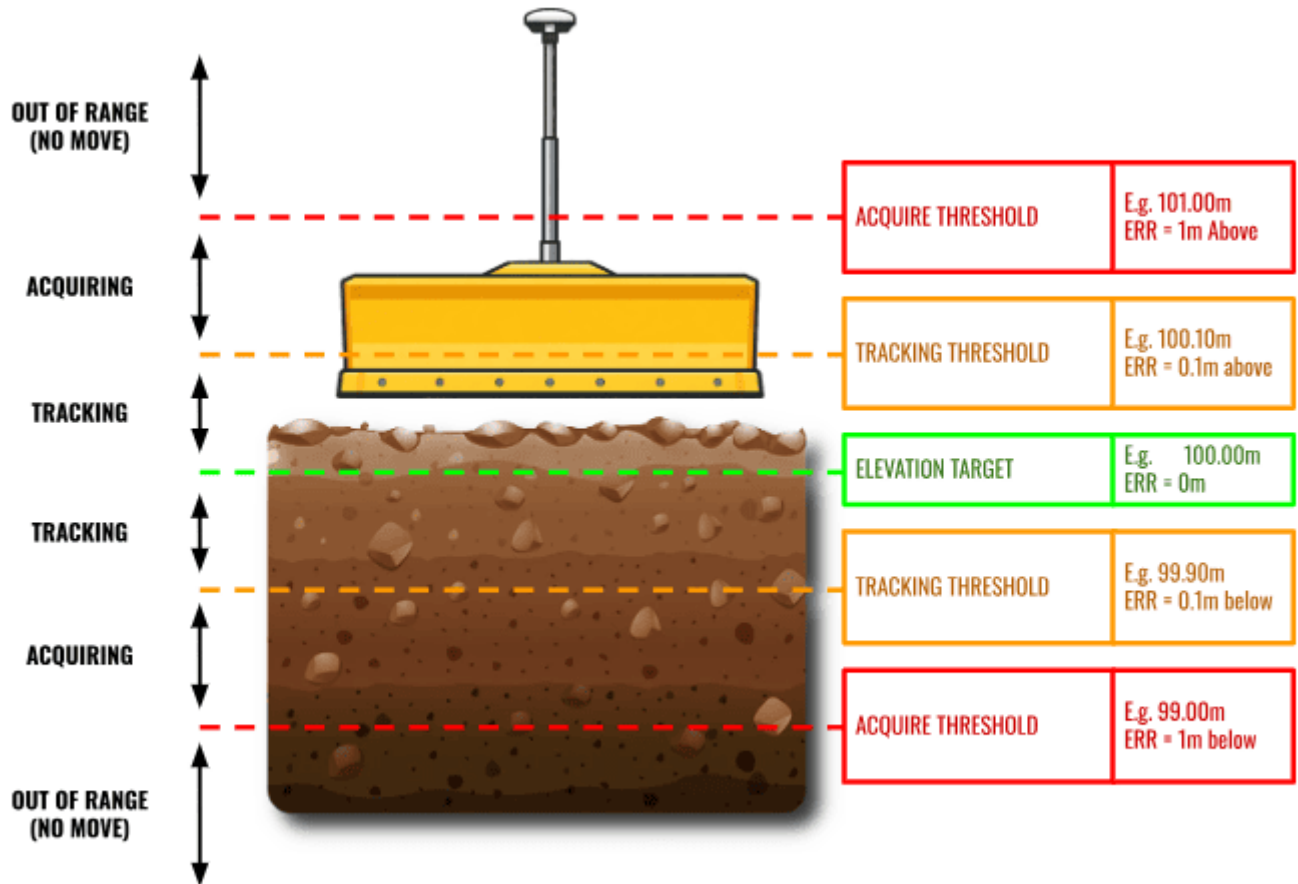


## 3.8 | Tuning Automatic Implement Control

The purpose of tuning is to achieve stable, accurate Automatic Control that follows the design surface smoothly without excessive lag or oscillation. The Tuning page provides the controls and feedback required to optimise control performance. To find the tuning page from the Apply View, press **More > COMMAND Settings > Tuning**.

### Tracking and Acquisition Behaviour

Once Automatic Control is engaged, the **COMMAND** ECU adjusts its control strategy according to the current error between the implement and the design surface.



Automatic Control transitions between Acquisition, Tracking and Out-of-Range regions according to the current error between the implement and the design surface.

