

LR Panel 1.0.4

User Manual

Ballistic Calculator. Edition: 21 October 2026

LR Panel calculates the parameters of points along a bullet's trajectory as a function of distance. The program also lets you build your own ammunition database or import one from a TXT or XLS file.

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Introduction

Part	Scope
I · Ballistic Calculator	settings, panel readouts, DIAL counter, wind, shooting conditions, ballistic table, PDF report, comparison of the bullets stored in slots P1, P2 and P3 in an XLS file with charts (C-XLS), BC calculator, configuration files
II · AMMO BASE Ammunition Database	creating and importing a database, editing, slots P1 / P2 / P3, METRIC ⇌ IMPERIAL unit conversion, searching the database (\$ prefix, e.g. \$heavy)

Disclaimer

- LR Panel is a computational tool. The accuracy of its results depends on the correctness of the input data: ballistic coefficient (BC), bullet velocity, sight height, zero range and atmospheric conditions.
- The DIAL counter exists only in the application and does not control the riflescope. The actual adjustments must be made manually with the scope's elevation and windage turrets.
- The values in the examples apply to the reference setup (chapter 1). They must not be used as settings for any other rifle or ammunition.
- In the transonic and subsonic velocity ranges the panel displays the messages **TRANSONIC** and **SUBSONIC**. Corrections calculated in these ranges must be verified by live fire.

Conventions

Notation	Meaning
CONFIG > Scope	menu path: CONFIG screen, Scope section
DIAL = CALC	button, field or message shown on the screen
▲ ▼ ► ◄	direction of the correction: up, down, right, left
CLK · MIL · MOA · CM	turret clicks · milliradians · minutes of angle · centimetres
4.08	numbers are written with a decimal point, exactly as the application displays and accepts them

Part I · Ballistic Calculator

1. Basic Data

All examples in Part I were calculated for the following reference setup.

Parameter	Value	CONFIG › section
Cartridge	308 175 HPBT	Files › Scheme name
Drag model / BC	G7 / 0.243	Projectile · V1
Bullet weight	11.34 g	Projectile · V1
Velocity V1 / measuring distance D1	790 m/s / 0 m	Projectile · V1
Sight height above the bore axis	4.5 cm	Scope
Zero range	100 m	Scope
Click value	10 mm/100 m (0.1 MIL)	Scope
Angular unit	MIL	Scope
Atmospheric conditions	15 °C · 1013.25 hPa · 50 %	Atmosphere

2. Main Panel

The screenshot shows the 'CONFIG' tab of the LR Panel interface. At the top, there are tabs for 'TABLE', 'P1', 'P2', 'P3', and 'CONFIG'. The 'CONFIG' tab is active. Below the tabs, the 'DISTANCE m' is set to 5, with 'STEP ±5' indicated. The 'ELEV UP' is set to 90, with 'MAX' indicated. The 'WIND · 0 CLK' is shown. Below this, a table displays four columns of data: V1 m/s (1040), V m/s (1033), E J (1797), and TOF ms (5). The next row shows Z1 m (92), Z2 m (100), ZD m (96), and APEX cm (0.0). Below the table, there are buttons for 'CLK', 'MIL', 'CM', 'UD', and 'LR'. The 'DIAL = CALC' and 'DIAL 0' buttons are also visible. The 'DIAL UD 0' is shown, with 'CALC +90 CLK · 9.02 MIL' below it. At the bottom, the 'WIND m/s' is set to 0, and the 'FROM' is set to 10h.

Fig. 1. Main panel (distance 5 m, UD axis, CLK unit).

Main panel, from top to bottom: distance, correction, bullet data, DIAL counter, wind.

Element	Meaning
TABLE ·  · P1 P2 P3 · CONFIG	ballistic table; unlocking the quick-load ammunition slots (Part II, chapter 4); settings
DISTANCE	distance to the target, 0–5000 m; the – / + buttons change it by the STEP increment, or the value can be typed in; 0 is the muzzle
Main readout	correction to dial on the scope or to hold on the reticle; ▲ UP, ▼ DOWN, ► RIGHT, ◄ LEFT
ELEV / WIND	axis shown in the main readout (UD / LR switch); the correction for the other axis appears in the line below
V1 · V · E · TOF	reference velocity (editable field) and the bullet's velocity, kinetic energy and time of flight at the selected distance
Z1 · Z2 · ZD · APEX	first (near) and second (far) intersection of the trajectory with the line of sight; distance of the trajectory apex and its height above the line of sight
CLK / MIL / CM	correction unit: clicks, angular unit (MIL or MOA, as set in CONFIG), centimetres at the target (inches in IMPERIAL mode)
DIAL = CALC · DIAL 0	copy the calculated correction into the DIAL counter · reset the counter (chapter 5)
DIAL UD / CALC	DIAL counter value and the full calculated correction
WIND · FROM	wind speed and the clock direction it blows from
MAX	field mode: the main readout fills the whole screen

A green main readout means that the DIAL counter matches the calculation and the remaining correction is less than half a click. Holding the – or + button down changes the value faster.

Distance 0 (muzzle). The angular correction to a point at zero distance is undefined (it tends to infinity), so in CLK, MIL and MOA the ELEV main readout shows “—”, as the ballistic table does. In CM the panel shows the sight height (▲ 4.5 CM), WIND is 0, and V and E are muzzle values. The counter bar shows $CALC - \cdot D = 0$, and $DIAL = CALC$ on the UD axis does not change the setting.

3. Initial Setup

The setup is done once for each rifle – scope – ammunition combination.

1. CONFIG > Projectile · V1 – drag model (G1 / G7 / GA / GS), BC, bullet weight, velocity V1, measuring distance D1, METRIC / IMPERIAL unit system.
2. CONFIG > Scope – sight height, zero range, click value (mm/100 or 1/8 · 1/4 · 1/2 · 1 MOA), angular unit MIL / MOA, maximum table distance.
3. CONFIG > Atmosphere – temperature, relative humidity and either pressure or altitude above sea level (one value determines the other).
4. CONFIG > Files > Scheme name – name of the setup, then SAVE CF (saves a copy of the settings to a file).

