

Laser-Spot™ Wheel Balancer

Installation and Operation Manual

Manual P/N 5900086 — Manual Revision B1 — February 2022

Model:

- LS43B



Designed and engineered in Southern California, USA. Made in China.

 **DANGER**

Read the *entire contents* of this manual *before* using this product. Failure to follow the instructions and safety precautions in this manual can result in serious injury or death. Make sure all other operators also read this manual. Keep the manual near the product for future reference. *By proceeding with setup and operation, you agree that you fully understand the contents of this manual and assume full responsibility for product use.*

Manual. LS43B Laser-Spot™ Wheel Balancer, *Installation and Operation Manual*, Manual P/N 5900086, Manual Revision B, released February 2022.

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Limitations. Every effort has been made to have complete and accurate instructions in this manual. However, product updates, revisions, and/or changes may have occurred since this manual was published. BendPak Ranger reserves the right to change any information in this manual without incurring any obligation for equipment previously or subsequently sold. BendPak Ranger is not responsible for typographical errors in this manual. Feel free to contact us at any time to get the latest information about any product: rangerproducts.com.

Warranty. The BendPak Ranger warranty is more than a commitment to you: it is also a commitment to the value of your new product. For full warranty details, contact your nearest BendPak Ranger dealer or visit bendpak.com/support/warranty. Go to bendpak.com/support/register-your-product/ and fill out the online form to register your product (be sure to click **Submit**).

Safety. Your new product was designed and manufactured with safety in mind. Your safety also depends on proper training and thoughtful operation. Do not set up, operate, maintain, or repair the unit without reading and understanding this manual and the labels on it; **do not use this product unless you can do so safely!**

Owner Responsibility. In order to maintain your product properly and to ensure operator safety, it is the responsibility of the product owner **to read and follow these instructions**.

- Follow all setup, operation, and maintenance instructions.
- Make sure product setup conforms to all applicable local, state, and federal codes, rules, and regulations, such as state and federal OSHA regulations and electrical codes.
- Read and follow all safety instructions. Keep them readily available for operators.
- Make sure all operators are properly trained, know how to safely operate the unit, and are properly supervised.
- Do not operate the product until you are certain that all parts are in place and operating correctly.
- Carefully inspect the product on a regular basis and perform all maintenance as required.
- Service and maintain the unit only with approved replacement parts.
- Keep the manual with the product and make sure all labels are clean and visible.
- **Only use this product if it can be used safely!**

Unit Information. Enter the Model Number, Serial Number, and the Date of Manufacture from the label on your unit. This information is required for part or warranty issues.

Model: _____

Serial: _____

Date of Manufacture: _____

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Introduction

This manual describes the Ranger LS43B Wheel Balancer, which is a computer-controlled Wheel Balancer that provides fast, accurate Wheel balancing for a wide variety of Wheels.

The LS43B includes our exclusive Laser-Spot™ technology for precise weight placement.

More information about BendPak Ranger products is available at rangerproducts.com.

This manual is mandatory reading for all users of the LS43B, including anyone who sets up, operates, maintains, or repairs it.

 DANGER Be very careful when setting up, operating, maintaining, or repairing this equipment; failure to do so could result in property damage, product damage, injury, or (in very rare cases) death. Make sure only authorized personnel operate this equipment. All repairs must be performed by an authorized technician. Do not make modifications to the unit; this voids the warranty and increases the chances of injury or property damage. Make sure to read and follow the instructions on the labels on the unit.

Keep this manual on or near the equipment so that anyone who uses or services it can read it.

Technical support and service for your Wheel Balancer is available from your distributor or by calling **BendPak Ranger at (805) 933-9970**. You may also call regarding parts replacement (please have the serial number and model number of your unit available).

Shipping Information

Your equipment was carefully checked before shipping. Nevertheless, you should thoroughly inspect the shipment **before** you sign to acknowledge that you received it.


When you sign the bill of lading, it tells the carrier that the items on the invoice were received in good condition. **Do not sign the bill of lading until after you have inspected the shipment.** If any of the items listed on the bill of lading are missing or damaged, do not accept the shipment until the carrier makes a notation on the bill of lading that lists the missing or damaged goods.

If you discover missing or damaged goods **after** you receive the shipment and have signed the bill of lading, notify the carrier at once and request the carrier to make an inspection. If the carrier will not make an inspection, prepare a signed statement to the effect that you have notified the carrier (on a specific date) and that the carrier has failed to comply with your request.

It is difficult to collect for loss or damage after you have given the carrier a signed bill of lading. If this happens to you, file a claim with the carrier promptly. Support your claim with copies of the bill of lading, freight bill, invoice, and photographs, if available. Our willingness to assist in helping you process your claim does not make us responsible for collection of claims or replacement of lost or damaged materials.

Safety Considerations

Read this manual carefully before using your new product. Do not set up or operate the product until you are familiar with all operating instructions and warnings. Do not allow anyone else to operate the product until they are also familiar with all operating instructions and warnings. Keep this manual on or near the product for future reference.

 **WARNING California Proposition 65.** This product can expose you to chemicals including styrene and vinyl chloride which are on the list of over 900 chemicals identified by the State of California to cause cancer, birth defects or reproductive harm. Always use this product in accordance with BendPak's instructions. For more information, visit www.p65warnings.ca.gov.

Safety Information

Please note the following:

- The product is a Wheel Balancer. **Use it only for its intended purpose.**
- The product should only be operated by authorized personnel. Keep children and untrained personnel away from the product.
- When using the product, wear appropriate work clothes (*nothing loose*) and ANSI-approved safety goggles (or similar). Keep hair, jewelry, and clothing away from the Balancer.
- When a Wheel is spinning, keep away from it.
- Do not use the product while tired or under the influence of drugs, alcohol, or medication.
- Do not use the product in the presence of cigarette smoke, dust, or flammable liquids or gases. Use the product indoors in a well-ventilated area.
- Do not make any modifications to the product; this voids the warranty and increases the chances of injury or property damage.

-
- Make sure all operators read and understand the *Installation and Operation Manual*. Keep the manual near the device at all times.
 - Make a visual inspection of the product before using it each time. Do not use the product if you find any missing or damaged parts. Instead, take the unit out of service, then contact an authorized repair facility, your distributor, or **Ranger Products at (805) 933-9970**.
 - BendPak Ranger recommends making a **thorough** inspection of the product once a month. Replace any damaged or severely worn parts, decals, or warning labels.

Symbols

Following are the symbols that may be used in this manual:



DANGER

Calls attention to a hazard that **will** result in death or injury.



WARNING

Calls attention to a hazard or unsafe practice that **could** result in death or injury.



CAUTION

Calls attention to a hazard or unsafe practice that could result in personal injury, product damage, or property damage.

NOTICE

Calls attention to a situation that, if not avoided, could result in product or property damage.



Tip

Calls attention to information that can help you use your unit better.

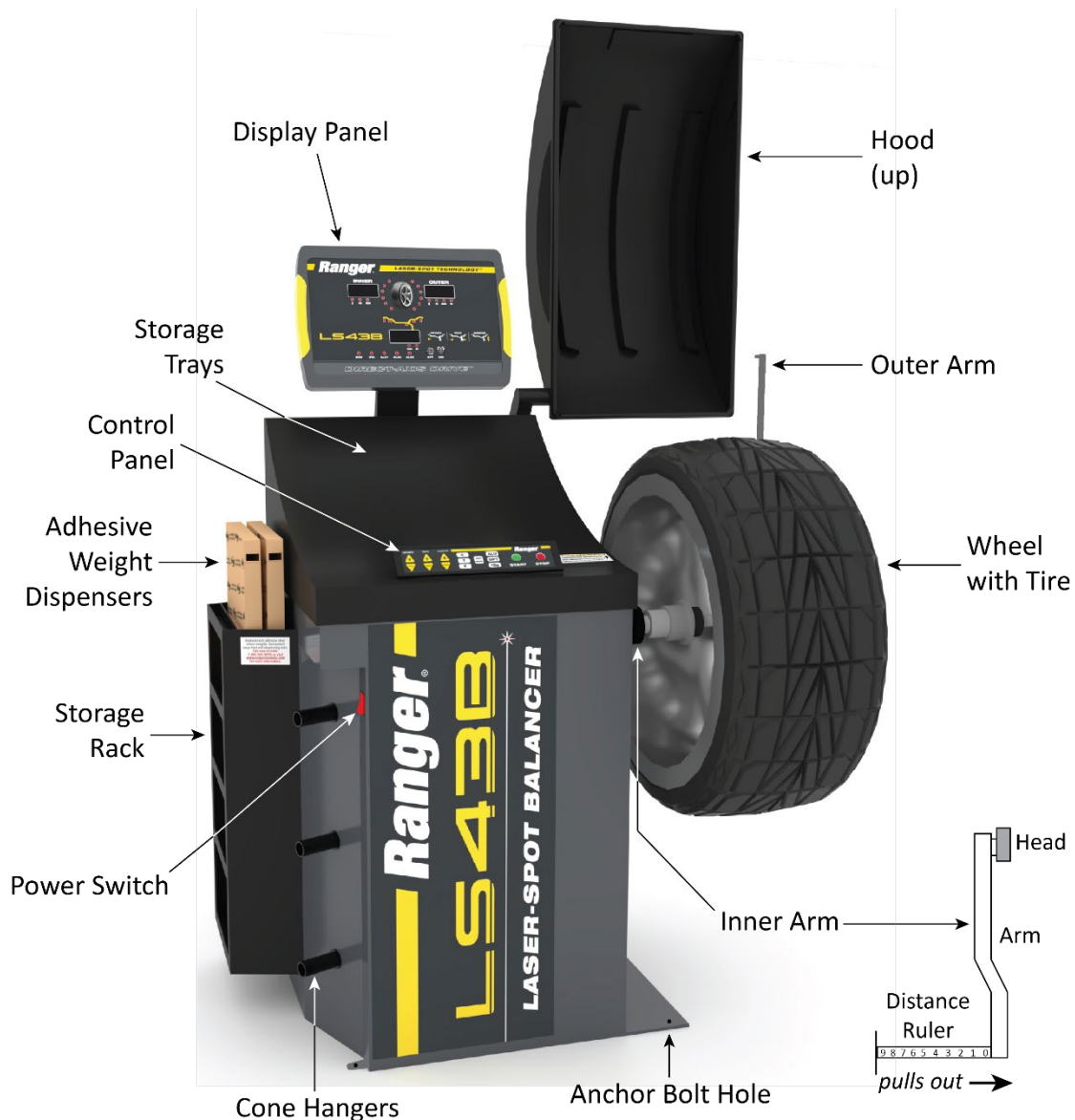
BendPak Ranger assumes **no** liability for damages resulting from:

- Use of the equipment for purposes other than those described in this manual.
- Modifications to the equipment without prior, written permission from BendPak Ranger.
- Modifying, disabling, overriding, or removing safety features.
- Damage to the equipment from external influences.
- Incorrect operation of the equipment.

Components

Balancer components include:

- **Display Panel.** Shows information about what you are doing with the Balancer.
- **Hood.** Covers the Wheel while it spins.
- **Inner Arm / Distance Ruler.** Used to find the Distance between the Balancer and the inner edge of the Wheel being balanced.
- **Outer Arm.** Used to find the Width of the Wheel being balanced.
- **Control Panel.** Used to control the Balancer.
- **Power Switch.** Turns the Balancer on and off.
- **Storage Trays.** Storage for Clip-On Weights and other items you want to have handy.
- **Adhesive Weight Dispensers.** Dispenses your Adhesive Weights.
- **Storage Rack.** Holds items you want to have handy.
- **Cone Hangers.** Hold Mounting Cones when not in use.



Balancer accessories include:

- **Quick-Release Hub Nut.** Holds the Wheel on the Balancer, once the Wheel is mounted.
- **Hex Key Wrench Set.** Used during installation. Hex key wrenches are sometimes called Allen® wrenches.
- **Anchor Bolts.** Anchor the Balancer to the floor at the desired location. Anchoring the Balancer is optional, but strongly recommended.
- **Wheel Weight Tool.** Used to put on and take off Clip-On Weights.
- **Weight Removal Tool.** Used to remove Adhesive Weights.
- **Mounting Spring.** Secures the Wheel when using Rear- and Dual-Cone Mounting.
- **Inner and Outer Gauge Calibration Tool.** Used for calibrating the unit, when necessary.
- **Mounting Cone assortment.** Supports a wide range of Wheel sizes.
- **Calipers.** Used to measure the Width of a Wheel. Done automatically in most cases, so you may not need to use the Calipers too often. Come in a box of their own.
- **Spacer Ring.** Attaches to the Shaft Flange for larger Wheels only.

All of the Balancer accessories are shown and identified in **Parts** (the Balancer accessories are shown on one of the pages towards the end of the Parts section).

Other terms you need to understand include:

- **Wheel.** A circular metal piece that attaches to an axle and rotates. A Tire is an optional part of a Wheel.
- **Tire.** A circular rubber piece that surrounds and attaches to a Wheel; more specifically, to the Rim, which is the part of the Wheel that directly touches the Tire. Most Tires are pneumatically inflated (filled with a gas, such as air, hydrogen, helium, or nitrogen) and made out of rubber (synthetic or natural).
- **Rim.** The part of a Wheel that directly attaches to a Tire; almost always the outer portion of the Wheel. Because modern Wheels are frequently created from a single piece of metal, “Wheel” and “Rim” are sometimes used interchangeably.
- **Hub.** The part of a Wheel that is not the Rim; the central portion of the Wheel.
- **Imbalance.** An unbalanced weight distribution in a Wheel; it can cause uneven rotation (which results in Wheel wobble, uneven Tire wear, and Vehicle vibration). ***To correct an imbalance, a weight must be applied opposite the imbalance.***
- **Planes.** When a Wheel is figuratively divided down the middle into two sections, it creates two planes; called Inner and Outer (see **About Planes** for more information). Balancing is more effective when planes are analyzed for imbalance separately (and addressed separately), called Dynamic Balancing. Inner and Outer planes are ***not*** the same as the three specific locations on the Wheel where Weight can be added, named Inner Plane, Center Plane, and Outer Plane.
- **Clip-On Weights.** Metal weights that are held in place on the Wheel by clipping them to the Inner or Outer Edge. Older Clip-On Weights *made of lead* should ***not*** be used as they are a hazard to the environment; they are also illegal to use in many countries and some states in the U.S.
- **Adhesive Weights.** Weights that are flat and held in place on the Wheel with adhesive; they get placed on the Inner, Outer, or Center Plane. Adhesive Weights come in both black and gray, making them harder to see and thus not interfering with the attractiveness of the Vehicle’s Wheels/Rims.
- **Placement Indicators.** Light up when the best weight location is reached.
- **Balancing modes.** The Balancer supports Dynamic Balancing, Static Balancing, Aluminum Alloy Balancing, and Hidden Balancing Modes.

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- **Dynamic Balancing.** Balancing a steel Wheel where each of the two planes are analyzed separately. If there is an imbalance, the two planes are brought back into balance separately. Dynamic Balancing is a more recent technology than Static Balancing and generally produces a better balance.
 - **Static Balancing.** Balancing a Wheel as a whole; that is, on a single plane only. This is an older method of balancing and is generally not as effective as Dynamic Balancing. Static Balancing is required for motorcycle Wheels and older Wheels that are 4 inches wide or less; also used if only Adhesive Weights can be attached on the Center Plane of the Wheel.
 - **Aluminum Alloy Balancing.** Balancing Wheels made of aluminum alloy. The Weights are placed differently on these Wheels, so you need to know where you want to put the Weights and select the appropriate ALU Mode. ALU Modes generally use Adhesive Weights, which are less visible than Clip-On Weights.
 - **HID (Hidden) Balancing.** Balancing a Wheel where the Outer Plane Weights are placed behind selected spokes so they are hidden, as much as possible.
 - **Optimize Function.** When a Wheel has significant imbalance (30 grams / 1 ounce or more), you can use the optional Optimize Function to lessen the imbalance.

Frequently Asked Questions

Question: What does a Wheel Balancer do?

Answer: They correct imbalance of a Wheel. If you drive a Vehicle with imbalanced Wheels, the Vehicle could experience noise, vibrations, wobbling, reduced or uneven Tire tread wear, and some components could wear out sooner rather than later. Getting a Vehicle's Wheels balanced may even increase its mileage.

Q: Is Wheel Balancing the same as Wheel Alignment?

A: No. When you *balance* a Wheel, you fix a weight distribution problem that can cause Wheel wobble, uneven Tire wear, and Vehicle vibration. This is done by putting Weights on the Wheel in appropriate locations.

When you *align* a Wheel, you are adjusting the angles of the Wheels back to the manufacturer's recommendation, which reduces Tire wear and ensures the Vehicle drives straight and true (that is, the Vehicle does not pull to one side).

Q: Where can I put my Wheel Balancer?

A: What you want is a flat Concrete floor with room around it that is also near where you work on Wheels. Ideally, you want it somewhere off the beaten path, as you want to keep everyone away from the Balancer while it is in use.

Q: Why are there two types of Weights?

A: Clip-On Weights are more visible. Adhesive Weights are lower profile and come in two colors so you can try to color match with the Rim, so they are less visible. Some Vehicle owners with expensive Tires prefer Adhesive Weights because they are less visible.

Q: Why isn't there a plug on the end of the Power Cord?

A: 220 VAC plugs vary by region, so you need to use one that is appropriate for the power outlet where you will be using your Wheel Balancer. You **must use** a licensed Electrician to wire the plug to the power source in accordance with applicable electrical codes.

Specifications

Model	LS43B
Motor	220 VAC, 50/60 Hz, 1 Ph
Working Temperature	-5°C to 50°C / 27°F to 82°F
Balancing Modes	1 dynamic / 1 static / 3 aluminum alloy / 1 hidden
Maximum Tire Diameter	47" / 1,194 mm
Maximum Tire Weight	145 lbs. / 65 kg
Max. Wheel Diameter	10" to 30" / 254 mm to 762 mm
Wheel Width Capacity	2" to 18" / 51 to 457 mm
Balancing Increments	0.25 grams / .01 ounce
Accuracy	+/- 1 gram / .035 oz
Resolution	5 grams / .25 oz
Height, Hood Up	66" / 1,676 mm
Height, Hood Down	53" / 1,346 mm
Width	54" / 1,371 mm
Depth, Hood Up	39" / 990 mm
Depth, Hood Down	40" / 1,016 mm
Power Cord Length	63" / 1,600 mm
Working Temperature	27°F – 82°F / 5°C – 50°C

Installation Checklist

Following are the steps needed to install an LS43B Wheel Balancer. Perform them in the order shown.

- 1. Review the installation Safety Rules.
- 2. Plan for Electrical Work.
- 3. Make sure you have the necessary Tools.
- 4. Select the Installation Site.
- 5. Make sure there is adequate Clearance on all Sides.
- 6. Unpack the Components.
- 7. Identify the Components on the Back of the Unit.
- 8. Install the Display Panel.
- 9. Install the Mount Box.
- 10. Install the Hood.
- 11. Install the Outer Arm.
- 12. Install the Shaft.
- 13. Anchor the Unit.
- 14. Connect to a Power Source. ***Requires a licensed Electrician.***
- 15. Test the Balancer.
- 16. Review the Final Checklist.

Installation

This section describes how to install your Balancer.

Installation Safety Rules

Pay attention at all times during installation. Use appropriate tools and equipment. Stay clear of moving parts. Keep hands and fingers away from pinch points.

Use caution when unpacking the Balancer from its shipping container and setting it up. The Balancer is heavy and the weight is not evenly distributed; dropping or knocking over the unit may cause equipment damage or personal injury.

⚠ WARNING You must wear appropriate protective clothing at all times during setup: leather gloves, non-skid steel-toed work boots, ANSI-approved eye protection, and an industrial back belt. Although rare, an accident could cause significant injuries. The Balancer includes a laser spotter: **Do not look directly into the laser.**

Only allow experienced, trained technicians to install the Balancer. In particular, all electrical work **must** be done by a licensed, certified Electrician.

⚠ CAUTION Certain parts of installing the Balancer are difficult for just one person. BendPak Ranger strongly recommends having two or more persons work together to install the Balancer.

If you have to use an extension cord, make sure its current rating is equal to or greater than that of the equipment being used. Make sure the extension cord cannot be stepped on, run over, or pulled out. Extension cords are also a tripping hazard, so they must be secured.

Plan for Electrical Work

The Balancer does not come with a Plug on the end of the Power Cord; it is your responsibility to supply the Plug and have an Electrician attach it to the Power Cord.

Refer to **Wiring Diagram** for wiring information.

⚠ WARNING All electrical work, such as attaching the Plug to the Power Cord, **must be done by a licensed, certified Electrician** in accordance with all applicable electrical codes at your location.

