



Safe Ignition System Small RTG & TAG Systems

ADP-PX16-150

MAN-PX1-007 (R03)

OWEN OIL TOOLS

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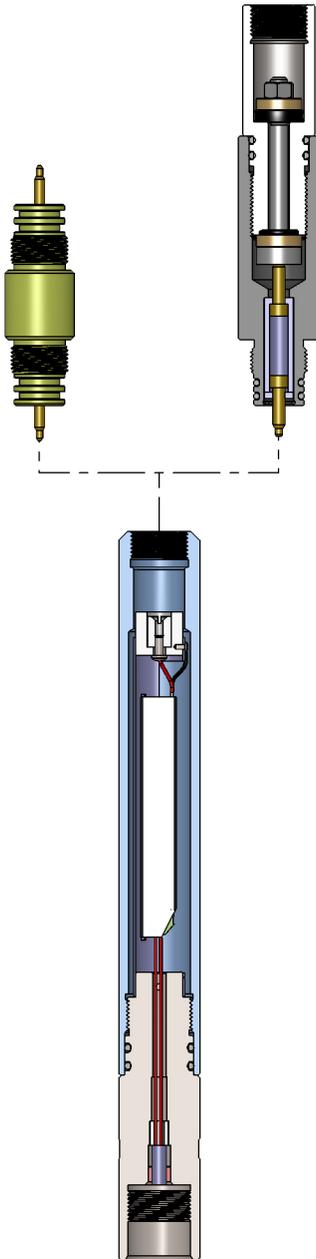
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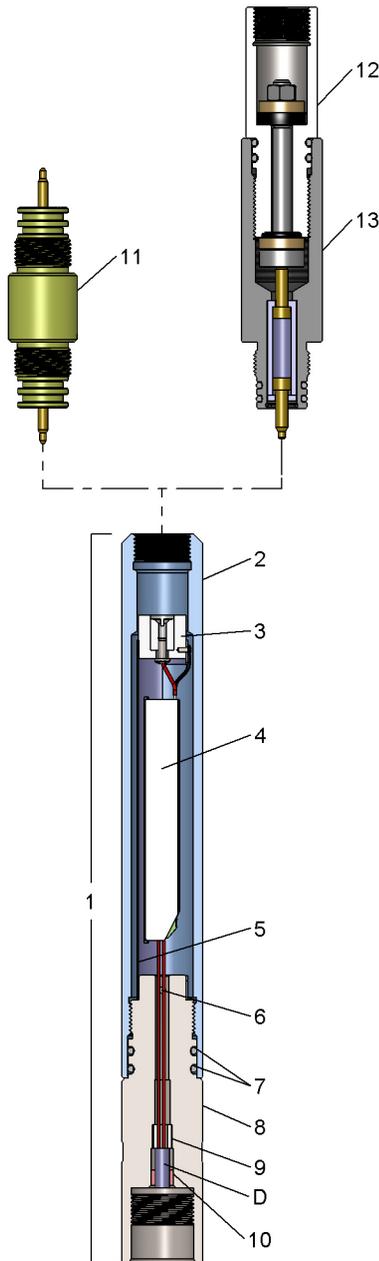
INTRODUCTION

The ADP-PX16-150 is a Safe Fire Initiation System that utilizes the PX-1 Fireset (with exploding bridgewire technology) to initiate RTG Gun Systems and small TAG Gun Systems. This system is an improvement over the standard ADP-PX16-100 RTG/Cut PX1 Firing System in that it utilizes a sealed system to ensure high pressure wellbore fluids do not migrate into wireline string.

Incorporation of the EBW detonator into the Firing Systems adds increased safety against rig-site hazards such as RF transmitter, cathodic protection, and stray voltages. The PX-1 EBW fireset allows normal oilfield operation to continue while perforating and other completion services are being performed.

All safety rules and regulations should be strictly followed when storing, handling, assembling, and using these tools and /or detonators. Safety precautions should be taken in accordance with your company's safety policies, governmental regulations, and the American Petroleum Institute Recommended Practice 67 (API RP-67)





