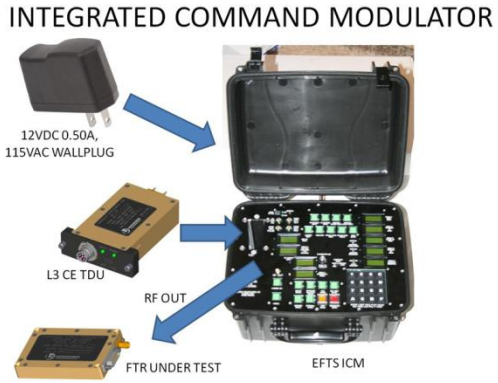
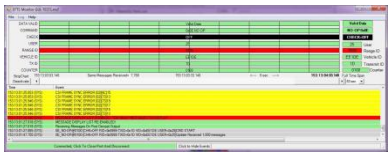
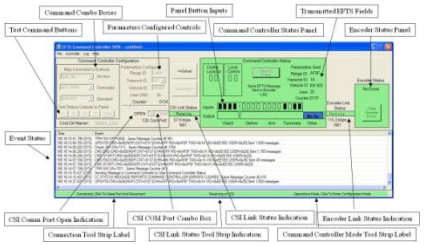


Bourne Technologies, Inc.

EFTS Support and Capabilities

2000-2011

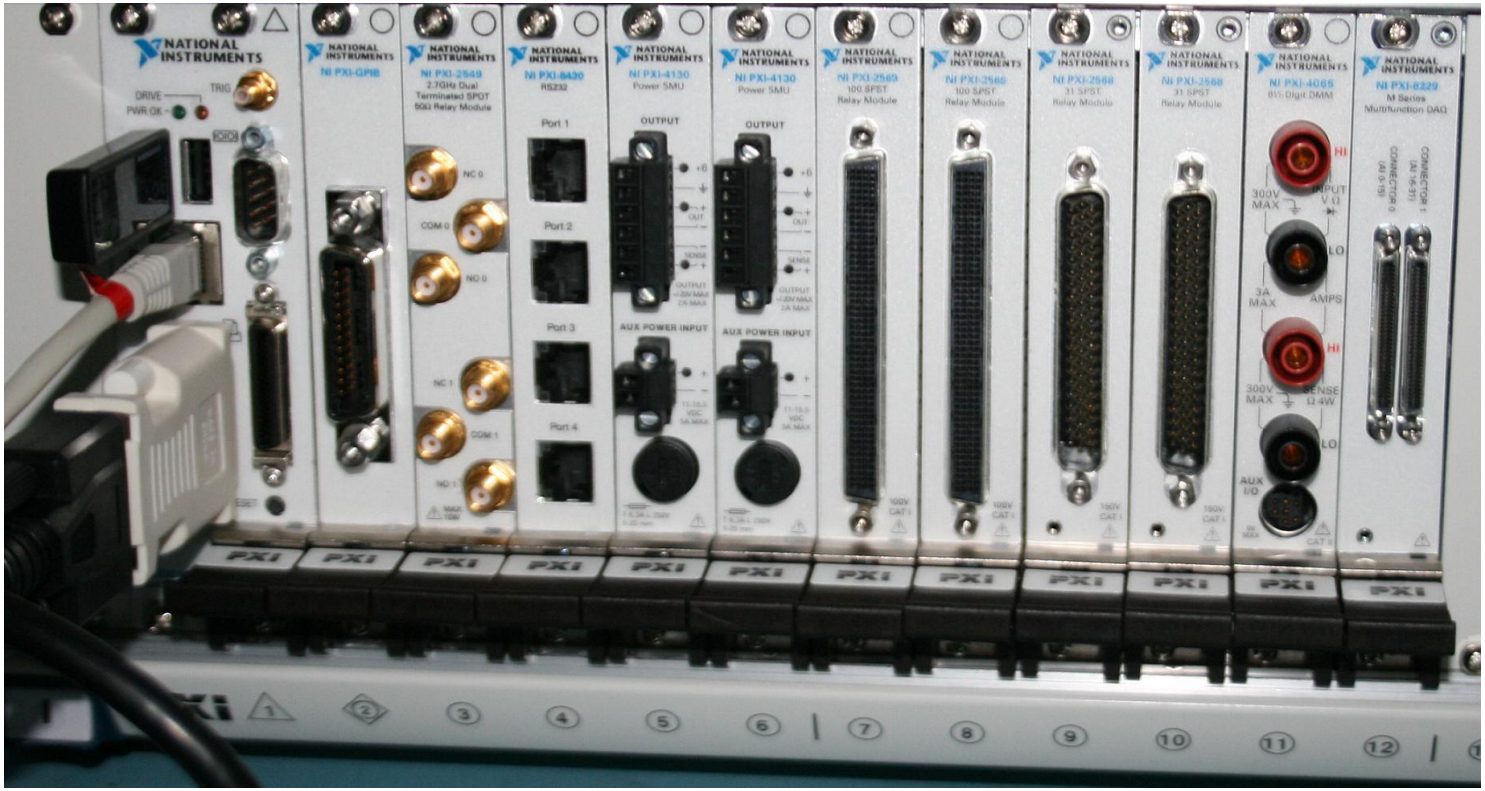




EFTS SUPPORT OVERVIEW

- Active on EFTS Program since 2000
- Roles:
  - Primary Supporting Technical Lead in the Development of the EFTS
  - Co-ordination with all Organizations (USAF, Army, Navy, NASA, NSA, Academia)
  - Development of Waveform and Prototyping by Cincinnati Electronics (Now L3-CE)
  - Managed Alternates to UHF approach (i.e. CDMA)
  - Supported NASA STARS Project
  - Development and Prototyping
  - Reports and Presentation on Activities
  - Documentation of Standards
- Primary Responsibility for All Major EFTS Documents on EFTS Program [2000-2006]
  - Study Approach and Initial Design
  - Request for Program Resources
  - EFTS IRD
  - All Specs for RFQs (EFTS FTR, EFTS TDU, EFTS Encoder, EFTR Monitor)
  - AMRAAM Testing
  - EFTS CONOPS
- Supported other EFTS Documents and Activities not of primary responsibility
  - EFTS Key Management
  - RCC Specifications (RCC 319, 313 re-writes)
- Supported and Witnessed EFTS CTEIP Development As Government Representative
  - EFTS FTR, EFTS Encoder, EFTS TDU, EFTS Monitor
- Developed Project Support Devices/Systems
  - EFTS BOSS
  - EFTS Configuration ICD Tool
  - EFTS Command Controller for Encoder Validation
  - FTR CONFIGURATION TOOL (EFTS CCSI)
- Support For AMRAAM Demonstration of EFTS
  - Supported Conception and Goals Development
  - Build Interface between Encoder and Range Interface (CC-AMRAAM)
  - Implementation and Use of System at Eglin AFB and Tyndall AFB
  - Operated Devices During Testing and Managed other Operating Devices
  - Supported Development of AMRAAM Report
- Developed Initial EFTS Capability for NASA Dryden
  - Updated EFTS Command Controller to Operational Component
  - Build Windows Based Software for Operators
    - Command Controller
    - Monitor Software
  - DTMF Command Panel System
- Support For NASA Dryden on ACDS (still active WV development)
  - Developed Specification for NASA Dryden, Edwards AFB
  - Supporting Project Reviews and Development
- Developed Manual Testing Support Hardware
  - EFTS Test Case
  - EFTS Manual Test Jig
  - FATS and FATS 2 Software
  - Support Updated to 313
- Developed EFTS Devices in Support of NASA's Mission Needs
  - EFTS PODs (Key POD, Frequency POD, Mission POD, Status POD)
  - EFTS Parameter Management Tool
  - EFTS Integrated Command Modulator
- Currently Developing Automated EFTS FTR Test Set
  - 2 FTRs
  - Labview

