SPERRY FLIGHT SYSTEMS

SERVICE BULLETIN

21-1169-02

NAVIGATION
AUTOMATIC/INSTRUMENT FLIGHT CONTROL SYSTEM
Helipilot Computer
Modifications B and C

Modification to Minimize Erratic Computer Performance and Reduce Computer Removal Rates

1. Planning Information

A. Effectivity

This Service Bulletin is applicable to Helipilot Computers, Part No. 4025008-901, with date code serial number XXX0129 and below. It applies to units not having the letters B and C marked out in the MOD block of identification plate.

NOTES: 1. The first three digits of the date code serial number indicate date of manufacture. The last four digits indicate sequence of manufacture.

2. In the serial number range from XXX0101 thru XXX0129 There are only 22 Computers in existence.

B. Reason

These modifications incorporate the following product improvement changes which will minimize erratic Computer performance and reduce removal rates.

(1) Modification B accomplishes the following:

(a) Improves power supply regulation and high frequency rejection; changes wet tantalum capacitors to dry tantalum and ceramic types for regulation and decoupling.

(b) Adds zener clamp to positive voltage supply for transient protection of C-MOS devices.

(c) Decreases demodulator current sinking into positive voltage supply.

(d) Decreases loading on C-MOS logic to be within source and sink capability of devices.

(e) Ensures dropout of SAS mode in the event a failure causes power supply collapse.

1. B. (1) (f) Changes A1VR1 and A1VR3 references for stability and reliability.

(g) Screens FET-input operational amplifiers for correct device; a vendor error occurred in device assembly which may cause sporadic oscillation of the amplifier.

(2) Modification C accomplishes the following:

(a) Revises signal ground terminations in the chassis to minimize power supply circulating currents in signal ground.

(b) Adds output functions of $\overline{\text{PCPL}}$ and $\overline{\text{RCPL}}$ for future compatibility with -904 HelCIS Computer.

C. Description

These modifications affect all cards in the Computer and the wiring harness assembly. Modification B changes 15 components on each pitch and roll card and 25 components on the calibration card. Modification C removes three wires and adds four wires in the wiring harness assembly.

D. Compliance

The work outlined herein is considered highly desirable and Sperry recommends its accomplishment at the earliest practical date.

E. Approval

FAA approval not required; TSO not affected.

F. Manpower

This modification may be accomplished in approximately 12 man-hours (excluding retesting time) when performed concurrently with other repair and testing operations. Compliance with Bulletin No. 4025008-22-1 (Sperry Pub. No. 21-1169-01, formerly 21-2517-01) is assumed.

NOTE: Service Bulletin 21-1169-01 was issued in preliminary form as Service Bulletin 21-2517-01 against Part No. 4025008-901.

G. Material - Cost and Availability

Parts required to accomplish the modifications described in this Bulletin are available from Sperry Flight Systems, a division of Sperry Rand Corporation, and are supplied at no charge to the customer. Refer to Section 3, Material Information, for part numbers, part descriptions, and ordering information.

1. H. Tooling - Price and Availability

No special equipment is required to accomplish the work described in this Bulletin.

NOTE: Ensure that appropriate wire wrap tooling is used when accomplishing these modifications.

I. Weight and Balance

None.

J. Reference

Service Bulletin No. 4025008-22-01 (Sperry Pub. No. 21-1169-01) Modification A.

NOTE: Service Bulletin No. 4025008-22-1 (Sperry Pub. No. 21-1169-01) must be incorporated prior to or concurrently with this Bulletin.

K. Other Publications Affected

None.

2. Accomplishment Instructions

A. Remove cover from Computer.

B. Remove all circuit card assemblies from Computer chassis.

C. Modify each pitch and roll card assembly, A2 and A3, Part No. 4025831-901, as follows:

NOTE: Refer to Drawing No. 4025831, revision J or later, for component locations.

(1) Use Freon TA or a soldering iron to remove conformal coating around terminals and components to be worked on.

(2) Remove resistor R11 (300k ohms) and discard. Install bus wire that was attached to resistor lead on A side of printed wiring board (PWB) in respective vacated hole.

(3) Remove resistors R54, R71, R79, R88, and R92 (15k ohms) and replace with Part No. 2500932-85 (33k ohms).

(4) Remove capacitor C11 (it may be 4,700 pF or 47,000 pF) and replace with Part No. 4011265-471 (470 pF).

(5) Remove capacitor C12 (22 uF wet polar). Sleeve leads and install new capacitor C12, Part No. 2501629-61 (0.1 uF, ceramic).

(6) Sleeve leads and install diode VR4, Part No. 2503676-228, (type 1N4470, 16 volts dc) physically and electronically in parallel with capacitor C12 (0.1 uF). Install cathode lead of VR4 at same location as positive (+) terminal of capacitor C12, removed in step 2.C.(5).

(7) Remove capacitor C23 (22 uF, wet polar). Sleeve leads and install new capacitor C23, Part No. 2501629-61 (0.1 uF ceramic).

(8) Using an ohmmeter, check amplifiers U7, U12, and U17 for continuity between the case and pin 4 of each device. If continuity does not exist or continuity exists between the case and pin 8 of any of the devices, remove the device and replace with Part No. 4011334-300.

NOTE: Check replacement amplifier for continuity between the case and pin 4. The Intersil device is piece-marked ITS 6258 with date codes 7404, 7449, 7605, 7606, and 7618, which have so far been identified as incorrect parts. Retain and return replaced operational amplifiers to Sperry Quality Assurance, Attn: Supervisor.

2. C. (9) Remove resistor R85 (3.0 ohms) and replace with Part No. 2500932-158 (3.9 ohms).

(10) Install capacitor C30 (0.01 uF, Part No. 2501629-41, in parallel with resistor R8. Secure the capacitor leads to the resistor leads.

(11) Sleeve leads and install resistor R111 (100k ohms), Part No. 4006559-97, on A side of card. Connect component leads between connector pins 2 and 28.

(12) Sleeve leads and install resistor R112 (100k ohms), Part No. 4006559-97, on A side of card. Connect component leads between connector pins 4 and 25. Spot tie resistors R111 and R112 to capacitor C5.

(13) Install sleeved bus wire between connector pin 63 and capacitor C16 positive (+) terminal on A side of card.

(14) Sleeve and install bus wire between connector pin 71 and capacitor C22 negative (-) lead on A side of card.

(15) Remove any previously marked revision letter on PWB near assembly part number, 4025831-901. Using black epoxy ink, mark in revision letter L and modification letters A and B.

D. Modify calibration card assembly A1, Part No. 4026051-901, as follows:

NOTE: Refer to Drawing No. 4026051, revision F or later, for component locations.

(1) Use Freon TA or a soldering iron to remove conformal coating around terminals and components to be worked on.

(2) Remove resistors R1, R34, R55, R56, and R58 (15k ohms) and replace with Part No. 2500932-85 (33k ohms).

(3) Remove resistors R85, R87, and R97,(330k ohms) and replace with Part No. 2500932-96 (91k ohms).

(4) Remove resistors R86, R88, and R98 (300k ohms) and replace with Part No. 2500932-97 (100k ohms).

(5) Mount resistor R146 (5.1k ohms), Part No. 2500932-66, between resistors R85 and R86. Sleeve leads, install one lead to diode VR5 (anode) (+) lead and the second lead to resistor R86 (right side lead).

(6) Mount resistor R147 (5.1k ohms), Part No. 2500932-66, between resistors R87 and R88. Sleeve leads. Install one lead to diode VR5 (anode) (+) lead and the second lead to resistor R88 (right side lead).

2. D. (7) Remove resistor R63 (15k ohms) and replace with Part No. 2500932-97 (100k ohms).

(8) Remove resistors R100, R104, R128, and R137 (15k ohms) and replace with Part No. 2500932-85 (33k ohms).

(9) Remove zener diodes VR1 and VR3 and replace with Part No. 2586239-212 (type 1N968B, 20 volts dc).

(10) Remove resistor R50 (5.1k ohms) and replace with Part No. 2500932-59 (2.7k ohms).

(11) Remove capacitors C3, C11, C26, and C35 (22 uF) and replace with Part No. 2503220-19 (22 uF).

(12) Remove any previously marked revision letter on PWB near assembly part number, 4026051-901. Using black epoxy ink, mark in revision letter G and modification letter B.

E. Apply conformal coating to all areas of A1, A2, and A3 cards affected by preceding steps. Air dry for 24 hours or oven cure for 30 minutes at 155 ± 10°F (68 ± 5°C).

F. Modify the wired rack assembly as follows:

(1) Disassemble rack and remove wire between J1A-3 and transformer T1-10.

(2) Remove wire between T1-10 and T1-7.

(3) Remove wire between T1-7 and T1-4.

(4) Install AWG 28 wire from J1A-3 to XA2-48.

(5) Install AWG 28 wire from J1A-3 (sleeve pin) to XA3-48.

(6) Install AWG 28 wire from J1A-66 to XA2-17.

(7) Install AWG 28 wire from J1A-67 to XA3-17.

(8) Assemble wired rack.

(9) Using an ohmmeter, check for continuity between the following points:

(a) From J1A-3 to XA2-48 to XA1-50 to J1A-23.

(b) From J1A-3 to XA3-48 to XA1-81 to J1A-24.

(c) From J1A-66 to XA2-17 to XA1-72.

(d) From J1A-67 to XA3-17 to XA1-74.

2. F. (10) Using black epoxy ink, apply a piecemark to one side of the top horizontal support bar of the rack assembly as follows:

07187 ASSY 4025934-901 MOD C

G. Install pitch, roll, and calibration card assemblies in Computer wired rack assembly and install cover.

H. Mark out the letters B and C in the MOD block of the Computer identification plate.

I. Test Computer in accordance with Integrated Test Specification IT4025008-901, revision F or later.

3. Material Information

The following parts are required to modify each Helipilot Computer, Part No. 4025008-901, in accordance with this Bulletin:

New Part No.	Qty	Unit List Price	Description	Old Part No.	Instructions-Disposition
2500932-85	19	No Charge	Resistor, composition, 33k ohms ±5%, 1/4 watt (RCR07G333JR)	2500932-77	1, 2, 3, 5
2500932-158	2	No Charge	Resistor, composition, 3.9 ohms ±5%, 1/4 watt (RCR07G3R9JR)	2500932-155	1, 2, 3, 5
2500932-97	4	No Charge	Resistor, composition, 100k ohms ±5%, 1/4 watt (RCR07G104JR)	2500932-108	1, 2, 3, 5
2500932-66	2	No Charge	Resistor, composition, 5.1k ohms ±5%, 1/4 watt (RCR07G512JR)	None	1, 2, 5
2500932-96	3	No Charge	Resistor, composition, 91k ohms ±5%, 1/4 watt (RCR07G913JR)	2500932-109	1, 2, 3, 5
2500932-59	1	No Charge	Resistor, composition, 2.7k ohms ±5%, 1/4 watt (RCR07G272JR)	2500932-66	1, 2, 3, 5
4006559-97	4	No Charge	Resistor, composition, 100k ohms ±5%, 1/8 watt (RCR05G104JS)	None	1, 2, 5
2501629-61	4	No Charge	Capacitor, ceramic, 0.1 uF ±10%, 100 vdcw (CK14BR104K)	2503221-54	1, 2, 3, 5
4011265-471	2	No Charge	Capacitor, ceramic, 470 pF ±5%, 50 vdcw (SCM12471J)	2501629-57	1, 2, 3, 5
2501629-41	2	No Charge	Capacitor, ceramic, 0.01 uF ±10%, 100 vdcw (CK13BX103K)	None	1, 2, 5
2503220-19	4	No Charge	Capacitor, ceramic, 22 uF ±10%, 35 vdcw (M39003-01-2368A)	2503221-54	1, 2, 3, 5

New Part No.	Qty	Unit List Price	Description	Old Part No.	Instructions-Disposition
2586239-212	2	No Charge	Diode, zener, 20 volts (V07595, Part No. 1N968B)	2504035-216	1, 2, 3, 5
2503676-228	2	No Charge	Diode, zener, 16 volts ±5% (V12969, Part No. 1N4470)	None	1, 2, 3, 5
4011334-300	See Note 4	No Charge	Operational Amplifier (V32293, Part No. ITS 6258)	4011334-300	1, 2, 4, 5
OW57P2928-006	5 ft	No Charge	Wire, insulated, AWG 28, GRN	None	1, 2, 5
OW57P2930-002	2 ft	No Charge	Wire, insulated, AWG 30, BRN	None	1, 2, 5

Sundry Items

No. 20 and 22	Sleeving, Teflon
	Conformal Coating, Humiseal Type 1B31, Columbia Technical Corp, Woodside, NY
	Freon, Type TA, DuPont Co, Wilmington, DE
	Ink, epoxy, black, commercial

1. Parts are supplied at no charge to customer.
2. When requesting parts, submit a no-charge purchase order listing the serial numbers of the Helipilot Computers on which the parts will be used and specify this Service Bulletin (21-1169-02). The purchase order should include only those parts listed in this Bulletin.
3. Discard old part; do not reuse.
4. The quantity of operational amplifiers is determined by Accomplishment Instructions, step 2.C.(8).
5. Return replaced operational amplifiers to Sperry Quality Assurance, Attn: Supervisor.

6. Request new parts from:

Sperry Flight Systems
Sperry Rand Corporation
P. O. Box 21111
Phoenix, Arizona 85036

Attn: Warranty Administrator,
Product Support

SPERRY
FLIGHT SYSTEMS
PHOENIX, ARIZONA

Single Pilot IFR System

Gazelle SA-341G

Maintenance Manual

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INTRODUCTION

This manual provides general system maintenance instructions and theory of operation for the Single Pilot IFR System (hereinafter called System) for the Gazelle SA-341G.

The System components described in this manual are manufactured by Sperry Flight Systems, a division of Sperry Rand Corporation, Phoenix, AZ.

Common System maintenance procedures are not presented in this manual. The best established shop and flight line practices should be used.

AIRWORTHINESS NOTICE

Sperry has an Airworthiness Analysis procedure to ensure that equipment designed by Sperry will not create a hazardous in-flight condition. As a result of the Airworthiness Analysis, certain installations have been designated INSTALLATION CRITICAL, and 100 percent compliance with those installations is required.

INSTALLATION CRITICAL is defined as:

> Specific methods of installation are required to ensure that either the failure of the assembly or part is extremely improbable or that its failure could not create a hazardous condition.

Abbreviations used in this manual are defined below.

Abbreviation	Equivalent
ADC	Air Data Computer
ADF	Automatic Direction Finder
AGC	Automatic Gain Control
ALT	Altitude
ANN	Annunciator
AS, A/S	Airspeed
ATC	Air Traffic Control
AUX	Auxiliary
ATT	Attitude
BARO	Barometric

Abbreviation	Equivalent
CD	Course Deviation
CE	Course Error
CMD	Command
COMP	Compensation
CONT	Controller
CRS	Course
DCL, DCPL	Decouple
DEC	Decrease
DECEL	Decelerate
DEV	Deviation
DH	Decision Height
EMI	Electrical Mechanical Interference
ERR	Error
FD, F/D	Flight Director
FDC	Flight Director Computer
GHI	Gyro Horizon Indicator
G/A, GA	Go Around
G/S, GS	Glide Slope
HDG	Heading
IF	Intermediate Frequency
IFR	Instrument Flight Rules
ILS	Instrument Landing System
INC-DEC	Increase-Decrease
IVS	Instantaneous Vertical Speed
LBS	Lateral Beam Sensor
LH	Left Hand
LOC	Localizer
NAV	Navigational
O/C	On Course
PATT	Pitch Attitude
P/S	Pitot Switch

Abbreviation	Equivalent
RA, R/A	Radio Altimeter
RCVR	Receiver
RDI	Radio Deviation Indicator
REV	Reverse Course
RH	Right Hand
RT, R/T	Receiver/Transmitter
SAS	Stability Augmentation System
SBY	Standby
SEL	Select
SMART	Signal Monitoring and Retraction Technique
STC	Sensitivity Time Control
SYNC	Synchronization
TSO	Type Standard Order
VBS	Vertical Beam Sensor
VG	Vertical Gyro
VOR	Variable Omni Range
VSER	Vertical Speed Error
V/L	VOR/LOC
VS, V/S	Vertical Speed
X-FEED	Crossfeed

SECTION 1

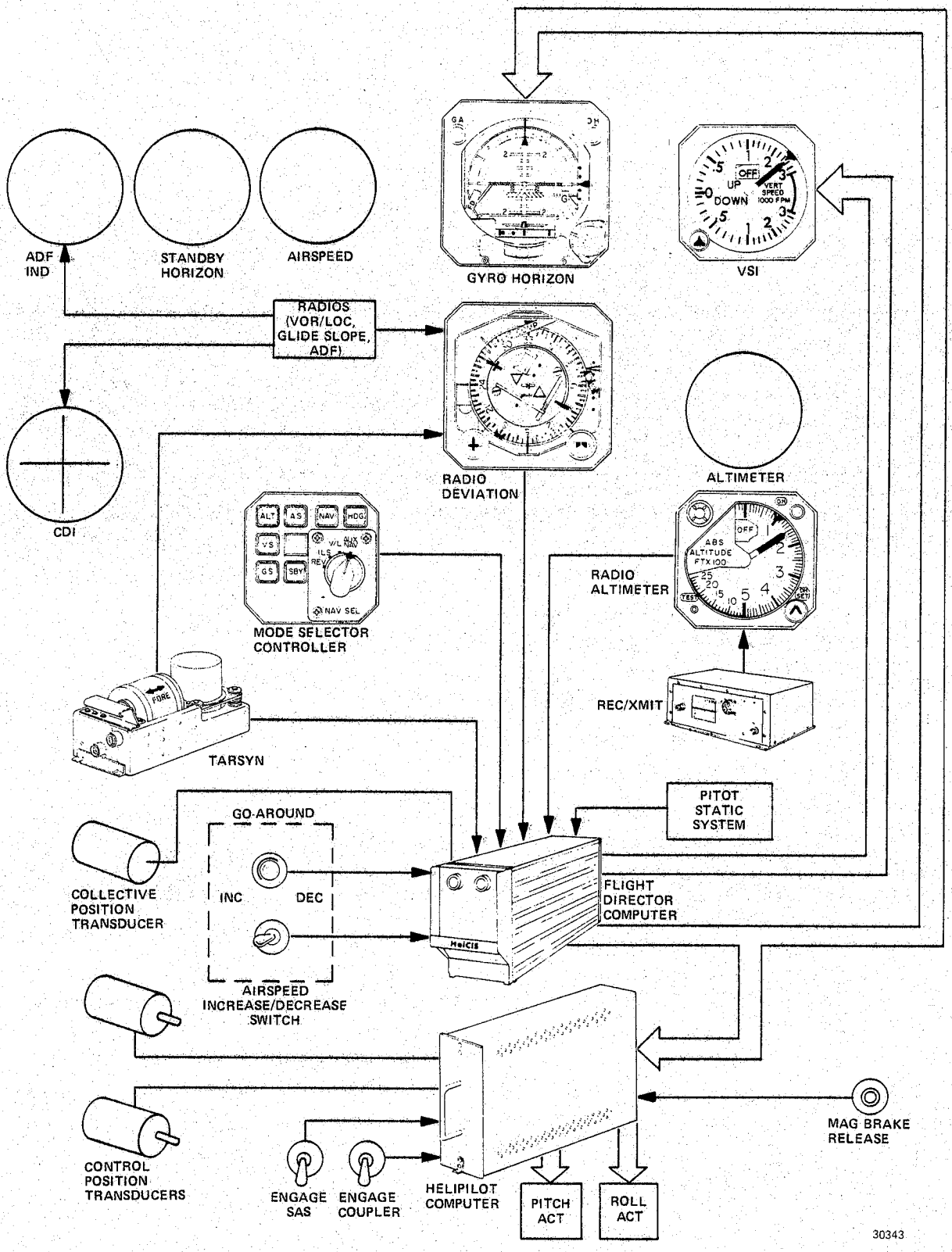
DESCRIPTION AND OPERATION

1. General

This section provides a general functional description of the System and a brief description, leading particulars, and a block diagram, where applicable, of each component used in the System. Table 1 lists the components and part numbers for the Gazelle installation. The overall relationship of the components and the signal flow through the System are shown in figure 1.

Component	Part Number
TARSYN 555H Gyroscope Assembly	4020936-901
Flux Valve	2594484
Compensator	656767
RD-44 Radio Deviation Indicator also called Horizontal Situation Indicator (HSI)	2592920-044
GH-14 Gyro Horizon Indicator (GH-14)	4021541-560
Flight Director Computer (FDC)	4015985-903
Mode Selector Controller	4012395-903
Helipilot Computer	4025008-901
VS-444 Vertical Speed Indicator (VSI)	4012384-902
RT-220 Receiver/Transmitter	4004437-901
RA-215 Radio Altimeter Indicator	4014267-901
AT-220 Antenna (2)	4004512

IFR System Components
Table 1



System Flow Diagram
Figure 1

2. System Description

The System is an integrated helicopter flight control system which can operate in the high density ATC environment. It enables precise control of altitude and direction when encountering IFR conditions.

This System presents computed flight path commands to the pilot. Critical flight information displays are integrated into a small panel area. Instruments in the System provide all of the raw data needed for cross-check, and provide commands which enable the pilot to capture and track his desired flight path.

The FDC is completely integrated with the Helipilot Computer to provide stabilized automatic flight during IFR operation. The Helipilot Computer also provides smoothness and accuracy to operate in the IFR environment and enables automatic flight during all phases of climbout, cruise, and descent. In addition, the Helipilot Computer may be operated in the SAS mode, thereby improving the aircraft hands-on stability.

3. System Operational Requirements

This paragraph specifies the functional modes which the System performs in the Gazelle.

A. Stability Augmentation

The Helipilot Computer, when operating in conjunction with SFENA 34-24-V10 pitch and roll series actuators, longitudinal and lateral stick position transducers, and the TARSYN vertical gyroscope, provides short-period attitude and attitude rate stabilization to the helicopter. Stability and handling qualities with SAS engaged are sufficient to meet all applicable requirements of Federal Aviation Regulations FAR 27, CAR 6, and Advisory Circular AC 29 over the IFR flight envelope of the Gazelle. The SAS is configured and calibrated such that during normal maneuvering the actuators and/or electronics function within their linear operating range, i.e., without saturation. The System is interfaced with the aircraft force trim system so that operation of the magnetic brake switch causes synchronization of the SAS shaping circuits, thereby recentering of the SAS actuators.

Operation of the SAS engage, disengage, or magnetic brake switches does not cause undesirable transients in the aircraft controls. The SAS engage switch is interlocked to prevent engagement whenever the gyro failure monitoring circuits indicate invalid.

B. Attitude Hold

When the autopilot engage switch is on, and no flight director modes are engaged, the Helipilot Computer causes the pitch and roll attitudes existing at engagement to be held by the SAS. When the magnetic brake switch is operated, a new attitude reference is established by the Helipilot Computer, causing the attitude existing at switch operation to

be maintained. Attitude stability is sufficient to permit unlimited hands-off operation in moderate turbulence at approved IFR speeds, so long as stick trim requirements do not exceed series actuator authority.

Operation of the autopilot engage, disengage, or magnetic brake switches does not cause undesirable transients in the aircraft controls. The autopilot engage switch is interlocked to prevent engagement unless both pitch and roll SAS channels are engaged.

3. C. Couple

With the autopilot engage switch on, any pitch or roll flight director mode selected is automatically coupled to the SAS through the Helipilot Computer, thereby providing automatic flight path control. Attitude commands from the flight director system are executed by the Helipilot Computer in a manner similar to that used by the pilot in manual flight director operation. Attitude commands are limited to amplitude and rate to a level compatible with IFR maneuvering. Specifically, automatic maneuvers are less than the following:

	Attitude	Attitude Rate
Pitch	±10 degrees	5 degrees/second
Roll	±25 degrees	10 degrees/second

Performance in the coupled mode is sufficient to permit unlimited hands-off operation in moderate turbulence at approved IFR airspeeds, while maintaining path guidance compatible with IFR air traffic control requirements. When operating in the coupled mode, requirements for retrimming the cyclic control are displayed on the flight director command bars. When the series actuators are displaced beyond approximately 80 percent of their range, the flight director bars are displaced sufficiently to positively indicate the proper trim command. Repositioning of the cyclic control such that the series actuators are recentered causes the command bars to recenter. If a flight director command is invalid (as evidenced by retraction of the appropriate command bar on the GH-14), the axis affected reverts to the attitude hold mode. When the signal again becomes valid, coupling will automatically resume.

D. Flight Director Modes

The System may be flown as a one-axis, two-axis, or three-axis system at pilot discretion. The System utilizes lateral and vertical deviation signals furnished by the navigation sensors (i.e., VOR, LOC, G/S), heading and attitude data from the TARSYN, and airspeed, altitude, and vertical speed data from the integral air data computing subsystem. Using this information, the System computes steering commands which are displayed on the roll and pitch flight director command bars and collective commands to guide the aircraft along a selected flight path for navigation or landing approach.

The following modes of operation are available to the pilot:

- Standby
- Lateral Axis Modes

  Heading Select
  VOR/localizer
  Reverse Course

- Longitudinal Axis Modes

  Vertical Speed Select
  Altitude Hold
  Airspeed Hold
  Glide Slope

- Collective or Power Axis Modes

  Vertical Speed Select
  Altitude Hold
  Glide Slope

- Go-Around (three-axis mode)

3. D. (1) Standby (SBY) - The standby mode of operation places the System in an always-ready operating condition, with the pitch and roll flight director command bars and the collective cue removed from view on the GH-14. When the command cues are removed, the GH-14 functions as a standard attitude reference indicator.

The System is on any time the flight director breakers are on; this permits immediate pilot selection of any flight director mode, once the warning flags are out of view. Standby mode is selected by pressing the SBY button. SBY acts as a press-to-test to light all the button lamps. SBY remains lighted when released.

When any other pushbutton switch/annunciator on the Mode Selector Controller is pressed, the command cues are driven to satisfy the FDC outputs. After mode selection, the pilot controls the miniature aircraft symbol to the command bars to smoothly intercept and maintain the desired course. The third cue is brought into view when a collective mode is selected.

(2) Lateral Axis Modes

Heading Select (HDG) - Heading select mode is used to intercept and maintain a desired flight heading. The mode is engaged by pressing the HDG button on the Mode Selector Controller. The button lights. If the heading select mode is not valid, the vertical bar is removed from view, and the HDG button remains illuminated.

Using the heading knob on the HSI, the heading bug may be positioned to any desired heading on the rotating heading dial. The FDC generates the correct flight director vertical bar roll command to bank the aircraft to intercept and smoothly roll out on the desired heading without overshoot. To prevent extreme bank attitudes, the FDC also limits the amount of roll angle commanded to a maximum of approximately 20 degrees.

If the SBY mode is selected before HDG, only the vertical bar is in view. However, airspeed, vertical speed, glide slope, or the altitude hold mode may also be selected to provide pitch attitude and/or collective commands in addition to the HDG mode of operation. Selection of HDG cancels the NAV mode if previously engaged.

VOR/Localizer (V/L) - VOR/localizer mode provides for variable angle capture of a selected VOR or localizer radio track. Either track can be smoothly intercepted and maintained by following the vertical command bar on the GH-14.

For VOR operation, the desired VOR radial is set by the course pointer on the HSI, the NAV SEL switch is set to V/L, and the NAV button is pressed. The flight director is armed for automatic capture of the VOR radial, maintaining any desired capture angle as selected by the HDG bug. Bank angles are limited to approximately 20 degrees, and heading washout is included to eliminate standoffs in crosswinds. An over-station sensor turns off the radio deviation as the VOR station is overflown, with automatic reengagement of beam when past the station.

If the VOR signal becomes invalid at any time, the vertical bar is removed from view, and the NAV mode button remains lighted. In this manner, the bar automatically returns to view when the signal again becomes usable.

For LOC operation, the proper ILS frequency is selected, and the course select pointer is set to the ILS inbound bearing. Pressing the NAV button arms the System for automatic capture of the localizer beam. Any capture angle may be selected with the HDG bug. Heading washout is included for crosswind correction on the beam, and automatic gain switching provides stable operation throughout the approach. If the LOC signal becomes invalid at any time, the roll command bar is removed from view, and the NAV mode button remains lighted. The bar automatically returns to view when the signal becomes usable again.

If the SBY mode is selected before NAV, only the vertical bar is in view. However, pitch and/or collective command information may be combined with NAV by pressing the desired mode(s) as needed for the type approach being flown. If the ILS mode is selected with only the vertical bar in view, the horizontal bar appears at glide slope capture. Selection of NAV cancels the HDG mode if previously engaged.

Reverse Course (REV) - Reverse course provides the capability to fly the localizer back-course.

The proper localizer frequency is selected. A valid signal from the HSI exists. The course pointer to the ILS is set inbound front course bearing. The NAV SEL switch is set to the REV position and the NAV pushbutton is pressed. The vertical bar roll commands are followed to intercept and maintain the desired ILS course.

If desired, the ALT, V/S, or A/S mode may also be selected to provide pitch bar commands during the REV mode operation.

If the ILS signal becomes invalid at any time, the vertical bar is removed from view, and the REV mode button remains lighted. The bar automatically returns to view when the signal becomes usable again.

3. D. (3) Longitudinal Axis Modes

Airspeed Hold (A/S) - The airspeed hold mode is selected on the Mode Selector Controller by pressing the A/S pushbutton. The airspeed existing at mode engagement will be commanded by the horizontal pitch bar. The System can be resynchronized to a different airspeed at any time by pressing the A/S pushbutton again. Airspeed changes may be commanded by operating the airspeed INC/DEC switch. This switch slews the airspeed reference at a constant rate of approximately 2 knots/second. Selection of the A/S mode cancels any other longitudinal axis mode previously selected.

Vertical Speed (V/S) - The vertical speed mode displays on the pitch bar the error between the vertical speed selected by the V/S set bug on the VSI and the actual vertical speed of the helicopter. The mode is engaged by pressing the V/S pushbutton on the Mode Selector Controller. Selection of the V/S mode cancels any other longitudinal mode previously selected.

Altitude Hold (ALT) - The altitude hold mode provides a pitch bar command to hold the altitude present at selection of ALT on the Mode Selector Controller. The FDC uses altitude error, vertical speed, and pitch attitude to provide a pitch command. A new altitude reference may be established at any time by re-engaging ALT. Engagement of ALT cancels any other vertical path mode.

Glide Slope (G/S) - Glide slope is automatically engaged at the proper capture point whenever the NAV mode is engaged, the NAV selector switch is in the ILS position, and a valid glide slope signal is being received. The mode also may be manually engaged by operating the G/S switch. ALT or V/S automatically cancels upon G/S engagement. When the glide slope is captured, the pitch bar commands a nose down to smoothly intercept and track the glide slope.

3. D. (4) Collective or Power Axis Modes

The power axis command controls the vertical path through direct lift control. Airspeed control is maintained through the pitch command bar. The power axis command is displayed on the GH-14 third cue and is brought into view when a collective mode is selected. Collective modes are engaged by engaging a vertical mode (ALT, V/S, GS) simultaneously with A/S.

Vertical Speed (V/S) - Vertical speed must be selected simultaneously with A/S (by pushing both buttons together) to establish the third cue command to control helicopter vertical speed with the collective stick.

Altitude Hold (ALT) - Altitude hold must be selected simultaneously with A/S to establish the third cue command to control the aircraft to the altitude existing at mode engagement. The FDC can be synchronized to a new altitude at any time by pressing the ALT button.

Glide Slope (G/S) - Glide slope guidance is provided automatically by the third-cue display when the collective cue is being used to maintain vertical path prior to glide slope capture. At glide slope capture, the vertical speed or altitude hold is cancelled and glide slope commands are presented to capture and maintain the glide slope beam. Airspeed hold remains on the pitch command bar.

(5) Go-Around Mode (G/A)

The go-around mode is selected with a remote switch on the collective stick. On selection of this mode, the lateral axis provides a disc level command. The collective command cue commands climb power. The pitch bar commands climb airspeed, approximately 85 knots. Any lateral mode may be selected after the go-around has been initiated and the pitch/collective axis is maintained in the go-around mode.

(6) Failure Monitor

Each function of the System is constantly monitored for proper operation, and warning flags or pointer retraction techniques are used to indicate what feature is bad. Depending upon the combination of the flags in view or pointers out of view, indicating what functions are bad, limited operation of the System is possible.

The System has in-line monitoring, which will detect and display a flag or retract the associated bars.

