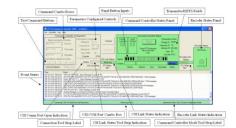




# Bourne Technologies, Inc.

### **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

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### **EFTS Automated FTR Test Set**

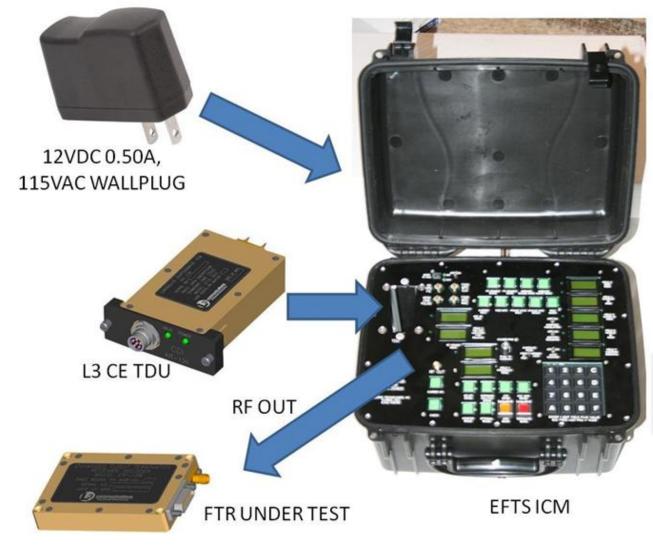


### **Automated Recertification of EFTS FTRs**

- 2 FTRS
- NI Labview based software
- NI PXI Components
- •28 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**

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|---|--|--|
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| OF ALL Gereneters 1   | That Can Be Changed  |  |
|   | In This Configuration FTR Global Parameters  | Standard FTR Testing   |
|   | ed FTR's Current Config Cmd Counters (Dec)   | Freq (MHz)= 420.0  |
| PARAMETERS  |  | Keuff) 7   |
| 01 🗖 11   |  | Download Manual FTR     Lonoice  |
| 02 🗖 12   | Vahiola ID (Hay)   | (Wreless Config OFF)   |
| 03 🗖 13   | Center Frequency U3 1023 1 13 1023   |  |
| 04 🗖 14   | 420.0 = (MHz) 04 1023 = 14 1023  |  |
| 05 🗖 15   |  | Testing Configurations   |
| 06 🗖 16   | Affect Configuration Us 1023 16 1023   | 2 [Wreess corrigion] 2 Key Zero  |
| 07 🗖 17   | E 00 Hex 07 1023 17 1023   | 2FTR in Status Mode  |
| 09 🗖 18   | □ Failsafe Used □ 08 1023 🛨 18 1023  | Most Hecent Valid Lmd  |
| 09 🗖 19   |  |  |
| 04. 🗖 14  | These Parameters 1 = (Secs) 04 1023 = 1A 1023  |  |
| 08 E 18   | Current Contig) Calculate Visitance 08 1023 18 1023  | TXID XX  |

28.0 🗧 (Volts)

0D 1023 🛨 1

Exit Form

0E 1023 = 1E 1023 = 0F 1023 = 1F 1023 =

#### **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

#### MANUAL CONFIGURATION OF EFTS FTR

Download Parameter

to Mission PBD Location

Erase A Local

Ilser XX

SST0 Voltage X.X

Flash Writes Bemainin

### **EFTS PODS**

#### EFTS FTR Key POD Z01004

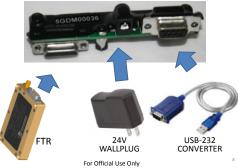
•Facilitates FTR Key Management without disturbing or viewing any other FTR Configuration Parameters •Provides Power to FTRs for loading of keys and key management. •VIEW FTR KEY IDENTIFIER •ZEROIZED FTR KEYS •Featurs



#### 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





7 EFTS FTR Status POD P/N Z01028:

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

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 Batteries2) Provided AC/DC wall plug3) 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

