WARNING

Refer to and apply the procedures listed in the “Recommended Practices for Oilfield Explosives Safety; API Recommended Practice 67 (RP67)” before assembling or using this product.

Explosives are by nature destructive. If mishandled or misused, the outcome may be immediate and disastrous, and may result in serious injury or death. Do not attempt to use this product unless you have received training in the handling and use of oilfield explosive products. The following Field Loading Procedures must be explicitly followed without attempts to shortcut, alter, switch or otherwise deviate in any way, or use alternate parts from those intended to be supplied by Jet Research Center for such field assembly.

Use Utmost Care!

JRC warrants only title to the equipment, products, materials, and supplies and that the same are free from defects in workmanship and materials. THERE ARE NO WARRANTIES, EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS OR OTHERWISE WHICH EXTEND BEYOND THOSE STATED IN THE IMMEDIATELY PRECEDING SENTENCE. JRC’s liability and Customer’s exclusive remedy in any cause of action (whether in contract, tort, breach of warranty or otherwise) arising out of the sale or use of any products, supplies or materials is expressly limited to the replacement of such products, supplies or materials on their return to JRC or, at JRC’s option, to the allowance to be Customer of credit for the cost of such items. In no event shall JRC be liable for special, incidental, indirect, punitive, or consequential damages.
This Field Loading Procedure should be followed in conjunction with the assembly and application of the following listed Jet Research Center, Segmented Explosive Jet Cutters:

<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-15/16in OD (75mm) Drill Pipe Cutter</td>
<td>101978733</td>
</tr>
<tr>
<td>3-5/16in OD (85mm) Drill Pipe Cutter</td>
<td>101978734</td>
</tr>
<tr>
<td>3-5/8in OD (93mm) Casing Cutter</td>
<td>101978736</td>
</tr>
<tr>
<td>4in OD (102mm) Casing Cutter</td>
<td>101978737</td>
</tr>
<tr>
<td>4-1/2in OD (115mm) Casing Cutter</td>
<td>101978738</td>
</tr>
<tr>
<td>4-3/4in OD (121mm) Casing Cutter</td>
<td>101978739</td>
</tr>
<tr>
<td>5-1/2in OD (140mm) Casing Cutter</td>
<td>101951863</td>
</tr>
<tr>
<td>6in OD (153mm) Casing Cutter</td>
<td>101978741</td>
</tr>
<tr>
<td>6-1/8in OD (156mm) Casing Cutter</td>
<td>101978742</td>
</tr>
<tr>
<td>7-1/4in OD (185mm) Casing Cutter</td>
<td>101978743</td>
</tr>
<tr>
<td>8-3/16in OD (208mm) Casing Cutter</td>
<td>101978744</td>
</tr>
</tbody>
</table>
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1. General Safety Precautions

- Do not attempt to use this product unless you have received training in the handling and use of oilfield explosive products.

- Refer to and apply the procedures listed in the Recommended Practices for Oilfield Explosives Safety; API Recommended Practice 67 (RP67) before assembling or using this product.

- Failure to follow the assembly instructions can result in extensive bodily injury and death.

- Do not throw, slide, or roughly handle boxes of explosives.

- The assembly and arming of the cutters should only take place at the job site where they are to be used and immediately prior to running the cutter into the pipe. If there is any delay the device should be disarmed and safely stored.

- Load only in designated areas. Floors are to be covered with rubber mats.

- No open flames, welding, or sparking devices are to be used in the loading area while handling explosives.

- No smoking in the loading area while handling explosives.

- No RF-transmitting devices such as cellular telephones, two-way pagers, or hand held radios are to be in the loading area.

- Never strike, drop, force, heat, grind, drill, or hammer on any explosive item or explosive assembly.

- Use only the tools designed to be used with or for explosive loading.

- Do not attempt to alter or modify any part of the assembly. Use only manufacturer approved parts.

