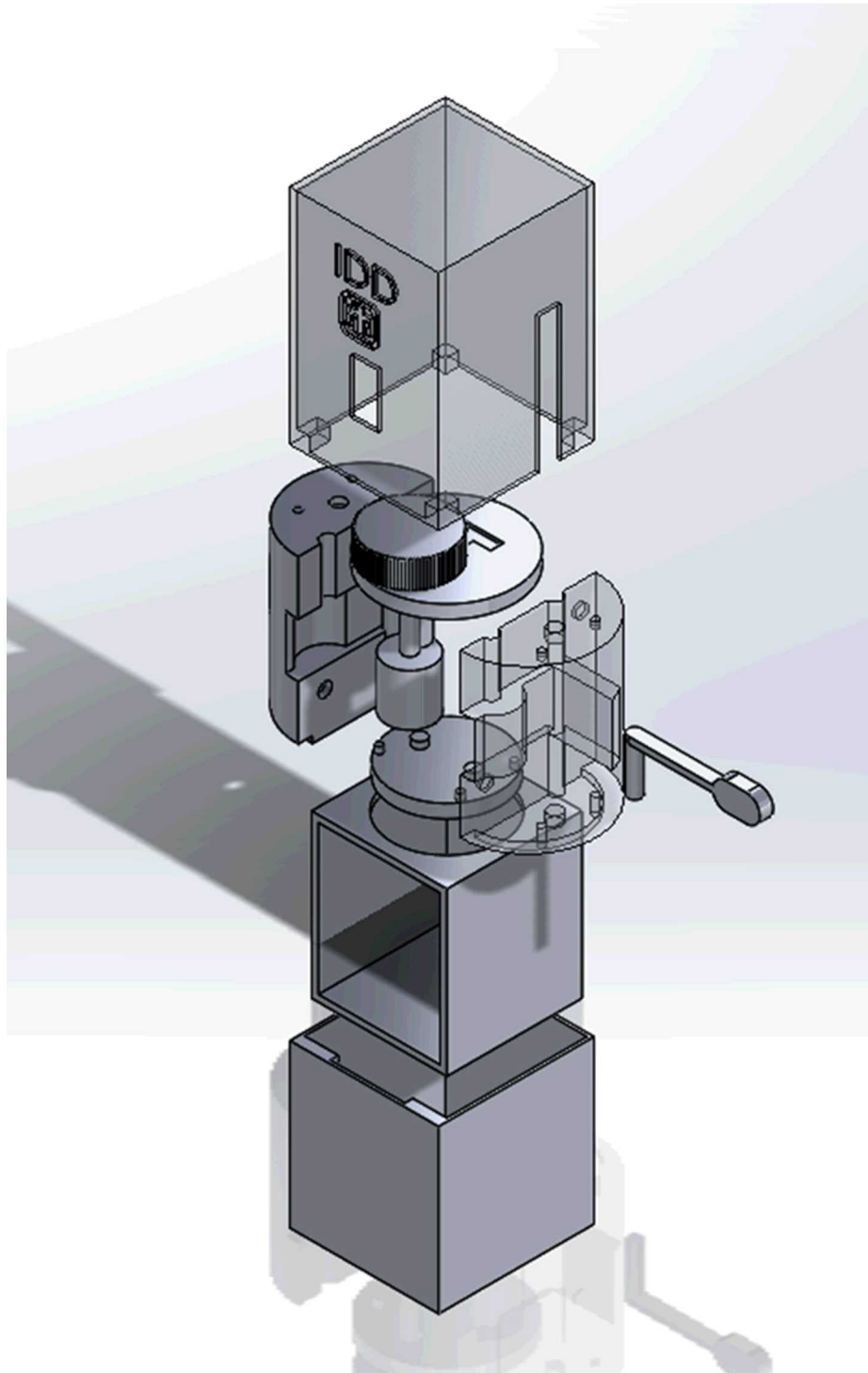


In-Device Delay (IDD) Irradiator Demo

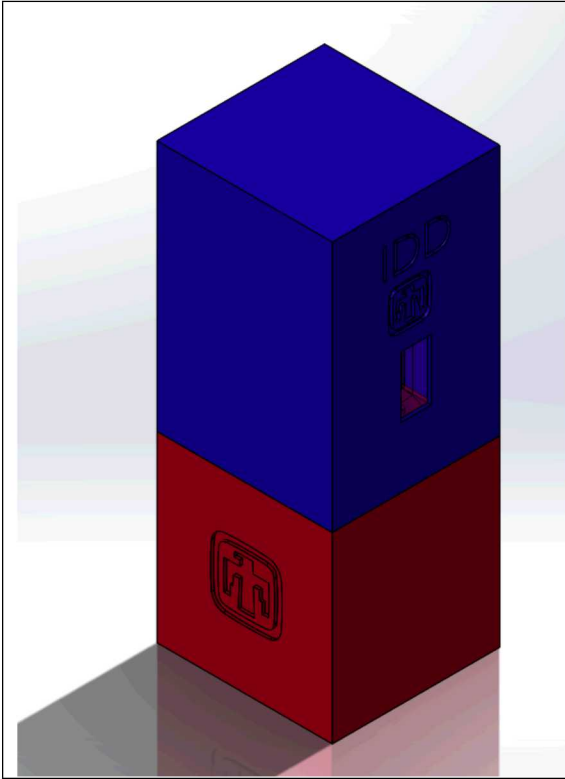


- The IDD LG-1000 is a mock blood irradiator used as a teaching tool to show
 - How a typical blood irradiator functions underneath the covers and lead

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- How attack pathways and hardening concepts are evaluated protecting irradiators

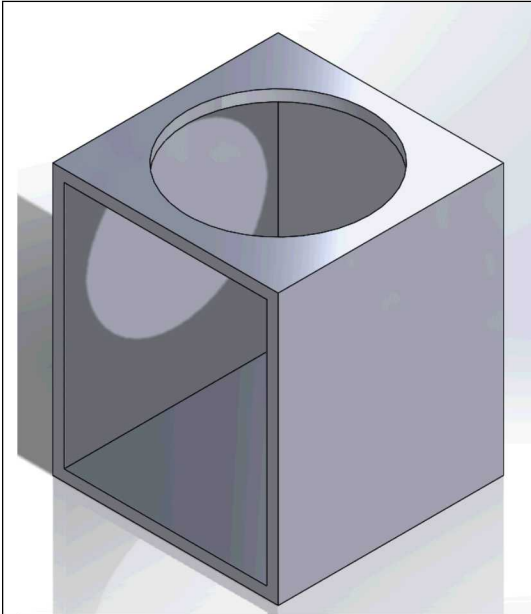
- Irradiator Panels



