User Manual

Bravo 4

Available Accessories

Retractable Gear Attachment

Quick Lock Fork(s)

Aircraft Specific Adapters

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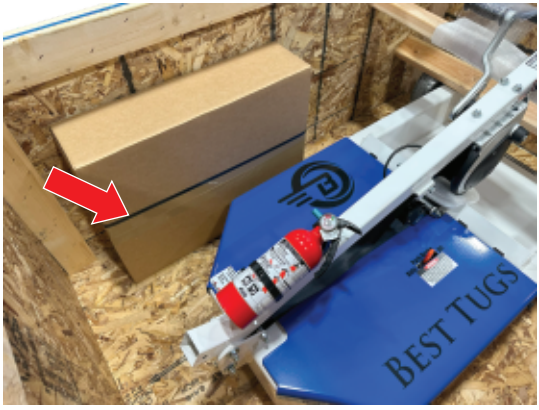
Uncrating

Screws needing to be removed during the uncrating process will be marked in red paint.

* Do not discard removed pieces immediately as they'll be used for the unloading ramp.

Start by removing the lid of the crate, then remove the rear wall. Cut the band around the accessory box and remove it from the crate. (1)

Next remove the two boards holding the tug in place inside the crate. (2) These are screwed in from the outside, the screws will be marked with red paint.



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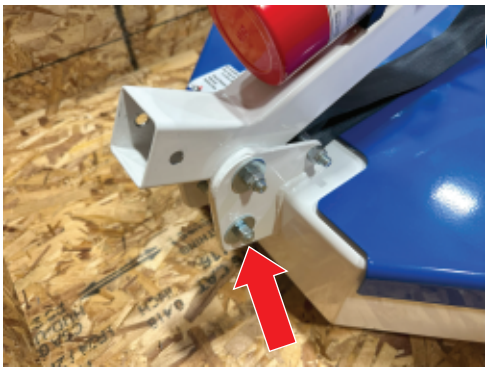
Uncrating Continued

With the tug free to move, ensure the Master switch is off & remove the bottom control arm bolt, pivot the control arm into the upright position and re-install the bolt to hold it. (3) Assemble the crate ramp as shown, it's recommended to screw the boards for the ramp to the crate to prevent rapid unplanned disassembly. (4)

Please read the manual in it's entirety before operating the unit, this tug is not a toy and has the power to damage property or cause serious harm to persons.



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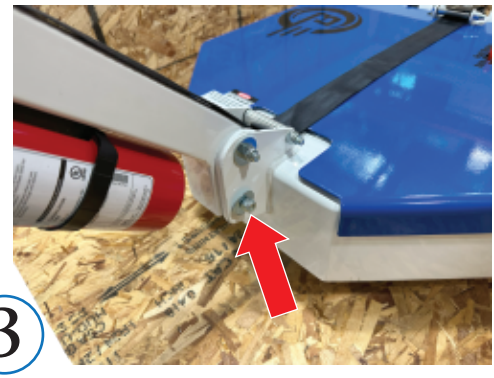
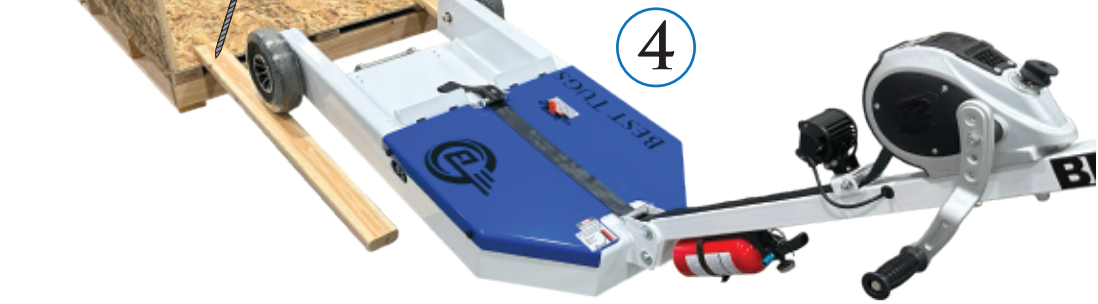


3

Secure the boards with the screws you removed to prevent the ramp shifting during unloading

4



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Safety

Disclaimer

Please read and follow the instructions laid out for use of your new equipment. Remember this tug is capable of moving several tons. If used incorrectly it can cause harm to aircraft, hangars, and itself or even death to persons. This tug will aid you in the safe & easy movement of your aircraft, however you are responsible for the safe use and operation of the tug. Always be aware of your surroundings when operating your Tug. Be aware of your wingtips and tail to avoid any kind of property or personal damage.