- Use only the proper razor blades and cutting blocks to cut detonating cord. Never use side cutters, pocketknives, scissors, or a cap-crimper to cut detonating cord. Aluminum covered detonating cord is cut using a small pipe cutter.

- Always use approved methods and carriers for the transportation of explosives to the job site.

- Do not handle explosives when electric storms (thunder and/or lightening) are in the immediate area. Do not handle explosives in a sandstorm or similar situation that can result in the build up of static electric charges.
2. Description, Specifications and Recommendations

JRC's segmented explosive jet cutters are field assembled devices designed to give reliable performance while offering the opportunity to transport the explosive product using preferable shipping methods due to its 1.4D shipping classification. The ability to transport the product as 1.4D is achieved by the segmentation of the cutter explosive load into smaller pellets that are in turn packaged and shipped separately from the hardware components of the cutter assembly. The shipping method requires the end user to handle and assemble the explosive pellets with the accompanying hardware to form the jet cutter.

The jet cutters are designed to cut casing and drill pipe under a variety of conditions. The cutters can be run on electric wireline; wireline-in-coiled tubing; slickline; pipe or coiled tubing. Be sure to follow all the safety practices associated with the conveyance method and detonation method used to run the cutter. This procedure addresses the initiation of the cutters using resistorized electric detonators. The cutters can be adapted for use with JRC TCP firing heads using the adapter 100014468 (17) and the parts and procedures in manual 100157156 (993.71036) 1-11/16" PAFH (Pressure Activated Firing Head).

Follow JRC recommendations to achieve maximum performance. All recommendations may not apply to any one application and may not cover all aspects of the operation.

For every application choose the largest diameter cutter that can be run in the well. The named size of each cutter indicates its outside diameter (OD). Centralize the cutter in the casing where possible, especially when running smaller O.D. cutters because of restrictions in the pipe.

Run a gauge run prior to running the casing cutter. This helps to ensure that the cutter can reach the required cut depth and it will not be necessary to return a live cutter to surface. The tool used for the gauge run, dummy casing cutter, gauge cutter, gauge ring etc, should be of similar length and the same diameter or slightly larger than the diameter of the cutter.

Avoid hitting obstructions in the pipe with the cutter. Do not run the cutter into an obstruction or restriction in an attempt to pass; often referred to as spudding. Never spud with an explosive tool.

The running-in-hole speed will often be determined by the small clearance between the cutter and the pipe and the viscosity of the fluid. Do not over-run the cutter with the cable. Slow down to pass restrictions and tools in the pipe string. Slow down at the fluid level.

Shoot cutters near a casing collar; 2 to 4 feet (0.6 to 1.2 m) above or below; to take advantage of the standoff between the casing and an outer casing to minimize the chance of damage to an outer casing string. The actual depth of the cut relative to a collar will depend upon the next operations to be performed in the well. It is the client’s decision as to where to cut the pipe.

Do not shoot the cutter in a collar, or in an up-set close to the collar, the cutter will not cut the pipe.
Figure 1 lists the Segmented Explosive Jet Cutters available and their recommended use. Do not shoot a cutter in a size of pipe larger than the pipe it is designed for, the cutter will not cut the pipe. A cutter is more likely to successfully cut a pipe which is heavier than recommended but less likely to cut a pipe with a larger O.D. than recommended.

Where possible have the same pressure and weight of fluid inside and outside the pipe to be cut. Large pressure differences can result in the tool string being lost or stuck after cutting. If necessary shoot some circulation holes to equalize pressures and/or to circulate the fluids to equalize the pressures before cutting the pipe.

If the cutter fails to cut on the first attempt check that the pipe is free at the cut depth. Do not shoot a second cutter at the same depth. The cutter is unlikely to cut on the second attempt at the same depth because damage to the pipe is likely to have moved the pipe wall beyond the limit of the cutting jet. Shoot a second attempt about 3 feet (1 m) above or below the first attempt depending on how this will influence the next operations in the well.

