REVISION	CHANGE	APPROVED	DATE
1	Published release	JTS	28/11/2025

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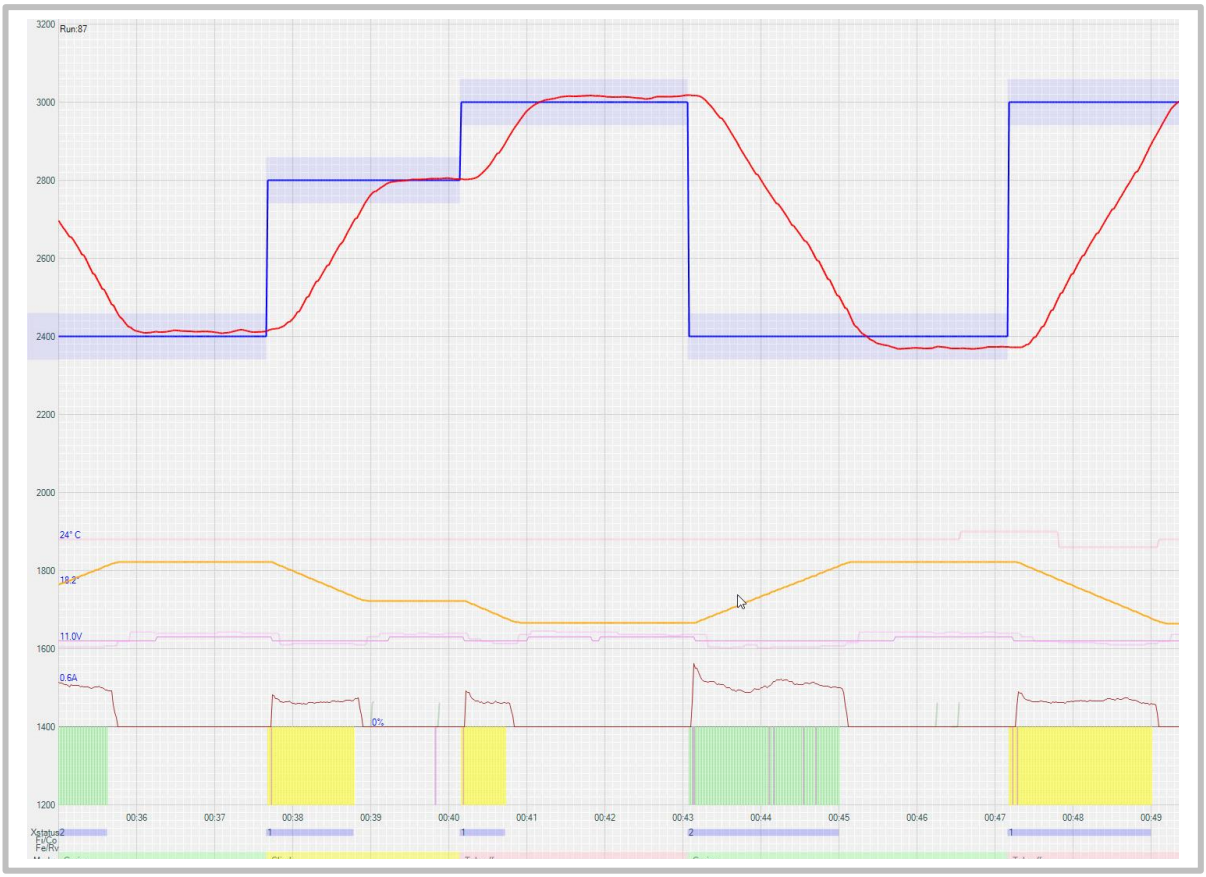
ASI-7-3-6

INTERPRETING PROPELLER LOG FILES

GUIDE



SUBJECT:	
Troubleshooting	
ASSEMBLY NO:	**APPLICABILITY:**
A0110x or A0170x	AC200 hardware version 5 and up. All AC300 versions.

1. TOPIC

1.1 Introduction

This document covers the Airmaster diagnostic program and how operators can access and interpret the diagnostic log files stored by the controller.

