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Report #: 2016038DXT

Appendix K: Manual

Please refer to the following pages.

DSP700 Series Wireless Wheel Alignment Sensors



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1. Getting Started

1.1 About This Manual

This manual contains important operation, maintenance, and safety information for the DSP700 series sensors. It is supplemented by the alignment system console operation manual. Read and become familiar with the contents of these publications.

A calibrated set of DSP700 series sensors can be used with any Hunter aligner using WinAlign[®] software version 11.1 or greater.


A calibrated set of DSP700 series sensors can be used with a PA100 series aligner with Pro-Align[®] software version 1.10.X or greater.


NOTE:	Due to the charging system, only cabinet style aligners may be used. Wall/column mounted aligners are not supported.
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1.2 For Your Safety

Hazard Definitions

Watch for these symbols:

 CAUTION:	Hazards or unsafe practices that could result in minor personal injury or product or property damage.
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 WARNING:	Hazards or unsafe practices that could result in severe personal injury or death.
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 DANGER:	Immediate hazards that will result in severe personal injury or death.
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These symbols identify situations that could be detrimental to your safety and/or cause equipment damage.

IMPORTANT SAFETY INSTRUCTIONS

Read all instructions.

Do not operate equipment with a damaged cord or if the equipment has been dropped or damaged until it has been examined by a qualified service representative.

Do not let cord hang over edge of table, bench, or counter or come in contact with hot manifolds or moving fan blades.

If an extension cord is necessary, a cord with a current rating equal to or more than that of the equipment should be used. Cords rated for less current than the equipment may overheat. Care should be taken to arrange the cord so that it will not be tripped over or pulled.

Let equipment cool completely before putting away. Loop cord loosely around equipment when storing.

To reduce the risk of fire, do not operate equipment near open containers of flammable liquids (gasoline).

Keep hair, loose clothing, neckties, jewelry, fingers, and all parts of body away from all moving parts.

To reduce the risk of electrical shock, do not use on wet surfaces or expose to rain.

Use only as described in this manual. Use only the manufacturer's recommended attachments.

ALWAYS WEAR OSHA APPROVED SAFETY GLASSES. Eyeglasses that only have impact resistant lenses are NOT safety glasses.

Do not replace batteries within 18 inches of garage floor level as that zone is a classified location from which arcing/sparking parts are to be removed.

SAVE THESE INSTRUCTIONS

Read and follow all caution and warning labels affixed to equipment and tools.


Use caution when jacking the vehicle up or down.

Misusing this equipment can shorten the life of the equipment. To prevent accidents and/or damage to the sensors, use only Hunter recommended accessories.


Remove the sensors from the wheels before moving the vehicle. When sensors are not in use, store and charge them on the sensor cabinet.

1.3 Care and Cleaning of the Sensors

When cleaning the sensors, use a mild window cleaning solution to wipe off the sensors and adaptors.

 **CAUTION:** Do not hose down or submerge the sensors in water. Do not spray cleaner on the sensor. This could damage the electrical system and optical components.

Keep wheel adaptor rods cleaned and lubricated. Lubricate as needed with a coating of light lubricant such as WD-40.

 **CAUTION:** Do not lubricate the center screw shaft of the wheel adaptor.

1.4 XF Pod

The DSP700 series sensors communicate with the aligner console using Extra High Frequency (XF). Radio waves are transmitted and received from the sensors and the XF Pod.

Occasionally the XF Pod may receive interference from electronic devices in the area (microwaves). The DSP700 series sensors and XF Pod may be configured to use different radio frequencies to minimize interference.

The XF system transceiver generates radio waves in the range of 2.4 GHz. Radio waves at these frequencies reflect off most objects, resulting in an indoor and outdoor range of approximately 100 feet (30 meters).

Interference has occurred when the XF Pod does not receive the radio waves. If this happens, move the mobile cabinet and/or XF Pod approximately 2 or 3 inches (50 to 80 mm) in any direction.

Precautions for Systems Equipped with XF Cordless Sensors

The following precautions apply to the XF transceivers installed in the aligner console and the alignment sensors as part of the XF cordless sensor option.



WARNING: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their own expense.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
1. this device may not cause harmful interference, and
2. this device must accept any interference received, including interference that may cause undesired operation.



WARNING: Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

Important radio compliance information for products that contain Hunter 45-1281 XF radio module:

FCC Listing Number: FCC ID: LS3-45-1281

Industry Canada Listing Number: IC: 2938A-451281

Important radio compliance information for products that contain Hunter 445-1549 XF radio module:

FCC Listing Number: FCC ID: LS3-45-1549

Industry Canada Listing Number: IC: 2938A-451549

	IMPORTANT NOTICE: This product contains a low power transceiver intended for commercial use in all EU and EFTA member states
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CE Marking & European Union Compliance

Products intended for sale within the European Union are marked with the CE Mark which indicates compliance to applicable Directives and European Normes (EN), as follows. Amendments to these Directives or Ens are included: Normes (EN), as follows.