The cutters are designed to cut with minimal flaring of the pipe. The amount of flare is a function of the pipe, cutter and well conditions. Shooting with low pressure or gas behind the pipe will result in the most significant flare. The larger cutters for each pipe size will generally result in a cleaner cut with little flare.

Applying tension to the pipe is generally going to result in a cleaner cut and increase the chance of making a cut when using an undersized cutter and/or decentralized cutter, or freeing a partially stuck pipe. In most situations it is not necessary to apply tension to the pipe to obtain a cut, but, where possible the pipe weight should be picked-up so that the pipe is at neutral weight or tension at the cut depth when the cut is made.

The jet cutters made with HMX have an operating temperature range up to 400ºF (204ºC) for one hour. See cutter specification table for the pressure rating of each cutter. For the Time v Temperature chart for explosive compounds refer to the JRC catalog or website. For special applications and cutter designs contact JRC.

The cutters have aluminum and/or steel housings. The O.D. of the cutter after detonation in some instances will be slightly larger than it was originally, but the increase in the O.D. should not result in retrieval problems in the pipe for which the cutter was designed.

The shock absorbing extension mandrel can be utilized to minimize damage to other tools in the tool string. The unique shock grooves absorb the detonation shock waves transmitted up the tool. The extension mandrel is recommended when shooting cutters with more than 20 grams of explosive load and in all cases when delicate tooling is being run above the cutter. Consider using two extension mandrels when shooting cutters with over 100 grams of explosive.

JRC’s jet cutter assemblies connect to the wireline via a 1.50 inch O.D. Firing Head (P/N 100000434) (Not included) which has a ‘GO’ 1 3/16” – 12UN thread box at the top end.

JRC jet cutters utilize safety arming procedures, using resistorized detonator assemblies and safety assembly equipment. A shunt plug keeps the system shunted during assembly as the
detonator shunt wire is removed. A protective holder encompasses the detonator, shielding the worker while the electrical connection is made to the CCL. The cutters use resistorized detonators, minimizing the chance of an accidental firing.

The cutters can also be initiated using a Top Fire version of the RED™ (Rig Environment Detonator) detonator (P/N 101272595) which further minimizes hazards, but will require a different adapter (P/N 101295128) (Not included) to adapt the Top Fire RED detonator to the cutter assembly.

