# 1 SWISS RADAR Clutter Filter

## 1.1 Introduction

The company JFS Electronic has developed a new digital clutter filter for the SWISS RADAR Precision Navigator II radar device and the SWISS RADAR Indicator Plus auxiliary monitor.

The new clutter filter effectively counteracts disturbances caused by various environmental influences such as rain, heavy seas, reflections, or interference from other radar signals.

The clutter filter requires reliable compass and turn indicator data.

From now on, the SWISS RADAR Precision Navigator II radar device (from the Standard version onwards) and the SWISS RADAR Indicator Plus auxiliary display will be delivered with the new clutter filter.

SWISS RADAR Precision Navigator II units already installed can be retrofitted with the new clutter filter via a paid software update (from s/n 7114).

The clutter filter has been tested by the Office for Inland Navigation Technology Koblenz and has the corresponding approvals.

## 1.2 Display and Operation

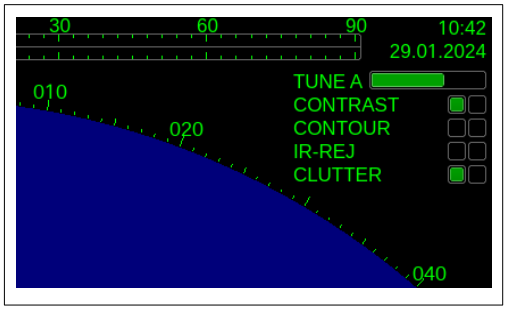


*Figure 1: Display of the Clutter Filter*

The status of the clutter filter is displayed in the upper right corner of the screen.

The filter has three levels:
OFF – ON Level 1 – ON Level 2.

Operation is performed via mouse or through the radar device's menu.

The two fields next to CLUTTER in the upper right corner are selected with the mouse pointer. The desired clutter level is chosen using the scroll wheel.

Alternatively, the filter can be controlled through the menu:

**MENU...** → **DISPLAY...** → **CLUTTER 0**

## 1.3 Functional Description

The clutter filter compares radar data from multiple antenna rotations. Echoes that were not continuously detected during past antenna rotations are displayed dimmed when the clutter filter is active.

To ensure that no relevant echoes are dimmed, active echo detection and target tracking are integrated. Echoes that are detected and tracked over multiple antenna rotations remain displayed without filtering.

By additionally activating the existing contrast filter, the dimmed echoes and echo parts are hidden.

☞ With the contrast filter switched on, darkened echoes are also removed.

With this filter, fast-moving objects may not be displayed.

## 1.4 Functional Description

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## 1.5 Echo Display

The following screenshots show the effect of the clutter filter in combination with the contrast filter.

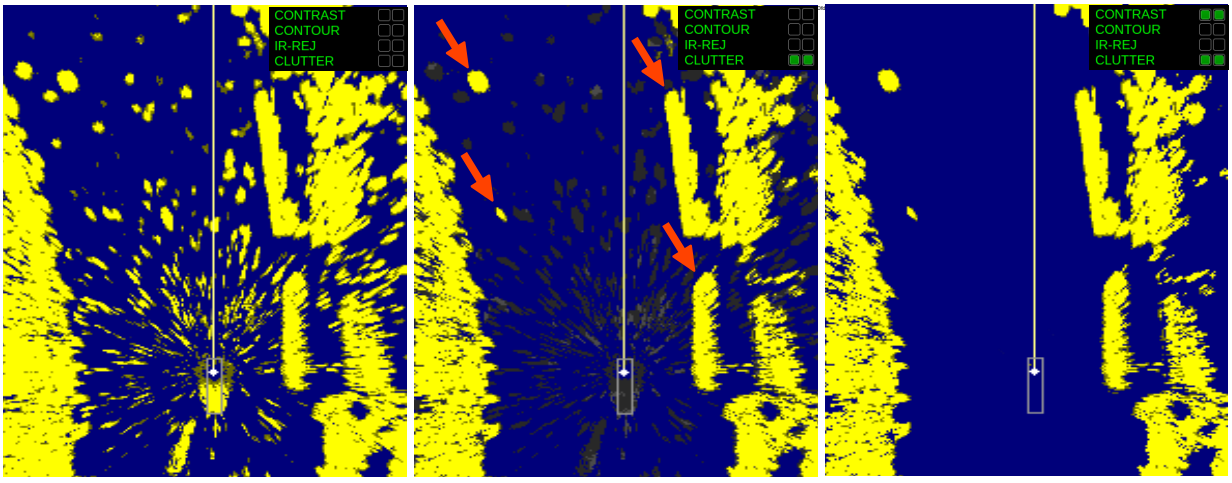


*Figure 2: Effect of CLUTTER FILTER*

Image section A) shows a situation in rain and heavy seas. The digital filters are turned off.

In image section B), the clutter filter is activated at level 2. Echoes that were not continuously detected in the previous antenna rotations are displayed dimmed.

In image section C), both the clutter filter and the contrast filter are set to level 2. Interfering echoes, which would be dimmed without the contrast filter, are now hidden.

The echoes marked with a red arrow have been detected by target tracking and tracked over multiple antenna rotations. These echoes are displayed without filtering.

## 1.6 Advantages of dimmed echo display

The clutter filter does not lose any image information. Interfering echoes are dimmed but still displayed. Relevant echoes and interfering echoes are differentiated. This display makes it easier to find the optimal GAIN setting for the best possible separation of interfering echoes and relevant echoes.

## 1.7 Advantages of the Target Tracking functions

Echoes detected at the same position over multiple antenna rotations are displayed. However, if the detected object moves, relevant echoes could be lost. Therefore, SWISS RADAR has implemented active Target Tracking. Both stationary and moving objects are detected, and their future positions are predicted. This allows echoes to be classified as relevant and displayed without filtering.

Fast-moving objects that are only detected briefly can be mistakenly classified as interference echo. If Clutter and Contrast are enabled, these echoes are not displayed.

The manufacturer recommends not activating the contrast filter when using the clutter filter, so that echoes are only darkened and not hidden.