Unlike the standard warning flag system used in most instrument systems, the flight director system features the Sperry-originated SMART (Signal Monitoring and Retraction Technique) functions. This means that any invalid radio (navigation) signal or invalid gyro (pitch, roll, or heading) signal causes the affected command bar (or bars) to automatically retract from view. It is possible to fly one bar at a time so if one channel should fail, the invalid bar automatically retracts, and the remaining command bar continues to be usable.

If an invalid function (radio, gyro signal) should exist, any mode selected on the Mode Selector Controller still engages; however, the associated command bar retracts from view, and the pushbutton mode annunciator selected remains lighted. This feature allows the pilot to identify what mode or modes are invalid, and to evaluate what flight director functions are still usable.

4. Component Description

A. TARSYN 555H Gyroscope Assembly (See figure 2.)

The TARSYN provides roll, pitch, and compass data in one, self-contained, gyro package. The gyro package consists of a directional gyro synchronizer, a vertical gyro, and a base. The gyro synchronizer provides compass information; the VG provides vertical reference information; and the base provides resilient mounting for the gyro synchronizer and VG, common and external electrical connections, erection control, and monitor functions. The erection and monitor circuits are contained on electronic components assemblies within the base. Electrical connections, external to the base, are made through a 32-pin and a 55-pin connector. Leading particulars are listed in table 2. The following are major features of the TARSYN:

Automatic initial fast synchronization provides a fully operational gyro synchronizer within 3 minutes.

Automatic fast erection provides a fully operational VG within 3 minutes.

Automatic roll erection and compass slaving cutoff is provided during turns in excess of ±6 degree bank.

Independent manual fast erection backup switches for gyro synchronizer and VG.

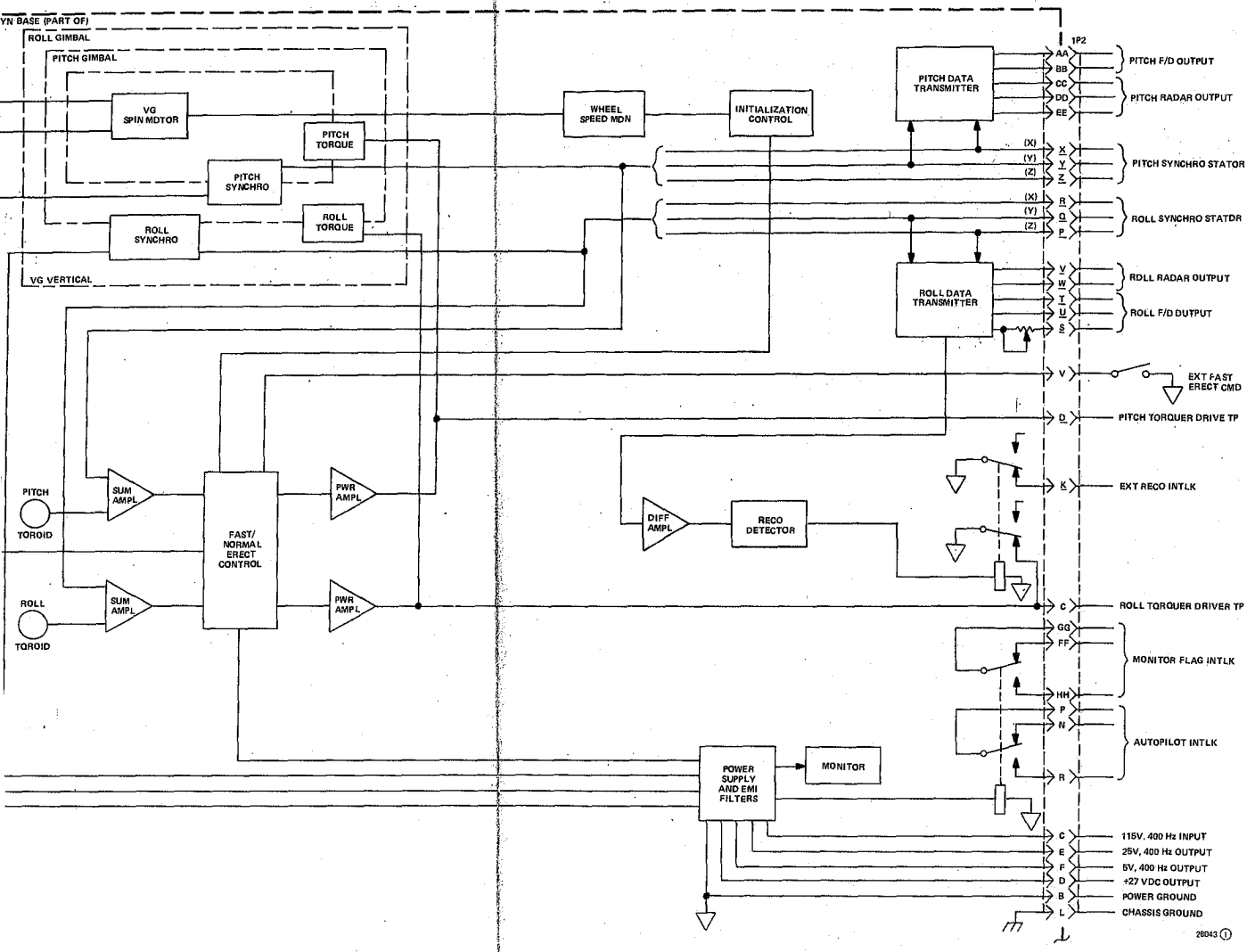
All roll, pitch, and heading outputs are in accordance with ARINC standard requirements.

High inertia gyros provide jitter-free heading and altitude data.

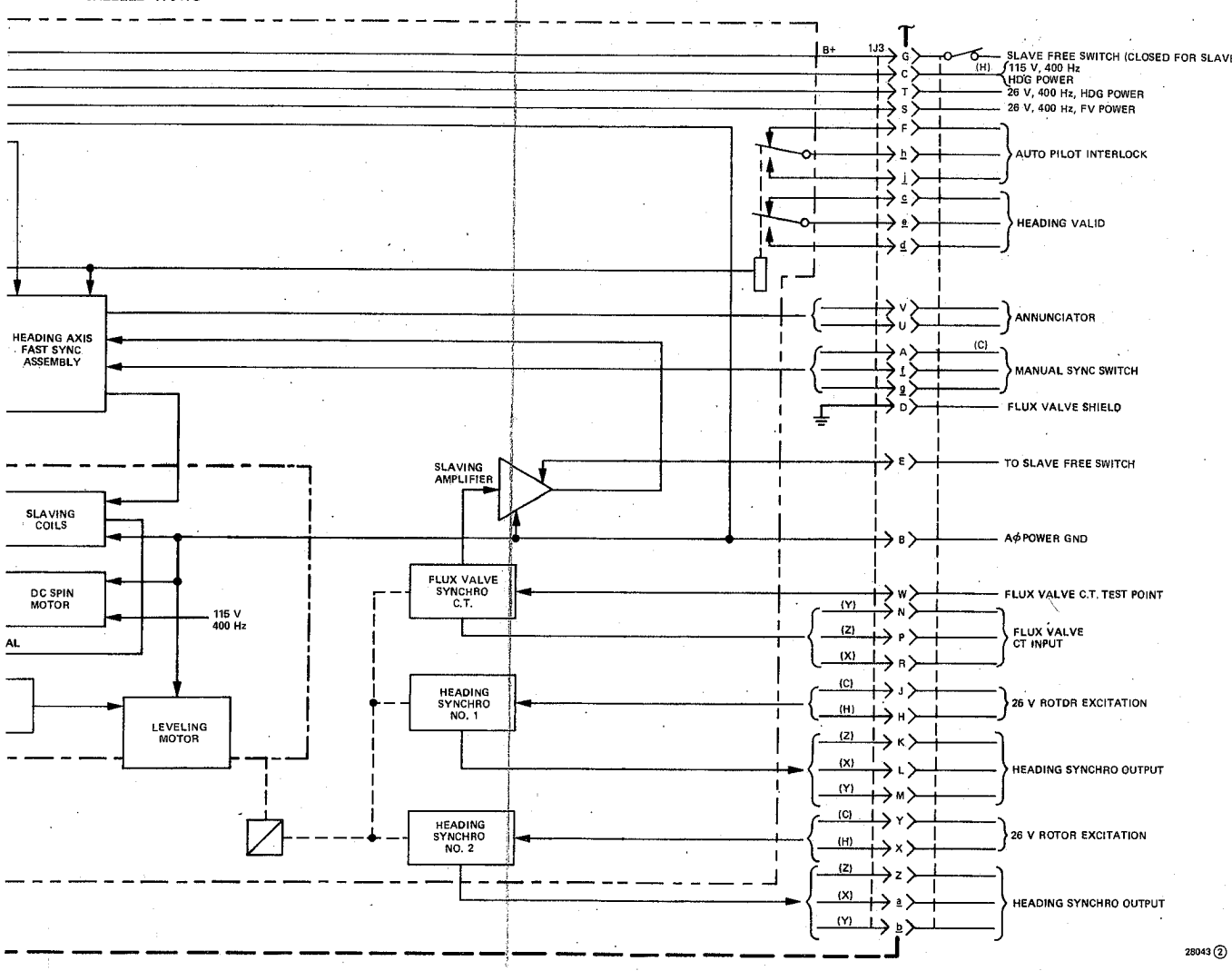
Power adequacy, fault monitoring, wheel speed monitoring, and warning circuits assure optimum flight safety.

Improved elastomer vibration isolators can endure continuous vibration at resonant frequency.

Toroidal sensors mounted in the TARSYN base and redundant slipring connections virtually eliminate intermittents in synchro transmitter circuits.



Block Diagram
e 2 (Sheet 1)



N Block Diagram
re 2 (Sheet 2)

Dimensions: (maximum)

Length	16.08 in. (408.4 mm)
Width	6.53 in. (165.8 mm)
Height	7.38 in. (187.4 mm)

Weight (nominal) ..... 15 lb (6.81 Kg)

Power Requirements: (primary power) ..... 115 ± 2 V, 400 Hz, 1 A

Mating Connector:

1J2 ..... MS3116F22-55SY or PT-08E22-55SY

1J3 ..... MS3116F18-32SY or PT-08F18-32SY

Mounting ..... In Mounting Tray

TSO C4c, C6c

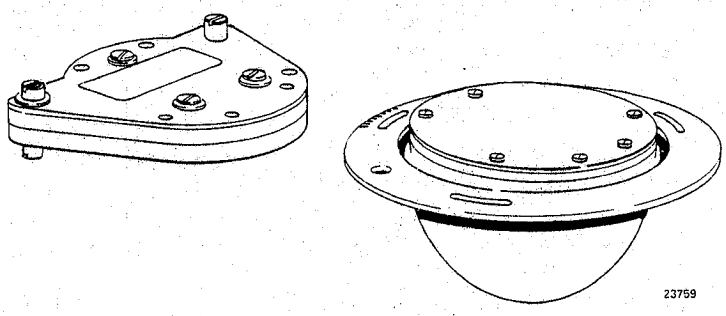
TARSYN Leading Particulars
Table 2

4. B. Flux Valve (See figure 3.)

The Flux Valve is a detector that transmits magnetic information as electrical energy. It contains a pendulous sensing element mounted in a damping fluid. A universal mounting permits this sensing element up to 30 degrees freedom in roll and pitch, while prohibiting rotation about the vertical axis. The sensing element consists of a transformer with one primary and three secondary windings wound about a spider-shape core. The secondary windings are positioned 120 degrees apart in a horizontal plane. The primary winding is located at the center of the spider-shape core. Leading particulars are listed in table 3.

C. Compensator (See figure 3.)

The Compensator consists primarily of two sets of two permanent bar magnets. The relative azimuth position of each of the two magnets constituting a set can be changed by rotating a screw on the outside of the unit. The screw positions the magnets by means of a gear train. One adjusting screw adjusts north-south compensation, and the other adjusts east-west compensation. Leading particulars are listed in table 4.



Flux Valve and Compensator
Figure 3

Dimensions (approximate):

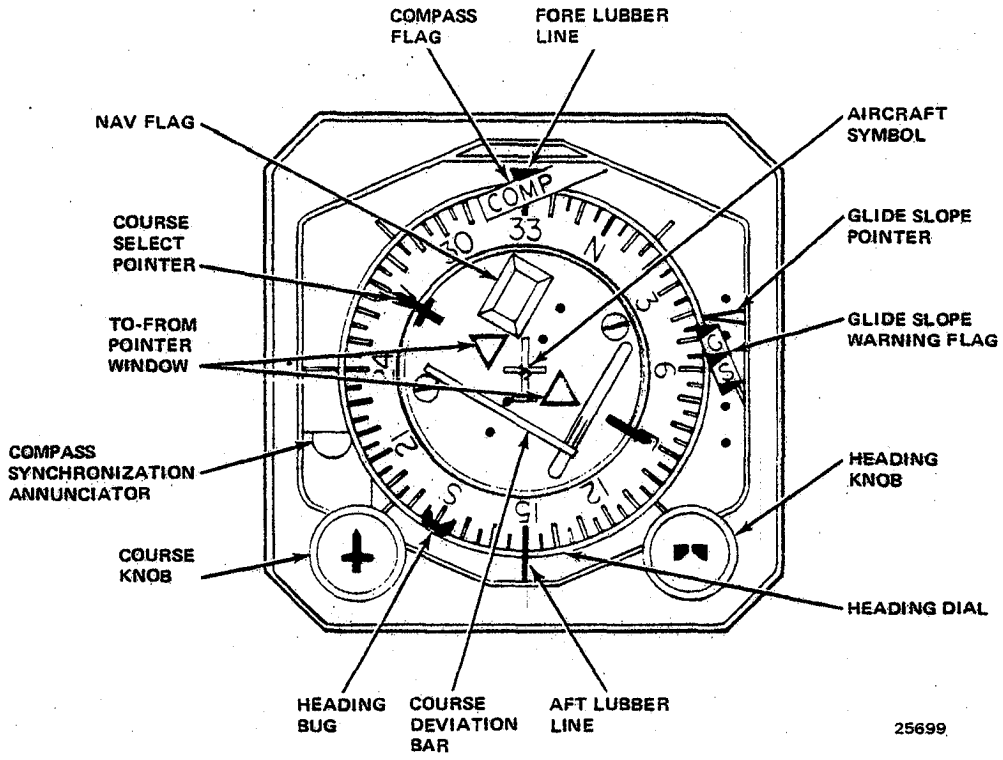
Bowl diameter	3.58 in. (90.93 mm)
Mounting flange diameter	4.80 in. (121.9 mm)
Height	2.88 in. (73.15 mm)
Weight (maximum)	1.5 lb (0.68 kg)
Power requirements	23.5 ± 0.05 V, 400 Hz, 0.04 A single-phase
Mounting	Hard Mount
TSO	C6c

Flux Valve Leading Particulars
Table 3

Dimensions (approximate):

Length	3.875 in. (98.43 mm)
Width	2.875 in. (73.03 mm)
Height	0.750 in. (19.05 mm)
Weight (maximum)	0.25 lb (0.113 kg)
Mounting	Hard Mount to Flux Valve

Compensator Leading Particulars
Table 4



RD-44 Radio Deviation Indicator
Figure 4

4. D. RD-44 Radio Deviation Indicator (See figures 4 and 5.)

When the heading data input at J2-Z, -a, and -b applied to the B2 synchro does not agree with the stator position, an ac error signal is generated, compared to ac reference signal, demodulated, amplified, and applied to motor B1. Motor B1 will rotate and mechanically position the heading dial, the rotors of resolver B5 and synchro B11, and the rotor of synchro B2 to reduce the error signal to a null. The B2 output, HDG valid, and the B+ supply voltage are monitored. Normally the transistor is on, the solenoid is energized, the compass flag is out-of-view, and HDG valid output is provided at J2-X. If HDG valid input at J2-Y is invalid or lost, or the power is lost, or the servo loop will not null, the compass flag will drop into view and the HDG valid output will be removed.

Manually turning the heading knob positions the heading bug to a selected heading. The B7 synchro rotor is mechanically linked to the heading knob to provide a three-wire output at J1-T, -U, -V to the FDC. The difference between the bug and the fore lubber line is the amount of heading error applied.

Comparison monitor synchro B11 is also mechanically linked to the heading knob. When a 26-volt signal is applied at J1-x to -y, the output on J1-s, -t, and -u will repeat the heading data input information. When a 26-volt signal is applied to J1-v to -w, the output will repeat the heading data input less 90 degrees.

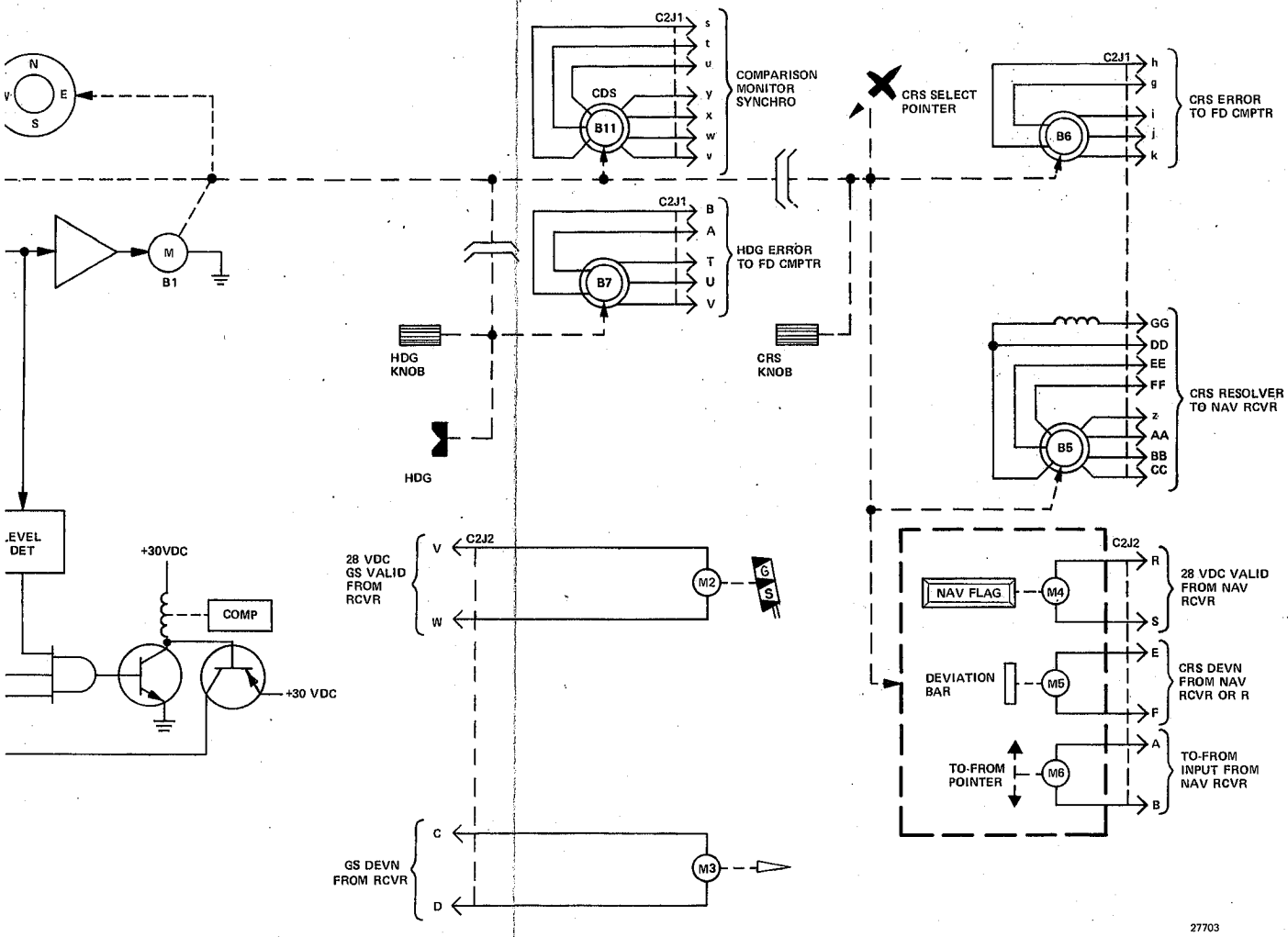
Course resolver B5 is mechanically linked to the course knob and positions when the course select pointer is moved to a selected course. Manually turning the course knob positions the course select pointer to a selected course. The rotor of synchro B6 is also mechanically linked to the course knob and positions to provide a three-wire coarse error output at J1-i, -j, -k to the FDC.

A fixed aircraft symbol shows the aircraft position and heading with respect to the heading dial and to a radio course. The course deviation When a +dc course deviation signal is applied at J2-E to -F, meter movement is activated and the CD bar will deflect to the right. When NAV RCVR valid is at J2-R to -S, solenoid M4 will be activated and the NAV flag will be out-of-view. An invalid signal or loss of the signal will drop the flag into view.

When GS valid is at J2-V or -W, solenoid M2 will be activated and the GS warning flag will be out-of-view. Loss of the valid signal or an invalid signal will drop the flag into view.

When a +dc GS deviation signal is applied at J2-C to -D, meter movement M3 will be activated and the GS pointer will deflect upward. A -dc input When the compass system is in the slaved mode, the sync annunciator signal at J2-J to -G will activate the compass sync annunciator to slowly oscillate between · and +, indicating the rotating heading dial is synchronized with gyro stabilized magnetic heading.

Leading particulars are listed in table 5.



Block Diagram
Figure 5

Dimensions: (approximate)

Length	7.8 in. (198.1 mm)
Width	4.06 in. (103.1 mm)
Height	4.06 in. (103.1 mm)

Weight (maximum) ..... 5.0 lb (2.27 kg)

Power Requirements:

Primary	26 V, 400 Hz
Airplane	28 V dc

Mating Connectors:

J1	MS3116F-22-55S
J2	MS3116F-18-32S

Mounting ..... Clamp

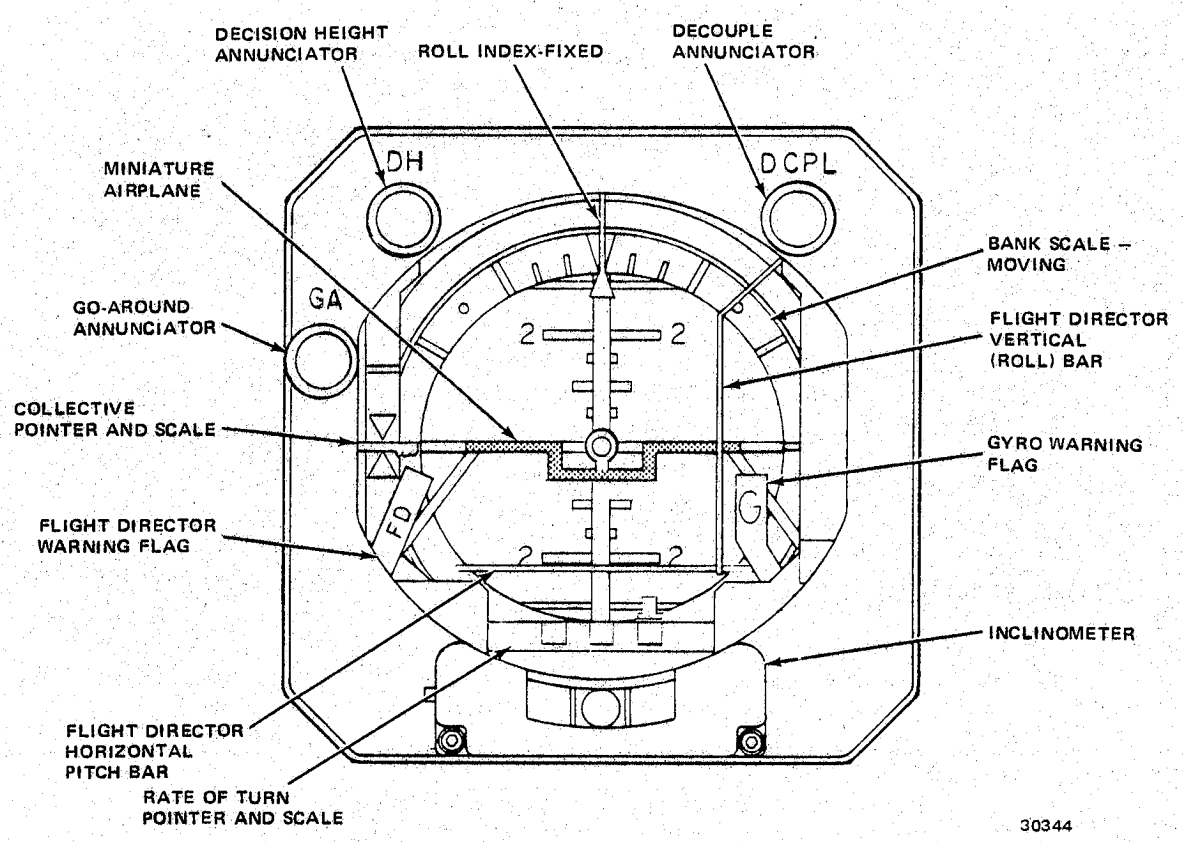
TSO C6c, C52a

RD-44 Leading Particulars
Table 5

4. E. GH-14 Gyro Horizon Indicator (See figures 6 and 7.)

Gyro motor B1 is driven directly by an external 26 V ac which also provides the excitation for the electro-magnetic erection system. The gyro erection circuitry maintains the gyro spin axis in a vertical position. The two erection switches, S1 pitch and S2 roll, sense the position of the pitch and roll gimbals with respect to the local vertical. The pitch (B4 and A4) and roll (B5 and A4) pick off and amplifiers provide two-wire isolated outputs. The torque motors (B2 and B3) are activated to correct the position of the gimbal whenever a deviation from the local vertical occurs. Leading particulars are listed in table 6.

Key malfunctions are detected and annunciated by monitor circuit A1, gyro warning flag meter M1, and relay K2. Normally the flag is biased out of view and the valid interlock relay contacts are closed. The flag comes into view and the relay contacts open simultaneously whenever: (1) primary power or power supply voltages are lost, (2) power excitation is reduced to less than 75 percent, (3) the gyro wheel speed is less than 75 percent, and (4) loss of wheel speed due to spin motor ground opens after wheel reaches full speed.



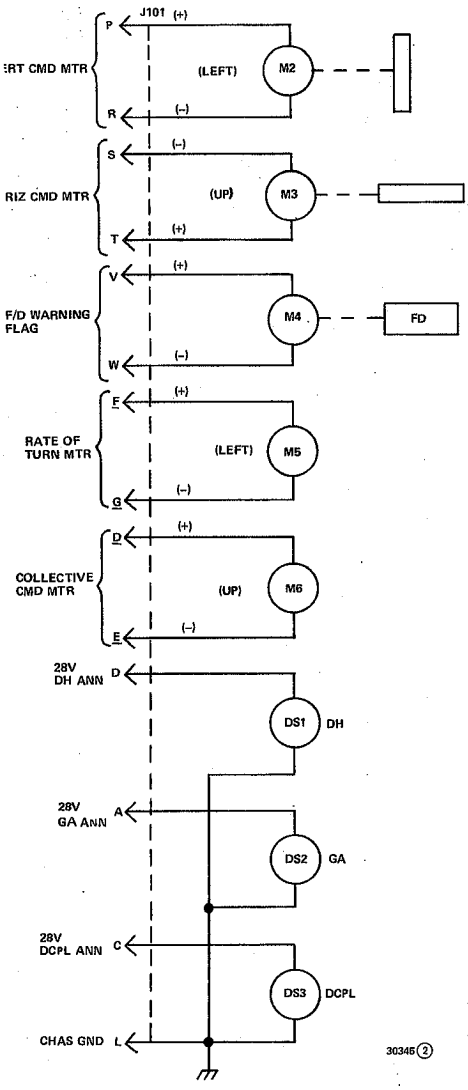
GH-14 Gyro Horizon Indicator
Figure 6

A dc roll command signal at J1-P to -R will activate meter movement M2 and move the roll (vertical) command bar right or left. A dc pitch command signal at J1-S to -T will activate meter movement M3 and move the pitch (horizontal) command bar up or down.

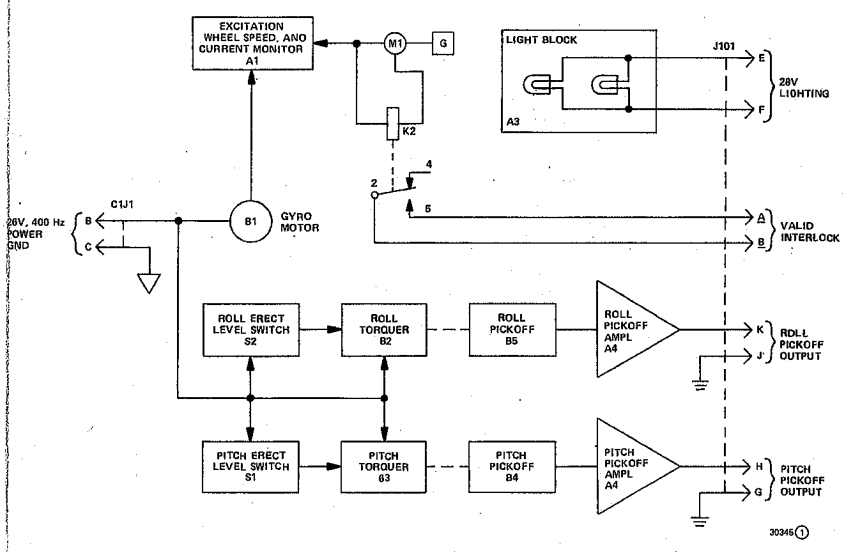
An FD valid at J1-V to -W will activate solenoid M4, causing the flight director warning flag to be out of view. Loss of the input signal will drop the flag into view.

The G/A annunciator illuminates when go-around mode is selected and +28 V dc is supplied. The DH annunciator illuminates when at or below the selected decision height on the RA-215 and +28 V dc from the RA-215 is supplied. The DCPL annunciator illuminates when the mode selected on the Mode Selector Controller goes invalid and reverts to ATT HOLD. The light indicates that the mode selected is no longer valid.

The roll fixed index pointer displays actual roll attitude when aligned with the index reference degree markings on the bank scale.



Block Diagram
Figure 7



Dimensions: (approximate)

Length	9.00 in. (228.6 mm)
Width	4.06 in. (103.1 mm)
Height	4.06 in. (103.1 mm)
Weight (maximum)	5.0 lb (2.27 kg)

Power Requirements:

Primary	26 V, 400 Hz
Starting (maximum)	33 VA
Running (maximum)	25 VA

Mating Connectors:

J101	MS3112-E18-32S
Mounting	Clamp
TSO	C4c, C9c, C52a

GH-14 Leading Particulars
Table 6

The rate of turn pointer and scale provide a visual display of true aircraft turn rate. The pointer responds to external signal inputs and, when not excited, is mechanically biased out of view.

The collective pitch command pointer/scale displays computed pitch commands to approach and maintain selected vertical paths or speeds for helicopter operation. The pointer responds to external signal inputs and may be biased out of view as a function of the FDC.

The inclinometer gives the pilot a conventional display of aircraft slip or skid, and is used as an aid to coordinate maneuvers.

4. F. Flight Director Computer (FDC)

The FDC provides all pitch, roll, and collective axis commands to the GH-14 and Helipilot Computer. The lateral channel combines compass heading, attitude, navigation receiver, and course select data into computed lateral cyclic commands. Integral to the FDC are air data sensors and a vertical accelerometer. Altitude, airspeed, instantaneous vertical velocity, and glide slope errors are computed and combined with pitch attitude to provide longitudinal cyclic and collective pitch commands.

Internal monitoring provides automatic cue retraction when a sensor is invalid or the FDC has failed, thereby preventing the pilot from following an invalid command. Leading particulars are listed in table 7.

Dimensions: (approximate)	
Length	15.19 in. (385.8 mm)
Width	4.91 in. (124.7 mm)
Height	7.78 in. (197.6 mm)
Weight (maximum)	12 lb (5.44 kg)
Power Requirements:	
Primary	115 V, 400 Hz
Starting	40 VA
Running	30 VA
Mating Connector:	
J1	DPX 2MA-67S-67S-33B-0001
Mounting	Shock Mount
TSO	C52a

FDC Leading Particulars
Table 7

4. F. (1) Functional Operation

Block diagrams of the roll, pitch and collective command channels and the air data section follow the description of each. Logic functions shown indicate a logic 1 (13 V dc) that causes the switch to be open, and a logic 0 to close the switch.

(2) Roll Channel (See figure 8.)