If the ammunition is stored in the database, step 1 is replaced by selecting the cartridge in AMMO BASE and pressing LOAD (Part II).

4. Calculation Examples

4.1 Correction for 500 m

1. Type 500 in the **DISTANCE** field, set it with the – / + buttons, or select it in the **TABLE**.
2. Read the correction: **ELEV UP ▲ 4.08 MIL**.
3. The unit selector switches between units:

Unit	Readout	Use
MIL	▲ 4.08 MIL	holdover on a MIL reticle
CLK	▲ 41 CLK	turret adjustment: 41 clicks up
CM	▲ 204 CM	point of impact below the point of aim when no correction is applied

4.2 Corrections for several distances

Distance	ELEV	V	E	TOF	Message
300 m	▲ 1.66 MIL	616 m/s	2154 J	430 ms	–
500 m	▲ 4.08 MIL	513 m/s	1494 J	786 ms	–
800 m	▲ 9.27 MIL	375 m/s	797 J	1469 ms	TRANSONIC · verify on target
1000 m	▲ 14.3 MIL	315 m/s	563 J	2061 ms	TRANSONIC · verify on target

The distance increment is set in **CONFIG > Panel > Distance ± step** (1 · 5 · 10 · 25 · 50 · 100).

4.3 Selecting a distance from the table

Press **TABLE** and tap the 600 row. The table closes and the **DISTANCE** field shows 600.

4.4 MOA instead of MIL

Set **CONFIG > Scope > Angular unit = MOA** and **Click value = 1/4**. At 500 m the panel shows ▲ 14.0 MOA, i.e. ▲ 56 CLK.

5. DIAL Counter (simulation of the UD / LR turrets)

The main readout on the panel is the correction that still has to be applied: the calculated correction minus the value stored in the DIAL counter. The counter bar shows both, e.g. **DIAL UD +30** and **CALC +41 CLK · 4.08 MIL**.

5.1 Copying the calculated correction into the counter

Conditions: distance 500 m, wind 4 m/s from 3 o'clock.

1. Select the **UD** axis and press **DIAL = CALC**. The counter shows **DIAL UD +41**.
2. The panel shows **ELEV 0.00 MIL** in green, a short signal sounds and the message **ON · rest 0.02 MIL < ½ click** appears.
3. Select the **LR** axis and press **DIAL = CALC**. The counter shows **DIAL LR +12** and **WIND 0.00** turns green.

- On the scope, dial 41 clicks up and 12 clicks right by hand.

A value of 0 is displayed when the remaining correction is less than half a click (a finer adjustment is not possible).

5.2 Scope with an adjustment already dialled

The scope has 30 clicks up dialled; the target is at 500 m.

- Select the UD axis and use the – / + buttons of the counter bar to set **DIAL UD +30**.
- Read **ELEV UP ▲ 1.08 MIL** – this is the amount to hold on the reticle or to dial in addition (11 clicks).

Z1, Z2, ZD and **APEX** then refer to the trajectory for the current adjustment (**Z2** = 417 m).

5.3 Returning to the zero setting

DIAL 0 resets the UD and LR counters. Working values entered on the panel (V1, wind speed and direction) revert to the **CONFIG** settings.

6. Effect of Wind

WIND is the wind speed and **FROM** is the clock direction it blows from: 12 o'clock – head-on, 3 – from the right, 6 – from behind, 9 – from the left. The correction arrow points opposite to the drift, i.e. into the wind.

6.1 Crosswind

Conditions: distance 500 m, wind 4 m/s from 3 o'clock.

Axis	Main readout	Line below
UD	ELEV ▲ 4.08 MIL	WIND ► 1.22 MIL
LR	WIND RIGHT ► 1.22 MIL	ELEV ▲ 4.08 MIL

6.2 Wind direction

FROM	WIND (500 m, 4 m/s)	ELEV
3 o'clock (90°)	► 1.22 MIL	▲ 4.08 MIL
2 o'clock (60°)	► 1.06 MIL	▲ 4.09 MIL
12 o'clock (head-on)	0.00 MIL	▲ 4.10 MIL

The increments for wind direction and speed are set in **CONFIG > Shot · Wind (Direction step, Wind ± step)**.

6.3 Working values

Velocity V1 and the **WIND** and **FROM** values can be changed on the panel without changing the settings in **CONFIG**. A field whose value differs from the base settings is shown dimmed. Example: V1 = 770 m/s, wind 3 m/s from 9 o'clock → **ELEV ▲ 4.34**, **WIND ◀ 0.95 MIL**. **DIAL 0** restores the values from **CONFIG**.

7. Shooting Conditions

7.1 Uphill and downhill shooting

The inclination of the line of fire is set in **CONFIG > Shot > Wind > SHOOTING ANGLE** (+ uphill, – downhill). Distance 500 m:

Angle	ELEV
0°	▲ 4.08 MIL
+15°	▲ 3.92 MIL
–15°	▲ 3.89 MIL
+30°	▲ 3.40 MIL

When shooting at an angle, the bullet drops less relative to the line of sight, so the correction decreases for both uphill and downhill shots.

7.2 Rifle cant

RIFLE CANT = 3°, distance 500 m, LR axis: **WIND LEFT** ◀ 0.06 MIL.

7.3 Temperature and pressure

Conditions (CONFIG > Atmosphere)	ELEV at 500 m	V at 500 m
15 °C, 1013 hPa (standard atmosphere)	▲ 4.08 MIL	513 m/s
winter, –10 °C	▲ 4.22 MIL	495 m/s
summer, +30 °C	▲ 4.01 MIL	524 m/s
mountains, 850 hPa (approx. 1500 m ASL)	▲ 3.82 MIL	554 m/s

Instead of pressure you can enter the altitude above sea level (**Altitude ASL**); the pressure is then derived from the standard atmosphere. Gravitational acceleration **Gravity g**: 9.80665 m/s² (standard value) or 9.81 m/s² (the value used in some ammunition manufacturers' tables).

7.4 Velocity measured at distance D1

A chronograph placed 20 m in front of the muzzle reads 790 m/s. Enter **V1** = 790 and **D1** = 20 – the correction at 500 m becomes ▲ 3.93 MIL. The ballistic table shows a 20 V1 row.

