



Navy's First Intermittent Fault Detection & Isolation System (IFDIS)

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Presented to:
JTEG

Presented by:
Brett Gardner

Advanced Aircraft Technologies (AAT) FRCSW



Outline



- Problem/Background
- Interim Solutions
- Current Solution(s)
 - a. Pros
 - b. Cons
- Main Issues/Concerns w/Current Technology
 - a. Cost
 - b. What it does well
 - c. What it doesn't do well



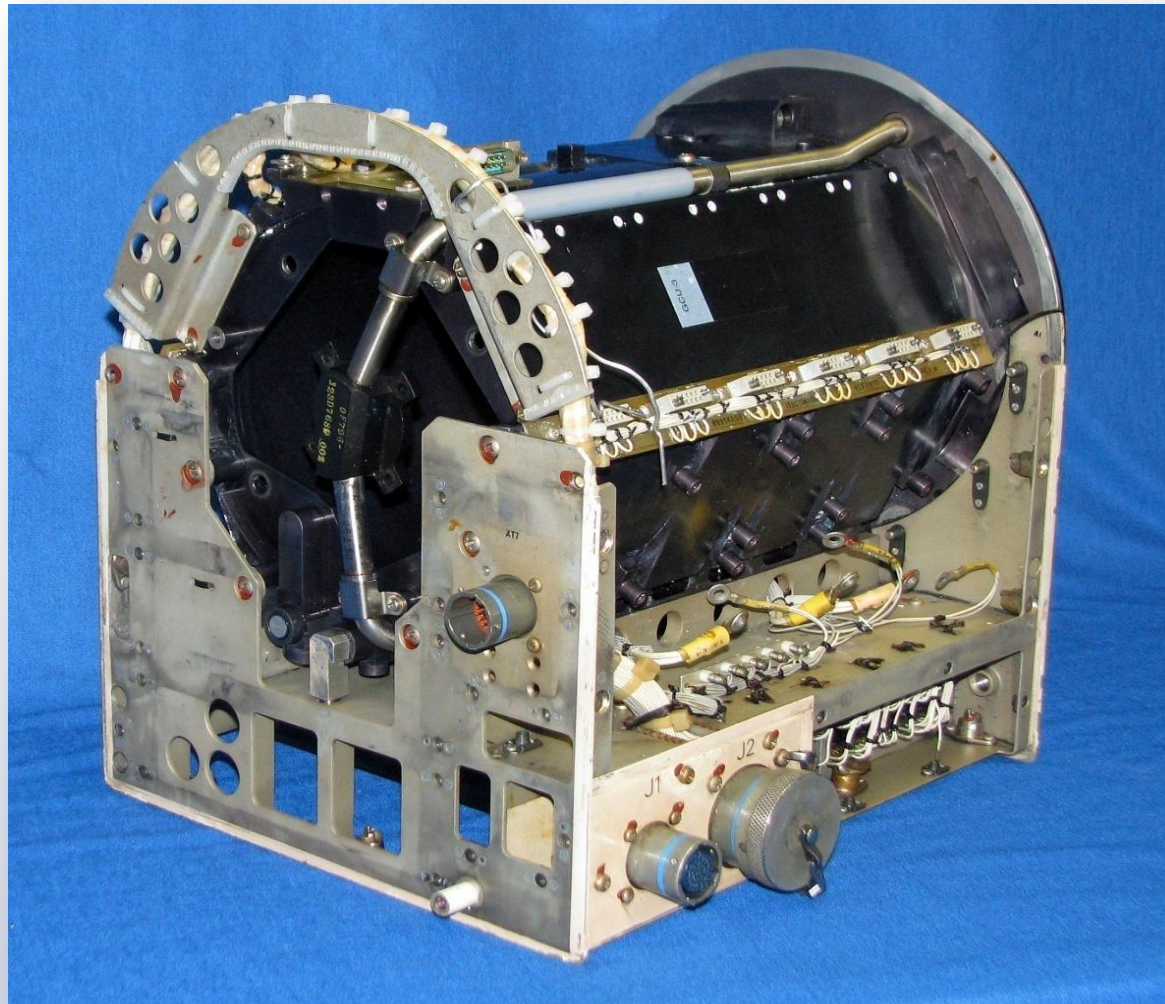
Background



- Intermittent / No fault found (NFF / A799) circuit problem with all Navy WRAs chassis
 - No way to reliably detect intermittent faults- currently technology it would take hundreds of hours to fully test a unit for intermittent faults using conventional technology – making current test sets unsuitable for intermittent testing
 - Difficult to conduct Engineering Investigations (EIs) when Intermittent chassis faults can not be eliminated from the equation
 - Bad actors due to Intermittent Fault continue to grow in the Navy Inventory
- AAT team from FRCSW visited Ogden Air Force Depot and was introduced to IFDIS technology as used on the F16 radar repair line
