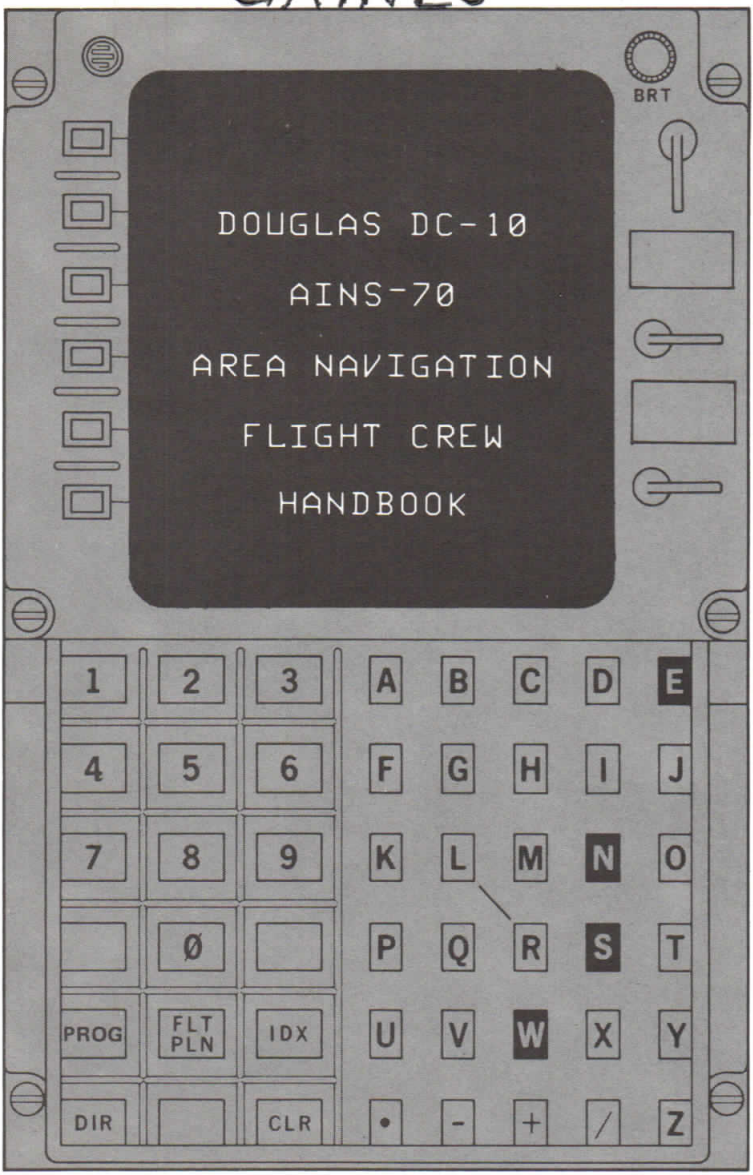
GAINES



MCDONNELL DOUGLAS CORPORATION

CONTROL PAGE

DATE NOV 1, 1979

APPLICABLE TAPE PART NUMBERS	
NAL	618-5314-017-XX

LOG OF PAGES	RPT NO	APPROVAL DATE
Page B	MDC J4400-1	OCT 20, 1978
Page C	MDC J4400-1	JAN 5, 1978
Page D	MDC J4400-1	NOV 1, 1979

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iii	J4400-1	5-15-76
iv	J4400-1	5-15-76
iv-a	J4400-1	5-15-76
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x	J4400-1	5-15-76
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xii	J4400-1	11-1-74
xiii	J4400-1	5-15-76
xiii-a	J4400-1	1-5-78
xiii-b	J4400-1	5-15-76
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CHECK LIST INDEX		
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e	J4400-1	11-1-74
f	J4400	1-5-78

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1-5	J4400-1	1-5-78
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1-7	J4400	1-5-78
1-8	J4400	11-1-74
1-9	J4400	11-1-74
1-10	J4400	5-1-76
1-11	J4400	5-1-76
1-12	J4400	5-1-76
1-12A	J44000	1-5-78
1-12B	BLANK	1-5-78
1-13	J4400	1-5-78
1-14	J4400	11-1-74
1-15	J4400	1-5-78
1-16	J4400	11-1-74
1-17	J4400	5-1-76
1-18	J4400	5-1-76
1-19	J4400	11-1-74
1-20	J4400	11-1-74
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1-25	J4400	5-1-76
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SECTION 2		
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2-2	J4400-1	11-1-74
2-3	J4400-1	10-15-75
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2-5	J4400	11-1-74
2-6	J4400-1	11-1-74
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2-8	J4400-1	11-1-74
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SECTION 3

3-1	J4400 -1	7-1-75
3-2	J4400	7-1-75
3-3	J4400	7-1-75
3-4	J4400	7-1-75
3-5	J4400 -1	7-1-75
3-6	J4400 -1	5-15-76
3-7	J4400	1-5-78
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SECTION 4

PAGE NO.	REPORT NO.	DATE
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4-2	J4400	5-1-76
4-3	J4400	1-5-78
4-4	J4400 -1	5-15-76
4-5	J4400 -1	7-1-75
4-6	J4400 -1	5-15-76
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SECTION 5

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5-2	J4400	11-1-74
5-3	J4400	7-1-75
5-4	J4400	11-1-74
5-5	J4400	11-1-74
5-6	J4400 -1	11-1-74
5-7	J4400 -1	1-5-78
5-7A	J4400-1	5-15-76
5-7B	BLANK	5-15-76
5-8	J4400	10-15-75
5-9	J4400-1	5-15-76
5-10	J4400	5-1-76

SECTION 6

PAGE NO.	REPORT NO.	DATE
6-1	J4400 -1	1-5-78
6-2	J4400	1-5-78
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6-4	J4400 -1	1-5-78
6-5	J4400 -1	1-5-78
6-6	J4400 - 1	1-5-78

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7-2	J4400 -1	1-5-78
7-3	J4400 -1	1-5-78
7-4	J4400-1	5-15-76
7-5	J4400-1	5-15-76
7-6	J4400-1	5-15-76
7-6A	J4400-1	5-15-76
7-6B	J4400-1	5-15-76
7-7	J4400-1	5-15-76

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7-9	J4400 -1	10-15-75
7-10	J4400	7-1-75
7-11	J4400	7-1-75
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7-13	J4400	1-5-78
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SECTION 8

PAGE NO.	REPORT NO.	DATE
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8-2	J4400	5-1-76
8-2A	J4400-1	5-1-76
8-2B	J4400-1	5-1-76
8-2C	J4400-1	5-1-76
8-2D	J4400-1	5-1-76
8-3	J4400	10-15-75
8-4	J4400	10-15-75
8-5	J4400	11-1-74
8-6	J4400	1-5-78
8-7	J4400	5-1-76
8-7A	J4400	1-5-78
8-7B	BLANK	5-1-76
8-8	J4400	1-5-78
8-9	J4400	1-5-78
8-10	J4400	1-5-78
8-11	J4400	1-5-78
8-12	J4400	1-5-78
8-13	J4400	1-5-78
8-14	J4400	1-5-78

PAGE NO.	REPORT NO.	DATE
8-15	J4400-1	11-1-74
8-16	J4400	11-1-74

SECTION 9

PAGE NO.	REPORT NO.	DATE
9-1	J4400	11-1-74
9-2	J4400	1-5-78
9-3	J4400	11-1-74
9-4	BLANK	11-1-74
9-5	J4400	1-5-78

SECTION 10 APPENDIX A & B

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B-2	J4400	1-5-78
C-1	J4400	1-5-78
C-2	J4400	1-5-78
C-3	J4400	1-5-78
C-4	J4400	1-5-78
C-5	J4400	1-5-78
C-6	J4400	1-5-78
C-7	J4400	1-5-78
C-8	BLANK	1-5-78
D-1	J4400	1-5-78
D-2	J4400	11-1-79
D-3	J4400	1-5-78
D-4	J4400	1-5-78
D-5	J4400	1-5-78
D-6	J4400	1-5-78
D-7	J4400	1-5-78

DC-10 AREA NAVIGATION

The DC-10 area navigation system utilizes tape programmed computers to process VOR/DME data to update the inertial navigation position and provide accurate navigational guidance between waypoints that are not necessarily VOR stations. Data storage capability allows selection of designated R-NAV routes, company routes, or direct point-to-point navigation on a world wide basis.

EQUIPMENT

The DC-10 R-NAV system may be configured either as a dual area nav/inertial navigation system for navigation on overwater routes or as a single area navigation system for use on domestic routes. The dual inertial R-NAV system consists of two (2) Navigation Computer Units (NCU's), two (2) Flight Data Storage Units (FDSU's), two (2) Control Display Units (CDU's), three (3) Inertial Sensor Systems (ISS's) and a single Inertial Sensor Display Unit (ISDU) used by each of the three (3) ISS's. The Inertial Sensor Systems consist of an Inertial Sensing Unit (ISU), a Battery Unit (BU), and Mode Selector Unit (MSU).

The single (non-inertial) R-NAV system consists of one (1) NCU, one (1) FDSU, and one (1) CDU and has the automatic navaid selection and tuning capability of the dual system. Installation of the single R-NAV system is optional, allowing the equipment to be installed in either the Captain's (No. 1), or First Officer's (No. 2) sides. For the purpose of this book it is assumed that the Captain's system will be operational.

Each NCU is a 16,000 word digital computer which is programmed from a tape cassette contained in the FDSU to operate as a navigation computer and a comprehensive system and sensor tester. In addition to the navigation computer program, the FDSU tape cassette may also store all of the routes terminal and airport data (SID's and STAR's) and airway navigation aid data for the entire route structure of the airline. The tape is up-dated to conform to the periodic FAA navaid and airway data updates. The CDU has a Cathode Ray Tube (CRT) display with an alphanumeric keyboard which allows the pilots to operate the system.

Navigation inputs to the system are provided by dual digital VOR/DME systems, dual digital air data systems and dual compass couplers. Inertial equipped DC-10 aircraft also receive navigation inputs from the ISS's.

MODES OF OPERATION

AREA NAVIGATION MODES

The R-NAV system has two modes of operation that are approved for use on area navigation routes.

Radio (R) Mode

This is the basic mode of navigation for the single NCU non-inertial R-NAV system and a reversionary mode for the dual NCU inertial R-NAV system in the event that only one (1) NCU is operative and none of the three ISS's are operative in the NAV mode. When operating in the R mode the NCU functions as a navigation computer using inputs from the dual VOR/DME systems combined with air data and magnetic heading inputs to compute the airplane position, track and ground speed. These and other pertinent navigation data are used to provide steering commands to the Autopilot/Flight Director system, and are displayed to the pilot on the CDU and HSI to indicate the airplane's present position and relationship to the waypoints of a predetermined flight plan. Navigation accuracy is maintained by autoselection logic that automatically selects the best VOR/DME stations from the available navaids for the route to be flown. VOR/DME frequencies will be automatically tuned if autotune is selected.

Radio Inertial (R/I) Mode

Inertial inputs are used primarily to compute the airplane's position when flying overwater routes, or on routes where limited or no VOR/DME inputs are available. The use of the inertial inputs provide a true north reference, not subject to magnetic errors, and allows a more accurate computation of wind direction and velocity to provide greater tracking accuracy. When operating in the R/I mode the NCU uses inertial inputs to compute a position and updates that position at one second (approx.) intervals using VOR/DME data. Auto selection of navaids is the same as the R mode with the addition of logic which prevents position accuracy degradation from a single remote VOR input.

INERTIAL NAVIGATION MODES

The following modes are approved for inertial navigation routes:

Radio Inertial (R/I) Mode

Single Radio Inertial (SR/I) Mode

The SR/I mode is the same as the R/I mode except that insuffi-

cient radio data is available to meet the AC-90-45 accuracy requirements.

Inertial (I) Mode

The I mode is the basic operating mode for overwater flights when no VOR/DME inputs are available.

(For additional details on modes of operation, see pages viii and 2-10).

ACCURACY

The AINS-70 meets the requirements of AC 25-4 as a sole means of navigation (self-contained long range) when in the Inertial (I) or R/I or SRI modes, and the requirements of AC 90-45 for airborne Area Navigation Systems when in the R/I or R mode.

AUTOTUNE TUNING

An autotune switch on each VOR/DME control panel provides selection of automatic tuning through the navigation computer. When selected to autotune the course read out on the navigation module, and the frequency readout on the VOR/DME control panel are shuttered.

ATTITUDE/HEADING (when installed)

Attitude and Heading information is provided to all using systems by the ISS. The inertial sensor subsystems will automatically revert to "Attitude" mode in the event of failures affecting only navigation performance.

ALIGNMENT OF INERTIAL SENSORS

Airplanes must remain stationary during alignment and be between 76.5 degrees North and 76.5 degrees South latitude.

BATTERY POWER

In the event of failure of the airplanes 115-vac power system, the inertial sensor subsystem automatically transfers to its own back-up battery which has been certified for 5 minutes of operation. A fully charged battery may provide 30 minutes of operating time.

FLIGHT PLAN

The R-NAV systems will accept a flight plan through the CDU either as a Company Route or as a "FROM-VIA-TO" between airports, gateways or LAT/LONG's. A second route can also be assembled to an alternate destination or from an inbound gateway

to the destination. The system then extracts the data required to fly the route from the FDSU tape. A swath of data is brought into the computer from the tape which includes required airways and waypoints 150 n.mi. each side of the route, and VOR/DME stations 200 n.mi. each side of the route selected. (See Page 1-13). Low altitude waypoint/airway data and airport data, including Standard Instrument Departures (SID's) for the departure airport, and Standard Terminal Area Routings (STAR's) for the destination and alternate airports are also brought in from the tape. All of these data are transferred automatically after route definition. Only data stored in the tape are available. If a route number selection was made, all of the enroute waypoints are automatically displayed consecutively on the CDU. If a FROM-VIA-TO format was used to define the desired route, the flight plan must be built up using airways, individual waypoints, etc., as required.

Complete pre-stored SID's and STAR's can be added to any flight plan by pilot selection from a list for that airport. Flight plans may be revised in many ways as operational requirements change. Six (6) waypoints may be viewed at once and up to fifty nine (59) are available. Space is provided for fifteen (15) Place/Bearing/Distance and LAT/LONG waypoints.

Vertical (altitude) profiles may be constructed by inserting altitudes or flight levels for enroute waypoints, SID's and STAR's that have assigned altitudes will display these pre-stored altitudes when the SID or STAR is inserted into the flight plan (See page 1-18). Straight line climb or descent profiles may be used by the pilot to monitor climb or descent progress (See page 3-1). Vertical profiles cannot be flown by the Autopilot/Flight Director system.

FLIGHT GUIDANCE

Autopilot/Flight Director

The automatic pilot and flight director navigation control mode is approved for this configuration. Operation is initiated by depressing the [LOC NAV] pushbutton located on the heading module of the FG & C control panel. Capture of the NAV track will occur when the "NAV" mode is selected and the aircraft is within the capture zone (See page 2-3).

Either Autopilot/Flight Director system (No. 1 or No. 2) may be used for NAV mode operation on the airplanes with dual installation. Autopilot/Flight Director operation on the airplanes with single system is limited to the system corresponding to the side that has the operating R-NAV system.

TURNING

The system computes the point at which a turn from one leg to the next must be started, as a function of ground speed and track angle change, to achieve a smooth transition and minimize overshoot.

Turns may start up to 10 miles prior to arriving at the "TO" waypoint. The pilot is alerted 15 seconds prior to each turn.

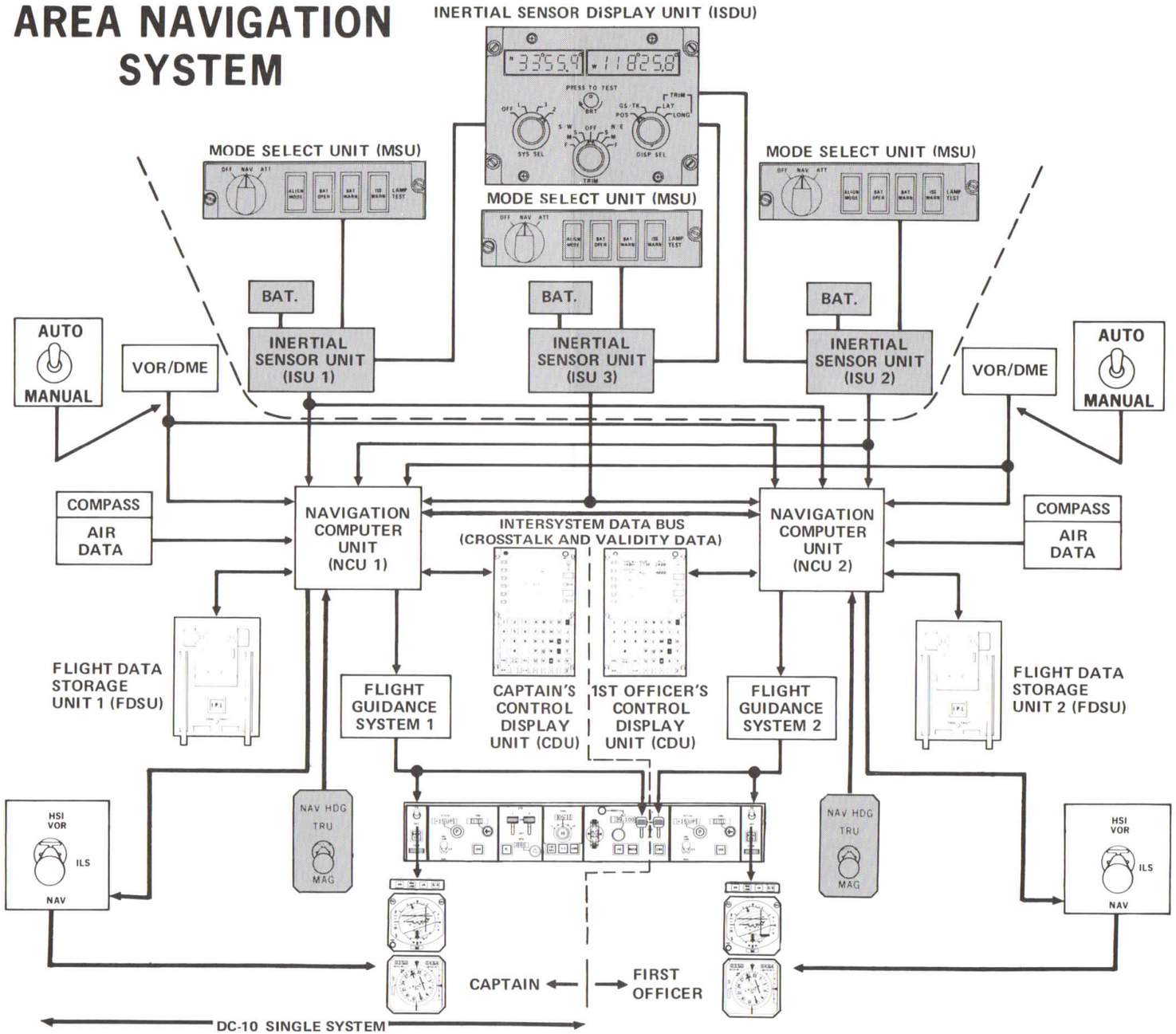
HORIZONTAL SITUATION INDICATOR (HSI)

An HSI select switch on the navigation control panel is used to select display of VOR, ILS, or area NAV data on the HSI. In the NAV position, the HSI card displays heading, the course pointer displays desired course and the heading bug displays the heading required to fly the desired course.

The MAG/TRU selector switch on each pilot's instrument panel of inertial equipped airplanes allows selection of magnetic or true North reference for the HSI displays when the HSI select switch is in the "NAV" position.

Vertical profile deviation is displayed on a vertical scale on the right side of the HSI.

AREA NAVIGATION SYSTEM

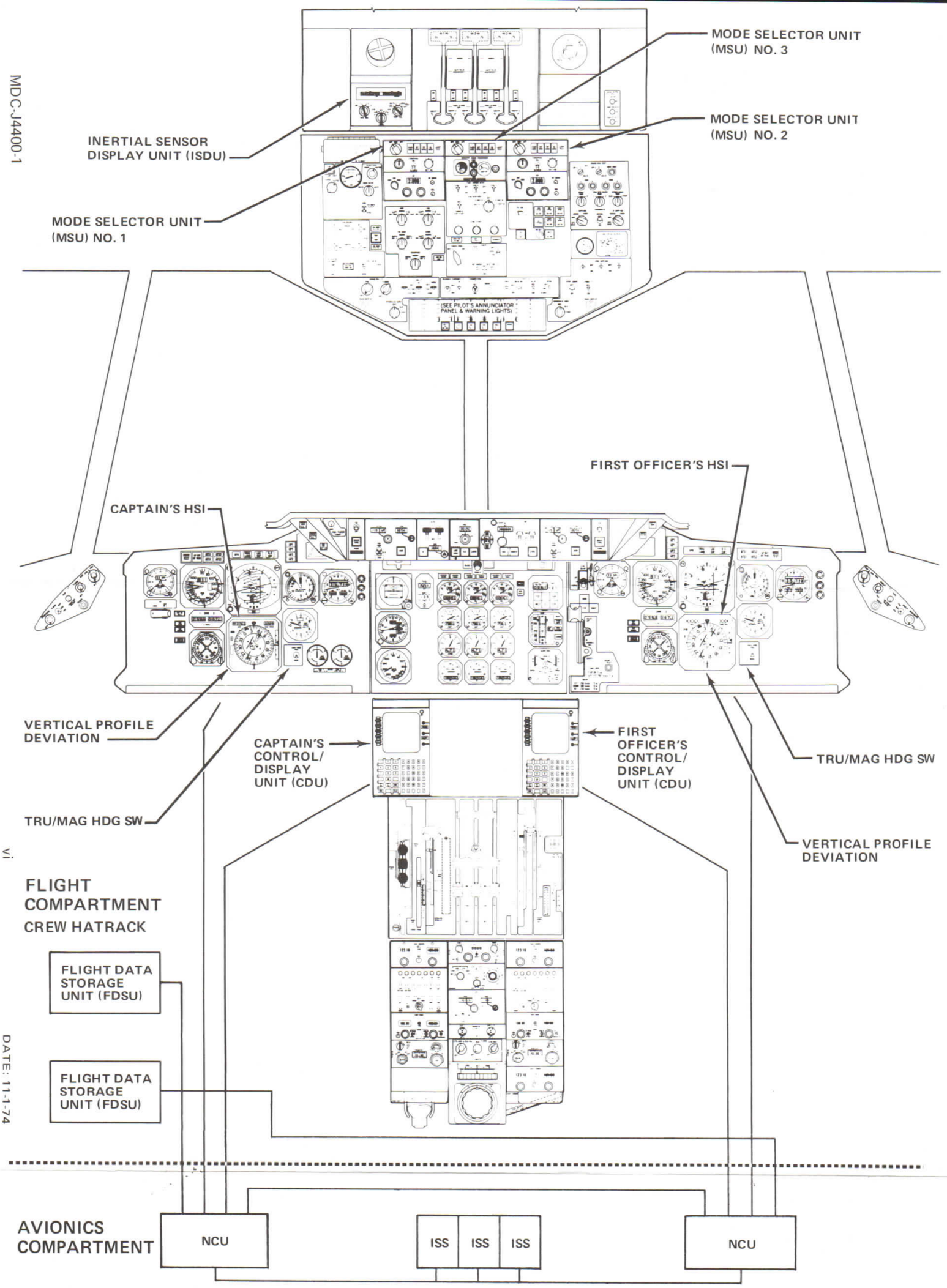


DATE: 5-15-76

The R-NAV system is automatically confgured for mode of operation, and VOR/DME autoselect and autotune, dependent upon the number of system components installed or operating.

Each NCU monitors the validity of each of the three ISS inputs to determine the number of ISS's operating. Each NCU also monitors the validity of the opposite NCU and its system components as well as the validity of the crosstalk from the opposite NCU. Using this logic each NCU configures its operating mode and its radio selection and tuning requirements based on the operational capability, if any, and requirements of the opposite system.

Operating Configuration	Mode	Autoselect Autotune	Validity Inputs Required
Dual Inertial	R/I	Master or Slave as required.	One or more ISS's Opposite NCU Opposite NCU Crosstalk
Single Inertial	R/I	Master (dual tune)	One or More ISS's
Dual Non-Inertial	R	Master or Slave as Required	Opposite NCU Opposite NCU Crosstalk
Single Non-Inertial	R	Master (dual tune)	- - - - - - - -


MODE SELECTOR UNIT (MSU) NO. 3
MODE SELECTOR UNIT (MSU) NO. 2
INERTIAL SENSOR DISPLAY UNIT (ISDU)
MODE SELECTOR UNIT (MSU) NO. 1
(SEE PILOT'S ANNUNCIATOR PANEL & WARNING LIGHTS)
FIRST OFFICER'S HSI
CAPTAIN'S HSI
VERTICAL PROFILE DEVIATION
CAPTAIN'S CONTROL/ DISPLAY UNIT (CDU)
FIRST OFFICER'S CONTROL/ DISPLAY UNIT (CDU)
TRU/MAG HDG SW
TRU/MAG HDG SW
VERTICAL PROFILE DEVIATION
FLIGHT COMPARTMENT
CREW HATRACK
FLIGHT DATA STORAGE UNIT (FDSU)
FLIGHT DATA STORAGE UNIT (FDSU)
AVIONICS COMPARTMENT
NCU
ISS
ISS
ISS
NCU

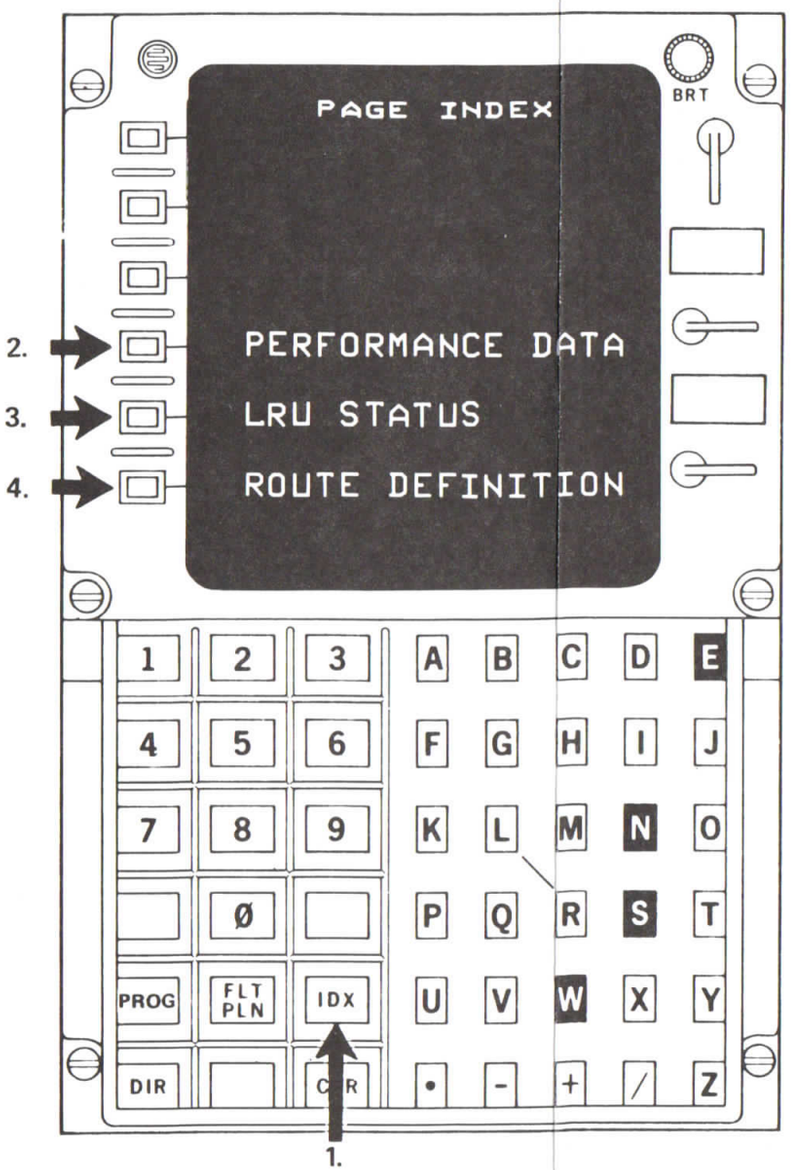
DATE: 11-1-74

1. INDEX PAGE IS ACCESSED BY PRESSING COMMAND KEY (IDX).

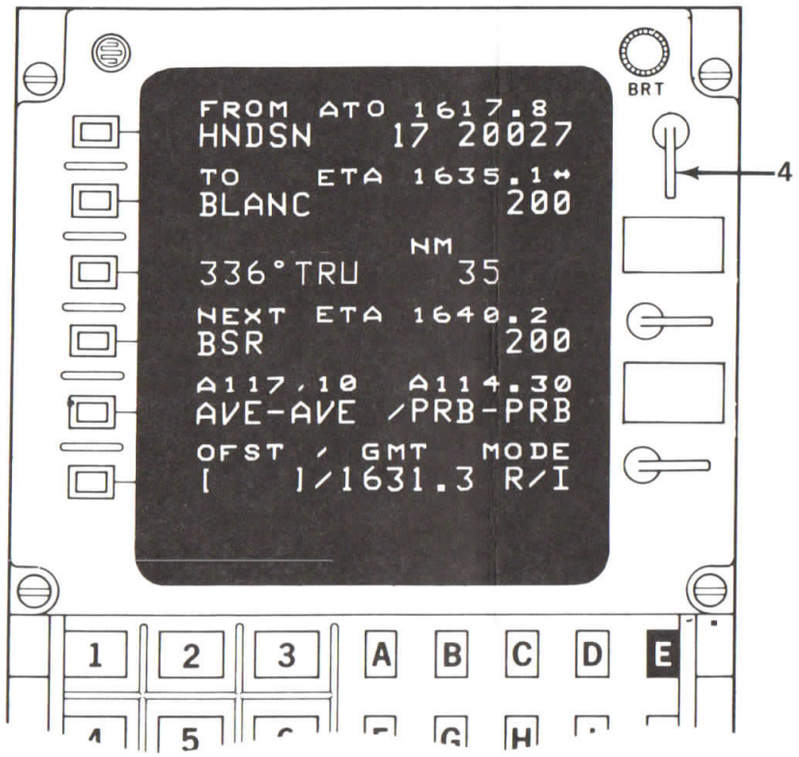
2. PERFORMANCE DATA PAGE IS ACCESSED BY PRESSING LINE KEY 4.

3. LRU STATUS IS ACCESSED BY PRESSING LINE KEY 5.

4. ON GROUND ROUTE DEFINITION SEQUENCE IS BROUGHT INTO THE NCU FROM TAPE STORAGE BY PRESSING LINE KEY 6.



PROGRESS PAGE



It is suggested that the pilot flying the aircraft selects the PROG page.

1. He can then monitor the basic route of flight Waypoints, Actual Time Over (ATO), Estimated Time Over (ETO's) and altitudes.

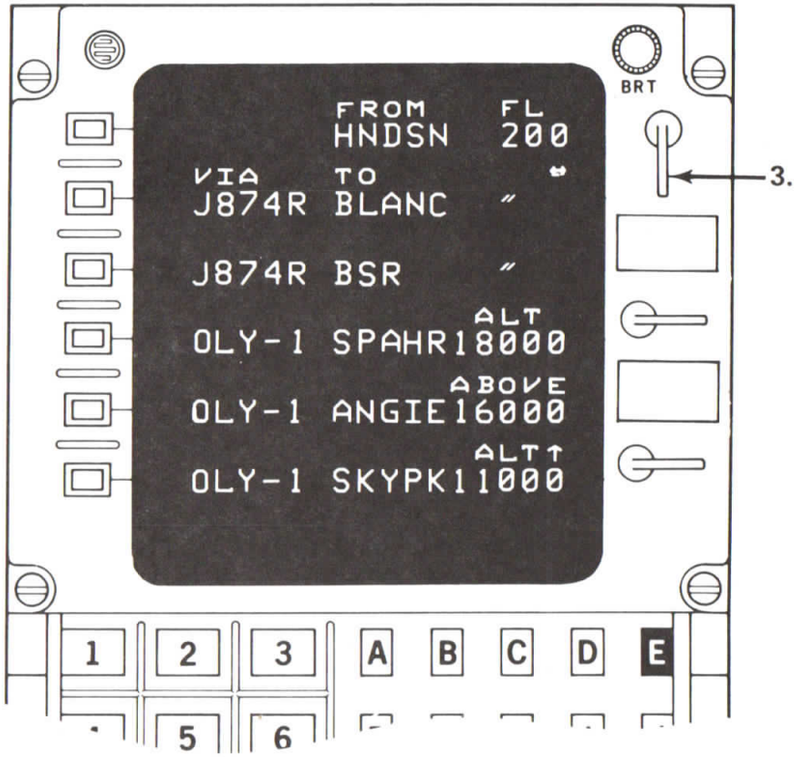
2. He can see his VOR/DME tuning status and observe or initiate changes.

3. He can see at once the cause of any faults and alerts lights.

4. He can flip to the Performance Page or Flight Plan Page if he so wishes using the lever switch.

5. He can very easily see the other CDU which will normally be on the Flight Plan Page.

FLIGHT PLAN PAGE



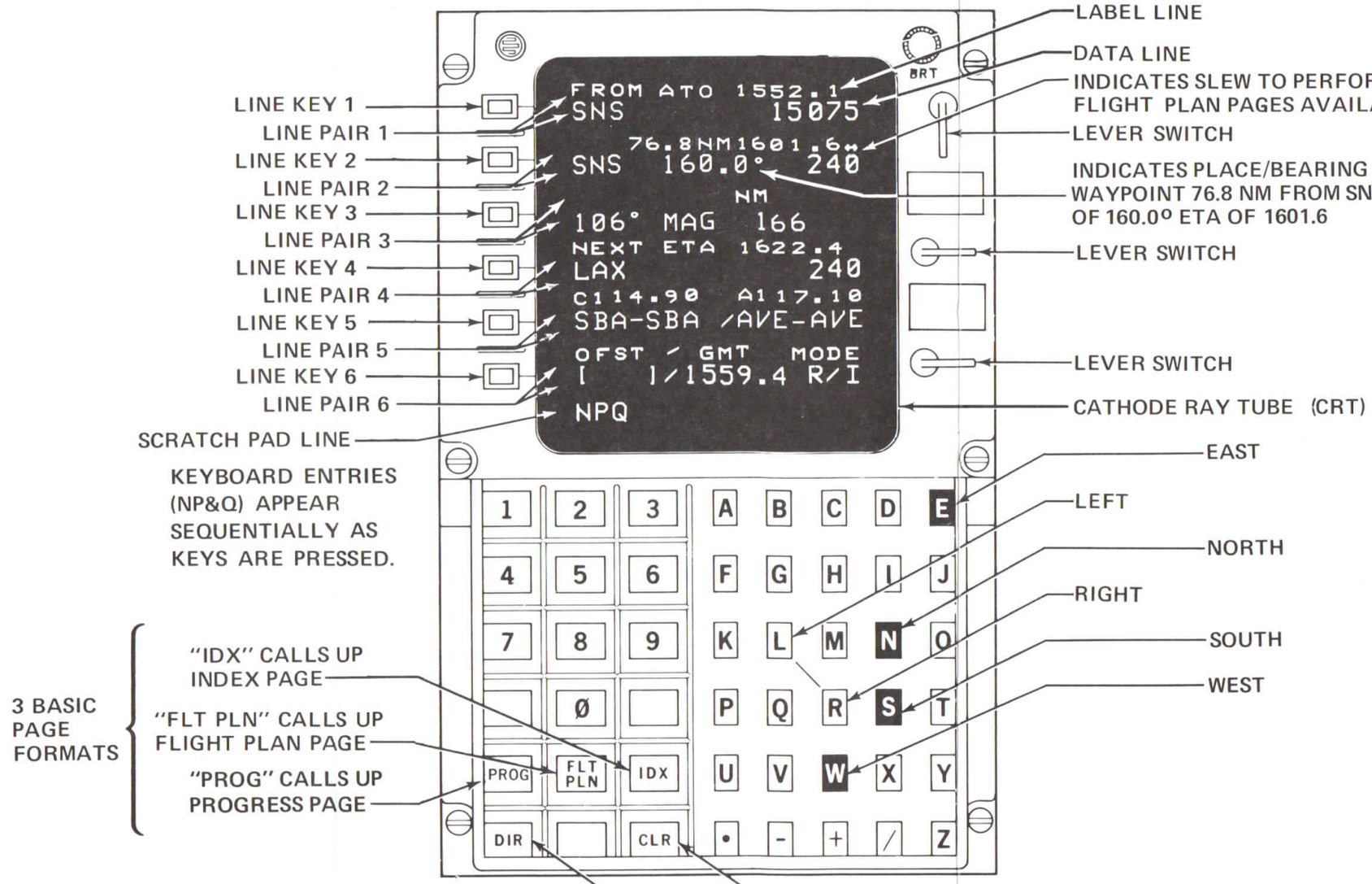
It is suggested that the pilot not flying the aircraft, and who is negotiating with ATC, be selected to the FLT PLN page.

1. He can then insert flight plan changes which he receives. (This is the only page for flight plan revisions.)

2. He can see the other CDU very easily to note the cause of fault or alert lights.

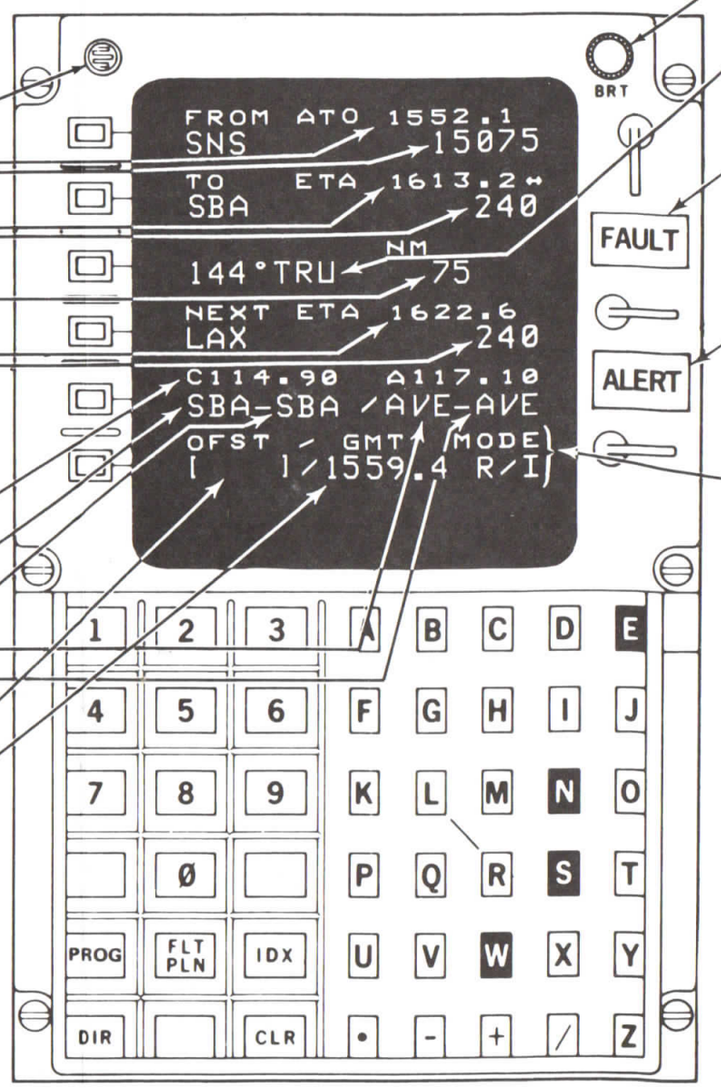
3. He can select the Progress Page to insert offsets or cancel the fault or alert lights and then select the Performance Page or return to the Flight Plan Page using the lever switch.

CONTROL DISPLAY UNIT (CDU) SELECTED TO PROGRESS PAGE



DATE: 5-15-76

CDU PROGRESS PAGE SELECTED



LIGHT SENSOR FOR AUTO BRIGHTNESS CONTROL FOR CRT DISPLAY

ACTUAL TIME OVER SNS

ACTUAL ALTITUDE OVER SNS

ETA AT SBA

ALTITUDE AT SBA

SBA TO LAX

ETA AT LAX

ALTITUDE AT LAX

FREQUENCY OF VOR/DME'S
"A" FOR AUTOSELECTED
"C" FOR PILOT SELECTED
VIA CDU

PILOT MAY OVERWRITE

- NO. 1 VOR IS TUNED TO
- NO. 1 DME IS TUNED TO
- NO. 2 VOR IS TUNED TO
- NO. 2 DME IS TUNED TO
- OFFSET
- PRESENT TIME

BRIGHTNESS CONTROL FOR CRT DISPLAY

MAG OR TRU DEPENDING ON POSITION OF MAG/TRU SWITCH

"FAULT LIGHT" (AMBER) ILLUMINATES STEADY TO INDICATE FAILURE OF NCU OR CDU – SYSTEM INOPERATIVE. BLINKS TO INDICATE LRU OR INPUT FAILURE.

"ALERT LIGHT" (WHITE) BLINKS FOR "CHECK NEXT", ALERT, MODE DOWN GRADE, BAROSET REQUEST, AND MANUAL TUNING REQUEST.

PRESS → PROG

TO SEE MESSAGE AND RESET LIGHTS (Page 8-1)

MODE OF OPERATION

†	R/I OK FOR R NAV ACCURACY	INERTIAL + DUAL VOR/DME DUAL DME SINGLE VOR/DME + DME SINGLE VOR/DME NOTE: DUAL MEANS 2 DIFFERENT NAVAIDS
	R * OK FOR R NAV ACCURACY	SAME AS ABOVE EXCEPT NO INERTIAL
†	SR/I NOT APPROVED FOR AREA NAVIGATION	INERTIAL + NON FREQ PAIRED VOR/DME DUAL VOR SINGLE DME SINGLE VOR
	SR** NOT APPROVED FOR AREA NAVIGATION	SAME AS SR/I EXCEPT NO INERTIAL
	D/R* NOT APPROVED FOR AREA NAVIGATION	NO RADIO OR INERTIAL
†	I OK FOR TRANSOCEANIC NAVIGATION	INERTIAL ONLY
	NONE	NO RADIO OR INERTIAL OR AIR DATA

MUST HAVE AIR DATA (See Pg 2-10)

* MUST HAVE COMPASS MAGNETIC HEADING

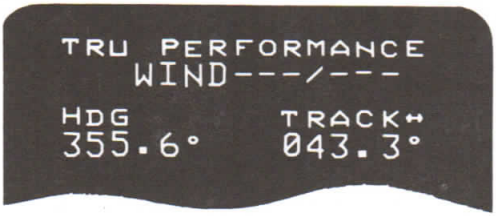
** LIMITED AVAILABILITY (For details see Pgs 2-10, 7-6, 7-7 & 7-8)

† APPROVED FOR INERTIAL NAVIGATION

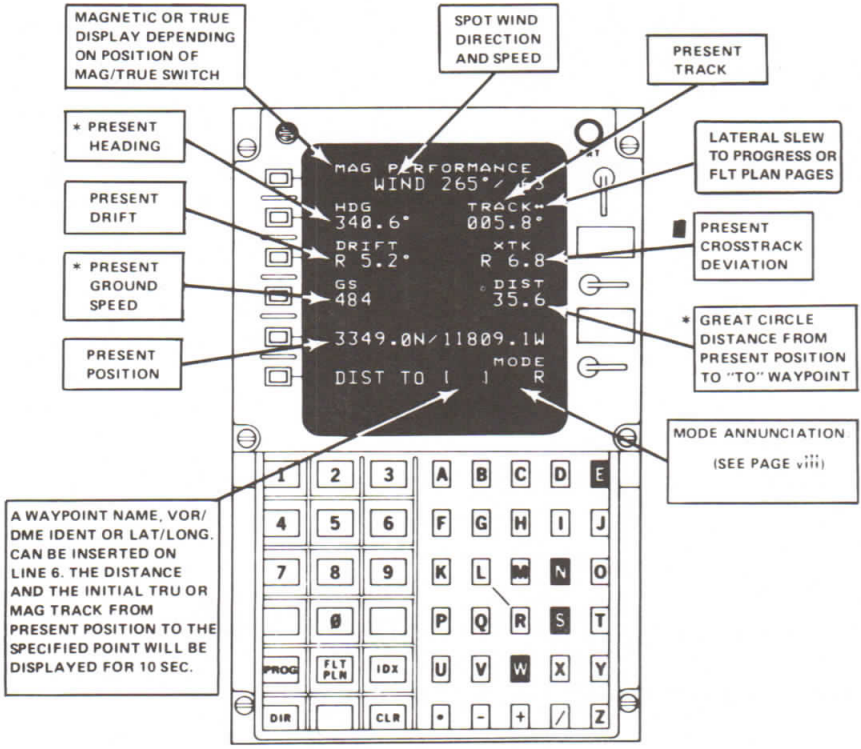
NOTE:
PANEL LIGHTING IS CONTROLLED BY PANEL LIGHTING CONTROL.

