

INSTALLATION MANUAL

HBE 193

ADVANCED DIFFERENTIAL LOCKING SYSTEM



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Thank you for choosing our solution to upgrade your
vehicle. We are committed to designing and
manufacturing innovative transmission solutions and
beyond.
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our latest developments.*



TABLE OF CONTENTS

INTRODUCTION	1
1. REMOVING THE EXISTING DIFFERENTIAL	4
2. INSTALLING THE RING GEAR	9
3. INSTALLING THE ELECTRIC LOCKER	14
CONNECTION KIT CONTENTS	20
ELECTRICAL CONNECTION DIAGRAM	22
ELECTRICAL CONNECTION DIAGRAM WITH SWITCH PANEL	23
4. CHECKING THE OPERATION OF THE ELECTRIC LOCKER	25

INSTALLATION AND OPERATING INSTRUCTIONS

CAUTION

The Electric Locker must be installed strictly in accordance with this manual. If any difficulties or uncertainties arise, stop the installation procedure and contact our technical support at **hardblockusa.com**. Our specialists will provide further instructions. Any deviation from the specified procedure, or any attempt to resolve installation issues without technical support, may result in damage to the Electric Locker assembly and/or vehicle components.

CAUTION

Removal of the magnet and retaining ring is permitted for installation of the ring gear onto the Electric Locker. Do not remove the rotating locking clutch or loosen the Electric Locker housing bolts. Disassembly may compromise the integrity of the assembly and result in internal components becoming dislodged or lost. If you would like to learn more about the design and operating principle of the Electric Locker, please watch the detailed video on the **@HardBlockLive** YouTube channel.

CAUTION

Toyota 90366-50130 bearings (**50 x 83 x 23 mm**) must be used for Electric Locker installation. Equivalent: Cup and cone set **KOYO STB5083 / STA5383** (also marked as **STB5083LFT / STA5383** or with the prefix **HC STB5083 LFT**).

- *Installation of the Electric Locker is recommended to be performed by a qualified service facility.*
- *If the product is installed by the user, ensure that all tools and materials specified in this manual are available before installation. The applicable vehicle service and repair manual must also be available.*
- *Before starting installation, verify that the Electric Locker package is complete. If any parts are missing, contact customer support via **hardblockusa.com** or contact the seller from whom the product was purchased.*
- *Use of the vehicle on public roads with the differential locked is unsafe.*
- *Engagement and disengagement of the Electric Locker while the vehicle is in motion is permissible and does **not** in itself cause damage to the mechanism. However, if the Electric Locker is engaged while one of the wheels is slipping, shock loads may occur in the drivetrain and may result in failure of drivetrain components. Engaging the Electric Locker at speed may also result in loss of vehicle control.*

- *Use of the Electric Locker in the disengaged state during prolonged one-wheel slip is not recommended. Prolonged slip of one wheel while the opposite wheel remains stationary causes oil starvation inside the mechanism, overheating, accelerated wear, seizure of the spider gears, and damage to internal components. The user assumes all risks associated with such operation. Damage resulting from improper use is not covered by the warranty.*

PARTS LIST

- *Wire harness*
- *Bracket*
- *Cable rubber seal*
- *Installation manual*
- *Differential side bearing shims*
- *Electric Differential Locking System (Electric Locker)*

REQUIRED TOOLS

- *Standard set of hand tools*
- *Bearing puller*
- *Torque wrench (bolt tightening torque values are specified in the applicable vehicle service and repair manual)*
- *Dial indicator with magnetic base for checking ring and pinion backlash*
- *Drill/driver, 1/2" drill bit*
- *Press and bearing driver set for installing differential bearings*
- *Oil container*
- *Center punch*
- *Paint marker*
- *Hammer with a plastic, rubber, or copper face*
- *Bench vise with soft jaws, or with wood or plastic jaw protectors*
- *Electric oven or electric hot plate (for heating the ring gear to 175–230° F)*
- *Laser thermometer (for monitoring ring gear temperature)*

REQUIRED MATERIALS

- *RTV silicone sealant (Room Temperature Vulcanizing)*
- *API GL-5 gear oil, SAE 75W-90*
- *Cleaner for removing dirt and oil*
- *Threadlocker*
- *Applicable vehicle service and repair manual*

1. REMOVING THE EXISTING DIFFERENTIAL

1.1 Raise and support the vehicle on a lift. A two-post lift is recommended because it provides convenient access to the differential area while allowing the wheels and axles to rotate freely and be removed easily.

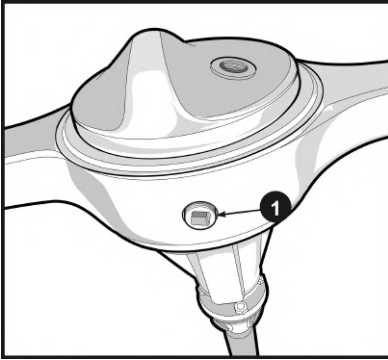


Fig. 1

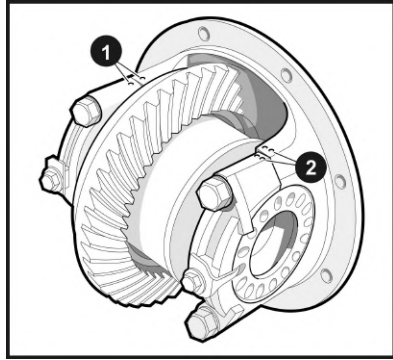


Fig. 2

1.2 Place an oil drain pan under the axle housing. Remove the drain plug (1) and allow all the gear oil to drain completely into the pan. (**Fig. 1**)

1.3 Remove the axle shafts in accordance with the vehicle service manual.

1.4 Disconnect the driveshaft from the differential drive flange in accordance with the vehicle service manual.

1.5 Remove the bolts securing the differential carrier housing to the axle housing and remove the differential assembly.

1.6 Clean the differential assembly of any residual oil and other contaminants.

1.7 Using a center punch, mark the bearing caps for identification. Make the punch marks on the bearing caps and on the adjacent surface of the differential carrier housing. Apply one punch mark (1) on one side and two punch marks (2) on the opposite side, as shown in **Fig. 2**.

