User Recommendations for RF-Safe Green Det™

2-300750-1

MAN-DET-RF (R08)

Please check Owen website at www.corelab.com/owen/ to confirm latest revision of User Manual

Warning: use of Owen equipment contrary to manufacturer’s specifications or operating instructions may result in property damage, serious injury or fatality. If you are not trained in the handling and use of explosive devices, do not attempt to use or assemble any Owen perforating systems or Owen firing devices.

This technology is regulated by and, if exported, was exported from the United States in accordance with the export administration regulations (EAR). Diversion contrary to U.S. Law is prohibited. Export and/or re-export of this technology may require issuance of a license by the bureau of industry and security (BIS), U.S. Department of Commerce. Consult the BIS, the EAR, and/or Owen Compliance Services, Inc. To determine licensing requirements for export or re-export of this technology.

This document contains confidential information of Owen Oil Tools LP (Owen) and is furnished to the customer for information purposes only. This document must not be reproduced in any way whatsoever, in part or in whole, or distributed outside the customer organization, without first obtaining the express written authorization of Owen. This document is the property of Owen and returnable upon request of Owen.
### TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Det™ with Crimp Sleeve (DET-3050-576)</td>
<td>3</td>
</tr>
<tr>
<td>Green Det™ with Side Block (DET-3050-400)</td>
<td>5</td>
</tr>
<tr>
<td>Green Det™ with Rubber Boot (DET-3050-409)</td>
<td>6</td>
</tr>
<tr>
<td>Green Det™ with DET-0010-576 ONLY</td>
<td>14</td>
</tr>
</tbody>
</table>

### SECTIONS:

1.0 - Procedures for Panel Setup and Firing Green Det™ ........................................7
2.0 - Arming ..................................................................................................................7
2.1 - Green Det™ with Crimp Sleeve (DET-3050-576) .............................................8
2.2 - Green Det™ with Side Block ..............................................................................9
2.3 - Green Det™ for Owen Split Shot® .....................................................................11
2.4 - Green Det™ with Rubber Boot for Radial Jet Cutters ........................................12
3.0 - Ballistic Transfer Interrupter ..........................................................................14
4.0 - Frequently Asked Questions .............................................................................15
**Warning:** Explosives are destructive by nature! Do not attempt to disassemble or alter the detonator in any manner! Do not crush, hammer, pinch, impact, pull wires or abuse the detonator or any explosive!

**Warning:** Be sure to follow safe operating practices as found in API RP-67 in accordance with governmental regulations, company policies and manufacturer’s recommendations!

Owen Oil Tool’s and Pacific Scientific’s RF-Safe Reactive Semi-Conductor Bridge (RSCB) Detonators are designed to detonate a lead free energetic material when an electrical voltage typically between 130 VDC and 180 VDC is applied. This allows the detonator to be fired with any standard 300V / 2A firing panel in wireline operations. The RF-Safe RSCB Detonator is manufactured to API RP-67 recommendations and has been tested and verified by Franklin Applied Physics to withstand up to 10 GHz frequency at 100 V/m field strength. This detonator will withstand temperatures of -40°F to 400°F for 12 hours while still maintaining a 99.99% initiation reliability @ 95% confidence. For more technical information regarding this detonator, please refer to Owen Oil Tool’s “Technical Specifications” sheet (Owen Document #2-300750-1-DS)

**Green Det™ with Crimp Sleeve DET-3050-576)**

When used with the “crimp sleeve” (P/N DET-3050-576), the GreenDet™ is designed to be used in hollow steel carrier or scalloped gun systems where a fluid disabled detonator will prevent the detonation of a flooded gun when used properly. Fluid migrating through the fluid holes in the body of the crimp sleeve will prevent the detonator from initiating the detonating cord. The detonator with crimp sleeve is designed to be used with the following detonating cords:

