C-5A/B

POCKET NOTEBOOK

FOR TRAINING PURPOSES ONLY

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Lockheed-Georgia Company
A DIVISION OF LOCKHEED CORPORATION
MARIETTA, GEORGIA 30063

December 1985

C-5 TEAM

With this reprint of the C-5 Pocket Notebook we are including information on the C-5B and its subsystems. We are pleased with the reception and acceptance you have given the C-5 Pocket Notebook and we hope the information provided herein is of value and use to you, the operations and maintenance personnel of the C-5 Galaxy team.

B. G. Robinson
Deputy Director
C-5A Programs

R. A. Meadows
Deputy Director
C-5B Programs

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SECTION I
GENERAL AIRCRAFT

INTRODUCTION

The C-5 is a long-range, high-speed, swept-wing aircraft, designed for use as a heavy logistics transport. The aircraft is manufactured by Lockheed Georgia Company, a Division of Lockheed Corporation and powered by four General Electric TF-39 engines mounted in individual pods beneath the wing. The C-5 is capable of airlifting in excess of 250,000 pounds of cargo and 75 troops at a clean recommended speed of 350 knots or 0.825 Mach. With its inflight refueling capability the range is unlimited.

The cargo compartment is adaptable to the transportation of personnel and can accommodate 270 troops when the palletized seat kit is installed. This is in addition to the 75 troops that can be carried in the troop compartment and eight persons in the troop/courier compartment. A minimal crew consists of three, with seating provisions for seven relief crew members. The aircraft provides for a possible seating arrangement of 366 persons.

The aircraft landing gear is of the fully retractable, modified tricycle type, with four wheels on the steerable nose landing gear and six bogie-mounted wheels on each of the four main landing gear assemblies. The weight of the aircraft is thus distributed among 28 wheels, which allows the aircraft to land or takeoff on unimproved runways. The maximum takeoff gross weight of the aircraft is 769,000 pounds with a fuel load of approximately 332,500 pounds/51,000 gallons (after wing modification C-5A).

The aircraft has many unique features, some of which are:

A forward and aft cargo door system, enabling straight-through loading and unloading; a landing gear kneeling system which enables the cargo deck to be tilted nose-down or tail-down, or to be lowered in the level position; two auxiliary power units, one located in each main landing gear pod, are provided to supply electrical, pneumatic, and hydraulic power (through use of air turbine motors) for engine starting and for ground operation and maintenance requirements.

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1C-5A-9	Cargo Loading
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1C-5A-10-1	Test Instructions Engine Build-up Unit, C-5A and C-5B
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1C-5A-10JG-1-1	Buildup Instructions, Aircraft Power Package, C-5A and C-5B
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1C-5A-23	System Peculiar Corrosion Control Manual, C-5A and C-5B
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1C-5A-102	Operating Instructions, Aircrew/Ground Crew, Malfunction Detection, Analysis, and Recording System (MADARS), C-5A
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1C-5A-01	List of Applicable Publications, C-5A and C-5B
1C-5A-06	Work Unit Code Manual, C-5A and C-5B
2J-TF39-6	Field Maintenance Instruction Turbofan Engine Model TF39-GE-1
00-25-113-C5	Critical Alloys and Precious Metals Parts List, C-5A and C-5B

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1C-5A-1CL-1-1	Pilots' Scroll Checklist, C-5A and C-5B
1C-5A-1CL-2	Flight Engineer's Flight Crew Checklist, C-5A and C-5B
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1C-5A-2-14	Interior Trim, C-5A and C-5B
1C-5A-2-15	Seal Repair and Replacement, C-5A and C-5B

Additional information on operation, repair, parts listing, inspection, storage, weight and balance, cargo loading, power package buildup, airplane inventory, and critical alloys and precious metals may be found in the following publications:

1C-5A-1	Flight Manual, C-5A and C-5B
1C-5A-1-1	Performance Data, C-5A and C-5B
1C-5A-3	Structural Repair Instructions, C-5A and C-5B
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1C-5A-4-8	Illustrated Parts Breakdown, Alternate Mission Kits, C-5A and C-5B
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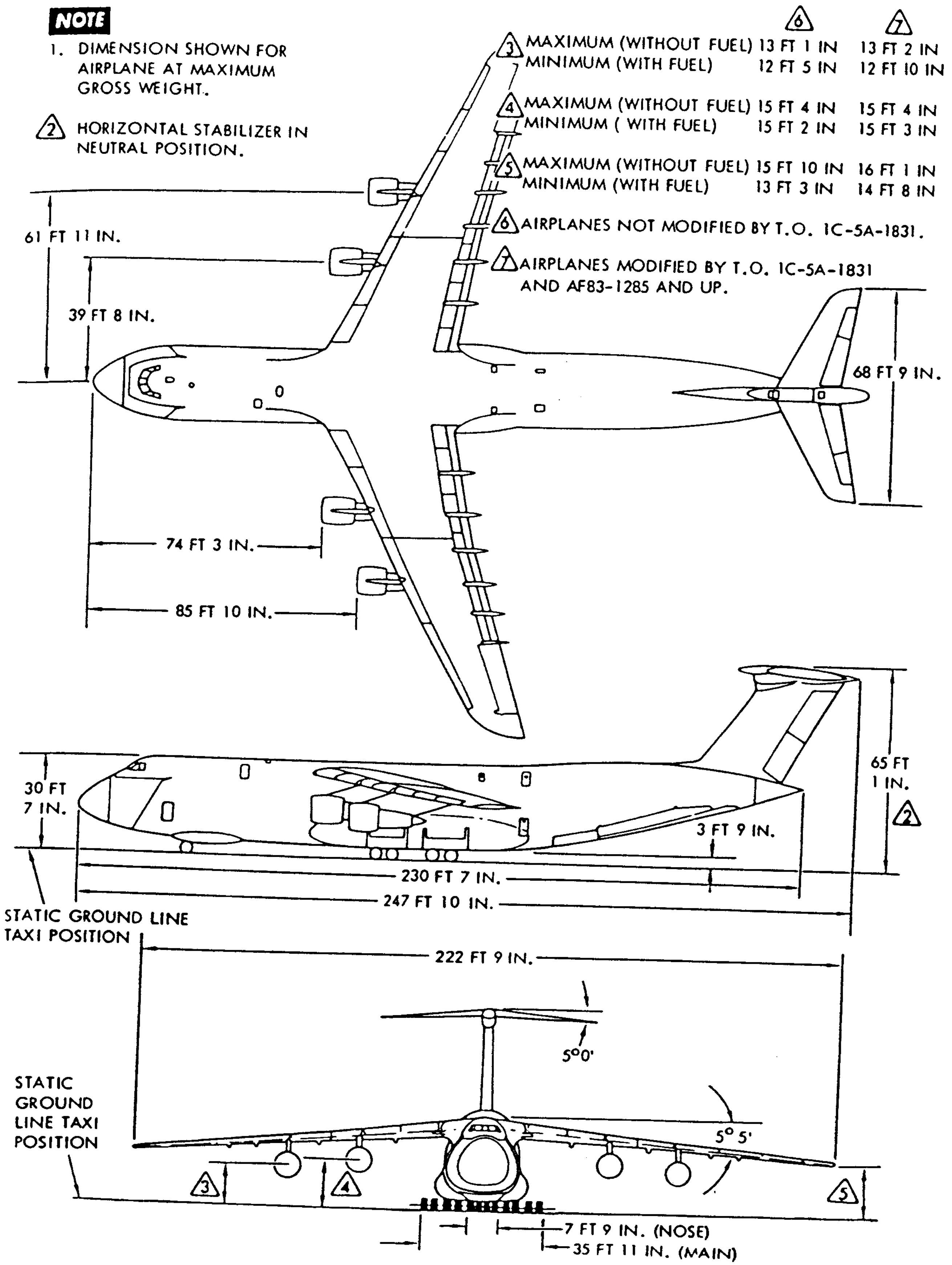
C-5A TECHNICAL ORDERS (SHEET 3)



MAJOR DIMENSIONS

DIMENSIONS

Length	247.8 ft
Height	65.1 ft
Wing Span	222.8 ft
Wing Area	6,200 sq ft

WEIGHTS

Maximum Ramp Weight	732,500 △1 772,000 △2 772,000 △3
Normal Ramp Weight	732,500 △2
Maximum Flight Weight	712,500 △1 769,000 △2
Maximum Fuel Weight	318,100 △1 332,500 △2
Normal Landing Fuel Weight	159,250
Maximum Zero Fuel Weight	498,000 △1 (2.50g) 590,000 △2 △3
Normal Landing Weight	635,850

CARGO COMPARTMENT

Length including Ramps	144.6 ft
Height	13.5 ft
Width	19.0 ft
Total Volume including Ramps	34,734 cu ft
Palletized Volume including Ramps (36 463L pallets)	19,020 cu ft
Forward Loading Opening	Height 13.5 ft, Width 19.0 ft
Aft Loading Opening	Height 9.5 ft, Width 19.0 ft

PERSONNEL CAPACITY

Active Crew	5
Relief Crew	7
Courier Seating	8
Troops - Upper Troop Compartment	75

FUEL SYSTEM

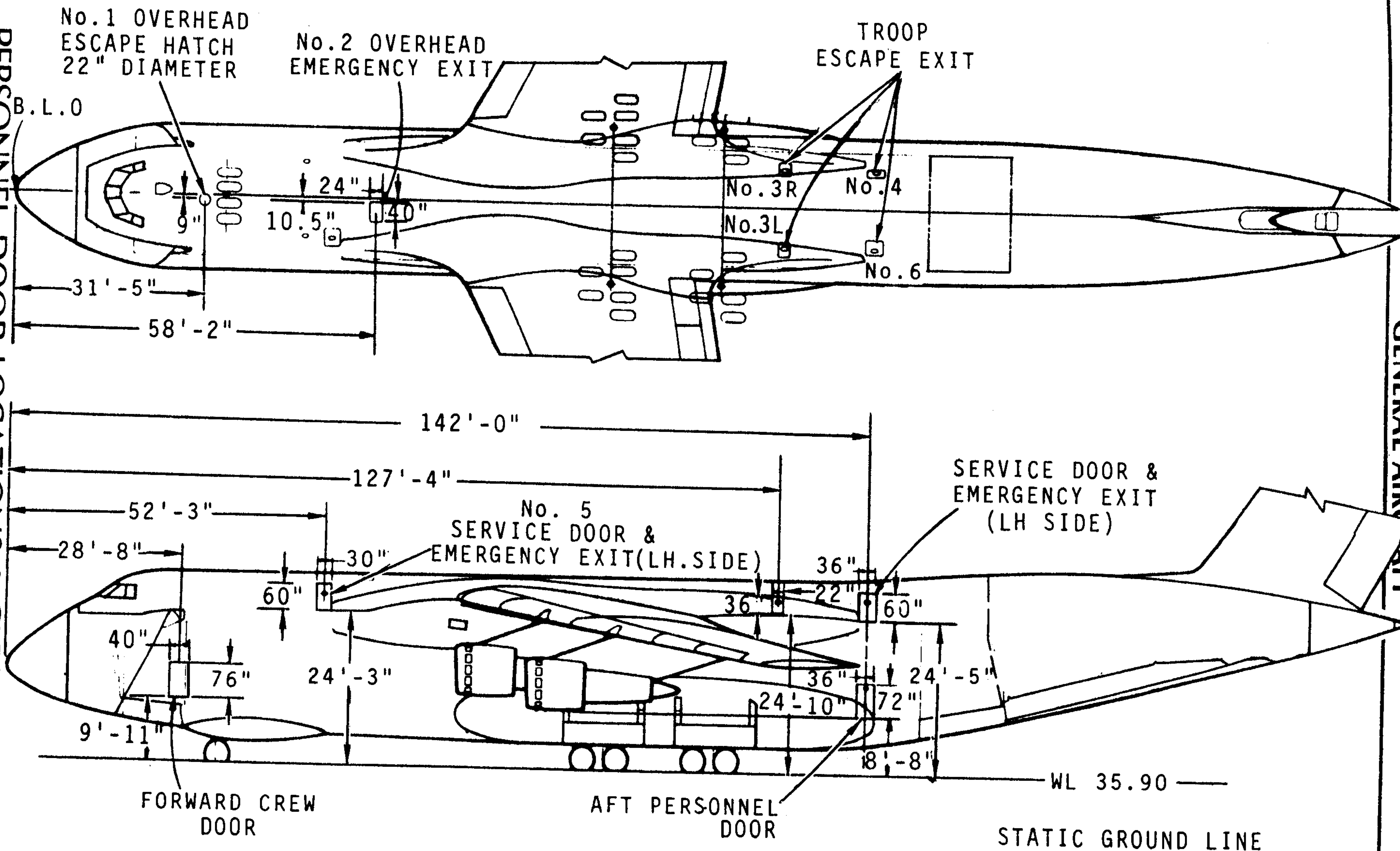
Capacity, JP-4 (6.5 lbs)	48,940 gal 51,150 gal	318,100 △1 332,500 △2 △3
Single Point Refueling Rate	2,400 U.S. Gallons/Min	(15,600 lb/min)
Jettison Rate	1,380 U.S. Gallons/Min	(8,970 lb/min)

LANDING GEAR

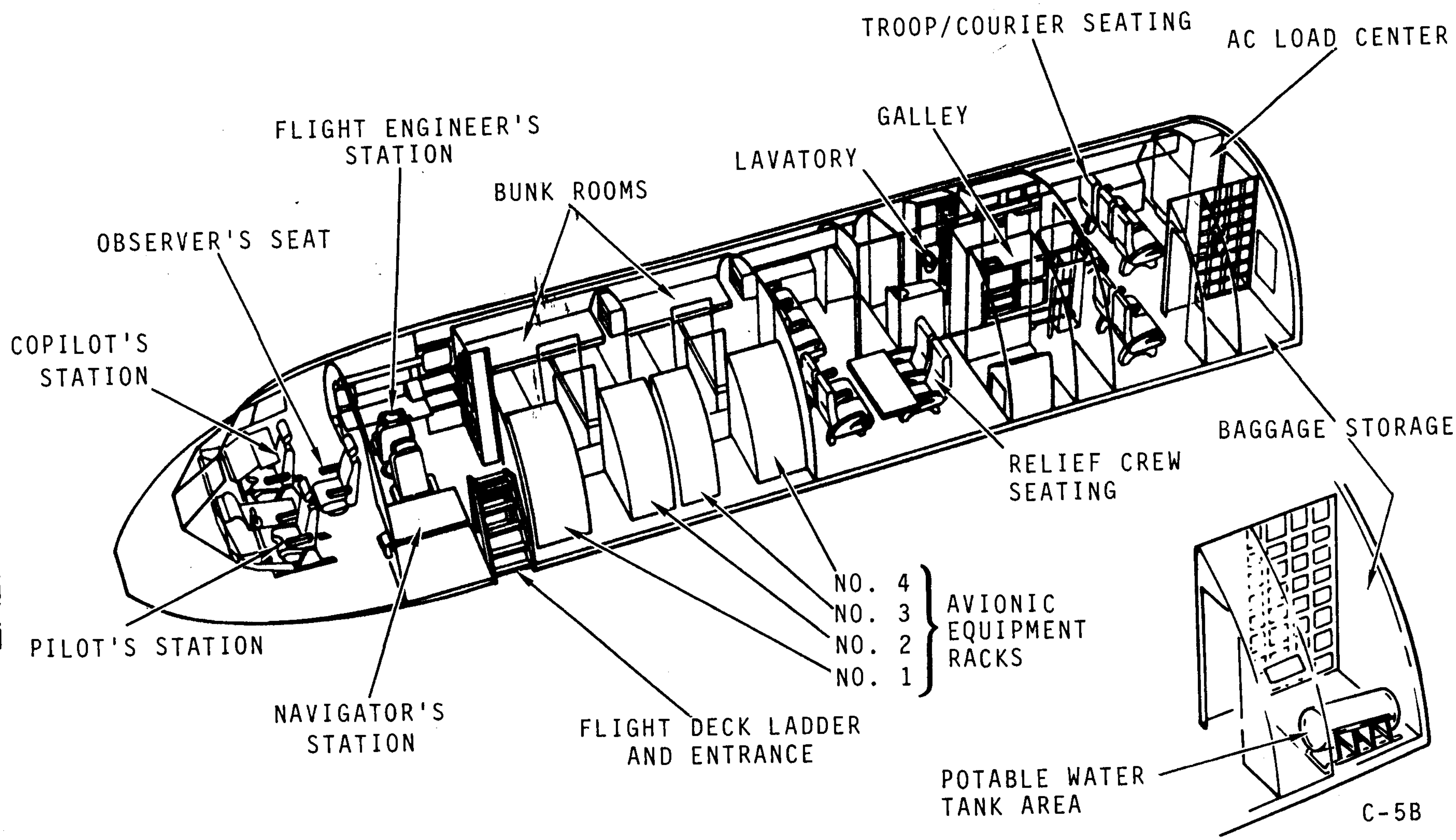
Number of Wheels	28(4 nose and 6 each on 4 main gear bogies)
Main Landing Gear Tread - Outer Tires	35.9 ft
Wheel Base	72.8 ft

△1 Airplanes Not Modified by T.O. 1C-5A-1831
△2 Airplanes Modified by T.O. 1C-5A-1831
△3 C-5B Airplane

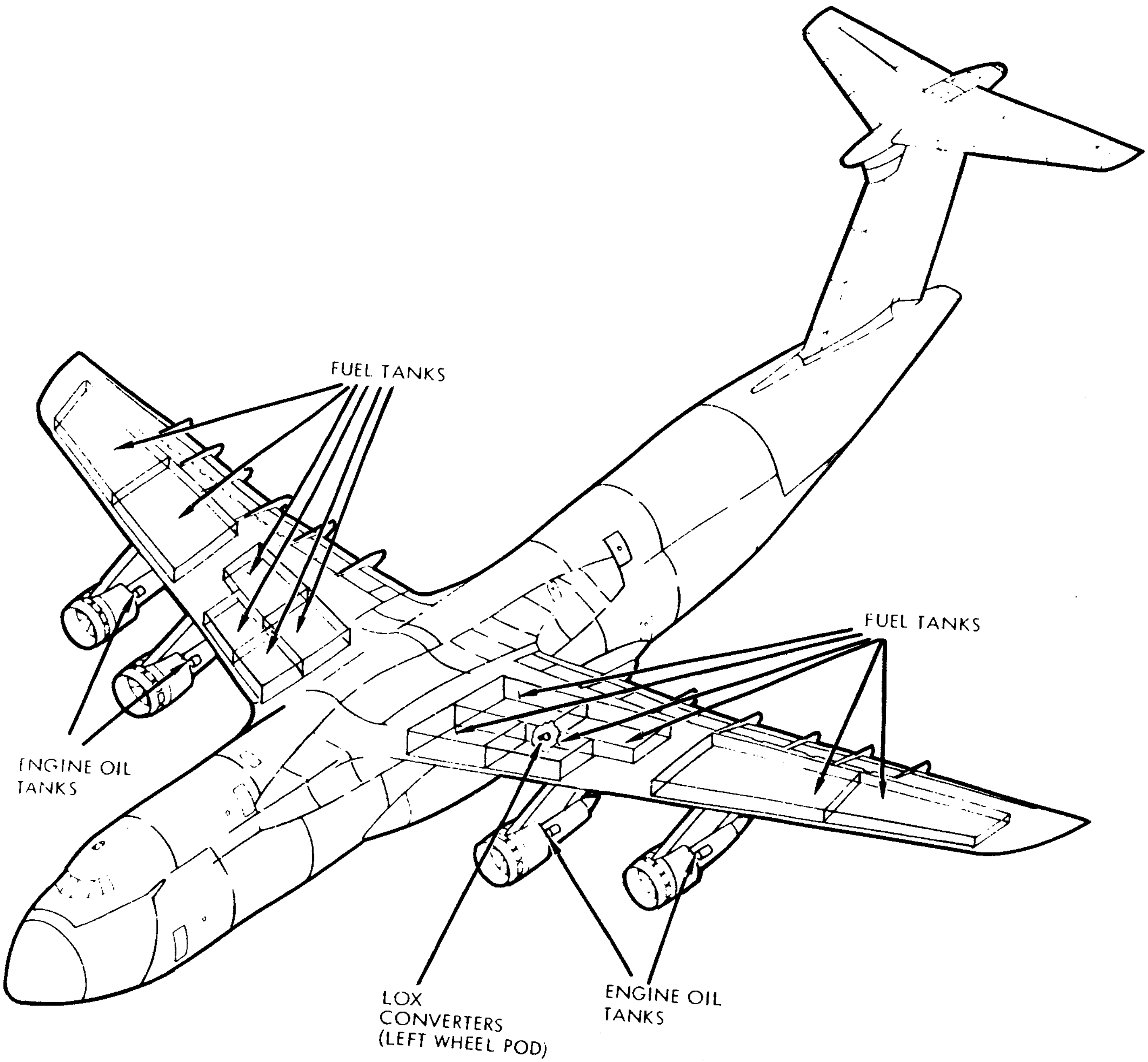
PERSONNEL DOOR LOCATIONS & CLEARANCES



FLIGHT DECK ARRANGEMENT

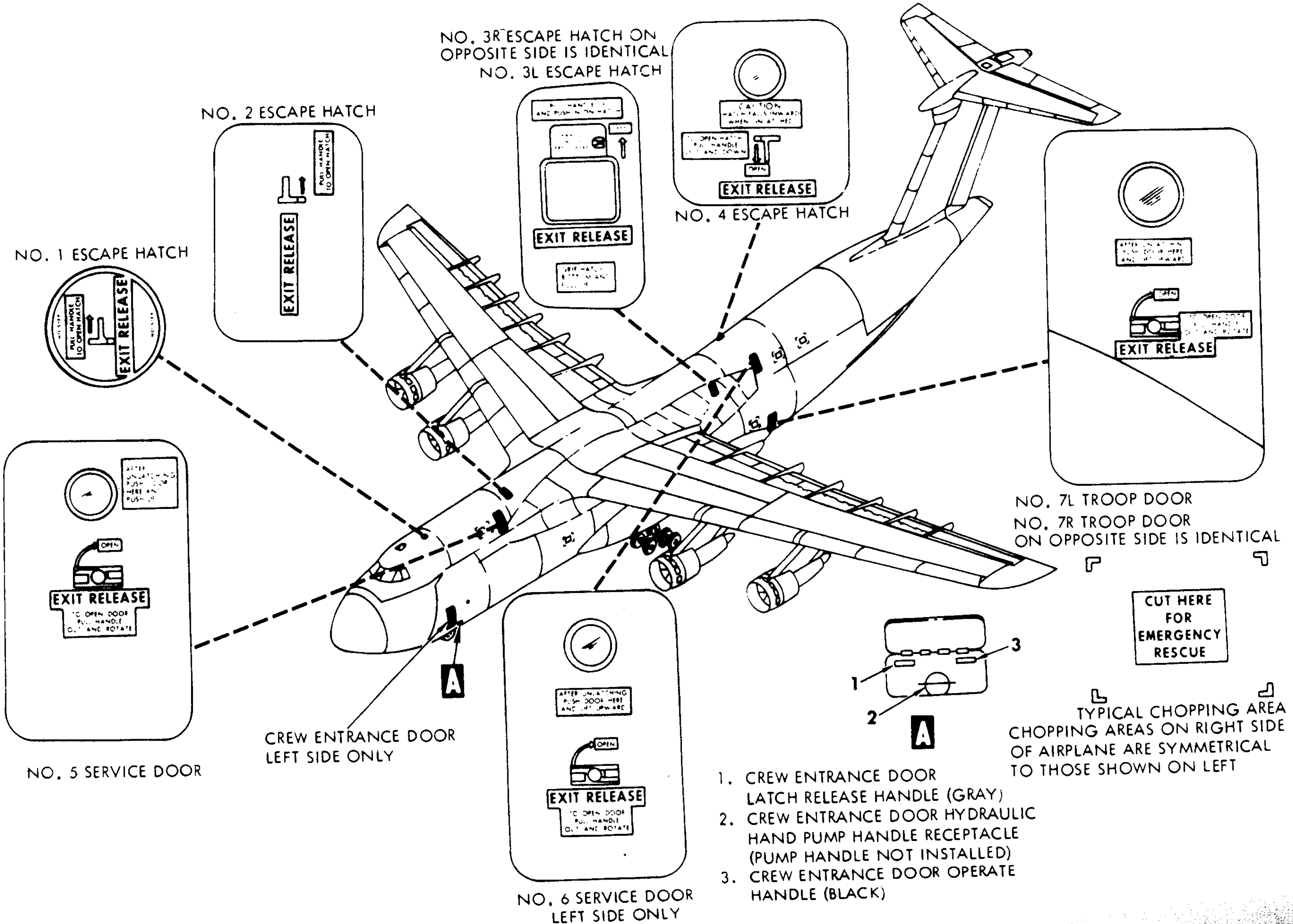


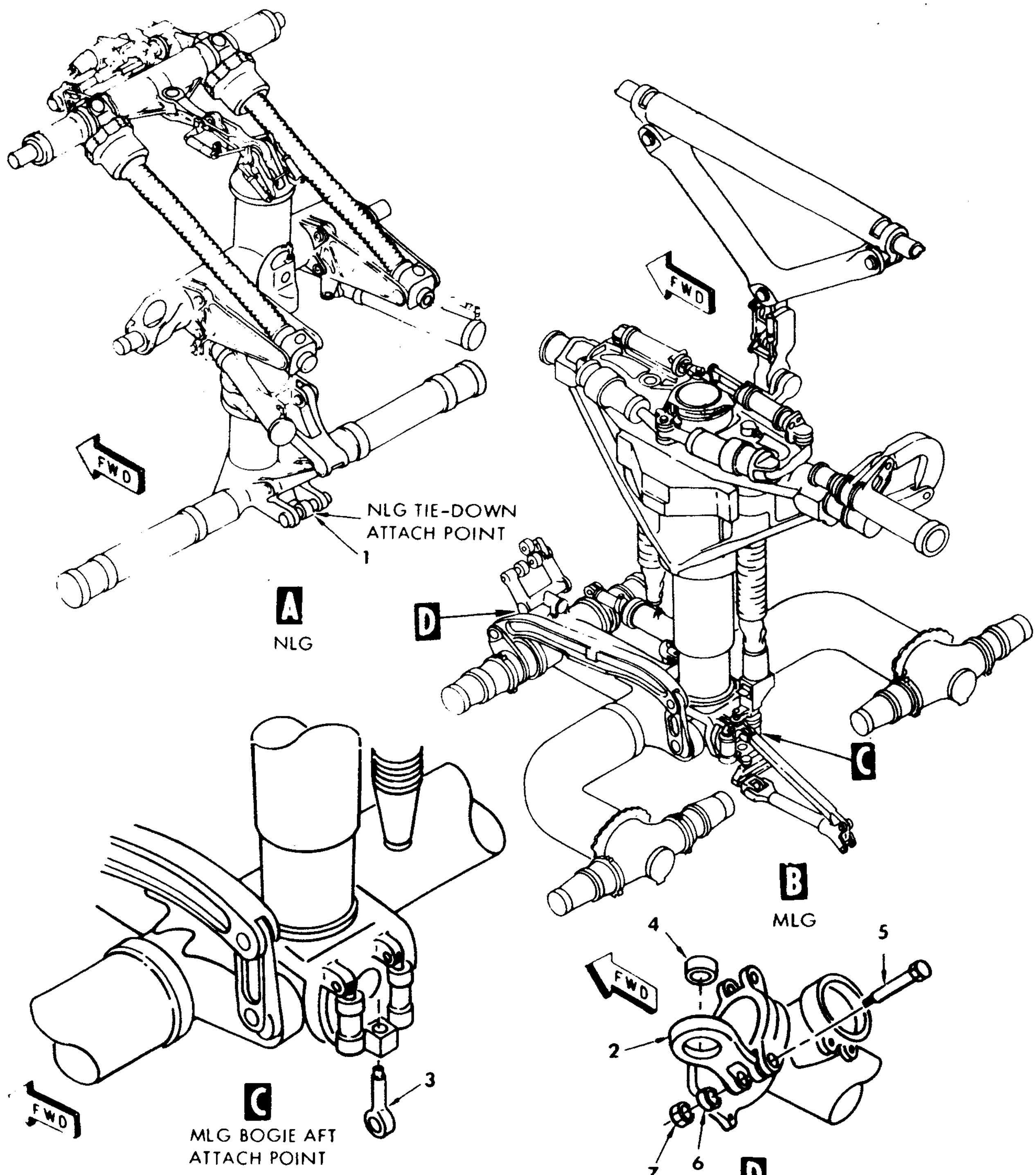
FLIGHT DECK ARRANGEMENT



HIGHLY FLAMMABLE AREAS

EMERGENCY ENTRANCES



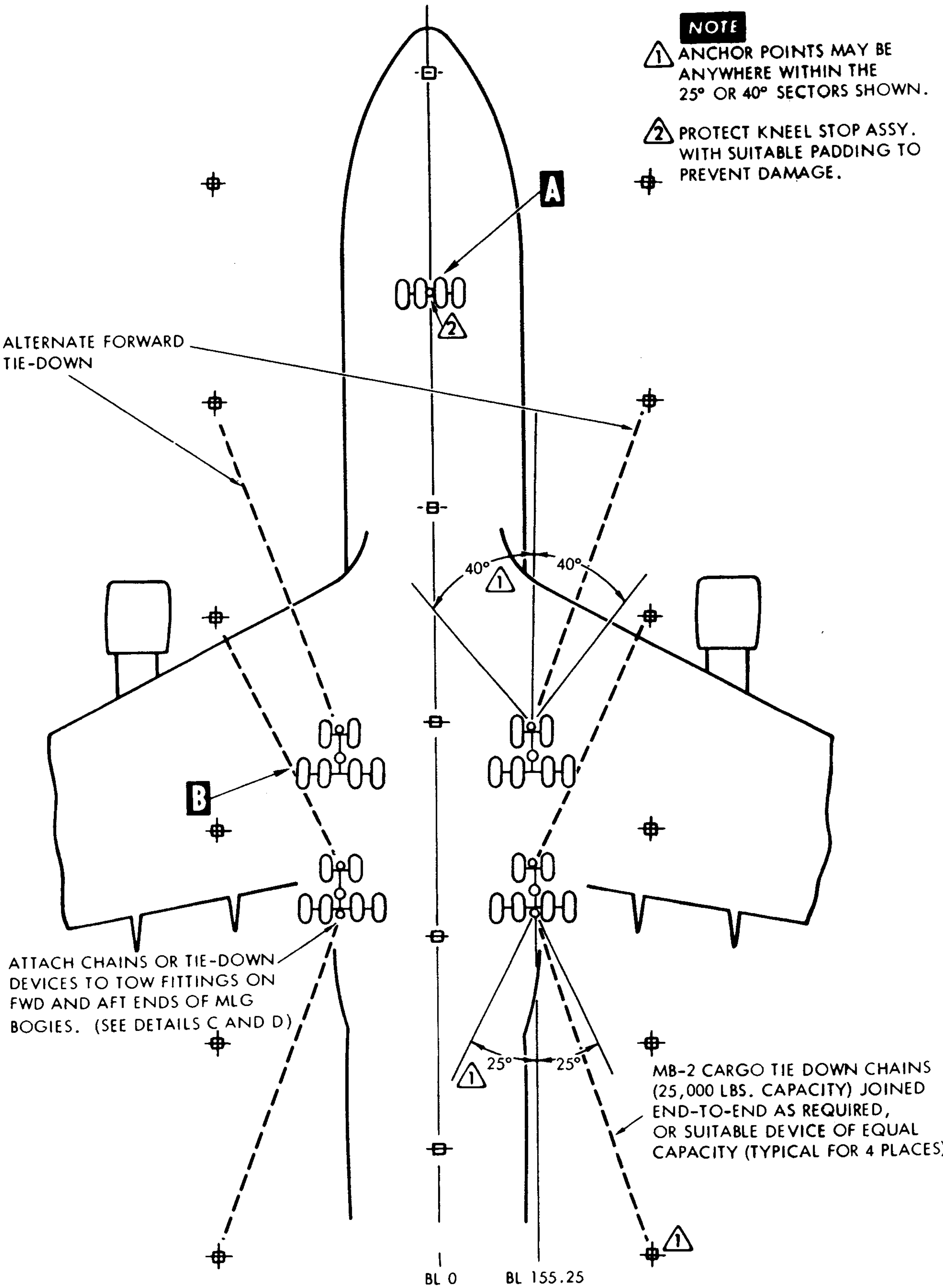


1. KNEEL STOP ROLLER
2. TOW RING (4G12427)
3. ADAPTER PIN (4G12557)
4. BUSHING (4S81117-141A)
5. BOLT (4G13810)
6. SPACER (4G13811)
7. NUT (AN310-18R)

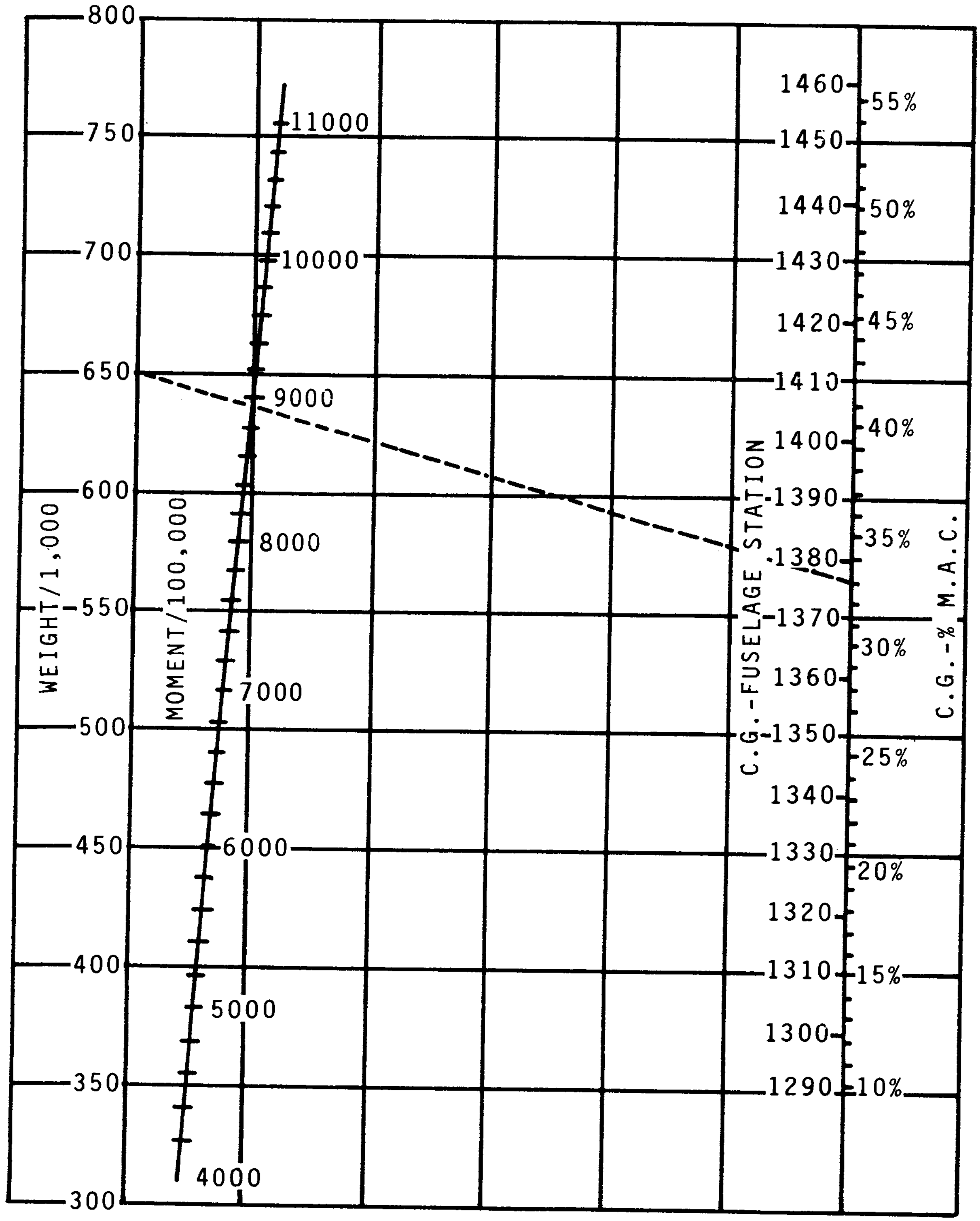
NOTE

ALL ITEMS ABOVE, EXCEPT ITEM 1, ARE ONBOARD EQUIPMENT.

AIRPLANE TIEDOWNS (SHEET 2)

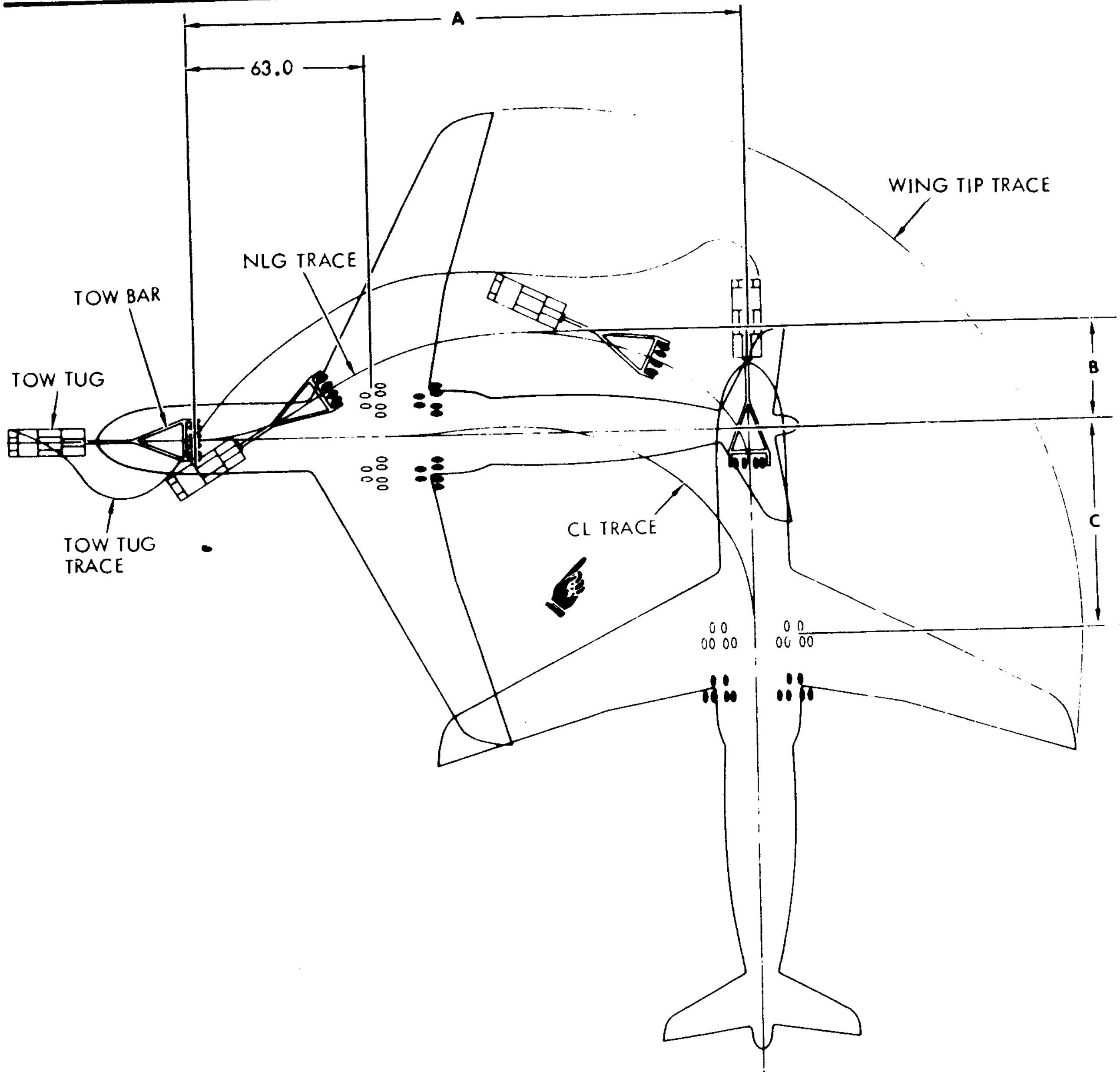


AIRPLANE TIEDOWNS (SHEET 1)



EXAMPLE:
GROSS WEIGHT=650,000 LB
MOMENT/100,000=8950
C.G.=STA 1377 (33.1%MAC)

CENTER OF GRAVITY LOCATOR



TOWING MODE	MAX NLG ANGLE	TOW DIRECTION	A (FEET)	B (FEET)	C (FEET)	REMARKS
FWD AND AFT MLG UNKNEELED AT 0 DEGREE POSITION	45 DEGREES	FORWARD	178.7	28.3	96.7	
		REARWARD	183.0	30.5	80.5	
FWD MLG UNKNEELED AFT MLG CASTERED	45 DEGREES	FORWARD	144.0	23.0	92.7	⚠1
	60 DEGREES	FORWARD	142.2	35.5	74.6	
FWD MLG KNEELED AFT MLG UNKNEELED AT 0 DEGREE POSITION	45 DEGREES	FORWARD	176.0	37.0	85.0	
		REARWARD	192.0	35.0	75.0	
	60 DEGREES	FORWARD	164.5	54.0	55.0	
		REARWARD	164.5	48.5	52.0	

⚠1 THE TRACE OF THE OUTBOARD HORIZONTAL STABILIZER TIP MAY GO OUTSIDE THE WING TIP TRACE BY APPROXIMATELY 12.0 FEET IN THIS TOWING MODE.

TOWING CLEARANCE PATTERNS

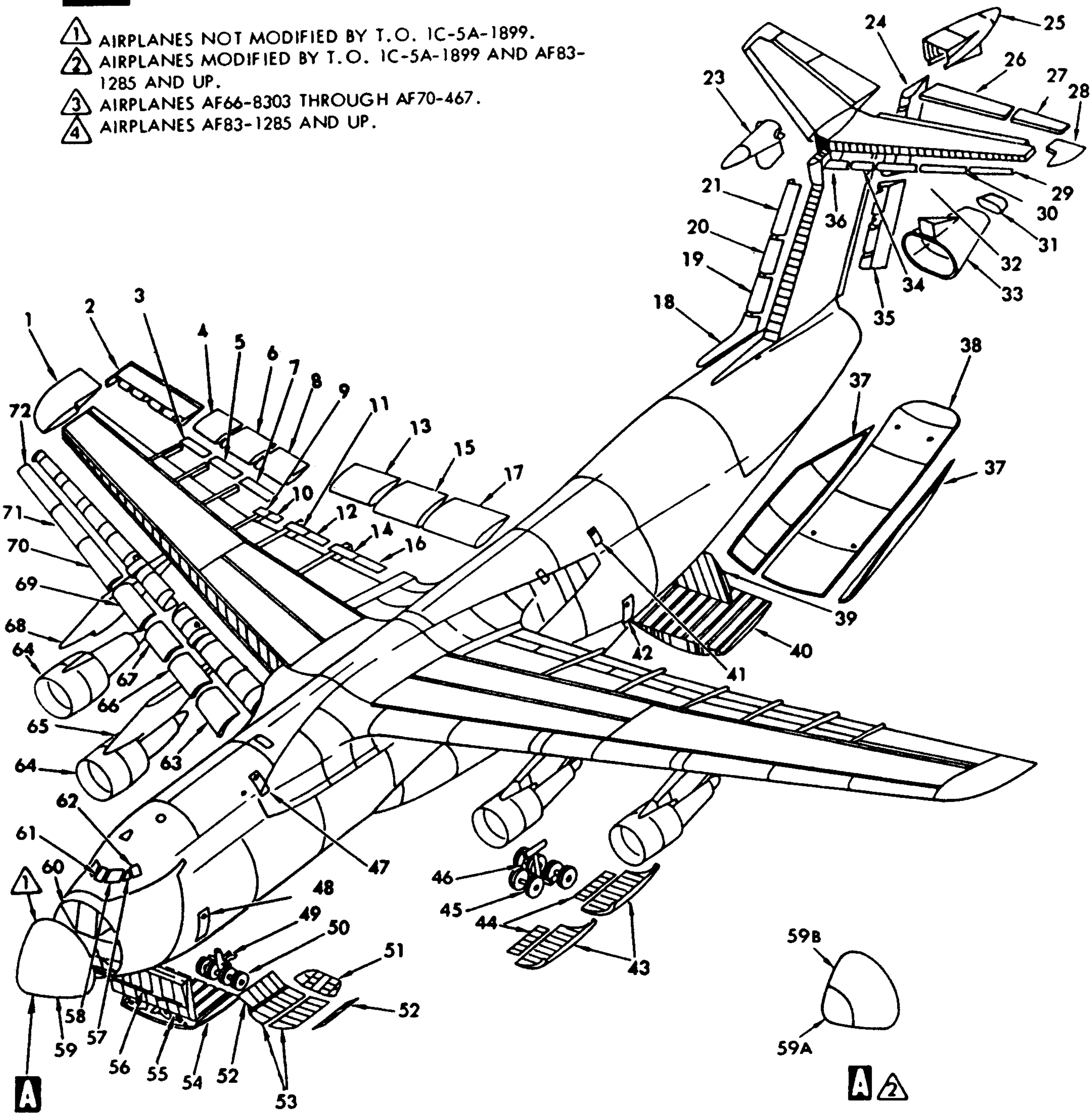
INDEX NO.	NOMENCLATURE	POUNDS ③	POUNDS ④
6	FLAP (NO. 5)		
7	SPOILER (NO. 7)	196	237
8	FLAP (NO. 4)	75	79
9	SPOILER (NO. 6)	217	258
10	SPOILER (NO. 5)	64	65
11	SPOILER (NO. 4)	67	65
12	SPOILER (NO. 3)	55	56
13	FLAP (NO. 3)	59	59
14	SPOILER (NO. 2)	293	349
15	FLAP (NO. 2)	63	64
16	SPOILER (NO. 1)	378	472
17	FLAP (NO. 1)	63	65
18	DORSAL	461	549
19	VERTICAL STABILIZER LEADING EDGE	26	31
20	VERTICAL STABILIZER LEADING EDGE	61	71
21	VERTICAL STABILIZER LEADING EDGE	41	32
22	DELETED	40	32
23	FORWARD BULLET FAIRING		
24	UPPER RUDDER	148	146
25	AFT BULLET FAIRING (INCLUDING EQUIPMENT)	272	283
26	INBOARD ELEVATOR	269	236
27	OUTBOARD ELEVATOR (INCLUDING BALANCE WEIGHTS)	298	321
28	HORIZONTAL STABILIZER TIP	249	255
29	HORIZONTAL STABILIZER LEADING EDGE	88	88
30	HORIZONTAL STABILIZER LEADING EDGE	10	12
31	STATION KEEPING RADOME	11	12
32	HORIZONTAL STABILIZER LEADING EDGE	23	23
33	AFTERBODY STRUCTURE	13	13
34	HORIZONTAL STABILIZER LEADING EDGE	260	253
35	LOWER RUDDER	15	14
36	HORIZONTAL STABILIZER LEADING EDGE	345	347
37	SIDE AFT CARGO DOOR	15	13
38	CENTER AFT CARGO DOOR	395	422
39	AFT PRESSURE DOOR	908	1015
40	AFT RAMP	1913	2098
41	AFT SERVICE DOOR	3888	4248
42	AFT PERSONNEL DOOR	69	89
43	MAIN LANDING GEAR OUTBOARD DOOR	93	81
44	MAIN LANDING GEAR INBOARD DOOR	278	382
45	MAIN LANDING GEAR WHEEL AND TIRE ASSEMBLY (INCLUDING BRAKE)	47	47
46	MAIN LANDING GEAR ASSEMBLY	373	373
47	FORWARD SERVICE DOOR	7436	7451
48	CREW DOOR	65	89
49	NOSE LANDING GEAR ASSEMBLY	75	76
50	NOSE LANDING GEAR WHEEL AND TIRE ASSEMBLY	3220	3734
51	NOSE LANDING GEAR KNEELING DOOR	248	243
52	NOSE LANDING GEAR OUTBOARD DOOR	75	105
53	NOSE LANDING GEAR INBOARD DOOR	54	56
54	FORWARD RAMP	165	224
55	FORWARD RAMP EXTENSION	3569	3501
56	FORWARD RAMP EXTENSION TOES	1457	1261
		410	468

INDEX NO.	NOMENCLATURE	POUNDS ③	POUNDS ④
57	CLEAR VISION WINDSHIELD (INCLUDING FRAME)	42	42
58	MAIN WINDSHIELD	126	126
59	NOSE RADOME	505	-
59A	NOSE RADOME	83	83
59B	NOSE RADOME PLUG	590	590
60	VISOR DOOR	5969	5969
61	CENTER WINDSHIELD	72	72
62	SIDE WINDSHIELD		
63	SLAT (NO. 1)	36	36
64	POWER PLANT (Q.E.C.)	381	387
65	INBOARD PYLON	9409	10424
66	SLAT (NO. 2)	1239	1635
67	SLAT (NO. 3)	350	351
68	OUTBOARD PYLON	290	241
69	SLAT (NO. 4)	1274	1702
70	SLAT (NO. 5)	239	242
71	SLAT (NO. 6)	325	258
72	SLAT (NO. 7)	230	222
		208	190

MAJOR COMPONENT WEIGHTS (SHEET 2)

NOTE

1. AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1899.
2. AIRPLANES MODIFIED BY T.O. 1C-5A-1899 AND AF83-1285 AND UP.
3. AIRPLANES AF66-8303 THROUGH AF70-467.
4. AIRPLANES AF83-1285 AND UP.



INDEX NO.	NOMENCLATURE	POUNDS 3	POUNDS 4
1	WING TIP	367	360
2	AILERON (INCLUDING BALANCE WEIGHT)	1010	1051
3	SPOILER (NO. 9)	64	65
4	FLAP (NO. 6)	190	223
5	SPOILER (NO. 8)	66	67

MAJOR COMPONENT WEIGHTS (SHEET 1)

UNIT	SERVICE WITH	CAPACITY	CONNECTION LOCATIONS	REMARKS
Lavatory A	Potable water	Flight station - 10 gallons, troop compartment - 26 gallons, cargo compartment - included in galley.	Same as for galley water	Same as for galley water.
	Toilet waste lines	Standard service trucks.	Flight station - same height and near water service panel, at FS816. Service panel location for the troop compartment is at FS1454. Service doors for the cargo compartment are at FS594 and FS734.	Same remarks as for galley water. Note - Lavatory toilet waste tanks: water charger primer 4.5 gallons and 8 ounces of chemical deodorizing agent.
Main Engines Ground Start	Pressurized air	N.A.	One in left main gear pod, FS1700.	Needed only when APUs inoperative. Standard MA-1A ground cart, or equivalent.
Rain Repellent A	Commercially available canisters	500 cc in 2 bottles prepressurized.	Flight station.	Readily accessible in the flight station, serviced as required.
Electrical Current	3-phase - 400-cycle 115/200V 4 wire Y connected	80 KVA ground cart.	FS974, WL100, RBL70	
Hydraulic	MIL-H-83282 fluid	290 gallons approximately.	Service panel, FS1210, right-hand landing gear pod.	Fluid is filtered through a 5 micron filter at each reservoir.
Fire Suppression System	Liquid nitrogen (LN_2)	750 pounds each Dewar (220 gallons total).	Service panel FS1478, right-hand landing gear pod.	Two Dewars, one each side of fuselage at wing root.
Airconditioning Turbo Compressors	MIL-L-7808 A	275 cc each turbine.	Remove plug at turbine for gravity feed.	Turbines located left and right sides of environmental compartment.
Main Landing Gear Main Gearboxes	MIL-L-7808		Sight gage plug on each gearbox, remove plug and fill til overflows.	Gearbox located in each wheel well.
Nose Landing Gear Main Gearbox	MIL-L-7808		Fill plug on gearbox in forward wheel well.	Fill to midpoint on sight gage.

SERVICING INFORMATION (SHEET 1)

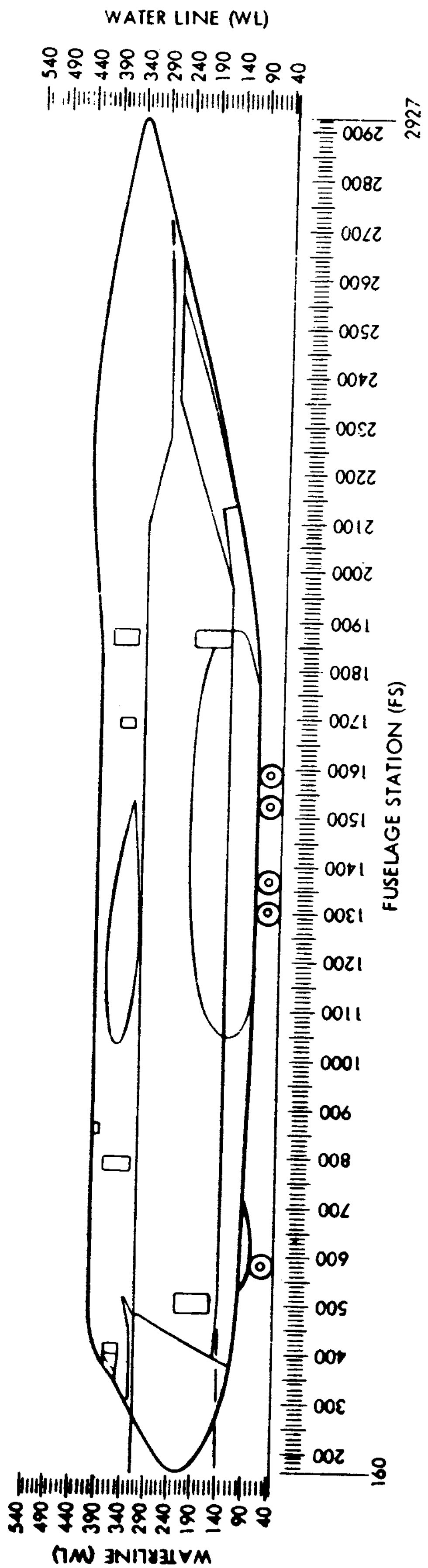
UNIT	SERVICE WITH	CAPACITY	CONNECTION LOCATIONS	REMARKS
Fuel	Primary JP-4 Alternates JP-5, Jet A, JP-8, Jet A-1, Jet B	49,000 gal. orig. wing. 51,154 gal. wing mod by T.O. 1C-5A-1831, and C-5B. For fuel weight limits ref. T.O. 1C-5A-2-1.	Two refueling adapters in the forward section of the left main gear pod and two in the right.	The adapters, MS24484-2, mate with type D-1 pressure fuel nozzles (MIL-N-5877 and MS29520). The adapters are for pressure refueling, 55 psi, with a flow rate of 600 gallons/minute each, for a total of 2400 gallons/minute.
Engine	MIL-L-7808 Oil	Each engine tank 9.1 gallons.	Inboard engine filler - located in nacelle at fuselage station 1194. Outboard engine filler - located at fuselage station 1333.	Filler cap for gravity refill - one in each engine nacelle. Fill to full mark on dipstick.
Constant Speed Drive	MIL-L-7808 Oil	Each CSD - 3 quarts.	Inboard engine filler - located in nacelle at fuselage station 1181. Outboard engine filler - located at fuselage station 1316.	Fill connection for pressure refill - one in each engine nacelle. Sight gauge on CSD.
Auxiliary Power Unit	MIL-L-7808 Oil	Each APU tank - 0.5 gallon.	One APU tank filler is located in the right and left aft main gear pods.	Filler caps for gravity refill. Sight gage on APU..
ATM	MIL-L-7808	Each ATM - 1.5 pints.	ATM below each APU.	Filler caps for gravity refill. Cap has dipstick attached.
Oxygen - Crew and Upper Aft Troop Compartment	Liquid oxygen per MIL-O-27210,Grade B Type II	100 liters (one 75-liter converter and one 25-liter).	In left main gear pod at fuselage station 1450.	Use type TMU-27/M liquid oxygen storage tank which regulates pressure to 30 psi. Refill valve on oxygen system conforms to MIL-V-25961, type CRU-50/A; female filter valve on storage tank hose conforms to MIL-V-38201A, type CRU-59E.
Galley	Potable water A	Flight station - 14 gallons, troop compartment - 50 gallons, cargo compartment - 160 gallons.	Crew Compartment - right side of the aircraft at FS 772. Troop compartment at FS 1428. Cargo compartment - 2 doors at FS 594 and 734.	Fittings and connections are standard commercial types or filler caps for gravity fill. Standard ground service trucks.
	Frozen meals	Flight station 20 - 60, troop compartment 75 - 150, cargo compartment 270 - 540.	Through regular access doors - stored in galley refrigerators.	Probably transferred, by hand, from service trucks through crew and passenger doors or service doors.
Water Tank B	**Potable water**	**50 gallons**	**Serviced at panel located in the forward left MLG wheel wall.**	**Fill to overflow.**

HPPS	High Pressure Pneumatic System
HSI	Horizontal Situation Indicator
IAS	Indicated Airspeed
IDNE	Inertial Doppler Navigation Equipment
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
INU	Inertial Navigation Unit
IWBS	Integral Weight and Balance System
IFIS	Integrated Flight Instrument System
IRU	Intercom Remote Unit
KCAS	Knots, Calibrated Airspeed
L/A	Lateral Augmentation
LDCS	Lift Distribution Control System
LESS	Load Environmental Spectra Survey
LPPS	Low Pressure Pneumatic System
LRU	Line Replaceable Unit
LVDT	Linear Voltage Differential Transformer
MDR	Maintenance Data Recorder
MADAR	Malfunction Detection, Analysis and Recording Subsystem
MMR	Multi-Mode Radar
MMUX	Manual Multiplexer
MSU	Mode Selector Unit
MUX PROC	Multiplexer Processor
N_1	Engine Fan RPM
N_2	Engine High Pressure Compressor RPM
ODRU	Oscilloscope and Digital Readout Unit
PACS	Pilot Assist Cable Servo
P/A	Pitch Augmentation
PCI	Peripheral Command Indicator
PLIES	Parachute and Line Intergrated Extraction System
PMG	Permanent Magnet Generator
POU	Printout Unit
PPI	Plan Position Indicator
PTU	Power Transfer Unit (Hydraulics)
RAE	Radar Altimeter Equipment
RAT	Ram Air Turbine
SAR-A	Signal Acquisition Remote Unit - Automatic
SAR-M	Signal Acquisition Remote Unit - Manual
SDC	Signal Data Converter
SKE	Station Keeping Equipment
SLRP	Service Loads Recording Program
TAT	Total Air Temperature
TIT	Turbine Inlet Temperature
VFU	Variable Feel Unit

COMMONLY USED ABBREVIATIONS (SHEET 2)

ADAC	Airplane Docking Alignment Control
AGL	Above Ground Level
ALDCS	Active Lift Distribution Control Subsystem
AMI	Airspeed/Mach Indicator
AOA	Angle-of-Attack
ARA	Airborne Radar Approach
ATLD	Air Transportable Loading Dock
ATM	Air Turbine Motor
AVVI	Altitude/Vertical Velocity Indicator
ADI	Attitude Director Indicator
AHRU	Attitude Heading Reference Unit
AFCS	Automatic Flight Control System
ATF	Automatic Terrain Following
ATS	Automatic Throttle Subsystem
A/P	Autopilot
APU	Auxiliary Power Unit
BARC	Barometric Altitude Rate Computer
BDHI	Bearing, Distance, Heading Indicator
BITE	Built In test Equipment
BU	Battery Unit
CADC	Central Air Data Computer
CARA	Combined Altitude Radar Altimeter
CARP	Computed Air Release Point
C/D	Control Display
CDU	Control Display Unit
CED	Crew Entry Door
CMA	Central Multiplexer Adapter
CPS	Control Power Supply
CPU	Central Processing Unit
CSD	Constant Speed Drive
CSU	Control and Sequencer Unit
CWR	Color Weather Radar
CWS	Control Wheel Steering
CDPIR	Crash Data Position Indicator/Recorder
DA	Drift Angle
DCOMP	Digital Computer
DRU	Data Retrieval Unit
EPR	Engine Pressure Ratio
FDS	Flight Director System
FSS	Fire Suppression System
FSAS	Fuel Savings Advisory System
G/A	Go-Around
GAAS	Go-Around Attitude Subsystem
GPWS	Ground Proximity Warning System
GS	Ground Speed

COMMONLY USED ABBREVIATIONS (SHEET 1)



AIRPLANE STATIONS

VERNAV	Vertical Navigation System
VERTNAV	Vertical Navigation System
VSFI	Vertical Scale Flight Instruments
WCIRU	Winch Control Intercom Remove Unit
Y/A	Yaw Augmentation

COMMONLY USED ABBREVIATIONS (SHEET 3)

FUSELAGE

FS	Fuselage Station
WL	Waterline
WRP	Wing Reference Plane
BL	Buttock Line

HORIZONTAL STABILIZER

HSFSS	Horizontal Stabilizer Forward Spar Station
HSRSS	Horizontal Sabilizer Rear Spar Station

POWER PLANT

PPS	Power Plant Station
PPWL	Power Plant Waterline

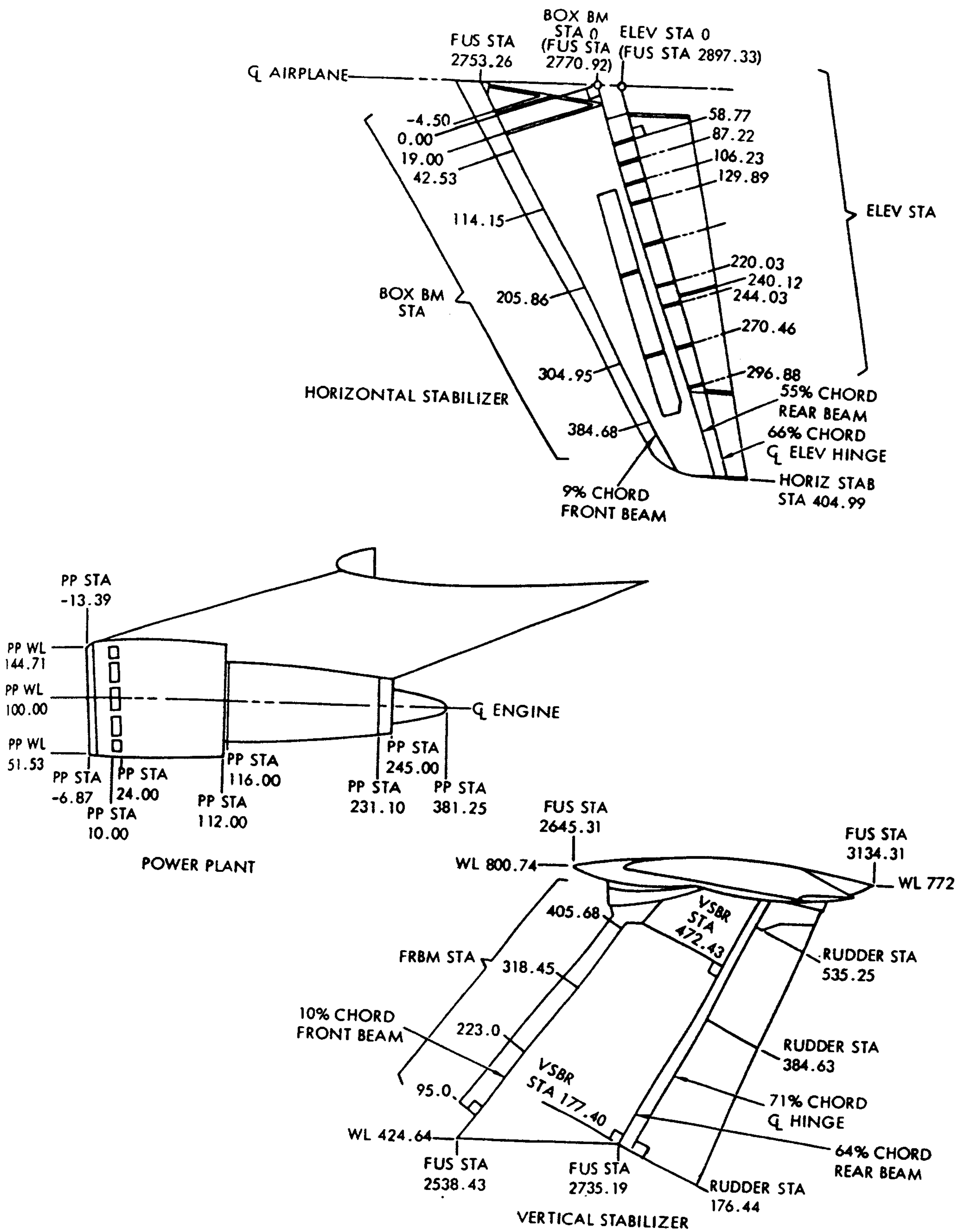
WING

WS	Wing Station
IWLES	Inner Wing - Leading Edge Station
OWLES	Outer Wing - Leading Edge Station
IFS	Inner Flap Station
OFS	Outer Flap Station
AS	Aileron Station
IWBRS	Inner Wing - Box Rib Station
OWBRS	Outer Wing Box Rib Station

VERTICAL STABILIZER

VSFSS	Vertical Stabilizer Forward Spar Station
VSCSS	Vertical Stabilizer Center Spar Station
VSBR	Vertical Stabilizer Box Rib

STATION BREAKDOWN ABBREVIATIONS

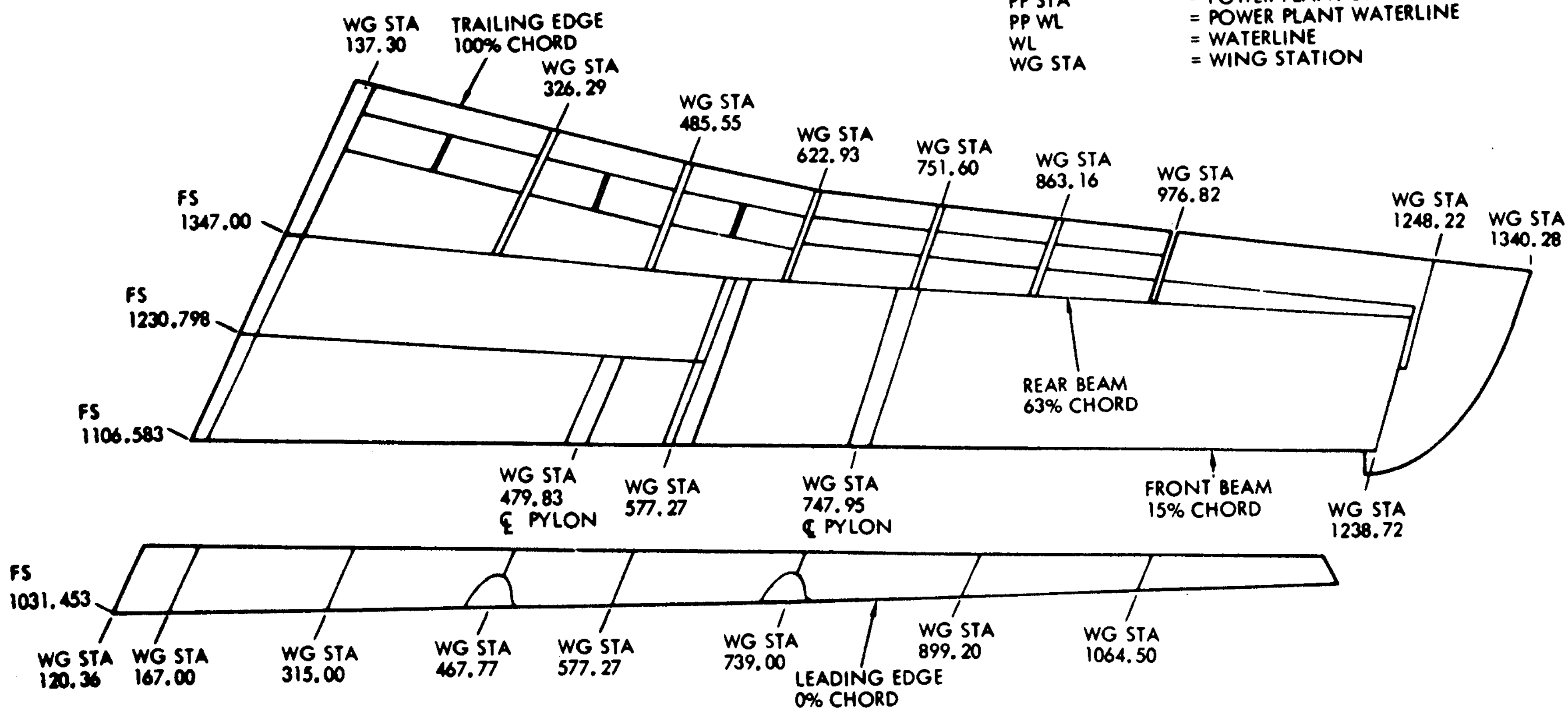


EMPENNAGE STATIONS

WING STATIONS

CODE

AIL STA	= AILERON STATION
BOX BM STA	= BOX BEAM STATION
BL	= BUTTOCK LINE
ELEV STA	= ELEVATOR STATION
FR BM STA	= FRONT BEAM STATION
FS	= FUSELAGE STATION
HORIZ STAB STA	= HORIZONTAL STABILIZER STATION
PP STA	= POWER PLANT STATION
PP WL	= POWER PLANT WATERLINE
WL	= WATERLINE
WG STA	= WING STATION



STRINGER LOCATIONS FROM
FS 524.00 TO FS 1603.16
FOR THE UPPER AND LOWER LOBE

STRINGER NO. LH	RH	BL	WL
1	2	130.29	140.00
3	4	133.30	147.17
5	6	135.92	154.50
7	8	138.14	161.95
9	10	139.94	169.52
11	12	141.33	177.17
13	14	142.31	184.88
15	16	142.86	192.64
17	18	142.99	200.42
19	20	142.70	208.19
21	22	141.99	215.94
23	24	140.85	223.63
25	26	139.30	231.25
27	28	137.34	238.78
29	30	134.97	246.18
31	32	132.20	253.45
33	34	129.04	260.56
35	36	125.50	267.48
37	38	121.59	274.21
39	40	117.32	280.70
41	42	112.70	286.96
43	44	107.74	292.96
45	46	102.47	298.68
47	48	96.90	304.10
49	50	91.04	309.21
51	52	84.91	314.00
53	54	84.97	320.11
55	56	84.60	326.21
57	58	83.79	332.27
59	60	82.55	338.25
61	62	80.88	344.13
63	64	78.80	349.87
65	66	76.30	355.45
67	68	73.42	360.84
69	70	70.15	366.00
71	72	66.52	370.92
73	74	62.55	375.56

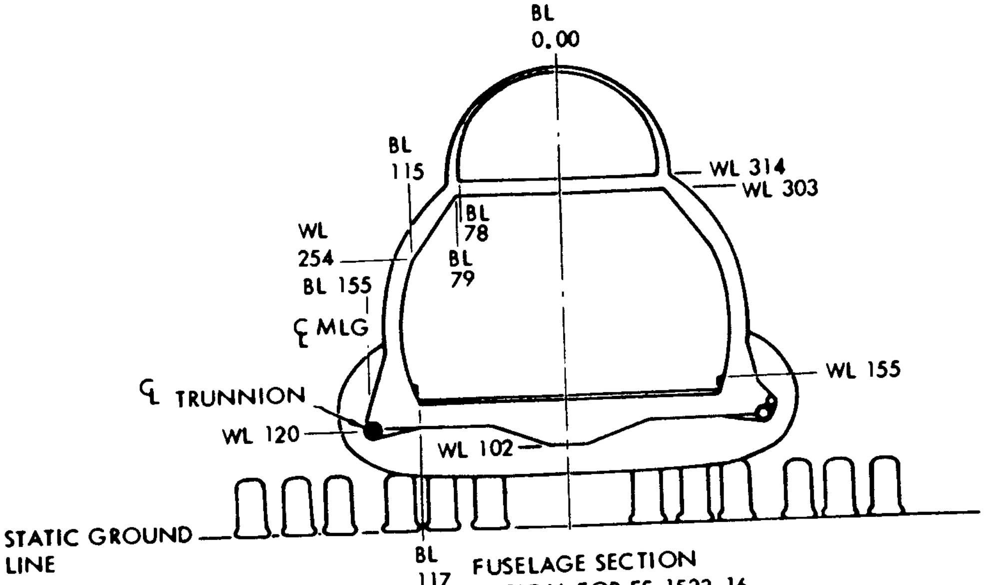
STRINGER LOCATIONS FROM
FS 524.00 TO FS 1603.16
FOR THE UPPER AND LOWER LOBE

STRINGER NO. LH	RH	BL	WL
75	76	58.25	379.90
77	78	53.65	383.93
79	80	48.78	387.61
81	82	43.65	390.94
83	84	38.30	393.88
85	86	32.75	396.44
87	88	27.03	398.59
89	90	21.17	400.32
91	92	15.20	401.63
93	94	9.15	402.51
95	96	3.06	402.95

UNDERFLOOR STRINGER LOCATIONS
FROM FS 524.00 TO FS 1268.16 FROM
FS 1638.16 TO FS 1964.00

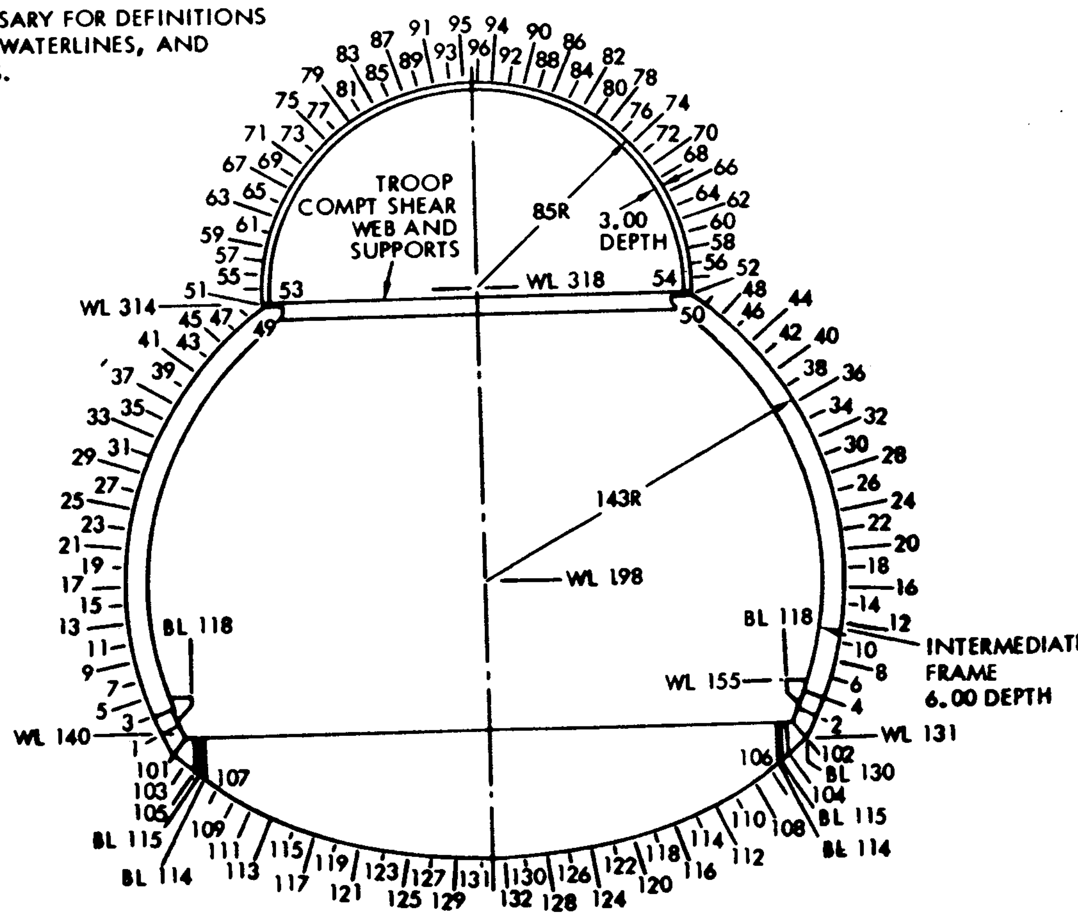
STRINGER NO. LH	RH	BL
101	102	125.89
103	104	119.21
105	106	112.24
107	108	104.98
109	110	97.45
111	112	89.68
113	114	81.68
115	116	73.47
117	118	65.08
119	120	56.52
121	122	47.82
123	124	39.00
125	126	30.58
127	128	22.10
129	130	13.57
131	132	5.00

STRINGER LOCATION CHART



FUSELAGE SECTION
TYPICAL FOR FS 1523.16
AND FS 1603.16
(VIEW LOOKING FORWARD)

NOTE
REFER TO GLOSSARY FOR DEFINITIONS OF STATIONS, WATERLINES, AND BUTTOCK LINES.



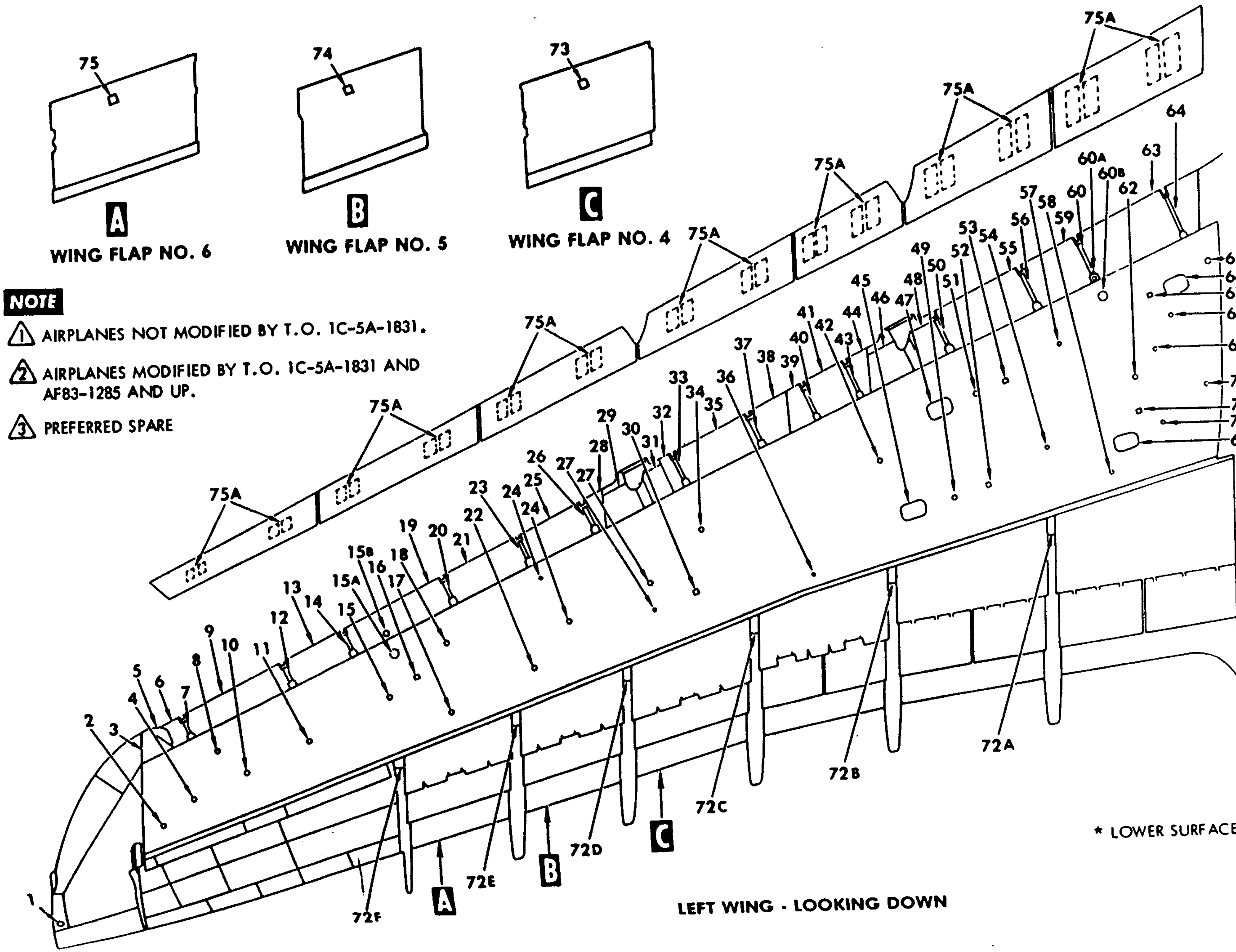
STRINGER LOCATION
(VIEW LOOKING FORWARD)

STRINGER LOCATIONS

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	3123-1	MAGNETIC DETECTOR ACCESS
2 △1	FG410A52	NO. 1 MAIN TANK FUEL PROBE
2 △2	FG410B14/ △3 20050-0000-0119	NO. 1 MAIN TANK FUEL PROBE
3	3113-9	SYSTEM ACCESS
4 △1	FG410A51	NO. 1 MAIN TANK FUEL PROBE
4 △2	FG410B13/ △3 20050-0000-0118	NO. 1 MAIN TANK FUEL PROBE
5	3113-10	FAIRING
6	3113-8	SYSTEM ACCESS
7	3113-7	NAS1153V8 BOLT
8 △1	FG416A3	NO. 1 MAIN TANK FUEL PROBE
8 △2	FG416B1/ △3 20049-0000-0106	NO. 1 MAIN TANK FUEL PROBE
9	3113-6	SYSTEM ACCESS
10 △1	FG410A50	NO. 1 MAIN TANK FUEL PROBE
10 △2	FG410B12/ △3 20050-0000-0117	NO. 1 MAIN TANK FUEL PROBE
11 △1	FG410A49	NO. 1 MAIN TANK FUEL PROBE
11 △2	FG410B11/ △3 20050-0000-0116	NO. 1 MAIN TANK FUEL PROBE
12	3113-5	NAS1153V8 BOLT
13	3113-4	SYSTEM ACCESS
14	3113-3	NAS1153V8 BOLT
15 △1	FG410A48	NO. 1 MAIN TANK FUEL PROBE
15 △2	FG410B10/ △3 20050-0000-0115	NO. 1 MAIN TANK FUEL PROBE
15A	N38260	NO. 1 MAIN OVERWING FILLER CAP
15B	AN3117-1	GROUNDING JACK
16	3113-2	NO. 1 MAIN TANK FUEL LEVEL CONTROL VALVE
17 △1	FG410A47	NO. 1 MAIN TANK FUEL PROBE
17 △2	FG410B9/ △3 20050-0000-0114	NO. 1 MAIN TANK FUEL PROBE
18 △1	FG410A46	NO. 1 MAIN TANK FUEL PROBE
18 △2	FG410B8/ △3 20050-0000-0113	NO. 1 MAIN TANK FUEL PROBE
19	3113-2	SYSTEM ACCESS
20	3113-1	NAS1153V8 BOLT
21	3112-12	SYSTEM ACCESS
22 △1	FG415A17	NO. 1 AUX TANK FUEL PROBE
22 △2	FG415B5/ △3 20049-0000-0105	NO. 1 AUX TANK FUEL PROBE
23	3112-11	NAS1153V8 BOLT
24 △1	FG410A57	NO. 1 AUX TANK FUEL PROBE
24 △2	FG410B19/ △3 20050-0000-0112	NO. 1 AUX TANK FUEL PROBE
25	3112-10	SYSTEM ACCESS
26	3112-9	NAS1153V8 BOLT
27 △1	FG410A56	NO. 1 AUX TANK FUEL PROBE
27 △2	FG410B18/ △3 20050-0000-0111	NO. 1 AUX TANK FUEL PROBE
28	3112-8	SYSTEM ACCESS
29	3112-7	SYSTEM ACCESS
30	3113-1	NO. 1 AUX TANK FUEL LEVEL CONTROL VALVE
31	3112-6	SYSTEM ACCESS
32	3112-5	SYSTEM ACCESS
33	3112-4	NAS1153V8 BOLT
34 △1	FG410A55	NO. 1 AUX TANK FUEL PROBE
34 △2	FG410B17/ △3 20050-0000-0110	NO. 1 AUX TANK FUEL PROBE
35	3112-3	SYSTEM ACCESS
36 △1	FG415A14	NO. 1 EXT RANGE TANK FUEL PROBE
36 △2	FG415B2/ △3 20049-0000-0104	NO. 1 EXT RANGE TANK FUEL PROBE
37	3112-2	NAS1153V8 BOLT
38	3112-1	SYSTEM ACCESS
39	3111-14	SYSTEM ACCESS
40	3111-13	SYSTEM ACCESS
41	3111-12	SYSTEM ACCESS
42 △1	FG415A16	NO. 2 AUX TANK FUEL PROBE

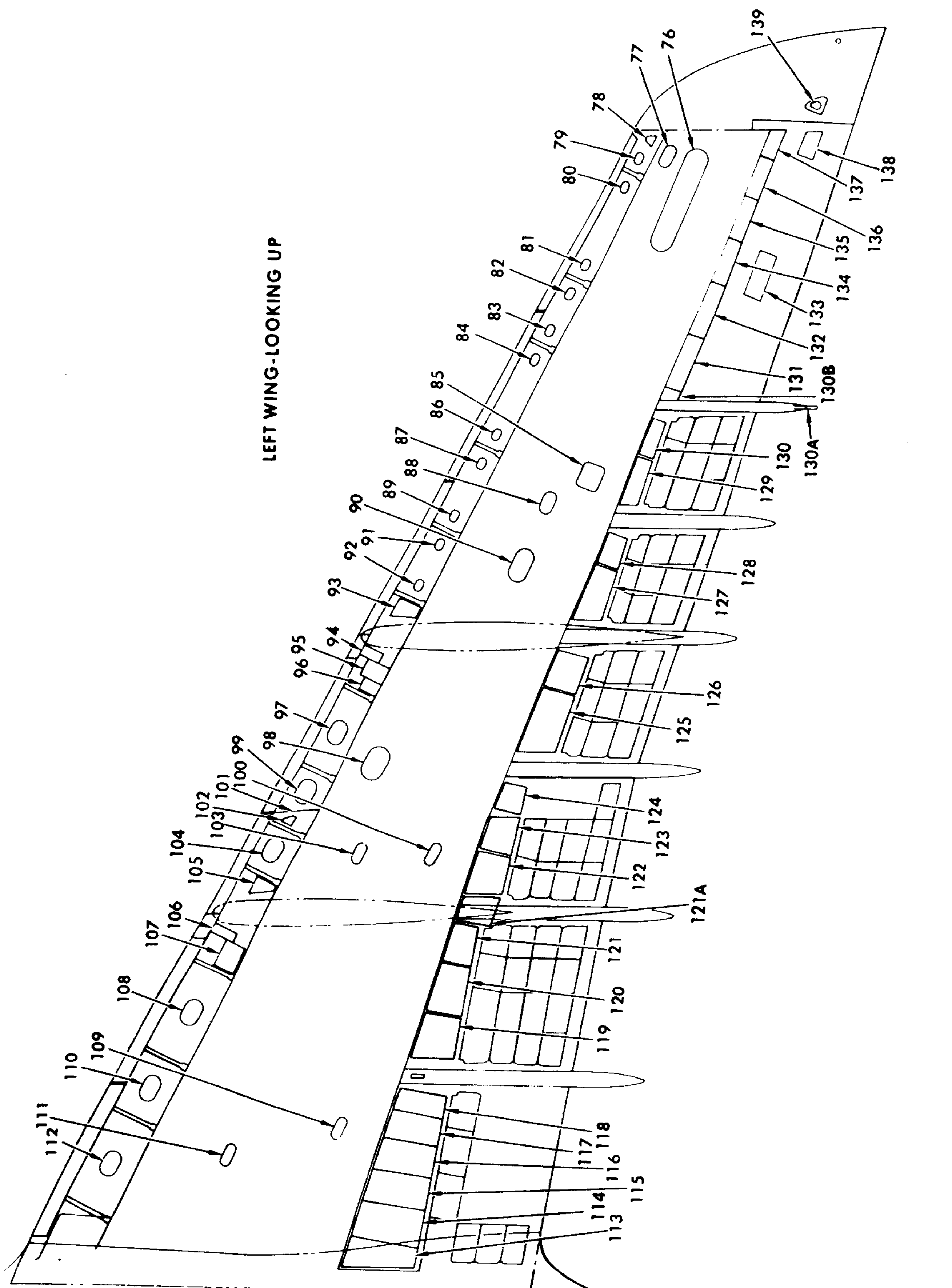
WING EXTERNAL ACCESS (SHEET 2)

WING EXTERNAL ACCESS (SHEET 1)



NOTE

1. AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1831.
2. AIRPLANES MODIFIED BY T.O. 1C-5A-1831 AND AF83-1285 AND UP.
3. PREFERRED SPARE

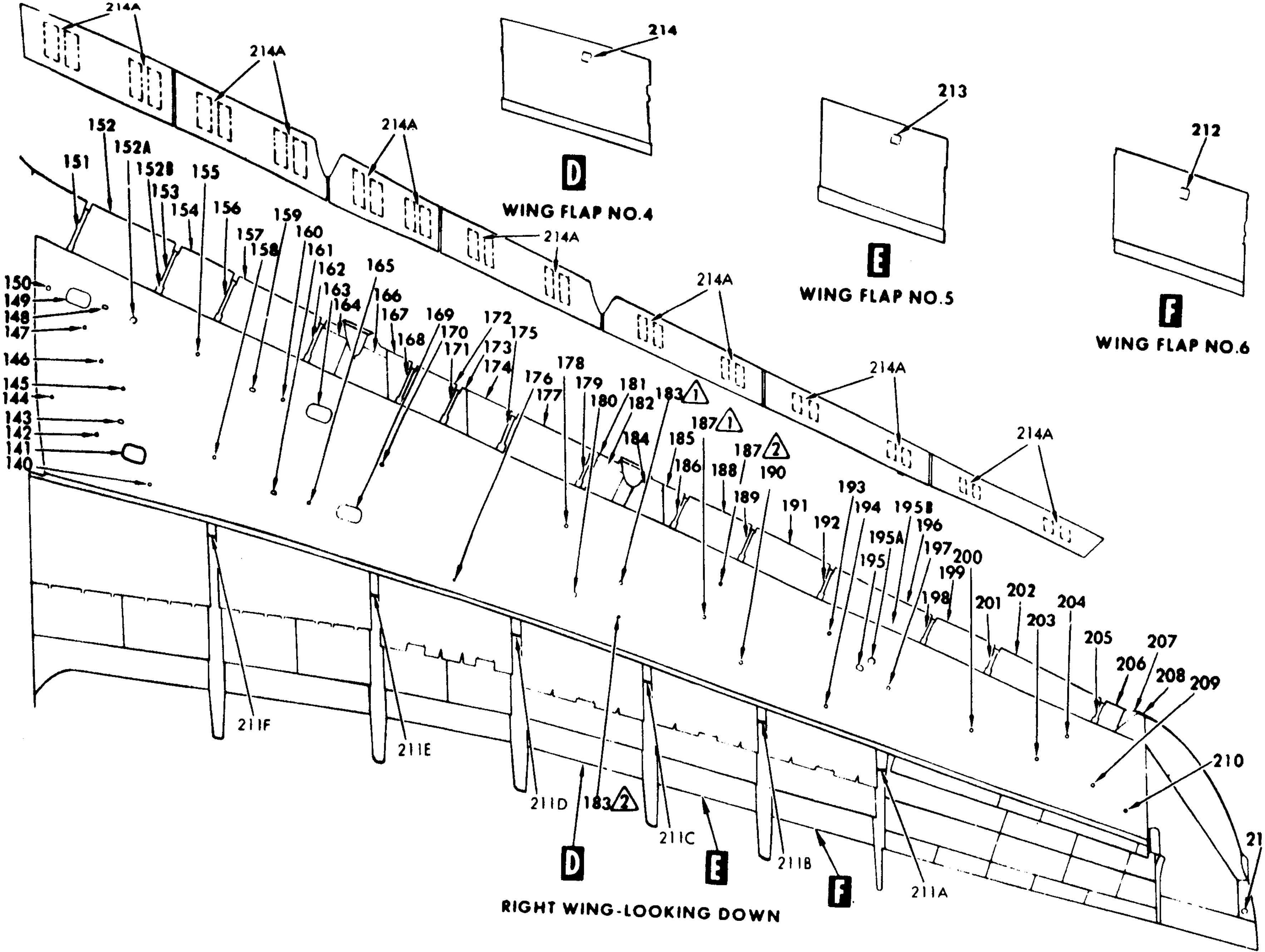


WING EXTERNAL ACCESS (SHEET 4)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
42 △2	FG415B4/ △3 20049-0000-0103	NO. 2 AUX TANK FUEL PROBE
43	3111-11	SYSTEM ACCESS
44	3111-10	SYSTEM ACCESS
45	3121-3	NO. 1 EXT RANGE TANK ACCESS
46	3111-9	SYSTEM ACCESS
47	3121-2	NO. 2 AUX TANK ACCESS
48	3111-8	SYSTEM ACCESS
49 △1	FG410A45	NO. 1 EXT RANGE TANK FUEL PROBE
49 △2	FG410B7/ △3 20050-0000-0109	NO. 1 EXT RANGE TANK FUEL PROBE
50	3111-7	SYSTEM ACCESS
51 △1	FG410A54	NO. 2 AUX TANK FUEL PROBE
51 △2	FG410B16/ △3 20050-0000-0107	NO. 2 AUX TANK FUEL PROBE
52	3121-7	NO. 2 AUX EXT RANGE TANK FUEL LEVEL CONTROL VALVE
53	3121-8	NO. 2 AUX TANK FUEL LEVEL CONTROL VALVE
54 △1	FG410A44	NO. 1 EXT RANGE TANK FUEL PROBE
54 △2	FG410B6/ △3 20050-0000-0108	NO. 1 EXT RANGE TANK FUEL PROBE
55	3111-6	SYSTEM ACCESS
56	3111-5	SYSTEM ACCESS
57 △1	FG410A53	NO. 2 AUX TANK FUEL PROBE
57 △2	FG410B15/ △3 20050-0000-0106	NO. 2 AUX TANK FUEL PROBE
58 △1	FG415A15	NO. 2 EXT RANGE TANK FUEL PROBE
58 △2	FG415B3/ △3 20049-0000-0102	NO. 2 EXT RANGE TANK FUEL PROBE
59	3111-4	SYSTEM ACCESS
60	3111-3	SYSTEM ACCESS
60A	AN3117-1	GROUNDING JACK
60B	N38260	NO. 2 MAIN OVER-WING FILLER CAP
61	3121-4	NO. 2 EXT RANGE TANK ACCESS
62 △1	FG415A9	NO. 2 MAIN TANK FUEL PROBE
62 △2	FG415B1/ △3 20049-0000-0101	NO. 2 MAIN TANK FUEL PROBE
63	3111-2	SYSTEM ACCESS
64	3111-1	SYSTEM ACCESS
65 △1	FG410A25	NO. 2 MAIN TANK FUEL PROBE
65 △2	FG410B1/ △3 20050-0000-0101	NO. 2 MAIN TANK FUEL PROBE
66	3121-1	NO. 2 MAIN TANK ACCESS
67	3121-5	NO. 2 MAIN TANK FUEL LEVEL CONTROL VALVE
68 △1	FG410A26	NO. 2 MAIN TANK FUEL PROBE
68 △2	FG410B2/ △3 20050-0000-0102	NO. 2 MAIN TANK FUEL PROBE
69 △1	FG410A27	NO. 2 MAIN TANK FUEL PROBE
69 △2	FG410B3/ △3 20050-0000-0103	NO. 2 MAIN TANK FUEL PROBE
70 △1	FG410A28	NO. 2 EXT RANGE TANK FUEL PROBE
70 △2	FG410B4/ △3 20050-0000-0104	NO. 2 EXT RANGE TANK FUEL PROBE
71	3121-6	NO. 2 EXT RANGE TANK FUEL LEVEL CONTROL VALVE
72 △1	FG410A29	NO. 2 EXT RANGE TANK FUEL PROBE
72 △2	FG410B5/ △3 20050-0000-0105	NO. 2 EXT RANGE TANK FUEL PROBE
72A	4J33332-101B	SKIN
72B	4J33333-103A	SKIN
72C	4J33334-101A	SKIN
72D	4J33335-101A	SKIN
72E	4J33336-101A	PANEL
72F	4J33337-103B	SKIN
73	3132-1	SPOILER ACTUATOR CLEARANCE DOOR
74	3133-1	SPOILER ACTUATOR CLEARANCE DOOR
75	3133-2	SPOILER ACTUATOR CLEARANCE DOOR
75A		SLAT ACCESS PANELS

WING EXTERNAL ACCESS (SHEET 3)

WING EXTERNAL ACCESS (SHEET 6)



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
76	3123-4	NO. 1 MAIN TANK ACCESS
77	3123-2	NO. 1 MAIN TANK BOOST PUMP
78	3213-8	SYSTEM ACCESS
79	3213-7	SYSTEM ACCESS
80	3213-6	SYSTEM ACCESS
81	3213-5	SYSTEM ACCESS
82	3213-4	SYSTEM ACCESS
83	3213-3	SYSTEM ACCESS
84	3213-2	SYSTEM ACCESS
85	3213-3	NO. 1 MAIN TANK STANDPIPE VENT
86	3213-1	SYSTEM ACCESS
87	3212-10	SYSTEM ACCESS (NO. 1 TANK FUEL QTY CONNECTORS)
88	3223-2	NO. 1 AUX TANK BOOST PUMP
89	3212-9	SYSTEM ACCESS
90	3223-3	NO. 1 AUX TANK OUTBD ACCESS
91	3212-8	SYSTEM ACCESS
92	3212-7	SYSTEM ACCESS
93	3212-6	SYSTEM ACCESS
94	3212-5	SYSTEM ACCESS
95	3212-4	SYSTEM ACCESS
96	3212-3	SYSTEM ACCESS (NO. 1 AUX FUEL QTY CONNECTORS)
97	3212-2	SYSTEM ACCESS
98	3213-1	NO. 1 AUX TANK INBD ACCESS AND DRY BAY ACCESS
99	3212-1	SYSTEM ACCESS
100	3223-2	NO. 1 EXT RANGE TANK BOOST PUMP
101	3211-9	SYSTEM ACCESS
102	3211-8	SYSTEM ACCESS
103	3223-1	NO. 2 AUX TANK BOOST PUMP
104	3211-7	SYSTEM ACCESS
105	3211-6	SYSTEM ACCESS
106	3211-5	SYSTEM ACCESS
107	3211-4	SYSTEM ACCESS
108	3211-3	SYSTEM ACCESS
109	3221-2	NO 2 EXT RANGE TANK BOOST PUMP
110	3211-2	SYSTEM ACCESS (NO. 2 AUX FUEL QTY CONNECTORS)
111	3221-1	NO. 2 MAIN TANK BOOST PUMP
112	3211-1	SYSTEM ACCESS (NO. 2 MAIN FUEL QTY CONNECTORS)
113	3231-1	STRUCTURE INSPECTION
114	3231-2	STRUCTURE INSPECTION
115	3231-3	STRUCTURE INSPECTION
116	3231-4	STRUCTURE INSPECTION
117	3231-5	STRUCTURE INSPECTION
118	3231-6	STRUCTURE INSPECTION
119	3232-1	STRUCTURE INSPECTION
120	3232-2	STRUCTURE INSPECTION
121	3232-3	STRUCTURE INSPECTION
121A	3232-11	STRUCTURE INSPECTION
122	3232-4	STRUCTURE INSPECTION
123	3232-5	STRUCTURE INSPECTION
124	3232-6	STRUCTURE INSPECTION
125	3232-7	STRUCTURE INSPECTION
126	3232-8	STRUCTURE INSPECTION
127	3232-9	STRUCTURE INSPECTION
128	3233-1	STRUCTURE INSPECTION
129	3233-2	STRUCTURE INSPECTION
130	3233-3	STRUCTURE INSPECTION
130A	4P10028-101A	FUEL JETTISON MAST
130B	4J53081-101B	PANEL
131	3233-4	STRUCTURE INSPECTION
132	3233-5	STRUCTURE INSPECTION
133	3233-2	STRUCTURE ACCESS
134	3233-6	STRUCTURE INSPECTION
135	3233-7	STRUCTURE INSPECTION
136	3233-8	STRUCTURE INSPECTION
137	3233-9	STRUCTURE INSPECTION
138	3233-3	STRUCTURE ACCESS
139	3223-1	LANDING LIGHT ACCESS

WING EXTERNAL ACCESS (SHEET 5)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
178 △2	FG410B17/ △3 20050-0000-0110	NO. 4 AUX TANK FUEL PROBE
179	4112-4	SYSTEM ACCESS
180	4113-2	NO. 4 AUX TANK FUEL LEVEL CONTROL VALVE
181	4112-5	SYSTEM ACCESS
182	4112-6	SYSTEM ACCESS
183 △1	FG410A56	NO. 4 AUX TANK FUEL PROBE
183 △2	FG410B18/ △3 20050-0000-0111	NO. 4 AUX TANK FUEL PROBE
184	4112-7	SYSTEM ACCESS
185	4112-8	SYSTEM ACCESS
186	4112-9	NAS 1153V8 BOLT
187 △1	FG410A57	NO. 4 AUX TANK FUEL PROBE
187 △2	FG410B19/ △3 20050-0000-0112	NO. 4 AUX TANK FUEL PROBE
188	4112-10	SYSTEM ACCESS
189	4112-11	NAS 1153V8 BOLT
190 △1	FG415A17	NO. 4 AUX TANK FUEL PROBE
190 △2	FG415B5/ △3 20049-0000-0105	NO. 4 AUX TANK FUEL PROBE
191	4112-12	SYSTEM ACCESS
192	4113-1	NAS 1153V8 BOLT
193 △1	FG410A46	NO. 4 MAIN TANK FUEL PROBE
193 △2	FG410B8/ △3 20050-0000-0113	NO. 4 MAIN TANK FUEL PROBE
194 △1	FG410A47	NO. 4 MAIN TANK FUEL PROBE
194 △2	FG410B9/ △3 20050-0000-0114	NO. 4 MAIN TANK FUEL PROBE
195	4113-1	NO. 4 MAIN TANK FUEL LEVEL CONTROL VALVE
195A	N38260	NO. 4 MAIN OVER-WING FILLER CAP
195B	AN3117-1	GROUNDING JACK
196	4113-2	SYSTEM ACCESS
197 △1	FG410A48	NO. 4 MAIN TANK FUEL PROBE
197 △2	FG410B10/ △3 20050-0000-0115	NO. 4 MAIN TANK FUEL PROBE
198	4113-3	NAS 1153V8 BOLT
199	4113-4	SYSTEM ACCESS
200 △1	FG410A49	NO. 4 MAIN TANK FUEL PROBE
200 △2	FG410B11/ △3 20050-0000-0116	NO. 4 MAIN TANK FUEL PROBE
201	4113-5	NAS 1153V8 BOLT
202	4113-6	SYSTEM ACCESS
203 △1	FG410A50	NO. 4 MAIN TANK FUEL PROBE
203 △2	FG410B12/ △3 20050-0000-0117	NO. 4 MAIN TANK FUEL PROBE
204 △1	FG416A3	NO. 4 MAIN TANK FUEL PROBE
204 △2	FG416B1/ △3 20049-0000-0106	NO. 4 MAIN TANK FUEL PROBE
205	4113-7	NAS 1153V8 BOLT
206	4113-8	SYSTEM ACCESS
207	4113-10	FAIRING
208	4113-9	SYSTEM ACCESS
209 △1	FG410A51	NO. 4 MAIN TANK FUEL PROBE
209 △2	FG410B13/ △3 20050-0000-0118	NO. 4 MAIN TANK FUEL PROBE
210 △1	FG410A52	NO. 4 MAIN TANK FUEL PROBE
210 △2	FG410B14/ △3 20050-0000-0119	NO. 4 MAIN TANK FUEL PROBE
211	4123-1	MAGNETIC DETECTOR ACCESS
211A	4J33337-104B	SKIN
211B	4J33336-102A	PANEL
211C	4J33335-102A	SKIN
211D	4J33334-102A	SKIN
211E	4J33333-104A	SKIN
211F	4J33332-102B	SKIN
212	4133-2	SPOILER ACTUATOR CLEARANCE DOOR
213	4133-1	SPOILER ACTUATOR CLEARANCE DOOR
214	4132-1	SPOILER ACTUATOR CLEARANCE DOOR
214A		SLAT ACCESS PANELS

WING EXTERNAL ACCESS (SHEET 8)

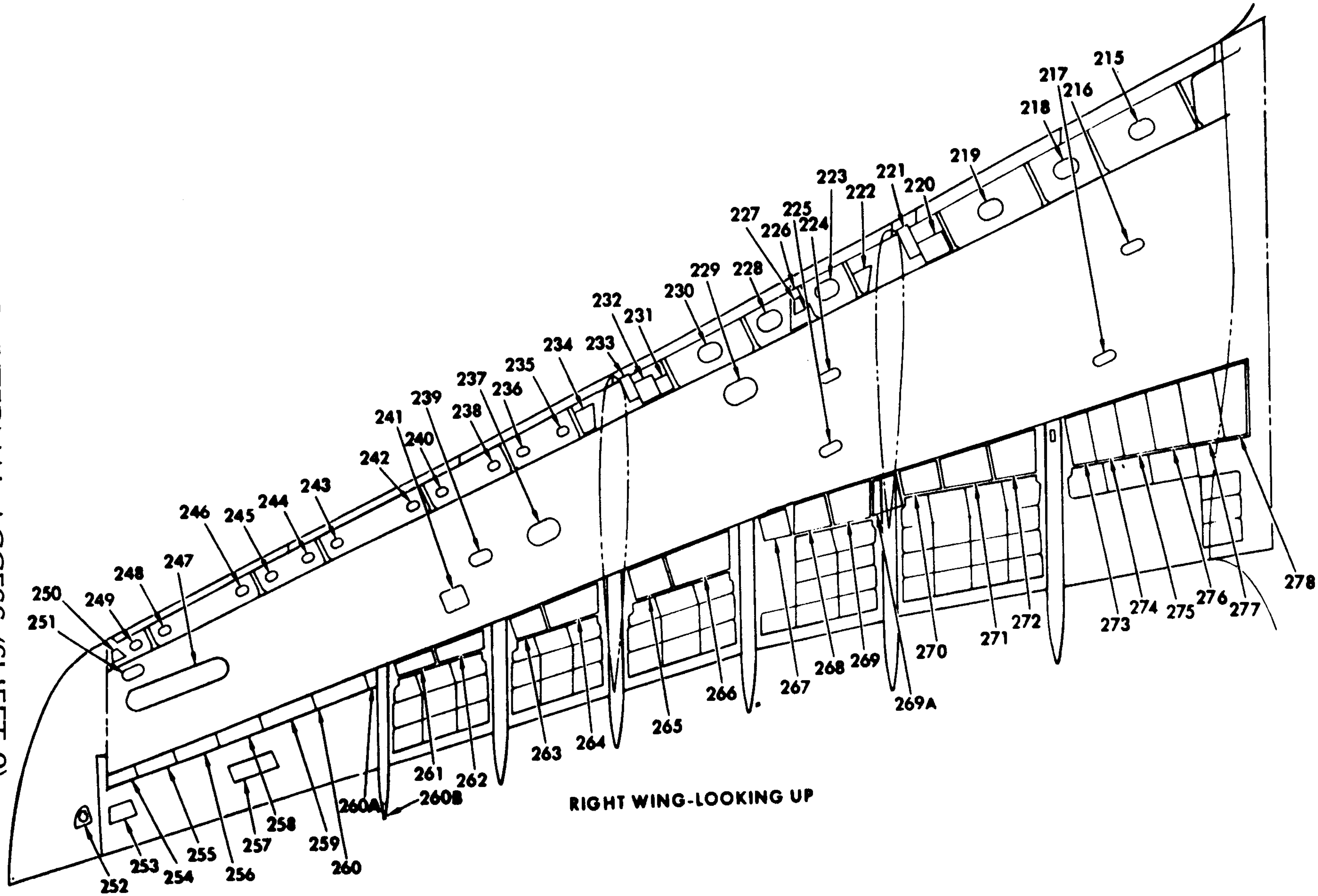
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
140 △1	FG415A15	NO. 3 EXT RANGE TANK FUEL PROBE
140 △2	FG415B3/ △3 20049-0000-0102	NO. 3 EXT RANGE TANK FUEL PROBE
141	4121-2	NO. 3 EXT RANGE TANK ACCESS
142 △1	FG410A29	NO. 3 EXT RANGE TANK FUEL PROBE
142 △2	FG410B5/ △3 20050-0000-0105	NO. 3 EXT RANGE TANK FUEL PROBE
143	4121-6	NO. 3 EXT RANGE TANK FUEL LEVEL CONTROL VALVE
144 △1	FG410A28	NO. 3 EXT RANGE TANK FUEL PROBE
144 △2	FG410B4/ △3 20050-0000-0104	NO. 3 EXT RANGE TANK FUEL PROBE
145 △1	FG415A9	NO. 3 MAIN TANK FUEL PROBE
145 △2	FG415B1/ △3 20049-0000-0101	NO. 3 MAIN TANK FUEL PROBE
146 △1	FG410A27	NO. 3 MAIN TANK FUEL PROBE
146 △2	FG410B3/ △3 20050-0000-0103	NO. 3 MAIN TANK FUEL PROBE
147 △1	FG410A26	NO. 3 MAIN TANK FUEL PROBE
147 △2	FG410B2/ △3 20050-0000-0102	NO. 3 MAIN TANK FUEL PROBE
148	4121-5	NO. 3 MAIN TANK FUEL LEVEL CONTROL VALVE
149	4121-1	NO. 3 MAIN TANK ACCESS
150 △1	FG410A25	NO. 3 MAIN TANK FUEL PROBE
150 △2	FG410B1/ △3 20050-0000-0101	NO. 3 MAIN TANK FUEL PROBE
151	4111-1	SYSTEM ACCESS
152	4111-2	SYSTEM ACCESS
152A	N38260	NO. 3 MAIN OVER-WING FILLER CAP
152B	AN3117-1	GROUNDING JACK
153	4111-3	SYSTEM ACCESS
154	4111-4	SYSTEM ACCESS
155 △1	FG410A53	NO. 3 AUX TANK FUEL PROBE
155 △2	FG410B15/ △3 20050-0000-0106	NO. 3 AUX TANK FUEL PROBE
156	4111-5	SYSTEM ACCESS
157	4111-6	SYSTEM ACCESS
158 △1	FG410A44	NO. 4 EXT RANGE TANK FUEL PROBE
158 △2	FG410B6/ △3 20050-0000-0108	NO. 4 EXT RANGE TANK FUEL PROBE
159	4121-7	NO. 3 AUX TANK FUEL LEVEL CONTROL VALVE
160 △1	FG410A54	NO. 3 AUX TANK FUEL PROBE
160 △2	FG410B16/ △3 20050-0000-0107	NO. 3 AUX TANK FUEL PROBE
161	4121-8	NO. 4 EXT RANGE TANK FUEL LEVEL CONTROL VALVE
162	4111-7	SYSTEM ACCESS
163	4121-3	NO. 3 AUX TANK ACCESS
164	4111-8	SYSTEM ACCESS
165 △1	FG410A45	NO. 4 EXT RANGE TANK FUEL PROBE
165 △2	FG410B7/ △3 20050-0000-0109	NO. 4 EXT RANGE TANK FUEL PROBE
166	4111-9	SYSTEM ACCESS
167	4111-10	SYSTEM ACCESS
168	4111-11	SYSTEM ACCESS
169	4121-4	NO. 4 EXT RANGE TANK ACCESS
170 △1	FG415A16	NO. 3 AUX TANK FUEL PROBE
170 △2	FG415B4/ △3 20049-0000-0103	NO. 3 AUX TANK FUEL PROBE
171	4111-13	SYSTEM ACCESS
172	4111-12	SYSTEM ACCESS
173	4111-14	SYSTEM ACCESS
174	4112-1	SYSTEM ACCESS
175	4112-2	SYSTEM ACCESS
176 △1	FG415A14	NO. 4 EXT RANGE TANK FUEL PROBE
176 △2	FG415B2/ △3 20049-0000-0104	NO. 4 EXT RANGE TANK FUEL PROBE
177	4112-3	SYSTEM ACCESS
178 △1	FG410A55	NO. 4 AUX TANK FUEL PROBE

WING EXTERNAL ACCESS (SHEET 7)

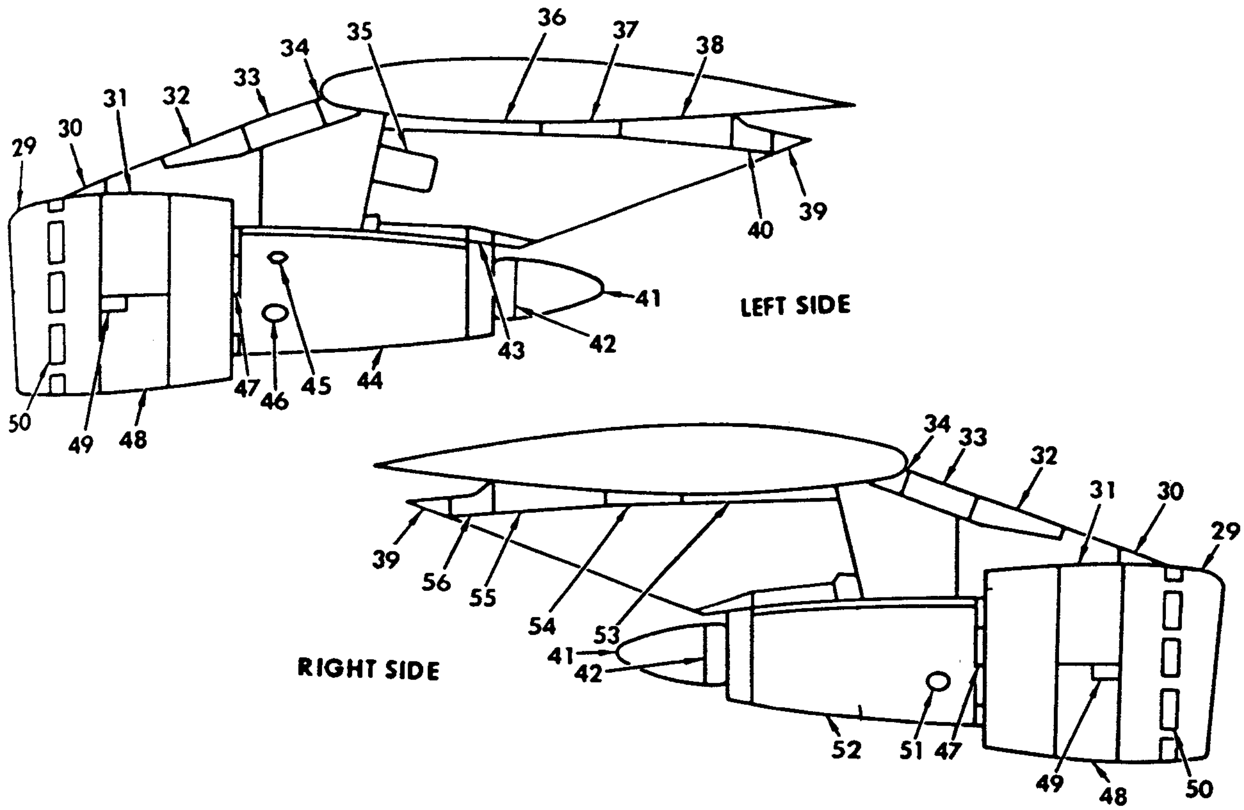
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
215	4211-1	SYSTEM ACCESS (NO. 3 MAIN FUEL QTY CONNECTORS)
216	4221-1	NO. 3 MAIN TANK BOOST PUMP
217	4221-2	NO. 3 EXT RANGE TANK BOOST PUMP
218	4211-2	SYSTEM ACCESS (NO. 3 AUX FUEL QTY CONNECTORS)
219	4211-3	SYSTEM ACCESS
220	4211-4	SYSTEM ACCESS
221	4211-5	SYSTEM ACCESS
222	4211-6	SYSTEM ACCESS
223	4211-7	SYSTEM ACCESS
224	4223-1	NO. 3 AUX TANK BOOST PUMP
225	4223-2	NO. 4 EXT RANGE TANK BOOST PUMP
226	4211-9	SYSTEM ACCESS
227	4211-8	SYSTEM ACCESS
228	4212-1	SYSTEM ACCESS
229	4213-1	NO. 4 AUX TANK INBD ACCESS AND DRY BAY ACCESS
230	4212-2	SYSTEM ACCESS
231	4212-3	SYSTEM ACCESS (NO. 4 AUX FUEL QTY CONNECTORS)
232	4212-4	SYSTEM ACCESS
233	4212-5	SYSTEM ACCESS
234	4212-6	SYSTEM ACCESS
235	4212-7	SYSTEM ACCESS
236	4212-8	SYSTEM ACCESS
237	4223-3	NO. 4 AUX TANK OUTBD ACCESS
238	4212-9	SYSTEM ACCESS
239	4223-2	NO. 4 AUX TANK BOOST PUMP
240	4212-10	SYSTEM ACCESS (NO. 4 MAIN FUEL QTY CONNECTORS)
241	4223-1	NO. 4 MAIN TANK STANDPIPE VENT
242	4213-1	SYSTEM ACCESS
243	4213-2	SYSTEM ACCESS
244	4213-3	SYSTEM ACCESS
245	4213-4	SYSTEM ACCESS
246	4213-5	SYSTEM ACCESS
247	4223-4	NO. 4 MAIN TANK ACCESS
250	4213-8	SYSTEM ACCESS
251	4213-2	NO. 4 MAIN TANK BOOST PUMP
252	4223-1	LANDING LIGHT ACCESS
253	4233-3	STRUCTURE ACCESS
254	4233-9	STRUCTURE INSPECTION
255	4233-8	STRUCTURE INSPECTION
256	4233-7	STRUCTURE INSPECTION
257	4233-2	STRUCTURE ACCESS
258	4233-6	STRUCTURE INSPECTION
259	4233-5	STRUCTURE INSPECTION
260	4233-4	STRUCTURE INSPECTION
260A	4J53081-102B	PANEL
260B	4P10028-101A	FUEL JETTISON MAST
261	4233-3	STRUCTURE INSPECTION
262	4233-2	STRUCTURE INSPECTION
263	4233-1	STRUCTURE INSPECTION
264	4232-9	STRUCTURE INSPECTION
265	4232-8	STRUCTURE INSPECTION
266	4232-7	STRUCTURE INSPECTION
267	4232-6	STRUCTURE INSPECTION
268	4232-5	STRUCTURE INSPECTION
269	4232-4	STRUCTURE INSPECTION
269A	4232-11	STRUCTURE INSPECTION
270	4232-3	STRUCTURE INSPECTION
271	4232-2	STRUCTURE INSPECTION
272	4232-1	STRUCTURE INSPECTION
273	4231-6	STRUCTURE INSPECTION
274	4231-5	STRUCTURE INSPECTION
275	4231-4	STRUCTURE INSPECTION
276	4231-3	STRUCTURE INSPECTION
277	4231-2	STRUCTURE INSPECTION
278	4231-1	STRUCTURE INSPECTION

WING EXTERNAL ACCESS (SHEET 10)

WING EXTERNAL ACCESS (SHEET 9)



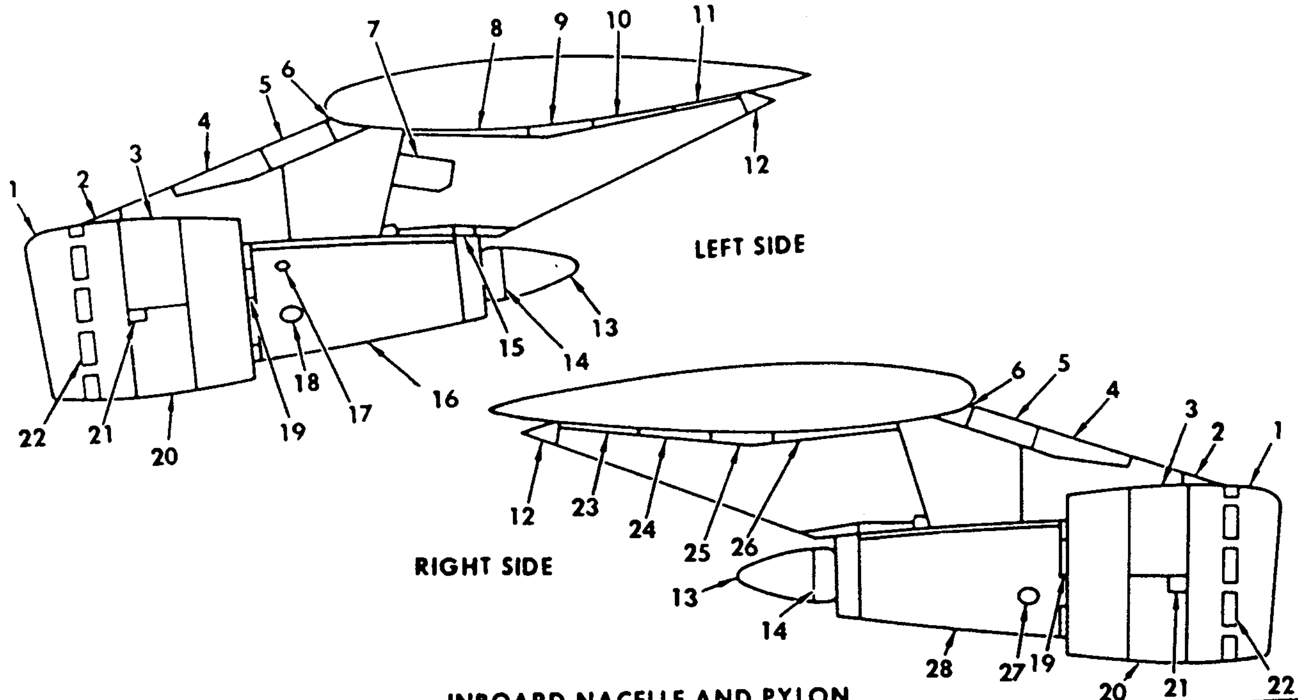
Wing External Access Provisions



OUTBOARD NACELLE AND PYLON

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
29	4P21014	INLET COWL
30	4P52000	FAIRING
31		UPPER FAN COWL ACCESS PANELS
32	4P52071	LEADING EDGE ACCESS PANEL
33	4P52072	AFT LEADING EDGE PANEL
34	4P51001	FAIRING
35	PP3L	ACCESS DOOR
36	4P51003	FAIRING
37	4P51010	FAIRING
38	4P51005 AND 4P51077	ACCESS TO PYLON AND WING ATTACH BOLT
39	4P52169	FAIRING
40	4P52170	FAIRING
41	4P20007	AFT EXHAUST PLUG
42	4P20008	FORWARD EXHAUST PLUG
43	PP4L	ACCESS DOOR
44	4P20009	MAIN COWL ENGINE ACCESS DOOR
45	4P22042	ENGINE OIL TANK FILLER ACCESS
46	⚠1 4P22040	BLOW-OUT PANEL
	⚠2 4P22042	BLOW-OUT PANEL
47		INNER FAN COWL ACCESS PANELS
48		LOWER FAN COWL ACCESS PANELS
49		FORWARD GROUND HANDLING ACCESS PANELS
50		INLET COWL BLOW-IN DOORS
51	⚠1 4P22040	BLOW-OUT PANEL
	⚠2 4P22140	BLOW-OUT PANEL
52	4P20010	MAIN COWL ENGINE ACCESS DOOR
53	4P51002	FAIRING
54	4P51009	FAIRING
55	4P51004	ACCESS TO PYLON AND WING ATTACH BOLT
56	4P52171	FAIRING

PYLON & NACELLE ACCESS (SHEET 2)



INBOARD NACELLE AND PYLON

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	4P21014	INLET COWL
2	4P52000	FAIRING
3		UPPER FAN COWL ACCESS PANEL
4	4P52071	LEADING EDGE ACCESS PANEL
5	4P52072	AFT LEADING EDGE PANEL
6	4P51011	FAIRING
7	PP3L	ACCESS DOOR
8	4P51013	FAIRING
9	4P51040	ACCESS TO PYLON AND WING ATTACH BOLT
10	4P51015	FAIRING
11	4P53344	FAIRING
12	4P51076 AND 4P51071	FAIRING
13	4P20007	AFT EXHAUST PLUG
14	4P20008	FORWARD EXHAUST PLUG
15	PP4L	ACCESS DOOR
16	4P20009	MAIN COWL ENGINE ACCESS DOOR
17	4P22042	ENGINE OIL TANK FILLER ACCESS
18	(1) 4P22040	BLOW-OUT PANEL
	(2) 4P22042	BLOW-OUT PANEL
19		INNER FAN COWL ACCESS PANELS
20		LOWER FAN COWL ACCESS PANELS
21		FORWARD GROUND HANDLING ACCESS PANELS
22		INLET COWL BLOW-IN DOORS
23	4P53343	FAIRING
24	4P51014	FAIRING
25	4P51039	ACCESS TO PYLON AND WING ATTACH BOLT
26	4P51012	FAIRING
27	(1) 4P22040	BLOW-OUT PANEL
	(2) 4P22140	BLOW-OUT PANEL
28	4P20010	MAIN COWL ENGINE ACCESS DOOR

NOTE

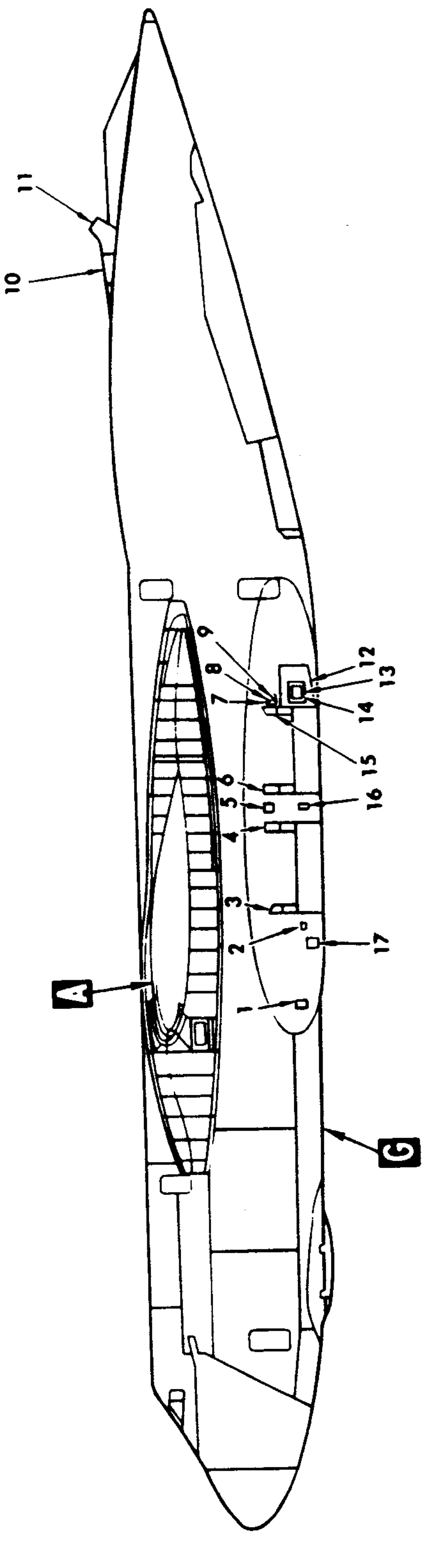
(1) AIRPLANES AF66-8303 THROUGH AF70-467.

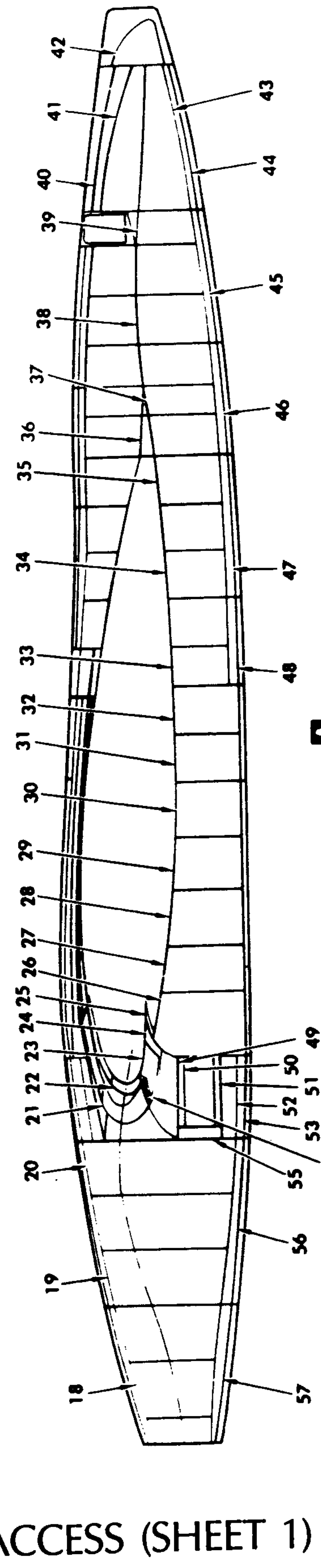
(2) AIRPLANES AF83-1285 AND UP.

PYLON & NACELLE ACCESS (SHEET 1)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	1223-1	JACK PAD ACCESS
2	1223-3	SPR LIGHT ACCESS
3	1233-2	SLOT DOOR
4	1233-4	SLOT DOOR
5	1132-2	LOX CONVERTER ACCESS
6	1233-5	SLOT DOOR
7	1132-1	APU INLET
8	1132-1-1-1	ACTUATOR ACCESS
9	1132-1-1	ACTUATOR ACCESS
10	4F41192	FAIRING ASSEMBLY
11	4F42165	DORSAL LEADING EDGE
12	1233-7	ATM & APU ACCESS PANEL
13	1233-7-1	SERVICE PANEL
14	1233-7-1-1	FIRE PANEL
15	1233-6	SLOT DOOR
16	1233-3	LOX BREATHING FILL ACCESS
17	1233-1	RAT ACCESS
18	1122-11	STRUCTURE INSPECTION
19	1122-12	STRUCTURE INSPECTION
20	1122-13	STRUCTURE INSPECTION
21	1122-14	STRUCTURE INSPECTION
22	1122-16	STRUCTURE INSPECTION
23	1122-17	STRUCTURE INSPECTION
24	1122-18	STRUCTURE INSPECTION
25	1122-19	STRUCTURE INSPECTION
26	1133-1	STRUCTURE INSPECTION
27	1133-2	STRUCTURE INSPECTION
28	1133-3	STRUCTURE INSPECTION
29	1133-4	STRUCTURE INSPECTION
30	1133-5	STRUCTURE INSPECTION
31	1133-6	STRUCTURE INSPECTION
32	1133-7	STRUCTURE INSPECTION
33	1133-8	STRUCTURE INSPECTION
34	1133-9	STRUCTURE INSPECTION
35	5113-1	STRUCTURE INSPECTION
36	5112-4	STRUCTURE INSPECTION
37	5113-3	STRUCTURE INSPECTION
38	5113-4	STRUCTURE INSPECTION
39	5113-6	STRUCTURE INSPECTION
40	5111-6	STRUCTURE INSPECTION
41	5112-1	STRUCTURE INSPECTION
42	5112-3	STRUCTURE INSPECTION
43	5112-2	STRUCTURE INSPECTION
44	5113-7	STRUCTURE INSPECTION
45	5113-5	STRUCTURE INSPECTION
46	5113-2	STRUCTURE INSPECTION
47	1133-11	STRUCTURE INSPECTION
48	1133-10	STRUCTURE INSPECTION
49	1122-15	STRUCTURE INSPECTION
50	1123-15	STRUCTURE INSPECTION
51	1123-14	STRUCTURE INSPECTION
52	1123-13	STRUCTURE INSPECTION
53	1123-12	STRUCTURE INSPECTION
54	1122-20	STRUCTURE INSPECTION
55	1122-21	STRUCTURE INSPECTION
56	1123-11	STRUCTURE INSPECTION
57	1123-10	STRUCTURE INSPECTION

FUSELAGE EXTERNAL ACCESS (SHEET 2)

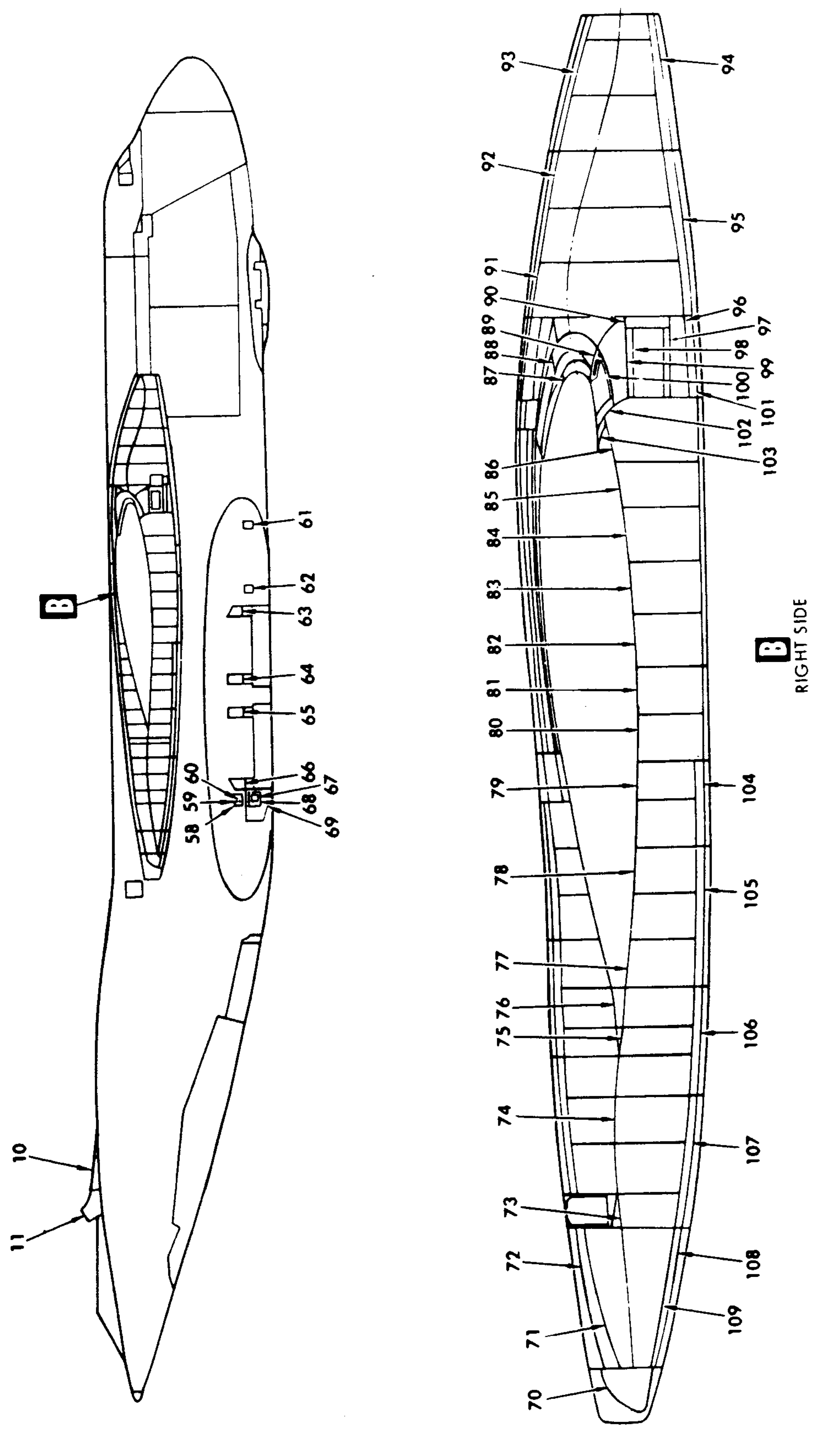




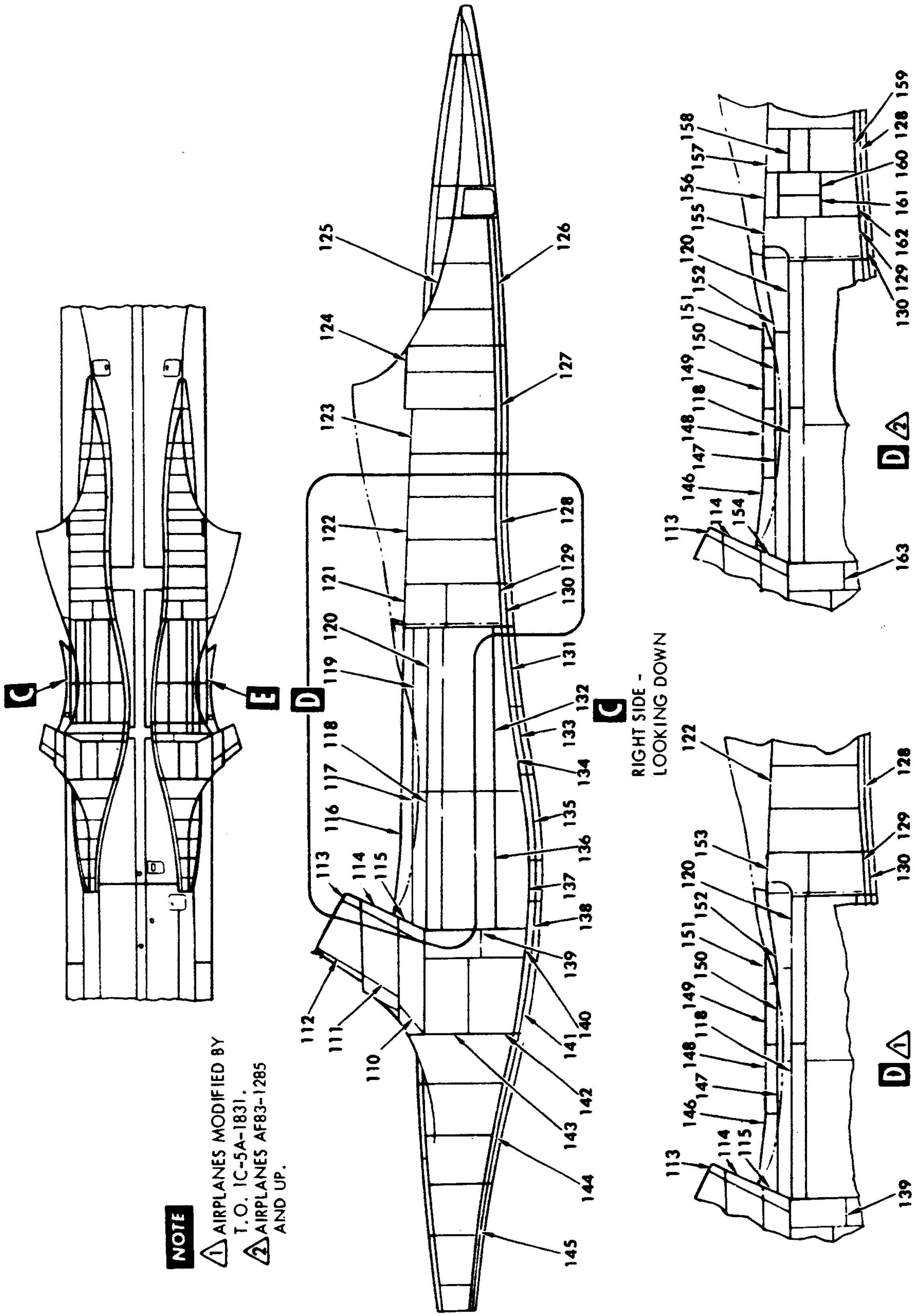
FUSELAGE EXTERNAL ACCESS (SHEET 1)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
58	2132-1	APU INLET
59	2132-1-1-1	ACTUATOR ACCESS
60	2132-1-1	ACTUATOR ACCESS
61	2223-1	JACK PAD ACCESS
62	2223-3	SPR LIGHT ACCESS
63	2233-2	SLOT DOOR
64	2233-4	SLOT DOOR
65	2233-5	SLOT DOOR
66	2233-6	SLOT DOOR
67	2233-7-1-1	FIRE PANEL
68	2233-7-1	SERVICE PANEL
69	2233-7	ATM AND APU ACCESS PANEL
70	6112-3	STRUCTURE INSPECTION
71	6112-1	STRUCTURE INSPECTION
72	6111-6	STRUCTURE INSPECTION
73	6113-6	STRUCTURE INSPECTION
74	6113-4	STRUCTURE INSPECTION
75	6113-3	STRUCTURE INSPECTION
76	6112-4	STRUCTURE INSPECTION
77	6113-1	STRUCTURE INSPECTION
78	2133-9	STRUCTURE INSPECTION
79	2133-8	STRUCTURE INSPECTION
80	2133-7	STRUCTURE INSPECTION
81	2133-6	STRUCTURE INSPECTION
82	2133-5	STRUCTURE INSPECTION
83	2133-4	STRUCTURE INSPECTION
84	2133-3	STRUCTURE INSPECTION
85	2133-2	STRUCTURE INSPECTION
86	2133-1	STRUCTURE INSPECTION
87	2122-16	STRUCTURE INSPECTION
88	2122-14	STRUCTURE INSPECTION
89	2122-20	STRUCTURE INSPECTION
90	2122-21	STRUCTURE INSPECTION
91	2122-13	STRUCTURE INSPECTION
92	2122-12	STRUCTURE INSPECTION
93	2122-11	STRUCTURE INSPECTION
94	2123-10	STRUCTURE INSPECTION
95	2123-11	STRUCTURE INSPECTION
96	2123-13	STRUCTURE INSPECTION
97	2123-14	STRUCTURE INSPECTION
98	2123-15	STRUCTURE INSPECTION
99	2122-15	STRUCTURE INSPECTION
100	2122-17	STRUCTURE INSPECTION
101	2123-12	STRUCTURE INSPECTION
102	2122-18	STRUCTURE INSPECTION
103	2122-19	STRUCTURE INSPECTION
104	2133-10	STRUCTURE INSPECTION
105	2133-11	STRUCTURE INSPECTION
106	6113-2	STRUCTURE INSPECTION
107	6113-5	STRUCTURE INSPECTION
108	6113-7	STRUCTURE INSPECTION
109	6112-2	STRUCTURE INSPECTION

FUSELAGE EXTERNAL ACCESS (SHEET 4)



FUSELAGE EXTERNAL ACCESS (SHEET 3)



FUSELAGE EXTERNAL ACCESS (SHEET 6)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
110	2121-12	STRUCTURE INSPECTION
111	2121-13	STRUCTURE INSPECTION
112	2121-21	STRUCTURE INSPECTION
113	2121-19	STRUCTURE INSPECTION
114	2121-18	STRUCTURE INSPECTION
115	2121-20	STRUCTURE INSPECTION
116 △3	2131-18	STRUCTURE INSPECTION
117 △3	2131-5	STRUCTURE INSPECTION
118	2131-4	STRUCTURE INSPECTION
119 △3	2131-12	STRUCTURE INSPECTION
120	2131-11	STRUCTURE INSPECTION
121	2131-15	STRUCTURE INSPECTION
122	2131-17	STRUCTURE INSPECTION
123	6111-2	STRUCTURE INSPECTION
124	6111-3	STRUCTURE INSPECTION
125	6111-4	STRUCTURE INSPECTION
126	6111-5	STRUCTURE INSPECTION
127	6111-1	STRUCTURE INSPECTION
128	2131-16	STRUCTURE INSPECTION
129	2131-14	STRUCTURE INSPECTION
130	2131-13	STRUCTURE INSPECTION
131	2131-8	STRUCTURE INSPECTION
132	2131-10	STRUCTURE INSPECTION
133	2131-7	STRUCTURE INSPECTION
134	2131-9	STRUCTURE INSPECTION
135	2131-6	STRUCTURE INSPECTION
136	2131-3	STRUCTURE INSPECTION
137	2131-2	STRUCTURE INSPECTION
138	2131-1	STRUCTURE INSPECTION
139	2121-16	STRUCTURE INSPECTION
140	2121-17	STRUCTURE INSPECTION
141	2121-11	STRUCTURE INSPECTION
142	2121-14	STRUCTURE INSPECTION
143	2121-15	STRUCTURE INSPECTION
144	2121-10	STRUCTURE INSPECTION
145	2122-10	STRUCTURE INSPECTION
146	4W54000-104A	UPPER JOINT FAIRING PANEL
147	4W54010-104A	WING TO FUSELAGE FAIRING PANEL
148	4W54000-151A	UPPER JOINT FAIRING PANEL
149	4W54000-145A	UPPER JOINT FAIRING PANEL
150	4W54010-132A	WING TO FUSELAGE FAIRING PANEL
151	4W54000-144A	UPPER JOINT FAIRING PANEL
152	4W54010-108B	WING TO FUSELAGE FAIRING PANEL
153	4W13501	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
154	4W54027-102A	WING TO FUSELAGE FAIRING PANEL
155	4W54024-102A	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
156	4W54040-102A	OUTBOARD WING TO FUSELAGE FAIRING CLOSURE PANEL
157	4W54039-102A	UPPER WING TO FUSELAGE FAIRING PANEL
158	4W54030-102A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
159	4W54029-102A	UPPER WING TO FUSELAGE FAIRING PANEL
160	4W54038-102A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
161	4W54032-102A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
162	4W54031-102A	UPPER WING TO FUSELAGE FAIRING PANEL
163	4W54028-102A	WING TO FUSELAGE FAIRING PANEL

NOTE

△3 AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1831.

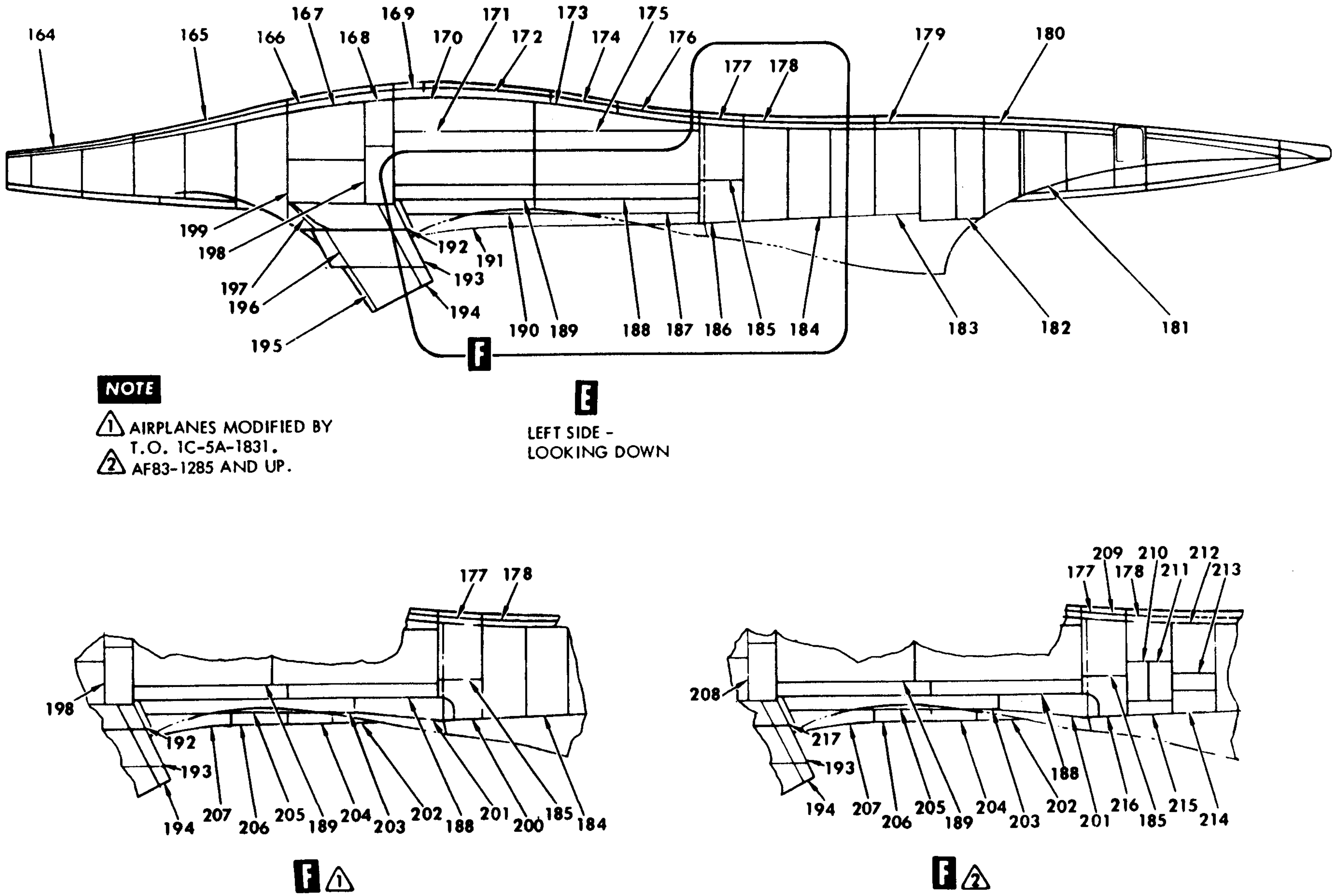
FUSELAGE EXTERNAL ACCESS (SHEET 5)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
164	1122-10	STRUCTURE INSPECTION
165	1121-10	STRUCTURE INSPECTION
166	1121-11	STRUCTURE INSPECTION
167	1121-14	STRUCTURE INSPECTION
168	1121-17	STRUCTURE INSPECTION
169	1131-1	STRUCTURE INSPECTION
170	1131-2	STRUCTURE INSPECTION
171	1131-3	STRUCTURE INSPECTION
172	1131-6	STRUCTURE INSPECTION
173	1131-9	STRUCTURE INSPECTION
174	1131-7	STRUCTURE INSPECTION
175	1131-10	STRUCTURE INSPECTION
176	1131-8	STRUCTURE INSPECTION
177	1131-13	STRUCTURE INSPECTION
178	1131-16	STRUCTURE INSPECTION
179	5111-1	STRUCTURE INSPECTION
180	5111-5	STRUCTURE INSPECTION
181	5111-4	STRUCTURE INSPECTION
182	5111-3	STRUCTURE INSPECTION
183	5111-2	STRUCTURE INSPECTION
184	1131-17	STRUCTURE INSPECTION
185	1131-14	STRUCTURE INSPECTION
186 △3	1131-15	STRUCTURE INSPECTION
187 △3	1131-12	STRUCTURE INSPECTION
188	1131-11	STRUCTURE INSPECTION
189	1131-4	STRUCTURE INSPECTION
190 △3	1131-5	STRUCTURE INSPECTION
191 △3	1131-18	STRUCTURE INSPECTION
192	1121-20	STRUCTURE INSPECTION
193	1121-18	STRUCTURE INSPECTION
194	1121-19	STRUCTURE INSPECTION
195	1121-21	STRUCTURE INSPECTION
196	1121-13	STRUCTURE INSPECTION
197	1121-12	STRUCTURE INSPECTION
198	1121-16	STRUCTURE INSPECTION
199	1121-15	STRUCTURE INSPECTION

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
200	4W13501	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
201	4W54010-1-7B	WING TO FUSELAGE FAIRING PANEL
202	4W54000-143A	UPPER JOINT FAIRING PANEL
203	4W54010-131A	WING TO FUSELAGE FAIRING PANEL
204	4W54000-145A	UPPER JOINT FAIRING PANEL
205	4W54010-103A	WING TO FUSELAGE FAIRING PANEL
206	4W54000-151A	UPPER JOINT FAIRING PANEL
207	4W55000-103A	UPPER JOINT FAIRING PANEL
208	4W54028-101A	WING TO FUSELAGE FAIRING PANEL
209	4W54031-101A	UPPER WING TO FUSELAGE FAIRING PANEL
210	4W54032-101A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
211	4W54038-101A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
212	4W54029-101A	UPPER WING TO FUSELAGE FAIRING PANEL
213	4W54030-101A	UPPER WING TO FUSELAGE FAIRING PANEL (DEWAR ACCESS)
214	4W54039-101A	UPPER WING TO FUSELAGE FAIRING PANEL
215	4W54040-101A	OUTBOARD WING TO FUSELAGE FAIRING CLOSURE PANEL
216	4W54024-101A	OUTBOARD UPPER WING TO FUSELAGE FAIRING PANEL
217	4W54027-101A	REAR WING TO FUSELAGE FAIRING PANEL

FUSELAGE EXTERNAL ACCESS (SHEET 8)

FUSELAGE EXTERNAL ACCESS (SHEET 7)



NOTE

⚠1 AIRPLANES MODIFIED BY T.O. 1C-5A-1831.

⚠2 AF83-1285 AND UP.

F ⚠1 F ⚠2

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
5 218	4F73460-101A	ACCESS DOOR
219	4F31268	ACCESS DOOR
220	1213-9	BORESCOPE ACCESS
221	1213-8	BORESCOPE ACCESS
222	1213-7	BORESCOPE ACCESS
223	1213-6	BORESCOPE ACCESS
224	1213-5	BORESCOPE ACCESS
225	1213-4	BORESCOPE ACCESS
226	1213-3	BORESCOPE ACCESS
227	1213-1	WASTE OUTLET
2 228	4F34330	FORWARD BILGE ACCESS HATCH
2 228A	4F34330	AFT BILGE ACCESS HATCH
229	4F31257-103A	AFT FUS RAMP FAIRING PANEL
230	4F31257-107A	AFT FUS RAMP FAIRING PANEL
231	4F31257	AFT FUSELAGE STABILIZING STRUT ACCESS DOOR
232	4F53005-321C	ACCESS DOOR
233	4F53005-243B	AFT RAMP FWD FAIRING PANEL
234	4F53005-241A	AFT RAMP FWD FAIRING PANEL
235	4F53005-239B	AFT RAMP FWD FAIRING PANEL
236	5231-1	CARRIAGE MECH. ACCESS
237	4F61425-101A	CARRIAGE MECH. ACCESS
238	4F41223	AFTERBODY MAINTENANCE DOOR ASSEMBLY
239	4F61425-102A	CARRIAGE MECH. ACCESS
240	6231-1	CARRIAGE MECH. ACCESS
241	4F53005-240B	AFT RAMP FWD FAIRING PANEL
242	4F53005-242A	AFT RAMP FWD FAIRING PANEL
243	4F53005-244B	AFT RAMP FWD FAIRING PANEL
244	4F53005-322C	ACCESS DOOR
245	4F31257-108A	AFT FUS RAMP FAIRING PANEL
246	2213-1	EXTERNAL POWER RECEPTACLE
247	2212-1	POTABLE WATER ACCESS
248	2213-3	BORESCOPE ACCESS
249	2213-4	BORESCOPE ACCESS
250	2213-5	BORESCOPE ACCESS
251	2213-6	BORESCOPE ACCESS
252	2213-7	BORESCOPE ACCESS
253	2213-8	BORESCOPE ACCESS
254	2213-9	BORESCOPE ACCESS
255	4F31268	ACCESS DOOR
4 256	4D61000	DOPPLER RADAR RADOME

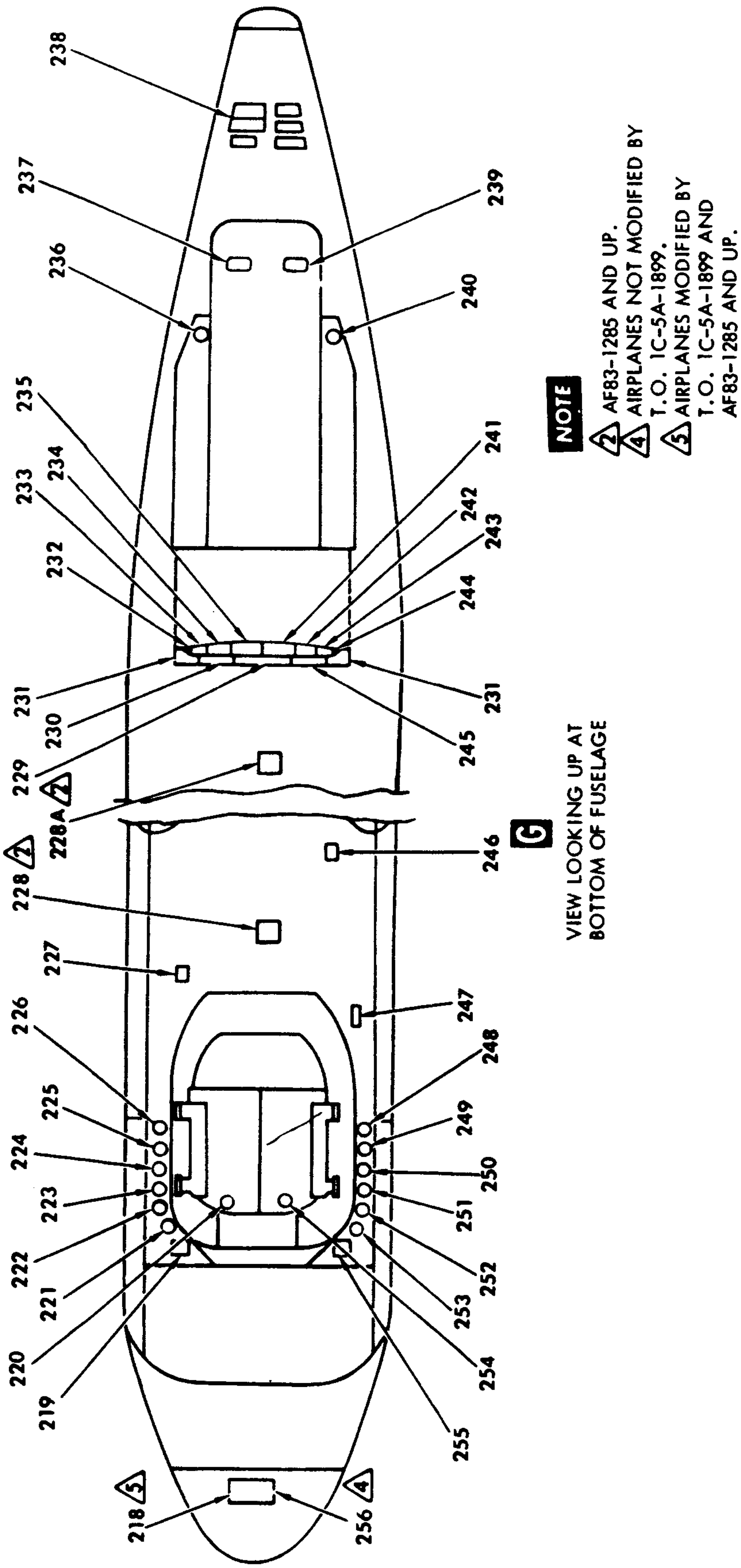
NOTE

2 AF83-1285 AND UP.

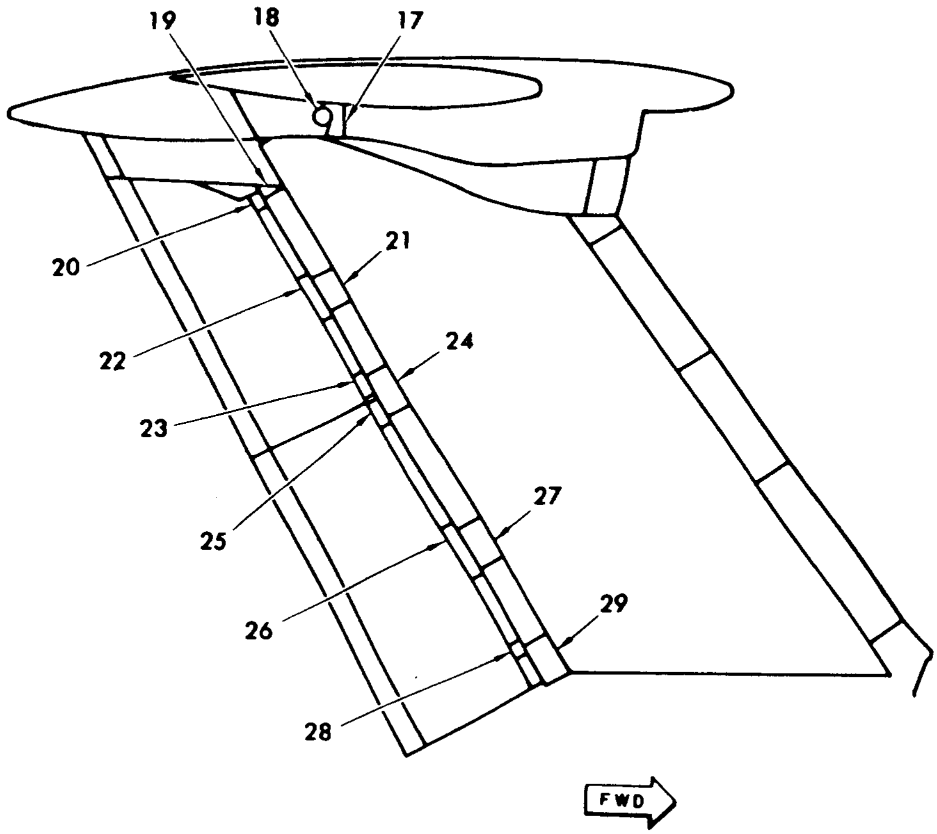
4 AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1899.

5 AIRPLANES MODIFIED BY T.O. 1C-5A-1899 AND AF83-1285 AND UP.

FUSELAGE EXTERNAL ACCESS (SHEET 10)

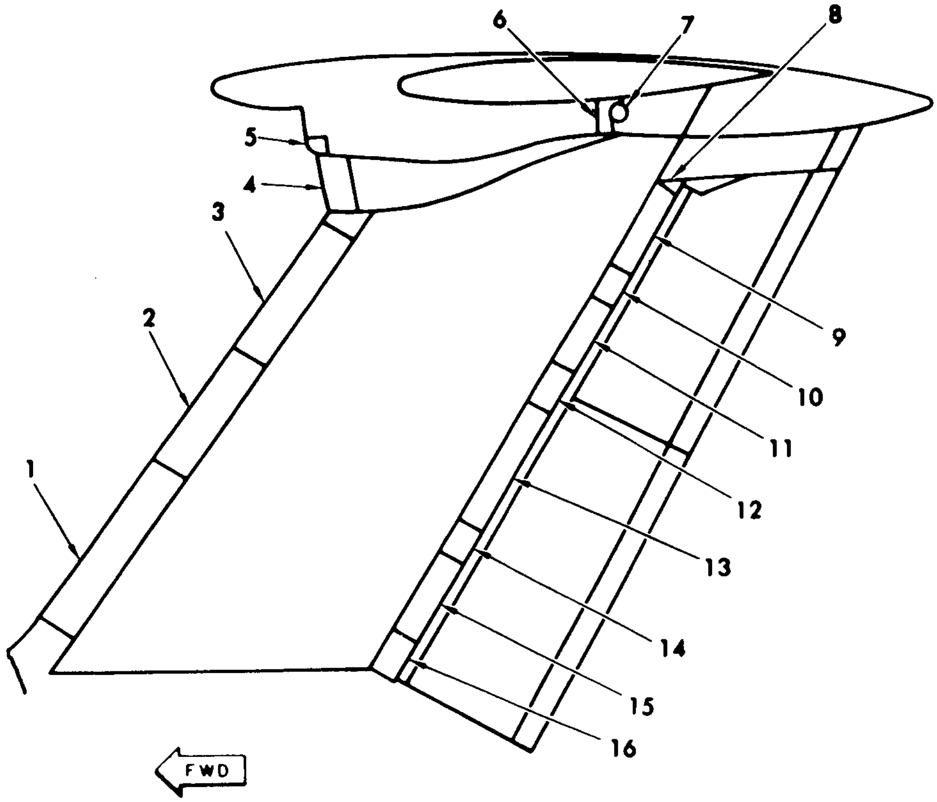


FUSELAGE EXTERNAL ACCESS (SHEET 9)



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
17	R9121-1	PIVOT PIN ACCESS PANEL
18	R9121-2	PIVOT PIN ACCESS DOOR
19	R9131-1	REMOVABLE SHROUD PANEL ASSEMBLY
20	R9131-3	UPPER HINGE ACCESS DOOR FOR UPPER RUDDER
21	R9131-2	UPPER RUDDER ACTUATOR ACCESS SHROUD PANEL
22	R9131-4	CENTER HINGE ACCESS DOOR FOR UPPER RUDDER
23	R9132-3	LOWER HINGE ACCESS DOOR FOR UPPER RUDDER
24	R9132-1	VERTICAL STABILIZER ACCESS SHROUD PANEL
25	R9132-4	UPPER HINGE ACCESS DOOR FOR LOWER RUDDER
26	R9133-4	CENTER HINGE ACCESS DOOR FOR LOWER RUDDER
27	R9133-1	LOWER RUDDER ACTUATOR ACCESS SHROUD PANEL
28	R9133-5	LOWER HINGE ACCESS DOOR FOR LOWER RUDDER
29	R9133-3	REMOVABLE SHROUD PANEL ASSEMBLY

EMPENNAGE EXTERNAL ACCESS (SHEET 2)



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	L9113-1	VERTICAL STABILIZER LOWER LEADING EDGE
2	L9112-1	VERTICAL STABILIZER CENTER LEADING EDGE
3	L9111-3	VERTICAL STABILIZER UPPER LEADING EDGE
4	L9111-2	CHIN FAIRING LEADING EDGE
5	L9111-1	FORWARD BULLET LEADING EDGE SKIRT
6	L9121-1	PIVOT PIN ACCESS PANEL
7	L9121-2	PIVOT PIN ACCESS DOOR
8	L9131-1	REMOVABLE SHROUD PANEL ASSEMBLY
9	L9131-2	REMOVABLE SHROUD PANEL ASSEMBLY
10	L9131-3	UPPER RUDDER ACTUATOR ACCESS SHROUD PANEL
11	L9131-1	REMOVABLE SHROUD PANEL ASSEMBLY
12	L9132-1	VERTICAL STABILIZER ACCESS SHROUD PANEL
13	L9132-2	REMOVABLE SHROUD PANEL ASSEMBLY
14	L9133-1	LOWER RUDDER ACTUATOR ACCESS SHROUD PANEL
15	L9133-2	REMOVABLE SHROUD PANEL ASSEMBLY
16	L9133-3	REMOVABLE SHROUD PANEL ASSEMBLY

EMPENNAGE EXTERNAL ACCESS (SHEET 1)

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
48	8112-4	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 3
49	8112-2	HORIZONTAL STABILIZER BOX CENTER REMOVABLE PANEL
50	8112-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 4
51	8113-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 5
52	8113-1	HORIZONTAL STABILIZER BOX OUTBOARD REMOVABLE PANEL
53	8123-3	HORIZONTAL STABILIZER REMOVABLE TIP
54	8123-2	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL
55	8133-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
56	8133-3	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
57	8123-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
58	8133-2	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
59	8122-6	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
60	8133-1	OUTBOARD ELEVATOR LEADING EDGE UPPER ACCESS PANEL
61	8122-5	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
62	8132-5	ELEVATOR SPLIT STRIP FAIRING
63	8132-4	ELEVATOR SPLIT STRIP FAIRING
64	8122-4	HORIZONTAL STABILIZER UPPER SHROUD PANEL
65	8132-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
66	8122-3	HORIZONTAL STABILIZER UPPER SHROUD PANEL
67	8132-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
68	8122-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
69	8132-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
70	8122-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
71	8131-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
72	8121-3	INBOARD ELEVATOR SERVO UPPER ACCESS PANEL
73	8121-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
74	8131-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
75	8131-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
76	8131-4	INBOARD ELEVATOR INBOARD STRIP FAIRING
77	8121-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
78	8121-4	CENTER BULLET UPPER AFT OUTBOARD ACCESS PANEL
79	7121-5	CENTER BULLET UPPER AFT INBOARD ACCESS PANEL
80	7121-4	CENTER BULLET UPPER AFT OUTBOARD ACCESS PANEL
⚠1 81	7131-6	CRASH DATA POSITION INDICATOR RECORDER
82	7131-4	INBOARD ELEVATOR INBOARD STRIP FAIRING
83	7131-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
84	7121-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
85	7131-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
86	7121-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
87	7131-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
88	7121-3	INBOARD ELEVATOR SERVO UPPER ACCESS PANEL
89	7122-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
90	7132-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
91	7122-2	HORIZONTAL STABILIZER UPPER SHROUD PANEL
92	7132-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
93	7122-3	HORIZONTAL STABILIZER UPPER SHROUD PANEL
94	7132-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
95	7132-5	ELEVATOR SPLIT STRIP FAIRING
96	7132-4	ELEVATOR SPLIT STRIP FAIRING
97	7122-4	HORIZONTAL STABILIZER UPPER SHROUD PANEL
98	7122-5	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
99	7133-1	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
100	7122-6	OUTBOARD ELEVATOR SERVO UPPER ACCESS PANEL
101	7133-2	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
102	7123-1	HORIZONTAL STABILIZER UPPER SHROUD PANEL
103	7133-3	OUTBOARD ELEVATOR LEADING EDGE ACCESS PANEL
104	7133-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
105	7123-2	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL

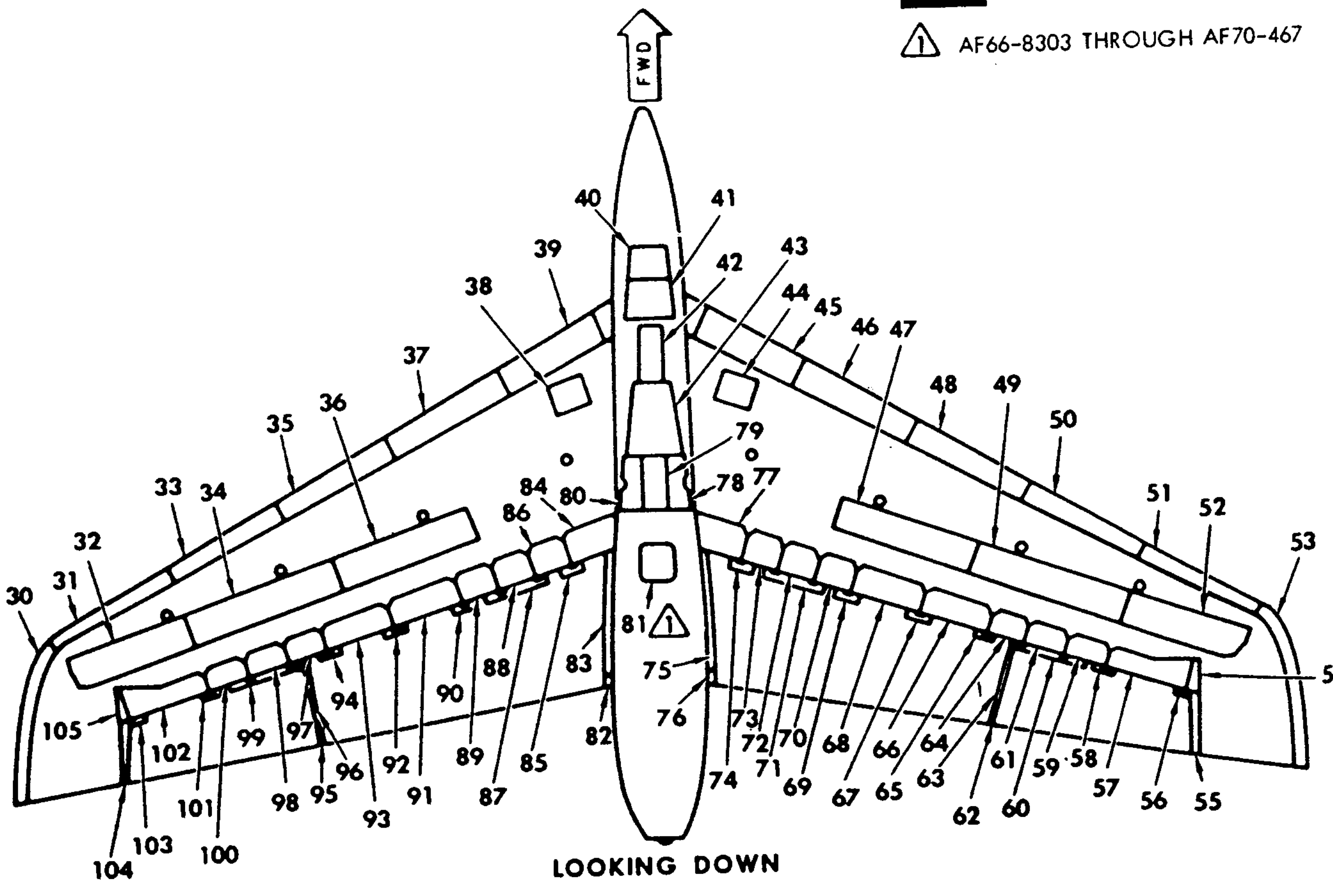
NOTE

⚠1 AF66-8303 THROUGH AF70-467.

EMPENNAGE EXTERNAL ACCESS (SHEET 4)

NOTE

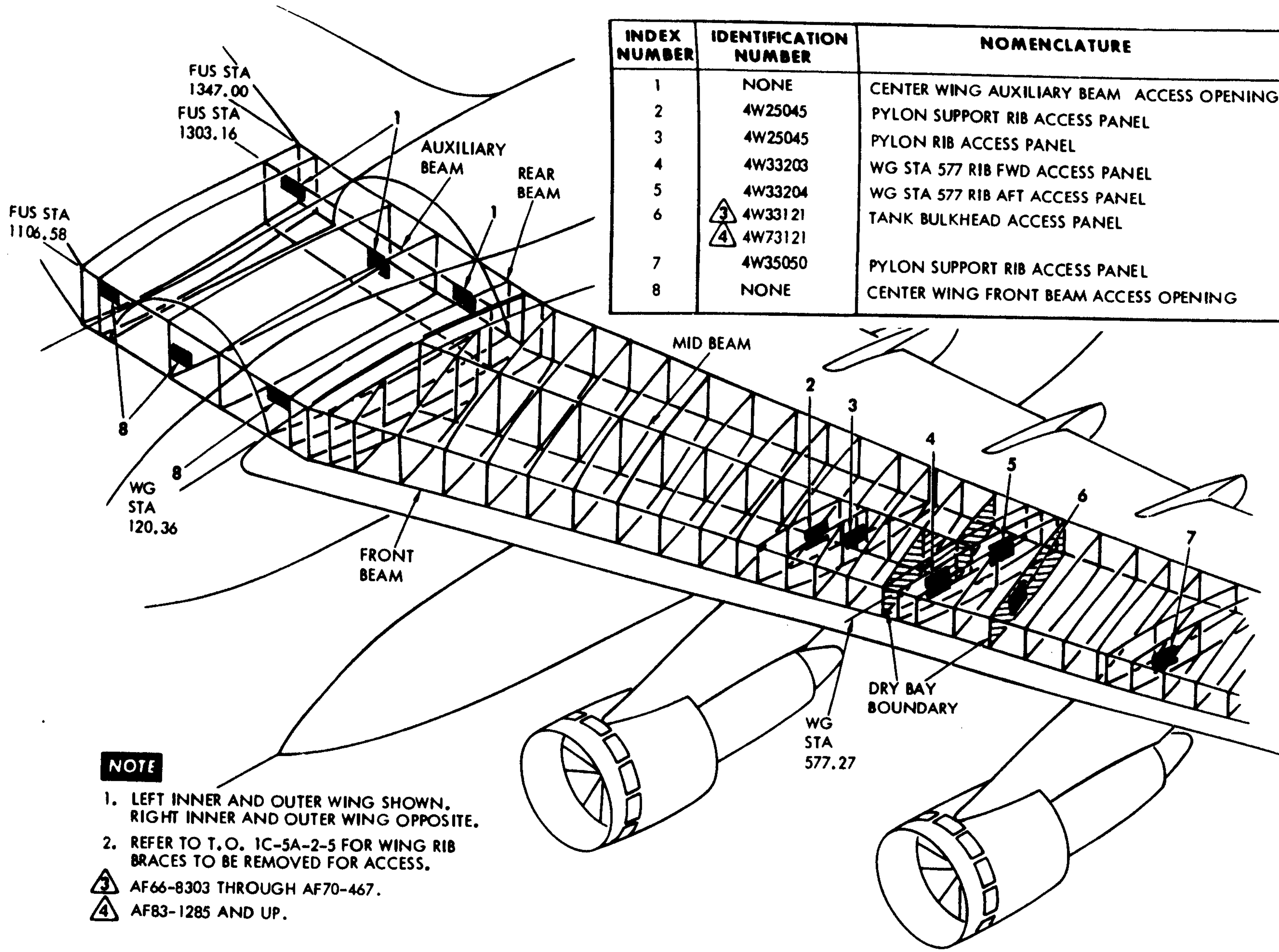
⚠1 AF66-8303 THROUGH AF70-467



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
30	7123-3	HORIZONTAL STABILIZER REMOVABLE TIP
31	7113-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 5
32	7113-1	HORIZONTAL STABILIZER BOX OUTBOARD REMOVABLE PANEL
33	7112-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 4
34	7112-2	HORIZONTAL STABILIZER BOX CENTER REMOVABLE PANEL
35	7112-4	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 3
36	7112-1	HORIZONTAL STABILIZER BOX INBOARD REMOVABLE PANEL
37	7111-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 2
38	7111-1	HORIZONTAL STABILIZER BOX ACCESS DOOR
39	7111-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 1
40	7111-7	PERSONNEL ACCESS PANEL
41	7111-6	PITCH TRIM ACTUATOR ACCESS PANEL
42	7111-5	CENTER BULLET UPPER FORWARD ACCESS PANEL
43	7111-4	CENTER BULLET UPPER CENTER ACCESS PANEL
44	8111-1	HORIZONTAL STABILIZER BOX ACCESS DOOR
45	8111-3	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 1
46	8111-2	HORIZONTAL STABILIZER LEADING EDGE, SECTION NO. 2
47	8112-1	HORIZONTAL STABILIZER BOX INBOARD REMOVABLE PANEL

EMPENNAGE EXTERNAL ACCESS (SHEET 3)

WING INTERNAL ACCESS PROVISIONS



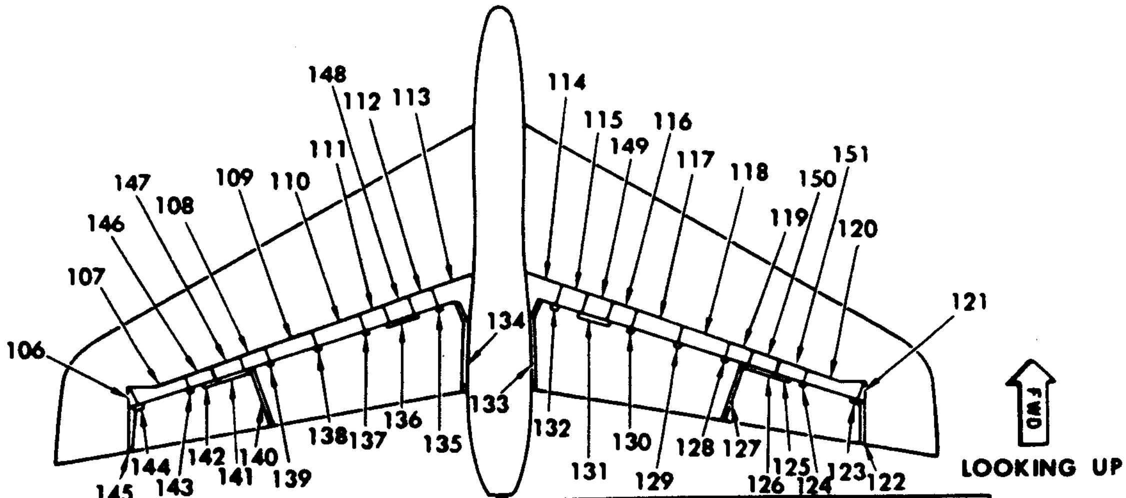
INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	NONE	CENTER WING AUXILIARY BEAM ACCESS OPENING
2	4W25045	PYLON SUPPORT RIB ACCESS PANEL
3	4W25045	PYLON RIB ACCESS PANEL
4	4W33203	WG STA 577 RIB FWD ACCESS PANEL
5	4W33204	WG STA 577 RIB AFT ACCESS PANEL
6	△3 4W33121 △4 4W73121	TANK BULKHEAD ACCESS PANEL
7	4W35050	PYLON SUPPORT RIB ACCESS PANEL
8	NONE	CENTER WING FRONT BEAM ACCESS OPENING

NOTE

1. LEFT INNER AND OUTER WING SHOWN. RIGHT INNER AND OUTER WING OPPOSITE.
2. REFER TO T.O. 1C-5A-2-5 FOR WING RIB BRACES TO BE REMOVED FOR ACCESS.

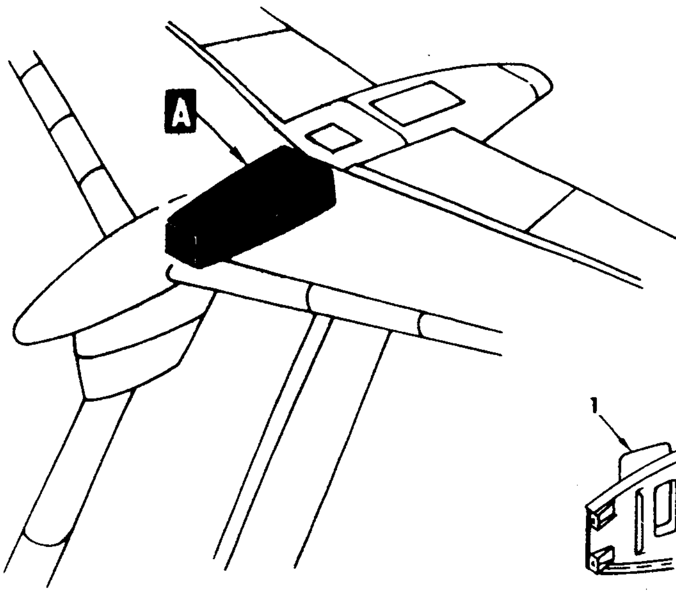
△3 AF66-8303 THROUGH AF70-467.

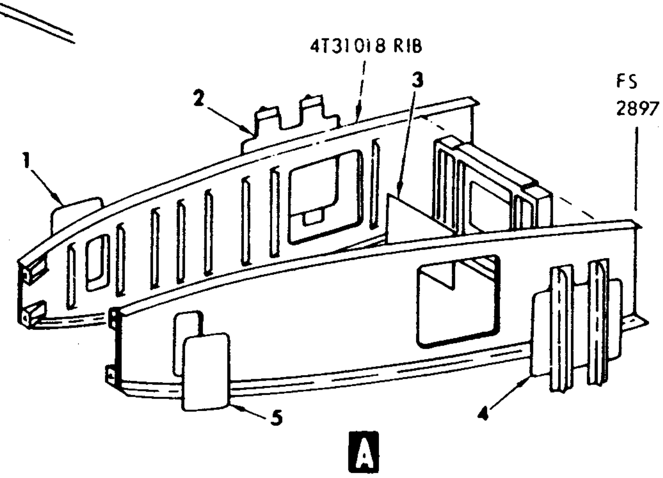
△4 AF83-1285 AND UP.



INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
106	8223-4	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL
107	8223-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
108	8222-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
109	8222-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
110	8222-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
111	8222-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
112	8221-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
113	8221-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
114	7221-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
115	7221-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
116	7222-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
117	7222-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
118	7222-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
119	7222-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
120	7223-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
121	7223-4	HORIZONTAL STABILIZER TIP INBOARD ACCESS PANEL
122	7233-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
123	7233-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
124	7233-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
125	7233-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
126	7233-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
127	7232-4	ELEVATOR SPLIT STRIP FAIRING
128	7232-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
129	7232-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
130	7232-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
131	7231-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
132	7231-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
133	7231-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
134	8231-3	INBOARD ELEVATOR INBOARD STRIP FAIRING
135	8231-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
136	8231-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
137	8232-1	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
138	8232-2	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
139	8232-3	INBOARD ELEVATOR LEADING EDGE ACCESS PANEL
140	8232-4	ELEVATOR SPLIT STRIP FAIRING
141	8233-1	HORIZONTAL STABILIZER LOWER SHROUD PANEL
142	8233-2	HORIZONTAL STABILIZER LOWER SHROUD PANEL
143	8233-3	HORIZONTAL STABILIZER LOWER SHROUD PANEL
144	8233-4	HORIZONTAL STABILIZER LOWER SHROUD PANEL
145	8233-4	HORIZONTAL STABILIZER TIP INBOARD FAIRING
146	8223-2	OUTBOARD ELEVATOR SERVO ACCESS PANEL
147	8223-1	OUTBOARD ELEVATOR SERVO ACCESS PANEL
148	8221-3	INBOARD ELEVATOR SERVO ACCESS PANEL
149	7221-3	INBOARD ELEVATOR SERVO ACCESS PANEL
150	7223-1	OUTBOARD ELEVATOR SERVO ACCESS PANEL
151	7223-2	OUTBOARD ELEVATOR SERVO ACCESS PANEL

EMPENNAGE EXTERNAL ACCESS (SHEET 5)

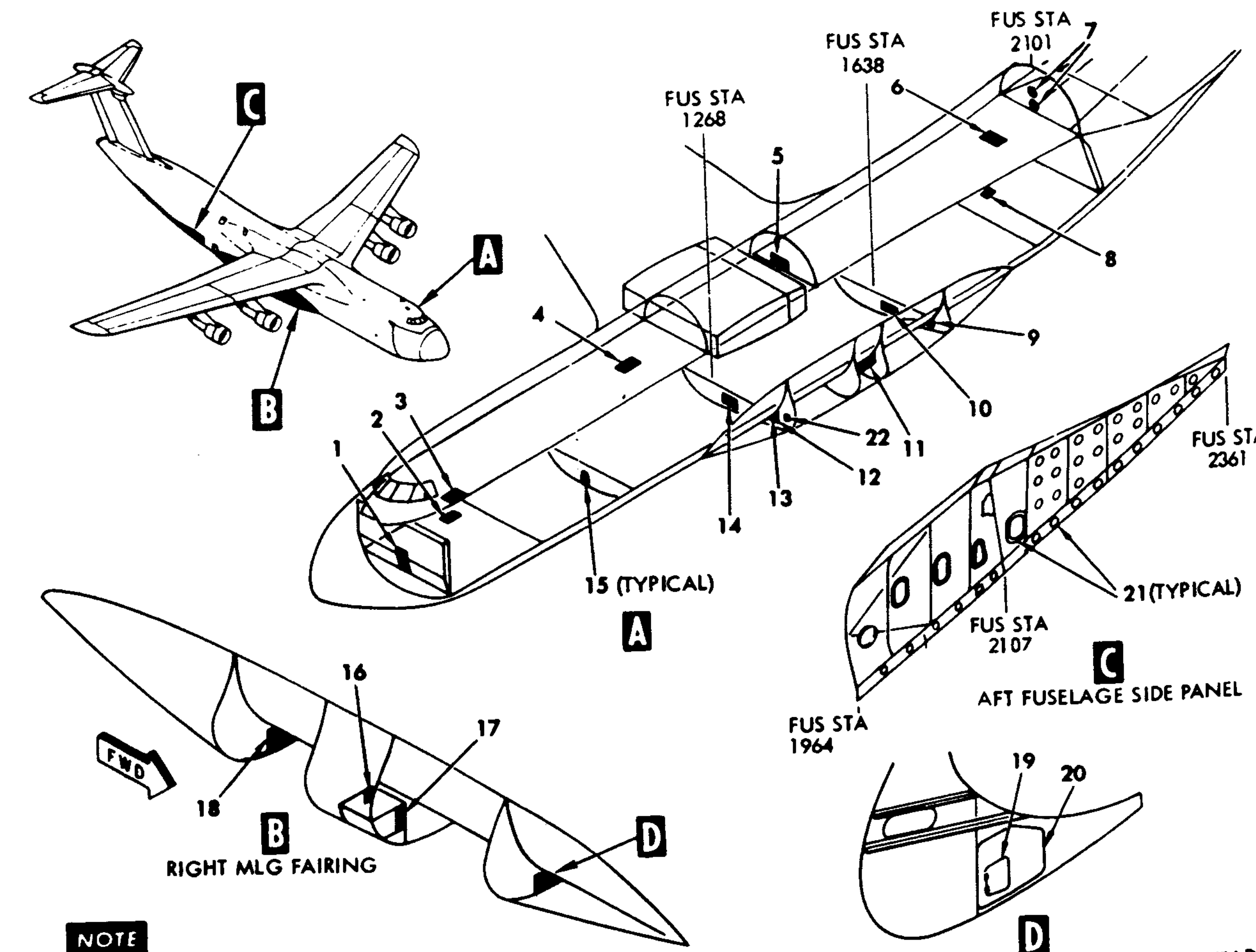




HORIZONTAL STABILIZER CENTER SECTION

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	4T31018-131A	PIVOT FITTING RIB ACCESS PLATE
2	4T31018-103A	PIVOT FITTING RIB ACCESS DOOR
3	4T33017-101A	TRANSVERSE BEAM ACCESS PANEL
4	4T31018-104A	PIVOT FITTING RIB ACCESS DOOR
5	4T31018-131A	PIVOT FITTING RIB ACCESS PLATE

HORIZONTAL STABILIZER ACCESS



NOTE

⚠1 AF83-1285 AND UP.

INDEX NUMBER	IDENTIFICATION NUMBER	NOMENCLATURE
1	4F52076	RAMP EXTENSION ACCESS DOOR FOR ACCESS TO VISOR DOOR
2	4F51057	FORWARD RAMP WINCH ACCESS DOOR
3	4F21450	FOLDING STAIR LADDER
4	4F11000	FLOOR HATCH FOR SECONDARY ACCESS TO CARGO COMPARTMENT
5	TPF 13-1	TROOP COMPARTMENT TO CENTER WING AFT BEAM ACCESS DOOR
6	4F12390	FOLDING STAIR LADDER
7	4F41211	AFT FUSELAGE ACCESS DOOR
8	4F53058	AFT RAMP WINCH ACCESS DOOR
9	LWA13-2	RADAR TRANSMITTER AND RECEIVER ACCESS DOOR
10	WA22	FUSELAGE STATION 1638 UNDERFLOOR ACCESS DOOR
11	LWB23-3	LIQUID OXYGEN ACCESS DOOR
12	LWF33-11	SPR FUEL DUMP VALVE ACCESS PANEL
13	LWF33-1	FORWARD WHEEL WELL FAIRING BULKHEAD ACCESS DOOR
14	WF22	FUSELAGE STATION 1268 UNDERFLOOR ACCESS DOOR
15	NONE	UNDERFLOOR CRAWLWAY
16	RWA11-5	MLG TIRE INFLATION UNIT AFT ACCESS PANEL
17	RWF31-4	MLG TIRE INFLATION UNIT FORWARD ACCESS PANEL
18	RWA33-2	RADAR ALTIMETER TRANSMITTER AND RECEIVER ACCESS DOOR
19	RWF13-11	SPR FUEL DUMP VALVE ACCESS PANEL
20	RWF13-1	FORWARD WHEEL WELL FAIRING BULKHEAD ACCESS DOOR
21		MISCELLANEOUS ACCESS
⚠1 22	4E32422	PRESSURIZED POTABLE WATER SERVICE PANEL DOOR

FUSELAGE INTERNAL ACCESS

SECTION II
HYDRAULICS

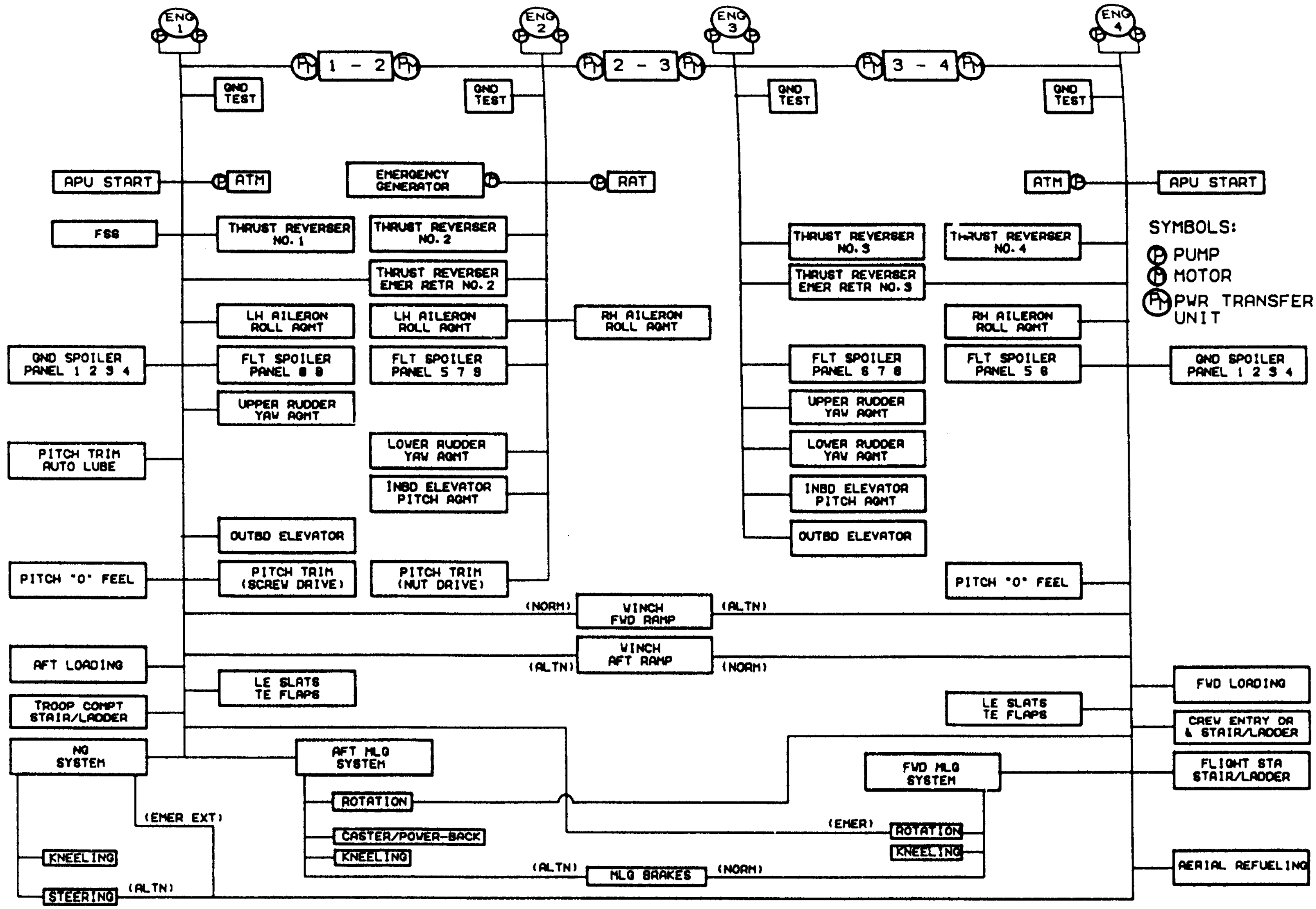
INTRODUCTION

Four separate and functionally independent 3,000 ($\pm$150) psi hydraulic systems are installed on the airplane. The systems are designated No. 1, No. 2, No. 3, and No. 4. Each system consists of two engine-driven hydraulic pumps, a hydraulically driven suction boost pump, a reservoir, a power transfer unit, and the necessary tubing and valves. Hydraulic systems No. 1 and No. 4 also contain an electrically driven suction boost pump. Two additional pumps, each driven by a separate air turbine motor (ATM), are provided to supply hydraulic pressure during flight and for ground operation. One of the ATM pumps pressurizes system No. 1 and the other ATM pump pressurizes system No. 4. A ram air turbine (RAT) is also provided to supply limited hydraulic power to system No. 2 for a controlled descent in the event of a multiple engine failure.

Two methods are available for hydraulic reservoir servicing. A ground fill connection in the right main landing gear fairing is provided for external servicing. A handpump and fluid receptacle are provided in service center number 3 for inflight or remote servicing. A selector valve located adjacent to the handpump is provided to select the hydraulic reservoir to be serviced. Each reservoir incorporates a sight gage on the side of the container and a fluid level indicator which provides a remote quantity readout on its respective gage on the flight engineer's hydraulic panel. A drain valve is located below each reservoir for draining the reservoir fluid overboard through the exterior mounted drain mast.

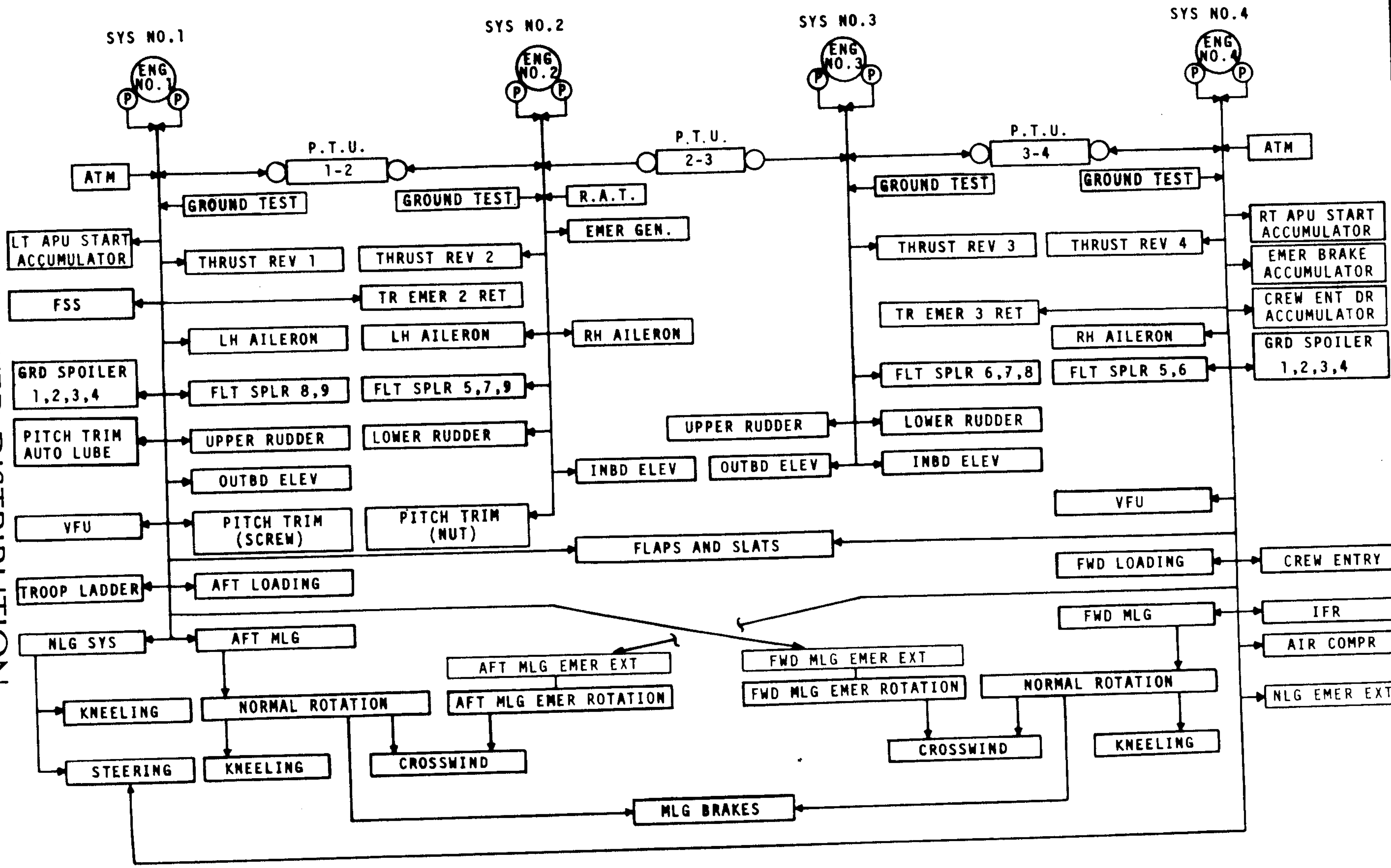
Each hydraulic system is equipped with a heat exchanger for fluid cooling. The heat exchangers for hydraulic systems No. 1 and No. 2 are installed in the No. 2 main fuel tank. The heat exchangers for hydraulic systems No. 3 and No. 4 are installed in No. 3 main fuel tank. Hydraulic fluid from the engine-driven and ATM-driven pumps case drains is circulated through the heat exchangers and then to the return system. The heat exchangers, through thermostatic control valves, are bypassed when the case drain fluid temperature is 130^{o}F or below. When the fluid temperature is 150^{o} or above, it is routed through the heat exchangers.

C-5B POWER DISTRIBUTION

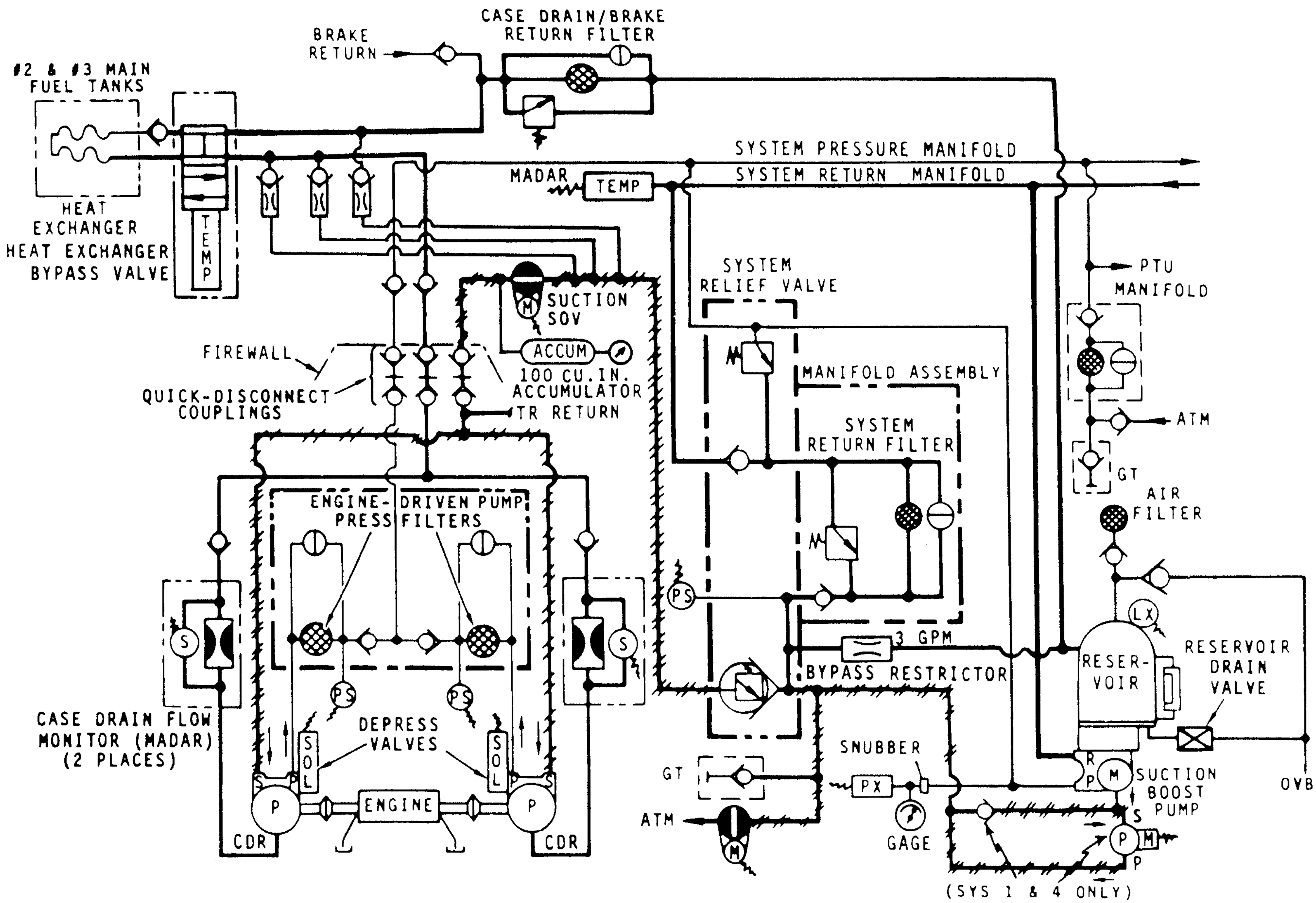


C-5A POWER DISTRIBUTION

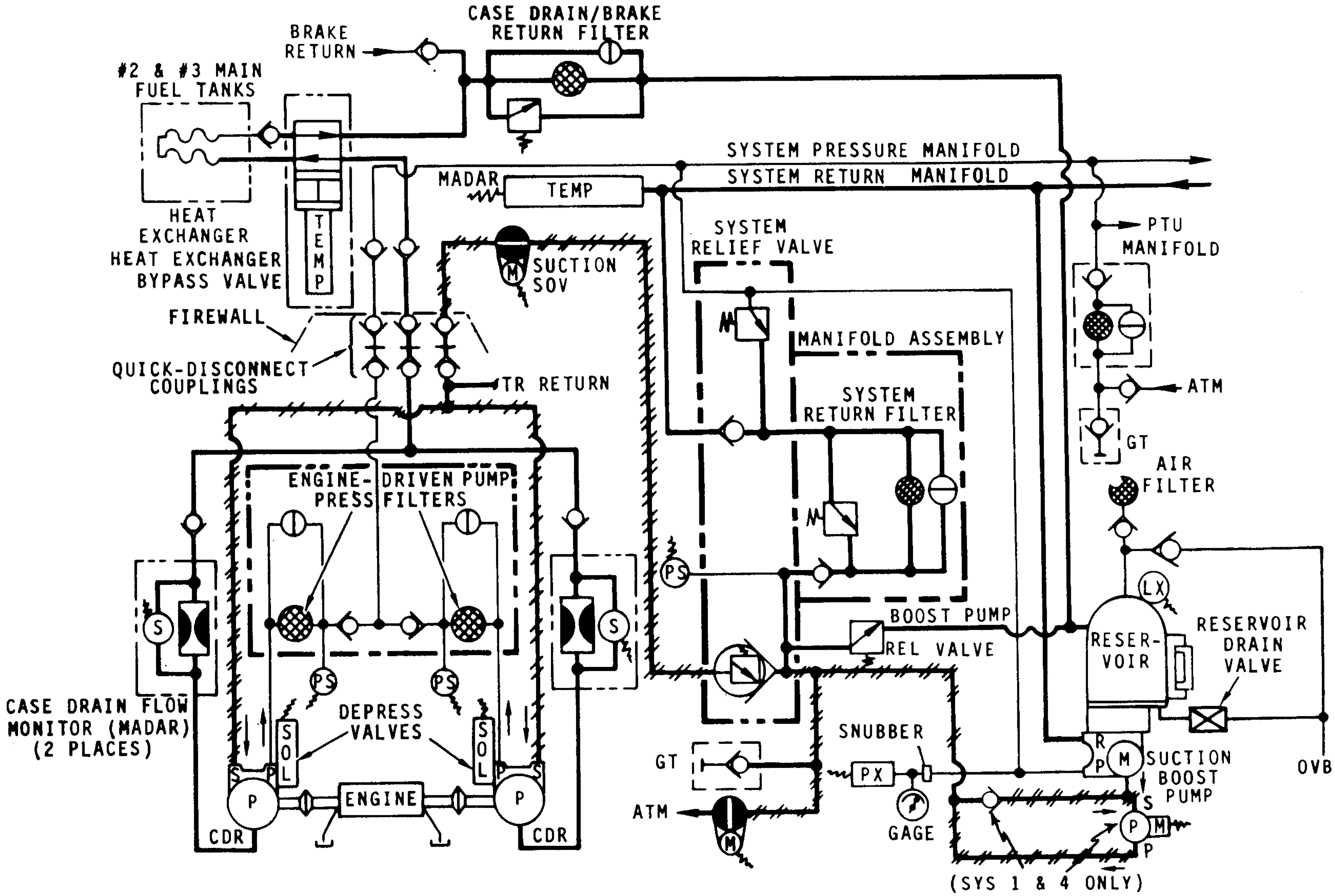
HYDRAULIC-POWER



C-5B POWER GENERATION SCHEMATIC



C-5A POWER GENERATION SCHEMATIC



MADAR FLOW MONITOR TRIP
Engine-Driven Pumps 6.3 ± 0.5 GPM
ATM-Driven Pumps 3.7 ± 0.5 GPM
P.T.U.'s 3.7 ± 0.5 GPM

RESERVOIR CAPACITIES
No. 1 - 10.01 Gals
No. 2 - 5.70 Gals
No. 3 - 5.70 Gals
No. 4 - 10.01 Gals

SYSTEM CAPACITIES (APPROX)
No. 1 - 95 Gals
No. 2 - 47 Gals
No. 3 - 53 Gals
No. 4 - 69 Gals
Total: 264 Gals (approx)

RAM AIR TURBINE (R.A.T.) HYDRAULIC PUMP
Fixed Displacement, Piston Type
110 to 350 KCAS
32 GPM @ 2900 PSI from 165 KCAS and Up
Press. Drops to 1470 PSI @ 110 KCAS
Air Bottle - 240 In^3 @ 1800 PSI Precharge
Accumulator - 100 In^3

CASE DRAIN RETURN (CDR) FILTER ASSY.
Filter - 15 Micron at 40 gpm (mesh)
Bypass - 50 ± 5 PSID
DPI - 35 ± 5 PSID

RESERVOIR
Vent Check Valve - Low Crack Press. - 0.8 PSI
Reservoir Relief - 15 - 17 PSI
Vent Filter - 10 Micron

CDR COOLER TEMP. CONTROL VALVE
130 - 150 Degrees F

SUCTION BOOST PUMP RELIEF VALVE
A 8 GPM @ 90 PSI
Reseat @ 70 PSI

B 3 GPM Two Way Restrictor

POWER GENERATION (SHEET 2)

ENGINE-DRIVEN PUMPS
Variable Volume - Constant Pressure
60 GPM @ 5000 RPM - 3000 PSI
40 GPM @ Idle
60 GPM @ Cruise
64 GPM @ Takeoff
Foot Valve (CDR to Inlet) - 75 PSI

A.T.M. - DRIVEN PUMPS
Variable Displacement - Constant Pressure
40 GPM - 3000 PSI
ATM Normal Speed - 38,200 RPm

P.T.U. PUMP/MOTOR
Constant Displacement
35 GPM @ 3000 PSI as Pump

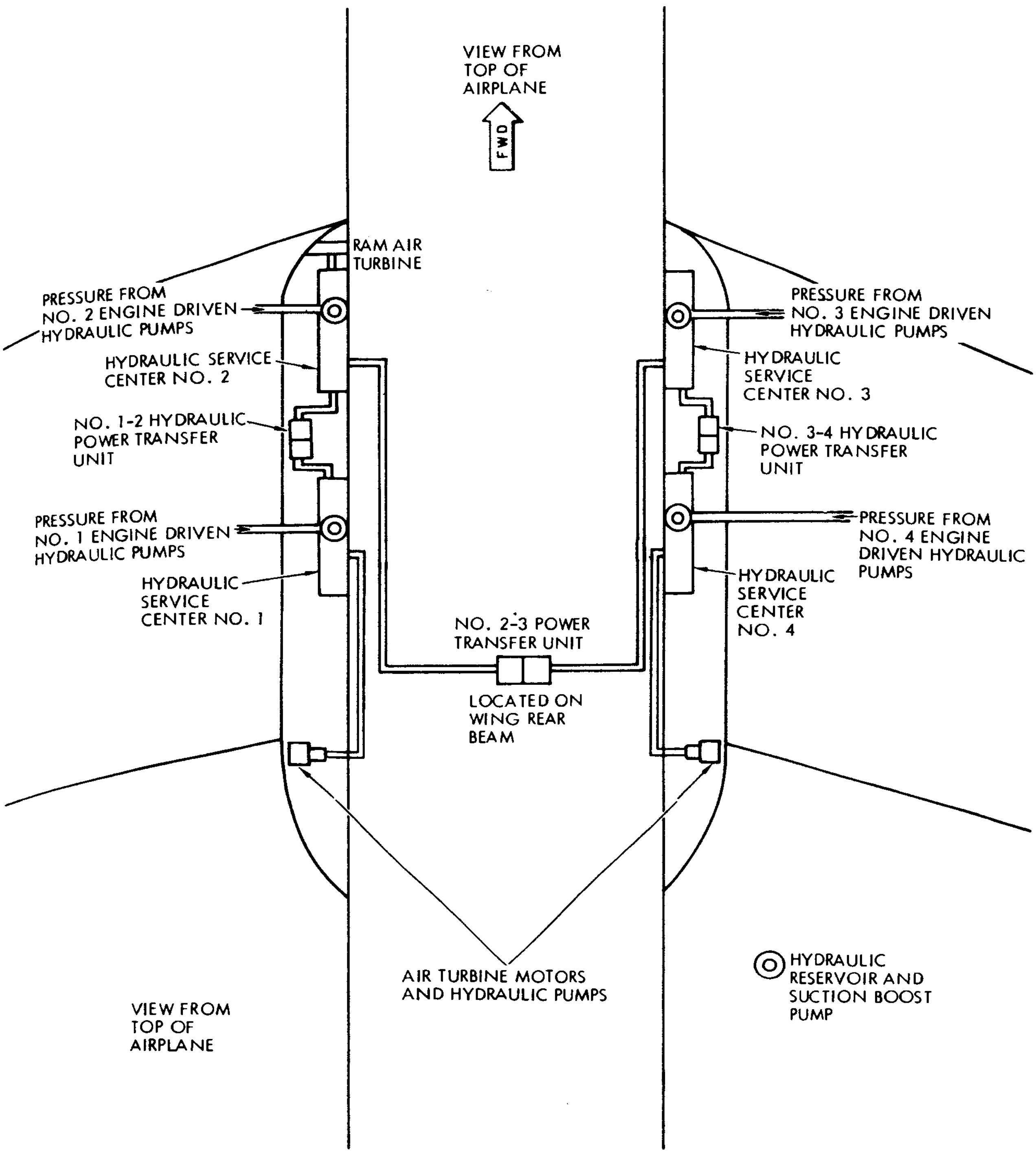
ELECTRIC MOTOR-DRIVEN SUCTION BOOST PUMP
115 Vac - 400 HZ - 3 Phase
98 PSI @ 0 GPM
91 PSI @ 10 GPM
80 PSI @ 19.2 GPM
Centrifugal Type

HYDRAULIC MOTOR-DRIVEN SUCTION BOOST PUMP
75 PSI @ 20 GPM (79.7 PSI Min.)
110 PSI @ 0 GPM (110 PSI Max.)
Centrifugal Type

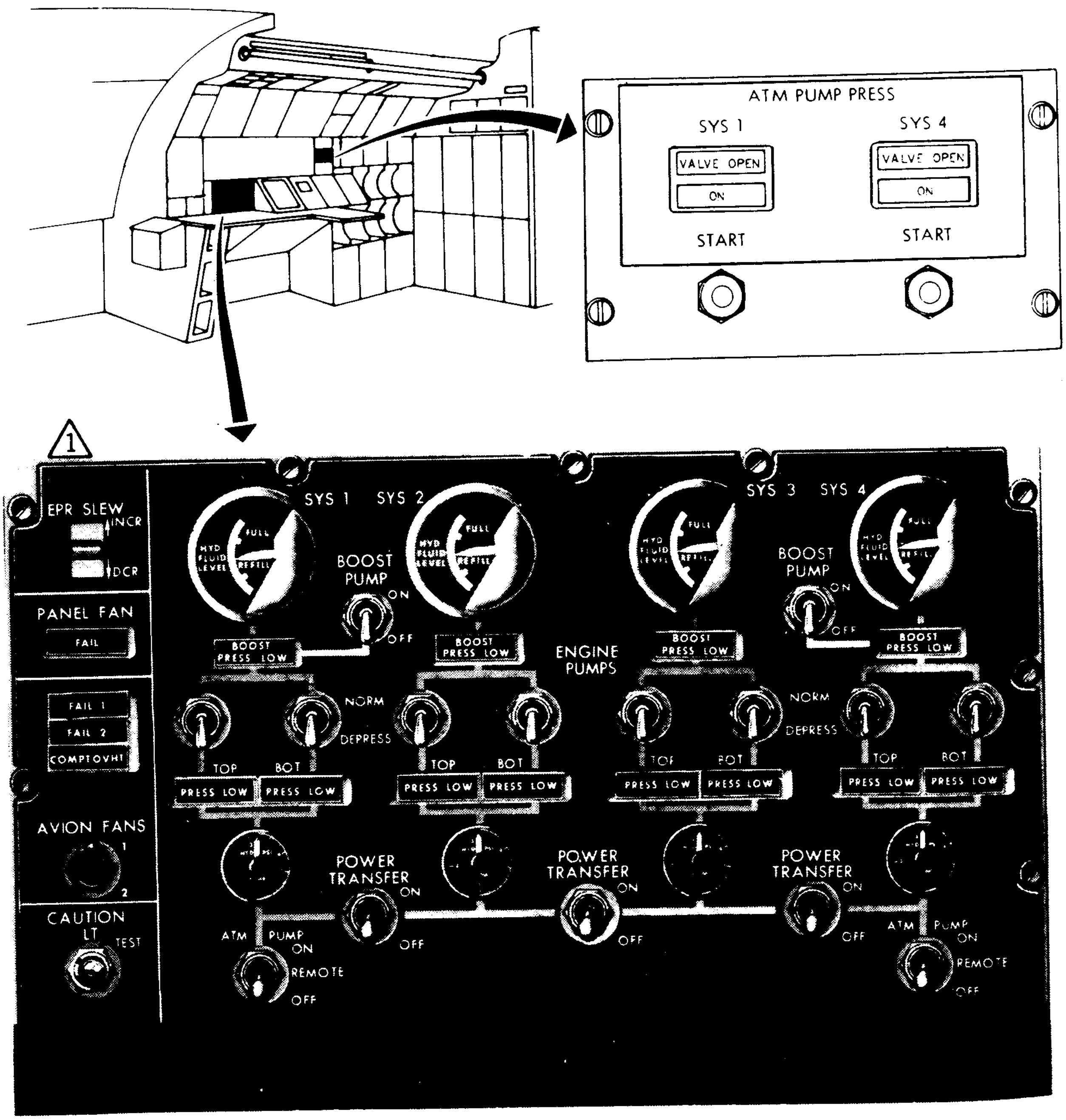
SYSTEM RETURN FILTER ASSEMBLY
Filter - 5 Micron @ 100 GPM (400 PSI)
DPI - 100 ± 15 PSI
Filter Bypass Valve - 225 PSI (Crack)
300 PSI (Open)
Suction Check Valve - 2 - 8 PSI @ 75 GPM
Return Check Valve - 3000 PSI @ 75 GPM
System Relief Valve - 3560 PSI @ 50 GPM
Boost Press. Low Switch - 25 ± 5 PSI

ENGINE-DRIVEN PUMP FILTER ASSY. (NO BYPASS)
Filter - 15 Micron, 40 GPM @ 3000 PSI
DPI - 70 ± 10 PSI
Pressure Low Switch - 1350 ± 150 PSI

POWER GENERATION (SHEET 1)



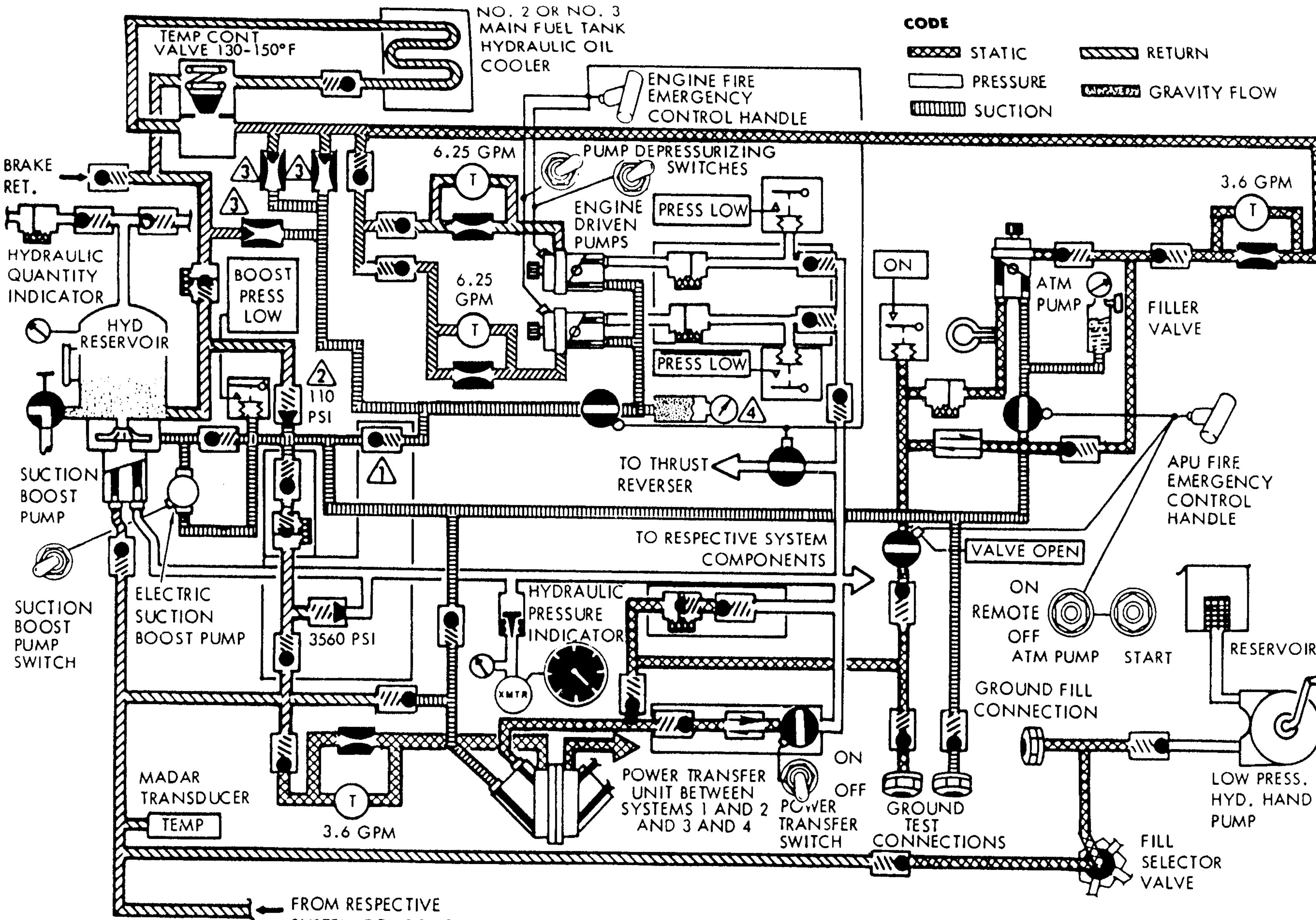
HYDRAULIC SYSTEM COMPONENT LOCATION



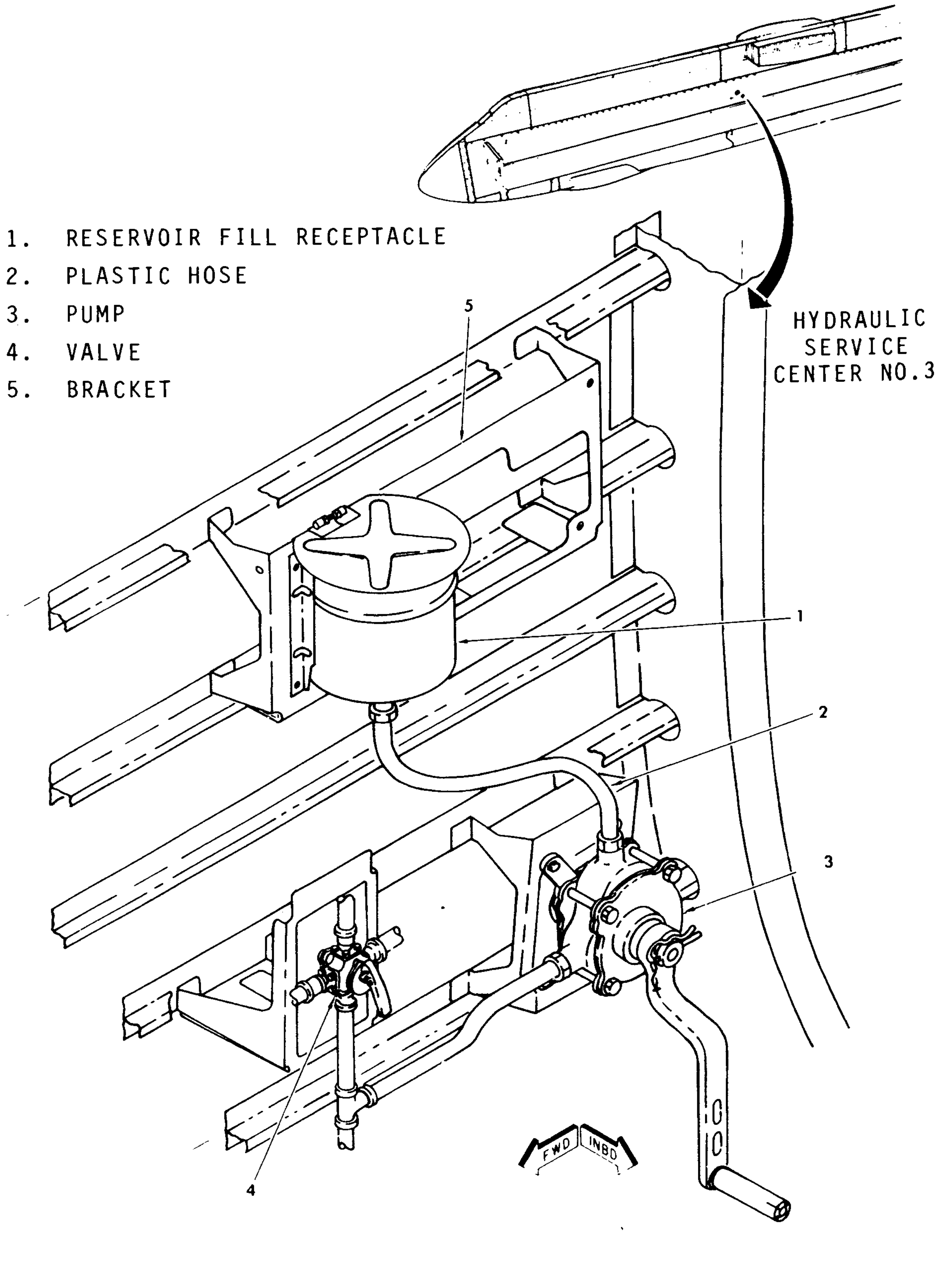
1 N_1 SLEW ON B

HYDRAULIC SYSTEM CONTROL & INDICATOR PANELS

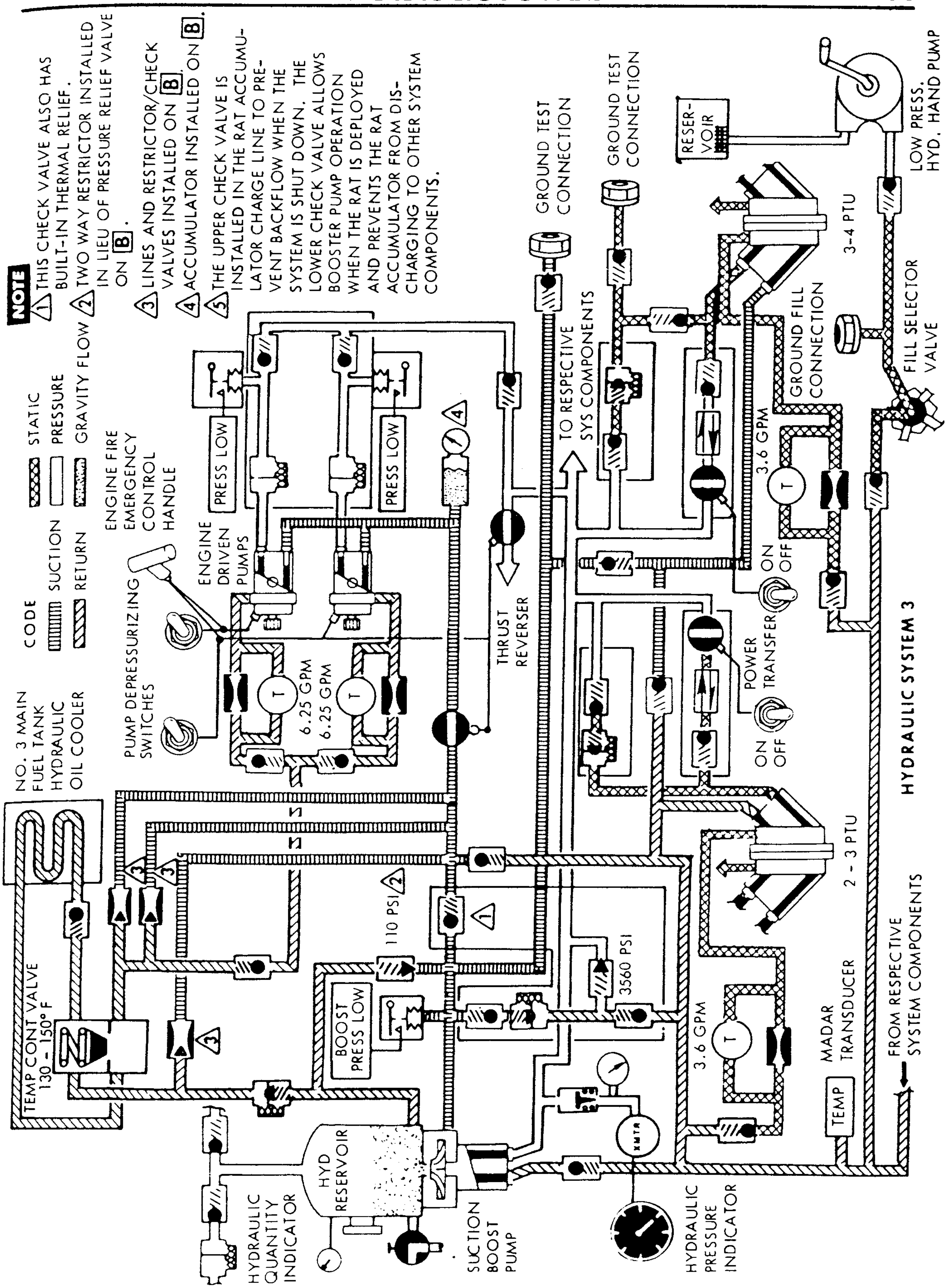
HYDRAULIC POWER SUPPLY SYSTEM (SHEET 1)



HYDRAULIC SYSTEM 1 OR 4



HYDRAULIC RESERVIOR SERVICING SYSTEM

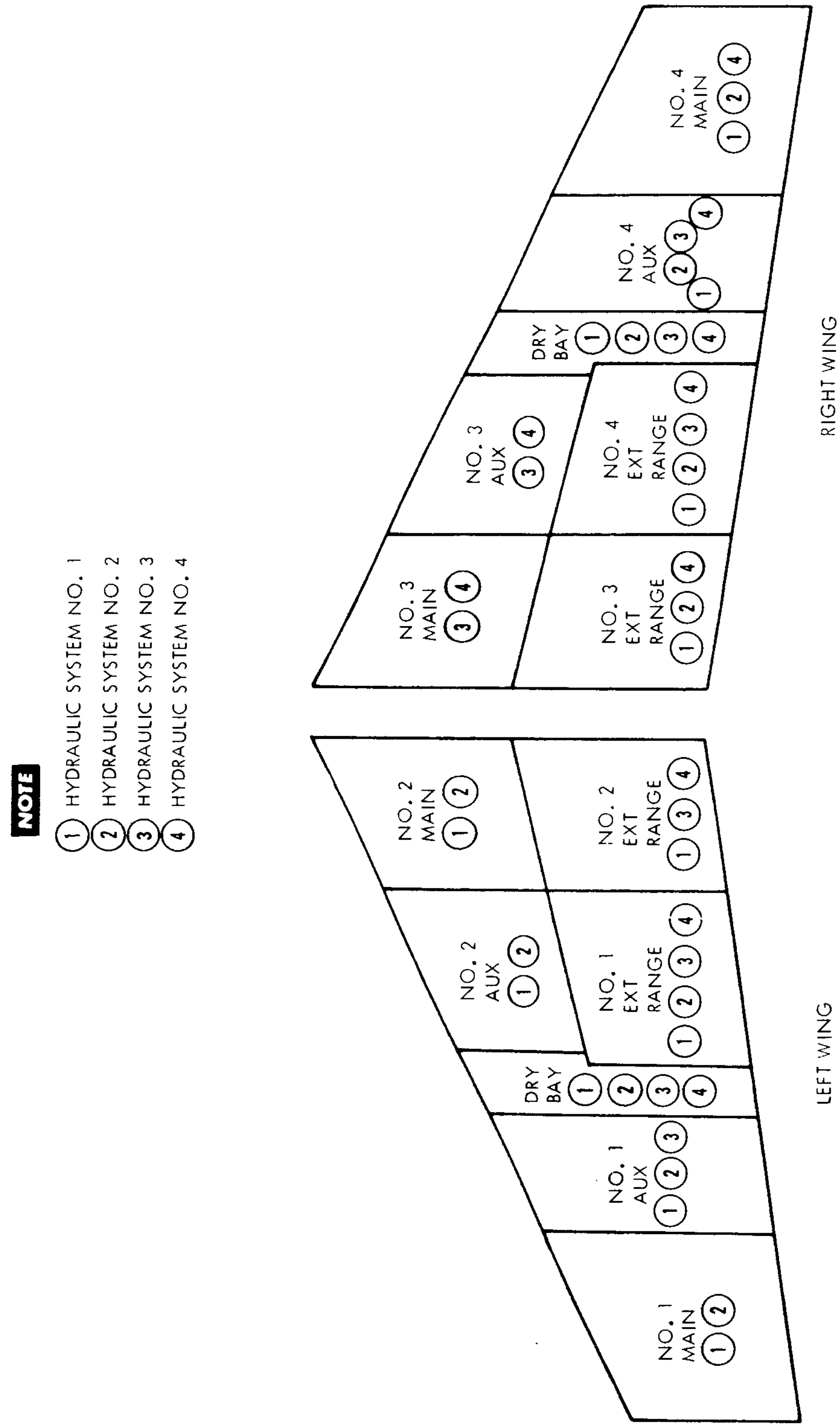


HYDRAULIC POWER SUPPLY SYSTEM (SHEET 3)

TUBE MATERIAL	TUBE DIMENSIONS IN INCHES		MINIMUM INCH-POUNDS	MAXIMUM INCH-POUNDS
	OUTSIDE DIAMETER	WALL THICK.		
AM350 STAINLESS STEEL (1) (3)	1/4 3/8 1/2 5/8 3/4 1 1 1/4	0.016 0.018 0.020 0.022 0.026 0.035 0.043	120 190 340 450 790 1000 1300	150 220 370 490 840 1100 1400
6061-T6 ALUMINUM (2) (3)	1/4 3/8 1/2 5/8 3/4 1 1 1/4	0.020 0.028 0.028 0.035 0.042 0.049 0.065	80 90 290 350 400 800 1000	90 110 310 440 500 900 1100
304 1/8H STAINLESS STEEL (2) (3)	1/4 3/8 1/2 5/8 3/4 1 1 1/4	0.020 0.028 0.035 0.042 0.049 0.065 0.083	110 190 340 450 790 1600 1600	140 220 370 490 840 1750 1800
TI-3AL-2. 5V TITANIUM (1) (3)	1/4 3/8 1/2 5/8 3/4 1 1 1/4	0.018 0.018 0.024 0.030 0.036 0.048 0.060	120 190 340 450 790 1000 1300	150 220 370 490 840 1100 1400
21-6-9 STAINLESS STEEL (1) (3)	1/4 3/8 1/2 5/8 3/4 1 1-1/4	0.020 0.020 0.026 0.033 0.039 0.052 0.054	120 190 340 450 790 1000 1300	150 220 370 490 840 1100 1400

(1) Using internally swaged flareless sleeve.
(2) Using MS21922 flareless sleeve.
(3) Lubricate fittings with Federal Spec VV-P-236 Petrolatum or Spec MIL-H-5606 hydraulic fluid prior to torquing.

