
Carousel INS

Delco Carousel IV-A Inertial Navigation System for *Microsoft Flight Simulator*

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Operations Manual

This manual provides descriptions and procedures used to operate Carousel Inertial Navigation System (INS) with flight program CIVA-28-A. The program part number identification "11 17" may be verified on the left display of the control display unit (CDU) with data selector positioned on DSRTK/STS and CDU HOLD key pressed.

Chapter 1: General Description

- The Delco Carousel INS continuously computes horizontal navigation data. The output signals from the INS can be used to automatically steer the airplane on the great circle course between pre selected and loaded waypoints. Each INS can also display its own navigation data and operating status.
- The INS calculated position (Inertial) can be updated by the crew:
 - Manually flying over an along track radio equipment which position is available on the navigation charts.
 - Using distance data from DME (Distance Measuring Equipment) to improve the calculated position (Displayed)
 - Using the 3 INS in triple mixing. This function allows, only in a triple system installation, to calculate a new mid position (Displayed) due to the navigation data transmission and reception between all 3 INS.
- Automatic alignment and calibration of the INS is required before the flight, and can be performed only while the plane is parked. Any, even minimum, taxi during alignment is not allowed and will cause a fatal error condition.

Chapter 2: Systems

Each INS consists of seven components as listed below:

- 1) Control Display Unit (CDU), normally located in cockpit.
- 2) Mode Selector Unit (MSU), normally located in cockpit.
- 3) INS NAV mode switch, normally located in cockpit.
- 4) INS DME updating indicator, normally located in cockpit.
- 5) INS BAT PARALLEL switch, normally located in cockpit.
- 6) Navigation Unit (NU), normally located in electronics bay.
- 7) Battery Unit (BU), normally located in electronics bay.

Single or multiple (Dual or Triple) installations are possible. In multiple INS installations,

each installed unit is able to communicate with others but it should be considered as a completely independent system. Intercommunication is limited to Inertial/Displayed position cross checks, DME Update data sharing and Waypoint position "broadcasting". Crew can select which INS is to be coupled to the Autopilot.

The battery unit can power INS operations for about 30 min in the event of VAC power loss. In a Triple INS installation it is possible to extend INS 1 battery power time by activating the INS BAT PARALLEL switch which connects INS 3 battery to INS 1. In this way INS 3 will be immediately lost while INS 1 will have sufficient power for about 1 hour.

In Carousel INS equipped planes, crew is able to accomplish the following tasks:

- Store and update, at any moment during flight, coordinates of up to 9 waypoints.
- Display horizontal great circle navigation data such as:
 - Track angle (TK) and ground speed (GS)
 - True Heading (HDG) and drift angle (DA)
 - Cross track distance (XTK) and track angle error (TKE)
 - Present position (POS) Lat&Long not updated (Inertial) and updated (Displayed)
 - Waypoint (WAYPT) Lat&Long
 - Distance (DIS) and flying time (TIME) to next waypoint, between any two waypoints, or from present position to any waypoint
 - Wind velocity and wind direction (WIND)
 - Desired track (DSRTK) and system status (STS)
 - Nose and stern wind components and velocity (WON) helpful in evaluating wind shear conditions
 - Display program identification
 - In a three INS installation, triple mixing may be used to obtain an optimum present position.
 - Perform a single or dual DME position updating to minimize drift errors

In addition the crew is required to continuously monitor INS status and performances by checking warnings and Action and Malfunction codes to identify instruments failures and to carry out the relevant and recommended procedures associated with each specific code.

MSU - Mode Selector Unit



Picture . 1: MSU - MODE SELECTOR UNIT

1 MODE SELECTOR Knob

The Mode Selector is a five position rotary switch that controls operating modes of the INS. The Knob must be pulled for rotation to overtake mechanical stops between STBY and ALIGN and NAV to ATT positions. See "Mode Selector Knob Positions" chapter.

2 READY NAV Light (GREEN)

When the Mode Selector Knob is in the ALIGN position, and API has reached value 5, the READY NAV Light illuminates to indicate the INS Navigation Unit is ready and alignment is complete. When alignment is performed setting the Mode Selector Knob directly on NAV position, the READY NAV Light will flash once when API 5 is reached.

