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***IDOC*** 0148-16R8

# King Air Fusion Technical Topics

Rockwell Collins

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***IDOC*** 0148-16R8

## Summary

This Info Doc is intended to be a repository of technical topics, tips, and discussion regarding the operation of the Fusion system as installed on Textron King Air aircraft. This Information Document (IDOC) will be continuously updated as new questions or troubleshooting guidelines become available; new topics will be added to this Information Document, or as applicable, new information will supersede the previous information on existing topics.

Topics in this IDOC include:

1. Applicable OPSB Reference (New OPSBs added July 2018)
2. Jeppesen Database Downloading
3. Nuisance Messages
4. Nuisance Maintenance (OMS) Messages
5. High Resolution Terrain Database (HRTDB)
6. Approach Issues
7. FMS Comparator Message on some LPV Approaches
8. Radio ID on Legends Menu
9. Check LOC Tuning
10. FMS Reset/Disappearing when making a flight plan edit
11. Avionics Powerup in Extreme Cold Temperatures
12. Retaining Map Configurations through Power Cycles

(June 2016) Revision 1 : Updates instructions for obtaining a High Resolution Terrain Database DVD.

(June 2016) Revision 2 : Adds FMS Comparator Message on some LPV Approaches

(August 2016) Revision 3 : Updates Jeppesen Database Loading.

(September 2016)Revision 4 : Remove JSUM as an alternate option.

(November 2016) Revision 5 : Add Radio ID on Legends Menu, Add OPSB 0156-16 (523-0824327) Recommendations for AFD flickering or Dim when dimming knob is set to the full brightness stop.

(December 2016) Revision 6 : Add 1. (D) to page 2, JDM 3.4.1 release solves the chart update loading issue in (1) Jeppesen Database Downloading

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(February 2018) Revision 7 : Adds OPSB Reference section. Adds Check Loc Tuning section. Adds FMS Reset/Disappearing when making a flight plan edit section. Removes out of data Jeppesen info from Jepp Database section. Removes OPSB 0156-16 from body of document.

(July 2018) Revision 8: Added OPSB 0188-17 (523-0825403) and 0188-18 (523-0825479. Updated current HRTDB part number. Added new topic regarding retaining map configurations through power up instructions.

## 1. Applicable OPSB Reference

The following table summarizes Operational Service Bulletin (OPSB) applicable to the King Air Fusion system as of the revision of this IDOC.

| OPSB | Publication | Subject | Purpose | Applicable to Phase/RCPN |
|---|---|---|---|---|
| 0086-08R1 | 523-0818231 | Procedure waypoint and associated altitude not displayed | Awareness | FMSA-6010<br>1 (810-0163-1H0003),<br>2 (810-0163-1H0004),<br>3 (810-0163-1R0001) |
| 0141-16 | 523-0823956 | After selecting Direct-to and then deviating from the procedure, the FMS may turn according to the database turn direction instead of in the shortest turn direction | Awareness | FMSA-6010<br>1 (810-0163-1H0003) |
| 0142-16 | 523-0823955 | Using barometric VNAV to operate to a Minimum Descent Altitude (MDA) with Advisory Vertical Descent Angle (VPA) | Information | All |
| 0143-16R1 | 523-0823958 | The FMS May Exceed Holding Pattern Area During a Direct Hold Entry | Awareness | FMSA-6010<br>1 (810-0163-1H0003) |
| 0128-15R4 | 523-0823967 | The FMS may turn the wrong direction on certain procedures | Awareness | FMSA-6010<br>1 (810-0163-1H0003) |

