IMAGING ALIGNER OPERATOR MANUAL

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1.0 Safety Information

1.1 General Safety

Read and understand all safety instructions before operating the aligner.
Improper use can result in injury, equipment damage, or inaccurate measurement.
Only trained, qualified personnel should operate or service the TreadPlus Protostar 9000 Series system.

Keep this manual available at all times in the working area.
Follow all safety labels on the equipment and comply with local workplace safety regulations.

⚠️ **Warning:** Failure to follow these instructions may result in personal injury, damage to property, or voided warranty.

1.2 Operator Qualification

The machine must be used only by trained automotive service personnel who:

- Have read and understood this manual in full.
- Are familiar with vehicle alignment procedures.
- Are capable of safely operating workshop equipment such as lifts and jacks.
- Understand basic electrical and mechanical safety principles.

Do not allow untrained or unauthorized personnel to use or modify the equipment.

1.3 Work Area Safety

- Keep the alignment area clear of tools, debris, and other obstructions.
- Ensure adequate lighting and ventilation.
- Confirm the lift and surrounding floor area are dry and free of oil or grease.
- Always position **wheel chocks** behind the rear tires when aligning a vehicle on a 2-post or 4-post lift.
- Verify that the lift locking mechanism is engaged before measurement.

1.4 Equipment Safety

- Do not bypass or disable any system safety function.
- Do not open the post, beam, or electrical enclosure without authorization.
- Disconnect AC power before performing service work.
- Avoid touching or blocking the camera lenses while the system is operating.
- Keep targets and clamps free from grease, dirt, and reflective contaminants.
- Use only **TreadPlus-approved clamps, targets, and cables** to maintain accuracy and safety.
- Ensure the power cable is properly grounded and undamaged before use.
- Always turn off the PC through software shutdown (**Esc × 2**) — do not unplug directly.

1.5 Vehicle Safety

- Verify the vehicle is centered and secured on the lift.
- Use wheel chocks when the lift design does not include automatic locks.
- Release the parking brake only when instructed by the software (during runout).
- Never enter or start the vehicle while alignment measurements are in progress.
- Do not move the vehicle until instructed by the software to roll forward/backward for runout compensation.
- Ensure turn plates and rear slip plates are **unlocked** during runout and **locked** after measurement.

1.6 Camera and Optical Safety

- The imaging cameras use visible and infrared light for target tracking.
- Do not stare directly into camera LEDs during operation.

- Avoid exposure of cameras to direct sunlight, welding arcs, or strong reflective surfaces.
- Use the protective caps when cameras are not in use.
- Do not use cleaning chemicals or solvents on lenses — use only a clean, soft microfiber cloth.

1.7 Electrical and Computer Safety

- Ensure all components are connected to a properly grounded electrical outlet.
- Do not use extension cords or shared multi-outlet adapters.
- Disconnect power before moving or repositioning the cabinet or post.
- Protect cables from pinch points or contact with sharp edges.
- Keep liquids away from the PC, monitor, and keyboard.
- Do not alter Windows or software configurations except where permitted in Section 6.0.

1.8 Maintenance and Service Safety

- Only **TreadPlus-certified service technicians** may perform calibration or internal repair.
- Before servicing, power down the system and disconnect all electrical connections.
- Ensure the camera beam is securely locked when working on the post or beam assembly.
- Do not remove protective panels or enclosures while the system is powered.
- Use genuine replacement parts only.
- Dispose of electronic components according to local regulations.

1.9 Emergency Procedures

In case of emergency:

- Immediately press the **Emergency Stop** on the lift (if equipped).
- Disconnect the aligner from AC power.
- If smoke, odor, or abnormal sound is detected, stop operation immediately.
- Contact authorized service via **service@treadplus.com** for further instructions.

1.10 Safety Symbols Used in This Manual

Symbol	Meaning
⚠️	**Warning** – Risk of personal injury or equipment damage.
🔌	**Electrical Hazard** – Disconnect power before servicing.
🔧	**Service Required** – Authorized technician intervention only.
🧰	**Maintenance Tip** – Routine care and operation advice.
📘	**Information** – Reference or supplementary instruction.

2.0 System Overview and Components

The **TreadPlus Protostar 9000 Series** is an advanced imaging wheel aligner engineered for professional workshops.
It combines high-resolution camera technology, adaptive clamping, and intelligent measurement algorithms to deliver fast, repeatable, and precise alignment results for a wide range of vehicles.

2.1 System Configuration

The Protostar 9000 Series is available in three configurations:

- **9000 Standard** – Fixed post, floor-anchored camera beam, industrial PC, and full-size monitor.
- **9000 AIO (All-In-One)** – Compact integrated post and cabinet design with built-in PC and display.

- **9000 Mobile** – Portable version mounted on a wheeled cabinet for multi-bay use or shared service areas.

9000 Standard

9000 AIO (All-In-One)

9000 Mobile

All versions share identical optical measurement accuracy, operating software, and accessories.

2.2 System Components

Each system consists of the following major assemblies and accessories:

Camera Beam Assembly

- Dual- or quad-camera imaging beam with precision-calibrated lenses.
- Tracks wheel targets using optical pattern recognition.
- Beam tilt and height adjusted through the support post.
- Equipped with **VisionCue LED Indicators** for visual guidance (caster sweep, runout, blocked-target alerts).

Post Assembly

- Provides stable vertical support for the camera beam.
- Includes beam-height adjustment and mechanical locking.
- For the mobile version, the post bolts inside the cabinet frame.
- For the standard and AIO versions, anchor the base plate securely to the floor with the supplied bolts.

Computer System (PC) and Display

- Industrial PC running Windows 11 with TreadPlus software pre-installed.
- 27"–32" Full HD display (or optional Android TV interface for TA-series compatibility).
- USB 3.0, Ethernet, and HDMI connectivity.
- Pre-configured for offline or network operation.

Wheel Clamping System

Two clamping systems are available:

- **Standard Wheel Clamp (25" Clamp)**
    - Universal rim clamp for steel or alloy wheels.
    - Supplied with three finger sets:
        - Standard Fingers (for conventional rims)
        - Mag Fingers (for magnesium or alloy rims)
        - Hubcap Fingers (for capped or recessed rims)
    - Lightweight and durable for passenger and light-truck use.
- **Adaptive Gripping Tire Clamp (AG Series)**
    - Available as **AG32 (18"–32" tire diameter)** or **AG43** for larger ranges.
    - Clamps directly on the tire sidewall—ideal for delicate or oversized rims.
    - Self-centering quick-release design for fast setup.
    - Constructed from high-strength aluminum with protective contact pads.
    - Optional accessory compatible with all Protostar 9000 models.

Targets

- Digitally printed, non-reflective imaging targets.
- Lightweight composite construction for high accuracy and durability.
- Stable optical pattern ensures reliable detection under workshop lighting.
- No electronics—zero maintenance required.

Turn Plates and Rear Slip Plates

- Heavy-duty bearing design for smooth wheel movement.
- **Turn Plates:** Front axle for steering and caster sweep.
- **Slip Plates:** Rear axle to relieve side load during adjustments.
- Equipped with mechanical lock/unlock levers for setup and transport.

Wheel Chocks

- Two chocks provided to secure the vehicle during alignment.
- Always position behind the rear wheels before measurement.

Cables and Power Supply

- Low-voltage communication cables connect beam, post, and PC.
- Power requirement: AC 110–240 V, 50/60 Hz, properly grounded.
- Includes surge and EMI protection module.

2.3 Packaging and Delivery

- All components ship in a **reinforced plywood crate** with foam supports.
- Each crate includes:
    - Camera beam assembly
    - Post assembly
    - Standard Wheel Clamps (4)
    - Targets (4)
    - Turn plates (2) and Slip plates (2)
    - Wheel chocks (2)
    - Cables and accessories
    - Installation manual and inspection certificate

Note: Adaptive Gripping Tire Clamps (AG32 / AG43) are optional and may ship separately.

Upon delivery:

- Inspect crate for visible damage.
- Report any damage immediately to the carrier and distributor.
- Verify all components before installation.

2.4 Operating Principle

The Protostar 9000 measures wheel alignment angles using camera-based imaging geometry.
During operation:

1. The cameras detect the position and orientation of each target simultaneously.
2. The software calculates toe, camber, caster, and thrust angle based on the relative coordinates.
3. **Spatial Dynamic Compensation** automatically corrects lift or surface irregularities in real time.

2.5 Key Features at a Glance

- High-definition optical measurement system
- Real-time geometric calculation
- Adaptive Gripping (AG) or Standard Clamp options
- VisionCue LED visual guidance
- Dynamic runout and caster compensation
- Multiple alignment routines: Standard, Quick, Precision, Random Measurement
- Auto-tracking height and spatial correction
- Multi-language interface and configurable units
- Smart diagnostic and reporting functions

3.0 Installation and Setup

3.1 Site Requirements

Before installation, ensure the workspace meets the following conditions:

- **Level Surface** – The lift and camera beam area must be flat, stable, and vibration-free.
- **Lighting** – Maintain even illumination without glare or direct sunlight aimed at the targets or cameras.
- **Environment** – Indoor, dry, and dust-free. Avoid strong infrared sources such as welding or radiant heaters.
- **Power** – AC 110–240 V, 50/60 Hz with proper grounding. Use a dedicated circuit protected by a surge suppressor.
- **Network** – A wired or wireless network connection is recommended for software updates and data backup.
- **Space** – Minimum clearance:
    - Front of lift to camera beam: 1.5 m–3.2 m (depending on configuration)
    - Side clearance: 0.6 m minimum per side
    - Ceiling height: 3 m minimum for full beam travel

3.2 Unpacking and Inspection

1. Inspect the **plywood shipping crate** for external damage.
2. Remove packaging carefully and retain for possible future transport.
3. Verify all components listed on the packing list are included:
    - Camera Beam Assembly
    - Post Assembly
    - Computer and Display Unit
    - Four Standard Wheel Clamps
    - Four Imaging Targets

    - Two Front Turn Plates and Two Rear Slip Plates
    - Two Wheel Chocks
    - All Cables and Accessories
    - Installation Manual and Inspection Certificate
4. Report any missing or damaged components immediately to your distributor.

🧰 **Tip:** Always handle the camera beam by its side supports. Avoid lifting by the camera housings.

3.3 Post and Beam Installation

For 9000 Standard and 9000 AIO

1. Position the post base on the prepared floor.
2. Anchor the base plate securely using the provided **anchor bolts**.
3. Confirm the post is vertical using a spirit level.
4. Mount the **camera beam** onto the holder and align it horizontally.
5. **Fasten the screw at the bottom** of the beam mount.
6. Before operating the post, **loosen the shipping screws** on the carriage to allow free travel.

For 9000 Mobile

1. Mount the post into the rear of the mobile cabinet.
2. Secure the two **top screws** inside the cabinet frame.
3. Insert and tighten the **long bottom bolt** through the base section.
4. Verify that all fasteners are tight before moving the cabinet.

⚠️ **Warning:** Do not power on or adjust the camera beam until all shipping locks and screws have been removed.

3.4 Electrical and Data Connections

1. Connect the **power cable** to a grounded outlet.

2. Connect all **camera and communication cables** from the beam to the control PC using labeled ports.
3. Confirm all USB and network connections are fully seated.
4. Do not bundle power and signal cables together — maintain separation to reduce interference.

🔌 **Note:** Always connect the power supply before turning on the PC or beam.

3.5 Initial Power-On

Before powering the system for the first time, **make sure all bolts used for transportation on the post are loosened or removed**.
These bolts secure the internal carriage during shipping and must not remain in place during normal operation.
Operating the post with transport bolts still installed can cause binding or damage to the beam lift mechanism.

Once confirmed:

1. Turn on the **main power switch** located at the rear of the cabinet or on the power supply module.
2. Press the PC power button — the Windows desktop and TreadPlus alignment software will load automatically.
3. Wait for the system to complete its startup sequence; camera initialization may take several seconds.
4. Observe the **VisionCue LED indicators** on the camera beam:
    - Visible LED Strip Flashes / Initialized
5. If an error is indicated, verify that all USB or network cables between the beam, post, and PC are properly seated.

⚙️ **Note:** During the first boot, Windows may perform automatic configuration. Allow the system to finish before launching the alignment program.

3.6 System Leveling and Verification

Although the Protostar system compensates for small lift irregularities through **Spatial Dynamic Compensation**, it is important to establish a baseline reference:

1. Verify the lift locking positions are level front-to-rear and side-to-side.
2. Ensure the vehicle lift is raised and locked at its alignment height.
3. Perform **Lift Level Calibration** from the Maintenance → Calibration → Lift Level menu if required.
4. Once calibrated, the software will automatically reference this plane for all subsequent measurements.

⚙️ **Note:** Lift calibration is a static correction. It only needs to be performed once unless the lift is relocated or adjusted.

3.7 Pre-Operation Checks

Before performing the first alignment:

- Clean the **camera lenses** and **target surfaces** with a soft microfiber cloth.
- Confirm the **beam height** is appropriate for the vehicle type (centered at wheel hub height).
- Verify **turn plates and slip plates** are unlocked and move freely.
- Ensure **wheel chocks** are positioned behind the rear wheels.
- Start the software and select **Aligner Test** from the Maintenance menu to confirm camera recognition and measurement stability.

📘 **Reminder:** Calibration is *not required at installation*. The system ships fully calibrated from the factory. Only trained service technicians are authorized to perform recalibration if necessary.

4.0 Alignment Routines and Operation Procedures

The **Protostar 9000 Series** provides multiple alignment routines to meet various service needs.
Each routine offers a different balance between measurement speed, accuracy, and user

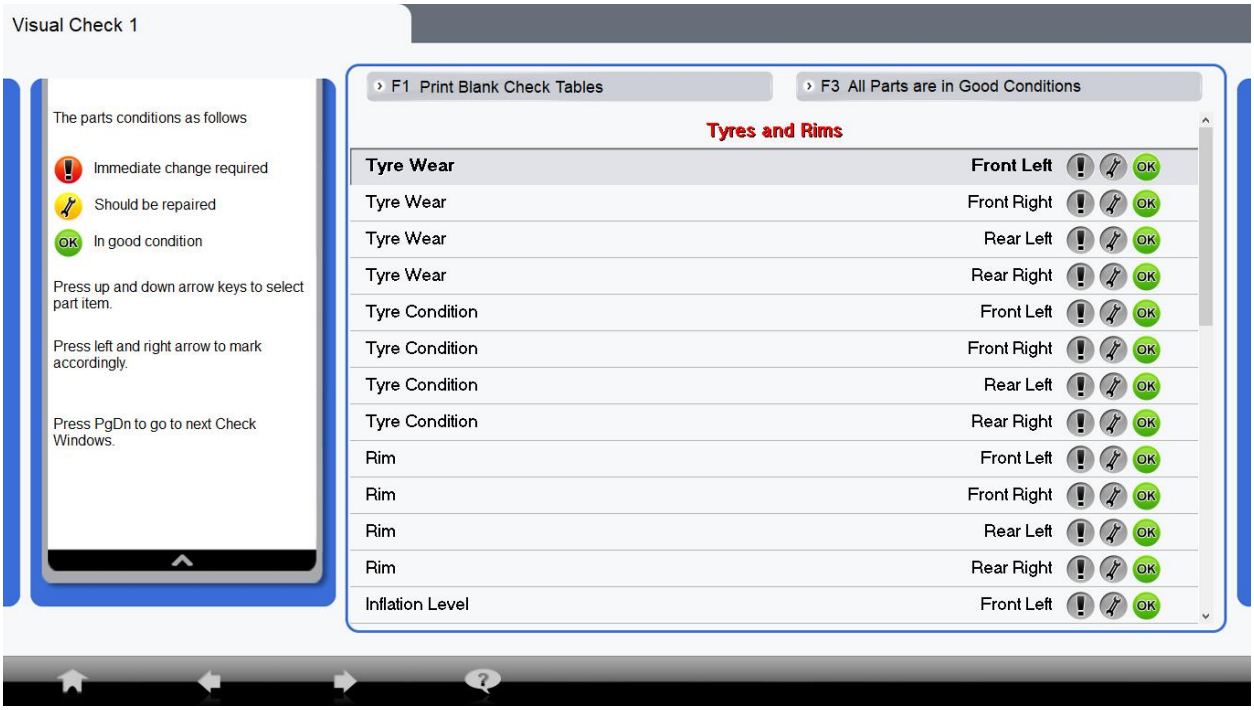
interaction.
All measurement procedures are controlled through the alignment software interface and guided visually on screen.