8. Additional Factors

All factors are disabled by default. The examples refer to a distance of 1000 m.

Factor	Setting	Result
Powder temperature sensitivity	CONFIG > Extra factors : ON; 1.2 m/s per 1 °C; V1 measured at 20 °C; current temperature 0 °C	POWDER 0°C · V1 –24.0 m/s; at 500 m ▲ 4.47 MIL
Spin drift	CONFIG > Spin drift : ON; twist 1:10, right-hand (RH); diameter 7.82 mm; length 31.2 mm	WIND LEFT ◀ 0.44 MIL
Aerodynamic jump	requires spin drift; wind 4 m/s from 3 o'clock	ELEV ▲ 14.4 instead of 14.3 MIL

Factor	Setting	Result
Coriolis effect	CONFIG > Coriolis: ON; latitude 52°; firing azimuth 90° (east)	ELEV ▲ 14.2, WIND ◀ 0.10 MIL
Moving target	CONFIG > Extra factors > Moving target lead: ON; 2 m/s; moving left to right (L → R); 300 m	panel header shows lead ▶ 2.87 mil

With aerodynamic jump and a crosswind, the trajectory may not cross the line of sight at the zero range. The panel then shows **NO ZERO CROSSING** and the **Z1** and **Z2** fields remain empty. This is a correct calculation result.

9. Ballistic Table, PDF Report and C-XLS Comparison

The **TABLE** button opens the table of corrections for the whole distance range. Example: reference setup, wind 4 m/s from 3 o'clock, D1 = 20 m, step 100 m, ZERO rows enabled (some rows omitted).

D [m]	ELEV [MIL]	WIND [MIL]	POI [cm]	DROP [cm]	V [m/s]	E [J]	TOF [ms]	MACH
0	—	0.00	−4.5	0.0	802.4	3651	0	2.358
20 V1	1.15	R 0.04	−2.3	−0.3	790.0	3539	25	2.322
54.5 Z1	0.00	R 0.11	0.0	−2.3	768.8	3351	69	2.259
77.4 ZD	−0.06	R 0.15	+0.4	−4.8	754.8	3231	99	2.218
100 Z2	0.00	R 0.20	0.0	−8.0	741.3	3116	130	2.178
300	1.60	R 0.66	−47.9	−81.0	627.2	2230	423	1.843
500	3.93	R 1.19	−196.7	−254.9	523.3	1553	772	1.538
800	8.92	R 2.22	−714.0	−809.8	383.5	834	1442	1.127
1000	13.77	R 3.11	−1377.2	−1498.0	318.2	574	2023	0.935

Column / marker	Meaning
ELEV	vertical correction (negative value – down)
WIND	horizontal correction: R – right, L – left
POI	point of impact relative to the line of sight without correction (+ above, – below)
DROP	bullet drop relative to the bore axis
V1 · Z1 · ZD · Z2	velocity measurement row · first intersection of the trajectory with the line of sight · trajectory apex · second intersection
green V and MACH digits	transonic region (Mach 1.2–0.9) – the result carries greater uncertainty (rows 800 and 1000 m in the example); in the PDF report this region is marked with the letter T next to the distance
– in the ELEV column at D = 0	the angular correction to a point at zero distance is undefined (it tends to infinity); in linear units (CM) the value is given

Setting	Where
CLK / MIL / CM unit	buttons above the table
columns and their order	EDIT COLUMNS → select a column → ◀ / ▶, SHOW / HIDE
Z1 / ZD / Z2 rows	ZERO · Z1 · ZD · Z2 field
corrections relative to the current adjustment	DIAL · UD · LR field (the table title changes to TABLE · DIAL)
step and range	CONFIG › Panel › Table step, CONFIG › Scope › Max distance (10–5000 m; not less than the table step – a smaller value is raised to the step)
report	PDF – cartridge, scope, atmospheric and zero data plus the table in its current layout
bullet comparison	C-XLS – XLS file (.xlsx) with a table, report and charts for slots P1–P3 (section 9.1)

9.1 C-XLS bullet comparison

The **C-XLS** button next to **PDF** creates the file **LR_COMPARE_<date>_<time>.xlsx**, which compares the bullets stored in slots P1, P2 and P3 (Part II, chapter 4). The comparison covers the columns enabled in the ballistic table, the same distance step and range, and the common conditions from **CONFIG** (scope, atmosphere, wind, shooting angle). Empty slots are skipped; if all slots are empty, the panel displays a message and no file is created. The panel settings remain unchanged after the export.

Sheet	Content
COMPARE	table: column D, followed by the values of each slot for every table column; the suffix is the slot number – with P1 and P3, for example, V1 , V3 . Green V and MACH digits – transonic region; empty cell – end of trajectory (bullet velocity too low)
REPORT	date, units, table step and range, common conditions and the ammunition data for P1–P3: drag model and BC, weight, V1 , D1 , twist, bullet geometry, Z1 / Z2 , ZD / APEX , start of the transonic and subsonic regions, stability factor SG . Values not stored in a slot are taken from CONFIG and marked (CONFIG)
V , E , WIND , ...	a chart for each table column – V , E and WIND first, then the others; one line per slot (P1 blue, P2 orange, P3 grey), with the Z1 , Z2 and ZD distances in the legend

The chart lines are calculated directly from the trajectory. Changing values on the **COMPARE** sheet does not affect the charts.

- The D axis starts at 0. In angular units the **ELEV** chart approaches the vertical axis (it tends to infinity as $D \rightarrow 0$) and has a fixed range matched to the table.
- When all values of a column are well above zero (e.g. **V**), the vertical axis starts at the minimum value rounded down, so that the curves fill the whole chart. Columns that cross zero (**POI**, **DROP**, **WIND**) use automatic scaling.

- Energy E is shown with one decimal place; the cells store three additional decimal places hidden by the number format.