AC200 controllers that are hardware version 5 or higher (as well as all AC300 controllers) incorporate a diagnostics module that records important propeller data and activity. Diagnostic data is accessed using Airmaster flash software running on a MS Windows PC. Airmaster may request that customers download their controller log files for the purposes of troubleshooting.

1.2 Prerequisites

Complete the following tasks before proceeding with this instruction:

- Check PC is updated to include .NET Framework 3.5 https://www.microsoft.com/en-us/download/details.aspx?id=21
- For AC200 controllers, ensure that controller hardware is version 5 or higher.

> *Note*
> *The controller hardware version is recorded in the 'Controller Firmware & Parameters Sheet' (found in the propeller assembly drawings booklet) as the first number in "Hardware Build State".*

- Download diagnostic data from controller in accordance with procedure ***ASI-7-2-4***.
- For more information on testing the propeller to generate a useful log file, refer to procedure ***ASI-7-3-5***.

2. MATERIAL REQUIREMENTS

2.1 Parts

ITEM	QTY	PART NO.	DESCRIPTION	IMAGE
1.	1	A0117	USB-Serial Cable	
2.	1	A0110x or A0170x	AC200 or AC300 Controller	

2.2 Tooling

ITEM	QTY	DESCRIPTION	IMAGE
1.	1	MS Windows Laptop	
2.	-	AC200 or AC300 Diagnostic Program (*.exe*)	

3. CONTROLLER DIAGNOSTICS

3.1 Interpreting Diagnostics Graph

The controller creates a new diagnostic log (referred to as a 'run') each time power is supplied to the propeller. The diagnostic log captures a variety of propeller data that is recorded for the duration that the controller remains powered.

This data can be represented graphically using the Airmaster diagnostic program. This may be helpful for:

- Diagnosing potential issues with the propeller.
- Analysing propeller performance.

An example section of a diagnostic log graph is shown below.

