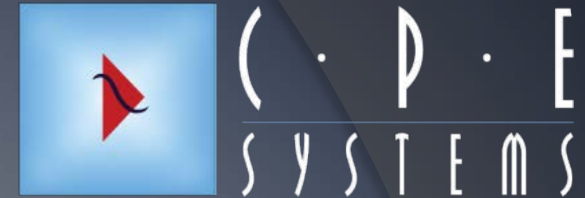




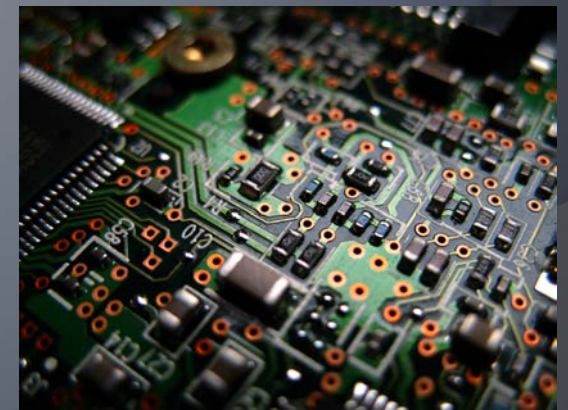
Best Practice for Rack Based Test Systems

Stephen Patterson
CPE Systems NZ Ltd

Overview



- The production process for PCBA's and Electronic Assemblies is complex and the opportunities for things to go wrong increases with the complexity of the product and the associated production process.
- In Circuit Testing (ICT) and functional testing are processes that reduce the risk of non conforming product getting to a customer or into the supply chain, by testing key parameters and functions
- ICT Test systems represent a significant investment for an organization and following good practices can result in achieving best value for this investment



Why Do ICT and Functional Test



C · P · E
S Y S T E M S

- Risk Management
 - Check production process is producing products that meet Specification
 - Check components such as PCBs have been fabricated correctly
 - Check the correct components have been used during assembly
 - Check assembly process (both automated and manual)
 - Get an understanding of the process capability to deliver products that meet specification
- Legislative Requirements (FDA, UL, etc)





Test System Challenges

- When to consider how a product will be tested (Design for Test)
 - Test Points and board access
 - Spacing
- Mass Interconnects
- Factoring in Testing as part of the overall development cost
- Test times and costs as part of the production process
- Re-use of Software and Hardware
- Test Equipment Capability
- Processor programming
- Operator Capability
- Capability and Capacity expansion
- Testing the Tester
-



Best Practice/Solutions



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- Test Rack - PXI/PXIe Rack System
- Rack Control
- Receiver System (e.g. GR2270 or VPC)
- Fixture solutions (Manual, Pneumatic, Test In Line)
- Wiring Systems
- Breakout Fixtures
- Self Test Fixtures
- Test Boards
- Matrix and Multiplexer
- JTag & Boundary Scan





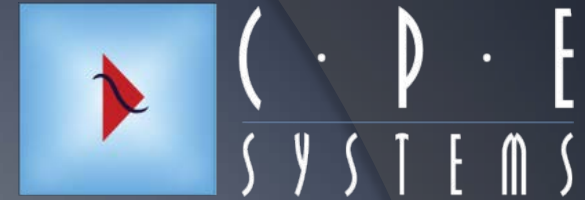
C · P · E
S Y S T E M S



Case Study

ABB Test Rack System

ABB Test – Overview



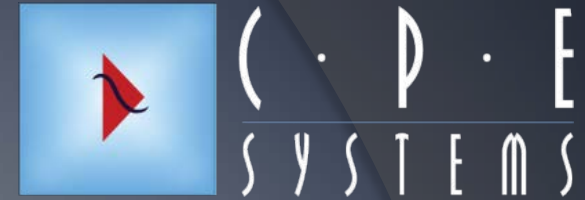
- Test Rack
- Rack Control
- Receiver
- Test Fixtures
- Capable of testing New and Existing Product
- Future Capability designed In
 - Pneumatic
 - Fibre Optics
 - Boundary Scan



ABB – Implementation

- Test Rack
 - Test Rack
 - PXI & Other Test Equipment
 - Rack Control
- Breakout and Self Test
- Customisation of UI and Database
- Individual Board Implementation

