

Enhanced Weapon Arming Safety By Controlled Accumulation of Arming Energy

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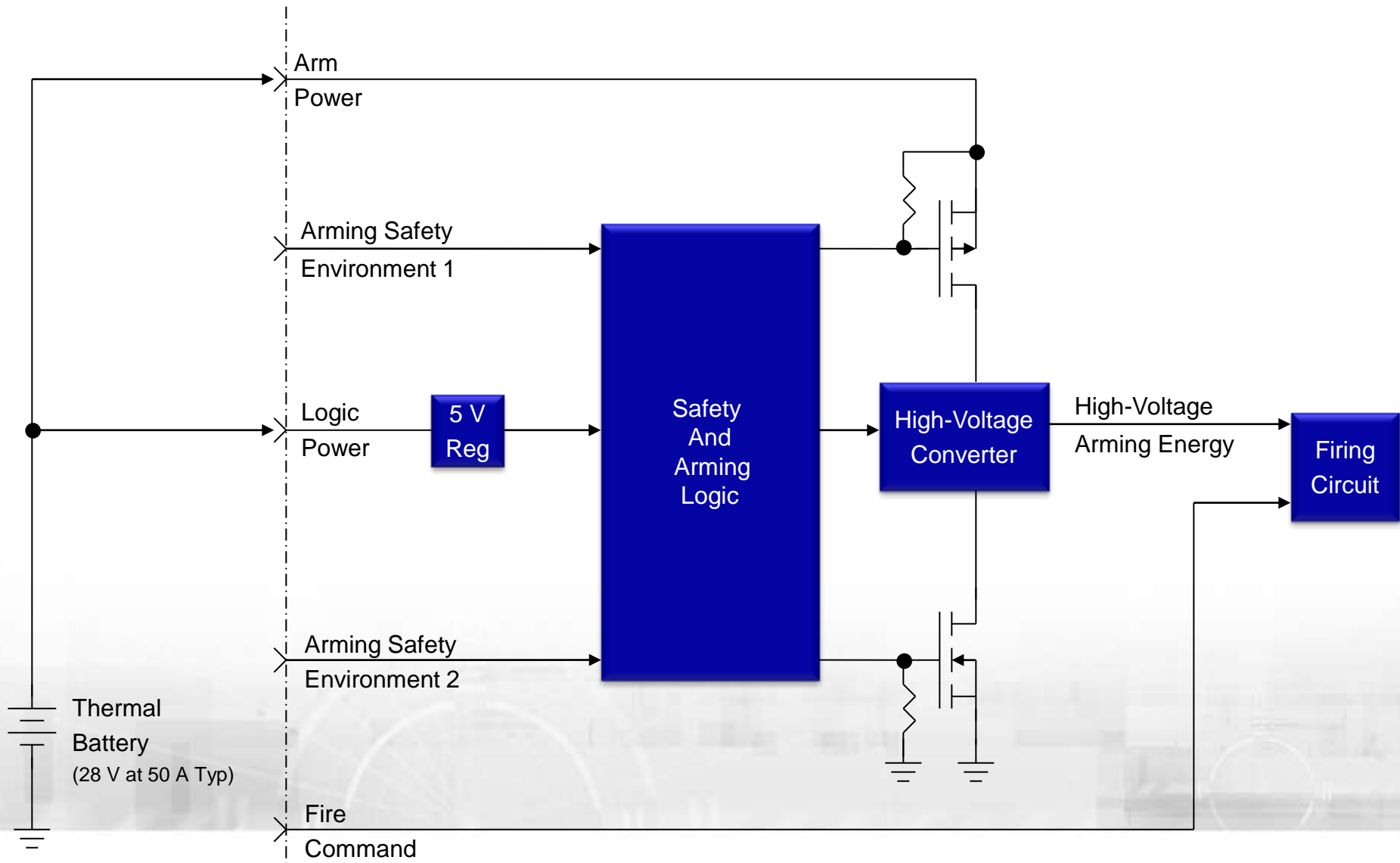
Problem Background

Statement Of Technical Deficiency

- Weapon system electronic safety devices define arming as charging of a high voltage firing capacitor to the all-fire voltage of the initiator (approximately 1.5 kV).
- Inadvertent or early arming is defined as a safety failure in MIL-STD-1316 and MIL-STD-1901.
- Most weapon systems use medium-voltage/high-power thermal batteries to power all subsystems.
- Thermal batteries have the power capability to immediately arm a safety device in the event of a sneak circuit or failed safety feature.
- The desired approach is to slowly accumulate arming energy from the environment, for example an FZU.

