Pro54® Reloadable Rocket Motor System

Age Requirements

Canada & USA

May be sold to certified High Power Rocketry users, 18 years of age and older.

WARNING **Fire or Projection Hazard**

Precautions Keep away from heat/sparks/open flames/hot surfaces. No smoking
Use within 1 year of manufacture

WARNING FOR ALL *Pro54*® *SKIDMARK*™ RELOAD KITS

SKIDMARK™ 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.

System Overview

Pro54® High-Power Reloadable Rocket Motors are professionally engineered propulsion systems designed for safe use, high performance, ease of assembly and high reliability. The ***Pro54***® 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 200N·s "H" motor, with 300N average thrust and a 15s *adjustable* delay. Please study Figure 1 for an overview and nomenclature of the ***Pro54***® motor system.

Storage

Store in accordance with local/regional/national regulations.
Storage location should be clean, dry and away from potential sources of heat or ignition.
Maintain the reload kit between -5°C and 30°C (23°F to 86°F) for storage and use.

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).

Figure 1: Pro24 Reload Kit Components

Step 1 – Time Delay Adjustment

Motors are equipped with a full-length delay grain that provides the delay time shown in the motor designation (except for –P, i.e. plugged motors which do not have motor eject). This delay may be *reduced* as required down to *the minimum delay time allowed****** for the motor type. To determine the correct delay adjustment tool setting, first you must know the delay time required for your rocket with that particular motor. For example, an 1195J295-16A has a 16s delay installed. Subtract the delay time you need from 16 seconds to calculate the adjustment setting required on the delay adjustment tool:

16 seconds – 9 seconds = 7 seconds. You therefore should set your delay adjustment tool to "-9" seconds.

It is worthwhile to remember that pyrotechnic delays are not perfect, and delay times will vary somewhat within industry permitted tolerances. Pro54® motor delays met or exceeded industry standards for accuracy during certification testing.

REMEMBER: the numbers on the delay adjustment tool are *not* the actual delay time – they are the amount you are removing from the motor's supplied delay!

***** The Pro54® delay adjustment tool has a maximum delay reduction setting of –10 seconds. If the full -10s of reduction is not permitted on a particular motor type, the motor label will tell you the maximum allowed adjustment. Warning - *NEVER exceed the maximum allowed value or motor failure and destruction of your rocket could result, and reload warranty will be void*.

NOTE: The ejection charge on all non-plugged ***Pro54***® motors is **2.0 g** 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 the cavity with tape – it will ignite when the ejection charge is activated. Proper installation of the ejection cap is critical to ejection reliability – removal of the ejection cap could result in ejection failure and will void warranty.

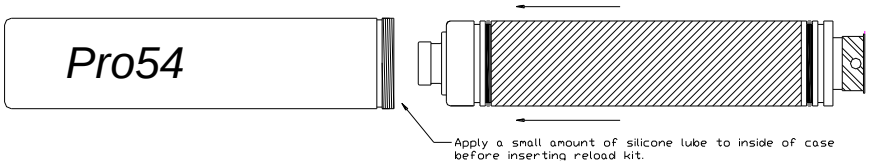
CAUTION
Work in a tidy area, away from other rocket motors and materials, well away from any open flame or heat source.
Perform delay adjustments in the field during rocket preparation.
Delay adjustments are irreversible, and are safer if done outside.

- 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 (Figure 2) for debris and clean if required before proceeding.
- Select the delay adjustment desired, rotate the drill holder to the appropriate setting and lock in place with the thumbscrew.
- Holding the drill guide in one hand, insert the delay module into the drill guide cavity until the drill bit touches the delay material. Rotate the forward closure 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, and shake or tap out any remaining material if necessary.
- For your 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. We recommend that you leave the delay unadjusted for these applications to minimize delay residue ahead of the motor forward closure.

