



## TRIMBLE GEDO SYSTEMS

PRECISION, EFFICIENCY, AND SAFETY IN RAIL MEASUREMENT







# FLEXIBLE SOLUTIONS FOR RAILWAY MEASUREMENT

RAILWAYS ARE ESSENTIAL COMPONENTS OF THE GLOBAL ECONOMY AND INFRASTRUCTURE. THROUGHOUT THEIR LIFE CYCLE, RAIL OPERATORS DEMAND EFFICIENT APPROACHES TO PLANNING, CONSTRUCTION, OPERATIONS, MAINTENANCE, AND EXPANSION. THESE APPLICATIONS CALL FOR INNOVATIVE SOLUTIONS FOR MEASUREMENT AND INFORMATION MANAGEMENT.

BASED ON DECADES OF EXPERIENCE IN THE RAILWAY INDUSTRY, TRIMBLE® GEDO SYSTEMS COMBINE POSITIONING AND MEASUREMENT SENSORS WITH COMMUNICATIONS AND SOFTWARE. TRIMBLE SYSTEMS PROVIDE FAST, ACCURATE AND RELIABLE SOLUTIONS FOR RAILWAY SPATIAL INFORMATION NEEDS.

## KEY BENEFITS

- Speed and precision in measurement operations
- Accurate, reliable information on track and facilities
- Optimized utilization of rail assets
- Increased efficiency in planning, design, and construction
- Reduced downtime for measurement and maintenance

### PLANNING

Trimble GEDO systems collect and manage detailed information needed by planners and designers.

### CONSTRUCTION

Use Trimble GEDO systems for precise alignment of track and for post-construction inspections and approvals.

### MAINTENANCE

Trimble GEDO systems increase productivity in inspection and tamping operations.

### MODERNIZATION AND EXPANSION

High-resolution data from Trimble GEDO systems assists planners to update facilities and track for larger, faster rolling stock.

### POSITIVE TRAIN CONTROL

Use Trimble GEDO systems to collect and manage information on location of track, control structures and other safety activities.

## TRIMBLE GEDO SYSTEM

### SPEED AND PRECISION

Capture measurements in seconds using GNSS and optical systems

Gather precise data on track and conditions

### SAFETY

Small, lightweight field equipment can be operated by one person

Install and remove from track quickly and easily

### FLEXIBILITY

Configure system to each application

Modular system can grow and adapt to changing needs

Optimize use of equipment and staff

### COORDINATED WITH RAILWAY PROCESSES

Electronic data streamlines information exchange

Reduce downtime for inspection and maintenance



## TRIMBLE GEDO SYSTEM

Trimble GEDO systems utilize Trimble GNSS, optical, and related technologies to capture precise positioning data on railway track and surrounding features. Based on decades of experience in the railway industry, Trimble GEDO systems provide efficient tools and workflows throughout the rail measurement process. By integrating rugged field hardware with customized software and point of work guidance, Trimble GEDO systems reduce rework and increase productivity across the entire enterprise workflow.

Flexible Trimble GEDO systems provide maximum return on your investment. You can quickly configure your system to support track location, inspection, construction and maintenance as well as planning for improvements, updates and expansion. As your client's needs change, Trimble GEDO systems can adapt to new requirements for measurement and data management.



# SOLUTIONS FOR TRACK DOCUMENTATION



EFFICIENT MANAGEMENT DEMANDS ACCURATE INFORMATION. TO PROVIDE COMPLETE INFORMATION, RAIL OPERATORS NEED PRODUCTIVE RAIL MEASURING SYSTEMS TO PROVIDE ACCURATE SURVEYS OF EXISTING TRACK.

THE TRIMBLE GEDO SYSTEM IS A FAST, EFFICIENT TOOL TO MEASURE, RECORD AND DOCUMENT DETAILED INFORMATION ABOUT EXISTING TRACK. BY SIMPLY WALKING THE TRACK, YOU CAN CAPTURE DETAILED INFORMATION FOR ASSET MANAGEMENT, REALIGNMENT, GIS, DESIGN, AND QUALITY CONTROL.

TO USE THE TRIMBLE GEDO SYSTEM, A SINGLE OPERATOR PUSHES A SIMPLE TROLLEY ALONG THE TRACK. ONBOARD THE TROLLEY, COMPONENTS FOR MEASUREMENT, RECORDING AND USER GUIDANCE ARE INTEGRATED INTO A RUGGED, WEATHERPROOF SYSTEM. THE CRITICAL DATA IS COLLECTED AND STORED IN A SINGLE OPERATION.

## TRIMBLE GEDO IN ACTION: TRACK DATA FOR PTC

California-based Cinquini & Passarino, Inc. use Trimble GEDO Rec system to capture data for more than 80 km of track for Positive Train Control (PTC). Limited to working at night in four-hour windows, the Cinquini & Passarino teams covered 8 km – 13 km each night. Using standard PTC Data Model Definitions, they collected more than 120,000 points maintaining accuracy of 2.5 cm or better.

## MEASUREMENT OF AS-BUILT TRACK CONDITIONS

The Trimble GEDO system enables operators to conduct complete geometric surveys of a rail line. In addition to capturing the absolute position of the rails, the system measures and stores cant and gauge. Measurements can be captured as the operator moves continuously along the rails, or by stopping at specified intervals.

## DETERMINING TRACK LOCATION

With the Trimble GEDO system, you can quickly survey existing lines without the need for alignment data. Using GNSS or optical surveying techniques, the system provides survey-quality location of the Trimble GEDO Trolley. Results can be tied to national or company-specific coordinate systems.

## FAST, PRECISE MEASUREMENT

Collect information using the Trimble GEDO system that matches requirements for precision and productivity. When configured with a Trimble S-Series Total Station, the Trimble GEDO Trolley can collect data with millimeter precision while covering up to 1.2 km of track in one hour. And, systems configured with Trimble GNSS can cover up to 3 km of track per hour with centimeter precision.

