TECDIS USER GUIDE AMENDMENT TRACK CONTROL

This user manual amendment provides information on operation of track control with TECDIS and the autopilot FURUNO FAP-3000.

Autopilot manual

For operation of track control, the operator should be familiar with the operation of the autopilot. It is recommended that the operator reads and understands the autopilot instruction manual, in particular sections 2.3.3 Remote control, 2.6.1 Condition selection, 2.6.2 Performance selection, 2.8 Autopilot system alerts and 2.14 Use of Arm Rest Panels.

TECDIS Track Control user interface and operation

There are minor differences in the TECDIS user interface in a Track Control system compared to a normal system.

AP mode

An “AP mode” status field is shown immediately above the alert user interface in the lower right-hand part of the display. This field will show the operating mode of the autopilot at all times. The following modes may be shown:

Mode	Description
Offline	TECDIS not in communication with AP
Manual	AP override for manual control is active
Heading ctrl	AP in heading mode with rudder limit control
Heading Radius	AP in heading mode with turn radius control
Course ctrl	AP in course mode with rudder limit control
Course Radius	AP in course model with turn radius control
Track request	AP has requested activation of track control
Track control	Track control is active

Track button

The ‘Track’ button shown below the AP mode field is enabled when route monitoring is active, and a track control request has been initiated on the AP by pressing the ‘CALL REMOTE CTRL’ button and is disabled at all other times.

When pressed, track control mode is initiated if the track control start requirements are met (as configured in TECDIS Setup during track control installation).

If track control is not accepted, a notification showing the reason for non-acceptance in the bottom middle part of the display.

The following reasons may be listed:

Reason	Description
Missing sensor(s)	One or more of the sensors required for track control operation are not providing data to TECDIS.
Low speed	The vessel speed is below the minimum requirement for track control.
Course deviation	The vessel course over ground difference to the route course is above the maximum requirement for track control.
Cross track deviation	The distance between the vessel and the route track is above the maximum requirement for track control.
Invalid turn(s)	The route contains one or more invalid turns.

Heading button

The ‘Heading’ button shown below the AP mode field is enabled when track control mode is active and is disabled at all other times.

When pressed, track control is stopped and AP heading control (radius) is activated. The current heading used as heading setpoint, and the radius is set to the radius of the next route turn (if pressed while on a route leg) or the current route turn (if pressed during a route turn).

Track control operation

While track control mode is active, TECDIS and the AP will cooperate to steer the vessel along the planned route track, including along curved turn segments (Track Control Category C).

Track control performance

The capability of track control to steer the vessel along the planned route depends on many factors that the operator should be aware of.

Weather conditions, including wind, current and sea state will affect the track control performance, with the possibility of making it hard to impossible for the system to follow the planned route. In adverse conditions, the operator should closely monitor the track control performance, and change to other modes of operation or a different route if needed.

Changes to the vessel loading conditions may affect the vessel maneuvering characteristics and track control performance. The operator should ensure that the AP loading condition setting reflects the loading condition of the vessel (See AP instruction manual section 2.6.1 Condition selection).

The AP performance setting will affect the precision of track control (See AP instruction manual section 2.6.2 Performance selection). Precision mode will allow more precise track control performance but will result in more active use of the rudder. The operator should ensure that the AP performance setting is configured appropriately for the navigational situation.

The TECDIS user interface includes a Wheelover distance setting available to the operator in the 'Ship' menu folder. An appropriate value for this setting has been determined during commissioning of the system, but the value may need adjustment depending on the weather conditions, loading condition of the vessel, vessel speed and turn radius settings.

During track control, if the vessel initiate turns too late with a correction later in the turn, increase the Wheelover setting. If the vessel initiate turns too early, decrease the Wheelover setting.

Autopilot and TECDIS settings have been calibrated for Track Control during commissioning of the system. If track control performance is poor when taking the above factors into account, please contact your service contact for reevaluation of the calibration.

Normal alerts during track control

Before each turn, two warnings will be triggered:

- The Early Course Change Warning (WOP IN x MINUTES OR LESS) will be triggered between 3-6 minutes before the vessel reaches the wheel-over line.
- The Actual Course Change Warning (WOP IN 30 SECONDS OR LESS) will be triggered 30 seconds before the vessel reaches the wheel-over line.

Additionally, the Track End Warning (TRACK END x MINS) will be triggered 3-6 minutes before the vessel reaches the last route waypoint.

