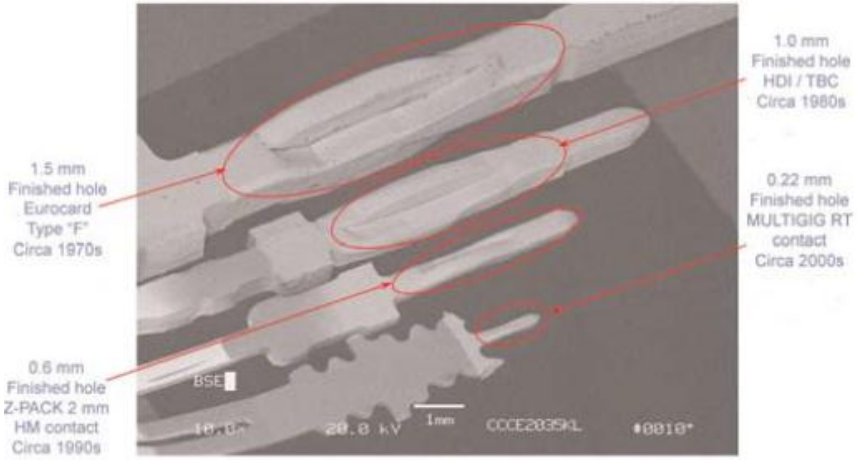
Press Fit Rework Project

Project Update
HDPUG Meeting
San José, CA 02/26/14

Background

- Since late 60's or early 70's
- First press fit was a square peg into a round hole using a fixed geometry solid pin construction, original pin designed for 1.5 mm diameter finished holes
- Recent years, compliant pins, finished holes just 0.22 mm diameter



Source: Tyco Electronics

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Background cont.

- When performing press fit component rework, the plated holes and their annular rings could easily get damaged. Questions that need to be answered are:
  - How much hole wall deformation does one, or several, rework(s) cause?
  - How is the pin insertion force affected by the rework(s)?
  - How is the pin retention force affected by the rework(s)?

- There is a need to evaluate press fit component rework for the most common new components, boards and designs.

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Project Goals

- The goal with this project is to understand and to document how rework affects press fit connection strength and hole wall deformation for new high-speed press fit connectors

- 0, 1x, 2x and 3x rework shall be performed on assemblies with:
  - A range of different pin sizes/shapes/metallizations (main focus is on small pin sizes)
  - A few different hole sizes for each component (if possible: minimum, nominal and maximum specified diameters)
  - Hole plating (ENIG and one of: ImAg, ImSn, Cu-OSP)
  - Moreover, standard board materials and designs shall be used

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Expected Outcome

- The outcome of this project shall be a document that specifies how press-fit rework affects
  - Pin insertion force
  - Pin retention force
  - Hole wall deformation

- The project shall tell which pin and design combinations that work well to rework and what strength and hole wall deformations that could be expected

