

# Pro24<sup>®</sup> Reloadable Rocket Motor System

FOR USE ONLY BY CERTIFIED HIGH-POWER ROCKETRY USERS 18 YEARS OF AGE OR OLDER  
 SALE TO PERSONS UNDER 18 YEARS OF AGE IS PROHIBITED BY FEDERAL LAW  
 FLAMMABLE MATERIAL – KEEP AWAY FROM OPEN FLAME, CIGARETTES OR OTHER HEAT SOURCES AT ALL TIMES

USE WITHIN 1 YEAR OF MANUFACTURING DATE

TEMPERATURE RANGE: -5 to 30°C

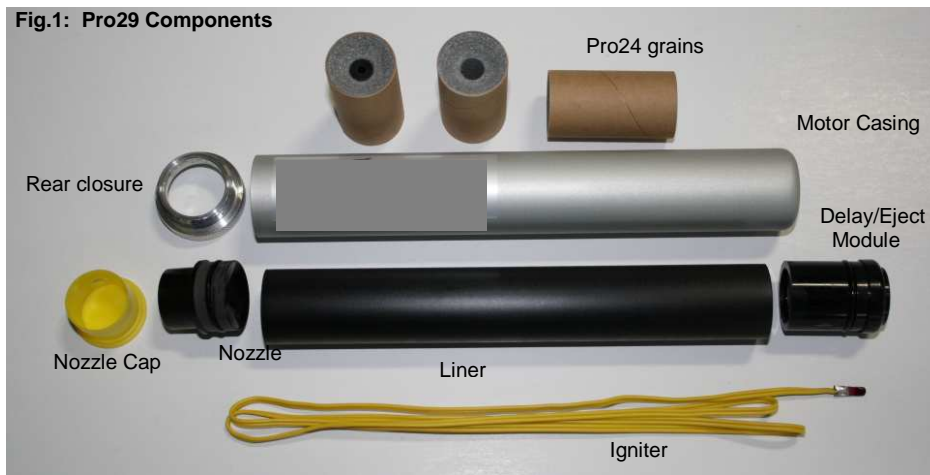
**Pro24<sup>®</sup>** High-Power Reloadable Rocket Motors are professionally engineered propulsion systems designed for safe use, high performance, ease of assembly and high reliability. The **Pro24<sup>®</sup>** system also features a unique *user-adjustable* time delay. Reloading is a quick, easy, 3-step operation. Select and adjust the time delay, motor assembly and igniter installation.

You will see that we've added a number to the front of the standard motor type code system. This number indicates the total impulse of the motor in Newton-seconds. For example, 200H300-15A is an 200Ns "H" motor, with 300N average thrust and a 15s *adjustable* delay. Please study Figure 1 for an overview and nomenclature of the **Pro24<sup>®</sup>** motor system.

## Assembly and Operating Instructions

**WARNING**

Comply with all Federal, State/Provincial and local laws in all activities with high-power rockets. Read and follow the Safety Codes of the Tripoli Rocketry Association (TRA), National Association of Rocketry (NAR) and Canadian Association of Rocketry (CAR).



### Step 1 – Time Delay Adjustment

Each motor is equipped with a full-length delay grain which provides the delay time shown in the motor designation. This delay may be *reduced* by 3,5,7, or 9 seconds as required down to the minimum delay time allowed for the motor type. Refer to the following table to select the proper adjustment for your application.

**Do not adjust the delay time to less than 4 seconds!**

Delay designation in motor type code:	Delay adjustment and resulting delay time:				
	None	-3	-5	-7	-9
<b>-7A</b>	7s	4s	Do not use	Do not use	Do not use
<b>-8A</b>	8s	5s	Do not use	Do not use	Do not use
<b>-9A</b>	9s	6s	4s	Do not use	Do not use
<b>-10A</b>	10s	7s	5s	Do not use	Do not use
<b>-11A</b>	11s	8s	6s	4s	Do not use
<b>-12A</b>	12s	9s	7s	5s	Do not use
<b>-13A</b>	13s	10s	8s	6s	4s

### CAUTION

Work in a tidy area, away from other rocket motors and materials, well away from any open flame or heat source.  
Perform delay adjustments in the field during rocket preparation.  
Delay adjustments are irreversible, and safer if done outside.