The shelf life of the explosive kit of the segmented cutter is 5 years, providing they are stored in original packaging and have not been subjected to excessive moisture. After this period the explosive kit should be disposed of as explosive items in accordance with prescribed methods and regulations. At 5 years the explosive components are not significantly more or less sensitive than when new; they still contain explosive material and all safety procedures firmly apply.
<table>
<thead>
<tr>
<th>Description</th>
<th>Part No.</th>
<th>Cutter OD (in)</th>
<th>Assembled Explosive Weight (g)</th>
<th>Housing Material *</th>
<th>Rating (psi / F)</th>
<th>Recommended Target Casing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-15/16” Drill Pipe Cutter</td>
<td>101978733</td>
<td>2.938</td>
<td>56.9</td>
<td>S</td>
<td>12500 / 400</td>
<td>4” 0.262 – 0.380 11.85 – 15.7</td>
</tr>
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<td>3-5/16” Drill Pipe Cutter</td>
<td>101978734</td>
<td>3.188</td>
<td>64.8</td>
<td>S/A</td>
<td>12000 / 400</td>
<td>4-1/2” DP 0.271 - 0.430 13.75 - 20.00</td>
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<tr>
<td>3-5/8” Casing Cutter</td>
<td>101978736</td>
<td>3.625</td>
<td>54.8</td>
<td>A</td>
<td>7,500 / 400</td>
<td>4-1/2” 0.205 - 0.337 9.50 - 15.10</td>
</tr>
<tr>
<td>4” Casing Cutter</td>
<td>101978737</td>
<td>4.000</td>
<td>90.8</td>
<td>A</td>
<td>9,000 / 400</td>
<td>5” 0.253 - 0.437 11.50 - 21.40</td>
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<tr>
<td>4-1/2” Casing Cutter</td>
<td>101978738</td>
<td>4.500</td>
<td>114.28</td>
<td>S/A</td>
<td>9,000 / 400</td>
<td>5-1/2” 0.304 - 0.415 17.00 - 23.00</td>
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<td>4-3/4” Casing Cutter</td>
<td>101978739</td>
<td>4.750</td>
<td>114.28</td>
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<td>9,000 / 400</td>
<td>5-1/2” 0.244 - 0.304 14.00 - 17.00</td>
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<tr>
<td>5-1/2” Casing Cutter</td>
<td>101951863</td>
<td>5.500</td>
<td>275.5</td>
<td>A</td>
<td>9,000 / 400</td>
<td>7” 0.408 - 0.534 29.00 - 38.00</td>
</tr>
<tr>
<td>6” Casing Cutter</td>
<td>101978741</td>
<td>6.000</td>
<td>275.5</td>
<td>A</td>
<td>9,000 / 400</td>
<td>7” 0.317 - 0.408 23.00 - 29.00</td>
</tr>
<tr>
<td>6-1/8” Casing Cutter</td>
<td>101978742</td>
<td>6.125</td>
<td>275.5</td>
<td>A</td>
<td>9,700 / 400</td>
<td>7-5/8” 0.375 - 0.500 29.70 - 39.00</td>
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<tr>
<td>7-1/4” Casing Cutter</td>
<td>101978743</td>
<td>7.250</td>
<td>421</td>
<td>A</td>
<td>8,000 / 400</td>
<td>8-5/8” 0.400 - 0.595 36.00 - 52.00</td>
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<td>8-3/16” Casing Cutter</td>
<td>101978744</td>
<td>8.188</td>
<td>404.8</td>
<td>A</td>
<td>8,000 / 400</td>
<td>9-5/8” 0.435 - 0.545 43.50 - 53.50</td>
</tr>
</tbody>
</table>

* Housing Materials:  A = Aluminum  CI = Cast Iron  S = Steel

Table 1: Segmented Explosive Jet Cutter Specifications and Recommended Use
3. Assembly of the Segmented Explosive Jet Cutter

JRC Segmented Explosive Jet Cutters are shipped disassembled to allow for preferable transportation methods. Upon delivery to the end user destination the cutter can be assembled in preparation for deployment into the well.

**WARNING**

Refer to and apply the procedures listed in the “Recommended Practices for Oilfield Explosives Safety; API Recommended Practice 67 (RP67)” before assembling or using this product.

BE SURE YOU HAVE READ AND THOROUGHLY UNDERSTAND ALL SAFETY AND ASSEMBLY PROCEDURES BEFORE BEGINNING ANY ASSEMBLY. BEFORE PROCEEDING WITH EXPLOSIVES ASSEMBLY, ENSURE THAT THE WORKING AREA IS CLEAN AND SUITABLE FOR WORKING WITH EXPLOSIVES AND THAT ANY SOURCES OF IGNITION ARE REMOVED.

Ensure all required materials are identified and on hand before proceeding with handling of the explosive components. Quantity and shape of explosive components in the kit is dependent on cutter size.
3.1 Cartridge Assembly

Fig. 1: Exploded view (left) and assembled view (right) of Cutter Cartridge.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Booster Pellet (if required)</td>
<td>A/R</td>
</tr>
<tr>
<td>2</td>
<td>Booster Sleeve (if required)</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Booster Rod (Al. Det. Cord)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Liner</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Liner Pellet</td>
<td>A/R</td>
</tr>
<tr>
<td>6</td>
<td>Retainer</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Al. Adhesive Disk</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2: Cartridge Components list
**Note:** Two cartridge designs exist. One uses a Booster Sleeve (2) centered in a Retainer (6), while the other uses a one-piece Retainer (6) only. The combined two piece design serves the same function as the one-piece design.

