



Contrail Rockets

152 mm Hybrid Rocket Motor Reload Instruction Manual

Congratulations on your purchase of a Contrail Rockets 152 mm Hybrid Reload. The supplied motor reload has been designed to operate in Contrail Rockets Hardware only. Before you begin assembly of this reload, please read through this manual and familiarize yourself with the steps. If you have any questions, please contact Contrail Rockets.

Included With this Reload Package is:

Quantity	Item Name
1	Multi Port Fuel Grain
1 + 6 + 1	Press-Lock Injectors 1 3/8, 6 5/16, 1 3/16 vent
7	Igniters (24 Volt Resistor Type Igniter)
1	Nylon Fill Line 3/8 inch for center injector
3	Nylon Crossover Line down one port up the next
1	3/16 Inch Vent Line
3 + 2	O-Rings (Size 252 + 236)
1	Instruction Manual

Not Included With this Reload Package is:

Synthetic Type Grease (Mobile 1 Synthetic or Similar Recommended)
 Pyrodex Pellets (Muzzle Loading Pellets, Size 50/50 Recommended 14 needed)
 Deep Wall Socket Set
 7/16 Inch Socket for 3/16 Inch vent
 9/16 Inch Socket for 5/16 Inch Injectors
 5/8 Inch Socket for 3/8 Inch Injector
 Allen Wrench (3/8 Inch Allen Wrench for 152mm Motors)
 Line Cutters (Recommended: Radio Shack Coax Cable Cutters or sharp razor knife)
 Roll of Electrical Tape
 Cleaning Supplies for Post Flight Cleanup

Motor Assembly Instructions



Step 1: Ensure that your motor hardware is clean and free from grease, oils, dirt and debris. Wipe the motor components with soap and water, to cut any residual grease from previous firings. Make sure you have all required tools and parts for motor assembly.



Step 2: Begin by installing all O-Rings onto Nozzle and Injector Baffle. The

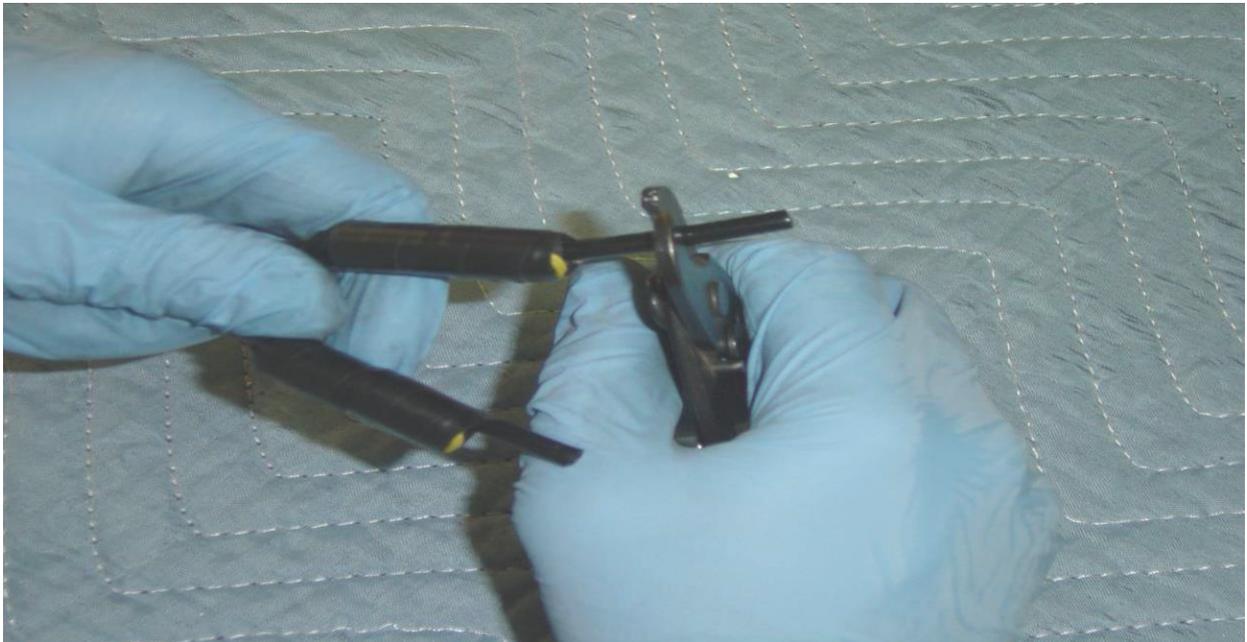
primary O-rings are Dash Number 252. O-Rings should be free from any cracks, burns or damage. The Nozzle O-rings are Dash number 236.



