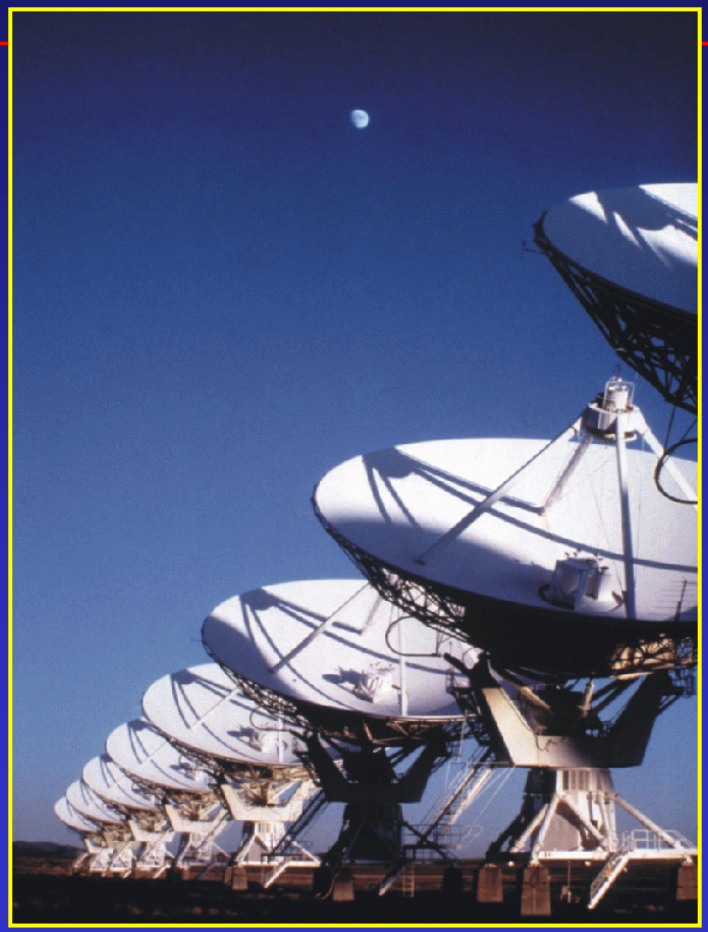
EVLA Production and Maintenance



Steven Durand

presenting

for the

Electronics Division

Electronics Division Manufacturing Goals

- Out-source board assemblies
- Build modules in-house as needed
- Facility is ready for production
- Electro-Static Discharge (ESD) protected facility

Outsource Circuit Cards Board Vendor Provides:

- **Fully assembled boards/cables**
- **Some assemblies tested**
  - ***Flying probe tests***
  - ***NRAO test fixtures***
- **Just-in-time deliveries**
- **VLBA Site Techs building some cables and small module assemblies**

In House Module Assembly

- Goal is to produce 28 identical antennas
- Small quantity builds, 5-10 at a time
- In-house module assembly and test
- Same team that built the prototypes
- Good job scheduling production

Electro-Static Discharge Prevention Program

- 12 ESD stations including floor mats
- ESD totes & parts bins
- ESD shoes & wrist straps
- Humidity controlled facility
- Staff training

In-House Assembly Support

- Complete in-house board assembly
- Reflow oven
- X-Ray machine
- Environmental chamber
- Secure storage

Quality Tools

- Shaker table
- Environmental chamber
- EVLA test rack
- Real-time monitoring
- Red/Green tag procedures

Quality Assurance Program

- **Formalized written QA procedures**
- **Bench test fixtures**
  - ***LabView test programs***
- **MainSaver maintenance software**
- **Collecting reliability data**

Production Time Table

- Maintain the 6 antennas per year rate.
- Track funding profile
- Time to complete production
  - 24 months to build LO and DTS modules
  - 36 months to outfit the remaining 16 antennas
  - 56 months to design & install the receiver suite

Electronic Modules Currently in Production

- D301-4 DTS Module – excluding 3-bit digitizer
- D305 Optical Wavelength Division Multiplexer
- D351 DTS De-formatter
- F317 Front End Controller
- F320 Front End Transition Module
- L354 LO Driver
- L355 Digital Timing Distributor
- L300 Synthesizer Reference Generator *
- L301 12-20 GHz Synthesizer *
- L302 10.8-14.8 GHz Synthesizer *
- L304 LO Reference Receiver
- L305 / L350 Reference Generators
- L351 Offset Generator
- L353 LO Transmitter

* Minor mechanical retrofits anticipated

Electronic Modules Currently in Production (cont.)