EFTS Automated FTR Test Set

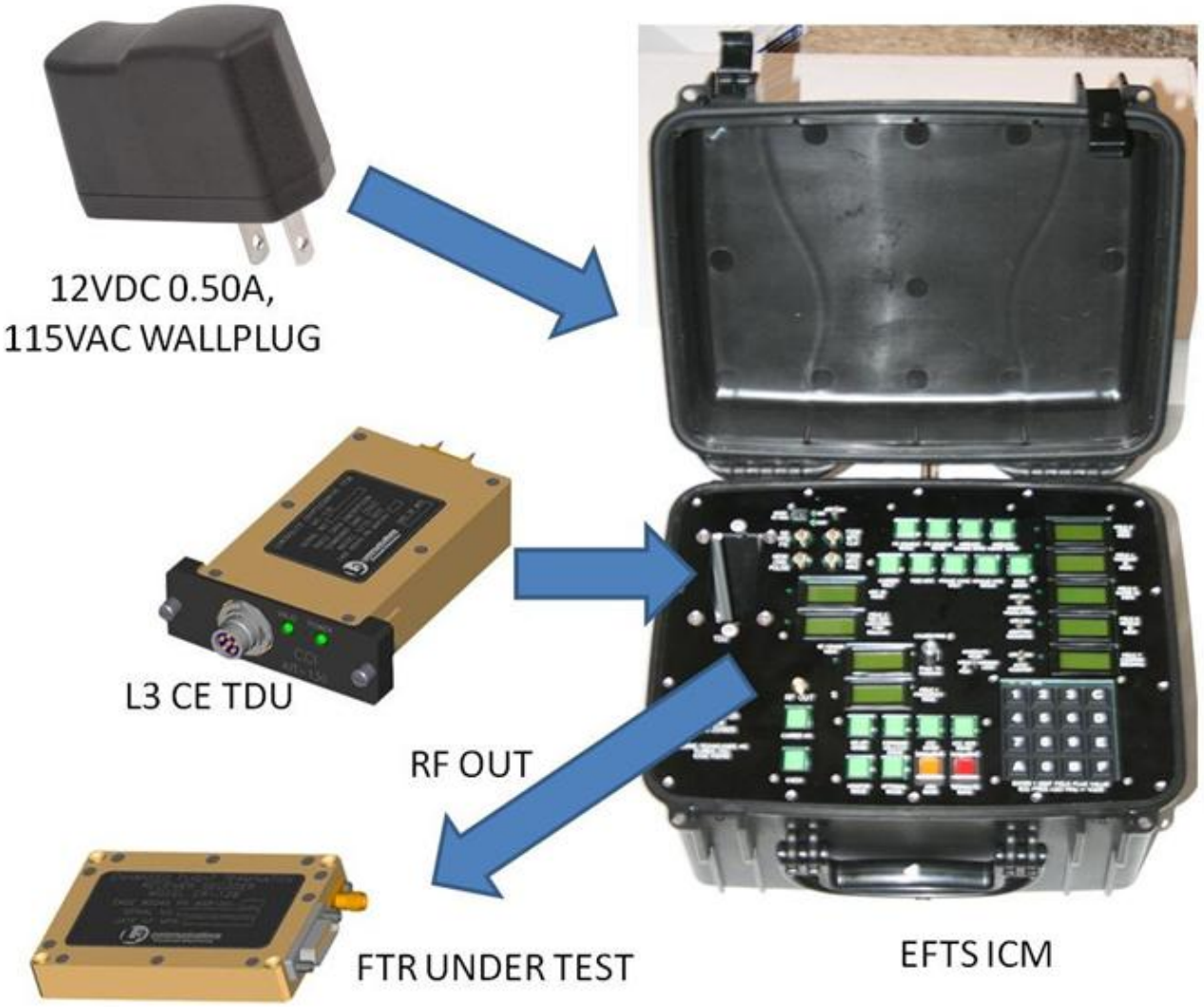


Automated Recertification of EFTS FTRs

- 2 FTRS
- NI Labview based software
- NI PXI Components
- 3 Temperatures

Developed to Support NASA Automated FTR Testing
Delivery: Q3/4 2011
Current Under Development