Step 3: Insert Press Lock Fittings into the Injector Face. A 3/8 Inch Fitting will always go in the center port. The Fittings should be tightened 1/2 turn past tight. The radial holes use a 5/16 injector the remaining hole is the vent which uses a 3/16 vent line.



Installation of the resistor and pellets like the photo is critical to ensure a quick ignition on all 7 injectors. Note that the resistor is 90 degrees away from the fill or crossover line. If the resistor is too close to the fill line the line will burst before the pellet is actively burning. If the resistor is 180 degrees away from the fill line the pellet will burn out before the line bursts. The pellets are wrapped with electrical tape, so the top is exposed and the rest of the pellet is covered including the bottom of the pellet this forces the flame to the face of the injector creating the heat needed for the line to fail.



Step 4: (Previous 4 Photo's): Verify that you have 2 50 Caliber / 50 Grain Pyrodex Pellets for each igniter. The correct size and number of Pyrodex Pellets for your reload and proper assembly and insertion of the line and pellets into the injector is critical for a fill and fire of your motor. Bend the resistor to the side of the powder pellet as shown. For 152 mm motors we recommend (2) 50 Caliber/50 Grain Pyrodex Pellets for each line. This equals a total of 14 pellets. The vent line runs down the center port with the fill line. Ensure that you have placed the Resistor 90 Degrees away from the Nylon Line. This ensures proper ignition of the Pyrodex Pellet before the line bursts. The Pyrodex Pellets should be taped together, and it is recommended that 2 wraps of Electrical tape should be sufficient over the entire igniter assembly to ensure ignition. Too Much Electrical Tape can be a bad thing and cause the pellets to burn to fast. You only need enough tape to hold them to the line. Prior to Moving onto the next step, ensure the lines are cut square and at a length of approximately $\frac{3}{4}$ of an inch from the top of the Pyrodex Pellets.