These alerts will be escalated to alarms if they are not acknowledged within 30 seconds. If the alerts are still not acknowledged 30 seconds after this, the Back-up Navigator Watch Alert System will be alerted, with the alert remaining in effect until the alert has been acknowledged.

Track control will resume regardless of acknowledgment of these alerts.

Stopping track control manually

Track control may be stopped at all times in one of the following ways.

- Pressing the 'Heading' button will change the AP mode to Heading Control (Radius) with no alerts being triggered. See 'Heading button' above for details.
- Activating the AP override controls for manual rudder operation will stop track control with the Track Control Stopped Warning being triggered.
- Selecting Heading or Course control on the AP operator control panel will engage the selected AP mode with the Track Control Stopped being triggered.

Similarly to the normal track control alerts, the Track Control Stopped warning will be escalated to an alarm if it is not acknowledged within 30 seconds. If the alert is still not acknowledged 30 seconds after this, the Back-up Navigator Watch Alert System will be alerted, with the alert remaining in effect until the alert has been acknowledged.

Automatic stop of track control

In addition to the manual means above, the system may automatically stop track control in the following situations:

- **10 minutes of operation without a valid position sensor**
  If all position sensors are lost, track control is not immediately stopped, but the 'ALL POSITION SENSORS LOST' alarm and the 'Switch to Heading Control or Manual' warning are triggered (the latter being repeated every 2 minutes). If track control mode is still active after 10 minutes without position sensors, track control is stopped in the same way as for termination of route monitoring.
- **Loss of heading sensors**
  If all heading sensors are lost, track control is stopped automatically with the 'ALL HEADING SENSORS LOST' alarm and the 'Switch to Manual Control' warning being triggered. The autopilot will also trigger a heading control failure alarm. In this situation, the rudder angle at the time of sensor loss on the autopilot will be maintained until manual control is engaged.
- **Loss of communication with the autopilot**
  If the TECDIS unit communication with the autopilot is lost, track control is stopped in the same way as for termination of route monitoring. A lost track control alert will be triggered on the autopilot.

In all of these situations, the TRACK CONTROL STOPPED warning will be triggered. The Track Control Stopped warning will be escalated as specified in the previous section.

Note: The same triggering of the Back-up Navigator Watch Alert System after 30 seconds unacknowledged is applied to the 'ALL POSITION SENSORS LOST', 'ALL HEADING SENSORS LOST' and the 'Lost Sensor Water Speed' alarms.

Track Control list of alerts

This section lists all additional alerts that may be presented by TECDIS with track control enabled. For each alert, the list includes the priority, category, alert field display, alert list description text if different, reasons for the alert, any special behavior of the alert, and applicable advice.

TECDIS permits responsibility transfer for all the listed alarms and warnings.

All the listed warnings are repeated as warnings after either 60 seconds or 4.8 minutes, depending on configuration in the 'Safe' menu, with the exception of the 'Switch to Heading Control or Manual' warning, which requires re-acknowledgment every 2 minutes until rectified.

Alarms

ALL POSITION SENSORS LOST		Priority:	Alarm	Category:	B
Reasons:	All position sensors are lost or are not providing valid positions.				
Special behavior:	Only triggered if Track Control mode is active. Back-up Navigator Watch Alarm System is triggered if not acknowledged within 30 seconds.				
Advice:	Switch to heading control or manual control.				
ALL HEADING SENSORS LOST		Priority:	Alarm	Category:	B
Reasons:	All heading sensors are lost or are not providing valid heading values.				
Special Behavior:	Only triggered if Track Control mode is active. Back-up Navigator Watch Alarm System is triggered if not acknowledged within 30 seconds.				
Advice:	Switch to manual control.				
Lost Sensor Water Speed		Priority:	Alarm	Category:	B
Reasons:	The water speed sensor has been lost or is not providing valid speed values.				
Special Behavior:	Only triggered if Track Control mode is active. Back-up Navigator Watch Alarm System is triggered if not acknowledged within 30 seconds.				
Advice:	Attend to the water speed sensor and determine if issue can be resolved. If not, attend to AP settings for alternative speed sensor or manual input. Monitor track control operation closely				

Warnings

WOL IN x MINUTES OR LESS		Priority:	Warning	Category:	A
Reasons:	Triggered the configured number of minutes before all turns while in track control.				
Special behavior:	Escalates to alarm after 30 seconds if not acknowledged and activates Back-up Navigator Watch Alarm System if still not acknowledged 30 seconds after alarm escalation.				
Advice:	Acknowledge the alert and attend to track control performance.				
WOL IN 30 SECONDS OR LESS		Priority:	Warning	Category:	A
Reasons:	Triggered 30 seconds before all turns while in track control unless WOL IN x MINUTES OR LESS has not been acknowledged.				
Special behavior:	Escalates to alarm after 30 seconds if not acknowledged and activates Back-up Navigator Watch Alarm System if still not acknowledged 30 seconds after alarm escalation.				
Advice:	Acknowledge the alert and attend to track control performance.				
TRACK END x MINS		Priority:	Warning	Category:	A
Reasons:	Triggered the configured number of minutes before reaching the final route waypoint.				
Special behavior:	Escalates to alarm after 30 seconds if not acknowledged and activates Back-up Navigator Watch Alarm System if still not acknowledged 30 seconds after alarm escalation.				
Advice:	Acknowledge the alert and attend to track control performance. Plan for maneuvering after route monitoring has completed.				
TRACK CONTROL STOPPED		Priority:	Warning	Category:	A
Reasons:	Track control has been stopped by other means than the 'Heading' button.				
Special behavior:	Escalates to alarm after 30 seconds if not acknowledged and activates Back-up Navigator Watch Alarm System if still not acknowledged 30 seconds after alarm escalation.				
Advice:	Attend to maneuvering of the vessel. Determine the cause of track control being stopped by evaluating other system alerts and system state.				

Heading difference limit exceeded		Priority:	Warning	Category:	B
Reasons:	The difference between the headings reported by the primary and the secondary heading sensor exceeds the configured limit.				
Special behavior:	Only triggered when Track Control is active				
Advice:	Check the position sensors. Refer to troubleshooting documentation for the sensors. Attend to track control performance.				
Pos sensors difference limit exceeded		Priority:	Warning	Category:	B
Reasons:	The difference between the positions reported by the primary and the secondary position sensor exceeds the configured limit.				
Special behavior:	Only triggered when Track Control is active				
Advice:	Check the position sensors. Evaluate position reported from both sensors and consider switching primary sensor.				
Lost sensor Water Speed		Priority:	Warning	Category:	B
Reasons:	The water speed sensor has been lost or is not providing valid speed values.				
Special behavior:	Only triggered if track control is not active				
Advice:	Attend to the water speed sensor and determine if issue can be resolved.				
Switch to Heading Control or Manual		Priority:	Warning	Category:	B
Reasons:	Track control performance has been degraded by sensor loss.				
Special behavior:	Returned to unacknowledged state every 2 minutes until the autopilot mode has been changed.				
Advice:	Change the autopilot mode to heading control or manual.				
Switch to Manual Control		Priority:	Warning	Category:	B
Reasons:	Track and Heading control have been degraded by heading sensor loss				
Advice:	Switch to Manual control.				
Back-up Navigator alarm active		Priority:	Warning	Category:	B
Reasons:	The Back-up navigator watch alarm system has been alerted due to an unacknowledged track control alarm.				
Advice:	Acknowledge unacknowledged track control alerts and attend to track control performance.				
Course difference limit exceeded		Priority:	Warning	Category:	B
Reasons:	The difference between vessel course over ground and planned route course exceeds the configured warning limit.				
Advice:	Attend to track control performance.				
Valid position sensor is available		Priority:	Warning	Category:	B
Reasons:	A valid position has become available after a period of no position sensors being available.				
Advice:	The position sensor has been automatically selected for use. Evaluate position sensor performance and attend to track control performance.				
Valid speed sensor is available		Priority:	Warning	Category:	B
Reasons:	The water speed sensor has become available after a period of no position sensors being available.				
Advice:	The water speed sensor has been automatically selected for use. Evaluate sensor performance and attend to track control performance.				
Low speed		Priority:	Warning	Category:	B
Reasons:	The vessel speed is below the configured minimum speed for track control				
Advice:	Increase vessel speed or switch to other autopilot mode or manual control.				
LOST AUTOPILOT		Priority:	Warning	Category:	B
Reasons:	Communication with the autopilot has been lost				
Special behavior:	Causes automatic stop of track control.				
Advice:	Evaluate Autopilot state and performance. Investigate connection between TECDIS and the autopilot. Contact service personnel if the alert persists.				

Cautions

Pos sensor difference limit exceeded		Priority:	Caution	Category:	B
Reasons:	The difference between the positions reported by the primary and the secondary position sensor exceeds the configured limit.				
Special behavior:	Only triggered when track control is not active.				
Advice:	Check the position sensors. Evaluate position reported from both sensors and consider switching primary sensor.				