ITEM	PART NO.	DESCRIPTION
1	ADP-PX16-150	Assembly, Small TAG and Bolted Guns, PX-1 Firing System
2	ADP-PX16-102	Top Housing
3	ADP-PX16-107	Contact Assembly
4	PUR-0610-008	PX-1 Fireset with Wire Outputs
5	SEV-1375-250	Carriage, PX1 Fireset
6	PUR-0509-040	6-32 x 1/4 Pan Head Screw - 2 Required
7	OOO-V569-217	O-Ring, Viton - 2 Required
8	ADP-PX16-119	Detonator Housing
9	ADP-PX16-123	Spacer, 3/8" OD x 0.218" ID x 1/2" Lg.
10	TC-001-0003-000	Rubber Grommet
*11	AES-8079	Internal Sealed Contact Sub (Sold Separately)
12	AES-AS80005	1-1/2" HP Firing Head (Sold Separately)
13	ADP-PX16-245	Sub Assembly, Double Contact, 1-11/16" OD (Sold Separately)
D	EBW-RISI-800	EBW - RDX Detonator (Sold Separately)
	ADP-PX16-151	Redress Kit for EBW - RDX Detonator, Includes Items 3, 4, 5, 6, 7, 9, 10
**	TAG-2750-281X	2-3/4" TAG Crossover Sub
	TAG-2875-280X	2-7/8" TAG Crossover Sub

*Item 11 can be interchanged with Items 12 & 13 to provide a sealed contact at the top of the assembly

** In order to use the ADP-PX16-150 Firing System with 2-3/4" and 2-7/8" TAG Systems, the appropriate TAG Crossover Sub (Item **) needs to be used between the TAG Top Gun and the Detonator Housing (Item 8).

To use this system with the Green Det™ see the catalog page for ADP PX16-155 or MAN-PX1-013



Note: To fire DC (+); connect the white/black wire to ground and connect the red wire to hot when using the EBW-RISI-800.

1.0 Pre-Assembly



Warning: *Explosives are destructive by nature! Do not attempt to disassemble or alter explosive products in any manner! Do not crush, hammer, pinch, impact, pull wires or abuse any explosive product!*



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!*



Note: *Before assembly, visually inspect all components for any defects.*

2.0 Assembly PX1 Fireset with EBW-RISI-800

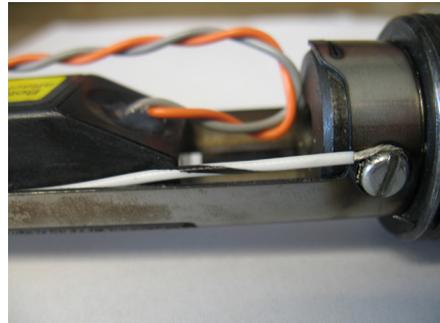
- 2.1 Install the O-Rings (item #7) onto the Detonator Housing (item #8) and lubricate.
- 2.2 Attach the Detonator Housing to the PX-1 Carriage (item #5) using the Pan Head Screws (item #6). Attach the Contact Assembly (item #3) to the other end of the PX-1 Carriage using the provided screws.
- 2.3 Remove the PX-1 Fireset (item #4) from its package and place it into the Carriage so that the PX-1 Fireset output wires (orange/grey) are facing the Detonator Housing. Press the PX-1 into the Carriage slots making sure that the PX-1 is secured in place by the slots as shown below.



- 2.4 Loosen one of the Pan Head Screws that is attached to the Detonator Housing, enough to attach the ground lead from the PX-1. Strip the PX-1 ground lead from the PX-1 to the appropriate length and ground to the Pan Head Screw as shown below.



Note: *The PX-1 Fireset is polarity sensitive; to fire with positive voltage (VDC+), the ground lead is the white/black wire; to fire with negative voltage (VDC-), the ground lead is the red wire.*



- 2.5 Strip the remaining wire coming from the PX-1 to the appropriate length and connect to the screw in the center of the Contact Assembly (item #3).
- 2.6 Feed the Detonator (item D) lead wires through the Spacer (item #9) and the O-Ring end of the Detonator Housing. The spacer will seat in the bore behind the detonator and will prevent the detonator from moving further into the detonator housing. Slide the Rubber Grommet (item #10) onto the end of the Detonator to hold the Detonator in the end of the Housing.
- 2.7 Thread a 1-11/16" Bull Plug from the Gun System you are running into the Detonator Housing. The use of a Bull Plug will keep the Detonator in place and serve as a blast shield for future assembly steps.
- 2.8 Cut the Detonator leads to an appropriate length, then strip 0.500 in. (1.3 cm) of insulation from each lead.
- 2.9 Using an approved digital blaster's multimeter, check the resistance of the detonator. The resistance should read less than 1 Ohm.
- 2.10 Check the output lead wires (orange and grey wires) of the PX-1 using an approved digital blaster's multimeter to make sure that no voltage is present before connecting the Detonator.
- 2.11 Connect the EBW detonator lead wires to the PX-1 output lead wires by attaching one detonator wire to the PX-1's orange wire and the other detonator wire to the PX-1's grey wire. Insulate each individual wire connection with electrical tape or other electrically insulating methods.