3 BAT Light (RED)

The Red BAT Light warns when there is insufficient battery voltage to power the INS. In this case the INS will be automatically shutdown.

Mode Selector Knob Positions

OFF

Turns INS power off

STBY

Turns INS power on and starts STBY mode operations. Starts fast INS warm up and turns on the NU and CDU allowing data insertion in the INS.

ALIGN

Starts automatic INS alignment as soon the fast warm up is over (fast warm up duration depends on the starting gas INS gyros temperature, which must reach 168°F (75,6°C), at a rate of about 20°F (6.7°C) per minute. Fast warm up will take about 5 minutes if initial temperature is 68°F (20°C). During warm up the INS will be automatically shut down if an over temperature condition occurs. During alignment a battery test will be performed when API 8 is reached and it is indicated by the CDU BAT light illumination.

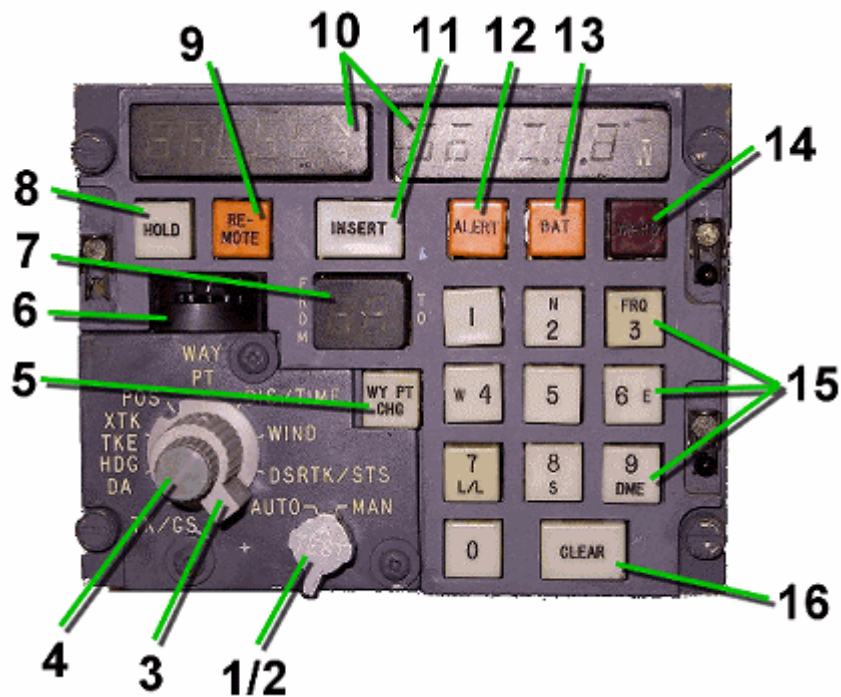
NAV

Selects navigation mode and MI (Mode Index) 4 if Accuracy Performance Index (API) is at least 5 and Ready Nav Light on MSU is on. From API 5 the alignment will continue down to API 0 and better accuracy performance index (API) may be obtained if the plane remains parked. API 5 is sufficient for flight operations. NAV position must be selected before moving the airplane. After NAV position has been selected the NAV READY light extinguishes. The INS will automatically sequence through STBY and ALIGN phases if NAV is selected directly from OFF, and ramp position has been loaded prior or when API 7 is reached. In this case the battery test at API 8 will not take place and the over temperature protection is not operative. READY NAV light only flashes once when API reaches 5.

ATT

Selects attitude mode. The INS provides attitude outputs only. The NU and CDU are shutoff and INS alignment is lost.

Control & Display Unit



picture .2 : CDU - CONTROL/DISPLAY UNIT

1 AUTO/MAN SWITCH

Selects automatic leg switching by the INS (AUTO) or manual leg switching by the pilot (MAN).

2 TEST SWITCH

If Action and malfunction codes are present allows the pilot to read and eventually clear the codes applying the relevant Abnormal Procedure. If codes are not present, when pushed, a test of MSU and CDU lights and all CDU displays will be made.