ABB – Test Equipment

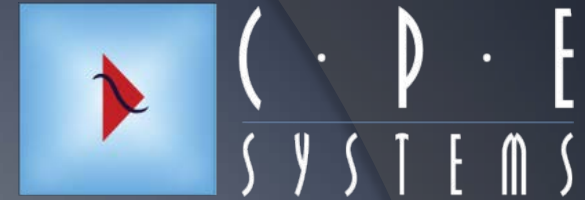


- PXI Chassis

| Item | Model | Manufacturer | Qty |
|--|-----------|----------------------|-----|
| PXIe 18 Slot Chassis + Fan Filers and Slot Blockers + 230 AC Power Cable | PXIe-1075 | National Instruments | 1 |
| PXIe Processor i5 with 250 GB SSD and 8 GB Ram | PXIe-8840 | National Instruments | 1 |
| PXI Industrial DIO | PXI-6515 | National Instruments | 2 |
| PXI 64 Ch Relay Drive | PXI-2567 | National Instruments | 1 |
| PXI 40 Ch DPST Relay Module | PXI-2521 | National Instruments | 1 |
| PXI 96 Ch 5V/TTI/CMOS DIO Module | PXI-6509 | National Instruments | 1 |
| PXIe 4x32 Matrix | PXIe-2529 | National Instruments | 4 |
| PXIe Multifunction DAQ | PXIe-6363 | National Instruments | 1 |
| PXIe DMM + Banana Plugs | PXIe-4081 | National Instruments | 1 |
| PXIe-SMU | PXIe-4138 | National Instruments | 1 |
| PXI 2 Ch Digitiser | PXI-5124 | National Instruments | 1 |
| PXI Function Gen | PXI-5406 | National Instruments | 1 |



ABB – Test Equipment

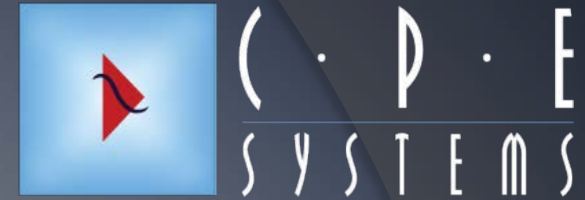


- Power Supplies

| Item | Model | Manufacturer | Qty |
|--|---------|--------------|-----|
| Low-Profile Modular Power System Mainframe | N6700B | Keysight | 1 |
| Precision DC Power Module, 50V, 3A, 100W | N6762A | Keysight | 2 |
| High-Performance Autoranging DC Power Module, 50V, 10A, 100W | N6752A | Keysight | 1 |
| High Voltage Power Supply | 2290E-5 | Keithley | 1 |



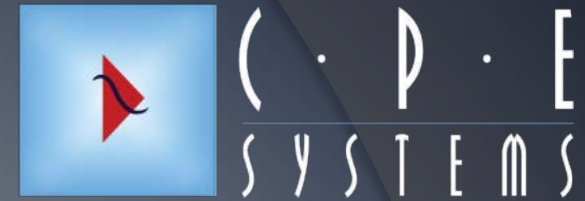
ABB – Test Equipment



- Custom Rack Control Unit
 - Rack Power supplies & Protection
 - E-Stop
 - Connected to PXIe DIO
 - Power Supply and Interlock Status
 - BRB's



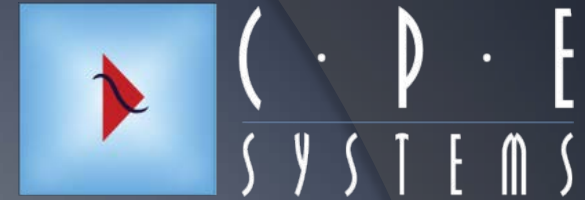
ABB – Receiver System



- Virginia Panel G12
 - Custom design for VPC Configuration
 - Design for high cycle count
 - Spare capacity for future expansion



ABB – ICT Fixtures



- Semco CamTrac Manual Fixtures
- VPC Connection frame
- Size Dependent on size & number PCBA's being tested
- Fixture design dependent on PCBA Test Requirements
- Custom Pin Plate