Tools

You may need some or all of the following tools:

- Hex key wrench set (four hex keys come with the unit: 3, 4, 5, and 8 mm in the Mount Bar box)
- SAE and Metric wrench sets
- Adjustable wrench
- Scissors, utility knife, or other cutting tool
- Hammer

Finding a Location

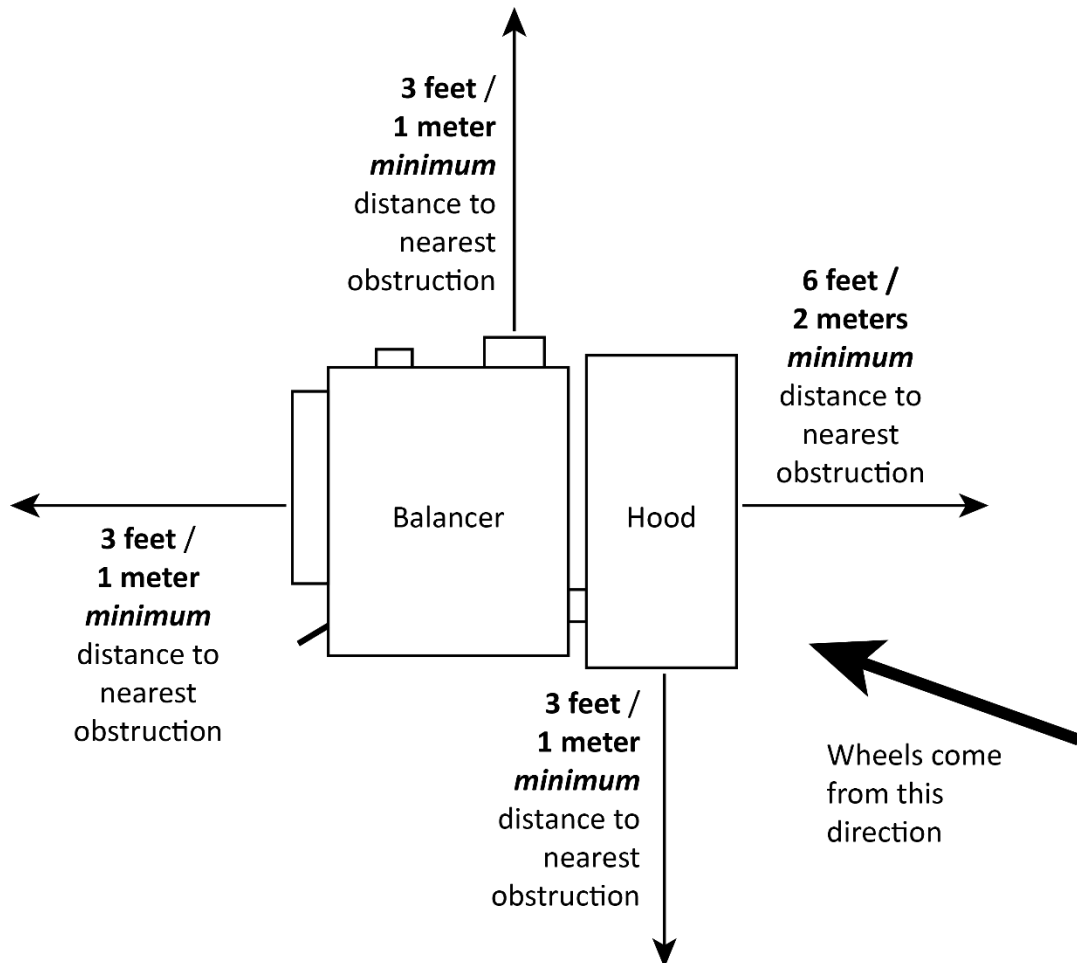
Keep in mind the following when deciding on a location:

- **Power source.** The Balancer needs to be near an appropriate 220 VAC power source.
- **Floor.** The Balancer is best used on a flat, concrete floor. If the floor is unstable or not flat, the Balancer will not work correctly; the readings will not be right.
- **Accessibility.** You need some space to move the Wheels you are going to balance to and from the Balancer.
- **Danger.** When a Wheel is spinning on the Balancer, you need to keep people away from it. Do not set up the Balancer in a well-travelled area.
- **No water.** The Balancer has electronic components. If the Balancer gets wet while turned on, those electronic components will most likely short circuit and have to be replaced.

⚠ WARNING Do not use the Balancer if it is sitting in water. You will almost certainly short circuit the electronic components in the Balancer and you could electrocute yourself.

Clearances

For safety purposes and to allow space to work with Wheels, a certain amount of space around the Balancer is needed.



You also need enough room **above** the Balancer for the Hood to move freely.

Unpacking

Use caution when unpacking the Balancer from its shipping container. You do not want to damage the unit, misplace any of the components that come with it, or hurt anyone.

⚠ CAUTION Make sure to use an appropriate lifting device, such as a forklift or pallet jack, to move the Balancer while it is on its pallet. Make sure only personnel who are experienced with material handling procedures are allowed to move the Balancer. The Balancer is heavy and the weight is not evenly distributed; dropping or knocking over the unit may cause equipment damage or personal injury. Do not lift the Balancer by the Shaft Housing; it is not strong enough for that.

We recommend you unpack the Balancer in the area where you are going to set it up.

To unpack the Balancer:

1. Remove the carton by flipping down the metal tabs at the bottom and pulling off the top.
2. Remove the shipping bolts that are holding the Balancer to the Pallet.
3. Remove the straps and plastic wrap that held the Balancer components during shipping.
4. *Lean the Balancer over and reach underneath it to **pull out the Accessory Box.***
5. Move the Balancer off the Pallet, then move it to the desired location.

Important: Do not lift the Balancer by the Shaft Housing; it is not strong enough to bear the weight of the Balancer.

⚠ CAUTION Ranger recommends having at least two people move the Balancer; it is heavy. If it is dropped or falls, it could cause injuries and/or the Balancer could be damaged.

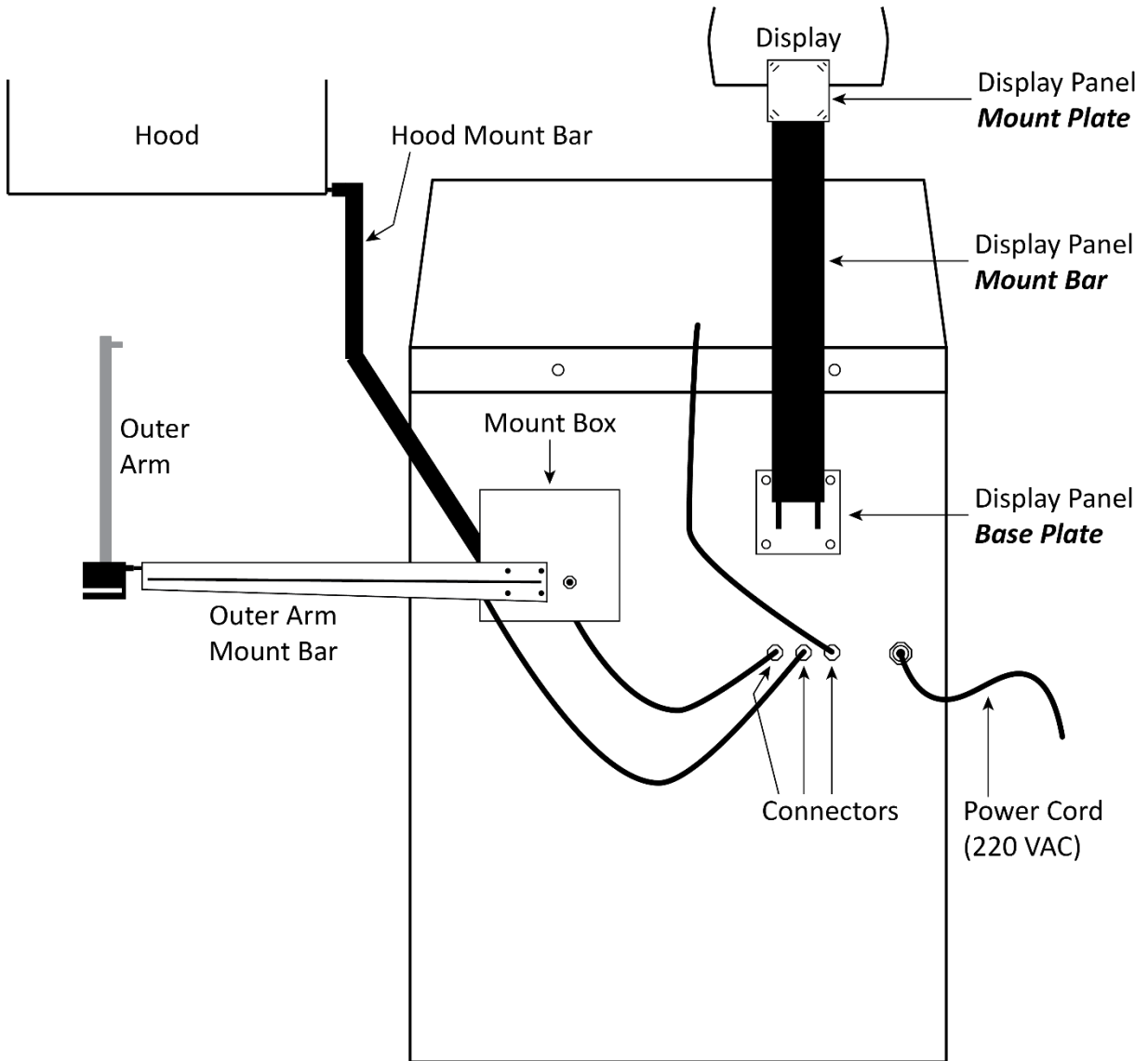
Components on the Back of the Balancer

The Balancer has multiple components on the back that need to be installed.

Balancer components on the back include:

- **Display Panel Mount Bar.** Holds the Display in place. Connects to the back of the Balancer via the Display Panel Base Plate, which is at one end. The Display attaches to the other end.
- **Mount Box.** Connection point for the Hood Mount Bar and the Outer Arm Mount Bar. Connects to the back of the Balancer.
- **Hood Mount Bar.** Holds the Hood. Connects the Hood to the Mount Box.
- **Outer Arm Mount Bar.** Holds the Outer Arm. Connects the Outer Arm to the Mount Box.

The following drawing shows the components on the back of the Balancer.



*Not necessarily to scale. Not all components shown. The three Connectors are **not** the same. Each cable fitting connects to one, and only one, of the three Connectors. Do not force a cable fitting into a Connector; you could damage the Connector and/or the cable fitting.*

*The **Display Panel Mount Bar** has a **Base Plate** at the bottom (where it connects to the back of the Balancer) and a **Mount Plate** at the top (where it connects to the Display).*

Installing the Display Panel

The Display Panel shows information about what is happening during the balancing of a Wheel.

To install the Display Panel:

1. Locate the Display Panel and the Display Panel Mount Bar.
 - The Display Panel Base Plate (located on the bottom of the Display Panel Mount Bar, see drawing on previous page) connects to the back of the Balancer using four hex bolts, four split lock washers, and four standard washers; these come connected to the back of the Balancer.
 - The Display Panel connects to the Display Panel Mount Plate (located on the top of the Display Panel Mount Bar) using four hex bolts that come connected to the back of the Display Panel.
2. Remove the four 6 mm hex bolts, four split lock washers, and four standard washers on the back of the Balancer.
3. Put the Display Panel Base Plate into position, then install the four hex bolts, four split lock washers, and four standard washers to secure it; tighten securely, but do not overtighten.
4. Remove the four 3 mm hex bolts from the center back of the Display Panel.
5. Put the Display Panel into place against the Display Panel Mount Plate, then install the four hex bolts to secure it; tighten securely, but do not overtighten.
6. Run the cable from the back of the Display Panel down to the Connectors, then connect it to the appropriate Connector.

Each of the three Connectors on the back of the Balancer are different, so make sure to connect the Display Panel cable to the appropriate Connector.

The Display Panel Cable Connector has five holes in it.

Installing the Mount Box

The Mount Box holds both the Hood Mount Bar and the Outer Arm Mount Bar. It installs on the back of the Balancer on the left side.

Note: You *must* install the Mount Box *before* you can install the Hood or the Outer Arm.

To install the Mount Box:

1. Locate the Mount Box and the four bolts, four washers, and four split lock washers required to install it.
 - The Mount Box comes in a separate box that also includes bolts and washers in a bag.
 - The Mount Box connects to the back of the Balancer using four hex bolts, four washers, and four split lock washers.
 - The cover of the Mount Box comes already in place. However, it is easier to install the Mount Box if you remove the Cover. To do this, remove the two 3 mm hex bolts on each side of the Cover.
2. Using four bolts, washers, and split lock washers, connect the Mount Box to the back of the Balancer; tighten securely with a wrench.

The Mount Box is now ready to support the Hood Mount Bar and the Outer Arm Mount Bar.

Installing the Hood

The Hood covers the Wheel while it spins during a Balancing.

⚠ CAUTION Keep away from the Hood and the Wheel while the Wheel is spinning. Touching the Wheel while it is spinning could result in injury.

Important: The following procedure assumes the Mount Box is already installed. If the Mount Box is **not** already installed, you must do it now.

To install the Hood:

1. Locate the Hood, the Hood Mount Bar, and the hex bolts and washers required to connect them.
 - The Hood connects to the Hood Mount Bar using two 5 mm hex bolts and washers; these come from the factory in place.
 - The Hood Mount Bar connects to the Mount Box via a large hole in one end of the Hood Mount Bar.
2. Put the hole on the bottom end of the Hood Mount Bar over the silver rod on the left side of the Mount Box, align the holes, then tighten the 4 mm screws.

Make sure to set up the Hood Mount Bar so that the rubber stop piece hits the back of the Balancer when the Hood Mount Bar is in its forward position.
3. Find the large silver washer and 8 mm bolt, put the washer and bolt into place where the Hood Mount Bar slid over the silver rod on the Mount Box, then tighten the 8 mm bolt into the end of the silver rod.
4. Remove the two 5 mm hex bolts and the split lock washers from the top of the Hood Mount Bar.

They come from the factory in place.
5. Put the Hood into position next to the top of the Hood Mount Bar.
6. Replace the two 5 mm hex bolts and split lock washers you just removed; tighten them securely.
7. Route the cable from the bottom of the Mount Box to the Connectors, then connect the end of the cable to the appropriate Connector.

The Hood Cable Connector has two holes in it.

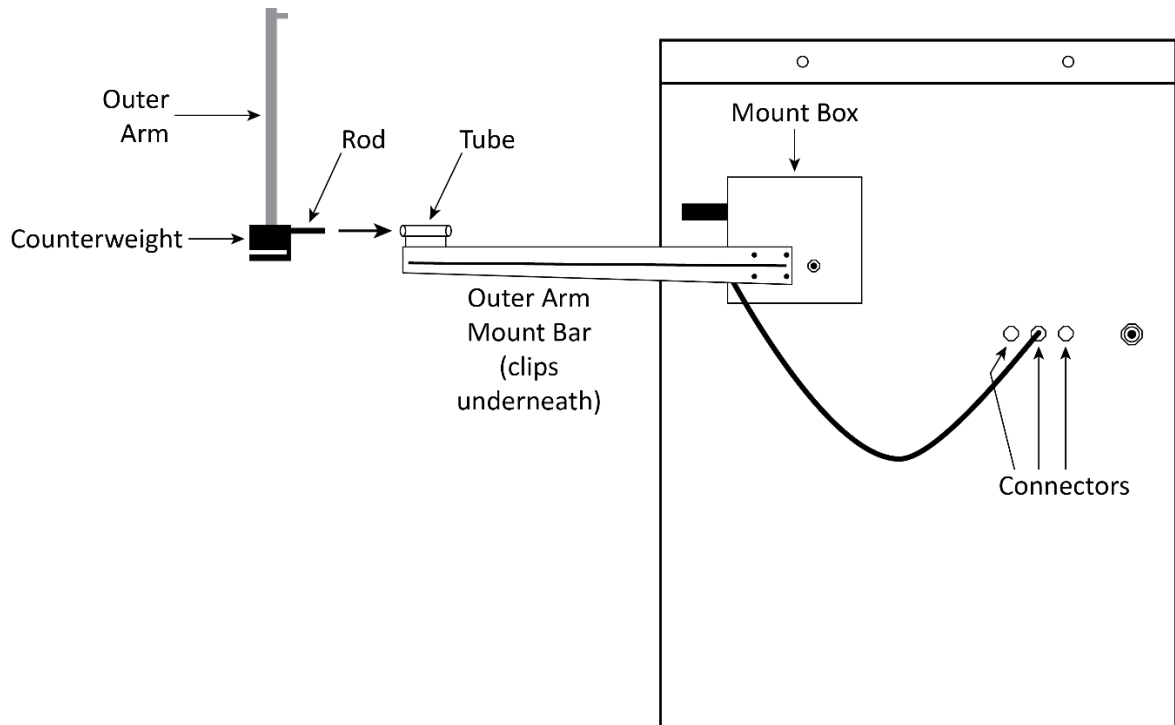
Installing the Outer Arm

The Outer Arm is used to automatically establish the Diameter of the Wheel being balanced.

Important: The following procedure assumes the Mount Box is already installed. If the Mount Box is **not** already installed, you must do it now.

To install the Outer Arm:

1. Locate the Outer Arm Mount Bar, the Outer Arm, and the Hex bolts required to connect them.
 - The Outer Arm Mount Bar connects to the Mount Box using four 5 mm hex bolts, four split lock washers, and four standard washers. These come in place on the Mount Box.
 - The Outer Arm connects to the Outer Arm Mount Bar using one 4 mm hex bolt, one split lock washer, and one large black plastic washer. These come in place on the long piece connected to the Outer Arm counterweight.
2. Remove the four 5 mm hex bolts, four split lock washers, and four standard washers from their location on the Mount Box.
3. Connect the Outer Arm Mount Bar to the Mount Box using the four 5 mm hex bolts, split lock washers, and standard washers you just removed. Tighten securely, but do not overtighten.
4. Remove the 4 mm hex bolt, split lock washer, and large black plastic washer from the end of the Rod connected to the Outer Arm counterweight.



5. Slide the Rod through the Tube on the Outer Arm Mount Bar, then reattach the 4 mm hex bolt, split lock washer, and large black plastic washer you just removed. Tighten securely, but do not overtighten.
6. Run the Cable coming off the Outer Arm through the clips on the underside of the Outer Arm Mount Bar, then connect the fitting on the end of the cable to the appropriate Connector.

The Display Panel Cable Connector has three holes in it.

Installing the Shaft

The Shaft holds the Wheels you are balancing.



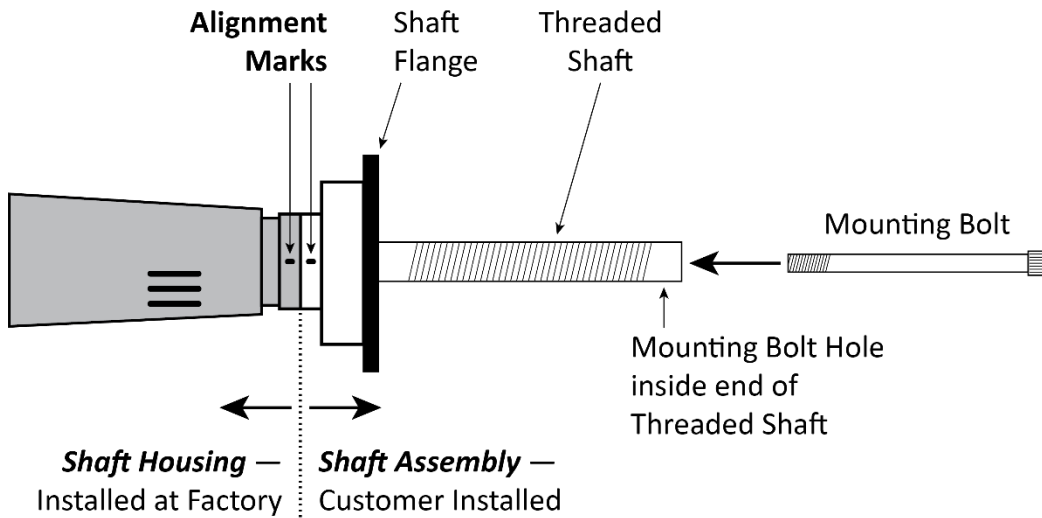
Tip Consider having two people on hand to install the Shaft: one person to hold the Shaft Assembly in place while the second person screws in the Mounting Bolt. Also, consider having some rags nearby; the Shaft comes greased to protect it.

To install the Shaft:

1. Locate the Shaft Assembly and the Mounting Bolt from the parts supplied with the Balancer.
2. Clean the Shaft Assembly by removing the shipping grease and any dirt that has accumulated.
3. Put the Shaft Assembly into place next to the Shaft Housing and hold it there.

Note: It is easier to install the Shaft with two people.

4. Put the Mounting Bolt into the end of the Threaded Shaft and *begin* tightening it.
5. *Before fully tightening* the Mounting Bolt, make sure the Alignment Marks are aligned (see drawing below).



Not necessarily to scale. Not all components shown.

6. Tighten the Mounting Bolt into place.

Anchoring the Balancer

The Balancer has three holes for Anchor Bolts, which hold the Balancer in place while you use it.

Important: You are **required** to bolt your Balancer into place, as movement during a Wheel Balance can result in inaccurate readings.

To anchor the Balancer:

1. Move the Balancer to the desired location.

Remember that you need to allow some space around the Balancer. Refer to [Finding a Location](#) for additional information.

2. Using the holes in the base as guides, drill the holes for the M10 x 59 mm Anchor Bolts.



Go in straight; do not let the drill wobble. Use a carbide bit (conforming to ANSI B212.15).

The diameter of the drill bit must be the same as the diameter of the Anchor Bolt. So if you are using an M10 diameter Anchor Bolt, for example, use an M10 diameter drill bit.