Available alignment routines include:

- **Visual Check**
- **Standard Routine**
- **Quick Routine**
- **Precision Routine**
- **Random Measurement** (direct feature access)

4.1 Visual Check

The **Visual Check** function is used to inspect suspension and steering components before alignment.
It does not require wheel clamps or targets and is not part of a standard alignment process.



Purpose

- Identify worn or damaged suspension components.

- Confirm vehicle readiness for accurate alignment.
- Record inspection results for customer reference.

Procedure

1. Select **Visual Check (F1)** from the Home Screen.
2. Follow the checklist displayed on screen for each component:
    - Tires and tread wear
    - Tie rods and joints
    - Suspension arms, bushings, and springs
    - Steering linkage
    - Mounting points and underbody condition
3. Mark each item as “Checked” or “Requires Service.”
4. At completion, the software can print either a **Check Table** or a **Checked Report** if items were marked during inspection.

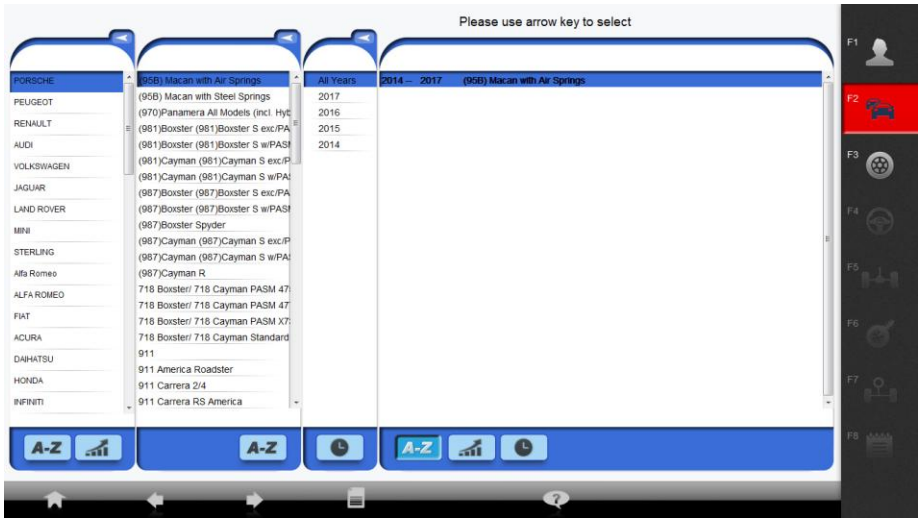
4.2 Standard Routine

The **Standard Routine** is the most commonly used alignment procedure, providing a complete process with balanced speed and precision.

Steps

1. **Customer Information** – Enter or confirm customer and vehicle record.

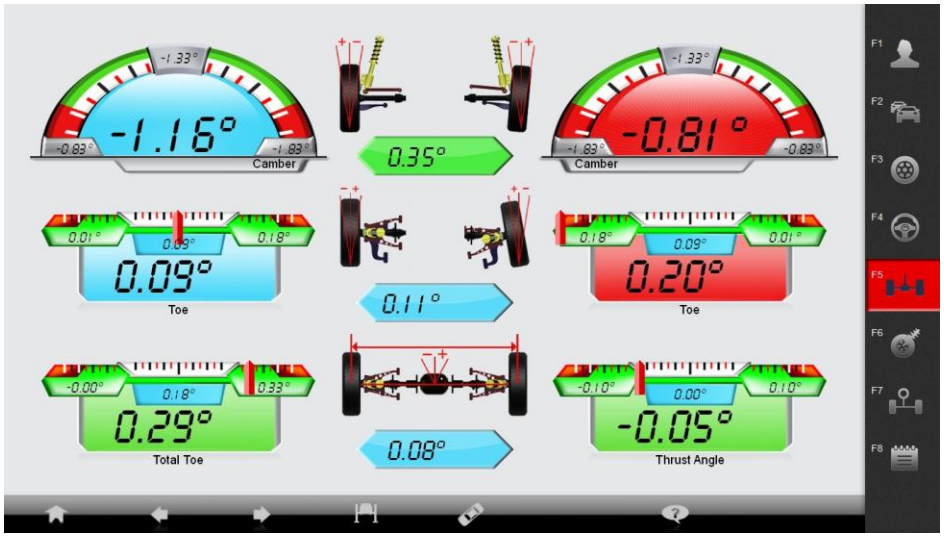
2. **Vehicle Selection** – Select by **Make → Model → Year** or **Make → Year → Model**.



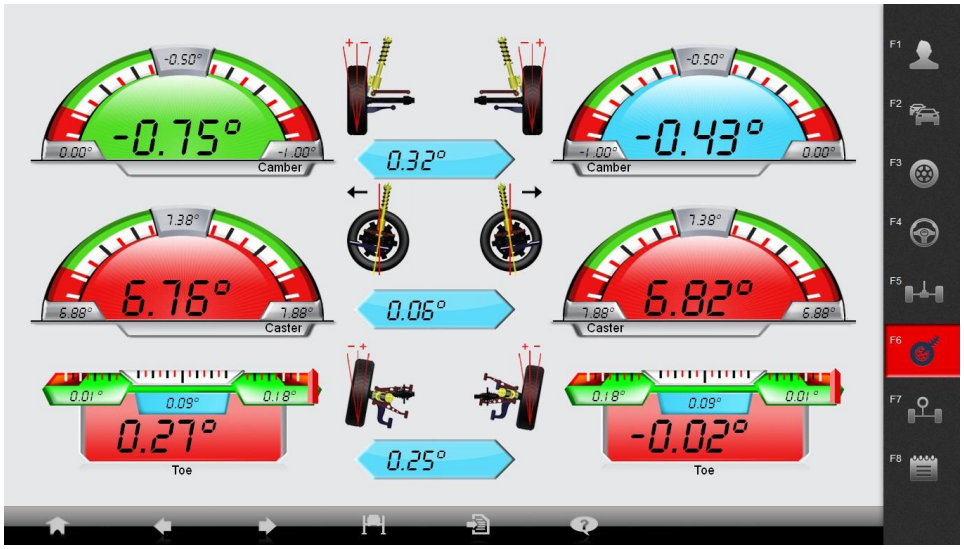
3. **Runout Compensation** – Roll the vehicle to eliminate wheel or clamp eccentricity.

4. **Caster Sweep** – Turn the steering wheel as instructed (typically ±10°).

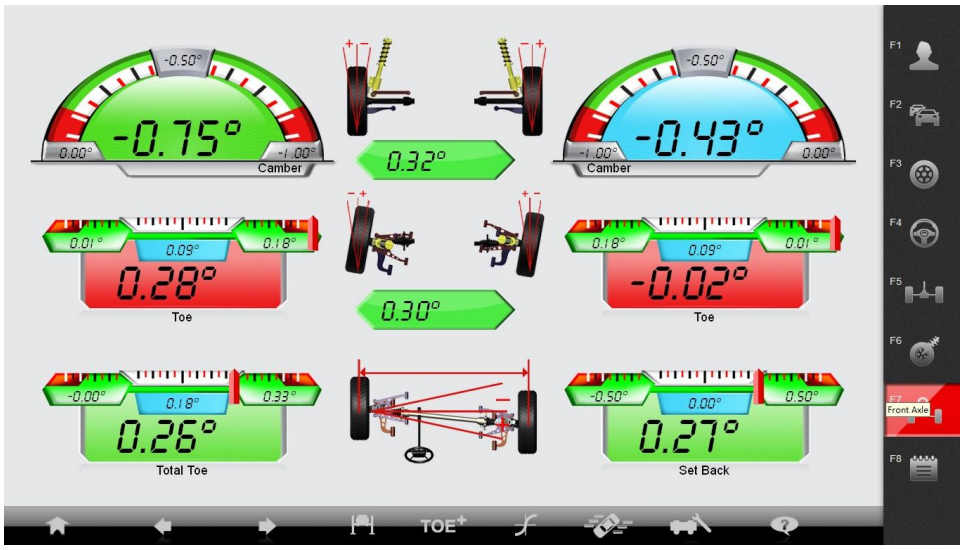
5. **Rear Adjustment** – Adjust rear camber and toe if applicable.



6. **Caster Adjustment** – Adjust caster angle if adjustable on vehicle.



7. **Front Adjustment** – Adjust front camber and toe.



8. **Report and Print** – Review and print final alignment results.

⚙️ **Tip:** Standard Routine automatically activates *Spatial Dynamic Compensation* for continuous accuracy on lifts that are not perfectly level.

4.3 Quick Routine

The **Quick Routine** is designed for fast measurement and basic adjustment — ideal for quick checks or service-lane inspections.

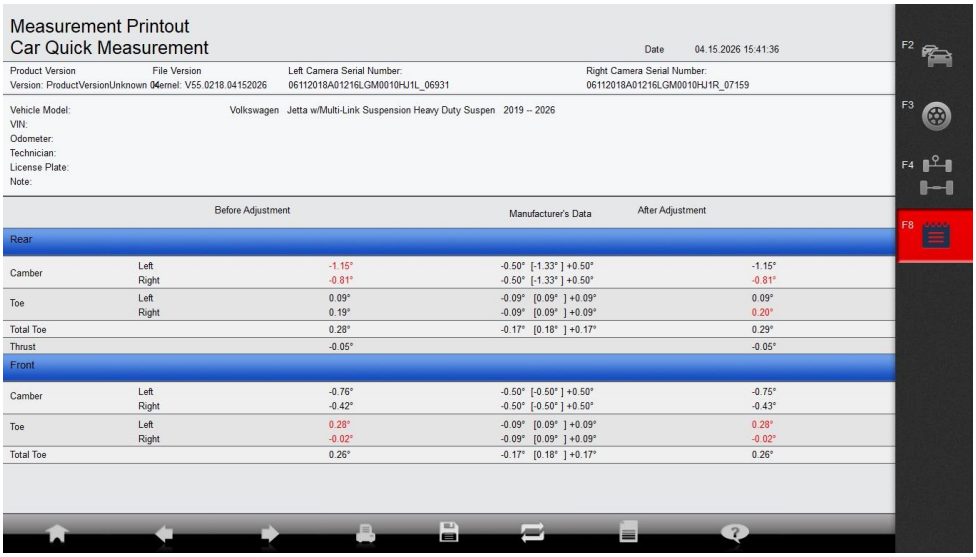
Steps

1. **Vehicle Selection** – Choose the correct vehicle specification.

2. **Runout Compensation** – Perform a short or forward-only compensation roll.

3. **Adjustment Screen** – Make front and rear camber and toe adjustments from a single combined view.

4. **Report and Print** – Print or save the quick alignment report.



Measurement Printout
Car Quick Measurement

Date 04.15.2026 15:41:36

Product Version
Version: ProductVersionUnknown

File Version
Kernel: V55.0218.04152026

Left Camera Serial Number:
06112018A01216LGM0010HJ1L_06931

Right Camera Serial Number:
06112018A01216LGM0010HJ1R_07159

Vehicle Model: Volkswagen Jetta w/Multi-Link Suspension Heavy Duty Suspen 2019 -- 2026
VIN:
Odometer:
Technician:
License Plate:
Note:

		Before Adjustment	Manufacturer's Data	After Adjustment
Rear				
Camber	Left	-1.15°	-0.50° [-1.33°] +0.50°	-1.15°
	Right	-0.81°	-0.50° [-1.33°] +0.50°	-0.81°
Toe	Left	0.09°	-0.09° [0.09°] +0.09°	0.09°
	Right	0.19°	-0.09° [0.09°] +0.09°	0.20°
Total Toe		0.28°	-0.17° [0.18°] +0.17°	0.29°
Thrust		-0.05°		-0.05°
Front				
Camber	Left	-0.76°	-0.50° [-0.50°] +0.50°	-0.75°
	Right	-0.42°	-0.50° [-0.50°] +0.50°	-0.43°
Toe	Left	0.28°	-0.09° [0.09°] +0.09°	0.28°
	Right	-0.02°	-0.09° [0.09°] +0.09°	-0.02°
Total Toe		0.26°	-0.17° [0.18°] +0.17°	0.26°

Notes

- Caster sweep is skipped for time efficiency.
- Useful for tire service or preliminary inspection prior to full alignment.

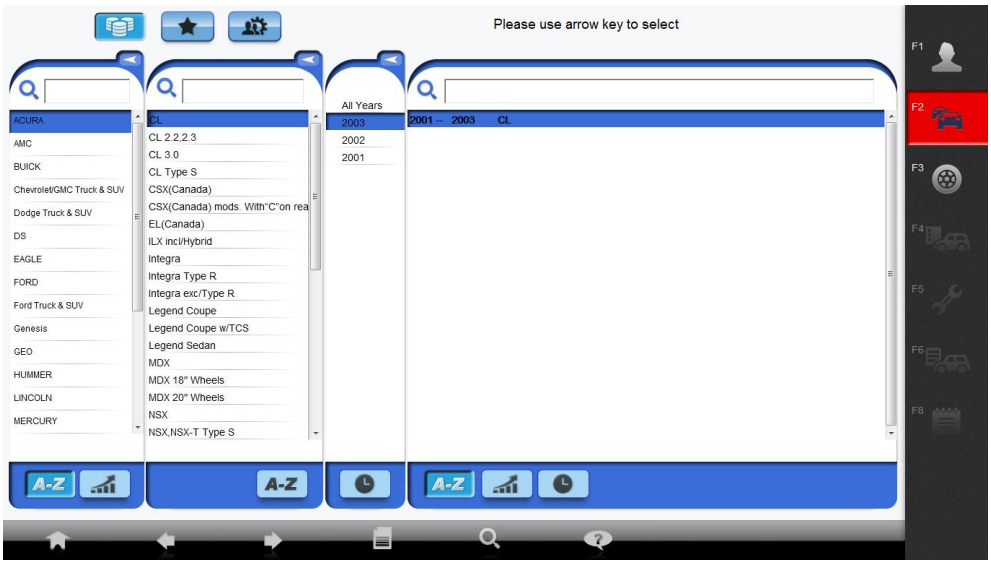
4.4 Precision Routine

The **Precision Routine** provides maximum accuracy and includes additional verification steps.