The default **Tracking Threshold** and **Acquire Threshold** values are suitable for almost all applications and should not normally require adjustment. Modification of these parameters is generally not recommended.

Three operating regions are used:

## Tracking Region (e.g. < 10cm Error)

The Tracking Region is the area immediately surrounding the design surface. This region provides the highest grading accuracy and is where the implement should spend most of its operating time.

When the current error is within the configured **Tracking Threshold**, **COMMAND** continuously adjusts hydraulic output using its tracking control algorithm to accurately maintain the implement on grade.

By default, the tracking threshold is 10cm for height functions, and 10 degrees for x-slope functions. Within the Tracking Region, hydraulic output is continuously adjusted between the calibrated minimum and maximum valve thresholds according to the current control error.

## Acquisition Region (e.g. > 10cm but < 1m Error)

The Acquisition Region exists between the **Tracking Threshold** and **Acquire Threshold**.

When the implement is outside the Tracking Region but remains within the **Acquire Threshold**, **COMMAND** prioritises returning the implement to the Tracking Region as quickly as possible.

During acquisition, the ECU commands hydraulic output at the calibrated **Max %** threshold until the implement re-enters the Tracking Region. Once inside the Tracking Region, control automatically transitions back to normal tracking.

## Out of Range (e.g. > 1m Error)

If the current error exceeds the configured **Acquire Threshold**, the implement is considered too far from the design surface for Automatic Control to operate safely or effectively.

In this condition, **COMMAND** does not command hydraulic movement. This prevents large or unexpected hydraulic movements when the implement is significantly displaced from the design surface. The operator should manually reposition the implement closer to the design surface before Automatic Control resumes operation.

# Before Tuning

**ECU Status:** Ready to engage  
**Input Status:** No Error  
**Valve Status:** Ready  
**Automatic Control:** Enabled

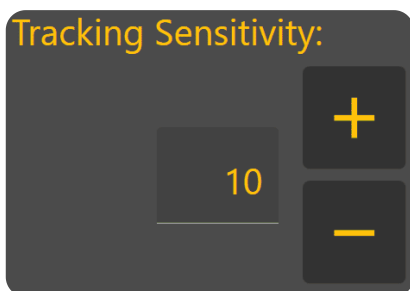
Before tuning, verify the following diagnostic indicators report normal operating status:

- **COMMAND** ECU Status

- Input Status
- Valve Status
- Automatic Control Diagnostics

Any active faults or invalid status conditions should be corrected before tuning begins.

## Tuning Procedure



Tuning should always be performed under normal working conditions using the same machine speed, hydraulic flow settings and operating practices that will be used during production work.