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| 0154-16R2 | 523-0824186 | L/V APPR guidance may be offset laterally and vertically from the published final approach | Awareness | FMSA-6010<br>2 (810-0163-1H0004)<br>3 (810-0163-1R0001) |
| 0156-16 | 523-0824327 | Adaptive Flight Display may flicker or dim when the dimming knob is set to the full brightness stop | Information | All |
| 0158-16 | 523-0824407 | RNP < 1NM Authorizations and Navigation Database Content | Information | All |
| 0160-16 | 523-0824452 | SVS “Sky Ground Inversion” (on ground) | Information | ATF-35x0<br>1,2 (810-0348-001)<br>3 (810-0391-001) |
| 0162-17 | 523-0824475 | Upon changing the STAR, the approach transition may incorrectly retain a speed and/or altitude from the previous STAR | Awareness | FMSA-6010<br>1 (810-0163-1H0003),<br>2 (810-0163-1H0004),<br>3 (810-0163-1R0001) |
| 0165-17 | 523-0824809 | Possible chart anomalies when airports with greater than 200 Electronic charts are contained in a flight plan | Awareness | FSA_6000<br>1, 2, 3 (810-0072-302) |
| 0177-18 | 523-0825097 | Fuel Indication icon on the Flight Management Systems (FMS) Route Page may indicate insufficient fuel when sufficient fuel remains | Awareness | FMSA-6010<br>1 (810-0163-1H0003),<br>2 (810-0163-1H0004),<br>3 (810-0163-1R0001) |
| 0178-18 | 523-0825102 | The Checklist Advance button will only advance checklists when displayed in the upper Multi-Function Window (MFW) | Information | FDSA-6500<br>1 (810-0234-1H0001)<br>2 (810-0234-1H0002) |

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| | | | | |
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| | | of the onside Primary Flight Display (PFD). | | 3 (810-0234-1H0003) |
| 0181-18 | 523-0825126 | On the FMS map, the turn direction arrow may be incorrect | Awareness | FMSA-6010<br>2 (810-0163-1H0004),<br>3 (810-0163-1R0001) |
| 0182-18 | 523-0825171 | Inserting an Along-track waypoint after a fix may result in incorrect FMS guidance for an RF Leg or DME Arc | Awareness | FMSA-6010<br>1 (810-0163-1H0003),<br>2 (810-0163-1H0004),<br>3 (810-0163-1R0001) |
| 0183-18 | 523-0825172 | After selecting a path to an Initial Fix, the FMS may turn the wrong way if the following leg has a specified turn direction to a fix | Awareness | FMSA-6010<br>1 (810-0163-1H0003),<br>2 (810-0163-1H0004),<br>3 (810-0163-1R0001) |
| 0188-17 | 523-0825403 | The PFD May Display "RWY" Instead of the Missed Approach Altitude During the First Leg of an LPV Missed Approach Procedure | Awareness | FMSA-6010<br>1 (810-0163-1H0003) |
| 0188-18 | 523-0825479 | EGNOS Loss of Signal Lock may result in EGNOS LPV NOT AVAILABLE | Awareness | GPS-4000S<br>822-2189-100 |

## 2. Jeppesen Database Downloading

a.) In Rev 6 (Dec 2016) Jeppesen released JDM release, 3.4.1, which addressed chart update loading issues associated with new orders and trip kits for Rockwell Collins Pro Line 21 and Fusion systems. Previous versions of this IDOC discussed various work arounds for this issue but these are no longer required. Note also that JSUM (the predecessor to JDM) was longer supported as of November 1, 2016.

b.) There have been instances of flight or maintenance crews accidentally downloading Pro Line 21 EMaps and attempting to use them; only Pro Line Fusion charts should be used on the King Air Fusion system (see Figure 1.) Fusion EMaps are labelled as such; EMaps labelled “IFIS E-Maps” are for Pro Line 21 systems and cannot be used on Fusion systems.

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## 3. Nuisance Messages

a.) Message:

SVS Degraded Alt

Explanation: This message is displayed when GNSS altitude near the ground is greater than 75 ft. difference than the Baro Corrected and Temperature Compensated ADC altitude. If the Baro setting used is not exactly correct, the 75 ft. difference with GNSS altitude could be exceeded. Once the aircraft climbs out, this message will be extinguished.

When to ignore: When this message is displayed in the initial climb.

When to investigate: If this message persists beyond the initial part of the climb, or appears in any other phase of flight.

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**4. Maintenance (OMS) Nuisance Messages**

a.) Message:
PFD 1 input bus GNSS-2 is disconnected or Failed
MFD input bus GNSS-2 is disconnected or Failed

Explanation: This message is displayed when a second GPS is installed and the GNSS- 2 bus is missing. Currently there is a logic fault with this message; it is not inhibited in aircraft that do not have the second GPS installed. The maintenance software sees that no GNSS2 bus is available, and displays this message.

When to ignore: When this message appears on an airplane configured for a single GPS.