Irradiators generally have several fiberglass, plastic or metal panels that cover machine components and add operator interface. These cover panels are usually attached with machine screws or plastic clips.

The IDD LG-1000 demo model has two panels an upper panel (blue) and a lower panel (red).

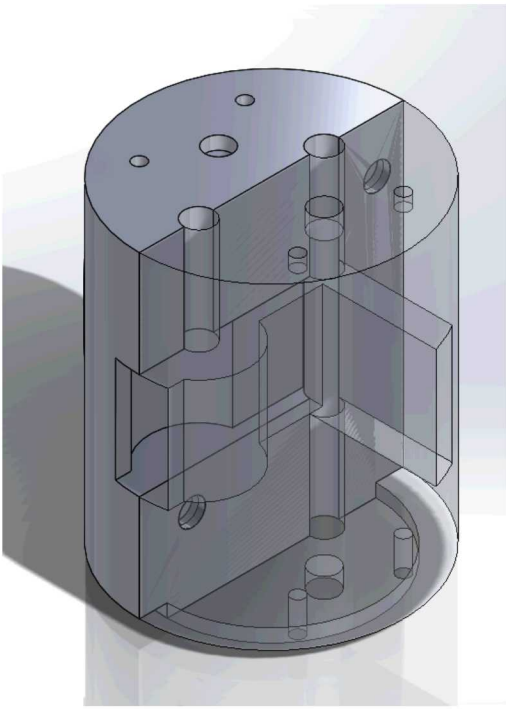
- Irradiator base



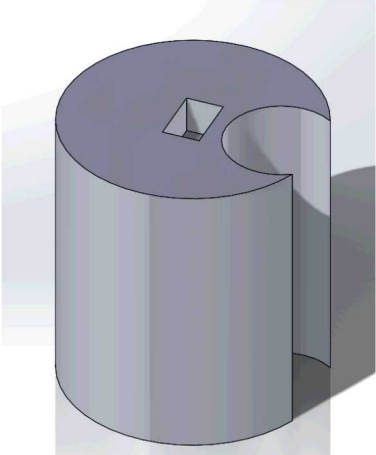
The base of the irradiator is typically made of steel and acts as a structural component to support the weight of the lead shielding.