- M301 Converter Interface
- M302/M303 utility modules
- M304 Module ID
- P301 LO/IF Rack DC/DC Power Supply
- P302 Utility Rack DC/DC Power Supply
- T301 4/P Converter
- T302 LSC Converter
- T303 UX Converter
- T304 Baseband Converter *
- T305 Baseband Converter - Digital
- ACU/FRM Interface
- Power Distribution Board for Antenna Racks
- Main Shielded Equipment Racks
- -48 VDC Power System
- Front End Card Cage

* Minor mechanical retrofits anticipated

Electronic Modules Not in Production

- P350/P351 Power supplies
- L352 Round Trip Phase measurement
- D301-4 DTS Module, 3-bit digitizer

Continuity of Operations Plan

- Hardware Redundancy
- Maintenance Plan
- Real Time Alarms
- Remote Monitor & Control

Hardware Redundancy

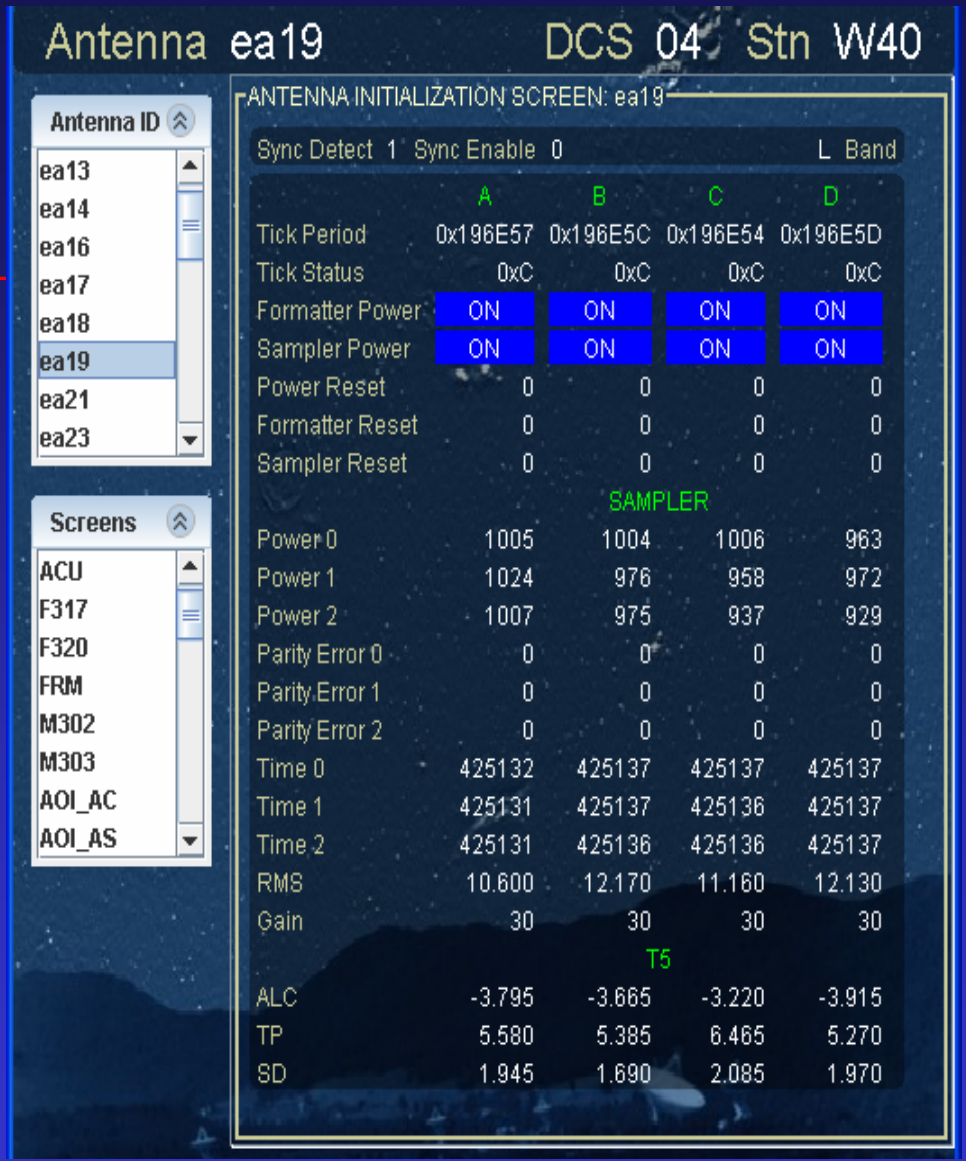
- **Central rack power supplies**
  - *P350 modules are installed in pairs*
  - *5 pairs power the central racks*
- **Antenna -48Vdc power supplies**
  - *5+1 redundant*
- **Antennas are repaired by swapping modules**
  - *Spares are stored at the VLA*