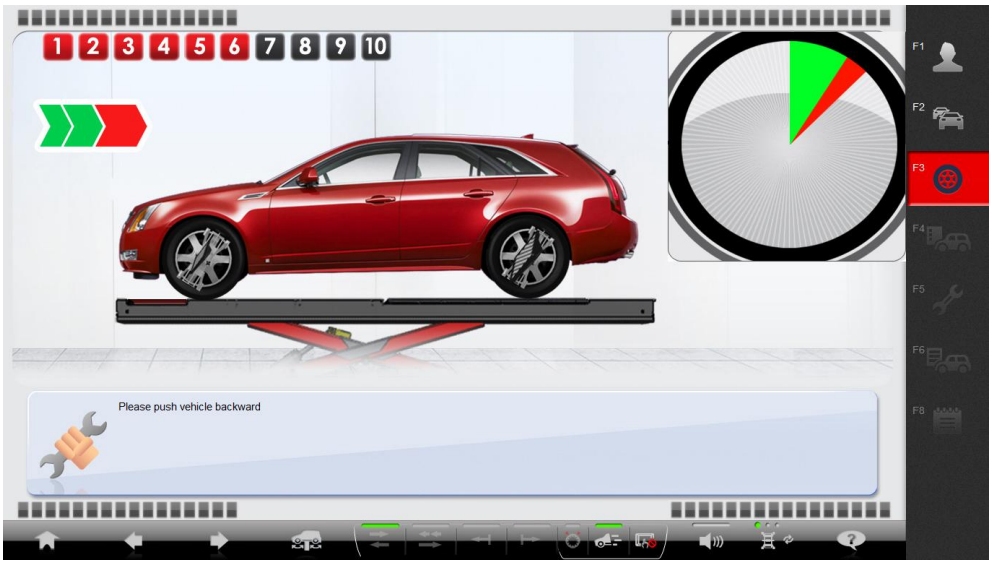
Steps

1. **Customer Information** – Enter or confirm customer details.

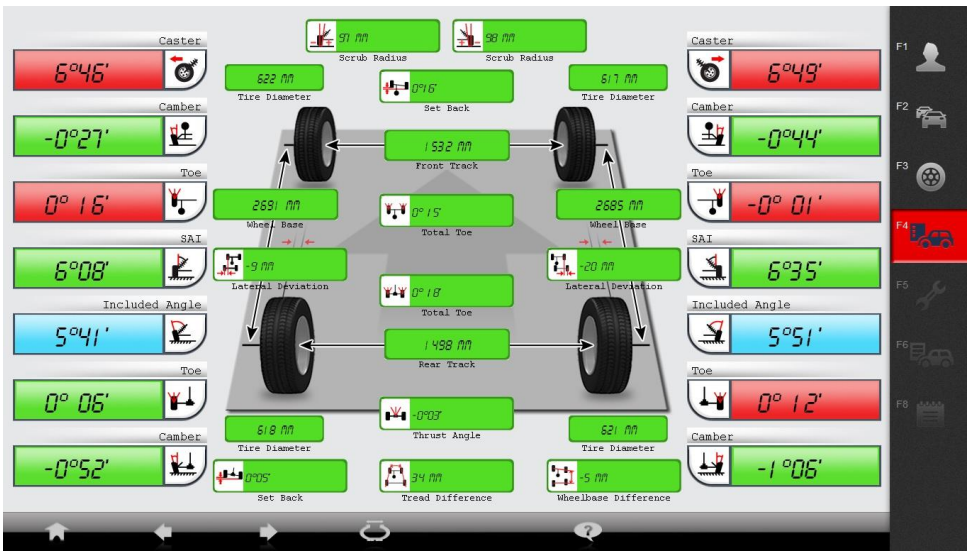
2. **Vehicle Selection** – Select from database as per vehicle year and model.



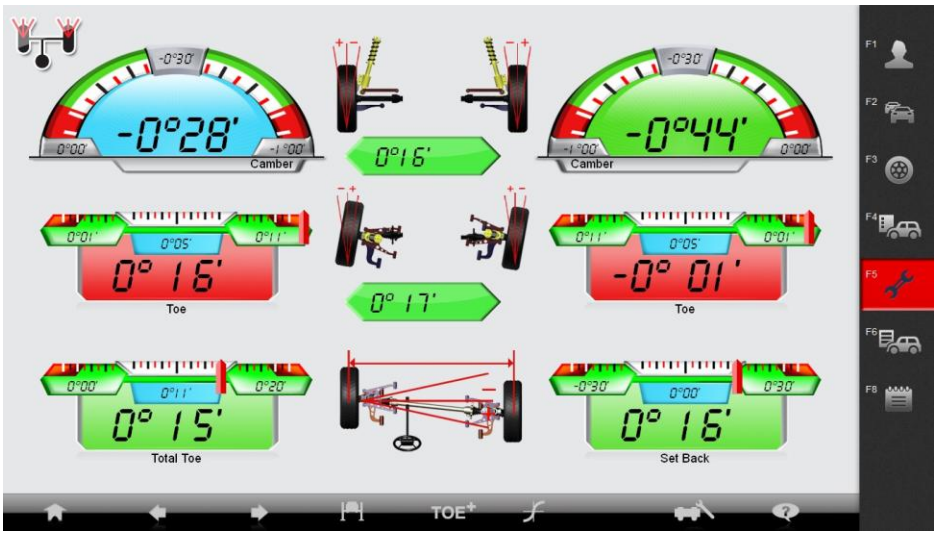
3. **Runout Compensation** – Perform standard or raised runout.



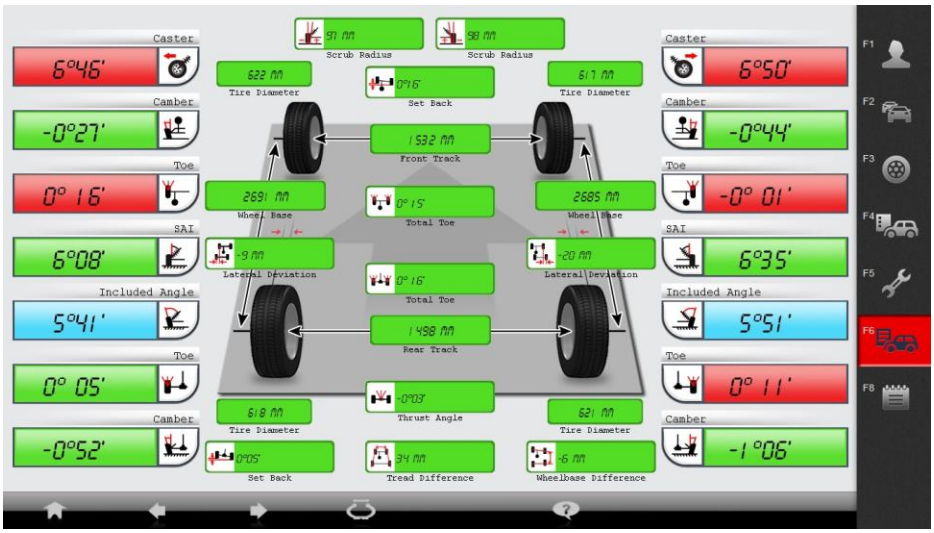
4. **Initial Caster Sweep** – Conduct full sweep (10°–20° range).



5. **Adjustments** – Rear, caster, and front adjustments performed sequentially.



6. **Caster Sweep Recheck** – Verify caster accuracy after all adjustments.



7. **Report and Print** – Print final verification report.

Measurement Printout
Car Standard Measurement

Date 04.15.2026 16:16:03

Product Version: ProductVersionUnknown 0
File Version: Kernel: V55.0218.04152026
Left Camera Serial Number: 06112018A01216LGM0010HJ1L_06931
Right Camera Serial Number: 06112018A01216LGM0010HJ1R_07159

Name:
Corporate Customer:
Cellphone:
Post Code/Zip:

Vehicle Model: Volkswagen Jetta w/Multi-Link Suspension Heavy Duty Suspen 2019 – 2026
VIN:
Odometer:
Note:
Technician:
License Plate:

Manufacturer's Data

Front	Left	Right	Left	Right	Left	Right
Caster	6°46'	6°49'	-0°30' [7°23'] +0°30'	-0°30' [7°23'] +0°30'	6°46'	6°50'
SAI	6°08'	6°35'			6°08'	6°35'
20 Deg. Steering Difference						
Max. Inside Wheel Turn Angle						
Max. Outside Wheel Turn Angle						
Camber	-0°27'	-0°44'	-0°30' [-0°30'] +0°30'	-0°30' [-0°30'] +0°30'	-0°27'	-0°44'
Toe	0° 16'	-0° 01'	-0° 05' [0° 05'] +0° 05'	-0° 05' [0° 05'] +0° 05'	0° 16'	-0° 02'
Total Toe	0° 15'		-0° 10' [0° 11'] +0° 10'		0° 14'	
Set Back	0°16'				0°17'	
Toe Curve	0°00'	0°00'	-0°02' [0°09'] +0°02'	--.--	0°00'	0°00'
Rear	**Left**	**Right**	**Left**	**Right**	**Left**	**Right**
Camber	-0°52'	-1°06'	-0°30' [-1°20'] +0°30'	-0°30' [-1°20'] +0°30'	-0°52'	-1°06'
Toe	0° 05'	0° 12'	-0° 05' [0° 05'] +0° 05'	-0° 05' [0° 05'] +0° 05'	0° 05'	0° 12'
Total Toe	0° 17'		-0° 10' [0° 11'] +0° 10'		0° 17'	
Set Back	0°05'				0°05'	
Thrust	-0°03'				-0°04'	

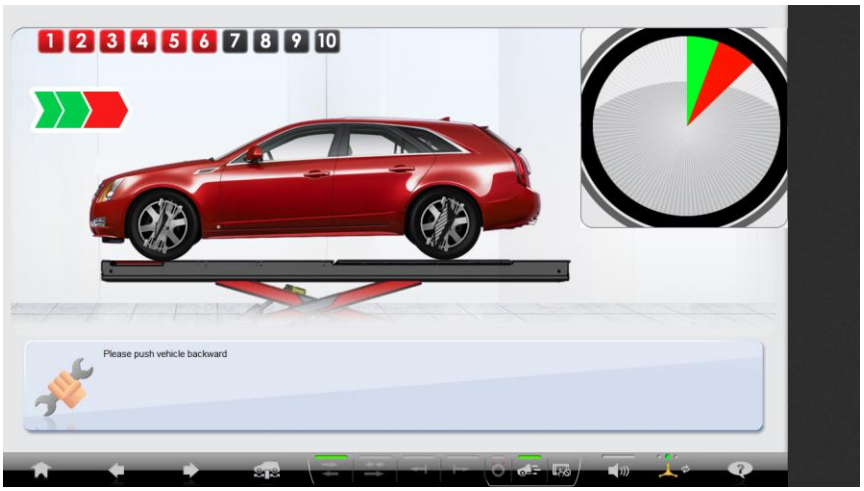
⚙️ **Recommended Use:** For premium service, difficult vehicles, or final verification after suspension repair.

4.5 Random Measurement

Random Measurement allows the operator to access individual functions directly — independent of a full alignment routine.
It is useful for diagnostics, training, or rechecking specific values.

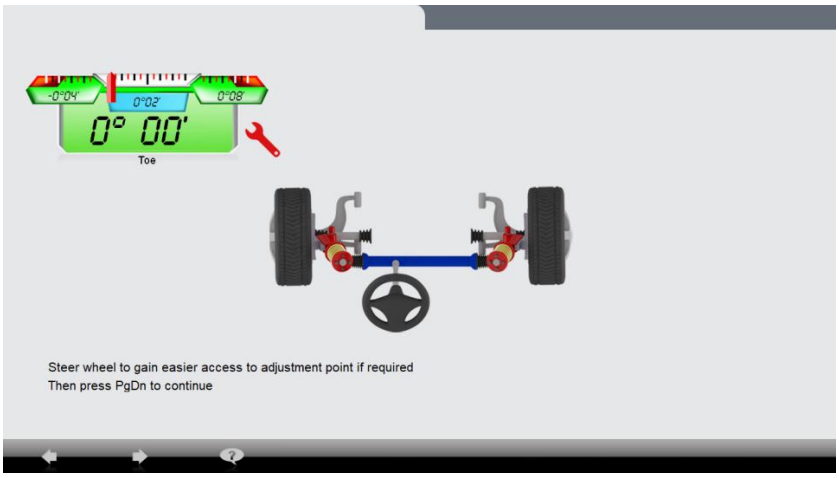
Available Features

- **Runout Compensation** – Perform a single roll or raised compensation.

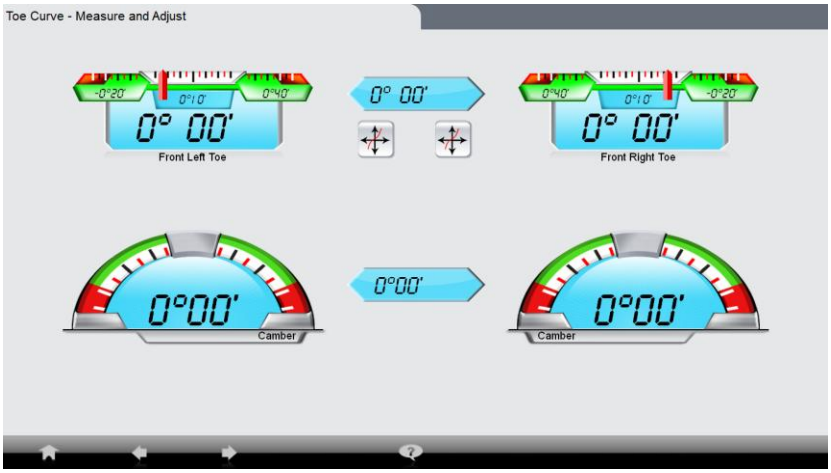


- **Summary Screen** – Display front and rear camber and toe on one screen.

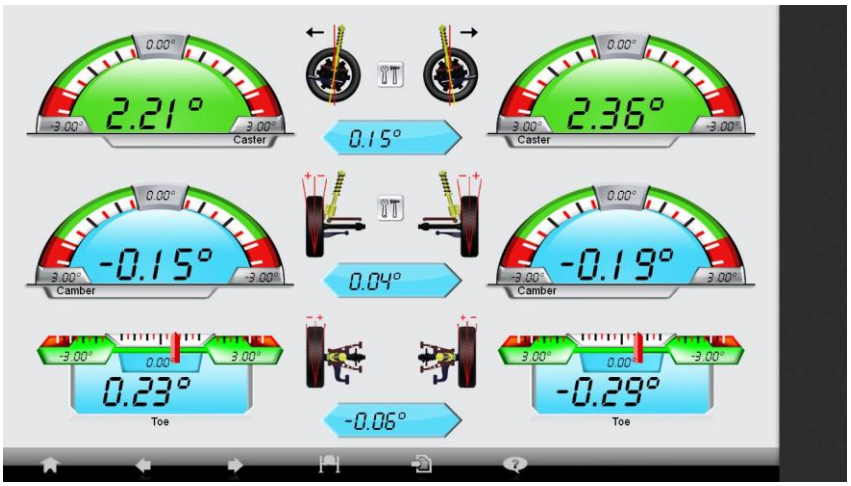
- **Toe Plus** – Guided real-time toe adjustment routine.