INTEGRATED COMMAND MODULATOR

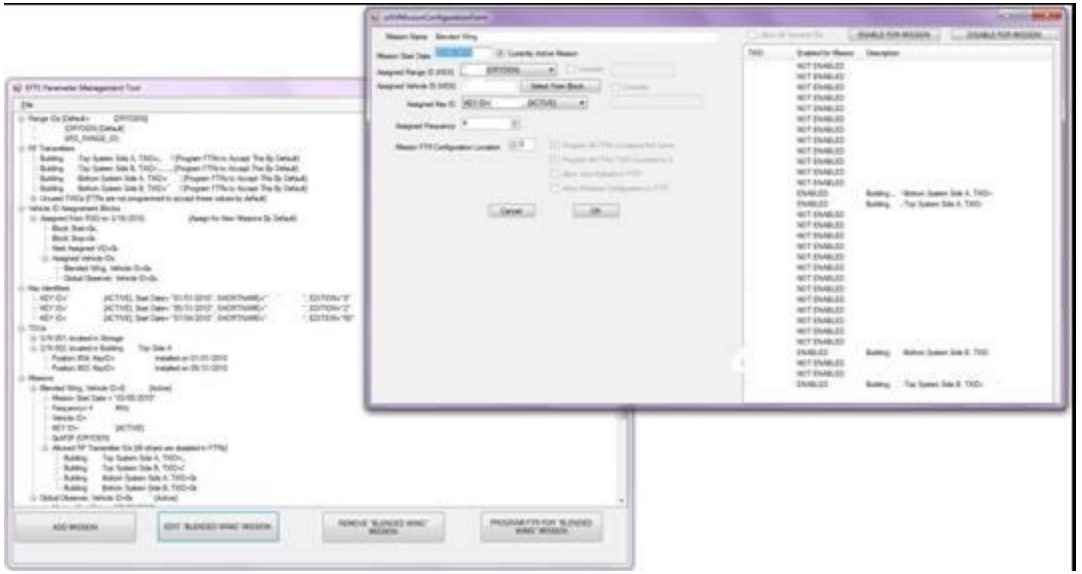


Complete Standalone EFTS Exciter

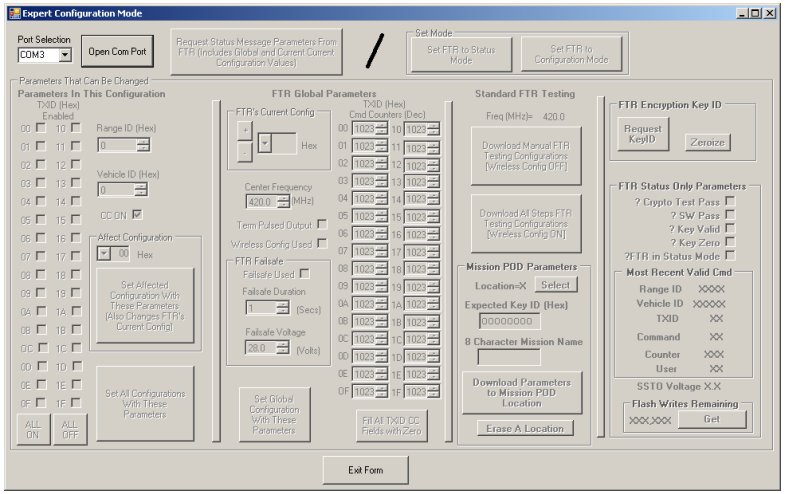
- Houses EFTS TDU
- Exciter (Frequency 420-450 MHz)
- Nominal -10 to 0 dBm output
- Change EFTS Parameters
- Mission Lock Feature
- Command Button for All EFTS Commands
- Other Modes facilitate FTR Testing (Carrier Only, Frame Sync Only, Bit Sync Only, Invalid Command)

Developed to Support NASA Dryden Program Pre-Flight Testing
Delivery: March 2011 (in use)

EFTS Parameter Management Tool



MANGEMENT OF ALL MISSION PARAMETERS



MANUAL CONFIGURATION OF EFTS FTR

Manage EFTS Parameters

- Allows single EFTS Parameter Management System
- Saves to XML based Text file
- Integrates with FTR via Serial Port
- Integrates with EFTS FTR Mission POD via Serial POD (Mission POD holds 10 Missions)

Developed to Manage and Support All EFTS Parameters in a Centralized EFTS Environment
Delivery: 2010-11
Current Operating Capability

EFTS PODS

EFTS FTR Key POD Z01004

- Facilitates FTR Key Management without disturbing or viewing any other FTR Configuration Parameters
- Provides Power to FTRs for loading of keys and key management.
- VIEW FTR KEY IDENTIFIER
- ZEROIZED FTR KEYS
- Featurs

EFTS FTR Frequency POD P/N Z01009

- Provides FTR Frequency Configuration without disturbing or viewing any other FTR Configuration Parameters
- View and change FTR Frequency

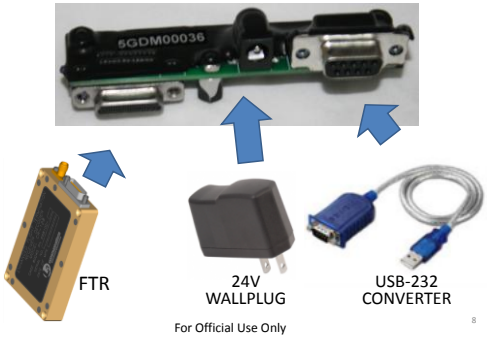
EFTS FTR Mission POD P/N Z01022:

- Used with EFTS Parameter Management Tool to Store and Download up to 10 different FTR Missions (32 Configuration each Mission)
- Download any of 10 Missions
- View all FTR Parameters in real time

EFTS FTR Status POD P/N Z01028:

- Allows Viewing of All FTR parameters in real Time.
- No ability to change FTR parameters.

POWER POD



For Official Use Only

Developed to support various compartmentalized capabilities at NASA Dryden
Delivery: 2010-11
Current Operating Capability at NASA Dryden

EFTS FTR TEST CASE (EFTC)

EFTS FTR DATA INTERFACE CONNECTOR BREAKOUT
Interconnection with the Enhanced Flight Termination System (EFTS) Flight Termination Receiver (FTR)

STANDALONE SOLUTION
This portable test set provides power, configuration and status of all EFTS FTR signals: Discrete, Control and Status Interface (CSI), User Defined Port Interface, and Message Error Rate Testing. Integrated Volt meter allows validation of all signals

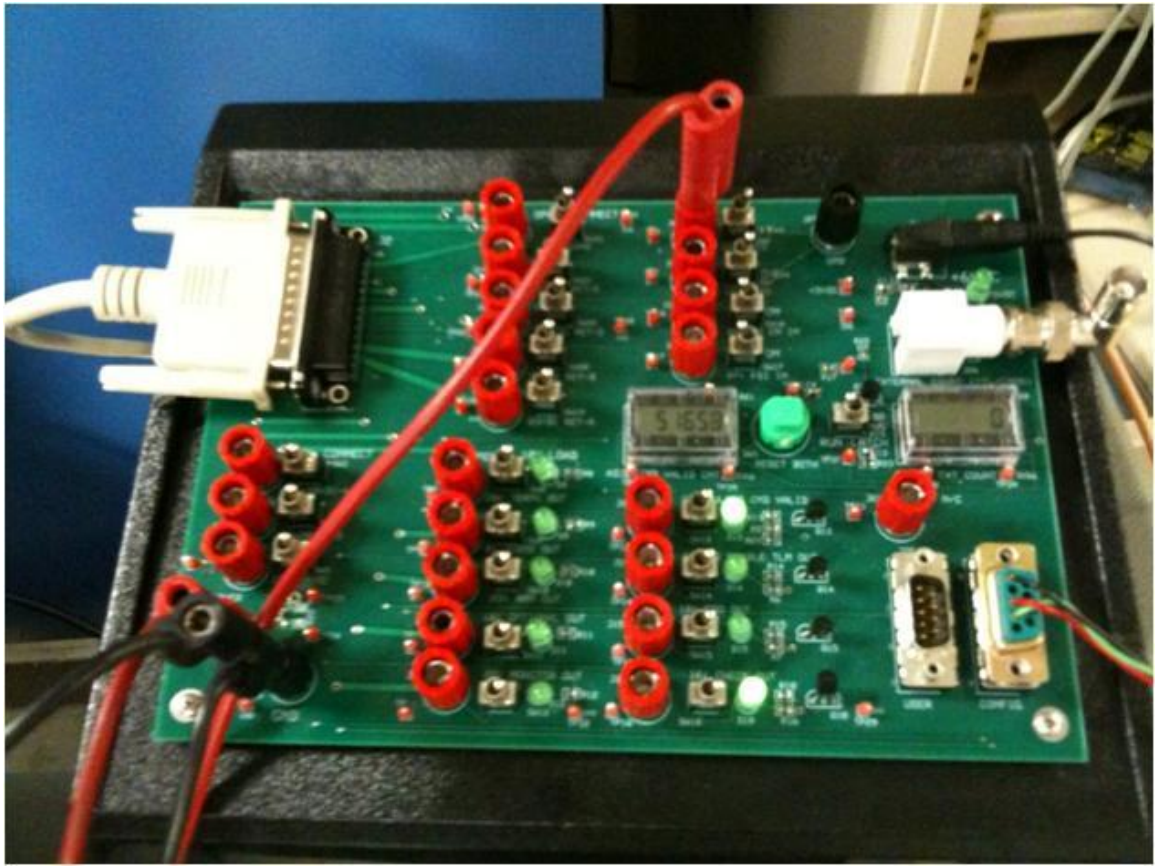
THREE POWER SOURCES
EFTC and FTR are powered from one of three sources:
1) 4 AA Lithium Photo Batteries
2) Provided AC/DC wall plug
3) RED/BLACK Banana plugs (22-36V)