PERFORMANCE PAGE

TRUE or MAG HDG display selected by NAV HDG switch (if installed)

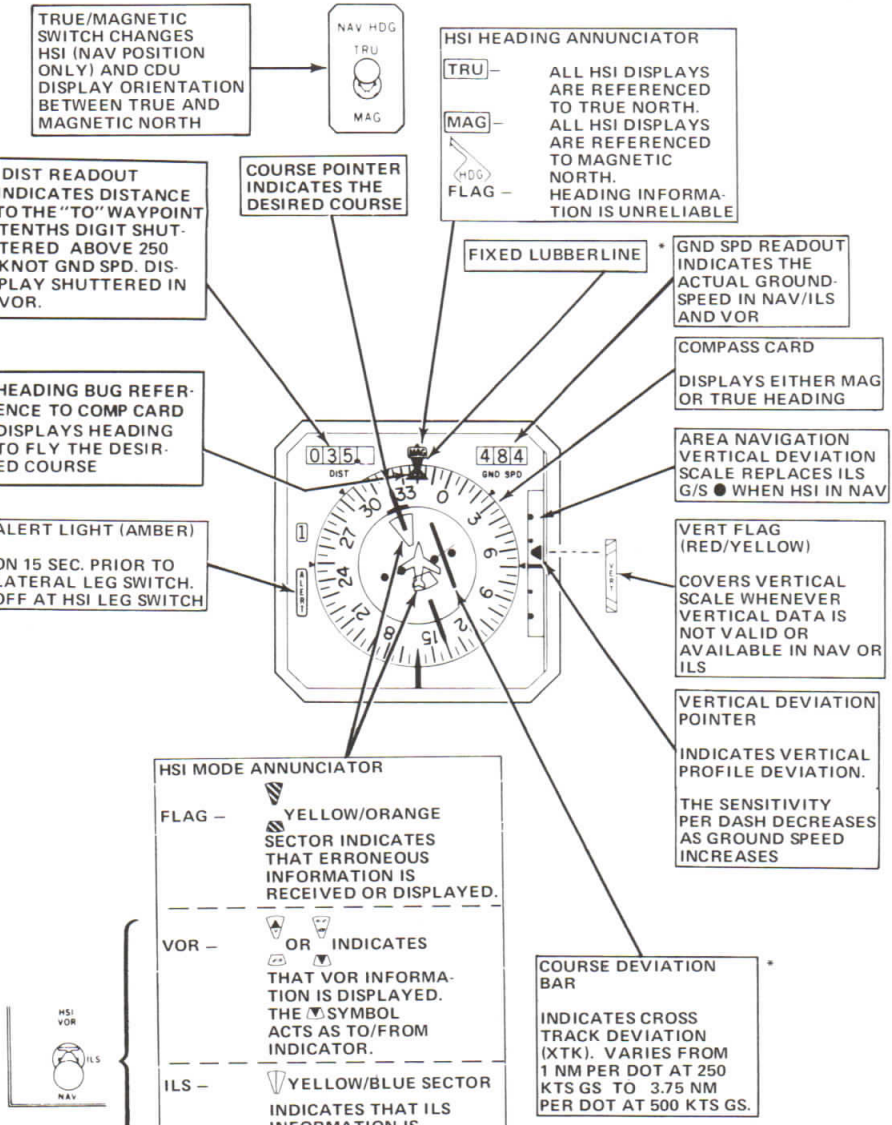


Displays detailed information about the leg presently being flown.



* REPEATED ON HSI. P xii

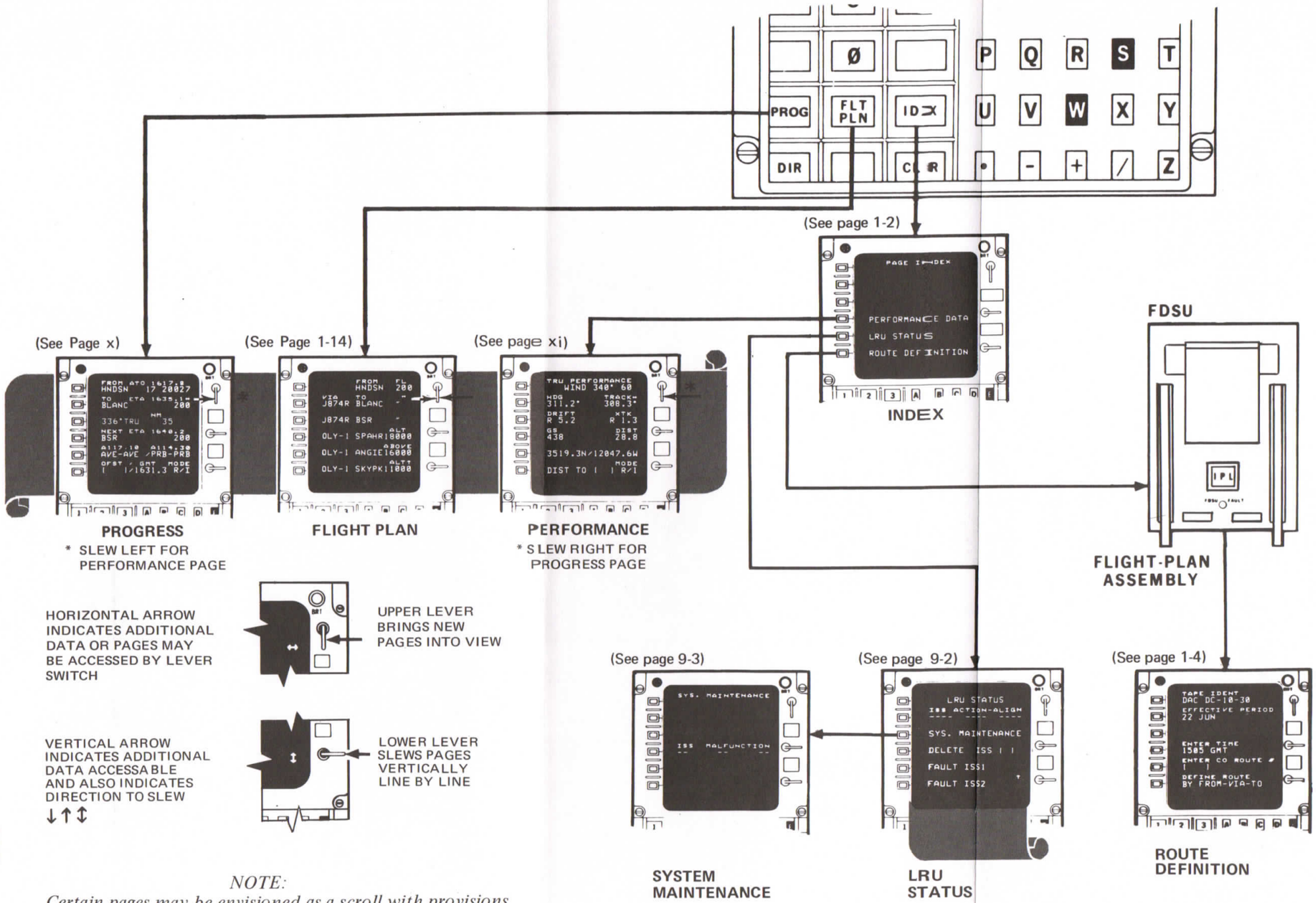
HORIZONTAL SITUATION INDICATOR (HSI)
ONLY AREA NAV DISPLAYS ARE INDICATED
DISPLAY SHOWN CAPTURING A NEW LEG
(COURSE 320°)



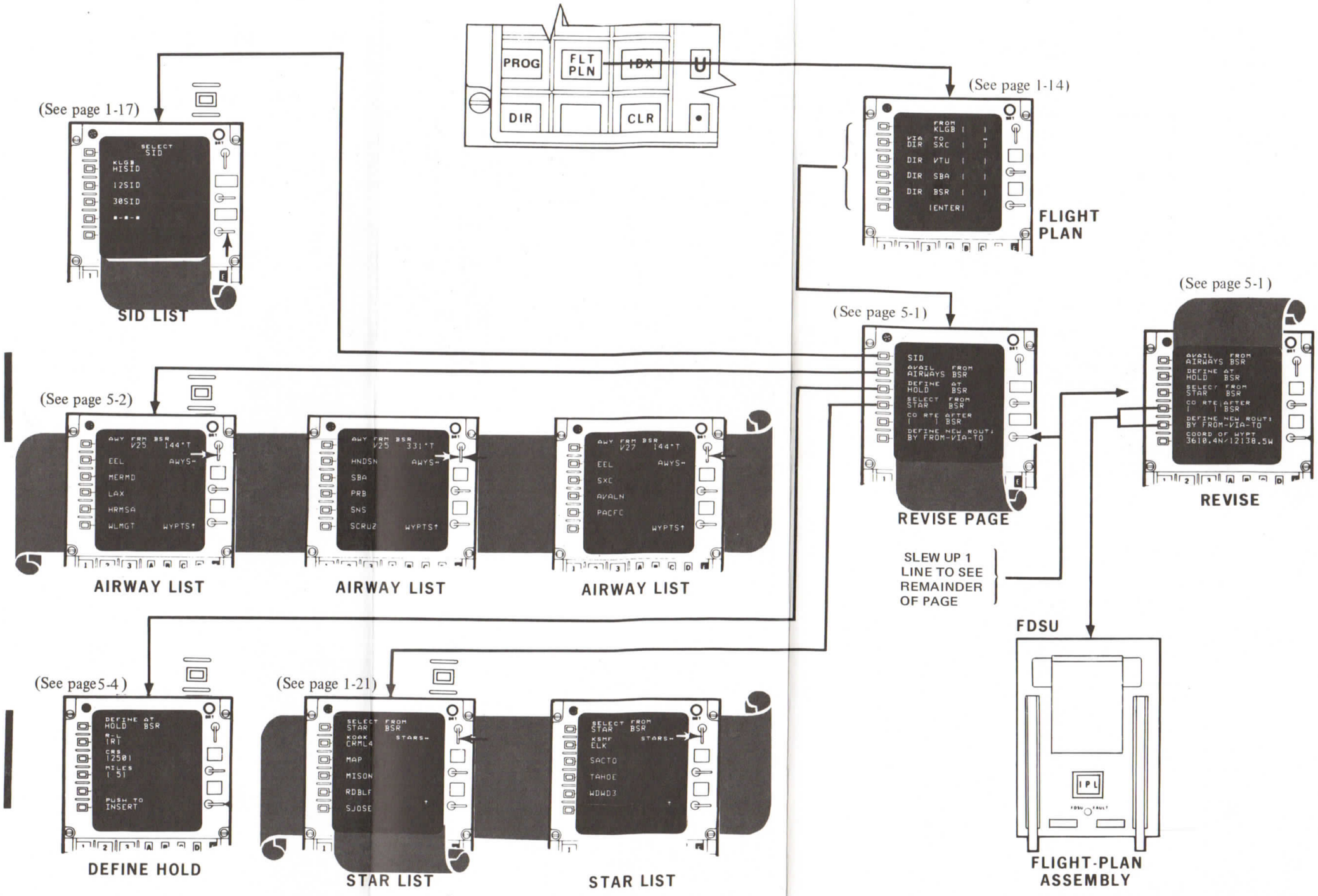
*REPEATED ON PERFORMANCE DATA PAGE – Xi

CDU DATA DISPLAYS

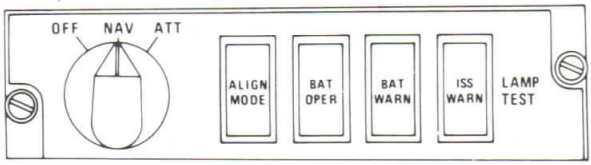
The following fold out pages provide an index to the navigation data and system maintenance status data that are available to the pilot. Also shown are the various ways that these data may be accessed on the CDU.



NOTE:
Certain pages may be envisioned as a scroll with provisions for shifting or slewing the display laterally and/or vertically.


PROG
FLT PLN
IDX
U
DIR
CLR
(See page 1-17)
SELECT SID
KLGB HISID
12SID
30SID
SID LIST
(See page 1-14)
FROM KLGB
VIA TO
DIR SXC
DIR VTU
DIR SBA
DIR BSR
(ENTER)
FLIGHT PLAN
(See page 5-1)
SID
AVAIL FROM AIRWAYS BSR
DEFINE AT HOLD BSR
SELECT FROM STAR BSR
CO RTE AFTER BSR
DEFINE NEW ROUTE BY FROM-VIA-TO
REVISE PAGE
(See page 5-1)
AVAIL FROM AIRWAYS BSR
DEFINE AT HOLD BSR
SELECT FROM STAR BSR
CO RTE AFTER BSR
DEFINE NEW ROUTE BY FROM-VIA-TO
COORD OF WYPT
3618.4N/12138.5W
REVISE
(See page 5-2)
AWY FRM BSR V25 144°T
EEL AWYS→
MERMD
LAX
HRMSA
WLMGT WYPTS↑
AIRWAY LIST
AWY FRM BSR V25 331°T
HNDSN AWYS→
SBA
PRB
SNS
SCRUZ WYPTS↑
AIRWAY LIST
AWY FRM BSR V27 144°T
EEL AWYS→
SXC
AVALN
PACFC
WYPTS↑
AIRWAY LIST
SLEW UP 1 LINE TO SEE REMAINDER OF PAGE
FDSU
IPL
FLIGHT-PLAN ASSEMBLY
(See page5-4)
DEFINE AT HOLD BSR
RAL
(R)
CRS
12501
MILES
(.5)
PUSH TO INSERT
DEFINE HOLD
(See page 1-21)
SELECT FROM STAR BSR
KOAK CRML4 STARS→
MAP
MISON
RDBLF
SJOSE
STAR LIST
SELECT FROM STAR BSR
KSMF ELK STARS→
SACTO
TAHOE
WDWD3
STAR LIST

MODE SELECT UNIT (MSU)
(INERTIAL EQUIPPED AIRCRAFT ONLY)



Three Mode Selector Units (MSU's) are located on the overhead panel as shown on page vi.

The MSU on the Captain's side determines the operating status of Inertial Sensor Unit (ISU) No. 1.

The MSU on the First Officer's side determines the operating status of ISU No. 2.

The Center MSU determines the operating status of ISU No. 3.

Mode Selector Switch

The Mode Selector has three positions to provide manual selection. "OFF", "NAV", for navigation, and "ATT" for attitude. The OFF position inactivates the system. The NAV position is the normal operating position when the ISU is being used for navigation. The ATT position may be used if the navigation function should fail. In this mode attitude signals are provided but the navigation function is inoperative.

CAUTION:

Once the mode selector has been moved from NAV to the ATT position, the navigation function cannot be recovered in flight. Therefore, do not move the mode selector prematurely.

The Inertial Sensor System (ISS) will automatically revert to attitude operation if the navigation function fails. For details of MSU warning annunciations and selector switch operation see page 8-16.

MSU Annunciations

The four annunciators located on the MSU indicate the operating mode and status of the ISU.

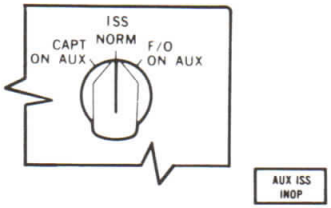
The "ALIGN MODE" annunciator is activated during the pre-flight when the mode selector is rotated from OFF to NAV. Alignment involves gyro spinup, leveling, and azimuth alignment. The "ALIGN MODE" light will be ON during the period of alignment.

The "BAT OPER" annunciator illuminates when the ISU switches to its own battery power. This occurs when the normal source of electrical power fails (or is turned OFF with the system in operation).

The "BAT WARN" annunciator illuminates when the battery power decreases to a level below that required to operate the ISU when the system is using battery power.

The "ISS WARN" annunciator will blink if alignment coordinates are not inserted within 3 minutes of switching to NAV, or if the ISS is unable to align to the inserted coordinates (lattitude). The "ISS WARN" will illuminate steady if the selected mode fails.

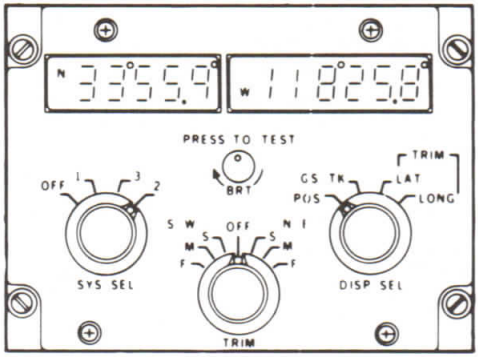
ISS SELECTOR SWITCH/AUX ISS INOP ANNUNCIATOR



The AUX ISS-3 INOP annunciator monitors the operational status of the ISU3 attitude and heading reference outputs. The complete operational status of ISU3 can be determined when the AUX ISS INOP annunciator is compared with MSU3 annunciations.

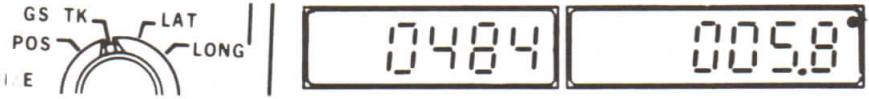
INERTIAL SENSOR DISPLAY UNIT (ISDU)

(INERTIAL EQUIPPED AIRCRAFT ONLY)



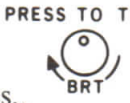
1. The ISDU is located on the pilot's overhead panel. It displays the Selected Inertial Sensor Unit (ISU) output.
2. The System Selector Switch selects the ISU to be read or set. Select to OFF position when not reading the display (NORMAL OPERATION).
3. The Display Selector allows selection of ISU:
   a) Position as shown above

   or



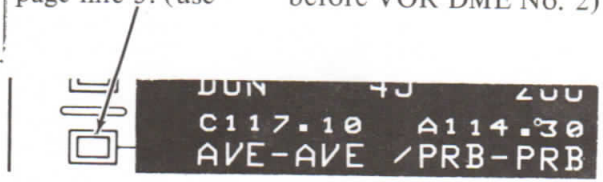
   b) Ground speed and true track. * (484 Kts./005.8° TRU)
   * Indicates true heading when on the ground.

4. During preflight, the ISDU may be used for backup alignment of the ISU's (See page C-2).

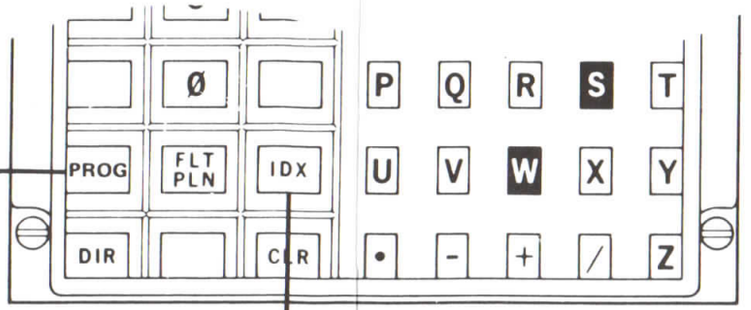
5. When the 

is pressed the display illuminates.

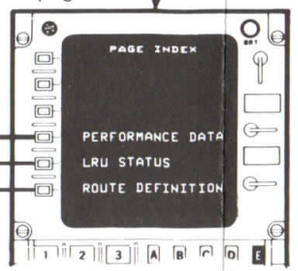
- Have patience.
- Do not expect to be able to use the area navigation system intuitively. Study it. It is not a modified autopilot system. It is a new concept.
- Initial ROUTE DEFINITION must be made from the IDX PAGE INDEX
- Flight plan changes such as addition/deletion of waypoints or airways, and insertion, or revision of altitudes and flight levels can be made on either CDU on or from the flight plan page only. FLT PLN
- Major inflight changes including diversions are made through the flight plan page and the revise page. (See Page 5-1).
- The DIR → DIRECT TO [ ] function is only used to go from present position direct to a waypoint, heading or track. It is not associated with DIR in the flt plan VIA column in any way.
- VOR/DME tuning, offsets and time updates can only be made on the Progress Page PROG
- If you wish to tune the VOR/DME to a station of your choice first try to do it with autotune by inserting the ident on the PROG page line 5. (use " " before VOR DME No. 2)



- If the ident inserted above appears briefly and then disappears, the selected VOR DME is out of programmed range as defined by the navaid logistic data.

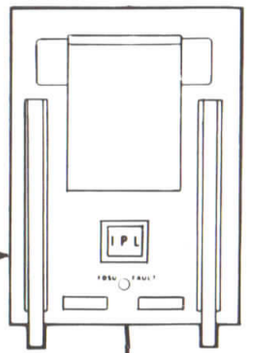


(See page 1-2)



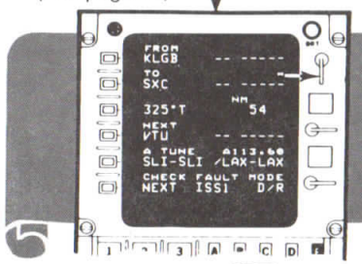
INDEX

FDSU



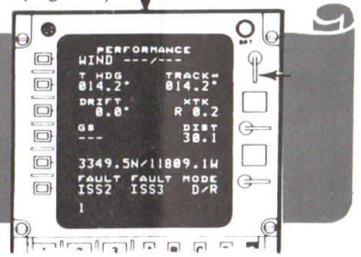
FLIGHT-PLAN ASSEMBLY

(See page ix)



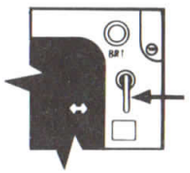
PROGRESS

(See page xi)



PERFORMANCE

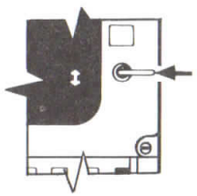
HORIZONTAL ARROW INDICATES ADDITIONAL DATA MAY BE ACCESSED BY LEVER SWITCH



UPER LEVER BRINGS NEW PAGES INTO VIEW

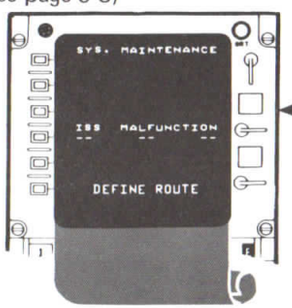
VERTICAL ARROW INDICATES ADDITIONAL DATA ACCESSABLE AND ALSO INDICATES DIRECTION TO SLEW

↓ ↑ ↕



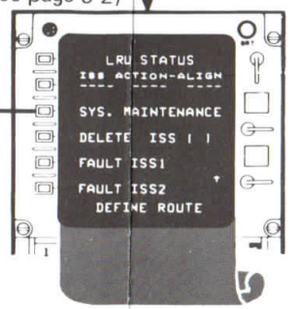
LOWER LEVER SLEWS PAGES VERTICALLY LINE BY LINE

(See page 9-3)



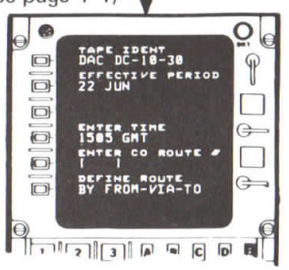
SYSTEM MAINTENANCE

(See page 9-2)



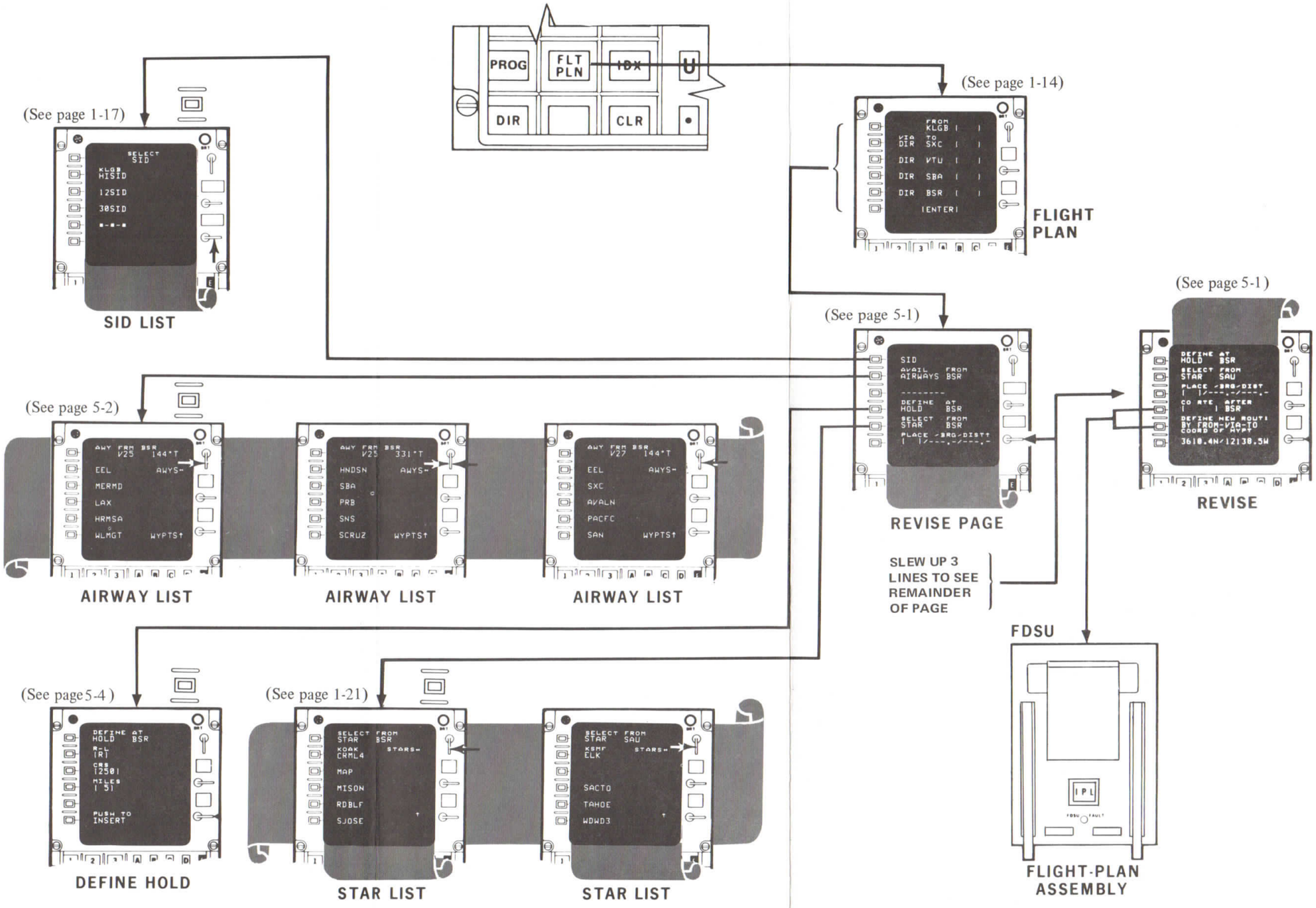
LRU STATUS

(See page 1-4)



ROUTE DEFINITION

NOTE:
Certain pages may be envisioned as a scroll with provisions for shifting or slewing the display laterally and/or vertically.

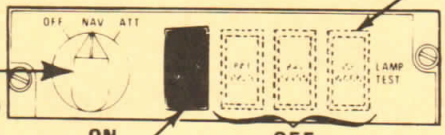

PROG
FLT PLN
IDX
DIR
CLR
(See page 1-14)
FLIGHT PLAN
(See page 1-17)
SID LIST
(See page 5-1)
REVISE PAGE
(See page 5-1)
REVISE
(See page 5-2)
AIRWAY LIST
AIRWAY LIST
AIRWAY LIST
SLEW UP 3 LINES TO SEE REMAINDER OF PAGE
FDSU
(See page5-4)
DEFINE HOLD
(See page 1-21)
STAR LIST
STAR LIST
FLIGHT-PLAN ASSEMBLY

SEE PAGE

MSU OPERATION

START ISS ALIGNMENT

SELECT 3 MSU'S TO NAV (DC-10-30 ONLY)



WILL BLINK IF LAT/LONG NOT INSERTED WITHIN 3 MINUTES

1-1

CDU OPERATION

PRESS IDX FOR

PRESS

PRESS AGAIN TO CONFIRM

1-2

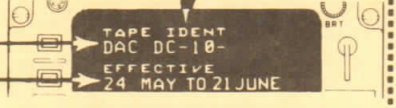
WAIT

OBSERVE BLINKING

1-3

WHEN BOTH CDU'S SHOW

CHECK TAPE IDENT AND DATE



1-4

TYPE TIME [ ] IN SCRATCHPAD

INSERT TIME

INSERT ROUTE NUMBER OR PRESS AND CONFIRM FROM-VIA-TO

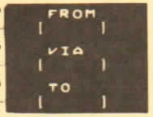
1

IF FROM-VIA-TO

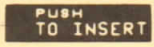
INSERT *GATEWAY, AIRPORT OR LAT/LONG*

OPTIONAL *GATEWAY, AIRPORT OR LAT/LONG.*

AND *GATEWAY, AIRPORT OR LAT/LONG.*



AND PRESS



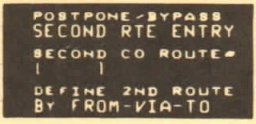
1-7

POSTPONE 2ND CO ROUTE

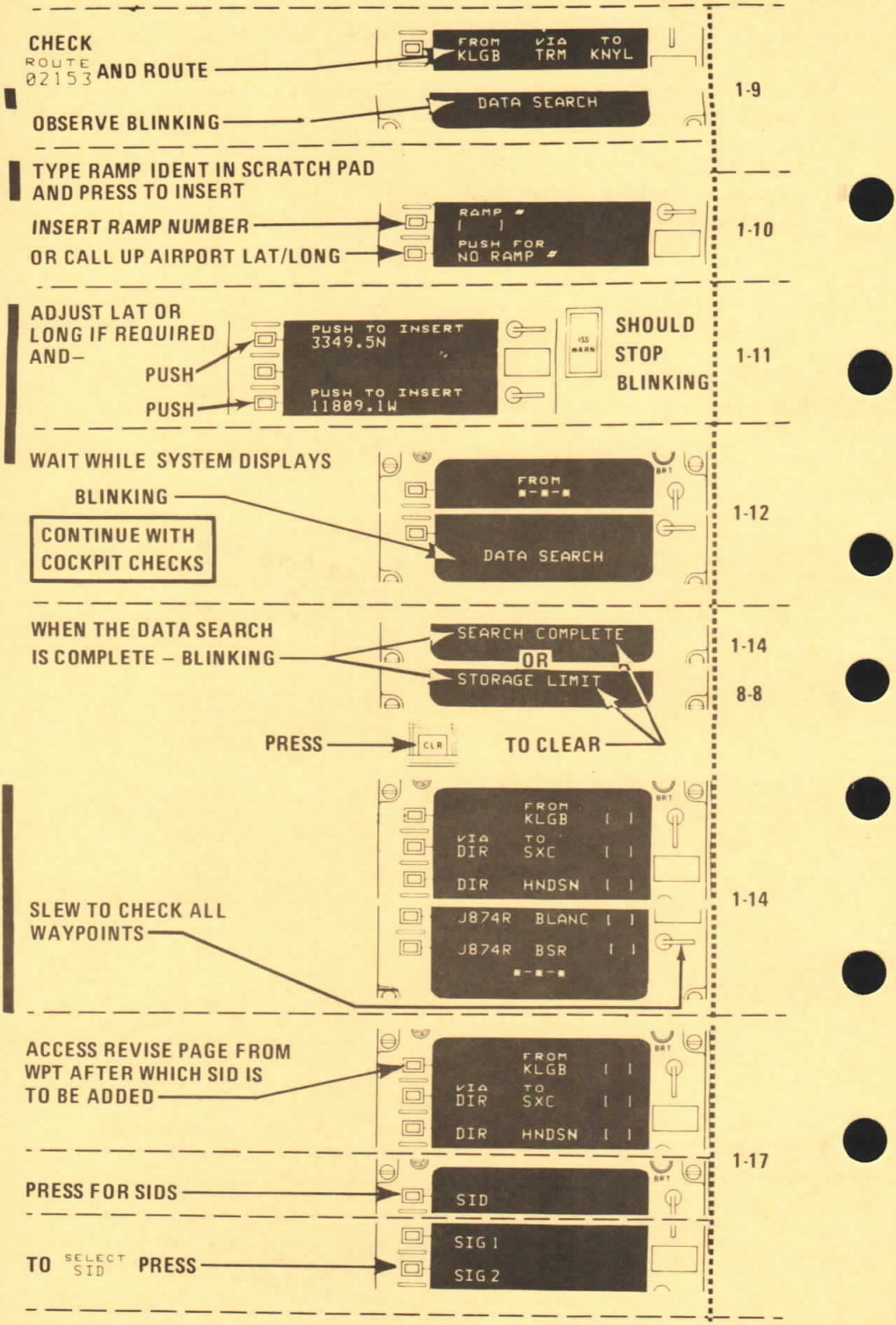
AND CONFIRM

OR

DEFINE 2ND ROUTE



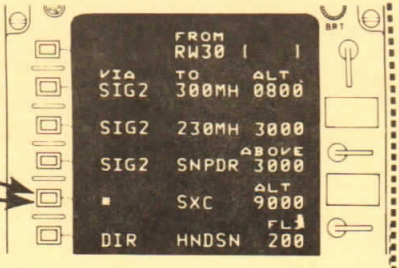
1-6


CHECK
ROUTE 02153 AND ROUTE
FROM KLGB VIA TRM TO KNYL
1-9
OBSERVE BLINKING
DATA SEARCH
TYPE RAMP IDENT IN SCRATCH PAD
AND PRESS TO INSERT
INSERT RAMP NUMBER
OR CALL UP AIRPORT LAT/LONG
RAMP #
[ ]
PUSH FOR NO RAMP #
1-10
ADJUST LAT OR
LONG IF REQUIRED
AND–
PUSH
PUSH
PUSH TO INSERT
3349.5N
PUSH TO INSERT
11809.1W
SHOULD
STOP
BLINKING
1-11
WAIT WHILE SYSTEM DISPLAYS
BLINKING
CONTINUE WITH
COCKPIT CHECKS
FROM
DATA SEARCH
1-12
WHEN THE DATA SEARCH
IS COMPLETE – BLINKING
SEARCH COMPLETE
OR
STORAGE LIMIT
1-14
8-8
PRESS
CLR
TO CLEAR
SLEW TO CHECK ALL
WAYPOINTS
FROM KLGB
VIA DIR TO SXC
DIR HNDSN
J874R BLANC
J874R BSR
1-14
ACCESS REVISE PAGE FROM
WPT AFTER WHICH SID IS
TO BE ADDED
1-17
PRESS FOR SIDS
SID
TO SELECT SID PRESS
SIG 1
SIG 2

SID WAYPOINTS AND ALTITUDES APPEAR IN FLIGHT PLAN

*INDICATES POSSIBLE DISCONTINUITY.
TO CONFIRM DIR SXC PRESS
TO DELETE SXC INSERT " – "

INSERT ALTITUDES



1-18

SLEW TO START STAR WPT (BSR)
PRESS FOR REVISE PAGE

1-21

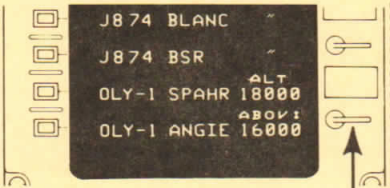
PRESS FOR STAR AFTER BSR

1-21

PRESS TO SELECT STAR

1-21

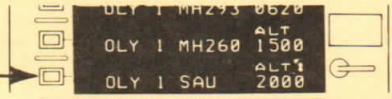
STAR WAYPOINTS AND ALTITUDES APPEAR IN FLIGHT PLAN AFTER BSR [STAR MAY REQUIRE ONE, TWO OR THREE INSERTIONS TO GET APPROACH, TRANSITION AND MISSED APPROACH]



1-22

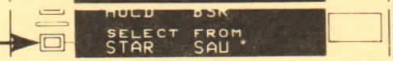
SLEW TO END OF STAR

PRESS FOR REVISE PAGE



1-22

PRESS TO SELECT STAR



PRESS TO SELECT ALTERNATE APPROACH

1-23

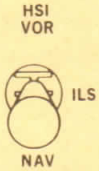
ALTERNATE APPROACH WAYPOINTS AND ALTITUDES WILL APPEAR IN FLIGHT PLAN ADDED TO LAST STAR WAYPOINT

CHECK ALL WPTS IN COMPLETED FLIGHT PLAN

1-23

YOU NOW HAVE A COMPLETE FLIGHT PLAN FROM THE LONG BEACH AIRPORT RUNWAY 30 THRESHOLD VIA THE SIGNAL HILL 2 SID DIRECT HENDERSON, BLANCAS, BIG SUR THEN VIA THE OLYMPIA 1 STAR TO THE OAKLAND AIRPORT TO MINIMUMS AND THEN TO THE RUNWAY 29 THRESHOLD AND THROUGH THE MISSED APPROACH PROCEDURE.

FLIGHT OPERATION

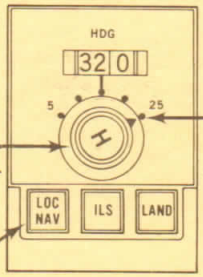
SELECT HSI TO NAV 

AND MAG OR TRU 

SET 

2-1

CHECK CROSSTRACK ON HSI 
AND PERFORMANCE PAGE XTK L3.0 2-2

IF REQUIRED SET HDG SELECT INTERCEPT HEADING PULL 

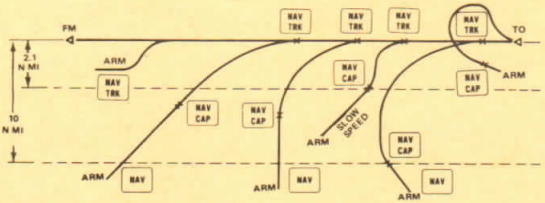
SET 25° HDG SEL 2-2

PRESS TO ARM NAV OBSERVE NAV ARMED NAV HDG SEL 2-2

FLY FLIGHT DIRECTOR OR ENGAGE 

IF REQUIRED 2-2

OBSERVE 
REDUCING CROSS TRACK PERFORMANCE XTK L2.5 2-2

CAPTURE LAWS 

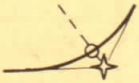
2-3

OBSERVE NAV CAP AND CAPTURE ON FD AND AP 2-2

ACKNOWLEDGE FAULT OR ALERT ON PROG PAGE PRESS (BY PRESSING LINE KEY 5 OR 6) 8-1

OBSERVE TO SXC ALERT 15 SECONDS PRIOR TO HSI LEG SWITCH  AND NAV CAP 2-4

MONITOR/ACCOMPLISH AUTOPILOT/FD/MANUAL LEG CAPTURE–TRACK 2-4

OBSERVE CDU FROM/TO CHANGE AT BISECTOR  2-4

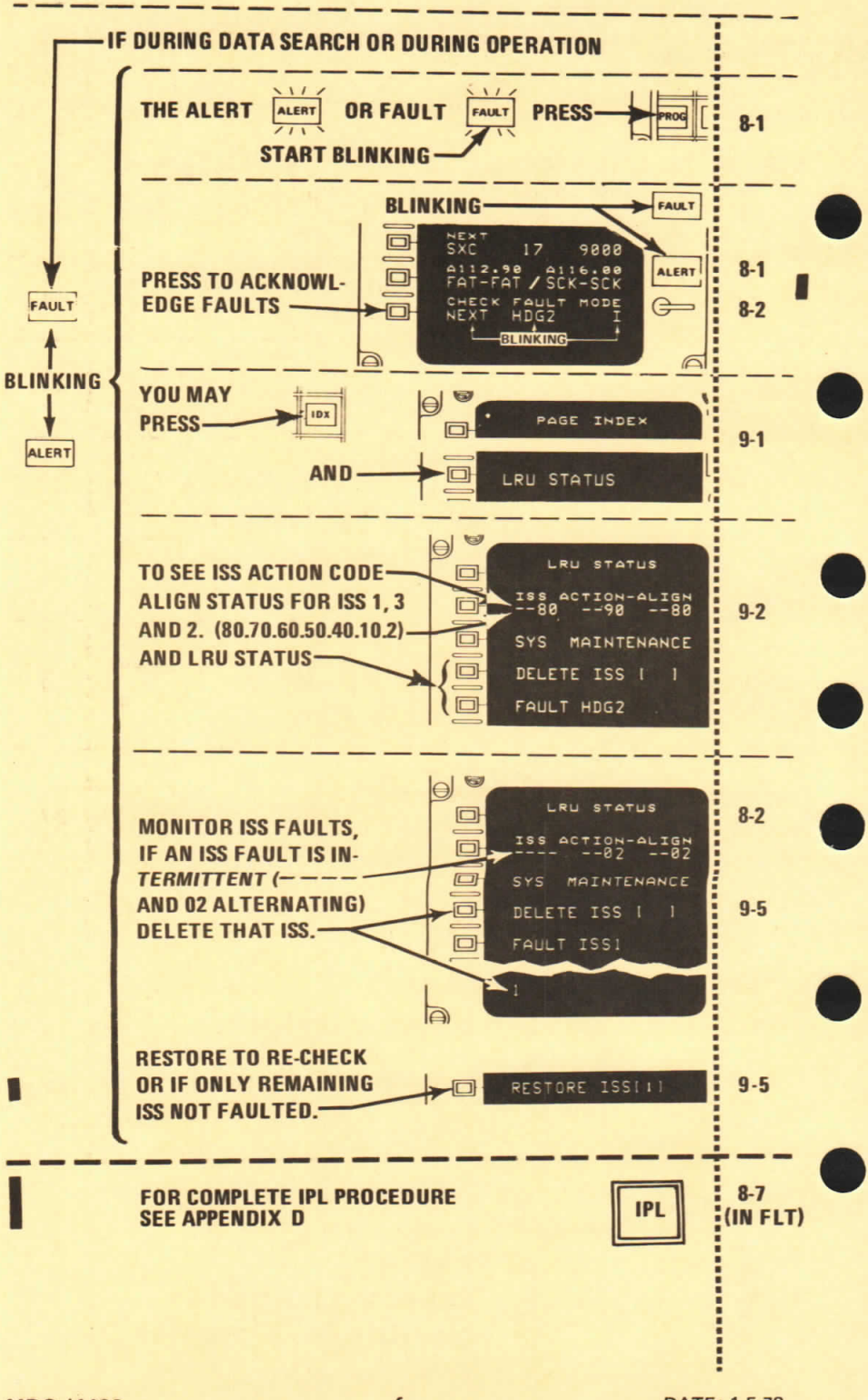
OBSERVE NAV TRK AND  AND PERFORMANCE XTK 0.0 2-7

SHUTTERED ABOVE 250 KT GND SPD

OBSERVE DISTANCE TO WAYPOINT DECREASING 

2-7

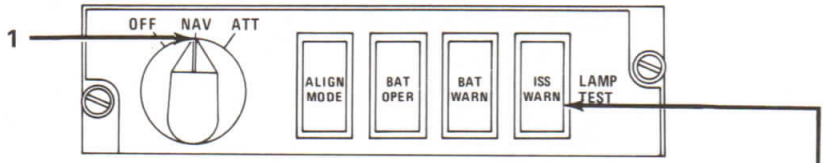
MONITOR HSI COURSE DEVIATION  AND PERFORMANCE XTK 0.0 2-7


IF DURING DATA SEARCH OR DURING OPERATION
THE ALERT
ALERT
OR FAULT
FAULT
PRESS
PROG
8-1
START BLINKING
BLINKING
FAULT
NEXT
SXC 17 9000
A112.90 A116.00
FAT-FAT / SCK-SCK
CHECK FAULT MODE
NEXT HDG2 I
BLINKING
ALERT
8-1
8-2
PRESS TO ACKNOWL-
EDGE FAULTS
FAULT
BLINKING
ALERT
YOU MAY
PRESS
IDX
PAGE INDEX
9-1
AND
LRU STATUS
TO SEE ISS ACTION CODE
ALIGN STATUS FOR ISS 1, 3
AND 2. (80.70.60.50.40.10.2)
AND LRU STATUS
LRU STATUS
ISS ACTION-ALIGN
--80 --90 --80
SYS MAINTENANCE
DELETE ISS 1 1
FAULT HDG2
9-2
MONITOR ISS FAULTS,
IF AN ISS FAULT IS IN-
TERMITTENT (- - - -
AND 02 ALTERNATING)
DELETE THAT ISS.
LRU STATUS
ISS ACTION-ALIGN
---- --02 --02
SYS MAINTENANCE
DELETE ISS 1 1
FAULT ISS1
1
8-2
9-5
RESTORE TO RE-CHECK
OR IF ONLY REMAINING
ISS NOT FAULTED.
RESTORE ISS1 1
9-5
FOR COMPLETE IPL PROCEDURE
SEE APPENDIX D
IPL
8-7
(IN FLT)

COCKPIT SETUP

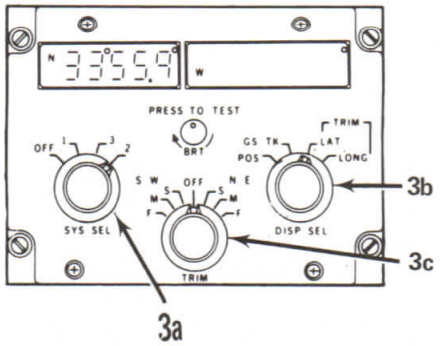
MODE SELECT UNIT (MSU)

For optimum accuracy at departure, it is good operating practice to realign the ISS's just prior to leaving the gate (provided turn-around time permits). To facilitate this, the ISS's should be switched OFF as soon as the airplane is parked at the gate to allow at least 4 minutes for gyro spin down.



1. Turn all three Mode Selector Switches to NAV to start coarse alignment of the ISS's. Fine alignment of the ISS's will begin when present airplane position is inserted either as a Ramp Number or as a LAT/LONG (See Pages 1-10 and 1-11).
   If present position (Ramp Position) has not been inserted within 3 minutes after selecting NAV mode, the ISS WARN light will blink until present airplane position is inserted.

2. If an ISS is turned ON after present position has been inserted via the CDU the ISDU may be used for back-up initialization (See page C-2). When ISDU is used, the LAT trim must be slewed for each ISS being initialized even if correct coordinates are displayed.



3. If an ISS WARN light continues to blink after initialization proceed as follows:
   a) Select affected ISS with ISDU SYS SEL switch.
   b) Select LAT with DISP SEL switch.
   c) Using Trim slew LAT display several tenths away and back to correct ramp coordinate.

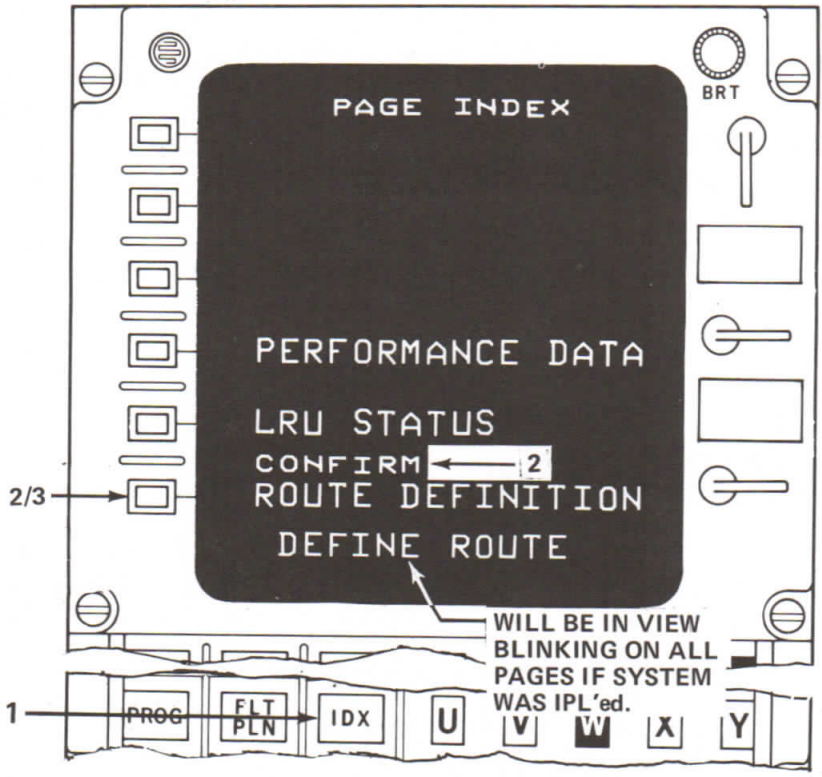
NOTE:

When ramp coordinates are inserted via CDU the ISDU LAT/LONG displays for each ISS should be within 0.1 degree.