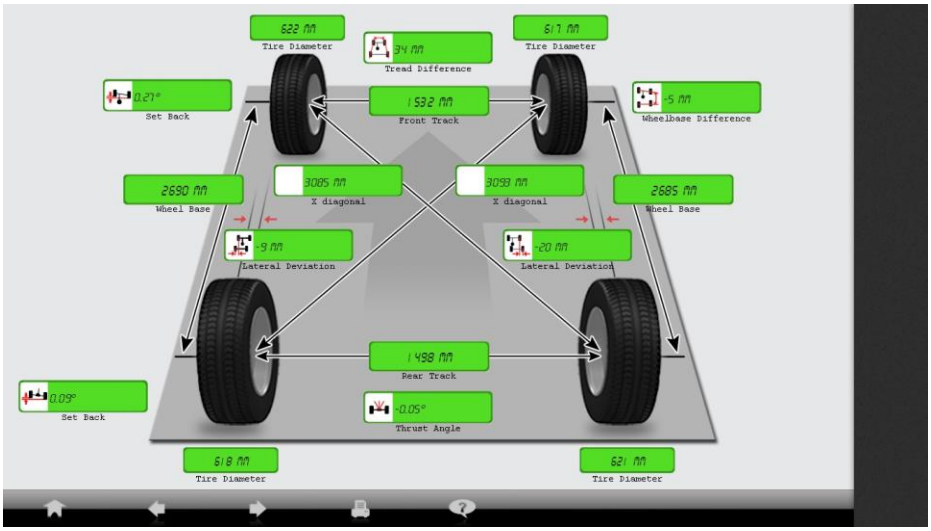
- **Toe Curve** – Volkswagen/Audi procedure for subframe adjustment (VAG 1941 tool).



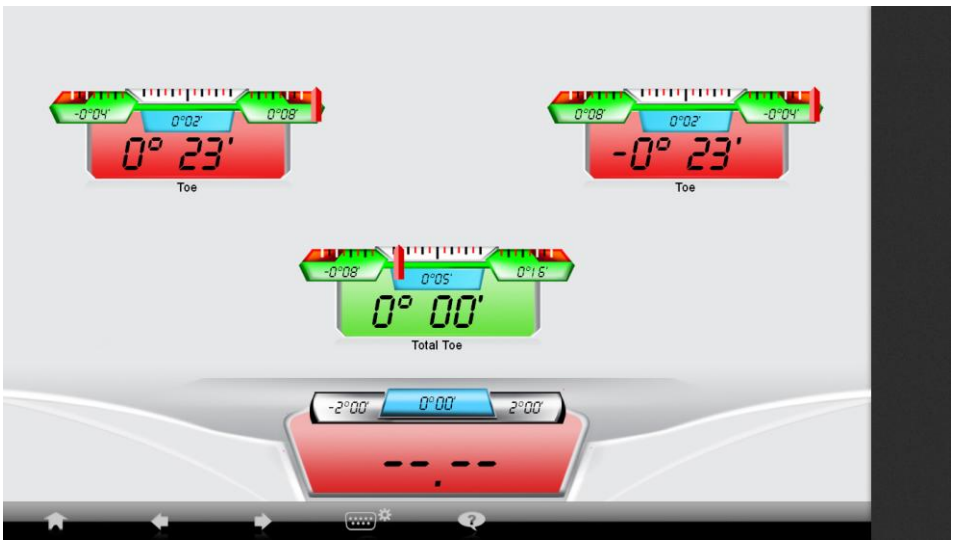
- **Live Caster** – Displays live caster readings during adjustment without new sweep.



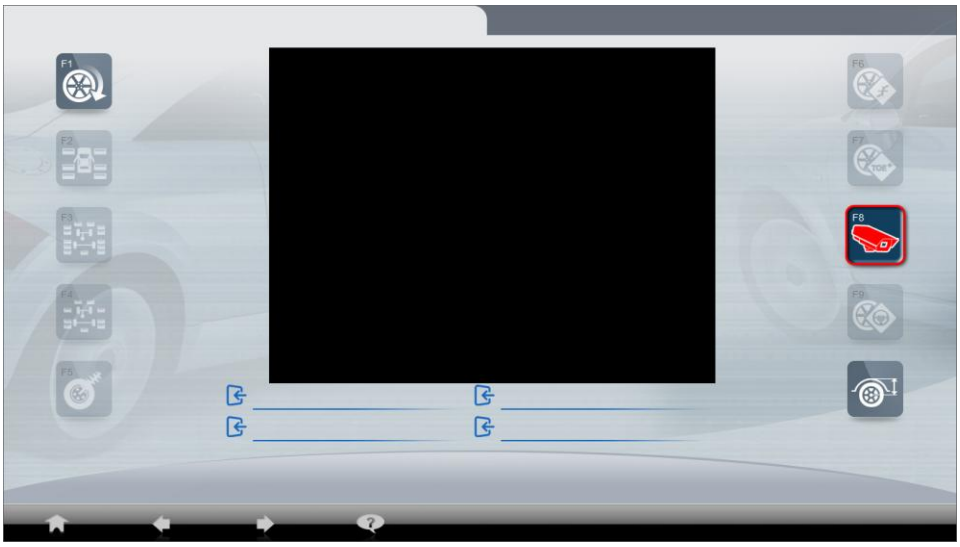
- **Additional Measurements** – Access to extended geometry values such as wheelbase, setback, and track difference.



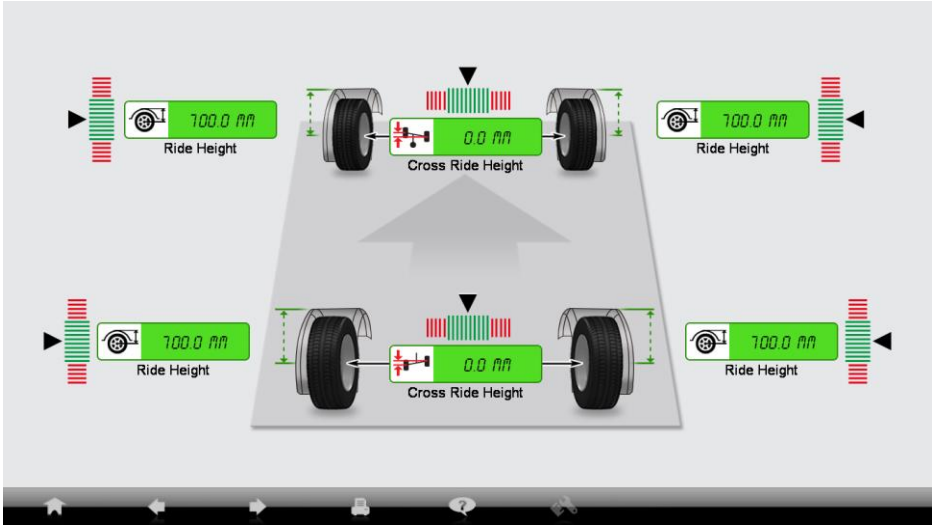
- **Steering Wheel Central (Romess Tool)** – Wireless steering angle display and centering.



- **Camera Monitor** – Live view for verifying target visibility and tracking stability.



- **Ride Height Measurement**



⚙️ **Tip:** Random Measurement mode is independent — exiting it will not overwrite alignment records from Standard or Precision routines.

5.0 Software Features and Advanced Functions

The **TreadPlus Protostar 9000 Series** software is designed for professional use, combining advanced imaging technology with a clean, intuitive interface.
It automates key steps in the alignment process, provides guided on-screen instructions, and ensures precise results through intelligent correction algorithms.

All functions are accessed through the main toolbar or via F-key shortcuts described in Section 6.0.

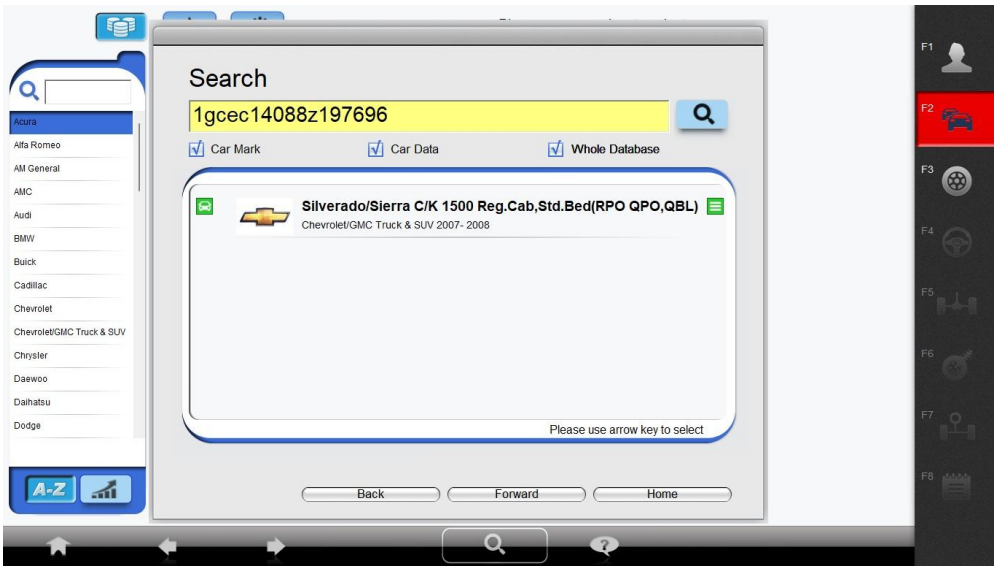
5.1 Vehicle Identification and VIN Scan

The system allows multiple methods of vehicle identification to simplify setup and minimize input time.

Methods of Vehicle Entry

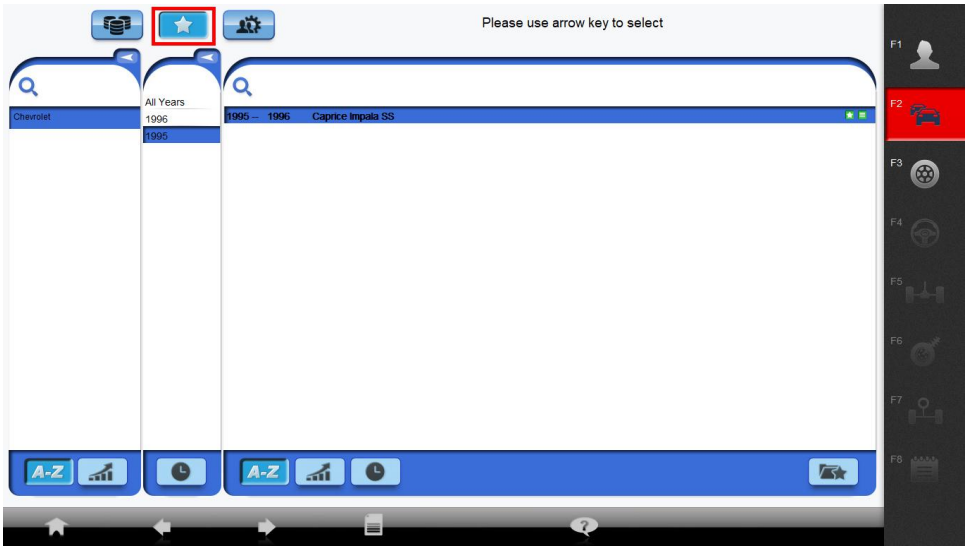
1. **Manual Selection** – Navigate using *Make → Model → Year* or *Make → Year → Model*.

2. **VIN Scan** – Use a connected barcode scanner or integrated camera to scan the vehicle's VIN label (typically located on the driver's door jamb or windshield).

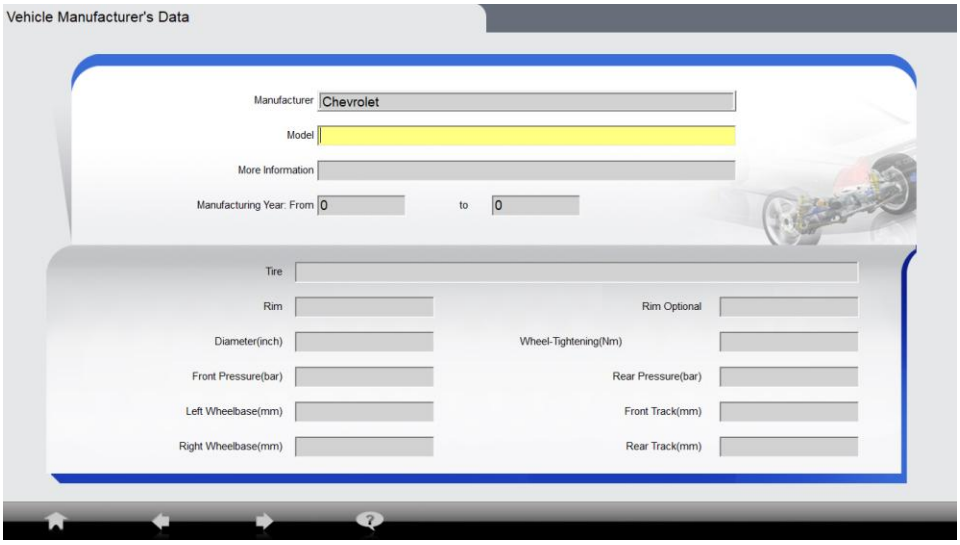


- The VIN decoder automatically identifies the vehicle manufacturer, model, and production year.
- If the VIN is incomplete or non-standard, the user can confirm or adjust the selection manually.

3. **Customer Favorites / Recent List** – Quickly reselect recently aligned vehicles or shop favorites.



4. **Custom Database Entry** – Add or modify alignment specifications for specialty or modified vehicles.



📘 **Note:** VIN scan requires network connection for decoding if not stored in the local database.

5.2 Lift Levelness

Definition

Lift Levelness defines the reference plane on which all vehicle angles are measured. Minor unevenness in the lift surface can affect measurement accuracy if not compensated.

Purpose

- Establish a baseline plane used as the system's zero reference.
- Compensate for small variations caused by floor slope or lift wear.

Nature
A static correction — performed once after installation or relocation.

Effect
Ensures all caster, camber, and toe readings are referenced accurately to a true level baseline.

5.3 Spatial Dynamic Compensation

Definition
An intelligent algorithm that continuously adjusts live measurement data to maintain true geometric accuracy.

Function

- Automatically compensates for lift flex or surface tilt while the vehicle is raised.
- Uses internal coordinate tracking to correct camber and caster data dynamically.
- Operates in real time during all alignment modes.

Benefit
Guarantees consistent readings even on lifts with minor mechanical variance or deflection.

5.4 Alignment Routines in Software

The system includes multiple software-controlled alignment routines:

Routine	Description	Use Case
Standard Routine	Full sequence with customer entry, runout, caster sweep, and adjustment.	Daily use.
Quick Routine	Rapid toe/camber check; no caster sweep.	Service lane or quick check.
Precision Routine	Includes recheck caster sweep for highest accuracy.	Premium service / final verification.
Visual Check	Component checklist; no targets required.	Pre-alignment inspection.
Random Measurement	Direct feature access for diagnostics.	Recheck or training.