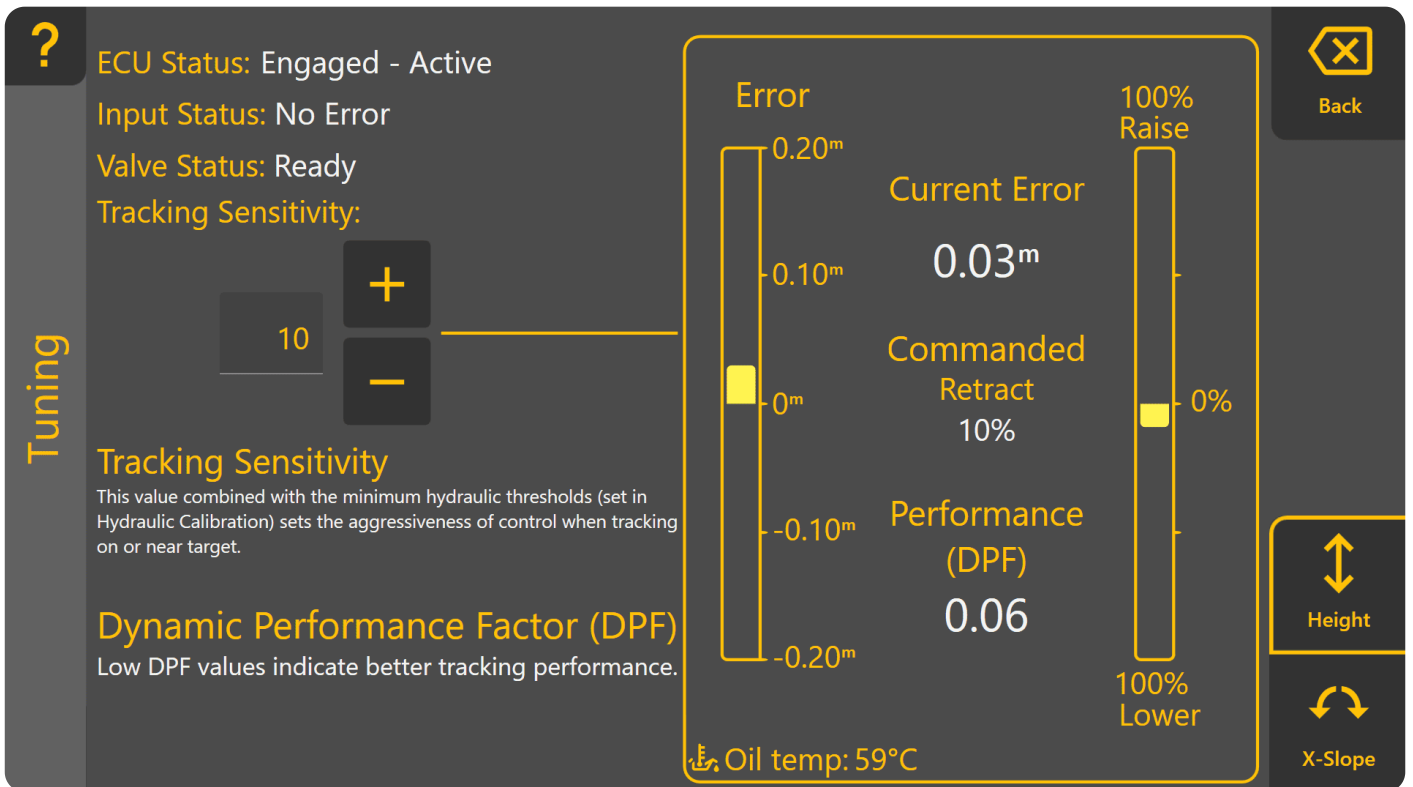
**Level COMMAND** currently provides a single tuning parameter called **Tracking Sensitivity**. The objective is to achieve stable control while maintaining accurate tracking of the target surface.

1. Load a suitable project or design surface.
2. Engage Automatic Control.
3. Perform several passes under normal operating conditions.
4. Observe implement behaviour and control performance.
5. Adjust **Tracking Sensitivity** as required.
6. Repeat until the implement follows the target smoothly without excessive lag or oscillation.

During normal grading, the implement should enter the Acquisition Region only briefly before returning to the Tracking Region, where it should remain for most of the grading operation. If the implement spends excessive time acquiring, overshoots repeatedly or oscillates around the target surface, further tuning may be required.

Adjustment	Typical Effect
Increase Tracking Sensitivity	Faster response, more aggressive control, increased risk of overshoot or oscillation.
Decrease Tracking Sensitivity	Slower response, smoother control, increased risk of lag and persistent tracking error.

# Understanding Tuning Feedback



The screenshot displays the tuning interface with the following information:

- ECU Status:** Engaged - Active
- Input Status:** No Error
- Valve Status:** Ready
- Tracking Sensitivity:** 10 (with + and - adjustment buttons)
- Tracking Sensitivity Description:** This value combined with the minimum hydraulic thresholds (set in Hydraulic Calibration) sets the aggressiveness of control when tracking on or near target.
- Dynamic Performance Factor (DPF):** 0.06 (with description: Low DPF values indicate better tracking performance.)
- Current Error:** 0.03m (displayed on a scale from -0.20m to 0.20m)
- Commanded Retract:** 10% (displayed on a scale from 0% to 100% Raise)
- Performance (DPF):** 0.06 (displayed on a scale from 100% Lower to 100% Raise)
- Oil temp:** 59°C
- Navigation:** Back, Height, X-Slope buttons.

## Current Error

**Current Error** displays the difference between the actual implement position and the target position. Large or persistent error indicates the implement is struggling to follow the target surface accurately.

## Commanded Output %

**Commanded %** displays the control effort being requested by Automatic Control. This value can help identify whether the controller is responding aggressively enough to changing conditions.

## Dynamic Performance Factor (DPF)

**Dynamic Performance Factor (DPF)** is a rolling performance metric used to indicate how closely the implement is following the target surface. A **DPF** value of **0** represents perfect control performance. Lower **DPF** values indicate better control performance.