Reference Standards:

- EN 60950: Safety of information technology equipment.
- EN 301 489: Electromagnetic Compatibility (EMC) standard for radio equipment and services.
- EN 300 328 Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband transmission systems; Data transmission equipment operating in the 2.4 GHz ISM band and using wide band modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive.

Note: Operating frequency range: 2405 - 2475 MHz .5mW eirp.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Hereby, Hunter Engineering Company, declares that this Hunter 45-1281 low power transceiver is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

1.5 Sensor Battery Packs

Each sensor contains a 3.6 VDC 5.2 Amp hour sealed NiMH rechargeable battery pack. To get the maximum life out of the battery packs, follow these three rules:

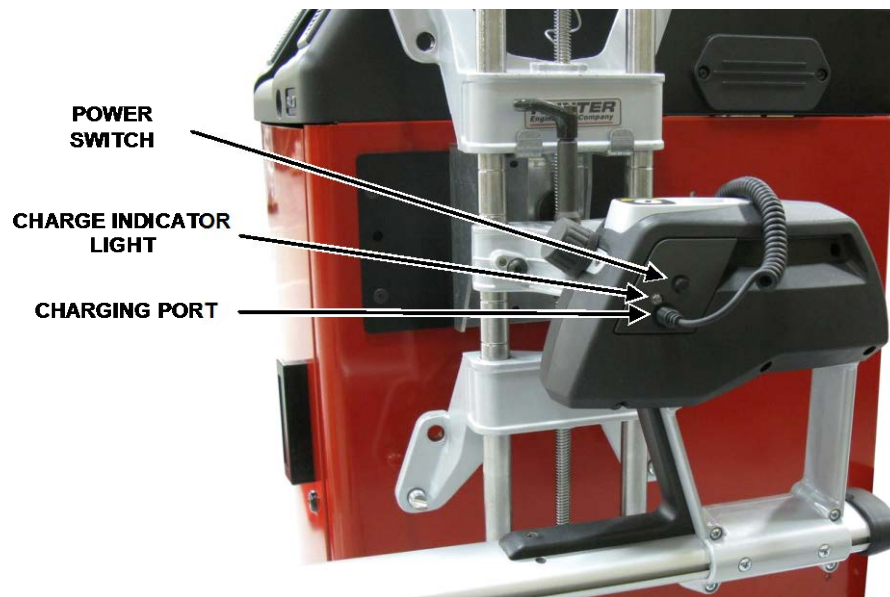
1. If the sensors are not in use, charge them.
2. Switch sensors “OFF” during charging.
3. Charge for eleven to thirteen hours, and/or provide an extended charge time (24 hours or longer) at least once a week.

NOTE:	Make sure the main power switch at the rear of the console is left “ON” and the outlet that supplies power to the aligner is on.
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To prevent premature degradation of battery performance, the charger has to replace 125% of the energy that was removed from the battery. It is not necessary to fully discharge the battery packs before charging. However, ***it is important they be charged fully.***

Charging information:

To recharge the battery packs when the sensors are not in use, place the wheel adaptor sensor assemblies on the cabinet storage hanger and leave the main aligner power on. Connect the charging wire harness, 38-1103-2, to the charging port(s) on the sensor(s).



Any time battery packs are being charged, the charge indicator light on the sensor will be illuminated.

The charge indicator light turning from red to green is an indication that the charging mode has switched from fast charge mode into a “trickle” charge mode and the battery is 100% charged and ready to use.

You should expect at least 8 hours of continuous use from a fully charged battery pack. If you are not getting this amount of usage time, the most likely cause is inadequate charging time.

Battery packs that are consistently subjected to partial charging rather than full charge cycles **will permanently lose capacity.**

Charging time for a fully discharged battery pack with the sensor power switch turned “OFF” is 11 to 13 hours. Three or four times this interval would be required if the sensors were left “ON” during the charge cycle. **It is very important that the sensors be turned “OFF” during charging.** The sensors power switch is located on the front face of the sensor, above the charging port and indicator light.

Charging overnight with the sensors’ power switches set to “OFF” will provide a proper charge.

The charging system cannot over-charge the battery packs. If you’re not using the sensors, charge them!

In a shop with extended service hours, there are some things that can be done to prolong battery pack life:

When the sensors are not being used to perform alignments, they should be stored with sensor power switched off. At a minimum, turn the sensors “OFF” between alignments. Any charging accomplished throughout the day helps maintain the batteries at peak performance, and helps extend their life.

One day out of the week when alignments are not performed, let the sensors charge continuously for 24 hours or longer. This should “undo” the effects of any undercharging that occurred during the previous week. This sort of prolonged charging will only be effective at restoring full capacity to the batteries if performed regularly. Once a week is the recommended minimum.

