

# HIGH-POWER RMS-PLUS™ Assembly and Operation Instructions

## READ THIS BEFORE YOU BEGIN:

• Study the illustrations and sequence of assembly. **THE SEQUENCE OF ASSEMBLY IS EXTREMELY IMPORTANT. READ ALL INSTRUCTIONS BEFORE USE. USE RMS™ MOTORS AND RELOAD KITS ONLY IN ACCORDANCE WITH ALL INSTRUCTIONS.** Review the parts list and become familiar with all parts before assembly. **IF ANY PARTS ARE MISSING OR DAMAGED, CONTACT RCS AT 1-435-865-7100.**

• **DO NOT USE ANY PARTS OF THE RMS™ SYSTEM THAT ARE DAMAGED IN ANY WAY.** If in doubt, contact RCS at the number above for assistance.

• **DO NOT MODIFY THE MOTOR IN ANY WAY.** Modification of the motor or the reload kit parts could result in motor failure, lead to the destruction of both your rocket and motor and may cause personal injury, death and/or property damage. Modification of the motor or reload kit in any way will invalidate your motor warranty.

• **USE ONLY AEROTECH/RCS RMS™ RELOAD KITS AND MOTOR PARTS TO REFURBISH YOUR RMS™ MOTOR.** The AeroTech/RCS reload kits have been designed specifically for use in your particular AeroTech/RCS RMS™ motor. Use of imitation components may destroy your motor, rocket and payload and will invalidate your motor warranty. Only use AeroTech/RCS RMS™ reload kits intended for your specific AeroTech/RCS RMS™ motor. **DO NOT INTERCHANGE PARTS!** Do not use AeroTech/RCS RMS™ reload kits or motor components for any other purpose than to refurbish an AeroTech/RCS RMS™ motor.

• **DO NOT REUSE ANY OF THE DISPOSABLE PARTS OF THE RMS™ RELOAD KIT.** This includes the liner, nozzle and o-rings. These components have been designed for one use only and must be discarded after firing. Reuse can result in motor failure during subsequent operation and will invalidate your motor warranty.

• Motors are hot after firing. Although the RMS™ operates at a lower temperature than most disposable motors, the higher thermal conductivity of the aluminum motor parts may make it seem otherwise. If necessary to handle a motor before it has cooled down, use a rag or similar article.

• Read and follow the safety code of the Tripoli Rocketry Association (TRA) and comply with all federal, state and local laws in all activities involving high power rockets.

## DO NOT OPEN RELOAD KIT UNTIL READY TO USE.

### PARTS:

#### RMS™ HARDWARE

38mm aft closure	1
38/120 case	1
38mm std. or plugged forward closure	1

#### RELOAD KIT

Nozzle (black plastic part)	1
Liner (1-3/8" O.D. paper tube)	1
Propellant grain	1
Aft o-ring (3/16" thick X 1-3/8" O.D.)	1
Forward o-ring (1/8" thick X 1-3/8" O.D.)	1
Grain O-ring (1/16" thick X 1-5/16" O.D.)	1
Forward & aft insulators (1-3/8" O.D. fiber washers)	2
Copperhead™ igniter	1
Nozzle cap (5/8" O.D. red plastic cap)	1
RMS-Plus™ smoke charge element (short solid part)	1
Smoke charge insulator (13/16" O.D. tube)	1
Smoke charge o-ring (3/32" thick X 13/16" O.D.)	1
Fwd smoke charge spacer (13/16" O.D. neoprene washer)	1

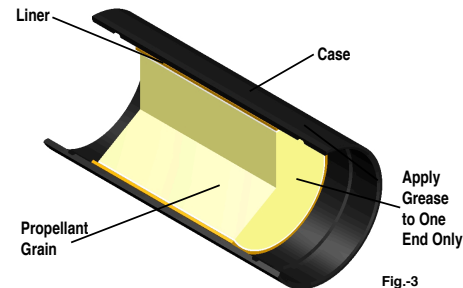
### ITEMS NEEDED FOR USE:

- Synco™ Super Lube™ or other grease
- Hobby knife
- Wet wipes or damp paper towels

**SAVE THE RELOAD KIT PLASTIC BAG FOR THE USED RELOAD PARTS. DISPOSE OF BAG AND PARTS PROPERLY.**

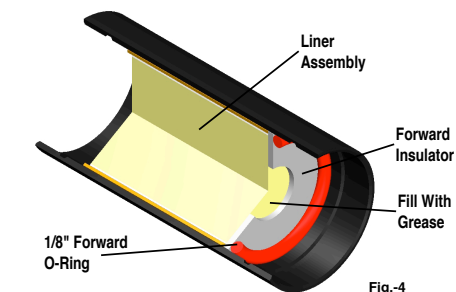
## Chapter 2. Case Assembly

2-1. **Fig.-3:** Apply a coat of grease to **one end** of the propellant grain, and install the propellant grain into the liner.