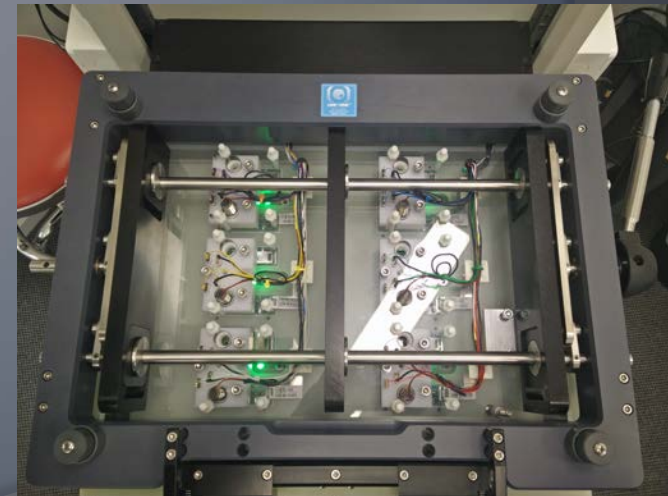


ABB – Test System Test

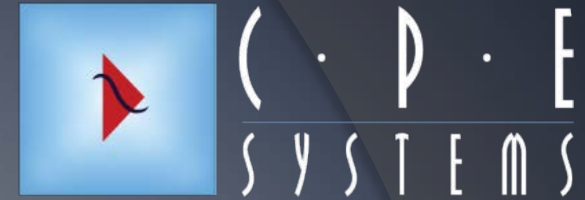


Breakout Fixture

- Provides user access to the Rack mounted equipment
- Test Development
- Process Engineering



ABB – Test System Test

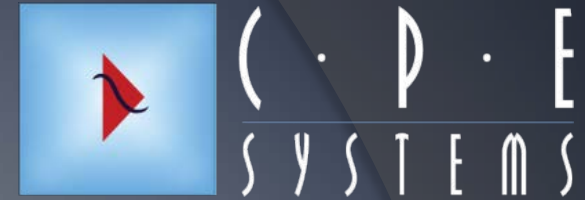


Self Test Fixture

- Fits into the Test Rack Receiver System.
- Test Test Rack using Self Test Sequence
- Provides Loop back test of the test rack
- Assist in diagnostics of the Test rack up to the Receiver
- Reduces down time on the process line



ABB – Test System Test



Self Test Board

- Modified loopback Boards that run on specific Test Fixture
- Test fixture using fixture Self Test Sequence
- Can identify bad pin pairs
- Assist in diagnostics of the Test system up to the board interface
- Reduces down time on the process line

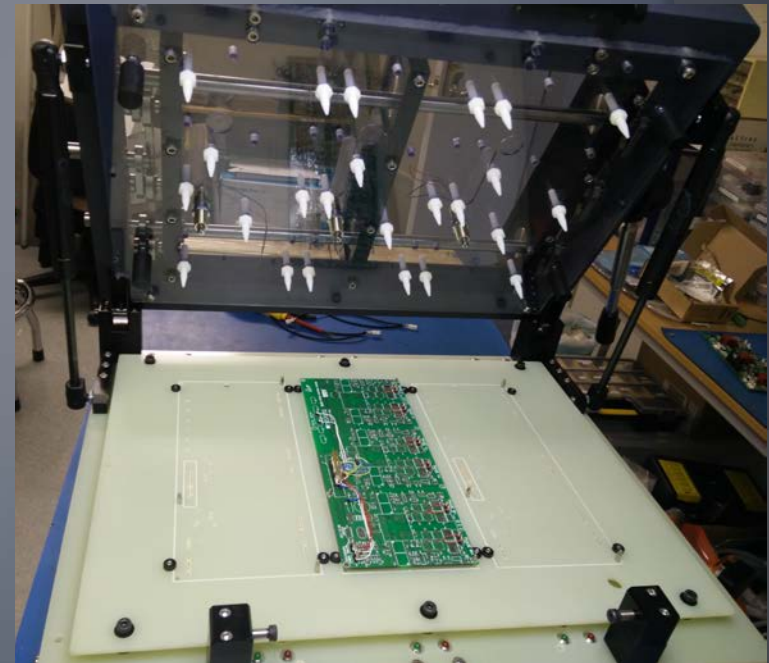
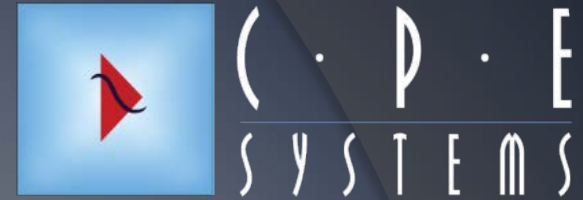
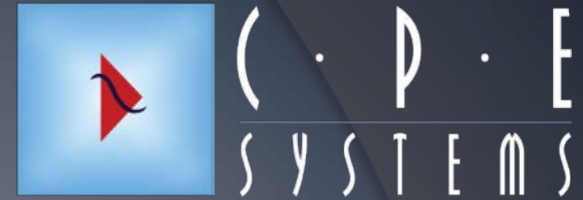


ABB – Summary



- Modern Electronic Products & systems are complex and ICT and Functional Testing are a way to reduce the risk of Non conforming product getting to your customer
- Test Systems represent a significant investment and following good practices in both product and test system design can help maximize the effectiveness of this investment.

Closing Thoughts



Success is the result of good judgement

Good Judgement is usually the result of Experience

Experience is usually the result of bad judgement

Experience is knowledge you get 10 minutes after you needed it

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