The base of the irradiator may house electronic or mechanical systems for the irradiator or act as a storage location.

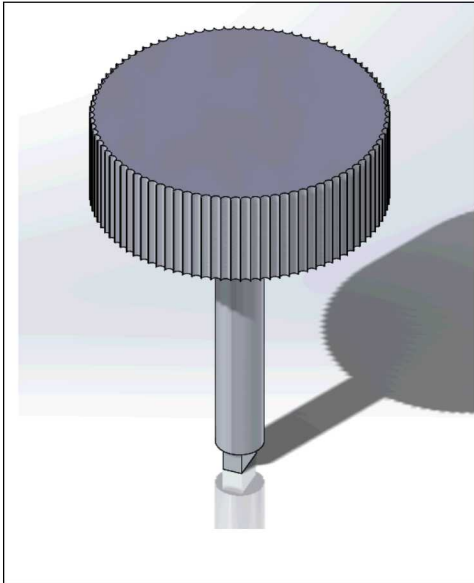
- Lead shielding

	<p>To protect operators and the public from excessive radiation exposure, the cesium-137 sources are encased in a lead cylinder. The irradiation chamber is located in this area of the device.</p> <p>The shielding of the demo model can be split in half to better visualize the inside workings of an irradiator. There is a large opening in the right side of the shielding. This is so that the model cesium pencil can be operated by hand and does not normally exist in real irradiators.</p> <p>The opening on the front of the irradiator is sample chamber, where the blood containers are loaded. The blood is spun to face the opening 180 degrees from the front where a pencil is raised to irradiate the blood.</p> <p>There are two deep holes in the top of the lead shielding the first goes all the way through the machine. This is where the pencil is stored. These openings are generally closed with lead plugs. The second hole is for the mechanical system to rotate the blood carousel.</p>
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- Carousel

	<p>The carousel is a lead cylinder where the blood containers are placed. The blood containers are also cylindrical</p> <p>For the LG-1000 Model Jolly Ranchers/tootsie rolls can be used in the place of blood containers. The square hole on top is for the Rotator knob which acts as a representation of the mechanical systems of the LG-1000</p>
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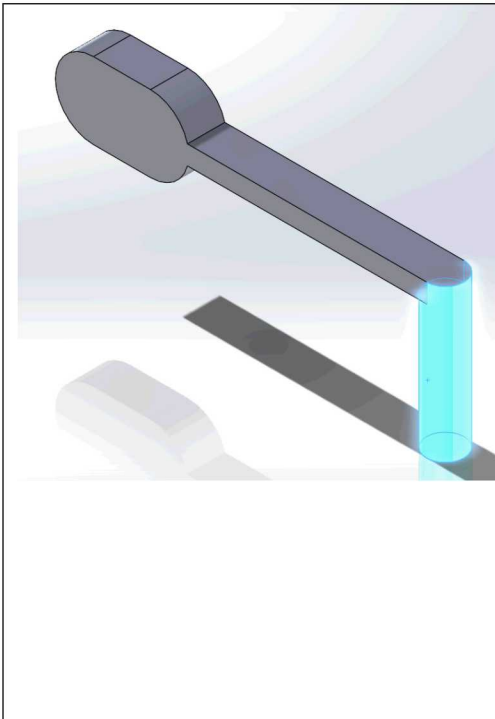
- Rotator Knob



Irradiators have a mechanical system to rotate the carousel. This mechanism may be direct drive, chain drive, gear drive, or belt drive, and may be located above or below the irradiators shielding.