2-2. **Fig.-3:** Push the liner assembly into the motor case until it is equally recessed from both ends of the case. **NOTE:** A light coat of grease on the outside surface of the liner will facilitate installation and casing cleanup after motor firing.

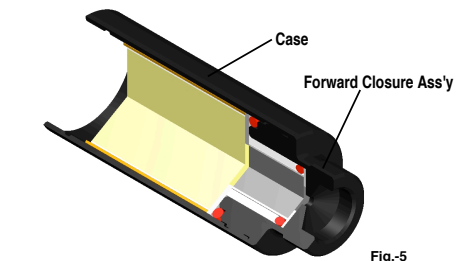
2-3. **Fig.-4:** Place the forward insulator (1-3/8" O.D. fiber washer) against the **greased end** of the propellant grain and liner.



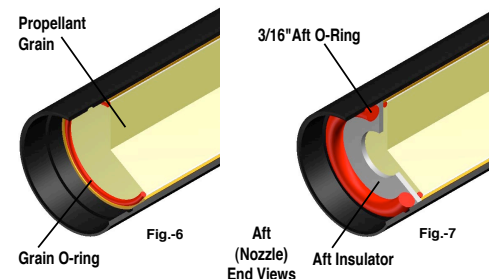
2-4. **Fig.-4:** Place the greased forward (1/8" thick X 1-3/8" O.D.) o-ring into the forward insulator end of the case until it is seated against the forward insulator.

2-5. **Fig.-4:** Fill the space in the forward insulator with grease.

2-6. **Fig.-5:** With the motor case held in a horizontal position, thread the previously assembled forward closure assembly into the forward end of the motor case by hand until it is seated against the case.



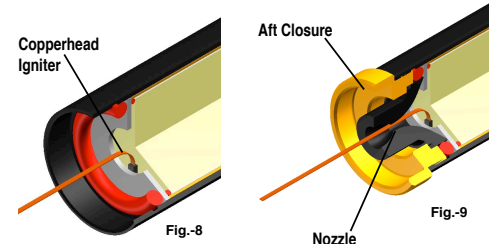
2-7. **Fig.-6:** Place the grain o-ring (1/16" thick X 1-5/16" O.D.) into the aft (nozzle) end of the motor case, seated against the propellant grain.



2-8. **Fig.-7:** Place the aft insulator (1-3/8" O.D. fiber washer) into the aft (nozzle) end of the motor case, seated against the liner assembly.

2-9. **Fig.-7:** Place the greased aft (3/16" thick X 1-3/8" O.D.) o-ring into the aft end of the motor case, seated against the aft insulator.

2-10. **Fig.-8:** Insert the coated end of the supplied Copperhead™ igniter into the gap between the aft insulator and the propellant grain.

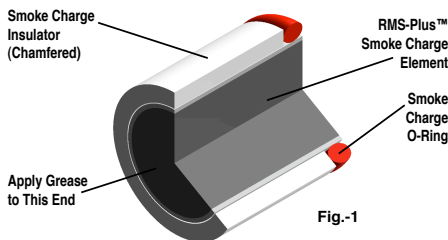


2-11. **Fig.-9:** Thread the larger end of the nozzle over the exposed lead of the Copperhead igniter and push the nozzle into the aft o-ring and against the aft insulator. The nozzle will be a snug fit in the o-ring.

2-12. **Fig.-9:** Thread the aft (gold) closure into the aft end of the motor case by hand until it is seated against the case. **NOTE:** There will be some resistance to threading in the closure during the last 1/32" to 1/16" of travel.

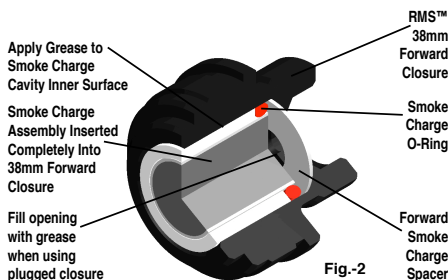
## Chapter 1. Forward Closure Assembly

1-1. Apply a light coat of Synco™ Super Lube™ or other grease to all threads and all o-rings except the grain o-ring. This will facilitate assembly and prevents the threads from seizing.



