Proper Use and Maintenance of your Total Station

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Introduction

Certificate of Calibration
- Accuracy Specifications angle, distance
- Distance Range

Related To
- Status at time of delivery


Certificate

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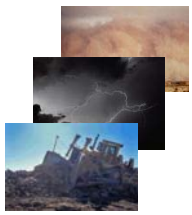
Introduction

- What is happening later with your instrument?
  - Transport
  - Hard field handling
  - Vibrations and shocks from construction machines
  - Extreme temperature changes
  - Windy, rainy, snowy weather



? Quality Status ⇒ Specs ?

Agenda

- **Total Station Basics**
- **Instrument Care and Maintenance**
- **Tracker (Autolock) Checks**
  - *DIN* Specs and Checks
- **Field Collimation**
- **Using Software to Test the**
- **Accuracy of your Instrument**

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Total Station Basics

- **How does that Instrument work?**
  - Horizontal and Vertical Circles
  - Servo Motors
  - Electronic Distance Meters

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Horizontal and Vertical Circles

- **The purpose of the angle system is to produce Horizontal and Vertical angle measurements.**
  - Angle systems consist of some or all of the following components:
    - Vertical Sensor
    - Horizontal Sensor
    - Compensator
    - Oscillator Angle Board
    - Angle Controller Board

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Natural Errors

- **Temperature Effects**
  - Extreme Temperature Changes:
    - Let Instrument Acclimate
    - Shielding from Sun
  - Wind
    - Do not collimate on windy days
  - Tripod Settlement
    - Let angles settle before collimation

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Servo Motors-Robotics

- **Servo Motors**
  - Mechanical Servo Motors
  - Need Routine Maintenance

- **Mag Drive System (Trimble S6/VX)**
  - Mag Drive Servo System
  - No Routine Maintenance
  - Absolute Encoder with Diametric Sensors

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EDM's

- **Reflectorless EDM's**
  - Routine Checking Required
  - EDM Alignment Adjustments

- **Non-Reflectorless EDM's**
  - Routine Checking Required
  - EDM Alignment Adjustments

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Instrument Use and Care

- **Manufacturers Recommend Minimum Annual Service Calibrations**
  - Before Start of Large Projects
  - Once Every Quarter
  - If anything is unclear
    After Field Calibration
  - Tracker Alignment once per month
  - Large Temperature Changes

Trimble S6 users – Spread Tripod Legs

Instrument Acclimation

- **Sufficient time for acclimation**
  - 1.2 min for 1°F
  - Example…
    77°F transport temperature
    23°F outside temperature
    45 min. acclimation time

Robotics-Checking the Tracker

- **Simple test to check your Autolock Tracker**
  - Set-up Prism 100m away
  - Zero Set the gun on the prism after manual sight
  - Turn Autolock on
  - Compare the values

Demonstration

Field Collimation

- **Field Collimations should be done regularly**
  - Set-up Prism 100m away
  - Measurement Collimation
  - Tilt Axis Collimation
  - Tracker Collimation
    - 4 times a year minimum
    - Extreme Temp changes
    - Large Projects

Demonstration

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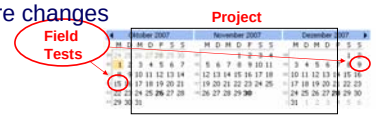
DIN/ISO Precision Checks

- **Why?**
  - Instrument precision status changes
  - Status knowledge is necessary
  - User should be sure deviations are nor caused by environment
- **How Often**
  - Once a quarter
  - Before the start of large projects
  - Temperature changes
- **What?**
  - Field Tests



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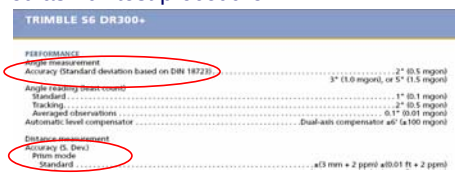
DIN/ISO Precision Checks

- **DIN**
  - German Industrial Standard
  - Common Angle Specs refer to DIN
  - Defined as “full test procedure”



- **ISO**
  - Standards based on DIN
  - Defined as “simplified test procedure

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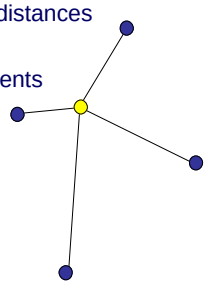
Sample DIN Test Procedure

- **Field Procedure for checking the accuracy of your instruments**
  - Set-up 3 to 4 Prisms at various distances 100 … 250 m
  - Take Direct/Reverse Measurements to each target (F1 and F2)
  - Should take 3 Rounds
  - Create ISO Report



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DIN/ISO Angles-Distances

- **ISO Report – simplified procedure**

Multiple Rounds

1. Horizontal Angles

1	2	3	4	5	6	7	8	9	10
Station	Target	Face 1	Face 2	Mean L1+L2	Mean Reduced	Mean out of all sets	Diff D	Res R	RR
		dms	dms	dms	dms	dms	sec	sec	sec²
1	100	0°00'03"	180°00'00"	0°00'02"	0°00'00"	0°00'00"	00.0	00.5	00.25
	200	14°53'14"	194°53'14"	14°53'14"	14°53'12"	14°53'12"	-00.4	00.2	00.02
	300	343°19'43"	163°19'55"	343°19'49"	343°19'48"	343°19'47"	-01.2	-00.7	00.49
							-00.5		
	100	0°00'02"	180°00'03"	0°00'02"	0°00'00"		00.0	-00.5	00.25
	200	14°53'16"	194°53'12"	14°53'14"	14°53'12"		00.4	-00.2	00.02
	300	343°19'41"	163°19'55"	343°19'48"	343°19'45"		01.2	00.7	00.49
							00.5		
Sum								00.0	01.52

Number of sets	2
Number of targets	3
Number of degrees of freedom	2
Std.Dev. of a direction measured in both faces	00.9 sec
Std.Dev. of a direction averaged over 2 sets	00.5 sec

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DIN/ISO Test Results

- **Review**
  - Field procedures
  - Carried out by the user
  - Regular basis
  - Very the specifications

- Anything Unclear?
  or
- Distance Specs?

Authorized Service Provider

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Summary

To Assure your total stations quality

- Check your instruments regularly
- Field Checks are necessary when working with Autolock or Robotic Total Stations
- Instruments calibrated annually
- Robotic Trackers need to be field calibrated regularly
- If Accuracy specs are required, check using a field DIN/ISO test
- Regular maintenance will go a long way in maintaining the accuracy of your instruments

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Questions

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