## MEASURE TRACK IN ANY LOCATION

Use the Trimble GEDO system to collect information on a wide variety of track. You can measure main lines, sidings, and spurs as well as urban trams and metro lines. The system can also measure track in industrial or commercial facilities. Because the Trimble GEDO system can use both GNSS and optical measurement, you are confident of accurate positioning in all locations.

## TRIMBLE GEDO FOR TRACK DOCUMENTATION

**FAST, RELIABLE DATA COLLECTION**

Capture data over long stretches of track

Collect information while in continuous motion

Gather precise measurements on track position, gauge, and cant

**GNSS OR TOTAL STATION POSITIONING**

Gather track position data with high precision

Operate in tunnels and urban areas

Integrate with other Trimble surveying systems

**SIMPLE AND LIGHTWEIGHT**

One person can install and operate the trolley

Single screw adjustment for different gauges

Reduce costs for surveying and inspection

**SAFETY**

Minimal disruption to normal rail traffic

Reduce the number of people near the track

Reduce downtime for inspection and maintenance



## TRIMBLE GEDO INTEGRATED SYSTEMS FOR LOCATION AND DOCUMENTATION

Trimble GEDO Rec Field software for track location. GEDO Rec provides guidance and information to the operator to ensure complete, accurate data collection. GEDO Rec runs onboard the Trimble TSC3 Controller.

Trimble GEDO Trolley for measurement equipment and field computer. The trolley can be quickly removed to stay clear of railway operations. As conditions change, you can configure the trolley to use either GNSS or Total Station positioning.

Trimble GEDO Rec Office software for data processing and information management. Track location data can be output to GIS and design systems.



# MEASUREMENT SOLUTIONS FOR PRECISE SLAB TRACK CONSTRUCTION



SLAB TRACK CONSTRUCTION CALLS FOR FAST, PRECISE MEASUREMENTS, AND IMMEDIATE FEEDBACK. THE TRIMBLE GEDO SYSTEM LETS YOU MEASURE FOR PRECISE ADJUSTMENTS, INSPECTIONS, AND QUALITY CHECKS. IN ONE OPERATION, THE TRIMBLE GEDO SYSTEM CAPTURES 3D COORDINATES OF THE TRACK, TOGETHER WITH GAUGE AND CANT. THE INFORMATION IS COMPARED TO THE DESIGN, AND OFFSETS AND CORRECTION VALUES ARE DISPLAYED IN THE FIELD, WHERE WORK CREWS MAKE THE NECESSARY ADJUSTMENTS.

BEFORE BRINGING THE DESIGN TO THE JOB SITE, USE TRIMBLE GEDO OFFICE SOFTWARE TO CHECK THE DATA AND UPLOAD TO THE FIELD COMPUTER. YOU CAN IMPORT DATA FROM POPULAR DESIGN SOFTWARE OR MANUALLY ENTER THE INFORMATION FROM PAPER.

## TRIMBLE GEDO IN ACTION: CONTROL SLAB TRACK IN THE NEW TUNNEL SCHÜCHTERN

As a service provider for Deutsche Bahn AG the engineering company GI-CONSULT GmbH used the GEDO CE 2.0 system for controlling the installed slab track (System GETRAC A3) in the new build Tunnel Schüchtern. The Tunnel is around 4 km long and the track is approved for a speed limit of 160 km/h.

## TOOLS FOR SLAB TRACK CONSTRUCTION AND ALIGNMENT

Trimble GEDO integrates measurements, field software and office systems to provide productivity and confidence in construction and quality control. Systems measure horizontal and vertical alignment, cant and gauge in a single operation. Working alongside track construction teams, the Trimble GEDO system provides immediate comparison of actual to nominal track positions. Construction teams can complete rough and precise adjustments as well as final checking quickly and with high confidence.

## TRACK CONSTRUCTION FOR HIGH-SPEED RAILWAYS

The Trimble GEDO measurement systems provide millimeter accuracy for construction, adjustment and inspection. Working in real time, the system displays measurements and information to ensure that rails precisely conform to design. Trimble GEDO systems support high-speed rail construction worldwide.

## TRIMBLE GEDO IN ACTION: CONTROL OF SETTLING IN SLAB TRACK HANNOVER – BERLIN

As a service provider for Deutsche Bahn AG the engineering company GI-CONSULT GmbH used the GEDO CE 2.0 system for controlling the settling of the installed slab track (System Rheda) on the high speed connection Hannover – Berlin. The measurements were only taken in nightshifts. The collected data was used to calculate new gradients for the track for nearly 1000 m and to control around 400 m of reconstructed areas of the slab track. The track is approved for a speed limit of 300 km/h.