When is it time to replace the battery packs?

If after a full charge the battery pack does not last for the expected 8 hours, it should be put through one or two sessions of extended charge time (24 hours or longer). If the battery pack does not recover and start giving satisfactory cycle time, it should be replaced. The sooner the battery pack losing capacity is detected, the more likely an extended charge time will restore the battery pack to normal capacity. If the battery pack discharge time is only three or four hours, it is unlikely, that extended charge time will help significantly.

Extension Cables

DSP700 series sensors are supplied with four 38-1106-2 extension cables. These extension cables can be used if battery power for the sensors is low. Simply connect one end of the extension cables to the charging cables on the aligner and the other end to the charging port on the sensor. Proceed with the alignment.

Additional information:

Any sensor that is powered up after being off for a while will initially indicate 100% capacity on the aligner screen. This is not an accurate indication of the charge state of the battery pack. The battery pack has a “surface charge” which dissipates quickly and within 5 minutes of operation the on-screen battery level indicator will settle at its true value. The individual wheels on the screen indicate the actual battery pack condition and are color-coded. The following is an indication of battery charging condition:

Green = fully charged or partially charged

Yellow = battery running low and will require charge soon

Red (with battery recharging icon) = requires charging

The charging circuit has been “fine tuned” to work specifically with Hunter battery pack, part number 194-27-1. Substituting different batteries is not recommended.

A sensor that is being used, and has a low battery pack, can retain its measurement data if a “hot swap” battery pack replacement is made. Hot swapping the battery pack simply requires the user to replace the battery pack. The sensor settings will be restored and the alignment process can proceed. *Refer to 1.7 DSP700 Series Sensors Hot Swap Battery Pack Replacement Instructions for more information.*



Battery Pack - Hunter 194-27-1

1.6 DSP700 Series Sensors Battery Pack Replacement Instructions

This procedure provides instructions for replacing the battery pack in DSP700 series sensors.

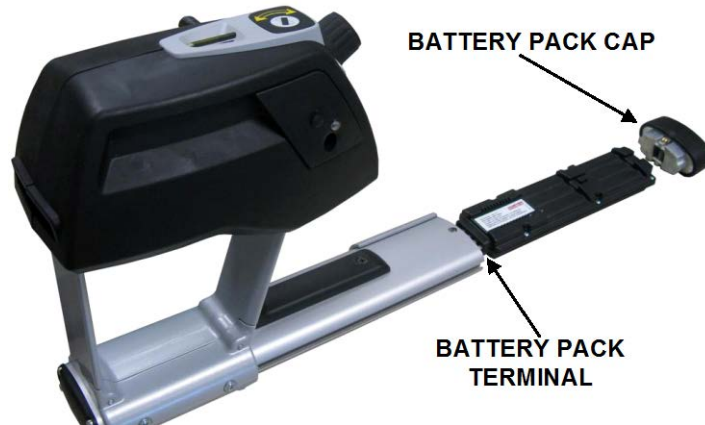
Remove the battery pack as follows:

1. Depress the upper and lower release buttons on the battery pack cover and remove.
2. Tilt sensor back and remove battery pack.

Replace the battery pack as follows:

NOTE:	The battery pack end caps have a different weight front to rear in order to correctly level the sensors. The heavier end cap belongs with the short toe arm sensors. Do not mix when replacing battery packs.
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1. Insert the battery pack with the factory label on top.
2. Replace the battery pack cover.



1.7 DSP700 Series Sensors Hot Swap Battery Pack Replacement Instructions

This procedure provides instructions for hot swapping the battery pack in DSP700 series sensors during an alignment procedure. Hot swapping the battery will recall/retain the information in the sensor if the alignment procedure is still in progress.

If the sensor was compensated prior to swapping the battery, the sensor will indicate it by illuminating the middle compensation indicator while flashing the two outer compensation indicators.

1. Remove and replace the battery as described above.
2. Restore the sensor to its original position.

The hot swap procedure should be completed in the time period of approximately 1 minute.

1.8 User Battery Replacement:

The batteries in the battery pack may be replaced. When replacing, use six rechargeable 2700 mAh AA NiMH batteries. Replace all batteries in the battery pack at the same time, with the same type of battery.

⚠ CAUTION: Be sure to check the battery placement, as reversing polarity may cause irreparable damage to the battery pack.

⚠ CAUTION: RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO INSTRUCTIONS.

⚠ CAUTION: INCORRECT BATTERY PLACEMENT CAN RESULT IN ARCS/SPARKS.

Remove the six screws securing the assembly. Remove the battery pack top. Replace individual batteries and reassemble.



The battery pack must be fully recharged before use.

1.9 Vehicle Preparation

Drive the vehicle onto the alignment lift/rack until the front wheels are centered on the turnplates.

