



 Holland

 **Holland**  
**TrackStar®**  
Track Testing Solutions  
for All Conditions

RMSS White Paper Series





Track measurement is a fundamental component of maintenance, planning and safety assurance on rail freight, passenger and transit systems. Class 1 railroads typically own and operate track geometry cars to collect data on mainlines across their systems. Most Class 1s also use hi-rail geometry vehicles, such as TrackSTAR® units, to augment mainline and branch line testing. TrackSTAR® vehicles are typically equipped with Gauge Restraint Measurement Systems (GRMS) to assess track strength under dynamic loadings on heavily used mainline and branch line track and in problematic areas, such as crossovers.

Holland's TrackSTAR® fleet, which performs more than 100,000 miles of contract- service track testing on about 100 railways in North America each year, measures track geometry, including the standard parameters (such as curvature, gauge, crosslevel, surface, alignment, etc.) along with rail profile to determine wear, shape and rail cant. Using the latest generation inertial-based technology and non-contact laser optical systems, TrackSTAR® measures and evaluates existing track geometry to FRA- or customer-specified thresholds. Track geometry data is collected in one-foot increments, providing complete measurement of track, including all calculated parameters.

Exceptions are reported by type, magnitude and length, both in distance-based (milepost) and GPS location. GRMS-equipped TrackSTAR® units use a split axle that applies a controlled vertical and lateral load to the track to measure track gauge strength under the types of dynamic loadings applied by train traffic.

## Track Gauge Strength

Holland's patented split-load-axle technology provides quantifiable assessment of track gauge strength, a measure of the track's ability to withstand lateral train forces and a performance-based assessment of tie and fastener conditions. Track gauge strength is determined on GRMS-equipped TrackSTAR® units through two measurements of track gauge — an unloaded measurement taken at the front of the vehicle, and a loaded measurement taken at the split loading axle, which delivers a constant, nondestructive, vertical and lateral load that effectively locates the weakest track locations. Delta Gauge (change in gauge between loaded and unloaded) and Gauge Widening Projection (GWP), which are collected and reported in one-foot increments, provide real-time exception reporting to identify locations with weak track-gauge strength. GWP data provides performance-based information that can be used to develop or support tie replacement plans. Dynamic rail cant measurements recorded at the load axle can help identify locations of differential plate-cutting on wood ties, rail-seat deterioration (in support of meeting FRA 213.234 regulations) on concrete ties, or areas of negative cant that may need maintenance attention.

## Rail Wear - Rail Profile Measurement

Rail wear and profile is obtained by laser line optical cameras mounted on the gauge and field sides of each rail. (Some systems record half profile, which images and collects data only on the gauge-side of the rail. Full rail profile systems image and collect data on the gauge and field sides of the rail.) Digital measurement is typically collected at 10-foot intervals to provide detailed measurement and digital images (like "snapshots") of the changing wear patterns on both rails. The accuracy of the measurement system allows for identification of the rail section, and complete assessment of all required rail wear and shape parameters, including gauge-face wear, vertical wear, gauge-face angle, rail cant, etc. Rail wear reporting with all calculated measurements is delivered post-testing, through printed reports or through Holland's Rangecam® software. Data can be overlaid with previous test data to generate wear trend charts, rail replacement forecasts, and plans to support maintenance planning.