3. Vacuum each hole clean.

BendPak recommends using a vacuum to get the hole very clean.

Do **not** ream the hole. Do **not** make the hole any wider than the drill bit made it.

4. Make sure the Washer and Nut are in place, then insert the Anchor Bolt into the hole.

The Expansion Sleeve of the Anchor Bolt may prevent the Anchor Bolt from passing through the hole in the Base Plate; this is normal. Use a hammer or mallet to get the Expansion Sleeve through the Base Plate and into the hole.



Even using a hammer or mallet, the Anchor Bolt should only go into the hole part of the way; this is normal. If the Anchor Bolt goes all the way in with little or no resistance, the hole is too wide.

Once past the hole in the Base Plate, the Anchor Bolt eventually stops going down into the hole as the Expansion Sleeve contacts the sides of the hole; this is normal.

-
5. Hammer or mallet the Anchor Bolt the rest of the way down into the hole.
Stop when the Washer is snug against the Base Plate.
 6. Wrench each Nut **clockwise** to the recommended torque, 60 – 70 lbf-ft / 81 – 95 N-m.

Important: Do **not** use an impact wrench to torque the Anchor Bolts.

Wrenching the Nut forces the Wedge up, forcing out the Expansion Sleeve and pressing it tightly against the Concrete.

Connect to a Power Source

The Balancer is configured to use a 220 VAC, 50/60 Hz power source. The Power Cord must be connected to a 15 amp breaker.

A Power Cord with *no Plug* is provided with the unit. You must have a licensed, certified Electrician wire the open end of the Power Cord to an appropriate 220 VAC Plug.

Refer to **Wiring Diagram** for a wiring diagram.

⚠ WARNING All electrical work **must be done by a licensed, certified Electrician**.

Additional electrical information:

- Operation with no Ground can damage electronics and could create a shock hazard.
- Damage caused by improper electrical installation voids the warranty.
- Most electrical codes require “hard-wiring” when the machine is bolted to the floor. Consult a licensed Electrician regarding the applicable codes for your location.

⚠ WARNING **For generator users and or areas with frequent brown-out conditions.** Premature electrical component and Motor failure due to excessive high or low voltage is **not** covered under warranty. Verify that the Generator can provide the required current and voltage. While voltage variations are common ($\pm 5\%$) both high and low voltage episodes in excess of 15% to 20% can cause Electric Motor overheating and premature Motor failure.

Low voltage will cause the Motor to draw more electrical current to deliver the same amount of force to the Spindle. Excessive current overheats the Motor Windings, eventually burning through the insulation and resulting in complete Motor failure.

High voltage episodes can cause premature failure of electrical and electronic components due to overheating.

Test the Balancer

To test the Balancer to see if it is ready for normal operation:

1. Turn the Balancer On/Off switch to On.

The Display Panel shows **Bal** on the Inner Window and **21** on the Outer Window, followed by default Wheel dimensions.

(The **21** is the software version; it may be different on your system.)

2. Mount a standard steel Wheel of a size you most often balance.

Refer to **Mounting a Wheel** for specific mounting instructions.

-
3. Move the Inner Arm to the Inner Edge of the Wheel; let go when you hear the Balancer beep.
 4. Move the Outer Arm to the outer Edge of the Wheel; let go when you hear the Balancer beep.
 5. Lower the Hood.

The Wheel starts to spin clockwise when the Hood is lowered.

If the Wheel does not spin or spins counterclockwise instead of clockwise, turn the Balancer off and contact your dealer, visit www.bendpak.com/support/, or call **(805) 933-9970**.

6. Put the Outer Arm against the Outer Edge and wait for the beep.

If there is no beep, refer to **Troubleshooting** for more information.

Final Checklist Before Operation

Make sure these things have been done **before** using your Balancer:

- Review the Installation Checklist to make sure all steps have been performed.
- Make sure the Balancer is getting power from the power source.
- Check to see that all Anchor Bolts are in position and tightened.
- Leave the Manual with the owner/operator.

Operation

This section describes how to use your LS43B Wheel Balancer.

About the LS43B Wheel Balancer


The LS43B Wheel Balancer is a computer-controlled Wheel Balancer that provides fast, accurate Wheel balancing for a wide variety of Wheels. It optimizes Wheel weight placement using Laser-Spot™ technology, which indicates weight placements on the Wheel using a red laser line.

 **WARNING** Do not look directly into the Laser. Doing so may damage your eyes.

Usage Precautions

Keep the following in mind while you use your Balancer:

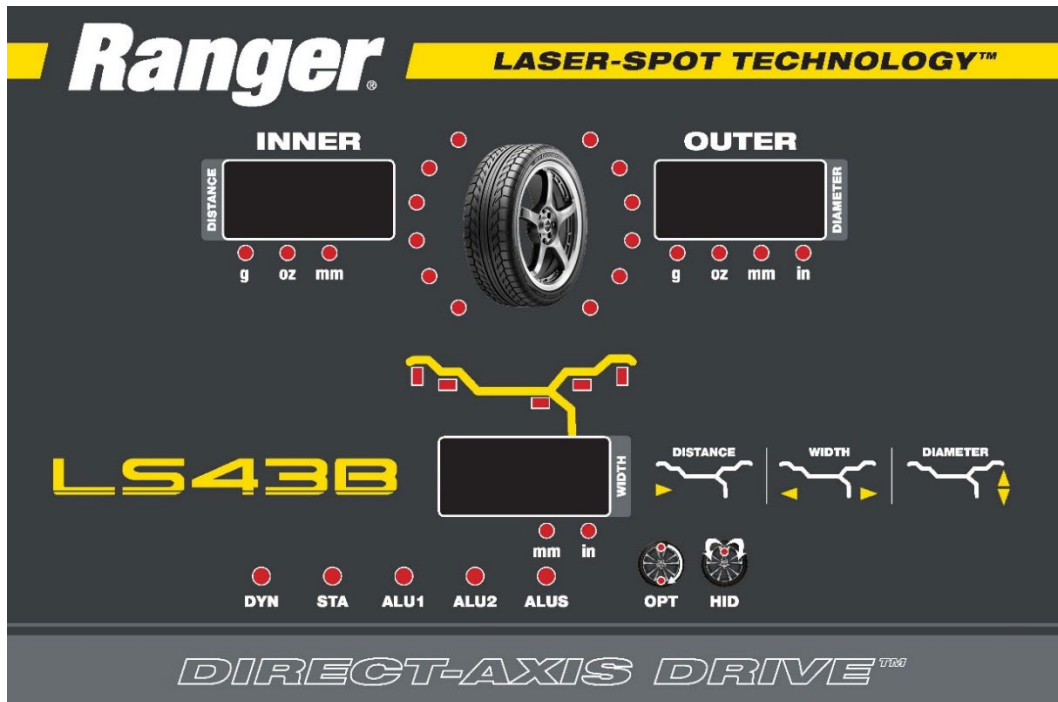
- Make a visual inspection of the unit **before each use**. Do not operate your Balancer if you find any issues. Instead, take the unit out of service, then contact your dealer, visit www.bendpak.com/support/, or call **(805) 933-9970**.
- Keep the work area clean and well lit. Dirty, cluttered, and dark work areas increase the chances of an accident happening.
- Do not remove the Storage Trays unless instructed to do so by Ranger Support. There are no user serviceable parts underneath.
- When using the product, you **must** wear appropriate work clothing: leather gloves, non-skid steel-toed work boots, and an industrial back belt. Keep hair, jewelry, and clothing away from the unit.
- When using the product, **the operator must wear ANSI-approved eye protection at all times**: safety glasses, a face shield, or protective goggles.

 **WARNING** Always wear ANSI-approved eye protection. Although rare, an accident could cause significant injuries to your eyes. **Do not look directly into the laser. Doing so may damage your eyes.**

- Only authorized personnel may use the unit. Keep children and untrained personnel away.
- Do not use the unit in a wet environment or expose it to rain or excess moisture.
- If an extension cord is necessary, a cord with a current rating equal to or more than that of the equipment must 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.
- Do not use the unit in the vicinity of open containers of flammable liquids.
- Clean the unit according to the instructions in **Maintenance**.
- Read the entire *Installation and Operation Manual* before using the unit.

Viewing Information on the Display Panel

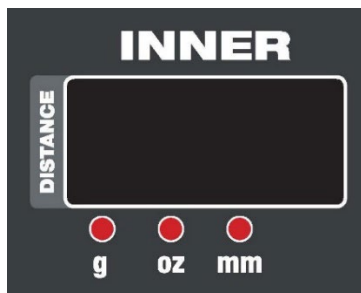
The Display Panel shows you information about the Wheel you are balancing.



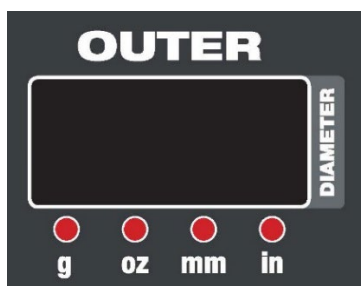
Note: There are no buttons to push on the Display Panel; it only displays information.

The parts of the Display Panel include:

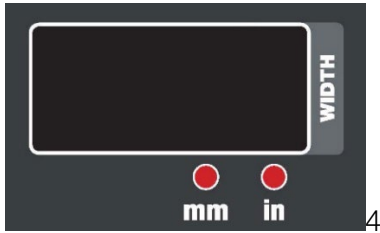
- **Inner / Distance Window.** During the Measurements phase—prior to spinning the Wheel—this Window shows the distance from the edge of the Balancer to the inner edge of the Wheel (measured by the Inner Arm). During the Weights phase—after spinning the Wheel—it shows the weight to be added to the inner plane of the Wheel.



- **Outer / Diameter Window.** During the Measurements phase, this Window shows the Diameter of the Wheel (measured by the Outer Arm). During the Weights phase, it shows the weight to be added to the outer plane of the Wheel.



- **Width Window.** During the Measurements phase, this Window shows the Width of the Wheel (determined automatically from the measurements taken by the Inner and Outer Arms).



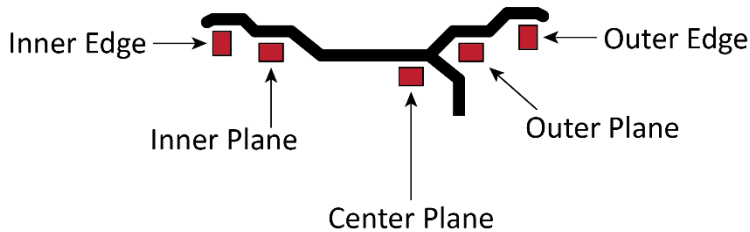
- **Indicators next to the Wheel.** When Weight needs to be added to a Wheel, you turn the Wheel and watch the indicators on the appropriate side of the Wheel. When all of the indicators are lit, the Wheel will lock automatically and the laser will show the exact spot to put Weight.



- **Weight Location indicators.** The appropriate weight location indicators turn on (red) to indicate where the Balancer thinks you are going to put the weights to balance the Wheel, based on Balancing Mode.

If the wrong weight indicators turn on, stop the balance and start again. If you put the weights on the Wheel in a location other than what the Balancer expects, the Wheel will not balance correctly.

The following drawing shows available weight locations.



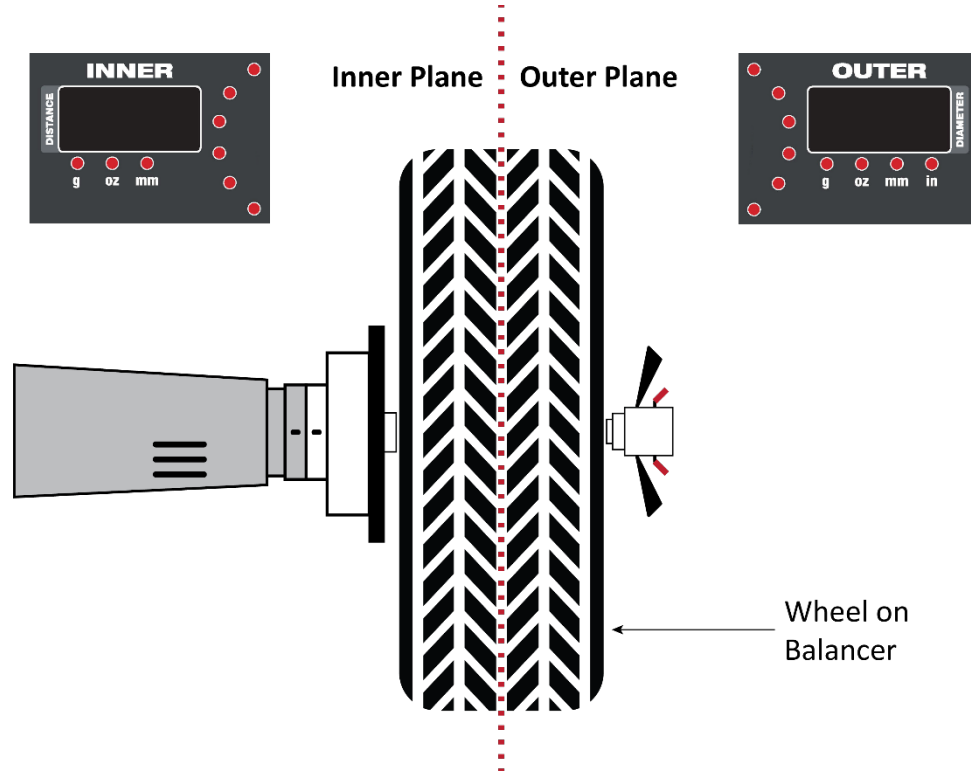
- **Balancing Mode indicators.** DYN, STA, ALU1, ALU2, ALUS, OPT, and HID. When a Balancing Mode is selected, the appropriate indicator goes on.

Note: OPT is the Optimize Function, which is not a Balancing Mode. It is an optional procedure to lessen the imbalance in a Wheel that is more than 30 grams / 1 ounce out of balance.

About Planes

If you were to split a Wheel down the center (as shown below), it would be split into two “Planes”, an Inner plane and an Outer plane.

Balancing a Wheel on **both** planes at the same time is the most effective method. Of the five Balancing Modes supported by the LS43B, four of them balance on two locations at the same time.



The fifth, Static (STA) Mode, is included for older, thin, automobile Wheels and motorcycle Wheels, which are not big enough to be balanced on both planes at the same time.

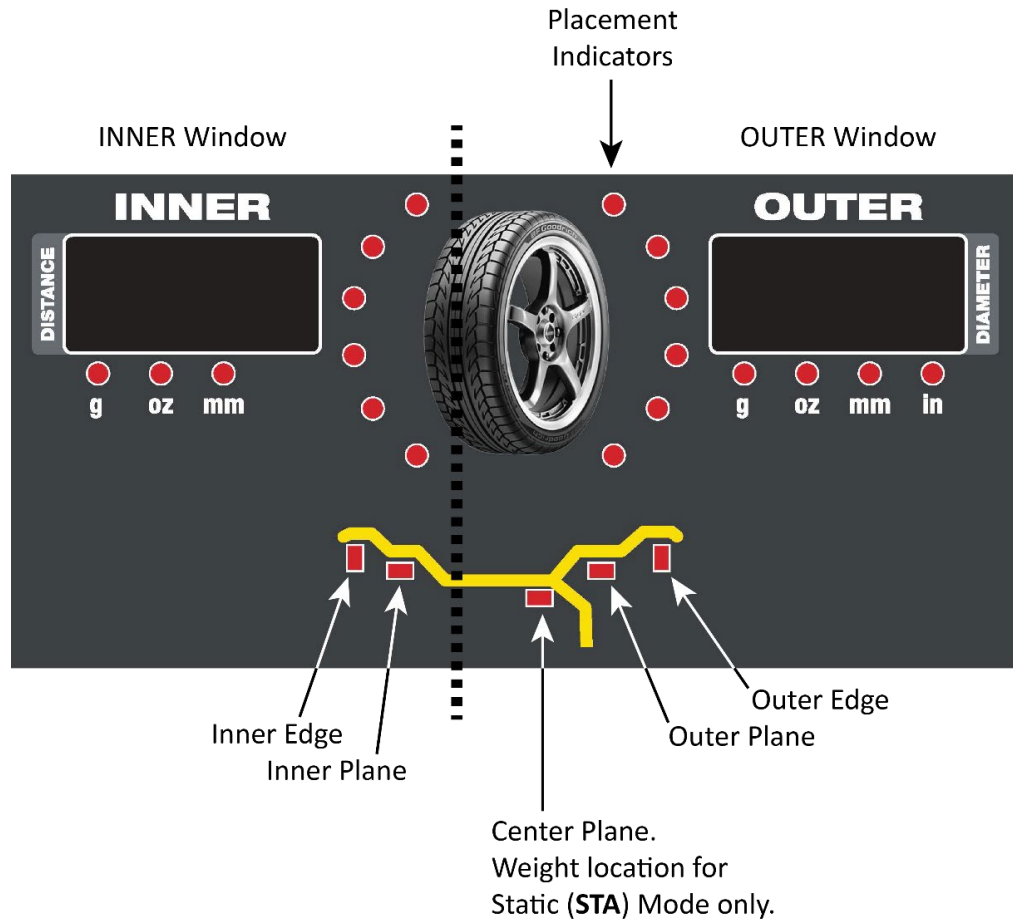
Because balancing a Wheel on both planes is so important for using the LS43B, the Display Panel shows a two-plane view of the Wheel being balanced.

The Inner “Plane” is on the left (based on the main placement method for Wheels on the Balancer, where the visible Rim on the outside) and the Outer “Plane” is on the right.

The INNER Window shows how much weight to place on either the Inner Edge or the Inner Plane weight locations. Note that the Inner Plane weight location is not the same as the Inner “Plane”, although it is on the Inner “Plane” side of the Display Panel.

The OUTER Window shows how much weight to place on either the Outer Edge or the Outer Plane weight locations.

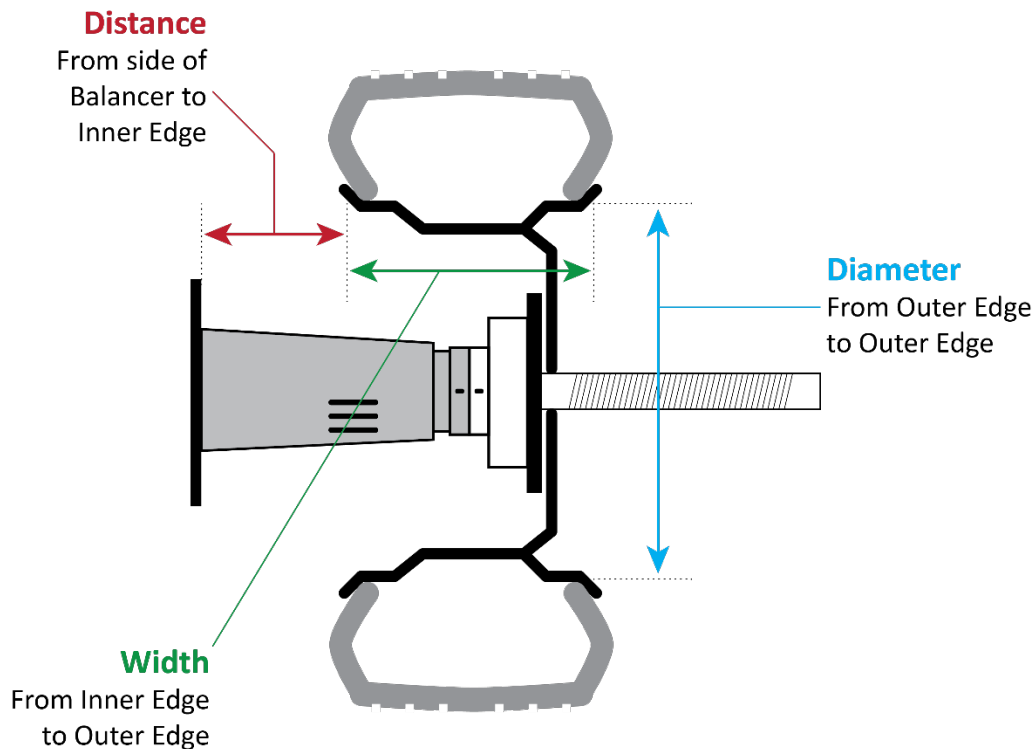
The Placement Indicators, six per Plane, all light up when the best weight location is reached.



About Measurements

There are three measurements of a Wheel that are important to understand for correct balancing. The LS43B finds these measurements automatically when you use the Inner Arm and the Outer Arm. The three measurements are:

- **Distance.** The distance from the side of the Balancer to the Inner Edge of the Wheel. Automatically measured by the Inner Arm.
- **Diameter.** The distance from Outer Edge to Outer Edge. Automatically measured by the Outer Arm.
- **Width.** The distance from the Inner Edge of the Wheel to the Outer Edge. Determined automatically from the Distance and Diameter values.