Install wheel chocks to prevent the vehicle from rolling.

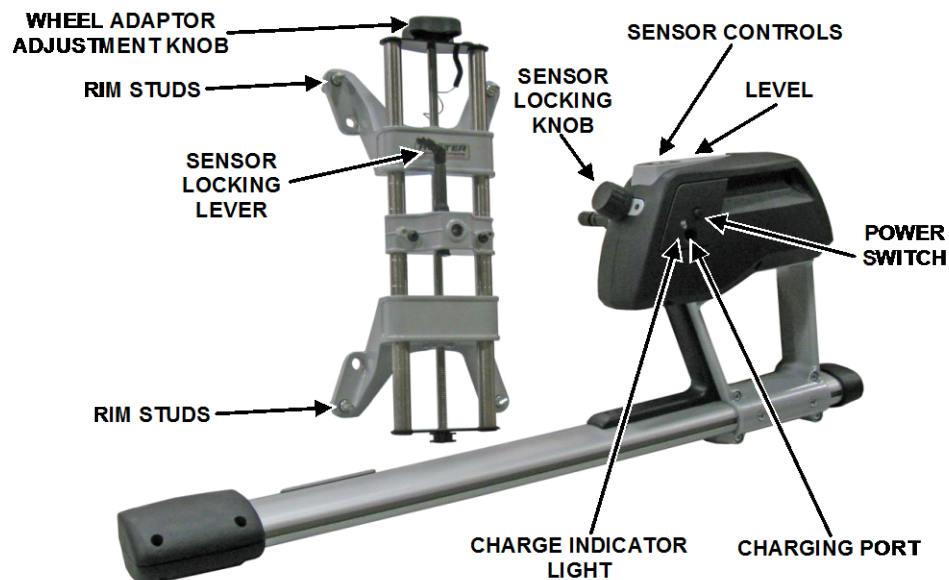
Raise the lift/rack to alignment height.

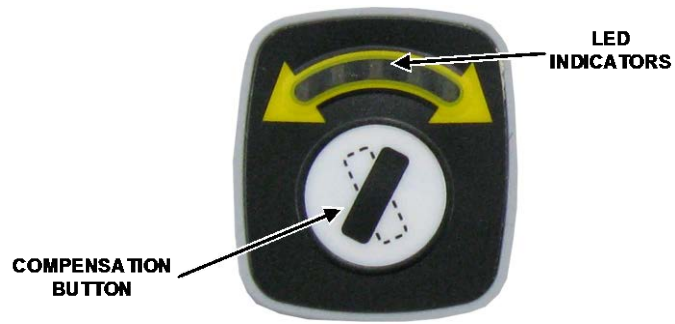
Lower the lift/rack leveling legs if your lift/rack is so equipped, and then lower the lift/rack onto the legs. If your lift/rack does not have leveling legs, lower the lift/rack onto the lift/rack locks.

Check and adjust the tire pressure, inspect for unevenly worn or mismatched tires.

Inspect all suspension and steering linkage components for wear or damage. A thorough inspection is important.

