



MK 432 MOD 0 ET Fuze

47th Annual Fuze Conference

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MK 432 MOD 0 ET FUZE OUTLINE



- Objectives
- Program Plan
- Weapon System
- Design
- Technical Experiences
- Summary
- Conclusion





MK 432 MOD 0 ET FUZE OBJECTIVES



- **Develop, qualify, and produce an electronic time fuze for use with the MK 45 5” gun weapon system for use on cargo projectiles.**
- **Maximize commonality with the Army’s M762A1 fuze.**





MK 432 MOD 0 ET FUZE PROGRAM PLAN



- **Customer: Naval Surface Warfare Center, Dahlgren**
- **Program manager: PM4 NSWC, Crane**
- **Strategy: Modify M762E1 Materiel Change Program (MCP) contract with L3-BT Fuze Products to incorporate MK 432 MOD 0 effort**
- **Phase 1: Design Qualification**
- **Phase 2: Production**



MK 432 MOD 0 ET FUZE PROGRAM PLAN

- **IPT: Used existing TACOM-ARDEC M762E1 MCP IPT with addition of Navy personnel**



TACOM-ARDEC



NSWC-Dahlgren



communications

BT Fuze Products Division

L3-BT Fuze Products

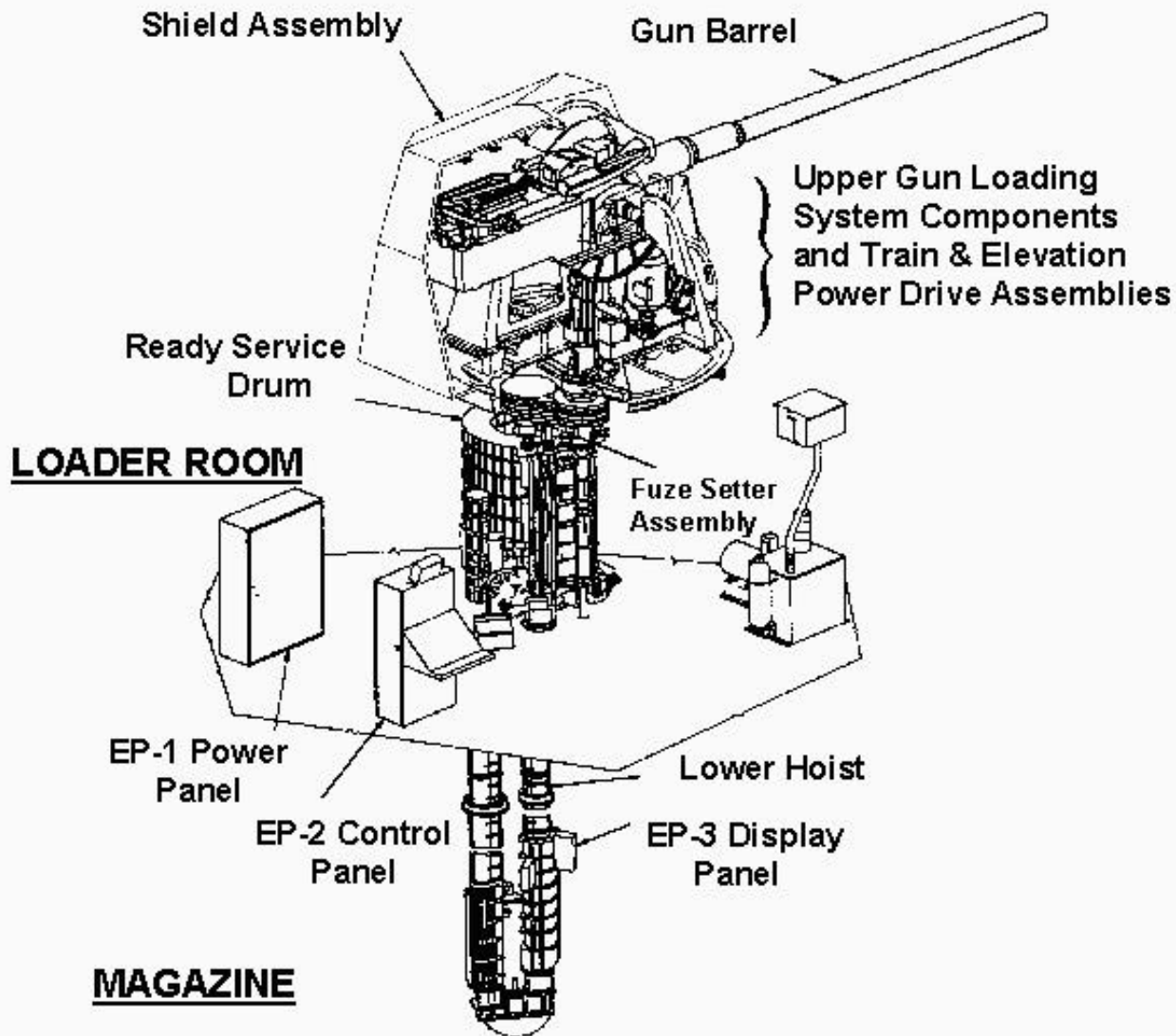


MK 432 MOD 0 ET FUZE 5" GUN





MK 432 MOD 0 ET FUZE 5" GUN





M762A1 & EX 432 MOD 0 ELECTRONIC TIME FUZE



- 155mm and 105mm projectiles
- Auto settable and hand settable
- Time mode and impact mode settings



- Based on M762A1 platform
- 5” projectiles
- Auto settable
- Time mode settings.





MK 432 MOD 0 ET FUZE DESIGN CHANGES



- **Eliminate Point Detonation (PD) capability**
- **Eliminate handset mechanism**
- **Activate battery on launch**
- **Change the setting precision - .1 s to .01 s**
- **Modify inductive setting capability**

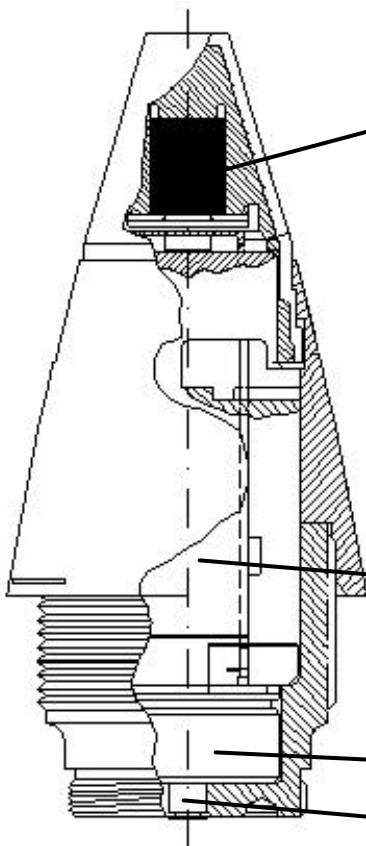




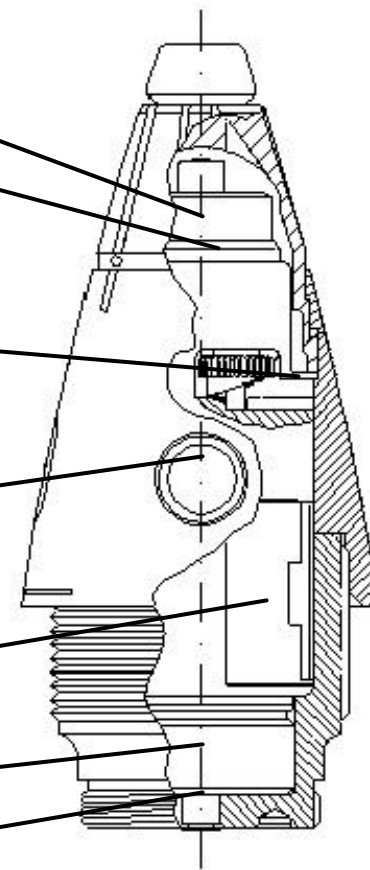
MK432/M762A1 CUTAWAYS



MK 432 FUZE



M762A1 FUZE



- Coil
- PD Contacts
- LCD window
(not shown)
- Push button
(to set fuze)
- Power supply
- Housing
- S&A
- Lead





