



# Contrail Rockets

## 54mm Hybrid Rocket Motor Reload Instruction Manual

Congratulations on your purchase of a Contrail Rockets 54mm 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	Fuel Grain
1	Press-Lock Injector (User Selected At Time of Purchase)
1	Igniter (24 Volt Resistor Type Igniter)
1	Nylon Fill Line (User Selected At Time of Purchase)
1	Nozzle O-Ring (Size 223)
1	1/8 Inch Vent Line (Clear)
1	Instruction Manual

### Not Included With this Reload Package is:

Snap Ring Pliers

Krytox™ Oxygen Safe Grease

Synthetic Type Grease (Mobile 1 Synthetic or Similar Recommended)

Pyrodex Pellets (Muzzle Loading Pellets)

Recommended and Approved Sizes are as listed in attached Chart.

Deep Wall Socket Set

7/16 Inch Socket for 1/8, and 3/16 Inch Injectors

1/2 Inch Socket for 1/4 Inch Injectors

9/16 Inch Socket for 5/16 Inch Injectors

5/8 Inch Socket for 3/8 Inch Injectors

Good Pair of Cutters (Recommended: Radio Shack Coax Cable Cutters)

Roll of Electrical Tape

# 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.

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**Step 2:** Begin by installing all O-Rings onto Nozzle, Injector Baffle, and Bulkhead. All O-rings are Dash Number 223. O-Rings should be free from any cracks, burns or damage.





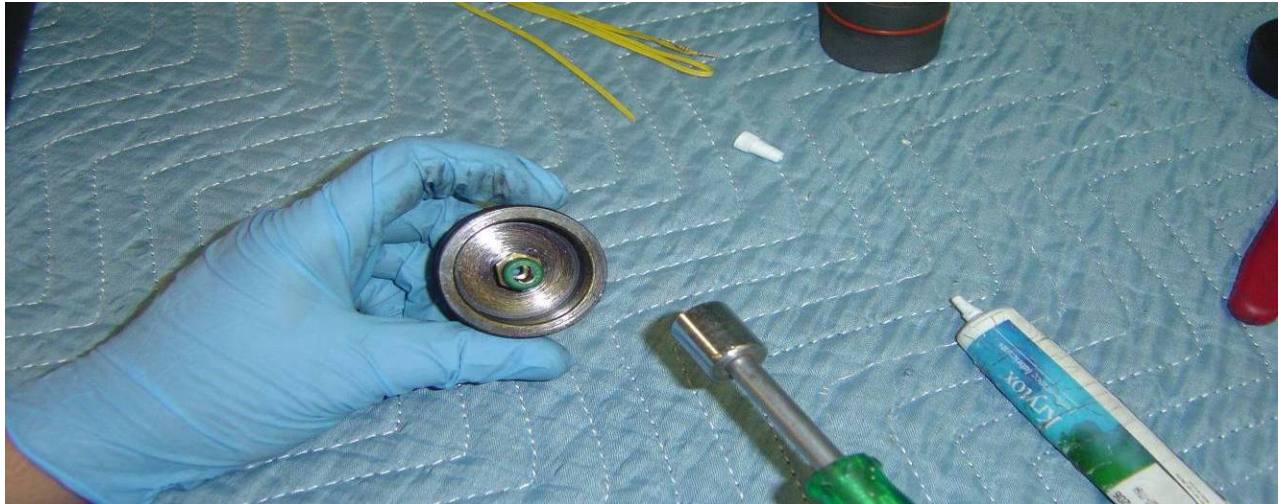
**Step 3:** Use Krytox™ grease on top Bulkhead O-rings. Smear Krytox™ over the entire outer cylindrical surface of the Bulkhead. This allows for an easy fit into the motor case. Krytox grease is available from Conrail Rockets and our Dealers.

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**Step 4:** Slide top bulkhead into the top side of the motor case. (The top of the motor case does not have an external groove cut into it for a thrust washer). Once the bulkhead is pushed just below the snap ring groove, install the snap ring using snap ring pliers.