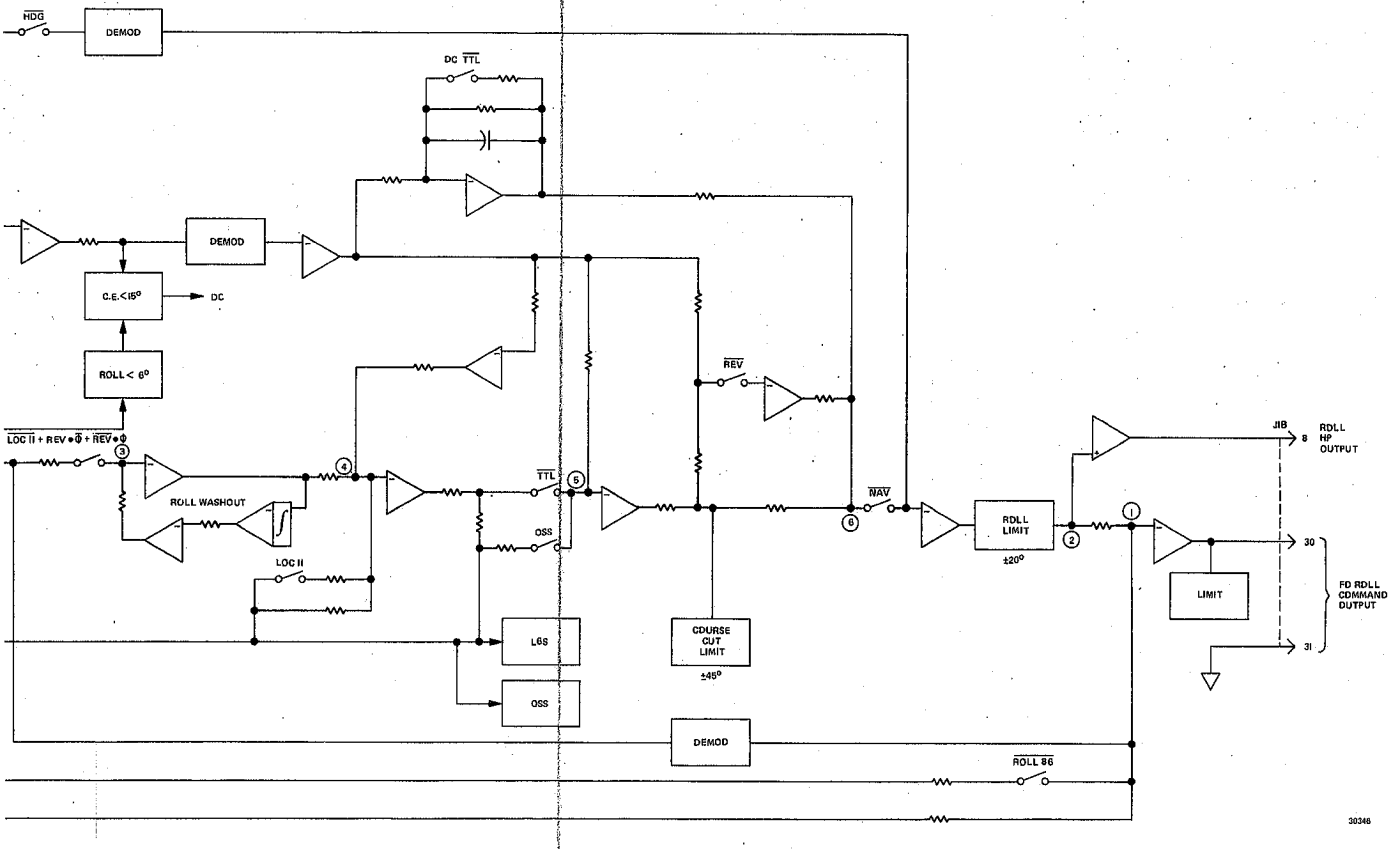
The roll channel circuitry receives and processes the roll attitude signal from the VG, HDG, course, and VOR/LOC DEV signals from the HSI and roll trim command. Only one lateral mode may be engaged at a time. Roll commands are provided to the Helipilot Computer and the GH-14.

HDG mode is engaged by momentarily grounding J1A-24 or -17. When VOR DEV is greater than 80 mv, the VOR DEV signal causes the LBS to prevent engagement of NAV mode until the LBS is satisfied. The HDG error signal is demodulated and limited by the roll limiter and summed with demodulated roll attitude and roll trim command at ①. The limited signal at ② represents roll Helipilot Computer Command and is buffered for roll A/P output. The signal at ① is buffered and limited before output to the FD roll command bar. HDG mode is cancelled when SBY or GA SEL is grounded or when the VOR/LOC DEV drops below the LBS trip level.

NAV mode is engaged by grounding J1A-17 when the VOR DEV signal is below LBS trip level. During NAV mode, CE is demodulated, buffered, and supplied to the roll channel circuitry.

Roll attitude is demodulated and summed with its negative integral at ③ to provide a washed-out RA signal at ④. This is then summed with the demodulated CE and VOR/LOC DEV at ④. The resultant signal is summed with a CE component at ⑤. This signal, when summed with another CE component, represents course cut and is limited to ±45 degrees by the course cut limiter. This output is summed with a lagged CE signal at ⑥ and then processed the same as the HDG error signal.

During REV, the roll attitude demodulator inverts the signal to ③ and the CE signal is inverted to ⑥. These inversions compensate for the reversal relationship between CE and the course correction required for a REV course LOC approach.



Block Diagram
Figure 8

4. F. (3) Pitch Channel (See figure 9.)

During individual modes, the FDC will provide the FD commands that are coupled to the Helipilot Computer. If A/S mode is selected simultaneously with any other pitch mode, the FD provides commands to maintain selected AS. The other selected mode is processed by the collective channel.

The ALT HOLD mode is engaged by momentarily grounding J1A-25. The ADC supplies the ALT ERR signal that is summed with IVS at ①. The resultant signal is then amplified with the IVS component as a damping term. When AS is selected simultaneously with ALT, the ALT ERR without the IVS component is processed in the collective channel. When only ALT is selected, the amplified signal is passed through the $\overline{ALT \cdot \overline{AS}}$ switch to ②. The signal is amplified and pitch limited. The resultant signal, the pitch channel crossfeed output to the collective channel, is fed to the Helipilot Computer and is amplified and summed at ③.

Pitch Attitude signal is demodulated, summed with its negative integral to provide pitch washout, and then summed at ③. Pitch trim command is also summed at ③. The resultant signal is amplified and limited and fed out as the pitch command signal.

VS mode is engaged by momentarily grounding J1A-26. IVS from the ADC is summed with the amplified VS SEL signal at ④. The resultant VSER signal is routed to ② when only VS has been selected or to the collective channel if both VS and AS are selected. The signal at ② is then processed like the ALT signal except that PATT washout component is optimized for VS Hold.

AS mode is engaged by momentarily grounding J1A-27 or when flare logic is satisfied. The ADC provides the AS and AS SEL signals that are summed at ② to produce an AS error signal. The AS SEL is not summed at ② when GA is selected. The AS signal is processed in the pitch channel when selected with another vertical mode. The other signal is then processed in the collective channel resulting in 3-cue operation. When only one vertical signal is selected, it is processed in the pitch channel.

GS mode is engaged after NAV is engaged by momentarily grounding J1A-21 or tripping the VBS. In 2-cue operation, the IVS switched signal and GS signal from the collective channel are summed at ② and processed for output at the ADI and Helipilot Computer.

GA mode is engaged by grounding J1A-11. A constant reference is applied to ②. The ADC supplies an AS term that is summed with the reference. The resultant signal is limited and summed with washed-out pitch at ③ to provide pitch command out.

The pitch command bar will be removed from view when the following conditions result in a signal at ③: power supply invalid or +28 V not present on J1A-49, in the 2-cue GS mode, invalid ALT or GS will result in pitch bar bias; in 2-cue VS or ALT mode, invalid ALT will result in pitch bar bias; in AS or GA mode, or SBY is selected and AS invalid will result in pitch bar bias.

4. F. (4) Collective Command (See figure 10.)

The collective channel is engaged whenever AS mode is selected simultaneously with another vertical mode in 3-cue operation. The AS signal, crossfed from the pitch channel to provide coordinated vertical commands, is applied to ② where it is summed with a collective stick position signal.

In 3-cue operation, the AS command is processed through pitch and the ALT ERR signal is routed to the collective channel, amplified, and applied through $\overline{\text{ALT}}$ to ①.

The collective stick position signal is demodulated and applied to ②. Upon selection of the 3-cue ALT mode, an IVS signal is gradually summed at ②. The resultant signal is processed through a washout circuit and routed to ③, where it is summed with the ALT ERR signal from ①. The resultant signal is amplified, limited, and fed out as collective command.

When in 3-cue VS mode, VSER from pitch is applied through the $\overline{\text{VS}\cdot\text{FLARE}}$ switch to ①. The resultant signal is amplified and summed with the washout signal at ③ as previously described.

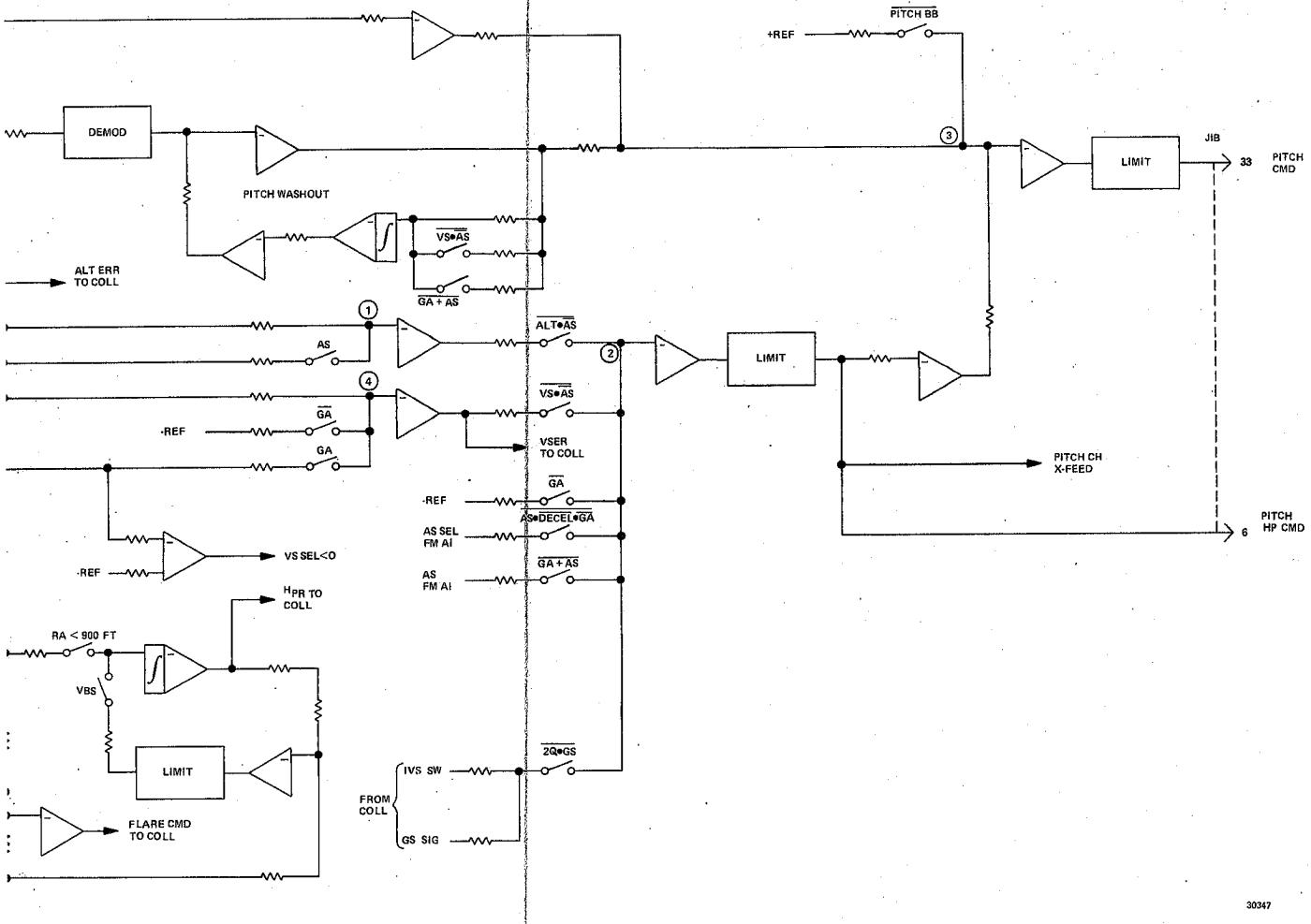
GS DEV is buffered and applied to the height programmer where it is multiplied by a variable as a function of programmed height. The resultant signal is fed to the VBS, the pitch channel, and through the $\overline{\text{GS}\cdot\text{FLARE}}$ switch to ① and processed as previously described.

The FLARE submode is activated when in GS mode or VS SEL and FLARE CMD are negative during VS mode. The FLARE CMD is applied through the $\overline{\text{FLARE}}$ switch to ① and processed as previously described.

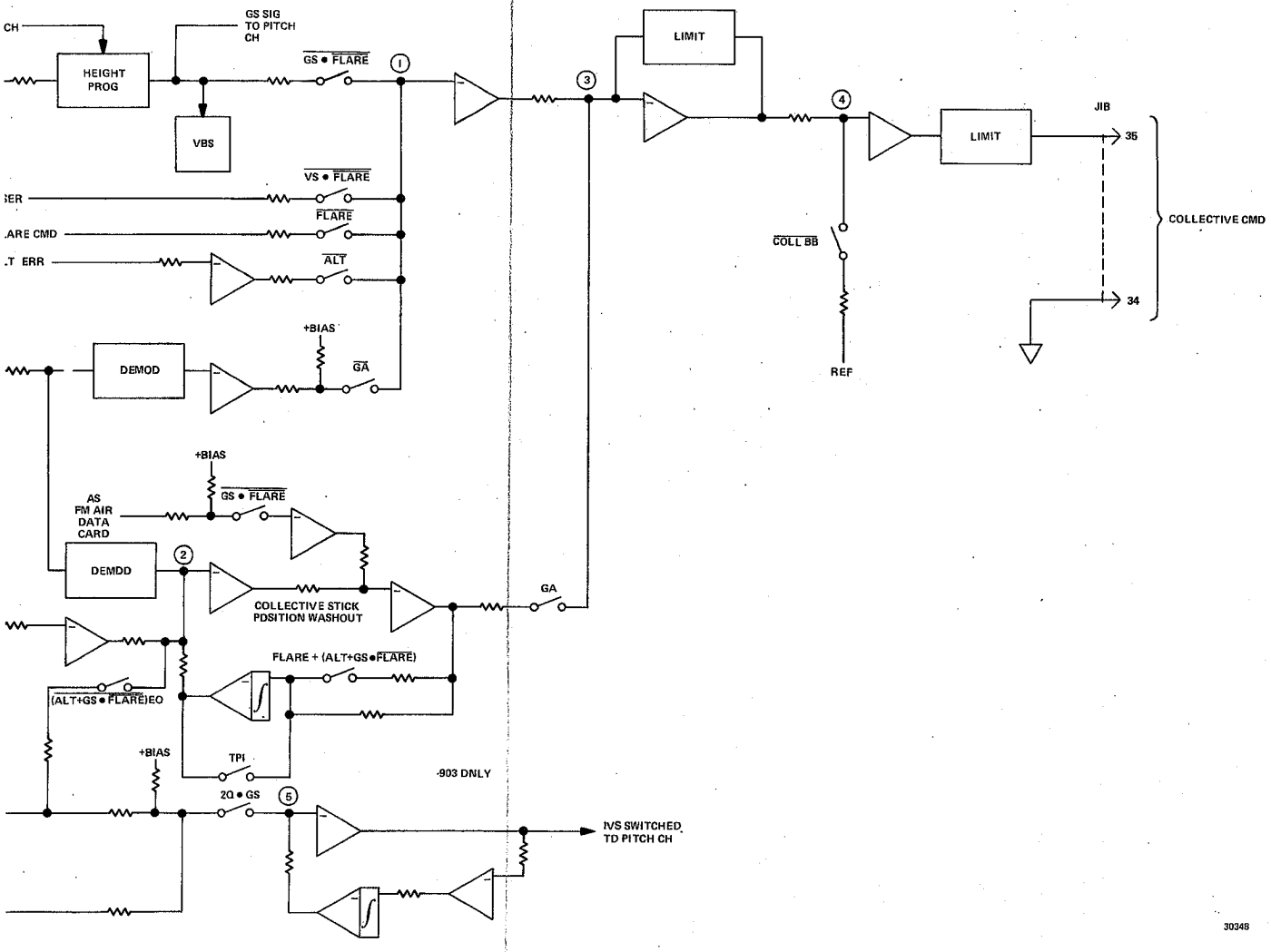
In GA mode, the demodulated collective stick position is summed with a bias term at ① and processed to the output.

Collective bar bias will be applied at ④ during any of the following conditions: any 2-cue mode is applied; the power supply monitor is invalid; SBY is engaged; in 3-cue mode with GS or BARO ALT invalid; or in 3-cue VS or ALT mode with BARO ALT invalid.

When 2-cue GS mode is selected; IVS, AS from the ADC, and a bias term are summed at ⑤. The negative integral of this sum is then fed back to ⑤ to provide washout of constant signal. The resultant IVS switched signal is routed to the pitch channel for GS CMD computation.



ch Block Diagram
Figure 9



Command Block Diagram
igure 10

4. F. (5) Air Data (See figure 11.)

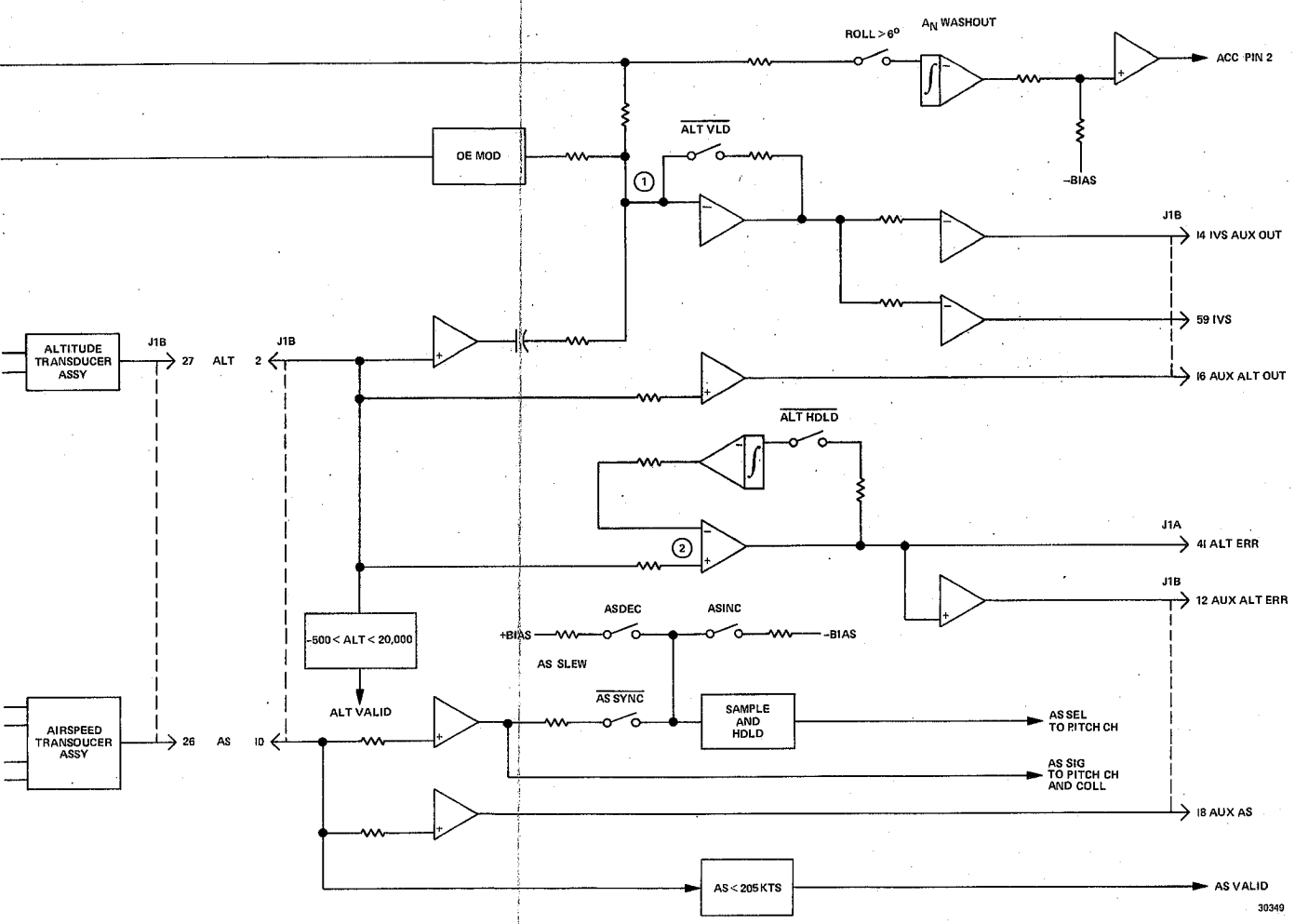
ALT signal H_p is amplified to provide an AUX ALT OUT and also is applied to an ALT valid sensor and IVS computation circuit. The ALT valid sensor will be valid when ALT is less than 19,000 feet.

The IVS computation circuit sums: the ALT derivative, demodulated roll attitude, and normal accelerometer output at ①. The resultant signal is amplified and fed out as IVS AUX OUT.

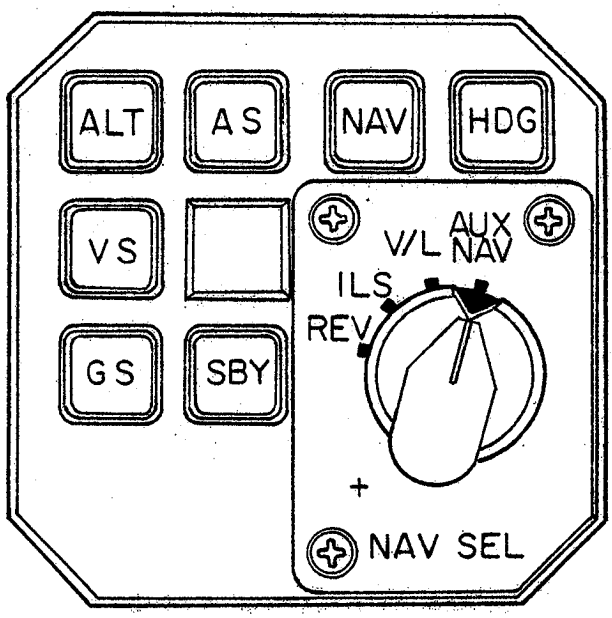
The ALT signal is also supplied to ②. This amplifier has a linear integrator in its feedback loop. The input to the integrator is removed during ALT mode and then acts as a memory to store the ALT signal present at the time the mode was engaged. This reference is summed with the ALT signal to generate an ALT ERR signal output.

The AS signal is amplified and applied to a sample-and-hold circuit through the $\overline{\text{AS·SYNC}}$ switch. When the switch is closed, AS information is constantly updating the circuit. When an AS mode is selected, the $\overline{\text{AS·SYNC}}$ switch opens and the hold circuit provides a reference AS SEL signal to the pitch channel. The AS SEL signal may be slewed by closing the AS DEC or AS INC switch. The AS signal is also amplified for an AUX AS output and applied to an AS valid detector, which is valid when AS < 205 knots.

The normal accelerometer washout circuit provides washout of normal ACC signals when roll attitude does not exceed 6 degrees.



ata Block Diagram
igure 11



Mode Selector Controller
Figure 12

4. G. Mode Selector Controller (See figures 12 and 13.)

The Controller enables the pilot to select and annunciate the various flight modes of the helicopter flight director system. It provides NAV mode switching to interface the course deviation indicator with standard navigation receivers. The bezel and panel display characteristics consist of illuminating pushbuttons and corresponding momentary-on switches for selecting flight director vertical and navigation flight modes, and an edgelighted panel and latching rotary switch for navigation mode switching. Leading particulars are listed in table 8.

Outline dimensions (maximum)	
Height	3.274 in. (83.16 mm)
Width	3.274 in. (83.16 mm)
Length (including knob and connector)	6.14 in. (155.96 mm)
Weight	2.3 lb (1.0 kg)
Excitation, switch annunciator lamps	28 V dc
Excitation, panel lighting	5 V dc or V ac
Mating Connector:	
J1	JT06RE22-2SD (SR)
Mounting	Clamp
TSO	C52a

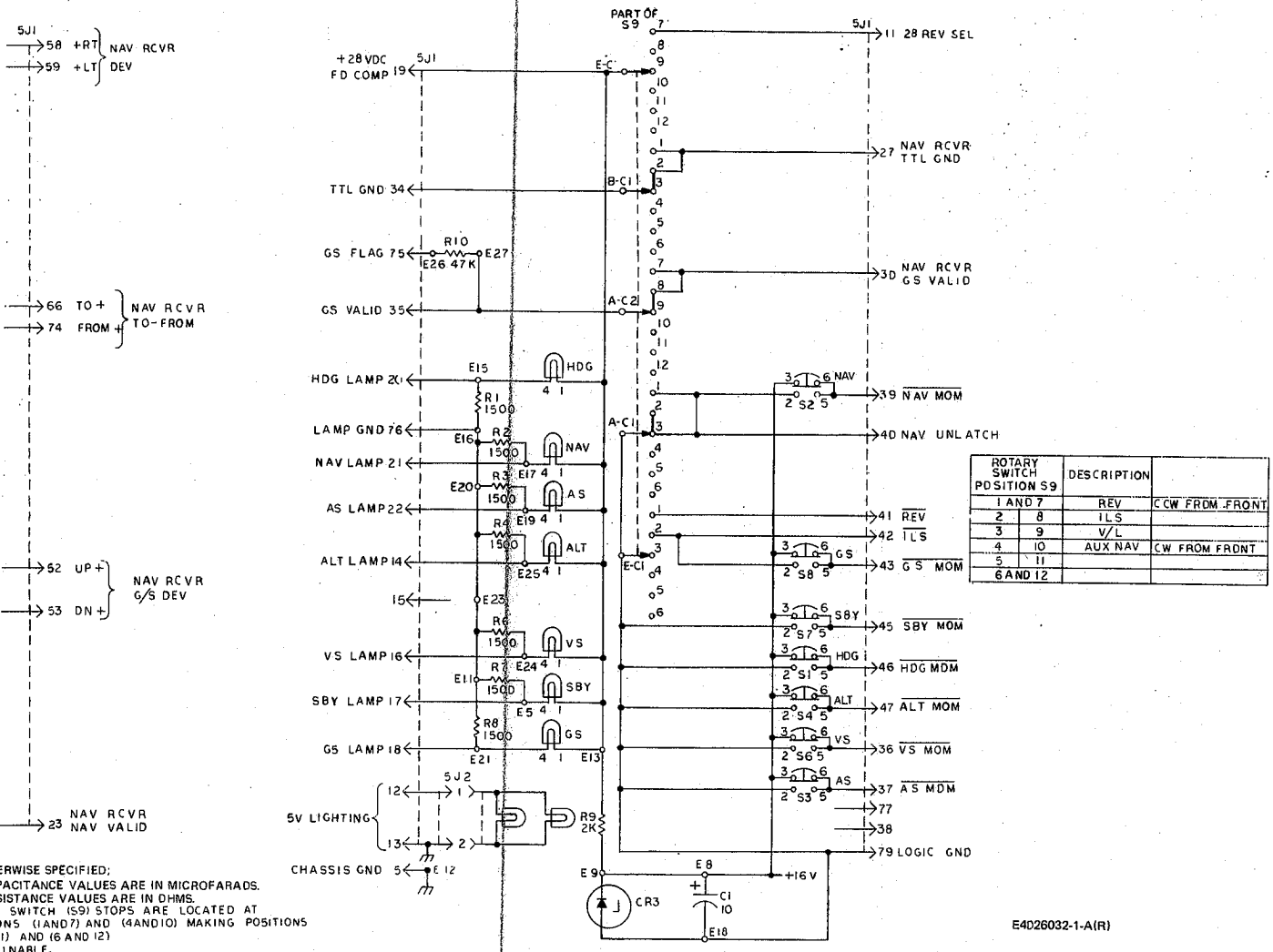
Mode Selector Controller Leading Particulars
Table 8

4. H. Helipilot Computer (See figure 14.)

The Helipilot Computer contains all electronics for the SAS and automatic flight control functions. Circuit components are mounted on four printed wiring boards which plug into a wire-wrap mother board. The unit connector is a rear-mounted rack type. Rack size is approximately 5/16 ATR short. The leading particulars are listed in table 9.

A block diagram of the pitch and roll channels is shown in figure 14. The A2 (pitch) and A3 (roll) electronic component assemblies (ECA) are identical and interchangeable. Signals are routed through A1 which contains the attenuating, summing, and monitoring circuitry for the channels. Logic functions are shown as switches which are open in the true state.

The pitch or roll attitude input is amplified, demodulated, filtered, and amplified by the input network before being applied to the washout circuitry. The washout circuitry allows selection of washout time constant as a function of operating mode. A step input is applied out as attitude error and fed through the integrator to reduce the output of the circuit to zero, the time being determined by the feedback resistor and integrating capacitor.

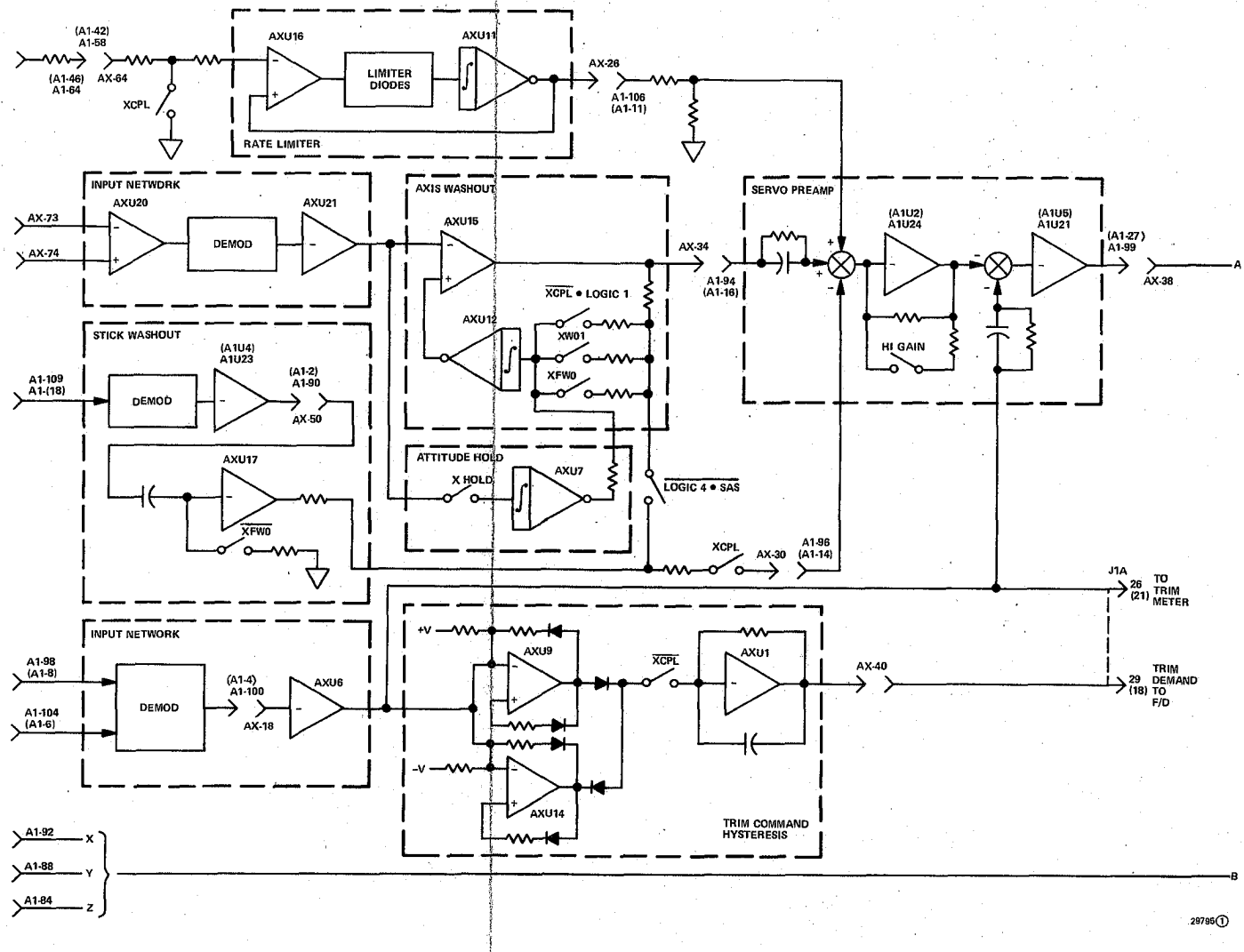


ROTARY SWITCH POSITION S9		DESCRIPTION	
1 AND 7		REV	CCW FROM FRONT
2	8	ILS	
3	9	V/L	
4	10	AUX NAV	CW FROM FRONT
5	11		
6 AND 12			

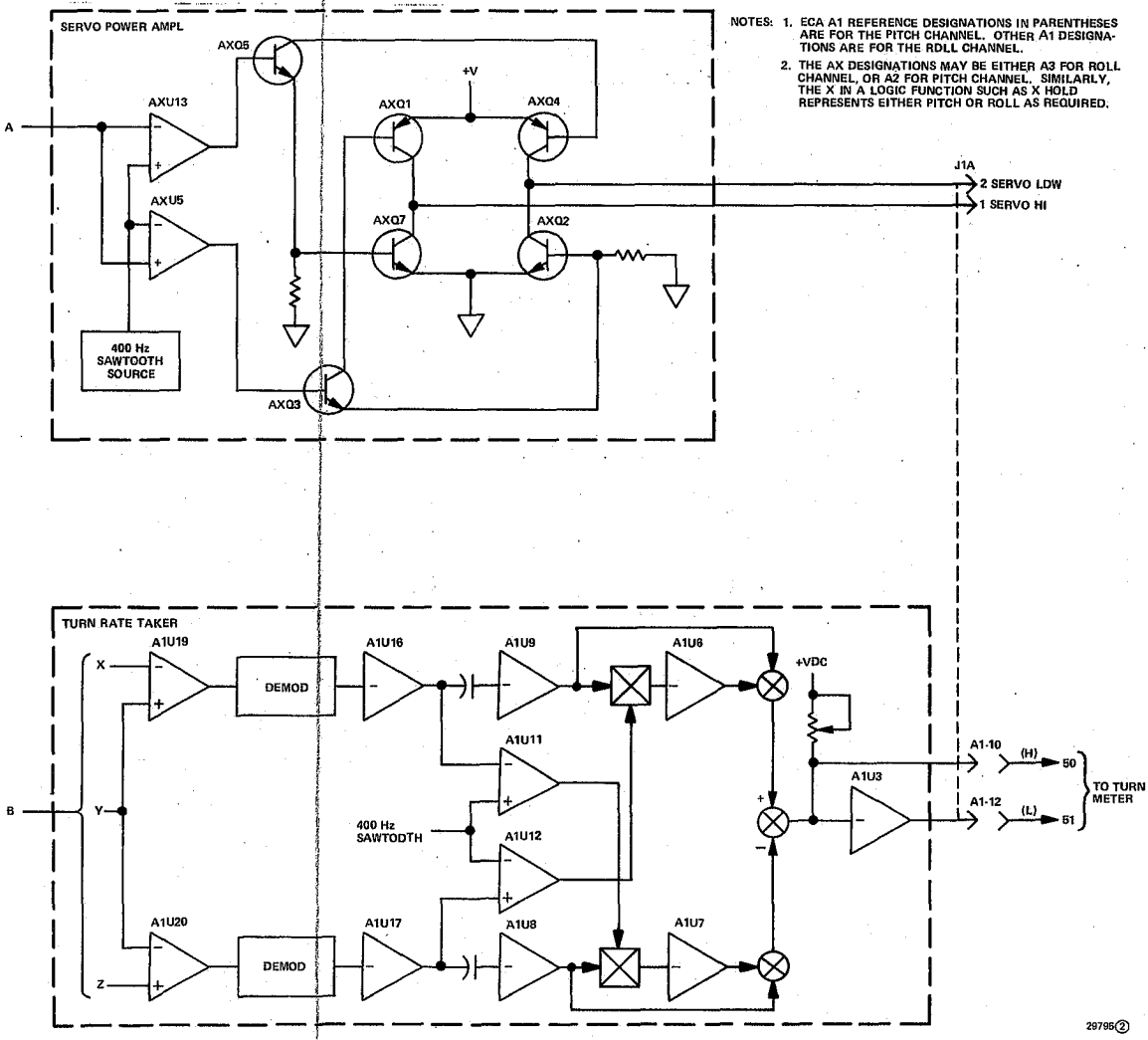
E4D26032-1-A(R)

ERWISE SPECIFIED;
PACITANCE VALUES ARE IN MICROFARADS.
ISTANCE VALUES ARE IN OHMS.
SWITCH (S9) STOPS ARE LOCATED AT
ONS (1AND7) AND (4AND10) MAKING POSITIONS
1) AND (6 AND 12)
INABLE.

ontroller Block Diagram
Figure 13



Computer Block Diagram
14 (Sheet 1 of 2)



puter Block Diagram
14 (Sheet 2)

Dimensions: (approximate)

Length	12.65 in. (321.3 mm)
Width	2.79 in. (70.9 mm)
Height	7.62 in. (193.6 mm)

Weight (maximum) ..... 6.0 lb (2.72 kg)

Power Requirements:

	115 V, 400 Hz
	28 V dc

Mating Connector:

J1	DPX2MA-67S67S-33B-0001

Mounting ..... Shock Mount

TSO C9c

Helipilot Computer Leading Particulars
Table 9

When not in attitude hold, the output of the attitude hold circuitry is equal in magnitude and opposite in polarity to its input from the input network. When attitude hold is engaged, the input is opened which causes the output to remain at the level existing at attitude hold engagement.

The attitude error signal out of the washout circuit is applied to the servo preamp and power amp to return the aircraft to the desired attitude. The attitude error is summed with a derived rate signal and, in pitch or roll, with a washed out stick position signal. The resultant signal is amplified and then summed with servo position feedback. This signal is then amplified, shaped, and applied to the servo power amp.

A sawtooth reference signal is applied to the input of the comparators. The relative amplitude and polarity of the reference signal and the signal from the servo preamp causes the output of either AXU13 or AXU5 to be pulse-width modulated. The pulses are applied to the transistor amplifier which drive the output transistors as elements of a bridge switch. This provides the power handling capabilities necessary to operate the series actuator in the helicopter control system.

The FD command signal is applied to a rate limiter. The signal is buffered and inverted, limited, and applied to the servo preamp.

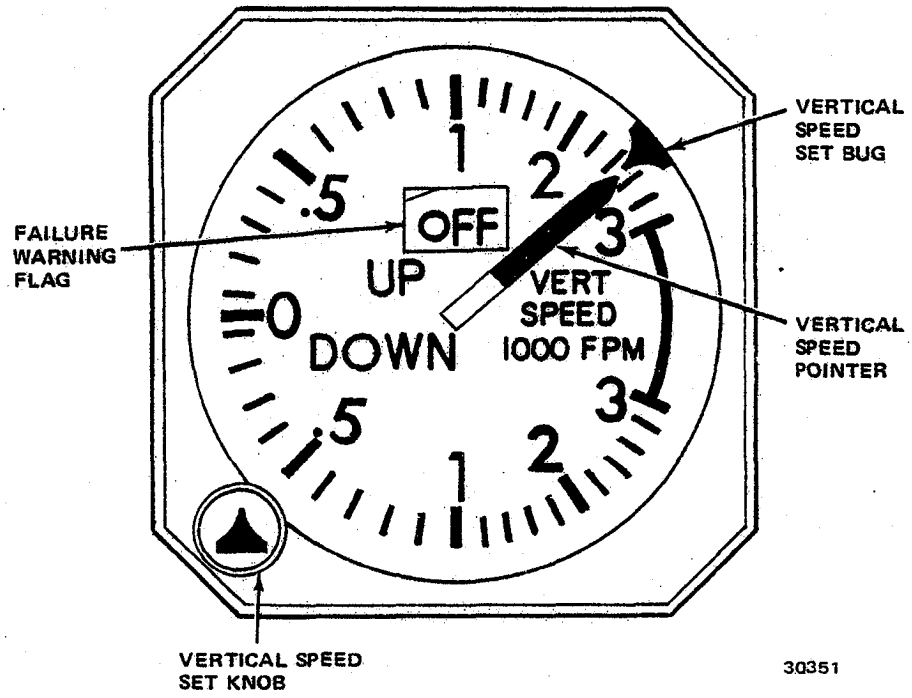
The pitch or roll stick position signal is fed to the stick washout where it is demodulated, buffered, and applied through a washout circuit. The output signal is applied to the axis washout circuit or to the servo preamp.

When in the LOGIC 4.XSAS mode, the stick position signal is shaped to augment the aircraft response to pilot inputs. When in the coupled mode, the stick position signal applied to the summing junction of the servo preamp is the reverse of the normal stick position.

The pitch or roll servo position signal is applied to the input network where it is buffered, demodulated, and amplified before being applied through a lead circuit in the servo preamp to a summing point, out to the trim meter, and to the trim command hysteresis circuitry. This circuit allows the positioning of the series actuator through a broad range without initiating a trim command signal to be displayed on the GH-14.

The input to the trim command hysteresis circuit is a comparator. When the input becomes sufficiently positive, AXU14 turns on; when negative, AXU9 turns on. Either will provide a linear amplification factor of unity until the input reduces to near a null. When in the pitch or roll coupled mode, the signal is buffered and smooths the output to provide a trim demand output to the GH-14 command bars.

The heading input is fed to the turn rate taker where it is fed through a differential amplifier, demodulated, buffered, and applied to the rate takers and to the comparators where it is compared with a 400-Hz sawtooth reference. The comparison produces outputs that are pulse-width analogs of the input amplitude. When applied to the rate takers, they have a multiplying effect on the rate signals. The resultant signals are then summed to make up a signal that is proportional in amplitude to the rate of heading change. This signal is then amplified and applied to an external rate-of-turn indicator.



VS-444 Vertical Speed Indicator
Figure 15

4. J. VS-444 Vertical Speed Indicator (See figures 15 and 16.)

The VSI displays instantaneous vertical speed of the helicopter and by means of a knob-controlled bug, allows the pilot to select a desired vertical speed for the VS mode. Leading particulars are listed in table 10.

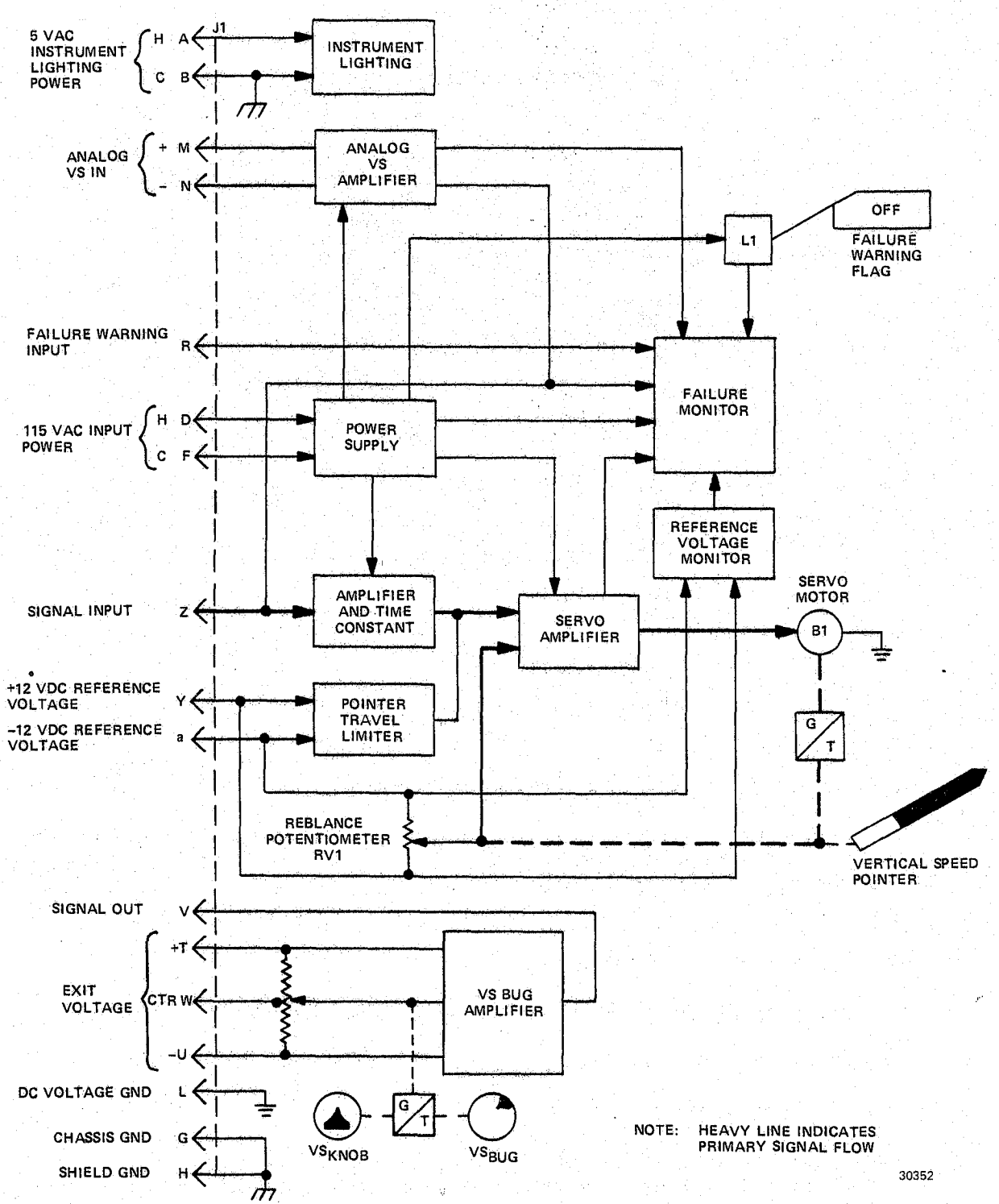
The VSI provides the following displays:

Pointer displays ±3000 ft/min of vertical speed

Vertical speed select bug manually set by knob or instrument

Failure warning flag

Figure 16 illustrates the major circuits and the primary signal flow of the VSI. The vertical speed signal is an analog dc voltage from the ADC which varies from +3 V dc to -3 V dc. This voltage variation represents a vertical speed of +3000 ft/min to -3000 ft/min, respectively. The VSI has an accuracy of ±40 ft/min at 0 ft/min which varies linearly to ±60 ft/min at ±3000 ft/min. The VSI has a threshold sensitivity of 25 ft/min.



VS-444 Block Diagram
Figure 16

Dimensions: (approximate)

Length	6.50 in. (165.1 mm)
Width	3.28 in. (83.3 mm)
Height	3.28 in. (83.3 mm)
Weight (maximum)	3.0 lb (1.36 kg)

Power Requirements:

Primary	115 V, 400 Hz
Alt Alert	28 V dc
Lighting	5 V ac

Mating Connector:

J1	MS3116-F18-32SY
Mounting	Clamp
TSO	C8b

VS-444 Leading Particulars
Table 10

4. K. RA-215 Radio Altimeter Indicator (See figures 17 and 18.)

The RA-215 displays radio altitude information from 2500 feet to touchdown. A dc altitude signal of -4 mV/ft from the RT-220 is applied at P1-T, amplified and applied to meter movement M1, and displayed by the pointer. When the altitude is below the DH cursor altitude, the DH annunciator will be lighted. The DH comparator compares the input altitude signal (J1-T) to that set by the DH set knob potentiometer. Adjustment of the knob moves the DH cursor and potentiometer wiper. When the comparator output goes positive, it turns on the DH switch which provides a ground at J1-F. With +28 V dc at J1-G, the DH annunciator turns on, alerting the pilot that the aircraft is at or below the altitude selected. When +28 V dc ANN DIM is on J1-D, the dimmer switch is off, allowing a ground return through a resistor, thus dimming the annunciator for night viewing. When J1-D is open, the dimmer switch is on and the annunciator is directly grounded, providing brighter lighting for day viewing.

When +28 V dc valid is at J1-N, the failure warning solenoid (L1) is activated, moving the failure warning flag out-of-view behind the mask. When +28 V dc is lost or removed, the failure warning flag will be in view, warning the pilot that RA information displayed is not valid.

The wedge lamp provides uniform standard lighting to all portions of the dial.

The self test switch, when depressed, applies a ground to J1-S which is routed to the RT-220. During self test the pointer indicates 100 ± 20 feet, the DH annunciator will be off if set above 100 feet, and the failure warning flag will be in view.

Leading particulars are listed in table 11.

Dimensions: (approximate)

Length	4.50 in. (114.3 mm)
Width	3.26 in. (82.8 mm)
Height	3.26 in. (82.8 mm)
Weight (maximum)	1.75 lb (0.79 kg)

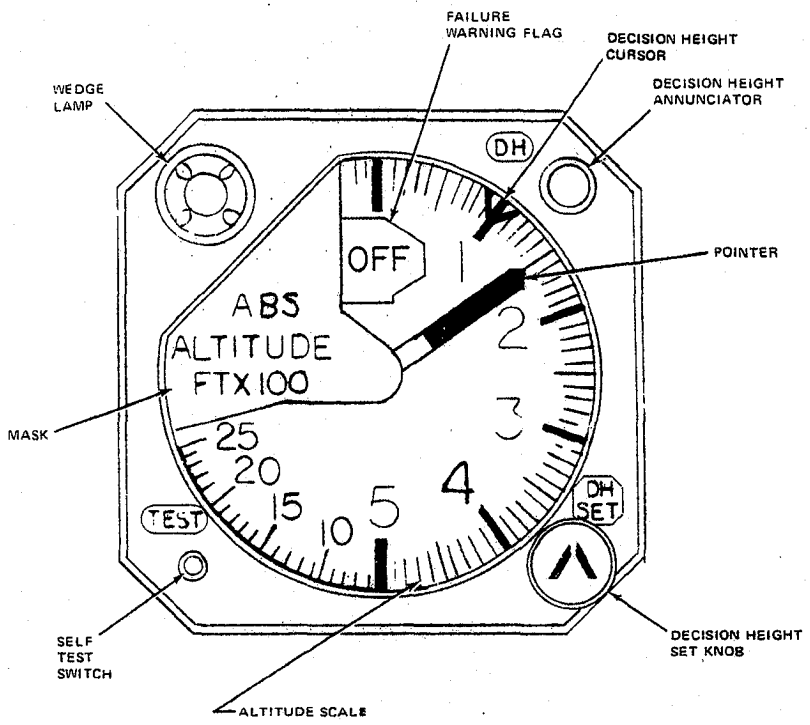
Power Requirements:

	±15 V dc
	28 V dc

Mating Connector:

J1	MS3116F-14-19S
Mounting	Clamp
TSO	C87 DCAAAX

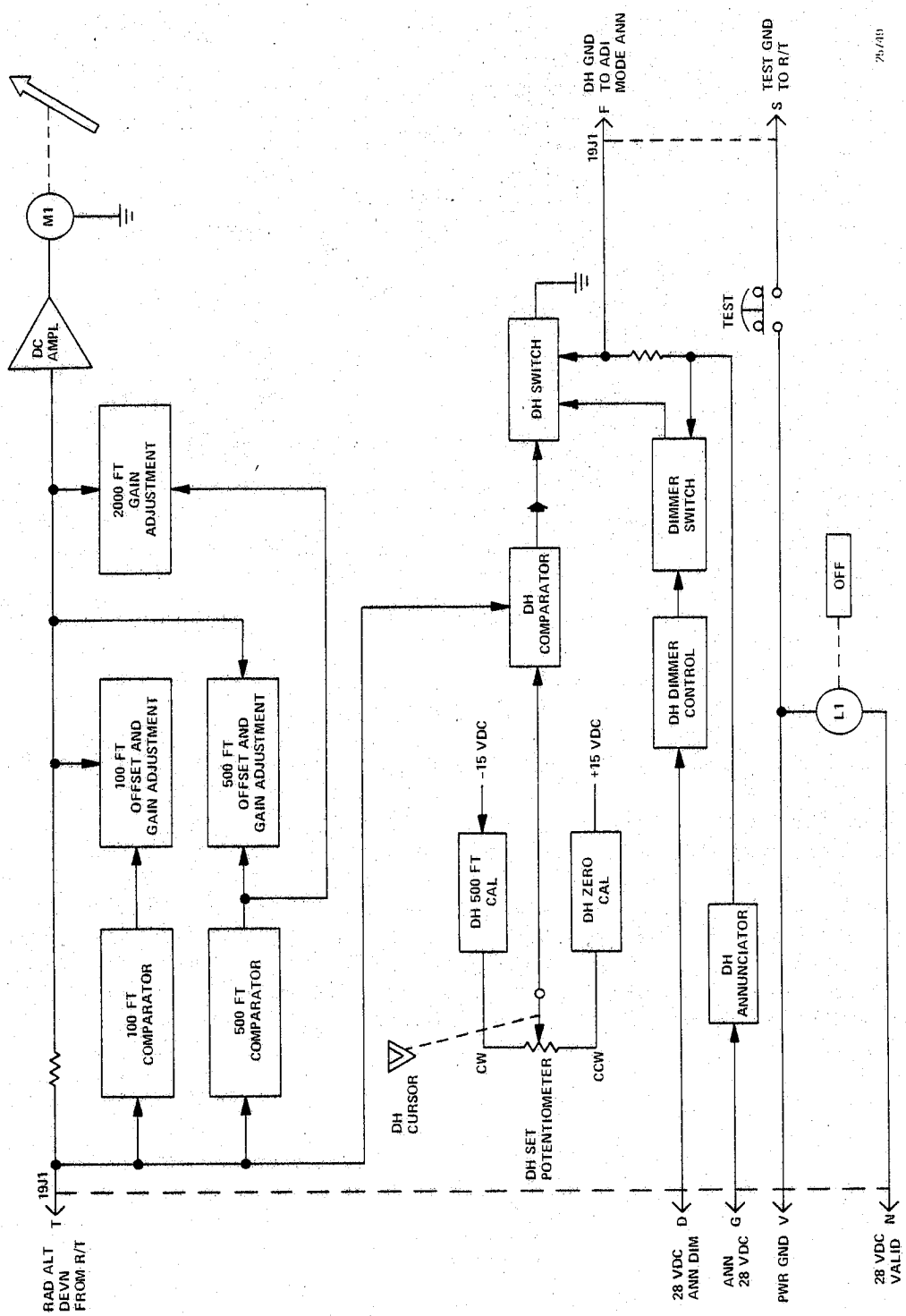
RA-215 Leading Particulars
Table 11



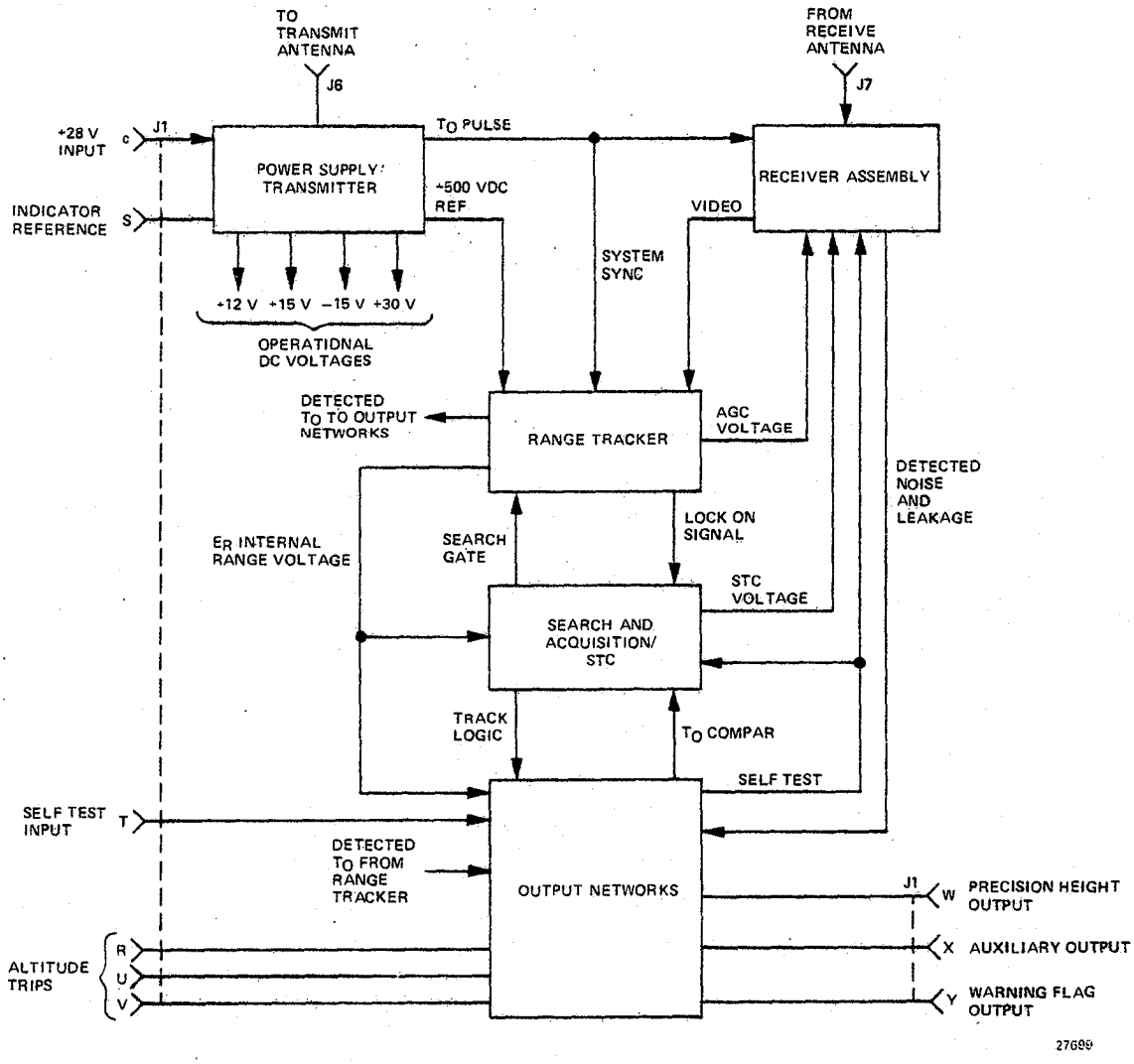
RA-215 Radio Altimeter Indicator
Figure 17

4. L. RT-220 Receiver/Transmitter (See figure 19.)

The receiver assembly provides a video output signal to the range tracker and detected receiver noise and transmitter leakage outputs to monitoring circuitry. It uses a 60-MHz pulse modulated IF. The noise detector is sensitive to short time base receiver noise and it produces a dc output proportional to the receiver noise to monitor the receiver operation above 2500 feet. The leakage detector is sensitive to the portion of the transmitted pulse which leaks from transmitter to receiver and it produces a dc output to monitor the transmitter operation above 2500 feet.



RA-215 Block Diagram
Figure 18



Receiver/Transmitter Block Diagram
Figure 19

The range tracker processes the receiver video signals to provide a dc analog voltage proportional to aircraft height. It provides AGC voltages and detects the presence of the transmitter output pulse. The output AGC error voltage is applied as feedback to the receiver assembly and maintains the video input to the range tracker at a constant voltage. Loss of the video input will remove the AGC overlap sensor output signal to search and acquisition/STC. After a time delay, the search input signal will change from a ground (track mode) to a squarewave (search mode). The squarewave into the range integrator produces a sawtooth output to the high speed comparator. The track gate then repeatedly slews from 0 feet to maximum range and rapidly retraces to 0 feet again.

The search and acquisition/STC card provides automatic search-mode/track-mode switching and it generates and shapes the STC voltage applied to the receiver front end and IF amplifier. Presence of the AGC detector voltage causes the search comparator to keep the system in the track mode and the search gate generator turned off. Loss of the signal causes the search comparator to turn on the 0.1-second delay and comparator, which turns on the search gate generator.

The output networks interface the internal range voltage to external circuitry, provide radio altitude trip points, and perform internal monitoring. The monitor provides a means of monitoring operation of the aircraft above 2500 feet. When the aircraft is beyond the range of the unit, the track valid signal will be lost and the altitude pointer will be biased out-of-view. The warning flag is also held out-of-view by the valid output from the monitor. The self test control output disables the receiver and produces a test height of 100 feet. Self test cannot be initiated when the warning flag is in view.

The power supply provides the operational dc voltages. The modulator provides trigger pulses to the transmitter. The transmitter output has a time zero pulse to provide system synchronization and has an output of 60 nanoseconds, 4.3 GHz pulse.

Leading particulars are listed in table 12.

4. M. AT-220 Antenna

One AT-220 Antenna is used to receive information from the RT-220 and another is used to transmit information to the RT-220. Leading particulars are listed in table 13.

Dimensions: (approximate)

Length	10.96 in. (278.4 mm)
Width	7.53 in. (191.3 mm)
Height	4.06 in. (103.1 mm)
Weight (maximum)	7.0 lb (3.17 kg)
Mating Connectors:	
J1	MS3116F-16-26S
J6, J7	TNC - male
Power Requirements	28 V dc
Mounting	Hard Mount
TSO	C87 AAAAAX

RT-220 Leading Particulars
Table 12

Dimensions: (approximate)

Length	6.25 in. (158.8 mm)
Width	5.58 in. (141.7 mm)
Height	2.50 in. (63.5 mm)
Weight (maximum)	0.75 lb (0.34 kg)
Power Requirements (average maximum)	100 W
Mating Connector:	
J1	TNC - male
Mounting	Flush Mounted to Aircraft Skin
TSO	C87 AAAAAX

AT-220 Leading Particulars
Table 13

SECTION 2

GROUND CHECK

1. General

This section describes procedures for checking the System for correct installation and proper operation of all components.

NOTICE

Procedures in table 101 are based on Sperry Engineering Bulletin EB 5340-10132.

Should any failure arise while performing the following ground check, refer to TROUBLESHOOTING as required.

2. Equipment and Materials

The power required to check the System is supplied by the aircraft.

AC/DC differential voltmeter - Model 803B, John Fluke Mfg Co Inc, Mountlake Terrace, WA, or equivalent

3. Procedure

Instructions for performing the checks are listed in table 101.

NOTE: Steps 4.5.10 thru 4.5.32 require a VOR/ILS test set, steps 4.5.22 thru 4.5.28 require an air data test set, and steps 4.1.1 thru 4.7.6 require a hardover test box. These are used by the airframe manufacturer and if not available, omit the above tests.

1.0 SCOPE

This specification defines the ground tests and alignment procedures required for the Stability Augmentation and Flight Director Systems installed in the Single Pilot IFR configuration of the Aerospatiale SA 341G Gazelle. All tests described below shall be performed on each aircraft prior to flight tests.

2.0 APPLICABLE DOCUMENTS

Aerospatiale Helicopter Corporation Drawing No. H341-76-6D-013; Wiring Diagram Sperry IFR System Interface

Aerospatiale Helicopter Corporation Drawing No. H341-76-6D-012; Wiring Diagram Radar Altimeter

Sperry EB4025990; Installation Engineering Bulletin for SA341-G Gazelle Helipilot System. (See table 202.)

3.0 SYSTEM COMPONENTS

The following components are covered under this test procedure. All other equipment installed as part of the System package shall be covered by other test procedures.

Component	Part Number
TARSYN 555H Gyroscope Assembly	Sperry 4020936-901
Flux Valve	Sperry 2594484
Compensator	Sperry 656767
RD-44 Radio Deviation Indicator (HSI)	Sperry 2592920-044
GH-14 Gyro Horizon Indicator	Sperry 4021541-560
Flight Director Computer	Sperry 4015985-903
Mode Selector Controller	Sperry 4012395-903
Helipilot Computer	Sperry 4025008-901
VS-444 Vertical Speed Indicator	Sperry 4012384-902
RT-220 Receiver/Transmitter	Sperry 4004437-901
RA-215 Radio Altimeter Indicator	Sperry 4014267-901
AT-220 Antennae	Sperry 4004512
Control Position Synchros	Sperry 2579483-1
Servo Position Indicators	Sperry 2503148-2
Series Linear Actuators	SFENA 34-24-V10

Ground Check Procedure
Table 101

4.0 REQUIREMENTS

4.1 System Wiring

Before installing the above listed components, all aircraft wiring shall be continuity checked to the applicable wiring diagrams.