This rotator knob is a simulacrum of the mechanical system

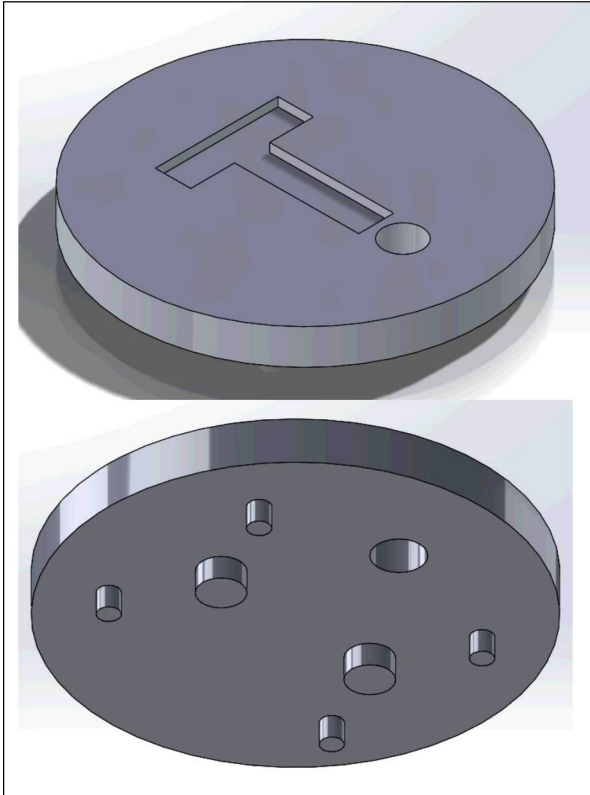
- Cesium Pencil



Cesium-137 cesium chloride sources are contained in double encapsulated in steel pencils and can have activities up to 3000 curies (111 Terabecquerels). These pencils are generally about a foot long (0.3 meters). Pencils may be moved into position, or may be statically installed into an irradiator.

The LG-1000 pencil is highlighted in blue here. The remaining portion, the handle acts as a simulacrum of the pneumatic, electrical or mechanical method of actuating the pencil.

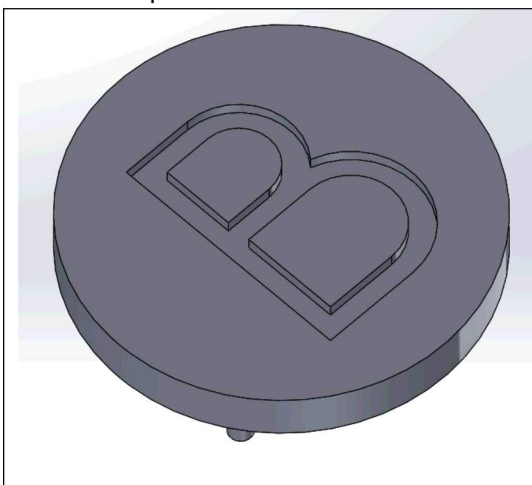
- The Top IDD plate



The IDD program creates plates to protect the cesium-137 pencils by adding delay to the irradiators. This is done by covering up attack pathways, adding security fasteners, and utilizing multiple layers of hardened materials to defend against multiple attacks. **The IDD plate is designed with the Irradiator manufacturer, doesn't inhibit maintenance or normal operation, and does not void the manufacturer's warranty.**

The LG-1000 top IDD plate protects against the top attack path. The top plate attaches so that the bottom of the T faces the opening of the irradiator. The hole in the plate allows for the rotator knob to pass through.