Current Weapon Arming Safety Architecture

High-Energy Source Applied at Start of Arming Sequence



Current Weapon Arming Safety Architecture

Summary of Issues

- Requires a high-power energy source to properly operate the safety device.
- The high-power energy source may be available to the safety device prior to safe separation.
- A sneak circuit from the high energy source to the arming circuit can cause an inadvertent or early arming condition.
- In a sneak circuit condition, the arming delay would be only a few milliseconds.

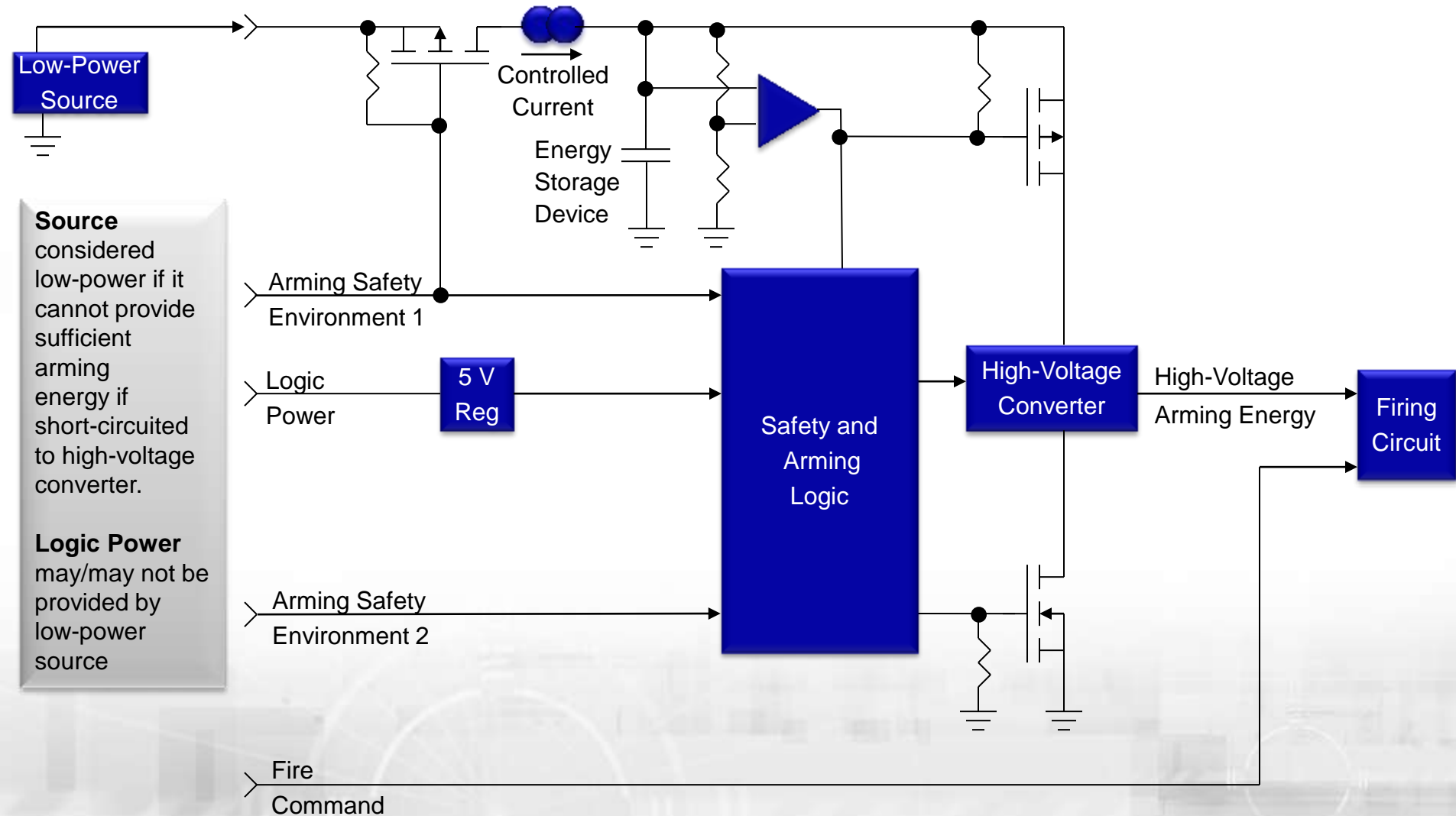
Enhanced Weapon Arming Safety Architecture

Potential Solution

- Provide power to safety devices from low-voltage/low-energy power sources.
- Accumulate the required arming energy over the safe separation time based on the application.
- Store the controlled accumulation of arming energy electronically to obtain the all-fire energy at the required rate.
- Utilize this stored energy to arm the safety device when all safety conditions have been achieved and arming is commanded.