MEASURING THE RING AND PINION BACKLASH

It is necessary to verify that the existing ring gear and pinion gear are in good condition and do not require replacement. Depending on the condition of the gears, follow the applicable instructions below.

- If the original gears are being replaced with new ones, a preliminary backlash measurement is not required. In this case, set the backlash in accordance with the gear manufacturer's specifications (skip Steps 1.8 and 1.9).*
- If the original ring and pinion gears are not being replaced and will be reused, a preliminary backlash measurement must be performed before disassembly. The measured backlash value must be precisely restored when*

1. REMOVING THE EXISTING DIFFERENTIAL

installing the Electric Locker. Using the backlash specifications from the vehicle manufacturer's service manual is not recommended, as these values are intended for new, unworn gears. During normal operation, the gears undergo a break-in process that establishes a contact pattern and naturally increases the backlash. Failure to restore the previously measured backlash during final axle assembly may result in improper operation and eventual component failure.

WARNING

Replacing the ring and pinion gears with used components is not recommended. Installing used gears taken from another vehicle may lead to improper axle operation and eventual component failure

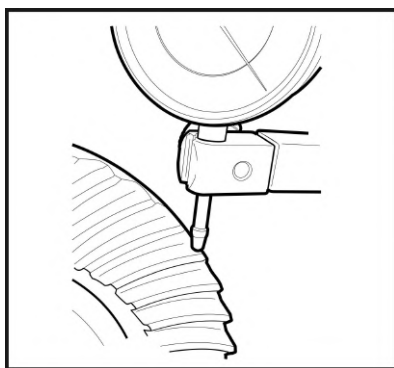


Fig. 3

1.8 Install a dial indicator. Secure the indicator holder to the outside of the differential housing and position the dial indicator tip perpendicular to a tooth of the ring gear. (**Fig. 3**)



Fig. 4

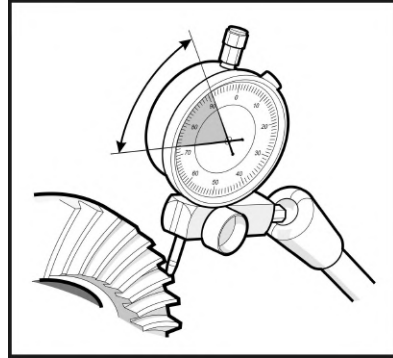


Fig. 5

1.9 While holding the drive pinion flange, rotate the ring gear back and forth until it stops and the indicator needle stabilizes on the dial (**Fig. 4** , **Fig. 5**). Record the obtained value in the corresponding row of the table (**Value 1**). To improve measurement accuracy, repeat the measurement two more times, rotating the differential approximately 120° each time. After each measurement, mark the gear tooth that was measured with a number. Record the obtained values in the table (**Values 2, 3**). Calculate the arithmetic mean of the three obtained values. This will allow the measurement to be reproduced in exactly the same positions during reassembly.

NOTE: To prevent damage to the dial indicator, move the indicator tip away from the ring gear teeth before rotating the differential.

RECORD BACKLASH HERE	
Value 1	
Value 2	
Value 3	
Mean	

1. REMOVING THE EXISTING DIFFERENTIAL

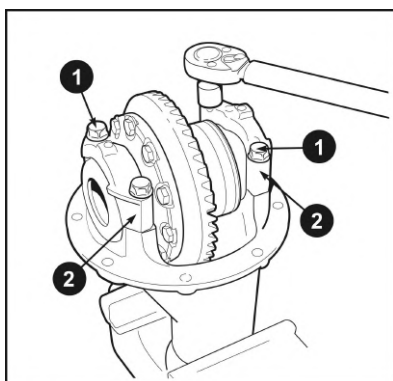


Fig. 6

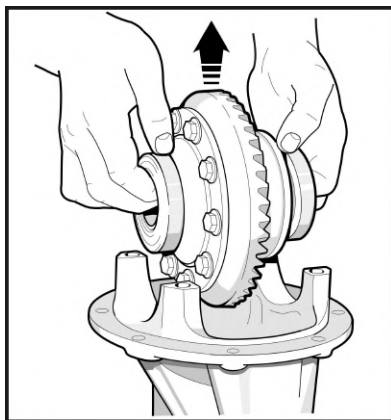


Fig. 7

1.10 Remove the bolts (1) and remove the bearing caps (2). (Fig. 6)

1.11 Carefully remove the differential with the bearings. Keep the shim packs in their original positions to avoid mixing them up during reassembly. (Fig. 7)

REMOVING BEARINGS

CAUTION

Make sure the bearings are in good condition. If any bearing is damaged, it must be replaced.

If the bearings are damaged and are to be replaced, they do not need to be removed from the factory differential.