4.2 Power Application

With inverters installed and connected, apply external dc power to the battery terminals. Apply System power as follows:

Battery Switch - ON
Radio Master Switch - ON
Gyro Select Switch - #1
Bus Bypass Switch - Normal
#1 Inverter Breaker - ON
#2 Inverter Breaker - ON
SAS AC Breaker - ON
Flight Director AC Breaker - ON
Gyro Compass AC Breaker - ON
VG AC Breaker - ON
Control Transducer AC Breaker - ON
Gyro Horizon AC Breaker - ON
Rad Alt DC Breaker - ON
SAS DC Breaker - ON
Flight Director DC Breaker - ON
Mag Brake DC Breaker - ON

Check for proper ac and dc excitation to each component connector.

4.3 Control Transducer Alignment

With control position synchros installed and connected and power applied as in step 4.2, connect ac voltmeter between 9J1-A22 and 9J1-A23. Place longitudinal and lateral rig pins in controls to achieve neutral cyclic position. Adjust pitch synchro shaft to achieve null within ±0.2 volt. Connect ac voltmeter between 9J1-A24 and 9J1-A25. Adjust roll synchro shaft to achieve null within ±0.2 volt. Tighten crank arms on synchro shafts. (Fine adjustments on synchros may be made with linkage rod ends.) Remove rig pins before further testing.

4.4 SAS Operation

4.4.1 Install and connect the following components.

Series Linear Actuators
Servo Position Indicators
TARSYN 555H
Helipilot Computer
GH-14

4.4.2 Apply power as in step 4.2. Set up following additional conditions:

Mag Brake Switch - ON
SAS Pitch Switch - ON
SAS Roll Switch - ON

After approximately 3 - 4 minutes, Gyro Fail Light shall go out, and gyro flag on GH-14 shall retract.

4.4.3 Set SAS Engage Switch to Engage. Switch shall remain engaged.

4.4.4 Press Force Trim Release Switch on pilot's cyclic stick. Servo position indicators shall assume center position within 5 seconds. Release Force Trim Release Switch.

4.4.5 Rotate TARSYN nose up. Cyclic stick shall initially move aft. Pitch servo position indicator shall initially move down. Rotate TARSYN nose down. Cyclic stick shall initially move forward. Pitch servo position indicator shall initially move up.

4.4.6 Return TARSYN to level. Operate Force Trim Release Switch to center servo position indicators. Rotate TARSYN right roll. Cyclic stick shall initially move right. Roll servo position indicator shall initially move left.

Rotate TARSYN left roll. Cyclic stick shall initially move left. Roll servo position indicator shall initially move right.

4.4.7 Return TARSYN to level. Operate Force Trim Release Switch to center servo position indicators. Move cyclic stick forward. Pitch servo position indicator shall move down. Move cyclic stick aft. Pitch servo position indicator shall move up. If not, repeat pitch synchro alignment (step 4.3), first rotating synchro shaft 180 degrees from previously aligned position.

4.4.8 Move cyclic stick right. Roll servo position indicator shall move right. Move cyclic stick left. Roll servo position indicator shall move left. If not, repeat roll synchro alignment (step 4.3), first rotating synchro shaft 180 degrees from previously aligned position.

4.4.9 Operate Force Trim Release Switch to center servo position indicators. Set Gyro Select Switch to Gyro #2. SAS Engage Switch shall drop out. Re-engage SAS Engage Switch. Switch shall hold in.

4.4.10 Rotate GH-14 nose down. Cyclic stick shall initially move forward and slowly return. Rotate GH-14 nose up. Cyclic stick shall initially move aft and slowly return.

4.4.11 Return GH-14 to level. Operate Force Trim Release Switch to center servo position indicators. Rotate GH-14 right roll. Cyclic stick shall initially move right and slowly return. Rotate GH-14 left roll. Cyclic stick shall initially move left and slowly return.

4.4.12 Return GH-14 to level. Operate Force Trim Release Switch to center servo position indicators. Set A/P Engage Switch to Engage. Switch shall remain engaged.

4.4.13 Rotate GH-14 nose down. Cyclic stick shall move forward and remain. Rotate GH-14 nose up. Cyclic stick shall move aft and remain.

4.4.14 Operate Force Trim Release Switch. Cyclic stick shall slowly return to center.

4.4.15 Return GH-14 to level. Operate Force Trim Release Switch. Rotate GH-14 right roll. Cyclic stick shall move right and remain. Rotate GH-14 left roll. Cyclic stick shall move left and remain.

4.4.16 Operate Force Trim Release Switch. Cyclic stick shall slowly return to center.

4.4.17 Operate Couple Release Switch on pilot's cyclic stick. A/P Engage Switch shall drop out.

4.4.18 Operate SAS Release Switch on pilot's cyclic stick. SAS Engage Switch shall drop out.

4.4.19 Re-engage SAS and A/P Engage switches. Operate Couple Release Switch and copilot's cyclic stick. A/P Engage Switch shall drop out.

4.4.20 Operate SAS Release Switch on copilot's cyclic stick. SAS Engage Switch shall drop out.

4.5 Flight Director Operation

4.5.1 Install and connect remaining Sperry components. Before testing flight director, radios shall be operational, and the gyro compass system shall be swung. Refer to the appropriate operation or maintenance manuals.

4.5.2 Apply power as in step 4.2, and set up following additional conditions.

RAD Alt Breaker - OFF
#1 NAV-Com Breaker - ON
#2 NAV-Com Breaker - ON
R-NAV Breaker (if supplied) - ON

The SBY light on the Controller shall be lit upon power application. All other annunciator lights shall be dimly lit for night viewing. All command bars on the GH-14 shall be biased out of view. Press SBY button on Controller. While holding SBY button in, all annunciators on Controller shall be lit. GA and DH annunciator on GH-14 shall also be lit. FD flag on GH-14 shall be in view. When SBY is released, SBY annunciator shall be lit. All other annunciators shall go out, and FD flag shall retract.

4.5.3 Center the heading bug on the HSI to the aircraft heading. Engage the HDG mode by depressing the HDG button on the Controller. The HDG annunciator shall light, and the roll command bar on the GH-14 shall center.

4.5.4 Rotate the heading bug clockwise. The roll command bar shall move right. Rotate the heading bug counter-clockwise. The roll command bar shall move left.

4.5.5 Center the heading bug. Rotate the TARSYN right roll. The roll command bar shall move left. Rotate the TARSYN left roll. The roll command bar shall move right.

4.5.6 Return the TARSYN to level. Rotate the course select pointer on the HSI to aircraft heading. Set up a VOR/ILS test set to transmit a VOR radial 10 degrees left of aircraft heading. Turn on #1 and #2 navigation radios, and tune to transmitted signal. Alternately select #1 and #2 radios to HSI. HSI deviation bar shall displace full scale left, NAV flag shall be retracted, and TO-FROM pointer shall display TO for each radio.

4.5.7 Set NAV Selector Switch on Controller to V/L. Engage NAV mode by pressing NAV button. NAV annunciator and HDG annunciator shall both be lit. The roll command bar shall still respond to heading bug changes.

4.5.8 Rotate the course select pointer 10 degrees left. The course deviation bar shall center, the HDG annunciator shall go out, and the roll command bar shall displace left. After approximately 1 minute, the roll command bar shall be slowly returning toward center.

4.5.9 Center the course select pointer to the aircraft heading. The roll command bar shall displace right and slowly return to center. After approximately 1 minute the roll command bar shall displace left.

4.5.10 Set the VOR/ILS test set to a localizer frequency, and adjust deviation for full scale (>2.5°) left. Tune NAV radios accordingly. Set the NAV Selector Switch on the Controller to ILS. Engage the NAV mode. The NAV and HDG annunciators shall be lit.

4.5.11 Reduce deviation on VOR/ILS test set to approximately 1 degree (one-half scale). The HDG annunciator shall go out, and the roll command bar shall displace left.

4.5.12 Rotate the course select pointer clockwise 20 degrees. The roll command bar shall move toward center initially but return to the left in 20 seconds.

4.5.13 Set the NAV Selector Switch to the REV position. Set the course select pointer back to aircraft heading. Re-engage the NAV mode. The roll command bar shall displace right.

4.5.14 Rotate the course select pointer clockwise 20 degrees. The roll command bar shall move toward center.

4.5.15 Operate the Go-Around Switch on the collective stick. All annunciator lights on the Controller shall go out, and the GA light on the GH-14 shall be lit. The roll command bar shall be centered, and the pitch command bar shall be displaced down.

4.5.16 Place the collective pitch stick at climb detent. Adjust the collective position synchro shaft to obtain centered collective pitch command cue.

4.5.17 Move collective stick down. Collective command cue shall move down. If cue moves up, repeat step 4.5.16 with synchro shaft rotated 180 degrees. Tighten crank arm on synchro shaft.

4.5.18 Center selector bug on VSI to zero ft/min. Engage VS mode. VS annunciator shall be lit. Pitch command bar shall be centered.

4.5.19 Rotate VS set bug to descent. Pitch command bar shall move down.

Ground Check Procedure
Table 101 (cont)

4.5.20 Rotate VS set bug to climb. Pitch command bar shall move up.

4.5.21 Recenter set bug. Rotate TARSYN nose down. Pitch command bar shall initially move up and return to center within approximately 10 seconds.

4.5.22 Replace TARSYN to level. Connect air data test set to FDC. Simulate climb condition. VSI shall indicate climb, and pitch command bar shall move down. Simulate descent condition. VSI shall indicate descent, and pitch command bar shall move up.

4.5.23 Set vertical velocity to zero. Engage ALT mode. ALT annunciator shall be lit, and VS annunciator shall go out. Pitch command bar shall be centered. Simulate an increase in altitude. Pitch command bar shall move down.

4.5.24 Set up simulated airspeed between 50 and 100 knots. Engage AS mode. AS annunciator shall be lit, and ALT annunciator shall go out. Pitch command bar shall be centered. Operate airspeed increase switch on collective stick. Pitch command bar shall move down.

4.5.25 Increase simulated airspeed. Pitch command bar shall move in up direction.

4.5.26 Engage VS and AS modes by simultaneously depressing both pushbuttons. The VS and AS annunciators shall be lit. The collective command cue shall be centered.

4.5.27 Rotate the set bug on the VSI to climb. The collective command cue shall move down.

4.5.28 Remove the air data test set from the FDC.

4.5.29 Set VOR/ILS test set to transmit localizer and glide slope signals. Set localizer deviation to zero and glide slope deviation to maximum up (aircraft below beam). Tune NAV radios to receive signals. Glide slope pointer on HSI shall indicate full scale up and GS flag shall be retracted for both radios switched to HSI. Switch NAV Selector Switch on Controller to ILS. Set Course Selector Switch to aircraft heading. Engage NAV mode and ALT modes. NAV and ALT annunciators shall be lit, all other annunciators shall be off. Pitch and roll command bars shall be centered.

4.5.30 Reduce glide slope deviation on VOR/ILS test set to zero. GS annunciator shall be lit, and ALT annunciator shall go out. Pitch command bar shall move down, and slowly return to center.

4.5.31 Set glide slope deviation down (aircraft above beam). Pitch command bar shall move down.

4.5.32 Recenter glide slope deviation. Set DH cursor on radio altimeter indicator to 50 ft. Engage RAD ALT breaker. After approximately 1 minute, indicator shall read zero, and indicator flag shall retract. AS annunciator on Controller shall come on and collective command cue shall move down. DH lights on indicator and GH-14 shall be lit.

4.5.33 Press self-test button on radio altimeter indicator. Indicator shall read approximately 100 feet, and collective command cue shall retract from view. DH lights on indicator and GH-14 shall go out.

4.6 Coupler Operation

4.6.1 Coupler operation may be checked only after completing SAS and flight director tests. Disconnect longitudinal and lateral control rod ends at input to boost actuators. Apply power as in step 4.2. (flight director should be in SBY mode.)

4.6.2 Center heading bug on HSI to aircraft heading and vertical speed set bug on VSI to zero climb. Set Gyro Select Switch to Gyro #2 position. Engage SAS and A/P.

4.6.3 Engage HDG Mode. Rotate heading bug clockwise 20 degrees. Roll servo position indicator shall move right. Rotate heading bug counterclockwise. Roll servo position indicator and roll command bar shall move left.

4.6.4 Move cyclic stick left. Roll servo position indicator and roll command bar shall return toward center.

4.6.5 Center heading bug. Rotate GH-14 right roll. Roll servo position indicator shall move left, and roll command bar shall move left.

4.6.6 Return GH-14 to level. Engage VS mode. Rotate vertical speed set bug to 1000 ft/min climb. Pitch servo position indicator and pitch command bar shall move down.

4.6.7 Move cyclic stick forward. Pitch servo position indicator and pitch command bar shall return toward center.

4.6.8 Return vertical speed set bug to zero. Rotate GH-14 nose down. Pitch servo position indicator and pitch command bar shall move up, and slowly return to center in approximately 10 seconds.

4.6.9 Return GH-14 to level. Wait until servo position indicator recenters, and engage ALT Mode.

4.6.10 Rotate GH-14 nose down. Pitch servo position indicator and pitch command bar shall move up, and slowly return to center in approximately 1 minute.

4.6.11 Return GH-14 to level. Wait until servo position indicator recenters, and engage AS mode.

4.6.12 Rotate GH-14 nose down. Pitch servo position indicator and pitch command bar shall move up, and slowly return to center in approximately 30 seconds.

4.6.13 Press SBY button on Controller. DCPL light on GH-14 shall light. Press Couple Release Switch on cyclic stick. DCPL light shall go out. Resecure all components and reconnect control rods to boost actuators.

4.7 Controls Pre-rigging

After SAS has been ground checked, aircraft cyclic controls may be rigged.

4.7.1 Connect hardover test box to hardover test connector. Apply power as in step 4.2, and engage SAS after gyro fail light indicates valid.

4.7.2 Select roll axis on hardover box, and apply hardovers in each direction, measuring actuator ram position for each direction. Total ram travel shall be nominally 7 mm, and within applicable actuator specifications.

4.7.3 With Hardover Switch in center position, measure actuator ram position. Ram shall be centered between stops within ±0.25 mm. Disengage SAS roll switch.

4.7.4 Select pitch axis on hardover box, and apply hardovers in each direction, measuring actuator ram position for each direction. Total ram travel shall be nominally 7 mm, and within applicable actuator specification.

4.7.5 With Hardover Switch in center position, measure actuator ram position. Ram shall be centered between stops within ±0.25 mm. Disengage SAS pitch switch.

4.7.6 Remove hardover box, turn off aircraft power, and proceed with normal aircraft rigging.

SECTION 3
TROUBLESHOOTING

1. General

This section provides a troubleshooting table (table 201), a description for a locally made breakout box, installation, and interconnect information (table 202) as aids in troubleshooting the System should any failure appear during ground check.

NOTICE

Procedures in table 202 are based on Sperry Engineering Bulletin EB4025990 - Revision A.

2. Procedure

Troubleshooting procedures in table 201 assume that the breakout box is available (locally made) and the tests are performed in numerical order.

The breakout box consists of a chassis; 2 connectors (DPX2MA-67S-67S-33-0001 and DPX2-W67FP-W67FP-34B-0101); 134 banana jacks, E.F. Johnson, Part No. 108-902 and 108-903 (67 of each); and 24 AWG wires to the desired length.

TESTING Step Failed	Symptom	Isolation/Correction Procedure
4.4.2	Light does not go out	Place SAS Engage to Engage. a. If switch does not latch, replace TARSYN. b. If switch latches, check wiring to CAUTION lights or replace TARSYN.
	Flag does not retract	Replace GH-14.
4.4.3	Switch does not remain engaged	a. Check that greater than 8 V ac exists at Helipilot Computer J1B-14. If not, check wiring to TARSYN or replace TARSYN. b. Check for 28 V dc at Helipilot Computer J1B-8 when SAS Engage is held to Engage position. If voltage is not present, check wiring to SAS Engage Switch. c. If voltage is present at J1B-8, check for 28 V dc at Helipilot Computer J1B-7. If voltage is present at J1B-7, check wiring to SAS Engage Switch. d. If voltage is not present at J1B-7, replace Helipilot Computer.
4.4.4	Indicators do not center	Check for ground at Helipilot Computer J1A-36 with Force Trim Release Switch pressed. a. If ground is not present, replace Helipilot Computer. b. If ground is present, check wiring to Force Trim Release Switch.
4.4.5	Stick or indicator does not follow	Check for signal at Helipilot Computer J1A-11 to -12 (low). a. If signal is present when rotating TARSYN, replace Helipilot Computer. b. If signal is not present when rotating TARSYN, check wiring or replace TARSYN.
4.4.6	Stick or indicator does not follow	Check for signal at Helipilot Computer J1A-14 to -13 (low). a. Same as 4.4.5.a b. Same as 4.4.5.b.

Troubleshooting Procedures
Table 201

TESTING Step Failed	Symptom	Isolation/Correction Procedure
4.4.7 4.4.8	Indicator does not move	a. Check alignment per 4.3 or wiring. b. If alignment is alright, replace Helipilot Computer.
4.4.9	Switch does not drop out	Check for 0 V ac at Helipilot Computer J1B-13. a. If 0 volts, replace Helipilot Computer. b. If voltage is not 0 volts, check wiring to Gyro Select Switch.
	Switch will not remain engaged	Check for 28 V dc at Helipilot Computer J1B-12. c. If voltage is present, replace Helipilot Computer. d. If voltage is not present, check wiring or replace GH-14.
4.4.10, 4.4.11	Stick does not move	a. Check wiring from Helipilot Computer J1A-11, -12, -13, and -14 relay box and GH-14 and repair as necessary. b. If wiring is alright, replace GH-14.
4.4.12	Switch does not stay engaged	Check for 28 V dc at A/P Engage Switch. a. If voltage is present, replace A/P Engage Switch. b. If voltage is not present, check wiring.
4.4.13, 4.4.15	Stick does not remain	Check for 28 V dc at Helipilot Computer J1B-11. a. If voltage is present, replace Helipilot Computer. b. If voltage is not present, check wiring to A/P Engage Switch.
4.4.14, 4.4.16	Stick does not return	Replace Helipilot Computer.
4.4.17, 4.4.19	Switch does not drop out	Check wiring from Couple Release Switch to A/P Engage Switch and repair as necessary.
4.4.18, 4.4.20	Switch does not drop out	Check wiring from SAS Release Switch to SAS Engage Switch and repair as necessary.

Troubleshooting Procedures
Table 201 (cont)

TESTING Step Failed	Symptom	Isolation/Correction Procedure
4.5.6	Course deviation bar does not move	Check operation of backup OBS. a. If alright, repair wiring from NAV relay box to HSI or replace HSI. b. If not alright, repair wiring or replace appropriate radio.
	NAV flag does not retract and OBS operates properly	Check for 28 V dc at FDC J1A-38. a. If voltage is present at J1A-38, repair wiring to HSI or replace HSI. b. If voltage is not present at J1A-38, check for greater than 0.2 V dc at FDC J1A-67 to -66 (low). If voltage is present at J1A-67 to -66, replace FDC. c. If voltage is not present at J1A-67 to -66, repair wiring to NAV relay box.
4.5.7	HDG annunciator does not light.	Check roll command bar for displacement. a. If bar is displaced, replace FDC. b. If bar is not displaced, check for signal at FDC J1B-24 to -25 (low). If present, replace FDC. c. If signal is not present, repair wiring from FDC to NAV relay box.
4.5.8	Roll command bar does not displace initially	Check for ac signal at FDC J1B-36 to -37 (low). a. If signal is present, replace FDC. b. If signal is not present, repair wiring to HSI.
	HDG annunciator does not go off.	Replace FDC.
4.5.9	Roll bar does not respond	Replace FDC.
4.5.10	HDG annunciator does not light	Replace FDC.
	NAV annunciator does not light	Check that the voltage at FDC J1A-17 drops from 15 V dc to 0 when NAV is pressed. a. If voltage drops, replace FDC. b. If voltage does not drop, repair wiring to Controller or replace Controller.

TESTING Step Failed	Symptom	Isolation/Correction Procedure
4.5.13	Roll bar goes left or does not move	Check for ground at FDC J1A-19. a. If present, replace FDC. b. If not present, repair wiring to Controller or replace Controller.
4.5.15	No change	Check for ground at FDC J1A-11 when GA is pressed. Repair wiring as necessary.
	Incorrect results	Replace FDC.
4.5.16, 4.5.17	Collective cue does not respond properly	Check for ac signal at FDC J1B-20 to -21. a. If not present, replace FDC. b. If present, repair wiring to collective synchro.
4.5.18	VS annunciator does not light	Check that voltage at FDC J1A-36 drops from 15 V dc to 0 when VS is pressed. a. If voltage drops, replace FDC. b. If voltage does not change, repair wiring or replace Controller.
	Pitch bar remains biased out of view.	Replace FDC.
4.5.19, 4.5.20	Pitch bar does not respond as indicated	Check for signal at FDC J1B-45. a. If signal is present, replace FDC. b. If signal is not present, repair wiring to VSI or replace VSI.
4.5.21	Pitch bar does not move	Check for ac signal at FDC J1B-55 to -56 (low). a. If present, replace FDC. b. If not present, repair wiring to TARSYN or replace TARSYN.
	Pitch bar returns too slowly	Replace FDC.
4.5.22	VSI does not perform as indicated	Check for dc signal at FDC J1B-59. a. If not present, replace FDC. b. If present, repair wiring to VSI or replace VSI.

Troubleshooting Procedures
Table 201 (cont)

TESTING Step Failed	Symptom	Isolation/Correction Procedure
4.5.23	Annunciator does not light	Check that voltage at FDC J1A-25 drops from 15 V dc to 0 when ALT is pressed. a. If alright, replace FDC. b. If not alright, repair wiring to Controller or replace Controller.
	Mode engaged, but operates improperly	Replace FDC.
4.5.24	AS annunciator does not light	Check that voltage at FDC J1A-27 drops from 15 V dc to 0 when AS is pressed. a. If alright, replace FDC. b. If not alright, repair wiring to Controller or replace Controller.
	Pitch bar does not respond to INC/DEC commands	Check for ground at FDC J1A-8 (INC) and -9 (DEC) when INC/DEC is pressed. a. If present, replace FDC. b. If not present, repair wiring to INC/DEC switch.
4.5.25	Pitch bar does not respond	Replace FDC.
4.5.26	Operates improperly	Replace FDC.
4.5.27	Collective command cue does not respond correctly	Replace FDC.
4.5.29	GS flag remains in view for NAV 1 and NAV 2	Check for 28 V dc at FDC J1A-15. a. If voltage is present, repair wiring to HSI or replace HSI. b. If voltage is not present, check for signal greater than 0.2 V dc at FDC J1A-56 to -57 (low). If signal is present, replace FDC. c. If signal is not present, repair wiring to NAV relay box.
	Improper operation	Compare operation of HSI and OBS, and repair wiring to NAV relay box or replace appropriate radio.

TESTING Step Failed	Symptom	Isolation/Correction Procedure
4.5.30	GS annunciator does not light	Check for TTL ground at FDC J1A-16 and repair wiring to FDC.
4.5.31	Pitch command box does not move.	Replace FDC.
4.5.32	Improper operation	Check for 28 V dc at FDC J1A-46. If voltage is not present, replace FDC.
4.5.33	Indicator is correct, but collective cue remains in view	Replace FDC.
4.5.34	Roll command bar does not deflect properly	Check for dc signal greater than 2.5 V dc at Helipilot Computer J1A-29. a. If not present at J1A-29, replace Helipilot Computer. b. If present, check for same signal at FDC J1A-58. If not present at J1A-58, repair wiring from Helipilot Computer to FDC. c. If present at J1A-58, replace FDC.
	Neither roll servo position indicator or roll command bar move appreciably	Check for dc signal at Helipilot Computer J1A-40 and greater than 10 V dc at J1A-41. a. If present, replace Helipilot Computer. b. If not present, check for same signals at FDC J1B-8 and J1A-6, respectively. If not present, replace FDC.
4.6.4 4.6.5	Indicator and bar do not respond correctly.	Replace Helipilot Computer.
4.6.6	Pitch command bar does not deflect correctly	Check for a dc signal greater than 2.5 V at Helipilot Computer J1A-18. a. If not present at J1A-18, replace Helipilot Computer. b. If present, check for same signal at FDC J1A-52. If present at J1A-52, replace FDC.

Troubleshooting Procedures
Table 201 (cont)

TESTING Step Failed	Symptom	Isolation/Correction Procedure
4.6.6 (cont)	Neither indicator or command bar deflect appreciably	Check for dc signal at Helipilot Computer J1A-32 and greater than 10 V dc at J1A-31. a. If present, replace Helipilot Computer. b. If not present, check for same signals at FDC J1B-6 and J1A-64, respectively. If not present, replace FDC.
4.6.7	Indicator and command bar do not respond correctly	Replace Helipilot Computer.
4.6.8	Pitch command bar returns to center too slowly	Check for dc signal greater than 10 V dc at Helipilot Computer J1A-44 and dc signal less than 2 V dc at J1A-43. a. If present, replace Helipilot Computer. b. If not present, check for same signals at FDC J1A-63 and -62, respectively. If not present at FDC J1A-63 and -62, replace FDC.
4.6.10	Pitch command bar returns too fast	Check for signal greater than 10 V dc at Helipilot Computer J1A-43 and -44. a. If present, replace Helipilot Computer. b. If not present, check for same signals at FDC J1A-62 and -63. If not present at FDC J1A-62 and -63, replace FDC.
4.6.12	Pitch command bar returns too slowly or too fast	Check for less than 2 V dc at Helipilot Computer J1A-44 and greater than 10 V at J1A-43. a. If present, replace Helipilot Computer. b. If not present, check for same signals at FDC J1A-63 and -62, respectively. If not present at FDC J1A-63 and -62, replace FDC.
4.6.13	DCPL light not lit	Check for greater than 10 V dc at Helipilot Computer J1A-49. a. If not present, replace Helipilot Computer. b. If present, check for same signals at FDC J1A-55. If present at J1A-55, replace FDC.

Troubleshooting Procedures
Table 201 (cont)

INSTALLATION BULLETIN FOR STABILITY AUGMENTATION/ FLIGHT DIRECTOR SYSTEM USED ON SA341G GAZELLE HELICOPTER

1. Introduction

This Engineering Bulletin (EB) defines the installation requirements for instrument and automatic flight control hardware for the SA341G Gazelle helicopter. The equipment includes the Sperry Helicopter Command Instrument System (HelCIS) flight director and Helipilot stability augmentation/autopilot system which, when combined with other necessary instrumentation, radios, etc., will provide single-pilot IFR capability to the Gazelle.

2. System Equipment

Following is a list of Sperry-supplied hardware which is covered by this EB. Installation data for other non-Sperry avionics required for the IFR system shall be the installer's responsibility.

Component	Qty Reqd	Sperry Part No.	Unit Wt. (Lb)
TARSYN-555H Gyro Assy	1	4020936-901	15.0
GH-14	1	4021541-560	5.0
RD-44 HSI	1	2592920-44	5.0
VS-444 VSI	1	4012384-902	3.0
RA-215 Rad Alt Ind	1	4014267-901	1.75
Helipilot Computer	1	4025008-901	6.1
Flight Director Computer	1	4015985-903	12.0
Mode Selector Computer	1	4012395-903	2.3
Servo Position Indicator	2	2503148-2	---
AT-220 Rad Alt Antenna	2	4004512	.75
RT-220 Rad Alt R/T	1	4004437-901	6.1

Component	Qty Reqd	Sperry Part No.	Unit Wt. (Lb)
Flux Valve	1	2594484/656767	1.6
Magnetic Compensator	1	2594733-200	

The following miscellaneous components, while not supplied by Sperry, are necessary to the operation of the Gazelle automatic flight control system, and thus are covered by this EB.

Component	Qty. Reqd	Characteristics/Part No.
Control Position Transducers	2	Synchro Transmitter Kearfott CR40919005, Clifton TGH-11-HS-4 or Equivalent
SAS Engage Switch	1	Magnetically-Held DPDT Toggle, Controls Corporation of America AT-1226 or Equivalent (Contact rating 10 amps resistive, 28 VDC coil)
Autopilot Engage Switch	1	SPDT Toggle Switch
SAS Release Switch (Optional)	1 per Control Stick	Single-pole, normally closed Momentary Pushbutton; to be mounted on Cyclic Stick
Couple Release Switch	1 per Control Stick	Single-pole, normally closed Momentary Pushbutton; to be mounted on Cyclic Stick
Go-Around Switch	1	Single-pole, normally open Momentary Pushbutton; to be mounted on collective stick
Axis Select Switches	2	Single-pole, double throw, 10 amps resistive contact rating
Force Trim Release Switch	1 per Control Stick	Double-pole, normally closed Momentary Pushbutton; to be mounted on cyclic stick

Component	Qty Reqd	Characteristics/Part No.
NAV1/NAV2 Switch	1	SPST Toggle Switch
DG Free-Slave Switch	1	SPST Toggle Switch
DG Manual Synch. Switch	1	SPDT, three position, center off momentary toggle switch
VG Fast-Erect Switch	1	DPST momentary toggle switch
Nav. Select Relay (s)	1	34 double-throw contact
Caution Lamp	1	28 VDC lamp with lighted legend and test capability (master or individual)

3. Power Requirements

The Single Pilot IFR system requires 115 volts, 400 Hertz, 26 volts 400 Hertz, and 28 volts DC power. The Flight Director System and SAS shall be powered from the primary electrical system.

Table 1 gives power consumption for each component.

TABLE 1 POWER CONSUMPTION

Component	AC Power Start	(115V) Run	AC Power (26V)	DC Power (28V)	Lighting (5V AC or DC)
TARSYN-555H	120.0 VA	70.0 VA	-	-	-
RD-44	-	-	8.5 VA	-	2.0 VA
VS-444	8.0 VA	8.0 VA	-	-	2.0 VA
RA-215	-	-	-	-	2.0 VA
RT-220	-	-	-	1.5 A	-
Helipilot Comp (-901)	20.0 VA	20.0 VA	-	.15A	-
Flight Director Comp	30.0 VA	30.0 VA	-	1.0 A	-
Controller	-	-	-	.5 A	2.0 VA
GH-14	-	-	33 VA (Start) 25 VA (Run)	-	-

4.2.5 RA-215 Radar Altimeter Indicator

The RA-215 should be mounted in a location near the barometric altimeter, such as below or to the right of that instrument.

4.2.6 Helipilot Computer

The Helipilot Computer may be mounted in any location which permits easy access and removal. Mounting tray for the Helipilot Computer is Sperry P/N 4011646.

4.2.7 Flight Director Computer (FDC)

The Flight Director Computer shall be located as near as practical to the aircraft center of gravity. The unit shall be level within 2 degrees of the aircraft cruise attitude. The location should permit easy access and removal. The mounting tray for the Computer is Barry Controls, P/N 404-50-S-1/DPX2-0.

4.2.8 Mode Selector Controller

The Controller shall be installed in the instrument panel or console in a position convenient to the pilot's reach. The location shall be such that the mode lights can be seen by the pilot during his normal instrument scans.

4.2.9 Linear Actuators

The linear actuators are to be installed as series links in the primary controls. Since the actuators are not self-centering, additional control stops, downstream of the actuators must be added in order to insure that the total recommended control travel is not exceeded.