Note: *Each detonator lead wire must be connected to a PX-1 output wire; it is not permitted to connect either wire directly to ground. The user may wish to cut and strip the PX-1 wires to length prior to connection so as to avoid extra wire length when proceeding to the next step.”*

2.12 Insert the PX-1 and Carriage assembly into the Top Housing (item #2) and tighten. The Detonator Housing will only thread into one end of the Top Housing.



Caution: *Make sure the lead wires are not damaged while threading the Detonator Housing into the Top Housing!*

2.13 Connect to the wireline toolstring. (Use an Internally Sealed Contact Sub)

2.14 Remove the Bull Plug.

2.15 Mechanically connect the Gun System (not shown) to the Detonator Housing.

2.16 Follow the standard running procedure for the Gun System you are using.

3.0 PX-1 Firing Instructions



Warning: *The PX-1 generates a high-voltage, high-current pulse that could be dangerous to personnel if the device is misused! Use caution at all times when handling the PX-1, and always use an approved meter to verify that no voltage is present on the output before attaching a detonator. NEVER attach a detonator to the PX-1 without first verifying that any attached power supplies are disabled!*



Caution: *These instructions only describe how to use the PX-1! They do not replace or override any of the operator's normal safety requirements and procedures! It is the operator's responsibility to ensure that all explosives and associated devices are handled in a safe manner!*



Note: *The PX-1 fireset is intended for one-time use to initiate EBW or EFI detonators. All firesets are test-fired by Ecosse before shipment, and to avoid misruns further test-firing prior to use is not permitted.*



Note: *PX-1 firesets are now packed in a clear plastic tube with a tamper-evident seal on the cap. The words “Ecosse Inc” are printed in blue on the seal. If these words are missing or the seal has been cut, it should be assumed that the PX-1 has already been fired, and that the fireset should not be used for critical applications.*

- 3.1** When ready to fire the detonator, slowly increase the applied voltage (positive DC to the red wire, negative DC to the black/white wire). At 200-230VDC cablehead voltage the PX-1 will switch on and draw current (160-260mA). Continue increasing the voltage quickly until the PX-1 fires, which should be almost immediately, then power down. Note that at downhole temperatures the PX-1 requires up to 30V more to switch on and fire than it does on the surface.



Note: *If the power supply being used does not provide a true DC output, see Q1/A1 and Q7/A7 on the other side of this page for power-up characteristics.*

4.0 Frequently Asked Questions

Q1- Is any special equipment required to use the PX-1?

A1 No equipment is required other than a DC power supply to activate the PX-1. However, the power supply needs to supply true DC to power the PX-1 efficiently. Many of the DC supplies used in perforating operations actually deliver unsmoothed full-wave-rectified AC, which is a series of 100-120 voltage “bumps” per second rather than flat DC. Although the PX-1 will work with this input it does so less efficiently, and it will not work above temperatures of about 290-300F with this kind of supply. Also, because of the way most volt meters work it will look as if the PX-1 is switching on at a lower voltage than it actually is (the voltmeter will indicate the average or RMS voltage, while the PX-1 will switch on with the peak voltage). You should be aware that if you are using the above type of unsmoothed power supply with a very short wireline (7000ft or less), it might be necessary to continue increasing the voltage quickly for a few seconds after the PX-1 switches on before it will fire. It is preferable to avoid this situation by using a true DC power supply to fire the PX-1. Filtering can be added to an unsmoothed shooting supply to provide a true DC output. In its simplest form this can be little more than a capacitor (1000-2000uF) and bleed resistors; if required Ecosse can supply a low-cost plug-in box to meet this need. Finally, the CCL and other downhole hardware must

be capable of handling the cablehead voltage required by the PX-1 (see A4 below), and all electrical connections and insulation must be clean.

Q2 - Can the PX-1 be test-fired prior to use?

A2 No. All PX-1s are test-fired by Ecosse prior to shipping, and further testing is unnecessary. Also, experience has shown that test-firing prior to use is more likely to cause an otherwise-good tool to fail than it is to detect a problem.

Q3 - Can the PX-1 be test-fired for demonstration or troubleshooting purposes?