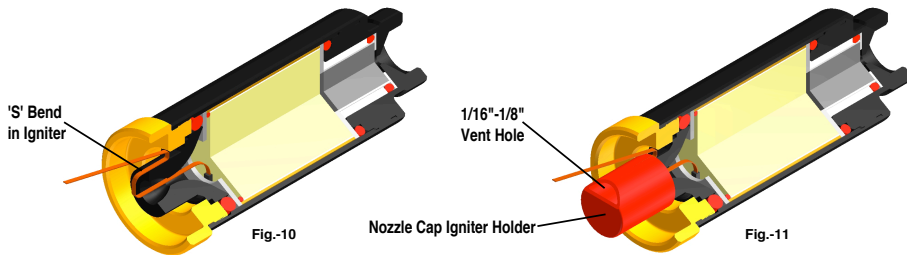
1-2. **Fig.-1:** Chamfer both inner edges of the smoke charge insulator with your fingernail. Assemble the RMS-Plus smoke charge element, smoke charge insulator and smoke charge o-ring as shown. Apply a coat of grease to the end of the smoke charge opposite the o-ring.

1-3. **Fig.-2:** Insert the forward smoke charge spacer (13/16" O.D. neoprene washer) into the smoke charge cavity until it is seated against the forward end of the cavity. Apply a **light film** of grease to the inner circumference of the smoke charge cavity.



1-4. **Fig.-2:** Insert the smoke charge assembly shown in Fig.-1 into the smoke charge cavity, o-ring end first, until it is seated against the forward smoke charge spacer. **NOTE:** When using a plugged forward closure, fill the opening in the forward smoke charge spacer with grease prior to installing the smoke charge assembly, and install the smoke charge components in this order: Forward smoke charge spacer, smoke charge o-ring, smoke charge insulator and smoke charge element.

### Chapter 3. Preparation For Flight



- 3-1. **Fig.-10:** Gently bend the exposed end of the Copper-head igniter into an 'S' shape as shown.
- 3-2. **Fig.-11:** Using a hobby knife, cut a corner off the red nozzle cap (5/8" O.D. red plastic cap) to create a small (1/16"-1/8") vent hole.
- 3-3. **Fig.-11:** Push the vented nozzle cap igniter holder over the igniter lead and nozzle until the igniter is held securely.
- 3-4. Install the motor into the rocket's motor mount tube. Ensure that the motor is securely retained in the rocket by using positive mechanical means to prevent it from being ejected at the time of recovery system deployment.
- 3-5. Prepare the rocket's recovery system and then launch the rocket in accordance with the Tripoli Rocketry Association (TRA) Safety Code and National Fire Protection Association (NFPA) Code 1127.

- 5-4. Apply a light coat of grease to all threads and the inside of the motor case. Reassemble metal parts and store motor in a dry place.

### Chapter 5. First Aid

For a minor burn, apply a burn ointment. For a severe burn, immerse the burned area in ice water at once and see a physician as quickly as possible. In the unlikely event of oral ingestion of the propellant, induce vomiting and see a physician as quickly as possible. The AeroTech/RCS composite propellant consists primarily of ammonium perchlorate and a rubber-like plastic elastomer.

### Chapter 6. Disposal

Damaged or defective reload kits should be returned to RCS.

### Chapter 7. Fire Safety

Tests show that the pyrotechnic components of RMS™ reload kits will not explode in fires and normally will not ignite unless subjected to direct flame and then will burn slowly. Use water to fight any fires in which AeroTech/RCS RMS™ reload kit pyrotechnic components may become involved: Direct the water at the AeroTech/RCS RMS™ reload kit pyrotechnic components to keep them below their 550 deg. F autoignition temperature. Foam and carbon dioxide fire extinguishers will NOT extinguish burning propellants of the type used in RMS™ reload kit pyrotechnic components. Keep reload kit pyrotechnic components away from flames, sources of heat and flammable materials.


### Disclaimer and Warranty

**NOTICE:** As we cannot control the storage and use of our products, once sold we cannot assume any responsibility for product storage, transportation or usage. RCS shall not be held responsible for any personal injury or property damage resulting from the handling, storage or use of our product. The buyer assumes all risks and liabilities therefrom and accepts and uses AeroTech/RCS products on these conditions. No warranty either expressed or implied is made regarding AeroTech/RCS products, except for replacement or repair, at RCS's option, of those products which are proven to be defective in manufacture within one year from the date of original purchase. For repair or replacement under this warranty, please contact RCS. Proof of purchase will be required. Note: Your state may provide additional rights not covered by this warranty.