**Step 5:** Install Parker Press-Lock Fitting into the Floating Injector. (The Floating Injector is denoted by an “I” Stamped on the top face) This should be done with a deep wall socket set. Make sure the injector is tightened to ½ turn past snug. To verify injector speeds and Igniter requirements please view the attached chart.

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### **Step 6 (Photos on Previous Page):**

Verify that you have the correct size and number of Pyrodex Pellets for your reload and then slide the igniter wire through the center hole of the pellet. Bend the resistor to the side of the powder pellet as shown. For Single Injector 54mm Motors We recommend (2) 50 Caliber/50 Grain Pyrodex Pellets. For Multi Injector

Motors We Recommend (3) 50 Caliber/50 Grain Pyrodex Pellets. 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. To Much can be a bad thing and cause the pellets to burn to fast.



**Step 7:** Make sure the nylon line is cut square. If it is not, use a set of cutters to square off the end of the lines. Once the line is cut square, push the line into the Press Lock Fitting. Be sure that you feel the fitting go past an O-Ring seal and seat snugly onto the bottom of the fitting. Once Seated give a slight pull to ensure the fitting is locked in, and the fittings “Teeth” grab onto the line.





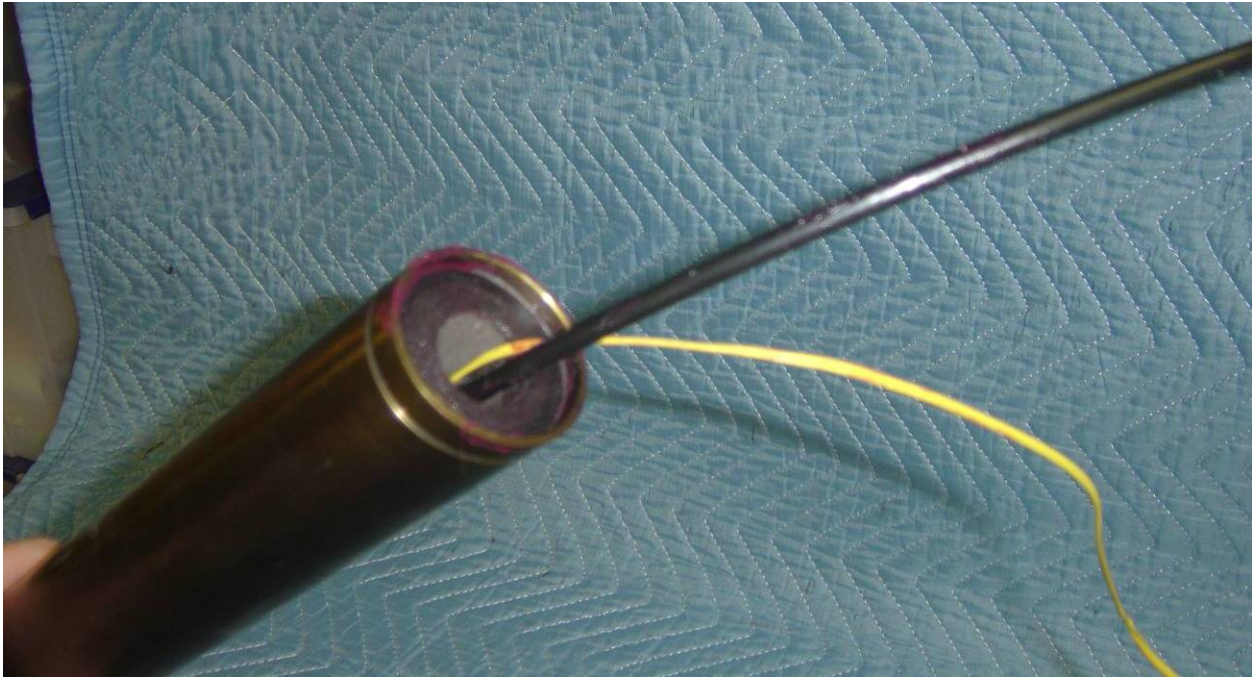
**Step 8:** Now that the Injector and Igniter assembly is put together, you will be greasing the Injector Assemble with Krytox™ Grease just as you did with the top bulkhead. Once the Injector is greased you will slide the assembly into the motor tube. Be sure to not slide the injector up to far, as you will use the grain to push the injector up the rest of the way into the case.