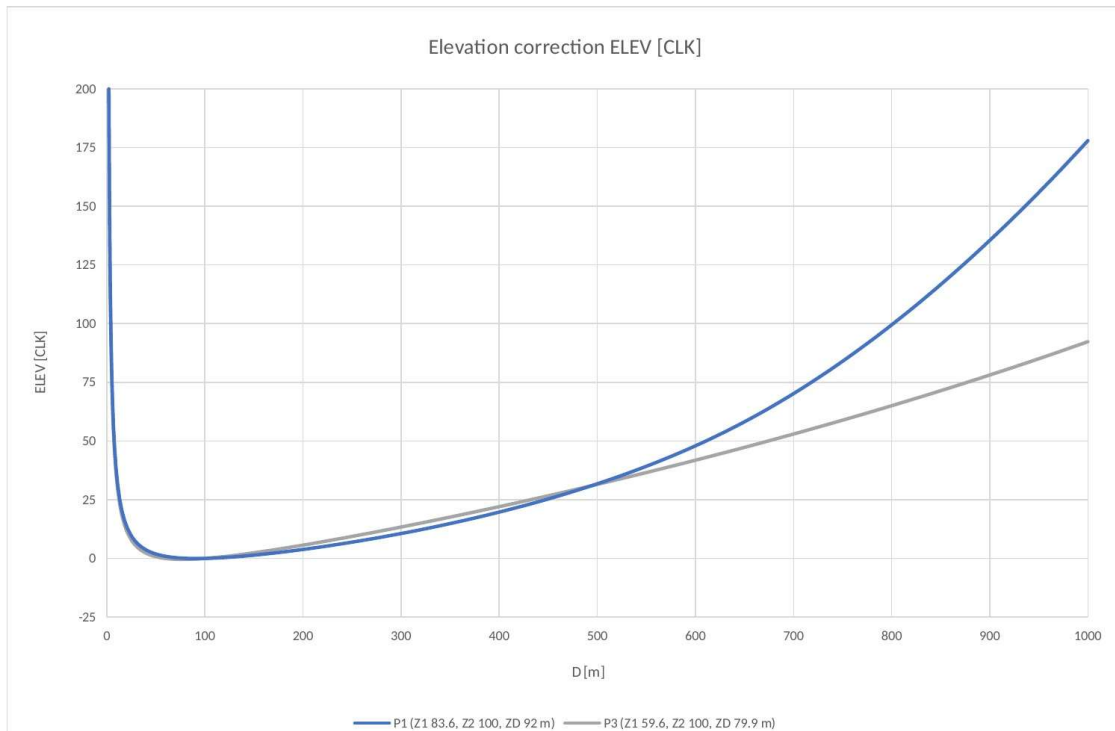


Fig. 2. ELEV [CLK] chart in a C-XLS file: P1 – .223 52 gr, P3 – .338 300 gr (LibreOffice Calc).

Example: P1 – .223 52 gr, P3 – .338 300 gr, step 25 m, range 1000 m. The file contains the **COMPARE** and **REPORT** sheets and eight charts: **V**, **E**, **WIND**, **ELEV**, **POI**, **DROP**, **TOF**, **MACH**. On Android the application opens a dialog for choosing where to save the file.

10. Ballistic Coefficient (BC) Calculator

The **CONFIG** > **BC Calculator** module fits the ballistic coefficient to measured velocity or to the position of bullet holes on the target. The new value is passed to the calculator only after **APPLY BC** is pressed.

10.1 Velocity method (VELOCITY)

A velocity of 540 m/s was measured at 600 m.

1. **LOAD CURRENT** – copies the current calculator settings.
2. **VELOCITY**; atmospheric conditions **CURRENT** (from **CONFIG**) or **STANDARD** (15 °C, 1013.25 hPa, 0 %).
3. **Distance D2 = 600, Measured V2 = 540**.
4. **CALCULATE** → result **Fitted BC 0.3264, ΔBC +0.0834 (+34.3 %), FIT OK**.
5. **APPLY BC** – the new BC is written to **CONFIG**. Save it with **SAVE CF** or in the ammunition database.

10.2 Point-of-impact method (POI)

The POI method determines the BC from the vertical position of the group. The calculator finds the coefficient for which the calculated point of impact at distance D2 equals the measured one.

Definition. POI (point of impact) is the vertical distance of the mean point of impact (group centre) from the point of aim, measured on the target in centimetres (in inches in IMPERIAL mode).

Entry	Meaning
+12	mean point of impact 12 cm above the point of aim
0	mean point of impact at the point of aim
-15	mean point of impact 15 cm below the point of aim

Only the vertical deviation is taken into account – lateral deviation does not affect the result. The POI refers to the scope adjustment with which the shots were fired. The calculator includes the **DIAL UD** counter, so its value must match the number of clicks dialled on the scope.

Conditions for a reliable measurement

- Zero (e.g. at 100 m) confirmed on the day of the measurement – any zeroing error is carried over in full into the fitted BC.
- Velocity V1 measured with a chronograph – with an incorrect velocity the calculator compensates with an incorrect BC.
- Current data in **CONFIG**: sight height, click value, temperature, pressure, shooting angle.
- A group of at least 5 shots; measure the position of the mean point of impact, not of a single hole.
- Aim at a point without holdover – the entire correction dialled on the turret.
- Distance D2 measured with a rangefinder; the longer it is (within the supersonic range, e.g. 500–800 m), the more reliable the result.

The method is sensitive to measurement accuracy: at 600 m a difference of 8 cm (–330 instead of –322 cm) changes the result from 0.2624 to 0.2492, i.e. approx. 0.6 % of BC per centimetre.

Example A – shooting without a turret adjustment

1. Press **DIAL 0** on the panel (UD counter = 0). Fire at 600 m, aiming at the centre of the target.
2. Result: mean point of impact 330 cm below the point of aim.
3. **CONFIG > BC Calculator → LOAD CURRENT → POI**, atmospheric conditions **CURRENT**.
4. Distance D2 = 600, Measured POI = -330.
5. **CALCULATE → POI 330.00 cm BELOW aim · FIT OK, Fitted BC 0.2492 (+2.5 %)**.
6. **APPLY BC** – the new BC is written to **CONFIG**.

Example B – shooting with a turret adjustment (typical case)

At 600 m the panel shows **CALC +56 CLK · 5.57 MIL**. The scope has 54 clicks up dialled.

1. Before **LOAD CURRENT**, select the **UD** axis on the panel and set the counter to **DIAL UD +54**, matching the scope adjustment.
2. Result: mean point of impact 15 cm below the point of aim.
3. **LOAD CURRENT** – check the **Dial UD 54 CLK** entry in the summary – then **POI**.
4. Distance D2 = 600, Measured POI = -15 → **Fitted BC 0.2363 (-2.8 %)**.

With the previous BC of 0.243 the calculator predicts POI = -10.1 cm for this adjustment (54 instead of 55.7 clicks). The mean point of impact is lower than predicted – the bullet loses velocity faster, so the BC decreases. Results for other measurements:

Measured POI (600 m, DIAL UD +54)	Fitted BC	Change
-15 cm (below)	0.2363	-2.8 %
-10.1 cm (as calculated)	0.2430	0 %
0 (at the point of aim)	0.2589	+6.6 %
+12 cm (above)	0.2820	+16.1 %

Interpreting the result: mean point of impact higher than calculated – BC increases; lower – BC decreases.

Atmospheric conditions. The **CURRENT** option uses the conditions stored in **CONFIG** at the moment **LOAD CURRENT** is pressed – enter the actual shooting conditions before the measurement. Use the **STANDARD** option (15 °C, 1013.25 hPa, 0 %, no wind) only if the shots were fired in conditions close to standard.

No solution. The message **POI outside calculable range ...** means that no BC produces such a point of impact. Check the sign (minus – below), the **DIAL UD** counter, the zero and velocity **V1**.

Message	Meaning
V2 outside calculable range ...	no BC produces this velocity – check the measurement and V1
BC NOT DETERMINABLE	at this distance the BC has almost no effect on the result – measure at a longer distance
MULTIPLE BC ROOTS	there are several solutions; the one closest to the previous BC was selected

11. Saving and Loading the Configuration

Button (CONFIG > Files)	Action
SAVE CF	saves all settings and the contents of slots P1, P2 and P3 to the file <name>_<date>_<time>.txt (name taken from the Scheme name field); if the field is empty – LR_CONFIG_<date>_<time>.txt
LOAD	loads an LR configuration file (also CH021) or a RETMAX / BC00x report; the P1–P3 slots stored in the file replace the current ones
DEFAULTS	restores the factory settings (after confirmation)

If you use several rifle setups, save each one separately with **SAVE CF** and switch between them with **LOAD**. To change only the ammunition, the database and slots P1–P3 are more convenient (Part II).

The slots are stored at the end of the file, one line per slot (**SLOT_P1=...**, **SLOT_P2=EMPTY** – empty slot). The message after **LOAD** lists the slots that were loaded, e.g. **Loaded 56 values from ... Slots: P1, P2 empty, P3**. Files saved by earlier versions do not contain these lines and leave the slots unchanged. A corrupted line (message **P1 invalid**) leaves that slot unchanged.

12. Appearance and Operation

Setting (CONFIG > Panel)	Action
Style	8 colour schemes: 1 – dark HUD, 2–3 – dark, 4–7 – light (daylight), 8 – red night mode
Keep screen on	the screen does not turn off
Signal target or P1 P2 P3	OFF · BEEP · DOUBLE · CHIME – signal when the DIAL counter matches the calculation and when a cartridge is loaded from slot P1–P3
Distance ± step / Table step	distance increment on the panel / in the table
Text lock	ON – numeric fields locked; only the buttons remain active

The **MAX** button enlarges the main readout to fill the screen (also in landscape orientation). The system Back button closes, in turn: **TABLE**, **CONFIG**, **MAX** mode and finally the application.

Two-finger zoom is locked on the main panel, in the table and in **CONFIG**, so that an accidental gesture does not change the view. The exception is the ammunition database editor (Part II, chapter 1).

13. Panel Messages

Message	Meaning	Recommended action
TRANSONIC · verify on target	the bullet velocity drops into the Mach 1.2–0.9 range	verify the correction by live fire
SUBSONIC · less reliable	bullet velocity below the speed of sound	treat the result as an estimate
ON · rest 0.02 MIL < ½ click	counter matches the calculation; remaining correction less than ½ click	–
NO ZERO · set sight height & zero range	sight height or zero range missing	complete CONFIG > Scope
NO ZERO · V1 too low for zero range	the bullet does not reach the zero range	check V1, BC and the zero range
NO ZERO CROSSING · trajectory below sight line	the trajectory does not cross the line of sight	information (e.g. with aerodynamic jump)
Trajectory ends at ... Reduce D.	bullet velocity too low for this distance	reduce the distance
SG < 1 · unstable	bullet unstable with the given twist	check the twist rate, bullet length and diameter
set bullet weight for E	bullet weight missing	enter the bullet weight
POWDER 0°C · V1 -24.0 m/s	powder temperature correction active	information

14. Worked Example Using Slot P1

1. Cartridge: tick ☐ and hold **P1** for 2 s – or select the cartridge in the database and press **LOAD**.
2. Distance: type the value or set it with the – / + buttons.
3. Wind: set **WIND** and **FROM**.
4. **UD** axis → **DIAL** = **CALC**; adjust the elevation turret by hand.
5. **LR** axis → **DIAL** = **CALC**, or hold the **WIND** correction on the reticle.
6. When you have finished shooting: **DIAL** 0.

Part II · AMMO BASE Ammunition Database

AMMO BASE stores up to 1000 ammunition records with bullet weight, BC values and velocity V1. A selected cartridge is loaded into the calculator or into slot P1–P3 with a single button. The database is opened in **CONFIG > AMMO BASE**.

1. AMMO BASE Screen

The screenshot shows the AMMO BASE interface. At the top, there's a title bar 'AMMO BASE'. Below it is a search bar labeled 'NAME' with the text 'LR_BASE · \$text = find' and a 'LOAD' button. Underneath are three checkboxes for 'P1', 'P2', and 'P3', followed by 'OPEN' and 'CLOSE' buttons. The main part of the screen is a table with 6 columns: '#', 'NAME', 'WEIGHT g', 'G1 BC', 'G7 BC', and 'V1 m/s'. The table contains 9 records. Below the table are buttons for 'EDIT', 'G7', 'G1', 'G5', and 'V1'. At the bottom are buttons for 'SAVE', 'DEL', 'U/R', 'XLS', and 'ADD'. A status bar at the very bottom reads 'Opened: LR_BASE_20261016_112734.xlsx · 9 RECORDS · METRIC'.