3.1.1 Ensure all hardware is clean and free of debris and defects.

3.1.2 Locate booster sleeve (2) (if required) inside retainer (6). Gather enough liner pellets (5) to build bottom half of cartridge and assemble them on retainer and around the booster sleeve.

3.1.3 Press the liner (4) by hand on top of assembled liner pellets. Ensure neat fit between liner, explosives and retainer by placing assembly on flat surface and use a twisting and pressing motion on the liner against the other explosive components.

3.1.4 Place booster rod (3) in bore of bottom half of assembly.

**Note:** Ballistic transfer from the Booster Rod (3) to the Liner Pellets (5) is achieved either directly or with use of a Booster Pellet (1). Larger Booster Pellets (1) may consist of multiple parts.

3.1.5 Place booster pellet (1) (if required) over booster rod and on top of bottom booster sleeve and retainer assembly.

3.1.6 Position upper liner on top of lower liner with both small diameter faces contacting one another.

3.1.7 Fill upper liner with remaining liner pellets.

3.1.8 Locate upper booster sleeve and then press upper retainer over top of assembly. Again use twisting and pressing motion on upper retainer to ensure neat fit between explosives and hardware components.

3.1.9 Place adhesive disks (7) on either end of cartridge to retain position of booster rod and booster pellet in the cartridge assembly.

3.1.10 Again ensure outer surfaces of liners are clean and that no debris exists inside cutter case.
3.2 Cutter Assembly

Fig. 2: Exploded view (left) and assembled view (right) of cutter assembly.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Cap</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Diaphragm Spring</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Case</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Socket Head Screw</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>O-Ring</td>
<td>1</td>
</tr>
<tr>
<td>13</td>
<td>Thread Protector</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3: Cutter components list
3.2.1 Ensure Diaphragm spring (9) is in place on the inside of the upper plate of cutter case (10). If not, retain in place inside recessed area using loctite glue.

3.2.2 Place assembled explosive cartridge on cutter bottom cap (8) (do not install o-ring on cap yet) and slide case over cartridge. Resistance should be felt with diaphragm spring when pressing case on to the cap. Turn assembly upside down and remove cap so that cartridge remains inside the case.

3.2.3 Place appropriate O-Ring (12) on groove of the cutter cap. Make up cap to case using appropriate socket head screws.

3.2.4 Use plastic thread protector cap on cutter female connecting thread to prevent debris ingress until cutter is ready for use.

3.2.5 The Explosive Assembly is now complete; set it aside until the Electrical Assembly has been connected to the wireline; being careful not to drop or damage it in handling.
4. **Arming and Deployment Procedures with Resistorized Electric Detonators**

The term ‘SAFE’ when used in this document is referring to a combination of actions that are designed to render the initiating system incapable of sending power to the electric detonator. These actions typically involve the shorting of the mono-conductor wireline conductor to ground via a power resistor (for multi-conductor the conductors are connected to one another and ground via power resistors); a key system which prevents the initiating system from connecting power to the electric wireline; and disconnecting power to the initiating system. The key is held outside the unit and visible until the explosive assembly is safely 200 ft (70 m) below ground level or the sea bed; or the cutter and detonator have been removed and returned to storage.

The term ‘Radio Silence’ is used to refer to the combination of actions which involves the shutting down of radio frequency transmissions within 1000 feet (305 m); the shutting down and isolating of electric welding equipment and active cathodic protection.

The Segmented Explosive Jet Cutter may use a resistorized detonator, which reduces the possibility of accidental firing by stray current, or a Top Fire RED detonator; that provides additional safety enhancements when compared to conventional resistorized detonators. Note that each detonator requires the use of a different adapter sub (item 17). All previously established safety rules and regulations should be maintained during the assembly of explosives.