Developed to allow manual and portable testing of EFTS FTRs
Delivery: 2008-Present
Current Operating Capability at NASA Dryden

MANUAL TEST BREAKOUT

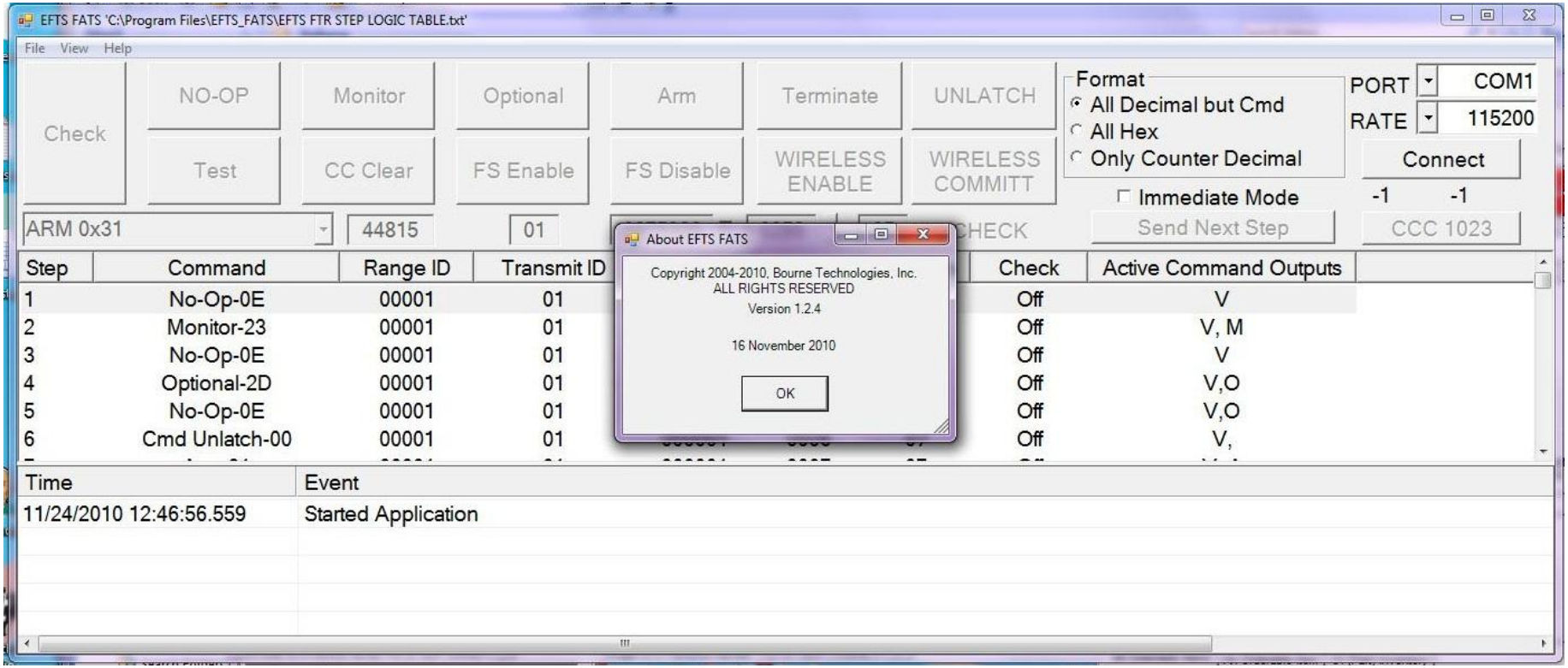
EFTS FTR DATA INTERFACE CONNECTOR BREAKOUT
Each Signal to Banana Jack and O-Scope clip
Each Signal can have 10K termination switched in or disconnected with LEDs

Command Signals have LED indications
- Check
- Monitor
- Optional
- Arm
- Terminate (x2)
- Pulsed Command Valid
- Failsafe



Developed to facilitate manual testing of EFTS FTRs in Lab Environment
Delivery: 2010
Current Operating Capability at NASA Dryden