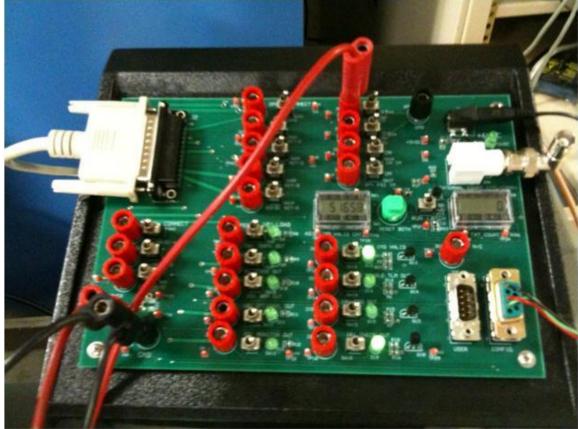
### EFTS FTR DATA INTERFACE CONNECTOR BREAKOUT

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

| File View He<br>Check | NO-OP          | Monitor            | Optional    | Arm                | Terminate                  | UNLATCH  | Format                               | PORT COM          |
|-----------------------|----------------|--------------------|-------------|--------------------|----------------------------|----------|--------------------------------------|-------------------|
| CHECK                 | Test           | CC Clear           | FS Enable   | FS Disable         | WIRELESS                   | WIRELESS | C Only Counter Decimal               | Connect           |
| ARM 0x31              |                | <u> </u>           | 01          | About EFTS FATS    | ENABLE                     |          | □ □ Immediate Mode<br>Send Next Step | -1 -1<br>CCC 1023 |
| Step                  | Command        | Range ID           | Transmit ID | Copyright 2004-201 | 0, Bourne Technologies, Ir | Chec     | k Active Command Outputs             |                   |
| 1                     | No-Op-0E       | 00001              | 01          | ALL RIG            | HTS RESERVED               | Off      | V                                    |                   |
| 2                     | Monitor-23     | 00001              | 01          | 10                 |                            | Off      | V, M                                 |                   |
| 3                     | No-Op-0E       | 00001              | 01          | 16 N               | ovember 2010               | Off      | V                                    |                   |
| 4                     | Optional-2D    | 00001              | 01          | Г                  | ок                         | Off      | V,O                                  |                   |
| 5                     | No-Op-0E       | 00001              | 01          |                    |                            | Off      | V,O                                  |                   |
| 6                     | Cmd Unlatch-00 | 00001              | 01          | U                  |                            | Off Off  | ν,                                   |                   |
| -<br>Time             |                | Event              |             |                    |                            |          | •••                                  |                   |
| 11/24/2010            | 12:46:56.559   | Started Applicatio | on          |                    |                            |          |                                      |                   |
|                       |                |                    |             |                    |                            |          |                                      |                   |
|                       |                |                    |             |                    |                            |          |                                      |                   |
|                       |                |                    |             |                    |                            |          |                                      |                   |

### 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

| EFTS FATS2-SSTO Test Ap   | plication  |  |   |                     |        |                |  |            |   | EE |
|---|--|--|---|---------------------|--------|----------------|--|------------|---|----|
| og Help   |  |  |   |                     |        |                |  |            |   |    |
| Center Frequency<br>Step Increment<br>Step Dwell Time<br>-107 Power Level -1<br>Image Testing<br>Image1 Imag<br>691.400 670.1<br>Image3 Imag<br>446.400 111.1 | 20 kHz<br>100 ms<br>106.5 dBm<br>3 57<br>ge2<br>000 MHz<br>ge4 | Band1 🖗<br>Band2 🖗<br>Band3 Г<br>Band4 Г<br>Band5 Г<br>Band6 Г | 10.000 to<br>425.275 to<br>1435.000 to<br>1755.000 to<br>2200.000 to<br>5700.000 to |                     | 020737 | Col<br>FTR S/N | omalies<br>Port  C<br>HPID ADDR          | COM1<br>18 | Start Test<br>Voltage Sensor<br>C Labjack<br>© USB-1608FS |    |
| FREQ= 0010.100N   |  | P to V F   | 424.965 to<br>└ Verb  | 425.035<br>ose Mode | Time   |                | at -107dBm=<br>Anoma<br>Description of A | liles      |   |    |
| 4/30/2010 12:04:33:500  | Started App  | ication  |   |                     |        |                |  |            |   |    |
|   |  |  |   |                     |        |                |  |            |   |    |

### 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) ProWides 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.