Be aware of the distance the tug needs to slow down and come to a stop. Get familiar with the acceleration and deceleration of the tug before using it with an aircraft connected. The acceleration and deceleration times will change only slightly with an aircraft connected. Always ensure that the aircraft is properly loaded, secure, and safe to move before you start towing. **This includes the use of any safety and securing devices provided by Best Tugs™ for use with your Bravo and aircraft. ie: tighten aircraft down using the provided strap(s) or Quick Lock Fork(s).** If you notice damage on the securing straps contact Best Tugs™ for a replacement.

If you notice something that looks like it could damage your aircraft cease operation and contact Best Tugs™ immediately. In no event shall we be liable for any direct, indirect, punitive, incidental or consequential damages, or any damages whatsoever. It is the responsibility of the owner and operator to stop the use of the unit and contact Best Tugs™ before any incident occurs.

There are many different aircraft and circumstances in which the tug can be incorrectly connected to an aircraft, and/or used under incorrect procedures leading to or causing damage to persons or property.

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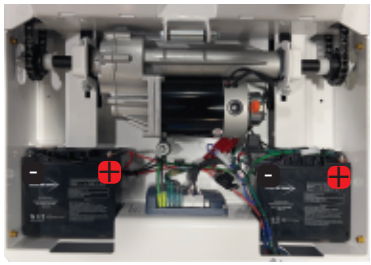
Electrical Safety



Your new Best Tugs™ Bravo is fully electric and operates using a 24 Volt 18 AH (Amp Hour) 180 CCA (Cold Cranking Amp) battery bank. This gives your tug the power it needs to move the aircraft, but it's also enough power to cause damage to, or destroy any components incorrectly installed into the wiring harness.

Any modifications made to this unit must be authorized by Best Tugs™. Attempting to modify ANY part of this unit without the written consent of Best Tugs™ voids any and all warranty applicable to this unit and may cause tug failure.

Working on this unit without insulated tools can cause electric shock. Always follow the proper maintenance procedures & heed any safety precautions given in this user manual. Improper maintenance of the batteries inside this unit can lead to battery failure, acid leaks, or in extreme cases explosion. If any batteries fall out of specification during the use of this unit immediately cease operation and replace the bad battery. Continued operation with a bad battery can cause further & more severe failure.

Use extreme caution not to contact the frame of the tug & the battery terminals, the frame of the tug will carry a ground through motor & controller bolt points. Touching a battery post when also contacting the frame may cause serious injury, or death. Using Insulated tools will minimize the risk of electric shock. It takes only a few amps and seconds to cause lethal amounts of damage if not careful.

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Operators Safety

When Operating this unit, be aware of your surroundings and ensure there are no hazards in the path of travel. It's recommended to have a wing walker watch the aircraft during movement. Doing so can greatly decrease the risk of damage during movement.

Ensure the aircraft is securely loaded before starting movement. This includes the use of any straps or securing bars provided by Best Tugs to secure your aircraft to the unit.

In the event of an emergency turning off the master power switch will engage the brake and stop the motor. In the event that this type of emergency stop is used, an aircraft inspection is required.

Never put yourself between the unit and a hard surface. This unit is not a toy and should not be used as such. Using this unit incorrectly can cause severe personal & property damage.

Always follow the regular maintenance schedule provided by Best Tugs to keep this unit in safe working order.

You are responsible for the safety of your aircraft, person, and property regardless of options provided by Best Tugs.

