IME
institute of makers of explosives
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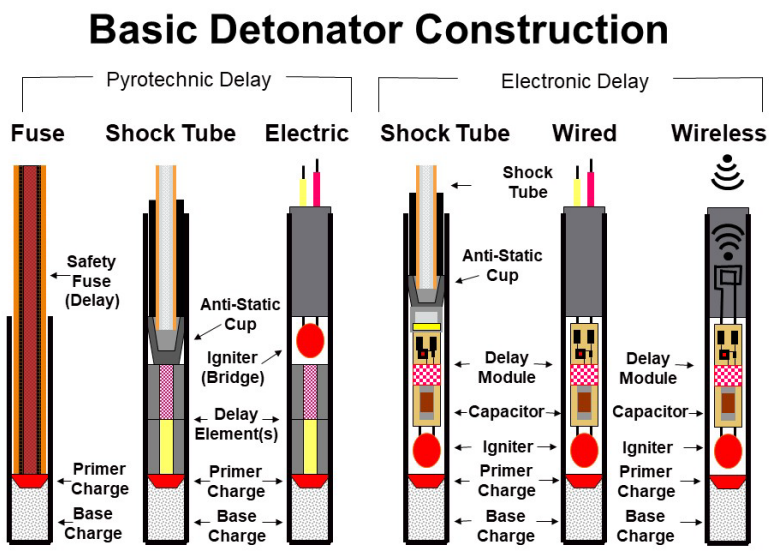
Electronic Blasting Initiation Systems (EBIS) Frequently Asked Questions for Regulators

What is an electronic detonator and how are they different than electric detonators?

A typical commercial electronic detonator can sometimes be confused with a commercial electric detonator since the construction of the detonator shell, bushings, and leads can be generally the same physical shape and size. A key difference between the two technologies is that in most all cases, an electronic detonator will incorporate a connector on the end of the wire leads to facilitate reliable connections as opposed to only stripped and shunted wires found on electric detonators.

Electronic detonators may use an aluminum shell or a copper alloy shell depending on the application or manufacturer, but the overall appearance will be similar to any commercial unit. The length of electronic detonators can vary from manufacturer to manufacture, but the outside diameters are generally the same as all other standard commercial detonators (electric and nonelectric).

The internal design and construction of an electronic detonator is what differentiates this technology from all others because the delay timing is provided by a circuit board and microchip technology versus a pyrotechnic delay composition which is generally jacketed in a steel or metal sleeve. The specific construction will differ from manufacturer-to-manufacturer, but one unifying characteristic of all electronic detonators is the existence of a circuit board populated with electronic components in addition to an application-specific integrated circuit (ASIC) or microchip/microprocessor.



An electronic detonator typically has several different forms of protection built into the design, e.g. spark gaps devices, internal electronic shunts, input resistors, etc., in addition to the fact that a circuit board physically separates the leads from the "match head." Because of the built-in electronic protection devices and the physical separation of the match head from the external lead wires, electronic detonators are much less sensitive to extraneous energies. Generally, electronic detonators cannot be fired from common energy sources such as car batteries, wall circuits, static, stray current etc.

How are electronic detonators transported and stored?

As with any detonator or initiation technology, the same recommendations apply for the transportation and storage of electronic detonators.

Will radio frequency energy (RF) interfere with electronic detonators?

Although RF energy may interfere with the communication of these systems, extensive testing by the manufacturers and independent laboratories have verified that electronic initiation systems manufactured by IME member companies will "fail to a safe" mode even if exposed to RF levels that exceed levels typically experienced in mining, quarrying, and construction applications.

To help clarify risks associated with RF energy sources and detonator technologies, IME has developed a suggested warning for equipment manufacturers, i.e., that **electric detonators** are clearly at risk of premature initiation from RF energy sources, and users should recognize and apply safe distances outlined in SLP 20, *Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps)*. It is important to note that SLP 20 does **NOT apply to electronic detonator technologies.**

EBISs provide not only a high level of immunity from premature detonation due to their design and construction (as discussed above), but also provide a high level of resistance to potential interference sources. However, not all electronic systems use the same construction and design concepts to provide this protection. Users should read and understand all aspects of the system they use and follow the manufacturer's recommendations.