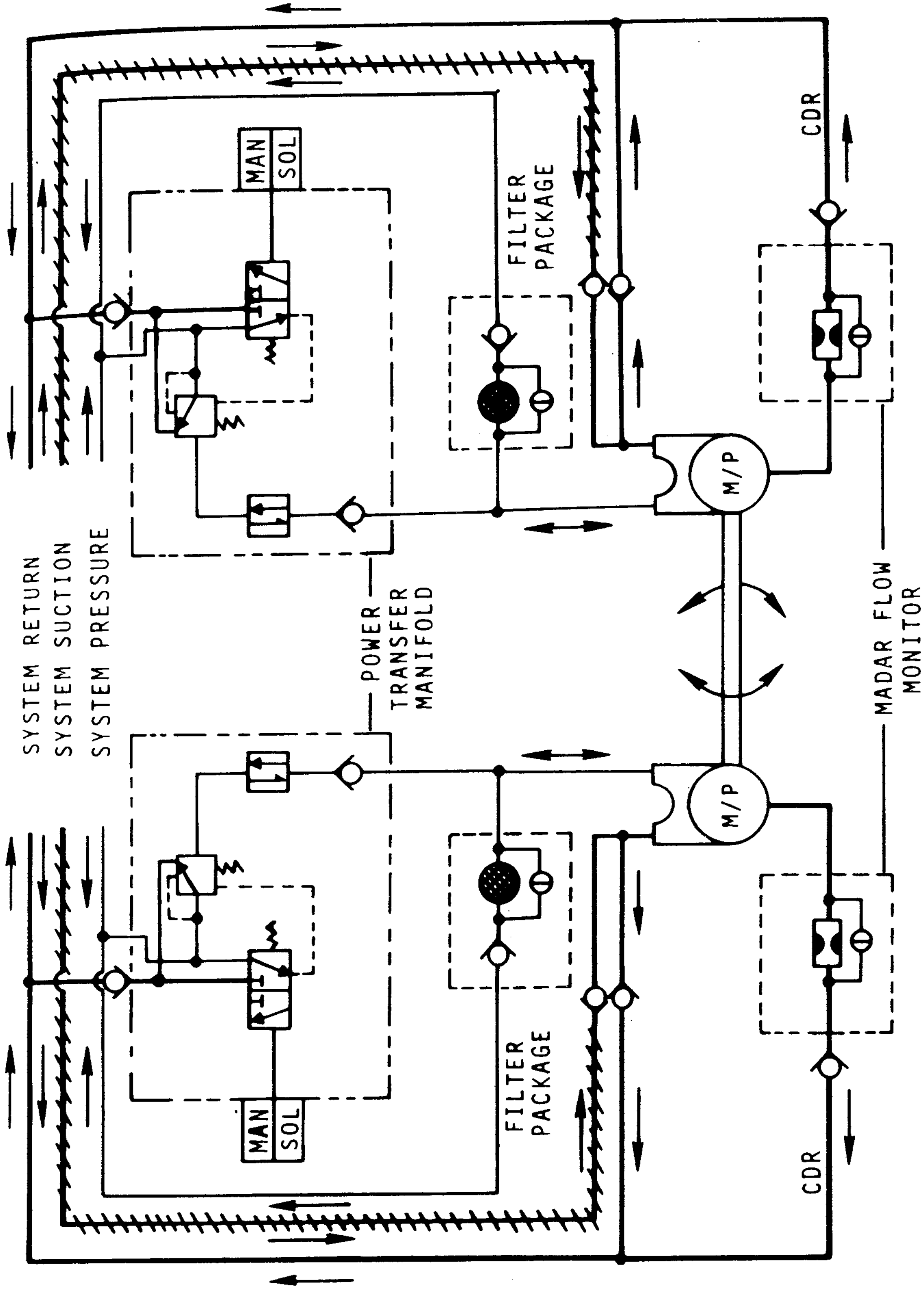
FLARELESS SLEEVE TUBING INSTALLATION TORQUE VALUES



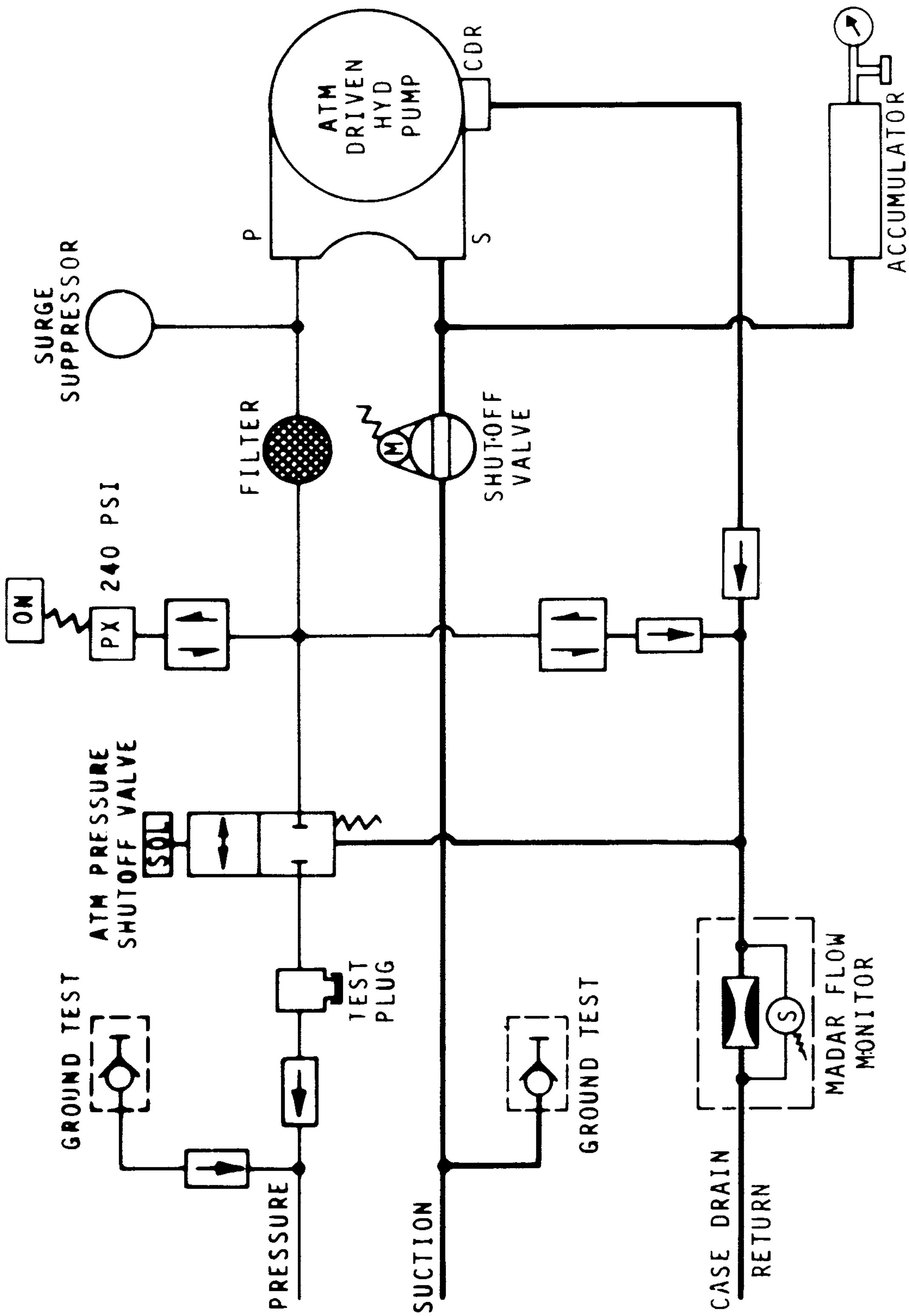
HYDRAULIC TUBE ROUTING
THROUGH FUEL TANKS & DRY BAYS

UNIT	FUSELAGE STATION	WATER LINE	LOCATION
R.H. Power Transfer Unit, System No. 3 to No. 4	1198	80	MLG Pod - RH
L.H. Power Transfer Unit System No. 1 to No. 2	1198	80	MLG Pod - LH
Center Power Transfer Unit System No. 2 to No. 3	1347	380	Center Wing Rear Beam
Hydraulic Systems No. 1 and No. 4 Pump - Air Turbine Motor	1700	95	APU LH and RH compartments
Pump - Ram Air Turbine	1231	119	FWD MLG Pod - LH
Engine-Driven Pump	PPS 112	PPWL 115	Power Plant
Electric Boost Pump	1208	50 LH and RH	Service Centers No. 1 and No. 4

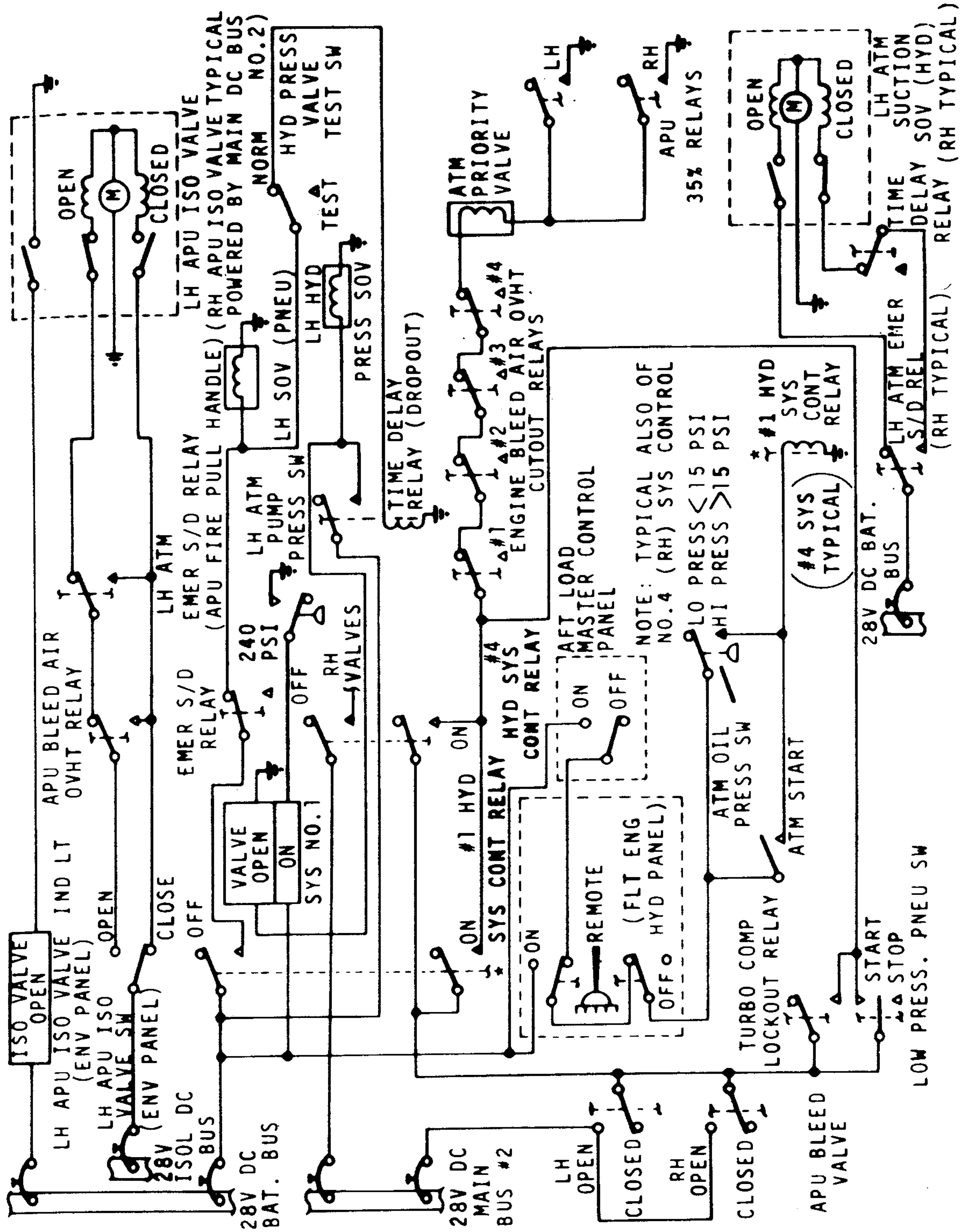
OVERBOARD SHAFT SEAL DRAIN LINE LOCATIONS



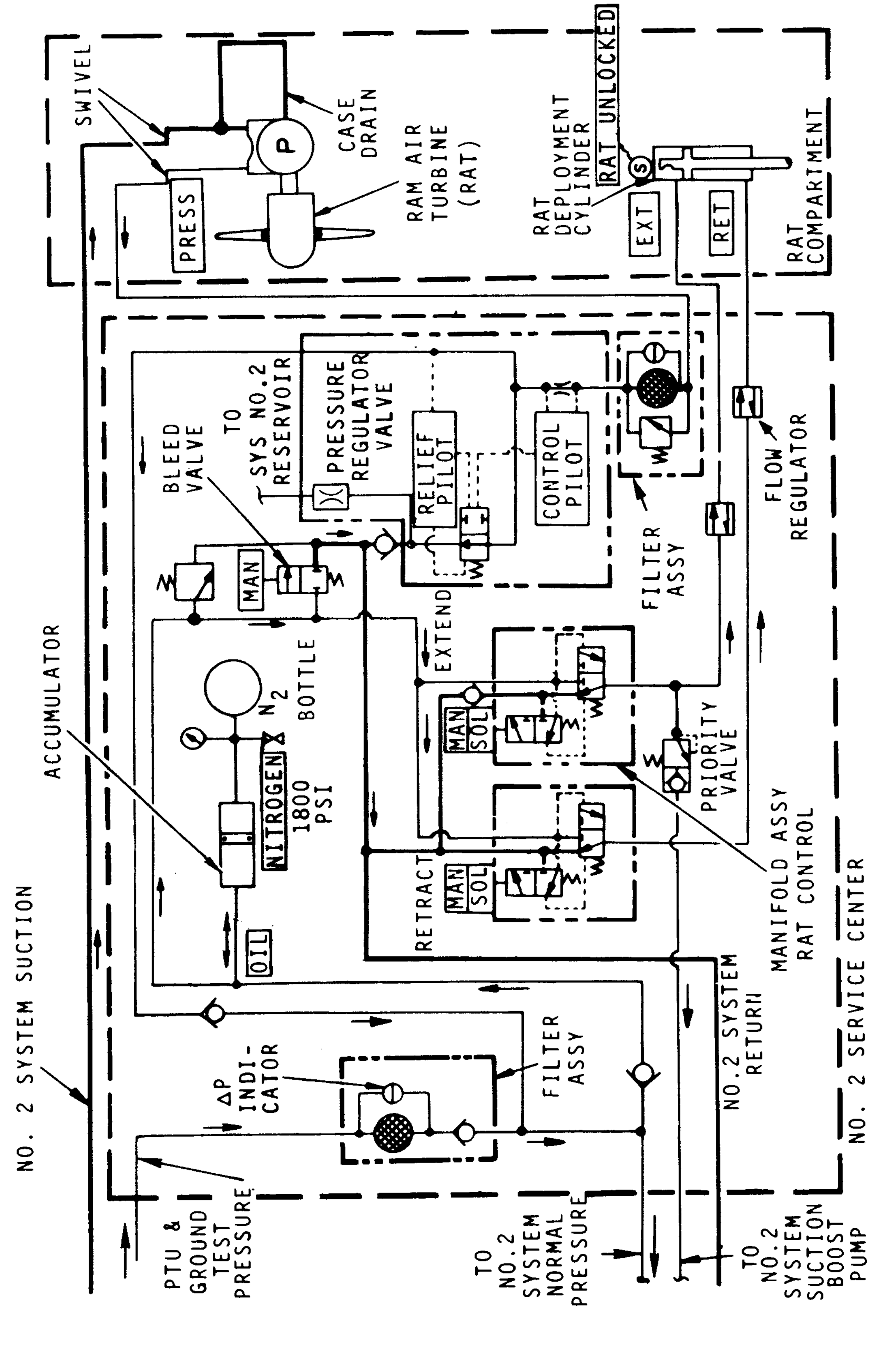
POWER TRANSFER UNIT HYDRAULIC SCHEMATIC



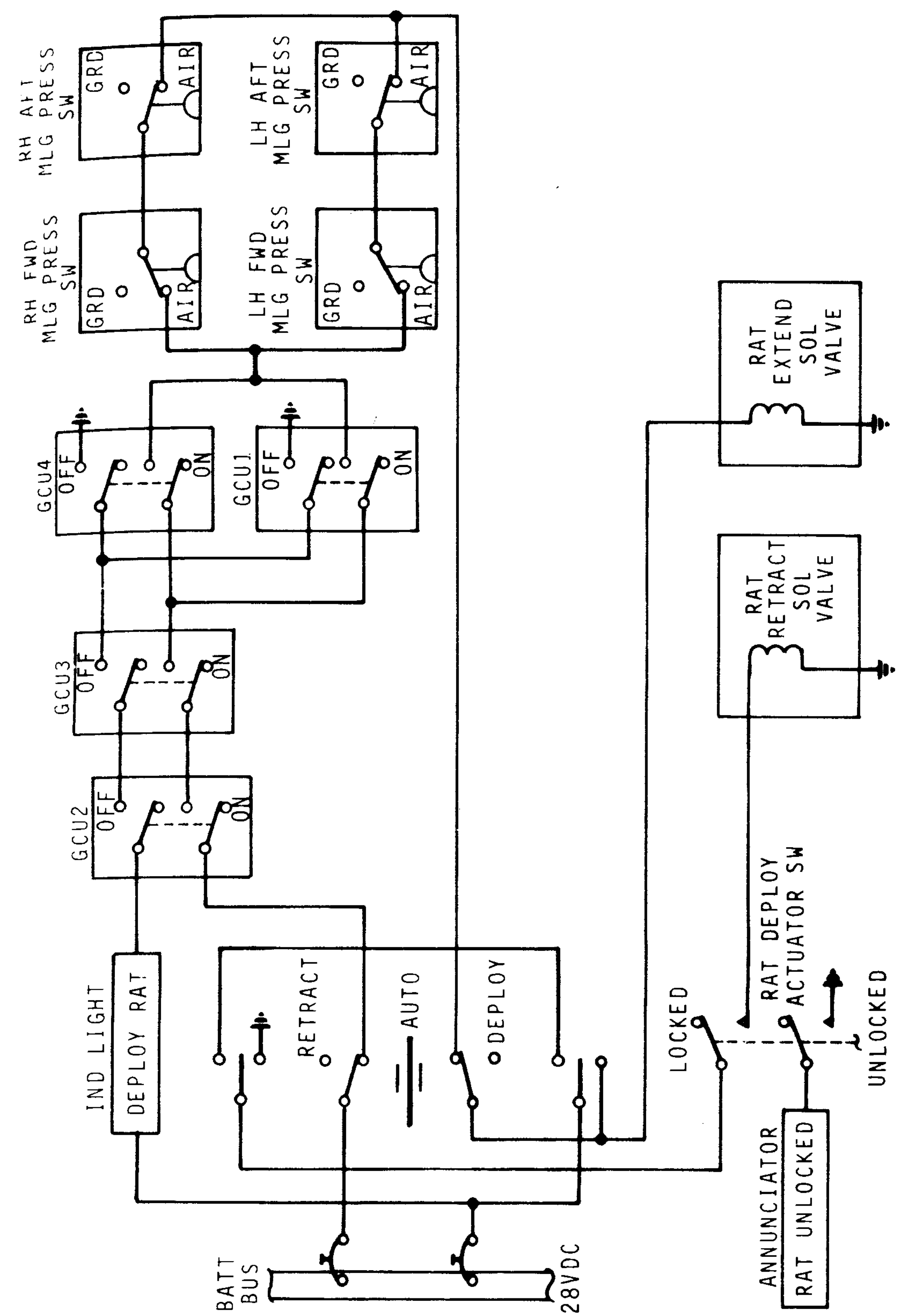
AIR TURBINE MOTOR HYDRAULIC SCHEMATIC



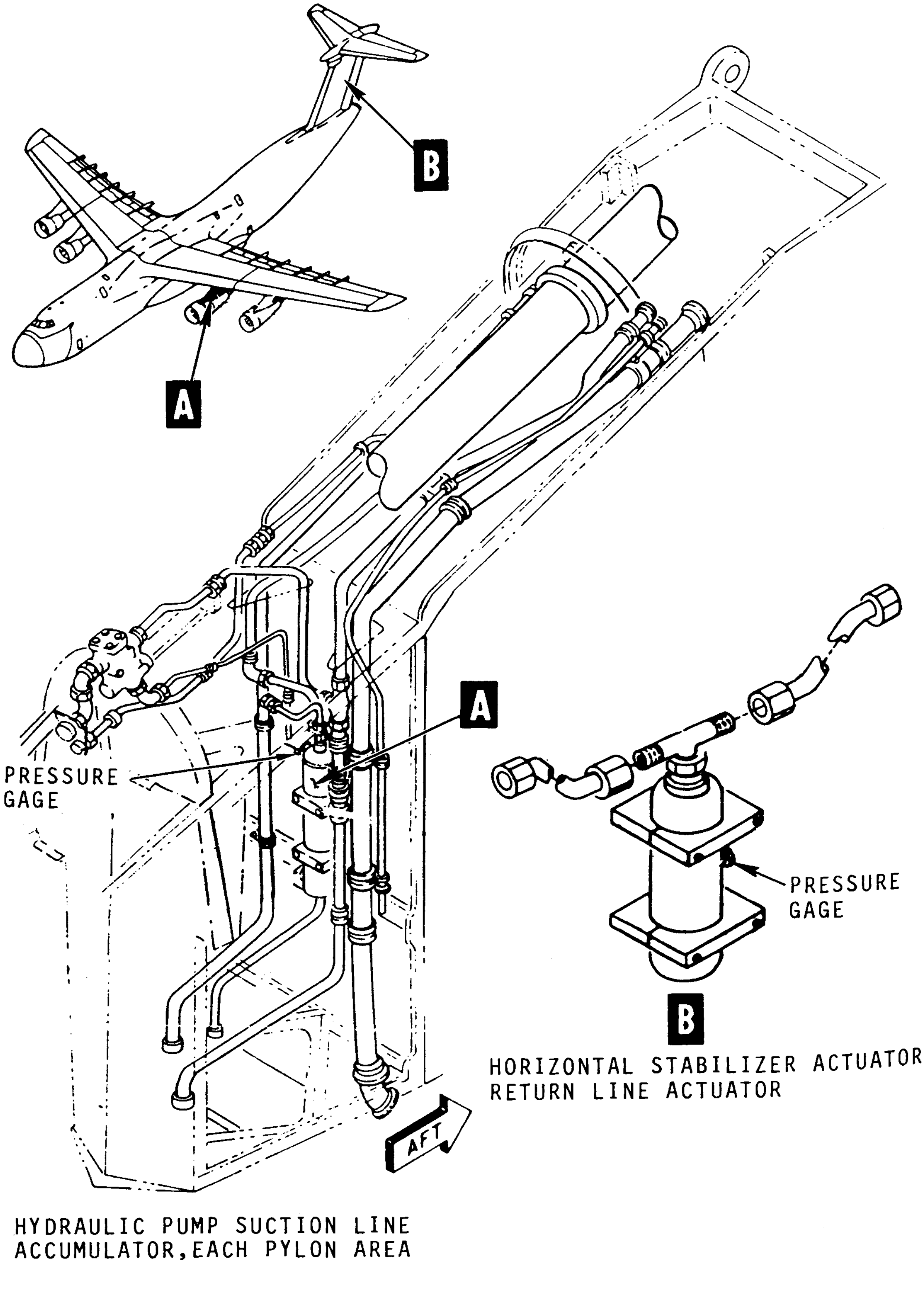
ATM ELECTRICAL CONTROL



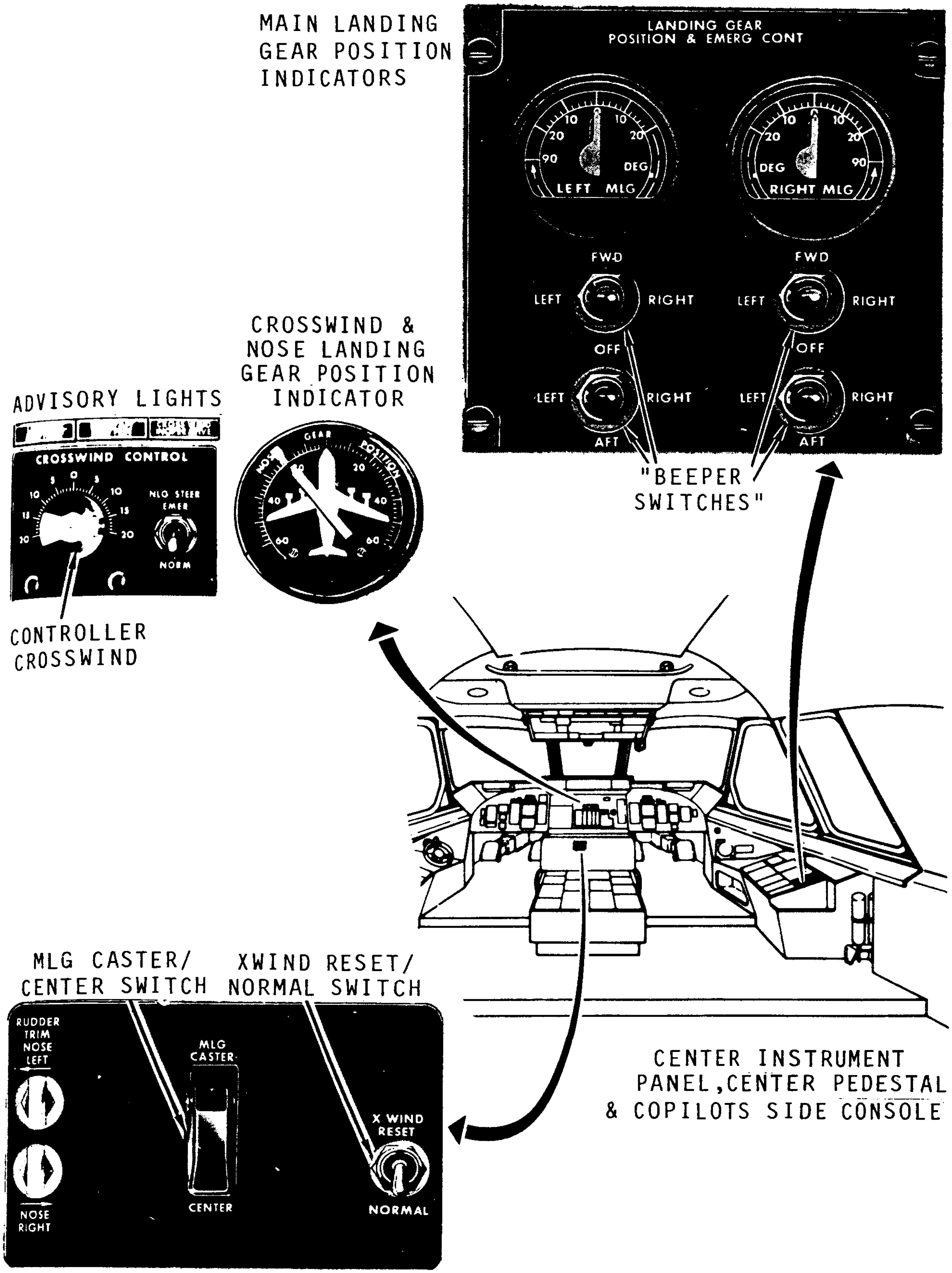
RAM AIR TURBINE HYDRAULIC SCHEMATIC



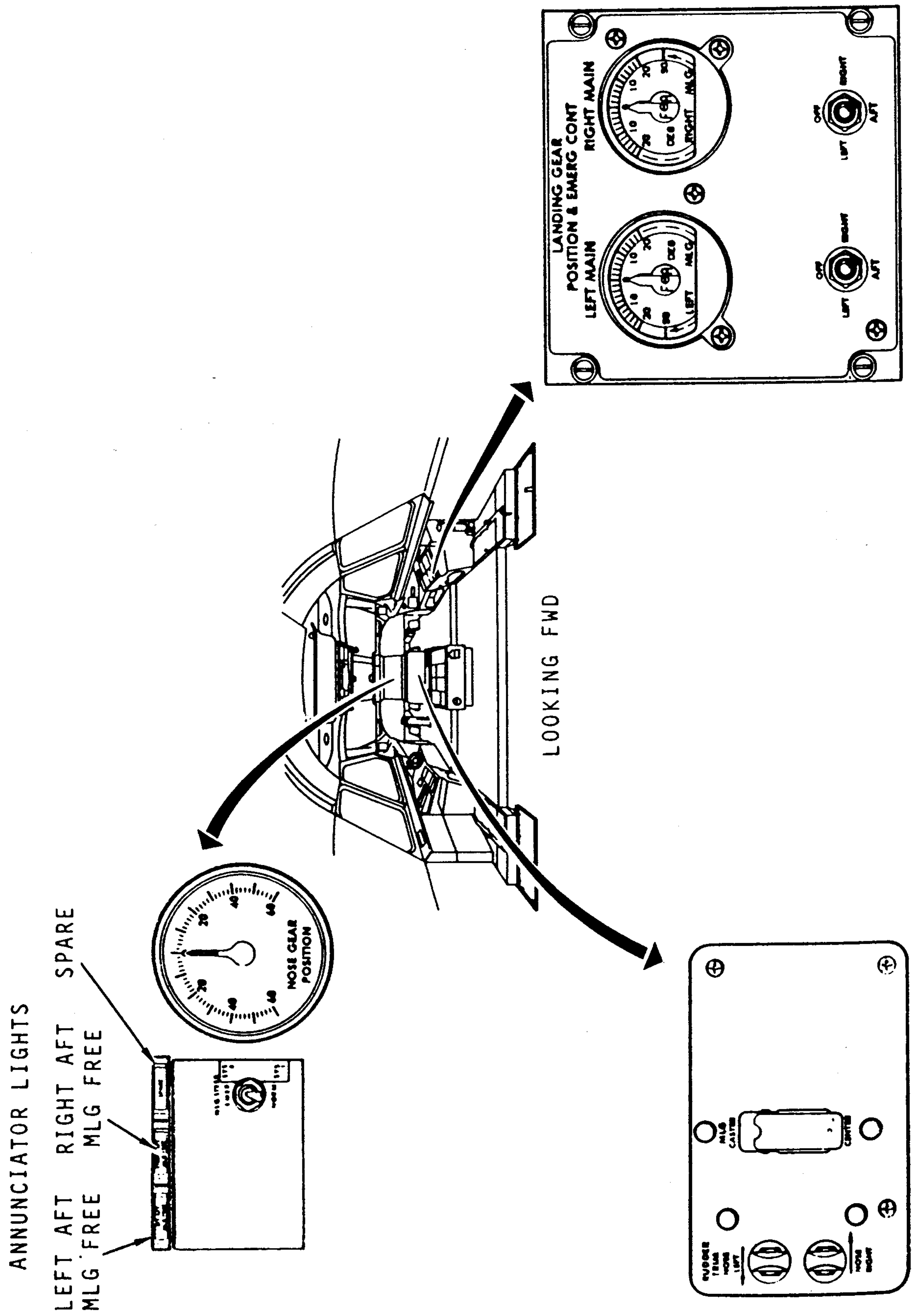
RAT ELECTRICAL CONTROL



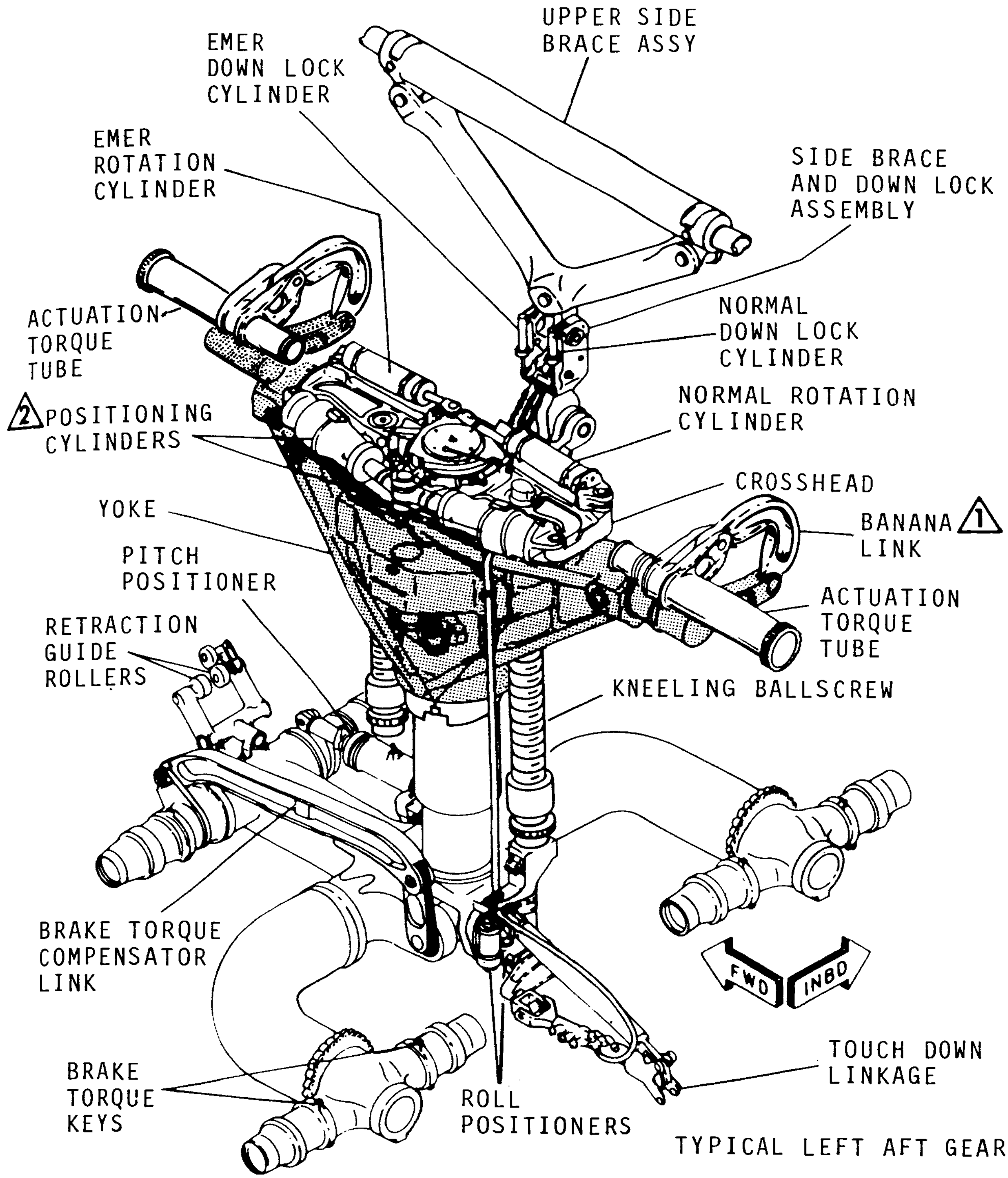
C-5B ACCUMULATORS



C-5A CROSSWIND
POSITIONING CONTROLS & INDICATORS



C-5B NOSE AND
MAIN GEAR CONTROL AND INDICATION

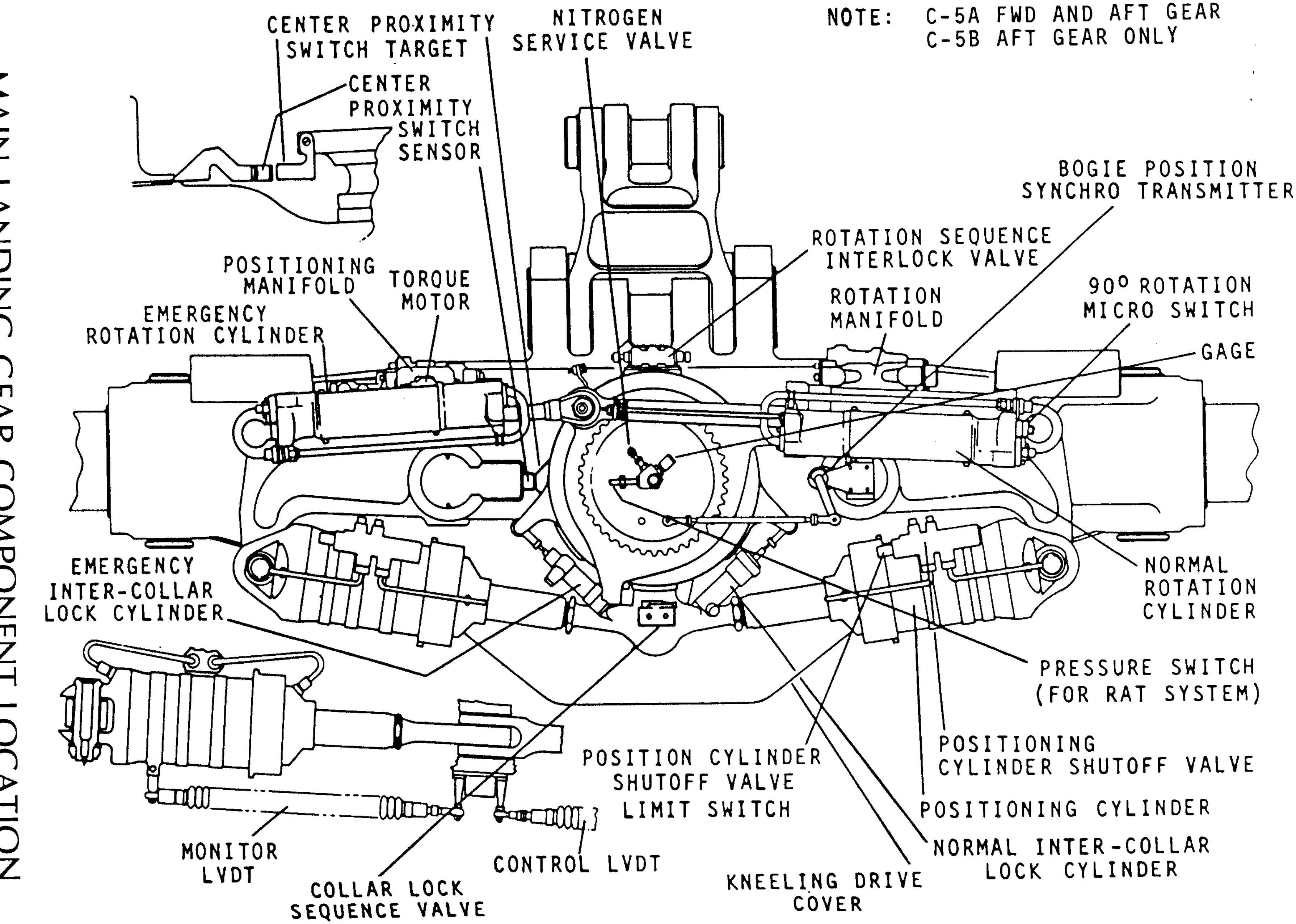


TYPICAL LEFT AFT GEAR

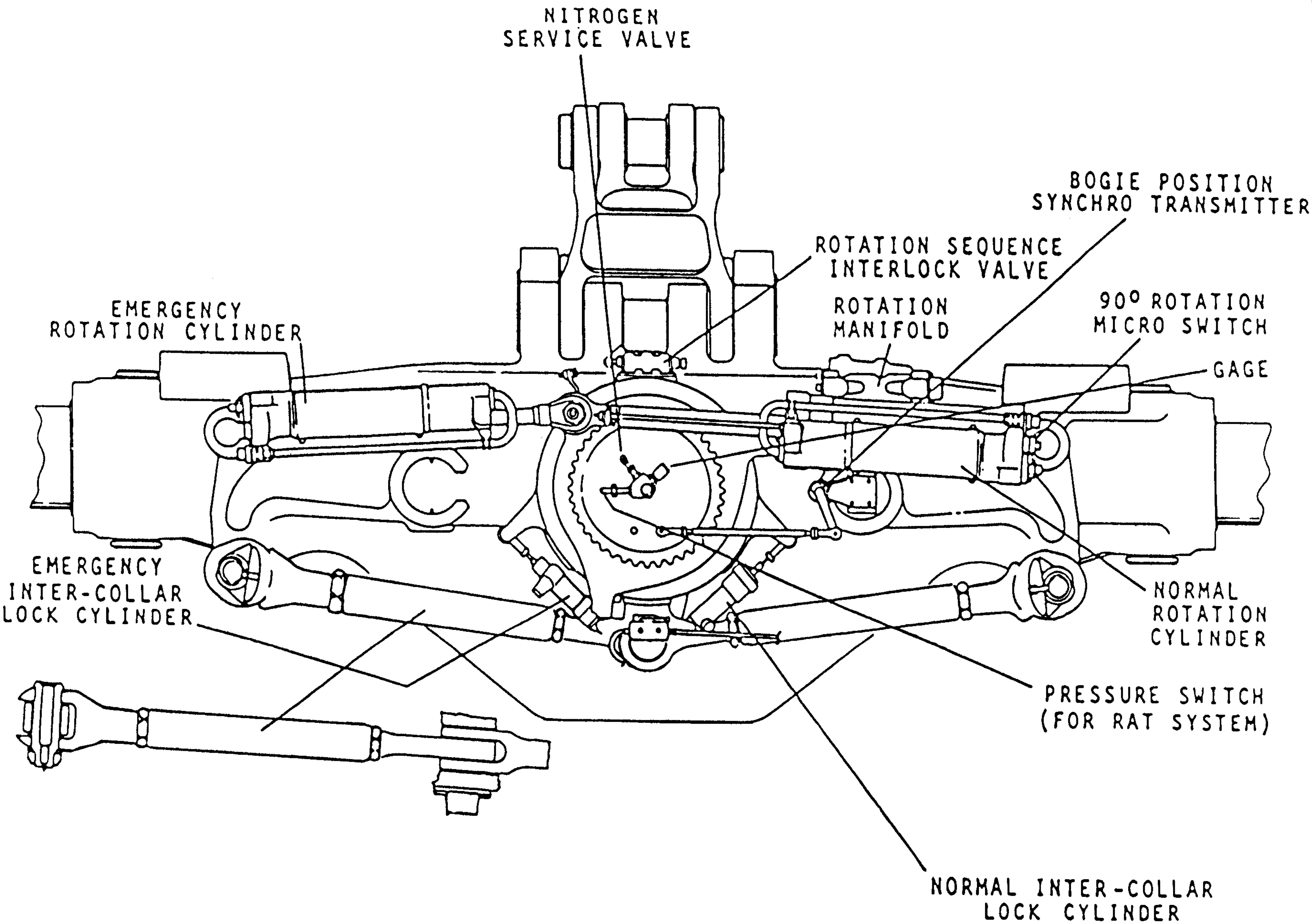
1 ONE BANANA LINK PER MLG (C-5A)

2 AFT GEAR ONLY

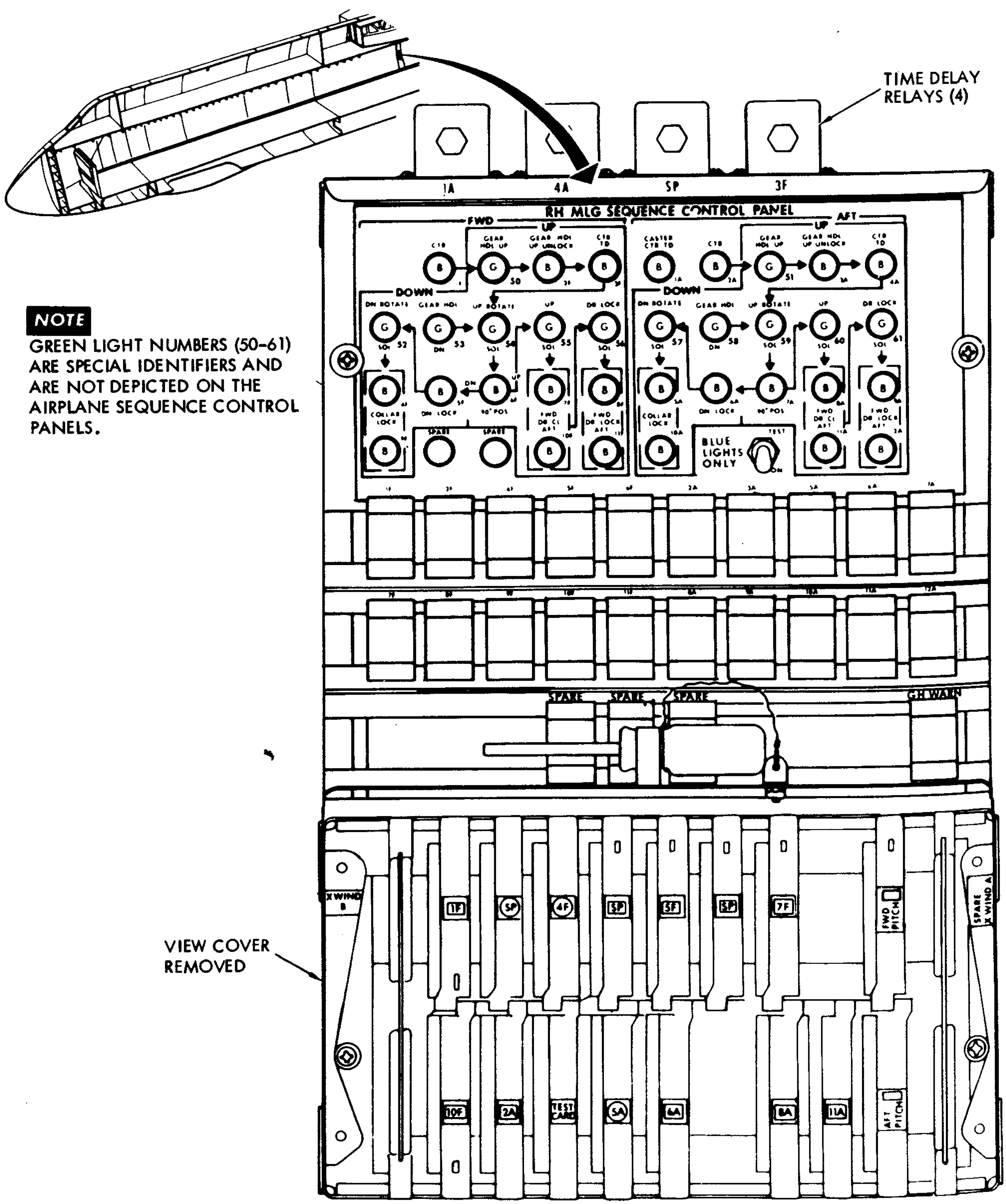
C-5B MAIN LANDING GEAR ASSEMBLY



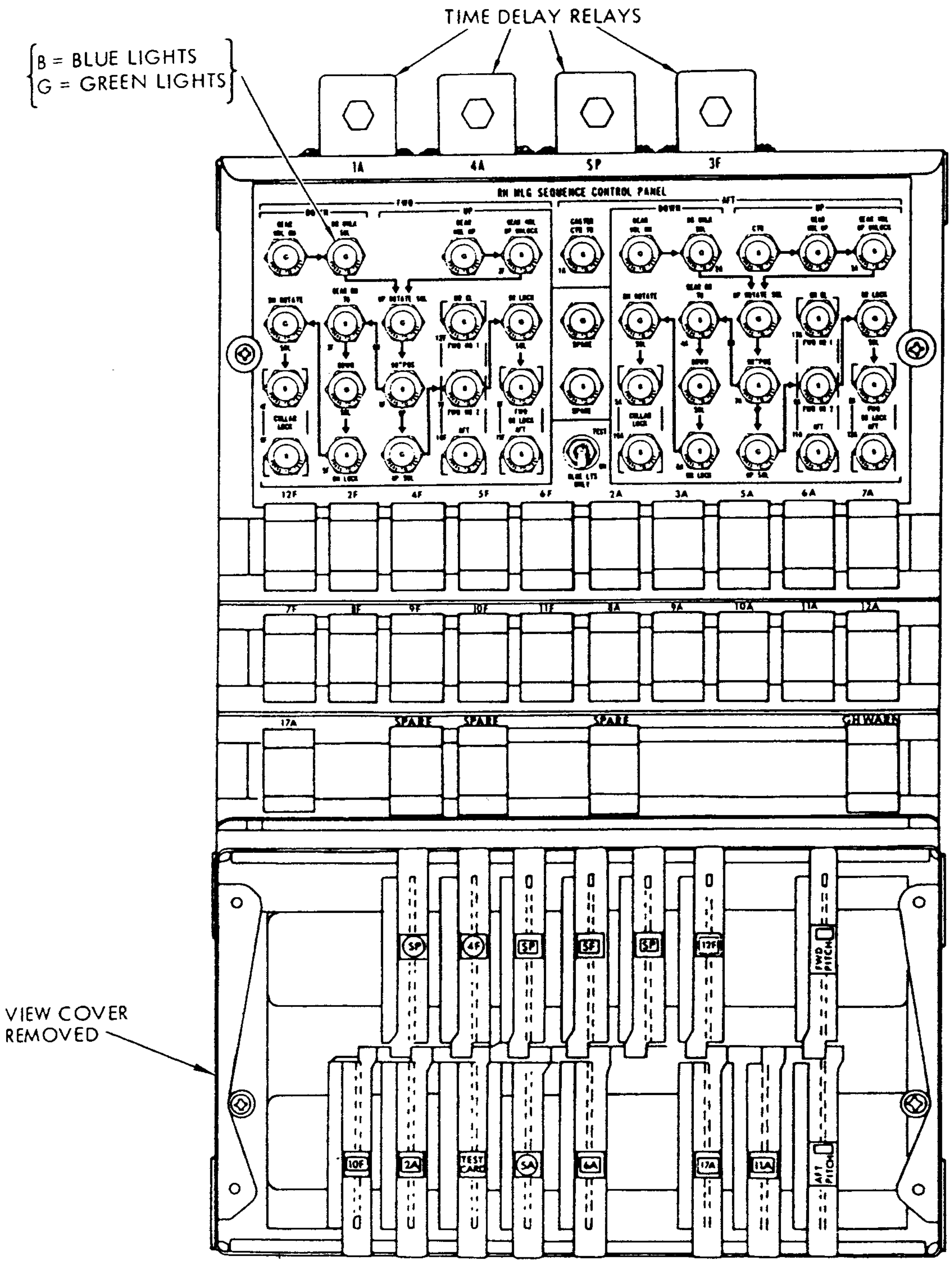
MAIN LANDING GEAR COMPONENT LOCATION



C-5B MLG COMPONENT LOCATION (FWD)

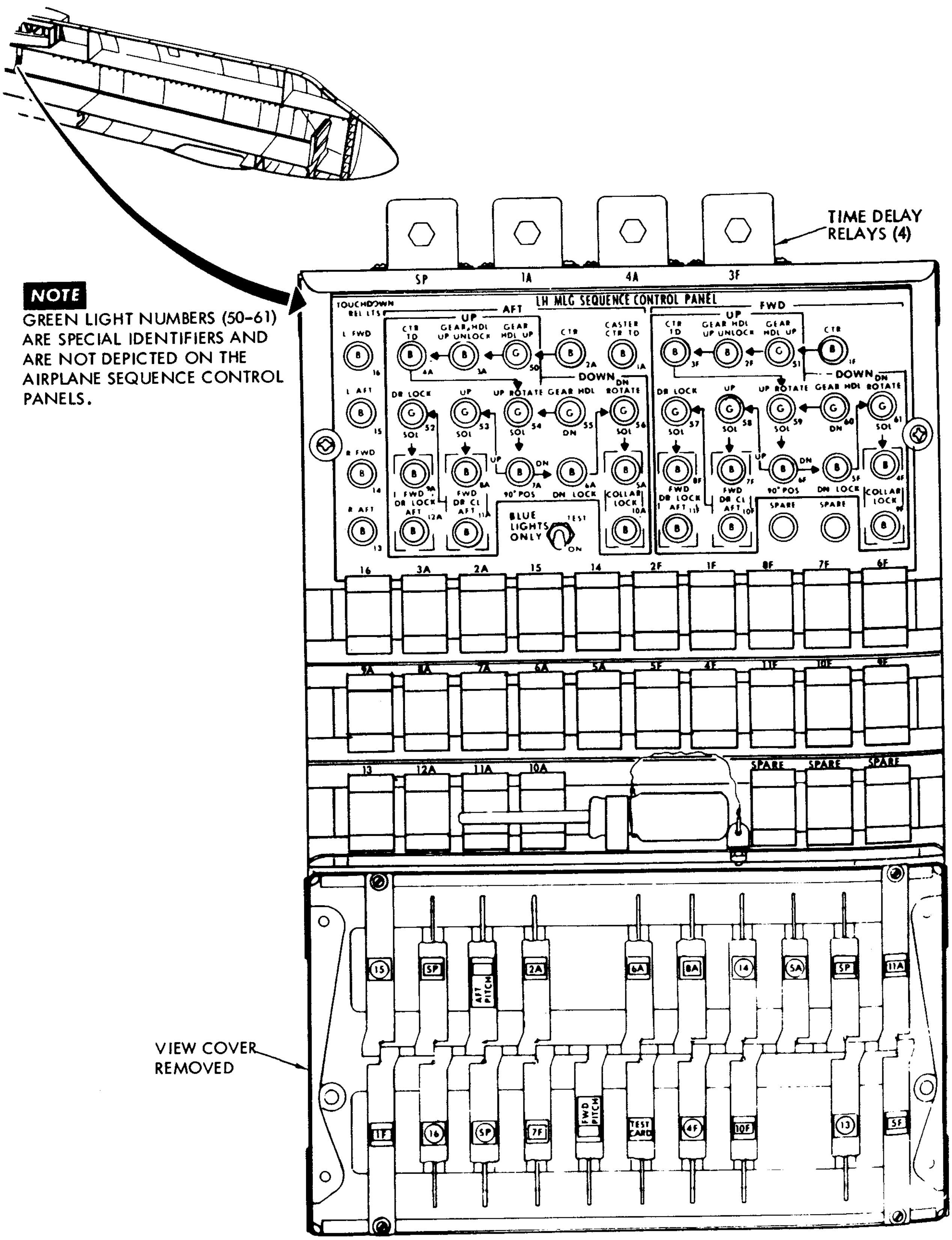


C-5A RH MLG SEQUENCE CONTROL PANEL

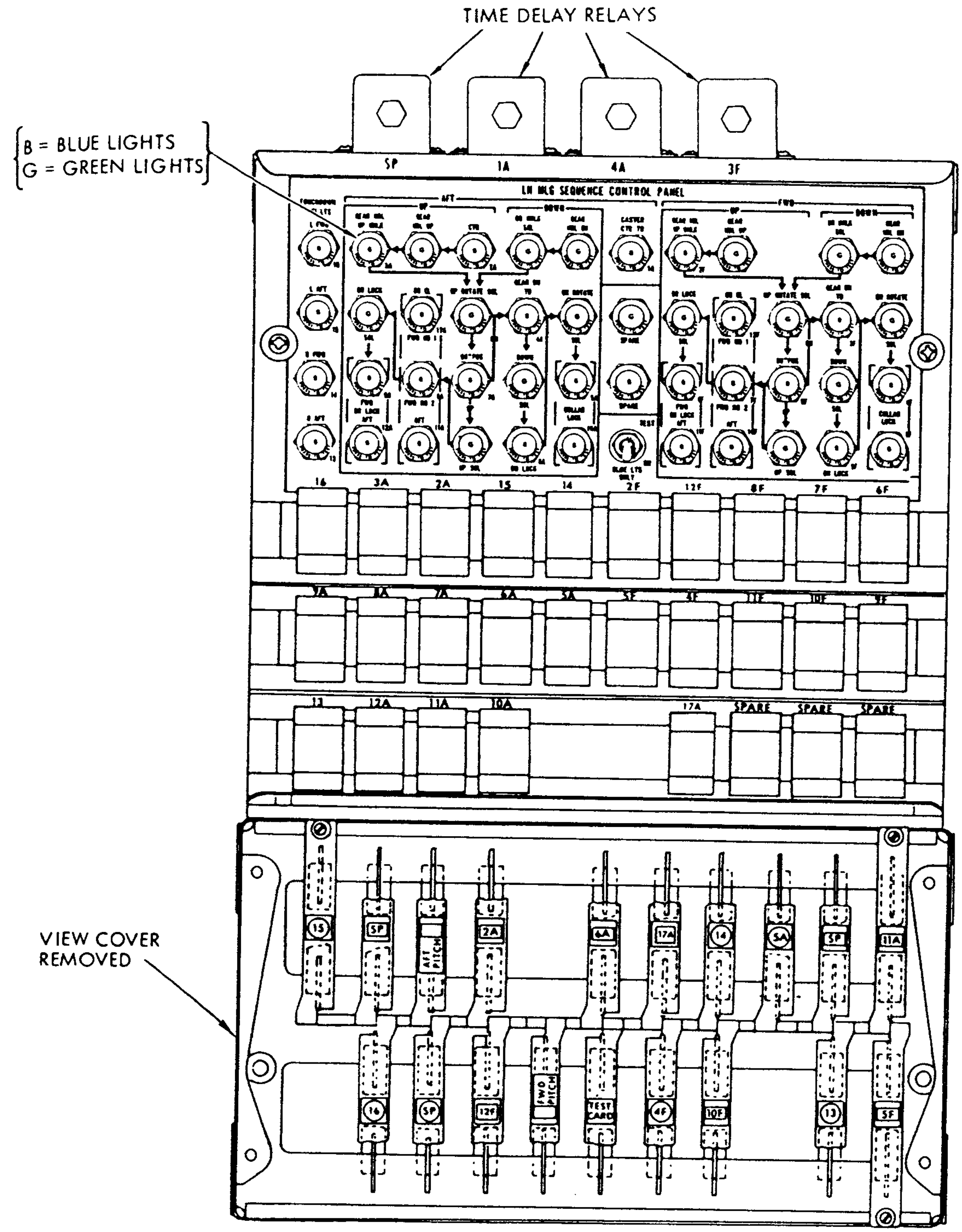


RH MLG SEQUENCE CONTROL PANEL

C-5B RH MLG SEQUENCE CONTROL PANEL

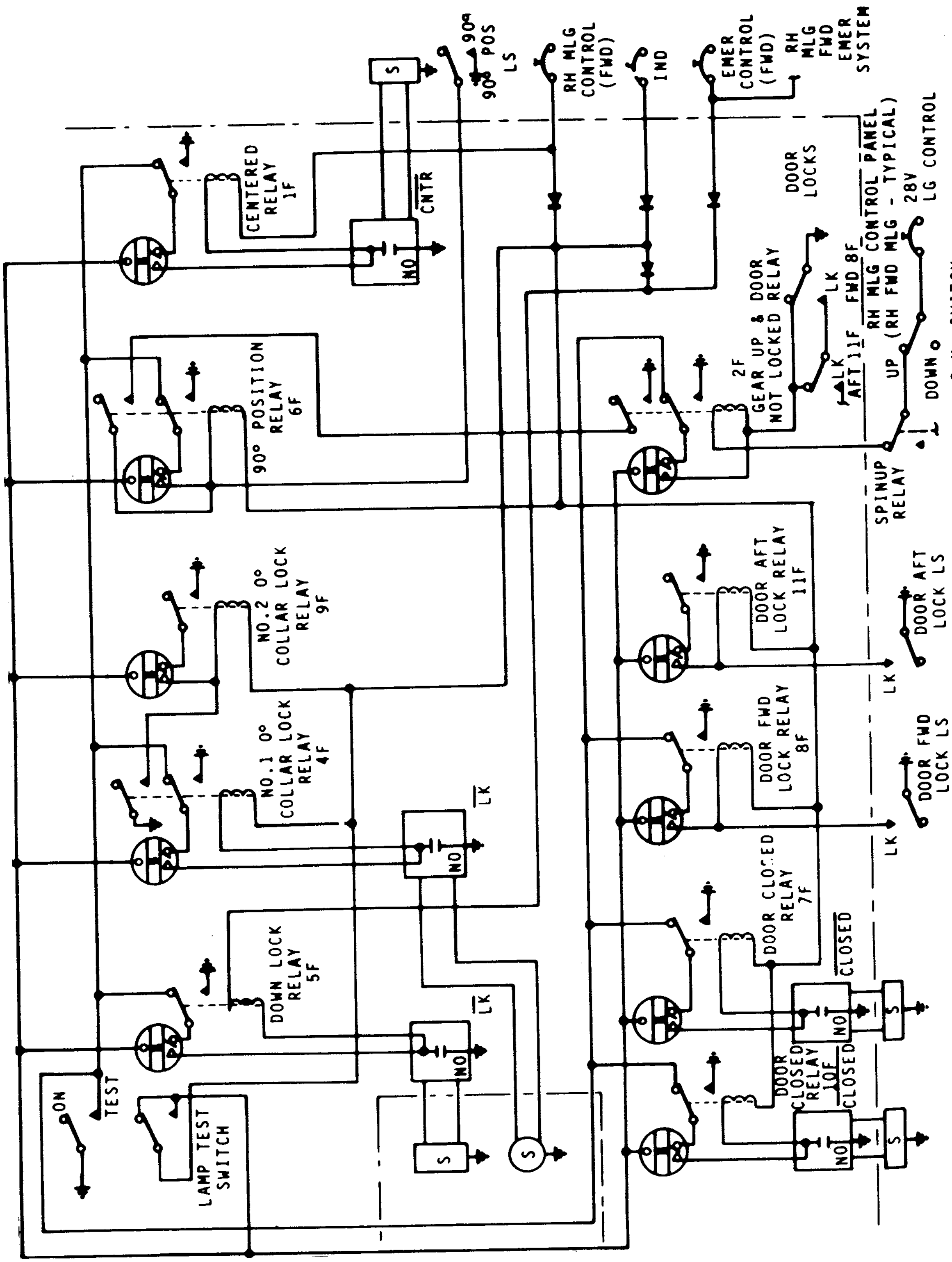


C-5A LH MLG SEQUENCE CONTROL PANEL

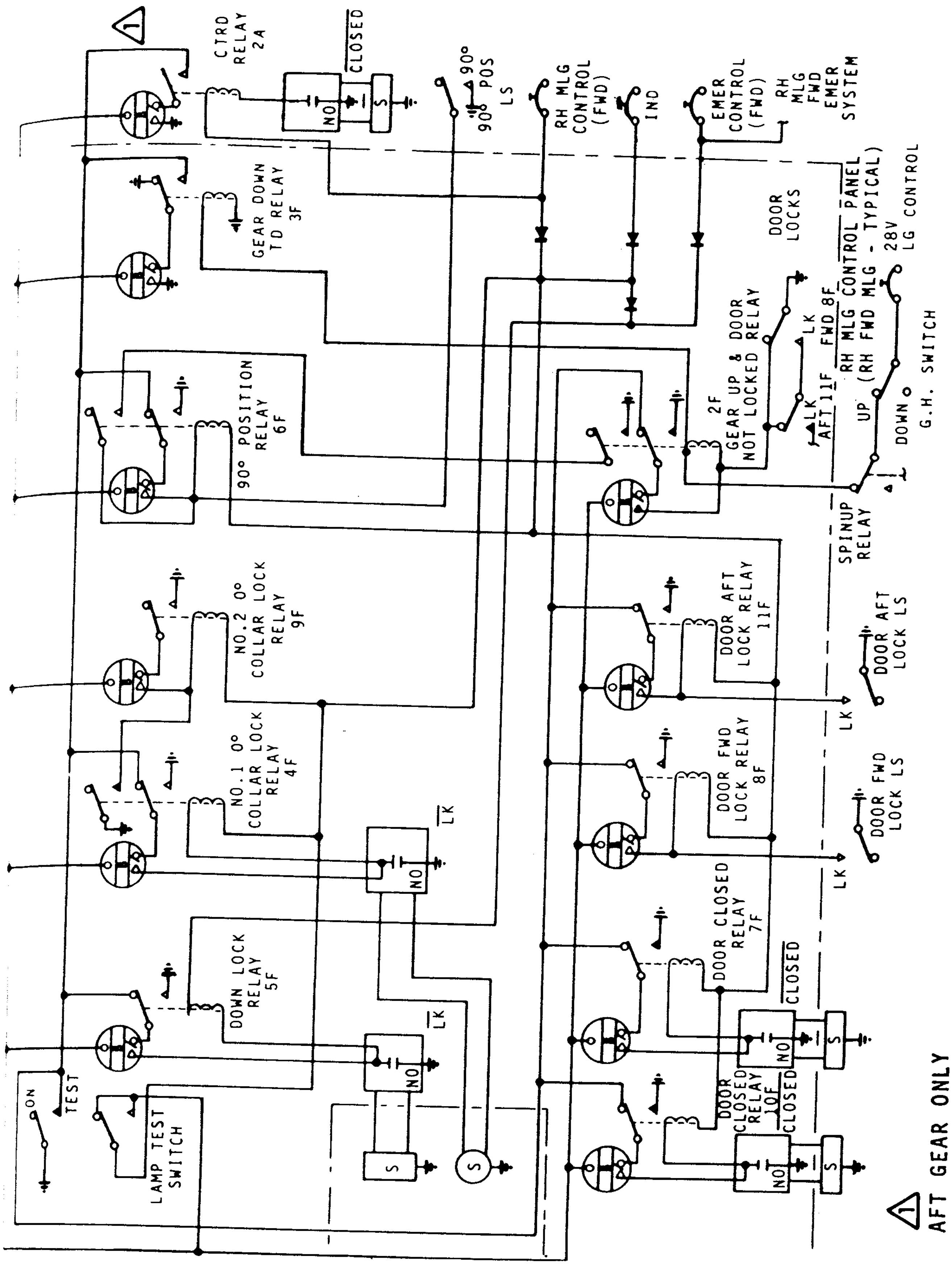


LH MLG SEQUENCE CONTROL PANEL

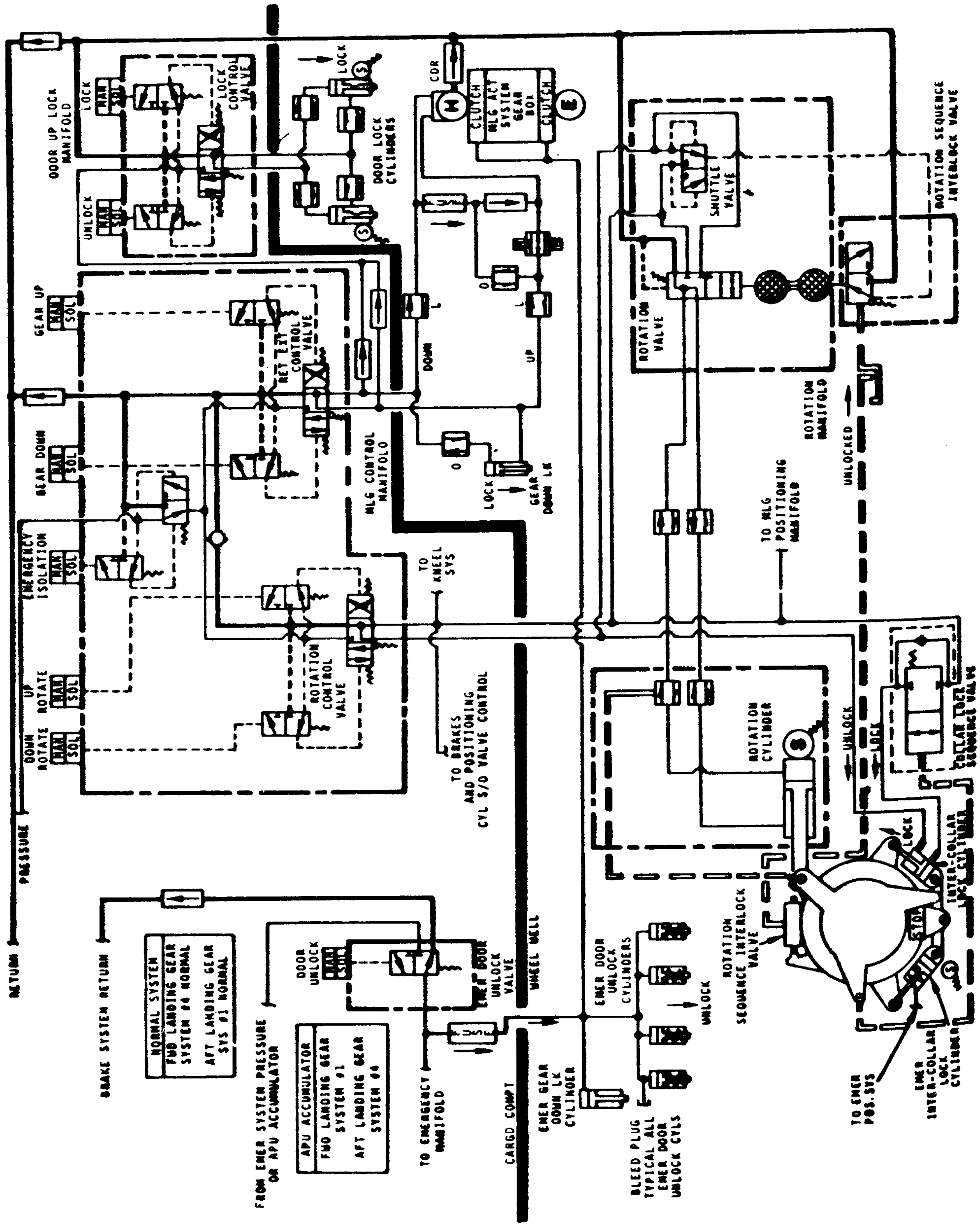
C-5B LH MLG SEQUENCE CONTROL PANEL



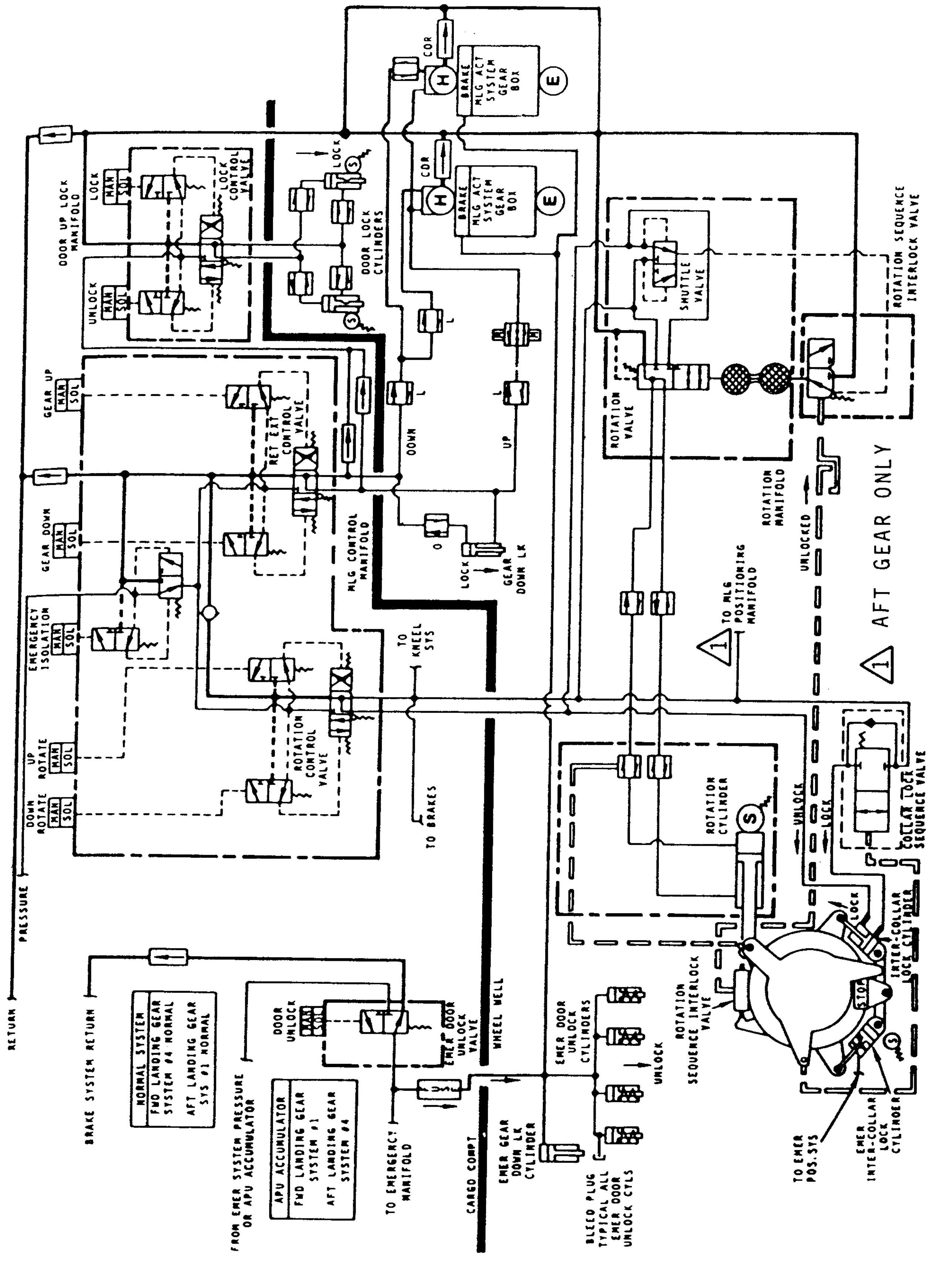
C-5A MLG RELAY OPERATION



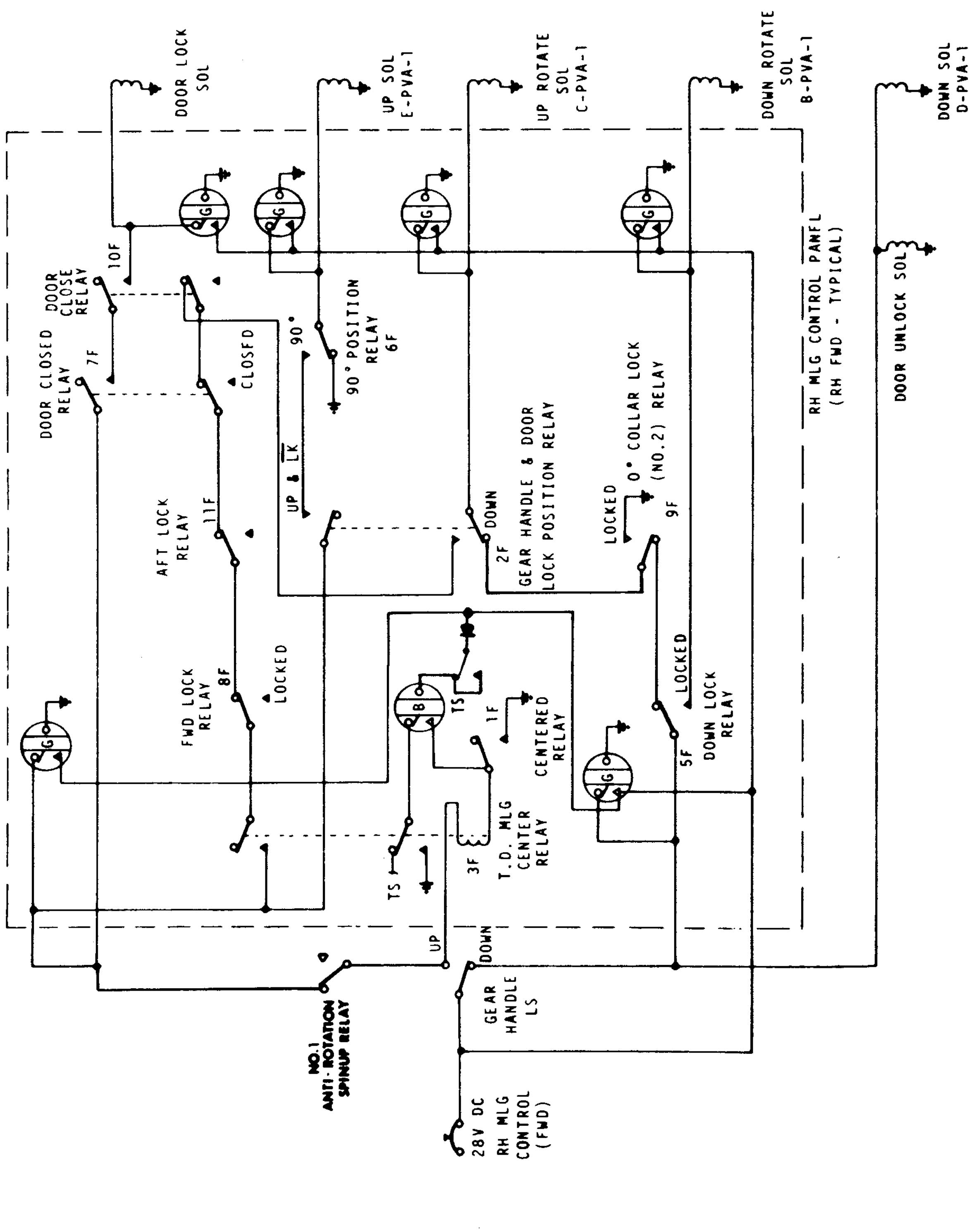
C-5B MLG RELAY OPERATION



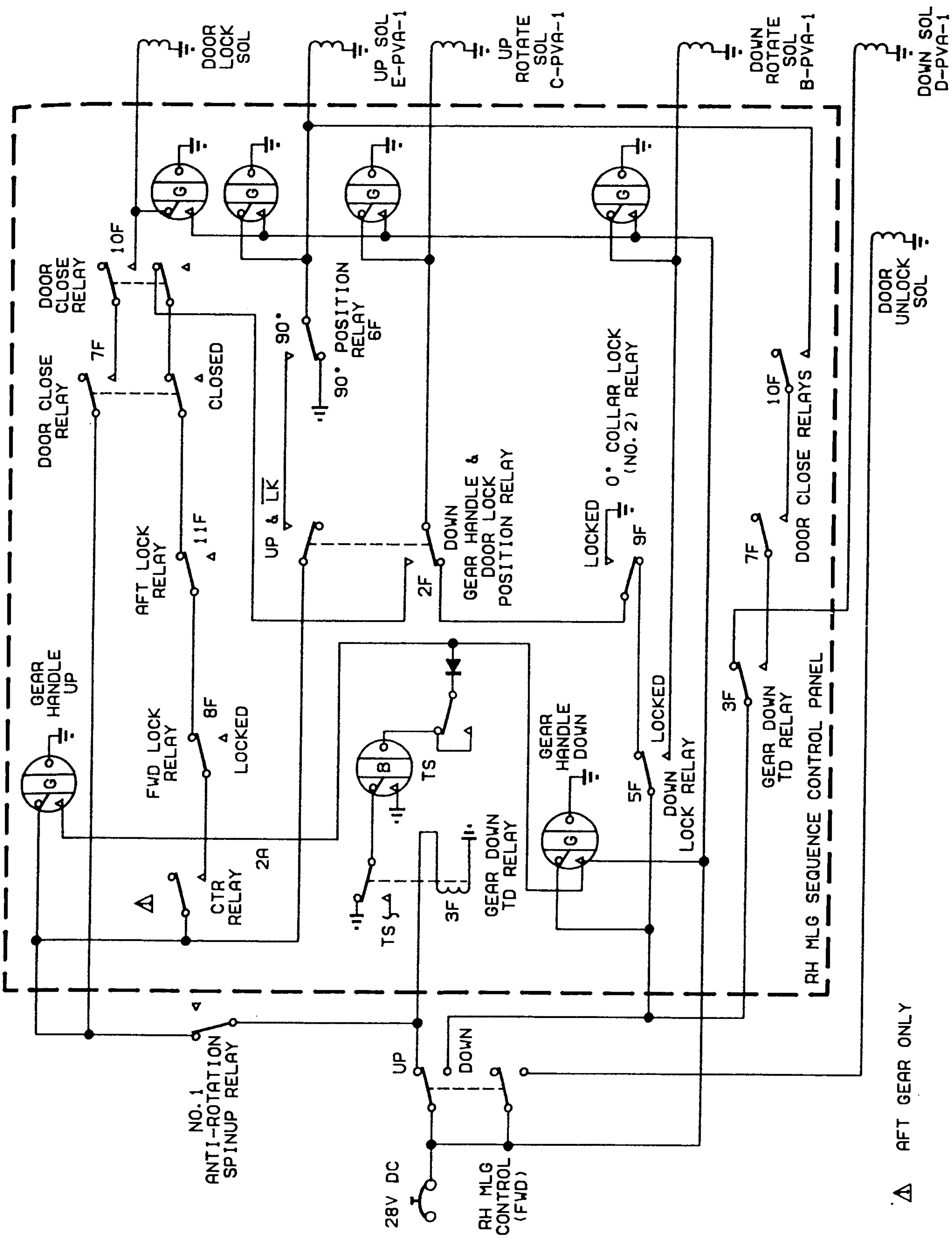
C-5A MLG & DOOR
HYDRAULIC SYSTEM SCHEMATIC (NORMAL)



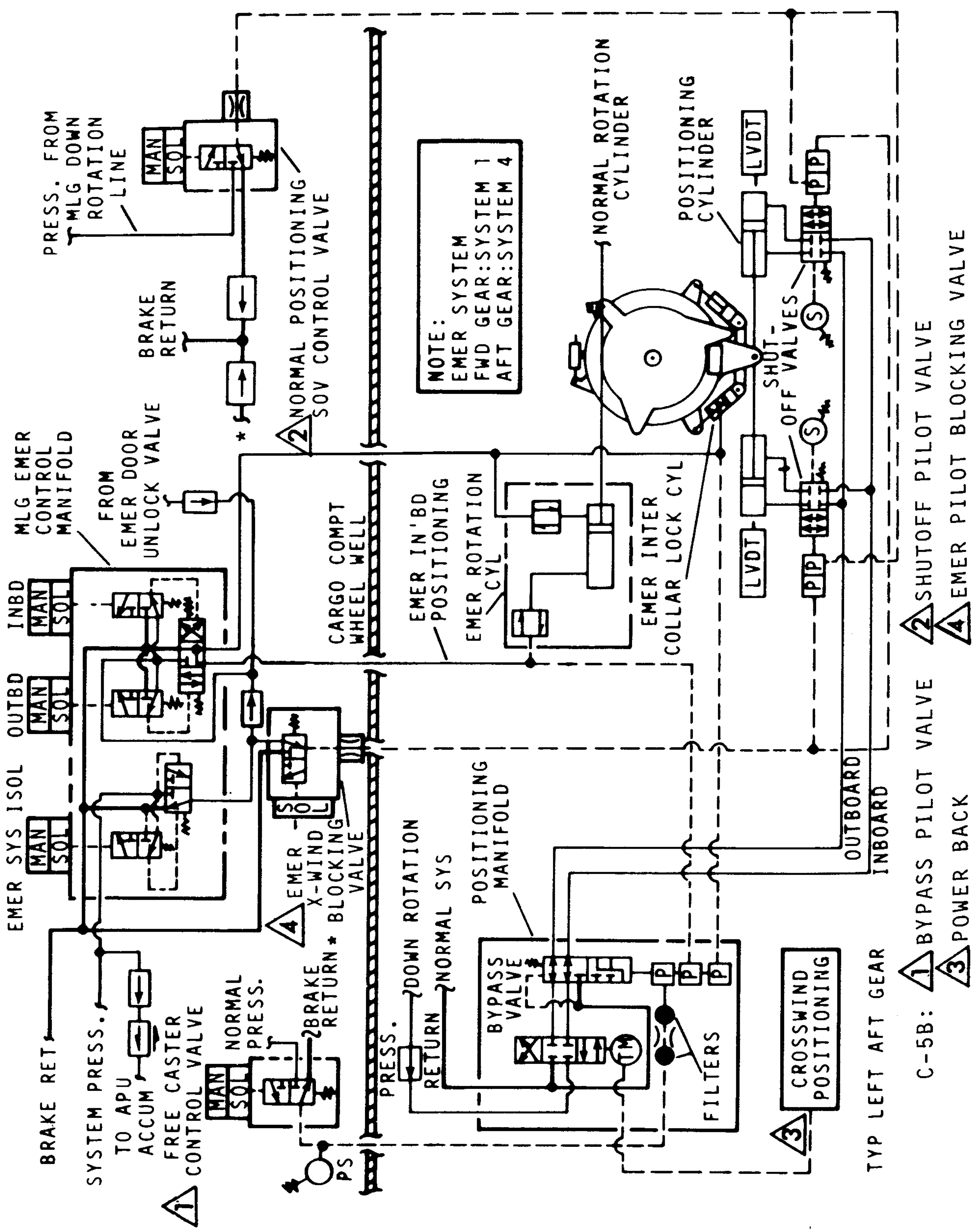
C-5B MLG AND DOOR
HYDRAULIC SYSTEM SCHEMATIC (NORMAL)



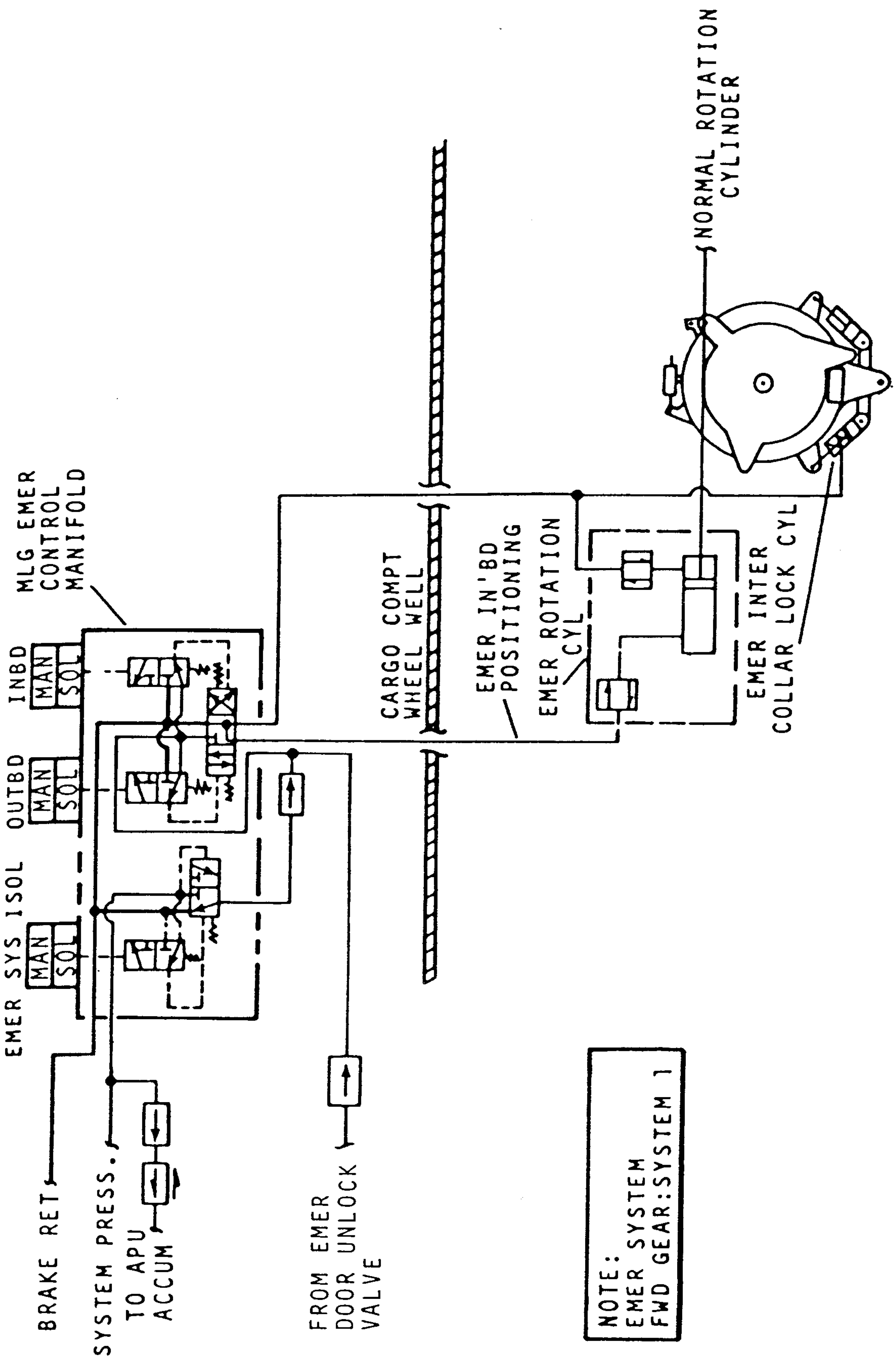
C-5A MLG NORMAL RETRACTION/EXTENSION



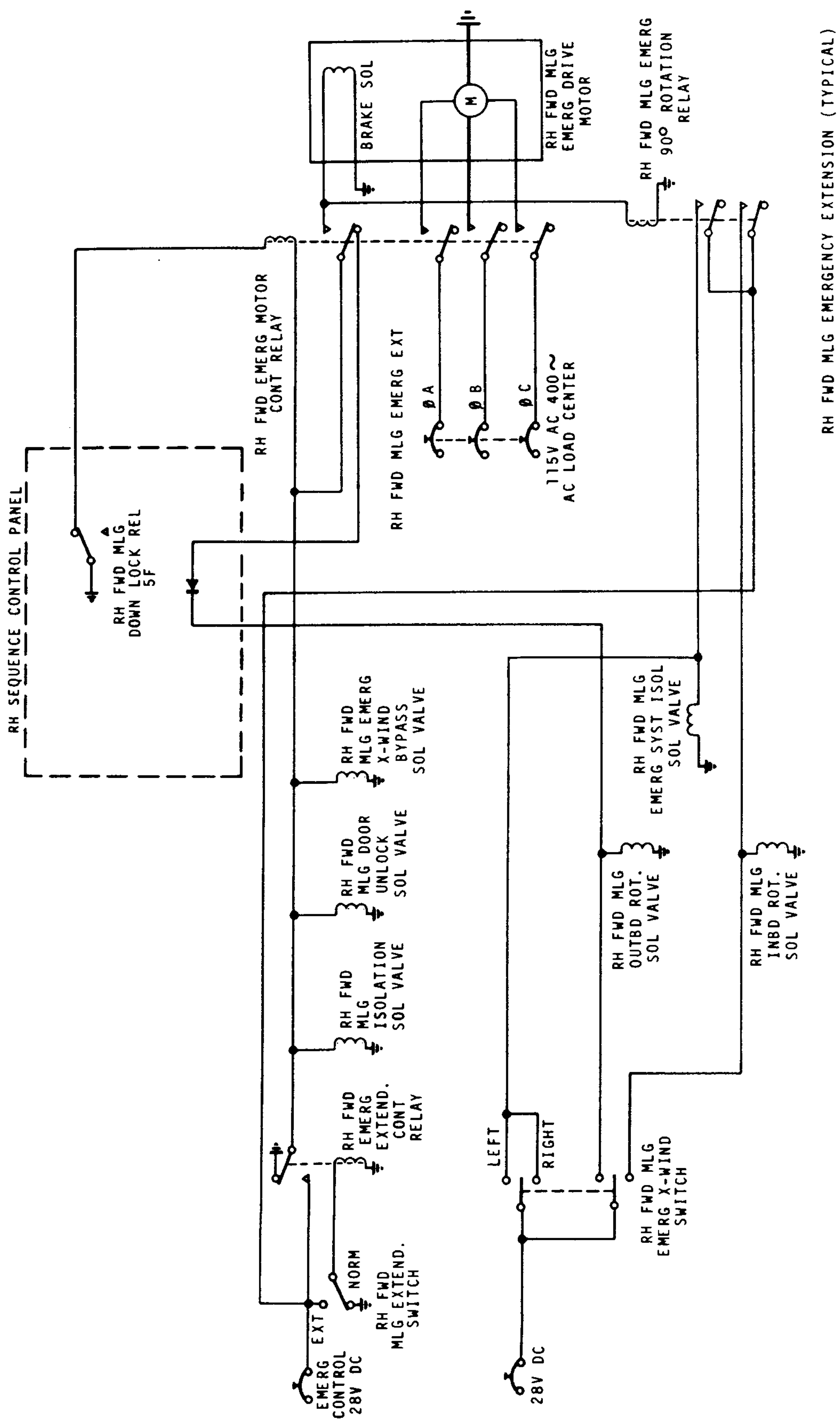
C-5B MLG NORMAL RETRACTION/EXTENSION



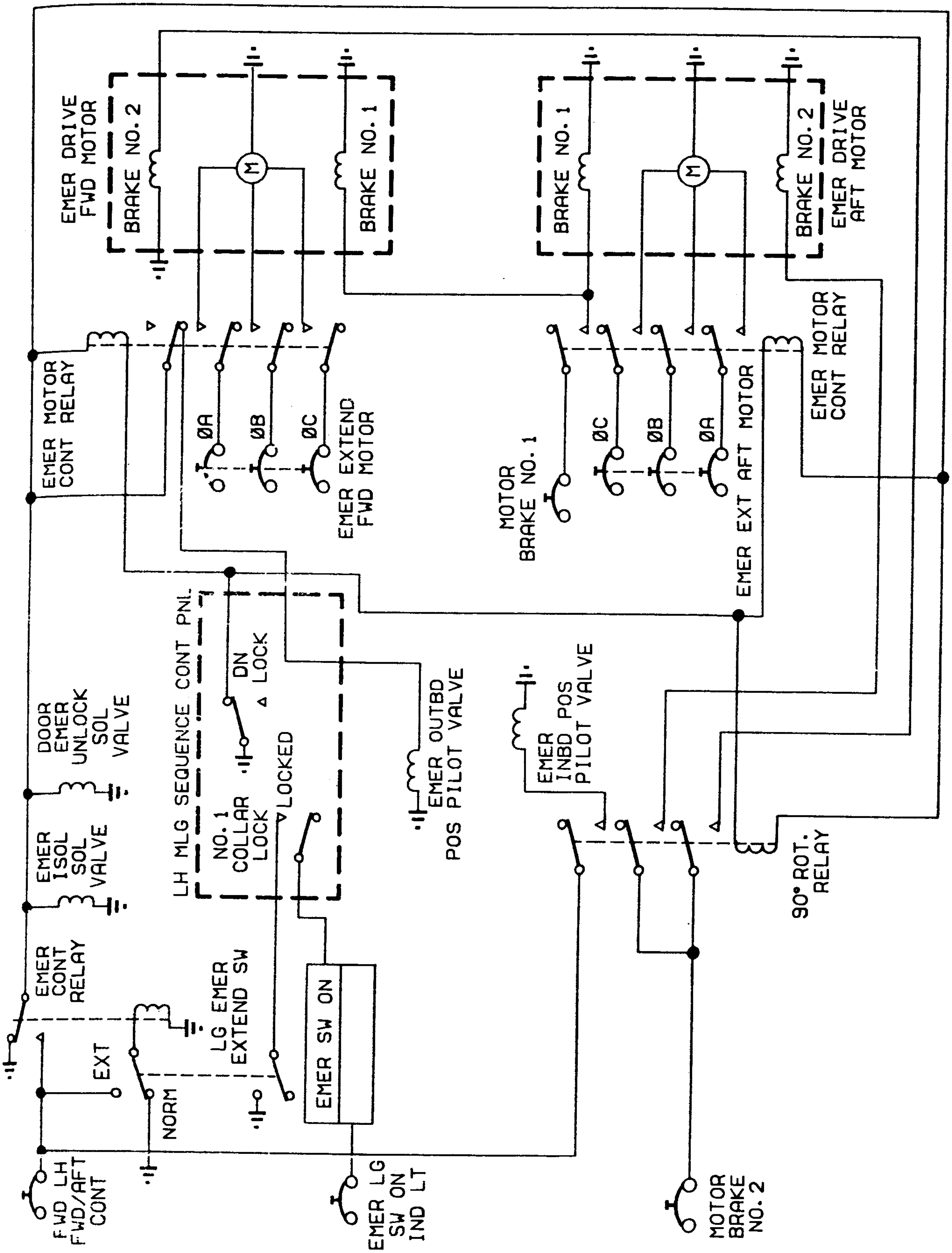
MLG HYDRAULIC (EMERGENCY)



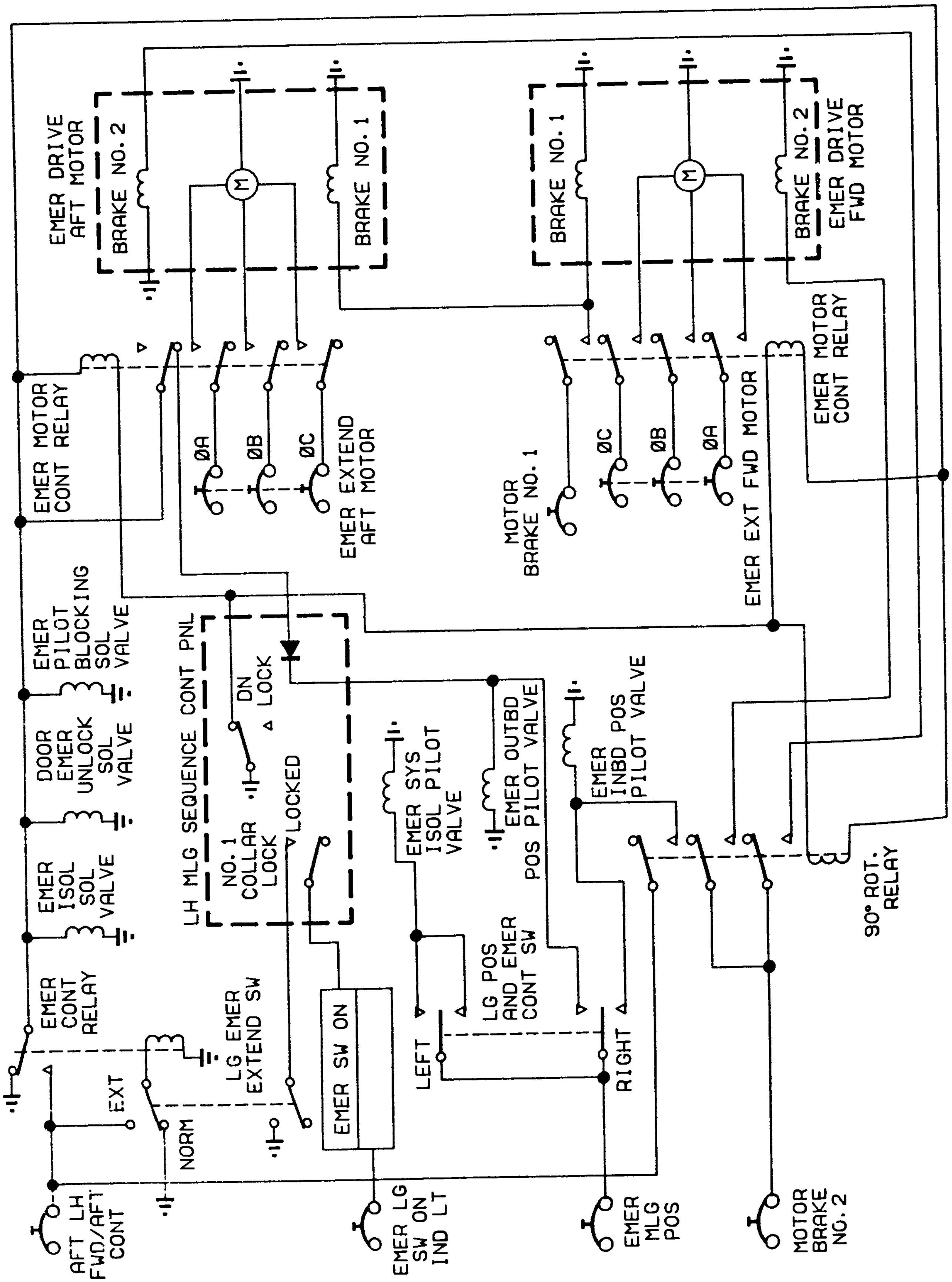
C-5B MLG EMERGENCY ROTATION
HYDRAULIC SCHEMATIC (FWD MLG)



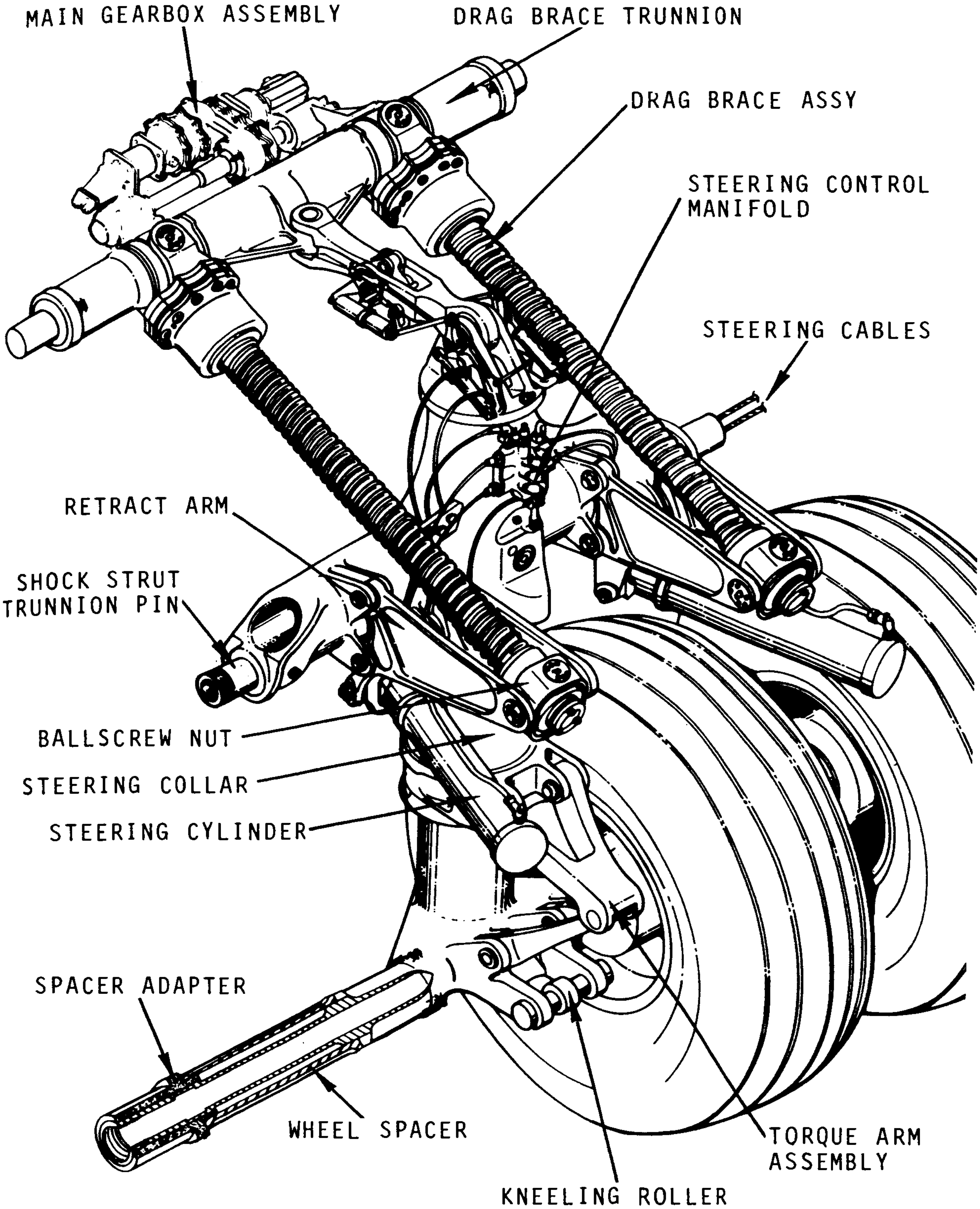
C-5A MLG EMERGENCY EXTENSION SYSTEM



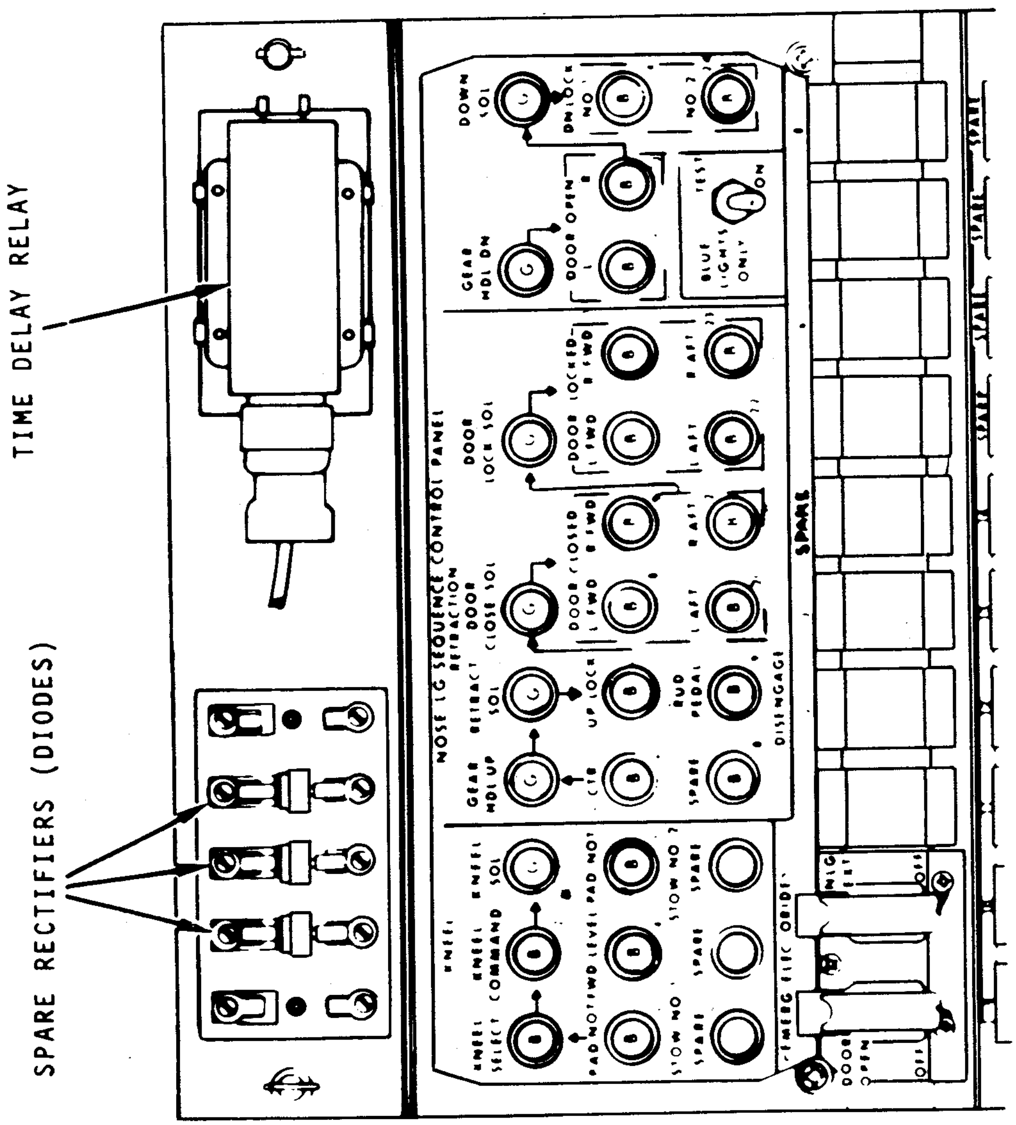
C-5B LEFT FWD
MLG EMERGENCY EXTENSION SCHEMATIC



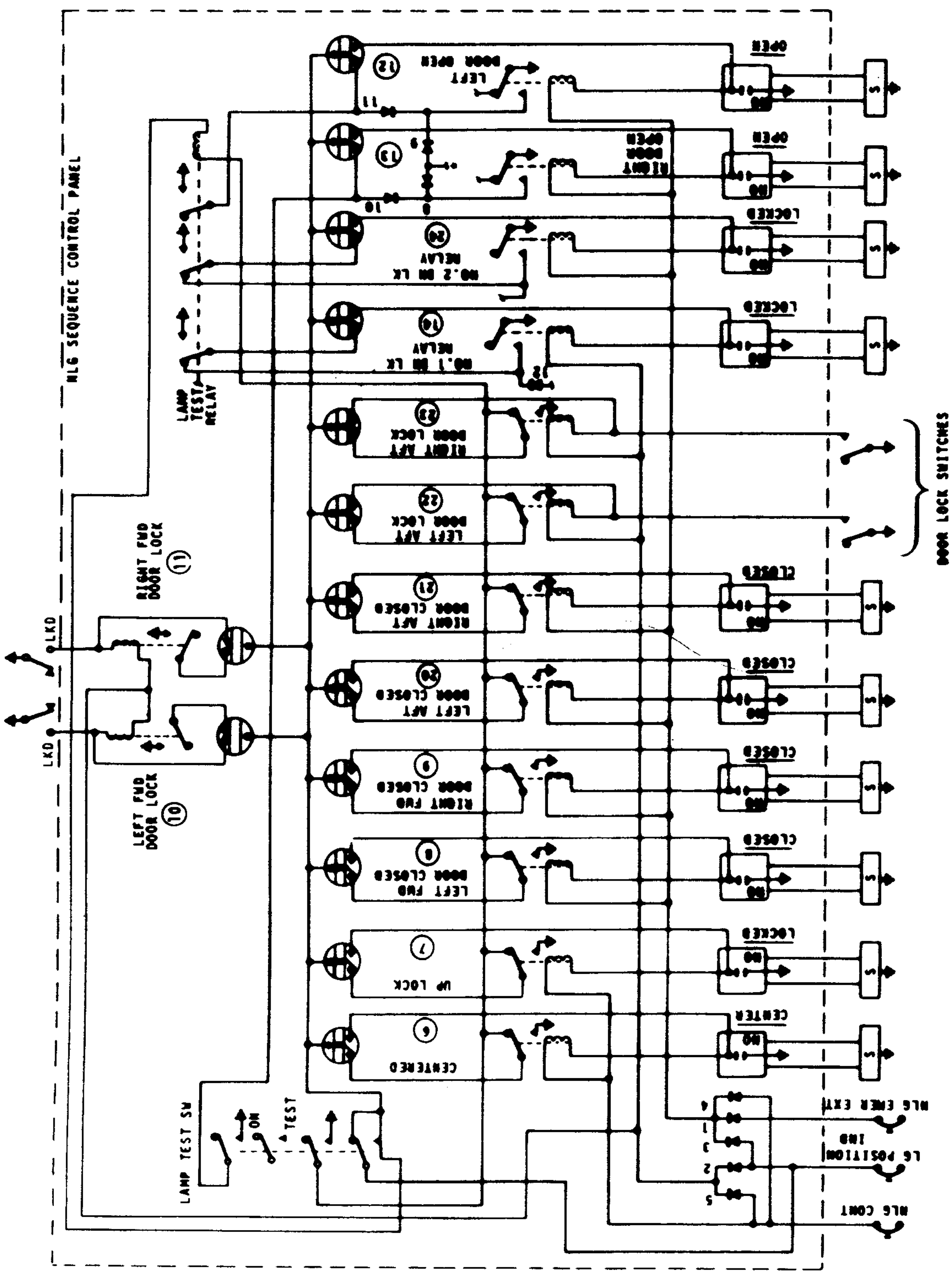
C-5B LEFT AFT
MLG EMERGENCY EXTENSION SCHEMATIC



NOSE LANDING GEAR ASSEMBLY

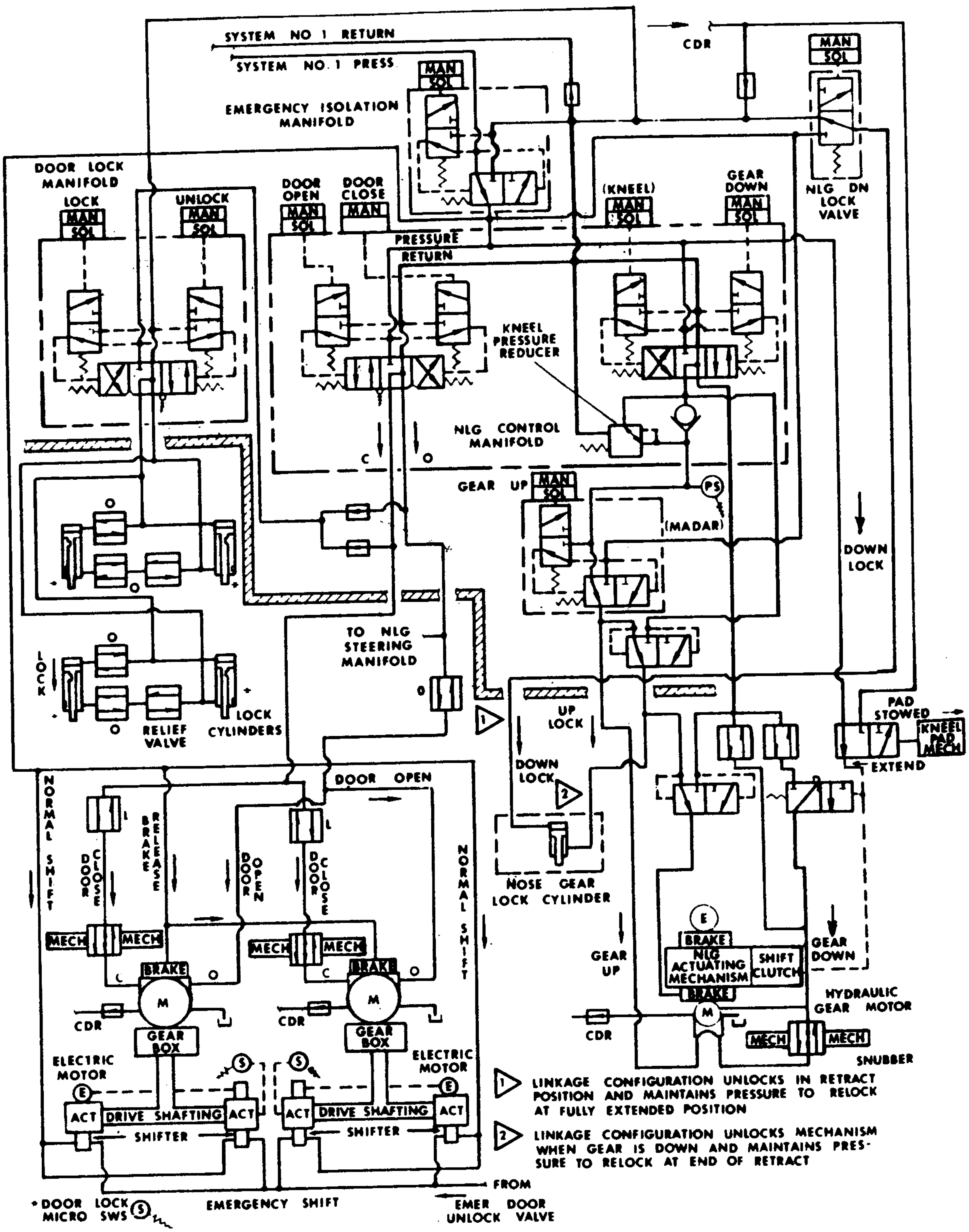


NLG SEQUENCE CONTROL PANEL

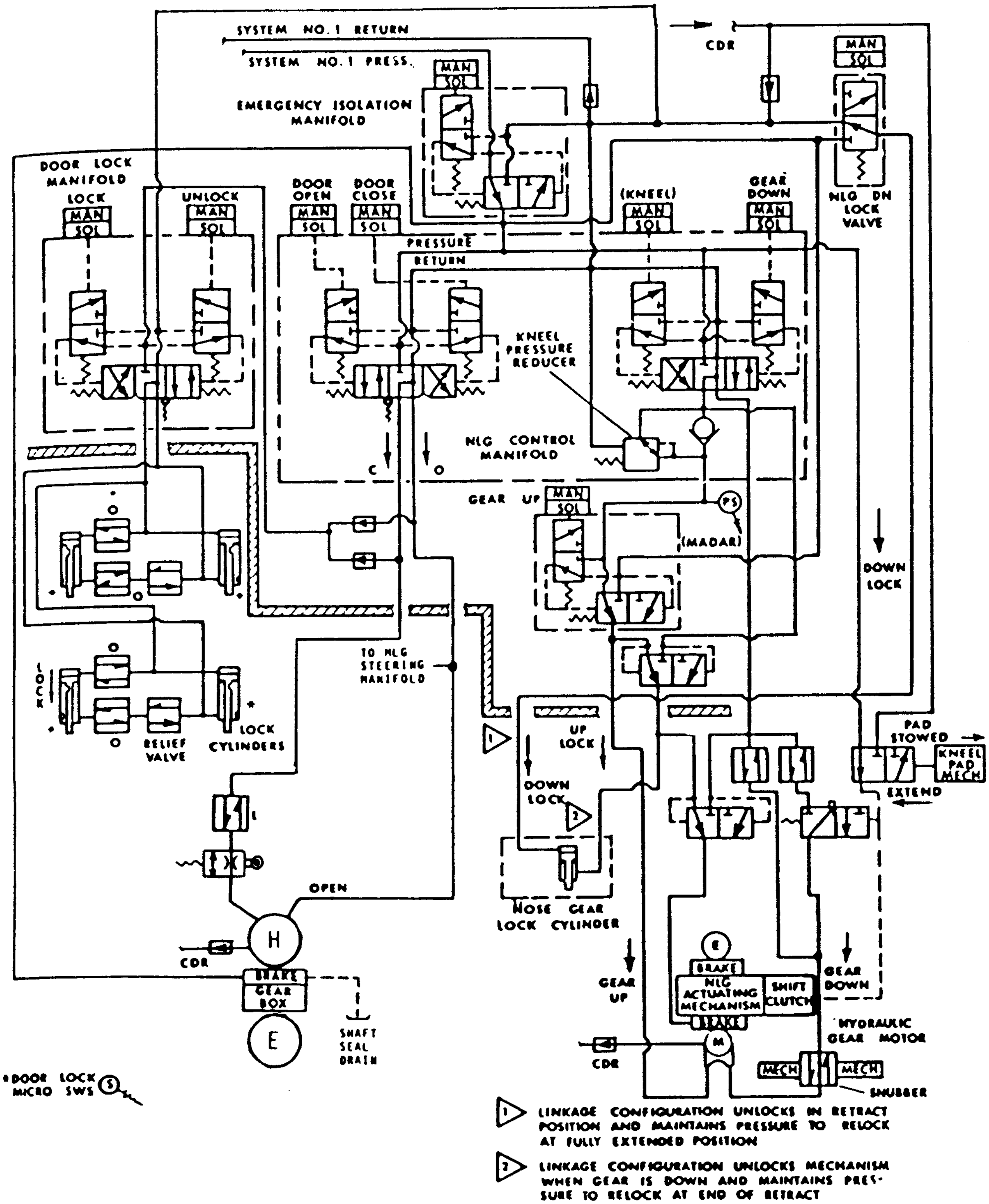


LEGEND
*TO NLG EMER ELECTRICAL SCHEMATIC

NLG RELAY OPERATION

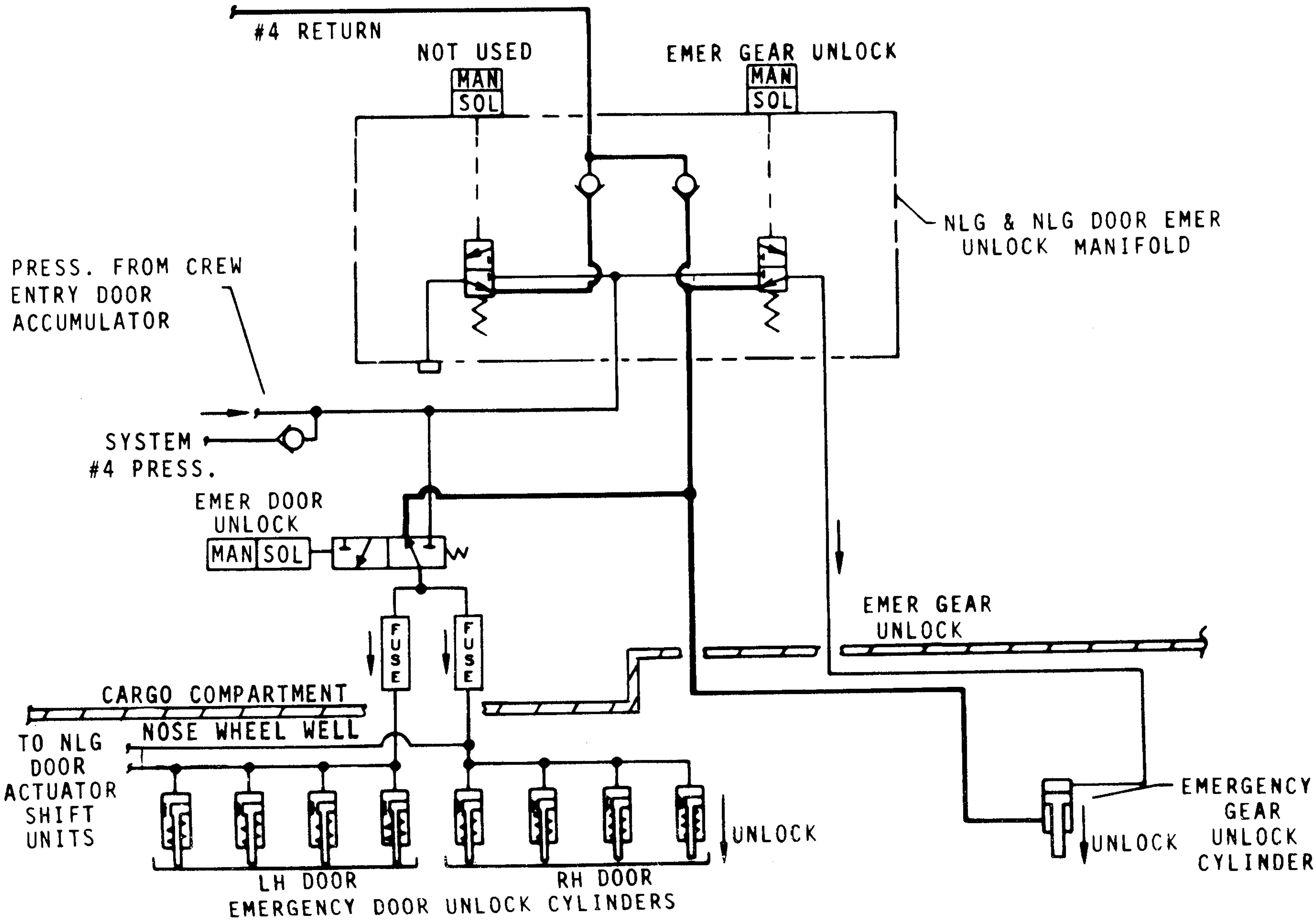


C-5A NLG HYDRAULIC (NORMAL)

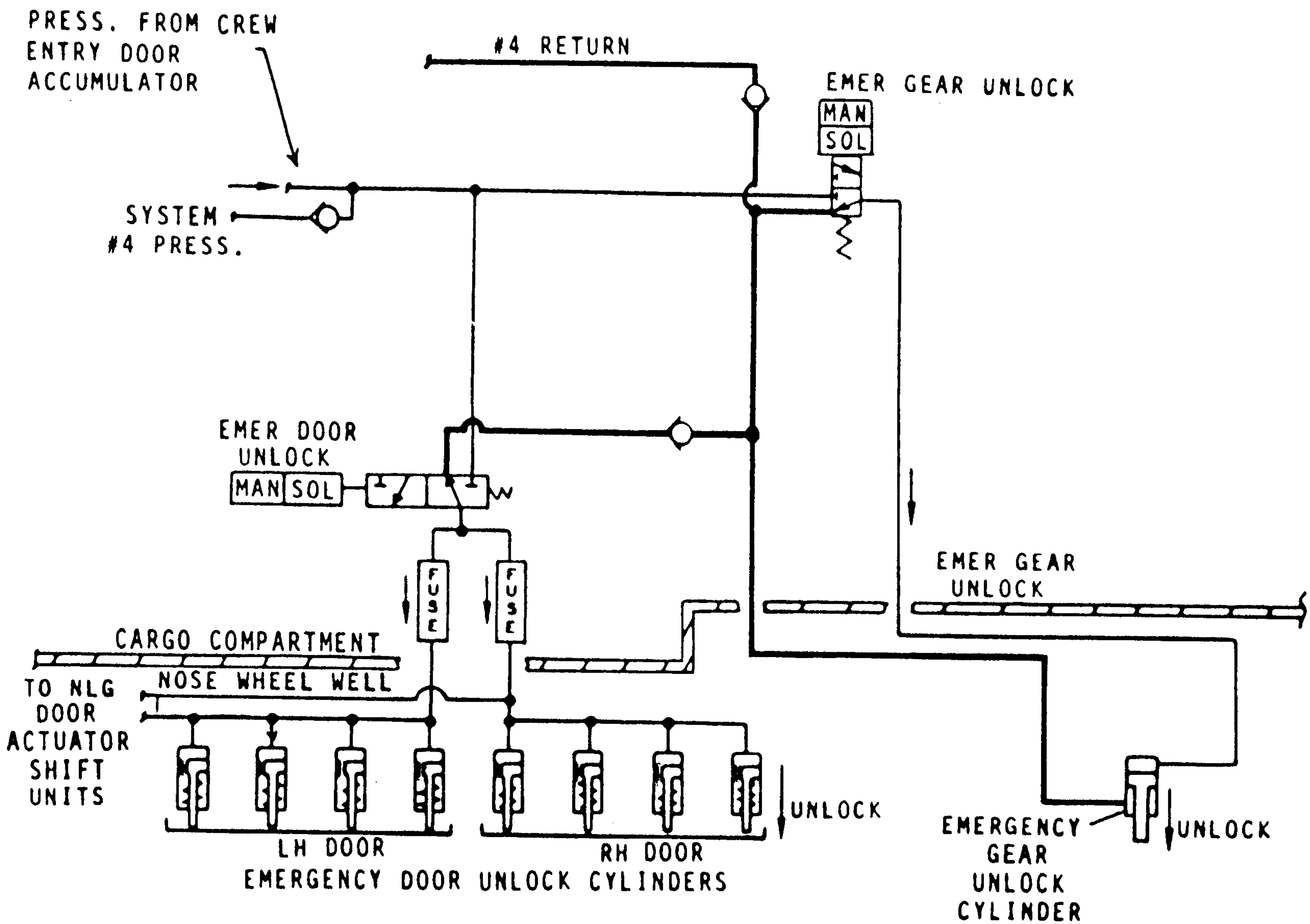


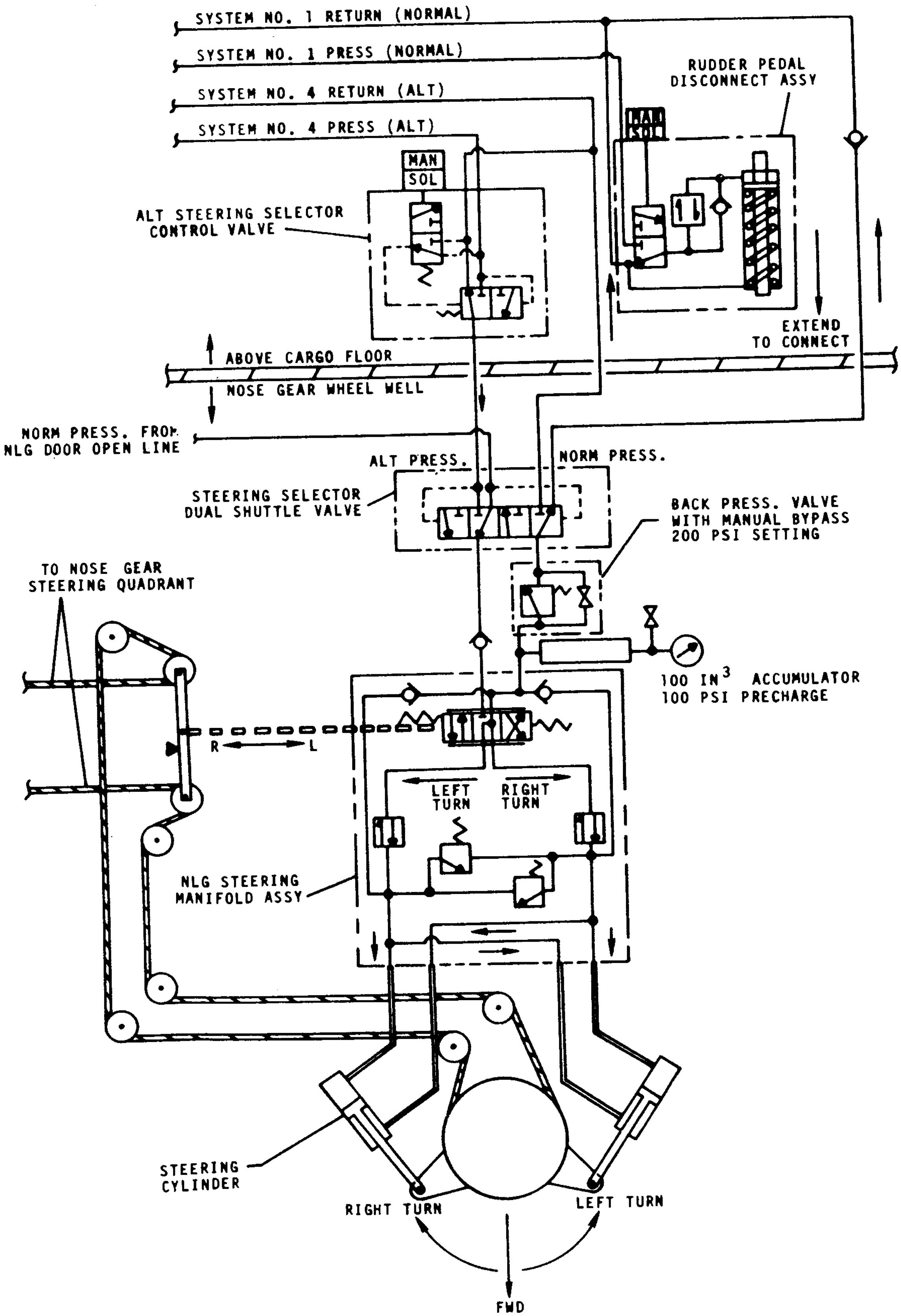
C-5B NLG
HYDRAULIC SYSTEM SCHEMATIC (NORMAL)

C-5A NLG HYDRAULIC (EMERGENCY)

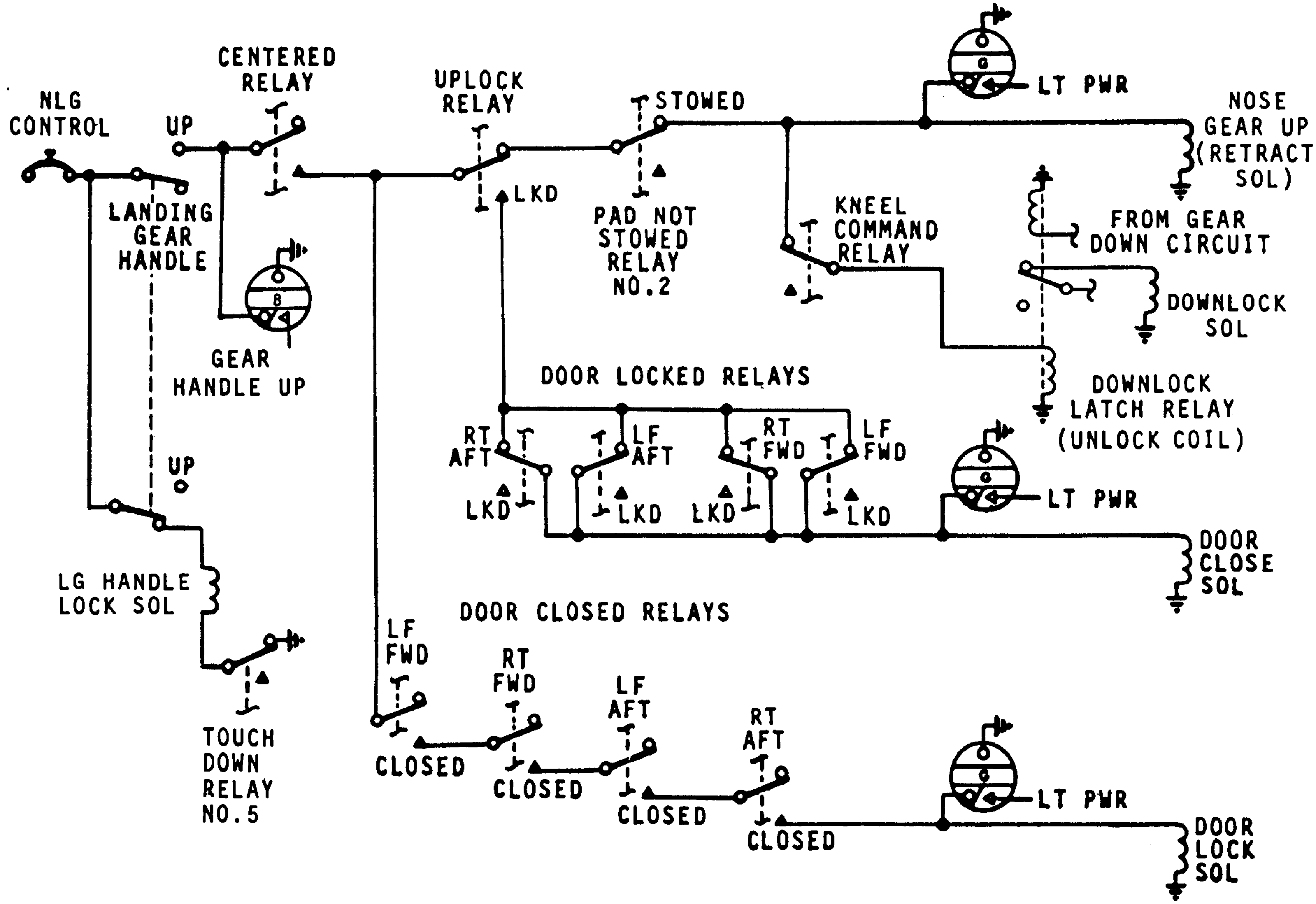


C-5B NLG HYDRAULIC (EMERGENCY)



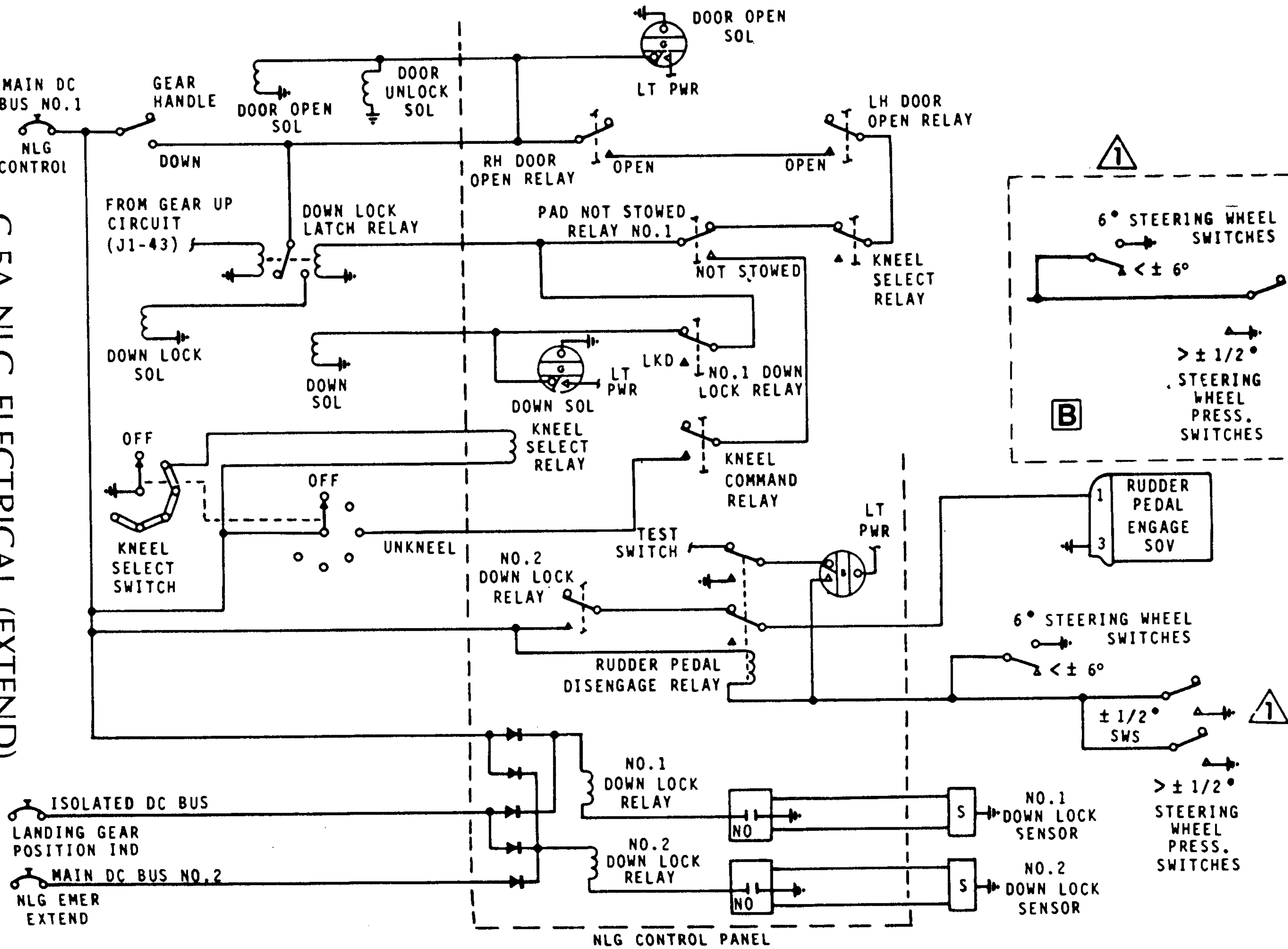


NLG STEERING HYDRAULIC SCHEMATIC

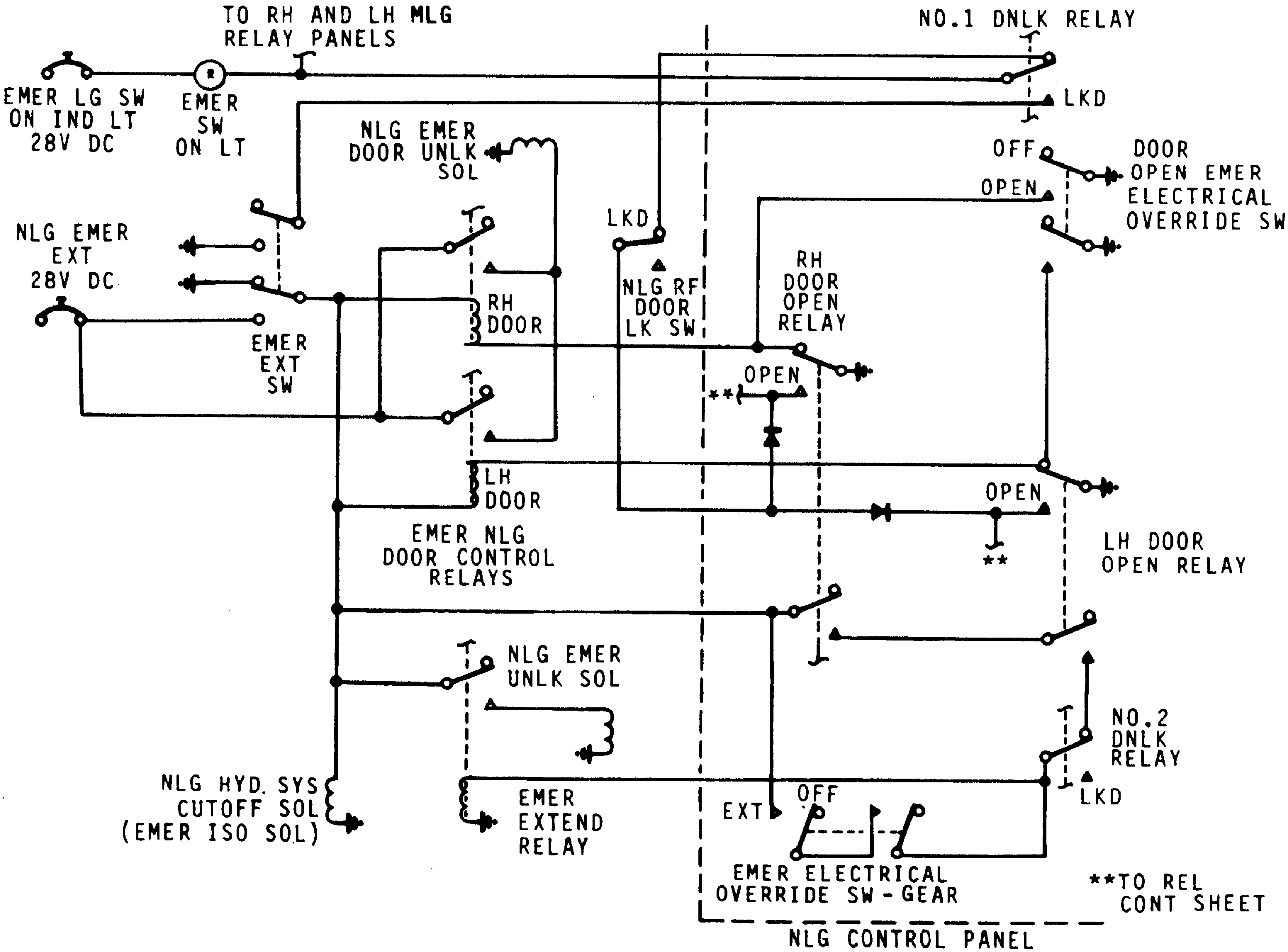


NLG ELECTRICAL (RETRACTION)

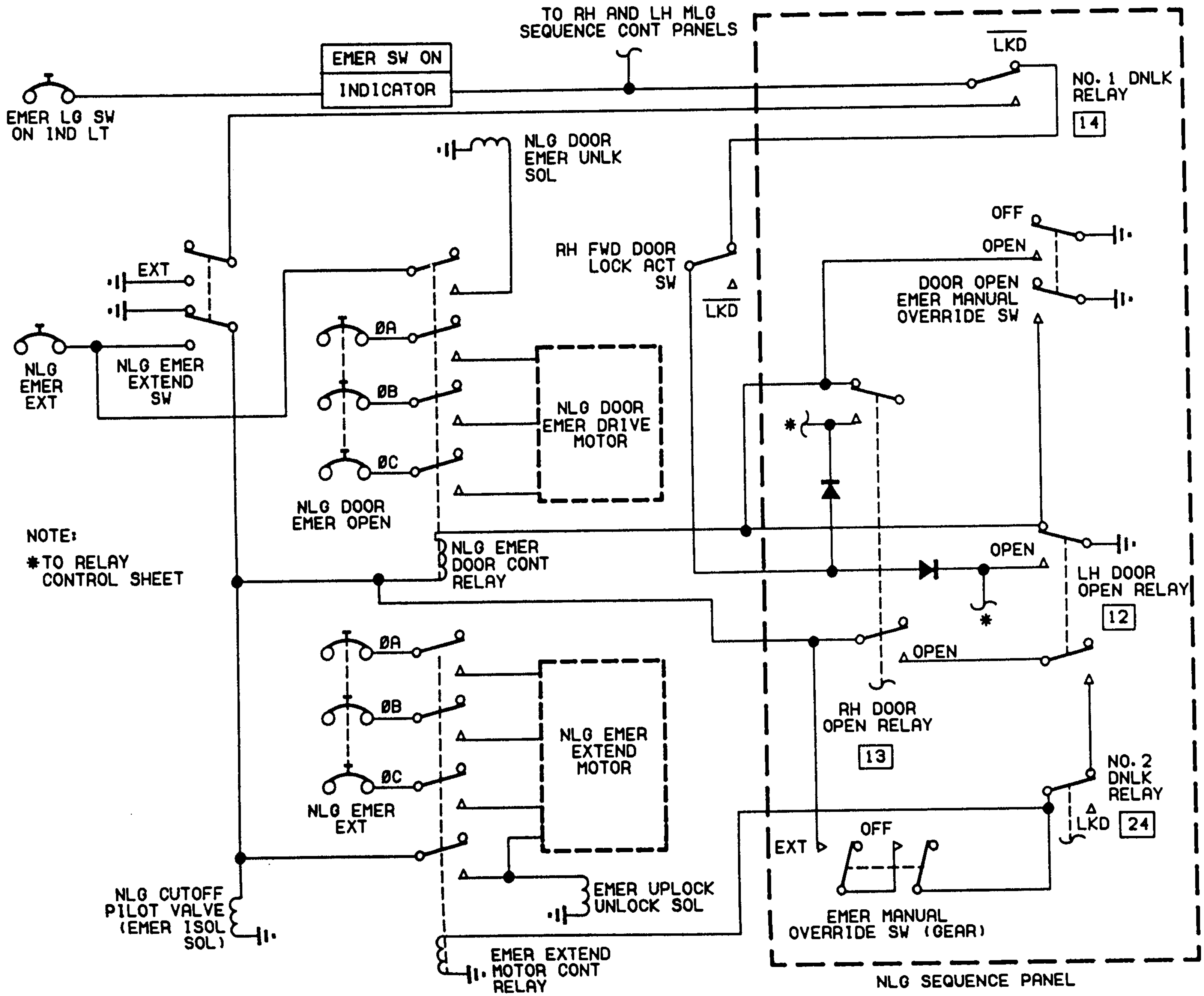
C-5A NLG ELECTRICAL (EXTEND)

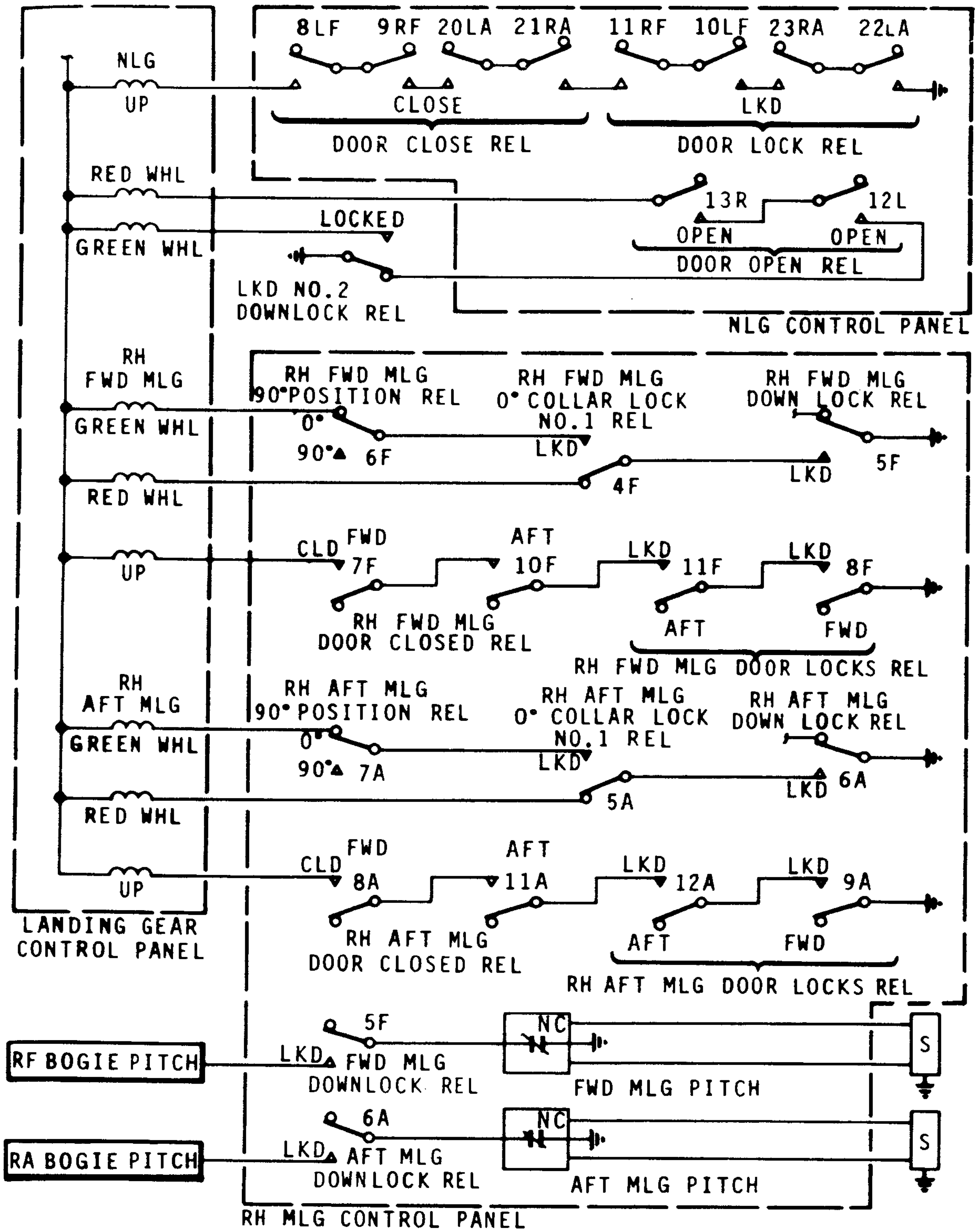


C-5A NLG ELECTRICAL (EMERGENCY)

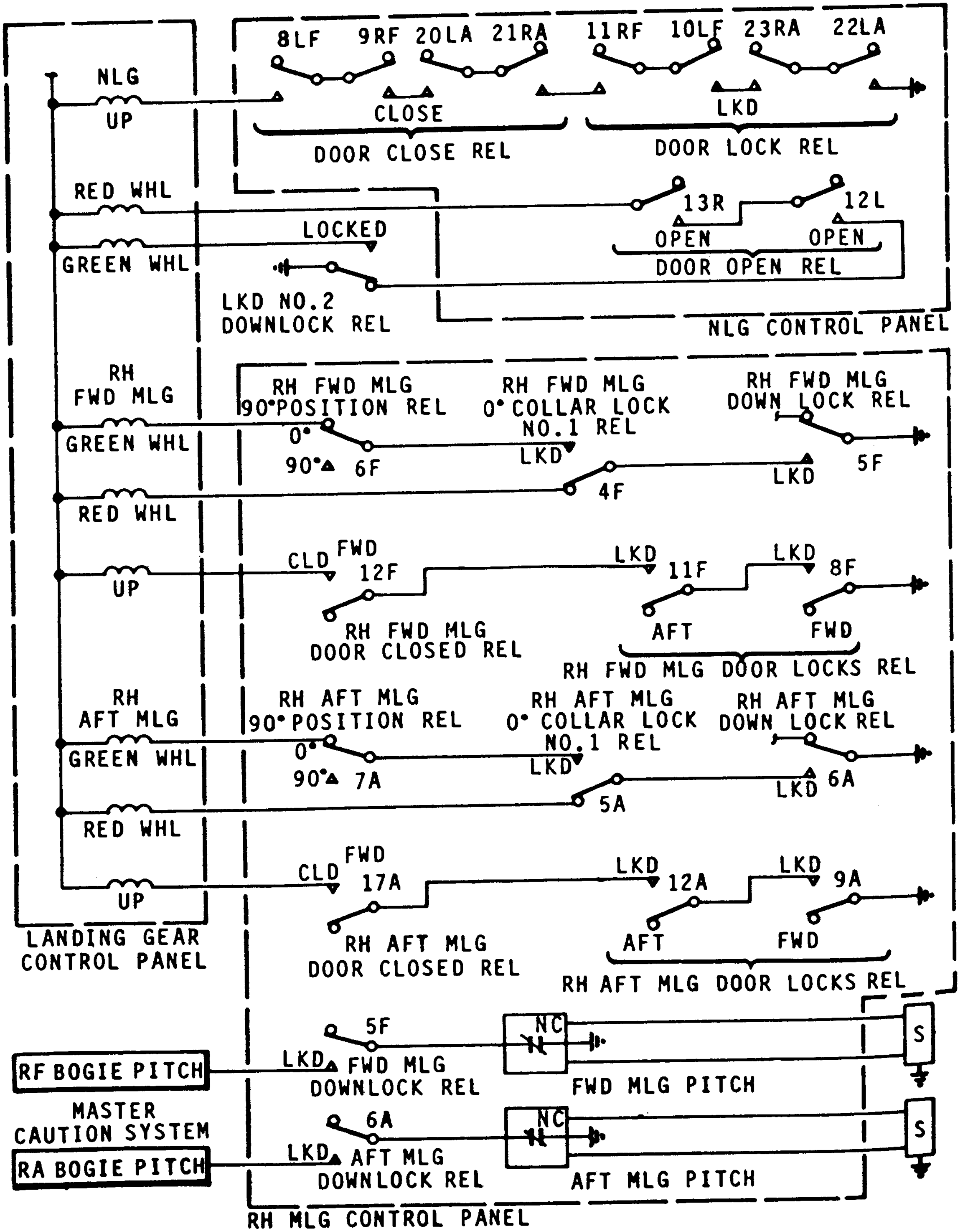


C-5B NLG EMERGENCY EXTENSION SCHEMATIC

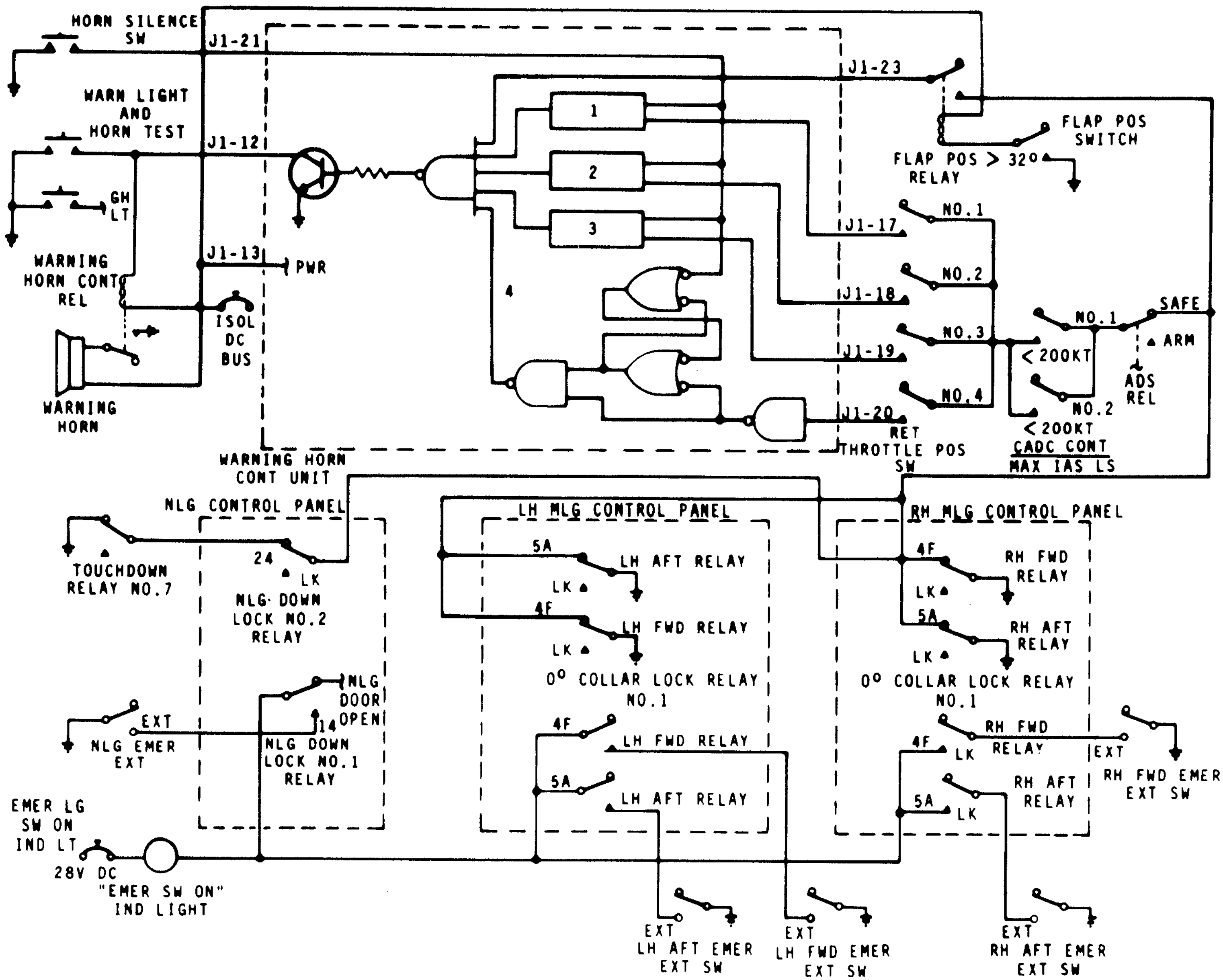




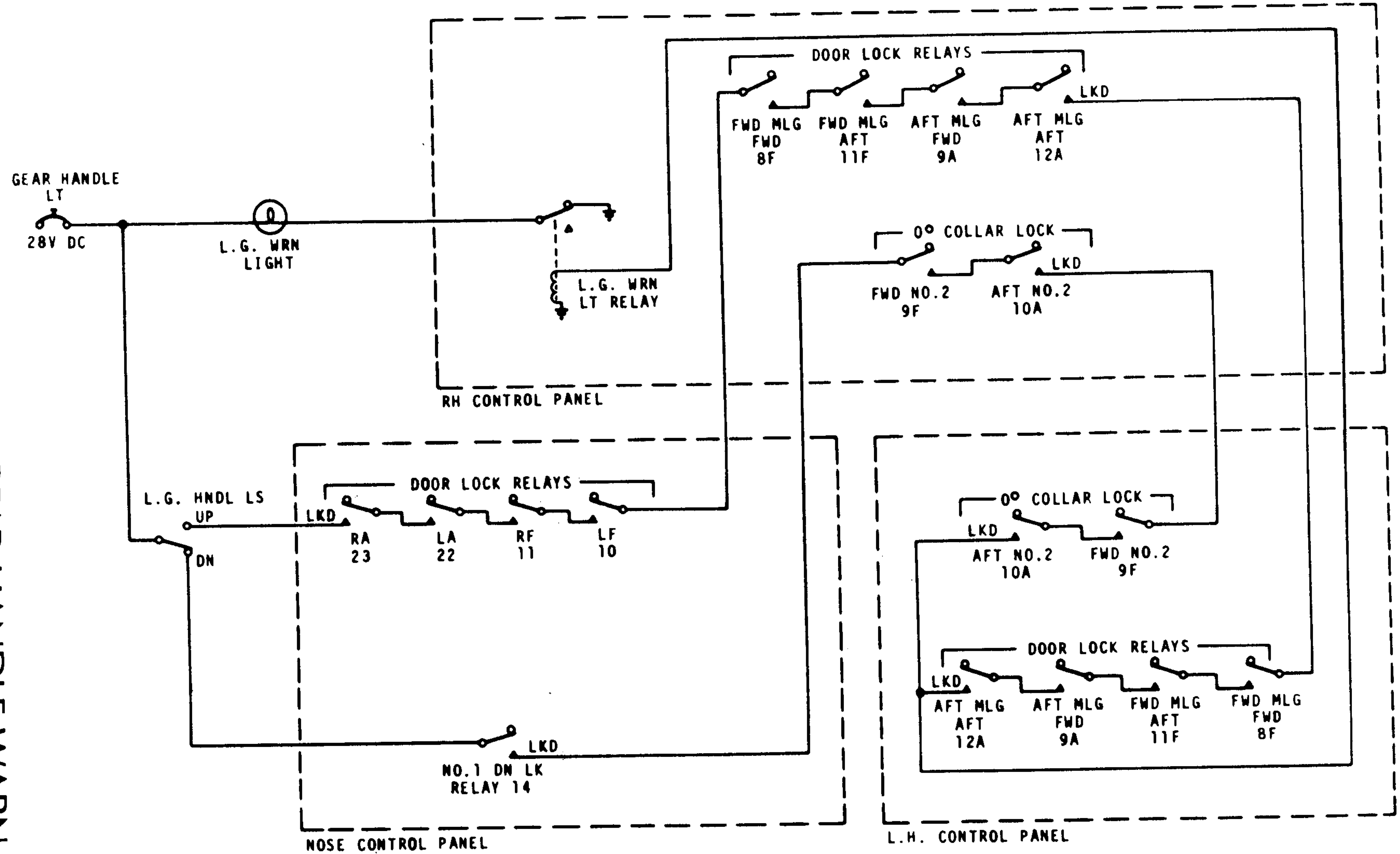
C-5A LANDING GEAR
POSITION INDICATION SCHEMATIC



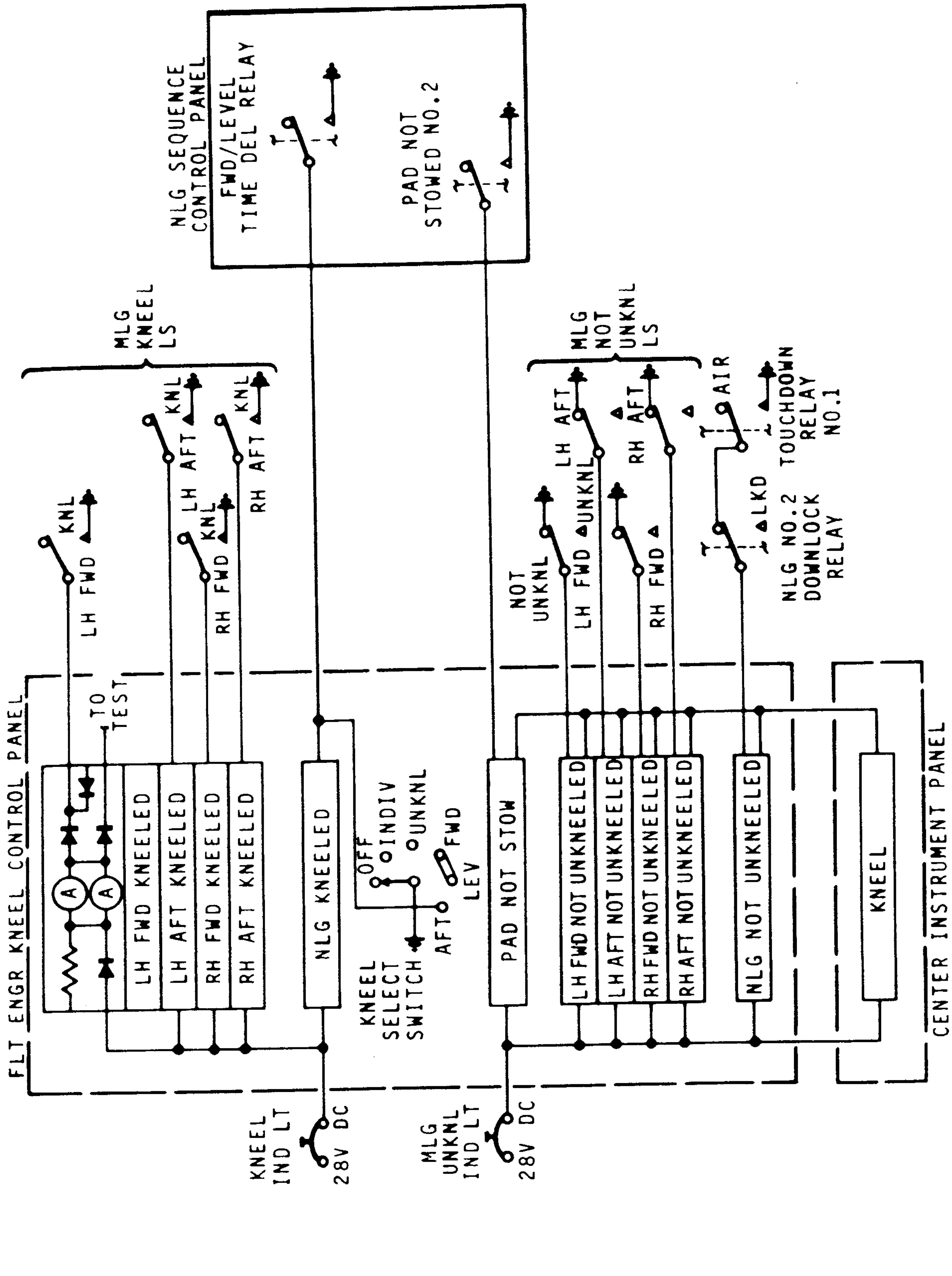
C-5B LANDING GEAR
POSITION INDICATION SCHEMATIC



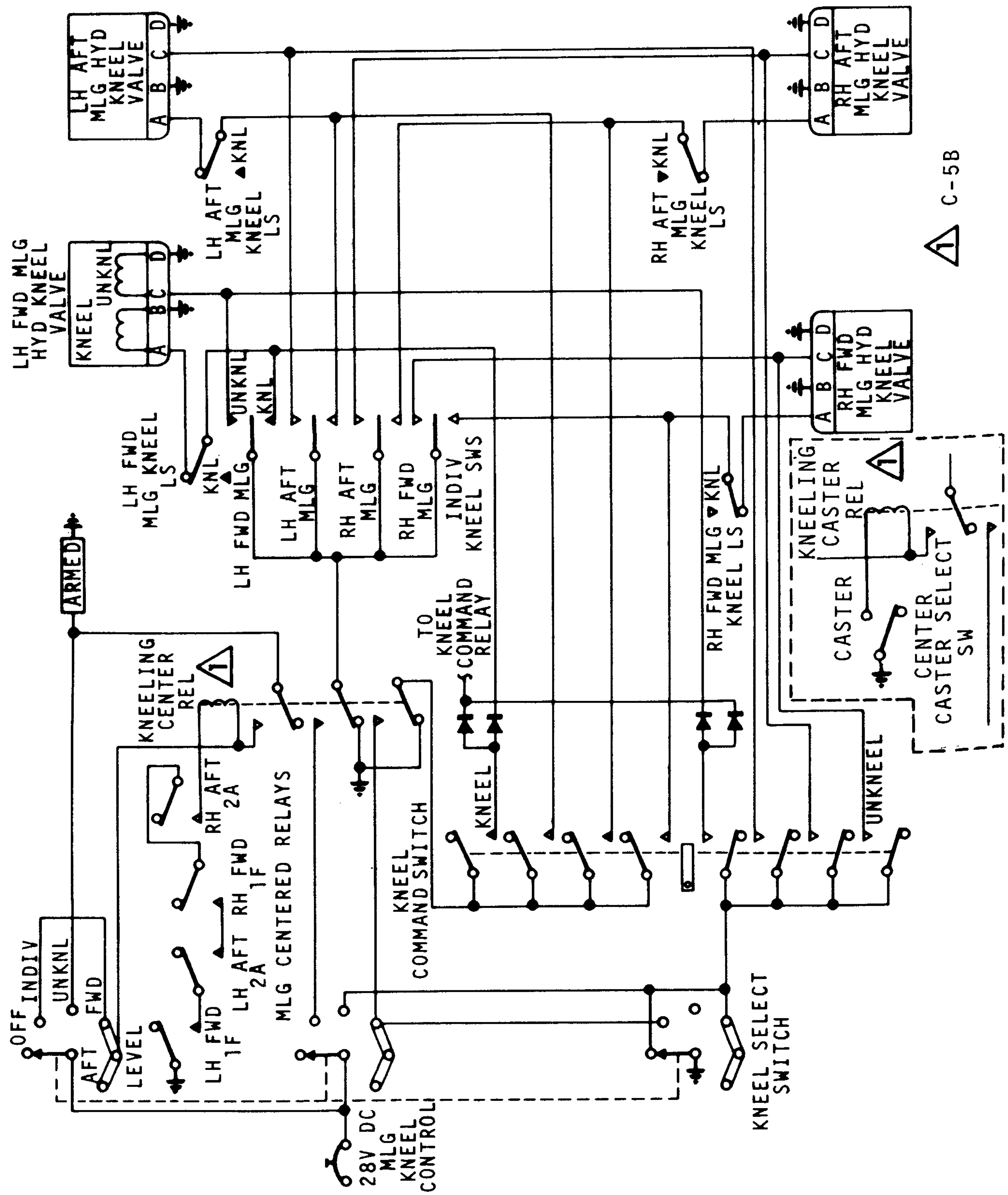
RELAY LOGIC SYSTEM (WARNING)



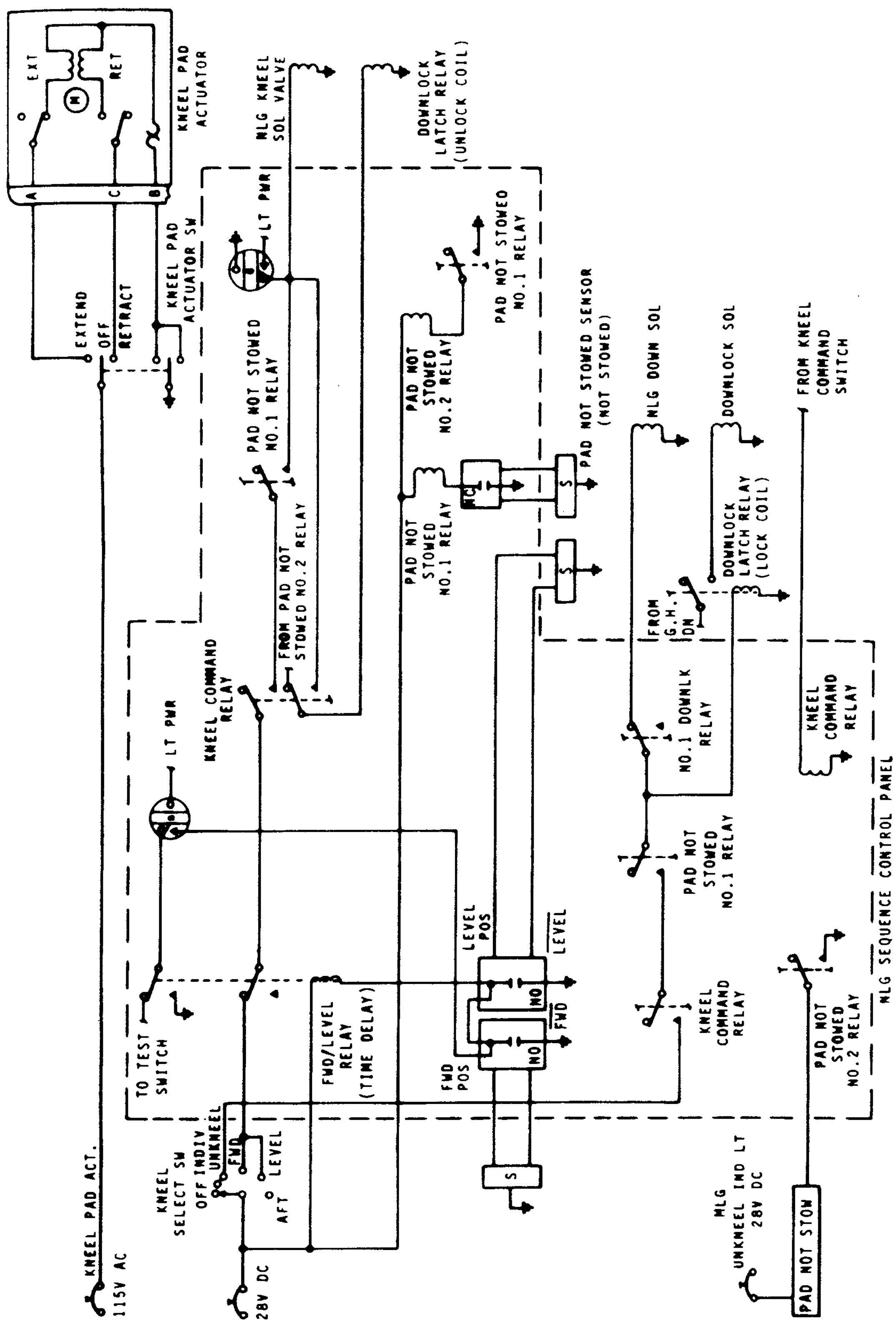
RELAY LOGIC SYSTEM (GEAR HANDLE WARN LT)



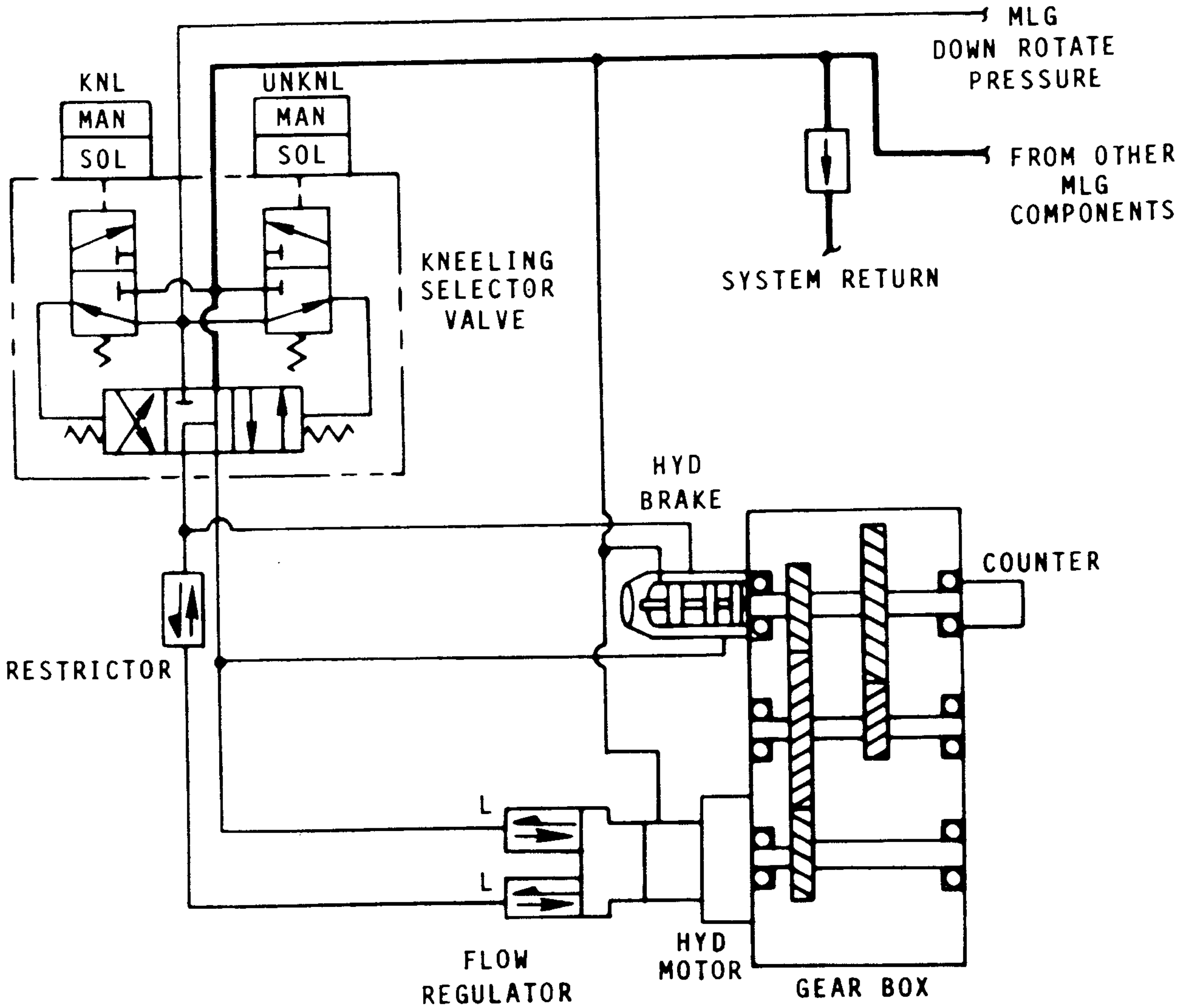
KNEEL CONTROL INDICATION



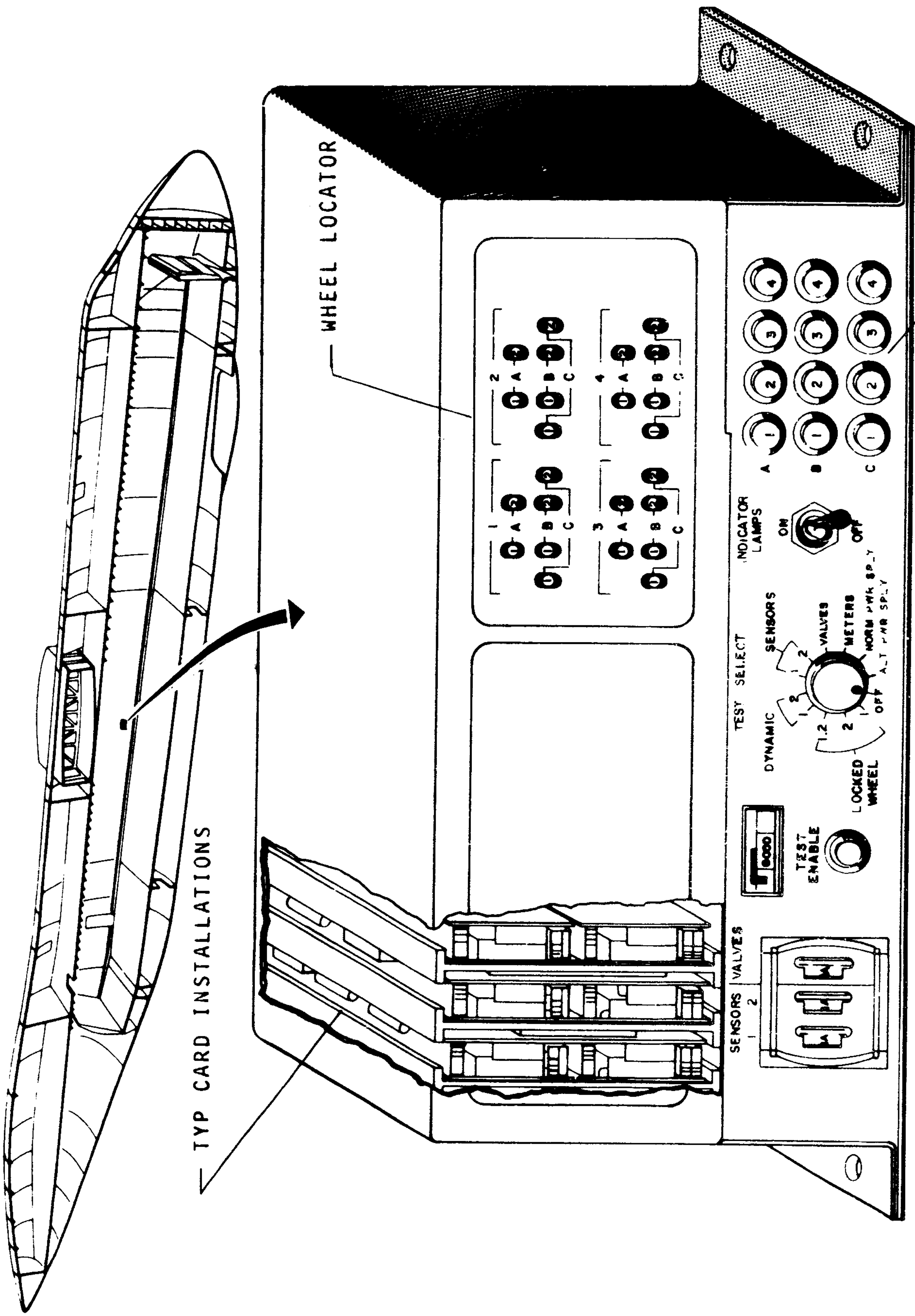
C-5A MLG KNEEL CONTROL (ELECTRICAL)



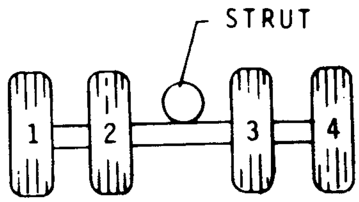
NLG KNEEL CONTROL (ELECTRICAL)

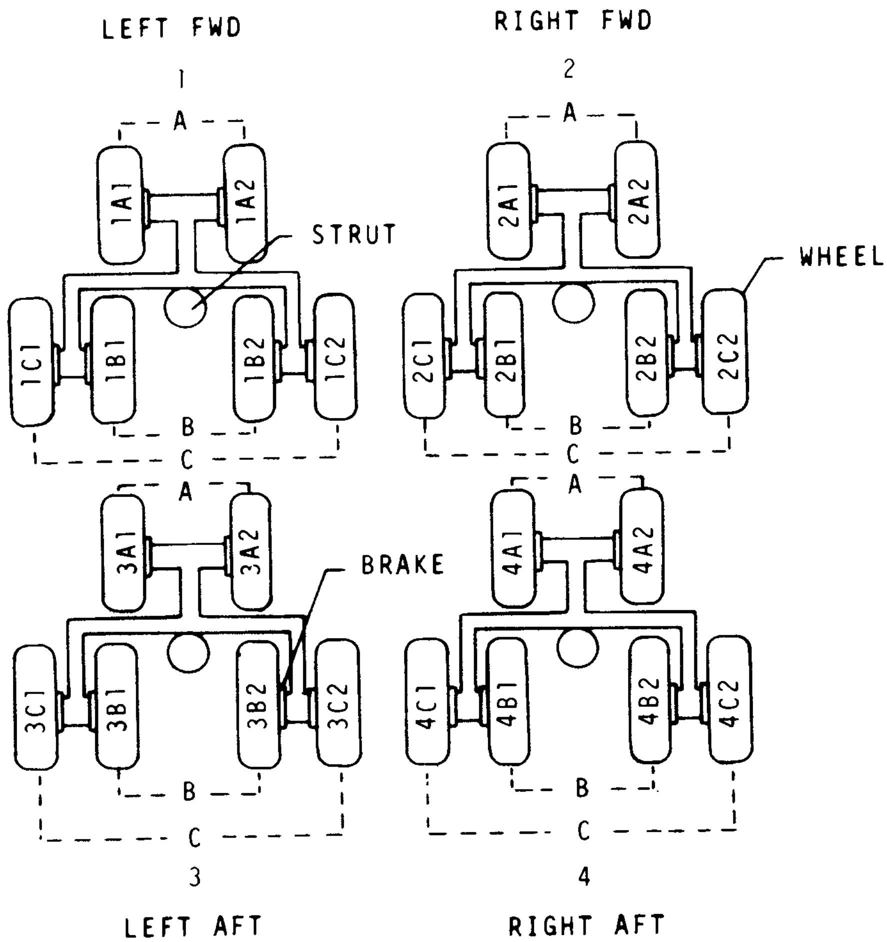


MLG KNEEL CONTROL (HYDRAULIC)



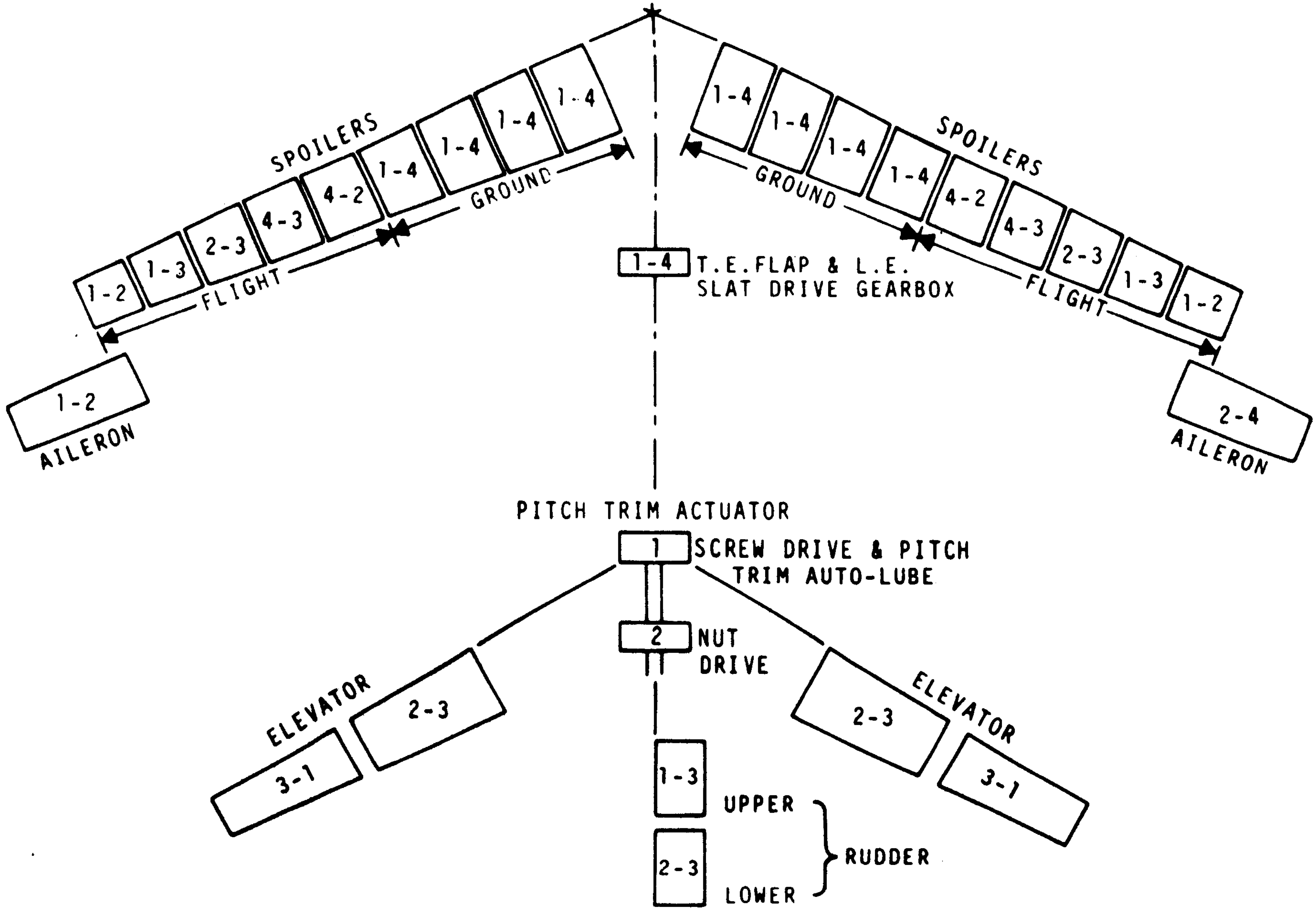
SKID CONTROL BOX

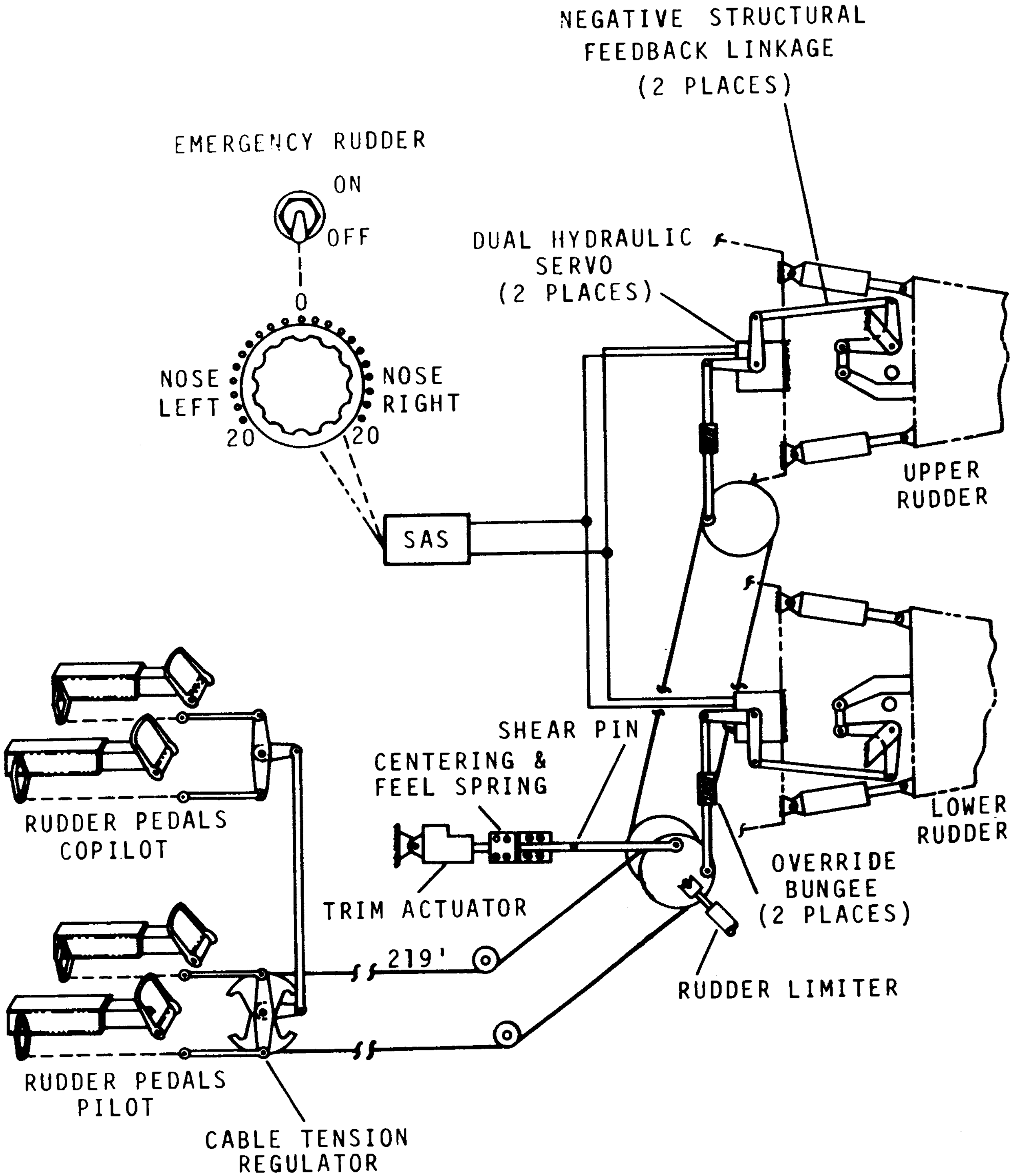




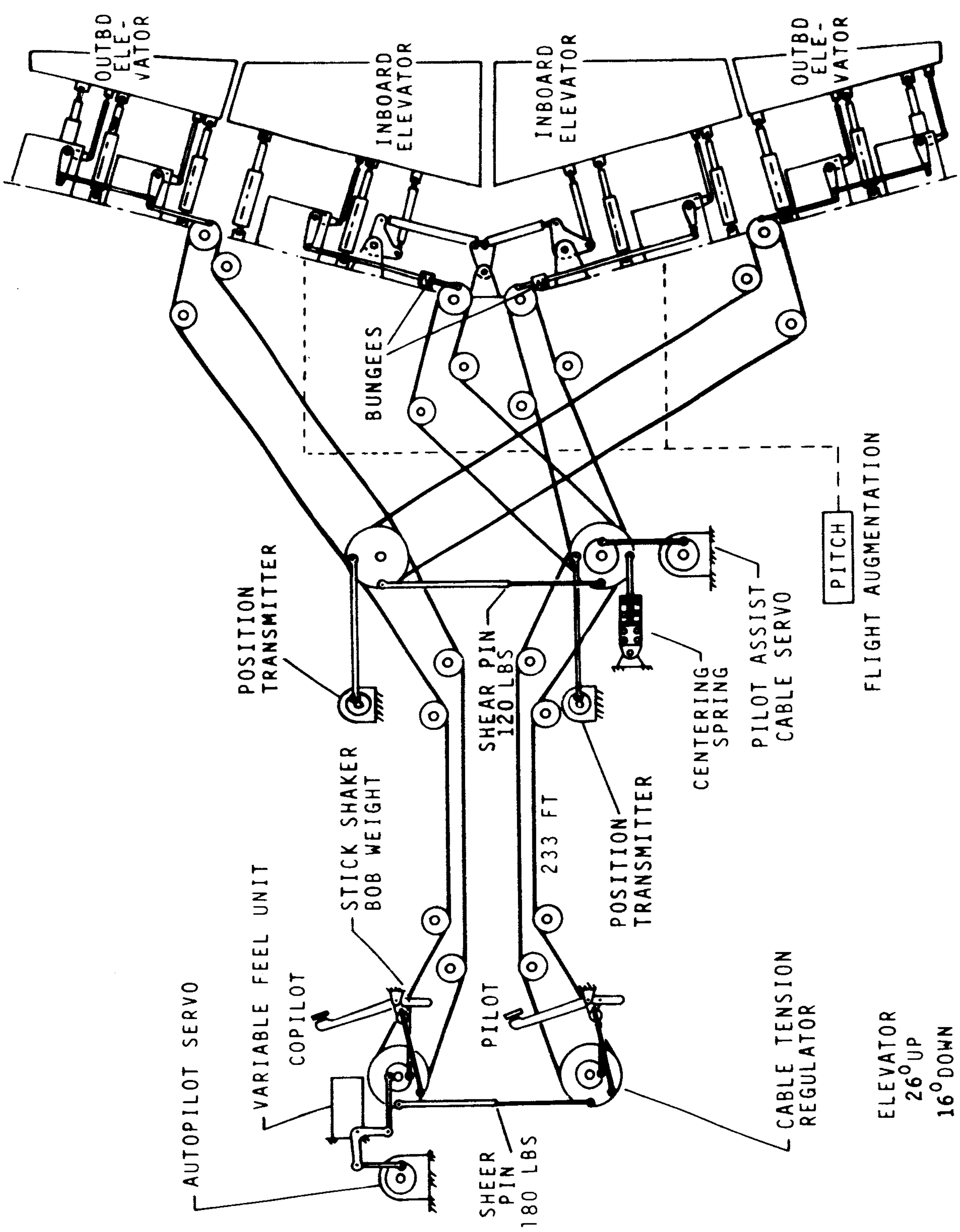
WHEEL & BRAKE IDENTIFICATION

HYDRAULIC FLIGHT CONTROL POWER DISTRIBUTION

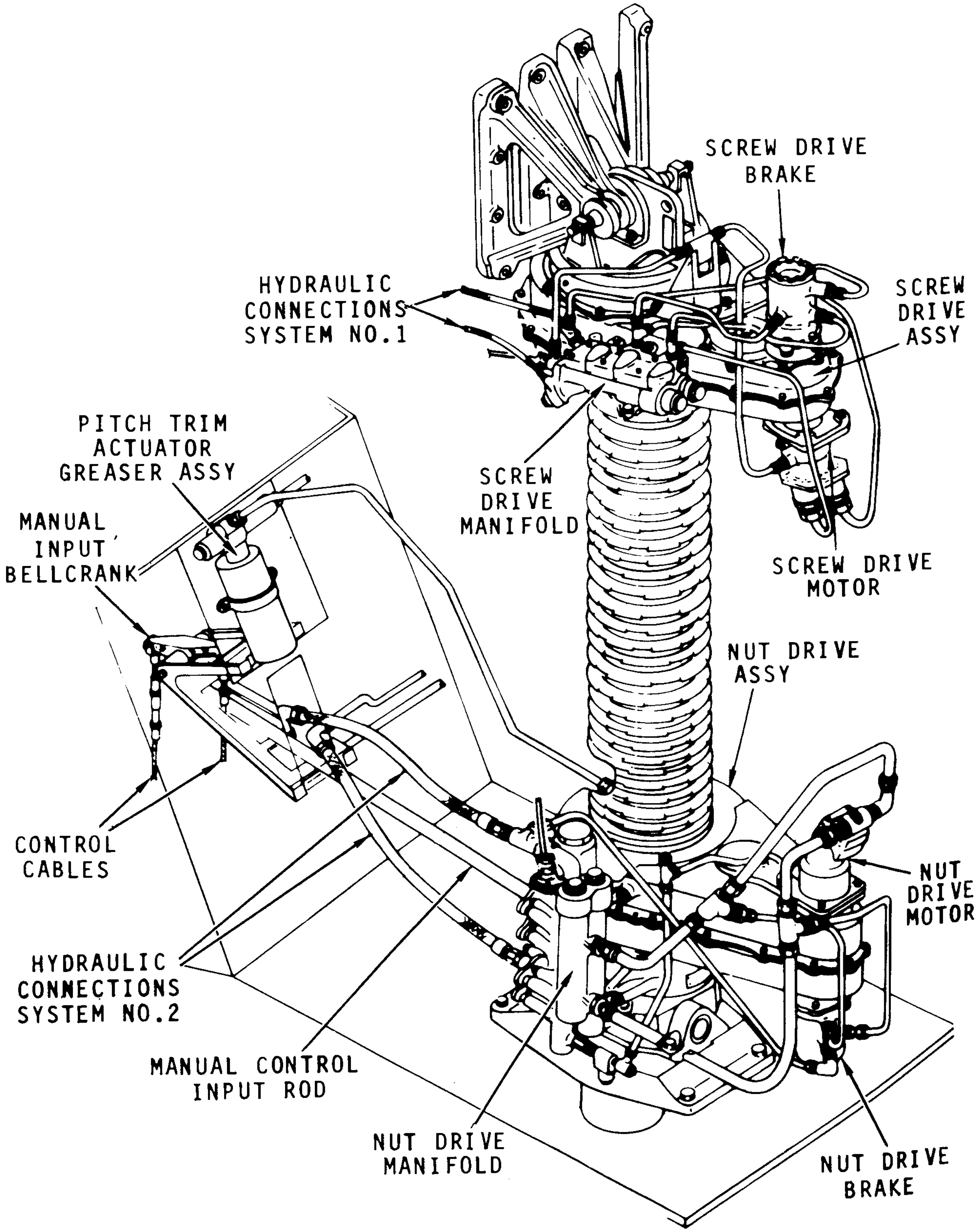




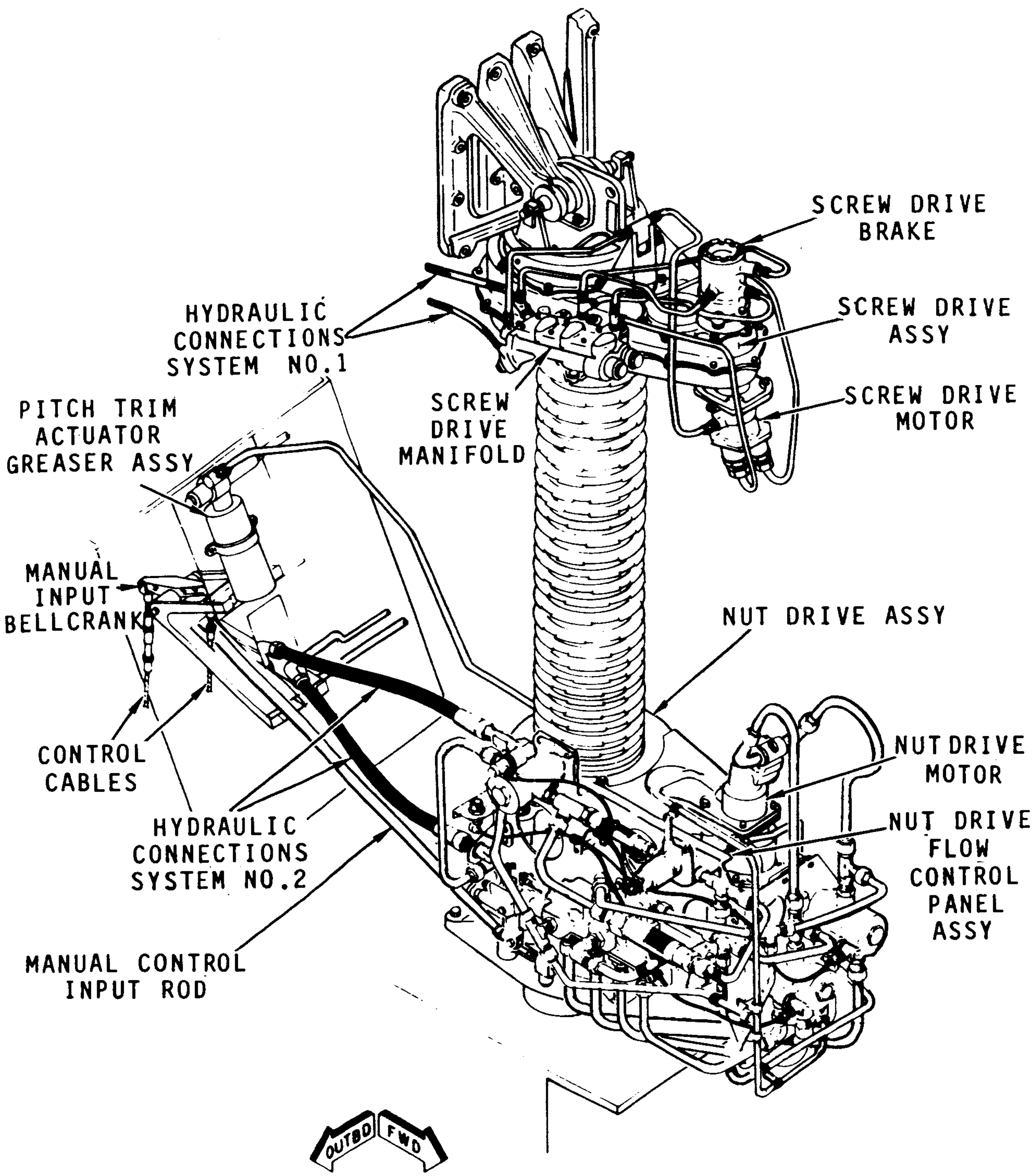
RUDDER SYSTEM SCHEMATIC



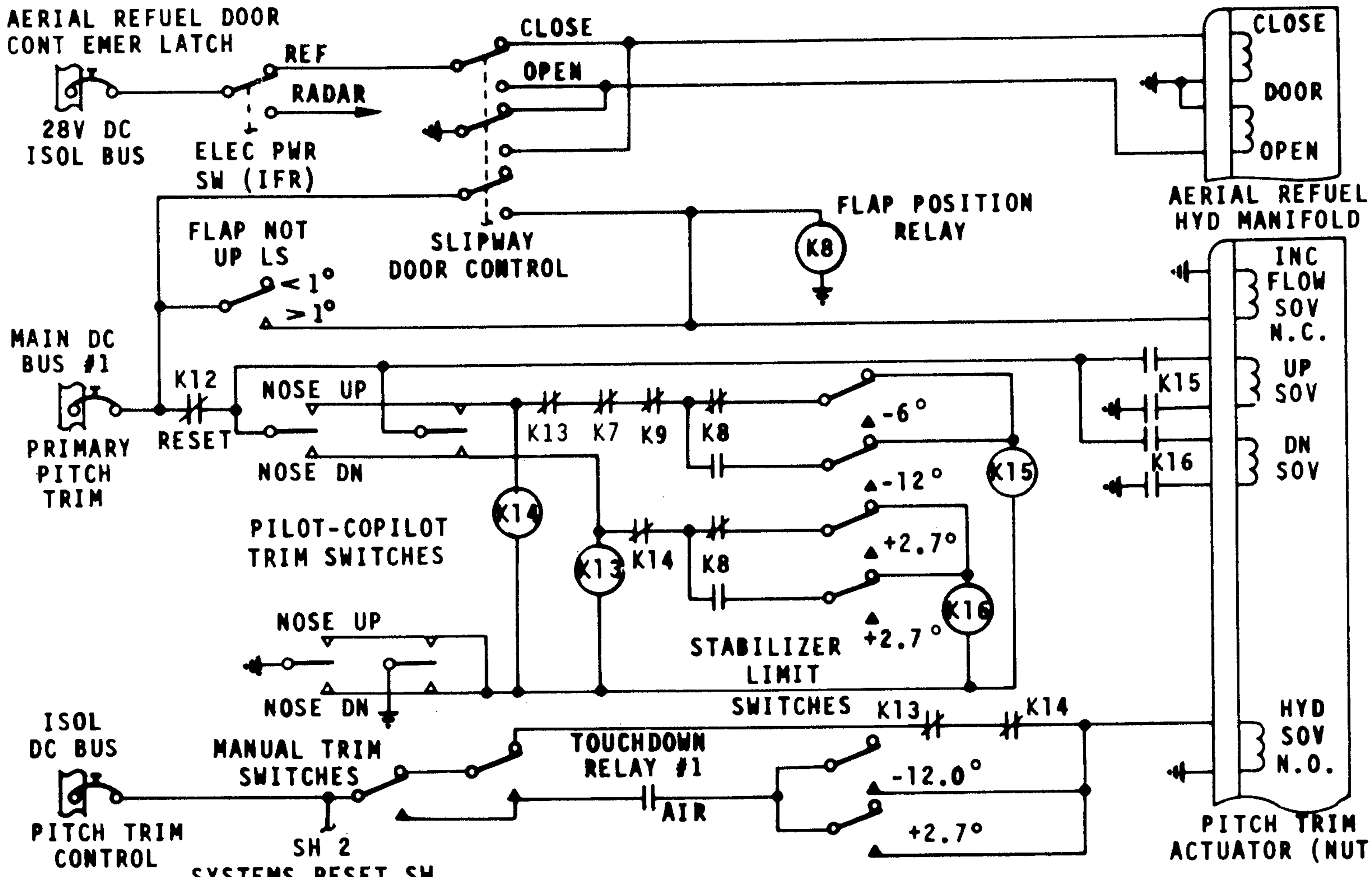
ELEVATOR SYSTEM SCHEMATIC



PITCH TRIM ACTUATOR



PITCH TRIM ACTUATOR - MODIFIED



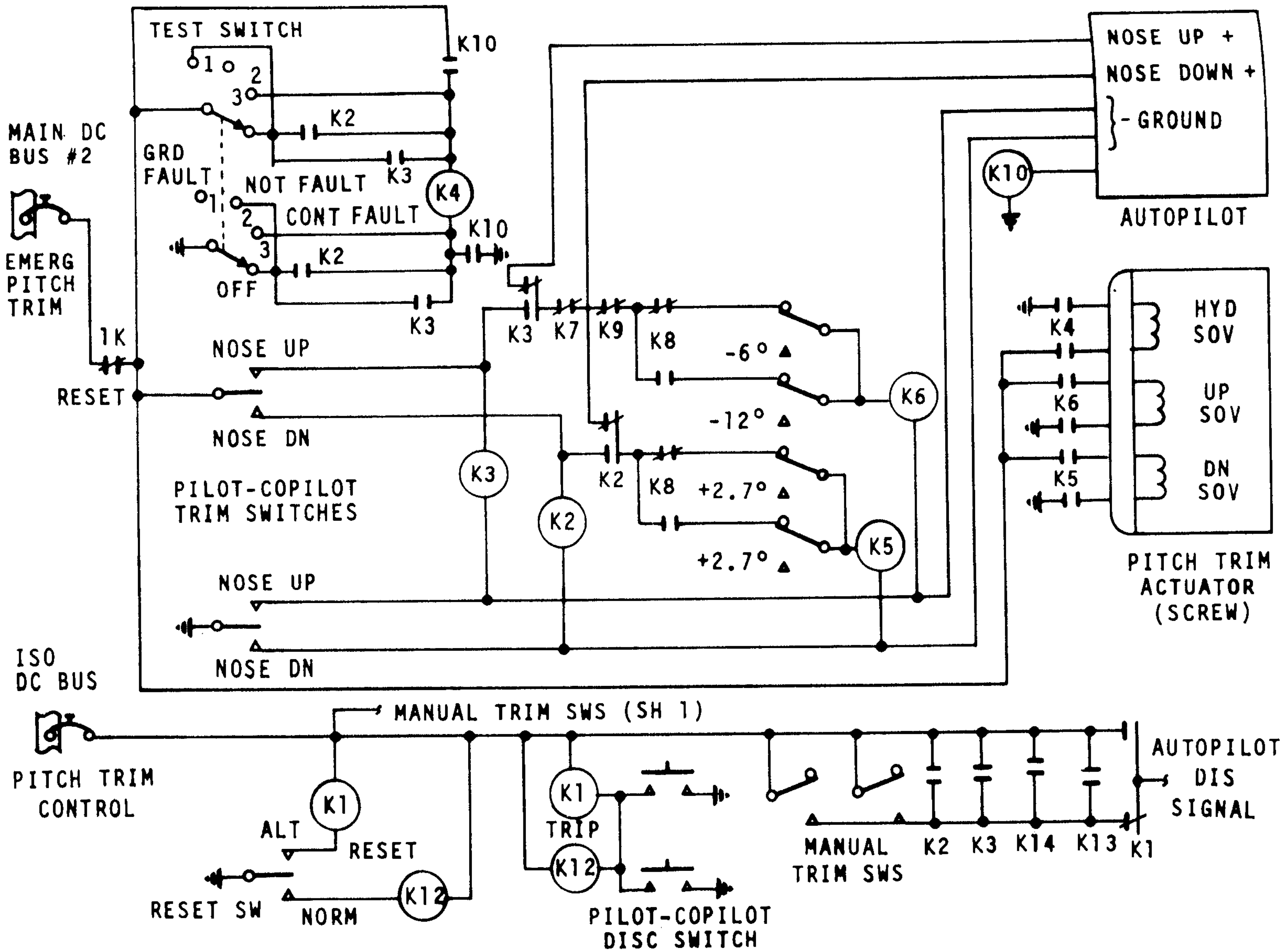
K1 TRIM DISC. REL (SCREW)
K2 NOSE DN (SCREW)(CONTROL)
K3 NOSE UP (SCREW)(CONTROL)
K4 SCREW CONTROL (HYD)

K5 NOSE DOWN (SCREW)
K6 NOSE UP (SCREW)
K7 PITCH TRIM INTER. REL NO.2
K8 FLAP POS
K9 PITCH TRIM INTER. REL NO.1
K10 AUTOPILOT SEL REL

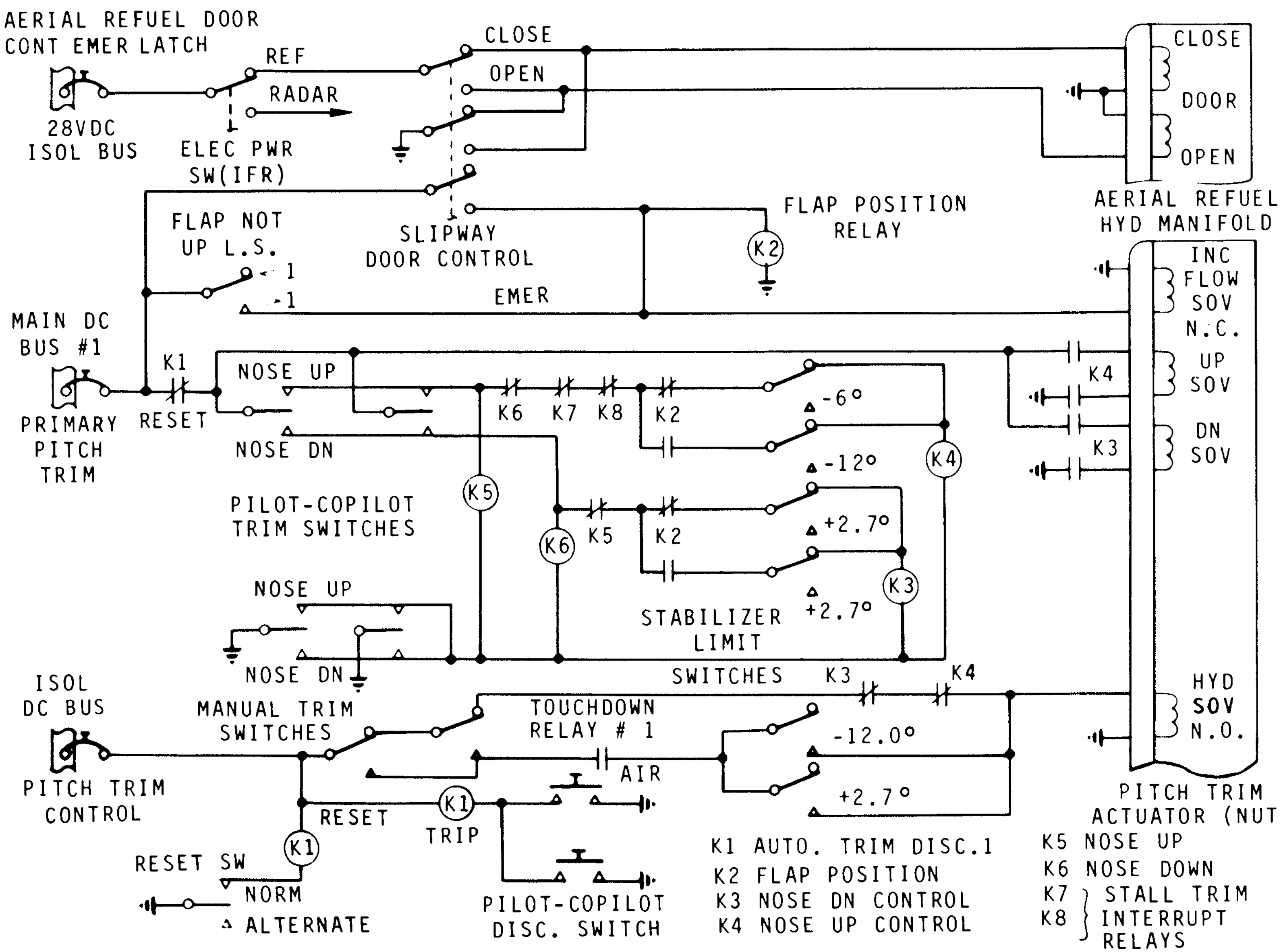
K12 AUTO. TRIM DISC REL NO.1 (NUT)
K13 NOSE DN (NUT)(CONT)
K14 NOSE UP (NUT)(CONT)
K15 NOSE UP REL (NUT)
K16 NOSE DN REL (NUT)

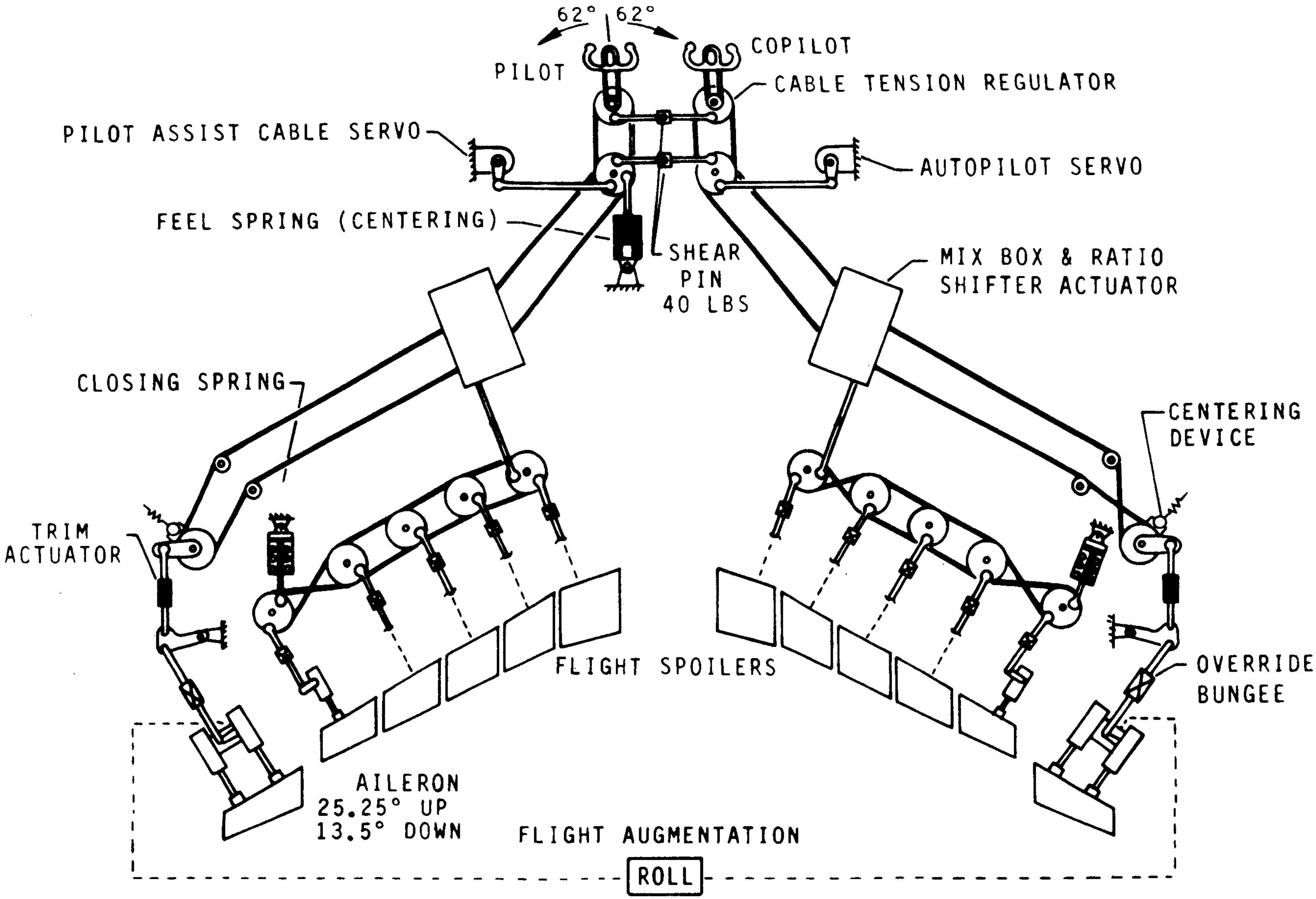
HORIZONTAL STABILIZER ELECTRICAL (SHEET 1)

HORIZONTAL STABILIZER ELECTRICAL (SHEET 2)

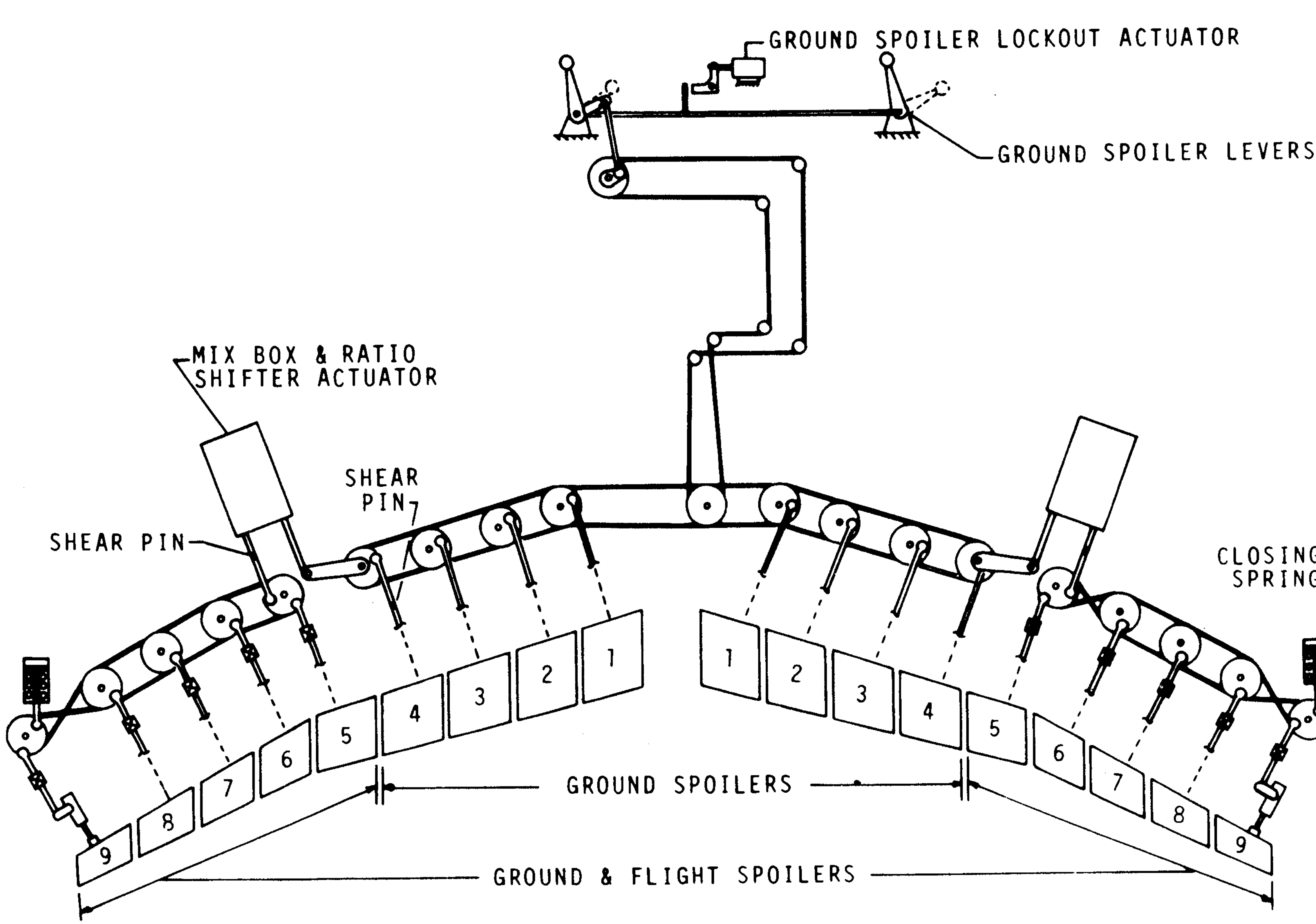


PITCH TRIM AUTHORITY - INFLIGHT REFUELING



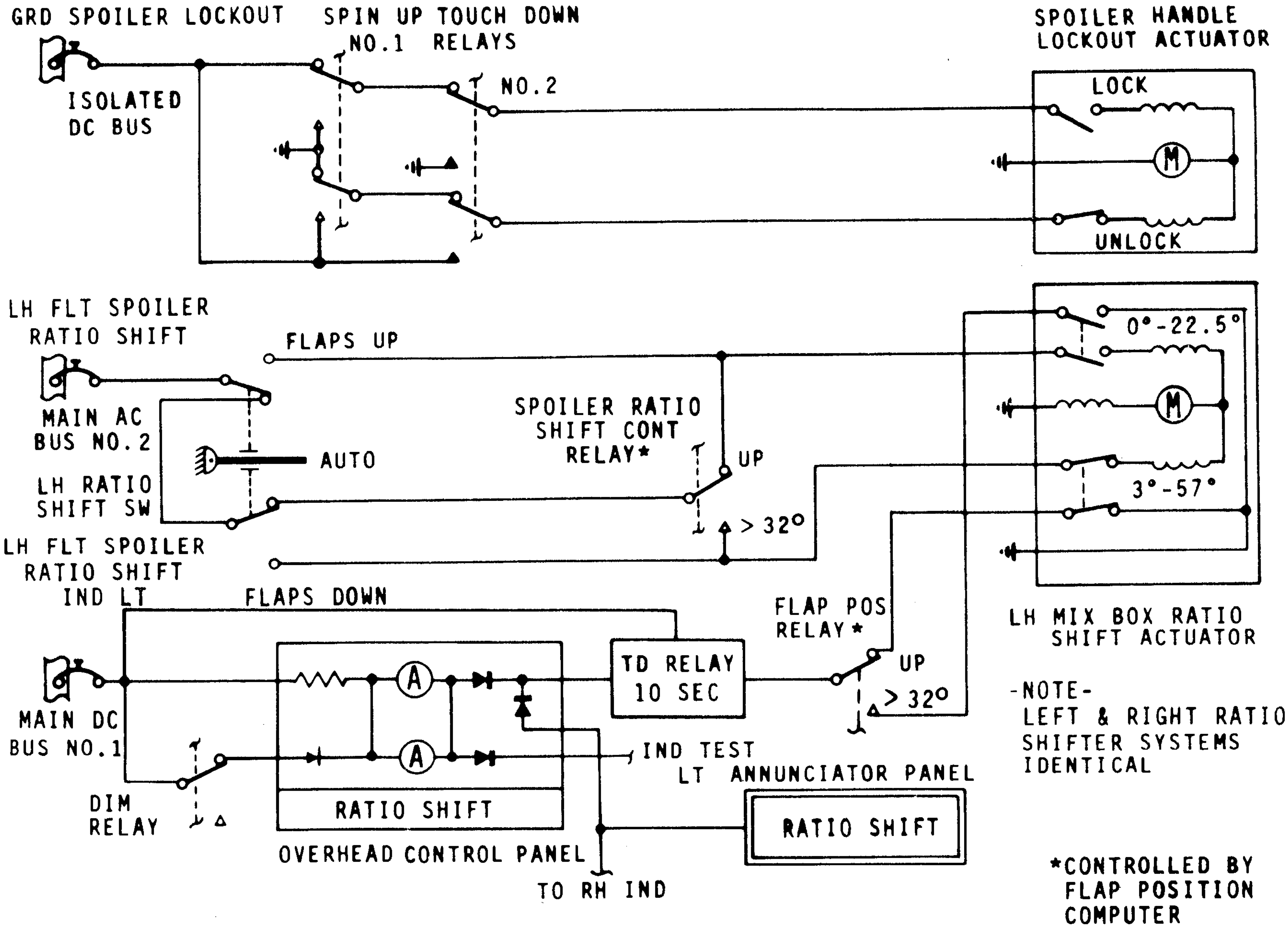


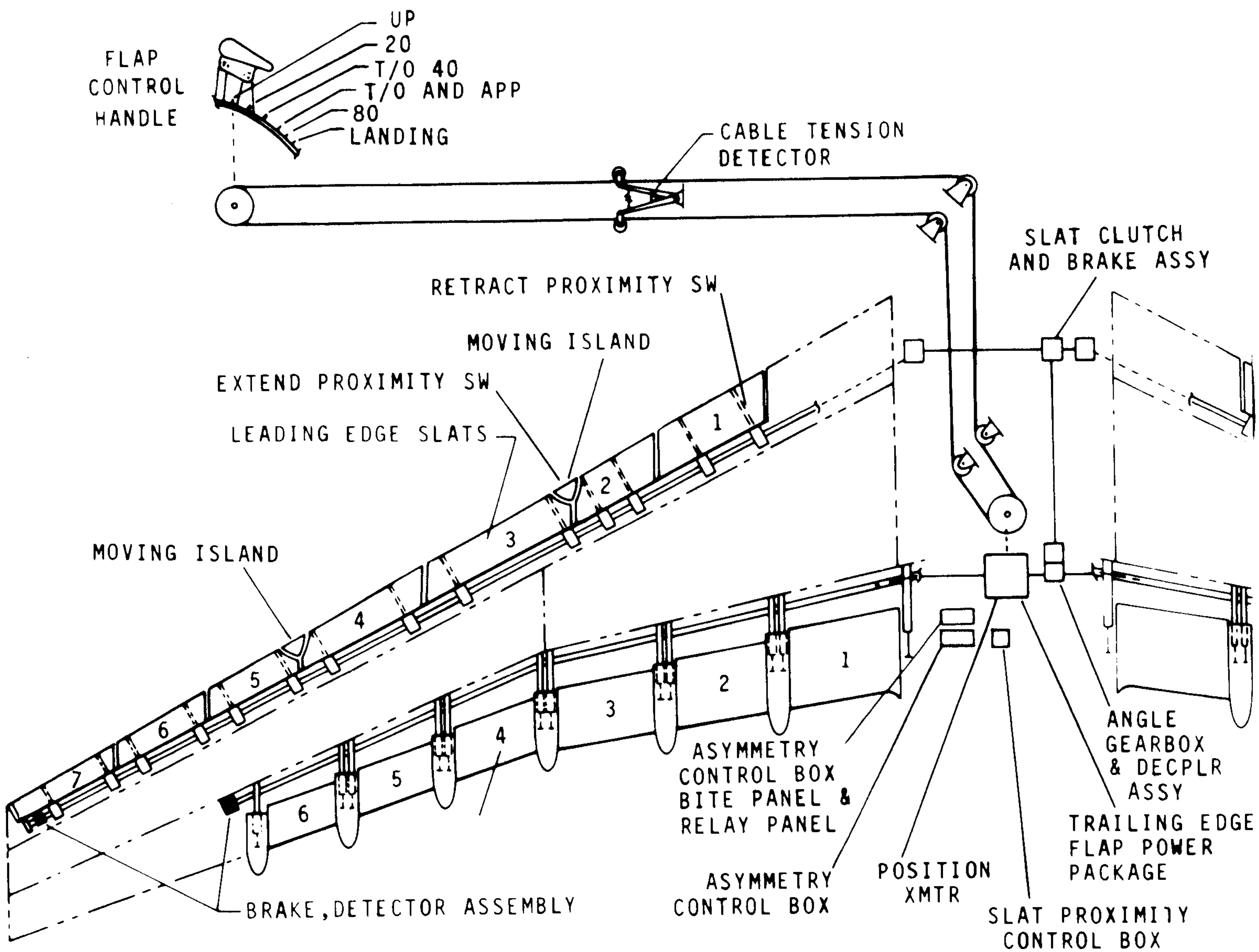
ROLL CONTROL SYSTEM SCHEMATIC



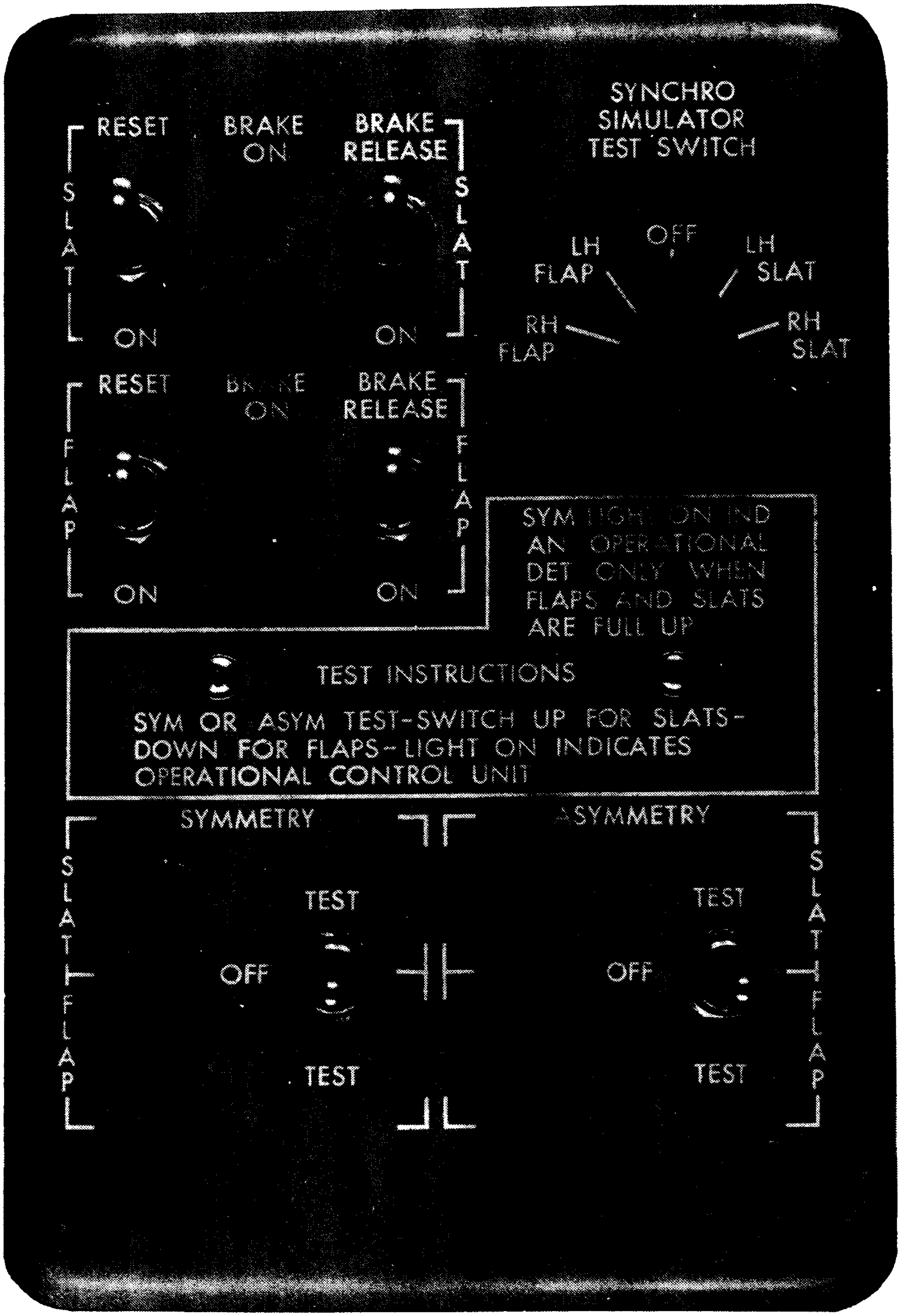
GROUND SPOILER SYSTEM

SPOILER RATIO SHIFTER

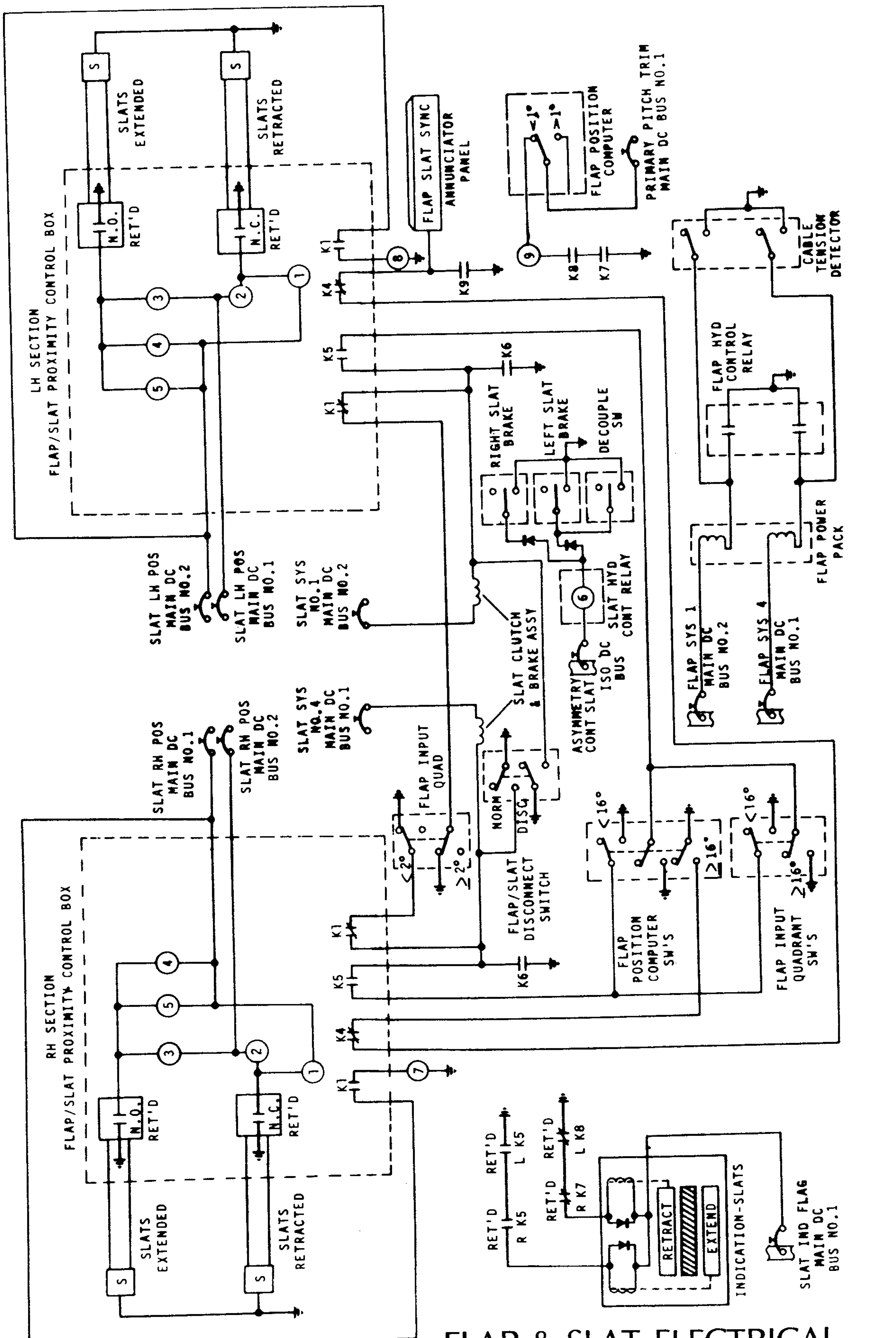




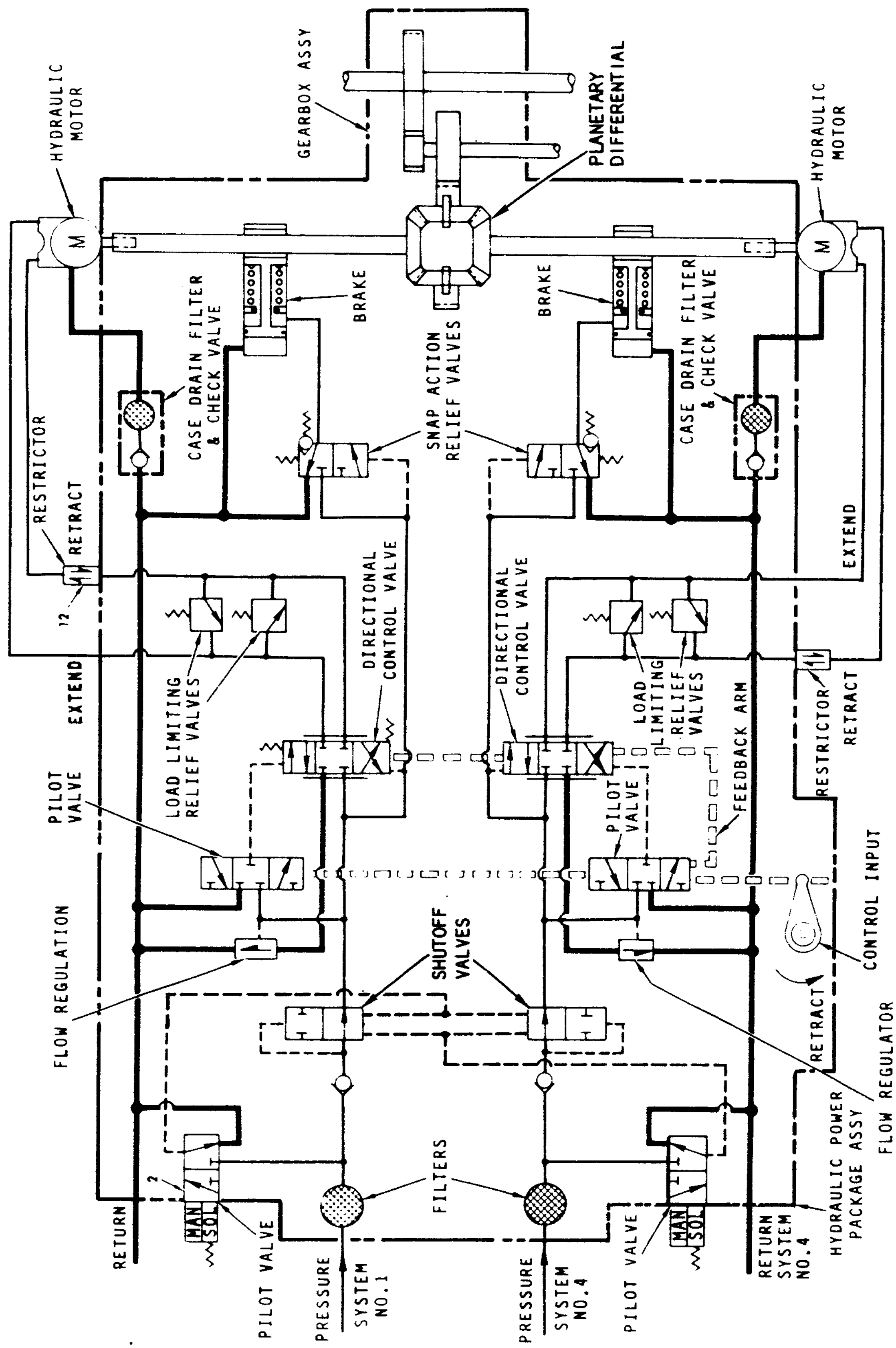
FLAP & SLAT SYSTEM SCHEMATIC



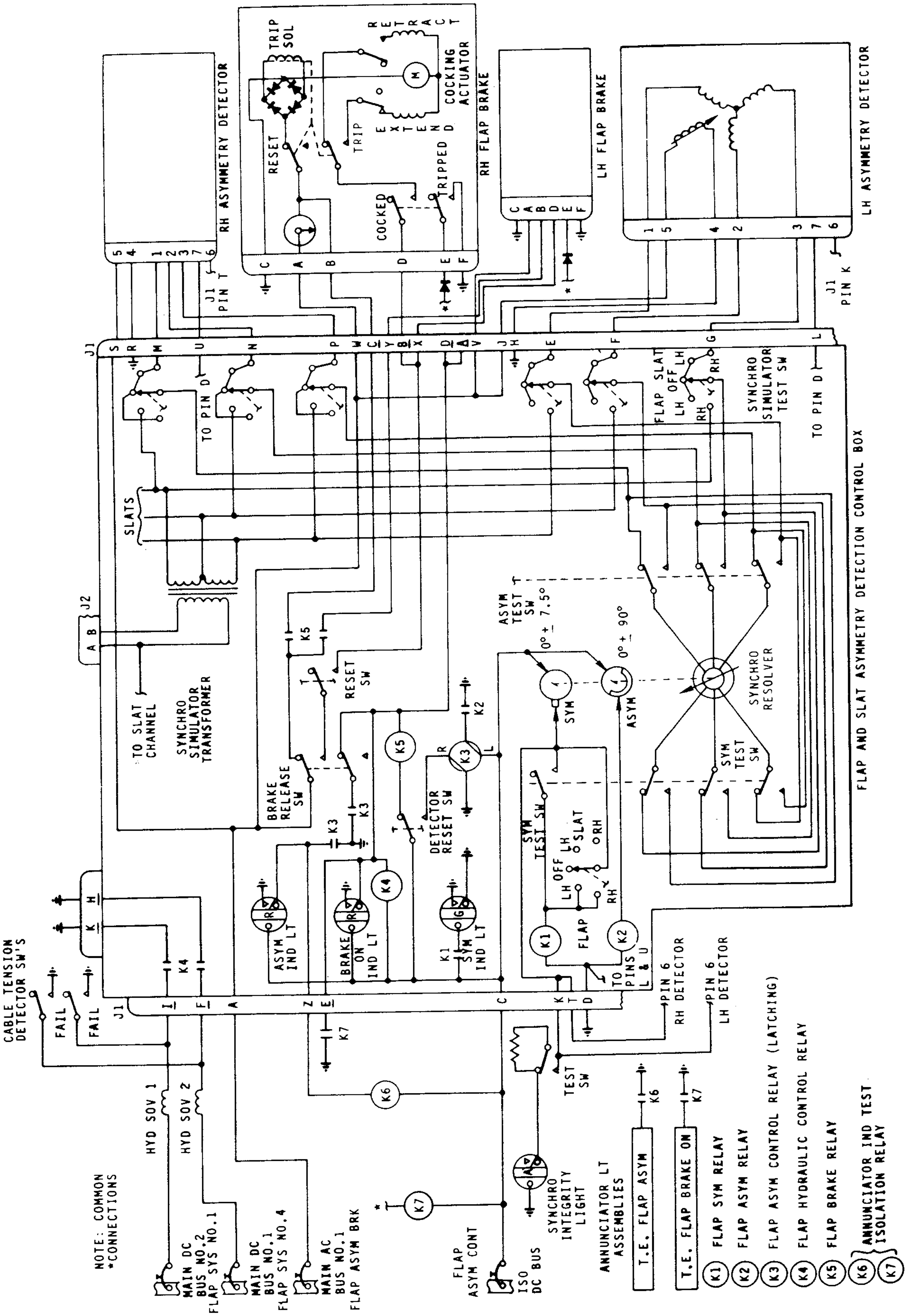
FLAP SLAT SYSTEM TEST PANEL



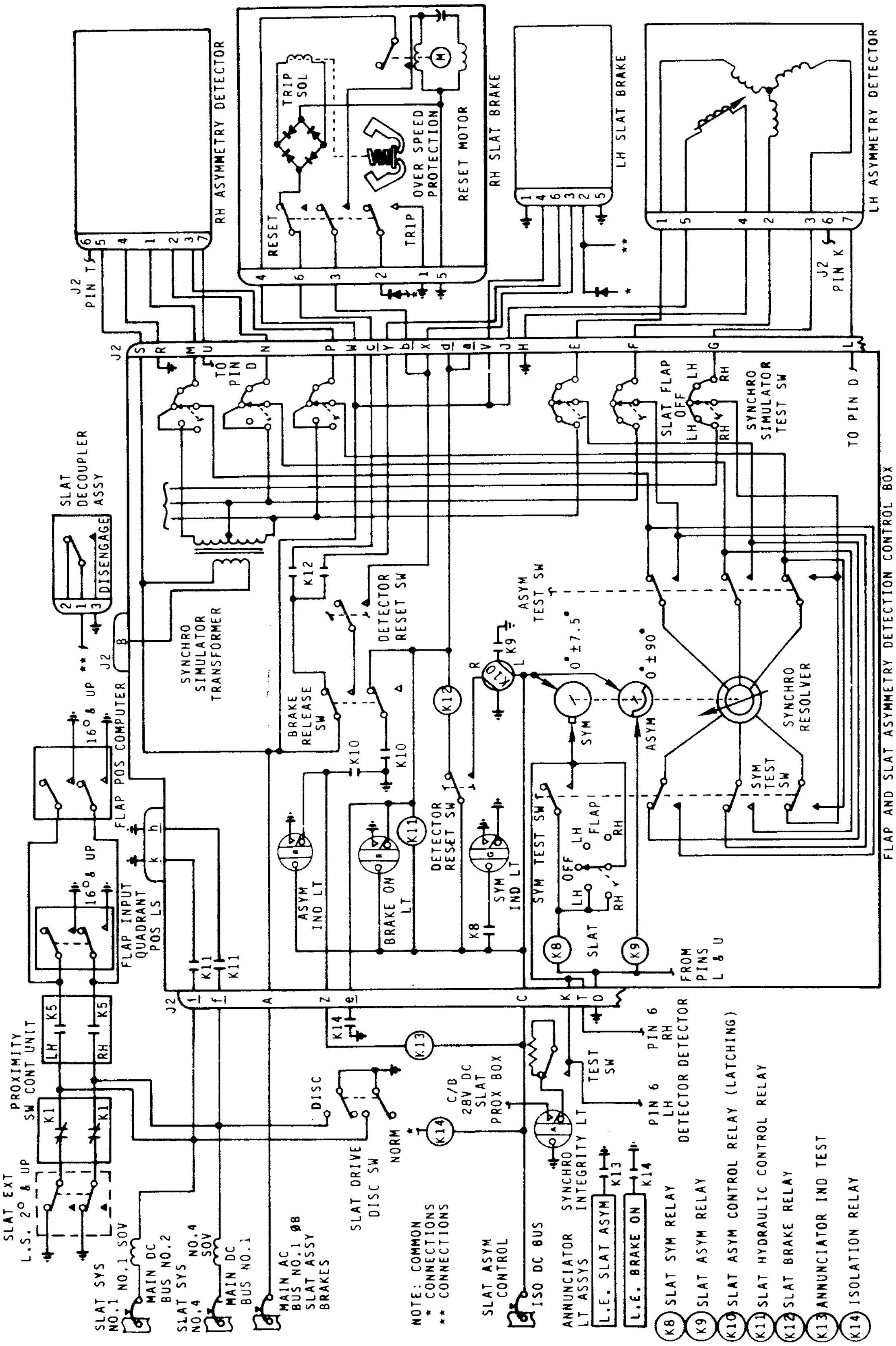
FLAP & SLAT ELECTRICAL



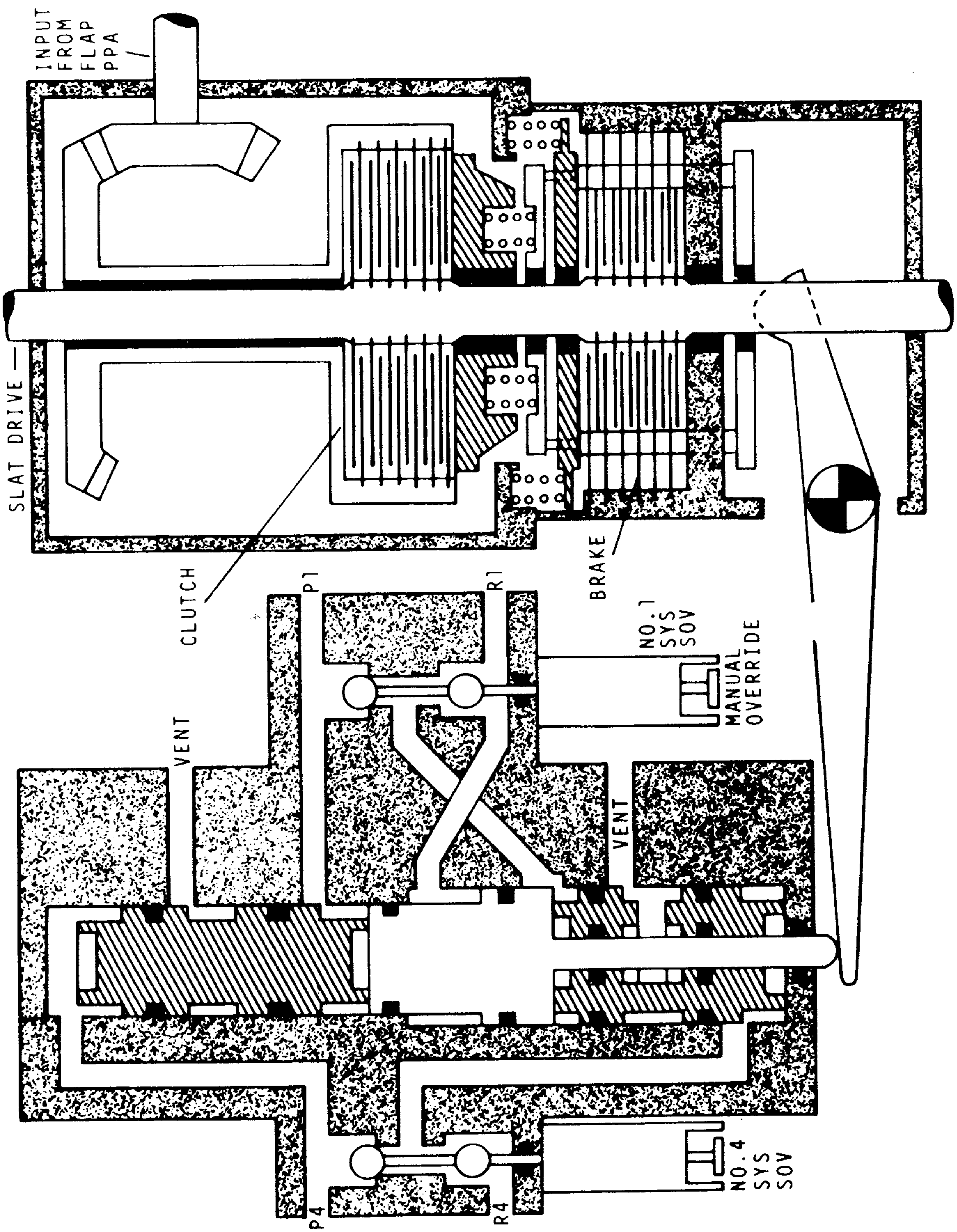
FLAP POWER PACKAGE SCHEMATIC



FLAP ELECTRICAL CONTROL & ASYMMETRY DETECTION

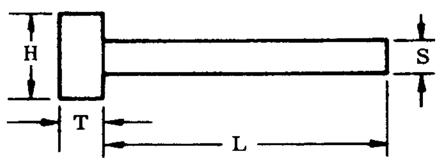


SLAT ELECTRICAL CONTROL & ASYMMETRY DETECTION



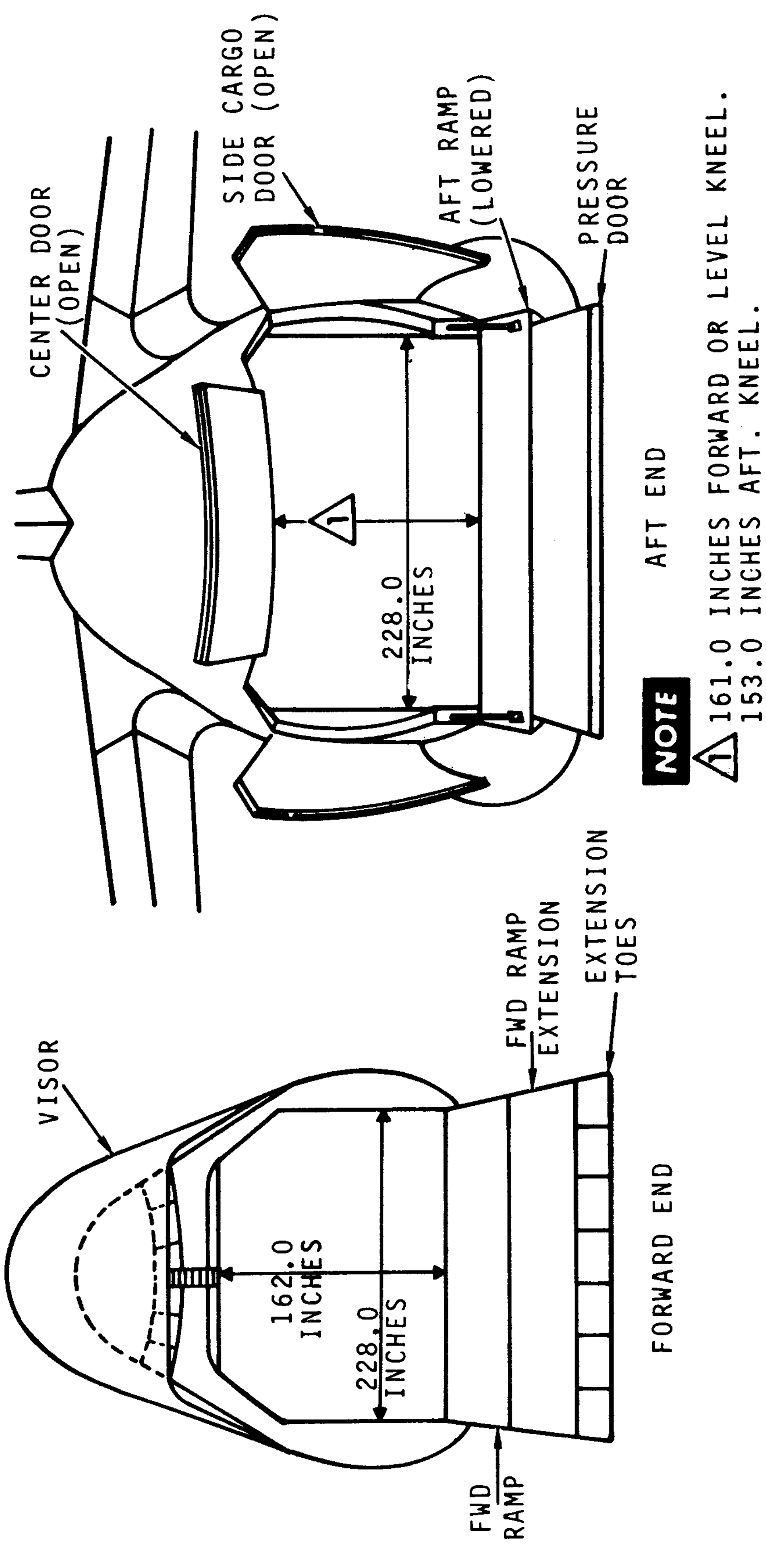
SLAT CLUTCH & BRAKE ASSEMBLY

Shear rivets, used throughout the C-5 flight control systems, are disconnect devices incorporated in the various interconnect and input rods, which enable one of the pilots to maintain control of the aircraft in the event of a system jam. Should a replacement shear rivet be required, here is a chart that may be helpful. The chart identifies these rivets, their locations, and gives some data on each rivet for possible local manufacture.