3 DATA SELECTOR

Selects what data is to be displayed on the Left and Right data displays. See "Data Selector Positions" paragraph for a complete reference.

4 DIM SWITCH

Controls light intensity of all data displayed on CDU

5 WYPT CHG key

When pushed and lit allows numbers selection in FROM-TO display using the CDU keyboard. Key light goes out if CLEAR or INSERT is pushed. INSERT key illuminates when WYPT CHG is pushed and lit, and goes out when CLEAR or INSERT key is pushed.

6 Waypoint/DME switch

Selects waypoint or DME station number to be loaded or displayed.

7 FROM-TO Display

It's a two digit display where the pilot is able to insert and read waypoints and DME ID numbers:

- 1) Two non flashing numbers are the waypoints defining the current navigation leg.
- 2) A single non flashing number in the FROM side of the display, with Data selector in WAYPT position, shows waypoint ID being displayed on data displays.
- 3) A single flashing number in the FROM side of the display, with Data selector in WAYPT position, shows the selected waypoint is involved in the leg currently being shown.
- 4) A flashing number in the TO side of the display defines the DME station designed for DME updating.

8 HOLD key

Key switch/light illuminates (or extinguishes if lit) when pushed. When lit, freezes displayed present position and inertial position, allowing a manual update to be performed. Also allows comparison of Inertial and Displayed positions. When lit, additional special displays occur. See "Data Selector Positions" paragraph for a complete reference.

9 REMOTE key

When pushed and lit, allows simultaneous loading and insertion of waypoint and DME coordinates. Remote function is disabled when pushed for a second time and the light goes out.

10 Left/Right data displays

Show data according to selected Data Selector position.

11 INSERT key

Inserts the loaded data into the navigation unit (NU). It is lit while data is being set by the CDU keyboard and goes out when pushed to insert it or CLEAR is pressed to abort current input.

12 ALERT light

Illuminates amber two minutes before airplane reaches TO waypoint. Flashes when, with AUTO-MAN switch positioned in MAN, the TO waypoint has been reached and passed. This is an alert to pilots that switching leg must be manually carried out. If AUTO/MAN selector is in the AUTO position the light will extinguish as soon as leg switching occurs.

13 BAT light

Illuminates amber during alignment at API 8 for about 15 seconds indicating the battery test is in progress. Illuminates also when INS is operating on battery power.

14 WARN light

Illuminates red when INS detects an abnormal condition.

15 Keyboard

Consists of 10 keys to load data into data displays and FROM-TO display.

16 CLEAR key

Used to cancel a data loading operation prior INSERT switch/light pushing.

DATA SELECTOR POSITIONS

Position	LEFT Data Display	Right Data Display
<u>TK/GS</u>	Present track angle from 0° to 359,9° to the nearest tenth of degree with respect to the true north	Ground speed from 0 to 2400kts.
	When HOLD switch/light is pushed and lit the along track acceleration (ATA) sign (N for negative blank for positive) will be indicated in the left display and the ATA value in millig's in the right one.	
<u>HDG/DA</u>	Airplane heading angle from 0° to 359,9° to the nearest tenth of degree with respect to the true north.	Drift angle from 0° to 180°left (L) or right(R) of the plane Heading to the nearest degree. Drift angle is 0° if GS is<75kts.
<u>XTK/TKE</u>	Cross track distance from 0 to 999,9 NMs right (R) or left (L) of the track to the nearest tenth of NM.	Track angle error from 0° to 180° left (L) or right (R) of the desired track angle to the nearest degree.
<u>POS</u>	North (N) or South (S) latitude	East (E) or West (W) longitude
	In degrees and minutes of displayed present position to the nearest tenth of minute. If the HOLD switch/light is pushed and lit the displays are frozen. POS is used to insert ramp and position updating coordinates.	

WYPT North (N) or South (S) latitude East (E) or West (W) longitude

In degrees and minutes of waypoint selected by the waypoint/DME selector to nearest tenth of minute. Waypoint 0 before a manual track leg change has been performed indicates the ramp position. When the INS is turned on the left and right displays digits will show all zeros for waypoint position. In DME updating mode, for DME position will show the last position loaded. Inertial position is indicated if HOLD switch/light is pushed and lit.