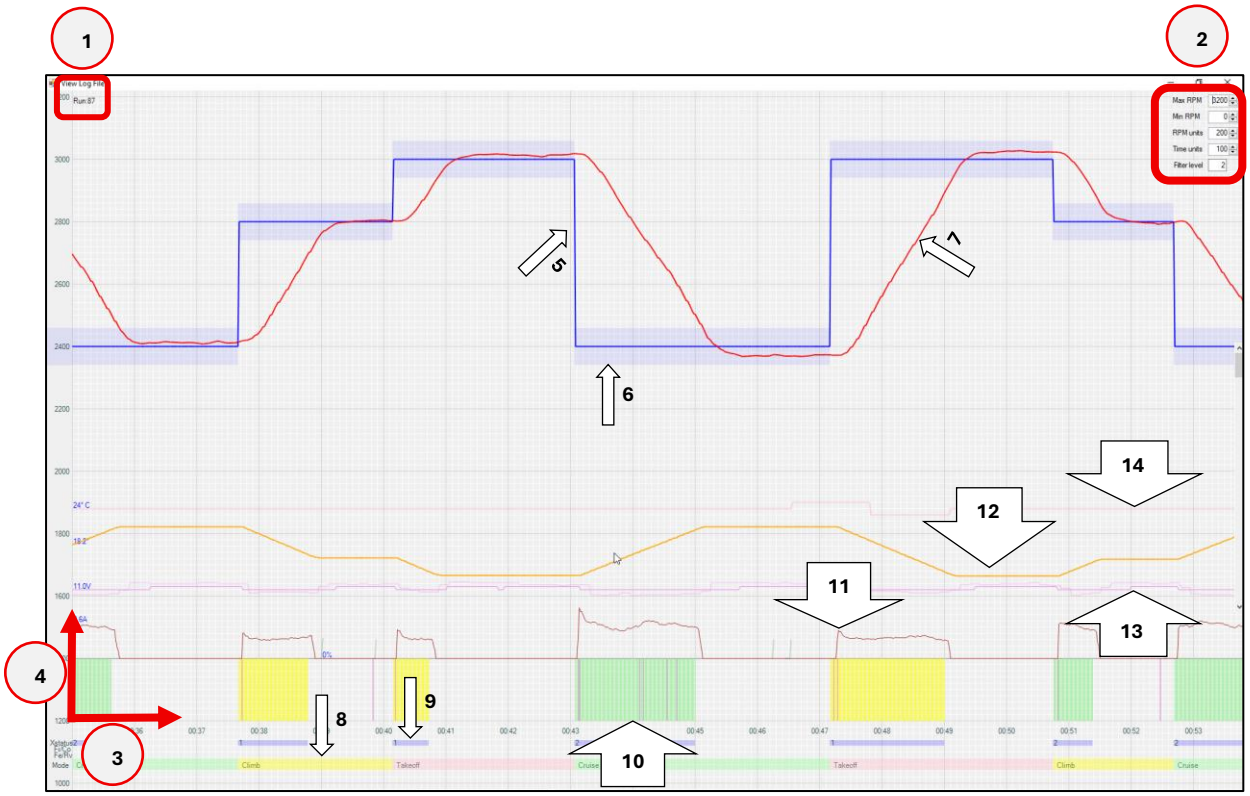


Figure 1. *Example log graph for propeller in-flight.*

The data that can be interpreted from this log graph is described next.

3.1.1 Display Properties

ITEM	PROPERTY	DESCRIPTION	NOTES
1.	**Run No.**	*(Top left)* Number assigned to this log.	A new chronological run number is assigned when controller is powered.
2.	**Display Settings**	*(Top right)* X-axis and Y-axis scaling.	Use toggle arrows or enter new values to adjust graph scaling.
3.	**X-Axis**	Time elapsed [min:sec] since controller was powered.	Double-brown vertical bars indicate no change in data across the indicated period (trimmed).
4.	**Y-Axis**	Speed [rpm].	

3.1.2 Log Data

Note *Log data at a specific point can be interpolated by hovering the cursor over the graph.*

ITEM	DATA	DESCRIPTION	NOTES
5.	**Target RPM**	*(**Blue** line)* Target engine speed.	Only displayed while automatic mode (AUTO) is selected on controller.
6.	**Deadband Tolerance**	*(**Blue** shaded band)* Allowable deviation from target speed.	Only displays for AC300 controllers. Usually (+/-60rpm) for Rotax engines, (+/-30rpm) for direct drive engines.
7.	**Actual RPM**	*(**Red** line)* Engine speed [rpm]	As measured by the propeller.
8.	**Mode**	*(**Bottom** bar containing text)* Control mode selected on controller.	Either manual mode (MAN) or an automatic setting (e.g. CRUISE).
9.	**Xstatus**	*(Small **blue** bars containing a number)* Operating status of PC mechanism.	Indicates pitch change direction, or attainment of adjustable pitch stops.
10.	**Drive Command**	*(**Green** or **Yellow** block)* Pitch change drive command.	Green: propeller driving fine. Yellow: propeller driving coarse.
11.	**Current**	*(**Maroon** line)* Current [A] drawn by PC motor.	Typically, shouldn't exceed 3A (depending on PC motor type).
12.	**Pitch**	*(**Orange** line)* Propeller blade pitch angle [°]	Only displays for AC300 controllers.
13.	**Voltage In**	*(**Pink** line)* Voltage [V] supplied to controller.	Typically ~12V.
14.	**Temp A**	*(**Light Pink** line)* Temperature [°C]	Only displays for AC300 controllers.

3.1.3 Error Alarms

ALARM	DESCRIPTION	NOTES
OPEN CIRCUIT	*(**Blue** bar)* Open circuit detected in propeller system.	Elapses the duration the open circuit is detected for. Xstatus code = 17 is also shown.
OVER-CURRENT	*(**Red** bar)* Over-current detected in propeller system.	Current has exceeded the defined current limit.

3.2 Example Troubleshooting Scenarios

3.2.1 Open Circuit Alarm

The example below shows an open circuit alarm detected for 1s. This may be because:

- The slipring brushes are providing intermittent contact with the slipring (e.g. due to damage or wear).
- If the alarm is frequent, this may indicate the presence of an electrical issue requiring further investigation.