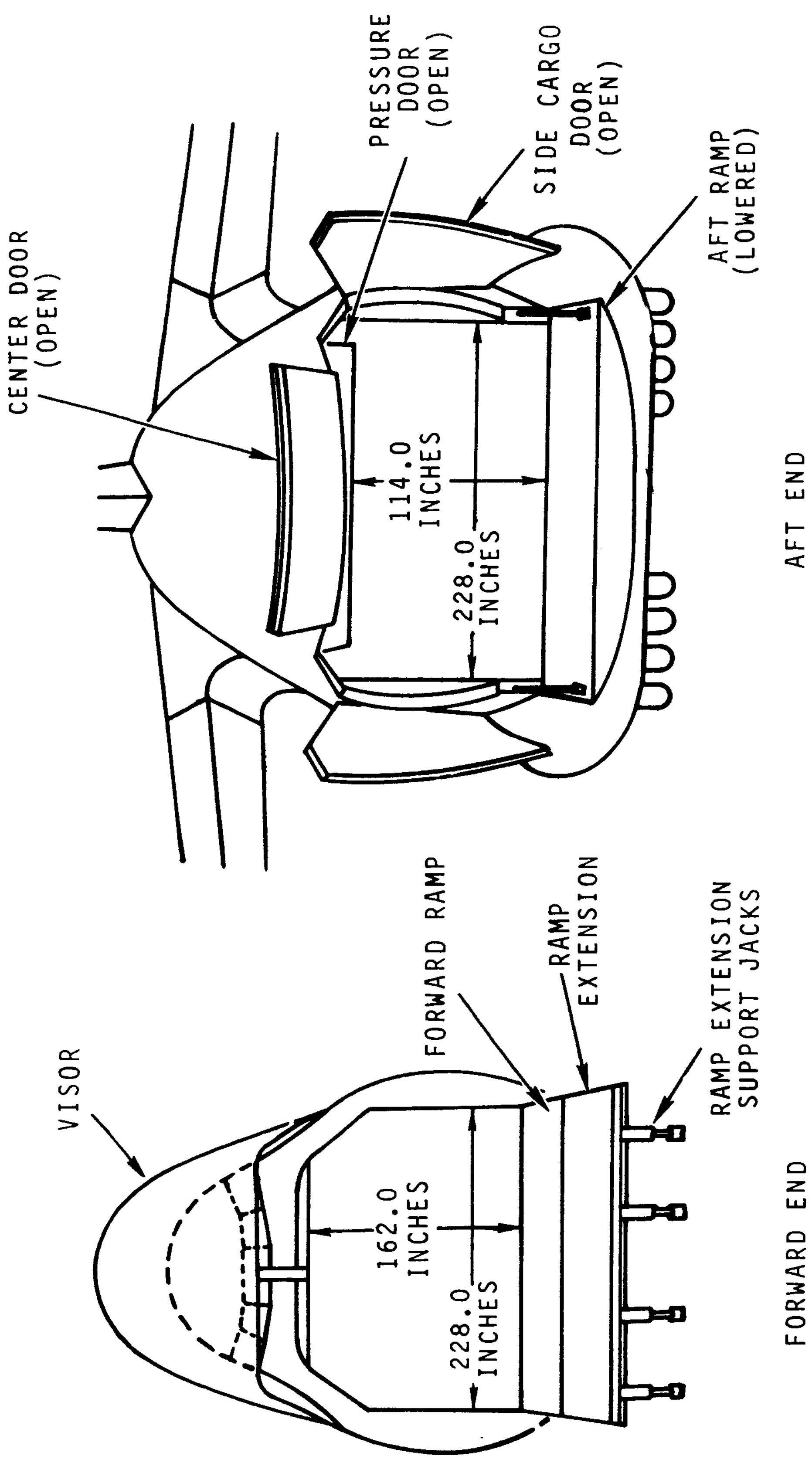


PART NO.	LOCATION	MAT'L SPEC	T.O. 1C-5A-4-5 Figure No.	T.O. 1C-5A-4-5 Index No.	MAT'L	HEAD DIAMETER H	HEAD THICKNESS T	SHANK LENGTH L	SHANK DIAMETER S
4C23005-119A	Aileron Tension Regulator & Aft Quadrant	STMO6-101 TEMP-T651	9 12	7 107	6061-T651	.240	.060	1.220	.065 .067
4C63118-119A	Ground Spoiler Nos. 1 & 2	STM06-101 TEMP-T651	45 45	11 46	6061-T651	.250	.060	1.768 1.828	.084 .086
4C63120-117A	Ground Spoiler No. 3	STM06-101 TEMP-T651	45	79	6061-T651	.250	.060	1.250	.084 .086
4C63121-119A	Ground Spoiler No. 4	STMO6-101 TEMP-T651	45	98	6061-T651	.250	.060	1.330	.084 .086
4C21020-117A	Elevator Tension Regulator	STM06-101 TEMP-T651	65	35	6061 T651	.240	.060	1.400	.108 .110
4C21129-107A	Elevator Autopilot Servo	QQ-A-225/8	65	64	6061-T651	.1870	.060	.750	.077 .078
4C21048-113A	Elevator VFU Output	STM06-101 TEMP-T651	65	51	6061 T651	.250	.060	1.220	.094 .095
MS20470AD3-6	Elevator Aft Quadrant		70	126	2117 Alum Alloy	.178 .196	.040 .050	.317 .375	.093 .097
MS20470AD3	Aileron - Spoiler Mixer Output		47	122	2117 Alum Alloy	.178 .196	.040 .050	1.250 1.375	.093 .097
MS20470AD5	Aileron - Spoiler Mixer Input		45	133	2117 Alum Alloy	.238 .262	.054 .064	1.750 1.875	.124 .128

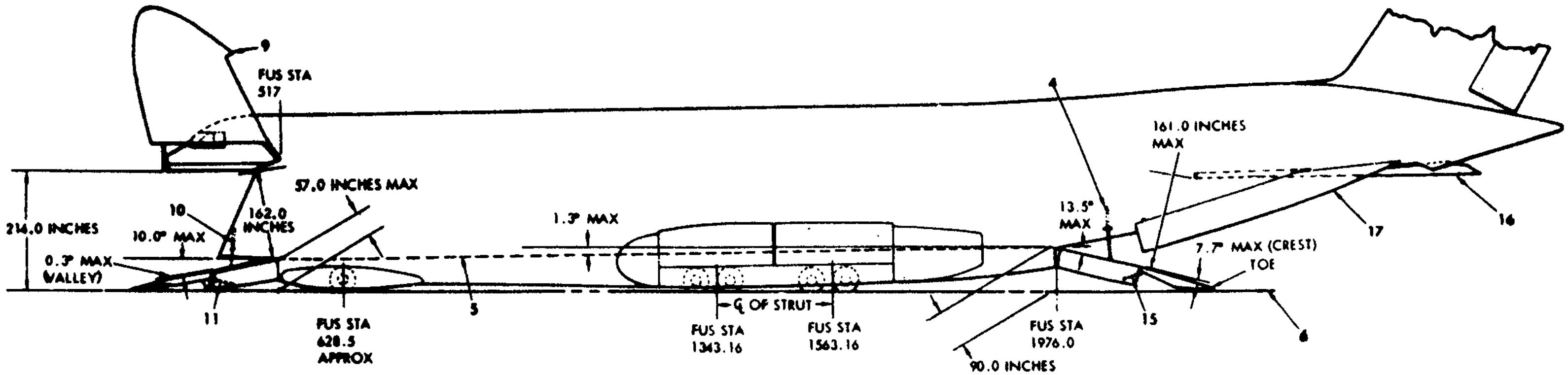
FLIGHT CONTROL SHEAR RIVETS



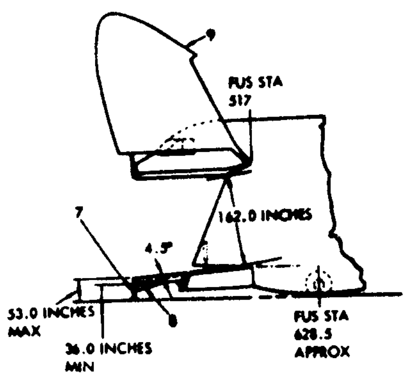
CARGO LOADING OPENING DIMENSIONS



CARGO OPENINGS - TRUCKBED LOADING



FORWARD KNEELED POSITION DRIVE-IN LOADING



FORWARD KNEELED POSITION TRUCK BED LOADING

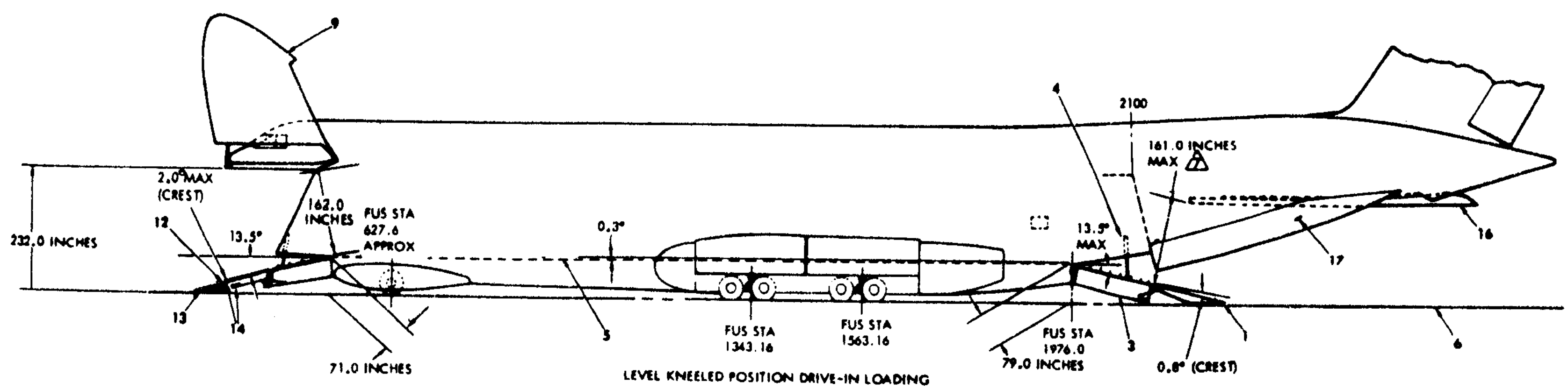
4. AFT RAMP ACTUATOR
5. CARGO FLOOR
6. GROUND LINE
7. FORWARD RAMP EXTENSION JACK (DEPLOYED)
8. FORWARD RAMP EXTENSION TOES (STOWED)
9. VISOR
10. FORWARD RAMP ACTUATOR
11. FORWARD RAMP EXTENSION ACTUATOR
15. PRESSURE DOOR ACTUATOR
16. CENTER CARGO DOOR (LOADING POSITION)
17. SIDE CARGO DOORS (LOADING POSITION)

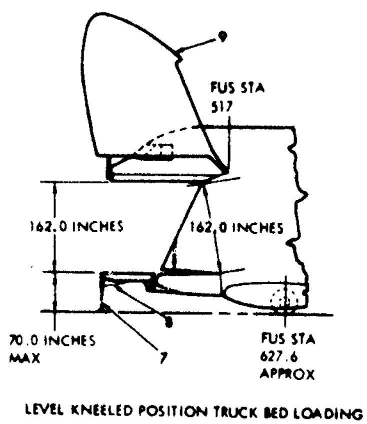
NOTE

1. COMBINED LENGTH OF FORWARD RAMP AND EXTENSION IN DRIVE-IN POSITION IS 273.0 INCHES.
2. COMBINED LENGTH OF FORWARD RAMP AND EXTENSION IN TRUCK-BED POSITION IS 228.0 INCHES.
3. COMBINED LENGTH OF AFT RAMP AND PRESSURE DOOR DRIVE-IN POSITION 311.5 INCHES.
4. ANGLE OF AFT RAMP TOES IS 24° MAX. ANGLE OF FORWARD RAMP TOES IS 17° MAX.
5. CLOSED ANGLE OF AFT RAMP IS 10° MAX CLOSED ANGLE OF FORWARD RAMP IS 3° MAX.
6. THIS FIGURE REPRESENTS A 350,000 POUND AIRPLANE WITH A C.G. AT 39 PERCENT M.A.C.

△ REPRESENTS VERTICAL CLEARANCE INSIDE CARGO COMPARTMENT.

AIRCRAFT KNEELING & LOADING POSITIONS (SHEET 1)





3. AFT RAMP
4. AFT RAMP ACTUATOR
5. CARGO FLOOR
6. GROUND LINE
7. FORWARD RAMP EXTENSION JACK (DEPLOYED)
8. FORWARD RAMP EXTENSION TOES (STOWED)
9. VISOR
12. FORWARD RAMP EXTENSION
13. FORWARD RAMP EXTENSION TOES (DEPLOYED)
14. FORWARD RAMP EXTENSION JACKS (STOWED)
16. CENTER CARGO DOOR (LOADING POSITION)
17. SIDE CARGO DOORS (LOADING POSITION)

NOTE

1. COMBINED LENGTH OF FORWARD RAMP AND EXTENSION IN DRIVE-IN POSITION IS 273.0 INCHES.
2. COMBINED LENGTH OF FORWARD RAMP AND EXTENSION IN TRUCK-BED POSITION IS 228.0 INCHES.
3. COMBINED LENGTH OF AFT RAMP AND PRESSURE DOOR DRIVE-IN POSITION 311.5 INCHES.
4. ANGLE OF AFT RAMP TOES IS 24° MAX. ANGLE OF FORWARD RAMP TOES IS 17° MAX.
5. CLOSED ANGLE OF AFT RAMP IS 10° MAX CLOSED ANGLE OF FORWARD RAMP IS 3° MAX.
6. THIS FIGURE REPRESENTS A 350,000 POUND AIRPLANE WITH A C.G. AT 39 PERCENT M.A.C.

⚠ REPRESENTS VERTICAL CLEARANCE INSIDE CARGO COMPARTMENT.

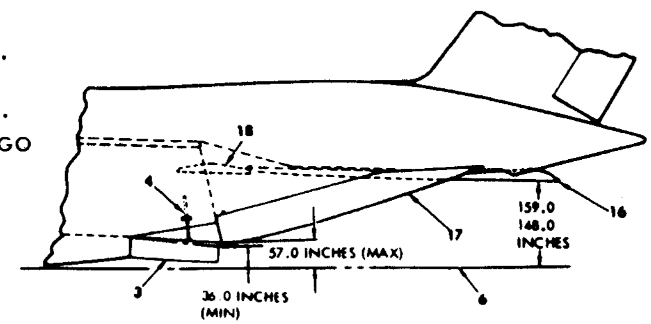
AIRCRAFT KNEELING & LOADING POSITIONS (SHEET 2)

NOTE

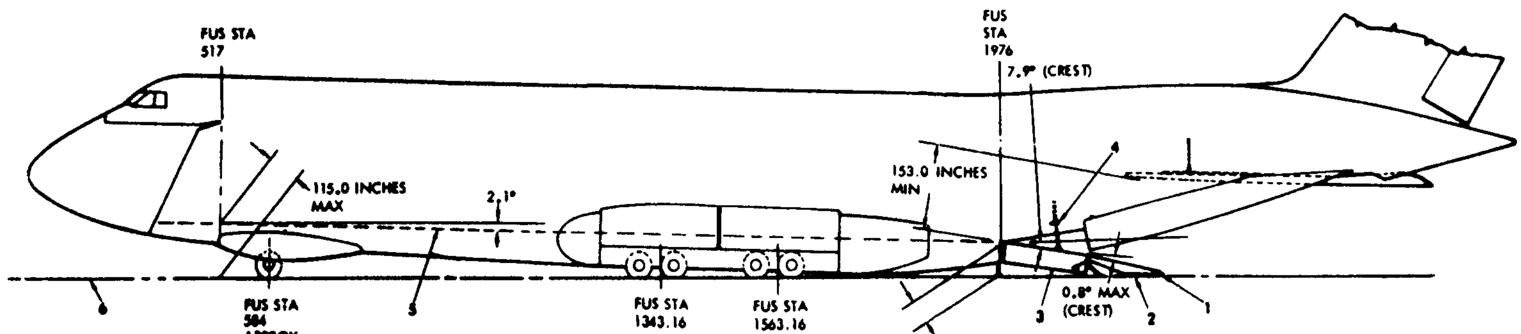
1. COMBINED LENGTH OF FORWARD RAMP AND EXTENSION IN DRIVE-IN POSITION IS 273.0 INCHES.
2. COMBINED LENGTH OF FORWARD RAMP AND EXTENSION IN TRUCK-BED POSITION IS 228.0 INCHES.
3. COMBINED LENGTH OF AFT RAMP AND PRESSURE DOOR DRIVE-IN POSITION 311.5 INCHES.
4. ANGLE OF AFT RAMP TOES IS 24° MAX. ANGLE OF FORWARD RAMP TOES IS 17° MAX.
5. CLOSED ANGLE OF AFT RAMP IS 10° MAX CLOSED ANGLE OF FORWARD RAMP IS 3° MAX.
6. THIS FIGURE REPRESENTS A 350,000 POUND AIRPLANE WITH A C.G. AT 39 PERCENT M.A.C.

△ REPRESENTS VERTICAL CLEARANCE INSIDE CARGO COMPARTMENT.

1. PRESSURE DOOR TOES
2. PRESSURE DOOR (DRIVE IN LOADING POSITION)
3. AFT RAMP
4. AFT RAMP ACTUATOR
5. CARGO FLOOR
6. GROUND LINE
16. CENTER CARGO DOOR (LOADING POSITION)
17. SIDE CARGO DOORS (LOADING POSITION)
18. PRESSURE DOOR (OVERHEAD LOADING POSITION)

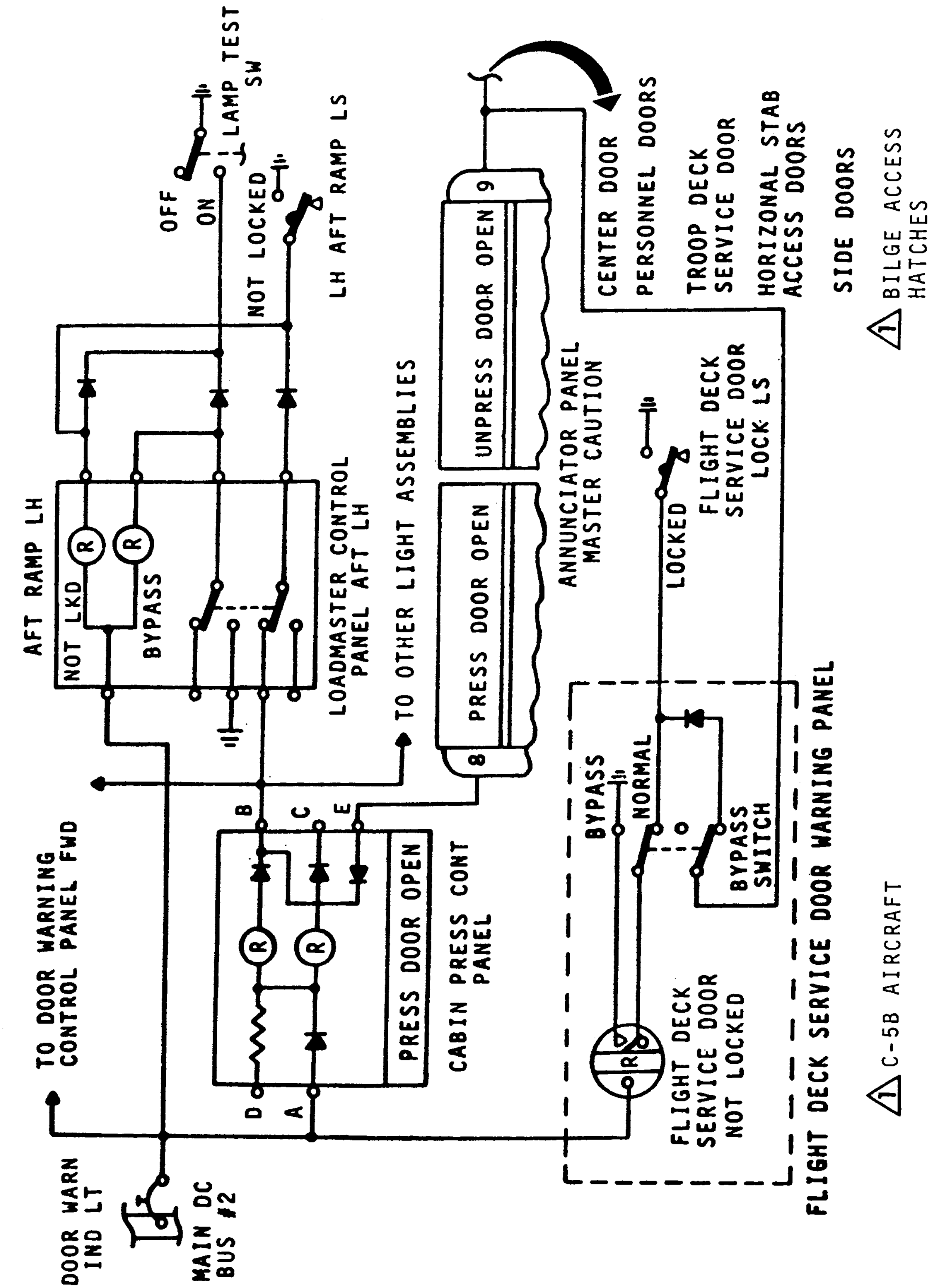


AFT KNEELING POSITION TRUCK BED LOADING

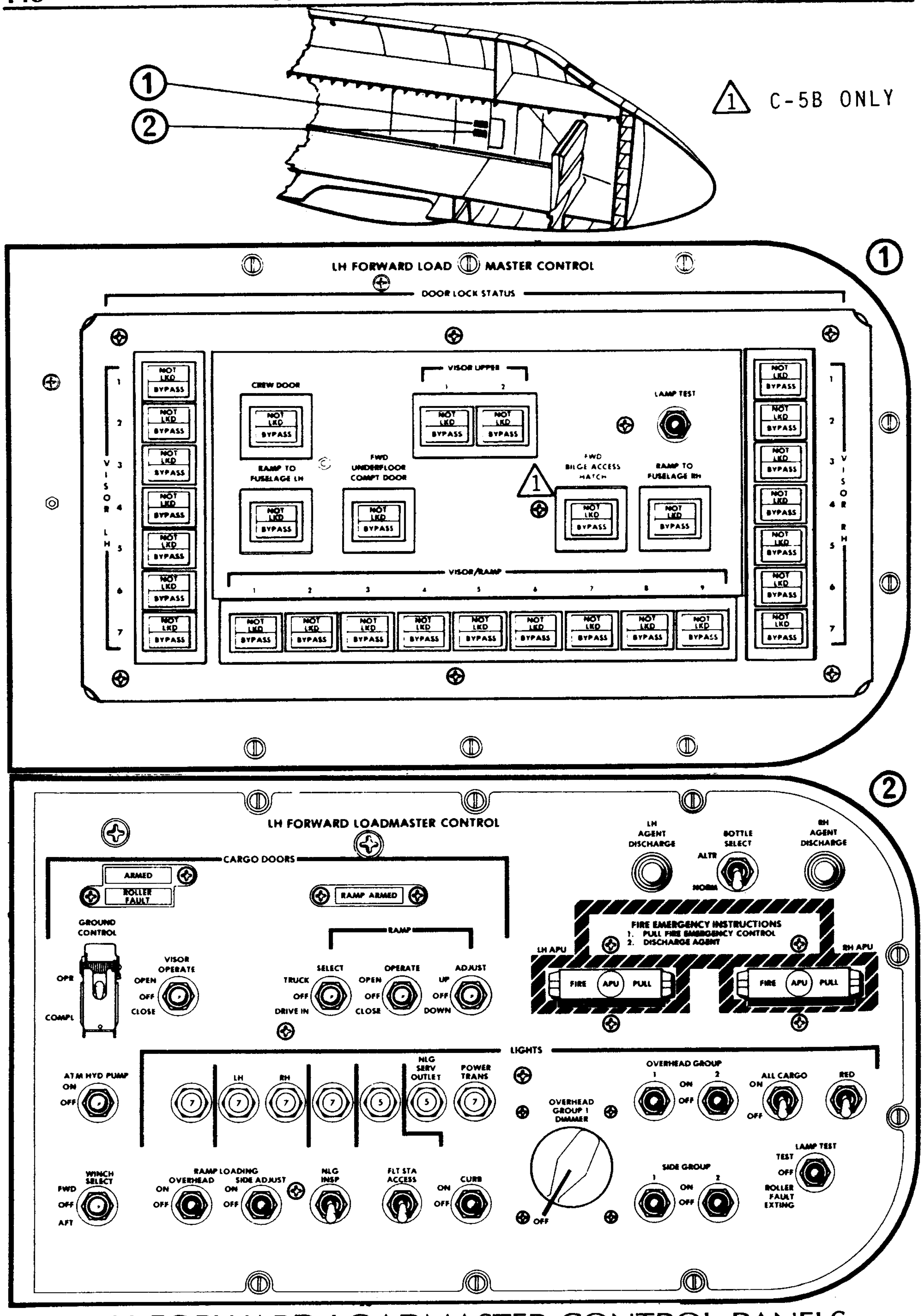


AFT KNEELED POSITION DRIVE-IN LOADING (NLG FULLY EXTENDED)

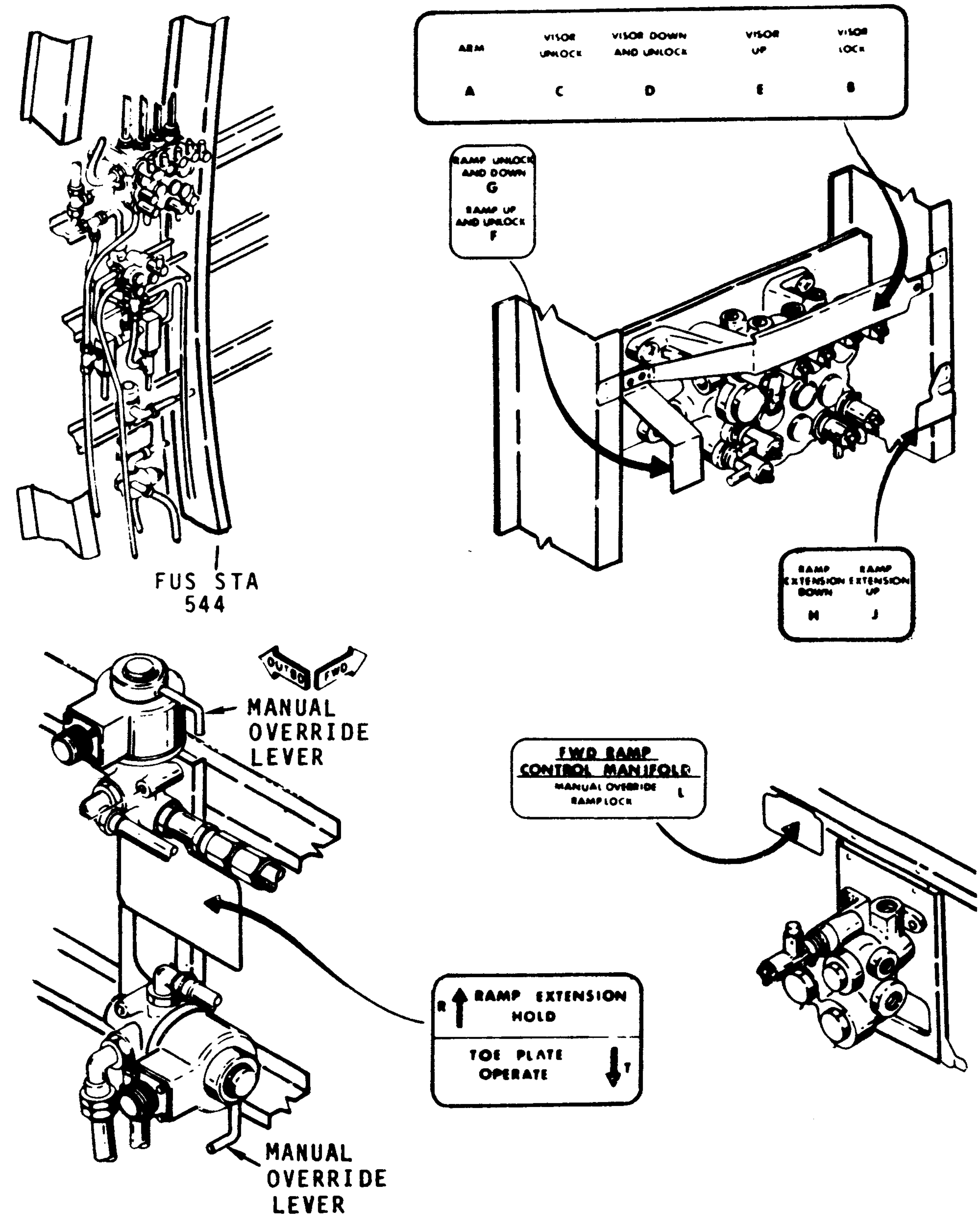
AIRCRAFT KNEELING & LOADING POSITIONS (SHEET 3)



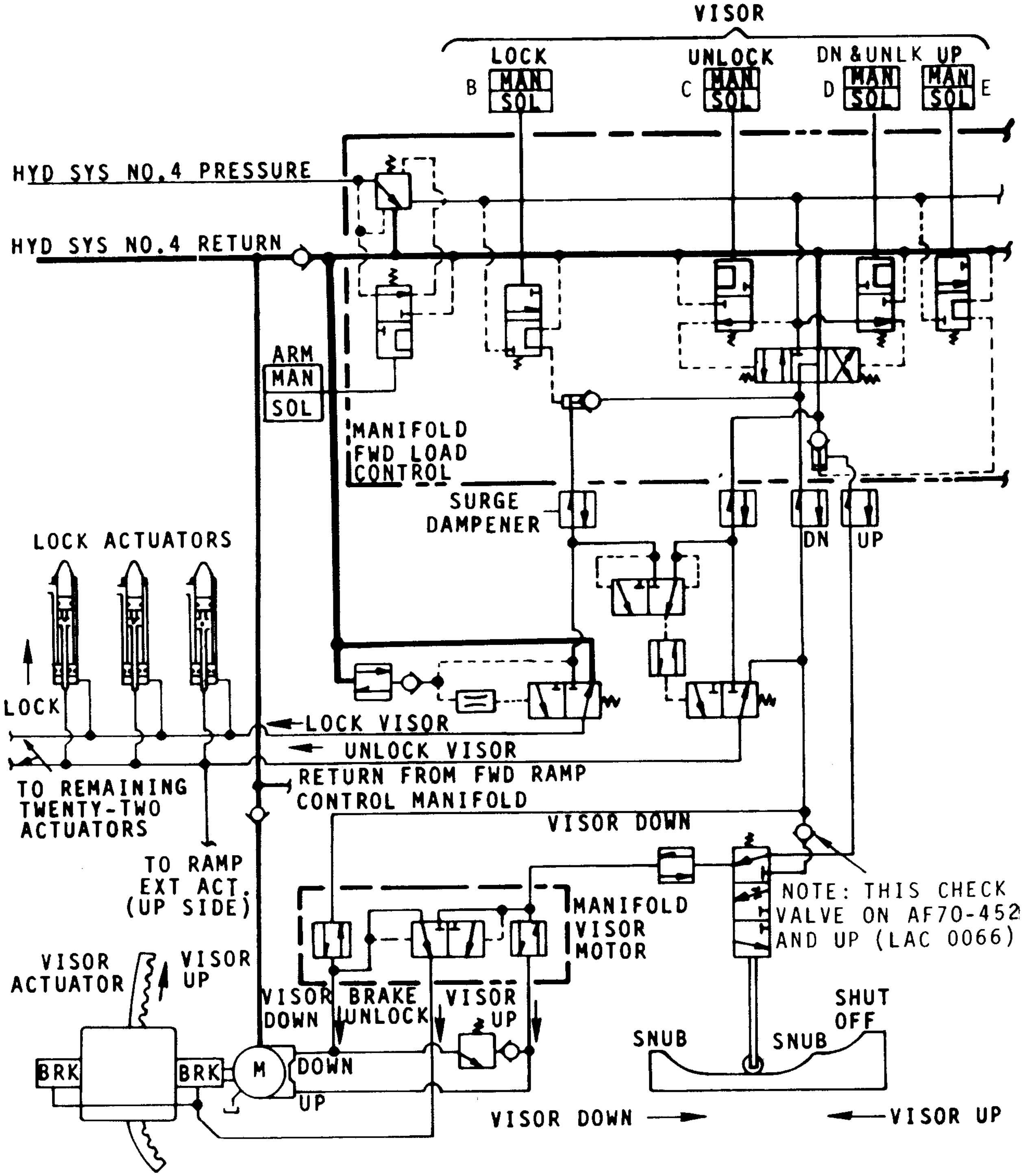
C-5A DOOR WARNING ELECTRICAL



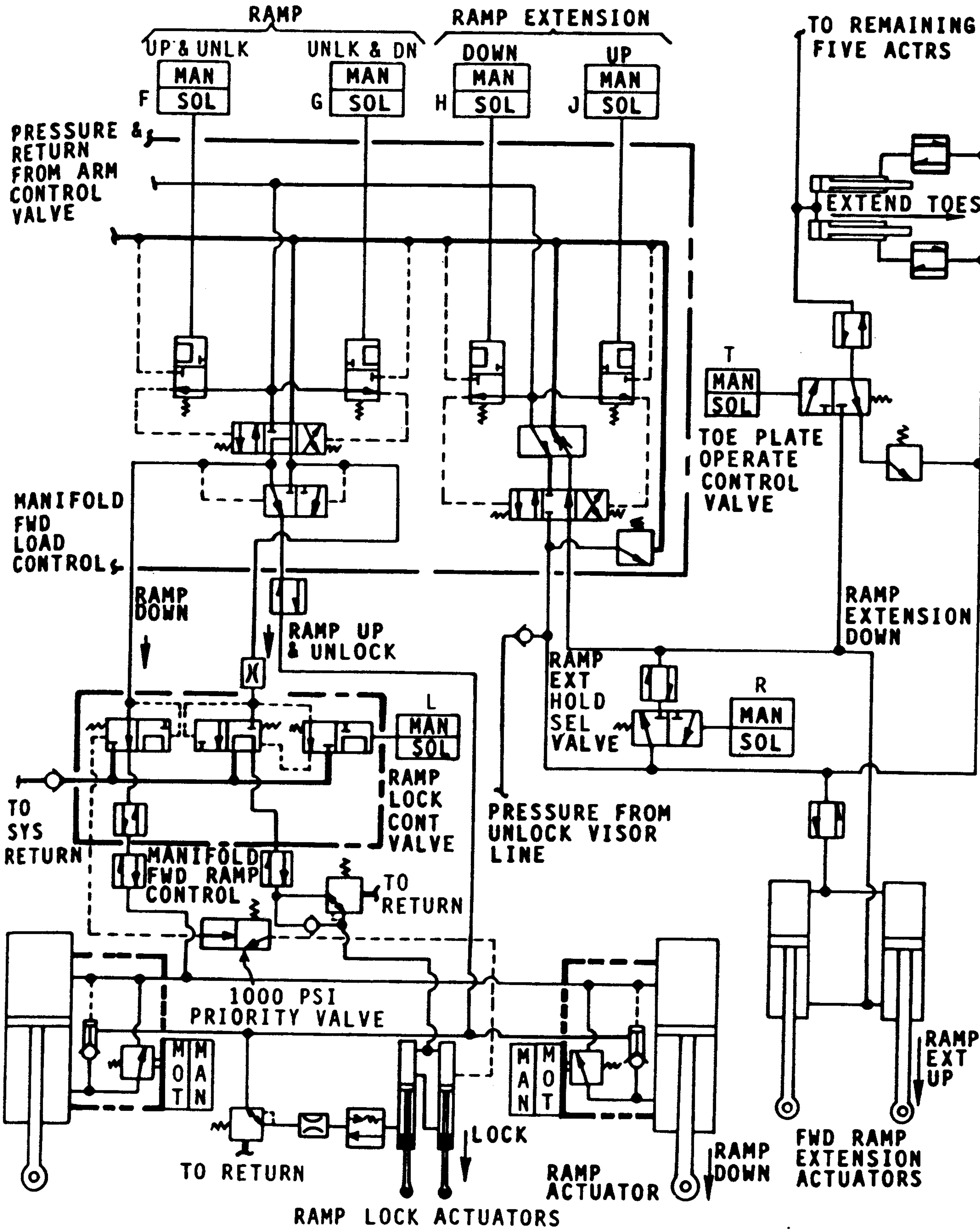
LH FORWARD LOADMASTER CONTROL PANELS



FORWARD CARGO DOOR SYSTEM CONTROL LOCATION



FORWARD LOADING HYDRAULIC SCHEMATIC (SHEET 1)



FORWARD LOADING HYDRAULIC SCHEMATIC (SHEET 2)

A. Visor Time Delay (10 sec. to energize)

B. Arm

C. Ramp Actuator Protection

D. Visor Safety

E. Truckbed Selected

F. Visor Roller Fault Warning

LIST OF RELAYS

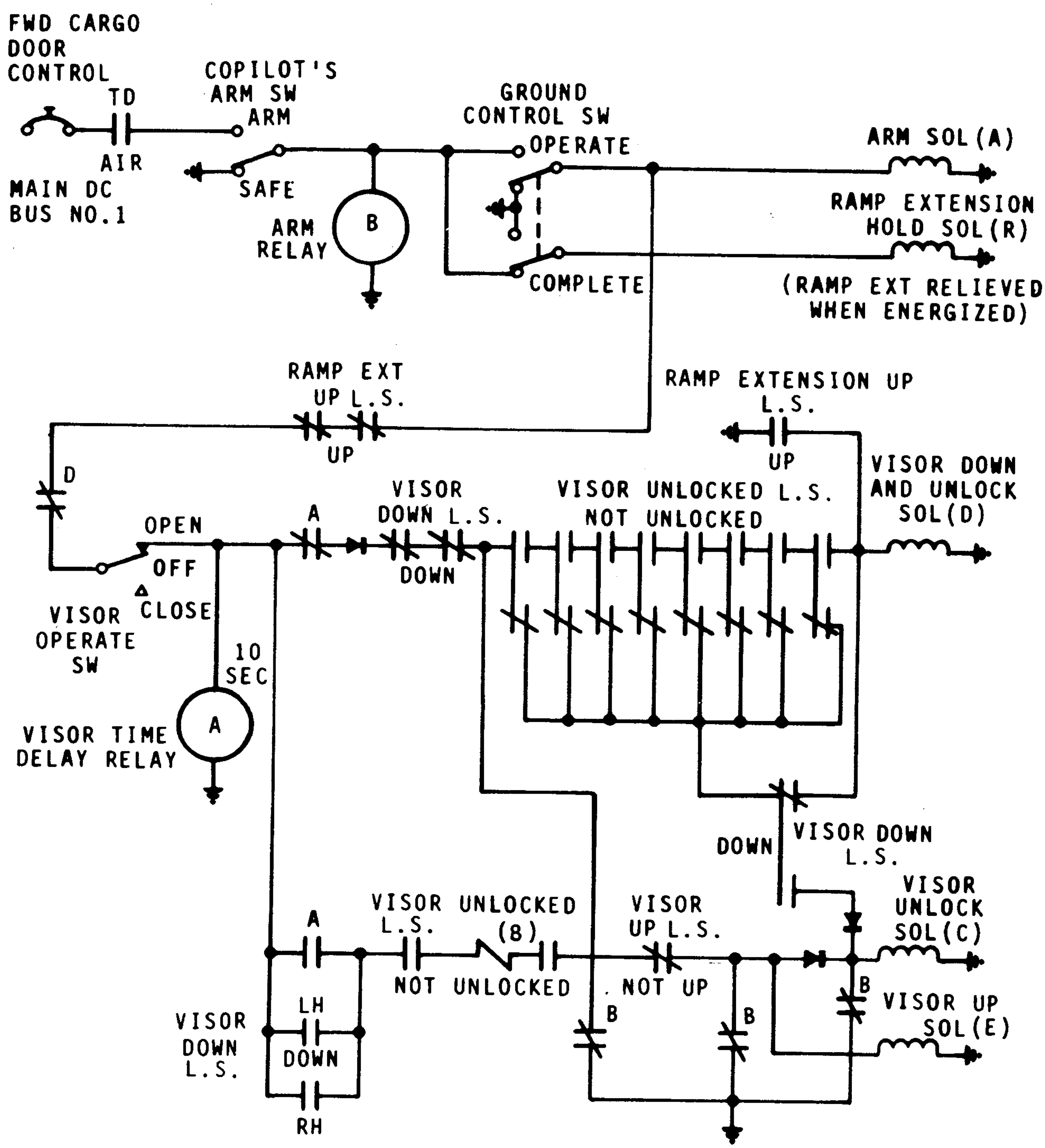
FORWARD CARGO DOOR AND RAMP SYSTEM

CARTRIDGE	FUNCTION
A. Arm	Pressurizes manifold.
B. Visor Lock	Extends visor lock actuators.
C. Visor Unlock	Retracts visor lock actuators.
D. Visor Down & Unlock	Closes visor and retracts visor lock actuators.
E. Visor Up	Opens visor.
F. Ramp Up & Unlock	Retracts ramp actuators & retracts ramp lock actuators.
G. Ramp Unlock & Down	Retracts ramp lock actuators & extends ramp actuators.
H. Ramp Extension Down	Retracts ramp extension actuators.
J. Ramp Extension Up	Extends ramp extension actuators.
L. Ramp Lock	Extends ramp lock actuators.
R. Ramp Extension Hold	Relieves ramp extension when energized.
T. Toe Plate Operate	Pressurize head side of ramp-extension toe-operate actuators. Also vents head side to return during ramp extension UP operations.

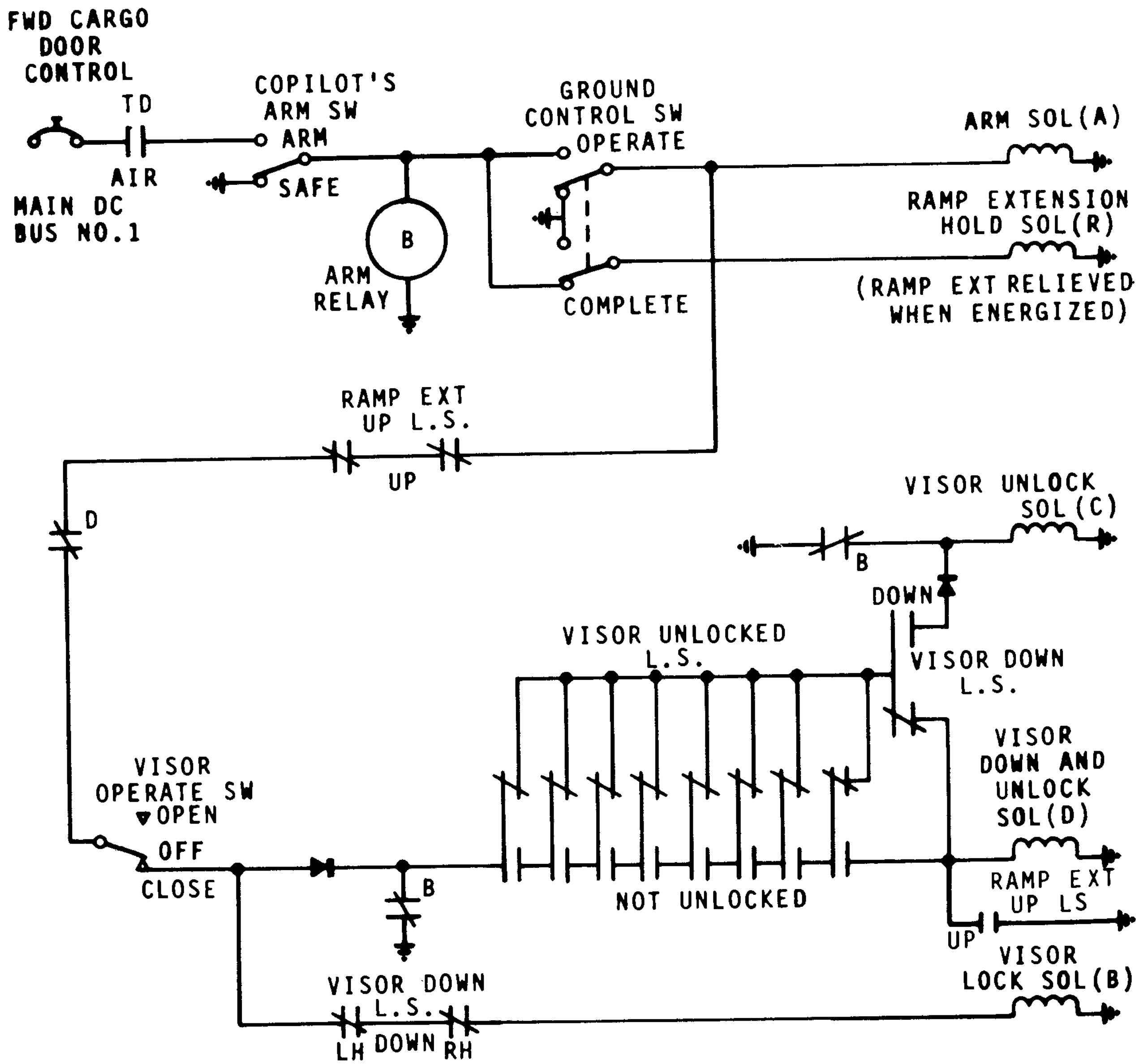
FUNCTIONS OF FORWARD LOADING CONTROL

MANIFOLD CARTRIDGES (ELECTRICALLY & MANUALLY OPERATED)

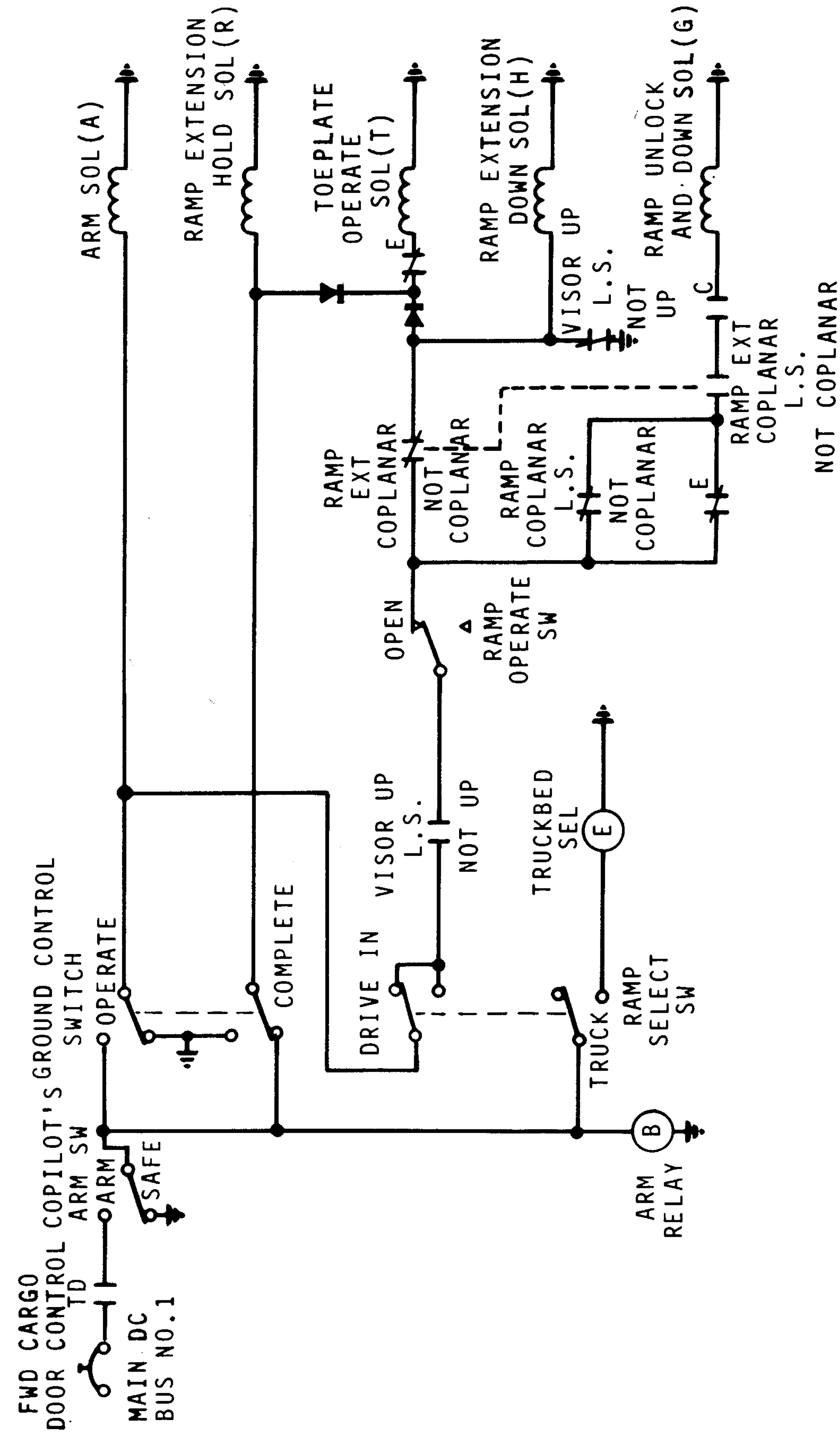
RELAYS & MANIFOLD CARTRIDGES LIST



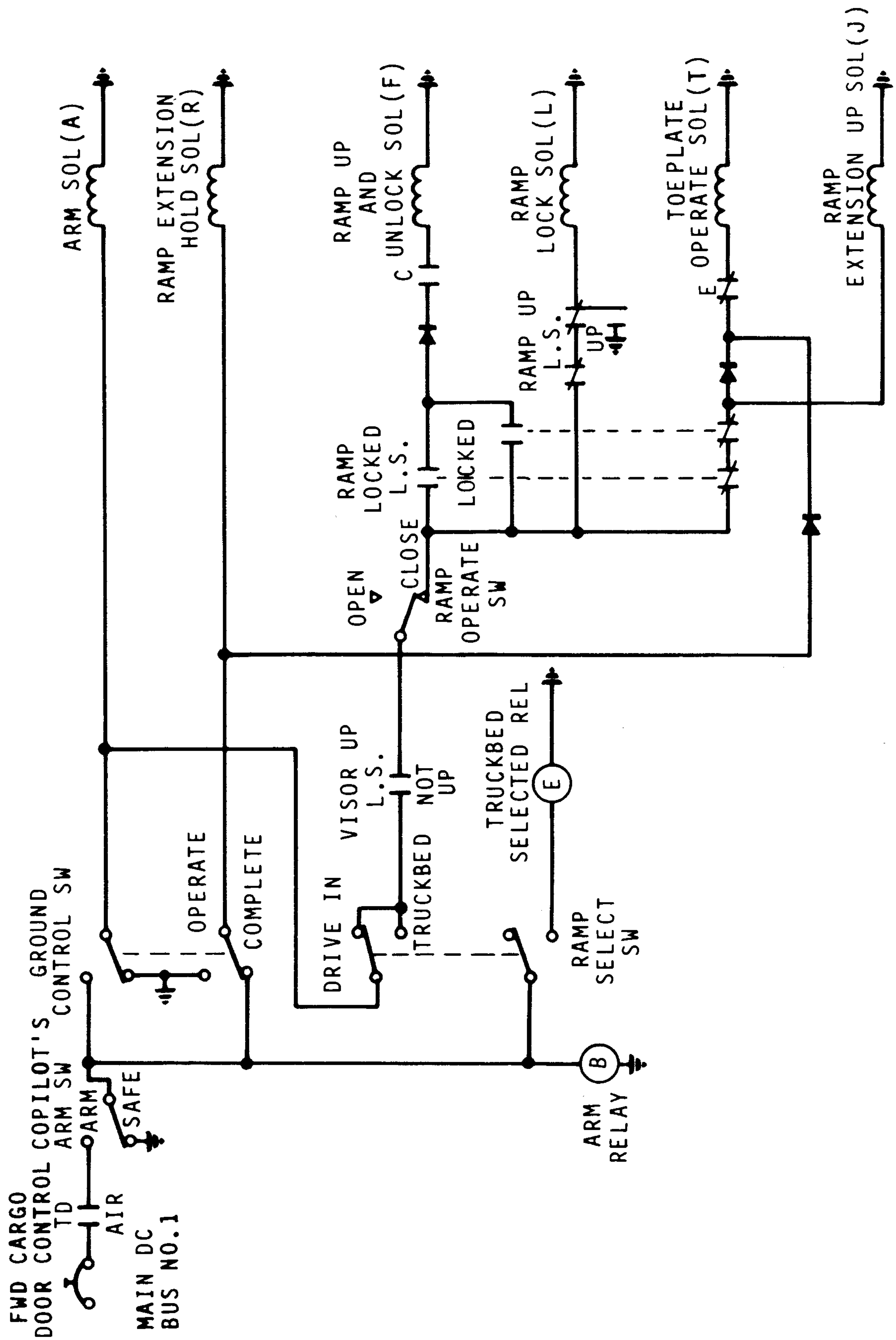
VISOR OPEN ELECTRICAL



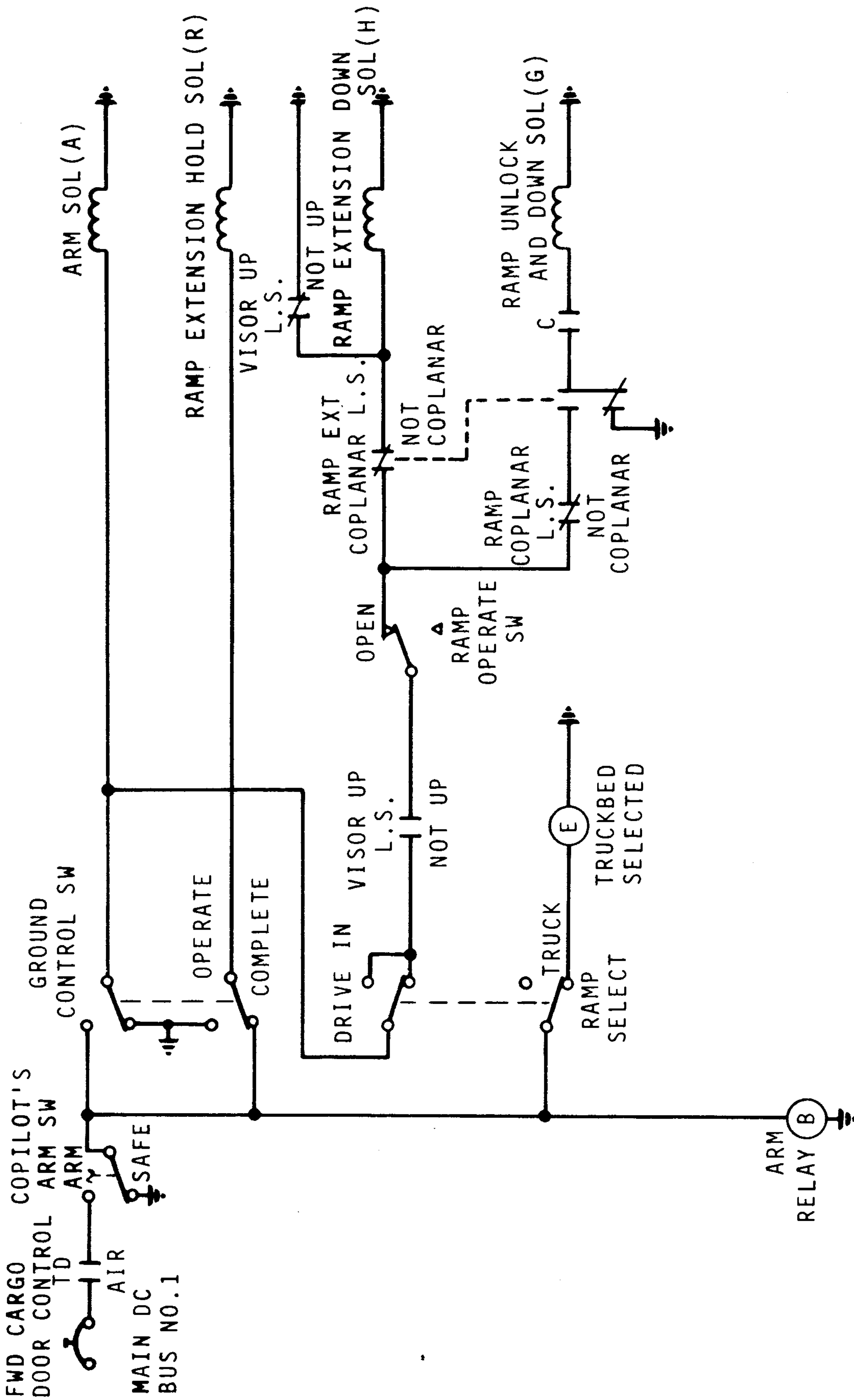
VISOR CLOSE ELECTRICAL



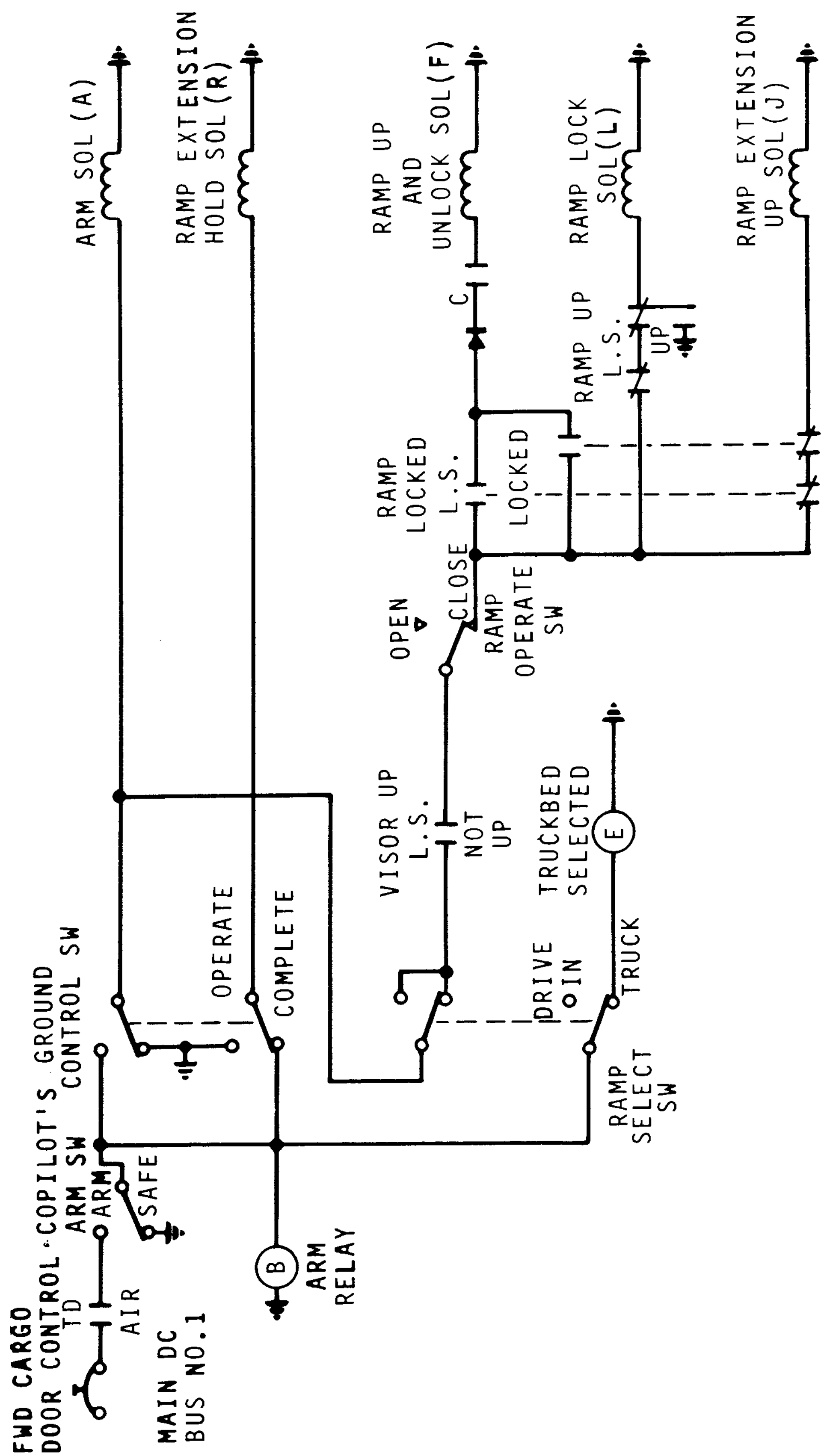
DRIVE-IN OPEN ELECTRICAL



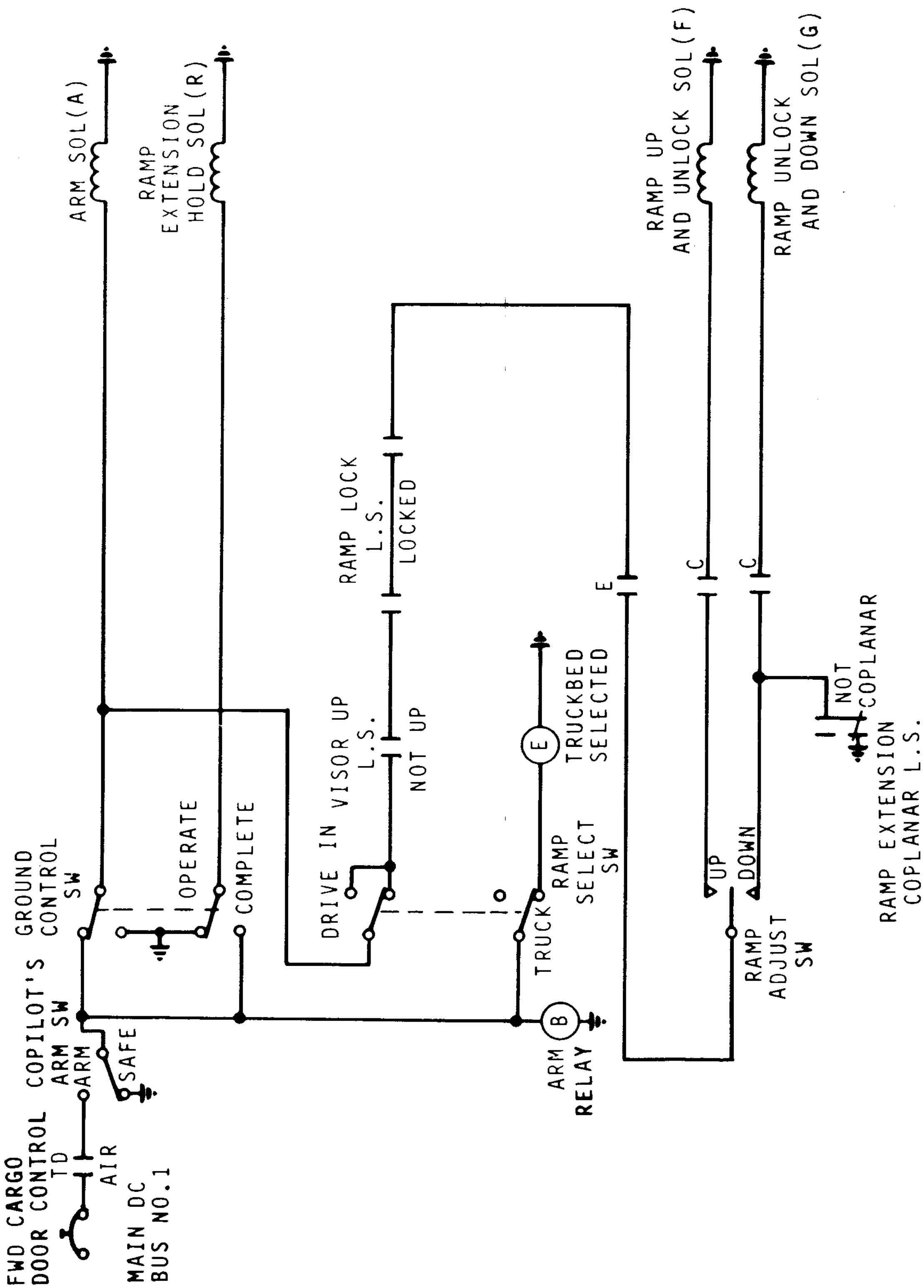
DRIVE-IN CLOSE ELECTRICAL



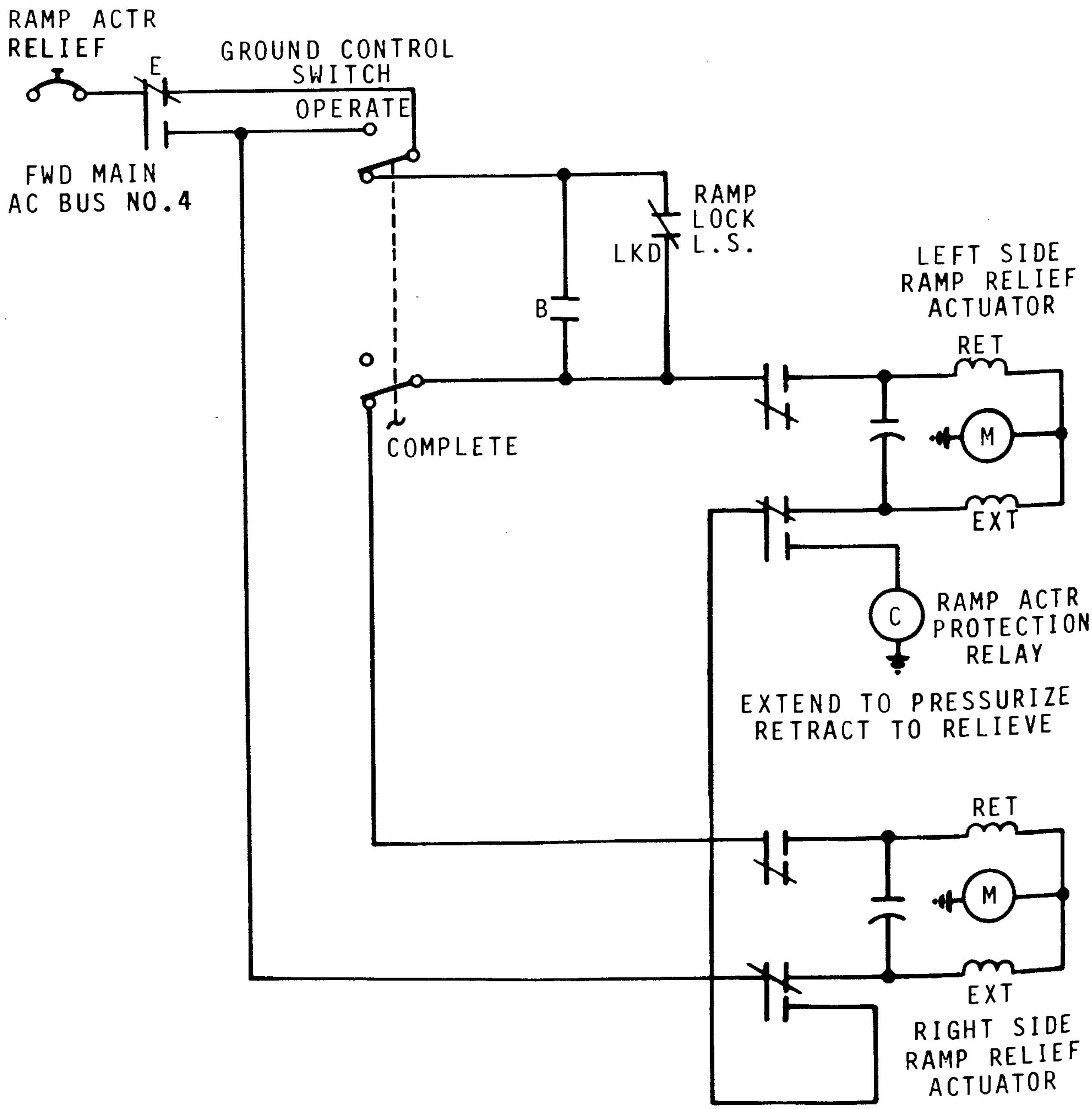
TRUCKBED OPEN ELECTRICAL



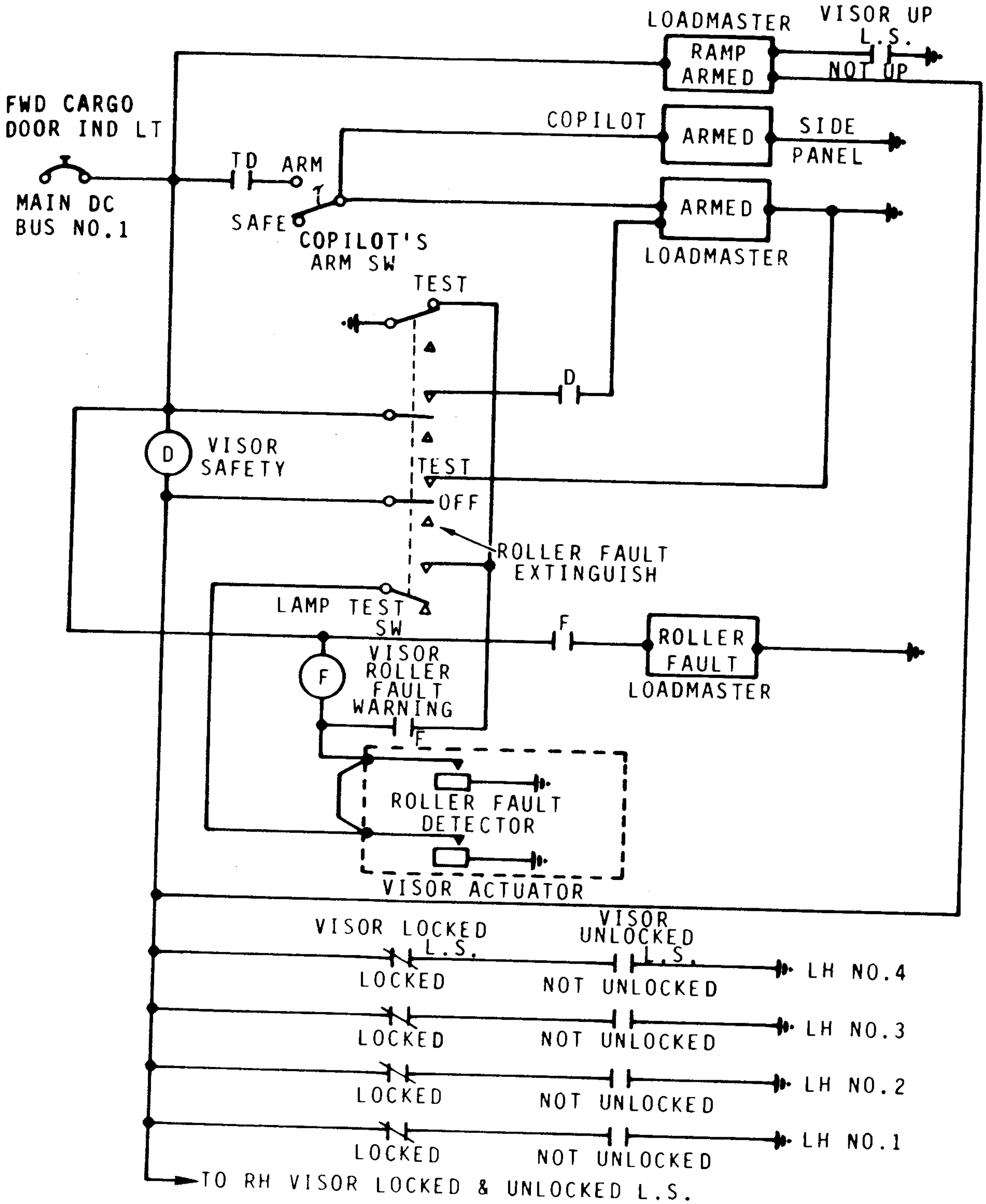
TRUCKBED CLOSE ELECTRICAL



TRUCKBED RAMP ADJUST ELECTRICAL

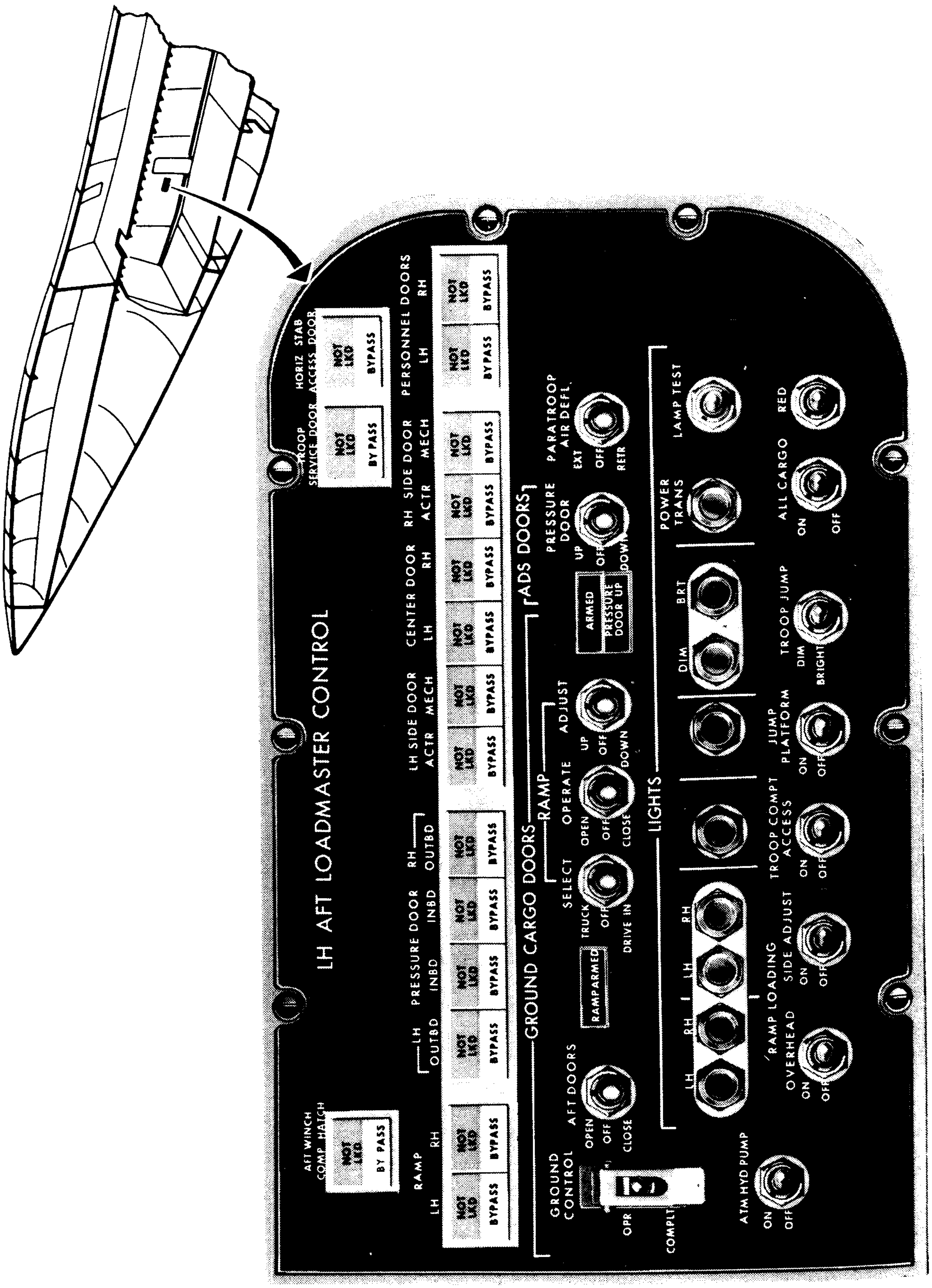


RAMP ACTUATOR RELIEF ELECTRICAL

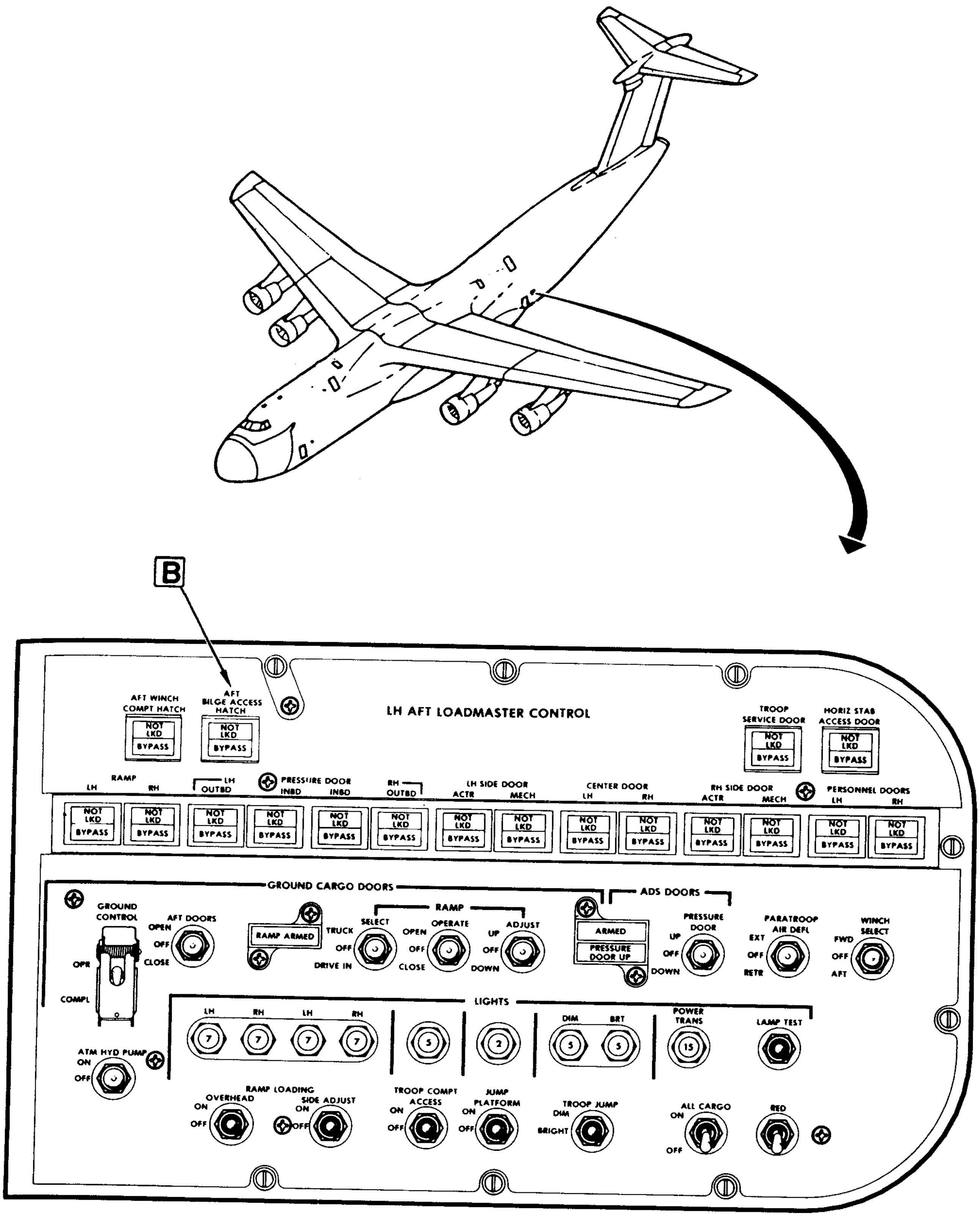


VISOR SAFETY CIRCUIT AND LIGHT TEST

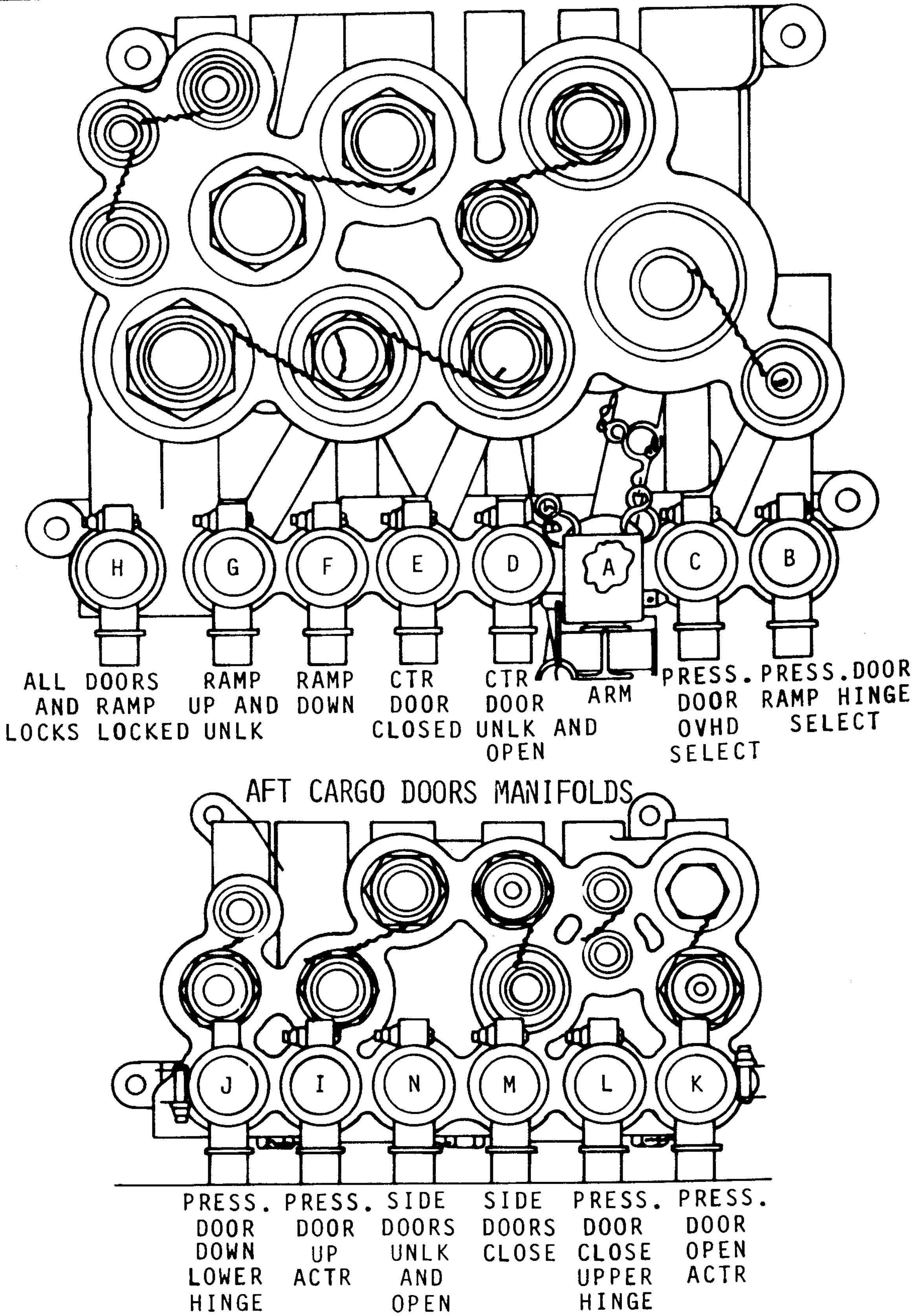
VISOR SAFETY CIRCUIT



C-5A LH AFT LOADMASTER CONTROL PANEL



C-5B LH AFT LOADMASTER CONTROL PANEL



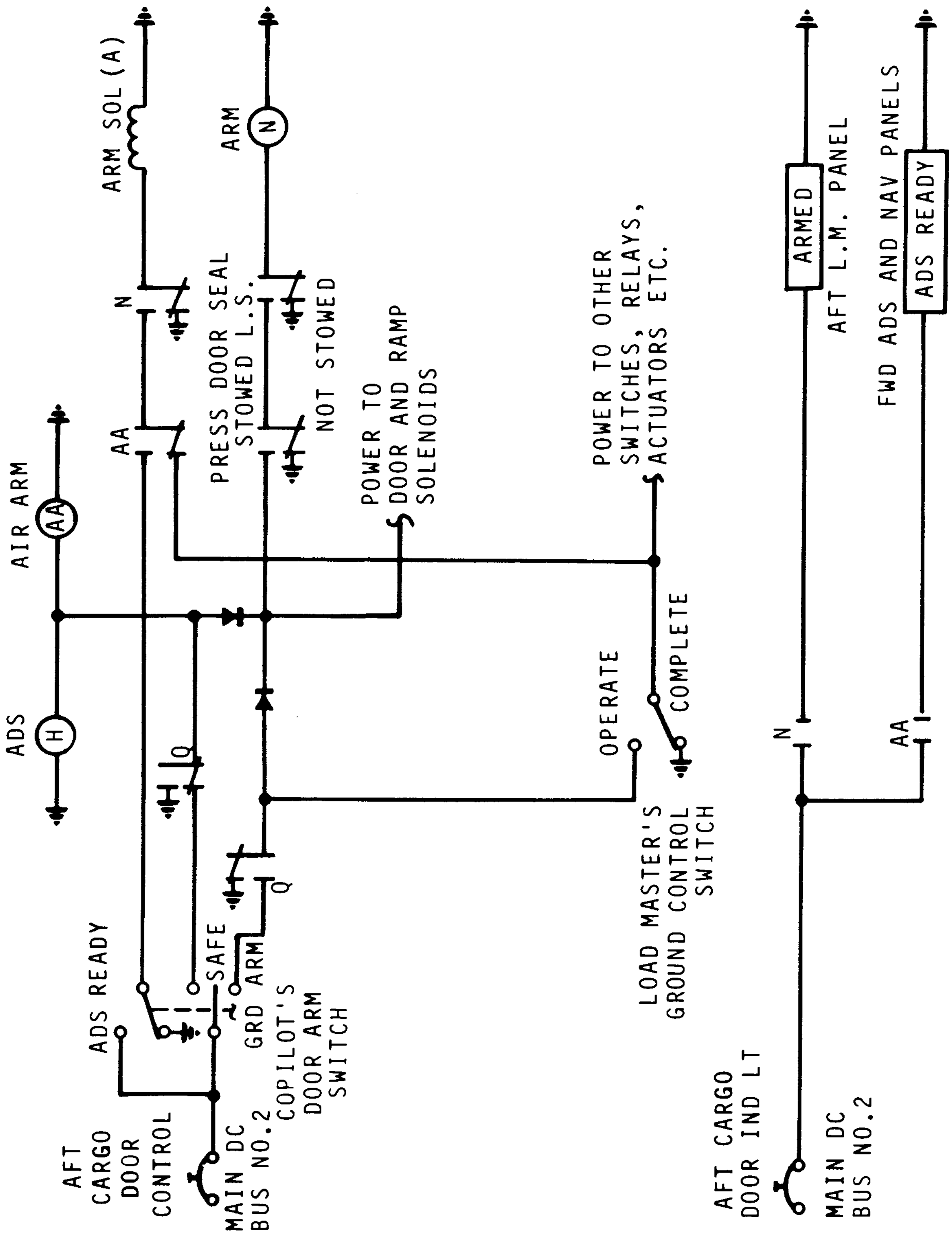
AFT CARGO DOORS MANIFOLDS

	Cartridge	Function
A.	ARM	Pressurizes both manifolds.
B.	Press. Door Ramp Hinge Select	Extends upper hinge select actuators.
C.	Press. Door Overhead Hinge Select	Retracts upper hinge select actuators.
D.	Center Door Unlock and Open	Retracts center door lock actuators, then hydraulically sequences hydraulic motor to open center door.
E.	Center Door Closed	Retracts center door lock actuators, then hydraulically sequences hydraulic motor to close center door.
F.	Ramp Down	Extends ramp lock actuators and extends ramp actuators.
G.	Ramp Up and Unlock	Extends ramp lock actuators and retracts ramp actuators.
H.	All Doors and Ramp Locks Locked	Used in combination with manual override buttons E, G, and M to lock center door, ramp, and side doors.
I.	Press. Door Up	Extends pressure door lower actuators.
J.	Press. Door Down	Retracts pressure door lower actuators.
K.	Press. Door Open	Extends upper hinge actuators.
L.	Press. Door Close	Retracts upper hinge actuators.
M.	Side Doors Close	Retracts side door lock actuators then hydraulically sequences side door forward and aft actuators to retract.
N.	Side Doors Unlock and Open	Retracts side door lock actuators, then hydraulically sequences side door forward and aft actuators to EXTEND.

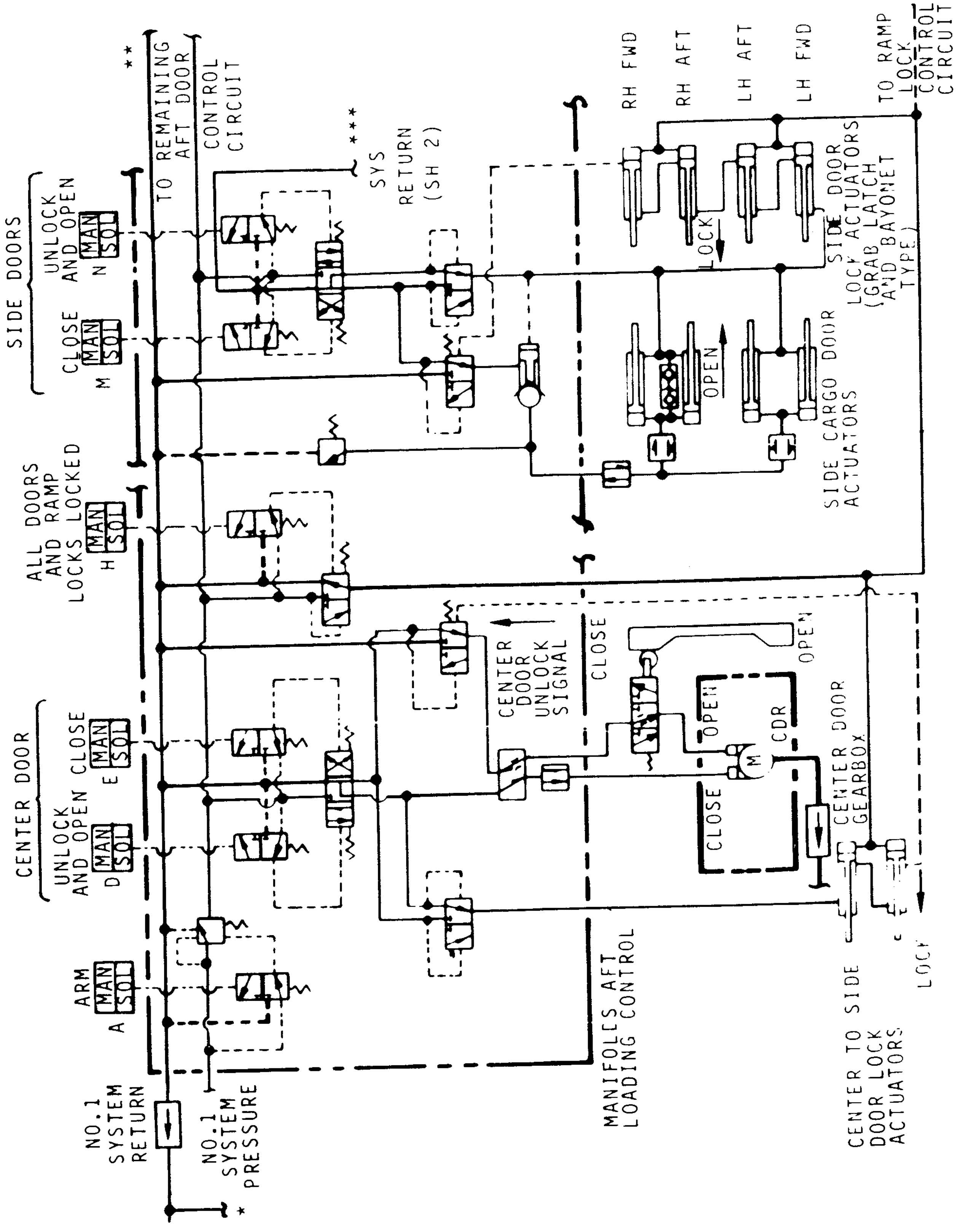
AFT LOADING CONTROL
MANIFOLD CARTRIDGES FUNCTIONS

A. ADS (Doors Open)
B. Ground Support Pads Extended/Retracted
C. ADS Door Open Selected
D. Pressure Door Lower No. 1 and No. 2
E. Pressure Door Up No. 1 and No. 2
F. Pressure Door Down
G. -
H. ADS No. 1 and No. 2
J. Ramp Relief
K. Drive-In Loading Selected
L. Ramp Down Relief
M. Truckbed Loading Selected
N. ARM
P. -
Q. Touchdown
R. Ramp Up; Ramp Up. No. 2
S. Side Doors Open
T. -
U. Ramp Down
V. -
W. Upper Hinge Hold Power
X. Solenoid Power No. 1
AA Air Arm
AB Ramp Up and Unlock Solenoid Power
AC Solenoid Power No. 2
AD Center Door OPEN Solenoid Power
AE Center Door CLOSE Solenoid Power

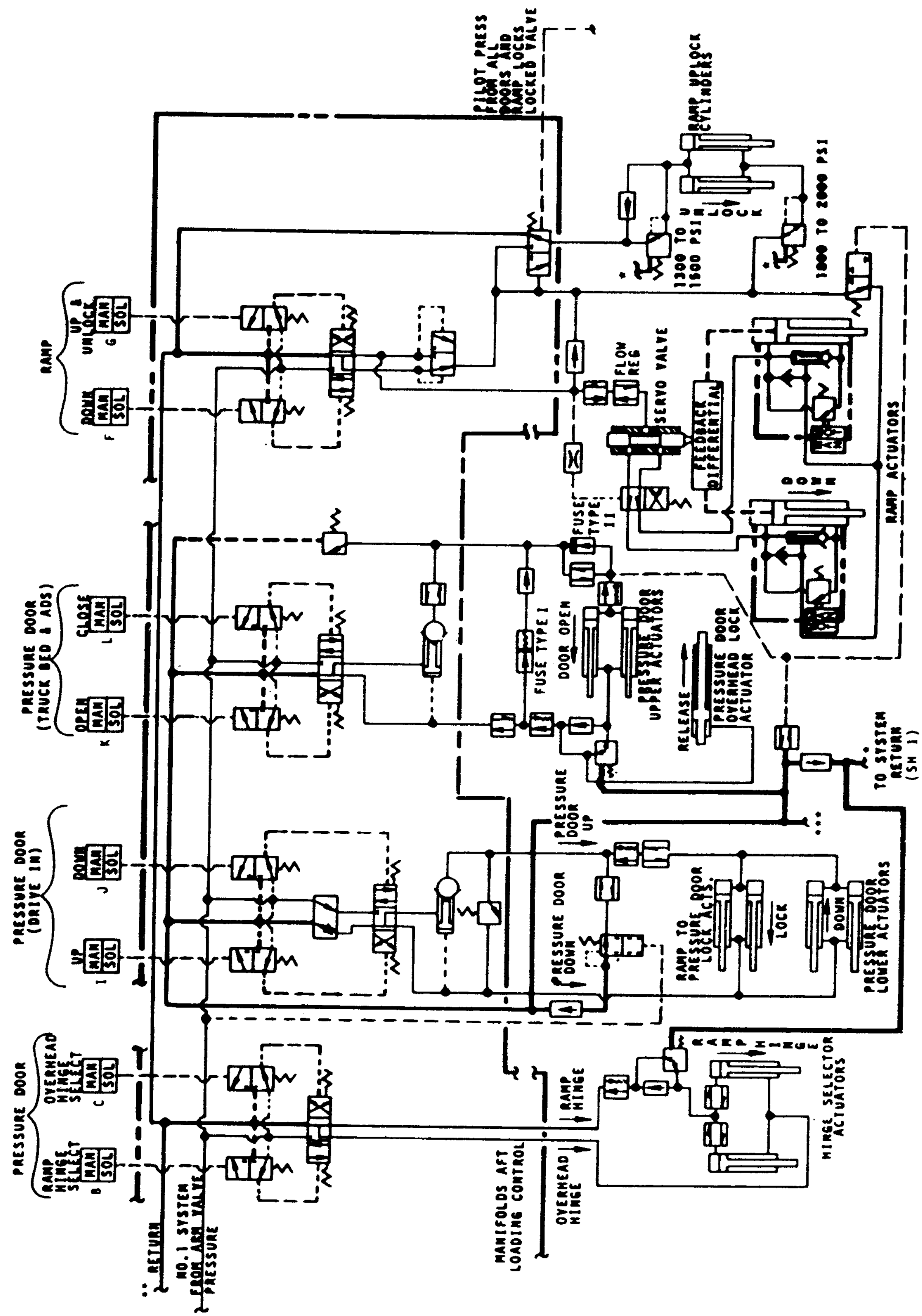
AFT CARGO DOOR & RAMP SYSTEM RELAY LIST



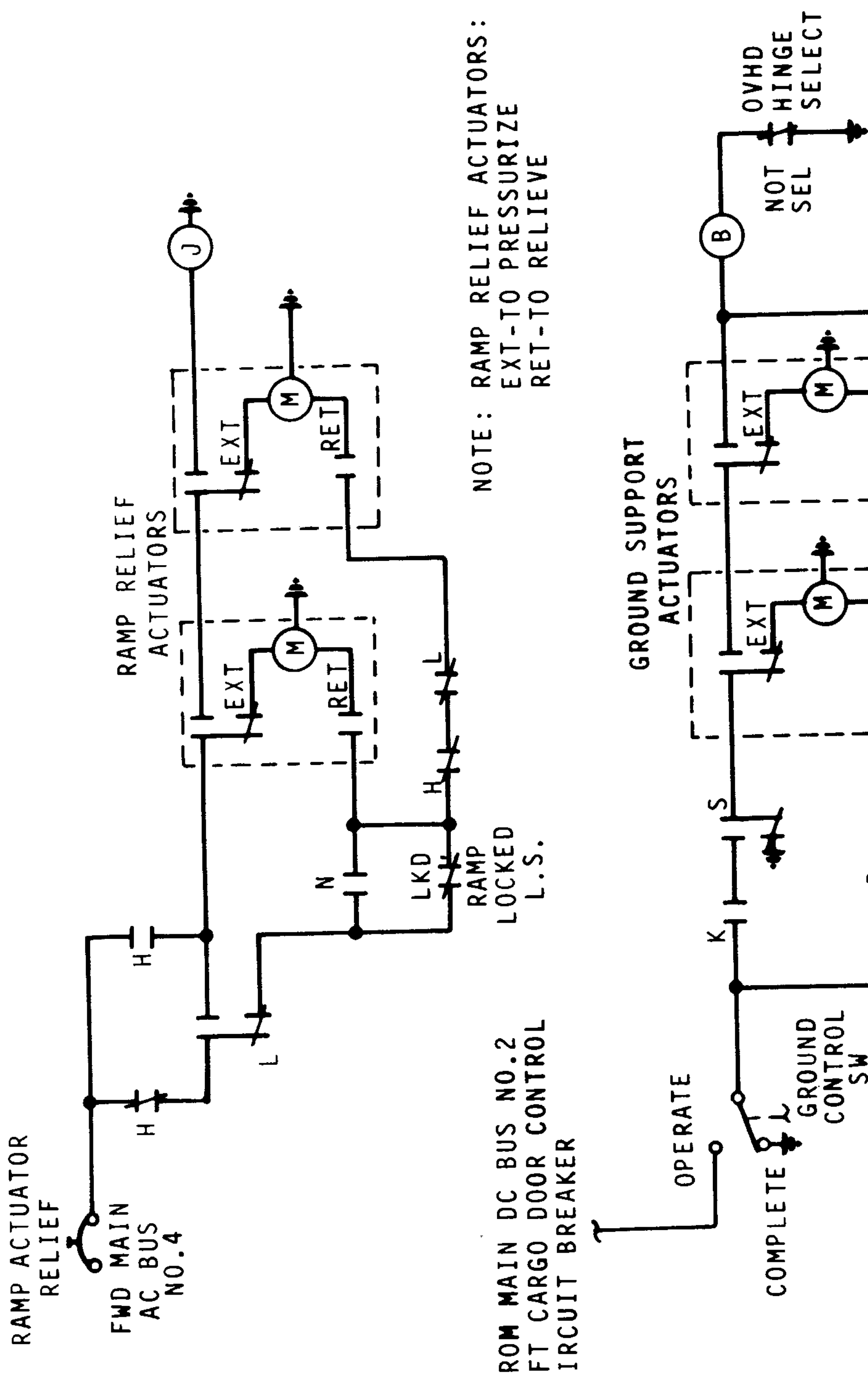
AFT CARGO DOORS ARM CIRCUIT



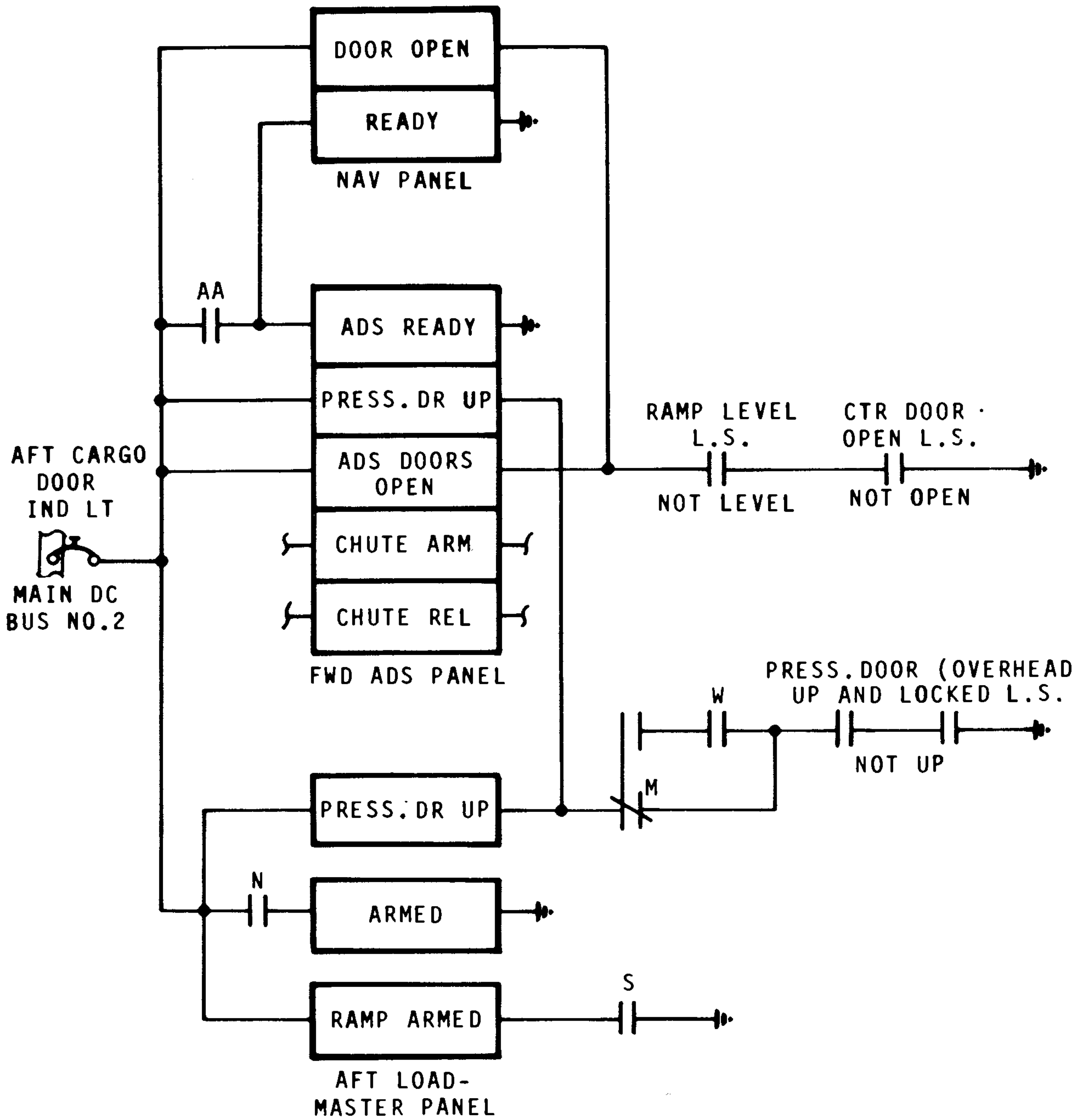
AFT LOADING HYDRAULIC SCHEMATIC (SHEET 1)



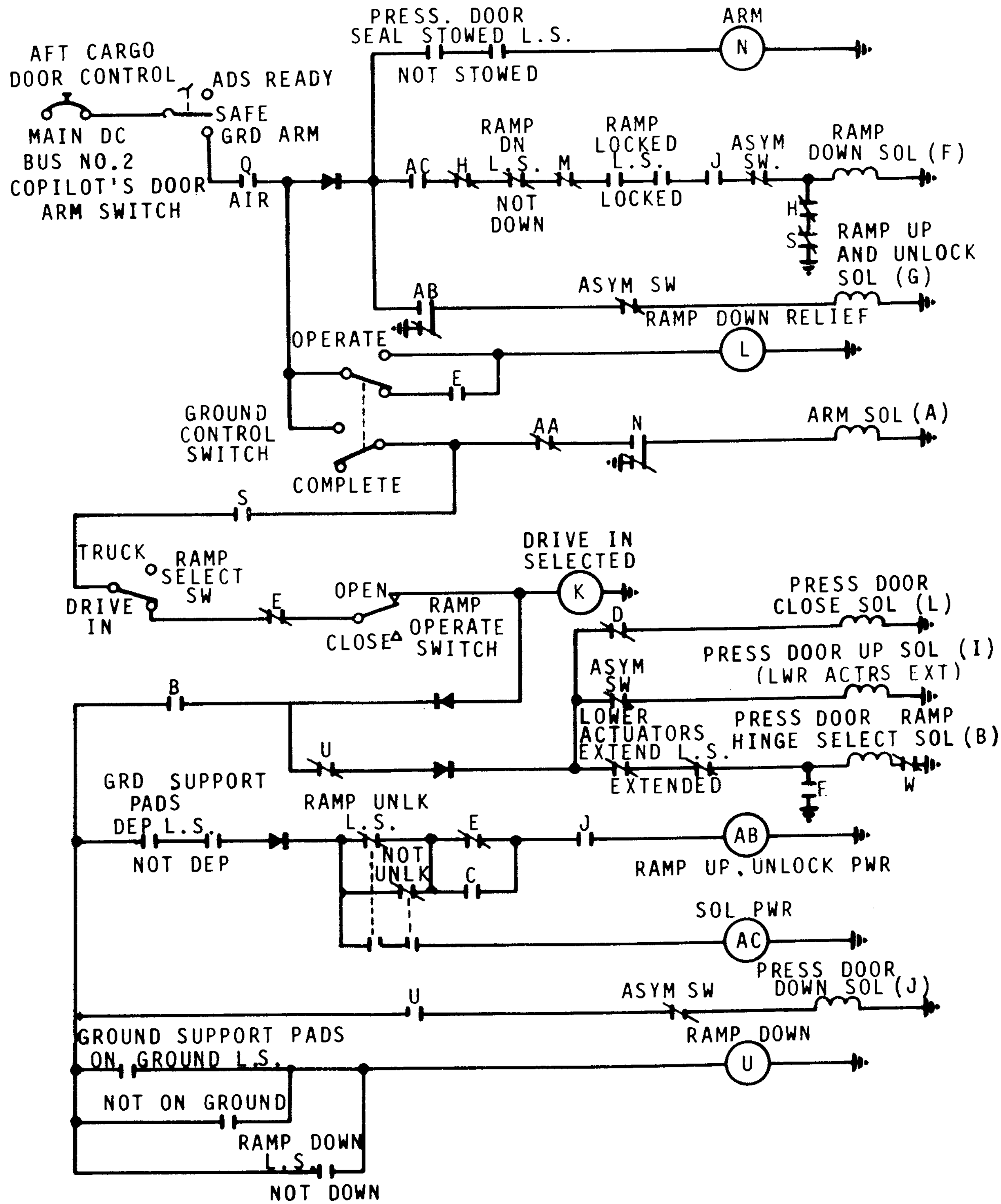
AFT LOADING HYDRAULIC SCHEMATIC (SHEET 2)



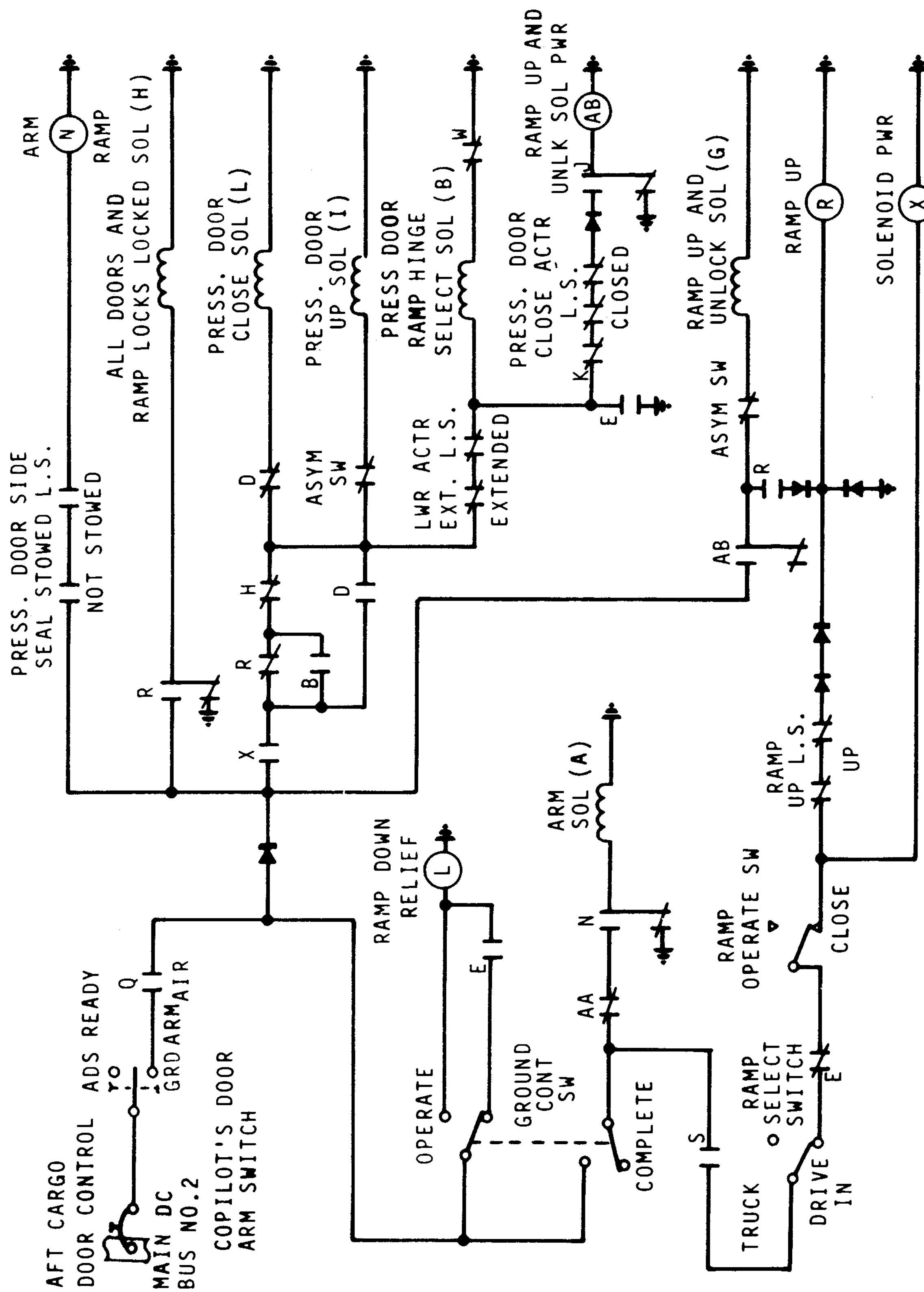
RAMP RELIEF & GROUND SUPPORT ACTUATORS



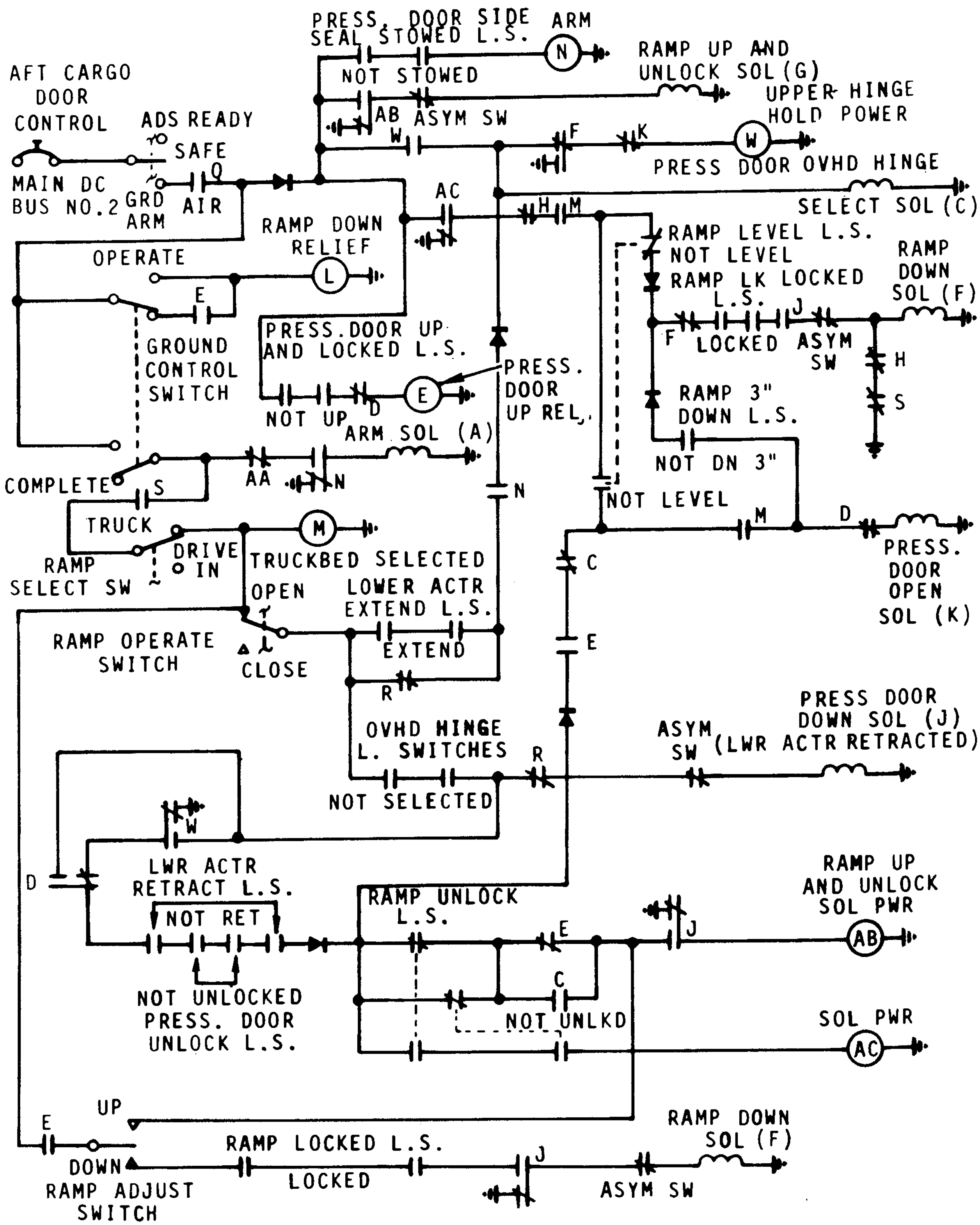
AFT CARGO DOOR & RAMP INDICATION



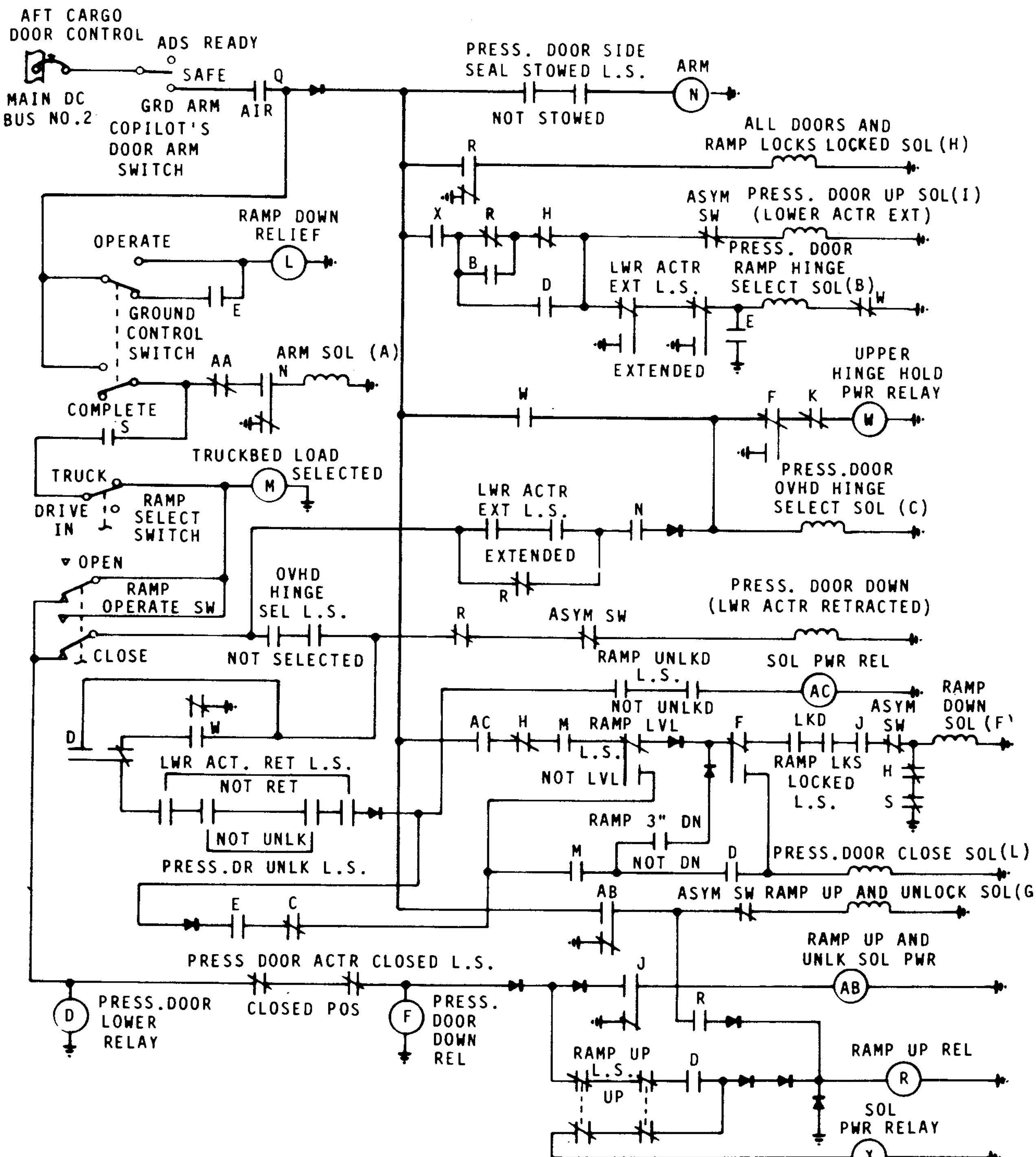
DRIVE-IN LOADING – OPEN



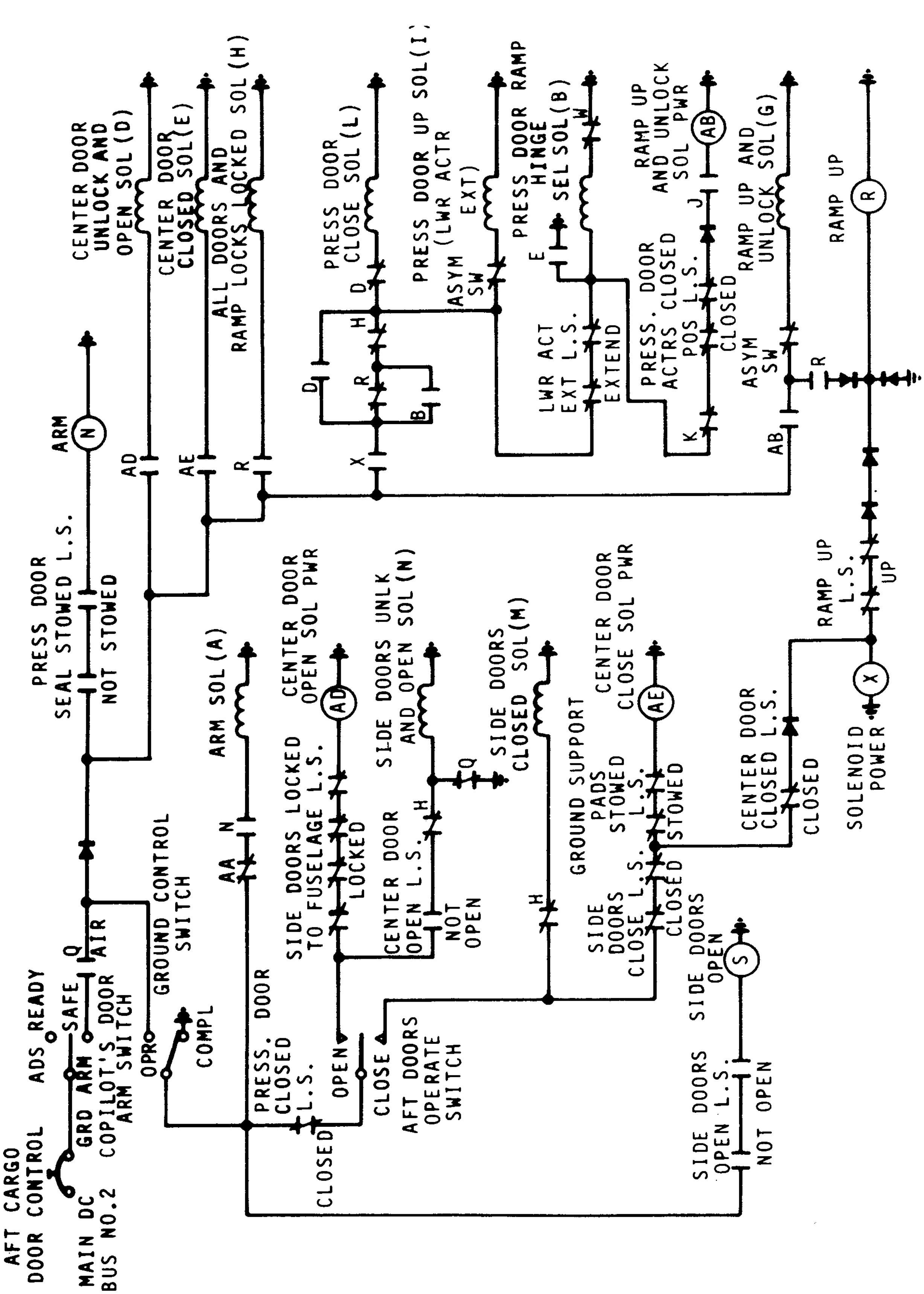
DRIVE-IN LOADING - CLOSE



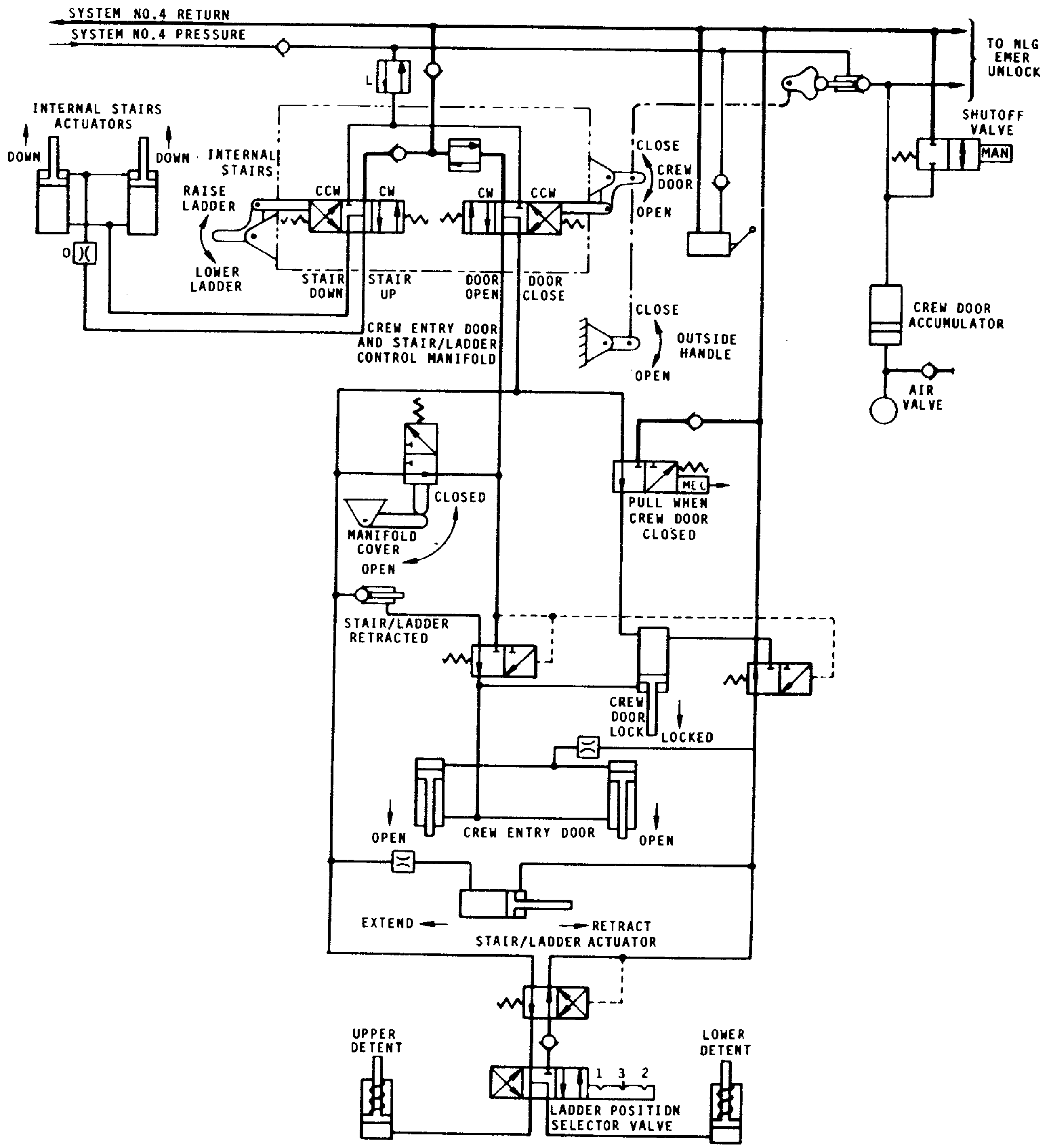
TRUCKBED LOADING - OPEN



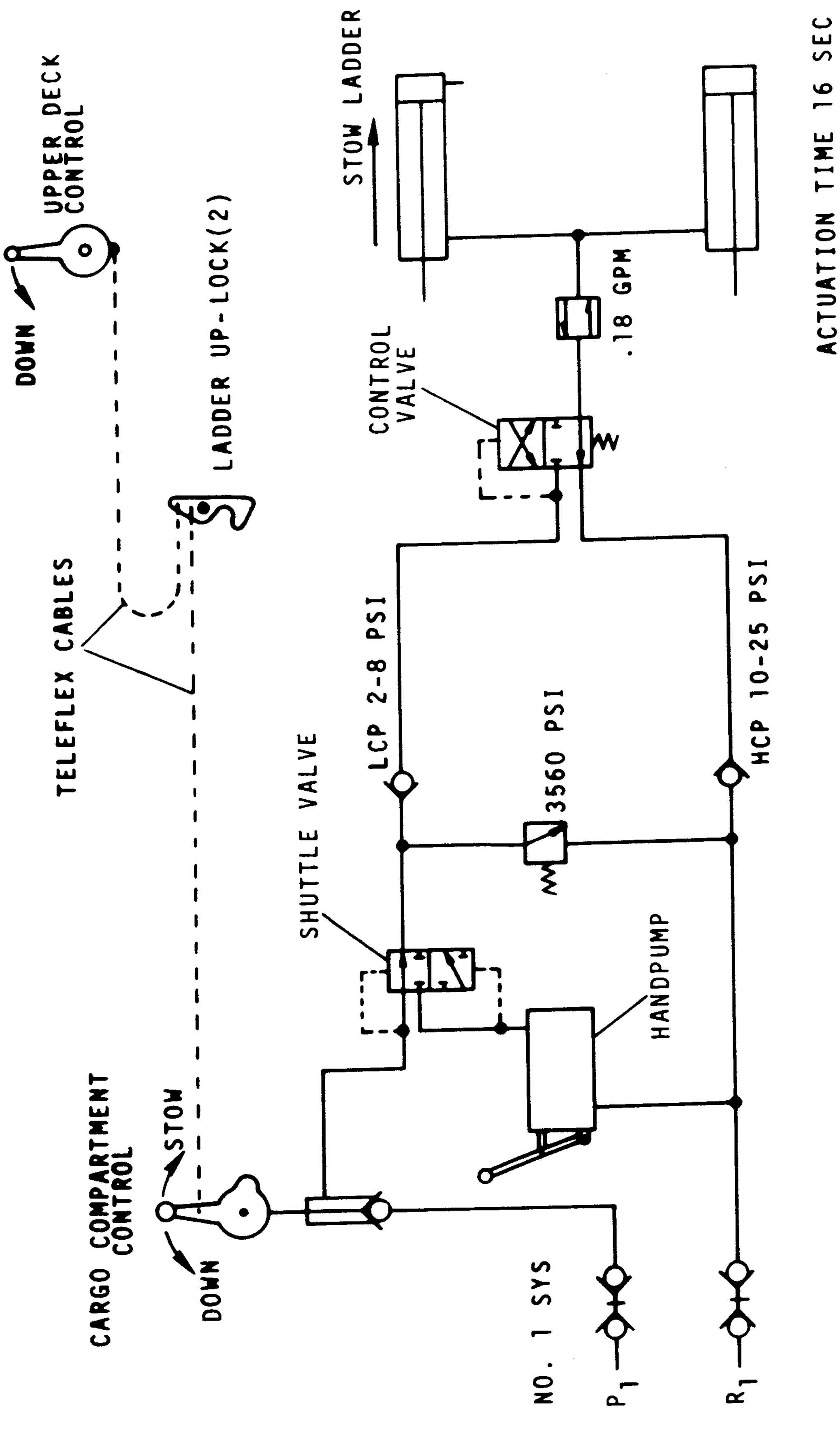
TRUCKBED LOADING - CLOSE



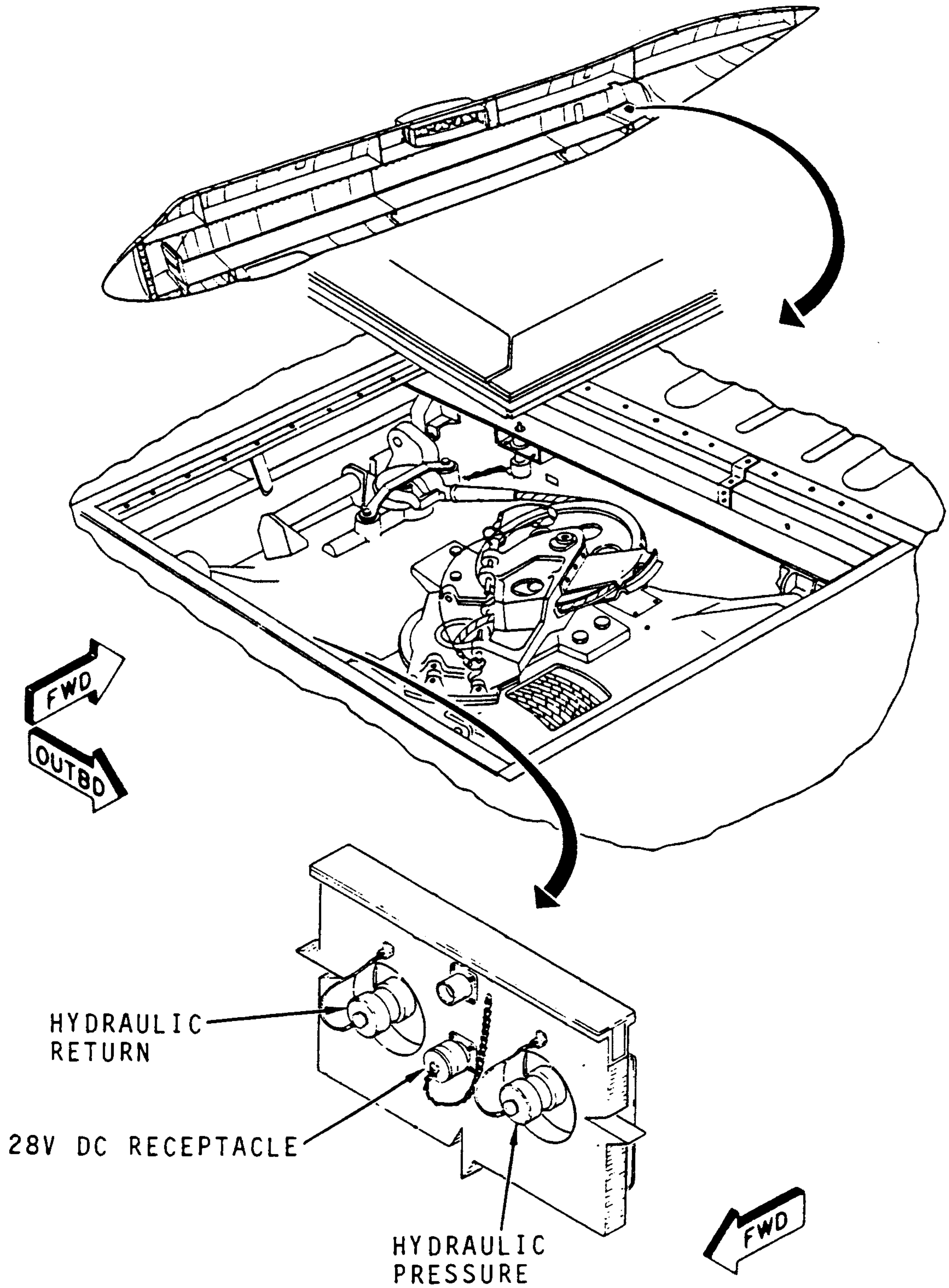
AFT-SIDE & CENTER DOORS - OPEN & CLOSE



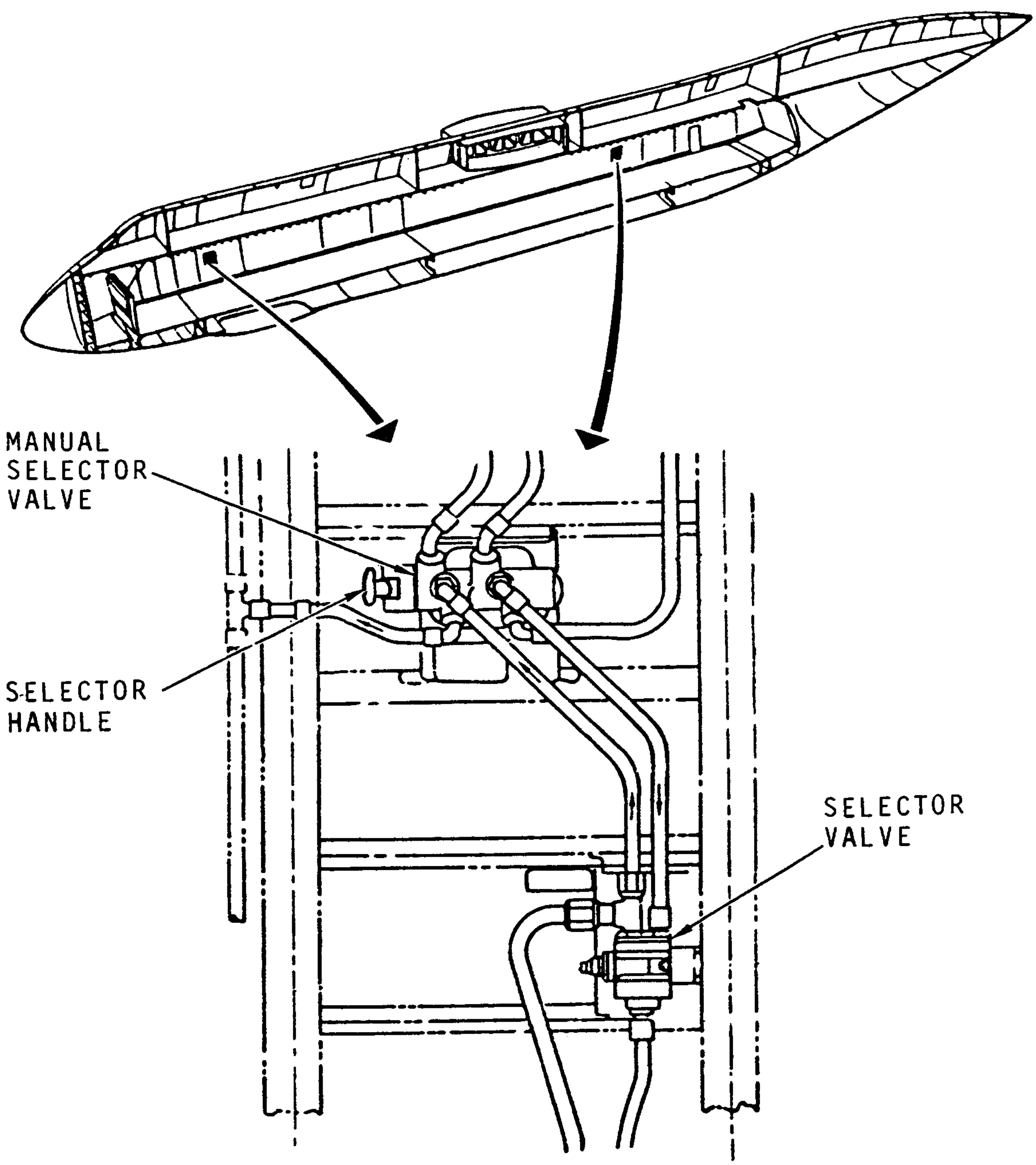
CREW ENTRY DOOR/STAIR LADDER HYDRAULIC



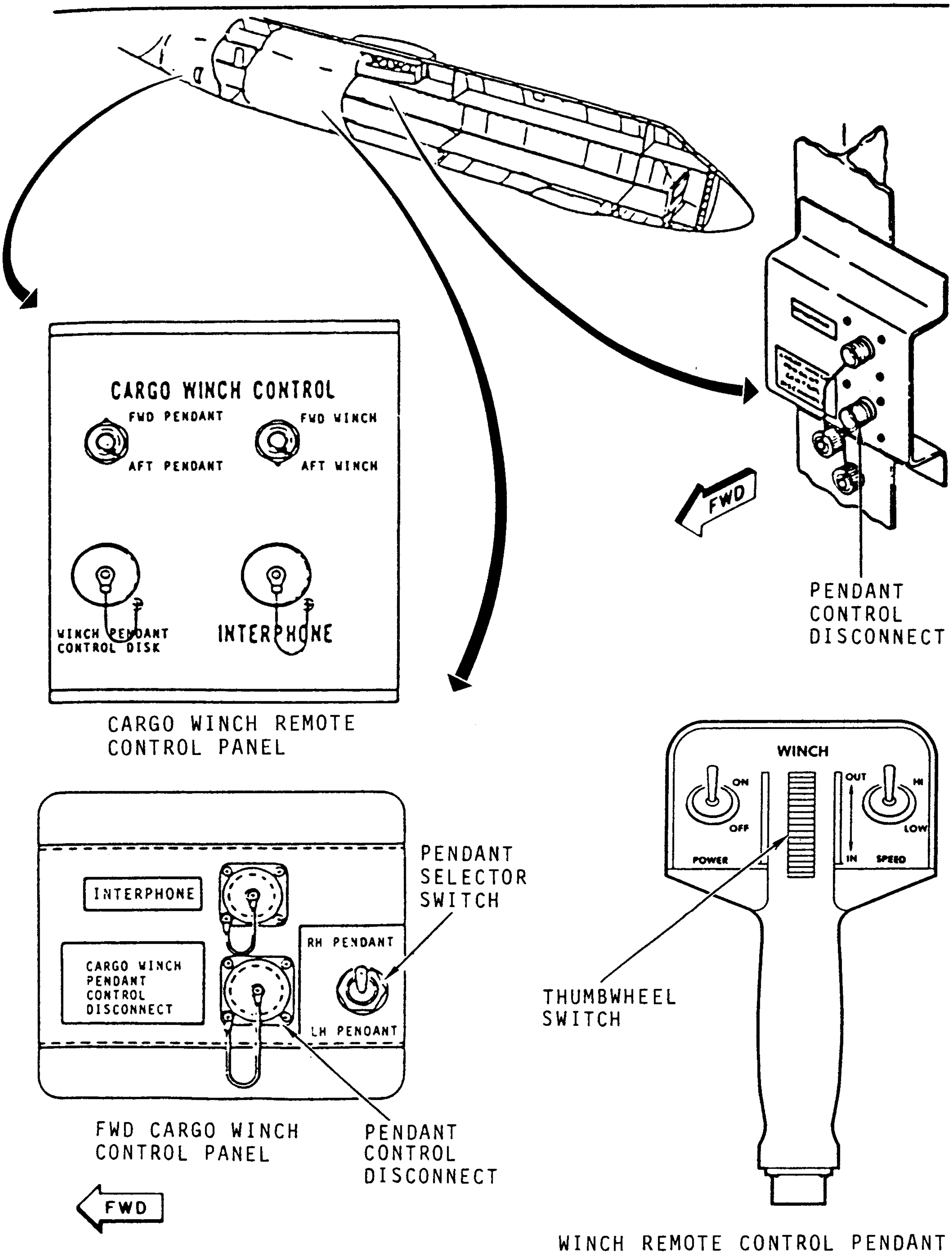
AFT TROOP COMPARTMENT STAIR & LADDER HYDRAULIC



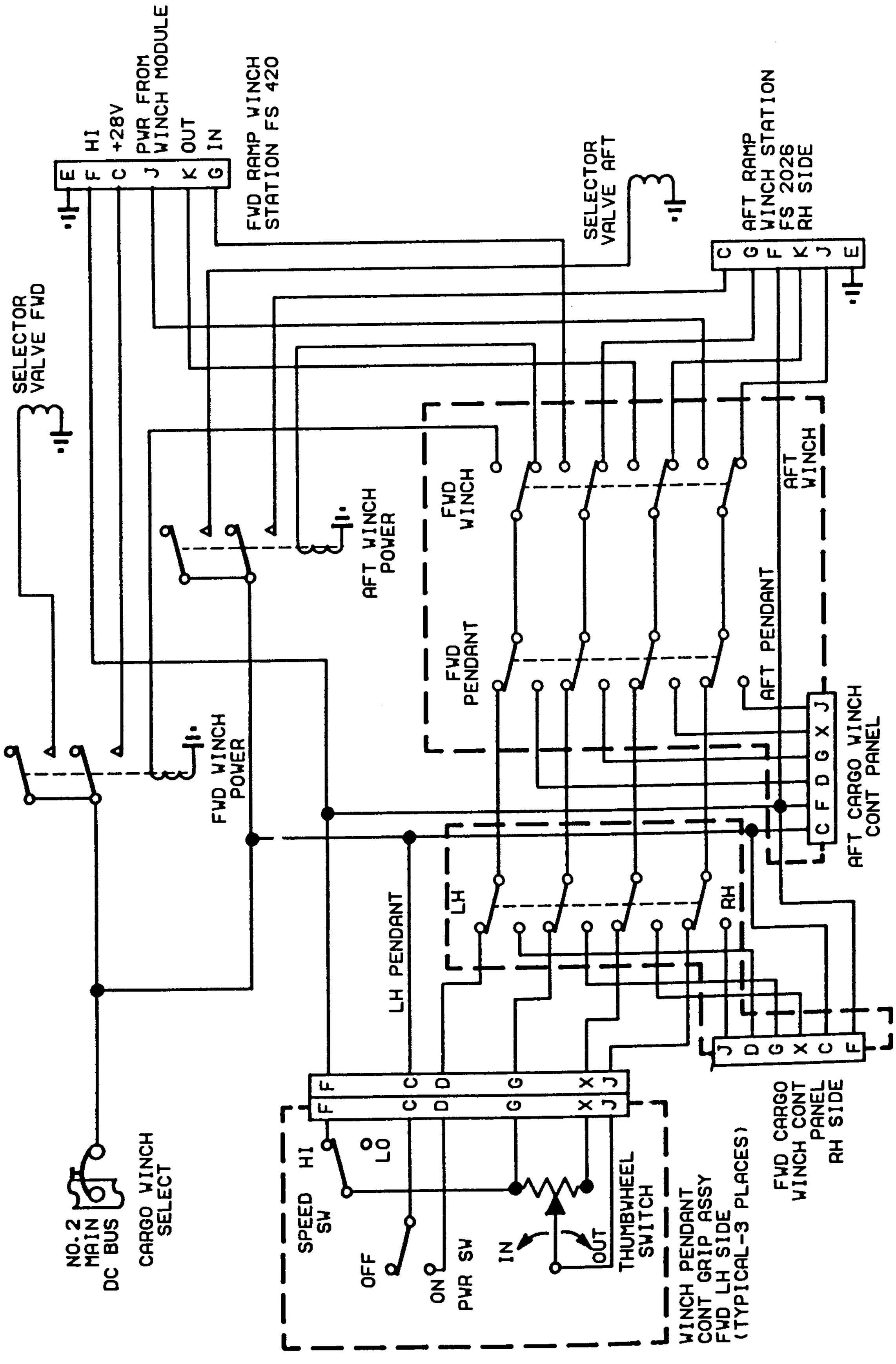
C-5B AFT WINCH COMPARTMENT HATCH AREA



C-5B CARGO WINCH CONTROL VALVES



C-5B CARGO WINCH CONTROLS



C-5B CARGO WINCH SELECTOR SYSTEM

SECTION III
ENVIRONMENTAL

INTRODUCTION

The C-5 environmental control system includes the following subsystems: bleed air; airconditioning; pressurization; cargo floor heating; fire suppression; nacelle anti-icing; windshield ice protection and rain removal; oxygen; air turbine motor (ATM); low pressure pneumatic system. There are three basic sources of pneumatic energy that may be used. These are: engines; onboard auxiliary power units and ground compressor cart.

Engine bleed air is the major source of pneumatic energy for environmental control. Air bled from the eighth - stage compressor section of each engine supplies the system requirements during most phases of operation. Under low - thrust conditions, the eighth - stage air supply is not adequate for environmental system demands; therefore, it is necessary to augment the supply by bleeding sixteenth - stage compressor discharge air. In order to provide augmentation when required, while keeping the fuel consumption penalty to a minimum, an automatic pressure augmenter is provided. In addition, temperature augmentation is provided during nacelle anti-icing operation. The control of bleed air also includes prevention of reverse flow into the engine, capability of shuting off flow from any or all engines, distribution of bleed air by suitable ducting, and the capability of isolating segments of the system to maintain essential functions following failure of any single component. A bleed air overheat detection system prevents damage or hazards by shutting off bleed air in the affected area.

The air conditioning system serves to maintain a comfortable personnel environment in the occupied compartments of the airplane. Cooling of the bleed air is accomplished by two bootstrap air cycle refrigeration units. Compartment temperatures are controlled by mixing bleed air with refrigerated air to maintain selected temperatures. A water separator, located downstream from each turbine, removes excess free moisture which is condensed by the cooling process. Auxiliary ram air is available for ventilation during unpressurized flight.

Cargo floor heating is accomplished by distributing a mixture of bleed air and cargo compartment air beneath the floor. Heating is provided from the forward ramp hinge to the aft ramp hinge, including the area over the landing gear wells. Three fans are used to draw air from the cargo compartment into underfloor ducts, where hot bleed air, metered by modulating valves, is mixed with the cargo compartment air for distribution. The mixed air travels beneath the floor surface to the chine area where it re-enters the cargo compartment. Temperature sensors in the re-entry path, in conjunction with an electronic circuit, control the bleed air flow to maintain the proper air temperature for floor heating.

Cabin pressure is regulated by controlling the overboard flow of air from the air conditioning and cargo floor heat systems. The flow is controlled automatically to maintain a constant rate of change or a compartment pressure altitude, as selected on the flight engineer's panel. Manual override and depressurization control, as well as positive and negative pressure relief functions, are also provided.

The fuel tank inerting and fire suppression system (FSS) provides a means of maintaining a low oxygen concentration in the vapor space of the airplane fuel tank, and of detecting fire in certain occupied and unoccupied areas, and also suppressing fires in unoccupied areas of the airplane. The system utilizes nitrogen to inert and pressurize the wing tank and vent boxes, and to suppress fires in designated unmanned areas. The FE 1301 (bromotrifluoromethane) fire suppression system is disarmed on the C-5A and is nonexistant on the C-5B.

The avionics compartment equipment is cooled by cabin air which is circulated through the compartment and then discharged overboard through a flow control valve. Two fans upstream of the valve provide airflow during all phases of operation.

The forward windshield panels are anti-iced and defogged by electrical heating, utilizing a conductive film which is laminated into the panels during fabrication.

The oxygen supply system provides gaseous oxygen to the crew, relief crew, and troop compartment when oxygen is required. Pressure-demand oxygen regulators are provided adjacent to each crew duty station and each bunk for the crew. A continuous flow oxygen distribution system is provided for the relief crew, troop/courier, and troop areas. The oxygen supply system consists of two liquid oxygen converters, one 25-liter and one 75-liter converter, and the required heat exchangers, pressure demand regulators, automatic oxygen mask presentation units, portable oxygen units, the oxygen distribution system, and a visual and audio warning system.

Each of the two air turbine motors (ATM's) drives a 40 GPM variable displacement 3000 psi hydraulic pump. The ATM's are located one on each side of the fuselage in the APU compartment at the aft end of the landing gear pod. The left-hand pump is in the No. 1 hydraulic system, and the right-hand pump is in the No. 4 hydraulic system.

The Potable Water System on the C-5B consists of a 55 gallon tank located in the courier compartment coat closet. System control is accomplished at the tank area.

BLEED AIR

Pylon Bleed Air Shutoff Valve -
Closes when pressure exceeds 100 PSI.
Closes when temperature exceed 650°F.
Automatically closes in event of pylon of wing overheat condition.

Pressure Augmenter Valve -
Augments 8th stage air with 16th stage air to maintain supply pressure at 30 ± 2 PSIG when 8th stage bleed air pressure is less than this value.

Temperature Augmenter Valve -
Maintains temperature at 550° ± 10°F, for nacelle anti-icing.

AIR CONDITIONING

With the temp. selector in mid-position, temperature will be maintained at 75°F. Range: 40°F to 95°F.

'DUCT OVHT' illuminates when bleed air leakage is detected at 310 ± 15°F.

'AIR COND OVHT' illuminates when air conditioning turbine compressor discharge overheats at 585°F and resets at 525°F.

Mainifold pressure (L/R), with both APU's operating; indicator should read 30 PSI.

Air Conditioning Flow Control Valve -
Closes when turbine-compressor thermal switch senses 585°F.
High flow schedule for aircraft speeds above 0.3 MACH.
Low flow schedule for:
(1) speeds blow 0.3 MACH.
(2) ground operation.
(3) slats extended.
NOTE: Low flow may be manually selected by switch on environmental panel.

Turbine - Compressor -
Service (C-5A only) with MIL-L-7808 OIL (275 cc). Operating speed: approximately 55,000 RPM.

Cooling Air Exit Control Valve -
Automatically controls primary heat exchanger discharge air at 160°F.
Overheat switch in outlet of primary heat exchanger will drive valve full open when discharge temperature reaches 285°F.

ENVIRONMENTAL SYSTEM STATS (SHEET 1)

Compartment Temperature Control Box -
Controls valves to obtain selected compartment temperature.
Controls temp. control valve to limit temp. in ducts to 310°F.

Low Limit Temperature Control Box -
Controls low limit temp. control valve.
Low limit sensor controls valve to maintain water separator temperature above freezing.
Manual selector switch placed to 'COOL', low limit control automatically reset to 35°F.

Cooling Air Temperature Control Box -
Signals cooling air exit valve to maintain primary heat exchanger exit air at 160°F.
Signals valve to drive full open if temperature reaches 285°F.

FLOOR HEAT

Controls temperature of air reentering cargo compartment from under floor area to 75°F.
Control box emits close signal to temp. control valve if temperature downstream of duct mix point exceeds 230 ± 10°F.
Floor overheat switches set at 330°F.

CABIN PRESSURIZATION

Automatic isobaric system with differential pressure limit to 8.2 (±0.1) PSID.
Safety valves cracking pressure - 8.4 PSID
Limit to 8.7 PSID with one valve inoperative
Cabin pressure low warning light at 10,000 ft. cabin altitude.

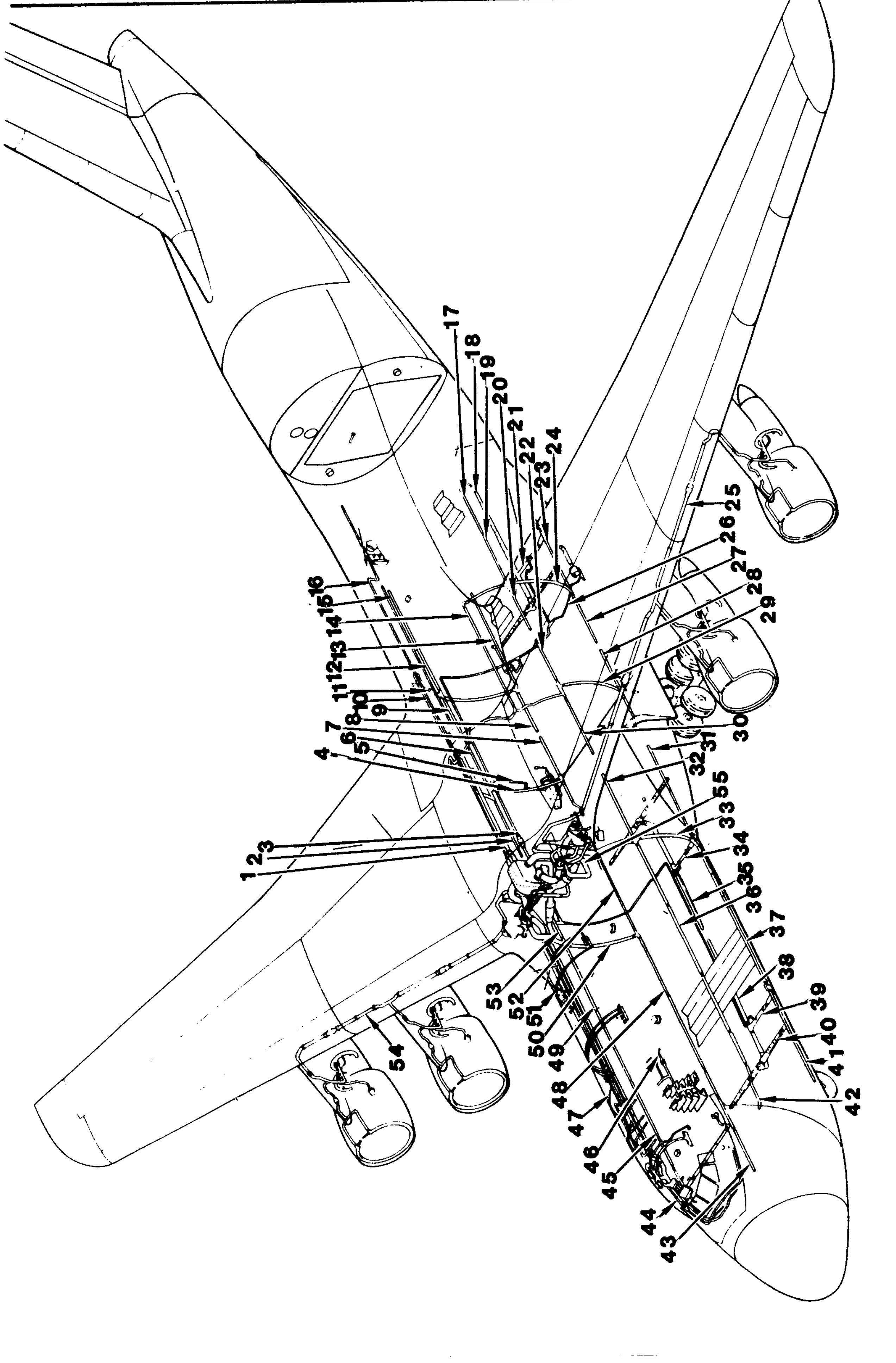
OXYGEN

Two lox converters: 25 liter and 75 liter.
Low pressure relief valves: 330-380 PSI.
High pressure relief valves: 380-430 PSI.
Check valves cracking pressure: 2-5 PSID.
Pressure closing valves 295-315 PSI.
Oxygen quantity low warning lights illuminate when quantity is 10% of converter capacity.
Oxygen warning system activates if cabin altitude ascends to 12,500 - 14,000 ft.

FIRE SUPPRESSION SYSTEM (FSS)

DeWar liquid nitrogen capacity.
110 gals (750 lbs) each
A FE-1301 (Bromotrifluoromethane): system disarmed.

ENVIRONMENTAL SYSTEM STATS (SHEET 2)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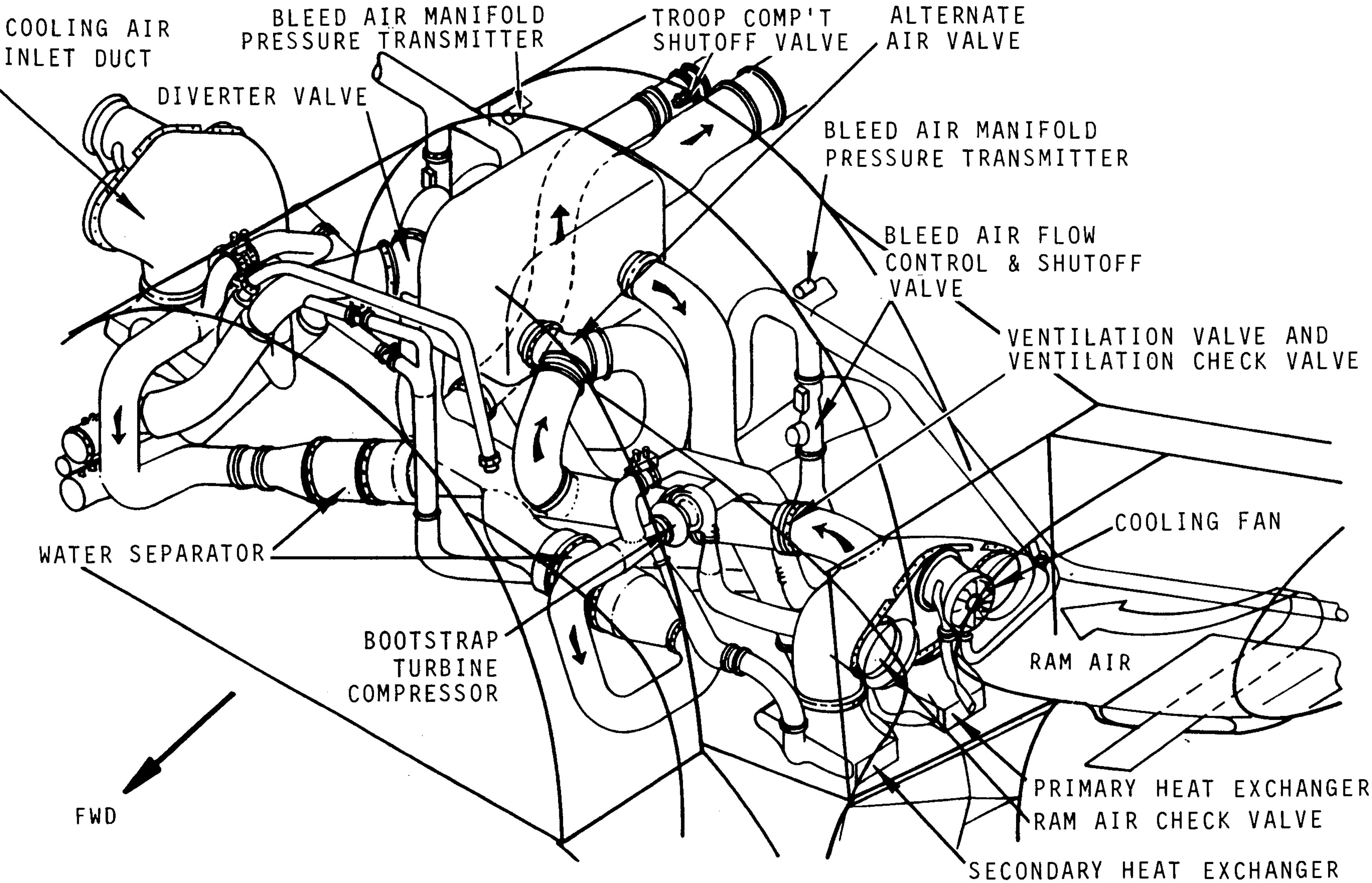
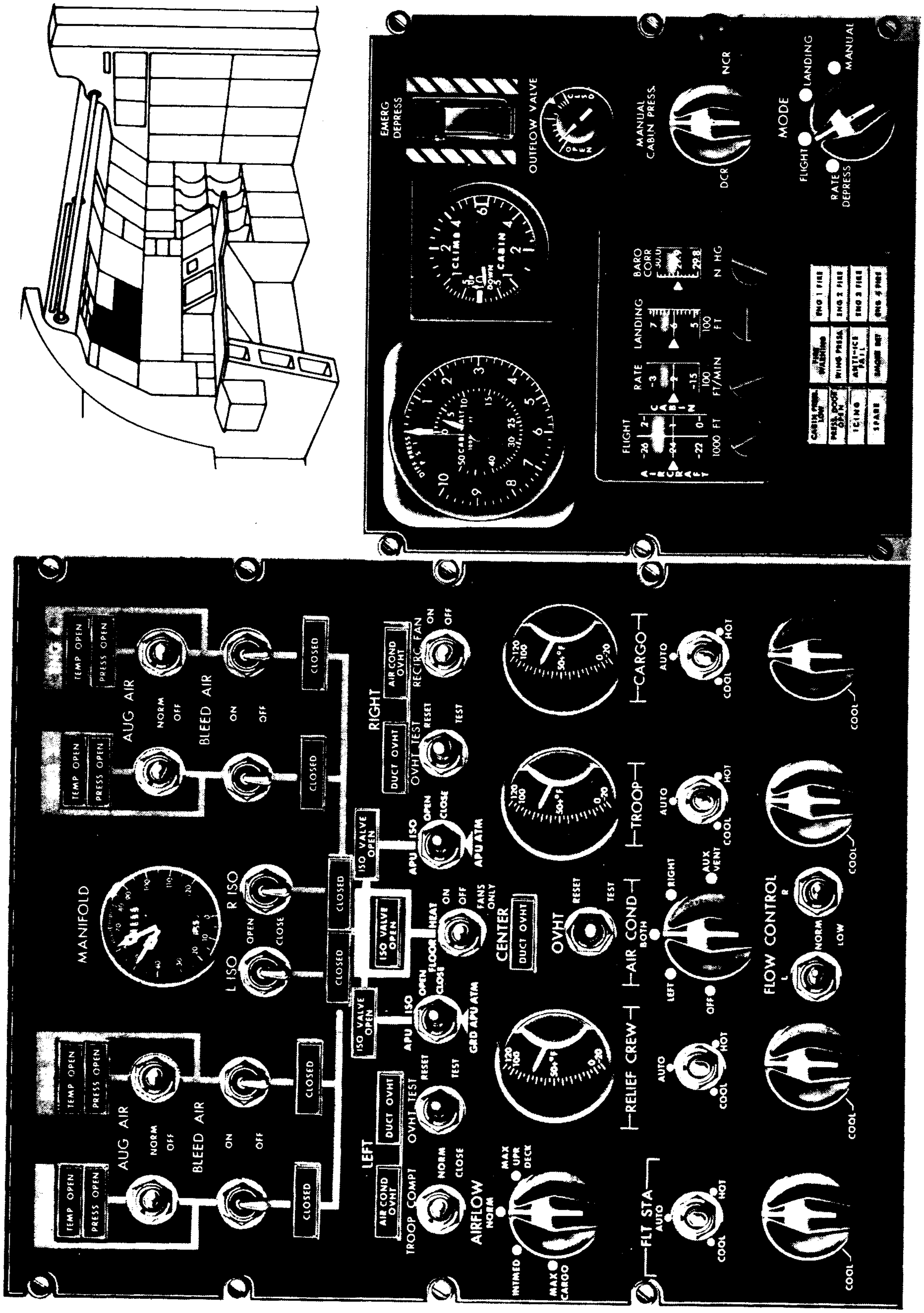
1. CARGO COMPARTMENT AIR SUPPLY DUCT, FUS STA 1106 TO FUS STA 1383
2. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1249 TO FUS STA 1342
3. APU BLEED AIR DUCT, FUS STA 1118 TO FUS STA 1665
4. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 1383
5. KNEELING SYSTEM AND LOW PRESSURE PNEUMATIC SYSTEM BLEED AIR DUCT, FUS STA 1453.
6. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1406 TO FUS STA 1506
7. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1306 TO FUS STA 1515
8. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1526 TO FUS STA 1733
9. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1523 TO FUS STA 1573
10. CENTER CARGO COMPARTMENT AIR SUPPLY DUCT, FUS STA 1386 TO FUS STA 1533
11. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 1613
12. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1627 TO FUS STA 1712
13. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1733 TO FUS STA 1834
14. CENTER CARGO COMPARTMENT AIR SUPPLY DUCT, FUS STA 1386 TO FUS STA 1533
15. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1712 TO FUS STA 1825
16. AIR DISTRIBUTION DUCT (TROOP COMPARTMENT KIT)
17. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1712 TO FUS STA 1825
18. AFT CARGO FLOOR HEAT AIR DISTRIBUTION DUCT
19. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1627 TO FUS STA 1712
20. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1523 TO FUS STA 1573
21. AFT FLOOR HEAT RECIRCULATION DUCT
22. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1406 TO FUS STA 1506
23. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1733 TO FUS STA 1834
24. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 1613
25. WING, ENGINE BLEED AIR MANIFOLD DUCT
26. APU & ENGINE BLEED AIR DUCT, UNDER FLOOR
27. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1526 TO FUS STA 1733
28. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1306 TO FUS STA 1515
29. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 1383
30. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1249 TO FUS STA 1342
31. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1088 TO FUS STA 1295
32. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1088 TO FUS STA 1208
33. FWD CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 1073
34. CENTER FLOOR HEAT RECIRCULATION DUCT
35. FORWARD CARGO FLOOR HEAT DUCT, FUS STA 924 TO FUS STA 1128
36. FORWARD CARGO COMPARTMENT AIR DISTRIBUTION, UPPER, FUS STA 636 TO FUS STA 1056
37. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 776 TO FUS STA 1056
38. FORWARD CARGO FLOOR HEAT DUCT, FUS STA 744 TO FUS STA 964
39. FORWARD FLOOR HEAT RECIRCULATION DUCT
40. CARGO FLOOR HEAT DUCT (NOSE WHEEL WELL)
41. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 528 TO FUS STA 776
42. FORWARD CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 470 TO FUS STA 636
43. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 528 TO FUS STA 776
44. FLIGHT STATION AIR DISTRIBUTION DUCTS
45. FORWARD CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 470 TO FUS STA 636
46. AVIONICS COMPARTMENT COOLING AIR EXHAUST DUCT
47. RELIEF CREW COMPARTMENT AIR DISTRIBUTION DUCT
48. CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 776 TO FUS STA 1056
49. FORWARD CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 636 TO FUS STA 1056
50. FORWARD CARGO COMPARTMENT AIR DISTRIBUTION DUCT, FUS STA 1073
51. COURIER COMPARTMENT AIR DISTRIBUTION DUCT
52. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, LOWER, FUS STA 1088 TO FUS STA 1295
53. CENTER CARGO COMPARTMENT AIR DISTRIBUTION DUCT, UPPER, FUS STA 1088 TO FUS STA 1208
54. WING, ENGINE BLEED AIR MANIFOLD DUCT
55. ENVIRONMENTAL COMPARTMENT

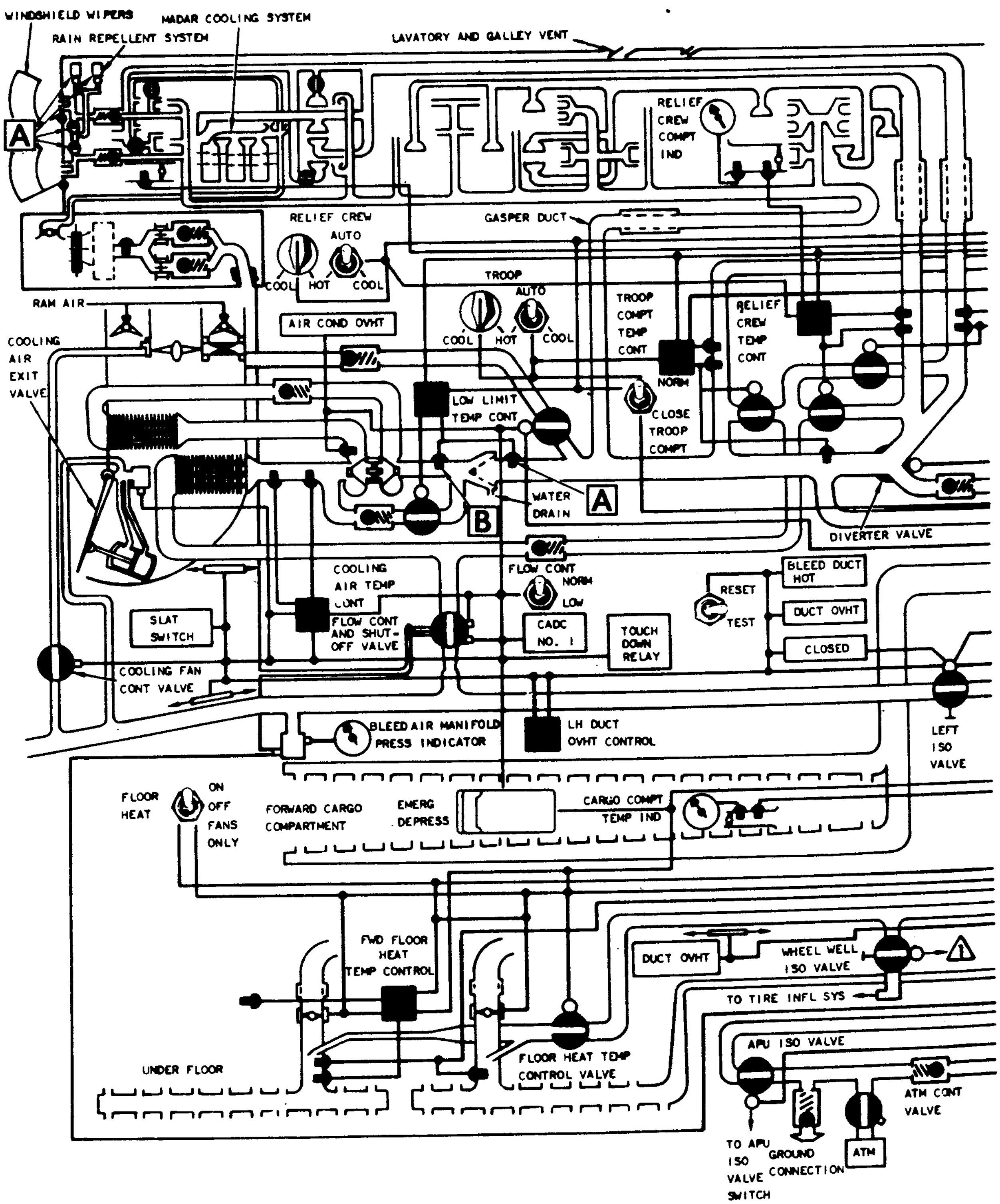
ENVIRONMENTAL CONTROL SYSTEM DUCT, COMPONENT LOCATIONS



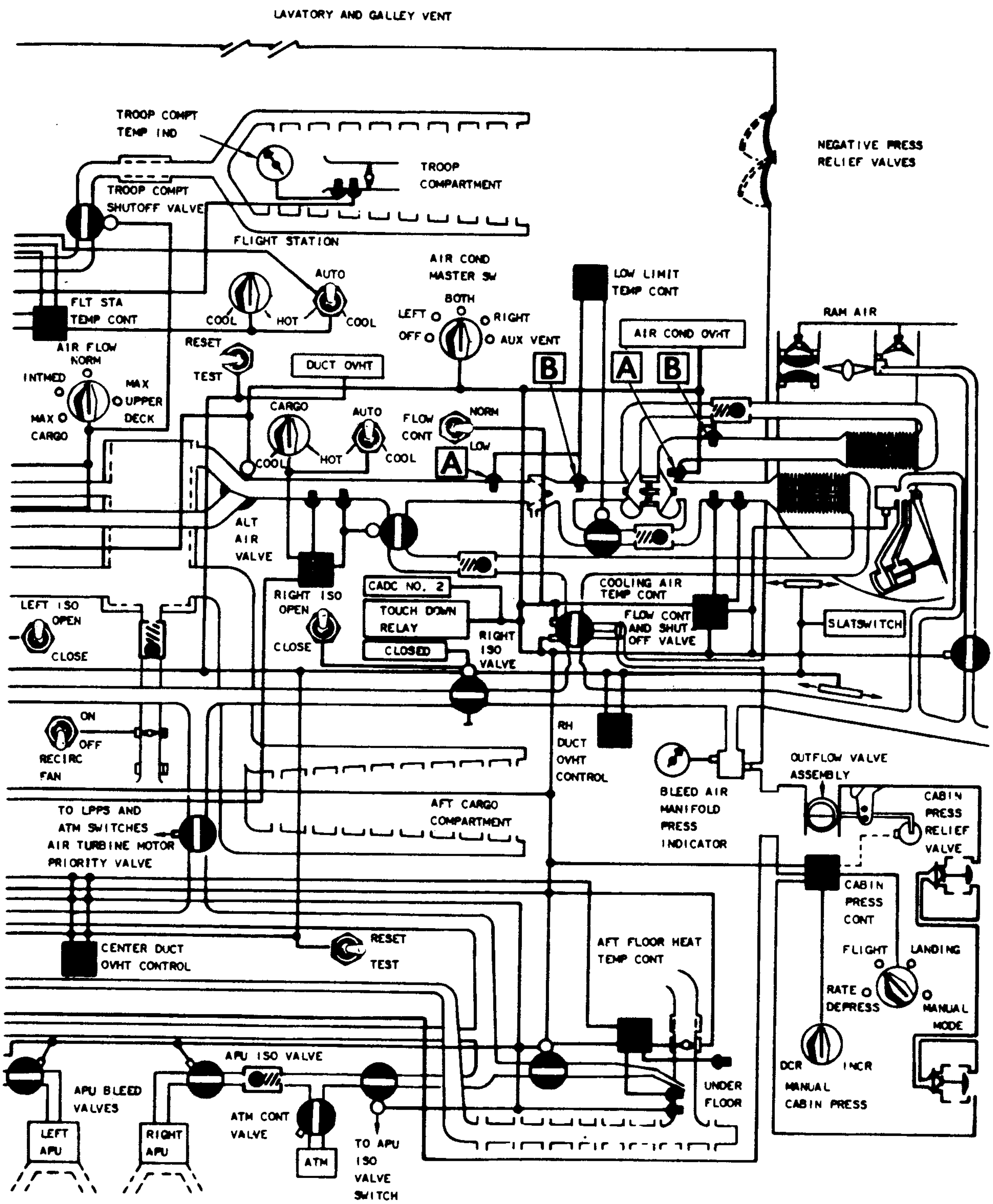
ENVIRONMENTAL COMPARTMENT



AIR CONDITIONING &
CABIN PRESSURIZATION CONTROL PANELS



ENVIRONMENTAL SYSTEM (SHEET 1)



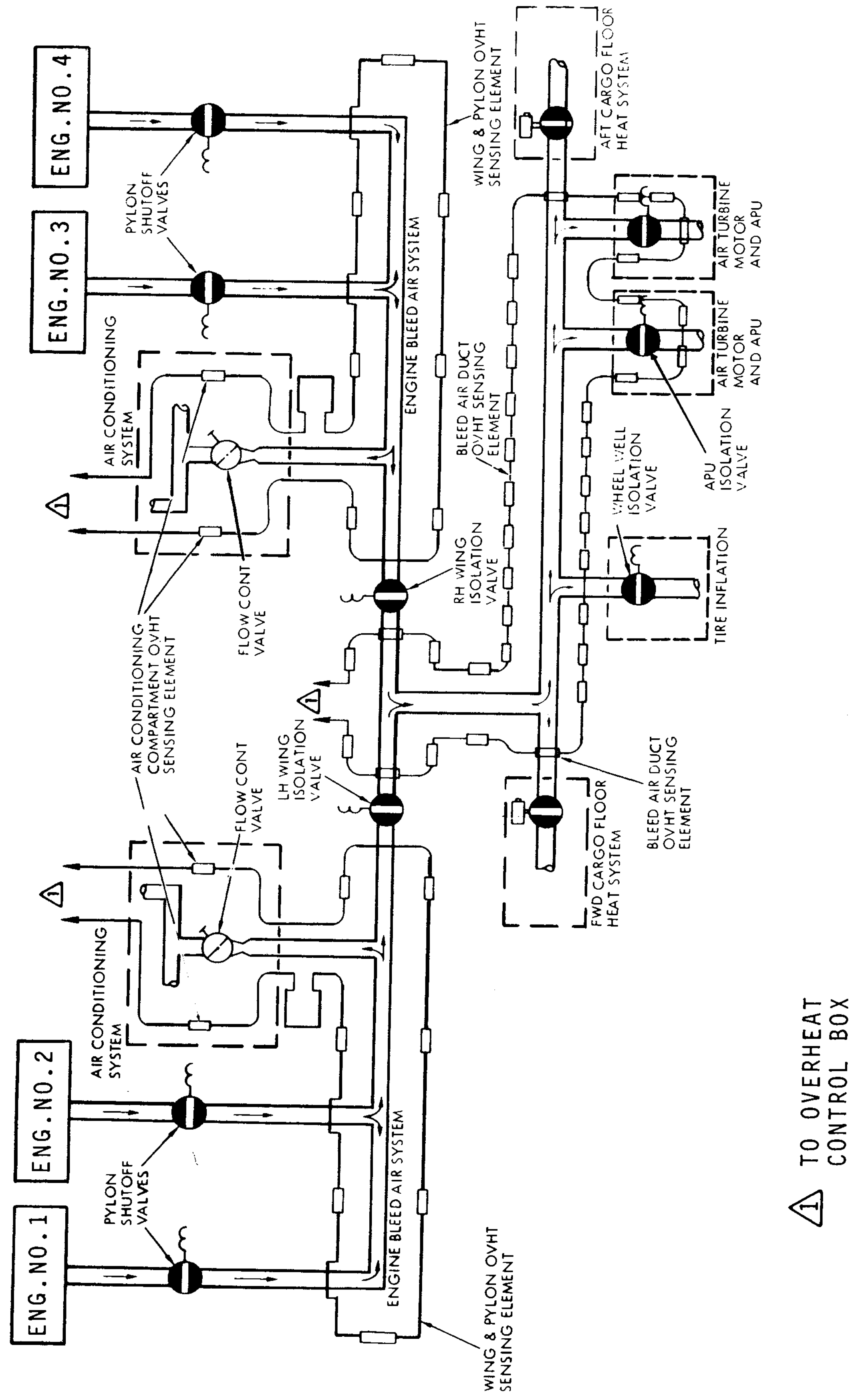
ENVIRONMENTAL SYSTEM (SHEET 2)

- HIGH TEMPERATURE HIGH PRESSURE BLEED AIR
- TEMPERATURE CONDITIONED AIR
- TEMPERATURE CONDITIONED AND BLEED AIR-MIXED
- PRIMARY HEAT EXCHANGER OUTLET AIR
- TURBINE INLET AIR
- TEMPERATURE CONDITIONED COLD AIR
- TURBINE OUTLET AIR (COLDEST)
- DUCT MUFFLER
- AUXILIARY AIR
- RAM AIR
- FLOOR HEAT CIRCULATING FAN
- ELECTRIC CONTROL BOX
- CIRCULATING FAN
- COOLING FAN AND CHECK VALVE
- CONTINUOUS LOOP TEMPERATURE SENSOR
- TEMPERATURE CONTROL SENSOR

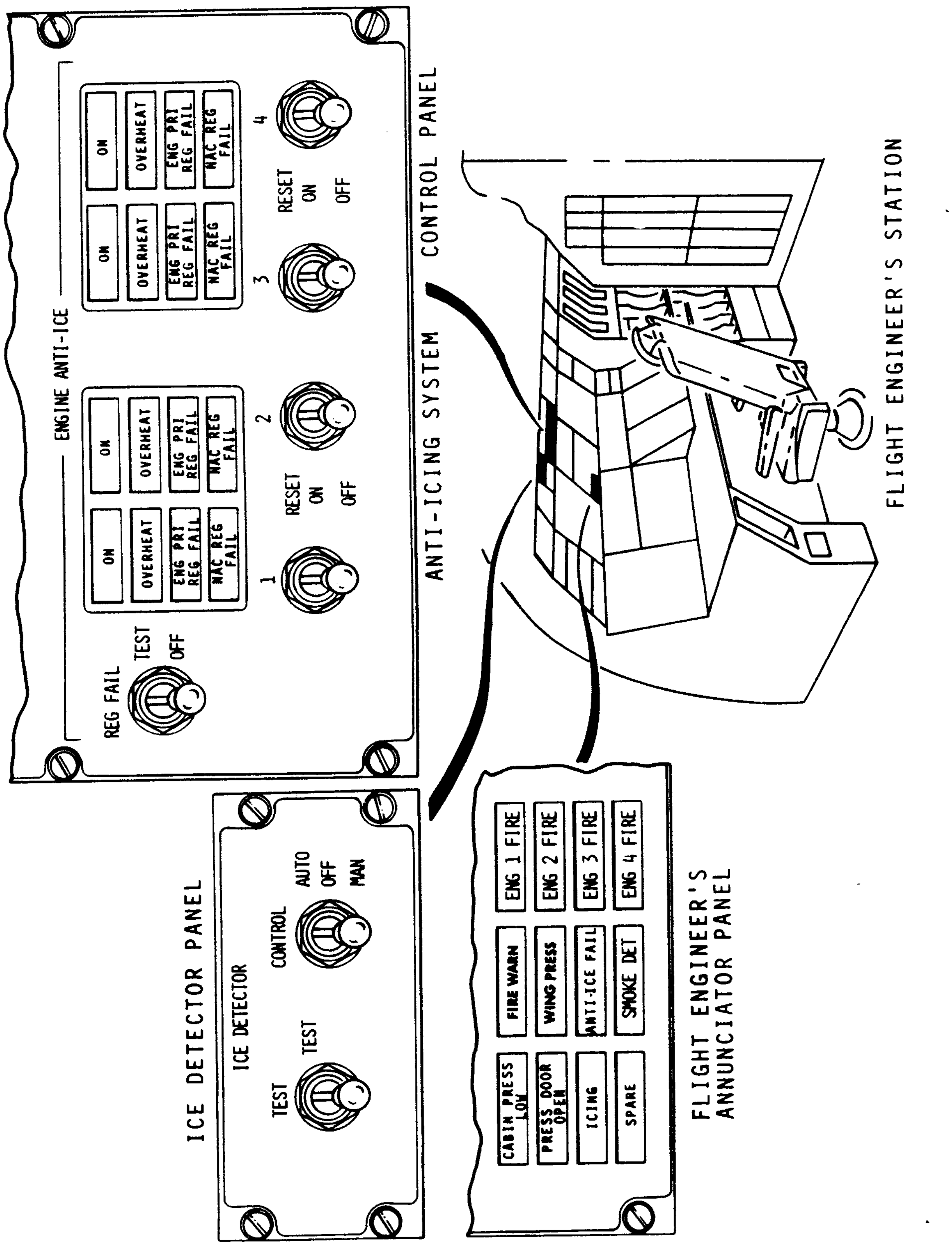
NOTE

1 CONTROL OF THIS VALVE IS ACCOMPLISHED THROUGH THE WHEEL WELL ISO VALVE SWITCH LOCATED AT FUS. STA. 1480 ON THE RIGHT HAND SIDE OF THE CARGO COMPARTMENT.

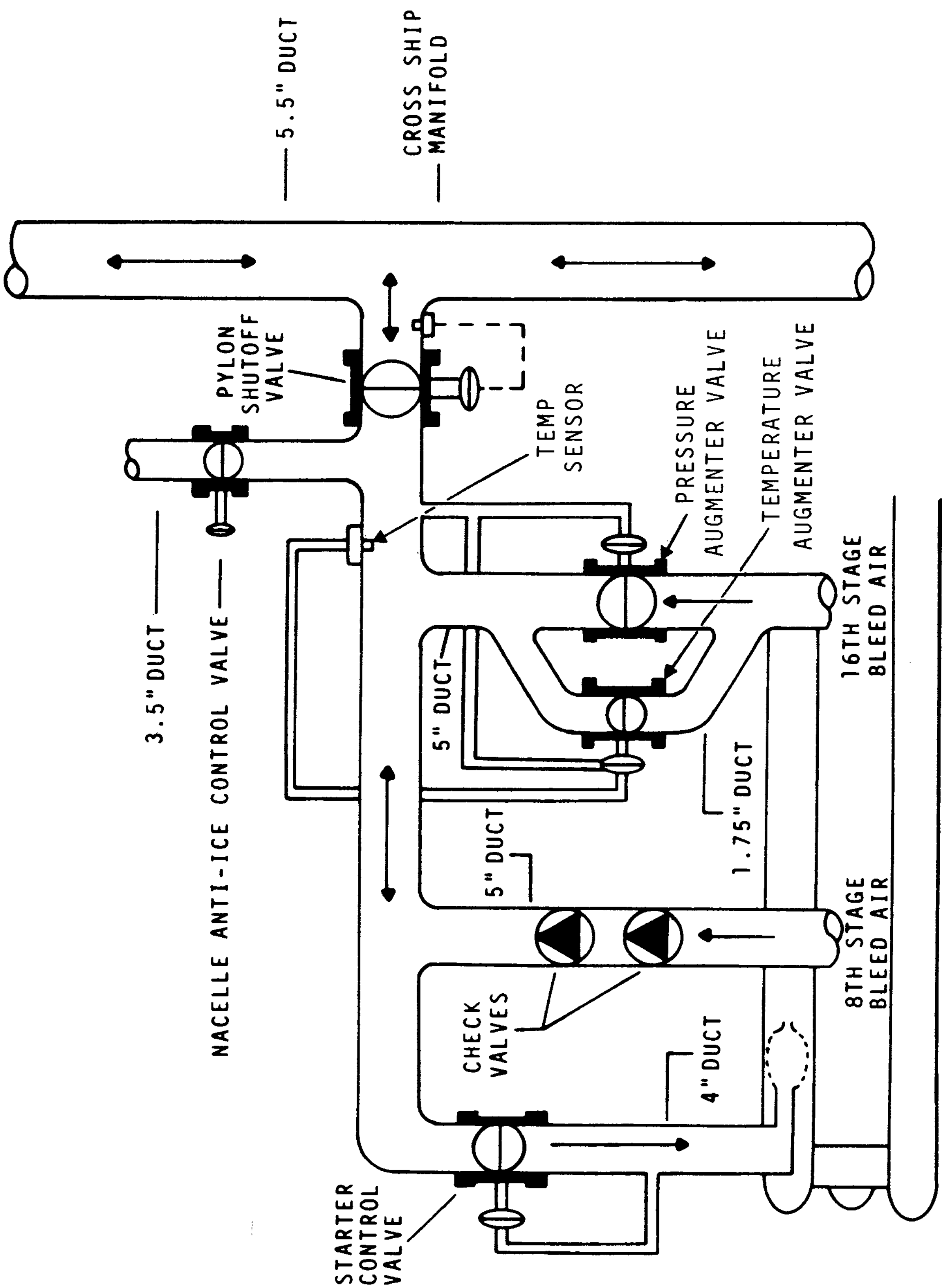
ENVIRONMENTAL SYSTEM (SHEET 3)



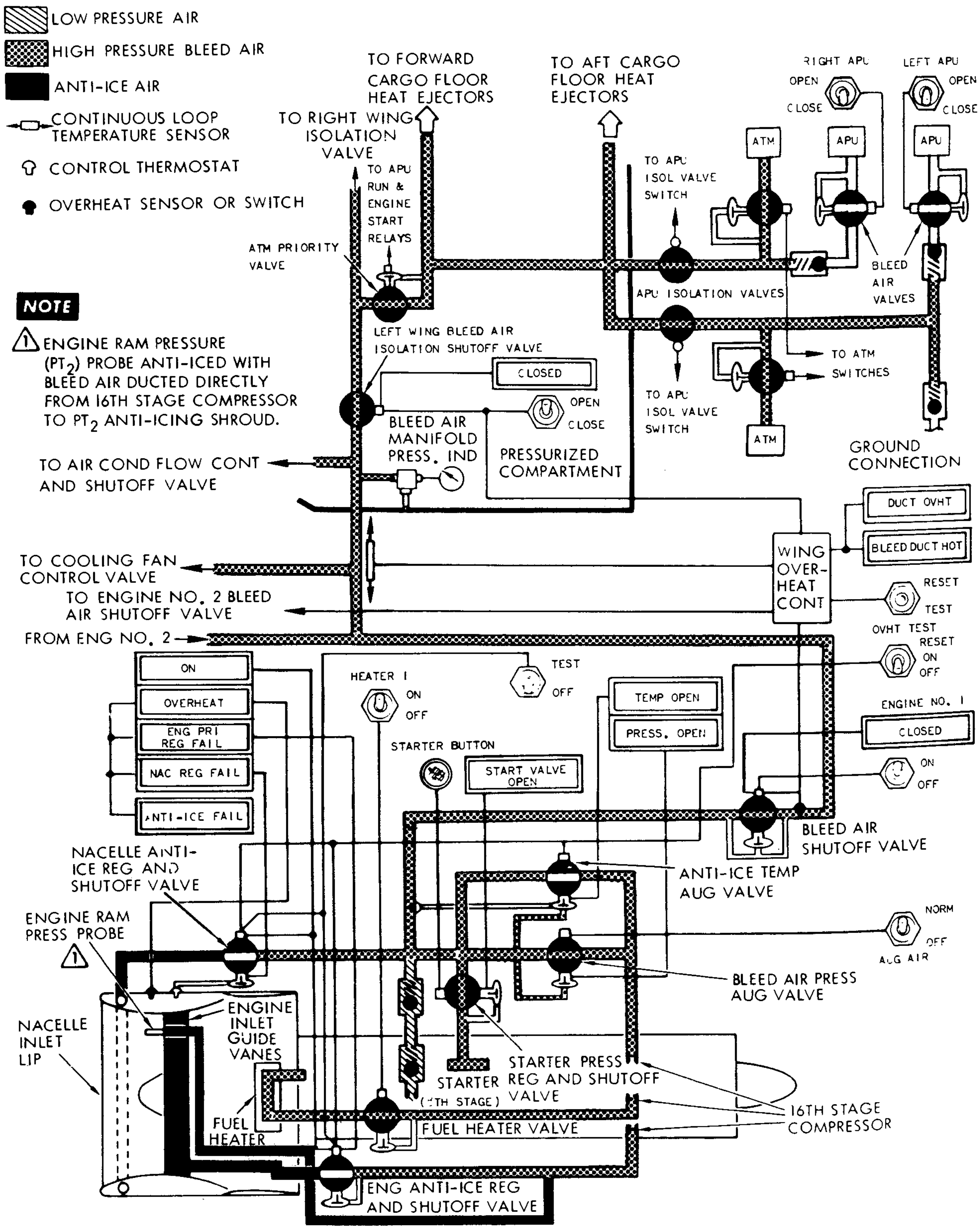
BLEED AIR OVERHEAT DETECTION SYSTEM



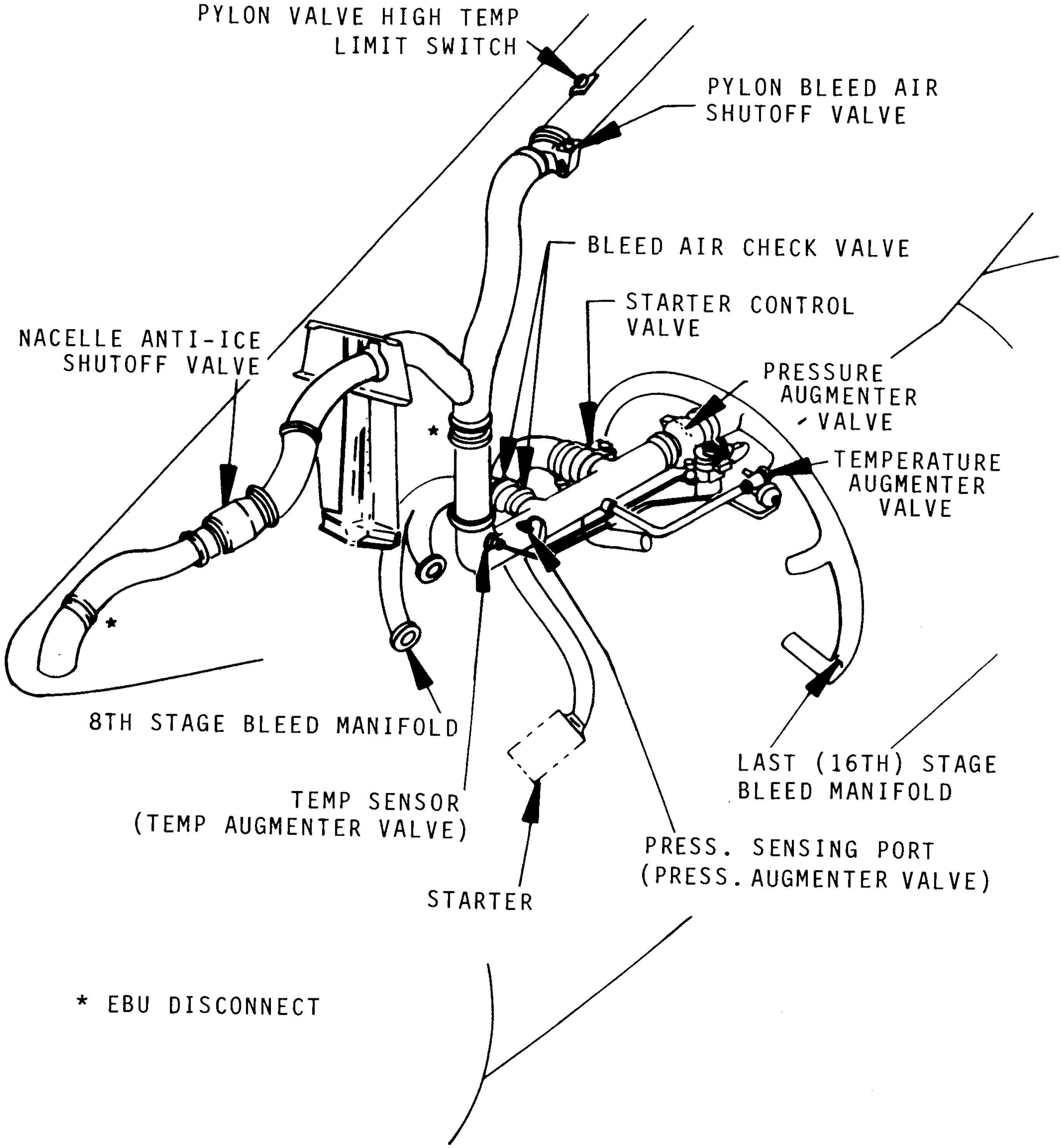
ENGINE ANTI-ICE CONTROL PANEL



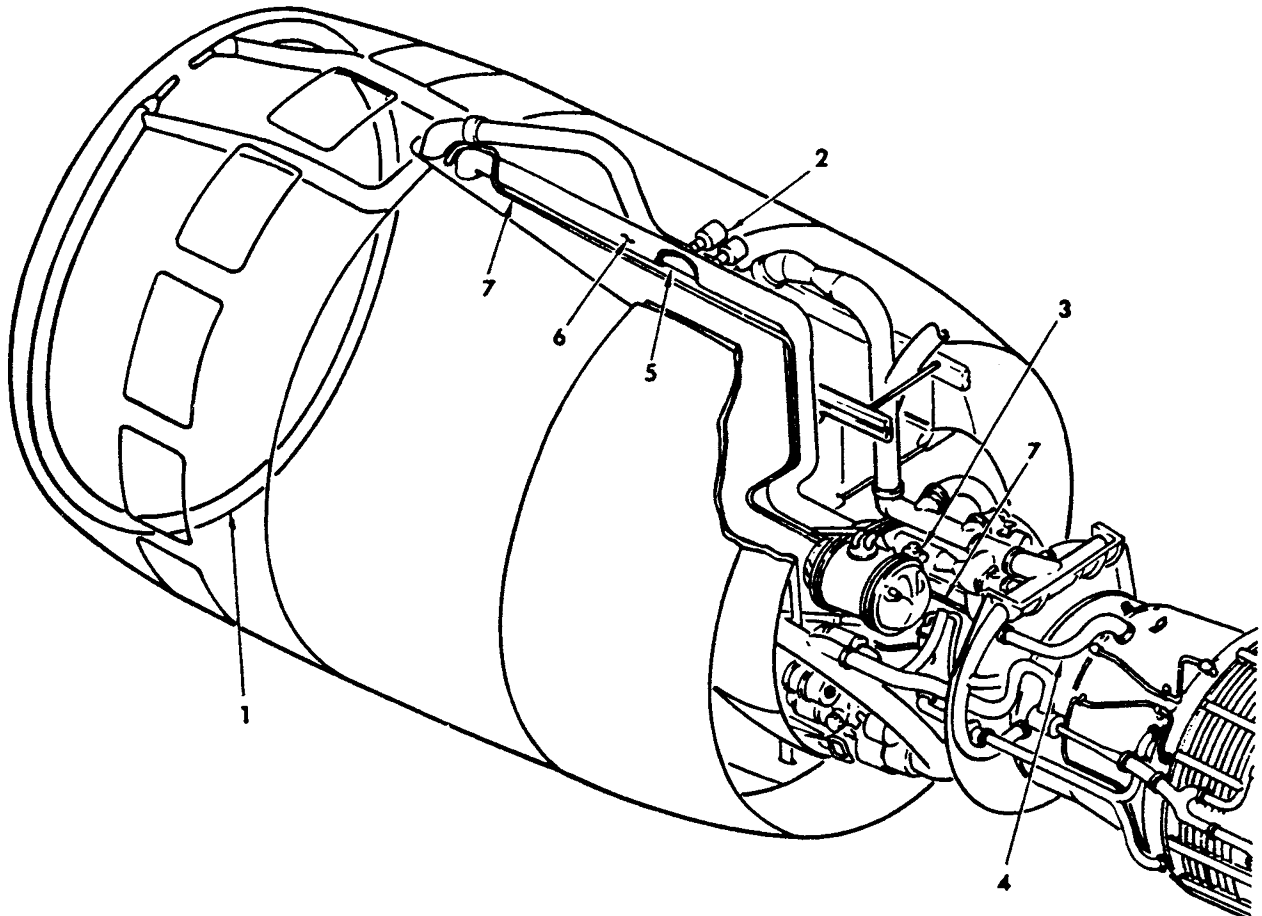
ENGINE BLEED AIR CONTROL SCHEMATIC



ENGINE BLEED AIR & ANTI-ICING SYSTEM SCHEMATIC



ENGINE BLEED AIR CONTROL SYSTEM INSTALLATION



1. INLET COWL ANTI-ICING DUCT
2. INLET COWL ANTI-ICING VALVE
3. ENGINE ANTI-ICING VALVE
4. BLEED AIR DUCT
5. ENGINE ANTI-ICING DUCT
6. INSULATION
7. P_{t2} PROBE ANTI-ICING LINE ⚠1

NOTE

⚠1 ENGINES MODIFIED BY T.O. 2J-TF39-625

ENGINE AND NACELLE ANTI-ICING SYSTEM

COMPONENTS AFFECTED	AIR CONDITIONING MASTER SWITCH POSITION				
	OFF	LEFT	BOTH	RIGHT	AUX VENT
LH FLOW CONT VALVE ⚠1	CLOSED	MODULATING	MODULATING	CLOSED	CLOSED
RH FLOW CONT VALVE ⚠1	CLOSED	CLOSED	MODULATING	MODULATING	CLOSED
LH COOL FAN VALVE	CLOSED	MODULATING BELOW M 0.3 OR WHEN SLATS EXTENDED	MODULATING BELOW M 0.3 OR WHEN SLATS EXTENDED	CLOSED	CLOSED OPEN (GND)
RH COOL FAN VALVE	CLOSED	CLOSED	MODULATING BELOW M 0.3 OR WHEN SLATS EXTENDED	MODULATING BELOW M 0.3 OR WHEN SLATS EXTENDED	CLOSED
FLOOR TEMP CONTROL	AS SELECTED	AS SELECTED	AS SELECTED	AS SELECTED	POWER OFF VALVES CLOSED
LH LOW LIMIT TEMP CONT	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF	POWER OFF
RH LOW LIMIT TEMP CONT	POWER OFF	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF
CARGO COMPT TEMP CONTROL	POWER OFF	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF
FLT STATION TEMP CONTROL	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF	POWER OFF
RELIEF CREW TEMP CONTROL	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF	POWER OFF
TROOP COMPT TEMP CONTROL	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF	POWER OFF
LH COOL AIR TEMP CONT	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF	CONTROLLING (AIR) POWER OFF (GND)
RH COOL AIR TEMP CONT	POWER OFF	POWER OFF	CONTROLLING	CONTROLLING	POWER OFF
RAM AIR VENT VALVE	CLOSED	CLOSED	CLOSED	CLOSED	OPEN
ALTERNATE AIR VALVE	UPPER DECK PORT CLOSED	UPPER DECK PORT CLOSED	UPPER DECK PORT CLOSED	CARGO COMPT PORT CLOSED	BOTH PORTS OPEN
LH COOL AIR EXIT VALVE	OPEN	MODULATING	MODULATING	OPEN	CLOSED (AIR) OPEN (GND)
RH COOL AIR EXIT VALVE	OPEN	OPEN	MODULATING	MODULATING	OPEN

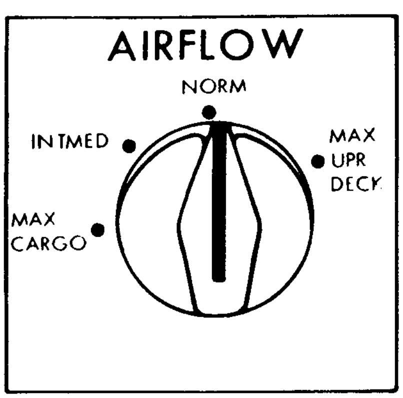
NOTE

⚠1 ON LOW FLOW SCHEDULE BELOW MACH 0.3, WHEN WING SLATS ARE EXTENDED, ON THE GROUND, OR BY FLOW CONTROL SWITCH.