5.5 Runout Compensation Options

Different vehicles and workshop layouts require different runout strategies.
The Protostar 9000 supports the following options:

1. **Standard Rolling Compensation** – Roll the vehicle forward and backward to calculate wheel eccentricity.
2. **Raised Compensation** – Lift and rotate each wheel individually when rolling is not possible.
3. **Split Compensation** – Perform runout in two steps for limited space.
4. **Forward Only** – Compensate during a single forward roll (no backward movement).
5. **Backward Only** – Use single backward roll if bay slope or obstruction prevents forward motion.
6. **Rapid Roll** – Shortened rolling distance for time-sensitive operations.

📢 **Audio Prompts:** The software emits tone cues during caster sweep and runout to allow hands-free operation.

5.6 Caster Sweep Options

Sweep Angle	Description	Use Case
7° Sweep	Fastest, lowest precision	Quick check
10° Sweep	Balanced accuracy (default)	General alignment
20° Sweep	Maximum precision	High-performance or sensitive vehicles
Auto-Switch	Auto-upgrade to 20° if excessive rotation detected	Error prevention
Rapid Sweep	Continuous motion sweep for faster capture	Reduces technician effort

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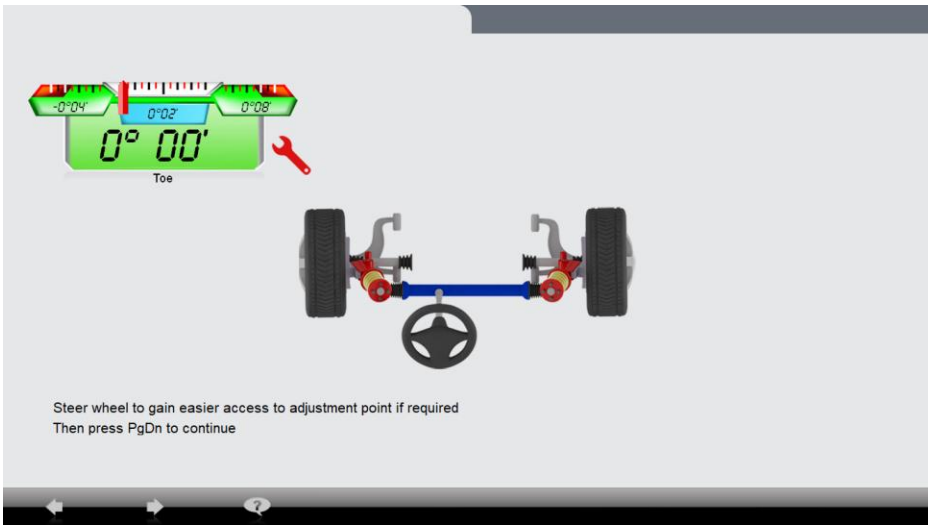
5.7 Toe Plus

Purpose

Guided live toe adjustment that eliminates the need for a steering wheel lock.



Operation

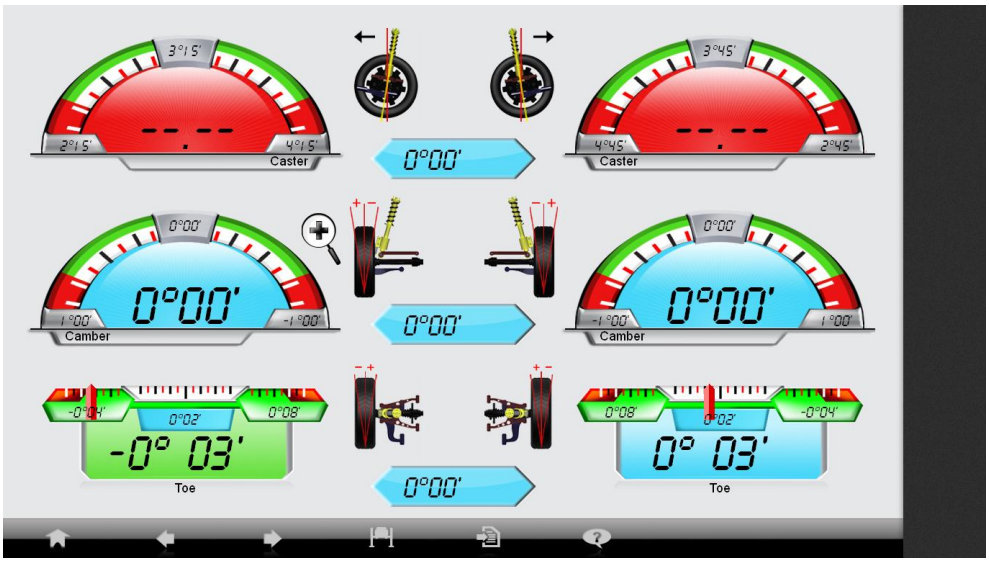
- System automatically tracks steering position.
- Technician adjusts tie rods freely; software compensates steering offset.
- Ends with software-guided centering verification.

Benefits

- Faster toe adjustment
- Real-time live data
- Automatically centers the steering wheel
- No mechanical holder required

5.8 Live Caster

Definition
Displays caster angle changes in real time while the technician adjusts suspension components.



How It Works

1. After initial caster sweep, the system continues monitoring suspension geometry.
2. Caster angle updates live as adjustments are made.
3. No need to perform another sweep after each adjustment.

Benefits

- Saves time
- Prevents over-adjustment
- Simplifies caster setup on heavy-duty or cam-type suspensions

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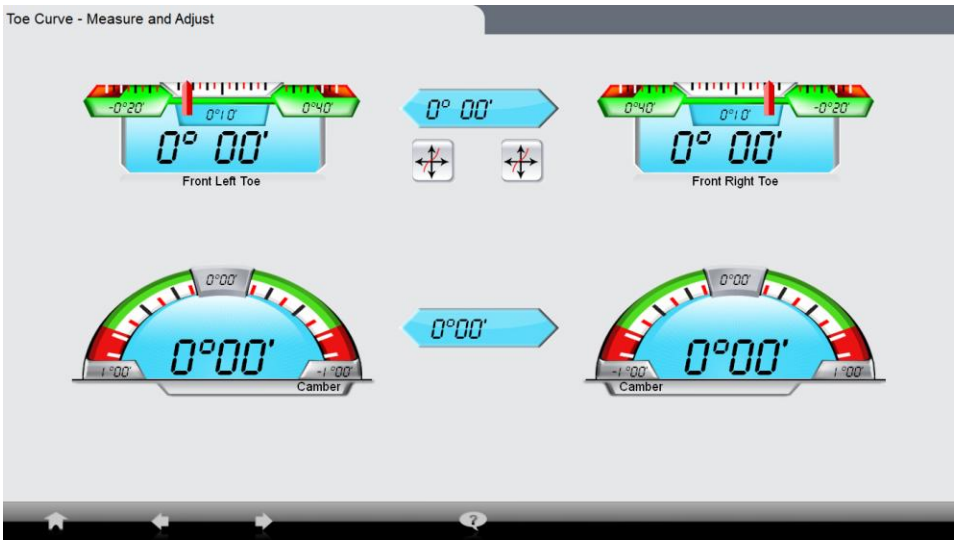
5.9 Toe Curve (VAG Function)

Purpose
OEM-specified verification of steering geometry for certain Volkswagen and Audi models. Measures toe change as the wheels are turned to confirm correct steering rack geometry and subframe position.



Benefit

- Detects subframe or rack misalignment.
- Verifies proper Ackermann angle behavior.
- Ensures correct tracking after collision repair or component replacement.

5.10 Drag Link Adjustment Mode (Commercial Vehicles)

Provides guided total-toe adjustment for vehicles equipped with a **single drag link** instead of individual tie rods (e.g., trucks, vans, commercial chassis).

Function Overview

- Accessed from the **Front Axle Adjustment screen**
- Enter by clicking the **Drag Link icon**
- Designed for single-point toe adjustment systems
- Displays live total-toe reading and steering wheel center guidance

How It Operates

- Operator first centers the steering wheel
- System monitors total toe
- After initial toe positioning, steering wheel is **locked with a steering-wheel holder**
- Drag-link sleeve is adjusted to set toe and maintain steering wheel center

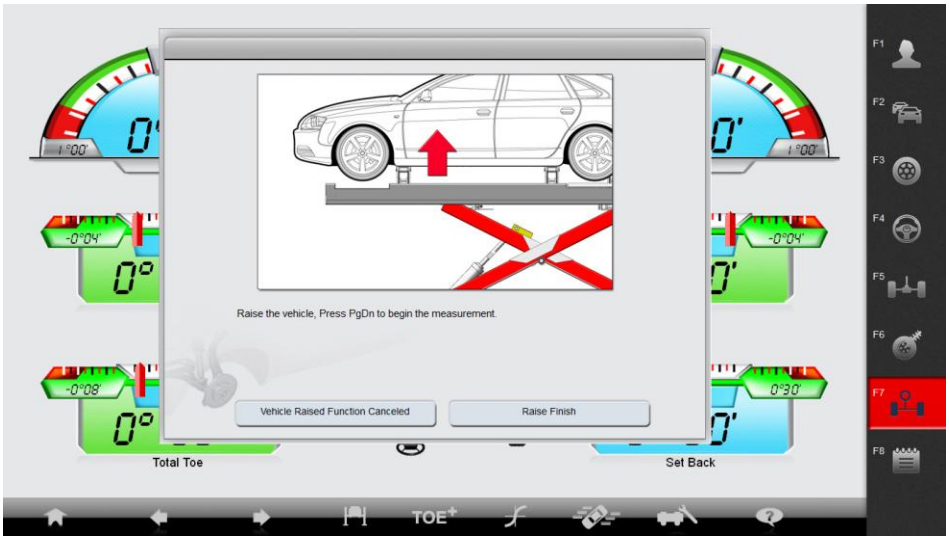
Benefit
Ensures accurate steering-center and thrust alignment for commercial vehicles where **individual toe adjustment is not possible**.

5.11 Raised Mode

Enables camber adjustment with the **suspension unloaded** where camber adjusters are only accessible with wheels hanging (strut top bolts, control arm eccentrics, HD truck suspension, etc.).

Function Overview

- Accessed from the **Front Axle Adjustment screen**
- Enter by pressing the **Raised Mode icon**
- System **simulates loaded camber value** while vehicle is lifted
- Live value updates automatically once vehicle is lowered to alignment height



Use Case

- When OEM requires unloading of suspension to access camber adjusters
- Solid-axle trucks, high-travel suspensions, or vehicles with limited access

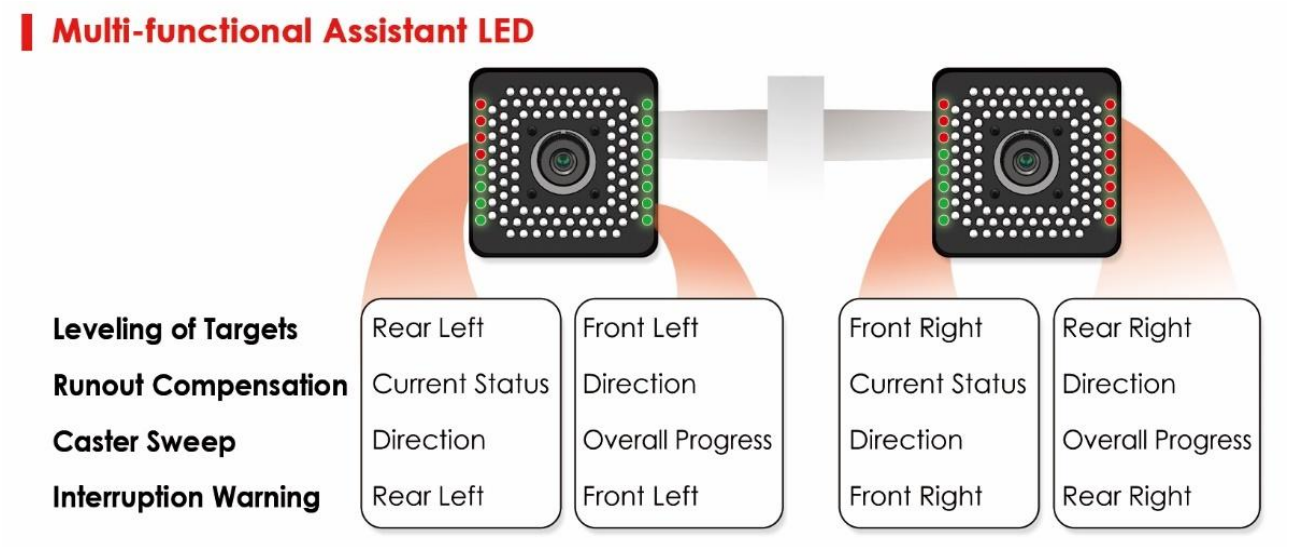
Benefit
Provides safe, accurate camber adjustment without losing reference plane or measurement integrity.

5.12 VisionCue LED System

Function
An LED indicator array integrated into the camera beam providing real-time visual feedback.

Features

- **Caster Sweep Guidance** – Indicates direction and rotation limits.
- **Runout Indication** – Flashing pattern signals forward/backward roll direction.
- **Blocked Target Alert** – Warns when a target is obstructed or out of view.
- **System Status** – Green = ready, red = error, flashing = initialization.



Benefits

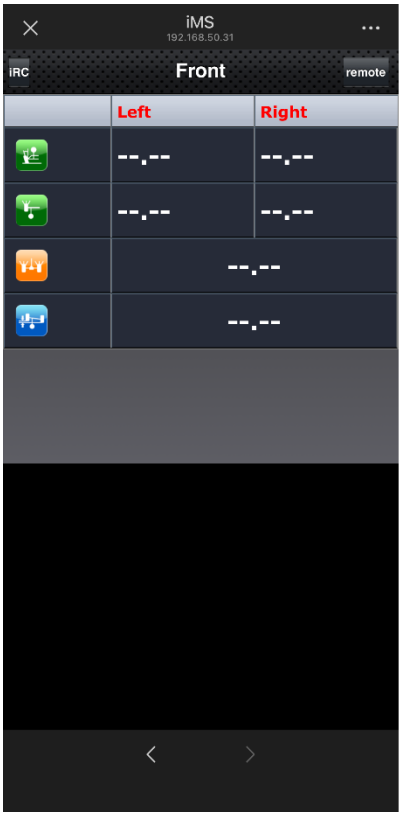
- Reduces technician movement between beam and monitor.
- Provides continuous visual cues near the working area.
- Prevents missteps during runout or caster sweep.