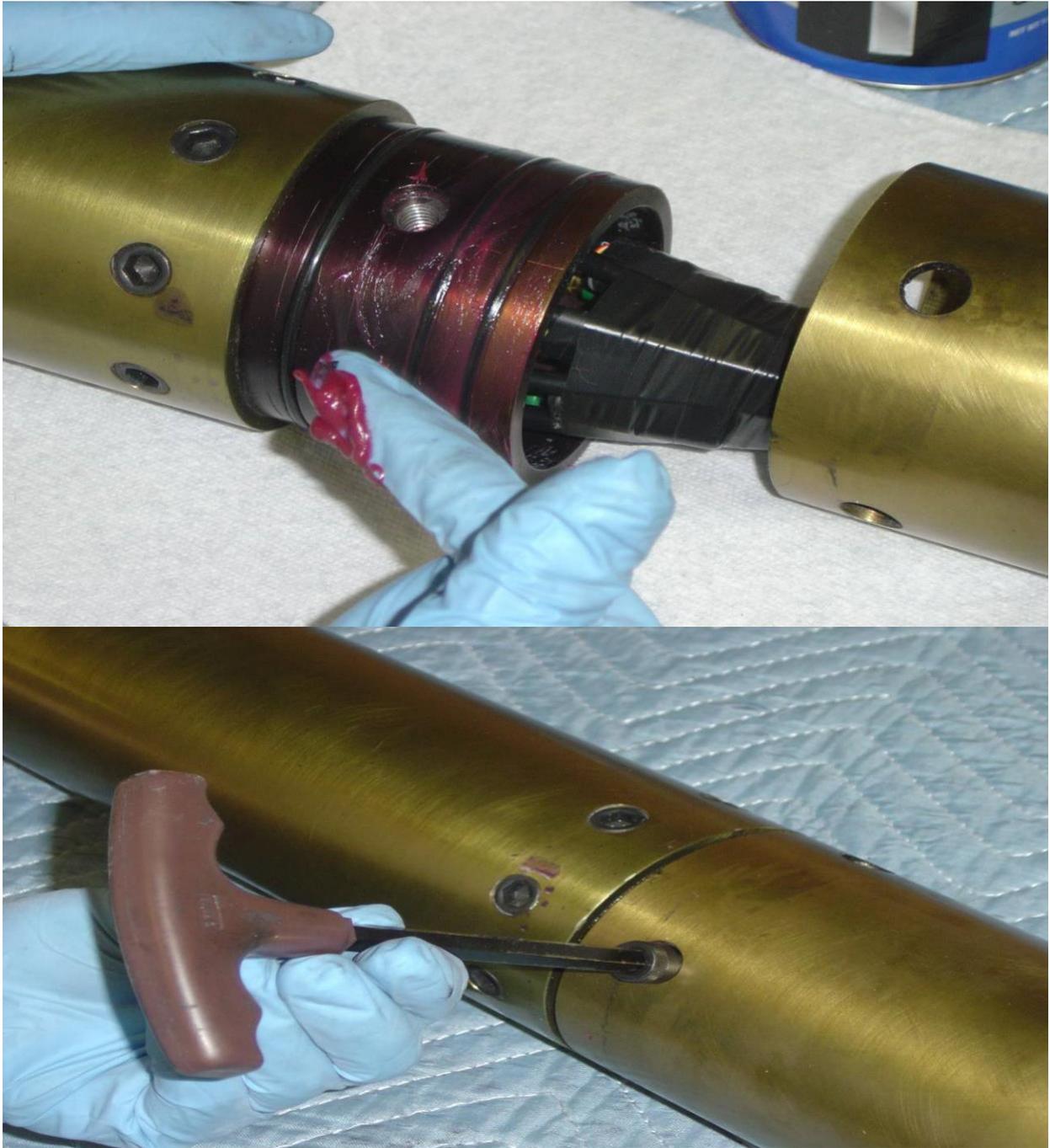




Step 5: The Cup of the Grain is the top so insert lines from the flat bottom of the fuel grain. Insert the 5/16 line thru two adjacent holes of the ported fuel grain. Do this two more times so that all perimeter holes have a crossover line in them. The center hole gets the 3/8 fill line. Then tape two Pyrodex pellets on each line for a total of seven igniters and 14 pellets. Insert the center line and then the six crossover lines into the injector baffle. The lines w/ Pyrodex Pellets attached into the injector baffle on so as to match the pattern from the ported grain. Ensure that the nylon lines go all the way into the press locks and go past the O-Ring Seal. You will feel it go past the O-ring and seat at the bottom of the fitting. You will now insert the 3/16-inch clear vent line into the 3/16 fitting on the injector baffle. Omit taping the lines together as shown below for a single core grain Ensure that all the lines are secure in the fittings prior to moving on. Cutting the lines, the same length $\frac{3}{4}$ of an inch from the pellets to the end of the line gives you a visual aid to ensure all lines are completely seated in the push to connect fitting/injector.

Step 6: You need to then grease the grain and slide the Combustion chamber over the greased grain. You need to ensure that the grain ports line up with the injector lines. Grease the included fuel grain with a synthetic type grease (Mobile 1 or similar) and slide the fuel grain into the combustion chamber. Ensure that the 3/8-inch fill line and the 3/16-inch vent line and igniter wire are all drawn through the center core of the grain. From the bottom of the grain you will have seven black lines, seven grey 24-volt igniter wires, and one clear vent line. All of these lines can be clustered and taped together 4 inches from the bottom of the grain. Each crossover line can be folded/kinked to make the bundle of lines and wires smaller. This allows the nozzle to fit over the lines and igniter wires. A thin coating of grease is all that is required.





Step 7: Grease the Injector Baffle O-rings and slide the nitrous tank section of the motor onto the combustion chamber and insert the retention bolts. The bolts will require a 3/8-inch hex head wrench.