1.10 Equipment Components and Controls





**DSP706 and DSP708
SENSOR CONTROLS**



DSP706 SENSORS



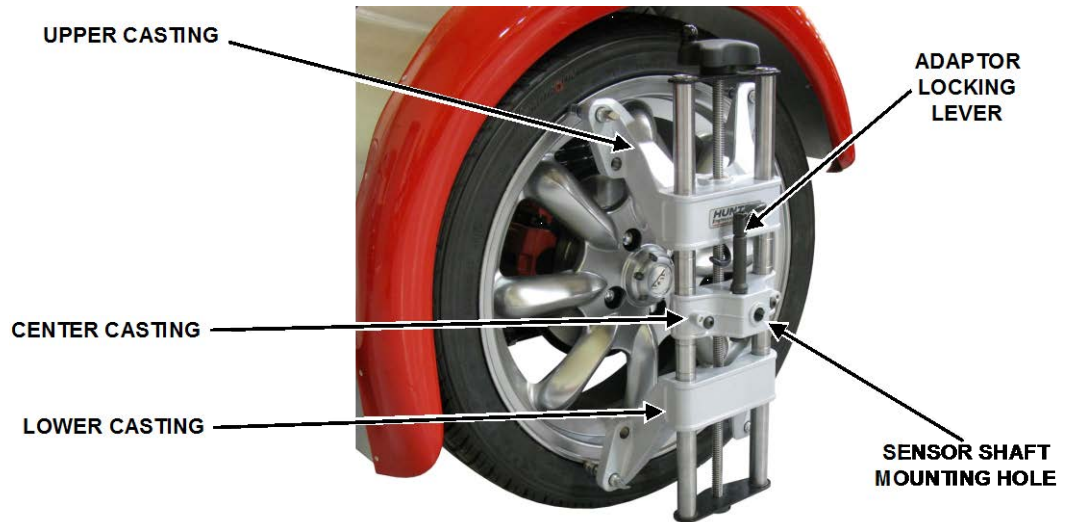
DSP708 SENSORS

2. Mounting Sensors

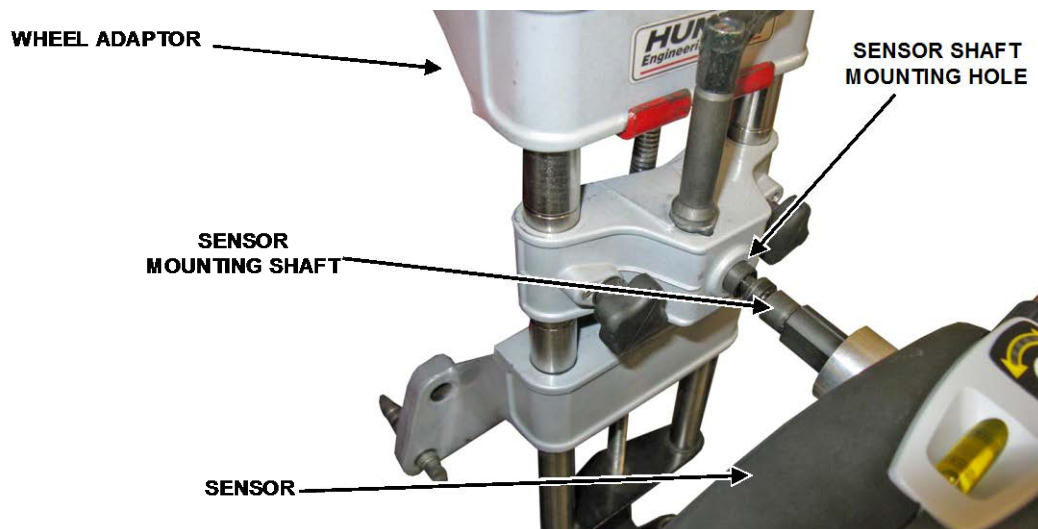
2.1 Mounting Sensors onto Wheel Adaptors

NOTE: For DSP706 sensors, sensor toe arm position is reversible. Toe arms may be mounted on the front or rear wheels to allow for clearance of air dams, mud flaps, etc.

Sensors may be mounted on the wheel adaptors before mounting the wheel adaptors on the vehicle. In some cases, it may be easier to mount the wheel adaptor first and then mount the sensor onto the adaptor. Either method may be used.



If detached, attach the sensor to the wheel adaptor by inserting the sensor mounting shaft (at the rear of the sensor) into the sensor shaft mounting hole in the middle of the center casting.



NOTE: The sensor mounting shaft must be fully inserted into the sensor shaft mounting hole.

SENSOR MOUNTING SHAFT FULLY SEATED



When the sensor shaft is fully inserted into the sensor shaft mounting hole, the adaptor locking lever should be rotated clockwise into the locked position using firm hand pressure. Tools should not be used to force the adaptor locking lever.

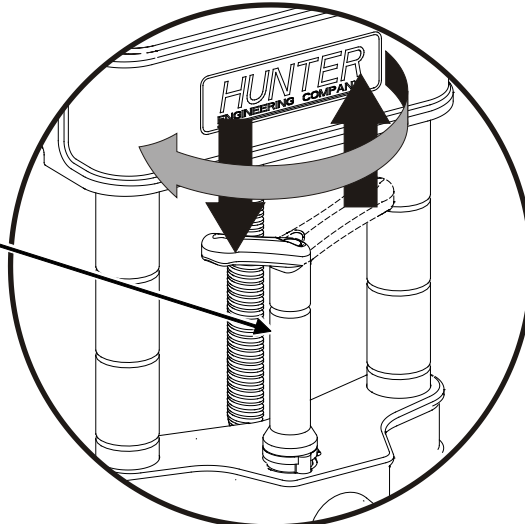
Wheel Adaptor 175-321-1 with Ratchet Adaptor Locking Lever

Rotate the adaptor locking lever clockwise to tighten. If upper casting prevents rotation of lever, either expand adaptor to move upper casting or re-position the adaptor locking lever by lifting up to disengage, rotating counter-clockwise, and lowering to re-engage.

Proceed until the shaft is locked tight to adaptor.

With shaft fully locked, re-position the lever to the 9 o'clock position by lifting the adaptor locking lever up to disengage, rotating to 9 o'clock, and lowering to re-engage.