Slot ID is Functional

- **Modules of each type are identical**
  - ***Slot ID defines function***
  - ***Hot swappable, rack stays powered***
- **Modules are identified using slot ID**
  - ***Ea14-L302-1***
- **Serial number and software version are also available from each installed module**

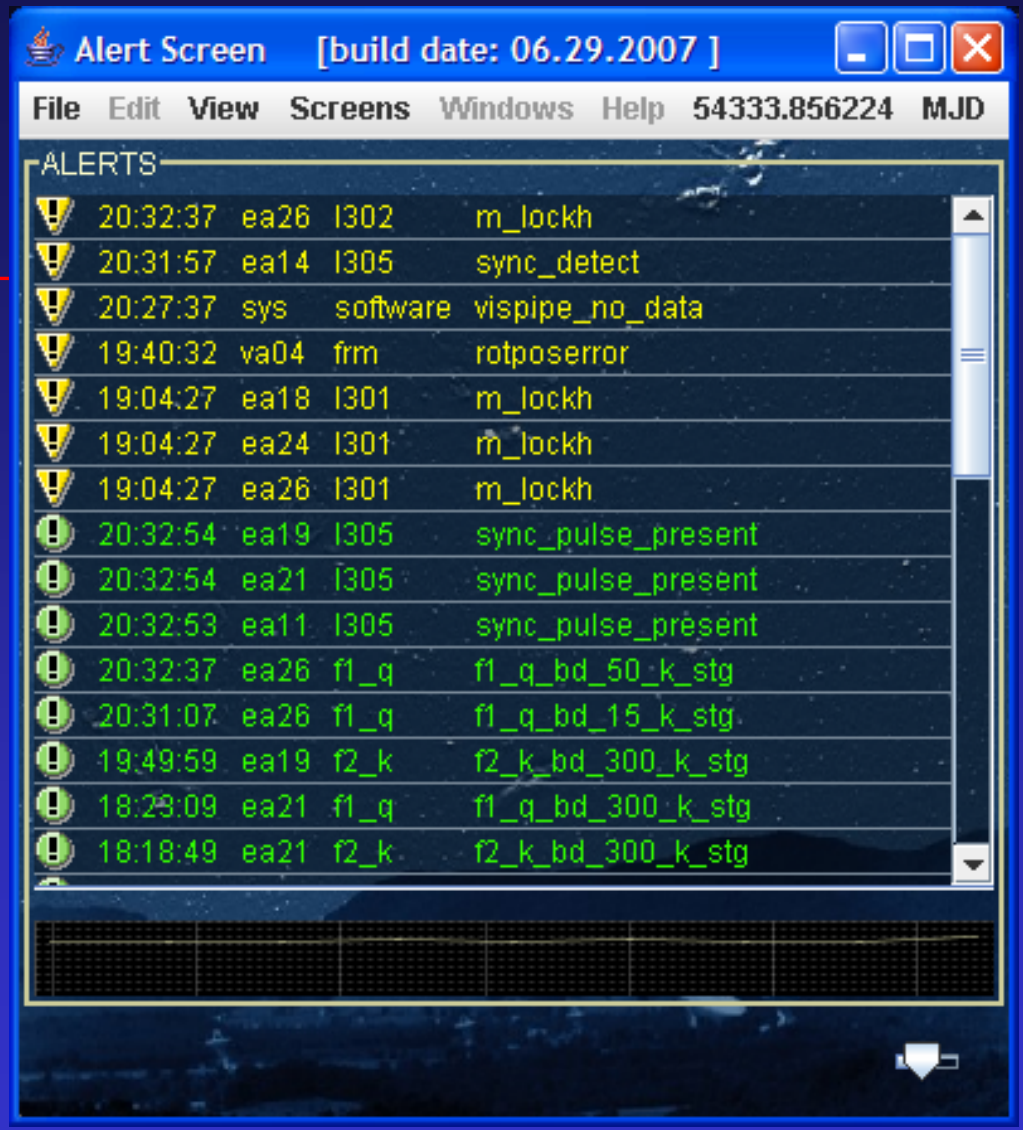
Cold Start Requirement

- **Power cycle causes automatic restart**
- **Personalities load from server/EPROM**
  - ***Deformatter tests***
- **Remote monitoring and reset/resync**
  - ***Antenna level initialization screen***



Real Time Alarms

- **Four severity levels:**
  - ***Immediate Action***
  - ***Antenna Rule***
  - ***Maintenance Request***
  - ***Informational Report***
- **Adjustable high and low trip points**



WELCOME TO EVLA MONITOR DATA RETREVAL

EVLA MODULES

EVLA-13
EVLA-14
EVLA-16
EVLA-17
EVLA-18
EVLA-19
EVLA-21
EVLA-23
EVLA-24
EVLA-26

show EVLA modules

NEW MODULE

Slot ID

show New module

VLA MODULES

DCS00
DCS01
DCS02

show VLA modules

TEST RACK MODULES

BENCH MODULES

OTHER MODULES

MODULE TREE

- modules (25)
  - ea19-acu (2)
    - ACU (26)
      - AZCur
      - AZCur1
      - AZCur2
      - AZOscillate
      - **AZPos**