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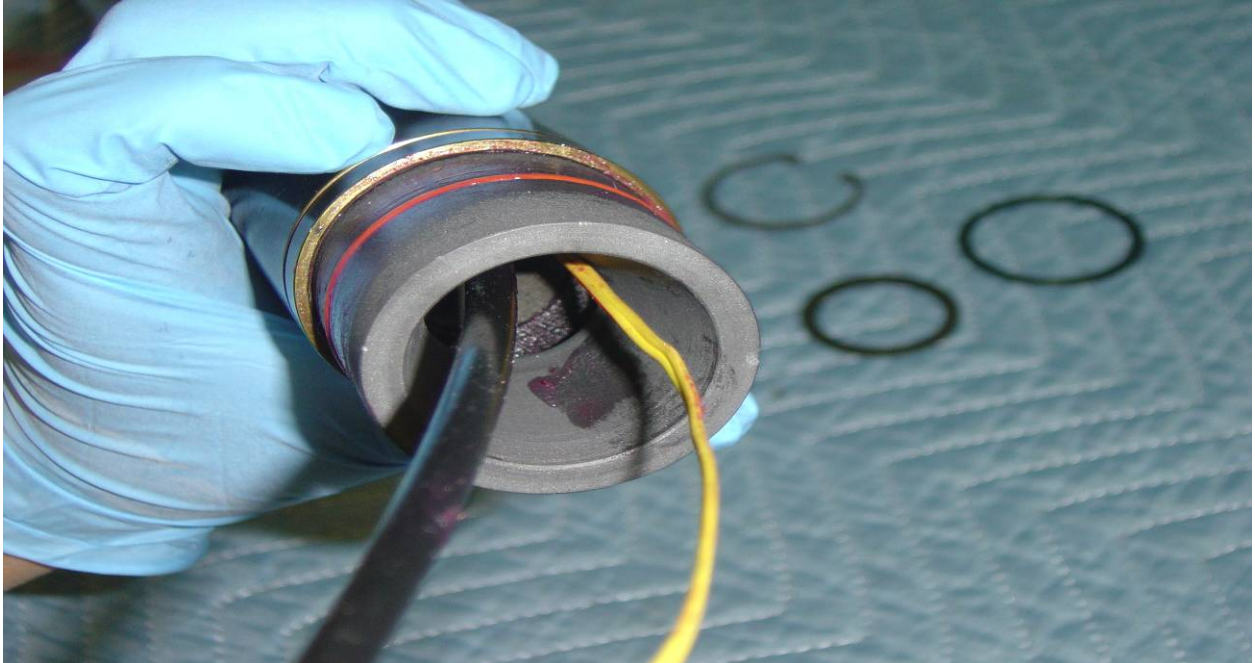
**Step 9:** Find the included Fuel Grain which came with the reload package. Grease the outside of this grain with a non-petroleum based grease. We recommend Mobile 1 Synthetic Grease. Completely cover the grain with grease before sliding the grain onto the fill line and igniter wire.



