

HORIZONTAL SITUATION
INDICATOR SYSTEM

ST-180



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Mineral Wells Municipal Airport
Mineral Wells, TX 76067-9236

REVISION REFERENCE SHEET

Original Bulletin, Horizontal Situation Indicator System Installation
Bulletin No. 280, dated 1-01-83.

Revision (1) dated 9-17-91 (Minor Change)
Removed all information pertaining to Aeronetics 8000 HSI System. Added
information pertaining to S-TEC 6443 HSI System. Reference FECO # 1286.

Revision (2) dated 11-12-91 (Minor Change)
Revised parts list to add hardware. Reference FECO # 1306.

Revision (3) dated 1-02-92 (Minor Change)
Removed Drawing No. 1084. Added Section IV, Appendix, Environmental
Qualification Forms. Reference FECO # 1318.

Revision (4) dated 4-24-92 (Minor Change)
Added Pilot's Operating Handbook, P/N 8726. Reference FECO # 1344.

Revision (5) dated 12-11-92 (Minor Change)
Removed Drawing No. 1083 and Drawing No. 99167. Added Drawing No. 1078.
Corrected documentation errors. Reference FECO # 1426.

Revision (6) dated 7-14-97 (Minor Change)
Revised Parts List to add hardware. Reference FECO # 2036.

Revision (7) dated 6-02-98 (Minor Change)
Revised Parts List to add hardware. Reference FECO # 2227.

Revision (8) dated 6-11-98 (Minor Change)
Revised Parts List to add 6443P Indicator and 01171P Slaving Panel.
Reference FECO # 2239.

Revision (9) dated 9-12-00 (Minor Change)
To change Part Number due to addition of GPS annunciator. Reference
FECO # 2705.

Revision (10) dated 12-29-00 (Minor Change)
Added 01171-P and 01171-1P to Slaving Panel. Reference FECO # 2773.

MASTER DRAWING LIST

FOR: Bulletin No. 280

DRAWING NO.	DESCRIPTION	SIZE	REVISION
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DRAWINGS THAT ARE REQUIRED FOR THE INSTALLER TO MAKE THE INSTALLATION:

280	Bulletin, Horizontal Situation Indicator System	(Rev. 10)	12-29-00
1078	Schematic, HSI System Interconnect	D	C
1078-1	Schematic, HSI System Interconnect	D	D

CHECKED: Harold W. Holdeman

PART NO.: 92168

DATE: 1-01-83

SHEET: 1 of 2
Form No. 8626-1

MASTER DRAWING LIST
REVISION REFERENCE SHEET

FOR: Bulletin No. 280

REV. LETTER	DESCRIPTION OF REVISION	DATE REV.
A	Rev. Bul. 280. Removed Dwg. 1009, Model 8000. Added Dwg. 1083, 1084, 99167.	9-17-91
B	Rev. Bul. 280.	11-12-91
C	Rev. Bul. 280. Dwg. 1083. Removed Dwg. 1084.	1-02-92
D	Rev. Bul. 280.	4-24-92
E	Rev. Bul. 280. Removed Dwg. 1083, 99167. Added Dwg. 1078.	12-11-92
F	Rev. Bul. 280.	7-14-97
G	Rev. Bul. 280.	6-02-98
H	Rev. Bul. 280.	6-11-98
I	Rev. Bul. 280. Added Dwg. 1078-1.	9-12-00
J	Rev. Bul. 280, Dwg. 1078-1.	12-29-00

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DATE: 1-01-83

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SECTION I.

INTRODUCTION

This installation bulletin and associated drawings are intended to provide installation and interconnection information for the installation of ST-180 Horizontal Situation Indicator System.

It is recommended that the installer thoroughly review all installation data and drawings provided before beginning the installation.

The HSI System ST-180 is a fully TSO'd heading system that combines continuously slaved heading information and VOR/ILS/GS indications all in one display. The system provides heading C.T., course C.T., and heading bootstrap outputs to other aircraft systems.

HORIZONTAL SITUATION INDICATOR MODEL 6443 INSTALLATION

GROUP I

Figure 1-1

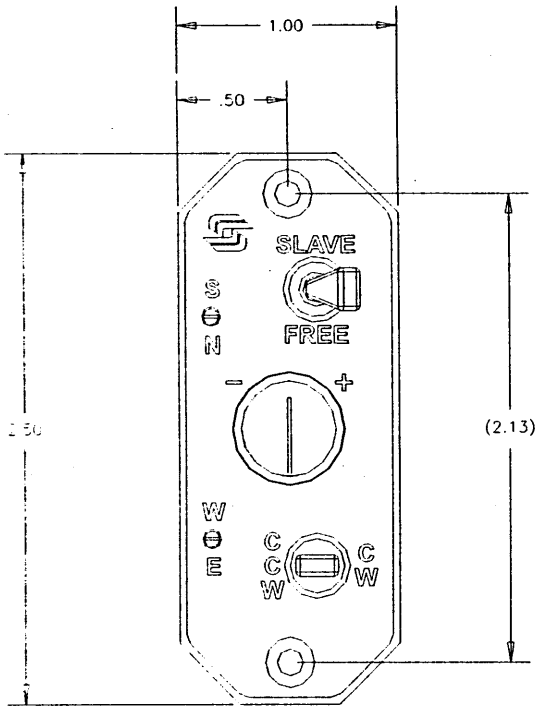
The 6443 Horizontal Situation Indicator should be located conveniently on the aircraft instrument panel. The preferred location for the 6443 Indicator is directly in front of the pilot, immediately below the flight director or attitude gyro. Select the desired location ensuring that sufficient clearance, approximately 11.5 inches, will exist for the unit, the connector, and wire connection at rear of unit. Refer to Figure 1-1 for panel cutout dimensions.

SLAVING PANEL MODEL 01171-() INSTALLATION

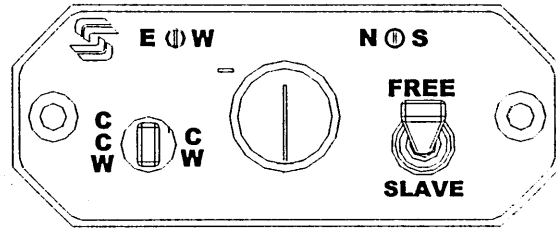
GROUP III

Figure 1-3

The 01171-() Slaving Panel should be located conveniently on the aircraft instrument panel. The preferred location is on the pilot's side within view and reach. This unit is front mounted. Refer to Figure 1-3 for panel cutout dimensions.

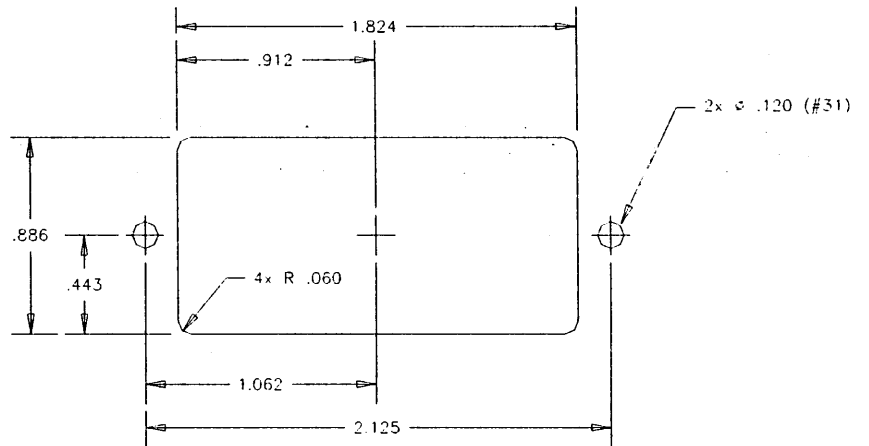


01171-1 OR 01171-1P SLAVING PANEL



01171 OR 01171-P SLAVING PANEL

1	N-S POT 3
2	N-S POT 2
3	N-S POT 1
4	NC(SPARE) NOTE 2
5	NC(SPARE) NOTE 2
6	E-W POT 3
7	E-W POT 2
8	E-W POT 1
9	GROUND
10	FREE GTRD
11	SLAVING METER HI
12	NC(SPARE) NOTE 2
13	SLAVING METER LO
14	MANUAL SLAVE CCW
15	MANUAL SLAVE CW



DETAIL - (PANEL CUTOUT)

NOTES:

1. SLAVING PANEL WEIGHT: .1 LB.
2. PART NUMBER 01171-P AND 01171-1P PIN 4 LIGHT DIMMER GROUND, PIN 5 +28V LIGHT DIMMER, PIN 12 +14V LIGHT DIMMER.

MODEL 01171, 01171-P, 01171-1 and 01171-1P
SLAVING PANEL, FIGURE 1-3

FLUX SENSOR MODEL 6446 INSTALLATION

GROUP IV

Figure 1-4

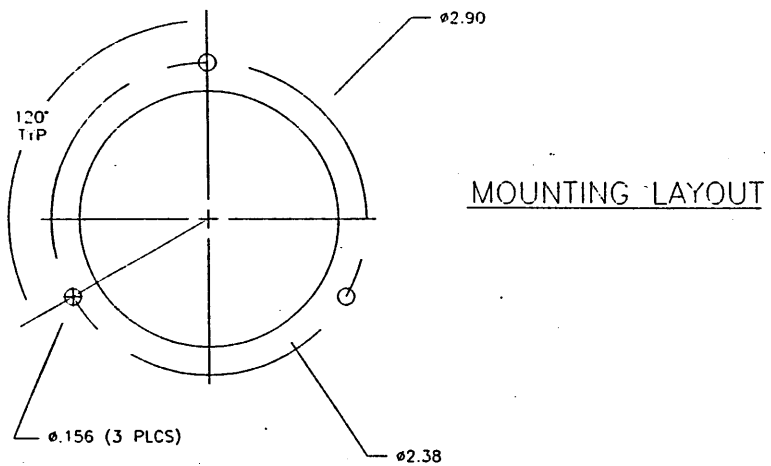
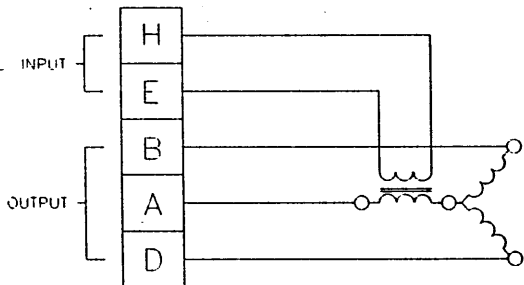
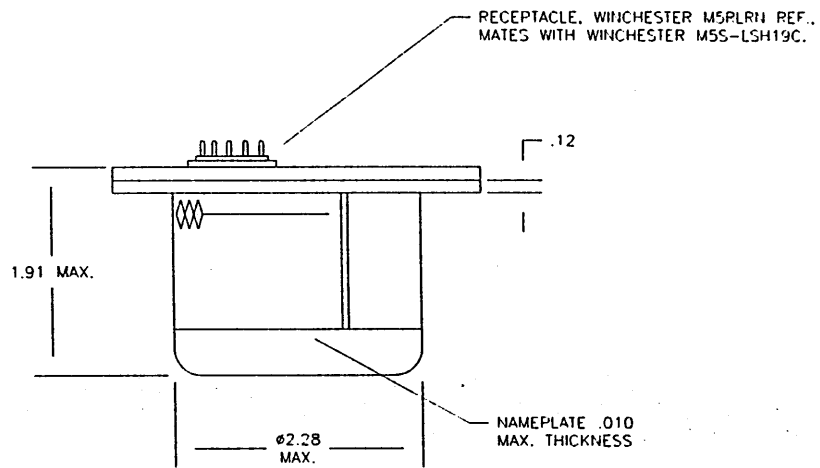
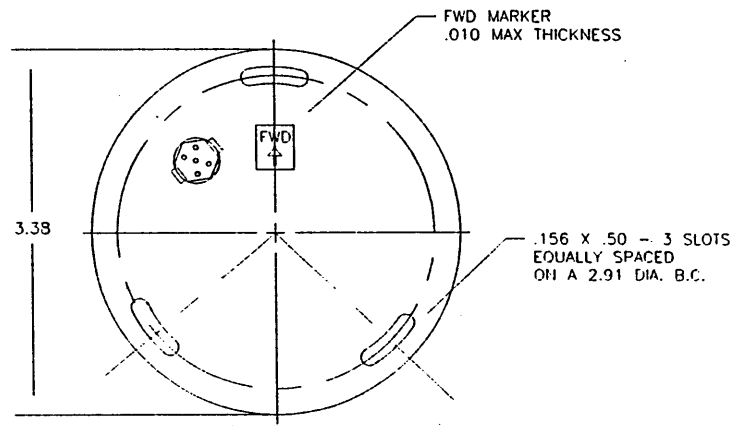
Figure 1-5

The 6446 Flux Sensor is to be located in an accessible spot in the outer wing or rear fuselage area of the aircraft, taking care to avoid locations adjacent to ferrous materials, such as control cables and hardware. Avoid current carrying wires such as those associated with navigation lights and radios. A spacing of one to two feet from hardware items, or three to four feet from baggage or radios, will generally be adequate.