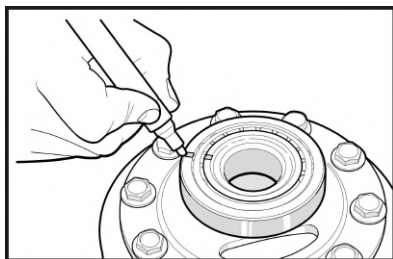


Fig. 8

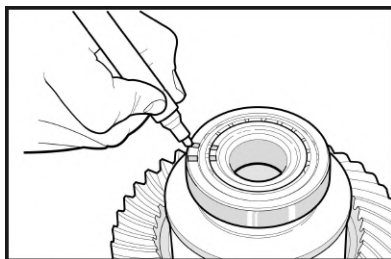


Fig. 9

1.12 If the bearings are in good condition and will be reused, mark the bearing cups and cones. Apply one mark to the bearings on one side of the differential and two marks to the bearings on the opposite side, as shown in the figures. (Fig. 8, Fig.9)



Fig. 10

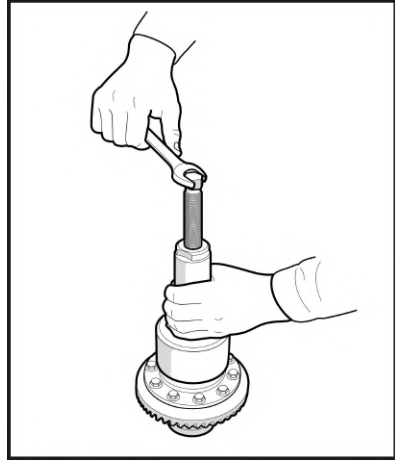


Fig. 11

CAUTION

Remove the bearing cones only with a clamshell-style puller or separator-style puller that fully supports the bearing and applies force evenly. (**Fig. 10**) Do not use a puller that applies force at only a few points. Point loading may deform the bearing cone and make it unsuitable for reuse.

1.13 Remove the bearing cones from the differential carrier. (**Fig. 11**)

2. INSTALLING THE RING GEAR

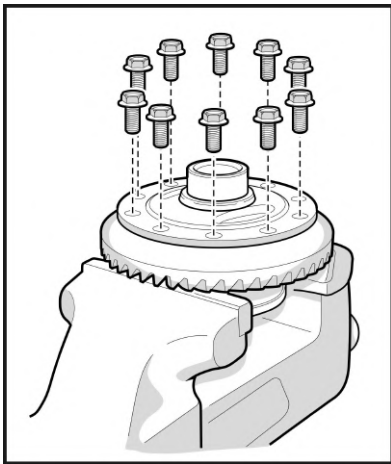


Fig. 12

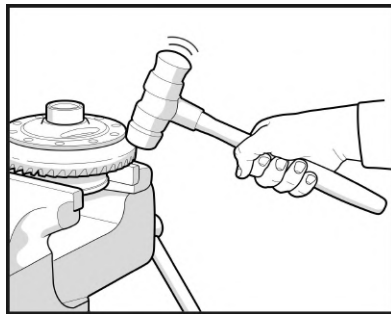


Fig. 13

2.1 Secure the existing differential in a vise. Remove the ring gear mounting bolts. (**Fig. 12**)

CAUTION

Place a shop rag under the ring and pinion to prevent damage if it falls during removal. Do not use a steel-faced hammer.

2.2 Drive the ring gear off the existing differential case using a plastic-, rubber-, or copper-faced hammer. To prevent binding, work evenly around the circumference. (**Fig. 13**)

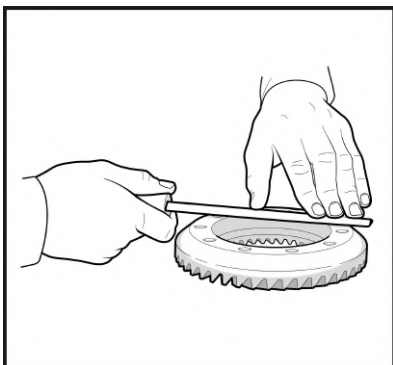


Fig. 14

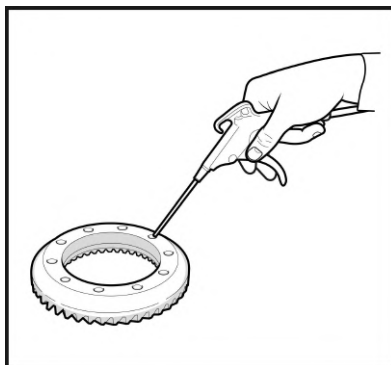


Fig. 15

2.3 Dress the mounting surfaces of the ring gear and the Electric Locker case with a file to remove raised edges and burrs around the holes and threads. (Fig. 14)

2.4 Blow the mounting surface and the ring gear threaded holes clean with compressed air. (Fig. 15)

2.5 Degrease the ring gear bolt holes and the ring gear bolts using a suitable degreasing agent.

MAGNET REMOVAL

To prevent damage to the magnet wire during installation of the ring gear onto the Electric Locker, the magnet may be removed if necessary. If the wire does not interfere with ring gear installation and is not at risk of being damaged, removal of the magnet is not required. Reinstall the magnet after installing the ring gear.

CAUTION

Perform all magnet removal operations with the Electric Locker in a strictly vertical position, with the magnet facing upward. Do not remove the locking clutch located beneath the magnet. Removing the locking clutch may compromise the integrity of the assembly.

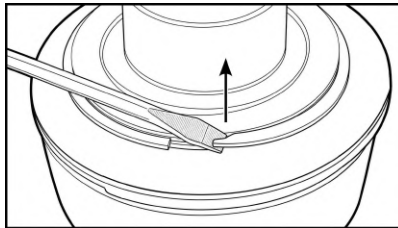


Fig. 16

- Using a flat-blade screwdriver, pry up the edge of the retaining ring and remove it. Then remove the magnet from the Electric Locker. (Fig. 16)

2.6 To facilitate assembly, heat the ring gear to **175–230° F** using hot water, an electric hot plate, or an oven.

CAUTION

Do not heat the gear with an open flame. This may damage the hardened surface layer and result in premature wear or gear failure.

2.7 If moisture is present, dry the gear and the bolt holes with compressed air.

NOTE: Make sure the mating surfaces of the ring gear and the Electric Locker case are dry, clean, and free of burrs and oil.

2. INSTALLING THE RING GEAR

CAUTION

Do not use the mounting bolts to draw the ring gear onto the Electric Locker case. This may deform the Electric Locker case or damage the gear threads.