CAUTION:

a) Do not move airplane when ALIGN mode light is on.

b) Always check compasses after switching MSU from OFF to NAV or ATT.



1. Access the PAGE INDEX via the IDX key.

   NOTE:

   Look at equipment status by pressing Line Key 5 if required. Return via IDX key.

2. Press Line Key 6 to access Route Definition Page. "CONFIRM" will appear – BLINKING.
3. Press Line Key 6 again to CONFIRM.
4. If the DEFINE ROUTE command is cross talked the other CDU will also display the flight plan.

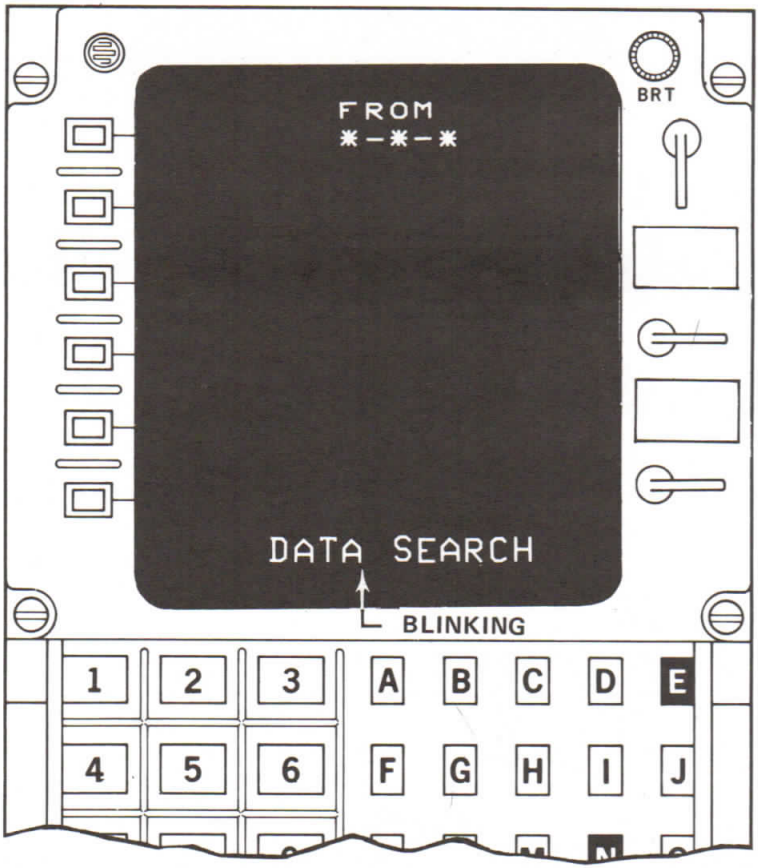
   If "DEFINE ROUTE" continues to blink on the opposite CDU, wait for the assembly to complete and cross talk. Then check flight plan and CLR the "DEFINE ROUTE" warning.

5. During Route Definition only limited CDU entries are possible. (See Page 5-10).

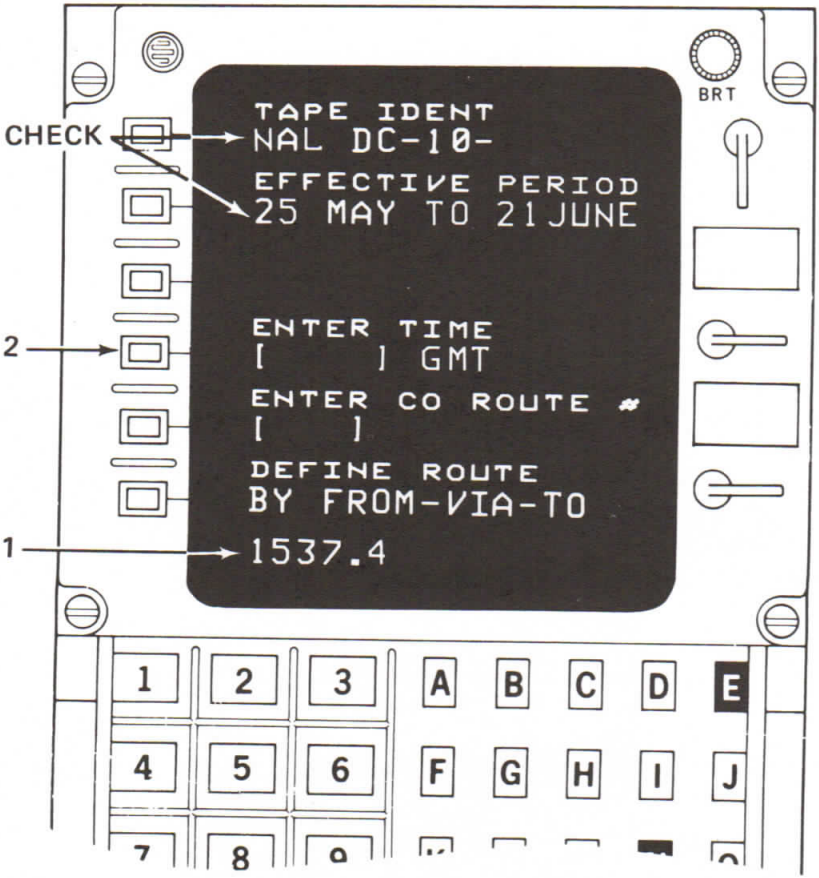
NOTE:

a) When the PAGE INDEX *appears following an IPL with the other NCU operating, both CDU's will freeze for about 30 seconds while the data base, Flight Plan, and PPSN are transferring from the operating NCU via cross talk.*

b) If the other NCU cannot crosstalk the flight plan and NAV data, after an inflight IPL, route assemblies are possible only from the Revise Page. For details of position updating and route definition, see page 8-7.



This format will then appear for about 40 secs while the computer gets ready to accept the flight plan. It is digging out a flight plan form for you.



The Route Definition page will then appear. The system is now ready to accept the time and routing.

CAUTION:

Wait until both CDU's have this page and check for proper tape identification.

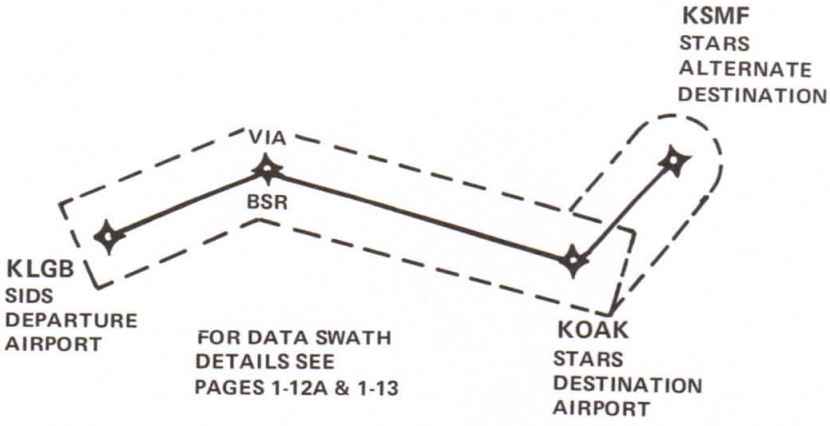
THEN

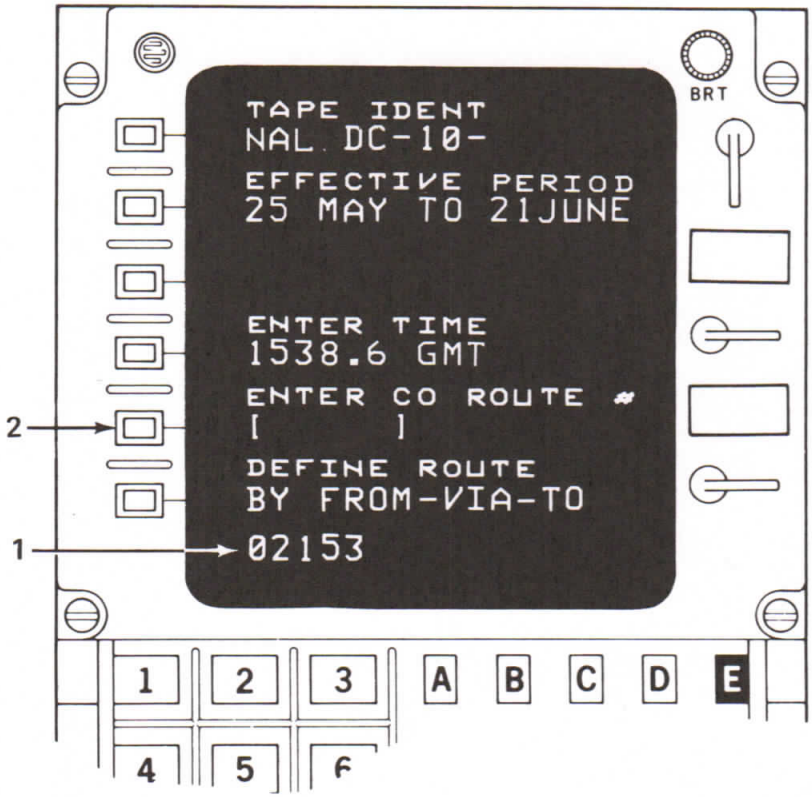
1. Enter (type in) the time at the next one tenth minute (1537.4). See it in the scratchpad.

NOTE:

As the first digit is pressed (1) the other CDU reverts to the blank Flight Plan page, or to the previously selected and/or displayed page.

2. Insert time at 1537.4 by pressing Line Key 4. (Time may be updated later if required.)





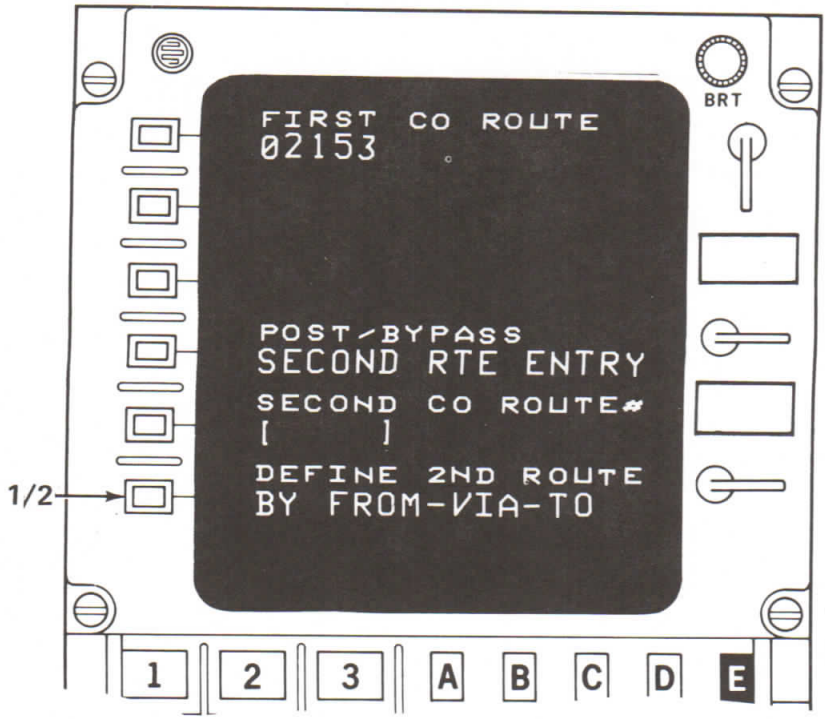
The first route (KLGB to KOAK) will be a company route, the second route to an alternate destination(KOAK to KSMF) will be defined by FROM-VIA-TO for this example.

1. Enter the route number into the scratch pad.
2. Insert into Line 5.

The page format then changes to request a second route. The second route may be postponed for later assembly by pressing Line Key 4. (Press again to CONFIRM)

NOTE:

This action should be taken to avoid STORAGE LIMIT *if the intended routes include dense terminal areas. The second, or continuation route should be loaded as an in-flight revision. (See Page 5-8)*



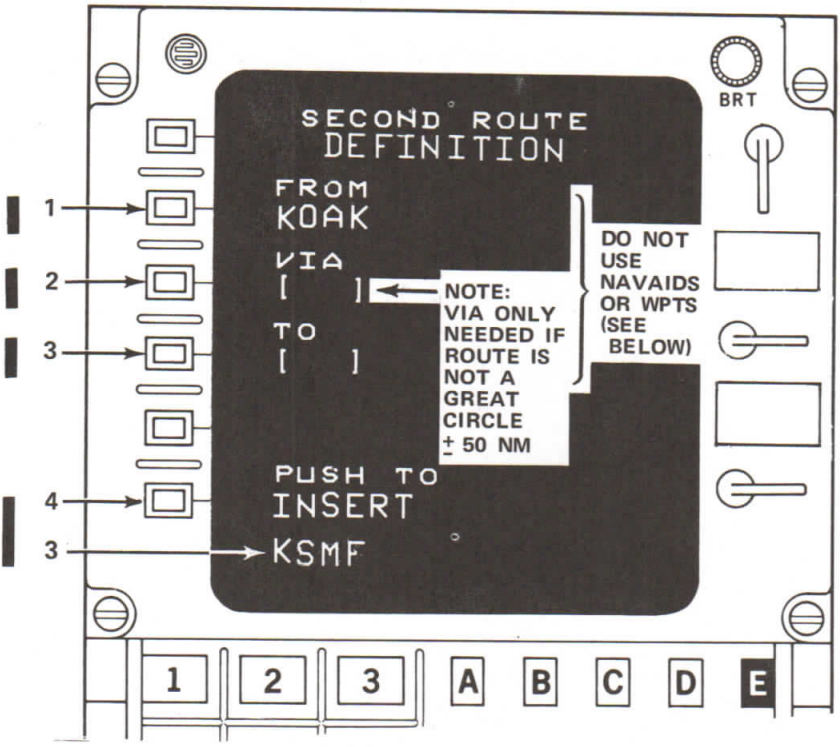
1. Press Line Key 6 to get FROM-VIA-TO format.
2. CONFIRM by pressing Line Key 6 again.

CAUTION

Do not press line key 5 or 6 unless second route is desired.

NOTE:

The route numbers and data base used for this book are fictitious examples for illustration only.



1. Enter original destination airport ident (KOAK) into the scratchpad and insert. Must be airport, LAT/LONG, or a Gateway. Entry may be overwritten.

2. When data swath requires a VIA, enter VIA ident and insert. Must be Airport, Gateway, or LAT/LONG. Entry may be minused out or overwritten.

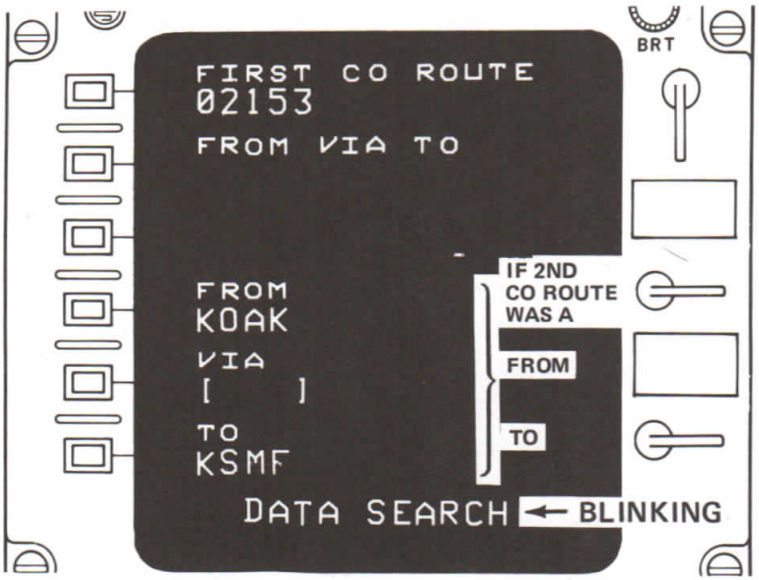
3. Enter alternate destination airport Ident (KSMF) and insert. Must be Airport. Gateway, or LAT/LONG. Entry may be overwritten.

4. Recheck entries and
   PUSH TO INSERT FROM-VIA-TO flight plan.

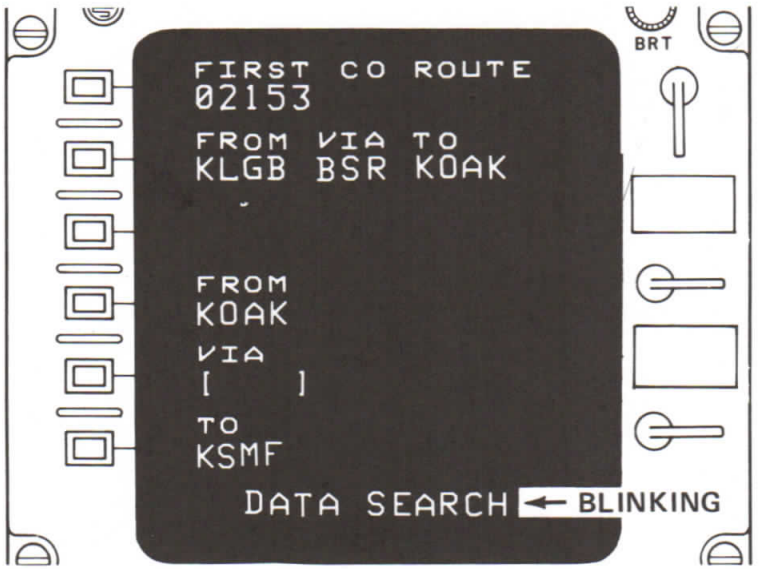
NOTE:

If steps 1, or 3 above are accomplished with a blank scratchpad and later step 4 is completed, the system will search for a "blank" ident and then display " NOT STORED *"Fill in the blank with an acceptable entry.*

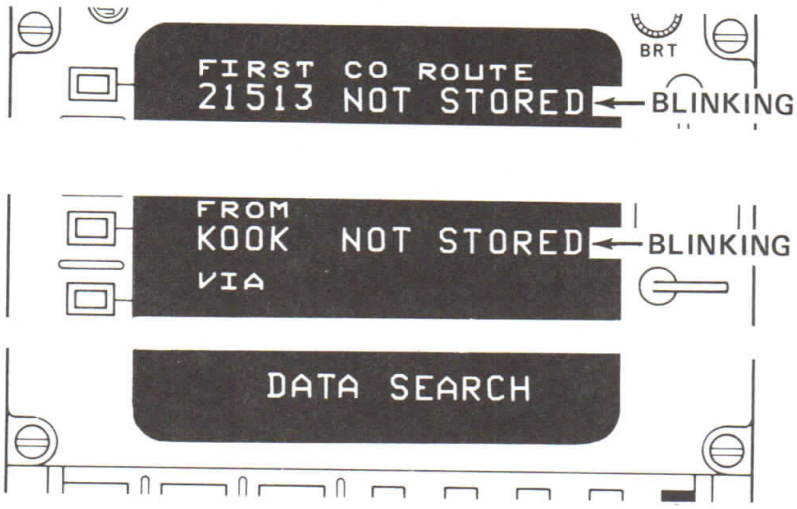
The system now searches the Route Directory for Company Route Ø2153 and KOAK to KSMF data swath.



In approximately 10 seconds it says we have asked for route 02153 from Long Beach via Big Sur to Oakland, and from Oakland to Sacramento. (It is still getting data).

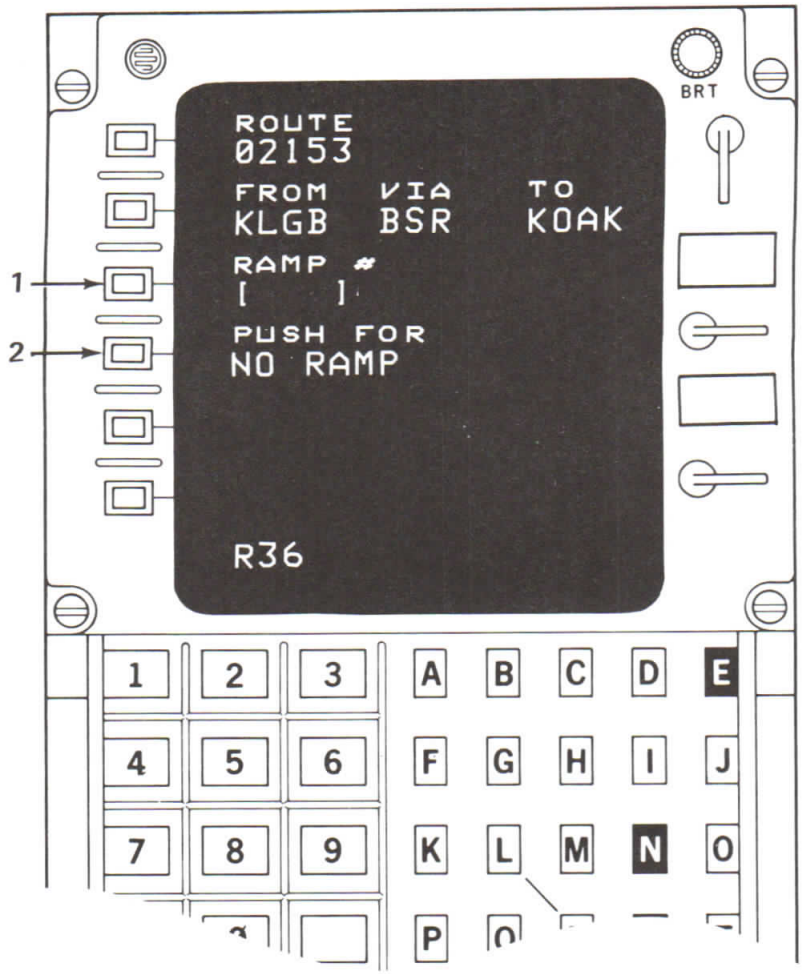


If the Company Route number or any Airport or Gateway in a FROM-VIA-TO are entered wrong, or not in the Route Directory, NOT STORED will blink by the incorrectly entered data. Enter the data correctly or any known correct data in the required direction and insert by the Line Key. Until this is accomplished the system will NOT move off this page.



RAMP NO.

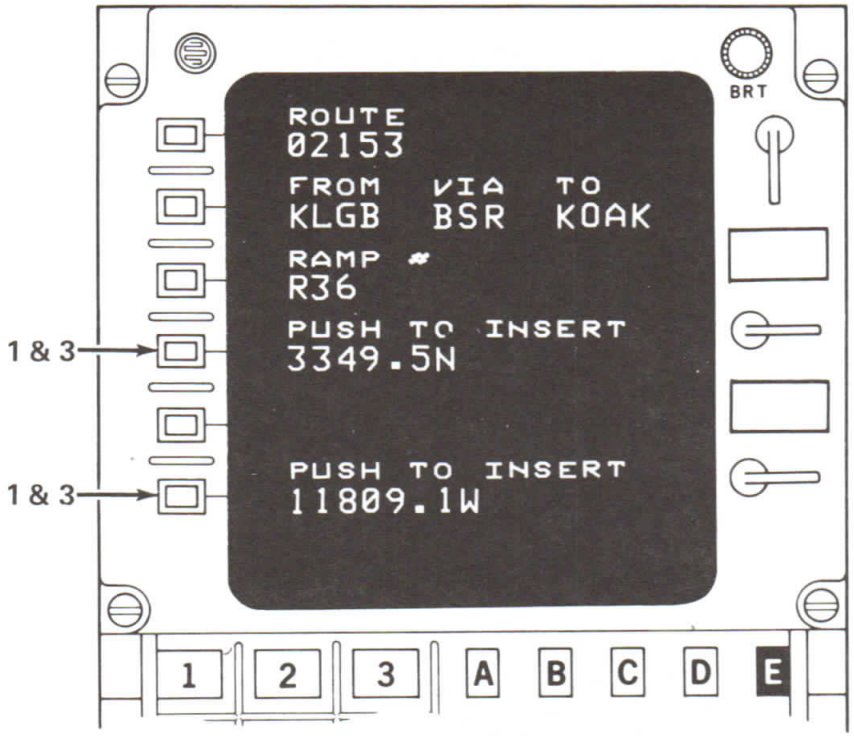
INSERT GATE NUMBER



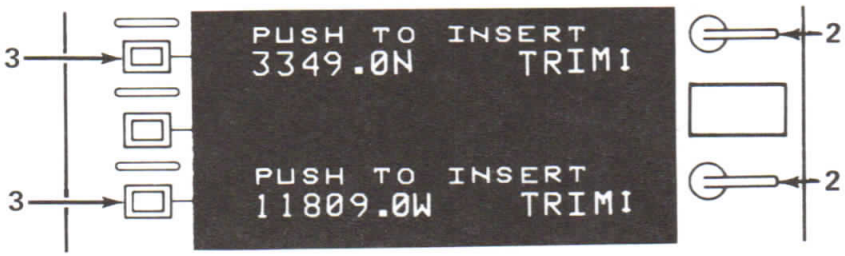
About 15 seconds later it will ask for aircraft position to be defined.

1. If we are on ramp R36 type it in and insert into Line 3.
2. If we want the Airport LAT/LONG. press Line Key 4.
3. If there are no ramps, Airport Reference Point LAT/LONG will be displayed and must be adjusted to airplane position.

Do not use Airport Reference Point (ARP.)

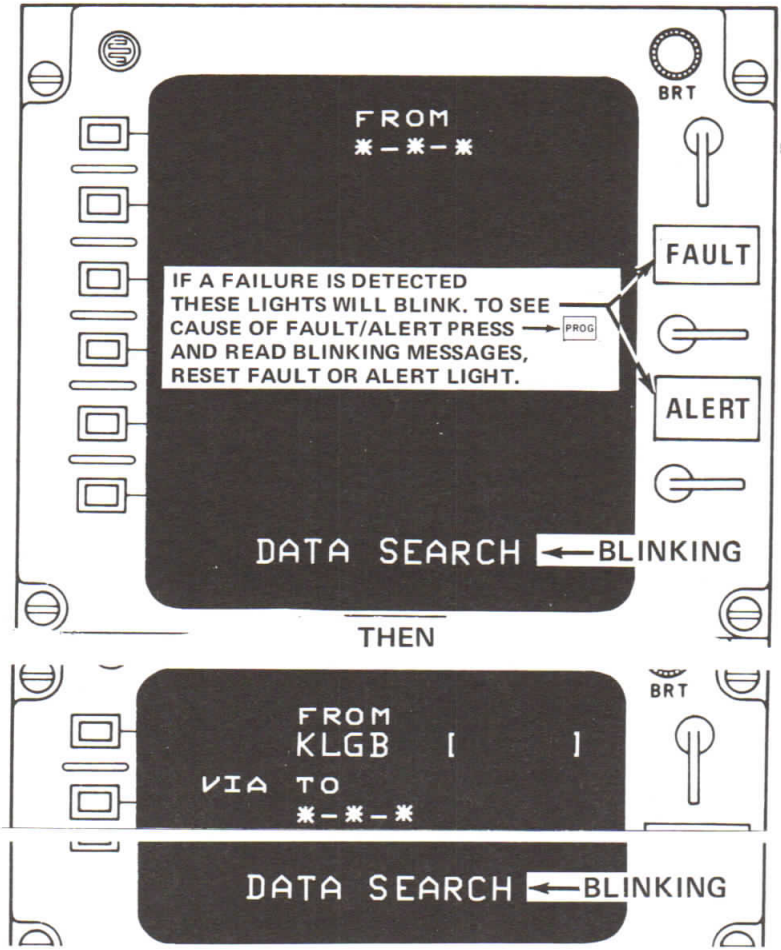


1. Now we see the LAT/LONG. of ramp R36. If we want to change it we may type in the exact LAT or LONG. and insert (overwrite) LAT/and/or LONG, individually.



2. If NO RAMP was selected or there are no ramps, vertical arrows (↕) will appear by lever switches. Airport reference LAT or LONG. may be adjusted to airplane position with Lever Switches.

3. Push Line Keys 4 and 6 to insert LAT & LONG. and start ISS fine alignment (13 minutes). PUSH TO INSERT disappears. Then page changes to 1-12.



The system will now go to the tape (library) and get data required for this flight (charts, etc.) into the computer "CORE" (flight bag). This includes the terminal area data for the departure, destination, and alternate airports, the departure airports SIDS, the destination and alternate airport STARS and the enroute data. You take the tape (library) with you, too!

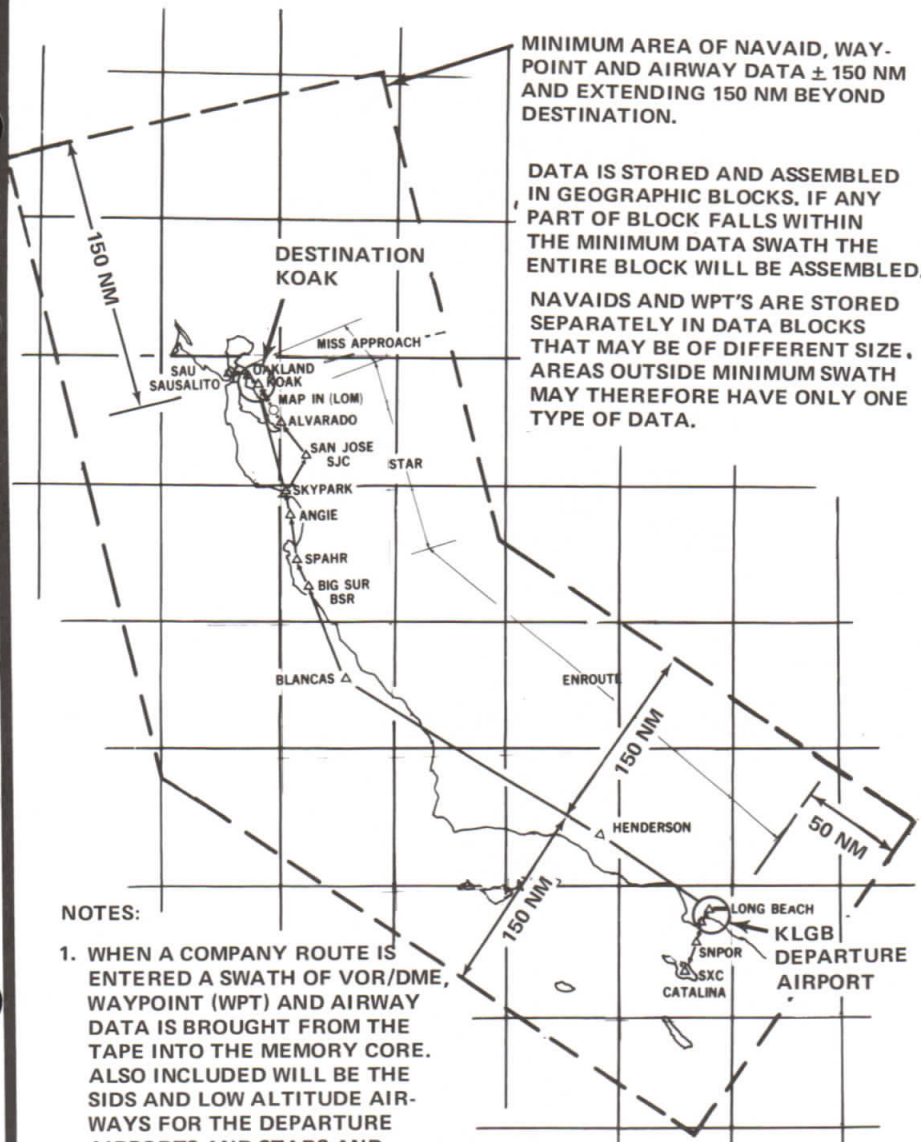
PROG FLT PLN IDX are available while in data search.

Select LRU status on other CDU to monitor the ISS alignment status.

NOTE:

This search takes a few minutes and other cockpit duties may be performed now.

MINIMUM DATA SWATH (COMPANY ROUTES)



MINIMUM AREA OF NAVAID, WAY-POINT AND AIRWAY DATA ± 150 NM AND EXTENDING 150 NM BEYOND DESTINATION.

DATA IS STORED AND ASSEMBLED IN GEOGRAPHIC BLOCKS. IF ANY PART OF BLOCK FALLS WITHIN THE MINIMUM DATA SWATH THE ENTIRE BLOCK WILL BE ASSEMBLED.

NAVAIDS AND WPT'S ARE STORED SEPARATELY IN DATA BLOCKS THAT MAY BE OF DIFFERENT SIZE, AREAS OUTSIDE MINIMUM SWATH MAY THEREFORE HAVE ONLY ONE TYPE OF DATA.

NOTES:

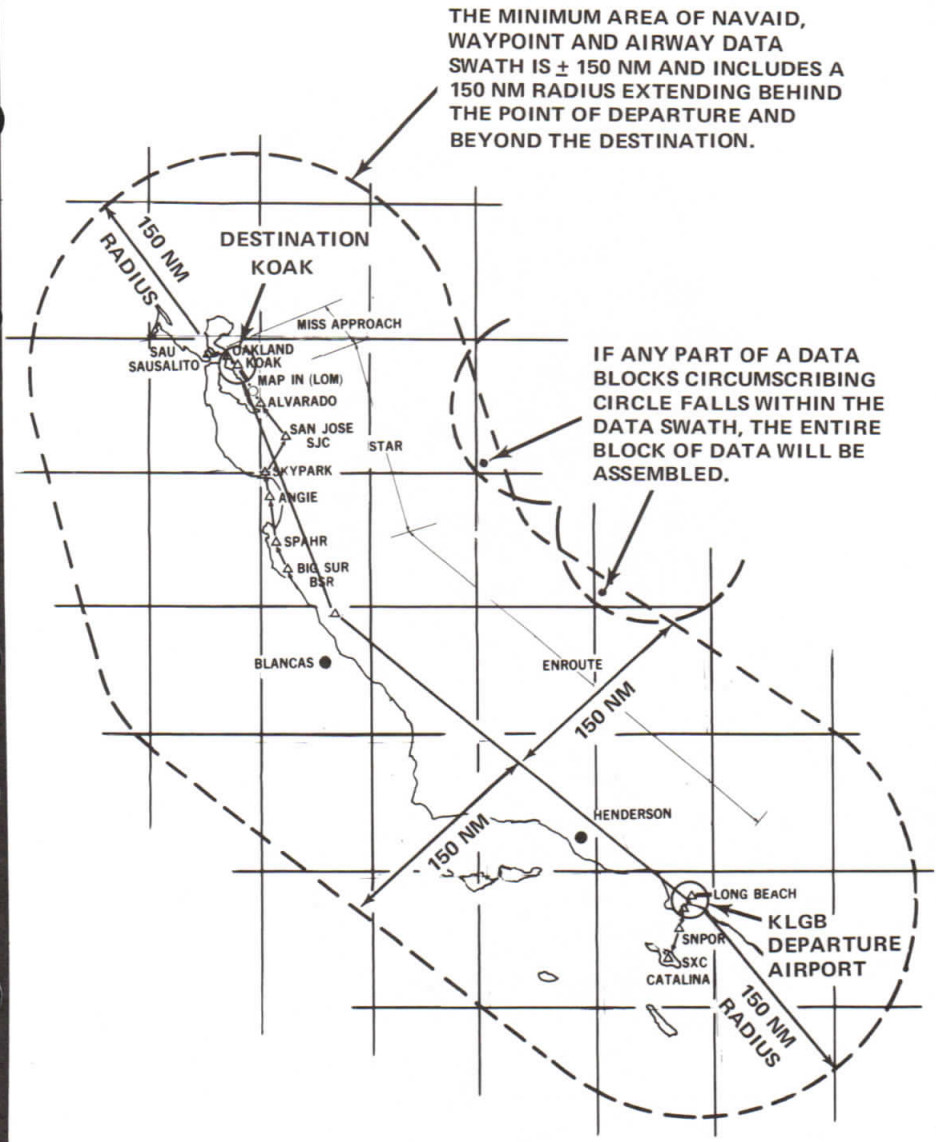
1. WHEN A COMPANY ROUTE IS ENTERED A SWATH OF VOR/DME, WAYPOINT (WPT) AND AIRWAY DATA IS BROUGHT FROM THE TAPE INTO THE MEMORY CORE. ALSO INCLUDED WILL BE THE SIDS AND LOW ALTITUDE AIR-WAYS FOR THE DEPARTURE AIRPORTS AND STARS AND LOW ALTITUDE AIRWAYS FOR THE DESTINATION AIRPORT.
2. THE DESTINATION OF THE FIRST CO. ROUTE AND THE ORIGIN OF THE SECOND ROUTE (IF ANY) WILL BE CONNECTED BY A ± 150 NM DATA SWATH. THEREFORE ASSEMBLY OF PARALLEL ROUTES SHOULD BE AVOIDED.

AREA OF NAVAID, WPT & AIRWAY COVERAGE EXTENDS 50 NM BEHIND POINT OF DEPARTURE ALONG THE RECIPROCAL OF FIRST LEG.

3. NOT TO SCALE

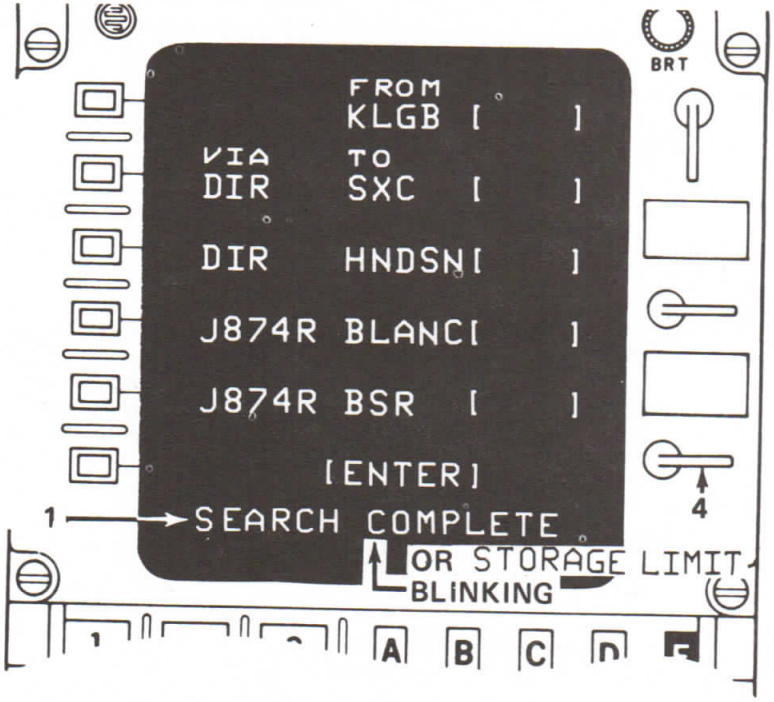
THIS PAGE LEFT INTENTIONALLY BLANK

MINIMUM DATA SWATH (FROM-VIA-TO)



NOT TO SCALE

SEARCH COMPLETE



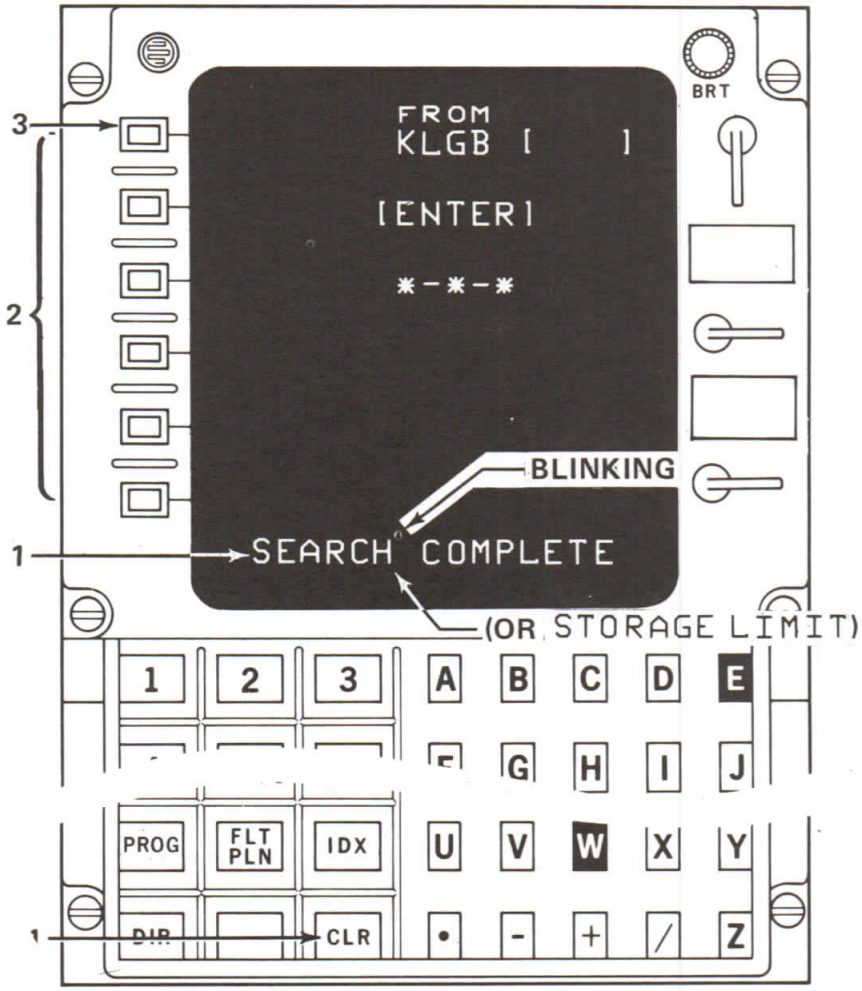
1. When the route data search is complete SEARCH COMPLETE or STORAGE LIMIT blinks in the scratchpad of all pages.
2. SEARCH COMPLETE or STORAGE LIMIT should be cleared with the CLR key on each CDU.
3. Now we see route Ø2153 on the FLT PLN and PROG pages.
4. If there are more than 6 waypoints in the route other waypoints on the route can be seen slewing with lever switch.

NOTE:

STORAGE LIMIT *means that all the required data could not be loaded (due to lack of space in the memory). The system will indicate the point after which data is incomplete by* STORAGE LIMIT AFTER WPT *and request* 'INITIATE SEARCH' *to load remaining data later in the flight. (See page 8-11)*

If the first route was defined by FROM-VIA-TO;
After FROM-VIA-TO assembly
and

are completed, the system is ready to accept waypoints.

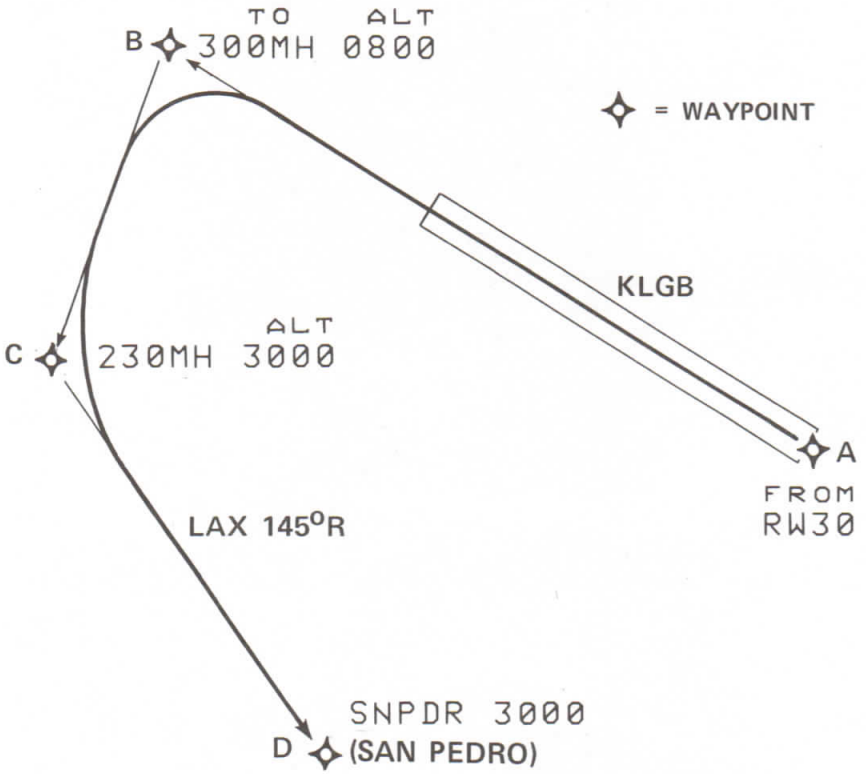


1. Clear scratch pad.
2. Enter and insert waypoints and/or airways, altitudes, etc.
3. Select SID (See page 1-17).
4. Select STAR (See pages 1-21/1-22).

STANDARD INSTRUMENT DEPARTURE

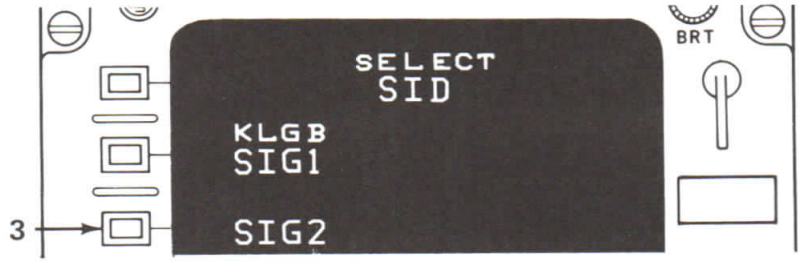
ATC CLEARANCE
VIA THE SIGNAL HILL 2 SID

Runway heading to 800 feet, left to 230°, Intercept the lax 145° radial, then via the 145° radial to San Pedro, climb to and maintain 3000 feet for 3 minutes.