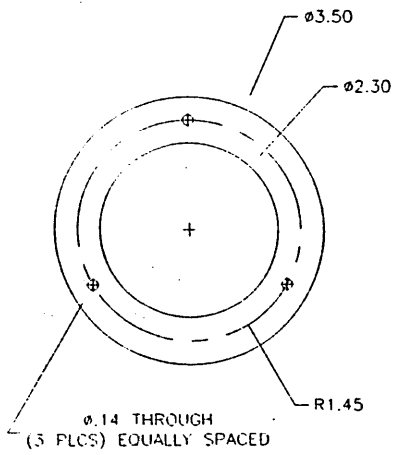
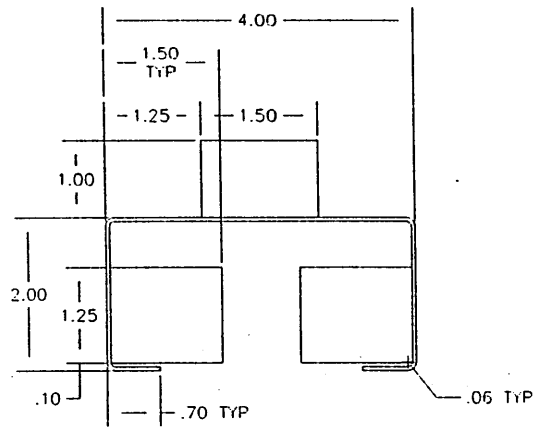
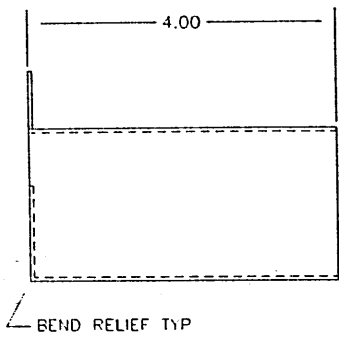
Once the location has been determined, a mounting bracket and ring must be fabricated from aluminum. The bracket should be rigid enough so that wing or fuselage vibrations are not amplified. Refer to Figures 1-4 and 1-5 for typical dimensions and material.

The Flux Sensor must be mounted with the label side Up and in a position which will be approximately level in normal flight. The arrow on the top of the unit must point forward.

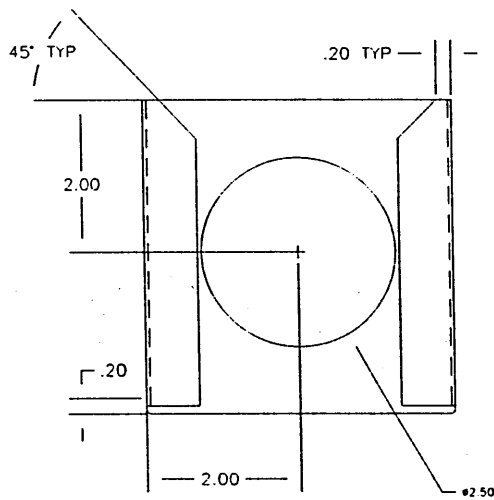
CAUTION: DO NOT INSTALL NEAR HIGH-CURRENT CARRYING CONDUCTORS OR STRONG MAGNETIC FIELDS. NON-MAGNETIC HARDWARE IS REQUIRED FOR MOUNTING.



MODEL 6446 FLUX SENSOR, FIGURE 1-4



MOUNTING RING DETAIL



MOUNTING BRACKET DETAIL

NOTES:

1. MATERIAL: MOUNTING BRACKET 2024-T3 ALUM. X .032 THK
MOUNTING RING 2024-T4 ALUM. X .050 THK
2. TOLERANCE: .XX \pm .010
.XXX \pm .005

MODEL 6446 FLUX SENSOR MOUNTING BRACKET AND RING, FIGURE 1-3

SECTION II.
PARTS LIST
ST-180
HORIZONTAL SITUATION INDICATOR SYSTEM

9-17-91
11-12-91 Rev.
4-24-92 Rev.
7-14-97 Rev.
6-02-98 Rev.
6-11-98 Rev.
9-12-00 Rev.
12-29-00 Rev.