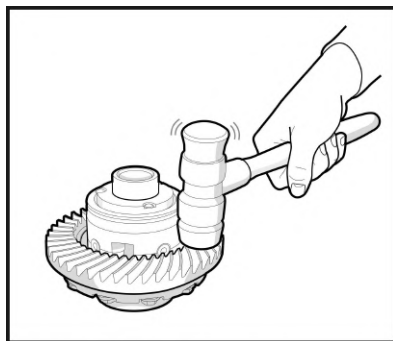


Fig. 17

2.8 Install the ring gear on the Electric Locker case, aligning its threaded holes with the holes in the case. If necessary, use a rubber-, plastic-, or copper-faced hammer to seat the ring gear by applying even blows around its circumference. (Fig. 17)

CAUTION

If the magnet was previously removed, reinstall it.

RING GEAR BOLT TIGHTENING

Use threadlocker on the ring gear bolts. Before applying it, make sure the ring gear is fully seated against the Electric Locker case to prevent misalignment caused by threadlocker getting between the mating surfaces.

CAUTION

If the ring gear bolts are in good condition, they may be reused. However, most service manuals recommend replacing the bolts each time they are removed.

To achieve the closest possible fit between the ring gear and the Electric Locker case, we recommend the following tightening procedure.

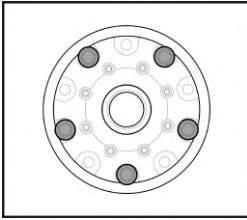


Fig. 18

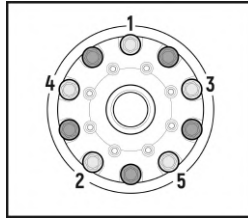


Fig. 19

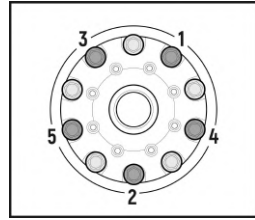


Fig. 20

- Preinstall **five** bolts and tighten them only until the ring gear seats firmly against the Electric Locker case, without threadlocker and without applying final torque. Mark each preinstalled bolt using a paint marker. These bolts will need to be removed in the next step. (**Fig. 18**)
- Apply threadlocker to the remaining **five** threaded holes in the ring gear and to the bolt threads. (**Fig. 21**) Install these **five** bolts and tighten them with a torque wrench to the torque specified in the vehicle service and repair manual. (**Fig. 19**)
- Remove the **five** previously installed bolts. Apply threadlocker to the threaded holes and to the bolt threads, then install and tighten them with a torque wrench to the torque specified in the vehicle service and repair manual. (**Fig. 20**)

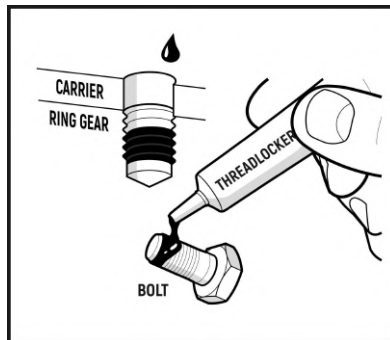


Fig. 21

2.9 Apply threadlocker to the threads of each bolt and to the threaded holes in the ring gear. (**Fig. 21**)

2.10 Install and tighten the ring gear bolts with a torque wrench to the torque specified by the vehicle service and repair manual.

NOTE: Tighten the bolts in a crisscross pattern to ensure the ring gear seats evenly.

2. INSTALLING THE RING GEAR

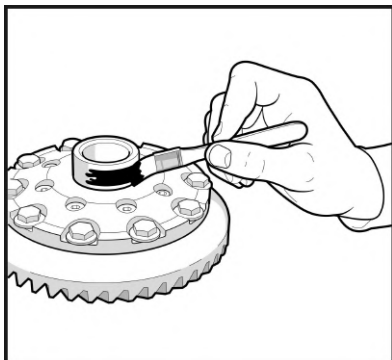


Fig. 22

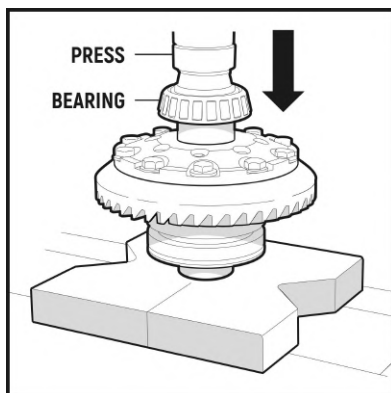


Fig. 23

2.11 Apply grease to the bearing journal surfaces. (**Fig. 22**)

2.12 Press the bearing cones onto the journals. If the bearings are to be reused, install them according to the previously made marks. (**Fig. 23**)

LOCATING AND DRILLING THE HOLE IN THE DIFFERENTIAL HOUSING

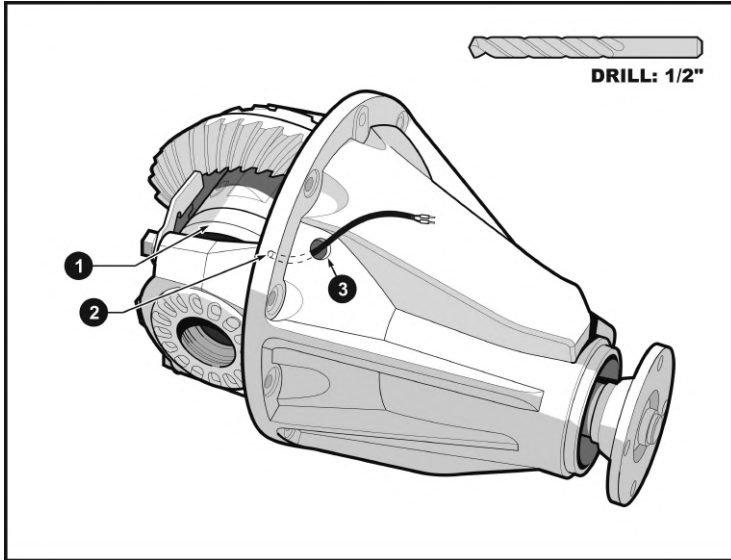


Fig. 24 : (1) - magnet; (2) - location of the cable exit from the magnet; (3) - hole in the carrier