MK 432 MOD 0 ET FUZE Activate Battery on Launch



- **Different mission – a set fuze may not be fired**
- **Dual independent battery activation schemes**
 - **Mechanical – Set back drops an actuating rod to release a firing pin into the battery primer.**
 - **Electrical – Upon spin switch closure the battery primer is activated electrically**





MK 432 MOD 0 ET FUZE

Fuze Power: pre-battery activation



- **Power provided by the inductive set carrier**
- **Power stored on capacitors before launch.**
- **Power saving sleep mode.**
 - **Carrier removal induces “sleep”**
 - **Launch “wakes up” fuze**





MK 432 MOD 0 ET FUZE Precision Change



- **From 0.1 to 0.01 seconds**
- **Needed for High Speed Maneuvering Surface Targets**
- **Replaced the 163.84 kHz crystal with a 204.8 kHz crystal**
- **Modified the ASIC**

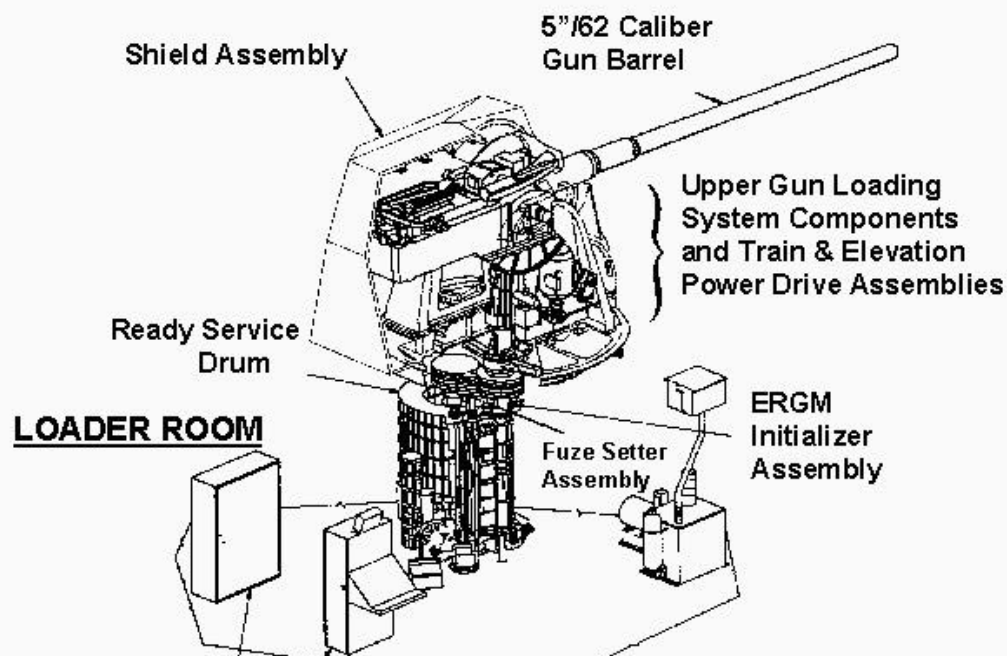




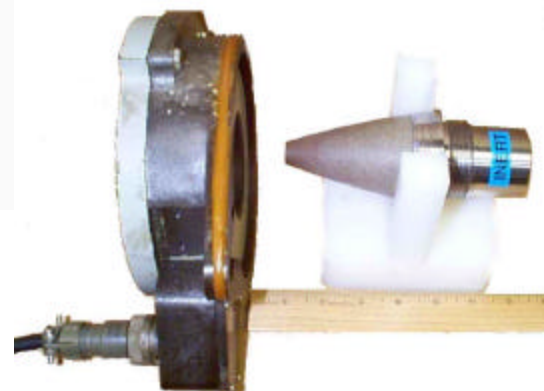
MK 432 MOD 0 ET FUZE Modify Inductive Set