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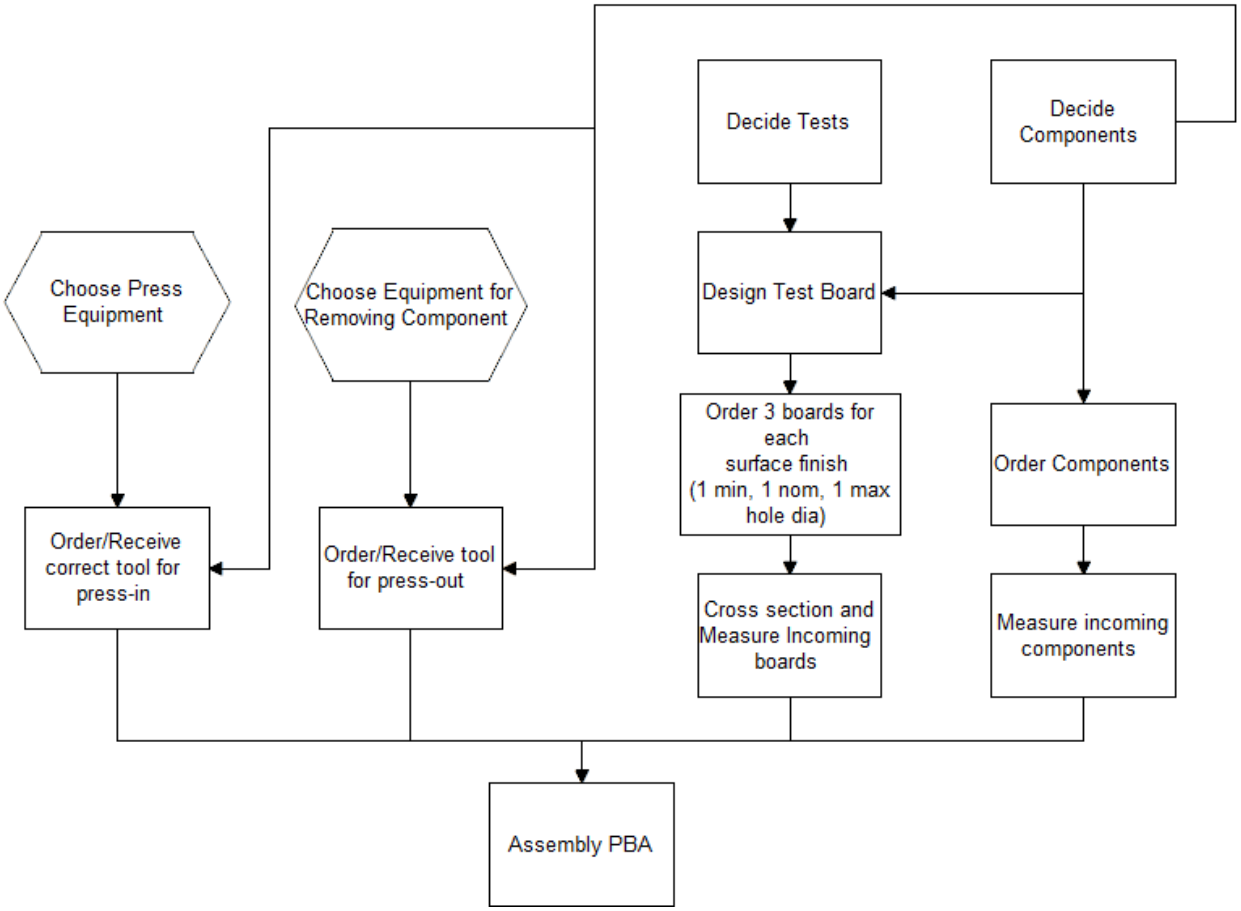
Flow Chart