A3 Yes, although any tools used for this purpose should be expected to fail quite quickly and must not be used afterward on a job. If test-firing is required it should be done into a low- inductance load resistor (solid ceramic type preferred) with a resistance of 100200S, minimum voltage rating of 6kV, and a minimum power rating of 10W; Ecosse can supply a suitable resistor. The general firing method is the same as described overleaf for downhole operation. At about

200-210VDC input voltage the PX-1 will draw current (160-260mA) and start firing rapidly; power down as soon as this happens to avoid overheating and damaging the tool. The power should be ramped down quickly, not toggled off, otherwise damage to the PX-1 might occur. The firing will be indicated by a series of pulsing sounds from the PX-1. Wait 2 minutes after powering down and disconnecting the PX-1 from the power supply, then remove the load resistor.

Q4 - Is 260mA @ 210VDC all the surface-supplied power necessary to charge and activate the PX-1?

A4 At a minimum, yes. However, to allow for variations in firesets and a drop in efficiency at higher temperatures you really want a power supply that can provide at least 1A @ 250VDC downhole to give you some margin. At downhole temperatures, the PX-1 requires up to 30V more to switch on and fire than it does on the surface. Also, the coil in most shooting Casing Collar Locators (CCL) drops current to ground when you apply power to the line. With conventional detonators this usually isn't noticeable, as you will normally be applying only about 30V at the cablehead to fire a 55ohm detonator; if the CCL has a coil resistance of 1000ohm, the coil will draw 30mA versus about 500mA going to the detonator. With the PX-1 and a cablehead voltage of 220V, the PX-1 will be drawing maybe 200mA and the CCL coil will be drawing 220mA. So, your power supply has to be able to supply current to the CCL coil as well, and the engineer has to be aware that even although the PX-1 won't power up until the cablehead voltage is about 220V, the CCL will be drawing current immediately. Adding it all up, a power supply that can generate 750-1000mA @ 250VDC at the cablehead would be suitable for use with the PX-1. Depending on the type of wireline used and the



CCL coil resistance, the voltage required at the surface from the power supply might be as high as 350-400VDC.

Q5 - How is the PX-1 connected in the gun?

A5 There are two input wires to the PX-1 - a red wire (positive) and a black/white striped wire (negative). One of these wires is connected to ground and the other wire is connected to the gun through-wire; either wire can be the ground as long as the correct polarity is applied to the other wire when firing the PX-1. The detonator lead wires are connected to the orange and grey output lead wires from the PX-1. Since EBW and EFI detonators are not polarity sensitive, it does not matter the configuration in which the detonator lead wires are connected to the PX-1.

Q6 - What is the firing procedure?

A6 It's the same as firing a conventional detonator, except that you're going for 200-230V at the cablehead rather than 20-30V; basically you hold down the fire button and increase the voltage until the detonator fires. A single sheet with operating instructions for the PX-1 is packed with each device. After firing the voltage should be ramped down quickly rather than switched off instantly, otherwise the rapidly collapsing electromagnetic field around the CCL coil might generate extremely high voltage spikes which can cause insulation problems elsewhere.

Q7 - After the PX-1 switches on, how long does it take before the attached EBW/EFI is fired?

A7 With a true DC power supply the PX-1 will switch on and fire the attached detonator almost instantly (less than one second) after the voltage at the input leads reaches 200-230VDC. With an unsmoothed shooting power supply (see Q1/A1) or a long wireline, before the PX-1 will fire the detonator, it might be necessary to continue increasing the voltage quickly for a few seconds after it switches on.

Q8 - Can the PX-1 be fired by toggling the necessary input voltage onto it rather than by ramping it up?

A8 Yes, the PX-1 has been tested successfully with this firing method, with up to 280VDC being switched to the input leads. However, whenever possible the PX-1 should be fired by ramping up the voltage as described earlier.



Q9 - Can the PX-1 be fired with a capacitive-dump power supply?

A9 Probably not. The PX-1 has not been tested with this firing method, and it is not a recommended procedure.

Q10 - How does the PX-1 work?

A10 The PX-1 uses a capacitor discharge to fire the detonator, triggered by an over-voltage switch. Basically, the fireset has a safety circuit, a high voltage supply, an output capacitor, and a trigger mechanism.

Q11 - Can the fireset be used in an exposed gun application?

A11 The PX-1 is not designed to withstand pressure directly, so it must be contained in a protective housing for exposed gun applications. Also, the EBW and EFI detonators currently available are not pressure-rated, so they must be protected as well. If you have a need in this area Ecosse can supply adapter hardware with a 5-6 week lead time (we would need to know your CCL connection looking down and your gun connection looking up). All of the hardware except the detonator housing would be reusable. Ecosse can also supply adapters to use the PX-1 with chemical cutters, setting tools, and cutting/severing tools, down to 1-3/8in. OD