DIS/TIME Distance from present position to the displayed TO waypoint, to any DME or between any two waypoints, from zero to 999,9 NM to the nearest NM. Time from present position to the displayed TO waypoint, or between any two waypoints, from zero to 999,9 mins to the nearest tenth of min. Displayed time is based on present ground speed.

WIND Wind direction from 0° to 359° to the nearest degree with respect to true north. Wind speed from 0 to 606 kts to the nearest knot.

If TAS < 115 KTS or > 606 KTS or GS < 75 KTS both displays will be blank. If HOLD switch/light is pushed and lit, the longitudinal wind speed component (WON) will be shown in the right data display and, in the left one N for Head wind and S for tail wind will be visible.

DSRTK/STS Desired track angle from 0° to 359° to the nearest degree with respect to true north. If HOLD switch/light is pushed and lit the program ID Number is displayed. System status: operation mode (0 for Not-NAV, 1 for NAV mode), system Mode Index (MI), ACTION & MALFUNCTION codes, accuracy required performance index, actual performance index (API).

INS DME UPDATING INDICATOR



picture .3 :INS DME UPDATING Indicator

1.INS UPDATING FLAGS

Green flag visible: relevant INS position is being updated by reference to a DME station.

INS BAT PARALLEL SWITCH



picture .3 :INS BAT PARALLEL Switch Positions

- 1) The switch is guarded in normal position: in case of power loss each INS unit will be connected to its own battery.
- 2) Cover open, switch still in the NORMAL position
- 3) ON: INS 1 and INS 3 batteries are paralleled to power INS 1. INS 3 is not powered.

Chapter 3: Operating Limitations

- The INS may be operated in NAV mode for flight duration up to 15hrs.
- INS ground alignment should be performed between 80°00'0" north & south latitudes.

Chapter 4: Normal Procedures

Execute the following procedures on all installed MSUs and CDUs:

1 - INS alignment

MSU Mode Selector _____ **STBY**
CDU DIM Selector _____ **SET as required**
CDU Data Selector _____ **DSRTK/STS**

Check if any action & malfunction code (second and third digits) is present and eventually, if possible, clear it pushing TEST switch as required.

Check if the status mode (1° digit on RH display) shows 0 (not in NAV mode) and Accuracy Performance Index (API on 5° digit on RH display) is 9 and the desired Mode Index (MI on 6° digit on RH display) is 5.

HOLD Switch/Light _____ **Push/On**

Push HOLD key and check on the LH display, the program ID "11 17".

HOLD Switch/Light _____ **Push/Out**
TEST Switch _____ **Push and hold**

The TEST is positive if all CDU and MSU lights come on and all CDU display digits indicate 8.

TEST Switch _____ **AUTO**
CDU Data Selector _____ **POS**

Insert the Latitude and Longitude ramp coordinates in all INS: first the sign (N or S for the

LATITUDE and W or E for LONGITUDE) and then the angle values, pushing INSERT switch/light after each entry (LAT/LONG) is complete.

MSU Mode Selector _____ALIGN
CDU Data Selector _____DSRTK/STS

From now on the alignment will take place and should be recognized by the API value decreasing. At API 8 check the amber BAT light comes on for about 15 sec. indicating the battery test is in progress. When API 5 is reached check the READY NAV light is illuminated on the MSU. If not ready to taxi the alignment may be continued to reach better refinement and accuracy. The best possible is indicated by API 0.

2 - Waypoints loading and distance check on ground

CDU Data Selector _____WAYPT
REMOTE Switches/Lights _____Push/Lights On
WAYPOINTS _____Load

Using the desired INS CDU keyboard and selecting waypoint numbers from 1 to 9 by the Waypoint/DME selector, insert (up to) 9 waypoints. Waypoints coordinates will be broadcasted to other INS units if the REMOTE switch/light is ON. It is recommended, at the first insertion on ground, to reinsert the ramp position as waypoint 1 to verify the DISTANCE from present position (waypoint 0) and waypoint 1 is 0.