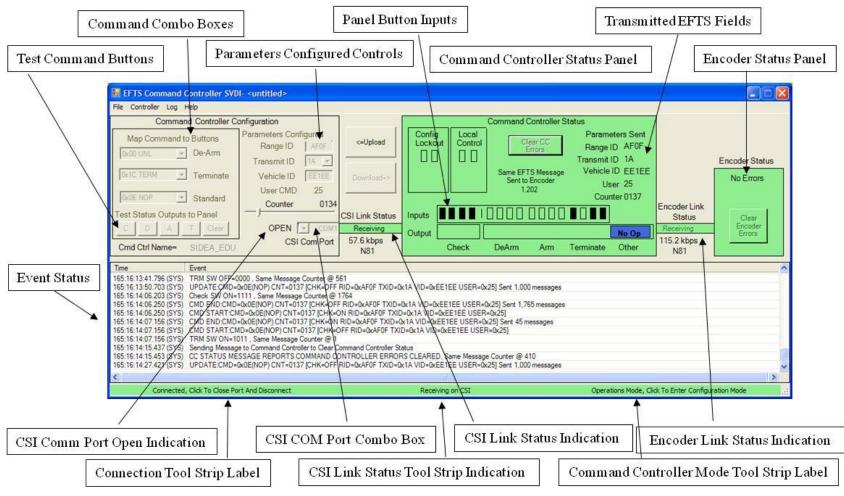
## EFTS CC SVDI (Dual)



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

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

| EFTS Monitor GUI-TEST:                           | 1.mcf  |                          |          |                                 |
|--|--|--------------------------|----------|---------------------------------|
| File Log Help                                    |  |                          |          |                                 |
| DATA VALID                                       |  | Valid Data               |          | Valid Data                      |
| COMMAND  |  | 0x0E NO OP               |          | NO-OP 0x0E                      |
| CHECK  |  | OFF                      |          | CHECK=OFF                       |
| USER   |  | 25                       |          | 25 User                         |
| RANGE ID   |  |                          |          | 9999 Range ID                   |
| VEHICLE ID                                       |  | EE1DE                    |          | EE1DE Vehicle ID                |
| TX ID  |  | 10                       |          | 1D Transmit ID                  |
| COUNTER  |  | 0100                     |          | 0100 Counter                    |
| StripChart 153:13:03:0                           | 03.148 Same Messages Received= 7,768   | 153:13:03:33.148         | < 6 sec> | 153:13:04:03.148 Full Time Span |
| Deactivate 4                                     | 12.07.270  |                          |          | ► 60 sec -                      |
| Time   | Event  |                          |          | ^ ^                             |
| 153:13:01:25:853 (SYS)<br>153:13:01:25:853 (SYS) | CSI FRAME SYNC ERROR [02][6C]15<br>CSI FRAME SYNC ERROR [02][73]13                                     |                          |          |                                 |
| 153:13:01:25.946 (SYS)                           | CSI FRAME SYNC ERROR [02][73]19  |                          |          |                                 |
| 153:13:01:25.946 (SYS)<br>153:13:01:25.946 (SYS) | CSI FRAME SYNC ERROR [02][73]17<br>CSI FRAME SYNC ERROR [02][73]15                                     |                          |          |                                 |
| 153:13:01:25.946 (SYS)                           | CSI FRAME SYNC ERROR [02][73]13  |                          |          |                                 |
| 153:13:01:27.818 (SYS)                           | MESSAGE DISPLAT LIST DISABLED TO MAINT MESSAGE<br>MESSAGE DISPLAY LIST RE-ENABLED!                     | D TO UDPLAT              |          |                                 |
| 153:13:01:27.818 (SYS)                           | Receiving Messages On Post Decrypt Output  | FEIDE UCED & SECND CTADT |          | E                               |
| 153:13:01:27.865 (SYS)<br>153:13:01:47.755 (SYS) | 0E_NO-OP@0100 [CHK=OFF RID=0x9999 TXID=0x1D VID=0<br>0E_NO-OP@0100 [CHK=OFF RID=0x9999 TXID=0x1D VID=0 |                          | s        |                                 |
| •  |  | m                        |          | •                               |
|  | Connected, Click To Close Port And Disconnect  | Click to Hide Events     |          |                                 |