As tracking error, overshoot, oscillation and other control deviations increase, the **DPF** value will also increase. **DPF** is calculated using approximately five seconds of Automatic Control performance data and is only updated while Automatic Control is engaged.

**DPF** should be used as a comparative tuning aid rather than an absolute performance target.

# Common Tuning Symptoms

Correct valve calibration—particularly the **Min %** thresholds—is essential before tuning begins. Incorrect **Min %** calibration can produce symptoms similar to incorrect **Tracking Sensitivity** and cannot be corrected through tuning alone.

## Tracking Sensitivity Too Low

- Implement responds slowly
- **Current Error** remains visible for extended periods
- Blade struggles to reach target grade
- **DPF** remains elevated due to persistent tracking error

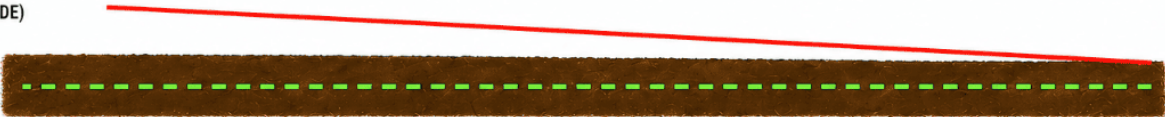
Recommended Adjustment > Increase **Tracking Sensitivity**.

**1) AGGRESSIVENESS TOO LOW (TRACKING SENSITIVITY LOW)**

Blade responds too slowly and never reaches the target.

— ACTUAL BLADE EDGE

- - - GROUND TARGET (DESIGN GRADE)



**TYPICAL RESULT WITH TRACKING SENSITIVITY TOO LOW:**

- Slow response, large steady-state error
- Blade stays above the target
- Surface remains high because the blade never gets down to grade in time

**RESULT:**

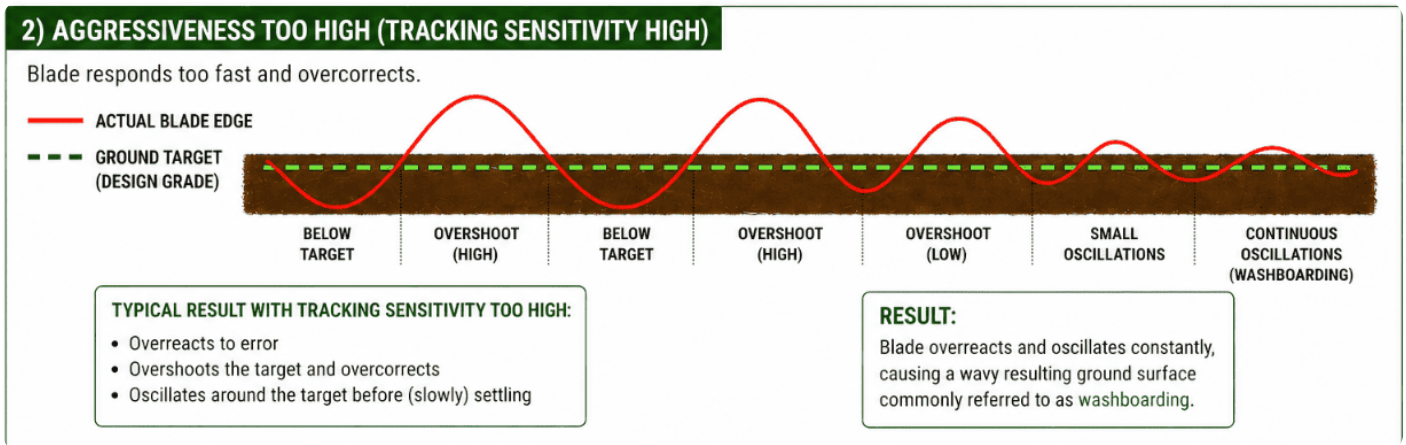
Blade takes too long to reach the target, resulting in long under and overcuts throughout the surface.

## Tracking Sensitivity Too High

- Implement reacts aggressively
- Blade overshoots the target surface
- Oscillation develops
- **DPF** increases due to instability and overcorrection

Reduce **Tracking Sensitivity**.

Recommended Adjustment > Reduce **Tracking Sensitivity**.



Once Automatic Control is performing at an acceptable level, continue on to **3.9 | Validating System Operation**.