When to investigate: When this message appears on an airplane configured for dual GPS.

b.) Message:
NAV 1 has an internal fault
NAV 2 has an internal fault

Explanation: This message is displayed when the NAV radios are tuned to a frequency outside the line of sight of the aircraft. This can be verified by tuning to a local NAV source and verifying that the fault is removed.

When to ignore: When a green echo frequency is displayed.

When to investigate: When a yellow echo frequency is displayed.

**5. High Resolution Terrain Database**

a. When an AFD-3700 is ordered from the Rockwell Collins Rental Exchange Pool, the unit is delivered with the factory firmware load only. Application software should be downloaded from Textron's website; the High Resolution Terrain Database is delivered as a separate item, RCPN 810-0406-xxx (see table below for latest).

This software (shipped on a DVD-ROM) will be provided at no charge to Rental Exchange customers; the customer should request the High Resolution Terrain Database as a no-charge line item, referencing part number 810-0406-xxx (see table below for latest), on the Rental Exchange PO.

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If a customer already has a copy of the HRTDB, additional copies are not needed for additional displays. However, it is important to note that the same version of the HRTDB needs to be loaded into all 3 displays.

b. Due to the file size, it is not a downloadable file on the Rockwell Collins FMS website.

c. The following tables identifies versions of the the HRTDB for King Air. The Rockwell Collins Database Alerts, Exclusions and Certifications website contains a Change Notice for the current released version

| RCPN | Database Name |
|---|---|
| 810-0406-100 | HRTDB_01_2014 |
| 810-0406-101 | HRTDB_02_2014 |
| 810-0406-106 | HRTDB_01_2018 |

## 6. Approach Techniques

a.) Vectors while FMS active leg is outbound on a NAV-to-NAV approach:

Rockwell Collins recommends that pilots always “clean up” the approach prior to the NAV-to-NAV transition. If the FMS flight plan guidance is to fly outbound and then turn back around for the localizer intercept, and instead vectors are given to shortcut the flight plan, the system may arm the back course approach when the front course is expected. This happens when the aircraft does not fly far enough outbound to satisfy the FMS logic to sequence through the flight plan legs prior to the inbound portion of the approach. When this happens, the FMS flight plan should be cleaned up so that the TO leg is along the final approach course. Failure to do so will leave the FMS Desired Track (DTK) in the active NAV source as an outbound heading. Then, when turning inbound in HDG mode and arming the approach, the automatic back course selection logic looks at the difference between the final approach course and the active navigation source DTK, and arms the back course instead of the localizer front course. When the capture happens, the current aircraft heading is used and the localizer front course is selected.

It should be noted that this is a change in logic from Pro Line 21 equipped aircraft where the localizer course was always used as a reference, even if the active navigation source is FMS. An example of this situation is depicted on the following page (Figures 2 and 3.)

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**Figure 2. FMS outbound active leg with approach armed.**

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**Figure 3. Approach armed after FMS flight plan is cleaned up to inbound course.**

b.) FMS course closely parallels localizer course

In some cases, the database values within the FMS along the final approach course to a localizer or ILS approach closely parallel the localizer, rather than lay directly over the top of one another. In this case, the NAV-to-NAV capture may be late to switch from FMS to LOC. The capture logic is based on the closure rate to the localizer. The extremely shallow angles of the parallel courses may not be sufficient for the NAV-to-NAV transfer until very late into the approach. Rockwell Collins recommends that capture angle be between 20 and 90 degrees for a proper capture of the NAV-to-NAV. If the situation does not allow for a sufficient angle and the flight crew thinks the transition should have occurred, it is recommended to manually switch the navigation source to localizer. Once the localizer is set as the active navigation source, guidance will immediately follow the localizer deviations as expected.

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c.) Late/missed capture of glideslope

The autopilot can only capture glideslope (GS) mode when on a converging vertical path to the glideslope beam. Additionally, glideslope (GS) capture cannot occur until the localizer is captured laterally. Therefore, if capturing a NAV-to-NAV, especially high or near the FAF, the aircraft may be already above the glideslope when the lateral mode transfers from HDG to LOC. In this case, the pilot must initiate a manual descent to the intercept the glideslope. Rockwell Collins recommends that if possible, keep VNAV engaged while vectoring to the final approach in order to help manage altitude. Even if not on the FMS lateral track (i.e. in HDG mode), if FMS is the active NAV source and the heading vectors are within 45 degrees of the inbound course, the VNAV will continue to provide vertical guidance. This will help the flight crews maneuver the aircraft in a manner such that aircraft approaches the glideslope beam, so that the automatic capture occurs as expected.