## TRIMBLE GEDO FOR SLAB TRACK CONSTRUCTION

### SYSTEM FOR PRECISE MEASUREMENT

Measure for adjustment, documentation, and acceptance

Real-time confirmation of construction results

Display correction values in the field

Reduce construction costs

### ADVANCED DATA MANAGEMENT

Import alignment data in popular formats

Alignment editor and checking

Support for FAKOP® system widening

Fast, error-free transfer to field systems

### QUALITY CONTROL AND INSPECTIONS

Compare design to as-built track

Record final configurations  
Fast measurement reduces construction delays

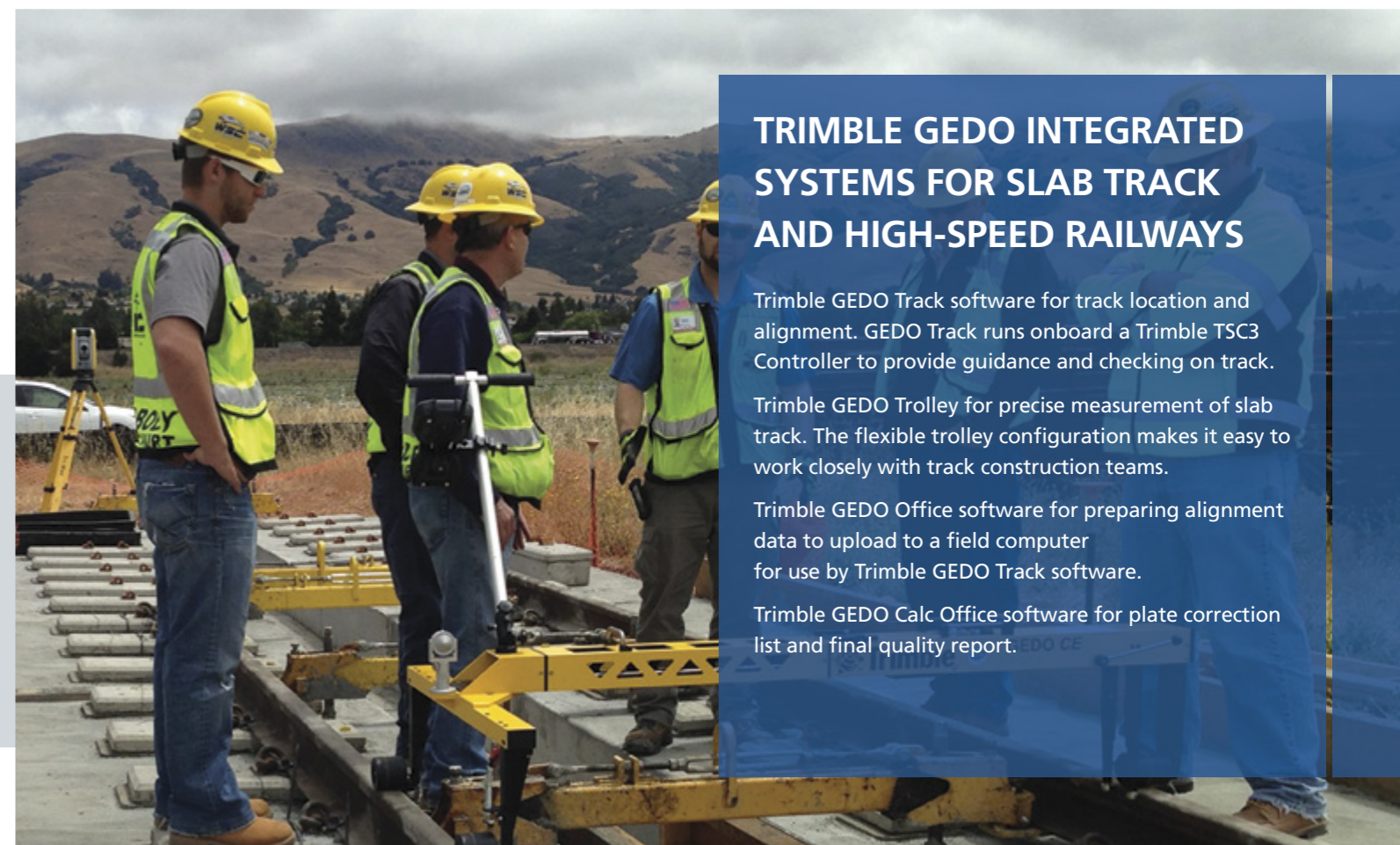
Reduce costs for surveying and inspection

### PRECISE MEASUREMENTS

Build and inspect high-speed rail lines

Millimeter accuracy conforms to project requirements

Reduce downtime for inspection and maintenance



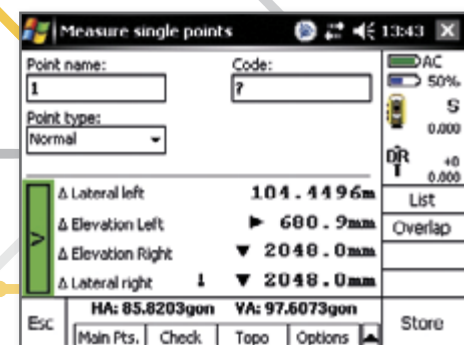
## TRIMBLE GEDO INTEGRATED SYSTEMS FOR SLAB TRACK AND HIGH-SPEED RAILWAYS

Trimble GEDO Track software for track location and alignment. GEDO Track runs onboard a Trimble TSC3 Controller to provide guidance and checking on track.

Trimble GEDO Trolley for precise measurement of slab track. The flexible trolley configuration makes it easy to work closely with track construction teams.

Trimble GEDO Office software for preparing alignment data to upload to a field computer for use by Trimble GEDO Track software.

Trimble GEDO Calc Office software for plate correction list and final quality report.







# TRIMBLE SYSTEMS FOR RAILWAY TAMPING MEASUREMENTS

TAMPING IS ESSENTIAL FOR RAILWAY MAINTENANCE TO ENSURE TRACK QUALITY AND STABLE BALLAST. TRIMBLE GEDO PROVIDES AN INTEGRATED SOLUTION FOR MEASUREMENT AND QUALITY CONTROL TO SUPPORT TAMPING MACHINES AND OPERATIONS.

USING THE TRIMBLE GEDO TROLLEY, A SURVEYOR COLLECTS INFORMATION ABOUT EXISTING TRACK POSITIONS. DATA IS QUICKLY ANALYZED AND PREPARED FOR OUTPUT TO THE TAMPING MACHINES. DELIVERIES OF BALLAST CAN BE PLANNED AND TIED TO SPECIFIC LOCATIONS ALONG THE TRACK. WHEN THE TAMPING OPERATION IS FINISHED, THE TRIMBLE GEDO TROLLEY RE-MEASURES THE TRACK TO CONFIRM THE WORK IS DONE CORRECTLY.

FOR SAFETY AND CONVENIENCE, THE LIGHTWEIGHT TRIMBLE GEDO TROLLEY CAN BE QUICKLY REMOVED AND REPLACED ONTO THE TRACK. THE TROLLEY AND OPERATOR CAN STAY CLEAR OF NORMAL TRAFFIC, TAMPING, AND CONSTRUCTION MACHINES.