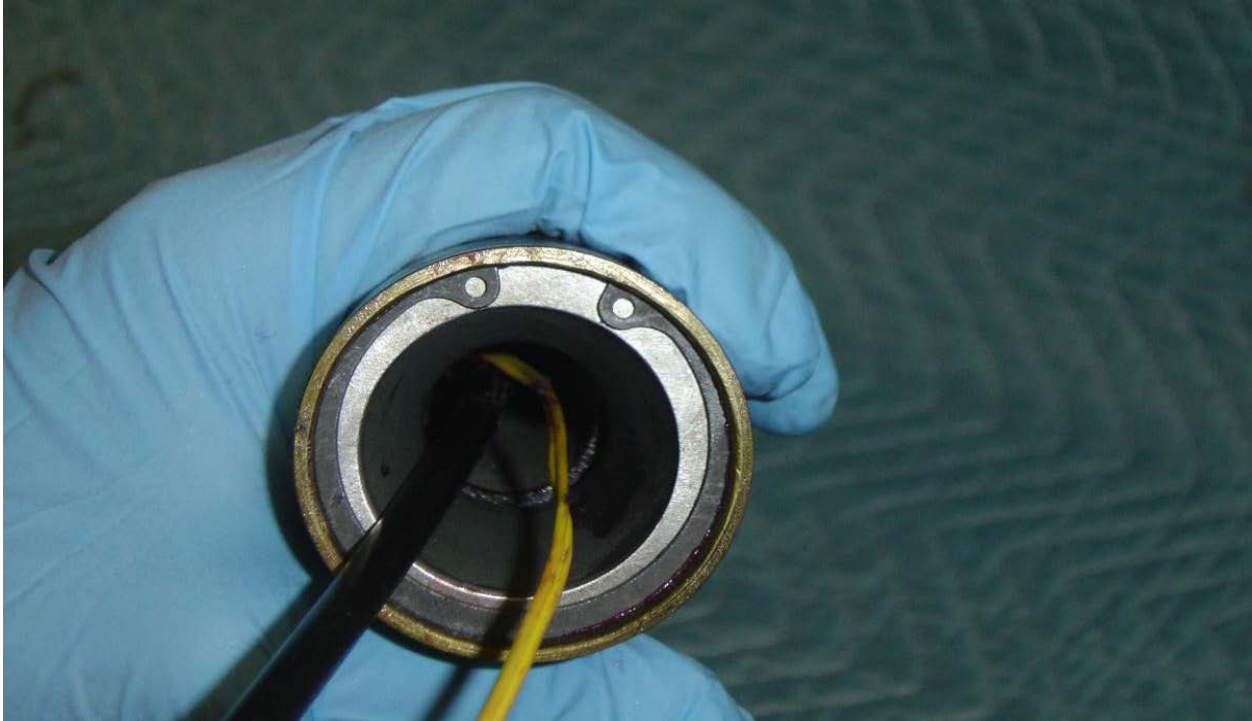


**Step 10:** Slide the Fuel grain into the motor case by pushing it down, which will also push the injector assembly into position as well. Wipe any excess grease off of the outside of the motor case.

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**Step 11:** Find the graphite nozzle with O-ring and give a light coat of synthetic grease. You then want to slide the graphite nozzle into the motor case. Following the insertion of the nozzle into the motor case you will then place the nozzle washer onto the face of the nozzle.



**Step 12:** Be sure that the nozzle and nozzle washer are pressed slightly below (approx. 1/16<sup>th</sup> of an inch) the snap ring groove. Find the second snap ring, and insert the snap ring into the groove to complete motor assembly.

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

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## Venting Instructions

The recommended procedure for venting Contrail Rockets Hybrid Motors is to drill the vent hole (1/8-3/16<sup>th</sup> hole) in the side of the rocket prior to motor installation.

Next, you will feed the clear vent line which is included with the reload package through the newly drilled hole, and down the motor mount tube.

You will then connect the clear vent to the Bulkhead Vent Assembly (The Vertical Press Lock Located in the Top Bulkhead)

Finally you feed the motor case and vent line back through and into the motor mount. You will then clip off any excess vent line which sticks out of the rocket body and you are ready to fly!

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# 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 550 psi or more than 900 psi.
  - It is required that you fill your Hybrid Motor from a Distance of no less than 100 Feet.
  - Manufactures of Hybrid Ground Support will be more able and willing to help assist you in the pre flight 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 of 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 Long Dowell for removing Internals (at least the length of the motor case)
- Soap and Water for Cleanup
- Paper Towels
- Lighter Fluid for Cleaning Nozzles
- Plyers or Vice Grips to pull out Top Bulkhead

Once you have fired the motor and it is time for cleanup you should begin by removing both snap rings and Nozzle Washer. Then find your pliers or Vice Grips to pull out the top bulkhead (Attach to the base of the Silver Fitting). Push Everything out of the motor from the top of the motor using the broom stick. Everything will then need to be cleaned using soap or lighter fluid. O-rings should be checked for cracks or burns, and replaced as necessary.

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## 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.

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## 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.

## Contact Information

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Manufacture Date: