GOVERNMENT OF WESTERN AUSTRALIA

Landgate

MEDJIL

SURVEY
INSTRUMENTATION CALIBRATION PORTAL

Medjil User Guide

Version: 29-08-2024

Barcoded Staff Range Calibration

This procedure can only be performed by an authorised Landgate Staff.

1. Fieldnotes and Data

The downloaded level data from a Leica Digital level (LS15/16) and the corresponding completed Booking Sheet (No 4) are shown in the figure below. If the downloaded data contains data from other surveys, it needs to be deleted and edited to just contain the right information. See this sample dataset below to ensure its integrity.

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LANDGATE - DIGITAL LEVELLING RECORD
       ~BFOD VERSION 18.0~
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DATE     :  8/ 6/2022                        LEVEL TYPE       :        LS15
JOB      :   220608BOYA                      SERIAL NUMBER    :      702272
SURVEYOR :          VU                       JOB COMMENT      :       26296
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CHECK & ADJUST
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>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>
| 1.54029 |         |         | 19.967 |            |            1 | 10 | 0.00001 |         1 | 20.0 |
|         |         | 0.84532 | 40.052 |            |            1 | 10 | 0.00001 |         2 | 19.0 |
|         |         | 1.01621 | 19.976 |            |            1 | 10 | 0.00000 |         3 | 19.0 |
| 1.71123 |         |         | 40.020 |            |            1 | 10 | 0.00002 |         4 | 19.0 |
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

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LINE LEVELLING
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|LINE   : LINE00001           STAFF NUMBER 1 : 26296                DATE :  8/ 6/2022                 |
|METHOD :         BF          STAFF NUMBER 2 :     0                     TIME :   10:02:11             |
|----------------------------------------------------------------------------------------------------|
|    BS   |   INT   |    FS   |  DIST   | TOTAL DIST |      ELEV      | NR |   STD   |  PT ID   | TEMP |
|         |         |         |         |            |                | MS |   DEV   |          |      |
|---------|---------|---------|---------|------------|----------------|----|---------|----------|------|
| 0.07110 |         |         | 10.008  |            |        0.00000 | 10 | 0.00000 |        1 | 20.0 |
|         | 0.16206 |         |  9.983  |            |       -0.09097 | 10 | 0.00000 |        2 |      |
|         | 0.32610 |         |  9.999  |            |       -0.25500 | 10 | 0.00000 |        3 |      |
|         | 0.47227 |         |  9.986  |            |       -0.40117 | 10 | 0.00000 |        4 |      |
|         | 0.68527 |         | 10.006  |            |       -0.61418 | 10 | 0.00000 |        5 |      |
|         | 0.87135 |         |  9.999  |            |       -0.80025 | 10 | 0.00000 |        6 |      |
|         | 1.07105 |         | 10.005  |            |       -0.99996 | 10 | 0.00000 |        7 |      |
|         | 1.27604 |         |  9.986  |            |       -1.20495 | 10 | 0.00000 |        8 |      |
|         | 1.52290 |         |  9.997  |            |       -1.45181 | 10 | 0.00000 |        9 |      |
|         | 1.79055 |         |  9.992  |            |       -1.71946 | 10 | 0.00000 |       10 |      |
|         | 2.12364 |         | 10.002  |            |       -2.05255 | 10 | 0.00000 |       11 |      |
|         | 2.38749 |         | 10.012  |            |       -2.31640 | 10 | 0.00000 |       12 |      |
|         | 2.51333 |         |  9.999  |            |       -2.44224 | 10 | 0.00000 |       13 |      |
|         | 2.64312 |         |  9.993  |            |       -2.57203 | 10 | 0.00000 |       14 |      |
|         |         | 2.87153 |  9.989  |            |       -2.80043 | 10 | 0.00000 |       15 | 19.0 |
|         |         |         |         |     19.997 |                |    |         |          |      |
<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<<

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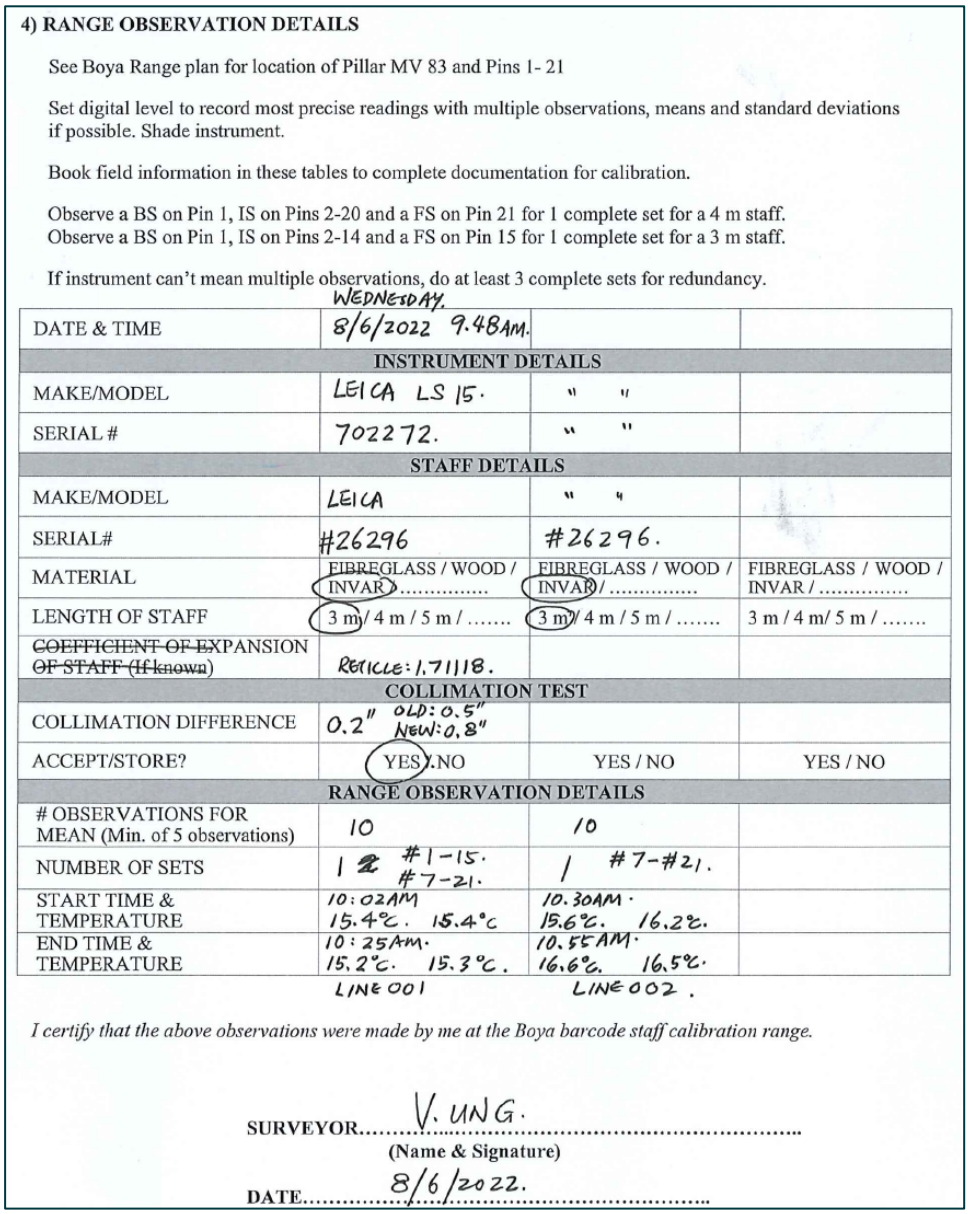
|LINE   : LINE00002           STAFF NUMBER 1 : 26296                DATE :  8/ 6/2022                 |
|METHOD :         BF          STAFF NUMBER 2 :     0                     TIME :   10:28:29             |
|----------------------------------------------------------------------------------------------------|
|    BS   |   INT   |    FS   |  DIST   | TOTAL DIST |      ELEV      | NR |   STD   |  PT ID   | TEMP |
|         |         |         |         |            |                | MS |   DEV   |          |      |
|---------|---------|---------|---------|------------|----------------|----|---------|----------|------|
| 0.07723 |         |         |  8.877  |            |        0.00000 | 10 | 0.00000 |        7 | 19.0 |
|         | 0.28222 |         |  8.842  |            |       -0.20500 | 10 | 0.00000 |        8 |      |
|         | 0.52914 |         |  8.819  |            |       -0.45191 | 10 | 0.00000 |        9 |      |
|         | 0.79674 |         |  8.789  |            |       -0.71951 | 10 | 0.00000 |       10 |      |
|         | 1.12981 |         |  8.805  |            |       -1.05259 | 10 | 0.00000 |       11 |      |
|         | 1.39368 |         |  8.794  |            |       -1.31645 | 10 | 0.00000 |       12 |      |
|         | 1.51949 |         |  8.795  |            |       -1.44226 | 10 | 0.00000 |       13 |      |
```

Figure 1: A text formatted version of Range Measurement at Boya by Leica Digital Level (LS15)



4) RANGE OBSERVATION DETAILS

See Boya Range plan for location of Pillar MV 83 and Pins 1- 21

Set digital level to record most precise readings with multiple observations, means and standard deviations if possible. Shade instrument.

Book field information in these tables to complete documentation for calibration.

Observe a BS on Pin 1, IS on Pins 2-20 and a FS on Pin 21 for 1 complete set for a 4 m staff.
Observe a BS on Pin 1, IS on Pins 2-14 and a FS on Pin 15 for 1 complete set for a 3 m staff.

If instrument can't mean multiple observations, do at least 3 complete sets for redundancy.

DATE & TIME	WEDNESDAY. 8/6/2022 9.48AM.		
INSTRUMENT DETAILS			
MAKE/MODEL	LEICA LS 15.	" "	
SERIAL #	702272.	" "	
STAFF DETAILS			
MAKE/MODEL	LEICA	" "	
SERIAL#	#26296	#26296.	
MATERIAL	FIBREGLASS / WOOD / INVAR /	FIBREGLASS / WOOD / INVAR /	FIBREGLASS / WOOD / INVAR / .....
LENGTH OF STAFF	3 m / 4 m / 5 m /	3 m / 4 m / 5 m /	3 m / 4 m/ 5 m / .....
~~COEFFICIENT OF EXPANSION OF STAFF (If known)~~	RETICLE: 1.71118.		
COLLIMATION TEST			
COLLIMATION DIFFERENCE	0.2" OLD: 0.5" NEW: 0.8"		
ACCEPT/STORE?	YES / NO	YES / NO	YES / NO
RANGE OBSERVATION DETAILS			
# OBSERVATIONS FOR MEAN (Min. of 5 observations)	10	10	
NUMBER OF SETS	1 & 2 #1-15. #7-21.	1 #7-#21.	
START TIME & TEMPERATURE	10:02AM 15.4°C. 15.4°C	10.30AM. 15.6°C. 16.2°C.	
END TIME & TEMPERATURE	10:25AM. 15.2°C. 15.3°C.	10.55AM. 16.6°C. 16.5°C.	
	LINE 001	LINE 002.	

I certify that the above observations were made by me at the Boya barcode staff calibration range.

SURVEYOR..... V. UNG.
(Name & Signature)

DATE..... 8/6/2022.

Figure 2: Field book records of a Range measurement at Boya

Note - At the moment, Medjil can read only read two (GSI) file formats exported by the Leica Digital Level (LS15/16 and DNA03). Should we plan to use digital level from a different manufacturer, a new function will need to be added in **'/rangecalibration/views.py'** to read a different file format.

2. Staff Range Calibration - Processing

- **Step 1:** To start a new Staff Range Calibration, click on the **Staff Calibration** > **Range Calibration**.
- **Step 2:** Click on the **New calibration** button. Enter a **Job Number** with a ten digit alphanumeric code.
  - **Site Name**: select **Boya** from the dropdown.
  - **Staff Number**: select the staff number or enter a new one by clicking on the + button. This is usually an **invar** staff recently calibrated by an internationally recognised