REMOTE Switches/Lights _____Push/Lights Out
CDU Data Selector _____DIS/TIME
WYPT CHG Switch/Light _____Push/Light On

Check the INSERT key illumination and the FROM-TO indicator displaying the figures 0-1. If the ramp position has been reinserted as waypoint 1, check the distance from ramp position and the waypoint 1 which must be 0. Otherwise the distance shown must be consistent with the flight plan's waypoint 0-1 distance. Push the '2' key, check the FROM-TO display shows "21" and check the related distance is consistent with the flight plan. Repeat this procedure for all loaded waypoints. Checking all INS leg distances match those reported by the flight plan is a good method to make sure waypoints definition phase has been performed without errors.

CLEAR Key _____Push

Check the WPT CHG and INSERT lights go out.

3 - Before Takeoff

When ready to start the engines and taxi:

MSU Mode Selector _____NAV

Check the READY NAV light turns off and the status mode (1° digit on RH display) changes from 0 to 1 (NAV mode) and the mode index (MI on 6° digit of RH display) from 5 to 4. Set the CDU data selectors in the desired positions. Recommended positions (when 3 INS units are installed) are:

CDU 1 Data Selector _____POS
CDU 2 Data Selector _____DIS/TIME
CDU 3 Data Selector _____WIND

4 - After Takeoff

When on track to the next waypoint

FROM-TO Indicator _____ Monitor

Monitor the selected leg to be flown, and if necessary change it.

INS NAV MODE SEL _____ Desired INS: ON

Monitor the flight instruments to ascertain if the plane is driven correctly to the next waypoint shown on the FROM-TO indicator.

5 - Waypoints loading and distance check in flight

Check the INSERT key illumination and the FROM-TO indicator displaying present leg data.

CDU Data Selector _____ WAYPT
REMOTE Switches/Lights _____ Push/Lights On
Waypoints _____ LOAD

On the desired INS CDU with data selector on WAYPT position select ID numbers, using the Waypoint/DME selector, and insert the subsequent flight plan waypoints, starting the one after the last loaded. Waypoint insertions will be copied to other INS units.

REMOTE Switches/Lights _____ Push/Light Out
CDU Data Selector _____ DIS/TIME
WPT CHG Switch/Light _____ Push/Light On

Check the INSERT key illumination and the FROM-TO indicator displaying present leg data. Insert in the FROM-TO indicator, starting from the first, the newly loaded legs and check their distances, referring to flight plan, in the same way as performed on the ground.

CLEAR Key _____ Push

Check the WPT CHG and INSERT lights go out

6 - Track leg change

It is possible to command a track leg change from present position (waypoint 0) to any waypoint, or from any waypoint to any other waypoint. On all installed INS units:

WAYPT CHG Switch/Light _____ Push/On
Data keyboards _____ Push desired keys
INSERT Switch/Light _____ Push/Out
AUTO/MAN Selector _____ AUTO

Monitor the flight instruments to ascertain that the track change has been executed correctly.

7 - Present position check

You can check the INS inertial (without any updating) and displayed (with updating)

positions while over flying a FIX which position is known.

INS NAV MODE SEL _____ OFF
CDUs Data Selector _____ POS

Using the autopilot HDG sel and referring to the related RMI drive the plane to precisely overfly the FIX.

When over the FIX

All HOLD Switches/Lights _____ Push/On (a right mouse click on a HOLD switch)

The displays will be frozen allowing the comparison between the Displayed position and the Fix position.

CDUs Data Selector _____ WAY PT

On WPT position You can also compare the Inertial positions to evaluate the differences. After the position check:

HOLD Switch/Light _____ Push/Out
WPT CHG Switch/Light _____ Push/On
On all INS keyboards _____ Push 0 (present position) X (next waypoint)
INSERT Switch/Light _____ Push/Out
INS NAV MODE SEL _____ Desired INS: ON

Monitor the flight instrument to ascertain that the plane is driven correctly to TO waypoint.

CDUs DATA SEL _____ As desired

8 - Post flight procedure

Purpose of this check is to evaluate the position and residual ground speed INS errors. At arrival ramp with parking brakes set:

Position Update Eradication Procedure _____ Perform

For eradication Procedure refer to the chapter 5 Conditional Procedures.