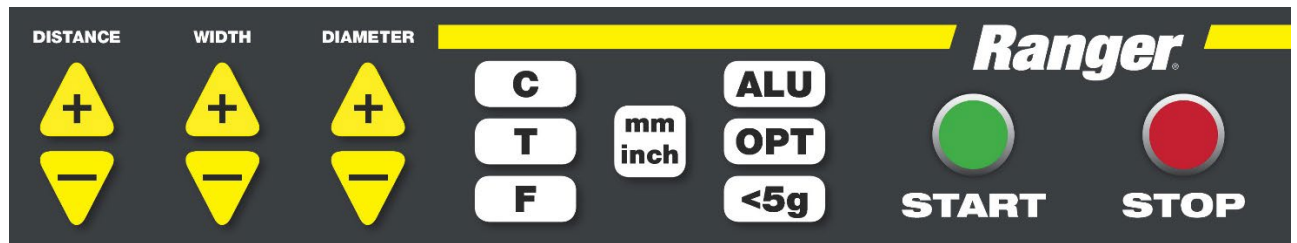
Inputting Measurement Data Manually

The LS43B determines measurement data automatically when you use the Inner Arm and the Outer Arm, but you can enter measurement data manually if you like:

- **Distance.** Pull out the Inner Arm to the desired location, note the value on the Distance Ruler, and enter that value using the **Distance +** and **-** buttons on the Control Panel.
- **Diameter.** Read the value from the tire sidewall or measure with the Calipers, then enter that value using the **Diameter +** and **-** buttons on the Control Panel.
- **Width.** Measure with the Calipers, then enter that value using the **Width +** and **-** buttons on the Control Panel.

Controlling the Balancer using the Control Panel

The Control Panel is used to control aspects of the Balancer during both the Measurements phase and the Weights phase.



- **Distance, Width, Diameter + / – buttons.** Used to change the Distance, Width, and Diameter settings during the Measurements phase of the balancing session (before you spin the Wheel). Only needed if you want to enter these values manually; otherwise, use the Inner Arm and Outer Arm to have the LS43B determine these values automatically.
- **C button.** Used for calibrating the Balancer.

Important: *The Balancer comes from the factory already calibrated.* There is no reason to calibrate it again when you first receive it. You only need to calibrate it if you are seeing multiple bad balances.

Also used with the **Stop button** to toggle the Wheel starting to spin automatically when you lower the Hood. Press **Stop-C** to toggle off, press **Stop-C** again to toggle back on.

- **T button.** Performs a test of the Balancer software.
- **F button.** Switches between Dynamic and Static Modes.
- **mm / inch button.** Toggles between millimeters (mm) and inches for those windows that show these measurements.

To switch between grams (g) and ounces (oz) when a window shows appropriate values, press and hold **Stop** and then press the **Distance +** button.

- **ALU button.** Press to switch between Dynamic Mode and the three ALU Modes.
- **OPT button.** Used with the Optimize Function.
- **<5g button.** Press and hold to see *exact* unbalance values. Otherwise, the Balancer rounds off.
- **Start button.** Starts the Wheel spinning, which can also be done by lowering the Hood.
- **Stop button.** Stops the Wheel from spinning and releases the automatic brake when you have added weight to the Inner Plane and want to move on to the Outer Plane.

Also used with the **C button** to toggle the Wheel starting to spin automatically when you lower the Hood. Press **Stop-C** to toggle off, press **Stop-C** again to toggle back on.

Mounting a Wheel

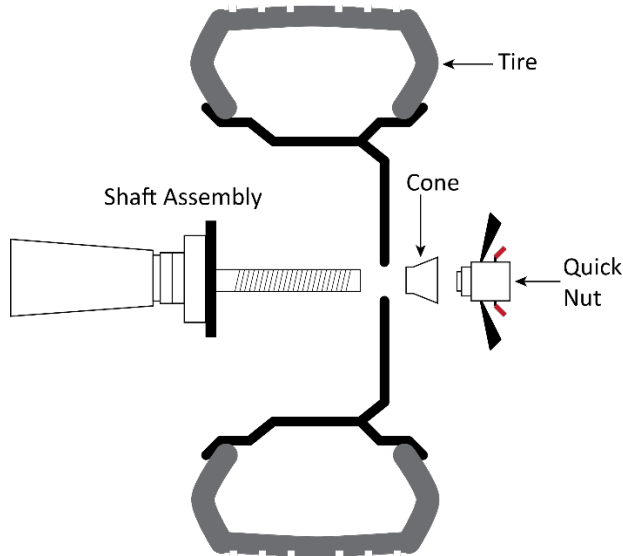
When you want to balance a Wheel, the first step is to mount it on the Shaft.

Important: All Wheels should be mounted so that the inside (the side of the Wheel that goes closest to the Vehicle) goes on the Shaft first.

There are three ways to mount a Wheel onto the Shaft:

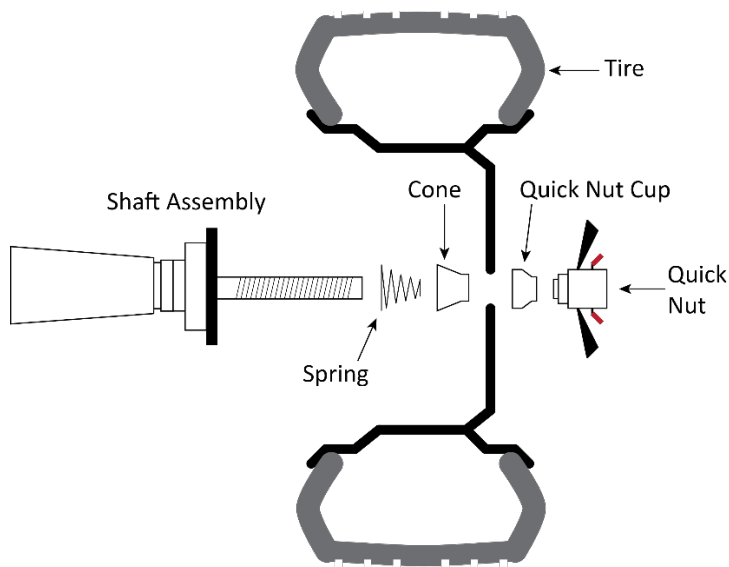
- **Front-Cone Mounting.** The preferred method, as it generally produces the most accurate balancing results.

An appropriately sized Mounting Cone goes on after the Wheel, then the Quick Nut.



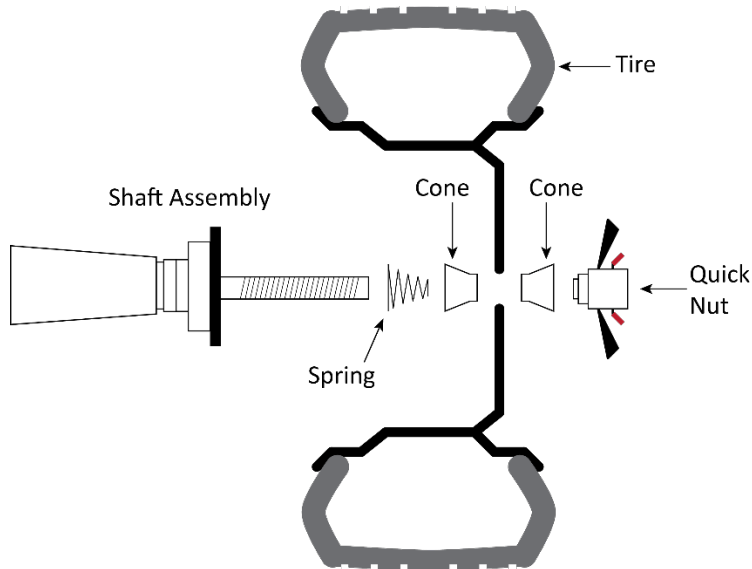
- **Rear-Cone Mounting.** Use this method if the Wheel you are balancing cannot be mounted with Front-Cone Mounting.

The Spring goes on first, then an appropriately sized Cone, the Wheel, the Quick Nut Cap, and finally the Quick Nut.



- **Dual-Cone Mounting.** Generally used only for some aftermarket or OEM performance Wheels that have a center hole that is deep enough to allow the use of two cones on the Shaft.

The Spring goes on first, then an appropriately sized Cone, the Wheel, a second appropriately sized Cone, and finally the Quick Nut.



To mount a Wheel:

1. Make sure you are wearing ANSI-approved eye protection: safety glasses, face shield, or goggles.
2. Determine which mounting method you want to use.
3. Move the Wheel you are going to mount next to the Shaft.
4. Select the Mounting Cone that best fits the center hole of the Wheel.
5. If Rear-Cone or Dual-Cone Mounting, put the Spring and the desired Cone onto the Shaft.
6. Lift the Wheel and put it onto the Shaft, then slide it back towards the Shaft Flange.

You may need to lift the Wheel slightly when positioning a Cone in the center hole of the Wheel.

7. While holding the Wheel and other hardware in place, slide the Quick Nut over the Shaft while holding the Quick-Release Levers next to the Wings.

Holding the Quick-Release Levers next to the Wings lets you quickly slide the Quick Nut into position near the Wheel.

8. Release the Quick-Release Levers.
9. Turn the Wings to fully tighten the Quick Nut, and thus the Wheel, in place.

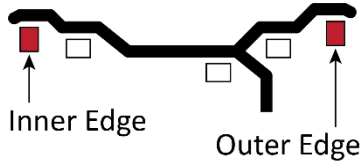
You may want to spin the Wheel some as you tighten the Quick Nut; this can help you get a strong, secure fit.

Important: Do not hammer or hit the Quick Nut to tighten it. You will damage the Quick Nut, which is not covered under the Warranty.

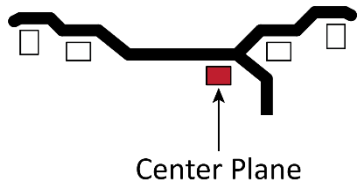
Balancing Modes

Balancing Modes are based on the locations where the weight gets put on if the Wheel is out of balance:

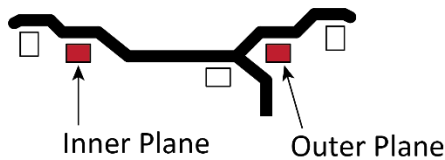
- **Dynamic (DYN)**. The most common Balancing Mode; used with steel rims. If the Wheel is out of balance, weights go on the Inner Edge and the Outer Edge.



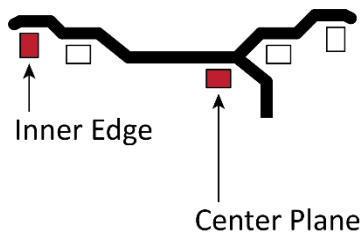
- **Static (STA)**. Used for older Wheels under 4 inches wide and motorcycle Wheels. If the Wheel is out of balance, weight goes on the Center Plane only.



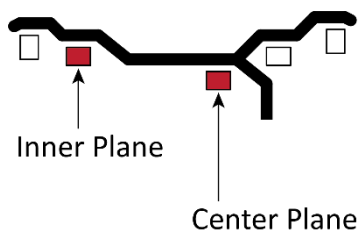
- **Aluminum 1 (ALU1)**. Used on Aluminum Alloy Wheels when you want the weights to go on the Inner Plane and the Outer Plane.



- **Aluminum 2 (ALU2)**. Used on Aluminum Alloy Wheels when you want the weights to go on the Inner Edge and the Center Plane.



- **Aluminum Special (ALUS)**. Used on Aluminum Alloy Wheels where the weights need to go on the Inner Plane and the Center Plane.



OPT (Optimize) Function

Not a Balancing Mode. The Optimize Function is an optional procedure to lessen the imbalance in a Wheel that is more than 30 grams / 1 ounce out of balance.

For more information, refer to [Using the Optimize Function](#).

HID (Hidden)

Applies Adhesive Weights on the Center Plane in multiple locations mounted behind spokes.

This prevents them from being seen, as much as possible.

Refer to [Hidden Weight Balancing](#) for specific instructions for using this Balancing Mode.

Before You Balance a Wheel

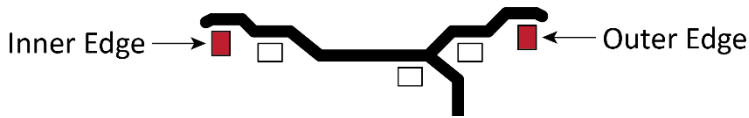
Before you balance a Wheel, you should:

- **Remove all existing Weights from the Wheel.** If the Wheel already has Weights on it, either Clip-On or Adhesive, take them off. They will throw off the new balancing process.
- **Thoroughly clean the Wheel.** Mud or dirt on the Wheel will impact the new balancing process. Also, if you end up putting on Adhesive Weights, they get placed onto a clean area (so they are less likely to fall off).
- **Put on appropriate eye protection.** Do not use the unit unless you are wearing ANSI-approved eye protection: safety glasses, a face shield, or protective goggles.
- **Make sure the area is clear.** Only the operator should be near (within 30 feet) of the Wheel Balancer while the Wheel is turning.

Dynamic Balancing

Dynamic Balancing balances a Wheel on both the Inner and Outer Edges.

If the Wheel is out of balance, the Clip-On Weight can go on the Inner Edge, the Outer Edge, or both.



To Balance a Wheel using Dynamic Mode:

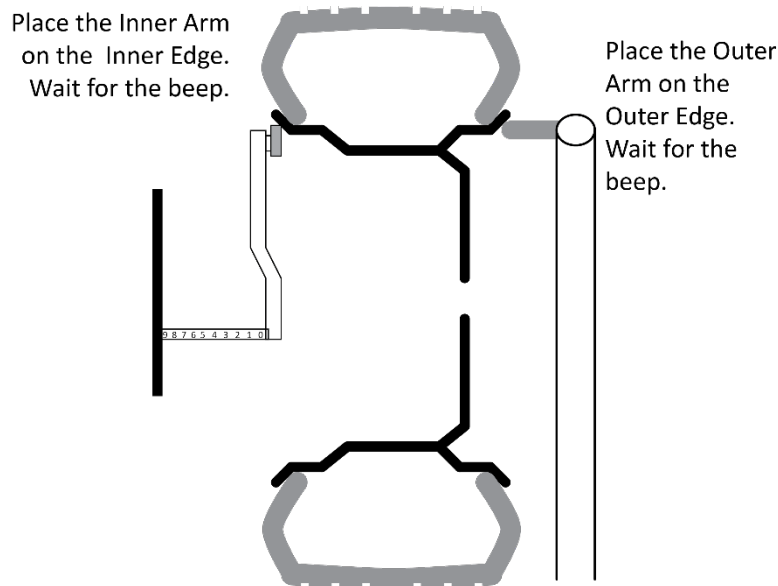
1. Make sure you are wearing ANSI-approved eye protection: safety glasses, face shield, or goggles.
2. Visually inspect the Balancer to make sure everything is in place. The Hood should be **up**.
3. Make sure the Wheel you want to balance is both clean and free of any weights that may have been put on previously, then mount it.

Refer to **Mounting a Wheel** for mounting instructions, if needed.

4. Turn the Balancer Off and then back On, to reset it.

On power up, **bal 21** will appear in the Inner and Outer Windows, followed by default Wheel dimensions.

5. Pull out the Inner Arm and place it against the Inner Edge of the Wheel (where the inner weight will go) and hold it there; **wait for the Balancer to beep**. See figure below.



6. When the Balancer beeps, return the Inner Arm to its rest position.

The Inner Window shows the Distance from the edge of the Balancer to the Wheel's Inner Edge.

The Inner Window always shows distance in millimeters (mm).

7. Place the tip of the Outer Arm on the Outer Edge of the Wheel (where the outer weight will go) and hold it there; **wait for the Balancer to beep**.
8. When the Balancer beeps, return the Outer Arm to its rest position.

The Outer Window shows the Diameter of the Wheel.

The Outer Window shows diameter in millimeters (mm) or inches (in). Press the **mm** **inch** button on the Control Panel to switch between units.



If you check the Mode indicators, you will see that **DYN** (Dynamic Mode) is lit.

A value also appears in the Width Window; it is determined automatically.

9. Verify then adjust the Wheel Distance, Width and Diameter data using the **+** and **-** buttons on the control panel marked Distance, Width and Diameter if required.

The Balancer now has enough information to perform a Dynamic Balance of the Wheel.

10. Lower the Hood; the Wheel spins briefly.

If you want to turn **off** the Automatic Hood feature, press and hold STOP, then press C (while continuing to hold STOP). You will then have to press START to spin the Hood.

To turn the Automatic Hood feature back on, repeat the same process.

11. When the Wheel stops, look at the values that appear in the Inner and Outer Windows on the Display Panel; these amounts show you how unbalanced each plane is.

The measurement system, grams or ounces (the default), is lit under the Inner and Outer Windows.

To switch between grams and ounces, press and hold **Stop**, then press **Distance +**.

The weight value that appears in the Inner Window is to be added to the Inner Edge of the Wheel.

The weight value that appears in the Outer Window is to be added to the Outer Edge of the Wheel.

If either value is over 1 oz / 30 grams, **Opt** appears in the Width Window, meaning that the Optimize Function can be used. Refer to [Using the Optimize Function](#) for more information.

12. Lift the Hood.

13. Turn the Wheel slowly to find the best location to put the weight on the Inner Edge (if the Inner Window shows **00**, do not add any weight to the Inner Edge).

The Inner Plane indicators light up or go out as you move the Wheel to find the best location to put the weight. See figure below.



↑
Indicators for
Inner Plane

↑
Indicators for
Outer Plane

14. When the Wheel is in the right location, the Balancer automatically locks the Wheel in position and a laser beam appears at the spot on the Wheel where the Balancer wants you to add the weight.

15. Add the correct amount of weight centered on the laser location.

16. Press **Stop** to release the Wheel from the automatic lock.

17. Turn the Wheel slowly again to find the best location for weight on the Outer Edge (again, assuming it needs weight; if the Outer Window shows **00**, do not add weight to the Outer Edge).
18. Add the correct amount of weight when the Wheel locks and the laser beam appears.
19. Lower the Hood to spin the Wheel again.

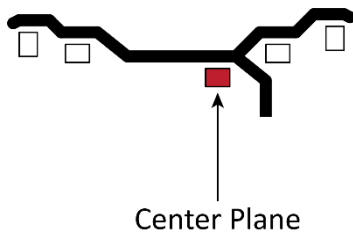
The Wheel is balanced when both the Inner and Outer Windows show **00**.

Static Balancing

Static Balancing is for older Wheels under 4 inches wide and motorcycle Wheels.

Note: The Optimize Function is **not** available for Static Mode.

If the Wheel is out of balance, weight goes on the Center Plane when using Static Mode.



To Balance a Wheel using Static Mode:

1. Make sure you are wearing ANSI-approved eye protection: safety glasses, face shield, or goggles.
2. Visually inspect the Balancer to make sure everything is in place. The Hood should be **up**.
3. Mount the Wheel you want to balance.

Refer to **Mounting a Wheel** for mounting instructions, if needed.

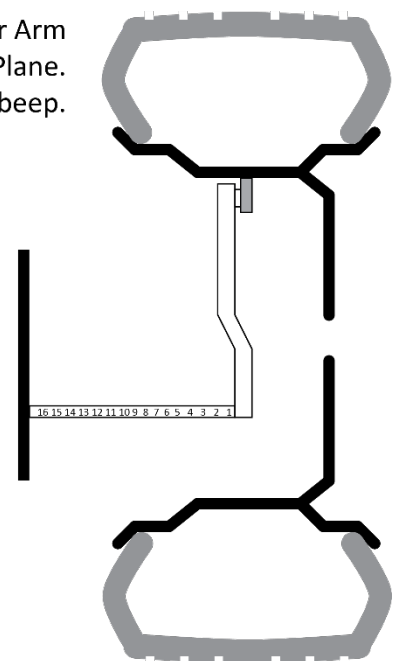
4. Turn the Balancer Off and then back On, to reset it.
5. On the Control Panel, press the **F** button until the **STA** (Static) indicator is lit.
6. Pull out the Inner Arm and place it on the Center Plane and hold it there; **wait for the Balancer to beep**. See the figure to the right.
7. When the Balancer beeps, return the Inner Arm to its rest position.

Numerical values appear in the Inner and Outer Windows. If they do not, it means the measurement was not noted correctly by the Balancer and you will **not** be able to correctly balance the Wheel. Start over at Step 4.

8. Verify then adjust the Wheel Distance, Width and Diameter data using the **+** and **-** buttons on the control panel marked Distance, Width and Diameter as required.

The Balancer now has enough information to perform a Dynamic Balance of the Wheel.

Place the Inner Arm on the Center Plane. Wait for the beep.



9. Lower the Hood; the Wheel spins briefly.

10. Raise the Hood when the Wheel stops.

The Inner Window shows **St** and the Center Plane indicator is lit.

The Outer Window shows the weight you need to add to the Center Plane, if weight needs to be added.

11. Turn the Wheel slowly to find the best location to put the weight.

12. When the Wheel is in the right location, it automatically locks and a laser beam appears at the spot where the Balancer wants you to add the weight.

13. Add the correct amount of weight centered on the laser location.

14. Lower the Hood to spin the Wheel again.

The Outer Window shows **00** When the Wheel is balanced.

Aluminum Alloy Balancing

The following procedure describes the three Aluminum Alloy (ALU) Modes available.

Important: ALU Modes are for balancing Wheels made of aluminum alloy. The weights can be placed in various locations on these Wheels. *Determine where the weights are to be applied, and then select the appropriate ALU Mode.*

Adhesive Weights are generally used when you are using ALU Modes as they are less visible than Clip-On Weights.