To install the Electric Locker, a hole must be drilled in the differential housing. To determine the drilling location, perform a trial fit of the Electric Locker. At this stage, there is no need to tighten the bolts to the specified torque or adjust the bearing preload, as the assembly is performed solely to determine the magnet position and the cable exit point relative to the differential housing walls (Fig. 24). Using the illustration as a reference, determine the location of the future hole. To ensure proper cable routing, follow the steps below:

3.1 Install the Electric Locker assembly, complete with the ring gear and bearings, into the differential housing. Install the bearing caps, then insert and tighten the bolts.

3.2 Remove the right-hand bearing cap bolts (3), then install the bracket (2) as shown in (Fig. 30). Rotate the magnet until its locating tab (1) engages with the dedicated notch in the bracket (2), then retighten the right-hand bearing cap bolts (3). Once the magnet is installed with its anti-rotation stop engaged, the cable exit point will assume its final position, allowing you to proceed with determining the hole location in the differential housing.

3.3 Figure 24 shows the recommended hole location (3) in the differential housing. Using the figure as a reference, mark the drilling point with a marker or a center punch. Ensure that the hole (3) is located on the magnet (1) side, adjacent to the cable exit point (2) on the magnet.

3. INSTALLING THE ELECTRIC LOCKER

NOTE: If the differential housing of your vehicle differs from the differential housing shown in **(Fig. 24)**, determine the location of the hole yourself. Perform a trial fit of the Electric Locker as described in **Steps 3.1** and **3.2**. Then, mark the location of the future hole on the differential housing surface, adhering to the following requirements:

- *The hole must be located on the magnet side (1). (Fig. 24).*
- *The hole must be positioned adjacent to the cable exit point on the magnet (2) (Fig. 24).*
- *The cable routed through the hole must not come into contact with the ring gear, the drive pinion, or any moving components of the electric differential lock.*
- *The hole must not be located in areas where the housing wall is thickened.*
- *The hole must be located on the outer surface of the differential housing in a position where the surface profile will not interfere with installing the cable rubber seal.*
- *If a suitable location cannot be found on the outer surface of the differential housing to ensure proper installation of the rubber seal, a small portion of the surface profile may be carefully machined away using a rotary tool until the cable fitting can be installed correctly.*

3.4 Once the drilling point has been determined and marked, remove the Electric Locker and all other differential assembly components installed in **Steps 3.1** and **3.2**.

3.5 Secure the differential housing in a bench vise with soft metal jaws or with wood or plastic jaw inserts.

3.6 Before drilling, cover the drive pinion area with a clean rag to prevent metal chips from entering.

3.7 Drill a hole with a diameter of **1/2"**.

3.8 Using a file, remove any sharp edges formed around the hole to prevent metal particles from entering the differential housing.

3.9 Remove the rag from the pinion gear area and remove any metal shavings generated during drilling.

3.10 Clean the differential housing and ensure it is free of contamination. Inspect the inner surface of the housing as well as the drive pinion using an additional light source to ensure no metal chips are present.

WARNING

During the following installation steps, ensure that the magnet cable is not damaged.

3.11 After this, install the Electric Locker assembly with the bearings into the differential housing. Ensure that the bearing cups and cones, as well as the adjusting shims, are correctly matched (see Step 1.12).

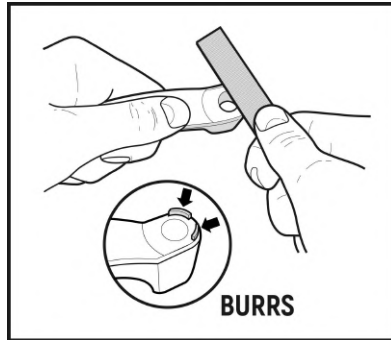


Fig. 25

3.12 Inspect the bolt head seating surfaces on the right-hand bearing cap. If burrs are present, dress the surfaces with a file to ensure proper contact between the bracket and the cap. (Fig. 25)

3.13 Install the bearing caps. The markings on the bearing caps must match the markings on the differential housing (**step 1.7**)

WARNING

When installing the Electric Locker, proper bearing preload adjustment is essential. Incorrect preload will result in accelerated bearing wear, noise, and eventual damage to the ring and pinion gear set.

3.14 Adjust the bearing preload in accordance with the vehicle repair manual. At this stage, accurately determine the required thickness of the shim pack.

3.15 Using a torque wrench, tighten the bearing cap bolts to the torque specified by the vehicle manufacturer.

WARNING

If the original gears are being replaced with new ones, set the backlash to the values specified in the ring and pinion gear manufacturer's manual.

3.16 Using a dial indicator and a set of adjusting shims, adjust the backlash of the final drive gears to the value obtained during the preliminary measurement and recorded in the table in **Step 1.9**. Take three measurements and calculate their arithmetic mean, then compare it with the value obtained in **Step 1.9**. Perform the measurement on the previously marked gear teeth. If the backlash value exceeds the required value, redistribute the shims so that the ring gear moves closer to the drive pinion. If the value is less than required, redistribute

3. INSTALLING THE ELECTRIC LOCKER

the shims so that the ring gear moves away from the drive pinion. To maintain the established bearing preload, redistribute the shims between sides by moving them from one side to the other. Do not remove or add any new shims for adjustment.