1. The SIDS should be called up by pressing Line Key 1 to add SID after KLGB. This will give us the revise page. . .

2. Now we ask for the SID list by pressing Line Key opposite the word SID.



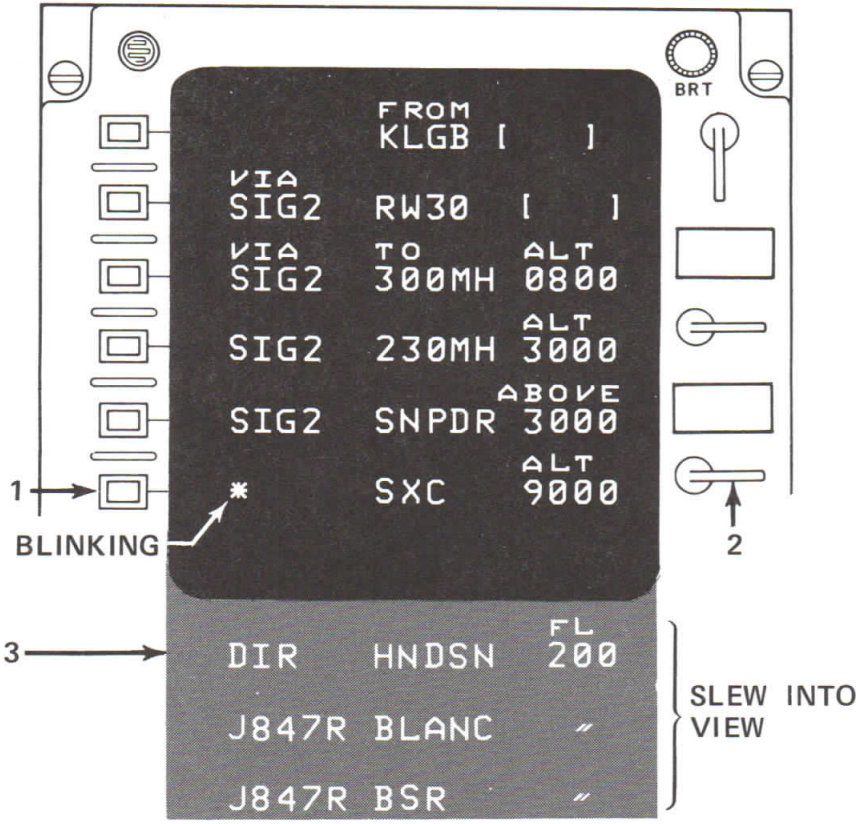
3. We now see all the stored SID idents and select the assigned SID "Signal Hill 2" by pressing Line Key 3.

4. Repeat for segmented SID's. All old SID waypoints from the insertion point to the first non-SID waypoint will drop out.

NOTE:

If the SID is changed prior to takeoff, repeat this procedure, Call up newly assigned SID which will replace the old SID from the point at which it was inserted.

INSERTION OF ASSIGNED ALTITUDE



The flight plan reappears at once with the SIG2 SID between KLGB and SXC complete with altitudes if these were assigned in the stored SID.

An * indicates possible discontinuity between SID and flight plan. To confirm just press Line Key at *. If desired, KLGB may be deleted by inserting "–" at line 1. The * will not appear if the discontinuity occurs between SID/STAR waypoints.

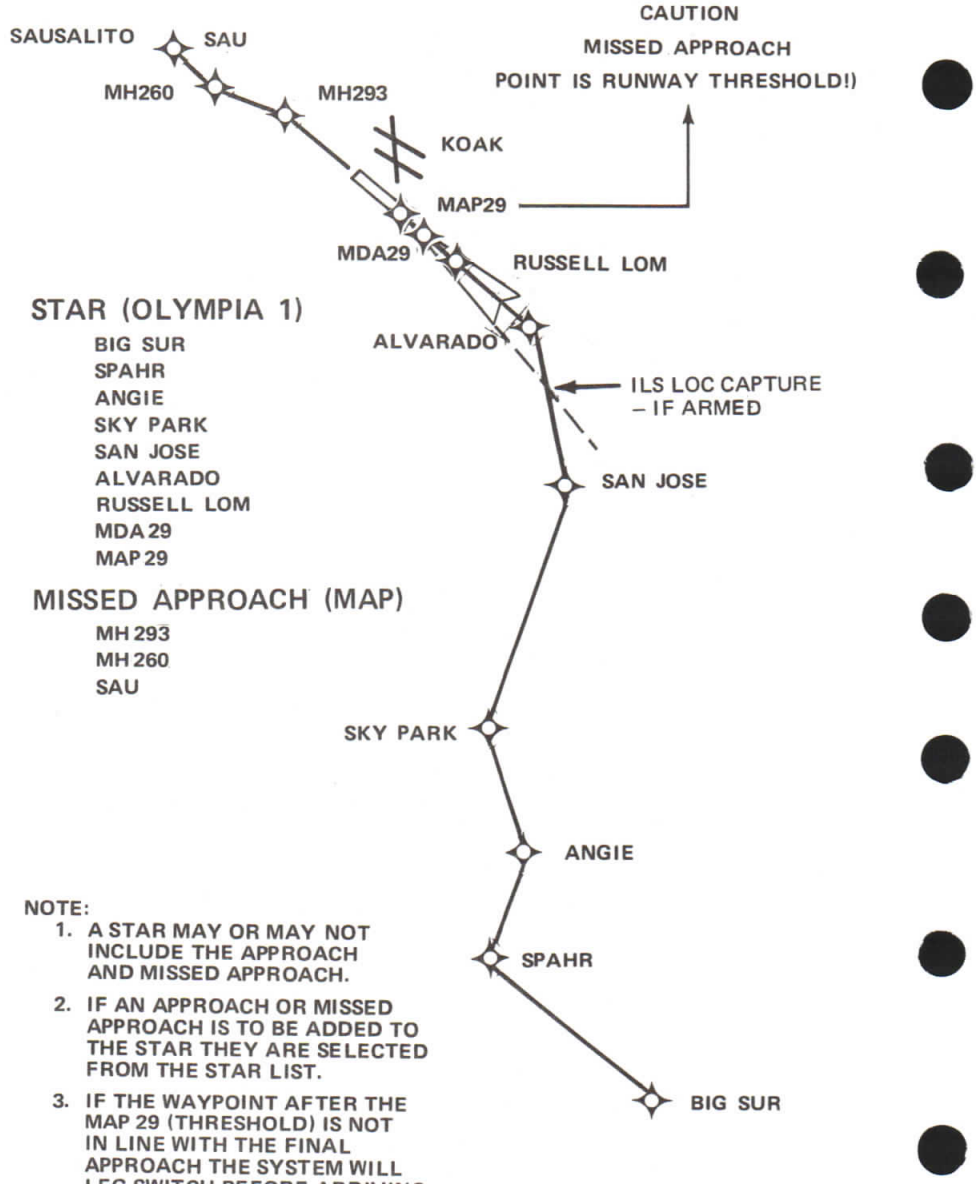
1. If we are assigned 9000 at SXC type it in and insert it at Line Key opposite SXC (altitudes in 4 or 5 digits) " (ditto) will also appear at all enroute WPT's after SXC.
2. Slew up with lever switch for more waypoints.
3. If we are assigned FL200 at HENDERSON type in 200 and insert it at Line Key opposite HNDSN (FL in 3 digits). FL 200 will also appear at all enroute WPT's after HNDSN.
4. If no altitude is entered into the FROM or the TO waypoint, the Vertical Deviation will be flagged on the HSI.

FLIGHT PLAN REVIEW

1. Review Flight Plan by slewing vertically with lever switch.

2. When any Flight Plan is first assembled, any navaids that are to be inhibited should be deleted (See Page 7-2, Para. 6). If NOT STORED results (due to navaid being beyond the storage limit), delete after next continuation assembly.

OLYMPIA ONE ARRIVAL/MISSED APPROACH RUNWAY 29



STAR (OLYMPIA 1)

BIG SUR
SPAHR
ANGIE
SKY PARK
SAN JOSE
ALVARADO
RUSSELL LOM
MDA 29
MAP 29

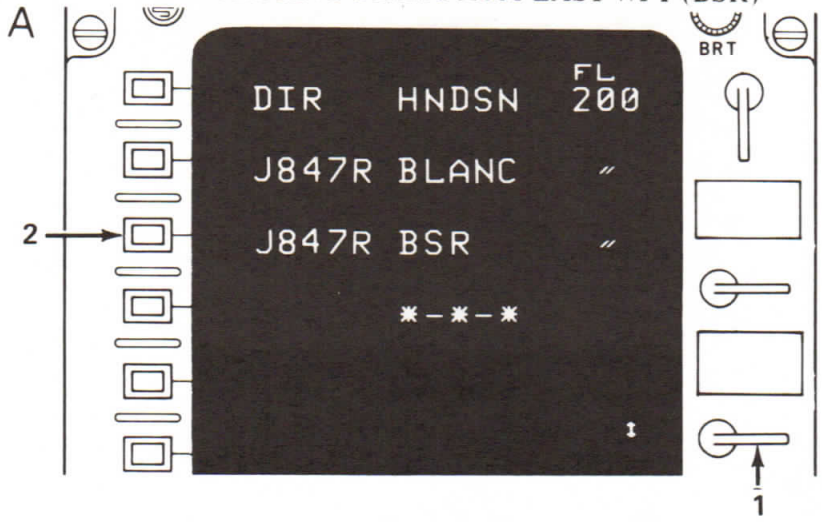
MISSED APPROACH (MAP)

MH 293
MH 260
SAU

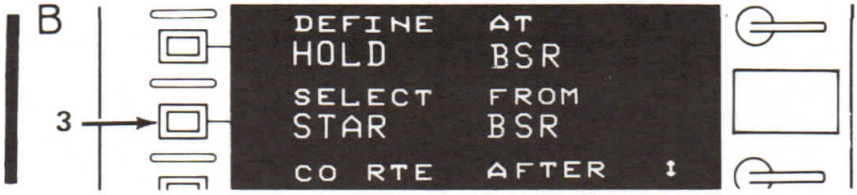
NOTE:

1. A STAR MAY OR MAY NOT INCLUDE THE APPROACH AND MISSED APPROACH.
2. IF AN APPROACH OR MISSED APPROACH IS TO BE ADDED TO THE STAR THEY ARE SELECTED FROM THE STAR LIST.
3. IF THE WAYPOINT AFTER THE MAP 29 (THRESHOLD) IS NOT IN LINE WITH THE FINAL APPROACH THE SYSTEM WILL LEG SWITCH BEFORE ARRIVING AT THE THRESHOLD PARTICULARLY IF THE TURN ANGLE IS LARGE.

FLIGHT PLAN TO KOAK IS COMPLETED
BY INSERTING STAR FROM LAST WPT (BSR)



1. Slew to the route waypoint from which you wish to start the STAR.
2. Press Line Key opposite this waypoint to access the Revise Page.



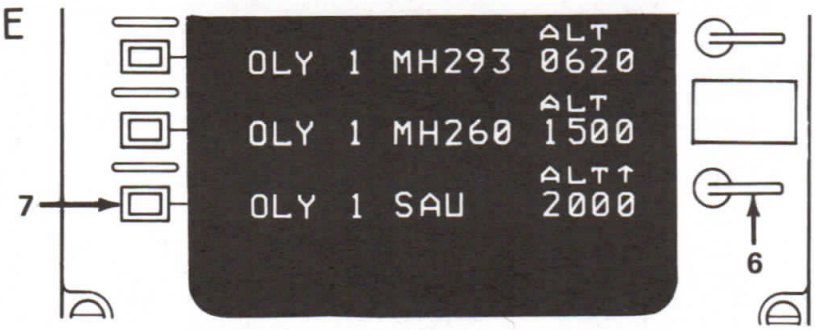
3. Now ask for the STAR list.

4. Select filed/assigned STAR Ident.
5. If Alternate Airport (second route) was inserted its STAR's are available by use of slew lever.

Flight plan will return at once with STAR waypoints and altitudes added to flight plan after the waypoint from which they were selected.

NOTE:

If there had been waypoints after **BSR** *they would have been displaced below the STAR.*



6. Slew to last STAR waypoint.
7. Go to Revise Page and select STAR LIST.

F

8. Select STAR for alternate or second approach which you want linked to the selected waypoint.

CAUTION

*If working on alternate airport do not link destination missed approach to alternate STAR's. You must slew to alternate STAR page (*9) each time you access the* SELECT STAR *page.*

G

Flight plan will return at once with ELK waypoints added to OLY-1 STAR at MH260 waypoint.

H

NOTE:

Any number of "STAR's" may be linked together in this way. This allows transitions, STAR's and missed approaches to be linked or repeated patterns to be flown. If STAR's overlap, all old WPT's from point of insertion to first non-STAR WPT will dropout.

I Blank STAR pages will appear for destination airports which have no STAR's listed and also will appear if Gateways have been selected as destinations.

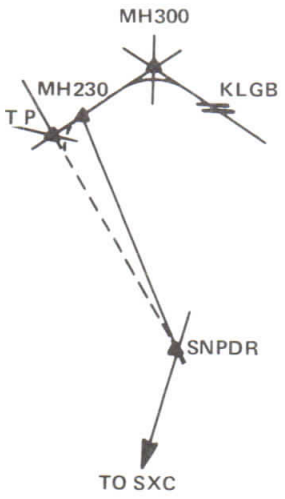
1. Slew to get alternate (2nd route) destination STAR's.

PRESTORED "TURN OVER" WAYPOINT

Any SID or STAR waypoint in the ROUTE NAV data file may be flagged by the airline so that when it is the "TO" waypoint, the leg capture maneuver will not occur until the waypoint is overflown.

The T-P is a point ahead of the "Turn Over" WPT necessary to achieve a tangential capture of the leg to the next waypoint. (The HSI display is the same as if a tangential DIR TO had been inserted at the Turn Over WPT. See Pages 6-1 and 6-2).

If MH230 is a "Turn Over" WPT the actual track which will be flown after passing WPT MH230 is shown by the dotted line from MH230 to SNPDR WPT.



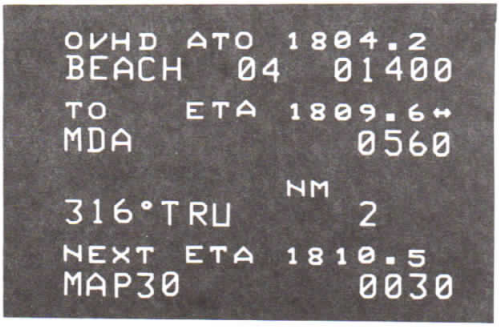
FLT PLN PAGE

OVHD is displayed in the label line of the WPT that has the Turn Over flag set.

	FROM	
	RW30	[DIR]
VIA	TO	ALT
30SID	300MH	0800
OVHD		ALT
30SID	230MH	3000
30SID	SNPDR	"
30SID	SXC	6000

STAR

OVHD		ALT
MIDWY	BEACH	1400
MIDWY	MDA	ALT 0560

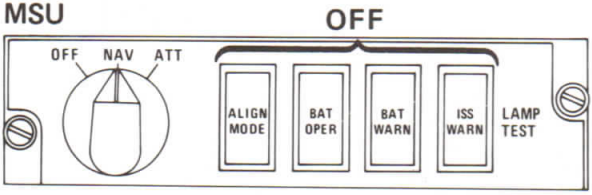


Actual Time Over (ATO), and altitude over a Turn Over WPT are referenced to the waypoint itself and not to the point where the bisector from the extrapolated T-P is crossed.

NOTE:

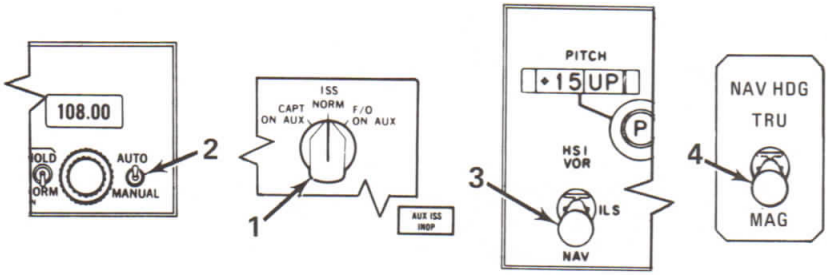
OVHD *will over write existing labels.* FROM-VIA-TO-NEXT

ISS ALIGN COMPLETION



The aircraft must not be moved until all the lights are out on the MSU's.

1. Check that ISS selector switch is in "NORM" and "AUX ISS INOP" light is out.



2. Check that Autotune switch is in AUTO .

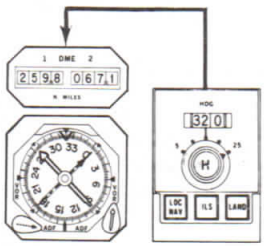
3. Set the HSI switch in NAV position. Observe the first R-NAV leg and cross track deviation display on the HSI and Performance Page.

4. Set NAV HDG switch to MAG or TRU on the main instrument panel. MAG recommended for terminal area operations.

5. Initial CDU mode annunciation will be D/R , changing to I when the first ISS goes into NAV mode. Radio updates will be inhibited until TAS is greater than 130K at which time R/I mode will be annunciated.

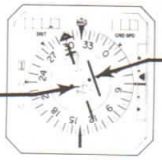
NOTE:

RMI always shows MAG HDG under lubber line and VOR/DME Radial/Distance. HDG SEL bug is always available.



FLIGHT DIRECTOR/AUTOPILOT ENGAGEMENT

CHECK CROSS TRACK ERROR

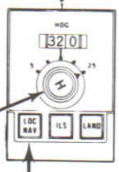


PERFORMANCE PAGE

XTK L3.0

SET BANK ANGLE SELECTOR TO 25°

SELECT INTER-CEPT HDG



PULL KNOB TO ENGAGE HDG SEL MODE

PRESS TO ARM NAV MODE AND

HDG SEL

VERT SPD

OBSERVE

NAV

HDG SEL

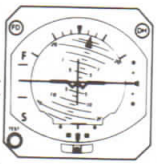
VERT SPD

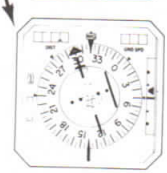
OBSERVE

NAV CAP

VERT SPD

FD OR AUTOPILOT CAPTURE

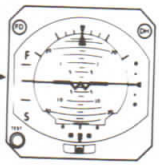


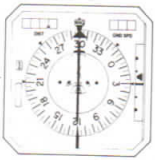


OBSERVE

NAV TRK

VERT SPD





CAPTURE LAWS

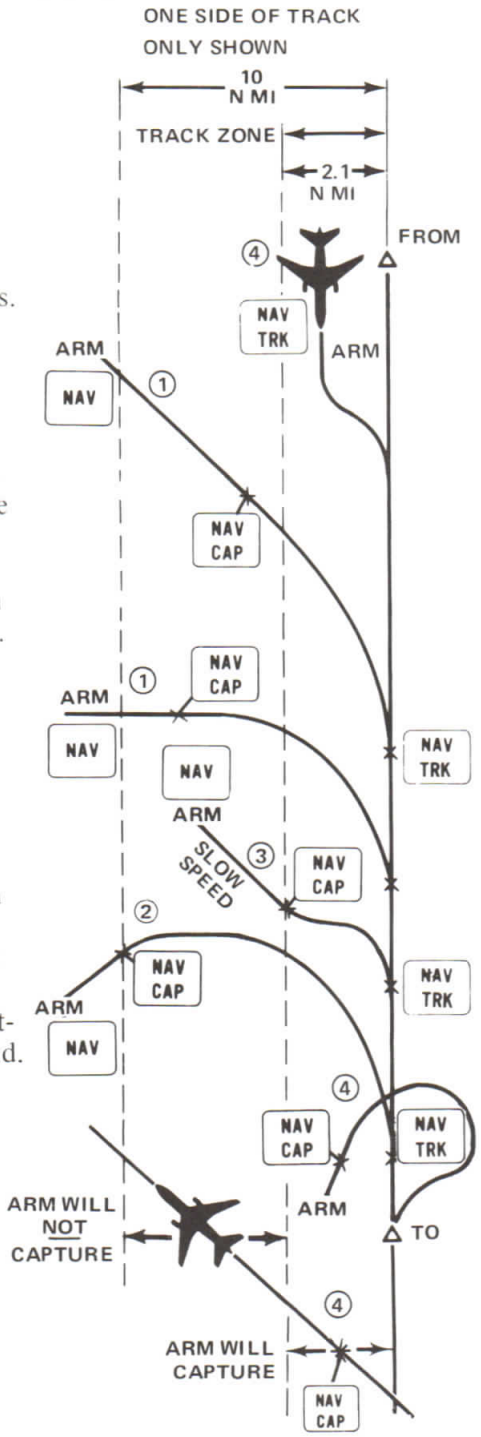
1. If intercept angle is 90° or less, autopilot will capture when NAV computer puts out a roll command to turn aircraft in direction of "TO" waypoint. Maximum X-TRACK allowable by autopilot for initial capture is 10 miles.

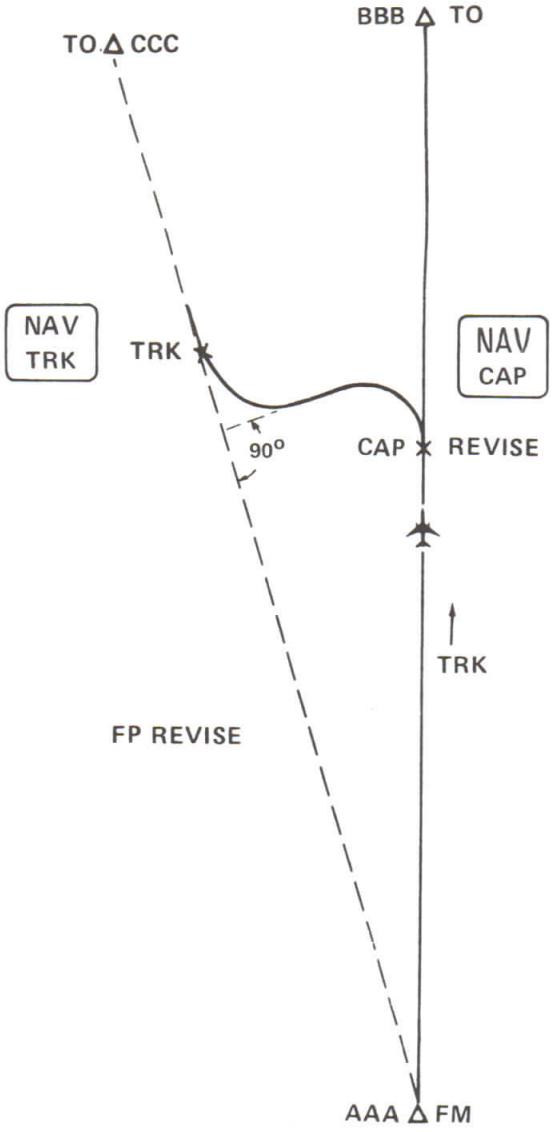
2. If intercept angle is greater than 90 degrees, the autopilot will capture at 10 mile X-TRACK, turn the airplane to 90 degrees, hold a 90-degree intercept until appropriate to make a smooth turn to the "TO" waypoint.

3. Initial captures at Slow ground speed will occur at 2.1 NM and may exhibit a slight "S" turn.

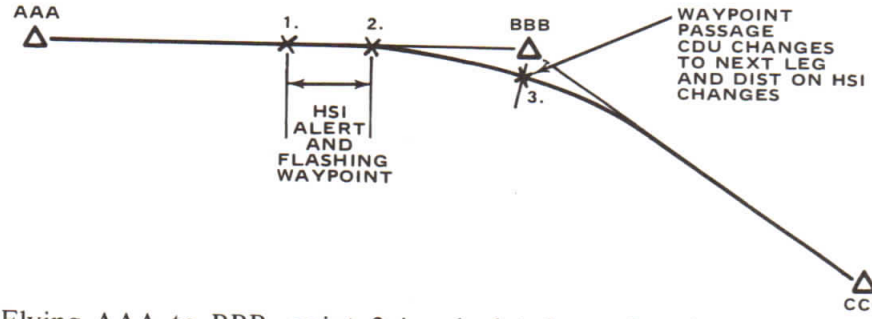
4. If autopilot is armed within the "TRACK" zone, and wings are level within 3°, it will capture immediately without regard to the direction of the steering command. Thus, if parallel to desired track, will make gentle S-turn to track.

5. After DIR TO a mag heading, NAV CAP will be annunciated whenever heading error exceeds 3°, NAV TRK will be annunciated when heading error is less than 3°, wings are within 3° of level, and no force on control wheel.





If "TO" Waypoint is revised from BBB to CCC while flying leg AAA to BBB, system captures leg AAA to CCC at 90° intercept if the distance between tracks permits.

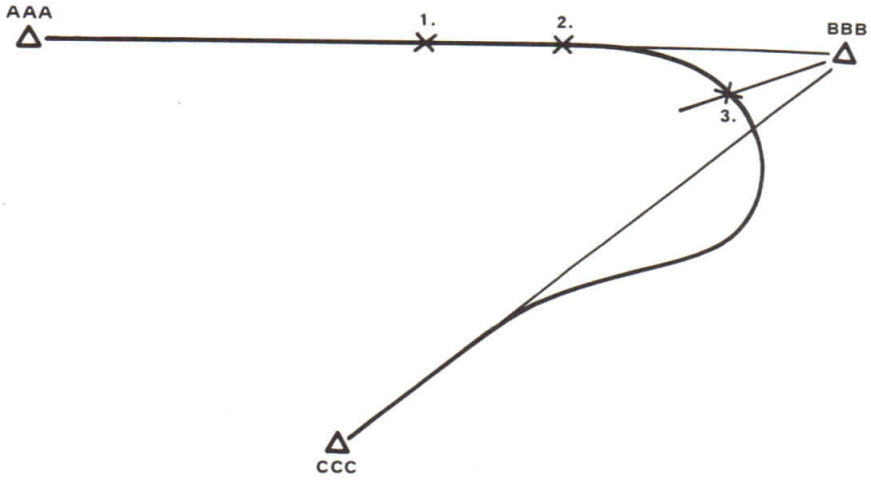


Flying AAA to BBB, point 2 is calculated as a function of ground speed and leg change angle to prevent overshoot. BBB to point 2 is limited to 10 n mi. This limit may result in an overshoot at high speeds and/or sharp turns.

Point 1 occurs 15 seconds before point 2. At this time the ALERT light on the HSI comes on and the Waypoint on the CDU flashes.

At point 2 the HSI switches the HSI card, Course Pointer, Movable Index, Cross-Track Deviation to the new leg. The ALERT light on the HSI goes out.

The Autopilot Bank Angle Limiter Selector is active in the NAV mode, so it will cause overshoots on turns if it is set to a value lower than the value automatically calculated in the NAV computer.



Point 3 is Waypoint Passage and is defined as the bisector of the angle between the two legs. At this point the display of the CDU changes and the distance on the HSI changes to the next Waypoint.

For sharp turns the distance from point 2 to Waypoint BBB is limited to 10 n mi and overshoot can be expected.

LEG SWITCHING

(1) Prior to takeoff, HSI indicates HDG, course and cross track deviation. (Vert Flag is in view if there is no "TO" or "FROM" altitude.) Windows indicate distance to "TO WAYPOINT" and ground speed.

(2) If NAV mode is selected after takeoff and airplane is on course, mode annunciator will show.] NAV TRK [

(3) At point A, (Ref Page 2-7) 15 seconds prior to leg switch, ALERT light illuminates on HSI and the "TO" WPT blinks on flight plan and Progress Pages of the CDU.

(4) At point B, the HSI switches the HSI card, course pointer, movable index, and, cross-track deviation to the new leg. The ALERT light on the HSI goes out. Airplane starts to turn. Distance to go is still to "TO" WPT (300MH).

] NAV TRK [changes to] NAV CAP [

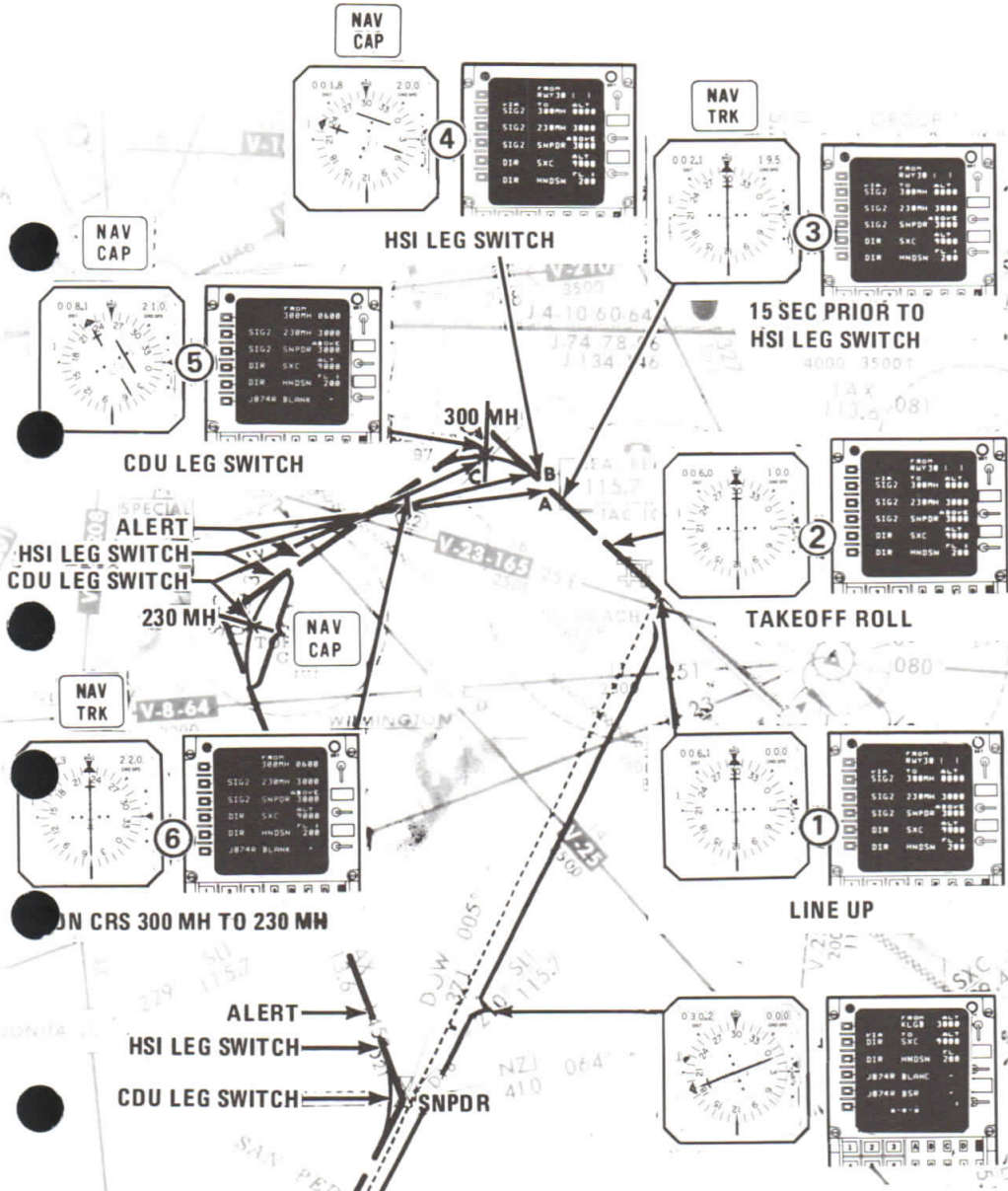
(5) Point C is waypoint passage, and is defined as the bisector of the angle between the two legs. At this point, the display of the CDU changes, and the distance on the HSI changes to the next waypoint.

(6) On CRS from 300MH to 230MH.

] NAV CAP [changes to] NAV TRK [

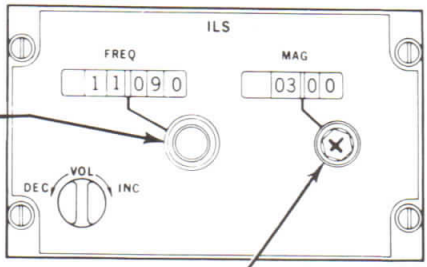
NOTE:

System computes the point at which to start turn to intercept new track tangentially. Airplane cuts corner.


NAV CAP
4
HSI LEG SWITCH
NAV TRK
3
15 SEC PRIOR TO HSI LEG SWITCH
NAV CAP
5
CDU LEG SWITCH
300 MH
C
B
A
ALERT
HSI LEG SWITCH
CDU LEG SWITCH
230 MH
NAV CAP
2
TAKEOFF ROLL
NAV TRK
6
ON CRS 300 MH TO 230 MH
1
LINE UP
ALERT
HSI LEG SWITCH
CDU LEG SWITCH
SNPDR
NOTE:
If no SID was inserted the HSI and CDU would show the first leg (from KLGB-DIR-TO SXC prior to take-off.
GULF OF
SANTA CATALINA
SANTA CATALINA RADIO
REV. JULY 72
SANTA CATALINA
109.4 SXC

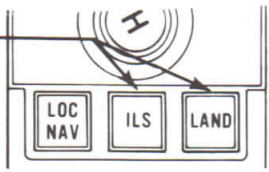
CAPTURING ILS FROM NAV

1. Tune and identify ILS.

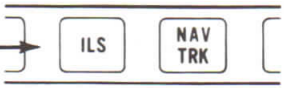


2. Set ILS inbound MAG course.

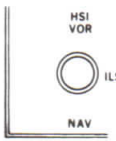
3. Arm ILS or LAND.

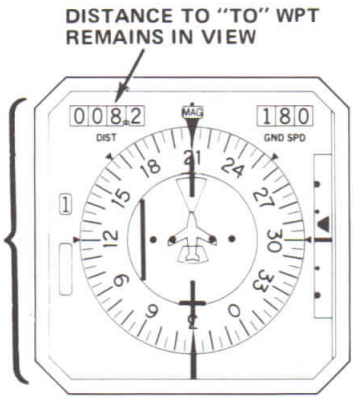


4. Observe armed mode.

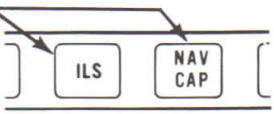


5. Switch HSI to ILS
and
check ILS situation on HSI.
(Downwind shown)



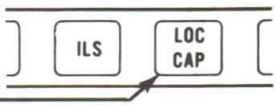


6. (a) Observe



On turn to final approach.

(b) And then ILS capture

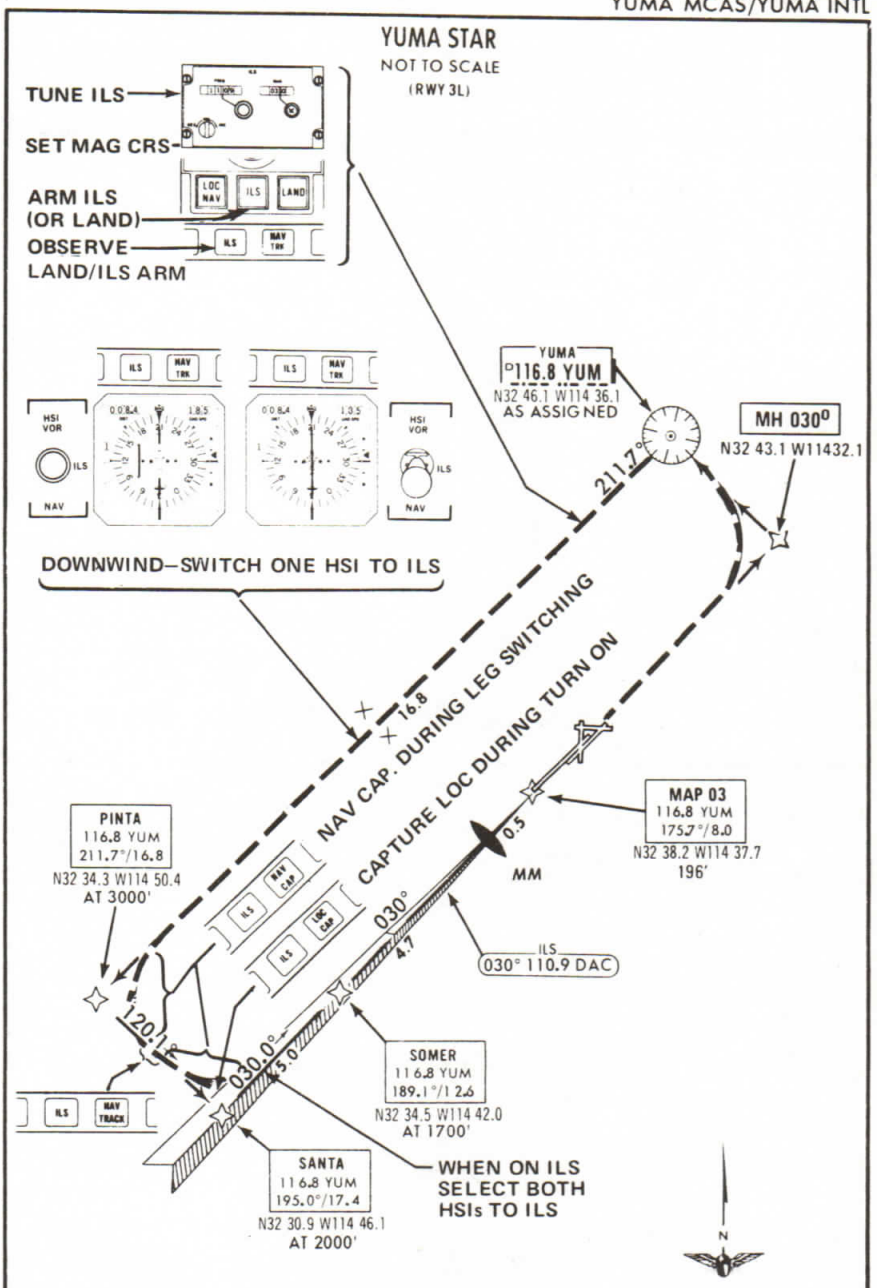


When ILS localizer capture occurs.

7. Monitor capture and track.

NOTE:

Area NAV will start the turn to the ILS inbound leg if the ILS approach is coincident with the STAR. When the ILS capture threshold is reached the FG&C system will transfer to LOC capture. (ILS ARMED)



NOTE:

1. ADI GLIDESLOPE SCALE INDICATES ILS GLIDESLOPE ONLY REGARDLESS OF HSI SWITCH
2. DIST ON HSI INDICATES TO "TO" R NAV WAYPOINT WITH HSI SWITCH IN ILS.

CHANGES: New chart.

MINIMUM INPUTS FOR NAV MODE ANNUNCIATIONS

MODE	VOR/ DME's	DME's ONLY	VOR's ONLY	ISS's	COM-PASS (5)	AIR DATA (5)
R/I (1)	1 or	1		1 (2)	0 (6)	1
SR/I		1 (3) or	1	1 (2)	0 (6)	1
I				1 (2)	0 (6)	0 (7)
R (1)	1 or	2			1	1 (8)
SR		1 (3) or	1 (4)		1	1 (8)
D/R					1	1 (8)
NONE	ANNUNCIATED WHEN NONE OF ABOVE ARE MET					

(1) OK for RNAV accuracy

(2) ISS's must be in NAV mode.

(3) Must pass ambiguity test, i.e., fly-by distance must be 16 times XTK position uncertainty.

(4) SR mode with one VOR-Only navaid obtainable only if NCU was recently in R mode.

(5) May be crosstalked from opposite side.

(6) Uses variation of closest navaid to derive magnetic heading. Exercise caution in using flight plan inputs involving MAG bearings.

(7) Wind display will be dashed and vertical deviation faulted.

(8) HSI NAV flag in view until TAS >130K.

POLAR NAVIGATION INSTRUCTIONS

1. AUTOMATIC NAVIGATION REFERENCE CHANGE ABOVE 85° N or S LATITUDE

   a. Position

   When the NCU Latitude exceeds 85° N or S, the system position will slowly move to coincide with the position of the nearest good ISS. This position change rate is about 0.5% of the present difference every second and will require about 8 minutes to complete. The inertial inputs other than the nearest will continue to be used for monitoring, but not for navigation or display.

   b. Heading, Ground Speed, Track

   Reference for true heading, ground speed and track angle will switch without any delay to the nearest ISS.

   c. Nearest Re-Determination

   The test to determine the nearest good ISS is run every 200 ms update cycle, so a failure or manual deletion of the last nearest ISS will immediately result in using the next nearest.

2. FAULTS ABOVE 85° N OR S LAT

   All on-line monitoring, including those for FAULT ISS 1, 2, 3, and THDG remains operative. When within about 50 mi of the pole, THDG FAULT and COMPare may be annunciated due to small differences in ISS position. Verify system operation and acknowledge faults.

3. RESTRICTIONS ON OPERATING FUNCTIONS ABOVE 85° N OR S LAT

   a. Manual Updates

   Manual position updates should not be used, because they would fade out and cause an error if subsequently deleted when latitude is less than 85°.

   b. Delete ISS ( )

   This function should not be used when there are three normally operating ISS's. If there are only two good ISS's extreme care should be used before deleting one of them. Deleting the nearest ISS would obviously cause a slow change of position to the remaining ISS.

3. Cont'd

c. Holds

Obviously holding patterns should not be defined that straddle the 85° meridian. Also, since holds are defined by the inbound magnetic bearing, their use in areas of unreliable compass headings should be avoided.

4. RESIDUAL EFFECTS AFTER RETURNING BELOW 85°

a. Polar Position Fades Remain

All position fades to the nearest ISS that occurred above 85° will not be eliminated by subsequent usage of additional inertial inputs. Displayed (Performance Page) position when crossing below 85° will be the starting position for incremental average inertial inputs, navaid updates, new manual position updates and deletion of all previous manual updates.

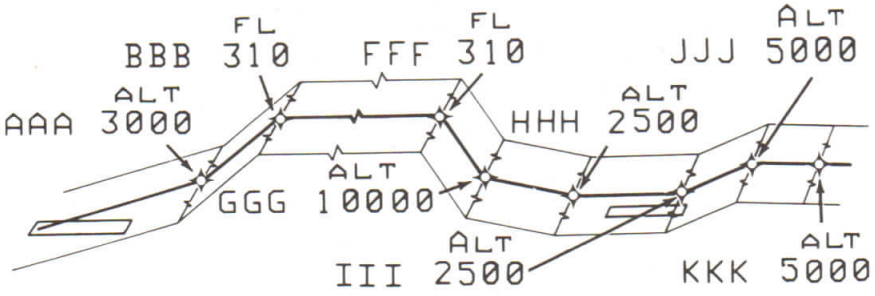
b. Deletion of Manual Updates Restricted

Previous manual updates should not be deleted (applies also to non-transpolar flights as well). If they were good when made earlier in the flight, their deletion may cause undesirable position jumps at "opposite" longitudes. If any manual position updates were made above 85° latitude, they should not be "deleted" because they most likely would have been faded out and their deletion would cause a comparable opposite position jump.

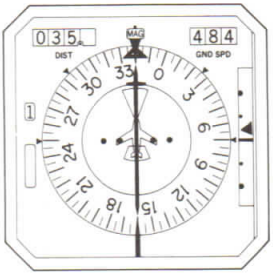
3 ALTITUDE/FLIGHTLEVEL/BAROSET ► 3

VERTICAL PROFILE

- When a 3 digit Flight Level or a 4 or 5 digit altitude is entered into the scratchpad and then inserted by pressing the Line Key next to the waypoint a three dimensional profile results.



- Each waypoint becomes a LAT/LONG. and Altitude. The airplane's position relative to the vertical profile is indicated on the HSI scale.
- The profile cannot be flown on the FD or autopilot.



- This profile may be used as a pilot aid to climb to a Waypoint/Altitude or to monitor the progress of a climb or descent.
- Altitudes/Flight Levels can be changed at will. Changes of the FROM altitude forms a new profile between the FROM and TO waypoint. Changes of the TO waypoint forms a new profile from the present altitude and position to the new TO waypoint altitude.
- Changing a SID or STAR waypoint altitude only changes that waypoint altitude.
- Changing an enroute altitude changes all subsequent enroute altitudes to that altitude with dittos.
- Profiles can be constructed thru one or more intermediate waypoints by entering 0, 00, or 000 at the first intermediate WPT. Profile will extend to the next different altitude. Intermediate altitudes will be displayed as altitudes with an arrow.

A waypoint FL/ALT may be changed by inserting the appropriate three digit FL or four/five digit altitude. (See Page 3-5 for the special case of the TO WPT.)

1. SID and STAR waypoints FL/ALT must be inserted individually and only overwrite the FL/ALT of the waypoint at which the insertion was made.
2. Enroute waypoint FL/ALT changes overwrite all subsequent enroute waypoint FL/ALT with ", except those at the FROM WPT. (See Page 3-5 for altitude changes at the TO WPT.

CAUTION

If an enroute waypoint FL/ALT is changed, reinsert re-required altitude at subsequent waypoints.

3. If the FLT/ALT at HNDSN is changed to FL 200

4. This new flight level will overwrite all subsequent waypoint ALT/FL in the flight plan right up to the first STAR waypoint. STAR waypoint FL/ALT will not be overwritten with (").

PROFILES THRU INTERMEDIATE WAYPOINTS

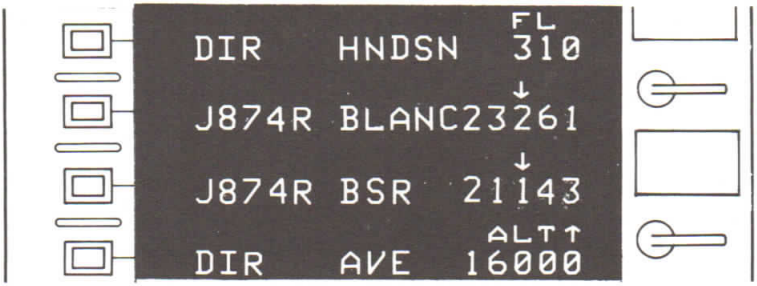
(Not available during DATA SEARCH)

1. If it is required to climb or descend between two waypoints without hard FL/ALT assignments at intermediate waypoints enter 0, 00 or 000 into the scratchpad at the first intermediate waypoint.

2. Insert 0 at BLANC (00 or 000 may also be used).

3. A computed altitude will be displayed at BLANC to provide a straight line descent (or climb) between HNDSN 310 and BSR 16000

4. If the desired altitude is 16000 at Avenal insert 0 at BSR. Since step 2 above had computed an altitude at BLANC, step 4 will compute an altitude profile from HNDSN to AVE.