## REDUCE SURVEYING COSTS FOR TAMPING AND INSPECTION

The Trimble GEDO system provides savings in time and labor costs for pre- and post-tamping surveys. In a single pass, the system collects information on track position, cant, and gauge. The Trimble GEDO Trolley can operate at speeds up to more than 2,000 m/hr (6,500 ft/hr). The system records all data electronically, eliminating potential delays and errors in handwritten notes. The Trimble GEDO system compares measured data with design information to produce adjustment data needed by the tamping machine.

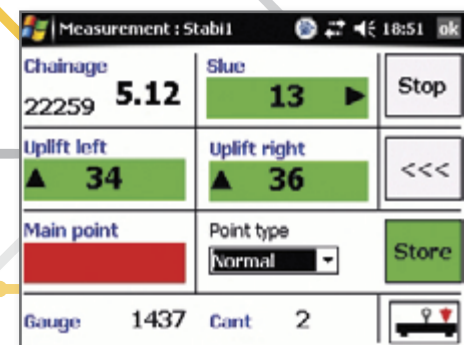
When compared to conventional surveying methods, labor costs are significantly reduced. Digital data management streamlines the capture and transfer of track information. Because the data are collected and checked in the field, the Trimble GEDO system reduces the possibility for costly revisits and rework.

## KEY BENEFITS

- Reduce downtime for pre-tamping surveys
- Fast field operations reduce idle time for tamping machines
- Eliminate errors and delays in data transfers

### TRIMBLE GEDO SYSTEM IN ACTION: SPITZKE SE

In 2011, Spitzke SE received a contract for rail maintenance from Deutsche Bahn AG. Using the Trimble GEDO system for pre-tamping measurements, Spitzke SE reduced labor costs by more than 80 percent and increased the productivity of the tamping machine by 30 percent. The accurate measurements allowed construction managers to make quick decisions on tamping parameters and the amount of ballast required.



## TRIMBLE GEDO FOR RAIL TAMPING

### GEDO TROLLEY SYSTEM FOR FAST MEASUREMENT

Reduce time and costs for pre-tamping surveys

Lightweight and easy to remove from track

Promote safety and schedule flexibility

### ADVANCED DATA MANAGEMENT

Quickly process and analyze field data

Prepare data for tamping machines

Fast, error-free transfer to field systems

Support for platform edges and nominal to actual comparison at fix points

### QUALITY CONTROL AND INSPECTIONS

Compare design to existing track

Post-tamping inspections to confirm final configurations

Fast measurement and results reduces delays

### EFFICIENT MEASUREMENT AND ANALYSIS

Reduce idle time for tamping machines

Reduce downtime for inspection and maintenance

Operate on standard and high-speed rail lines



## TRIMBLE GEDO SYSTEM FOR PRE-TAMPING MEASUREMENT

Trimble GEDO Vorsys software is specifically designed for pre-tamping measurement of track location and alignment. Trimble GEDO Vorsys runs on a Trimble TSC3 Controller to capture the field data needed for tamping operations.

Trimble GEDO Trolley for efficient measurement prior to tamping. The flexible trolley configuration makes it easy to work closely with tamping and construction teams.

Trimble GEDO Tamp Office software for preparing alignment data and upload to field computers. The software lets you ensure that design information is complete before going to the job site. After the field data is downloaded and processed, Trimble GEDO Office Module Tamp outputs tamping information in standard tamping machine formats.





# TRACK CLEARANCES AND ASSET MANAGEMENT

AS DEMAND FOR RAIL TRANSPORT INCREASES, RAILWAYS ARE INTRODUCING ROLLING STOCK THAT IS FASTER AND LARGER THAN EXISTING RAIL CARS. TO ENSURE THAT TRACKS AND FACILITIES CAN SUPPORT THE NEW CARS, RAILWAYS NEED TO COLLECT DETAILED INFORMATION ABOUT EXISTING TRACKS AND SURROUNDING STRUCTURES.

THE TRIMBLE GEDO SCAN SYSTEM COMBINES PRECISE POSITIONING WITH 3D LASER SCANNING TO CAPTURE HIGH-DENSITY INFORMATION IN TUNNELS AND UNDERPASSES, STATIONS, RAIL YARDS AND OTHER AREAS WHERE CLEARANCE TOLERANCES ARE CRITICAL. TRIMBLE GEDO SCAN REPLACES SLOW, LABOR-INTENSIVE MEASUREMENTS WITH HIGH-SPEED MEASUREMENT AND AUTOMATED DATA COLLECTION.

## KEY BENEFITS

- Fast, accurate data collection and processing
- Reduce time on site and downtime for surveys
- 3D point clouds for design and analysis
- Quickly identify clearance issues
- Plan new construction and rolling stock with confidence

## 3D SCANNING FOR RAILWAY APPLICATIONS

### RAILWAY DESIGN

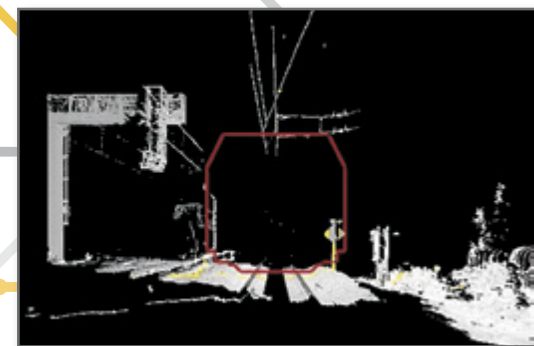
- Develop accurate, detailed models of existing conditions. All features can be tied directly to the track alignment
- Detect and analyze clearance encroachments. Compare clearance envelopes against existing features and provide information for track clearance databases
- Test new designs using Trimble visualization and animation tools

### CONSTRUCTION

- Final inspections
- As-built documentation / survey
- Quality control

### ASSET MANAGEMENT

- Collect information on railway facilities and structures



### TRIMBLE GEDO SCAN IN ACTION: CLEARANCE DATA FOR DEUTSCHE BAHN

As a service provider for Deutsche Bahn AG the engineering company GI-CONSULT GmbH used the GEDO CE 2.0 Scan system for track clearance survey. Measurements of 42 bridges over the new build track Erfurt – Halle were taken to proof the clearance of the slab track under the bridges including the catenary and distance to the bearings. The bridges belong to an 123 km long track planned for train speeds of 330 km/h.