PART NO.	QTY.	DESCRIPTION	SPEC. NO.
GROUP I			
*6443	1	Indicator	TSO C6d, C34e, C36e, C40c, C9c, C52a
*6443-PA	1	Indicator	TSO C6d, C34e, C36e, C40c, C9c, C52a
3411	1	Receptacle, 50 Pin	RD-50F-000
5504	1	Cover, 50 Pin	MD50-000-K
6105	1	Locking Lever, 50 Pin	MD50-000-VL
5208	50	Socket, 20-26 Ga.	FC6020D
3351	1	Plug, 25 Pin	RD-25M
5519	1	Cover, 25 Pin	MD25-000-J
6127	1	Locking Lever, 25 Pin	MD25-000-VL
5210	25	Pin, 20-22 Ga.	MC6020D
GROUP II			
*6444	1	Remote Gyro	TSO C6d
*6444-1	1	Remote Gyro	TSO C6d
3422	1	Receptacle, 37 Pin	RD37F-000
5520	1	Cover, 37 Pin	MD37-000-J
6128	1	Locking Lever, 37 Pin	MD37-000-VL
5208	37	Socket, 20-26 Ga.	FC6020D
4711	1	Ferrite Bead	F-2643164151
1108C832-8A	4	Screw	AN525-832R8
1406C832A	4	Nut	AN365-832
1201C8-031A	4	Washer	AN960-8

*Ship only one part number per order.

PART NO.	QTY.	DESCRIPTION	SPEC. NO.
GROUP III			
*01171	1	Slaving Panel, Horizontal	TSO C6d
*01171-P	1	Slaving Panel, Horizontal	TSO C6d
*01171-1	1	Slaving Panel, Vertical	TSO C6d
*01171-1P	1	Slaving Panel, Vertical	TSO C6d
34136	1	Receptacle, 15 Pin	RD15F00000
55230	1	Cover, 15 Pin	D15000J00
61138	1	Locking Lever, 15 Pin	D150000VL0
5208	15	Socket, 20-26 Ga.	FC6020D
1406C440A	2	Nut	AN365-440
1103D440-10A	2	Screw	MS51959D-18B
1201C4-031A	2	Washer	AN960-4

GROUP IV

6446	1	Flux Sensor	TSO C6c
34114	1	Connector	GH5FSCLSH19S

GROUP V

Wiring to be field fabricated.

GROUP VI

8726	1	POH	
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*Ship only one part number per order.

WIRING INSTALLATION

GROUP V

Drawing No. 1078
Drawing No. 1078-1

1. All system interconnect wiring is to be accomplished in accordance with information provided on Drawing No. 1078, for 6443-PA Indicator use Drawing No. 1078-1. All wiring used for field fabrication must meet or exceed the requirements of MIL-W-22759/16 and be accomplished in accordance with AC 43.13-1A.
2. Locate and drill a 7/16" diameter hole in the instrument panel, preferably in the area of existing circuit breakers, and install a 5 Amp circuit breaker. Connect to existing circuit breaker buss with 20 AWG min. wire.
3. Install the P/N 4711 ferrite bead positioned around the wire bundle approximately 3" aft of the connector at the remote gyro.

PILOT'S OPERATING HANDBOOK

GROUP VI

Remove the Pilot's Operating Handbook, P/N 8726, from the back of this installation bulletin and insert in the supplemental section of the appropriate document.

COMPONENT WEIGHTS AND CURRENT DRAIN

COMPONENT WEIGHTS

6443-() Indicator	2.90 lbs.
6444 Remote Gyro	3.40 lbs.
6444-1 Remote Gyro	3.80 lbs.
6446 Flux Sensor30 lbs.
01171-() Slaving Panel10 lbs.

CURRENT DRAIN

Maximum Continuous 6444.....	1.50 Amps
6444-1.....	3.00 Amps

SECTION III.