> **Note** *For more information on open circuit alarms, refer to failure modes in **ASI-7-3-1**.*

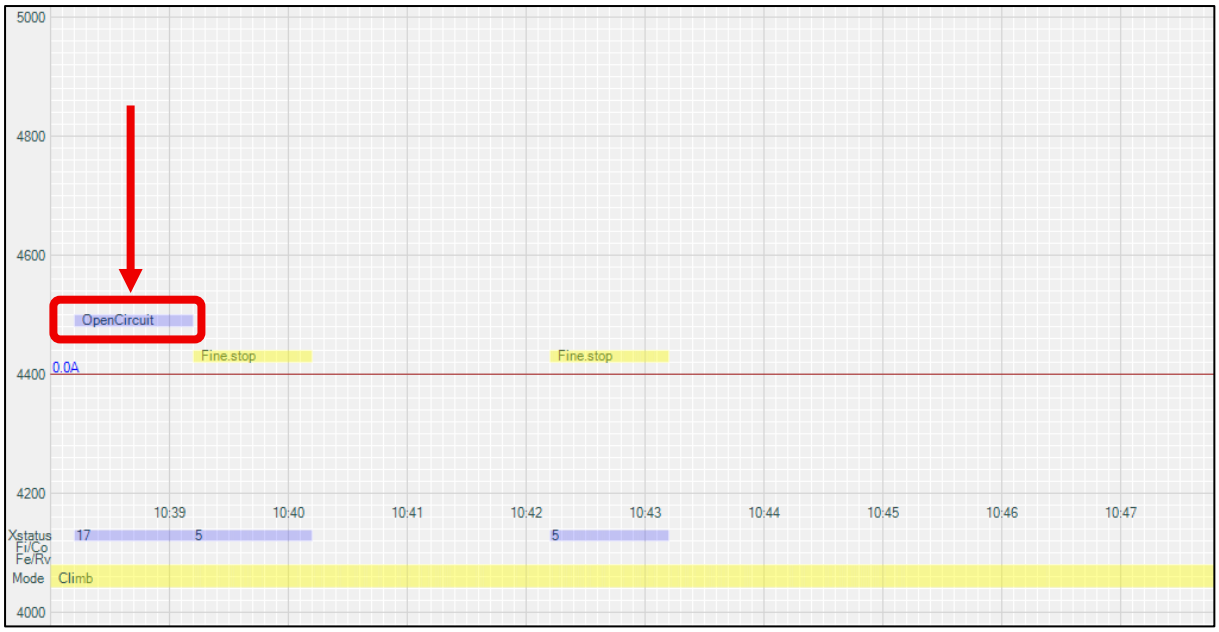


Figure 2. *Example log graph showing open circuit alarm.*

3.2.2 Unstable ('Hunting') Propeller Response

The example below shows a form of unstable propeller response often referred to as 'hunting'.

- Observe that the propeller continually overshoots target rpm during each automatic pitch adjustment (RPM fluctuates).
- Observe that it takes a relatively long time for RPM to stabilise (not shown in graph).
- The pilot would observe this as alternating orange flashes of the fine and coarse lamps as the controller continually makes automatic pitch adjustments in opposite directions.

In this case, the propeller's pitch change response may be too aggressive/sensitive. It may be possible to improve propeller performance by fine-tuning the controller's NCV parameter in accordance with advice provided by Airmaster.

> ⓘ *Note* *Generally in this case, the NCV parameter is set too low and must be increased.*