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**WARNING**

CCL SHOULD BE CHECKED OUT PRIOR TO OFF-LOADING EXPLOSIVE ASSEMBLIES. TURN OFF ALL RIG RADIOS, ARC WELDERS AND CATHODIC PROTECTION DEVICES BEFORE ASSEMBLING. BE SURE CABLE IS IN **SHORT** OR **SAFE** POSITION AND PERFORATING UNIT’S POWER PLANTS ARE TURNED **OFF**. MEASURE STRAY VOLTAGES BETWEEN PERFORATING UNIT TO GROUND, RIG TO GROUND AND WELLHEAD TO GROUND, ENSURING NO STRAY VOLTAGES ARE PRESENT. PLACE A GROUNDED LOOP BETWEEN PERFORATING UNIT, RIG, AND WELLHEAD.

---

4.1 Ensure all required materials are identified and on hand before proceeding but keep the explosive items in safe storage until after the safety precautions are in place. Ensure that the wireline has been put into ‘SAFE’; and that ‘Radio Silence’ (not required if using RED) and all other safety procedures previously stated are in place before handling the explosive components.
Fig. 3: Sectional view of electrical and detonator configuration (left) and deployment assembly (right).
Table 4: Component list for electrical arming and deployment.

4.2 Check the insulation and continuity of the firing head (14) and the extension mandrel (15).

4.3 Check o-rings (size 214) on all parts listed, making sure there are no cuts, nicks or scratches, install and replace as necessary. Lubricate o-rings and male threads only with a thin coating of clean downhole grease.

4.4 Make up the firing head to the extension mandrel. The extension mandrel is used to protect the running tools from the detonation shock. **It is recommended to run the extension mandrel when running cutters with explosive weights of 20 grams or larger or when there are tools above which may be damaged by the shock.** Consider using two extension mandrels when running cutters with 100 grams, or more, of explosive.

4.5 Make up the firing head and extension mandrel to the running tools, making sure the firing head or CCL is made up to the electric wireline cable. Check fire and CCL function. Correct all problems before proceeding and recheck until correct.

4.6 Ensure that cable is in the ‘SAFE’ position. Ensure a stray voltage and current survey has been performed and grounding lines are attached. Ensure ‘Radio Silence’ is in place. Clear the assembly and arming area of non-essential personnel.

4.7 Check the firing circuit for the presence of stray voltage with a blasters multimeter in the volts position, between the lower contact and the body of the extension mandrel; first in the DC and then in the AC voltage position. Ensure that no voltage is present between the conductor and ground.
4.8 Remove the firing head and extension mandrel from the tool string. Install the shunt plug (19) into the top of the firing head.

4.9 Attach the detonator assembly (16) to the end of the extension mandrel by pushing the boot of the detonator assembly onto the end of the extension mandrel. Wrap the ground wire clockwise, looking from the lower end, into the o-ring groove above the boot. Push the o-ring (the o-ring size 020 is included with the detonator assembly) up into the groove ensuring that the end and approximately 2 inches (50 mm) of ground wire is pressed between the o-ring and the mandrel. (Note if using RED, that no ground wire is present as ground is made from barrel spring on body of detonator to the adapter when installed).

4.10 Remove the tape and/or label and the temporary shunt wire from the detonator assembly.

4.11 Install the appropriate adapter (17) for the detonator assembly being used.

4.12 Make up the protective holder (20), hand tight, to the adapter, extension mandrel and detonator assembly. Wrench tighten the firing head, extension mandrel and adapter. The shunt plug and protective holder remain hand tight.

4.13 Remove the shunt plug.

**WARNING**

DO NOT USE AN OHM-METER! USE AN APPROVED BLASTERS MULTIMETER ONLY.

4.14 Check the firing head, extension mandrel, detonator assembly and adapter for electrical continuity between the top contact and the body of the firing head using a blasters multimeter in the 200 ohm position. The meter should read the resistance of the detonator assembly, typically between 49 and 61 Ohms for the resistorized detonator. Follow specific procedures for measuring continuity with RED.