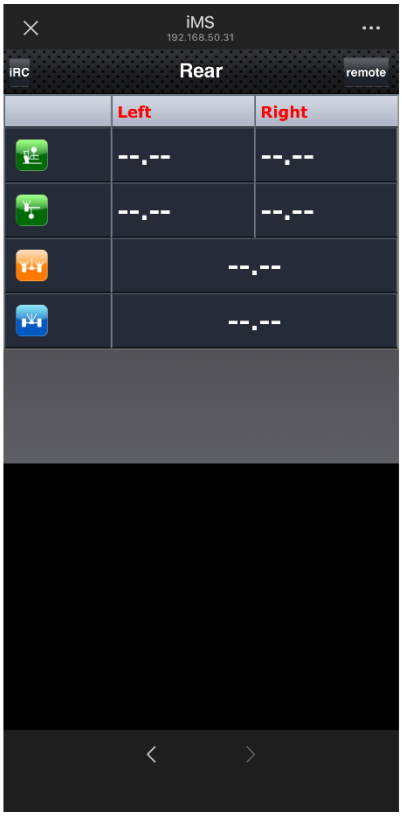
5.13 QR Remote (iOS / Android)

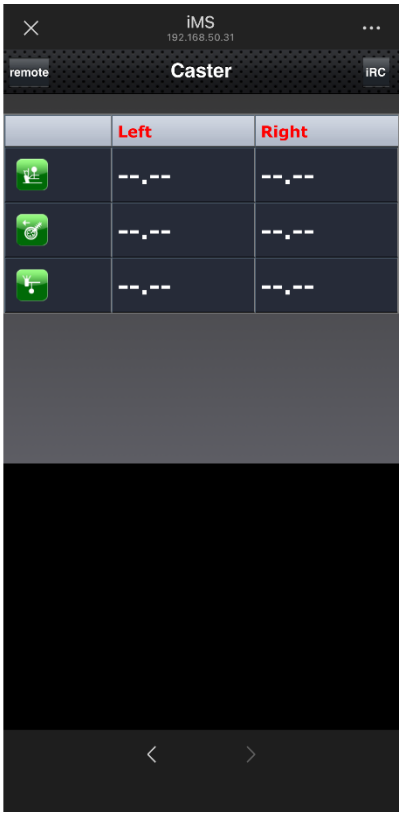
Purpose
Allows the technician to control the aligner using a smartphone or tablet.

Operation

1. From the alignment screen, display the QR code.
2. Scan the QR code with the mobile device camera.
3. The mobile browser opens a secure remote interface.
4. Technician can change screens, view live data, and control measurement functions.

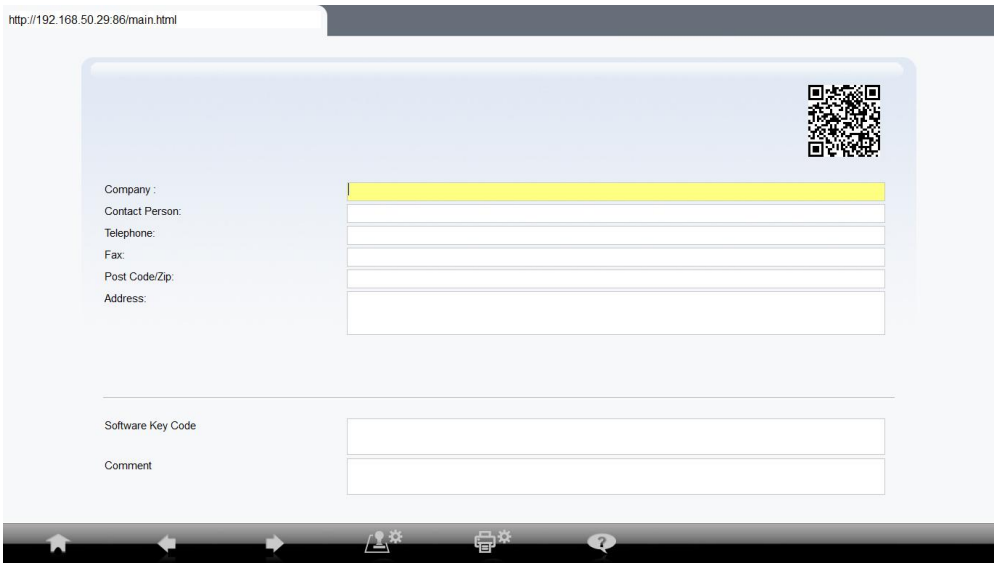






Advantages

- No extra hardware required.
- Supports multiple connected users.
- Reduces back-and-forth movement between vehicle and PC.



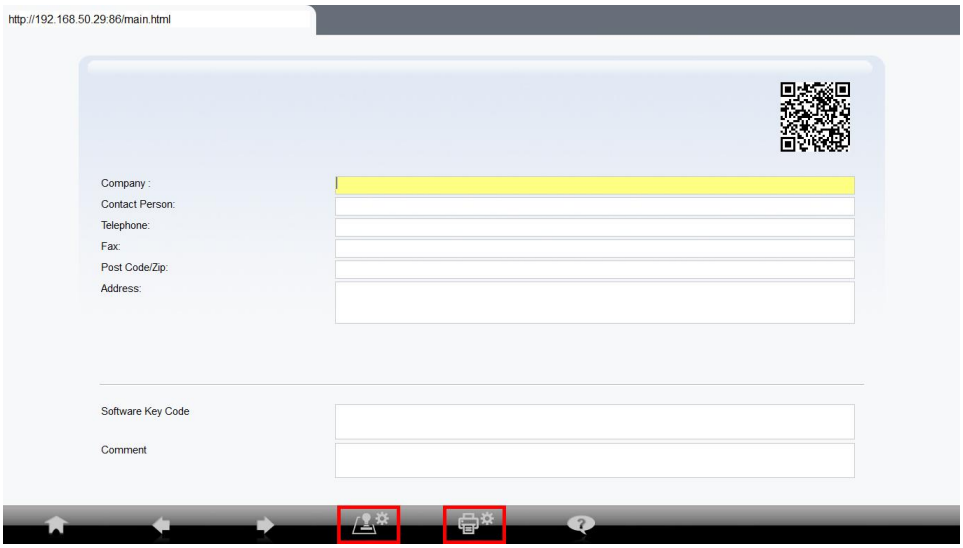
5.14 Customizable Print and Report Format

Features

- Add shop logo, contact details, and footer messages.
- Choose between detailed technical reports or simplified customer versions.
- Display numeric values, bar graphs, or pass/fail color indicators.
- Optional inclusion of technician notes, alignment type, and diagnostic flags.

Export Options

- Print directly from PC
- Save as PDF
- Supports multiple languages and unit systems



5.15 Diagnostic Alignment Warning (ADAS-Linked)

Function

The **Diagnostic Alignment Warning** feature automatically analyzes each alignment result in relation to both mechanical geometry and the vehicle's stored database profile.
It serves two purposes:

1. Detects measurement inconsistencies or setup errors.
2. Identifies whether the selected vehicle model includes **Advanced Driver Assistance Systems (ADAS)** and prompts the technician accordingly.

Operation

- During or after measurement, the software compares the selected vehicle entry against the database.
- If the vehicle is flagged as **ADAS-equipped**, the system automatically adds a **warning line** on the **printed alignment report**.
- The warning advises the workshop that one or more ADAS features (such as camera, radar, or lane-keeping sensors) **may require calibration** after alignment.

Example Display on Report

⚠️ *This vehicle may be equipped with one or more ADAS systems.*
Calibration is recommended following wheel alignment.

Diagnostic Alert Conditions

In addition to the ADAS message, the system also monitors alignment data for irregularities such as:

- **Thrust Angle Deviation** beyond tolerance
- **Left/Right Camber or Caster Imbalance** exceeding database limits
- **Unstable Toe Values** caused by turn-plate binding or vehicle movement
- **Ride Height or Chassis Angle Mismatch** relative to vehicle specification

When any of these conditions are detected, a **Diagnostic Alert Icon** appears on-screen and the result is flagged on the printed report.

Benefits

- **ADAS Awareness:** Automatically reminds technicians of potential calibration requirements, reducing liability.
- **Professional Reporting:** Printed warning line ensures transparency with customers and insurance documentation.
- **Error Detection:** Flags possible setup, mechanical, or data input issues before finalizing results.

- **Integration:** Uses the same vehicle database used for alignment specifications, ensuring consistent and automatic identification.

Notes

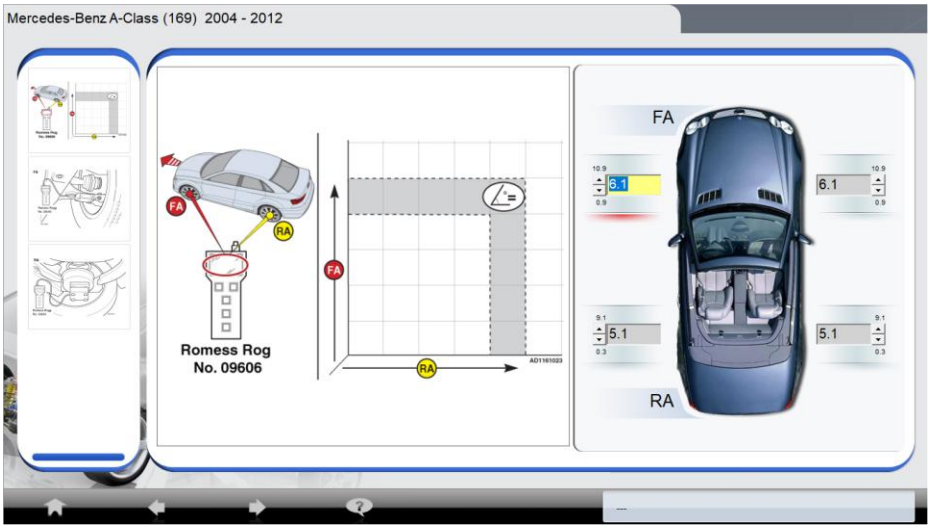
- The ADAS linkage is embedded within the **regional vehicle database** and updated through specification updates.
- The warning does **not replace OEM calibration procedures** — it only alerts that calibration *may be required*.
- When **Diagnostic Warning** is toggled off (via *Ctrl + A*), ADAS notice lines will not print.
- Shops using **Cosmic Web / TreadPlus Hub** can log these ADAS-linked vehicles for calibration tracking and service records.

5.16 Ride Height and Chassis Angle Databases

Certain manufacturers (BMW, Mercedes-Benz, Renault, PSA) require alignment values that depend on vehicle ride height or chassis inclination.

Function

- Prompts technician to measure ride height or chassis angle before loading vehicle specs.
- Software then applies correct camber and toe targets for that configuration.



Tools Supported

- Romess CM-09606 inclinometer (for chassis angle)
- Tape or digital gauge (for ride height input)

5.17 Custom and Favorite Vehicle Databases

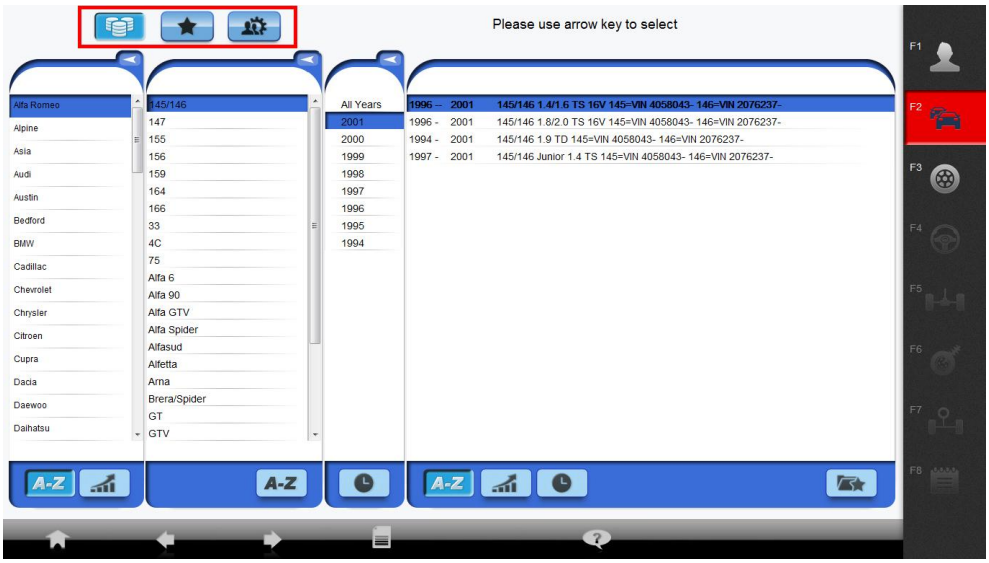
Workshops can save customized alignment data or favorite models for quick recall.

Functions

- Mark common vehicles as favorites.
- Store modified or fleet-specific specifications.
- Share across technicians within the same shop account.

Benefits

- Improves workflow efficiency.
- Ensures consistent results across multiple operators.
- Reduces setup time for repeat customers.



6.0 Software Configuration and Shortcut Keys

The **TreadPlus Protostar 9000 Series** software allows full customization of measurement behavior, display precision, and user preferences through a structured configuration menu. Access configuration settings from the **Main Menu → Configuration**, or by pressing the corresponding **F-key (F1–F11)** on the keyboard.

Only trained personnel or workshop supervisors should modify configuration parameters.

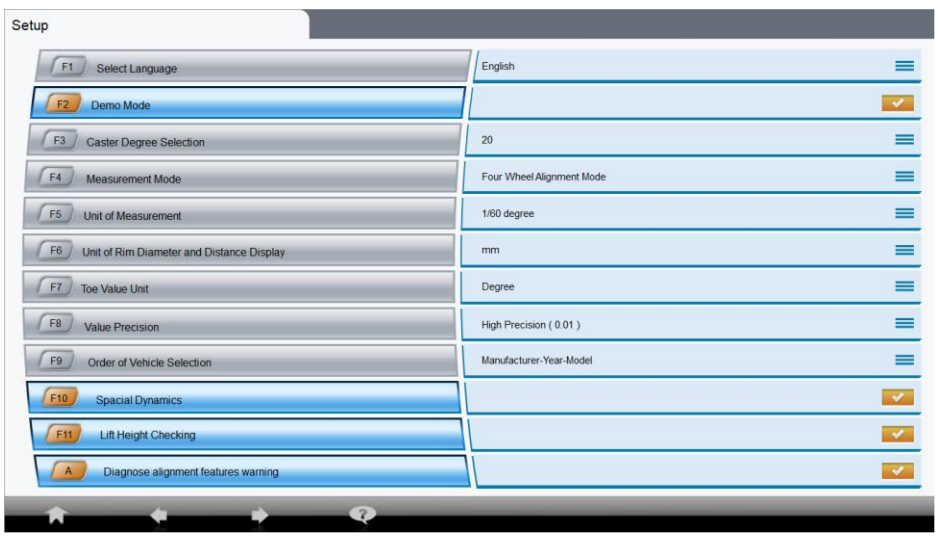
6.1 Configuration Menu Overview

Each function key (F1–F11) represents a specific configuration item.
Press the function key once to open its setting; press **PgDn / PgUp** to change values; press **Enter** to confirm.

6.2 Configuration Menu Functions (F1–F11)

Key	Function	Description
F1 – Language	Select the user interface language.	Choose preferred operating language (English, Spanish, French, Chinese, etc.).
F2 – Demo Mode	Enables or disables demonstration mode.	Simulates alignment procedures for showroom or training use.
F3 – Default Caster Sweep	Sets default steering sweep angle.	Options: 7°, 10°, or 20° (default = 10°).
F4 – Measurement Mode	Selects alignment type.	2-Wheel (front only) or 4-Wheel alignment.
F5 – Unit of Angle Measurement	Defines display format for angles.	Choose **1/100°** or **1/60°** (degrees and minutes).
F6 – Unit of Rim & Distance	Sets units for rim diameter and distance gauge.	Options: **mm** or **inch**. When using mm/inch, rim size must be entered for each vehicle.