#	NAME	WEIGHT g	G1 BC	G7 BC	V1 m/s
1	223REM V342242 52GRS	3.37	0.248	0.121	1040
2	223REM V330672 69GRS	4.47	0.34	0.169	920
3	223REM V330672 77GRS	4.99	0.376	0.193	861
4	6.5×55SE V341622 142GRS	9.2	0.525	0.264	752
5	308W V341312 168 GRS	10.9	0.458	0.231	800
6	308W V341812 175GRS	11.35	0.474	0.239	800

Fig. 3. AMMO BASE screen with a user database (9 records, XLS file; the status line shows the file name, number of records and unit system).

Element	Action
NAME	file name used when saving (without date and extension); empty field – LR_BASE_.... Text starting with \$ (e.g. \$308) searches the records (section 3.6)
LOAD	loads the selected record into the calculator and, if slot P1 / P2 / P3 is ticked, also into that slot
☐ P1 ☐ P2 ☐ P3	slot selection for LOAD (one at most)
OPEN	opens a TXT or XLS file; if a database is already open, appends the records at the end
CLOSE	closes the database (can be undone with U/R)
Table	columns #, NAME, WEIGHT, BC columns, V1; tapping a row selects the record, tapping a header sorts the table
EDIT	text editor of the database; in the editor the button reads TABLE (back to the table)

Element	Action
G7 GA GS V1	show or hide the column (hiding does not delete data – see the note below)
SAVE · DEL · U/R · ADD	save · delete record · undo / redo (5 steps) · copy of a record at the end of the table
XLS / TXT	format used by SAVE ; a tap switches the format. Default XLS – an Excel .xlsx file. OPEN reads both formats regardless of this setting
Status line	file name, number of records, unit system; * – unsaved changes

Hiding columns. Switching off a **G7**, **GA**, **GS** or **V1** column that holds values hides it in the table but does not delete the data: **SAVE** writes it to the file and the **EDIT** editor shows it. **LOAD** (also into slot P1–P3) **does not use a hidden column**: with **V1** hidden, velocity V1 from **CONFIG** is kept (message **V1 from CONFIG (column hidden)**); with **G7**, **GA** or **GS** hidden, another BC of the record is used. The button of a hidden column is underlined; tapping it again shows the column. An empty column is removed from the database when switched off.

The editor (**EDIT**) shows the database as text. **OK** checks the syntax and saves the changes, **CONVERT** converts the units (chapter 5), **CANCEL** closes the editor without changes. If a table row was selected before pressing **EDIT**, the cursor is placed at the beginning of that record and the editor scrolls to it (with **Text lock** on, the editor only scrolls – no cursor and no keyboard). **EDIT** also unlocks zoom on mobile devices.

Screen	Zoom (two-finger gesture)
main panel, TABLE , CONFIG , database table	locked, 100 %
CONFIG > AMMO BASE > EDIT	available, up to approx. 500 %
after OK , CANCEL , TABLE , DONE or Back	returns to 100 % and locks

2. Database File Format

A TXT file (UTF-8 encoding) or an XLS file (**.xlsx** format) with the following layout: row 1 – unit system, row 2 – column headers, subsequent rows – ammunition records. Fields are separated by semicolons; a decimal comma is also accepted.

```
METRIC
NAME;WEIGHT;G1;G7;V1;TWIST/MM;LENGTH/MM;DIAMETER/MM
308 175 HPBT;11.34;0.505;0.243;790;254;31.2;7.82
308 155 HPBT;10.04;0.450;0.230;860;;;
```

Column	Required	Unit METRIC / IMPERIAL	Range
NAME	yes (value must not be empty)	–	1–40 characters
WEIGHT	yes (value may be empty)	g / gr	0.01–500 g
G1	yes (value may be empty)	–	0.001–4.9999

Column	Required	Unit METRIC / IMPERIAL	Range
G7 GA GS	no	–	0.001–4.9999
V1	no	m/s / ft/s	5–2000 m/s
TWIST/IN · TWIST/N · TWIST/MM	no	in the header	1:3–1:60 in (76.2–1524 mm) – twist rate
LENGTH/MM · LENGTH/IN	no	in the header	0–120 mm – bullet length
DIAMETER/MM · DIAMETER/IN	no	in the header	2–30 mm – bullet diameter

The **TWIST**, **LENGTH** and **DIAMETER** columns always go at the end of the header; they are not shown in the table. A \$ before the column name (e.g. \$**TWIST/IN**) protects it from unit conversion. A new database has a \$**TWIST/IN** column by default – the twist rate in inches, whatever the unit system. The twist direction (RH / LH) is set only in **CONFIG**.

In an XLS file, cell A1 contains **METRIC** or **IMPERIAL** and row 2 contains the column headers. The **AMMO BASE** sheet is read or, if it does not exist, the first sheet. Formulas are not recalculated; the maximum file size is 4 MB.

3. Working with the Database

3.1 Creating a database from the current bullet data

1. **CONFIG** > **Files** > Scheme name = 308 175 HPBT.
2. **CONFIG** > **AMMO BASE** > **ADD** – a record is created with the weight, velocity V1 and the BC for the drag model set in **CONFIG**; the header of a new database contains \$**TWIST/IN**.
3. Fill in any missing BC values (e.g. G1) in the **EDIT** editor.
4. **NAME** = **MY_BASE**, set the format button to **TXT** (default **XLS**), **SAVE** → file **MY_BASE_20261016_173512.txt**. If the **NAME** field is empty, the file is named **LR_BASE_<date>_<time>.txt** (or **.xlsx**).

3.2 Importing from a spreadsheet

1. Prepare the sheet as shown in Fig. 4 (chapter 7) and save it in Excel format (**.xlsx**).
2. **OPEN** → select the file. The status line shows the file name, number of records and unit system, e.g. Opened: **MY_BASE.xlsx** · 9 **RECORDS** · **METRIC**.
3. If the unit system of the file (cell A1) differs from **CONFIG** > **Projectile** > **Units**, the application asks whether to switch the units in **CONFIG**. If you decline, the database is not opened.