4.15 With the protective holder still in position, make up the firing head, extension mandrel, detonator, adapter and protective holder assembly to the tool string wrench tight. The detonator is now connected to the firing circuit. The firing circuit must remain in ‘SHORT’ and ‘SAFE’ position.

4.16 Remove the plastic cap or plug from the jet cutter charge assembly.

4.17 Remove the protective holder from the adapter, extension mandrel and detonator assembly.

4.18 Make up the jet cutter charge assembly to the adapter, extension mandrel and detonator assembly and tighten with a strap wrench.

**WARNING**

DO NOT USE METAL WRENCHES ON THE OUTSIDE DIAMETER OF THE JET CUTTER.
4.19 Measure and record the distance from the center of the casing cutter charge assembly to the measure point of the tool string; typically the CCL. Also record the part numbers and date codes of the explosive components used in the assembly.

4.20 The cutter assembly is now ready to be run into the pipe. The safety procedures must be maintained until the assembly has been ran below ground level: typically 200 feet (70 m) below ground on land or 200 feet (70 m) below the seabed offshore.

4.21 After Attempting to make the cut; even if there are good indications that the cutter functioned; it is still necessary to go back into ‘SAFE’ and ‘Radio Silence’ when coming out of the hole while still 200 feet (70 m) below ground level on land or 200 feet (70 m) below the seabed offshore. Check that the grounding lines are still in place and clear the disarming and disassembly area of non-essential personnel. The safety precautions must remain in force until the explosives responsible person has seen that the cutter functioned and has confirmed that the cutter is no longer a potential explosive hazard. If the cutter did not function it must be disassembled and disarmed before the safety procedures are lifted. The disarming and disassembly procedure follows.

5. Disarming and Disassembly Procedures with Electric Detonators

In the event of having to disarm and disassemble the jet cutter use the following procedure.

If the cutter was run in the well but was unable to detonate it is imperative to use these procedures to remove the cutter and detonator assembly before attempting to perform any investigation and testing to find the problem.

**WARNING**

SPECIAL ATTENTION MUST BE PAID WHEN RETRIEVING ANY DEVICE CONTAINING HMX EXPLOSIVE THAT HAS BEEN EXPOSED TO TEMPERATURE EXCEEDING 302°F (150°C). AT THIS TEMPERATURE HMX UNDERGOES AN IRREVERSIBLE PHASE TRANSITION AND INCURRS INCREASED IMPACT SENSITIVITY. ADDITIONAL CARE IN HANDLING SHOULD BE TAKEN IN THIS SITUATION.

If the cutter is run into a well and returned to surface without detonating JRC normally recommends the replacement of all explosive components and o-ring seals. JRC always recommends the replacement of all explosive components and o-ring seals if the cutter has been exposed to temperatures or pressures significantly above ambient conditions.
5.1 The same safety procedures applied while assembling and arming the cutter apply for disarming and disassembly. While the cutter is still deeper than 200 feet (70 m) below the ground level on land or 200 feet (70 m) below the sea bed offshore; ensure that cable is in the ‘SAFE’ position; grounding lines are attached; If required ‘Radio Silence’ is in place; and that the disassembly and disarming area is clear of non-essential personnel.

**WARNING**

BE AWARE OF POTENTIAL TRAPPED PRESSURE WHEN BREAKING CONNECTIONS ON THE TOOLSTRING ASSEMBLY.

5.2 Remove the cutter from the adapter, (17) while monitoring the disassembly for indications of trapped pressure.

5.3 Install the protective holder (20) over the adapter (17), extension mandrel (15) and detonator assembly (16).

5.4 Install the plastic cap or plug (13) into the casing cutter charge assembly and lay safely aside while disarming the detonator.

5.5 Disconnect the firing head (14) and extension mandrel, with detonator assembly adapter and protective holder attached, from the tool string and install the shunt plug (19) into the top of the firing head.