Duty Cycle

Tug Capacity - M^J = Safe weight M = Tug max tow /5 J = Slope ° ***Weight limits are for constant use**	
0°	4,000
1°	3,200
2°	2,400
3°	1,600
[3° & ABOVE NOT RECOMMENDED]	

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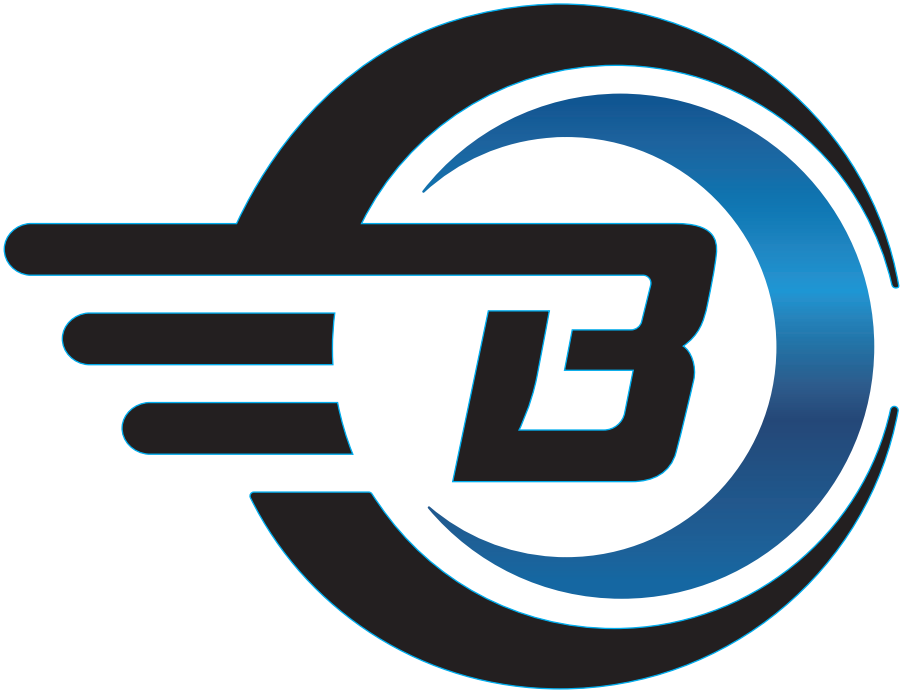

Operations

Operations

Turn the unit ON & OFF using the master power switch on the top display panel of the unit. With the power switch on, the LED on the switch will light, the battery indicator will come on and the unit will be ready to move.

Use the High / Low switch to select a control speed, low is recommended for in hangars & tight areas. Once a speed is selected, use the Wig Wag throttle to move the tug, pushing the right side of the throttle forward will Push the aircraft, pushing the left side of the throttle forward will Pull the aircraft.

Get used to the throttle operation before towing with an aircraft attached.

To use the winch, first choose a direction using the top selector knob, center the knob to free-spool the winch, turn the knob clockwise to extend the winch strap, counter clockwise to retract the strap.

The LED headlights can be operated by the Light switch on the panel, when ON both the LED headlight, and the LED in the switch will be illuminated.

The battery indication on the top will help you maintain the batteries, to read the display accurately the tug should be resting for 30 seconds. When using the tug the battery percentage may drop quickly, this is normal and the percentage should increase when the tug is stationary. Charge the tug when it's not in use, and if the percentage reads below 70% at rest.

Winch handle Rotates Rapidly when unloading

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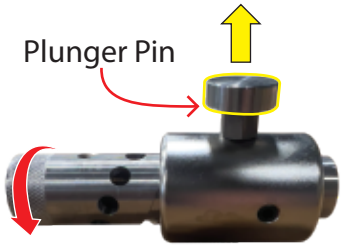
QLF Connection

There are two primary methods of connecting the Bravo tug to an aircraft, a QLF (Quick Lock Fork) and a Retractable Gear Attachment. Under typical circumstances a QLF will be used for aircraft with wheel pants while the RGA will be used for aircraft without wheel pants.