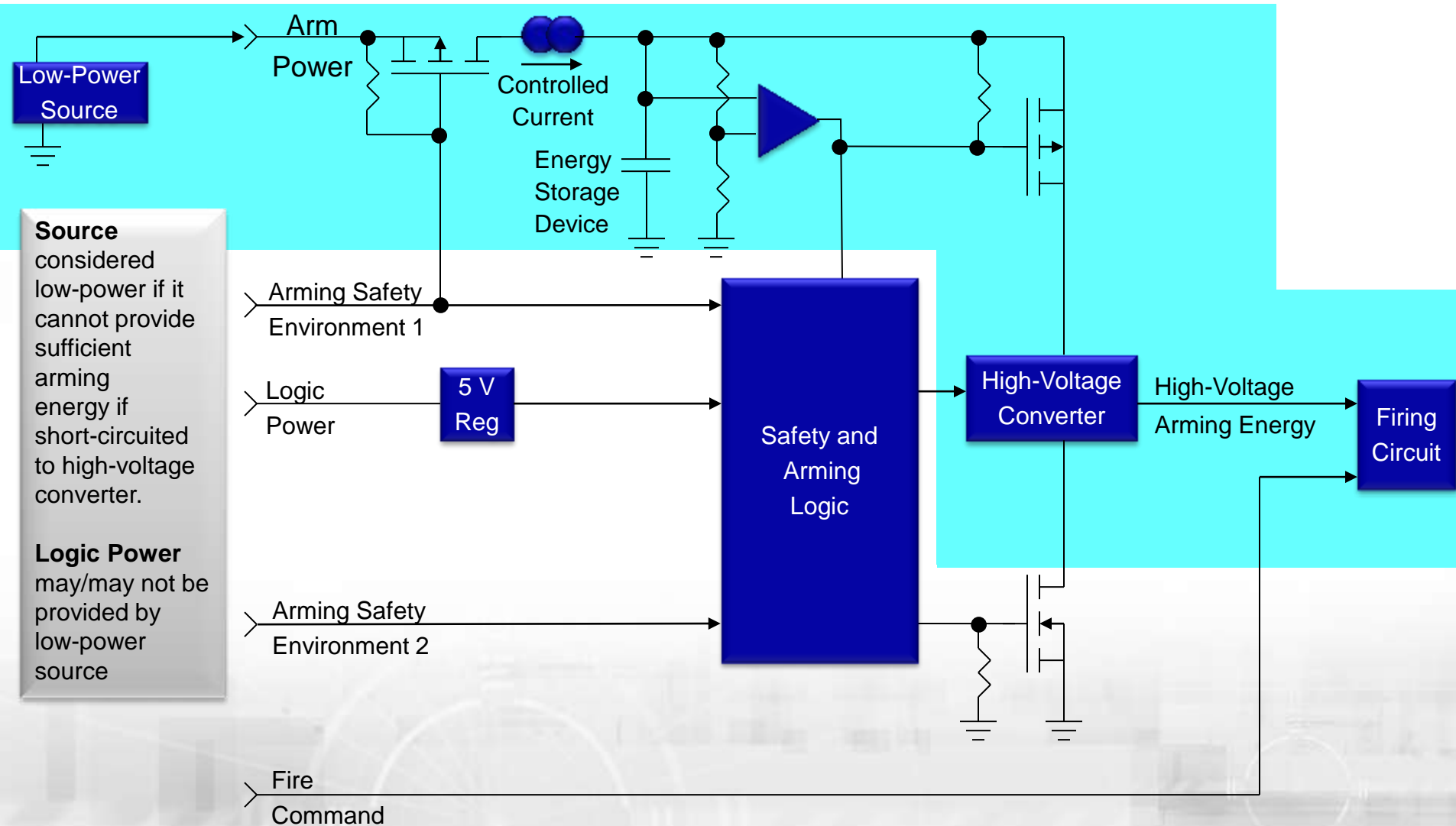
Enhanced Weapon Arming Safety Architecture

Controlled Accumulation Of Arming Energy



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Advantages

- Enhanced safety with operation from a low-voltage/low-energy source.
- Sneak circuit fault tolerant due to low-voltage/low-energy source.
- Accurate control of accumulation of energy via constant current source.
- Arming energy accumulated over time precluding unintended immediate or early arming.
- Removes requirement for high-power source for weapon arming.
- Circuit cannot be armed until accumulated energy is sufficient for proper arming.