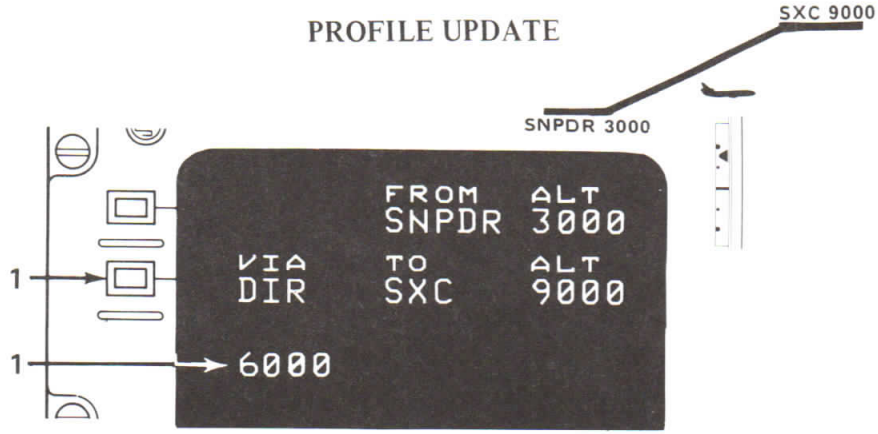


5. Computed altitudes are displayed at BLANC and BSR to provide a straight line descent from HNDSN FL 310 to AVE ALT 16000

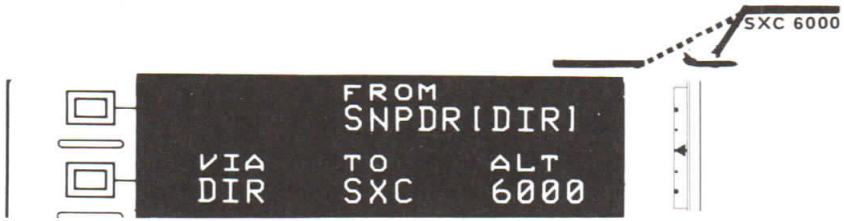
6. If the end point FL/ALT is changed – here AVE 8000 the intermediate WPT altitudes are recomputed* to provide a new continuous profile. They are also recomputed if profile starts at FROM WPT and its altitude is changed.

7. If a profile starts from a FL at the FROM waypoint, FL will remain displayed as waypoints with computed altitudes become the FROM waypoint, regardless of the magnitude of the altitude.

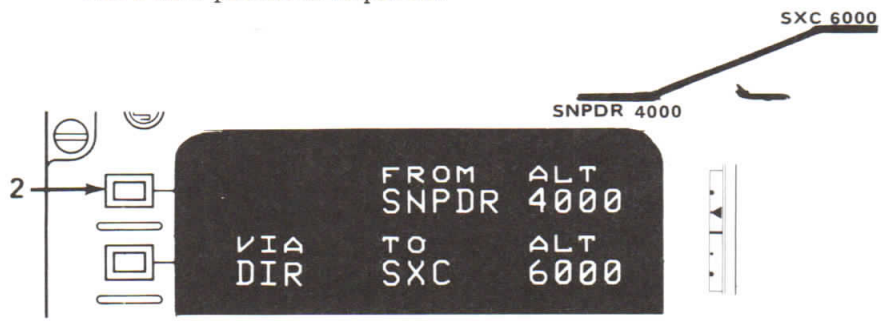
*Not available during DATA SEARCH. Existing arrows change to ALT.



1. If the FL/ALT at the TO waypoint is changed – even by reinserting the same FL/ALT – the profile deviation is re-started from the LAT/LONG and FL/ALT which exist at the instant of insertion. DIR appears in the FROM FL/ALT. This is not available during DATA SEARCH so the FROM altitude would be blanked.



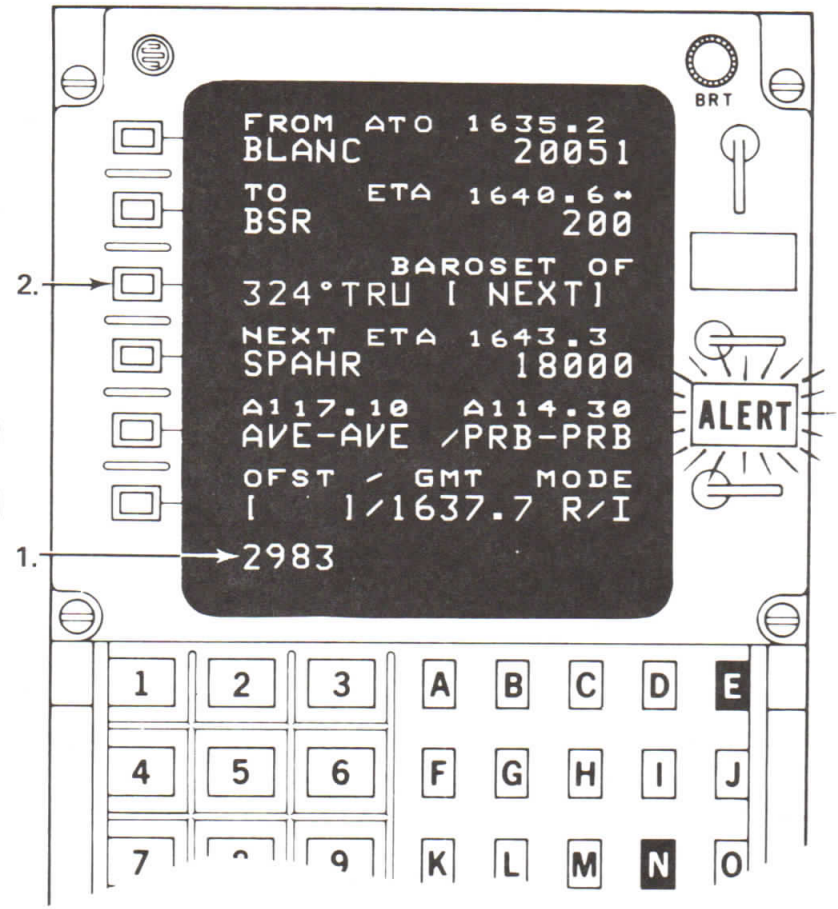
2. A FL/ALT may be inserted at the FROM waypoint to establish a new profile if required.



3. If the TO WPT is changed, it will have a blank altitude which will cause VERT DEV fault, until a new altitude is inserted.

4. If the FROM WPT is changed, a new profile from PPSN is computed (as in step 1 above).

BLANCAS TO BIG SUR
PROGRESS PAGE



Received baroset of KOAK before starting descent at Big Sur.

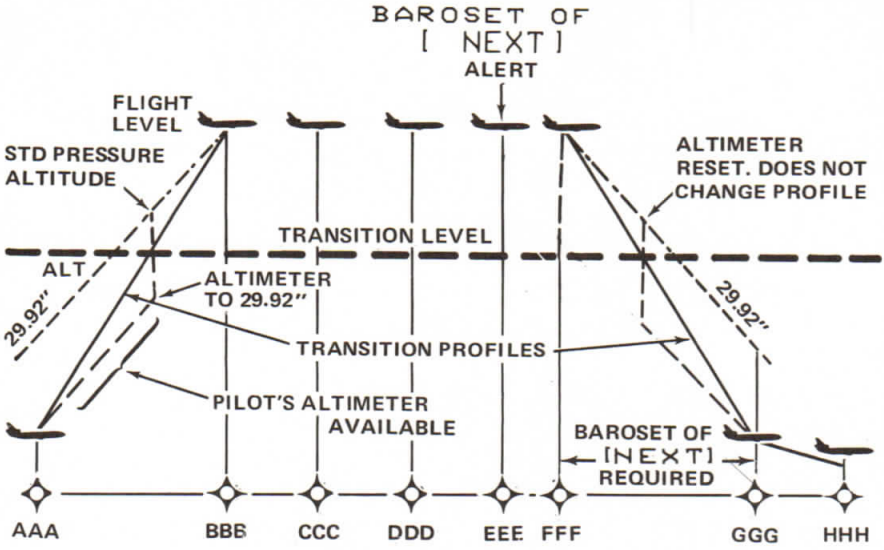
1. Enter KOAK baroset (2983) into scratch pad.

2. Insert using Line Key 3 where requested.

3. Baroset will be displayed in brackets
BAROSET OF
[29.83]

NOTE:

Baroset may be entered either in Millibars or Inches of Mercury – 4 digits required, in both cases, decimal is optional in inches.



1. Transition legs of a profile that start at an altitude and end with a flight level require no BAROSET OF [NEXT] entry. AAA to BBB is an example. The profile is computed using the baroset to standard pressure altitude difference existing at the time that the profile is established. It will not change when the baro setting is changed at the transition level.

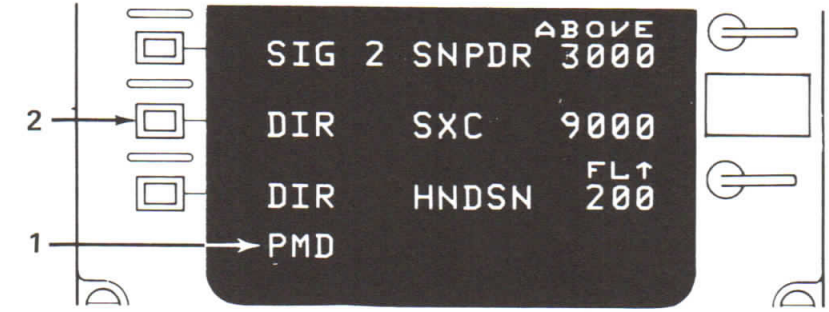
2. Transition legs that start with a flight level (FL must be displayed above three digits) and end at an altitude (ALT above four or five digits), the system must receive a BAROSET OF [NEXT] entry to correctly compute the transition profile. FFF to GGG is an example. This alert, as shown on page 3-6, first occurs when a transition leg becomes the next leg and remains in view until the transition leg is dropped. If the entry has not been made when the transition leg is being flown, VDEV will fault. The entry may be updated. This will recompute the profile, but an altimeter reset will not.

3. Transition legs can extend through intermediate lateral waypoints. The rules in 1 and 2 apply only to the end waypoints. For descending transition legs, when an intermediate lateral waypoint (with a computed (↓) altitude) shifts up to the FROM position, it is automatically converted to the nearest flight level. This retains the BAROSET OF [NEXT] display.

4. If a lateral DIR TO is done, when present altitude is above the transition level, to a waypoint whose altitude is below the transition level, since T-P has a computed (and displayed) altitude this would not be a transition leg and the BAROSET OF [NEXT] alert would not appear. If a FL to altitude transition is desired, insert a FL at T-P and enter the proper baroset entry when the alert appears.

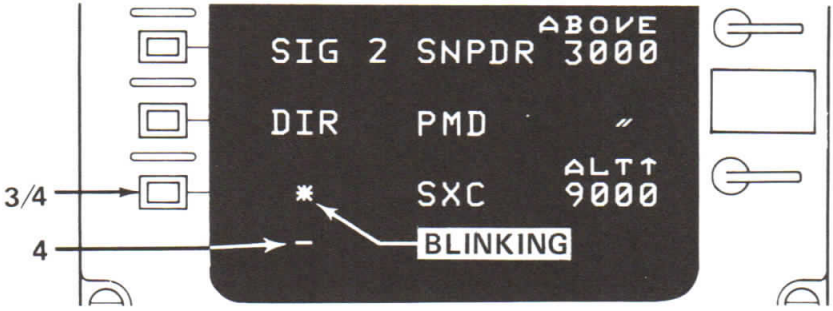
5. If the TO waypoint altitude is updated to an altitude when present altitude is above the transition level, since the resulting DIR at the FROM waypoint is considered an altitude, this also would not be a transition leg. There would be no BAROSET OF [NEXT] alert, even if it had just previously existed. If a transition leg is desired starting at the FROM waypoint, simply insert a flight level at the FROM waypoint and enter the proper baroset entry when the alert appears. If a transition leg from present altitude is desired, it would be advisable to first do a DIR TO the TO waypoint and then proceed as in 4. above.

4 INSERT WPT/AIRWAY/OFFSET/TIME ► 4
/DUPLICATE NAMES



1. Press FLT PLN and enter new WPT in scratchpad.

2. Insert new WPT at required point – here after SNPDR (San Pedro) PMD will displace SXC. Altitude at SNPDR will be dittoed for PMD. Revise if necessary.



An * Indicates possible discontinuity in flight plan.

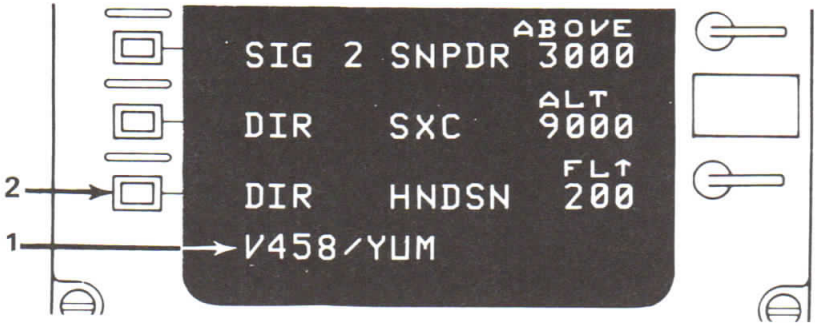
If you want to route SNPDR – PMD – SXC

3. Press Line Key by | ▭ | * SXC

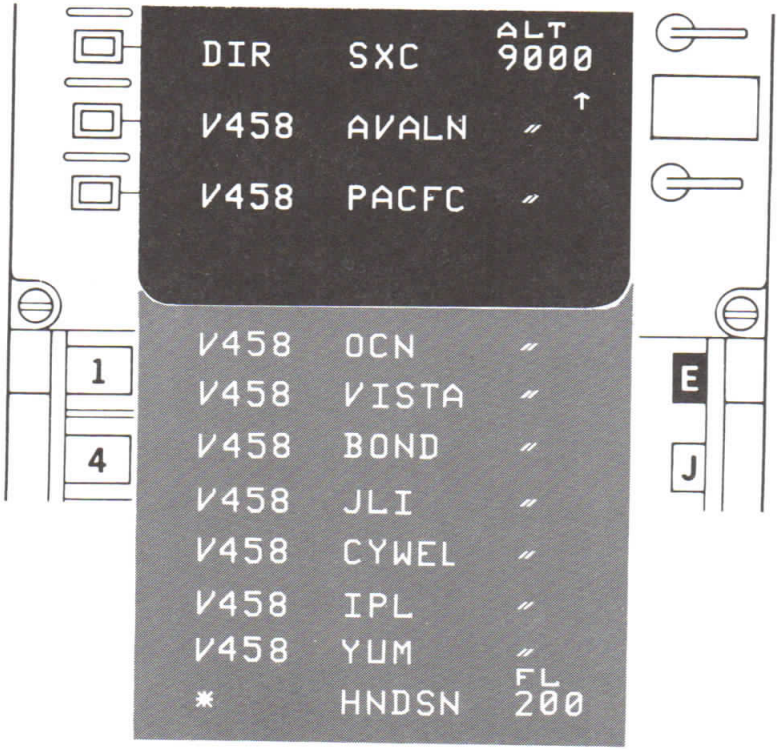
4. If cleared PMD direct HNDSN enter " – " in scratchpad and insert at SXC to eliminate SXC. An * will appear by HNDSN Confirm PMD direct HNDSN by pressing Line Key opposite * HNDSN

INSERT KNOWN STORED AIRWAY

1. Press FLT PLN and enter V458/YUM. in scratchpad.



2. Insert V458/YUM after SXC.



All V458 waypoints to YUM will appear in flight plan displacing HNDSN. If V458 does not pass through SXC or is not stored or if YUM is not stored, V458/YUM will alternate with airway not stored in scratchpad. To obtain list of airways available (See Page 5-2).

1. Enter LAT/LONG. as shown and check.

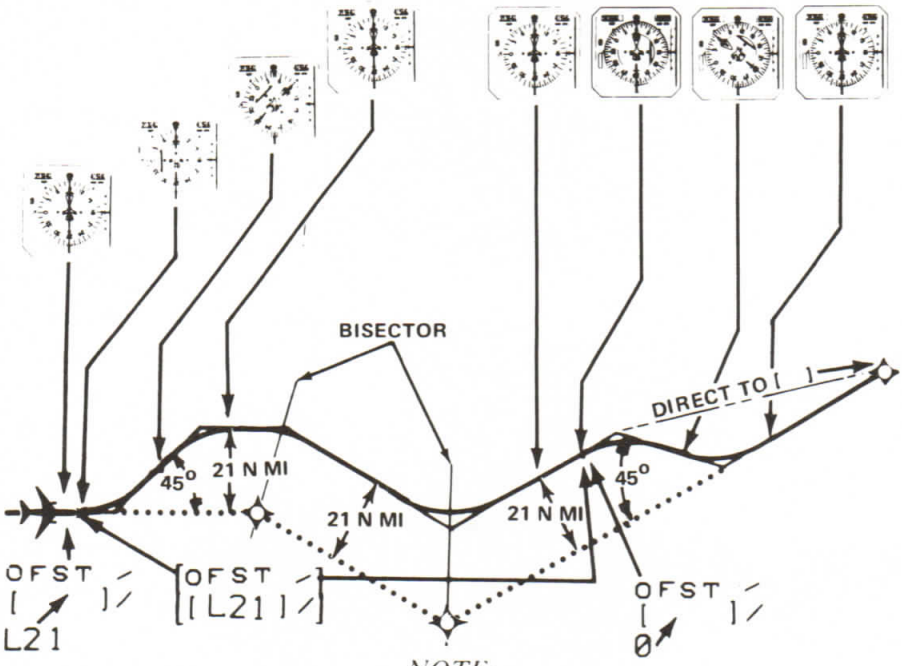
2. Insert LAT/LONG. waypoint into flight plan where it is required.

3. LAT/LONG. waypoint will displace BLANC and be displayed in sequence as shown above. If desired BLANC may be deleted by inserting "—" with the line key opposite BLANC.

NOTE:

LAT/LONG. may be used for any waypoint or the entire route if required. The system will navigate on such a route in or out of "Data Swath" coverage. However, when out of Data Swath the radio mode may be inoperative. The system will only accept 15 LAT/LONG. and/or place/bearing/distance waypoints.

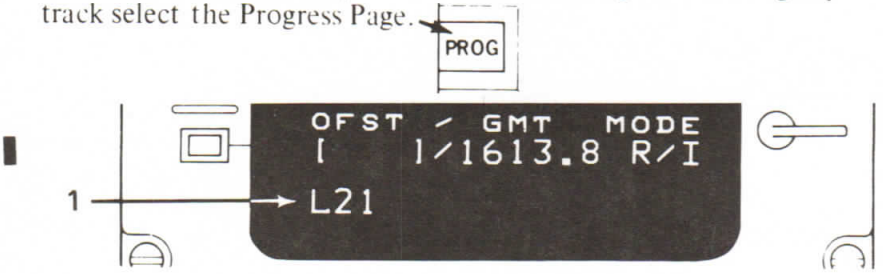
PARALLEL OFFSET



NOTE:

The course will change at the bisector of the angle between the two legs.

To fly a parallel track up to 99 miles left or right of the flight plan track select the Progress Page.

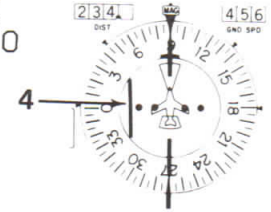


1. Enter required offset direction (L or R) and distance in whole miles up to 99.

2. Insert offset into Line 6. Offset may be revised by over writing or deleted by inserting "0" zero.

3. OFFSET will appear in scratchpad on all Pages. If an entry is made OFFSET will be overwritten until the entry is inserted or cleared, then OFFSET will reappear.

PERFORMANCE
XTK
L21.0



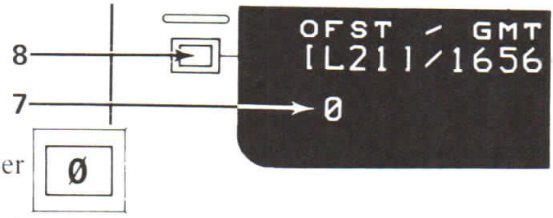
4. The HSI course deviation bar will immediately show the Cross-Track deviation. The Performance Page will also show the XTK deviation.

5. The FG&C system will command a roll up to 25 deg of bank (if required) towards the new track and establish a 45-deg capture angle.

XTK
L16.1 will reduce.

6. The parallel offset leg will be captured.

Note:
Legs terminate where offset course crosses bisector. For large course changes, in the opposite direction to the offset, the leg switching will be delayed significantly.



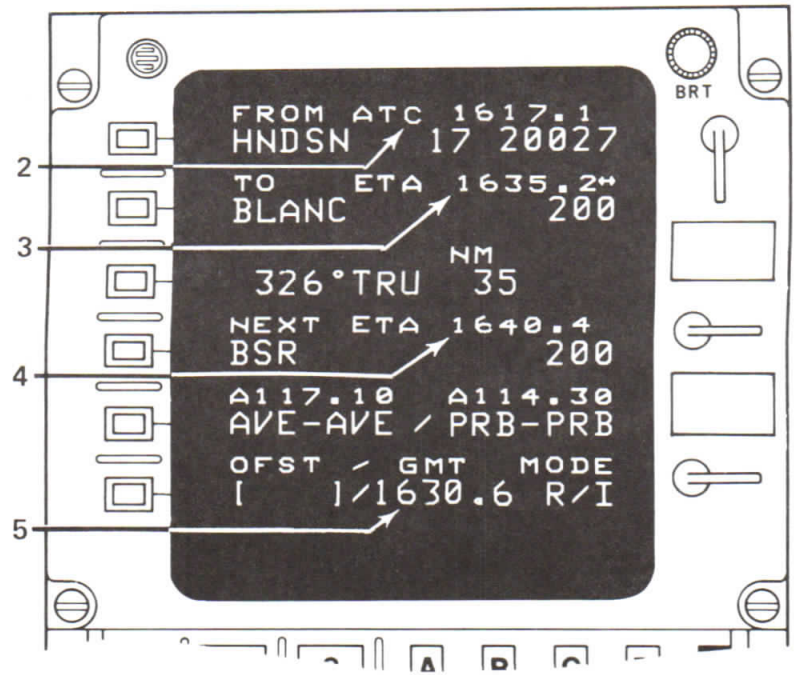
7. To remove offset enter [0]

8. Insert 0 at Line Key 6.

9. Original leg will be captured with a 45-degree cut. If step 8 is done during capture of the next leg, capture will conform to laws on Page 2-3.

10. [DIR] DIRECT TO the next WPT will also cancel offset.

See Page 6-1



1. All time related data are displayed on the PROG page.
2. The Actual Time Over (ATO) the FROM waypoint is displayed in hours, minutes, and tenths of minutes on label line one. If you did not pass the FROM waypoint five dashes will be displayed instead ----.
3. Estimated Time Arrival (ETA) the "TO" waypoint is displayed in hours, minutes, and tenths of minutes on label line two. If it cannot be computed five dashes will be displayed.
4. ETA the NEXT waypoint is displayed in hours, minutes and tenths of minutes on label line four. If it cannot be computed five dashes will be displayed.
5. Present time will be displayed at data line six in hours and minutes, and tenths of minutes.
6. If time is interrupted by more than 2 seconds (power off, etc.) line six time will display GMT [ ] and dashes will replace ETO in lines two and four.
7. Time may be updated by entering / correct time at the next tenth minute and inserting it into line six at the time "HACK".

DUPLICATE WAYPOINT/NAVAID IDENTS

Duplicate waypoints or navaids are listed on a separate CDU page titled DUPLICATE NAMES which appears when the waypoint/navaid with a duplicate ident of 4 characters or less is entered into the scratch pad and inserted for one of the following functions:

a) Entering WPT/navaid into flight plan
b) Manually updating PPSN to WPT/navaid
c) Using DIR TO WPT/navaid
d) Using DIST TO WPT/navaid
e) Manually selecting/deleting a navaid
f) Defining PLACE/BRG/DIST or PLACE/BRG/--- waypoints

1. Enter new WPT into scratch pad.

2. Insert new WPT at required point – here after SNPDR (San Pedro). GER (GERALD) a duplicate WPT calls up the DUPLICATE NAMES page listing GERONIMO (+1, +2 and +3) and GERALD (+4, +5 and +6).

3. If the Duplicate WPT ident is known, it can be entered directly into the Flight Plan.

1. If more than five duplicate WPT's are indicated use vertical slew.

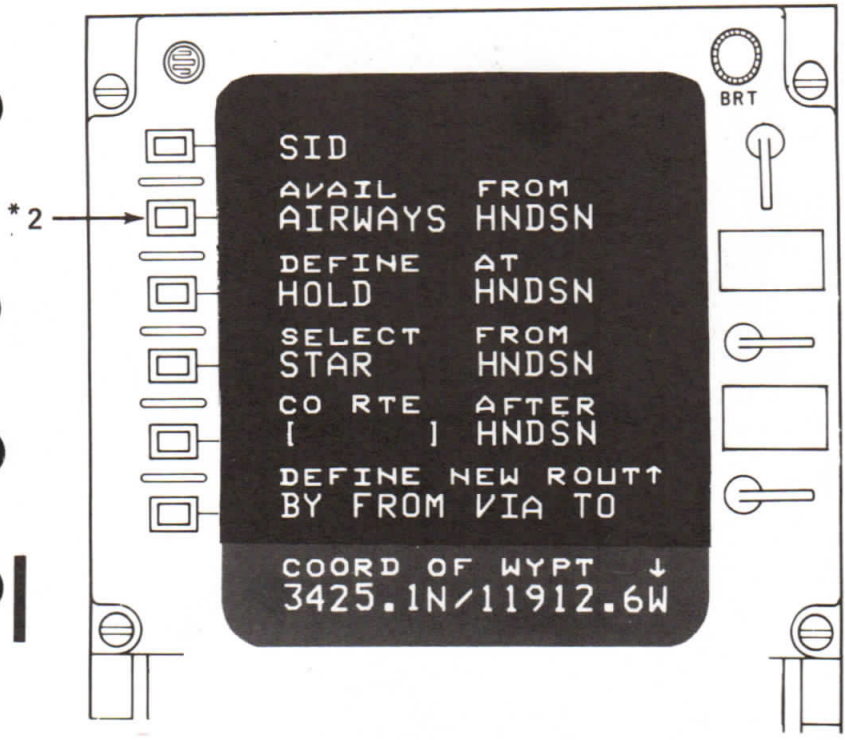
2. Press Line Key opposite desired WPT to insert into flight plan. In this case GER+5 is selected based on coordinates. Identification may also be made from supplementary idents appearing in the label lines above the primary idents.

3. All characters in the primary IDENT including "+" and succeeding characters are displayed on all pages whether the entry was by DUPLICATE NAMES pages or automatically as part of a list. Supplementary IDENTS, if defined, are displayed on all pages directly above the primary IDENT if an existing label would not be over written.

5 FLIGHT PLAN REVISION ▶ 5
AIRWAY/HOLDING/PLACE BRG
DIST/NEW ROUTE

Press → FLT PLN

And select/WPT from which revision is required.



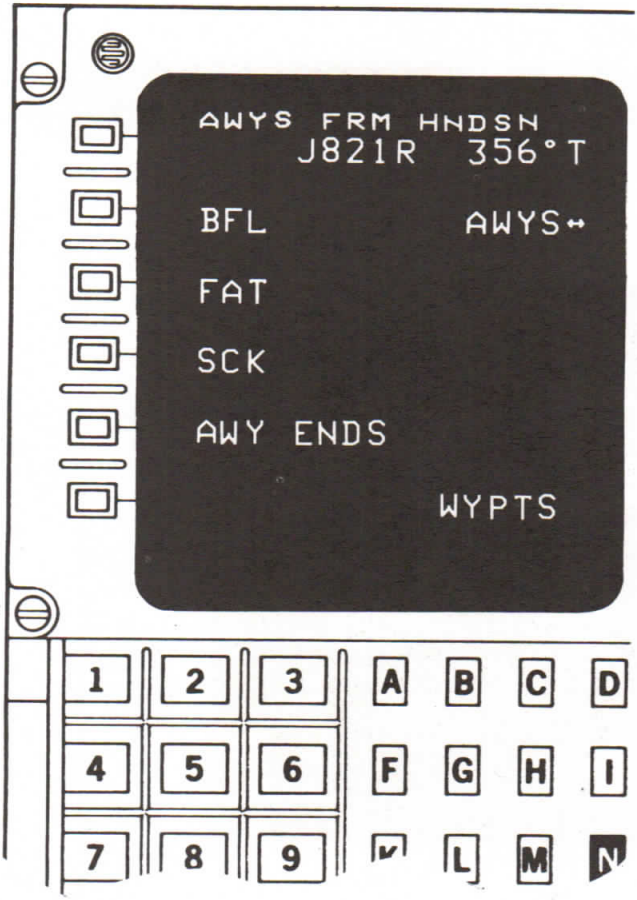
1. We now see the options at HNDSN. We have already used SID's and STAR's.
2. So let's look at airways from HNDSN by pressing Line Key 2.

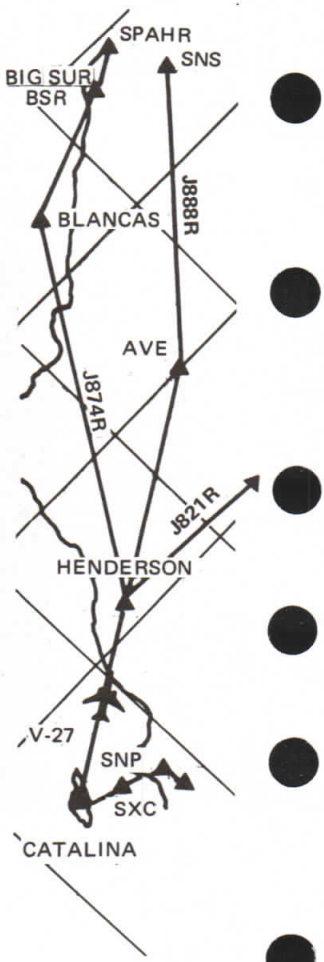
* Not available using SID/STAR or LAT/LONG. waypoints.

NOTE:

The Revise Page appears whenever a Line Key is pressed on the Flight Plan page without data in the scratchpad or an ✱ *in the "VIA" column.*

For route revision via airways such as "FROM Henderson via J888R to Salinas."



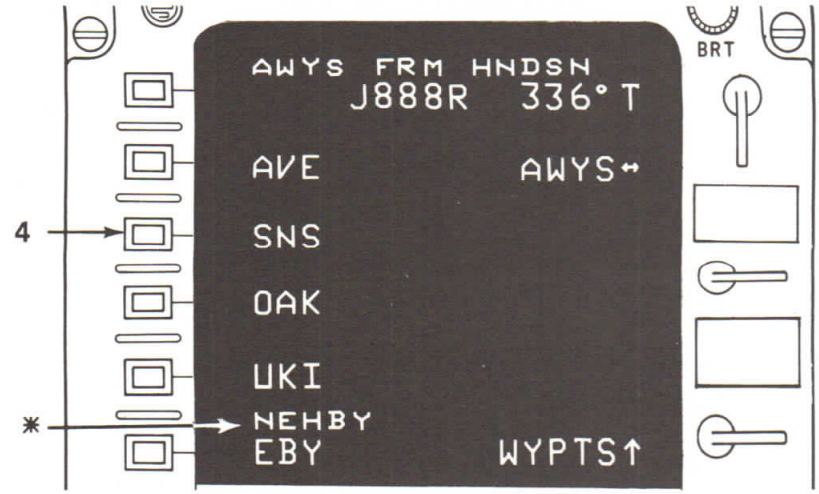


3. If the required airway or direction is not displayed slew airway pages with lever switch until the required airway and direction is in view.

NOTE:

AWY ENDS *is displayed after last airway WPT.*

LAST WYPT STORED *is displayed if airway continues out of data swath (See page 1-13).*



4. Indicate waypoint to which you wish to proceed on the airway. In this case HNDSN VIA J888R to SNS. Select line key by SNS

5. The flight plan will reappear with J888R AVE, J888R SNS after HNDSN. An (*) will appear by the displaced J874R BLANC.

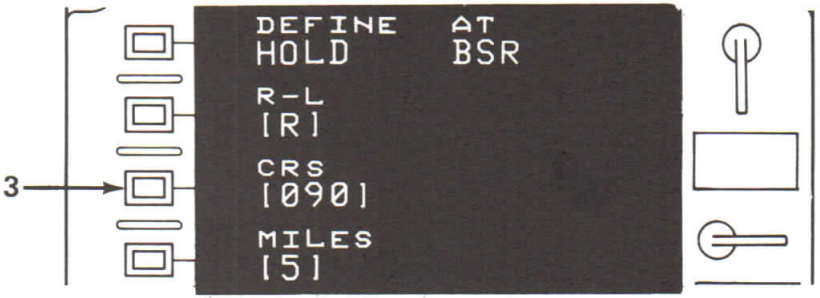
6. Delete WPT's BLANC and BSR (insert "–" at those WPT's.)

NOTE:

Supplemental WPT idents are sometimes displayed in the label lines above primary idents. (NEH BY for Neah Bay). Also shows on F.P. page except in "FROM" and "TO" lines.

1. If cleared to hold at BIG SUR call up Revise Page by pressing line key opposite holding WPT BSR.

2. Select the DEFINE HOLD page by pressing key 4.



3. Enter the inbound COURSE Magnetic 090 into the scratchpad and insert by pressing Line Key 3. Over write turn direction and leg distance if required by entering correction in scratchpad and pressing appropriate Line Key.

NOTE:

If there is a published pattern stored for BSR, *all details including inbound course will be filled in automatically.*

4. Insert HOLD into flight plan by pressing Line Key 6.

CAUTION:

The insert key 6 must be pressed after any revision of the holding pattern or data will not be inserted.

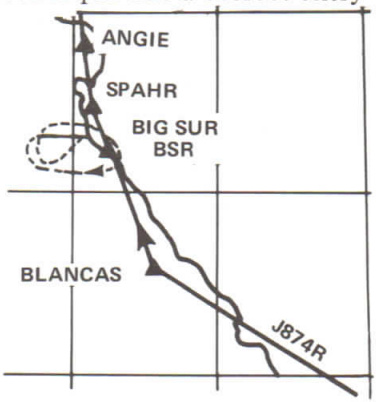
5. The holding pattern will then be inserted in the flight plan and may be reviewed or changed by pressing the Line Key by HOLD.

NOTE:

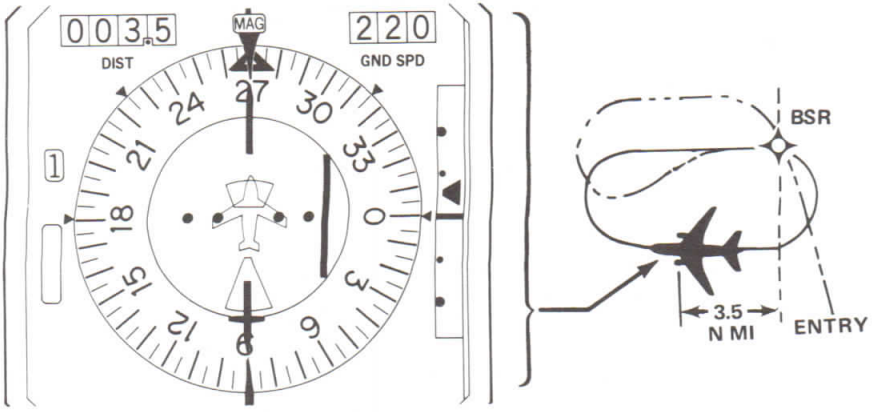
The holding fix BSR *cannot be deleted until after deleting* HOLD

6. The airplane will proceed to BSR and provide a correct entry and hold.

7. During holding the airplane will always overfly the holding fix prior to turning.



8. During the holding the HSI course pointer — + always points to the inbound course, and the deviation — — + is always indicated from the inbound leg. The dist [003.5] always indicates the distance from a line at 90° to the course through the holding fix. The heading bug indicates inbound and outbound command heading as appropriate.



9. The alert light will come on when 15 seconds from the holding fix inbound to the fix.

DEPARTING THE HOLD

10. If cleared to depart holding fix during the outbound turn press HOLD↑ and insert 0 → miles [0] to turn back to the Holding fix and then minus out HOLD when at the fix.

11. If approaching the fix when cleared to proceed the [DIR] DIRECT TO[ ] waypoint may be used to the next WPT or the HOLD may be minused out.

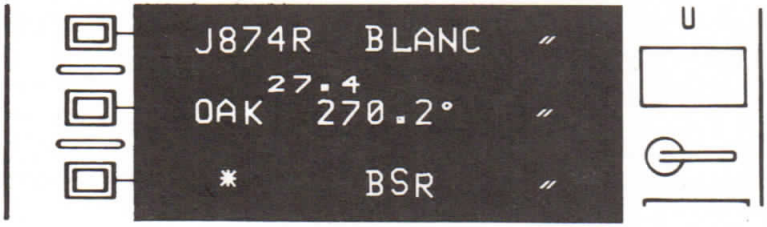
12. To hold at present position (PPSN), do a [DIR] TO the "TO WPT" and define HOLD at resulting T-P using the resulting course. If the "TO WPT" is not on present track, the HOLD will be displaced ahead as shown on Page 6-2.

PLACE/BEARING/DISTANCE

If you want to go to a WPT defined as a bearing and distance from a stored WPT the entry is made on the Flight Plan Page.

1. Type the place ident OAK [/] magnetic bearing 270.2 [/] and distance 27.4 (400 N MI max) into the scratchpad. (Decimals may be omited if not required).

2. Check the scratchpad display and then enter the P/B/D WPT using the Line Key opposite the place in the flight plan where the new WPT is desired.

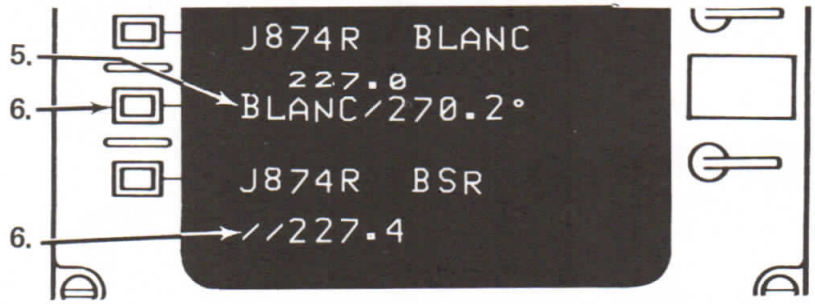


3. The P/B/D WPT will appear between BLANC and BSR moving BSR and all subsequent WPTs down 1 Line.

NOTE:

PLACE/BEARING *waypoints can also be defined by omitting* DISTANCE *if the preceding waypoint is is the same place.*

4. If more than 16 spaces are required for a P/B/D entry, the tenth digit for the distance cannot be entered into the scratchpad (BLANC/270.2/227.4).



5. When entered into the flight plan the tenth digit of the distance entry will appear as a 0.

6. The distance entry may be corrected by typing [/][/]227.4 into the scratchpad and inserting it into the flight plan with the appropriate Line Key. The distance will then appear 227.4 NM. Distance may be added to PLACE/BEARING WPT in the same manner.

7. Changes may be made to the bearing by typing [/] followed by the correct bearing into the scratchpad and inserting it into the flight plan.

CAUTION:

When PLACE is navaid, the variation stored with that Navaid is used to convert MAG HDG to TRU to locate the P/B/D WPT. When place is not navaid, variation is computed from PRESENT compass HDG and average TRU HDG from ISS's. Location is recomputed at any WPT passage, when it becomes the 4th, 3rd, 2nd or 1st WPT in flight plan, or when the Revise Page is accessed from it. Thus, compass system errors will cause WPT location errors. Since separate compasses are used by each NCU, they may compute different locations.

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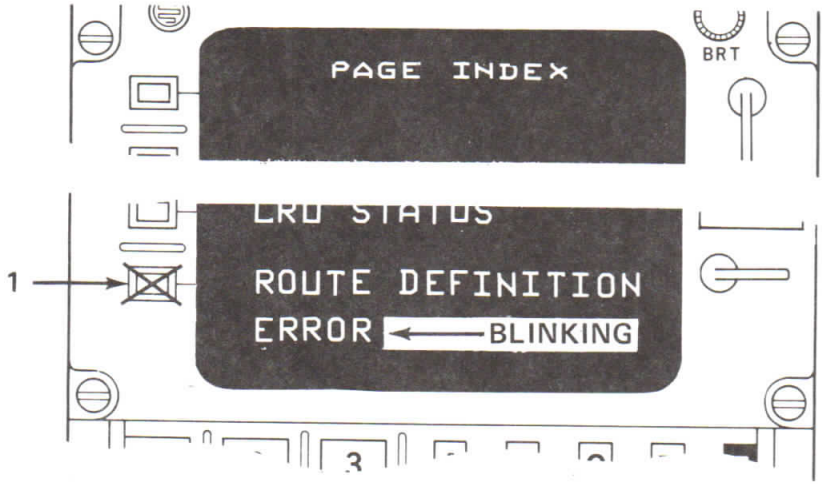
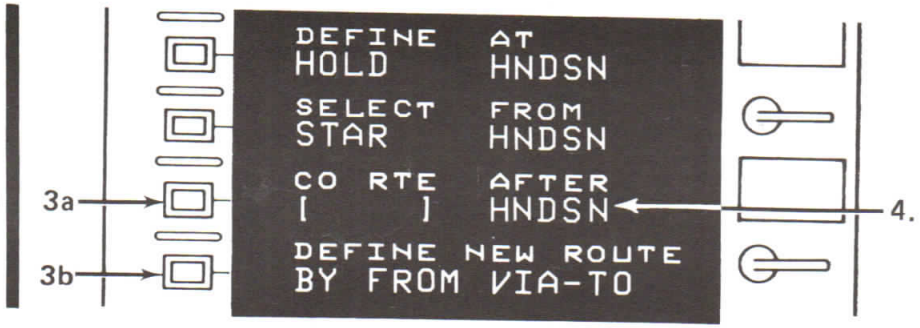


1. If the Page Index ROUTE DEFINITION key is pressed with either or both air data TAS above 130 Kts ERROR will blink in the scratchpad. This prevents dumping of all nav data in flight by an on-ground assembly.

2. Call up the flight plan Revise Page from the WPT from which you wish to start the diversion. Subsequent waypoints and their supporting data will be dropped.

NOTE: dropping of STARs during a diversion

*If one or more STAR waypoints are in the flight plan at or before the diversion waypoint, that airport's STARs will be retained. STARs for the last airport will also be retained if the diversion is made from the last waypoint in the flight plan and there are no other airport STARs in the flight plan. If waypoints from STARs of two airports are included, an in-flight assembly will be rejected (*ERROR*), if the diversion is at or after the second airport STARs.*



3. a) Define the diversion as a Company Route CO RTE

A data swath will be assembled from the diverson waypoint (BSR) to the origin of the new company route and then along the company route.

or

b) Define the diversion as a FROM-VIA-TO

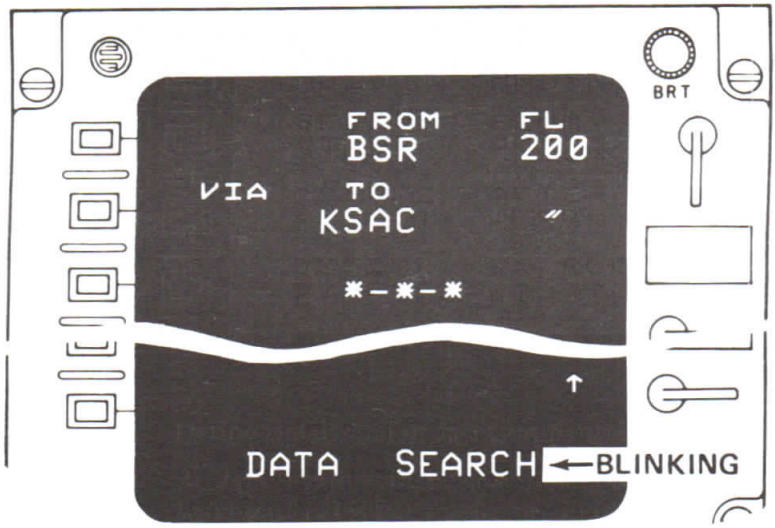
4. In either case the new route will be from the waypoint used to call up the Revise Page.

5. Stored data more than 150 NM ahead of the point from which the revise page was called up and more than 150 N MI behind the FROM waypoint will be dumped. The system will go into DATA SEARCH leaving only limited CDU operations available while the new data is being brought into the computer from the tape. (See Page 5-10, item 7)

Existing computed intermediate WPT altitude will be converted to fixed altitudes. The FROM WPT will revert to its LAT/LONG to facilitate dropping terminal area (low altitude) waypoint data.

6. During an inflight route definition data search, the airplane will navigate normally between the remaining waypoints. Route definition will take a form very similar to a preflight route definition. (See Page 1-5)

DISPLAY DURING ENROUTE ASSEMBLY



7. The reduced CDU capability during this time consists of accessing:

Progress Page	Performance Page
Index Page	Flight Plan Page
LRU Status Page	

8. CDU entries are restricted to:

Entry of LAT/LONG. WPT'S;	Lateral Offset;
Waypoint deletion;	GMT;
ALT and FL entries; *	Reset of annunciations;
PPSN manual update;	"DIRECT TO" functions;
ISS Delete/Restore;	

NOTE:
Crosstalk may be delayed until completion of assembly. If delays of entry crosstalk cannot be tolerated, due to operational considerations, make simultaneous entries into both CDU's.

9. Full CDU operation is restored when SEARCH COMPLETE appears in the scratchpad line. The blinking SEARCH COMPLETE may be cleared using the CLR key.

10. Data for the entire revised route will be added to the existing flight plan below the waypoint used to call up the Revise Page. It will be necessary to delete unwanted WPT's using [–] " – " (See Page 5-3 item 6)

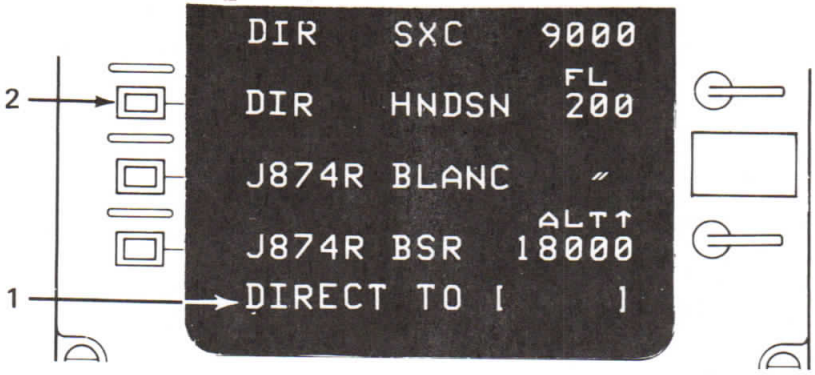
11. An inflight assembly restores any pilot deleted navaids and clears the Failed Navaid and Failed Receiver Lists.