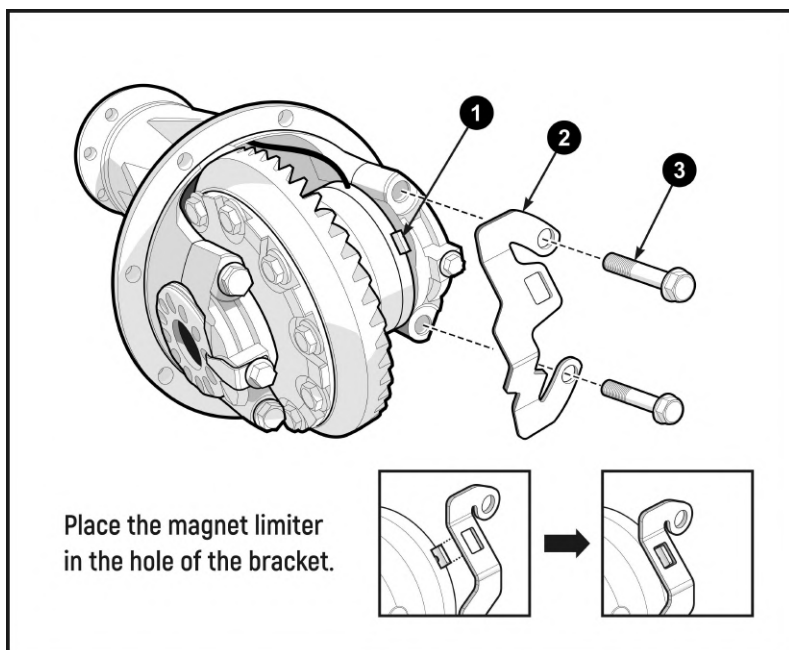


Fig. 26

3.17 After completing the backlash adjustment, tighten the left-hand bearing cap bolts to the torque specified by the vehicle manufacturer, and install the bracket (2) onto the right-hand bearing cap. (**Fig. 26**)

3.18 Position the magnet so that its rotation stop tab (1) engages with the corresponding slot in the bracket. Insert the bolts (3) through the bracket holes and thread them into the right-hand bearing cap. (**Fig. 26**)

3.19 Ensure that the magnet rotation stop tab has a slight clearance within the bracket slot. To verify this, rotate the magnet up and down — it should move slightly, and the stop tab should contact the upper and lower edges of the bracket slot. If no clearance is present, slightly shift the bracket position relative to the bolts and recheck.

3.20 After adjusting the clearance of the magnet rotation stop tab, tighten the right bearing cap bolts with a torque wrench to the torque specified in the vehicle manufacturer's service manual.

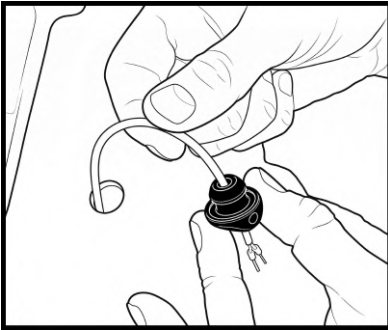


Fig. 27

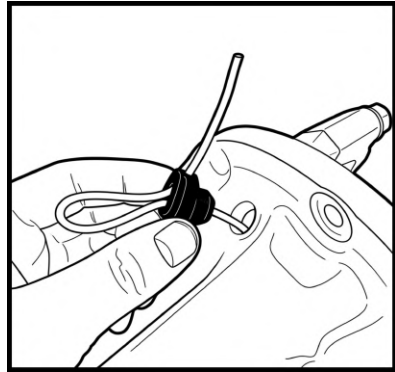


Fig. 28

3.21 Install the rubber seal onto the magnet cable by pressing the cable into the longitudinal slot and routing it through the side opening. **(Fig. 27, 28)**