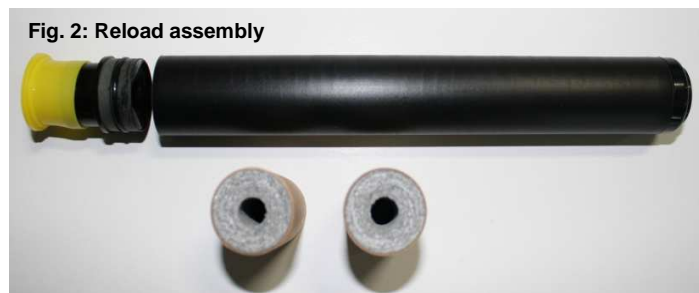
NOTE: The ejection charge on all **Pro24**<sup>®</sup> motors is 0.6g of FFFFG black powder. If additional ejection charge is required, do not remove white cap. Instead, add additional powder on top of white cap and seal cavity with tape.

- Remove the delay/ejection module (Figure 1) from the reload kit liner. Return the reload kit to the package and store safely away during the delay adjustment operation. Check the drill guide and drill holder for debris and clean if required before proceeding. **Only use the Pro38<sup>®</sup> drill guide (Pro-DAT) in combination with the Pro24 centering ring. DO NOT** attempt to use without the centering ring, as the delay may not be drilled correctly.
- Select the delay adjustment desired, rotate the drill holder to the appropriate notch in the drill guide and seat the drill holder tab into the drill guide notch.
- Drop the Pro24 centering ring into the drill guide cavity.
- Holding the drill guide and drill holder together in one hand, insert the delay module into the drill guide cavity with insert until the drill bit touches the delay material. Rotate the drill holder clockwise while applying light pressure. Drill into the delay material until the drill guide bottoms out against the delay material. Rotate the drill for several more revolutions in order to clear the delay material from the hole.
- Remove the delay module from the guide. Empty any residue from the module.
- For safety, we recommend that you dispose of the delay residue by soaking it in water for a minimum of 1 hour then discarding the residue. A small zip-lock bag or plastic container filled with water is ideal and will safely dissolve the oxidizer from the delay material. This aqueous solution is not harmful to septic or sewage systems.

NOTE: If using an electronic recovery system, remove the white plastic disc from the end of the delay/ejection module and transfer the powder to your remote ejection charge holder and follow the recovery system instructions. Reinstall the module into the reload assembly.

### Step 2 – Motor Assembly

- Inspect the motor casing for damage. Discard if damaged. Modification of the casing can cause property damage or result in serious personal injury.
- Using a gentle twisting motion, insert the delay/ejection module into the forward end of the plastic liner as far as it will go. A small gap between the forward end of the liner and the shoulder on the delay/ejection module as shown is.



### Step 3 – Igniter Installation

**NFPA 1127 – Code for High Power Rocketry, 1995 edition, states the following:**

*“2-12.4 A person shall install an ignition device in a high-power rocket motor at the launcher or within the area designated by the safety monitor. The rocket shall be pointed in a safe direction during and after installation of the ignition device.”*

This rule must be followed when **removing** or **installing** igniters for **ANY** reason.

#### **WARNING**

Never store rocket motors with igniters installed. Do not install igniters until the rocket motor is installed in the rocket vehicle and the rocket vehicle is completely prepared and ready for launch. If weather, safety or other conditions result in a delay of the launch, disconnect all igniters from the launch system and replace the shunts. If the launch is aborted for any reasons, remove the igniters from the motors and install the shunts.

#### **WARNING**

Twist the bare igniter leads together several times **BEFORE** proceeding with igniter installation. **NEVER** check continuity of an electric igniter after it has been installed in a rocket motor unless done remotely from launch control while all personnel are in the safe location for rocket launch.