The QLF will have two adjusting slides, the left one is a twist slide, used to adjust the width of the connecting points. The right slide is sprung and has a single detention point.



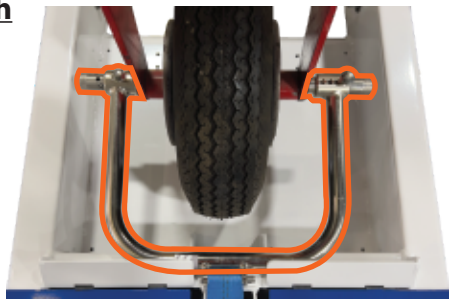
Twist Slide

To set the QLF up for your aircraft, first move the twist slide to the fully open position by lifting the plunger pin, and twisting the slide counter clockwise. Next push the right slide into the engaged position, then align the fork with the connection point on the aircraft & tighten the twist side until the fork holds snugly onto the connection point.

Sprung Slide

To release the aircraft once the twist slide is adjusted, simply pull the plunger pin on the sprung slide allowing it to open. Connect the aircraft by aligning the fork and pushing the sprung slide until it's locked in by the plunger pin.

When releasing the aircraft, turn the winch knob to the neutral position, then slowly back the tug away from the aircraft. **Keep hands clear of the winch handle as it will spin rapidly.**



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RGA Connection

RGA (Retractable gear attachment) is the second common connection method. This method uses a strut strap and a wheel chock to load the aircrafts wheel onto the tugs loading platform.

First place the wheel chock into the wheel chock bracket and secure it using the included detention pin.

Next align the tug with the aircrafts wheel & loosen the strap so it can reach the wheel strut. Run the provided Strut Strap around the strut & connect both ends to the carabiner.

Winch the aircraft closer to the tug until it touches the front lip of the load area, if spacing allows, apply slight throttle and continue to winch to make loading easier. Continue winching until the wheel of the aircraft becomes snug with the wheel chock bracket.

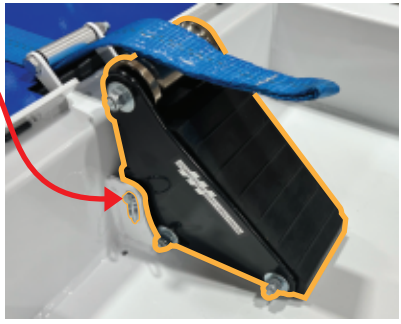
When releasing the aircraft, turn the winch knob to the neutral position, then slowly back the tug away from the aircraft. **Keep hands clear of the winch handle as it will spin rapidly.**

RGA

Carabiner

Detention Pin

Strut Straps



Retractable Gear Attachment in RGA Bracket

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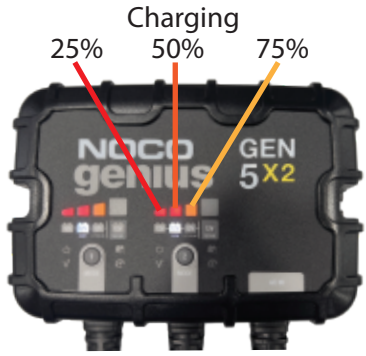
Maintenance

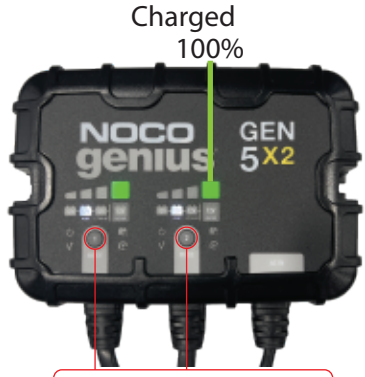
Charging

Your Bravo 4 comes with a NOCO Genius 5x2 charger, this charger will charge the batteries inside the unit independently of each other giving each battery the best charging conditions.



To charge your unit, simply connect the charger to AC wall power via the 3 prong outlet plug then connect the 4 prong connector to the charge port on your unit.

The charger will come set for 12 Volt AGM batteries, if this changes depress the (1) or (2) button to change the mode on the desired channel. Charging the batteries in a non AGM charge mode will cause damage to the batteries and render them inoperable.