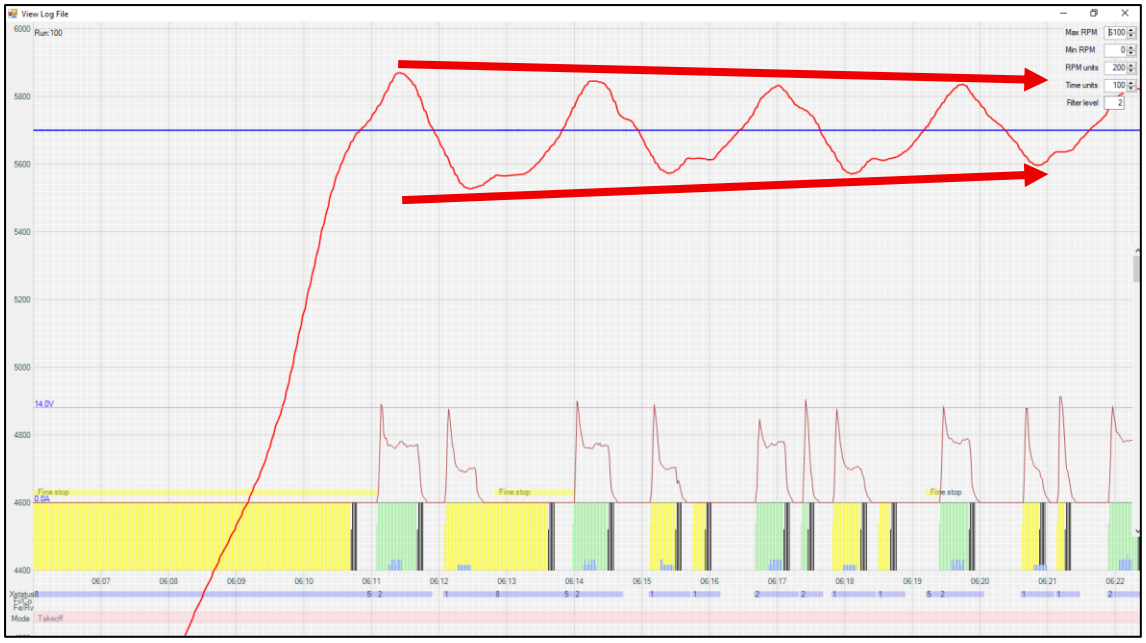


Figure 3. *Example log graph showing a 'hunting' propeller response.*

3.2.3 Unstable ('Sluggish') Propeller Response

The example below shows another form of unstable propeller response, which may be referred to as 'sluggish'.

- Observe that it takes 5 seconds for an automatic pitch adjustment to take noticeable effect (a 100rpm speed reduction).
- Observe that ten separate pitch adjustment commands are required to achieve one pitch adjustment (each 'spike' indicates one drive command performed by the pitch change motor).
- The pilot would observe this as consecutive orange flashes of either the fine or coarse lamp as the propeller continually attempts to adjust pitch in the same direction.

In this case, the propeller's pitch change response is too weak. It may be possible to improve propeller performance by fine-tuning the controller's NCV parameter in accordance with advice provided by Airmaster.

> **Note** *Generally in this case, the NCV parameter is set too high and must be decreased.*