### Chapter 4. Post-Recovery Cleanup

**NOTE:** Perform motor clean-up as soon as possible after motor firing. Propellant and smoke charge residues become difficult to remove after 24 hours and can lead to corrosion of the metal parts. Place the spent motor components in the reload kit plastic bag and dispose of properly.

- 5-1. After the motor has cooled down, remove the forward and aft closures.
- 5-2. Remove the smoke charge insulator, smoke charge o-ring and forward smoke charge spacer (neoprene washer) from the forward closure and discard. Remove and discard the nozzle and the forward and aft o-rings. Using wet wipes or damp paper towels, remove all delay and propellant residue from the closures. **WARNING: FAILURE TO COMPLETELY REMOVE SMOKE CHARGE RESIDUE FROM THE INSIDE OF THE FORWARD CLOSURE CAN LEAD TO GAS LEAKAGE ON A SUBSEQUENT FLIGHT AND DAMAGE TO YOUR RMS MOTOR FORWARD CLOSURE AND ROCKET VEHICLE.**
- 5-3. Remove the liner from the casing by pushing on either end. Discard the liner and the forward and aft insulators. Using wet wipes or damp paper towels, wipe the inside of the casing to remove all propellant residue.




Division of RCS Rocket Motor Components, Inc.

# HIGH-POWER RMS™

## Reloadable Motor System

DO NOT OPEN  
RELOAD KIT  
UNTIL READY  
TO USE

With  **Advanced Delay Sealing System**

# RMS™ 38/120 EB WARP-9™

**THIS PACKAGE CONTAINS ONE RMS-PLUS™ RELOAD KIT:**

☐ **G69N-P** (38/120)

**NOTE: Warp-9 reload kits do not include an ejection charge. Warp-9 motors must be used in conjunction with a timer, altimeter or radio-actuated recovery system.**


N=Warp-9™

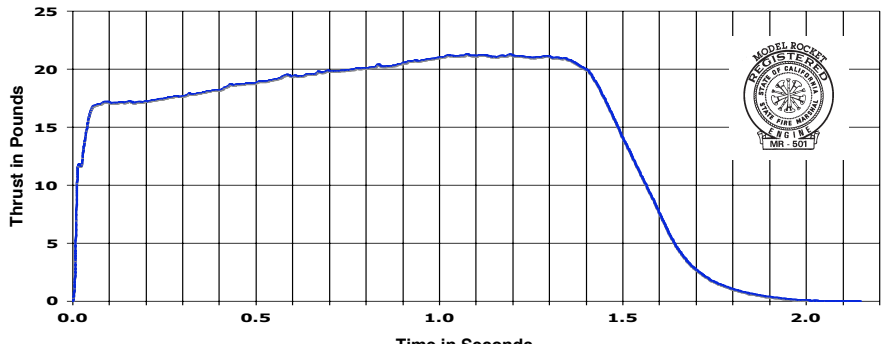
The reload kit shown above is *ONLY* for use in AEROTECH RMS-38/120 high-power motors.

**NOTE: SALE OF PROPELLANT RELOAD KITS TO PERSONS UNDER 18 YEARS OF AGE PROHIBITED BY FEDERAL LAW. WARNING-FLAMMABLE: Read Instructions Before Use. KEEP OUT OF REACH OF CHILDREN. FOR USE ONLY BY INDIVIDUALS 18 YEARS OF AGE OR OLDER. DO NOT SMOKE when loading these motors or use in the vicinity of open flames.**

### Typical Time-Thrust Curve:

Certified by the National Association of Rocketry (NAR)





### RMS-38/120 EB WARP-9 RELOAD KIT DATA

Hardware Desig.	Performance Desig.	Total Impulse	Propellant Wt.	Loaded Motor Wt.
RMS™-38/120	<i>G69N</i>	137 N-sec	62.2 g (0.137 lb)	195 g (0.430 lb)

### RMS-38/120 HARDWARE DATA

Hardware Designation	Motor Diameter	Motor Length	Hardware Weight	Reload Used
<i>RMS™-38/120</i>	1.500" (38mm)	4.19"	103.6 g (0.228 lb)	G69N

**NOTE:** Total impulse shown is average. Motor length is measured from end of aft closure to end of forward closure.