- Generator Convertor Unit (GCU) consistently appears on the top degrader list
 - GCU chassis currently verified with conventional continuity testers provided limited results – intermittent connections continued to be an issue although we could not prove that they were because we could not reliably detect them
 - Intermittent circuit detection extremely limited using conventional tester
- IFDIS technology was investigated by AAT 2010 and the idea was born to test the GCU at TQS facility in Ogden
- NAVSUP funded GCU/IFDIS test demonstration to determine if intermittent contact was an issue for the GCU



Test Demonstration- GCU Chassis



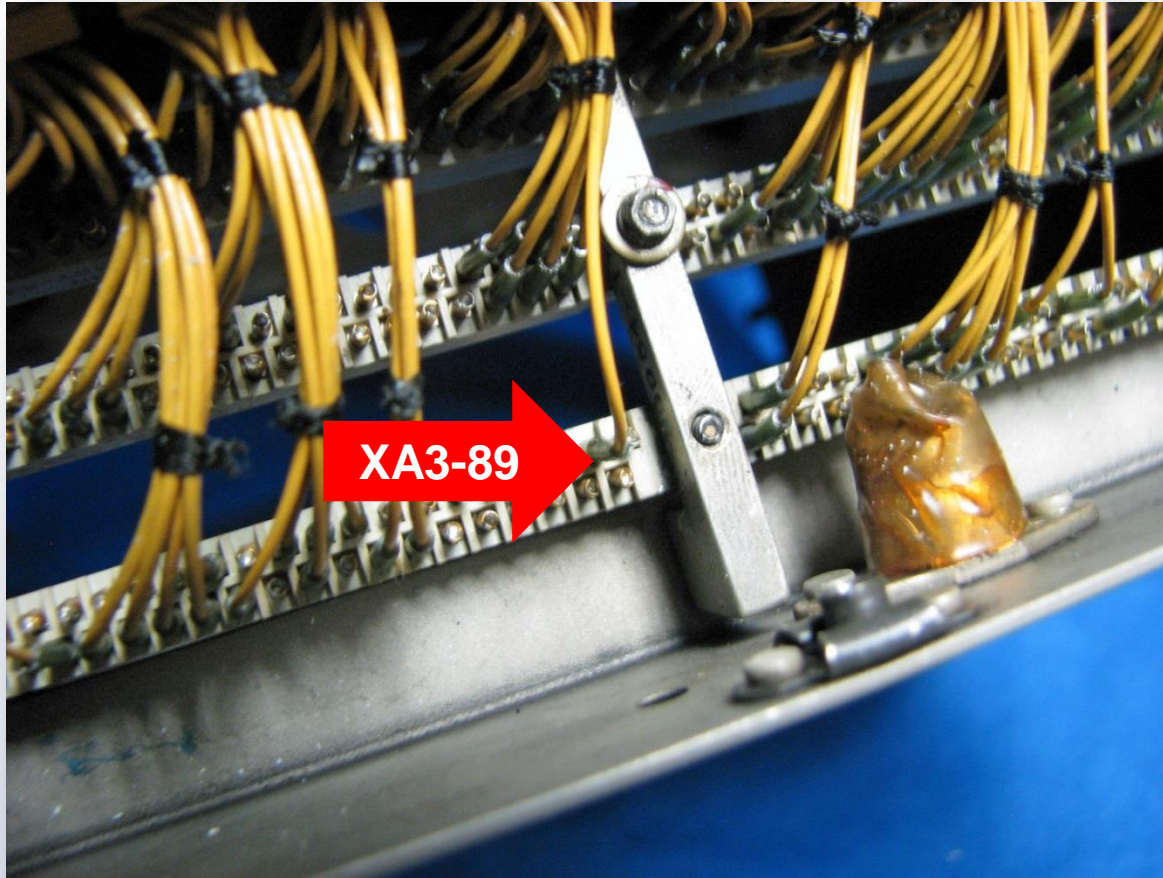


Test Demonstration - GCU Chassis Tied to IFDIS





Test Demonstration - GCU Intermittent Wire



IFDIS precisely detected and isolated one or more intermittent circuits in 80% of the GCUs tested



Test Demonstration - Results



- Selected (5) Ready For Use (RFU) GCUs chassis for IFDIS testing
- IFDIS detected and isolated intermittent circuits in 80% of the RFU GCU Chassis



Interim Solutions



- FRCSW uses DIT-MCO , Eclypse, digital and analog multi-meters testers to isolate opens, shorts, and miswires.
 - This technology is not useful in detecting intermittent faults
 - FRC was unknowingly building back up chassis with intermittent faults and returning them to the Fleet



Current Solution

- FRCSW, through coordination with COMFRC, has purchased an IFDIS system and three separate GCU IDs (G1, G2, and G3) via the Depots Capitol Improvement Program (CIP).
 - IFDIS to be installed October – December 2015
 - Training to be conducted January - February 2016.
 - Local Engineering Specification to be released by engineering to direct GCU chassis onto IFDIS test bench
 - Follow-on WRAs in work for future testing, suggested WRAs are APG-65/73 RADAR and various cockpit displays
 - RIF topic white paper submitted to Navy by Universal Synaptics for (1) IFDIS test set and three (yet to be determined) ID's to be built for COMFRC



Current Solution – cont.



- Pros
 - Will eliminate GCU bad actors that are due to intermittent chassis within the Fleet
 - Testing is short duration; approximately 1 hour, relatively inexpensive for the gain in reliability
 - Will improve reliability of GCU- increased Time on Wing (TOW) due to reduced A799.
 - Programming of chassis is simplistic – self learning
 - IFDIS Identifies the exact circuit path that is faulty making repair relatively straight forward
 - Improves FRCSW GCU quality.



Current Solution – cont.



- Cons
 - Unit is costly \$\$ - no efficiency of purchase for the Government for the multiple units we have purchased, (2) @ at Ogden, (1) at FRC SW
 - Originally thought that building IDs could be done organically but – it has taken 9 months to design and build the 3 GCU ID's at significant cost
 - Possible solution is to stand up organic ID build capability at IDATS lab in Lakehurst
 - No high voltage testing
 - Capturing of intermittent waveforms is not automatic, waveforms must be captured manually



Main Issues/Concerns w/Current Technology



- Cost
 - As mentioned in the previous slide, the system is expensive:
 - Suggest buying multiple units to reduce cost per contract.
 - ID's are expensive – Suggest developing Organic capability
- What it does well:
 - Quickly identifies intermittent faults
 - Identifies opens, shorts, and miswires in seconds
 - Identifies approximately 95 % of intermittent faults in a one axis test
 - To obtain 99% detection, the other two axis tests must be completed – tripling testing time(3 hours)- Still extremely fast (magnitudes of order better) compared to the other testers out on the market



Intermittent Faults



Questions?