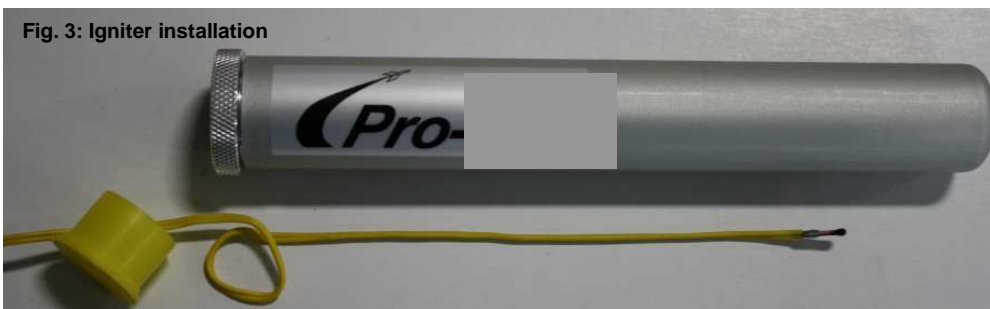


Fig. 3: Igniter installation



Fig. 4: Igniter installed

#### **Igniter specifications\*:**

Bridge wire resistance: 0.8 – 1.2  $\Omega$   
Recommended nominal firing current: 1.25 A  
Maximum no-fire current: 0.4A  
Maximum test current: 0.04A

(\*) These are manufacturer's specs. CTI assumes no responsibility for their use or misinterpretation.

- Carefully uncoil the igniter leads. Remove any kinks or twists and straighten the wires for about 24" (60 cm) from the igniter head. Remove the yellow nozzle cap from the motor and feed the shunted ends of the igniter leads through the inside of the nozzle cap and out through the hole.
- Insert the igniter head into the nozzle and push until it stops against the igniter pellet. With the igniter in this position, bend a loop into the igniter leads one cap length from the nozzle exit (Figure 3 – igniter shown outside motor for indication of approximate location of the igniter pellet).
- Slide the nozzle cap up to the loop made in the previous step and firmly push the yellow nozzle cap over the nozzle and loop previously made to retain the igniter (Figure 4).
- Remove the shunt and separate the wire leads **ONLY** while the rocket is installed on the pad and the launch control system is rendered safe (i.e. disarmed and shunted where applicable).

#### **Important notes:**

- Only use the igniter provided with the reload kit. Do not interchange with other **Pro24**<sup>®</sup> igniters or with any other type of igniter.
- The following motors do not use an igniter pellet, but use a fortified (dipped) igniter instead: 282H399 and 348I204.

➤ **Step 4 – Post Firing**

**CAUTION**

Your **Pro24**<sup>®</sup> rocket motor may be hot after firing. Allow the motor to cool COMPLETELY before proceeding.

- Unscrew the reload kit from the motor casing and discard - there are no reusable parts. If the delay module remains in the motor casing after removal of the reload assembly, push it out through the forward end of the motor case with a wooden or plastic tool. Be careful not to dent or scratch the motor casing in any way. The use of metal tools is **NOT** recommended.
- Ordinarily, the motor casing will not require any post-flight cleanup. In the event that any combustion residue remains, the casing should be cleaned as soon as possible with hot soapy water and a non-abrasive cloth. When not in use, store the motor casing in its original package for protection. Care must be taken not to dent the motor casing or to damage the internal threads.

**MEANS OF DISPOSAL:** Remove forward closure and remove propellant grains from plastic liner. Discard plastic liner and nozzle assembly. Place forward closure and grains in a shallow hole in the ground, away from any combustibles, install igniter in forward grain in contact with the igniter pellet, secure with tape if necessary. Ignite electrically from distance of 10 meters (min). Wait until flames cease. Remnants may be disposed of with household garbage.

**First Aid:** If ingested, induce vomiting. Burns from flames are to be treated as regular burns with normal first aid procedures. In either case, seek medical attention.

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- ⇒ Check out our web site at <http://www.pro38.com/> for tech tips, FAQ's, user feedback and photos
- ⇒ For technical and warranty inquiries, please contact your **Pro24**<sup>®</sup> dealer.

**Pro24**<sup>®</sup> is a registered trademark of **Cesaroni Technology Incorporated**.  
Patent # US06079202. Other patents pending.  
Made in Canada.

**WARNING FOR ALL *Pro24*<sup>®</sup> SKIDMARK™ RELOAD KITS**

**SKIDMARK**<sup>™</sup> motors can produce a risk of FIRE. The user **MUST** adhere to the NFPA/NAR/Tripoli/CAR Safety Codes. The user **MUST** have a minimum 70' diameter cleared of all combustible materials, or dry grass. Sparks are emitted and can cause fire if not properly flown. Water or fire equipment should be on hand. The user assumes all risks.

**NOTES:**