**Warning:** The Green Det™ Crimp Sleeve is an explosive device and should be handled with care! The block assembly contains an HNS explosive booster! Local and federal regulatory shipping and storage methods must be applied! Block assemblies should be stored in an environmentally controlled magazine when not being used!
### PART NUMBER | DETONATING CORD DESCRIPTION | DET-3050-576 (SILVER)
--- | --- | ---
A571010 | DynoNobel FireLine 80gr/ft HMX LS | YES
A580010 | DynoNobel FireLine 80gr/ft RDX | YES
A578010 | DynoNobel FireLine 80gr/ft RDX LS | YES
A585010 | DynoNobel FireLine 80gr/ft HNS LS | YES
A544010 | DynoNobel FireLine 40gr/ft HMX LS | YES
A539010 | DynoNobel FireLine 40gr/ft RDX LS | YES
A538010 | DynoNobel FireLine 40gr/ft RDX LS Ribbon* | YES
2315353 | DynaEnergetics 80gr/ft PT 250 HNS | YES
2315355 | DynaEnergetics 60gr/ft PT 250 Slim HNS** | YES
2317411 | DynaEnergetics 40gr/ft T 250 Slim40 HNS*** | YES

*Owen 40gr/ft Ribbon detonating cord adapter must be used. (P/N DET-0010-006)
**Owen 60gr/ft Round detonating cord adapter must be used. (P/N DET-0100-018)
***Owen 40gr/ft Round detonating cord adapter must be used. (P/N DET-0100-020)

---

**Note:** Detcord adapters must be used with 40gr/ft and 60gr/ft detonating cords. Sold separately and packaged individually by Owen Oil Tools.

When used with the green crimp sleeve (P/N DET-0010-074), the Green Det™ can also be interruptible. Please refer to *Section 3.0* for more details.

The user should satisfy themselves as to the suitability of this product for the user’s application. Please refer to the Owen Oil Tool’s “Technical Specifications” sheet (Owen Document # DET-3050-576-DS) for more information.
Green Det™ with Side Block (DET-3050-400)

When used properly with Owen’s Green Det™ Side Block (P/N DET-3050-400), the Green Det™ can be used in threaded gun systems where a fluid disabled design will prevent the detonation of a flooded gun. If gun flooding occurs, fluid migrating through the fluid holes in the body of the block will prevent the initiation of detonating cord. The Green Det™ Side Block with detonator installed will fit into all of Owen’s angled port subs 2.75” O.D. or larger. The fit in straight port subs may vary due to sub design. Please consult your local Owen representative for details. The detonator side block is designed to be used with the following detonating cord types:

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DETONATING CORD DESCRIPTION</th>
<th>DET-3050-400</th>
</tr>
</thead>
<tbody>
<tr>
<td>A571010</td>
<td>DynoNobel FireLine 80gr/ft HMX LS</td>
<td>YES</td>
</tr>
<tr>
<td>A572010</td>
<td>DynoNobel FireLine 80gr/ft HMX LS XHV</td>
<td>YES</td>
</tr>
<tr>
<td>A580010</td>
<td>DynoNobel FireLine 80gr/ft RDX</td>
<td>YES</td>
</tr>
<tr>
<td>A578010</td>
<td>DynoNobel FireLine 80gr/ft RDX LS</td>
<td>YES</td>
</tr>
<tr>
<td>A570010</td>
<td>DynoNobel FireLine 80gr/ft RDX LS XHV</td>
<td>YES</td>
</tr>
</tbody>
</table>

The Green Det™ Side Block utilizes a small HMX booster inside the block for added initiation reliability of detonating cord in the parallel side configuration. This block design is rated to 400°F for 1 hour. The regulatory shipping and storage methods must be applied with the Green Det™ Side Block to maintain functionality.

**Warning:** The Green Det™ Side Block is an explosive device and should be handled with care! The block assembly contains an HMX explosive booster! Local and federal regulatory shipping and storage methods must be applied! Block assemblies should be stored in an environmentally controlled magazine when not being used!
The user should satisfy themselves as to the suitability of this product for the user’s application. Please refer to the Owen Oil Tool’s “Technical Specifications” sheet (Owen Document # DET-3050-400-DS) for more information.