Step 8: Grease the Nozzle O-rings and slide the nozzle into the combustion chamber. If you will be using a retaining ring on the nozzle, be sure to put this onto the nozzle prior to bolting it into the combustion chamber.

***You're Now Done Assembling your Contrail Rockets
Hybrid Rocket Motor.***

Venting Instructions

The 152 mm Contrail Hybrid do not require a vent hole on the top of the motor. Instead, the motor will vent nitrous oxide through the combustion chamber. Prior to motor ignition, the nylon line is routed through the combustion chamber and to wherever the user prefers. A Re-usable vent fitting is attached to the end of the 3/16-inch vent line. It is a good idea to secure this fitting to your launch pad so that you can find it after the motor has fired. The Fitting has a restrictor inserted into the fitting, which allows for a positive vent stream to be seen when the motor is full and ready for launch. Putting a dark background behind the vent makes seeing the change from gas to liquid easier to see.

Launch Setup and Procedure

- In order to fire any Contrail Rockets Hybrid Motor you will need to have available a Hybrid Ground Support System. We recommend the Contrail Rockets Ground Support System, or the Pratt Hobbies Ground Support System. For More information on Ground Support Contact your favorite hybrid vendor. Pad Setup is Simple.
 - No Hybrid Motor should be operated when Nitrous Oxide Pressures are less than 600 psi or more than 900 psi.
 - It is required that you fill your Hybrid Motor from a Distance of no less than 1000 Feet.
 - Manufactures of Hybrid Ground Support will be more able and willing to help assist you in the preflight setup and procedures which go along with there equipment. If you are not familiar with there equipment, ask them prior to use.
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Warnings

- Only Contrail Rockets Certified Reloads are to be used in Contrail Rockets Hardware. The use of any other manufactures reload in Contrail Rockets Hardware will void your warranty and will also render the assembled motor non-certified.
 - Never Approach a Hybrid Motor when filling or while the motor has pressurized Nitrous Oxide in it.
 - After Firing your motor, it may be hot, and should be handled with care.
 - Always Wear Protective Eyewear, Gloves, and Clothing when working with Hybrid Motors, or Ground Support.
 - Always follow the Tripoli Safety Code as well as the NFPA Safety Code for Mid and High Power Rocketry.
 - Not heeding these warnings could result in injury or death to yourself or others.
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Disposal and Cleanup

If for any reason you need to return or dispose of your reload, please contact Contrail Rockets LLC. for information on how to return the item. Appropriate shipping and handling, as well as packaging requirements

may be necessary. Any used items should be disposed of in the proper trash receptacle.

Disassembly and Motor Cleaning

Necessary Items:

Broom Stick or 30-inch-long 2x4 for removing Internals (at least the length of the combustion chamber)

Soap and Water for Cleanup

Paper Towels

Lighter Fluid for Cleaning Nozzles

Socket Set for Removal of Press Lock Fittings

Once you have fired the motor and it is time for cleanup you should begin by removing the retention bolts holding in the combustion chamber section only. Never disassemble the Nitrous Oxide Portion of the Motor. This will void all warranties. Remove the burned-up press lock fittings in the injector face. Next, remove the burned grain from the combustion chamber and dispose of. Everything will then need to be cleaned using soap or lighter fluid. O-rings should be checked for cracks or burns and be replaced as necessary.

Safety and First Aid

Conrail Rockets Hybrid Motor Reloads will not burn without the presence of a High Temp Heat Source, and strong oxidizer. If for some reason, any part of a reload is ingested, induce vomiting and seek medical attention.

Disclaimer

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Warranty

Our Products are Warranted for a time period of one year, from the date of original purchase. The warranty expressed by Conrail Rockets LLC., covers defects in material or workmanship. There shall be no expressed or implied warranty, which covers any item damaged, through the use of a Conrail Rocket Motor. This includes the motor hardware, electronics, and any other items which suffer from the misuse, neglect caused by the user. Conrail Rockets LLC. Reserves the right to alter the Warranty at any time, at their discretion.

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Manufacture Date: