

# ARINC 424 NDB

Draft 4 of Supplement 23  
Proposal

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## CODE INSERTED RUNWAY FIXES AS FINAL END POINTS

V.0

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SUMMARY
Garmin is proposing that the inserted landing threshold points (LTPs) be coded as final end points (FEPs)

## 1.0 INTRODUCTION/ BACKGROUND

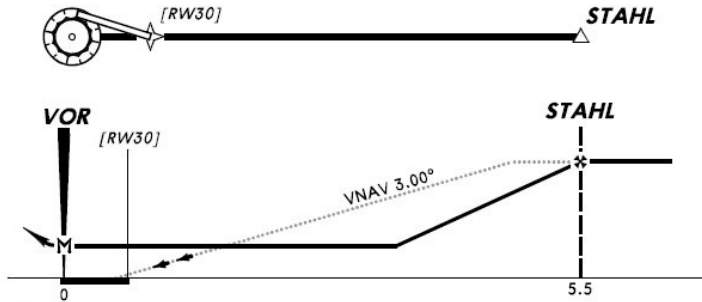
The Attachment 5 of the ARINC 424 specification has three different rules for what should be coded when the charted missed approach point is beyond the landing threshold.

From Attachment 5:

- 8.10 VNAV Coding of Non-Precision Approach Procedures With Missed Approach Points - Other Than Landing Threshold**
- Coding standards for Non-Precision Approach Procedures that have a published missed approach beyond the Landing Threshold Point have been developed. These standards are included in the three VNAV coding scenarios in the following paragraphs. In these scenarios, the term final approach course crosses over the landing threshold is used as a qualification for the three scenarios. This attachment does not define with any precision what is meant by this qualification. The intent of this wording is that the published final approach course will lead to the landing threshold without course changes or corrections.
- 8.10.1** Missed Approach Point beyond the landing threshold and the published Final Approach Course crosses the landing threshold. The ARINC 424 rules for this case call for **inserting the Landing Threshold Point as a fix in procedure coding**. See VNAV Coding Example A.
- 8.10.2** Missed Approach Point beyond the landing threshold and the published Final Approach Course does not cross the landing threshold. The ARINC 424 rules for this case call for **inserting a Final End Point as a fix in the procedure coding**. See Coding Example B.
- 8.10.3** Missed Approach Point is a Navaid beyond the landing threshold. The published final approach course does not cross over the landing threshold but the navaid is located equal to or less than 0.1NM from that threshold. The ARINC 424 rules for this case call for **coding the navaid as the missed approach point**, no insertion of an additional fix. See Coding Example C.

In last two cases, where the FEP or Navaid is coded, the charted MAP is coded with the Waypoint Description Code 4 (5.17 column 43) value of 'M' – Missed Approach Point. But in the first case, where the LTP is coded, the charted missed approach point is not flagged with the Waypoint Description Code 4 (5.17 column 43) value of 'M'. The example of this is seen in Attachment 5 VNAV coding example A and B.

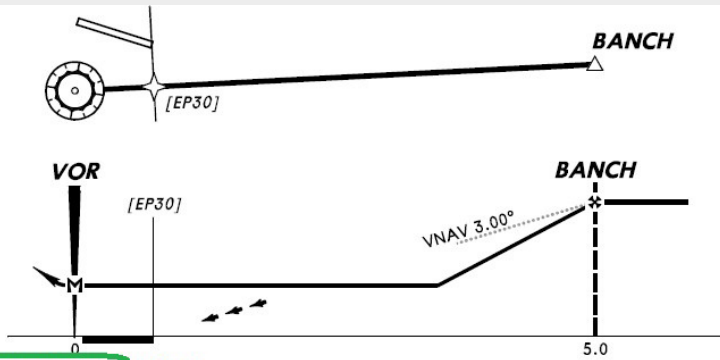
CODE INSERTED RUNWAY FIXES AS FEPS



Inserted Runway Fix Coding:

APP ID	SEQ NR	FIX ID	P/T	WAYPOINT DESCRIPTION			MAG COURSE	DIST	ALT DESC/ALT	VERT ANGLE	ARINC 424 REF.
D30	020	STAHL	IF	E		F	0.0	0.0	At or Above Procedure Altitude		Attachment 5, Rule 8.1.1
D30	030	RW30	CF	G	Y	M	Published FAC	4.7	At LTP + published TCH (if no procedure TCH is specified by source use 40 or 50 feet)	-3.00	Attachment 5, Rule 8.1.2 Rule 6.2.9.3 Rule 6.2.10.2.c
D30	040	VOR	CF	V	Y	M	Published FAC	0.8			Attachment 5, Rule 6.2.10.2.c Rule 9.2.3
D30	050		CA				Published FAC		At or Above Airport Plus 400 feet		Attachment 5, Rule 9.4.1.4
D30	060	STAHL	DF	E	E				At or Above Procedure Altitude		

Figure 1: VNAV Coding Example A: Inserted Runway Fix



Inserted Final End Point Fix Coding:

APP ID	SEQ NR	FIX ID	P/T	WAYPOINT DESCRIPTION			MAG COURSE	DIST	ALT DESC/ALT	VERT ANGLE	ARINC 424 REF.
D30	020	BANCH	IF	E		F	0.0	0.0	At or Above Procedure Altitude		Attachment 5 Rule 8.1.1
D30	030	EP30	CF	E	Y	E	Published FAC	4.1	At LTP + published TCH (if no procedure TCH is specified by source use 40 or 50 feet)	-3.00	Attachment 5 Rule 8.1.2 Rule 6.2.9.4 Rule 6.2.10.2.d
D30	040	VOR	CF	V	Y	M	Published FAC	0.9	At or Above Airport Plus 400 feet		Attachment 5 Rule 6.2.10.2.d Rule 9.2.3
D30	050		CA			M	Published FAC		At or Above Airport Plus 400 feet		Attachment 5 Rule 9.4.1.4
D30	060	BANCH	DF	E	E				At or Above Procedure Altitude		

Figure 2: VNAV Coding Example B: Inserted Final End Point

## 2.0 DISCUSSION and/or ACTION

The problem with the current Attachment 5 rules for inserting the landing threshold point (LTP) in the first case is that we lose the charted missed approach (MAP).

Garmin would like to know when the runway is being inserted using the Attachment 5 rule 8.10.1, so that we can always know the charted MAP. To this end, Garmin proposes to code the runway inserted points with the Waypoint Description Code 4 (5.17 column 43) value of 'E' – Final End Point so that the Navaid can be coded with the Waypoint Description Code 4 (5.17 column 43) value of 'M' – Missed Approach Point.

### 3.0 Legacy ARINC 424 changes as depicted (Track Changes is Helpful)

#### 3.1 Update Chapter 2.2.2, Procedure and Route Terms

##### 3.1.1 Update definition for Final End Point

#### **Final End Point (FEP)**

The FEP is a waypoint located in the coded Final Approach Course (FAC). It is located at a point defined by the intersection of the FAC and a line perpendicular to that course through the runway threshold for procedures designed to straight-in criteria or threshold the first usable landing surface for circling only procedures. **The FEP may also be the landing threshold point (LTP).** Rules governing when a FEP waypoint is coded are contained in Attachment Five of this specification.

#### 3.2 Update Attachment 5 rules

##### 3.2.1 Update 6.2.9.3 & 6.2.9.4 rules:

- 6.2.9.3 If the published missed approach point is beyond the runway threshold, and the runway threshold will be coded as **the Final End Point** fix in the lateral path, that fix will be on the established path, with no course changes.
- 6.2.9.4 If the published Missed Approach Point is beyond the runway threshold and a runway threshold fix cannot be inserted as defined in Rule 8.10, a Final End Point fix is to be inserted into the final approach coding sequence. For complete details, see Rule 8.10.

##### 3.2.2 Update 6.2.10.2.c rules:

- 6.2.10.2.c For a published Missed Approach Point beyond the runway threshold, and where a landing threshold point fix **as the Final End point** has been inserted into the final approach coding by the data supplier, based on the rules in Rule 8.10 of this Attachment, code an at altitude equal to the runway threshold elevation plus the published TCH (if no procedure TCH is specified by source, then use 40 or 50 feet) in Altitude 1 of the landing threshold point fix record. See Rule 8.10 of this attachment.

##### 3.2.3 Update 8.10.1 rule:

- 8.10.2 Missed Approach Point beyond the landing threshold and the published Final Approach Course crosses the landing threshold. The ARINC 424 rules for this case call for inserting the Landing Threshold Point **as the Final End Point** as a fix in **the** procedure coding. See VNAV Coding Example A.

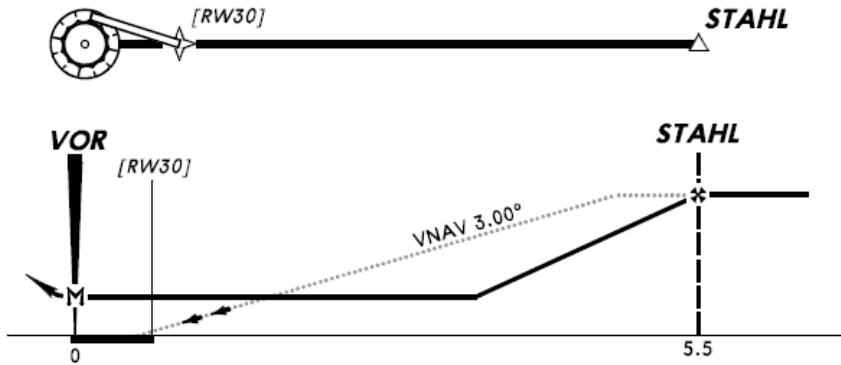
3.2.4 Update VNAV coding example A:

**CODING EXAMPLE A**

**VNAV APPROACH CODING EXAMPLE**

**Inserted Runway Fix (Rule 8.10.1)**

This example shows a procedure published as Final Approach Fix (FAF) to a Missed Approach Point (MAP) beyond the Landing Threshold Point (LTP). The Final Approach Course (FAC) crosses over the landing threshold. The landing alignment is straight-in. As the officially published MAP position is beyond the LTP, a runway fix waypoint [RW30] is inserted as ~~an additional~~ **the final end point** waypoint into the Final Approach Coding of this example. The VNAV Path angle is calculated from the LTP elevation + TCH (if no procedure TCH is specified by source use 40 or 50 feet [see Section 5.67 of this specification]) using the LTP and the FAF to determine the distance used in the calculation, to the FAF altitude and is coded in the Runway Fix sequence. The missed approach procedure is not included in the graphic. It is included in the coding sequence example. The inserted runway fix is coded as the **MAPFEP**. The coded first leg of the missed approach path is a continuation of the FAC ~~from the inserted Runway Fix~~ to the officially published MAP. The flyover code is set in position 2 of the waypoint description field. The first leg of the published missed approach path is a climb on the FAC to an altitude of airport elevation plus 400 feet, or as specified by source, followed by a direct to a fix at the FAF.



Inserted Runway Fix Coding:

APP ID	SEQ NR	FIX ID	P/T	WAYPOINT DESCRIPTION				MAG COURSE	DIST	ALT DESC/ALT	VERT ANGLE	ARINC 424 REF.
D30	020	STAHL	IF	E			F	<del>0.0</del>	<del>0.0</del>	At or Above Procedure Altitude		Attachment 5, Rule 8.1.1
D30	030	RW30	CF	G	Y		<del>M</del> E	Published FAC	4.7	At LTP + published TCH (if no procedure TCH is specified by source use 40 or 50 feet)	-3.00	Attachment 5, Rule 8.1.2 Rule 6.2.9.3 Rule 6.2.10.2.c
D30	040	VOR	CF	V	Y		<del>M</del> M	Published FAC	0.8			Attachment 5, Rule 6.2.10.2.c Rule 9.2.3
D30	050		CA				<del>M</del> M	Published FAC		At or Above Airport Plus 400 feet		Attachment 5, Rule 9.4.1.4
D30	060	STAHL	DF	E	E					At or Above Procedure Altitude		

Waypoint Description:

Column One – Fix Type: E = Waypoint, G = Runway, V = VHF Navaid

Column Two – E = End of Final Approach Coding, Y = Flyover waypoint

CODE INSERTED RUNWAY FIXES AS FEPS

Column Three – M = First Leg of Missed Approach Procedure

Column Four – Fix Function in Coding: F = FAF, **E = Final End Point Fix**, M = Missed Approach Fix

Note: FAF Altitude Description may be at when this is prescribed by source documentation. The altitude in sequence 050 may be a source provided value for the first leg of a missed approach or may be regionally adjusted to 500 feet above the airport. The At or Above Airport Plus 400 feet is the minimum requirement.

**4.0 XML ARINC 424 changes as depicted (Track Changes is Helpful)**

N/A