800-series TrackSTAR® vehicle

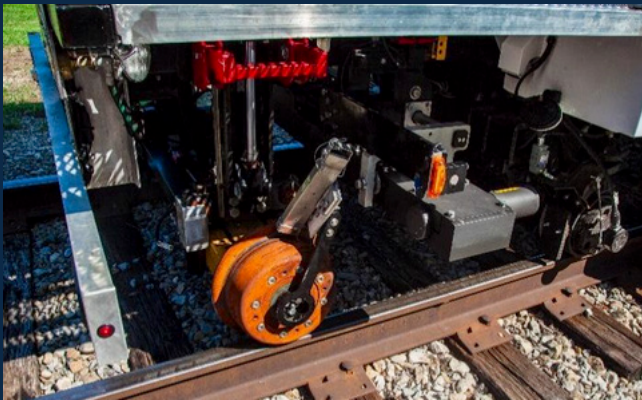


The Argus® track geometry system mounted on 800-series TrackSTAR® vehicle

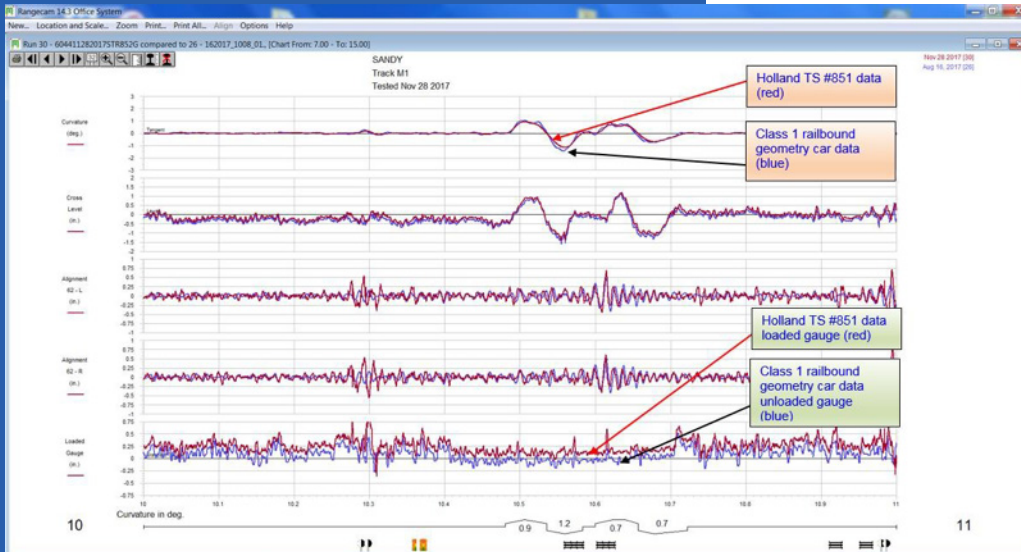
The 850-series TrackSTAR® units provide all the capabilities of the Argus® system used on the 800-series vehicles, with the added benefit of a GRMS-type mini load axle that applies up to a 3,000-pound lateral load, which is sufficient to find broken spikes and missing or broken fasteners that may not be identified by unloaded geometry cars or visual inspection.



800-series TrackSTAR® vehicle



An Argus® track geometry system mounted incorporating a mini load axle on 800-series TrackStar® vehicle



There is close correlation between TS 851 (red lines) and a Class 1 railbound geometry car data (blue lines). The 1/8" to 1/4" difference in gauge is due to the 851's load axle.

Holland also operates a Transit Testing hi-rail vehicle (TTV) that is designed specifically to accommodate the unique conditions on transit systems, including broad gauge, tight clearances, and tight-radius curves (up to 70 degrees). TrackSTAR® 491 also incorporates a mini load axle to identify areas with poor tie/fastener conditions.



TrackSTAR® 491, Holland's Track Testing Vehicle (TTV), designed for transit systems





400-series TrackSTAR® vehicle

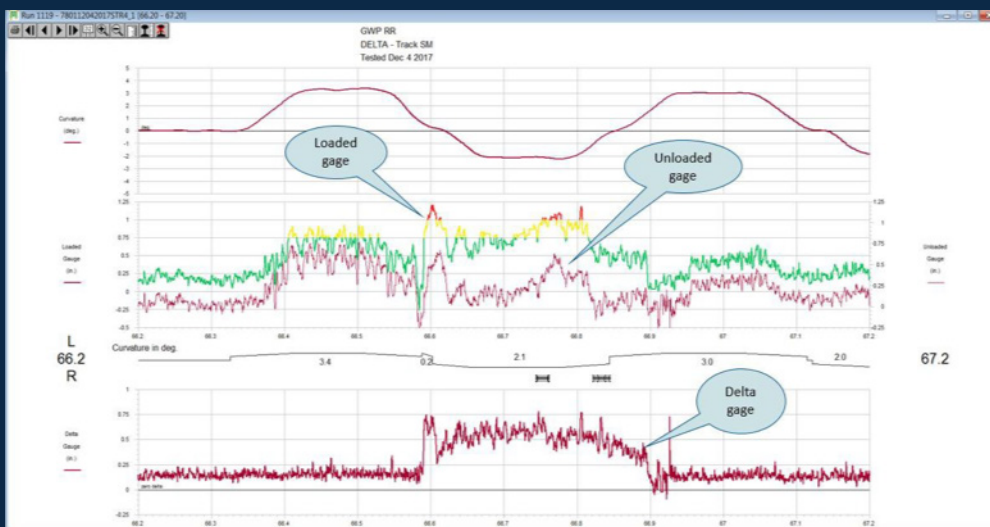


Holland's patented load axle applies a balanced lateral/vertical load to measure track gauge strength.



The Holland 400-series GRMS TrackSTAR units are the largest and most ubiquitous of the fleet. The load axle on these vehicles can apply up to 15,000-pound vertical and 10,000-pound lateral loads to the track, generating L/V ratios between 0.5 and 1.25, depending on the actual applied loads. Loadings such as these, which replicate the type of loading that poorly performing vehicles are likely to generate, provide a truer picture of what the track actually “sees” under traffic. Data from these GRMS systems can identify:

- Loose, missing or broken spikes or elastic fasteners
- Worn, missing or broken tie plates, pads or shoulders
- Clusters of weak (decayed, deteriorated, abraded, spike-killed, plate-cut) or missing ties
- Differential plate cutting
- Loose bolts or worn joint bars
- Gage widening in timber-tie track
- The delta between static and dynamically loaded conditions
- Areas with poor track-gauge strength
- Areas of track that are susceptible to excess cant due to rail rotation
- Indications of rail seat deterioration in concrete-tie track
- Areas that pose potential derailment risk



GRMS data shows delta gauge, a measure of track gauge strength

Holland’s fleet of track testing vehicles is designed to satisfy the track geometry and rail profile measurement requirements of Class 1, Regional, Short Line, and Transit properties in North America.

Email [sales@hollandco.com](mailto:sales@hollandco.com) and let us help you learn more about how Holland helps you make the most of your testing and data requirements.

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