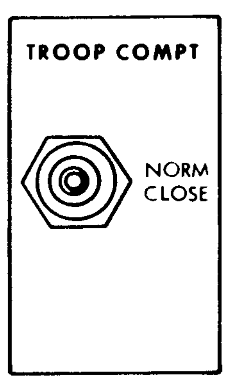
2. THIS CHART ASSUMES THAT ELECTRICAL POWER AND BLEED AIR ARE AVAILABLE TO THE APPROPRIATE COMPONENT.

AIR CONDITIONING MASTER SWITCH POSITION CHART

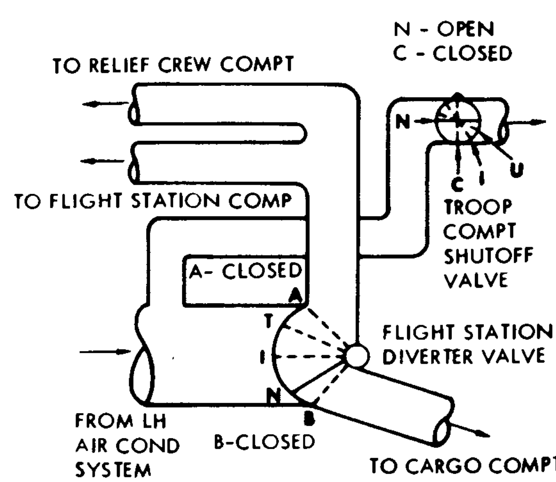
TROOP COMPT SWITCH POSITION	AIRFLOW SELECTOR POSITION	TROOP COMPT SHUTOFF VALVE POSITION	DIVERTER VALVE POSITION	TROOP COMPT TEMP CONT VALVE OPERATION	FLT STA & RELIEF CREW TEMP CONT VALVE OPERATION	PERCENT (±5) FLOW FROM LH AIR CONDITIONING UNIT			
						TROOP COMPT	FLIGHT STATION	RELIEF CREW	CARGO COMPT
NORM	NORMAL (N)	N	N	MANUAL OR AUTO	MANUAL OR AUTO	44.6%	20%	20%	15.4%
	INTMED	I	I	MANUAL OR AUTO	MANUAL OR AUTO	27%	20%	20%	33%
	MAX UPR DECK	U	B	MANUAL OR AUTO	MANUAL OR AUTO	44.6%	27.7%	27.7%	0
	MAX CARGO (C)	C	A	MANUAL ONLY	CLOSED	0	0	0	100%
CLOSE	NORMAL (N)	C	T	CLOSED	MANUAL OR AUTO	0	20%	20%	60%
	INTMED (I)	C	I	CLOSED	MANUAL OR AUTO	0	27.4%	27.4%	45.2%
	MAX UPR DECK	C	B	CLOSED	MANUAL OR AUTO	0	50%	50%	0
	MAX CARGO (C)	C	A	MANUAL ONLY	CLOSED	0	0	0	100%



DIVERTER VALVE SELECTOR



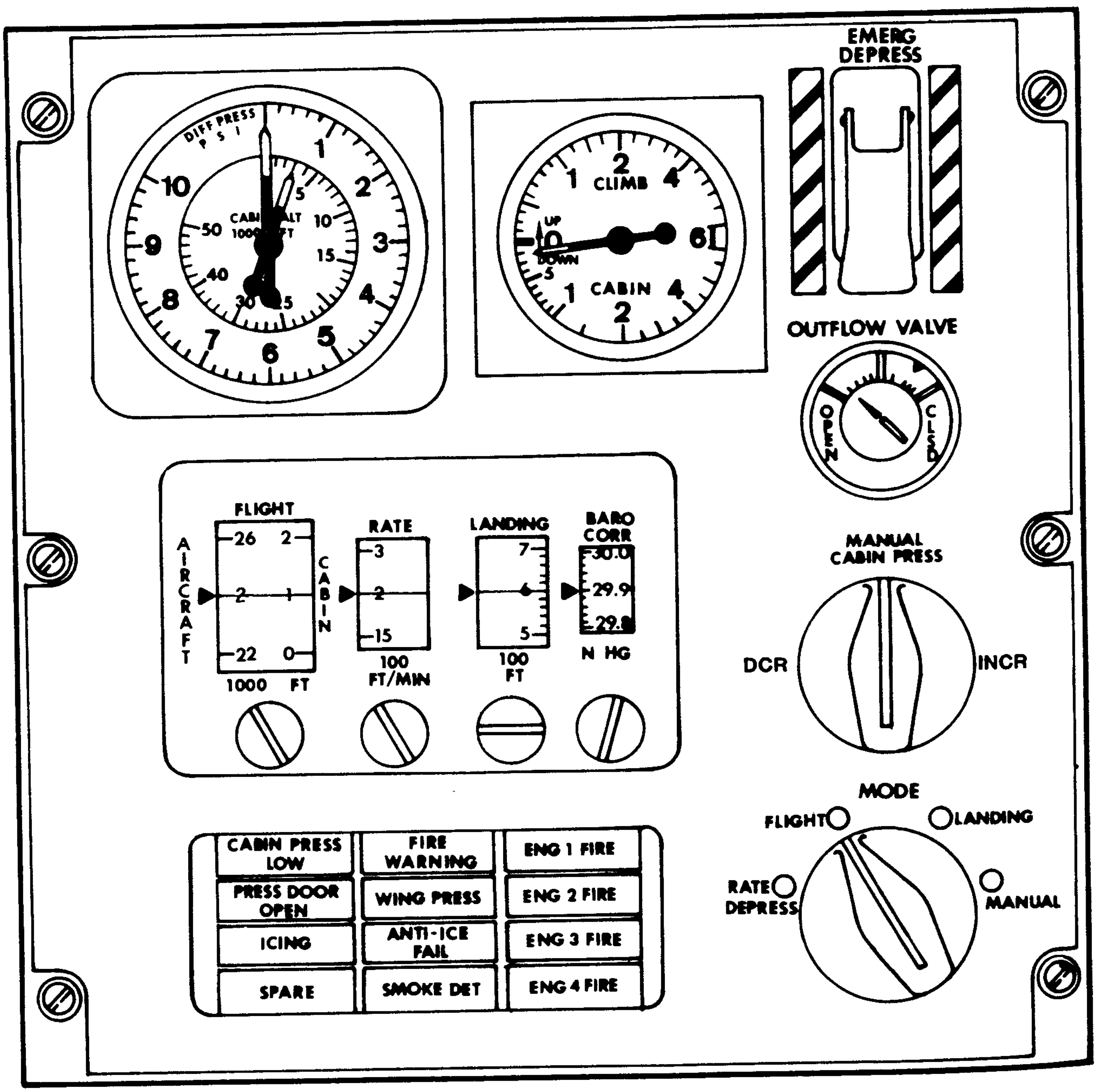
TROOP COMPT SWITCH



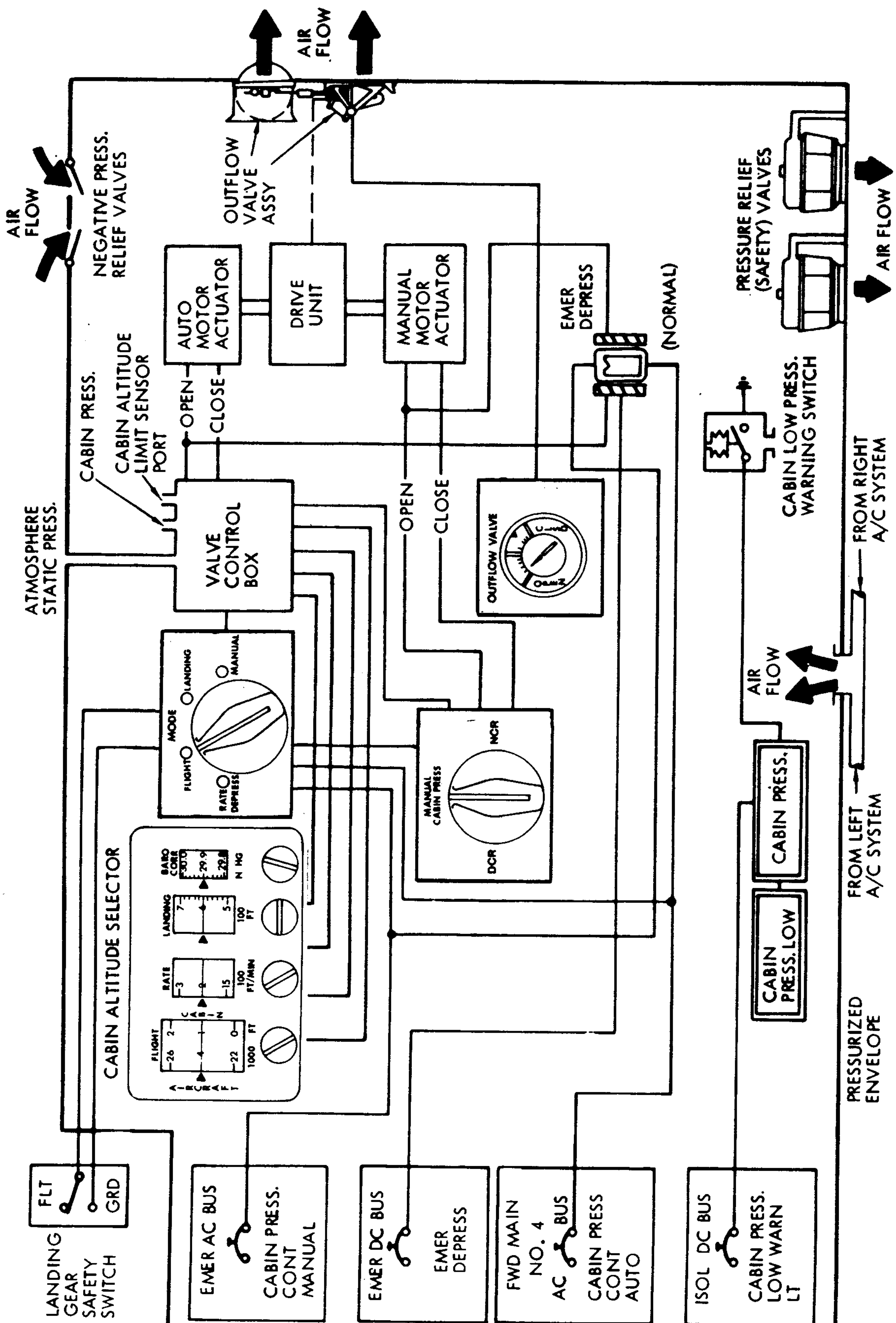
AIR CONDITIONING AIRFLOW SELECTOR CHART

AIR COND MASTER SELECTION SWITCH POSITIONS	SLATS EXTENDED (IN FLIGHT)		CENTRAL AIR DATA COMPUTER (C.A.D.C)				TOUCH DOWN PROXIMITY SWITCHES (ON GROUND)	
			< MACH 0.3		> MACH 0.3			
	LEFT FAN	RIGHT FAN	LEFT FAN	RIGHT FAN	LEFT FAN	RIGHT FAN	LEFT FAN	RIGHT FAN
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
LEFT	ON	OFF	ON	OFF	OFF	OFF	ON	OFF
BOTH	ON	ON	ON	ON	OFF	OFF	ON	ON
RIGHT	OFF	ON	OFF	ON	OFF	OFF	OFF	ON
AUX VENT	FLT: OFF; GRD: ON	FLT: OFF; GRD: OFF	FLT: OFF	GRD: OFF	OFF	OFF	ON	OFF

OPERATION OF COOLING AIR FAN CONTROL VALVE



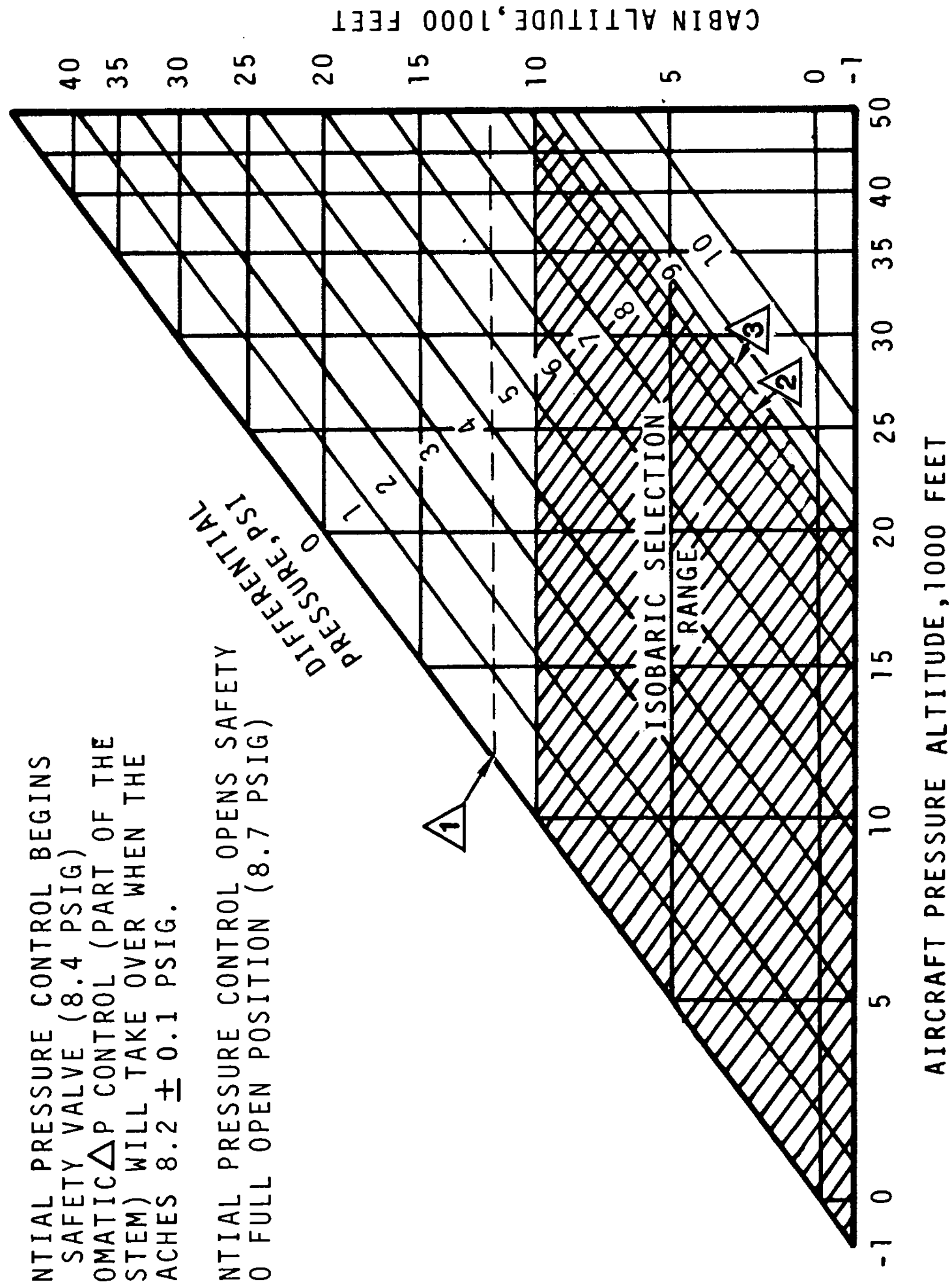
CABIN PRESSURIZATION CONTROL



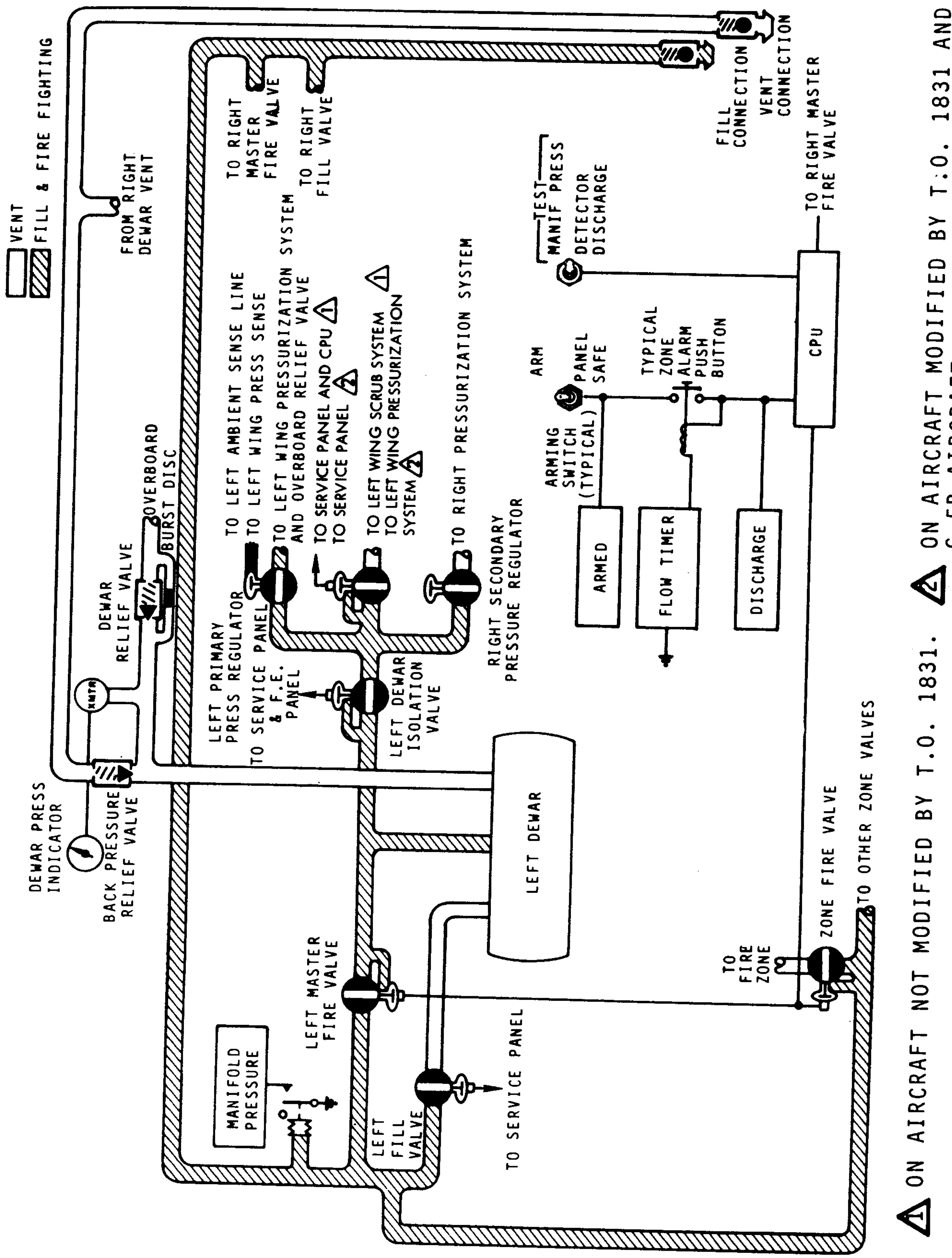
CABIN PRESSURE CONTROL SYSTEM SCHEMATIC

NOTE

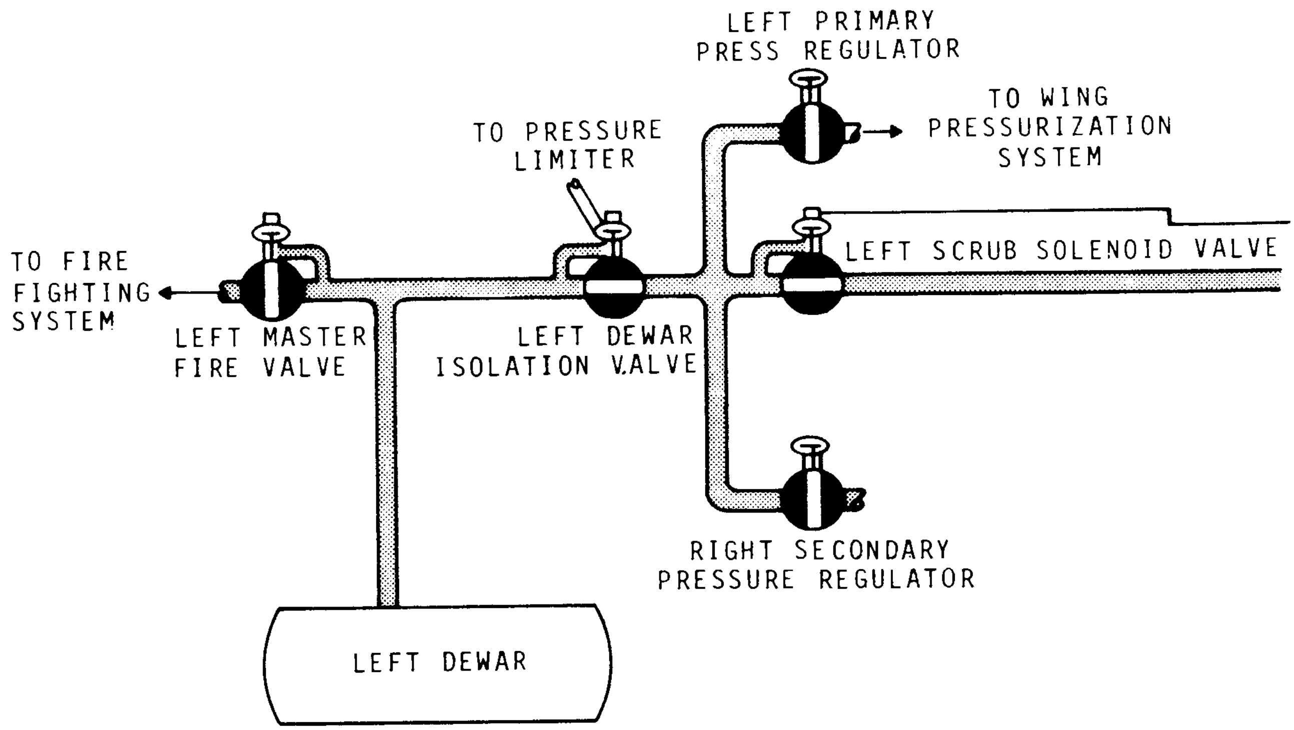
1. CABIN ALTITUDE LIMIT CONTROL
2. DIFFERENTIAL PRESSURE CONTROL BEGINS OPENING SAFETY VALVE (8.4 PSIG) THE AUTOMATIC ΔP CONTROL (PART OF THE AUTO SYSTEM) WILL TAKE OVER WHEN THE ΔP REACHES 8.2 $\pm$ 0.1 PSIG.
3. DIFFERENTIAL PRESSURE CONTROL OPENS SAFETY VALVE TO FULL OPEN POSITION (8.7 PSIG)

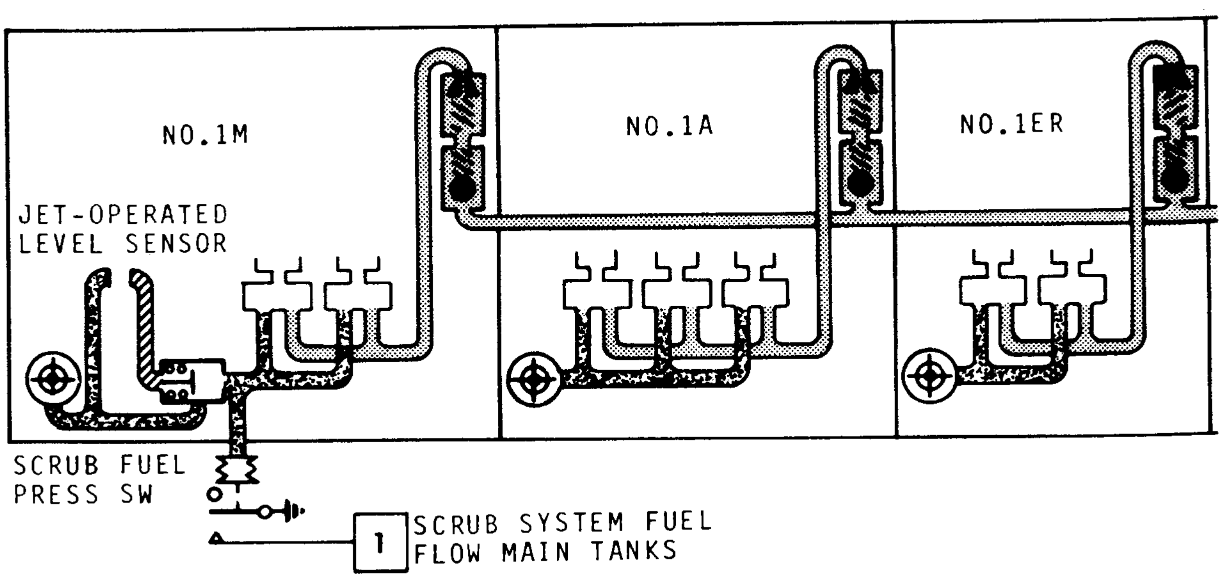


CABIN PRESSURE ALTITUDE CHART

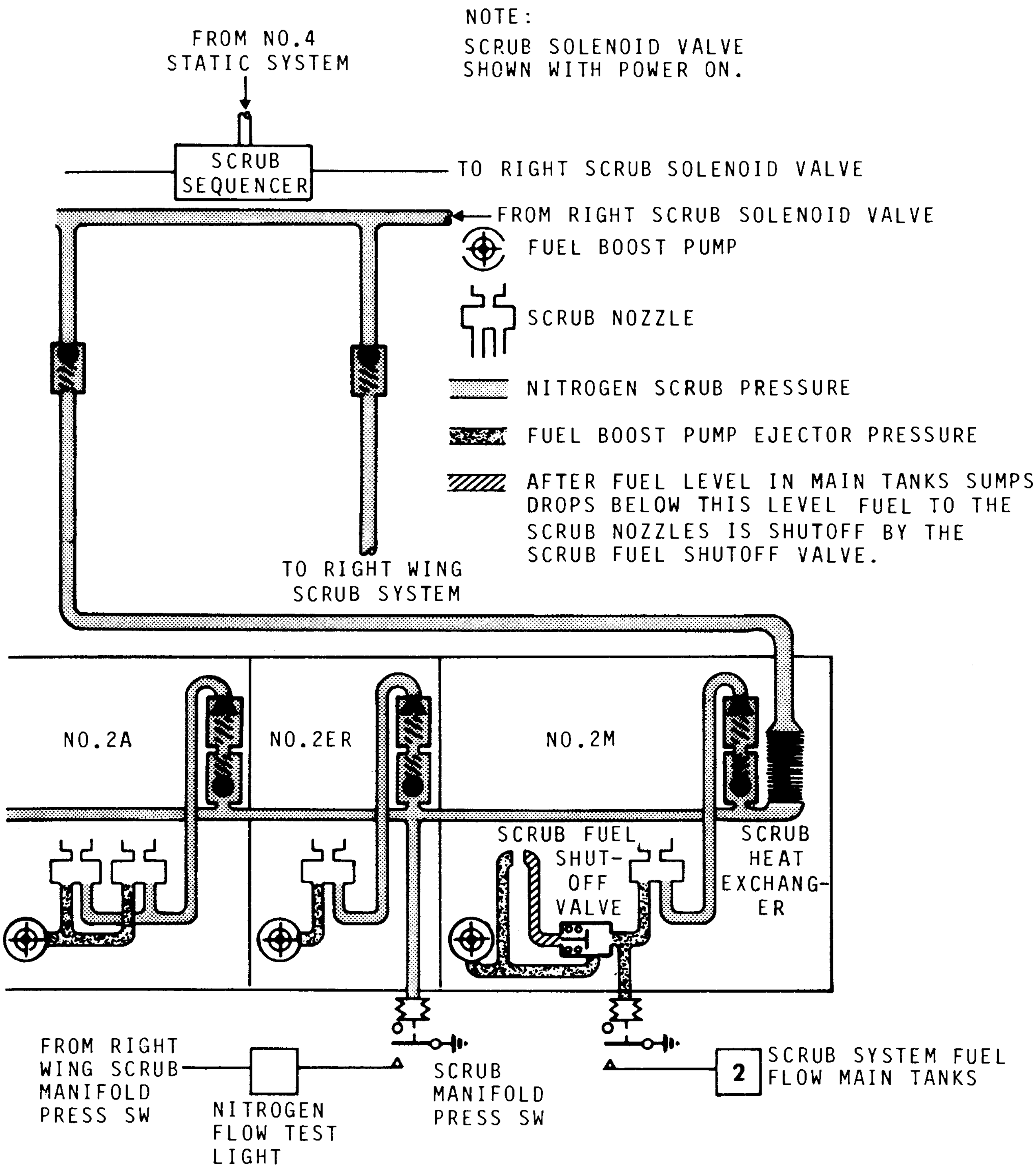


FIRE SUPPRESSION SYSTEM - FSS



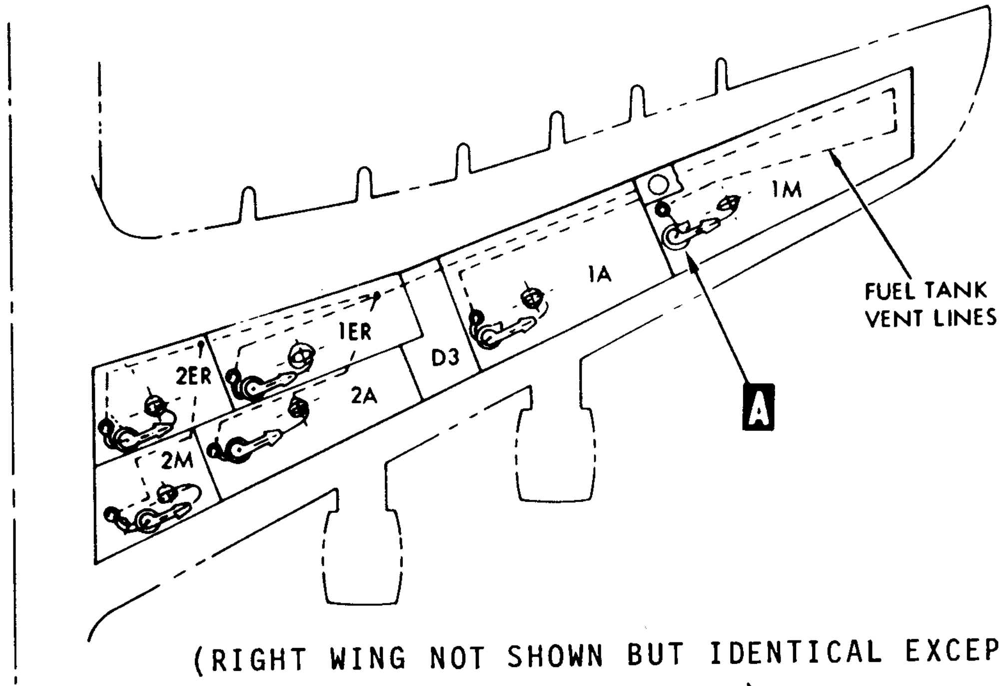


FSS - LEFT WING SCRUB SYSTEM SCHEMATIC (SHEET 1)



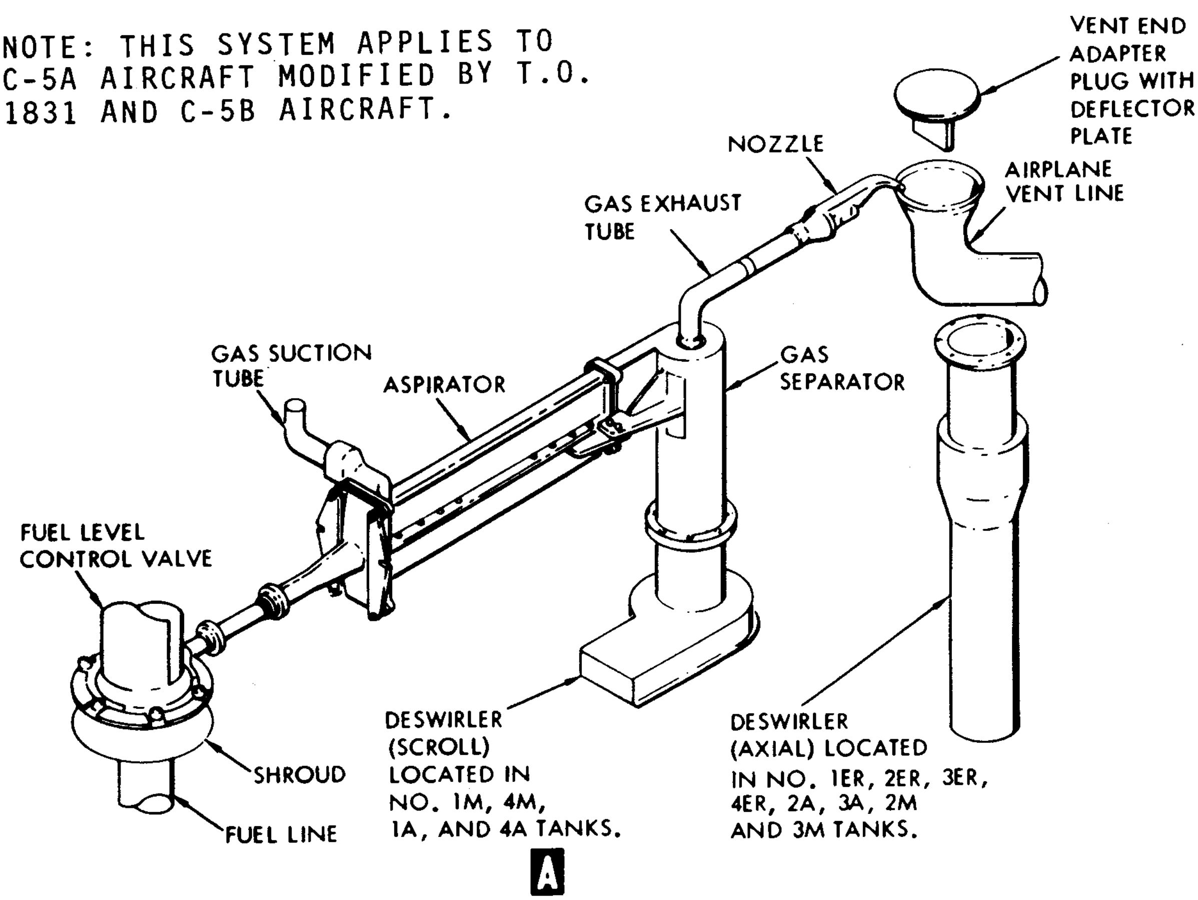
NOTE: THIS SYSTEM APPLIES ON AIRPLANES NOT MODIFIED BY T.O. 1831

FSS – LEFT WING SCRUB SYSTEM SCHEMATIC (SHEET 2)

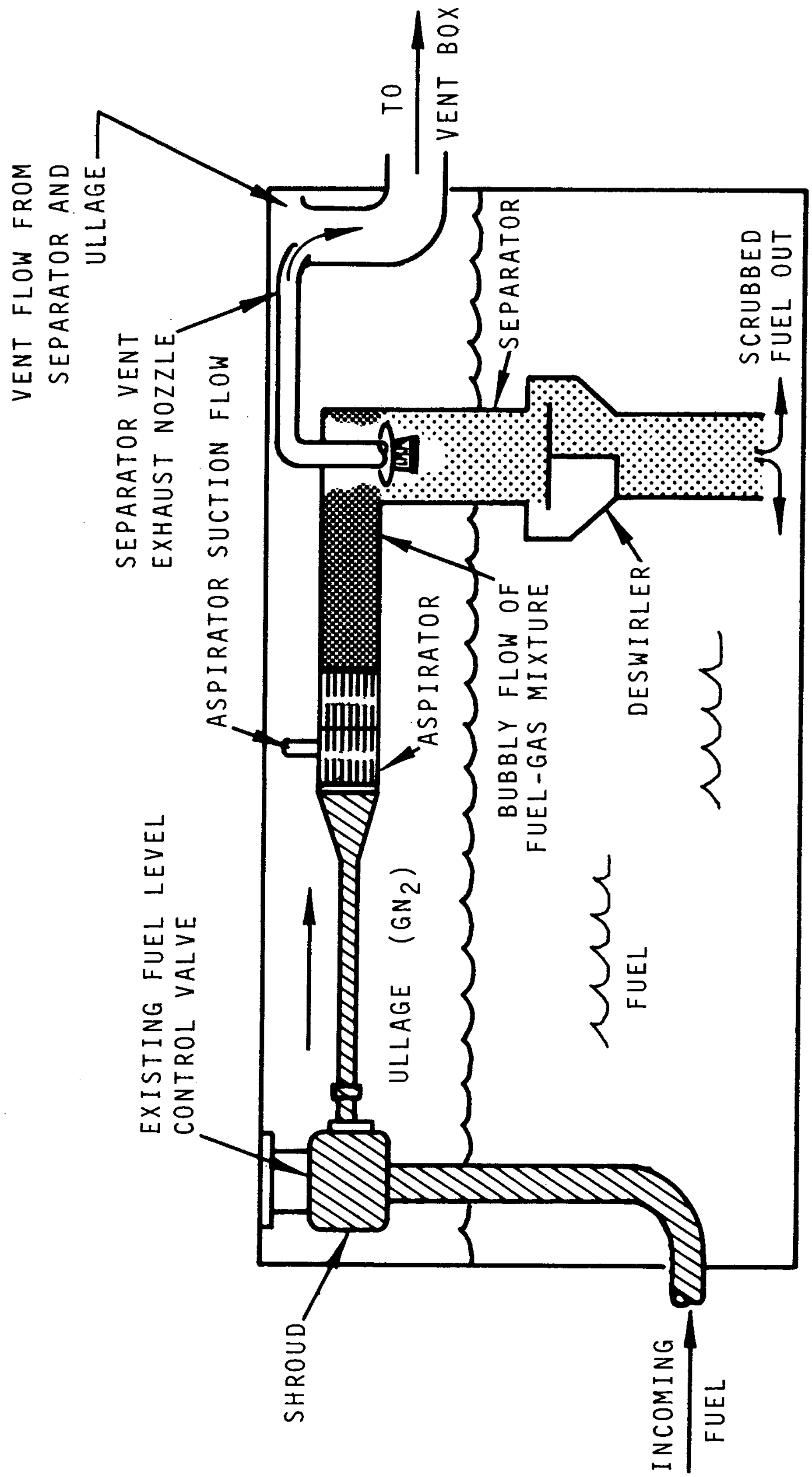


(RIGHT WING NOT SHOWN BUT IDENTICAL EXCEPT FOR TANK NUMBERS)

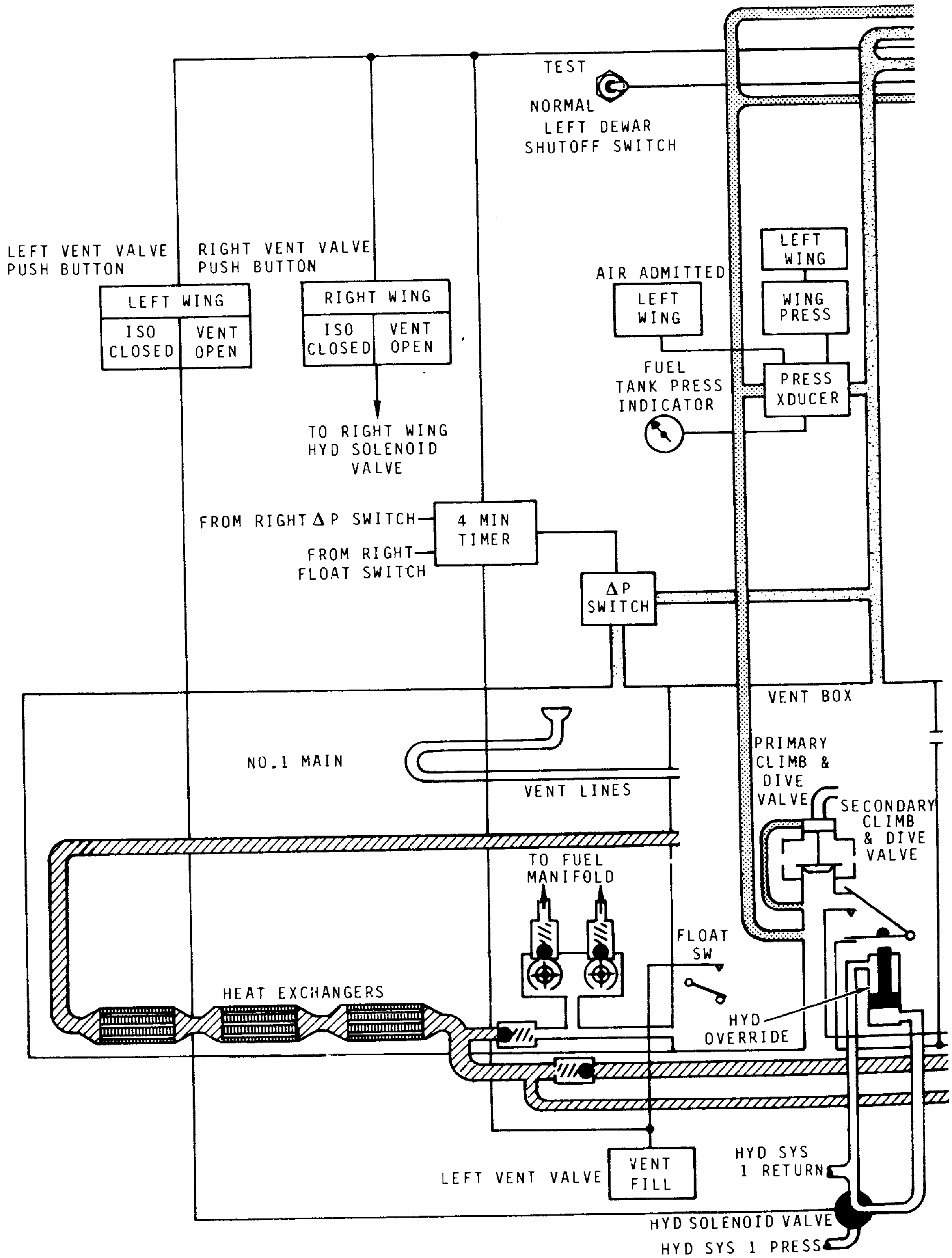
NOTE: THIS SYSTEM APPLIES TO C-5A AIRCRAFT MODIFIED BY T.O. 1831 AND C-5B AIRCRAFT.



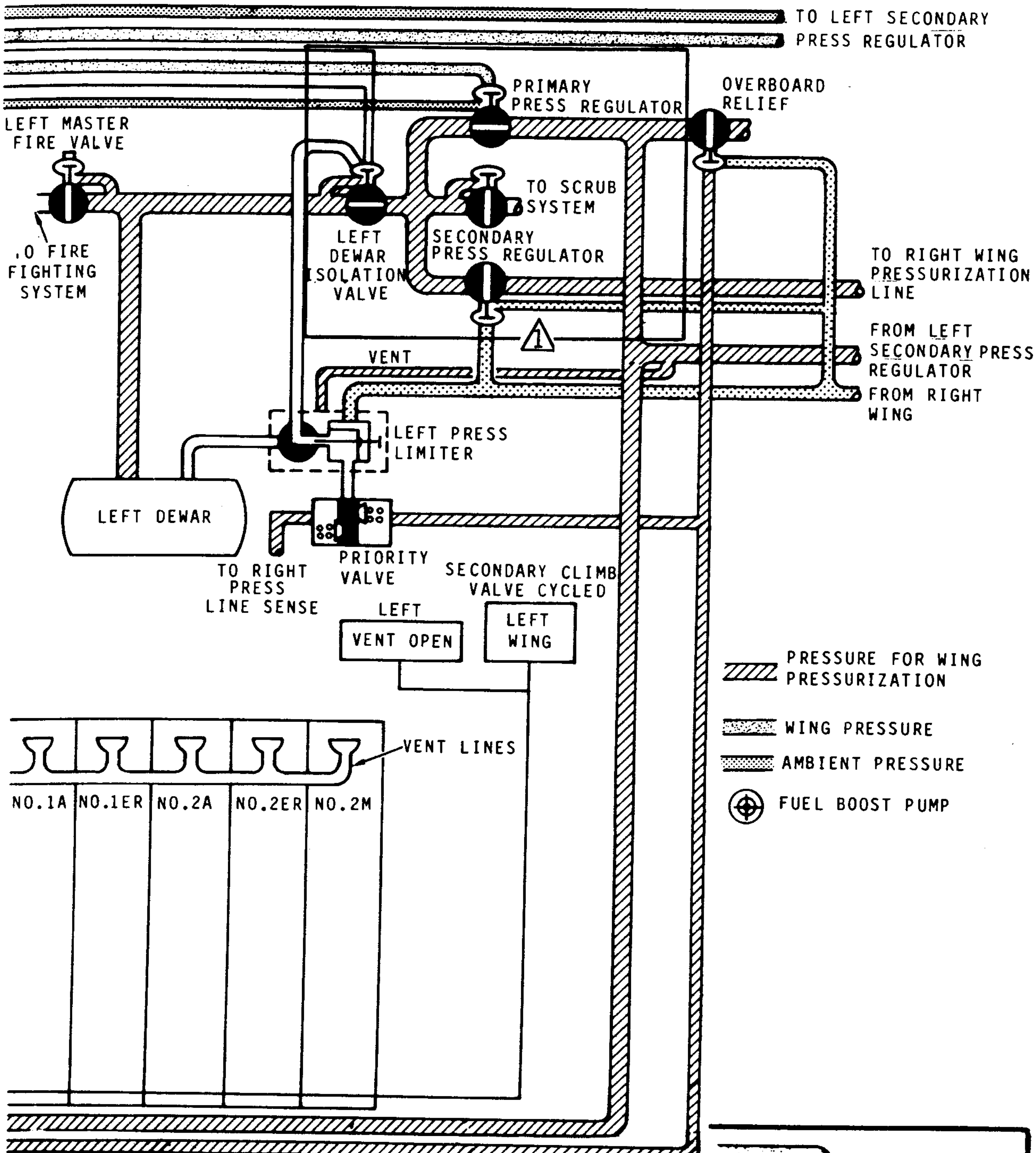
FSS - LEFT WING SCRUB SYSTEM



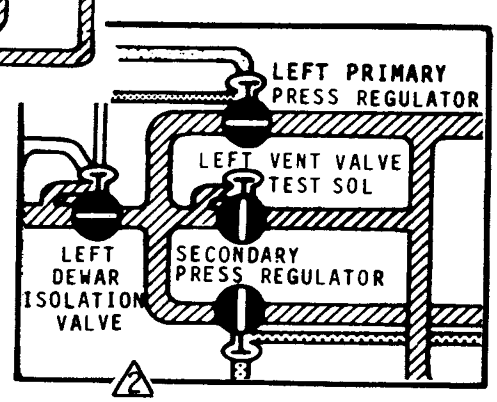
FSS - SEPARATOR ASPI SCRUBBING SCHEMATIC



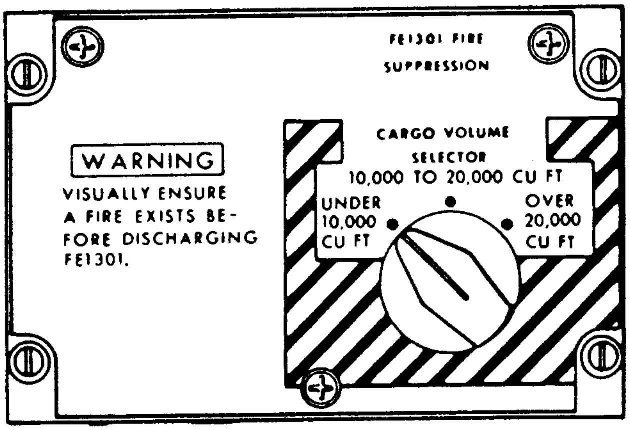
FSS - LEFT WING PRESSURIZATION SYSTEM (SHEET 1)



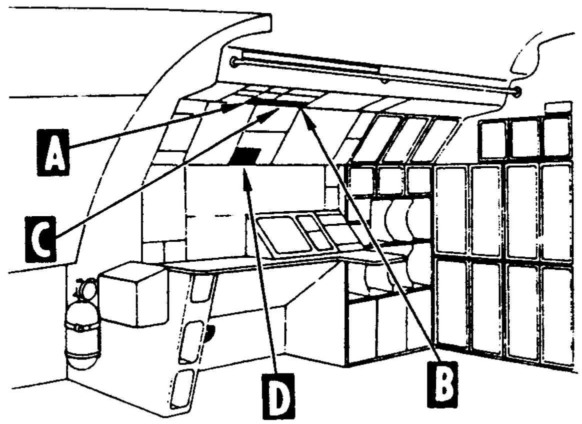
1. ON AIRPLANES NOT MODIFIED BY T.O. 1831
2. ON AIRPLANES MODIFIED BY T.O. 1831 AND C-5B AIRCRAFT.
3. SCRUB SOLINOID VALVE SHOWN WITH POWER ON.
4. THE ONLY TIME THAT THE REMOTE DEWAR ISOLATION SWITCHES TURN ON THE ISO CLOSED LIGHTS IS WHEN BOTH SWITCHES ARE PLACED TO TEST.



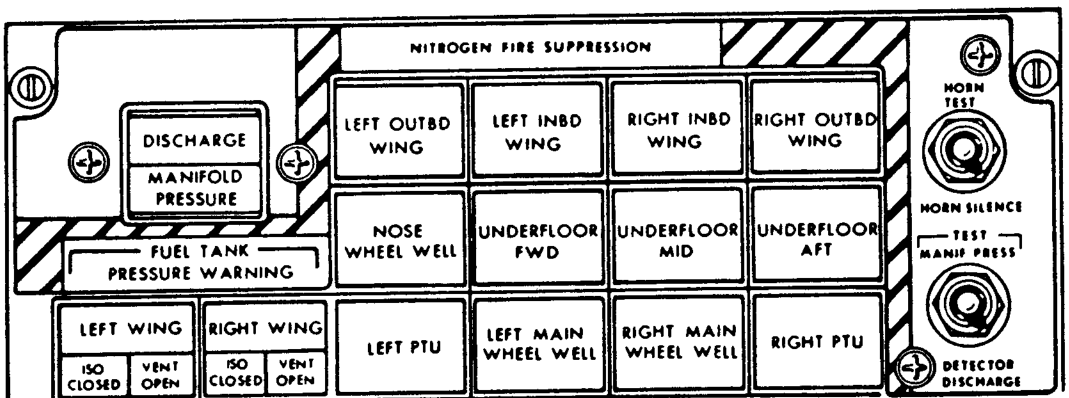
FSS - LEFT WING PRESSURIZATION SYSTEM (SHEET 2)



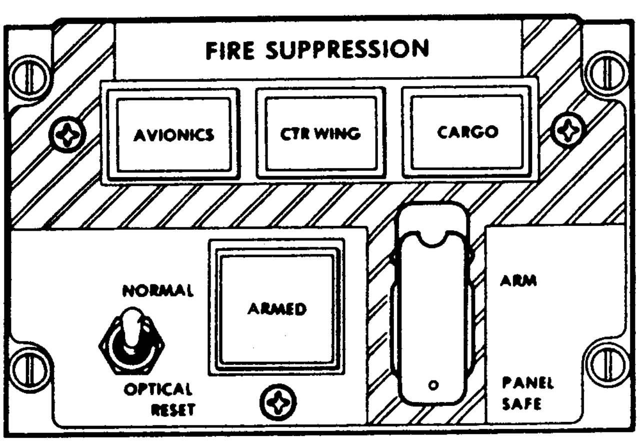
A [A]
FE1301 FIRE SUPPRESSION CONTROL PANEL



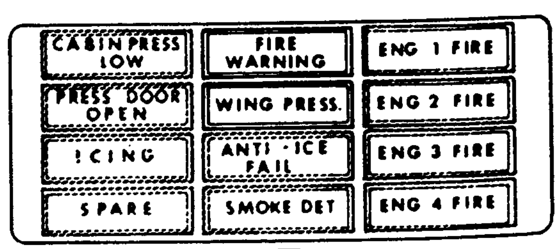
FLIGHT ENGINEER'S STATION



B
NITROGEN FIRE SUPPRESSION CONTROL AND INDICATOR PANEL

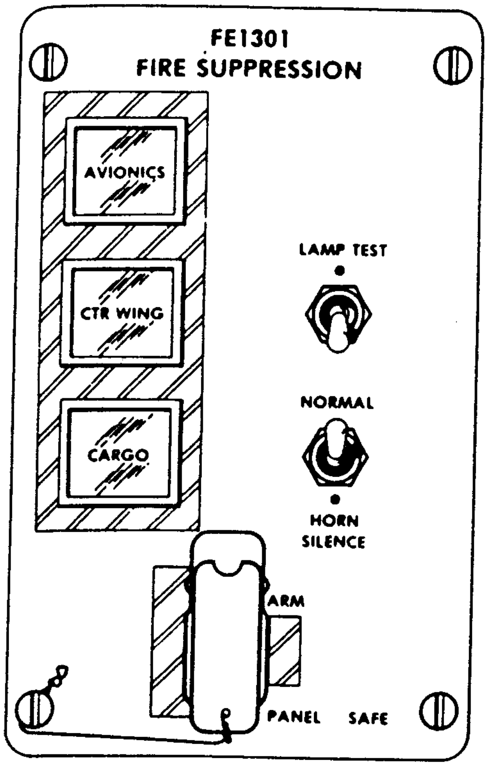


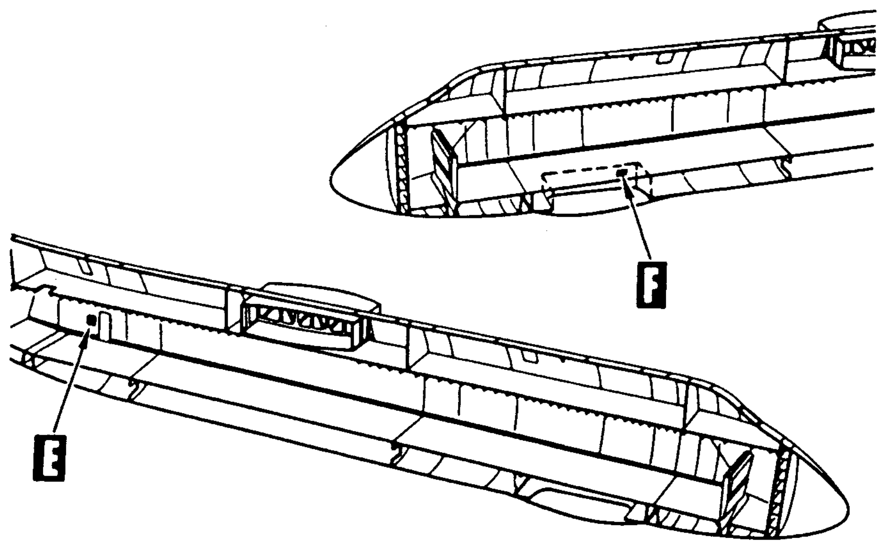
C
FIRE SUPPRESSION CONTROL AND INDICATOR PANEL



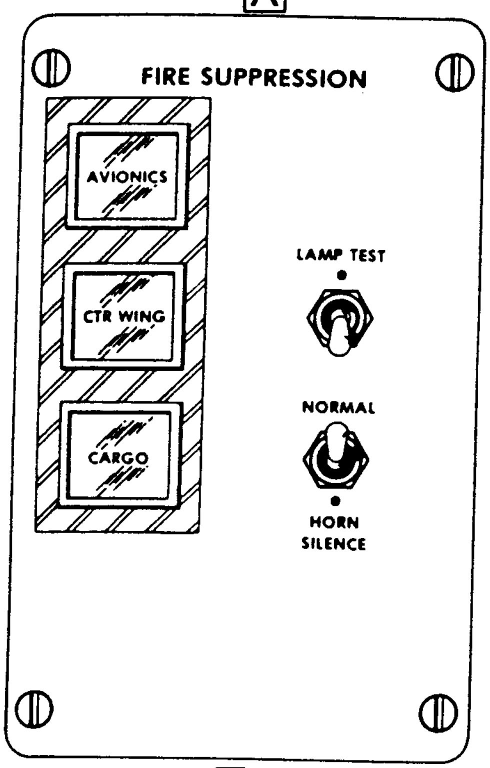
D
FLIGHT ENGINEER'S ANNUNCIATOR PANEL

FSS CONTROL & INDICATOR PANELS (SHEET 1)



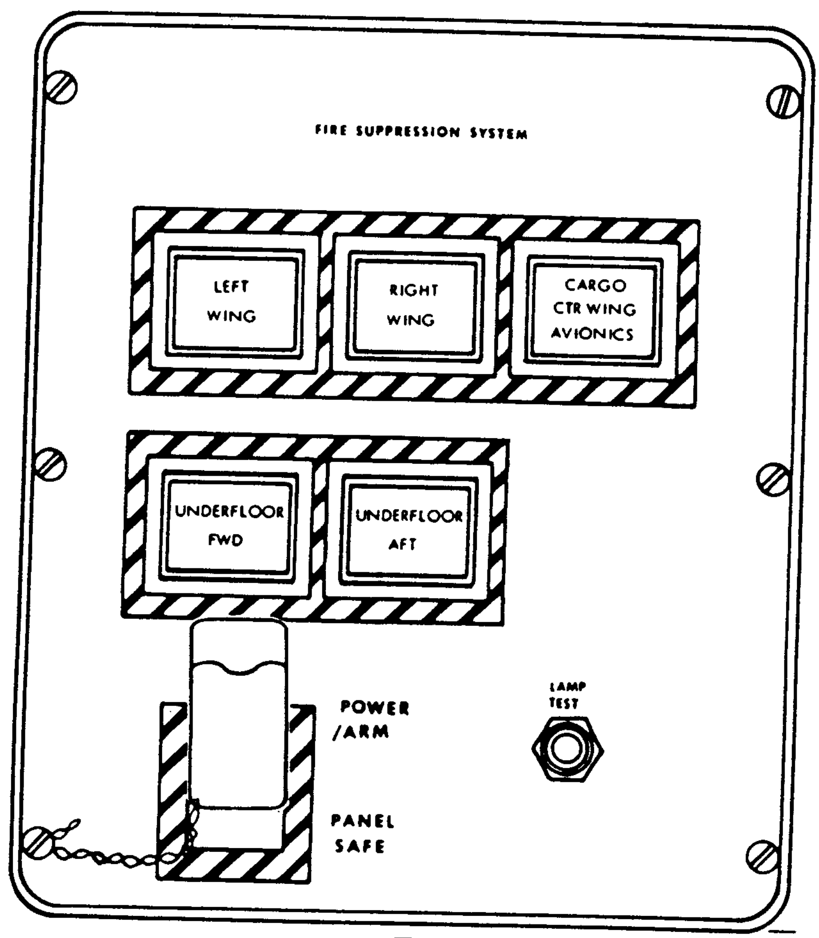


E A



E B

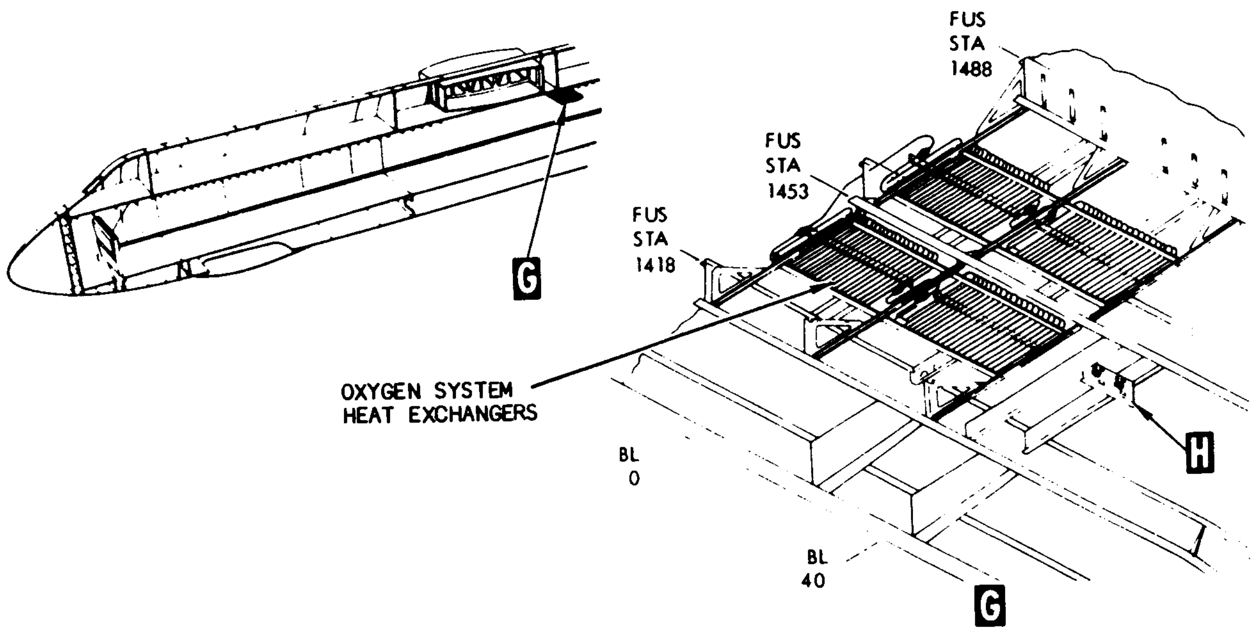
CARGO COMPARTMENT FIRE SUPPRESSION CONTROL AND INDICATOR PANEL



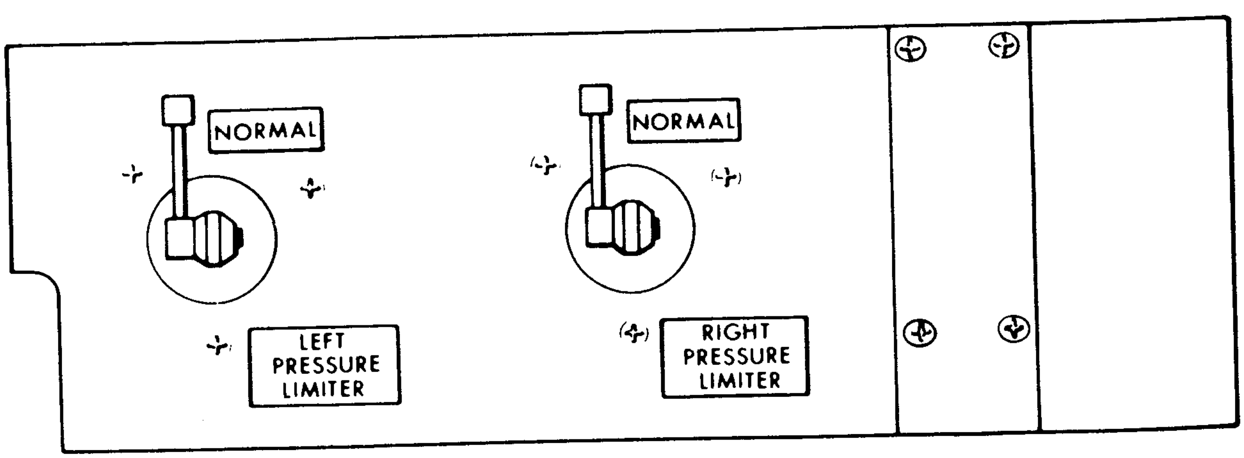
F

NOSE WHEEL WELL NITROGEN AND FIRE SUPPRESSION CONTROL AND INDICATOR PANEL

FSS CONTROL & INDICATOR PANELS (SHEET 2)



VIEW LOOKING UP, FORWARD AND OUTBOARD (RIGHT HAND SIDE)

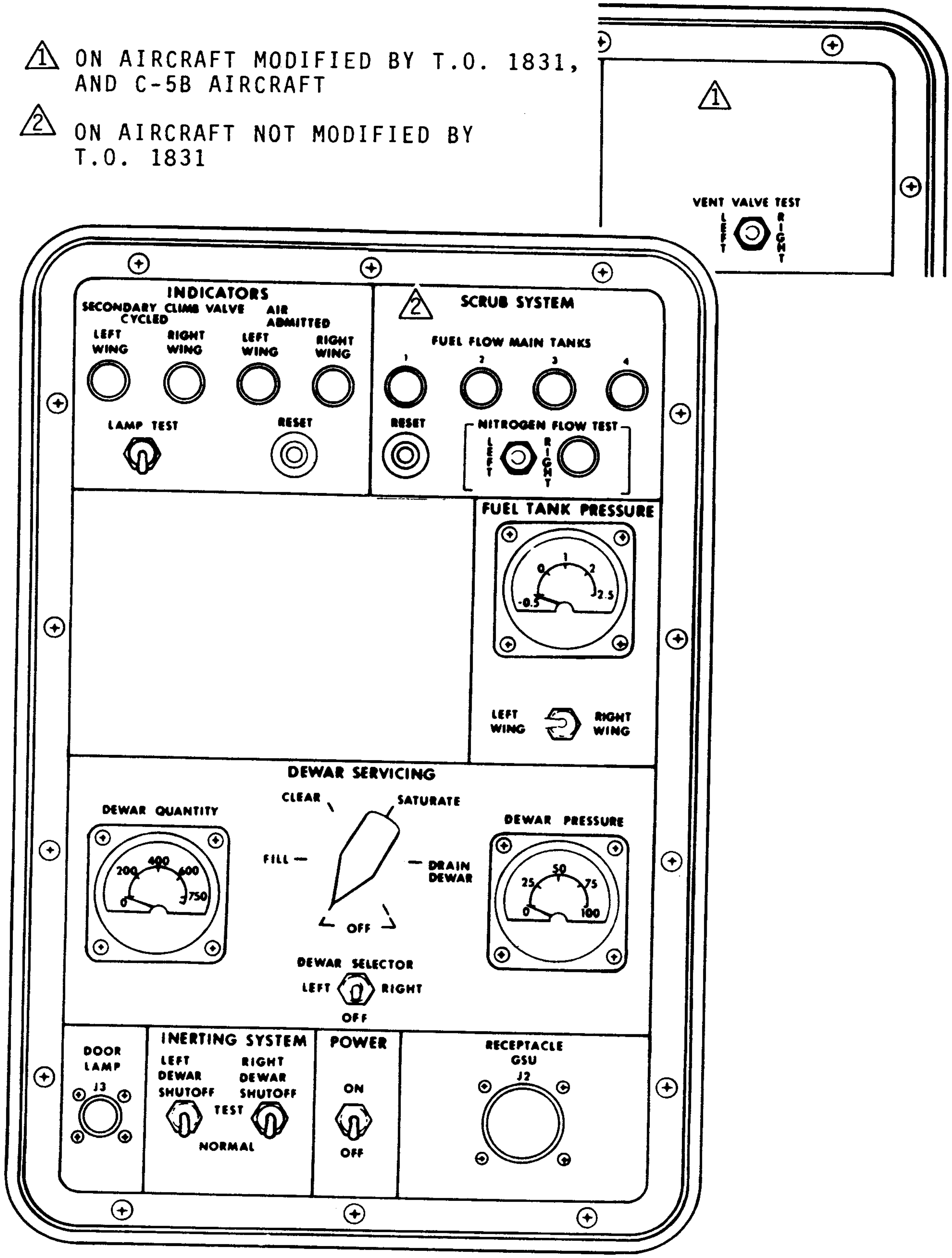


H
PRESSURE LIMITER PANEL

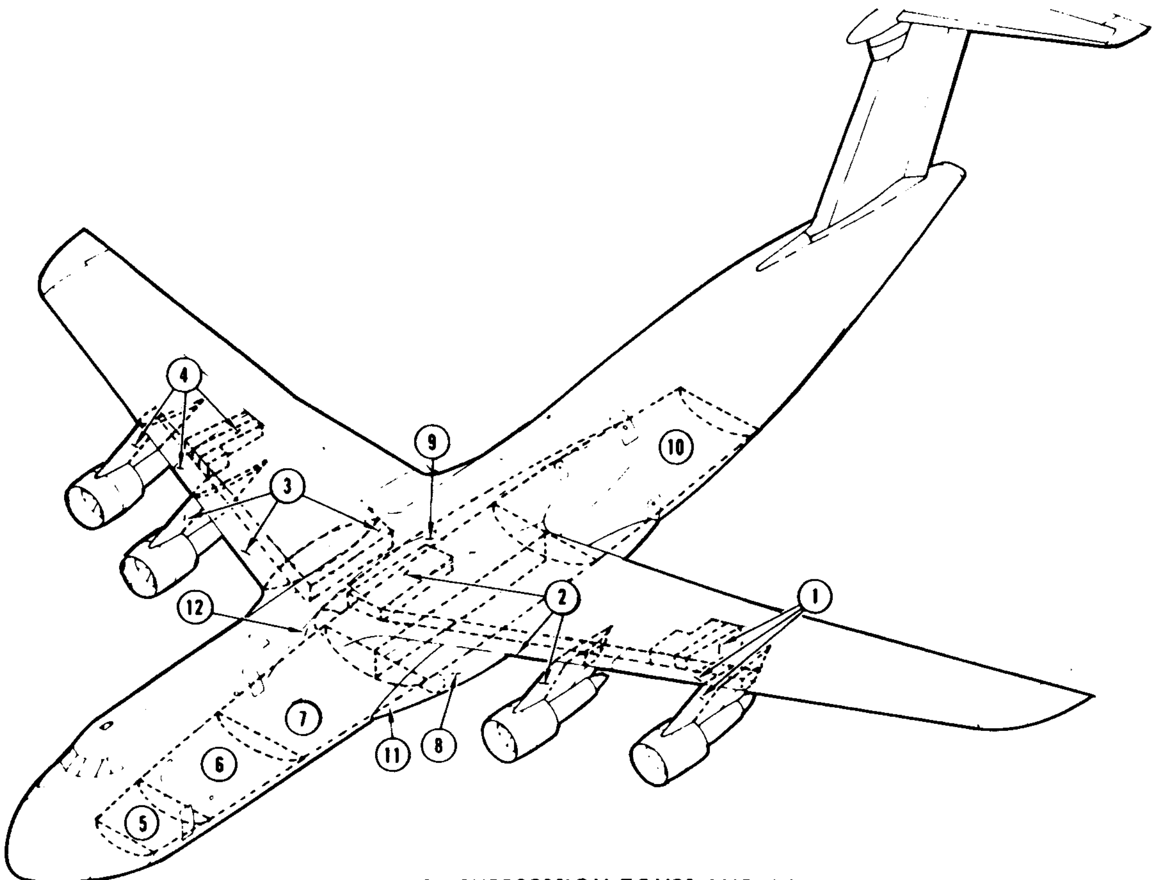
FSS CONTROL & INDICATOR PANELS (SHEET 3)

△1 ON AIRCRAFT MODIFIED BY T.O. 1831, AND C-5B AIRCRAFT

△2 ON AIRCRAFT NOT MODIFIED BY T.O. 1831



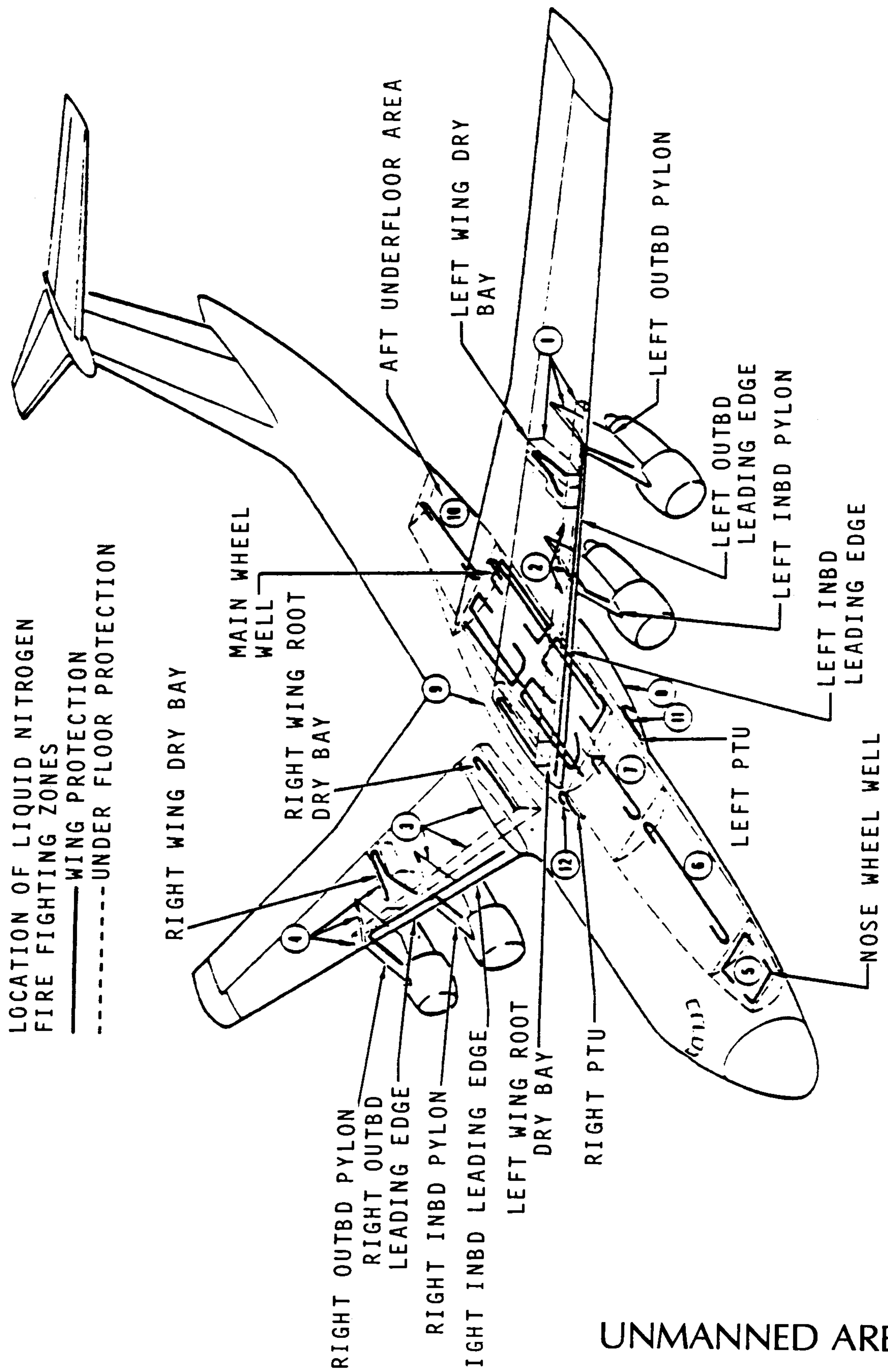
FSS CONTROL & INDICATOR PANELS (SHEET 4)



NITROGEN FIRE SUPPRESSION ZONES AND CONTROLS

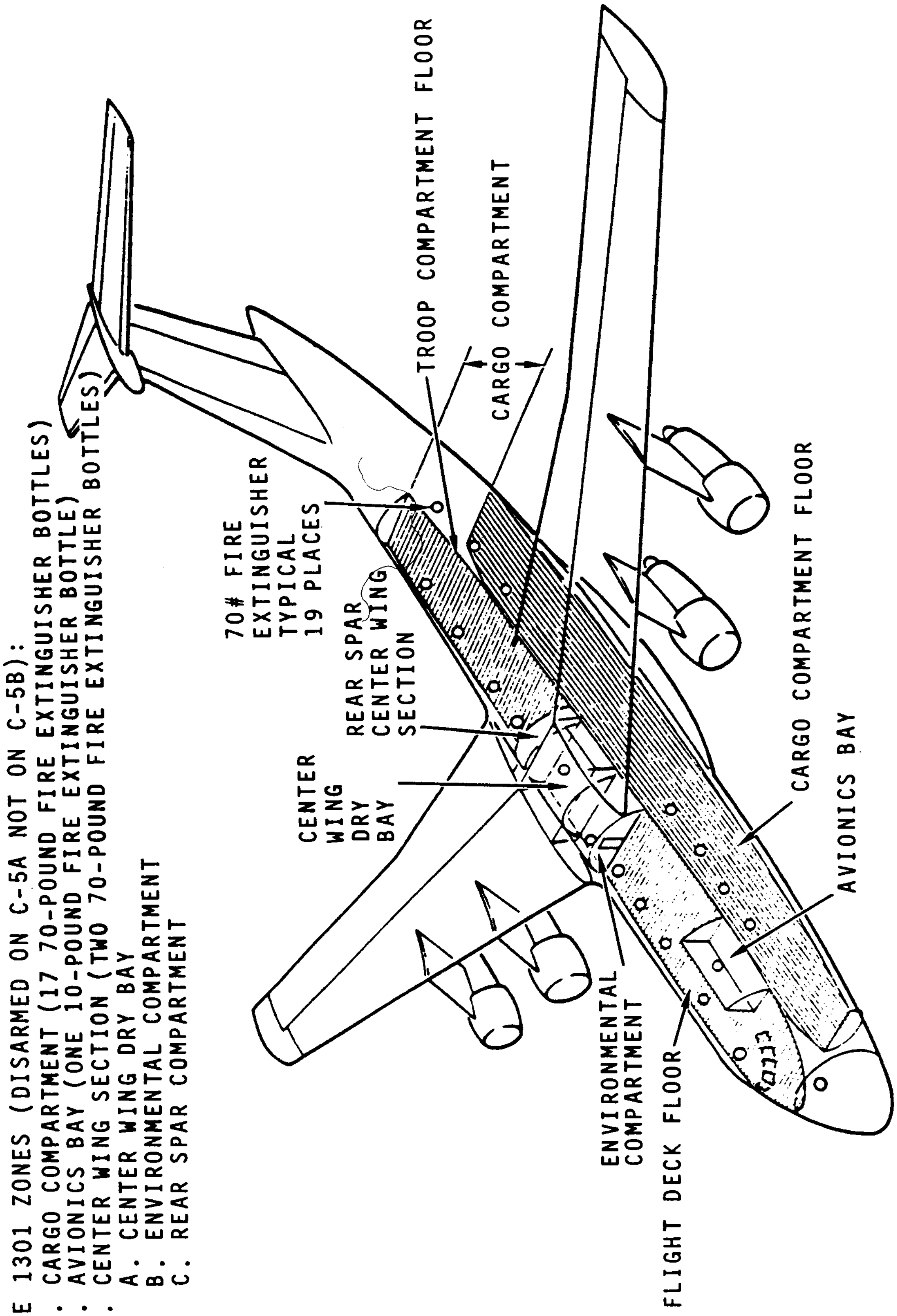
ZONE	SPACES INCLUDED IN ZONE	FLIGHT ENGINEER'S PANEL DISCHARGE PUSHBUTTON	NOSE WHEEL WELL PANEL DISCHARGE PUSH BUTTON
1	LEFT WING DRY BAY, LEFT OUTBOARD LEADING EDGE, LEFT OUTBOARD PYLON LEADING EDGE	LEFT OUTBD WING	LEFT WING
2	LEFT WING ROOT DRY BAY, LEFT INBOARD LEADING EDGE, LEFT INBOARD PYLON LEADING EDGE	LEFT INBD WING	
3	RIGHT WING ROOT DRY BAY, RIGHT INBOARD LEADING EDGE, RIGHT INBOARD PYLON LEADING EDGE	RIGHT INBD WING	RIGHT WING
4	RIGHT WING DRY BAY, RIGHT OUTBOARD LEADING EDGE, RIGHT OUTBOARD PYLON LEADING EDGE	RIGHT OUTBD WING	
5	NOSE WHEEL WELL	NOSE WHEEL WELL	-
6	CARGO UNDERFLOOR, FORWARD	UNDERFLOOR FWD	UNDERFLOOR FWD
7	CARGO UNDERFLOOR, MID	UNDERFLOOR MID	
8	LEFT MAIN WHEEL WELL	LEFT MAIN WHEEL WELL	-
9	RIGHT MAIN WHEEL WELL	RIGHT MAIN WHEEL WELL	-
10	CARGO UNDERFLOOR, AFT	UNDERFLOOR AFT	UNDERFLOOR AFT
11	LEFT PTU COMPARTMENT	LEFT PTU	UNDERFLOOR FWD
12	RIGHT PTU COMPARTMENT	RIGHT PTU	

NITROGEN FIRE SUPPRESSION ZONES

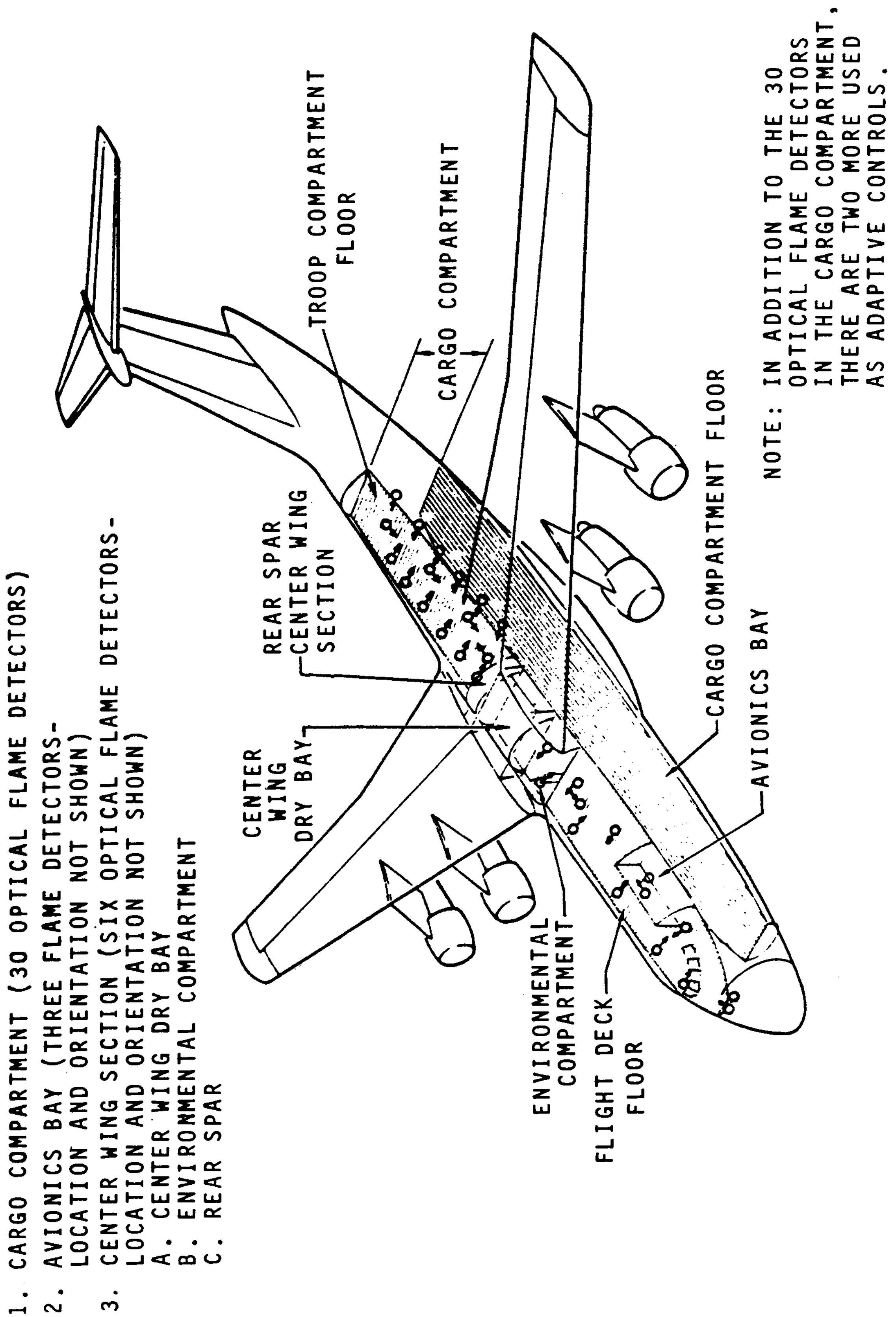


UNMANNED AREAS

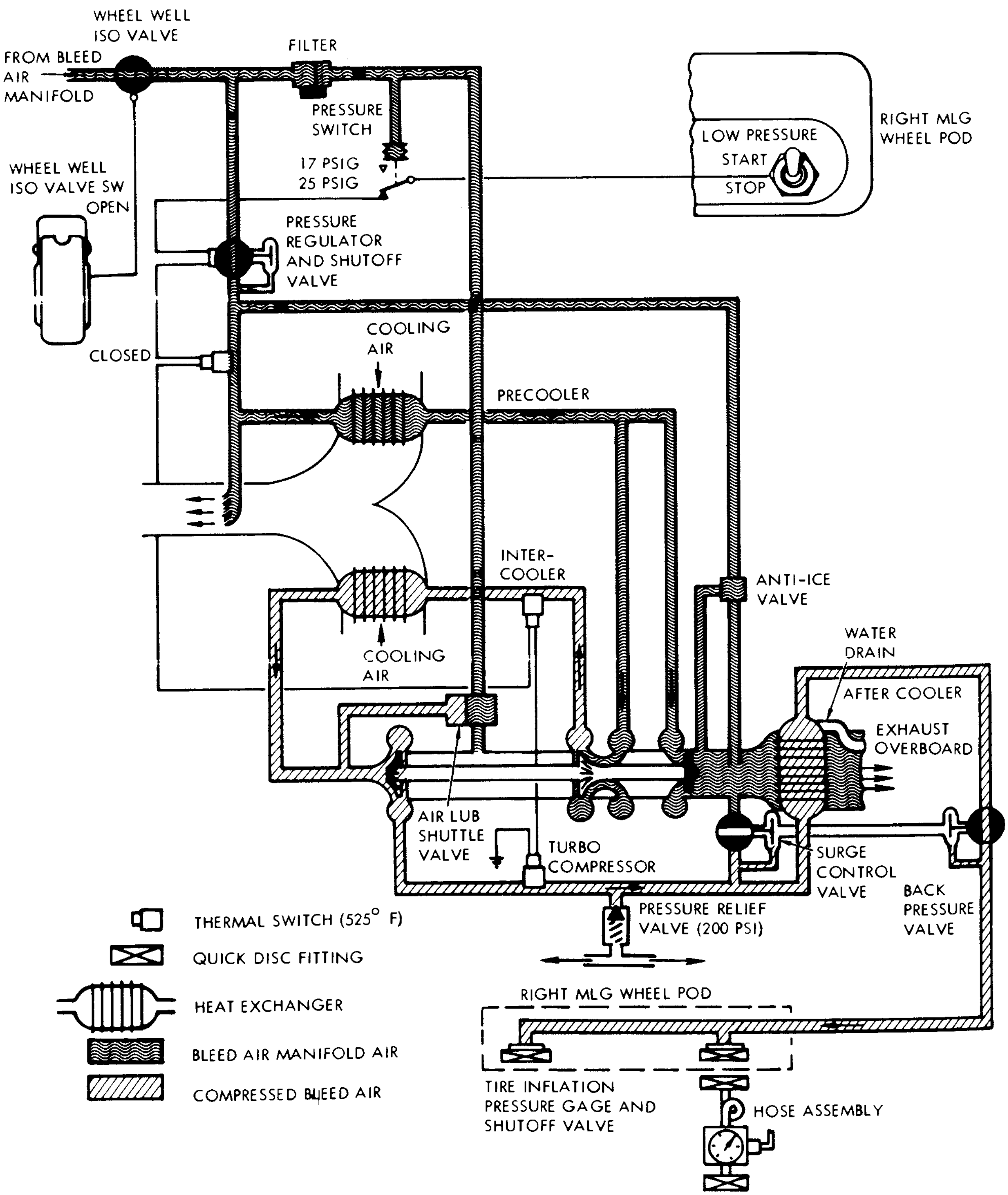
CONTINUOUS THERMAL SENSOR LOCATIONS



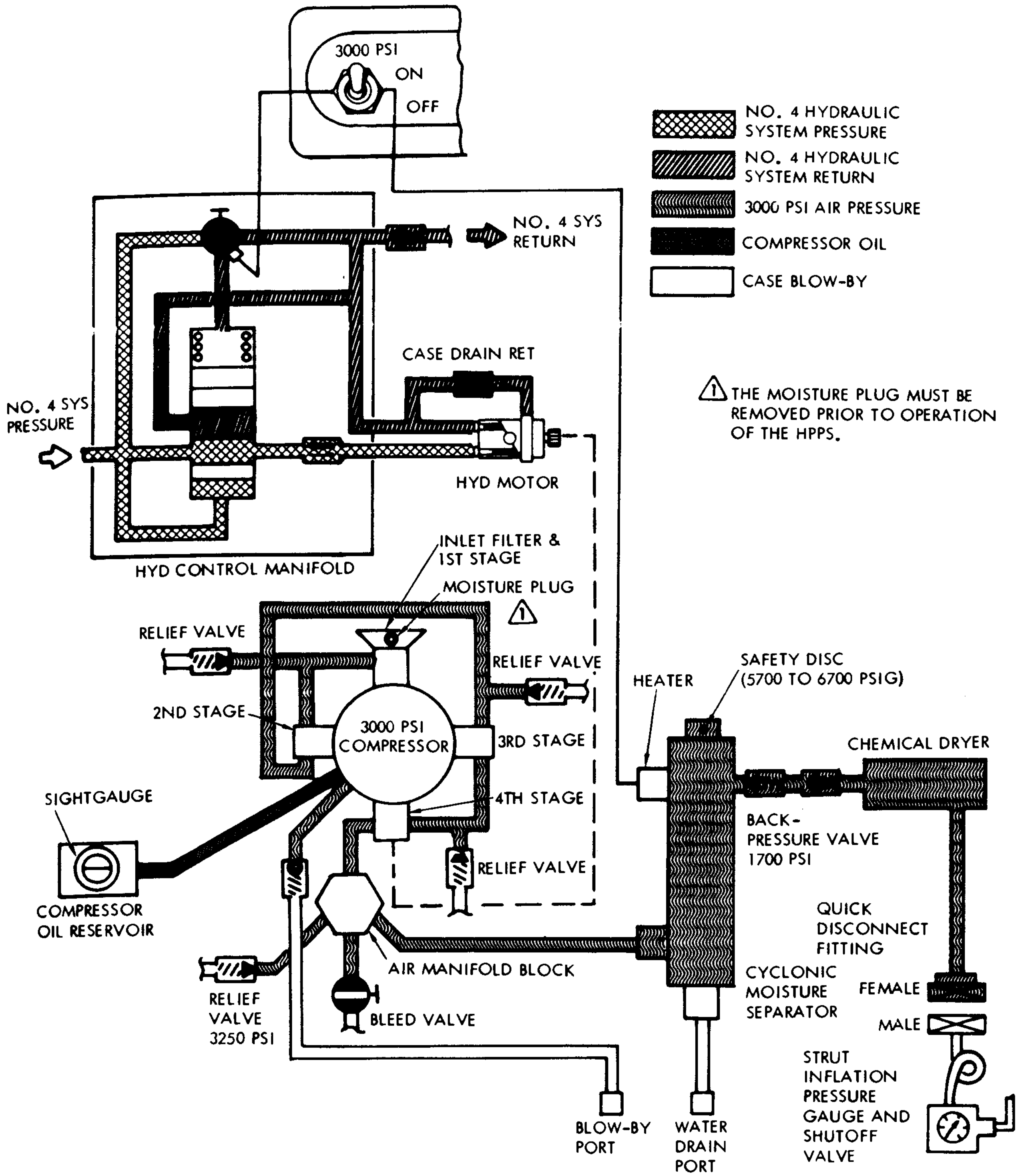
C-5A FE 1301 FIRE FIGHTING ZONES AND EXTINGUISHER LOCATIONS



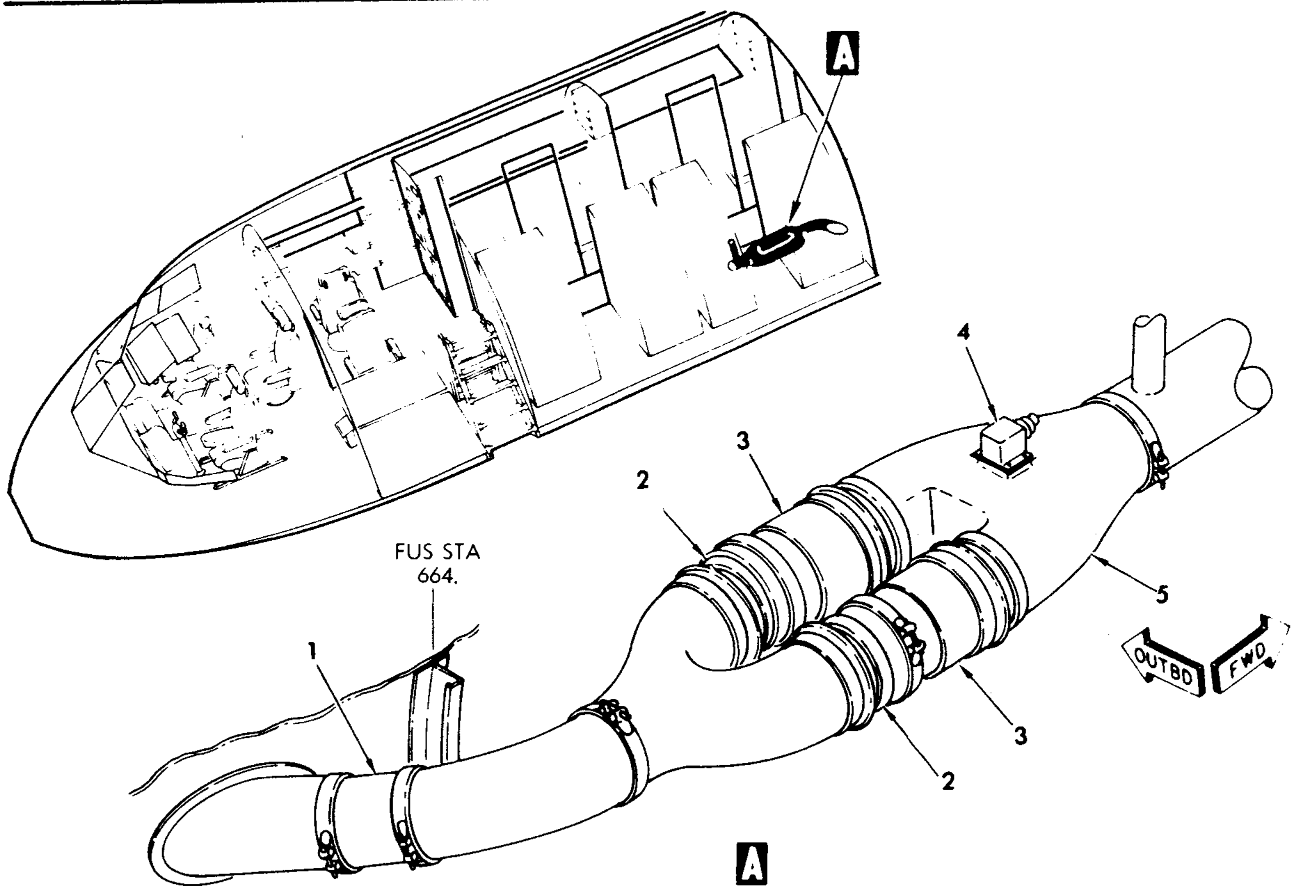
OPTICAL FLAME
DETECTOR LOCATIONS – CARGO COMPARTMENT

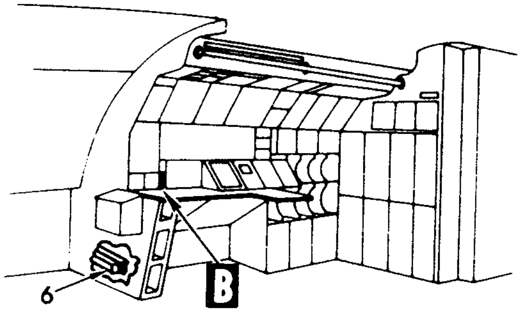


LOW PRESSURE PNEUMATIC SYSTEM



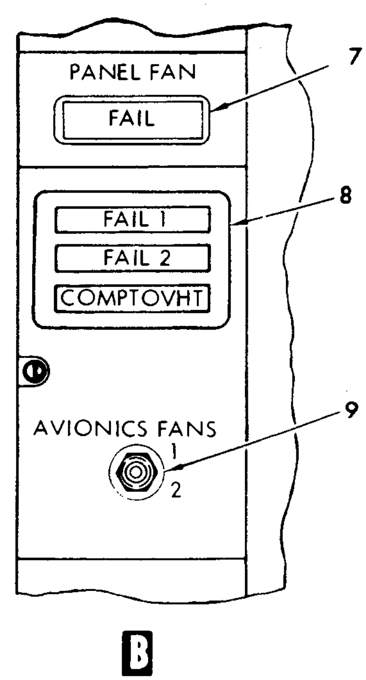
C-5A HIGH PRESSURE PNEUMATIC SYSTEM



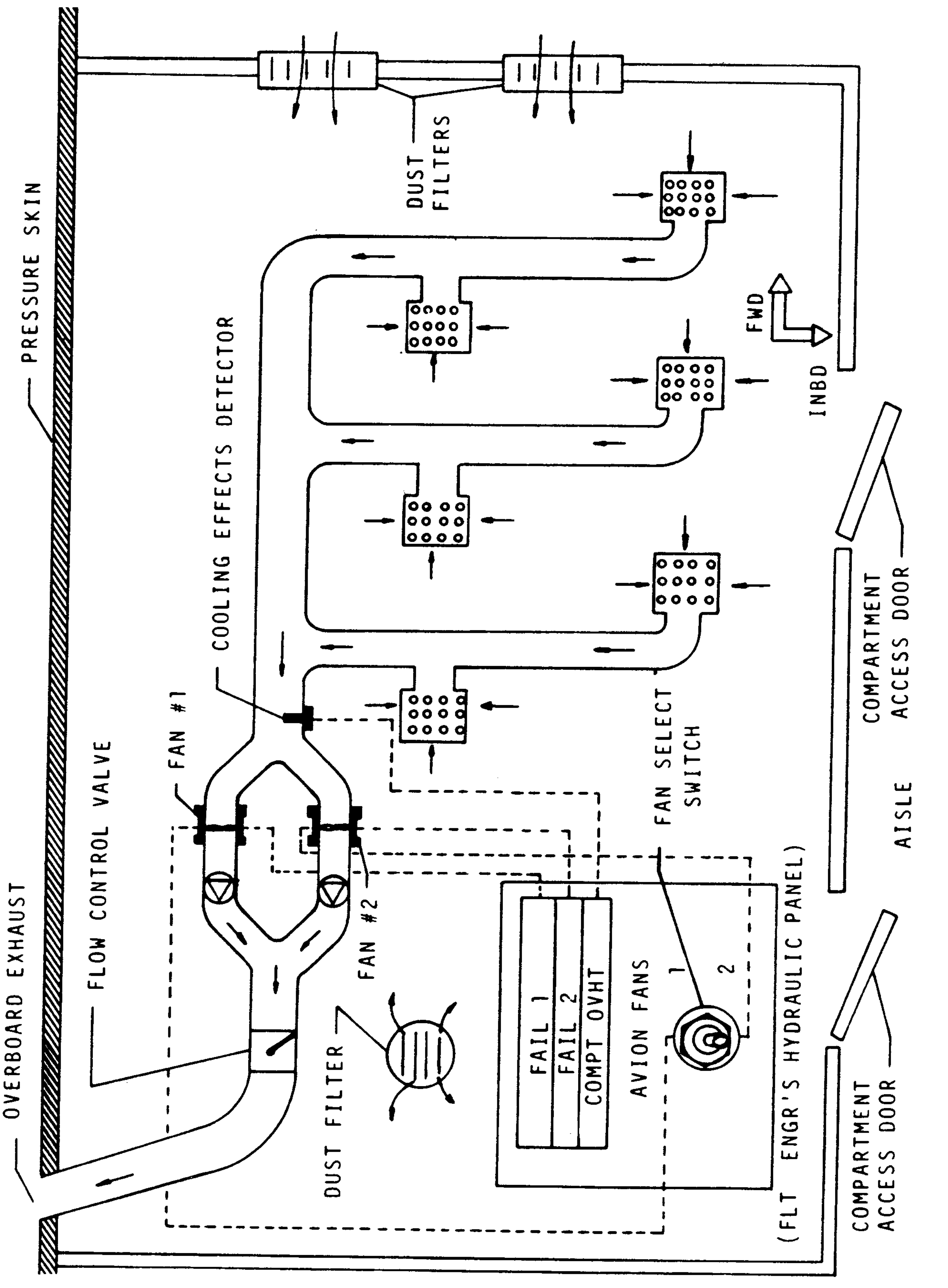


FLIGHT ENGINEER'S STATION

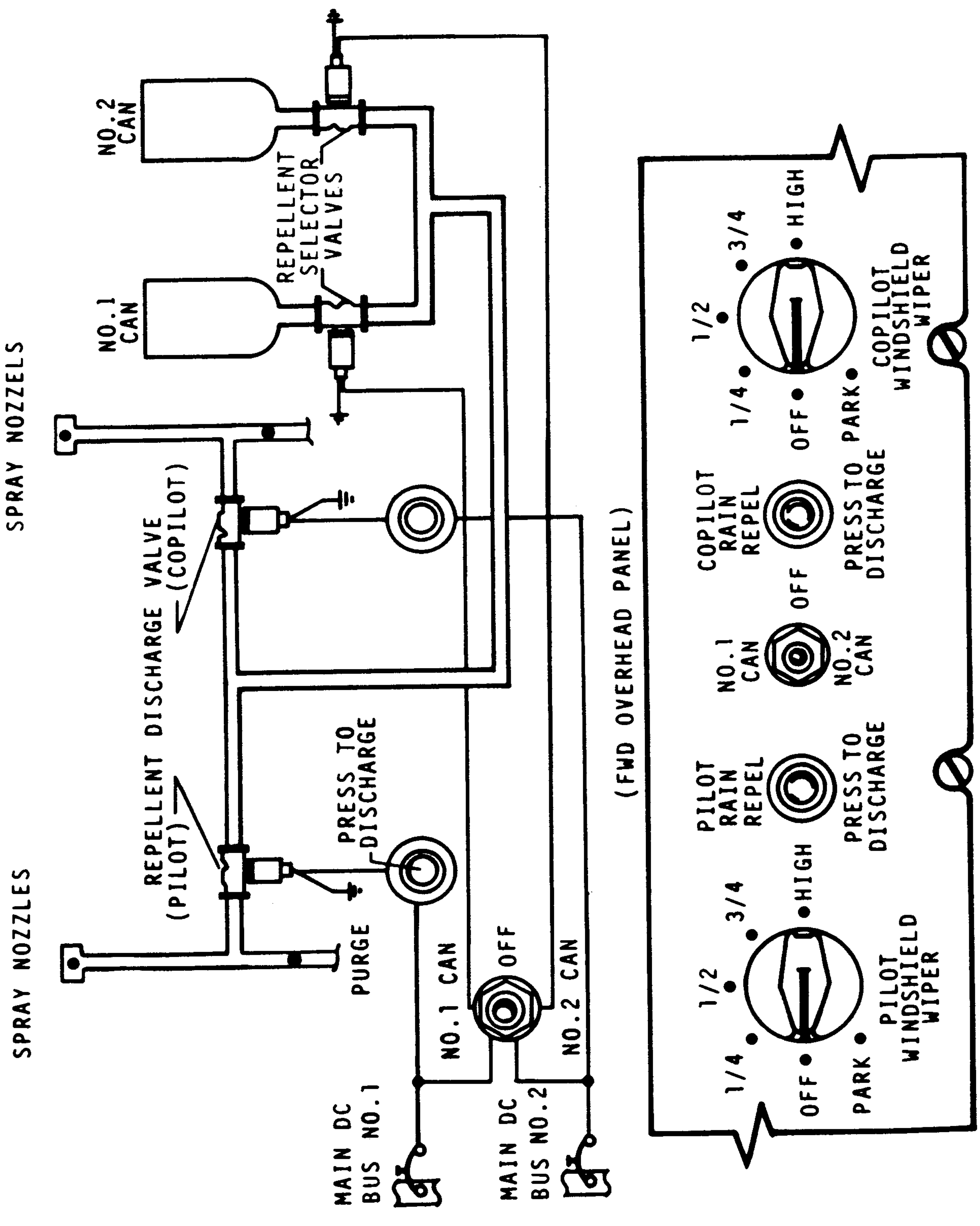
1. AVIONICS COOLING AIR FLOW CONTROL VALVE
2. AVIONICS COOLING CHECK VALVE
3. AVIONICS COOLING FAN
4. AVIONICS EQUIPMENT COOLING EFFECTS DETECTOR
5. AVIONICS COMPARTMENT COOLING AIR DUCT ASSEMBLY
6. MADAR COOLING FAN AND DUCT ASSEMBLY
7. MADAR COOLING FAN LIGHT ASSEMBLY
8. AVIONICS COOLING·FAN FAILURE LIGHT ASSEMBLY
9. AVIONIC FANS SELECTOR SWITCH



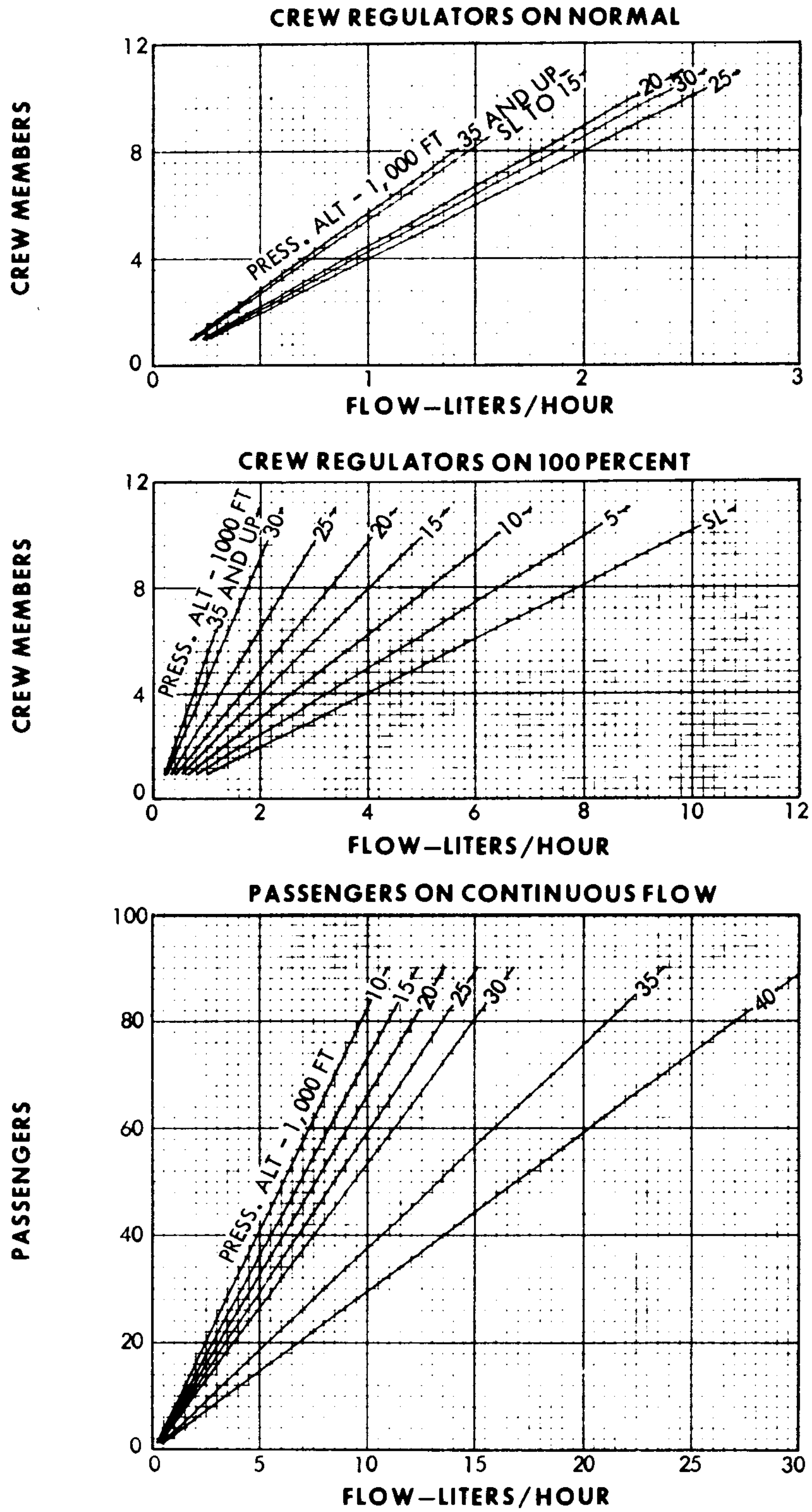
AVIONICS & MADAR EQUIPMENT COOLING SYSTEM COMPONENT LOCATIONS



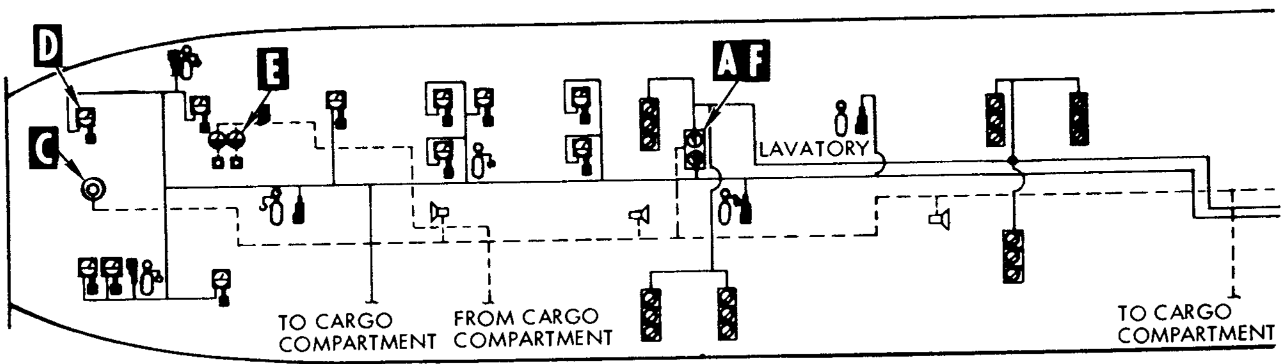
AVIONICS COOLING SYSTEM SCHEMATIC



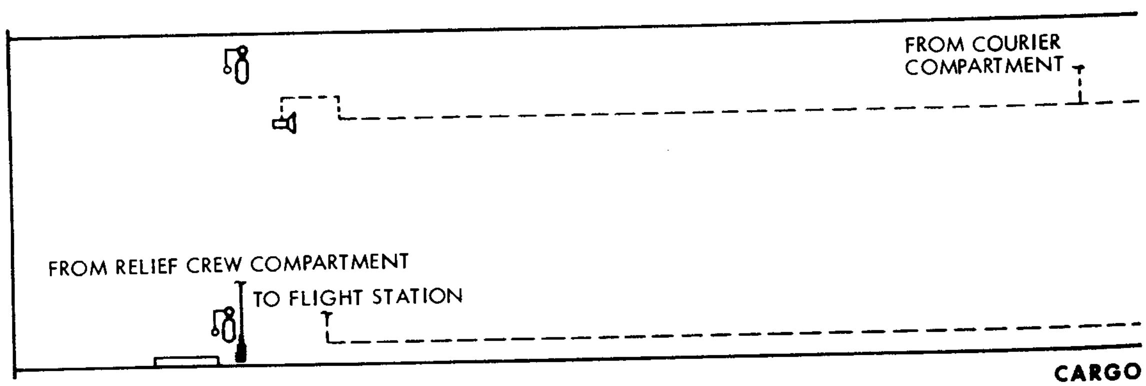
C-5A WINDSHIELD RAIN REPELLENT SYSTEM



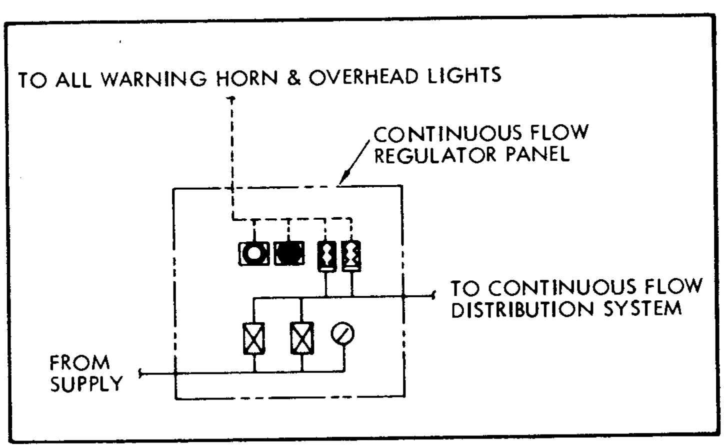
OXYGEN DURATION CHART



UPPER

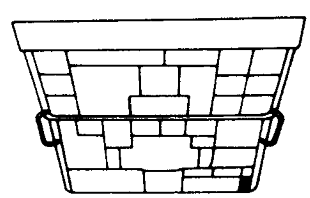


CARGO



A

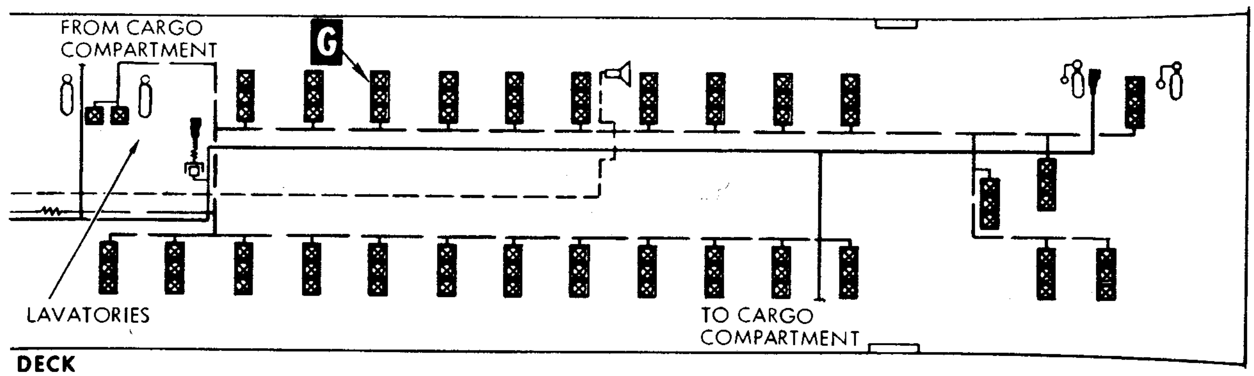
REGULATOR PANEL—CONTINUOUS FLOW SYSTEM

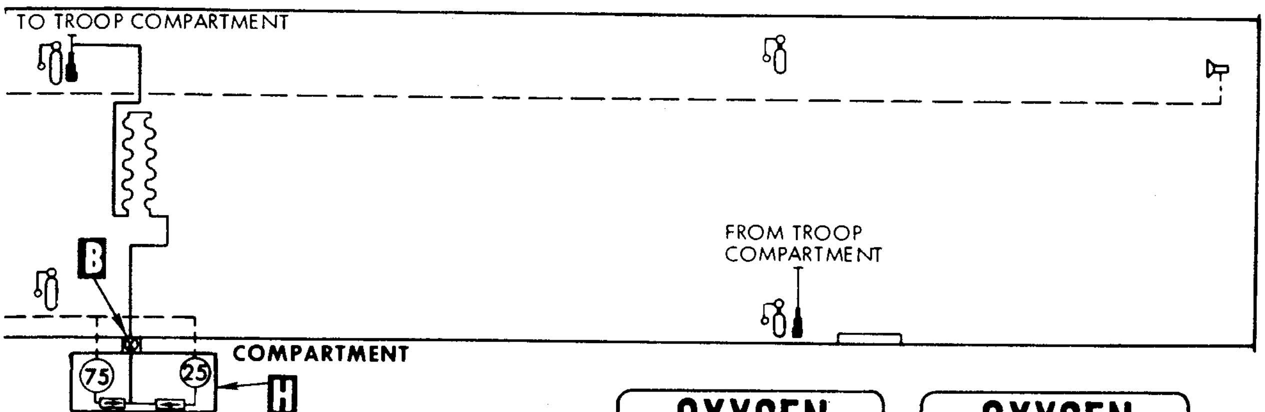


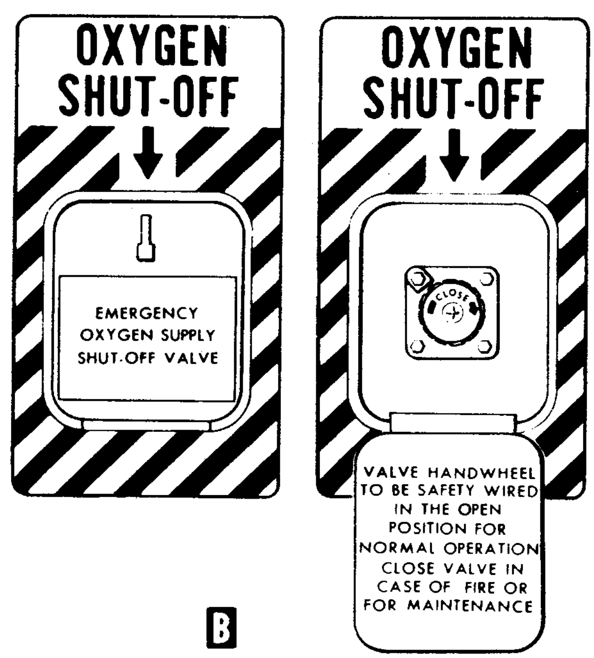
C

PILOT'S OVERHEAD PANEL

OXYGEN SYSTEM (SHEET 1)

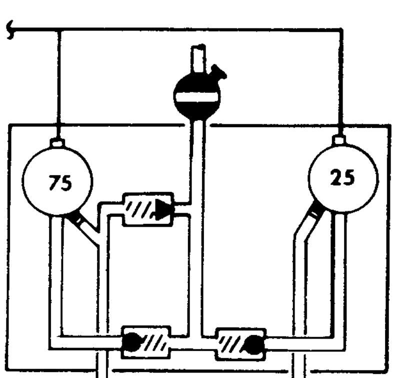






B

MANUAL SHUT—OFF VALVE

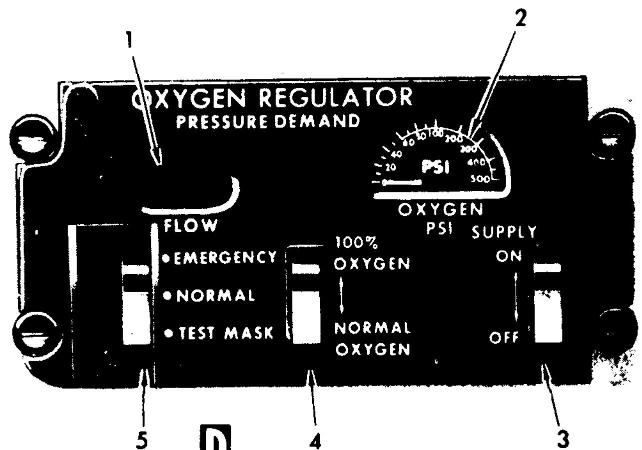


H

OXYGEN SYSTEM (SHEET 2)

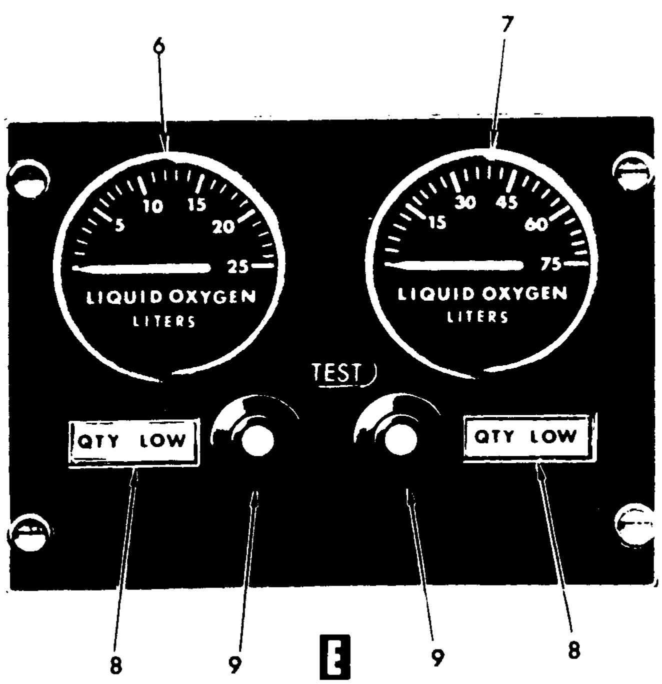
C

PILOT'S OVERHEAD PANEL



D

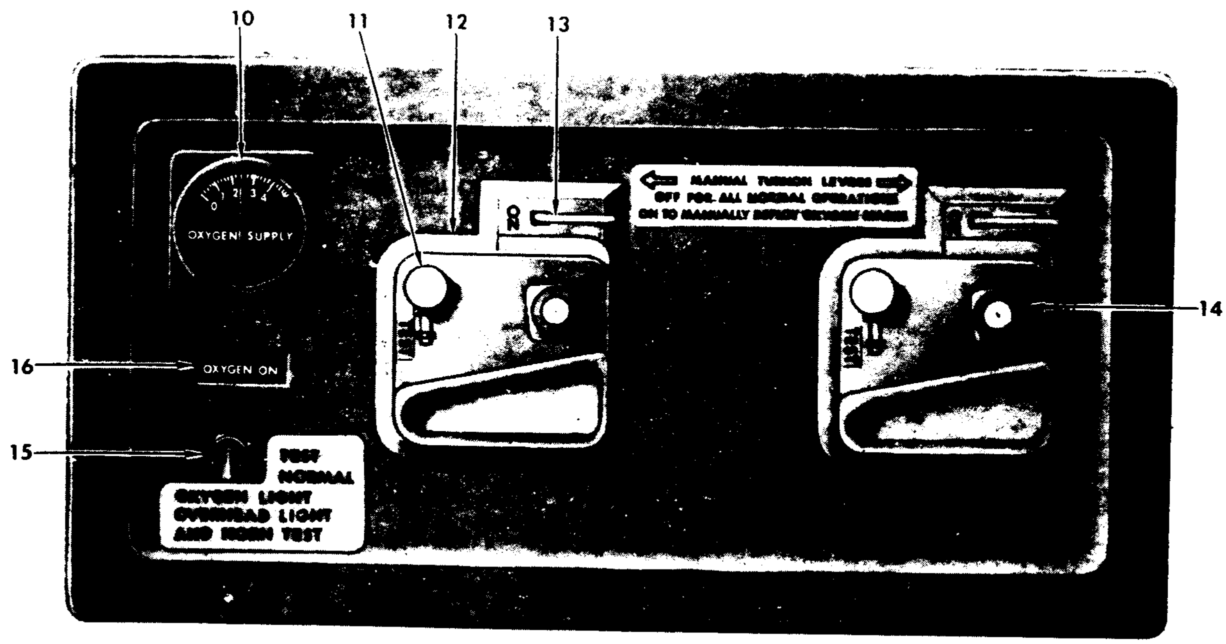
OXYGEN REGULATOR (TYPICAL 11 PLACES)



E

FLIGHT ENGINEER'S OXYGEN SYSTEM PANEL

OXYGEN SYSTEM (SHEET 3)

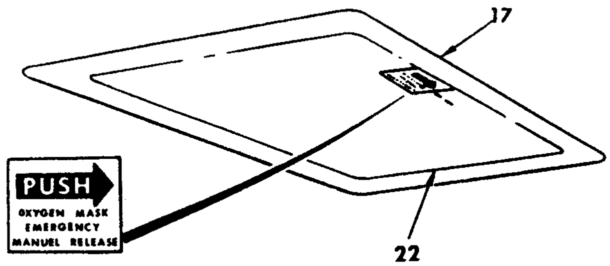


F

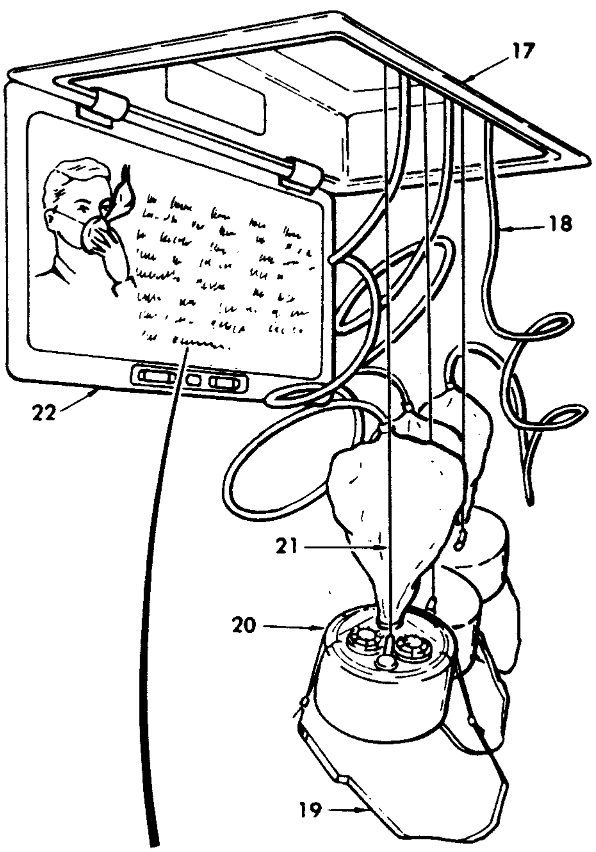
CONTINUOUS FLOW OXYGEN REGULATOR PANEL

1. VISUAL FLOW INDICATOR
2. PRESSURE GAGE
3. SUPPLY LEVER
4. DILUTER LEVER
5. EMERGENCY TOGGLE LEVER
6. LIQUID OXYGEN INDICATOR (25-LITER)
7. LIQUID OXYGEN INDICATOR (75-LITER)
8. LIQUID OXYGEN QUANTITY LOW INDICATORS
9. TEST SWITCHES
10. SUPPLY PRESSURE GAGE
11. CABIN ALTITUDE SENSING AND TEST PORT
12. CONTINUOUS FLOW OXYGEN REGULATOR
13. REGULATOR MANUAL TURN-ON LEVER
14. REGULATOR ON-OFF INDICATOR
15. TEST SWITCH
16. OXYGEN ON LIGHT
17. OXYGEN MASK STORAGE CONTAINER
18. MASK HOSE
19. HEAD STRAP
20. OXYGEN MASK
21. LANYARD
22. CONTAINER DOOR

OXYGEN SYSTEM (SHEET 4)



- LIQUID OXYGEN CONVERTER 25-LITER
- LIQUID OXYGEN CONVERTER 75-LITER
- LINE VALVE
- PORTABLE RECHARGER
- MASK-REGULATOR TUBING
- REGULATOR PRESSURE DEMAND
- QUANTITY INDICATOR
- REGULATOR, AUTOMATIC, CONTINUOUS FLOW
- PRESSURE GAGE
- OXYGEN CONTROL PANEL
- PRESSURE SWITCH
- WARNING HORN
- CHECK VALVE
- LOW QUANTITY WARNING LIGHT
- HORN SHUTOFF SWITCH
- OXYGEN ON LIGHT
- OXYGEN LIGHT AND HORN TEST SWITCH
- MALE / FEMALE — QUICK DISCONNECT
- AUTOMATIC MASK PRESENTATION 3 UNIT
- AUTO MASK PRESENT. 3 UNIT KIT INSTL
- AUTO MASK PRESENT. 1 UNIT KIT INSTL
- PORTABLE UNIT-CONTINUOUS FLOW WITH MASK ATTACHED
- PORTABLE UNIT DEMAND WITH FIRE FIGHTER'S MASK ATTACHED



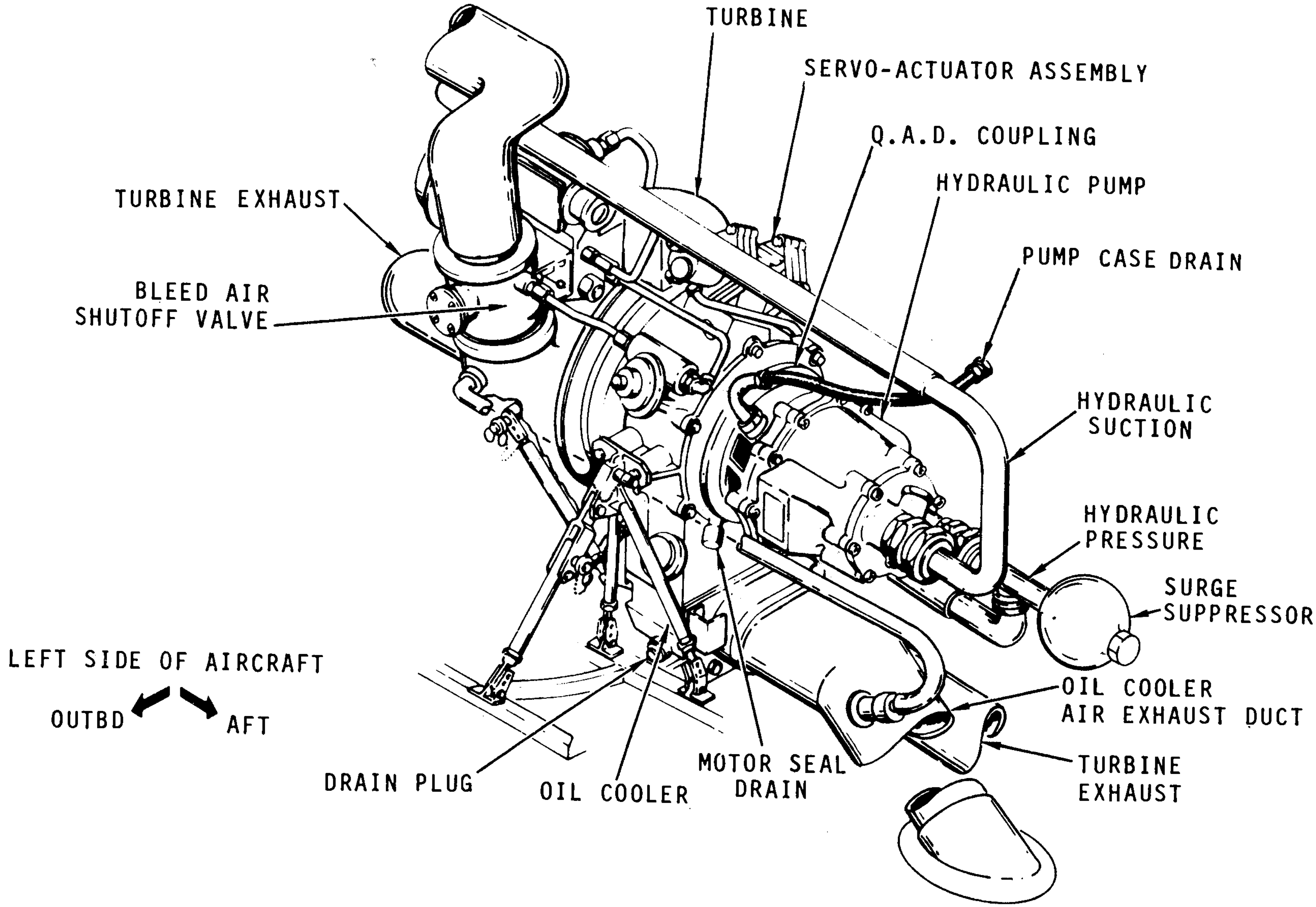
1. GRASP MASK BY FACE CONE AND PULL DOWN TO OPEN OXYGEN VALVE.
2. PLACE FACE CONE OVER MOUTH AND NOSE AS SHOWN.
3. POSITION ELASTIC HEAD BAND AND ADJUST MASK TO MINIMUM DRAFT IN EYES DURING EXHALATION.
4. BREATHE NORMALLY.

G

OVERHEAD OXYGEN MASK
STORAGE CONTAINER

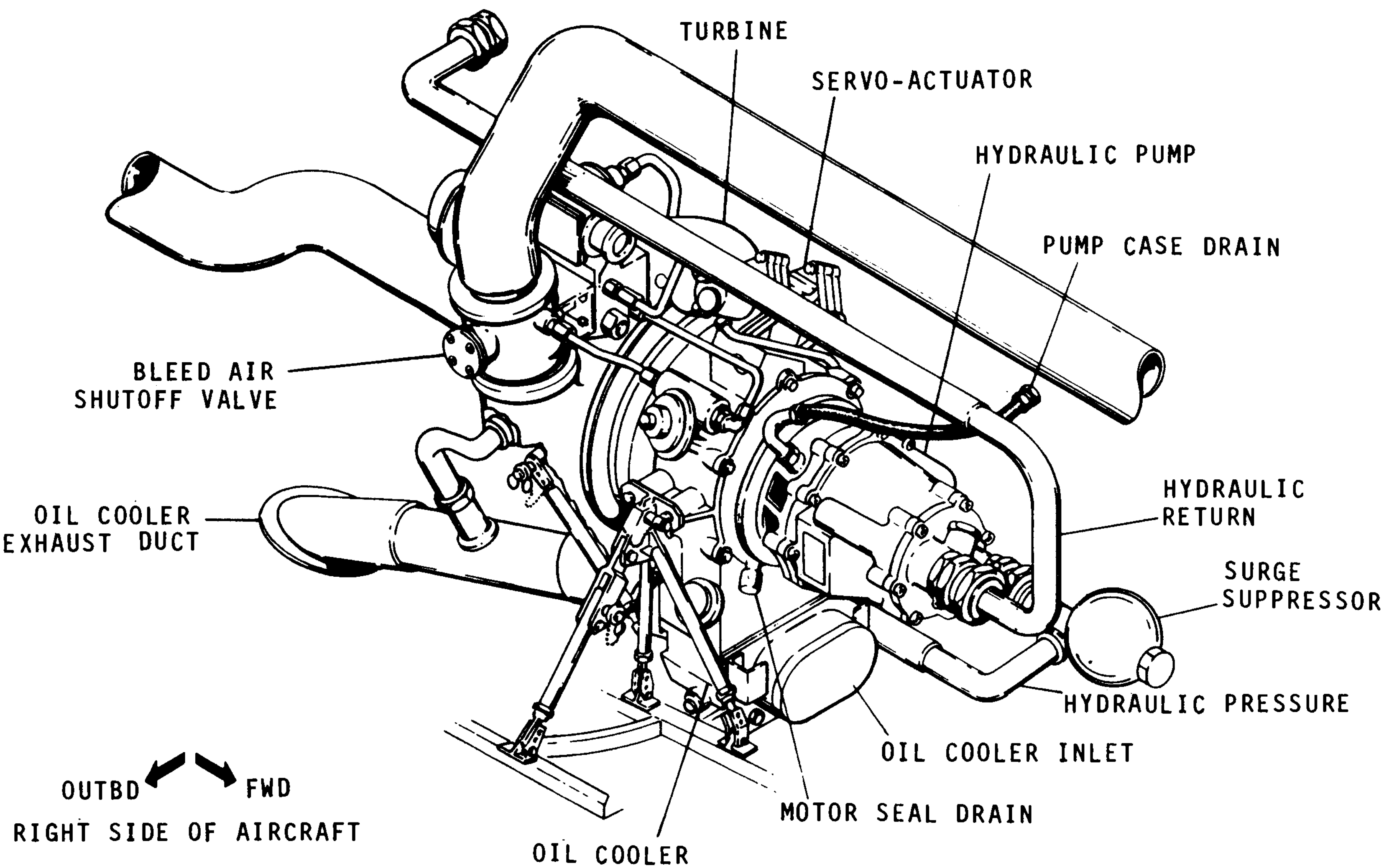
- DISTRIBUTION LINE
- ELECTRICAL LINE
- WARMING EQUIPMENT
- FLEXIBLE LINE- KIT INSTL
- DISTRIBUTION LINE - KIT INSTL

OXYGEN SYSTEM (SHEET 5)

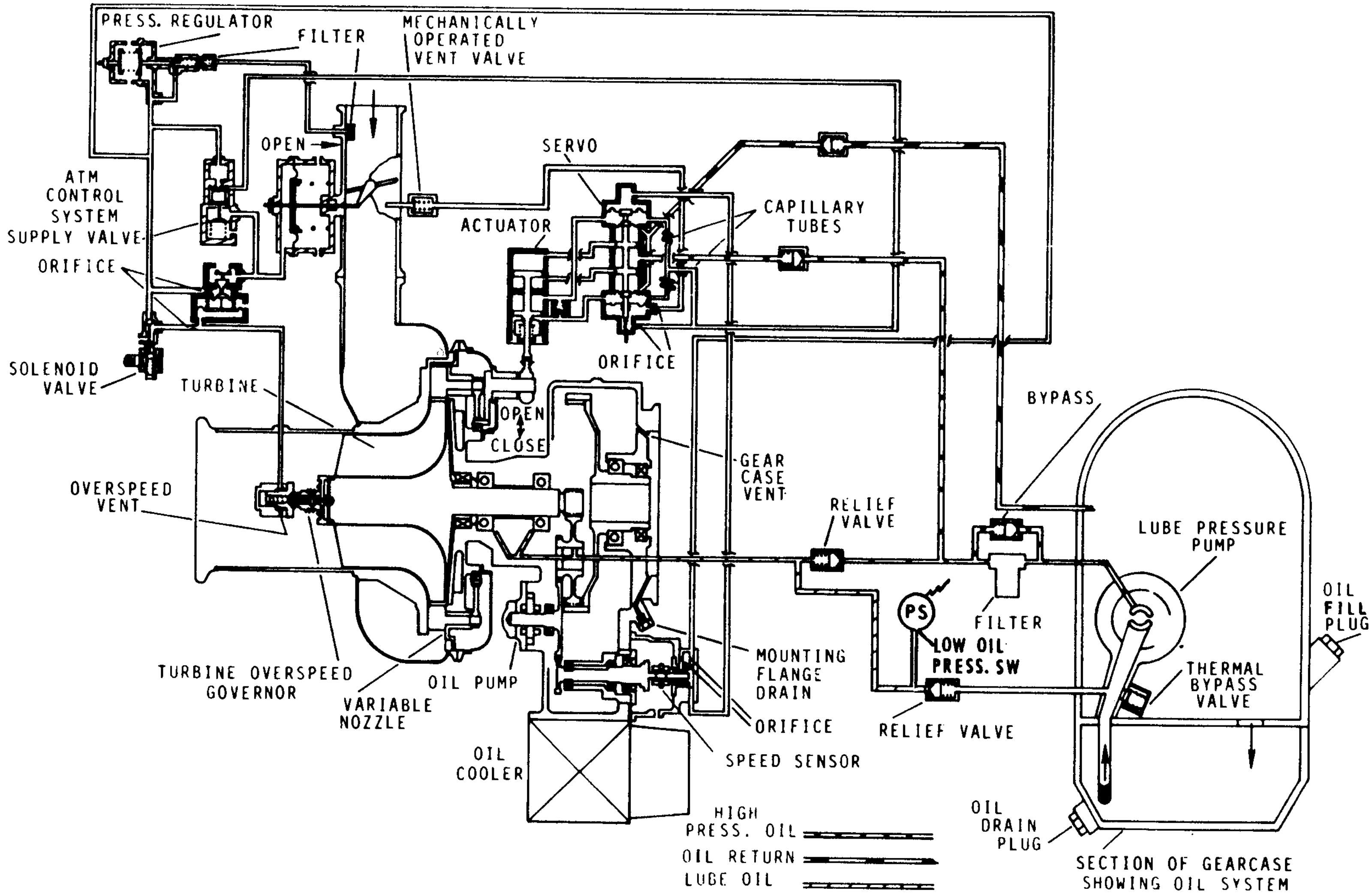


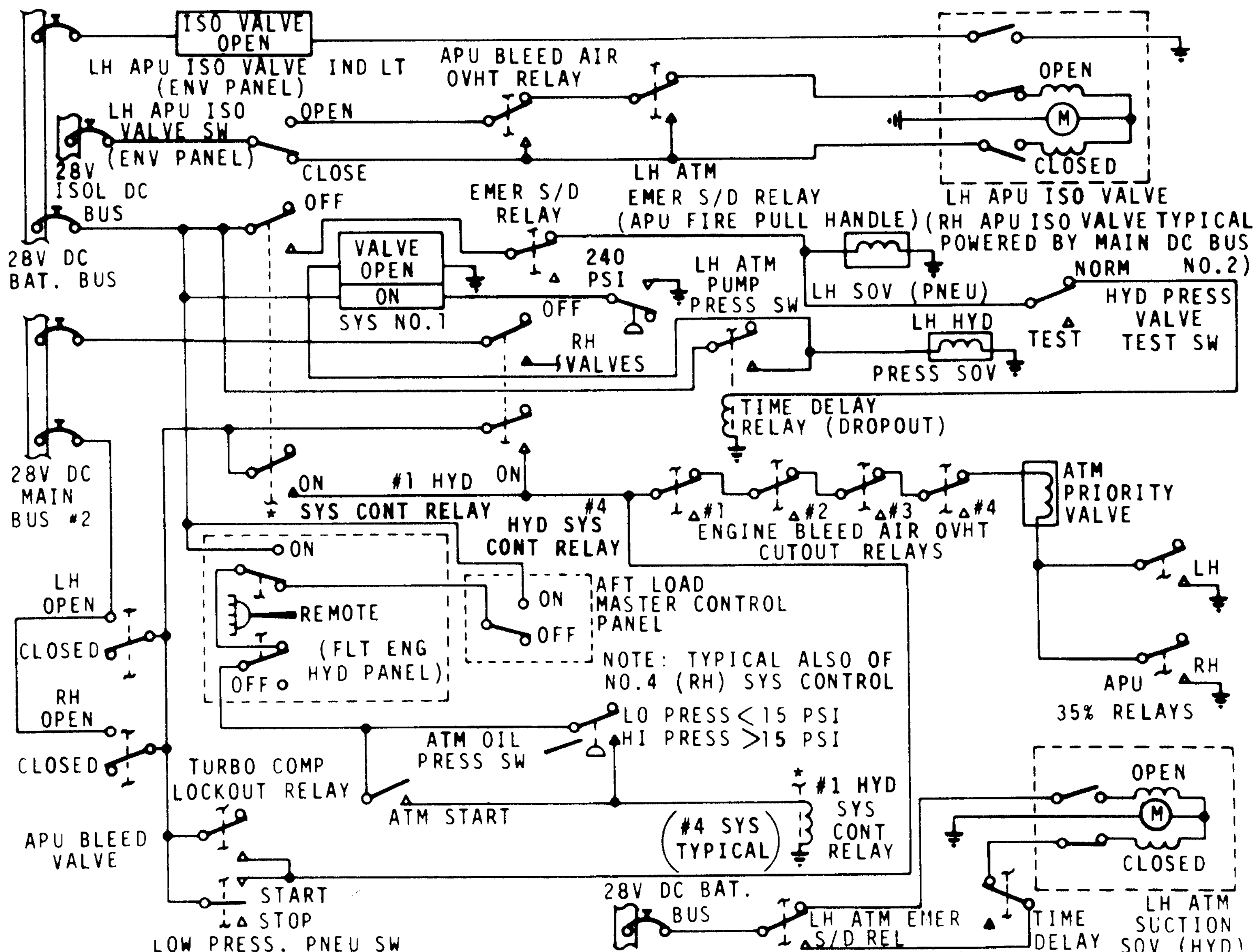
AIR TURBINE MOTOR INSTALLATION (LEFT SIDE)

AIR TURBINE MOTOR INSTALLATION (RIGHT SIDE)



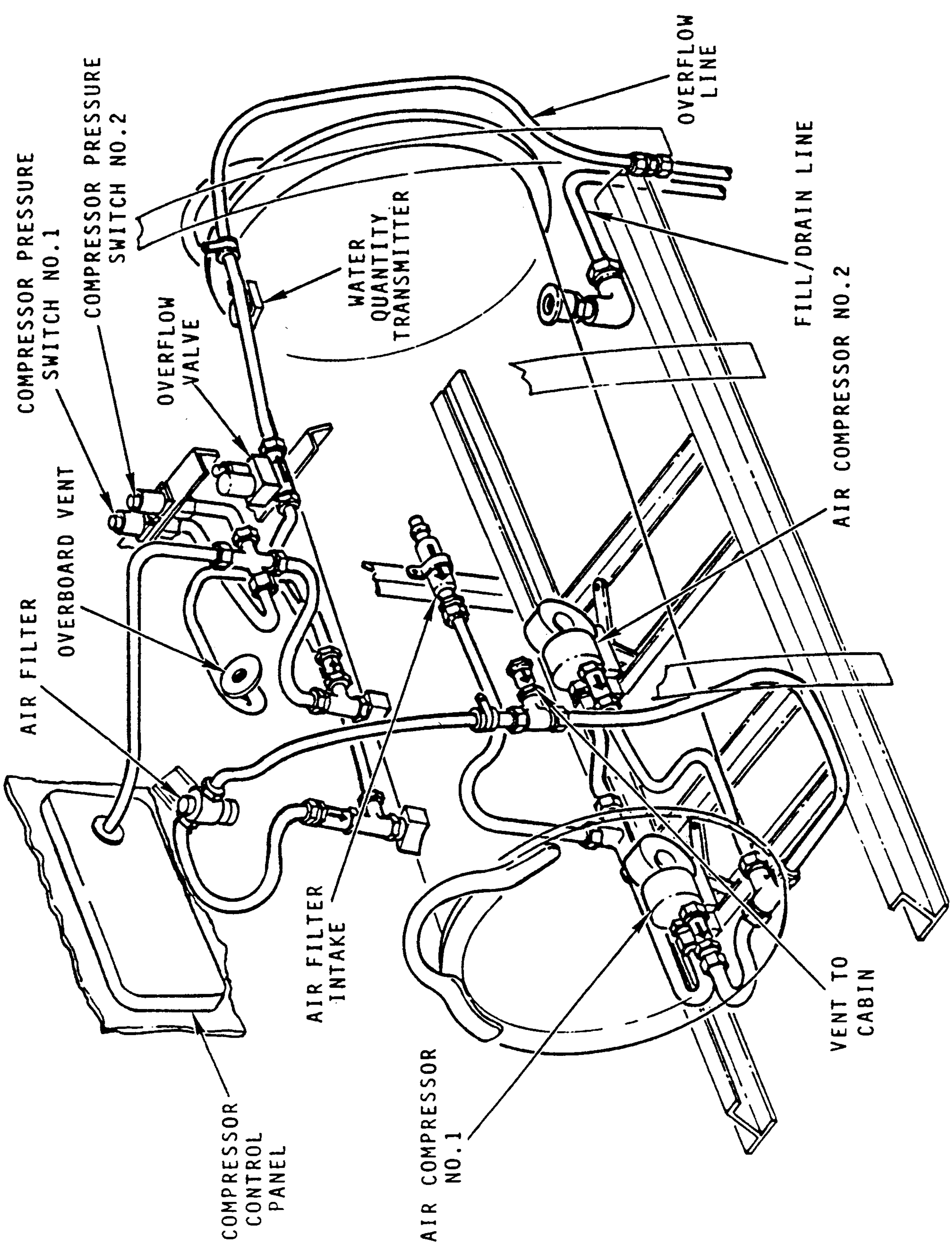
AIR TURBINE MOTOR SCHEMATIC



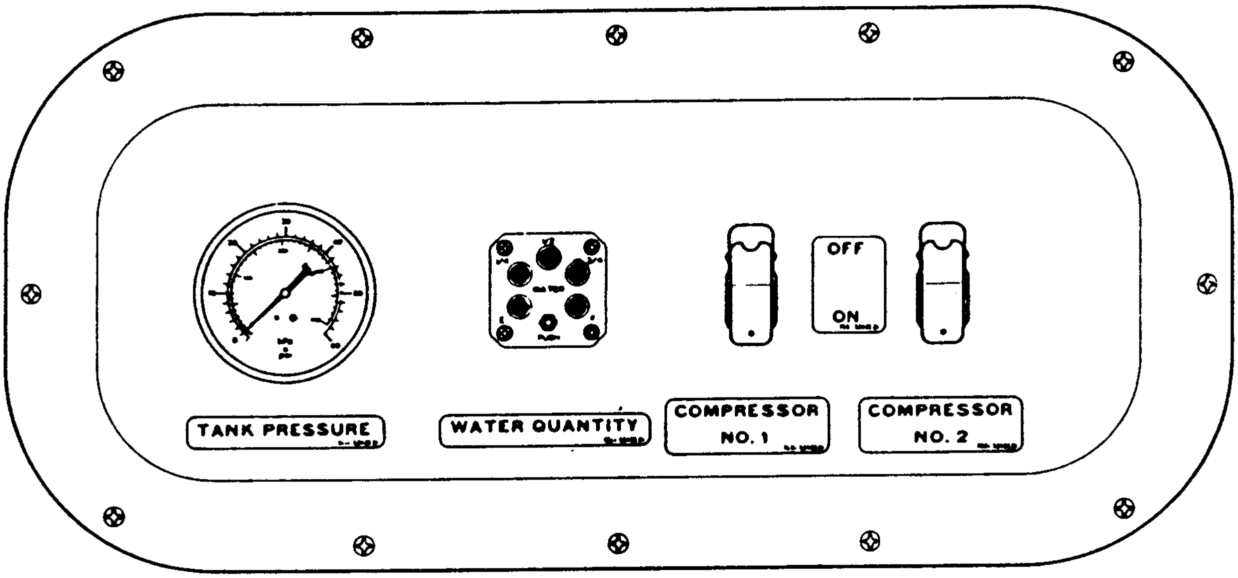


ATM CONTROL SYSTEM

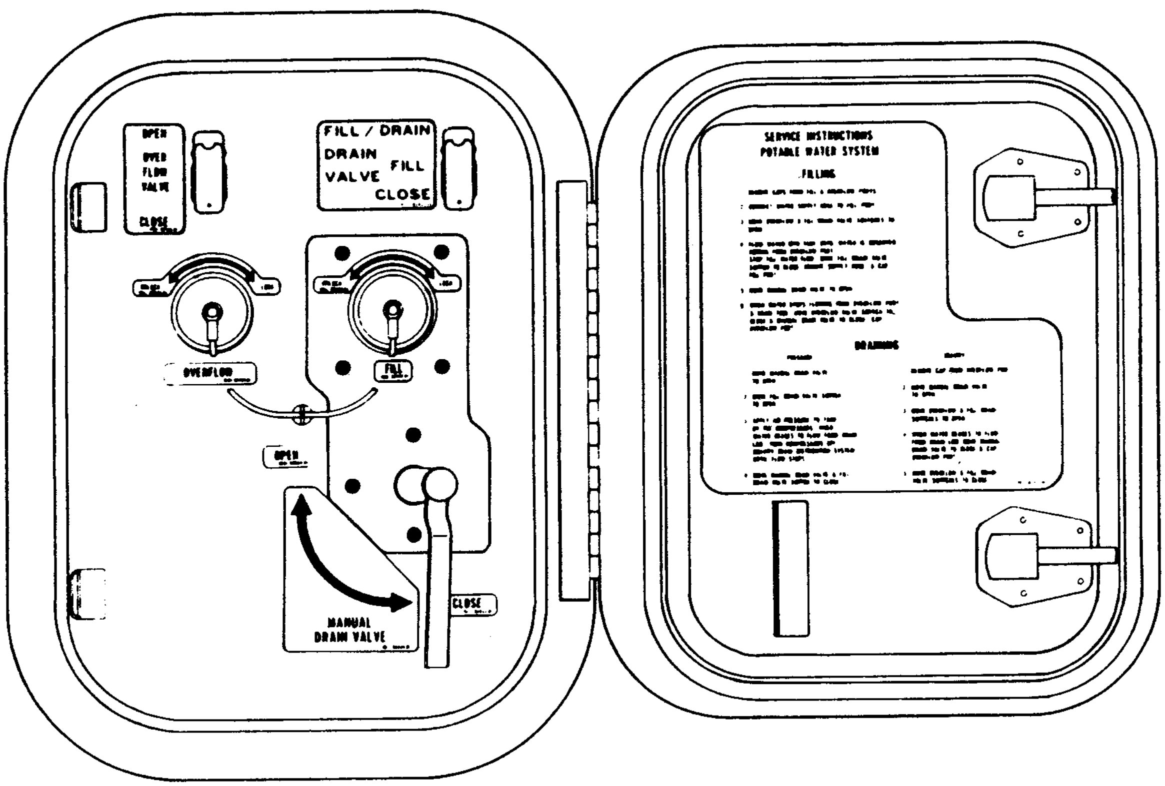
*INDICATES CONNECTED



C-5B POTABLE WATER SYSTEM COMPONENTS

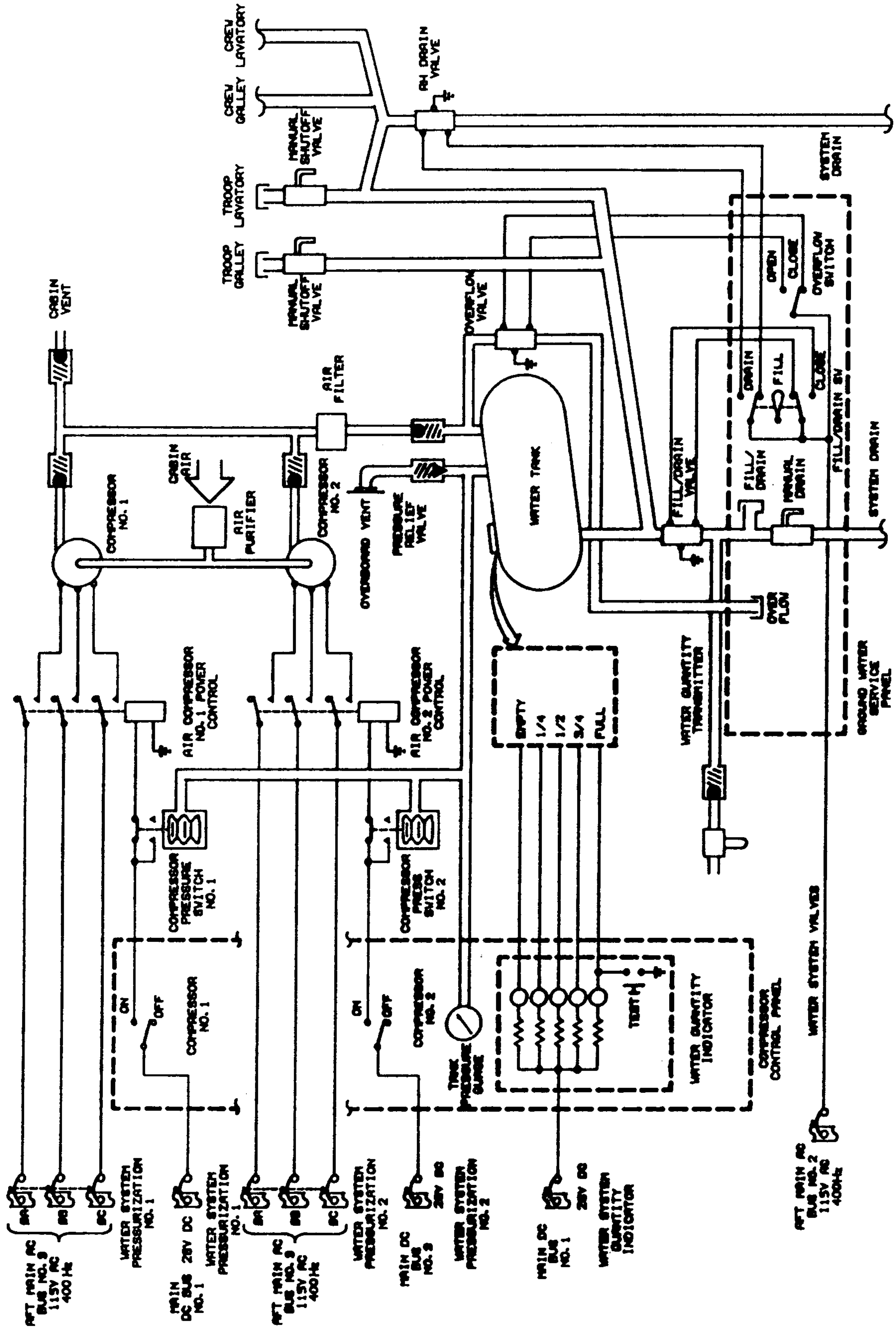


COMPRESSOR CONTROL PANEL

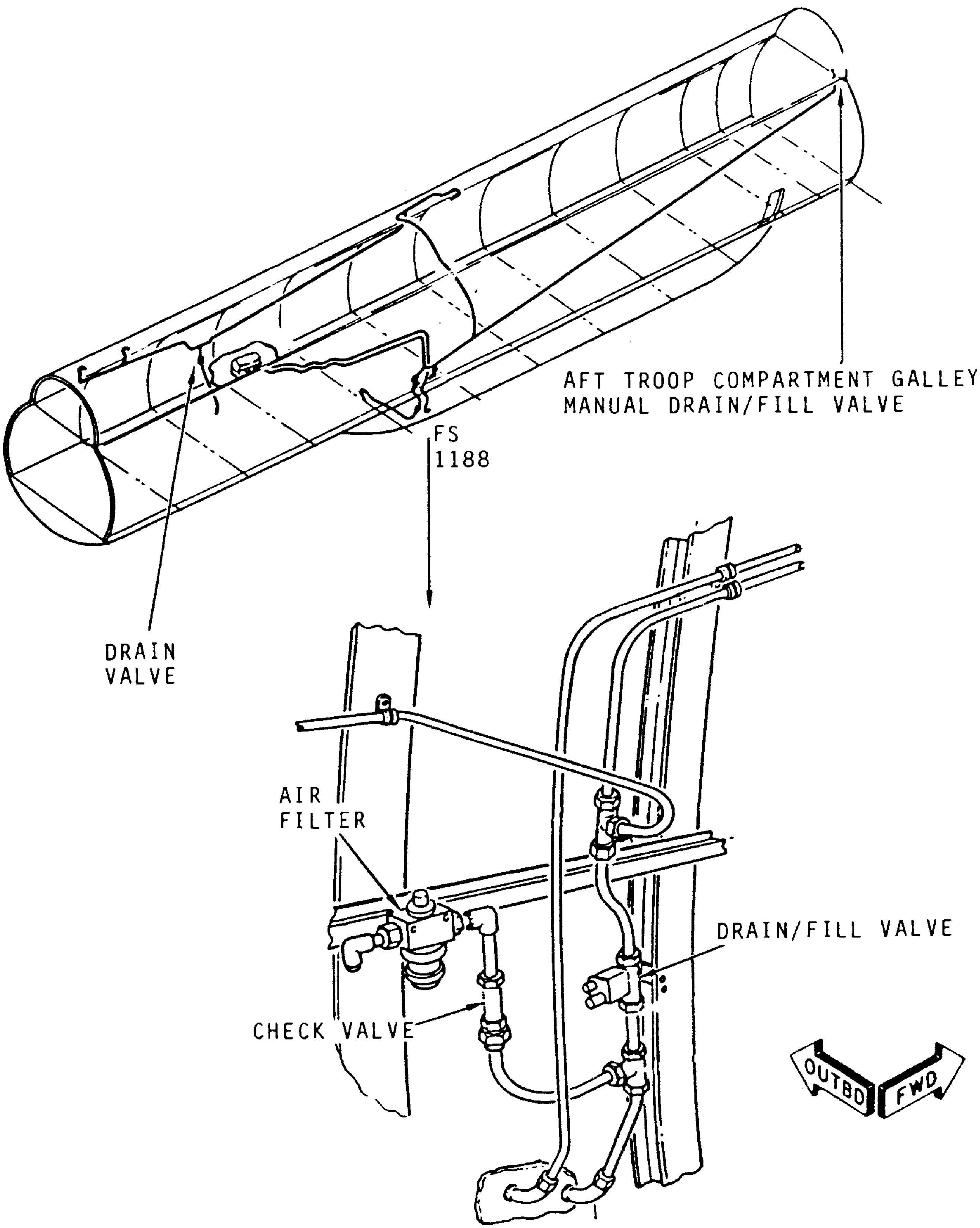


GROUND WATER SERVICE PANEL

C-5B POTABLE WATER PANELS



C-5B POTABLE WATER
ELECTRICAL/PLUMBING SCHEMATIC



C-5B POTABLE WATER PLUMBING

SECTION IV
FUEL

INTRODUCTION

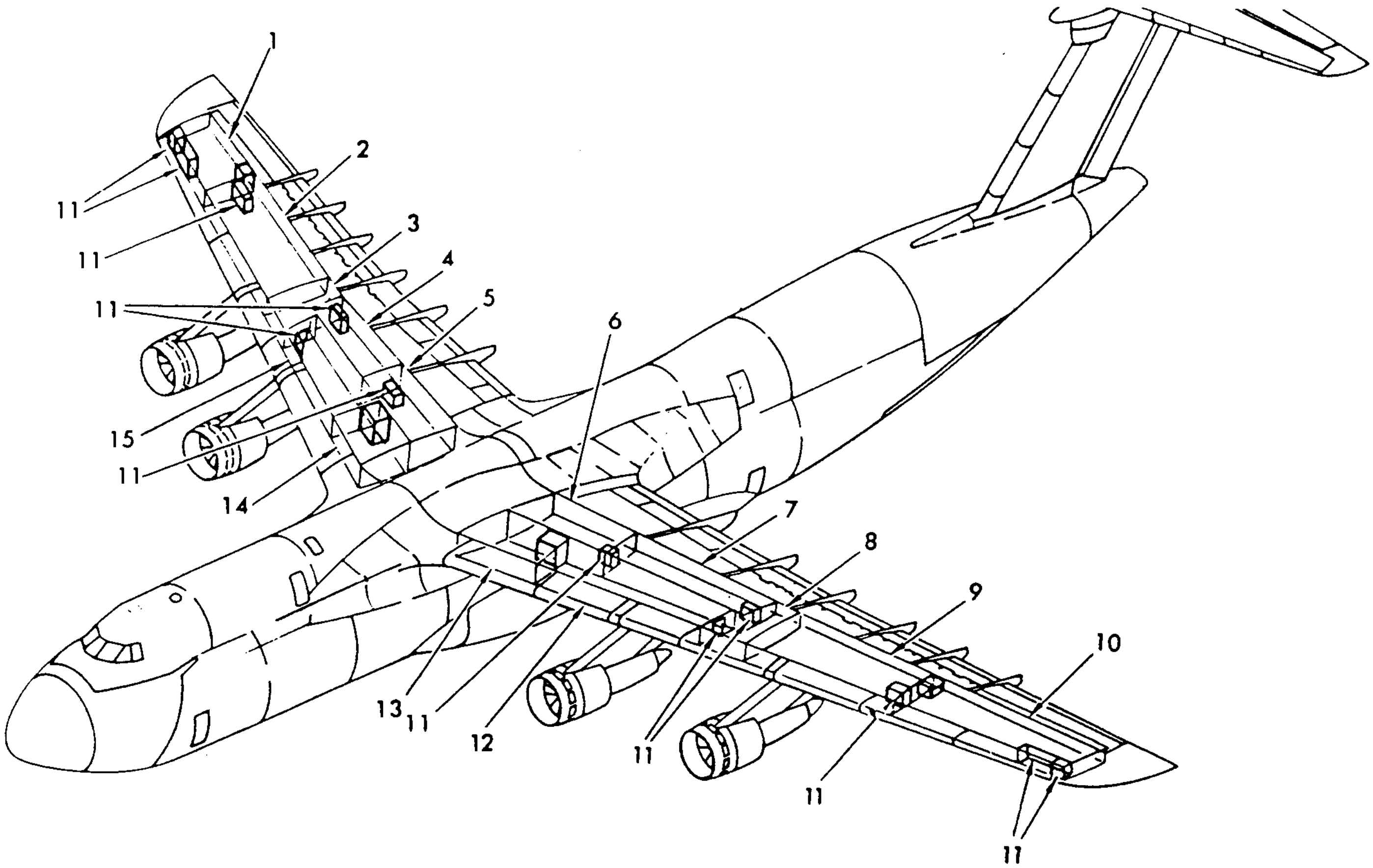
The C-5 fuel system consists of twelve integral wing tanks, functional and control components, and associated plumbing. There are four main fuel tanks, four auxiliary fuel tanks, and four extended range fuel tanks. The tanks are numbered according to the engine they normally supply. For example, the number 1 main, number 1 auxiliary, and number 1 extended range fuel tanks normally supply the number 1 engine.

System management and control is accomplished from the schematized fuel management panel at the flight engineer's station. System design provides for single point refueling, defueling, aerial refueling, fuel jettison, and various engine fuel supply operations.

During normal engine fuel feed operations, fuel is supplied directly to the engine from each corresponding main fuel tank. Fuel from the auxiliary and extended range fuel tanks is utilized by first transferring it to the main fuel tanks. Other operations can be performed by the proper use of the fuel management panel. Fuel may be furnished to the engines directly from the auxiliary or extended range fuel tanks through a fuel crossfeed system without first being transferred to the main tanks. Fuel may also be transferred from tank to tank by means of the fuel transfer system. In addition, the fuel transfer system is used during ground and air-refueling operations to refuel the fuel tanks to the desired level. A crossfeed system is provided to supply fuel to two engines from one main tank in event of multiple failures.

A boost pump assembly is located in a surge box located in the lowest point of each fuel tank. Each boost pump assembly contains two pumping elements within a common housing. All pump elements are interchangeable, and can be removed and replaced without draining the fuel tanks. Each element has its own control circuit and normally only one fuel boost pump element is operated at a time in the desired fuel tanks, with the other element as a back-up in the event of failure of the operating element. In the unlikely event both elements of a main tank boost pump fail, gravity flow occurs through the engine fuel feed lines to the engine, aided by the suction created by the engine-driven fuel pump.

The main tanks can be fueled by the over-the-wing method through filler ports in the upper wing surface. Fuel can then be transferred by use of the boost pump and fuel crossfeed system to any desired tanks.

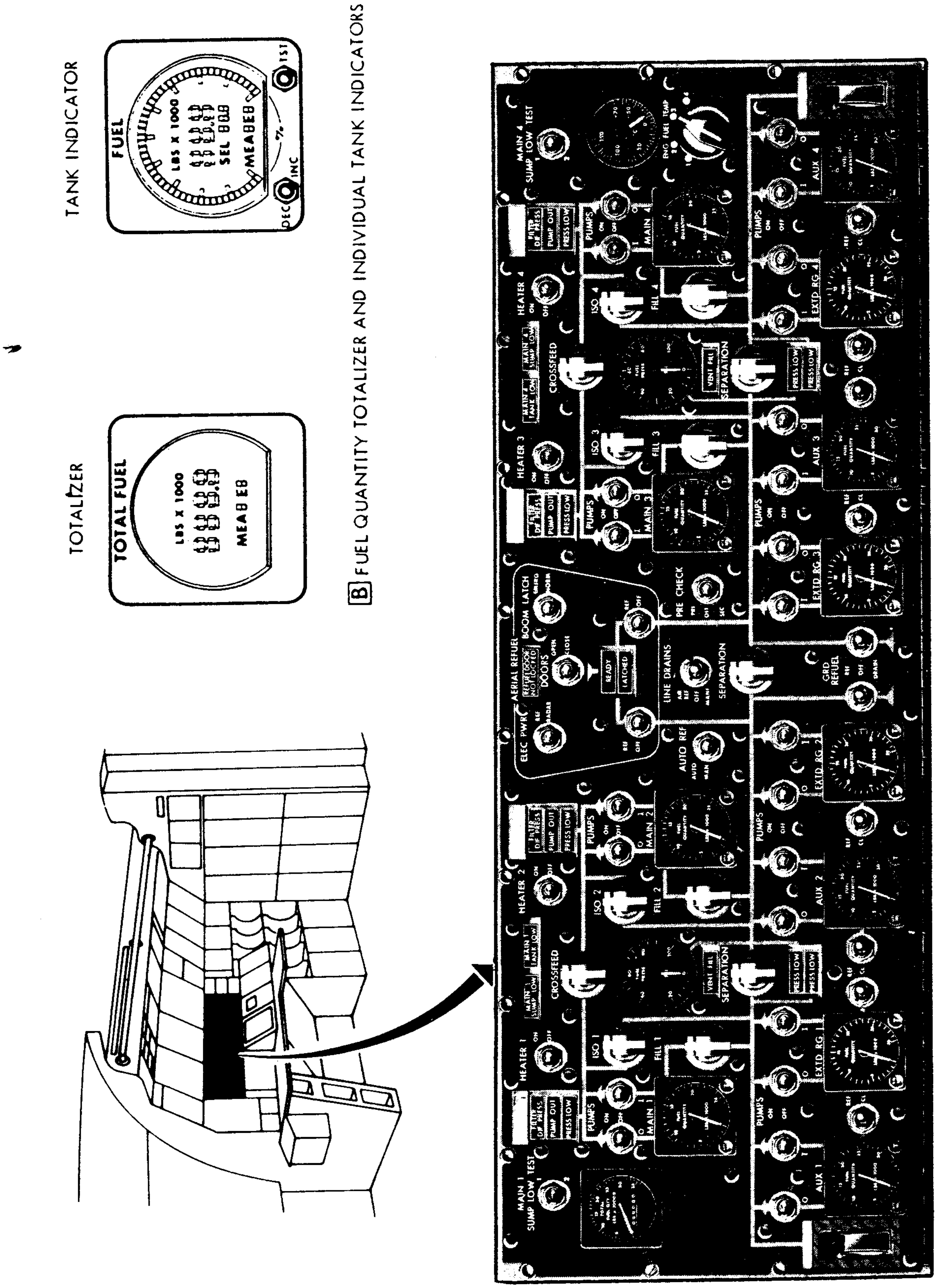


1. NO. 4 MAIN TANK - 3,625 △1 /3,666 △2 GALLON CAPACITY (OWBR STA 368 TO 762)
2. NO. 4 AUXILIARY TANK - 4,625 △1 /4,765 △2 GALLON CAPACITY (OWBR STA 79 TO 368)
3. DRY BAY (IWBR STA 492 TO OWBR STA 79)
4. NO. 4 EXTENDED RANGE TANK - 4,000 △1 /4,191 △2 GALLON CAPACITY (IWBR STA 248 TO 523)
5. NO. 3 EXTENDED RANGE TANK - 4,000 △1 /4,196 △2 GALLON CAPACITY (IWBR STA 79 TO 248)
6. NO. 2 EXTENDED RANGE TANK - 4,000 △1 /4,196 △2 GALLON CAPACITY (IWBR STA 79 TO 248)
7. NO. 1 EXTENDED RANGE TANK - 4,000 △1 /4,191 △2 GALLON CAPACITY (IWBR STA 248 TO 523)
8. DRY BAY (IWBR STA 492 TO OWBR STA 79)
9. NO. 1 AUXILIARY TANK - 4,625 △1 /4,765 △2 GALLON CAPACITY (OWBR STA 79 TO 368)
10. NO. 1 MAIN TANK - 3,625 △1 /3,666 △2 GALLON CAPACITY (OWBR 368 TO 762)
11. SURGE BOX
12. NO. 2 AUXILIARY TANK - 4,625 △1 /4,861 △2 GALLON CAPACITY (IWBR STA 186 TO 492)
13. NO. 2 MAIN TANK - 3,625 △1 /3,898 △2 GALLON CAPACITY (IWBR STA 0 TO 186)
14. NO. 3 MAIN TANK - 3,625 △1 /3,898 △2 GALLON CAPACITY (IWBR STA 0 TO 186)
15. NO. 3 AUXILIARY TANK -4,625 △1 /4,861 △2 GALLON CAPACITY (IWBR STA 186 TO 492)

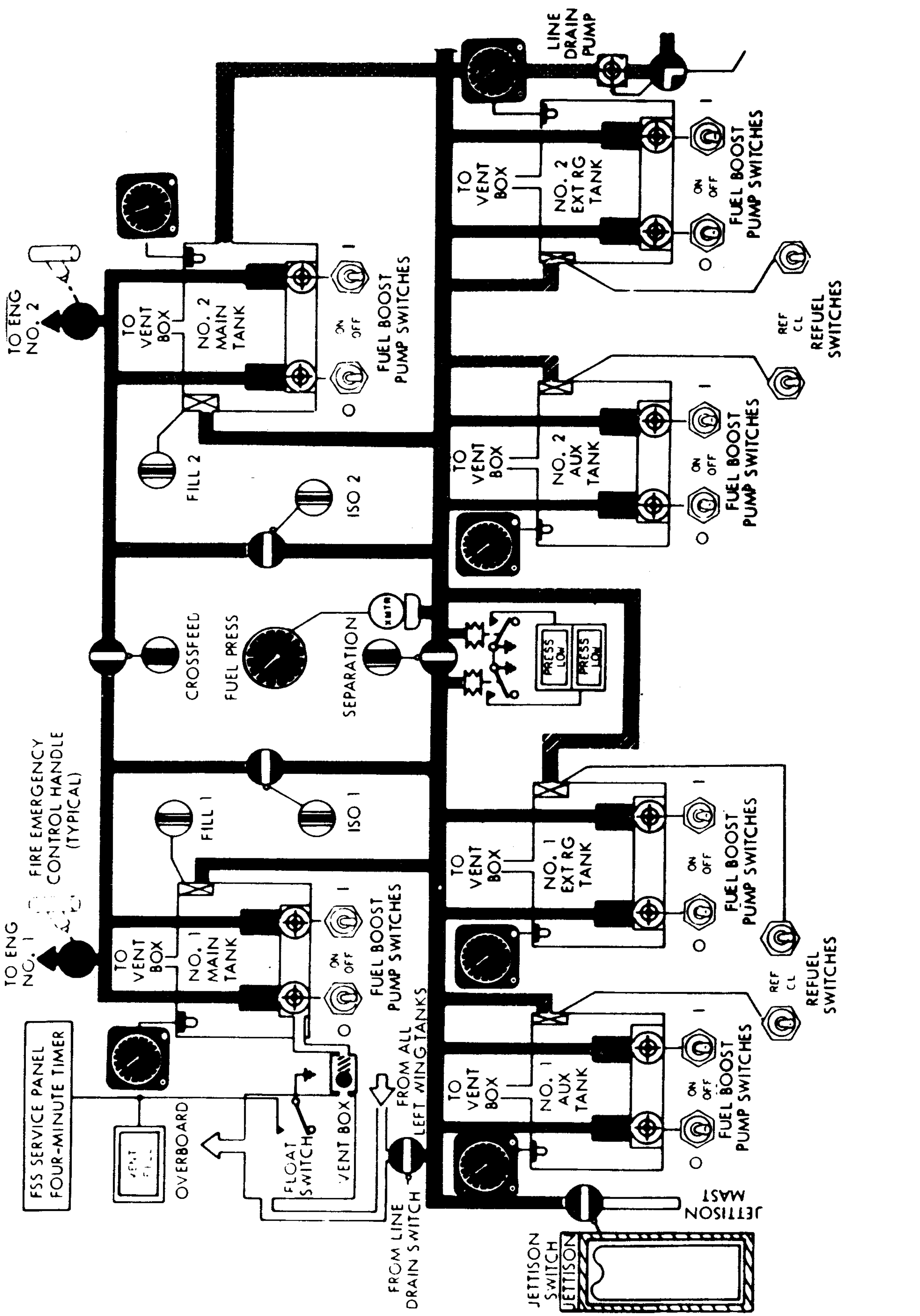
NOTE

△1 APPLIES TO AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1831.
△2 APPLIES TO AIRPLANES MODIFIED BY T.O. 1C-5A-1831, AND C-5B AIRCRAFT.

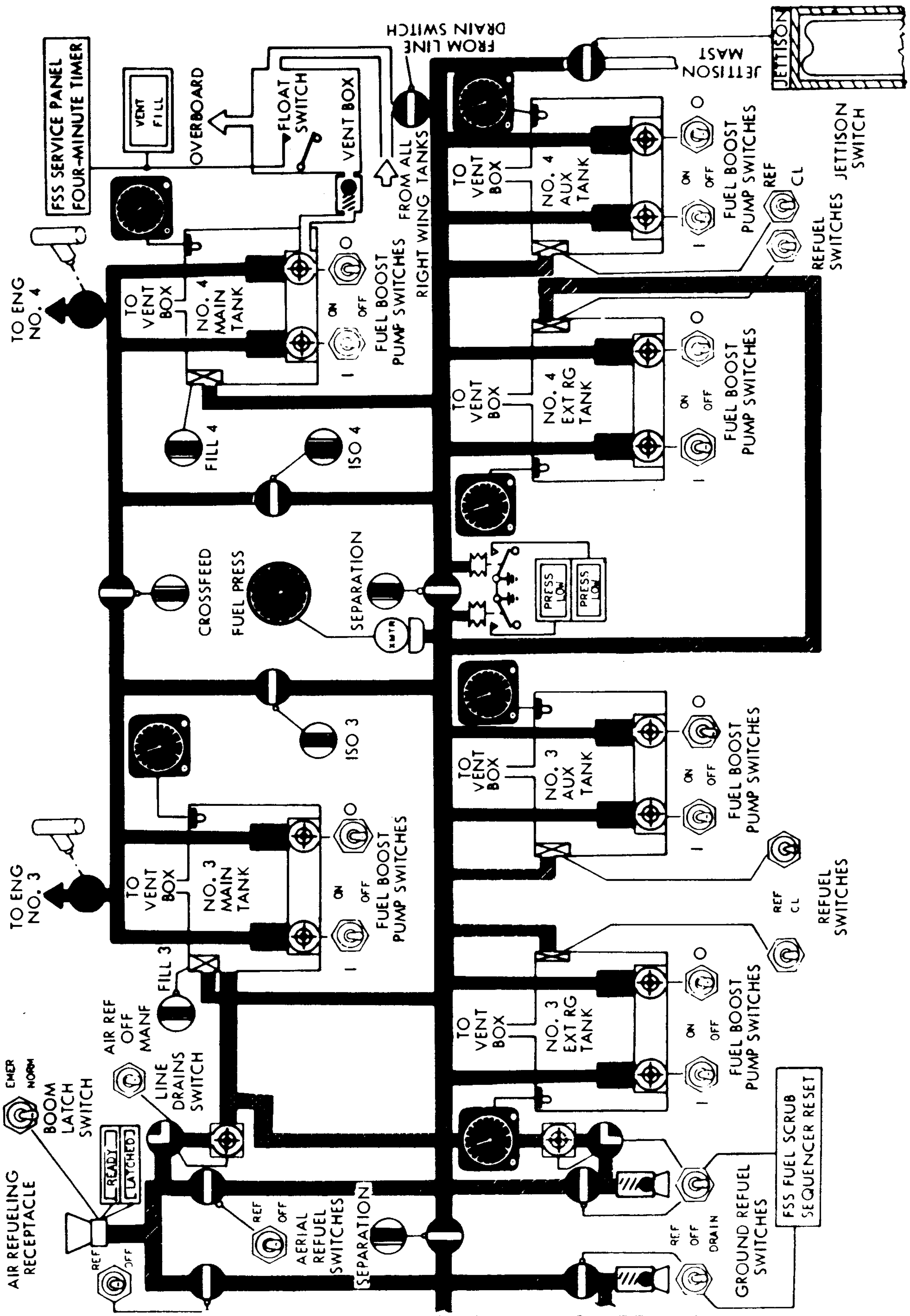
FUEL TANK - GENERAL ARRANGEMENT



FUEL MANAGEMENT PANEL



FUEL SUPPLY SYSTEM (SHEET 1)



FUEL SUPPLY SYSTEM (SHEET 2)

FUEL SUPPLY SYSTEM (SHEET 3)

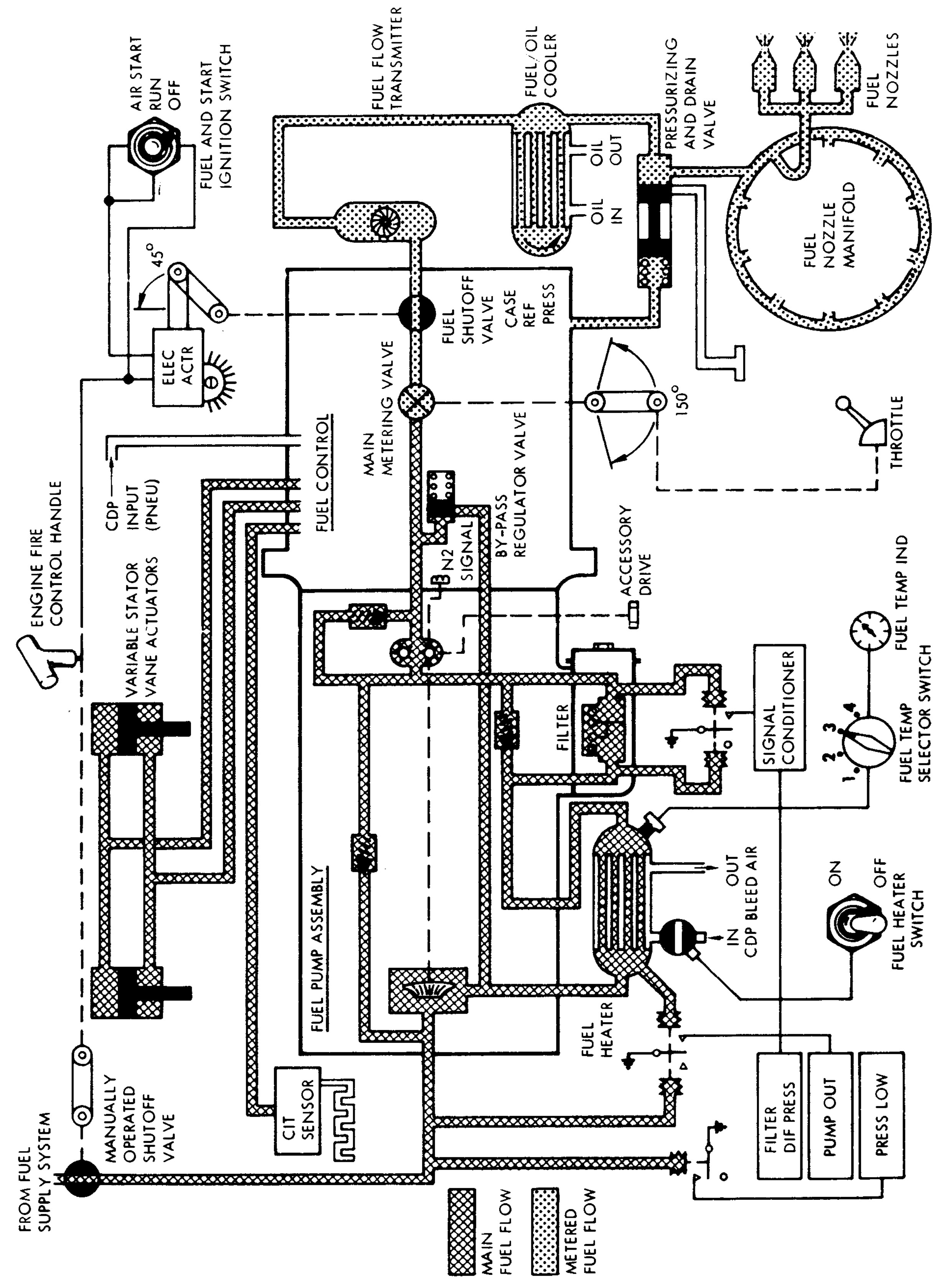
TANK	USABLE FUEL		USABLE FUEL △4	
	GAL	LB	GAL	LB
NO. 1 OR NO. 4 MAIN	3610	23,462	3665	23,826
NO. 2 OR NO. 3 MAIN	3622	23,542	3898	25,337
NO. 1 OR NO. 4 AUX	4622	30,043	4764	30,970
NO. 2 OR NO. 3 AUX	4622	30,043	4861	31,600
NO. 1 OR NO. 4 EXT RANGE	3997	25,980	4191	27,244
NO. 2 OR NO. 3 EXT RANGE	3997	25,980	4196	27,273
TOTAL ALL TANKS	48,940	318,100	51,150	332,500

NOTE

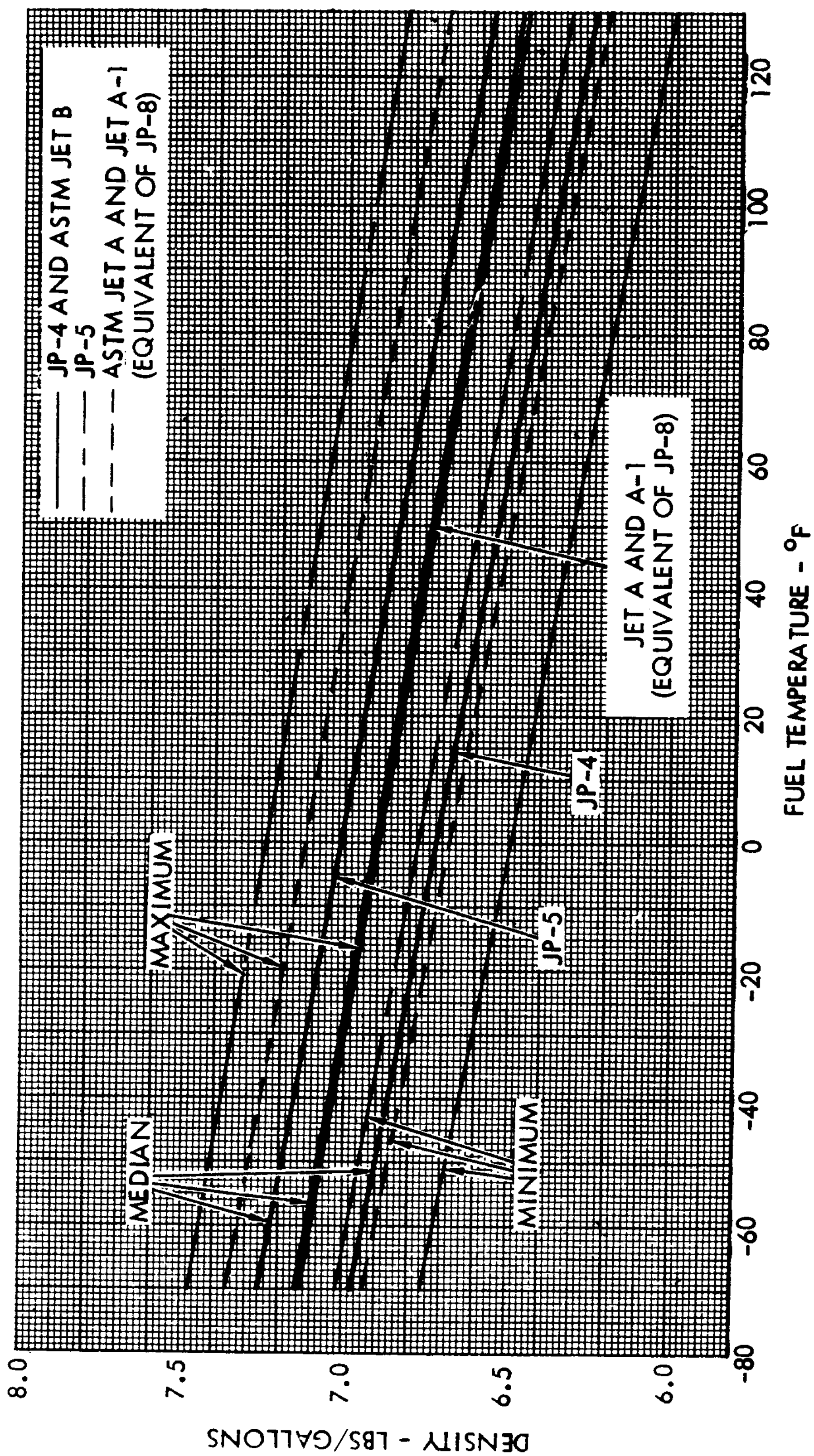
1. WEIGHT IS BASED ON FUEL AT 6.5 POUNDS PER GALLON.
2. SUCTION FEED (BOOST PUMPS OFF) FROM A MAIN TANK REQUIRES THAT THE ASSOCIATED CROSSFEED AND ISOLATION VALVES BE CLOSED.
3. DURING THE SUCTION FEED, THE USABLE FUEL QUANTITY IN NO.1 OR NO.4 MAIN TANK IS REDUCED BY 2432 POUNDS AND THE QUANTITY IN NO.2 OR NO.3 MAIN TANK IS REDUCED BY 113 POUNDS.

△4 AIRPLANES MODIFIED BY T.O. 1831, AND C-5B AIRCRAFT.

FUEL QUANTITY DATA TABLE

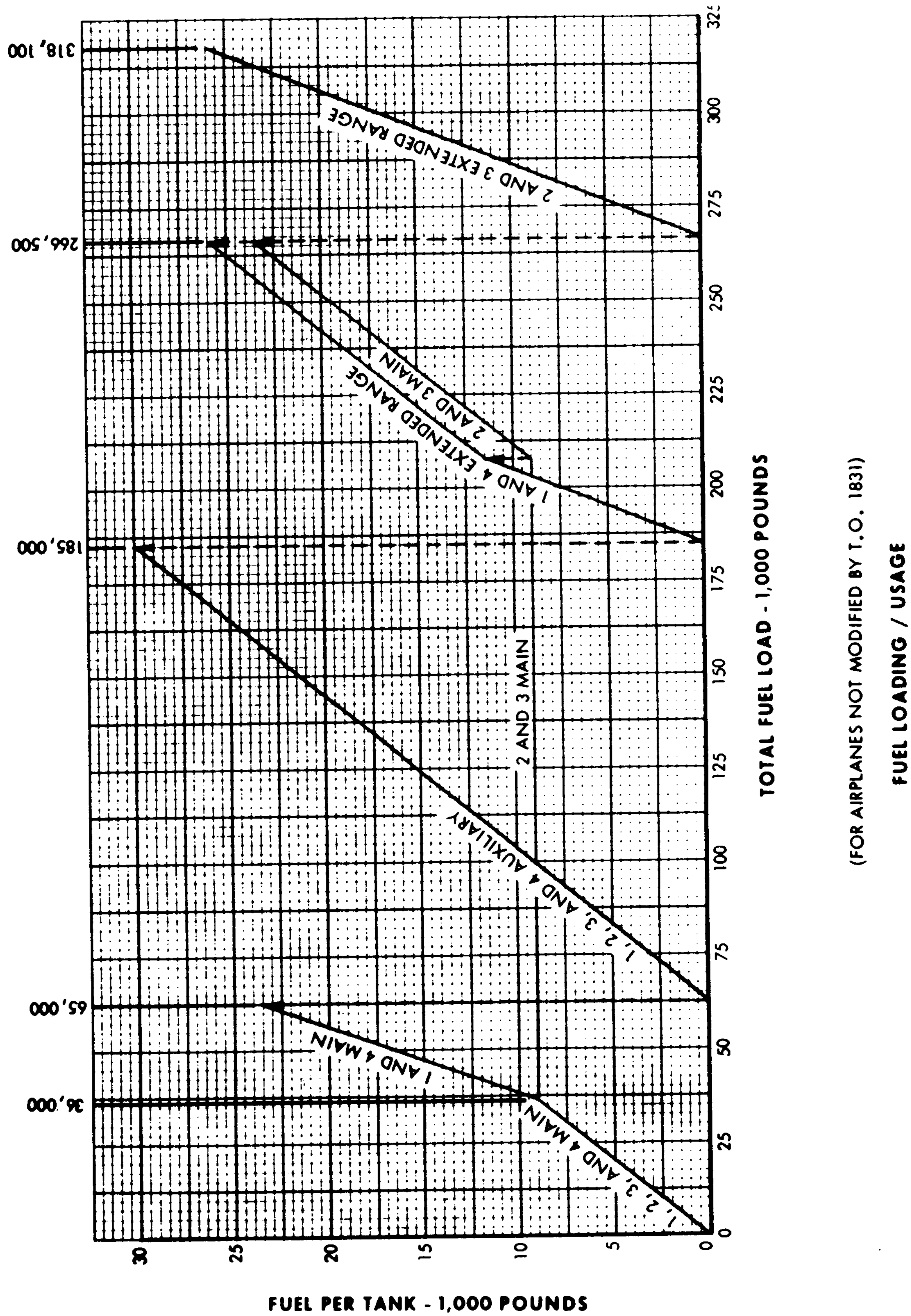


ENGINE FUEL FLOW

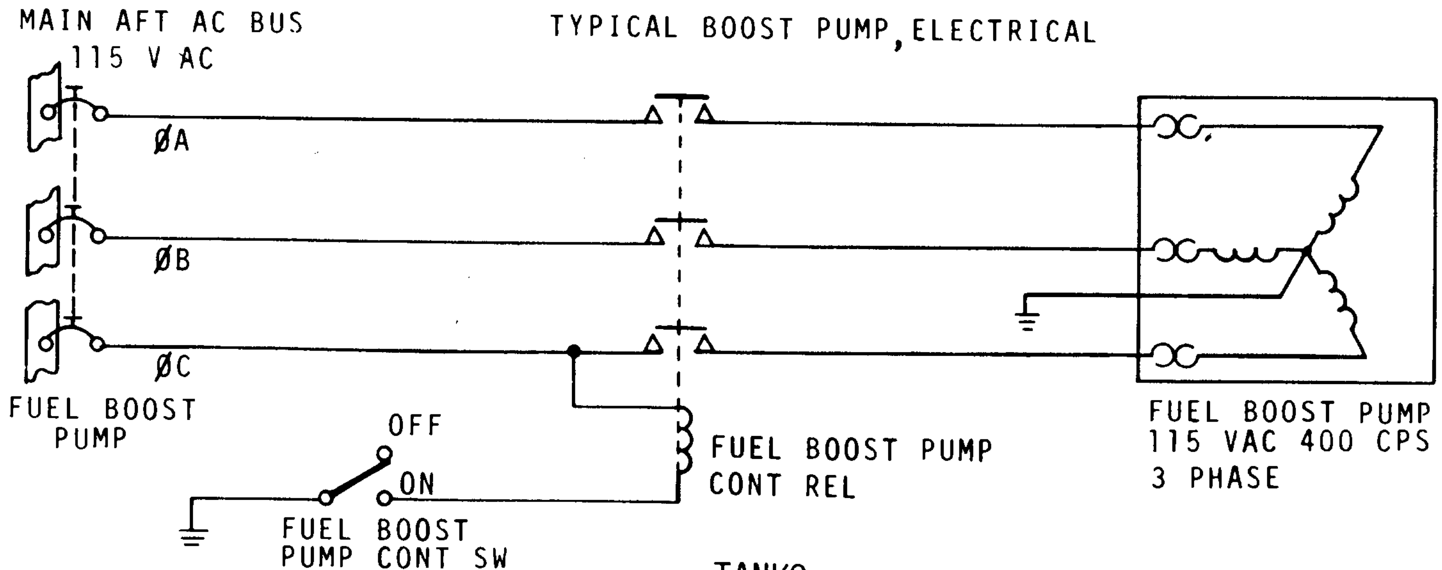


PERMITTED BY SPEC FOR FUELS TO BE
USED IN THE C-5A/B

FUEL DENSITY CHART



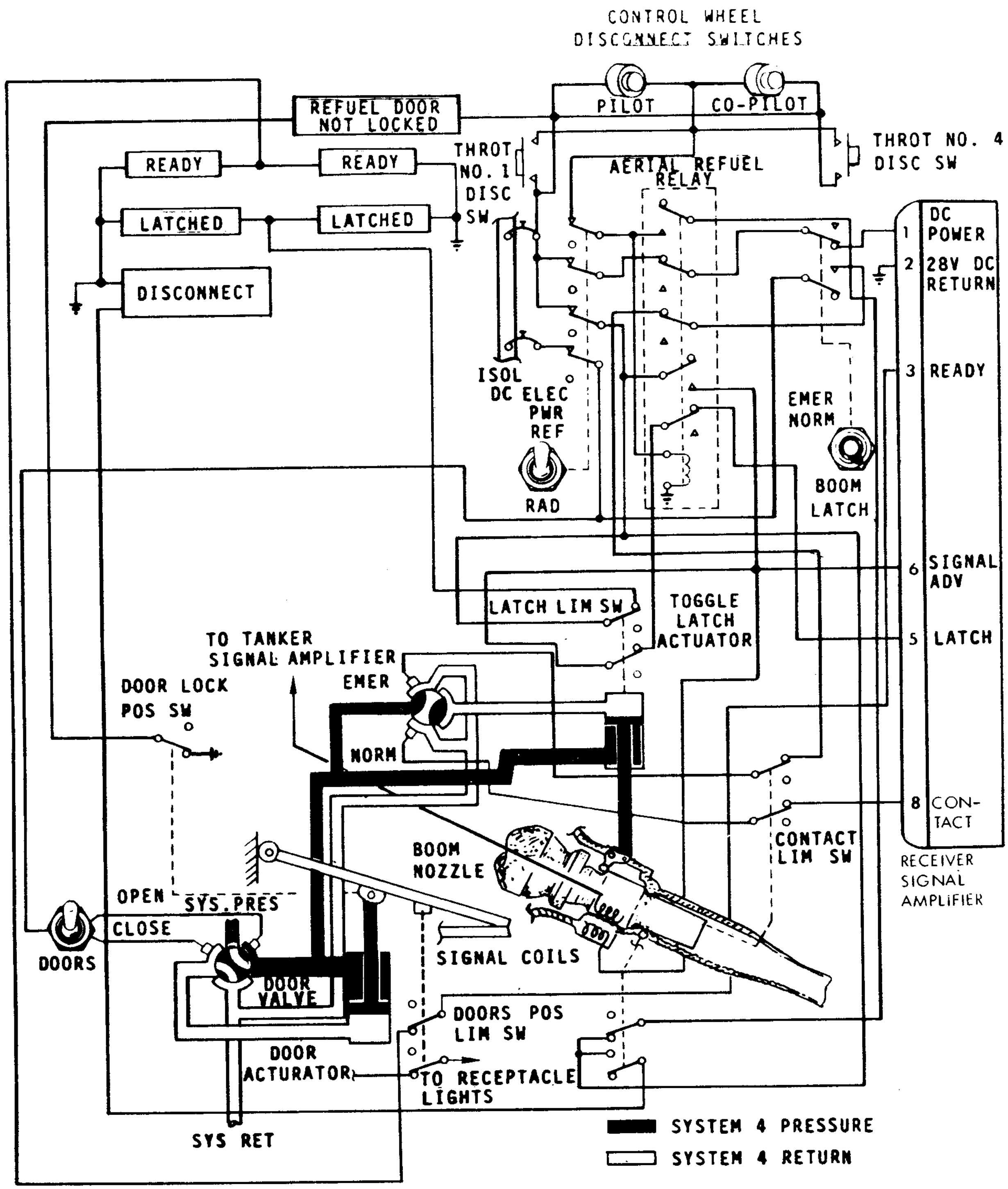
ALTERNATE FUEL SEQUENCE



TANKS

TANKS	MAIN 1	MAIN 2	MAIN 3	MAIN 4	MAIN 1	MAIN 2	MAIN 3	MAIN 4	AUX 1	AUX 2	AUX 3	AUX 4	AUX 1	AUX 2	AUX 3	AUX 4	EXTENDED RANGE 1	EXTENDED RANGE 2	EXTENDED RANGE 3	EXTENDED RANGE 4	EXTENDED RANGE 1	EXTENDED RANGE 2	EXTENDED RANGE 3	EXTENDED RANGE 4
AFT CKT BKR PNL NO. 1	OUTBOARD PUMPS				INBOARD PUMPS				OUTBOARD PUMPS				INBOARD PUMPS				OUTBOARD PUMPS				INBOARD PUMPS			
AFT MAIN AC BUS NO. #1				X	X							X	X							X	X			
AFT MAIN AC BUS NO. #2			X			X					X			X					X			X		
AFT CKT BKR PNL NO. 4																								
AFT MAIN AC BUS NO. #3		X					X			X					X			X					X	
AFT MAIN AC BUS NO. #4	X							X	X							X	X							X

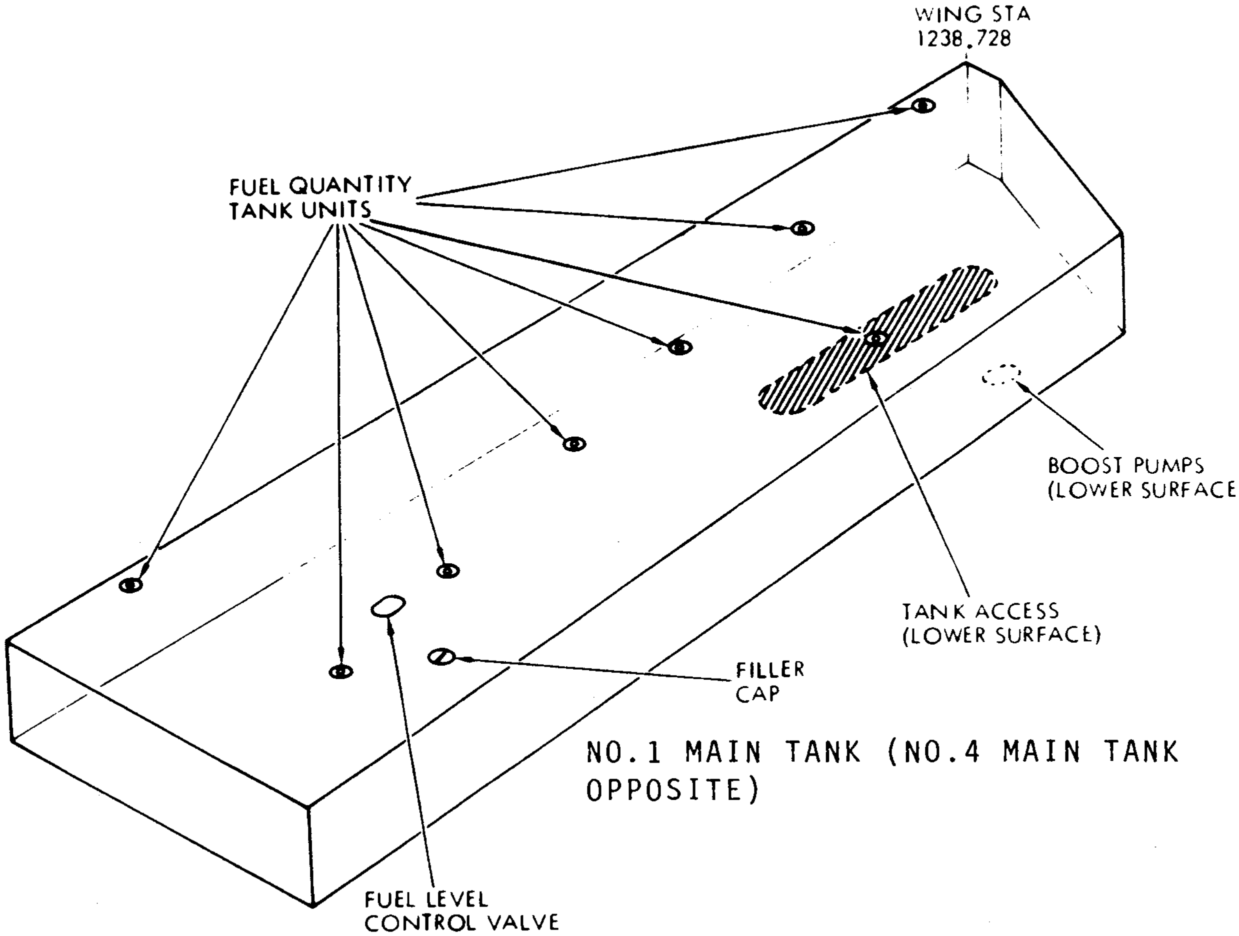
BOOST PUMP ELECTRICAL



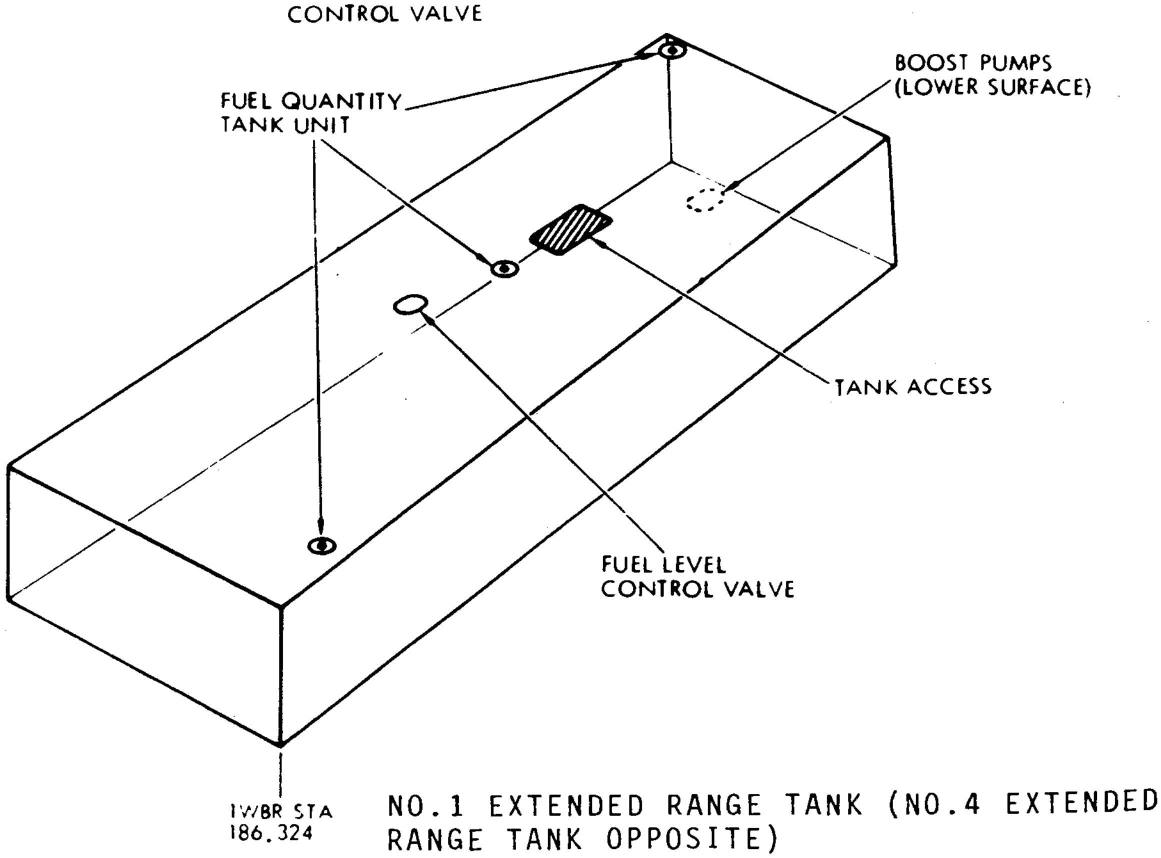
AERIAL REFUEL SYSTEM SCHEMATIC

COMPONENTS	BUS ISOLATION		BATTERY	MAIN	
	AC	DC	DC	AC	DC
Jettison Valves	X				
Ground Refueling Isolation Valves			X		
Separation Valves			X		
Aerial Refueling Isolation Valves	X				
Ground Refueling Drain Valves				X	
Aerial Refueling Drain Valves				X	
Manifold Drain Valves				X	
APU Shutoff Valves			X		
Isolation Valves	X				
Crossfeed Valves	X				
Boost Pumps				X	
Fuel Level Control Valves				X	
Fuel Probes				X	
Vent Float Switch/Warn Light					X
Drain and Transfer Pump				X	
Aerial Refueling Amplifier		X			
Fuel Pressure Switch/Warn Light					X
Pressure Transmitter/Indicator	26 VAC INSTRUMENT BUS				

COMPONENT ELECTRICAL REQUIREMENTS

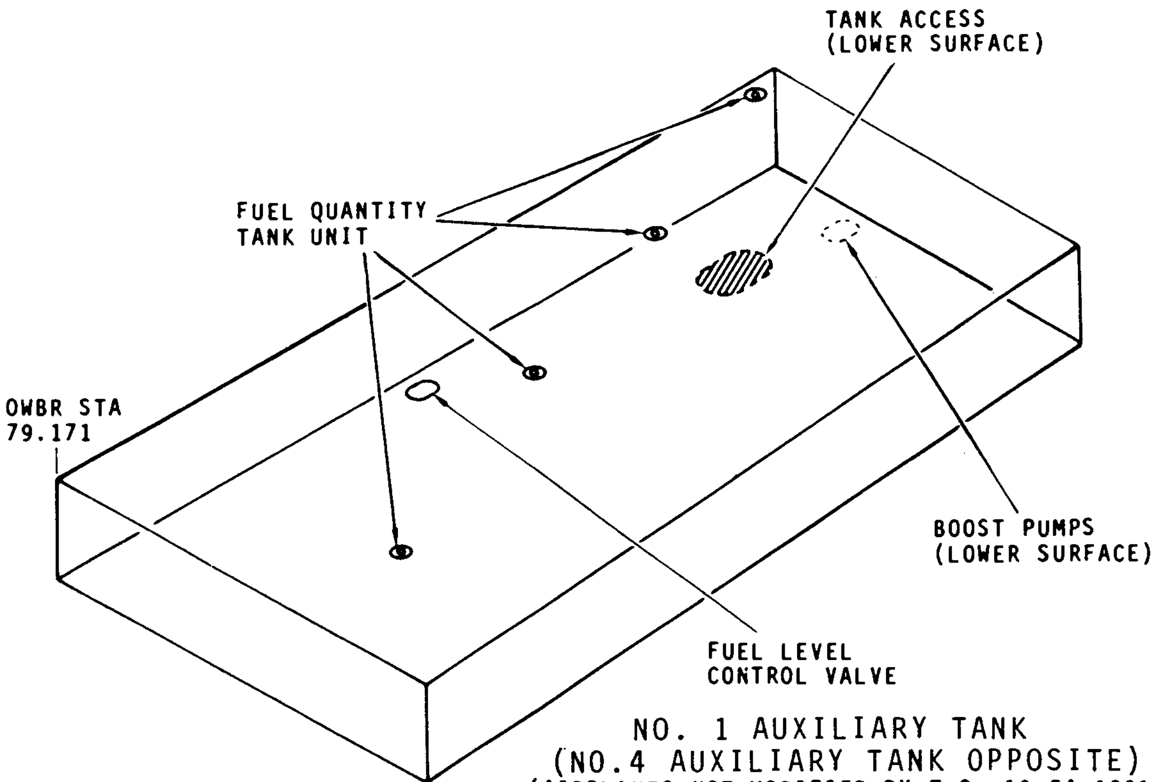


NO.1 MAIN TANK (NO.4 MAIN TANK OPPOSITE)

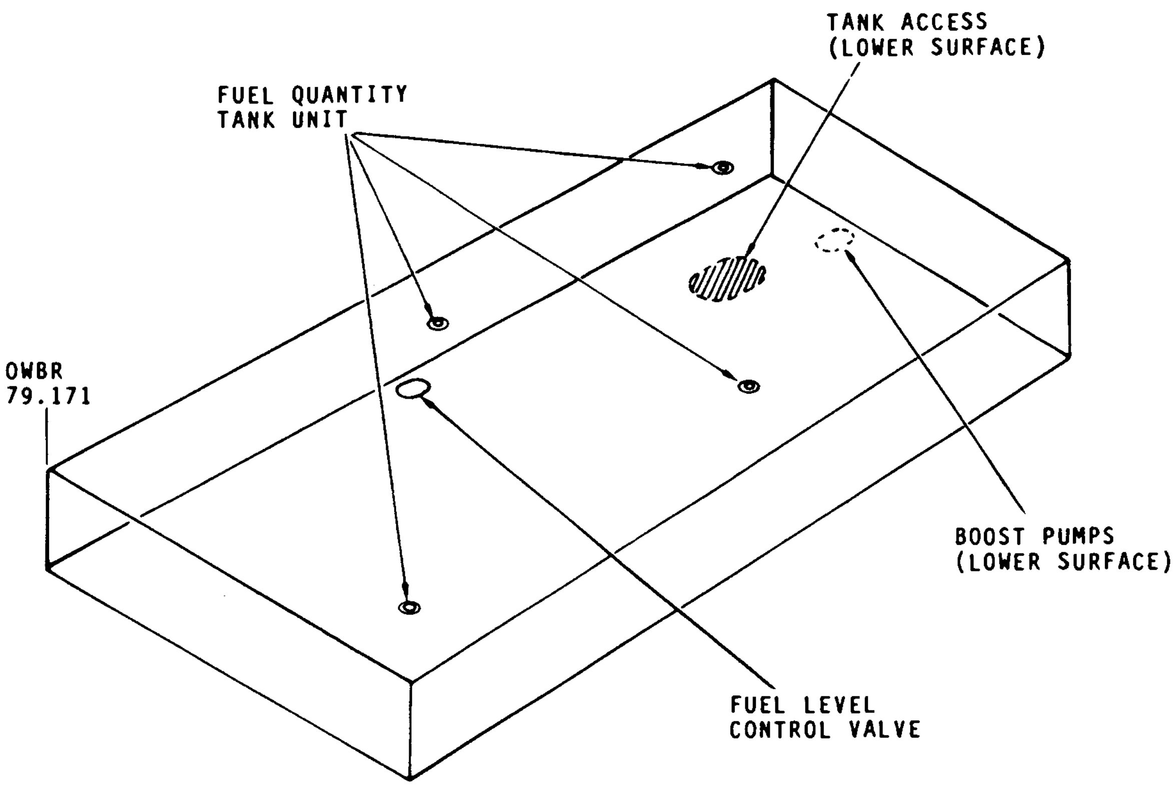


NO.1 EXTENDED RANGE TANK (NO.4 EXTENDED RANGE TANK OPPOSITE)

FUEL TANK OPENINGS (SHEET 1)

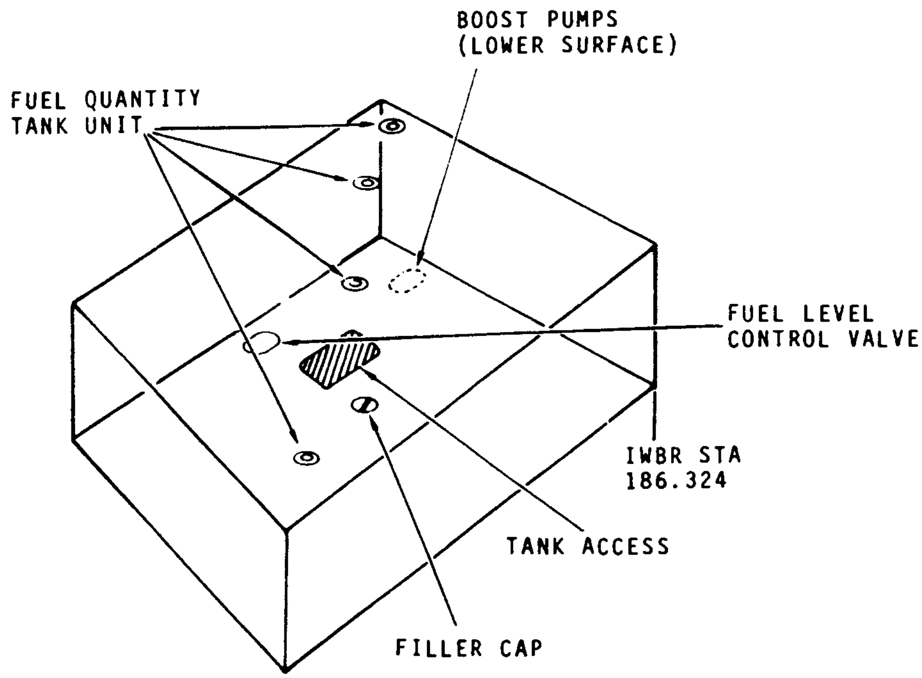


NO. 1 AUXILIARY TANK
(NO.4 AUXILIARY TANK OPPOSITE)
(AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1831)



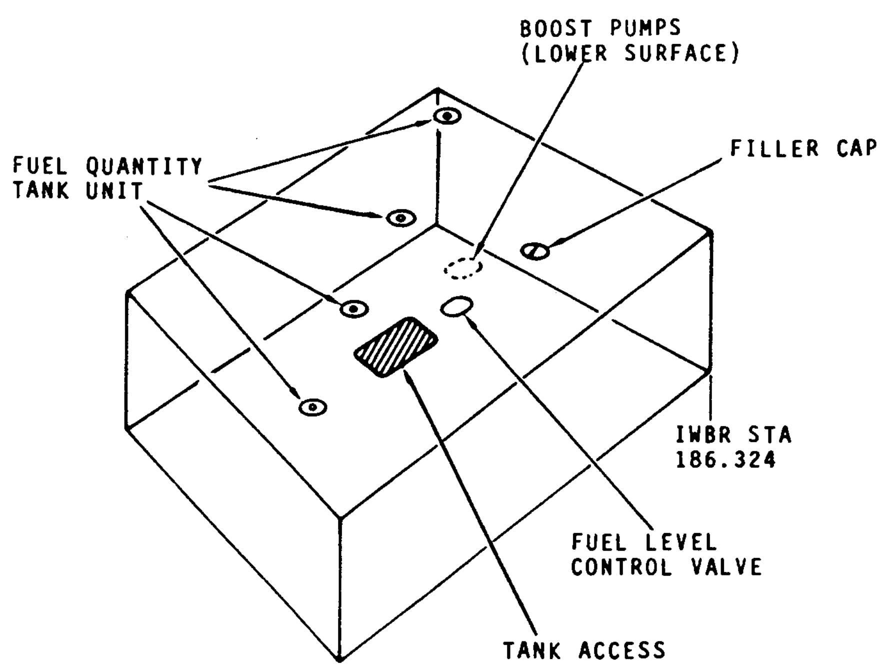
AIRPLANES MODIFIED BY T.O. 1C-5A-1831 AND C-5B
NO. 1 AUXILIARY TANK
(NO. 4 AUXILIARY TANK OPPOSITE)

FUEL TANK OPENINGS (SHEET 2)



NO. 2 MAIN TANK (NO.3 MAIN TANK OPPOSITE)

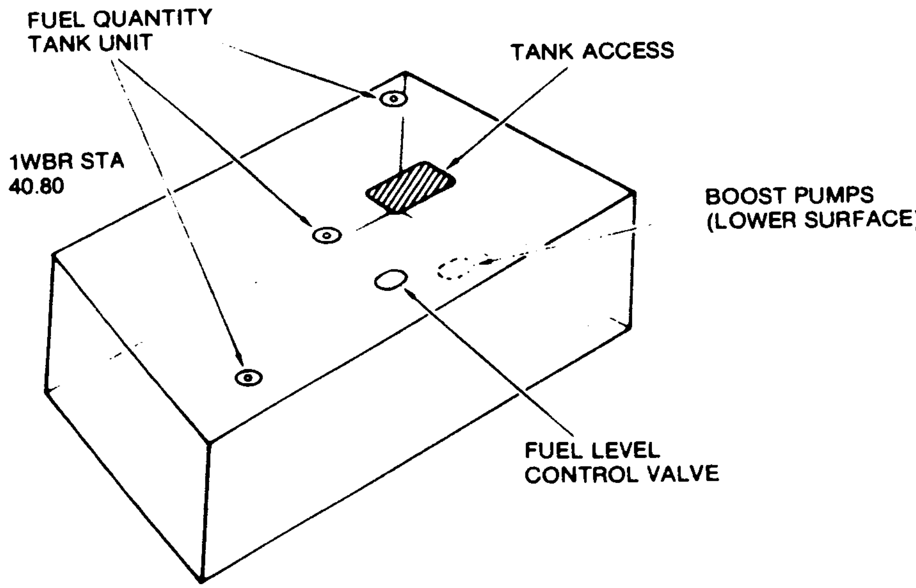
AIRPLANES MODIFIED BY T.O. 1C-5A-1831 AND C-5B



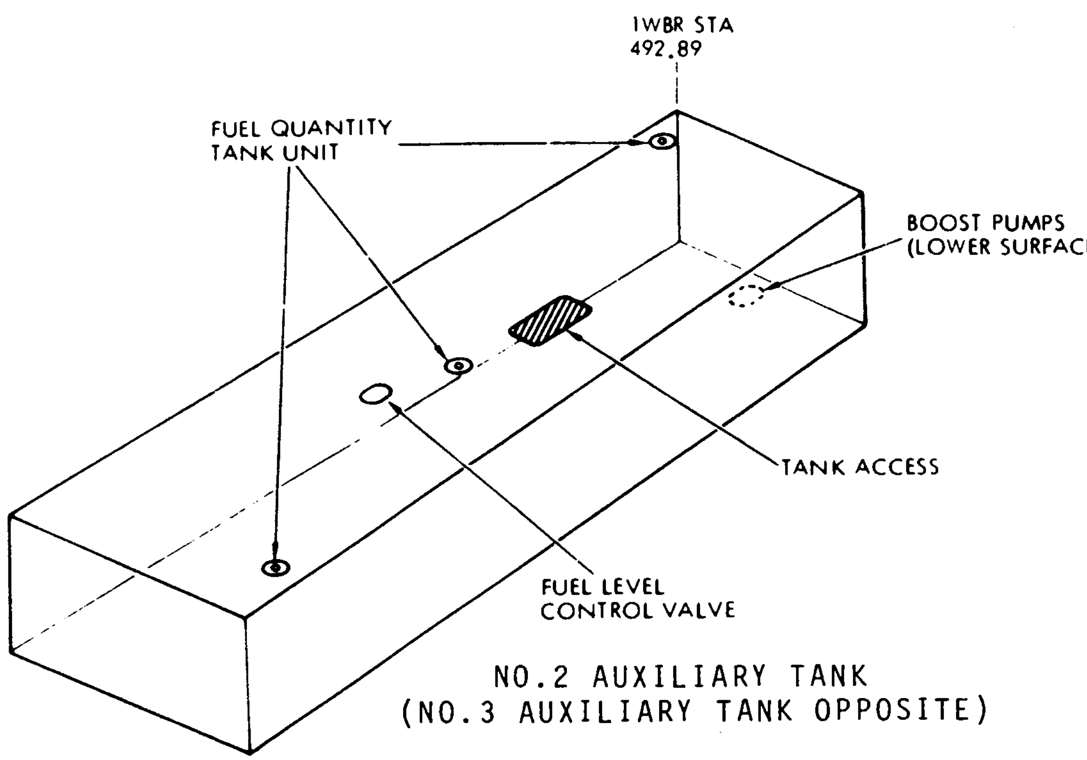
NO.2 MAIN TANK (NO.3 MAIN TANK OPPOSITE)

(AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1831)

FUEL TANK OPENINGS (SHEET 3)

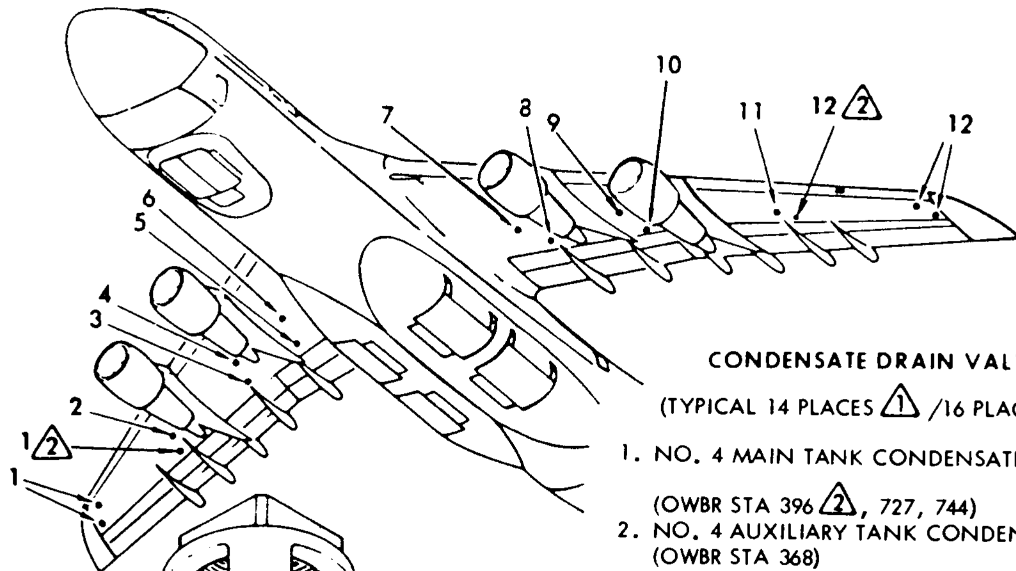


NO.2 EXTENDED RANGE TANK
(NO.3 EXTENDED RANGE TANK OPPOSITE)



NO.2 AUXILIARY TANK
(NO.3 AUXILIARY TANK OPPOSITE)

FUEL TANK OPENINGS (SHEET 4)



CONDENSATE DRAIN VALVE

(TYPICAL 14 PLACES ⚠1 /16 PLACES ⚠2)

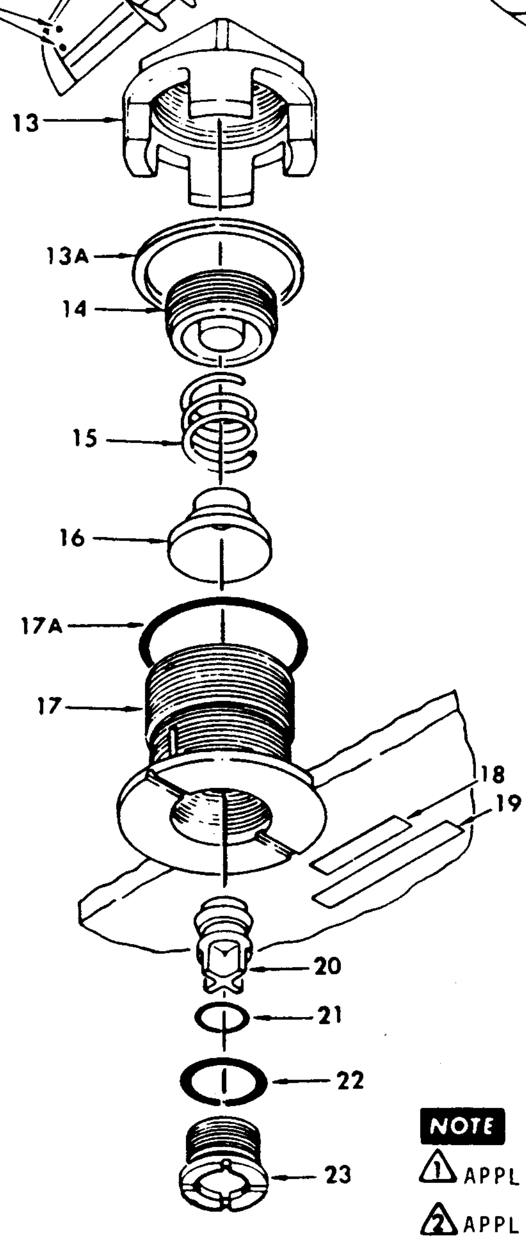
1. NO. 4 MAIN TANK CONDENSATE DRAIN VALVE (OWBR STA 396 ⚠2, 727, 744)
2. NO. 4 AUXILIARY TANK CONDENSATE DRAIN VALVE (OWBR STA 368)
3. NO. 4 EXTENDED RANGE TANK CONDENSATE DRAIN VALVE (IWBR STA 523)
4. NO. 3 AUXILIARY TANK CONDENSATE DRAIN VALVE (IWBR STA 492)
5. NO. 3 EXTENDED RANGE TANK CONDENSATE DRAIN VALVE (IWBR STA 248)
6. NO. 3 MAIN TANK CONDENSATE DRAIN VALVE (IWBR STA 186 ⚠1 /174 ⚠2
7. NO. 2 MAIN TANK CONDENSATE DRAIN VALVE (IWBR STA 186 ⚠1 /174 ⚠2)
8. NO. 2 EXTENDED RANGE TANK CONDENSATE DRAIN VALVE (IWBR STA 248)
9. NO. 2 AUXILIARY TANK CONDENSATE DRAIN VALVE (IWBR STA 492)
10. NO. 1 EXTENDED RANGE TANK CONDENSATE DRAIN VALVE (IWBR STA 523)
11. NO. 1 AUXILIARY TANK CONDENSATE DRAIN VALVE (OWBR STA 368)
12. NO. 1 MAIN TANK CONDENSATE DRAIN VALVE (OWBR STA 396 ⚠2, 727, 744)
13. VALVE RETAINER

13A. WASHER

14. SPRING RETAINER
15. SPRING
16. SECONDARY POPPET
17. CONDENSATE DRAIN VALVE BODY

17A. PACKING

18. FUEL DRAIN STENCIL
19. FUEL TANK STENCIL
20. PRIMARY POPPET
21. PACKING
22. PACKING
23. SEAT



NOTE

⚠1 APPLIES TO AIRPLANES NOT MODIFIED BY T.O. 1C-5A-1831.

⚠2 APPLIES TO AIRPLANES MODIFIED BY T.O. 1C-5A-1831 AND C-5B.