laboratory with values determined for *Coefficient of expansion*(α) and *the scale factor*(m0) at a *standard tempearture*(T0).

- **Level Number**: select the digital level (number) or enter a new one by clicking on the + button.
- **Calibration date**: Choose a calibration date.
- Enter an **Observer** name or tick the **I am the Observer**, if the observer is same as the person performing this procedure.
- Click the **next** button.
- **Note:** Form errors will be shown in red text to help correctly fill the form.

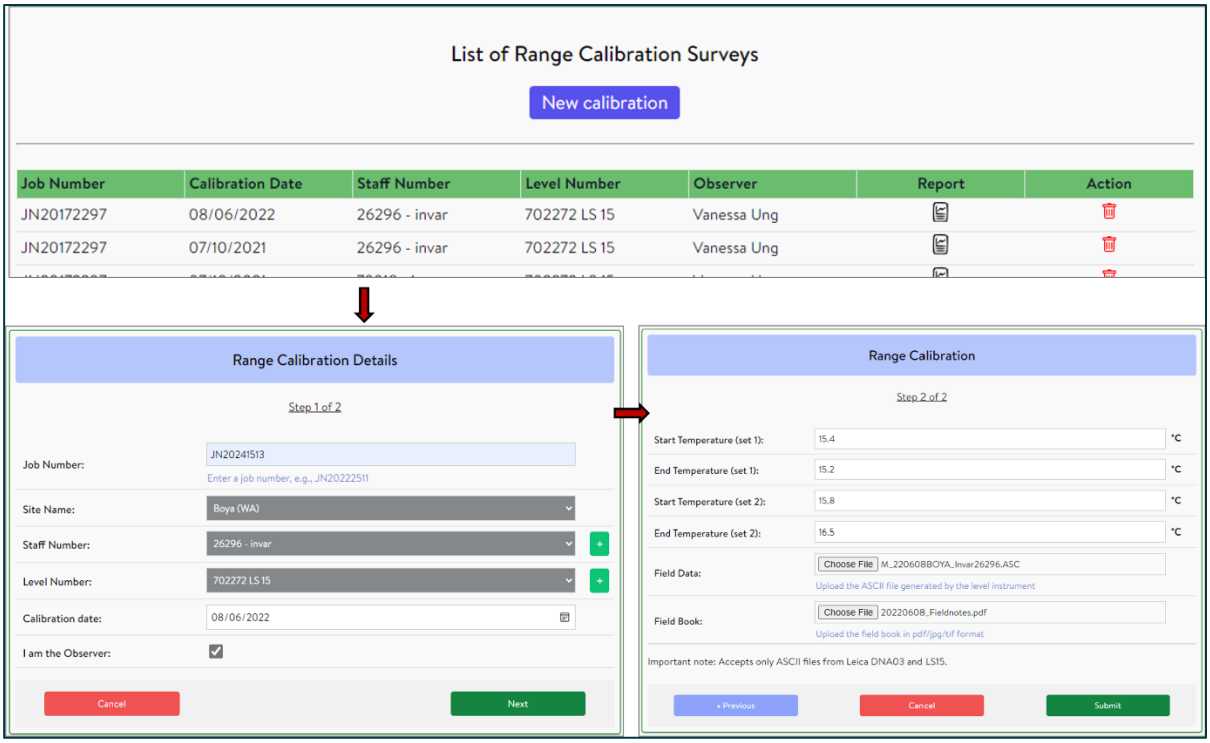
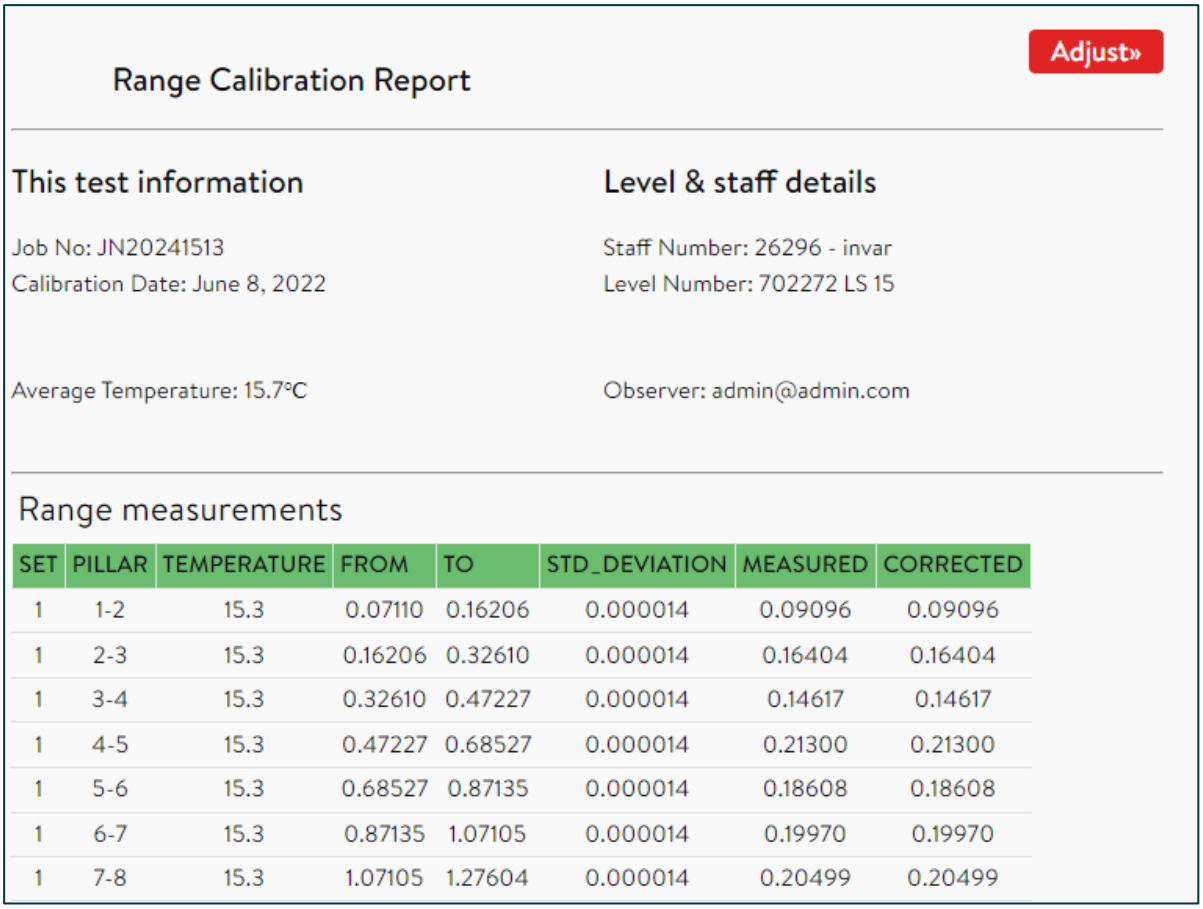


Figure 3: Range Calibration process in Medjil

- **Step 3:** Enter the temperatures and select the datasets.
  - **Start Temperature (set 1)**: Temperature at the beginning of measurement. For example, at Pillar MV 83 for a 3 or 4 metre staff.
  - **End Temperature (set 1)**: Temperature at the end of measurement. For example, at Pillar MV 83 for a 3 or 4 metre staff.
  - **Start Temperature (set 2)**: Temperature at the beginning of measurement. For example, at Pillar B for a 3-metre staff and at Pillar MV 83 for a 4-metre staff.
  - **End Temperature (set 2)**: Temperature at the end of measurement. For example, at Pillar B for a 3-metre staff and at Pillar MV 83 for a 4-metre staff.
  - **Field Data**: Click the **Choose File** button to select the Leica GSI file (in .asc format).
  - **Field Book**: Click the **Choose File** button to select the field book (in pdf format).
  - Click the **Submit** button.
  - **Note:**
    - ✓ Form errors will be shown in red text to help correctly fill the form.
    - ✓ Test data is provided here with the corresponding Field Book to assist with the Staff Range Calibration procedure.
- **Step 4:** By submitting the form in **Step 3**, the next page will tabulate the Range measurements and calculated height differences (incorrect and corrected for