ADAPTOR LOCKING LEVER

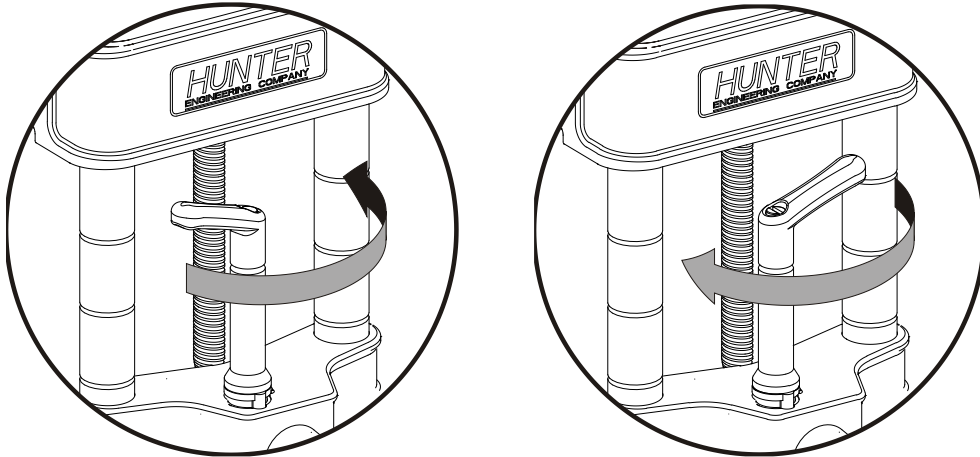


Re-position lever to 9 o'clock

The adaptor locking lever in the 9 o'clock position eliminates possible contact with upper casting or sensor during alignments.

Operation of Ratchet Adaptor Locking Lever after Initial Setup

To remove the sensor, loosen the sensor shaft by turning the adaptor locking lever counter-clockwise to the 3 o'clock position.

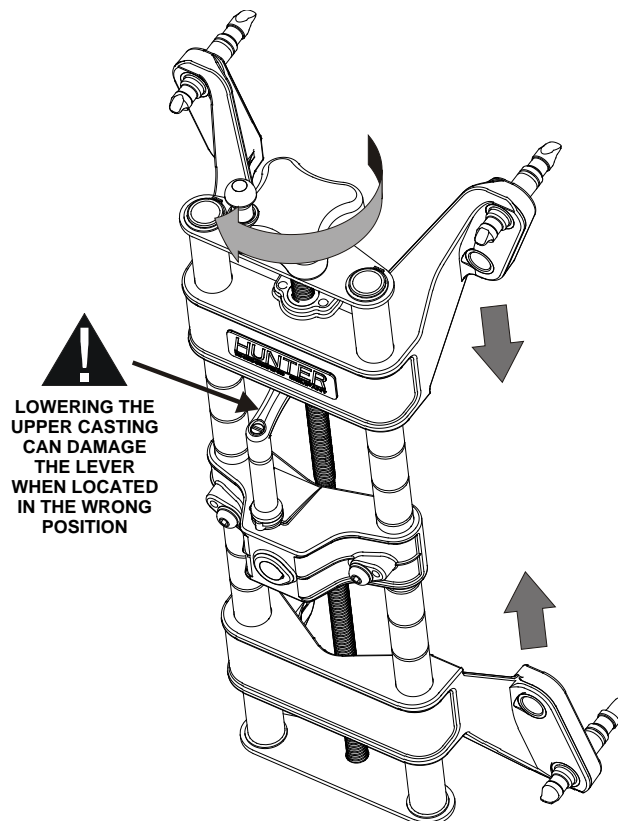


To loosen, turn the adaptor locking lever from 9 to 3 o'clock.

To lock, turn the adaptor locking lever from 3 to 9 o'clock

To lock the sensor shaft, tighten the sensor shaft by turning the adaptor locking lever clockwise to 9 o'clock position.

⚠ CAUTION: Failure to follow tightening and loosening procedures may result in damage to the adaptor locking lever. Upper casting can damage adaptor locking lever if contact occurs when going from a large to small diameter rim. *Refer to figure below. Also refer to "2.2 Mounting Wheel Adaptors onto Wheels" for information for adjusting adaptor size.*



⚠ CAUTION: When mounting sensors to the wheel adaptors, the sensor shaft must be fully seated. Make certain that there is no play or looseness between the sensor shaft and the wheel adaptor. Rotate the wheel while holding the sensor. Listen and feel for movement between the sensor and wheel adaptor. Runout compensation and alignment accuracy will be adversely affected if there is any movement between the sensor and wheel adaptor. Sensors must fit tightly against the surface of the wheel adaptor or the lock may not hold. This could allow the sensor to fall and be damaged.