      - AZPosError
      - AZPosRaw
      - AZVel
      - AzMtrStat
      - DigitalPos
      - ELCur
      - ELCur1
      - ELCur2
      - ELOscillate
      - ELPos
      - ELPosError
      - ELPosLimitStat
      - ELPosRaw
      - ELVel
      - ElMtrStat
      - IF_No_S_Codes
      - IF_Parity_Errors
      - MoreStuff
      - PhaseA
      - PhaseB
      - PhaseC
    - FRM (37)
  - ea19-d301 (1)
  - ea19-d302 (1)

Monitor Point Query List

delete	module	device	mpt
☐	ea19-acu	ACU	AZPos

Delete checked selections | Delete all selections | Save as query script for report

START TIME (Local Time)

format(MM/dd/yyyy hh:mm:ss)

08/17/2007 14:41:04

END TIME (Local Time)

format(MM/dd/yyyy hh:mm:ss)

08/17/2007 15:41:04

submit query

DATAFILE LIST

ea19-acu_ACU_AZPos

show data

Optional Y-range--> min: max: make chart

The file is comma delimited text file

download data

REPORTS: Upload Query Script

File Name: Browse... upload

Increasing System Level Availability

- 1) Build a few prototypes
- 2) Field systems (10+ antennas)
- 3) Trend system reliability
- 4) Integrate findings and enhancements
- 5) Repeat 3-5

Availability

Goal is to reduce the impact of hardware failures