What precautions should be taken regarding use of electronic detonators during the approach and duration of electrical storms and lightning?

As with any detonator or initiation technology, the same recommendations apply for the approach of electrical storms and lightning.

How do you shunt electronic detonators?

In an *electric* detonator, the term "shunt" refers to a closed-loop circuit through the matchhead/fusehead. An electronic detonator typically has several different forms of protection built into the design, e.g. spark gaps devices, internal electronic shunts, input resistors, etc., in addition to the fact that a circuit board physically separates the leads from the "matchhead." It is inherently shunted internally through design of the ASIC or the integrated circuit (contained within the delay module illustrated above) and therefore much less sensitive to extraneous energies. All currently available electronic detonators manufactured by IME members and used in North America are shunted in this way.

How to you test electronic detonators?

Electronic and electric initiation system technologies vary significantly in the manner a detonator can be tested in the field prior to use. Users of electric detonators are familiar with the use of a "Blaster's Galvanometer" to test for continuity as well as the level of resistance for each detonator and branches and circuits that are used while tying in a blast.

The electronic bench testing unit which often may be called a "logger", "tagger", or "programmer" unit by individual manufactures, will provide the user with circuit tests to ensure communication with the detonator (wire breakage, leakage ranges, circuit board test protocols, match-head existence), as well as facilitating the programming of delay times and sequences of individual detonators. The methodology, sequence and type of communication varies between manufacturers due to proprietary technologies, but EBISs, using on bench testing and programming equipment ("on bench testers"), provide a much higher level of information and communication capability than conventional electric or nonelectric initiation systems.

It should be noted and understood by users that all on bench testers are designed so that that electronic detonator testing and communication is done at a voltage and current level that is below the level needed to charge and fire the detonator. The tester, by design, does not have the capability to produce or deliver a high enough energy to fire a blast or a single detonator. This design feature, as well as the other detonator design features, make electronic detonators nearly impossible to accidentally fire from extraneous electrical energy found in normal mining, quarrying and construction activities, and provides users of EISs the highest possible level of safety and security.

How do you fire electronic detonators?

Electronic detonator blasting machines are the only devices designed to provide password protection, programming capability, and the energy levels needed to charge the detonators in a circuit and send a fire command. It is the charging capability of the blasting machine that sets the units apart from all other field equipment used for electronic detonators. Users must ALWAYS clear the blast area of personnel, vehicles and equipment prior to hooking up to the firing device or blast controller. Refer to IME's SLP 4 for other electronic initiation system ALWAYS and NEVERS.

Many systems will require both password protected firmware and/or software interfaces for the user as well as a physical key or manual device to ensure no accidental firing can occur. As mentioned above, each system is specific to a manufacturer's design, and users must understand and follow all protocols to ensure reliable, safe and secure use of electronic blasting machines.

Where can I find out more about electronic detonators?

IME has developed and incorporated several references, guidelines, and recommendations for the safe use of electronic detonators for commercial blasting operations. Users of these products are encouraged to review, understand and, unless otherwise instructed by the system manufacturer, follow these recommendations. These recommendations can be found on-line at www.ime.org.

- "Electronic Blast Initiation Systems (EBIS) Guideline: General User Information for Mining, Quarrying and Construction Applications"
- SLP 3 "Suggested Code of Regulations for the Manufacture, Transportation, Storage, Sale. Possession and Use of Explosive Materials"
- SLP 4 "Warnings and Instructions for Consumers in Transporting, Storing, Handling and Using Explosive Materials"
- SLP 17 "Safety in the Transportation, Storage, Handling and Use of Explosive Materials"
- SLP 32 "Safety in the Transportation, Storage, Handling and Use of Oilfield Explosive Materials"