* New profiles from PPSN to TO WPT will not be available.

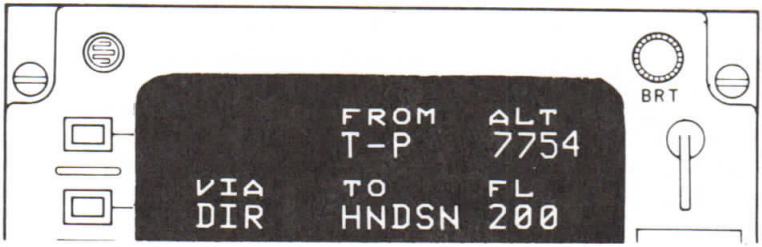
6 DIRECT TO- ▶ 6

CLEARED DIRECT TO A WAYPOINT IN THE FLIGHT PLAN

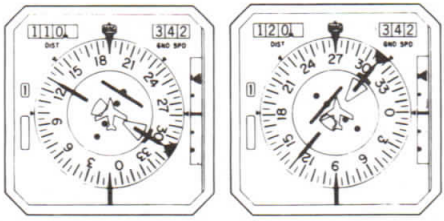
1. Press DIR and see Flight Plan Page appear with DIRECT TO [ ] in scratchpad.



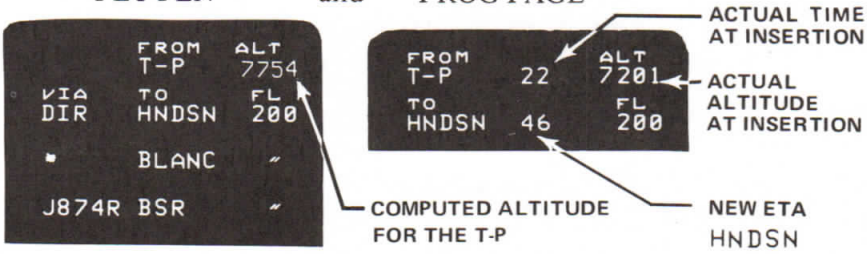
2. Then press Line Key by desired DIRECT TO WPT.



3. Observe HSI display new course from computed turn point to Henderson. As the airplane turns, crosstrack error decreases.



4. Observe CDU display on FLT PLN and PROG PAGE



5. The from WPT changes to T-P. T-P is a point ahead of the present course necessary to achieve a tangential capture. This switching distance is limited to 10 N Mi to minimize corner cutting, but at the expense of overshoots.

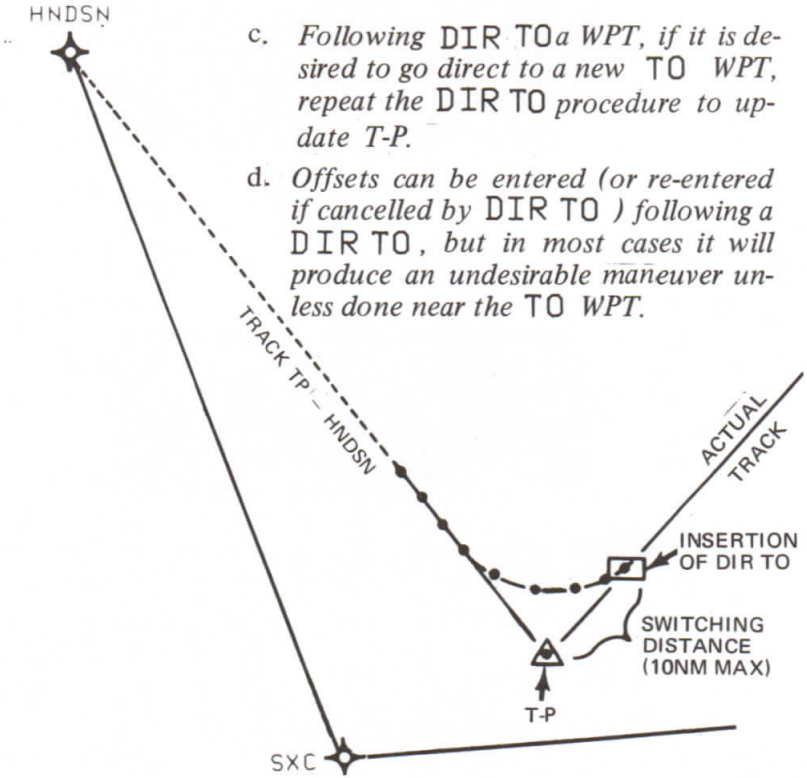
NOTES:

a. DIRECT TO HNDSN *insertion deletes all waypoints in the flight plan before* HNDSN

b. *The* [DIR] *key does not relate to "DIR" in the via column of the* [FLT PLN].

c. *Following* DIR TO *a WPT, if it is desired to go direct to a new* TO *WPT, repeat the* DIR TO *procedure to update T-P.*

d. *Offsets can be entered (or re-entered if cancelled by* DIR TO *) following a* DIR TO, *but in most cases it will produce an undesirable maneuver unless done near the* TO *WPT.*

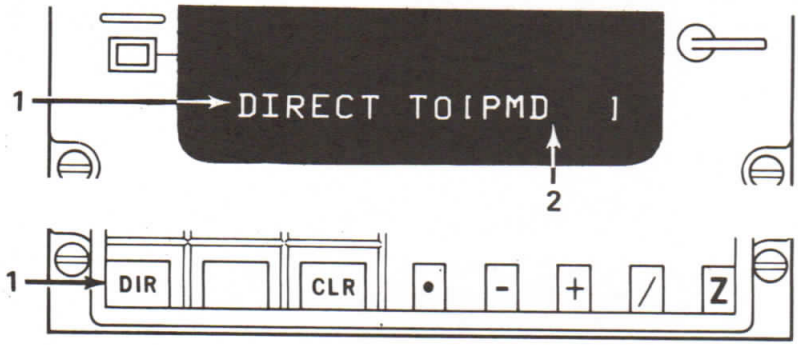


6. When a lateral turn is required as a result of a DIR TO selection, a vertical deviation to climb or descend to the TO WPT will be displayed. If no turn is required when DIR TO is selected the vertical deviation will be centered.

Altitude and time (on PROG. PAGE) opposite T-P are actually for point of DIR TO to insertion. The altitude opposite T-P on the Flight Plan Page is the computed altitude for the T-P.

7. LAT/LONG. of T-P will be correct for T-P. LAT/LONG. of point of insertion will not be available.

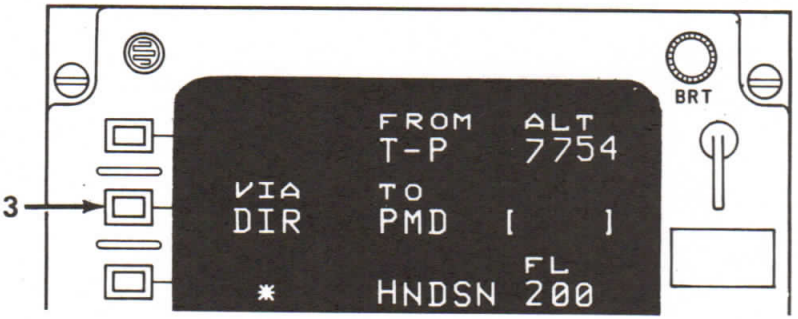
DIRECT TO A WAYPOINT NOT IN THE FLIGHT PLAN



1. Select DIR and observe Flight Plan Page appears with DIRECT TO[ ] in the scratchpad line.

2. Enter ident of PMD into scratchpad.

NOTE:
DIRECT TO[ ] *changes to* D *if first keyboard entry is a number. The E or W of a full LAT/LONG entry will not be displayed.*

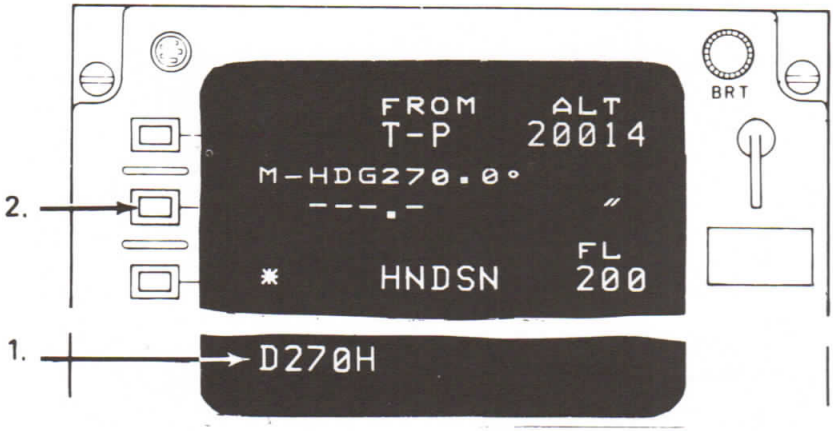


3. Insert DIRECT TO [PMD] into line two only, then insert the assigned altitude.

4. The DIRECT TO WPT will displace the previous WPT in line two and the entire flight plan will move downward one line unless the DIR TO entry is a LAT/LONG and the old TO WPT is a LAT/LONG.

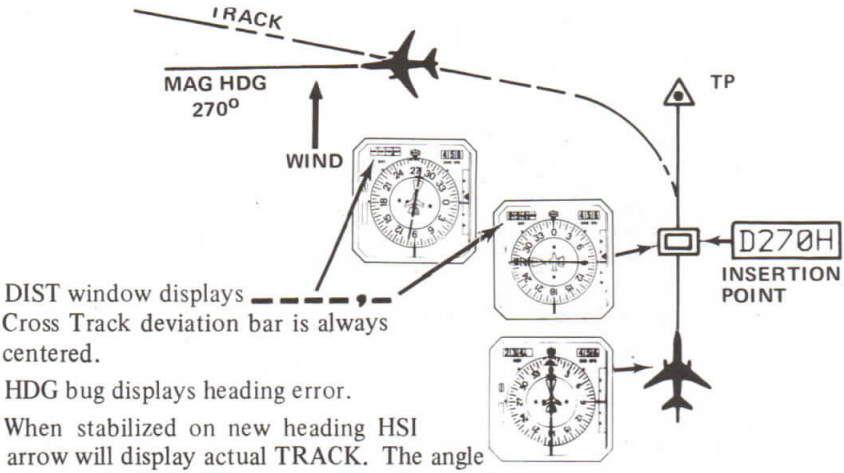
5. If a DIRECT TO [WPT] is inserted into any line except line two ERROR will blink alternating with DIRECT TO[WPT] until it is inserted into line two or cleared.

DIRECT TO A MAGNETIC HEADING



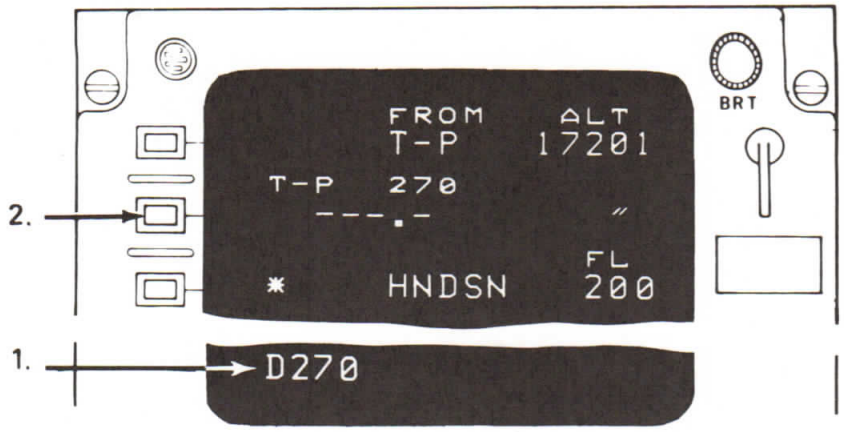
1. If vectored to 270° magnetic, select DIR DIRECT TO [ ] and type in 270H or 270M in the scratch pad. DIRECT TO[ ] changes to D when "2" is typed in.

2. Insert D270H or D270M at Line Key 2. A T-P WPT is computed such that the insertion position is the correct switch point for the existing speed and heading change. T-P immediately becomes FROM WPT with altitude that existed at insertion point.



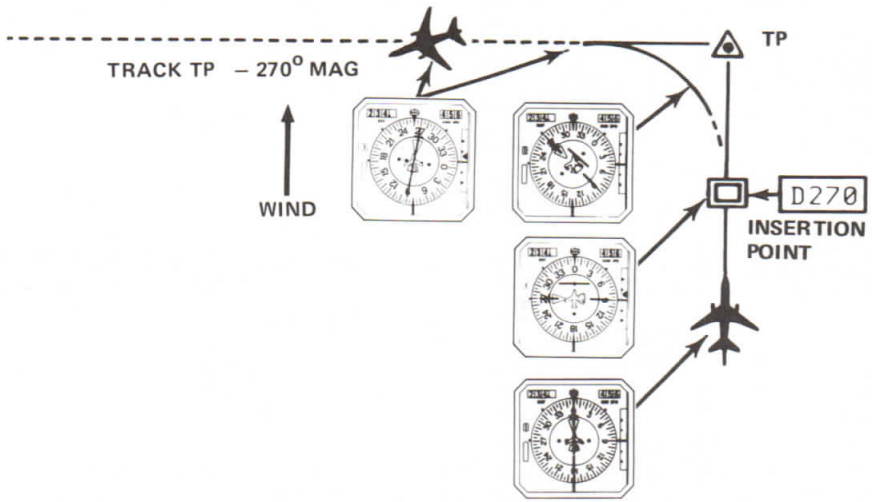
3. Aircraft will turn to and intercept the 270° magnetic heading. There will be no correction for wind drift. XTK deviation and DIST to TO WPT on Performance Page will display dashes.

4. Subsequent DIR TO entries, or edits of TO WPT will overwrite the DIR TO a Mag Hdg, rather than shifting the flight plan downward.



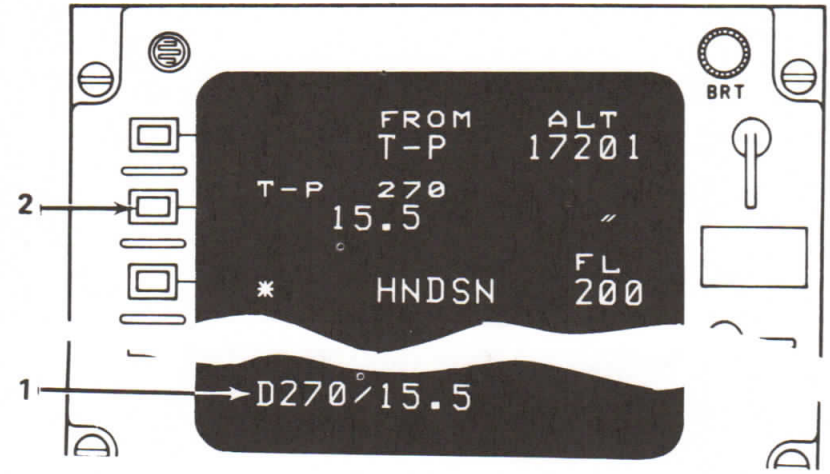
1. To fly a magnetic track select DIR DIRECT TO [ ] and type in 270.

2. Insert D270 at Line Key 2. A T-P WPT is computed such that the insertion position is the correct switch point for the existing speed and course change. T-P immediately becomes FROM WPT with altitude that existed at insertion point.



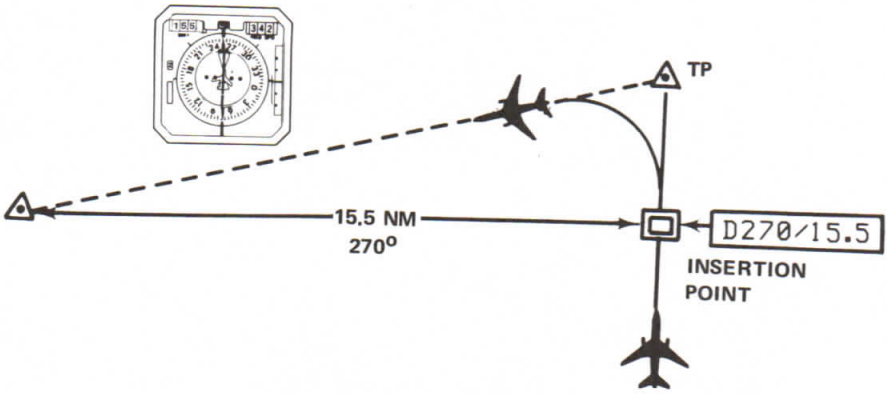
3. Aircraft will turn to and intercept the 270° magnetic track from the computed T-P without overshoot. (Except when accelerating or when switching distance is limited to 10 N MI.)

4. Subsequent DIR TO entries or TO WPT edits will overwrite the DIR TO track entry.



1. If a waypoint is desired select DIR DIRECT TO [and type in 270/15.5 (Distance up to 400 NM may be used).

2. Insert D270/15.5 at Line Key 2, A TO WPT will be formed 15.5 NM on a TRACK of 270° from the point of insertion, and a T-P WPT is computed such that the insertion position is the switch point for the existing speed and course change.



3. The airplane will turn to and intercept a TRACK computed from the T-P to the BEARING/DISTANCE WPT. The HSI arrow will display this new TRACK. When stabilized on TRACK, the angle between HSI TRACK arrow and heading bug will be drift.

4. Subsequent DIR TO entries or TO WPT edits will overwrite the DIR TO track entry.

VOR/DME AUTOSELECTION (See Page 7-5 for details)

Automatic selection of VOR/DME navaids begins with route definition SEARCH COMPLETE, when the terminal area and enroute navaids are brought into the NCU memory core from the data swath for the desired route. Different autoselection logic is required for Terminal Area (TA) and enroute navaids due to use of defined approach navaids for each airport.

Autoselect logic changes from terminal area criteria to enroute criteria when TAS >300K.

- "Terminal Area Navaids" are the programmed navaids for the departure, destination, or alternate airport and have priority over other autoselected navaids when they come within range and when the TAS is< 300K.

CAUTION

When TAS <300K, navaids remain selected even if they are not being received. Also, pilot selected navaids take priority over terminal area navaid autoselection.

- The same navaid will not be selected on both sides unless; 1. It is pilot selected on both sides; 2. It is the only navaid available. Navaids autoselected enroute are chosen to give the best NAV accuracy.

- If either VOR or DME data from a navaid is determined to be unreasonable or failed, a new selection will be made after 40 seconds.

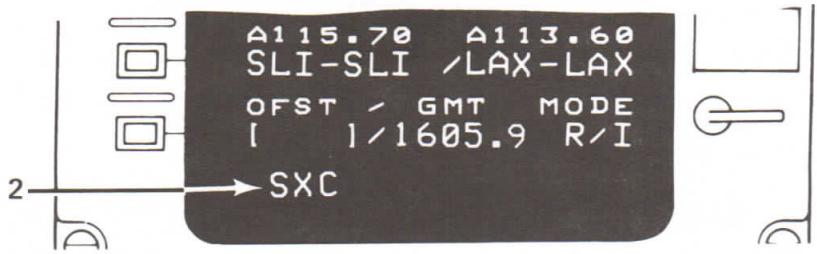
- If no navaids are within "PROGRAMMED" range, idents and frequencies go blank on the Progress Page.

- Autoselected navaids are identified by an ⍙ preceding the frequency.

The pilot may override autoselection by inserting a navaid of his choice on the Progress Page. Autoselection can be reinitiated by inserting an out of range navaid selection.

Stored navaids may be deleted from autoselection by inserting -ABC or /-ABC into line 5. It will be restored by pilot selection ABC or /ABC or by an on-ground or enroute assembly. There is no display of deleted navaids.

PILOT OVERRIDE OF AUTOSELECTION LOGIC



1. Select PROG page.
2. Type in selected VOR/DME ident, SXC for example.

3. Insert by pressing Line Key 5*. C denotes station was pilot selected and will remain tuned until out of range, at which time autoselection will be re-enabled. If the ident appears momentarily and then disappears the selected VOR DME is out of programmed range. If the ident appears for approximately 40 seconds and then disappears the navaid is within programmed range but has been rejected for lack of acceptable DME or VOR data.

NOTE:

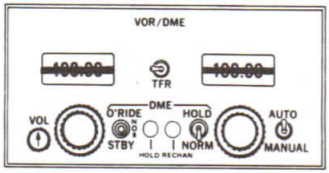
Programmed ranges of 40, 70, 130 and 250 NM and corresponding figures of merit are assigned to navaids based on the airline route data classification as Terminal Area, Low Altitude Airway, High Altitude Enroute or Gateway navaids respectively.

4. System will autotune SXC ** (If AUTO tune selected).
5. To enter a pilot selection for NAV-2, precede the ident by "/".
6. If crosstalk has failed, pilot selections must be entered into both CDU'S.

* If the DUPLICATE NAMES page appears select the desired navaid from those listed.

** If the AUTO/MANUAL switch is in MANUAL a tuning command TUNE 109.40 will appear blinking until pilot tuned.

1. AUTOTUNE/MANUAL switch to AUTO.



2. The navaids selected for autotuning are shown on the Progress Page.

"C" preceding frequency indicates pilot selected via the CDU. "A" indicates auto selected.

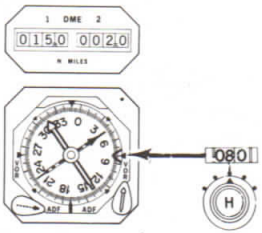
3. Navaids that are either autoselected or pilot selected will be automatically tuned when AUTO is selected, if they are within programmed range.

4. RMI operation is NOT changed in any way.

   a. Radial/distances are to the tuned VOR/DME.

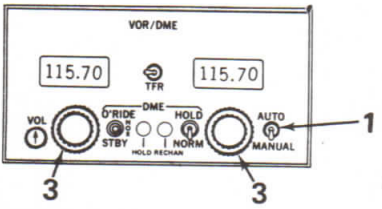
   b. MAG heading is always under the RMI lubber line.

   c. Heading select bug is always available on the RMI.



MANUAL VOR/DME TUNING

1. Select MANUAL.

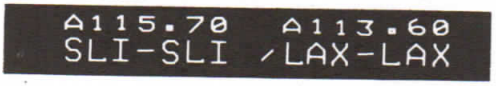


2. Autoselected navaids will be displayed on the Progress Page with a manual tuning command.

ALERT

The ALERT light will blink and TUNE will blink alternately in label line 5 with the frequency of the autoselected navaid.

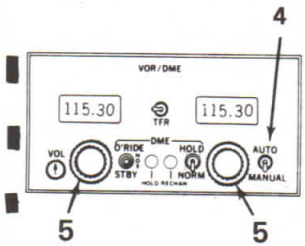
Pressing Line Key 5 with blank scratchpad will suppress the ALERT light, but not the blinking TUNE/115.70 request.



3. Manually tuning the displayed frequency will reset the manual tuning command and ALERT light.

4. If it is required to tune a NOT STORED navaid, or a navaid out of programmed range, select MANUAL.

5. Select required frequency.



NOTE:

While tuned to a NOT STORED *or not autoselected navaid,* ALERT *light will blink and system will request* TUNE *alternating with the best autoselected navaid. Press Line Key 5 to reset the* ALERT *light. System operation will be impaired, since data from* NOT STORED *navaid cannot be used.*

RMI will show tuned station radial and DME distance. R/I or SR/I *mode operation will continue so long as the minimum radio inputs are being received. (See Page 2-10)*

6. A manual tuning command will also be displayed if the other NCU is down, or autotune is inoperative. In these cases, AUTO TUNE must be OFF, and the requested frequency tuned manually.

AUTOSELECTION LOGIC FOR AUTOTUNING OR MANUAL TUNE REQUEST

R-NAV System Configuration (Autoselect & Autotune)

Autoselection and autotune are automatically configured for the Single R-NAV system or the Dual R-NAV system dependent upon the validity logic received from the Intersystem Data Bus. In dual system operation, NCU-1 will supply tuning commands to VOR/DME -1 and NCU-2 will supply tuning commands to VOR/DME-2. Each NCU with S/B 34-79 incorporated has the capability of supplying tuning commands to the opposite VOR/DME system if the opposite NCU becomes inoperative.

Autoselection (With Service Bulletin (S/B) 34-79 incorporated)

The master (No. 1) NCU of a dual system will do the autoselection and communicate primary and secondary selections to the slave (No. 2) NCU via crosstalk. If the slave NCU detects that crosstalk is not operating but that the master NCU is still valid as indicated by the Intersystem Data Bus valid, it will also perform autoselection, using the same logic as the master NCU. If the slave NCU detects that the master NCU is inoperative, as indicated by an Intersystem Data Bus invalid, it will perform the autoselection and continue to give the primary selection to the VOR/DME-1 system.

Autotune

The NCU will tune only its respective side (VOR/DME-1 for NCU-1 or VOR/DME-2 for NCU-2) if there is an Intersystem Data Bus valid input from the opposite NCU. If the input from the opposite NCU is invalid it will output tuning commands for both VOR/ DME-1 and VOR/DME-2.

Manual Tune Request

When ever the tuning lines are sensed to have a frequency other than the one (or pair) being commanded by the program, the alternate TUNE and frequency message will appear on line 5 of the Progress Page. This will occur if an unmodified NCU (prior to Service Bulletin 34-79) is installed in a single system, in which case the VOR/ DME systems for the opposite side must be manually tuned.

The following pages in this section are not part of the operating instructions. The information is included to provide a more detailed explanation of the autoselection, autotune, and navaid usage logic.

1. GENERAL

Autoselection, which applies to both autotuning and displaying of a frequency to be manually tuned, starts as soon as in-range navaids are brought into core during an assembly. It continues every 5 to 10 seconds (depending on the length of the navaid list in core) as long as there are navaids in core. Displays and tuning are inhibited when no navaids are within programmed range.

There are two regimes of autoselection logic, enroute and terminal area. Enroute logic is used unless TAS<300K and there is a terminal area navaid within programmed range. Both regimes are influenced by Equipment Status Lists.

2. EQUIPMENT STATUS LISTS

A. Failed Navaid List

If good data is not received from both the VOR or DME (when on board receivers are OK, and it is not a terminal area navaid and TAS>300K), it is listed as a failed navaid. It is removed from the autoselection list and will not be tried again while on the Failed Navaid List unless all other in-range navaids have been found failed.

The Failed Navaid List is cleared of all entries when (1) a pilot selection of a navaid is entered for either NAV-1 or NAV-2, (2) when any new route definition (flight plan) assembly is made. (3) When TAS first falls below 300K.

B. Failed Receiver List

(1) If a DME is flagged (failed), that DME is listed as failed. Any stations to be tuned on that side would be weighted as VOR only navaids (provided that the VOR receiver is OK).

(2) If the digital output of a VOR is missing or carries an invalid status, that VOR is listed as failed. Any stations to be tuned on that side would be weighted as DME only navaids (provided that the paired DME transceiver is OK).

(3) Failed units are removed from the above list if they subsequently become valid.

TERMINAL AREA LOGIC

Two terminal area navaids are normally designated for each airport. Those for the origin, destination and alternate are available* for autoselection when TAS is below 300K as follows:

a. Pilot selected navaids that are still within range will be retained regardless of availability of terminal area navaids.

b. If no terminal area stations are within range when TAS goes below 300K enroute logic will apply.

c. If only one terminal area station is within range, the side previously tuned to the second best enroute navaid will be tuned to the terminal area station and the other side will continue the enroute logic until a second terminal area station is within range.

d. If only 2 navaids are in range, they will be tuned.

e. If 3 or more terminal area navaids are within range the best two will be selected using the same logic as in 4,B.

f. Pilot selection of any in-range navaid will override autoselection.

g. Terminal area navaids are never rejected for lack of data and are not put on the Rejected Navaid list as long as TAS $<$ 300K. Applies whether auto or pilot selected.

4. ENROUTE AUTOSELECTION CRITERIA

Autoselection is accomplished in a two-phase operation as follows:

A. List of Five Best Navaids

Both NCU's set up and maintain a list of the five best naviads.

All in-range navaids in core not on the Failed Navaid List and not in the manually deleted status are ranked in the following order:

(1) Pilot selected navaids
(2) VOR/DME navaids in order of range
(3) DME Only navaids in order of range.
(4) VOR Only navaids in order of range.

* Except under some storage limit situations.

B. Best Two Navaid Selection

The NCU selects the highest ranking pair of navaids from the possible pairs listed below*.

(1) If there are two pilot selections, they go to the designed sides and no further logic is applied. If only one pilot selection is made it will go to the designated side and must be included in any pair selected.

(2) The preferred pairing is two VOR/DME's or DME-Only navaids that give DME+DME geometry (30^{O} to 150^{O} difference in computed bearings to the stations).

(3) VOR/DME's are selected over DME-Only or VOR-Only navaids.

(4) DME-Only navaids are preferred over VOR-Only navaids.

(5) Shortest range is preferred when other criteria are equal.

(6) Both sides are tuned to the same navaid only when there is only one on the list of navaids selected per A above.

C. After selecting the highest ranking navaid pair, the master NCU of a dual system will assign the best selection to be tuned by the master side (NCU-1 VOR/DME-1), and will command the slave side (NCU-2 VOR/DME-2) to tune the second best, unless logic from the Failed Receiver List indicates the opposite order to be better.

If crosstalk is invalid (FAULT XTALK annunciated) and the master NCU is operating (Valid), the slave NCU will also perform autoselection, using the same logic as the master NCU, and assign the secondary selection to VOR/DME-2. The navaid selection will be the same with the exception of a pilot selected navaid that has not transferred to the slave NCU via crosstalk, or when there is a difference in present position between the two systems. If either NCU detects that the opposite NCU inoperative (dual system failure mode or single system installation) the operating NCU will perform autoselection and output tuning command to both VOR/DME-1 and VOR/DME-2.

* Selections are limited to the combinations possible when considering any VOR or DME on the Failed Receiver List.

D. Re-Selection Rules

1. When a new best pair is determined that includes one of the already tuned pair, the best to side 1 logic is bypassed and the new station is tuned on the side having the station to be dropped.

2. When a new best pair is determined that does not include either presently tuned station, both sides are retuned simultaneously as in B above. Since new data is not used for 5 seconds, both NCU's may down mode during this period.

3. Lack of a response to a manual tuning command will not cause the selected navaid to be shifted to the other side, even if it is the best navaid or the first available Terminal Area navaid.

NAVAID DATA USAGE CRITERIA TESTS

Present position is updated from all of the available acceptable navaid inputs once per second. Before such updates, each input must meet all of the applicable criteria below.

1. Range – The navaid ident will not appear (or stay if entered) on the Progress Page unless within programmed range.

2. Validity – The DME receiver valid discrete must be available. The VOR digital output must be valid.

3. DUAL DME Ambiguity Protection Logic – When two DME's are available, both are used except when the ambiguous positions are close together. When this occurs, one DME will be inhibited (except in a special case).

   One DME is inhibited when – Computed position if within 5 miles of a line between the DME's or computed bearings to the DME's are within 10^{o} of each other.

   - The far DME will be inhibited if two VOR/DME or two DME-only navaids are available.
   - The DME-only navaid will be inhibited if one VOR/DME and one DME-only navaids are available.

   Special Case - When within 3 1/8 miles of a navaid and TAS<300 kts the near DME will be inhibited if its VOR is not in use. If it is being used, both DME's will be used.

   Additional Criteria - After the above logic has been applied, the uninhibited complement of inputs will then have the following criteria applied, if applicable (items 4 through 9).

4. Radio Reasonableness Limits - Inputs must be within the limits described on pages 7-10 and 7-11.

5. Single DME Ambiguity Protection Logic – Use of a single DME, that is on or near the projected track, is inhibited when the projected fly-by distance is less than 16 times the sum of the estimated position uncertainty crosstrack component and a small allowance for track angle error (not less than 5 NM).

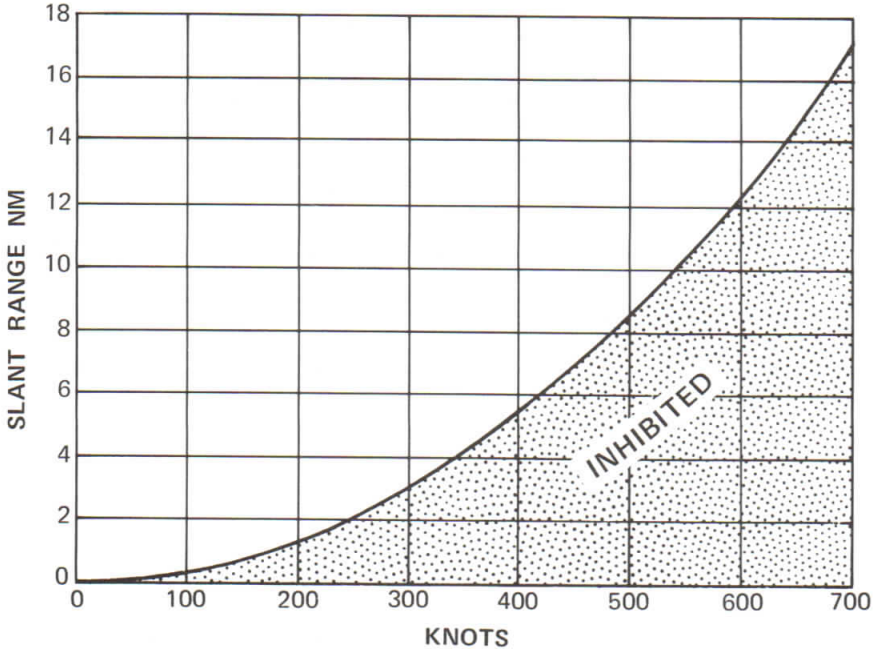
6. Single Radio Mode Uncertainty Criteria – In an non-inertial system if there is an input from only a single VOR or DME (even if from both receivers), the input is used only as long as both N-S and E-W computed position uncertainty are less than .5 NM. When this value is exceeded, the input is dropped and the mode reverts to DR.

7. Single Navaid Environment VOR Usage Test – Position accuracy is prevented from degradation by a single VOR under special circumstances as described in detail on pages 7-12, 7-13, and 7-14. If a VOR is inhibited, criteria in 5 above is then applied.

8. Cone of Silence – VOR bearing is inhibited when the computed PPSN is in a 90^{o} cone above that VOR. When there is no paired DME station elevation, the VOR altitude is assumed to be sea level.

9. DME Range Acceleration Test – DME is inhibited when slant range is less than

$$\frac{(\text{GS Knots})^2}{28{,}800}$$



RNAV ACCURACY ANNUNCIATION CRITERIA

The R/I or R mode is annunciated only when the system's best estimate of its own accuracy is within FAA certifiable RNAV limits.

1. Accuracy Estimate - The system maintains an accuracy estimate which is dependent on the number of radio inputs, the time the radio inputs have been used, and the aircraft position relative to the navaids. Without radio inputs, the accuracy estimate is increased at different rates depending on whether inertials are available.

2. Annunciation Criteria - R/I or R mode will be annunciated when the accuracy estimate is less than 1.5 NMi when TAS is above 300 Kts. and 0.6 NMi. when TAS is below 300 Kts.

3. Range Exception - Downmoding will occur regardless of the accuracy estimate when the minimum required navaids for R/I or R mode (see page 2-10) are not within their programmed range limit.

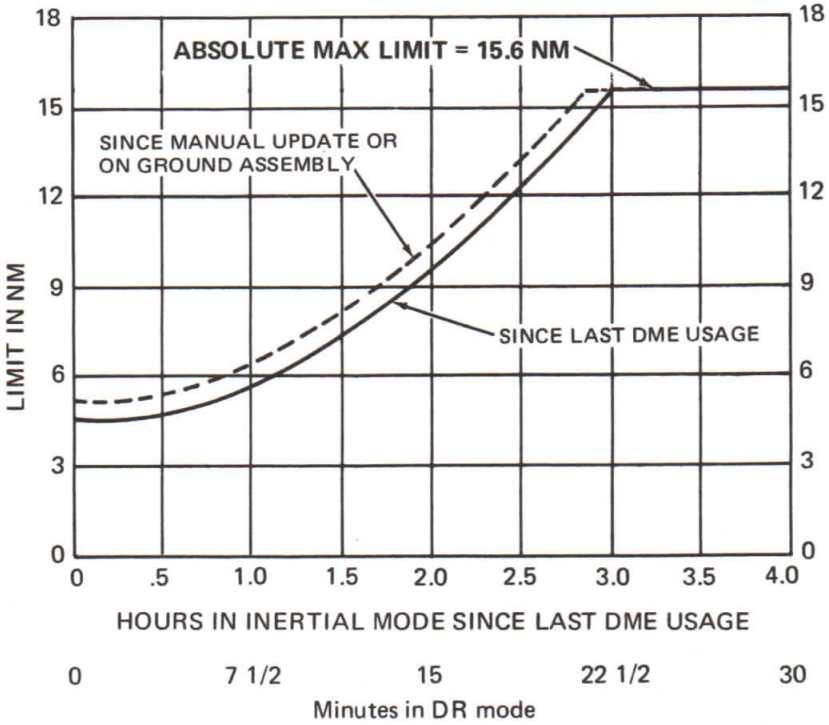
4. Additional Downmoding ALERT Light Delays - The 60 sec. for enroute or 8 sec. for terminal area delays apply to the ALERT light for all downmoding alerts.

RADIO REASONABLENESS LIMITS

Each time radio data is to be used, it must be within these limits. The difference between the received data and the corresponding data computed from the best estimate of position must not exceed the values shown in the curves below, or it will not be used. Curves are based on average operation, so actual limits may be different under some circumstances. They are based on the estimated accuracy of the last radio data used, plus the likely accumulated error since the last radio fix. Since position errors are distances, the last VOR inputs and the VOR acceptance limits are a function of range at which the last station was dropped and the present range to the new station respectively.

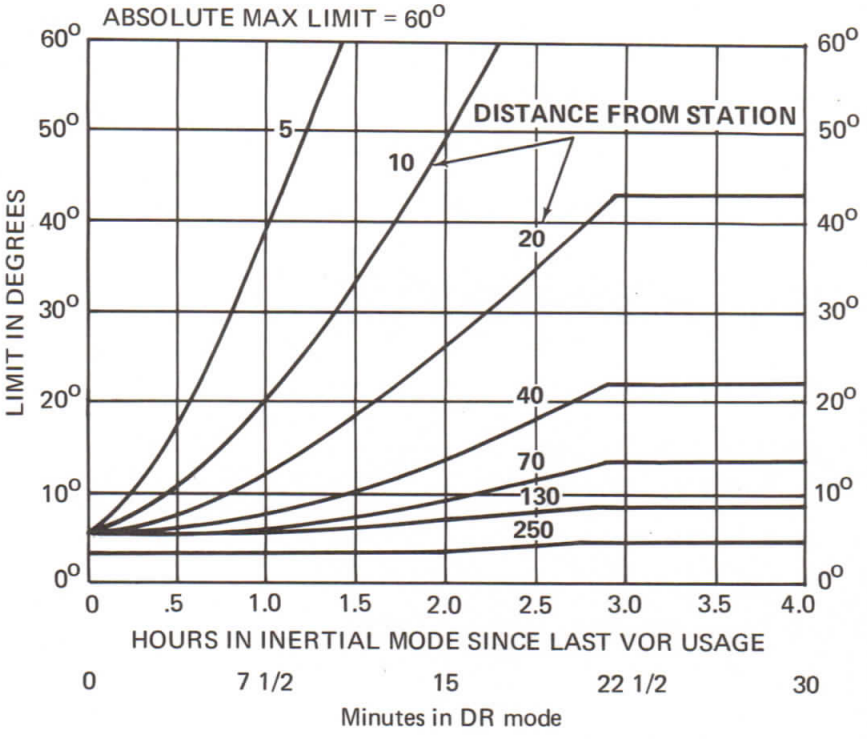
DME

This curve is based on assumption that the along track component of last radio update was from a DME. If it was from a VOR, the limit would be higher, but not exceeding the absolute limit.



NOTE:
Zero time is the correct limit for radio modes. (R or R/I)

Curves are based on assumption that the crosstrack component of last radio update was from a VOR.



NOTE:

With manual update or on ground assembly, VOR reasonableness limits are increased.

INHIBITED USE OF VOR INPUTS IN SINGLE* VOR/DME OR VOR ONLY ENVIRONMENT (ITEM 7 Page 7-8)

This section is not part of the operating instructions. It is included only to explain why the system may down-mode from R/I to SR/I or I when the minimum inputs for the R/I mode are not available.

The system will inhibit usage of a VOR input when such usage will likely degrade present position accuracy. When operating with no inertial inputs the VOR input will not be inhibited by the VOR usage test. When the inertial inputs are available the system uses these inputs to maintain position accuracy to the degree possible with the drift of the combined inertials operating. VOR usage is inhibited when the probable error from that VOR is increasing (due to its range increasing) at a rate faster than the probable inertial error due to drift. The uninhibited range for VOR usage is then expanded at a rate proportional to the inertial drift since the last VOR usage. When VOR usage is inhibited the R/I mode will be retained as long as system accuracy is estimated to be adequate for R NAV routes. If accuracy falls below this criterion and the single DME Ambiguity Test (Item 5, page 7-8) is valid, the system will down-mode to SR/I. If this test is failed the DME would be inhibited and the system would revert to the I mode.

Inhibiting logic starts with the assumptions that the VOR error is 2^{o} and that this is as accurate as other inputs up to a range of 20 miles. It also assumes each ISS to be drifting at 2 NM/hour and DR position drifting at 25 NM/hour. A VOR input is inhibited if its computed range (R_P) exceeds the maximum uninhibited range (R_U) which is the sum of the range of the last used VOR (R_L) and an allowance for position drift since the last VOR usage.**

R_P = Computed range to VOR whose input is being tested.

$R_U = R_L + ET$, where:

R_U = Max uninhibited range

R_L = Range to nearest VOR at last VOR usage or 20 NMI.***

T = Hours since R_L was set

E = = Rate of range increase of a 2^{o} VOR error that is the equivalent of the assumed ISS or DR drift rate

= 33 for 3 ISS's, 40 for 2 ISS's, 57 for 1 ISS.

Asterisk notes on next page.

* Defined as when there are inputs from only one navaid that pass all acceptability criteria and are not otherwise inhibited.

** Drift expressed as the equivalent range along a 2^{o} VOR error.

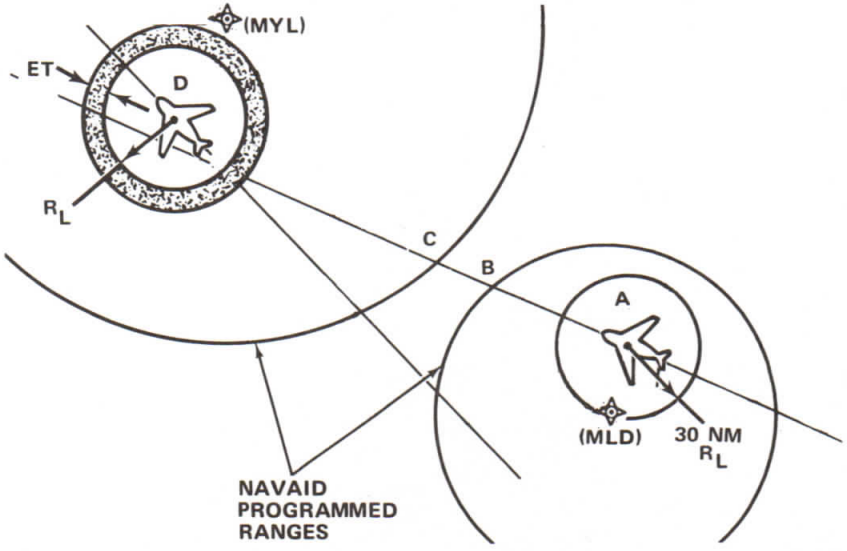
*** 20 NM is used and T is initialized if last position fix was from:

(1) 2 DME's
(2) A manual PPSN update
(3) On-ground route assembly position initializion
(4) $R_P < 20$ NMi (R_L has lower limit of 20 NMi.)

R_L for a currently in use VOR is the range at the previous update cycle. R_L, when there are no VOR's in use, is best defined in the three examples below.

Example 1

1. R_L = range to only VOR when last VOR update was received (assume GS = 500K, 3 ISS's and inbound to MLD the envelope was 40 NM).
   a. MLD first inhibited at A (where range started increasing) established initial uninhibited envelope of 30 NM.
   b. From A to B, MLD VOR would be inhibited. R/I mode would be maintained to B (See page 7-9). Mode would be I from B to C.
   c. At C, MYL DME is used if single DME ambiguity and reasonableness tests are passed (SR/I mode).
   d. At D, uninhibited envelope has grown to 36 NM as shown but not enough to reach MYL.



Example 2

R_L = range to nearest VOR if there were 2 VOR's but only 1 DME when last VOR was used and nearest VOR was dropped. In figure below, assume system had tuned MLD and BVL, that MLD DME was inoperative, GS = 500K, 3 inertials (E = 33).

a. At P, MLD was dropped at 70 mi. range limit, and since MLD is closer than BVL, R_L would be set at 70 mi. BVL VOR would be inhibited both because its range exceeds 70 miles and its range rate exceeds 33K.

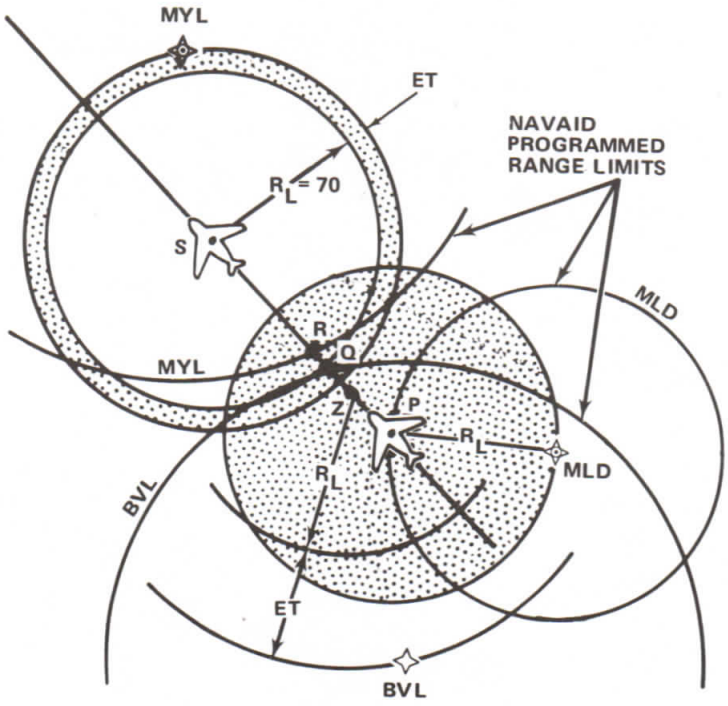
b. System would use BVL DME to Q. R/I mode would be held as long as RNAV accuracy was maintained to the range limit. With no navaids in range from Q to R, system would be in I mode.

c. At R, MYL DME would be accepted, but R_U has grown only to 73 miles, so MYL VOR would be inhibited, resulting in S/RI mode to S.

d. At S, MYL VOR would be accepted. The distance when the VOR (MYL) would first be accepted is at 76.6 miles.