- Basic work



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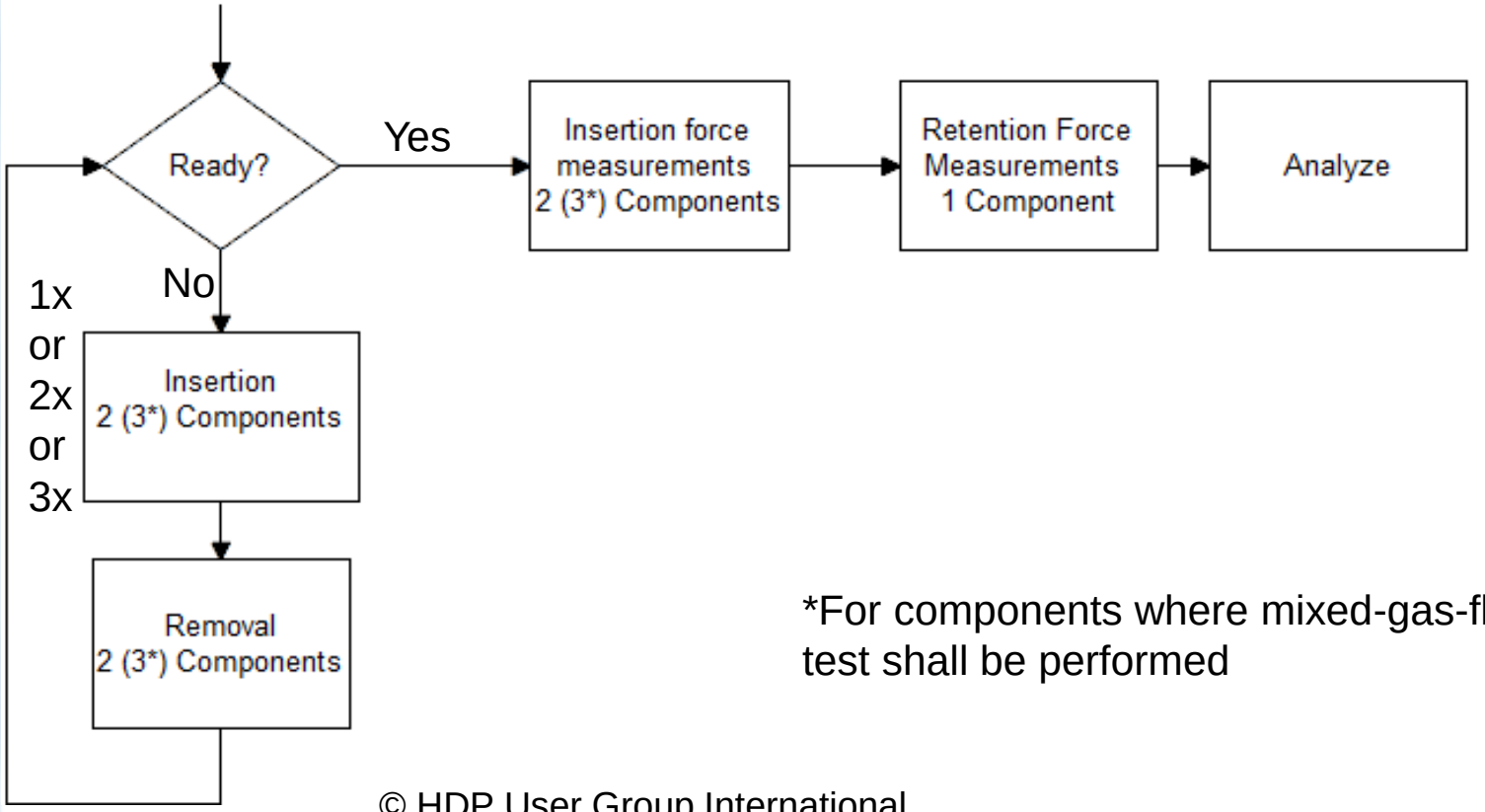
Flow Chart cont. version 1

- Work for <u>each</u> chosen component, surface finish and hole size



*For components where mixed-gas-flow test shall be performed

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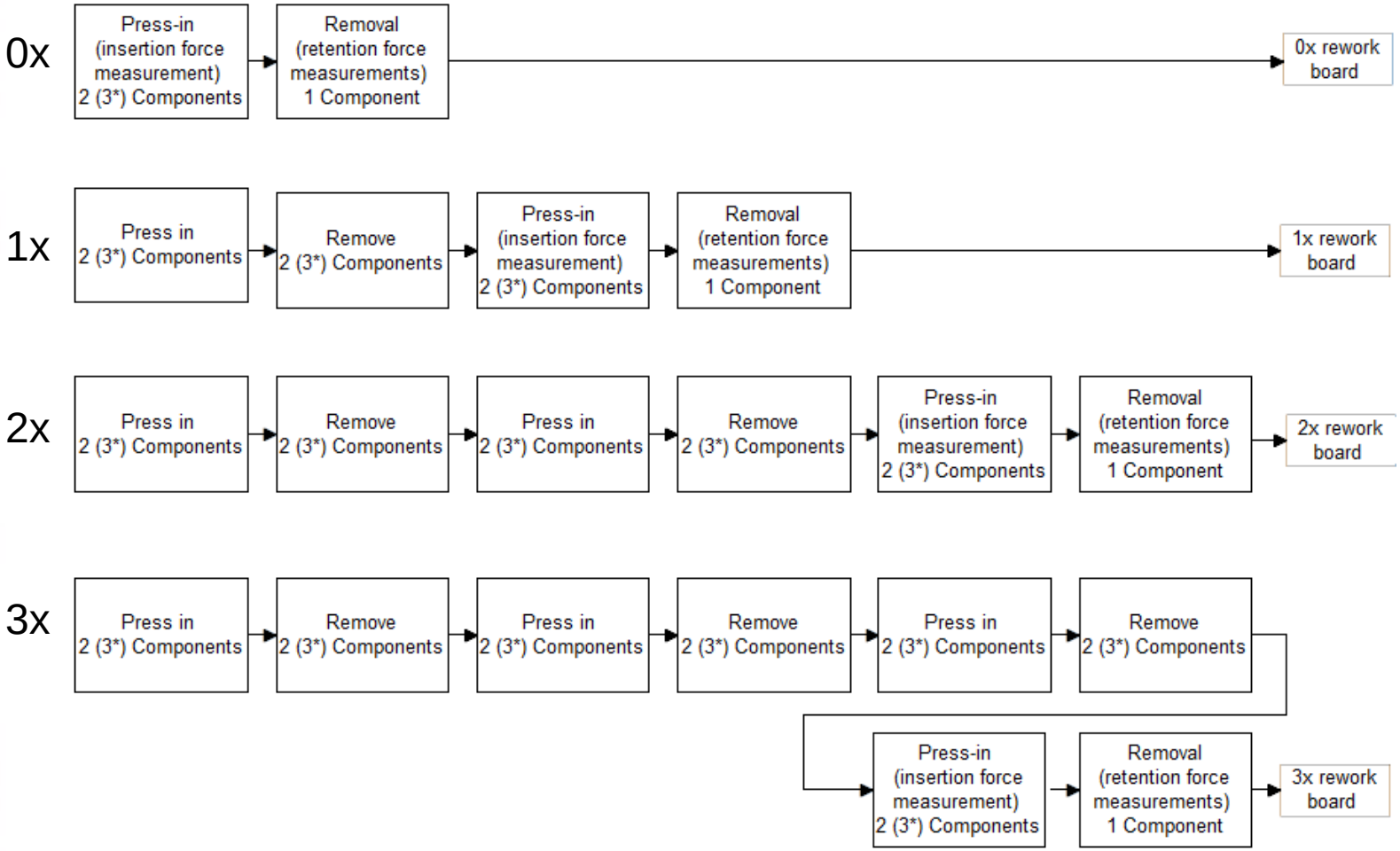
Flow Chart cont. version 2