CONDENSATE DRAIN VALVES

SECTION V
POWER PLANT

INTRODUCTION

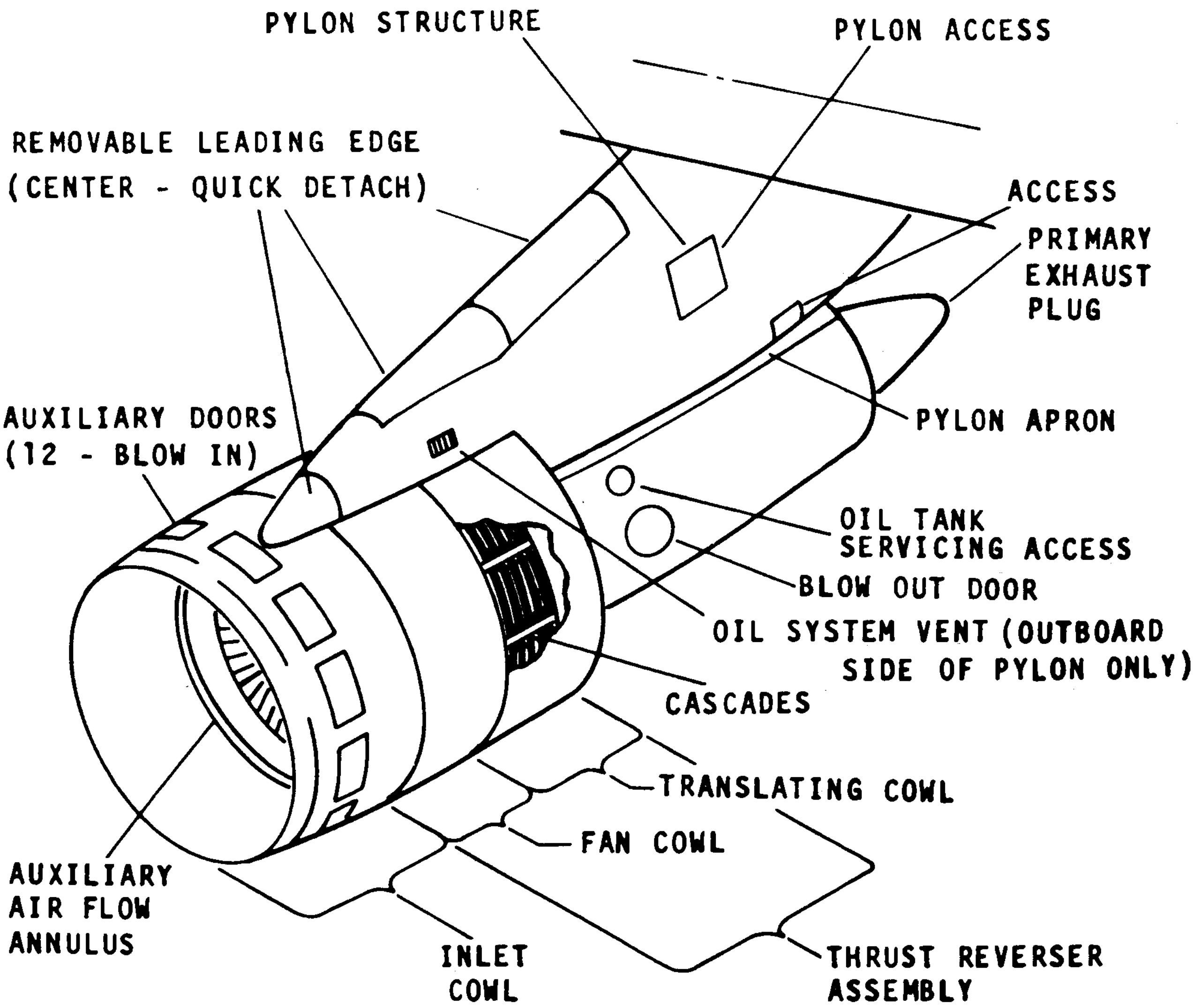
Power for the C-5 is provided by four TF39-GE-1C turbofan engines. The TF39 is a dual-rotor turbofan with fixed exhaust nozzles. It has a 1 1/2 - stage front fan that is driven by a six-stage low-pressure turbine. At 100% RPM, the fan is rotating at 3,500 RPM. The fan has a pressure ratio of 1.5 to 1 and generates 85% of total engine thrust. The high-pressure compressor has 16 stages and is driven by a two-stage, air cooled turbine. The inlet guide vanes and the first six compressor stator stages are variable, and their scheduling is regulated by the fuel control. At 100% RPM, the compressor is rotating at 9,827 RPM. Below 32°C, the installed engine operating at sea level develops approximately 39,000 pounds of static thrust.

DETAILS

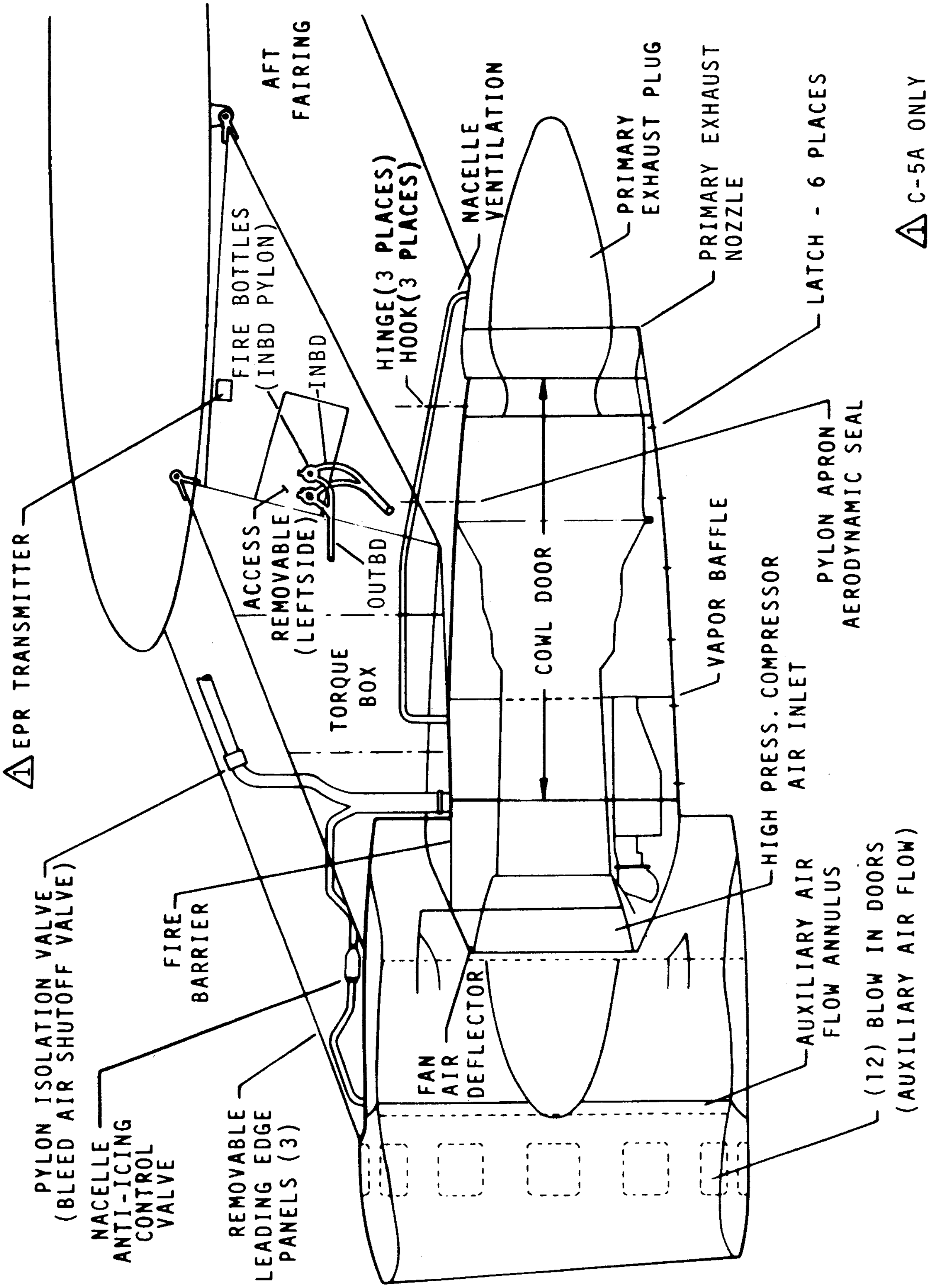
Test Cell Thrust Rating (89.5° Day, 2,300°F TIT) ......41,100 pounds
Cruise Thrust (Mach 0.8 and 36,089 ft.)......................8,244 pounds
Weight ....7,900 pounds
Thrust to Weight Ratio ....5.2 to 1
Bypass Ratio ....8.5 to 1
Airflow (Max at takeoff) ....1,549 pounds/second
Nacelle Exterior Diameter ....8.5 feet
Engine Pod Length ....26.2 feet
Oil Tank Capacity (each engine) ....9.1 gallons
Engine Length with Spinner (but not tail cone) ....203 inches

The thrust reverser is a cascade type, mounted on the fan cowl and only fan exhaust air is reversed, the primary gas generator stream is not reversed. Reverse thrust is equal to approximately 37% total engine forward thrust. Reversers operate effectively down to a cut-off speed of approximately 30 knots and the two inboard engines can be placed in reverse idle in flight for rapid descent.

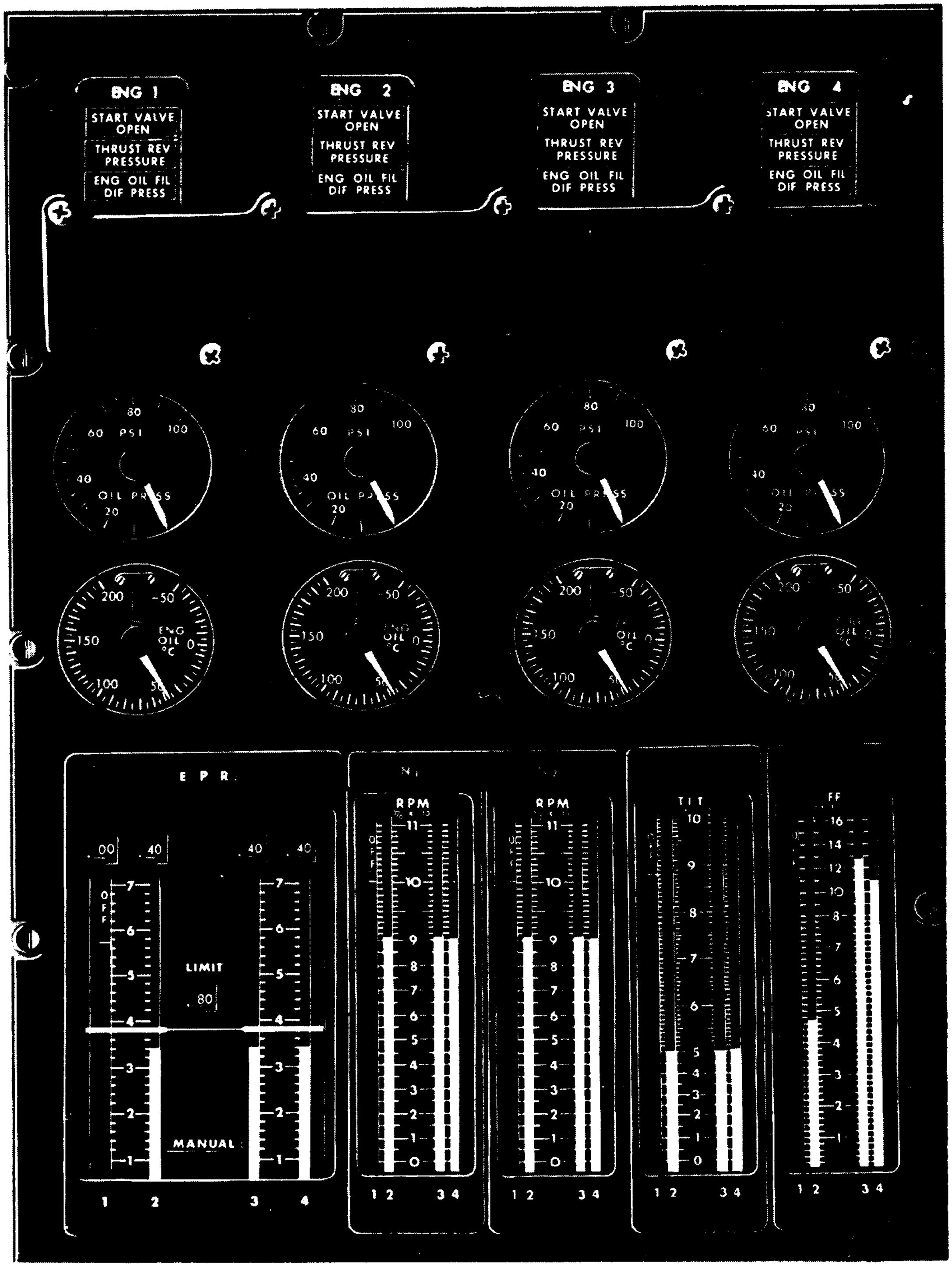
Two APUs, one located in each main landing gear pod, supply air to the bleed air manifold. Each APU also drives an 80-KVA generator for auxiliary electrical power. The APUs are normally for ground use only but can be operated in flight in the event of an emergency. Each APU is equipped with a starting system which consists of a hydraulic starter motor, a hydraulic accumulator, a hydraulic shutoff valve, and a handpump.



EBU AND PYLON

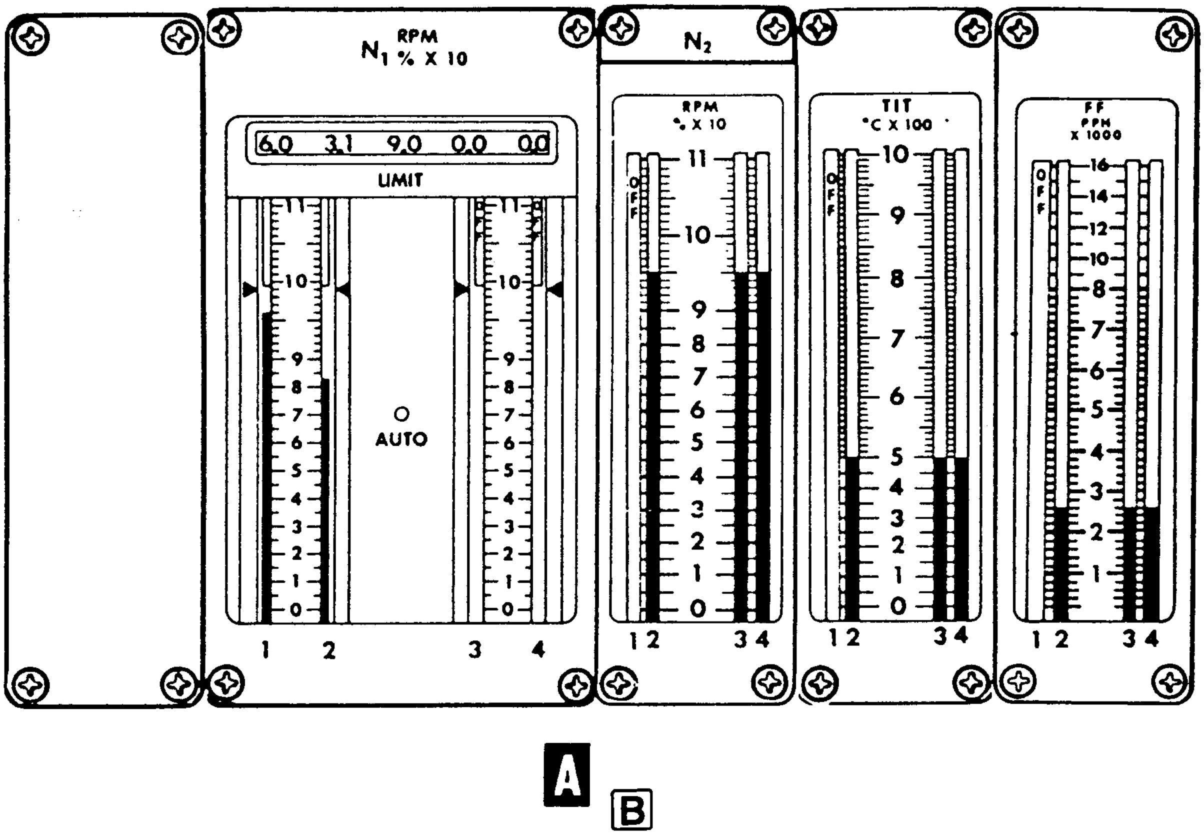


EBU INSTALLATION

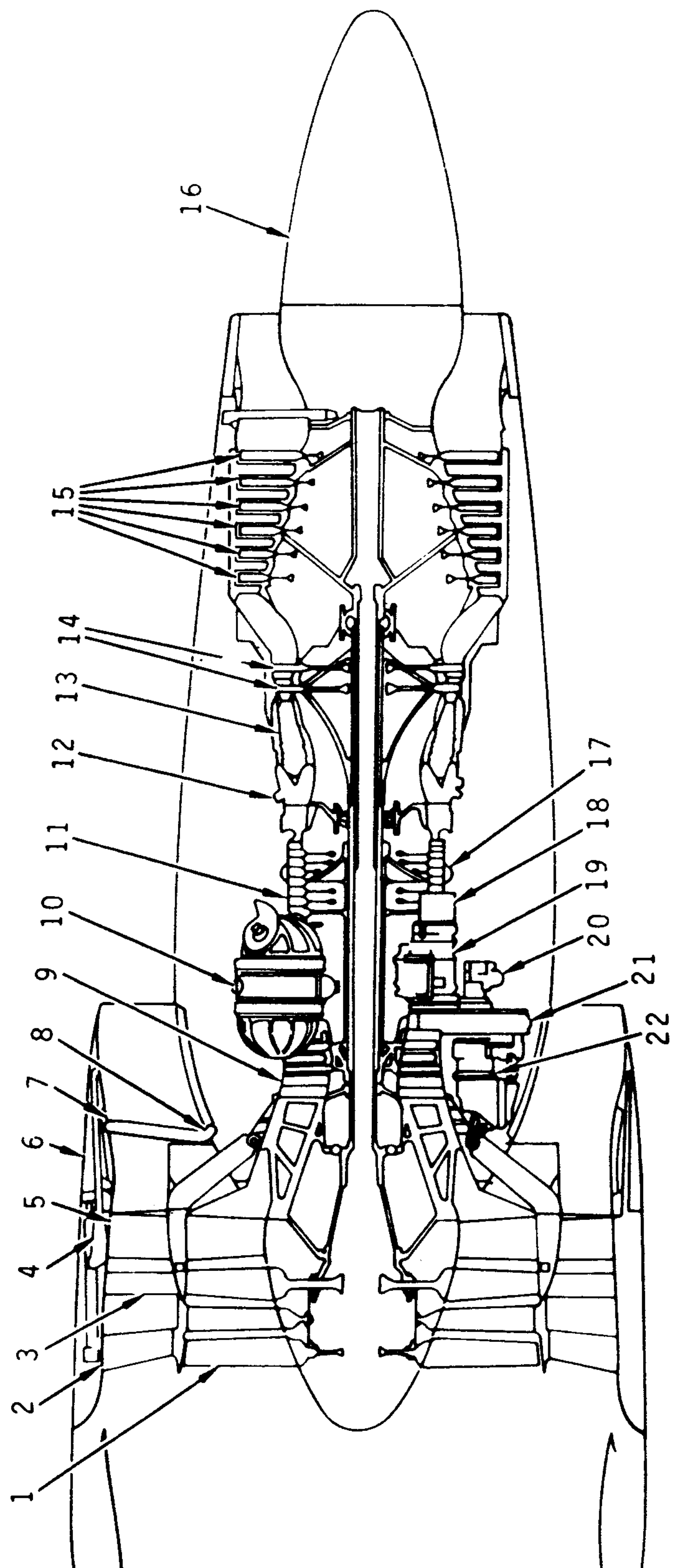


A A

C-5A ENGINE INDICATORS (SHEET 1)

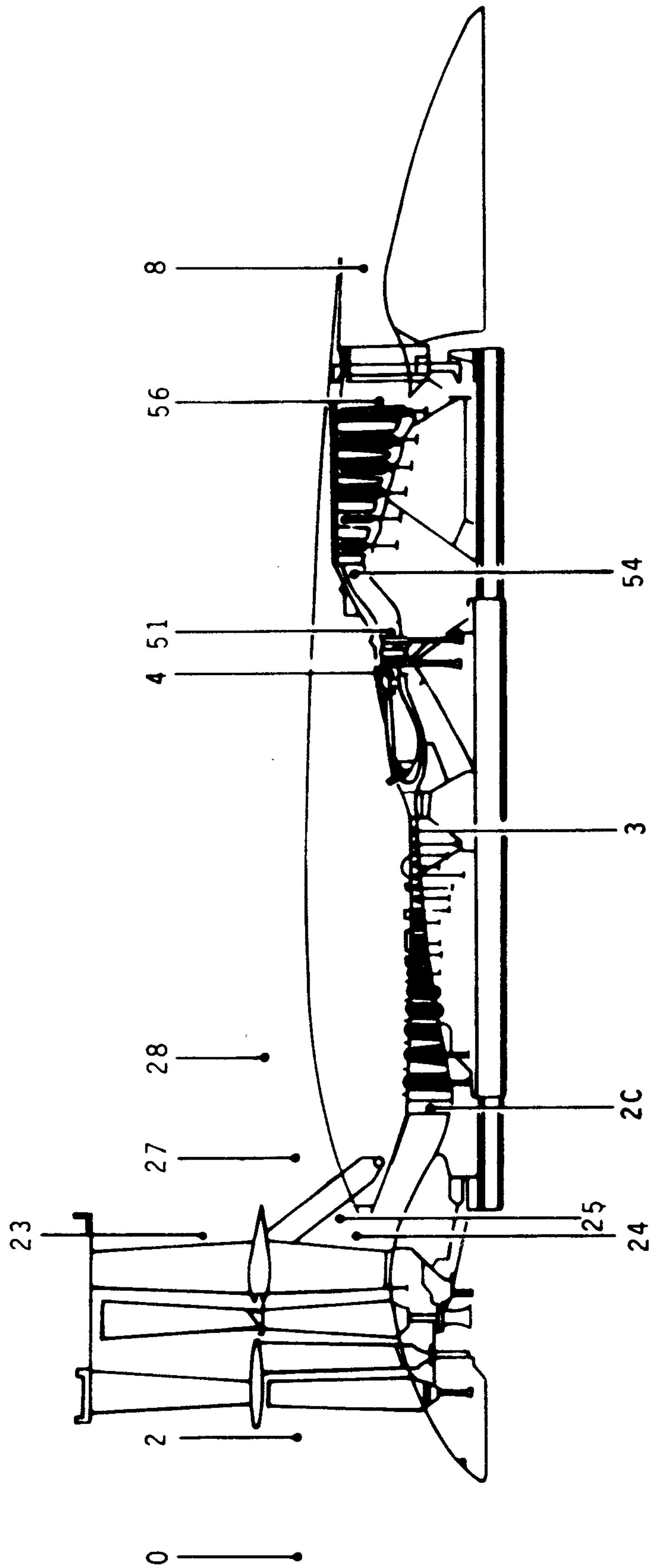


C-5B ENGINE INDICATORS (SHEET 2)



1. FIRST STAGE FAN (N_1)
2. FAN INLET GUIDE VANE
3. SECOND STAGE FAN (N_1)
4. TRANSLATING COWL ACTUATOR
5. FAN AIR EXIT VANE
6. TRANSLATING COWL
7. BLOCKER FLAP
8. BLOCKER LINK
9. HIGH PRESSURE COMPRESSOR INLET GUIDE VANE
10. ENGINE OIL TANK
11. HIGH PRESSURE COMPRESSOR (N_2)
12. FUEL NOZZLE
13. COMBUSTION CHAMBER
14. HIGH PRESSURE TURBINE
15. LOW PRESSURE TURBINE
16. EXHAUST CONE
17. 13th STAGE BLEED AIR MANIFOLD
18. FUEL CONTROL
19. FUEL PUMP
20. LUBE AND SCAVENGE PUMP
21. ACCESSORY DRIVE GEARBOX
22. TRANSFER GEARBOX

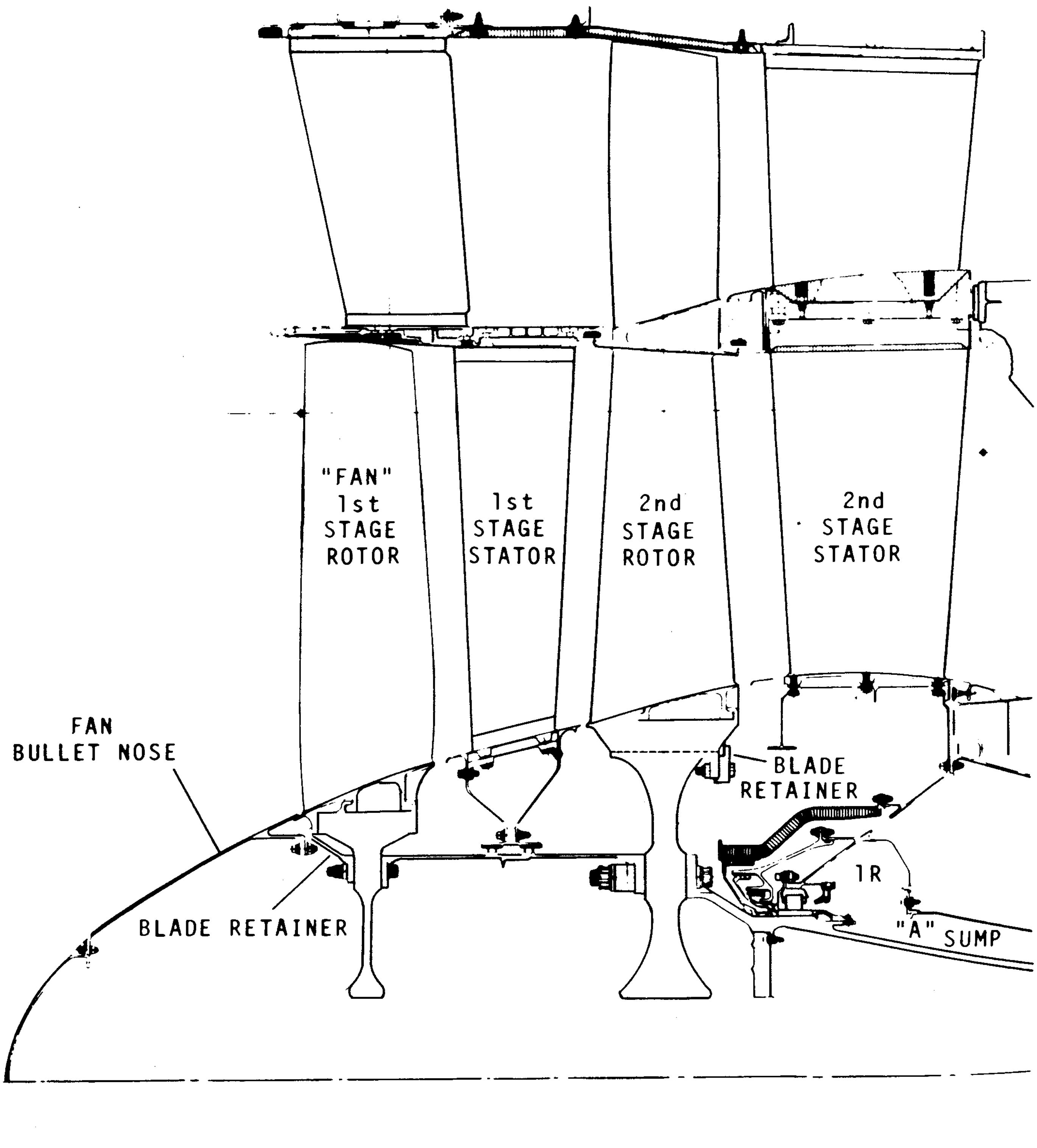
TF39-GE-1 ENGINE



LEGEND:

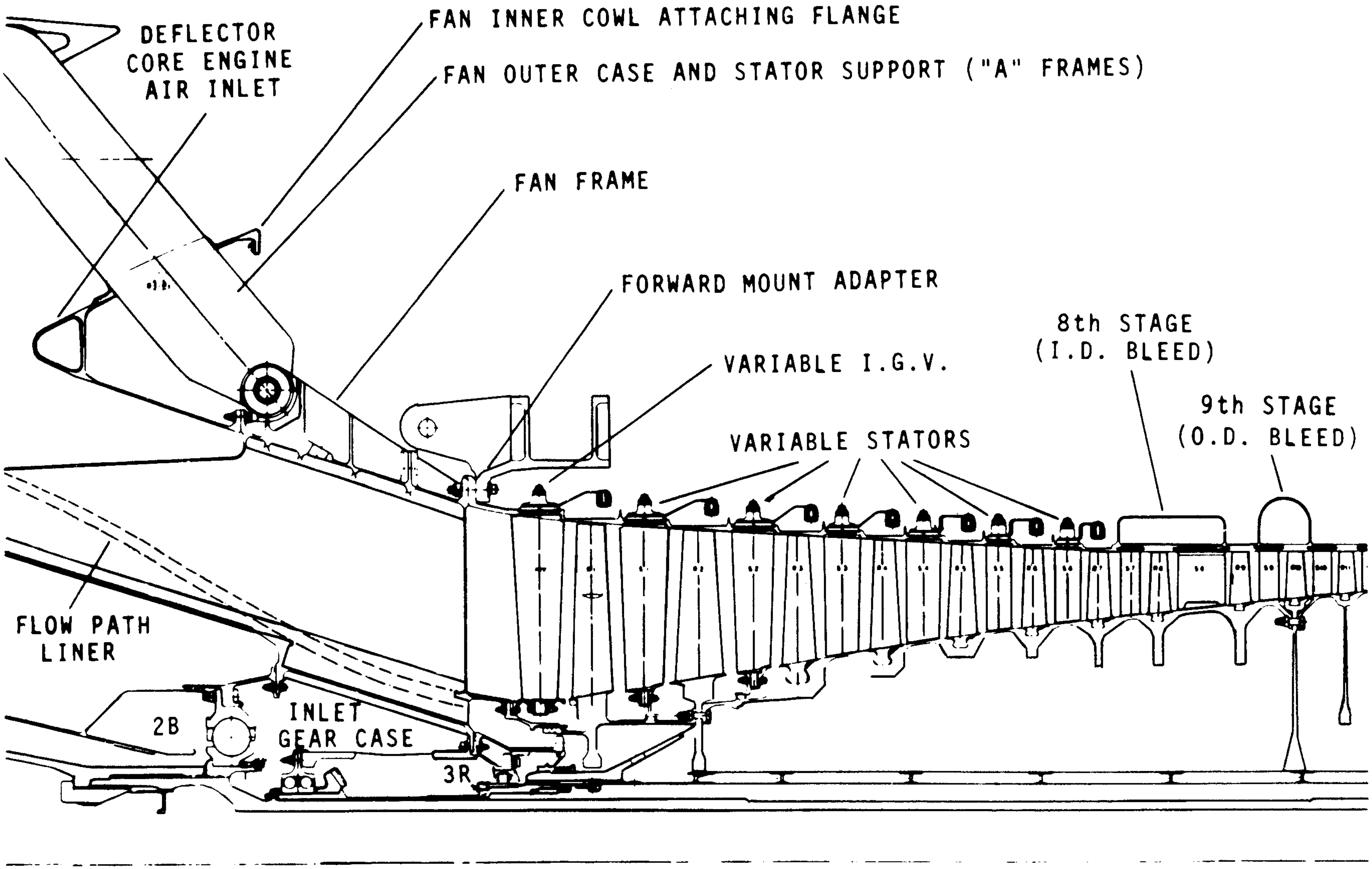
0 AMBIENT
2 FAN INLET
23 FAN DISCHARGE
24 FAN HUB DISCHARGE
25 BYPASS DUCT INLET
27 BYPASS NOZZLE INLET
28 BYPASS NOZZLE THROAT
2C HP COMPRESSOR INLET
3 HP ENGINE COMPRESSOR DISCHARGE
4 HP TURBINE INLET
51 HP TURBINE DISCHARGE
54 LP TURBINE INLET
56 LP TURBINE DISCHARGE
8 PRIMARY NOZZLE THROAT

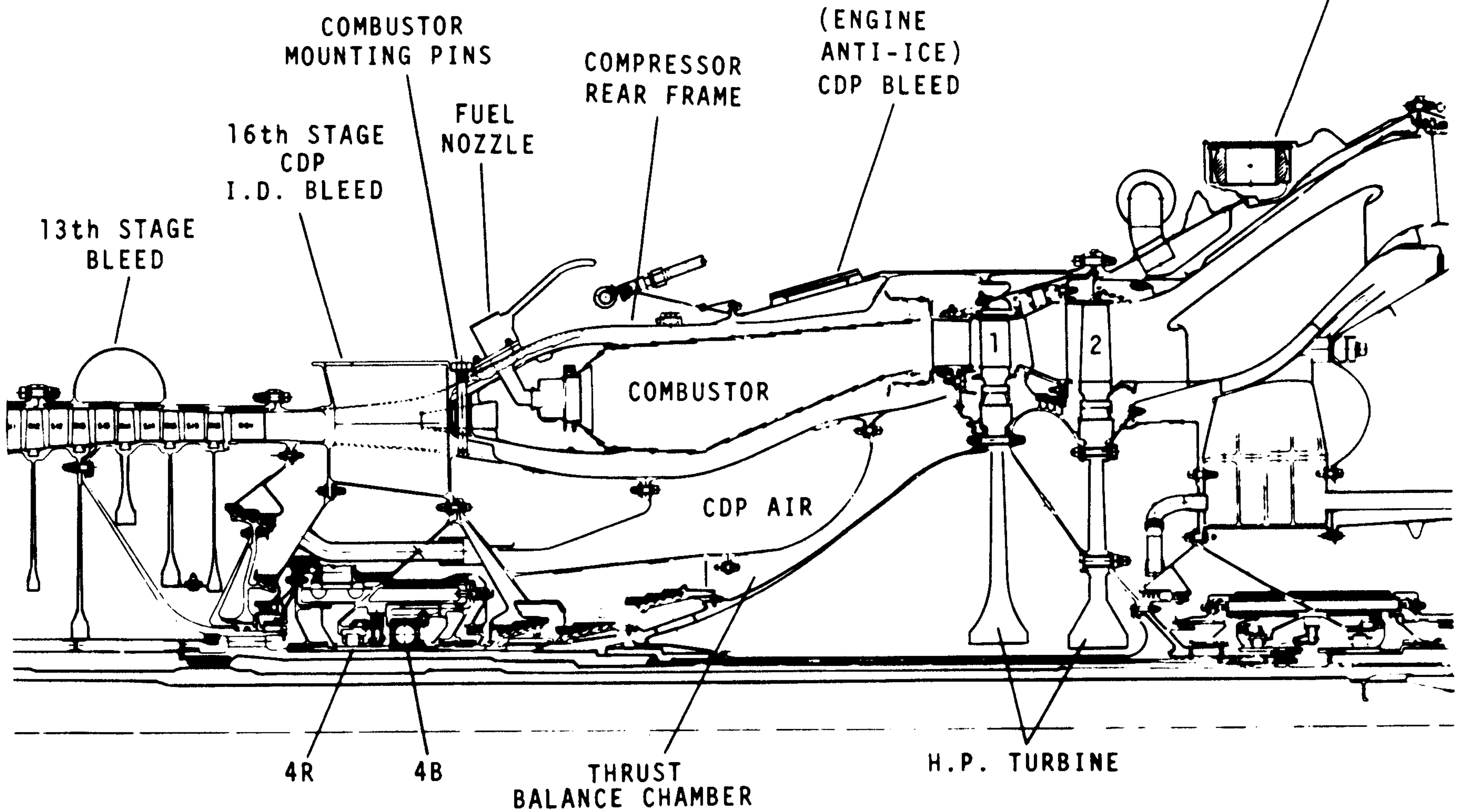
ENGINE STATION DESIGNATION



TF-39 FAN SCHEMATIC

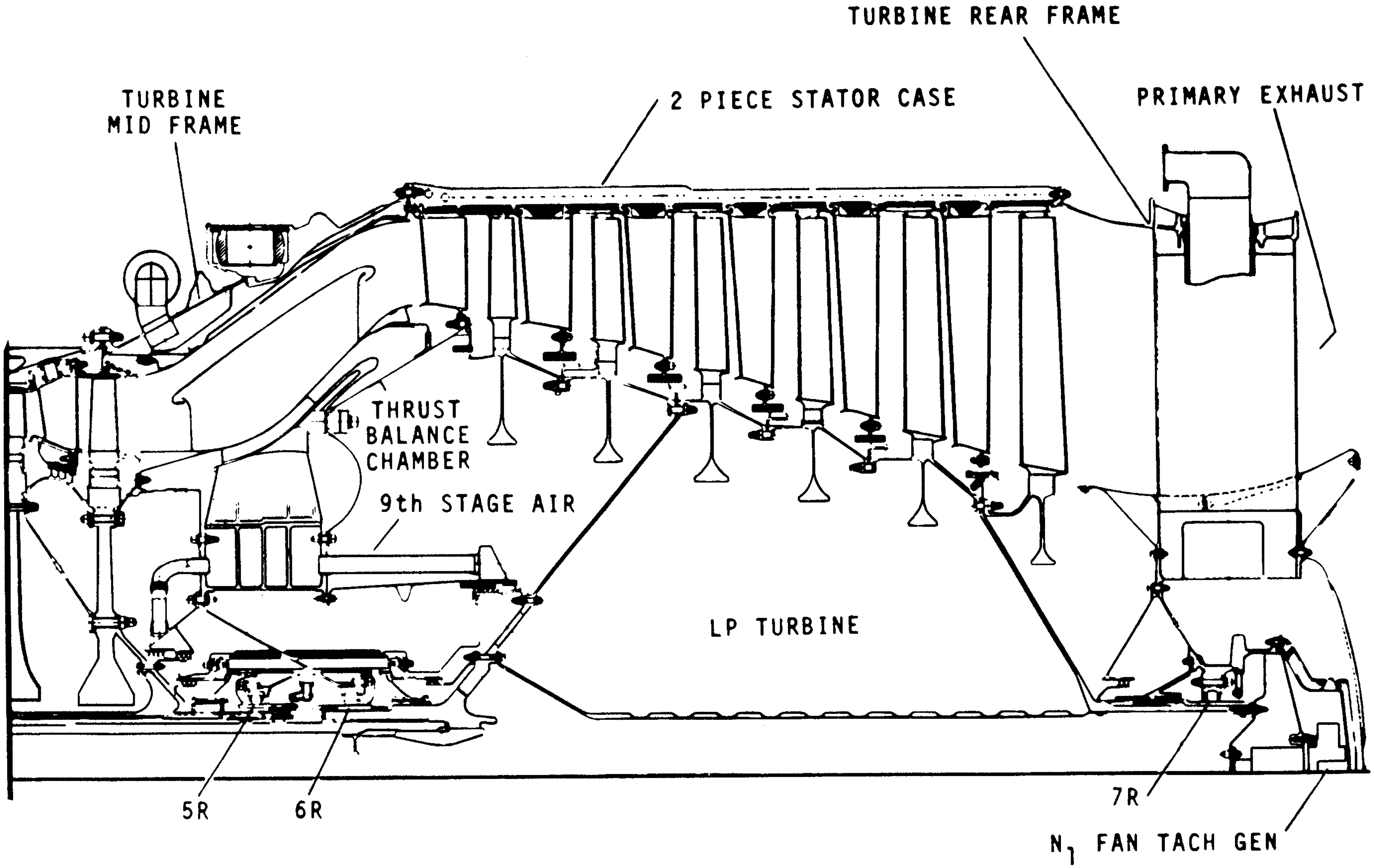
FAN FRAME AND COMPRESSOR SCHEMATIC

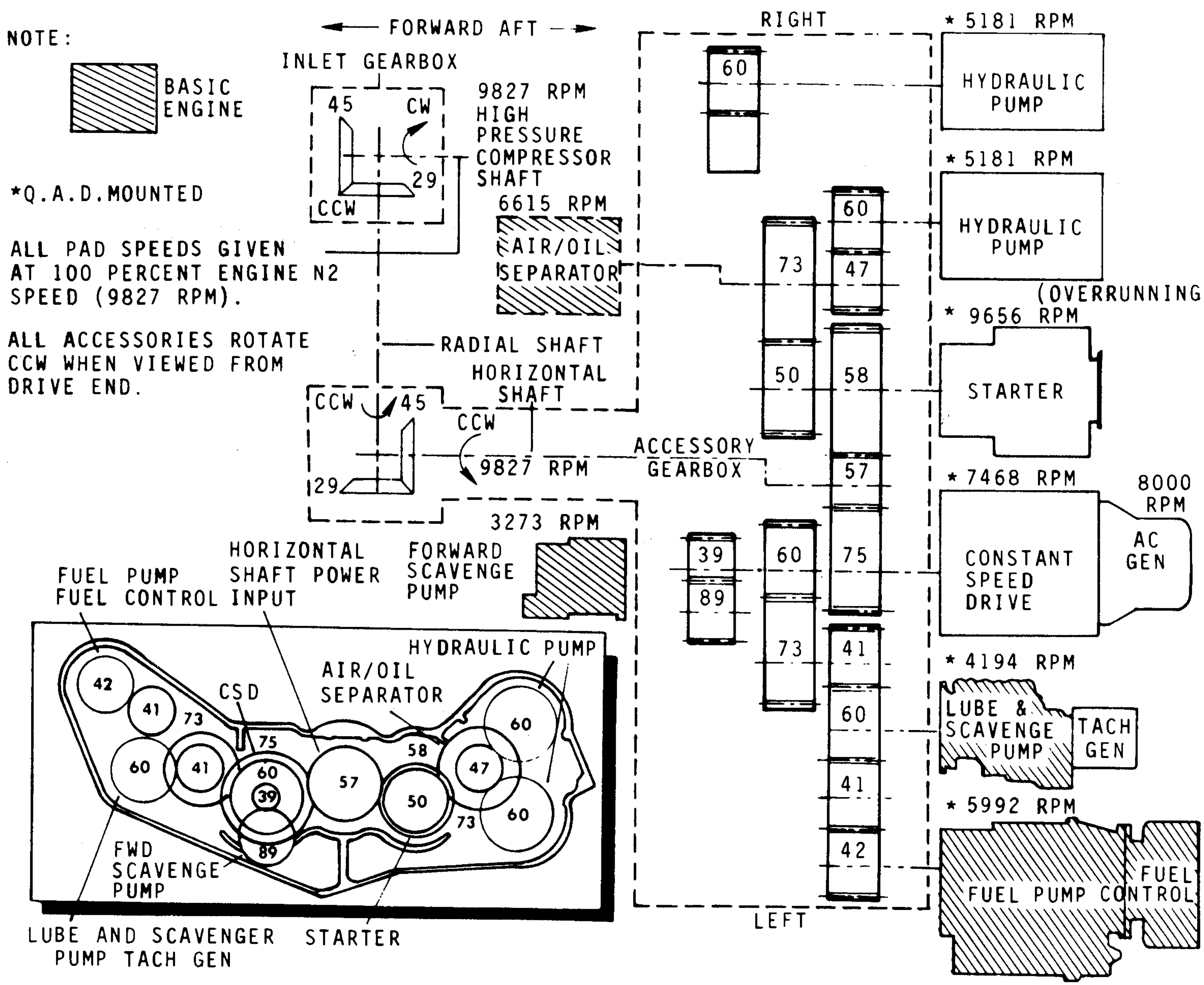




COMBUSTOR AND H.P. TURBINE SCHEMATIC

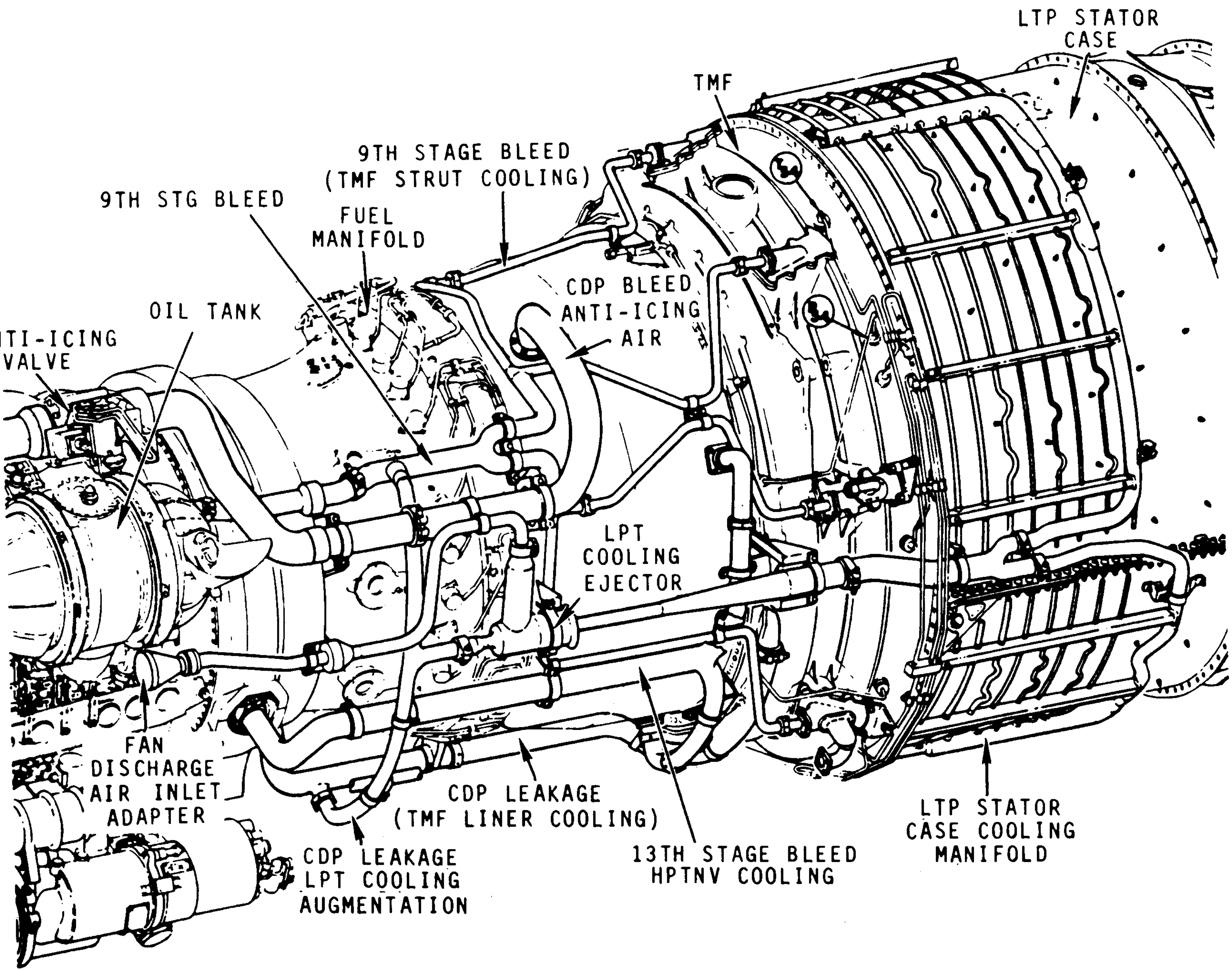
L.P. TURBINE

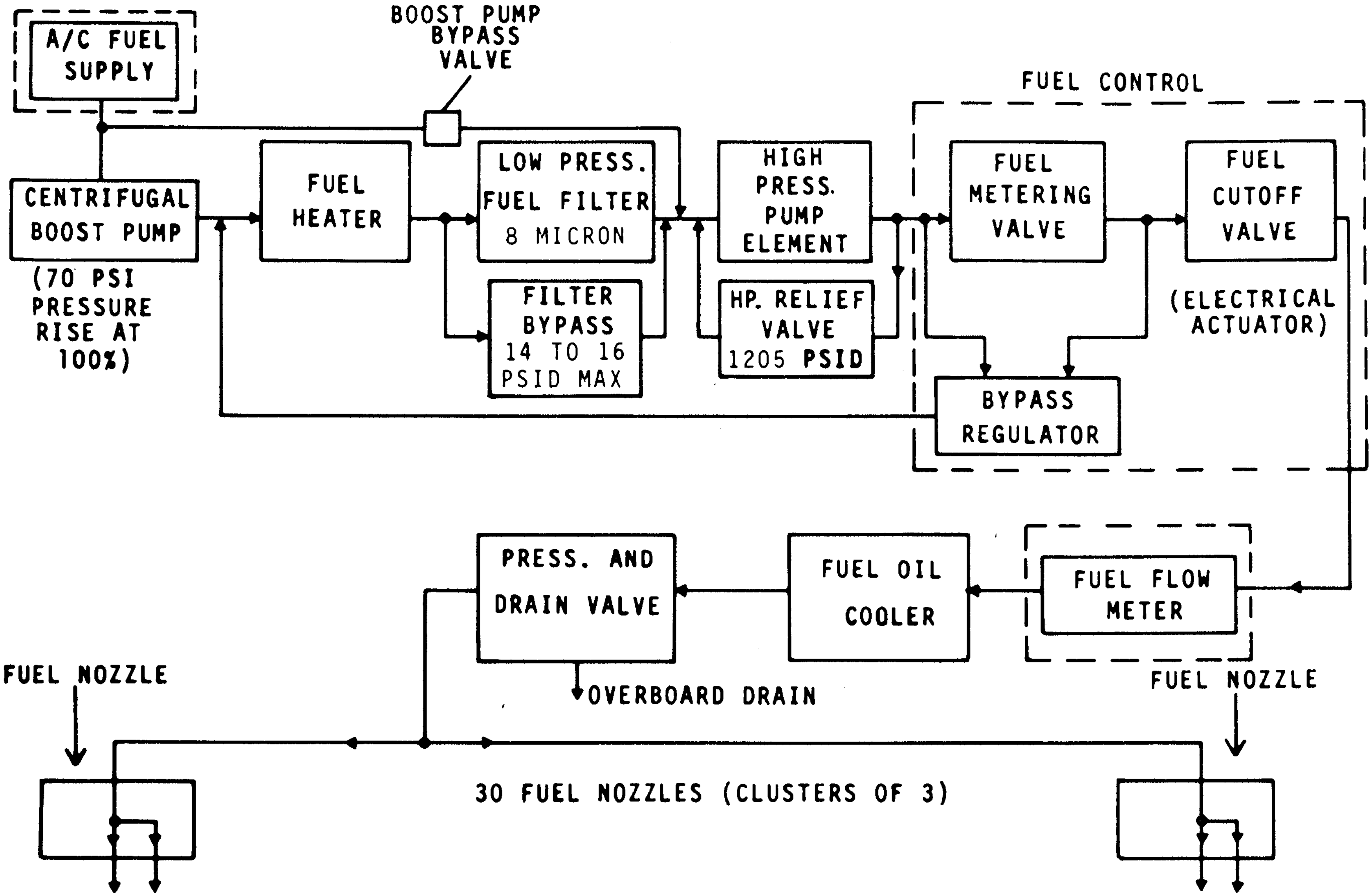

TURBINE REAR FRAME
2 PIECE STATOR CASE
PRIMARY EXHAUST
TURBINE
MID FRAME
THRUST
BALANCE
CHAMBER
9th STAGE AIR
LP TURBINE
5R
6R
7R
N1 FAN TACH GEN



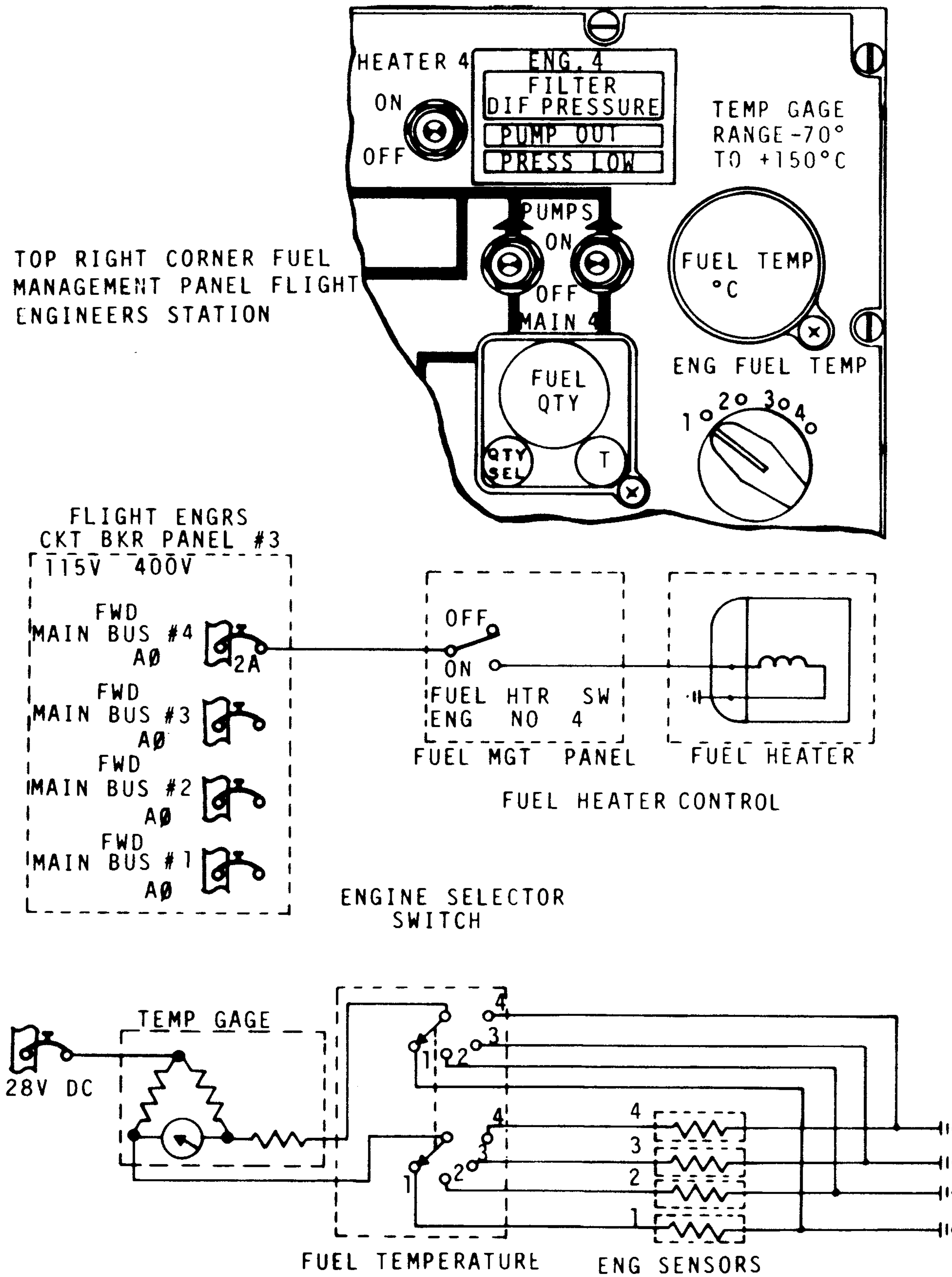
ACCESSORY DRIVE SCHEMATIC

ENGINE COOLING AIRFLOW

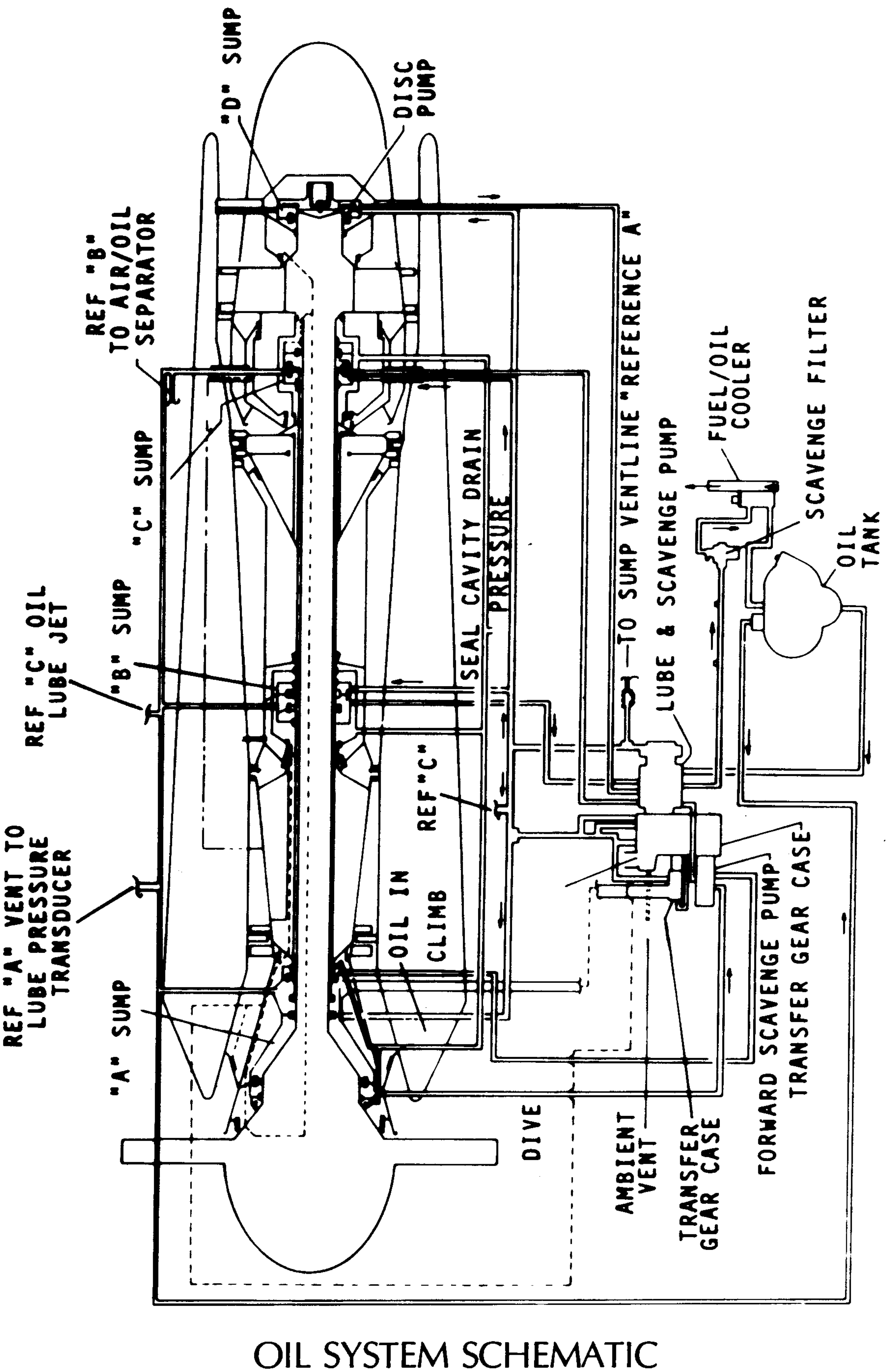




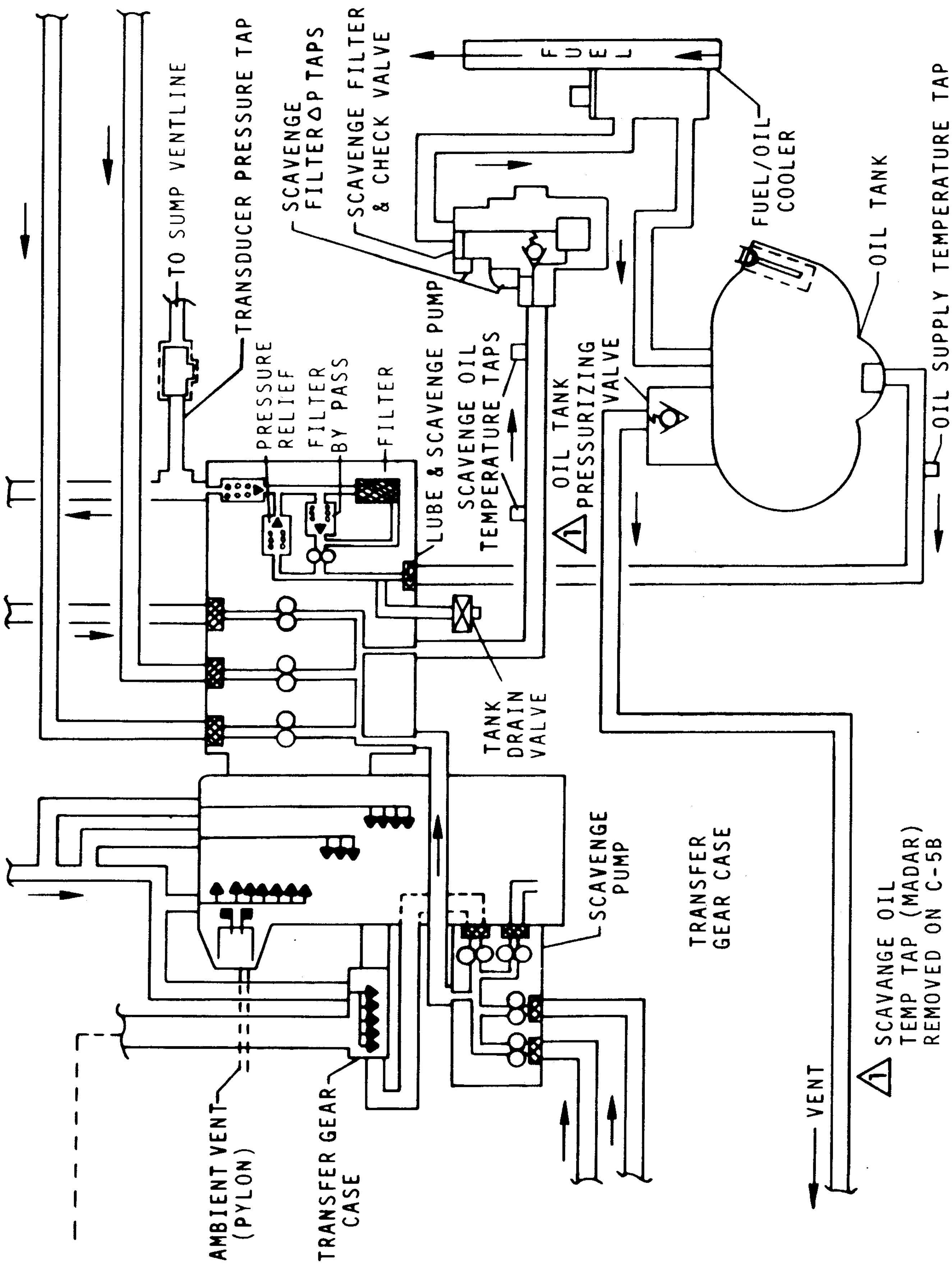
FUEL SYSTEM BLOCK DIAGRAM



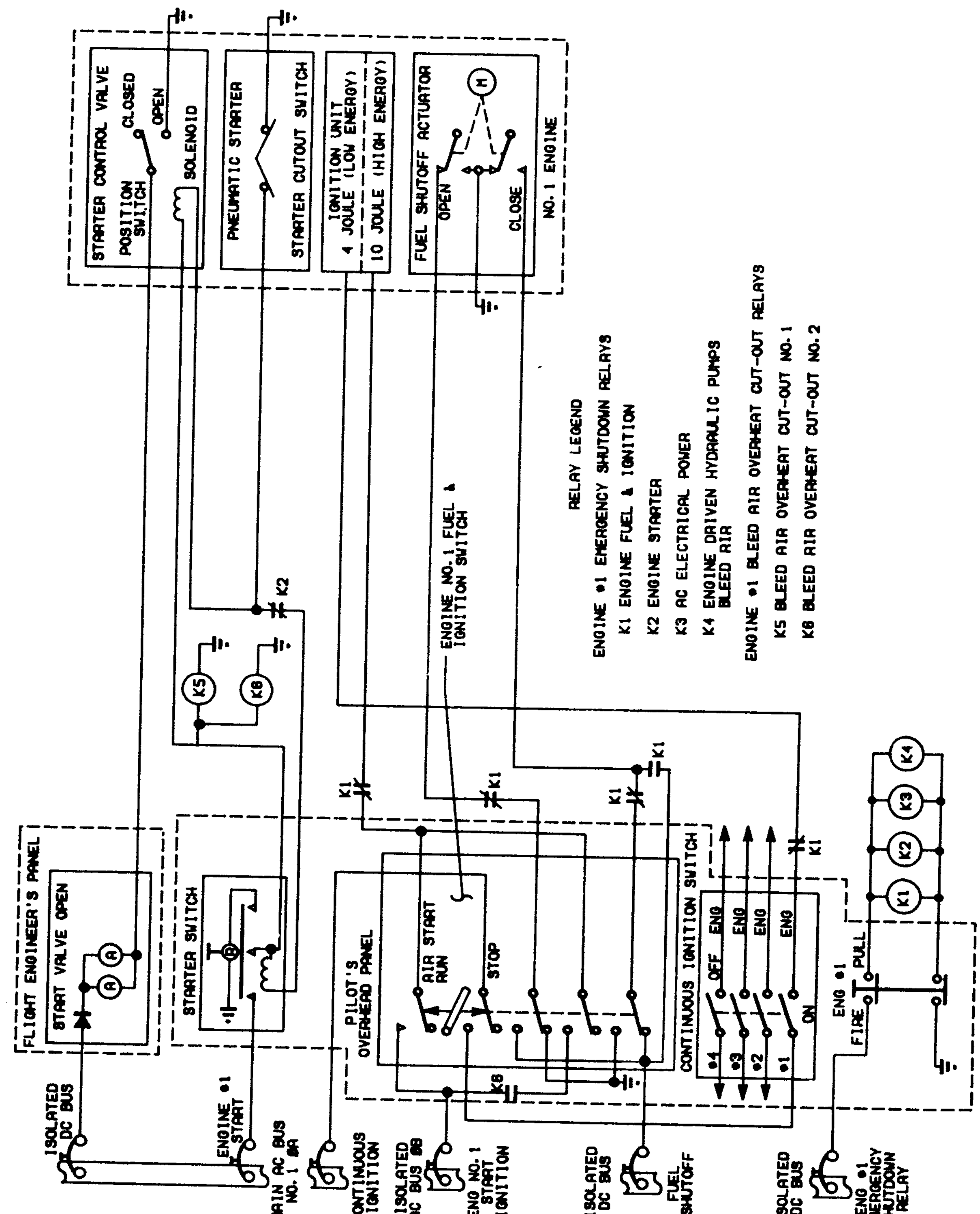
FUEL HEATER-ELECTRICAL CONTROL
AND TEMP. INDICATION



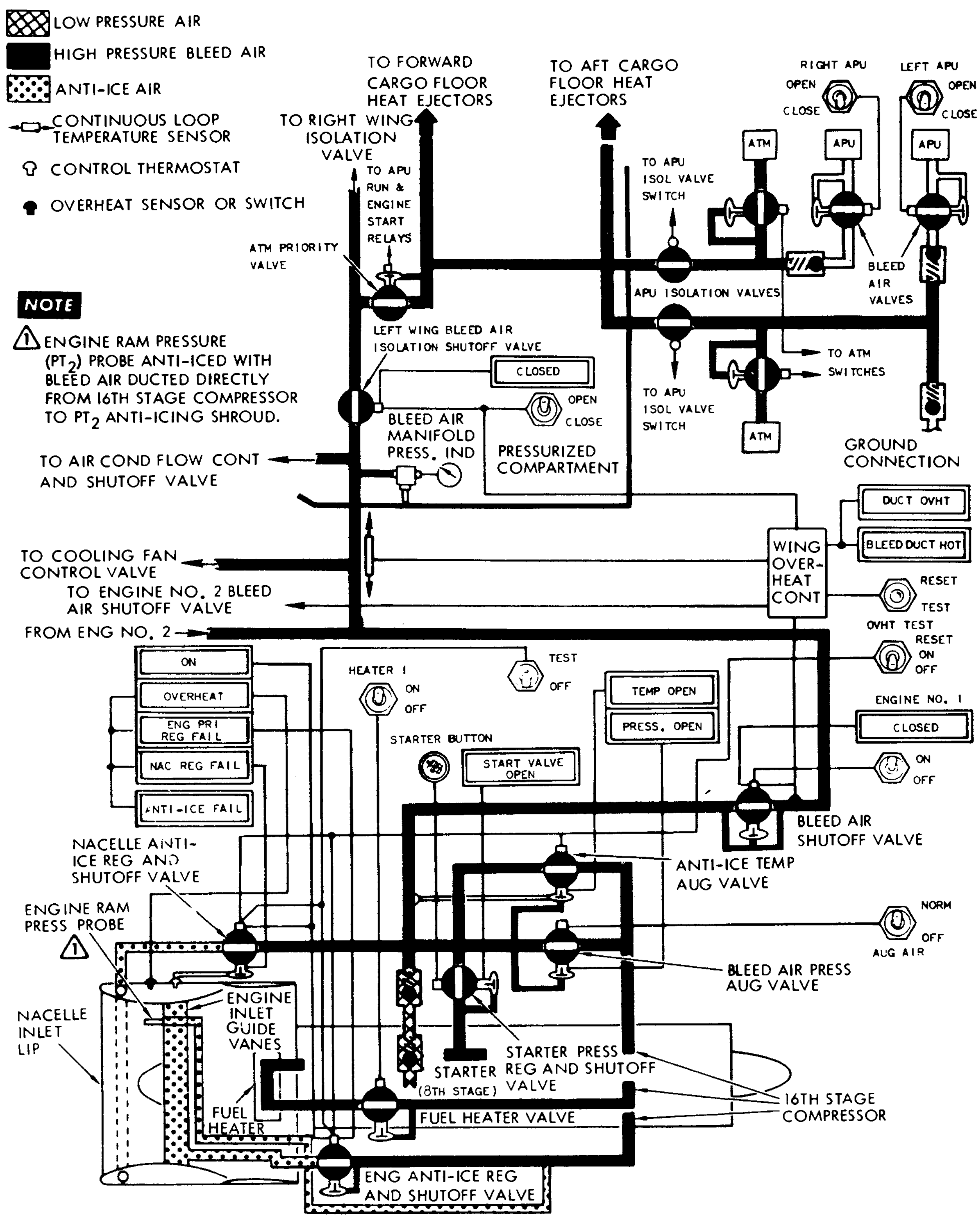
OIL SYSTEM SCHEMATIC



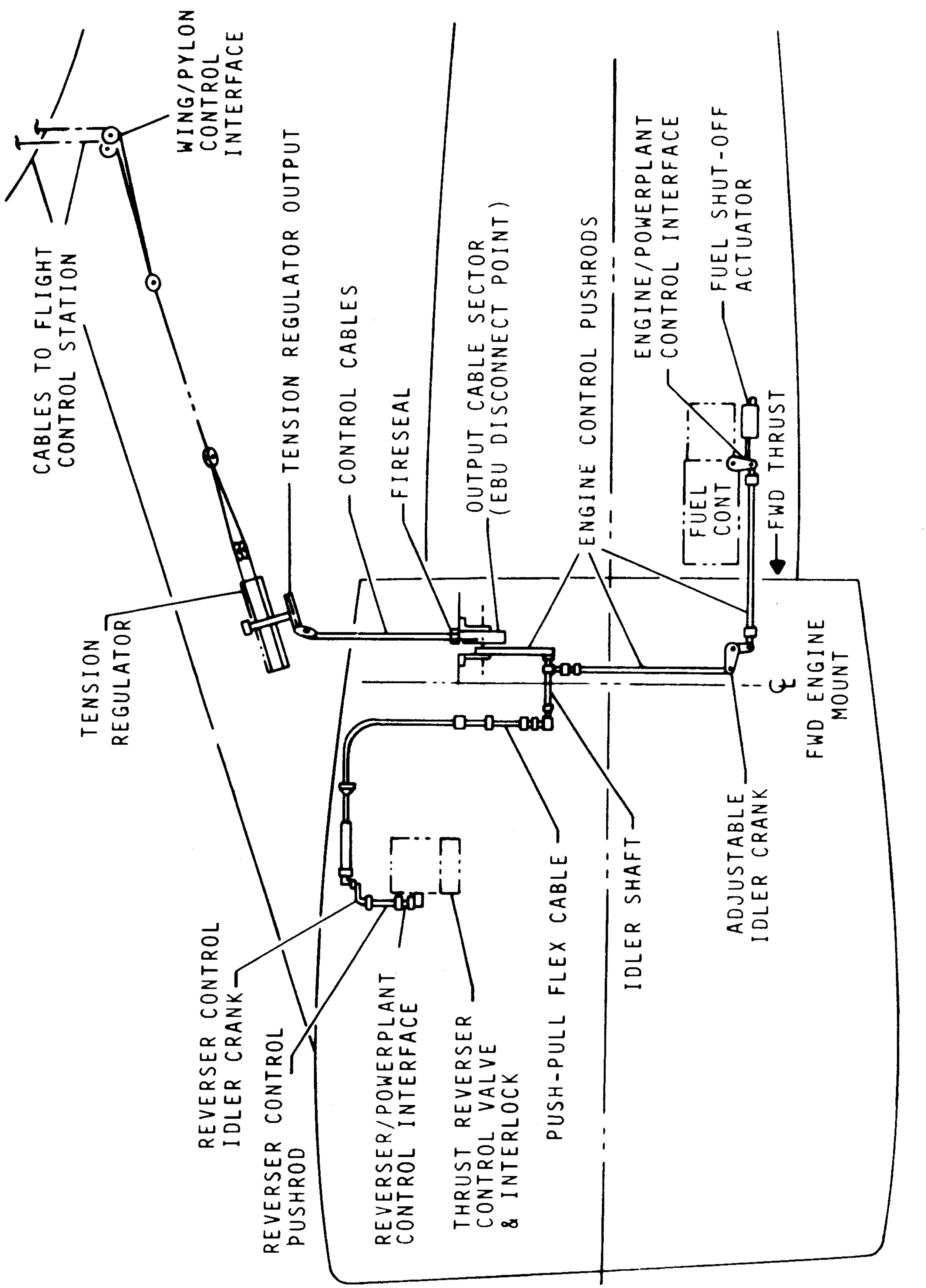
SUPPLY-PUMPS AND SCAVENGE OIL SYSTEM SCHEMATIC



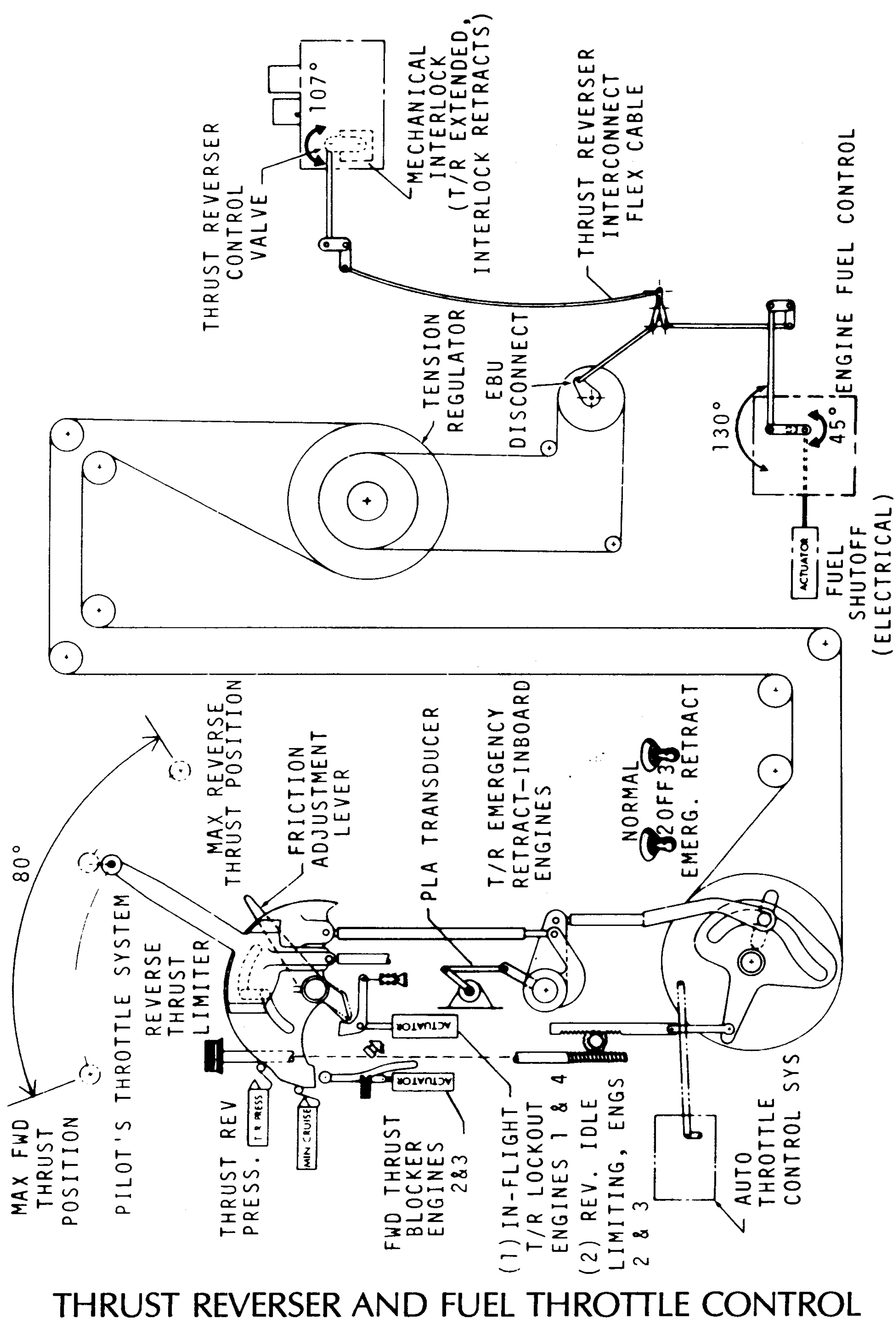
ENGINE START CONTROL



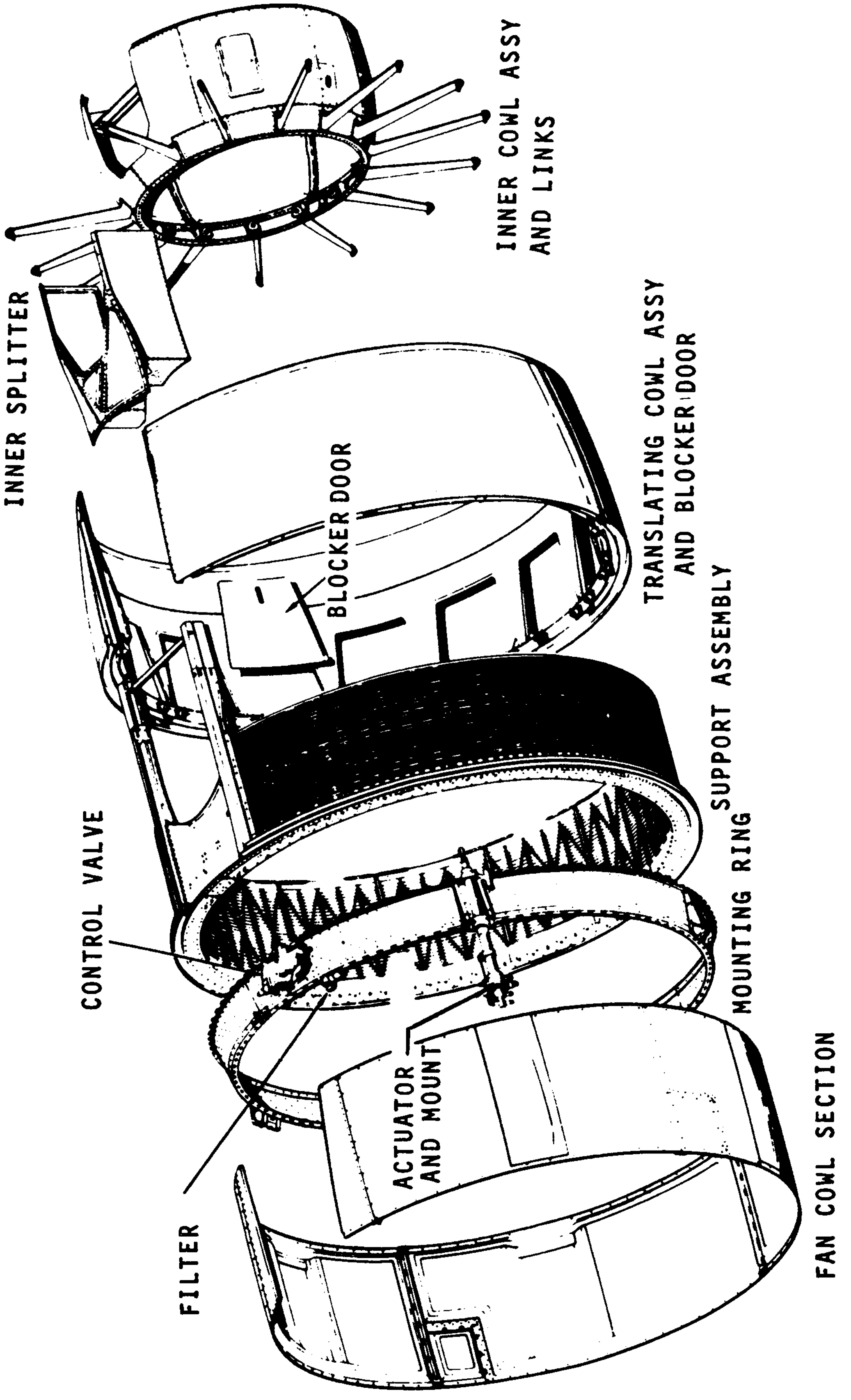
ENGINE BLEED AIR AND ANTI-ICING SYSTEM



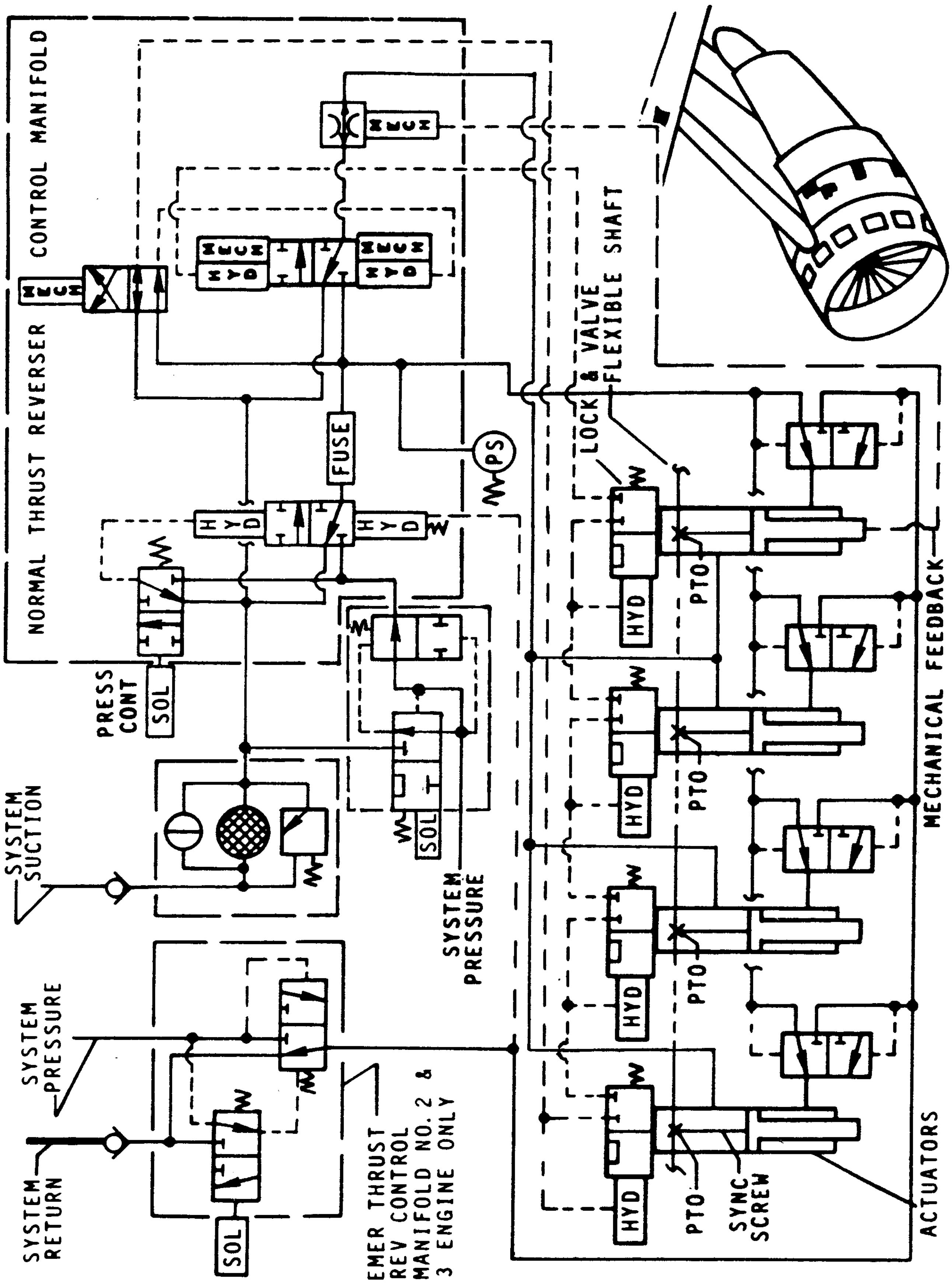
PROPULSION CONTROL SCHEMATIC



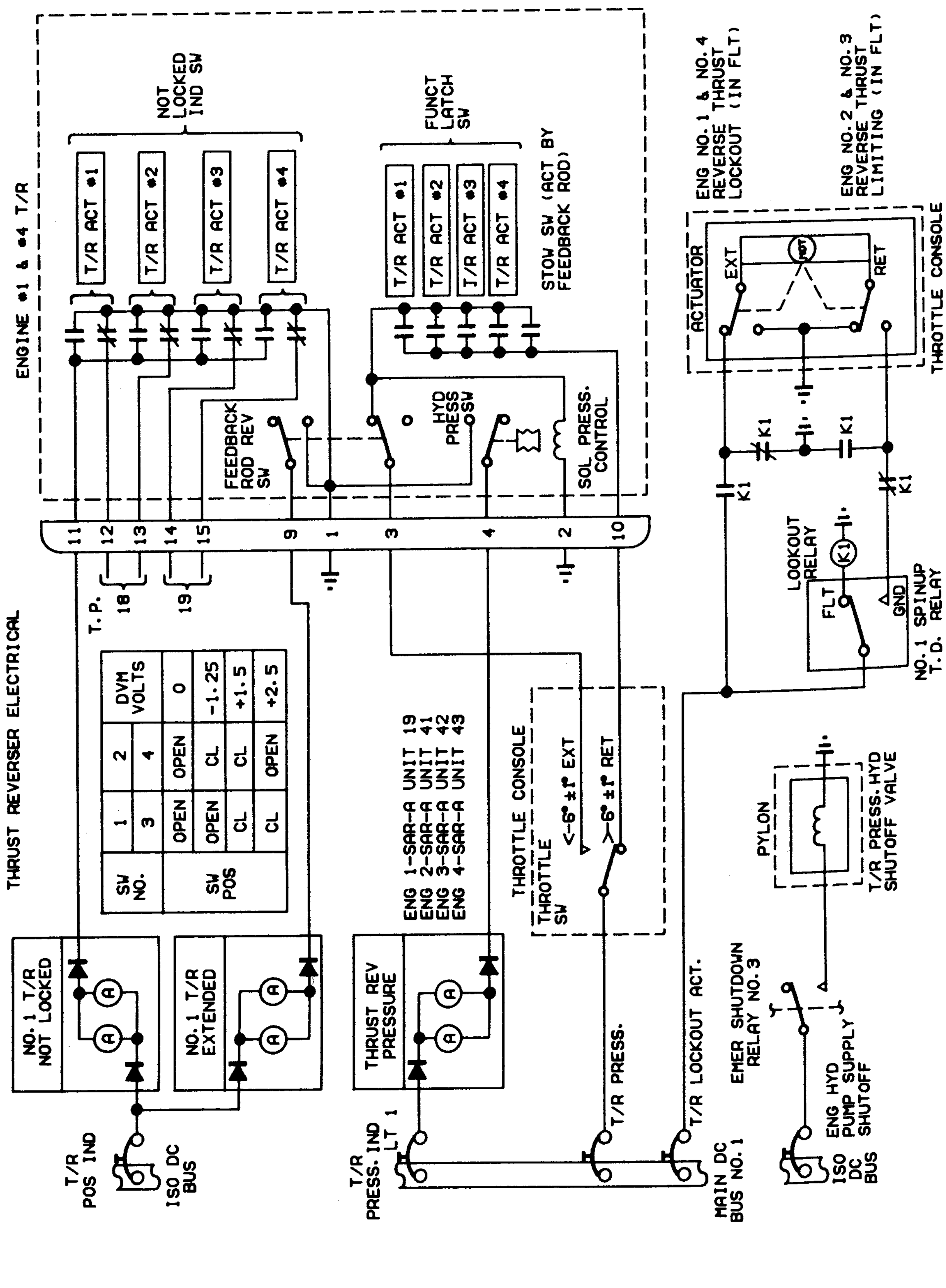
THRUST REVERSER AND FUEL THROTTLE CONTROL



THRUST REVERSER MAJOR COMPONENTS

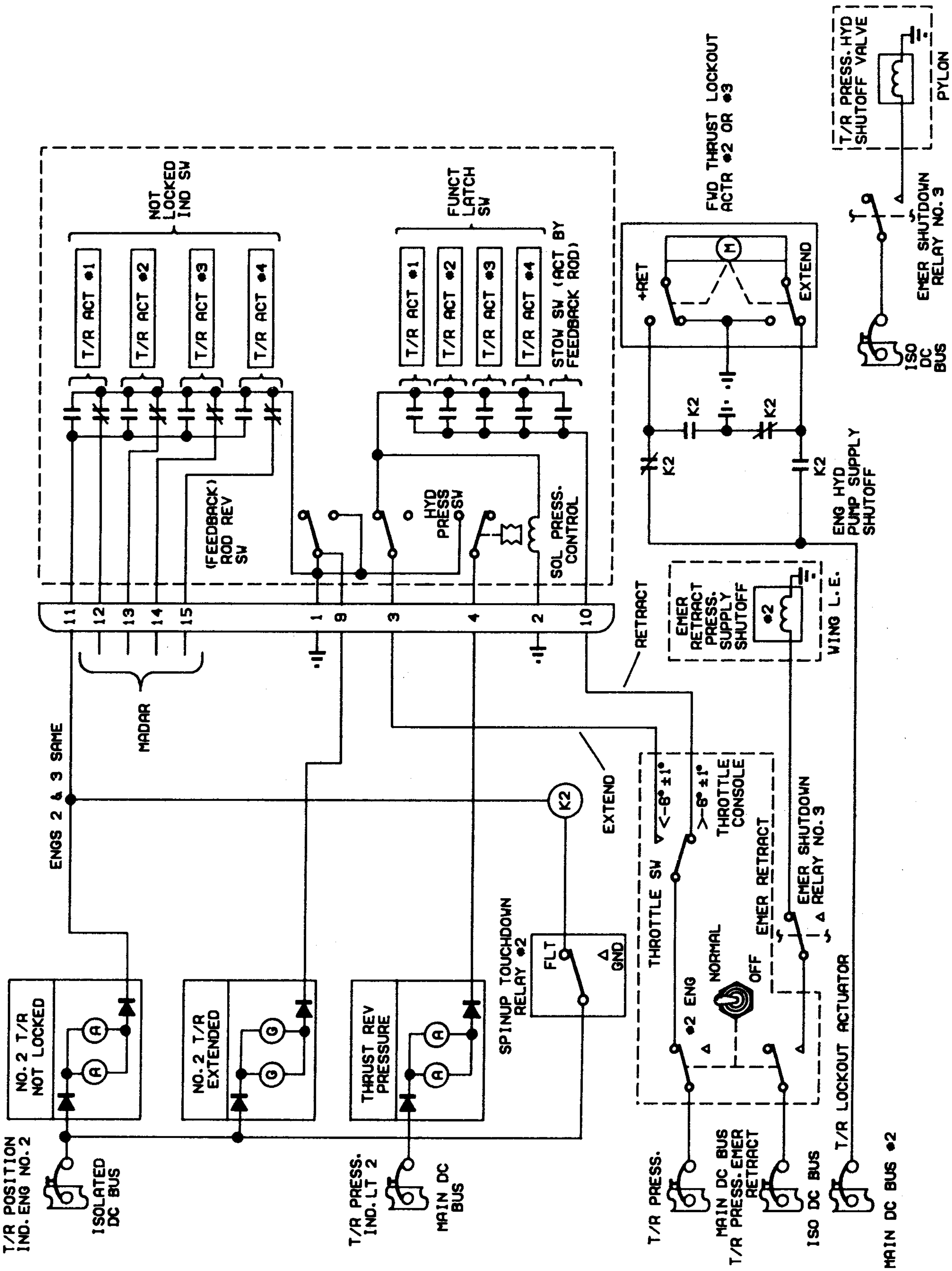


THRUST REVERSER HYDRAULIC

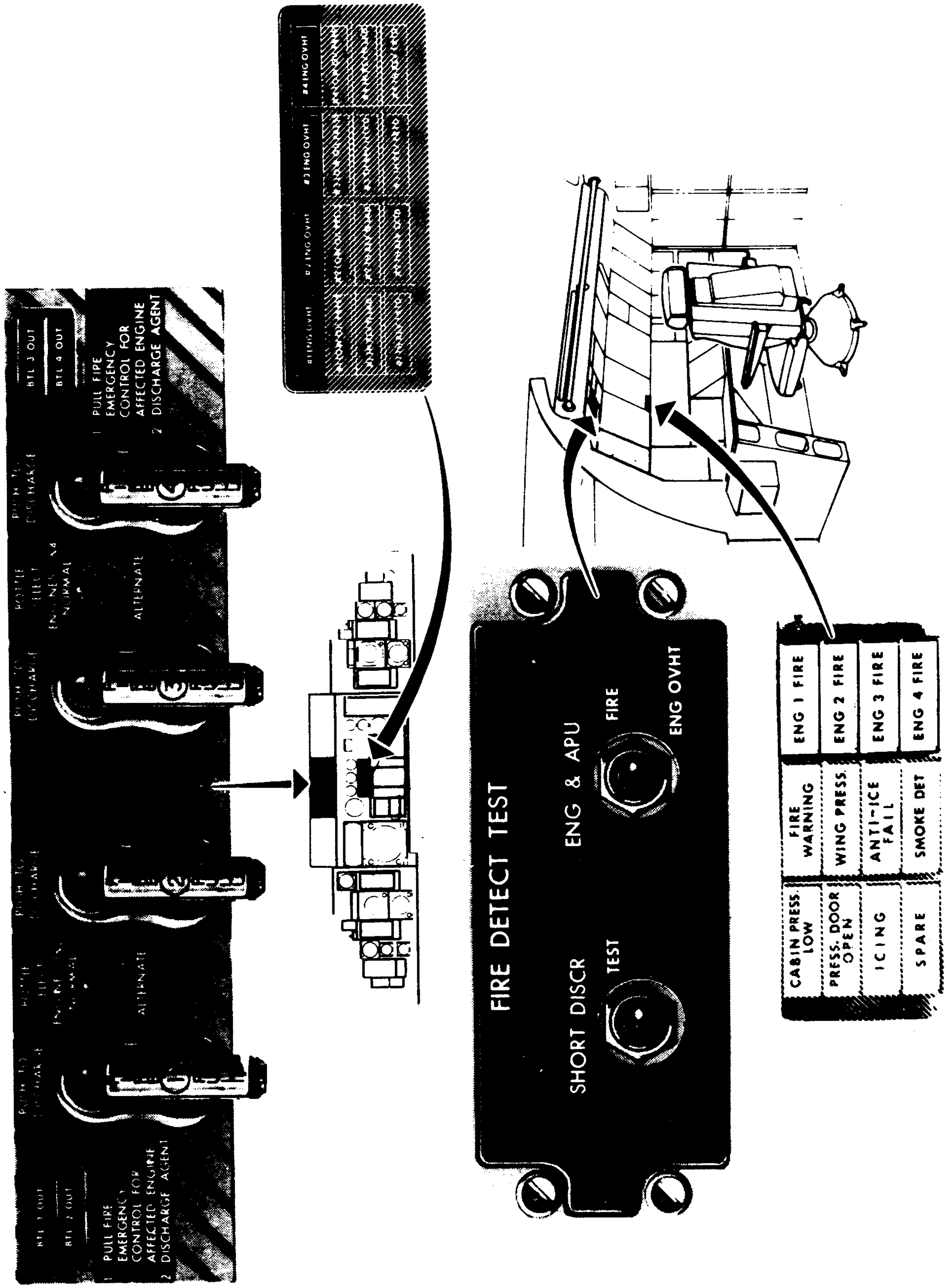


SW NO.	1	2	DVM VOLTS
	3	4	
SW POS	OPEN	OPEN	0
	OPEN	CL	-1.25
	CL	CL	+1.5
	CL	OPEN	+2.5

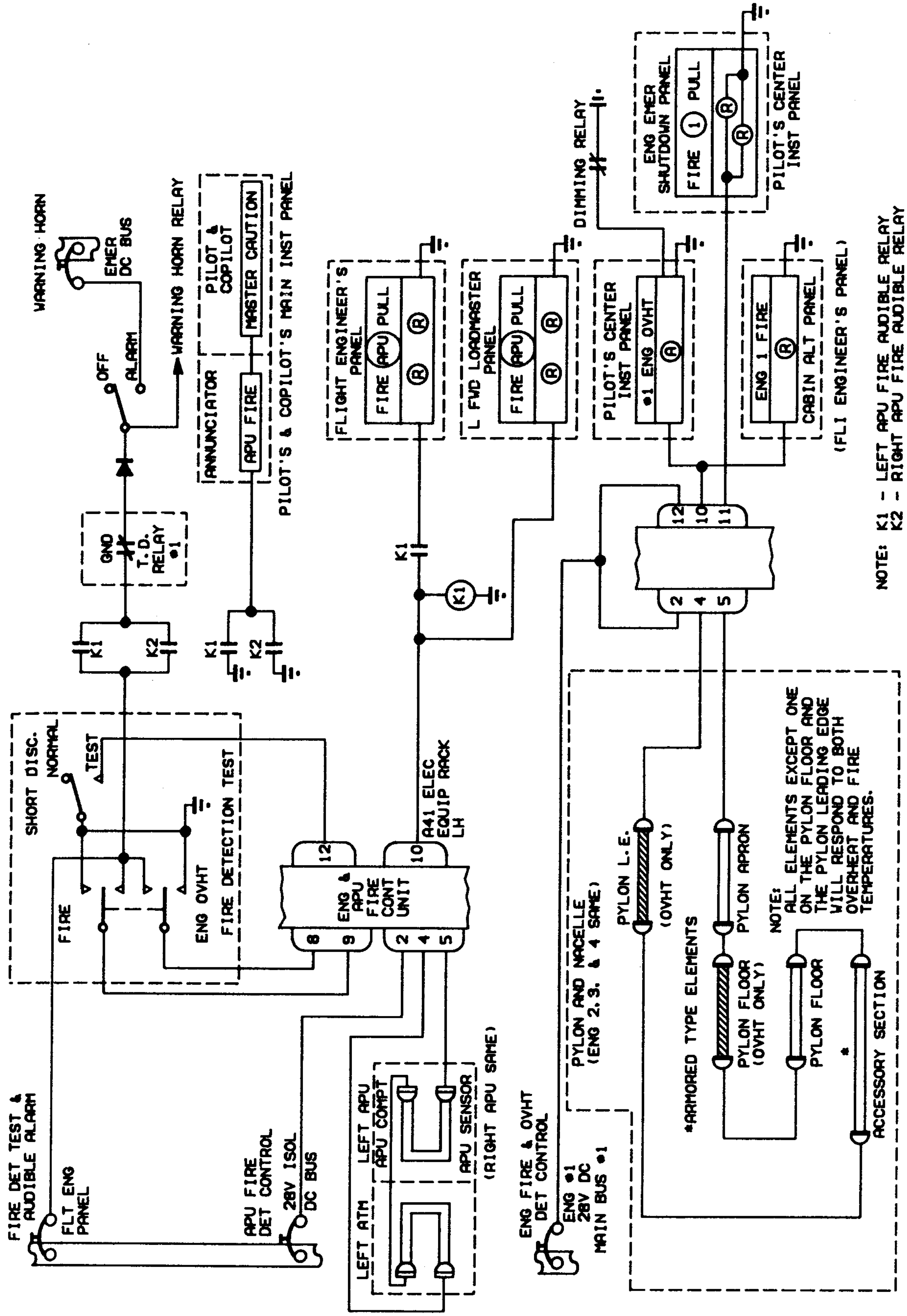
THRUST REVERSER ELECTRICAL (SHEET 1)



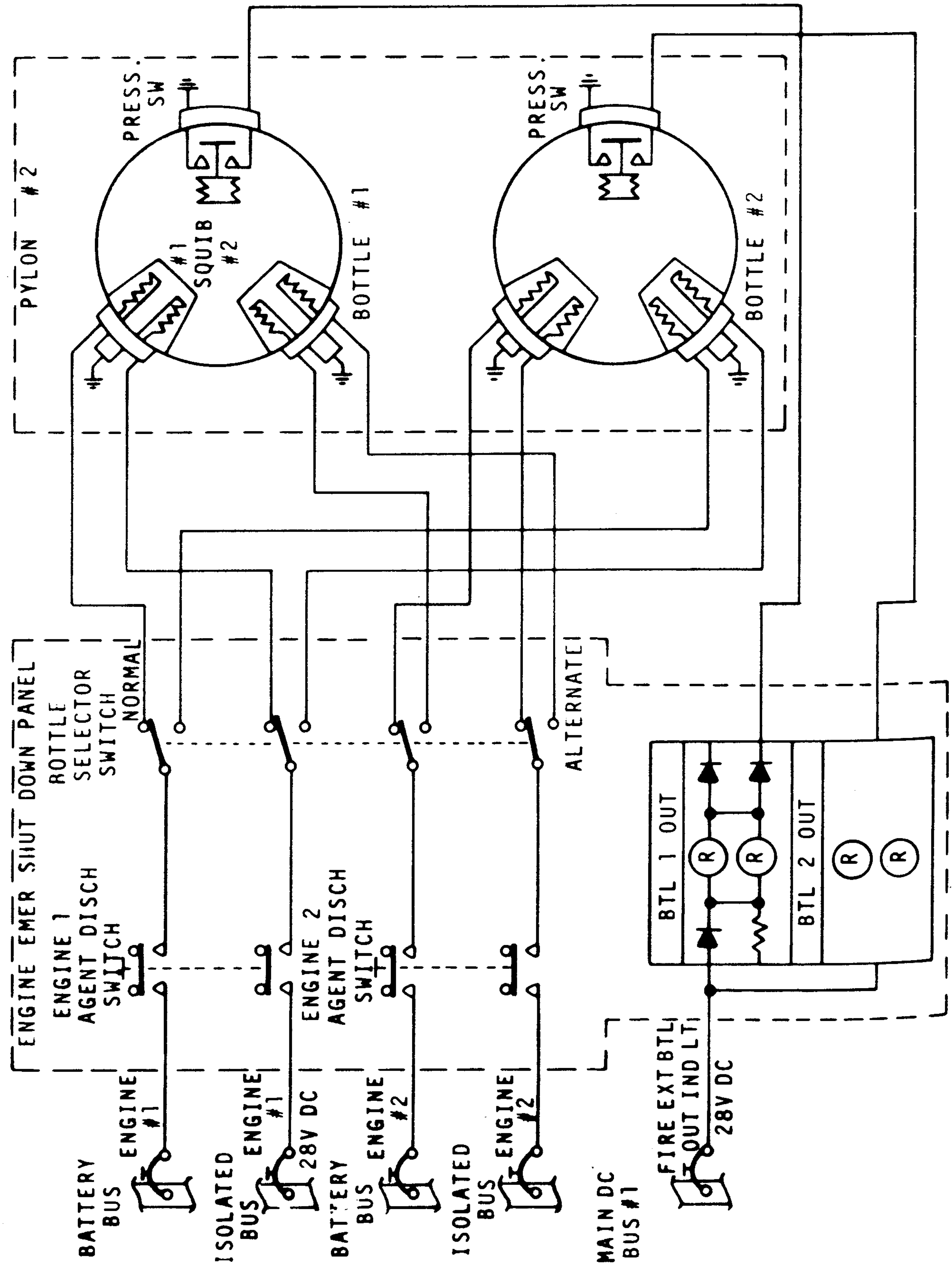
THRUST REVERSER ELECTRICAL (SHEET 2)



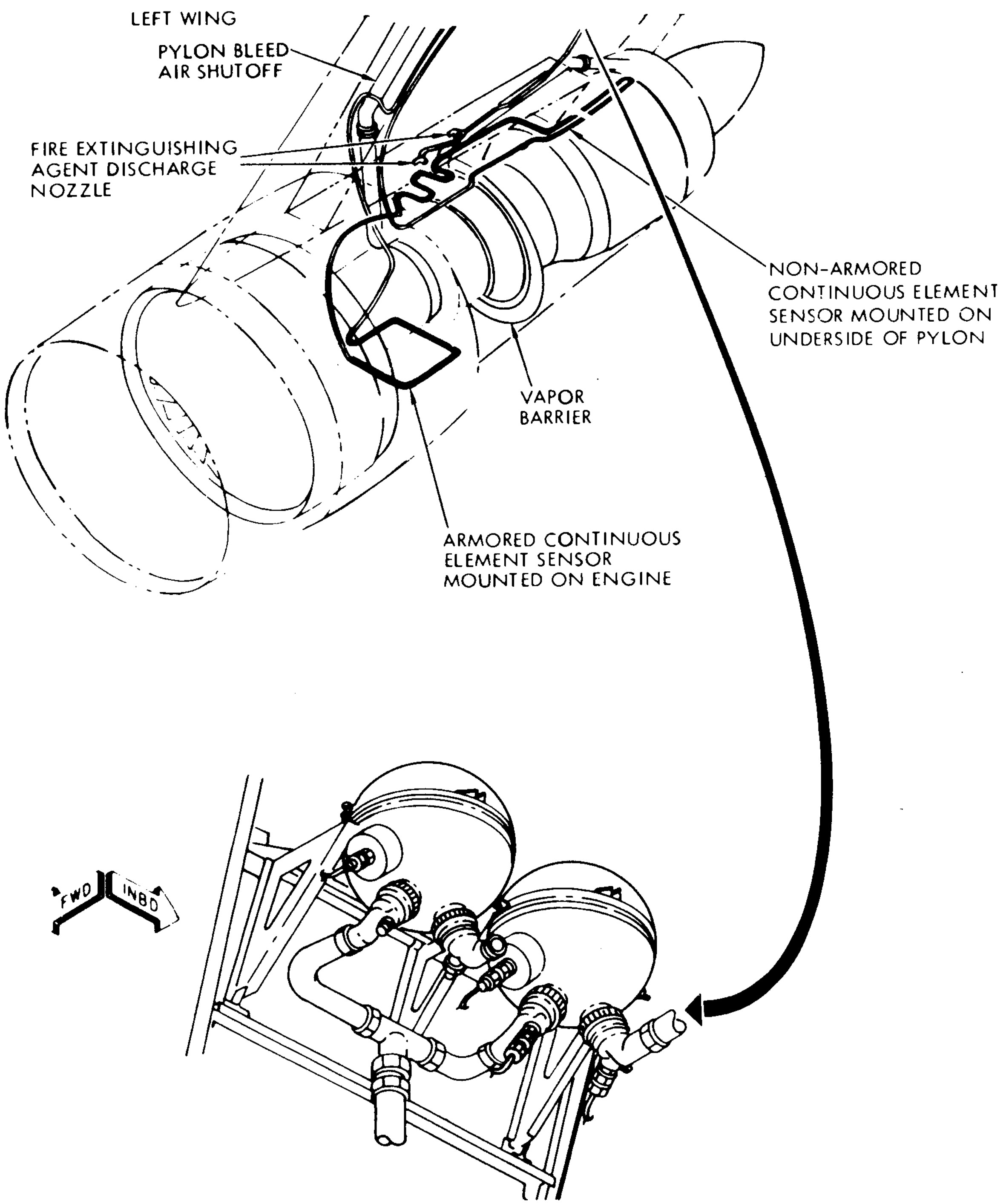
ENGINE FIRE DETECTION AND
EXTINGUISHING SYSTEM CONTROL AND INDICATORS



ENGINE OVERHEAT & FIRE WARNING



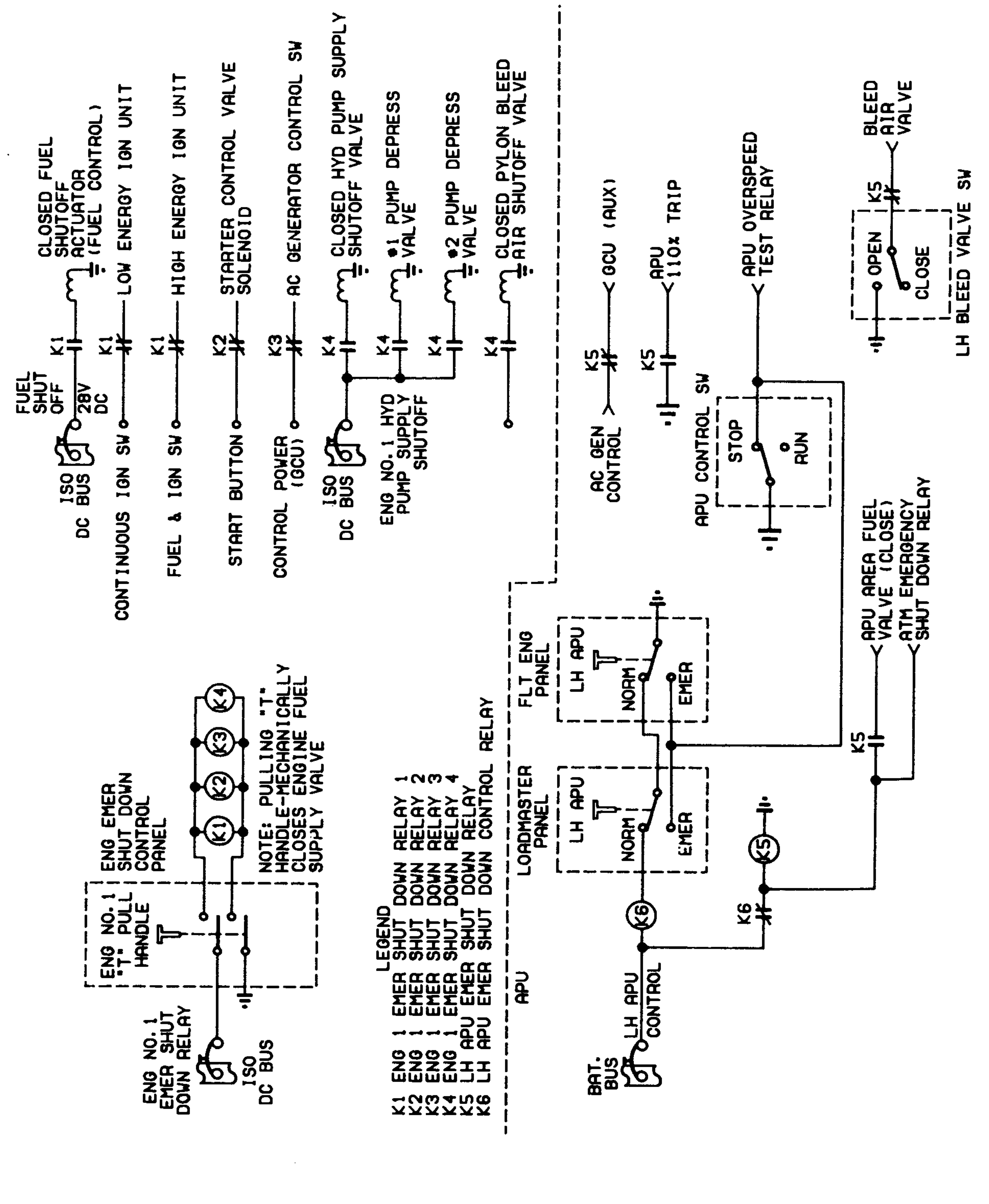
ENGINES 1 & 2 FIRE EXTINGUISHING
(ENGINES 3 & 4 SAME)



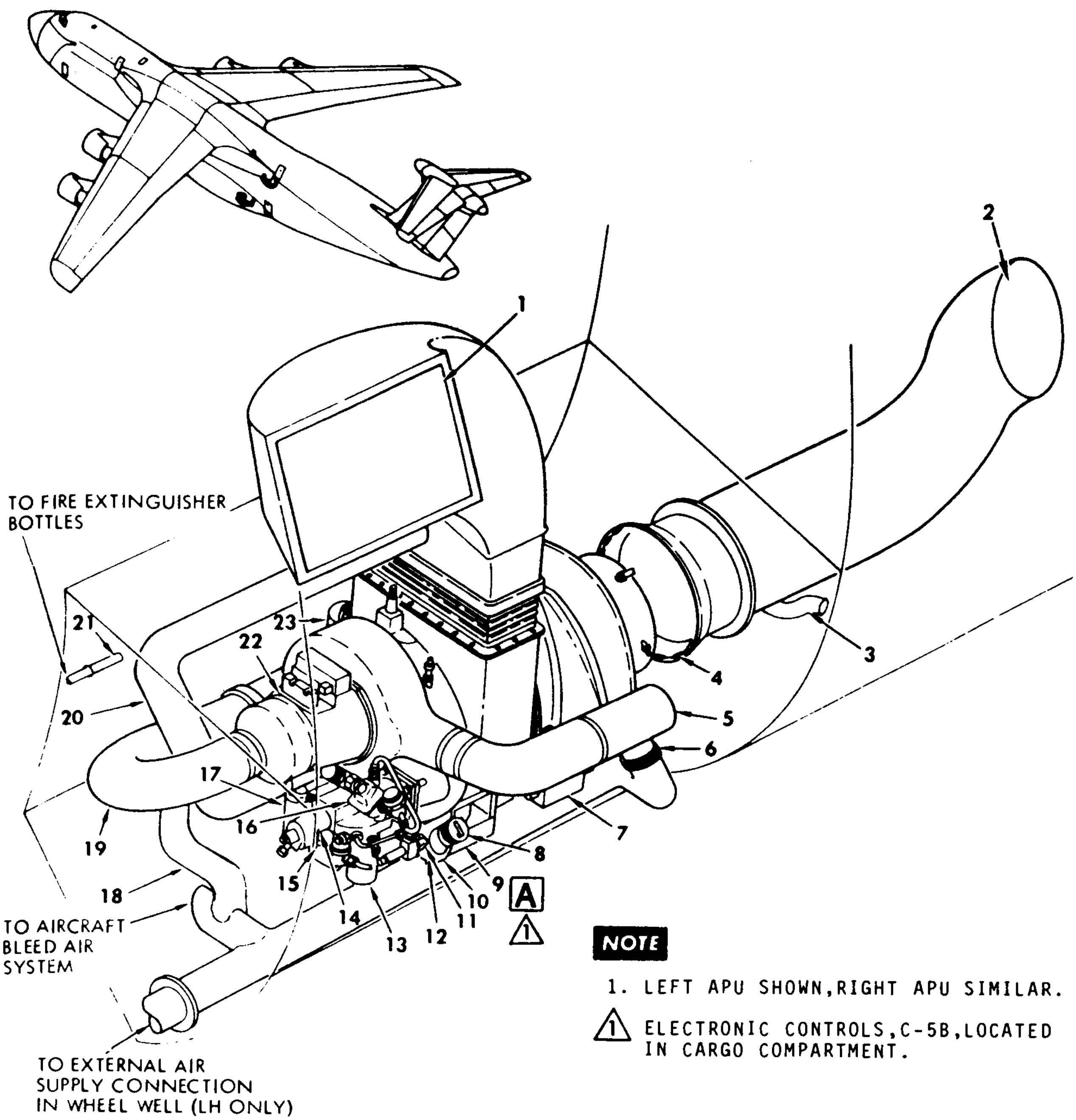
POWER PLANT FIRE EXTINGUISHER

NOTE INSTALLATION IS TYPICAL FOR ENGINES NO. 3 AND 4.

ENGINE FIRE DETECTION AND EXTINGUISHING SYSTEM



ENGINE & APU FIRE ISOLATION



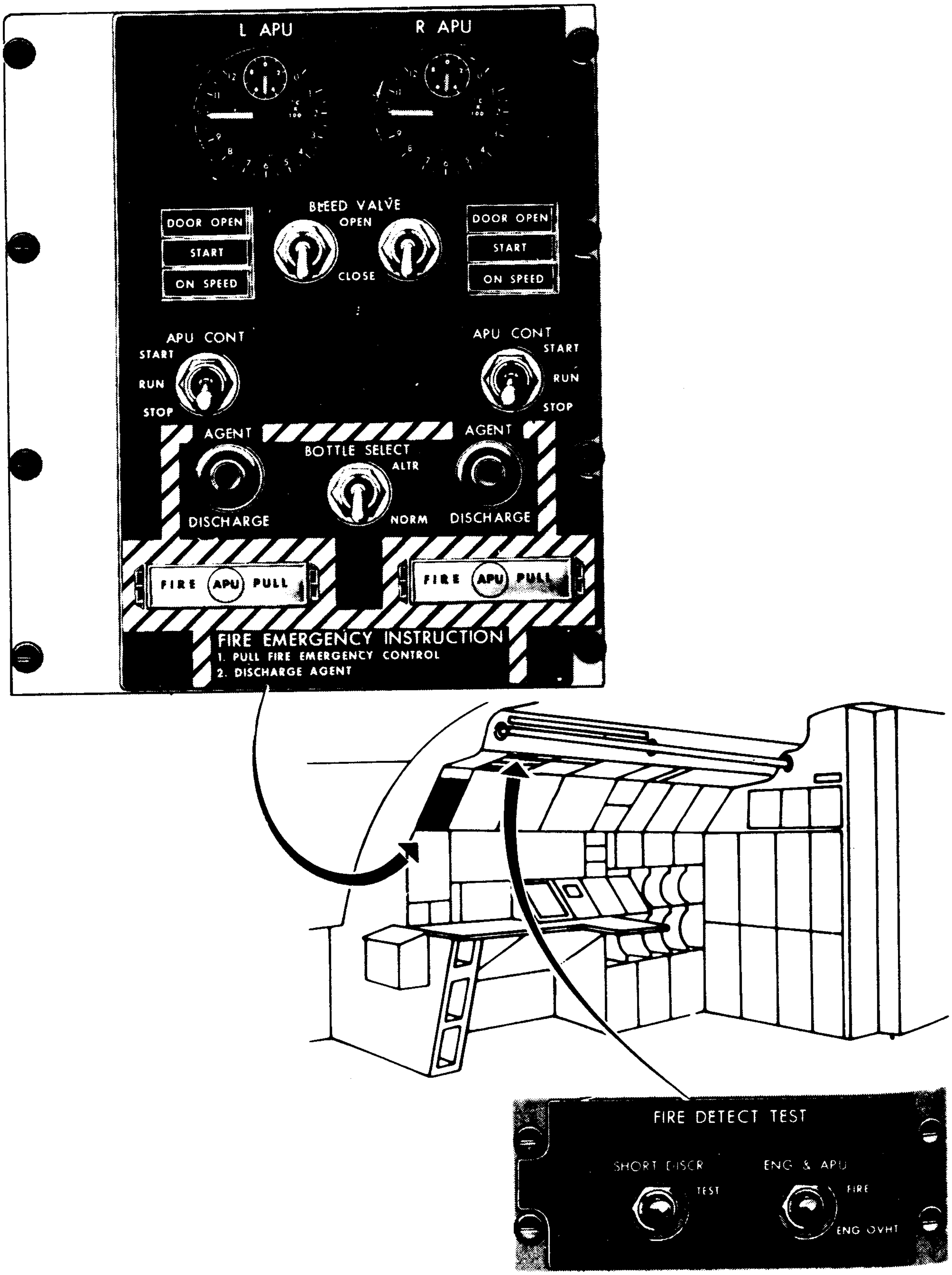
NOTE

1. LEFT APU SHOWN, RIGHT APU SIMILAR.

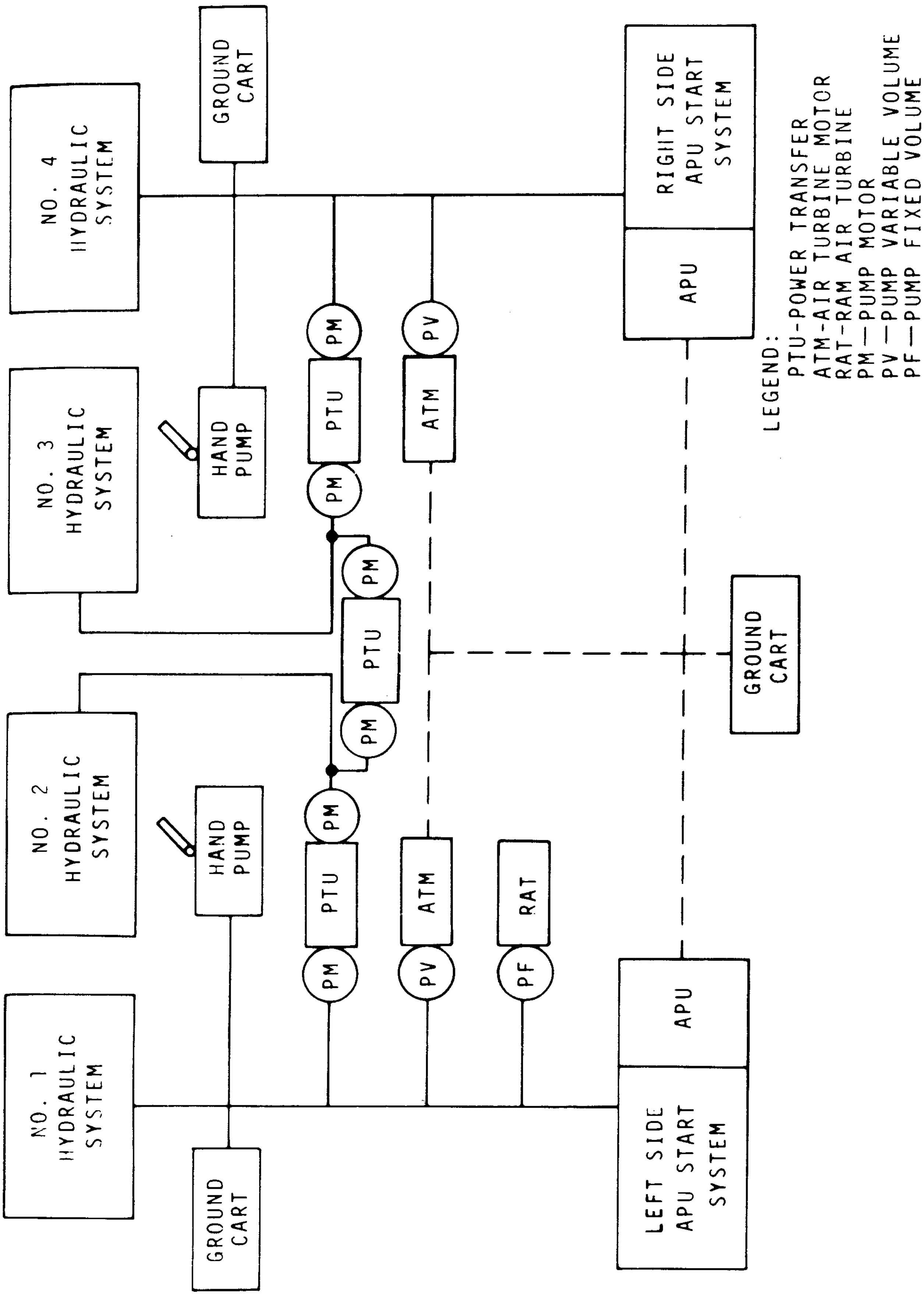
⚠1 ELECTRONIC CONTROLS, C-5B, LOCATED IN CARGO COMPARTMENT.

1. AIR INLET DOOR
2. TURBINE EXHAUST DUCT
3. AIR TURBINE MOTOR EXHAUST DUCT
4. FIRE DETECTION ELEMENTS
5. GENERATOR COOLING AIR DISCHARGE DUCT
6. BLEED AIR OUTLET
7. IGNITION EXCITER
8. OIL TANK FILLER CAP
9. ELECTRONIC CONTROLS
10. OIL TANK
11. OIL LEVEL SIGHT GAGE
12. MAGNETIC OIL SUMP DRAIN PLUG
13. FUEL FILTER
14. START COUNTER
15. HOUR METER
16. HYDRAULIC STARTER
17. OIL FILTER
18. AIR TURBINE MOTOR INLET DUCT
19. GENERATOR COOLING AIR DUCT
20. COOLING AIR FAN INLET DUCT
21. FIRE EXTINGUISHER NOZZLE
22. GENERATOR
23. OIL COOLER

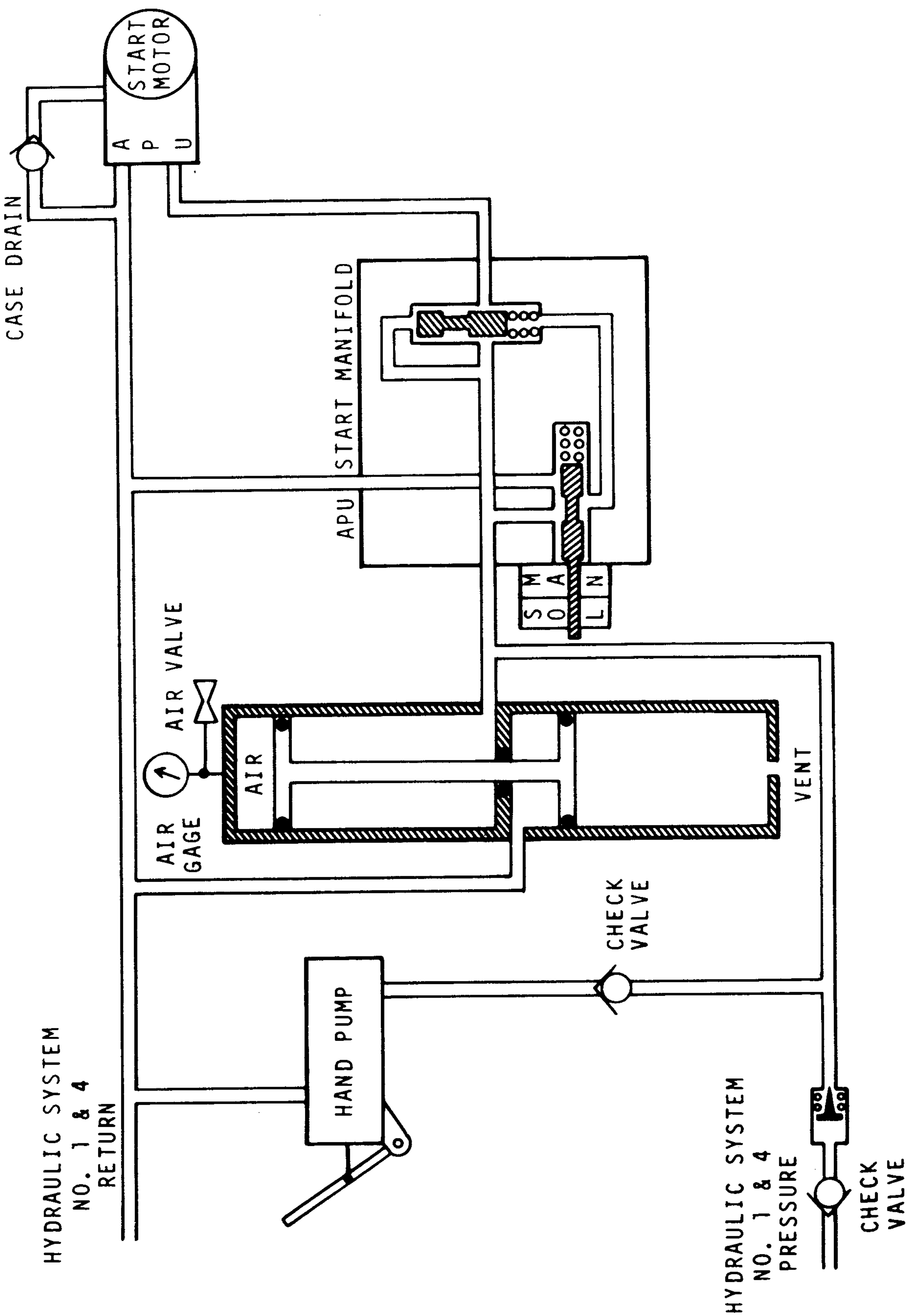
AUXILIARY POWER UNITS


L APU
R APU
BLEED VALVE
OPEN
CLOSE
DOOR OPEN
START
ON SPEED
DOOR OPEN
START
ON SPEED
APU CONT
START
RUN
STOP
APU CONT
START
RUN
STOP
AGENT
DISCHARGE
BOTTLE SELECT
ALTR
NORM
AGENT
DISCHARGE
FIRE APU PULL
FIRE APU PULL
FIRE EMERGENCY INSTRUCTION
1. PULL FIRE EMERGENCY CONTROL
2. DISCHARGE AGENT
FIRE DETECT TEST
SHORT DISCR
TEST
ENG & APU
FIRE
ENG OVHT

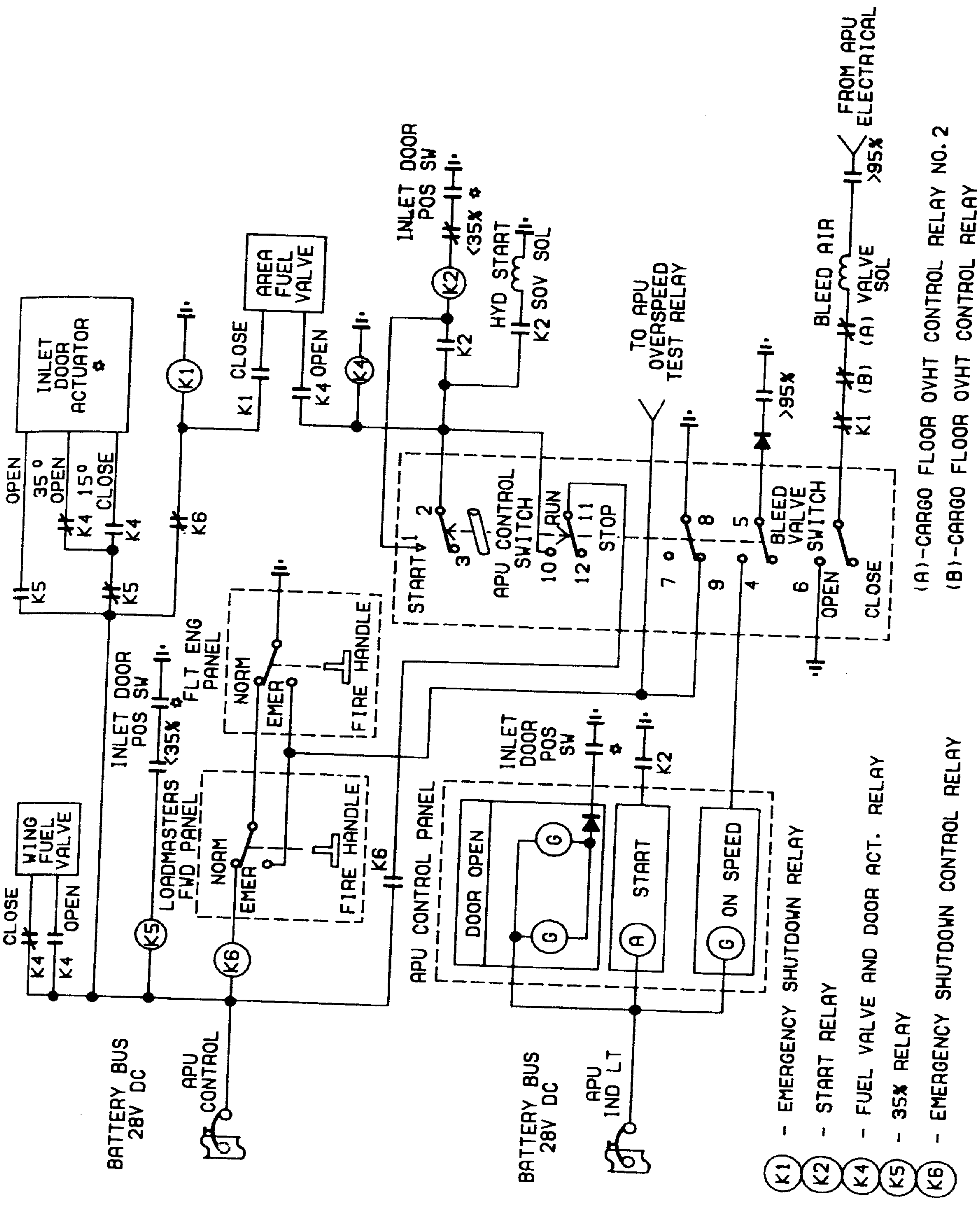
APU PANELS



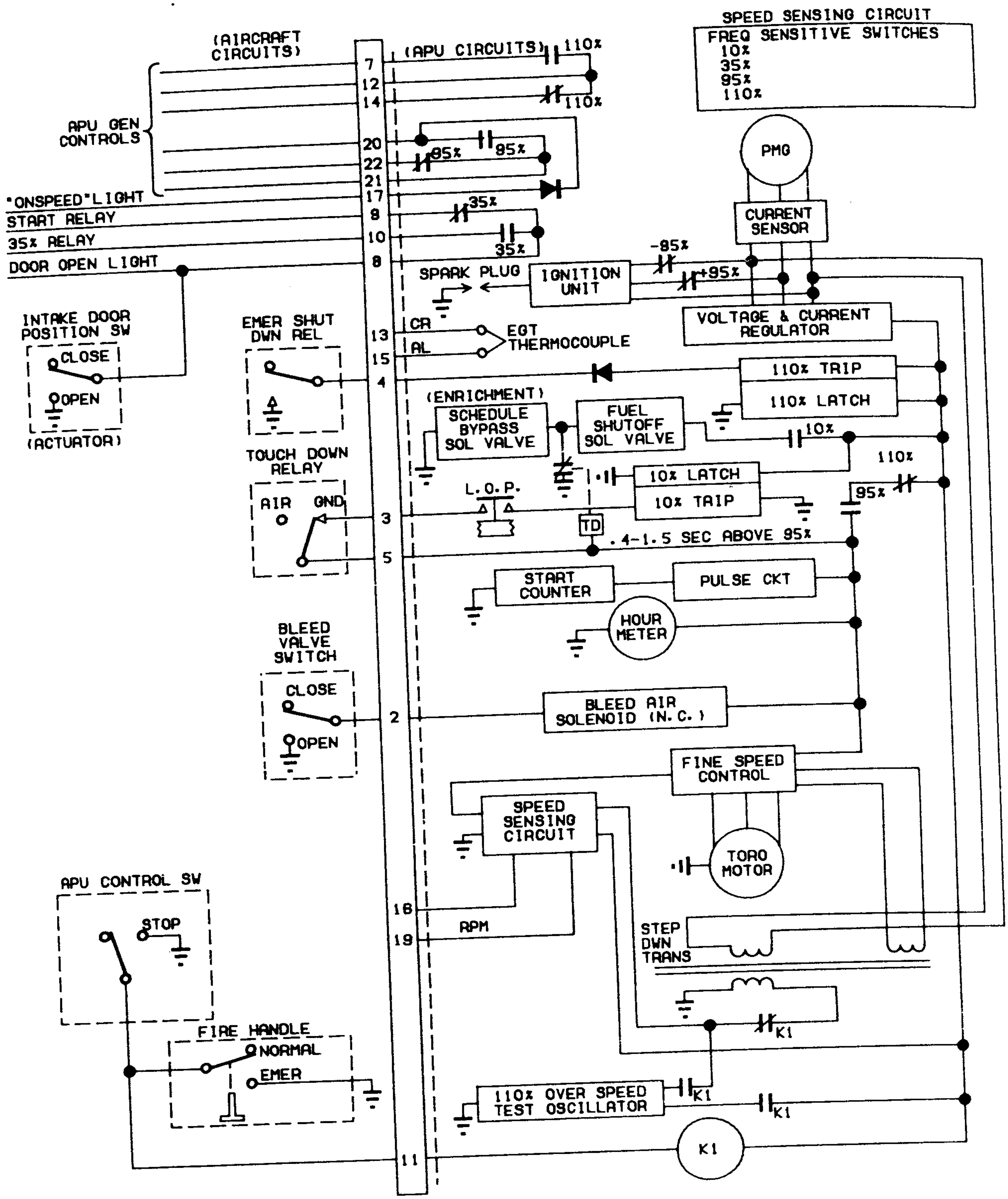
APU START SYSTEM SCHEMATIC



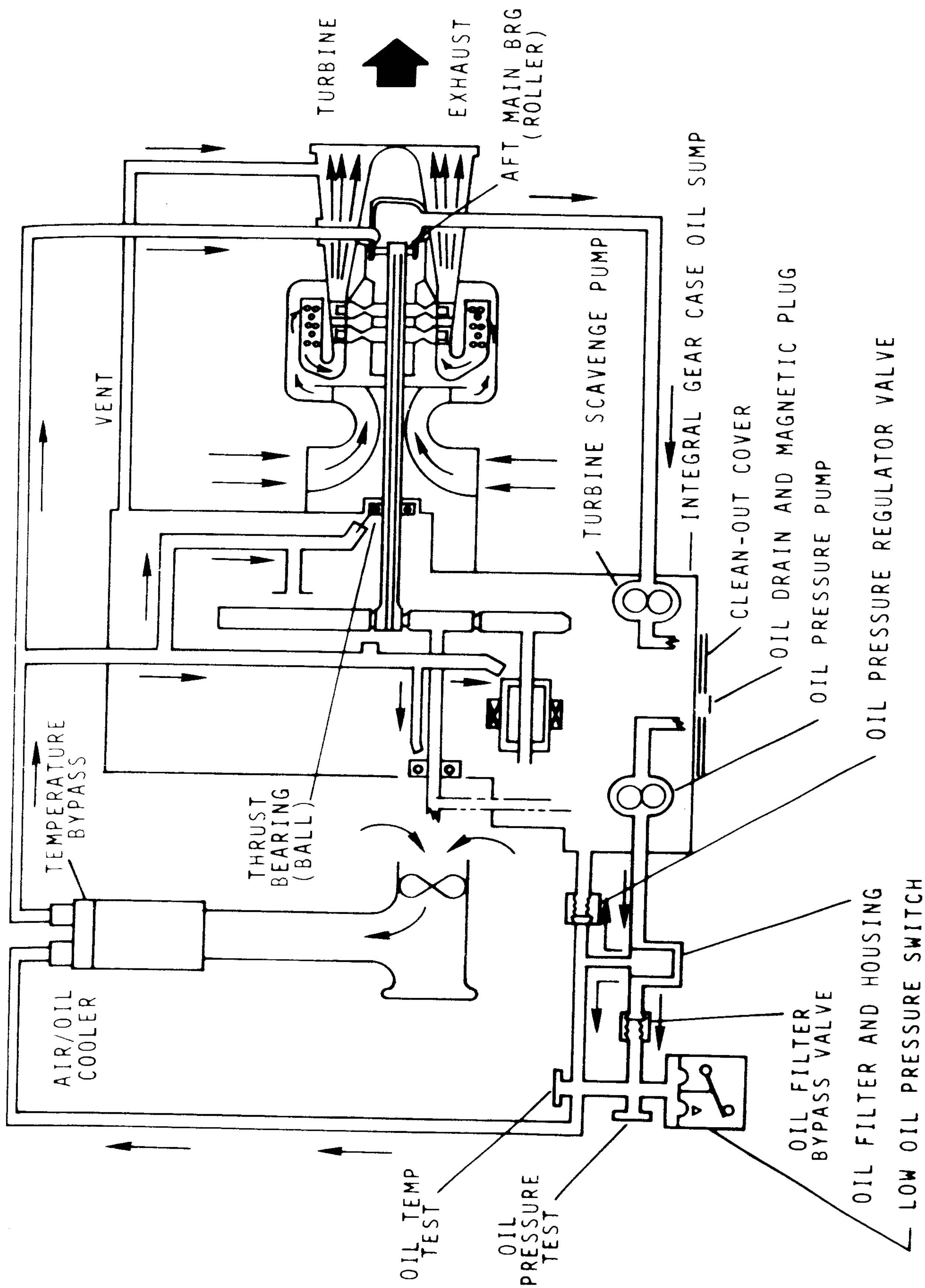
APU HYDRAULIC START SYSTEM SCHEMATIC



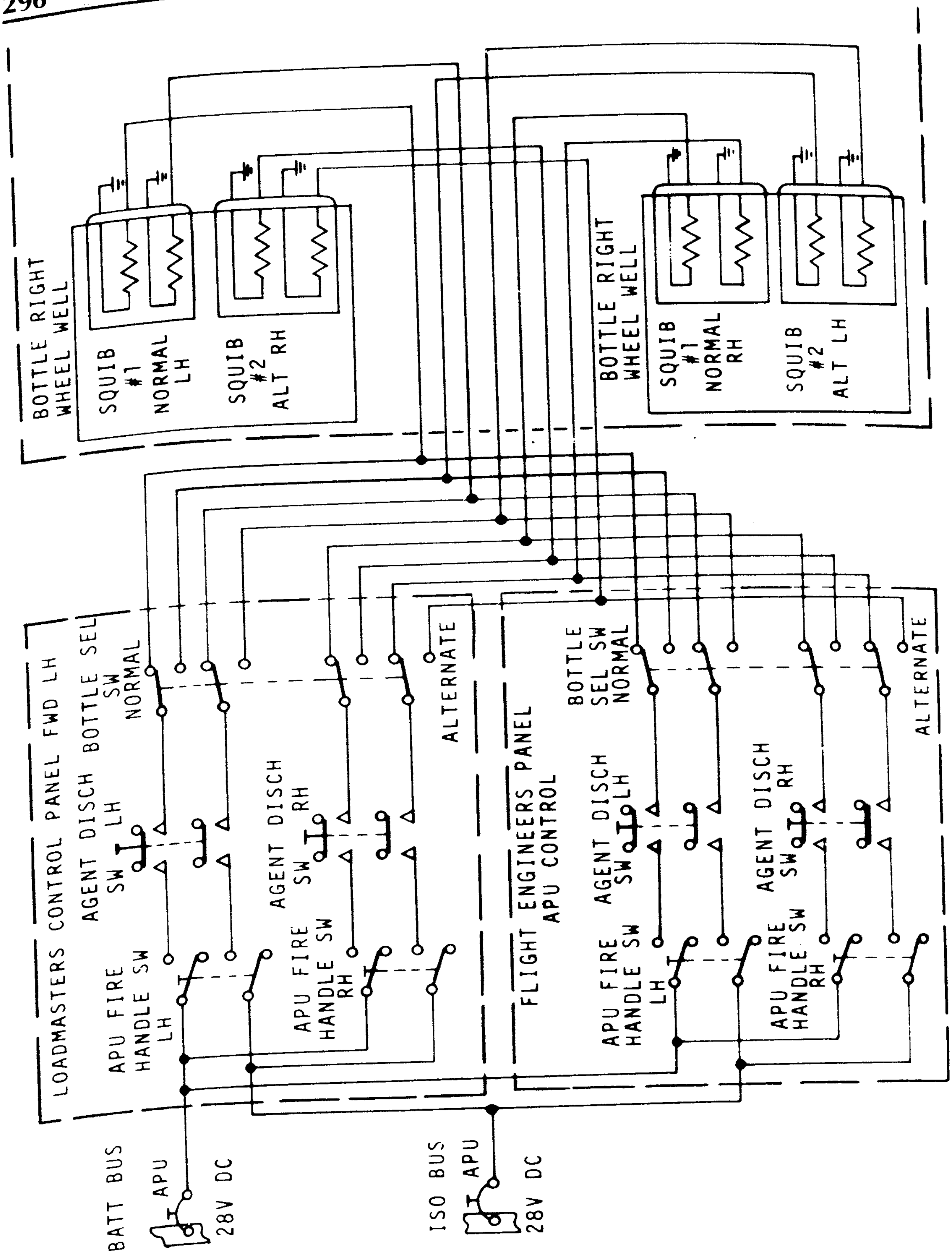
APU CONTROL ELECTRICAL (AIRCRAFT)



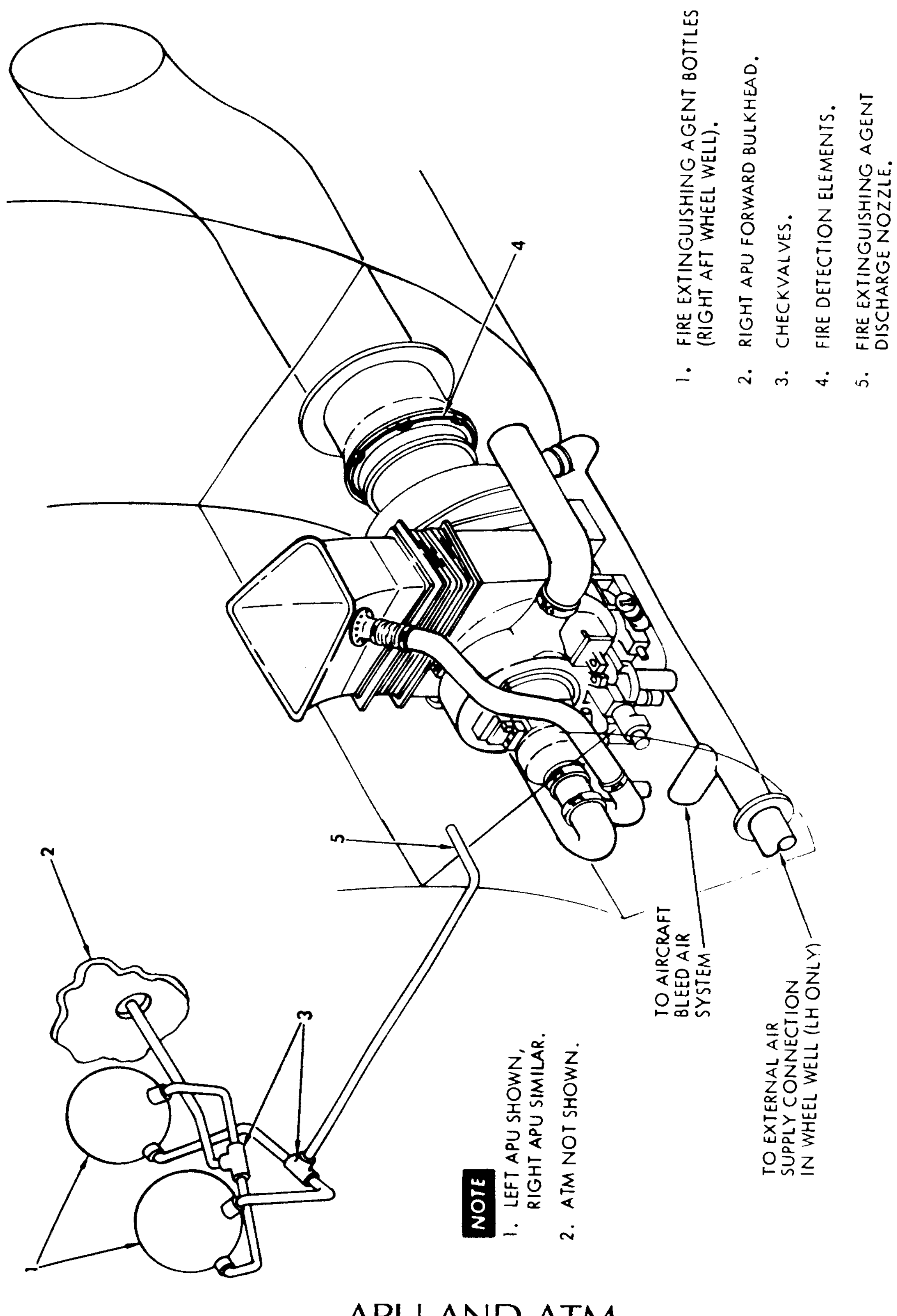
APU CONTROL ELECTRICAL (APU)



APU OIL SYSTEM SCHEMATIC



APU FIRE EXTINGUISHING ELECTRICAL



APU AND ATM
FIRE DETECTION AND EXTINGUISHING SYSTEM

SECTION VI
ELECTRICAL

INTRODUCTION

Alternating current (200/115-volt A.C.) is used as a basic power source, and is normally furnished by four generators driven by the engines through constant speed drive units. In addition there are two generators driven by the auxiliary power units (APUs), either of which can be selected to power all AC buses. All generators are rated at 80-KVA (kilovolt amperes), with the four engine driven generators capable of parallel operation. Direct current (28-volt DC) is provided normally by the AC system through the use of two transformer-rectifiers. In an emergency, the amount of AC and DC power required to maintain operation of the basic flight and engine instruments and the minimum warning control, navigation, and communication systems, is supplied by a hydraulically driven 3.9 KVA AC/DC generator. On the ground, AC power can be supplied by an external source which is plugged into the external power receptacle, or by either of the two APU-driven auxiliary AC generators. Two 24-volt, 5.0 ampere-hour batteries are provided as an emergency power source. The batteries are located inside the cargo compartment on the forward right side.

The flight engineers circuit breaker panels and the circuit breaker panels for the forward main AC buses, isolated AC and DC, main DC buses, and the battery bus are color coded to provide a convenient method of determining the airplane system powered through the circuit breakers. The following is a list of airplane systems and the colors used to identify them:

Engine - purple

Fuel - blue

Flight Controls and Hydraulics - gray

Environmental - green

Engine Instruments (26 VAC) - black

Electrical and Miscellaneous - brown

Certain groups of circuit breakers are controlled by individual guarded ground switches located on the circuit breaker panels. The circuit breakers and the switch that controls them are enclosed in a cross-hatch design. By this method it is quite obvious which circuit breakers are controlled by the various switches.

The circuit breaker panels on the C-5 are located at seven main locations in the airplane. The following is a list of the panels and sub panels:

Pilot's Emergency Circuit Breaker Panel

Emergency AC Bus
Emergency DC Bus

Flight Engineers Circuit Breaker Panel

Number 1

Forward Main AC Bus # 3
28 Volt AC Lighting
Forward Main AC Bus # 2

Number 2

Battery Bus
Isolated DC Bus
Isolated AC Bus

Number 3

Forward Main AC Bus # 4
Forward Main AC Bus # 3

Number 4

Forward Main AC Bus # 2
Forward Main AC Bus # 1

Number 5

Main DC Bus # 2

Number 6

Main DC Bus # 1

DC Load Center

Main DC Bus 2 Power
Main DC Bus 2 Power
Isolated DC Bus Power
Battery Bus Power

Navigator's Circuit Breaker Panel

Number 1

Avionics Isolated DC Bus
Avionics DC Bus # 1
Avionics Isolated AC Bus
Avionics Isolated DC Bus
Avionics AC Bus 1
Nav. AC Bus # 1
26 VAC Isolated AC Bus
26 VAC Nav. Bus # 1

Number 2

Avionics DC Bus # 2
Avionics AC Bus # 1
Avionicis AC Bus # 2
Nav. AC Bus # 2
26 VAC Nav Bus # 2

AC Load Center Circuit Breaker Panel

Generator Panel # 4
Generator Panel # 3
Generator Panel # 2
Generator Panel # 1

Number 1

Monitor AC Bus # 2
Aft Main AC Bus # 2
Aft Main AC Bus # 1

Number 2

Monitor AC Bus # 2
Aft Main AC Bus # 2
Aft Main Bus # 1

Number 3

Aft Main AC Bus # 4
Aft Main AC Bus # 3
Monitor AC Bus # 3

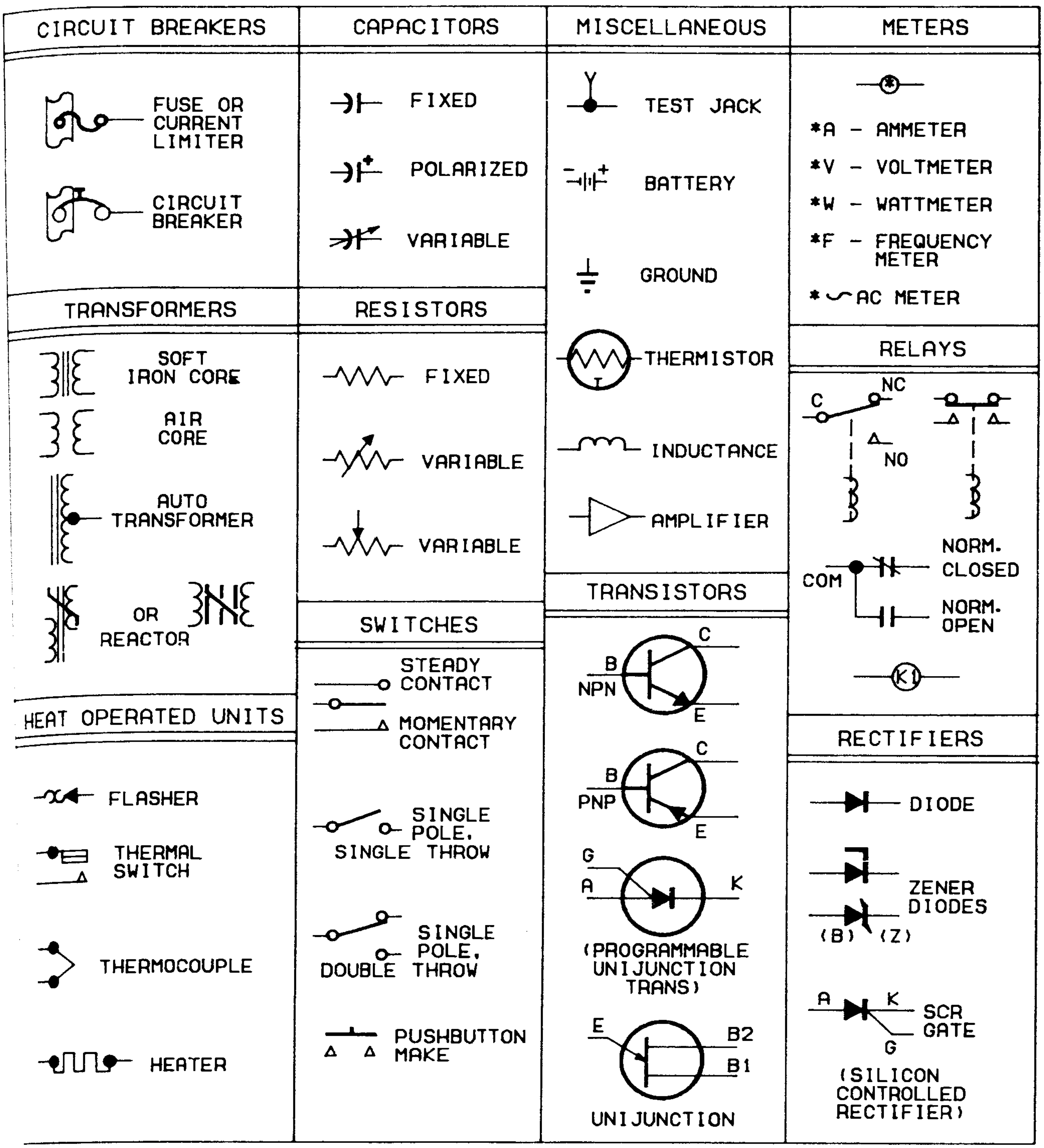
Number 4

Aft Main AC Bus # 4
Aft Main AC Bus # 3
Monitor AC Bus # 3

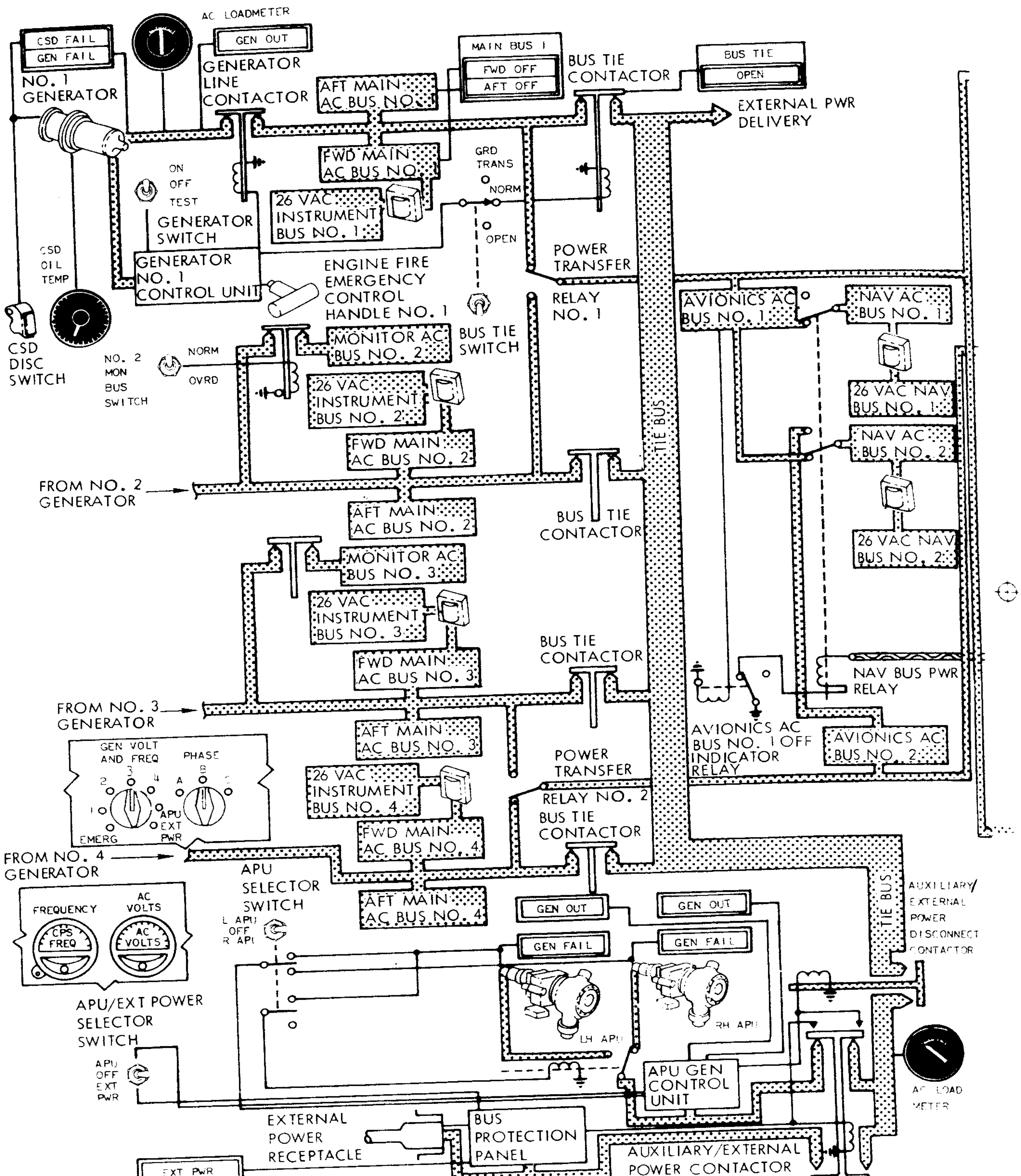
APU and External AC Power Circuit Breaker Panel

Emergency Generator Circuit Breaker Panel

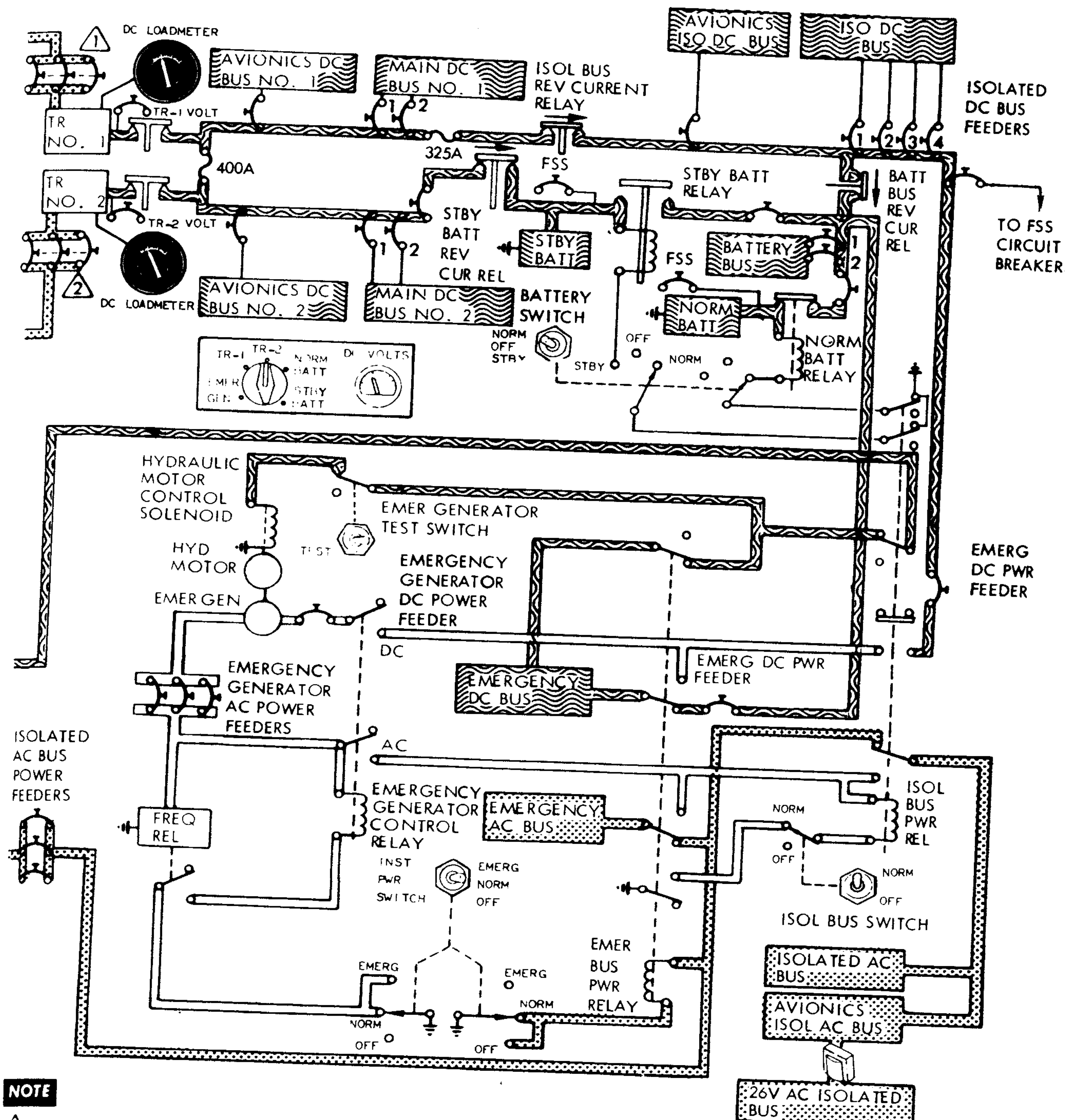
Battery Compartment Circuit Breakers



ELECTRICAL SCHEMATIC SYMBOLS



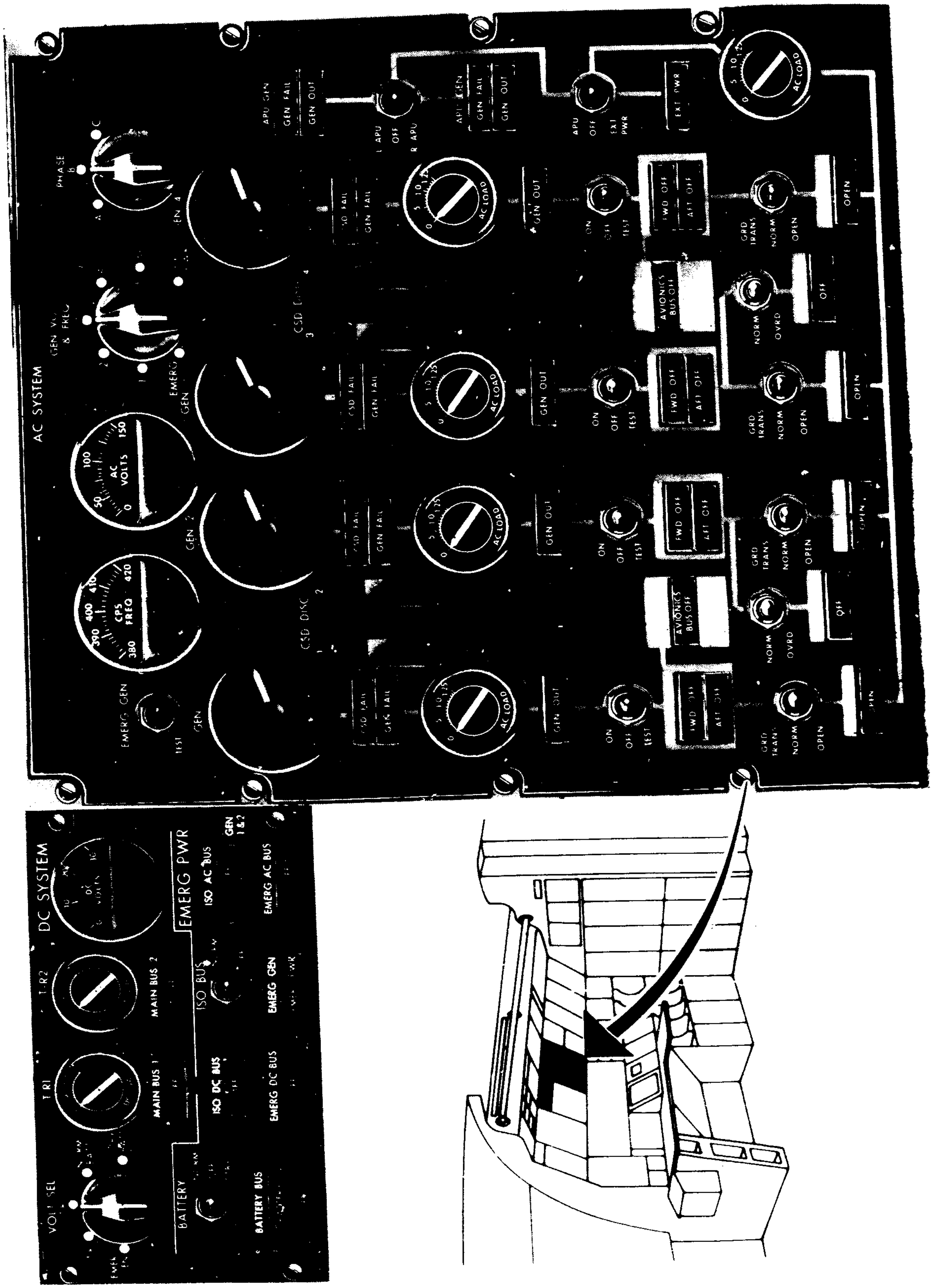
ELECTRICAL SYSTEM SCHEMATIC (SHEET 1)



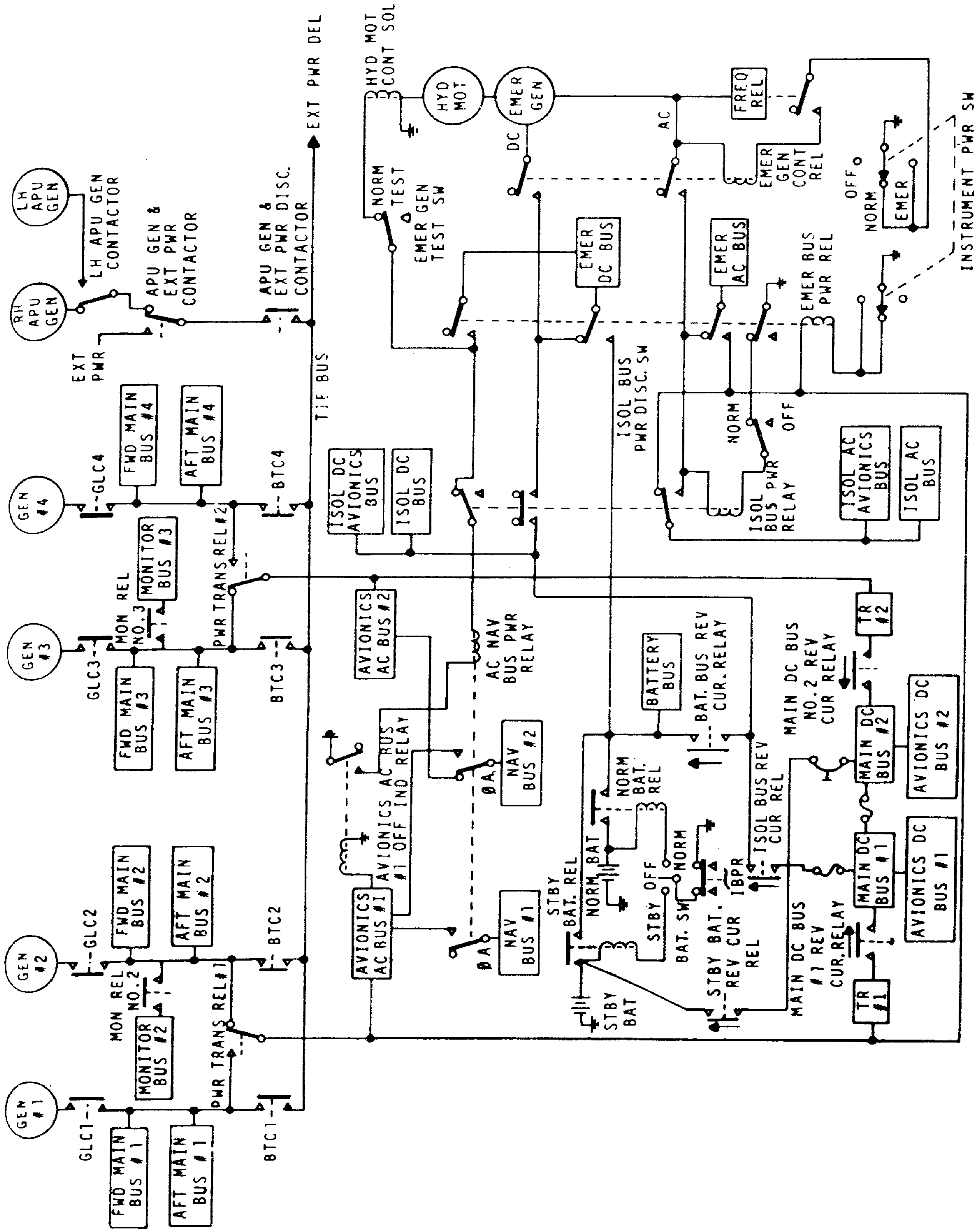
NOTE

⚠1 TRANSFORMER RECTIFIER 1 CIRCUIT BREAKER.
⚠2 TRANSFORMER RECTIFIER 2 CIRCUIT BREAKER.

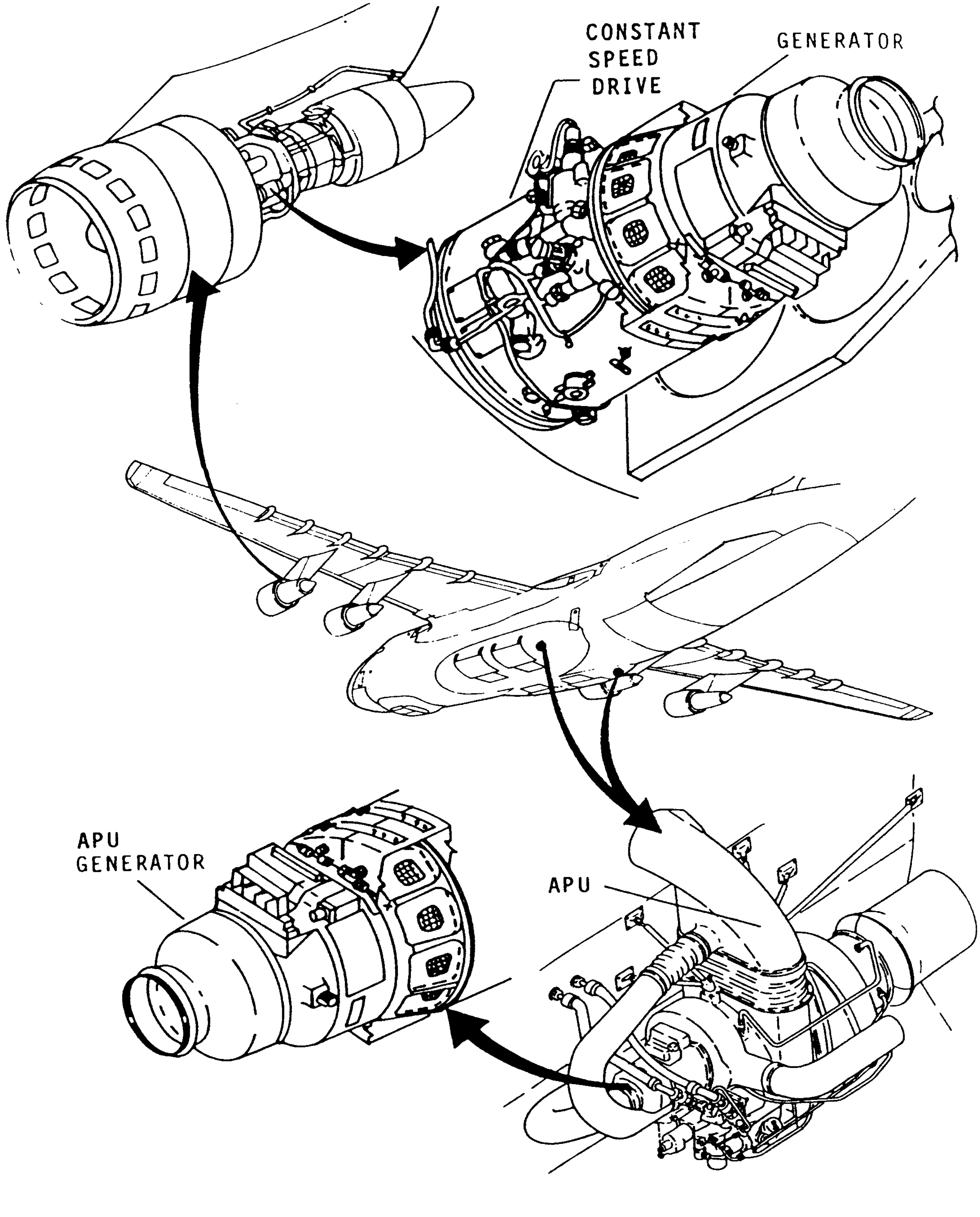
ELECTRICAL SYSTEM SCHEMATIC (SHEET 2)



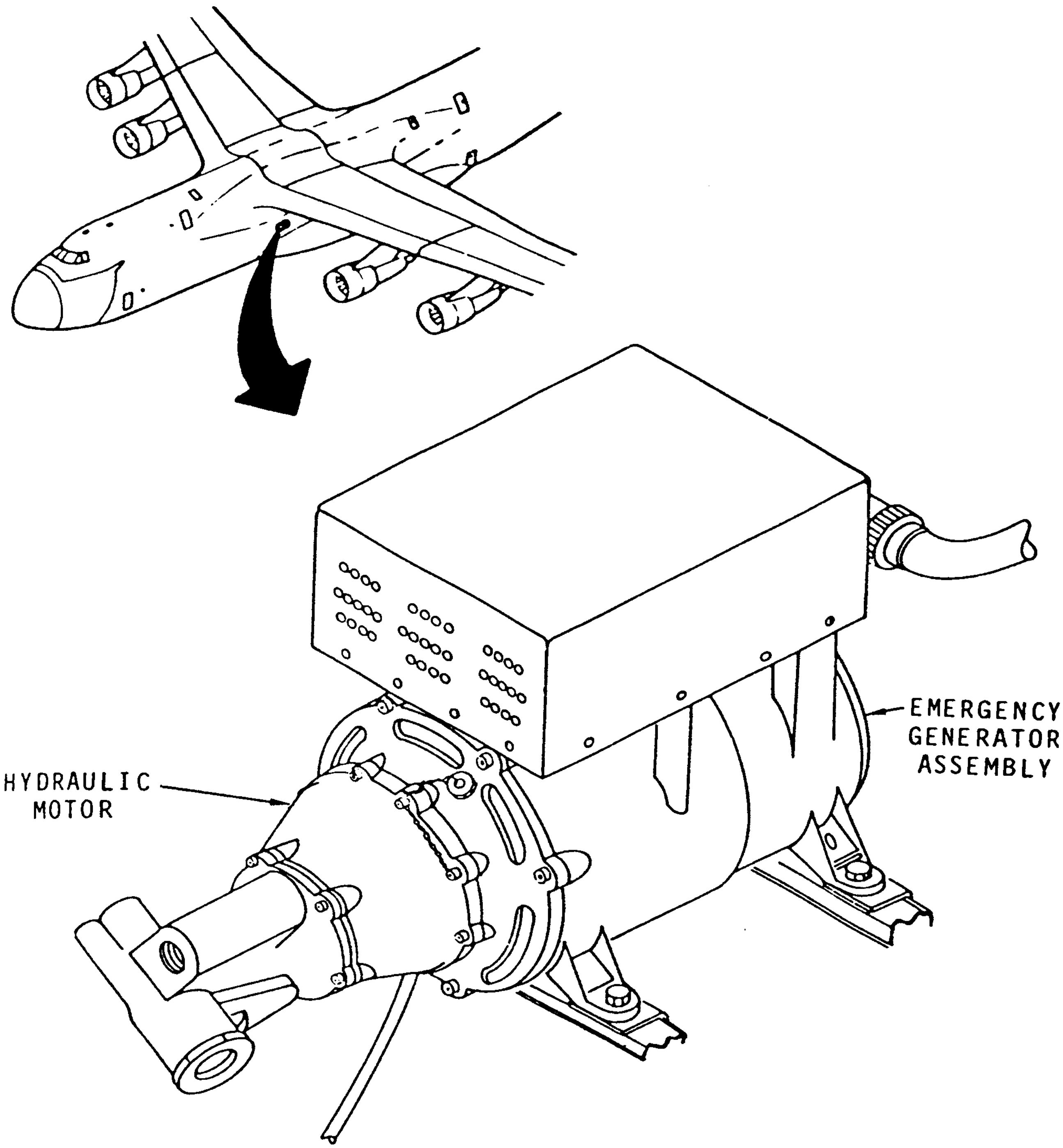
ELECTRICAL PANEL



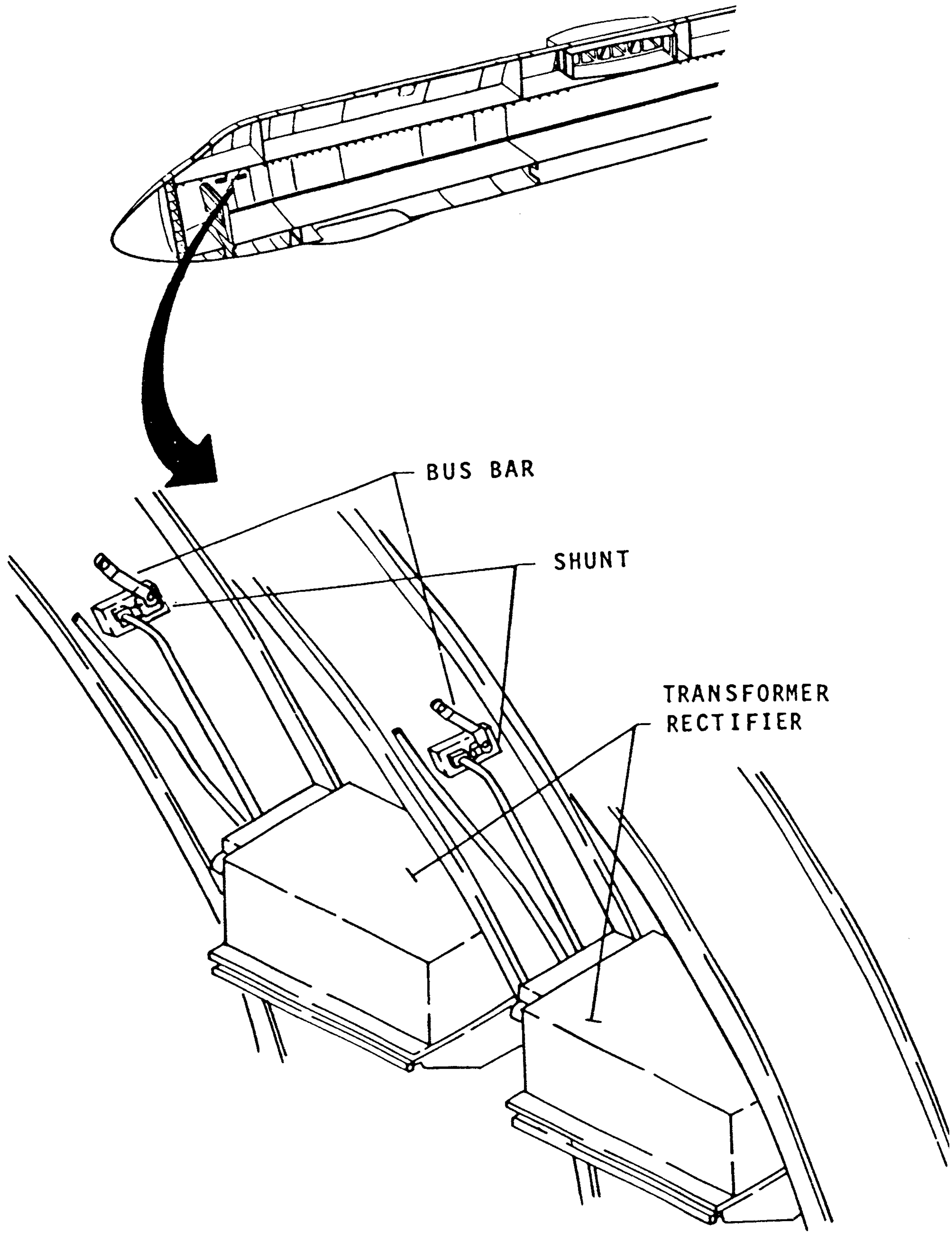
ELECTRICAL BUS DISTRIBUTION



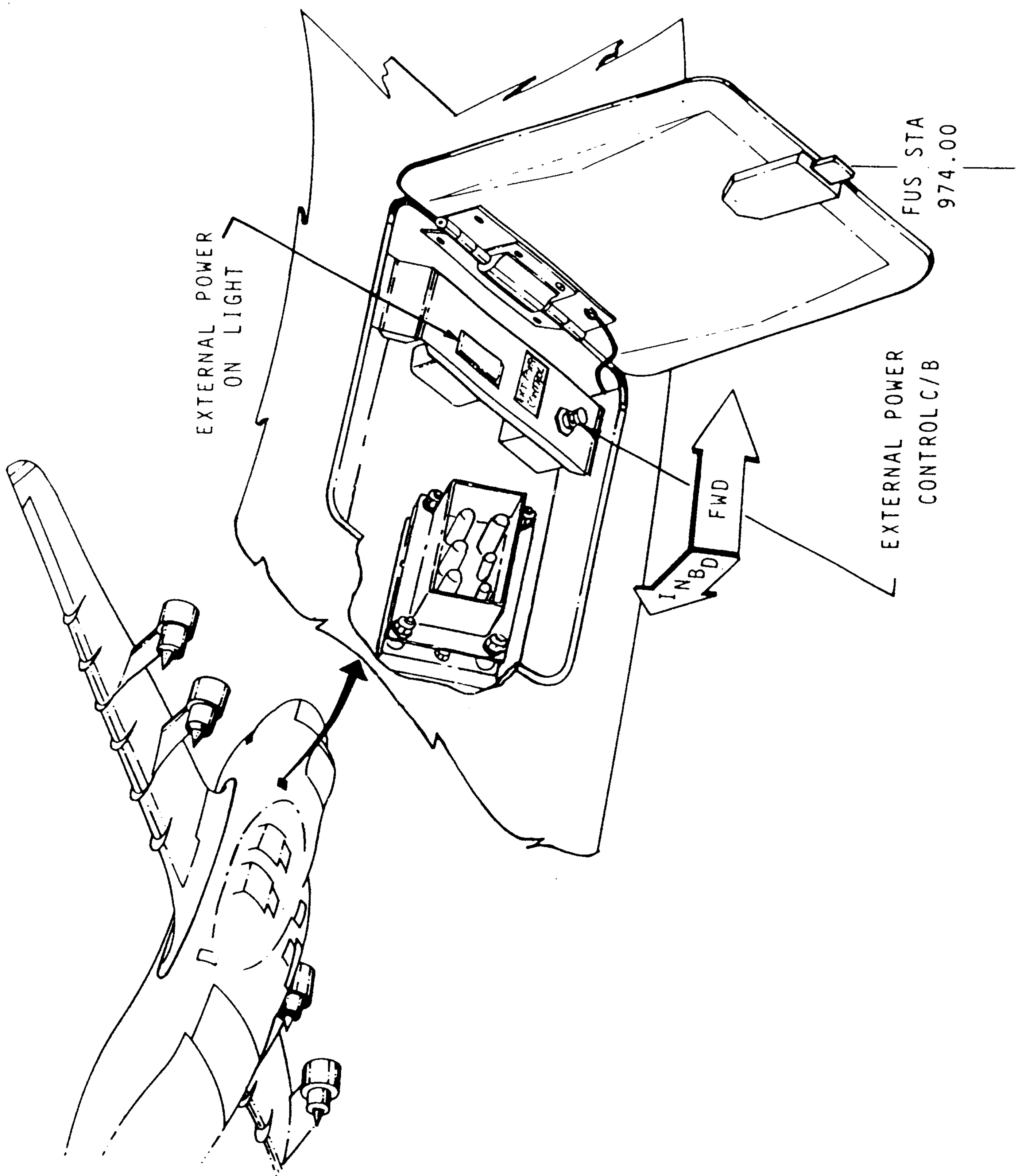
MAIN AND AUX GENERATOR LOCATION



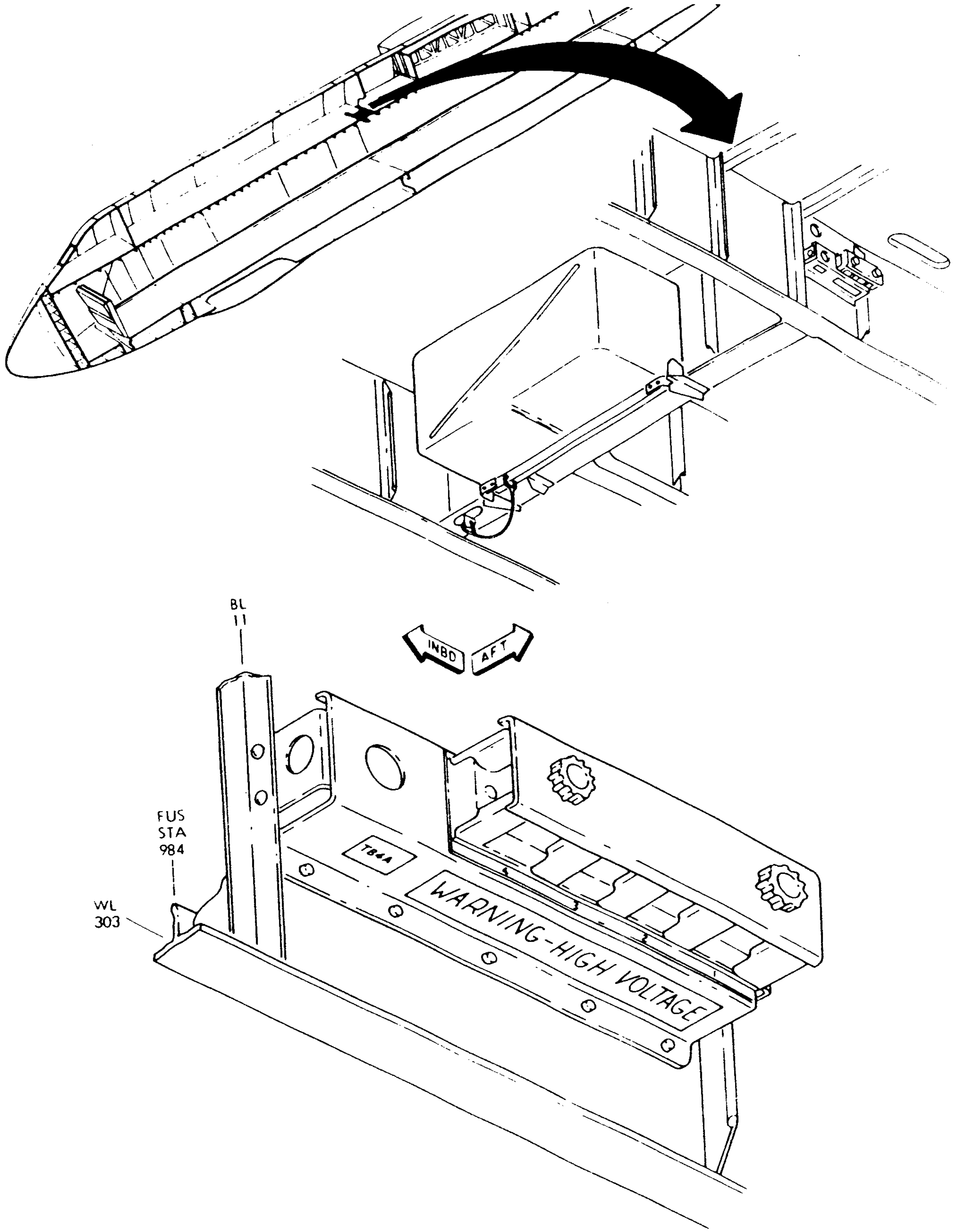
EMERGENCY GENERATOR LOCATION



TRANSFORMER – RECTIFIER UNITS



EXTERNAL POWER RECEPTACLE

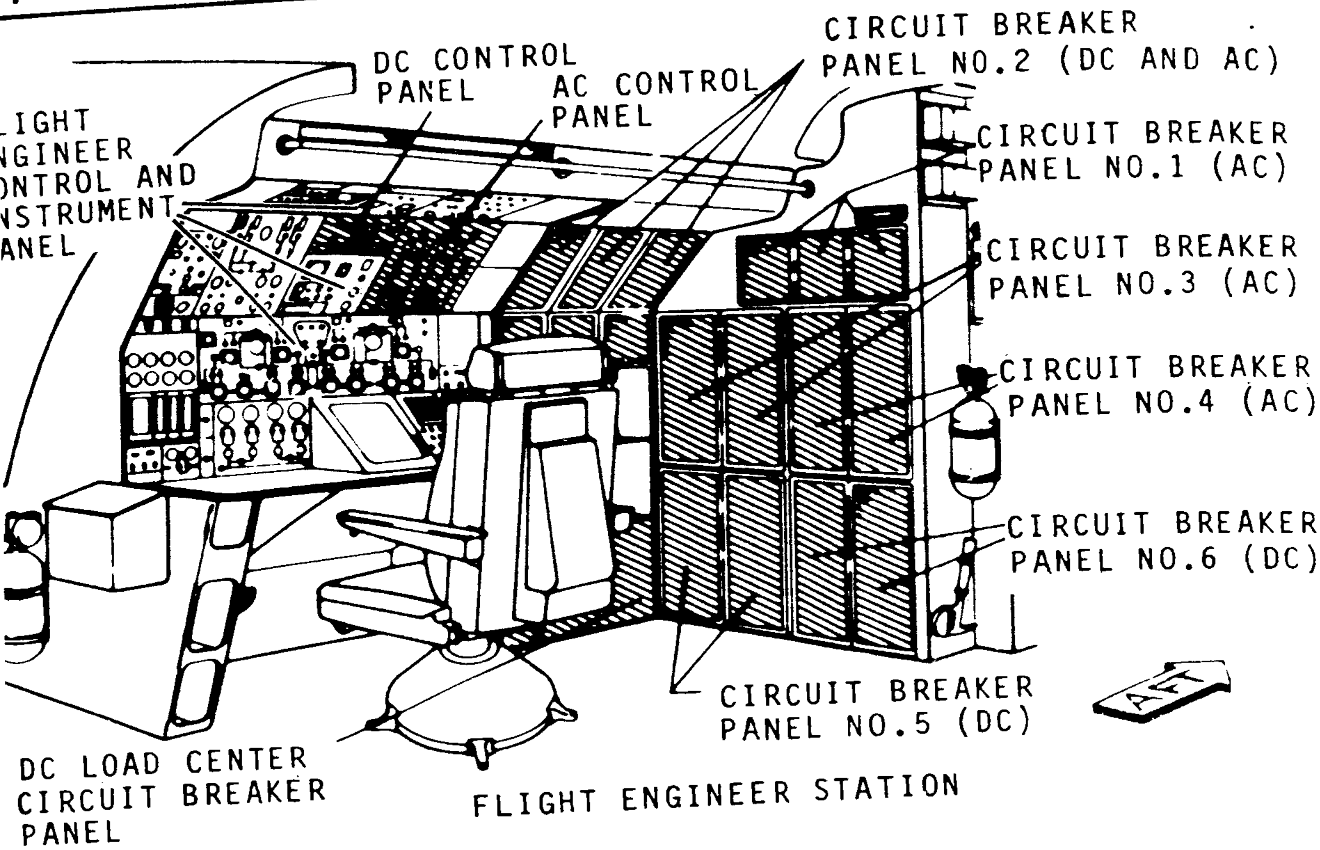


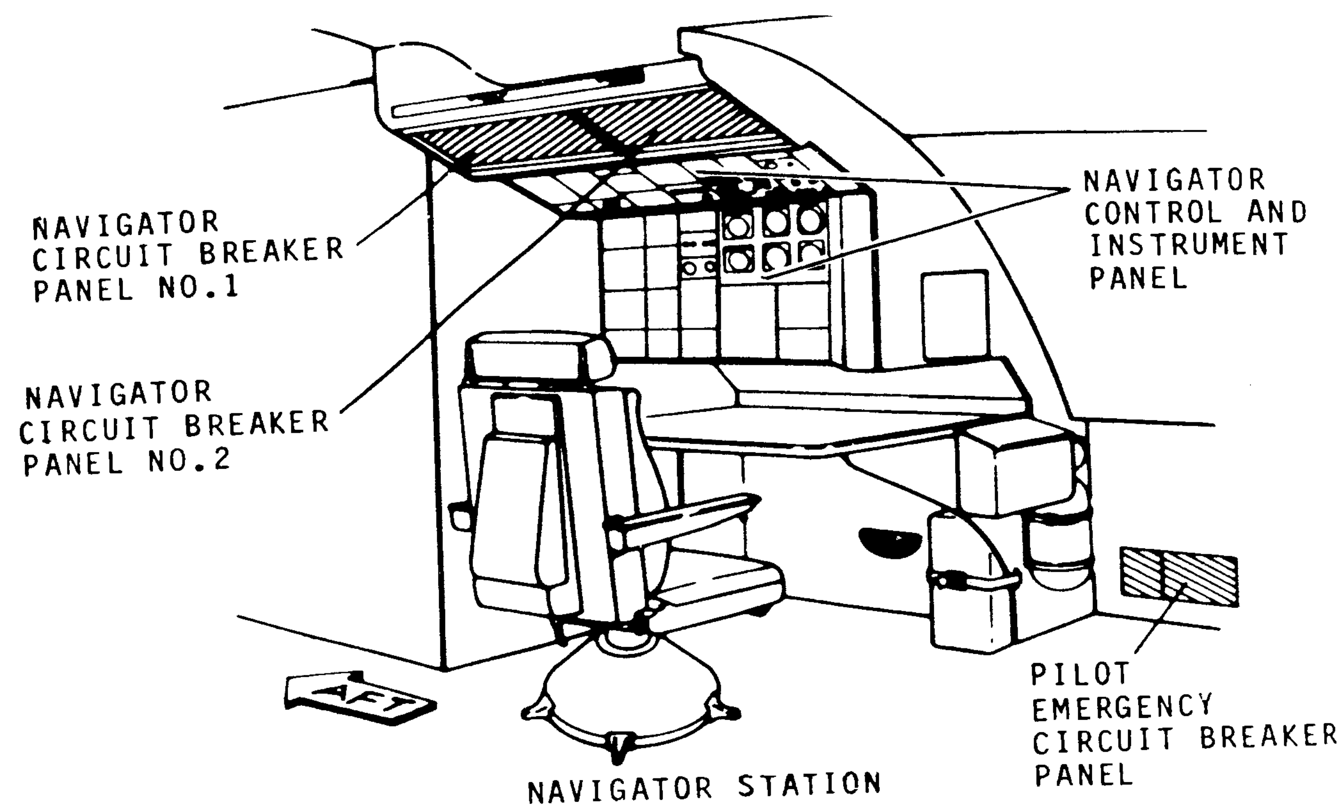
EXTERNAL POWER DELIVERY

POWER SOURCE							RELAYS - CONTACTORS																	AC BUSES								
							AE PC	AE DC	LA GC	GLC ON				EB PR	IB PR	MON		BTC-NORM				PTR		AVI		MAIN				TIE BUS	ISOL BUS	EMER BUS
EXT	RA	LA	G1	G2	G3	G4				1	2	3	4			2	3	1	2	3	4	1	2	1	2	1	2	3	4			
X							X	X						X		X	X	X	X	X	X	X	X	E	E	E	E	E	E	E	E	E
	X							X						X				X	X	X	X	X	X	A	A	A	A	A	A	A	A	A
		X						X	X					X				X	X	X	X	X	X	A	A	A	A	A	A	A	A	A
			X							X				X				X	X	X	X	X	X	1	1	1	1	1	1	1	1	1
			X	X						X	X			X		X	X	X	X	X	X	X	X	P	P	P	P	P	P	P	P	P
			X	X	X					X	X	X		X		X	X	X	X	X	X	X	X	P	P	P	P	P	P	P	P	P
			X	X	X	X				X	X	X	X	X		X	X	X	X	X	X	X	X	P	P	P	P	P	P	P	P	P
X			X	X	X	X	X	X		X	X	X	X	X		X	X					X	X	1	4	1	2	3	4	E	1	1
	X		X	X	X	X		X		X	X	X	X	X		X	X					X	X	1	4	1	2	3	4	A	1	1
		X	X	X	X	X		X	X	X	X	X	X	X		X	X					X	X	1	4	1	2	3	4	A	1	1
X			X				X	X		X				X		X	X		X	X	X	X	X	1	E	1	E	E	E	E	1	1
	X		X					X		X				X					X	X	X	X	X	1	A	1	A	A	A	A	1	1
		X	X					X	X	X				X					X	X	X	X	X	1	A	1	A	A	A	A	1	1
X			X	X			X	X		X	X			X		X	X			X	X	X	X	1	E	1	2	E	E	E	1	1
	X		X	X				X		X	X			X		X	X			X	X	X	X	1	A	1	2	A	A	A	1	1
		X	X	X				X	X	X	X			X		X	X			X	X	X	X	1	A	1	2	A	A	A	1	1
			X			X				X			X	X		X	X	BTC-OPEN				X	X	1	4	1			4		1	1
			X		X					X		X		X		X	X	"	"	"	"	X		1	3	1		3			1	1
				X		X				X		X		X		X	X	"	"	"	"		X	2	4		2		4		2	2
				X	X						X	X		X		X	X	"	"	"	"			2	3		2	3			2	2
				X							X			X				"	"	"	"			2			2				2	2

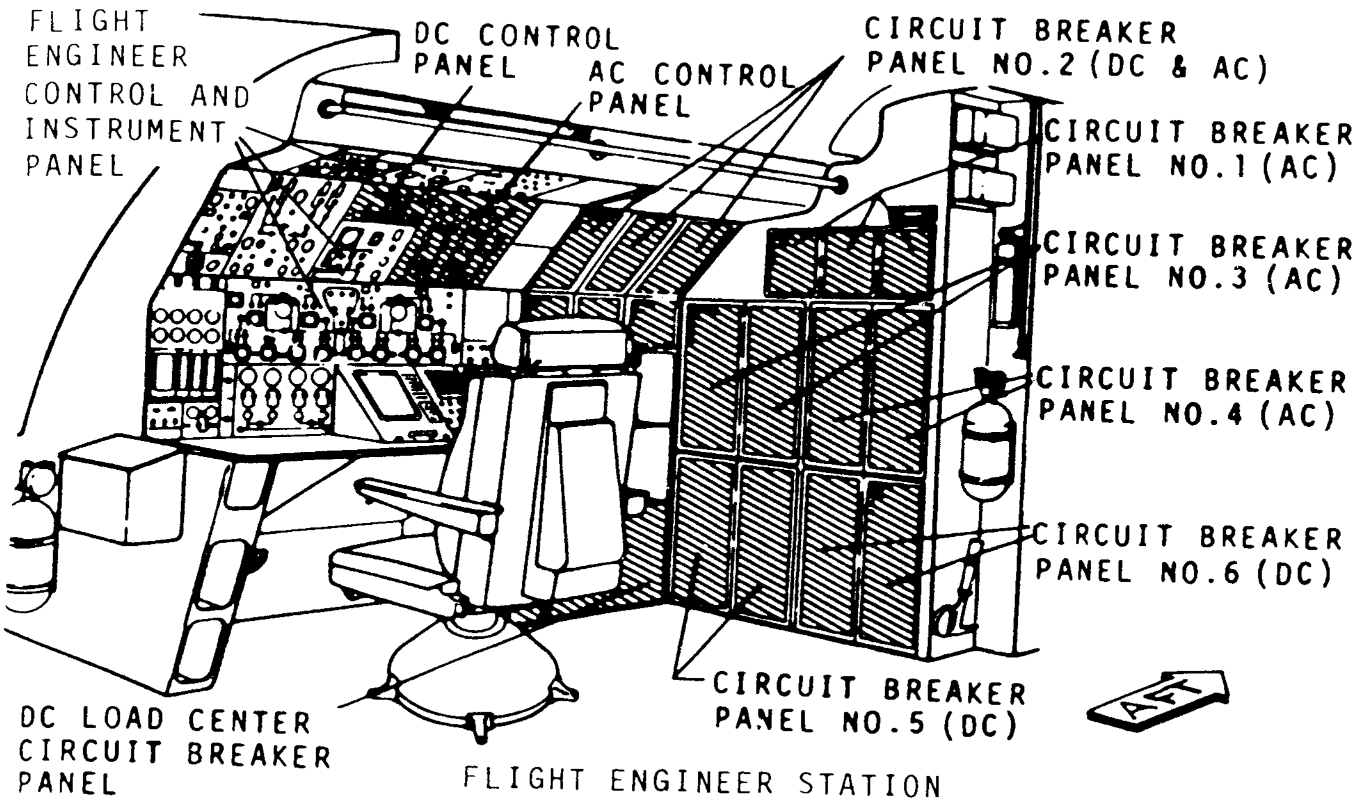
X - ENERGIZED
E - EXTERNAL POWER
AEPC - APU/EXT POWER CONTACTOR
AEDC - APU/EXT PWR DISCONNECT CONTACTOR
LAGC - LEFT AUX GEN CONTACTOR
1-4 - MAIN GEN POWER
A - AUXILIARY POWER
P - PARALLEL SOURCE
BLANK - DE-ENERGIZED

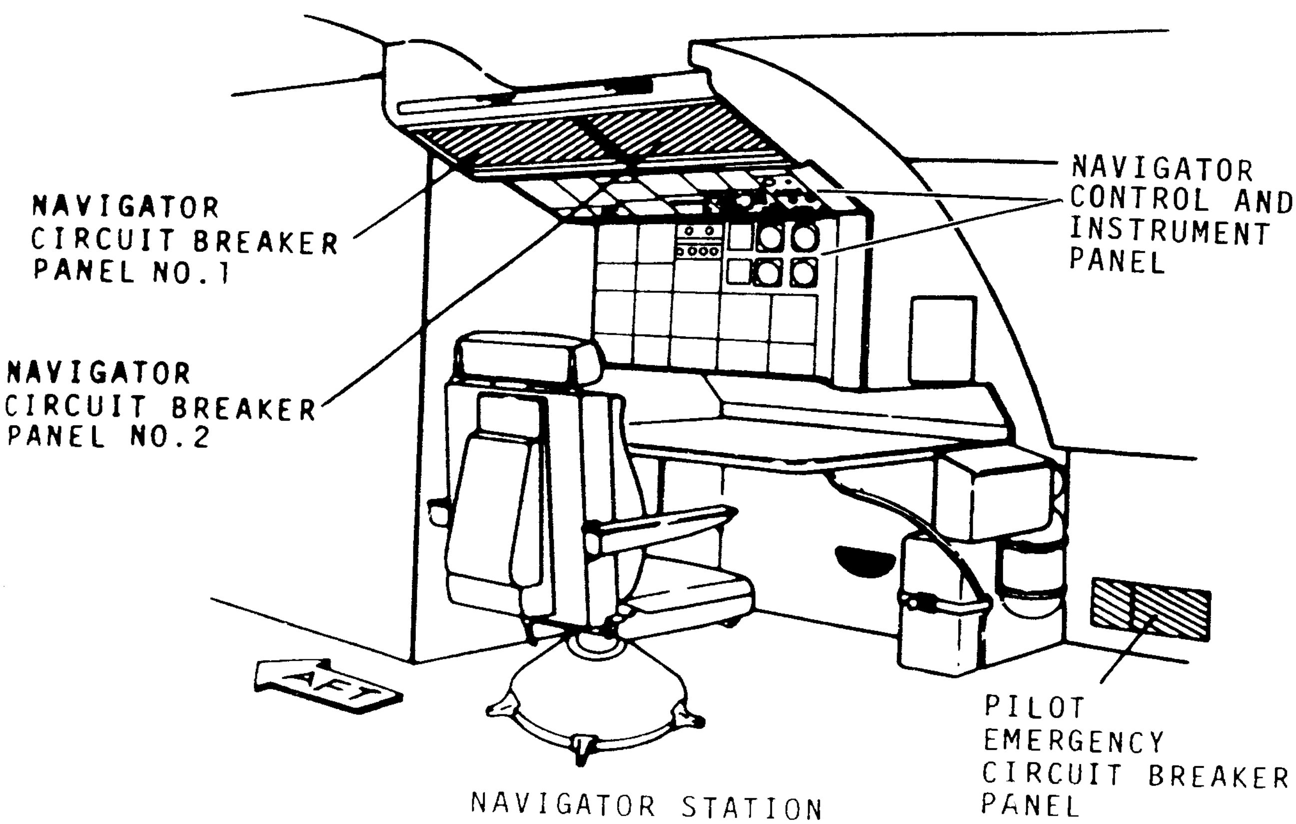
POWER SOURCE & RELAY CHART - AC CIRCUITS



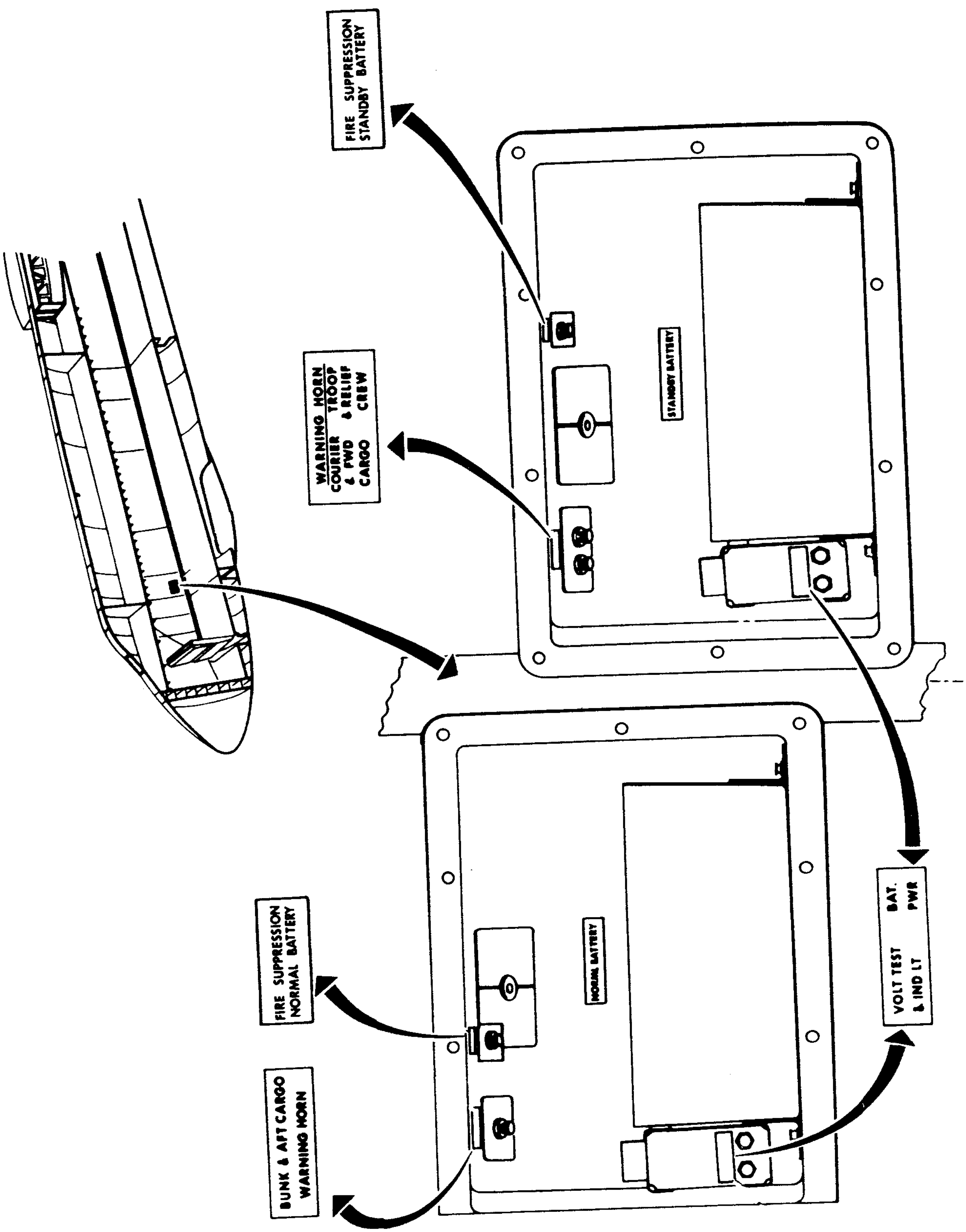


C-5A CIRCUIT BREAKER PANELS – NAVIGATOR/FLT. ENG. STATIONS



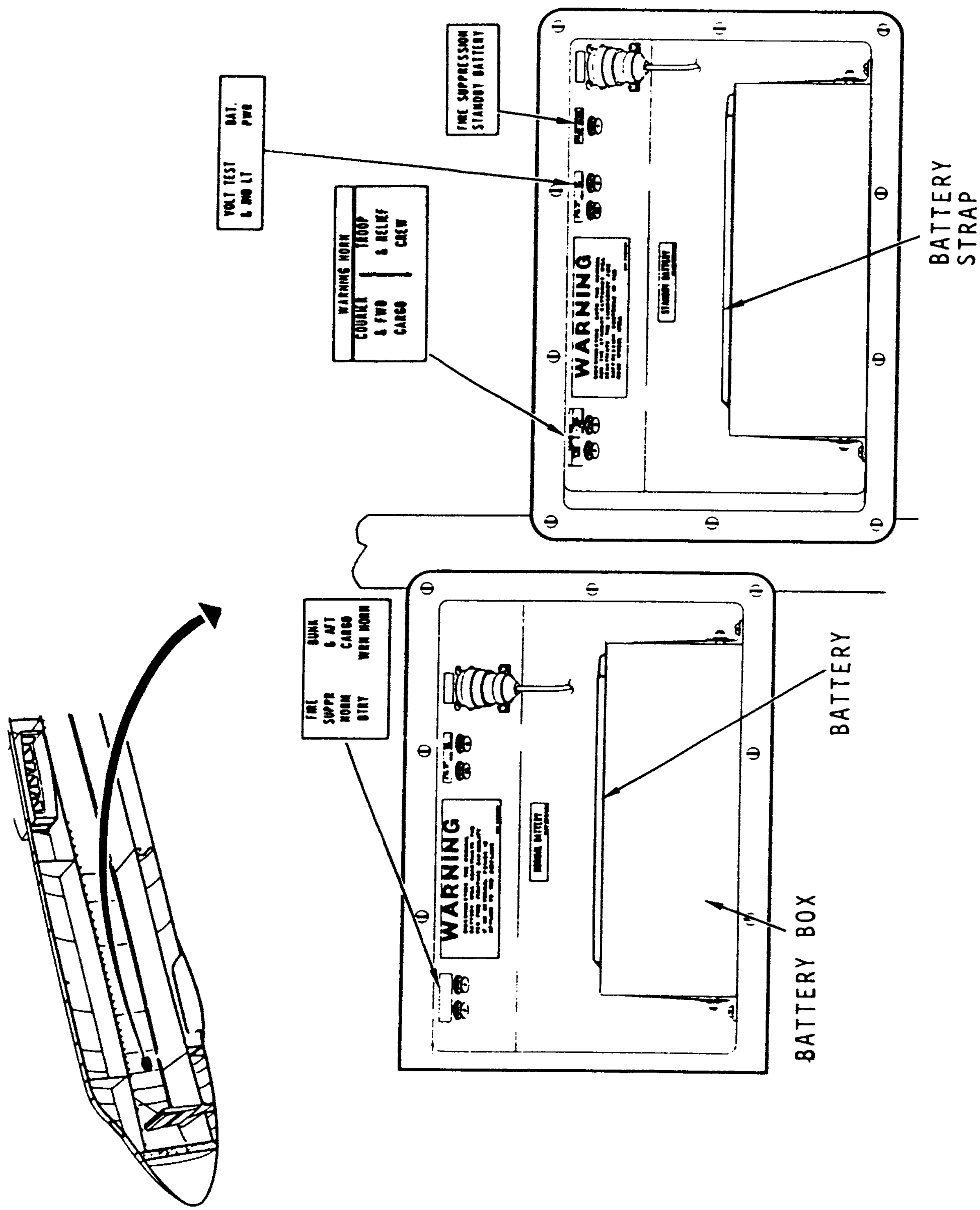


C-5B CIRCUIT BREAKER
PANELS – NAVIGATOR/FLT. ENG. STATIONS

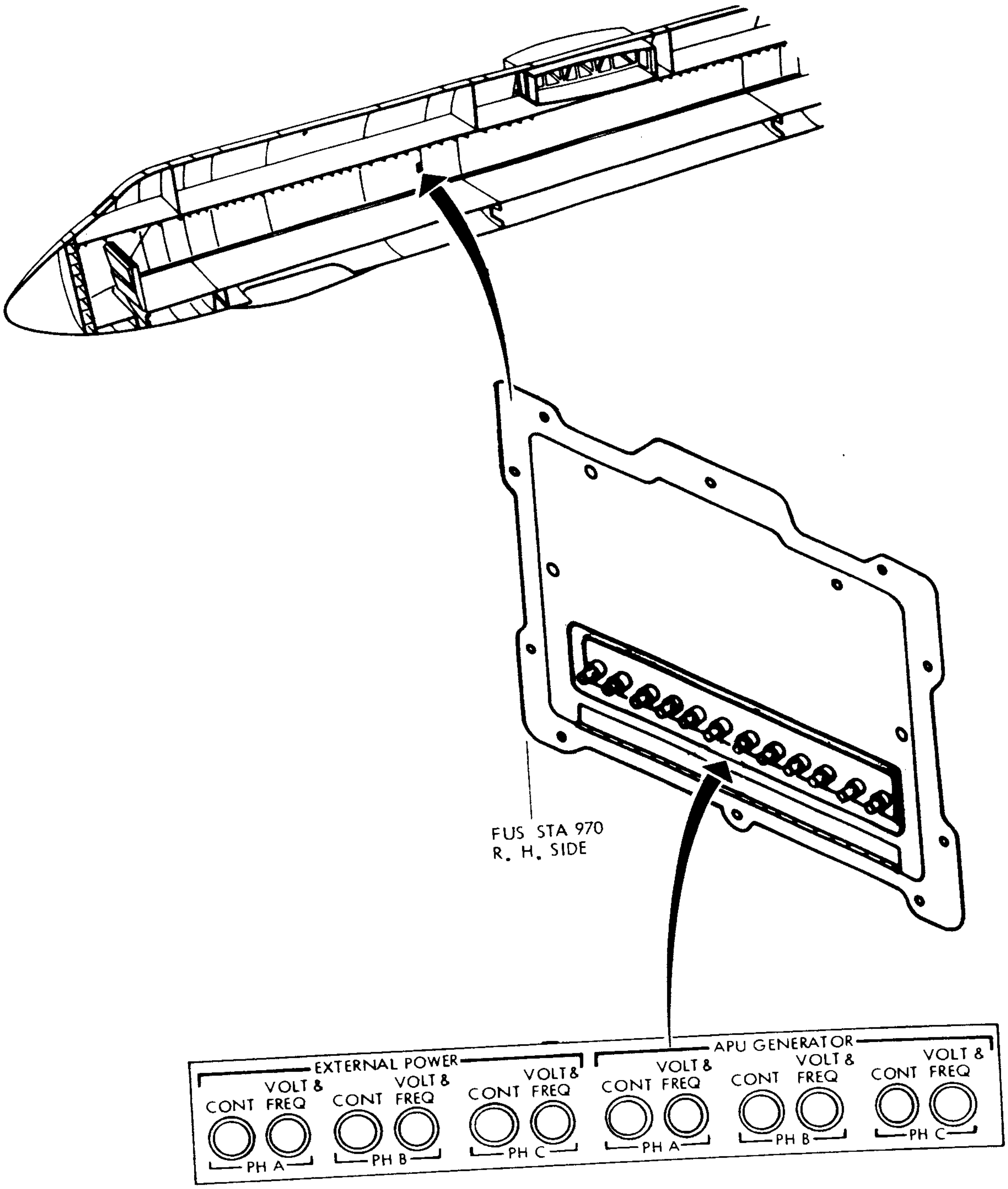


C-5A CIRCUIT BREAKERS – BATTERY COMPARTMENT

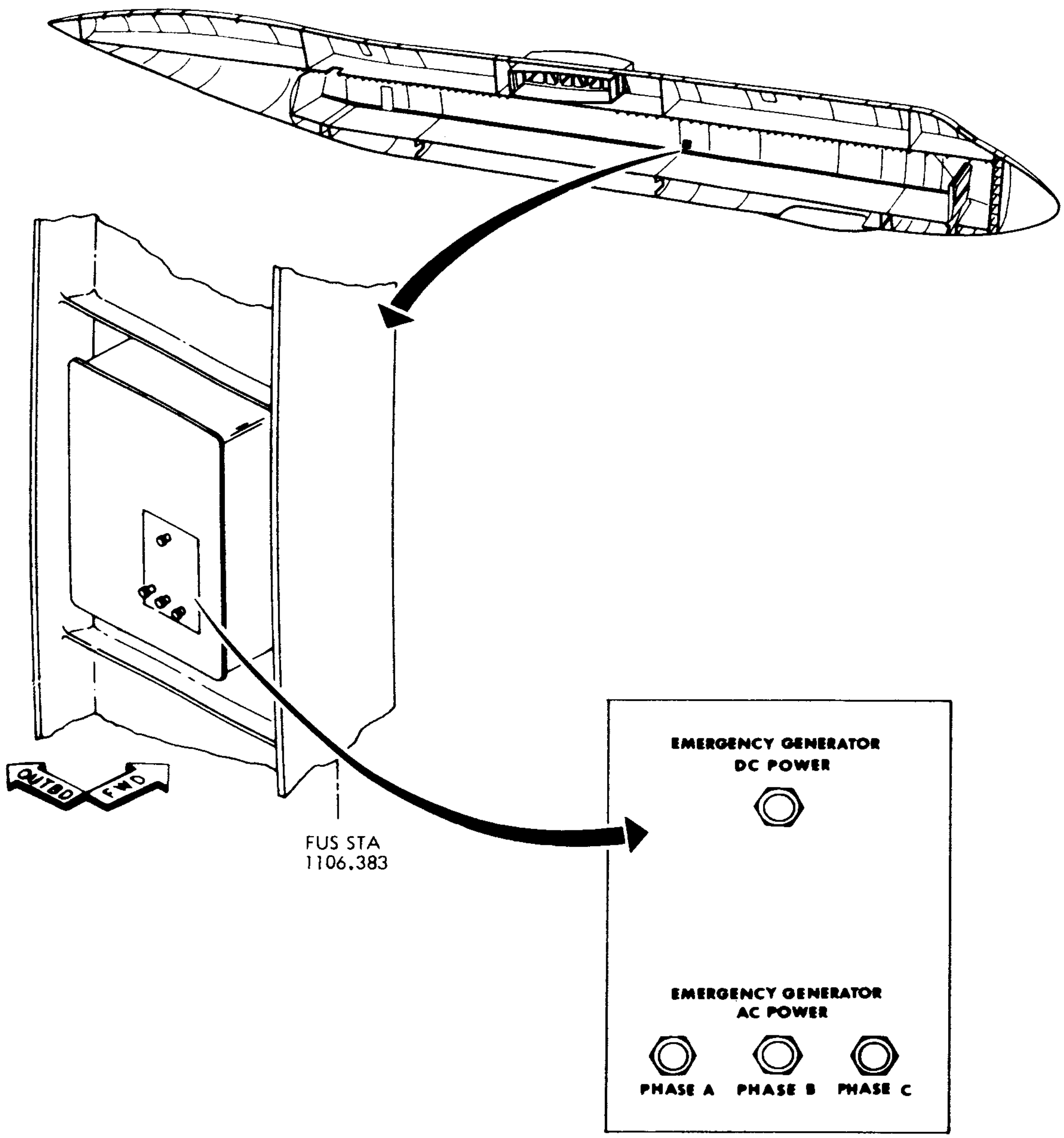
C-



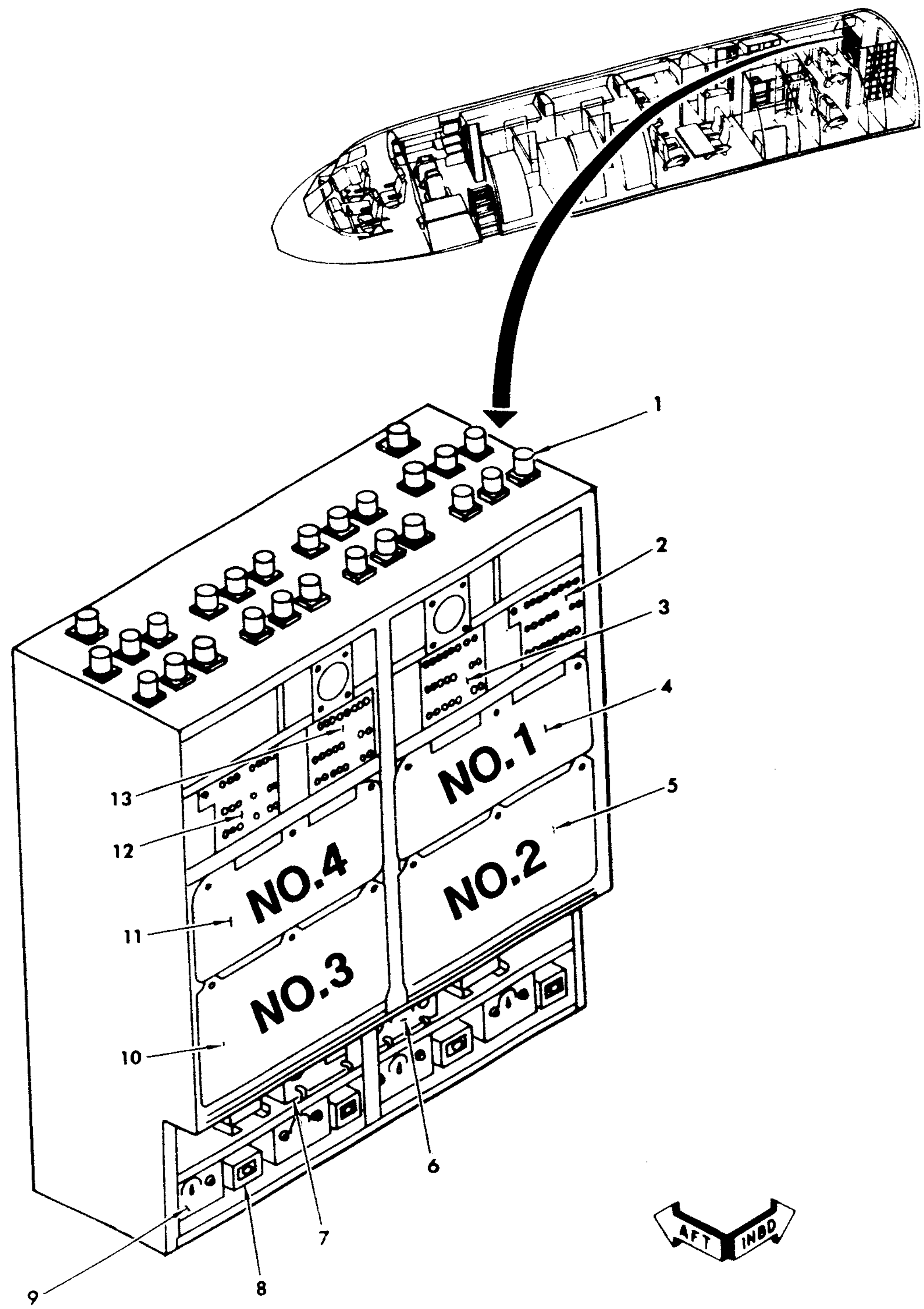
C-5B CIRCUIT BREAKERS – BATTERY COMPARTMENT



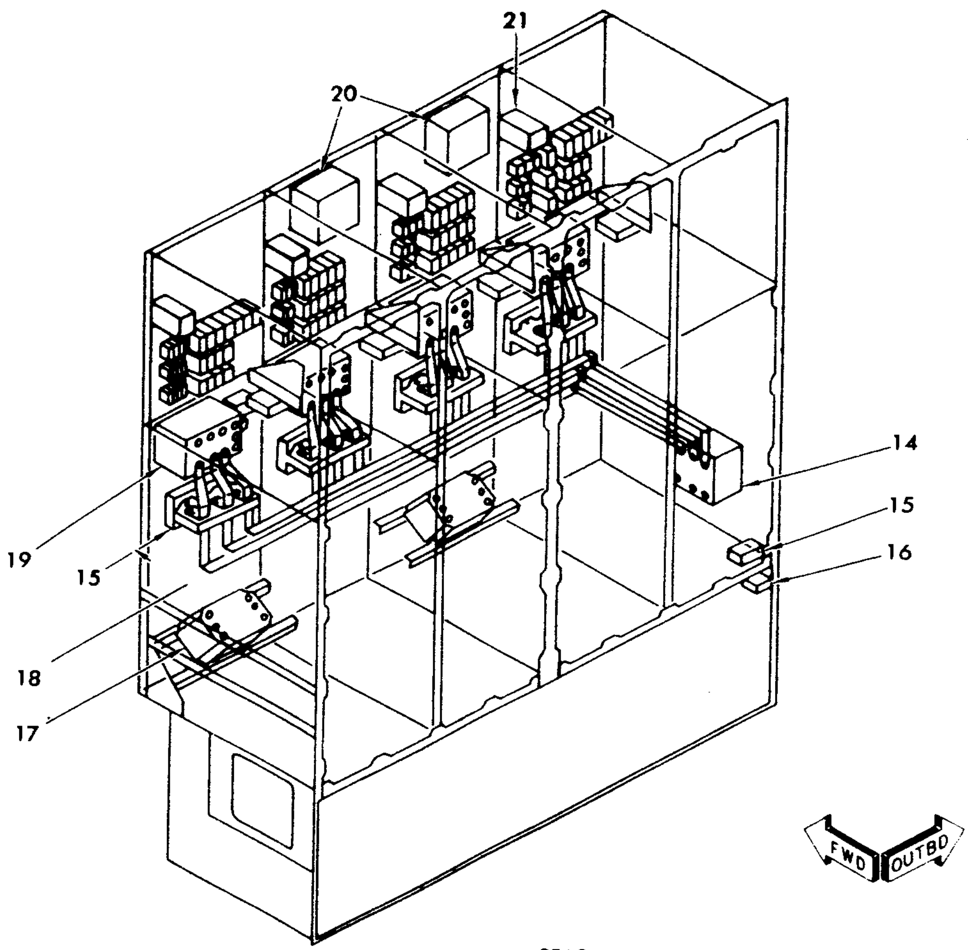
CIRCUIT BREAKER PANEL – APU & EXTERNAL AC POWER



CIRCUIT BREAKER PANEL – EMERGENCY GENERATOR



CIRCUIT BREAKER PANELS–AC LOAD CENTER–FRONT



REAR VIEW

1. FUEL BOOST CONTROL RELAYS (TYPICAL)
2. GENERATOR PANEL NO. 1
3. GENERATOR PANEL NO. 2
4. A.C. LOAD CENTER CIRCUIT BREAKER PANEL NO. 1
5. A.C. LOAD CENTER CIRCUIT BREAKER PANEL NO. 2
6. BUS PROTECTION PANEL (TYPICAL)
7. APU GENERATOR CONTROL
8. LOAD CONTROLLER (TYPICAL 4 PLACES)
9. GENERATOR CONTROL UNIT (TYPICAL 4 PLACES)
10. A.C. LOAD CENTER CIRCUIT BREAKER PANEL NO. 3
11. A.C. LOAD CENTER CIRCUIT BREAKER PANEL NO. 4
12. GENERATOR PANEL NO. 4
13. GENERATOR PANEL NO. 3
14. APU/EXTERNAL POWER DISCONNECT CONTACTOR
15. DIFFERENTIAL FAULT PROTECTION CURRENT TRANSFORMERS (TYPICAL 5 PLACES)
16. APU GENERATOR LOAD METER CURRENT TRANSFORMER
17. POWER TRANSFER RELAY (TYPICAL 2 PLACES)
18. MAIN TIE BUS
19. GENERATOR LINE/BUS TIE CONTACTOR (TYPICAL 4 PLACES)
20. MONITOR BUS CONTACTORS
21. LOAD DIVISION CURRENT TRANSFORMERS (TYPICAL 4 PLACES)

CIRCUIT BREAKER PANELS–AC LOAD CENTER–REAR

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
AIR CONDITIONING SYSTEM.			
Air Cond LH	28-VDC	Main DC No. 1	FE-6
Air Cond RH	28-VDC	Main DC No. 2	FE-5
Cargo Fan Recirculating	115-VAC	Monitor AC No. 3	LC-4
Cargo Recirc Fan Control	115-VAC	Fwd Main AC No. 3	FE-3
Cargo Temp Control	115-VAC	Fwd Main AC No. 1	FE-4
Cargo Temp Ind	28-VDC	Main DC No. 1	FE-6
Diverter Valve	115-VAC	Fwd Main AC No. 3	FE-6
LH Air Cond Flow Cont	28-VDC	Emergency DC	PE
LH Air Cond Heat Exch Cooling	28-VDC	Emergency DC	PE
LH Air Cond Low Limit	115-VAC	Aft Main AC No. 1	LC-2
[A] LH Air Cond Turbine Time Ind	115-VAC	Aft Main AC No. 1	LC-2
LH Heat Exch Cooling	115-VAC	Emergency AC	PE
LH Ht Exch Ovht/Altr Air Valve	115-VAC	Emergency AC	PE
Ram Air Valve	115-VAC	Emergency AC	PE
RH Air Cond Flow Cont	28-VDC	Main DC No. 2	FE-5
RH Air Cond Heat Exch Cooling	28-VDC	Main DC No. 2	FE-5
RH Air Cond Heat Exch Cooling	115-VAC	Aft Main AC No. 4	LC-3
RH Air Cond Low Limit	115-VAC	Aft Main AC No. 4	LC-3
[A] RH Air Cond Ht Exch Ovht Turbine Time Ind	115-VAC	Aft Main AC No. 4	LC-3
[B] Ht Exch Ovht	115 VAC	Aft Main AC No. 4	LC-3
Temp Cont Flight Station	115-VAC	Fwd Main AC No. 4	FE-3
Temp Cont Relief Crew	115-VAC	Fwd Main AC No. 4	FE-3
Temp Cont Troop	115-VAC	Fwd Main AC No. 4	FE-3
Temp Ind Relief Crew	28-VDC	Main DC No. 2	FE-5
Temp Ind Troop	28-VDC	Main DC No. 2	FE-5
Troop Air Control	115-VAC	Fwd Main AC No. 1	FE-4