## TRIMBLE GEDO SCAN SYSTEM

### GEDO TROLLEY SYSTEM FOR FAST MEASUREMENT

Collects scanning data, location, gauge, and cant in one operation  
Fast, lightweight and easy to remove from track  
Safety and schedule flexibility

### COLLECT DATA FOR PLANNING AND DESIGN

Create 3D models of critical areas  
Precise, detailed information on track and structures  
Analyze clearance issues  
Develop cross section drawings

### OPTIMIZED SYSTEMS FOR RAILWAY SCANNING

Collect thousands of points each second  
Capture complete profiles in tunnels and underpasses  
Absolute or relative positioning  
Collect complete scan data in a single pass

### INTEGRATED SYSTEM

Streamlined data flow  
Single system for measurement, processing and data analysis  
Combine scanning with data from other Trimble GEDO applications



## TRIMBLE GEDO SCAN SYSTEM COMPONENTS

The Trimble TX5 Scanner can collect thousands of points per second. Mounted on the Trimble GEDO Trolley, the scanner can measure directly overhead to produce precise 3D information on tunnels, overpasses and stations. The TX5 can collect even data while the trolley is in motion. When not in use on the Trimble GEDO Trolley, the TX5 can be used for other projects and applications.

Trimble GEDO Scan Field software controls the field operations. Running on a Trimble Tablet Rugged PC, Trimble GEDO Scan Field assures crew they have complete, accurate information. Field work is completed quickly and without revisits.

Trimble GEDO Scan Office software lets you create and manage detailed 3D point clouds of rail facilities. Scanning data is combined with data from Trimble GEDO Rec software to produce accurate information about track location and conditions. The system can manage clearance envelopes and automatically detect potential trouble spots.





# THE VERSATILE SOLUTION FOR RAILWAY MEASUREMENTS

## THE TRIMBLE GEDO TROLLEY PROVIDES THE ULTIMATE IN PRODUCTIVITY AND FLEXIBILITY

DEVELOPED BASED ON YEARS OF EXPERIENCE, THE TRIMBLE GEDO TROLLEY IS A KEY COMPONENT OF TRIMBLE GEDO FIELD MEASUREMENT SYSTEMS. EASILY ADJUSTED TO FIT DIFFERENT TRACK GAUGES, THE LIGHTWEIGHT TROLLEY IS DESIGNED FOR OPERATION BY ONE PERSON. POWERED BY REMOVABLE TRIMBLE S-SERIES BATTERIES, THE SYSTEM CAN OPERATE FOR UP TO EIGHT HOURS BEFORE REPLACING THE BATTERY.

### APPROVED BY THE DEUTSCHE BAHN AG

The Trimble GEDO CE 2.0 is approved by the Deutsche Bahn Netz AG (Germany), Network Rail (United Kingdom) and other rail companies around the world as measurement equipment for railway construction. As part of the approval process, the compatibility with the network (e.g. signals), the aptitude of the verification process, the functionality and occupational safety, as well as the ergonomics were all taken into consideration. All these capabilities mean that the Trimble GEDO CE 2.0 can work on a track that is open to traffic.

### RAILWAY DESIGN

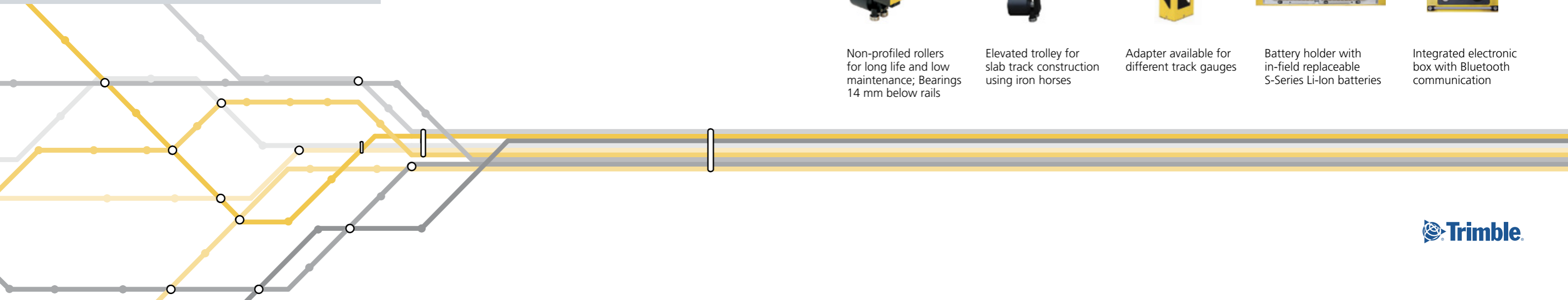
- Lightweight, easy to use by one person
- Configurable to work with onboard Trimble GNSS, Scanner, or Total Stations
- Built-in sensors for rail gauge and cant
- Onboard cable-free Bluetooth® communications
- Removable rechargeable batteries for reliable power
- Single- and dual-trolley configurations to optimize speed and accuracy
- Non-profiled rollers for long life and low maintenance
- Special elevated trolley for slab track construction with iron horses

### PRODUCT SPECIFICATIONS

- Description: Track-mounted trolley
- Gauge: 1000 mm, 1067 mm, 1435 mm, 1520 mm, 1600 mm, 1668 mm, 1676 mm, other gauges on request
- Gauge Measurement Range: -20 mm to +60 mm
- Gauge Measurement Accuracy: ±0.3 mm
- Cant Measurement Range: ±10° or ±265 mm
- Cant Measurement Accuracy: ±0.5 mm (static)
- Weight: 16.0 kg–19.5 kg
- Power: Self-contained, in-field replaceable
- Battery Type: Trimble S-Series Li-Ion, rechargeable
- Battery Life: 6–8 hours
- Certified by: Deutsche Bahn AG (Germany), Network Rail (United Kingdom) and other rail companies around the world