## 7. FMS Comparator Message on some LPV Approaches – Phase 1 (FDSA-6500 810-0234-1H0001 only)

a.) There have been 21 LPV approaches identified where the Rockwell Collins Fusion system will annunciate an FMS Comparator Failure (Figure 4) after sequencing the FAF. This is due to a conservative logic error in the LPV monitor code in the display software. If an LPV comparator annunciation is displayed during an approach, flight crews must still initiate a missed approach procedure.


**Figure 4. FMS Comparator Failure Message.**

Rockwell Collins recommends selecting a different approach to the runway if available, or electing to fly the approach using Baro VNAV instead of LPV and flying to the LNAV/VNAV line of minima on the chart. To change to Baro VNAV, open the Arrivals Dialog Box to select the approach (Figure 5.) Once the approach is selected, the status line will display the service provider (e.g. WAAS, EGNOS, etc.) and the level of service; in this case, LPV.

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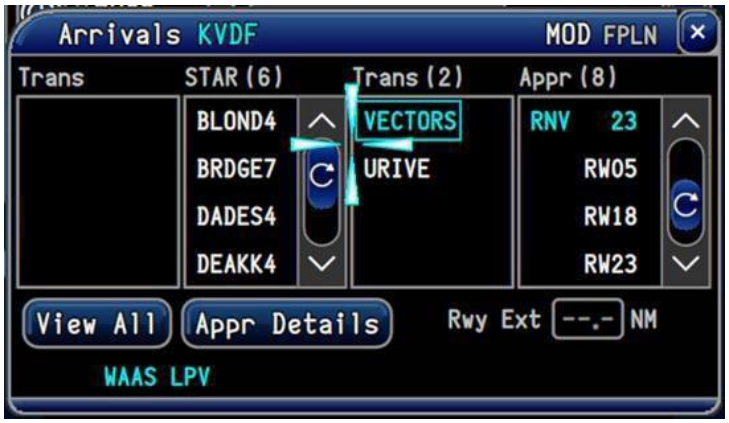


**Figure 5. Arrivals Dialog Box.**

Select the 'Appr Details' button to open a new dialog box with information about the selected approach. There is a control on the Appr Details dialog box wherein the pilot can choose which Approach Mode to use (Figure 6.) The default is always the highest level of service, which in this case is LPV. The GP Mode is dependent upon the selection of the Approach Mode control. Selecting 'RNP' for the Approach Mode will also change the GP Mode from the SBAS Mode to Baro.


The FMS will now fly the approach as a LNAV/VNAV approach. When setting the minimums, the flight crews should select the appropriate line of minima from the chart.

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The following airports/procedures are affected by the comparator monitor and have an associated Baro VNAV approach available for the specific RNAV Approach.

| Airport Identifier | Procedure |
|---|---|
| EDWE | R07-Z |
| EDBN | R09 |
| EDBN | R27 |
| EDFQ | R29 |
| EDME | R26 |
| EDMS | R27 |
| EDQC | R30 |
| EDTD | R36 |
| EDTM | R26 |
| EDTY | R10 |
| EDBM | R27 |
| EDVE | R08 |
| EDWE | R25-Z |
| EHTE | R26 |
| EDTY | R28 |
| KBDE | R30 |
| KBLF | R23 |
| KMYF | R28R |
| KVDF | R23 |

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The following airports/procedures are affected by the comparator monitor and **do not** have an associated Baro VNAV approach available for the specific RNAV Approach. A different approach procedure will need to be selected.

| Airport Identifier | Procedure |
|---|---|
| LFPB | R27 |
| KRIL | R26-X |

**8. <u>Radio ID Legends Menu</u>**

The Radio ID on the Legends Menu may show up as dashes. It does not mean that the XMWR-1000 is not functioning.


If the Radio ID is dashed and needed for a subscription Renewal/Rehit the Radio ID can be found on a sticker affixed to the XMWR-1000 chassis opposite the connectors and will be in the format of:

Weather: xxxxxxxx.