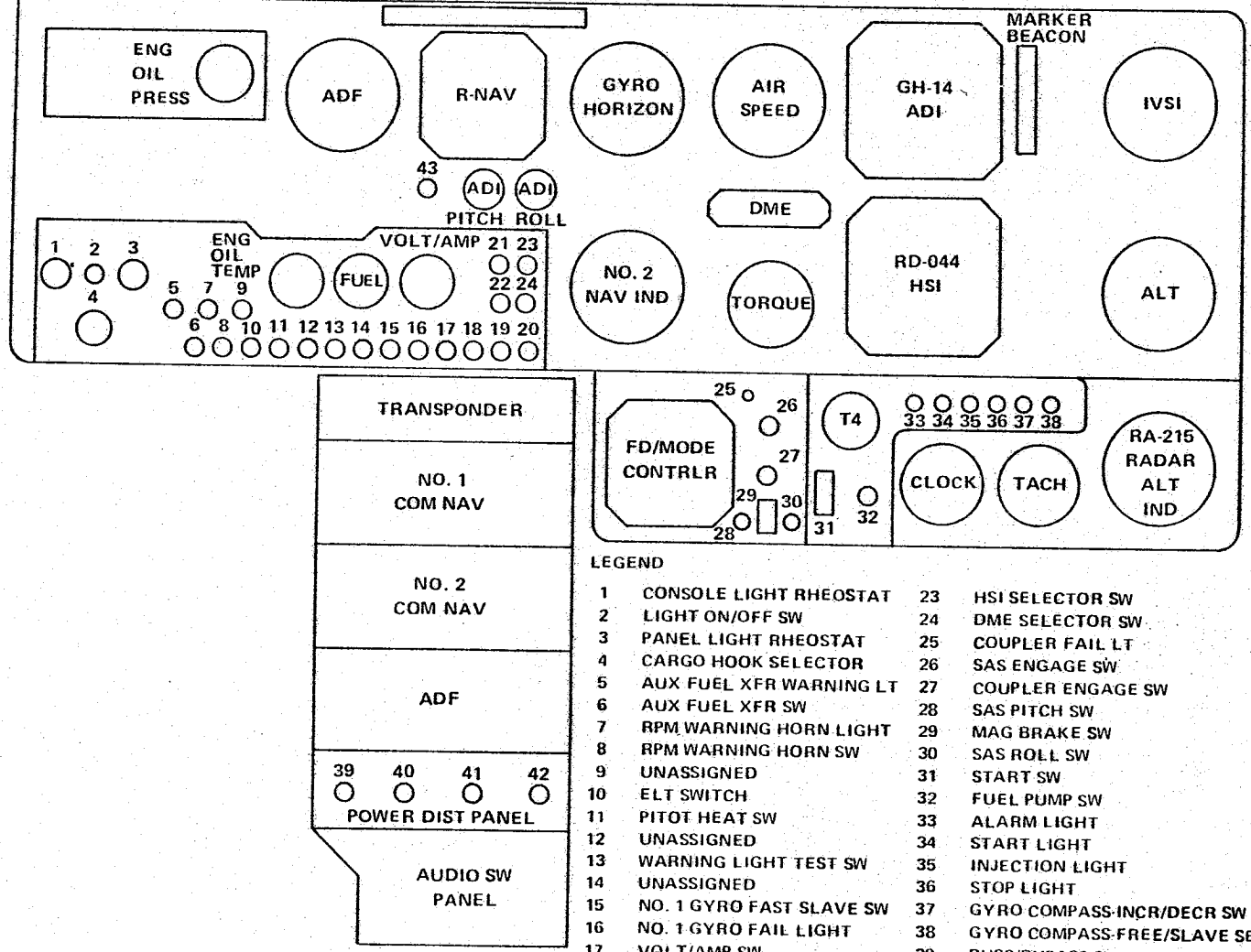
Installation Critical - The actuator strokes specified in Para. 4.2.9.1 and 4.2.9.2 must not be exceeded. Use of actuators with strokes in excess of those specified could result in unsafe aircraft upsets in the event of a Helipilot Computer or actuator failure.

4.2.9.1 Longitudinal Actuator

The authority shall be 12% of total control travel with an actuator stroke of ±3.5mm.

4.2.9.2 Lateral Actuator

The authority shall be 12% of total control travel with an actuator stroke of ±3.5 mm.



LEGEND

1	CONSOLE LIGHT RHEOSTAT	23	HSI SELECTOR SW
2	LIGHT ON/OFF SW	24	DME SELECTOR SW
3	PANEL LIGHT RHEOSTAT	25	COUPLER FAIL LT
4	CARGO HOOK SELECTOR	26	SAS ENGAGE SW
5	AUX FUEL XFR WARNING LT	27	COUPLER ENGAGE SW
6	AUX FUEL XFR SW	28	SAS PITCH SW
7	RPM WARNING HORN LIGHT	29	MAG BRAKE SW
8	RPM WARNING HORN SW	30	SAS ROLL SW
9	UNASSIGNED	31	START SW
10	ELT SWITCH	32	FUEL PUMP SW
11	PITOT HEAT SW	33	ALARM LIGHT
12	UNASSIGNED	34	START LIGHT
13	WARNING LIGHT TEST SW	35	INJECTION LIGHT
14	UNASSIGNED	36	STOP LIGHT
15	NO. 1 GYRO FAST SLAVE SW	37	GYRO COMPASS-INCR/DECR SW
16	NO. 1 GYRO FAIL LIGHT	38	GYRO COMPASS-FREE/SLAVE SELECTOR
17	VOLT/AMP SW	39	BUSS/BYPASS SW
18	ALTERNATOR SW	40	MASTER RADIO SW
19	GENERATOR SW	41	GYRO NO. 1/GYRO NO. 2 SELECTOR
20	BATTERY SW	42	EMER BATT SELECTOR
21	POSITION LIGHT SW	43	RNAV INVALID LIGHT
22	ANTI COLL LIGHT SW		

REF. ID. 30199

Figure 1

Instrument Panel

4.2.10 Servo Position Indicators

Three servo position indicators shall be installed on the instrument panel in a location easily seen by the pilot during normal instrument scans. Since the indicators are not internally lighted external lighting will be required for night viewing. Suggested orientation and labeling of the indicators are shown in Figure 1.

4.2.11 Radar Altimeter System

The RT-220 Receiver/Transmitter and AT-220 Antennae shall be installed in accordance with the AA-200 Operational and Installation Manual, Sperry Pub. No. 15-3321-02.

4.2.12 Flux Valve

The Flux Valve should be located as far as possible from all sources of local magnetic distrubances such as electrical cables, engines, and magnetic materials. A recommended location is the tail boom. Installation should be on a suitable bracket or frame which is rigidly attached to the aircraft structure. The Flux Valve flange should be within 2 degrees of level for cruise flight attitude.

4.2.13 Control Position Transducers

The control position synchros shall be installed on the upstream side of the series actuators. Synchros are required for each of the longitudinal, lateral, and collective controls. The mechanical ratios from control linkage to synchro shaft shall be 60 degrees synchro rotation for full control travel. The linkage should be configured to provide symmetrical rotation each direction from neutral.

4.2.14 SAS/Autopilot Engage Switches

The SAS and autopilot magnetic toggle switches shall be mounted on the instrument panel or console in a location near the HelCIS controller. The functions shall be clearly marked, and illuminated for night viewing.

4.2.15 SAS/Autopilot Release Switches

If a quick disconnect switch is desired for the SAS, a single pole, normally closed pushbutton should be located on the cyclic control stick. For autopilot quick release, a single-pole normally closed pushbutton shall be employed. Location shall be the cyclic control stick.

4.2.16 Go-Around Switch

A single pole normally open pushbutton, preferably located on the collective pitch stick, shall be used for go-around engagement.

4.2.17 Force Trim Release Switch

The standard aircraft force trim release switch is to be interfaced with the SAS.

4.2.18 NAV1/NAV2 Select Switch/Relay

If it is desired to switch navigation radios between the HSI and auxiliary navigation deviation indicator, a single-pole toggle switch should be located near the HSI, which in turn operates multiple relay contacts for radio signal switching. This function is considered optional.

4.2.19 DG Control Switches

Two switches shall be supplied to provide control for the directional gyro. A single pole toggle provides for selection of slave (magnetic) or free operation, and a single pole, 3-position momentary toggle provides for fast slaving of the compass card. Location should be convenient to the pilot's reach.

4.2.20 VG Fast Erect Switch

A double pole, single throw momentary toggle switch shall be provided to allow fast erection of the VG in the TARSYN. Location shall be convenient to the pilot's reach.

4.2.21 Caution Lamp

A caution lamp is required for the Automatic Flight Control System. So as to indicate a coupled mode failure.

5. Wiring Requirements

Included herein is a complete point-to-point wire list. System connector types, and designations used in the wire list are as follows.

Component	Connector Designation	Mating Connector Type
TARSYN-555H	S1P2	MS3126F22-55SY(SR)
	S1P3	MS3126F18-32SY(SR)
Flight Director Computer	F4P	DPX2MA-67S-67S-33B-0001
Controller	F5P1	Bendix JT06RE-22-2S(SR)
RD-44	C2P1	MS3126F22-55S(SR)
RD-44	C2P2	MS3126F18-32S(SR)
VS-444	F6P1	MS3126F18-32SY(SR)
GH-14	F3P1	MS3121F-20-41S
RA-215	R8P1	MS3126F14-19S(SR)
RT-220	R7P1	MS3126F16-26S(SR)
Helipilot Computer	S9P1	DPX2MA-67S-67S-33B-0001
Pitch Actuator	S11P1	MS3122E14-19S
Roll Actuator	S12P1	"
SAS Test Connector	S13P1	TBD (Any suitable 6-pin bulkhead connector)
Long Synchro	SA3	-
Lat Synchro	SA2	-
Collective Synchro	SA4	-
Pitch Trim Meter	SPTM	-
Roll Trim Meter	SRTM	-
Flux Valve	CFV1	-
SAS Engage Switch	SES	-
SAS Release Switch	SRS	-
Autopilot Engage Switch	AES	
Go-Around Switch	GAS	-
DG Free-Slave Switch	SFS	-
DG Manual Synch Switch	MSS	-
Roll SAS Switch	RSS	-
Pitch SAS Switch	PSS	-
Force Trim Release	FTS	-
Fast Erect Switch	FES	-
Couple Release Switch	CRS	-
Airspeed Increase/ Decrease Switch	PBS	-
Sperry Relay Box	SRP105	-
NAV Selector Relay	NSR	-

TARSYN 555H GYRO
P/N 4020936-901
S1P2

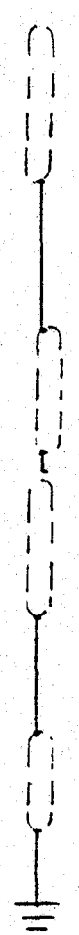
Sheet 1 of 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S1P2-V	FES-2				VG#1 Fast Erect
C	VG BRKR (115VAC)				115 VAC (H)
U	SRP105-3				Roll Att F/D (H)
s	SRP105-6				Roll Att F/D (C)
t	S1P2-s				Roll Load Jumper
p	SRP105-5				Roll Sync Stator (X)
q	SRP105-8				Roll Sync Stator (Y)
r					
AA	S1P2-BB				Pitch Att F/D (C)
BB	SRP105-16				Pitch Load Jumper
CC	SRP105-12				Pitch Att F/D (H)
GG	SRP105-22				Mon Flag Exit 28 VDC
HH	S1P2-D				Gyro Flag Valid 28 VDC
D	S1P2-HH				
H	S1P2-J				Reco Control
J	S1P2-H				Reco Control
P	S9P1B-14				A/P Intlk
R	S1P2-z				A/P Intlk 26 VAC
y	SRP105-18				Pitch Sync Stator (Y)
x	SRP105-15				Pitch Sync Stator (X)
z	S1P2-R				Pitch Sync Stator (Z)
B	Gnd Bus				Power Gnd
L	Gnd Bus				Chassis Gnd

Installation
Table 202 (cont)

TARSYN 555H GYRO
P/N 4020936-901
S1P3 Sheet 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S1P3-C	DG BRKR (115VAC)				115 VAC, 400 Hz
d	FD BRKR (28VDC)				Pwr Wrn Intlk
e	C2P2-Y				Pwr Wrn Intlk (28 VDC)
X	S1P3-H				
H	XDCR BRKR (26VAC)				#1 HDG XMT Rotot (H)
T	XDCR CRKR (26 VAC)				26 VAC, 400 Hz
K	C2P2-b				#1HDG XMT Stator (Z)
L	C2P2-z				#1HDG XMT Stator (X)
M	C2P2-a				#1HDG XMT Stator (Y)
B	Gnd Bus				PWR GND
Y	S1P3-J				
J	Gnd Bus				#1HDG XMT Rotor (C)
N	CFV-C				FVCT Stator (Y)
P	CFV-A				FVCT Stator (Z)
R	CFV-B				FVCT Stator (X)
S	CFV-E				FVCT Excite (H)
D					
Z	S9P1A-53				#2 HDG (X)
a	S9P1A-54				#2 HDG (Y)
b	S9P1A-52				#2 HDG (Z)
E	SFS-2				Free-Slave Wiper
G	SFS-1				Slave
f	MSS-1				DG Slave (+)
A	MSS-2				DG Slave Wiper
g	MSS-3				DG Slave (-)
U	C2P2-G				Annunciator (+)
V	C2P2-H				Annunciator (-)



Installation
Table 202 (cont)

Flight Director Computer
P/N 4015985-903
F4P1

Sheet 1 of 4

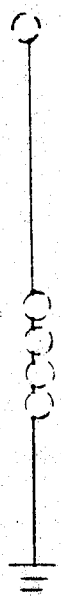
FROM	TO	AWG	SHLD	TWIST	FUNCTION
F4P1A-1	CB52-2				115VAC, 400 Hz (H)
2	Gnd Bus				115VAC, 400 HZ (C)
3	F5P1-19				28V Mode Lamp Excit
4	FD BRKR (28VDC)				28 VDC Pwr
5	Gnd Bus				DC Gnd
6	F3P1-c				DCPL Annun
7	Gnd Bus				Chassis Gnd
8	PBS-1				Airspeed Increase
9	PBS-3				Airspeed Decrease
10					
11	GAS-1				GA MOM
12					
13	Inst Lite SW				Nav Lite on 28 VDC
14	C2P2-X				28V DG Valid
15	C2P2-U				28V GS Valid in
16	C2P1-a				TTL Gnd
17	F5P1-39				NAV MOM
18	F5P1-40				Nav Unlatch
19	F5P1 41				REV
20	F5P1-42				ILS
21	F5P1-43				GS MOM
22					
23	F5P1-45				SB MOM
24	F5P1-46				HDG MOM
25	F5P1-47				ALT MOM
26	F5P1-36				VS MOM
27	F5P1-37				AS MOM
30	F5P1-20				HDG Annun
31	F5P1-21				NAV Annun
32	F5P1-22				AS Annun
33	F5P1-14				ALT Annun
34					
35	F5P1-16				VS Annun
36	F5P1-17				SB Annun
37	F5P1-18				GS Annun
38	C2P2-P				NAV Valid 28V in
39					
40	F3P1-D				DH Annun
41	F4P1A-54				
42	F3P1-A				GA Annun
43	F3P1-V				FD Valid (+)

Installation
Table 202 (cont)

FD Computer
P/N 4015985-903
F4P1A

Sheet 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
F4P1A-44	F4P1A-45				
45	F6P1-R				ALT Valid +28V OUT
46	R7P1-Y				RAD ALT Valid +28VDC
47					
48	R8P1-F				DH Gnd in
49	SRP105-10				VG Valid 28 VDC
50					
51	Gnd Bus				Logic Gnd
52	S9P1A-18				Pitch Trim demand
53					
54	F4P1A-41				
55	S9P1A-49				DCPL WRN IN
56	Glide Slope RCVR - c				GS Flag (+) IN
57	Glide Slope RCVR - p				GS Flag (-) IN
58	S9P1A-29				Roll Trim demand
59					
60	F5P1-23				Nav Valid +28V out
61	F5P1-30				GS Valid +28V out
62	S9P1A-43				$\overline{\text{VS}}$ *2Q
63	S9P1A-44				$\overline{\text{AS}}$ *GA
64	S9P1A-31				$\overline{\text{PBB}}$
65	S9P1A-41				$\overline{\text{RBB}}$
66	NSR-10				Nav Flag in (+)
67	Sig Gnd				Nav Flag in (-)



Installation
Table 202 (cont)

FD Computer
P/N 4015985-903
F4P1B

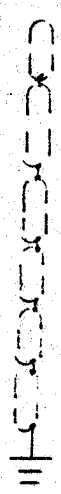
Sheet 3

FROM	TO	AWG	SHLD	TWIST	FUNCTION
F4P1B-1					
2	F4P1B-27				
3	F3P1-E				28VDC Lighting
4	C2P1-M				5VDC Lighting
5	Gnd Bus				Sig Gnd
6	S9P1A-32				Pitch A/P Cmd
7					
8	S9P1A-40				Roll A/P Cmd
9					
10	F4P1B-26				
11					
12					
13					
14					
15					
16					
17					
18					
19					
20	SA4-Yel				Coll Stk Pos (H)
21	SA4-Blu				Coll Stk Pos (C)
22	C2P2-C				GS Dev (+) UP
23	C2P2-D				GS Dev (+) DN
24	C2P2-E				NAV Dev (+) RT
25	C2P2-F				NAV Dev (+) Lt
26	F4P1B-10				
27	F4P1B-2				
30	F3P1-R				Roll Cmd (-)
31	F3P1-P				Roll Cmd (+)
32	F3P1-T				Pitch Cmd (+)
33	F3P1-S				Pitch Cmd (-)
34	F3P1-e				Coll Cmd (-)
35	F3P1-d				Coll Cmd (+)
36	C2P1-j				CRS Error (C)
37	C2P1-i				CRS Error (H)
40	C2P1-U				HDG Error (C)
41	C2P1-T				HDG Error (H)
42					
43					
44					

Installation
Table 202 (cont)

FD Computer
P/N 4015985-903
F4P1B

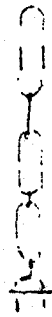
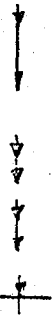
Sheet 4

FROM	TO	AWG	SHLD	TWIST	FUNCTION
F4P1B-45	F6P1-V				V/S Select Sig(+)
46	F6P1-W				V/S Select Sig(-)
47	F6P1-T, F4P1B-60				V/S Select (+)Ref
48	F6P1-U				V/S Select (-)Ref
49	F6P1-M				IVS Sig (+)
50	F6P1-N				IVS Sig (-)
51	R7P1-W				RAD ALT (H)
52	R7P1-N				RAD ALT (C)
53	SRP105-2				Roll (H)
54	SRP105-8				Roll (C)
55	SRP105-11				Pitch (H)
56	SRP105-18				Pitch (C)

MS Controller

P/N 4012395-903
F5P1

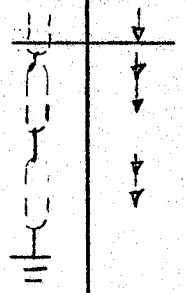
Sheet 1 of 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
F5P1-5	Gnd Bus				Chassis Gnd
12	F4P1B-4				5V Lighting (+)
13	Gnd Bus				5V Lighting (-)
14	F4P1A-33				Alt Annun
15					
16	F4P1A-35				VS Annun
17	F4P1A-36				SB Annun
18	F4P1A-37				GS Annun
19	F4P1A-3				28VDC Mode Lamp Excit
20	F4P1A-30				HDG Annun
21	F4P1A-31				NAV Annun
22	F4P1A-32				AS Annun
23	F4P1A-60				NAV Valid +28VDC
27	NSR-1				NAV RCVR TTL GND
30	F4P1A-61				GS Valid +28VDC
32	C2P2-P				NAV Valid 28VDC OUT
34	C2P1-a				TTL Gnd, HDI & FD
35	C2P2-U				GS Valid 38VDC OUT
36	F4P1A-26				VS MOM
37	F4P1A-27				AS MOM
39	F4P1A-17				NAV MOM
40	F4P1A-18				NAV Unlatch
41	F4P1A-19				REV
42	F4P1A-20				ILS
43	F4P1A-21				GS MOM
45	F4P1A-23				SB MOM
46	F4P1A-24				HDG MOM
47	F4P1A-25				ALT MOM
52	Glide Slope RCVR - t				NAV RCVR GS Dev (+) UP
53	Glide Slope RCVR - v				NAV RCVR GS Dev (+) DN
58	NSR-7				NAV RCVR Dev (+) RT
59	NSR-4				NAV RCVR Dev (+) LT
69	C2P2-E				NAV Dev (+) RT
70	C2P2-F				NAV Dev (+) LT
71	C2P2-A				To-From (+) TO

Installation
Table 202 (cont)

MS Controller
P/N 4012395-903
F5P1

Sheet 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
F5P1-72	C2P2-B				To-From (+) FROM
66	NSR-13				NAV RCVR (+) TO
74	NSR-16				NAV RCVR (+) FROM
79	Gnd Bus				DC Gnd
81	C2P2-D				GS Dev (+) DN
73	C2P2-C				GS Dev (+) UP

Installation
Table 202 (cont)

RD-44 Horizontal Situation Indicator
P/N 2592920-044
C2P1

Sheet 1 of 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
C2P1-A	26 VAC BRKR				HDG CT Excit (H)
B	Gnd Bus				HDG CT Excit (C)
C	Gnd Bus				Chassis Gnd
D	Gnd Bus				DC Gnd
L	C2P1-A				26VAC, 400 Hz
M	F3P1B-4				5V Lighting (H)
N	Gnd Bus				Lighting Gnd
T	F4P1B-41				HDG Error (H)
U	F4P1B-40				HDG Error (C)
a	F4P1A-16				TTL Gnd
b	FD BRKR (28VDC)				+28 VDC
g	C2P1-L				CRS CT Excit (H)
h	Gnd Bus				CRT CT Excit (C)
i	F4P1B-37				CRS Error (H)
j	F4P1B-36				CRS Error (C)
z	NSR-25				VOR CRS RSLVR (o)
AA	NSR-28				VOR CRS RSLVR (E)
BB	NSR-31				VOR CRS RSLVR (F)
CC	NSR-34				VOR CRS RSLVR (G)
EE	C2P1-FF				VOR CRS RSLVR (B)
FF	NSR-22				VOR CRS RSLVR (C)
GG	NSR-19				VOR CRS RSLVR (H)
C2P2-A	F5P1-71				To-From (+) TO
B	F5P1-72				To-From (+) FROM
C	F5P1-73, F5P1B-22				GS Dev (+) UP
D	F5P1-81, F4P1B-23				GS Dev (+) DN
E	F4P1B-24, F5P1-69				NAV Dev (+) Rt
F	F5P1-70, F4P1B-25				NAV Dev (+) Lt
G	C1P3-U				Compass Annun (+)
H	C1P3-V				Compass Annun (-)
P	F4P1A-38, F5P1-32				28VDC NAV Valid
S	Gnd Bus				NAV Valid Gnd
U	F5P1-35, F4P1A-15				28 VDC GS Valid
W	Gnd Bus				GS Valid Gnd

Installation
Table 202 (cont)

RD 44 HSI
P/N 2592920-044
C2P2

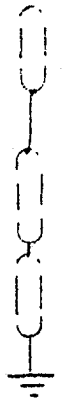
Sheet 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
C2P2-X	F4P1A-14				HDG Valid OUT
Y	C1P3-e				DG Valid 28VDC IN
Z	C1P3-L				HDG CT (X)
a	C1P3-M				HDG CT (Y)
b	C1P3-K				HDG CT (Z)
f	Gnd Bus				AC Pwr Gnd

Installation
Table 202 (cont)

VS-444 Vertical Speed Indicator
P/N 4012384-902
F6P1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
F6P1-A	F3P1B-4				5V Lighting (H)
B	Gnd Bus				5V Lighting (C)
C					
D	FD BRDR (115VAC)				115VAC, 400Hz(H)
E					
F	Gnd Bus				115VAC, 400Hz(C)
G	Gnd Bus				Chassis Gnd
L	Gnd Bus				DC Gnd
M	F4P1B-49				IVS Sig (+)
N	F4P1B-50				IVS Sig (-)
R	F4P1A-45				Altitude Valid +28VDC
T	F4P1B-47				V/S Select (+) REF
U	F4P1B-48				V/S Select (-) REF
V	F4P1B-45				V/S Select Sig (+)
W	F4P1B-46				V/S Select Sig (-)



Installation
Table 202 (cont)

GH-14 Gyro Horizon Indicator
P/N 4021541-560
F3P1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
F3P1-A	F4P1A-42				GA Annun
B	GH BRKR (26VAC)				Gyro Excit 26VAC, 400 Hz
C	Gnd Bus				Gyro Exict Pwr Gnd
D	F4P1A-40				DH Annun Lite
E	F4P1B-3				Lighting 28 VDC
F	Gnd Bus				Lighting Low
G	SRP105-16				Pitch Pickoff (C)
H	SRP105-13				Pitch Pickoff (H)
J	SRP105-6				Roll Pickoff (C)
K	SRP105-1				Roll Pickoff (H)
L	Gnd Bus				Chassis Gnd
P	F4P1B-31				Roll Cmd (+)
R	F4P1B-30				Roll Cmd (-)
S	F4P1B-33				Pitch Cmd (-)
T	F4P1B-32				Pitch Cmd (+)
V	F4P1A-43				FD WRN Flag (+)
W	Gnd Bus				FD WRN Flag (-)
a	GH BRKR (26VAC)				Valid Intlk 28V
b	S9P1B-12				Valid Intlk (L)
c	F4P1A-6				DCPL Annun
d	F4P1B-35				Coll Cmd (+)
e	F4P1B-34				Coll Cmd (-)
f	S9P1A-50				Rate-of-turn (+)
g	S9P1A-51				Rate-of-turn (-)

Installation
Table 202 (cont)

RA-215 Rad Alt Indicator
P/N 4014267-901
R8P1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
R8P1-E	R7P1-S				+9VDC Ind Ref
F	F4P1A-48				DH Gnd
G	R7P1-c				+28VDC
H	R7P1-z				+15VDC
J	R7P1-a				-15VDC
K	R7P1-M				±15VDC Common
M	+28VDC Light Bus				28VDC Lighting
N	R7P1-Y, F4P1A-46				Rad Alt Valid 28VDC
R	Gnd Bus				Lighting Gnd
S	R7P1-T				Test
T	R4P1-W, FP1B-51				Ind Alt Sig (H)
U	R7P1-N, TB7-12				Ind Alt Sig (C)
V	R7P1-b, Gnd Bus				Pwr Gnd

RT-220 Rad Alt R/T
P/N 4004437-901
R7P1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
R7P1-M	R8P1-K				±15VDC Common
N	TB7-12, R8P1-U				Alt Sig (C)
P	Gnd Bus, R7P1-b				
S	R8P1-E				+9VDC Ind Ref
T	R8P1-S				Test
U	F4P1A-47				1200' Trip
W	R8P1-T				Alt Sig (H)
Y	F4P1A-46, R8P1-N				Rad Alt Valid 28VDC
Z	R8P1-H				+15VDC
a	R8P1-J				-15VDC
b	R8P1-V, Gnd Bus				Pwr Gnd
c	R8P1-G, Rad Alt Brkr				+28VDC

Installation
Table 202 (cont)

Helipilot Computer (SAS)
P/N 4025008-901
S9P1A

Sheet 1 of 4

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S9P1A-1	S11P1-C				Pitch Motor (H)
2	S11P1-D				Pitch Motor (L)
3	Gnd Bus				Sig Gnd
4					
5					
6	S12P1-D				Roll Motor (L)
7	S12P1=C				Roll Motor (H)
8	Gnd Bus				28 VDC Bus
9					
10	S11P1-F				Pitch Pot
11	SRP105-14				Pitch Att (H)
12	SRP105-17				Pitch Att (L)
13	SRP105-7				Roll Att (L)
14	SRP105-4				Roll Att (H)
15	S12P1-F				Roll Pot
16					
17	Gnd Bus				Sig Gnd
18	S4P1A-52				Pitch Trim Demand
19					
20					
21	SPTM (+)				Pitch Trim Meter (H)
22	SA3-Yel				Long Position (H)
23	SA3-Blu				Long Position (L)
24	SA2-Blu				Lateral Position (L)
25	SA2-Yel				Lateral Position (H)
26	SRTM (+)				Roll Trim Meter (H)
27					
29	S4P1A-58				Roll Trim Demand
30					
31	F4P1A-64				$\overline{PBB}$
32	S4P1B-6				Pitch AP Cmd
33					
34	S13P-C				P HO Test Pt
35					
36	FTS-1				FTR in
37					
38	S13P-D				R HO Test Pt
39					
40	S4P1B-8				Roll AP Cmd

Installation
Table 202 (cont)

Helipilot Computer
P/N 4025008-901
S9P1A

Sheet 2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S9P1A-41	F4P1A-65				$\overline{RBB}$
42					
43	S4P1A-62				$\overline{VS * 2Q}$
44	S4P1A-63				$\overline{AS * GA}$
45					
46					
47					
48					
49	S4P1A-55				DCPL Warning
50	F3P1-f				Rate_of_Turn (+)
51	F3P1-g				Rate-of-Turn (-)
52	S1P3-b				HDG (Z)
53	S1P3-z				HDG (X)
54	S1P3-a				HDG (Y)
55					
56					
57					
58					
59					
60					
61	Gnd Bus				Sig Gnd
62					
63	Gnd Bus				Sig Gnd
64					
65					
66					
67					

Installation
Table 202 (cont)

Helipilot Computer
P/N 4025008-901
S9P1B

Sheet 3

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S9P1B-1	Gnd Bus				Pwr Gnd
2	Gnd Bus				Sig Gnd
3	Gnd Bus				Gnd Bus
4	SAS BRKR (115VAC)				115VAC Pwr
5					
6	Gnd Bus				Chassis Gnd
7	SES-1				28V SAS Mag SW
8	PSS-1				28V P SAS Eng Cmd
9					
10					
11	AES-2				28VDC Att Eng
12	F3P1-b				GH-14 Intlk
13	Gyro SW Wiper				INV #1 DC
14	S1P2-P				A/P Intlk
15	CB54-2				28VDC Bus
16	RSS-1				28 Roll SAS Eng Cmd
17					
18	S11P1-B				Pitch Pot Excit +13 VDC
19	S11P1-A				Pitch Pot Excit -13 VDC
20					
21					
22					
23					
24					
25					
26					
27	S12P1-B				Roll Pot Excit -13 VDC
28	S12P1-A				Roll Pot Excit +13 VDC
29					

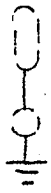
Pitch Linear Actuator S11P1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S11P1-A	S9P1B-19				-13 VDC Pot Excit
B	S9P1B-18				+13 VDC Pot Excit
C	S9P1A-1				Motor Hi
D	S9P1A-2				Motor Lo
E					
F	S9P1A-10				Actuator Position

Installation
Table 202 (cont)

Roll Linear Actuator
S12P1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S12P1-A	S9P1B-28				+13VDC Pot Excit
B	S9P1B-27				-13VDC Pot Excit
C	S9P1A-7				Motor HI
D	S9P1A-6				Motor LO
E					
F	S9P1A-15				Actuator Position



Installation
Table 202 (cont)

Actuator Test Connector
S13P1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
S13P1-A	Gnd Bus				Ground Bus
B	S9P1B-28				Roll Pot Excit, -13 VDC
C	S9P1A-34				Pitch HO TP
D	S9P1A-38				Roll HO TP
E					
F	S9P1B-27				Roll Pot Excit, +13 VDC

Pitch Stick Synchro
P/N 2579483-1
SA3

FROM	TO	AWG	SHLD	TWIST	FUNCTION
SA3-RED/WHT	XDCR BRKR (26VAC)				26 VAC, 400 Hz
Blk/Wht	Gnd Bus				Pwr Gnd
Yel	S9P1A-22				Long. Stk. Pos (H)
Blu	S9P1A-23				Long Stk. Pos (L)

Roll Stick Synchro
P/N 2579483-1
SA2

FROM	TO	AWG	SHLD	TWIST	FUNCTION
SA2-Red/Wht	XDCR BRKR (26VAC)				26VAC, 400 Hz
Blk/Wht	Gnd Bus				Pwr Gnd
Yel	S9P1A-25				Lat. Stk. Pos. (H)
Blu	S9P1A-24				Lat. Stk. Pos. (L)

Installation
Table 202 (cont)

Collective Stick Synchro
P/N 2579483-1
SA4

FROM	TO	AWG	SHLD	TWIST	FUNCTION
SA4-RED/WHT	XDCR BRKR (26VAC)				26VAC, 400Hz
Blk/WHT	Gnd Bus				Pwr Gnd
Yel	S4P1B-20				Coll. Stk. Pos (H)
Blu	S4P1B-21				Coll. Stk. Pos (L)

Installation
Table 202 (cont)

Pitch Trim Meter

P/N 2503148-2

SPTM

FROM	TO	AWG SHLD TWIST	FUNCTION
SPTM (+) SPTM (-)	S9P1A-21 Gnd Bus		(+) Input Sig Gnd
		Roll Trim Meter P/N 2503148-2 SRTM	
SRTM (+) SRTM (-)	S9P1A-26 Gnd Bus		(+) Input Sig Gnd