TEC LINE MODEL ST-180 HORIZONTAL SITUATION INDICATOR SYSTEM POST INSTALLATION CHECKOUT AND ADJUSTMENT

- A. General: Accuracy of the entire heading system is dependent on the location of the flux sensor and proper calibration. Accuracies of plus or minus one degree are possible when care is taken during installation and calibration. There are basically two steps which must be followed to achieve precise results: (1) the flux sensor must be positioned so that it points in the direction of aircraft flight, and (2) the north-south and east-west correctors must be adjusted to compensate for extraneous magnetic fields near the location of the flux sensor.
- B. Test Equipment: The test equipment required for post installation of the HSI ST-180 Horizontal Situation Display System consists of an RF signal generator. Required characteristics of the signal generator include: frequency ranges 108 to 118 MHz, 117 to 136 MHz, and 328 to 336 MHz; +/- 0.01% accuracy, output level continuously adjustable from 1.0uV to 0.1V into a 50 ohm load; 50 ohm output impedance; and internal adjustable or stepped VOR, LOC, and GS modulation. The representative of RF signal generator used in the functional checks of this manual is a Model NAV-401L manufactured by Instrument Flight Research Corp. RF signal generators with characteristics equal to or greater than those listed above may be substituted for the representative type used here. The RF signal generator should be portable and convenient for use while sitting in the aircraft cockpit.
- C. Heading Functional Check and Adjustment:
1. Apply power to the Model ST-180 HSI System. Allow at least three minutes for the gyro to erect and synchronize.
 2. Prior to actual alignment of the flux sensor, turn the aircraft to both north and east headings. Apply power to electrical equipment such as navigation and beacon lights and verify that the compass system is not affected.
 3. Align the aircraft to an approximate magnetic north heading. Record the actual magnetic heading. Record the 6443 heading card reading on the deviation chart.
- NOTE: Use the centerline of the aircraft. One method is to suspend a plumb bob from the tail cone and sight with a transit over the plumb bob to the center of the nose wheel strut. Do not use the vertical stabilizer as a reference since it may be offset from the centerline of the aircraft.
4. Determine and record the deviation between the actual magnetic heading and the heading card heading. If the heading card reads high, the deviation is a plus.

(Continued)

5. Repeat steps 3 and 4 for east, south, and west headings. Record actual magnetic headings, heading card readings, and deviations on the chart.
6. Plot deviations on the initial deviation graph in Figure 1-6.
7. Realign the aircraft to north. Adjust the north-south corrector, accessed on the 01711-() Slaving Panel, for one half of the difference between the north and south deviations. Record the new deviation for north and south on the initial deviation graph.
8. Realign the aircraft to east. Adjust the east-west corrector, accessed on the 01171-() Slaving Panel, for one half the difference between the east and west deviations. Record the new deviation for east and west on the initial deviation graph.
9. If the pattern is not centered around zero, rotate the flux sensor clockwise to correct for minus deviation or counterclockwise for plus deviations. Plot final deviations on the final deviation graph in Figure 1-6.
10. The deviation should now center around the zero reference line of the graph. If the error exceeds the specified system error limits (+/-3 degrees), the complete procedure must be repeated or the flux sensor relocated.

OPERATION

A. Display Description:

This section contains information pertaining to controls and indicators, operating procedures, and emergency operation of the Model ST-180 Horizontal Situation Indicator System. Refer to figure 1-7 for additional information.

Model 6443 Indicator and Controls

Indicator and Controls

Function

Compass Card:

This rotating card displays gyro stabilized magnetic compass information beneath the lubber line.

Heading Select Knob:

Positions the heading select marker relative to the compass card.

Symbolic Aircraft:

Represents the relationship of the aircraft with respect to the display.

Reciprocal Course Pointer:

Indicates the reciprocal of the selected course.

(Continued)

Indicator and Controls

Function

Course Select Knob:

Positions the selected course pointer with respect to the compass card.

Lateral Deviation Bar:

Represents VOR radial or LOC course. When referenced to the symbolic aircraft, the position of the deviation bar is the same as the position of the chosen VOR radial or LOC course to the aircraft.

Glideslope Pointer:

Represents the actual aircraft deviation from the glideslope path.

Glideslope Warning Flag:

When unusable glideslope information is present, the warning flag is in view.

Heading Select:

Indicates the selected aircraft heading.

NAV Warning Flag:

When unusable VOR/LOC information is present, the warning flag is in view.

Lubber Line:

Aircraft magnetic heading is read under this line.

Heading Warning Flag:

In view when the compass system is not operating properly.

Selected Course Pointer:

Indicates the selected VOR radial or LOC course.

To-From Indicator:

Indicates the direction of the VOR station along the selected radial.

Automatic Emergency Mode Light (LED):

Indicates that the compass card is being controlled by the flux valve.

Reset Button:

Puts the system into the fast slave mode and resets the fault monitor.

B. Operating Procedures:

When power is applied to the ST-180 System, the HDG flag will remain in view until the fast slave mode has been executed and normal system power is present. The fast slaving mode is initiated when power is applied and is switched to the slow slave mode when the slaving error is reduced to zero. The fast slave rate is 50-80 degree/minute. The slow slave rate is 3 degree/minute to keep the system aligned with the earth's magnetic field.

Set the navigation receiver to the desired VOR/LOC station and rotate the course select knob to adjust the selected course pointer to the desired course radial. When a usable navigation signal is received by the 6443 Indicator, the NAV warning flag will disappear from view.