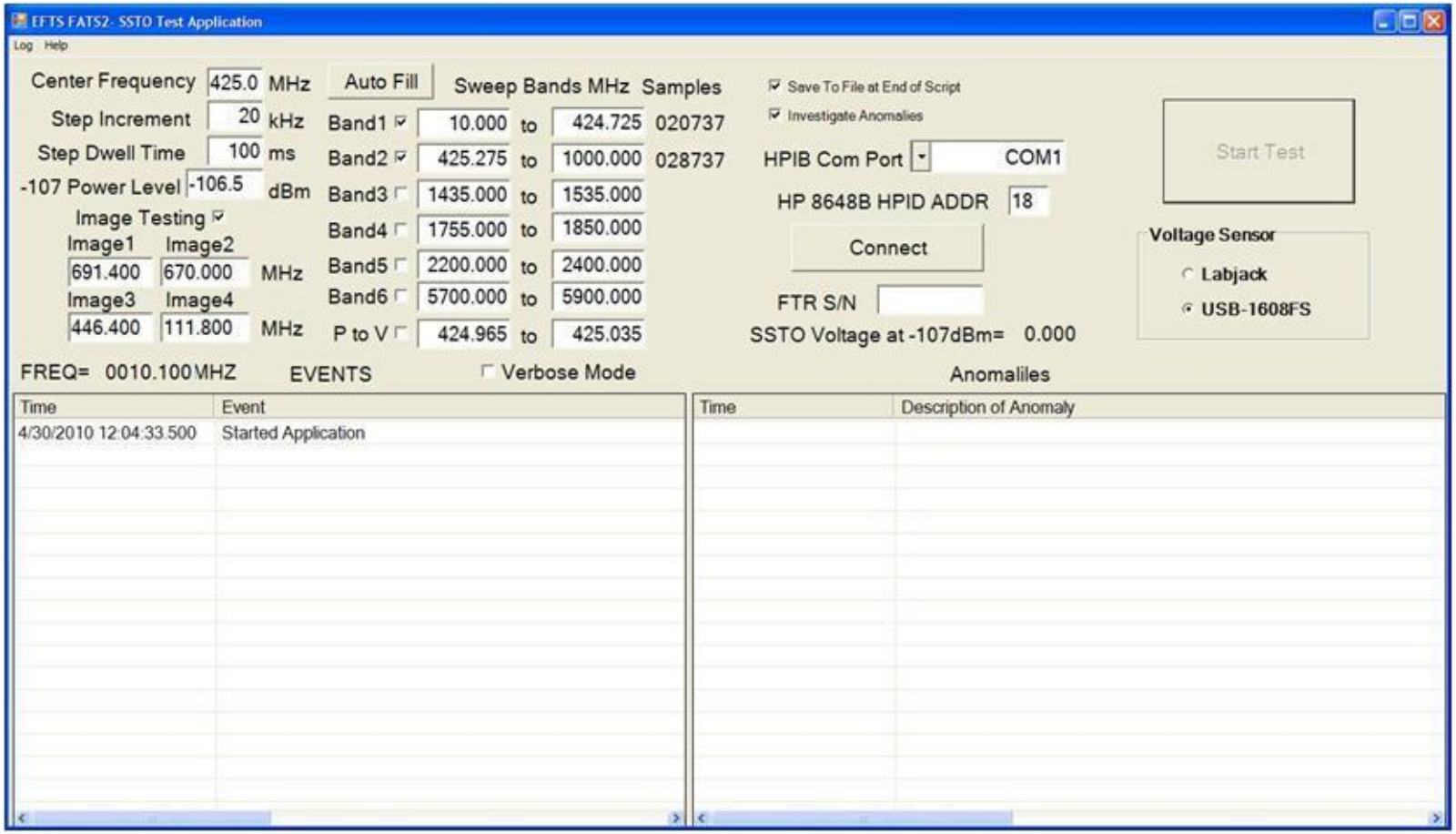
FATS SOFTWARE



Works with L3 CE Encoder to Develop 64 bit EFTS Waveform
Windows 7 based application
Uses Serial Port
Allows sending all EFTS Commands
Allows simple testing of all EFTS "Logic Step Table"

Developed to facilitate manual testing of EFTS FTRs in Lab Environment
Delivery: 2010
Current Operating Capability at NASA Dryden

FATS 2 SOFTWARE



Works with stand test equipment to validate FTR performance

Windows 7 based application

Uses IEEE-488 with standard RF Generator

Uses USB Based DAQ Card

Validates FTR performance (SSTO) for various tests and Image response (Auto Sweep and validation)

Provides Saved Output Reports in Text Format

Developed to facilitate manual testing of EFTS FTRs in Lab Environment

Delivery: 2010

Current Operating Capability at NASA Dryden

NASA Dryden-Initial Operating Capability Progression

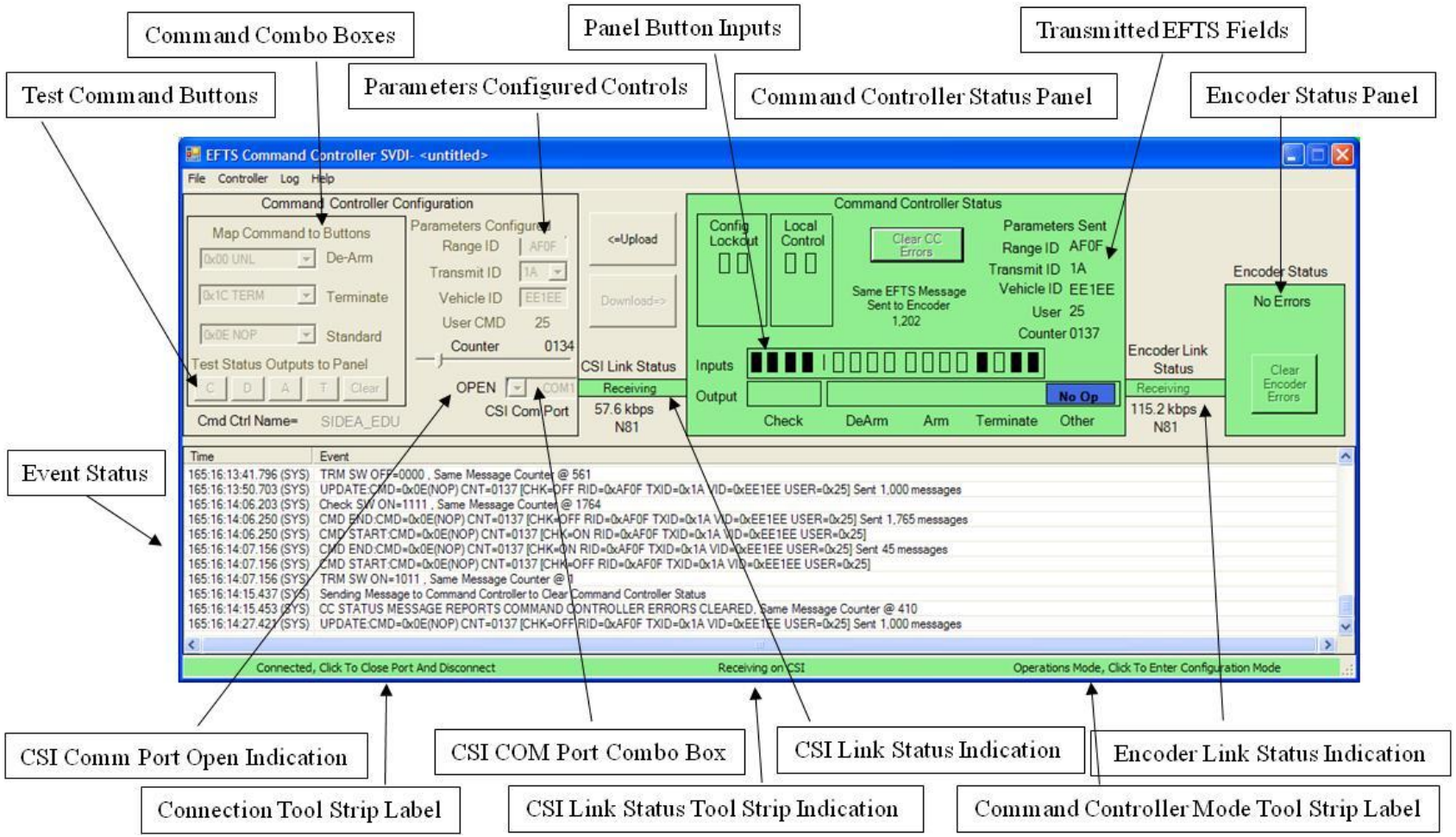
- EFTS Side by Side with Existing PC System (Quad Redundant)
  - Required moving Cables when switching between EFTS and IRIG based Missions
- Development of EFTS DTMF CPS (Quad Redundant)
  - DTMF LCP incorporated front panel switches to allows selection of system type (EFTS or IRIG) from front panel
- Split of System into Two Dual Systems
  - Quad Redundant System split into two dual systems to support 2 missions (at 2 different frequencies) simultaneously.