- Location of fuze and coil
- Different message format



**M1155
(PIAFS)**



**MK 45 GUN
w/ MK 34 SETTER**



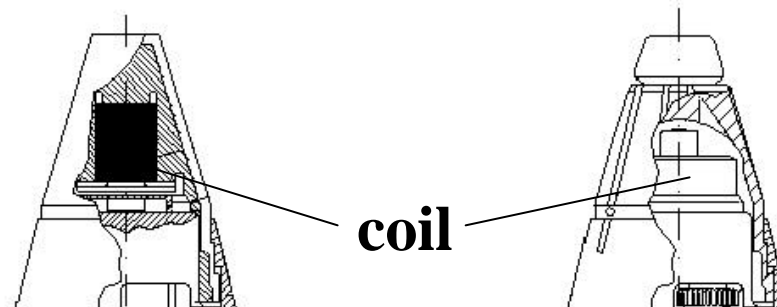


MK 432 MOD 0 ET FUZE

Modify Inductive Set



- Moved the fuze coil closer to the nose
- Added a ferrite core within the fuze coil
- Modified the ASIC



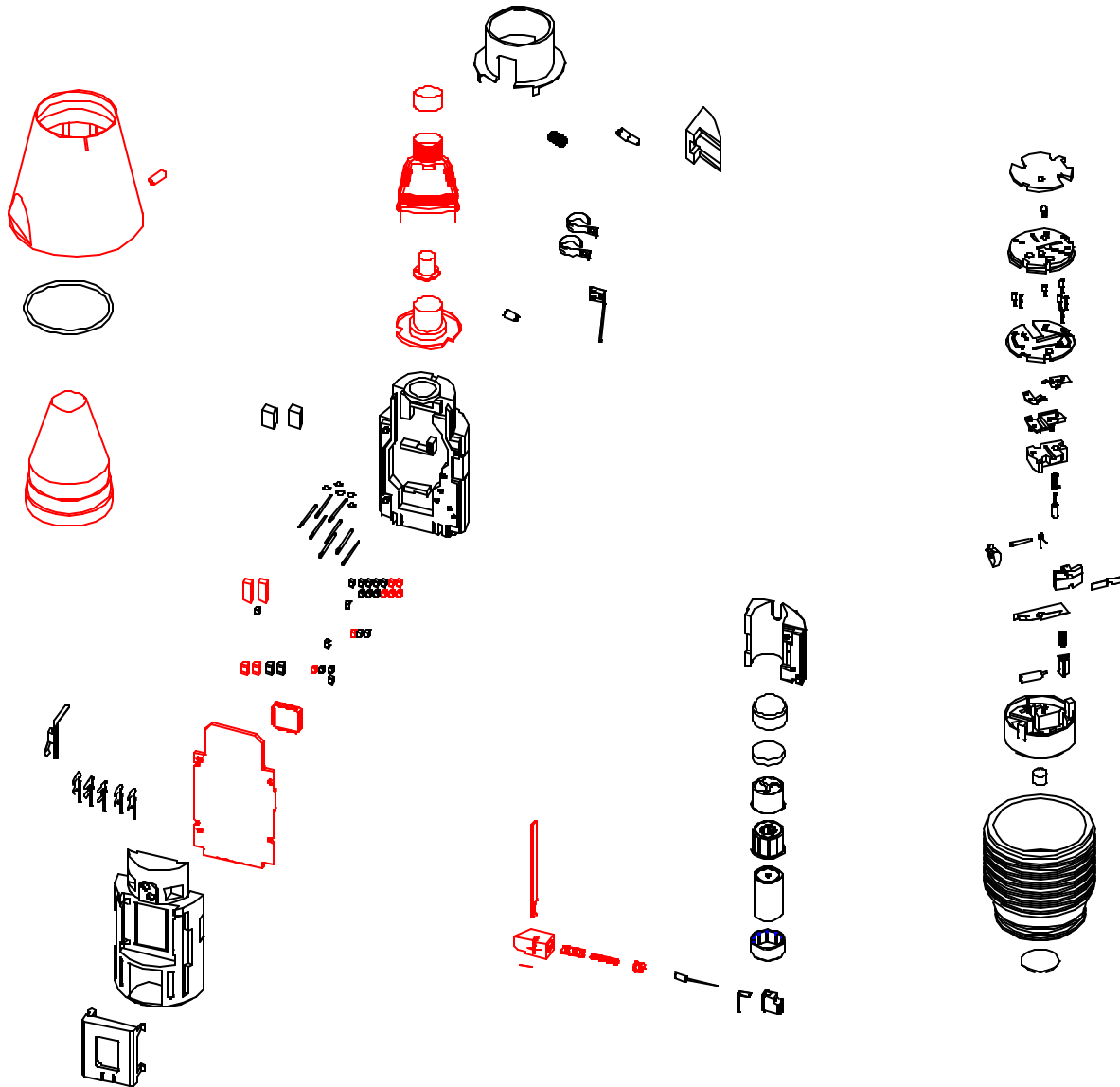


MK 432 MOD 0 ET FUZE M762A1 PARTS COMP.



Black:
M762A1/
MK 432
MOD 0
Common