## TRIMBLE GEDO HARDWARE

- |   |                                 |
|---|---------------------------------|
| 1 Trimble S-Series Total Station          | A Brake                         |
| 2 Trimble TX5 Laser Scanner               | B Pushing rod                   |
| 3 Precise prism for survey and slab track | C Prism holder                  |
| 4 Trimble MT1000                          | D Roller                        |
| 5 Trimble GEDO Profiler                   | E Gauge adapter                 |
| 6 Trimble GNSS/GPS Receiver               | F Dove tail adapter             |
| 7 Precise prism for pre-measuring         | G Battery holder                |
| 8 Trimble TSC2/TSC3 Controller            | H Electronic box with Bluetooth |
| 9 Trimble Yuma® 2 Tablet PC               | I Gauge sensor                  |
|   | J Spring loaded contact         |





# SOFTWARE TO CONNECT FIELD AND OFFICE

## SEAMLESS FLOW OF DATA AND INFORMATION FOR MEASUREMENT AND ANALYSIS

THE TRIMBLE GEDO SYSTEM ENSURES EASY, SECURE DATA MANAGEMENT THROUGHOUT DATA COLLECTION AND ANALYSIS. IN THE OFFICE, GEDO SOFTWARE PROVIDES DATA MANAGEMENT AND ANALYSIS IN A MODERN, COHESIVE SOFTWARE ENVIRONMENT. IMPORTING DATA FROM EXTERNAL SOURCES - BOTH DIGITAL AND PAPER PLANS - IS FAST AND EFFICIENT. YOU CAN QUICKLY COMPLETE YOUR WORK AND PROVIDE DELIVERABLES TO CLIENTS AND COLLEAGUES.

### KEY BENEFITS

- Integrated software eliminates data reformatting and transfers
- Consistent look and feel streamlines workflows and reduces training needs

## INTEGRATED SOFTWARE FOR EFFICIENCY AND ACCURACY

### FIELD SOLUTIONS

Trimble GEDO Field software provides powerful functionality and excellent user interface addressing various applications.

**GEDO Doc** for collecting gauge, cant, and twist parameters

**GEDO Rec** for track survey to collect location and track parameters

**GEDO Track** for track construction and as-built survey

**GEDO Vorsys** for high productive pre-measuring for tamping

**GEDO Scan** for 3D laser scanning data collection

### OFFICE SOLUTIONS

Trimble GEDO Office software integrates field and office operations. With advanced capabilities for data management and analysis, the GEDO Office suite provides a seamless flow of information and results. Simple operation and concise quality reports add to the confidence in the system performance.

**GEDO Office Base** provides data preparation and management for field operations. You can import and check design information prior to field work, using digital files or manual entry from paper plans.

**GEDO Office Module Rec** manages processing and output for GEDO Rec measurements. Segments measured from different station setups get merged.

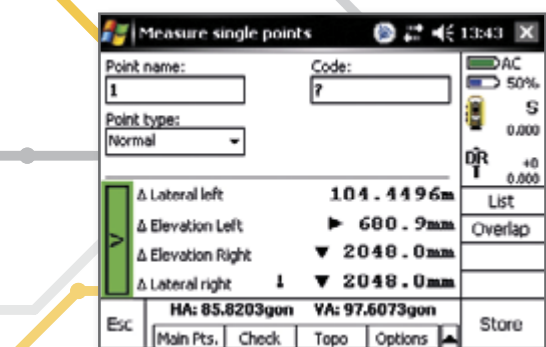
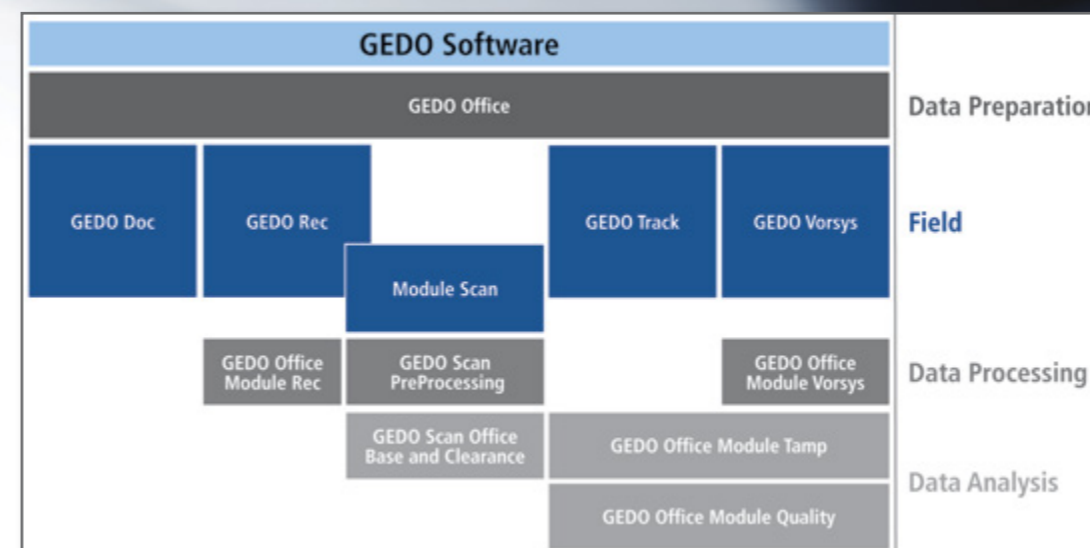
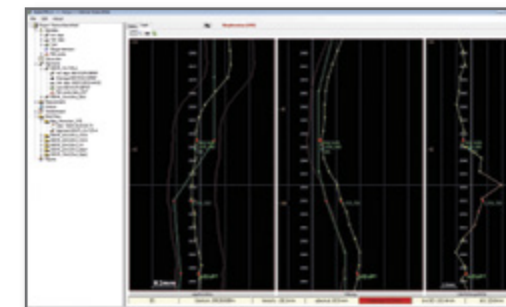
**GEDO Office Module Vorsys** manages processing for GEDO Vorsys measurements. All data can be reprocessed according to new alignment data and final reference point coordinates.