To balance a Wheel using an ALU Mode:

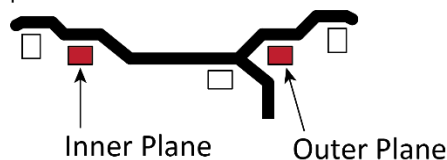
1. Make sure you are wearing ANSI-approved eye protection: safety glasses, face shield, or goggles.
2. Visually inspect the Balancer to make sure everything is in place. The Hood should be **up**.
3. Mount the Wheel you want to balance.

Refer to **Mounting a Wheel** for mounting instructions, if needed.

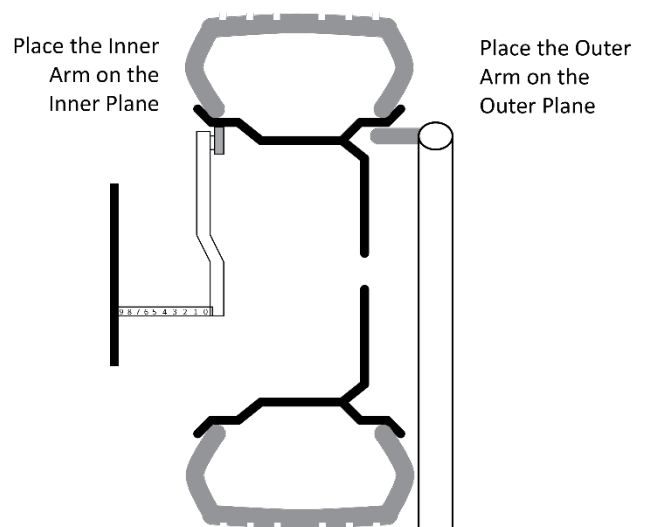
4. Turn the Balancer Off and then back On, to reset it.
5. Begin in the Dynamic Mode (**DYN**). The operator will select **ALU1** or **2** within the procedure. The **ALUS** mode is automatically selected.
6. The instructions for all three of the **ALU** Modes are different:

ALU1

ALU1 Mode is used on Aluminum Alloy Wheels when the adhesive weight correction is to be placed on the Inner and Outer Planes.



- a. Pull out the Inner Arm, place it on the Inner Plane, and hold it there. See figure to the right.
- b. Listen for the beep.
After the beep, return the Inner Arm to its rest position.
- c. Place the tip of the Outer Arm on the Outer Plane and hold it there.
- d. Listen for the beep.
- e. After the beep, return the Outer Arm to its rest position. The Wheel data (Inner Distance, Diameter, and Width) should now be indicated on the Display Panel.



- f. **Press** the **ALU** button until **ALU1** is selected on the Display Panel.

- g. Close the Hood to spin the wheel.
- h. Raise the Hood when the Wheel Stops.
- i. The Balancer automatically stops the Wheel with correction weight indications for the inner and outer planes shown on the display panel.

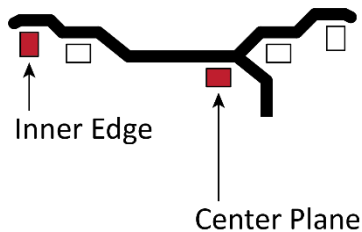
In **ALU1** mode, both Inner and Outer Plane Adhesive Weight locations are at 6 o'clock.

- j. Spin the wheel by hand slowly until all the indicators are lit on either the Outer or Inner Planes. The balancer will automatically lock the wheel position and a laser generated line will indicate the weight location on the Wheel.
- k. Place the correction Weight on the Wheel at the 6 o'clock position indicated by the laser and on the Wheel Plane indicated by the **ALU1** mode.
- l. Press STOP to unlock the Wheel.
- m. Spin the wheel slowly by hand again until the opposite plane indicators are all lit and the balancer locks the tire.
- n. Place the weight at the 6 o'clock position indicated by the laser and the plane indicated by the **ALU1** mode.
- o. Lower the Hood to spin the Wheel again.

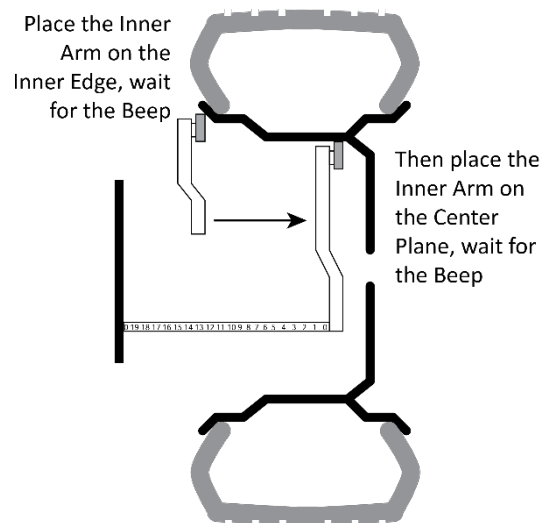
The Wheel is balanced when both the Inner and Outer Windows show **00**.

ALU2

ALU2 Mode is used on Aluminum Alloy Wheels when the weight correction is to be applied to the Inner Edge and the Center Plane.



- a. Pull out the Inner Arm, put it on the Inner Edge, and hold it there. See figure below.
- b. Listen for the beep.
- c. After the beep, move the Inner Arm to the Center Plane and hold it there.
- d. Do **not** return the Inner Arm to its rest position between the two locations.
- e. Listen for the beep.
- f. After the beep, return the Inner Arm to its rest position.
- g. Adjust the Wheel data using the **+** and **-** buttons on the control panel marked Distance, Width and Diameter, if required.
- h. Press the **ALU** button until **ALU2** is selected and indicated on the Display Panel.

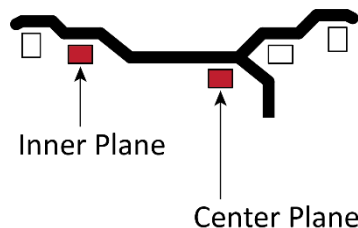


- i. Close the hood to spin the wheel. The Balancer automatically stops the Wheel with correction weight values for the Inner Edge and Center Plane shown on the display panel.
- j. In **ALU2** mode, the Inner Edge Weight location will be at the 12 o'clock position indicated by the laser, and the Center Plane Adhesive Weight location will be at the 6 o'clock position indicated by the laser.
- k. Spin the wheel by hand slowly until all the indicators are lit on either the Outer Plane or Inner Edge. The balancer will automatically lock the wheel position and a laser generated line will indicate the weight location on the Wheel.
- l. Place the correction Weight on the Wheel at the 6 o'clock position for the Center Plane and 12 o'clock position for the Inner Edge as indicated by the laser.
- m. Press STOP to unlock the Wheel.
- n. Spin the wheel slowly by hand again until the opposite plane indicators are all lit and the balancer locks the tire.
- o. Place the weight at the position indicated by the laser.
- p. Lower the Hood to spin the Wheel again.

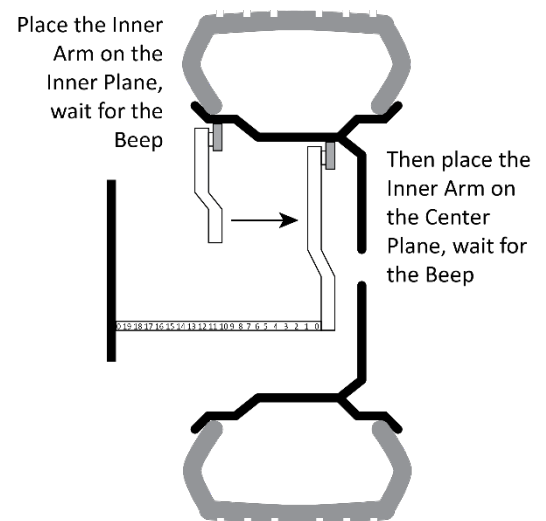
The Wheel is balanced when both the Inner and Outer Windows show **00**.

ALUS

ALUS Mode is used on Aluminum Alloy Wheels where the weights need to be applied on the Inner Plane and the Center Plane.



- a. Pull out the Inner Arm, place it on the Inner Plane, and hold it there. See figure below.
- b. Listen for the beep.
- c. After the beep, move the Inner Arm to the Center Plane and hold it there.
- d. Do **not** return the Inner Arm to its rest position between the two locations.
- e. Listen for the beep.
- f. After the beep, return the Inner Arm to its rest position. The Wheel data should now be displayed.
- g. Adjust the Wheel data using the **+** and **-** buttons on the control panel marked Distance, Width and Diameter as required.
- h. Make sure that **ALUS** is selected (this should be done automatically).
- i. If **ALUS** mode is **not** automatically selected, restart the procedure.



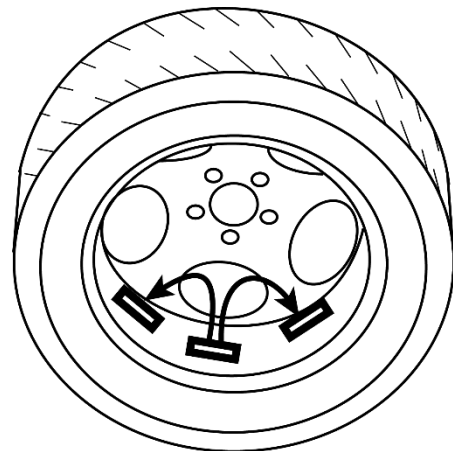
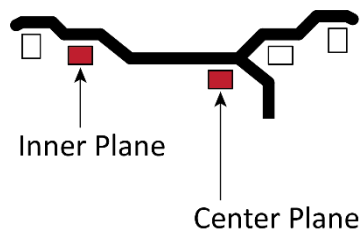
- j. In **ALUS** mode, both Adhesive Weight locations are at 6 o'clock.
- k. Close the hood to spin the wheel. The Balancer automatically stops the Wheel with correction weight indications for the inner and center planes shown on the display panel.
- l. In **ALUS** mode, the Inner Plane and the Center Plane Weight location will both be at the 12 o'clock position indicated by the laser.
- m. Spin the wheel by hand slowly until all the indicators are lit on either the Inner or Center Planes. The balancer will automatically lock the wheel position and a laser generated line will indicate the weight location on the Wheel.
- n. Place the correction Weight on the Wheel at the 12 o'clock position for the Inner and the Center Planes as indicated by the laser.
- o. Press STOP to unlock the Wheel.
- p. Spin the wheel slowly by hand again until the opposite plane indicators are all lit and the balancer locks the tire.
- q. Place the weight at the position indicated by the laser.
- r. Lower the Hood to spin the Wheel again.

The Wheel is balanced when both the Inner and Outer Windows display **00**.

Hidden Weight Balancing

The Hidden Weight (**HID**) mode allows the operator to hide correction weights behind wheel spokes by dividing the correction weight between two adjacent wheel spokes. See the figure below.

Begin Hidden Weight Balancing in the **ALUS** Mode.



To balance a Wheel using Hidden Weight Mode:

1. Make sure you are wearing ANSI-approved eye protection: safety glasses, face shield, or goggles.
2. Visually inspect the Balancer to make sure everything is in place. The Hood should be **up**.
3. Mount the Wheel you want to balance.

Refer to **Mounting a Wheel** for mounting instructions, if needed.

4. Turn the Balancer Off and then back On, to reset it.
5. The Balancer display panel should indicate Dynamic Balance (**DYN**) mode.

6. Pull out the Inner Arm, place it on the Inner Plane, and hold it there.
7. Listen for the beep.
8. After the beep, move the Inner Arm to the Center Plane just behind the Wheel Spokes and hold it there.

Do **not** return the Inner Arm to its rest location between the two locations. See figure to the right.

9. Listen for the beep.
10. After the beep, return the Inner Arm to its rest position.
11. Make sure that the **ALUS** mode indicator is lit on the Display Panel (the Balancer should enter this mode automatically when the Inner Arm is returned to its rest position).

If **ALUS** mode is **not** automatically selected, restart the procedure.

The Inner Distance, the Wheel Diameter and the Wheel Width should now be displayed.

In **ALUS** mode, both Adhesive Weight locations are at 6 o'clock.

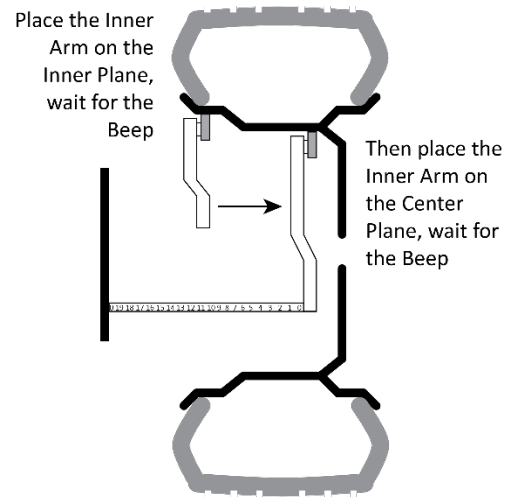
12. Adjust the Wheel data using the **+** and **-** buttons on the control panel marked Distance, Width and Diameter, if required.
13. Lower the Hood; the Wheel will spin briefly.
14. Raise the Hood when the Wheel stops.

The Inner and Outer Windows show the weight correction that is required for the Inner and Center Planes in the **ALUS** Mode.

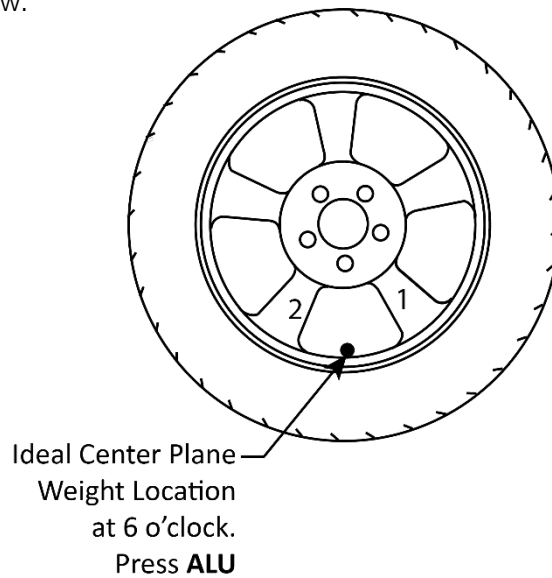
15. Turn the Wheel slowly to find the best location to apply the Inner Plane weight. All the indicators on the Inner Plane display will light.

When the Wheel is in the right location, it automatically locks and a laser indicates the spot the Balancer wants you to add the weight.

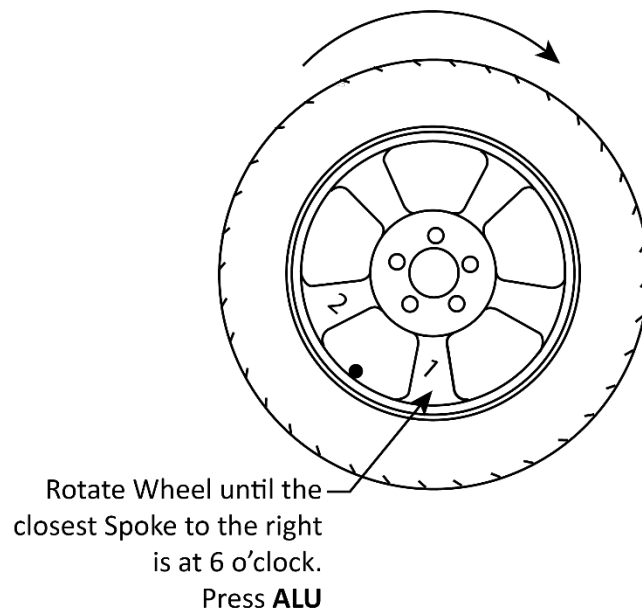
16. Apply the correction weight to the Inner Plane where the laser is indicating.
17. Press the **Stop** button to unlock the Wheel.
18. Turn the Wheel slowly to find the ideal location to apply the Center Plane correction weight. All the Outer Plane indicators will light and the Wheel will lock. (Presumably this weight position is visible and between spokes.)
19. Press **OPT + T** simultaneously. The Inner and Outer Display Windows should display **SPO** and **6H**. The **HID** indicator on the display panel should light.



20. Press **ALU** on the control panel. The Inner and Outer Display Windows should now display **SPO** and **-1-**. See the figure below.

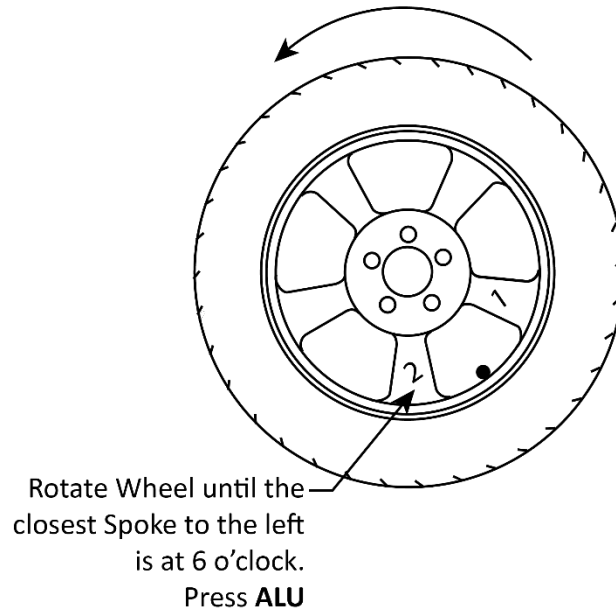


21. Press **Stop** to unlock the Wheel.
22. Rotate the wheel to bring the next closest Wheel Spoke to the **right** of the ideal weight location to the 6 o'clock position. Then Press **ALU**. See the figure below. This indicates to the Balancer where the first hidden weight is to be placed.



23. The Inner and Outer Display Windows should now display **SPO** and **-2-**.

-
24. Rotate the wheel to bring the next closest Wheel Spoke to the **left** of the ideal weight location to the 6 o'clock position. Press **ALU**. See the figure below. This indicates to the Balancer where the second hidden weight is to be placed.



25. The center Width Display Window should now display **SPL**.
26. Rotate the Wheel back toward position 1, until all the indicators light for position **-1-** (to the **right** of the ideal position) and the Wheel locks. Apply the correction weight shown in the Outer Display Window for position **-1-** behind and as close to the Wheel Spoke as possible. The balancer will split the weight and display the correct weight split for each position.
27. Press **Stop** to unlock the Wheel.
28. Rotate the Wheel toward position **-2-** (to the **left** of the ideal position) and when all the Outer Plane indicators light and the Wheel locks, apply the correction weight shown in the Outer Display window position **-2-** on the Center Plane behind and as close to the Wheel Spoke as possible.
29. Lower the Hood to spin the Wheel again.
- The Wheel is balanced when both the Inner and Outer Windows show **00**.
- Repeat the process until the Wheel is balanced.

Using the Optimize Function

The Optimize Function lets you help lessen the imbalance of a Wheel that is more than 1 ounce / 30 grams out of balance. You are not **required** to use the Optimize Function.

Important: The Optimize Function does not bring a Wheel to fully balanced; instead, it lessens the imbalance of a Wheel that is significantly out of balance. Depending on the state of the Wheel, even if you correctly Optimize a Wheel, it may still be more than 1 ounce / 30 grams out of balance when you are done with the Optimize.

When you see **Opt** in the Width Window during a balance, it means the Wheel you are balancing is more than 1 ounce / 30 grams out of balance on one or both planes.

To Optimize a Wheel:

1. When you see **Opt** in the Width Window during a balance, raise the Hood, then rotate the Wheel until the indicators next to the Inner Window are all lit.

2. Press the **OPT** button on the Control Panel.

180 appears on the Outer Window and the **OPT** icon on the Display Panel goes on.

The Balancer is now in Optimize Mode.

Important: If you use the Balancer to balance a different Wheel or you turn the Balancer on and off, the Balancer will be taken out of Optimize Mode.

3. Mark the Cone, the Rim at the Cone, the Rim at the Tire, and the Tire itself.

Tip: You want a Mark that will come off when you are done with the process but not come off during the process. Using tape generally works, using a pen or pencil usually does not. A pen or pencil Mark on tape works the best.

4. Remove the Wheel from the Balancer, then use a Tire Changer to take the Tire off the Wheel, rotate the Tire 180°, then put the Tire back on the Wheel.

Make sure not to cover or remove the Marks on the Wheel and Tire.

5. Put the Wheel back on the Balancer, making sure to align the marks on the Cone, the Rim at the Cone, and the Rim at the Tire.

The Mark on the Tire itself will be 180° from the other Marks.

6. Lower the Hood or press the **Start** button.

7. When the Wheel stops, turn the Wheel until the Inner Placement Indicators are all lit and the Wheel locks in position.

8. Put a Mark at Top Dead Center on the Wheel Rim.

9. Press **Stop** to release the Wheel, then turn the Wheel until the Outer Placement Indicators are all lit and the Wheel locks in position.

10. Put a Mark at Top Dead Center on the part of the Tire next to the Wheel Rim.


11. Remove the Wheel from the Balancer, then use a Tire Changer to take the Tire off the Wheel, rotate the Tire so the two Marks you just put on are aligned, and then put the Tire back on the Wheel.

12. Put the Wheel back on the Balancer and restart the Balancing process that was interrupted by using the Optimize Function.

Maintenance


Make sure your Wheel Balancer is maintained on a regular basis.

