some tracking to determine the average contact problem free life of the pins in a particular application. Since test and environmental conditions vary widely, it is difficult to generalize about Fixture Interface Pin life. Some applications call for replacement as often as every few thousand cycles, while pins in clean environments or applications with wide electrical tolerances can last far longer.

Better test yields and reduced down-time are the rewards for keeping fixtures and Fixture Interface Pins in top condition.

Common Failure Modes for Fixture Interface Pins

1. **High electrical resistance between the Fixture Interface Pin contact and the fixture surface** is the most common failure mode for Fixture Interface Pins. One or more of the following cause this:

   A. **Contamination buildup on the** Fixture Interface Pin **contacts** (in the valleys and on the tips) which forms art insulating layer and prevents reliable contact. This contamination is commonly composed of.

      1) Contamination from clothing, skin particles, gloves or the recently sheared PCB material also concrete dust from unsealed floors can also get on contacts.

2) **Using non-HP personality pins in the fixture.**

B. **Damaged Fixture Interface Pins contacts** that can no longer create contact pressure high enough to make reliable contact. Contacts are commonly damaged by improper installation, bottoming during use, or lateral motion between the tip and the device under test.

2. **Internal wear** is the next common failure mode for Fixture Interface Pins and Fixtures.

A. **Wear of plating on internal contact surfaces,** which in turn is caused by:

1) Side-loading of the Fixture (contacting angled component leads with crowns, contacting misaligned open vias with chisels, etc.).
2) Lack of lubricants caused by rinsing with solvent, or using unlubricated Fixture Interface Pins.
3) Normal wear of contact surfaces caused by extended cycling.

B. **Introduction of contamination into the internal contact surfaces.** For example, rinsing dirty plungers with solvent is an ideal (and unfortunately, common) method of bringing contamination onto the critical internal contact areas.

C. Deflecting Fixture Interface Pins beyond their rated working stroke (particularly in cases of extremely high force springs) will cause fatigue failure of the spring, which in turn creates a loss of contact force (both at the tip and internally). The Fixture Interface Pins will often continue to function after fatigue failure, but tile broken coils will quickly damage the internal contact surfaces.

3. **Spring failure** is the least-common failure mode, and it falls into two categories:

A. **Fatigue failure,** which is generally caused by over stroking. Fixture Interface Pins are rated for a particular working stroke, and when that stroke is exceeded fatigue failure of the spring may occur. Fatigue failure of the spring affects contact reliability in the following ways:

1) The plunger may no longer extend enough to make contact.
2) The spring force is reduced, which decreases contact pressure and contact reliability.
3) The broken coils of the spring will damage the critical inside contact surfaces of the Fixture Interface Pin tube as the plunger is exercised.

B. **Temperature relaxation,** which occurs when music "Ire springs are exposed to temperatures greater than 250 degrees F (120 degrees Q for extended periods. Temperature relaxation reduces spring force and therefore contact reliability.