**GEDO Office Module Tamp** uses data from GEDO Track or GEDO Vorsys to produce information for tamping machines. A graphical user interface simplifies the analysis and supports special functions including ramping, constrain points, parallel shifts as well as maximal lift and shift values. Data sets usable for various tamping machines are supported (e.g. ALC Dos/Win, Matisa, Harsco, etc.).

**GEDO Office Module Quality** generates report to verify the track quality. As well as a flexible standard travelling chord, special reports like MKS (Deutsche Bahn AG), Speed Racer (Network Rail), or TukRail (Netherlands) are supported.

**GEDO Scan Pre Processing** processes GEDO Scan measurements to get either a local, global (together with track survey) or semi-global (using design data) 3D point cloud for further analysis.

**GEDO Scan Office** registers field scanning data into 3D point clouds for analysis. Specialized clearance analysis functions let you check for encroachments and produce cross section drawings.





# THE COMPONENTS OF ACCURACY

## ADVANCED TECHNOLOGIES FOR EFFICIENT MEASUREMENT

Trimble instruments provide world-class performance in precision and reliability. For track documentation in open areas, you can use Trimble GNSS with standard RTK or Trimble VRS™ corrections. To measure in tunnels, stations and congested or urban zones, Trimble Total Stations provide flexible easy-to-use positioning. If the application calls for the highest precision, use Trimble Total Stations for fast, reliable measurements.

### TRIMBLE S-SERIES TOTAL STATIONS

The Trimble S6 and S8 Total Stations provide automated tracking and measurement with millimeter precision. Trimble Total Stations let you meet demanding tolerances for precise track positioning. Robotic measurement and free stationing gives the greatest flexibility and efficient operation.

### TRIMBLE GNSS

Trimble GEDO Systems let you choose from a range of Trimble RTK GNSS receivers. Trimble's most advanced GNSS receiver, the Trimble R10, combines advanced GNSS tracking and computation technology to ensure reliable results in challenging conditions.

### TRIMBLE TX5 SCANNER

The Trimble TX5 is a versatile scanner for civil and industrial applications. It can capture high-resolution data for 2D and 3D maps, CAD and quality analysis. The scanner is designed to handle the low-light and difficult environmental conditions. Overhead scanning provides high-resolution data for tunnels, stations, and underpasses.

## RUGGED HARDWARE FOR FIELD COMPUTING

### TRIMBLE TSC3 CONTROLLER

The powerful, handheld Trimble TSC3 Controller includes wireless communications and a full keyboard. Touch screen or keyboard operation and quality VGA resolution keep you working in all lighting conditions. Long battery life and IP67 environmental protection insure reliable operation and data integrity in difficult conditions.

### TRIMBLE TABLET RUGGED PC

The Trimble Tablet Rugged PC provides integrated communications and built-in cameras in a tough, portable tablet. With its large display and touch screen operation, the Trimble Tablet provides detailed information to field crews. The genuine Microsoft® Windows® 7 Professional operating system provides high data security and support for other Trimble field systems.