CDU Data Selector _____ WAY PT
Waypoint/DME Selector _____ Select desired waypoint number
Ramp position _____ Insert

Insert the arrival ramp coordinates as waypoint (within FS the arrival ramp position may be obtained, both from parking charts, or pushing SHIFT+Z on your computer keyboard):

CDU Data Selector _____ DIS/TIME
WPT CHG Switch/Light _____ Push/On
In all CDU keyboards _____ 0-X (0 [present position], X [arrival ramp coords. waypoint number])

Monitor the FROM-TO indicator for leg data inserted

INSERT Switch/Light _____ Push/Out

Evaluate the distance between the INS calculated Inertial position and the real arrival

ramp position for all installed INS units. If distance is greater than 10NM compute the hourly drift dividing the distance shown in the left display by the flight hours. Satisfactory hourly drift is not greater than 3nm/hr.

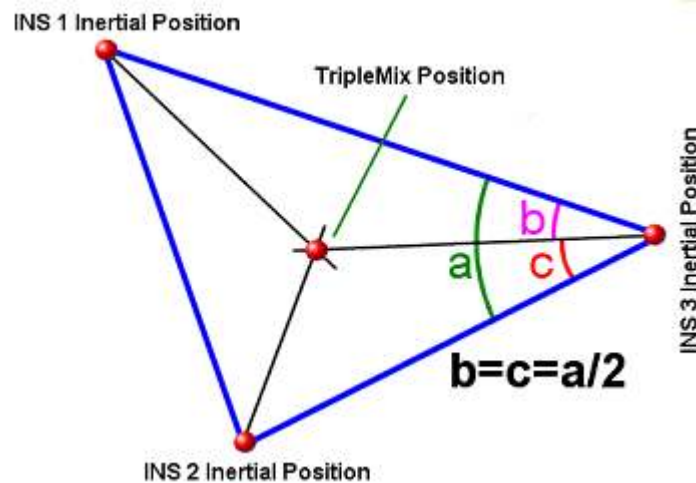
CDU Data Selector _____ **TK/GS**

The shown residual ground speed should not be more than 15 kts.

MSU Mode Selector _____ **OFF**

Chapter 5: Conditional Procedures

1 TRIPLE MIXING UPDATING (Triple configuration only)



picture .5 : TRIPLE MIXING POSITION

Triple mixing updating is available only when, in a triple INS installation, all three INS are operating in NAV mode and no CDU WARN lights are on. This operation mode may be manually commanded and discontinued at any time on the desired systems. It's recommended to command in triple mixing the INS connected to the Autopilot/flight director in use. When Triple Mixing is activated on at least one INS unit, a fourth position (or Triple Mixing Position) is calculated as being the the crossing point of angle bisector lines in the triangle defined by the three INS calculated inertial positions, as shown in picture . 5.

Commanding Triple mixing updating (MI 4 operation)

CDU Data Selector _____ **DSRTK/STS**

Verify if the MI (Mode Index) in use is 4. In case the MI is 5

Data keyboard _____ **Push key 4**

INSERT Switch/Light _____ **Push/Out**

For the INS commanded in MI 4 "mode", from now on the triple mixing is effective with a small retard to avoid abrupt information changing to the A/P in use.

CDUs Data Selector _____ **As desired**

2 MANUAL POSITION UPDATING

At any time during NAV mode, over flying a Fix which position is published in the navigation charts, the pilot is able to manually update the INS position. NOTE: REMOTE switches are ineffective for manual updating. Coordinates should be loaded separately in all INS units.

INS NAV Mode Switch _____ OFF

CAUTION: Disconnect the INS NAV mode switch because the manual position updating may induce abrupt heading change to the A/P in use. Drive the plane by the Autopilot HDG selector, referring to the related RMI, sharply over the FIX

CDU Data Selector _____ POS

When over flying the FIX

All HOLD Switches/Lights _____ Push/On (a right mouse click on a HOLD sw)

The CDUs displays will be frozen showing the Displayed positions.

Fix Coordinates _____ Insert

Insert the Latitude and Longitude coordinates as described in the present position insertion for ground alignment.

HOLD Switches/Lights _____ Push/Out

Verify that position data are unfrozen and monitor flight instruments. If all navigation data are coherent fly the plane from new present position to the next waypoint.