EFTS CC SVDI (Dual)

- Develops 64 bit EFTS Message
- Interface to existing Range Infrastructure
- Communicates with L3 CE Encoder

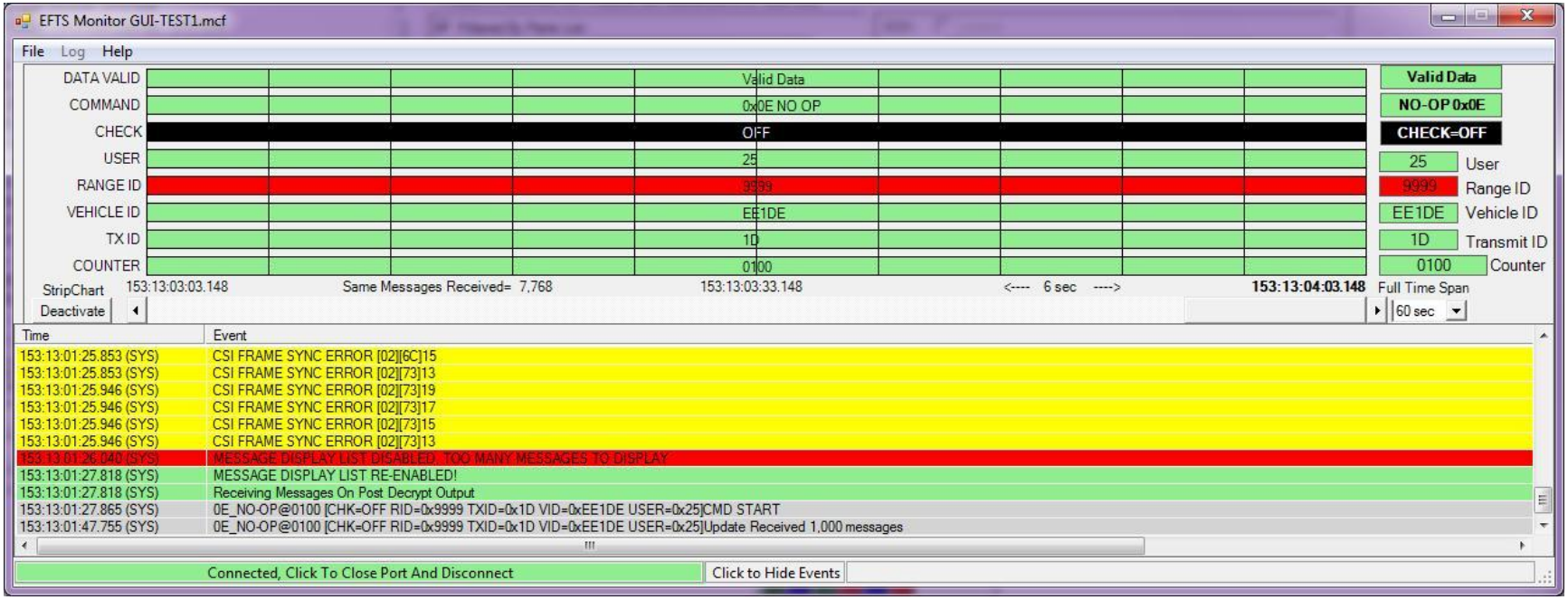
Developed as initial Operating Capability for NASA Dryden
Delivery: 2008
Current Operating Capability at NASA Dryden

SVDI USER INTERFACE



Developed as Initial Operating Capability for NASA Dryden
Delivery: 2008, 2010
Current Operating Capability at NASA Dryden

EFTS MONITOR GUI



- Interface to L3 CE EFTS Monitor, Post Decryption Output
- Displays all commands in strip chart format

Developed as Initial Operating Capability for NASA Dryden
Delivery: 2008, 2010
Current Operating Capability at NASA Dryden

DTMF COMMAND PANEL SYSTEM

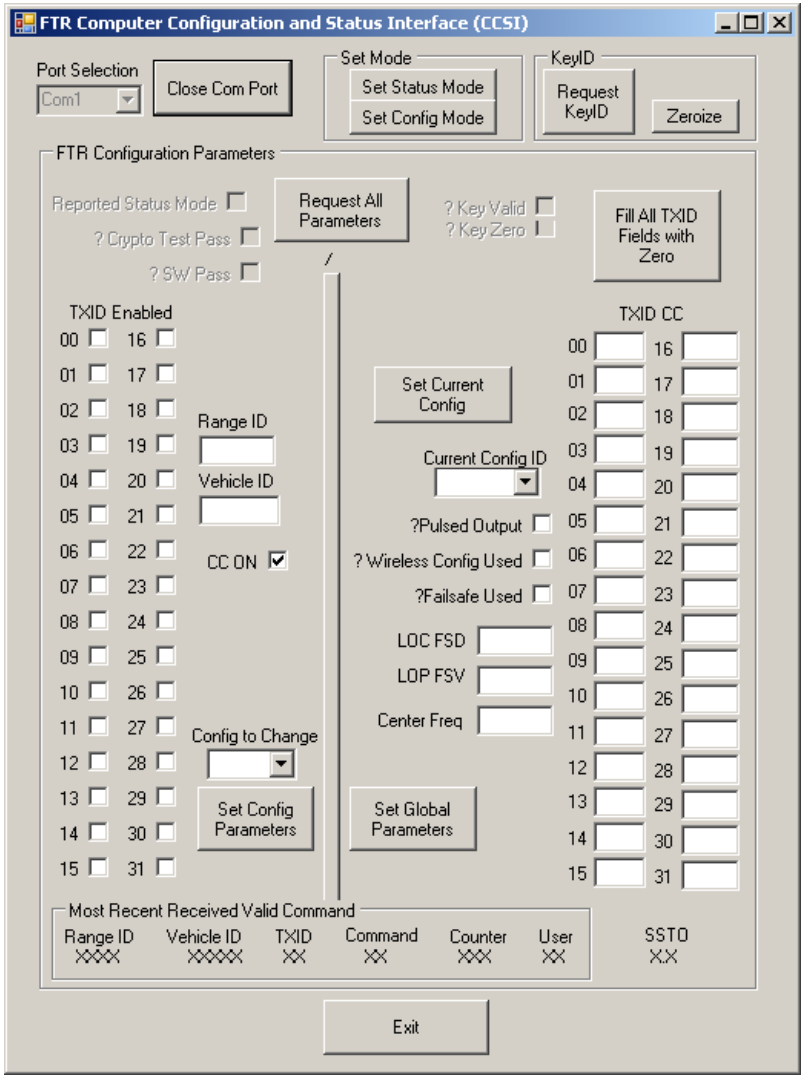
- Dual Tone Multi-Frequency (DTMF)
- No Software or Firmware
- RSO Panel (Top)
- Local Panel (Bottom)
- User Interface at NASA Dryden
- Communicates with existing IRIG and EFTS CC SVDI