The 6443 Indicator lateral deviation bar represents the selected VOR/LOC course. The relationship of the deviation bar to the symbolic aircraft presents the relationship of the selected course to the aircraft.

For an ILS approach, tune the navigation receiver to the desired frequency. For LOC operation, the selected course pointer should be set to the inbound localizer course. The glideslope warning flag will disappear from view if a usable glideslope signal is received. The glideslope pointer indicates the relative position of the glideslope path with respect to the aircraft.

For LOC operation and ILS front course approach, tune the navigation receiver to the desired frequency, set the pointer to the selected inbound localizer course, and if a usable glideslope signal is received the glideslope warning flag will disappear from view. The glideslope pointer indicates the position of the glideslope path with respect to the aircraft. The position of the deviation bar with respect to the symbolic aircraft indicates the relative position of the selected course. For backcourse operation, set the course pointer to the inbound front localizer course. The deviation bar position relative to the symbolic aircraft then represents the position of the backcourse with respect to the aircraft.

C. Emergency Operation:

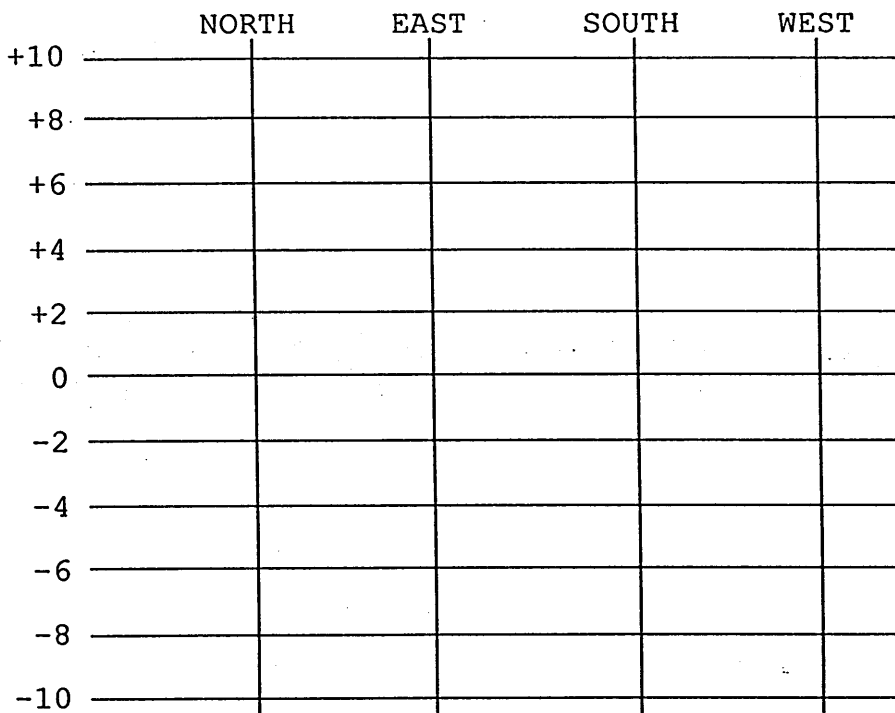
If the heading flag appears, the compass system is not operating properly. Pushing the reset button will do two things: First, it will reset the fault monitor if a temporary short has occurred, and second, it will put the system into the fast slave mode. The system will remain in the fast slave mode until the gyroscope synchronizes with the flux valve (heading flag disappears), or after three minutes, the system will switch to the automatic emergency mode (LED lights with heading flag still in view). In the automatic emergency mode, the compass card is being controlled by the flux valve and the gyroscope is electrically disconnected.

Note: If a failure other than a mechanical failure of the gyroscope occurs, the compass system is unusable. This condition will be evident if three minutes have elapsed since pushing the reset button and the automatic emergency mode light has not come on and the heading flag is still down.