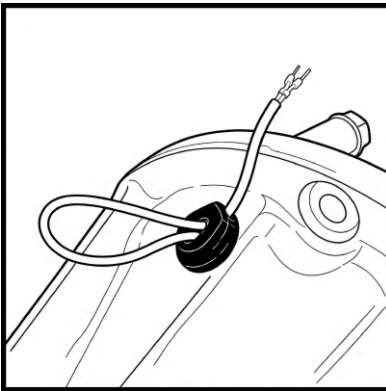


Fig. 29

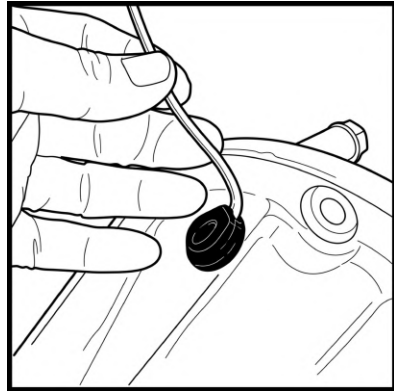


Fig. 30

3.22 Apply gasket maker to the narrow section of the rubber seal that will be inserted into the carrier hole.

3.23 Insert the rubber seal into the hole in the differential carrier. Remove any excess gasket maker. **(Fig. 29)**

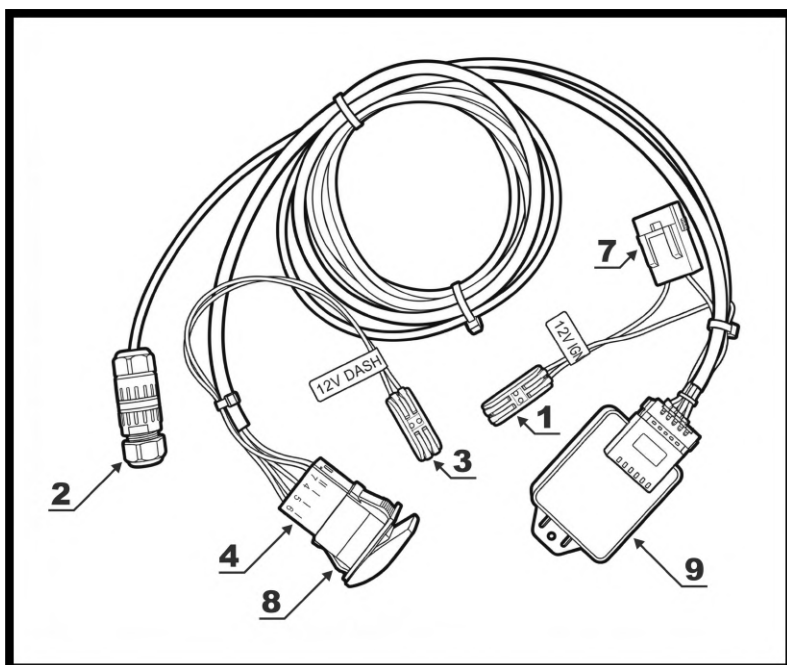
3.24 Adjust the length of the magnet cable inside the carrier so that the cable does not stretch and does not touch the moving parts of the differential. If the cable is stretched, pull it slightly into the axle housing; if there is too much cable in the axle housing, pull it out.

3. INSTALLING THE ELECTRIC LOCKER

3.25 While holding the rubber seal in place with one hand, pull the end of the cable through the side opening with the other hand. This will allow the magnet cable to rotate and lock into position at a 90° angle in the cable gland. **(Fig. 30)**

WARNING

Make sure the Electric Locker is unlocked. To check this, insert an axle shaft into the side gear and turn it while holding the driveshaft flange steady. If everything is adjusted correctly, the axle shaft should turn freely while the ring gear remains stationary.



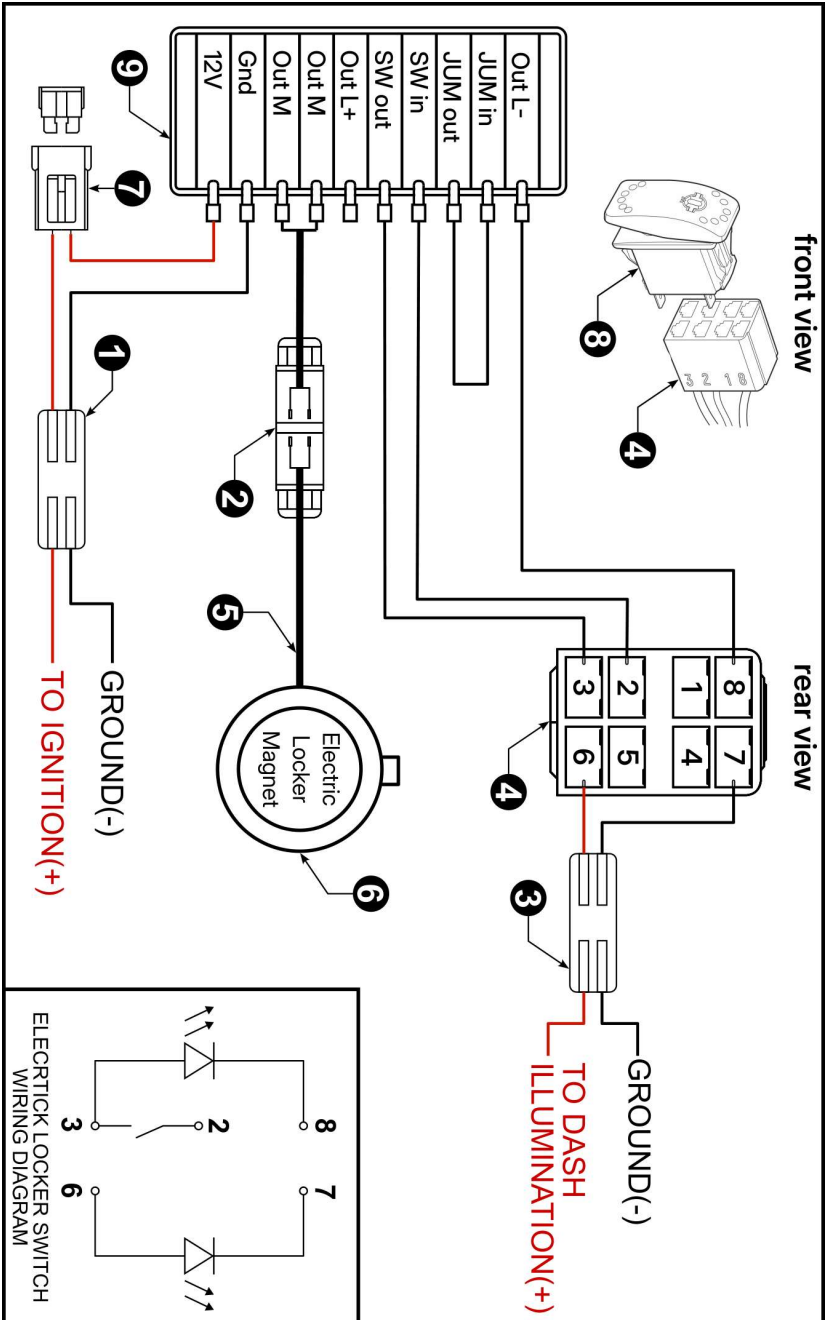
- 1 — Connector (to Ignition)
- 2 — Waterproof Connector
- 3 — Connector (to dash illumination)
- 4 — Button Wire Connector
- 5 — Magnet Cable
- 6 — Electric Locker
- 7 — Fused Power Wire (5 A)
- 8 — Electric Locker Switch
- 9 — Electric Locker Control Unit

CAUTION

The Electric Locker Control Unit does not provide a high level of protection against moisture. To prevent damage to the Unit, install it inside the vehicle cabin. If installation outside the cabin is required, the unit must be installed in a dedicated sealed waterproof enclosure.