**Video:** Video requires the latest flash player to view. Download it here: [https://www.adobe.com/support/flashplayer/downloads.html](https://www.adobe.com/support/flashplayer/downloads.html)

**Green Det™ with Rubber Boot (DET-3050-409)**

The Green Det™ is compatible with all radial jet cutter products for pipe recovery applications. For Owen Cutter products, the rubber boot (P/N DET-0100-113) must be used in order for the detonator to be properly installed into the cutter hardware. Please refer to Section 2.0 for general installation and arming procedures using the Green Det™.

**Note:** Please refer to the Owen User Manual specific to the pipe recovery system being used. This manual will contain more specific information and instructions regarding the pipe recovery system being used.

The user should satisfy themselves, as to the suitability of this product for the user’s application. Please refer to Owen Oil Tool’s “Technical Specifications” sheet (Owen Document # DET-3050-409-DS) for more information.
1.0 Procedures for Panel Setup and Firing Green Det™

1.1 Prior to arming or gun make up:

- Measure the voltage output from the panel with a blasters meter at the cable head, CCL, or Quick-Change. Verify a minimum of 300V DC output can be applied from the panel to the meter.

1.2 Reset panel to safe mode.

1.3 Continue proper assembly of the toolstring.

1.4 When ready to fire the gun or detonator downhole, increase the power to the firing circuit from 0V DC to the marked needle location that corresponds to 300V DC. The detonator will typically fire between 130 and 180 V DC.

Note: The user will not see any current being applied to the detonator when ramping up on the rheostat dial. However, the voltage should continue to ramp up until the 300 V DC level is reached.

2.0 Arming

2.1 Green Det™ with Crimp Sleeve (DET-3050-576)

2.1.1 Make sure panel is safe, key is removed and outside the unit, and verify no voltage is measured on the wireline.

2.1.2 Remove both the Green Det™ (P/N 2-300750-1) and stainless steel crimp sleeve from their packaging. Keep the detonator shunted during handling.

2.1.3 Slide the stainless steel crimp sleeve onto the output end of the detonator making sure to slide the end with the slits onto the detonator. The figure below shows an example.
Make sure the crimp sleeve sits flush with the shoulder of the detonator. The crimp sleeve should be snug on the detonator. The finished product should look like this:

2.1.4 Insert the detonator into a detonator safety tube (P/N DET-2000-000) and secure the lid shut. The resistance may be checked this time using a blasters meter. The detonator will measure between 0.800 MΩ and 1.100 MΩ.

2.1.5 With the detonator still in the safety tube, electrically connect the detonator to the wireline cable by attaching the red wire to the center conductor (hot wire) and the blue wire to the ground wire. The detonator is now electrically armed, and it may now be removed from the safety tube.

2.1.6 Carefully make a square, clean cut of the detonating cord using the Owen Super Cutters (P/N DET-0000-036). Insert the newly cut end of the detonating cord into the open end of the crimp sleeve until it becomes flush with the fluid hole (see figure below). If using 40 gr/ft or 60 gr/ft detonating cord, then use the proper detonating cord adapters found in Owen’s catalog. The fluid hole should not be filled or covered by explosive powder, detonating cord, tape, etc. as this could prevent the detonator from being fluid disabled. Crimp the cord in place 3/8 in. from the end of the crimp sleeve using Owen Super Crimpers (P/N DET-0100-053). The detonator is now ballistically armed, and the finished product should look something like the figure below:
2.1.7 Complete the mechanical assembly of the device and tool assembly taking care not to force, pinch, crush, or impact the explosive components or wiring. Be sure the green crimp sleeve is still attached properly and flush with the end of the detonator.

**Note:** Alternate assembly may be used where the detonating cord is crimped onto the crimp sleeve prior to the crimp sleeve being attached to the detonator. In either case, the detonator shall be electrically connected before attached to detonating cord.

### 2.2 Green Det™ with Side Block

2.2.1 Make sure the panel is safe, key is removed and outside the unit, and verify no voltage is measured on the wireline.