(A picture of the Radio ID tag location is shown below)

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**9. <u>Check LOC Tuning</u>**

Observation: When the LOC Tuning command for a NAV-NAV is sent, the NAV2 radio does not change from Auto to Manual, this opens the radio to being tuned to a follow on frequency (i.e. another station), resulting in NO APPR posted on onside PFD (i.e. R-PFD). If radio auto re-tunes to ILS and does not drop out of auto, the system switches back and forth (between LOC and VOR) with NO APPR intermittently displayed until FAF is sequenced (then NO Appr). The system may perform NAV-NAV, but then drop LOC for another station (auto-tuned).

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Flight Deck Workaround: During NAV-NAV, monitor NAV radios to ensure they drop to manual. If not, select Manual on Nav radio Cntl window or manually tune to LOC.

**10. FMS Reset/Disappearing when making a flight plan edit – Phase 1 (FMSA-6500 810-0163-1H0003 only)**

On Phase 1 aircraft, an issue may occur where the FMS will reset when editing the flight plan. After 3 resets, the FMS will be pulled from the display for the remainder of the flight. This is due to an excessive number of flight legs in the FMS history.

To prevent this from occurring the flight crew will need to clear out the legs history before the first flight of the day. They can do this by performing one of the following procedures:

a. Delete the origin airport – select the origin airport, push the CLR/Delete MKP button, and execute the mod
b. Switch the FMS NAV Database – toggle between the two available FMS database dates

This issue has been corrected in the Phase 2 version of the FMS.

**11. Avionics Powerup in Extreme Cold Temperatures**

When powering up the avionics below approximately -10 °C certain images and functions will be missing. The AFD-3700 contains a commercial grade graphics chip that will not operate below a certain temperature. This chip renders the Splash screen, Synthetic Vision, and Topographical terrain images.

This operation is to be expected. Once the display has had approximately 5 minutes to warm up the images will return. This does not impact the required operational software of the display, and dispatch can continue.

**12. Retaining Map Configurations through Power Cycles**

The Fusion system does not retain the map configuration items (in particular the symbols) upon shutdown. However, it is possible to use the following procedure to help lessen the amount of preflight configuration required after each power up.

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Note: The following procedure is a maintenance action; as such, it will need to be performed by the appropriate maintenance personnel.

This procedure will use the Map Themes function to adjust the Map Theme Power Up default for map symbol overlays to the Flight crews preference. If the Flight crew so chooses they can modify any of the currently defined map themes listed below in Table 1.

| **Theme (Strapping Name)** | **Touch Tool Bar Name** |
|---|---|
| Thm Pwr | n/a |
| Thm 1 | "Depart" |
| Thm 2 | "Cruise" |
| Thm 3 | " VFR" |
| Thm 4 | "Arrival" |
| Thm 5 | "User 5" |
| Thm 6 | "All Off" |
| Thm 7 | "All On" |

*Table 1 Theme Strapping vs Tool Bar Selection*

With the assistance of the Flight crew use Table 2 below to decide what items are to be displayed for each map theme.

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| **Overlay/ Symbol** | **Selection** | **Thm Pwr** | **Thm 1** | **Thm 2** | **Thm 3** | **Thm 4** | **Thm 5** | **Thm 6** | **Thm 7** |
|---|---|---|---|---|---|---|---|---|---|
| Enabled | Yes/No | n/a | | | | | | | |
| Traffic | On/Off | | | | | | | | |
| Terrain | Topo/ Relative | | | | | | | | |
| Political | On/Off | | | | | | | | |
| Obstacles | On/Off | | | | | | | | |
| Cities | On/Off | | | | | | | | |
| Ctrld Airspace | On/Off | | | | | | | | |
| SUA | On/Off | | | | | | | | |
| TFR | On/Off | | | | | | | | |
| DF (Direction Finder) | On/Off | | | | | | | | |
| Altitude | On/Off | | | | | | | | |
| GNSS Position | On/Off | | | | | | | | |
| IRS Position | On/Off | | | | | | | | |
| Range To Alt Sel | On/Off | | | | | | | | |
| Airports | On/Off | | | | | | | | |
| Nearest Airports | On/Off | | | | | | | | |
| High Navaids | On/Off | | | | | | | | |
| NDBs | On/Off | | | | | | | | |
| Term Waypoints | On/Off | | | | | | | | |
| Intersections | On/Off | | | | | | | | |
| High Airways | On/Off | | | | | | | | |
| Low Airways | On/Off | | | | | | | | |
| Missed Approach | On/Off | | | | | | | | |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Alternate FPLN | On/Off | | | | | | | | |
| ETA | On/Off | | | | | | | | |
| Speed | On/Off | | | | | | | | |
| AHRS Position (LCR-100N install) | On/Off | | | | | | | | |