parts

Red:
MK 432
unique
parts





MK 432 MOD 0 ET FUZE TECHNICAL EXPERIENCES



- **Crystals and Fuze wake-up**
- **Inductive Setter**



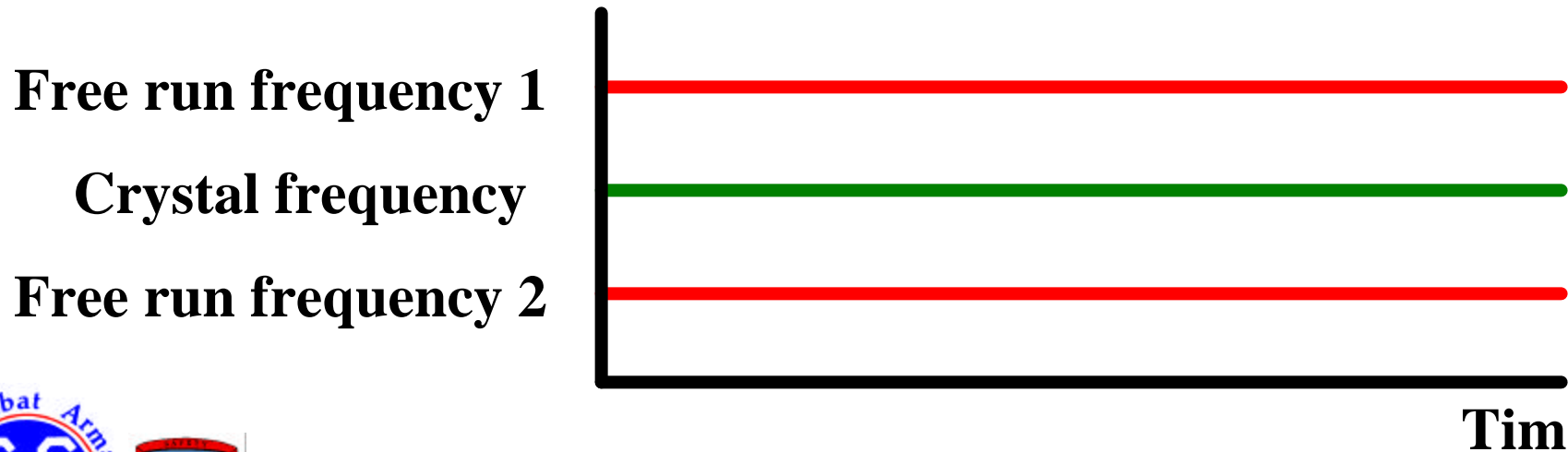


MK 432 MOD 0 ET FUZE

FUZE OPERATION



- **Dual crystals**
 - While in flight the frequencies of two crystals are compared.
 - Countdown stops if frequencies differ
 - Circuitry determines a “free run frequency” when a crystal is not oscillating

