914 Log Analysis – User Manual

914 Log Analysis evaluates log files and memory protocols of the Turbo Control Unit (TCU) of the Rotax 914. It shows the measured values as instruments and charts, evaluates them against fixed limits and creates a PDF report with a fault report and the required actions.

The site is bilingual. Choose **DE** or **EN** at the top right; **? Help** next to it opens this manual.

Supported files

Format	Description
TLR 4.6 (DOS)	LOG files, e.g. `10211435.LOG` (file name = month, day, hour, minute). About 12–13 values per second.
TLR-Win	CSV recordings with title line `TLR-Win CSV DD.MM.YYYY …`, about 10 values per second.
914 Data Logger / CSV	CSV files with header line; columns are assigned by their headings.
TCU memory protocol	Text `TURBO CONTROL UNIT PROTOCOL` with interval memory, max. operating parameters and alarm records.
TCU protocol as PDF	PDF printout of the TCU protocol (e.g. from TLR 4.6 via the DOSBox printer). The text is read by text recognition.

Uploaded data is deleted automatically after 24 hours.

UPLOAD

1. Drag files into the upload field or click the field and select files.
2. Allowed are **ZIP archives** or **up to 20 single files** (`.txt`, `.log`, `.csv`, `.pdf`). Please upload more files as ZIP.
3. Click **Upload**.
4. The list **Uploaded files** shows the detected format, number of lines, start, end and status (OK or number of faulty lines) for each file.
5. **Analysis conditions** lists all active evaluations.
6. Click **Start analysis**. The **RESULTS** page opens.
7. **New analysis** starts over.

Merging of log files

All uploaded log files – even from different days and formats – are merged into **one** recording and sorted by time. Every **data gap** (more than 3 s without values) and every **time jump** is shown on the time axis as a hatched **5-second marker**. There are no measured values within these periods, so limits cannot be checked there.

TCU protocols as PDF

If the PDF contains only images (e.g. printed via the DOSBox printer and “Microsoft Print to PDF”), the text is read by text recognition. The PDF creation date is used as date. Results and report show the note *“Read from PDF printout by text recognition – please compare values with the printout.”* Lines

that cannot be read reliably are discarded. The recognised text is included in the ZIP package as `<name>.pdf.txt`. A text output of the protocol remains the most reliable source.

RESULTS

Key figures

Field	Meaning
Date	Day(s) of the recording
Start – End	Time of the first and last value
Recording time	Duration of the recording
Engine run time	Time with engine speed above 500 rpm
Sampling rate	Average number of values per second (e.g. “Ø 13 Hz”)
Format	Detected file format

Evaluation

All findings with severity (**Note**, **Warning**, **Alarm**), time, duration and extreme value. For limit exceedances the **actions** can be expanded. **Chart** jumps to the position in the charts, **Play** to the position in the instruments.

Data gaps and time jumps

List of all gaps with period, duration and the values before/after, plus the total missing time.

Throttle time shares

Range	Name
0–5 %	Idle
5–40 %	Taxi
40–90 %	Part load
90–106 %	Continuous power
106–112 %	TCU transition range (red)
112–115 %	Take-off power

Caution: TCU transition range (108–110 %)
The throttle range between 108 % and 110 % must be avoided and passed through quickly when opening and closing the throttle, as unstable boost control and controller oscillations can occur in this range.

Channels

Minimum and maximum of each channel (engine speed, throttle, manifold pressure act./nom., ambient pressure, servo position, airbox temperature, height above start). Values of 0 are not shown.

TCU memory

If a TCU memory protocol was uploaded, the engine number, operating hours, boost time and read-out time are shown, together with the evaluation of the memory, the **max. operating parameters**,

the **alarm records** and the **interval memory**. The memory holds 1-minute maxima: a single minute counts as an exceedance of max. 1 minute, several consecutive minutes as longer.

INSTRUMENTS

Playback of the recording as in TLR-Win.

Displays

- **Engine speed** up to 6500 rpm; the range up to 4000 rpm is compressed, 4000 is at the top. Below it the propeller speed (engine speed ÷ 2.43).
- **Manifold pressure** with nominal marker (triangle) and value in inHg. Zones: green up to 1220, yellow up to 1550, red above 1550 mbar.
- **Throttle** (scale up to 115 %) and **servo position** (scale up to 100 %) as sliders.
- **Airbox temperature**: green up to 88, yellow up to 96, red above 96 °C.
- **Header**: time of day, elapsed time and the lamps **BOOST** (from 1280 mbar), **WARNING** and **ALARM**, each with reason.
- **Altitude profile**: height above the starting point, calculated from the ambient pressure (standard atmosphere). Field elevation and QNH are not contained in the log, so the height starts at 50 ft. After pauses of more than 10 minutes or a change of day it starts again. Shown in feet in English, in metres in German.

Operation

Action	**Control**
Play / Pause	**Play** button or space bar
Speed	¼× to 50×
±5 s / ±60 s	Arrow keys / Shift + arrow keys
Select position	Click or drag on the progress strip or altitude profile

When playing across a data gap, the info window **Data gap** with the period appears.

CHARTS

All channels as time curves (engine speed, throttle, manifold pressure act./nom. with ambient pressure, servo position, airbox temperature, height above start).

Action	**Control**
Zoom	Mouse wheel or **Zoom +** / **Zoom −**
Pan	Drag with the mouse
Zoom to range	Shift + drag
Show all	Double-click or **All**
Set playback position	Click into the chart
Overview	Bar at the top shows the visible section

Data gaps are hatched; hovering over them shows the info window **Data gap**.

REPORT

- **PDF report**: overview, evaluation, throttle time shares, channel values, TCU memory, all charts, detail charts and finally the **fault report** (from TCU data and fault memory) with limit overview, events, actions to tick off and fields for name, date and signature.
- **Everything as ZIP**: PDF report, merged measured data as CSV and the original files.

Engine speeds are given with propeller speed (Prop.), manifold pressures additionally in inHg. The report is created in the selected language.

EXAMPLE

EXAMPLE evaluates a stored example archive (TLR 4.6 log files and a TCU memory protocol), so all functions can be tried without your own files.

Evaluation criteria

Exceeding of max. admissible engine RPM

Any exceeding of the max. admissible engine RPM must be entered by the pilot into the engine log book stating duration, extent of overspeeding and pertinent detail.

Range	Level	Actions
5800 up to max. 6200 rpm (Prop. 2387–2551) for max. 1 minute	Warning	No action is required.
5800 up to max. 6200 rpm for more than 1 minute	Alarm	Check that the push-rods are straight. See Chapter 72-00-00 of the latest Maintenance Manual Heavy (MMH).
6200 up to max. 6500 rpm (Prop. 2551–2675) for max. 1 minute	Alarm	Check that the push-rods are straight.
6200 up to max. 6500 rpm for more than 1 minute	Alarm	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness. Check that the push-rods are straight. Inspect the crankshaft for out-of-roundness and distortion (Chapter 72-00-00 MMH). Inspect all systems for correct functioning. Detailed inspection of affected engine components.
more than 6500 rpm (Prop. 2675)	Alarm	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Rotax instructions for continued airworthiness. Check cylinder differential pressure. Check that the push-rods are straight. Check if piston had contact with valve. Check for out of roundness of valves. Replace the crankshaft; the crankshaft has to be inspected according to the current Overhaul Manual (OHM). Inspect all systems for correct functioning. Detailed inspection of affected engine components.

Overboost (manifold pressure)

Up to 1550 mbar no warning.

Range	Level	Actions
above 1550 up to 1800 mbar (45.8–53.2 inHg)	Warning	Caution overboost – please check the turbocharger control: see MMH 912-914 Chapter 76-10-00 TURBOCHARGER CONTROL UNIT (TCU).
above 1800 mbar (53.2 inHg)	Alarm	Inspect the crankshaft for out-of-roundness and distortion (Chapter 72-00-00 MMH, CRANKSHAFT DISTORTION — INSPECTION). Check the axial play of the crankshaft: nominal 0.08–0.32 mm; only falling below the minimum of 0.08 mm is relevant. If the crankshaft is distorted or the axial play is too small, the crankshaft must be replaced.

Airbox temperature

No time limit – at high airbox temperature the TCU reduces the nominal pressure.

Range	Level	Actions
above 88 °C	Warning	Note: the TCU reduces the nominal pressure.
above 96 °C (also channel 5 in the TCU memory)	Warning	Possibly too high intake air temperature or poor thermal conditions under the cowling: check air ducting, intake path and cooling in the engine compartment.

Further evaluations

Criterion	Level	Note / Actions
Engine speed above 5500 rpm for more than 5 minutes	Warning	–
Take-off power (throttle above 112 %) for more than 5 minutes	Warning	–
Servo at end stop (≥ 99 %) with throttle ≥ 100 %, manifold pressure stays more than 50 mbar below nominal for at least 5 s	Warning	Indication of a possible turbocharger defect: check turbocharger, wastegate and wastegate actuation (servo, cable), check exhaust system and boost air ducting for leaks. See MMH 912-914 Chapter 76-10-00 TURBOCHARGER CONTROL UNIT (TCU).
Implausible sensor values: value outside the measuring range for at least 0.5 s	Warning	Indication of a possibly defective sensor: check sensor, connector and wiring of the affected channel.
Data gaps and time jumps (more than 3 s without values)	Note	Limits cannot be checked for these periods. Possible causes: interruption of the serial connection or of the recording program.

Measuring ranges for the plausibility check

Channel	Measuring range
Engine speed	0 – 9000 rpm
Throttle	−5 – 125 %
Manifold pressure act.	300 – 2500 mbar
Ambient pressure	500 – 1100 mbar

Channel	Measuring range
Servo position	−5 – 120 %
Airbox temperature	−40 – 150 °C

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