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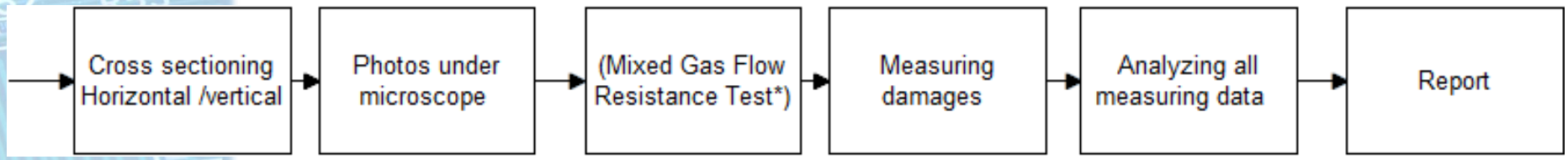
Flow Chart cont.

- Analyze
  - Activities after 0x, 1x, 2x and 3x rework



*Mixed Gas Flow Test only performed on 1 or 2 components

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Test Processes

- Initial mechanical measurements of all used materials
- Insertion/Retention test
  - Demand on retention and insertion force in Telcordia GR-1217-CORE
- Visual inspection according IPC-001, IPC-610, Telcordia GR-78 R4-10, GR-1217-CORE and IEC 60352-5 (hole deformation, delamination etc.)
  - Directly after insertion
  - After rework
  - After retention of pins
- Electrical contact resistance measurements after aging shall be performed for, at least, one component (Amphenol Xcede)

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Operations per Package

- If two different surface finishes are chosen and min, nom and max hole diameters are used for each component:
  - 20 x 6 = 120 components
  - 30 x 6 = 180 components (for components with Mixed Gas Flow test)
- Amount of press-in operations
  - 120
  - 180 (for components with Mixed Gas Flow test)
- Amount of removals
  - 16 x 6 = 96
  - 22 x 6 = 132 (for components with Mixed Gas Flow test)

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Need of Boards

- One board for each hole size (min, nom, max) and surface finish (e.g. ENIG, Cu-OSP) is needed for incoming board hole inspection/measurement
  - 3 hole sizes and 2 surface finishes give 6 boards
- Four boards are needed for each hole size and surface finish for the rework test (i.e. for 0x, 1x, 2x and 3x rework)
  - 4 boards, 2 surface finishes, 3 hole sizes give 24 boards
- Altogether <u>30 boards</u> are needed