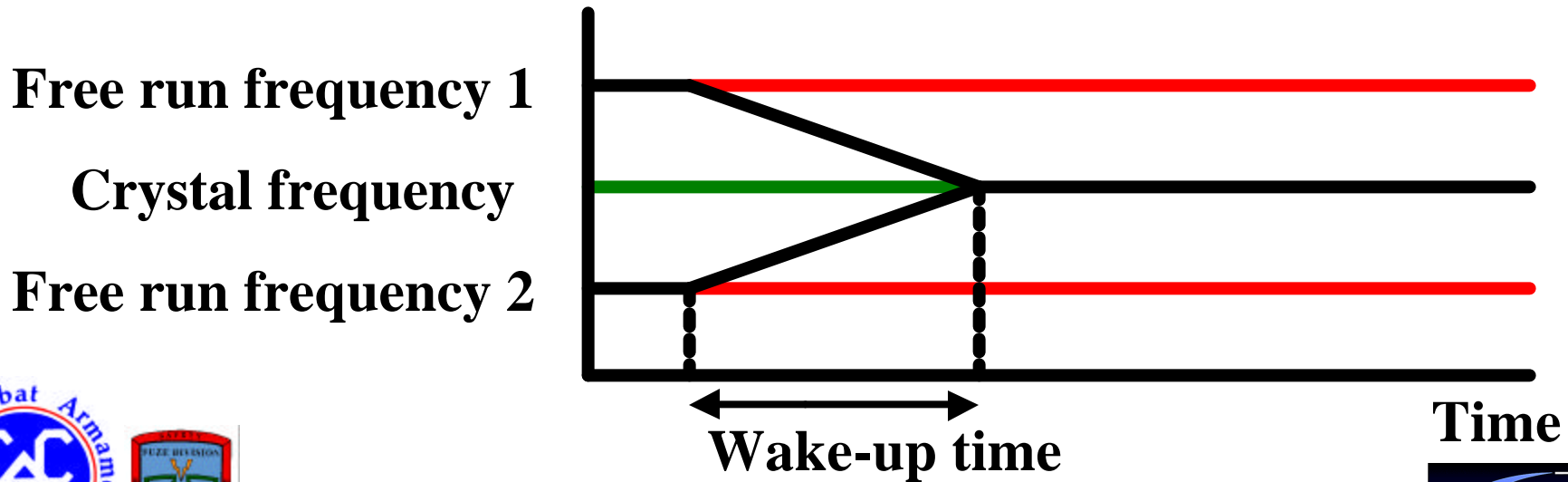




MK 432 MOD 0 ET FUZE FUZE WAKE-UP



- **Fuze wake-up**
 - During ASIC evaluation a delay was noticed when the chip exited from sleep mode into active mode.
 - Caused by transition from free run frequency to crystal frequency