2.2.2 Remove both the Green Det™ (P/N 2-300750-1) and Green Det™ Side Block (P/N DET-3050-400) from their individual packaging. Keep the detonator shunted during handling.

2.2.3 Insert the detonator into a detonator safety tube (P/N DET-2000-000) and secure the lid shut. The resistance may be checked at this time.

2.2.4 With the detonator still in the safety tube, electrically connect the detonator to the wireline cable by attaching the red wire to hot lead and blue wire to ground. The detonator is now electrically armed, and it may now be removed from the safety tube.
2.2.5 Slide the detonator into the Green Det™ Side Block by inserting the output end first until the detonator “bottoms out” inside the block. There should be roughly 0.7” of the detonator still sticking out of the block. The user may wish to tape the detonator in place, if desired. The figures below show an example of the assembly.

2.2.6 Install the detonator block assembly onto the detonating cord approximately 2 - 3 inches by feeding the cut end of the detonating cord towards the detonator from the opposite side (see figure below). The remaining length of detonating cord attached to the gun charges should be on the side opposite from the detonator lead wires.
2.2.7 Once the detonating cord is fed through the block, cover the cut end of detonating cord with tape prior to assembly into the ported sub. This will prevent the detonating cord from sliding back through the block. Ensure that the fluid hole is not filled or covered by explosive powder, detonating cord, tape, etc. as this could prevent the detonator from being fluid disabled. The detonator is now ballistically armed, and the finished product should look similar to the figure below:

2.2.8 Complete the mechanical assembly of the device and tool assembly taking care not to force, pinch, crush, or impact the explosive components or wiring. Be sure the block is still attached properly.

**Note:** Alternate assembly may be used where the detonating cord is inserted into the block prior to the block being attached to the detonator. In either case, the detonator shall be electrically connected before being attached to detonating cord.

2.3 Green Det™ for Owen Split Shot®

2.3.1 Make sure the firing panel is safe, key is removed and outside the unit, and verify that no voltage is measured on the wireline.

2.3.2 Remove the Green Det™ from its packaging. Keep the detonator shunted during handling.

2.3.3 Insert the detonator into a detonator safety tube (P/N DET-2000-000) and secure the lid shut. The resistance may be checked at this time.

2.3.4 While keeping the detonator in the safety tube, insert the shunted wires of the detonator through the hole in the top sub.
2.3.5 With the detonator still in the safety tube, electrically connect the detonator to the wireline cable by attaching the **red wire to hot lead and the blue wire to ground**. The detonator is now electrically armed, and it may now be removed from the safety tube.

2.3.6 For all remaining steps, please refer to the Owen User Manual specific to the Split Shot system being used. This will contain specific information to the Split Shot and how to complete the ballistic arming procedure.

### 2.4 Green Det™ with Rubber Boot for Radial Jet Cutters

2.4.1 Make sure the firing panel is safe, key is removed and outside the unit, and verify that no voltage is measured on the wireline.

2.4.2 Remove the Green Det™ Pipe Recovery assembly (P/N DET-3050-409) from its packaging. Keep the detonator shunted during handling.

2.4.2.1 If the rubber retainer accessory (P/N DET-0100-113) and Green Det™ detonator were ordered separately, then remove each individual item from their packaging and install the green rubber retainer onto the detonator as shown in the figure below. The detonator will “bottom out” on an internal shoulder inside the rubber accessory, and there should be roughly 1.27” of detonator length protruding from the part. Keep the detonator shunted during handling.
Warning: Never pull on the detonator lead wires as this could damage the detonator or cause serious injury!

2.4.3 With the detonator still shunted, feed the shunted wires of the detonator through the shock sub or extension adapter and install the booted portion of the detonator over the end of the shock sub or extension adapter.

2.4.4 Install a jet cutter safety tube onto the shock sub or extension adapter to prevent injury during arming. After installation of safety tube, the detonator's resistance may be checked.