Button 1 & 2 change charge modes for battery 1 & 2.

The charger has several lights above each bank, these indicate the status of charge when connected. Each light indicates 25% state of charge with the final light turning green to indicate a full charge. Once the full charge state has been indicated the Green lights will start flashing to indicate that a float charge has been started on the batteries.

Float charge states will maintain the batteries for long periods of time by regulating the voltage so the batteries don't become over, or under charged.

SELECT 12V AGM

Leaving the charger connected for long periods of time when away from the tug is recommended to prevent rapid battery decay. Charging is recommended when the tug is not in use as well as when it's below 70% at rest.

Charge port

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General Maintenance

• Greasing the Caster wheel

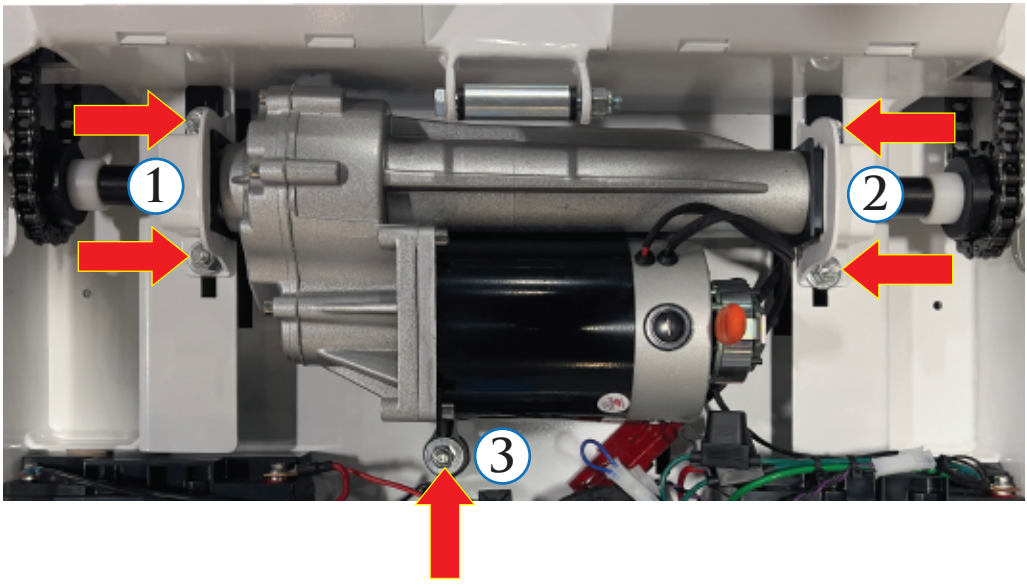
To grease the caster wheel on your new Bravo 4 unit, use a grease gun with a flexible hose to connect to the grease Zerk on the caster wheel. Pump grease into the wheel until a small amount of clean grease passes through the bearing.

• Tightening the Chains

First, loosen the 5 x 3/8" nuts holding the motor brackets down until they can slide. Wedge a pry bar in between the motor bracket and the frame rail, then apply pressure to the pry bar in order to create tension in the chain. Do this to one side at a time and tighten the 2x 3/8" nuts on the side that's being held tight before continuing to the next side.

① ② ③

Each chain should have about 1/2" of total up - down play.



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Replacing Batteries

When replacing the batteries take care not to let conductive tools touch more than one live terminal at a time. Conductive tools can create a short damaging the internal electronics of the unit and damaging the tool.

Before removing the bad batteries from the unit, we recommend taking a picture of the tugs internal wiring for reference when installing the new batteries.

Removing bad batteries:

Start by removing the main battery ground ① followed by the 12 Volt positive terminal ②. Next remove the 12 Volt negative terminal ③ then the 24 Volt positive terminal ④. With all terminals dismounted lift the batteries out of the battery tray.

Installing batteries:

Lay the new batteries in the battery trays as the previous batteries were. Start by connecting the main ground ①, followed by the 12 Volt positive terminal ②. Next connect the 12 Volt negative terminal ③ then the 24 Volt positive terminal ④.