- 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

20 May 2011

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

| FTR Computer Configuration and S  | tatus Interface (CCSI)   | _ D ×   |
|---|--|---|
| Port Selection<br>Com1  Close Com Port  | Set Status Mode  | eyID<br>Request<br>KeyID Zeroize  |
| FTR Configuration Parameters  |  |   |
|   | est All ? Key Valid<br>? Key Zero  | Fill All TXID<br>Fields with<br>Zero  |
| T×ID Enabled       00       16         00       16       0         01       17       0         02       18       Range ID         03       19       0         04       20       Vehicle ID         05       21       0         06       22       CC ON         07       23       0         08       24       0         09       25       0         10       26       1         11       27       Config to Change         12       28       ✓         13       29       Set Config         14       30       Parameters         15       31       0 | Set Current<br>Config<br>Current Config ID<br>Pulsed Output<br>? Wireless Config Used<br>?Failsafe Used<br>LOC FSD<br>LOP FSV<br>Center Freq<br>Set Global<br>Parameters | TXID CC         00       16         01       17         02       18         03       19         04       20         05       21         06       22         07       23         08       24         09       25         11       27         12       28         13       29         14       30 |
| Most Received Valid Comman<br>Range ID Vehicle ID TXID<br>XXXX XXXX XX  | nd<br>Command Counter Use<br>XX XXX XX   | er SSTO   |
|   | Exit   |   |