*Table 2 Map Overlays Selections*

Referencing the Pro Line Fusion for King Air Aircraft Maintenance Manual (523-0821905 for Phase 2 SW, 523-0824677 for Phase 3 SW) perform TASK 31-60-07-840-801 Load the Aircraft Personality Module (APM).

Using the following figures as a guide, change the selections according to the agreed upon settings in **Error! Reference source not found.**. When complete select the "Save To APM" button.


*Figure 1 Power Up Map Theme Option Straps (Phase 2 SW –page 3)*

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*Figure 2 Power Up Map Theme Option Straps (Phase 2 SW page 4)*

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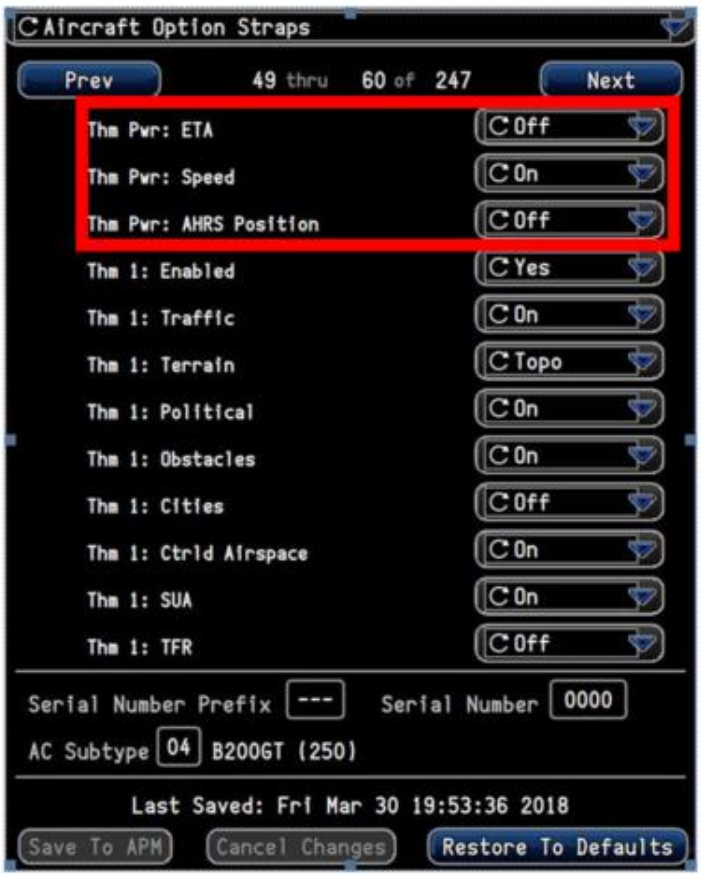


*Figure 3 Power Up Map Theme Option Straps (Phase 2 SW Page 5)*

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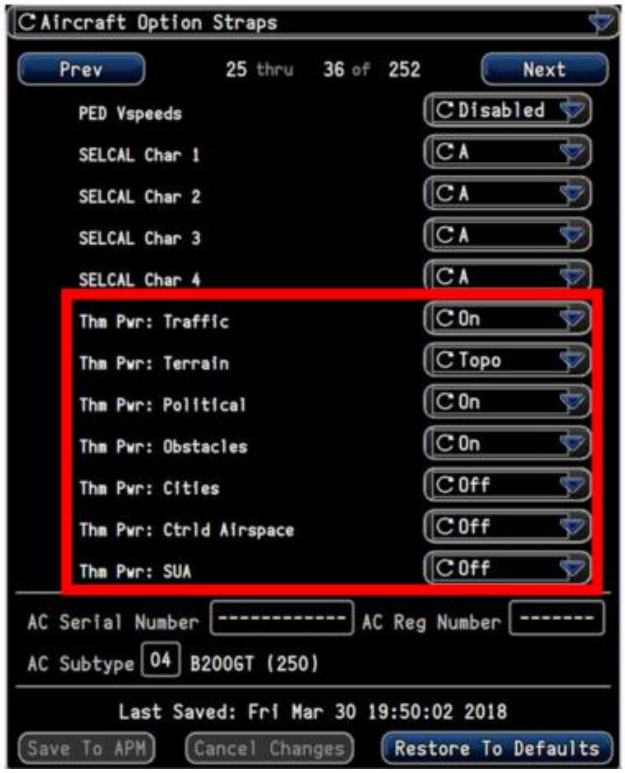