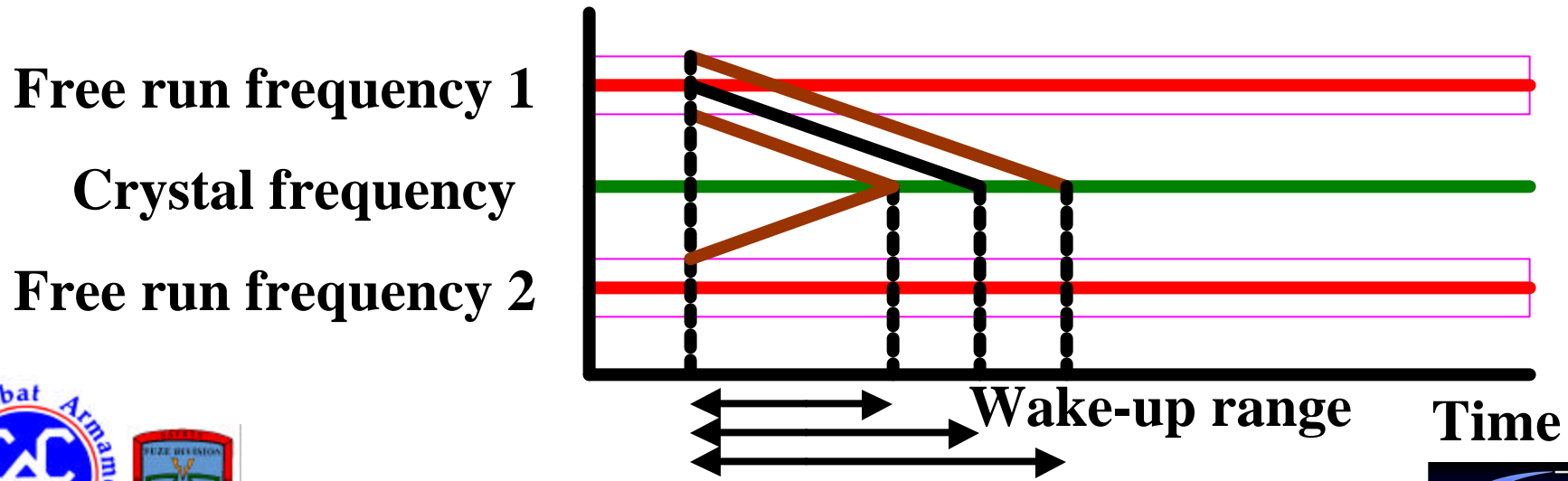


MK 432 MOD 0 ET FUZE FUZE WAKE-UP



- **Fuze wake-up**

- There is a tolerance associated with the free run frequency based on resistance in circuit.
- By moving resistors from inside the ASIC to the PWB, the tolerances were brought in.
- This made the wake-up time consistent