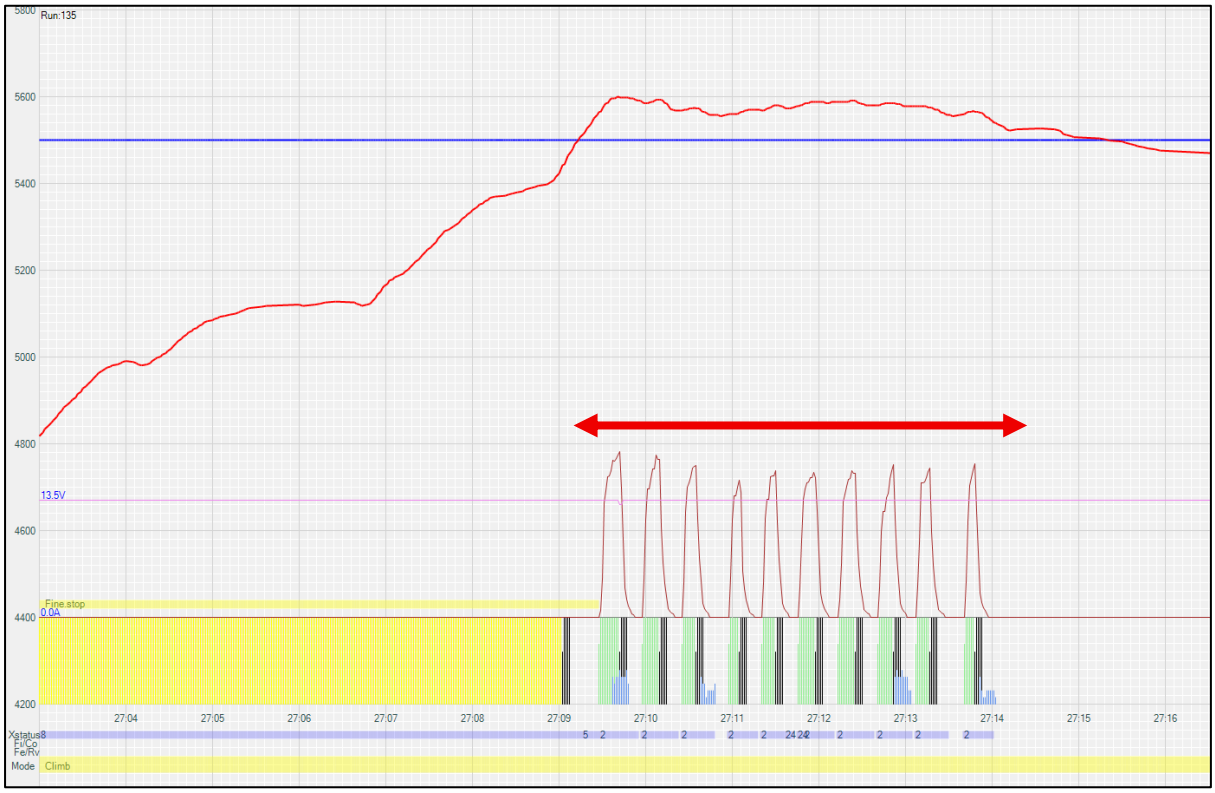


Figure 4. *Example log graph showing a 'sluggish' propeller response.*

3.2.4 Stable Propeller Response

In comparison with the previous examples, the example below shows a stable propeller response.

- Observe that RPM does not (significantly) overshoot or undershoot the target RPM during each step change in target speed.
- Observe that RPM stabilises relatively quickly (within 1 second) after each step change in target RPM.
- Observe that a single, continual pitch drive command achieves each pitch adjustment process.