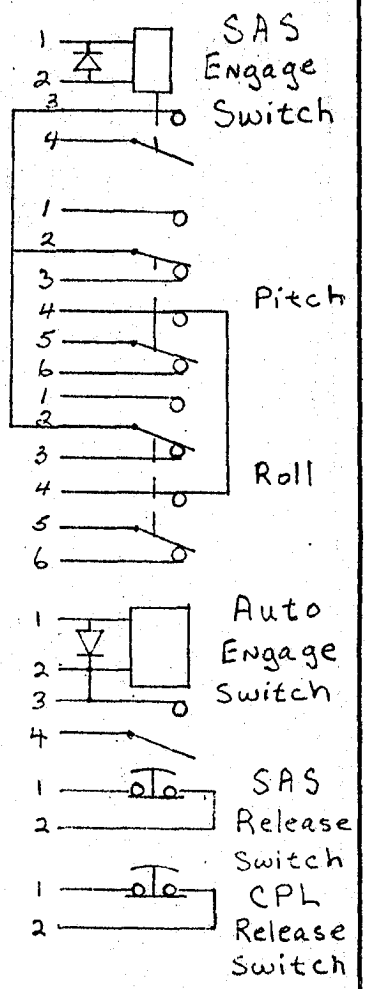
Flux Valve
P/N 2594484
CFV1

FROM	TO	AWG	SHLD	TWIST	FUNCTION
CFV-A	S1P3-P				FVCT Stator (Z)
B	S1P3-R				FVCT Stator (X)
C	S1P3-N				FVCT Stator (Y)
D	Gnd Bus				FVCT Exit (C)
E	S1P3-S				FVCT Exit (H)
F	Shield Gnd				FVCT Shld Gnd

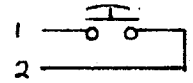
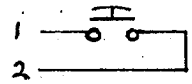
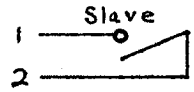
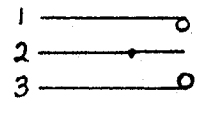
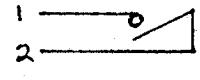
Installation
Table 202 (cont)

Cockpit Switches

FROM	TO	AWG	SHLD	TWIST	FUNCTION
SES-1	S9P1B-7	22			
2	SRS-1	22			
3	PSS-2,RSS-2	22			
4	28 VDC	20			
PSS-1	S9P1B-8,PSS-5	22			
2	SES-3,RSS-2	22			
3					
4	RSS-14	22			
5	S9P1B-8,PSS-1	22			
6					
RSS-1	S9P1B-8,PSS-1	22			
2	SES-3,PSS-2	22			
3					
4	PSS-4	22			
5	AES-4	22			
6					
AES-1	CRS-1	22			
2	S9P1B-11	22			
3	AES-2	22			
4	RSS-5	22			
SRS-1	SES-2				
SRS-2	Gnd Bus				
CRS-1	AES-1				
CRS-2	Gnd Bus				



Cockpit Switches

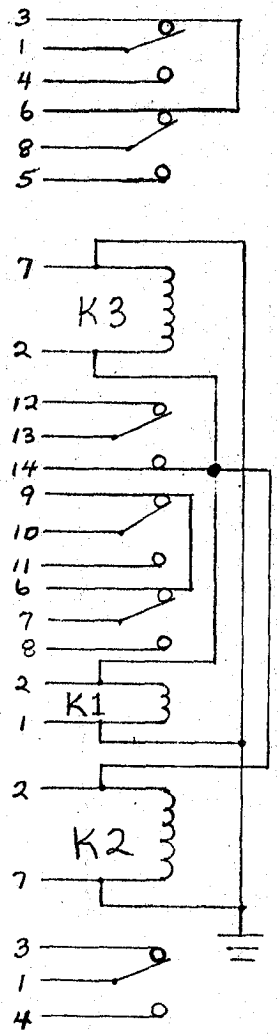
FROM	TO	AWG	SHLD	TWIST	FUNCTION
GAS-1	F4P1A-11	22			 Go/Around
GAS-2	Gnd Bus	22			
FTS-1	S9P1A-36	20			 Force Trim Release
FTS-2	Gnd Bus	20			
SFS-1	C1P3-G	22			 DG Slave/Free Switch
SFS-2	C1P3-E	22			
MSS-1	C2P3-f	22			 DG Manual Sync. Switch
-2	C2P3-A	22			
-3	C2P3-g	22			
FES-1	Gnd Bus	22			 VG Fast Erect Switch
FES-2	C2P2-V	22			
PBS-1	F4P1A-8				 Inc. Dec.
PBS-2	Gnd Bus				
PBS-3	F4P1A-9				

Installation
Table 202 (cont)

Sperry Relay Box
de-energized
SRP 105

Sheet 1 of 2

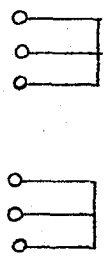
FROM	TO	AWG	SHLD	TWIST	FUNCTION
SRP105-1	F3P1-K				
2	F4P1B-53				
3	S1P2-u				
4	S9P1A-14				
5	S1P2-p				
9	Gnd Bus				
10	F4P1A-49				
11	F4P1B-55				
12	S1P2-CC				
13	F3P1-H				
14	S9P1A=11				
15	C1PA-x				
19	Gyro Select Wiper				
20	Gnd Bus				
22	S1P2-GG				
21	VG Fail Lite				
28	28V Bus				
23					



Installation
Table 202 (cont)

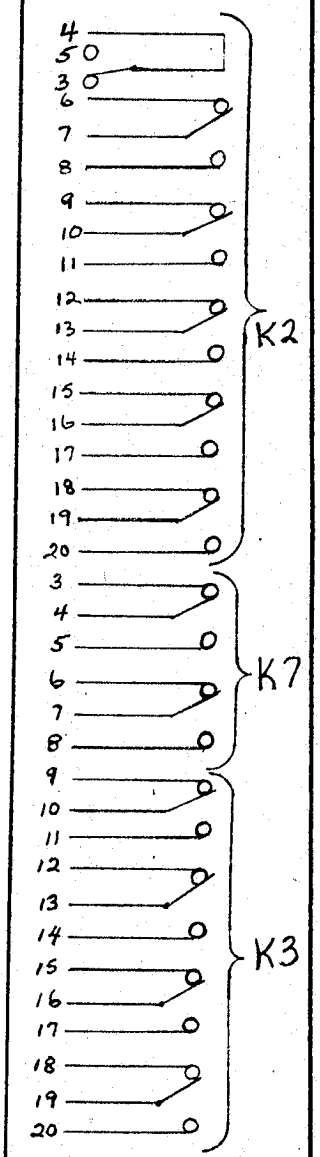
Sperry Relay Box
de-energized
SRP105

FROM	TO	AWG	SHLD	TWIST	FUNCTION
SRP105-6	F3P1-J, S1P2-s				
7	S9P1A-13				
8	S1P2-q, F4P1B-54				
16	F3P1-G, C1P2-BB				
17	S9P1A-12				
18	C1P2-y, F4P1B-56				



NAV Selector Relay
NSR

FROM	TO	AWG	SHLD	TWIST	FUNCTION
NSR-1	F4P1-27				
2	#2 NAV Rec TTL Gnd				
3	#1 Dev (+) Lt				
4	F4P1-59				
5	#2 Dev (+) Lt				
6	#1 Dev (+) Rt				
7	F4P1-58				
8	#2 Dev (+) Rt				
9	#1 NAV Rec Flag				
10	F4P1A-66				
11	#2 NAV Rec Flag				
12	#1 to Dev (+)				
13	F3P1-66				
14	#2 to Dev (+)				
15	#1 From Dev (+)				
16	F5P1-74				
17	#2 From Dev (+)				
18	#1 CRS RSLVR (H)				
19	C2P1-GG				
20	#2 CRS RSLVR (H)				
21	#1 CRS RSLVR (C)				
22	C2P1-FF				
23	#2 CRS RSLVR (C)				
24	#1 CRS RSLVR (D)				
25	C2P1-Z				
26	#2 CRS RSLVR (D)				
27	#1 CRS RSLVR (E)				
28	C2P1-AA				
29	#2 CRS RSLVR (E)				
30	#1 CRS RSLVR (F)				
31	C2P1-BB				
32	#2 CRS RSLVR (F)				
33	# CRS RSLVR (G)				
34	C2P1-CC				
35	#2 CRS RSLVR (G)				



Installation
Table 202 (cont)

SECTION 4

REINSTALLATION/ADJUSTMENT

1. General

This section provides instructions for reinstalling and adjusting each unit that has been removed from a correctly installed System. Should any INSTALLATION CRITICAL cases arise with the reinstallation of any unit, be sure to comply 100 percent with the instructions.

2. Equipment and Materials

No special equipment or materials other than those commonly used in shop are required for reinstalling and adjusting the System.

3. Procedure

NOTE: No adjustment is required, unless stated otherwise.

A. Reinstall TARSYN 555H Gyroscope Assembly.

(1) Slide TARSYN 555H into mounting tray, being careful to catch rear lip. Lift bar over chassis lip and tighten wing nuts.

(2) Mate connectors 1J2 and 1J3 with aircraft electrical cable assembly connectors (MS3126-F22-55SY and MS3126-F18-32SY).

B. Reinstall Flux Valve and Compensator.

(1) Secure Compensator to Flux Valve with six 4-40 by 9/16-inch, round head, non-magnetic screws.

(2) Secure Flux Valve to mounting bracket with three 6-40 by 3/8-inch round head, non-magnetic machine screws, Sperry Part No. 319011.

(3) Mate Flux Valve connector.

3. C. Adjust Flux Valve.

NOTE: Generally, ground swinging can be considered satisfactory for most types of aircraft. Unless it is found that for a particular type of aircraft the engine operation affects the indication of the Flux Valve, the engines need not be run during this adjustment. In this case, aircraft power is supplied by means of an auxiliary power source. Ground swinging may be more rapidly and conveniently performed by use of the MC-1, MC-1M, or MC-2 Compass Calibrator Set.

(1) Position the aircraft on a compass rose and turn it to each of the four cardinal headings. Record the difference in readings between the directional indicator dial and the compass rose as plus or minus, depending on whether the dial readings are greater or less than the compass rose readings. Allow sufficient time for the dial to settle out at each heading before taking the readings.

NOTE: Instead of the compass rose, a magnetic sighting compass may be used. To take a reading, the compass is located at a considerable distance fore and aft of the aircraft and is moved back and forth from the line of sight coinciding with the plane. When a sight is taken facing aft, 180 degrees must be added or subtracted from the sighted compass reading. When facing fore, the compass reads directly.

(2) Add the errors algebraically and divide by four. The result is the index error.

(3) Loosen the screws holding the Flux Valve flange to its mounting surface and rotate the flange of the unit to cancel out the index error. If the error is positive, the flange should be rotated in the counterclockwise direction (giving a "minus" reading on the flange), as observed from above the unit.

(4) If the error is negative, rotate the flange in the clockwise direction (giving a plus reading on the flange). The amount of rotation should equal the index error.

(5) Tighten the mounting screws and recheck the readings at the four cardinal headings. Recalculate the index error to make sure it is zero. If it is not zero, readjust the Flux Valve flange until this error is cancelled. Any remaining errors in excess of ±1 degree which are caused by extraneous magnetic fields should be counteracted by using the Compensator.

3. D. Reinstall RD-44 Radio Deviation Indicator.

(1) Mate RD-44 connector J1 with aircraft electrical cable assembly connector (MS3126-F22-55S), and connector J2 with aircraft electrical cable assembly connector (MS312618-32S), and slide RD-44 into the control panel.

(2) Secure RD-44 to control panel with mounting clamp (MSP Co, Part No. 9964).

E. Reinstall GH-14 Gyro Horizon Indicator.

(1) Mate GH-14 connector J1 with aircraft electrical cable assembly connector (MS3121F-20-41SW), and slide GH-14 into the slot on the control panel.

(2) Secure GH-14 to control panel with mounting clamp (MSP Co, Part No. 9964).

F. Reinstall Flight Director Computer.

(1) Slide FDC into mounting tray.

CAUTION: DO NOT FORCE FIT CONNECTORS. IF MATING IS DIFFICULT, REMOVE THE FDC AND CHECK FOR CONNECTOR PINS THAT MAY BE BENT OR OUT OF ALIGNMENT. ALSO CHECK THE ALIGNMENT OF THE RECEPTACLE IN THE MOUNTING TRAY.

(2) Carefully apply firm pressure until connectors J1A and J1B are mated with receptacle on mounting tray (DPX2MA-67S67S-33B-0001).

(3) Insert mounting tray holddown assembly knob into hook on front of FDC, and tighten holddown knob.

G. Reinstall Mode Selector Controller.

(1) Mate Controller connector J1 with aircraft electrical assembly connector (JT06RE-22-2S), and slide Controller into the slot on the control panel.

(2) Secure Controller to control panel with mounting clamp (MSP Co, Part No. 9963).

3. H. Reinstall Helipilot Computer.

WARNING: FAILURE TO COMPLY WITH THE FOLLOWING INSTALLATION CRITICAL REQUIREMENT COULD RESULT IN HAZARDOUS FLIGHT CONDITIONS IN THE EVENT OF HELIPILOT COMPUTER OR ACTUATOR FAILURE.

INSTALLATION CRITICAL

WHEN INSTALLED IN THE AEROSPATIALE SA1341-G AIRCRAFT, THE HELIPILOT COMPUTER MUST BE OPERATED WITH THE FOLLOWING ACTUATOR TRAVELS:
LONGITUDINAL CYCLIC - 7 MM MAX STOP TO STOP
LATERAL CYCLIC - 7 MM MAX STOP TO STOP.

(1) Slide Helipilot Computer into mounting tray.

CAUTION: DO NOT FORCE FIT CONNECTORS. IF MATING IS DIFFICULT, REMOVE THE HELIPILOT COMPUTER AND CHECK FOR CONNECTOR PINS THAT MAY BE BENT OR OUT OF ALIGNMENT. ALSO CHECK THE ALIGNMENT OF THE RECEPTACLE IN THE MOUNTING TRAY.

(2) Carefully apply firm pressure until connectors J1A and J1B are mated with receptacle on mounting tray (DPX2MA-67S67S-33B-0001).

(3) Insert mounting tray holddown assembly knob into hook on front of Helipilot Computer, and tighten holddown knob.

J. Reinstall VS-444 Vertical Speed Indicator.

(1) Mate VS-444 connector J1 with aircraft electrical cable assembly connector (MS3126F18-32SY) and slide VS-444 into the control panel.

(2) Secure VS-444 to control panel with mounting clamp (MSP Co, Part No. 9963).

K. Reinstall RA-215 Radio Altimeter Indicator.

(1) Mate RA-215 connector J1 with aircraft electrical cable assembly connector (MS3126-F14-19S), and slide RA-215 into the slot on the control panel.

(2) Secure RA-215 to control panel with mounting clamp (MSP Co, Part No. 9963).

3. L. Reinstall RT-220 Receiver/Transmitter.

(1) Secure RT-220 to aircraft frame with six No. 6-32 UNC fillister head screws.

(2) Mate RT-220 connector J1 with aircraft electrical cable assembly connector (MS3126-F16-26S), and transmit and receiver connectors with RF cable connectors (GRFF 4007-0002).

M. Reinstall AT-220 Antenna.

(1) Secure AT-220 to aircraft frame with 12 No. 8-32 UNC screws.

(2) Mate AT-220 connector J1, BNC female, with aircraft electrical assembly connector (GRFF4007-0002).

SECTION 5
STORAGE INSTRUCTIONS

1. General

This section provides detailed procedures for preparing components for storage or shipment.

The Sperry Flight Systems warranty responsibility is contingent upon the use of specified ATA container, or equivalent, when returning equipment for warranty repair.

If necessary to store components for long periods of time, store in an environmental temperature range of -22 to +131 °F (-30 to +55 °C). For long periods of storage it is essential that the component be protected from dust, moisture, and other contaminants.

2. Storage Instructions for Mode Selector Controller

A. Equipment and Materials

NOTE: Equivalent substitutes may be used for listed items.

Container, ATA 300, Category II, size 014, 10 by 10 by 10 in. (254 by 254 by 254 mm)

Dunnage, fire retardant polyether polyurethane convoluted foam with a density of 1.5 pounds per cubic foot (24 kg per cubic meter):

Dunnage A - 8 by 8 by 4 in. (203 by 203 by 102 mm)

Dunnage B - 10 by 10 by 7.5 in. (254 by 254 by 191 mm)

Polyethylene bag, 15 by 3 by 8 in. (381 by 76 by 203 mm)

Strapping, 3/8-in. (10 mm) steel or plastic, with applicable strapping tool

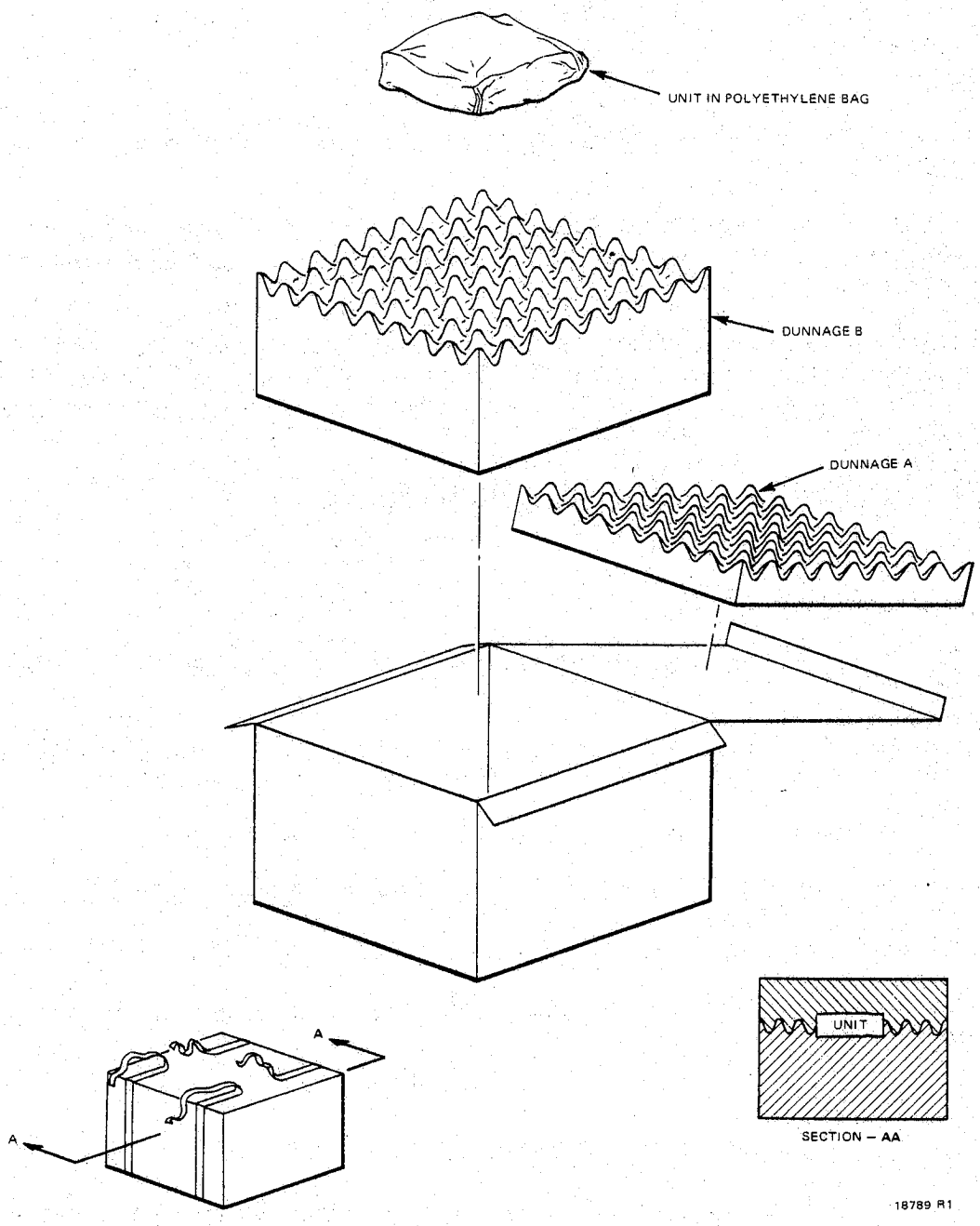
FRAGILE labels

B. Storage Procedure (See figure 401.)

(1) Place component in polyethylene bag. Fold mouth of bag over. Do not seal bag.

(2) Place dunnage B, with convoluted side facing up, in container.

(3) Place bagged component into center of container.



Shipping and Storage Container
for Mode Selector Controller
Figure 401

2. B. (4) Place dunnage A on flap of container, with convoluted side up.

CAUTION: DO NOT USE CARTON TAPE; REMOVAL OF THIS TAPE DAMAGES CONTAINER AND SHORTENS ITS REUSABLE LIFE SPAN.

(5) Close container and secure with strapping. Place two lengths of strapping around width of container.

(6) Apply FRAGILE labels and mark carton to identify component and to indicate date of packing.

3. Storage Instructions for Flux Valve and Compensator

A. Equipment and Materials

NOTE: Equivalent substitutes may be used for listed items.

Container - ATA 300, Category II, Size 025, 14.5 by 13 by 10 in. (368 by 330 by 254 mm)

Dunnage - fire retardant polyether urethane convoluted foam with a density of 1.5 pounds per cubic foot (24 kg per cubic meter).

Dunnage A - 13.8 by 12.5 by 4 in. (351 by 318 by 102 mm)

Dunnage B - 14.5 by 13 by 6.3 in. (368 by 330 by 160 mm) with a 4.75 by 4.75-in. (121 by 121 mm) convoluted cavity centered on the top surface and 2.75 in. (70 mm) deep.

Polyethylene bag, 15 by 3 by 8 in. (381 by 76 by 203 mm)

Strapping, 3/8-in. (10 mm) wide steel or plastic, with applicable strapping tool.

Foam adhesive - Scotch Grip 4500, 3M Co, St. Paul, MN

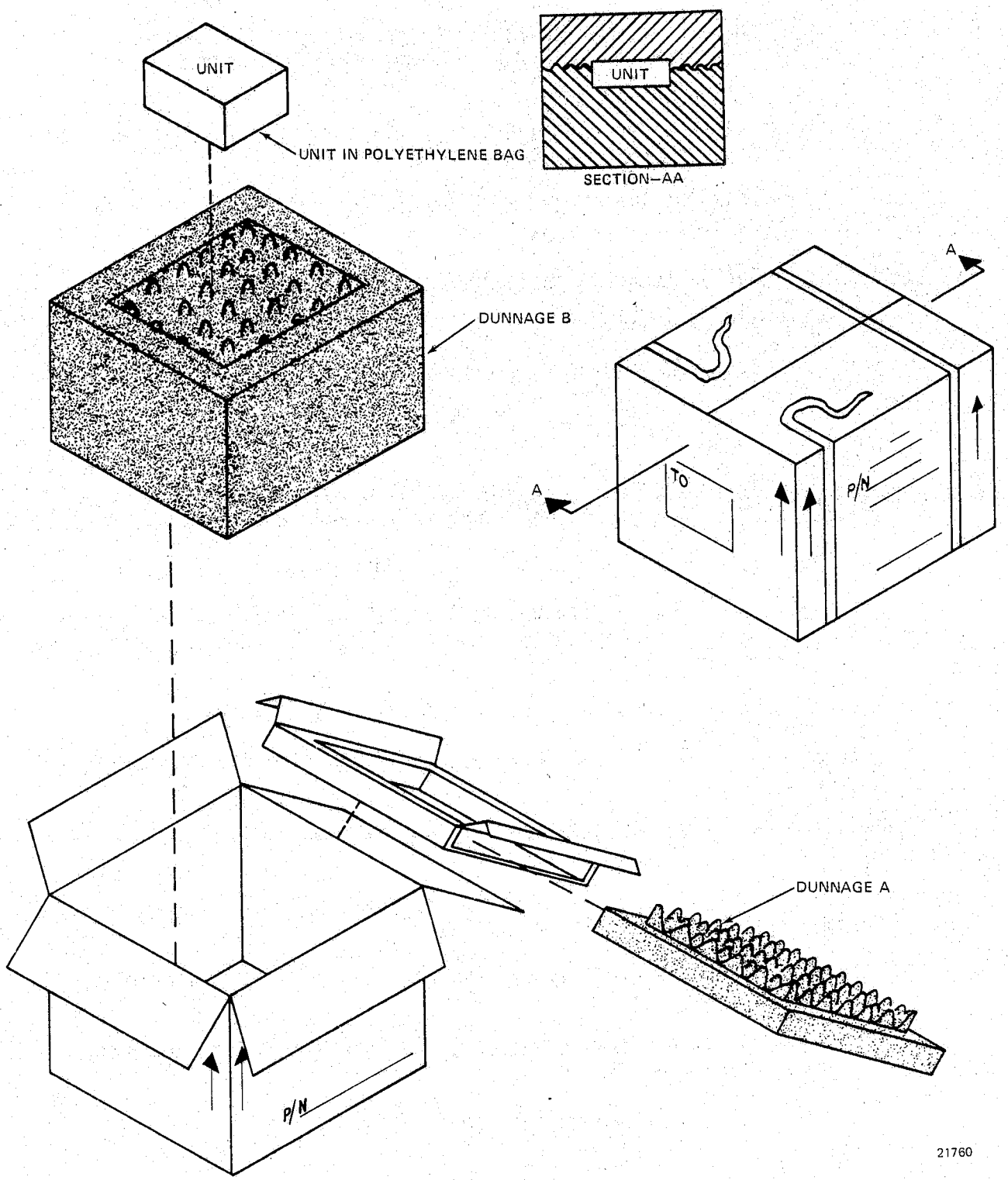
FRAGILE labels

B. Storage Procedures (See figure 402.)

(1) Place component in polyethylene bag. Fold mouth of bag over. Do not seal bag.

(2) Apply foam adhesive to bottom of dunnage B and place dunnage, with convoluted side facing up, in container.

(3) Place bagged component into center of container.



Shipping and Storage Container
for Flux Valve and Compensator
Figure 402

3. B. (4) Place dunnage A in insert attached to one end flap of container, with convoluted side up.

CAUTION: DO NOT USE CARTON TAPE; REMOVAL OF THIS TAPE DAMAGES CONTAINER AND SHORTENS ITS REUSABLE LIFE SPAN.

(5) Close container and secure with strapping. Place two lengths of strapping around width of container.

(6) Apply FRAGILE labels and mark carton to identify component and to indicate date of packing.

4. Storage Instructions for Helipilot Computer and Receiver/Transmitter

A. Equipment and Materials

NOTE: Equivalent substitutes may be used for listed items.

Container, ATA 300, Category II, size 038, 20 by 13 by 12 in. (508 by 330 by 305 mm)

Dunnage, fire retardant polyether polyurethane convoluted foam with a density of 1.5 pounds per cubic foot (24 kg per cubic meter):

Dunnage A - 19.3 by 12 by 4 in. (490 by 305 by 102 mm) with a 17.3 by 10 by 2-in. (439 by 254 by 52-mm) convoluted surface.

Dunnage B - 20.3 by 13 by 10 in. (516 by 330 by 254 mm) with a 14.3 by 8 by 3-in. (363 by 203 by 76-mm) convoluted cavity centered on the top surface.

Polyethylene bag, 15 by 3 by 8 in. (381 by 76 by 203 mm)

Strapping, 3/8-in. (10 mm) steel or plastic, with applicable strapping tool

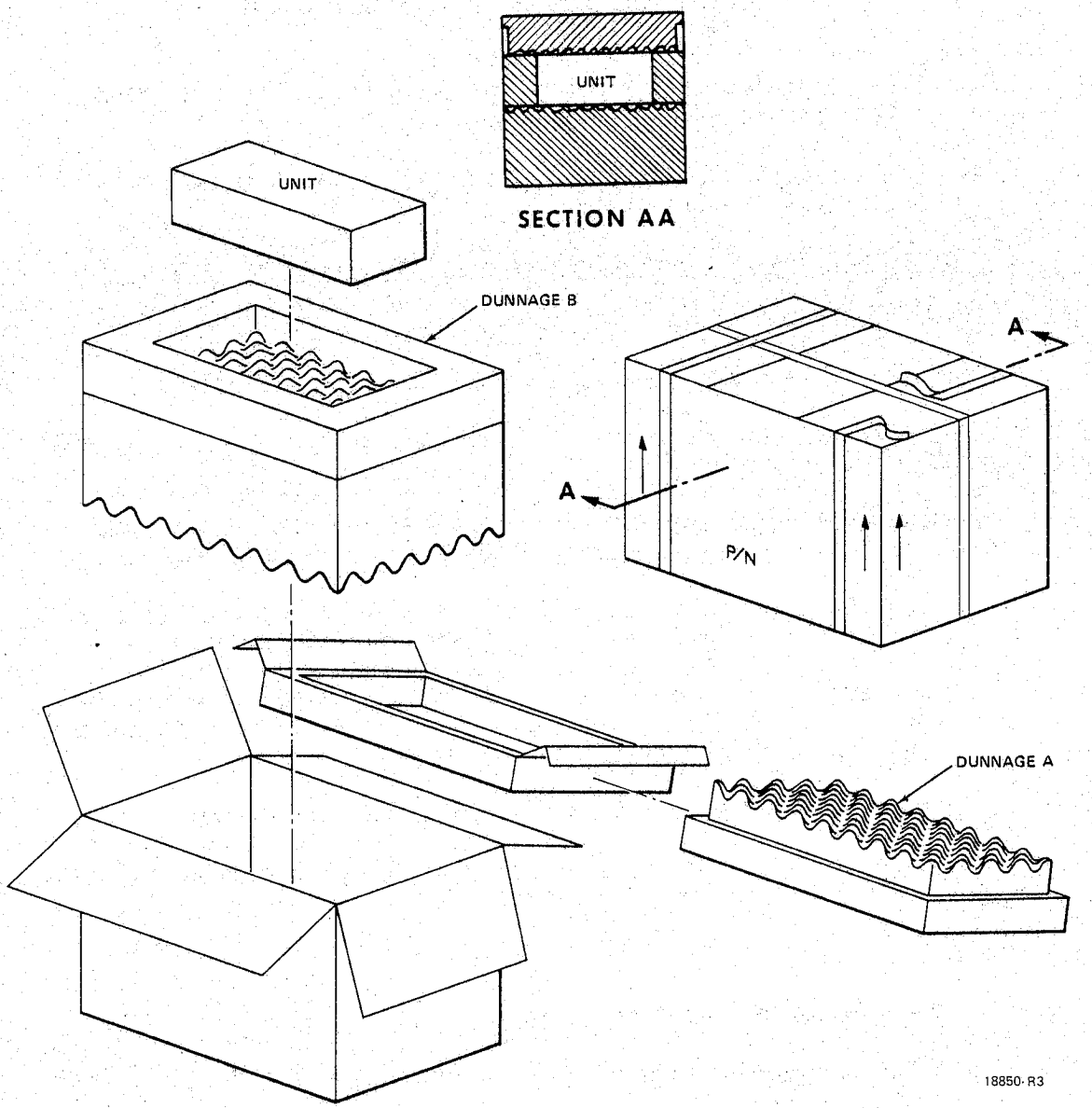
FRAGILE labels

B. Storage Procedure (See figure 403.)

(1) Place component in polyethylene bag. Fold mouth of bag over. Do not seal bag.

(2) Place dunnage B, with cavity side facing up, in container.

(3) Place bagged component into center of cavity.



Shipping and Storage Container
for Helipilot Computer and Receiver/Transmitter
Figure 403

4. B. (4) Place dunnage A in insert attached to one end flap of container, with convoluted side up.

CAUTION: DO NOT USE CARTON TAPE; REMOVAL OF THIS TAPE DAMAGES CONTAINER AND SHORTENS ITS REUSABLE LIFE SPAN.

(5) Close container and secure with strapping. Place two lengths of strapping around width of container and one band around length of container.

(6) Apply FRAGILE labels and mark carton to identify component and to indicate date of packing.

5. Storage Instructions for FDC

A. Equipment and Materials

NOTE: Equivalent substitutes may be used for listed items.