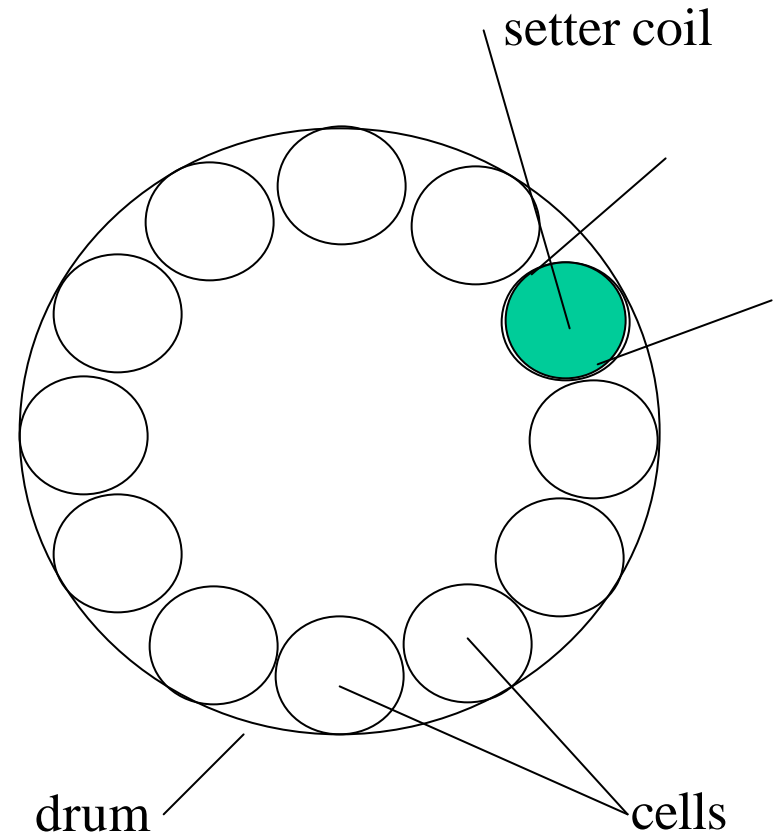




MK 432 MOD 0 ET FUZE INDUCTIVE SETTER

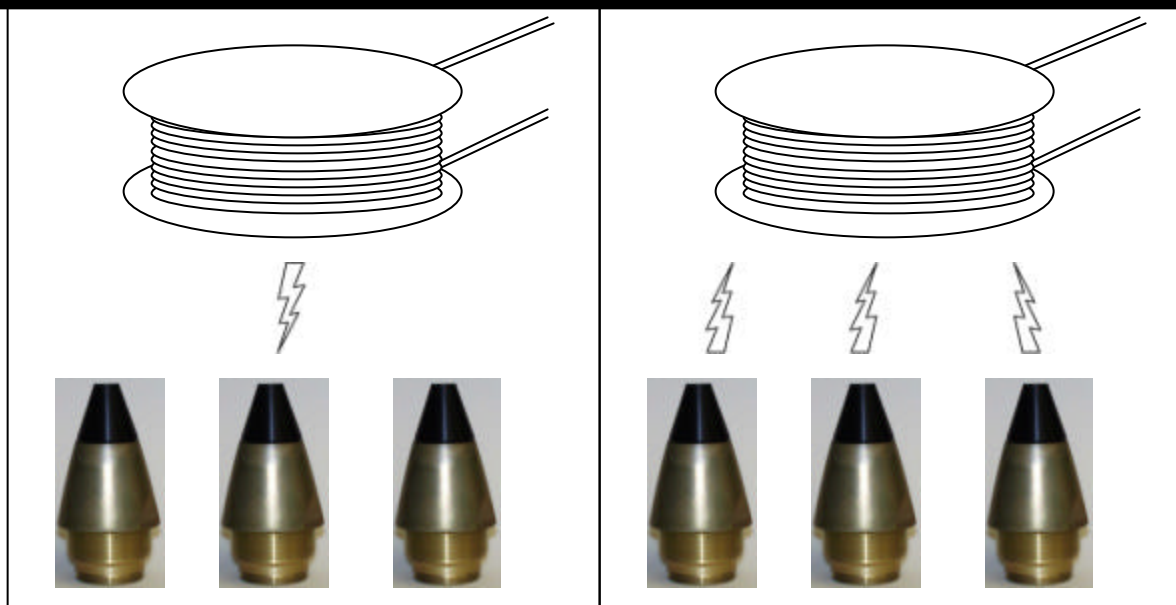


- **MK 34 inductive setter**
 - When a fuze is under the setter coil, the setter is constantly sending set information.
 - During testing it was noticed that a fuze would stop talking back after being under the coil for several minutes and be declared a dud by the gun control panel.





MK 432 MOD 0 ET FUZE INDUCTIVE SETTER



- Investigation revealed that with in the gun mount, where rounds and fuzes are in close proximity, multiple fuzes were talking to the setter.
- As a fix, a voltage divider was placed on the input of the chip that allows talkback





MK 432 MOD 0 ET FUZE SUMMARY



- **May 2000: Program Started**
- **June 2002: Design Qualification Phase**
 - Environmental (Trans, Thermal, E3, Drop, Leak)
 - Ballistic
- **November 2002: LAT**
 - Ballistic
 - Tear-down
- **November 2002: 14,212 MK 432 MOD 0 fuzes delivered to the Navy**





MK 432 MOD 0 ET FUZE CONCLUSION



- Quick fuze development program
- Successful cooperative effort between Army and Navy



MK 432 MOD 0



M762A1