5.6 Remove the protective holder and adapter from the extension mandrel.

5.7 Disassemble the detonator assembly from the extension mandrel and re-shunt with appropriate wire.

5.8 Return the detonator with associated labeling to its original packaging and label appropriately for further use or disposal and store appropriately.

5.9 Disassemble the Segmented Explosive Jet Cutter assembly and return its contents to its original packaging and label appropriately for further use or disposal and store appropriately.

5.10 Disposal should be made in accordance with federal, state, and local regulations.
6. Parts Lists

When ordering JRC’s Segmented Explosive Jet Cutters use the following SAP part numbers. Explosive components and hardware are packaged separately and are shipped together in an overpack. Table 5 (below) lists the available sizes of Segmented Explosive Jet Cutters along with the individual packages contained within the overpack.

<table>
<thead>
<tr>
<th>Part No. (Explosives &amp; Hardware kit Overpack)</th>
<th>Description</th>
<th>Explosive Pellet Kit P/N</th>
<th>Hardware Kit P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>101978733</td>
<td>2-15/16in OD (74.6mm) Drill Pipe Cutter</td>
<td>101978722</td>
<td>101978709</td>
</tr>
<tr>
<td>101978734</td>
<td>3-5/16in OD (84.1mm) Drill Pipe Cutter</td>
<td>101978723</td>
<td>101978710</td>
</tr>
<tr>
<td>101978736</td>
<td>3-5/8in OD (92.1mm) Casing Cutter</td>
<td>101978725</td>
<td>101978712</td>
</tr>
<tr>
<td>101978737</td>
<td>4in OD (101.6mm) Casing Cutter</td>
<td>102160749</td>
<td>101978713</td>
</tr>
<tr>
<td>101978738</td>
<td>4-1/2in OD (114.3mm) Casing Cutter</td>
<td>101978728</td>
<td>101978714</td>
</tr>
<tr>
<td>101978739</td>
<td>4-3/4in OD (120.7mm) Casing Cutter</td>
<td></td>
<td>101978715</td>
</tr>
<tr>
<td>101951863</td>
<td>5-1/2in OD (139.7mm) Casing Cutter</td>
<td>101951865</td>
<td>101951914</td>
</tr>
<tr>
<td>101978741</td>
<td>6in OD (152.4mm) Casing Cutter</td>
<td>101978730</td>
<td>101978719</td>
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<tr>
<td>101978742</td>
<td>6-1/8in OD (155.6mm) Casing Cutter</td>
<td>101978728</td>
<td>101978717</td>
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<tr>
<td>101978743</td>
<td>7-1/4in OD (184.2mm) Casing Cutter</td>
<td>101978728</td>
<td>101978718</td>
</tr>
<tr>
<td>101978744</td>
<td>8-3/16in OD (208mm) Casing Cutter</td>
<td>101978731</td>
<td>101978720</td>
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</tbody>
</table>

Table 5: Segmented Explosive Jet Cutter Part No’s.

The following additional accessories are not contained within the Segmented Explosive Jet Cutter kits listed above and should be obtained separately to ensure reliable and safe operations as described in this document.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Firing Head Assy 1.50in OD</td>
<td>100000434</td>
</tr>
<tr>
<td>16a</td>
<td>Detonator Resistorized HT (A161), HNS 460 DegF for 1hr</td>
<td>100000432</td>
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<tr>
<td>16b</td>
<td>Detonator RED Top-Fire, HMX 375 DegF for 1hr</td>
<td>101272595</td>
</tr>
<tr>
<td>17b</td>
<td>Detonator Adapter for RED</td>
<td>101295128</td>
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<tr>
<td>19</td>
<td>Shunt Plug</td>
<td>100010861</td>
</tr>
<tr>
<td>20</td>
<td>Protective Holder</td>
<td>100010862</td>
</tr>
</tbody>
</table>

Table 6: Additional parts required