2.2 Mounting Wheel Adaptors onto Wheels

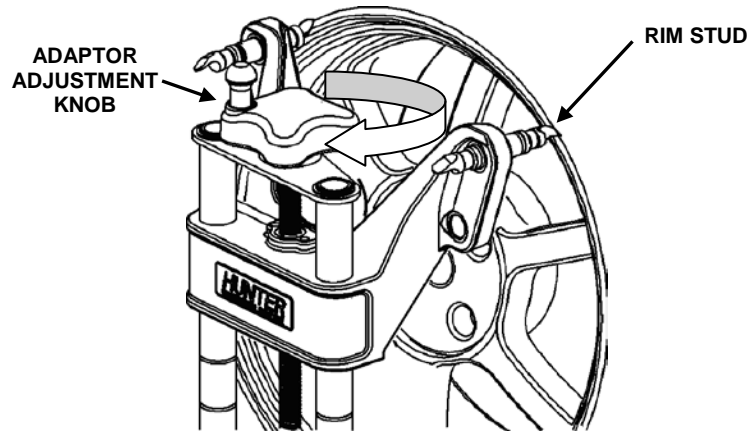
Typical Installation (Grasping the Outside of Rim Lip)

NOTE: Rim studs are reversible. Use the spade end that best fits the rim. The two wheel adaptors on the front wheels or back wheels need to be uniform with same end of the rim studs engaged onto the rim.

Position the wheel adaptor with the two upper external rim studs on the outside of the wheel rim.

Align the two lower external rim studs on the outside of the wheel rim and check that all four rim studs will engage the outside of the wheel rim.

Turn the adaptor adjustment knob clockwise to firmly attach the adaptor to the wheel.



Test the security of the installation by lightly tugging on the wheel adaptor.

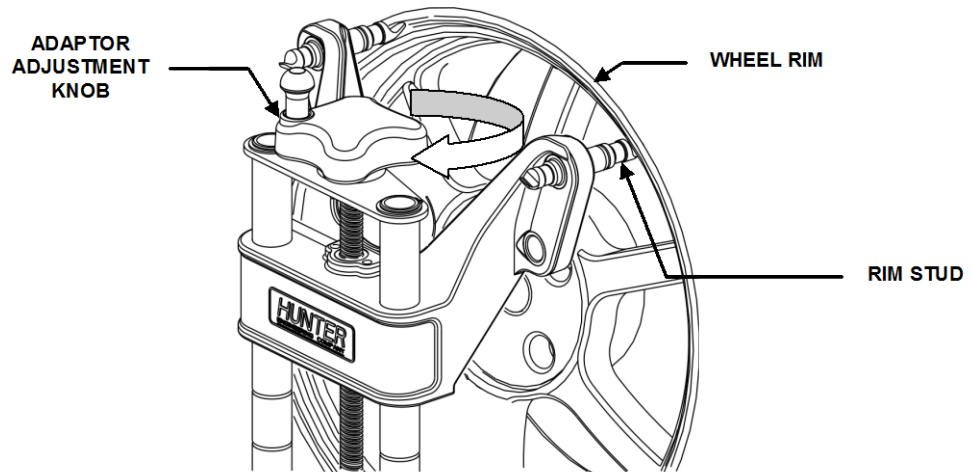
⚠ CAUTION: Do not allow the rim studs to slip on the wheel. Runout compensation and alignment accuracy will be adversely affected if the wheel adaptor is allowed to slip on the wheel.

Attaching to Inner Rim Lip

Position the wheel adaptor with the two lower rim studs engaging the inside of the lower wheel rim lip.

Align the two upper rim studs with the inside of the upper wheel rim lip and check that all four studs will engage the inner portion of the rim lip.

Turn the adaptor adjustment knob clockwise to firmly attach the adaptor to the wheel.



Test the security of the installation by tugging on the wheel adaptor.

⚠ CAUTION: Do not use rim studs on alloy or clear coat wheels. Rim studs can damage these wheels.

⚠ CAUTION: Do not allow the rim studs to slip on the wheel. Runout compensation and alignment accuracy will be adversely affected if the wheel adaptor is allowed to slip on the wheel.

3. Compensating Sensors

3.1 General Compensation

The sensors must be compensated to eliminate errors in angle measurements caused by runout of the wheel, wheel adaptor, and sensor shaft.

The sensors must be "ON" to compensate.

Do not disturb the sensor until the two outer LED's respond.

Sensors may be compensated in any order; however, these precautions must be followed:

If a sensor is removed from a wheel, that sensor must be re-compensated when reinstalled. The other sensors do not need re-compensation.

During two-point compensation and normal operation, be certain no obstructions are blocking the infrared beams between the sensors. When compensating sensors that are mounted to the vehicle drive wheels, place the transmission in NEUTRAL.

The lift/rack should be level and on the leveling legs, if so equipped.