*Figure 4 Power Up Map Theme Option Straps (Phase 3 SW - page 3)*

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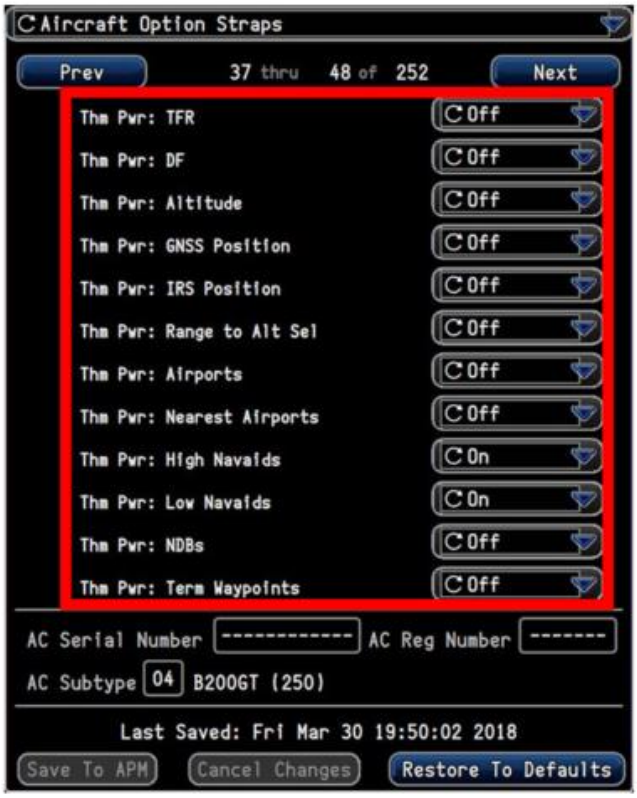


*Figure 5 Power Up Map Theme Option Straps (Phase 3 SW - page 4)*

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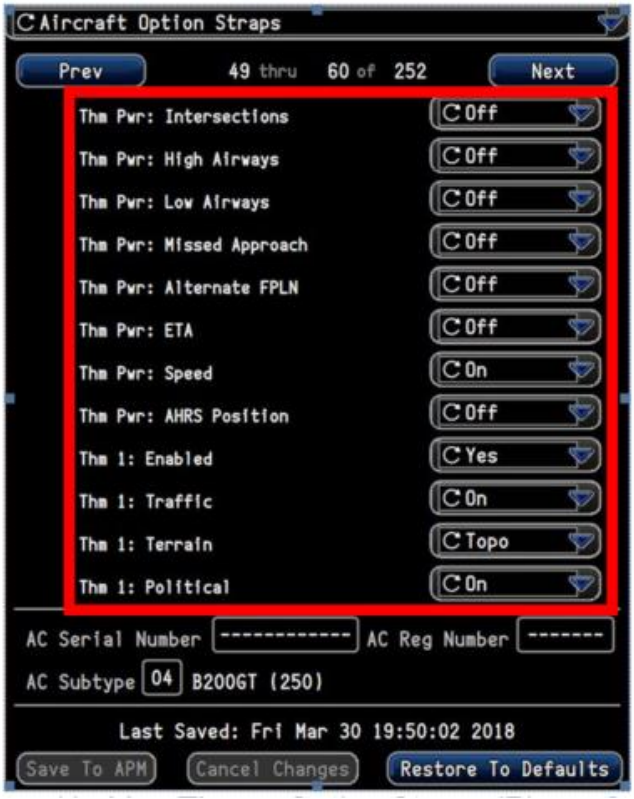


*Figure 6 Power Up Map Theme Option Straps (Phase 3 SW - page 5)*