$R_U = R_L + ET$

$= 70 + 33\ (.2\ Hr.) = 76.6$ miles



MANUAL PRESENT POSITION (PPSN) UPDATE

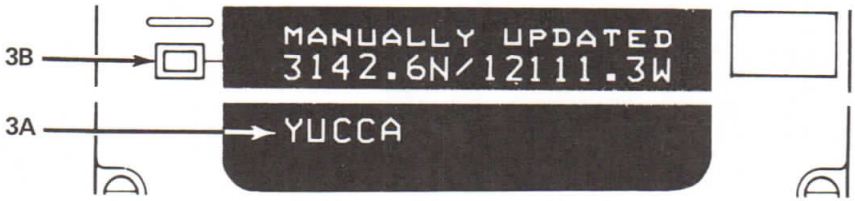
1. In I or D/R Mode, PPSN can be updated on Performance Page. When in any radio mode, PPSN can be frozen (for checking),* but an attempt to insert an updated position will result in ERROR appearing in the scratchpad.

2. Scratch pad should be clear. When over known point (YUCCA in this example) press Line Key 5 to freeze update point. Line 5 alternately displays frozen LAT/LONG, and:

NOTE:

Selection of other pages will not unfreeze this step of manual updating. Distance and bearing functions can be used but will be from current position.

3. Type ident or LAT/LONG of known WPT [YUCCA] into scratchpad. Check carefully and insert into Line 5. PPSN is unfrozen to current updated position. Place/Bearing/Distance will not be accepted.



CAUTION:

If INSERT UPDATE *appears on the Performance Page inadvertently (without anyone knowingly freezing a known position), do not attempt an update. The* INSERT UPDATE *can be the result of accidently pressing Line Key 5 earlier in the flight over the position being displayed with the* INSERT UPDATE *command. Unfreeze by pressing Line Key 5 again with a blank scratchpad.*

4. To Cancel Update
   Enter minus into Line 5. PPSN reverts to pre-update position carried forward.

NOTE:

Manual update also makes the VOR/DME reasonableness limits smaller. Deleting the update does not increase the limits.

*To unfreeze without updating, press Line Key 5 again with blank scratchpad.

5. Acceptable radio data will update PPSN as if no manual update had occured. "MANUALLY UPDATED" will drop out.

6. Manually updated PPSN may be re-updated without limit. Only one minus is required to delete all updates.

7. If a manual update is done while flying a DIR TO, repeat the DIR TO to avoid "S" turning to capture the old T-P to TO leg.

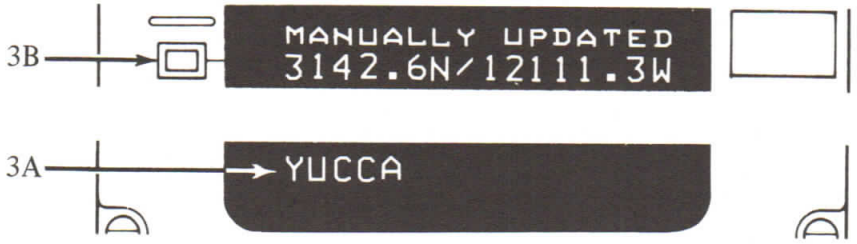
8. When flying at latitudes greater than 85^{o}, manual updates (as well as radio updates) will fade-out. MANUALLY UPDATED annunciation will not disappear.

MANUAL PRESENT POSITION (PPSN) UPDATE

1. In I or D/R Mode, PPSN can be updated on Performance Page. When in any radio mode, PPSN can be frozen (for checking),* but an attempt to insert an updated position will result in ERROR appearing in the scratchpad.

2. Scratch pad should be clear. When over known point press Line Key 5 to freeze update point. Line 5 alternately displays frozen LAT/LONG. and:

3. Type ident (No Place/Bearing/Distance WPTS) or LAT/LONG. of known WPT [YUCCA] into scratchpad. Check carefully and insert (B) into Line 5. PPSN is unfrozen to current updated position.



4. To Cancel Update
   Enter minus into Line 5. PPSN reverts to pre-update position carried forward.

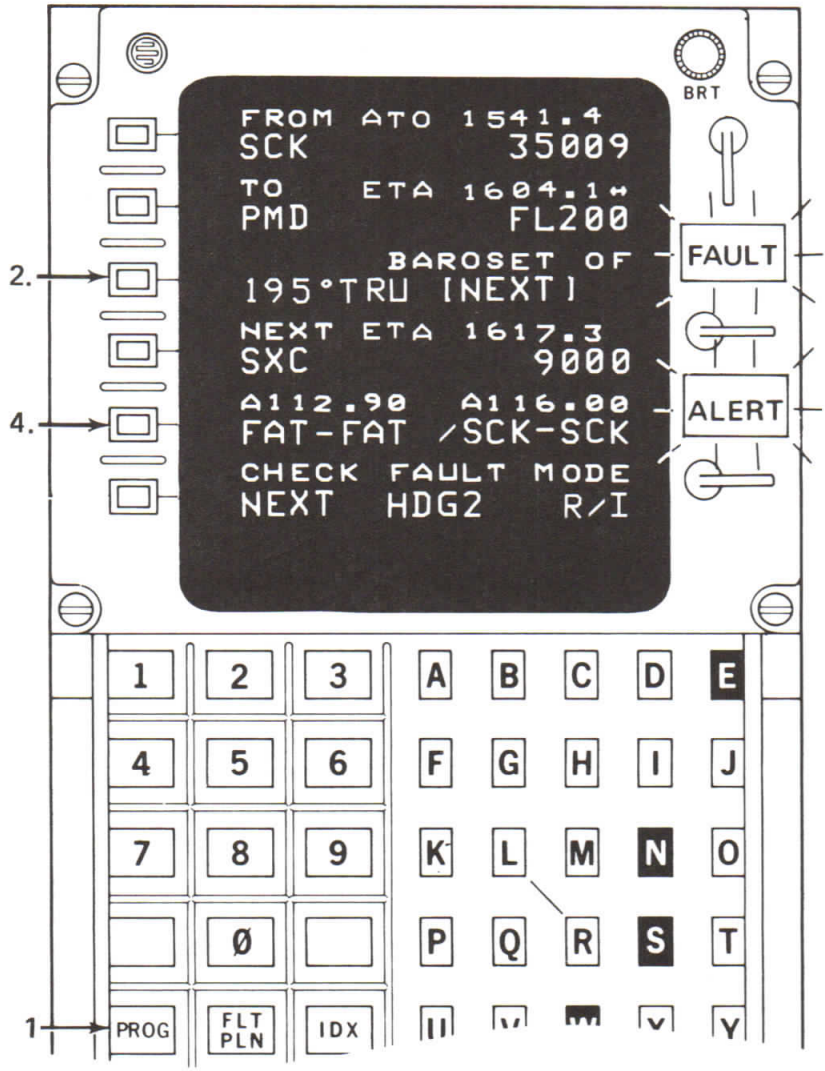
5. Acceptable radio data will update PPSN as if no manual update had occurred. "MANUALLY UPDATED" will drop out.

6. Manually updated PPSN may be re-updated without limit. Only one minus is required to delete all updates.

*To unfreeze without updating, press Line Key 5 again with scratchpad clear.

8 FAULT/ALERTS/IN FLIGHT IPL/ STORAGE LIMITS/ISS POWER ▶ 8

PROGRESS PAGE



1. If fault or alert lights are blinking, always select Progress Page.

2. Enter baroset when requested. (See page 3-7).

3. Acknowledge FAULTS, ALERTS, or MODE (see page 8-6 for priority order of faults and alerts).

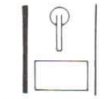
4. Satisfy Manual Tune request by manually tuning requested frequency.

IDENTIFICATION AND CORRECTION OF R NAV MALFUNCTIONS

When an R NAV system fails to operate correctly, the identification of the failure and the corrective action possible depends on an analysis of the failure symptoms. Several failures with typical symptoms and recommended corrective action are detailed below. Key indications to the nature of the failure are the CDU FAULT light and the HSI NAV flag. Reduced CDU capability during the DATA SEARCH (See Page 5-10) or temporary CDU data drop-out during DATA SEARCH should not be interpreted as a system failure.

1. CONTROL DISPLAY UNIT (CDU) LOCK UP WITHOUT FAULT LIGHT

a. Symptoms of CDU lock up



(No FAULT light)

(1) CDU locked up - display not updating, unable to enter data, or change display.

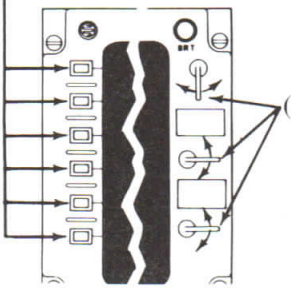
(2) No steady fault light on locked up CDU

(3) HSI for locked up system displays and not

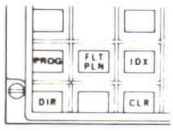
(4) Flight Guidance System (FGS) on locked up side remains in NAV mode.

b. Action for locked up CDU (Do not IPL)

(1) Firmly actuate the six line keys several times.



(2) Firmly actuate the three lever switches several times.



(3) Firmly actuate the function keys, particularly the blank keys, several times.

(4) Check all of the above switches and free any that are stuck.

NOTE:

Stuck alphanumeric keys cannot lock up the CDU and need not be actuated.

(5) Make all required entries on the other system CDU if available.

(6) Use the autopilot corresponding to the operative R NAV.

(7) DO NOT IPL - An IPL cannot be successfully completed without an operative CDU.

2. CDU FAILURE LOCK UP WITH STEADY FAULT LIGHT

a. Symptoms of a CDU failure.

(Steady)

(1) CDU locked up - display not updating, unable to enter data or change display.

(2) Steady **FAULT** light on locked up CDU.

(3) HSI for locked up system displays N, if the NCU has failed. See 3. NCU Failure below.

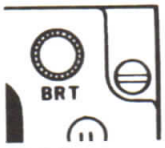
FAULT
CDU 1 or 2
(Opposite CDU)

(4) Blinking **FAULT** light on opposite system CDU.

(5) FAULT CDU 1 or 2 message on opposite system CDU Progress and Performance Pages and on LRU status page.

(6) Flight Guidance System on locked up side remains in NAV mode.

b. Action for FAULT CDU 1 or 2 on dual system.



(1) Turn brightness to minimum.

(2) Make all entires on other CDU if available.

(3) Use operational CDU system autopilot if available.

(4) DO NOT IPL - An IPL cannot be successfully completed without an operative CDU, and IPLing will not clear a failed CDU.

c. Action for CDU failure on single system.

Shutdown system and revert to other means of navigation.

3. NAVIGATION COMPUTER UNIT (NCU) FAILURE

a. Symptoms of an NCU failure.

(Steady)

(1) CDU locked up - display not updating, unable to enter data or change display.

(2) Steady **FAULT** light on failed system CDU.

(3) HSI for locked up system displays and not . If displayed see 2 CDU Failure above.

(4) Blinking **FAULT** light on opposite system CDU.

FAULT
NCU 1 or 2
(Opposite CDU)

(5) FAULT NCU 1 or 2 message on opposite system CDU Progress and Performance Pages and on LRU Status Page.

(6) If Flight Director engaged (no autopilot in CMD) the Flight Guidance System mode annunciation will revert to **HDG HOLD**, from **NAV** mode for system receiving input from failed NCU.

(7) With an autopilot engaged in CMD.

(a) If the failed NCU coincides with the engaged autopilot, the roll bar for the opposite side Flight Director System will bias from view.

(b) If the failed NCU does not coincide with the engaged autopilot, the mode annunciation will remain **NAV** and the roll bar for the opposite side Flight Director will bias from view.

(8) If both NCU's fail, or if operating on a single system which fails, (4) and (5) will not occur.

b. Action for NCU failure.

(1) Cycle the NCU 115 VAC circuit breaker of the failed system. This may cause the CDU to display a jumble of characters. If so, proceed as below.

IPL

(2) Perform inflight IPL, see Page 8-7.

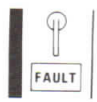
NOTE:

If the "failure" was a monitor shut down due to detection of overheating or improper power supply, normal operation will resume when conditions return to normal.

HSI is normal with no inertials operating and TAS < 130Kts.

4. ACTIONS FOR SOME OTHER FAULT MESSAGES
DO NOT IPL FOR THESE FAULTS

- FAULT
  FDSU



(Blinking)

(1) If a dual system, no action required. Only one FDSU's is required for normal operation.

(2) If a single system, or both FDSU's are fault status, no action required if the route is loaded and no storage limit.

(3) If IPL of a system with failed FDSU is necessary (per (3b) above exchange tape cassettes before IPLing. (Fault may be in cassette)

DATA SEARCH FAIL (dual system) - Pull circuit breaker on failed FDSU and continue operation on remaining FDSU.

- FAULT
  NAVPOS

Check both CDU positions by checking DIST TO a tuned navaid against RMI/DME display; or check ISDU LAT/LONG against CDU positions. Manually up-date to correct position if required (See page 7-17).

- FAULT
  ISC

This indicates an NCU cannot crosstalk.

- FAULT
  XTALK

This indicates an NCU received no reply to its crosstalk.

All entires must be made on both CDU's.
All comparison faults will be inoperative, so periodic crosschecks should be made.

- FAULT
  ASC

  This indicates the NCU is unable to communicate with some components of the system, such as the HSI, VOR/DME receivers, etc. (During an IPL this occurs if HSI switch is not in NAV, or Autotune is OFF).

5. FAULT AND ALERT LIGHT ANNUNCIATIONS

- Fault light blinks to indicate LRU (Systems Component) failure or comparator limit trip. Failed units are identified on line pair 6 of Performance and Progress Page and on LRU Status Page.

  Units monitored and annunciated are:

VOR1/2	ISC (INTERSYSTEM COUPLER)
HDG1/2	XTALK (CROSSTALK)
CADC1/2	*ISS1/2 AND 3
DME1/2	ASC1/2 (AIRCRAFT SYSTEMS COUPLER)
THDG1/2 AND 3	NAVPOS (NAVIGATION POSITION)

  *If an ISS fault is intermittent, DELETE that ISS.

- Failure of Aircraft System Coupler (ASC) affects interface with other aircraft systems. Navigation capabilities via CDU might still be possible.

- If compass or air data faults occur while XTALK is operative, opposite side inputs are used.

- Inter-Systems Coupler (ISC) fault results when an NCU detects a fault in its own cross talk, CDU or FDSU transmitter or receiver circuits. A XTALK fault results when the ISC is OK, but no answer is received after 3 attempts to talk to the other NCU.

FAULT

- NAVPOS is annunciated to indicate an erroneous radio position computation and will require an alternate means of navigation and a manual update of present position. This will occur only during an erroneous DME/DME update when the radio update track angle has differed from the inertial or DR track angle by more than 90° for 2 to 8 minutes.

XCHEK

XTK V.DEV DIST LAT LONG

- Blinks with data abbreviation (see below) on the line pair 6 of Performance and Progress Page when comparison between systems exceeds values below.

XTK	crosstrack deviation	1.0 n mi
V. DEV	vertical deviation	325 ft
DIST	distance to GO	1.0 n mi
LAT	present latitude	1.0 min
LONG	present longitude	1.0 min approx

- MHDG THDG ISS
  COMP COMP COMP

  Blinks with data abbreviation (see below) on line pair 6 of Performance and Progress Pages when comparison of inputs from compasses or present position from ISS exceed values below:

MHDG	Mag heading 10°
THDG	True heading 2°
ISS	PPSN split (2+4T) NM
	Where T = average time since ISS's aligned.

ALERT (BLINKING) Go to **PROG** Page

- Indicates one of the following conditions:

- TUNE (frequency)

  Alternately blinks on label line 5 to request manual tuning of the opposite radios, if the opposite NCU or Autotune is inoperative. Reset by manually tuning indicated frequency or by pressing Line Key 5.

- BAROSET OF
  324°T [NEXT]

  Blinks on line pair 3 when present leg is flight level and next leg is altitude. Reset by inserting QNH (either millibars or inches Hg).

- CHECK
  NEXT

  Blinks on line pair 6 of Progress and Performance Page if:

  a. Turn of more than 90° required to capture next leg

  b. Length of next leg is less than 1 N MI

  c. Length of next leg is more than 700 N MI in inertial mode or more than 350N MI in radio mode.

  d. There is an ✱ at the "NEXT" WPT on the FLT Plan Page.

  e. If there is no next Waypoint on Flight Plan Page.

  Reset by pressing Line Key 6 on **PROG** or Performance Pages.

SR/I, SR, I or DR

- Blinks if down moding occurred.

- Reset by pressing Line Key 6 on **PROG** or Performance Pages.

- ALERT light is delayed 8 sec. after down mode annunciation if TAS < 300 KTS, 60 sec. if TAS > 300 KTS. Up moding resets ALERT (blinking annunciation and light) without any delay.

CONFIRM

- Blinks alternating with original text in certain label lines.
- Reset by confirming (pushing same Line Key second time) or by pushing CLR key.

VIA TO
DIR SXC

- TO waypoint blinks for 15 seconds prior to HSI leg switching.

ERROR

- Blinks alternating with loaded data in the scratchpad whenever data are inserted incorrectly, or the operation is not proper at that time.
- Reset by inserting data in correct place or by pushing CLR key.

WPT NOT STORED or AWY NOT STORED or NOT STORED

- Blinks alternating with ident in scratchpad if inserted data are not stored in the computer. Data may or may not be on tape.
- Reset by pushing CLR key.

\- - - - -

- Dashes, (–) displayed if computer is unable to compute data.

SEARCH COMPLETE

- Blinks in scratchpad on all pages at end of route assembly.
- Reset by pushing CLR key on each CDU.

STORAGE LIMIT

- Appears in scratchpad whenever flight plan assembly cannot be completed due to amount of data.
- Reset by pushing CLR key.

STORAGE LIMIT
AFTER (WPT)

- Appears with ident of last WPT of Flight Plan covered by navaid and AWY/WPT data.

STORAGE LIMIT
INITIATE SEARCH

- Appears when within less than 15 minutes of last WPT of complete data coverage. INITIATE SEARCH also appears in the scratchpad of all pages, clearable with "CLR" key on all pages.
- Reset by initiating data search. (See Page 8-11)

DATA SEARCH

- Blinks in scratchpad on all pages when data transfer from FDSU to NCU takes place and limited CDU service is available.
- Reset is automatic at end of data transfer.
- Various entries are possible while in data search.
- Data search returns after insertion.

DATA SEARCH FAIL/DEFINE ROUTE

- "DATA SEARCH FAIL" if inflight assembly (TAS>130 Kts)
  or
  "DEFINE ROUTE" if ground assembly, blinks in scratchpad of all pages as a result of failure in obtaining NAV data from tape or via crosstalk. For either case repeat the route definition.
  When either appears blinking when the index page appears, it means to define a route to get a data base.
- Reset by pushing CLR key.

NO DATA FOUND

- Blinks in scratchpad on all pages when FROM VIA-TO assembly calls for points outside the bounds of data contained on the tape.
- Reset by pushing CLR key.

TAPE MISMATCH

- Blinks in scratchpad on all pages when FDSU's contain cartridges having different tapes.
- Re-IPL with identical part number tape cartridges, or a single cartridge if only one is available.

PRIORITY OF FAULT AND ALERT DISPLAY

When there are more than one FAULT or ALERT to be displayed on line 6 of PROG. PAGE (2 max.) or the LRU Status Pages (2 max.) they will be presented in the following orders:

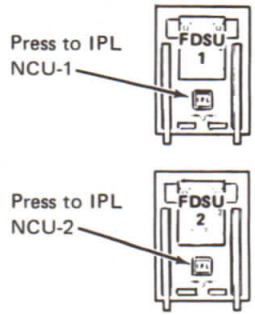
FAULT NAV POS	FAULT CDU2	FAULT HDG1	XCHEK LON
CHECK NEXT	FAULT FDSU2	FAULT CADC1	FAULT THDG1
FAULT ISS1	FAULT ASC1	FAULT NCU2	FAULT THDG2
FAULT ISS2	FAULT ASC2	FAULT CDU1	ISS COMP
FAULT ISS3	FAULT ISC	FAULT FDSU1	MHDG COMP
FAULT VOR1	XCHEK XTK	FAULT HDG2	THDG COMP
FAULT DME1	XCHEK V DEV	FAULT CADC2	FAULT THDG3
FAULT VOR2	XCHEK DIST	FAULT NCU1	
FAULT DME2	XCHEK LAT		

In-flight IPL with the other NCU and crosstalk operative

CAUTION:

Identify the FDSU of the failed system.

Do not press the good system's IPL button (even with the FDSU circuit breaker pulled) or you will lose that system too. Do not pull the circuit breaker of the good NCU.



1. To initiate IPL of a system in flight, firmly press the appropriate system's IPL button on the Flight Data Storage Unit (FDSU).

2. If after 2 minutes the system fails to enter IPL status, cycle its FDSU circuit breaker and press the IPL button again.

3. As the IPL proceeds, ignore FAULT ISC and FAULT NCU on operative CDU and step through by pushing Line Key 6 when appropriate to bypass the manual test, etc. The corresponding VOR and DME will self-test and show momentary faults on the opposite CDU.

4. When the Page Index appears, both CDU's will appear to freeze for about 30 seconds while all the data is being transferred from the operating system to the IPL'd system. SEARCH COMPLETE indicates transfer complete.

Dual In Flight IPL or In Flight IPL of Single System

1. Proceed through steps 1-3 above for the locked-up NCU or NCU's. If dual IPL, push both IPL buttons together and don't abort (or bypass) crosstalk check. If single system, crosstalk check must be bypassed.

2. Present position (PPSN) must be approximately correct before initiating a route assembly. If inertial inputs are available, present position will be the average of the ISS positions. If inertial inputs are not available, Line 5 of the Progress Page must be manually updated to the approximate present position LAT/LONG. (Idents cannot be used.)

3. Route assemblies are possible only from the Revise Page. When the Page Index appears, the DATA SEARCH FAIL annunciation will appear in place of DEFINE ROUTE (See page 8-6). Press the DIR key and enter desired track (or heading)/and a distance of approximately 100 miles and insert into Line 2. (NAV may now be selected on the FGS). Access the Revise Page from TO WPT and accomplish an in-flight assembly. (See page 5-8 for in-flight route assemblies.) Do not use a company route originating significantly behind the airplane. This could cause STORAGE LIMIT's behind the airplane as the data swath will be assembled from the TO WPT to the route origin and then along the company route.

4. After route assembly, and navaids are available, if radio updating does not occur present position may be more accurately manually updated (See page 7-17). Idents may now be used.

5. Review and edit flight plan.

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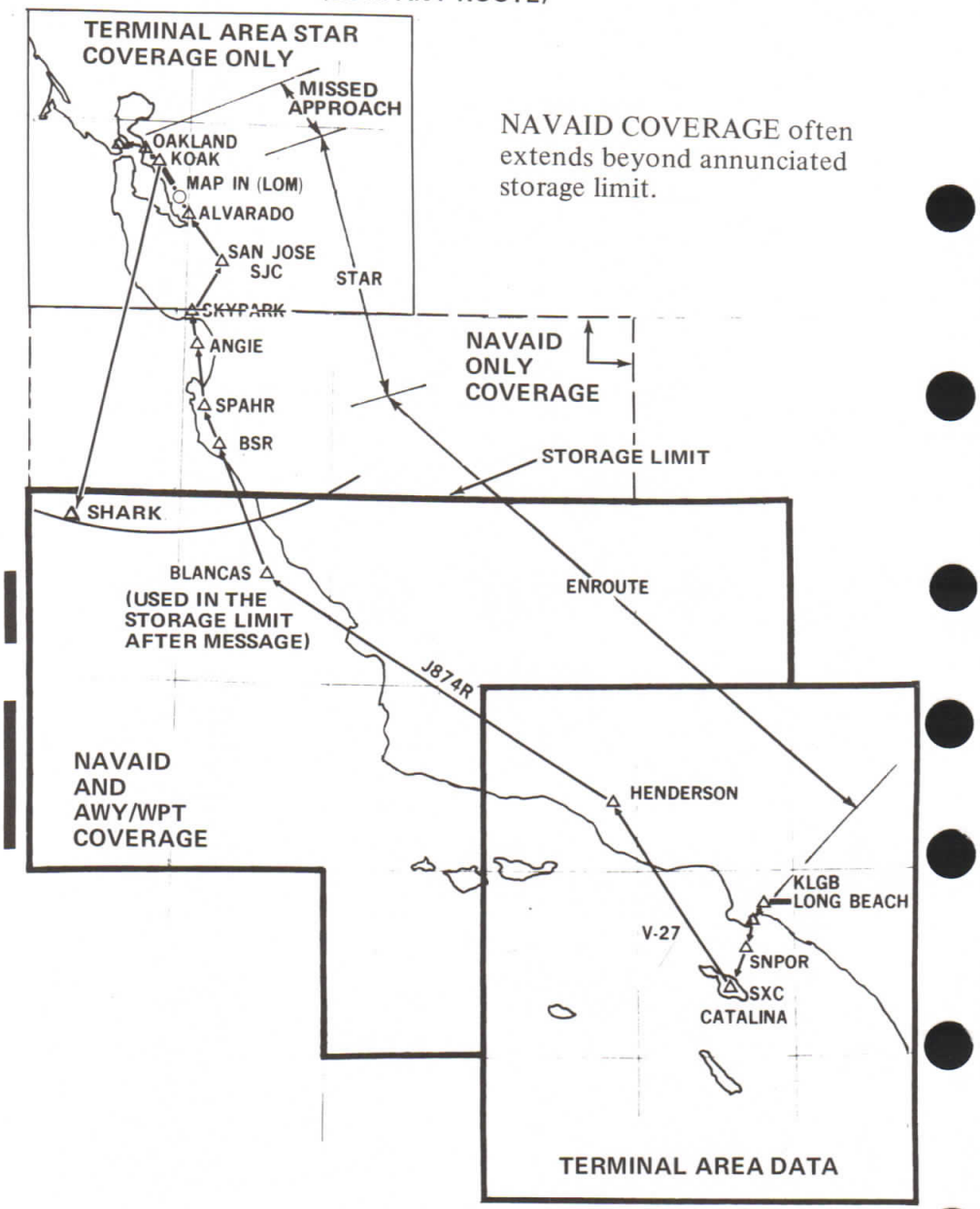
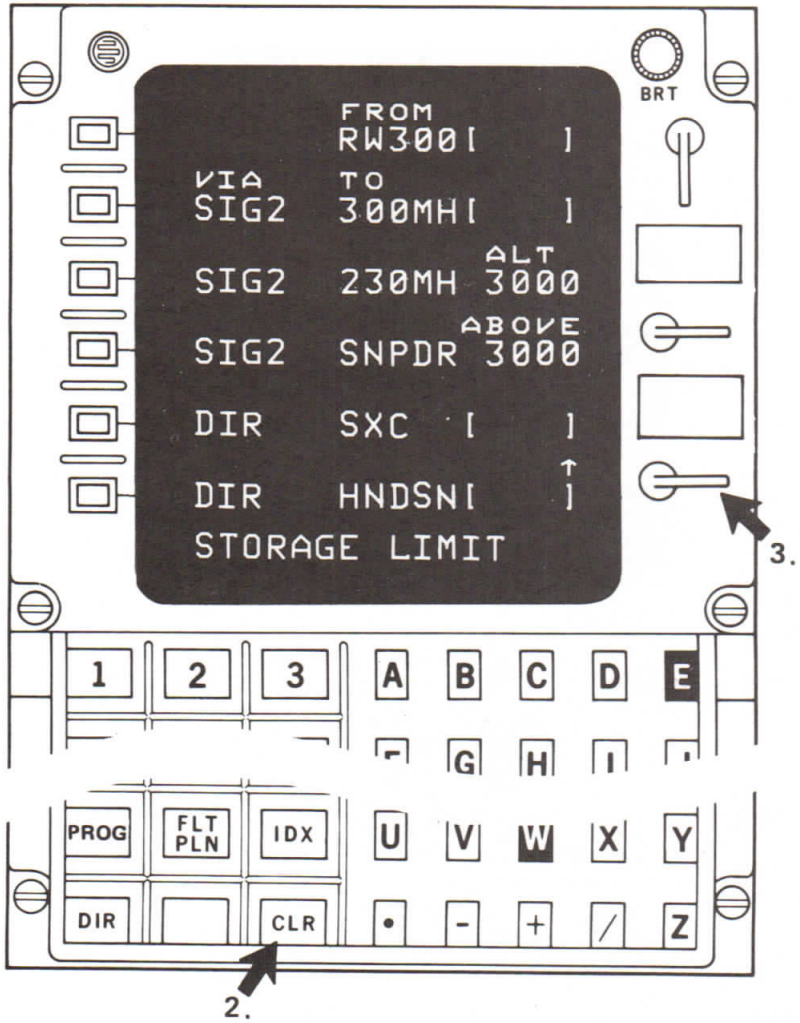
STORAGE LIMIT
(COMPANY ROUTE)



NAVAID COVERAGE often extends beyond annunciated storage limit.

STORAGE LIMIT (COMPANY ROUTE)

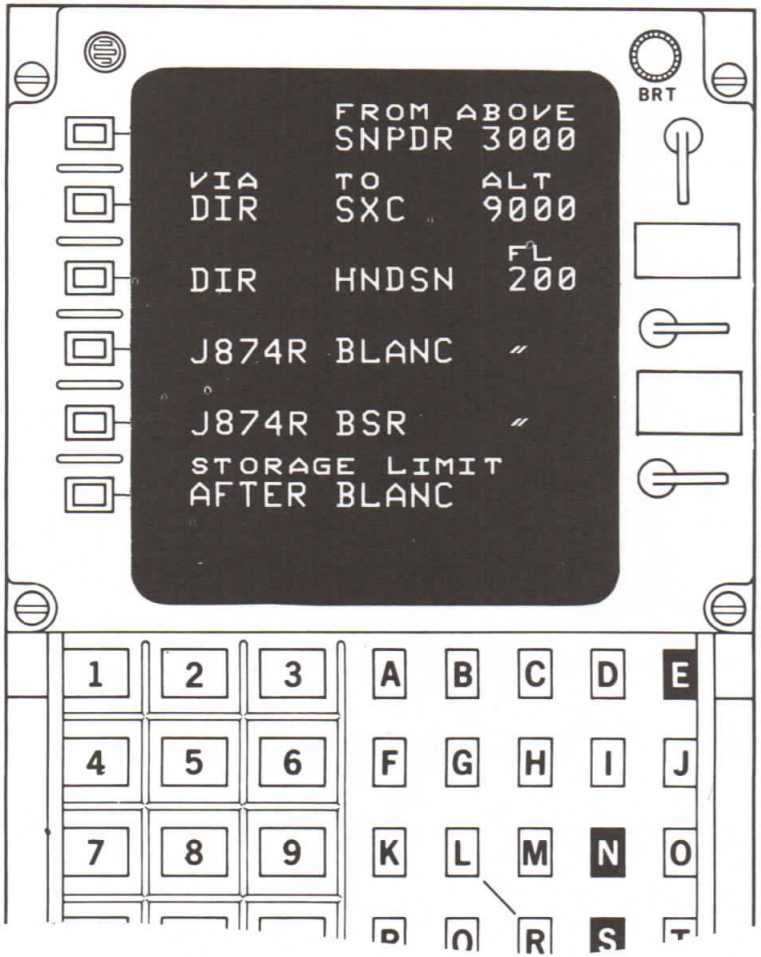


1. STORAGE LIMIT appears on the scratchpad on all pages whenever an assembly from origin to destination cannot be completed due to amount of data exceeding core capacity.

2. The message can be cleared using the "CLR" command key.

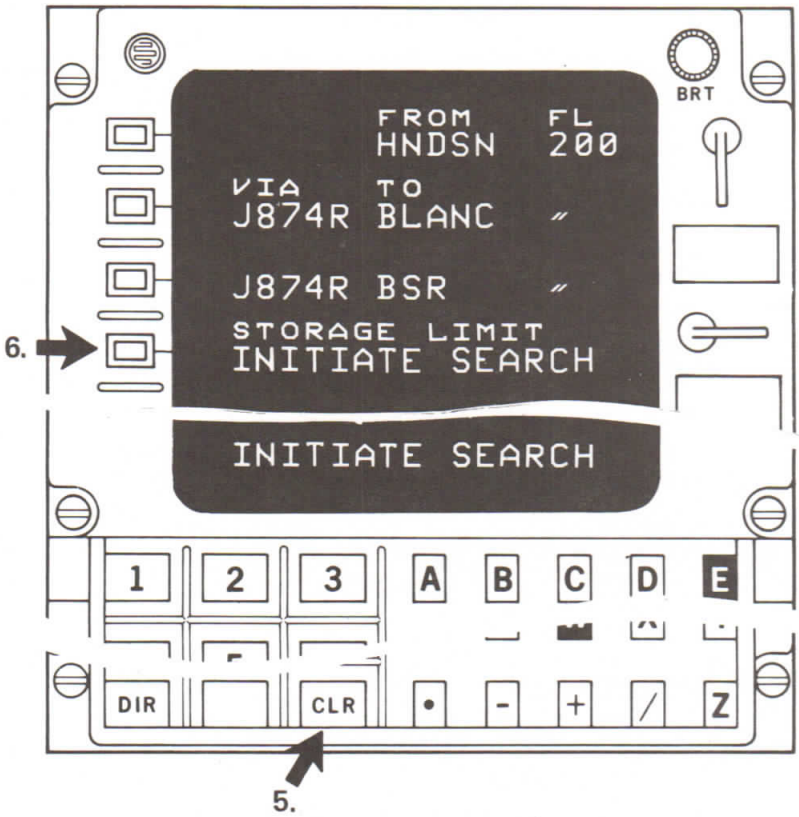
3. To find the location in the flight plan of STORAGE LIMIT the slew the Flight Plan Page up using lever switch.

STORAGE LIMIT (COMPANY ROUTE)



4. The enroute waypoint BLANCAS (BLANC) is used in the STORAGE LIMIT AFTER message as it is the last waypoint in the Flight Plan that has navaid and airway coverage.

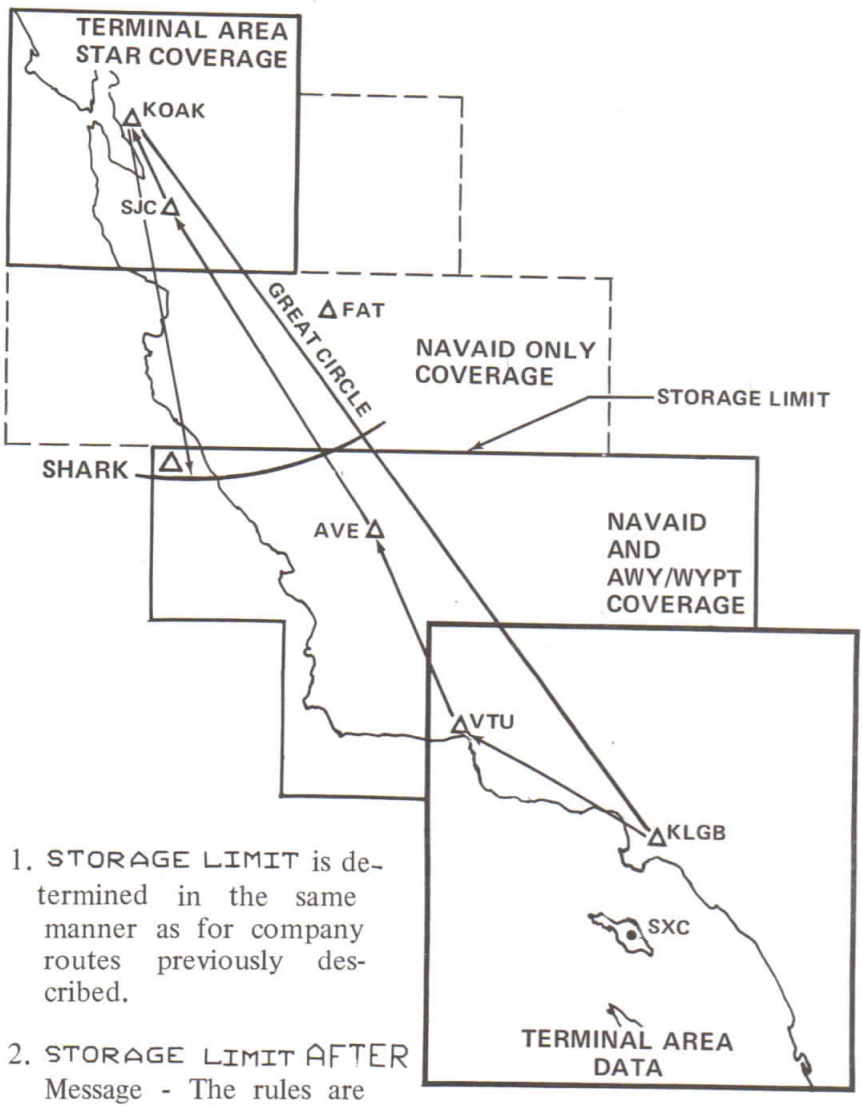
   The system first determines that SHARK is the closest waypoint with navaid and airway coverage or navaid with waypoint and airway coverage to the destination and the computer stores this (SHARK) as the storage limit. It then looks for the enroute flight plan waypoint closest to the destination but not closer than SHARK. It uses this waypoint (BLANC in this case) in the "STORAGE LIMIT AFTER" annunciation.



5. When within 15 minutes (based on G.S. and direct distance) of "BLANC" (last WPT of complete data coverage) the message changes to "STORAGE LIMIT INITIATE SEARCH" also "INITIATE SEARCH" appears on the scratchpad line of all pages, clearable with "CLR" key on all pages.

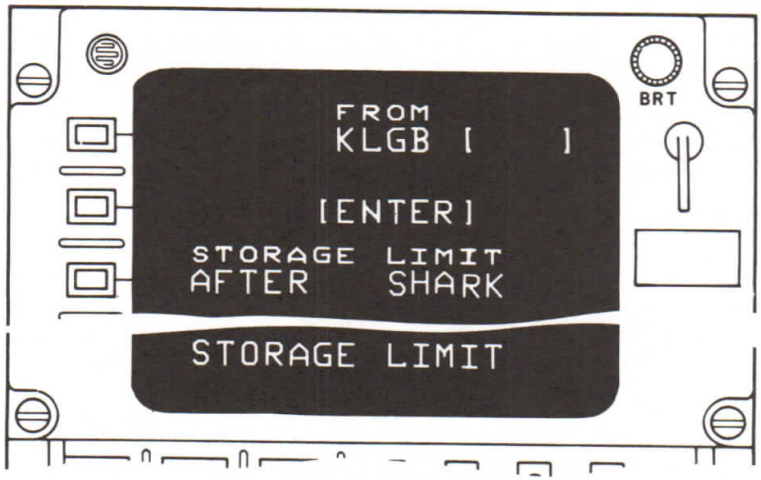
6. Data search can be initiated at any time by pressing Line Key opposite STORAGE LIMIT message. But to prevent running out of any data it should be initiated prior to reaching BLANC.
Departure terminal area data, SID's and enroute data behind the FROM WPT (waypoints 75 NMI, NAVAIDS 100 NMI) will be dropped by the new route assembly. The FROM WPT ident will change to its LAT/LONG to facilitate the dropping of terminal area data.

STORAGE LIMIT
(FROM-VIA-TO)

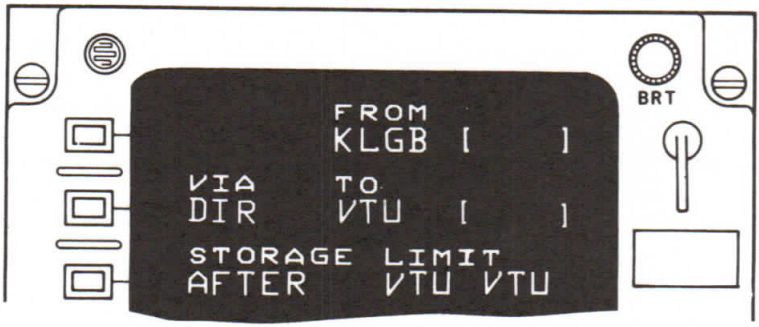


1. STORAGE LIMIT is determined in the same manner as for company routes previously described.

2. STORAGE LIMIT AFTER Message - The rules are the same as for company routes. Accordingly, when the assembly is first completed there are no enroute waypoints in the Flight Plan. The origin of the FROM VIA TO is not considered an enroute data waypoint. In this example, KLGB is from the Airport and Gateway Table data.

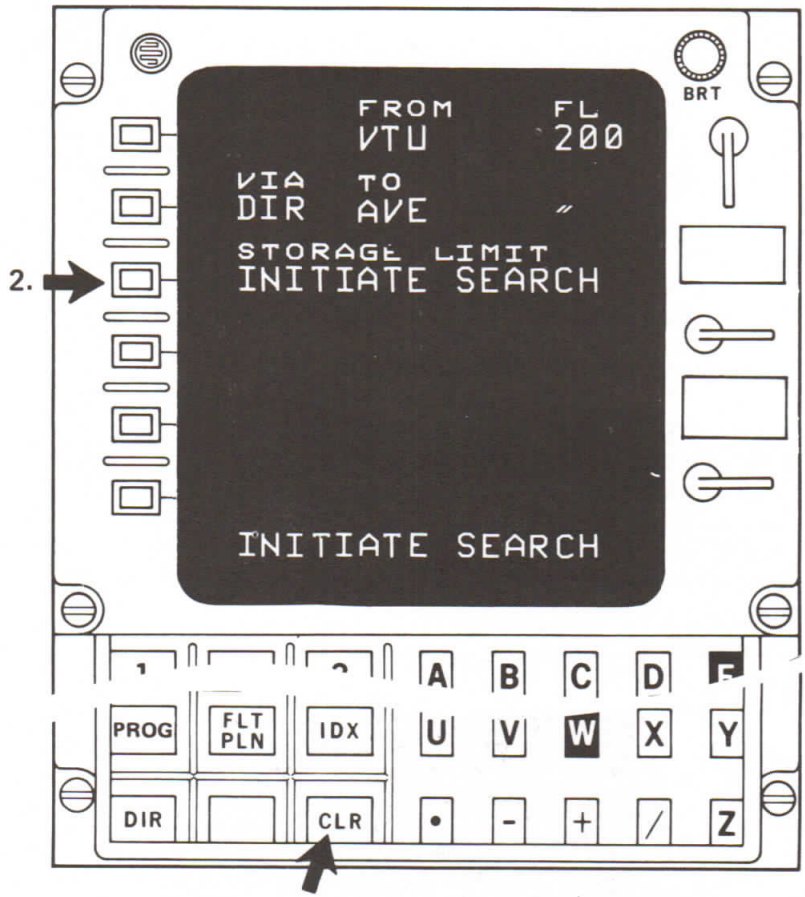


3. The storage limit waypoint (SHARK in this example) is used in the STORAGE LIMIT AFTER message until the first enroute waypoint is entered.



4. The first waypoint will then be used in the STORAGE LIMIT AFTER message. Navaid names will be as on prog. page.

5. As each succeeding enroute waypoint is entered the STORAGE LIMIT AFTER message will change to the new waypoint. When a waypoint is entered that does not have waypoint/airway and navaid coverage, the STORAGE LIMIT AFTER annunciation will use the last enroute waypoint with complete coverage, in this case AVE AVE.



6. When within 15 minutes (based on G.S. and Direct Distance) of AVE (ANNUNCIATED STORAGE LIMIT) the message changes to "STORAGE LIMIT INITIATE SEARCH" Also "INITIATE SEARCH" appears on the scratchpad line of all pages, clearable with "CLR" key.

7. Data search can be initiated at any time by pressing LineKey opposite message. It should be done prior to reaching AVE.

NOTE:

a. *Complete stored data coverage is not available after AVE. LAT/LONG. Waypoints can still be entered.*

b. *During ground assembly, the flight plan should be extended to the STORAGE LIMIT before takeoff to prevent premature triggering of the initate search alert. Once STORAGE LIMIT INITIATE SEARCH is triggered, it cannot be reset by flight plan extension.*

INERTIAL SENSOR SYSTEM (ISS) POWER

The airplane is equipped with 3 Inertial Sensor Systems (ISS). Each ISS includes an Inertial Sensor Unit (ISU), a Battery Unit, and a Mode Selector Unit (MSU). In addition to NAV functions, the ISU also provides attitude reference for the ADI, FGS, and weather radar and heading stabilization for the compass system. Each ISU requires 115 VAC to switch ON initially and if 115 VAC power is lost when the ISU is operating the Battery Unit has been demonstrated to sustain operation for 5 minutes. The battery may provide operation for 30 minutes if completely charged. The Battery Unit is on charge whenever the ISS is operating on 115 VAC power, however, every minute of battery operation requires approximately 10 minutes of 115 VAC operation to recharge. The ISS will provide navigation and attitude outputs when operating on its battery, however airplane 28 VAC is required to provide the attitude and heading outputs for ADI/HSI operation.

When operating on battery power the "BAT OPER" annunciator will illuminate. The ISU will automatically shut down when battery voltage reaches an unsatisfactory level. At this time "BAT WARN" and "ISS WARN" will be annunciated. Once an ISU is shutdown it requires 115 VAC to switch ON again and cannot be realigned in flight for the NAV mode. The ISU may be used for attitude and heading stabilization by switching the MSU to ATT and reestablishing 115 VAC power.

Normal ISS Power Supply

ISS1 (Captains, L.) is powered from the No. 1 115 VAC Bus. ISS2 (First Officers, R.) is powered from the Right Emergency 115 VAC Bus. ISS3 is powered from the No. 3 115 VAC Bus.