CIRCUIT BREAKER INDEX GUIDE (SHEET 1)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
AIR DROP SYSTEM (ADS).			
ADS Actr	28-VDC	Main DC No. 2	FE-5
ADS Control & Pos Ind Lt	28-VDC	Main DC No. 2	FE-5
Light, Jump & Caution	28-VDC	Main DC No. 1	FE-6
AIR TURBINE MOTORS.			
Hyd ATM Sys 1 Cont & Ind Lt	28-VDC	Batt	FE-2
Hyd ATM Sys 4 Cont & Ind Lt	28-VDC	Main DC No. 2	FE-5
Hyd ATM Sys Priority	28-VDC	Main DC No. 2	FE-5
ANTI-ICING AND DE-ICING SYSTEMS.			
Ice Detector Control	28-VDC	Main DC No. 2	FE-5
Engine Anti-Icing System.			
De-Ice Htr Ice Detector Probe	115-VAC	Fwd Main AC No. 4	FE-3
De-Ice Htr Total Temp Probe 1	115-VAC	Fwd Main AC No. 1	FE-4
De-Ice Htr Total Temp Probe 2	115-VAC	Fwd Main AC No. 4	FE-3
Engine Anti-Ice Control 1	28-VDC	Main DC No. 1	FE-6
Engine Anti-Ice Control 2	28-VDC	Main DC No. 2	FE-7
Engine Anti-Ice Control 3	28-VDC	Main DC No. 2	FE-5
Engine Anti-Ice Control 4	28-VDC	Main DC No. 1	FE-6
Engine Anti-Ice Ind Lt 1	28-VDC	Main DC No. 1	FE-4
Engine Anti-Ice Ind Lt 2	28-VDC	Main DC No. 2	FE-5
Engine Anti-Ice Ind Lt 3	28-VDC	Main DC No. 2	FE-5
Engine Anti-Ice Ind Lt 4	28-VDC	Main DC No. 1	FE-6
Engine Anti-Ice Regulator Test	28-VDC	Main DC No. 1	FE-6
Eng 1 Anti-Ice Valves, Engine	115-VAC	Fwd Main AC No. 1	FE-4
Eng 1 Anti-Ice Valves, Nacelle	115-VAC	Fwd Main AC No. 1	FE-4
Eng 2 Anti-Ice Valves, Engine	115-VAC	Fwd Main AC No. 2	FE-4
Eng 2 Anti-Ice Valves, Nacelle	115-VAC	Fwd Main AC No. 2	FE-4
Eng 3 Anti-Ice Valve, Engine	115-VAC	Fwd Main AC No. 3	FE-3

CIRCUIT BREAKER INDEX GUIDE (SHEET 2)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Eng 3 Anti-Ice Valve, Nacelle	115-VAC	Fwd Main AC No. 3	FE-3
Eng 4 Anti-Ice Valve, Engine	115-VAC	Fwd Main AC No. 4	FE-3
Eng 4 Anti-Ice Valve, Nacelle	115-VAC	Fwd Main AC No. 4	FE-3
Angle-of-Attack Vanes De-Icing System.			
AOAT Htr Lower Left	115-VAC	Avionics AC 1	N-1
AOAT Lower Left	115-VAC	Avionics AC 1	N-1
AOAT Htr Lower Right	115-VAC	Avionics AC 1	N-1
AOAT Lower Right	115-VAC	Avionics AC 1	N-2
AOAT Htr Upper Left	115-VAC	Avionics AC 2	N-2
AOAT Upper Left	115-VAC	Avionics AC 2	N-2
AOAT Htr Upper Right	115-VAC	Avionics AC 2	N-2
AOAT Upper Right	115-VAC	Avionics AC 2	N-2
Pitot Heat System.			
Pilot Pitot & Angle-of-Attack Warn Lt.	28-VDC	Emergency DC	PE
Pitot Coplt Cont & Pit Ind Lt & Total Temp	28-VDC	Main DC No. 1	FE-6
Pitot Static HD Htr Lwr RH	115-VAC	Emergency AC	PE
Pitot Static HD Htr Upper LH	115-VAC	Emergency AC	PE
Pitot Static Htr Lower LH	115-VAC	Fwd Main AC No. 4	FE-3
Pitot Static Htr Upper RH	115-VAC	Fwd Main AC No. 4	FE-3
Pitot Static Htr Lower RH	115-VAC	Fwd Main AC No. 1	FE-4
Pitot Static Htr Upper LH	115-VAC	Fwd Main AC No. 1	FE-4
Windshield Ice and Fog Protection System.			
Copilot Side Wshld Heating	55-VAC	Fwd Main AC No. 2	FE-1
Pilot Side Wshld Heating	55-VAC	Fwd Main AC No. 2	FE-1
Pilot Wshld Heat	115-VAC	Fwd Main AC No. 1	FE-4
Wshld Heat Control, Copilot	28-VDC	Main DC No. 2	FE-5

CIRCUIT BREAKER INDEX GUIDE (SHEET 3)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Wshld Heat Control, Copilot Side	28-VDC	Main DC No. 1	FE-6
Wshld Heat Control, Ctr	28-VDC	Main DC No. 2	FE-5
Wshld Heat Control, Pilot	28-VDC	Main DC No. 1	FE-6
Wshld Heat Control, Pilot Side	28-VDC	Main DC No. 2	FE-5
Wshld Heat Copilot	115-VAC	Fwd Main AC No. 4	FE-3
Wshld Heat Copilot, Side	115-VAC	Fwd Main AC No. 2	FE-4
Wshld Heat Ctr	115-VAC	Fwd Main AC No. 4	FE-3
Wshld Heat Pilot, Side	115-VAC	Fwd Main AC No. 2	FE-4
AUTOMATIC FLIGHT CONTROL SYSTEM.			
Autopilot.			
AFCS Control Panel	115-VAC	Avionics AC 1	N-1
AFCS Control Panel	115-VAC	Nav AC 2	N-2
Autopilot Lat	115-VAC	Avionics AC 1	N-1
Autopilot Lat	28-VDC	Avionics DC 1	N-1
Autopilot Lat	115-VAC	Nav AC 1	N-1
Autopilot Lat & Roll PACS	115-VAC	Avionics AC 2	N-2
Autopilot Pitch	115-VAC	Avionics AC 1	N-1
Autopilot Pitch	28-VDC	Avionics DC 1	N-1
Autopilot Pitch	115-VAC	Nav AC 1	N-1
$\boxed{A}$ Autopilot Pitch & PACS	115-VAC	Avionics AC 2	N-2
$\boxed{B}$ Autopilot Pitch Pacs	115-VAC	Avionics AC 2	N-2
Automatic Throttle Subsystem.			
Auto Throt	115-VAC	Avionics AC 1	N-1
Auto Throt	28-VDC	Avionics DC 1	N-1
FLIGHT AUGMENTATION SYSTEM.			
Lat Aug 1	115-VAC	Avionics AC 1	N-1

CIRCUIT BREAKER INDEX GUIDE (SHEET 4)

ELECTRICAL

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
at Aug 2	115-VAC	Avionics ISO AC	N-1
itch Aug 1	115-VAC	Avionics AC 1	N-1
itch Aug 2	115-VAC	Avionics ISO AC	N-1
itch Aug 3	115-VAC	Avionics AC 2	N-2
'aw Aug 1	115-VAC	Avionics AC 1	N-1
'aw Aug 2	115-VAC	Avionics ISO AC	N-1
'aw Aug 3	115-VAC	Avionics AC 2	N-2
Go-Around Attitude Subsystem.			
GAAS Demod Ref	26-VAC	26-VAC NAV 2	N-2
GAAS Demod Ref	26-VAC	Emergency AC	PE
Go-Around	28-VDC	Avionics DC 2	N-1
Go-Around	115-VAC	NAV AC 1	N-1
AUXILIARY POWER UNITS.			
APU Control, LH	28-VDC	Battery	FE-2
APU Control, RH	28-VDC	Battery	FE-2
APU EGT LH	115-VAC	ISOL AC	FE-2
APU EGT RH	115-VAC	ISOL AC	FE-2
APU Fire Det Cont, LH	28-VDC	ISOL DC	FE-2
APU Fire Det Cont, RH	28-VDC	ISOL DC	FE-2
APU Fire Extinguisher	28-VDC	ISOL DC	FE-2
APU Gen Fail Lt	28-VDC	Battery	FE-2
APU Ind Lt, LH	28-VDC	Battery	FE-2
APU Ind Lt, RH	28-VDC	Battery	FE-2
Engine Fire Extinguisher, APU	28-VDC	Battery	FE-2
AVIONICS EQUIPMENT COOLING SYSTEM.			
Avionics Cooling Duct Overheat Ind Lt	28-VDC	Main DC No. 2	FE-5
Avionics Cooling Fan 1	115-VAC	Fwd Main AC No. 2	FE-1

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CIRCUIT BREAKER INDEX GUIDE (SHEET 5)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Avionics Cooling Fan 2	115-VAC	Fwd Main AC No. 3	FE-1
Avionics Cooling Fan 1 Cont	28-VDC	Main DC No. 1	FE-6
Avionics Cooling Fan 2 Control	28-VDC	Main DC No. 2	FE-5
FLT Engr Cooling Fan	115-VAC	Fwd Main AC No. 3	FE-1
BLEED AIR SYSTEM.			
Bleed Air Duct Overheat Detection System.			
Cargo Floor Duct Ovht	28-VDC	ISOL DC	FE-2
Cargo Floor Ovht	28-VDC	ISOL DC	FE-2
Cargo Floor Ovht	115-VAC	ISOL AC	FE-2
Wing & Pylon Overheat LH	28-VDC	ISOL DC	FE-2
Wing & Pylon Overheat RH	28-VDC	ISOL DC	FE-2
Wing & Pylon Overheat LH	115-VAC	ISOL AC	FE-2
Wing & Pylon Overheat RH	115-VAC	ISOL AC	FE-2
Engine Bleed Air System.			
Bleed Air Inbd Ind Lt	28-VDC	Main DC No. 2	FE-5
Bleed Air Outbd Ind Lt	28-VDC	Main DC No. 1	FE-6
Bleed Air Valve (Eng 1, 2, 3, 4)	28-VDC	ISOL DC	FE-2
Press Aug Valve (4, 1)	28-VDC	Main DC No. 1	FE-6
Press Aug Valve (3, 2)	28-VDC	Main DC No. 2	FE-5
Pressure Indicator Manf Bleed Air	26-VAC	26VAC Inst No. 1	FE-4
Wing Isolation Valve LH	115-VAC	ISOL AC	FE-2
Wing Isolation Valve RH	115-VAC	ISOL AC	FE-2
CARGO COMPARTMENT FLOOR HEAT.			
Aft Floor Heat Fan	115-VAC	Monitor AC No. 3	LC-4
Ctr Floor Heat Fan	115-VAC	Monitor AC No. 2	LC-1
Floor Heat Control, Aft	115-VAC	ISOL AC	FE-2
Floor Heat Control, Fwd	115-VAC	ISOL AC	FE-2
Fwd Floor Heat Fan	115-VAC	Monitor AC No. 2	LC-1

CIRCUIT BREAKER INDEX GUIDE (SHEET 6)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
CARGO DOOR AND RAMP SYSTEMS.			
Aft Cargo Door Control	28-VDC	Main DC No. 2	FE-5
Aft Cargo Door Ind Lt	28-VDC	Main DC No. 2	FE-5
Fwd Cargo Door Control	28-VDC	Main DC No. 1	FE-6
Fwd Cargo Door Ind Lt	28-VDC	Main DC No. 1	FE-6
Ramp Actuator Relief	115-VAC	Fwd Main AC No. 4	FE-3
CARGO LOADING EQUIPMENT.			
[A] Aft Cargo Winch & Service Outlet RH (3)	115-VAC	Monitor AC No. 3	LC-3
Cargo Winch Selector	28-VDC	Main DC No. 2	FE-5
[A] Fwd Cargo Winch & Buffet/Lav Outlet (3)	115-VAC	Monitor AC No. 2	LC-2
[B] **COMBINED ALTITUDE RADAR ALTIMETER**			
Radar Alt No. 1	28-VDC	Avionics DC No. 1	N-1
Radar Alt No. 2	28-VDC	Avionics DC No. 2	N-1
COMMUNICATION SYSTEMS.			
[B] Fwd Cargo Troop Compt Intph	28-VDC	Emergency DC	PE
HF1 (3)	115-VAC	Avionics AC 1	N-1
HF 2 (3)	115-VAC	Avionics AC 2	N-2
[B] HF 1	28-VDC	Avionics DC 1	N-1
[B] HF 2	28-VDC	Avionics DC 2	N-2
IFF	28-VDC	Emergency DC	PE
IFF	115-VAC	Emergency AC	PE
[A] IFF Test	28-VDC	Avionics ISO DC	N-1
[A] Inter Compt/Fwd Cargo Inph	28-VDC	Emergency DC	PE
Interphone, Flt Sta	28-VDC	Avionics DC 2	N-2
[A] Interphone, Service	28-VDC	Avionics DC 2	N-2
Interphone, Plt/FE	28-VDC	Emergency DC	PE
[B] Interphone, Obs/Cargo	28-VDC	Avionics DC 2	N-2
Interphone, Service	28-VDC	Avionics DC 2	N-2
Public Address, Aft Cargo	28-VDC	Avionics DC 1	N-1

CIRCUIT BREAKER INDEX GUIDE (SHEET 7)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Public Address Aft Troop	28-VDC	Avionics DC 1	N-1
Public Address Fwd Cargo	28-VDC	Avionics DC 1	N-1
Public Address Relief Crew	28-VDC	Avionics DC 1	N-1
[B] Selscan 1	115-VAC	Avionics AC 1	N-1
[B] Selscan 2	115-VAC	Avionics AC 2	N-2
[A] UHF 1 (3)	115-VAC	Avionics ISO AC	N-1
[A] UHF 2 (3)	115-VAC	Avionics AC 2	N-2
[B] UHF 1	28-VDC	Avionics ISO DC	N-1
[B] UHF 2	28-VDC	Avionics DC 2	N-2
VHF Comm 1	28-VDC	Avionics ISO DC	N-1
VHF Comm 2	28-VDC	Avionics DC 2	N-2
VHF Comm Ant Sw	28-VDC	Avionics DC 2	N-2
[A] VHF/FM	28-VDC	Avionics DC 1	N-1
Secure Voice Systems ([A] MODIFIED BY T.O. 1C-5A-1930 AND T.O. 1C-5A-1931 AND [B])			
HF 1 Keyer	28-VDC	Avionics DC 1	N-1
HF 2 Keyer	28-VDC	Avionics DC 2	N-2
HF 1 Relay	28-VDC	Avionics DC 1	N-1
HF 2 Relay	28-VDC	Avionics DC 2	N-2
UHF 1 Cont	28-VDC	Avionics ISO DC	N-1
UHF 2 Cont	28-VDC	Avionics DC 2	N-2
UHF 1 Relay	28-VDC	Avionics ISO DC	N-1
UHF 2 Relay	28-VDC	Avionics DC 2	N-2
VHF 1 Cont	28-VDC	Avionics ISO DC	N-1
VHF 2 Cont	28-VDC	Avionics DC 2	N-2
VHF 1 Relay	28-VDC	Avionics ISO DC	N-1
VHF 2 Relay	28-VDC	Avionics DC 2	N-2
[A] CRASH DATA POSITION INDICATOR-RECORDER (CDPIR).			
CDPIR	28-VDC	Avionics ISO DC	N-1
CDPIR (2)	115-VAC	Avionics ISO AC	N-1
CDPIR	26-VAC	Emergency AC	PE

CIRCUIT BREAKER INDEX GUIDE (SHEET 8)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
B DATA RECORDERS			
Ckpt Voice Rcdr	115-VAC	Avionics ISO AC	N-1
Flt Data Rcdr	115-VAC	Avionics AC 1	N-1
ELECTRICAL POWER SUPPLY SYSTEM.			
26-VAC Inst Trans	115-VAC	Emerg AC	PE
26-VAC Inst Trans	115-VAC	Fwd Main AC No. 1	FE-4
26-VAC Inst Trans	115-VAC	Fwd Main AC No. 2	FE-4
26-VAC Inst Trans	115-VAC	Fwd Main AC No. 3	FE-3
26-VAC Inst Trans	115-VAC	Fwd Main AC No. 4	FE-3
26-VAC Iso Trans	115-VAC	Avionics Iso AC	N-1
26-VAC Nav 1 Trans	115-VAC	Nav AC No. 1	N-1
26-VAC Nav 2 Trans	115-VAC	Nav AC No. 2	N-2
APU Gen Cont (3)	115-VAC	Gen 4 C/B Pnl	LC
APU Gen Fail Lt	28-VDC	Battery	FE-2
APU Generator Cont (3)	115-VAC	APU and External AC Power C/B Pnl	
APU Generator Volt & Freq (3)	115-VAC	APU and External AC Power C/B Pnl	
Auto Parallel	115-VAC	Gen 1 C/B Pnl	LC
Avionics AC Bus 1 (3)	115-VAC	Gen 1 C/B Pnl	LC
Avionics AC Bus 2 (3)	115-VAC	Gen 4 C/B Pnl	LC
Avionics Pwr Feeder	28-VDC	Isol DC Bus Pwr	DC/LC
Avionics Serv Outlet (3)	115-VAC	Fwd Main AC No. 1	FE-4
Bat Bus Pwr Bus 1	28-VDC	Bat Pwr	DC/LC
Bat Bus Pwr Bus 2	28-VDC	Bat Pwr	DC/LC
Bat Bus Pwr Norm Bat	28-VDC	Bat Pwr	DC/LC
Bat Bus Pwr Stby Bat	28-VDC	Bat Pwr	DC/LC
B Buffet/Lav Outlet (3)	115-VAC	Monitor AC No. 2	AC/LC
Bus Off Ind Lt	28-VDC	Isol DC	FE-2
Bus Off Warn	28-VDC	Bat Pwr	DC/LC
Bus Off Warn (3)	115-VAC	Avionics AC No. 1	N-1

CIRCUIT BREAKER INDEX GUIDE (SHEET 9)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Bus Off Warn (3)	115-VAC	Avionics AC No. 2	N-2
Bus Off Warn (3)	115-VAC	Emergency AC	PE
Bus Off Warn	28-VDC	Emergency DC	PE
Bus Off Warn	28-VDC	ISOL DC	FE-2
Bus Off Warn	28-VDC	Main DC No. 1	FE-6
Bus Off Warn	28-VDC	Main DC No. 2	FE-5
Bus Off Warn (3)	115-VAC	Emerg AC	PE
Bus Off Warn (3)	115-VAC	ISOL AC	FE-2
Bus Off Warn (3)	115-VAC	Aft Main AC No. 1	LC-2
Bus Off Warn (3)	115-VAC	Aft Main AC No. 2	LC-2
Bus Off Warn (3)	115-VAC	Aft Main AC No. 3	LC-3
Bus Off Warn (3)	115-VAC	Aft Main AC No. 4	LC-3
Bus Off Warn (3)	115-VAC	Fwd Main AC No. 1	FE-4
Bus Off Warn (3)	115-VAC	Fwd Main AC No. 2	FE-4
Bus Off Warn (3)	115-VAC	Fwd Main AC No. 3	FE-3
Bus Off Warn (3)	115-VAC	Fwd Main AC No. 4	FE-3
Bus Off Warn (3)	115-VAC	Monitor AC No. 2	LC-2
Bus Off Warn (3)	115-VAC	Monitor AC No. 3	LC-3
Bus Tie Cont 1	28-VDC	Battery	FE-2
Bus Tie Cont 2	28-VDC	Battery	FE-2
Bus Tie Cont 3	28-VDC	Battery	FE-2
Bus Tie Cont 4	28-VDC	Battery	FE-2
CSD Disc 1	28-VDC	Main DC No. 1	FE-6
CSD Disc 2	28-VDC	Main DC No. 2	FE-5
CSD Disc 3	28-VDC	Main DC No. 2	FE-5
CSD Disc 4	28-VDC	Main DC No. 1	FE-6
Emer AC & DC Bus Off Ind Lt	28-VDC	Battery	FE-2
Emerg DC Pwr Feeder	28-VDC	Batt Pwr	DC/LC

CIRCUIT BREAKER INDEX GUIDE (SHEET 10)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Emerg DC Pwr Feeder	28-VDC	Isol DC Pwr	DC/LC
Emerg Gen Volt	28-VDC	Emerg DC	PE
Emerg Gen Volt & Freq (3)	115-VAC	Emerg AC	PE
Emerg Pwr Cont	28-VDC	Emerg DC	PE
Emergency Generator AC Power, Phase A	115-VAC	Emerg Gen	
Emergency Generator AC Power, Phase B	115-VAC	Emerg Gen	
Emergency Generator AC Power, Phase C	115-VAC	Emerg Gen	
Emergency Generator DC Power	28-VDC	Emerg Gen	
External Power Cont (3)	115-VAC	APU and External AC Power C/B pnl	
External Power Volt & Freq (3)	115-VAC	APU and External AC Power C/B Pnl	
Feeder 1, 2	28-VDC	Main DC 1 Pwr	DC/LC
Feeder 1, 2	28-VDC	Main DC 2 Pwr	DC/LC
Feeder Avionics Bus	28-VDC	Main DC 1 Pwr	DC/LC
Feeder Avionics Bus	28-VDC	Main DC 2 Pwr	DC/LC
Gen & CSD Fail Lt 1	28-VDC	Main DC No. 1	FE-6
Gen & CSD Fail Lt 2	28-VDC	Main DC No. 2	FE-5
Gen & CSD Fail Lt 3	28-VDC	Main DC No. 2	FE-5
Gen & CSD Fail Lt 4	28-VDC	Main DC No. 1	FE-6
Gen Diff Prot Reset	28-VDC	Main DC No. 2	FE-5
Gen 1 Control (3)	115-VAC	Gen 1 C/B Pnl	LC
Gen 1 Volt & Freq (3)	115-VAC	Gen 1 C/B Pnl	LC
Gen 2 Control (3)	115-VAC	Gen 2 C/B Pnl	LC
Gen 2 Volt & Freq (3)	115-VAC	Gen 2 C/B Pnl	LC
Gen 3 Control (3)	115-VAC	Gen 3 C/B Pnl	LC
Gen 3 Volt & Freq (3)	115-VAC	Gen 3 C/B Pnl	LC
Gen 4 Control (3)	115-VAC	Gen 4 C/B Pnl	LC
Gen 4 Volt & Freq (3)	115-VAC	Gen 4 C/B Pnl	LC

CIRCUIT BREAKER INDEX GUIDE (SHEET 11)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
[B] Inst Gnd Switch	115-VAC	Avionics AC No. 2	N-2
Inst Grd Sw	28-VDC	Avionics DC No. 1	N-1
Inst Grd Sw	28-VDC	Avionics DC No. 2	N-2
Inst Grd Sw	115-VAC	Avionics AC No. 1	N-1
Inst Ground Switch	115-VAC	Fwd Main AC No. 1	FE-4
Inst Ground Switch	115-VAC	Fwd Main AC No. 2	FE-4
Inst Ground Switch	115-VAC	Fwd Main AC No. 3	FE-3
Inst Ground Switch	115-VAC	Fwd Main AC No. 4	FE-3
Isolated AC Bus (3)	115-VAC	Gen 1 C/B Pnl	LC
Iso Bus Off Ind Lt	28-VDC	Emerg DC	PE
Iso DC Bus Pwr Feeder 1	28-VDC	Isol DC Pwr	DC/LC
Iso DC Bus Pwr Feeder 2	28-VDC	Isol DC Pwr	DC/LC
Iso DC Bus Pwr Feeder 3	28-VDC	Isol DC Pwr	DC/LC
Iso DC Bus Pwr Feeder 4	28-VDC	Isol DC Pwr	DC/LC
Load 1 Cont	115-VAC	Gen 1 C/B Pnl	LC
Load 2 Cont	115-VAC	Gen 2 C/B Pnl	LC
Load 3 Cont	115-VAC	Gen 3 C/B Pnl	LC
Load 4 Cont	115-VAC	Gen 4 C/B Pnl	LC
Light Nav Ckt Bkr Pnl	115-VAC	Avionics AC No. 1	N-1
Main AC Bus 1 Aft (3)	115-VAC	Gen 1 C/B Pnl	LC
Main AC Bus 2 Aft (3)	115-VAC	Gen 2 C/B Pnl	LC
Main AC Bus 3 Aft (3)	115-VAC	Gen 3 C/B Pnl	LC
Main AC Bus 4 Aft (3)	115-VAC	Gen 4 C/B Pnl	LC
Main AC Bus 1 Fwd (3)	115-VAC	Gen 1 C/B Pnl	LC
Main AC Bus 2 Fwd (3)	115-VAC	Gen 2 C/B Pnl	LC
Main AC Bus 3 Fwd (3)	115-VAC	Gen 3 C/B Pnl	LC
Main AC Bus 4 Fwd (3)	115-VAC	Gen 4 C/B Pnl	LC
Monitor AC Bus 2 (6)	115-VAC	Gen 2 C/B Pnl	LC
Monitor AC Bus 3 (6)	115-VAC	Gen 2 C/B Pnl	LC
Monitor Bus Tie Cont 2	28-VDC	Battery	FE-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 12)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Monitor Bus Tie Cont 3	28-VDC	Battery	FE-2
Nac 1 & 2 Service Outlet	115-VAC	Aft Main AC No. 2	LC-2
Nac 3 & 4 Service Outlet	115-VAC	Aft Main AC No. 3	LC-3
Nav Bus 1	115-VAC	Avionics AC No. 1	N-1
Nav Bus 2	115-VAC	Avionics AC No. 1	N-1
Nav Bus 2	115-VAC	Avionics AC No. 2	N-2
Normal Battery Bat Pwr	28-VDC	Normal Batt	BC
Normal Battery Volt Test & Ind Lt	28-VDC	Normal Batt	BC
Power 1 Transfer (6)	115-VAC	Gen 1 & 2 C/B Pnls	LC
Power 2 Transfer (6)	115-VAC	Gen 3 & 4 C/B Pnls	LC
Radome Service Outlet	115-VAC	Fwd Main AC No. 4	FE-3
Service Outlet LH	28-VDC	Main DC No. 1	FE-6
Service Outlet RH	28-VDC	Main DC No. 2	FE-5
Service Outlet LH (3)	115-VAC	Monitor AC No. 2	LC-2
[B]Service Outlet RH (3)	115-VAC	Monitor AC No. 3	LC-3
Standby Battery Bat Pwr	28-VDC	Stby Batt	BC
Standby Battery Volt Test & Ind Lt	28-VDC	Stby Batt	BC
Stby Bat Chg Pwr	28-VDC	Main DC 2 Pwr	BC
Stby Bat Cont	28-VDC	Main DC 2 Pwr	NBC
Sync Bus Relay	28-VDC	Battery	FE-2
Transformer Rectifier 1	115-VAC	Gen 1 C/B Pnl	LC
Transformer Rectifier 2	115-VAC	Gen 4 C/B Pnl	LC
TR-1 Volt	28-VDC	Main DC No. 1 Pwr	DC/LC
TR-2 Volt	28-VDC	Main DC No. 2 Pwr	DC/LC
[B]EMERGENCY LOCATOR TRANSMITTER			
ELT	28-VDC	Avionics DC 1	N-1
ENGINES.			
Engine Fire Extinguisher System.			
Eng Fire Exting 1	28-VDC	Batt	FE-2
Eng Fire Exting 2	28-VDC	Batt	FE-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 13)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Eng Fire Exting 3	28-VDC	Batt	FE-2
Eng Fire Exting 4	28-VDC	Batt	FE-2
Eng 1 Fire Exting	28-VDC	Isol DC	FE-2
Eng 2 Fire Exting	28-VDC	Isol DC	FE-2
Eng 3 Fire Exting	28-VDC	Isol DC	FE-2
Eng 4 Fire Exting	28-VDC	Isol DC	FE-2
Fire Exting Blt Out Ind Lt	28-VDC	Main DC No. 1	FE-6
Engine Fuel System.			
Eng 1 Fuel & Low Boost Press Ind Lt	28-VDC	Main DC No. 1	FE-6
Eng 2 Fuel & Low Boost Press Ind Lt	28-VDC	Main DC No. 2	FE-5
Eng 3 Fuel & Low Boost Press Ind Lt	28-VDC	Main DC No. 2	FE-5
Eng 4 Fuel & Low Boost Press Ind Lt	28-VDC	Main DC No. 1	FE-6
Fuel Filter ΔP Ampl, Eng 1	115-VAC	Fwd Main AC No. 1	FE-4
Fuel Filter ΔP Ampl, Eng 2	115-VAC	Fwd Main AC No. 2	FE-4
Fuel Filter ΔP Ampl, Eng 3	115-VAC	Fwd Main AC No. 3	FE-3
Fuel Filter ΔP Ampl, Eng 4	115-VAC	Fwd Main AC No. 4	FE-3
Fuel Heater, Eng 1	115-VAC	Fwd Main AC No. 1	FE-4
Fuel Heater, Eng 2	115-VAC	Fwd Main AC No. 2	FE-4
Fuel Heater, Eng 3	115-VAC	Fwd Main AC No. 3	FE-3
Fuel Heater, Eng 4	115-VAC	Fwd Main AC No. 4	FE-3
Engine Ignition System.			
Cont Ignition, Eng 1	115-VAC	Fwd Main AC No. 1	FE-4
Cont Ignition, Eng 2	115-VAC	Fwd Main AC No. 2	FE-4
Cont Ignition, Eng 3	115-VAC	Fwd Main Ac No. 3	FE-3
Cont Ignition, Eng 4	115-VAC	Fwd Main AC No. 4	FE-3
Eng Start Ignition (4)	115-VAC	ISOL AC	FE-2
Engine Instruments.			
Eng & CSD Oil Temp Ind 1	28-VDC	Main DC No. 1	FE-6
Eng & CSD Oil Temp Ind 2	28-VDC	Main DC No. 2	FE-5
Eng & CSD Oil Temp Ind 3	28-VDC	Main DC No. 2	FE-5

CIRCUIT BREAKER INDEX GUIDE (SHEET 14)

ELECTRICAL

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Eng & CSD Oil Temp Ind 4	28-VDC	Main DC No. 1	FE-6
Eng 1 Oil Pressure Indicator	26-VAC	26V AC Instrument Bus 1 Phase B	FE-4
Eng 2 Oil Pressure Indicator	26-VAC	26V AC Instrument Bus 2 Phase B	FE-4
Eng 3 Oil Pressure Indicator	26V AC	26-VAC Instrument Bus 3 Phase B	FE-3
Eng 4 Oil Pressure Indicator	26-VAC	26V AC Instrument Bus 4 Phase B	FE-3
$\boxed{A}$ EPR & N_2 RPM IND (4)	115-VAC	ISOL AC	FE-2
$\boxed{B}$ N_2 RPM IND (4)	115-VAC	ISOL AC	FE-2
$\boxed{A}$ EPR Slew Cont	28-VDC	Avionics DC No. 1	N-1
$\boxed{B}$ N_1 Slew Cont	28-VDC	Avionics DC No. 1	N-1
$\boxed{A}$ EPR Slew Pwr	115-VAC	Avionics AC No. 1	N-1
$\boxed{B}$ N_1 Slew Power	115-VAC	Avionics AC No. 1	N-1
Fuel Flow, TIT, & N_1 RPM, Eng 1 Ind	115-VAC	Fwd Main AC No. 1	FE-4
Fuel Flow, TIT, & N_1 RPM, Eng 2 Ind	115-VAC	Fwd Main AC No. 2	FE-4
Fuel Flow, TIT, & N_1 RPM, Eng 3 Ind	115-VAC	Fwd Main AC No. 3	FE-3
Fuel Flow, TIT, & N_1 RPM, Eng 4 Ind	115-VAC	Fwd Main AC No. 4	FE-3
Oil Filter ΔP Ampl, Eng 1	115-VAC	Fwd Main AC No. 1	FE-4
Oil Filter ΔP Ampl. Eng 2	115-VAC	Fwd Main AC No. 2	FE-4
Oil Filter ΔP Ampl. Eng 3	115-VAC	Fwd Main AC No. 3	FE-3
Oil Filter ΔP Ampl, Eng 4	115-VAC	Fwd Main AC No. 4	FE-3
Oil Low Press & Filter ΔP Ind Lt, Eng 1	28-VDC	Main DC No. 1	FE-6
Oil Low Press & Filter ΔP Ind Lt, Eng 2	28-VDC	Main DC No. 2	FE-5
Oil Low Press & Filter ΔP Ind Lt, Eng 3	28-VDC	Main DC No. 2	FE-5
Oil Low Press & Filter ΔP Ind Lt, Eng 4	28-VDC	Main DC No. 1	FE-6
Engine Overheat and Fire Detection System.			
Fire Det Test & Audible Alarm	28-VDC	ISOL DC	FE-2
Fire & Ovht Detect Control Eng 1	28-VDC	Main DC No. 1	FE-6

CIRCUIT BREAKER INDEX GUIDE (SHEET 15)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Fire & Ovht Detect Control Eng 2	28-VDC	Main DC No. 2	FE-5
Fire & Ovht Detect Control Eng 3	28-VDC	Main DC No. 2	FE-5
Fire & Ovht Detect Control Eng 4	28-VDC	Main DC No. 1	FE-6
Engine Starter System.			
Emergency Shutdown Relay (4)	28-VDC	ISOL DC	FE-2
Eng Start (4)	28-VDC	ISOL DC	FE-2
Eng Starter Valve Ind Lt	28-VDC	ISOL DC	FE-2
Engine Thrust Reverser System.			
Engine Hydraulic Shutoff Valve (4)	28-VDC	ISOL DC	FE-2
Thrust Reverser Lockout Actuator 1 & 4	28-VDC	Main DC No. 1	FE-6
Thrust Reverser Lockout Actuator 2	28-VDC	Main DC No. 2	FE-5
Thrust Reverser Lockout Actuator 3	28-VDC	Main DC No. 2	FE-5
Thrust Reverser Pos Ind Lt (4)	28-VDC	ISOL DC	FE-2
Thrust Reverser Press Emerg Retract	28-VDC	ISOL DC	FE-2
Thrust Reverser Pressure 1	28-VDC	Main DC No. 1	FE-6
Thrust Reverser Pressure 2	28-VDC	Main DC No. 2	FE-5
Thrust Reverser Pressure 3	28-VDC	Main DC No. 2	FE-5
Thrust Reverser Pressure 4	28-VDC	Main DC No. 1	FE-6
Thrust Reverser Pressure Ind Lt 1	28-VDC	Main DC No. 1	FE-6
Thrust Reverser Pressure Ind Lt 2	28-VDC	Main DC No. 2	FE-5
Thrust Reverser Pressure Ind Lt 3	28-VDC	Main DC No. 2	FE-5
Thrust Reverser Pressure Ind Lt 4	28-VDC	Main DC No. 1	FE-5
FLIGHT CONTROL SYSTEM.			
Aileron.			
Aileron LH Sys 2 SOV	115-VAC	Fwd Main AC No. 2	FE-4
Aileron LH Trim Actuator	115-VAC	Fwd Main AC No. 2	FE-4
Aileron RH Sys 2 SOV	115-VAC	Fwd Main AC No. 3	FE-3
Aileron RH Trim Actuator	115-VAC	Fwd Main AC No. 3	FE-3
Aileron Sys 1 & 4 Ind Lt	28-VDC	Main DC No. 1	FE-6

CIRCUIT BREAKER INDEX GUIDE (SHEET 16)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Aileron Sys 2 Ind Lt	28-VDC	Main DC No. 2	FE-5
Aileron Trim Pos Ind	115-VAC	Fwd Main AC No. 3	FE-3
ALDCS	115-VAC	Avionics AC No. 1	N-1
Autopilot Lat & Roll PACS	115-VAC	Avionics AC No. 2	N-2
[A] Autopilot Pitch & PACS	115-VAC	Avionics AC No. 2	N-2
[B] Autopilot Pitch Pacs	115-VAC	Avionics AC No. 2	N-2
LH Aileron Sys 1 SOV	115-VAC	Fwd Main AC No. 1	FE-4
PACS Roll	28-VDC	Avionics DC No. 2	N-2
RH Aileron Sys 4 SOV	115-VAC	Fwd Main AC No. 4	FE-3
Elevator.			
Elevator Feel Mal Ind	28-VDC	ISOL DC	FE-2
Elevator Ind Lt Feel Sys 1	28-VDC	Main DC No. 1	FE-6
Elevator Ind Lt Feel Sys 4	28-VDC	Main DC No. 2	FE-5
Elevator Ind Lt Inbd Sys 2	28-VDC	Main DC No. 1	FE-6
Elevator Ind Lt Inbd Sys 3	28-VDC	Main DC No. 2	FE-5
Elevator Ind Lt Outbd Sys 1	28-VDC	Main DC No. 2	FE-5
Elevator Ind Lt Outbd Sys 3	28-VDC	Main DC No. 2	FE-5
Elevator Ind Lt Outbd Sys 3	28-VDC	Main DC No. 1	FE-6
Elevator SOV Feel Sys 1	115-VAC	Fwd Main AC No. 1	FE-4
Elevator SOV Feel Sys 4	115-VAC	Fwd Main AC No. 4	FE-3
Elevator SOV Inbd LH Sys 2	115-VAC	Fwd Main AC No. 2	FE-4
Elevator SOV Inbd LH Sys 3	115-VAC	Fwd Main AC No. 4	FE-3
Elevator SOV Inbd RH Sys 2	115-VAC	Fwd Main AC No. 3	FE-3
Elevator SOV Inbd RH Sys 3	115-VAC	Fwd Main AC No. 4	FE-3
Elevator SOV Outbd Sys 1	115-VAC	Fwd Main AC No. 2	FE-4
Elevator SOV Outbd Sys 3	115-VAC	Fwd Main AC No. 3	FE-3
Elevator SOV Outbd Sys 3	115-VAC	Fwd Main AC No. 1	FE-4
Emerg Pitch Trim	28-VDC	Main DC No. 2	FE-5
Flight Spoiler LH Ratio Shift	115-VAC	Fwd Main AC No. 2	FE-4
Flight Spoiler RH Ratio Shift	115-VAC	Fwd Main AC No. 3	FE-3

CIRCUIT BREAKER INDEX GUIDE (SHEET 17)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Flight Spoiler Sys 1 SOV	115-VAC	Aft Main AC No. 1	LC-2
Flight Spoiler Sys 2 SOV	115-VAC	Aft Main AC No. 2	LC-2
Flight Spoiler Sys 3 SOV	115-VAC	Aft Main AC No. 3	LC-3
Flight Spoiler Sys 4 SOV	115-VAC	Aft Main AC No. 4	LC-3
Horiz Stab Trim Pos Ind	115-VAC	Fwd Main AC No. 4	FE-3
PACS Pitch	28-VDC	Avionics DC No. 2	N-2
Pitch Trim Control	28-VDC	Isol DC	FE-2
Pri Pitch Trim	28-VDC	Main DC No. 1	FE-6
Rudder.			
Limit Cont 1	28-VDC	Main DC No. 2	FE-5
Lower Rudder Sys 2 SOV	115-VAC	Fwd Main AC No. 4	FE-3
Lower Rudder Sys 3 SOV	115-VAC	Fwd Main AC No. 3	FE-3
Rudder Limit	115-VAC	ISOL AC	FE-2
Rudder Limit Cont 2	28-VDC	Main DC No. 1	FE-6
Rudder Lower Sys 2 Ind Lt	28-VDC	Main DC No. 1	FE-6
Rudder Lower Sys 3 Ind Lt	28-VDC	Main DC No. 2	FE-5
Rudder Trim Pos Ind	115-VAC	Fwd Main AC No. 3	FE-3
Rudder Trim Actuator	115-VAC	Fwd Main AC No. 2	FE-4
Rudder Upper Sys 1 Ind Lt	28-VDC	Main DC No. 2	FE-5
Rudder Upper Sys 3 Ind Lt	28-VDC	Main DC No. 1	FE-6
Upper Rudder Sys 1 SOV	115-VAC	Fwd Main AC No. 2	FE-4
Upper Rudder Sys 3 SOV	115-VAC	Fwd Main AC No. 1	FE-4
Spoilers, Flight and Ground.			
Flight Spoiler LH Ratio Shift Ind Lt	28-VDC	Main DC No. 1	FE-6
Flight Spoiler RH Ratio Shift Ind Lt	28-VDC	Main DC No. 2	FE-5
Flight Spoiler Sys A LH Ind Lt	28-VDC	Main DC No. 2	FE-5
Flight Spoiler Sys A RH Ind Lt	28-VDC	Main DC No. 1	FE-6
Flight Spoiler Sys B LH Ind Lt	28-VDC	Main DC No. 1	FE-6
Flight Spoiler Sys B RH Ind Lt	28-VDC	Main DC No. 2	FE-5
Ground Spoiler Ratio Shift Cont	28-VDC	Main DC No. 1	FE-6

CIRCUIT BREAKER INDEX GUIDE (SHEET 18)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Ground Spoiler Sys A LH Ind Lt	28-VDC	Main DC No. 2	FE-5
Ground Spoiler Sys A RH Ind Lt	28-VDC	Main DC No. 1	FE-6
Ground Spoiler Sys No. 1 Shutoff Valve	115-VAC	Aft Main AC No. 1	LC-2
Ground Spoiler Sys No. 4 Shutoff Valve	115-VAC	Aft Main AC No. 4	LC-3
Ground Spoiler Lockout	28-VDC	Isol DC	FE-2
Ground Spoiler Sys B LH Ind Lt	28-VDC	Main DC No. 1	FE-6
Ground Spoiler Sys B RH Ind Lt	28-VDC	Main DC No. 2	FE-5
Spoiler Servo Sys A SOV	28-VDC	Main DC No. 1	FE-6
Spoiler Servo Sys B SOV	28-VDC	Main DC No. 2	FE-5
FUEL SAVINGS ADVISORY SYSTEM (FSAS)			
[B] FSAS	115-VAC	Emergency AC	
[A] FSAS Cmptr/CDU	115-VAC	Emergency AC	
[B] FSAS CMPTR	28-VDC	Avionics DC 2	N-2
[A] FSAS Computer Relays	28-VDC	Avionics DC 2	N-2
FSAS DIU	28-VDC	Avionics DC 2	N-2
FUEL SUPPLY SYSTEM.			
Air Refuel Control	28-VDC	ISOL DC	FE-2
Air Refuel Door Cont & Emerg Latch	28-VDC	ISOL DC	FE-2
Air Refuel Drain	115-VAC	Fwd Main AC No. 1	FE-4
Auto Refuel Control, Aux	28-VDC	ISOL DC	FE-2
Auto Refuel Control, Ext Range	28-VDC	ISOL DC	FE-2
Auto Refuel Control, Main	28-VDC	ISOL DC	FE-2
Fuel Crossfeed Valve, LH	115-VAC	ISOL AC	FE-2
Fuel Crossfeed Valve, RH	115-VAC	ISOL AC	FE-2
Fuel Isolation Valve (4)	115-VAC	ISOL AC	FE-2
Fuel Manifold Drain Valve	115-VAC	Fwd Main AC No. 1	FE-4
Fuel Mismanage Ind Lts	28-VDC	Main DC No. 1	FE-6
Fuel Pressure Ind, LH	26-VAC	26V AC Inst No. 2	FE-4
Fuel Pressure Ind, RH	26-VAC	26V AC Inst No. 3	FE-3

CIRCUIT BREAKER INDEX GUIDE (SHEET 19)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Fuel Quantity Ind			
Aux 1	115-VAC	Fwd Main AC No. 4	FE-3
Aux 2	115-VAC	Fwd Main AC No. 3	FE-3
Aux 3	115-VAC	Fwd Main AC No. 2	FE-4
Aux 4	115-VAC	Fwd Main AC No. 1	FE-4
Ext Range 1	115-VAC	Fwd Main AC No. 4	FE-3
Ext Range 2	115-VAC	Fwd Main AC No. 3	FE-3
Ext Range 3	115-VAC	Fwd Main AC No. 2	FE-4
Ext Range 4	115-VAC	Fwd Main AC No. 1	FE-4
Main 1	115-VAC	Fwd Main AC No. 4	FE-3
Main 2	115-VAC	Fwd Main AC No. 3	FE-3
Main 3	115-VAC	Fwd Main AC No. 2	FE-4
Main 4	115-VAC	Fwd Main AC No. 1	FE-4
Total	115-VAC	Fwd Main AC No. 2	FE-4
Fuel Separation Valve, Center	28-VDC	Battery	FE-2
Fuel Separation Valve, LH	28-VDC	Battery	FE-2
Fuel Separation Valve, RH	28-VDC	Battery	FE-2
Fuel Shutoff (4)	28-VDC	ISOL DC	FE-2
Fuel Temp Ind	28-VDC	Main DC No. 1	FE-6
Grd Refuel ISO Valve LH	28-VDC	Battery	FE-2
Grd Refuel ISO Valve RH	28-VDC	Battery	FE-2
LH Fuel Valve Aerial ISO	115-VAC	ISOL AC	FE-2
RH Fuel Valve Aerial ISO	115-VAC	ISOL AC	FE-2
Inboard Fuel Boost Pumps.			
Aux 1	115-VAC	Aft Main AC No. 1	LC-1
Aux 2	115-VAC	Aft Main AC No. 2	LC-1
Aux 3	115-VAC	Aft Main AC No. 3	LC-4
Aux 4	115-VAC	Aft Main AC No. 4	LC-4
Ext Range 1	115-VAC	Aft Main AC No. 1	LC-1
Ext Range 2	115-VAC	Aft Main AC No. 2	LC-1

CIRCUIT BREAKER INDEX GUIDE (SHEET 20)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Ext Range 3	115-VAC	Aft Main AC No. 3	LC-4
Ext Range 4	115-VAC	Aft Main AC No. 4	LC-4
Main 1	115-VAC	Aft Main AC No. 1	LC-1
Main 2	115-VAC	Aft Main AC No. 2	LC-1
Main 3	115-VAC	Aft Main AC No. 3	LC-4
Main 4	115-VAC	Aft Main AC No. 4	LC-4
LH Fuel Valve Jettison	115-VAC	ISOL AC	FE-2
RH Fuel Valve Jettison	115-VAC	ISOL AC	FE-2
Outboard Fuel Boost Pump.			
Aux 1	115-VAC	Aft Main AC No. 4	LC-4
Aux 2	115-VAC	Aft Main AC No. 3	LC-4
Aux 3	115-VAC	Aft Main AC No. 2	LC-1
Aux 4	115-VAC	Aft Main AC No. 1	LC-1
Ext Range 1	115-VAC	Aft Main AC No. 4	LC-4
Ext Range 2	115-VAC	Aft Main AC No. 3	LC-4
Ext Range 3	115-VAC	Aft Main AC No. 2	LC-1
Ext Range 4	115-VAC	Aft Main AC No. 1	LC-1
Main 1	115-VAC	Aft Main AC No. 4	LC-4
Main 2	115-VAC	Aft Main AC No. 3	LC-4
Main 3	115-VAC	Aft Main AC No. 2	LC-1
Main 4	115-VAC	Aft Main AC No. 1	LC-1
Pri Fuel Level Valve			
Aux	115-VAC	Fwd Main AC No. 2	FE-4
Ext Range	115-VAC	Fwd Main AC No. 2	FE-4
Main	115-VAC	Fwd Main AC No. 2	FE-4
Refuel Manifold Drain LH	115-VAC	Fwd Main AC No. 2	FE-4
Refuel Manifold Drain RH	115-VAC	Fwd Main AC No. 3	FE-3
Sec Fuel Level Valve			
Aux	115-VAC	Fwd Main AC No. 3	FE-3
Ext Range	115-VAC	Fwd Main AC No. 3	FE-3

CIRCUIT BREAKER INDEX GUIDE (SHEET 21)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Main	115-VAC	Fwd Main AC No. 3	FE-3
Tank 1 Sump Low Level Warn	115-VAC	Fwd Main AC No. 1	FE-4
Tank 4 Sump Low Level Warn	115-VAC	Fwd Main AC No. 4	FE-3
Fuel Tank Inerting and Fire Suppression System.			
Feeder FPS (or FSS)	28-VDC	Isol DC Pwr	DC/LC
Fire Protection, FSS	28-VDC	Isol DC	FE-2
Fire Protection, Nitrogen Inerting	28-VDC	Isol DC	FE-2
Fire Suppression Normal Battery	28-VDC	Normal Battery	BC
Fire Suppression Standby Battery	28-VDC	Standby Battery	BC
GROUND PROXIMITY WARNING SYSTEM.			
[A] GPWS	28-VDC	Avionics Iso DC	N-1
[A] GPWS	115-VAC	Avionics Iso AC	N-1
[B] GPWS	28-VDC	Avionics DC 1	N-1
[B] GPWS	115-VAC	Avionics AC 1	N-1
HYDRAULIC POWER SUPPLY SYSTEM.			
Engine 1 Hyd Pump Control	28-VDC	Isolated DC	FE-2
Engine 2 Hyd Pump Control	28-VDC	Isolated DC	FE-2
Engine 3 Hyd Pump Control	28-VDC	Isolated DC	FE-2
Engine 4 Hyd Pump Control	28-VDC	Isolated DC	FE-2
Hyd ATM Sys 1, Cont & Ind Lts	28-VDC	Battery	FE-2
Hyd ATM Sys 1, Pneu & Hyd SOV	28-VDC	Battery	FE-2
Hyd ATM Sys 1, Suction SOV	28-VDC	Battery	FE-2
Hyd ATM Sys 4, Cont & Ind Lts	28-VDC	Main DC No. 2	FE-5
Hyd ATM Sys 4, Pneu & Hyd SOV	28-VDC	Main DC No. 2	FE-5
Hyd ATM Sys 4, RH APU Iso	28-VDC	Main DC No. 2	FE-5
Hyd ATM Sys Priority	28-VDC	Main DC No. 2	FE-5
Hyd ATM Sys 4, Suct SOV	28-VDC	Battery	FE-2
Hydraulic Shutoff Valve, Eng 1	28-VDC	Isolated DC	FE-2
Hydraulic Shutoff Valve, Eng 2	28-VDC	Isolated DC	FE-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 22)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Hydraulic Shutoff Valve, Eng 3	28-VDC	Isolated DC	FE-2
Hydraulic Shutoff Valve, Eng 4	28-VDC	Isolated DC	FE-2
LH APU Iso	28-VDC	Isolated DC	FE-2
Hydraulic Pump Ind Lt.			
Hyd Level Ind, Sys 1	28-VDC	Main DC No. 1	FE-6
Hyd Level Ind, Sys 2	28-VDC	Main DC No. 2	FE-5
Hyd Level Ind, Sys 3	28-VDC	Main DC No. 2	FE-5
Hyd Level Ind, Sys 4	28-VDC	Main DC No. 1	FE-6
Hyd Pwr Transfer Sys 1 & 2	28-VDC	Battery	FE-2
Hyd Pwr Transfer Sys 2 & 3	28-VDC	Main DC No. 1	FE-6
Hyd Pwr Transfer Sys 3 & 4	28-VDC	Main DC No. 2	FE-5
Hyd Sys 1 Suction Boost Pump	115-VAC	Aft Main AC No. 1	LC-1
Hyd Sys 4 Suction Boost Pump	115-VAC	Aft Main AC No. 4	LC-4
Pressure Indicator Hyd Sys 1	26-VAC	26VAC Instrument 1	FE-4
Pressure Indicator Hyd Sys 2	26-VAC	26VAC Instrument 2	FE-4
Pressure Indicator Hyd Sys 3	26-VAC	26VAC Instrument 3	FE-3
Pressure Indicator Hyd Sys 4	26-VAC	26VAC Instrument 4	FE-3
Ram Air Turbine Auto Cont	28-VDC	Battery	FE-2
Ram Air Turbine Manual Cont & Ind Lt	28-VDC	Battery	FE-2
Sys 1 Boost	28-VDC	Main DC No. 1	FE-6
Sys 1 Bottom	28-VDC	Main DC No. 1	FE-6
Sys 1 Top	28-VDC	Main DC No. 1	FE-6
Sys 2 Boost	28-VDC	Main DC No. 2	FE-5
Sys 2 Bottom	28-VDC	Main DC No. 2	FE-5
Sys 2 Top	28-VDC	Main DC No. 2	FE-5
Sys 3 Boost	28-VDC	Main DC No. 2	FE-5
Sys 3 Bottom	28-VDC	Main DC No. 2	FE-5
Sys 3 Top	28-VDC	Main DC No. 2	FE-5
Sys 4 Boost	28-VDC	Main DC No. 1	FE-6

CIRCUIT BREAKER INDEX GUIDE (SHEET 23)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Sys 4 Bottom	28-VDC	Main DC No. 1	FE-6
Sys 4 Top	28-VDC	Main DC No. 1	FE-6
INSTRUMENTS.			
Flt Engr Total Temp Ind	115-VAC	Fwd Main AC No. 1	FE-4
TAS Ind	26-VAC	26-VAC NAV 2	N-2
Vert Vel Ind	115-VAC	Avionics AC 1	N-1
[A] INTEGRAL WEIGHT AND BALANCE SYSTEM (IWBS). (System deactivated)			
IWBS Computer	115-VAC	Aft Main AC No. 3	LC-3
INTEGRATED FLIGHT INSTRUMENT SYSTEM (IFIS).			
ADI 1	115-VAC	Emergency AC	PE
CADC No. 1	115-VAC	Emergency AC	PE
CADC 2	115-VAC	Nav AC 2	N-2
CADC/VSFI Test, Copilot	28-VDC	Avionics DC 2	N-2
CADC/VSFI Test, Pilot	28-VDC	Avionics DC 2	N-2
Copilot HSI, Az Brg	115-VAC	Nav AC 2	N-2
Copilot HSI, Hdg Course	115-VAC	Nav AC 2	N-2
Copilot VSFI Airspeed	115-VAC	Nav AC 2	N-2
Copilot VSFI Alt	115-VAC	Nav AC 2	N-2
Flt Dir Cmptr 1	115-VAC	Avionics Iso AC	N-1
Flt Dir Cmptr 1	28-VDC	Avionics Iso DC	N-1
Flt Dir Cmptr 2	28-VDC	Avionics DC 2	N-2
Flt Dir Cmptr 2/ADI 2	115-VAC	Nav AC 2	N-2
HSI Bias	26-VAC	26-VAC ISO	N-1
HSI Range, Copilot ([A] MODIFIED BY T.O. 1C-5A-1919 AND [B])	26-VAC	26-VAC Nav 1	N-2
HSI Range, Pilot ([A] MODIFIED BY T.O. 1C-5A-1919 AND [B])	26-VAC	26-VAC Nav 1	N-2
HSI Range, Pilot ([A] NOT MODIFIED BY T.O. 1C-5A-1919)	26-VAC	26-VAC ISO	N-1
HSI 1 Range, Copilot ([A] NOT MODIFIED BY T.O. 1C-5A-1919)	26-VAC	26-VAC Nav 2	N-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 24)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
HSI 2 Bias	26-VAC	26-VAC Nav 2	N-2
Nav Sel Copilot	28-VDC	Avionics DC 2	N-2
Nav Sel Pilot	28-VDC	Avionics ISO DC	N-1
[A] PCI 1	115-VAC	Nav AC 1	N-1
[A] PCI 2	115-VAC	Nav AC 2	N-2
Pilot - HSI Az Brg	115-VAC	Avionics ISO AC	N-1
Pilot - HSI Hdg Course	115-VAC	Avionics ISO AC	N-1
Pilot VSFI Airspeed	115-VAC	Emergency AC	PE
Pilot VSFI Alt	115-VAC	Emergency AC	PE
Rate-of-Turn Sensor 2	115-VAC	Avionics AC 2	N-2
Rate-of-Turn Xmtr 1	115-VAC	Emergency AC	PE
LANDING GEAR SYSTEM.			
Brake System.			
Anti-Skid Alt Cont	28-VDC	Isolated DC	FE-2
Anti-Skid Failure & Emerg Hyd Ind Lt	28-VDC	Isolated DC	FE-2
Anti-Skid Normal Control	28-VDC	Main DC No. 1	FE-6
Anti-Skid Test	26-VAC	AC Inst No. 1	FE-4
Emer Brake Valve	28-VDC	Isolated DC	FE-2
MLG Anti-Rotation	28-VDC	Main DC No. 1	FE-6
Pressure Indicator, Alt Hyd Brake	26-VAC	26V AC Inst No. 4	FE-3
Pressure Indicator Norm Hyd Brake	26-VAC	26V AC Inst No. 1	FE-4
[A] Crosswind Steering System.			
Emerg NLG Steering	28-VDC	Main DC No. 2	FE-5
Emerg X-wind Pos	28-VDC	Main DC No. 2	FE-5
MLG X-wind Pos Ind LH	115-VAC	Fwd Main AC No. 1	FE-4
MLG X-wind Pos Ind RH	115-VAC	Fwd-Main AC No. 1	FE-4
X-wind Cmptr Pwr	115-VAC	Fwd Main AC No. 3	FE-2
X-wind Computer	28-VDC	Main DC No. 2	FE-5
X-wind Mon LVDT Pwr	115-VAC	Fwd Main AC No. 3	FE-3
X-wind Inop Ind Lt	28-VDC	Isolated DC	FE-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 25)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
X-wind NLG Pos Ind	115-VAC	Fwd Main AC No. 3	FE-3
X-wind Shutoff Valve Cont	28-VDC	Main DC No. 2	FE-5
[B] Steering, Caster/Power Back Systems			
Caster/Pwr-Back Control Box	28-VDC	Main DC No. 2	FE-5
Caster/Pwr-Back Control Box Pwr	115-VAC	Fwd Main AC No. 3	FE-3
Caster/Pwr-Back MON LVDT Pwr	115-VAC	Fwd Main AC No. 3	FE-3
Caster/Pwr-Back Shut off Valve Cont	28-VDC	Main DC No. 2	FE-5
Emer MLG Pos	28-VDC	Main DC No. 2	FE-5
MLG Pos Ind LH	115-VAC	Fwd Main AC No. 1	FE-1
MLG Pos Ind RH	115-VAC	Fwd Main AC No. 1	FE-1
NLG Pos Ind	115-VAC	Fwd Main AC No. 3	FE-3
Emerg NLG Steering	28-VDC	Main DC No. 2	FE-5
Inflight Tire Deflation System.			
[A] Tire Deflation	28-VDC	Main DC No. 2	FE-5
[B] Tire Deflation Power	28VDC	Main DC No. 2	FE-5
Landing Gear Kneeling System.			
Kneel Ind Lt	28-VDC	Main DC No. 1	FE-6
Kneel Pad Actuator	115-VAC	Fwd Main AC No. 1	FE-4
[A] Kneel Press. Regulator	28-VDC	Main DC No. 1	FE-6
MLG Aft DC Bus	28-VDC	Main DC No. 2	FE-5
MLG Kneel Control	28-VDC	Main DC No. 2	FE-5
MLG Unkneel Ind Lt	28-VDC	Isolated DC	FE-2
Pneu Isolation Valve	115-VAC	Aft Main AC No. 1	FE-2
Main and Nose Landing Gear.			
Emerg LG Sw On Ind Lt	28-VDC	Main DC No. 1	FE-6
Landing Gear Pos Ind	28-VDC	Isolated DC	FE-2
Landing Gear Warn Horn	28-VDC	Isolated DC	FE-2
Landing Gear Warn Lt	28-VDC	Isolated DC	FE-2
[A] LH Aft MLG Emerg Extend	115-VAC	Aft Main AC No. 3	LC-4
[A] LH Fwd MLG Emerg Extend	115-VAC	Aft Main AC No. 1	LC-1

CIRCUIT BREAKER INDEX GUIDE (SHEET 26)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
MLG Control, Aft LH	28-VDC	Main DC No. 1	FE–6
MLG Control, Aft RH	28-VDC	Main DC No. 1	FE–6
MLG Control, Fwd LH	28-VDC	Main DC No. 1	FE–6
MLG Control, Fwd RH	28-VDC	Main DC No. 1	FE–6
[A] MLG DC BUS, MLG EMERGENCY EXTEND			
Aft LH	28-VDC	Main DC No. 2	LC–2
Aft RH	28-VDC	Main DC No. 2	LC–2
Fwd LH	28-VDC	Main DC No. 2	LC–2
Fwd RH	28-VDC	Main DC No. 2	LC–2
MLG Emergency Extend, Aft LH	28-VDC	Main DC No. 2	FE–5
MLG Emergency Extend, Aft RH	28-VDC	Main DC No. 2	FE–5
MLG Emergency Extend, Fwd LH	28-VDC	Main DC No. 2	FE–5
MLG Emergency Extend, Fwd RH	28-VDC	Main DC No. 2	FE–5
[B] MLG DC BUS, (DC SUPPLY) MLG EMERGENCY EXTEND			
Aft LH, Fwd/Aft Cont	28-VDC	Main DC No. 2	LC–2
Aft LH, Mot Bk No. 1	28-VDC	Main DC No. 2	LC–2
Aft LH, Mot Bk No. 2	28-VDC	Main DC No. 2	LC–2
Aft RH, Fwd Aft Cont	28-VDC	Main DC No. 2	LC–2
Aft RH, Mot Bk No. 1	28-VDC	Main DC No. 2	LC–2
Aft RH, Mot Bk No. 2	28-VDC	Main DC No. 2	LC–2
Fwd LH, Fwd/Aft Cont	28-VDC	Main DC No. 2	LC–2
Fwd LH, Mot Bk No. 1	28-VDC	Main DC No. 2	LC–2
Fwd LH, Mot Bk No. 2	28-VDC	Main DC No. 2	LC–2
Fwd RH, Fwd/Aft Cont	28-VDC	Main DC No. 2	LC–2
Fwd RH, Mot Bk No. 1	28-VDC	Main DC No. 2	LC–2
Fwd RH, Mot Bk No. 2	28-VDC	Main DC No. 2	LC–2
[B] MLG AC EMERGENCY EXTENSION			
LH Aft MLG Emerg Extend, Aft Mot (3)	115-VAC	Aft Main AC 3	LC–4

CIRCUIT BREAKER INDEX GUIDE (SHEET 27)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
LH Aft MLG Emerg Extend, Fwd Mot (3)	115-VAC	Aft Main AC 3	LC-4
LH Fwd MLG Emerg Extend, Aft Mot (3)	115-VAC	Aft Main AC 1	LC-1
LH Fwd MLG Emerg Extend, Fwd Mot (3)	115-VAC	Aft Main AC 1	LC-1
RH Aft MLG Emerg Extend, Aft Mot (3)	115-VAC	Aft Main AC 4	LC-4
RH Aft MLG Emerg Extend, Fwd Mot (3)	115-VAC	Aft Main AC 4	LC-4
RH Fwd MLG Emerg Extend, Aft Mot (3)	115-VAC	Aft Main AC 2	LC-2
RH Fwd MLG Emerg Extend, Fwd Mot (3)	115-VAC	Aft Main AC 2	LC-2
NLG Control	28-VDC	Main DC No. 1	FE-6
NLG Door Emerg Open - LH (A NOT MODIFIED BY T.O. 1C-5A-1946)	115-VAC	Fwd Main AC No. 2	FE-1
NLG Door Emerg Open - RH (A NOT MODIFIED BY T.O. 1C-5A-1946)	115-VAC	Fwd Main AC No. 2	FE-1
NLG Door Emerg Open (3) (A MODIFIED BY T.O. 1C-5A-1946 AND B)	115-VAC	Fwd Main AC No. 2	FE-5
NLG Emerg Extend	28-VDC	Main DC No. 2	FE-5
NLG Emerg Extend	115-VAC	Fwd Main AC No. 2	FE-1
A RH Aft MLG Emerg Extend	115-VAC	Aft Main AC No. 4	FE-4
A RH Fwd MLG Emerg Extend	115-VAC	Aft Main AC No. 2	FE-1
Spin Up 1	28-VDC	Isolated DC	FE-2
Spin Up 2	28-VDC	Isolated DC	FE-2
Spin Up Test	28-VDC	Isolated DC	FE-2
Touchdown 1	28-VDC	Isolated DC	FE-2
Touchdown 2	28-VDC	Isolated DC	FE-2
Spinup Test	26-VAC	26V AC Instrument No. 1	FE-4
LIGHTING SYSTEM.			
28V AC Lighting Envir Compt & Seat Belt	28-VAC	Aft Main AC No. 3	LC-4

CIRCUIT BREAKER INDEX GUIDE (SHEET 28)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Aft Cargo Ovhd Gr 2	115-VAC	Aft Main AC No. 2	LC-2
Aft Cargo Side Gr 1	115-VAC	Aft Main AC No. 1	LC-2
All Cargo Light Control	28-VDC	Main DC No. 2	FE-5
Anti-Collision Emp Light	115-VAC	Fwd Main AC No. 3	FE-3
Anti-Collision Lower Light	115-VAC	Fwd Main AC No. 2	FE-4
Anti-Collision Upper Light	115-VAC	Fwd Main AC No. 3	FE-3
Avionics Service	28-VAC	28-VAC Lighting	FE-1
Bunk Dome	28-VAC	28-VAC Lighting	FE-1
Bunk Reading	28-VAC	28-VAC Lighting	FE-1
Cargo Side Gr 2 Light	115-VAC	Aft Main AC No. 2	LC-2
Center Console Light	115-VAC	Fwd Main AC No. 2	FE-4
Copilot Flood Light	115-VAC	Fwd Main AC No. 2	FE-4
Copilot Inst Main Pnl Light	115-VAC	Fwd Main AC No. 3	FE-3
Copilot Side Console Light	115-VAC	Fwd Main AC No. 2	FE-4
Emerg Exit Arm Light	28-VDC	Main DC No. 1	FE-6
Emerg Exit Light Disarm	28-VDC	Battery Bus	FE-2
Flight Eng Inst Light	115-VAC	Fwd Main AC No. 3	FE-3
Flt Eng Flood & Work Table Light	115-VAC	Fwd Main AC No. 2	FE-4
Flt Eng Pnl Lower Light	115-VAC	Fwd Main AC No. 3	FE-3
Flt Eng Pnl Uppr Light	115-VAC	Fwd Main AC No. 3	FE-3
Flt Sta Dome Light	115-VAC	Fwd Main AC No. 1	FE-4
Fwd Cargo Ovhd Gr 2 Light	115-VAC	Aft Main AC No. 2	LC-2
Fwd Cargo Side Gr 1 Light	115-VAC	Aft Main AC No. 1	LC-2
Fuselage Top & Bottom Light	115-VAC	Fwd Main AC No. 2	FE-4
Inflight Refuel Light	115-VAC	Fwd Main AC No. 2	FE-4
Landing Control, LH Light	28-VDC	Main DC No. 1	FE-6
Landing Control, RH Light	28-VDC	Main DC No. 1	FE-6
LE Inspect Light	115-VAC	Aft Main AC No. 4	LC-3
LH Aft Curb Light	115-VAC	Aft Main AC No. 4	LC-3
LH Fwd Curb Light	115-VAC	Aft Main AC No. 4	LC-3

CIRCUIT BREAKER INDEX GUIDE (SHEET 29)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
LH Landing Light	115-VAC	Aft Main AC No. 1	LC-2
LH Taxi Light	115-VAC	Aft Main AC No. 2	LC-2
Light Cargo Red	115-VAC	Aft Main AC No. 1	LC-2
Ltg Trans, 28-VAC	115-VAC	Aft Main AC No. 3	LC-3
Ltg Trans, 28-VAC	115-VAC	Fwd Main AC No. 2	LC-2
Main Ckt Brk Pnl Light	115-VAC	Fwd Main AC No. 2	FE-4
Motor LH Ldg Light	115-VAC	Fwd Main AC No. 1	FE-4
Motor RH Ldg Light	115-VAC	Fwd Main AC No. 4	FE-3
NAV Flasher Control	28-VDC	Main DC No 2	FE-5
NAV Flood Light	115-VAC	Avionics AC 1	N-1
NAV Inst Light	115-VAC	Avionics AC 1	N-1
NAV Panel Light	115-VAC	Avionics AC 1	N-1
Navigation Light	115-VAC	Fwd Main AC No. 4	FE-3
No Smoking Light	115-VAC	Aft Main AC No. 2	LC-2
Overhead Panel Flood Light	115-VAC	Fwd Main AC No. 3	FE-2
Ovhd Pnl Light	115-VAC	Fwd Main AC No. 2	FE-4
Ovhd Cargo Gr 1 Light	115-VAC	Aft Main AC No. 3	LC-3
Pilot Inst Ctr Pnl Light	115-VAC	Fwd Main AC No. 1	FE-4
Pilot Inst Flood Light	115-VAC	Emerg AC	PE
Pilot Inst Main Pnl Light	115-VAC	Fwd Main AC No. 2	FE-4
Pilot Side Console Light	115-VAC	Fwd Main AC No. 1	FE-4
Radome Service	28-VAC	28-VAC Lighting	FE-1
Relief Crew Dome Light	115-VAC	Aft Main AC No. 3	LC-3
Relief Crew Reading Light	115-VAC	Aft Main AC No. 3	LC-3
RH Aft Curb Light	115-VAC	Aft Main AC No. 3	LC-3
RH Fwd Curb Light	115-VAC	Aft Main AC No. 4	LC-3
RH Landing Light	115-VAC	Aft Main AC No. 4	LC-3
RH Taxi Light	115-VAC	Aft Main AC No. 3	LC-3
Seat Belt Light	115-VAC	Aft Main AC No. 2	LC-2
Signal Light Outlet	28-VDC	ISOL DC Bus	FE-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 30)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Smoke & Seat Belt Light	28-VDC	Main DC No. 2	FE-5
Taxi & Landing Light	115-VAC	Fwd Main AC No. 1	FE-4
Taxi & LE Light Control	28-VDC	Main DC No. 2	FE-5
Thunderstorm Light	28-VDC	Main DC No. 2	FE-5
Troop Aisle Light	115-VAC	Aft Main AC No. 4	LC-3
Troop Courier Reading	28-VAC	28-VAC Lighting	LC-3
Troop Reading, LH	115-VAC	Aft Main AC No. 4	LC-3
Troop Reading, RH	115-VAC	Aft Main AC No. 4	LC-3
LOW ALTITUDE RADAR ALTIMETER SYSTEM.			
[A] Radar Alt 1	115-VAC	Avionics AC 1	N-1
[A] Radar Alt 2	115-VAC	Avionics AC 2	N-2
[B] Radar Alt No. 1	28-VDC	Avionics DC 1	N-1
[B] Radar Alt No. 2	28-VDC	Avionics DC 2	N-2
MALFUNCTION, DETECTION, ANALYSIS AND RECORDING (MADAR) SUBSYSTEM.			
[B] LESS Sys (AF84-0062 Through 85-0004)	115-VAC	Avionics AC 2	N-2
[B] LESS System (AF84-0062 Through 85-0004)	28-VDC	Main DC No. 1	LC-1
MADAR (3)	115-VAC	Fwd Main AC No. 4	FE-3
MADAR Absolute Press Xducer	115-VAC	Fwd Main AC No. 3	FE-3
[A] MADAR Control & APU Egt	28-VDC	Main DC 1	FE-6
[B] MADAR Control	28-VDC	Main DC 1	FE-6
[A] MADAR Dru	26-VAC	26-VAC Nav 2	N-2
MADAR Flap Pos Xducer	26-VAC	26-VAC Inst 2	FE-4
[B] MADAR Synchro Conv Exc	26-VAC	26-VAC Nav 1	FE-4
MADAR Xducer Compt Temp	115-VAC	Aft Main AC No. 3	LC-3
MADAR Xducer Eng 1	115-VAC	Aft Main AC No. 1	LC-2
MADAR Xducer Eng 2	115-VAC	Aft Main AC No. 2	LC-2
MADAR Xducer Eng 3	115-VAC	Aft Main AC No. 3	LC-3
MADAR Xducer Eng 4	115-VAC	Aft Main AC No. 4	LC-3
[B] MADAR Xducer, Hyd Sys 1&2	115-VAC	Aft Main AC No. 2	LC-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 31)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
[B] MADAR Xducer, Hyd Sys 3&4	115-VAC	Aft Main AC No. 3	
[A] MADAR Xducer LH Apu	115-VAC	Aft Main AC No. 2	LC–2
MADAR Xducer Refrg	28-VDC	Main DC No. 2	FE–5
MADAR Xducer Refrg	115-VAC	Aft Main AC No. 2	LC–2
MADAR Xducer RH Apu	115-VAC	Aft Main AC No. 3	LC–3
[A] SLR Sys	28-VDC	Main DC No. 1	FE–6
SLR Sys ([A] and [B] AF84-0062 Through 85-0004)	26-VAC	26-VAC Nav 2	N–2
MISCELLANEOUS EQUIPMENT.			
Lav Water Heater (2)	115-VAC	Monitor AC No. 2	LC–2
Relief Crew Galley (3)	115-VAC	Monitor AC No. 2	LC–2
Relief Crew Lav (3)	115-VAC	Monitor AC No. 2	LC–2
Troop Galley (3)	115-VAC	Monitor AC No. 3	LC–3
Troop Lav (3)	115-VAC	Monitor AC No. 3	LC–3
NAVIGATION SYSTEMS.			
ADF 1	28-VDC	Avionics DC 1	N–1
ADF 1	26-VAC	26-VAC Nav 1	N–1
ADF 2	28-VDC	Avionics DC 2	N–2
ADF 2	26-VAC	26-VAC Nav 2	N–2
Attd Excitation, Altr.	26-VAC	26-VAC Nav 1	N–1
Attd Excitation, Copilot	26-VAC	26-VAC Nav 2	N–2
Attd Excitation, Pilot	26-VAC	Emergency AC	PE
BDHI Nav 1	28-VDC	Avionics DC 1	N–1
BDHI Nav 1 ([A] MODIFIED BY T.O. 1C-5A-1919 AND [B])	26-VAC	26-VAC Nav 1	N–1
BDHI Nav 1 ([A] NOT MODIFIED BY T.O. 1C-5A-1919)	115-VAC	Nav AC 1	N–1
BDHI Nav 2	28-VDC	Avionics DC 2	N–2
BDHI Nav 2 ([A] MODIFIED BY T.O. 1C-5A-1919 AND [B])	26-VAC	26-VAC Nav 1	
BDHI Nav 2 ([A] NOT MODIFIED BY T.O. 1C-5A-1919)	115-VAC	Nav AC 2	N–2

CIRCUIT BREAKER INDEX GUIDE (SHEET 32)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
BDHI Copilot	28-VDC	Avionics DC 1	N-1
BDHI Copilot ([A] MODIFIED BY T.O. 1C-5A-1919 AND [B])	26-VAC	26-VAC Nav 1	N-2
BDHI Copilot ([A] NOT MODIFIED BY T.O. 1C-5A-1919)	115-VAC	Nav AC 1	N-1
BDHI Pilot	28-VDC	Avionics DC 2	N-2
BDHI Pilot ([A] MODIFIED BY T.O. 1C-5A-1919 AND [B])	26-VAC	26-VAC Nav 1	N-1
BDHI Pilot ([A] NOT MODIFIED BY T.O. 1C-5A-1919)	115-VAC	Nav AC 2	N-2
[A] Glideslope 1	28-VDC	Avionics ISO DC	N-1
[A] Glideslope 1	26-VAC	26-VAC ISO	N-1
[A] Glideslope 2	28-VDC	Avionics DC	N-2
[A] Glideslope 2	26-VAC	26-VAC Nav 2	N-2
Hdg Coupler 1	115-VAC	Emergency AC	PE
Hdg Coupler 1 Excitation	26-VAC	Emergency AC	PE
Hdg Coupler 2	115-VAC	Nav AC 2	N-2
Hdg Coupler 3	115-VAC	Avionics ISO AC	N-1
INS Emerg Switch	115-VAC	Avionics AC 1	N-1
INS 1	115-VAC	Emergency AC	PE
INS 1 Air	28-VDC	Emergency DC	PE
INS 1 & 3 CADC Excitation	26-VAC	26-VAC Nav 1	N-1
INS 1 HSI/Hdg Excitation	26-VAC	Emergency AC	PE
INS 1 Htr	115-VAC	Emergency AC	PE
INS 1 Rly/Val	28-VDC	Emergency DC	PE
INS 2	115-VAC	Avionics AC 2	N-2
INS 2 Air	28-VDC	Avionics DC 2	N-2
INS 2 CADC Excitation	26-VAC	26-VAC Nav 2	N-2
INS 2 HSI/Hdg Excitation	26-VAC	26-VAC Nav 2	N-2
INS 2 Htr	115-VAC	Avionics AC 2	N-2
INS 2 Val	28-VDC	Avionics DC 2	N-2
INS 3	115-VAC	Avionics AC 1	N-1

CIRCUIT BREAKER INDEX GUIDE (SHEET 33)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
INS 3 Air	28-VDC	Avionics DC 1	N-1
INS 3 Altr.	115-VAC	Emergency AC	PE
INS 3 HSI/Hdg Excitation	26-VAC	26-VAC ISO	N-1
INS 3 Htr	115-VAC	Avionics AC 1	N-1
INS 3 Rly	28-VDC	Avionics DC 1	N-1
INS 3 Val	28-VDC	Avionics ISO DC	N-1
[A] Marker Beacon	28-VDC	Avionics DC 2	N-2
[B] Marker Beacon Indicator	28-VDC	Avionics DC 2	N-2
MMR LCU ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	26-VAC	26-VAC Nav 1	N-1
MMR LCU ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	28-VDC	Avionics DC 1	N-1
MMR LCU ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	115-VAC	Avionics AC 1	N-1
Multi-Mode Radar Distr ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	28-VDC	Avionics DC 2	N-2
Multi-Mode Radar Distr ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	115-VAC	Avionics AC 1	N-1
Multi-Mode Radar Distr ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	26-VAC	26-VAC Nav 2	N-2
Multi-Mode Radar Ku ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	28-VDC	Avionics DC 2	N-2
Multi-Mode Radar Ku ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	115-VAC	Avionics AC 1	N-2
Multi-Mode Radar Ku ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	26-VAC	26-VAC Nav 2	N-2
Multi-Mode Radar X ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	28-VDC	Avionics DC 2	N-2
Multi-Mode Radar X ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	115-VAC	Avionics AC 1	N-2
Multi-Mode Radar X ([A] NOT MODIFIED BY T.O. 1C-5A-1899)	26-VAC	26-VAC Nav 2	N-2
TACAN 1	28-VDC	Avionics DC 1	N-1
TACAN 1	115-VAC	Nav AC 1	N-1
TACAN 1	26-VAC	26-VAC Nav 1	N-1
TACAN 2	28-VDC	Avionics DC 2	N-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 34)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
TACAN 2	115-VAC	Nav AC 2	N-2
TACAN 2 ($\boxed{A}$ NOT MODIFIED BY T.O. 1C-5A-1919)	26-VAC	26-VAC Nav 2	N-2
TACAN 2 ($\boxed{A}$ MODIFIED BY T.O. 1C-5A-1919 AND $\boxed{B}$)	26-VAC	26-VAC Nav 1	N-1
VHF Nav 1	28-VDC	Avionics Iso DC	N-1
VHF Nav 1	26-VAC	26-VAC ISO	N-1
VHF Nav 2	28-VDC	Avionics DC 2	
VHF Nav 2	26-VAC	26-VAC Nav 2	N-2
Weather Radar Control ($\boxed{A}$ MODIFIED BY T.O. 1C-5A-1899 AND $\boxed{B}$)	28-VDC	Avionics DC 1	N-2
Weather Radar Copilot's Ind. ($\boxed{A}$ MODIFIED BY T.O. 1C-5A-1899 AND $\boxed{B}$)	115-VAC	Avionics AC 1	N-1
Weather Radar Pilot's Ind. ($\boxed{A}$ MODIFIED BY T.O. 1C-5A-1899 AND $\boxed{B}$)	115-VAC	Avionics AC 1	N-1
Weather Radar RCVR-XMTR ($\boxed{A}$ MODIFIED BY T.O. 1C-5A-1899 AND $\boxed{B}$)	115-VAC	Avionics AC 1	N-1
OXYGEN SYSTEM.			
Lox Qty Ind	115-VAC	Fwd Main AC No. 2	FE-4
Oxygen Warn	28-VDC	Isolated DC	FE-2
PARATROOP EQUIPMENT.			
Paratroop Air Deflect	28-VDC	Main DC No. 1	FE-6
PNEUMATIC SYSTEMS.			
$\boxed{A}$ 3000 PSI Pneu	115-VAC	Aft Main AC No. 4	LC-3
$\boxed{A}$ 3000/155 PSI Pneu	28-VDC	Main DC No. 2	FE-5
$\boxed{B}$ 155 PSI Pneu & Tire Deflation Cont & Ind	28-VDC	Main DC No. 2	
Pneu Isolation Valve	115-VAC	Aft Main AC No. 1	LC-2
$\boxed{B}$ **Potable Water Systems**			
Water Sys Press No. 1	28-VDC	Main DC No. 1	FE-6
Water Sys Press No. 2	28-VDC	Main DC No. 2	FE-5

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CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Water Sys Press No. 1	115-VAC	Aft Main AC No.2	LC-2
Water Sys Press No. 2	115-VAC	Aft Main AC No.3	LC-3
Water Sys Qty Ind	28-VDC	Main DC No. 1	FE-6
Water Sys Valves	115-VAC	Aft Main AC No.2	LC-2
PRESSURIZATION SYSTEM.			
Cabin Press. Cont Auto	115-VAC	Fwd Main AC No. 4	FE-3
Cabin Press. Cont Manual	115-VAC	Emergency AC	PE
Cabin Press. Low Warn Lt	28-VDC	Isolated DC	FE-2
Emerg Depress	28-VDC	Emergency DC	PE
STALLIMITER SYSTEM.			
Stallimiter 1	115-VAC	Avionics AC No. 2	N-2
Stallimiter	115-VAC	Avionics AC No. 1	N-1
Stallimiter Shaker Motor 1	28-VDC	Avionics DC No. 2	N-2
Stallimiter Shaker Motor 2	28-VDC	Avionics DC No. 1	N-1
Stallimiter Sys 1	28-VDC	Avionics DC No. 2	
Stallimiter Sys 2	28-VDC	Avionics DC No. 1	N-1
TEST EQUIPMENT.			
[A] VGH Rec	28-VDC	Avionics DC No. 2	N-2
[A] VGH Rec	115-VAC	Avionics AC No. 2	N-2
WARNING SYSTEM.			
Annunciator Control Bright 1	28-VDC	Isolated DC	FE-2
Annunciator Control Bright 2	28-VDC	Isolated DC	FE-2
Annunciator Control Dim 1	28-VDC	Isolated DC	FE-2
Annunciator Control Dim 2	28-VDC	Isolated DC	FE-2
Bunk & Aft Cargo Warn Horn	28-VDC	Emergency DC	PE
Bunk & Aft Cargo Warning Horn	28-VDC	Normal Batt	BC
Courier & Fwd Cargo Warn Horn	28-VDC	Emergency DC	PE
Courier & Fwd Cargo Warning Horn	28-VDC	Stby Batt	BC
Door Warn Ind Lt	28-VDC	Main DC No. 2	FE-5
Ind Lt Test 1, 2, 3, 4	28-VDC	Isolated DC	FE-2

CIRCUIT BREAKER INDEX GUIDE (SHEET 36)

CIRCUIT BREAKER	POWER	BUS	PANEL NUMBER
Master Caution Control	28-VDC	Isolated DC	FE-2
Smoke Detector	28-VDC	Isolated DC	FE-2
Troop & Relief Crew Warn Horn	28-VDC	Emergency DC	PE
Troop & Relief Crew Warning Horn	28-VDC	Stby Batt	BC
WINDSHIELD RAIN REMOVAL SYSTEM.			
Copilot Wshld Wiper	115-VAC	Fwd Main AC No. 3	FE-3
Pilot Wshld Wiper	115-VAC	Fwd Main AC No. 2	FE-4
[A] Rain Repellent Copilot	28-VDC	Main DC No. 2	FE-5
[A] Rain Repellent Pilot	28-VDC	Main DC No. 1	FE-6
[B] WSHLD Wiper Pilot	28-VDC	Main DC No. 1	FE-6
[B] WSHLD Wiper Copilot	28-VDC	Main DC No. 2	FE-5
WING FLAPS AND SLAT SYSTEM.			
Asym Brake, Flap	115-VAC	Aft Main AC No. 1	LC-2
Asym Brake, Slat	115-VAC	Aft Main AC No. 1	LC-2
Asymmetry Cont			
Flap	28-VDC	Isolated DC	FE-2
Slat	28-VDC	Isolated DC	FE-2
Flap Pos Ind	28-VDC	Main DC No. 2	FE-2
Flap Sys 1	28-VDC	Main DC No. 2	FE-2
Flap Sys 4	28-VDC	Main DC No. 1	FE-6
Slat Ind Flag	28-VDC	Main DC No. 1	FE-6
Slat LH Pos	28-VDC	Main DC No. 1	FE-6
Slat LH Pos	28-VDC	Main DC No. 2	FE-5
Slat RH Pos	28-VDC	Main DC No. 1	FE-6
Slat RH Pos	28-VDC	Main DC No. 2	FE-5
Slat Sys 1	28-VDC	Main DC No. 2	FE-5
Slat Sys 4	28-VDC	Main DC No. 1	FE-6

CIRCUIT BREAKER INDEX GUIDE (SHEET 37)

SECTION VII
AVIONICS

INTRODUCTION

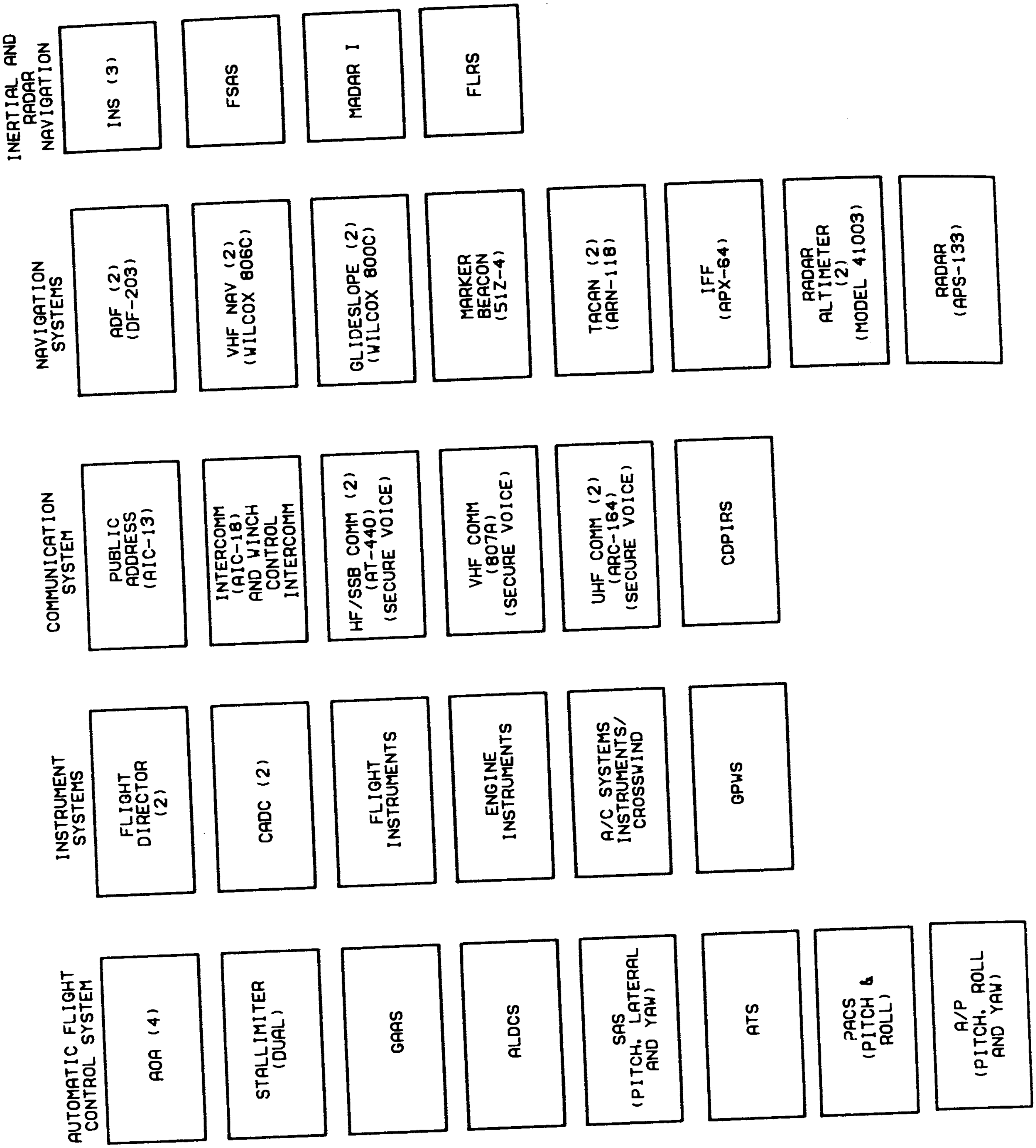
The C-5 aircraft requires many highly specialized electronic systems for safe and efficient operation during all kinds of weather. These systems enable the flight crew to operate with the least amount of effort for long periods of time, thereby reducing the possibility of accidents due to fatigue.

The avionics systems can be divided into five groups as follows:

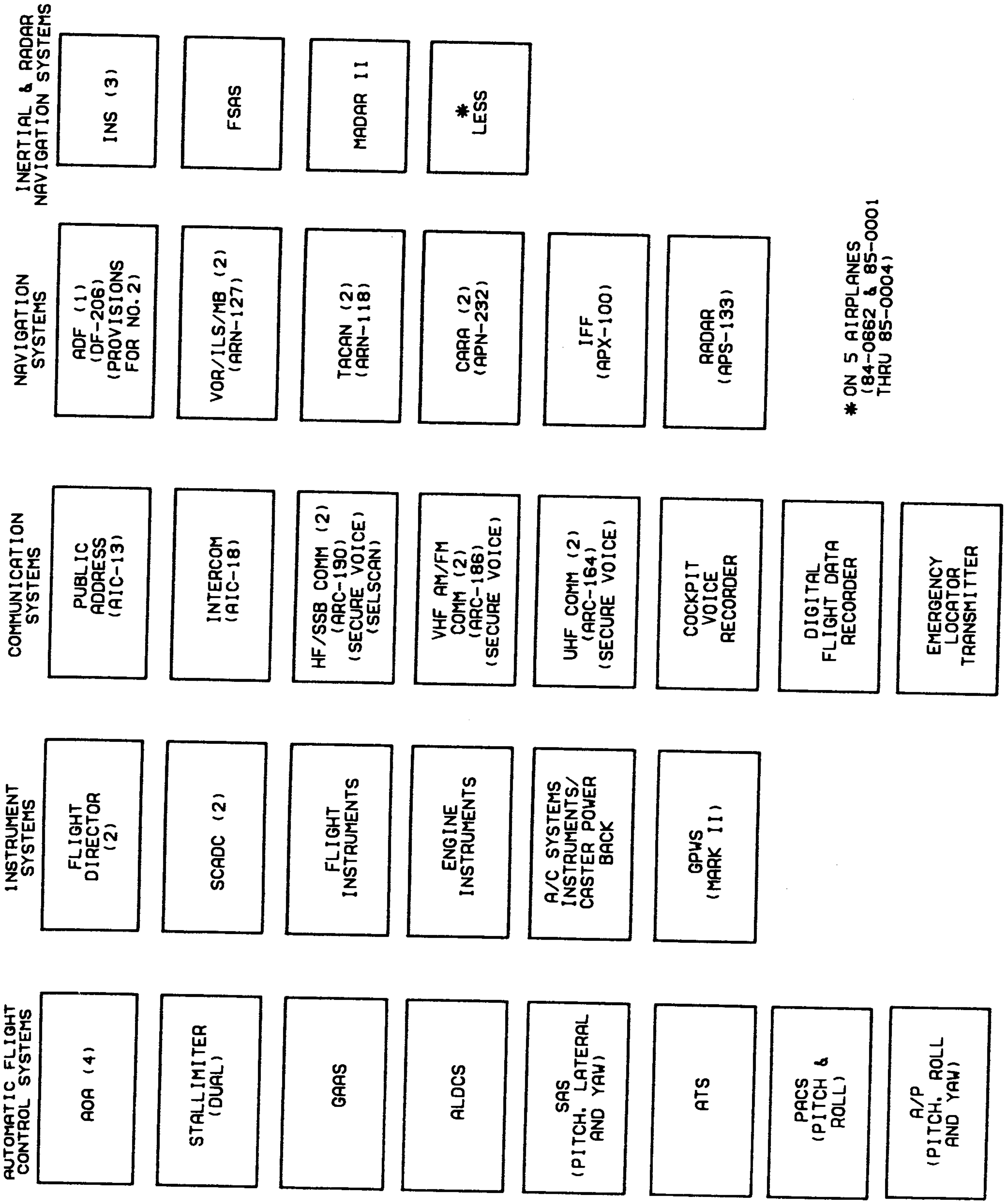
- Automatic flight control systems
- Instrument systems
- Communication systems
- Navigation systems
- Inertial and radar navigation systems

In many cases dual systems and in one case triple systems are provided to improve aircraft operational capability.

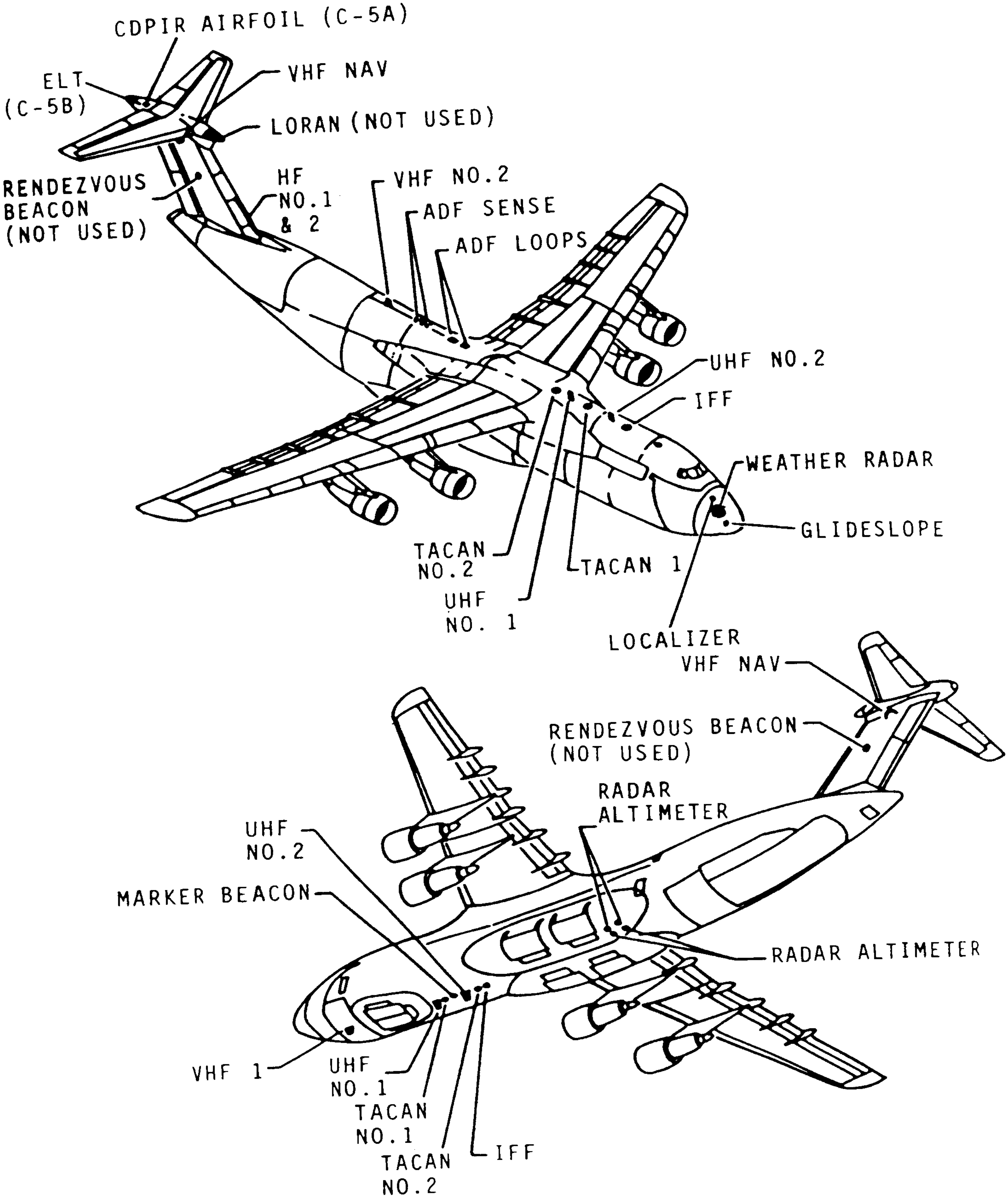
Antennas are required for many of the electronic systems, most of which are located flush with or protruding from the skin of the aircraft. Electronic componets are located throughout the interior of the aircraft, however, most are located in four avionic compartment bays located on the left side of the flight deck just aft of the flight station ladder entrance.



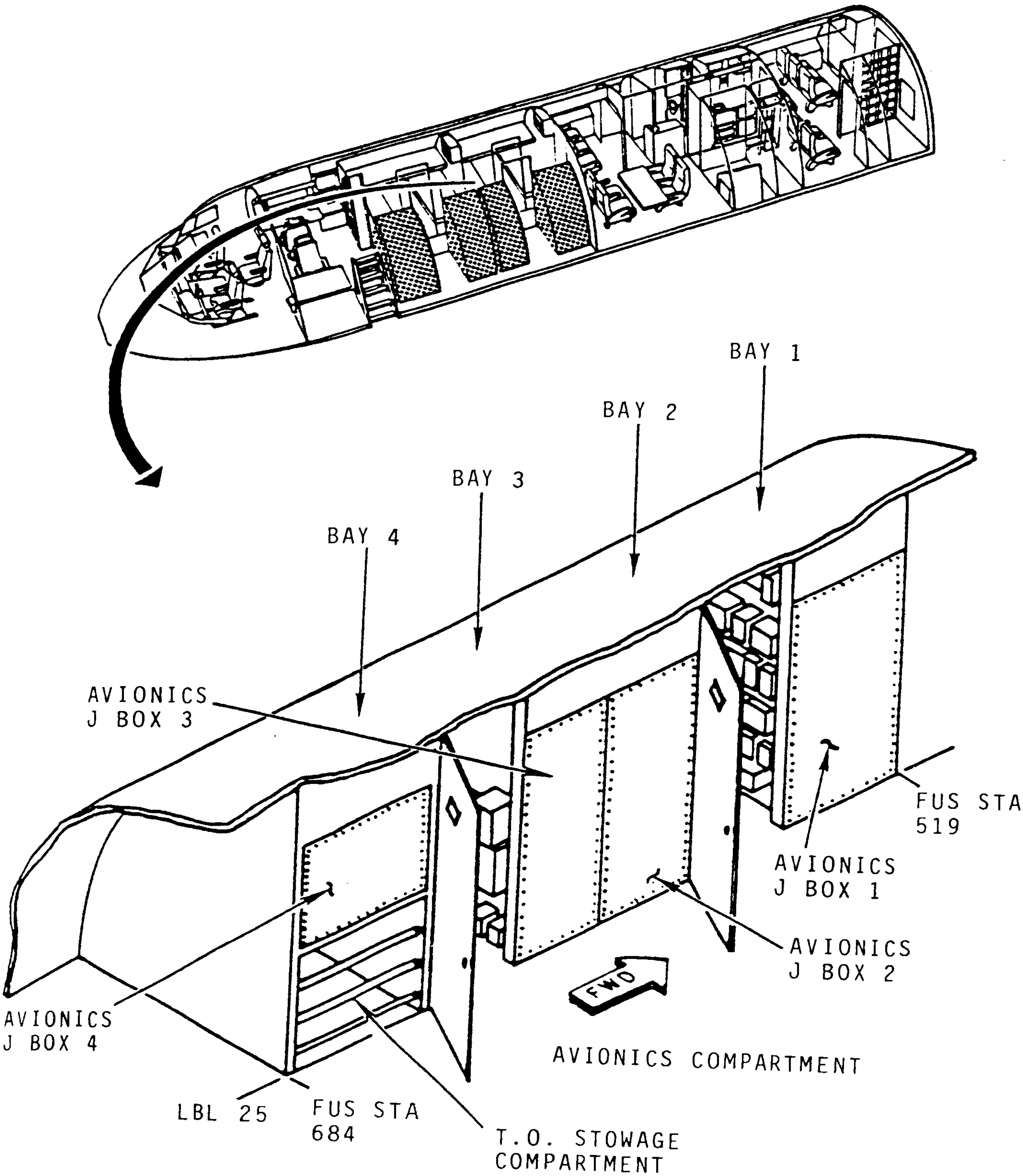
C-5A AVIONICS SYSTEMS



C-5B AVIONICS SYSTEMS



C-5A/B ANTENNA LOCATION



C-5A/B AVIONICS COMPARTMENT & JUNCTION BOXES

AUTOMATIC FLIGHT CONTROL SYSTEMS

The Automatic Flight Control Systems (AFCS) provide stall warning, go-around flight path guidance, wing lift distribution, stability augmentation, throttle control, assistance in moving the ailerons and elevator controls and autopilot flight path control. The C-5A/B AFCS systems are:

- Stallimiter (STL) (dual)
- Angle-of-attack System (AOA)
- Go-Around Attitude System (GAAS)
- Active Lift Distribution Control System (ALDCS)
- Stability Augmentation System (SAS)
- Automatic Throttle System (STS)
- Pilot Assist Cable Servos (PACS)
- Autopilot (A/P)

The dual stallimiter provides two stall warnings; the first is a control column shaker warning of an approach toward a stall condition and the second is an audible warning at actual stall entry.

The AOA system detects angle-of-attack and provides it for use by other systems.

The GAAS computes pitch attitude steering commands for go-around rotation and climbout and for take-off rotation and climbout. It also provides angle-of-attack for display to the pilots.

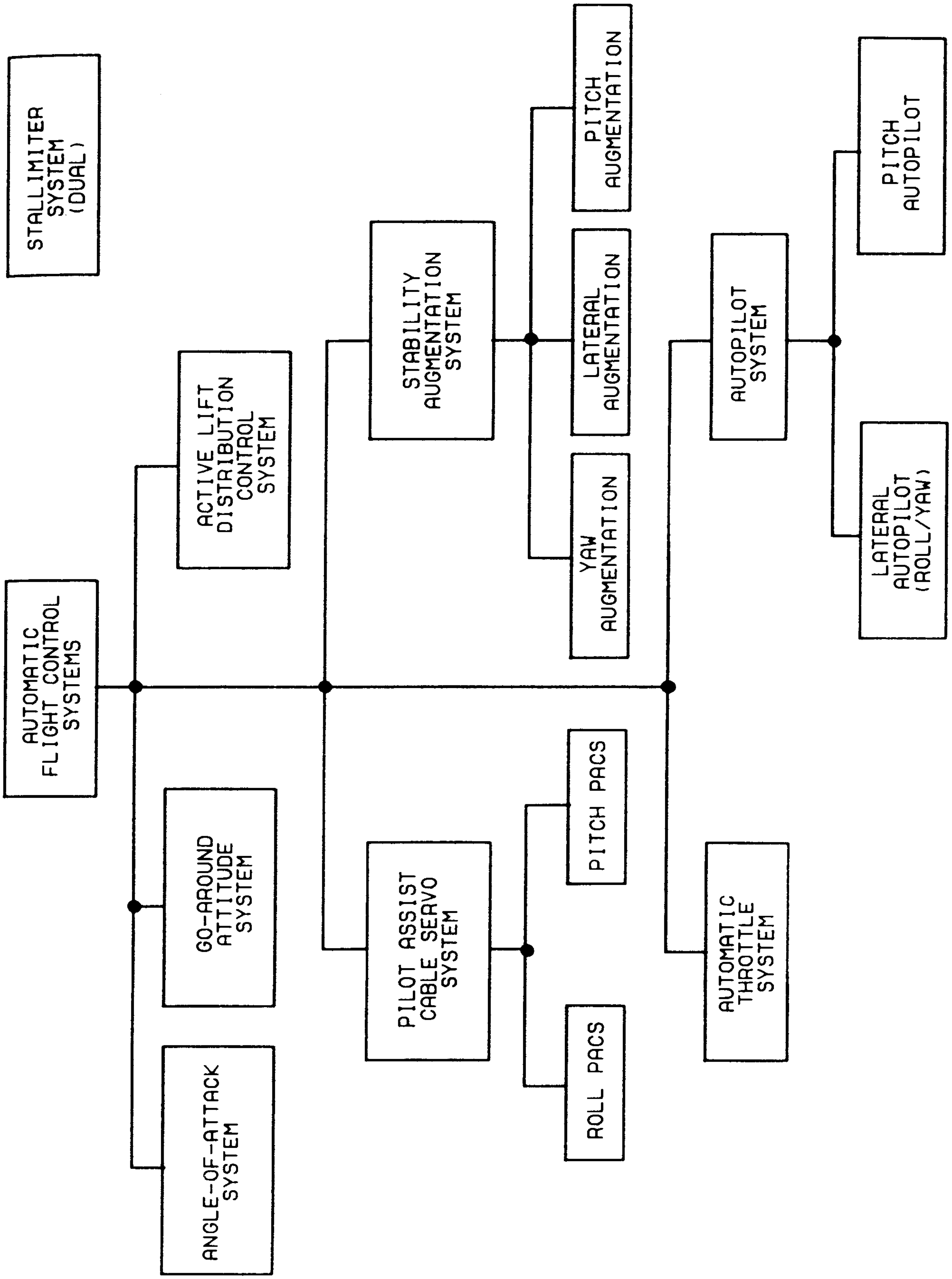
The ALDCS increases the fatigue life of the wings by reducing wing bending caused by maneuver and turbulence loads.

The SAS provides pitch, roll, and yaw rate damping and automatic turn coordination. It also provides aileron and inboard elevator control for the ALDCS, and rudder control for the A/P during autoland.

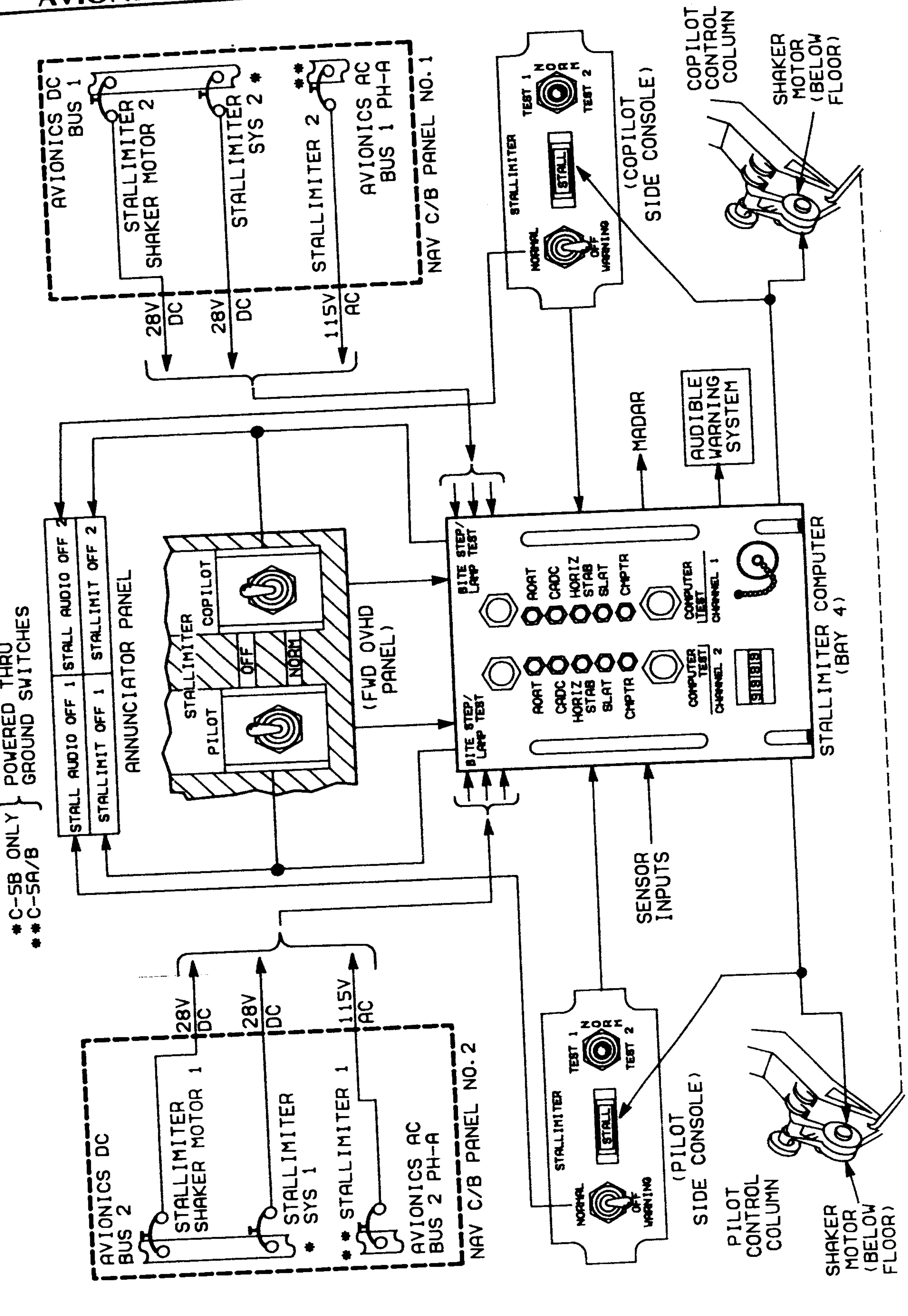
The ATS provides: speed control for climb, cruise and descent; throttle advance for go-around; and throttle retard for flare during A/P autoland.

Two PACS systems are provided; pitch PACS and roll PACS. They assist the pilots in moving the aileron and elevator control cable systems.

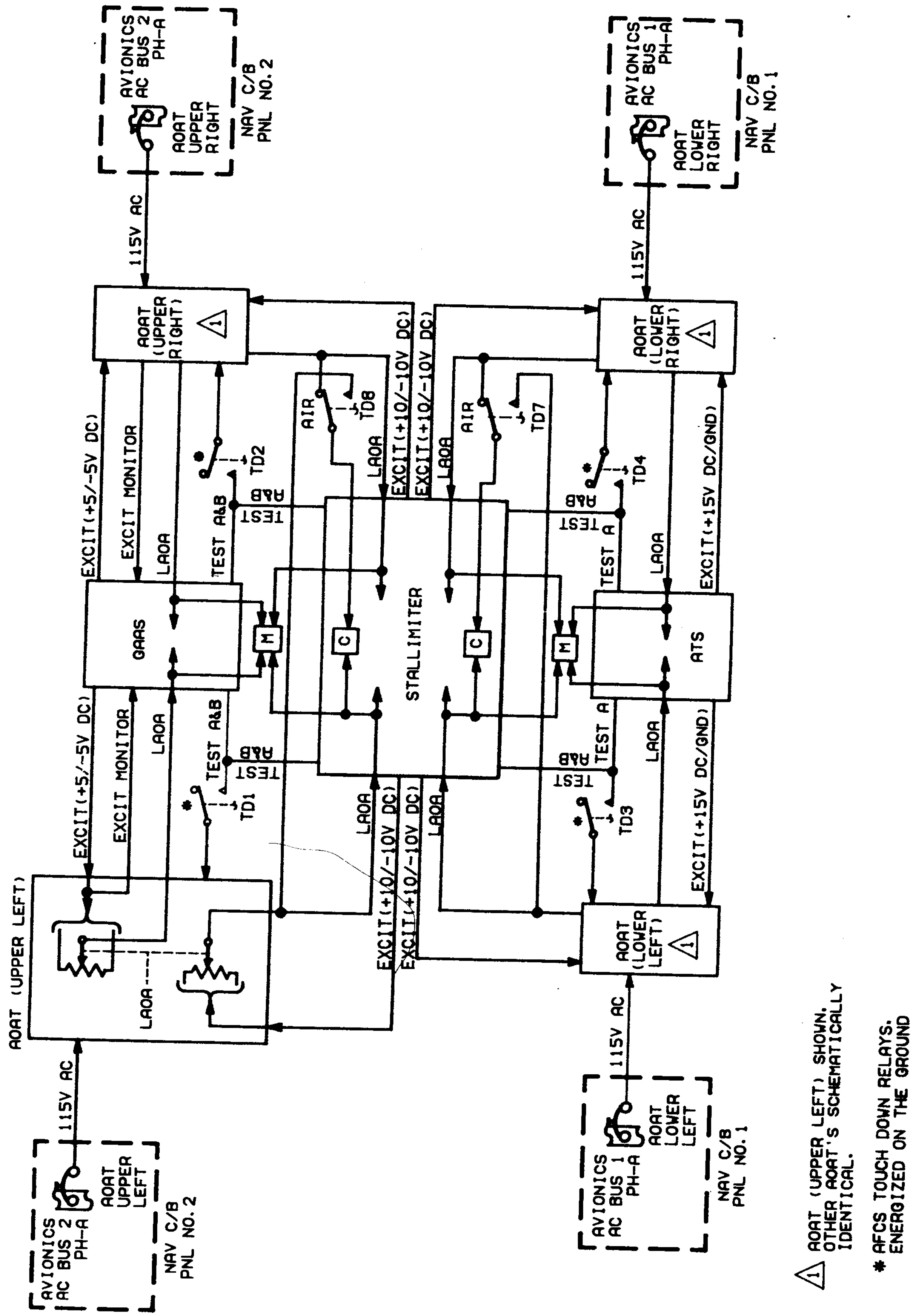
The A/P controls aircraft pitch and roll to provide flight path control of the aircraft during basic flight and enroute navigation. It controls aircraft pitch, roll and yaw during ILS approach, and automatic landing including flare and rollout.



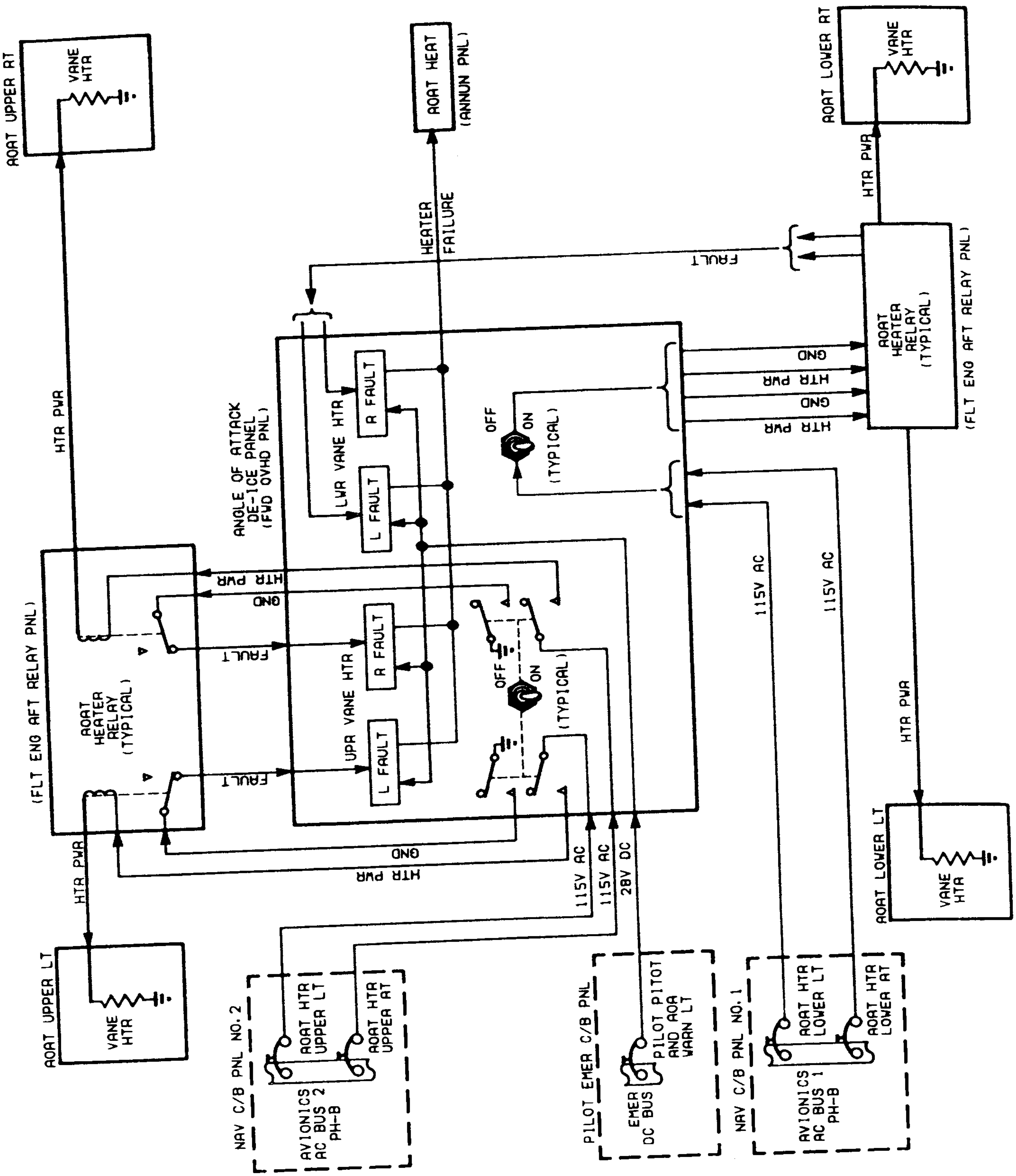
C-5A/B AUTOMATIC FLIGHT CONTROL SYSTEMS



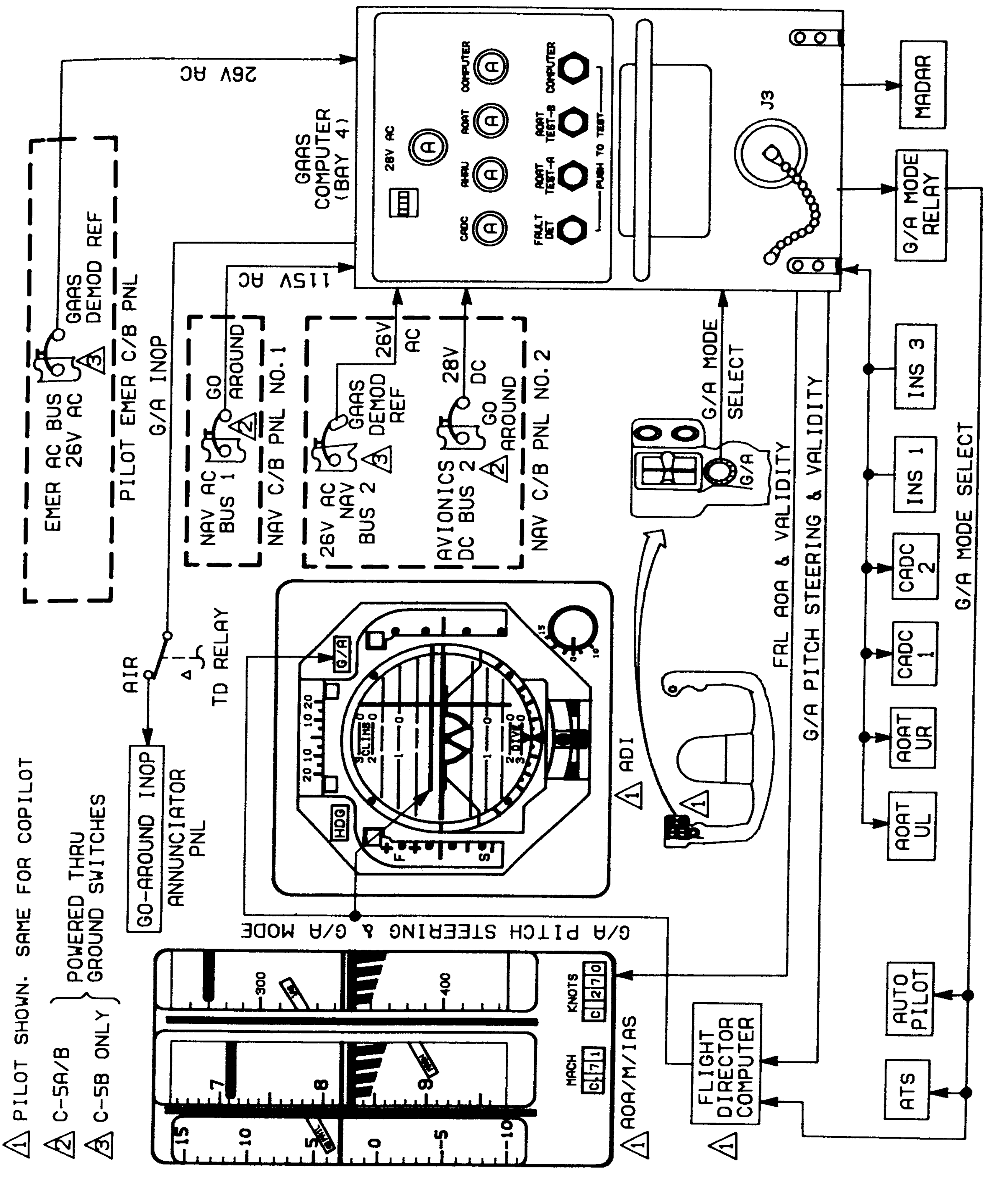
C-5A/B STALLIMITER FUNCTIONAL DIAGRAM



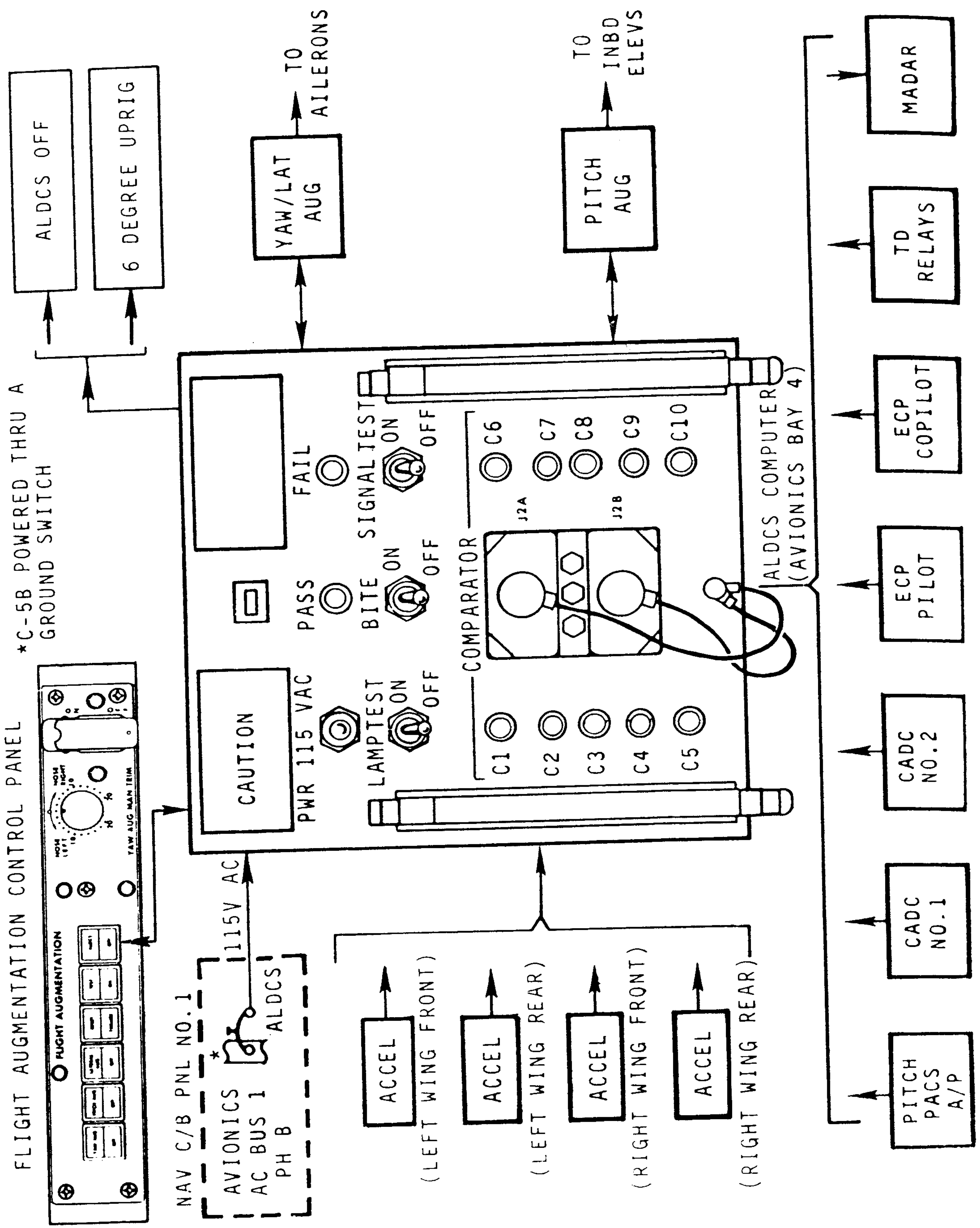
C-5A/B AOA INTERFACE DIAGRAM



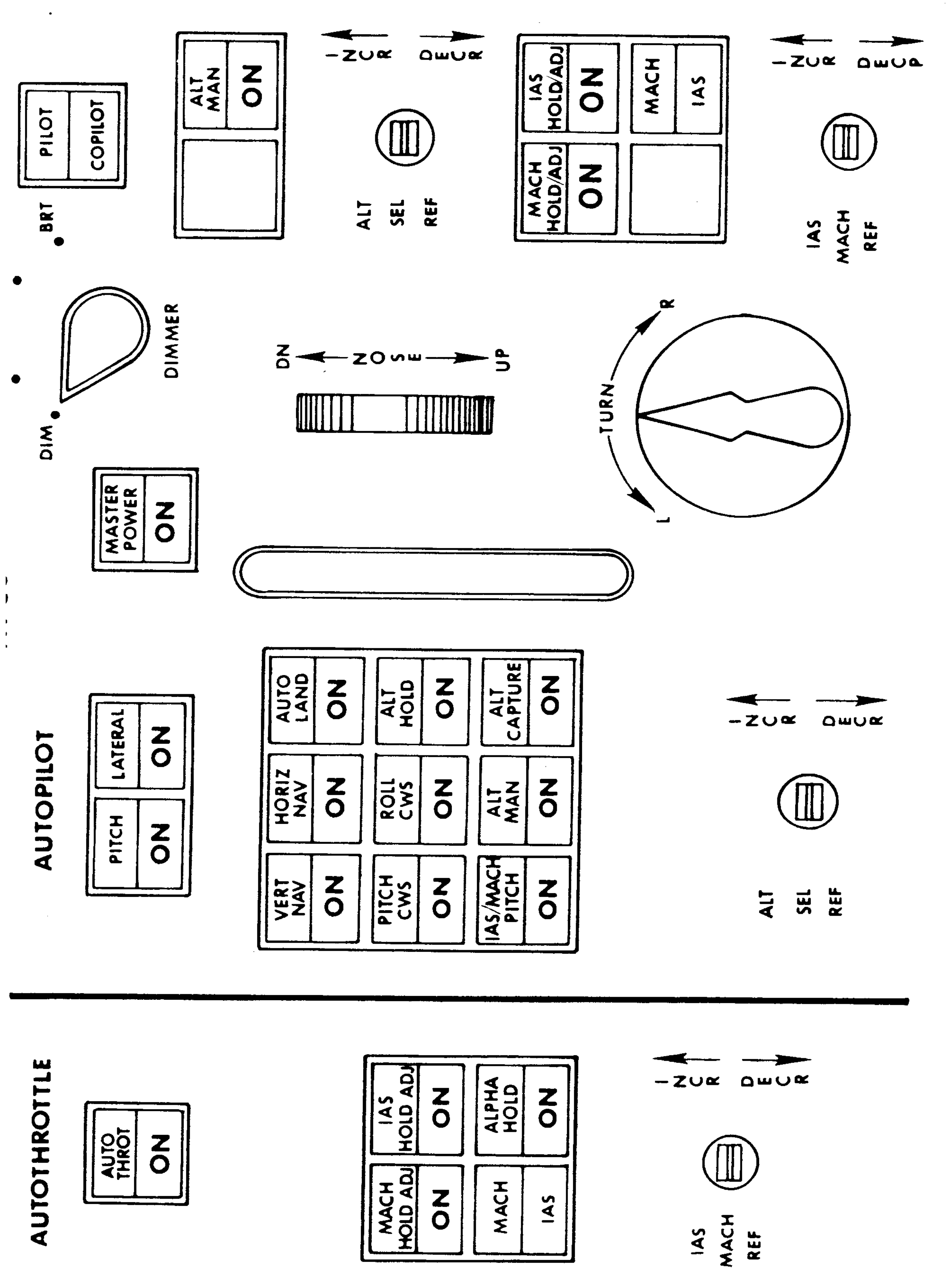
C-5A/B AOA DE-ICE DIAGRAM



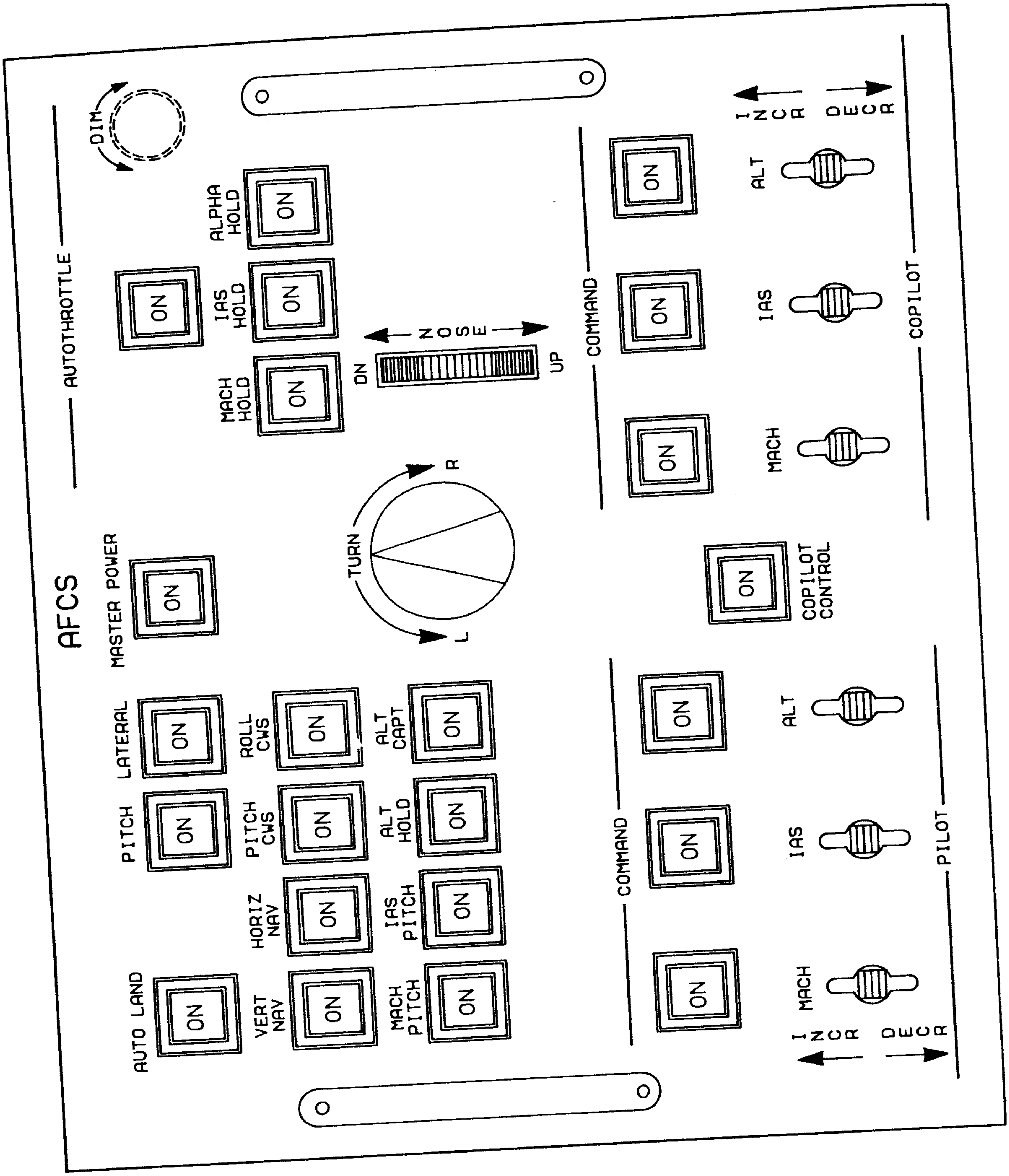
C-5A/B GAAS FUNCTIONAL DIAGRAM



C-5A/B ALDCS FUNCTIONAL DIAGRAM

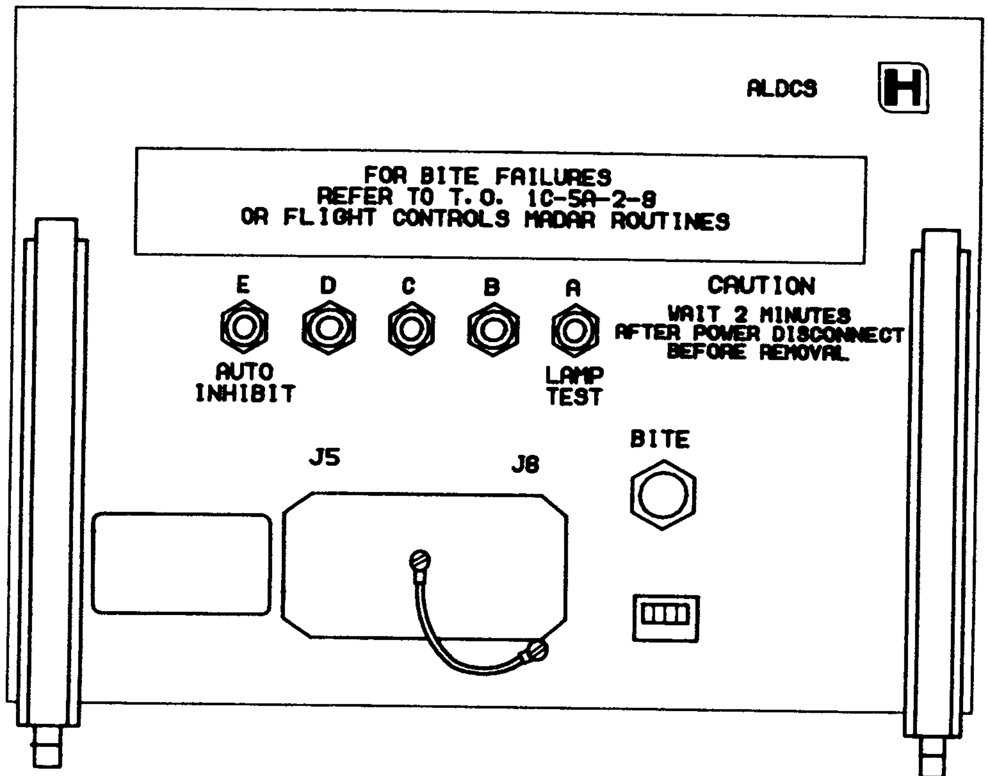


C-5A/B AFCS CONTROL PANEL (CG527C)

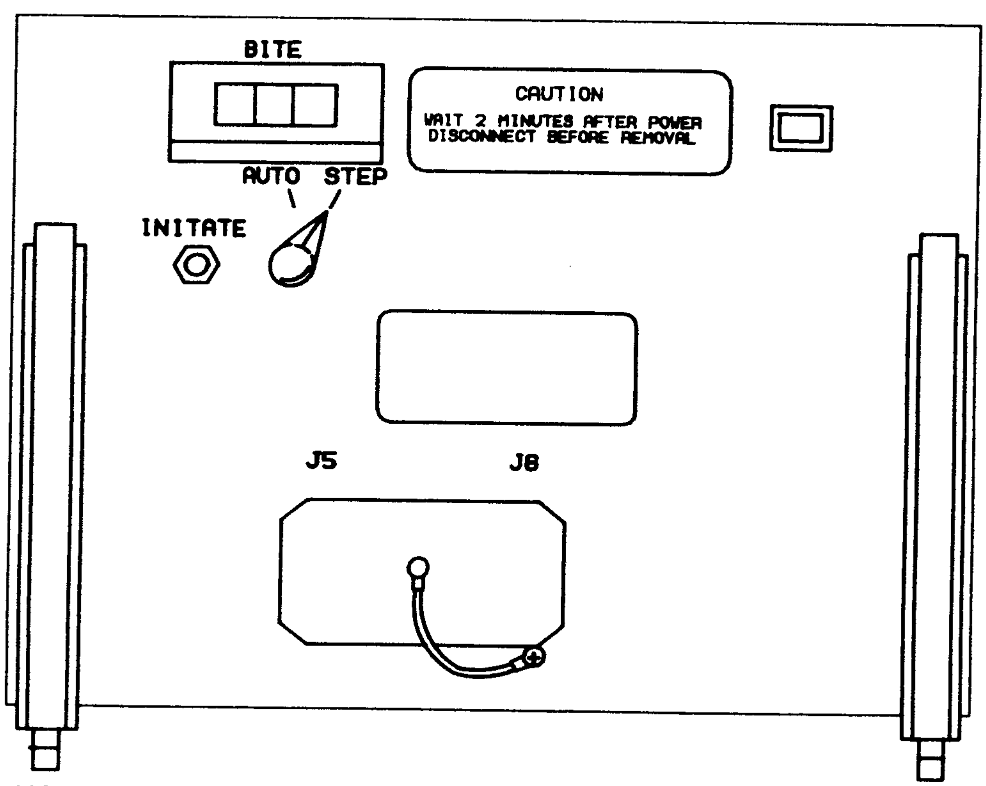


PREFERRED
SPARE

C-5A/B AFCS CONTROL PANEL (CG527D)



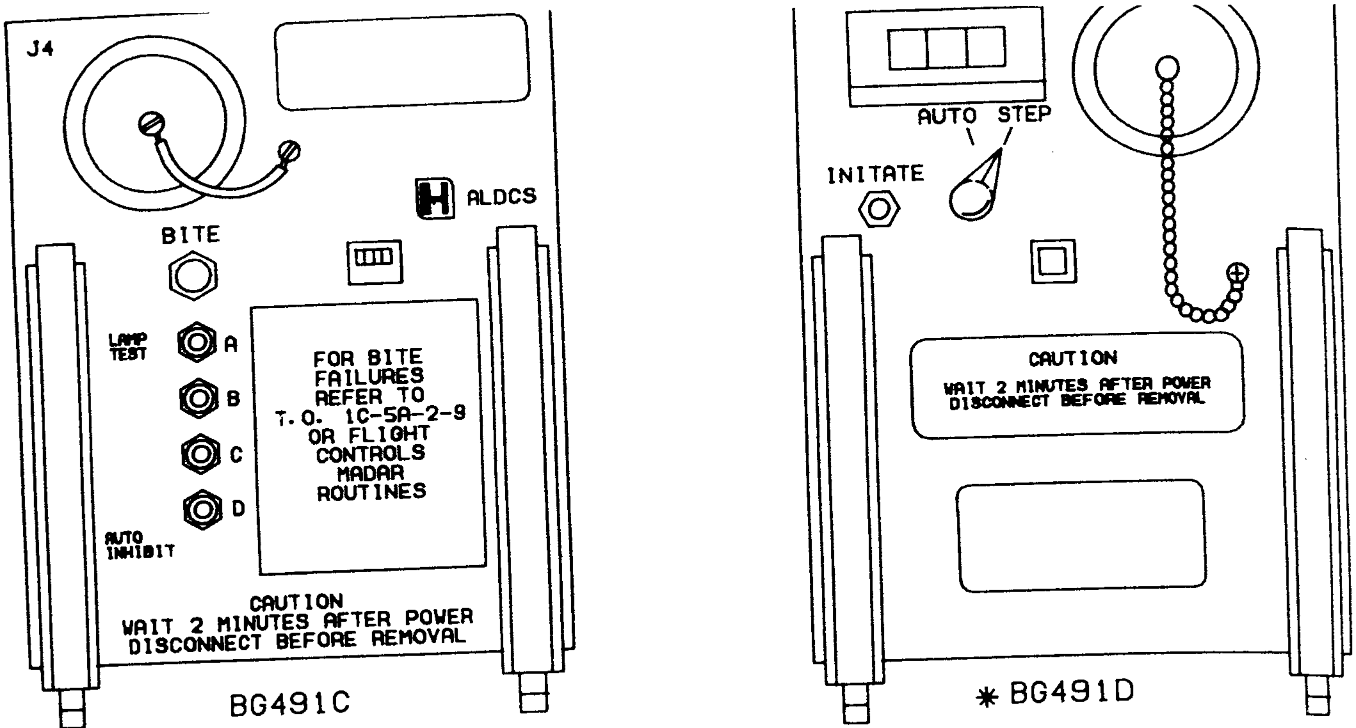
YAW/LATERAL AUGMENTATION COMPUTER (BG490C)



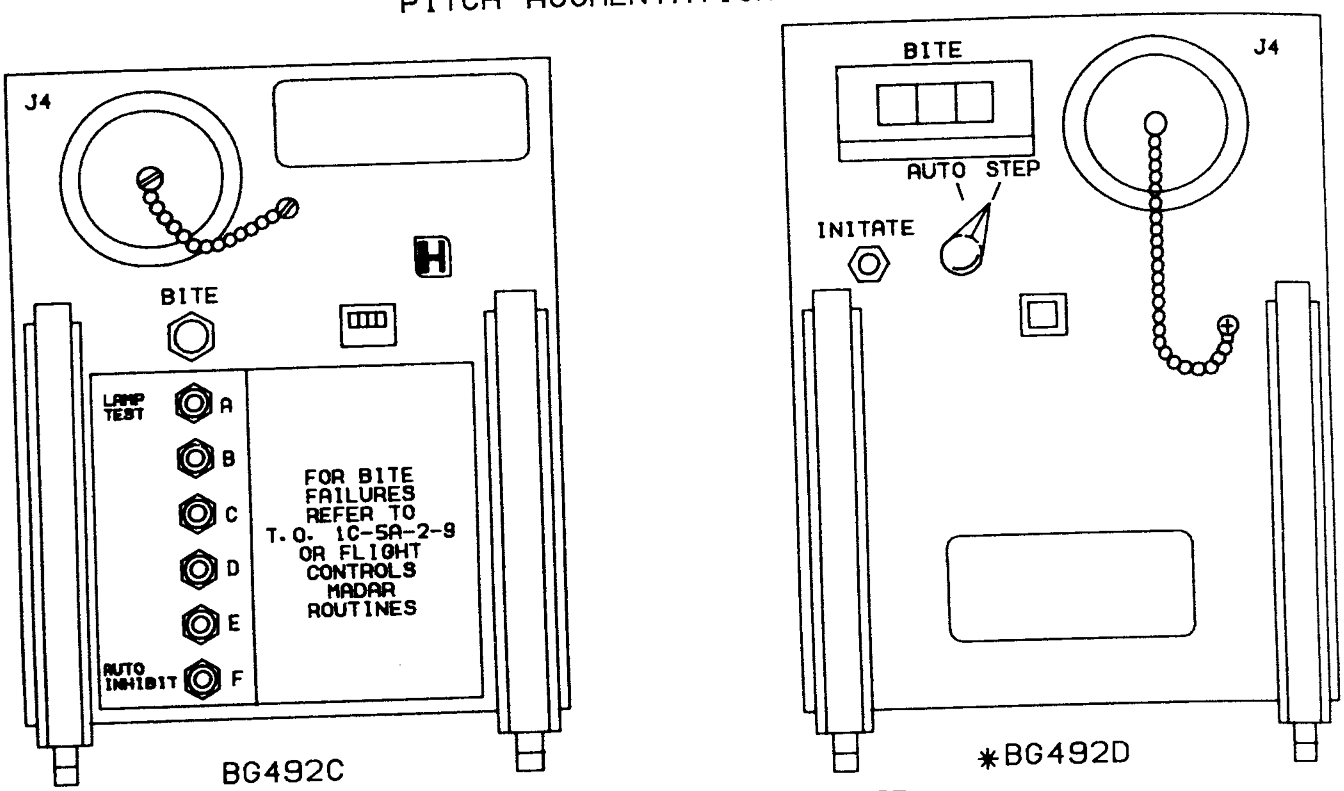
* PREFERRED
SPARE

* YAW/LATERAL AUGMENTATION COMPUTER (BG490D)

C-5A/B YAW/LATERAL AUGMENTATION COMPUTER



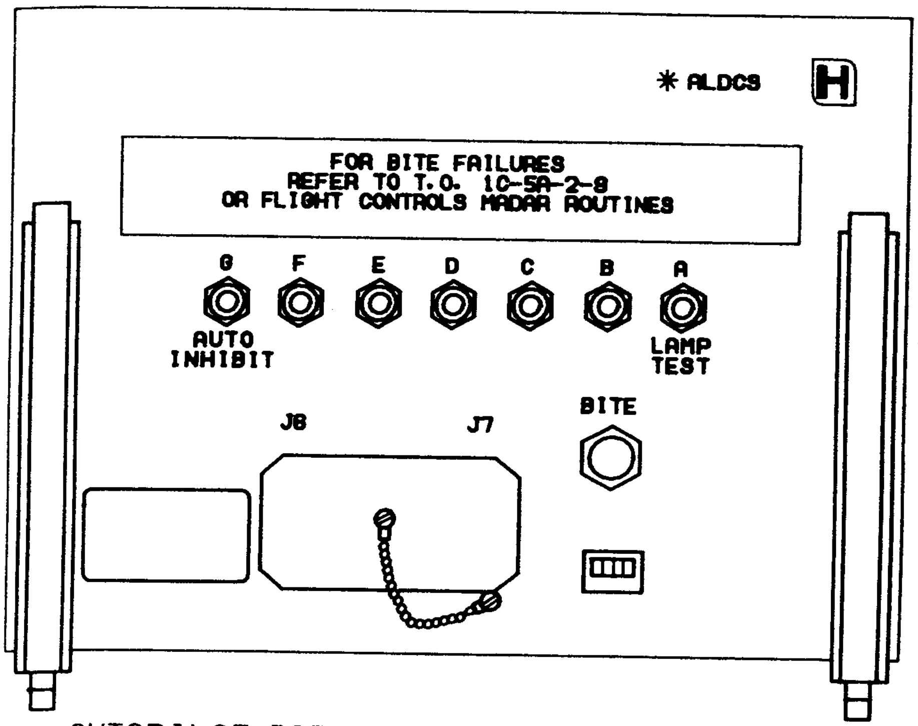
PITCH AUGMENTATION COMPUTER



AUTOTHROTTLE COMPUTER

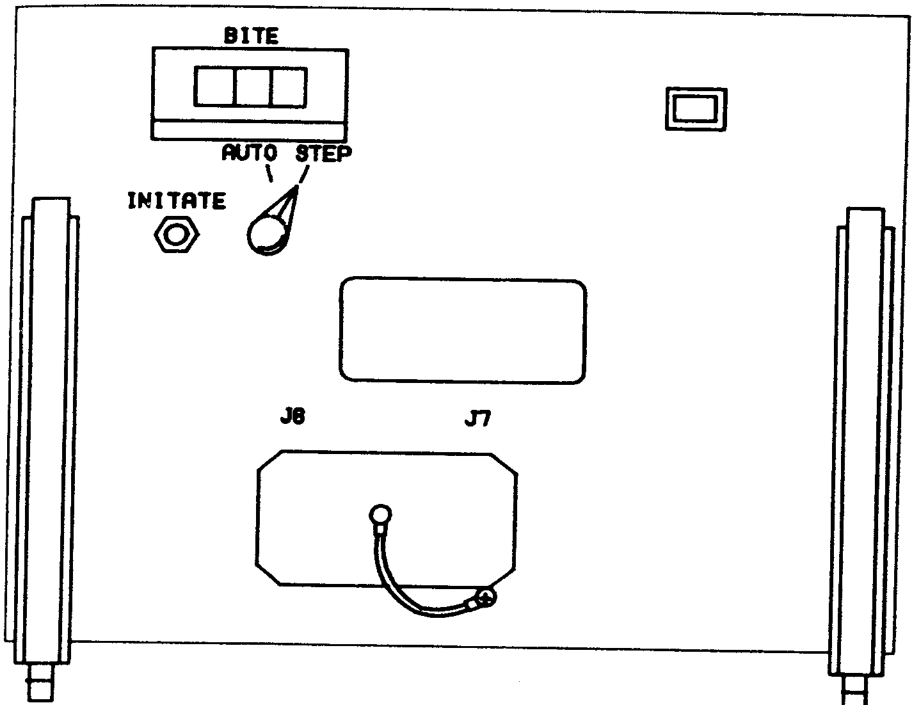
* PREFERRED SPARE

C-5A/B PITCH AUGMENTATION & AUTOTHROTTLE COMPUTERS



* ALDCS
NOT ON
BG488C

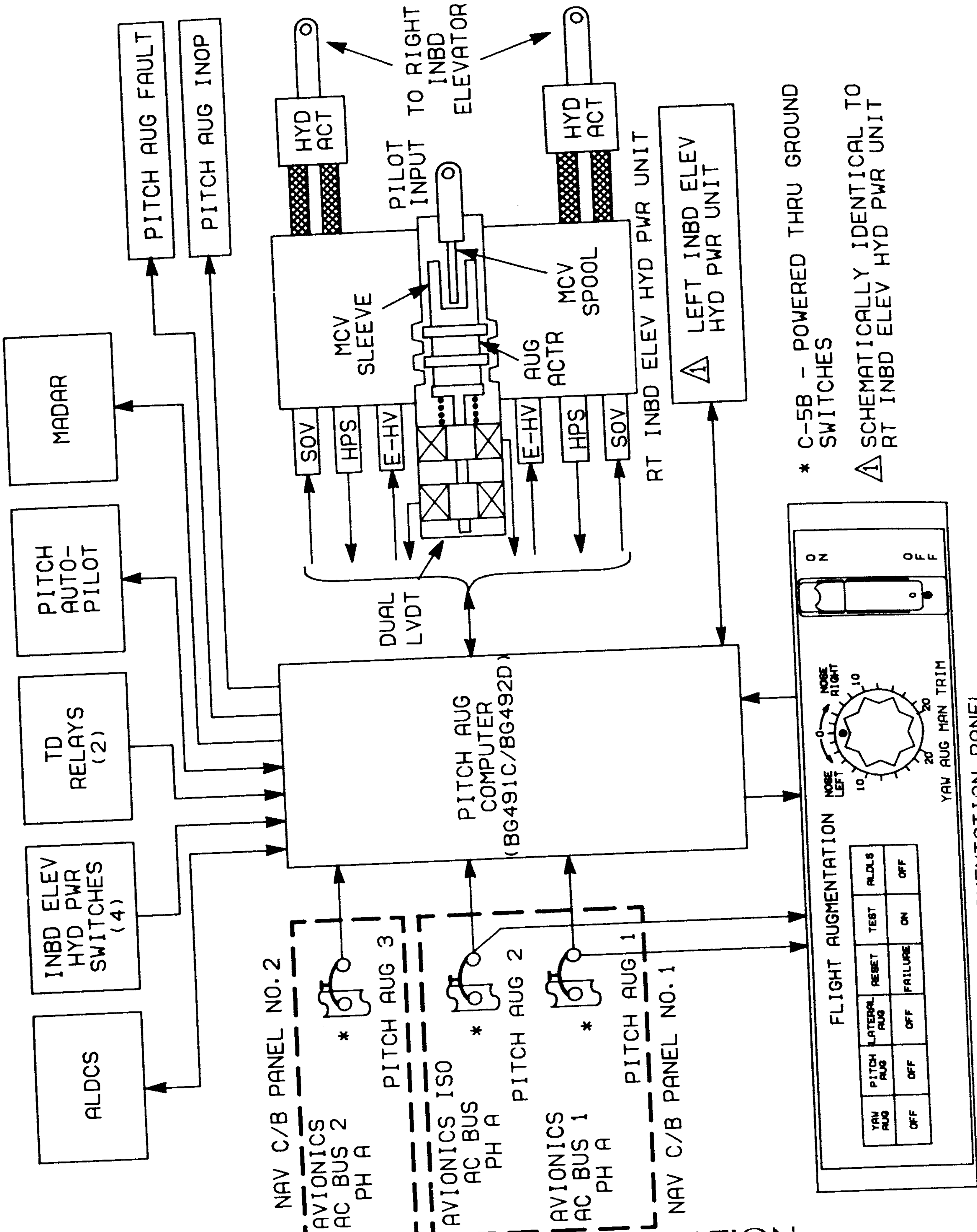
AUTOPILOT PITCH/PACS COMPUTER (BG489C)
OR
AUTOPILOT ROLL/YAW/PACS COMPUTER (BG488C)



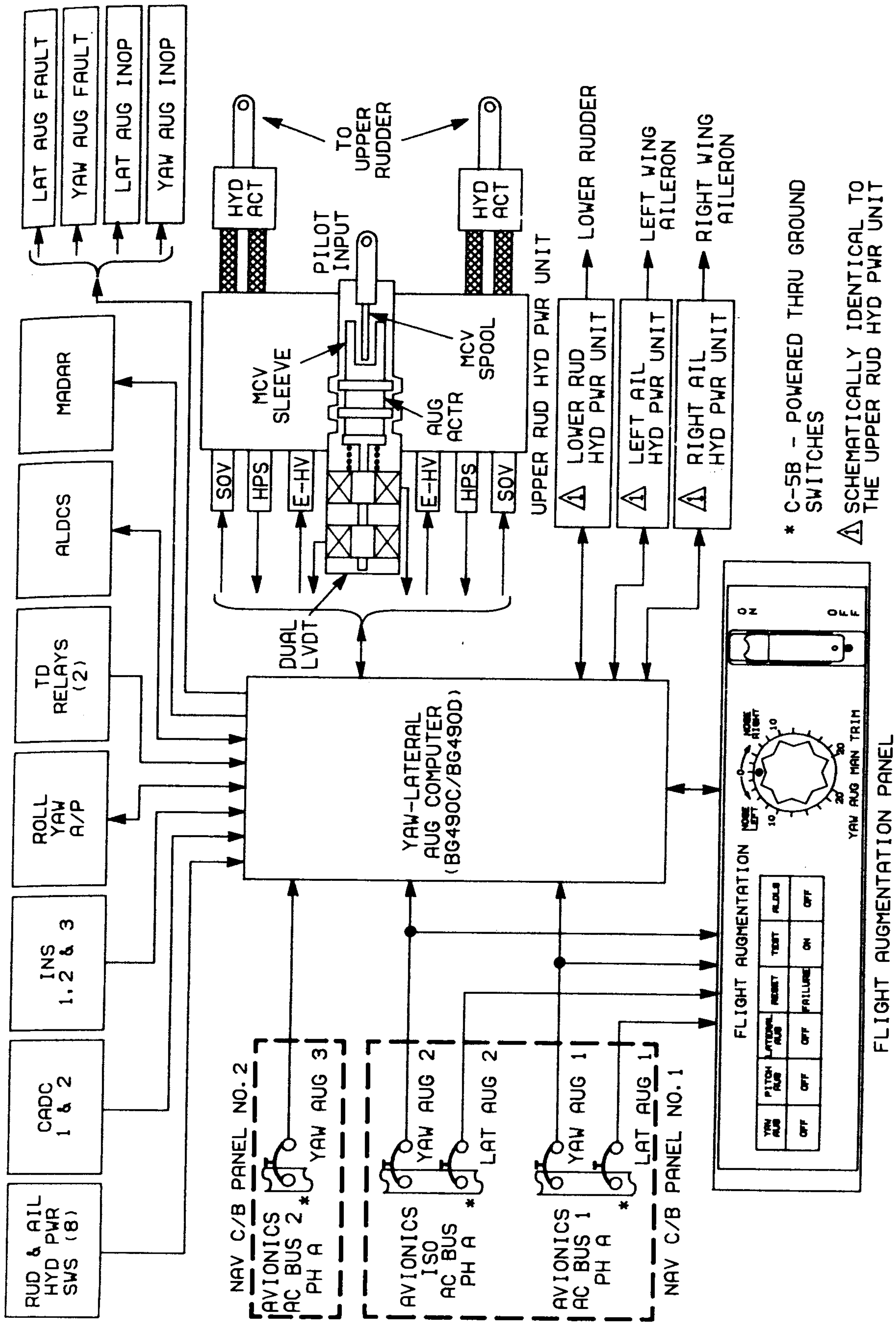
** PREFERRED
SPARE

** AUTOPILOT PITCH/PACS COMPUTER (BG489D)
OR
** AUTOPILOT ROLL/YAW/PACS COMPUTER (BG488D)

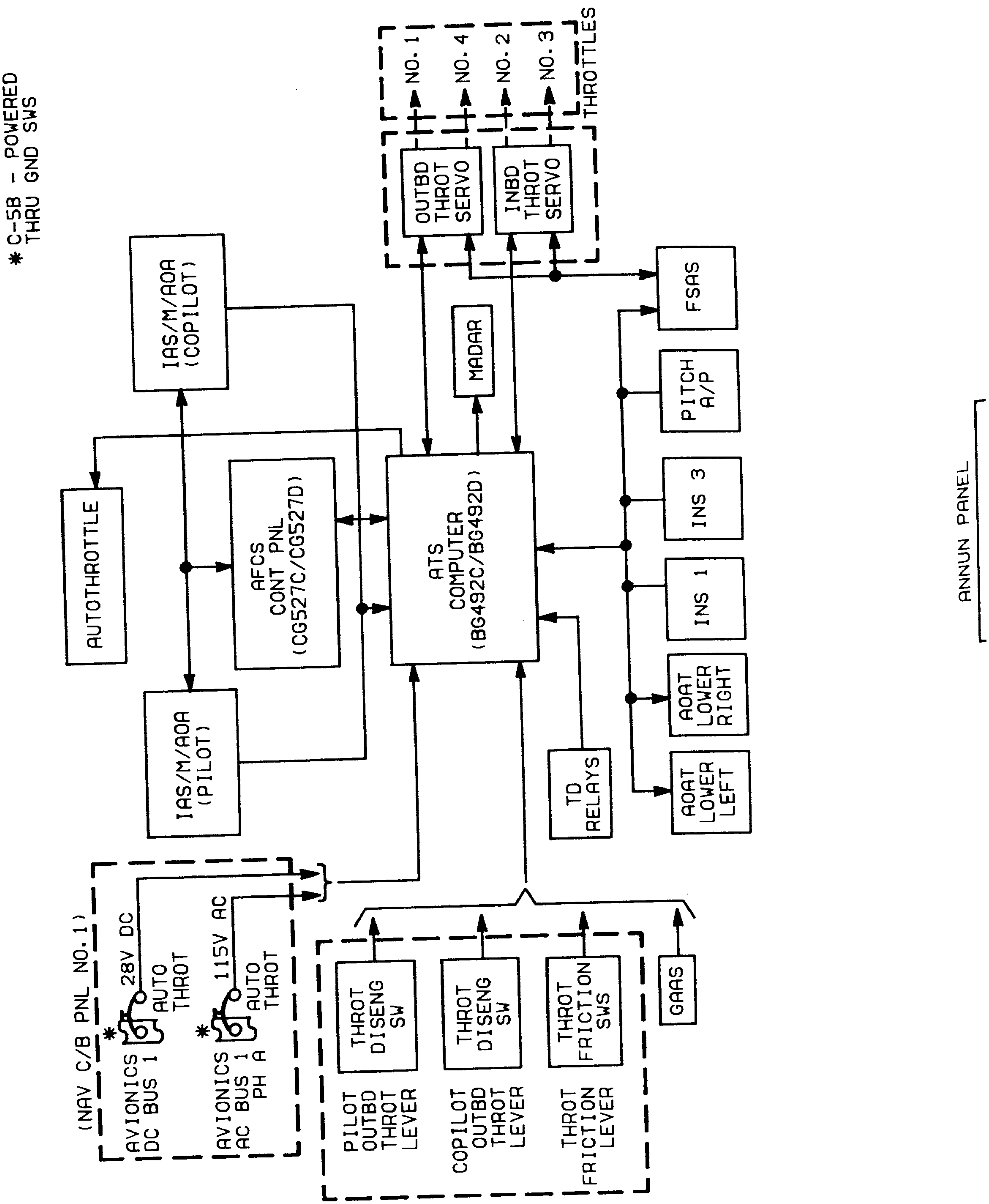
C-5A/B AUTOPILOT/PACS COMPUTERS



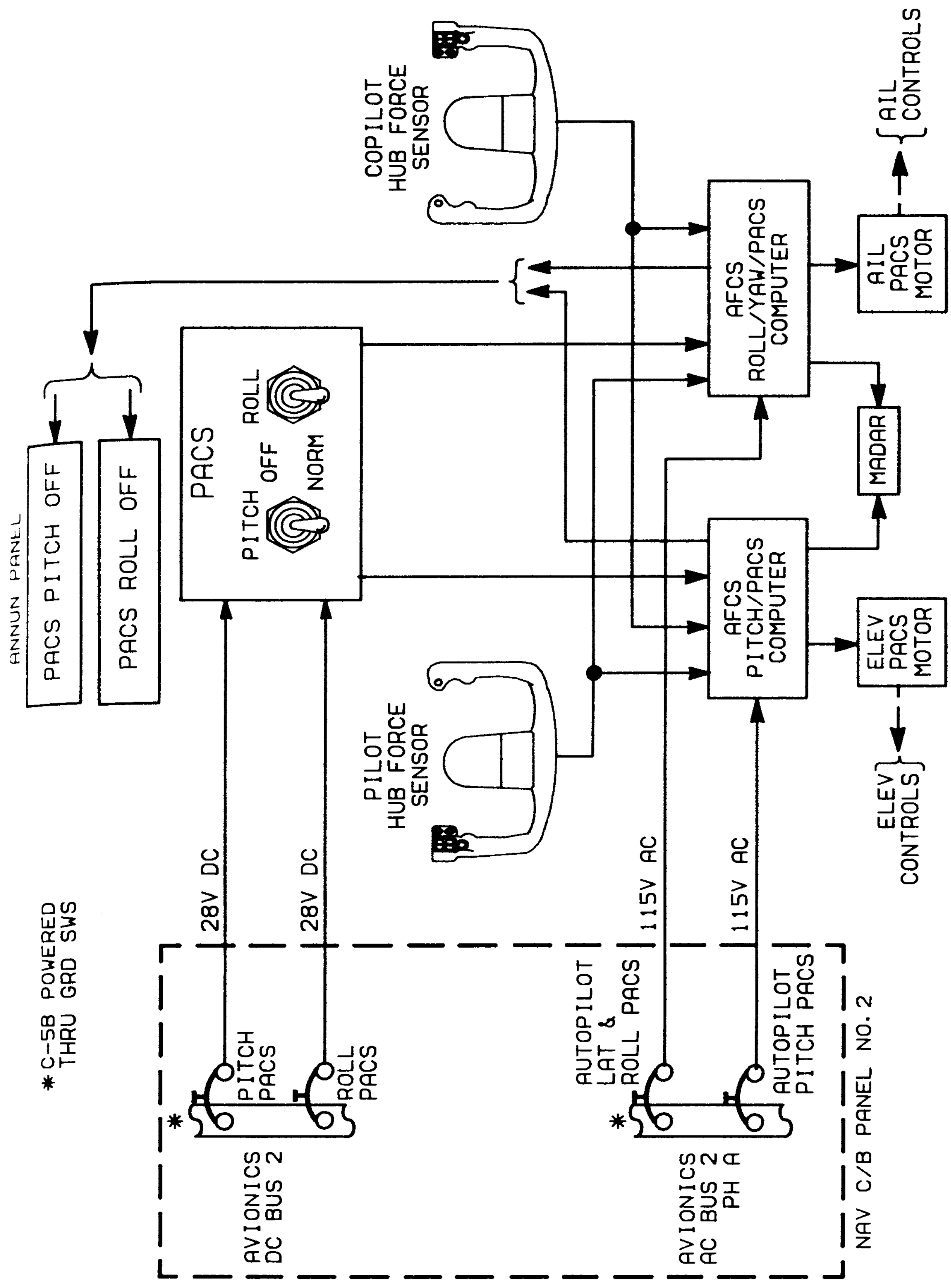
C-5A/B PITCH AUGMENTATION FUNCTIONAL DIAGRAM



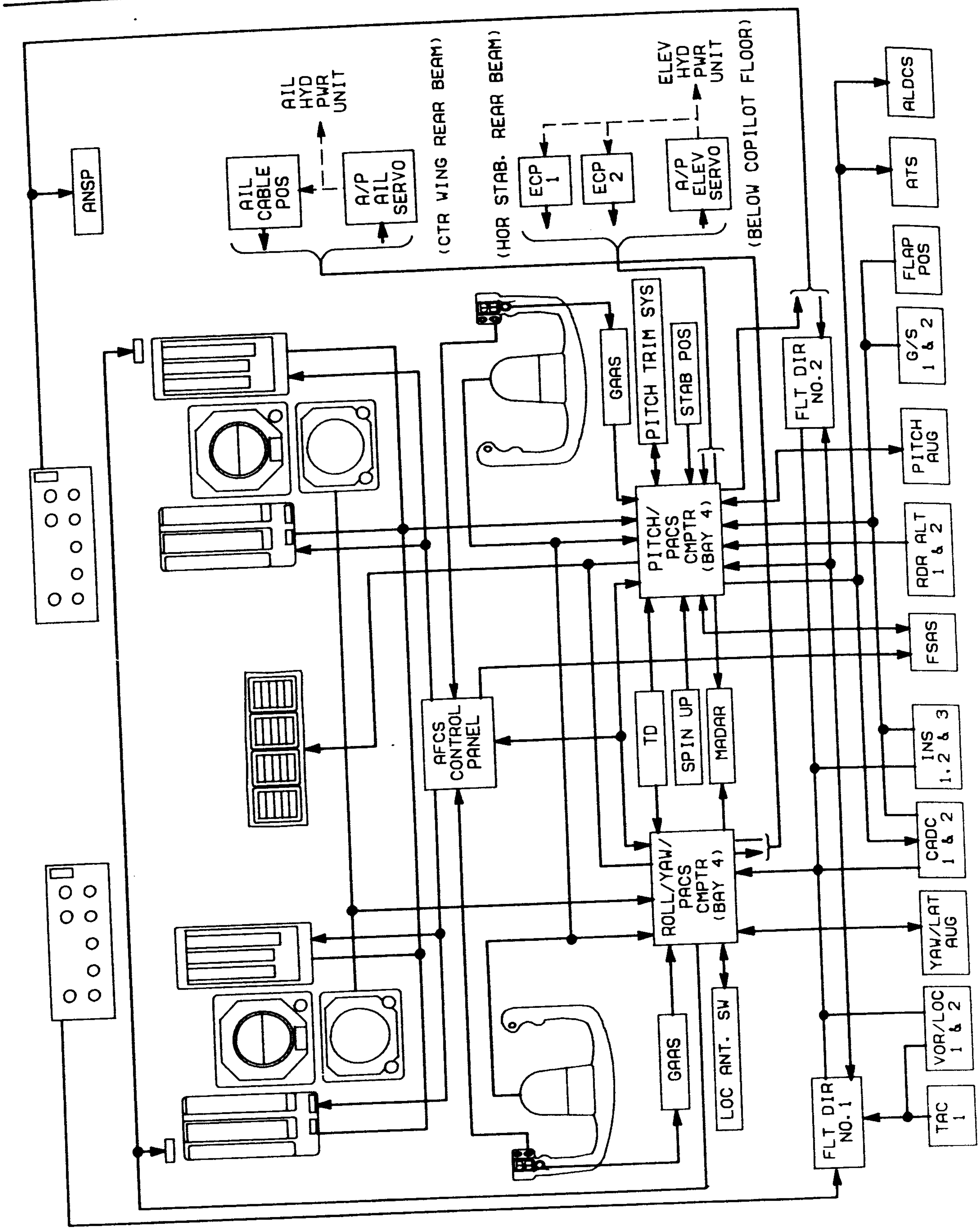
C-5A/B YAW-LATERAL AUGMENTATION FUNCTIONAL DIAGRAM



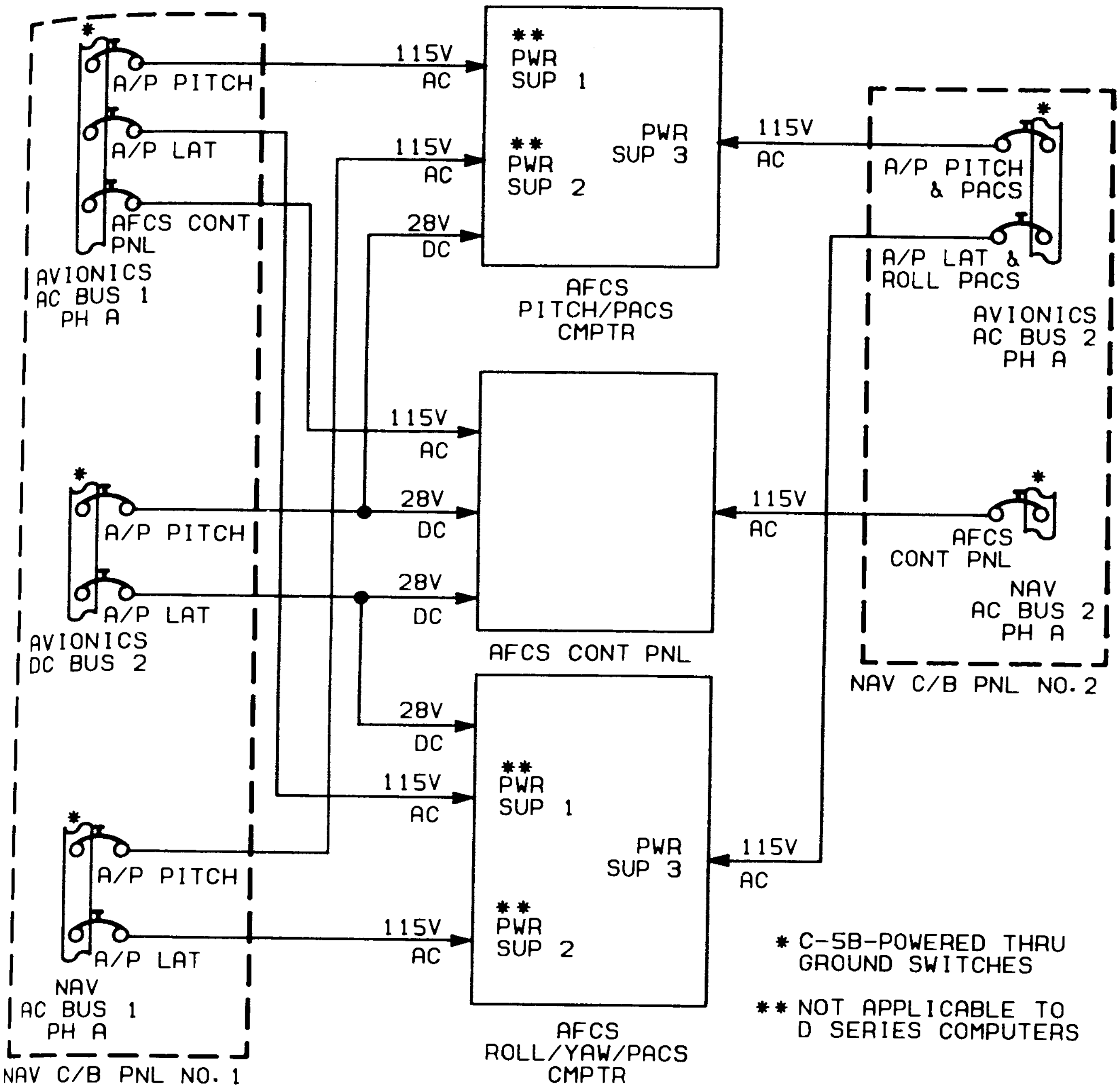
C-5A/B ATS FUNCTIONAL DIAGRAM



C-5A/B PACS FUNCTIONAL DIAGRAM



C-5A/B AUTOPILOT FUNCTIONAL DIAGRAM



C-5A/B AUTOPILOT POWER DISTRIBUTION

Bank Command/Attitude Limits: (From 0° Reference)

NO LIMITS	45° LIMITS	33° LIMITS	27° LIMITS	7.5 LIMITS
Rate CWS	Attitude Hold	Turn Knob	Hdg Hold	VOR Track
* Coupled CWS			Hdg Select	TACAN Track
			Intercept Hdg	LOC Track and GS Capture
			VOR Capture	
			Over station	
			I-NAV (Track Steer)	
			LOC Capture	
			LOC Track and Not G/S Capture	

*Coupled CWS not provided in the D series computer.

Pitch Command Limits: (From variable reference which changes with speed, CG, Flap Position, etc.)

NO LIMITS	45° LIMITS	30° LIMITS	15° LIMITS	APPROACH LIMITS
Rate CWS	Att Hold	Altitude Hold	Nose Up-Down Control	ILS Glideslope (+10°, -3.5°)
		Altitude Capture Round-Out		Flare (+10°, -1°)
		I AS Hold/AD		
		Mach Hold/ADJ		
		Coupled CWS		

AUTOPILOT BANK & PITCH

Capture and Track Deviation Switching Levels

Mode	Capture	*Track
VOR	1 Dot (5°)	1/4 Dot
TACAN	1 Dot (5°)	1/4 Dot
LOCALIZER	Slightly Less Than 2 Dots	Approx. Equal to 2/3 Dot
I-NAV	4 1/2 NM(3 NM = 2 Dots)	Slightly Less than 1/3 Dot

OVERSTATION SWITCHING: Beam deviation rate greater than 9.4 mv (0.63°)/second. Overstation operation is retained until 30 seconds after the deviation signal stabilizer.

*NOTE: Track switching also requires that bank angle be less than 2°.

A/P Override Forces

LATERAL: 40 lbs.

Pitch: 50 lbs.

Miscellaneous

Flaps lowered to approach position from full up give 10° nose down elevator command.

Flaps lowered to full down position from approach position gives 2.5° additional nose down elevator command.

LOC Antenna switching (tail to nose): LOC TRK and less than 40° course error.

Automatic Stabilizer Trim Activation Threshold

.5° elevator deflection at less than 240 knots

.5° elevator deflection at greater than 240 knots

AUTOPILOT SUBMODE SWITCHING LEVELS & PARAMETERS

INSTRUMENTS

The instrument systems provide basic flight data displays, lateral and vertical guidance, air data, engine and aircraft systems operation and performance data displays, landing gear positioning for crosswind takeoff and landing (C-5A only), castering during taxi, and ground proximity warning. The instrument systems are:

C-5A	C-5B
o Flight Director System (FDS) (2)	o FDS (2)
o Central Air Data Computer (CADC) (2)	o Standard CADC (SCADC) (2)
o Flight Instruments	o Flight Instruments
o Engine Instruments	o Engine Instruments
o Aircraft System Instruments	o Aircraft System Instruments
o Crosswind positioning and Castering System	o Caster/Power Back System
o Ground Proximity Warning System (GPWS, FPC-75)	o GPWS (MARK II)

The FDS systems display basic flight data, navigational information, and computed vertical and lateral steering information for enroute and terminal flying.

The CADCs (C-5A) and SCADCs (C-5B) provide basic air data such as altitude, airspeed, etc., for display on Vertical Scale Flight Instruments (VSFIs) and for use by other aircraft systems.

Flight instruments provide additional basic flight data and standby flight data to the four flight crew stations.

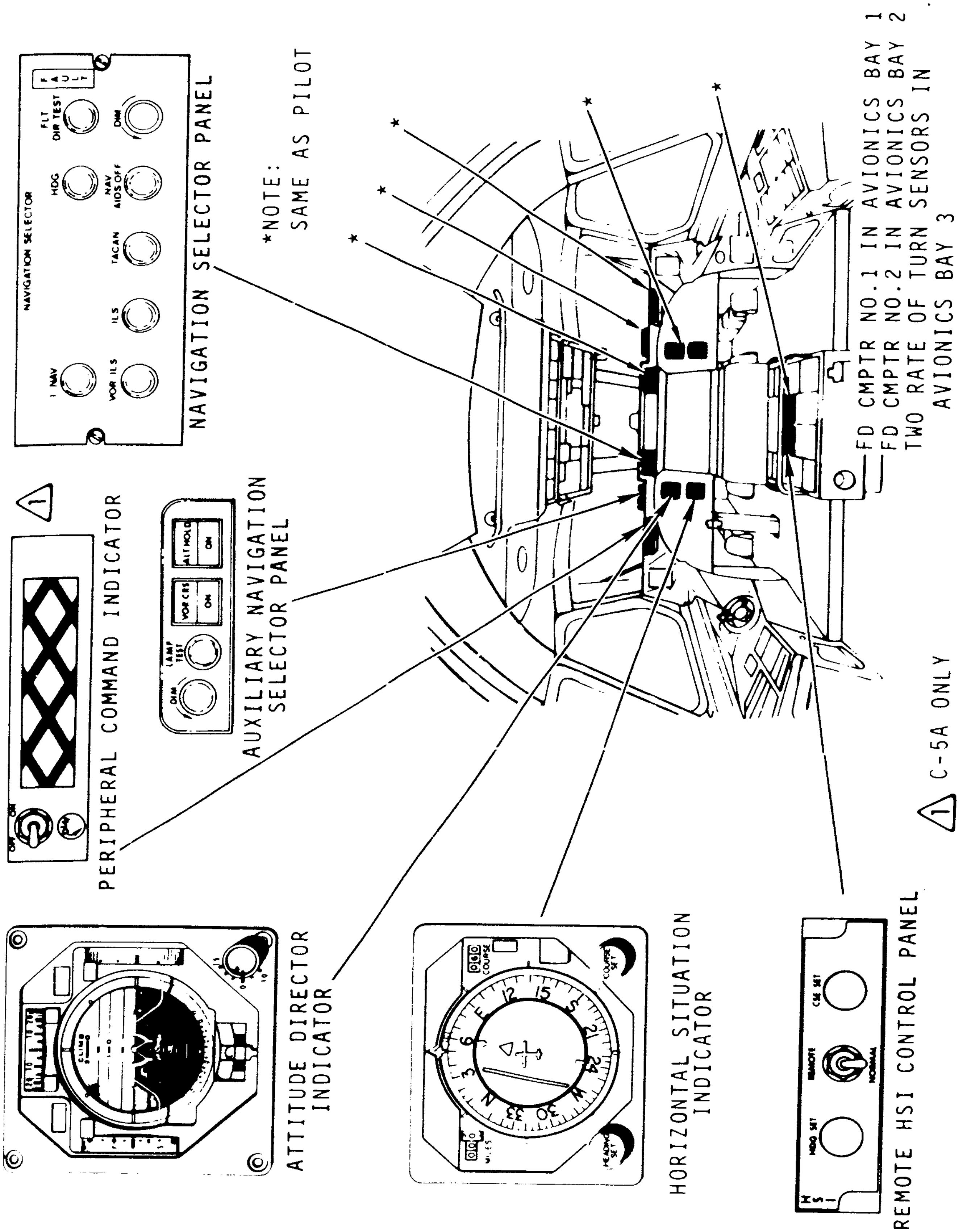
Engine instruments provide engine performance information and other related data.

Aircraft system instruments provide performance and operating condition of aircraft systems, such as, hydraulic, electrical, oxygen, fuel, environmental and movable air foil surfaces.

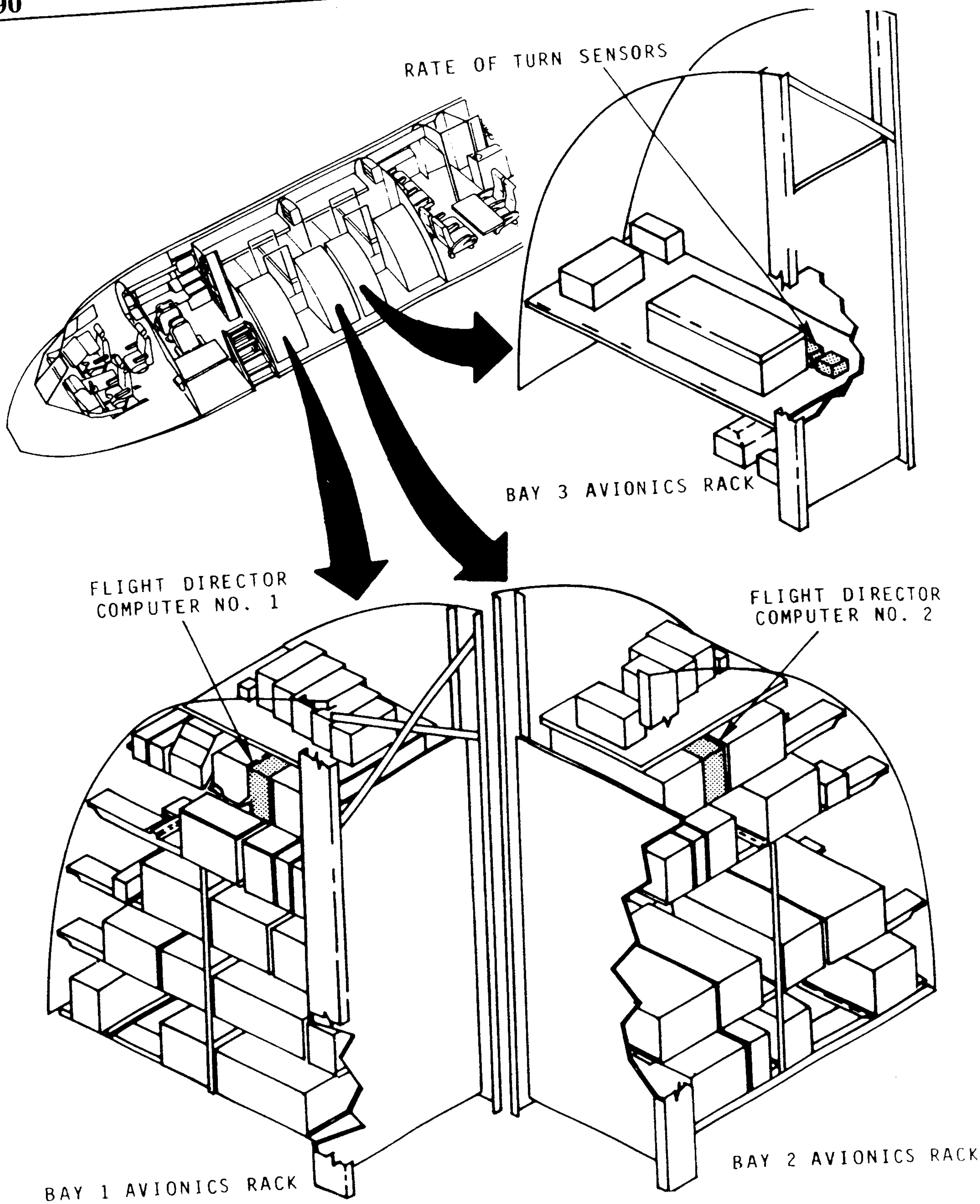
On the C-5A, the crosswind positioning and castering system provides prepositioning of the Nose Landing Gear (NLG) and Main Landing Gear (MLG) for alignment with the runway for take-off and landing whenever the airplane heading must assume an angle to compensate for crosswind. It also allows the aft MLG to caster during taxi operation.

On the C-5B, the caster/power back system provides castering and straight ahead positioning of the aft MLG only.

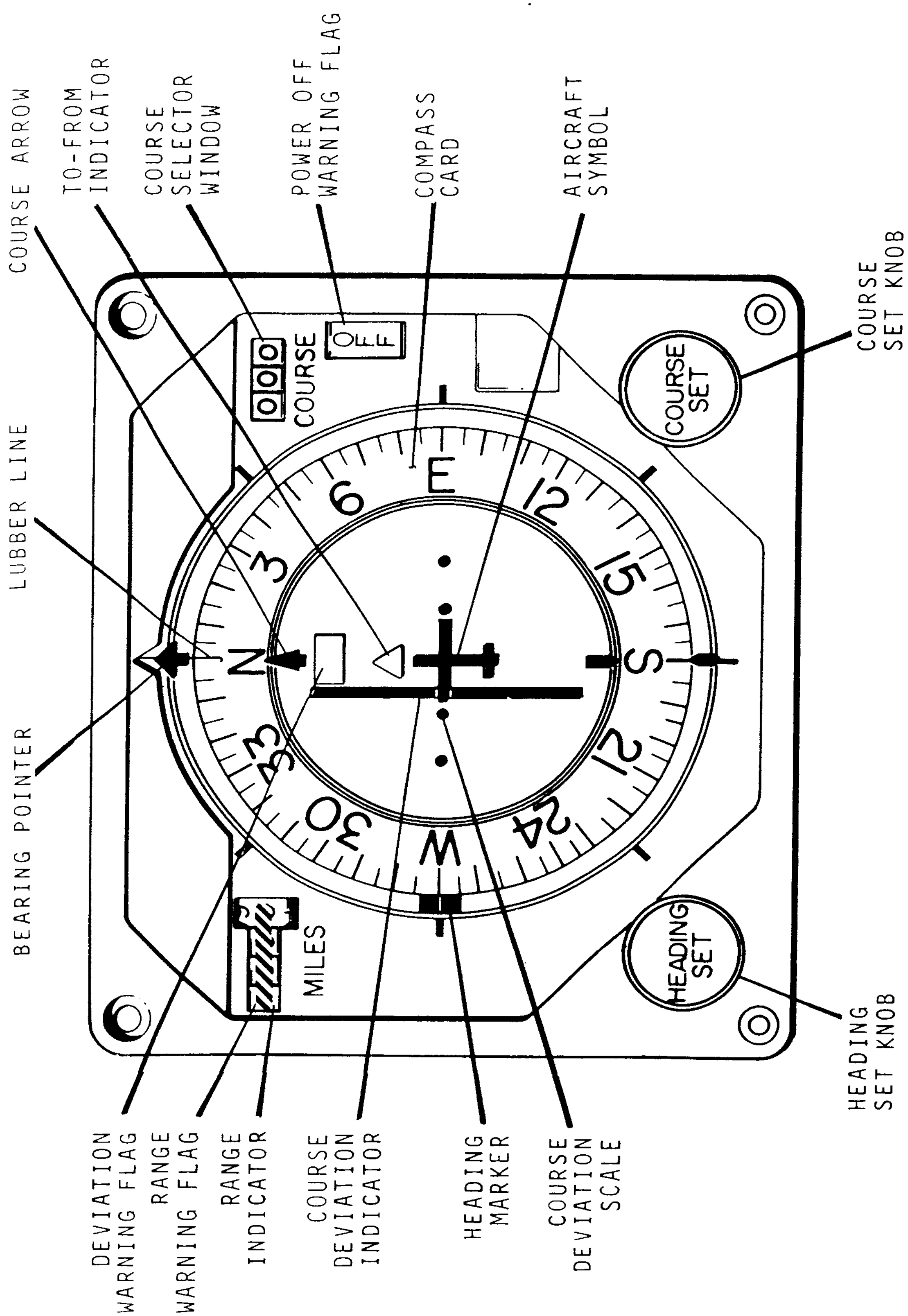
The GPWS provides the pilots with visual and voice warnings of potentially dangerous flight paths with respect to the ground.



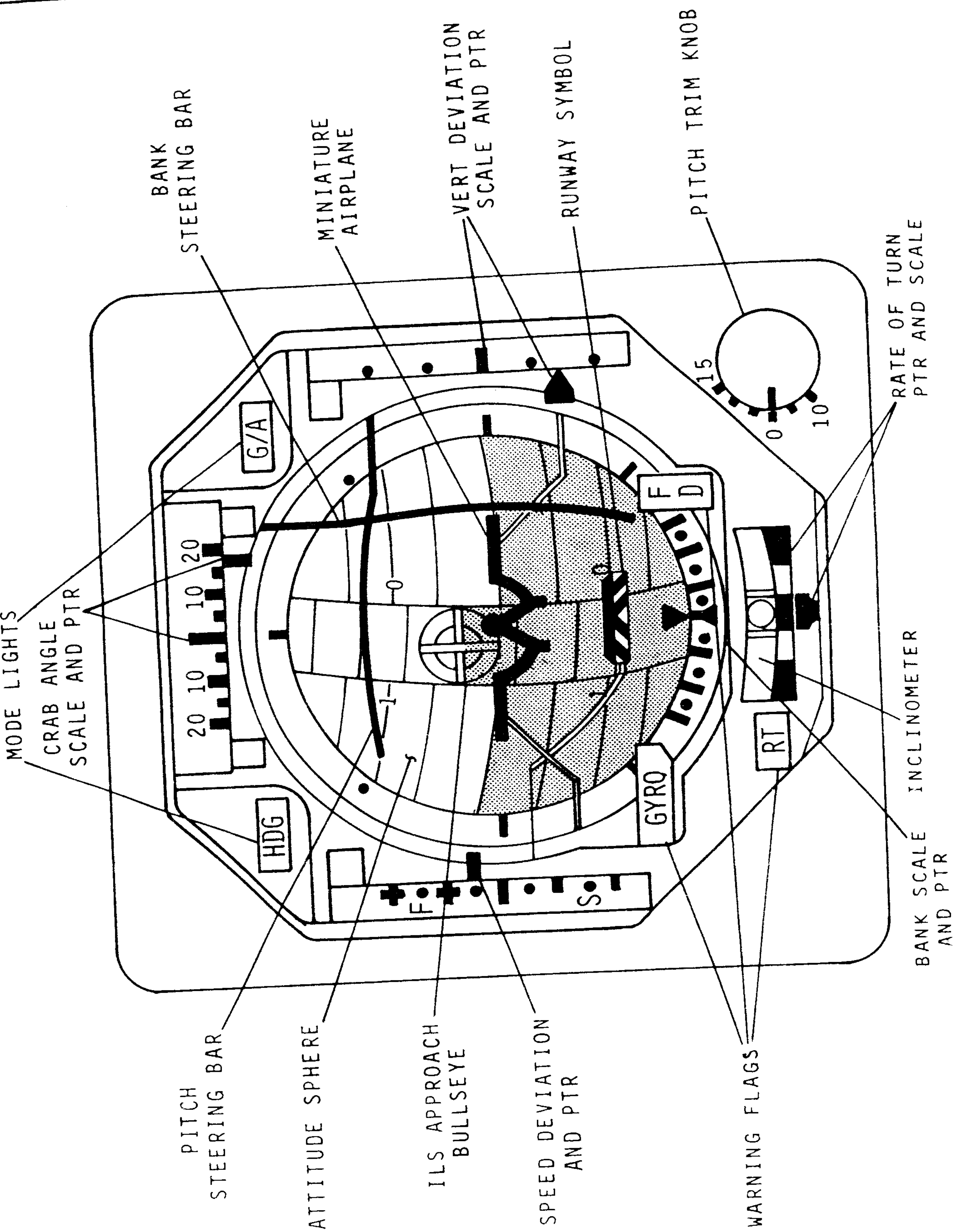
C-5A/B FLIGHT DIRECTOR
COMPONENT LOCATIONS (SHEET 1)



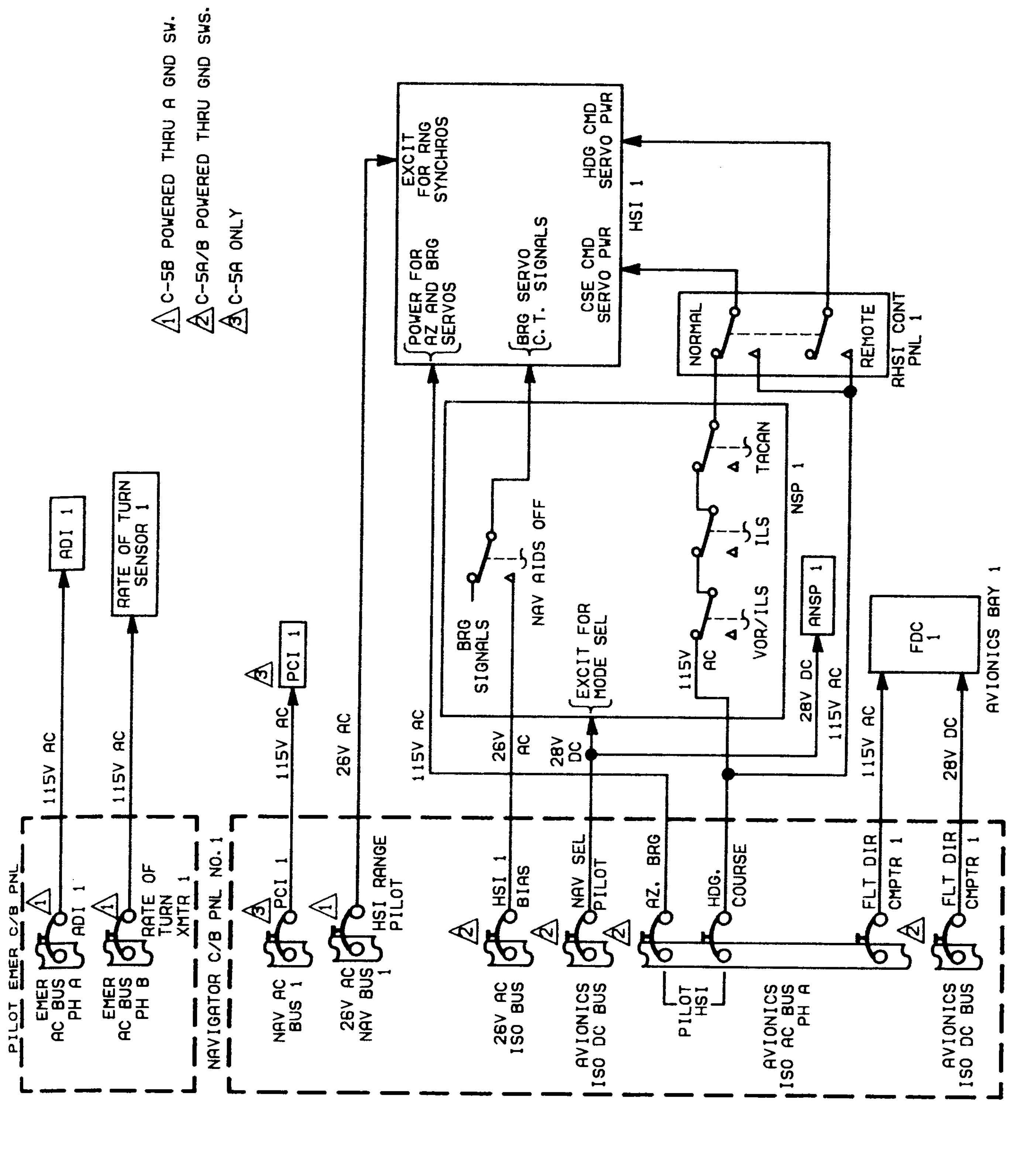
C-5A/B FLIGHT DIRECTOR
COMPONENT LOCATIONS (SHEET 2)



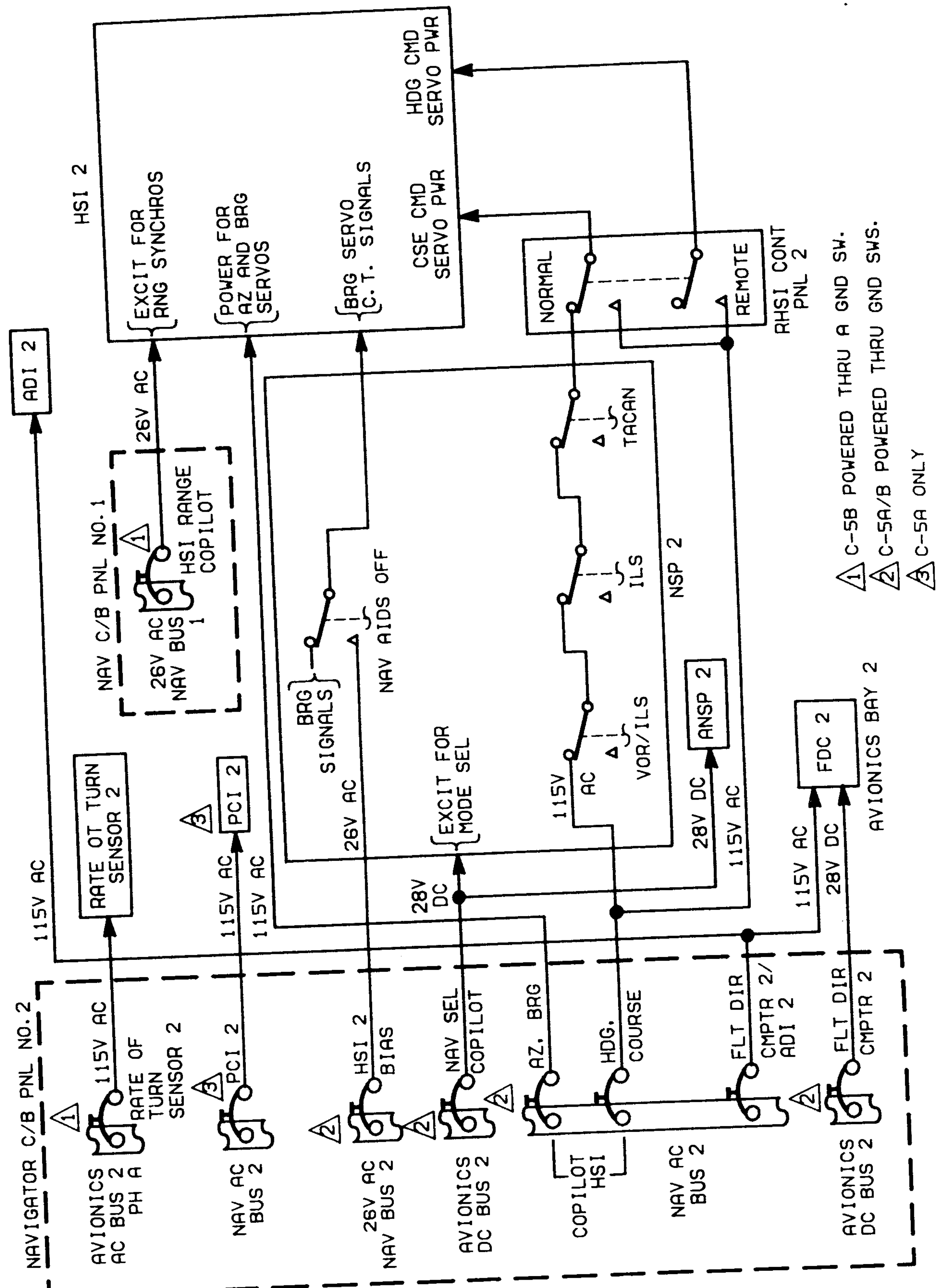
C-5A/B HORIZONTAL SITUATION INDICATOR



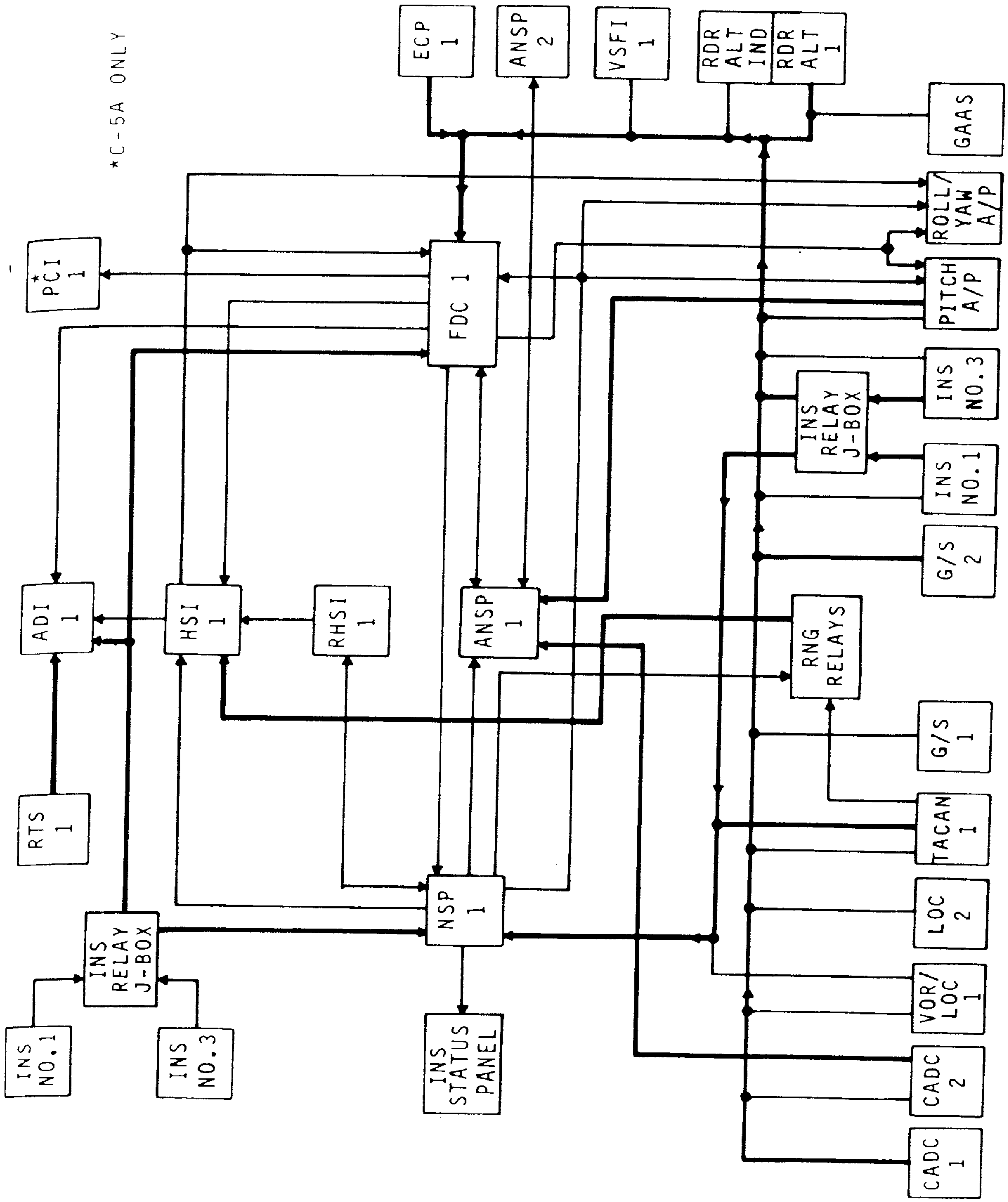
C-5A/B ATTITUDE DIRECTOR INDICATOR



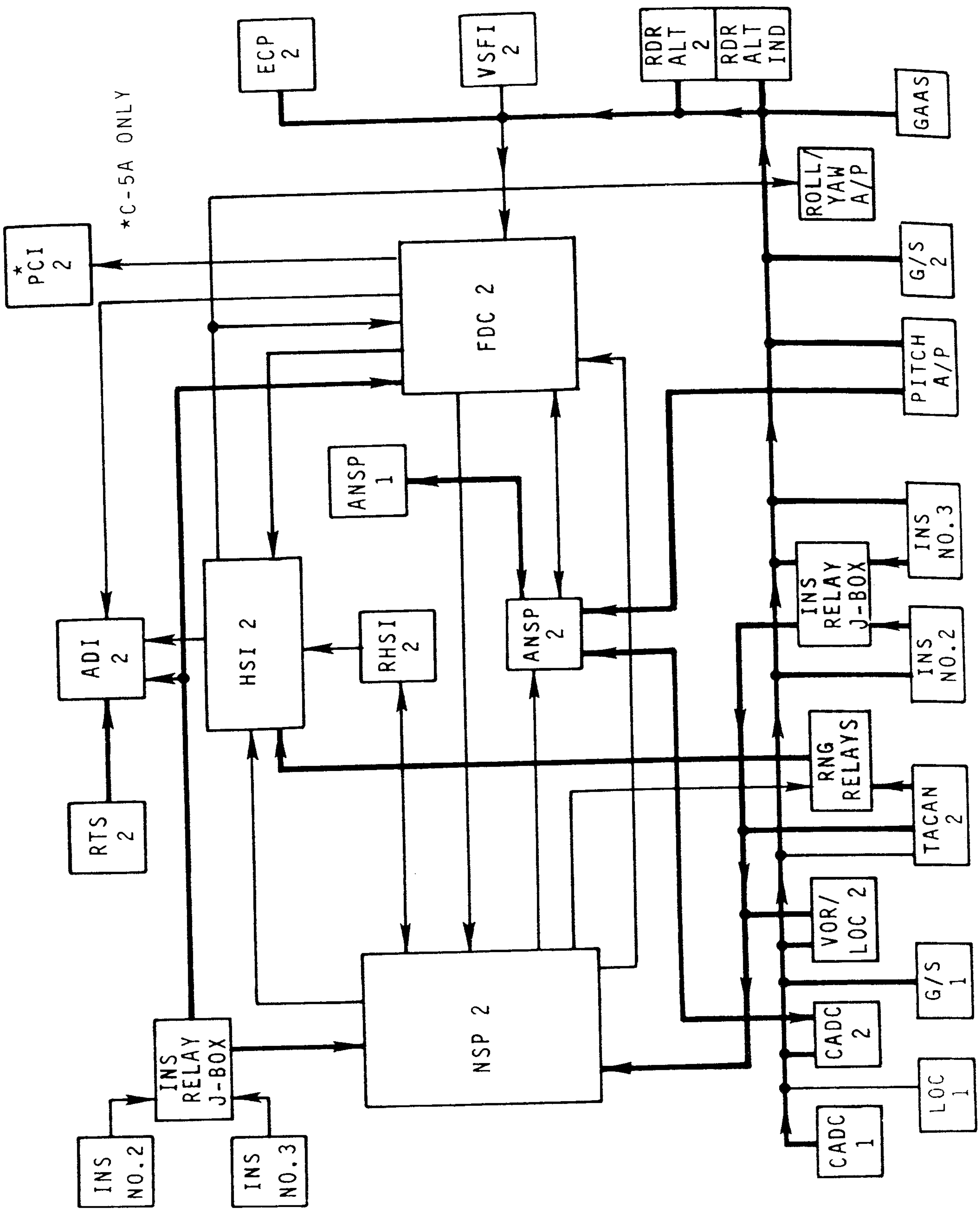
C-5A/B PILOT FLIGHT DIRECTOR SYSTEM
POWER REQUIREMENTS



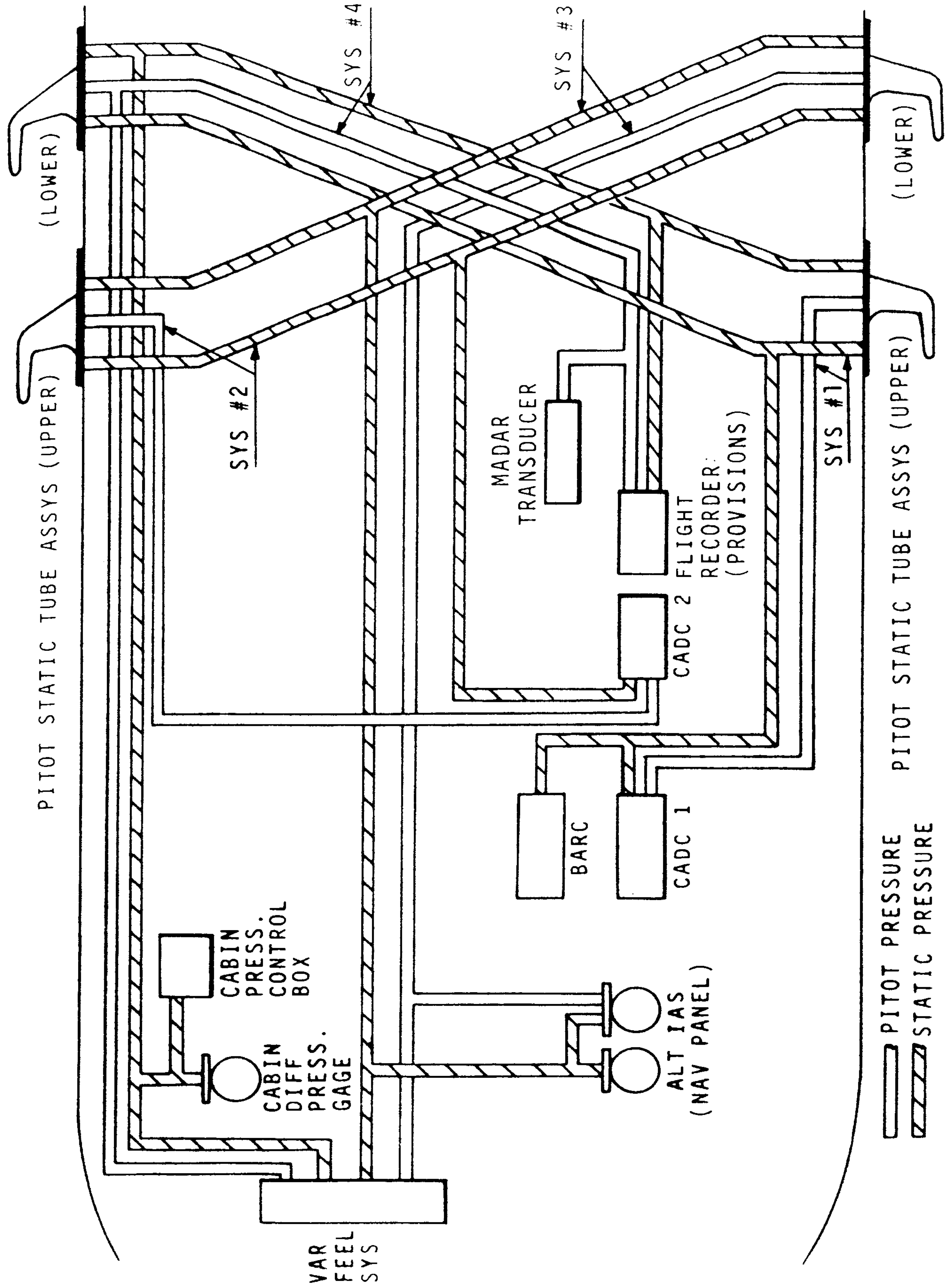
C-5A/B COPILOT FLIGHT DIRECTOR SYSTEM POWER REQUIREMENTS



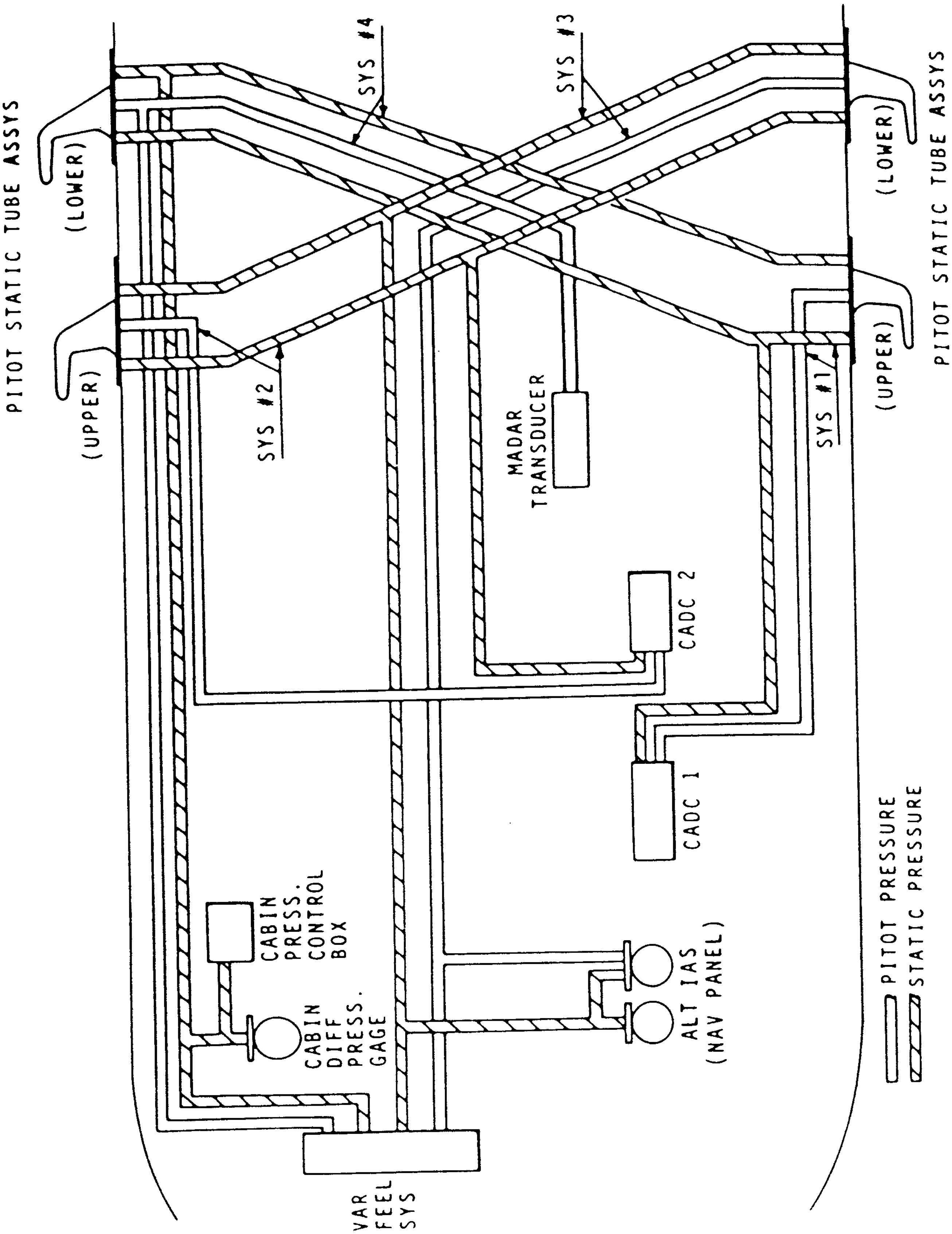
C-5A/B PILOT FLIGHT DIRECTOR SYSTEM INTERFACE



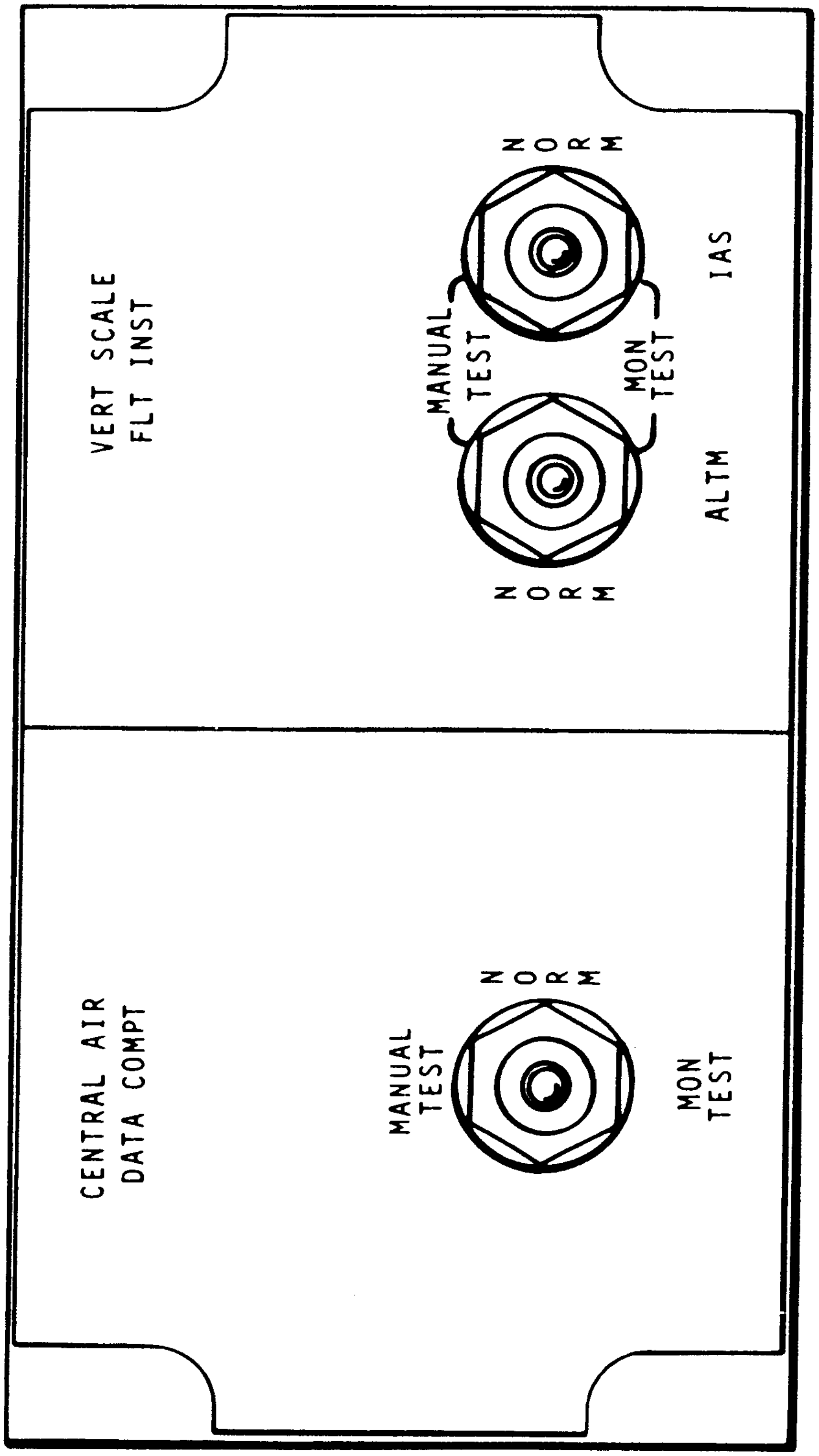
C-5A/B COPILOT FLIGHT DIRECTOR SYSTEM INTERFACE



