Providing America
Advanced Armaments for
Peace and War

THE ARMY’S INDUCTIVE FUZE SETTER FOR EXCALIBUR

PRESENTED TO THE NDIA FUZE SYMPOSIUM
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Inductive Setting
Gun/Target Locations
GPS Data, Keys & Precise Time

PIK/EPIAFS
to Support
Excalibur XM982

▶ Add GPS capability to M1155 PIAFS
FUZE SETTER SYSTEM

- Platform Integration Kit (PIK)
  - Single board computer
  - GPS receiver & antenna
  - Auxiliary circuit
  - Cables
- EPIAFS
- L1/L2 Antenna
FSS BLOCK DIAGRAM

EPIAFS

XM982 & std fuzes

BA-5800 Lithium

GPS antenna

JLW-155

power

Fire control

Talin (IMU)

PIK

Aux pcb

SBC

GPS

AA Lithium

ZERO keys

GPS-153B ICD

PIK-Host System ICD

28v power

Reset
JLW-155

CLA
PIK

- 6 lbs
- 9”x7”x4” size
- 3 watts
- Lithium AA battery

SBC

Battery cap

GPS receiver

Auxiliary pcb
PIK ALGORITHM

Power applied

Initialize SBC

Wait for request from Host System
- receive fuze data
- set fuze when EPIAFS enter switch is pressed and return results
- interrogate fuze
- return PIK status
- return fuze history
- return GPS key status
- zeroize GPS keys
- return software version
- return BIT failure log

Establish links

Init GPS rcvr & EPIAFS

BIT: SBC, GPS, EPIAFS
PIK SINGLE BOARD
COMPUTER

- COTS: ADS “Graphics Master”
- 3 watts
- 32M flash
- 32M DRAM
- 7 serial ports
- Ethernet
- 5”x7” size
- LINUX OS
PIK GPS RECEIVER

- Rockwell Collins “MPE-S”
- SSI GRAM with SAASM
- 12 channel, L1/L2
- ICD-GPS-153C
- 1 pps & 10 pps
- 3.3 volts, 3 watts
- 3.5”x2.5”x0.6” size

Antenna
- 3.5” diam
- 0.7 lbs
EPIAFS Exploded View

- 4.5 lbs, 12”x4.5”x4.5”
- Alkaline or BA-5800
- 1 watt (+ 4 watts heater)
- Cabled XM982 & std fuzes, uncabled std fuzes

Faceplate assembly

Bumper

Cable to PIK connector

D cells

Battery cover & bumper
EPIAFS BLOCK DIAGRAM

BATTERY POWER

ON/OFF SWITCH

DC/DC CONV.

5V DC/DC CONV.

15V DC/DC CONV.

5V DC/DC CONV.

EEPROM & RESET

MICRO-CONTROLLER

A/D

RS-232 DRIVER

TEMPERATURE SENSOR

TEMPERATURE SENSOR

2.5 v ref

EEPROM & RESET

USER INPUTS

• INC
• DEC
• ENTER

RS-232 DRIVER

USER INPUTS

• INC
• DEC
• ENTER

LCD, HEATER, BACKLIGHT

PWM

TUNING CAPS

DAMPING

COIL DEMOD.

COIL DRIVER

STANAG COIL

STANAG COIL

RX CKT

XM982 COIL

VCC

15 VOLTS

15 VOLTS

PIK SW 28 v

PIK SW 28 v

PIK- EPIAFS comm.

PIK- EPIAFS comm.

XM982 pwr/data
EPIAFS XM982 DATA CIRCUIT

XM982 TX/RX data format

3 power pulses + data burst = 112 us

1 ms continuous power pulses

10 PPS

DATA TO COIL

CTS TO PIK

DATA FROM PIK

DATA TO PIK

DATA FROM COIL
FSS POWER CONSUMPTION

• Fuze setting off (GPS functional for Talin): 3 watts
• Fuze setting enabled
  – standby: 8 watts (13 watts cold)
  – set std fuze 3 sec: 9 watts (14 watts cold)
  – set Excalibur 3 sec: 95 watts (100 watts cold)

• EPIAFS uncabled
  – standby: 0.4 watt (4.4 watts cold)
  – set std fuze 3 sec: 1 watt (5 watts cold)
PIK DEMO
PIK - PROJECTILE DATA MESSAGES

• Time Mark Message (TMM) and Projectile Control
• TMM and Crypto Keys
• TMM and Target & Gun Data
• TMM and Ephemeris (min. 4)
• TMM and Almanac
• TMM and Subframe Data
• TMM and Projectile Control
• TMM and Final Projectile Status Request
EXAMPLE 100 ms PIK TO PROJECTILE MESSAGE FRAME

• Sense when Time Mark Pulse arrives
• Read Time Mark Message from GPS receiver
• Send Time Mark Message to Projectile
• Send Target and Gun data to Projectile
• Request a Status Message from Projectile
• Receive and Process the Projectile Status
PLANS

• Finish baseline EPIAFS software
• Complete testing PLD design
• Integrate PLD with coil driver circuit
• Design & build 12v reg and 24v switch
• Demonstrate PIK/EPIAFS brass-board
• Update PIK & EPIAFS design
• Convert EPIAFS software to new micro
• Deliver prototype setters
• User human factor evaluations
• Assist PIK integration in JLW-155
• Test PIK with prototype Raytheon GNC
CONCLUSION

• PIK Demonstration
  – XM982 data and power inductive interface
  – Initialized projectile simulator
  – Validate PIK baseline software
  – First interface with Talin
• Host & XM982 interface testers
• Draft ICD’s
• FSS Prototype packaging