Regular Maintenance

 **WARNING:** Disconnect the Power Cord from power **before performing any maintenance** and take whatever steps are necessary to make sure the unit cannot be re-energized until Maintenance is over. Because the unit uses electricity, you could be electrocuted or even killed if the unit is powered back on during Maintenance.

To maintain your Wheel Balancer:

- **Daily:** Make sure the unit is clean and dry before using it.
- **Weekly:** Make sure the Shaft Assembly is correctly oriented with the Shaft Housing and is securely tightened.
- **Monthly:** Make sure all Anchor Bolts are tightened and secure.
- **Monthly:** Check all components to make sure they are in good operating condition. If you find a component that is **not** working correctly, take the unit out of service and refer to **Troubleshooting** for more information.
- **Every three months:** Check the bolts on the components attached to the rear of the unit to make sure they are tight and secure.
- **Yearly:** Have an Electrician come out and check the electronic components.
- **Yearly:** Take the unit out of service, disconnect the Power Cord from the power source, and then thoroughly check and clean all components.

 **WARNING:** Do not operate your Wheel Balancer if you find issues; instead, take the unit out of service, then contact your dealer, visit rangerproducts.com/support/, or call **(805) 933-9970**.

Troubleshooting

Perform the following checks if you are experiencing balancing problems:

- Confirm the location and alignment of the alignment marks on the Shaft Assembly and Shaft Housing (see [Installing the Shaft](#) for more information).
- Make sure the Balancer is anchored in place (see [Anchoring the Balancer](#) for more information).
- Perform a Weight Location Verification Test (see [Weight Location Verification Test](#) for more information).

Perform the calibration with a steel Wheel of the most commonly used size.

Note: It is a good practice to keep a known good Wheel of the most commonly used size to use as a calibration / reference tire to assist in troubleshooting.

Make sure the calibration weight used is a 100 gram or 3.5 ounce weight and that is mounted correctly during the calibration procedure.

Issues

Issue	Action to Take
Nothing on the Display Panel.	Make sure the unit is turned on and getting power.
No beep when using the Inner Arm or the Outer Arm.	Make sure the unit is turned on and getting power. Make sure the Outer Arm was correctly installed.
The Outer Arm is not producing correct values on a consistent basis.	Calibrate the Outer Arm. Refer to Calibrating the Outer Arm for more information.
The Inner Arm is not producing correct values on a consistent basis.	Calibrate the Inner Arm. Refer to Calibrating the Inner Arm for more information.
The Balancer is not producing good balances on a consistent basis.	Perform a Weight Location Verification Test. Refer to Weight Location Verification Test for more information.
The lower laser (6 o'clock) does not appear.	The laser has been set to Off or is broken. Turn the laser On, then check to see if it is working. If it still does not work, contact BendPak Ranger for instructions.

If you continue to have problems with your Wheel Balancer, visit www.bendpak.com/support or call **BendPak Ranger at (805) 933-9970**.

Calibrating the Outer Arm

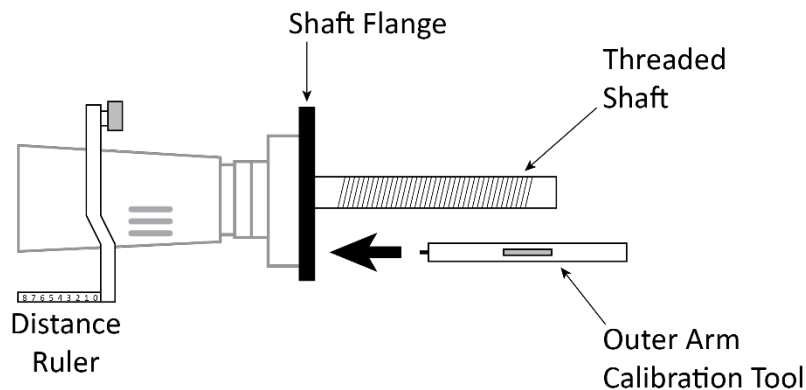
The Outer Arm Calibration makes sure the Outer Arm is returning correct values.

Note: The Balancer comes from the factory correctly calibrated. You do not need to perform this calibration when you receive the Balancer. You only need to perform this calibration if you are seeing multiple incorrect Wheel balances.

Perform this procedure **without** a Wheel mounted.

To calibrate the Outer Arm:

1. Put the 200 mm Outer Arm Calibration Tool into one of the two holes on the Shaft Flange.

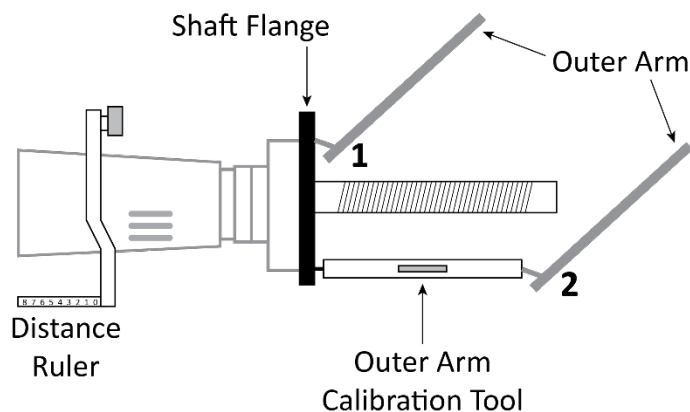


2. Press and hold **Stop**, then press **OPT**.

CAL-OF appears.

3. Place and hold the tip of the Outer Arm on the side of the Shaft Flange (**1** below), then press **ALU**.

CAL-200 appears.



4. Place and hold the tip of the Outer Arm on the end of the 200 mm Outer Arm Calibration Tool (**2** above), then press **ALU**.

CAL-END appears.

The calibration is complete.

Calibrating the Inner Arm

The Inner Arm Calibration makes sure the Inner Arm is returning correct values.

Note: The Balancer comes from the factory correctly calibrated. You do not need to perform this calibration when you receive the Balancer. You only need to perform this calibration if you are seeing multiple incorrect Wheel balances.

Perform this procedure **without** a mounted Wheel.

To calibrate the Inner Arm / Distance Ruler:

1. Press *and hold* **Stop**, then press **<5g**.

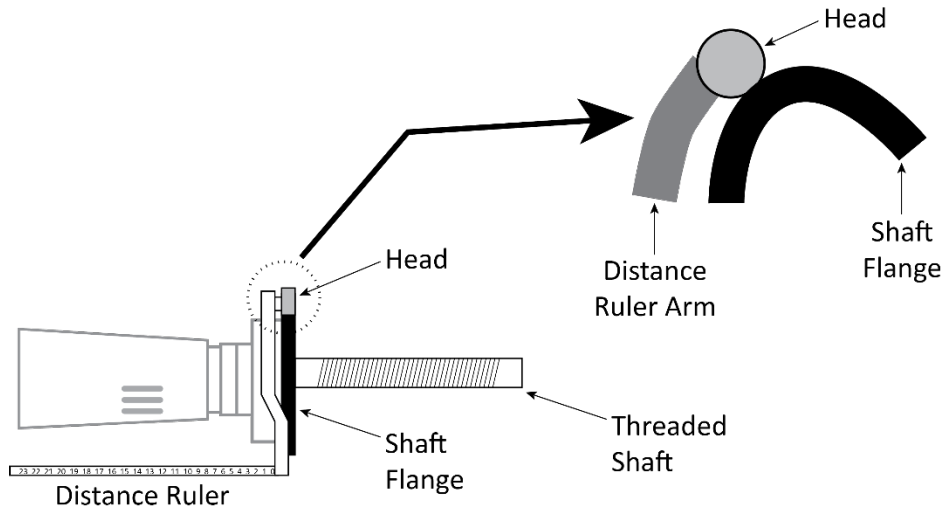
CAL-100-dIS appears.

2. Pull out the Distance Ruler to **10** and hold it there, then press **ALU**.

CAL-235-dIS appears.

3. Pull out the Distance Ruler to **23.5** and hold it there, rest the Head against the Shaft Flange, then press **ALU**, as shown in the graphic below.

CAL 15.0 appears.



4. Mount a steel 15" to 17" diameter Wheel onto the Threaded Shaft.

Important: A steel, undamaged Wheel 15" to 17" is required for this procedure. Do **not** use a Trailer Wheel to perform this calibration. Trailer Wheels are too narrow.

5. Set the **15.0** to the actual diameter of the Wheel you just mounted, then press **ALU**.

If you mounted a 15" diameter Wheel, you don't have to change anything.

6. Put the Head of the Distance Ruler on the Inner Edge of the Wheel, then press **ALU**.

Calibration is complete.

Dual-Plane Self-Calibration Procedure

The Dual-Plane Self-Calibration Procedure ensures the Balancer is producing accurate readings by aligning the software with the existing spindle positions and hardware on the Balancer.

Before performing the Dual-Plane Self-Calibration Procedure, make sure the Balancer is anchored down and/or rigid to the floor and that the shaft and centering cones are clean and undamaged. Dirt or damage can cause inaccurate readings.

Important: Pay close attention to this procedure. If not done correctly, the Balancer will not produce accurate readings, leading to Wheels not being balanced correctly.

Important: A steel, undamaged Wheel 15" to 18" is required for this procedure. Do **not** use a Trailer Wheel to perform this calibration. Trailer Wheels are too narrow.

To perform the Dual-Plane Self-Calibration Procedure:

1. Balance the Wheel to fully balanced; **00** displays in both the Inner and Outer Windows.
2. Program the correct Distance, Width, and Diameter values into the Balancer using the Inner Arm and the Outer Arm or enter them manually.
3. Press and hold the **C** and **T** buttons on the Control Panel until the Placement Indicators stop flashing and **CAL CAL** appears.

4. Lower the Hood.

The Wheel spins briefly, then stops.

Add 100 appears (**Add 3.5** if oz is selected).

5. Turn the Wheel by hand until the Inner Placement Indicators are all lit.
6. Add the 100-gram Calibration Weight (Clip-On) to the **Inner Edge** of the Wheel at Top Dead Center or 12 o'clock).
7. Close the Hood.

The Wheel spins briefly, then stops.

Add 100 appears again.

8. Turn the Wheel by hand until the Outer Placement Indicators are all lit.
9. Remove the 100-gram Calibration Weight from the Inner Edge of the Wheel and *add it to the **Outer Edge*** at Top Dead Center or 12 o'clock.

10. Close the Hood.

The Wheel spins briefly, then stops.

End CAL appears.

11. Remove the 100-gram Calibration Weight from the Wheel.

The Dual-Plane Self-Calibration Procedure is complete.

Weight Location Verification Test

The Weight Location Verification Test verifies that the Balancer is calibrated correctly.

Before performing the Weight Location Verification Test, make sure the Balancer is bolted down to the floor and that the Shaft and Centering Cones are clean and undamaged. Even the slightest amount of dirt or damage can cause inaccurate readings.

Important: Pay close attention to this procedure. If not done correctly, the Balancer will not produce accurate readings, leading to Wheels not being balanced correctly.

Important: A steel, undamaged Wheel 15" to 18" is required for this procedure. Do **not** use a Trailer Wheel to perform this calibration. Trailer Wheels are too narrow.

You will need a steel Wheel with a Tire of the most commonly used size, balanced to within 5 grams on either inner or outer with minimal wear or damage to the tire or Wheel, for this procedure.

To perform the Weight Location Verification Test:

1. Balance an average-sized Tire and Wheel to **00 – 00**.
2. Program the correct Distance, Width, and Diameter values into the Balancer using the Inner Arm and the Outer Arm or entering them manually.
3. Add a 100-gram Wheel weight to the Outer edge of the Wheel.
4. Lower the Hood or press the Start button.

The Wheel spins briefly, then stops.

Add 100 appears on the Outer Indicator (**Add 3.5** if oz is selected) and **00** on the Inner indicator.

5. Turn the Wheel by hand until the Outer Placement Indicators are all lit.

The 100-gram Wheel weight should be at 6 o'clock Bottom Dead Center.

6. Remove the 100-gram Wheel weight from the Outer edge of the Wheel.
7. Install the 100-gram Wheel weight on the Inner edge of the Wheel.
8. Close the Hood or press the Start button.

The Wheel spins briefly, then stops.


9. **Add 100** appears on the Inner Indicator (**Add 3.5** if oz is selected) and **00** on the Outer indicator.

10. Turn the Wheel by hand until the Inner Placement Indicators are all lit.

The 100-gram Wheel weight should be at 6 o'clock Bottom Dead Center.

The Weight Location Verification Test is complete.

Changing the Setting of the Lower Laser

 **WARNING** Do *not* look directly into the laser. Doing so may damage your eyes.

The Lower Laser is set to On at the factory, which is the desired setting.

If the Lower Laser is set to Off, or if you are trying to determine if the Lower Laser is working correctly, use the following procedure.

To set the Lower Laser to On:

1. Turn the Balancer **On** using the Power Switch.
2. Press and hold the **C** and **T** buttons.
CAL CAL appears in the Inner and Outer windows.
3. Continue to hold both buttons until the lights stop blinking.
4. Release both buttons.
5. After releasing both buttons, check the Inner and Outer windows; **CAL CAL** should still be visible. If **CAL CAL** are no longer visible, start the entire process over again.
6. Press **Distance -**.
7. Press **Distance +**.
8. Press **ALU**.
rP appears on the Inner window and **0.25** in the Outer window.
9. Press **Distance +** five more times, until you see **LAS** in the Inner window and **On** or **Off** in the Outer window.
10. If you see **Off** in the Outer window, press **Width +**, then press **Distance +** again.
11. If you see **On** in the Outer window, just press **Distance +** again.

The LS43B returns to normal operation.

The Lower Laser is now set to **On**, the desired setting.

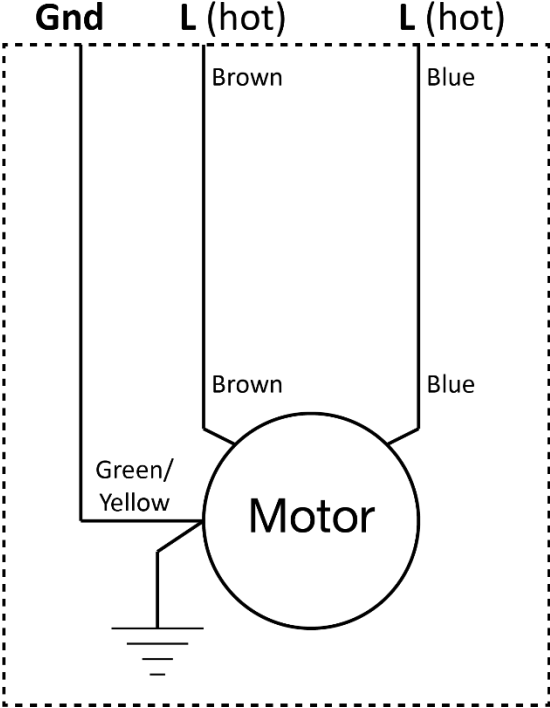
12. If you are trying to determine if the Lower Laser was set to Off or if it is broken, balance a tire using ALU1 mode (where both weight locations are at 6 o'clock).

If the Lower Laser appears, it was just Off, not broken.

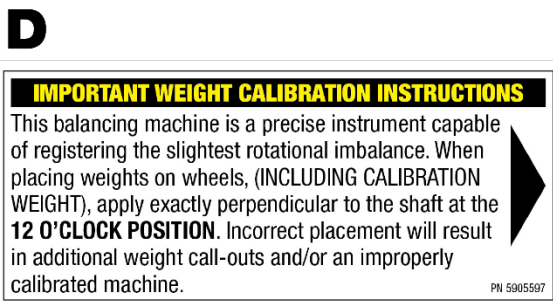
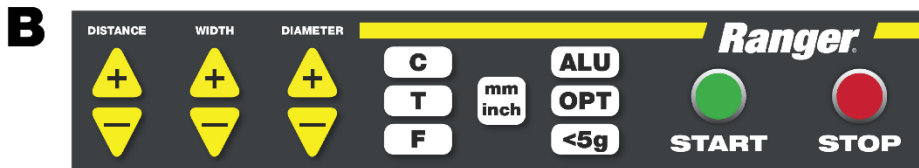
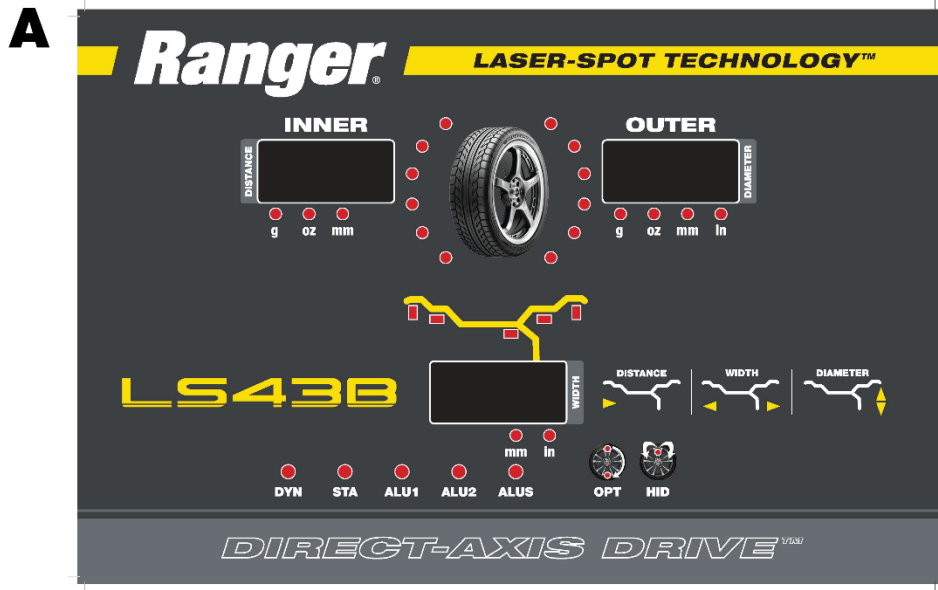
If the Lower Laser still does not appear, contact Ranger Support by visiting

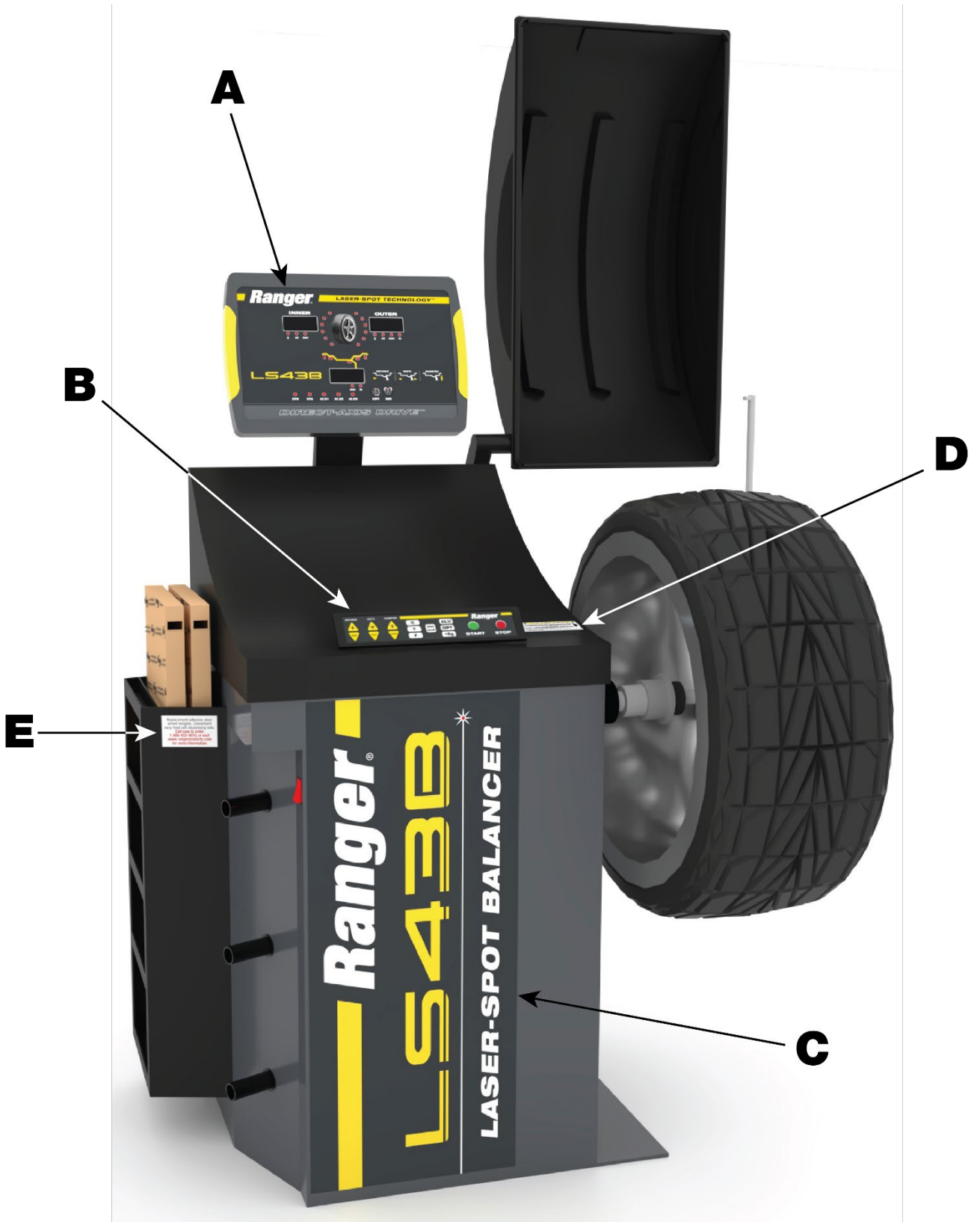
www.bendpak.com/support or call **BendPak Ranger at (805) 933-9970** for assistance.