Container - ATA 300, Category II, size 110, 29.0 by 14.5 by 14.375 in. (737 by 368 by 365 mm)

Dunnage, fire retardant bonded polyester urethane foam with density of 4 pounds per cubic foot (64.08 kg per cubic meter)

Dunnage A, 28.0 by 13.75 by 3.0 in. (711 by 349 by 76 mm)

Dunnage B, 29.0 by 14.375 by 7.0 in. (737 by 365 by 178 mm) with a 22.25 by 4.75 by 7.0-in. (565 by 121 by 178-mm) cavity in the center of the 29.0 by 14.375 in. (737 by 365 mm) surface

Dunnage C, 29.0 by 14.375 by 5.0 in. (737 by 365 by 127 mm)

Polyethylene bag - 12 by 8 by 35 in. (305 by 203 by 889 mm)

3/8-in. (10-mm) steel or plastic strapping with suitable strapping tool

FRAGILE labels

B. Storage Procedure (See figure 404.)

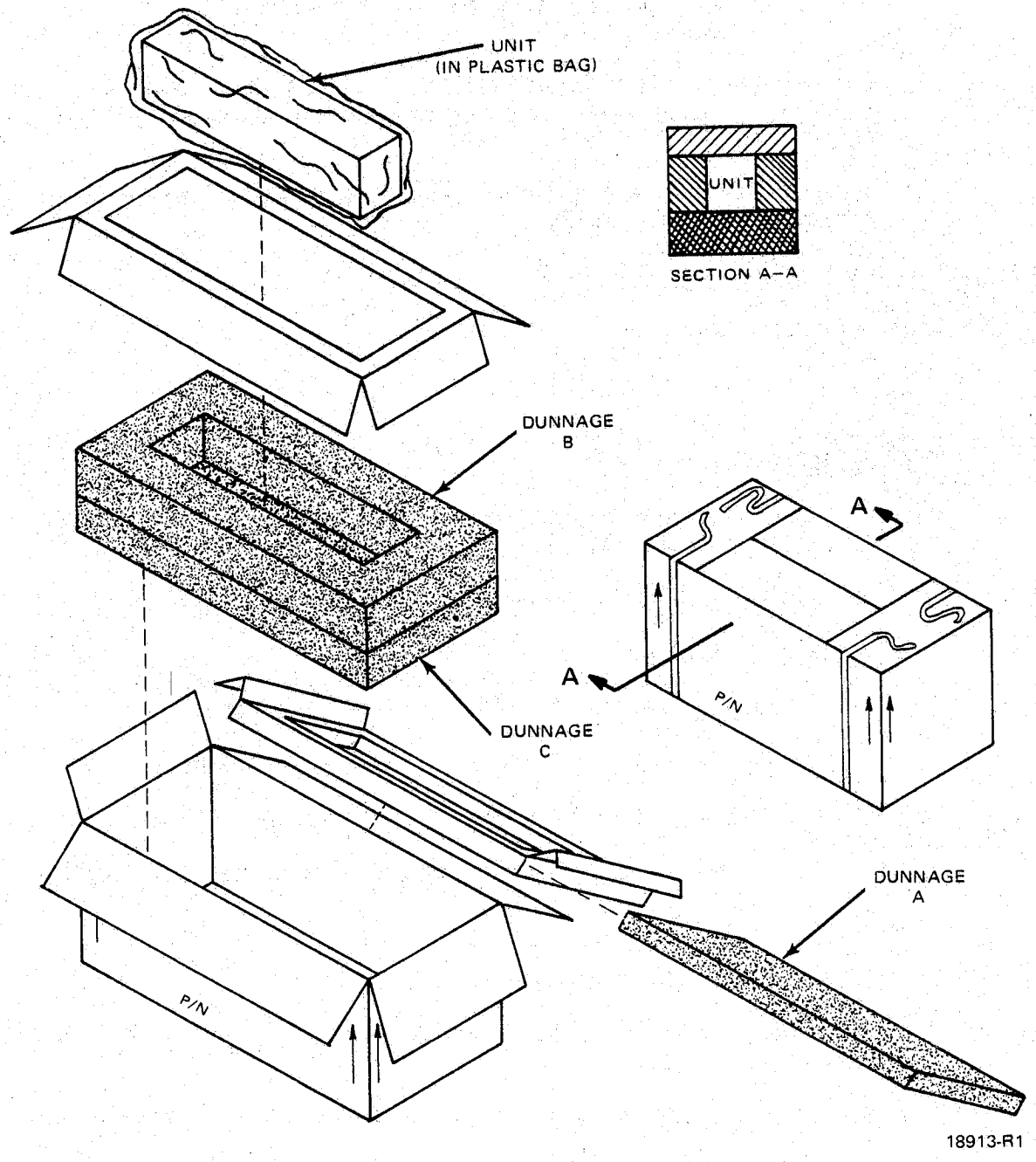
(1) Place dust covers over pitot and static air data inputs. Puncture cover for pressure relief.

(2) Place unit in polyethylene bag. Do not seal. Fold bag over.

(3) Place dunnage C and B into container.

(4) Place bagged unit into cavity.

(5) Place bottom insert into container to hold down dunnage C and B.



Shipping and Storage Container for FDC
Figure 404

5. B. (6) Place dunnage A into insert on flap of container.

(7) Fold in flap with dunnage, then fold in opposite flaps.

CAUTION: DO NOT USE CARTON TAPE. REMOVAL OF THIS TAPE DAMAGES THE CONTAINER AND SHORTENS ITS REUSABLE LIFE SPAN.

(8) Close carton and secure with strapping bands girthwise around container. Girthwise refers to side where the two longest flaps meet.

(9) Affix FRAGILE labels and mark carton to identify component and to indicate date of packing.

6. Storage Instructions for Radio Deviation Indicator, Vertical Speed Indicator, and Radio Altimeter Indicator

A. Equipment and Materials

NOTE: Equivalent substitutes may be used for the items listed.

Outer container, ATA 300, Category II, size 125, 22.5 by 22.5 by 21 in. (572 by 572 by 533 mm)

Inner container, 14 by 14 by 14 in. (356 by 356 by 356 mm)

Dunnage, fire retardant polyether polyurethane foam with density of 1.5 pounds per cubic foot (24 kg per cubic meter), in the following dimensions and quantities:

Dunnage A - Two pieces - 19.5 by 8.5 by 2.5 in. (495 by 216 by 64 mm)

Dunnage B - Four pieces - 8.5 by 8.5 by 4 in. (216 by 216 by 102 mm) with a square 4 by 4 in. (102 by 102 mm) cut from one corner of the 8.5 by 8.5 in. (216 by 216 mm) surface

Dunnage C - Four pieces - 8.5 by 8.5 by 8 in. (216 by 216 by 203 mm) with a cube 4 by 4 by 4 in. (102 by 102 by 102 mm) cut from one corner

Dunnage D - One piece - 13.8 by 13 by 4 in. (351 by 330 by 102 mm)

Dunnage E - For RD-44's (figure 405)

One piece - 14 by 14 by 10 in. (356 by 356 by 254 mm) with a 4 by 4 by 5.5 in. (102 by 102 by 140 mm) cavity, centered on one 14 by 14 in. (356 by 356 mm) surface

Dunnage E - For VS-444's and RA-215's (figure 406)

One piece - Convoluted foam 14 by 14 by 10 in. (356 by 356 by 254 mm) with a 3 by 3 by 6.5-in. (76 by 76 by 165-mm) cavity centered on the flat surface and a cutout in the convoluted surface, leaving four 3.5 by 3.5 by 3.5-in. (89 by 89 by 89-mm) cubes on each corner.

Adhesive, Scotch Grip 4500, 3M Co, St. Paul, MN

Polyethylene bag, 8 by 4 by 24 in. (203 by 102 by 610 mm)

3/8-in. (10 mm) steel or plastic strapping with suitable strapping tool
FRAGILE labels

6. B. Storage Procedure (See figure 405 or 406.)

(1) Place component in polyethylene bag. Fold mouth of bag over. Do not seal bag.

(2) Insert dunnage E cavity side up, in bottom of inner container. Place component in cavity.

(3) Insert dunnage D in retainer on the inner container top flap.

(4) Fold in flap with dunnage first; then fold in remaining three flaps to close inner container.

(5) Secure four pieces of dunnage C in the four bottom inside corners of the outer container, with the cutout facing up so inner container can rest in the four cutouts.

(6) Secure four pieces of dunnage B in the four upper inside corners of the outer container, with the cutout corners facing inside of outer container.

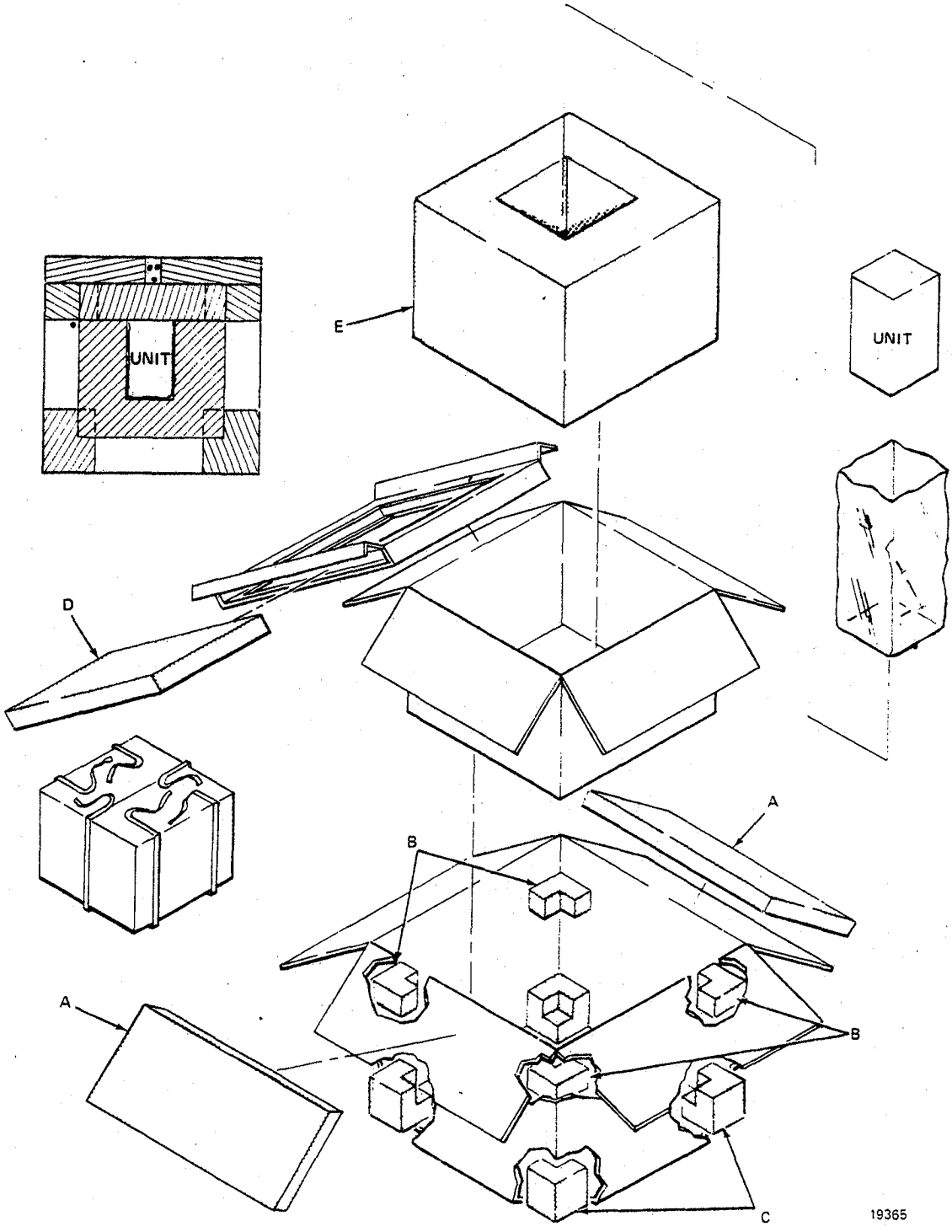
(7) Secure two pieces of dunnage A, one on opposite top flaps of outer container.

(8) Insert inner container into outer container and fold in flaps of outer container with dunnage first; then fold in the remaining two flaps to close container.

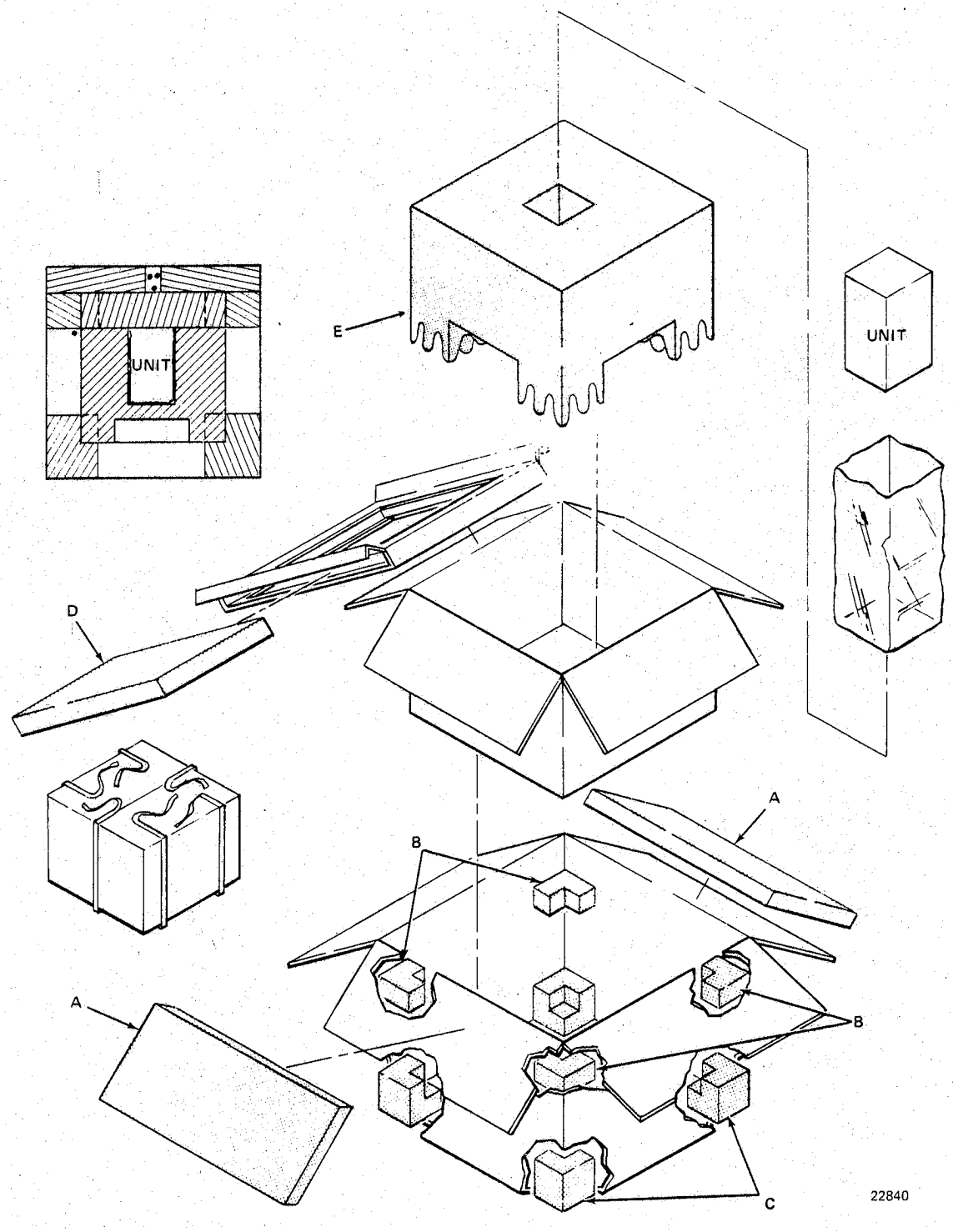
CAUTION: DO NOT USE CARTON TAPE. REMOVAL OF THIS TAPE DAMAGES THE CONTAINER AND SHORTENS ITS LIFE SPAN.

(9) Install one strap parallel to top flap seam on outer container and two straps intersecting top flap seam.

(10) Apply FRAGILE labels and mark carton to identify component and to indicate date of packing.



Shipping and Storage Container for Radio Deviation Indicator
and Gyro Horizon Indicator
Figure 405



Shipping and Storage Container for Radio Altimeter
and Vertical Speed Indicator
Figure 406

7. Storage Instructions for GH-14

A. Equipment and Materials

NOTE: Equivalent substitutes may be used for the items listed.

Outer container - ATA 300, Category II, size 500, 22.5 by 22.5 by 30 in. (572 by 572 by 762 mm)

Inner container, 14 by 14 by 22.5 in. (356 by 356 by 572 mm)

Dunnage fire retardant polyether polyurethane foam with density of 1.5 pounds per cubic foot (24 kg per cubic meter), in the following dimensions and quantities:

Dunnage A - Two pieces - 19.5 by 8.5 by 2.5 in. (495 by 216 by 64 mm)

Dunnage B - Four pieces - 8.5 by 8.5 by 4.0 in. (216 by 216 by 102 mm) with a square 4.0 by 4.0 in. (102 by 102 mm) cut from one corner of the 8.5 by 8.5 in. (216 by 216 mm) surface.

Dunnage C - Four pieces - 8.5 by 8.5 by 8.0 in. (216 by 216 by 203 mm) with a cube 4.0 by 4.0 by 4.0 in. (102 by 102 by 102 mm) cut from one corner.

Dunnage D - One piece - 13.75 by 12.0 by 6.0 in. (349 by 305 by 152 mm)

Dunnage E - One piece - 14 by 14 by 16.5 in. (356 by 356 by 419 mm) with a 7.0 by 4.0 by 3.5-in. (178 by 102 by 89-mm) cavity centered on one 14 by 14 in. (356 by 356 mm) surface.

Adhesive - Scotch Grip 4500, The 3M Co, St. Paul, MN

Polyethylene bag - 8 by 4 by 24 in. (203 by 102 by 610 mm)

Strapping (steel or plastic) - 3/8 in. (10 mm) with required strapping tool

FRAGILE labels

7. B. Storage Procedure (See figure 405.)

(1) Place GH-14 in polyethylene bag. Fold mouth of bag over. Do not seal bag.

(2) Insert dunnage E, cavity side up, in bottom of inner container. Place GH-14 in cavity face down. Coil cable on foam around the unit.

(3) Insert dunnage D in retainer on the inner container top flap.

(4) Fold in flap with dunnage first, then fold in remaining three flaps to close inner container.

(5) Secure four pieces of dunnage C in the four bottom inside corners of the outer container, with the cutout facing up so inner container can rest in the four cutouts.

(6) Secure four pieces of dunnage B in the four upper inside corners of the outer container, with the cutout corners facing inside of outer container.

(7) Secure two pieces of dunnage A, one on opposite top flaps of outer container.

(8) Insert inner container into outer container and fold in flaps of outer container with dunnage first, then fold in the remaining two flaps to close container.

CAUTION: DO NOT USE CARTON TAPE. REMOVAL OF THIS TAPE DAMAGES THE CONTAINER AND SHORTENS ITS LIFE SPAN.

(9) Install one strap parallel to top flap seam on outer container and two straps intersecting top flap seam.

(10) Apply FRAGILE labels and mark carton to identify component and to indicate date of packing.

8. Storage Instructions for TARSYN

A. Equipment and Materials

NOTE: Equivalent substitutes may be used for listed items.

Carton and panels - Corrugated fiber board, 200-lb (90.8-kg) test in the following sizes:

Carton A - 16 by 16.5 by 7.25 in. (406 by 419 by 184 mm)

Carton B - 22 by 12.5 by 13 in. (559 by 318 by 330 mm)

Carton C - 28 by 18.5 by 19 in. (711 by 470 by 482 mm)

Panel A - 16 by 16.5 in. (406 by 419 mm)

Panel B - 15 by 16.5 in. (381 by 419 mm)

Carton D - Corrugated fiber board, 275-lb (125-kg) test; 34 by 24.5 by 24.75 in. (864 by 622 by 629 mm)

Corner cushion blocks (24) - fire retardant polyether polyurethane foam with density of 1.5 pounds per cubic foot (24 kg per cubic meter); 6 by 6 by 6 in. (152 by 152 by 152 mm) with a 3 by 3 by 3-in. (76 by 76 by 76-mm) cutout on one corner

Styrene insert, see figure 407 for fabrication instructions

Polyethylene bag - 12 by 8 by 35 in. (305 by 203 by 889 mm)

3/8-in. (10 mm) steel or plastic strapping with suitable strapping tool

FRAGILE labels

8. B. Storage Procedure (See figures 407 and 408.)

(1) Obtain or fabricate an insert (figure 407).

(2) Place TARSYN in polyethylene bag. Fold mouth of bag over. Do not seal bag.

(3) Place panel B in carton A, place TARSYN on panel B, cover TARSYN with insert, and place panel A on insert.

CAUTION: DO NOT USE SHIPPING TAPE TO SEAL ANY OF THE CARTONS.

(4) Close carton A and strap around girth of carton twice, 3 inches (76.2 mm) from both ends. Ensure that the following label appears on top of the carton near the center of top seam. If label is not present, mark the carton as follows:

DO NOT OPEN THIS CARTON WITH A RAZOR TYPE KNIFE. DO NOT CUT BAND AT TOP CENTER OF TOP SEAM OF CARTON.

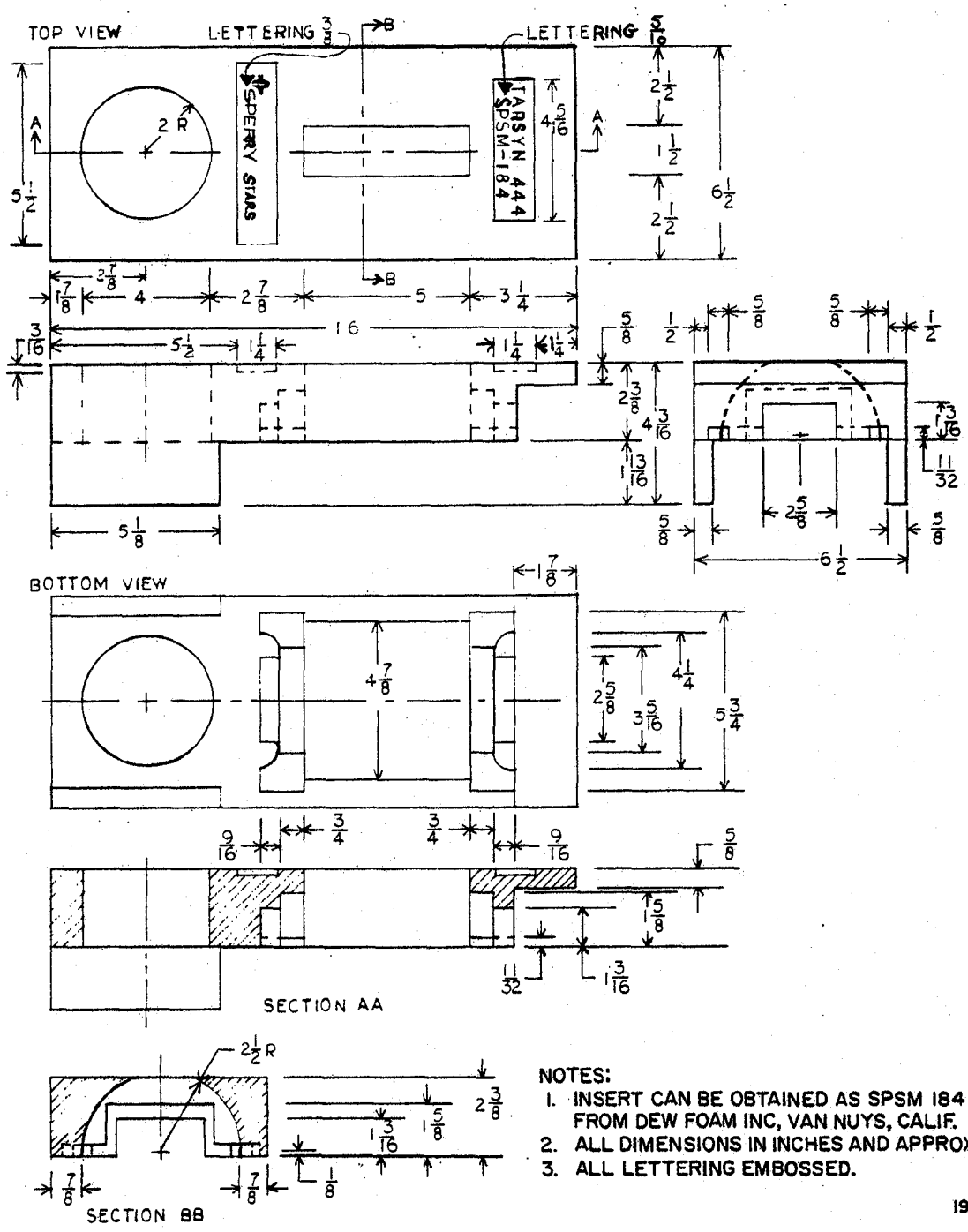
(5) Place four corner blocks in bottom corners of carton B and place carton A in corner blocks.

(6) Place four corner blocks on top of carton A and close carton B.

8. B. (7) Repeat the procedure outlined in steps (4) and (5), placing carton B in carton C and then, carton C in carton D.

(8) Strap carton D two places each on the length and girth, 4 inches (101.6 mm) from each corner.

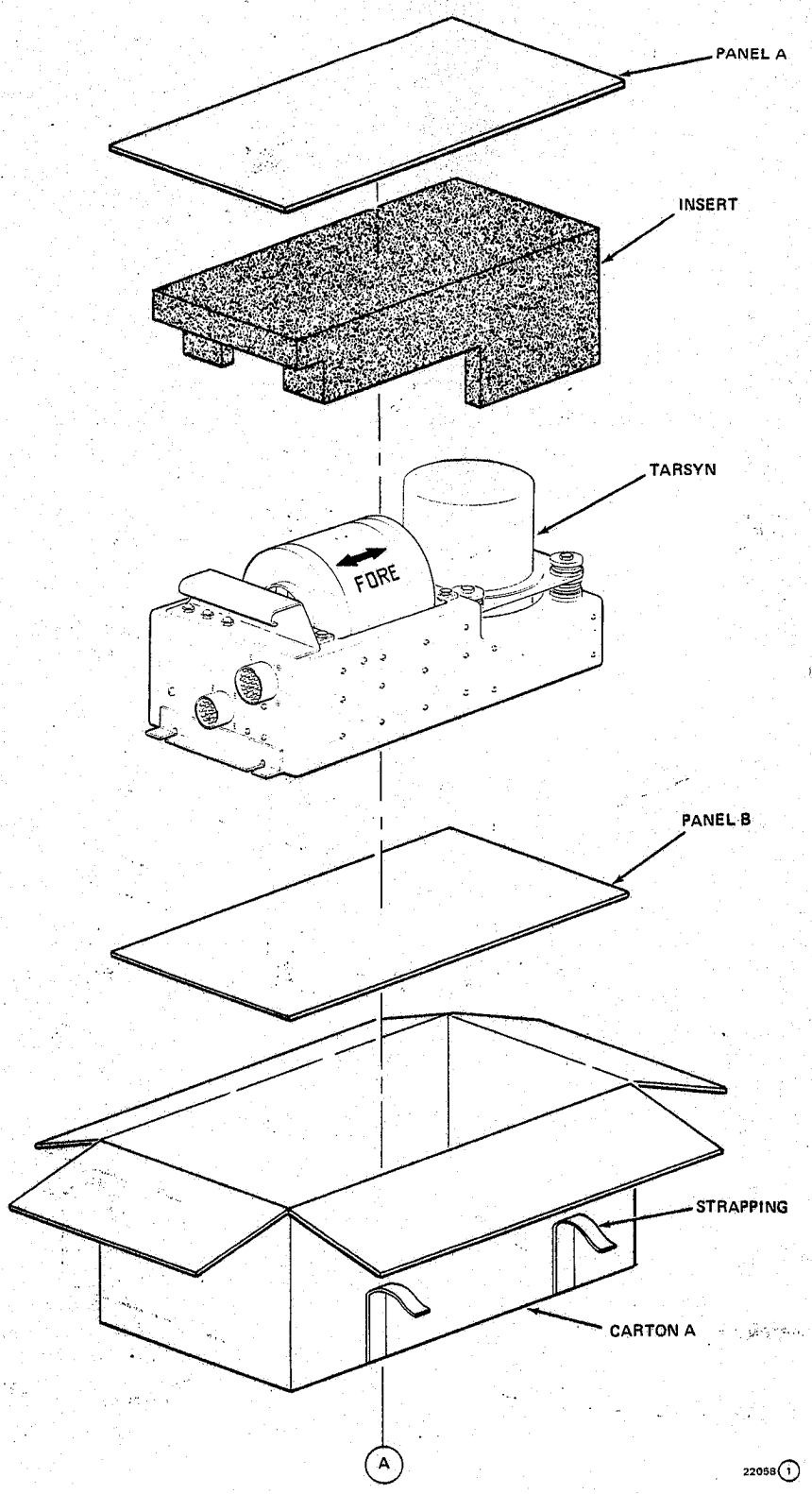
(9) Apply FRAGILE labels and mark carton to identify the component and indicate the date of packing.



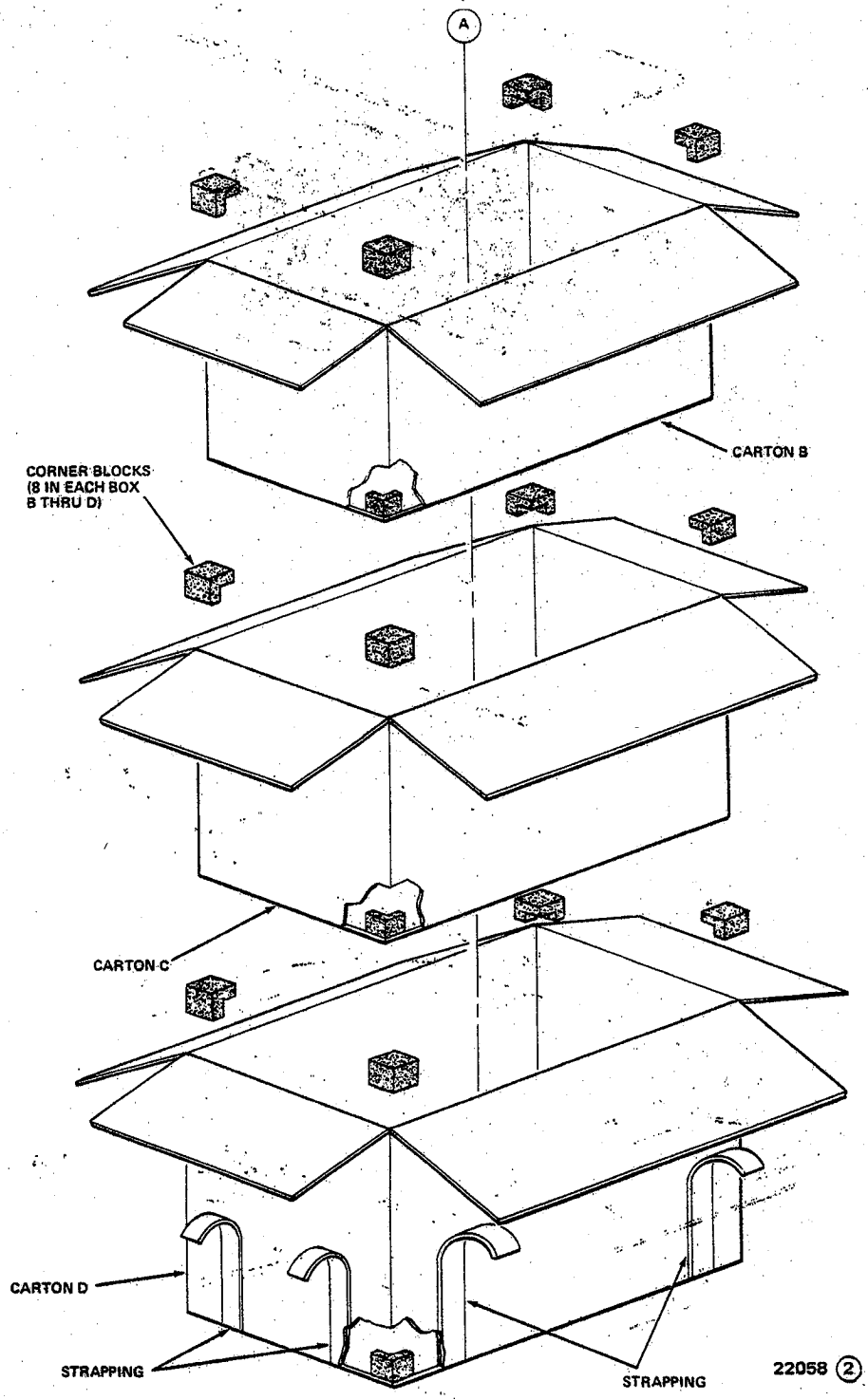
NOTES:
1. INSERT CAN BE OBTAINED AS SPSM 184 FROM DEW FOAM INC, VAN NUYS, CALIF.
2. ALL DIMENSIONS IN INCHES AND APPROXIMATE.
3. ALL LETTERING EMBOSSED.

19653

Insert Construction for TARSYN
Figure 407



Shipping and Storage Container for TARSYN
Figure 408 (Sheet 1)



Shipping and Storage Instructions for TARSYN
Figure 408 (Sheet 2)