# 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

| BEQUEST_MODE         OTO         (03)         (01)         (02)         (01)         (02)   | essage Name       |                 | ID     | Value (stx)[Command]{CR0 | -}             | Expect      | ed Response                          | <b>A</b> |
|--|-------------------|-----------------|--------|--------------------------|----------------|-------------|--------------------------------------|----------|
| DEREY, MODE         011         (02)(011)((6354592))         Do Response Required           SET_MODE         012         (02)(011)((6354592))         Message ID—909, Name=ACC'           REQUEST_FIR_STATUS         020         (02)(02)(10358595)         Message ID—909, Name=ACC'           REQUEST_MONVOLATILE REMAINING         031         (02)(02)(103585727)         No Response Required           REQUEST_MONVOLATILE REMAINING         031         (02)(02)(10358577)         No Response Required           REQUEST_MONVOLATILE REMAINING         031         (02)(02)(10319(3342727E)         Message ID—909, Name=ACC'           REPLY_INGE_ID         040         (02)(02)(103147574)         Message ID—909, Name=ACC'           REPLY_INGE_ID         040         (02)(02)(119)(1052528)         No Response Required           REPLY_INGE_ID         041         (02)(02)(02)(4774)         Message ID—909, Name=ACC'           REPLY_INGELID         042         (02)(02)(02)(4774)         Message ID—909, Name=ACC'           REPLY_INGELID         042         (02)(02)(02)(4774)         Message ID—901, Name=REPLY_VEHICLE_ID'           REPLY_INGELID         050         (02)(02)(02)(4774)         Message ID—901, Name=REPLY_VEHICLE_ID'           REPLY_INGE_ID         050         (02)(02)(02)(02)(4774)         Message ID—901, Name=REPLY_VEHICLE_ID'  |                   |                 | 010    |                          |                | Messar      | ne ID='011'. Name='REPLY_MODE'       |          |
| EET_MODE         (022) |                   |                 |        |                          |                |             |                                      |          |
| REQUEST_FIR_STATUS         020         (02)003/1003586F)         Message Du=021', Name=REPLY_FIR_STATUS'           REQUEST_MON+OLATER REMAINING         030         (02)00319(3084272FE)         Message Du=999, Name=ACK'           REQUEST_MON+OLATER REMAINING         031         (02)00319(3084272FE)         Message Du=999, Name=ACK'           REQUEST_MON+OLATER REMAINING         030         (02)0319(304272FE)         Message Du=999, Name=ACK'           REQUEST_MON*OLATER REMAINING         031         (02)0319(304272FE)         Message Du=999, Name=ACK'           REQUEST_MON*OLATER REMAINING         030         (02)0319(304272FE)         Message Du=999, Name=ACK'           REQUEST_MON*E_ID         041         (02)019(310755F9)         No Reponse Required         Message Du=999, Name=ACK'           REQUEST_VENCLE_ID         050         (02)019(1002047474)         Message Du=901', Name=REPLY_VENCLE_ID'           REQUEST_VENCLE_ID         051         (02)019(10152022)         Message Du=901', Name=REPLY_VENCLE_ID'           VENCHT         mestage Du=901', Name=REPLY_VENCLE_ID'         Message Du=901', Name=REPLY_VENCLE_ID'         Message Du=901', Name=REPLY_VENCLE_ID'           VENCHT         mestage Du=901', Name=REPLY_VENCLE_ID'         Message Du=901', Name=REPLY_VENCLE_ID'         Message Du=901', Name=REPLY_VENCLE_ID'           VENCHT         mestage Du=901', Name=REPLY_VENCLE_ID'         M  |                   |                 |        |                          |                |             |                                      |          |
| Deta to Tx         Field Name         Length         Value         Description           Piter Message         Data to Tx         Field Name         Length         Value         Description           Piter Message         Data to Tx         Field Name         Length         Value         Description           Piter Message         Dot         CR32 (20119)(3245)(2542727)         Message ID-999, Name-ACK'         Message ID-999, Name-ACK'           PEQUEST PANGE JD         040         (02)(0119)(3245)(E5259)         Mo Reponse Required         Message ID-999, Name-ACK'           PEQUEST PANGE JD         041         (02)(0119)(02)(310)(5559)         Mo Reponse Required         Message ID-999, Name-ACK'           REQUEST Vehicle JD         050         (02)(05119)(10:52022)         Message ID-999, Name-ACK'         Message ID-999, Name-ACK'           Piter Message         Data to Tx         messaft Indepense Anti-ACK'         Message ID-999, Name-ACK'         Message ID-999, Name-ACK'           Piter Message         Data to Tx         messaft Indepense Anti-ACK'         Message ID-999, Name-ACK'         Message ID-999, Name-ACK'           Piter Message         Description         Message ID-991, Name-ACK'         Message ID-991, Name-ACK'         Message ID-991, Name-ACK'           Piter Message         Description         Message ID-991, Name-ACK' </td <td></td> <td>TUS</td> <td>020</td> <td></td> <td></td> <td>Messad</td> <td>ge ID='021', Name='REPLY FTR STATUS'</td> <td></td>   |                   | TUS             | 020    |                          |                | Messad      | ge ID='021', Name='REPLY FTR STATUS' |          |
| Deck         Open COM Poil         Open COM Poil <td>PLY_FTR_STATUS</td> <td>5</td> <td>021</td> <td>(02)[021191000012345600</td> <td>00001010000000</td> <td>0000 No Res</td> <td>ponse Required</td> <td></td>   | PLY_FTR_STATUS    | 5               | 021    | (02)[021191000012345600  | 00001010000000 | 0000 No Res | ponse Required                       |          |
| Deta to Tx         Deta to Tx         Field Name         Length         Value         Description           Flor Message         Dott         Transmit         Group         A byte         Distance         Cross         A byte         Distance         Cross         Cros         Cross         Cross  | QUEST_NON-VOL     | ATILE REMAINING | 030    | (02)[03019]{38AE72FE}    |                | Messag      | ge ID='999', Name='ACK'              |          |
| Detail         Differ         Open COM Port         Field Name         Length         Value         Description           Filter Message         D=051         (02)(05031673474)         Message ID=090 Name=ACC'         Message ID=051 Name=RegLy VEHICLE ID'           Filter Message         D=051         (02)(05031673474)         Message ID=051 Name=RegLy VEHICLE ID'           Filter Message         D=051 Name=RegLy VEHICLE ID'         Message ID=051 Name=RegLy VEHICLE ID'           Filter Message         D=051 Name=RegLy VEHICLE ID'         Message ID=051 Name=RegLy VEHICLE ID'           Filter Message         D=051 Name=RegLy VEHICLE ID'         Message ID=051 Name=RegLy VEHICLE ID'           Filter Message         D=051 Name=RegLy VEHICLE ID'         Message ID=051 Name=RegLy VEHICLE ID'           Filter Message         D=051 Name=RegLy VEHICLE ID'         Message ID=051 Name=RegLy VEHICLE ID'           Filter Message         D=051 Name=RegLy VEHICLE ID'         Message ID=051 Name=RegLy VEHICLE ID'           Field Name         Length         Value         Description           filter Message         Transmit         Field Name         Length         Value           C RC         Field Name         Length         Value         Description           G Ration         Open COM Port         C ComI         Raw Received Data      <   | PLY_NON-VOLAT:    | ILE REMAINING   | 031    | (02)[031190123456]{EA5E  | 7F27}          |             |                                      |          |