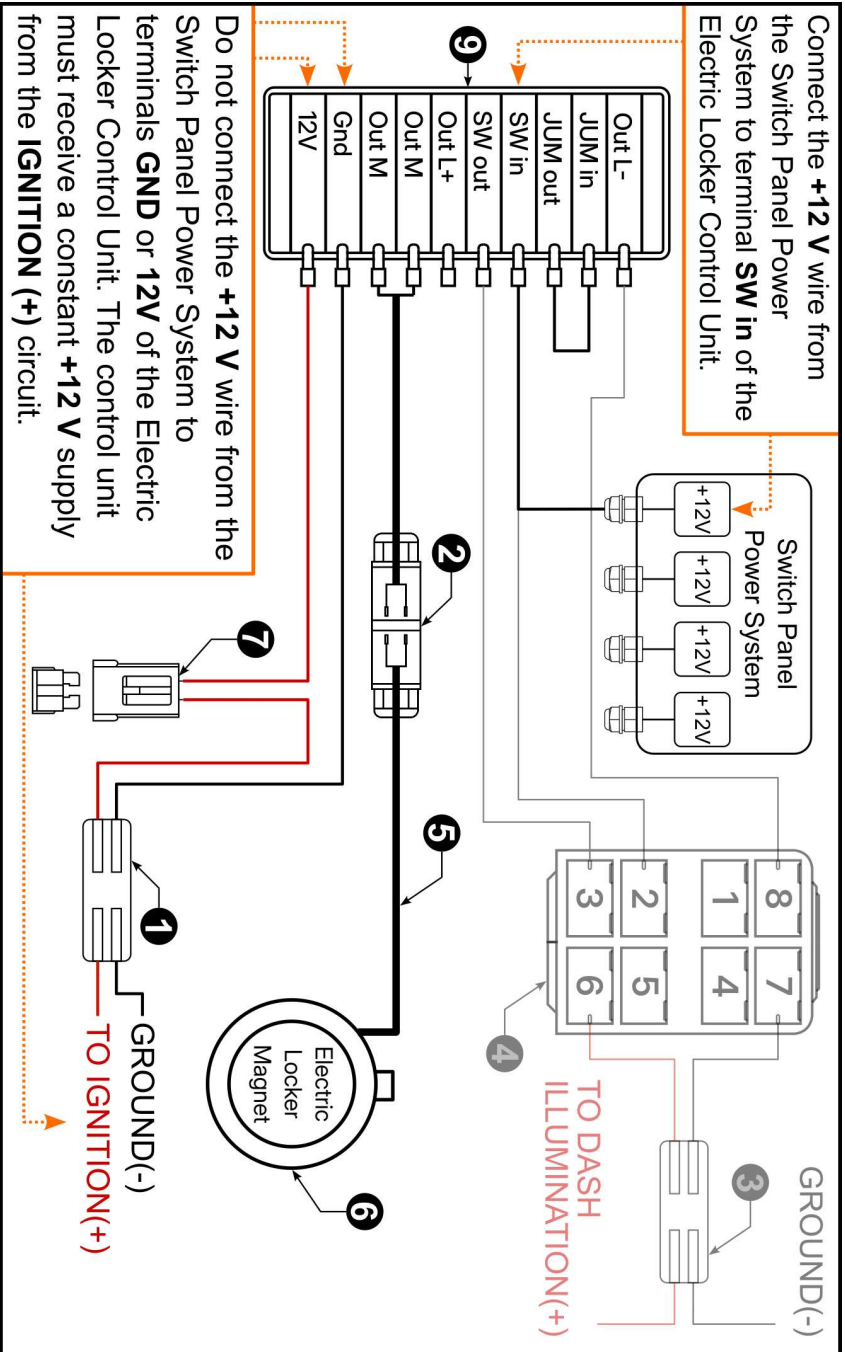
NOTES:

- The polarity of the voltage applied to the magnet is not important.
- The Electric Locker Control Unit must receive a constant **+12 V** supply from the **IGNITION (+)** circuit.



ELECTRICAL CONNECTION DIAGRAM WITH SWITCH PANEL

If the Electric Locker is to be connected using a Switch Panel, refer to the wiring diagram below. Before connecting, completely disconnect the Electric Locker Switch and all wiring components associated with it from the Locker Control Unit; these components are shown in a lighter shade in the diagram.



4. CHECKING THE OPERATION OF THE ELECTRIC LOCKER

PRELIMINARY CHECK OF THE ELECTRIC LOCKER

After connecting the electrical components, verify Electric Locker operation. Perform this check only by rotating the drive pinion flange, not by rotating the axle shafts relative to each other.

4.1 Insert one of the axle shafts into the Electric Locker.

4.2 Set the switch to the **OFF** position.

4.3 Hold the axle shaft and rotate the drive pinion flange. The drive pinion flange must rotate freely and independently of the stationary axle shaft.

4.4 Set the switch to the **ON** position.

4.5 Hold the axle shaft and rotate the drive pinion flange. When the Electric Locker is engaged, the drive pinion flange and the axle shaft must rotate together as a single unit. Rotation of the drive pinion flange independently of the axle shaft is not permitted.

4.6 Repeat the engagement and disengagement procedure several times.

NOTE: If the Electric Locker engagement mechanism does not operate properly, contact customer support via the HardBlock website at **hardblockusa.com**.

4.7 After confirming proper Electric Locker operation, proceed with final axle assembly in accordance with the vehicle service and repair manual.

4.8 After completing final axle assembly, fill the axle with oil and recheck Electric Locker operation as described above.

CAUTION

During the first drive with the Electric Locker installed, perform 5 to 10 engagement and disengagement cycles. Each cycle must last several minutes while driving at low speed and making slight turns without stopping. The Electric Locker must engage consistently and without delay.

ENG

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