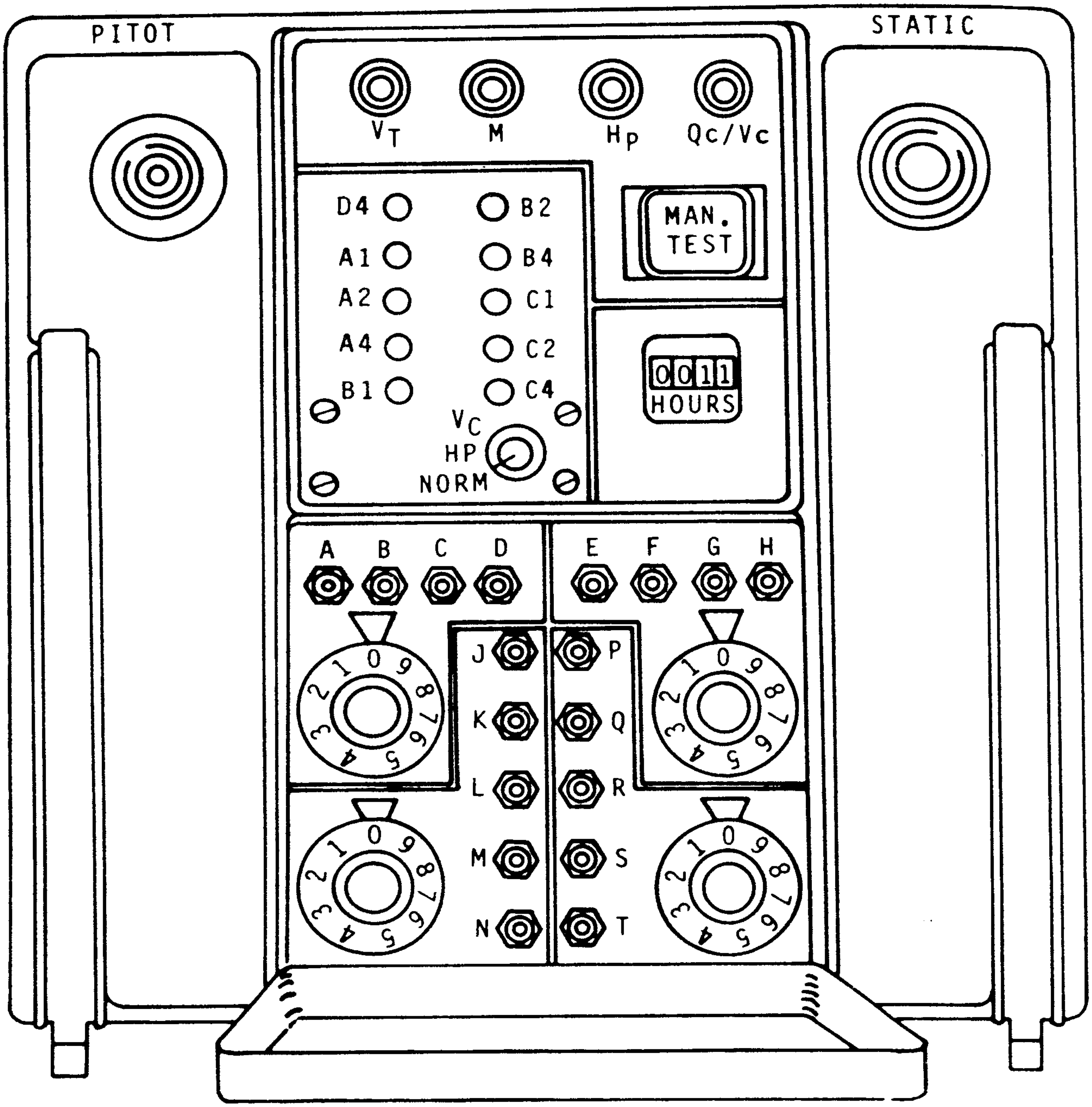
C-5A PITOT STATIC SYSTEM



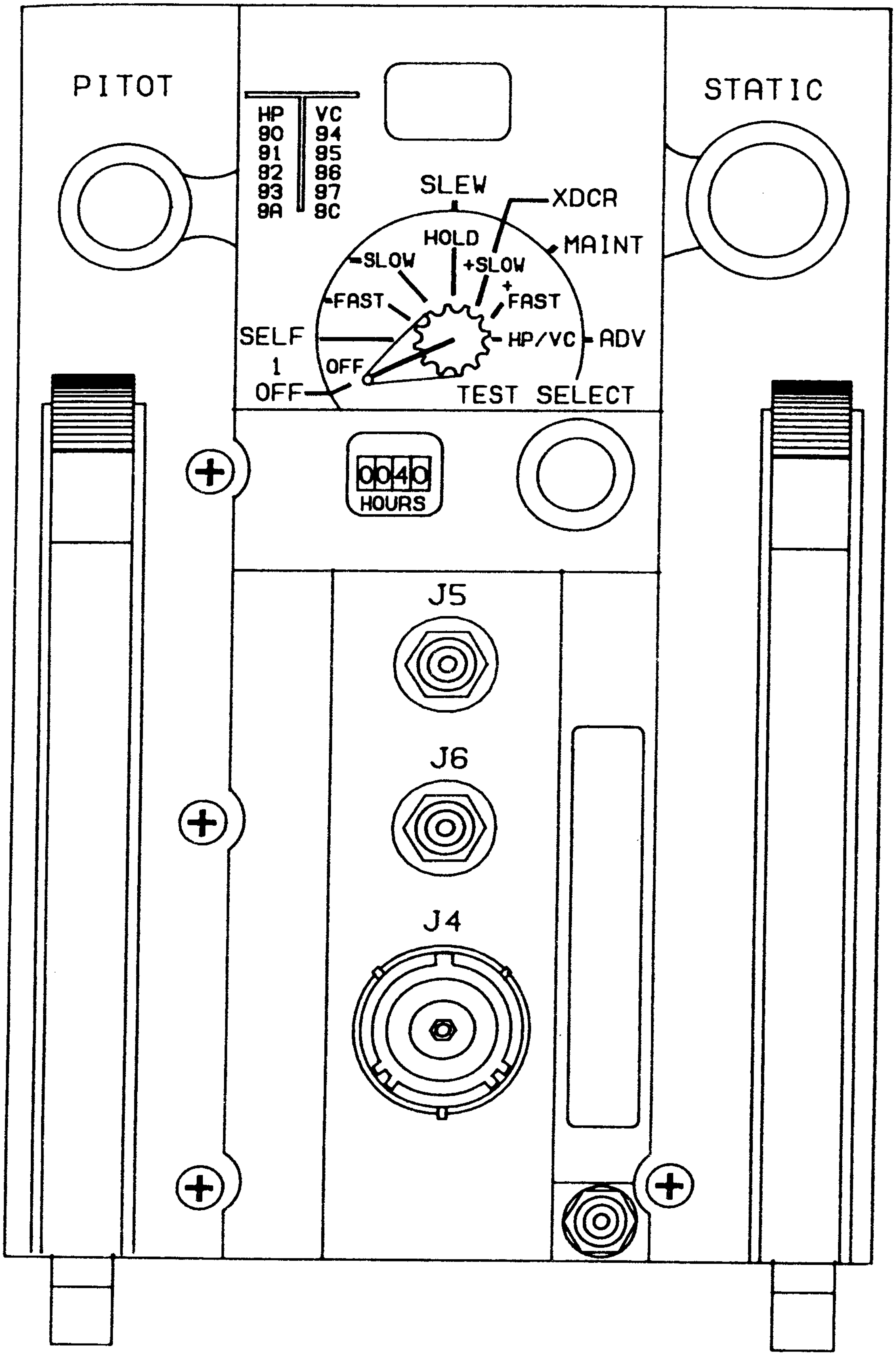
C-5B PITOT STATIC SYSTEM



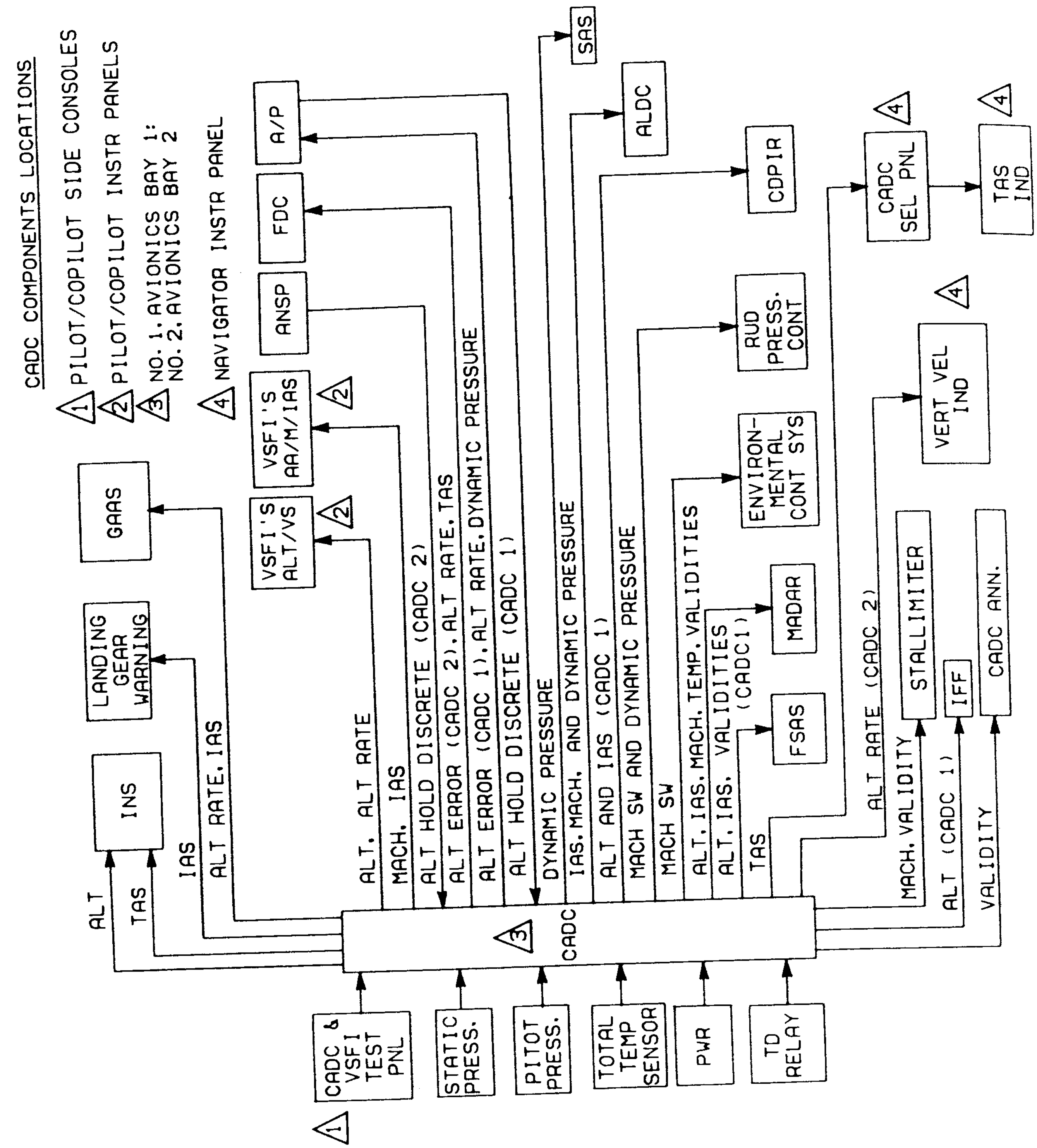
C-5A/B CADC/VSFI TEST PANEL



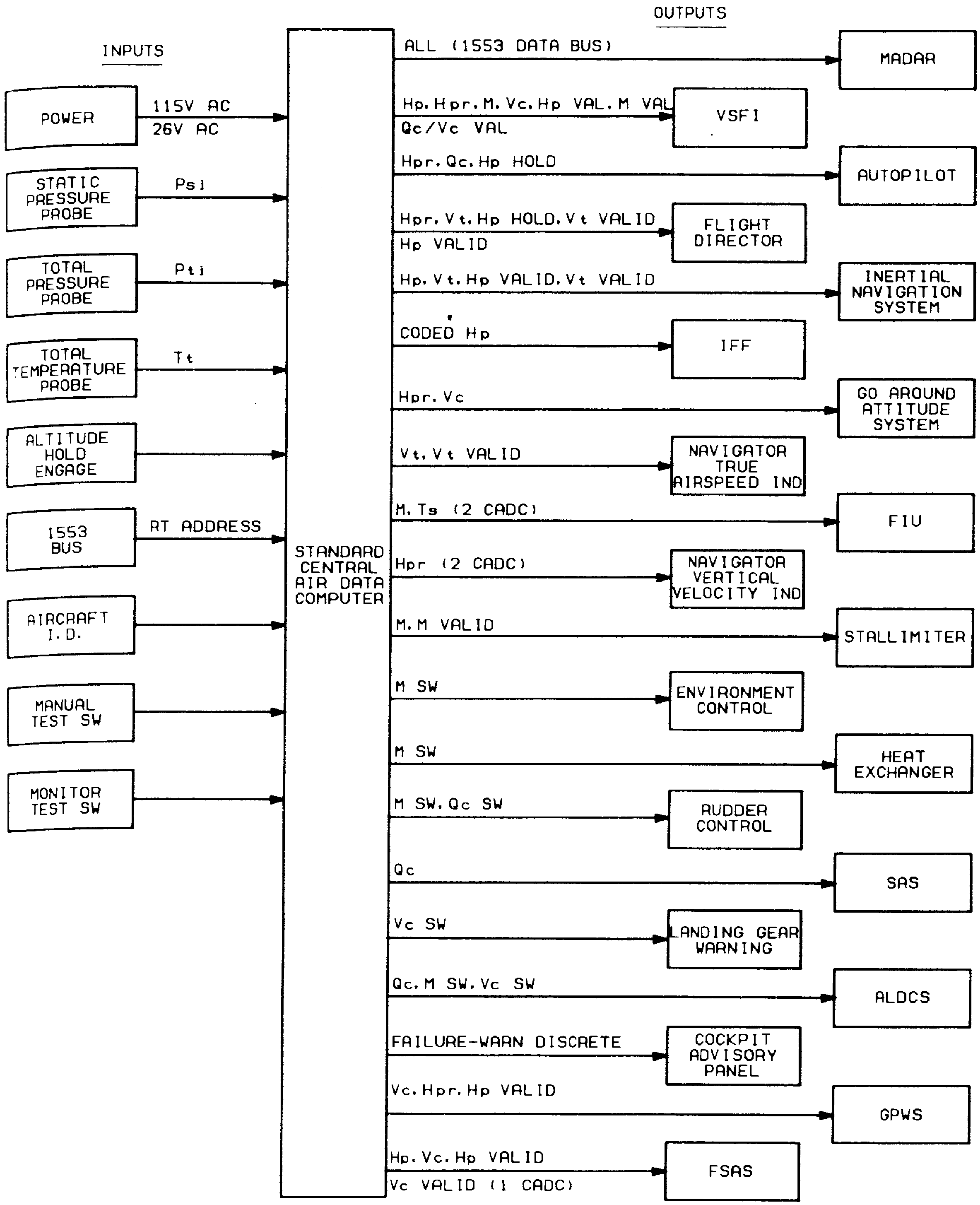
C-5A CADC FRONT PANEL



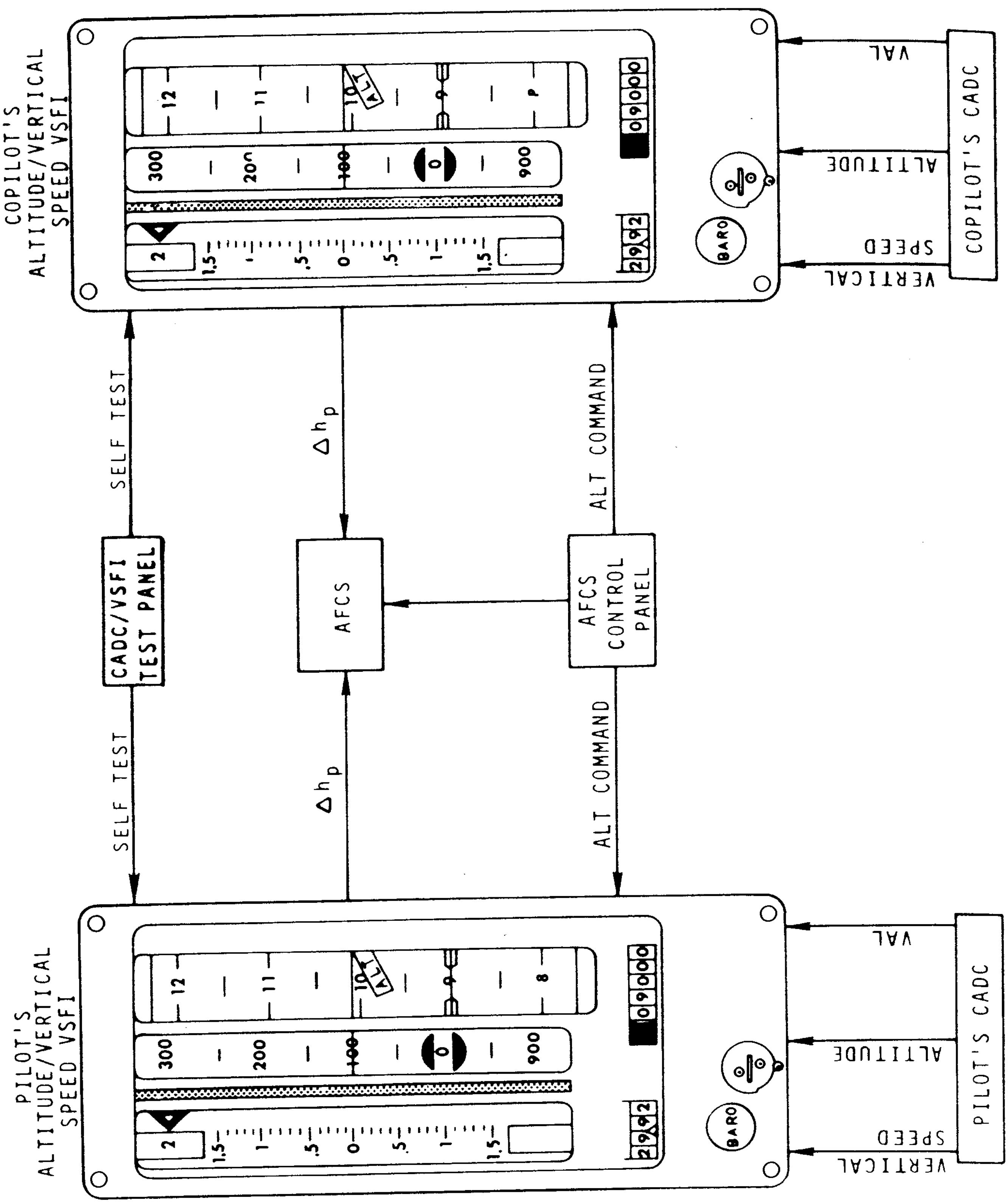
C-5B SCADC FRONT PANEL



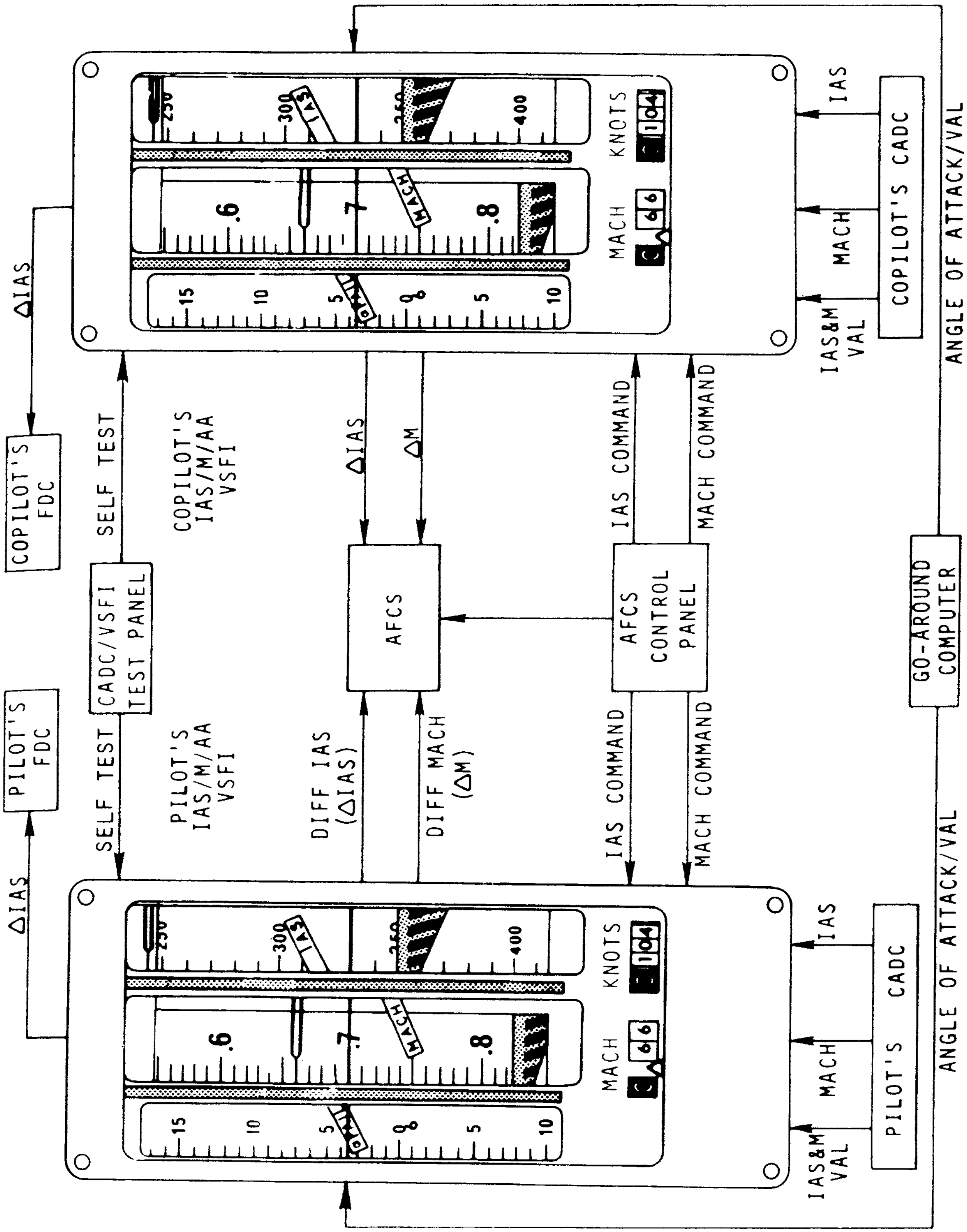
C-5A CADC INTERFACE BLOCK DIAGRAM



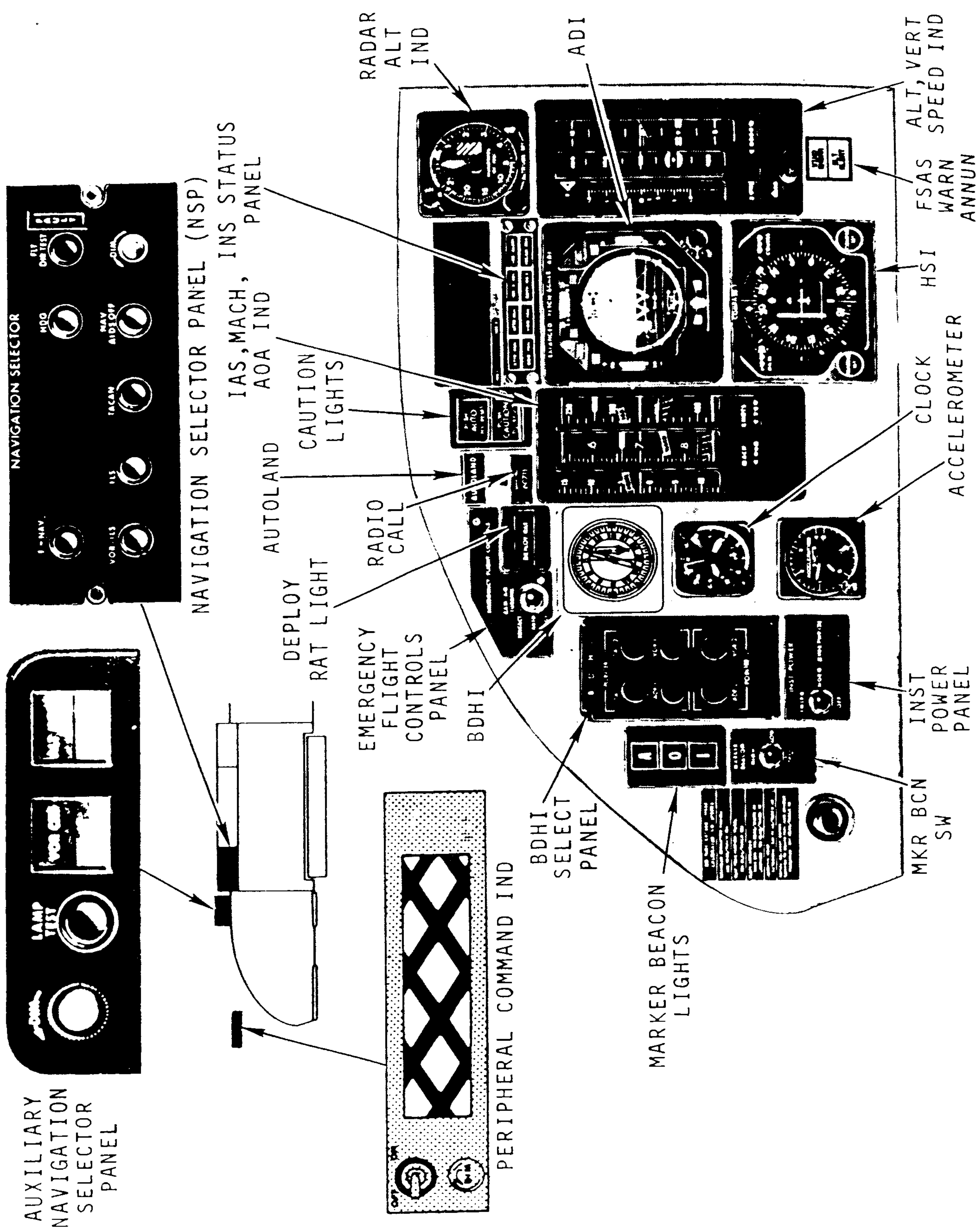
C-5B SCADC INTERFACE BLOCK DIAGRAM



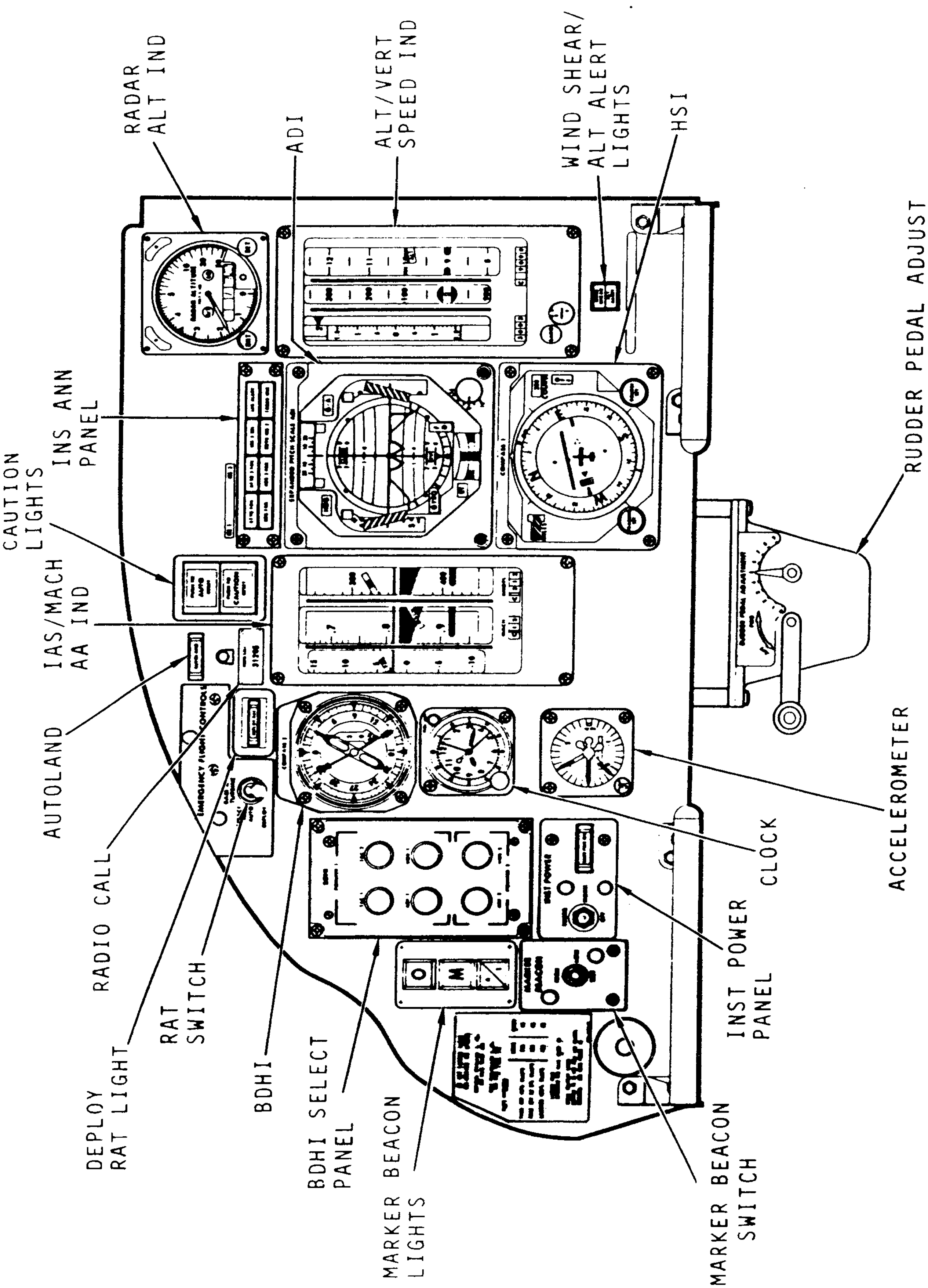
C-5A/B VSFI INTERFACE BLOCK DIAGRAM (ALTITUDE)



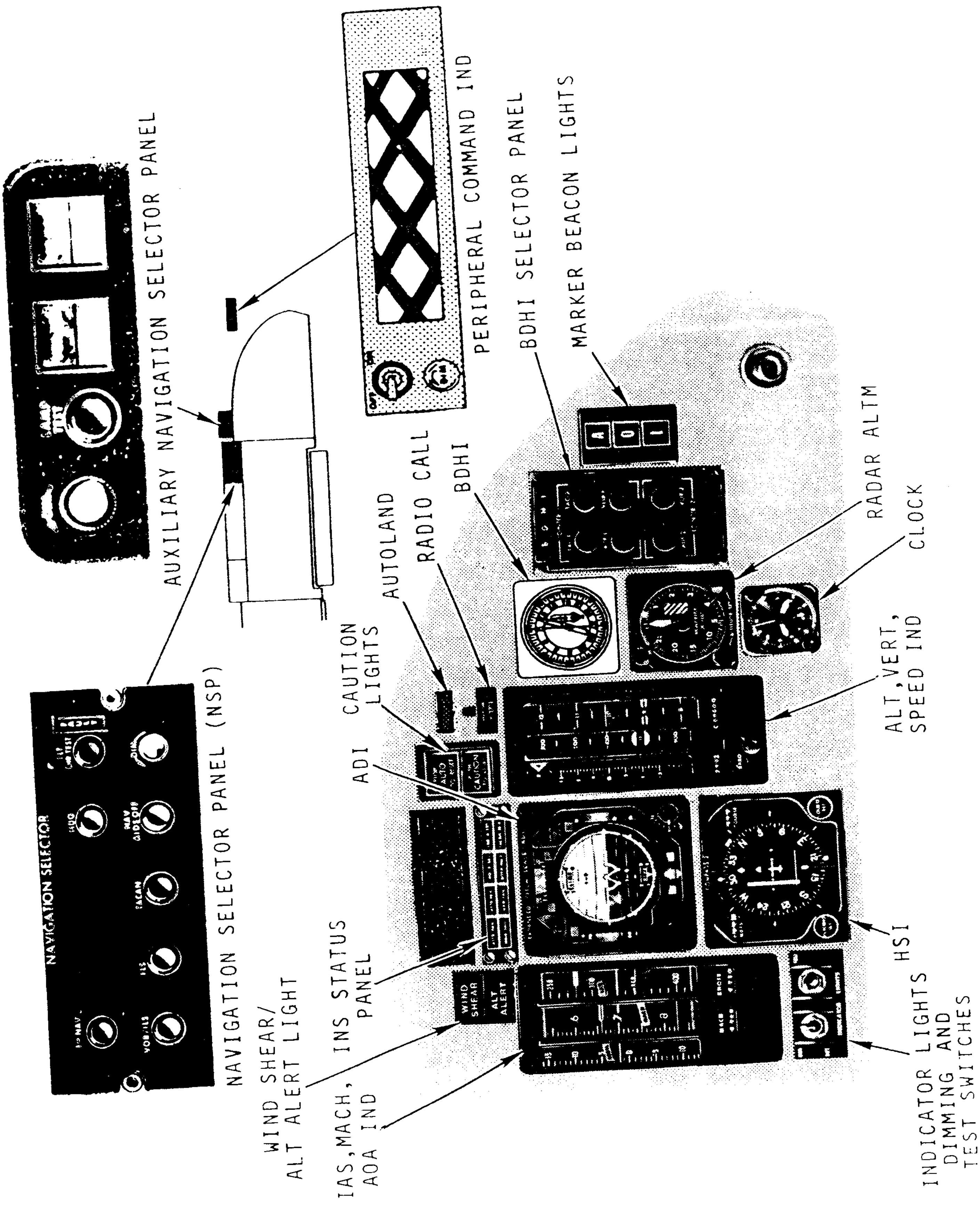
C-5A/B VSFI INTERFACE BLOCK DIAGRAM
(AIRSPEED - MACH)



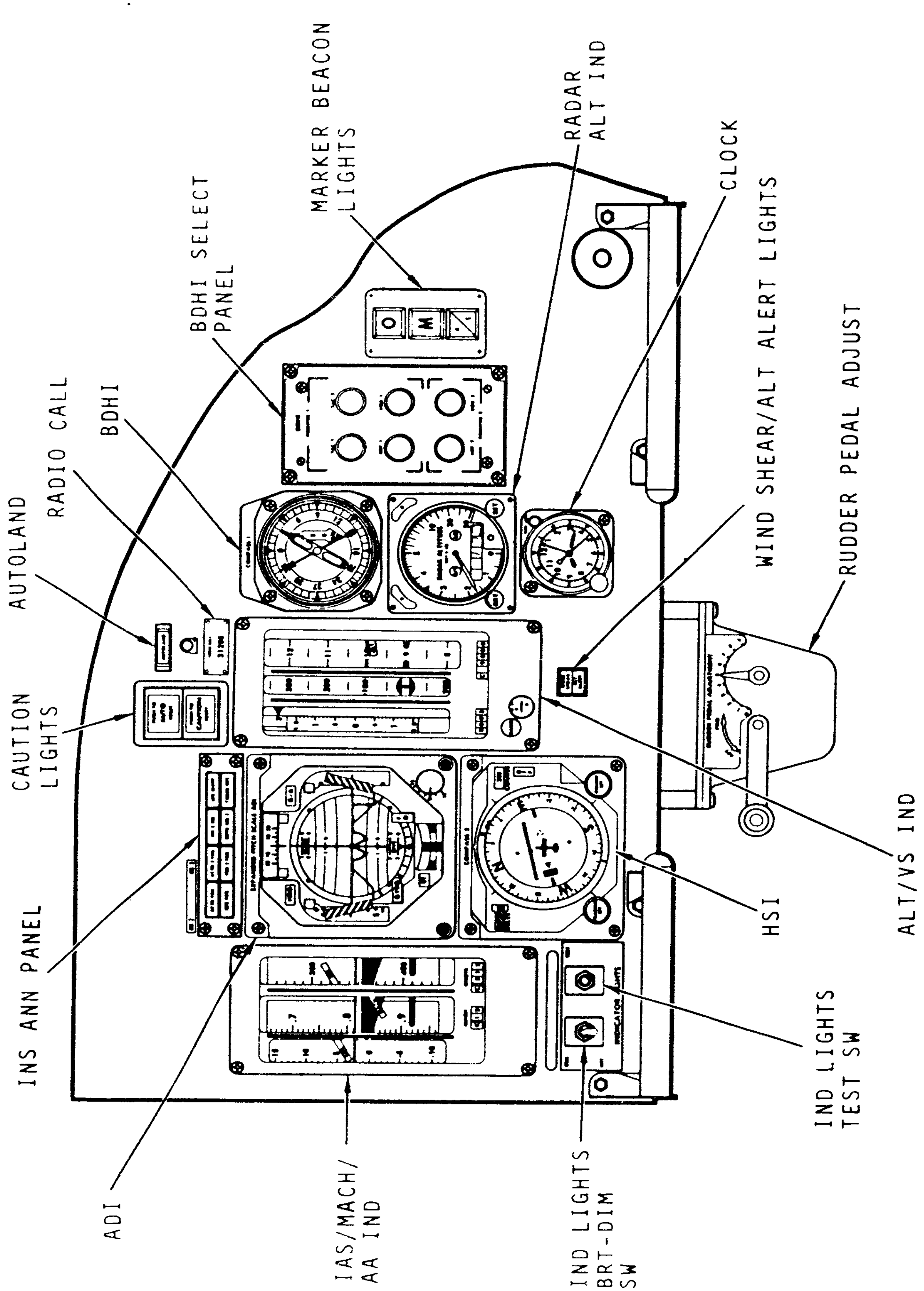
C-5A PILOT INSTRUMENT PANEL



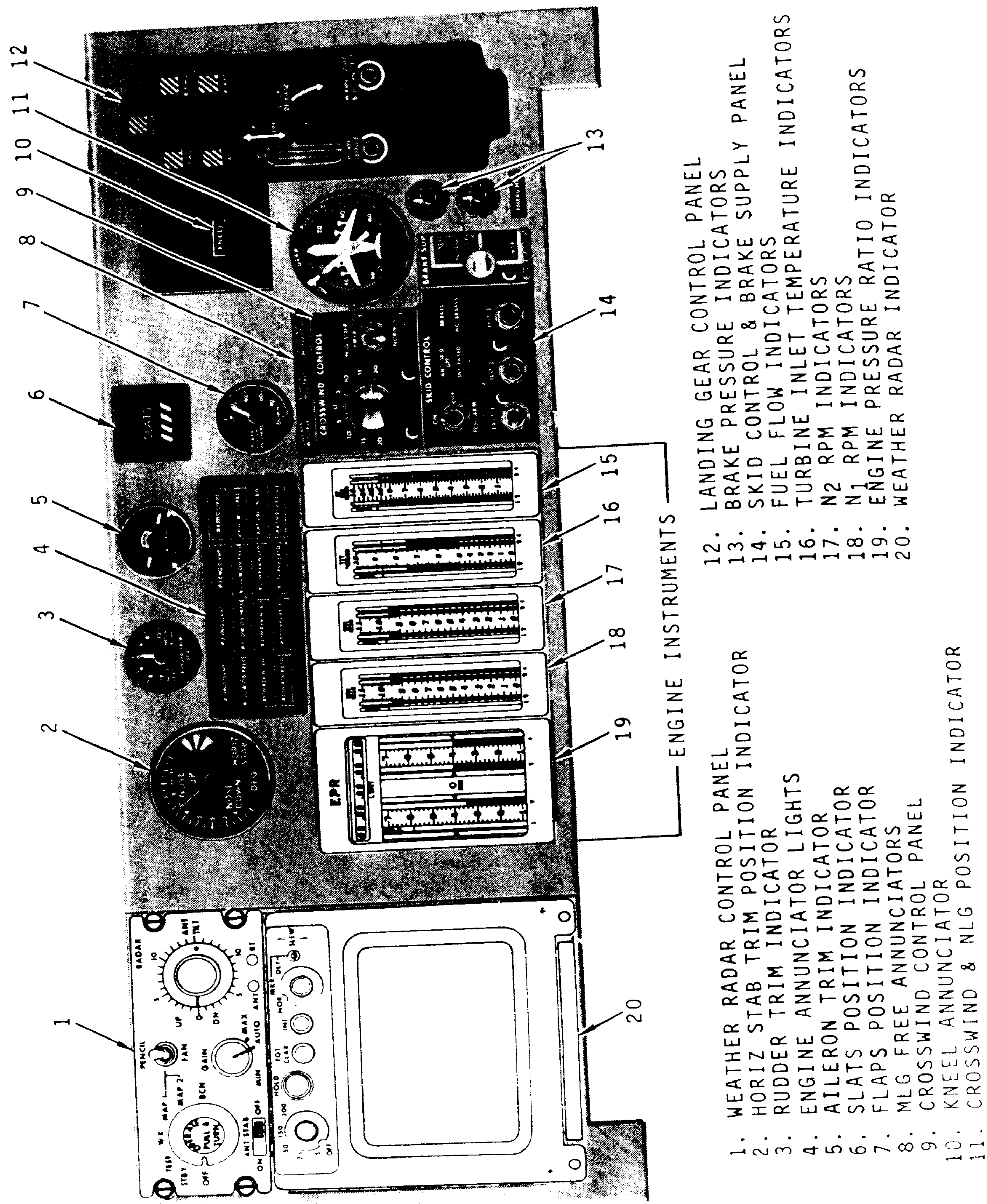
C-5B PILOT INSTRUMENT PANEL



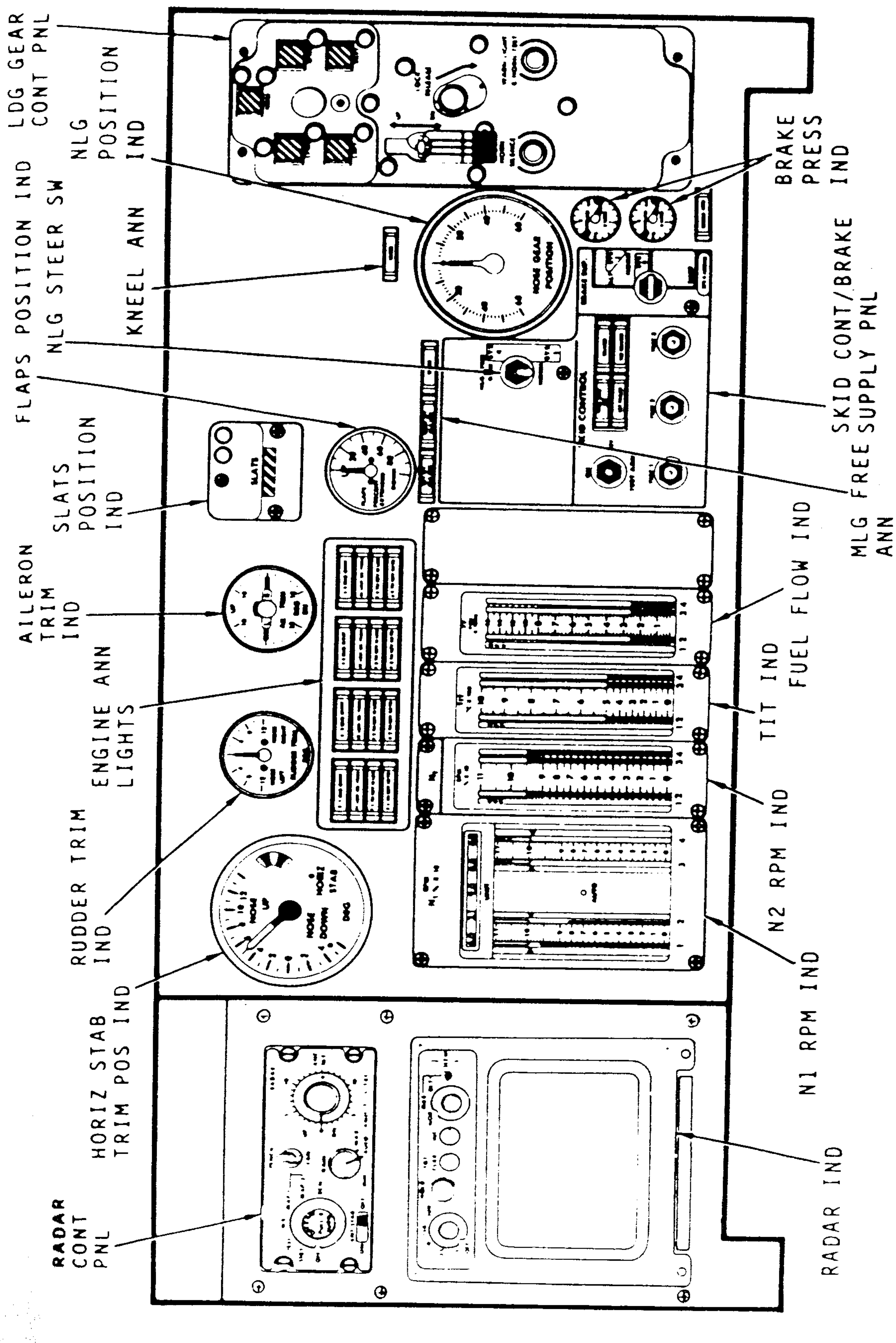
C-5A COPILOT INSTRUMENT PANEL



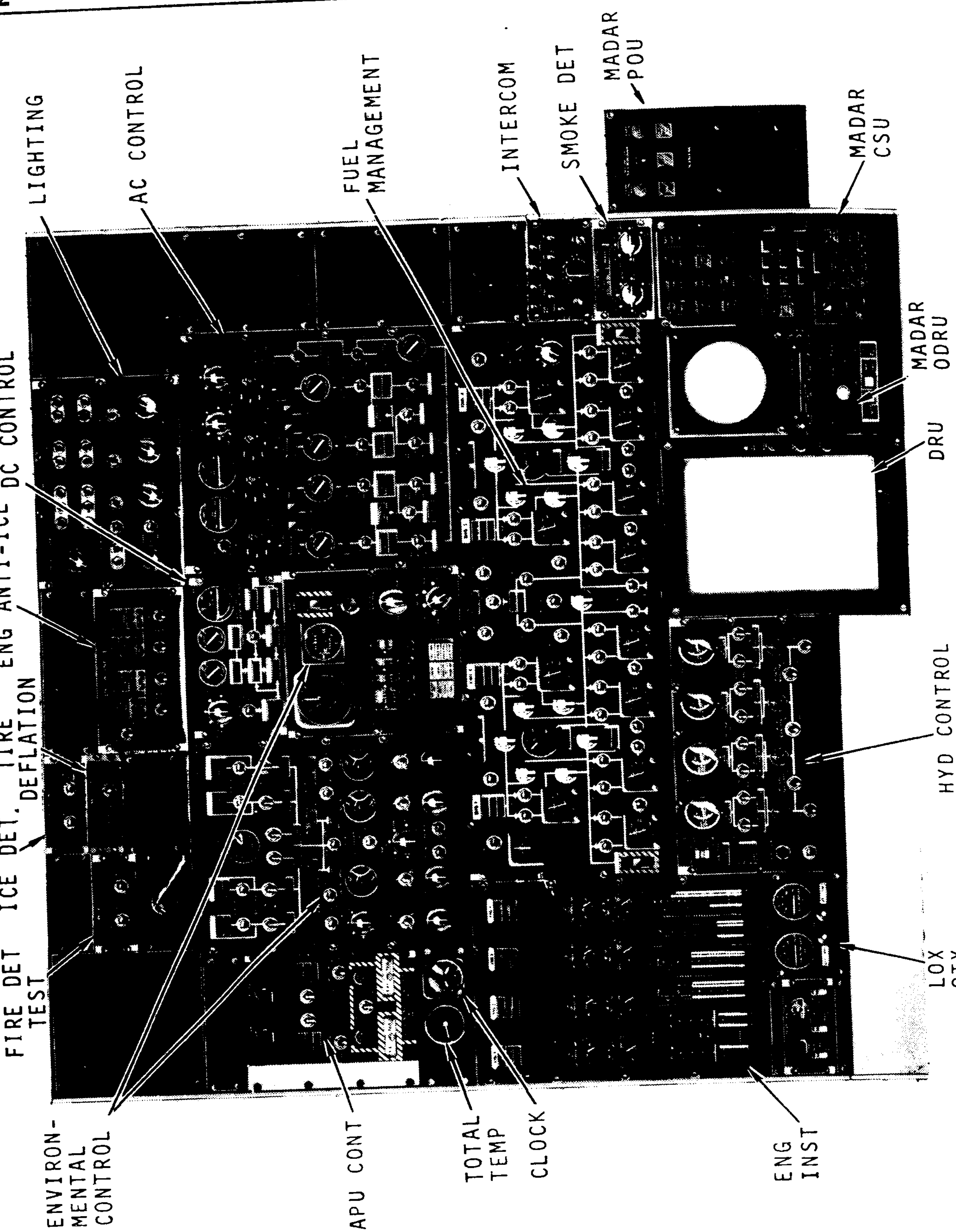
C-5B COPILOT INSTRUMENT PANEL



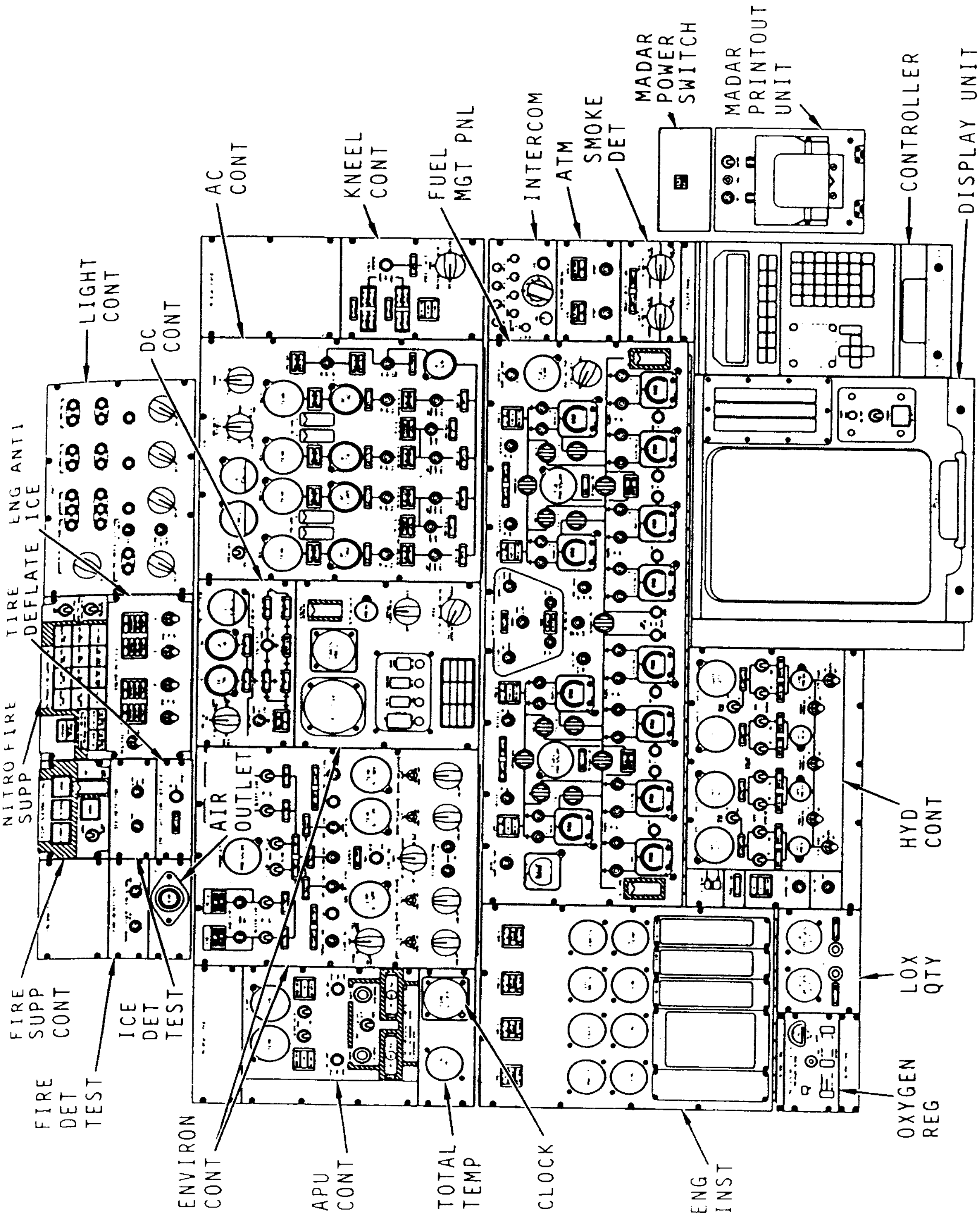
C-5A CENTER INSTRUMENT PANEL



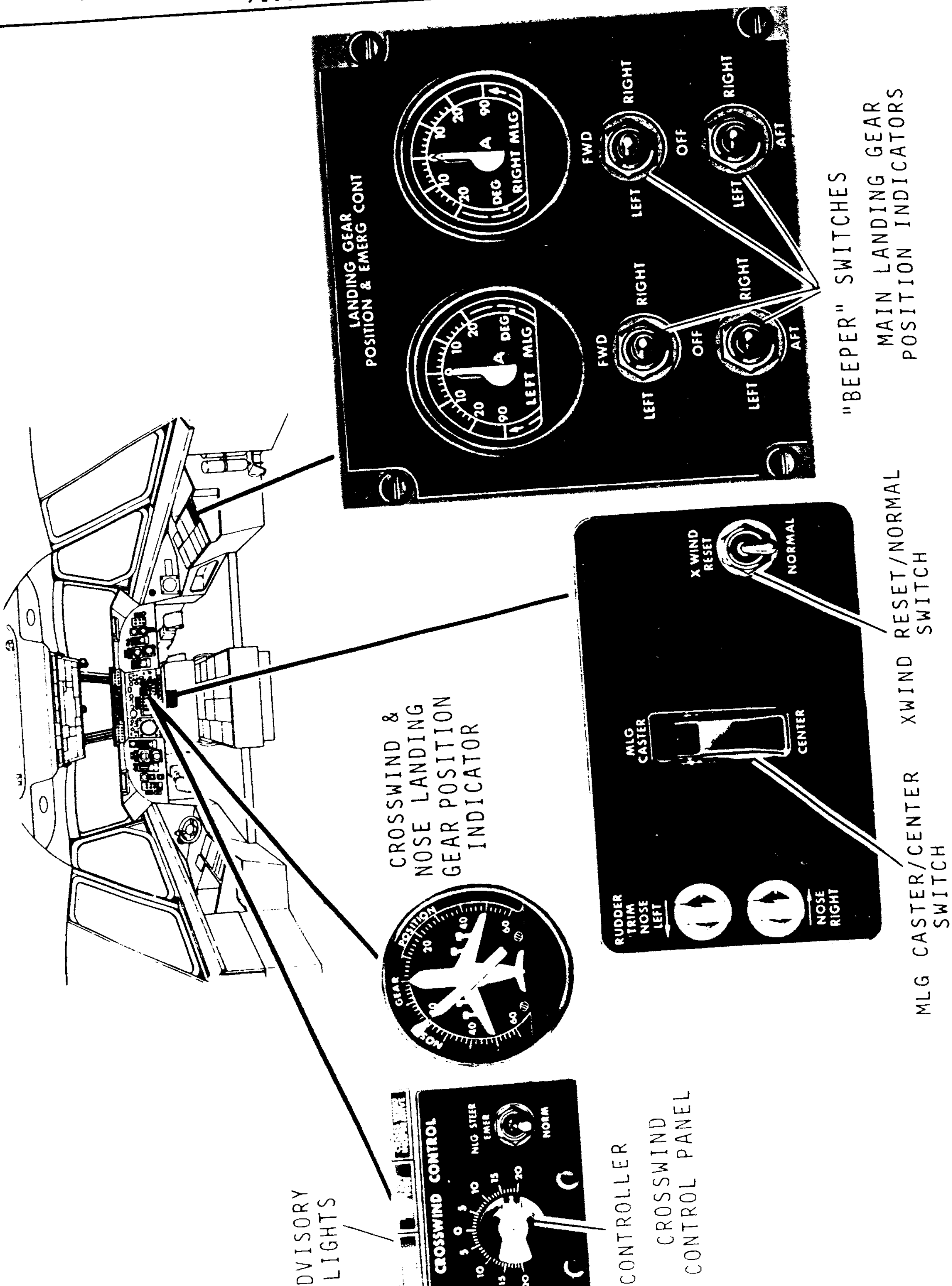
C-5B CENTER INSTRUMENT PANEL



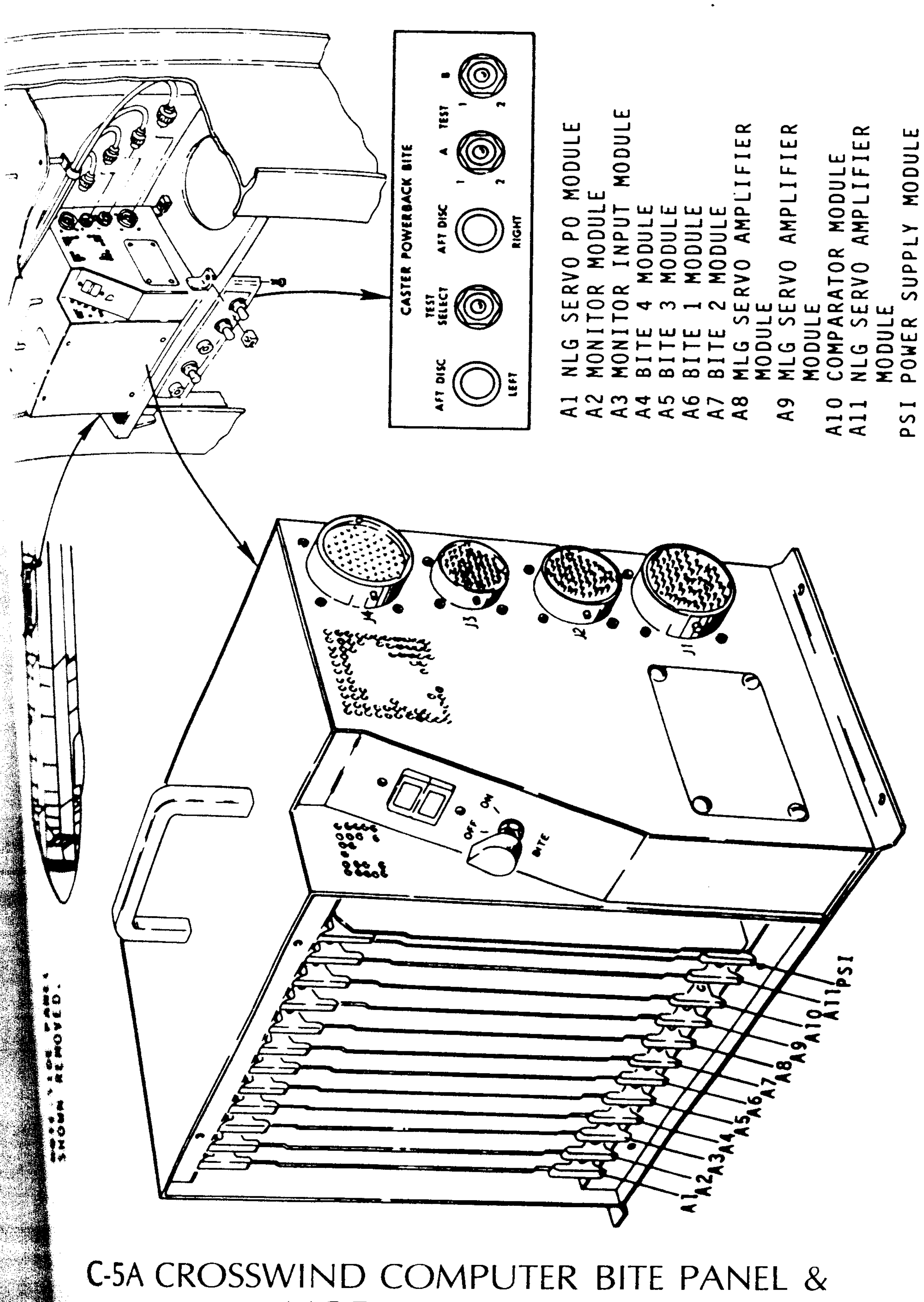
C-5A FLIGHT ENGINEER PANEL



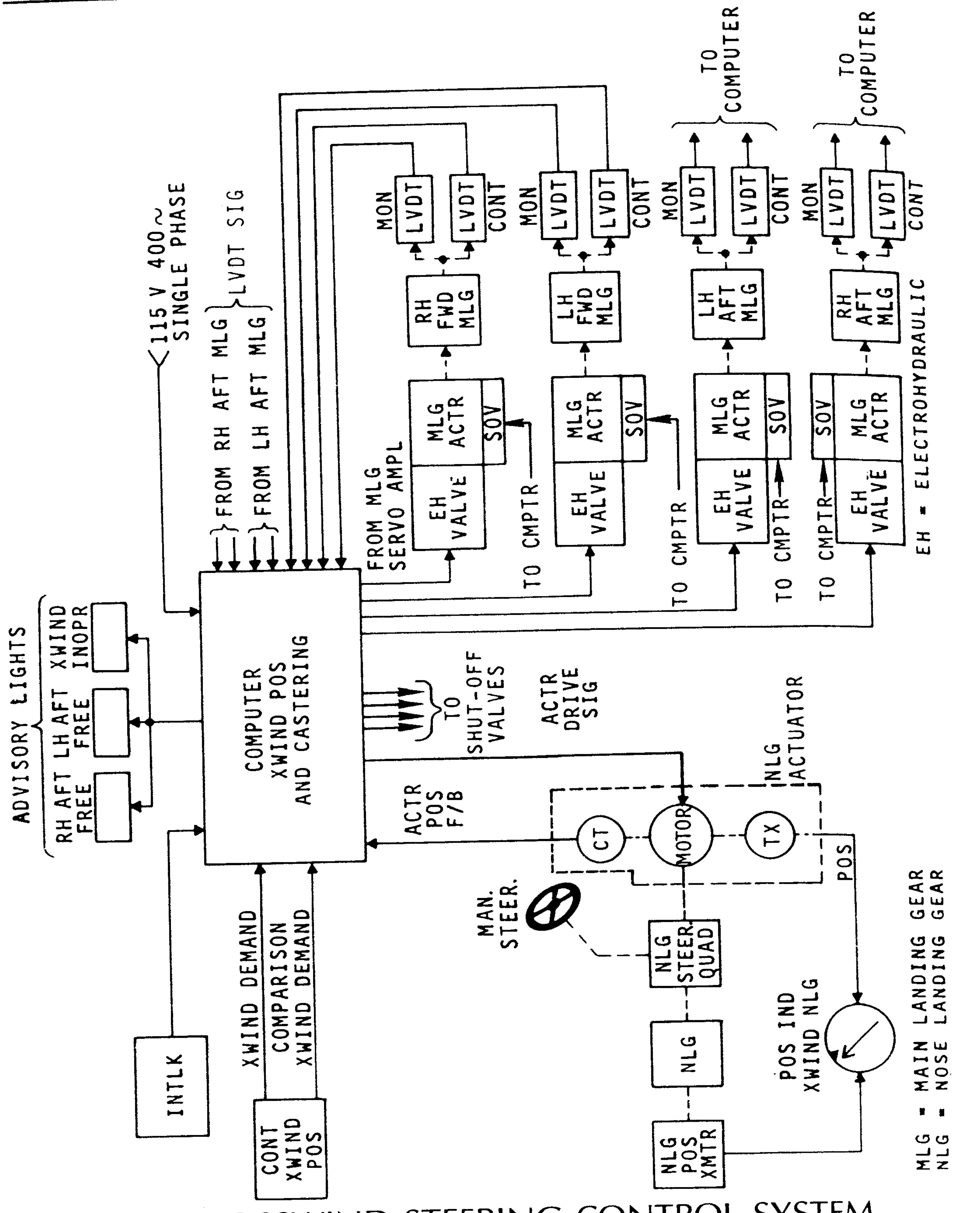
C-5B FLIGHT ENGINEER PANEL



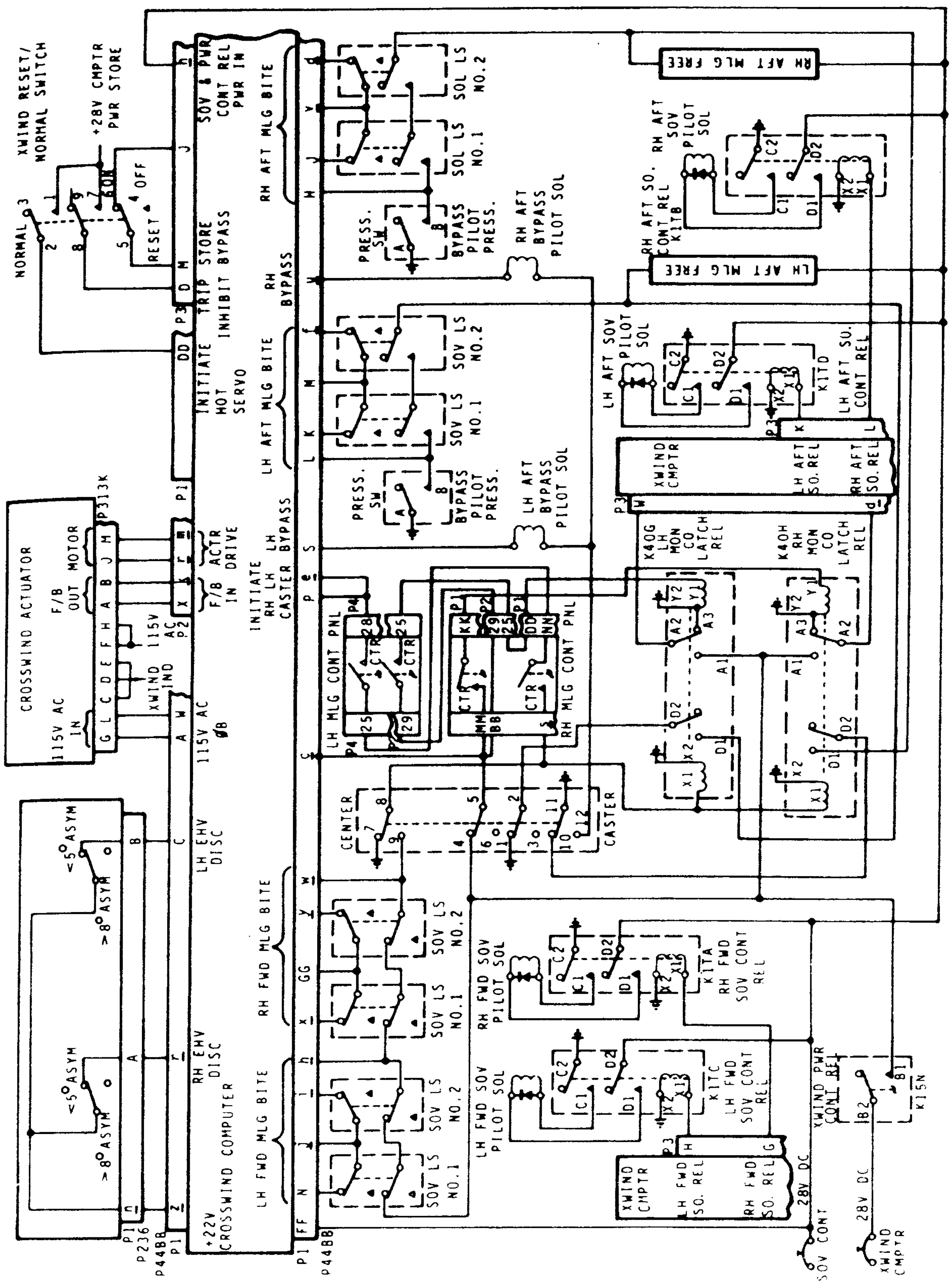
C-5A CROSSWIND POSITIONING CONTROLS & INDICATORS



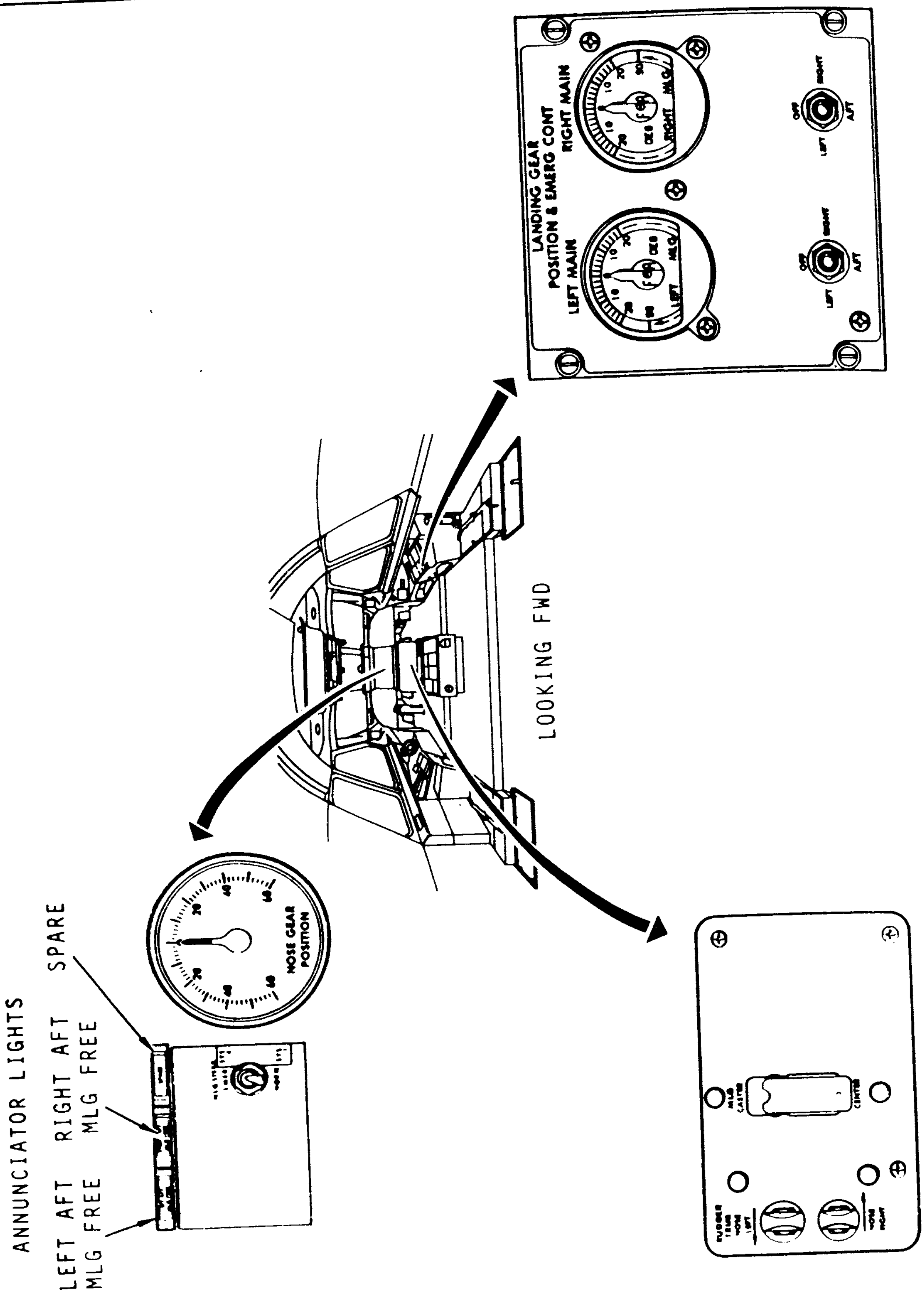
C-5A CROSSWIND COMPUTER BITE PANEL & MODULE LOCATION



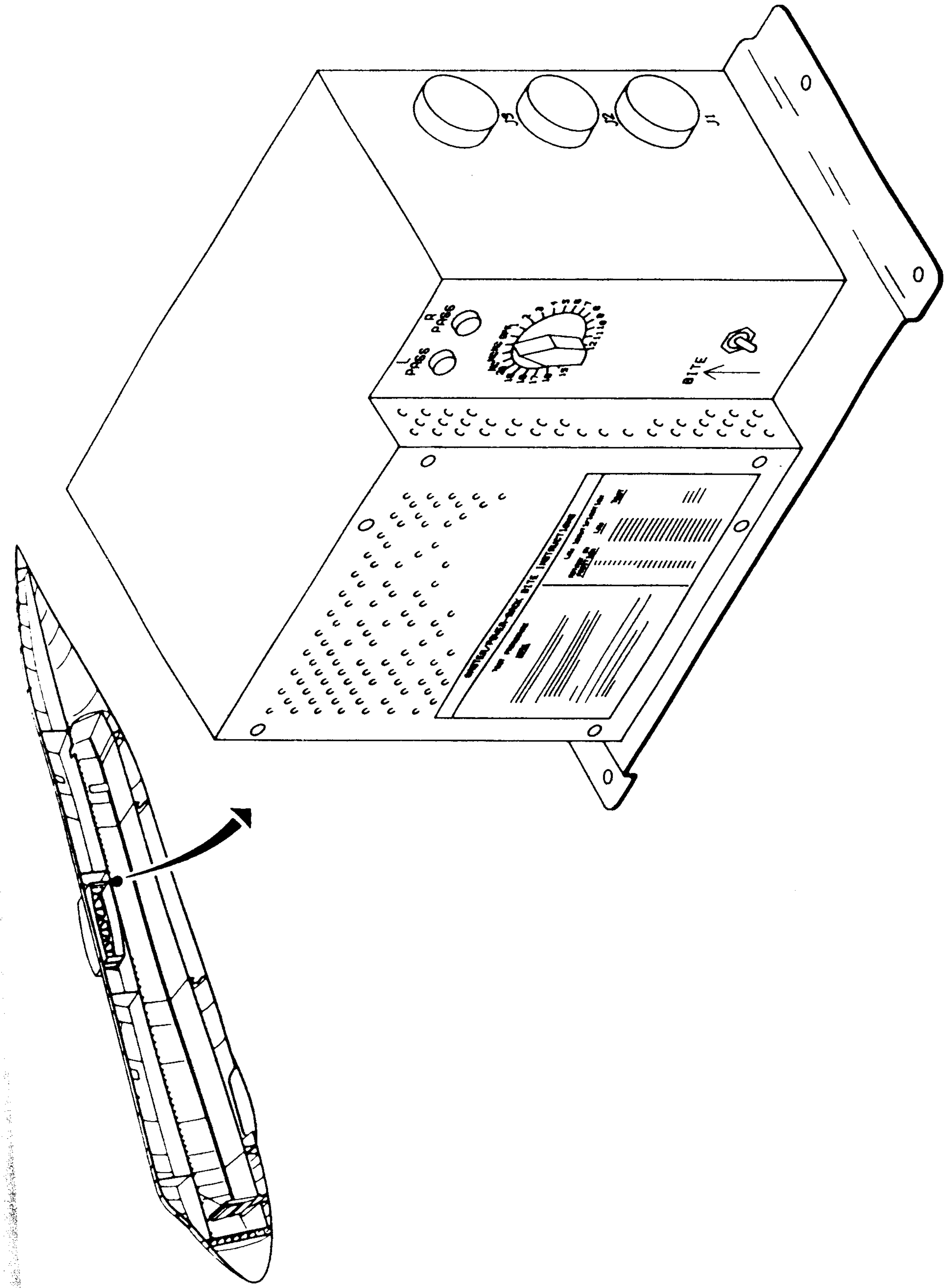
C-5A CROSSWIND STEERING CONTROL SYSTEM
BLOCK DIAGRAM



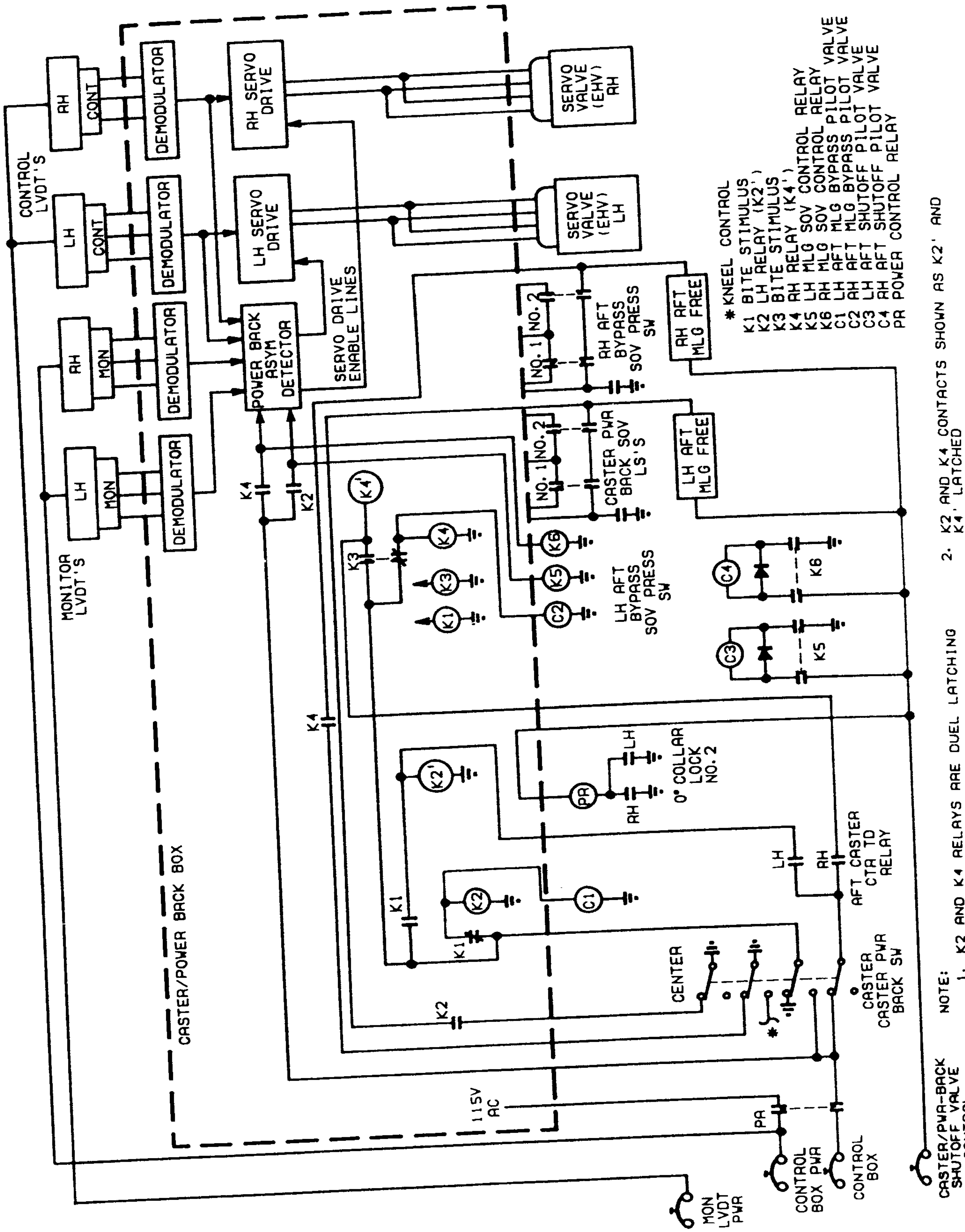
C-5A CROSSWIND POSITIONING/CASTERING



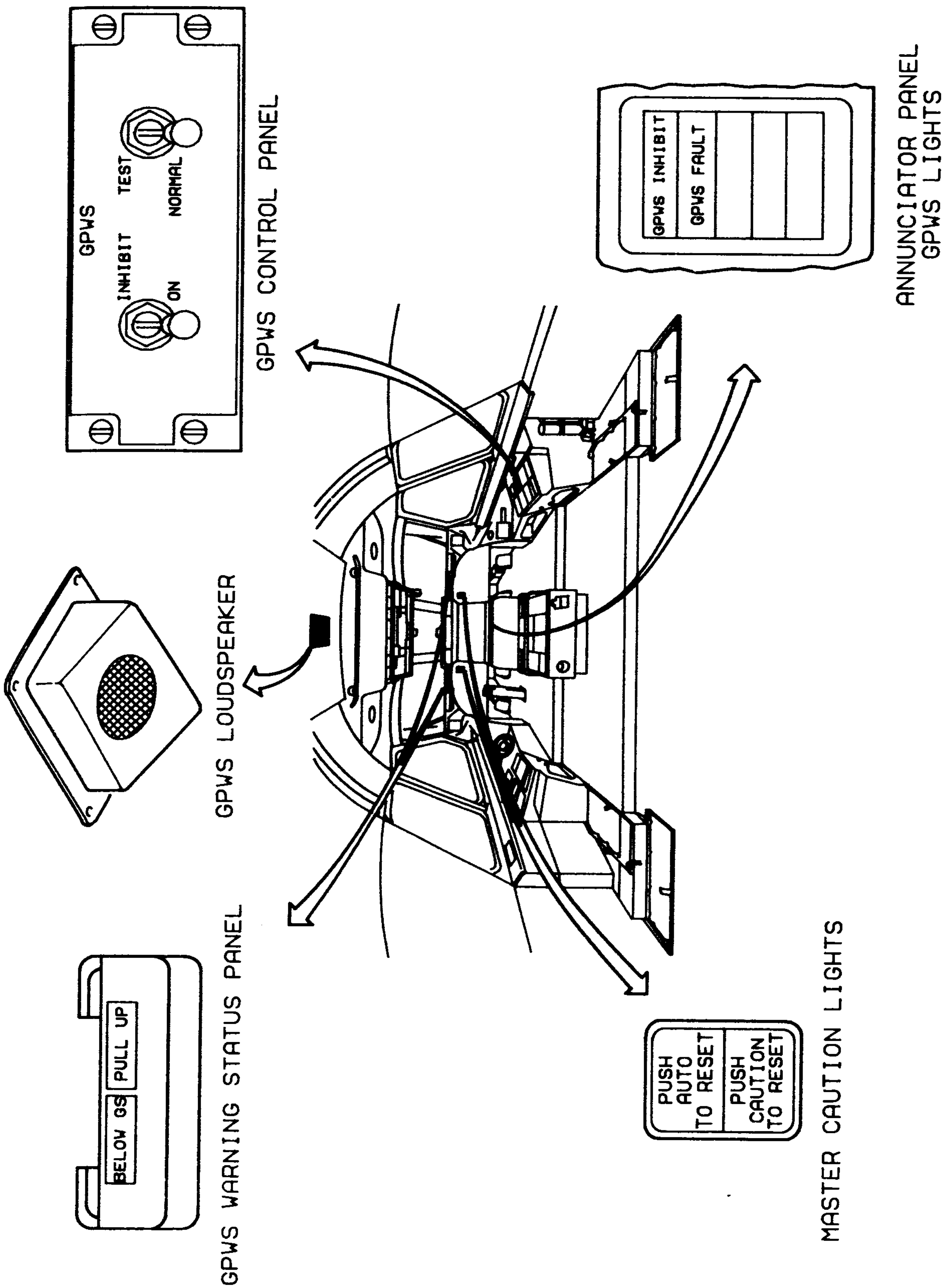
C-5B NOSE & MAIN GEAR CONTROLS & INDICATION



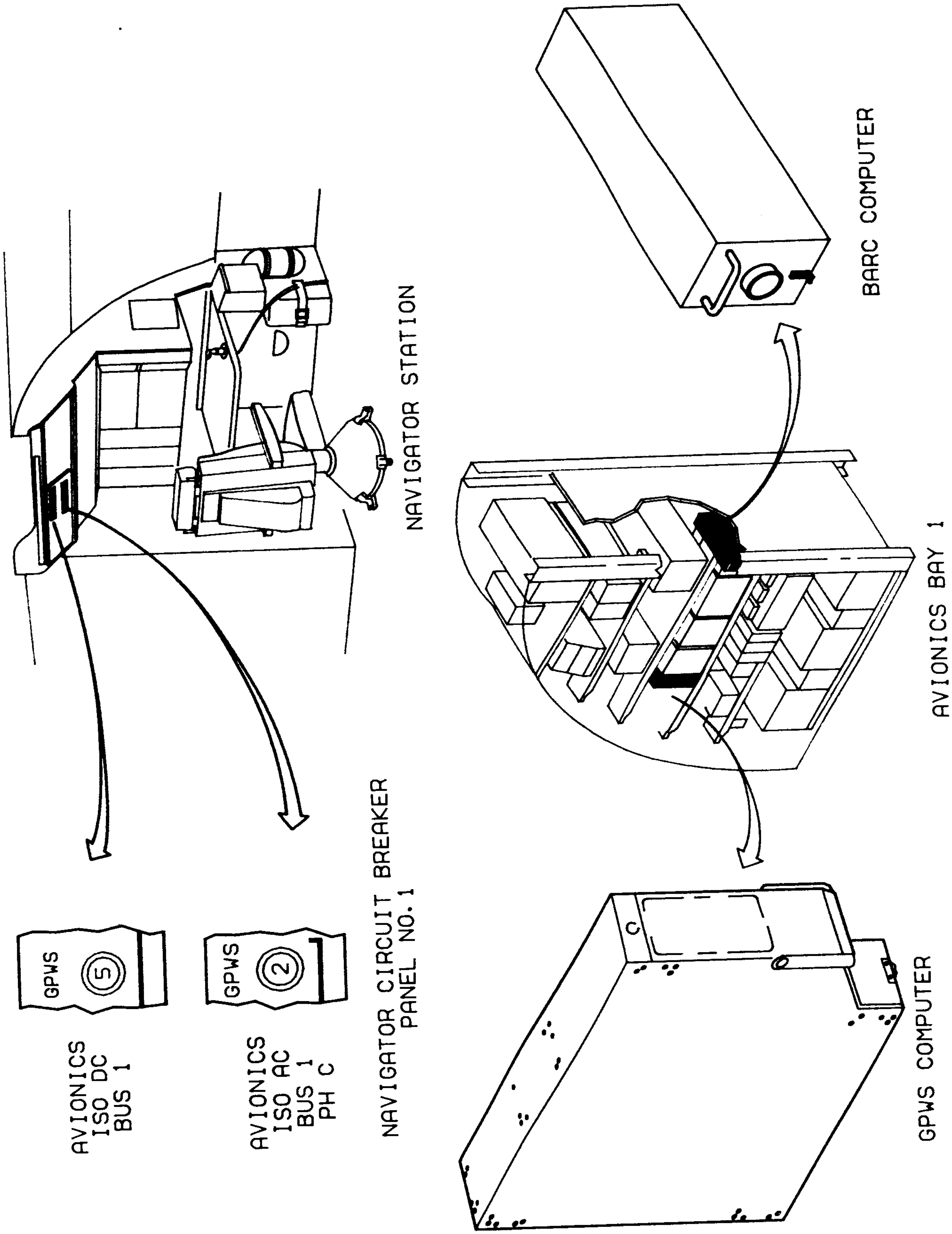
C-5B CASTER/POWER BACK CONTROL BOX



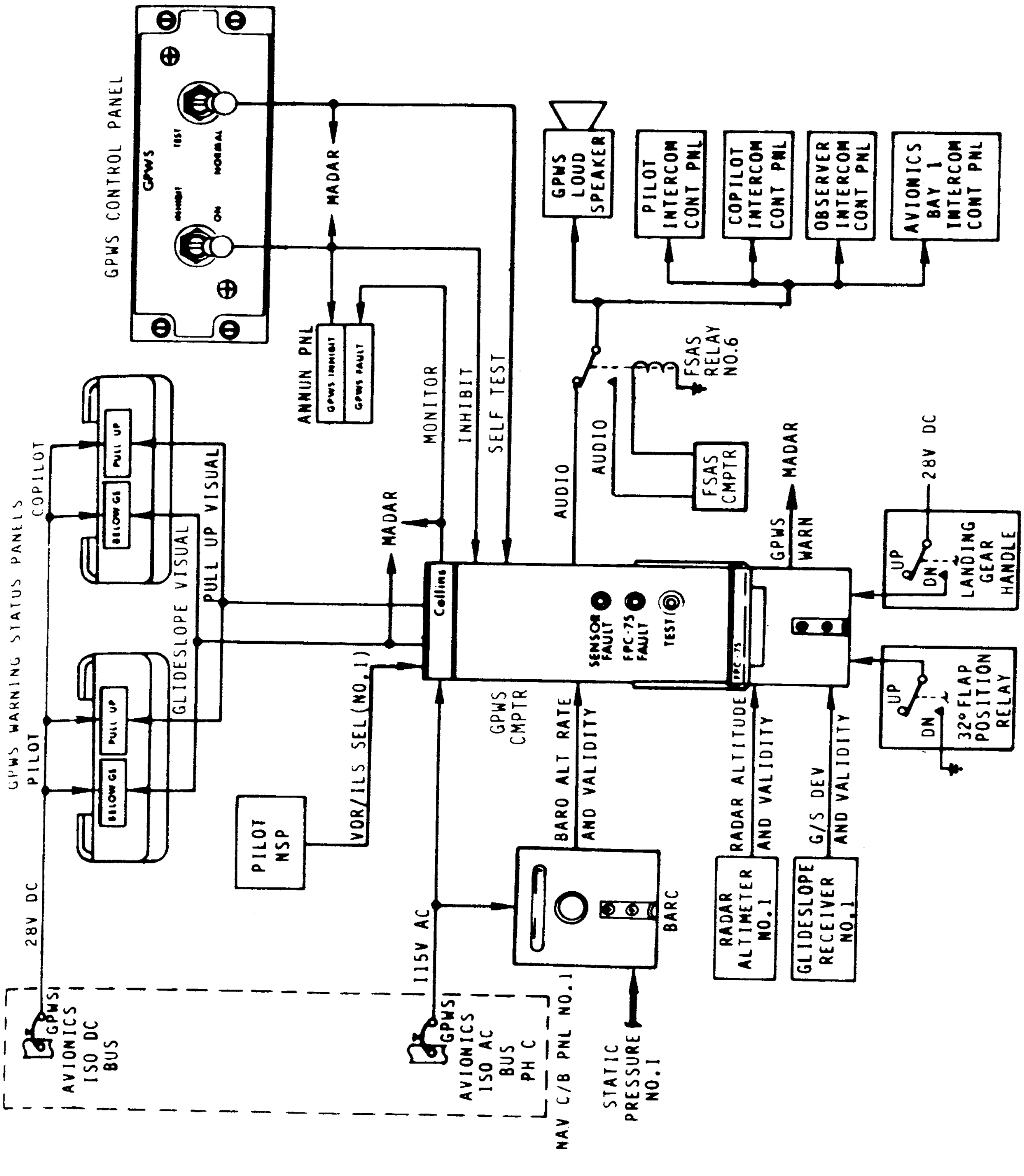
C-5B CASTER/POWER BACK SYSTEM



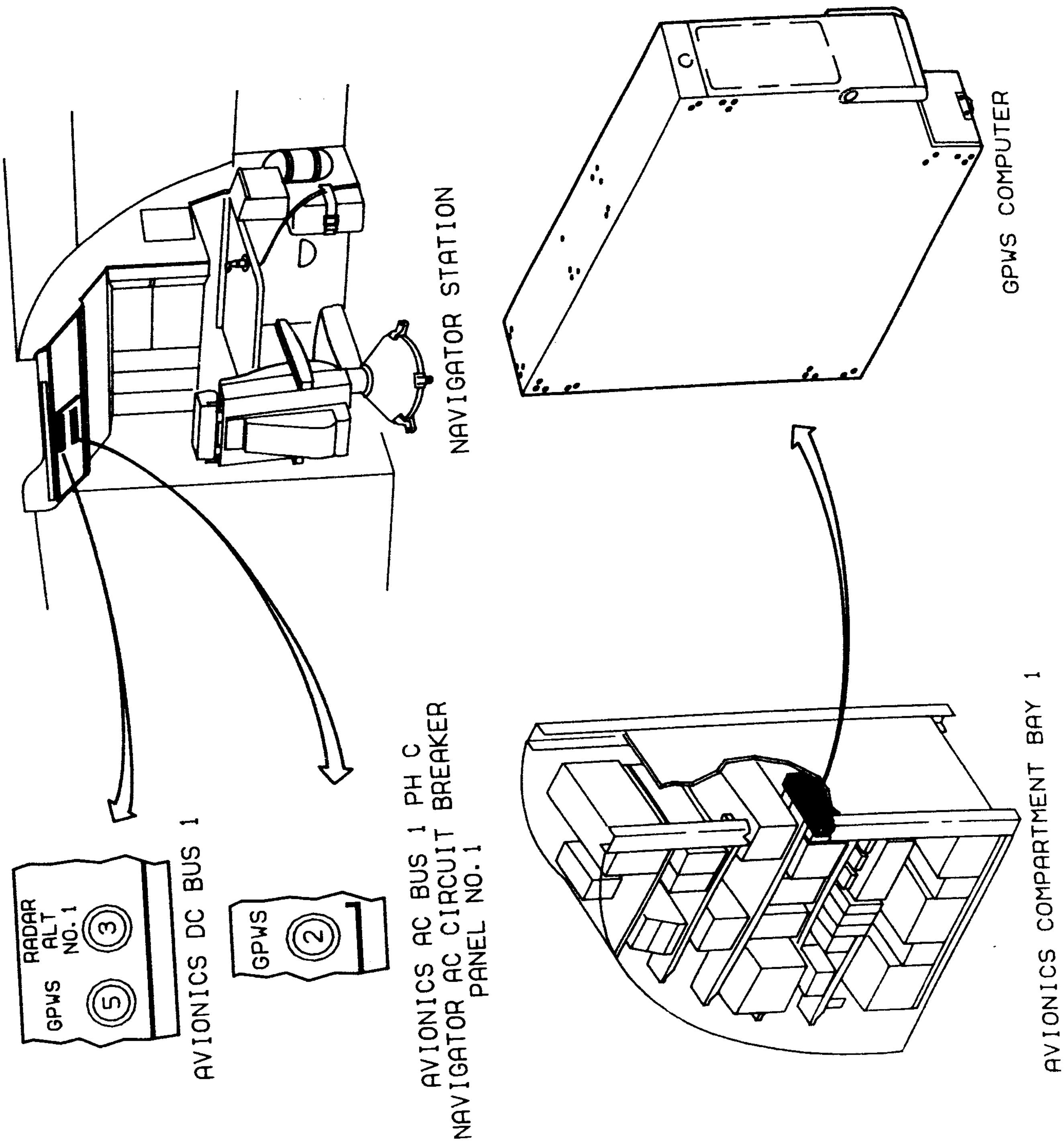
C-5A FPC-75 GPWS COMPONENT LOCATIONS
(SHEET 1)



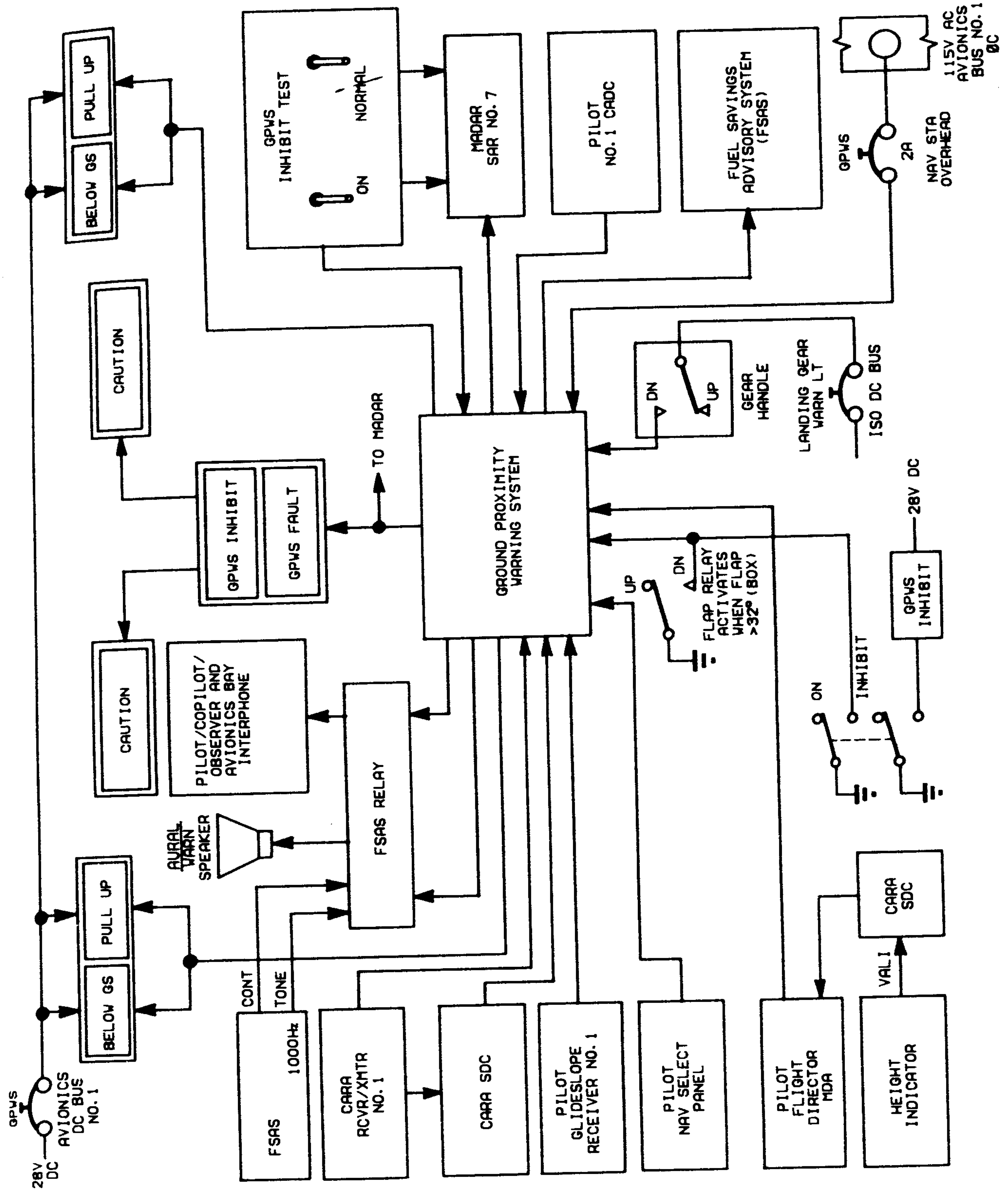
C-5A FPC-75 GPWS COMPONENT LOCATIONS
(SHEET 2)



C-5A FPC-75 GPWS FUNCTIONAL DIAGRAM



C-5B MARK II GPWS COMPONENT LOCATIONS



C-5B MARK II GPWS SYSTEM INTERFACE

COMMUNICATIONS

The communication (COMM) systems provide communications within the aircraft, with other aircraft, and with surface stations. The COMM systems on the C-5A/B are:

C-5A	C-5B
o Public Address, AIC-13	o Same
o Intercom, AIC-18	o Intercom, AIC-18
o HF COMM, AT-440 with provisions for Secure Voice (2)	o HF COMM, ARC-190 with provisions for Secure Voice and SELSCAN (2)
o VHF COMM, 807A with provisions for Secure Voice (2)	o VHF COMM, ARC-186 with provisions for Secure Voice (2)
o UHF Comm, ARC-164 with provisions for Secure Voice (2)	o ARC-164 with "Have Quick" capability and provisions for Secure Voice(2)
o Crash Data Position Indicator Recorder (CDPIR)	o Cockpit Voice Recorder
	o Digital Flight Data Recorder
	o Emergency Locator Transmitter

The public address system provides one-way communications with the relief crew area, aft troop compartment, cargo compartment, and loading areas adjacent to the aircraft.

The intercom system provides communications between personnel within and adjacent to the aircraft and transmission over and/or monitoring of communication and selected navigation systems. The C-5A winch control intercom system is deactivated.

The HF COMM systems provide reception and high-power transmissions for long-range communications between aircraft and surface stations. They also have provisions for secure voice operation. Additionally the C-5B systems have provisions for SELSCAN operation.

The VHF COMM systems provide line-of-sight voice communications for enroute and terminal operations. These systems also have provisions for secure voice operation.

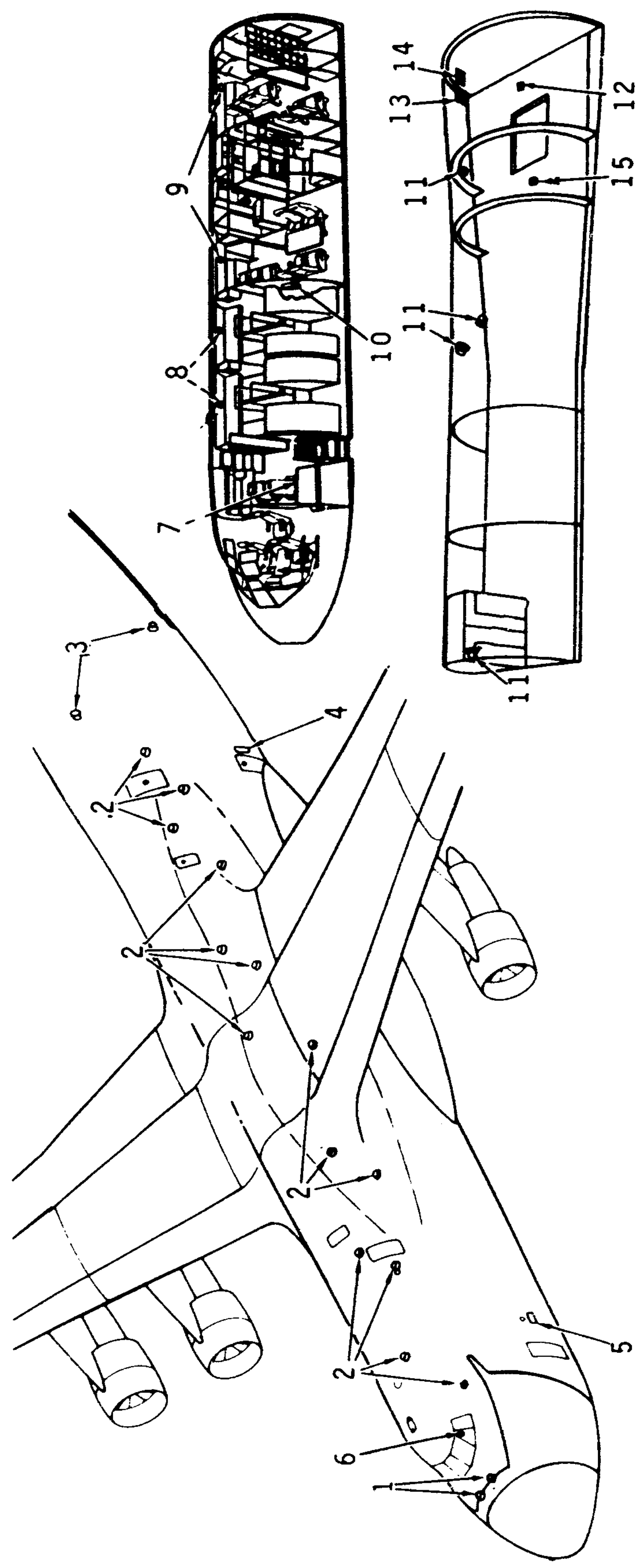
The UHF COMM systems provide line-of-sight communications for enroute and terminal operations. The systems also have provisions for secure voice operation.

The C-5A CDPIR transmits a radio beacon on the UHF Emergency frequency to minimize the time required to locate the aircraft in case it crashes. It also provides a recoverable recording of the last 30 minutes of communications, flight deck sounds, and selected aircraft parameters.

The C-5B cockpit voice recorder provides a recoverable recording of the last 30 minutes of communications and flight deck sounds.

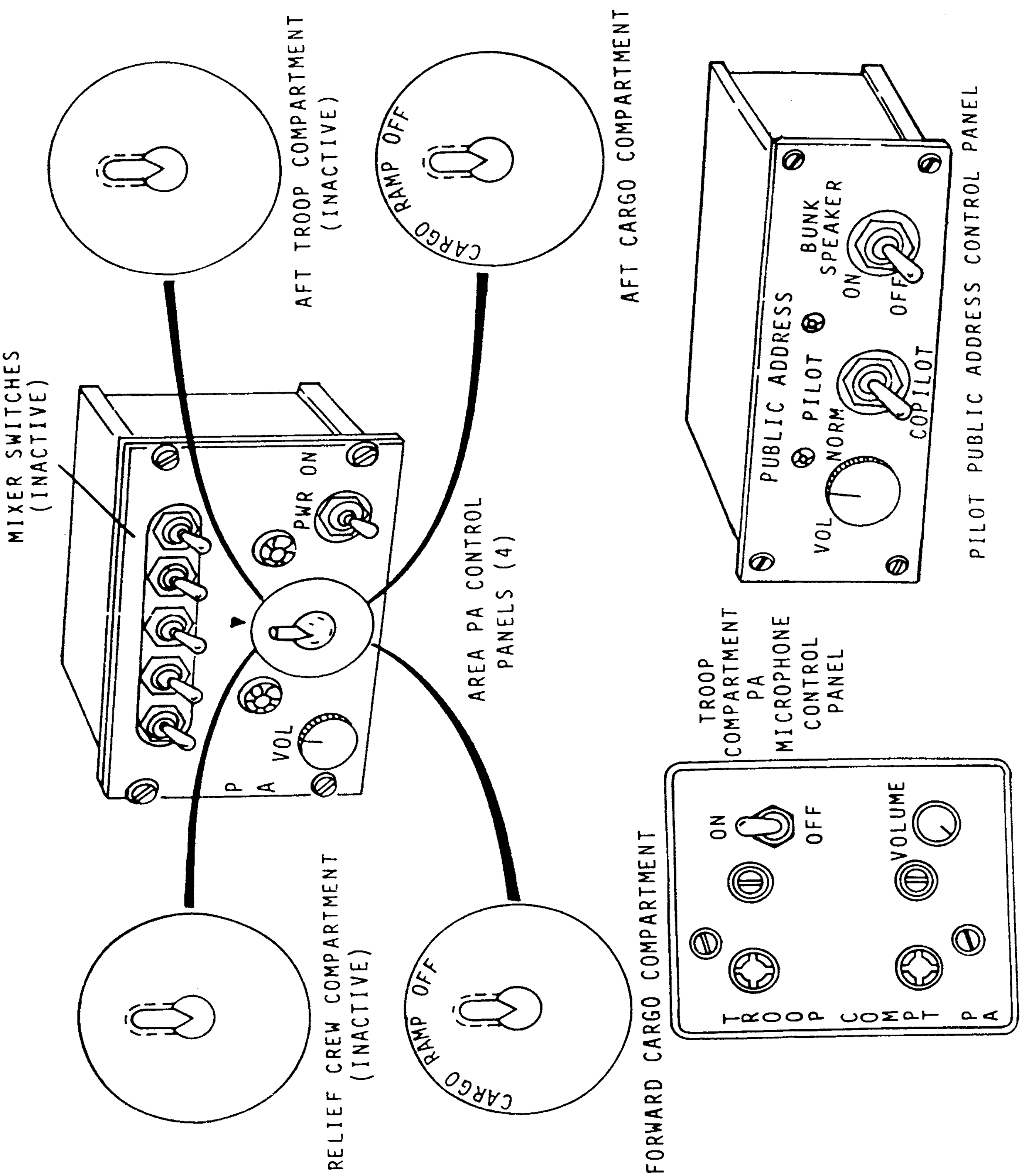
The C-5B digital flight data recorder provides a recoverable recording of the last 25 hours of selected aircraft parameters.

The C-5B emergency locator transmitter transmits a radio beacon on the VHF and UHF emergency frequencies to aid in locating a crashed aircraft.

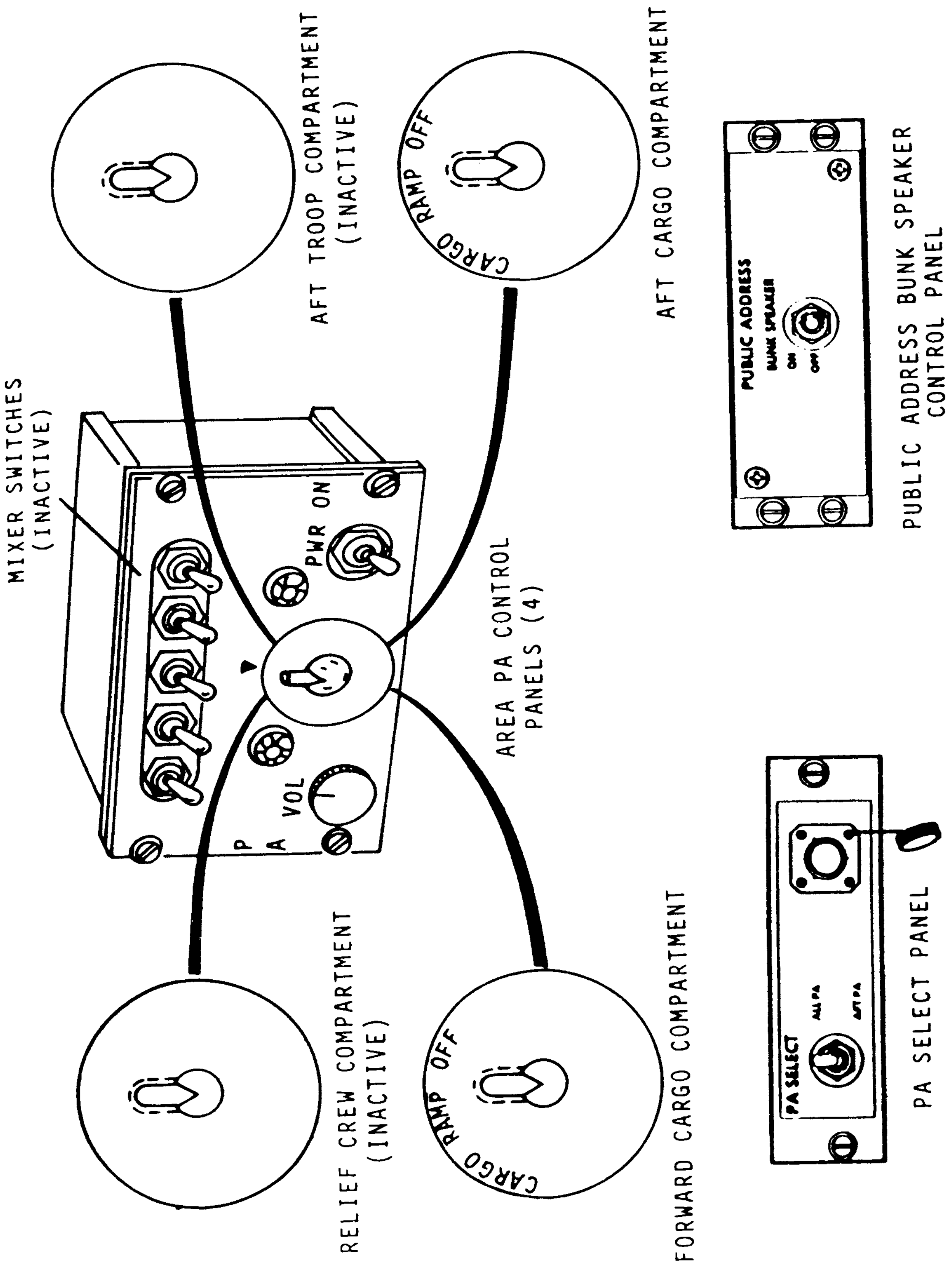


1. FWD RAMP SPEAKER (2 PLACES)
2. CARGO COMPARTMENT SPEAKER (14 PLACES)
3. AFT RAMP SPEAKER (2 PLACES)
4. AFT CARGO AREA PA CONTROL AND AMPLIFIER
5. FWD CARGO AREA PA CONTROL AND AMPLIFIER
6. C-5A PUBLIC ADDRESS CONTROL PANEL C-5B PUBLIC ADDRESS BUNK SPEAKER CONTROL PANEL
7. NAVIGATOR CIRCUIT BREAKER PANEL NO.1 (4 C/Bs)
8. BUNK AREA PA SPEAKER (2 PLACES)
9. RELIEF CREW AREA PA SPEAKER (2 PLACES)
10. RELIEF CREW AREA PA CONTROL AND AMPLIFIER
11. TROOP COMPARTMENT SPEAKER (4 PLACES)
12. TROOP COMPARTMENT AREA PA CONTROL
13. TROOP COMPARTMENT PA MICROPHONE
14. TROOP COMPARTMENT PA MICROPHONE CONTROL
15. TROOP COMPARTMENT PA AMPLIFIER

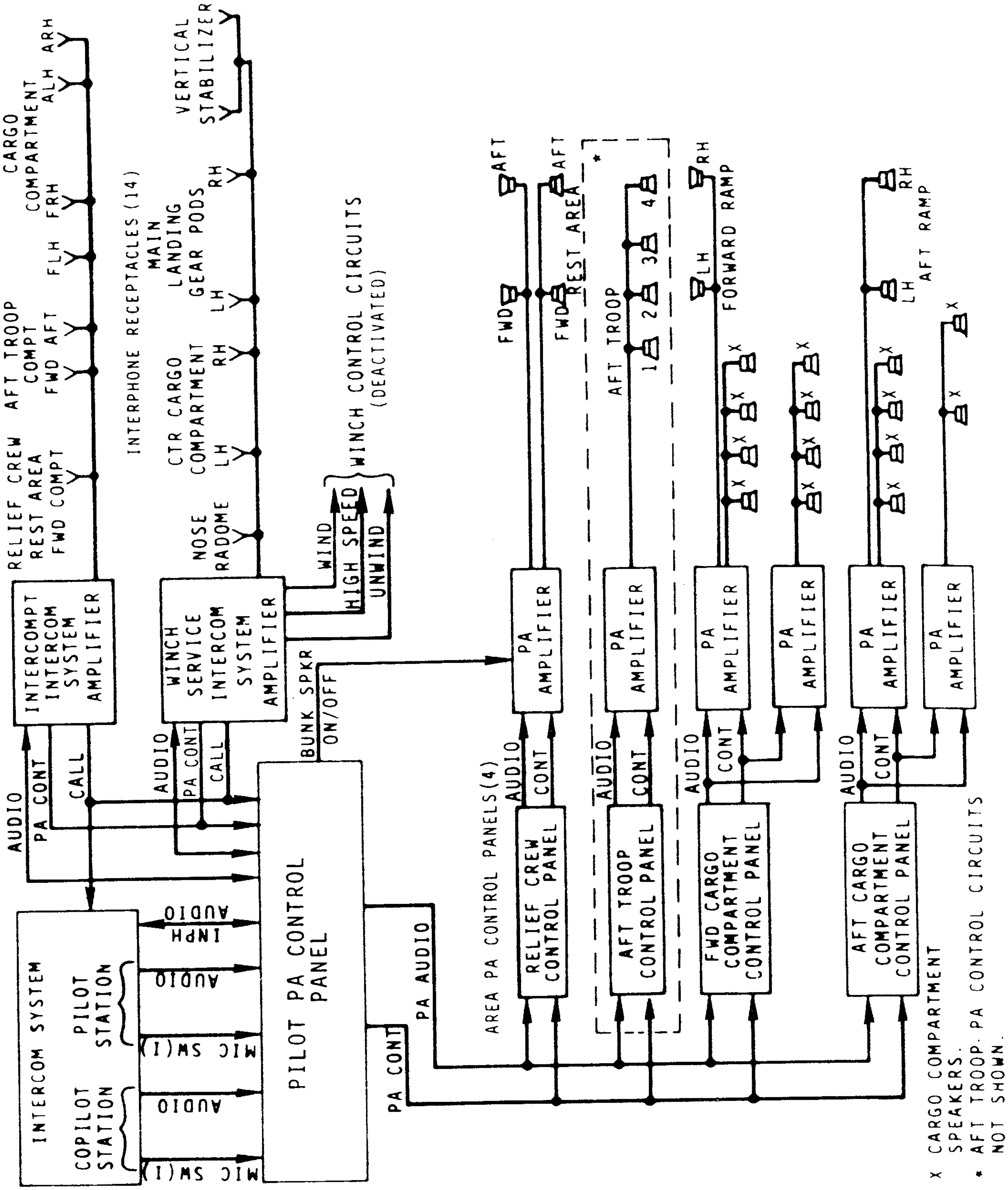
C-5A/B AIC-13, PA SYSTEM COMPONENT LOCATIONS



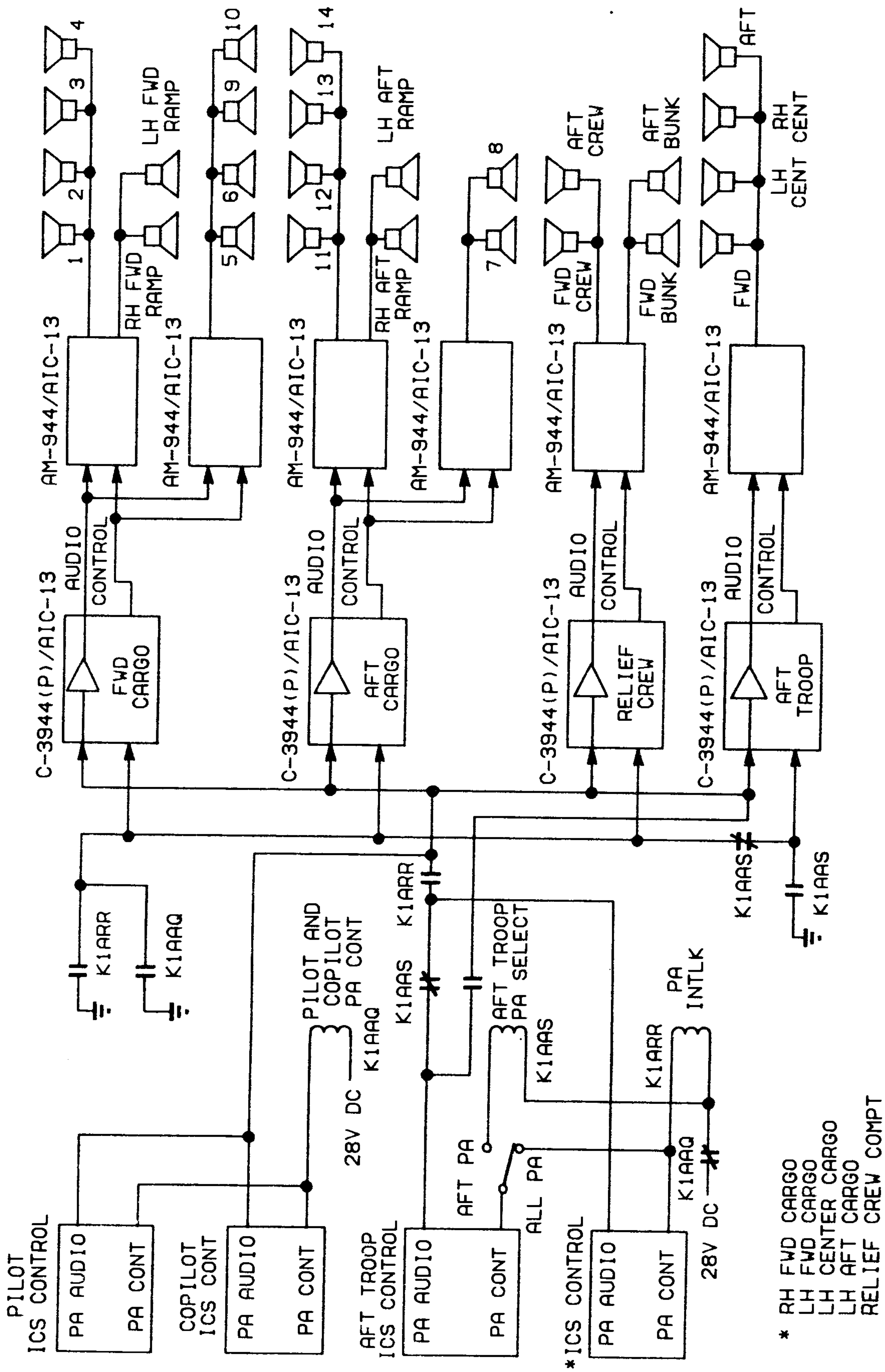
C-5A AIC-13, PA SYSTEM OPERATIONAL COMPONENTS



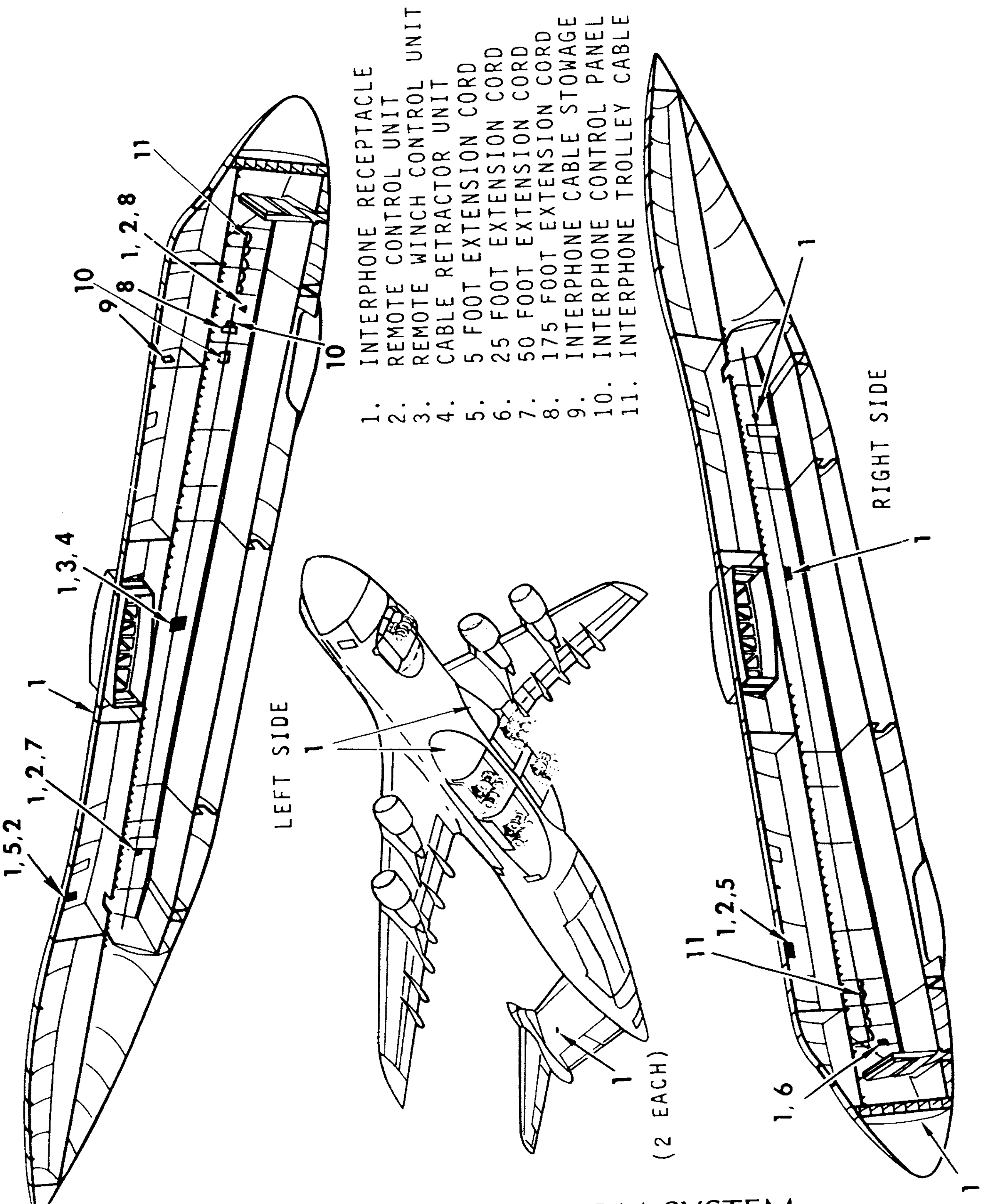
C-5B AIC-13, PA SYSTEM OPERATIONAL COMPONENTS



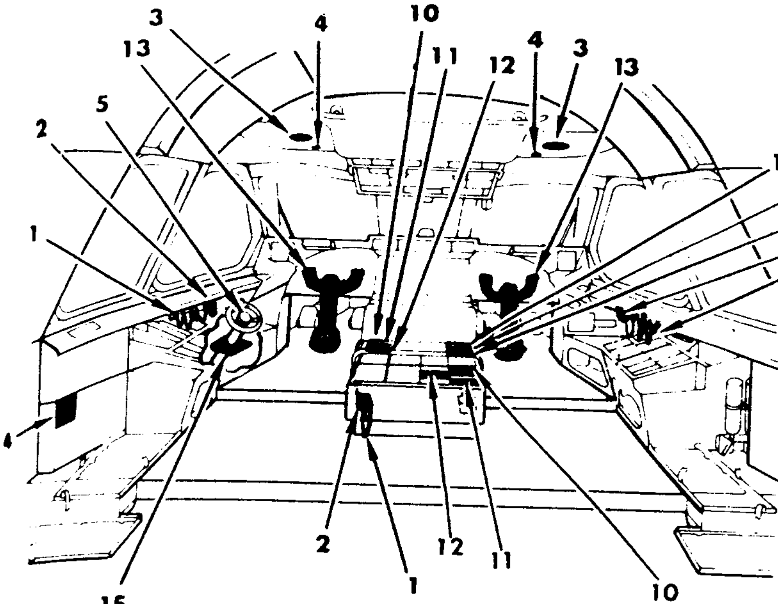
C-5A AIC-13, PA SYSTEM FUNCTIONAL BLOCK DIAGRAM



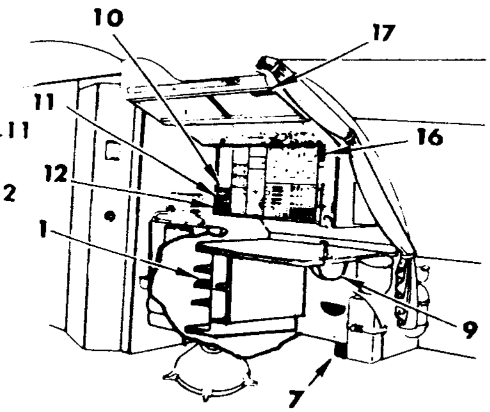
C-5B AIC-13, PA SYSTEM INTERFACE



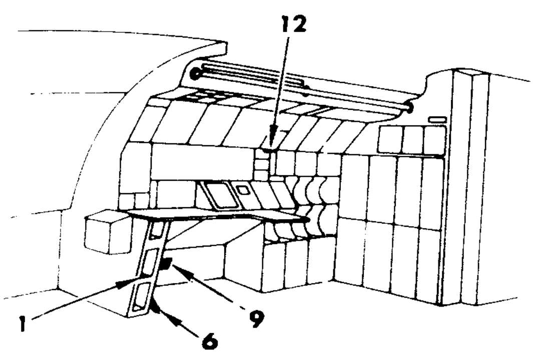
C-5A AIC-18, INTERCOM SYSTEM COMPONENT LOCATIONS (SHEET 1)



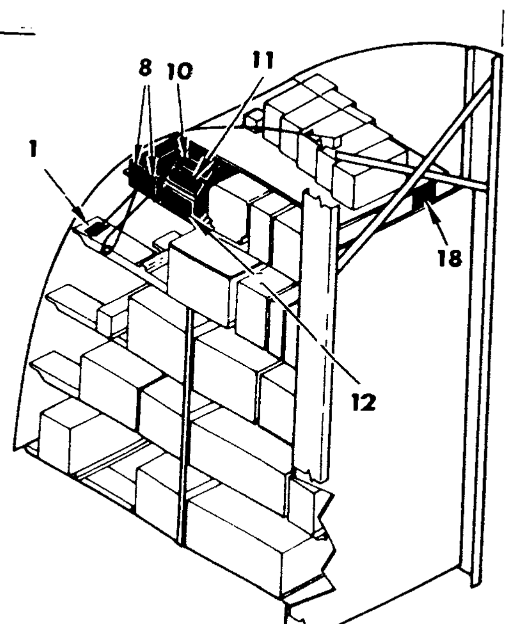
PILOT STATIONS



NAVIGATOR STATION



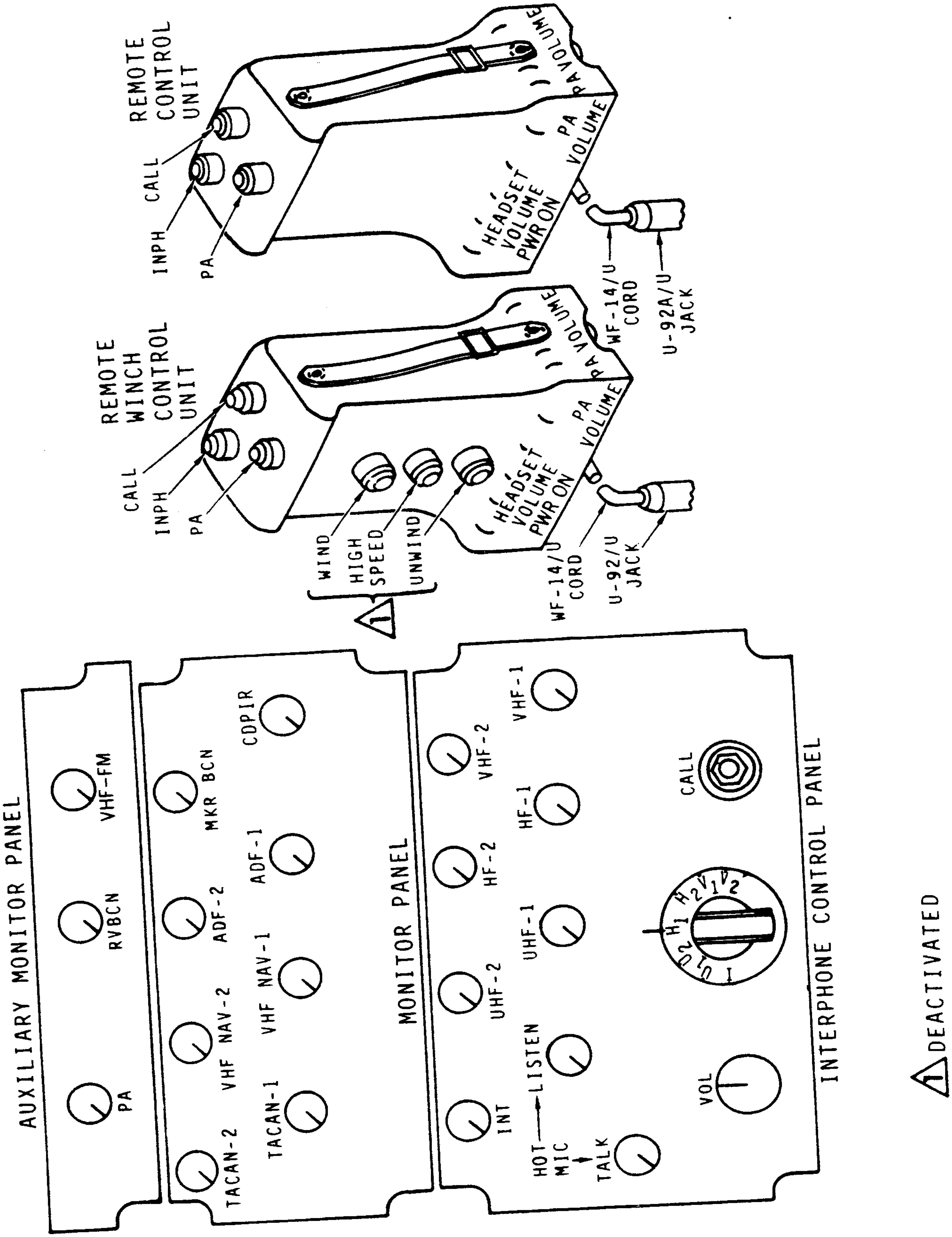
FLIGHT ENGINEER STATION



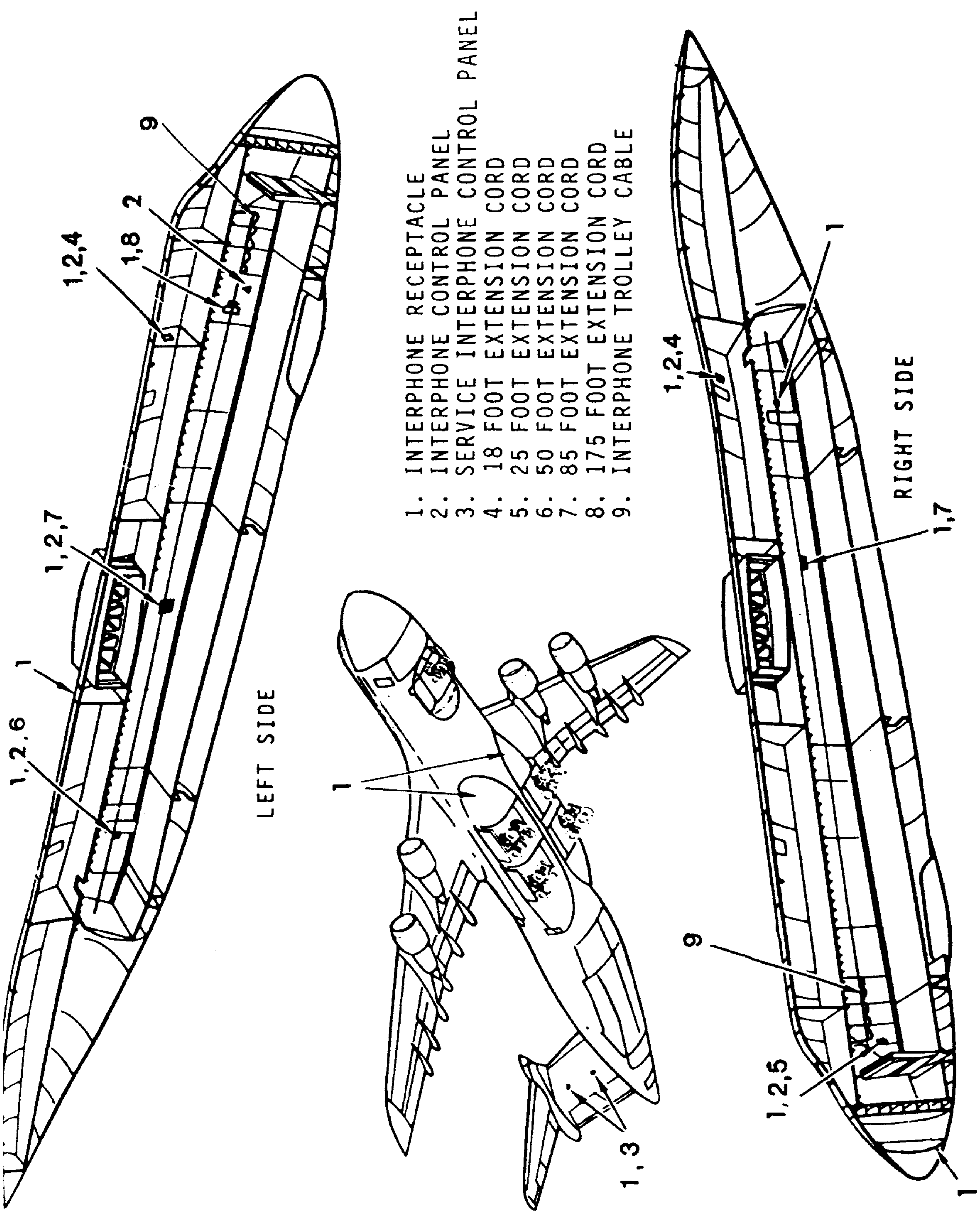
AVIONICS BAY 1

1. CORDAGE ASSEMBLY
2. MICROPHONE
3. INTERPHONE LOUDSPEAKER
4. INTERPHONE LOUDSPEAKER SWITCH
5. NOSE WHEEL STEERING INTERPHONE SWITCH BUTTON
6. FLIGHT ENGINEER STATION FOOT SWITCH
7. NAVIGATOR STATION FOOT SWITCH
8. SYSTEM AMPLIFIERS
9. STUDENT INSTRUCTOR CORD ASSEMBLY
10. AUXILIARY MONITOR PANEL
11. MONITOR PANEL
12. INTERPHONE CONTROL PANEL
13. CONTROL WHEEL INTERPHONE SWITCH
14. EMERGENCY CIRCUIT BREAKER PANEL (2 C/Bs)
15. NOSE WHEEL STEERING INTERPHONE SWITCH
16. ADS AND PARATROOP JUMP LIGHTS CONTROL PANEL
17. NAVIGATOR C/B PANEL NO. 2 (3 C/Bs)
18. FUSE HOLDER BRACKET

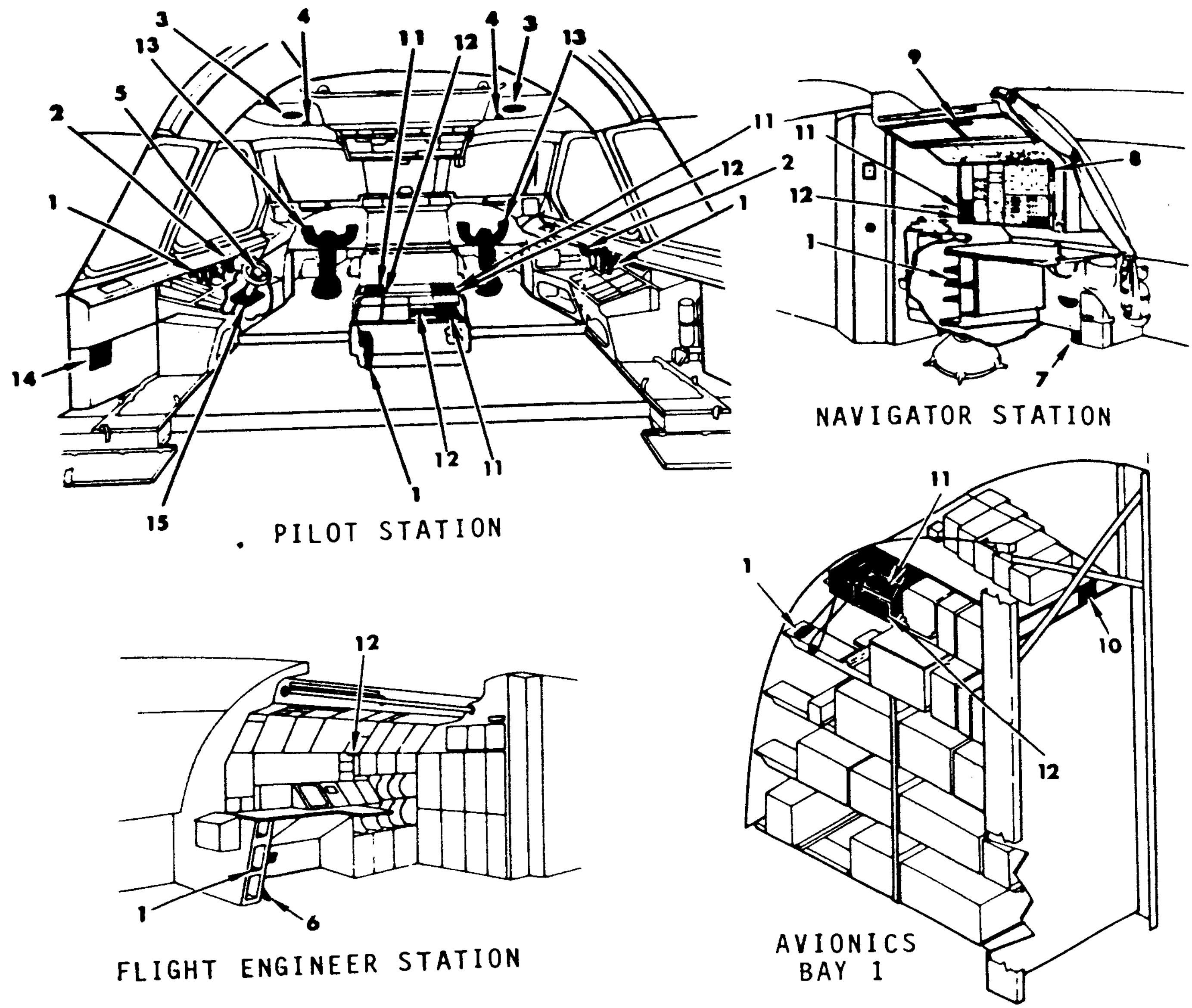
C-5A AIC-18, INTERCOM SYSTEM COMPONENT LOCATIONS (SHEET 2)



C-5A AIC-18, INTERCOM SYSTEM
OPERATIONAL COMPONENTS

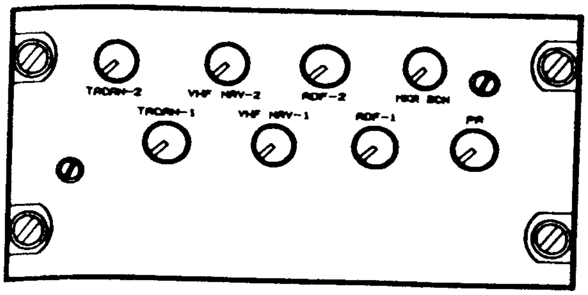


C-5B AIC-18, INTERCOM SYSTEM
COMPONENT LOCATIONS (SHEET 1)

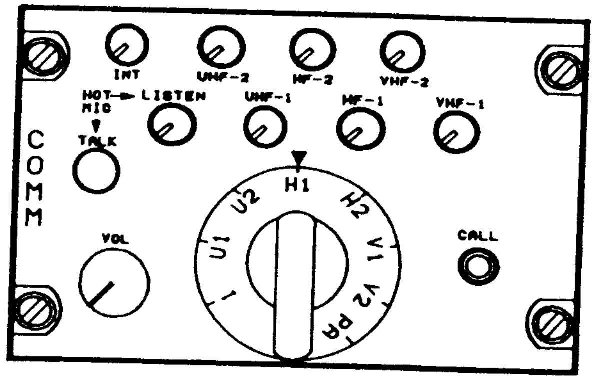


1. CORDAGE ASSEMBLY
2. MICROPHONE
3. INTERPHONE LOUDSPEAKER
4. INTERPHONE LOUDSPEAKER SWITCH
5. NOSE WHEEL STEERING INTERPHONE SWITCH BUTTON
6. FLIGHT ENGINEER STATION FOOT SWITCH
7. NAVIGATOR STATION FOOT SWITCH
8. ADS AND PARATROOP JUMP LIGHTS CONTROL PANEL
9. NAVIGATOR C/B PANEL NO.2 (2 C/B'S)
10. FUSE HOLDER BRACKET
11. MONITOR PANEL
12. INTERPHONE CONTROL PANEL
13. CONTROL WHEEL INTERPHONE SWITCH
14. EMERGENCY CIRCUIT BREAKER PANEL (2 C/B'S)
15. NOSE WHEEL STEERING INTERPHONE SWITCH

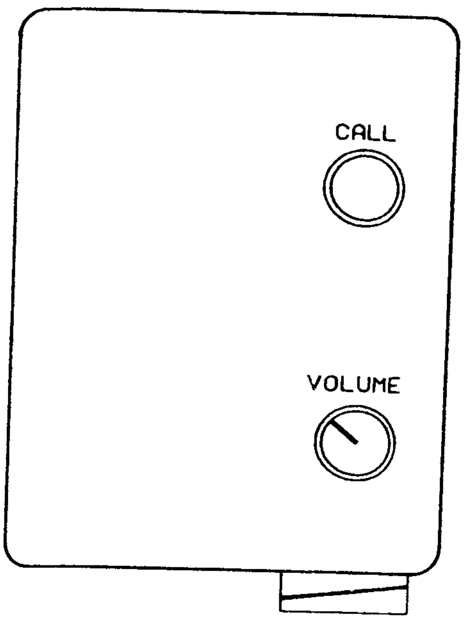
C-5B AIC-18, INTERCOM SYSTEM COMPONENT LOCATIONS (SHEET 2)



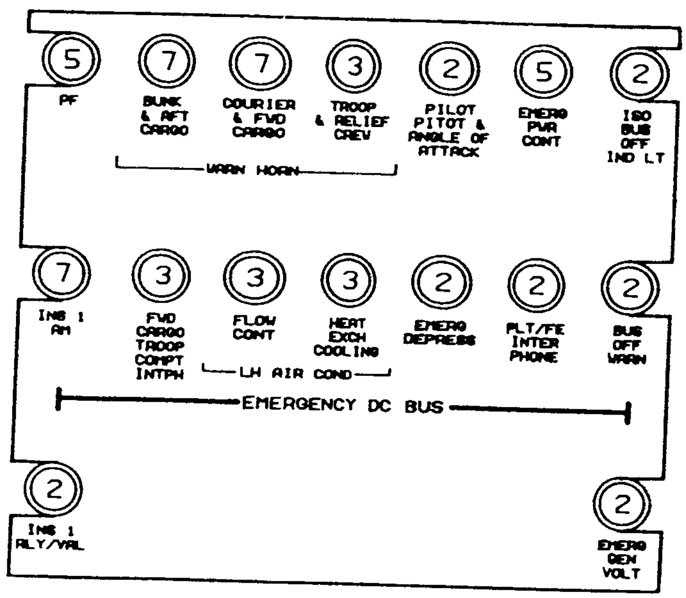
MONITOR PANEL



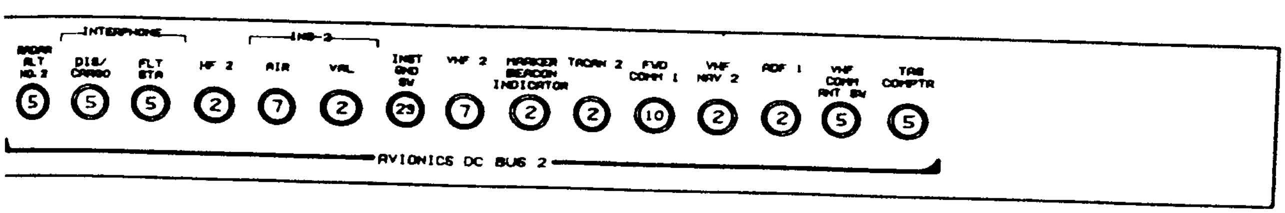
INTERPHONE CONTROL PANEL



BILIZER SERVICE INTERPHONE
CONTROL PANEL

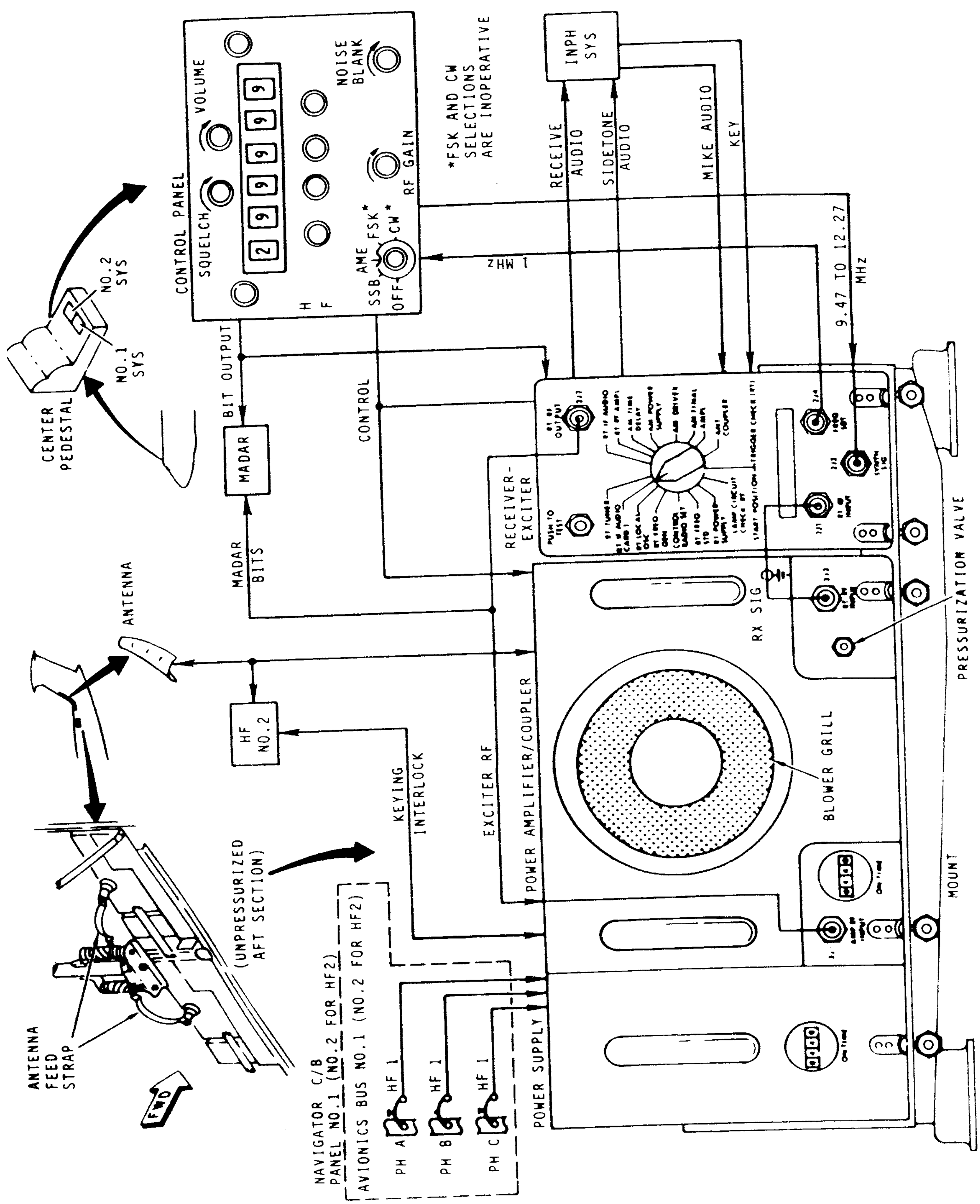


EMERGENCY DC CIRCUIT BREAKER PANEL
EMERGENCY POWER CENTER

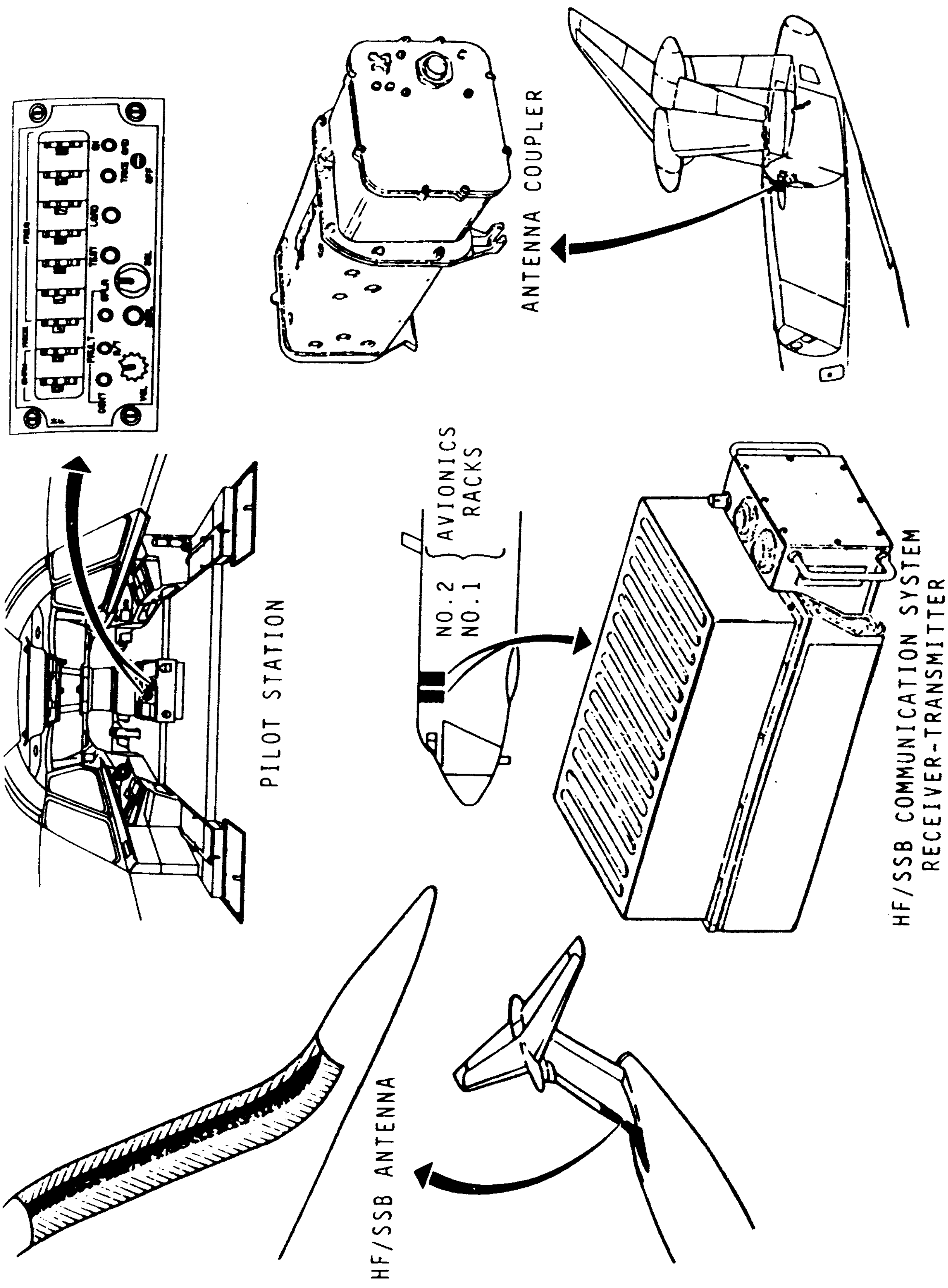


NAVIGATOR CIRCUIT BREAKER PANEL NO. 2

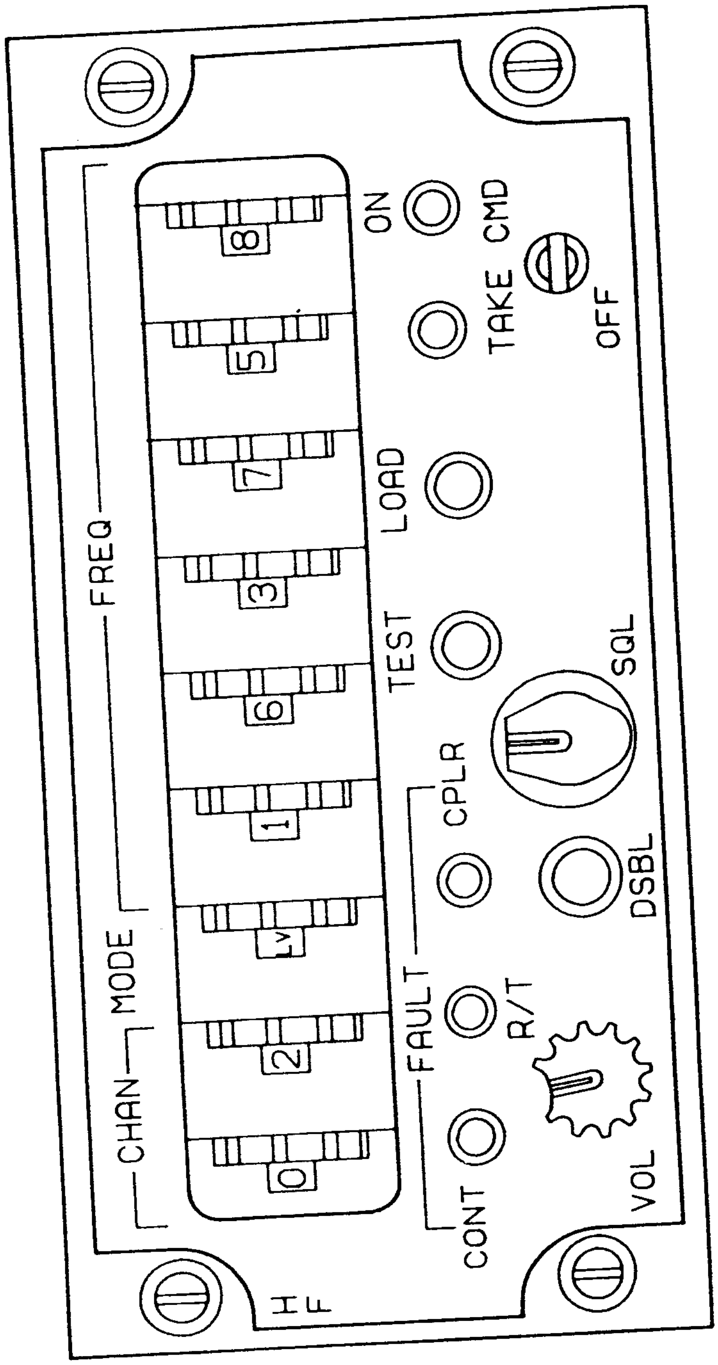
C-5B AIC-18, INTERCOM SYSTEM CONTROLS



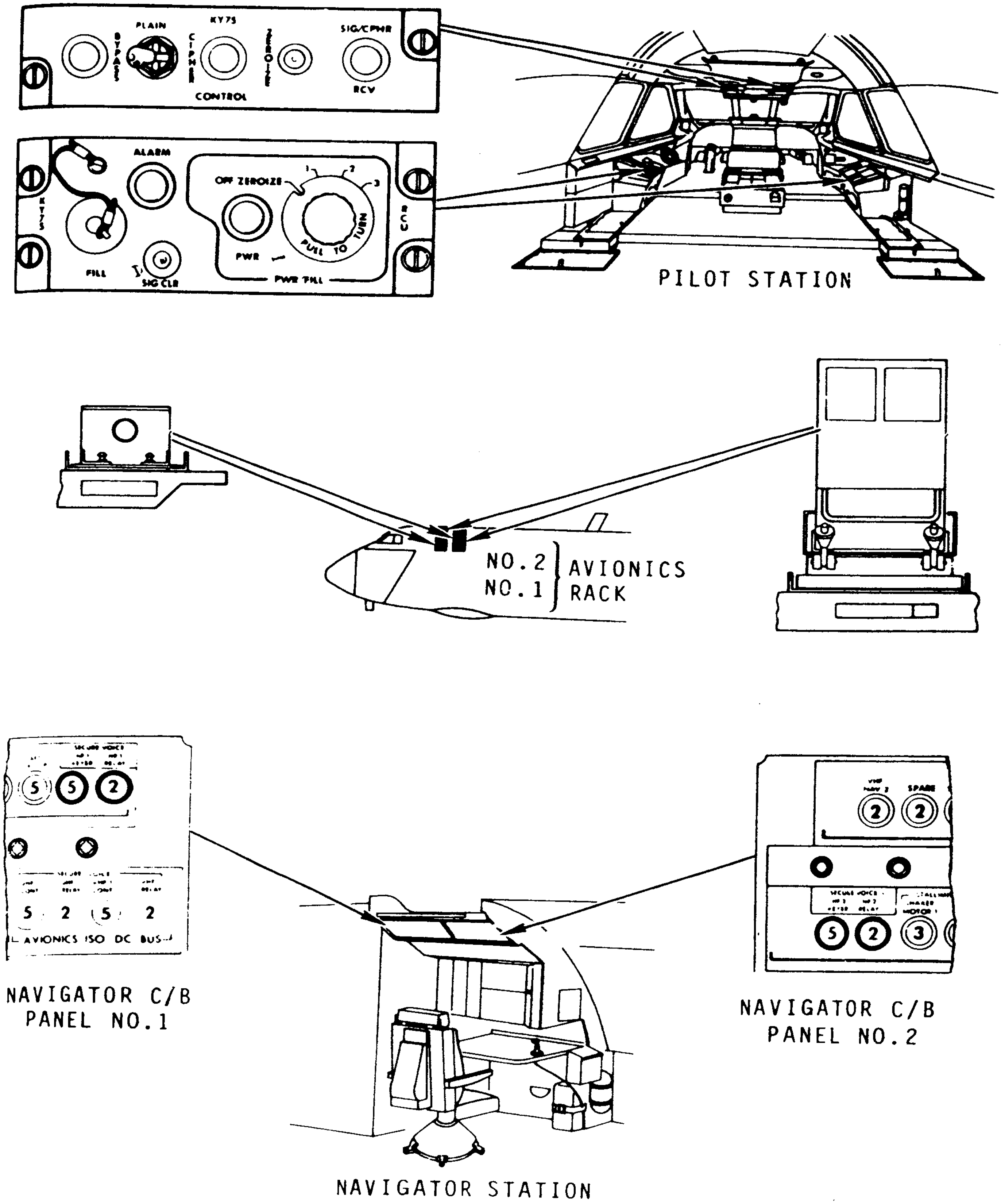
C-5A AT-440, HF/SSB COMM CABLING & COMPONENT LOCATIONS



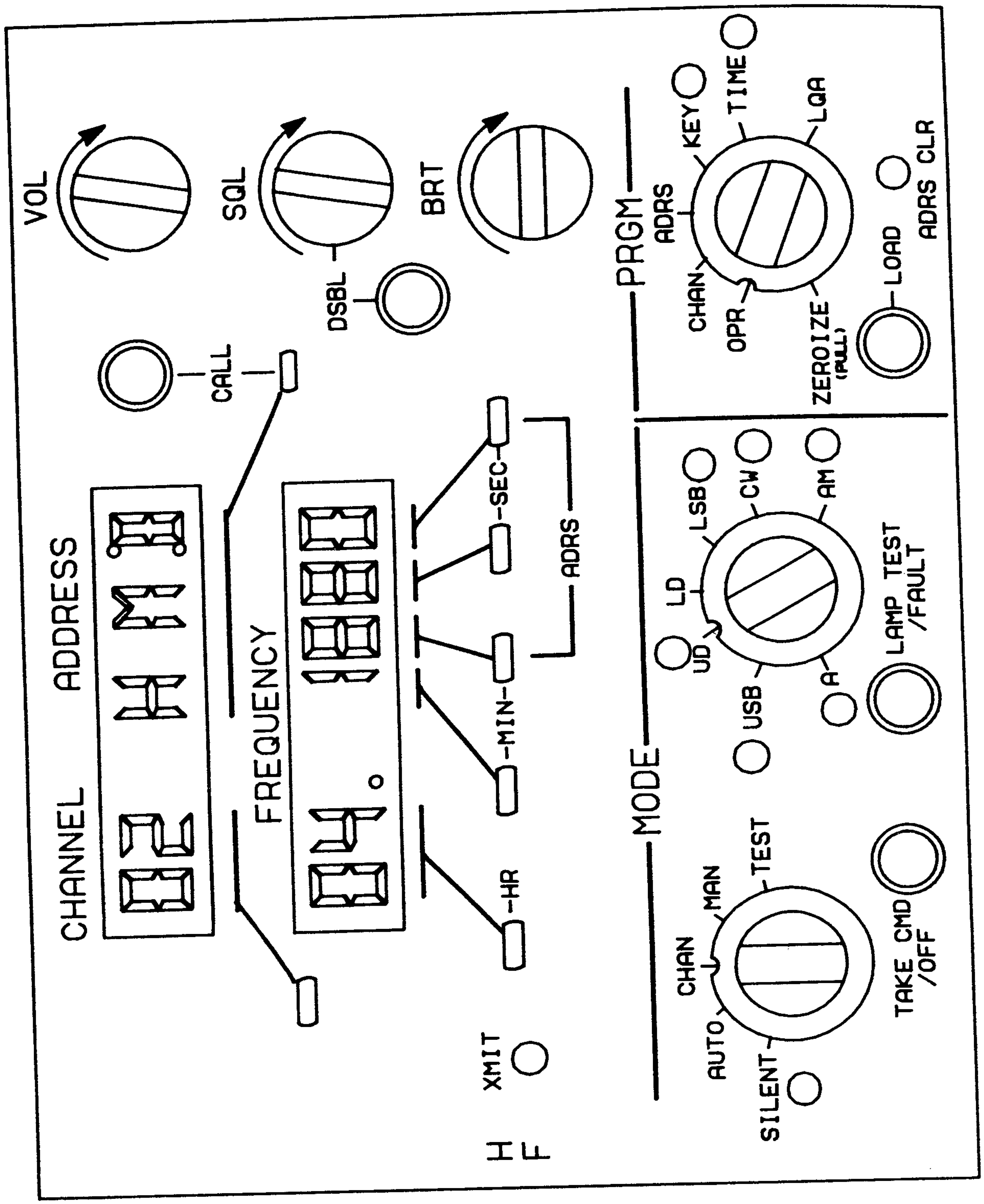
C-5B ARC-190, HF/SSB COMM
COMPONENT LOCATIONS



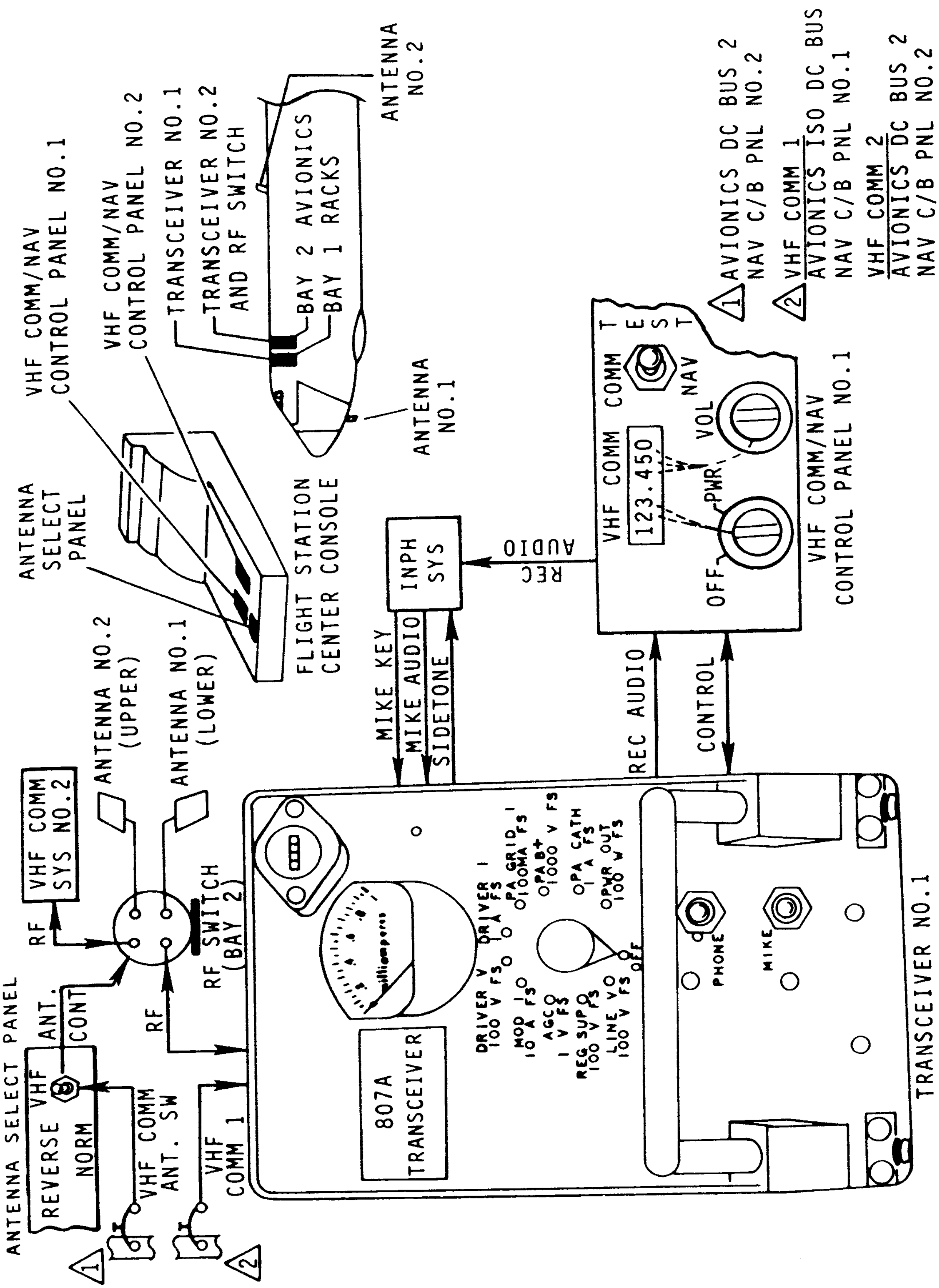
C-5B AN/ARC-190, HF COMM CONTROLS AND INDICATORS



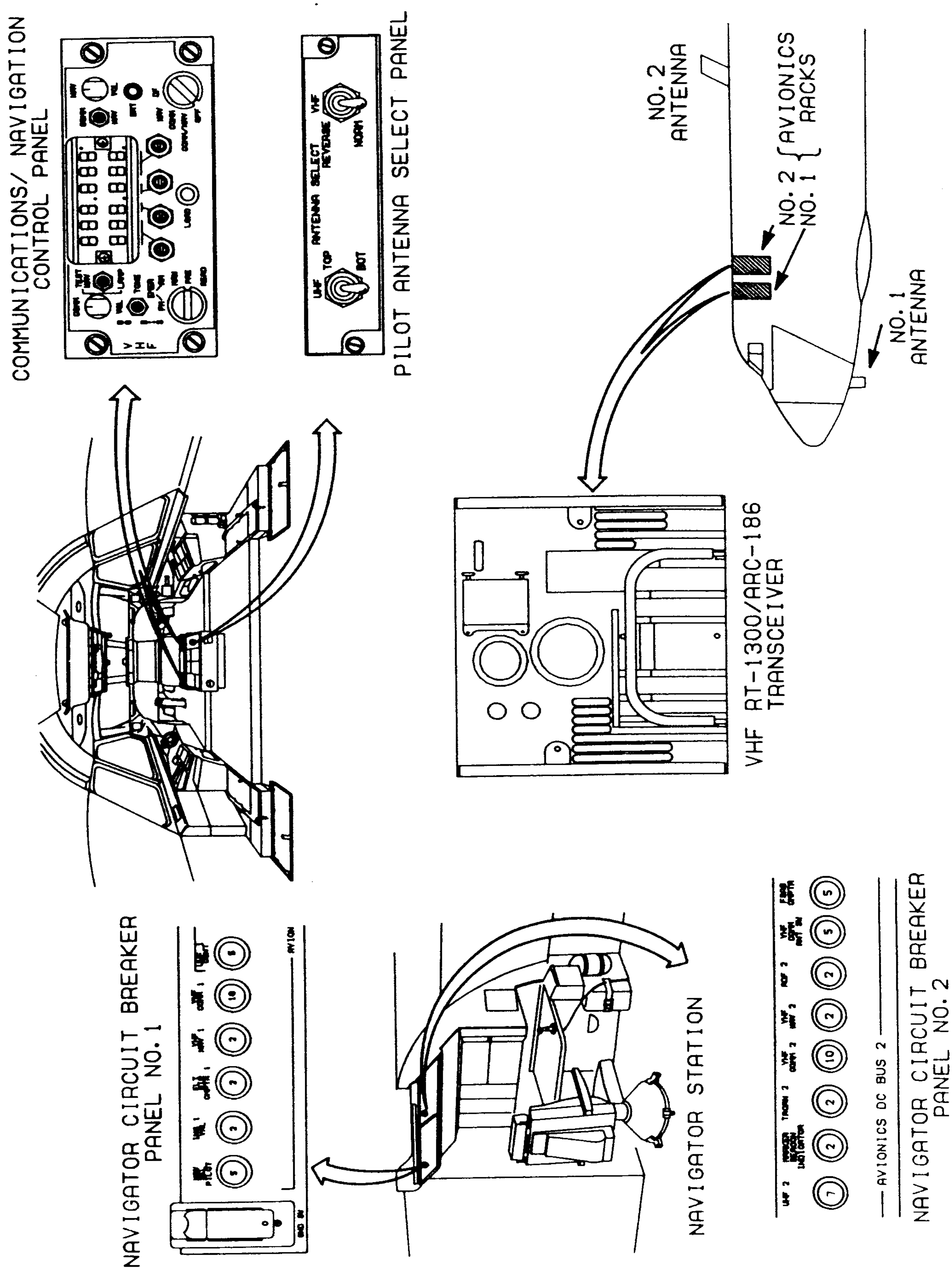
C-5B HF SECURE VOICE SYSTEM
COMPONENT LOCATIONS



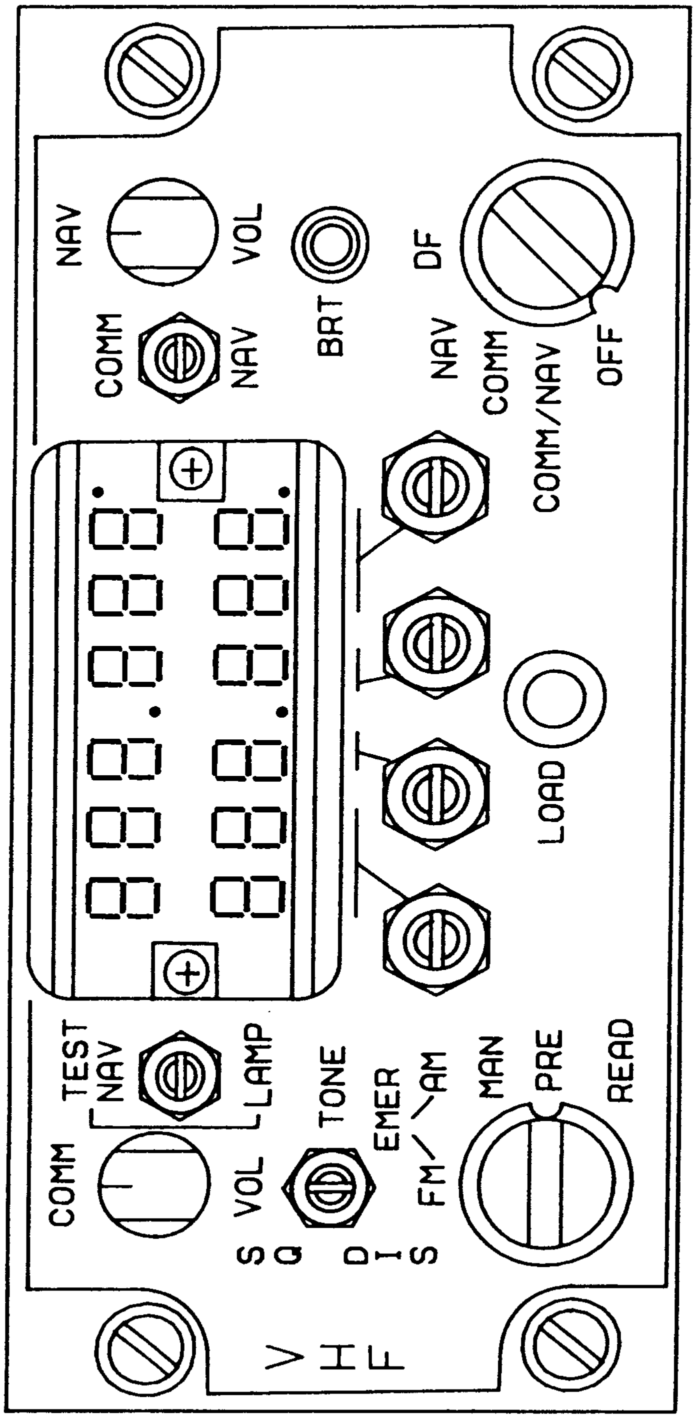
C-5B HF SELSCAN CONTROL PANEL



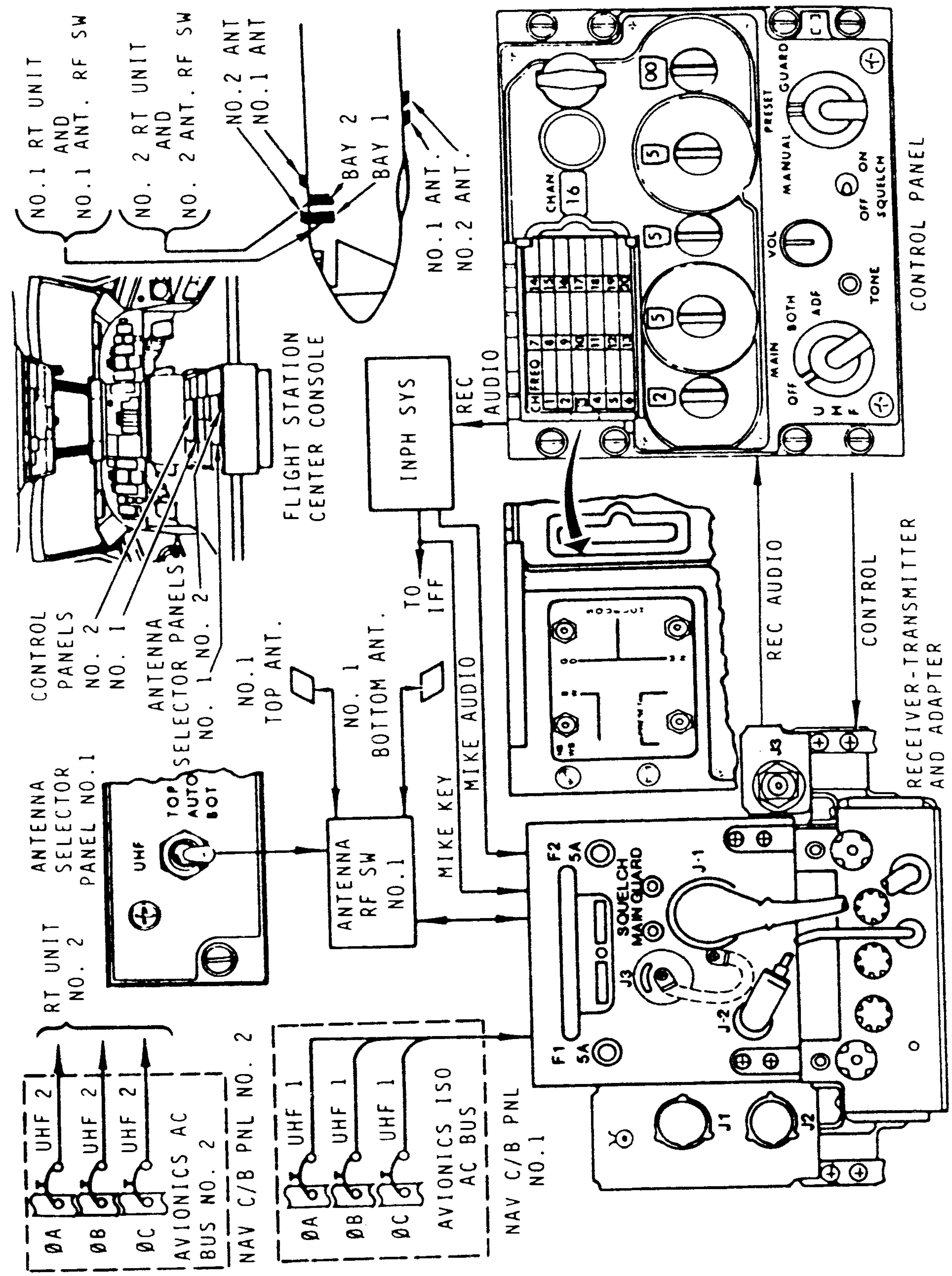
C-5A 807A, VHF COMM COMPONENT LOCATIONS



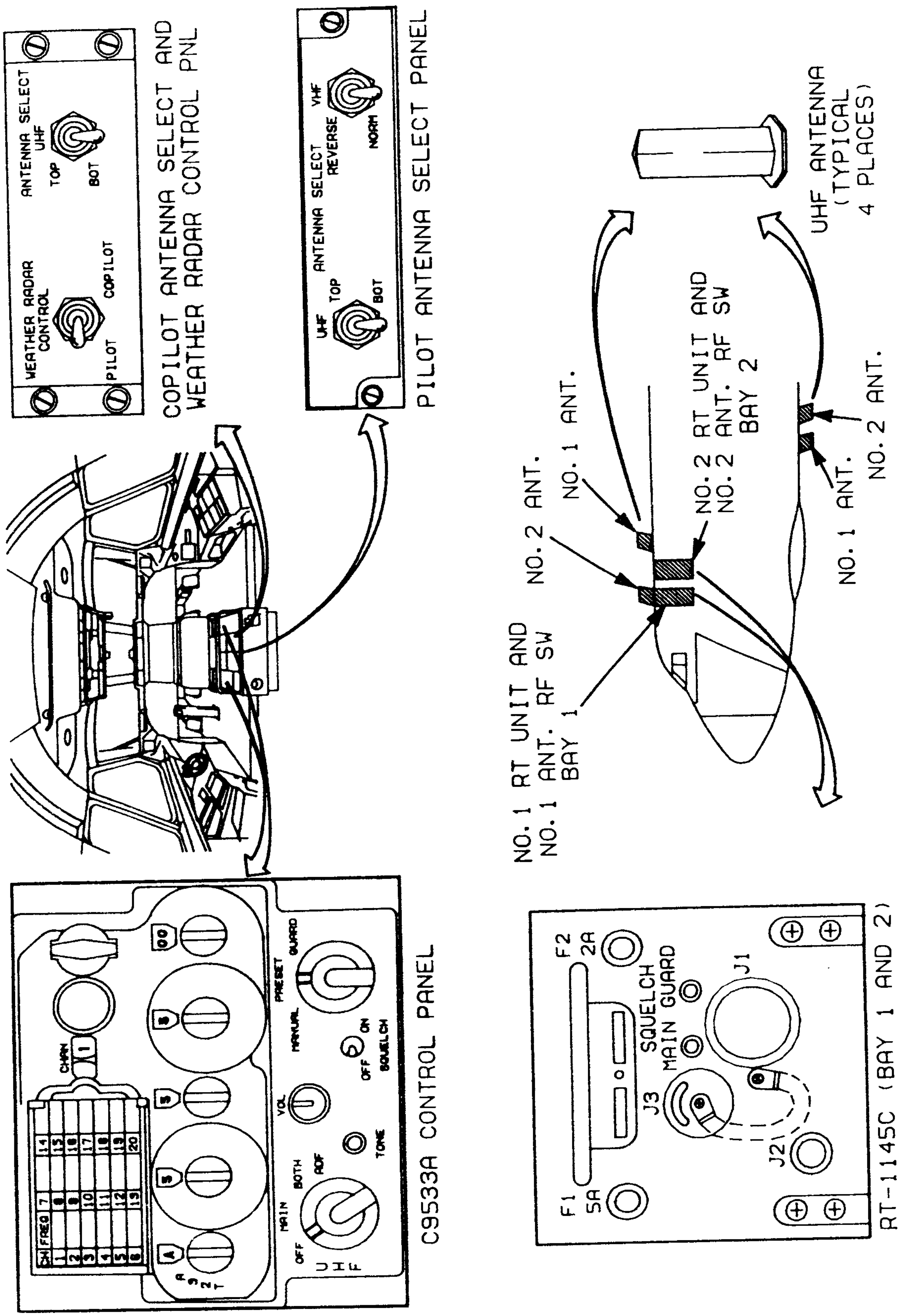
C-5B ARC-186, VHF COMM COMPONENT LOCATIONS



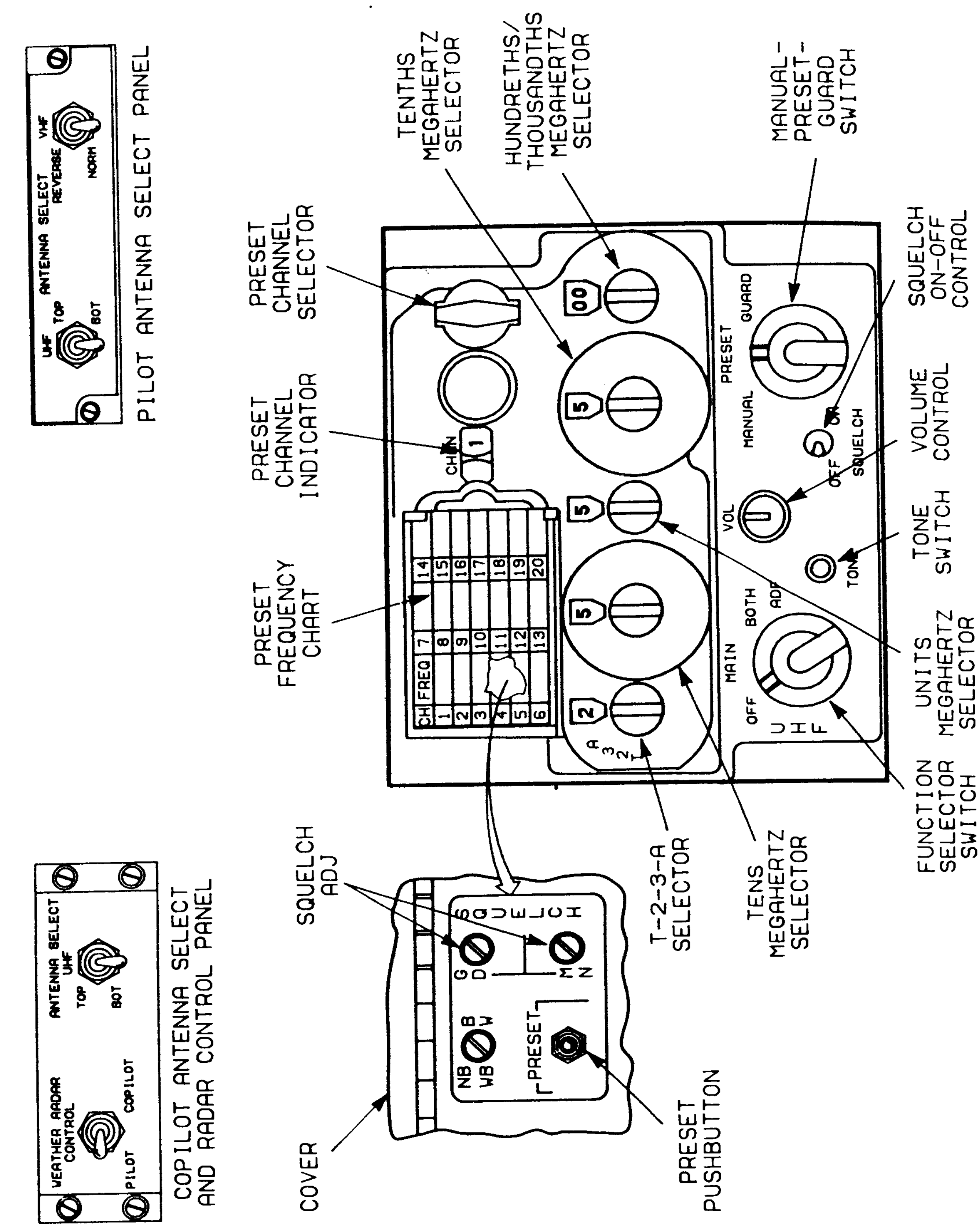
C-5B AN/ARC-186, VHF COMM CONTROLS AND INDICATORS



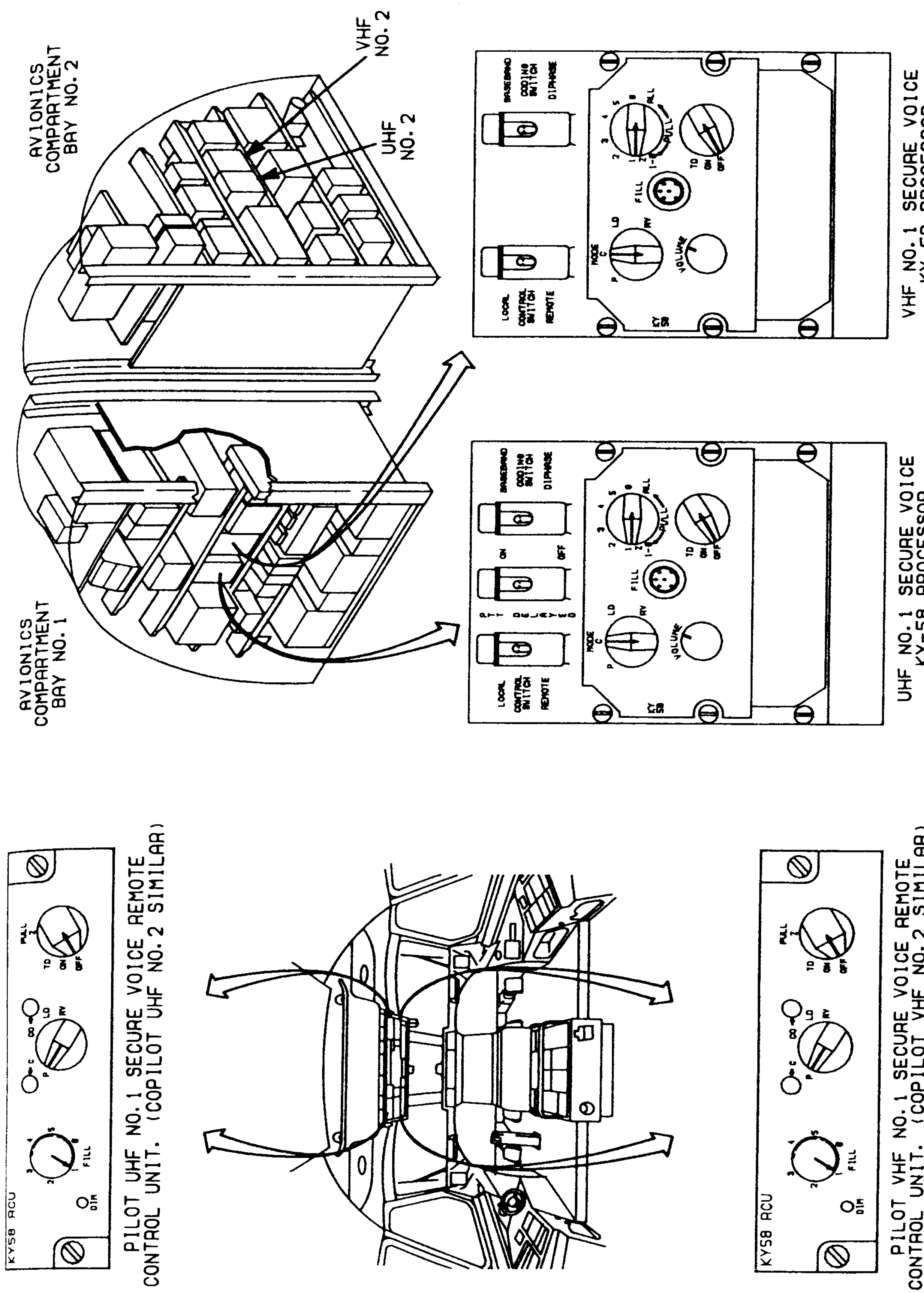
C-5A ARC-164, UHF COMM COMPONENT LOCATIONS



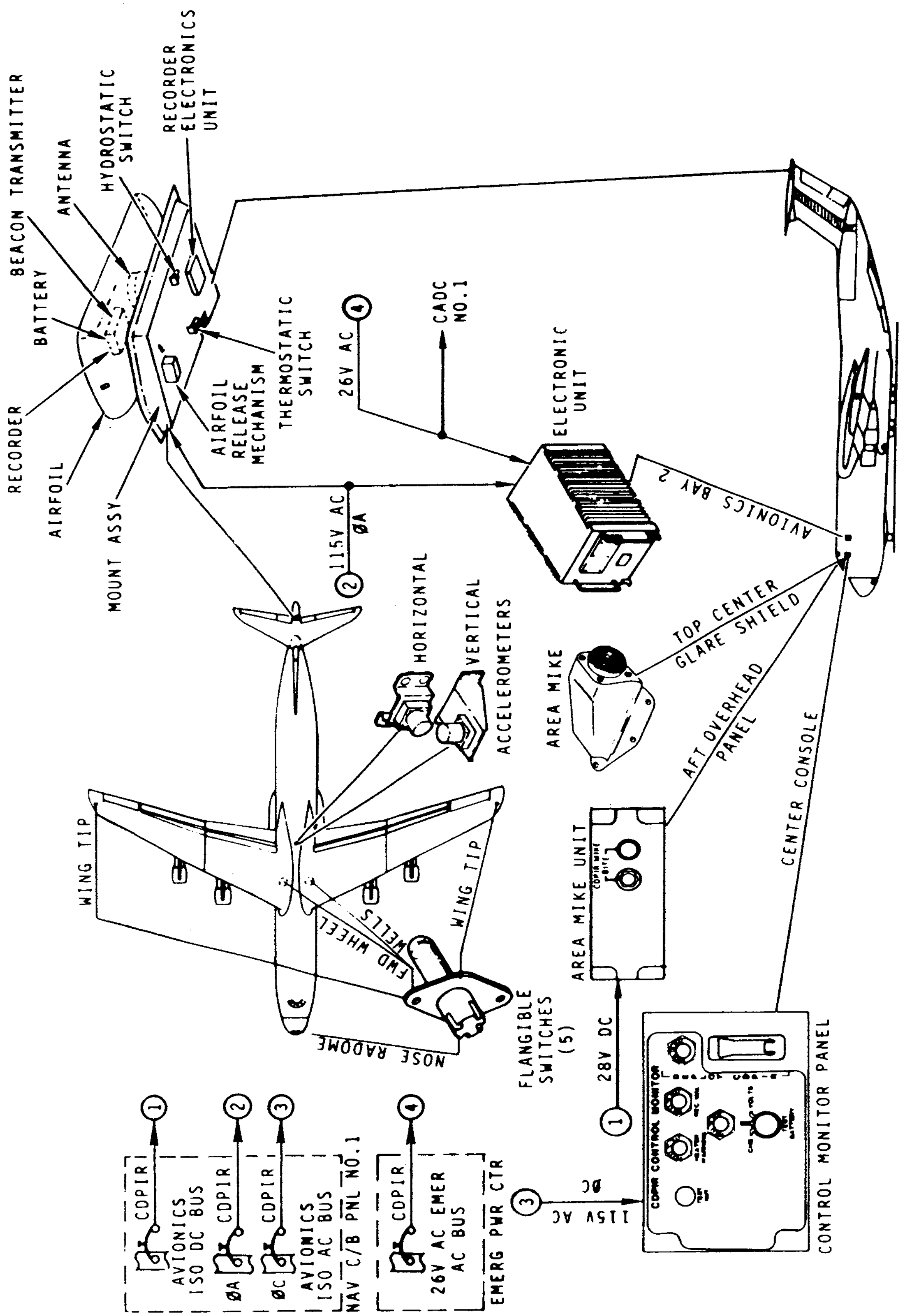
C-5B ARC-164, UHF COMM
COMPONENT LOCATIONS



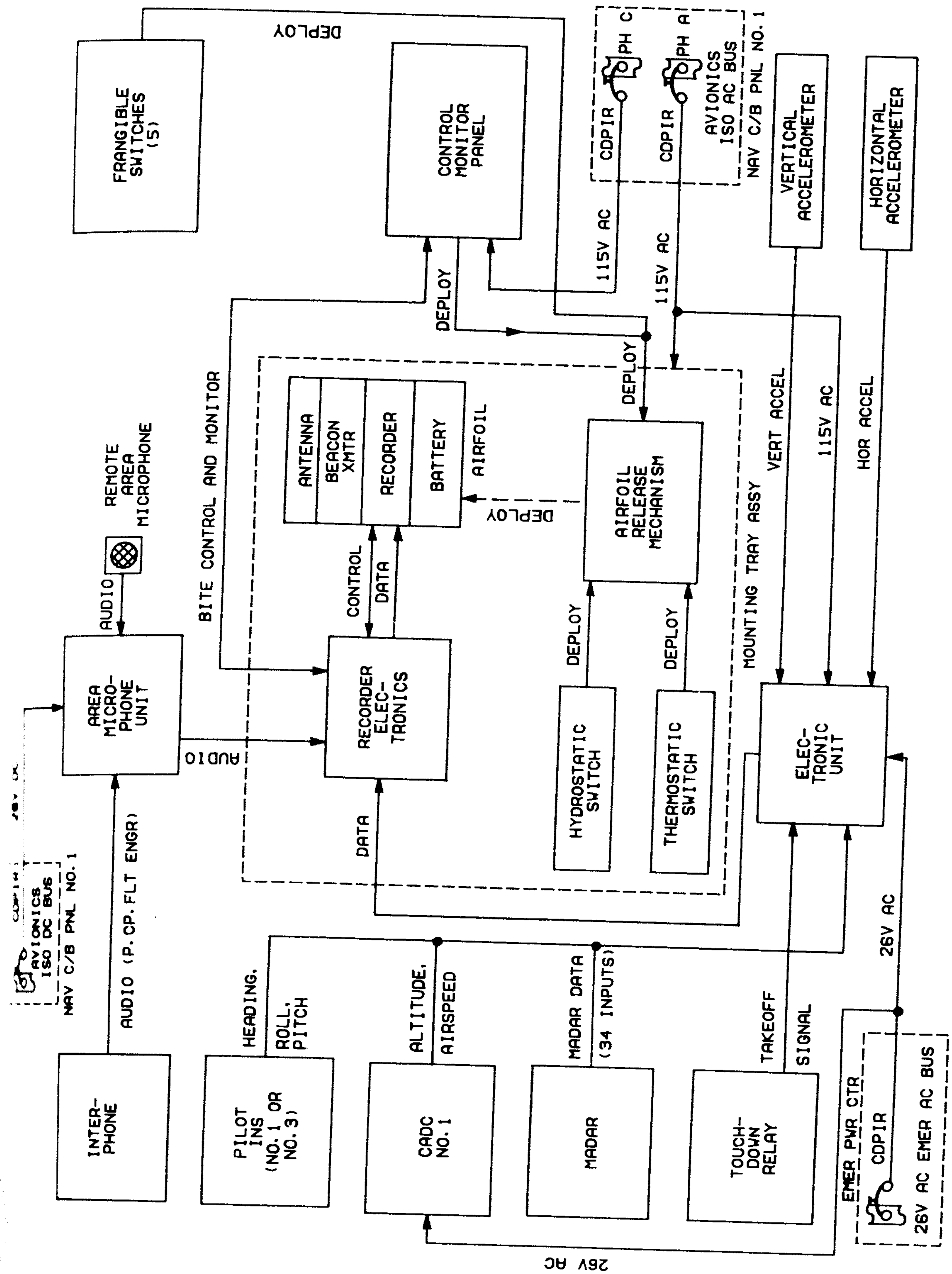
C-5B ARC-164, UHF COMM CONTROLS



C-5A/B UHF AND VHF RADIO SECURE VOICE (KY-58)
SYSTEM COMPONENT LOCATIONS



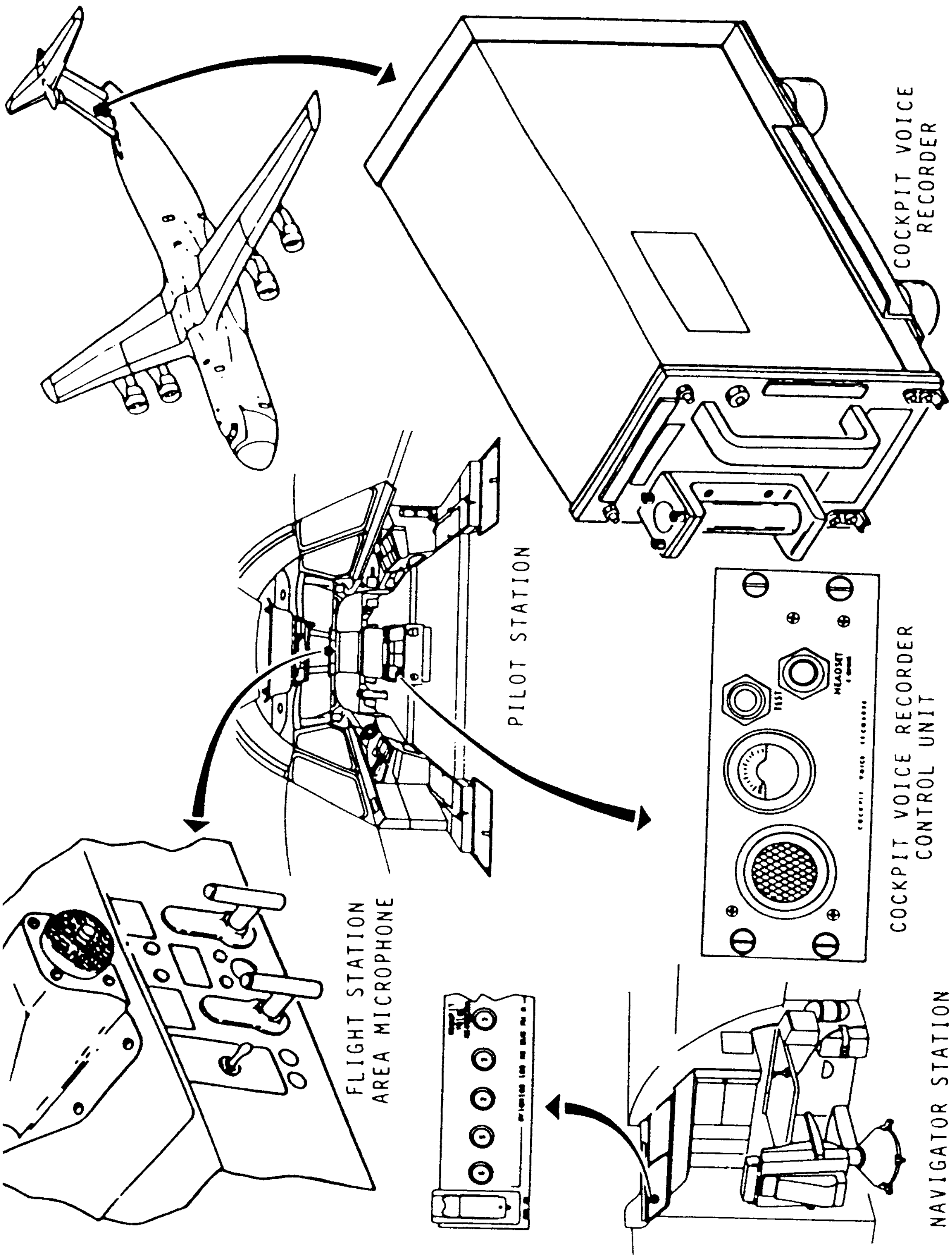
C-5A CDPIR COMPONENT LOCATIONS



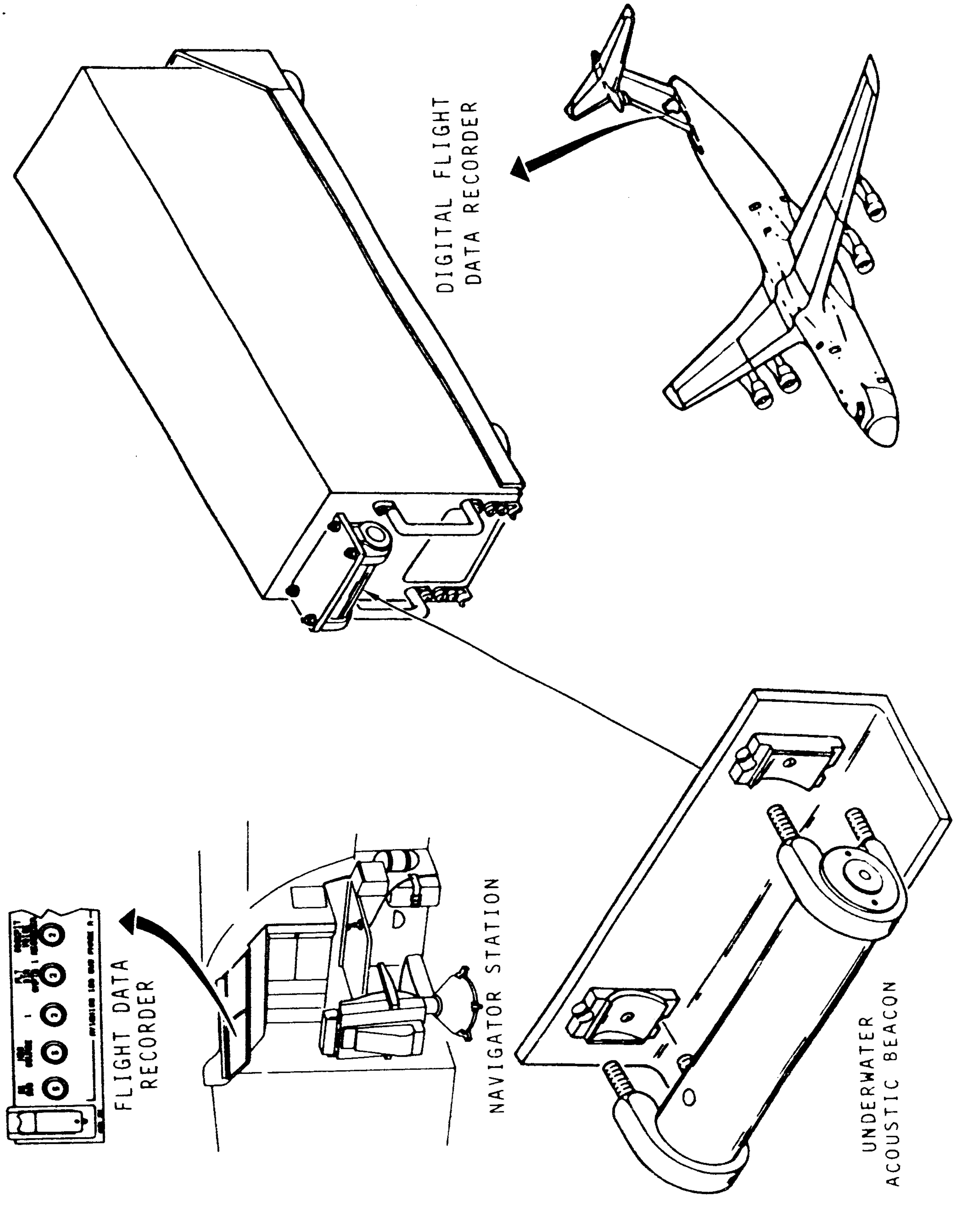
C-5A CDPIR DATA FLOW INTERFACE

ITEM NO.	PARAMETER	SAMPLE RATE PER -SEC	RANGE (UNITS) MONITORED	ACCURACY	DATA WORDS (ON TAPE)	DATA SOURCE	INTERFACE
1	VERT ACCEL	10	-3 TO +6g	±2%	10	XDUCER	STRAIN GAGE
2	HORIZ ACCEL	10	-5 TO +5g	±2%	10	XDUCER	STRAIN GAGE
3	AIRSPEED	1	50 TO 500 KNOTS	±10KNOTS	1	CADC	SYNCHRO
4	ALTITUDE	1	-1K FT TO +40K FT	±100FT	1	CADC	POT.
5	PITCH ATTITUDE	10	± 75°	±2%	10	INS	SYNCHRO
6	ROLL ATTITUDE	10	±100°	±2%	10	INS	SYNCHRO
7	HEADING	1	0 TO 360°	±2%	1	INS	SYNCHRO
8	EPR(4)	1	0 TO 7.0	±2%	4	MADAR	DIGITAL
9	RPM N1 (4)	1	0 TO 110%	±2%	4	MADAR	DIGITAL
10	RPM N2 (4)	1	0 TO 110%	±2%	4	MADAR	DIGITAL
11	TIT(4)	1	0 TO 1K °C	±2%	4	MADAR	DIGITAL
12	FUEL FLOW(4)	1	0 TO 16K PPH	±2%	4	MADAR	DIGITAL
13	THROTTLE ANGLE(4)	1	0 TO 80°	±2%	4	MADAR	DIGITAL
14	CABIN PRESSURE	1	0 TO 10 PSID	±2%	1	MADAR	DIGITAL
15	FREE AIR TEMP	1	-54 TO +55°C	±2%	1	MADAR	DIGITAL
16	TIME(ELAPSED)	1	0 TO 20 HRS.	0.1%	2	ELEC ASSY	(INTERNAL)
17	SLAT POSITION (3) LE RET, LE EXT TE FLAP POS	1	0 TO 100% EXTEND-RETRACT	±2%	3	MADAR	DIGITAL
18	CABIN AND CARGO SMOKE DETECTION	1	ON/OFF	---	1	MADAR	DIGITAL
19	OIL PRESSURE (4)	1	0 TO 100 PSI	±2%	4	MADAR	DIGITAL

C-5A CDPIR FLIGHT RECORDER PARAMETERS



C-5B COCKPIT VOICE RECORDER SYSTEM
COMPONENT LOCATIONS



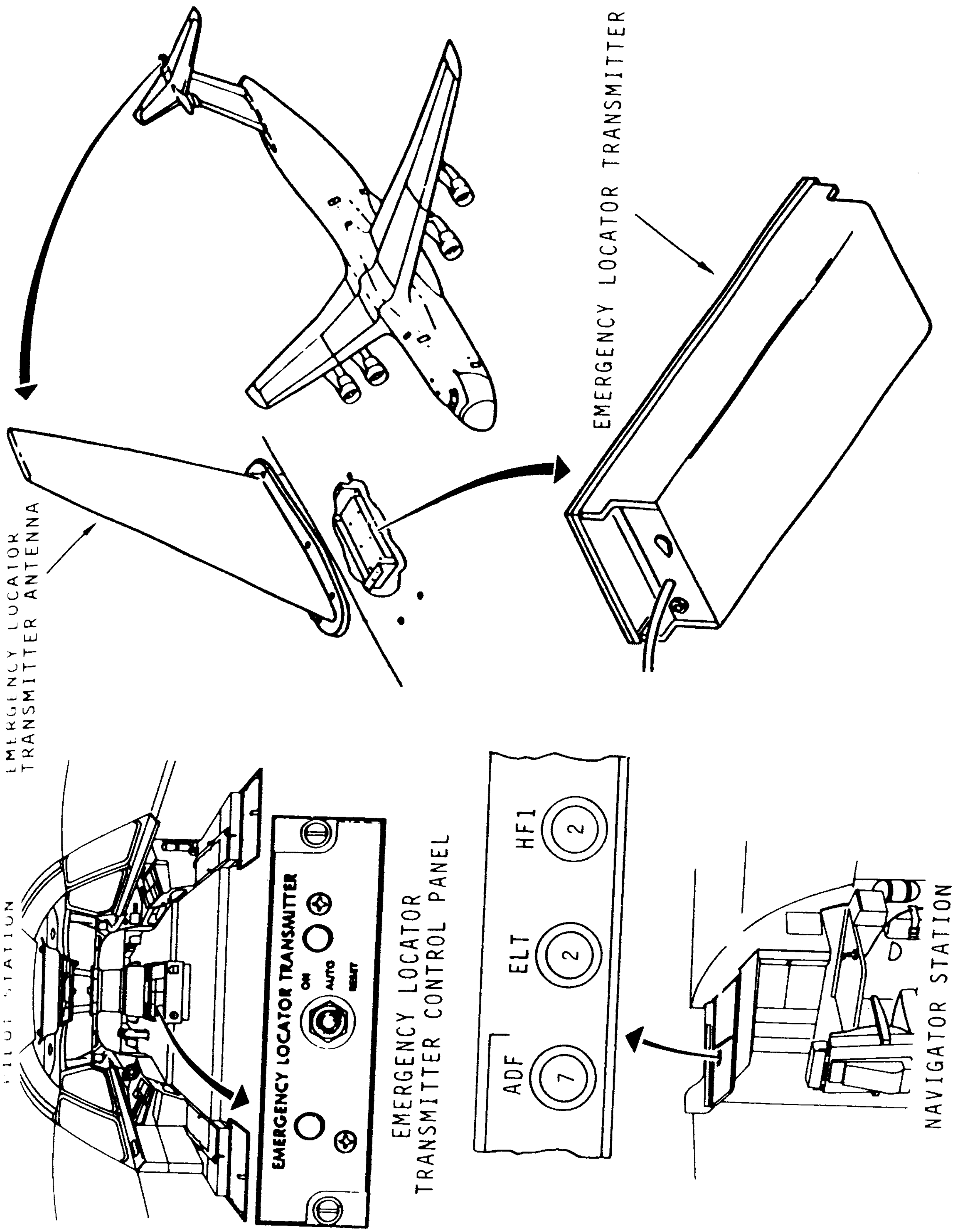
C-5B DIGITAL FLIGHT DATA RECORDER (209F) SYSTEM
COMPONENT LOCATIONS

ITEM	PARAMETER	SAR	CHAN	RANGE
1-4	SYNCHRONIZATION CODE	MUX/PROC		
5	HEADING	MUX/PROC		0 TO 359°
6	ALTITUDE FINE	1553 BUS		0 TO 4191 FT
7	FAN RPM N1 ENG 1	04	14	0 TO 110%
8	FAN RPM N1 ENG 2	04	13	0 TO 110%
9	FAN RPM N1 ENG 3	04	03	0 TO 110%
10	FAN RPM N1 ENG 4	04	10	0 TO 110%
11	CORE RPM N2 ENG 1	04	09	0 TO 111%
12	CORE RPM N2 ENG 2	04	02	0 TO 111%
13	CORE RMP N2 ENG 3	04	06	0 TO 111%
14	CORE RPM N2 ENG 4	04	05	0 TO 111%
15	VERTICAL ACCELERATION	05	21	-3 TO +6G
16	LATERAL ACCELERATION	05	22	-1 TO +1G
17	ROLL ATTITUDE	MUX/PROX		-100 TO +100
18	HF 1 KEY	05	08	ON-OFF
19	HF 2 KEY	05	09	ON-OFF
20	VHF 1 KEY	05	10	ON-OFF
21	VHF 2 KEY	05	11	ON-OFF
22	UHF 1 KEY	05	12	ON-OFF
23	UHF 2 KEY	05	13	ON-OFF
24	AIRSPEED	1553B BUS		50 TO 500 KIAS
25	TIT ENG 1	04	29	0 TO 1000°C
26	TIT ENG 2	04	25	0 TO 1000°C
27	TIT ENG 3	04	26	0 TO 1000°C
28	TIT ENG 4	04	30	0 TO 1000°C
29	ALTITUDE COARSE	1553B BUS		4192 TO 40KFT
30	THROTTLE ANGLE ENG 1	01	30	0 TO 80 DEG
31	THROTTLE ANGLE ENG 2	01	29	0 TO 80 DEG
32	THROTTLE ANGLE ENG 3	01	26	0 TO 80 DEG
33	THROTTLE ANGLE ENG 4	01	25	0 TO 80 DEG
34	LUBE OIL PRESSURE ENG 1	03	07	0 TO 100 PSI
35	LUBE OIL PRESSURE ENG 2	03	03	0 TO 100 PSI
36	LUBE OIL PRESSURE ENG 3	03	05	0 TO 100 PSI
37	LUBE OIL PRESSURE ENG 4	03	01	0 TO 100 PSI
38	FUEL FLOW ENG 1	03	22	0 TO 1600 PPH
39	FUEL FLOW ENG 2	03	18	0 TO 1600 PPH
40	FUEL FLOW ENG 3	03	26	0 TO 1600 PPH
41	FUEL FLOW ENG 4	03	30	0 TO 1600 PPH
42	STATIC AIR TEMP	1553B BUS		-54 TO +55°C
43.0	GMT SECONDS	MUX/PROC		0 TO 59
43.1	GMT MINUTES	MUX/PROC		0 TO 59
43.2	GMT HOURS	MUX/PROC		0 TO 23
44	TRAIL EDGE FLAP POS	18	29	0 TO 45 DEG
45	WING SLAT RETRACT	01	2	ON-OFF
46	WING SLAT EXTEND	01	1	ON-OFF
47	LONGITUDINAL ACCEL	05	23	-1 TO +1G
48	CABIN PRESSURE	03	9	ON-OFF
49	CABIN SMOKE	03	10	ON-OFF

C-5B DIGITAL FLIGHT DATA RECORDER MONITORED PARAMETERS (SHEET 1)

ITEM	PARAMETER	SAR	CHAN	RANGE
50	PITCH ATTITUDE	MUX/PROC		-75 TO +75 DEG
51.0	MISSION ELAPSED TIME (S)	MUX/PROC		0 TO 59
51.1	MISSION ELAPSED TIME (M)	MUX/PROC		0 TO 59
51.2	MISSION ELAPSED TIME (H)	MUX/PROC		0 TO 23
52	AOA SIGNAL, UPPER LEFT AOAT	13	18	
53	PMG VOLTAGE GEN 1	28	15	
54	PMG VOLTAGE GEN 2	28	20	
55	PMG VOLTAGE GEN 3	28	03	
56	PMG VOLTAGE GEN 4	29	16	
57	AC SYSTEM ROTARY SW	27	03	
58	GEAR HANDLE UP	01	03	BIT 1=0 & BIT 2=1 HANDLE UP; BIT 1=1 & BIT 2=0 HANDLE DOWN
59	PITCH AUTOPILOT SERVO CLUTCH	01	12	BIT 11=0 & BIT 12=1 CLUTCH ENGAGED; BIT 11=1 & BIT 12=0 CLUTCH DISENGAGED
60	ROLL AUTOPILOT SERVO CLUTCH	14	28	BIT 9=0 & BIT 10=1 CLUTCH ENGAGED BIT 9=1 & 10=0 CLUTCH DISENGAGED;
61	AUTOTHROTTLE ENGAGE SWITCH STATUS	17	01	BIT 7=0 & BIT 8=1 ENGAGE STATUS; BIT 7=1 & BIT 8=0 DISENGAGE STATUS
62.0	RADAR ALTITUDE SYSTEM NO. 1	5	19	-20 TO 2500 FT
62.1	COARSE RADAR ALTITUDE SYSTEM NO. 1 (NOT USED)	5	19	
63	THRUST REV ACTUATOR SW 1 & 2 ENGINE NO. 1	19	18	BIT 9=0 SW 1 LOCKED BIT 10=0 SW 2 LOCKED
64	THRUST REV ACTUATOR SW 3 & 4 ENGINE NO.1	19	19	BIT 11=0 SW 3 LOCKED BIT 12=0 SW 4 LOCKED
65	THRUST REV ACTUATOR SW 1 & 2 ENGINE NO. 2	20	18	BIT 5=0 SW 1 LOCKED BIT 6=0 SW 2 LOCKED
66	THRUST REV ACTUATOR SW 3 & 4 ENGINE NO. 2	20	19	BIT 7=0 SW 3 LOCKED BIT 8=0 SW 4 LOCKED
67	THRUST REV ACTUATOR SW 1 & 2 ENGINE NO. 3	21	18	BIT 9=0 SW 1 LOCKED BIT 10=0 SW 2 LOCKED
68	THRUST REV ACTUATOR SW 3 & 4 ENGINE NO. 3	21	19	BIT 11=0 SW 3 LOCKED BIT 12=0 SW 4 LOCKED
69	THRUST REV ACTUATOR SW 1 & 2 ENGINE NO. 4	22	18	BIT 5=0 SW 1 LOCKED BIT 6=0 SW 2 LOCKED
70	THRUST REV ACTUATOR SW 3 & 4 ENGINE NO. 4	22	19	BIT 7=0 SW 3 LOCKED BIT 8=0 SW 4 LOCKED
71	CADC NO. 1 STATUS	1553B BUS		
72	CADC NO. 2 STATUS	1553B BUS		
73	INS. NO 1 & NO. 3 PILOT SELECT	01	13	BIT 1=0 INS 1 SELECTED BIT 1=1 INS 3 SELECTED

C-5B DIGITAL FLIGHT DATA RECORDER MONITORED PARAMETERS (SHEET 2)



C-5B EMERGENCY LOCATOR TRANSMITTER COMPONENT LOCATIONS

NAVIGATION

The navigation systems provide direction finding information, terminal and enroute navigation information, aircraft location determination, identification and pressure altitude reporting, absolute altitude, and weather detection, mapping and beacon interrogation. The navigation systems are:

C-5A	C-5B
o Automatic Direction Finder (ADF), DF-203 (2)	o ADF, DF-206 (1, with provisions for a second system)
o VHF NAV, Wilcox 806C (2)	o VOR/ILS/MB, ARN-127 (2)
o Glideslope, Wilcox 800C (2)	
o Marker Beacon, 51Z4	
o Tacan, ARN-118 (2)	o Same
o Identification Friend or Foe (IFF), APX-64	o IFF, APX-100
o Radar Altimeter, Model 41003 (2)	o Combined Altitude Radar Altimeter (CARA), APN-232
o Weather Radar, APS-133	o Same

The ADF systems (two on C-5A, one on C-5B) receive radio range navigation stations and standard broadcast stations. They provide relative bearing to a received station and receive voice or CW transmissions from the station.

The C-5A VHF NAV systems provide lateral guidance nformation for enroute navigation (VOR) and for the ILS ocalizer portion of terminal navigation.

he C-5A glideslope systems provide vertical guidance nformation for the ILS glideslope portion of terminal avigation.

The C-5A marker beacon system provides aural and visual indications of aircraft passage over ground beacon stations.

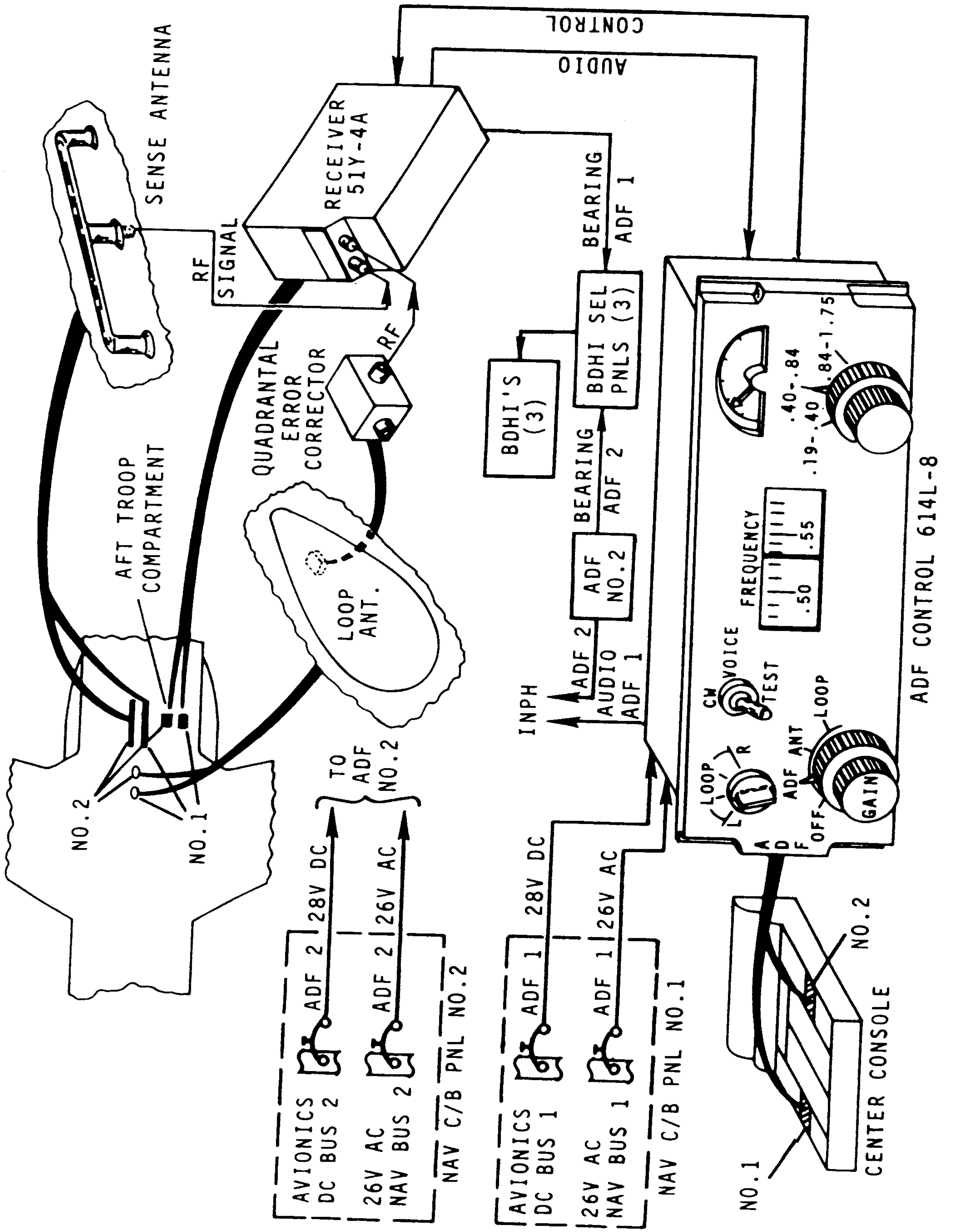
The C-5B VOR/ILS/MB systems provide the VHF NAV, localizer, glideslope and marker beacon functions. The marker beacon function is not used in system No. 2.

The tacan systems provide lateral and distance information during enroute navigation.

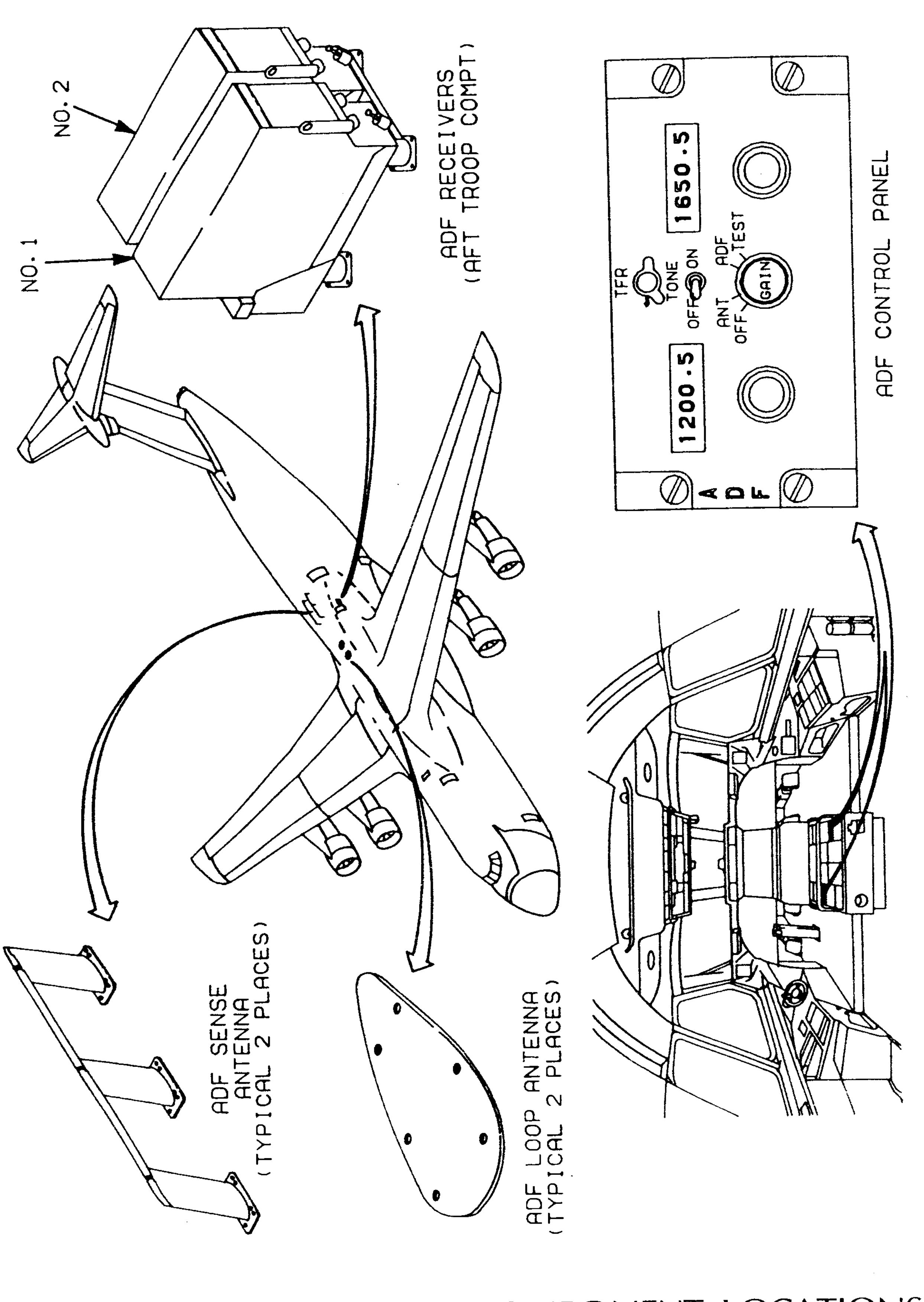
The IFF system provides automatic aircraft identification and pressure altitude reporting to an interrogating radar beacon station.

The C-5A low range radar altimeter (0 to 2500 feet) and the C-5B combined low/high range radar altimeters (0 to 50,000) provide accurate indications of absolute altitude above the surface of the earth.

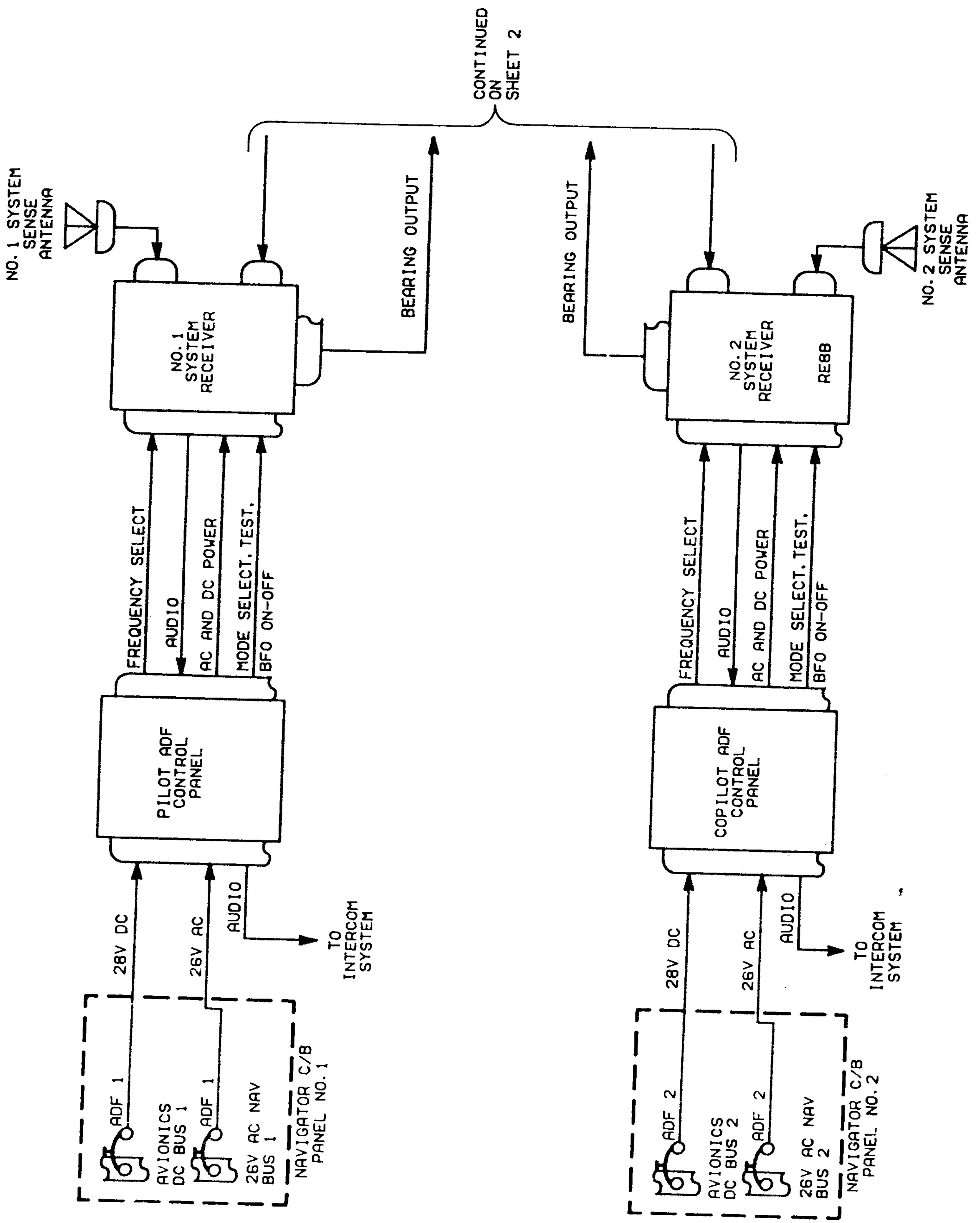
The APS-133 weather radar provides a visual presentation of the area forward of the aircraft for weather location and avoidance, ground mapping and beacon operation.