temperature).



Range Calibration Report

Adjust»

This test information

Job No: JN20241513
Calibration Date: June 8, 2022

Average Temperature: 15.7°C

Level & staff details

Staff Number: 26296 - invar
Level Number: 702272 LS 15

Observer: admin@admin.com

Range measurements

SET	PILLAR	TEMPERATURE	FROM	TO	STD_DEVIATION	MEASURED	CORRECTED
1	1-2	15.3	0.07110	0.16206	0.000014	0.09096	0.09096
1	2-3	15.3	0.16206	0.32610	0.000014	0.16404	0.16404
1	3-4	15.3	0.32610	0.47227	0.000014	0.14617	0.14617
1	4-5	15.3	0.47227	0.68527	0.000014	0.21300	0.21300
1	5-6	15.3	0.68527	0.87135	0.000014	0.18608	0.18608
1	6-7	15.3	0.87135	1.07105	0.000014	0.19970	0.19970
1	7-8	15.3	1.07105	1.27604	0.000014	0.20499	0.20499

Figure 4: Range measurement reports in Medjil

- **Step 5:** Click the **Adjust** button at the right to generate the Range calibration report/certificate. The Range Calibration report/Certificate contains three tables that is being printed on four pages respectively, by clicking the **Print Report >>** button.
  - Staff Readings and calculated height differences
  - Adjusted height differences and their uncertainties
  - Height differences and their observed and calculated standard errors
- **Step 6:** Calculating the time-dependent Range – The time-dependent Range is calculated automatically once the **Adjust >>** button is clicked. This is done through the function in rangecalibration/views.py as follows:

```
try:
        update_range_table_current(thisRecord)
        thisRecord.updated_to = True
        messages(request, 'Successfully updated the Calibration Range.')
except:
        pass
```

where, thisRecord refers to the Range being updated for that date. Further, any calibrated Range that are adjusted but may not have been updated in the above script will be updated when an authorised Landgate user (usually is_staff) clicks the **RangeCalibration** tab > Staff Calibration > Range Calibration.