3.3 Loading a cartridge into the calculator

Select a record and press **LOAD** without ticking any slot. The calculator takes over the bullet weight, velocity V1, BC and – if stored in the file – the twist rate, bullet length and diameter. Empty fields and hidden columns (**G7**, **GA**, **GS**, **V1**) do not change the settings in **CONFIG**.

Drag model in CONFIG	BC in the record	BC applied
G7	G1 and G7	G7

Drag model in CONFIG	BC in the record	BC applied
G7	G1 only	G1
GA	G1 and G7	G1 (first available in the order G1, G7, GA, GS)

3.4 Merging two files

Open the first file with **OPEN**, then the second – its records are appended at the end and ***** appears in the status line. Save the merged database with **SAVE** under a new name. The appended file must use the same unit system as the open database – otherwise convert one of them with **CONVERT** first. The total number of records must not exceed 1000.

3.5 Sorting and undoing operations

Tapping the header of a numeric column sorts the records in descending order, tapping again sorts them in ascending order, and a third tap restores the original file order. The **NAME** column is sorted alphabetically (A–Z and Z–A). The record order is preserved in the file after **SAVE**. The **U/R** button undoes or redoes up to the last 5 operations.

3.6 Searching for records

Type **\$** followed by the search text in the **NAME** field, e.g. **\$308**. The table shows, as you type, only the records whose name contains this text; letter case and diacritics are ignored. The status line shows the number of matches, e.g. **ub.txt • FIND “308” • 1 / 3**; if nothing matches, the table shows **No NAME contains “...”**.

- Selecting, **LOAD** (also into slot P1–P3), **EDIT**, **DEL** and sorting all work on the search results.
- Clearing the text in the **NAME** field restores the full list.
- When the **NAME** field starts with **\$**, **SAVE** gives the file the default name **LR_BASE_<date>_<time>**.

4. Slots P1, P2 and P3

Assigning a cartridge to a slot: tick ☐ **P1**, select a record and press **LOAD**. The cartridge is loaded into the slot and into the calculator at the same time.

Using a slot on the main panel:

1. Tick the ☐ box next to the **TABLE** button.
2. Hold **P1** for 2 s. The cartridge is loaded, a signal sounds and the panel shows **P1 loaded • AMMO • <name>**.

A short tap or pressing two buttons at once has no effect. After 10 s of inactivity the slots lock again; an empty slot shows **EMPTY**.

The slot contents are saved together with the configuration by **CONFIG > Files > SAVE CF** and restored by **LOAD** (Part I, chapter 11) – this is how slots can be transferred to another device.

5. Unit Conversion (CONVERT)

The **CONVERT** command in the editor converts the whole database between the **METRIC** and **IMPERIAL** systems; the change is confirmed with **OK**. After confirmation, **CONFIG > Projectile > Units** switches automatically to the database’s system and the status line shows, e.g., **Updated • 9 rows • CONFIG units → IMPERIAL • SAVE**.

Column	Conversion
WEIGHT	g ⇌ gr
V1	m/s ⇌ ft/s
TWIST, LENGTH, DIAMETER without \$	always to the opposite unit: mm ⇌ in
\$TWIST, \$LENGTH, \$DIAMETER	unchanged
NAME, BC	unchanged

Before	After	Rule
254 mm	10 in	exact result
1:8 in	203.2 mm	exact result
9.72 g	150 gr	shortest notation that converts back to 9.72 g
250 mm	9.84 in	shortest notation that converts back to 250 mm

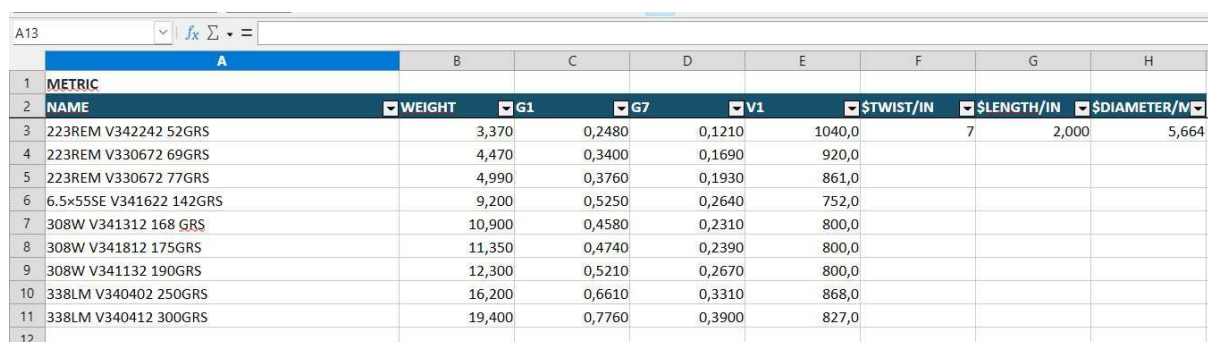
Running **CONVERT** again restores exactly the previous text.

6. Messages and Errors

Message	Cause	Recommended action
Select a row	LOAD or DEL without a selected record	select a record
prompt Switch CONFIG units to ...?	the unit system of the database being opened differs from Units in CONFIG	confirm the switch or cancel
UNITS: ... base not used • CONFIG stays ...	unit switch declined	the database was not opened – use CONVERT or change Units
UNITS: <file> is IMPERIAL, the open base is METRIC ...	the appended file uses a different system from the open database	convert one of the databases with CONVERT
Line 1: first line must be METRIC or IMPERIAL	unit-system line missing	add METRIC or IMPERIAL
required columns: NAME; WEIGHT; G1	a required column is missing	add the column
TWIST/LENGTH/DIAMETER must be at the end of the header	a hidden column precedes a visible one	move it to the end of the header
\$ is allowed only before TWIST, LENGTH or DIAMETER	\$ before another column	remove the \$
Line N: ... is not a number or ... outside ...	invalid value in line N	correct the value