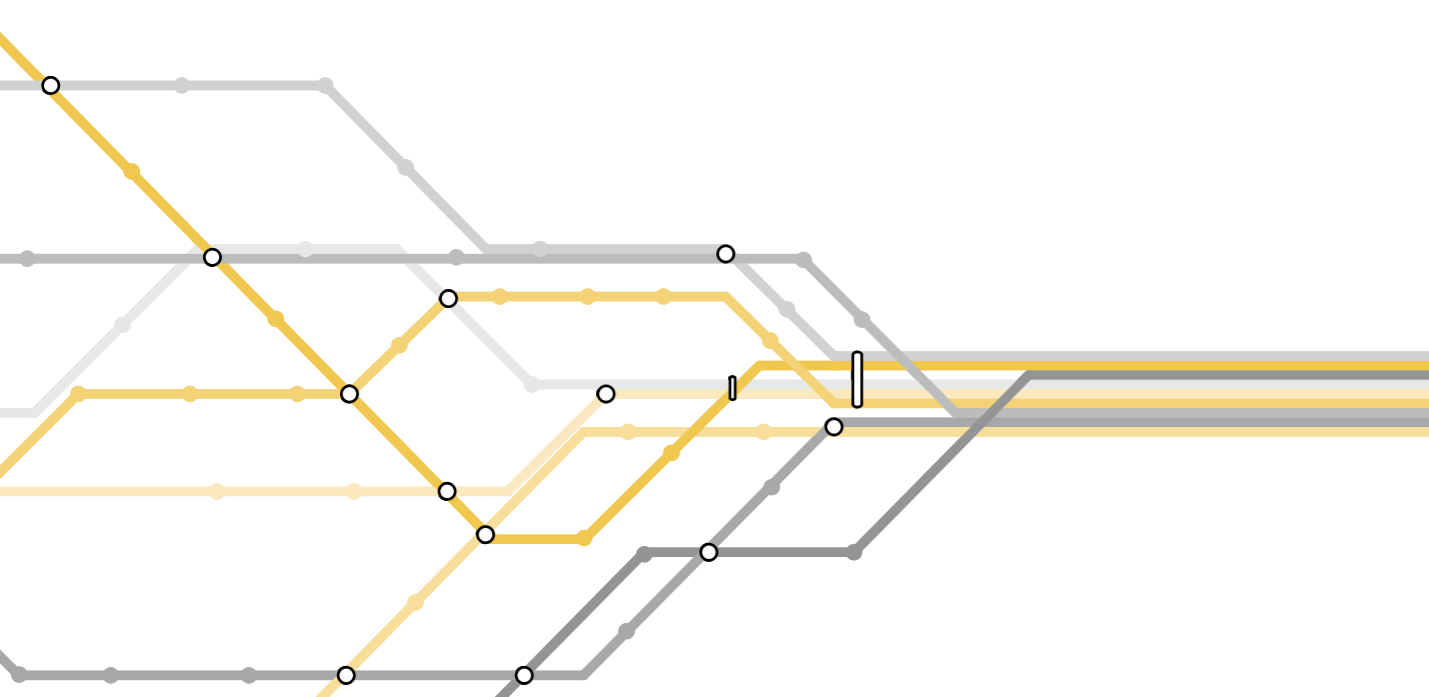


BY INTEGRATING TRIMBLE TECHNOLOGIES FOR MEASUREMENT AND INFORMATION MANAGEMENT, GEDO SYSTEMS ARE TAILORED TO THE ENVIRONMENT AND APPLICATIONS OF THE RAILWAY INDUSTRY. TRIMBLE INSTRUMENTS AND SYSTEMS ARE DESIGNED TO MEET EXACTING STANDARDS OF PERFORMANCE UNDER THE MOST CHALLENGING CONDITIONS. THE FLEXIBLE, MODULAR DESIGN LETS YOU ADAPT TRIMBLE GEDO SYSTEM TO MEET CHANGING AND EXPANDING NEEDS. A SINGLE TROLLEY CAN BE CONFIGURED TO WORK WITH EITHER OPTICAL OR GNSS POSITIONING EQUIPMENT.



## MAXIMUM RETURN ON INVESTMENT

The Trimble GEDO system helps you get the most from your Trimble positioning systems. When your Trimble instruments are not at work with the Trimble GEDO Trolley, you can use them on other projects. Your Trimble Total Stations, GNSS, Scanners and Field Controllers provide world-class performance in applications for surveying, construction, planning and industrial measurement.







AROUND THE WORLD, DIFFERENT CONSTRUCTION METHODS REQUIRE DIFFERENT APPROACHES TO TRACK MEASUREMENT. IN MANY AREAS, NEW APPROACHES TO INCREASE QUALITY AND REDUCE COSTS ARE BEING DEVELOPED AND TESTED. IN ADDITION TO TRIMBLE GEDO TROLLEYS AND SOFTWARE, TRIMBLE CAN DEVELOP MEASUREMENT SOLUTIONS THAT ARE TAILORED TO YOUR CONSTRUCTION NEEDS. THE TRIMBLE GEDO STAFF OF IN-HOUSE DEVELOPMENT EXPERTS PROVIDE FAST, FLEXIBLE IMPLEMENTATION FOR YOUR NEEDS.

**BÖGL SPS IN ACTION: MAX BÖGL  
NEW RAILWAY PROJECT EBENSFELD - ERFURT**

In 2012 and 2013 the German based MAX BÖGL used the custom specific SPS and SSPS systems to adjust more than 10.000 standard, special, compensation, and turn-out slabs. Some of the major challenges for the 32.3 km project had to overcome were the difficult site access and time constraints.

# CUSTOMIZED SOLUTIONS

## TRIMBLE GEDO SPS SYSTEMS FOR PLATE ADJUSTMENT

**GEDO SPS**

Trimble GEDO SPS is a single-source system developed from years of on-site experience. During plate adjustment, the GEDO SPS measuring bar communicates with a Trimble TSC3 Controller running GEDO SPS software. Results are displayed immediately in the field and the workers can make adjustments according to the measured information.

**GEDO J-SLAB**

Developed to support Japanese slab track techniques, Trimble GEDO J-Slab is optimized to support larger ranges for side and height adjustment. You can use GEDO J-Slab for mounting Japanese slabs, and then use GEDO Track for fine adjustment of the rails.

**GEDO SYSTEMS FOR SLAB TRACK BÖGL**

Developed in cooperation with Max Bögl, the Bögl SPS and Bögl SSPS systems enable precise adjustment of the Bögl system of preassembled rail plates. The Trimble solution provides high inner coherence and fast construction. These specialized applications support construction of high-speed switch slabs.

## TRIMBLE GEDO TRACK MEASURING BAR

The Trimble GEDO Track Measuring bar is an ideal solution for slab track measurements when the Trimble GEDO Trolley is not suitable or when you need to measure only a few locations on the track. It's easy to carry and place the bar where needed.

- Built-in gauge and cant sensors
- Bluetooth communications to Trimble field controllers
- Optical target for positioning with Total Station
- Fast and lightweight

## TRIMBLE TRACK MEASURING TOOLS

Railway survey work requires specialized equipment and tools. Some work can only be done if you have the right tools tailored to the job at hand. For other jobs having specialized tools will increase the productivity and accuracy of your results. Trimble offers a wide range of solutions to meet country specific as well as worldwide needs for railway survey work.



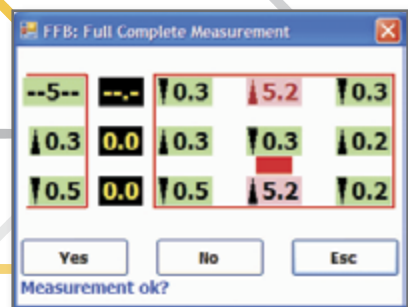
## TRIMBLE GEDO SPS SYSTEM

The Trimble GEDO SPS system is a flexible measurement solution to adjust pre-fabricated slabs. The adjustment is done based on digital alignment data and precise reference points.

The system can be adapted to various slab types, workflows and construction methods where no rail is installed during adjustment.

All measurements are made by a Total Station in combination with additional sensors and special bars which are positioned on the slabs.

The Trimble GEDO SPS system provides precise correction values for height and side adjustment at all necessary locations on the slab. An easy user interface enables construction workers to operate the system.





**About Trimble** Founded in 1978, Trimble is a publicly traded company headquartered in Sunnyvale, California. Trimble serves its customers with employees and distribution partners in more than 100 countries. The company's more than 1,800 patents provide the basis for the broadest portfolio of positioning solutions in the industry. Trimble's integrated solutions allow customers to collect, manage and analyze complex information faster and easier, making them more productive, efficient and profitable.

Trimble Railway solutions combine measurement with data management, communications and customized software to deliver accurate information with speed and reliability. Trimble solutions enable advanced process and workflow integration for a more streamlined operation. From feasibility studies through construction and operation, Trimble Railway solutions help keep your operation running smoothly and safely.

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