Step 2 – Motor Assembly

- Inspect the motor casing for damage. Discard and replace if damaged. Modification of the casing can cause property damage or result in serious personal injury.
- Leave the protective cap on the nozzle for now.
- Most reloads will only use one o-ring per closure, but provision has been made for two if required in future products. Check that the o-rings are installed in the forward and rear closures properly. Also check the o-rings for any inadvertent damage. If the o-rings appear damaged in any way, DO NOT proceed. Instead, contact your Pro54™ dealer to arrange for replacement or remedy.
- The o-rings are pre-lubricated at the factory, but we recommended that you apply a light film of silicone o-ring lubricant to the inside edge of the motor casing where the reload kit will be inserted. This will make installation and removal of the reload kit much easier!
- Insert the delay/ejection module into the forward end of the case liner. A small gap between the forward end of the liner and the shoulder on the delay/ejection module is normal.
- Insert the reload kit assembly into the casing, forward closure first. There will be some resistance as the o-rings compress into the casing. To ease insertion, place the nozzle end against a smooth surface and push carefully on the forward end of the casing until the reload kit is completely inserted into the motor case. Be careful not to damage the nozzle. Once fully inserted, the rear closure/nozzle assembly should be flush or slightly proud (up to about 1/16") of the threaded end of the motor case. If not, remove the reload kit and investigate.
- Remove the nozzle cap, and screw the retaining ring onto the rear of the motor case. Snug it up until it feels seated against the rear closure, and the forward closure is firmly seated against the forward lip of the motor case. Do not over tighten - hand tight is sufficient. The cap will rotate approximately 3-3/4 turns to fully seat against an empty case, and it should engage by at least 3 turns when the reload is installed. Reinstall the nozzle cap.



- Your Pro54™ motor is now ready to be installed in your rocket. DO NOT install the igniter until the rocket is mounted on the launch pad, or in a location approved by the Range Safety Officer.

Step 3 – Igniter Installation

NFPA 1127 – Code for High Power Rocketry, 2018 edition, states the following:

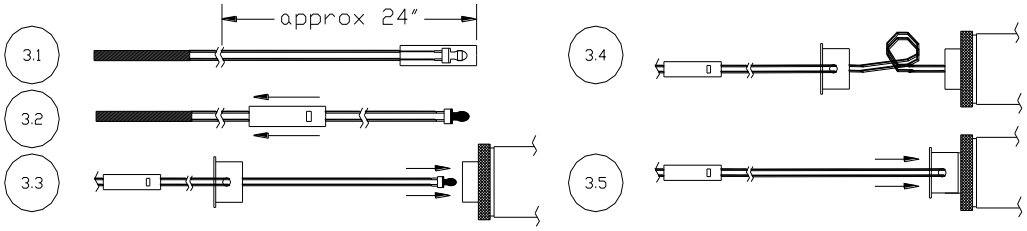
"4-13.5 An ignition device shall be installed in a high power rocket motor only at the launcher or within the prepping area.
4-13.6 A high power rocket shall be pointed away from the spectator area and other groups of people during and after installation of the ignition device."

These rules must be followed when **removing** or **installing** igniters for **ANY** reason.

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.

3.1 Carefully uncoil the igniter (electric match) leads. Remove any kinks or twists and straighten the wires for about 24" (60 cm) from the igniter head.
3.2 (If ematch is provided with a protective shroud) Slide the protective shroud off the match head, far enough down the wires that it will not go into the nozzle when the igniter is inserted all the way.
3.3 Remove the nozzle cap from the motor and feed the head of the igniter through the hole in the outside of the nozzle cap. Slide the cap down the igniter leads out of the way for now. Insert the igniter head into the nozzle and push until it stops against the top of the motor core. This distance should equal the assembled motor length less about 2" inches. Verify this distance if you are unsure - be careful that the igniter does not catch partway up the core.
3.4 With the igniter in this position, bend a loop into the igniter leads one cap length from the nozzle exit.
3.5 Slide the nozzle cap up to the loop made in the previous step and firmly push the nozzle cap over the nozzle to retain the igniter.



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).

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.

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Important notes:

- Only use the igniter provided with the reload kit. Do not interchange with other ***Pro54***® igniters or with any other type of igniter.

Step 4 – Post Firing

CAUTION

Your ***Pro54***® 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 in the reload kit. 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 damage the internal threads.

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. See Safety Data Sheet for more detailed information.

Warranty

Cesaroni Technology Incorporated ("**CTI**") certifies that it has exercised reasonable care in the design and manufacture of its products. We do not assume any responsibility for product storage, transportation or usage. **CTI** shall not be held responsible for any personal injury or property damage resulting from the improper handling, storage or use of their products. The buyer assumes all risks and liabilities and accepts and uses **CTI** products on these conditions. No warranty either expressed or implied is made regarding ***Pro54***® products, except for replacement or repair, at **CTI's** option, of those products which are proven to be defective in manufacture within one (1) year from the date of original purchase. For repair or replacement under this warranty, please contact your point of purchase. Proof of purchase will be required. Your province or state may provide additional rights not covered by this warranty.

⇒ Check out our web site at **http://www.pro54.com/** for tech tips, FAQ's, and photos

⇒ For technical and warranty inquiries, please contact your ***Pro54***® dealer.