Developed as Replacement of E&M based panels at NASA Dryden
Delivery: 2009-Present
Current Operating Capability at NASA Dryden

FTR CONFIGURATION AND STATUS INTERFACE

- WINDOW BASED
- C#, .NET 2.0

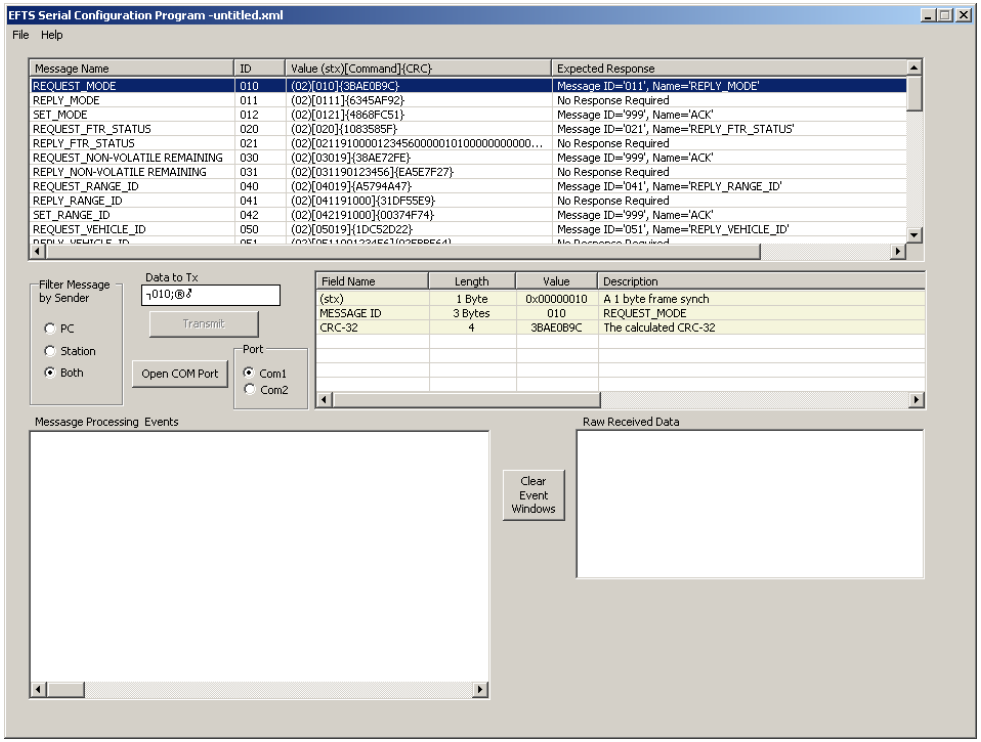
Developed to support FTR Configuration
Initial Delivery:2005
Updated: 2006-2008
Used by Edwards AFB and NASA Dryden during FTR Testing



EFTS CONFIGURATION ICD TOOL

- WINDOW BASED
- C#, .NET 2.0

Developed to support FTR Vendor Compliance with Configuration ICD
Initial Delivery:2005
Provided to L3 CE and Herley During FTR and Ground System Development



Baseband Output Signal Simulator (BOSS)

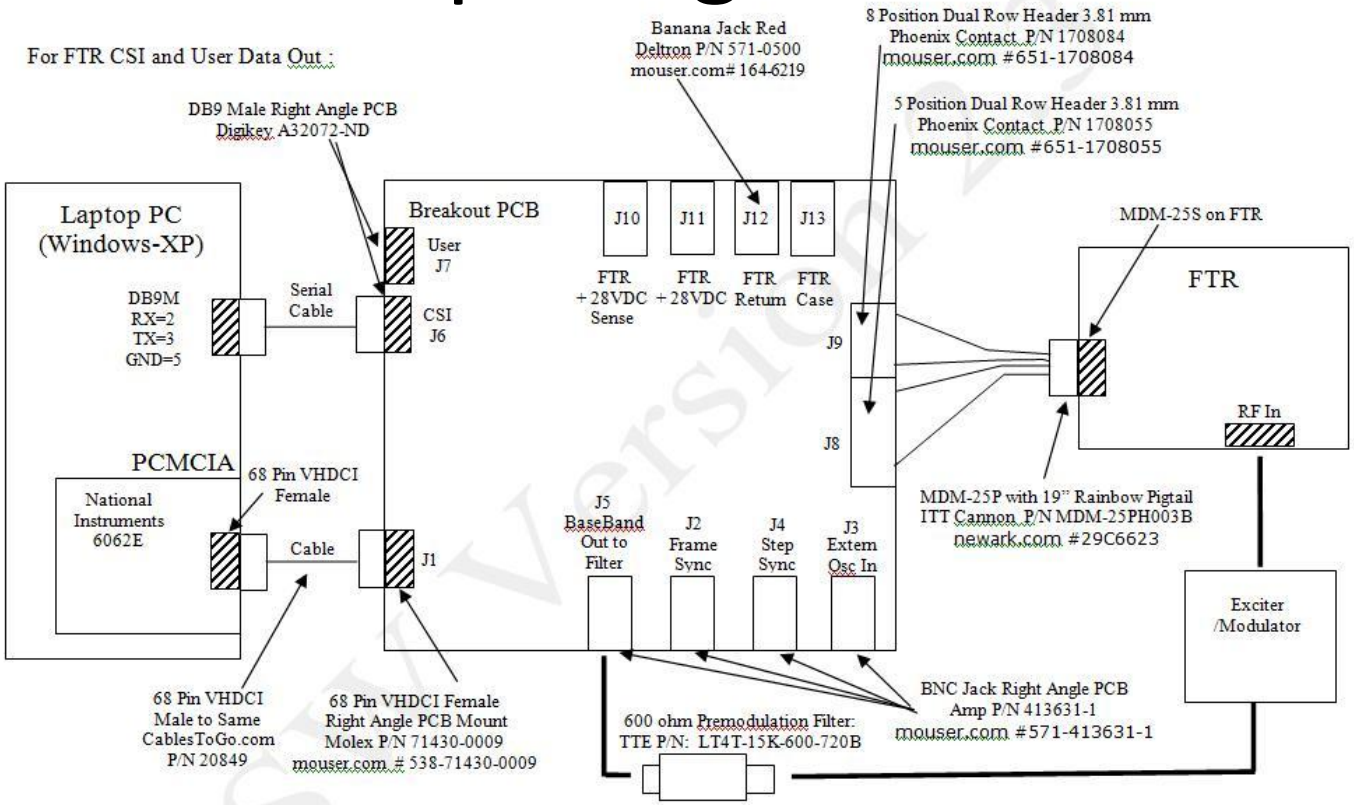
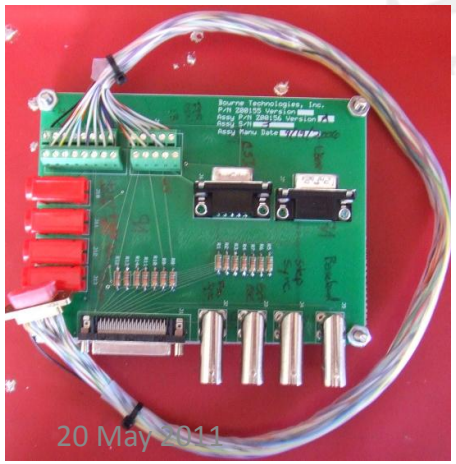
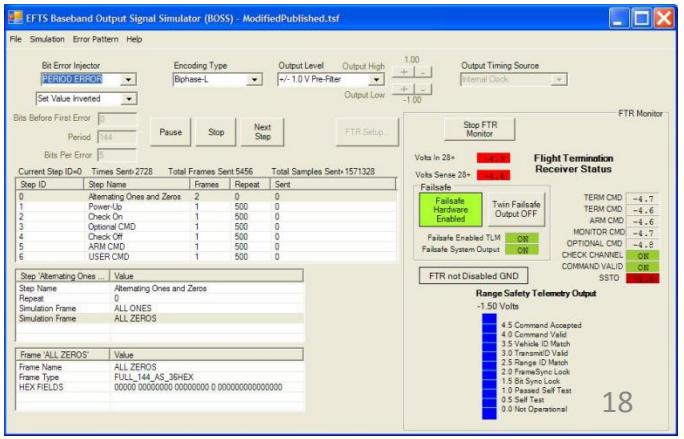