2.4.5 With the detonator still in the safety tube, electrically connect the detonator to the wireline cable by attaching the red wire to hot lead and the blue wire to ground. The detonator is now electrically armed, and it may now be removed from the safety tube.

2.4.6 Insert the detonator, output end first, into the cutter top sub and thread the top sub onto the extension adapter. The detonator end should be slightly recessed from the bottom of the cutter top sub (see depiction below: 0.04 in. recess).

Note: Top Subs and Extension Adapters will vary. Please refer to the Owen User Manual specific to the cutter system being used for more details on hardware and procedures.

2.4.8 Make sure the top sub's o-ring is lightly lubricated with grease and thread the explosive cutter load/components onto the top sub being careful not to force, pinch, crush, or impact the explosive components. The ballistic arming is now complete.
Note: Please refer to the manufacturer’s assembly and arming procedures for the cutter system being used. This manual will contain more specific information and instructions regarding the cutter assembly being used.

3.0 Ballistic Transfer Interrupter

**Warning:** Owen’s Ballistic Interrupter device is NOT compatible with any type of PETN based detonating cord! Due to PETN’s sensitivity, it may still be able to pick up the shock from the detonator and initiate high order. In no circumstances should Owen’s interrupt device be used with PETN detonating cord. Please see compatible detonating cords in the Green Det™ with Crimp Sleeve (DET-3050-576) section.

Green Det™ with DET-3050-576 ONLY

3.1 When used with the crimp sleeve, this detonator can use an Owen Interrupter to prevent ballistic transfer from the detonator to the detonating cord. With the interrupter in place, the detonating cord will not detonate. (Please see warning above).

**Warning:** Do NOT use any other type of interrupter device other than Owen’s INT-3050-125I! Extensive testing has been performed by Owen Oil Tools to ensure reliability and confidence when using this specific interrupter part.

3.2 To interrupt the ballistic transfer, the interrupter device must be purchased from Owen Oil Tools, P/N INT-3050-125I. Place the interrupter into the detonator crimp sleeve’s fluid hole making sure that it is fully inserted with part of the interrupter sticking out of both sides of the crimp sleeve. The interrupter will fit snugly. The below figure below shows the interrupter in place. The interrupter can also be removed through a sub port.
4.0 Frequently Asked Questions

4.1 What amperage will these detonators fire at?
• The Green Det™ is not like Owen’s typical resistorized detonators and no current amperage will be seen on the firing panel when energy is applied through the wireline. Instead, only the voltage dial will continue to rise. This is due to the spark gap design in the detonator that prevents the flow of current until enough energy builds up to “jump” that gap. At this point, an almost instantaneous rise of current is seen that travels across the spark gap, through the RSCB, and initiates the detonator. However, the current “jump” may happen too fast for most standard firing panels to record. Therefore, Owen recommends that voltage is continued to be applied up to the 300V “All-Fire Level” to ensure the most reliable initiation. Typically the detonator will fire around 130V - 180V. For elevated temperatures near 400F, this range may drop to 100V - 120V.

4.2 Does it matter if I fire the detonator on positive or negative polarity?
• No. It does not matter as the detonator is not polarity sensitive.

4.3 Does it matter which wire is connected to the ground?
• The detonator includes a case ground requiring the blue wire to always be the ground wire (negative power source). The red wire should only be connected to the center conductor (hot wire / positive power source).

4.4 What resistance will the detonator measure?
• When the lead wires are attached to a blasters meter, the Green Det™ will measure anywhere from 0.800MΩ – 1.100MΩ. For best results, Owen recommends using alligator clips connected to the detonator lead wires. This will give the best connection and most accurate reading.
4.5 Do I need a PX-1 or special firing panel to use this detonator?
   • No, a special firing panel or Fireset is not required with the Green Det™. This detonator will
     fire off a standard wireline power supply that has the capability to supply 300V & 1.5A.

4.6 Can I use this detonator with electronic addressable switches?
   • Yes, the Green Det™ is compatible with most electronic addressable switches. Please
     consult your local Owen representative to receive more details before using the Green Det™
     with the electronic addressable switch.