Wiring Diagram

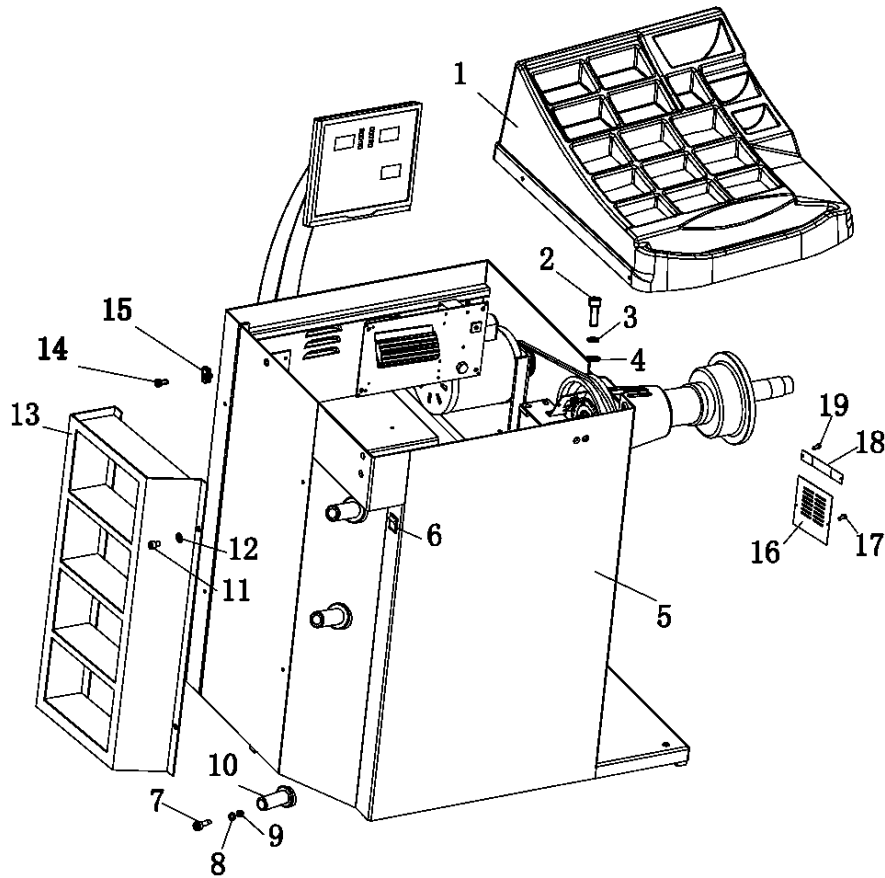


Labels

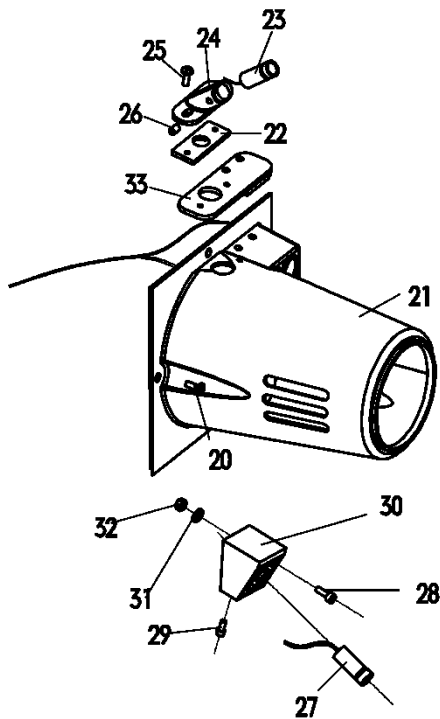




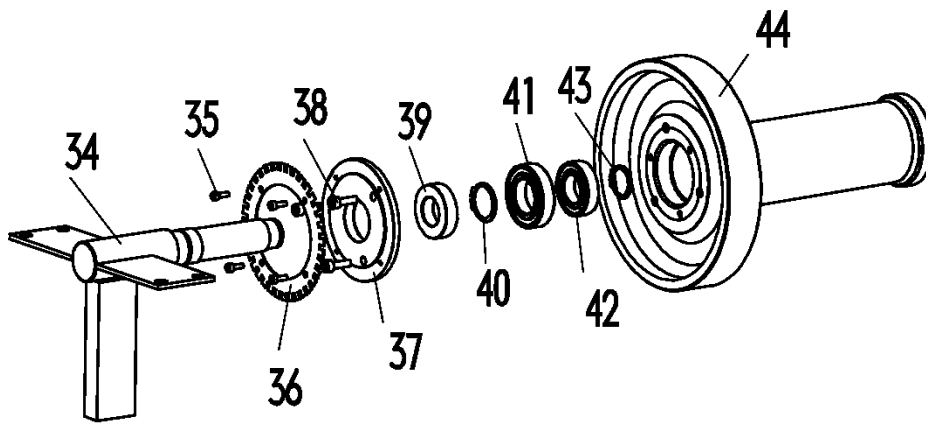
Parts



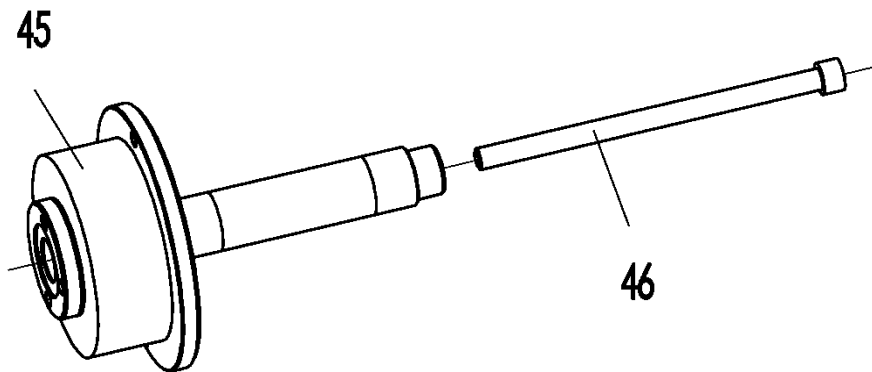
#	Part Number	Description
1		Weight Tray
2	5530304	Hex Socket Head Screws M8 x 20
3		Washer Φ 8 Spring
4		Washer Φ 8 Flat
5		Storage Cover
6		Rocker Switch
7		Hexgen socket head screws M6 x 30
8		Washer Φ 6 Flat
9		Hexgen Nut M6
10		Tool Shanking
11		Hexagon Head Bolt Full Thread M8 x 20
12		Washer Φ 8 Flat
13	5327993	Slide Storage Cover
14		Hexagon Socket Head Flange Screw M6 x 20
15		B Type Reed Nut M6
16		Baffle
17		Spring Washer Tail Screw ST 5. 5 x 25
18		Baffle Plate Weldment
19		Cross Slotted Large Flat Head Screw (Black) M4 x 8



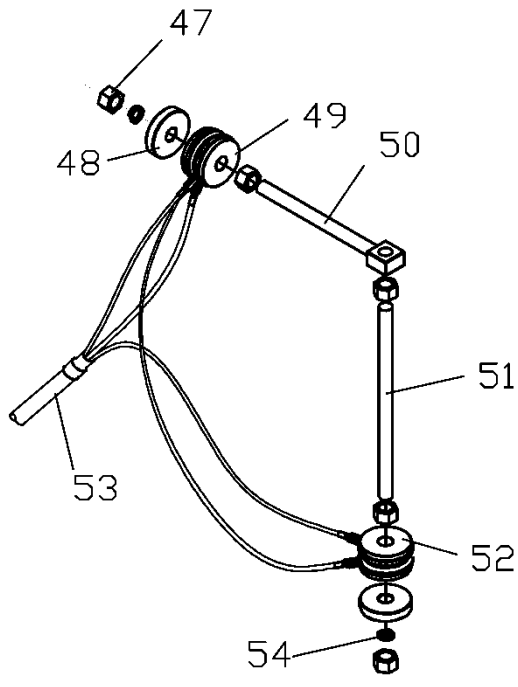
#	Part Number	Description
20		Cross Recessed Pan Head Screw M4 x 12
21		Thread Shaft Plastic Cover
22		Top Laser Light Assembly
23		One Font Laser Light Source
24		Laser Chassis
25		Cross Recessed Pan Head Screw M4 x 12
26	5327505	Inner Hexagon End Set Screw M5 x 5
27		Lower Laser Light Assembly
28		SHCS M4 x 20
29		Hexagon Socket Set Screw with Flat Point M4 x 4
30		Laser Stents
31		Washer; $\phi 4$
32		Hexagon Head Nut M10
33		Laser Plate



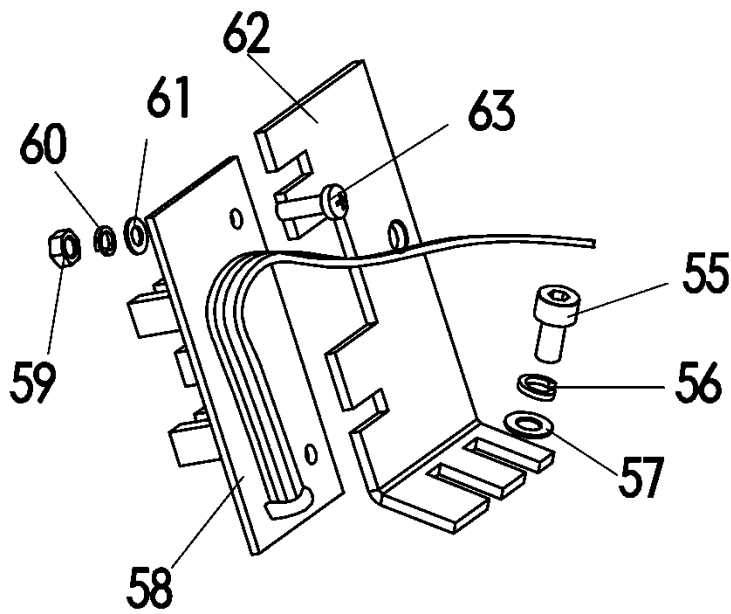
#	Part Number	Description
34		Deformation of Beams
35		SHCS M4 x 12
36		Tooth 64
37		Bearing Cover
38		SHCS M6 x 20
39		Round Nut
40		Snap Ring 30 mm
41		Bearing 6006
42		Bearing 6005
43	5327179	Snap Ring 25 mm
44		Axle Sleeve Assembly



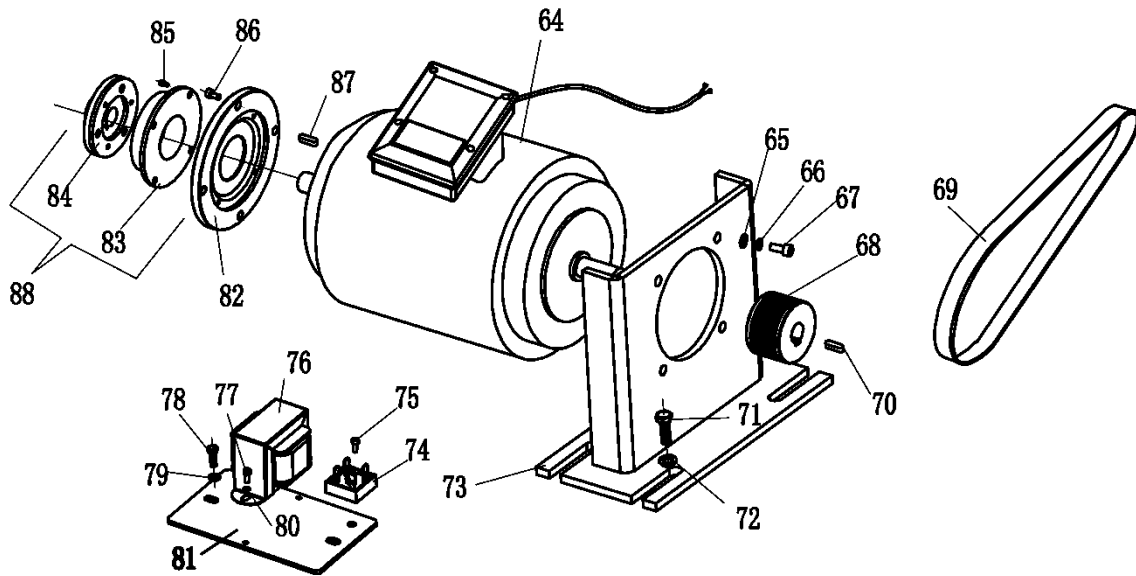
#	Part Number	Description
45	5327330	Matchers
46		SHCS M14 x 260



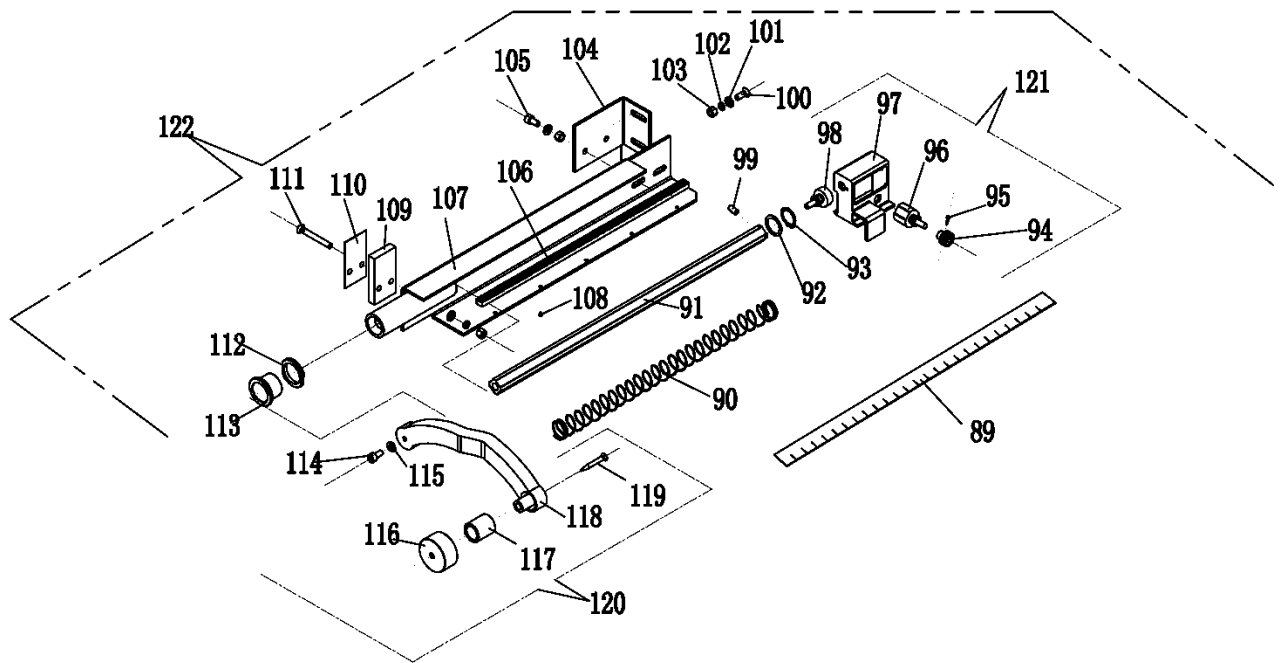
#	Part Number	Description
47		Hex Nut M10
48		Piezo Sensor Pad
49		Sensor (Horizontal)
50	5327140	Piezo Horizontal Shaft
51	5327139	Piezo Vertical Shaft
52		Sensor (Vertical)
53		Sensor Wire
54		Washer



#	Part Number	Description
55	5327870	SHCS M4 x 8
56		Spring Pad
57		Plain Washer
58		Photovoltaic Panels
59		Hex Nut
60		Spring Pad
61		Washer
62	5327686	Encoder Bracket
63		Cross Recessed Pan Head Screw

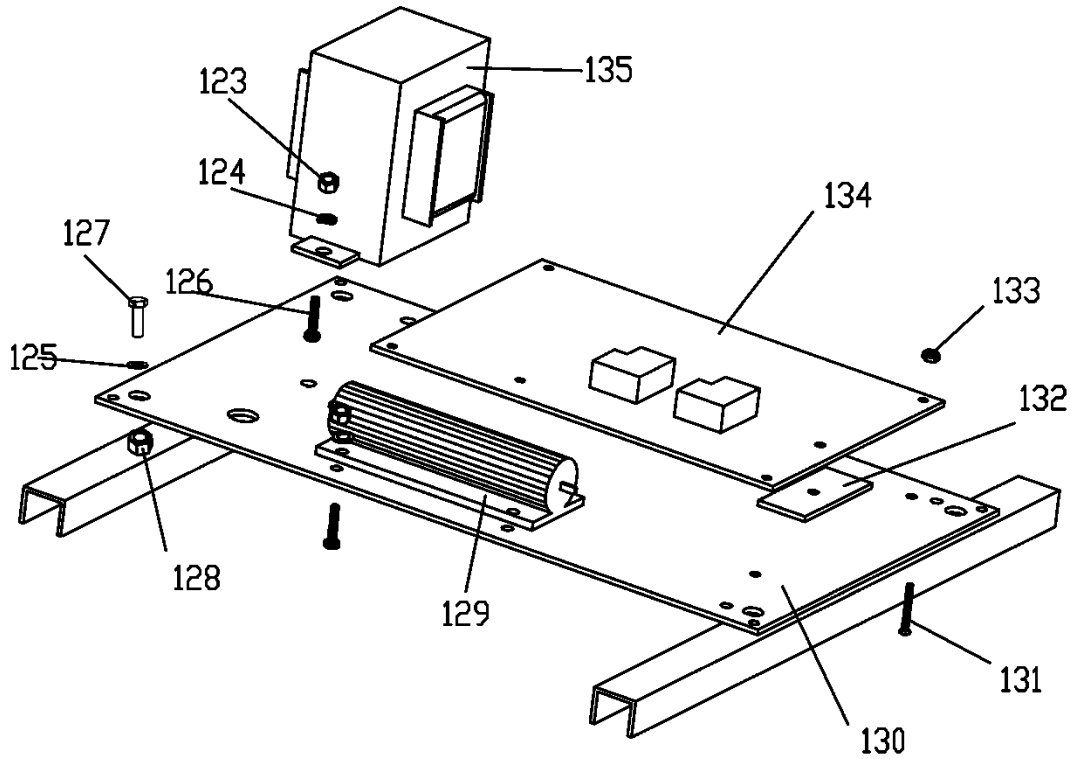


#	Part Number	Description
64		Electromagnetic Brake Motor
65		Plain Washer
66		Spring Pad
67		SHCS M6 x 16
68	5327144	Small Belt Pulley
69		Motor Belt
70	5327145	Motor Pulley Key 5 x 5 x 30
71		Hexagon Head Bolt Full Thread
72		Big Washer
73		Motor Cabinet
74		Rectifier
75		Cross Recessed Pan Head Screw
76		Transformer Balancer
77		Cross Recessed Pan Head Screw
78		HHB
79		Plain Washer ϕ 6
80		Plain Washer ϕ 4
81		Transformer base
82		Brake Mounting Plate
83		Electromagnetic Brake Assembly
84		Friction Disk
85		SHCS M4 x 10
86		SHCS M6 x 20
87		Motor Pulley Key 5 x 5 x 20
88		Dry Disc Electromagnetic Brake

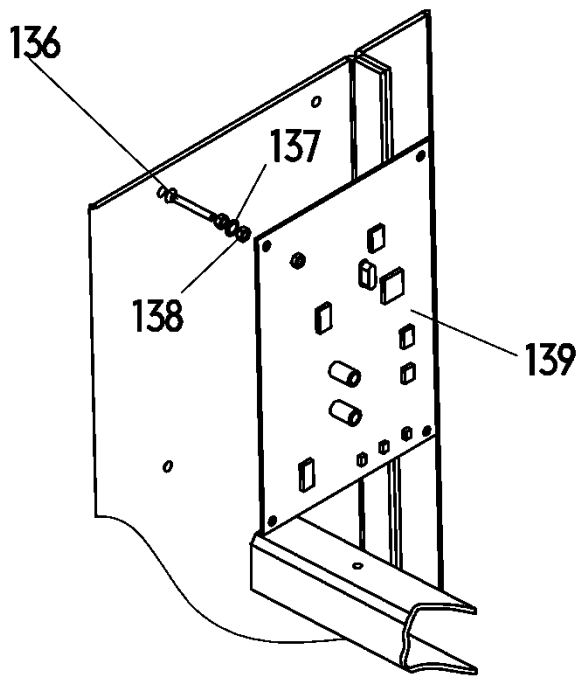


#	Part Number	Description
89	5327591	Distance Arm Sticker
90	5328023	Distance Arm Spring
91		Distance Arm Rod
92		Distance Arm Rod Washer
93		Snap Ring 20
94	5328022	Distance Arm Gear
95		FHPS
96		Wheel Distance Potentiometer
97		Distance Arm Slide Block
98		Wheel Diameter Potentiometer
99		Hexagon Socket Set Screw with Flat Point M4 x 4
100		Cross Recessed Pan Head Screw M6 x 20
101		Washer 6 mm Flat
102		Washer 6 mm Split Lock
103		Hex Nut
104		Distance Arm Angle Plate
105		SHCS M6 x 16
106		Distance Arm Sticker
107		Distance Arm Basement
108		Cross Recessed Tapping Screw
109		Internal Pad
110		Distance Arm Spacer Shim
111		Cross Recessed Pan Head Screw
112		Distance Arm Nut
113		Distance Arm Nut Sleeve
114		SHCS M6 x 10
115		Washer 6 mm Flat
116		Caput Ulnare