Message	Cause	Recommended action
Import rejected: ... exceeds 1000 rows.	record limit exceeded after merging	split the database
TEXT LOCK is ON • editing disabled	text lock enabled	CONFIG > Panel > Text lock = OFF

7. Sample User Database



METRIC	NAME	WEIGHT	G1	G7	V1	\$TWIST/IN	\$LENGTH/IN	\$DIAMETER/IN
223REM V342242 52GRS		3,370	0,2480	0,1210	1040,0	7	2,000	5,664
223REM V330672 69GRS		4,470	0,3400	0,1690	920,0			
223REM V330672 77GRS		4,990	0,3760	0,1930	861,0			
6.5x55SE V341622 142GRS		9,200	0,5250	0,2640	752,0			
308W V341312 168 GRS		10,900	0,4580	0,2310	800,0			
308W V341812 175GRS		11,350	0,4740	0,2390	800,0			
308W V341132 190GRS		12,300	0,5210	0,2670	800,0			
338LM V340402 250GRS		16,200	0,6610	0,3310	868,0			
338LM V340412 300GRS		19,400	0,7760	0,3900	827,0			

Fig. 4. User database in a spreadsheet (LibreOffice Calc). The bullet geometry columns have the \$ prefix, so CONVERT does not change them.

The same database in TXT format:

```

METRIC
NAME;WEIGHT;G1;G7;V1;$TWIST/IN;$LENGTH/IN;$DIAMETER/MM
223REM V342242 52GRS;3.37;0.248;0.121;1040;7;2;5.664
223REM V330672 69GRS;4.47;0.34;0.169;920;;;
223REM V330672 77GRS;4.99;0.376;0.193;861;;;
6.5x55SE V341622 142GRS;9.2;0.525;0.264;752;;;
308W V341312 168 GRS;10.9;0.458;0.231;800;;;
308W V341812 175GRS;11.35;0.474;0.239;800;;;
308W V341132 190GRS;12.3;0.521;0.267;800;;;
338LM V340402 250GRS;16.2;0.661;0.331;868;;;
338LM V340412 300GRS;19.4;0.776;0.39;827;;;

```

The **LENGTH** column holds the length of the bullet, not of the cartridge. The value of 2.000 in (50.8 mm) in the first record should be checked: a 52 gr .223 bullet is usually about 0.6–0.7 in long. Bullet length affects the stability and spin drift calculations.

8. Example: an XLS Database from an Image

Ammunition makers often publish ballistic data as an image or as a table in a PDF. A database can be built from it in three steps: an empty form from LR Panel, conversion of the image into a spreadsheet, and transfer of the data into the form.

8.1 An empty database form in LR Panel

1. Set the unit system of the database in **CONFIG > Projectile > Units** (e.g. METRIC) and enter the bullet weight and BC in **CONFIG > Projectile – ADD** needs both values (otherwise it shows **Set bullet weight and BC first**).
2. **CONFIG > AMMO BASE > ADD** – a database with one record is created.
3. Set the format button to **XLS** (the default), type e.g. **FMJ** in the **NAME** field and press **SAVE**. The file **FMJ_<date>_<time>.xlsx** is created.

The file already has the required layout: cell A1 – unit system, row 2 – column headers (e.g. **NAME**, **WEIGHT**, **G1**, **G7**, **V1**, **\$TWIST/IN**, **LENGTH/MM**, **DIAMETER/MM**), row 3 – a sample record. An empty database cannot be saved, so the form contains one record; it is replaced with data in step 8.3.

8.2 Converting the image into a spreadsheet

1. Save the maker's table as an image (a screenshot of the web page or a page of the PDF catalogue).
2. Upload the image to an online "image to Excel" converter (text recognition, OCR) and download the result in XLSX format.
3. Open the result in a spreadsheet and compare it with the image.

Check the OCR result before going on. Converters often shift the headers: one header cell (e.g. "Caliber & Catalog No") spans two data columns, so every following label sits above the wrong column. Identify the columns by their **values**, not by their labels. Also look out for thousands separators (**1,006**), decimal commas and misread characters (O/O, I/I). An image uploaded to an online service leaves your device – do not send confidential data this way.

8.3 Transferring the data into the form

1. Open both the form from step 8.1 and the converter's file in a spreadsheet.
2. Copy the data columns one by one into the matching columns of the form, starting at row 3 (the sample record is overwritten). Paste values only (Paste Special → Values), without formatting.
3. Build a name made of several columns (e.g. calibre and catalogue number) with the formula `=A2&" "&B2` in a helper column, then paste it into the **NAME** column as values.
4. Do not change cell A1, the header row or the sheet name **AMMO BASE**; do not enter data in columns without a header.
5. Save the file in Excel format (**.xlsx**) – not as **.xls**, **.ods** or **.csv**.
6. In LR Panel: **CONFIG** > **AMMO BASE** > **OPEN** → select the file. The status line shows the number of records, e.g. **Opened: FMJ_....xlsx · 18 RECORDS · METRIC**.

Example of column mapping (FMJ cartridge catalogue, METRIC database):

Catalogue column	Database column	Notes
Calibre + catalogue number	NAME	merged with a formula; 40 characters at most
Weight g	WEIGHT	grams in a METRIC database; grains in IMPERIAL (column "Weight gr")
Ballistic coefficient G1 / G7	G1 / G7	0.001–4.9999
Velocity V ₀ m/s	V1	muzzle velocity; distance D1 = 0 in CONFIG
Cartridge length	–	length of the cartridge – do not enter it as LENGTH (bullet length)

Message after OPEN	Cause and remedy
Line N: V1 1,006 m/s outside the allowed range	a number with a thousands separator stored as text; remove the separator (Find and Replace: , → nothing) or type 1006

Message after OPEN	Cause and remedy
Line N: ... is not a number	a numeric cell contains text or a unit (e.g. 2.90 g); leave the number only
Line N: NAME empty · NAME longer than 40 characters	fill in or shorten the name
Line N: 9 fields, header has 8	data was entered in a column without a header; delete it
Too many columns · unknown column ...	a column was added to the form or a header was changed; restore the layout from step 8.1

A file with an error is not loaded at all – correct the reported row and open the file again. Before using the data in the field, compare a few records with the maker's data.