Figure 1, BOSS Block Diagram

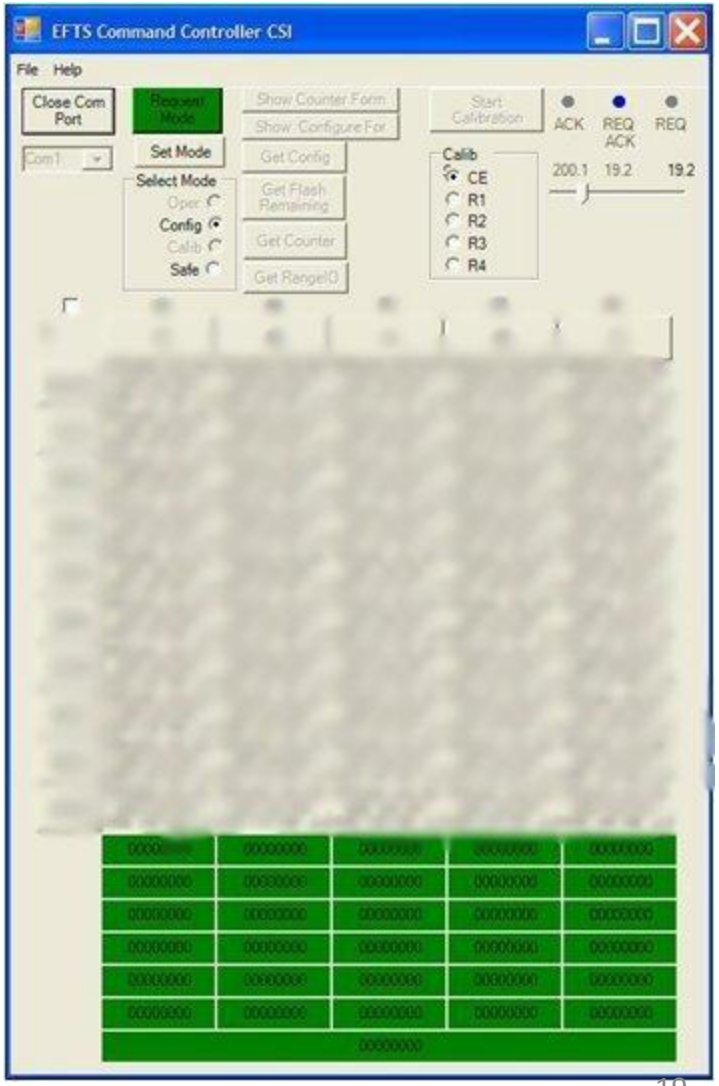


Developed to support FTR Vendor Compliance with EFTS Interface Requirements Document (IRD)
Initial Delivery:2004
Updated: 2006
Provided to L3 CE and Herley During FTR Development



EFTS Command Controller (AMRAAM)

- Dual EFTS Command Controller
- Up to 10 Vehicles and Use of L3 CE Encoder with up to 5 remote encoders.

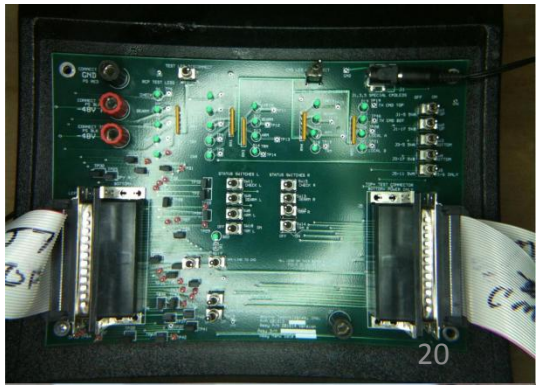


Developed to support EFTS Encoder Validation and AMRAAM Support
Initial Delivery:2006
Used during L3 CE Encoder Validation and AMRAAM

Support Devices

- FTR Data Simulator (2 Versions)
  - All Signals (Shown)
  - Circuit and POD Version Also
- Monitor Simulator
  - Circuit Card Version
- Encoder Simulator (2 Versions)
  - PC Version
  - Circuit Card Version
- TDU Simulator
  - Circuit Card
- CC SVDI Test Set
  - All signals
- DTMF CPS Test Set
  - All Signals

Circuit Card Version of simulators



Technical Software Tools

- Subversion/Tortoise-SVN-
  - Configuration Management/Document Mgmt
- MS Visual Studio- C# Language
  - Windows Applications
- IAR Embedded Workstation/Seggar J-Flash
  - Embedded Software, C based programming
  - Has MISRA “C” COMPLIANCE CHECKER BUILT-IN
- National Instruments Labview
  - Automatic Test Set
- DIPTrace
  - PWB Design
- Bourne Technologies MyProductionLibrary
  - Manufacturing/ERP