



DELAYING EBW DETONATORS

Recently, a customer called with the problem of initiating a number of EBW detonators, each of them 50 microseconds later than the preceding one. Whereas one of the major advantages of EBW's is their rapid function time, trying to delay an EBW can be difficult. We manufacture a Time Delay unit for use with the FS-10 (P/N 188-7282) and the FS-17 (PN 188-7332) for delaying a few detonators, but trying to delay large numbers can be expensive.

In working with this customer, we developed a somewhat unique method of delaying or firing groups simultaneously at various delays for almost any quantity of EBW detonators.

The method uses any one of the many "cord" type of initiating lines such as MDF, Primacord, linear shaped charges or even strips of Detasheet to close a switch. Since most of these explosive cords detonate at a rate of 6 to 7 millimeters per microsecond, each millimeter of length can be used to delay a switch closure by about 155 nanoseconds or about 4 microseconds per inch. Fig 1 shows a schematic for firing two detonators with a delay of approximately 50 microseconds between the two det outputs.

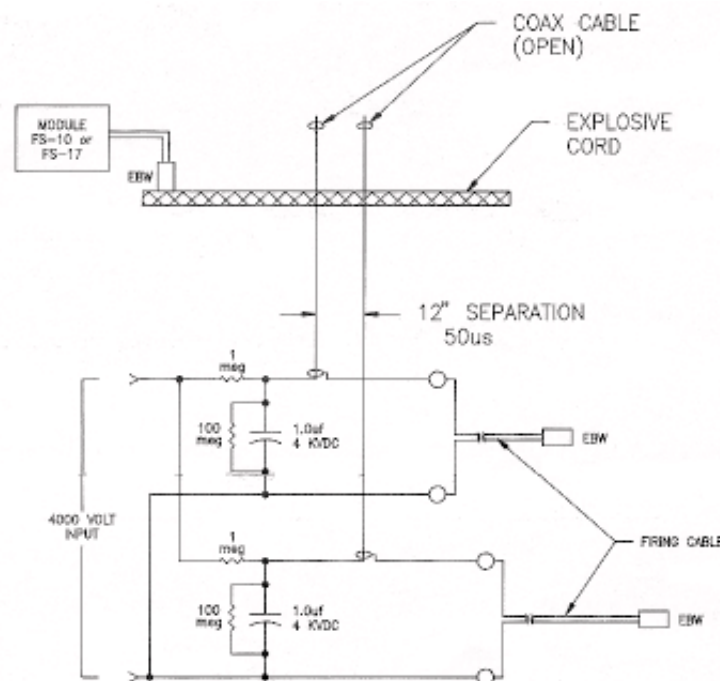


FIGURE 1

The "switch" works by the explosive cord crushing or cutting the insulation between the coax center conductor and the braid, thus completing the circuit i.e. the electrical path is out the center conductor and back on the braid. Obviously, prior to firing the end of the coax must be an open circuit. Delay time can be easily adjusted by varying the distance between the two cables on the explosive cord.

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As many channels as there are required delays can be stacked and charged from a single power supply. Any one channel can also be used to fire a number of EBW detonators simultaneously in series or parallel as described in the RISI general catalog.

RISI maintains a stock of 1 microfarad capacitors (PN 188-4521) suitable for these types of tests. Call or e-mail for price and delivery.

Hints:

- Place the cables to be crushed on wood, plastic or some other dielectric to prevent arcing to ground. Fasten securely to this base material to provide an “anvil” effect for the crushing.
- After the cable is crushed, the braid becomes “hot” so it must be carefully insulated to prevent arcing to ground
- A few turns of wire around each of the firing cables will induce sufficient current to drive a counter or oscilloscope and provide an accurate record of the delay time.
- Some coax cables are so tough that plastic sheathed explosive cords will not easily crush the insulation. We found that a few turns of copper tape around the explosive cord provided sufficient mass to crush the insulation.

We have also used the same general method for firing EBW's on a test bed accelerating down a sled track. In this application, we charged an onboard capacitor before launch from a trackside power supply and allowed the coax crush switch to function by impact with the target or by impacting a wooden stake alongside the track.

The method described above allows experimenters to take advantage of an EBW Detonator's inherent safety and repeatability while still providing an easily adjustable method for delaying detonator function times.

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