DEVIATION CHART

APPROX MAG. HEADING	ACTUAL MAG. HEADING	HEADING CARD READING	DEVIATION
NORTH			
EAST			
SOUTH			
WEST			

INITIAL DEVIATION GRAPH



FINAL DEVIATION GRAPH

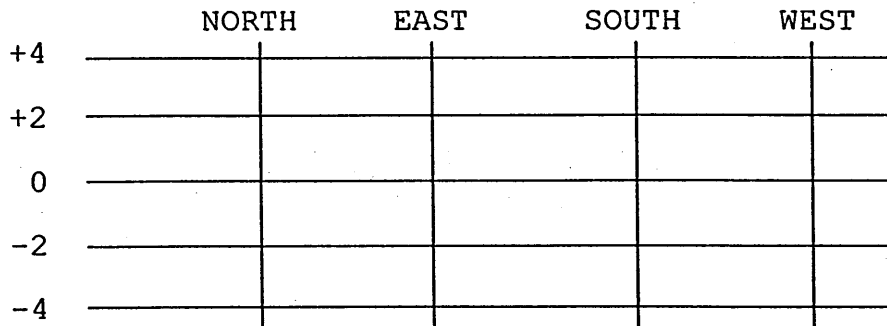


FIGURE 1-6

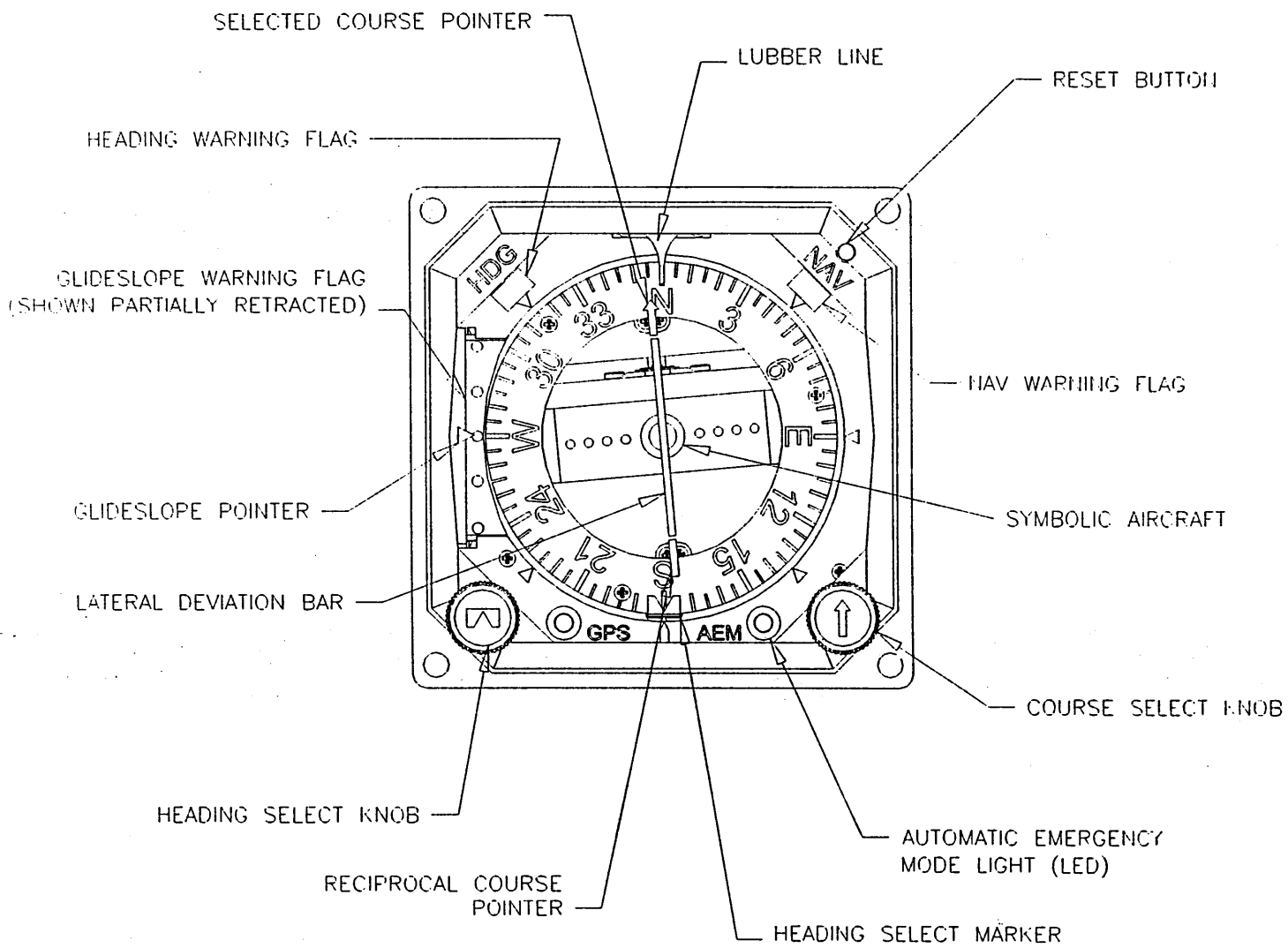


FIGURE 1-7