Terminal removal & Connecting order

Battery Specifications:

- 12 Volt
- 18 Amp hours
- 180 Cold Cranking Amp
- M6 insert or NB terminals work best

We recommend sticking with name brands such as Duracell or Bright Way Group, our tugs don't perform as well using off-brand batteries.

Good batteries should last 2-3 years under proper maintenance.

With all terminals mounted, check that the connections are tight. Apply NoCo® NCP2® to prevent buildup of corrosion if desired. ⓘ

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Error Codes

If you experience an error code not listed please call or email support. 801.855.7757 ext 2 | Support@Besttugs.com		
,	Thermal Cutback	>92°C / < -29°C • Excessive load on vehicle • Brake not releasing • Operation in extreme environment
*,**	Throttle Fault	• Potentiometer out of specification • Throttle not centered upon initializing
*,****	Under Voltage	• Batteries are too low to be used • Battery voltage below 11 volts per battery
,*	Contactor Fault	• Main contactor driver failed
***,**	Brake Fault On	• Brake driver shorted • Brake driver Brake coil failed open

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Trouble Shooting

Tug was left on / The batteries are dead	Press the mode button on the charger to put it in 12 Volt repair mode. If the batteries do not recover replace them.
Using the Quick Lock Fork / Retractable gear attachment	These two attachment methods are to be used separately, using the two methods together may cause severe damage to either the aircraft or accessories.
Master power switch ON but the tug isn't moving	Cycle the master power switch OFF for 5 seconds, and turn ON to reset the internal sleep timer.
Master power switch is flashing	See error codes on Page 15.
Tug died outside of hangar & wont move	The tug can be moved manually by releasing the parking brake. Move the parking brake lever to the "OFF" Position.
Tug struggles to pull the aircraft	Ensure the aircraft falls within tugs weight capability found on Page 6. Ensure batteries are charged, and still good. During a tug movement none should fall below 11 Volts DC measured individually.
Tug making excessive noise / grinding noise coming from under the cover	Chain tension needs to be adjusted. If over 1/2" of play on the chain add tension, if under 1/2" of play remove tension see page 13.

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Standard Warranty

Best Tugs™ includes a one (1) year warranty on all parts, excluding batteries, from date of delivery. Warranty excludes labor and the cost of shipping. Call sales if you want to purchase the optional extended warranty.

This warranty does not apply to any Best Tugs™ component(s) that have damage caused by, misuse of the vehicle, accidents, collision or object striking the vehicle, vandalism, fire, explosion, water damage, customer-applied chemicals to painted surfaces, improper handling or application, nor does it extend to Best Tugs™ parts which have been repaired or altered outside of Best Tugs™ provided maintenance of an authorized service representative. Furthermore, any modification of Best Tugs™ electrical system MUST be pre-approved and documented in writing by Best Tugs™. Failure to do so voids the unit's electrical component warranty. Best Tugs™ parts which have been repaired or altered outside of Best Tugs™ provided maintenance of an authorized service representative as well as any modification of a Best Tugs™ tugs MUST be pre-approved and documented in writing by Best Tugs™. Failure to do so voids the warranty.

Warranty Claim Procedure

When a warranty situation arises, it is essential that the customer contact Best Tugs™ support department at 801.855.7757 ext 2. The customer will need to provide the Best Tugs™ serial number (located under the control panel) and tug model. A customer service representative will analyze the problem and determine the next steps. In many cases Best Tugs™ technical support personnel will be able to analyze the problem and recommend a solution that will solve the problem and reduce down time. If further service is required, a Best Tugs™ customer service representative will work with customer personnel to arrange a service provider and/or will send parts to your facility for the repair as quickly as possible.

Notice of any claimed defect must be given to Best Tugs™ within the warranty period and within ten (10) days after such defect is discovered. Liability under this warranty is limited to either replacing or repairing, at Best Tugs™ discretion, any part or parts deemed defective after examination by Best Tugs™ or an Authorized Service Representative. Best Tugs™ reserves the right to use re-manufactured parts as replacements in warranty claims.

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