Key	Function	Description
F7 – Toe Value Unit	Defines preferred toe measurement unit.	Choose **Degree**, **mm**, or **inch**.
F8 – Value Precision	Sets numeric display resolution.	Camber: 0.1°, Toe: 0.01° (default). Options: 0.01 / 0.05 / 0.1.
F9 – Vehicle Selection Order	Determines how vehicles are selected from the database.	Choose **Make → Year → Model** or **Model → Year → Make**.
F10 – Spatial Dynamics	Enables or disables dynamic geometric compensation.	Automatically adjusts readings for lift tilt or body movement during alignment.
F11 – Lift Height Check / Auto Tracking	Activates height verification and automatic beam tracking.	Monitors lift height and adjusts camera view automatically.



⚙ **Note:** After configuration changes, restart the software to apply new settings.

6.3 Diagnostic Alignment Warning (Ctrl + A)

Function

Displays a diagnostic alert on screen and printed report when readings deviate beyond expected ranges.

Examples of Diagnostic Alerts

- Excessive thrust angle deviation
- Large left/right camber imbalance
- Unstable toe values due to turn plate movement
- Measurement inconsistency between compensation and adjustment

📘 **Tip:** Enable this feature to assist technicians in identifying setup errors or mechanical faults early in the process.

6.4 Shortcut Keys

The following keyboard shortcuts allow technicians to navigate and operate the software efficiently without leaving the vehicle.

Key / Combination	Function	Usage Description
PgDn	Next / Forward	Move to the next screen or step.
PgUp	Previous / Backward	Return to the previous screen.
Home	Home Screen	Return directly to the main menu.
F1	Visual Check	Start pre-alignment inspection.
F2	Standard Measurement	Launch standard alignment routine.
F3	Quick Measurement	Start quick alignment routine.
F4	Random Measurement	Access individual measurement functions.
Ctrl + Click on F2	Precision Mode	Activates precision alignment procedure.
Ctrl + Q	Target Recognition	Re-scan all targets for detection or identification.
Ctrl + C	Distance to Front Targets	Displays distance from camera beam to front targets.

Key / Combination	Function	Usage Description
Ctrl + B	Distance to Rear Targets	Displays distance from camera beam to rear targets.
Ctrl + A	Diagnostic Alignment Warning	Enables or disables diagnostic alert system.
Esc ×2	Power Off PC	Safely shuts down the system.
Esc then F8	Exit to Windows	Enter password when prompted to return to desktop.

🧭 **Tip:** Shortcut keys allow full operation during alignment, especially when the technician is working at the vehicle.
Use **PgDn** to advance screens hands-free while adjusting suspension.

6.5 Configuration Recommendations

For best performance in professional workshops:

- Keep **Spatial Dynamics (F10)** enabled.
- Use **1/100°** unit mode for precise data recording.
- Set **Caster Sweep Default** to 10° for most vehicles.
- Enable **Lift Auto Tracking (F11)** if using scissor lifts or variable height systems.
- Leave **Diagnostic Alerts (Ctrl + A)** enabled to flag inconsistent readings.

7.0 Maintenance and Service Procedures

Regular maintenance ensures consistent accuracy, extends equipment life, and reduces downtime.
The following procedures should be carried out by trained workshop personnel according to the recommended schedule.
Calibration and internal service adjustments must only be performed by authorized TreadPlus service technicians.

7.1 Daily Maintenance

Perform these checks at the beginning or end of each workday.

Item	Procedure	Purpose / Notes
System Power-On	Verify system startup and proper communication between PC and camera beam.	LEDs on VisionCue should illuminate briefly during initialization.
Camera Beam & Posts	Check that the beam is securely mounted and post bolts are tight.	Loose mounting may cause inaccurate readings.
Wheel Clamps	Clean contact surfaces and check that clamp fingers move freely.	Prevents slippage and maintains secure fit.
Targets	Wipe target plates with a soft microfiber cloth.	Dust or smudges may affect image recognition.
Wheel Chocks	Ensure wheel chocks are available and in use during setup.	Prevents accidental vehicle movement.
Cables & Connectors	Inspect for kinks, pinches, or wear.	Damaged cables should be replaced immediately.
PC & Monitor	Confirm display clarity and stable connection.	Replace loose or damaged cables as needed.
Printer Check	Ensure report printer has paper and ink.	Avoids downtime during alignment output.

7.2 Weekly Maintenance

Item	Procedure	Purpose / Notes
Camera Lenses	Inspect lenses for dust or oil residue. Clean gently with a dry lens cloth only.	Avoid touching the sensor or using solvents.
Clamp Threads & Levers	Apply a small amount of light lubricant to threaded parts if movement feels stiff.	Do not over-lubricate; keep surfaces clean.

Item	Procedure	Purpose / Notes
Turn Plates & Slip Plates	Check for free movement and debris buildup.	Binding plates cause incorrect toe readings.
System Storage	Remove unnecessary temporary files or reports.	Maintains fast boot and measurement performance.

7.3 Monthly Maintenance

Item	Procedure	Purpose / Notes
Beam Alignment Check	Verify camera beam height and tilt visually.	Ensure beam remains level to the lift surface.
PC Backup	Perform system data backup using the built-in Backup/Restore tool.	Backup includes database, configuration, and reports.
Software Version	Confirm latest version via “About” screen.	Contact TreadPlus if update is available.
Lift Condition	Inspect lift for oil leaks, unusual noises, or uneven raising.	Ensure the lift platform remains level.
Wheel Clamp Condition	Inspect for bent arms or worn rubber pads.	Replace damaged components promptly.

7.4 Semi Annual Maintenance

Performed every six months or 1,000 operating hours.

Item	Procedure	Purpose / Notes
Camera Beam Mounting	Check the integrity of the beam-to-post connection.	Tighten all structural fasteners.
Post & Base Hardware	Verify anchor bolts (AIO and Standard) or cabinet mount bolts (Mobile).	Re-torque if necessary.

Item	Procedure	Purpose / Notes
System Fan & Ventilation	Clean intake vents on the computer and camera beam if dusty.	Prevents overheating.
Database Synchronization	Back up alignment database and update specifications if applicable.	Keep data current for new vehicle models.

7.5 VisionCue and LED Indicator Check

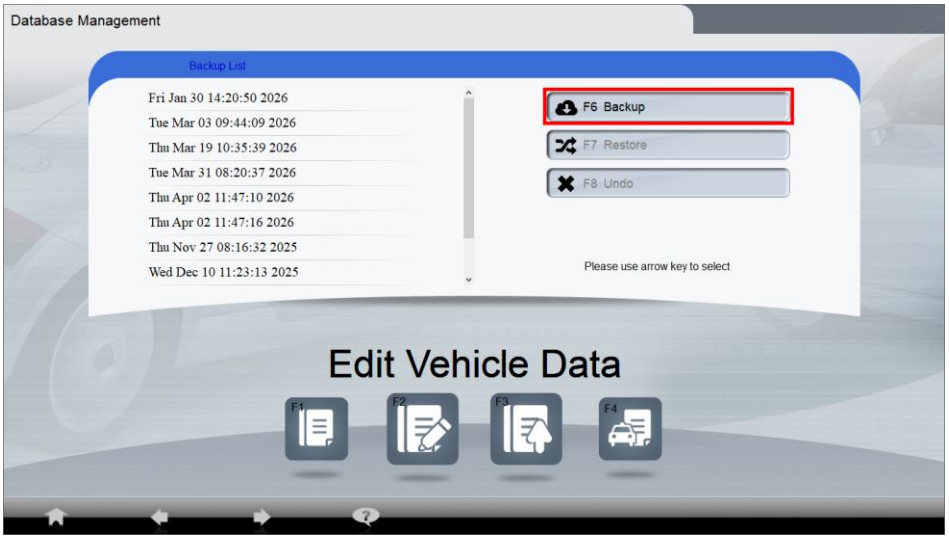
1. From the main screen, access **Diagnostics → Beam LED Test**.
2. Verify each VisionCue LED segment lights up sequentially.
3. If any LED fails, note the section and contact service support.
4. Do not disassemble the beam; LED modules are factory-calibrated.

📘 **Tip:** VisionCue LEDs are integral to the camera assembly. Do not apply cleaners directly onto LED panels.

7.6 Software Backup and Restore

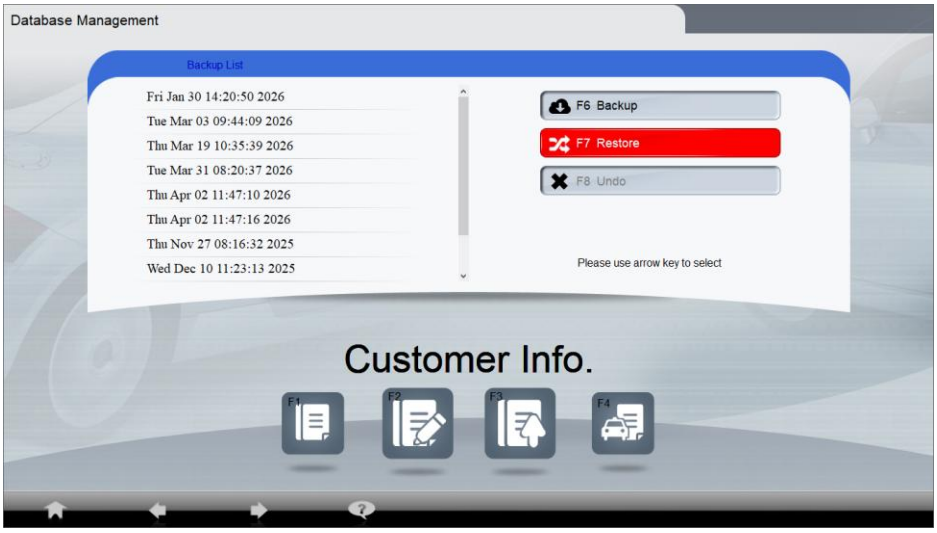
To perform manual backup:

1. Go to **Management → Maintenance → Database Backup/Restore**.
2. Choose **Backup**, select destination (local or USB drive).
3. Confirm operation. The system saves all customer, vehicle, and report data.



To restore:

1. Access the same menu and choose **Restore**.
2. Select backup file (.tpb format).
3. Confirm restart after completion.



⚠️ Always perform backup before software updates or configuration changes.

7.7 System Reinstallation or Update

- Only authorized service centers may reinstall or update alignment software.
- During update, confirm **dongle or license key** is present.

- Retain backups of all data and configurations before reinstalling.

7.8 Calibration Notice

- **Calibration is not required during normal installation or movement of the system** unless the camera beam, posts, or targets are replaced.
- **Calibration procedures must only be performed by trained TreadPlus service technicians.**
  Unauthorized calibration may result in incorrect readings and void warranty coverage.

7.9 Service Contact

For all service, parts, and technical inquiries:

TREADPLUS Technical Support
📧 **service@treadplus.com**
All service communication should include model name, serial number, and a brief description of the issue.

8.0 Diagnostic & Troubleshooting Guide

This section provides quick reference solutions for common messages, warnings, or measurement irregularities encountered during operation.
Follow each recommended action before contacting TreadPlus Technical Support.
If the issue persists, record the error message and system serial number before emailing **service@treadplus.com**.

⚠️ **Important:**
Only trained personnel should perform checks described in this section.
Do **not** attempt internal calibration, firmware reset, or hardware disassembly unless authorized by TreadPlus.

8.1 General Startup Issues

Symptom / Message	Possible Cause	Corrective Action
System does not power on	PC power switch off or loose power cable.	Check power cord and outlet. Verify cabinet main switch is ON.
No camera connection detected	USB or data cable disconnected, camera beam not powered.	Verify beam power cable and USB data cable are properly connected.
VisionCue LEDs not illuminating	Beam power off or initialization fault.	Confirm 24V power supply and connection at post. Restart system.
Software fails to start	Missing or corrupted configuration file.	Restart Windows → Run alignment software → If error persists, contact service.
"Dongle Not Found" message	USB license key removed or damaged.	Reinsert dongle and restart software. If not detected, contact service.

8.2 Target and Clamp-Related Errors

Symptom / Message	Possible Cause	Corrective Action
Target Not Recognized	Dirty or damaged target surface; excessive light reflection.	Clean target with soft microfiber cloth; ensure beam is not exposed to direct sunlight.
Incorrect Target Detected	Mixed target sets or target ID mismatch.	Verify all four targets belong to the same system (serial-matched).
Target Blocked / Lost Signal	Vehicle component or lift obstructing view.	Remove obstruction or slightly raise/lower lift for line-of-sight.
Clamp Slipping During Measurement	Incorrect finger selection or tire contamination.	Re-secure clamp; use appropriate **AG32 Adaptive Gripping Clamp** or

Symptom / Message	Possible Cause	Corrective Action
		Standard 25" Clamp; clean tire surface.
Uneven Target Height Warning	Tire pressure variation or incorrect mounting height.	Check inflation; ensure clamps are seated evenly.

8.3 Camera and Beam Warnings

Symptom / Message	Possible Cause	Corrective Action
Camera Communication Error	USB link interruption or system sleep.	Reconnect camera cable; disable PC power saving. Restart software.
Beam Not Detected	Power not reaching beam or post connection loose.	Check beam power supply and post connector.
“Beam Tilt Detected” Warning	Beam or post slightly shifted from original level.	Re-level post base or tighten mount; if still inaccurate, contact service.
Image Distortion or Flicker	Dirty lenses or unstable lighting.	Clean lenses; ensure consistent workshop lighting (avoid flicker from LED tubes).

8.4 Alignment Process Messages

Symptom / Message	Possible Cause	Corrective Action
“Incorrect Toe – Check Turn Plates”	Turn plates locked or binding; vehicle not settled.	Unlock plates and rock vehicle to neutral position before remeasuring.
“Vehicle Moved During Compensation”	Technician pushed or braked vehicle too hard.	Repeat runout smoothly; avoid sudden stops.
“Unstable Measurement – Check Targets”	Vibration or unstable clamp.	Ensure clamps and targets are secured and vehicle is stationary.

Symptom / Message	Possible Cause	Corrective Action
“Caster Sweep Incomplete”	Steering not turned full range.	Repeat caster sweep with full ± range as prompted.
“Lift Height Error”	Lift not in alignment position; sensors detected excessive elevation.	Lower lift to nominal measurement height.
“Runout Too Short”	Vehicle rolled insufficient distance.	Roll at least 20–25 cm per side or repeat compensation.
“Runout Direction Error”	Vehicle rolled opposite of prompted direction.	Follow VisionCue LED arrows (forward or backward).