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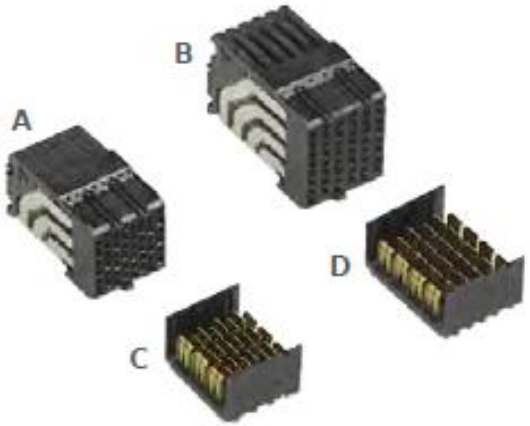
Components

- Below is the components that have been chosen for this project:

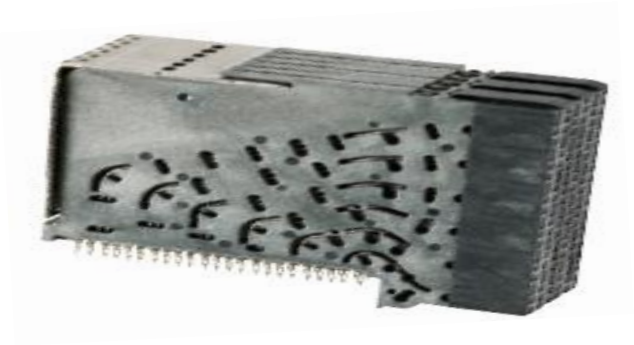
ExaMax,
FCI



Impel,
Molex

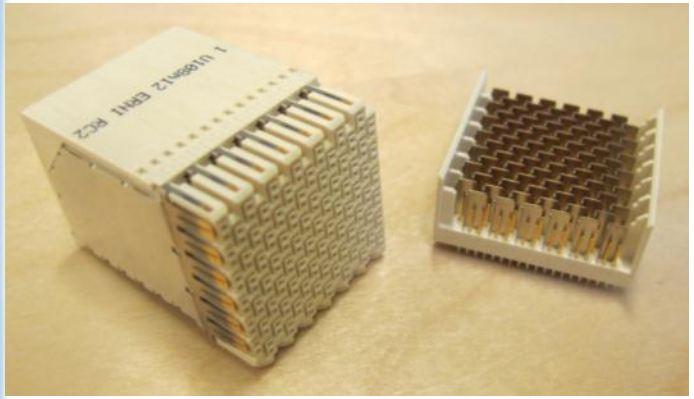
Components cont.

Strada Whisper,
Tyco Electronics



Xcede,
Amphenol

Components cont.



ZDHD,
ERNI

DIN 41612 reference pin*,
Molex

*Example from FCI

Plans for the Nearest Future

- All Component Commitments
  - March 2014
- Received all necessary rework information and tools
  - April 2014
- Finalized Design of Test Board
  - May 2014
- Start assembly and rework tests
  - June 2014

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Test Questions

- Who shall design the test board?
- Who shall manufacture the test board?
- Where shall the rework tests be performed?
- Who shall do the cross-sectioning?
- Who shall do the analysis?

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Team List

- Team List:

Team List Apr 2013

- Participating Companies:
  - Dell
  - Philips
  - GE
  - Delphi
  - Curtis Wright
  - PWB Corp
  - Nihon Superior
  - Ericsson
  - Alcatel-Lucent
  - Multek
  - Cookson
  - **FCI**
  - **Molex**
  - TTM
  - Juniper
  - ASUS
  - Oracle
  - Flextronics
  - Plexus
  - Cisco
  - Fujitsu
  - Ciena
  - Isola
  - IBM
  - **ERNI**
  - ASE
  - Continental
  - Panasonic
  - Emerson
  - IST Group
  - Boeing
  - Fujitsu
  - ZTE
  - Sytech
  - **Amphenol**
  - **TE Connectivity**

Tentative Schedule

- Kick off - San José 2012
- Idea Stage - Q2 2012
- Definition - Q2 2014
- Implementation - Q2 2014
- Publish Report - Q4 2014

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