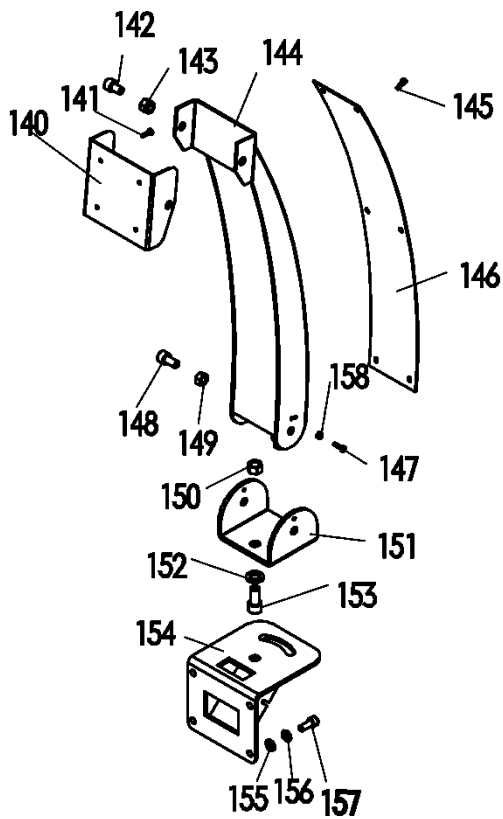
117		Caput Ulnare Cover
118		Distance Arm Caput Bend Rod
119		Cross Recessed Pan Head Screw
120	5328409	Distance Arm Assembly
121		Distance Arm Slide Block Assembly
122		Inner Distance Arm Assembly



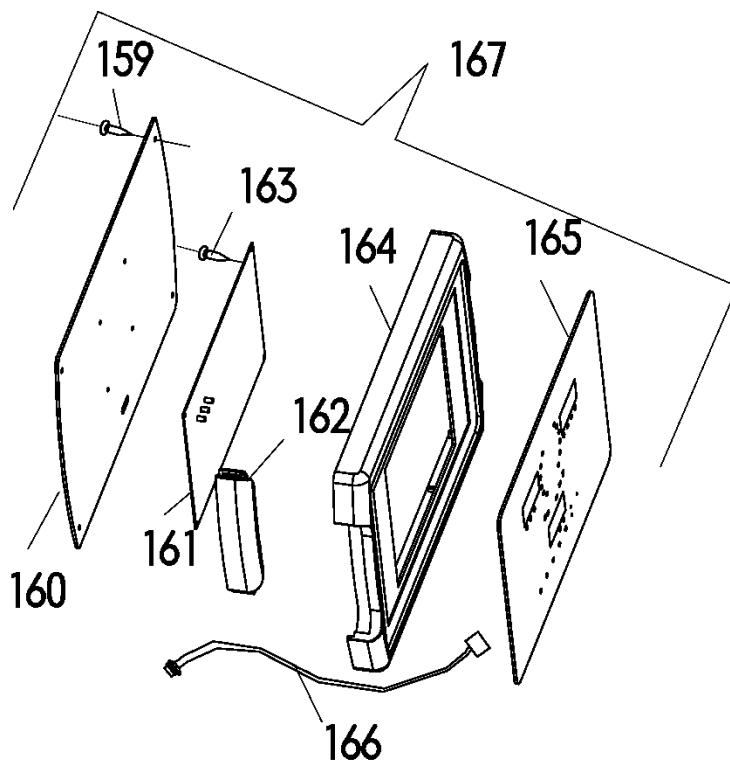
#	Part Number	Description
123		Nut M4
124		Washer 4 mm Split Lock
125		Washer 6 mm Split Lock
126		Cross Recessed Pan Head Screw M4 x 16
127		HHB M6 x 16
128		Nut M8
129	5327148	Resistor
130		Electrical Mounting Plate
131		Cross Recessed Pan Head Screw M3 x 25
132		Thermal Slug
133		Nut M3
134		Power Board
135		Transformer



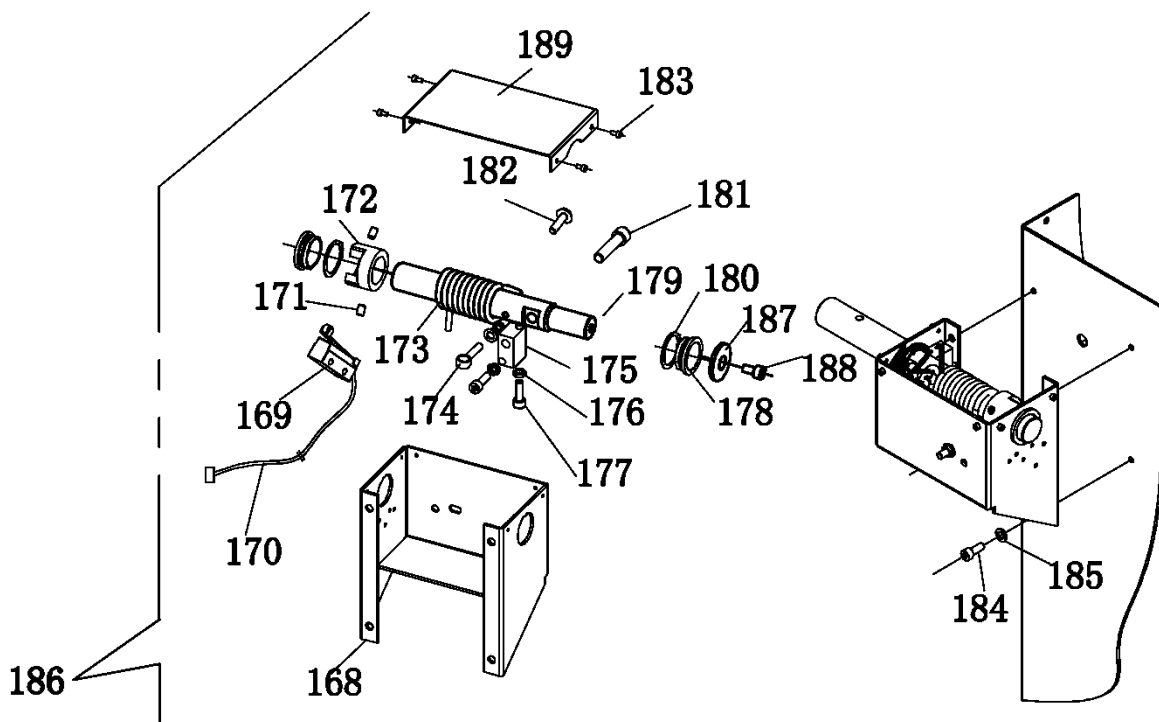
#	Part Number	Description
136		Cross Recessed Pan Head Screw M3 x 25
137		Washer 3 mm Split Lock
138		Nut M3
139	5328402	Computer Board



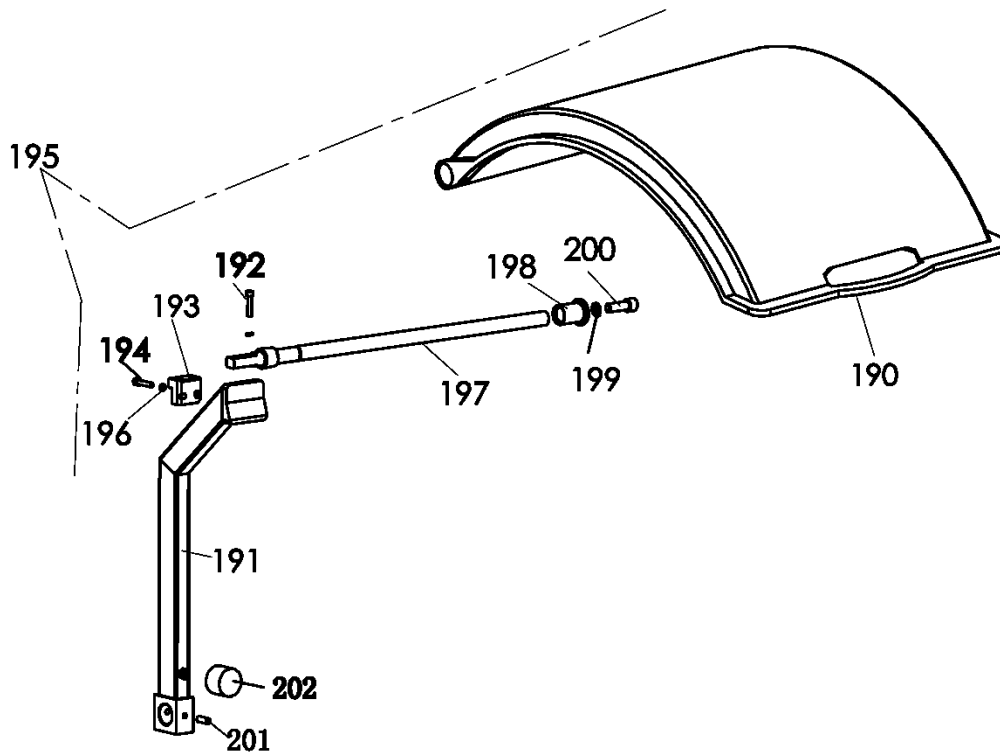
#	Part Number	Description
140	5328407	Display Mounting Plate
141		Cross Recessed Pan Head Screw M4 x 16
142		SHCS M10 x 20
143		Non-Metal Insert Self-Locking Nut
144	5328408	Display Support
145	5328408	SHCS M4 x 12
146	5328408	Back Shroud
147		SHCS M4 x 20
148		SHCS M10 x 20
149		Non-Metal Insert Hexagonal Lock Nut
150		Non-Metal Insert Hexagonal Lock Nut
151	5328419	U Channel Display Support
152		Washer; 12 mm Flat
153		SHCS M12 x 30
154		Joint Block Welding
155		Washer 8 mm Flat
156		Washer 8 mm Plick Lock
157		SHCS M8 x 20
158		Nut M4



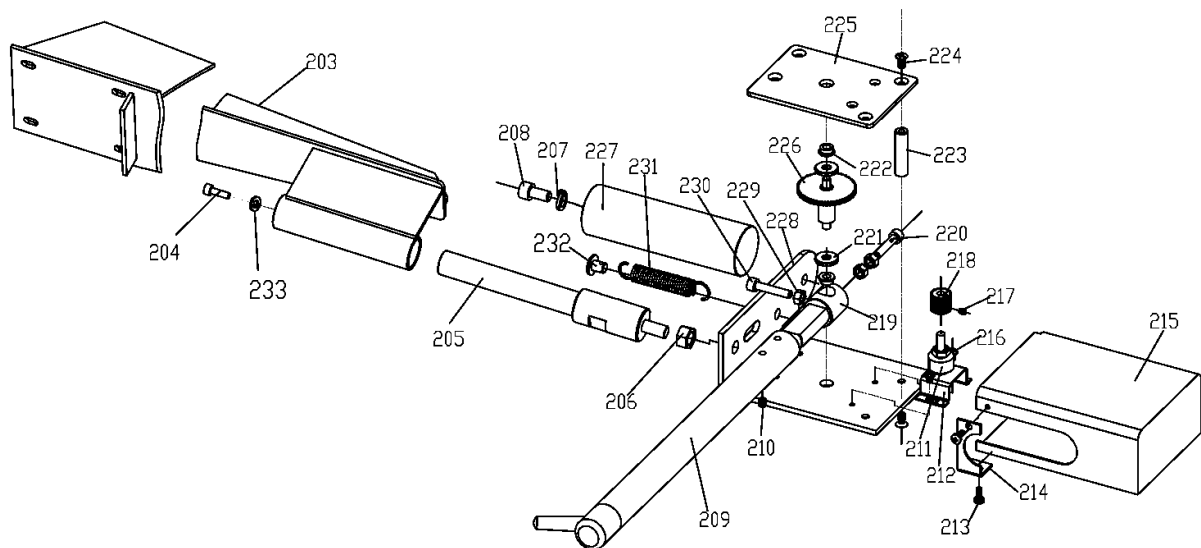
#	Part Number	Description
159		SHCS M4 x 8
160	5328403	Display Baseplate
161	5328404	Display Board
162		Display Board Cover Gommures
163		Cross Slotted Half-Round Head Self-Tapping Screw
164	5328405	Display Board Mask
165	5328406	Display Cover
166	5328412	Display Board Top Harness
167		Displayer Support Assembly



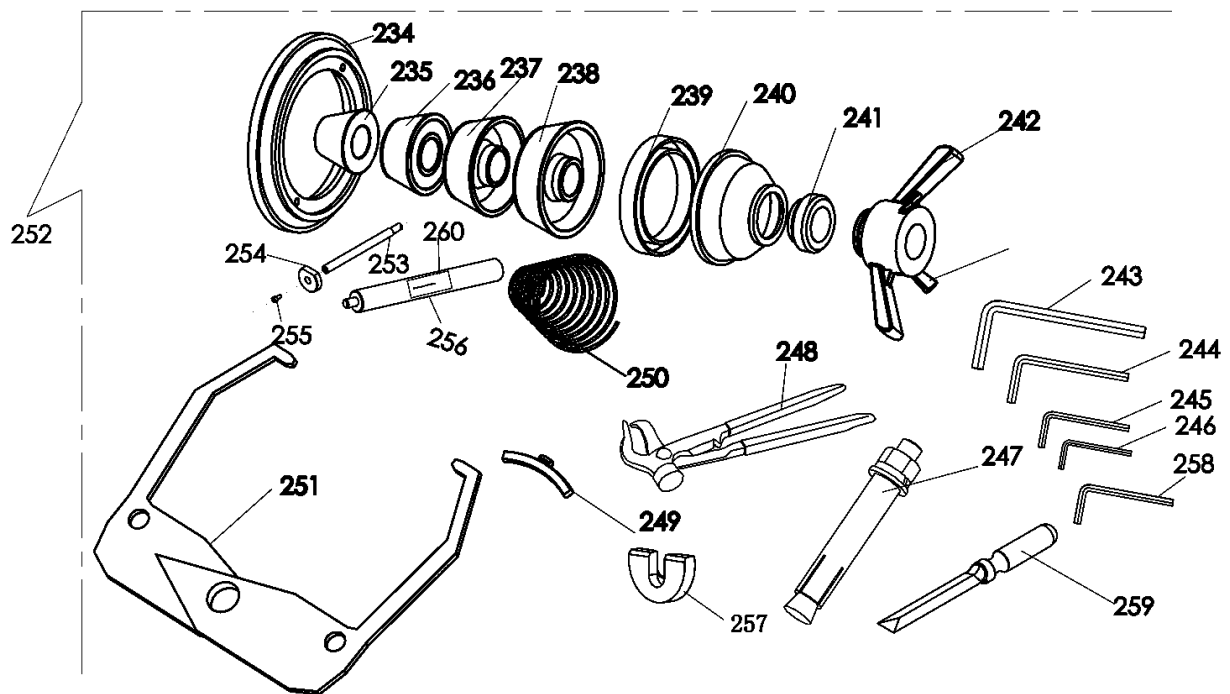
#	Part Number	Description
168	5328012	Hood Mounting Assembly Bracket
169		Hood Switch
170		Short Hood Switch Wires
171		Hexagon Socket Set Screw with Flat Point M8 x 12
172		Hood Cam
173	5327168	Hood Spring
174	5327180	Adjustable Eye Bolt
175		Hood Cam Stop
176		Nut M8
177		SHCS M8 x 25
178	5327167	Hood Shaft Bushing
179		Hood Rotating Shaft
180		Snap Ring 38 mm
181		SHCS M12 x 40
182		Hexagon Flange Face Bolt
183		SHCS M4 x 8
184		SHCS M8 x 20
185		Washer 8 mm Flat
186	5328014	Hood Mounting Assembly
187		Washer 8 mm
188		SHCS M10 x 16
189	5327164	Hood Mounting Assembly Upper Cover



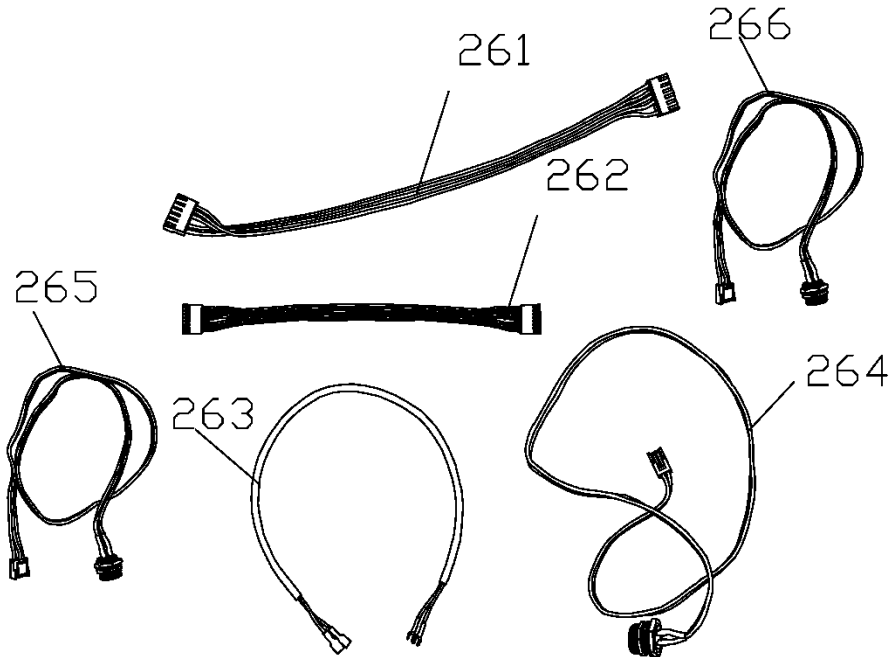
#	Part Number	Description
190		Hood
191	5328246	Hood Mount Support
192		SHCS M6 x 25
193	?????????	Adjusting Plate
194		SHCS M6 x 25
195		Tire Guard Department
196		Spring Pad
197		Long Axis
198		Front Axle Sleeve
199		Spring Pad
200		SHCS
201	5327505	Hexagon Socket Set Screw with Flat Point
202		Column Buffer Cylinder



#	Part Number	Description
203	5327997	Touch Wand Arm BRKT
204		SHCS M5 x 10
205		External Bracket Shaft
206		Nut M10
207		Spring Washer
208		SHCS M8 x 16
209		Touch Wand Pointer Subassembly
210		Hexagon Socket Set Screw with Flat Point M6 x 6
211		Touch Wand Potentiometer
212		Touch Wand Potentiometer Support
213		Cross Recessed Pan Head Screw M4 x 10
214	5328054	Touch Wand Bracket Side
215	5328053	Touch Wand Bracket Cover
216		Cross Recessed Pan Head Screw M4 x 6
217	5327505	Cross Recessed Pan Head Screw M5 x 10
218	5328052	Touch Wand Potentiometer Gear
219		External Gauge Connector
220		SHCS
221		Rotary Shaft Spacer
222	5328049	Touch Wand Bearing
223		External Support Column
224		Cross Recessed Pan Head Screw M5 x 10
225		Hood Mounting Assembly Upper Plate
226	5328045	Central Shaft Assembly
227		Balancing Weight
228	5328044	Touch Wand Assembly
229		Nut M6
230		SHCS M6 x 30
231	5328050	Touch Wand Return Spring
232		External Gauge Spring Hook
233		Washer



#	Part Number	Description
234	5327063	Spacer Ring
235	5327069	Cone 1
236	5327071	Cone 2
237	5327067	Cone 3
238	5327065	Cone 4
239	5327074	Quick Nut Cup Cover
240	5327061	Quick Nut Cup
241	5327172	Quick Nut Cover
242	5327073	Quick Nut 36 mm
243	5327720	Allen Wrench 12 mm
244	5328055	Allen Wrench 6 mm
245	5328056	Allen Wrench 4 mm
246	5328057	Allen Wrench 3 mm
247	5327100	Anchor Bolt M10 x 59
248	5346425	Weight Hammer Pliers
249	5346879	Calibration Weight
250	5402252	Mounting Spring 36 mm
251	5402187	Wheel Width Caliper
252		Accessory Box
253		Extension Lever
254		Distance Arm Head
255	5400002	FHSS; M6 x 12
256		Outer Arm Calibration Tool
257	5328128	Diameter Calibration Tool
258	5328068	Allen Wrench 5 mm
259	5328286	Weight Removal Tool
260		Label 3



#	Part Number	Description
261		Connecting Wire
262		Keyboard Wire
263		Switch Wire
264		Cover Wire
265		Outer Measure Gauge Contact Wire
266		Display Board Wire



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