WPT CHG Switch/Light _____ Push/On

CDU keyboard _____ Push 0-X (0 stands for present position, X for the next waypoint)

INSERT Switch/Light _____ Push/Out

When on Track

INS NAV MODE SEL _____ Desired INS: ON

3 DME POSITION UPDATING

The INS positions may be updated by a single or dual DME (Distance Measuring Equipment). Optimum single updating may be obtained selecting a DME station "off track", at least 15 NM off the intended track, and within 200NM of range. Optimum dual DME updating is obtained tuning a second DME along track. INS 3 does not require DME data insertion, since the INS 3 receives DME updating from INS1 and/or INS2. Tuning both VHF NAV on the same frequency will not improve the single DME updating both in efficiency and velocity.

CDU Data Selector _____ DSRTK/STS

Verify if MI is 4. Otherwise:

CDU Keyboard _____ Push 4

INSERT Switch/Light _____ Push/Out

Tune on VHF-NAV panels (n°1 and/or n°2) one DME or two DME stations, for a single or dual DME updating as desired. INS 1 is connected to NAV 1 and INS 2 to NAV 2.

CDU Data Selector _____ WAYPT

Waypoint/DME Selector _____ Select DME ID Number

Select from 1 to 9 (0 cannot be loaded) the desired DME station ID number and verify that it appears on the FROM indicator (TO indicator is blank).

CDU Keyboard _____ Push 7&9 (a right mouse click on key 7 and key 9)

Simultaneously pushing of the 7 & 9 keys commands DME data mode and the following data will be displayed:

FROM indicator is blank and TO indicator flashes 0 or the ID number of a DME station in use if a DME updating is already in progress. Left and right displays now are showing the DME coordinates previously loaded in this position, since the DME station coordinates are not canceled even at system shut down.

DME STATION COORDINATES _____ INSERT

Load and insert the DME station coordinates as described for waypoints loading. If DME station elevation is available:

CDU Keyboard _____ Push 3&9 (a right mouse click on key 3 and key 9)

Simultaneously pushing of 3 & 9 keys commands the DME elevation data mode. On CDU left display the DME station elevation previously loaded will appear, in thousands of feet. Right data display is blank.

CDU Keyboard _____ Push key N (2)

Verify that INSERT switch/light comes on. The N(2) key pushing is, for the INS, the signal that the DME station elevation will be the next data insertion.

DME STATION ELEVATION _____ Load

The elevation should be rounded to the nearest thousand of feet. The INS accepts up to 15 (thousand feet) values. The loaded elevation will appear on 5° digit of LH display. (ex: if the elevation is 3650 ft load and insert "4")

LEFT DATA DISPLAY _____ Check loaded value

INSERT Switch/Light _____ Push/Out

The DME coordinates will appear again on the displays after INSERT switch/light pushing.

CDU Data Selector _____ DIS/TIME

In the left display will appear the great circle distance (not slant) to the selected DME station. Check it against the value shown by the DME distance Indicator on the relevant VOR/RMI. Except a little difference, due to the slant, the indications should be quite the same.

WAYPT CHG Switch/Light_____Push/On

Check INSERT switch/light comes on and TO indicator stops flashing.

CDU Keyboard_____Push DME ID Number

Check that DME ID number appears on TO indicator.

INSERT Switch/Light_____Push/Out

WAYPT CHG switch/light goes out and the TO indicator flashes the DME ID number already inserted.

INS DME UPDATING Indicator_ Relevant green flag in view

On the INS DME UPDATING indicator, after few seconds of delay, the relevant green flag will come in view indicating that the DME updating is in progress. Also the FROM-TO Display will display the DME Station ID. The triple mixing automatically will be discontinued during DME updating, and automatically it will be carried on again when the DME updating is over.

CDU Data Selector_____Any position but WAYPT and DIS/TIME

The selection of any position but WAYPT and DIS/TIME commands the exiting the DME mode.

4 EXITING FROM TRIPLE MIXING OR DME UPDATING

Pilot may command at any time the INS to exit from TRIPLE MIXING or DME UPDATING (MI4 Modes). In MI5 mode, previous updating will be retained and INS will then calculate its present position by relying only on its own gyros.