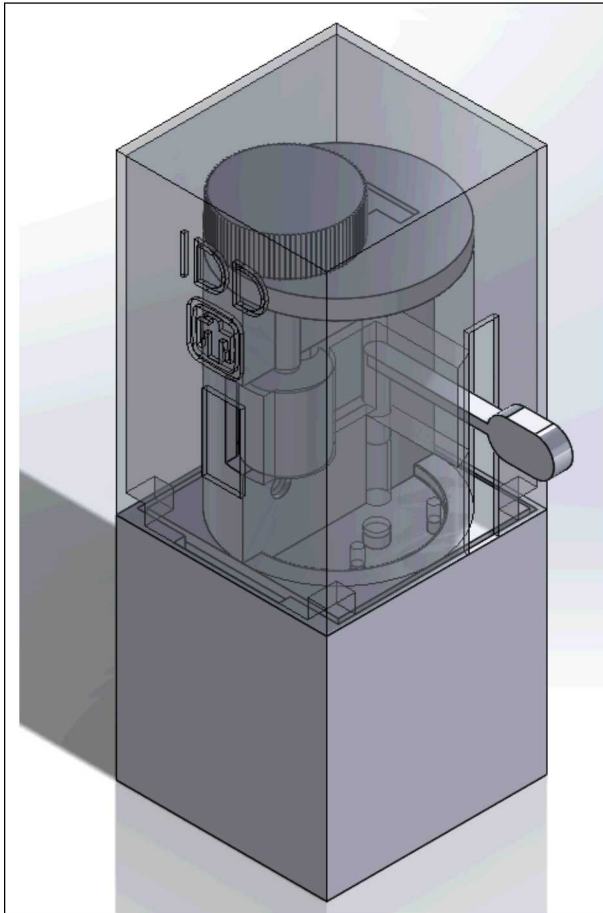
- Bottom IDD plate



Some Irradiators may have multiple attack pathways and may require multiple plates and/or upgrades.

The LG-1000 bottom IDD plate protects against the bottom attack path and can be attached with either the top or the bottom of the B facing the front of the irradiator.

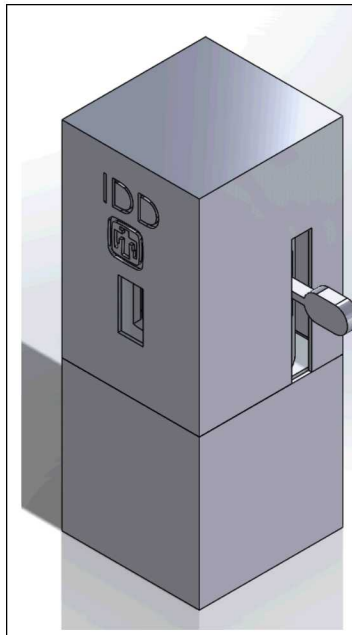
- Fully assembled Irradiator



Once assembled the irradiator should look like the figure to the left.

Attack Test #1 without IDD plates

- Step 1:

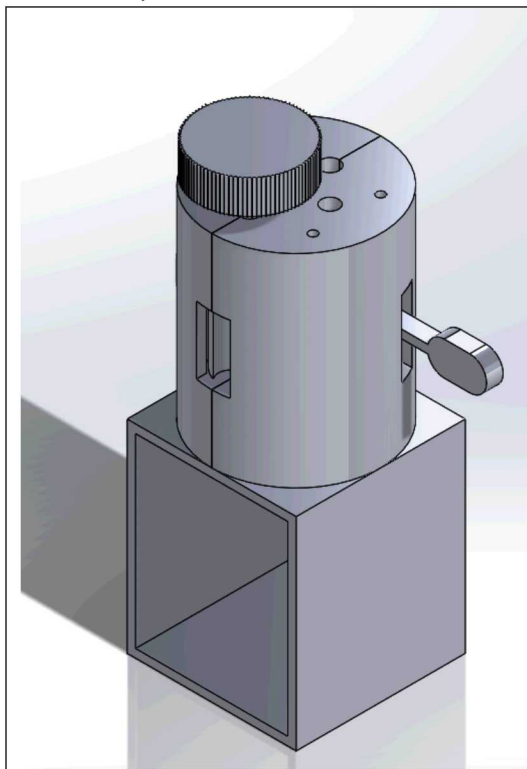


Assemble the irradiator without the IDD plates.

Ask a participant how long it takes to remove panels
Example answer: 20 seconds

Remove the upper and lower panels (the pencil may need to be temporarily removed in order to remove the lower panel)

- Step 2:



The Irradiator should look like the picture on the right. Point out that the only thing standing between the adversary and the pencil is a lead plug on the top and bottom.

Ask a participant how long it takes to remove the lead plug
Example Answer: 1 minute

Now the source is exposed

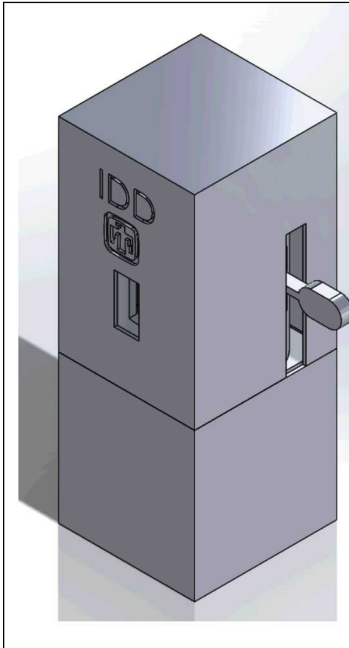
Ask a participant how long it takes to remove the pencil from the machine?
Example answer: 1minute