| EFT_RANGE_DD         042         (02)(02)(02)(02)(07)(774).         Message DD='999, Name=-ACK'.           RepLiesT_VENCLE_DD         050         (02)(05019)(100152022).         Message DD='919, Name=-ACK'.           Filter Message         010:(0.2)         051         (02)(05019)(100152022).         Message DD='919, Name=-ACK'.           Filter Message         010:(0.2)         051         (02)(05019)(100152022).         Message DD='919, Name=-ACK'.           Filter Message         010:(0.2)         051         020000010.         At byte frame synch.           Filter Message         010:(0.2)         1.8yte         0:00000010.         At byte frame synch.           C PC         Transmit         0.00         2.8ytes         0.00         REQUEST_MODE           G Station         Open COM Port         C com1         4         38AEUB9C         The calculated CRC-32           Message Processing Events         Raw Received Data         Clear         Clear         Clear  | QUEST_RANGE_I     | D               | 040    | (02)[04019]{A5794A47}    |                |             |                                      |          |
| Deta to Tx         Field Name         Length         Yalue         Description           Filter Message         Data to Tx         Field Name         Length         Yalue         Description           Filter Message         Data to Tx         Field Name         Length         Yalue         Description           Filter Message         Data to Tx         Field Name         Length         Yalue         Description           Filter Message         Data to Tx         Field Name         Length         Yalue         Description           C PC         Transmit         Field Name         Length         Yalue         Description           C Station         Open COM Port         For         Com1         CC-32         4         38AE0B9C         The calculated CRC-32           Message Processing Events         Cent         Clear         Clear         Clear         Clear  | PLY_RANGE_ID      |                 | 041    |                          |                |             |                                      |          |
| Data to Tx     Data to Tx       filter Message     Data to Tx       by Sender     000;003       C PC     Transmit.       G Station     Open COM Port       C Station     Open COM Port       C Com1     C Com1       Ressage Processing Events     Raw Received Data   |                   |                 |        |                          | 4}             | Messag      | ge ID='999', Name='ACK'              |          |
| Image: Sender by Sender by Sender by Sender     Image: Deta to Tx image: Transmit     Field Name     Length     Value     Description       Image: C PC     Transmit     Image: C C-32     1 Bytes     010     RE LEngth     A byte frame synch       Image: C Station G Both     Open COM Port     Port     Image: C C-32     4     3BAE0B9C     The calculated CRC-32       Image: C Complex Com   |                   |                 |        | (02)[05019]{1DC52D22}    |                |             |                                      | -        |
| Filter Message<br>PS Sender     Data to Tx<br>(1010)@.4     Fild Name     Length     Value     Description       C PC     Transmit     I Syte     0.0000010     A 1 byte frame synch<br>RESAGE ID     3 Bytes     010       C Station     Open COM Port     C com1     Received Data     The calculated CRC-32       Messasge Processing Events     Raw Received Data  | INV VENTICLE TO   |                 | 051    | /02)[0E11001224E4](02E8  | 0024)          | No Doc      | manes Doguized                       | النار ا  |
| Inter Message<br>by Sender     notifyee     Construction       Import     Import       C PC     Transmit       C Station     Open COM Port       C Station     Open COM Port       C Complexity     Complexity       Message Processing Events     Raw Received Data   |                   |                 |        |                          |                |             |                                      |          |
| by Sender<br>by Sender<br>C PC<br>C PC<br>C Station<br>C Both<br>Open COM Port<br>Messasge Processing Events<br>Reseasge Processing Events   |                   | Data to Tx      |        | Field Name               | Length         | Value       | Description                          |          |
| Open CoM Port     Port       © Both     Open COM Port       © Com1     Com1       © Com2     Reversion   |                   | -010:®∛         |        |                          |                |             |                                      |          |
| C PC     Transmit     CRC-32     4     38AE089C     The calculated CRC-32       C Stabion     Open COM Port     C Com1     C     Image: Comparison of Com1     Image: Comparison of Com1       Messaage Processing Events     Raw Received Data     C     C  | y Jender          | <u> </u>        |        |                          |                |             | A LOVE HAILE SYLCH                   |          |
| C Station<br>C Station<br>C Both<br>Open COM Port<br>C Com1<br>C Com2<br>Ressarge Processing Events<br>Raw Received Data   | C. 0C             | Transmit        |        |                          |                |             |                                      |          |
| Messasge Processing Events   | OPC               |                 |        | CRC-02                   | т              | JUMEODIC    | The calculated CKC-02                |          |
| Messasge Processing Events Raw Received Data   | C Station         |                 | Port - |                          |                |             |                                      |          |
| Messasge Processing Events Raw Received Data   | G Dath            | Come COMPANY    | G      |                          |                |             |                                      |          |
| Messasge Processing Events Raw Received Data Clear Event   | boun              | Open COM Porc   |        |                          |                |             |                                      |          |
| Messasge Processing Events Raw Received Data   |                   |                 | U Cor  | n2                       |                |             |                                      | Þ        |
| Clear  |                   |                 |        |                          |                |             | -                                    |          |
| Event  | essasge Processin | ig Events       |        |                          |                | R           | aw Received Data                     |          |
| Event  |                   |                 |        |                          |                |             |                                      |          |
| Event  |                   |                 |        |                          |                |             |                                      |          |
| Event  |                   |                 |        |                          |                | 1           |                                      |          |
|  |                   |                 |        |                          |                |             |                                      |          |
| windows  |                   |                 |        |                          |                |             |                                      |          |
|  |                   |                 |        |                          |                | Windows     |                                      |          |
|  |                   |                 |        |                          |                |             |                                      |          |
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### **Baseband Output Signal Simulator (BOSS)**