ISS Switching/Power Supply Transfer

ISS3 may be switched to supply attitude and heading reference to the Captains ADI, Compass System, and No. 1 FGS by selecting the overhead ISS selector switch to "Capt on AUX." Switching to "F/O on AUX" transfers ISS3 to the First Officers ADI. Compass System and No. 2 FGS. When switched to the Capt or F/O positions ISS3 exchanges 115 VAC power sources with the ISS it replaces.

MSU OPERATION AND WARNING LIGHTS

ISS WARN

Selector in NAV – The warning will activate for any detected failures which affect the navigation function (digital sub system, instrument cluster, etc.).

Selector in ATT – The warning will activate only for failures affecting attitude. (The NAV functions are not operating.)

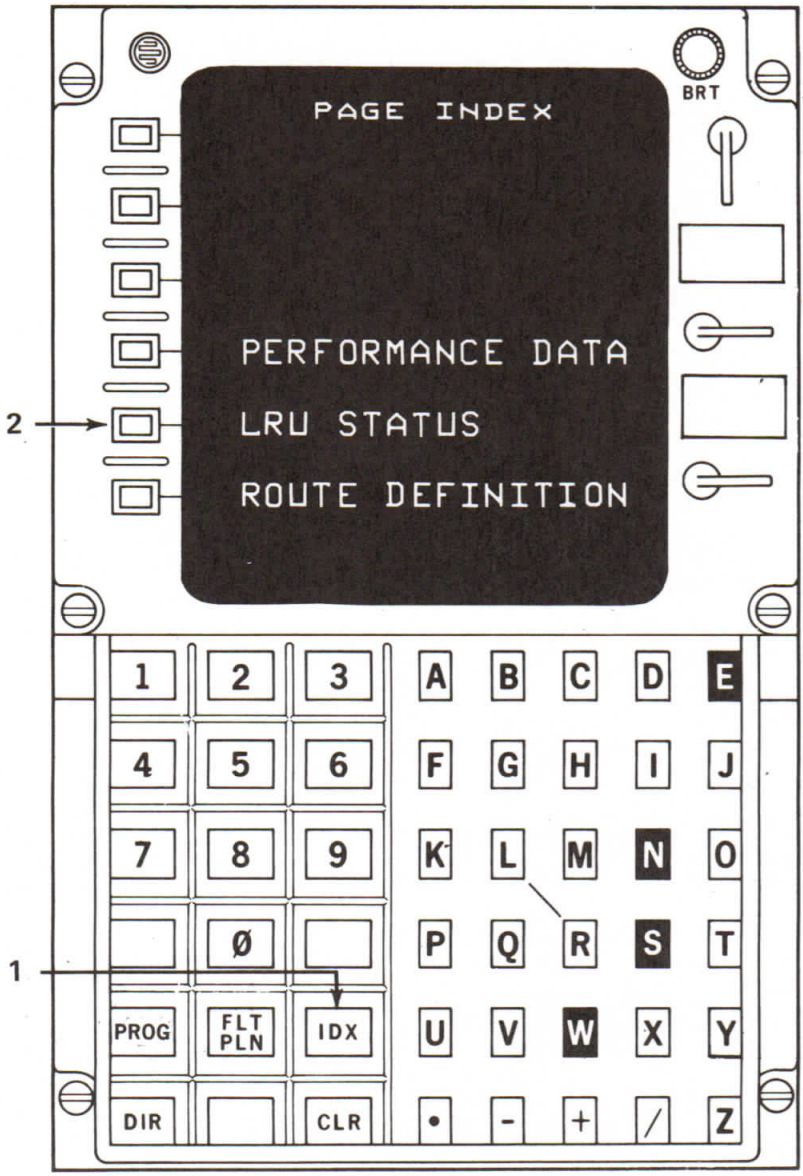
NOTE:

The "ISS WARN" annunciator will not be activated by failures which affect the attitude outputs only if system is operating in NAV mode.

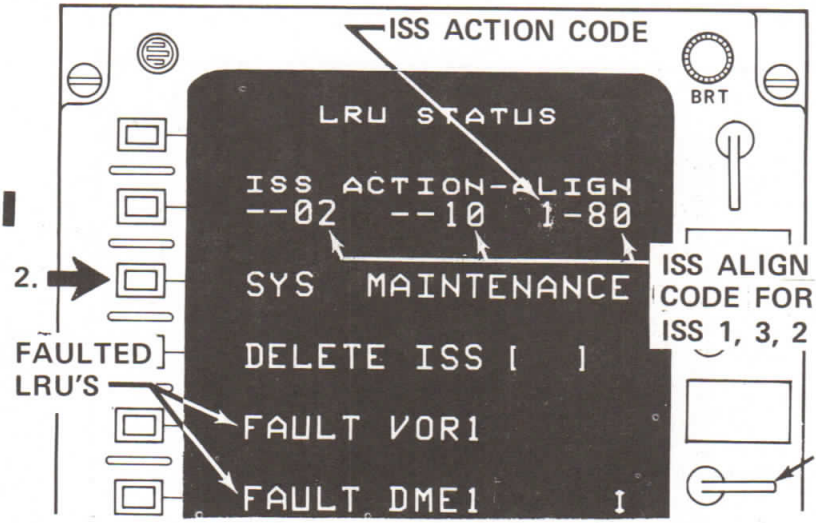
Abnormal Operation of the MSU Select Switch (in flight)

1. If the "ISS WARN" annunciator illuminates steady with the selector in NAV, place the selector to ATT. If the "ISS WARN" goes out, the attitude portion is still operable.
2. If the "ISS WARN" annunciator illuminates (or remains illuminated in ATT, the ISU is probably unusable. Check for attitude and heading flags on the appropriate ADI and RMI. If flags are present, place the MSU selector switch to OFF, and select L on 3/R on 3 as appropriate.
3. If attitude or heading flags are present in the appropriate ADI or RMI, but the MSU ISS WARN annunciator is not illuminated, the MSU selector switch should not be moved, from the NAV position to the ATT position.

If you want to know alignment status or LRU Status Select IDX and LRU STATUS



1. Selected the PAGE INDEX
2. The LRU Status can then be viewed and the ISS Alignment Status code may be monitored. (See page 9-2)



ISS Alignment Codes

ISS alignment status is indicated by codes 90-80-70-60-40-10-02, 02 being alignment complete. A "–" with any alignment code is normal. no action required.

ISS Action Codes

* 0 Momentarily changing to "–" with no align status, FAULT ISS, no ISS Warn light, no true heading on ISDU GS/TK mode, check HDG PLATFORM circuit breaker. If not open, ISS has internal fault on true heading output.

1 Insert present position. Use ISDU if route assembly PPSN has already been inserted. (See Page 8-17).

2 Switch MSU to OFF. If ISS has been in operation more than 15 minutes (02 status) wait 4 minutes for gyros to spin down as gyros will be caged when repowered. Switch MSU to NAV.

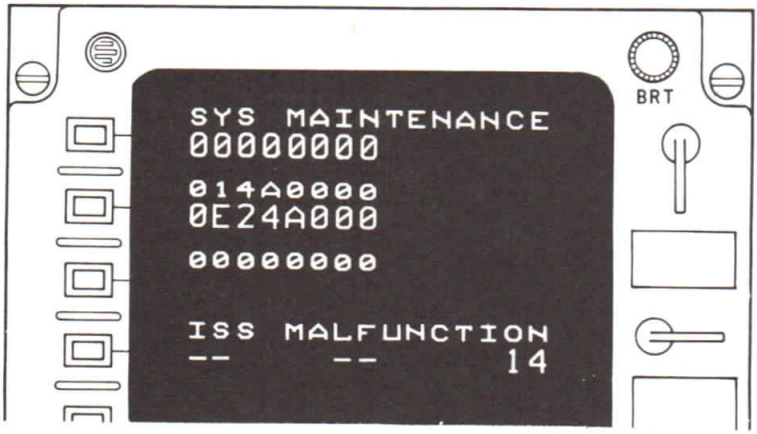
3 Switch MSU to Attitude. If ISS warn light goes out attitude references are usable.

4 Switch MSU to OFF. Replace ISU.

5 Switch MSU to OFF. Attitude slew test connector must be removed from ISU before the ISS can be aligned.

1. Slew up for more items.
2. Access system maintenance page from Line Key 3.

* *Appears only momentarily. Fail status of true heading causes NCU to fail entire ISS output (displays dashes for action and align status).*



1. Accessed from LRU status page
2. System maintenance codes (Not Presently Defined)
3. ISS malfunction codes displayed:

ACTION CODE**	MALF CODE	FAILURE	ISS WARN
1	11	POSITION NOT ENTERED	WARN BLINK
2	12	COARSE ALFA FAIL	WARN BLINK
2	13	UPDATE EXCESSIVE	WARN BLINK
2	14	VELOCITY EXCESSIVE	WARN BLINK
2	21	PLAT NOT UP TO TEMP	WARN BLINK
3	32	REPEAT COARSE ALFA FAIL	WARN
3	33	REPEAT UPDATE EXCESSIVE	WARN
3	34	REPEAT VELOCITY EXCESS.	WARN
0	41	A/D SELF-TEST FAIL	VALID *
3	42	DISCRETE ERROR	WARN
3	43	GYRO TORQUER FAIL	WARN
3	44	ΔV EXCESSIVE	WARN
3	45	V_g UNREASONABLE	WARN
3	51	MEMORY ERROR	WARN
3	52	ARITHMETIC ERROR	WARN
4	61	REPEAT PLAT NOT UP TO TEMP	WARN
5	71	ATT SLEW MODE	WARN BLINK

* The navigation equation is not affected.

** See page 9-2 for action to be taken.

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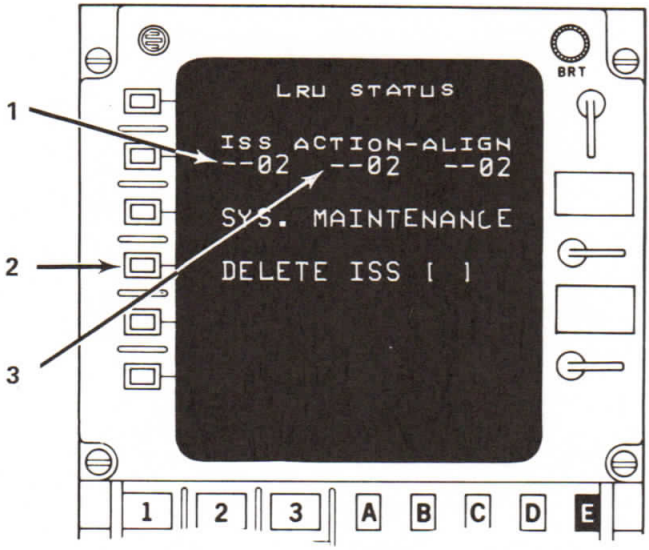
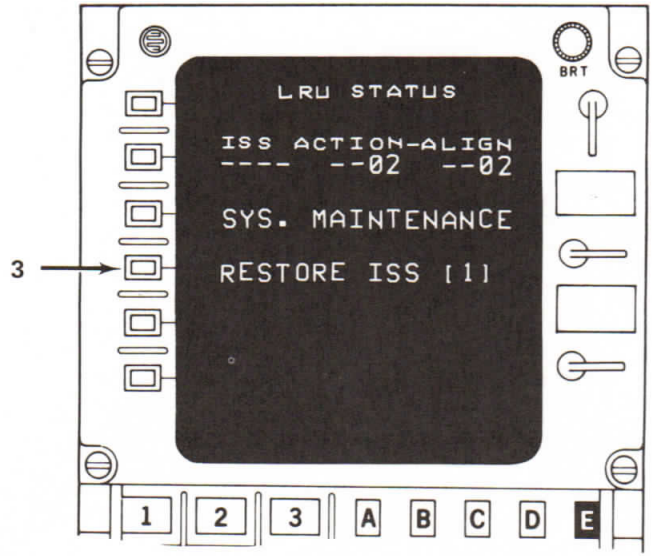
ISS 1 DELETION

1. When an ISS input is faulting intermittently it should be deleted from use. Also, if it can be determined that one of the ISS's in use is of significantly less accuracy, its use can be deleted.



2. If ISS-1 is to be deleted, insert 1 into brackets using keyboard and Line Key 4. Display changes to figure below.

ISS 1 RESTORE



3. Use of ISS-1 can be restored by depressing Line Key 4 again.

APPENDICES

APPENDIX A

ABREVIATIONS

AAA – Actual Altitude Abeam
AINS – Area Inertial Navigation System
ALT – Altitude
ARP – Airport Reference Point
ASC – Aircraft Systems Coupler
ATA – Actual Time Abeam
ATO – Actual Time Over
ATT – Attitude
AWY – Airway

BAROSET – Barometer Setting (altimeter)
BRG – Bearing
BU – Battery Unit

CADC – Central Air Data Computer
CDU – Control Display Unit
CLR – Clear
CMD – Command
COMP – Comparator
CRS – Course
CRT – Cathode Ray Tube

D•DIR – Direct
DR•D/R – Dead Reckoning
DME – Distance Measuring Equipment

ETA – Estimated Time Abeam
ETO – Estimated Time Over

FD – Flight Director
FDSU – Flight Data Storage Unit
FG & C – Flight Guidance & Control
FL – Flight Level
FP – Flight Plan
FREQ – Frequency

GS – Ground Speed

HDG – Heading
HSI – Horizontal Situation Indicator

I – Inertial (mode)
IDX – Index
IPL – Initial Program Load
ISC – Inter Systems Coupler
ISDU – Inertial Sensor Display Unit
ISS – Inertial Sensor System
ISU – Inertial Sensor Unit
K•KN – Knot

L – Left (OFFSET, XTK, or DRIFT)
LAT/LONG – Lattitude/Longitude
LK – Line Key (CDU)
LON•LONG – Longitude
LRU – Line Replaceable Unit
M•MAG – Magnetic
MHDG – Magnetic Heading
MSU – Mode Selector Unit
NAVPOS – Navigation Position
NCU – Navigation Computer Unit
NM – Nautical Mile
OFST – OFFSET Offset
OVHD – OVERHEAD – Turnover WPT Ident

PLTFM – Platform
PROG – Progress
PPSN – Present Position

R – Radio (mode)
R – Right (OFFSET, XTK, or DRIFT)
R/I – Radio Inertial (mode)
RTE – Route
RW – Runway

SR – Single Radio (mode)
SR/I – Single Radio Inertial (mode)

TA – Terminal Area
T HDG•THDG – True Heading
TP – Turn Point
TRK – Track
TRU – True

V. DEV – Vertical Deviation
VOR – VHF Omni Range

WPT – Waypoint

XTALK – Crosstalk
XTK – Crosstrack

APPENDIX B
WAYPOINT IDENTIFIERS

The following rules have recently been established for Waypoint Identifiers and may prove useful in identifying and inserting Waypoints.

1. Waypoints must not exceed 5 alphanumeric's.
2. VOR, DME, VOR/DME, VORTAC, and TACAN STATIONS. Use the official two or three character identifier codes.

   Example:

STATION NAME	IDENT
Los Angeles	LAX
Abilene	ABI
Quebec Canada	QB

3. Named Waypoints, Intersections, and Reporting Points.

   An identifier code shall be developed using the following rules. The rules shall be applied sequentially until a five-character or less identifier is established.

   a) One-Word Names

   b) Use the full name if five or less characters.

   Example:

WAYPOINT NAME	IDENT
ACRA	ACRA
BAGBY	BAGBY

   c) Eliminate double letters

   Example:

WAYPOINT NAME	IDENT
KIMMEL	KIMEL
RABBITT	RABIT

   d) Keep the first letter, first vowel, and last letter. Drop additional vowels starting from right to left.

   Example:

WAYPOINT NAME	IDENT
ADOLPH	ADLPH
AQUEDUCT	AQDCT
BEAUMONT	BEMNT

e) Drop consonants starting from right to left.

Example:

WAYPOINT NAME	IDENT
ANDREWS	ANDRS
BRIDGEPORT	BRIDT

f) Multiple Word Names

Use the first letter of the first word and abbreviate the last word using the rules in 3a thru 3e.

Example:

WAYPOINT NAME	IDENT
BELLE TERRE	BTERE
CONNERS PASS	CPASS
POINT ANO	PANO
ROUGH AND READY	RREDY

g) Duplicate Identifiers

When the above results in more than one waypoint having the same identifier they may be tagged with a "+" for display on the DUPLICATE NAMES page. Supplemental idents appearing in the label line above the primary idents, or LAT/LONG coordinates may be used to select the desired WPT.

Example:

WAYPOINT NAME	IDENT
LAKE (Calif)	LAK+1
LAKE (Texas)	LAK+2
SHAWNEE (Colo.)	SHA+1
SHAWNEE (Fla.)	SHA+2
SHAWNEE (Kans.)	SHA+3
SHAWNEE (Okla.)	SHA+4

4. Nondirectional Beacon (NDB) and Fan Markers (FM)

An identifier code shall be developed using the full name of the station and applying the rules of 3a thru 3e.

Example:

STATION NAME	IDENT
ROMEO (Los Angeles LOM)	ROMO1
ROMEO (Chicago O'Hare)	ROMO2
RIVER GROVE (Chicago O'Hare)	RGROE
QUEBEC NDB	QUEBC

APPENDIX C

INERTIAL OPERATION

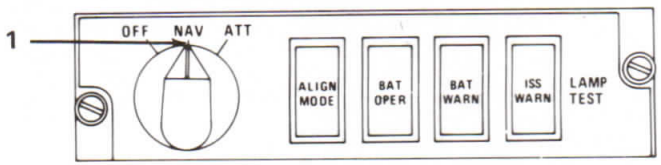
The operator should have studied the introduction of this handbook with particular attention to the CDU page descriptions and HSI NAV mode displays.

The AINS-70 R-NAV system will meet the requirements of AC25-4 as the sole means of navigation using the Inertial (I) mode when the following procedure is used.

CHECK LIST

1. Switch the three MSU's from OFF to NAV.
2. Initialize ISS's using ISDU.
3. An IPL is required to clear the previous data base from memory and will establish the initial position if at least one ISS is in NAV status when the IPL program completes XTALK TEST and goes into DATA SEARCH.
4. Check present position on PERFORMANCE Page. LAT/LONG should agree with LAT/LONG displayed on ISDU.
5. Enter time.
6. Enter Flight Plan
7. Review Flight Plan
8. AUTOTUNE switches OFF

OPERATIONAL PROCEDURE



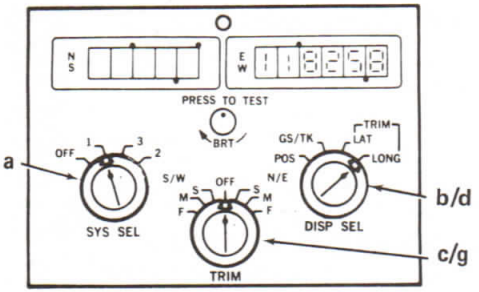
1. Start ISS alignment:
   a. Place all 3 Mode Selector switches to NAV position.
   b. Test MSU annunciator lights by pressing ISS WARN annunciator.

2. ISS INITIALIZATION (Using ISDU)

a. Select Inertial Sensor System to be initialized using SYS SEL Switch.

b. Set DISP SEL to LONG.

c. Operate TRIM switch to adjust LONG to desired value.

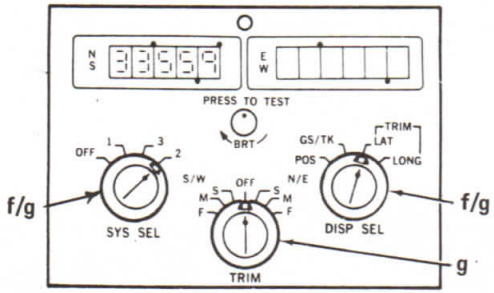


d. Set DISP SEL to LAT.

e. Trim LAT to desired value with TRIM

f. Repeat for the other Inertial Sensor Systems.

g. Set DISP SEL to POS and check each ISS for correct LAT/LONG with SYS SEL.



CAUTION:

1. *Check the trim position very carefully against ramp position as very small latitude errors will cause alignment failure. A second alignment attempt with a gross error will LOCK UP the ISU and maintenence action will be required.*

2. *The system cannot detect longitude trim position errors.*

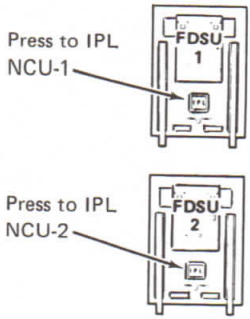
3. IPL for INS operation

NOTE:

IPL'ing before each flight is recommended for the following reasons.

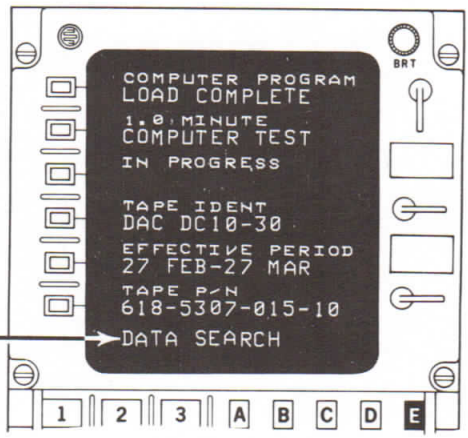
1 To insure that no navigation data is stored for any part of the route.

2 To allow acceptance of ISS initial position and thereby avoid having to carry a manually updated position for the entire flight.



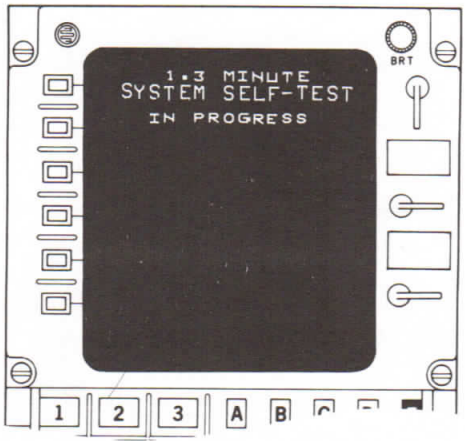
a. Place HSI switches in NAV position, auto tune ON. Firmly press the IPL buttons on both FDSU.s simultaneously.

b. The CDU will display:



Appears at completion of successful computer test.

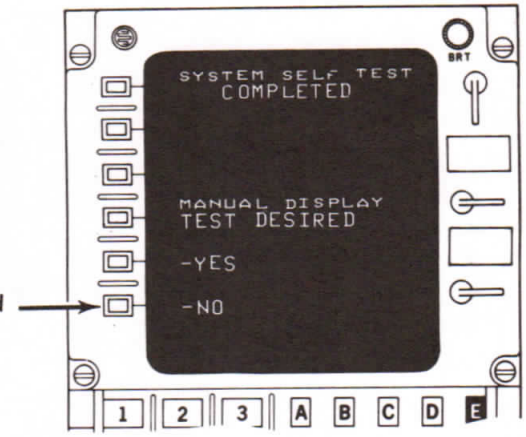
c. Changing to:



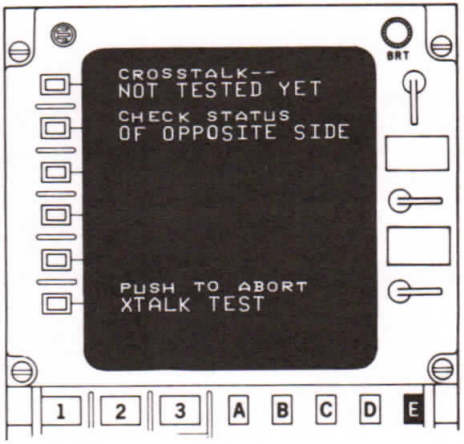
NOTE:

HSI displays, VOR's and DME's being automatically tested.

d. When system selftest is completed MANUAL DISPLAY test may be performed at pilots option or bypassed by pressing Line Key 6. If it is to be bypassed, wait for one or more platform ALIGN MODE lights out, then select NO.



e. If this page appears, do not abort CROSSTALK Wait for GOOD XTALK and a PLATFORM ALIGN light OUT, PUSH TO CONTINUE will appear in place of PUSH TO ABORT



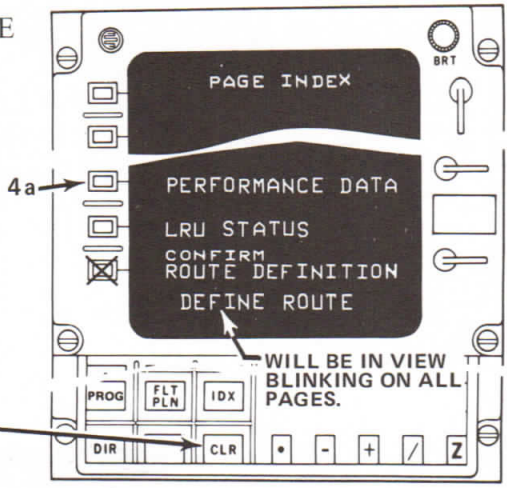
f. If crosstalk tested good during 1.3 minute system test cross talk page will be bypassed and DATA SEARCH will appear for approximately 2 minutes.

g. When PAGE INDEX appears IPL is completed.

f. Clear DEFINE ROUTE

CAUTION:

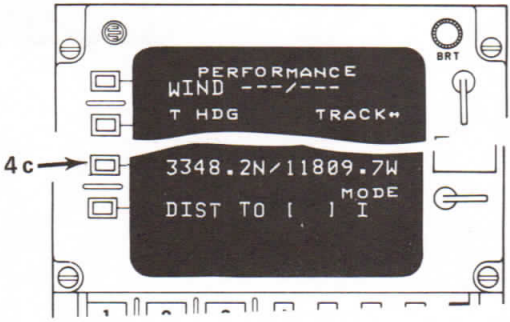
Do not press and confirm ROUTE DEFINITION or you will be committed to the ROUTE DEFINITION page and to define a route. If this occurs re IPL.



Press CLR Key on each CDU to clear DEFINE ROUTE message.

4. Present position check/update.

a. Press Line Key 4 to access PERFORMANCE Page.



b. Compare PPSN LAT/LONG with ISDU display. If the NCU has accepted the ISS position the LAT/LONG should be the same and should agree with the present airplane position.

c. If PPSN Update is required press Line Key 5 with blank scratchpad to freeze PPSN for update.

d. Type LAT/LONG of present airplane position into scratchpad.

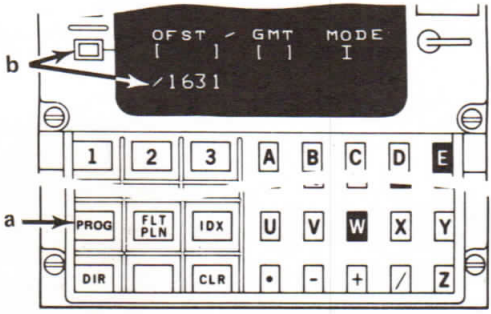
e. Check carefully and insert into Line 5. PPSN is unfrozen to the updated position. MANUALLY UPDATED will appear above LAT/LONG.

CAUTION:

Be careful not to cancel a manual PPSN update when operating in INS mode. If manual PPSN update is cancelled the NCU will delete the correction made by the manual update.

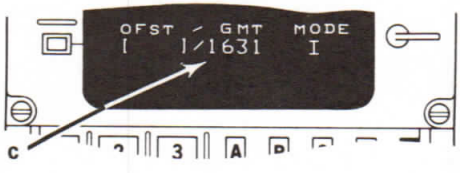
5. Enter and/or check GMT.

   a. Access the Progress Page with PROG Key.



   b. To enter GMT type / followed by the correct GMT to the next whole minute into the scratchpad and insert with Line Key 6 at the next time "HACK".

   c. Recheck GMT as entered in line 6.



   d. Check that GMT and PPSN have crosstalked to opposite system.

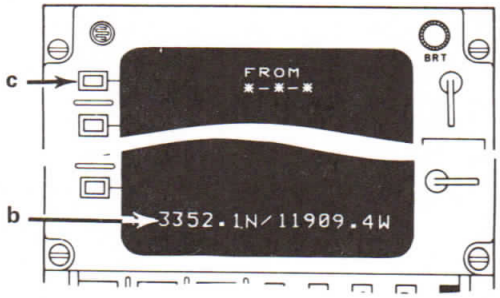
   e. R NAV is now ready to accept LAT/LONG Waypoints.

6. Entry of LAT/LONG waypoints.

a. Select Flight Plan Page with FLT PLN key.

b. Enter LAT/LONG of first waypoint into the scratchpad and check carefully.

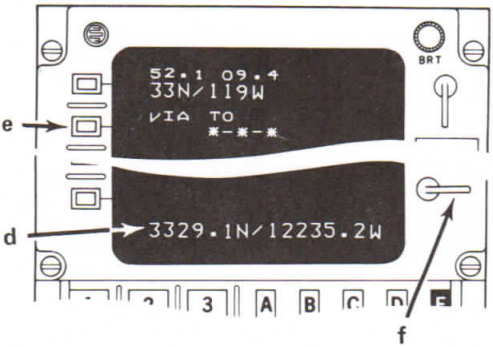
c. Insert into blank flight plan with Line Key 1. This will be the FROM waypoint.



LAT/LONG wpt format prevents display of FROM, VIA and TO in the label lines.

d. Enter LAT/LONG of next waypoint into the scratchpad and check.

e. Insert into flight plan with Line Key opposite asterisks.



CAUTION:

If a waypoint is inserted opposite another waypoint the Flight Plan will open up and the previous waypoint will be displaced downward one line.

The coordinates of up to fifteen waypoints may be entered in this manner flight plan overflow will result if entry of more than fifteen LAT/LONG waypoints is attempted.

f. Use vertical slew switch as required when entering waypoints or reviewing flight plan.

7. Review Flight Plan

a. Check waypoint coordinates as entered against flight plan for accuracy and proper sequence.

8. Place AUTOTUNE switches in OFF position.

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APPENDIX D
INITIAL PROGRAM LOAD (IPL)

IPL is normally performed whenever a new tape cartridge is installed or for troubleshooting. The Computer program is reloaded in addition to a comprehensive diagnostic test of the computer.

IPL is also required if a locked up NCU is experienced and it cannot be otherwise cleared.

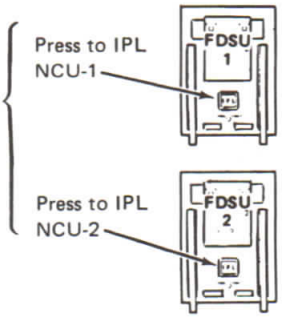
NOTE:

All previously inserted route data is lost during an IPL. A ROUTE DEFINITION *must be made after an IPL, unless the opposite system already contains the defined route. In this case it will be crosstalked to the IPL'ed system upon reaching the Index Page display sequence.*

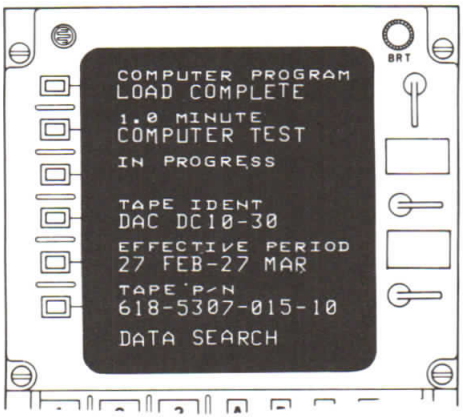
IPL PROCEDURE

The following describes the complete IPL procedure. For abbreviated in-flight IPL, see Page 8-7.

1. a. All R NAV system circuit breakers must be on.
   b. MSU's selected to NAV.
   c. AUTOTUNE selected (both systems).
   d. HSI switch should be in NAV.
   e. Lift cover and firmly press IPL button of appropriate FDSU.



2. The following page will appear on the CDU as test cycle begins.



a. Loads and runs computer diagnostic test.

b. Loads navigation system test.

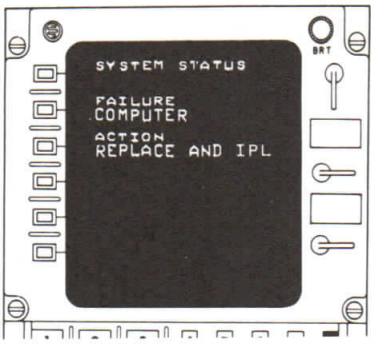
c. Total display time approx 1.5 min.

d. If no faults detected DATA SEARCH appears between 34 seconds and 1 minute.

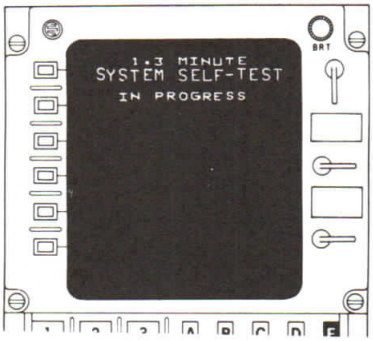
3.

a. Failure will be displayed and failed component identified.

b. Action required is also displayed.



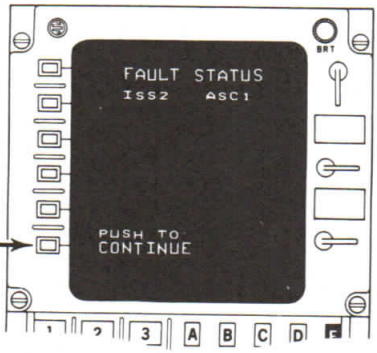
4.



Display during system test. RMI's will indicate VOR's and DME's are being tested during this period. Rapid HSI changes indicate that HSI inputs are being tested.

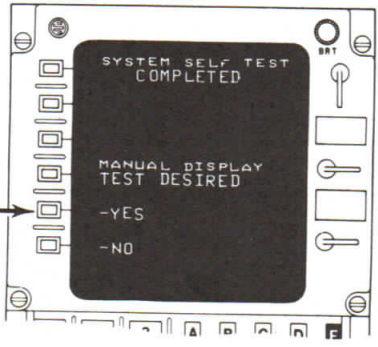
5. Display after system test if there is a failure.

a. Action - Access FAULTS, if not major, PUSH Line Key 6 to continue. If no sensors are failed this page will be skipped and following page will appear.



NOTE:
Some 860 E-5 DME tranceivers may not pass this test due to self test tolerances. If this occurs verify DME operation with manual DME self test and DME readouts. The NCU will accept DME input if the output is valid.

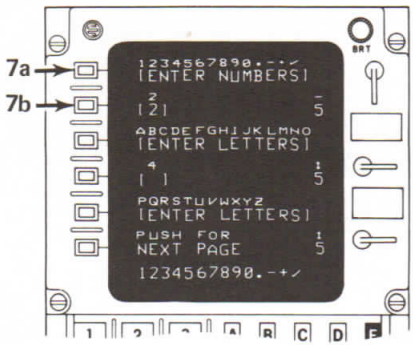
6.



Appears after satisfactory completion of system test.

a. Push Line Key 5 for MANUAL TEST.

7. (Optional)



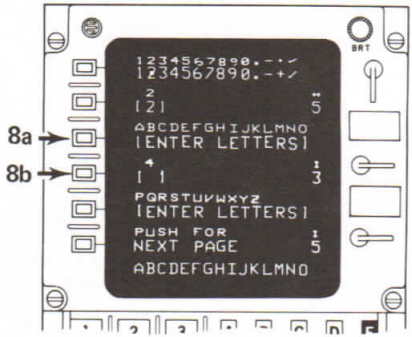
a. Type numerals in to scratchpad and enter with line Key 1.

b. Type numeral 2 into scratchpad and enter with line Key 2.

8. (Optional)

a. Type letters A thru O into scratchpad and enter with Line Key 3.

b. Type numeral 4 into scratchpad and enter with Line Key 4.

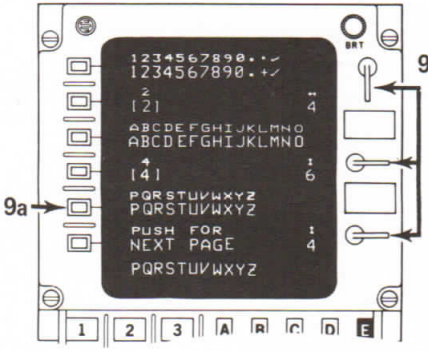


a. Type letters P thru Z into scratchpad and enter with Line Key 5.

b. Using each lever switch change the adjacent numeral 5 up scale and down scale.

c. Push Line Key 6 for next page.

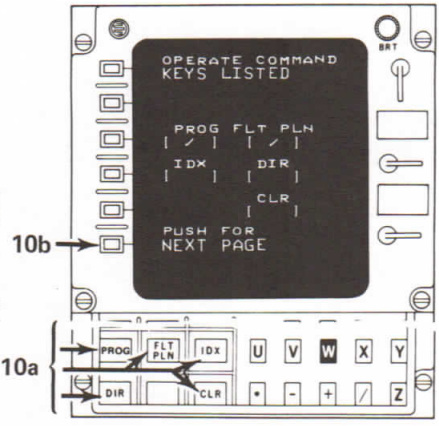
9. (Optional)



10. (Optional)

a. Push each COMMAND Key. A ✓ will appear as each key is pressed.

b. Push Line Key 6 for next page.



11. (Optional)

VERIFICATION OF SIGNALS TO HSI
FLIGHT DIRECTOR AND AUTOPILOT

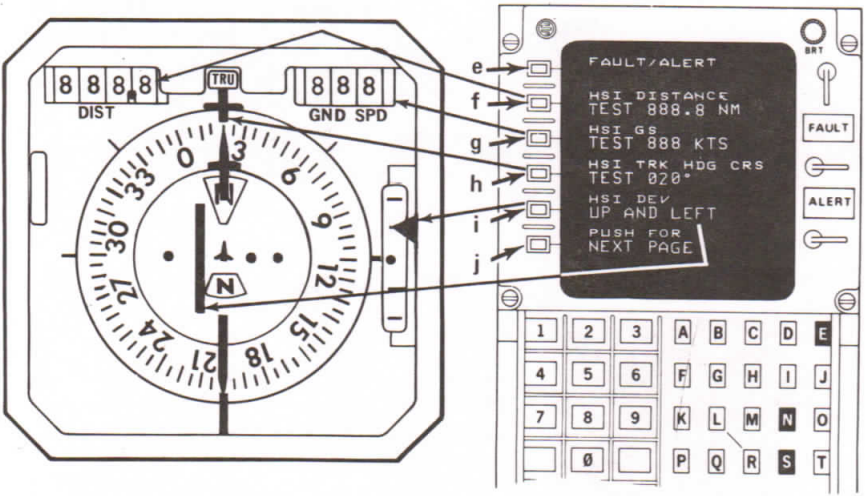
a. Set TRU-MAG switch to TRU. Observe the TRU-MAG indication on HSI change and heading display change as switch is moved.

b. Set Captains and First Officers HSI switches to NAV.

c. Set FD switch on FGS Control Panel to FD.

d. Press NAV selector on FGS Directional Control to place flight director in NAV mode. Flight Mode Annunciator should display NAV TRACK mode.

VERIFICATION OF SIGNALS TO HSI



e. Push Line Key 1, FAULT and ALERT lights on CDU illuminate.

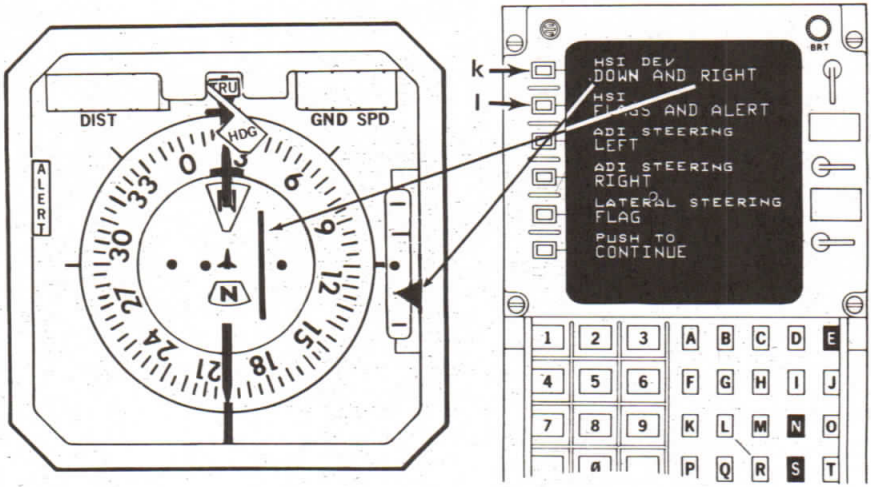
f. Push Line Key 2.DIST Shutter lifts and 888.8 appears in DIST window, 000 appears in GND SPD window.

g. Push Line Key 3, DIST display is 000.0, GND SPD displays changes to 888.

h. Push Line Key 4, HSI HDG Bug, Compass Card and CRS displays will indicate 020°. DIST and GND SPD shutters drop - (window blank).

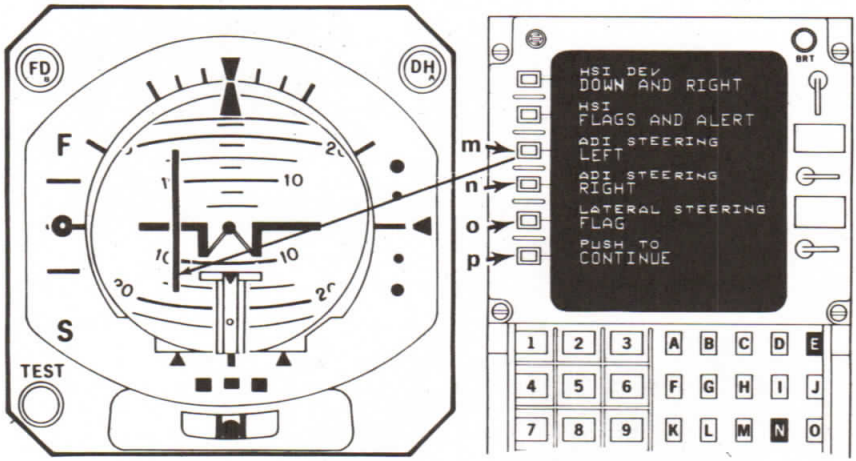
i. Push Line Key 5. The HSI Deviation should be UP - LEFT.

j. Push Line Key 6.for NEXT PAGE.



k. Push Line Key 1. HSI deviations should be down - right.

l. Push Line Key 2. HSI ALERT light, HDG flag CRS deviation flags and VERT NAV flag should appear.



m. Push Line Key 3. Flight Director Steering bar on ADI should indicate fly left.

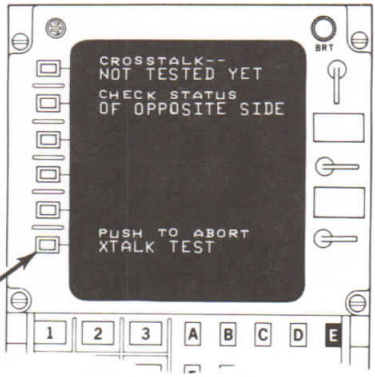
n. Push Line Key 4. ADI Steering bar should indicate fly right.

o. Push Line Key 5. and observe Flight Director reverts to HDG HOLD mode. Steering bar centered.

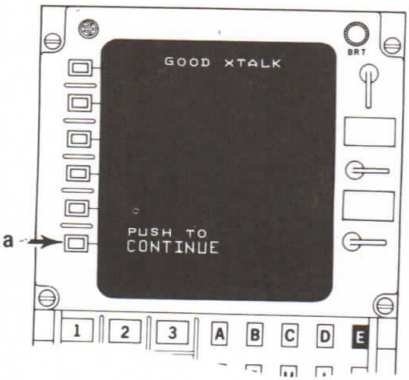
p. Push Line Key 6 to continue test.

12. This page will appear for a single system IPL until crosstalk is established.

a. Abort crosstalk for a single system IPL or if a known FAULT exists. This page will not appear for a dual IPL if XTALK test was successful during 1.3 minute system test. If dual IPL wait for completion of test. Page will automatically change to display FAIL XTALK or

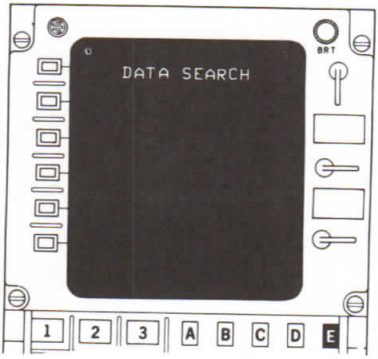


13.

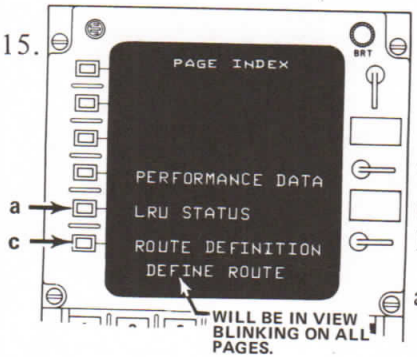


a. Push Line Key 6 to continue test.

14. This page appears for approximately 2 minutes during loading of computer program.



15.



This page appears after completion of program load indicating that the IPL is completed.

a. Push Line Key 5 to check LRU status (See Pages 9-1 and 9-2).

b. If opposite NCU has a flight plan, or is assembling a flight plan, when SEARCH COMPLETE appears, both CDU's will freeze for 30 seconds while route data is being crosstalked.

c. Push Line Key 6 to define route if required. (See Page 1-2 for details.)

Refer to the following basic handbook sections for operating instructions applicable to inertial operation (with no nav data).

2 PREFLIGHT/CAPTURE/TRACK LEG SWITCH/& ILS/POLAR NAVIGATION ▶

3 ALTITUDE/FLIGHT LEVEL/BAROSET ▶

4 INSERT WPT/AIRWAY/OFFSET/TIME/DUPLICATE NAMES ▶

5 FLIGHT PLAN REVISION ▶
AIRWAY/HOLDING/PLACE BRG DIST/NEW ROUTE

6 DIRECT TO- ▶

7 VOR-DME AUTOSELECTION ▶
MANUAL VOR-DME TUNING
ENROUTE AUTOSELECTION LOGIC
NAVAID DATA USAGE
MANUAL POSITION (PPSN) UPDATE

8 FAULT/ALERTS/INFLIGHT IPL/STORAGE LIMITS/ISS POWER ▶

9 SYSTEM & ISS STATUS ▶

10 APPENDICES - A - ABBREVIATIONS/ ▶
B - WAYPOINTS IDENTIFIERS/
C - INERTIAL NAVIGATION/D - IPL