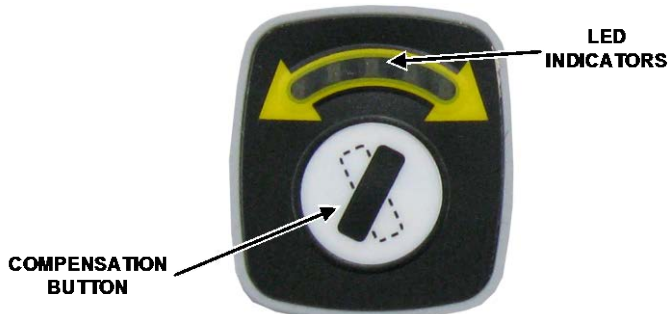
3.2 Three-Point Compensation

All sensors need not be mounted before starting compensation.

Raise either the front or rear axles, or both, while remembering to use the safety on all jacks.

⚠ WARNING: If only one axle is to be raised, chock wheels on the axle that is not being raised (before raising), to prevent the vehicle from rolling.

Turn sensors on and select any one of the sensors for compensation. The starting position of the wheel adaptor does not matter. The middle LED will be on.



Hand-tighten the sensor lock knob.

Rotate the wheel until the sensor is level (as indicated by the spirit level on top of the sensor).

Press the compensate button. Do not disturb the sensor until the two outer LED's begin to blink and the middle LED turns off, indicating that the measurements have been stored.

Loosen the sensor lock knob and rotate the wheel 120°, clockwise or counter clockwise, until the middle LED turns on. Hand tighten the sensor lock knob and rotate the wheel to level the sensor.

NOTE: It is recommended that the front wheels of front wheel drive vehicles be rotated in the forward direction to reduce disturbing the sensor on the opposite front wheel.

With the middle compensate LED on, press the compensate button. Do not disturb the sensor until the two outer LED's begin to blink faster and the middle compensate LED turns off to indicate that the measurements have been stored.

Loosen the sensor lock knob and rotate the wheel 120° more, until the middle LED turns on. Hand tighten the sensor lock knob and rotate the wheel to level the sensor.

With the middle LED on, press the compensate button. Do not disturb the sensor. Wait for the sensor to save the measurement. The two outer LED's and the middle LED will stay on.

Loosen the sensor lock knob.

The sensor is now compensated. Repeat this procedure for the remaining sensor(s).

After three-point compensation, the wheel may be rotated to any position without affecting the alignment measurements.

NOTE:	All sensors should be level, but unlocked to minimize tilt of the sensors. Avoid rapid steering motion that may cause sensors to swing vertically, which can cause them to come into contact with the rack, or even dislodged from the wheel.
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Remove the lock pins from the turning angle gauges and rear slip plates.

Apply the parking brake and place the transmission in park if applicable.

Lower the vehicle onto the rack.

Jounce the vehicle.

Continue the alignment procedure.

For three-point compensation, if a previously compensated sensor should require re-compensation, pressing the sensor compensate button twice within four seconds will restart the compensation procedure and retake the first reading for that sensor at this position.

4. Operation Information

4.1 Sensor Level Check Procedure

To achieve an accurate alignment, it is important that the sensors hang level when the sensor lock knob is loosened. A sensor must be balanced correctly to hang level.

To check the balance of a sensor:

Mount the sensor on a wheel adaptor.

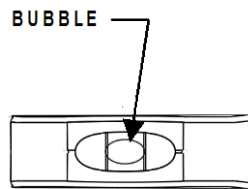
Mount the wheel adaptor onto a wheel without connecting the sensor charging cable.

With the sensor lock knob loosened, wait until the sensor does not rock on the wheel adaptor.

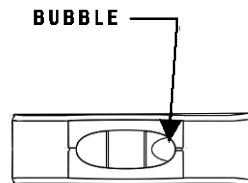
Observe the level in the sensor.

If the bubble is in the center of the level, as shown below, the sensor is balanced.

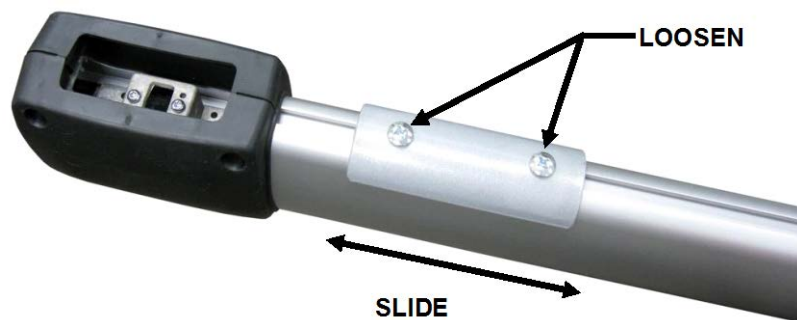
NOTE:	A level reminder icon will appear on the vehicle plan view indicator when a sensor is severely out of level.
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If the bubble is off to one side of the level, as shown below, the sensor must be adjusted to restore the sensor to level.



To balance sensors, loosen the screws securing the weight to the toe arm. Slide the weight in the proper direction to center the bubble in the level.



Contact your local Hunter Service Representative if you need assistance with balancing adjustments.