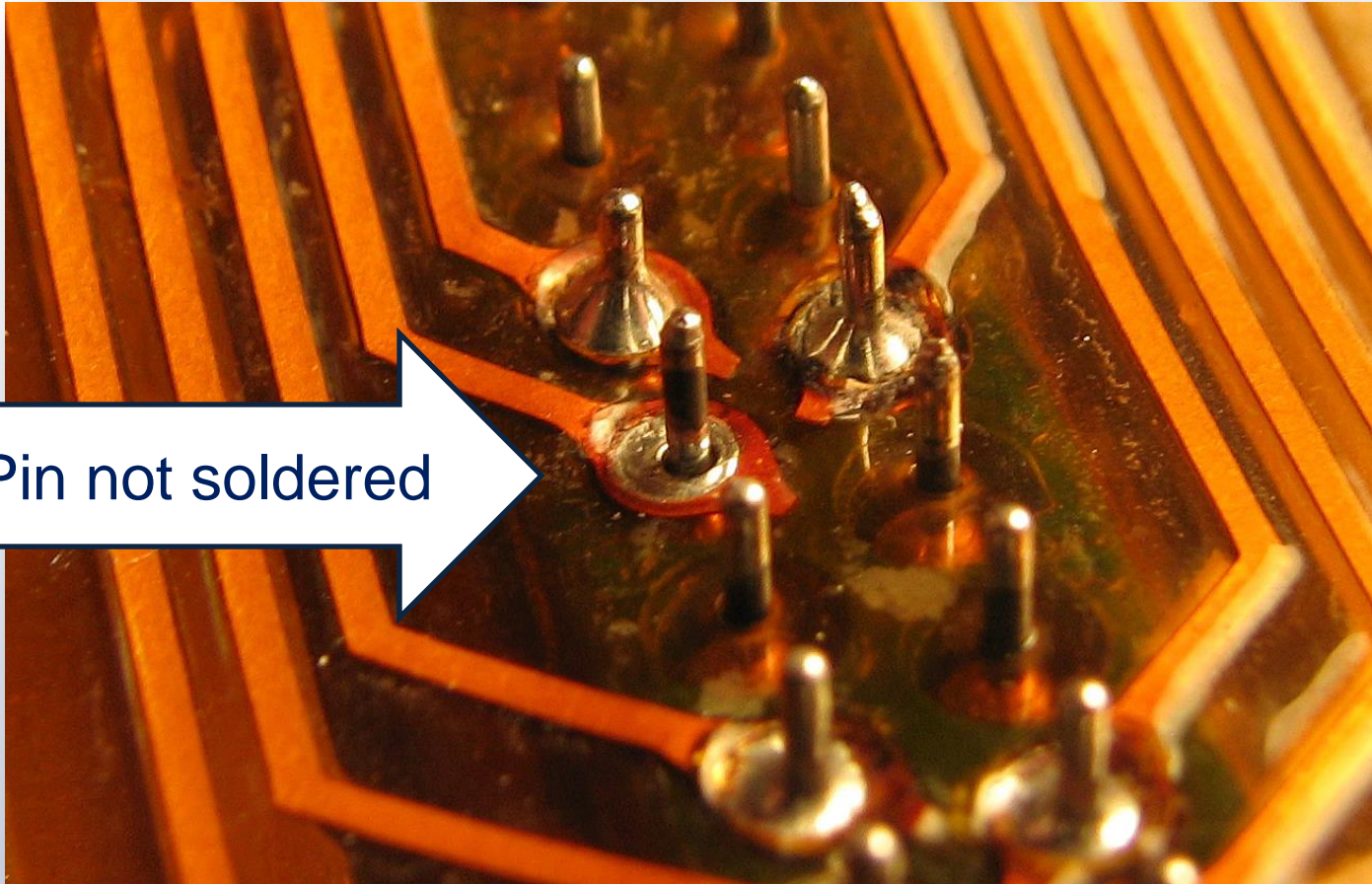
Intermittent



Backup slides

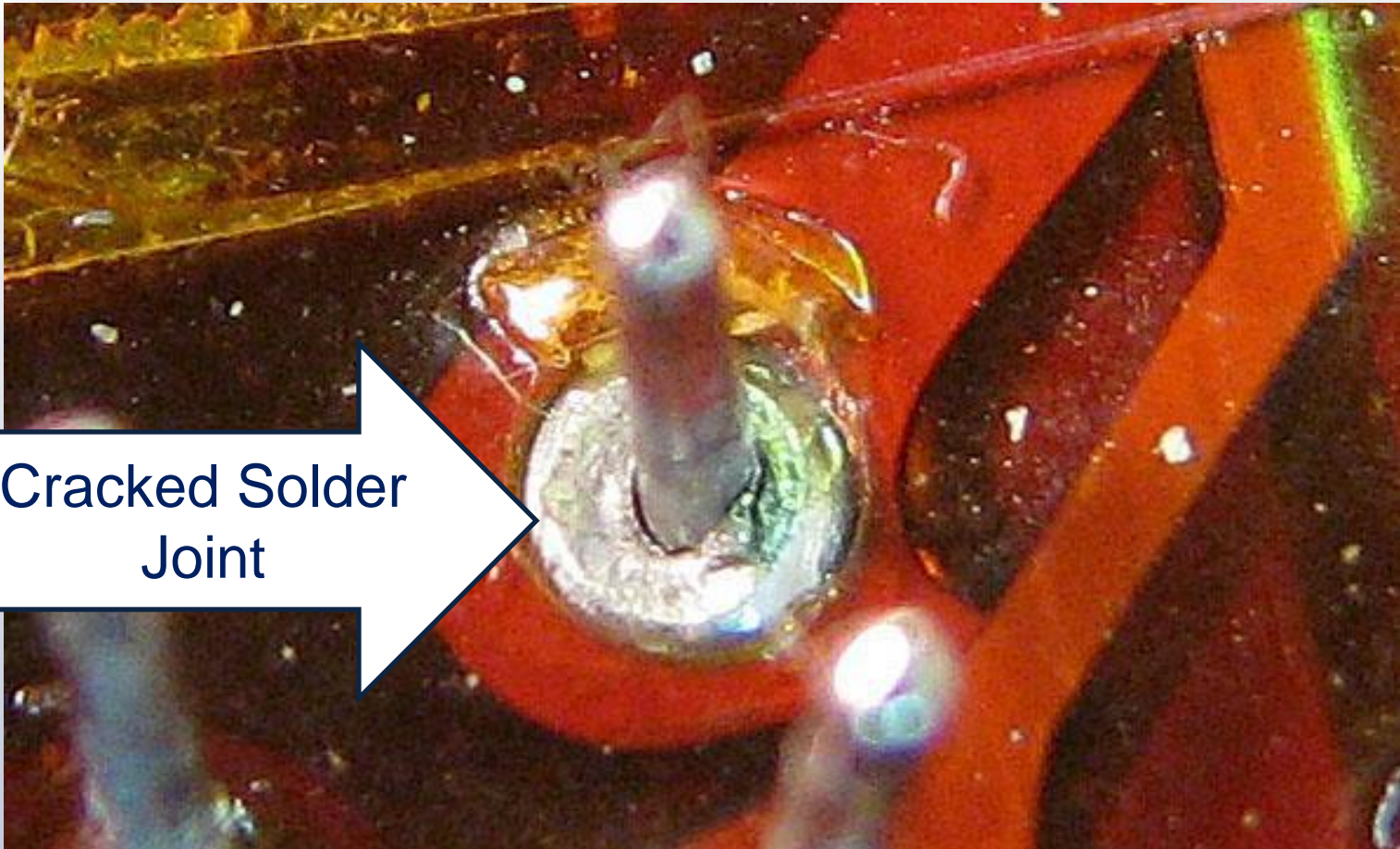


Intermittent Examples



Pin not soldered

Intermittent Examples



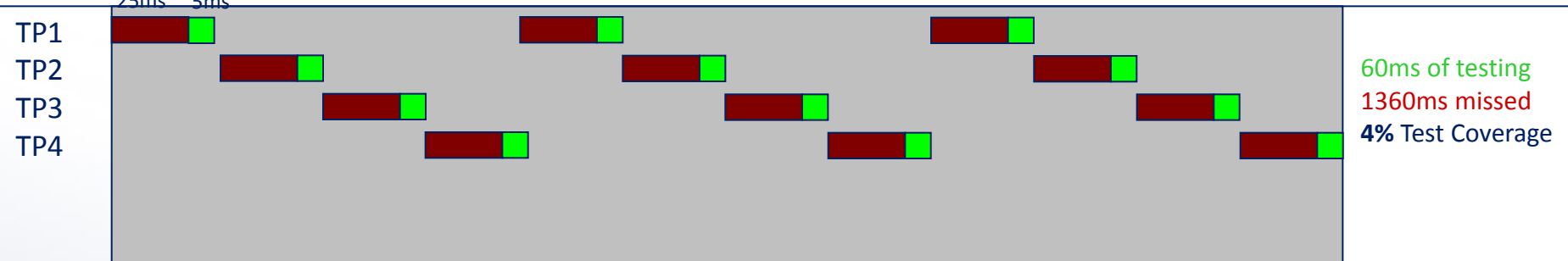
Cracked Solder
Joint



Test Coverage 101

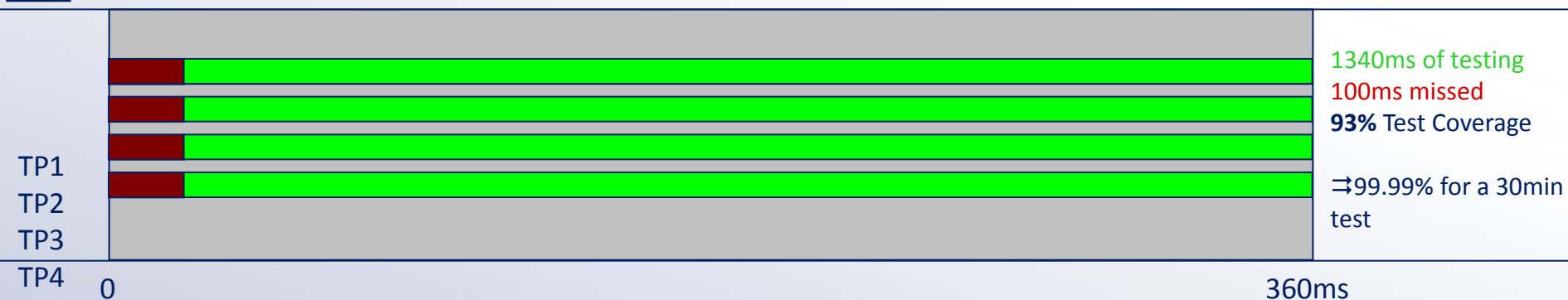


Conventional Automatic Test Equipment (ATE)



*Note – Conventional ATE scanning measurement window must perfectly synchronize with fault at the precise moment the fault occurs or the fault is missed completely, the result is No Fault Found.

IFDIS



*Note – All lines All the time test coverage equals no missed defects!