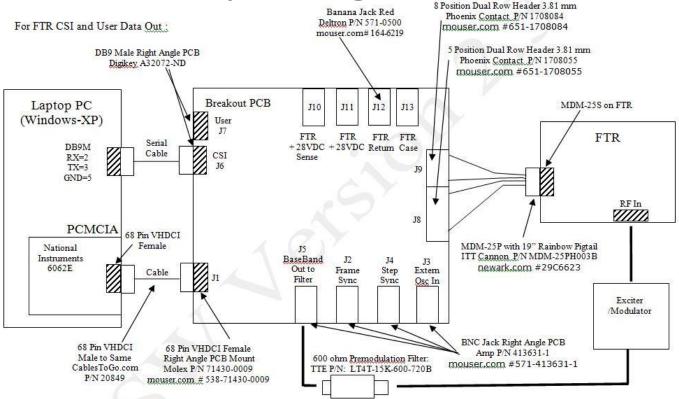
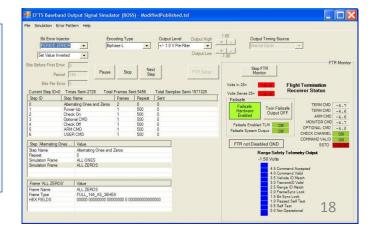




Figure 1, BOSS Block Diagram Developed to support FTR Vendor Compliance with EFTS Interface Requirements Document (IRD) Initial Delivery:2004 Updated: 2006 Provided to L3 CE and Herley During FTR Development

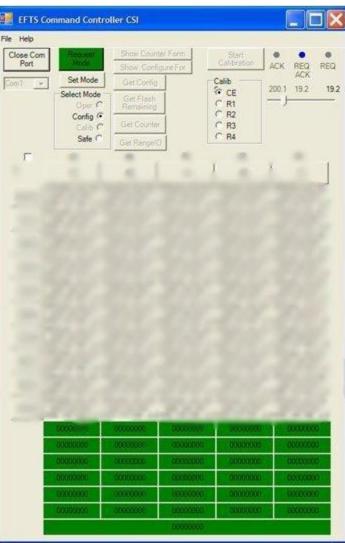


### EFTS Command Controller (AMRAAM)

- 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