The UUR attack time (based off the examples) can be calculated

Example: 2 minutes and 20 seconds

Attack Test #2 with IDD plates

- Step 1:

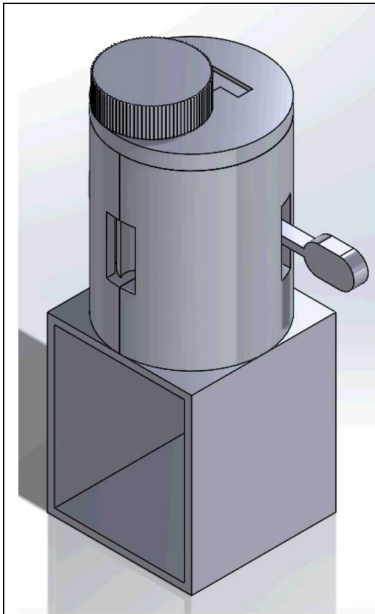


Reassemble the irradiator with IDD plates and panels

Remove the panels **and remind the audience of the assumed time**

Example answer: 20 seconds

- Step 2:



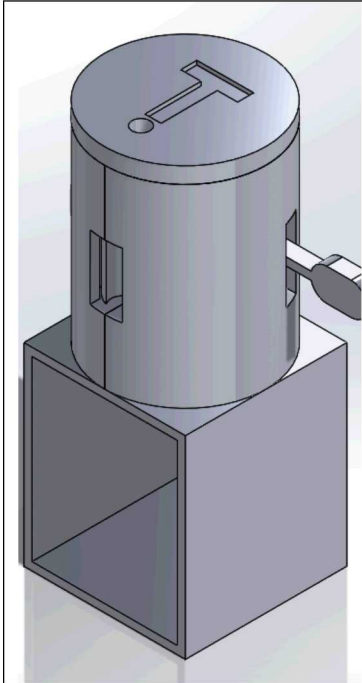
The lead plug is now covered by the IDD plates which are in turn covered by the mechanical systems.

Ask a participant how long it takes to remove the Mechanical systems

Example answer: 3 minutes

Remove the rotator knob

- Step 3:



The Irradiator should look like the picture on the left.

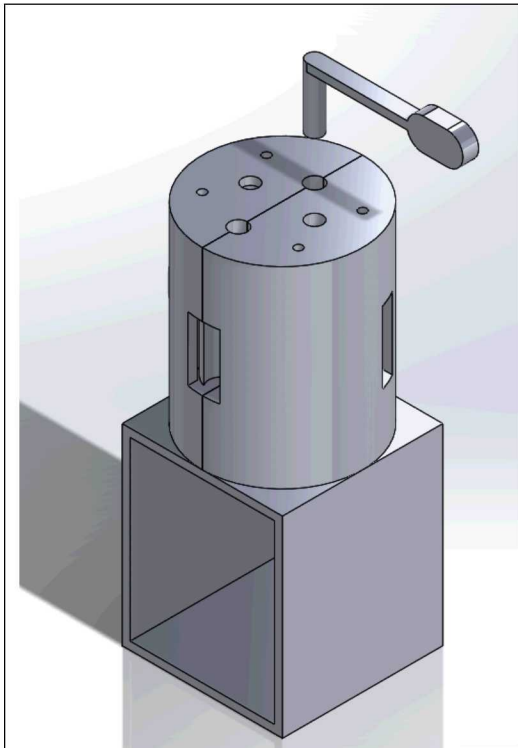
The IDD plates aim to add enough time so that police can respond and cost less than 10% of the manufacturing cost of the device.

Ask a participant how long they think it will take the police to arrive.

Example answer: 45 minutes

Remove the IDD plate

- Step 4:



The next attack step is to remove the lead plug.

Remind the audience of the plug removal time.

Example reminder: 1 minute

The final step is to remove the pencil.

Remind the audience of the source removal time.

Example reminder: 1 minute.

This gives you a new UUR attack time of 50 minutes and 20 seconds which is 48 minutes better than an unprotected device