8.5 Software and Display Warnings

Symptom / Message	Possible Cause	Corrective Action
“Database File Missing”	Spec data not loaded or corrupted.	Reload database from backup or contact service.
“Language File Error”	System language data incomplete.	Reinstall language pack.
“Printer Not Found”	Printer disconnected or driver issue.	Reconnect printer or reinstall driver.
“Alignment Report Cannot Save”	Insufficient disk space or folder permissions.	Clear report folder or free storage.
“ADAS Warning Suppressed”	Diagnostic Warning disabled.	Enable Diagnostic Alignment Warning (Ctrl + A) in configuration.

8.6 Measurement Accuracy Verification

Perform this check monthly or whenever measurement instability is suspected.

1. Park a known reference vehicle (previously aligned).

2. Mount the same clamps and targets.
3. Verify that camber, caster, and toe readings match previous results within ±0.05°.
4. If variation exceeds tolerance:
    - Check beam mounting, post level, and clamp seating.
    - Clean targets and lenses.
    - If still inconsistent, contact TreadPlus service.

8.7 Preventive Actions

- Avoid strong light sources pointing directly at the camera beam.
- Keep tires clean before mounting clamps.
- Ensure lift is level and free of debris.
- Confirm all clamps are of the same model (AG32 or 25” Standard).
- Avoid moving the camera beam during operation.
- Perform database backup monthly.

8.8 When to Contact Service

Contact **service@treadplus.com** for assistance if:

- Camera beam does not initialize or VisionCue LEDs remain dark.
- Image capture freezes or software repeatedly disconnects.
- Repeated “Beam Tilt Detected” or “Runout Invalid” messages persist after re-leveling.
- Measured angles fluctuate excessively even with vehicle stationary.
- System requires calibration or component replacement.

📧 Include the following in your email:
• System model (Protostar 9000 AIO / Mobile / Standard)
• Serial number (found on beam label or software “About” page)
• Brief description of error and environment (lift type, PC version, etc.)

9.0 Warranty and Support Policy

The **TreadPlus Protostar 9000 Series** aligner is built under strict quality assurance and factory calibration standards to provide long-term reliability and accuracy.
This section defines warranty coverage, support procedures, and data update policies for the equipment and its accompanying software.

9.1 Warranty Coverage

TreadPlus warrants each new Protostar 9000 Series aligner to be free from defects in materials and workmanship under normal use and proper maintenance.

Component	Coverage Period	Notes
Camera Beam Assembly	24 months	Includes camera modules, VisionCue LED board, and housing.
Post Assembly / Mount Structure	24 months	Covers post hardware and anchoring components.
PC, Display, and Interface Components	12 months	Includes computer, monitor, keyboard, and accessories supplied.
Wheel Clamps (AG32 / Standard)	12 months	Covers manufacturing defects, not wear or accidental damage.
Targets and Reflective Panels	12 months	Covers delamination or printing defects.
Software License	Lifetime	Includes updates within the warranty period.
Vehicle Database / Specification Data	24 months	Includes all specification and measurement data updates. Yearly renewals available after expiration.

⚙️ **Note:** Warranty period starts from the original invoice date and applies to the first purchaser only.

9.2 Specification and Database Updates

The **TreadPlus Vehicle Specification Database** includes full coverage for:

- **North America, Europe, China, South America, and Southeast Asia**,
- with additional regions available on request.

Database Update Policy

- All systems include **24 months of database updates** from the date of purchase.
- After 24 months, optional **annual update renewals** are available for continued access to the latest vehicle data.
- Regional databases can be updated separately or bundled according to workshop needs.
- Updates are provided via encrypted USB or online download through the authorized distributor.
- Subscription status can be viewed from the **"Spec Update"** menu within the software.

📘 **Tip:** Keeping the database current ensures full coverage of new models and ADAS-equipped vehicles.

9.3 Warranty Limitations

This warranty does **not** cover:

- Normal wear (rubber pads, clamp fingers, cables).
- Damage due to misuse, negligence, accident, or modification.
- Improper installation or relocation.
- Electrical surges, unstable power, or lightning damage.
- Environmental exposure (dust, humidity, chemical contact).
- Software or database tampering by unauthorized users.
- Calibration or service performed by non-certified personnel.

9.4 Warranty Exclusions

- Warranty is **not transferable** to other owners, workshops, or resellers.
- Units sold second-hand or via unauthorized channels are excluded.
- Removal or alteration of serial number labels voids warranty.
- Use of non-TreadPlus components (targets, clamps, or beam modules) invalidates warranty.

9.5 Obtaining Warranty Service

If an issue occurs during warranty coverage:

1. Stop operation immediately.
2. Record the following:
    - Model and serial number (on beam or post label)
    - Date of purchase
    - Description of the problem and any error messages
3. Contact **TreadPlus Technical Support** at:
   📧 **service@treadplus.com**

Support will provide remote diagnostics and guide you through next steps.
Do not open the beam, post, or computer cabinet unless instructed by TreadPlus service staff.

⚠️ Unauthorized repair or calibration voids warranty.

9.6 Replacement Parts and Returns

- Replacement components are shipped only after support verification.
- Faulty parts must be returned (if requested) within **30 days** in original packaging.
- Returned parts are inspected before final credit or replacement approval.

9.7 Post-Warranty Support

After warranty expiration, the following services remain available:

- **Parts Replacement & Repair** (billed service).
- **Certified Calibration and Verification.**
- **Software & Database Renewals** (annual subscription).
- **Remote Technical Assistance.**

To request out-of-warranty support, contact:
📧 **service@treadplus.com**

9.8 Warranty Transfer Policy

TreadPlus warranty applies **only to the original purchaser** and **cannot be transferred** to another owner or reseller.
Transferred units may still receive service and database updates on a paid, non-warranty basis after verification.

9.9 Liability Disclaimer

TreadPlus shall not be responsible for:

- Business interruption or lost productivity caused by system downtime.
- Damage to vehicles, property, or personnel resulting from misuse or installation errors.
- Claims exceeding the product's original purchase value.

The user must ensure proper use according to installation, safety, and maintenance procedures described in this manual.

10.0 Technical Specifications

The following specifications apply to all **TreadPlus Protostar 9000 Series Imaging Wheel Aligners**, including **9000 AIO**, **9000 Standard**, and **9000 Mobile** configurations.
Specifications may vary slightly depending on regional supply, component configuration, or software revision.

10.1 General System Information

Item	Specification
Measurement Type	Imaging-based optical wheel alignment
Operating Modes	Visual Check / Standard / Quick / Precision / Random Access
Supported Vehicle Types	Passenger cars, SUVs, light commercial vehicles
Camera System	2 cameras
Working Distance	1.6 m – 3.0 m
Targets	Checkerboard pattern
Wheel Clamps	Standard 25" Universal Clamp (4 pcs)
Clamp Compatibility	Standard Clamp or Adaptive Gripping Tire Clamp
Data Display	Real-time dynamic measurement with 0.01° resolution
VIN Recognition	Barcode or image scan

10.2 Measurement Ranges and Accuracy

Parameter	Range	Resolution	Accuracy
Total Toe	±20°	0.01°	±0.02°
Individual Toe	±10°	0.01°	±0.02°
Camber	±10°	0.01°	±0.02°
Caster	±20°	0.01°	±0.05°
Kingpin Inclination (SAI)	0–20°	0.01°	±0.05°
Thrust Angle / Setback	±5°	0.01°	±0.02°

Parameter	Range	Resolution	Accuracy
Wheelbase Difference (ΔWB)	0–50 mm	1 mm	±1 mm
Track Width Difference (ΔTW)	0–50 mm	1 mm	±1 mm

⚙️ Accuracy values apply under standard installation and environmental conditions.

10.3 System Components

Component	Specification	Notes
Camera Beam	Dual imaging modules in rigid aluminum housing	Integrated VisionCue LED system
Support Post	Steel construction with internal cable routing and height adjustment	Safety locking mechanism
Mobile Cabinet	Powder-coated steel with 32" display and PC compartment	Lockable doors and storage
Computer Unit	Windows 11 PC (	Factory configured and tested
Display	32" Full HD Monitor (1920×1080)	Wall or cabinet mount
Printer	Color inkjet or thermal printer	USB or Wi-Fi connection
Power Input	100 – 240 V AC, 50/60 Hz	Auto-sensing universal input
Power Consumption	Approx. 120 W	Excluding PC peripherals
Communication	USB / LAN / Wi-Fi (optional)	For updates and remote support

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10.4 Environmental Requirements

Parameter	Specification	Notes
Operating Temperature	+5 °C to +45 °C (41–113 °F)	Avoid direct sunlight on beam
Storage Temperature	–10 °C to +60 °C (14–140 °F)	Protect optics from moisture
Relative Humidity	≤ 85 % non-condensing	
Lighting	Indoor ambient light, no strobe flicker	Avoid direct IR/UV
Floor Surface	Concrete or level floor	Anchor AIO/Standard base to floor

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10.5 Software and Database

Feature	Specification	Notes
Operating System	Windows 11	Pre-installed and secured
Core Software	TreadPlus V35/45/55	Supports all 9000 variants
Language Support	Multi-language (English, Chinese, Spanish, French, German, Polish, Portuguese, etc.)	Configurable via F1 Language menu
Vehicle Database	North America, Europe, China, South America, Southeast Asia	Region-selectable dataset
Update Cycle	Annual renewal available	Delivered via USB or online file
ADAS Awareness	Integrated diagnostic database link	Prompts ADAS calibration advisory on report
Advanced Features	Spatial Dynamics, Lift Levelness, Live Caster, Toe+, Toe Curve (VAG)	See Section 5.0

Feature	Specification	Notes
Report Output	Full / Summary/Toe Only PDF or Print	Includes shop branding and logo
Units	Degree / mm / inch	User-selectable on screen

10.6 Dimensions and Weight

Component	Dimensions (L×W×H)	Weight
9000 AIO	106” x 22” x 31” | 2690*565*780 mm	436 lbs | 198 kg
9000 Standard	44" x 28" x 46"|1185mm x 720mm x 720mm 112" x 22" x 16"|2690mm x 630mm x 380mm	510 lbs | 230kg
9000 Mobile	44" x 28" x 46"|1185mm x 720mm x 720mm 112" x 22" x 16"|2690mm x 630mm x 380mm	525 lbs | 240kg

10.7 Compliance and Safety Standards

The **Protostar 9000 Series** aligner conforms to international safety, EMC, and environmental requirements.
Testing and verification were performed under KJC Engineering’s technical file references **KJC_AE / KJC_AK / KJC_AN**.

European Union Directives

Directive	Description	Reference Standard(s)
2006/42/EC – Machinery	Mechanical safety of equipment and moving assemblies	EN ISO 12100:2010
2014/30/EU – EMC	Electromagnetic compatibility for industrial equipment	EN 61326-1:2021, EN 61000-6-2/-6-4

Directive	Description	Reference Standard(s)
2014/35/EU – Low Voltage	Electrical safety between 50–1,000 VAC	EN 60204-1:2018, EN 61010-1:2010 +A1:2019
2011/65/EU – RoHS II	Restriction of hazardous substances	EN IEC 63000:2018

North American Compliance

Standard	Description	Status
FCC Part 15 Class A	Industrial emission limits	Compliant
CSA C22.2 / UL 61010-1	Electrical safety for measurement equipment	Design compliant (self-declared)

11.0 Revision History and Document Control

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Note:
This document is subject to controlled revision.
All updates and changes are recorded within the KJC Engineering technical file.
Unauthorized reproduction, distribution, or modification of this manual is strictly prohibited.

Appendix A – Basic Alignment Angles (Educational Reference)

This section provides an overview of the fundamental alignment angles measured and adjusted by the Protostar 9000 Series.
It is intended for training and educational purposes to help technicians understand vehicle geometry and handling behavior.

A.1 Toe

Definition:
Toe is the angle formed between the direction the tires are pointed and the vehicle's geometric centerline when viewed from above.

- **Toe-In:** Front edges of the tires point toward each other.
- **Toe-Out:** Front edges point away from each other.

Effect:

- Excessive **toe-in** causes tire shoulder wear and poor fuel economy.
- Excessive **toe-out** causes unstable straight-line driving and inside-edge wear.

A.2 Camber

Definition:
Camber is the inward or outward tilt of the wheel when viewed from the front of the vehicle.

- **Negative Camber:** Top of the wheel tilts inward.
- **Positive Camber:** Top of the wheel tilts outward.

Effect:

- **Negative camber** improves cornering grip but increases inner-edge wear.
- **Positive camber** improves straight-line stability but may cause outer-edge wear.

A.3 Caster

Definition:
Caster is the forward or backward tilt of the steering axis (drawn through the upper and lower ball joints) when viewed from the side.

- **Positive Caster:** Steering axis tilts toward the rear of the vehicle.
- **Negative Caster:** Steering axis tilts toward the front.

Effect:

- **Positive caster** enhances stability and steering returnability.
- **Negative caster** may cause wandering or poor return after turning.

A.4 Kingpin Inclination (SAI)

Definition:
Steering Axis Inclination (SAI) is the inward tilt of the steering axis when viewed from the front.
It works together with camber to create **Included Angle**, affecting steering feel and vehicle self-centering.

Effect:

- Aids in directional stability.
- Differences in SAI left vs right indicate possible bent suspension parts.

A.5 Thrust Angle

Definition:
Thrust Angle is the direction the rear wheels point relative to the vehicle centerline.
When the thrust line is not centered, the vehicle may “dog track” or drift to one side.

Effect:

- Off-center thrust causes steering wheel misalignment and uneven tire wear.
- Corrected by rear toe adjustment or axle repositioning.

A.6 Setback

Definition:
Setback measures the difference between left and right front wheel positions relative to the vehicle's geometric centerline.

Effect:

- Minor setback may be normal (0–3 mm).
- Large setback indicates frame or suspension damage.

A.7 Steering Axis Geometry (Toe Curve / Ackermann)

Definition:
Toe Curve, or Ackermann Angle, describes how inner and outer wheels turn at different angles during cornering.
It ensures proper tire tracking through turns.

Effect:

- Incorrect geometry causes tire scrub and over/understeer.
- Verified in Protostar software for VAG and specific models.

Appendix B – Glossary of Terms

Term	Definition
ADAS	Advanced Driver Assistance System – includes cameras, radar, and sensors that may require recalibration after alignment.
AIO	All-In-One configuration of the Protostar 9000 Series with integrated computer and display.
Auto Tracking	Automatic camera following function that adjusts for lift height changes.
Caster Sweep	Steering wheel rotation left and right to measure caster angle.

Term	Definition
Cosmic Web / TreadPlus Hub	Cloud-based data system for database updates, reporting, and workshop connectivity.
Diagnostic Alignment Warning	Software feature that flags vehicles equipped with ADAS; prompts calibration advisory.
Hub Align	Alignment mode where targets are mounted directly to hub adapters instead of wheel rims.
Lift Levelness	Calibration procedure compensating for uneven lift or floor.
Precision Mode	Alignment routine adding an extra caster sweep for high-accuracy measurement.
Runout Compensation	Rolling procedure to eliminate rim or target mounting errors.
Spatial Dynamic	Real-time compensation algorithm maintaining accuracy during lift motion.
Target	Pattern plate attached to wheel or hub used for imaging measurement.
Toe+	Guided toe adjustment procedure allowing steering-free centering.
VisionCue	LED indicator system on the camera beam for alignment visual guidance.
VIN Scan	Optical or barcode vehicle identification function in database entry.