DATA SEL_____DSRTK/STS

DATA KEYBOARD_____Push key 5

Check INSERT switch/light comes on and the RH display shows 000005

INSERT sw/lt_____Push/Out

Verify that the RH display shows now: 1 on first digit and 5 on sixth digit (1- - - -x5)

DATA SEL_____As desired

5 POSITION UPDATE ERADICATION

The position updates obtained by Triple mixing, and/or by DME updating, and/or by manual updating may be canceled and the INS will return to the pure inertial navigation computed from the beginning of flight. The POSITION UPDATE ERADICATION should be used in case of inadvertent erroneous position update has been inserted with WARN LT on and ACTION&MALFUNCTION codes 06-56

DATA SEL_____DSRTK/STS

INS NAV MODE SEL_____OFF

Monitor the flight instrument to ascertain that the plane is flown on the right track. The last item is to avoid the abrupt heading changes induced by transition from displayed to inertial operations.

DATA KEYBOARD_____PUSH KEY 1

Verify the right display shows 000001 and INSERT Switch/Light is on.

INSERT Switch/Light_____PUSH/OUT

On the right display now the MI (Mode Index) should indicate 5.

DATA SEL_____As desired

The INS from now on will navigate as pure inertial system and all previous updates are canceled. This procedure is also required in the POST FLIGHT NORMAL PROCEDURE. Refer to chapter 4, "Normal Procedures".

CHAPTER 6: ABNORMAL PROCEDURES

INS FAILURE

Caution: Shut down the INS when CDU is blank and the red WARN Light and/or red MSU BAT Light is/are ON

INS WARN LT_____ON/OUT

OUT should be associated to one/both of following conditions :

- a) Aircraft VAC power loss.(BAT mode in progress).
- b) The INS coupled with A/P & F/D navigation is unsatisfactory (XTK/TKE values not coherent).

RELEVANT CDU DATA SEL____DSRTK/STS

RIGHT DATA DISPLAY_____CHECK FOR ACTION&MALFUNCTION CODES

TEST BUTTON_____PUSH AND RELEASE AS REQUIRED

Press and release TEST button sequentially until ACTION code either clears or reappears.

WARN LT&ACTION CODE_____LIGHT OUT AND NO ACTION CODE

The occurred failure is temporary:INS is unaffected. In this case the procedure is over.

Otherwise:

WARN LT&ACTION CODE_____LIGHT ON/OUT AND ACTION CODES ARE STILL PRESENT

INS NAV MODE SEL _____ SELECT UNAFFECTED SYSTEM

Apply the following check list:

ACTION CODE 01 _____ SHUT DOWN THE INS

Action code 01 is indicative of failures which can cause system damage.

ACTION CODE 02 _____ WATCH FOR DEGRADATION. SELECT ATT IF NECESSARY. ON GROUND DOWNMODE TO STBY AND RESTART ALIGNMENT

Action code 02 is indicative of malfunctions which can affect some or all navigation data.

**ACTION CODE 03 _____ CONNECTION TO AUTOPILOT AND FLIGHT DIRECTOR IS AFFECTED.
Disconnect relevant INS NAV MODE Selector**

Action code 03 is not associated with the CDU red WARN light and is indicative of unreliability of INS outputs to A/P & F/D due either to power loss (BAT mode in progress) or connection failure with A/P & F/D. INS can be still used for navigation but disconnected from A/P & F/D.

ACTION CODE 04 _____ ON GROUND ONLY DOWNMODE TO STBY AND RESTART ALIGNMENT

Action code 04 is indicative of possible airplane movement or incorrect gyros/accelerometers data during alignment.

Note: If ramp position is out of limits (80 00.0 N or S) select ATT on all MSUs. Flight must be performed along a radio or radar navigation assisted track.

ACTION CODE 06 _____ During alignment: verify present position and reload if necessary.

If present position is correct clear the warning by TEST button pushing as required.

ACTION CODE 06 _____ During NAV mode: Perform ERADICATION procedure

Eradicate any previous updating, system accuracy is suspected.

_____ END OF MANUAL _____