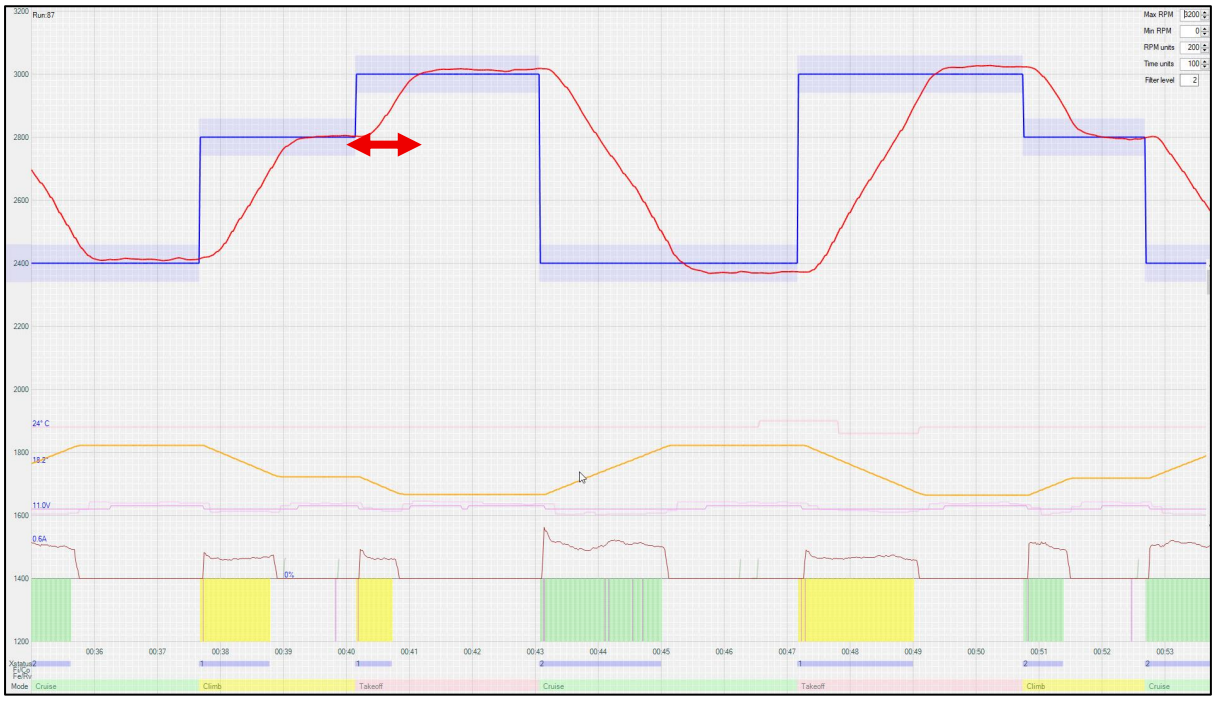


Figure 5. *Example log graph showing a stable propeller response.*

3.2.5 Over-Current Alarm

The example below shows an over-current alarm detected for 7s. This may be due to:

- Mechanical construction inside the hub.
- The presence of an electrical issue requiring further investigation.

> **Note** *For more information on over-current alarms, refer to failure modes in **ASI-7-3-1**.*

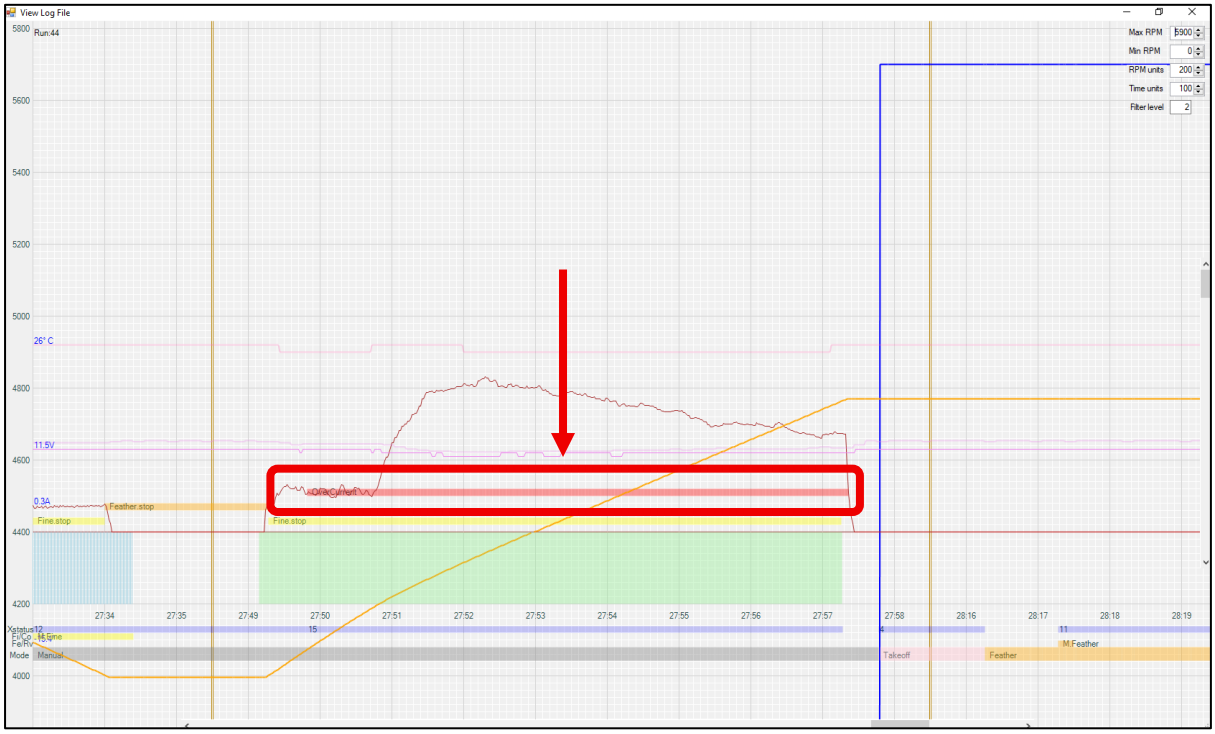


Figure 6. *Example log graph showing an over-current alarm.*