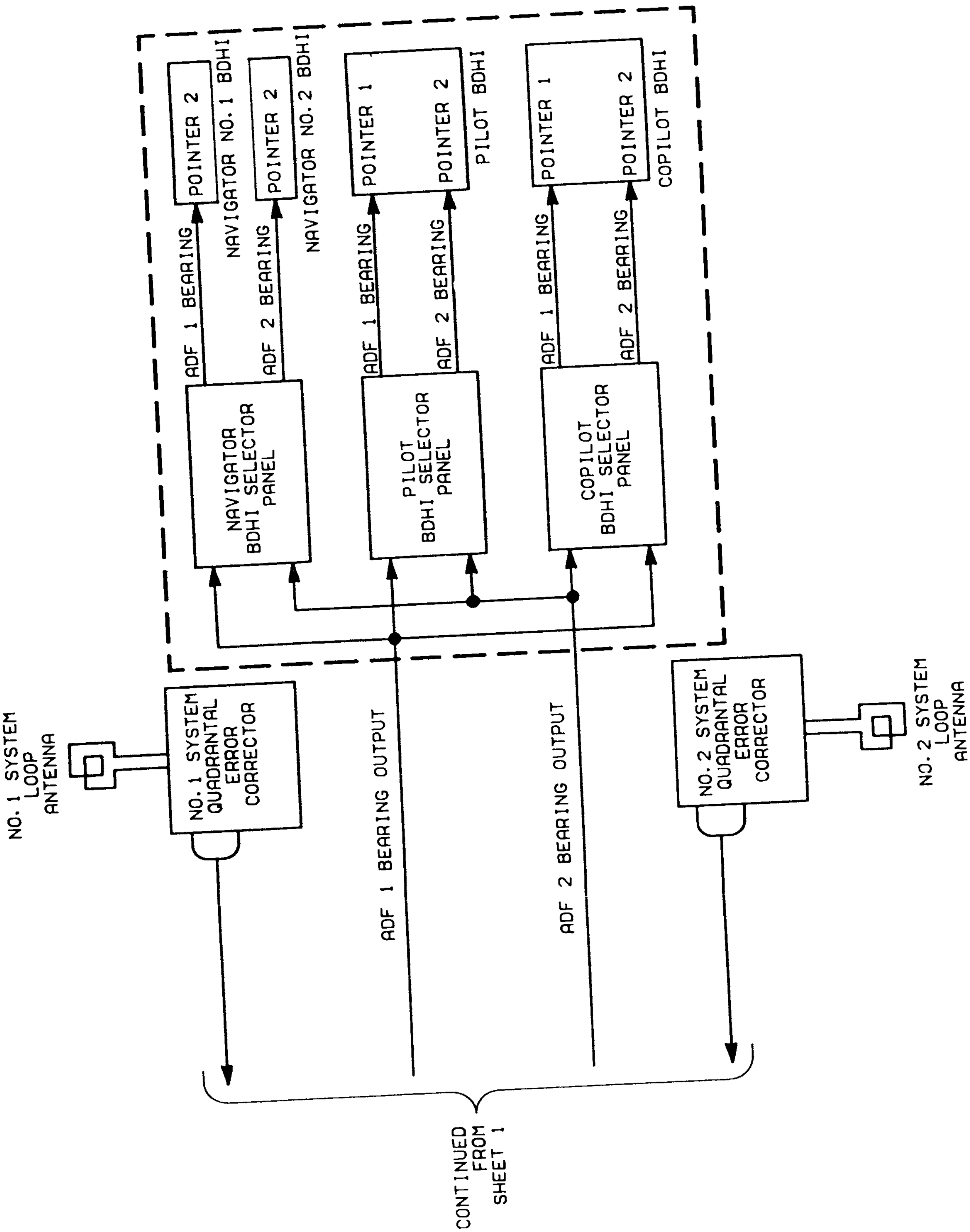
C-5A DF-203 ADF SYSTEM COMPONENT LOCATIONS



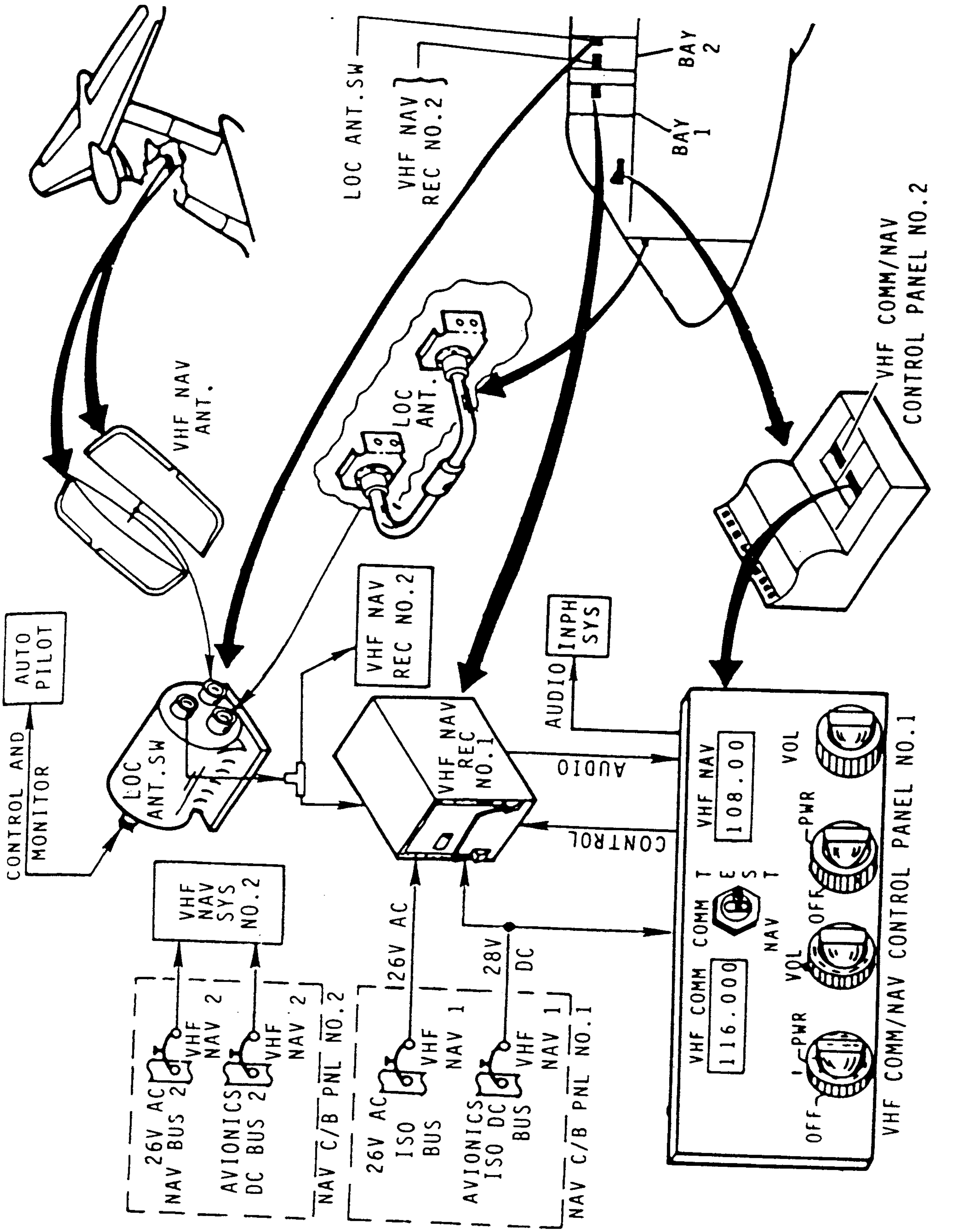
C-5B DF-206 ADF SYSTEM COMPONENT LOCATIONS



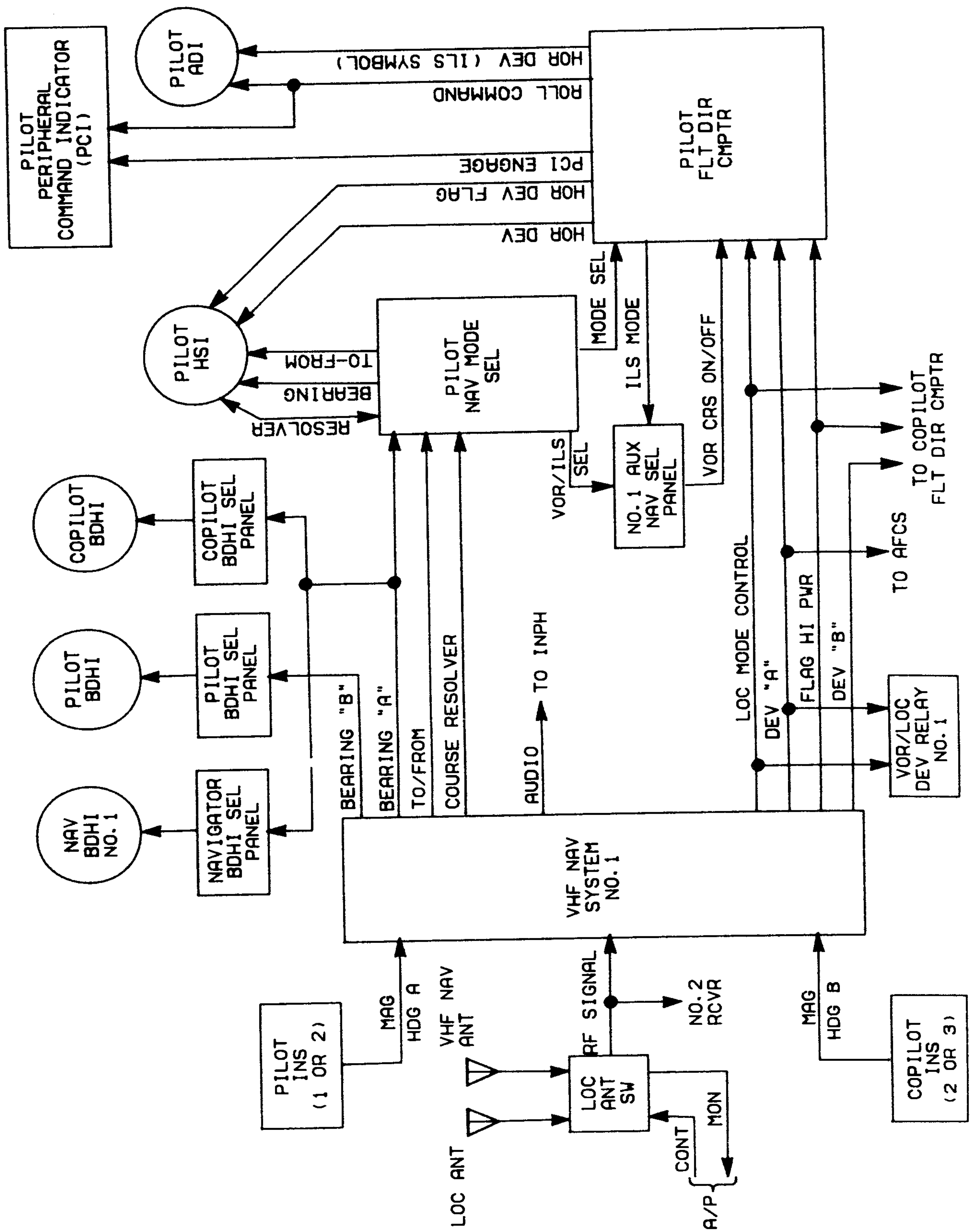
C-5B DF-206 ADF SYSTEM INTERFACE (SHEET 1)



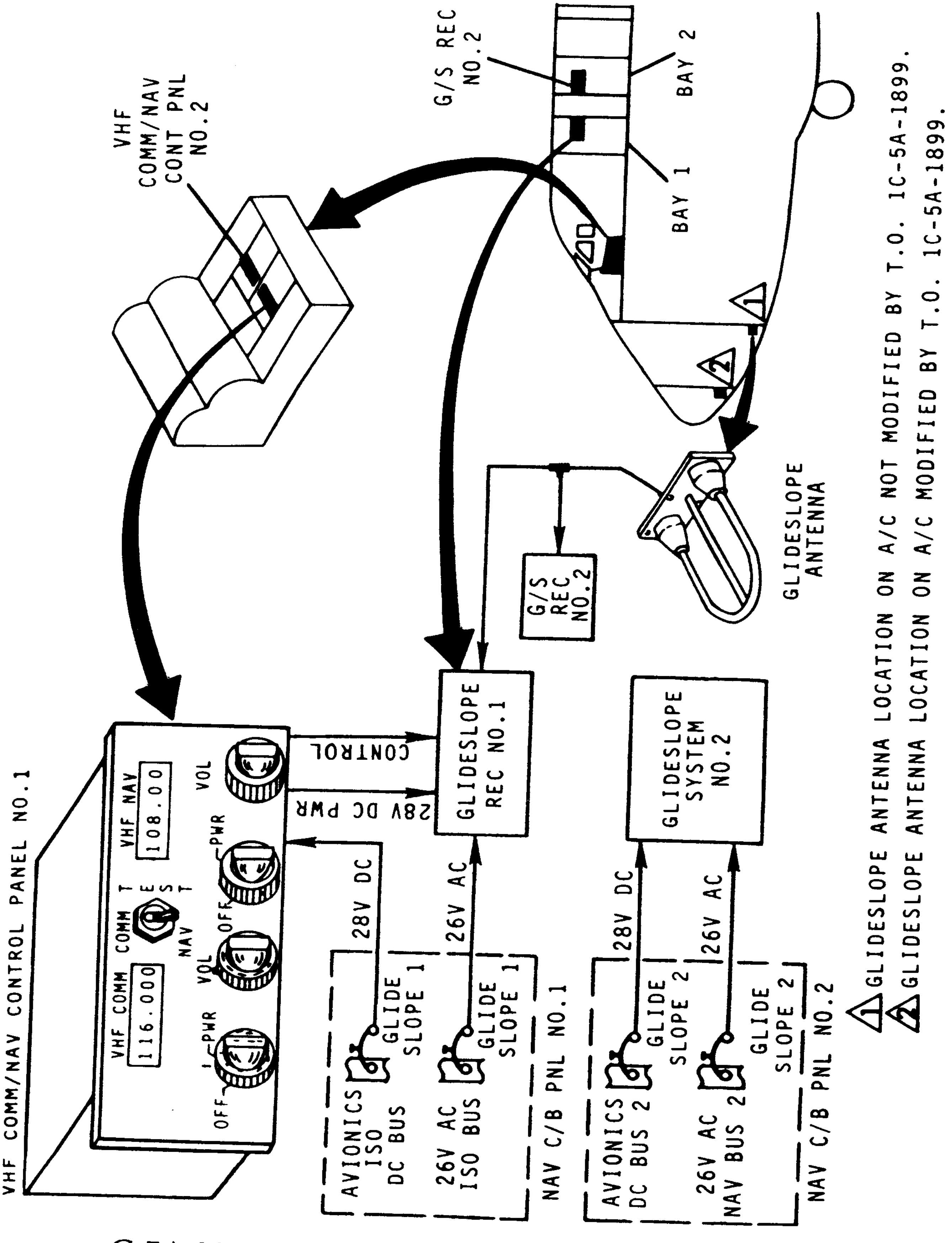
C-5B DF-206 ADF SYSTEM INTERFACE (SHEET 2)



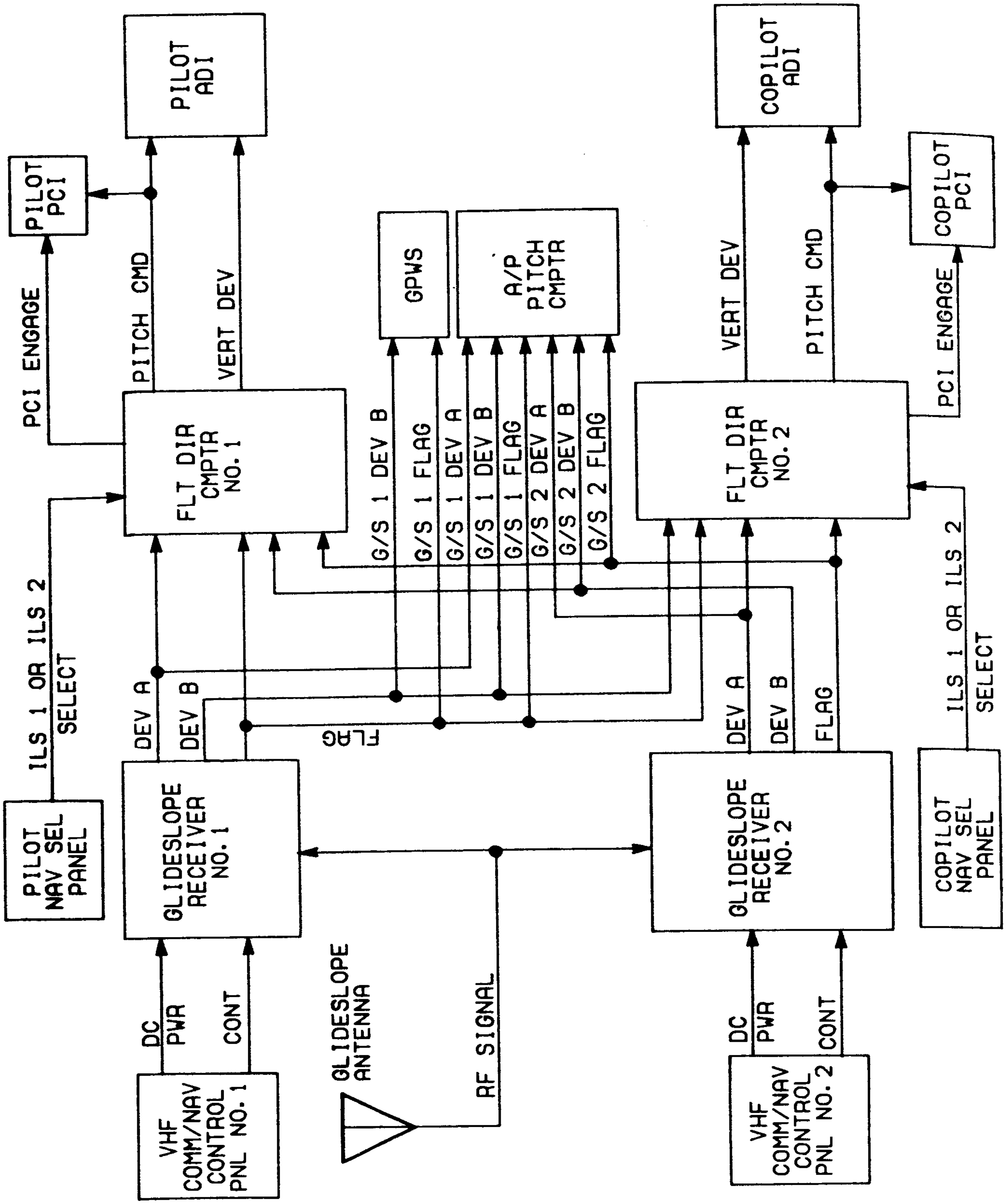
C-5A WILCOX 806C, VHF NAV SYSTEM COMPONENT LOCATIONS



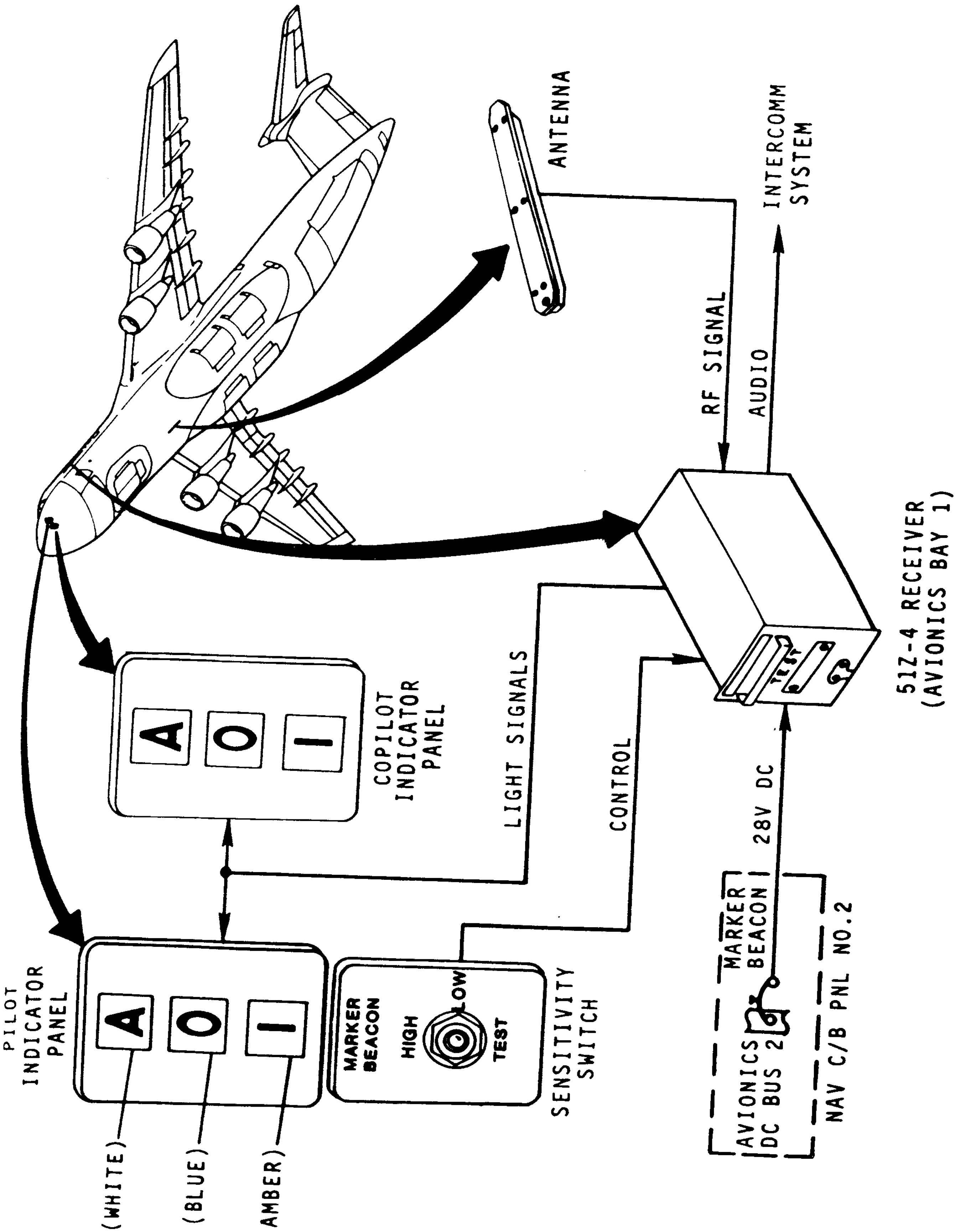
C-5A WILCOX 806C, VHF NAV SYSTEM NO. 1 INTERFACE



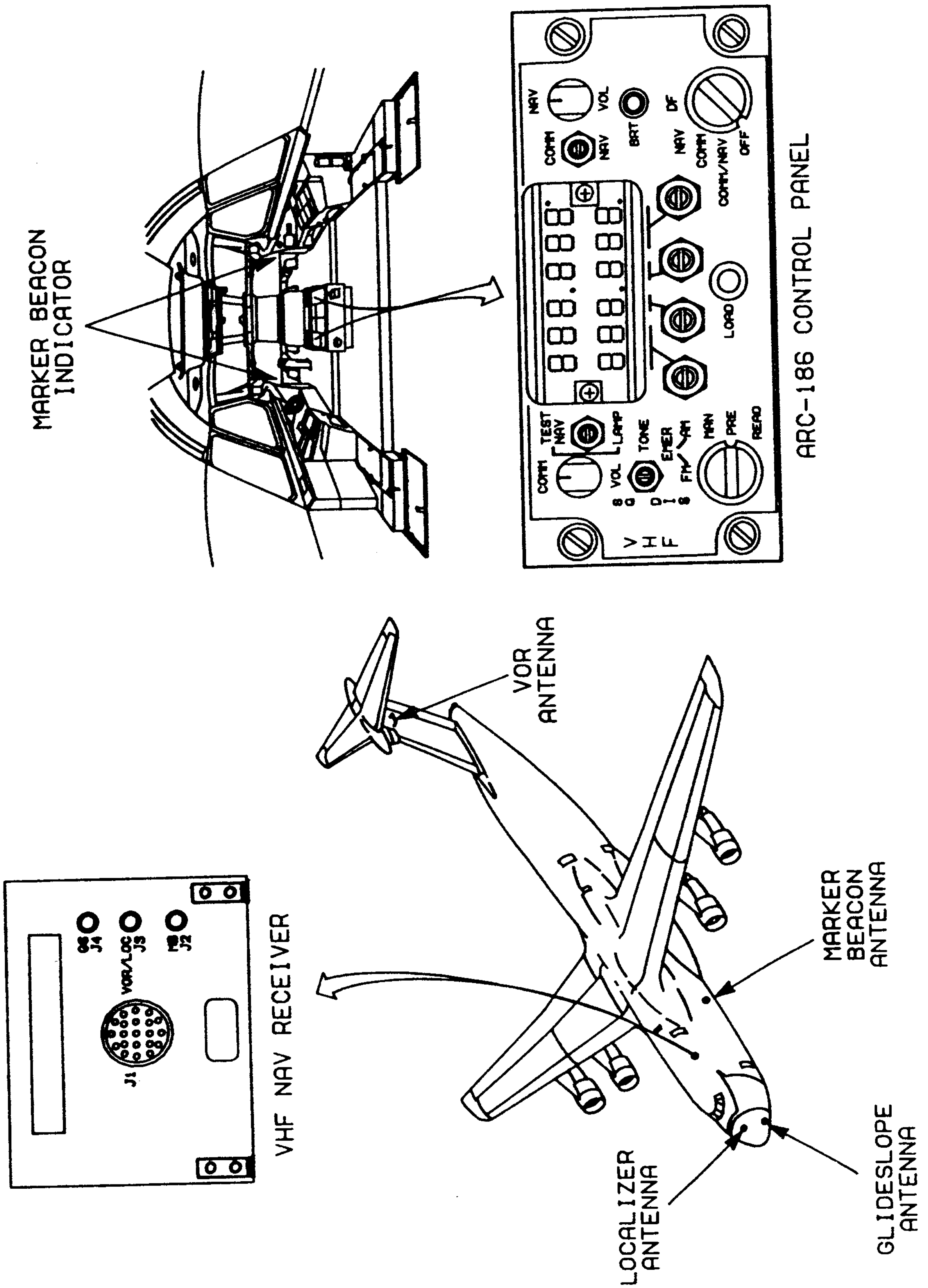
C-5A WILCOX 800C, GLIDESLOPE SYSTEM
COMPONENT LOCATIONS



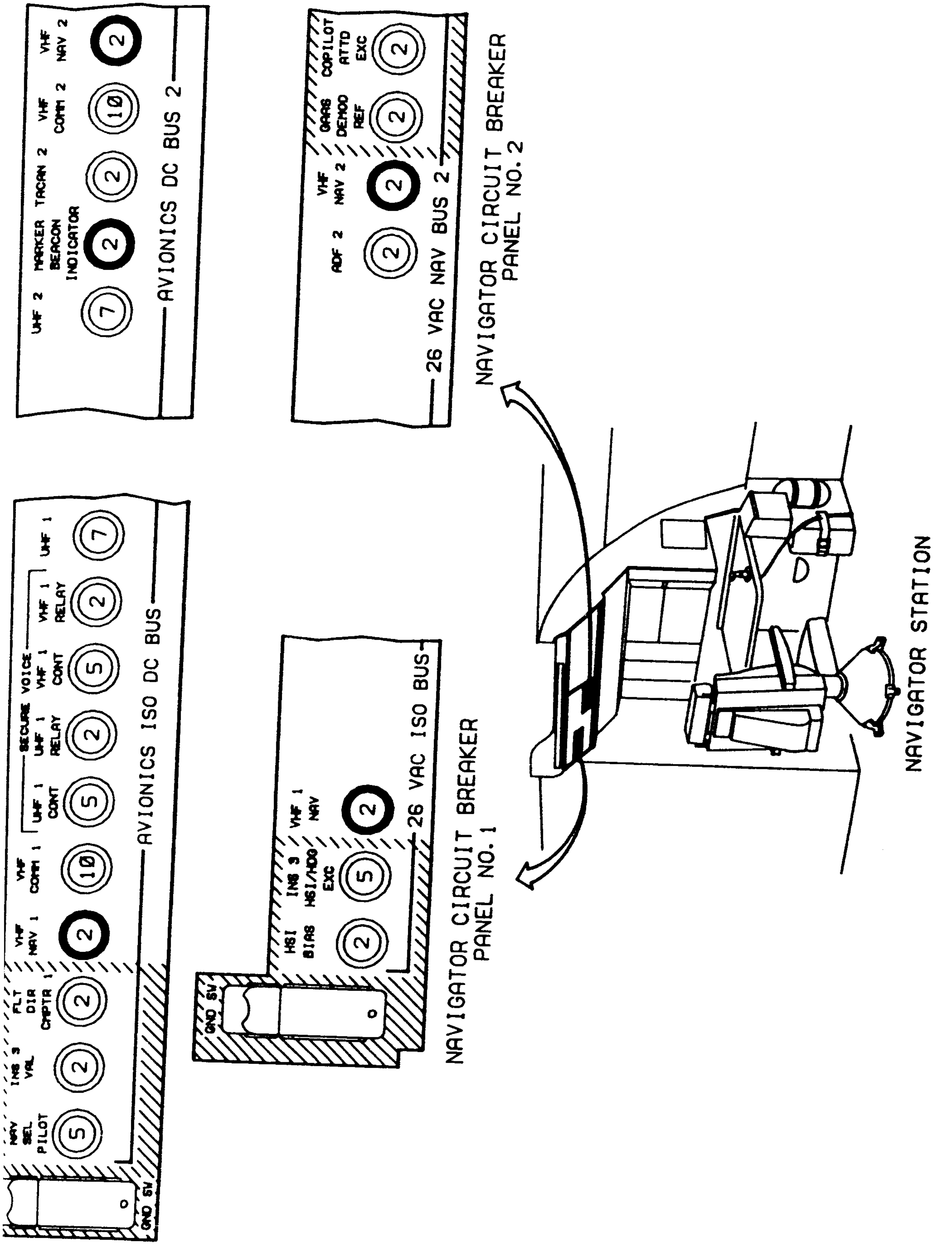
C-5A WILCOX 800C, GLIDESLOPE SYSTEM INTERFACE



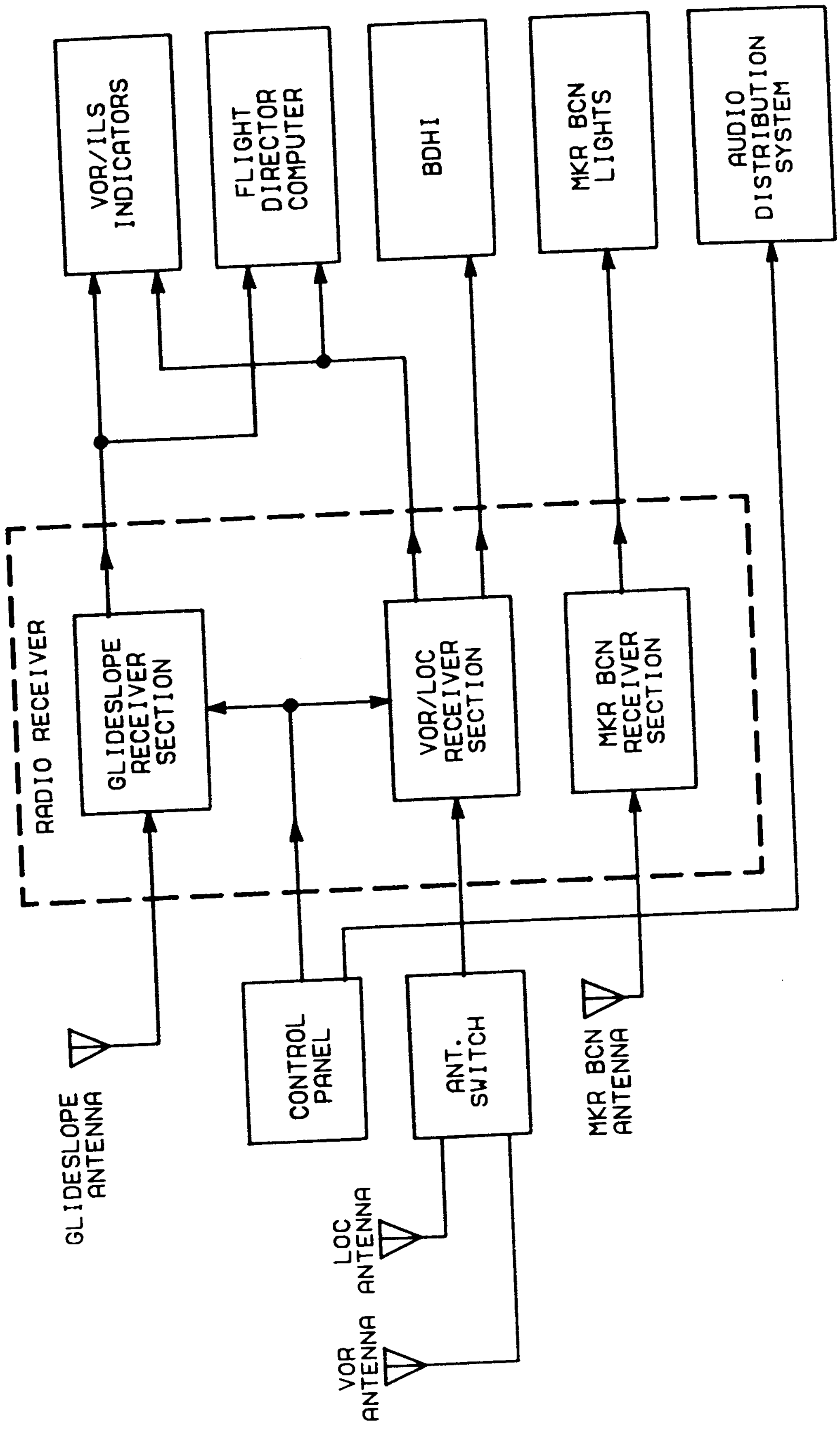
C-5A 51Z-4, MARKER BEACON SYSTEM COMPONENTS



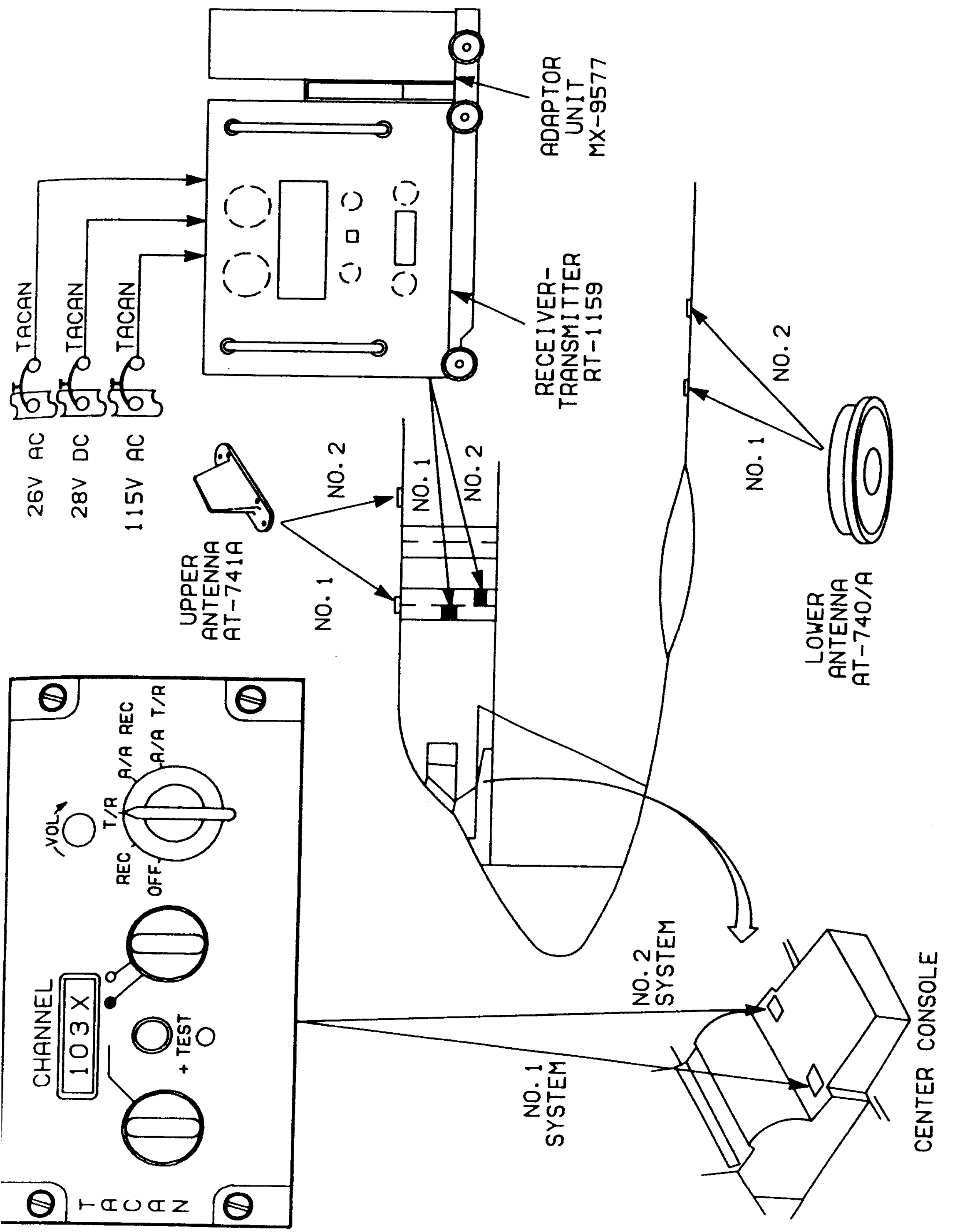
C-5B ARN-127, SYSTEM COMPONENT LOCATIONS



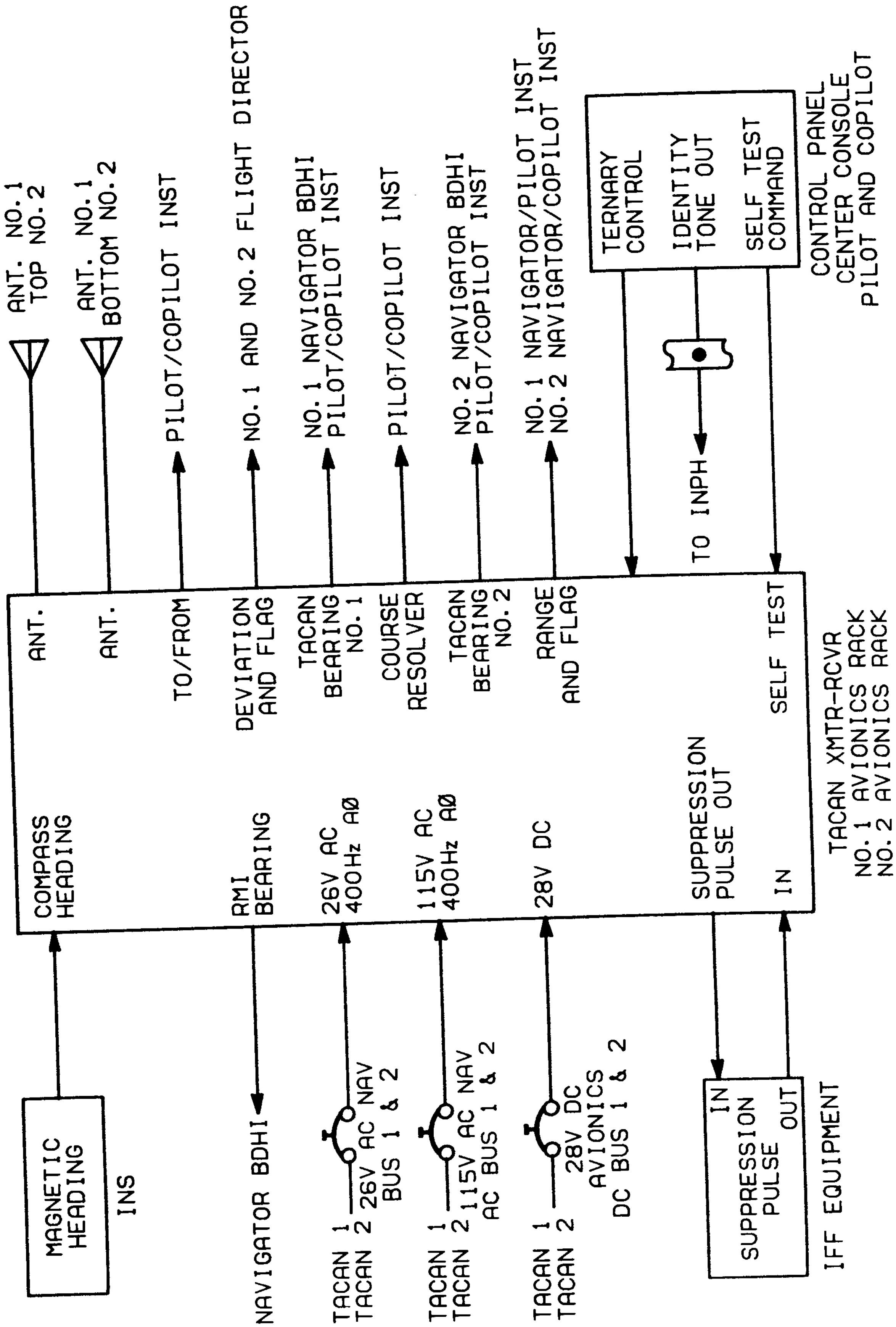
C-5B ARN-127, CIRCUIT BREAKER LOCATIONS



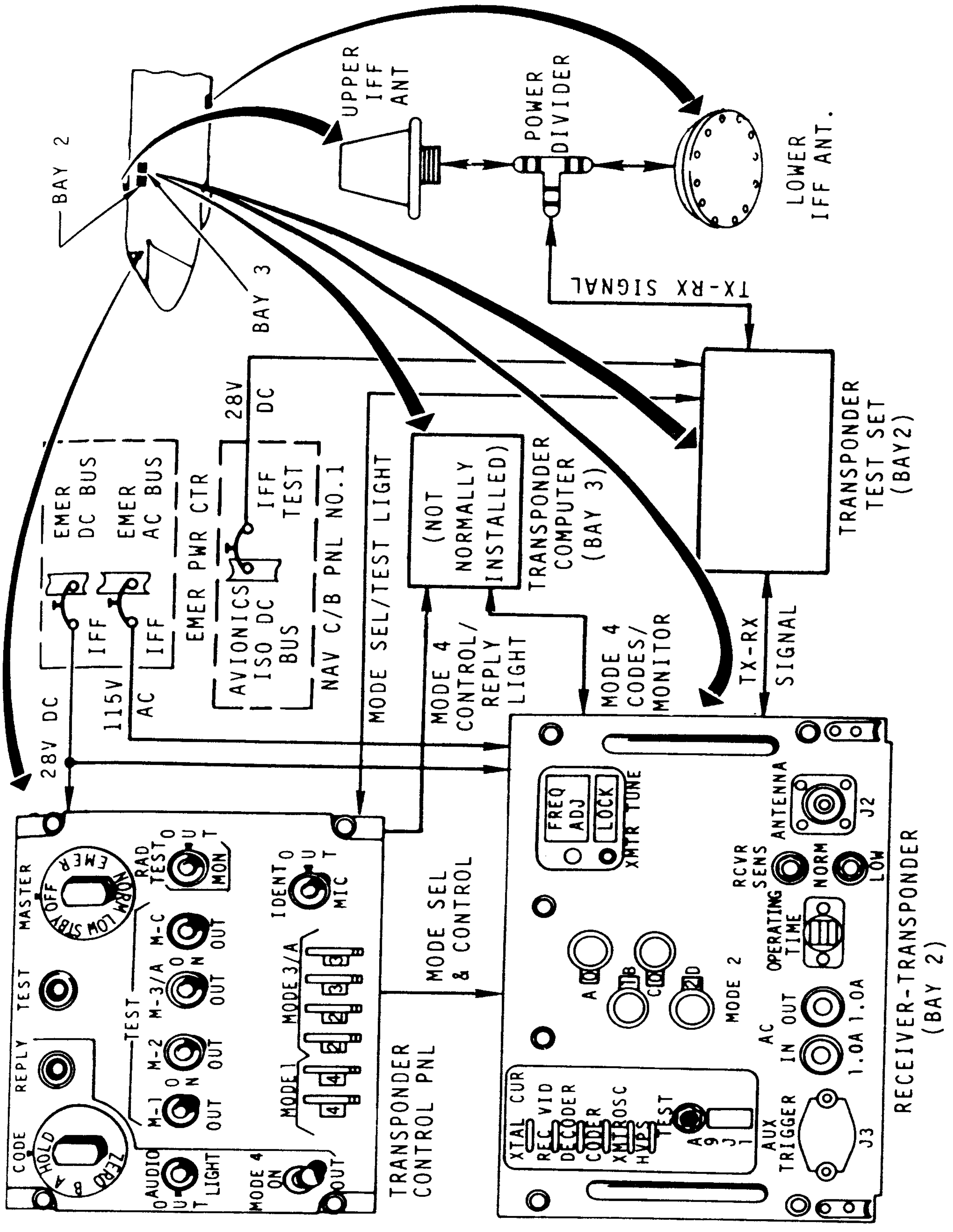
C-5A ARN-127, RECEIVER SYSTEM BLOCK DIAGRAM



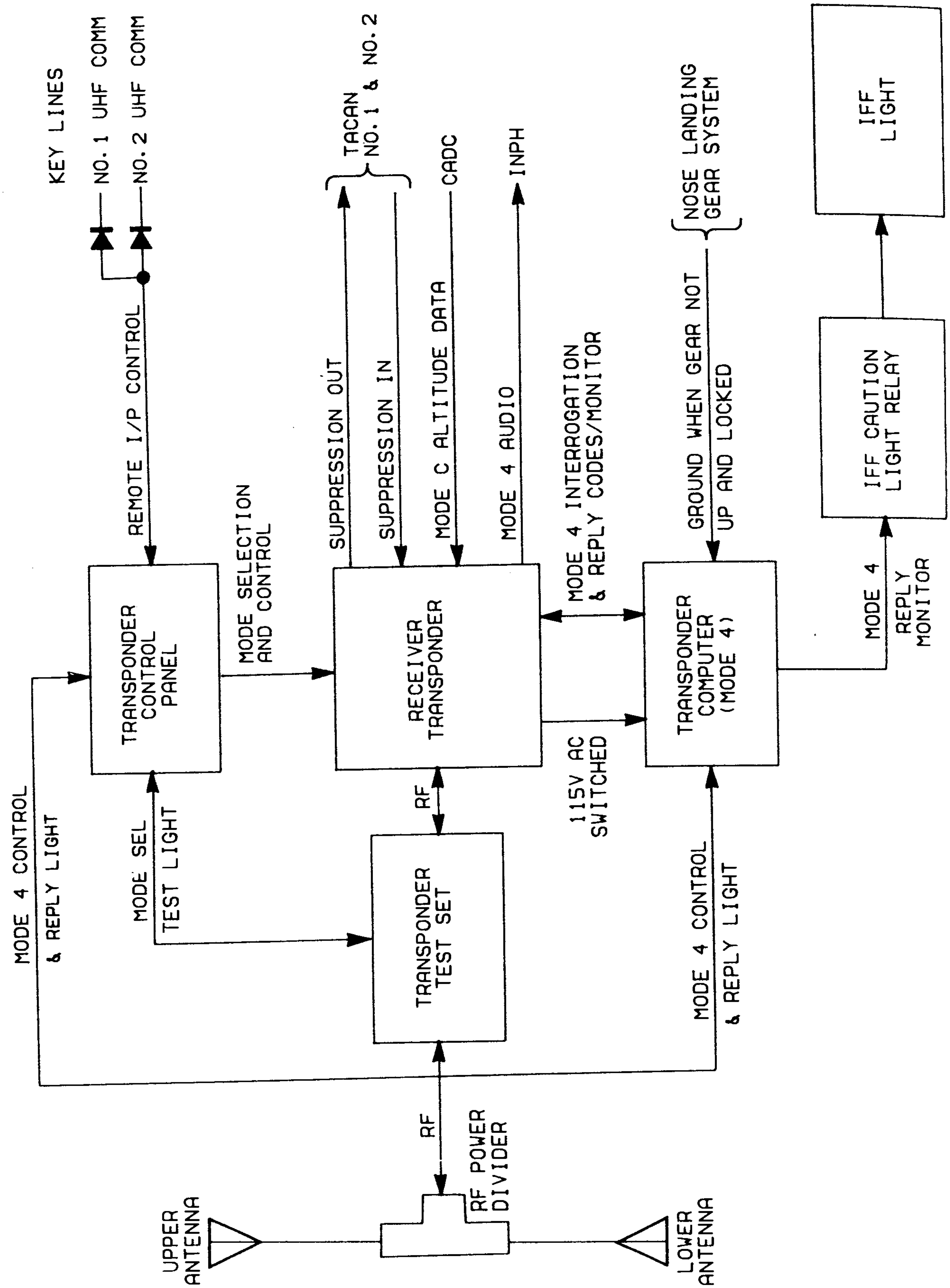
C-5A/B TACAN COMPONENT LOCATIONS



C-5A/B TACAN SYSTEM INTERFACE



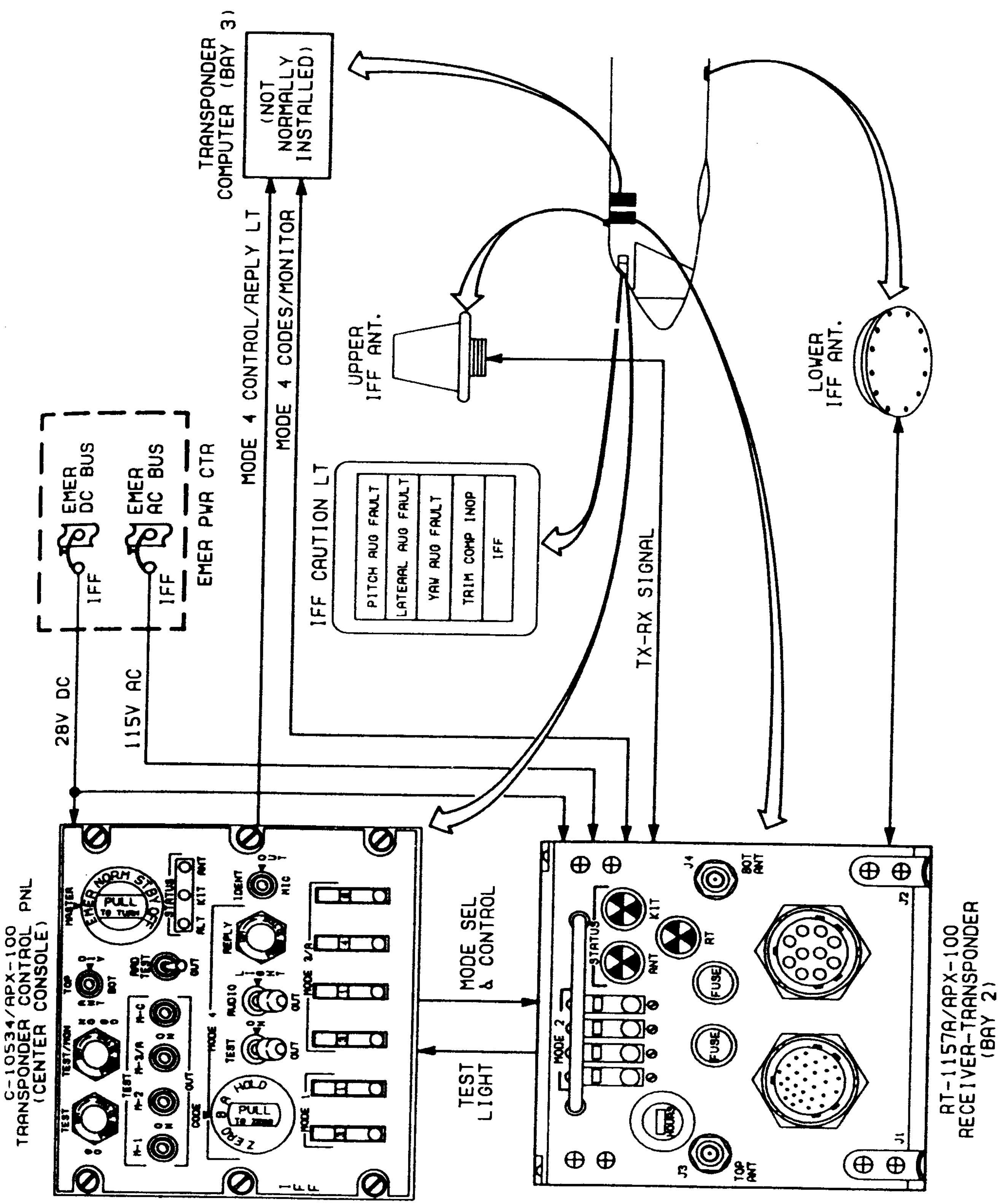
C-5A APX-64, IFF COMPONENT LOCATIONS & CABLING



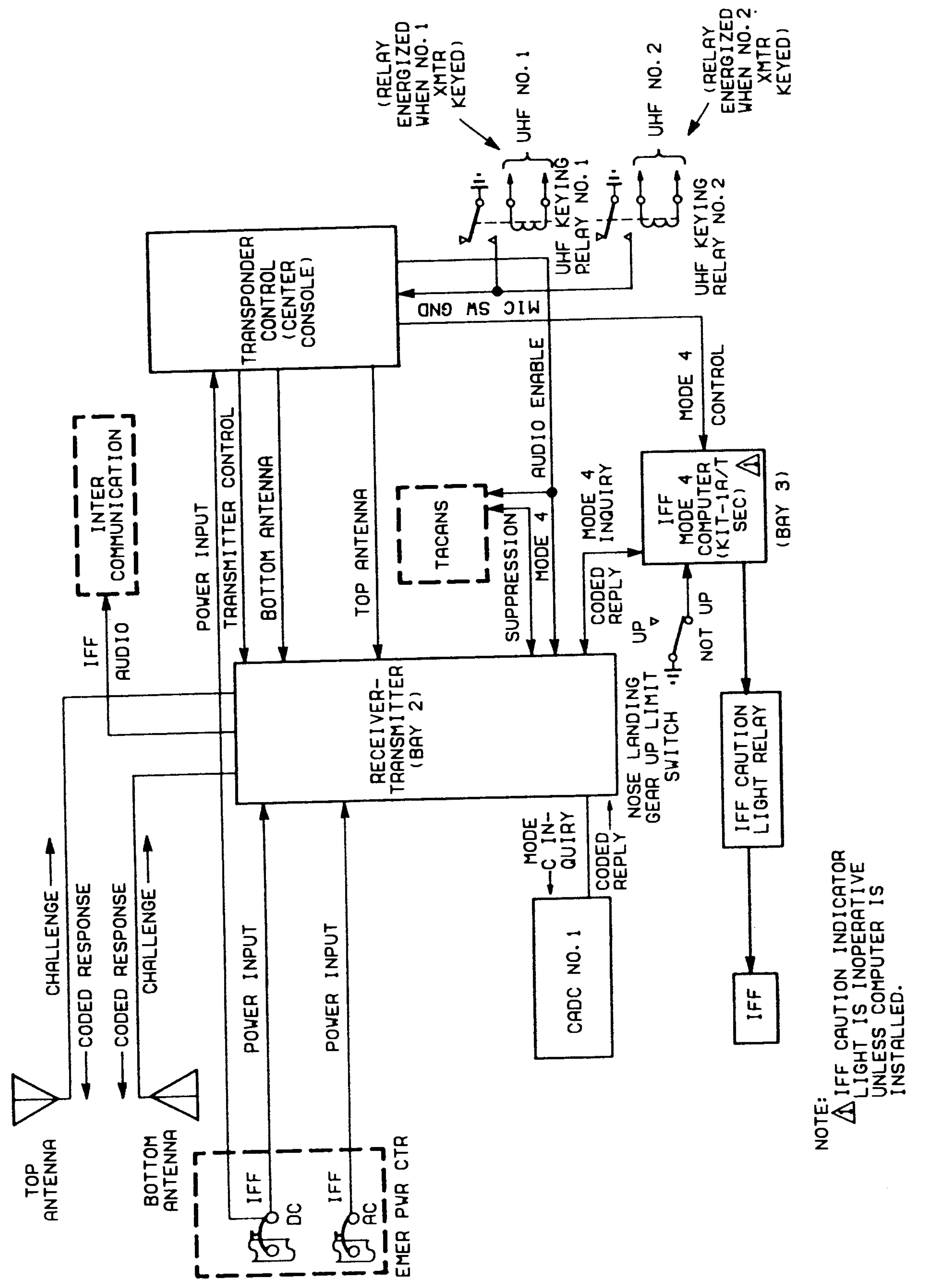
C-10534/APX-100

C-5A APX-64, IFF INTERFACE

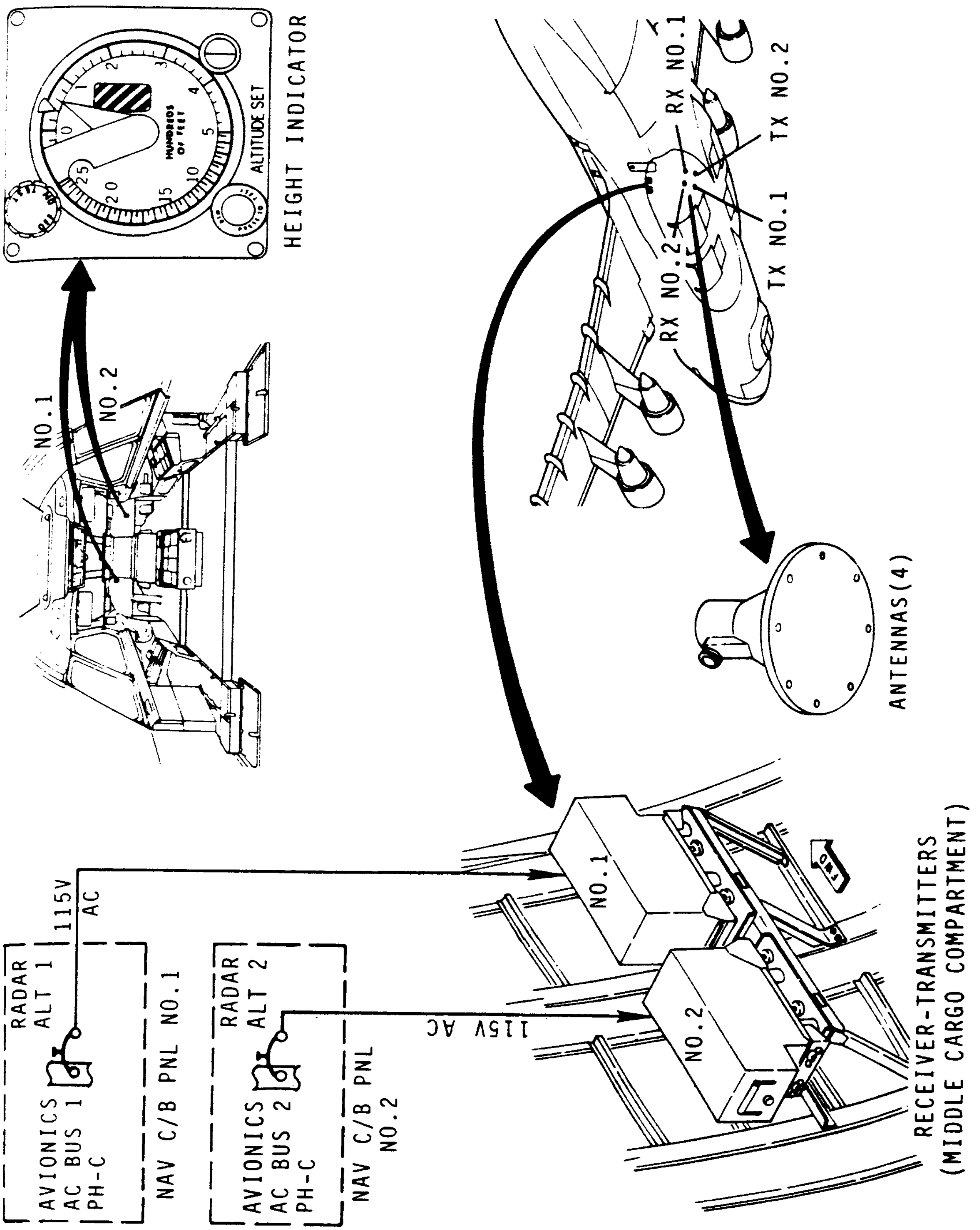
C



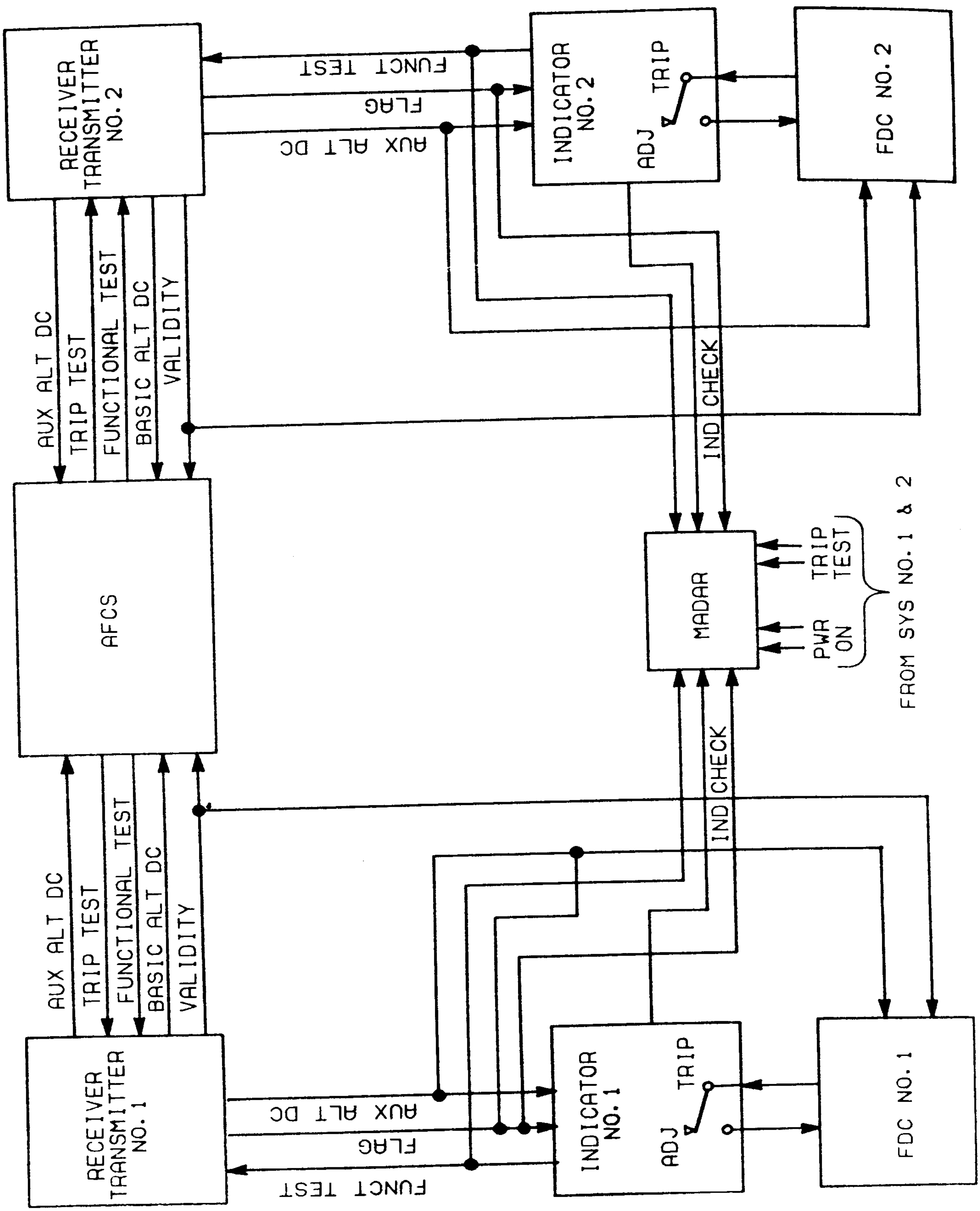
C-5B APX-100, IFF COMPONENT CABLING & LOCATIONS



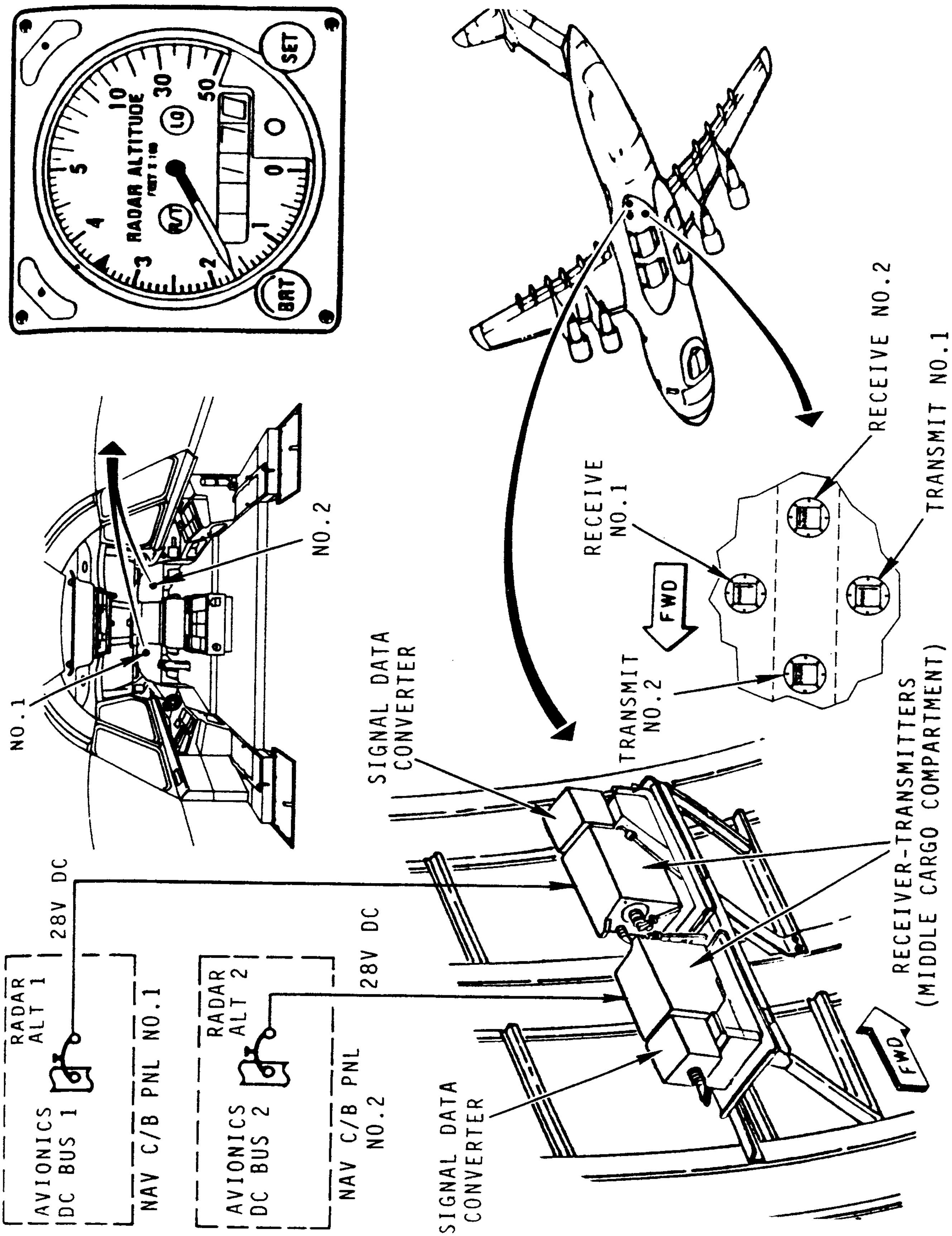
C-5B APX-100, IFF SYSTEM DATA FLOW & INTERFACE



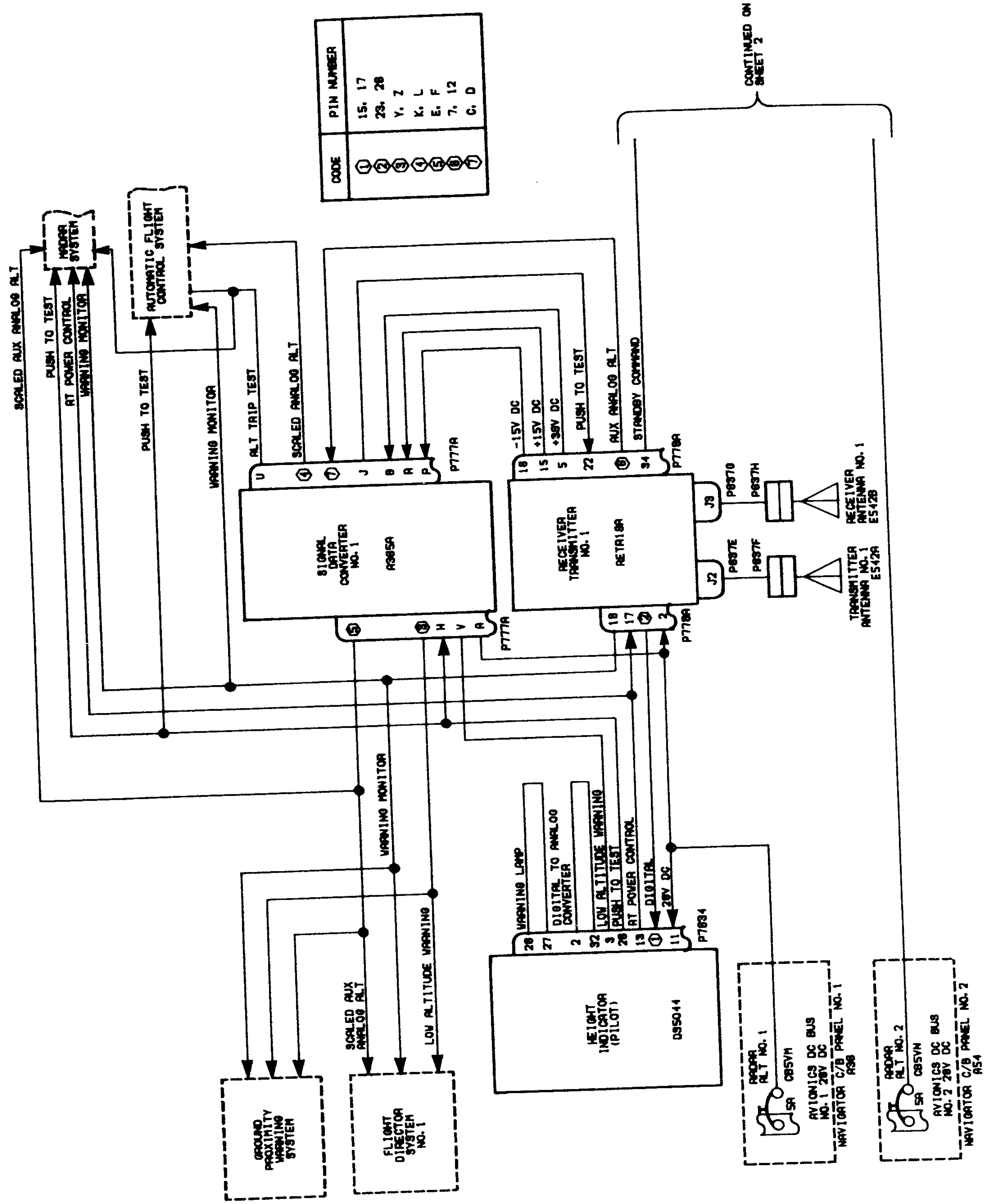
C-5A MODEL 41003, RADAR ALTIMETER COMPONENT LOCATIONS



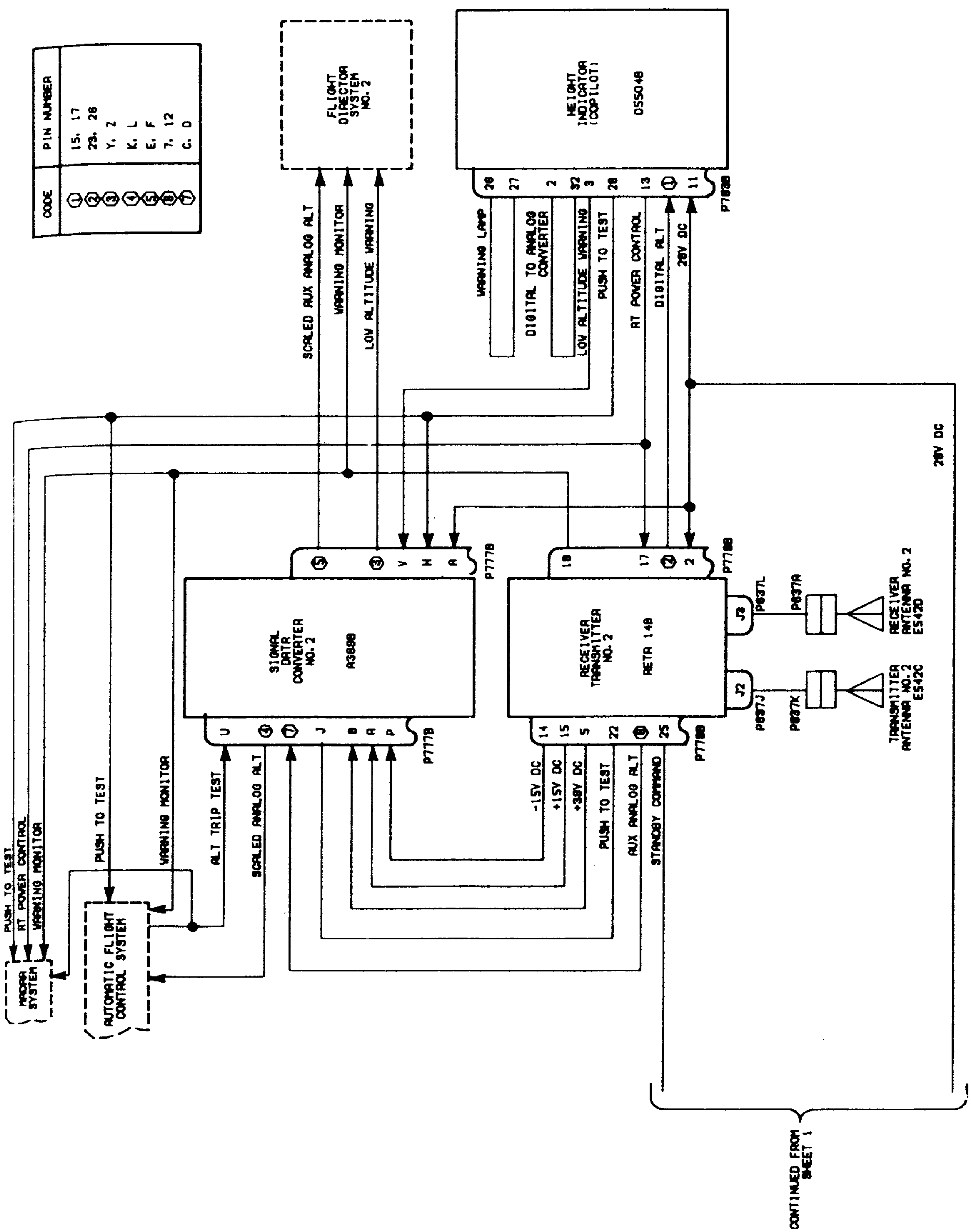
C-5A MODEL 41003, RADAR ALTIMETER INTERFACE



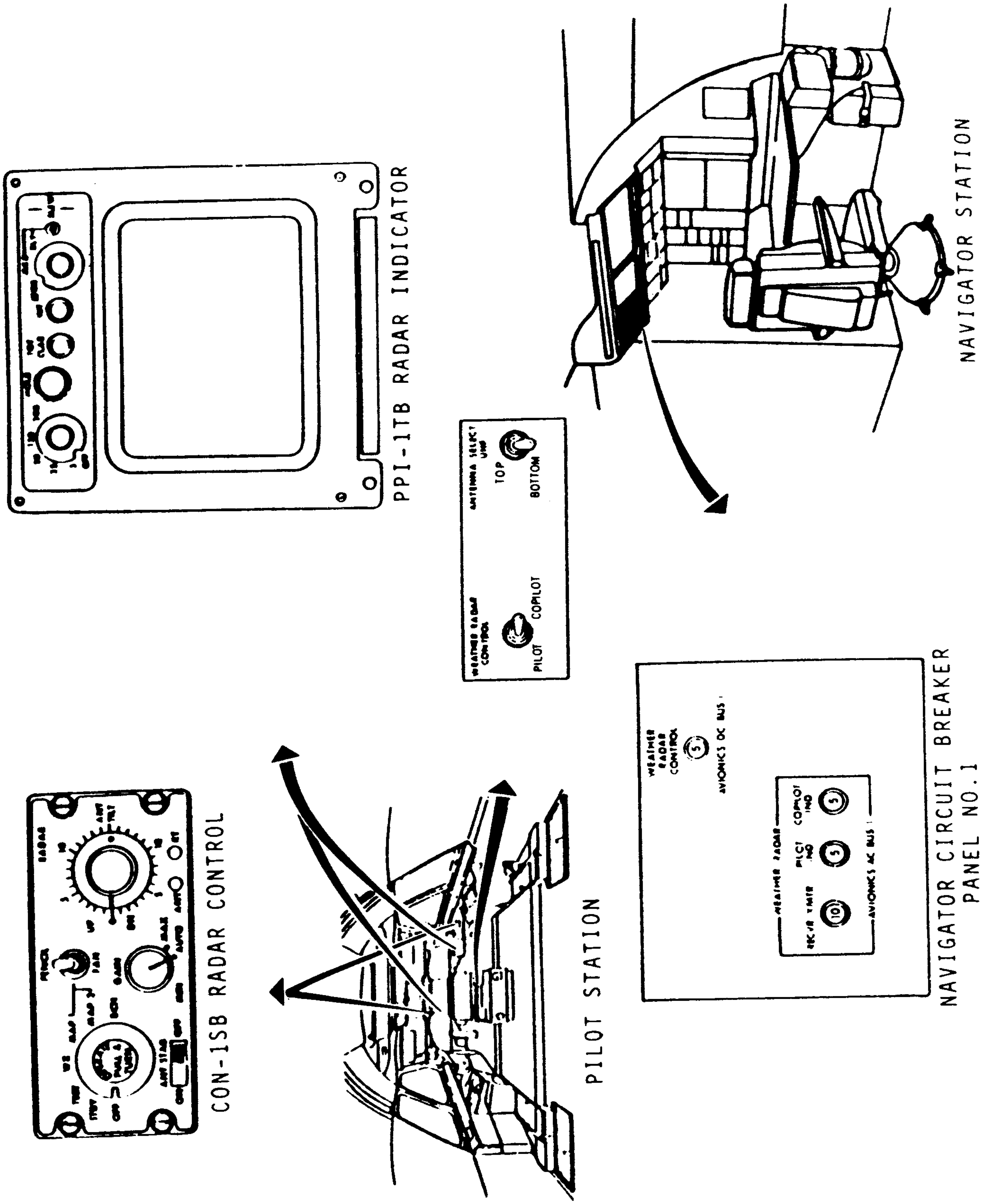
C-5B APN-232, CARA RADAR ALTIMETER COMPONENT LOCATIONS



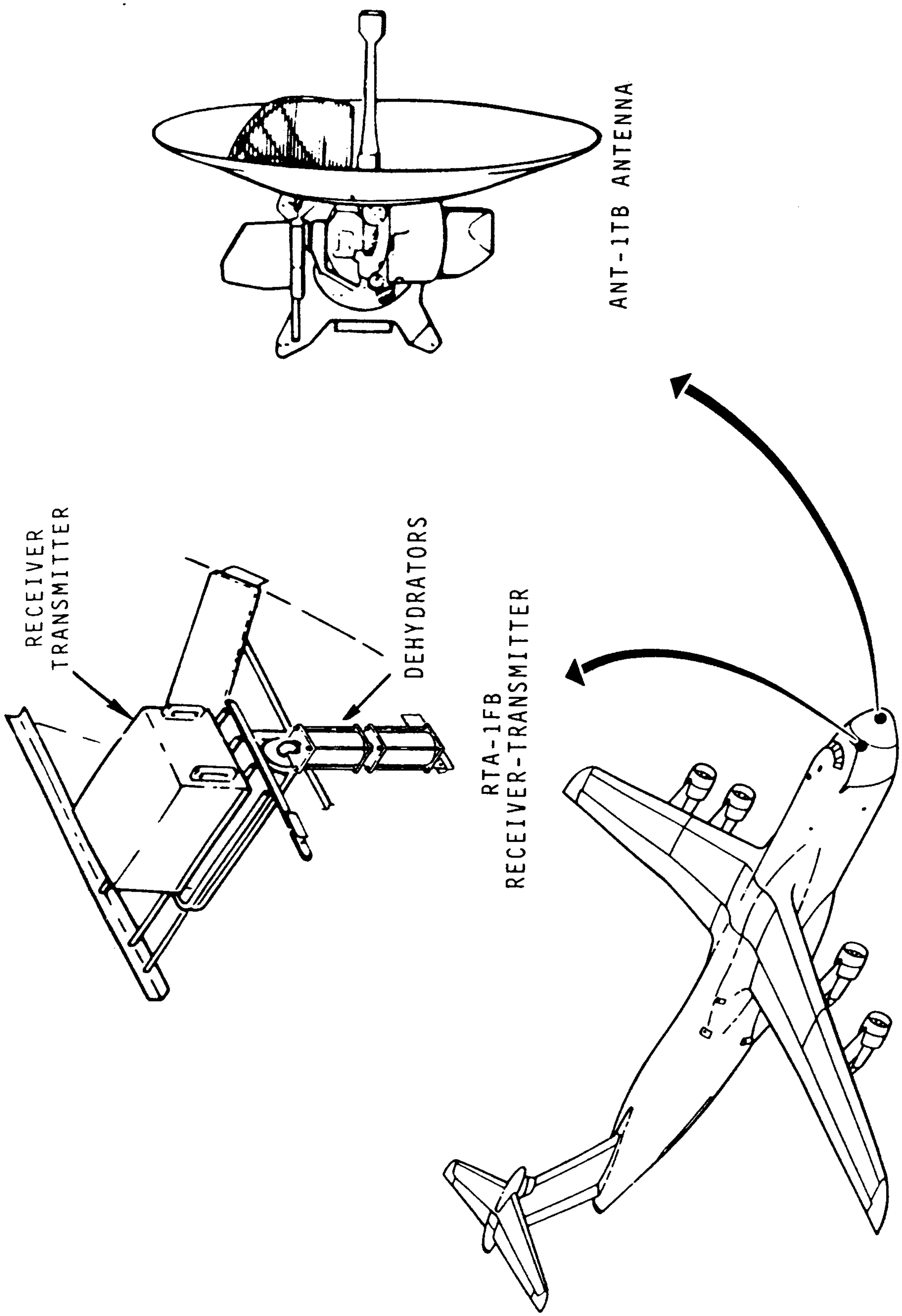
C-5B CARA SYSTEM INTERFACE (SHEET 1)



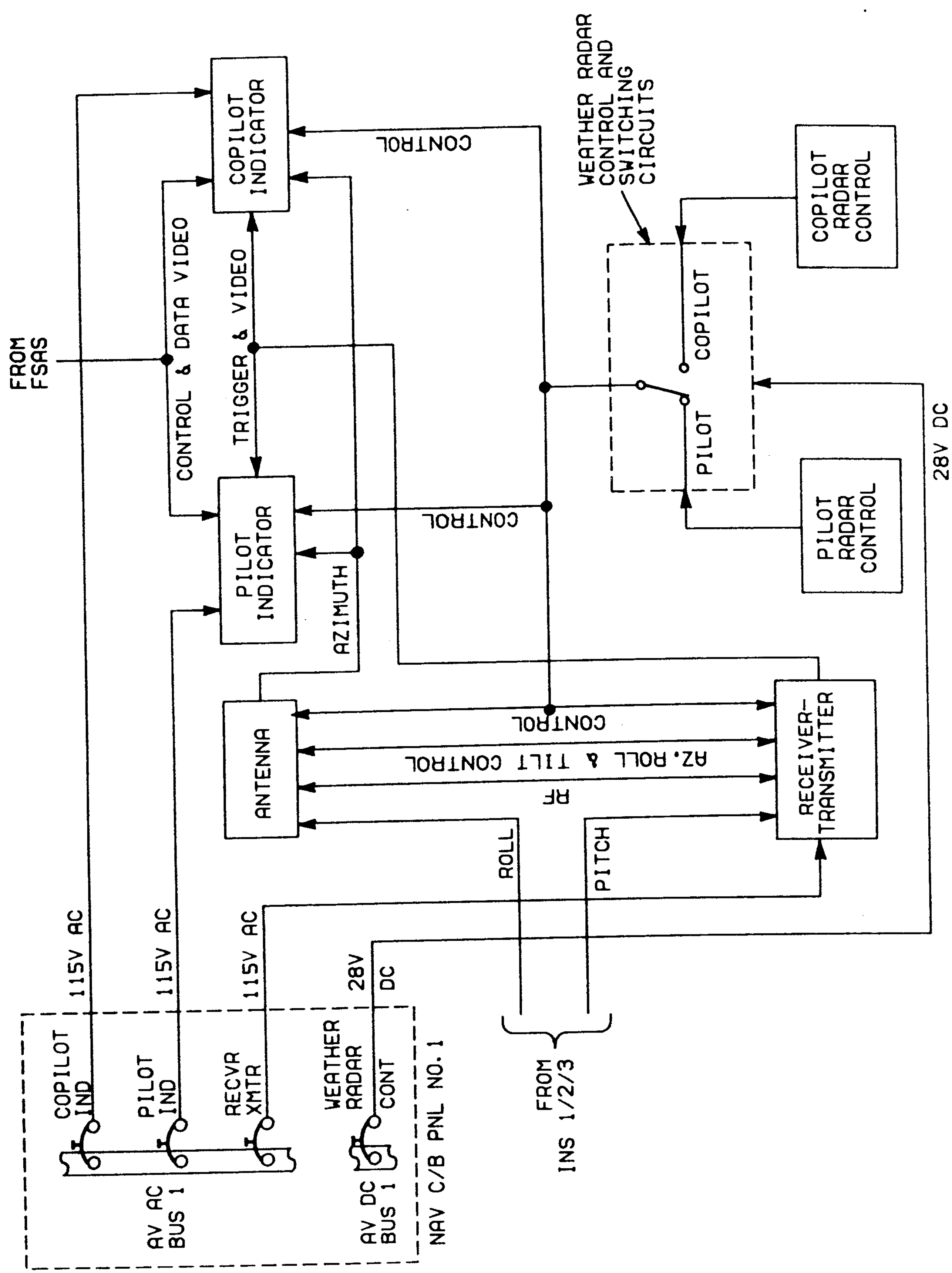
C-5B CARA SYSTEM INTERFACE (SHEET 2)



C-5A/B APS-133, WEATHER RADAR COMPONENT LOCATIONS (SHEET 1)



C-5A/B APS-133, WEATHER RADAR COMPONENT LOCATIONS (SHEET 2)



C-5A/B APS-133, WEATHER RADAR
FUNCTIONAL DIAGRAM & INTERFACE

INERTIAL AND RADAR NAVIGATION

The inertial and radar navigation systems provide: enroute navigation information; aircraft attitude information; information to accomplish flight profiles with minimum fuel consumption; and monitoring and recording of many aircraft parameters, system parameters, malfunctions, and flight loads. The inertial and radar navigation systems are:

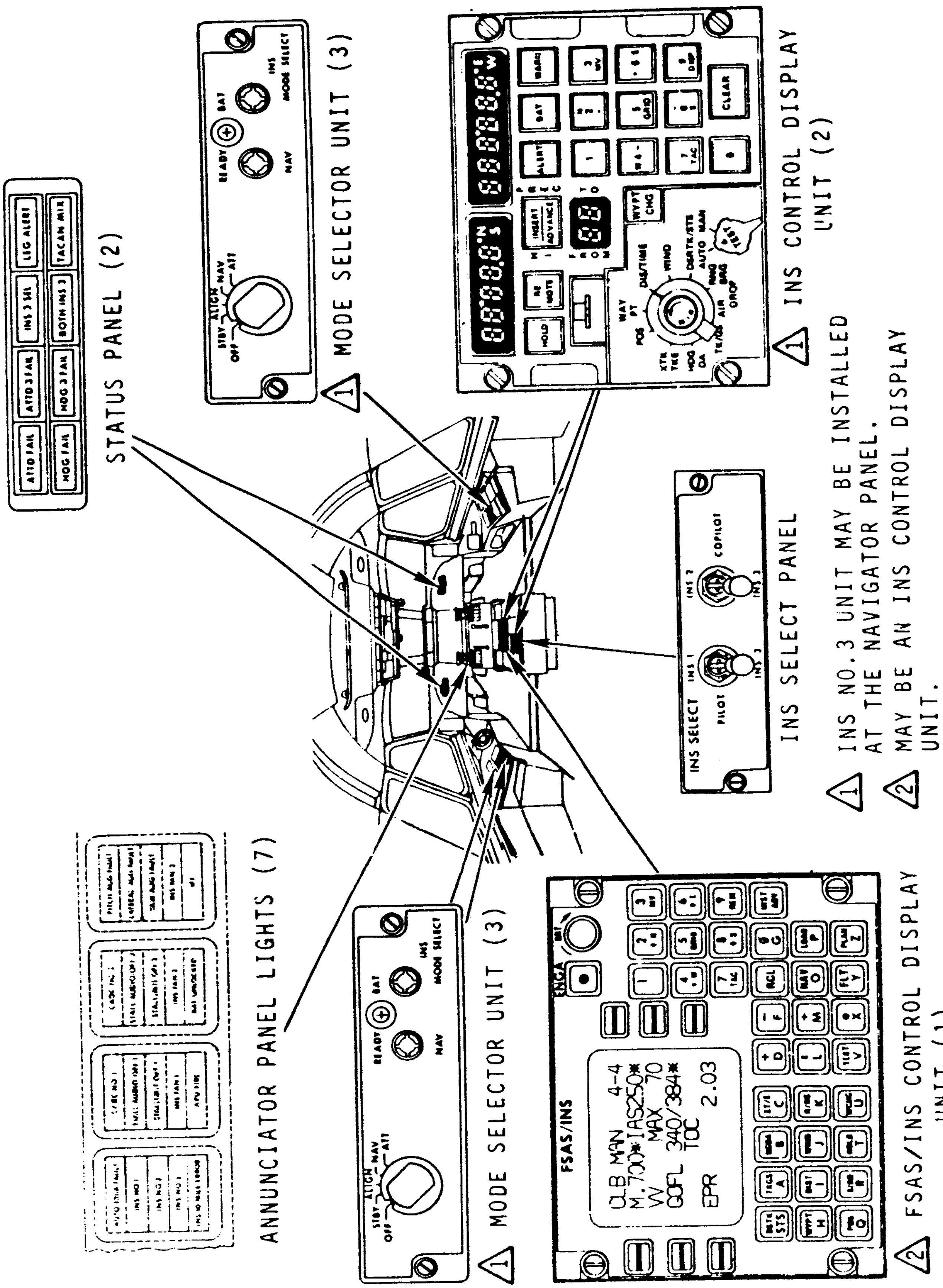
C-5A	C-5B
o Inertial Navigation System (INS) (3)	o Same
o Fuel Savings Advisory System (FSAS)	o Same
o Malfunction Detection, Analysis and Recording (MADAR) System, MADAR I	o MADAR II
o Flight Loads Recording System (FLRS)	o Loads Environment Spetra Survey (LESS) System

The INS systems provide aircraft present position, true and magnetic heading, roll and pitch attitude, and lateral guidance and steering information without the use of any navigation aids from the earth's surface.

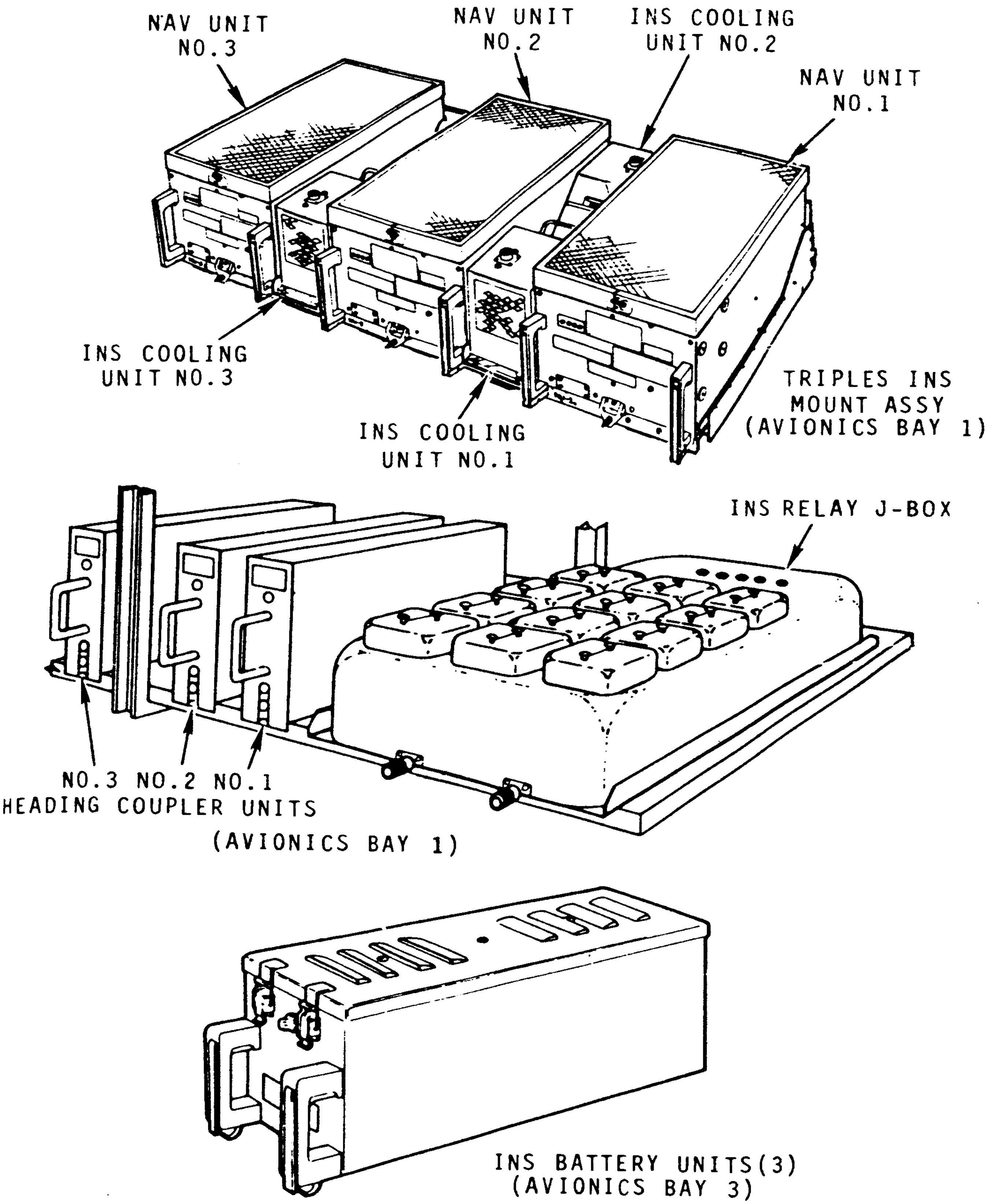
The FSAS receives many inputs including engine parameters, air data, and manually inserted flight plan data to compute the most efficient flight profile. It provides outputs for display and for manual and automatic control of the throttles and the pitch flight path.

The MADAR system monitors many parameters of the aircraft and its systems. It assists the flight crew and ground crew in isolating malfunctions to the defective component. Malfunctions, system degradation, and trend information are recorded for processing into maintenance data.

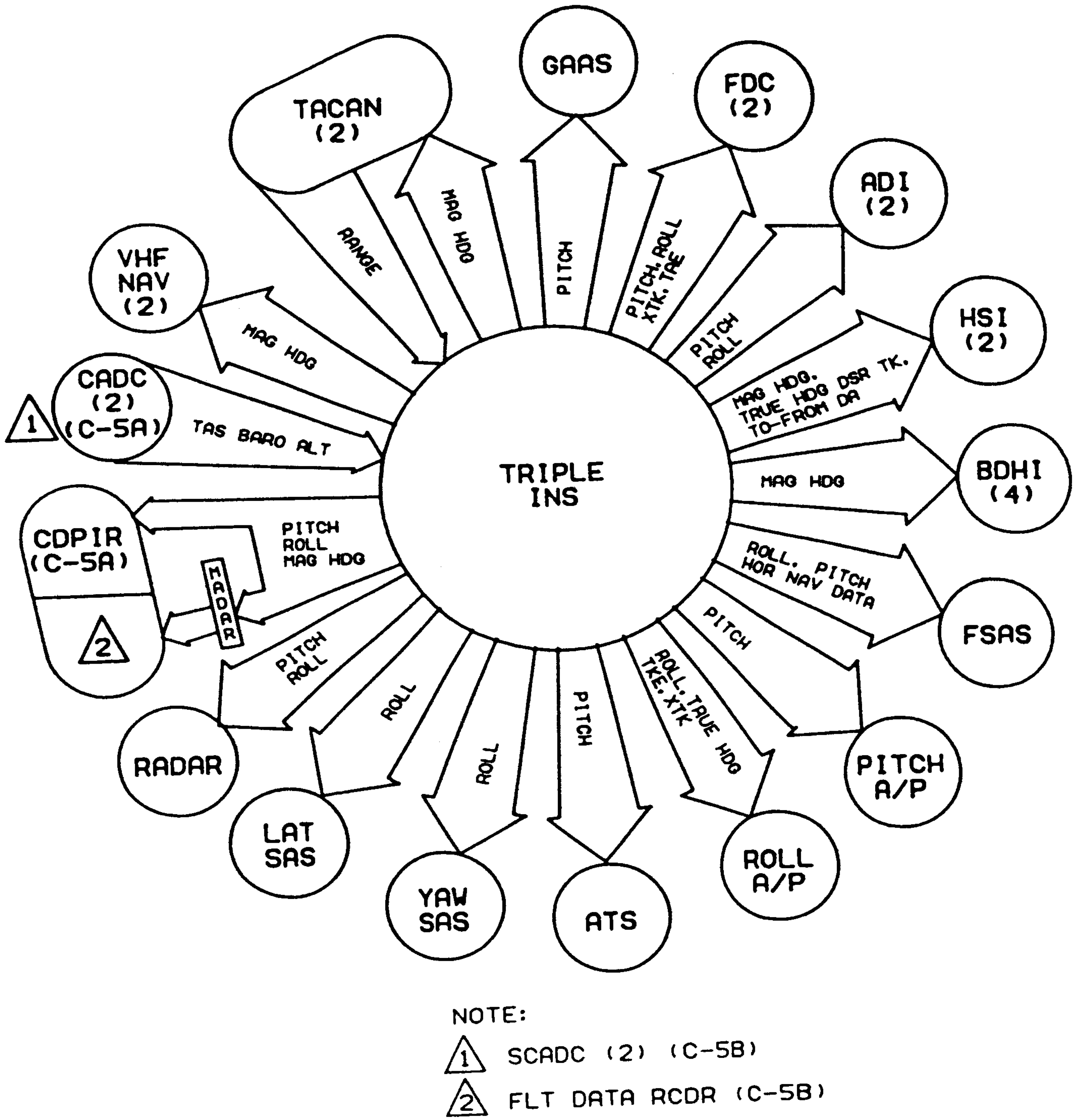
The C-5A FLRS and the C-5B LESS systems are automatic data acquisition systems which collect and process certain major structural loads and associated aircraft parameters for recording by MADAR. FLRS is installed on all C-5As and LESS is stalled on 5 C-5B aircraft (aircraft 84-0662 and 85-0001 through 85-0004).



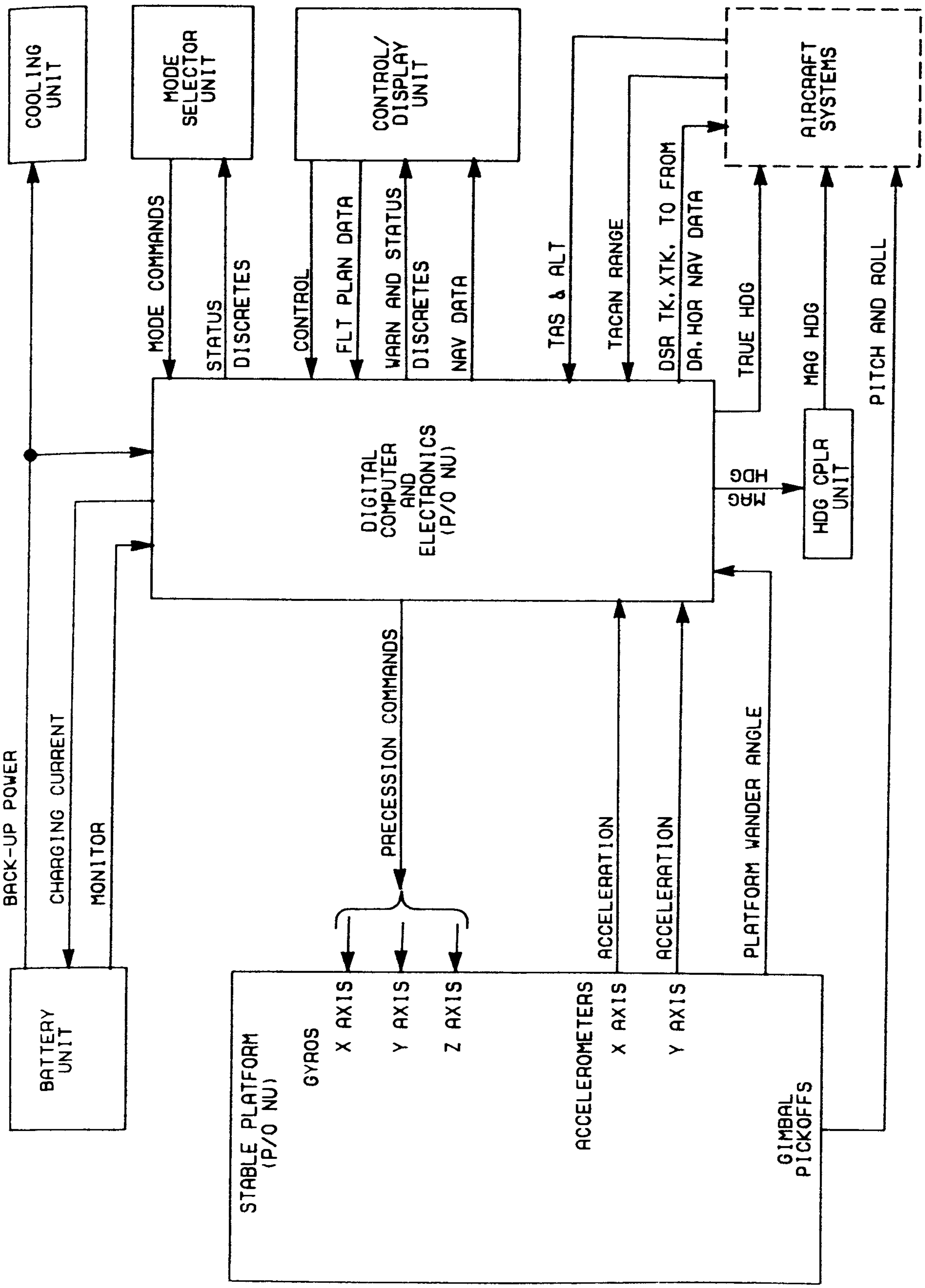
C-5A/B TRIPLE INS CONTROL AND DISPLAY COMPONENTS



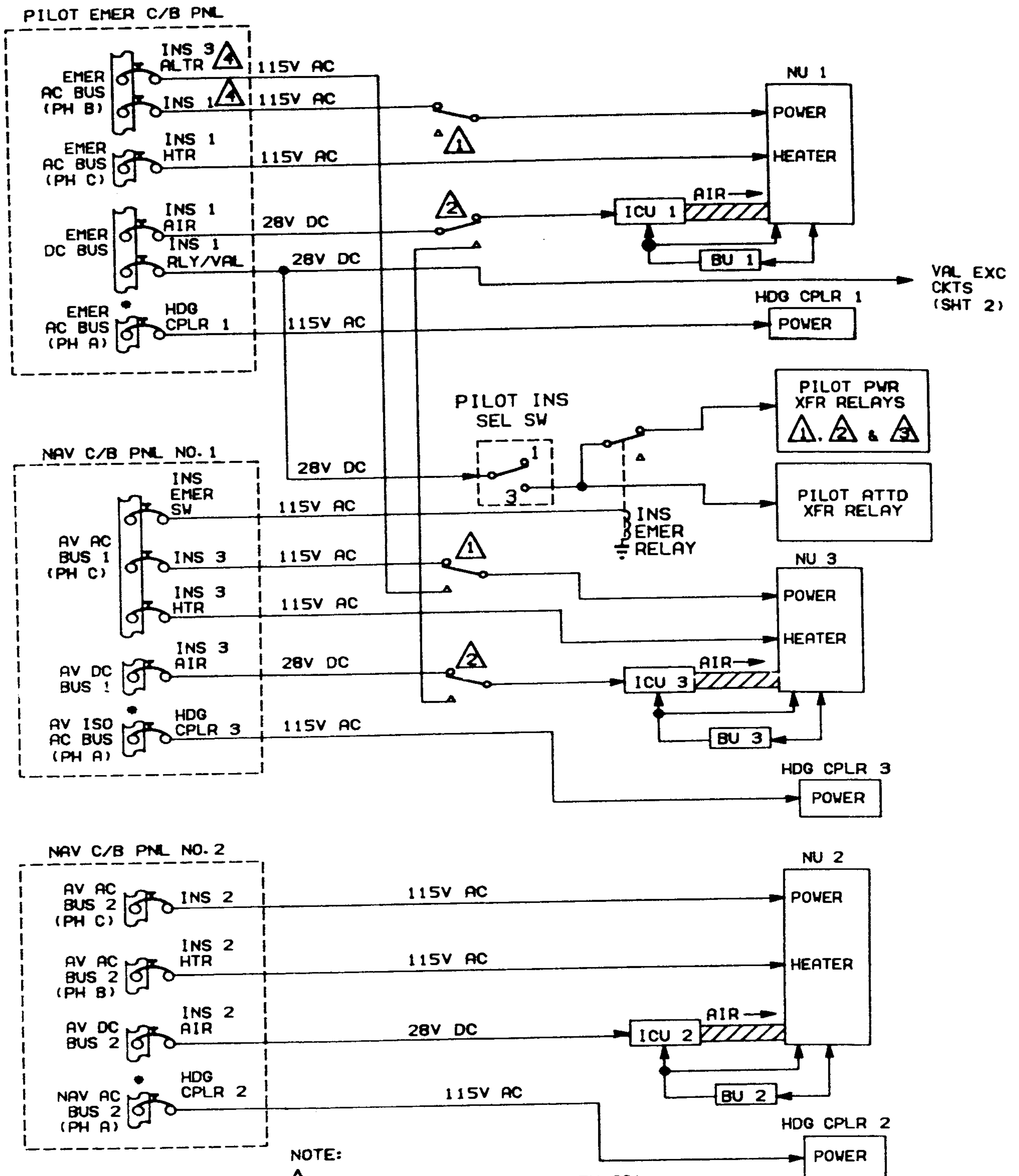
C-5A/B TRIPLE INS RACK MOUNTED COMPONENTS



C-5A/B TRIPLE INS INTERFACE

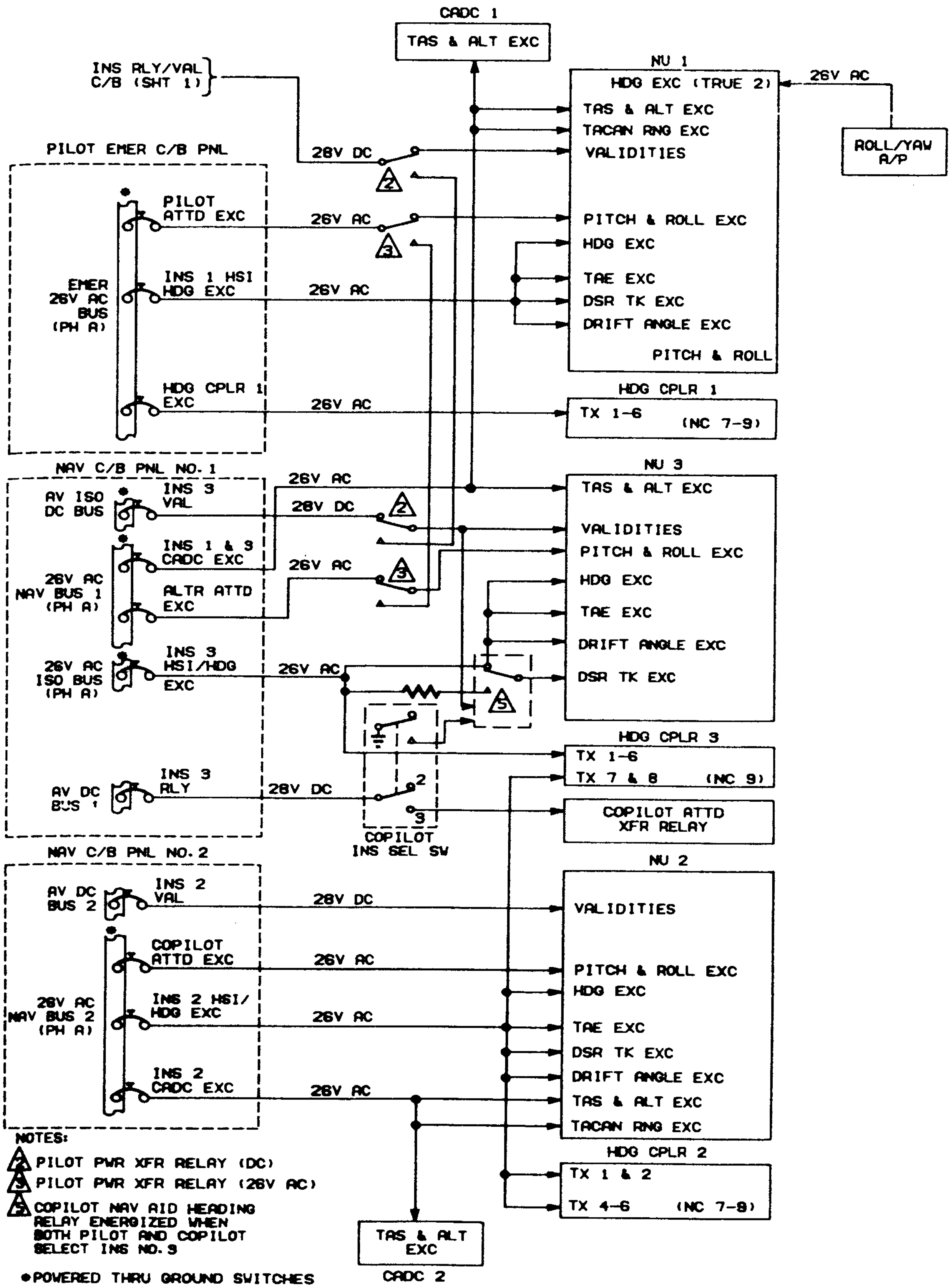


C-5A/B TRIPLE INS BLOCK DIAGRAM

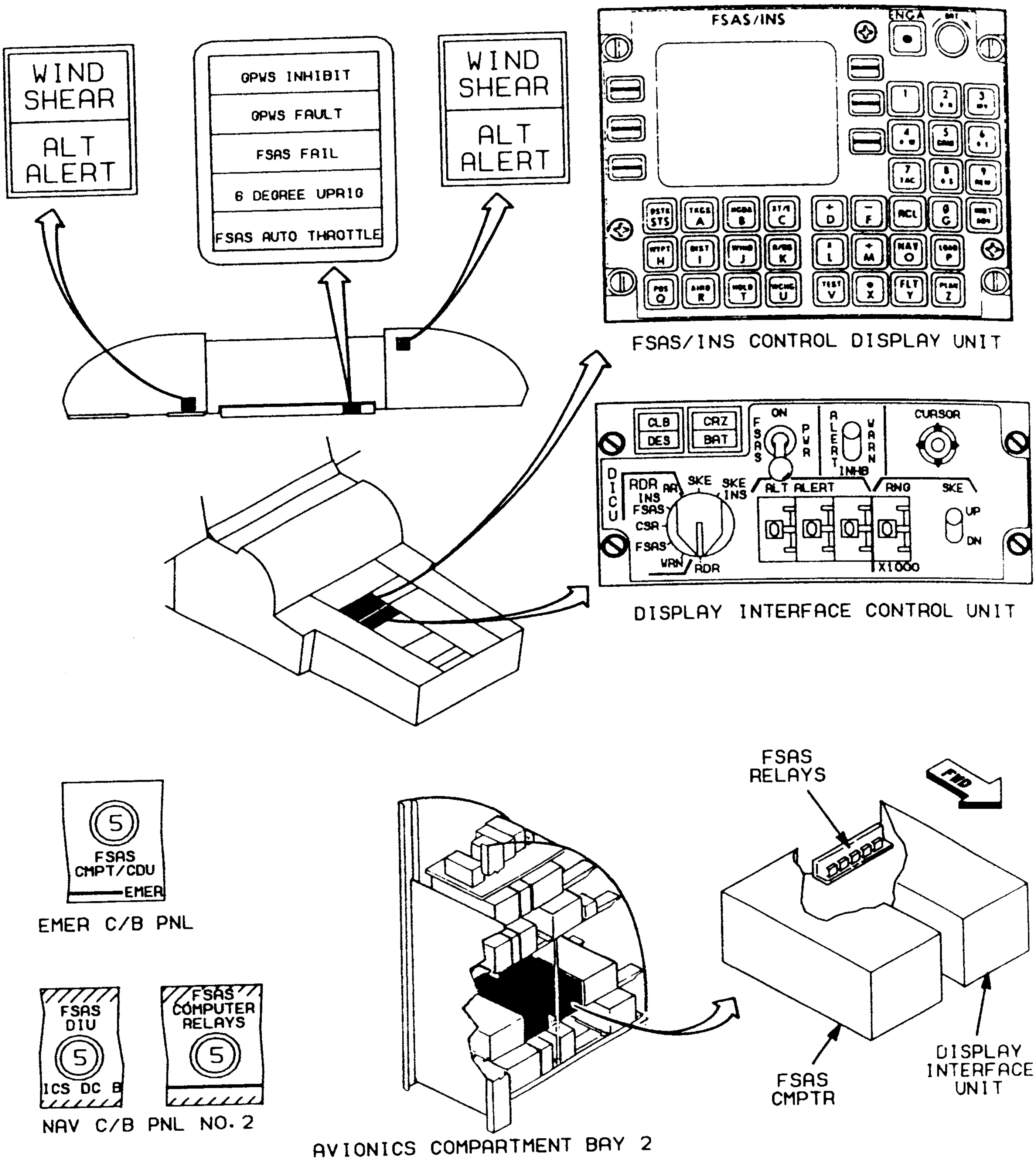


NOTE:
1. PILOT PWR XFR RELAY (115V AC)
2. PILOT PWR XFR RELAY (DC)
3. PILOT PWR XFR RELAY (26V AC)
4. C-5A SHOWN. C-5B ON EMER AC BUS (PH C)
• POWERED THRU GROUND SWITCHES

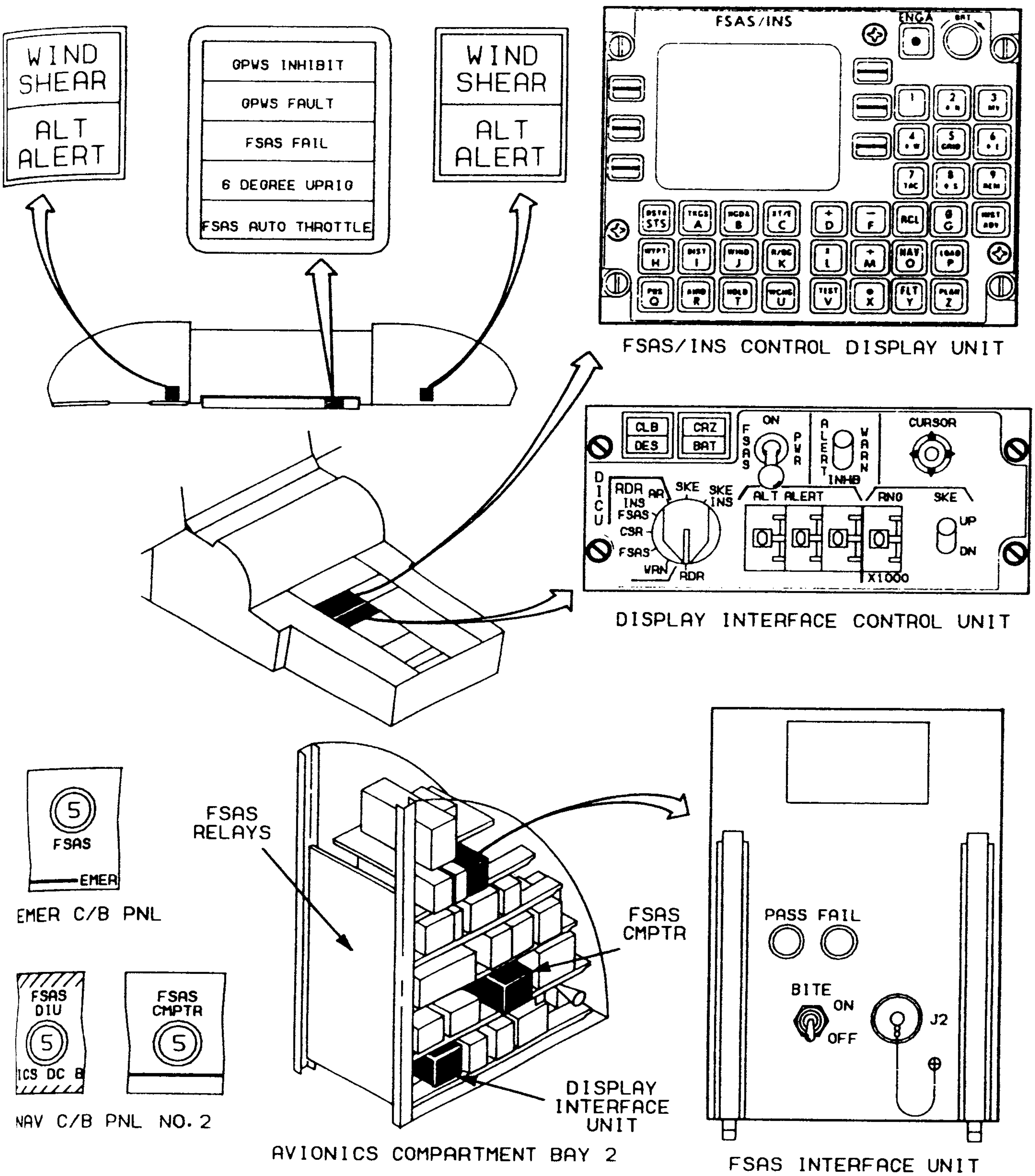
C-5A/B TRIPLE INS PRIMARY POWER (SHEET 1)



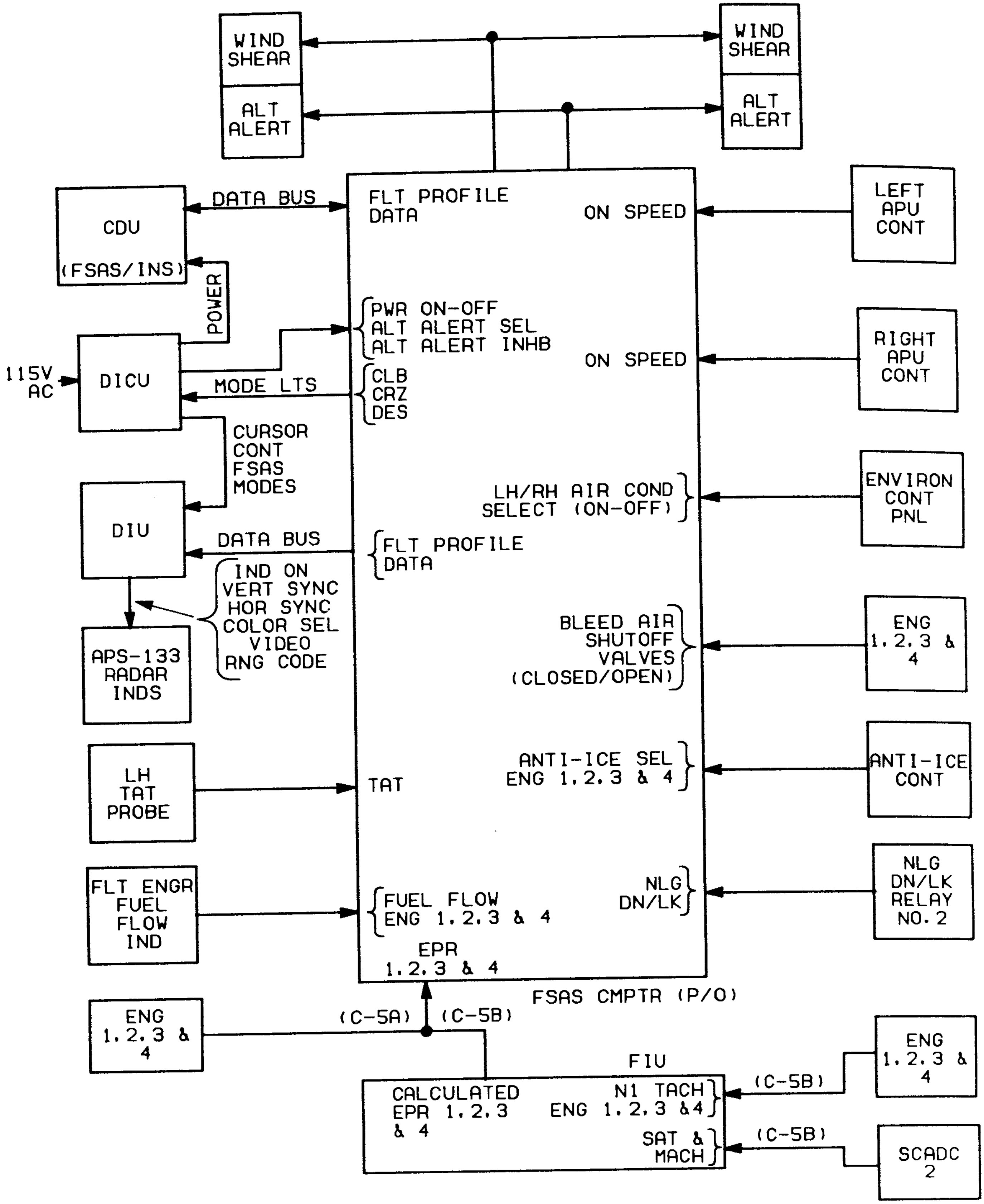
C-5A/B TRIPLE INS EXCITATION POWER (SHEET 2)



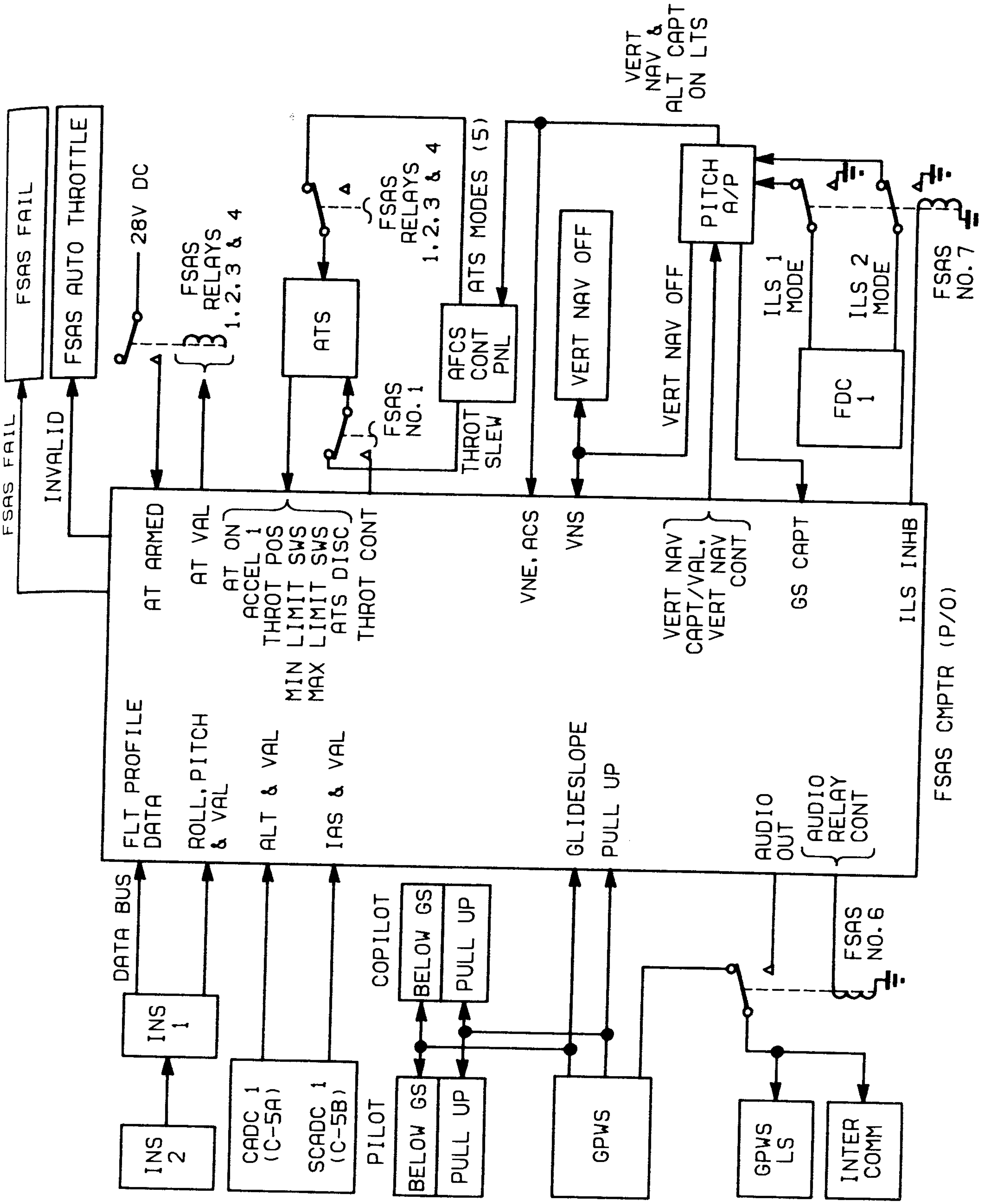
C-5A FSAS COMPONENT LOCATIONS



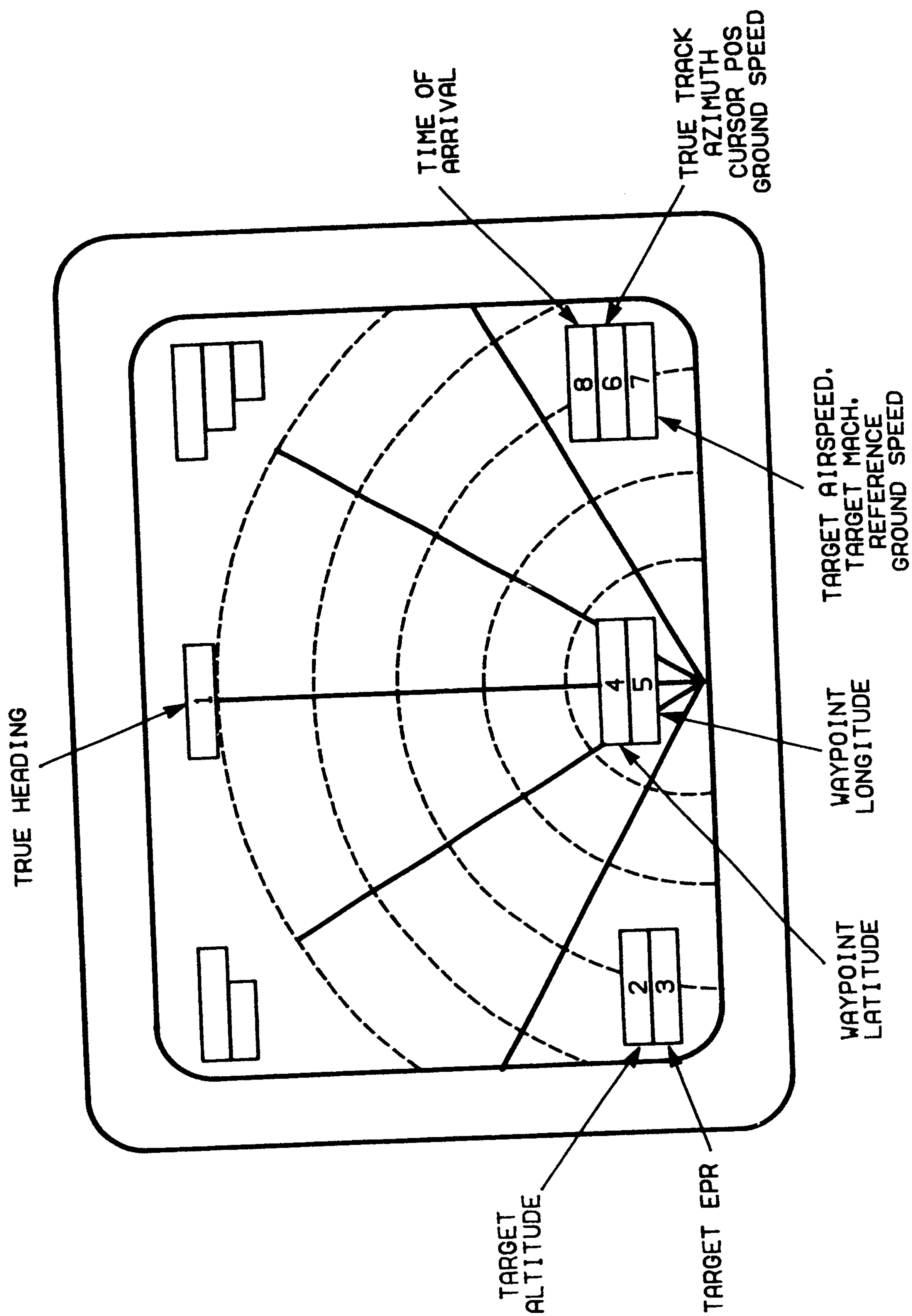
C-5B FSAS COMPONENT LOCATIONS



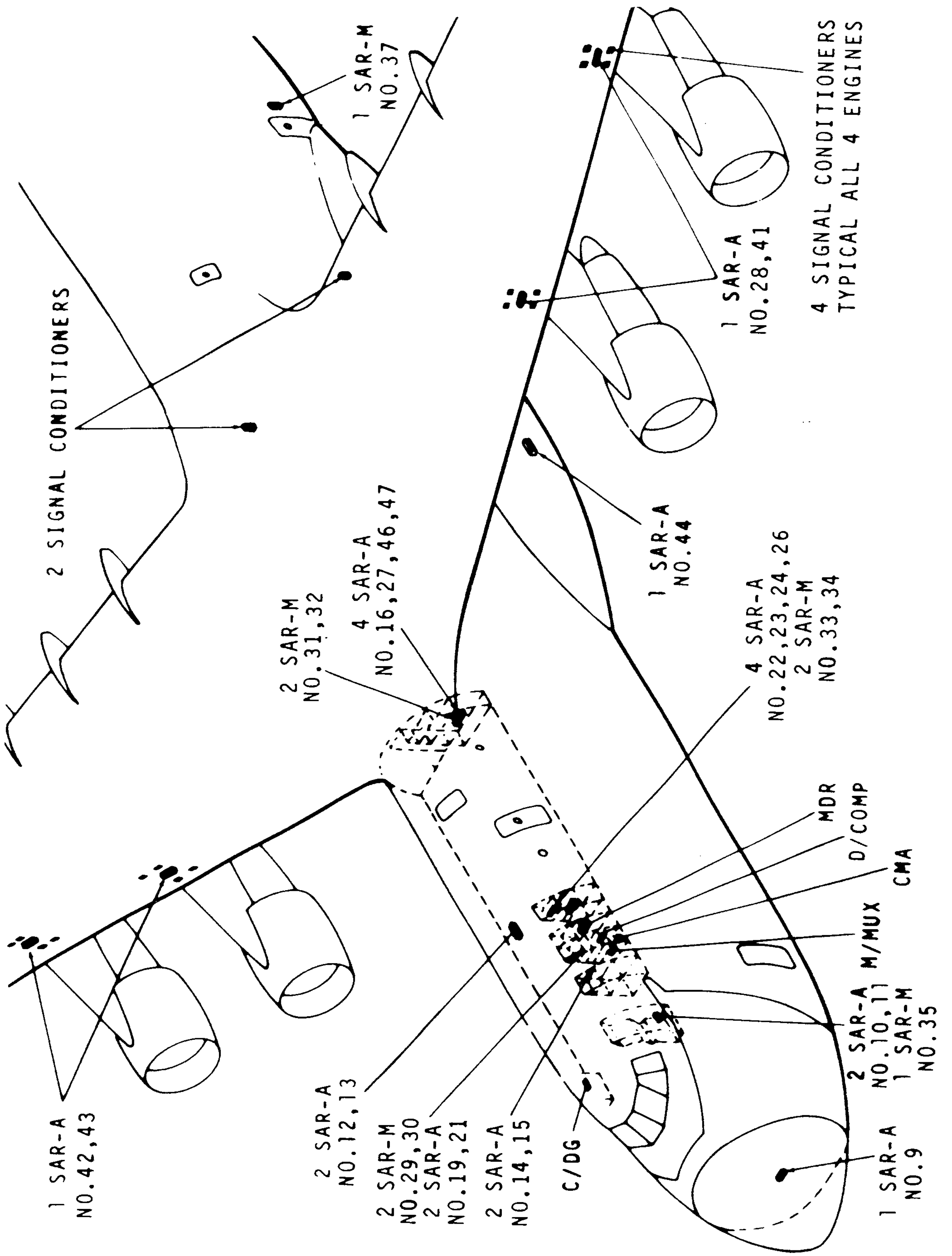
C-5A/B FSAS INTERFACE (SHEET 1)



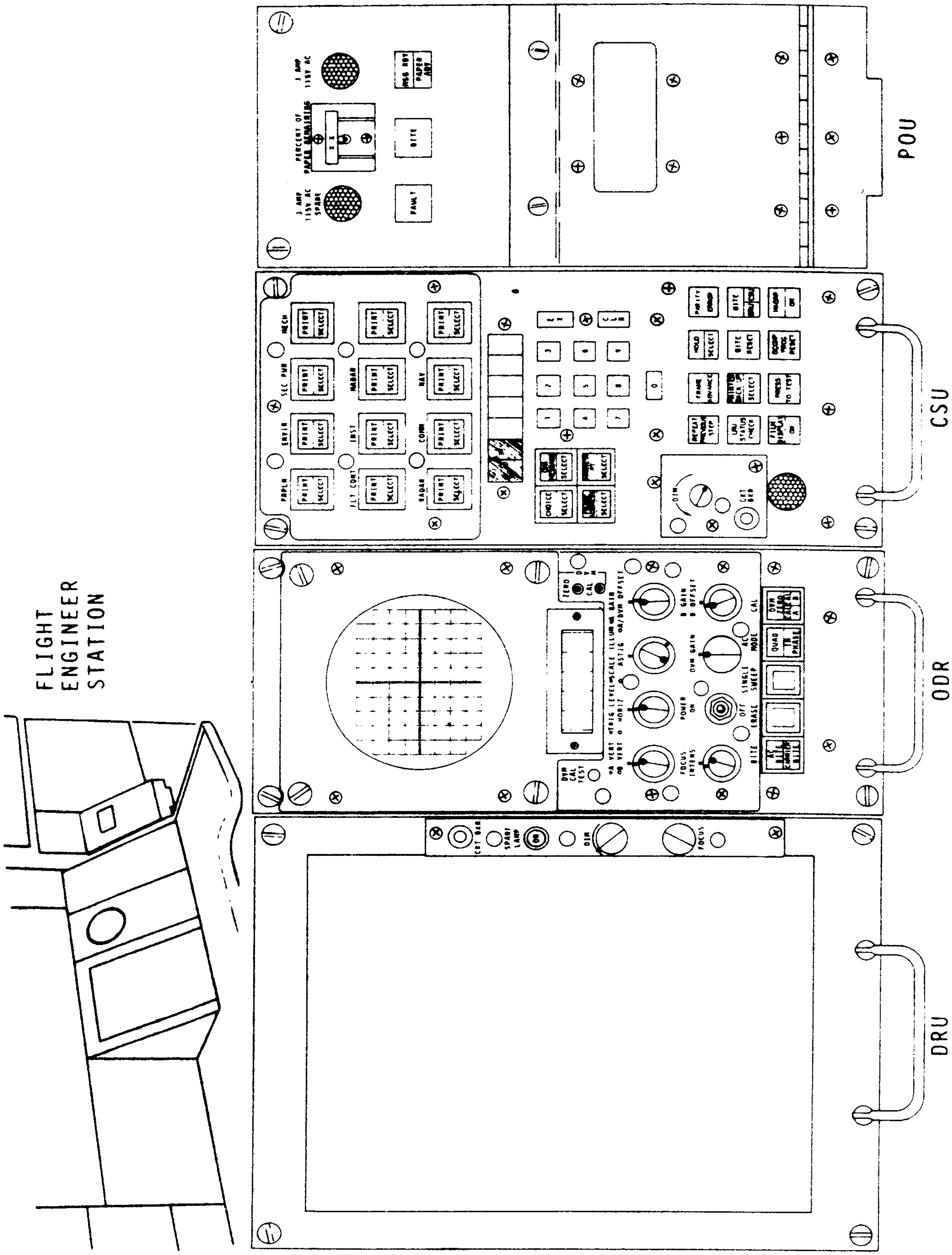
C-5A/B FSAS INTERFACE (SHEET 2)



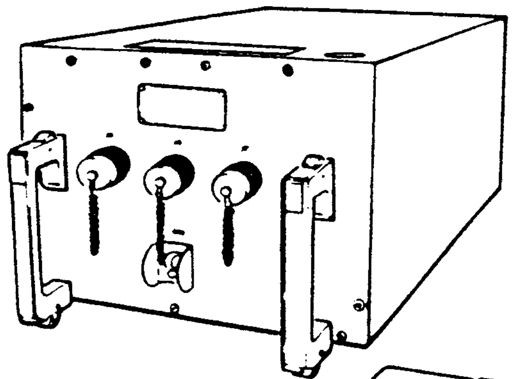
C-5A/B FSAS DISPLAY WEATHER RADAR INDICATOR



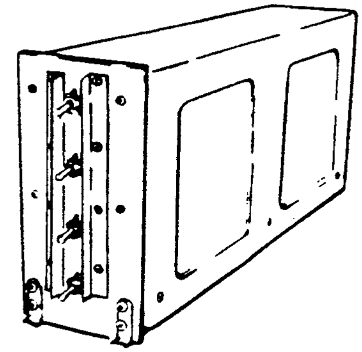
C-5A MADAR COMPONENT LOCATIONS



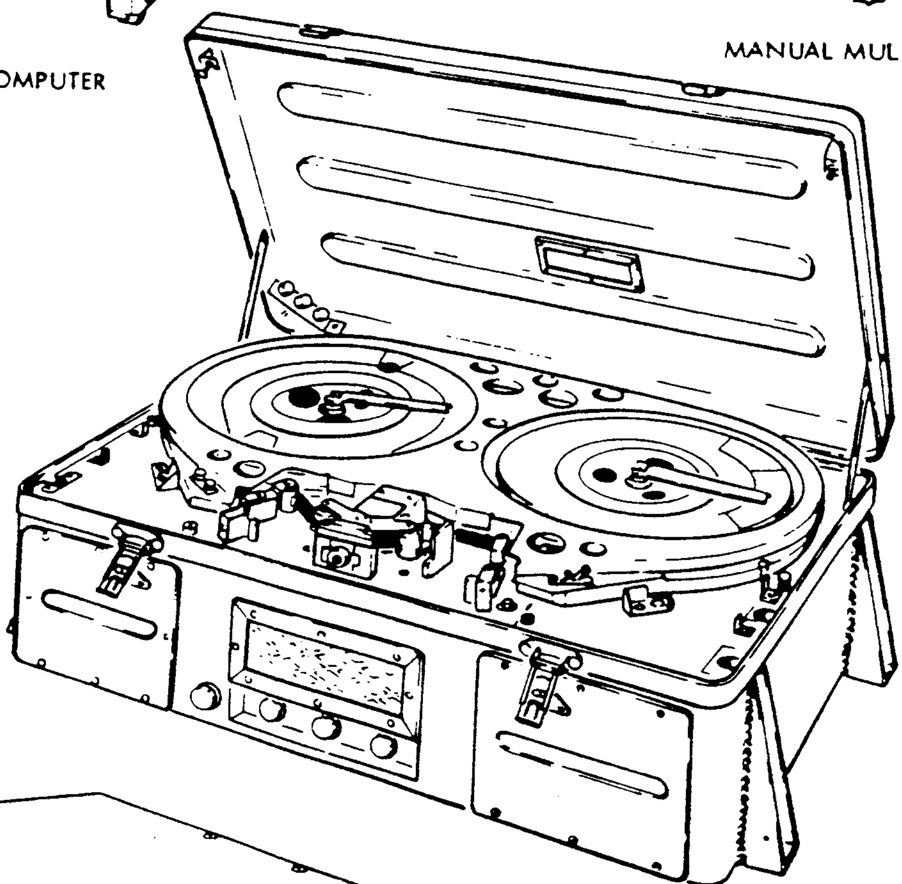
C-5A MADAR OPERATING CONTROLS



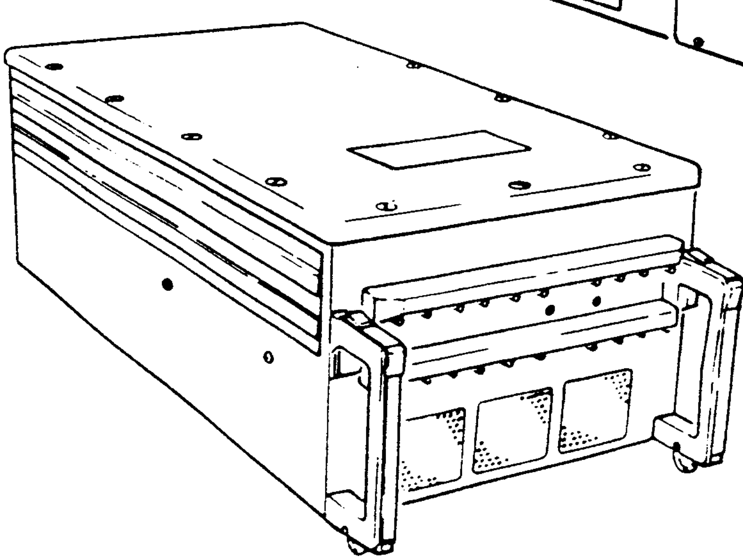
DIGITAL COMPUTER



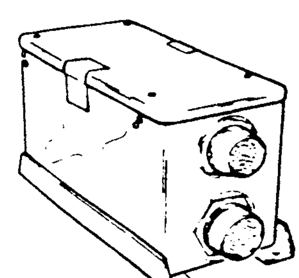
MANUAL MULTIPLEXER



MAINTENANCE DATA RECORDER

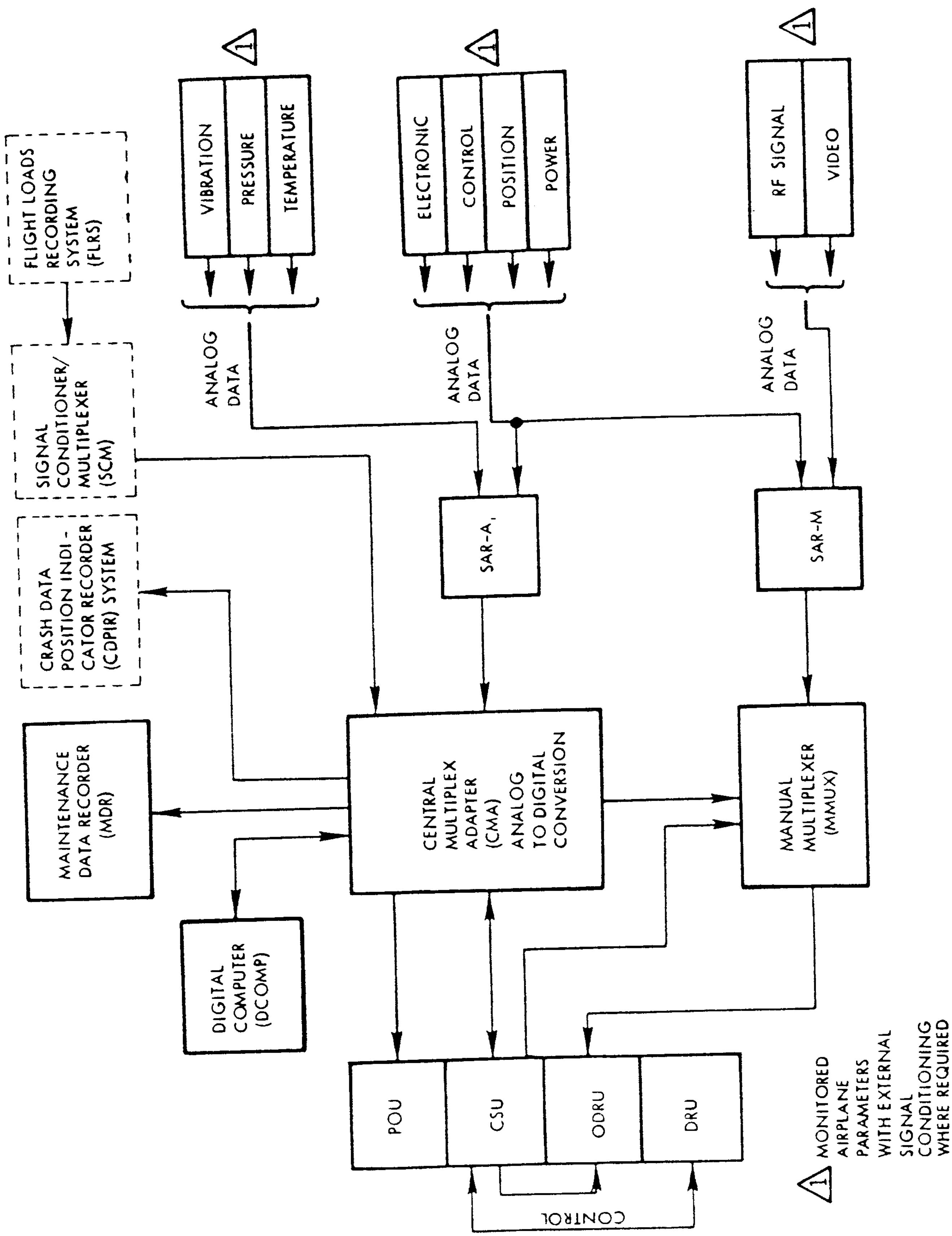


CENTRAL MULTIPLEXER ADAPTER



SAR UNIT

C-5A MAJOR MADAR COMPONENTS



C-5A SIMPLIFIED MADAR FLOW DIAGRAM

MADAR STARTUP

1. Rotate the DIM control fully clockwise.

2. Press the MADAR pushbutton.

3. Press the CLR pushbutton.

4. Press the FILM DISPLAY pushbutton.

5. Ensure that the PRINTER BACK-UP pushbutton SELECT light is off. Press if necessary.

6. Set the ODRU POWER switch to the ON position.

7. Place MADAR in the TEST mode as follows:

   a. Press the CMA MESSAGE pushbutton to turn on the SELECT light.

   b. Enter 1000002 into the keyset display.

   c. Verify the numbers; if not correct press CLR and reenter the numbers.

   d. Press the EX pushbutton.

8. Press the PRINT SELECT pushbutton corresponding to the desired system then follow film pack instructions.

MADAR SHUTDOWN

1. Place MADAR in the STANDBY mode as follows:

   a. Press the CMA MESSAGE pushbutton to turn on the SELECT light.

   b. Enter 1000001 into the keyset display.

   c. Press the EX pushbutton.

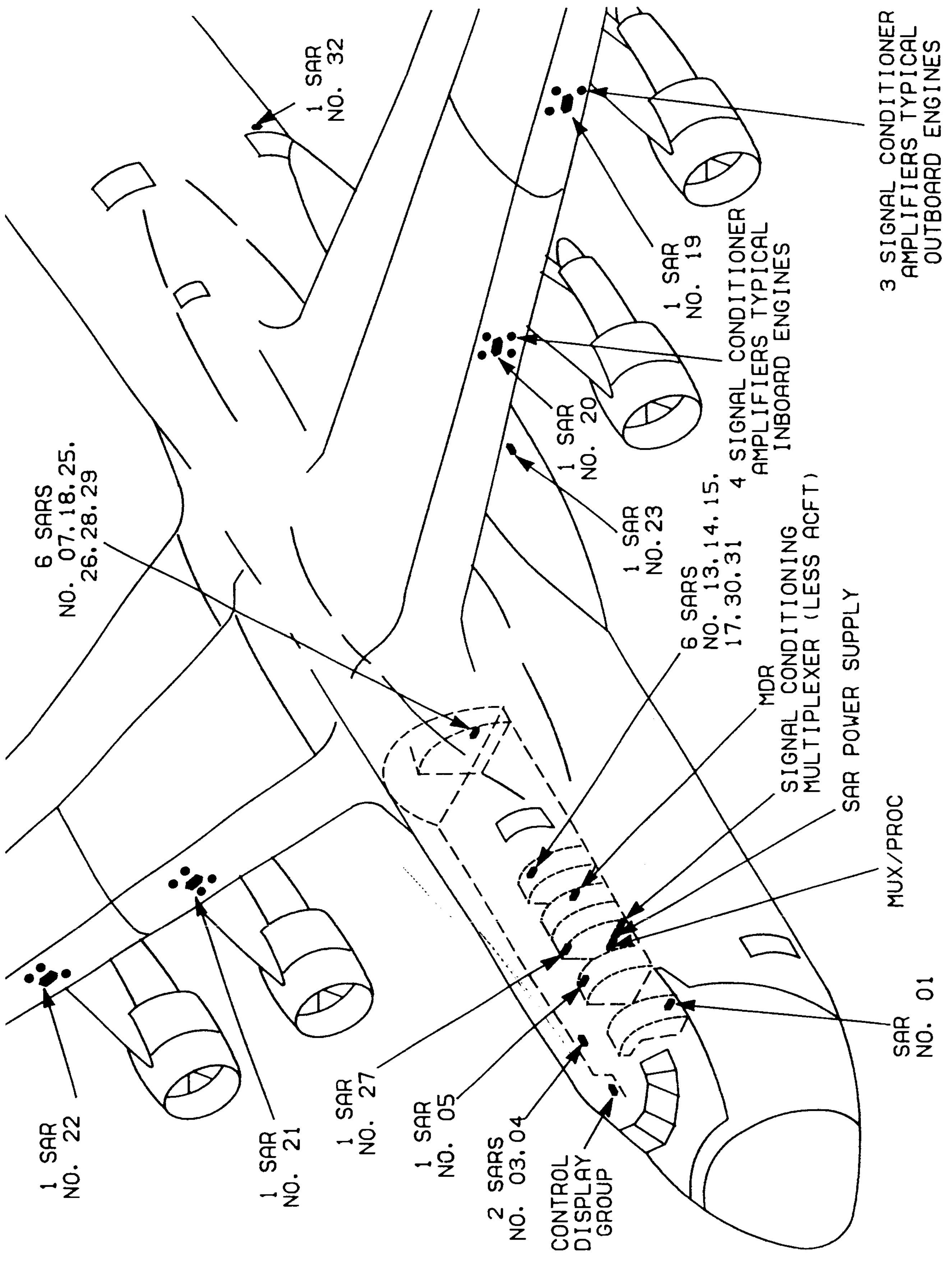
2. Set the ODRU POWER switch to the OFF position.

3. Press the FILM DISPLAY pushbutton.

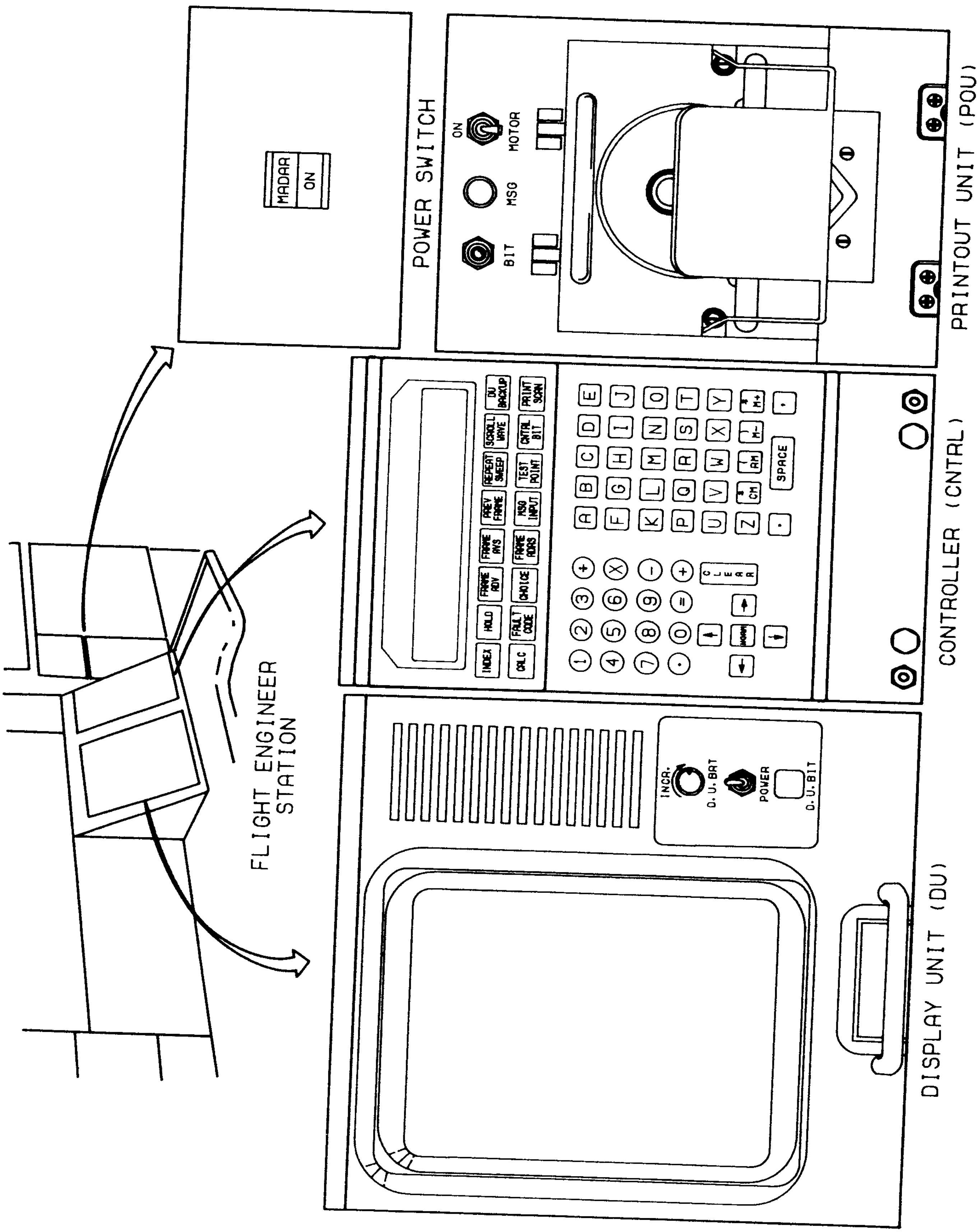
4. Press the MADAR pushbutton.

   NOTE: Consult T.O. 1C-5A-102 and/or T.O. 1C-5A-1 for more detailed instructions and associated circuit breaker locations.

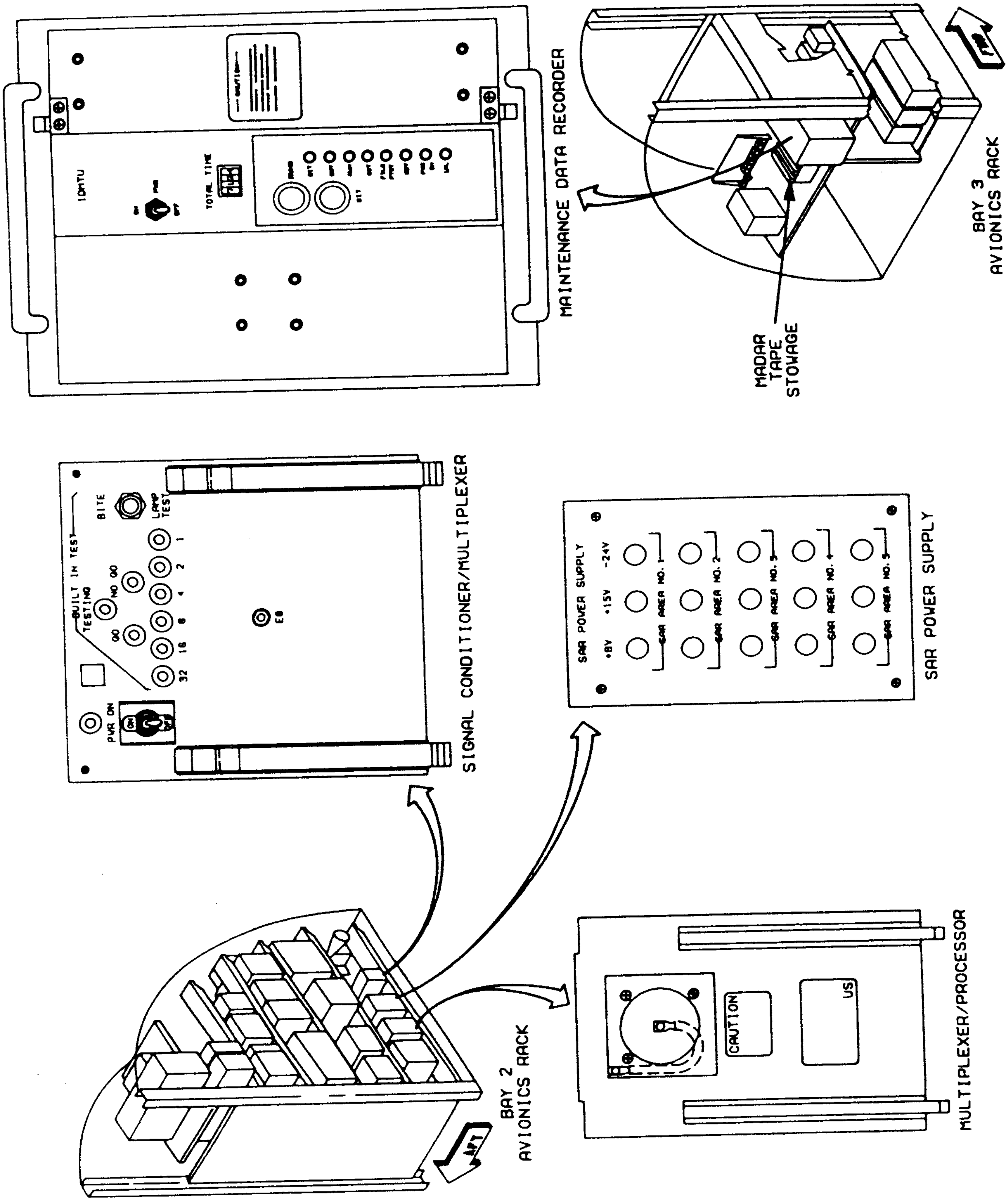
C-5A MADAR STARTUP/SHUTDOWN PROCEDURES



C-5B MADAR II COMPONENT LOCATIONS



C-5B MADAR II COMPONENTS
(CONTROL DISPLAY GROUP)



C-5B MADAR II COMPONENTS

MADAR II STARTUP

1. Turn the DU POWER switch on.

2. Rotate the D.U. BRT control fully clockwise.

3. Turn on the PCU MOTOR switch.

4. Press the MADAR power switch to on. The MADAR will then perform a self-test. After sucessful completion of the self-test (approximatley 22 seconds), display frame 00001 will appear in the frame display area and STDY will appear in the events display area.

NOTE: If the MADAR was shut down prior to this startup in any mode other than standby, display frame 00909 will appear and the mode annunciated in the events display area will indicate the mode at last shutdown.

If the aircraft is airborne, or any engine N2 is more than 60 percent, the system will go directly to the operate mode.

5. Adjust the D.U. BRT control for optimum display brightness. The system can now be switched to test or operate by inserting TEST or OPER with the keyboard and pressing MSG INPUT.

6. If MDR recording is required, perform the following steps:

   o Ensure MDR switch is in the ON position.

   o Enter INIT and press MSG INPUT to display initialization data.

   o Verify and update the data as required.

   o Enter OPER and press MSG INPUT at the time data is to be recorded.

   o Enter TEST or STBY and press MSG INPUT when data recording is complete.

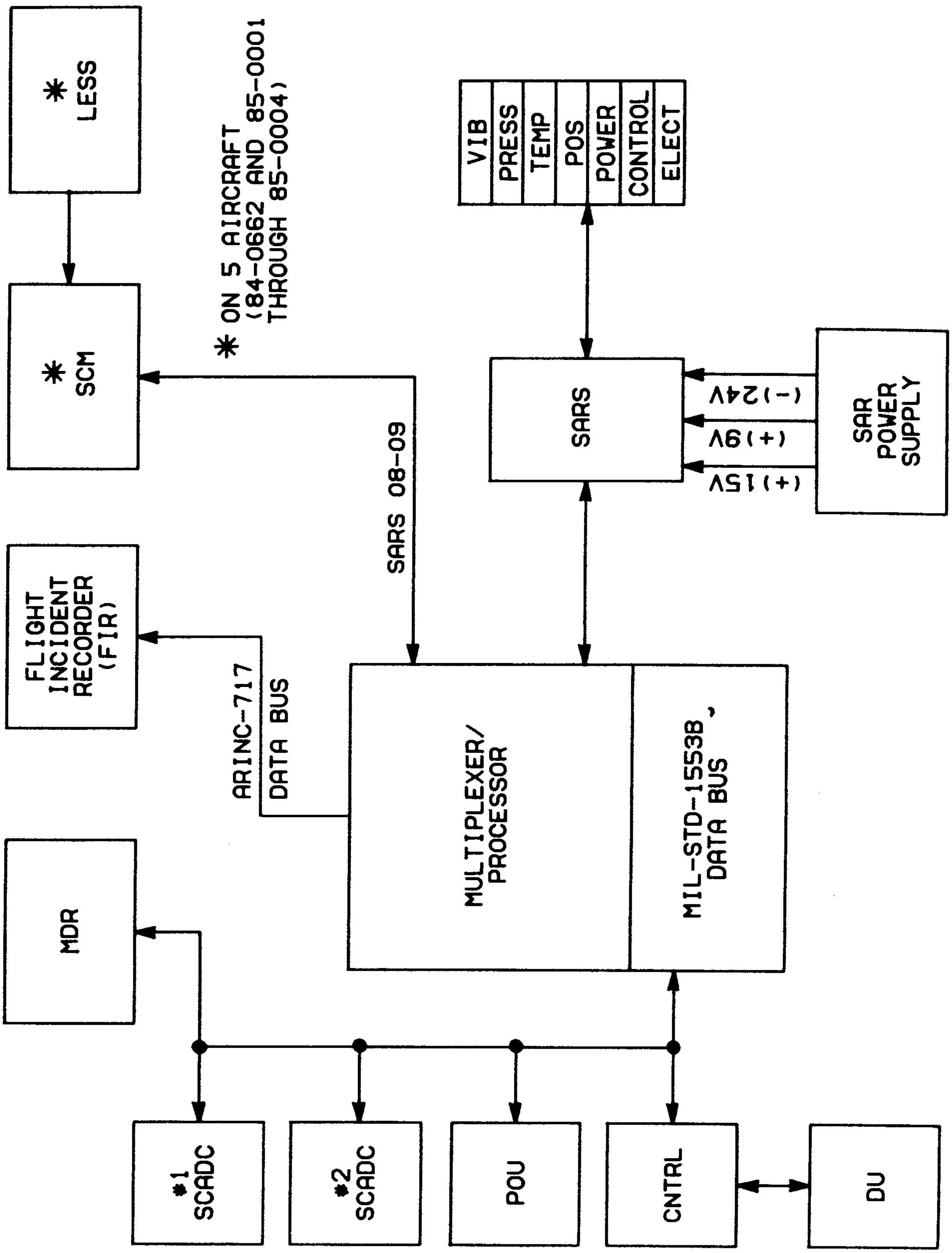
MADR II SHUTDOWN

1. Enter FLTR and press MSG INPUT.

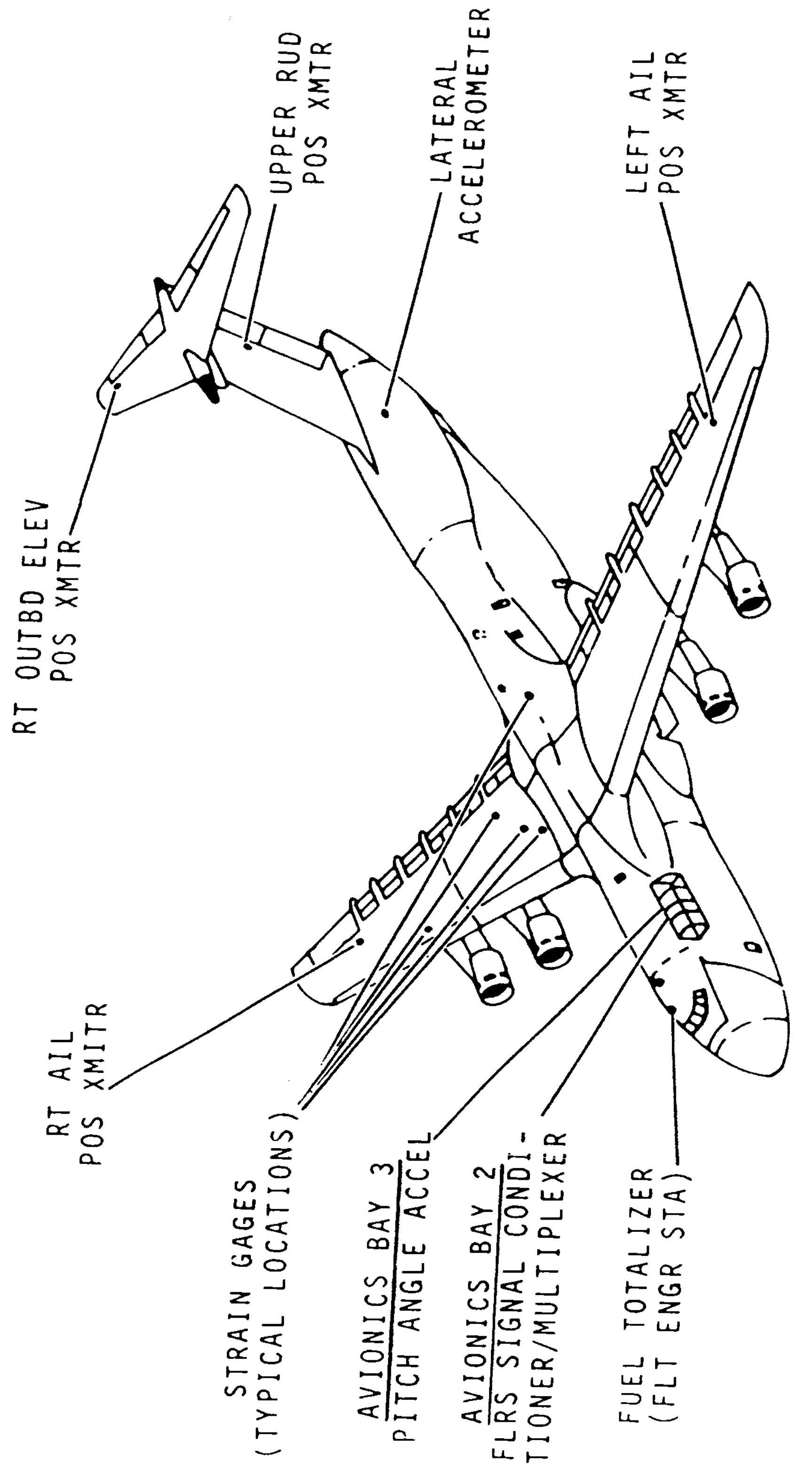
2. Enter STBY and press MSG INPUT.

3. Press the MADAR power switch to off.

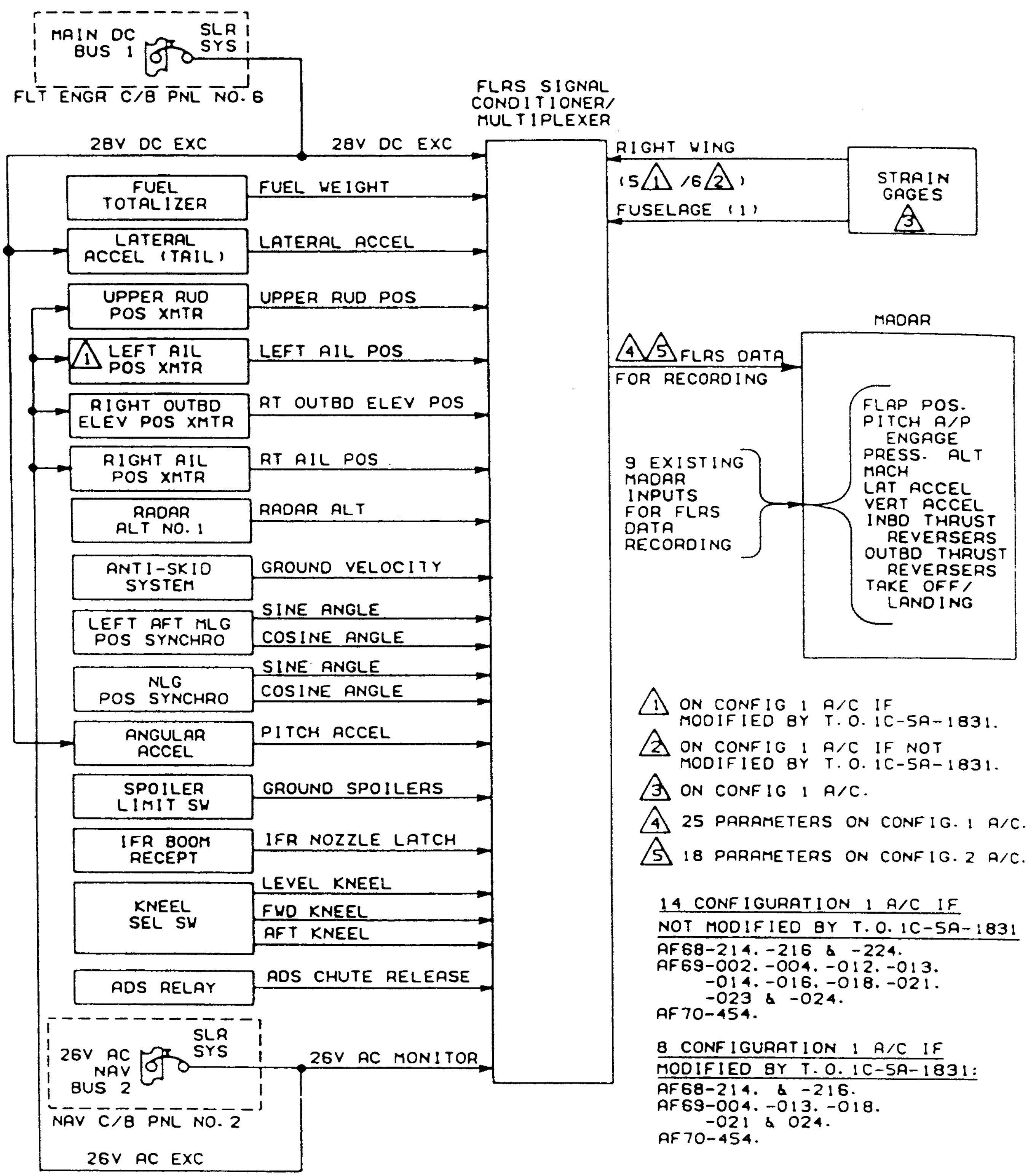
C-5B MADAR II STARTUP/SHUTDOWN PROCEDURES



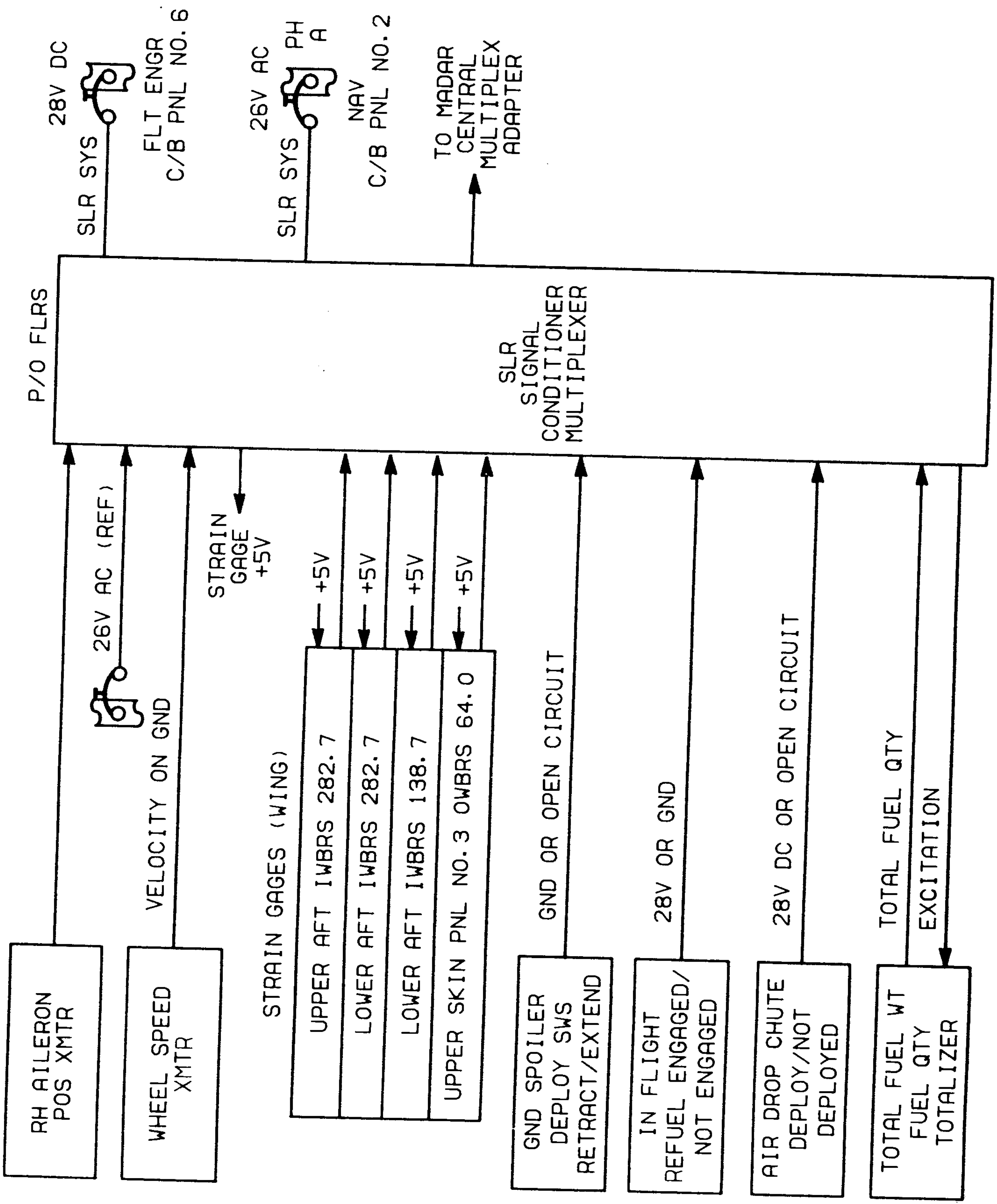
C-5B SIMPLIFIED MADAR FLOW DIAGRAM



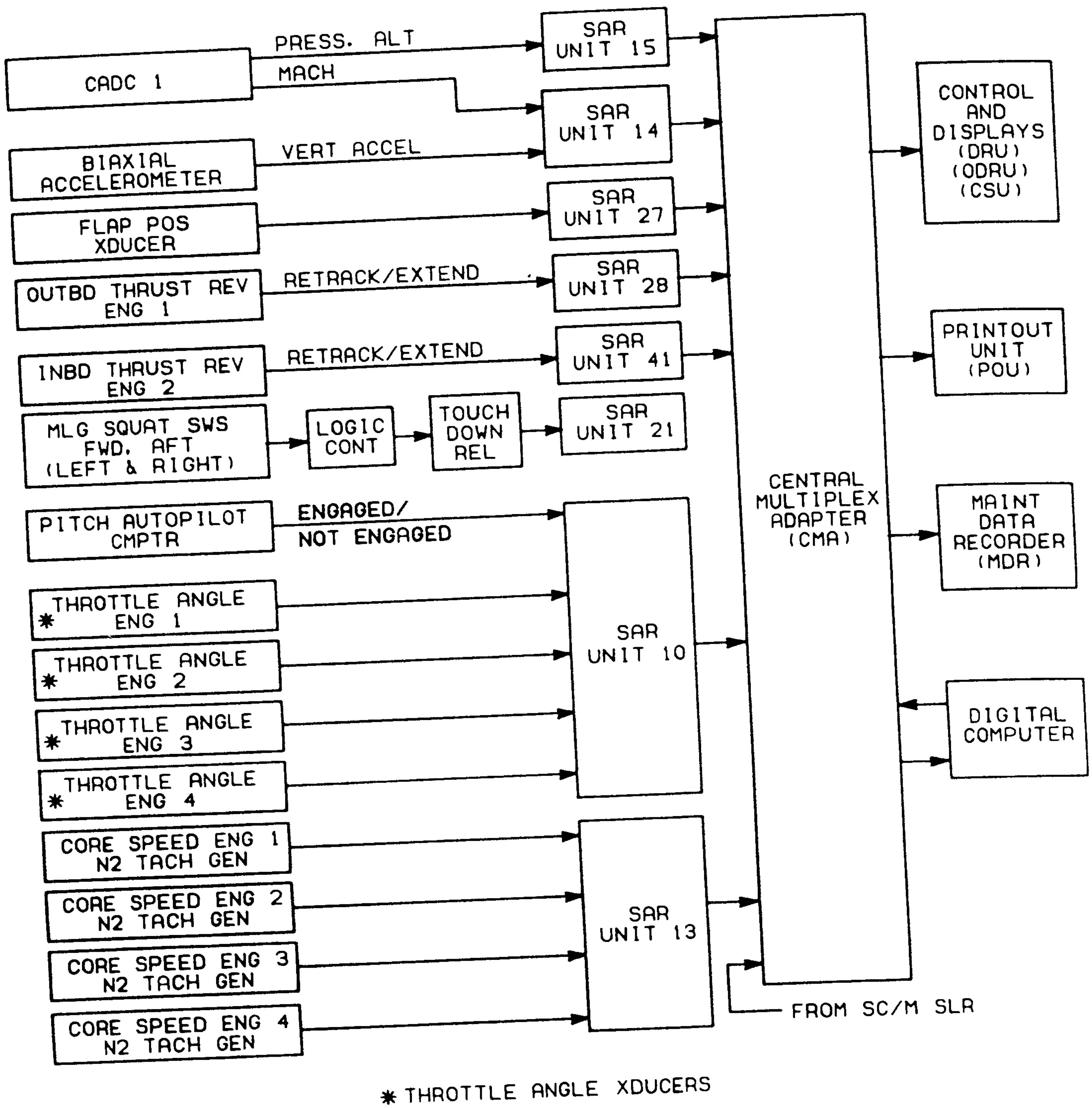
C-5A FLRS (FLIGHT LOADS RECORDING SYSTEM)
COMPONENT LOCATIONS



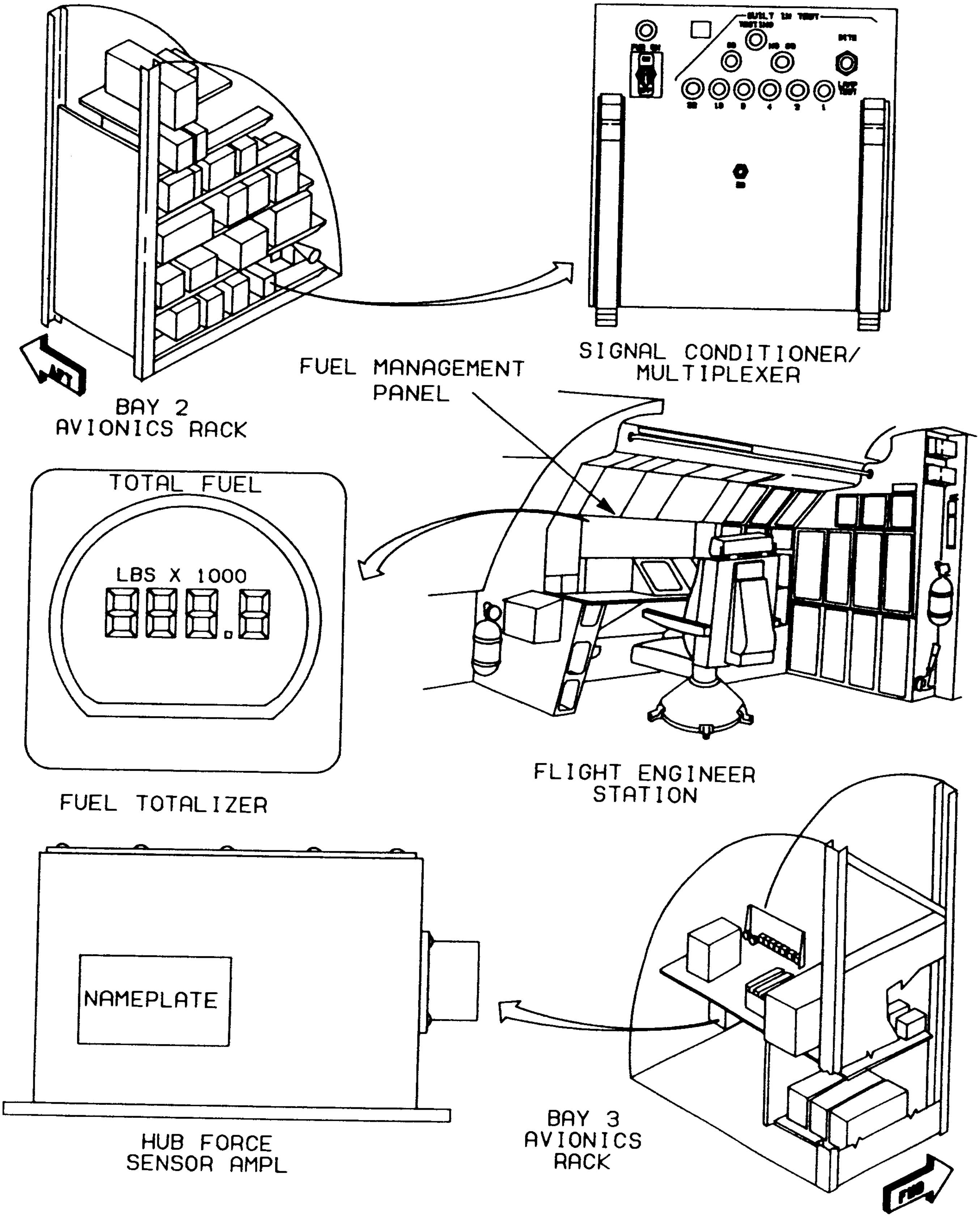
C-5A FLRS INTERFACE



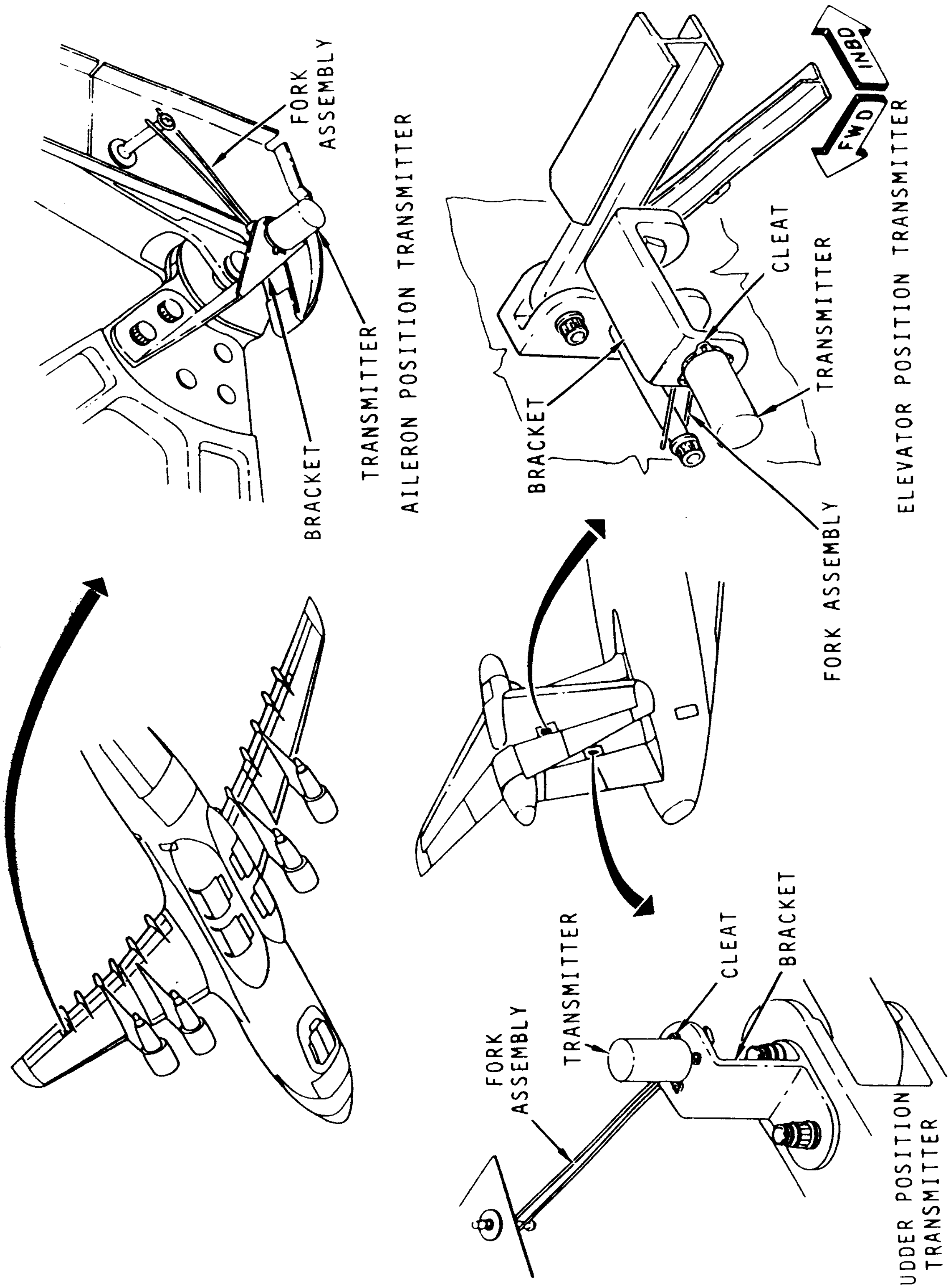
C-5A FLRS DATA FLOW BLOCK DIAGRAM
(SLR SC/M DATA)



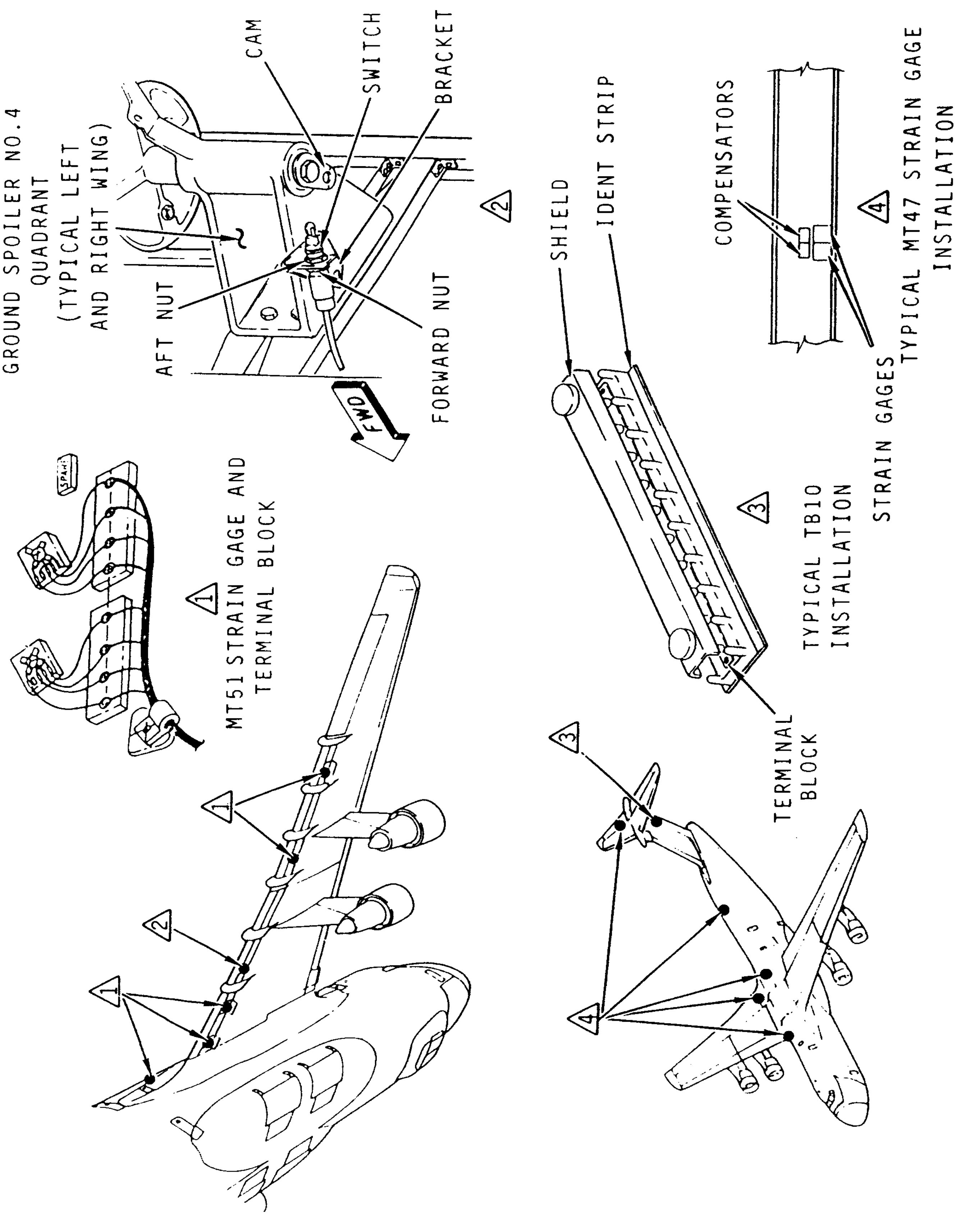
C-5A FLRS DATA FLOW DIAGRAM (MADAR MONITORED)



C-5B LESS COMPONENTS (SHEET 1)



C-5B LESS COMPONENTS (SHEET 2)



C-5B LESS COMPONENTS (SHEET 3)

TEST POINT DESCRIPTION	PARAMETER ID	SAR/CHANNEL	
Pitch A/P Engage	PIT	01	12
Throttle Angle Engine 4	TA-4	01	25
Throttle Angle Engine 3	TA-3	01	26
Throttle Angle Engine 2	TA-2	01	29
Throttle Angle Engine 1	TA-1	01	30
Fuel Flow Engine 1	FF-1	03	22
Fuel Flow Engine 2	FF-2	03	18
Fuel Flow Engine 3	FF-3	03	26
Fuel Flow Engine 4	FF-4	03	30
Compressor RPM Engine 1	N2-1	04	09
Compressor RPM Engine 2	N2-2	04	02
Compressor RPM Engine 3	N2-3	04	06
Compressor RPM Engine 4	N2-4	04	05
Vertical Accel At CG	VA/CG	05	21
Mach Number	Mach	73	19
Altitude	PR ALT	73	16
Spoiler Position	SPOIL	08	01
Air Refueling	AR	08	03
Air Drop	AO	08	04
Fuel Weight	Fuel	08	13
Upper Rudder Position	UP RUD	08	17
Inboard Elevator Position	IN EL	08	18
Right Aileron Position	AILER	08	19
Ground Speed	VG	08	21
Strain, Wing Upper IWBRS 281	UAST	08	24
Strain, Wing Lower IWBRS 281	LAST	08	25
Strain, IWBRS 156	LAST 2	08	26
Strain, Wing Upper OWBRS 64	UP PNL	08	28
26V AC Monitor	26V AC	08	29
Strain, Right Horiz BL 83.5	RH 83.5	09	05
Strain, Vertical Tail WL 475	V475	09	06
Strain, Vertical Tail WL 705.5	V705.5	09	07
Strain, Fus Crown FS 1660	F1660	09	08
Strain, Fus Crown FS 2182	F2182	09	09
Strain, Frame Stick Outer Cap FS 1383	S01383	09	10
Strain, Main Frame Outer Cap FS 1383	MO 1383	09	11
Strain, Fus Main Frame Inner FS 1383	MI 1383	09	12
Roll Angle	Bank	09	13
Heading	HEAO	09	14
Hub Force Sensor P/CP	HUB FO	09	15
Left Aileron Position	LT AIL	09	16
Strain, Wing Lwr Aft OWBRS 409	L409A	09	17
Flap Position	Flap	18	29
Outboard Thrust Reversers	OUT TR	19	18
Inboard Thrust Reversers	IN TR	20	18
Touchdown Switch	TD/SW	12	30
ALDCS Validity	AL	14	29

C-5B LESS PARAMETERS

C-5B AFCS

Description and Operation

Second Printing, February 1989

C-5B AFCS PILOT'S GUIDEBOOK

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This study guide should not be used in any way as a technical reference for inspections and maintenance procedures.

Training Systems Department
Lockheed Aeronautical Systems Company-Georgia
A Division of Lockheed Corporation

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C-5B AFCS PILOT'S GUIDEBOOK

C-5B AFCS PILOT'S GUIDEBOOK

GENERAL

The C-5B Automatic Flight Control Systems provide the pilots with manual guidance information displayed on instruments located on their instrument panels and with automatic control of the airplane through the autopilot. The major displays, selections, and control of the Automatic Flight Control Systems (Figures 1 and 2) are provided by the following:

- o Flight Instrumentation Display (ADI and HSI).
- o Navigation Selection and Control.
- o Flight Director System.
- o Autopilot System (A/P).
- o Stability Augmentation Systems (SAS).

Attitude Director Indicator (ADI)

The ADI displays basic aircraft roll and pitch attitude information on a sphere, basic turn and slip information on a pointer and ball, and roll and pitch steering commands on two crosspointers. It also displays speed command, crab angle, glideslope deviation, radar altitude, heading mode and go-around mode annunciators, and three warning flags. In addition, an instrument landing system (ILS) approach bullseye on the ADI also provides a combined display of localizer and glideslope deviation, minimum decision altitude (MDA), and flare engage annunciation. Engagement of the A/P has no affect on the ADI. The flight director system roll and pitch steering commands displayed on the ADI are tailored for manual control of the aircraft, which may differ slightly from the automatic steering provided by the A/P.

Heading (HDG) Mode Annunciator

The HDG mode annunciator on the ADI illuminates when the corresponding flight director (not autopilot) is in the HDG select mode.

G/A Mode Annunciator

When the go-around mode is initiated and the flight director engages the mode, the go-around (G/A) mode annunicator on the ADI illuminates.

Crab Angle Indicator

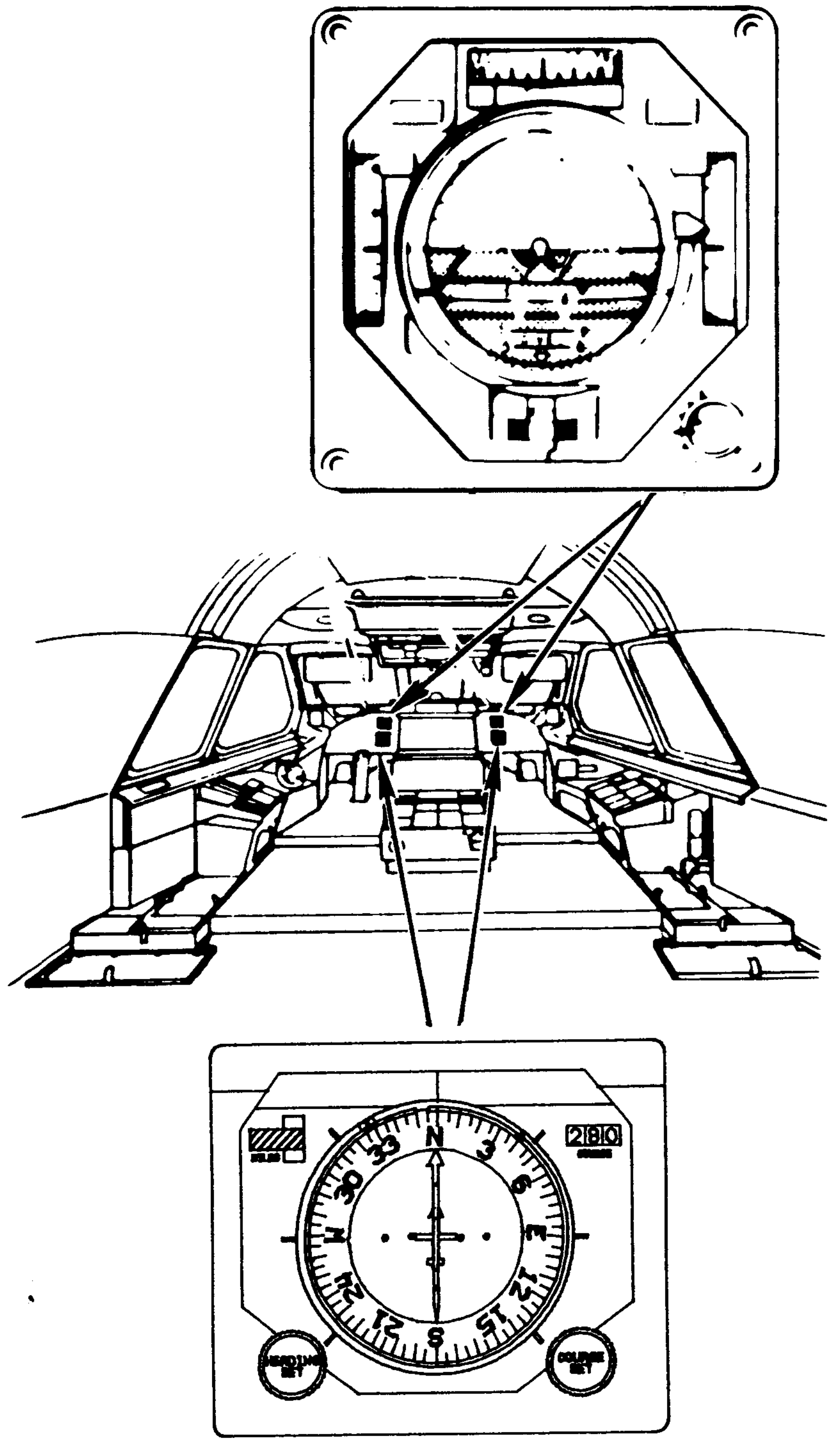
When the crab angle indicator pointer comes into view on an ILS approach, the indication on the scale is the difference between the localizer course set on the HSI and aircraft heading.

ILS Approach Bullseye

The ILS approach bullseye will be in view only during an ILS approach or flight director test. The bullseye also provides altitude alert (MDA) and flare mode engagement annunciation. When the MDA (set manually on the radar altimeter indicator) is reached, the outer ring in the bullseye illuminates (yellow). The inner circle illuminates (green) when the flare mode is engaged.

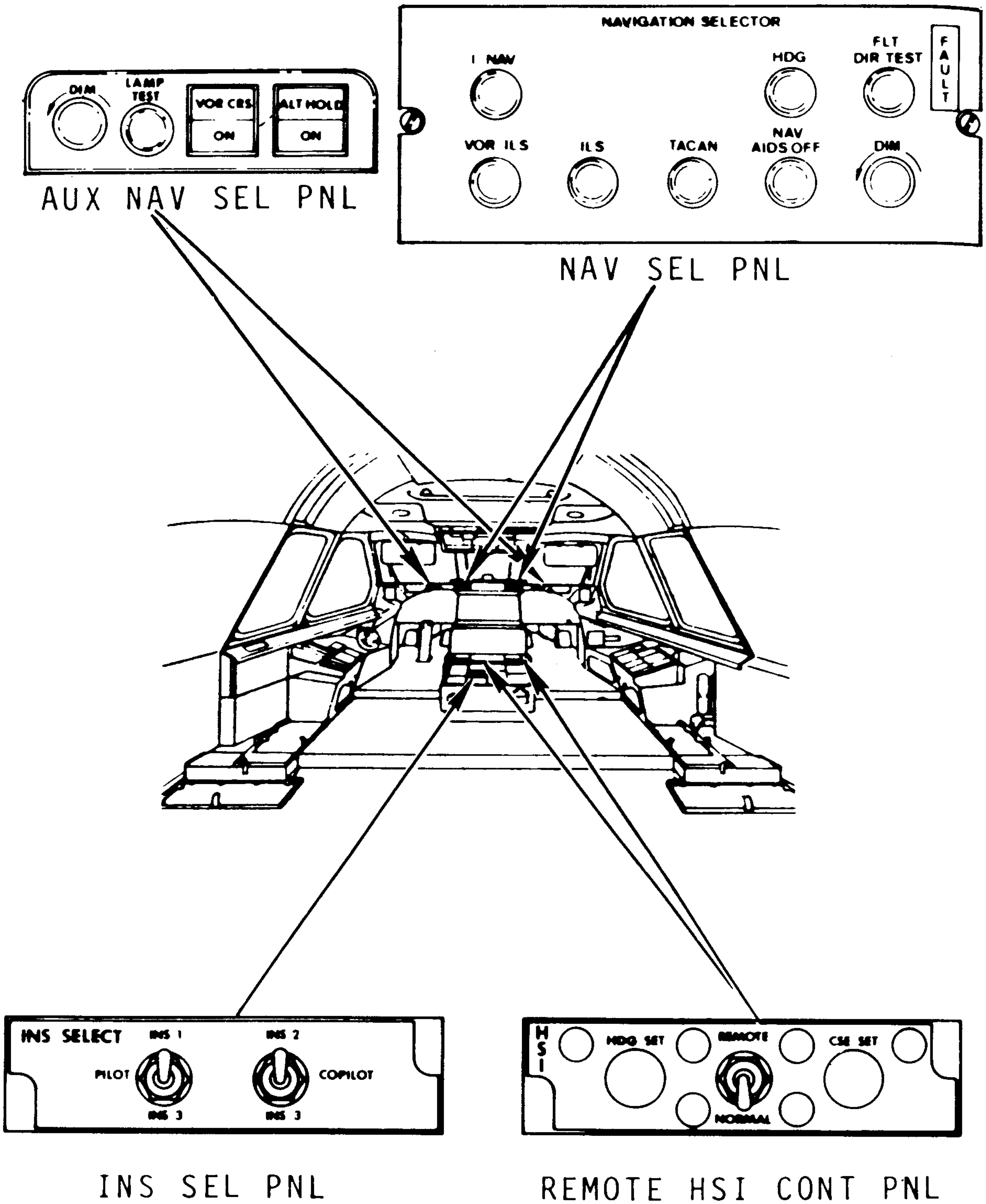
The following is a list of conditions that are required before the ILS approach bullseye will come into, and stay in, view:

- Valid G/S desensitization from the A/P pitch computer.
- VOR/ILS switches pressed on both pilot and copilot navigation selector panels (NSP).
- ILS frequencies tuned on both VOR/ILS systems.
- No. 1 and No. 2 G/S receivers valid (no flag).
- Difference between No. 1 and No. 2 G/S deviation less than ½ dot.



FLIGHT DIRECTOR COMPONENT LOCATION

Figure 1



FLIGHT DIRECTOR COMPONENT LOCATION

Figure 2

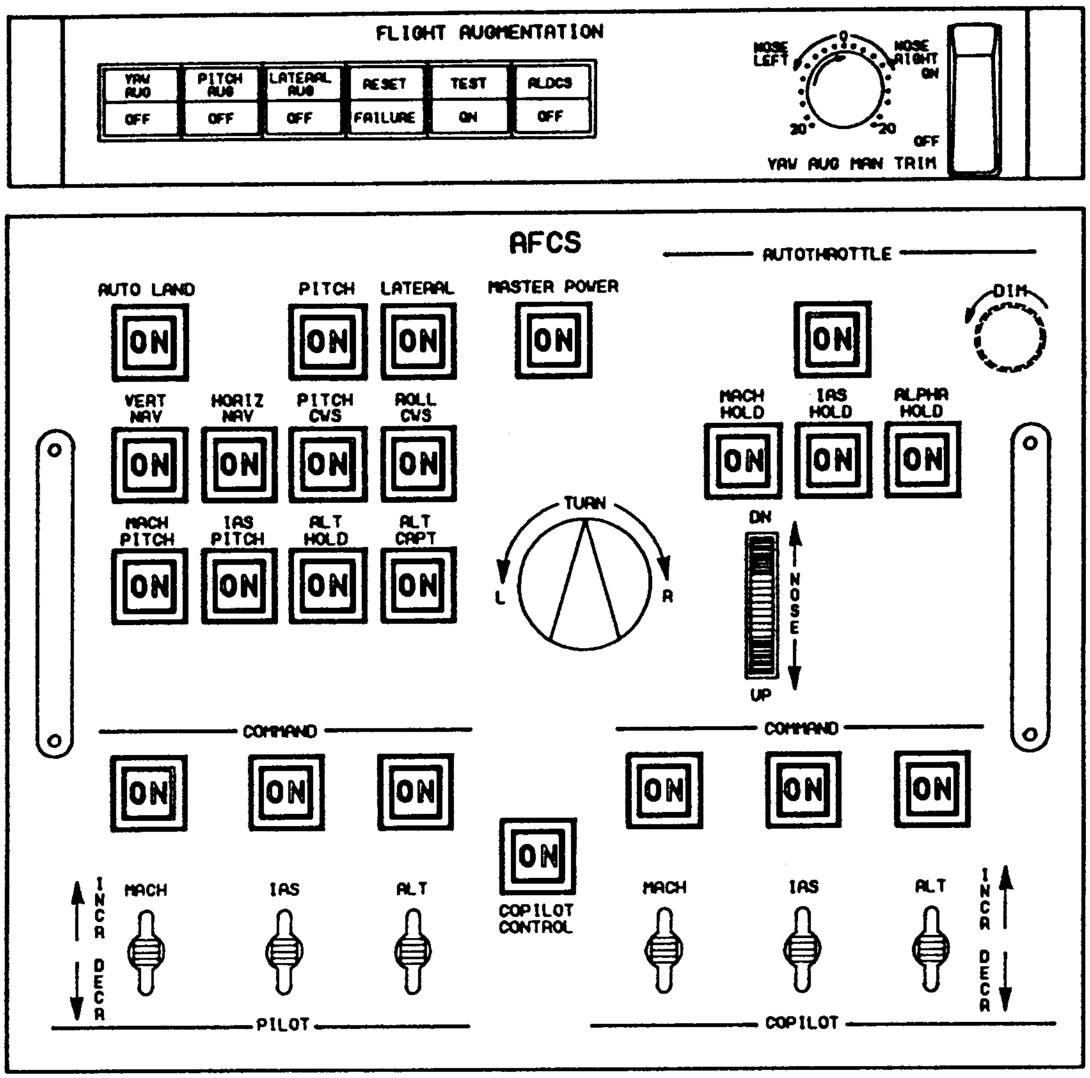
- Both radar altimeters valid (no flag).
- Difference between No. 1 and No. 2 radar altimeters less than 14 feet.

Neither A/P or AUTOLAND has to be engaged for the bullseye to come into view. When the flare mode is engaged in the flight director, the bullseye will move vertically to center the bullseye G/S bar with the miniature aircraft.

Horizontal Situation Indicator (HSI)

The HSI displays aircraft heading (magnetic or true), aircraft horizontal position relative to the selected navigational aids, and warning flags.

When I-NAV is selected, true heading information rather than magnetic heading is displayed on the compass card. The primary source of heading (magnetic or true) is INS No. 1 for the pilot and INS No. 2 for the copilot. An alternate source of heading is provided by INS No. 3 and can be selected with two-position toggle switches on the INS SELECT panels.



AFCS CONTROL PANEL

Figure 3

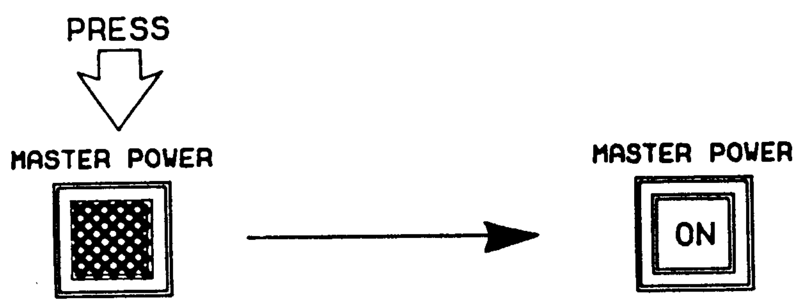
AUTOPILOT SYSTEM

AFCS Control Panel (Figure 3)

The controls for engaging and disengaging the A/P are located on the AFCS control panel (Figure 3). A/P disengage is also provided on the aileron control wheels. Before the A/P can be engaged, the associated augmentation system(s) must be engaged and AFCS master power must be on.

Master Power Turn-On

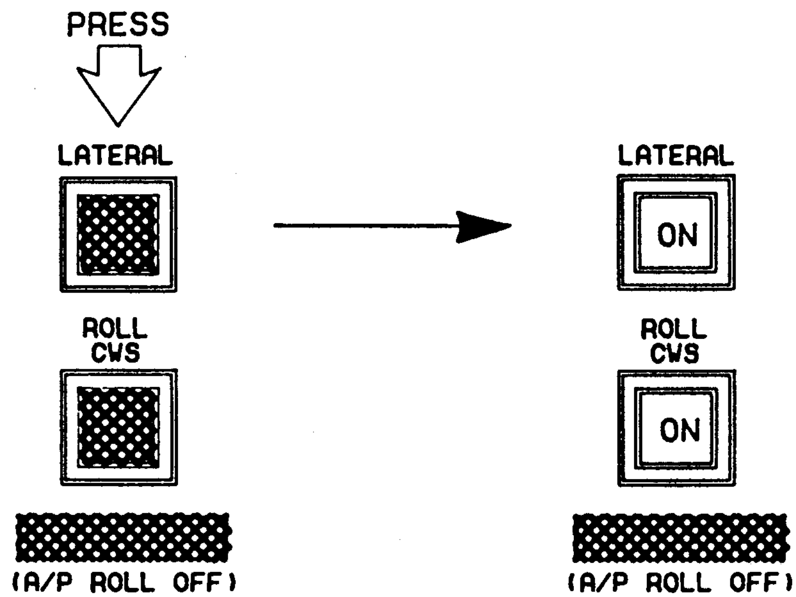
To turn master power on, press the MASTER POWER switch.



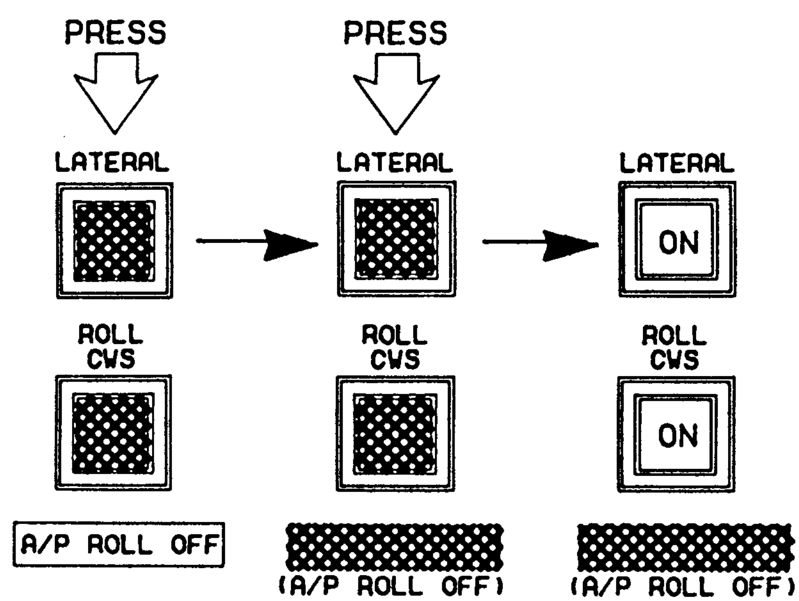
Roll A/P Engagement

To engage the roll A/P, press the LATERAL switch.

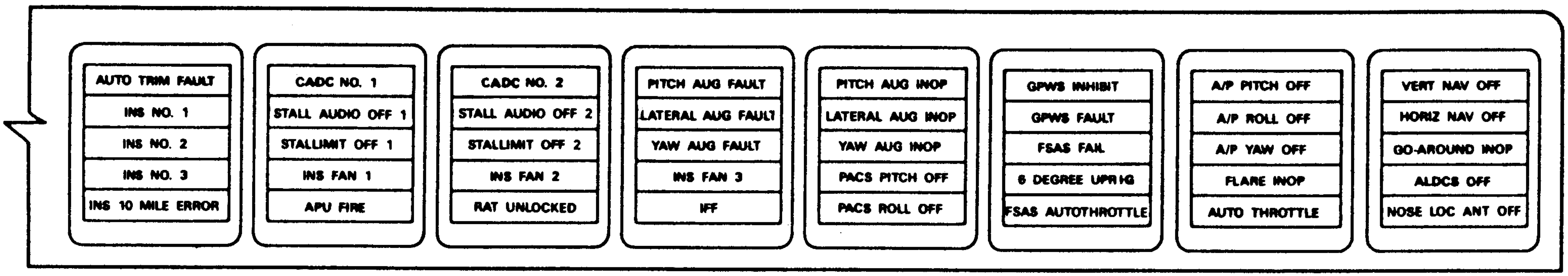
- o Aileron servo engages.
- o Roll control wheel steering (CWS) comes on.
- o Heading hold mode engages if bank angle is less than 3 degrees (attitude hold mode engages if bank angle is greater than 3 degrees).



If the A/P ROLL OFF fault annunciator is illuminated and engagement is attempted, the following sequence will occur:

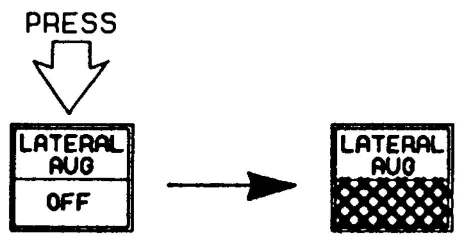


If the roll A/P does not engage check the following conditions and take the indicated action before calling for maintenance:

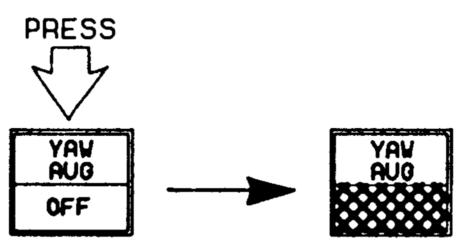


PORTION OF ANNUNCIATOR PANEL

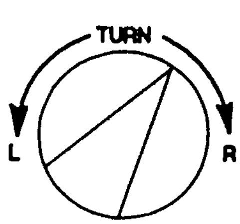
CONDITION	ACTION
Lateral Augmentation is off.	Attempt to clear the inop condition by pressing the LATERAL AUG switch once. If the LATERAL AUG FAULT annunciator is also illuminated, press the switch twice. Attempt to engage roll A/P again.

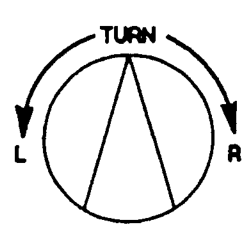


Yaw Augmentation is off.	Attempt to clear the inop condition by pressing the YAW AUG switch once. If the YAW AUG FAULT annunciator is also illuminated, press the switch twice. Attempt to engage roll A/P again.



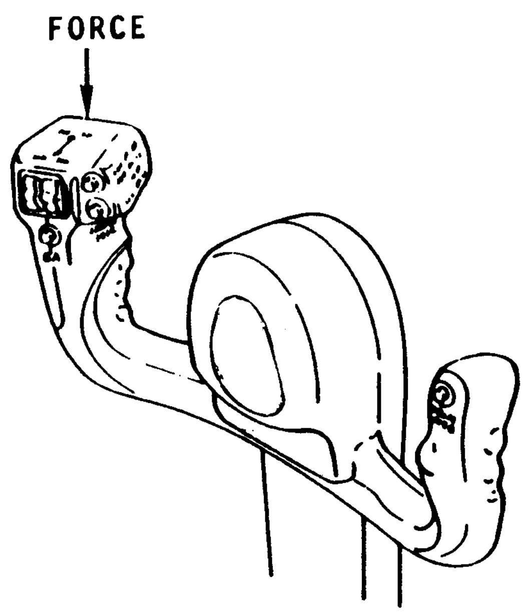
Turn knob is out of center detent.	Rotate the TURN knob to center detent. Attempt to engage roll A/P again.





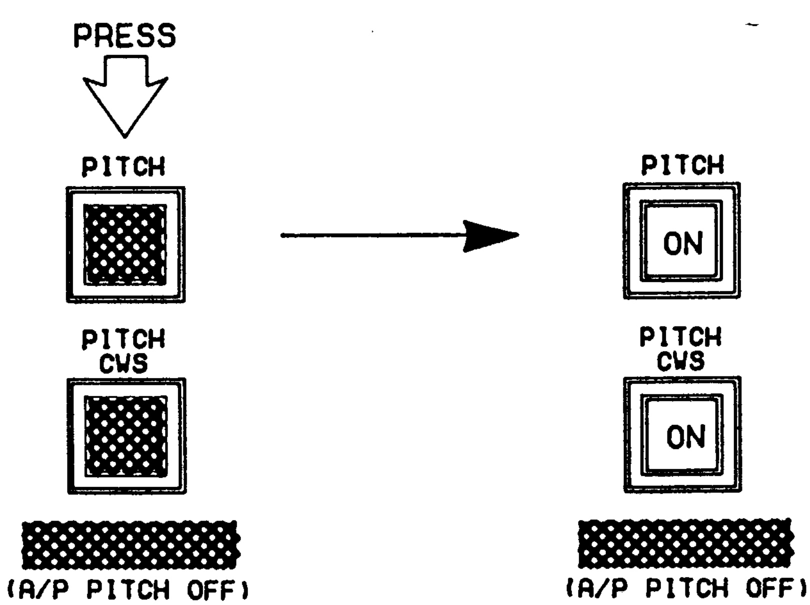
Force

Remove all force, such as hand pressure, from the aileron control wheels. Attempt to engage roll A/P again.

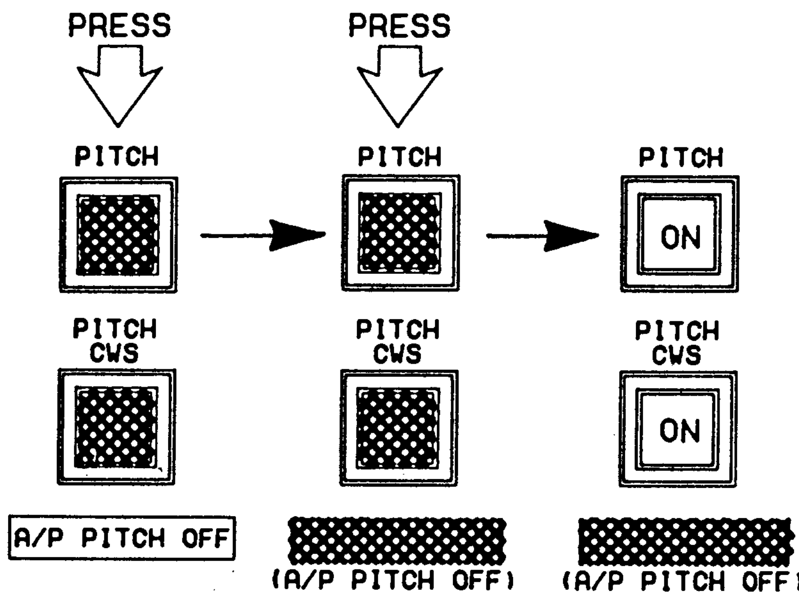


Pitch A/P Engagement

To engage the pitch A/P, press the PITCH switch.

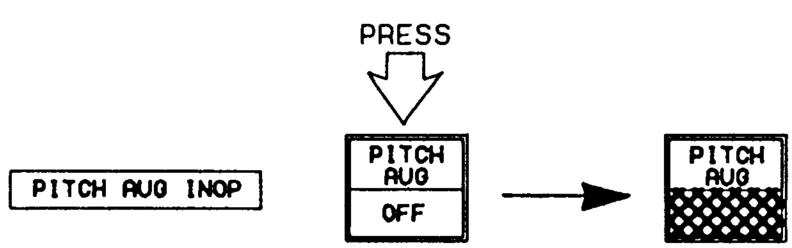


If the A/P PITCH OFF fault light is illuminated and engagement is attempted, the following sequence will occur:



If the pitch autopilot does not engage, check the following conditions and take the indicated action before calling for maintenance:

CONDITION	ACTION
Pitch Augmentation is off.	Attempt to clear the inop condition by pressing the PITCH AUG switch once. If the PITCH AUG FAULT annunciator is also illuminated, press the switch twice. Attempt to engage pitch A/P again.



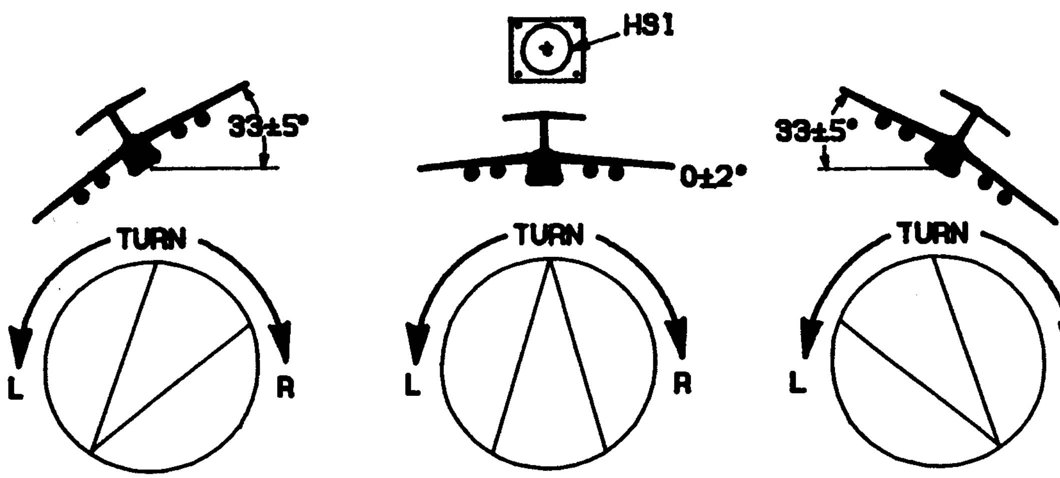
Alternate trim has been disconnected.	Reset alternate trim by momentarily positioning the STAB TRIM RESET toggle switch to ALTR. Attempt to engage pitch A/P again.

Basic Roll A/P

With the roll A/P engaged with the wings level and no other commands inserted, the roll servo will control the ailerons to hold the heading existing at the time of roll A/P engagement.

Turn Knob

The bank of the aircraft can be controlled by rotating the TURN knob. Rotating the knob left or right will cause the aircraft to bank respectively. Full rotation will produce a maximum bank angle of between 28 to 38 degrees.



During rollout from a turn (turn knob returned to detent) if the aircraft has not completely stopped turning when the heading hold mode re-engages, the aircraft will overshoot the heading by a few degrees, then return to the re-engaged heading.

Roll Control Wheel Steering (Roll CWS)

Roll CWS is available to both pilots. A rotating force applied to either control wheel will cause a banking rate proportional to the applied force. If the rotating force is removed when the bank angle is greater than 3 degrees, the A/P will assume the attitude hold mode and hold that attitude. If bank angle is below 3 degrees, the A/P will re-engage the heading hold mode in the same manner as it does during rollout from a turn knob command.

Basic Pitch A/P

With the pitch A/P engaged and no other commands inserted, the pitch A/P will control the elevators and the horizontal stabilizer (pitch trim) to hold the attitude existing at the time of pitch A/P engagement.

Pitch Knob

The pitch attitude can be varied in the basic pitch autopilot mode by rotating the pitch knob in either the NOSE DN or NOSE UP direction. Maximum change possible is 15 (±2) degrees.

Pitch Control Wheel Steering (Pitch CWS)

Pitch CWS is available to both pilots. A forward or aft force applied to the control wheel will cause the aircraft to pitch accordingly. The pitch attitude existing when the force is removed becomes the new pitch reference.

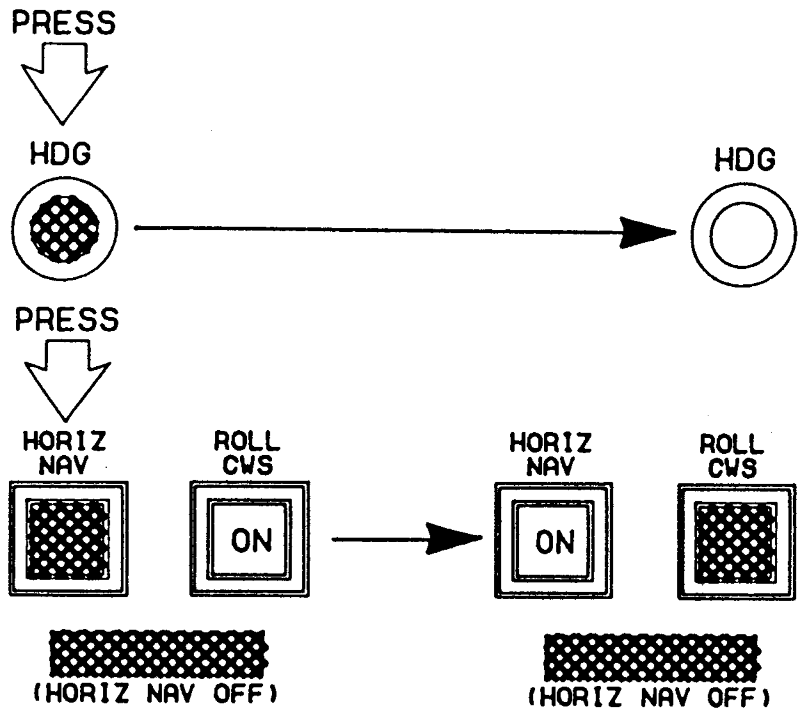
Horizontal Navigation Modes

The roll A/P provides the following horizontal navigation modes and sub-modes:

MODE	SUBMODE
Heading Select	None
VOR/TACAN	Heading select Capture (Course cut) Track Overstation
INS(I-NAV)	Heading select Capture Track
Localizer	Heading select Capture Track Runway Align (Autoland only) Rollout (Autoland only)

Heading Select Mode

In this mode a desired magnetic heading (true heading in INS) is selected. The autopilot turns the aircraft to the heading selected by the position of the pilot's HSI heading marker. The heading select mode is engaged by pressing the HDG switch on the Navigation Selector Panel (NSP) and the HORIZ NAV switch on the AFCS Control Panel.



The bank angle limit for an A/P heading select turn is 27 (±4) degrees. The new heading should be turned onto and maintained within ± 3 degrees. Should the aircraft be out of trim, these limits may be exceeded. Moving the TURN knob out of detent will disengage the heading select mode by disengaging HORIZ NAV as indicated by the ON light extinguishing and illumination of the HORIZ NAV OFF annunciator. When the HDG switch is pressed on the NSP, all other horizontal navigation modes are locked out since heading select has priority.

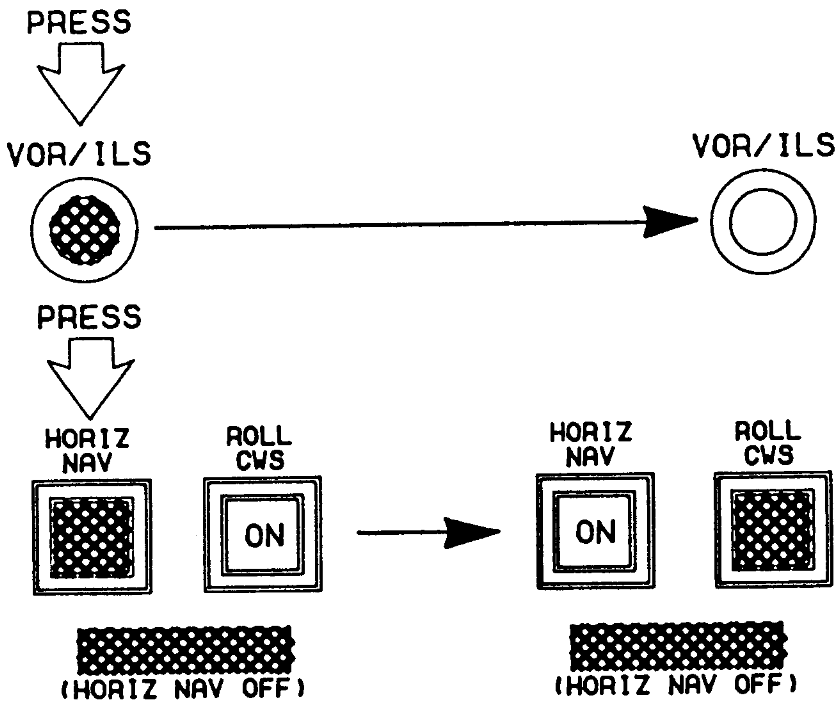
Heading select is also an initial submode of the other HORIZ NAV modes (VOR, TACAN, I-NAV or ILS LOC) when the HDG switch is not pressed. During these NAV modes the heading select submode will remain engaged until the NAV capture submode is engaged.

NOTE: The HDG switch must not be pressed during these NAV modes.

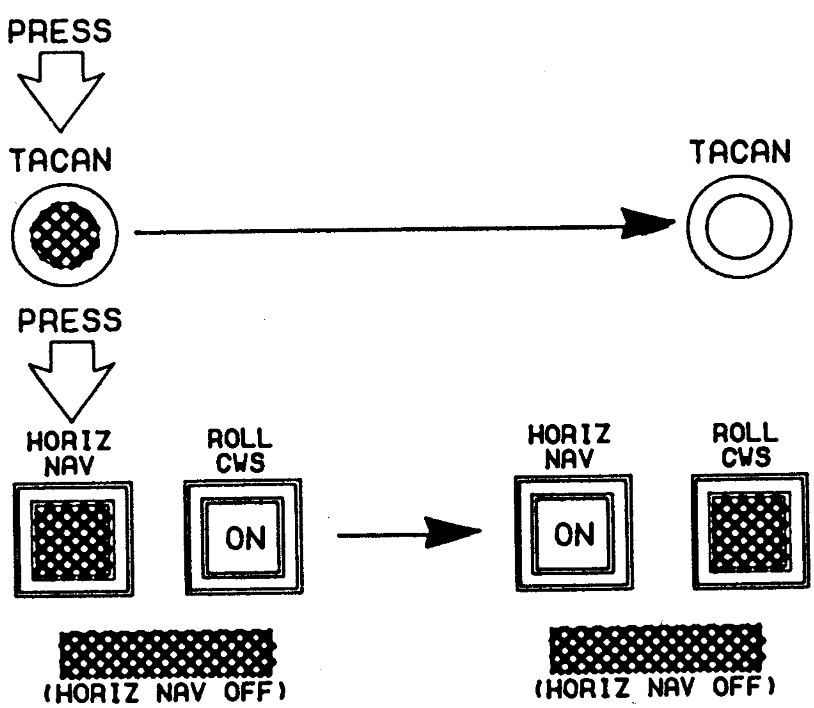
VOR/TACAN NAV Aid Modes

The VOR and TACAN A/P modes are the same except for the switch pressed on the NSP and the receiving equipment used. These modes are armed as follows:

o VOR Mode Selection



o TACAN Mode Selection



Submodes of VOR and TACAN

Heading Select Submode (VOR or TACAN Arm)

If the No. 1 HSI course deviation is greater than 1 dot, the mode is armed and the heading select submode of the A/P is engaged. The bank limit in this submode is 27 (±4) degrees.

Capture Submode

At 1-dot deviation with a heading select intercept angle of 45 degrees or more, the capture submode engages and the A/P turns to a 45-degree course cut intercept angle. If the intercept is less than 45 degrees, the capture submode is bypassed and the heading select mode remains engaged. In either case, as the aircraft nears the selected course, a turn to on course begins.

In the first case, there often isn't enough time to establish the 45-degree course cut intercept angle before the turn to on course is started. This occurs because of the variables involved during a beam capture. The bank angle limit is 27 (±4) degrees in this mode.

Track Submode

When the bank angle is less than 2 degrees and course deviation is about ¼ dot, the track submode is engaged. The autopilot will then establish a crab angle to correct for winds. The bank angle is now limited to 7.5 (±2.5) degrees.

Overstation Submode

Rapid movement of course deviation will cause the overstation submode to engage. This submode holds the course that is set on the HSI course arrow plus the established crab angle until the station has been overflown. After station passage, the aircraft will re-establish the track submode with a maximum intercept angle of approximately 20 degrees.

A new outbound course up to about 30 degrees course change can be selected while in the overstation submode. To accomplish larger course changes, use the heading mode (press the HDG switch) and after station passage deselect the heading mode.

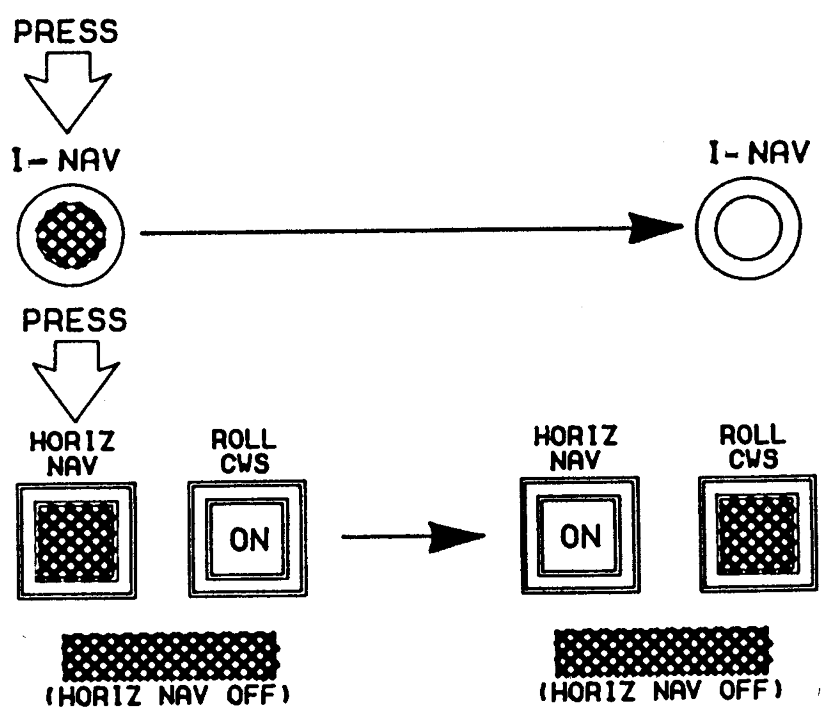
During course capture when the aircraft is close to the station or is initially near the desired course, standard capture procedures most likely cannot be accomplished by the A/P, and set up and capture should be altered accordingly.

Noisy radio signals from VOR or TACAN stations (observed by rapid deviation bar movement) may cause premature track submode engagement. This results in undesirable bank angle limiting to 7.5 degrees. Pressing the HORIZ NAV switch twice to disengage and re-engage the submode should clear any premature track engagements. If not, the beam is not usable for A/P tracking and the heading select mode (HDG) should be used instead.

INS Mode (I-NAV)

Navigational guidance from the pilot's selected INS is provided to the roll A/P. The I-NAV mode can be armed as shown below.

o I-NAV Mode Selection



Submodes of I-NAV

Heading Select Submode (I-NAV Arm)	If crosstrack deviation is greater than 4½ NM, the heading select mode of the A/P is engaged.

NOTE: Two dots deviation on the HSI is equal to 3 NM.

Capture Submode

In the I-NAV mode, the A/P will turn to an intercept angle not to exceed 45 degrees. Maximum angle of bank is 27 (± 4) degrees. The capture point occurs at approximately 4½ NM. Then at some point later, depending on track closure rate, the aircraft will turn to intercept the INS track.

Track Submode

When the bank angle is less than 2 degrees with a crosstrack less than 0.4 NM, the track submode is engaged. This mode differs only slightly from the capture submode such that small out-of-trim conditions or offsets will slowly be removed.

The A/P will automatically capture the new track when an INS track changeover occurs. Changeover occurs 15 seconds before the TO waypoint is reached (not when the INS ALERT light illuminates). For track changes of greater than 30 degrees, a smoother transition to the next track with less overshoot can be achieved by disengaging HORIZ NAV about 5 miles before the waypoint is reached, then setting the heading marker to the new INS course and re-engaging HORIZ NAV just after track changeover occurs.

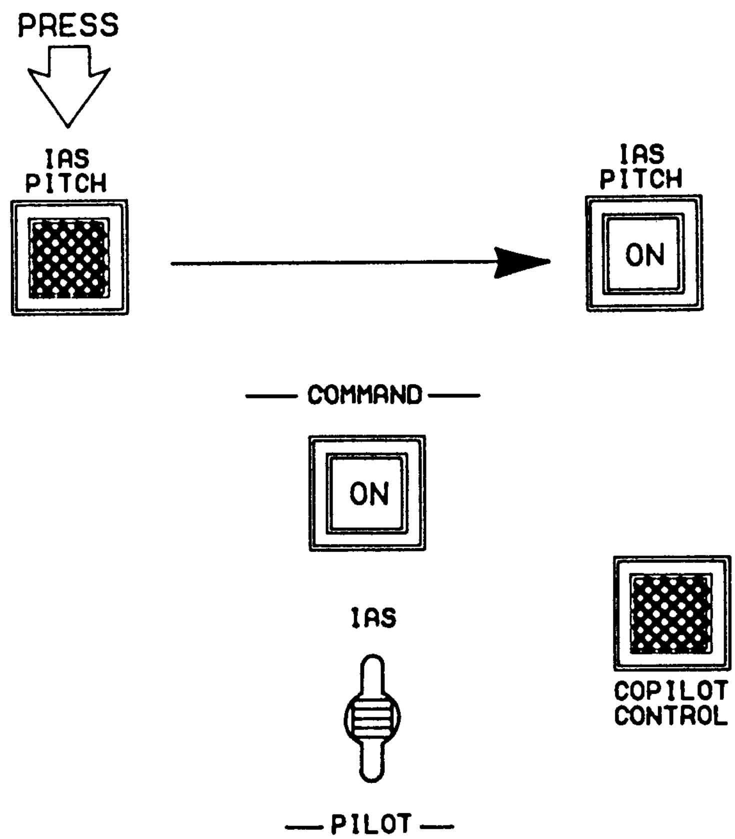
Localizer Mode

This mode is discussed under the ILS approach mode section.

Pitch A/P Modes

IAS Pitch Mode

The IAS pitch mode will allow an airspeed selected on the airspeed-Mach VSFI to be maintained by the A/P via changes in aircraft pitch attitude (assuming engine power remains constant). Engagement of this mode automatically disengages the autothrottle system if it is engaged. Initial engagement always occurs on the pilot IAS command and is accomplished as follows:



The IAS pitch mode will not engage, as indicated by the ON light of the IAS/MACH PITCH switch remaining extinguished until the command airspeed marker on the pilot's VSFI synchronizes to present airspeed (moves under the fixed index line). Synchronization may take as long as one second.

The IAS pitch mode will hold the IAS existing at mode engagement or a new IAS can be commanded by slewing the IAS command marker.

The IAS pitch mode will be automatically disengaged by any of the following:

- o ATS engagement.
- o Mach pitch mode engagement.
- o Altitude capture initiation.
- o Altitude hold mode engagement.

The COPILOT CONTROL transfer switch can be used to transfer control of this mode between the pilot and copilot.

NOTE: Flight Director FAST/SLOW speed commands are displayed on the pilot and copilot ADIs from their respective VSFIs, whether or not the A/P IAS or Mach pitch mode is engaged.

Mach Pitch Mode

Selection and operation of the Mach pitch mode is accomplished the same as the IAS pitch mode.

Altitude Hold Mode

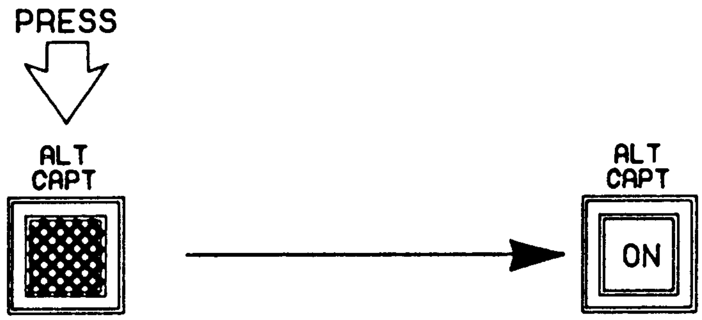
The altitude hold mode will hold the altitude existing at mode engagement. The altitude signal used is from CADC No. 1. Engagement is normally accomplished as follows:

If IAS or Mach pitch is engaged or G/S capture occurs when altitude hold is engaged, altitude hold will disengage.

Pitch CWS is disengaged when the altitude hold mode is engaged.

Altitude Capture Mode

The altitude capture mode is exclusive to the autopilot and consists of two phases; arm and capture. The capture phase of the selected altitude terminates in the automatic engagement of the altitude hold mode. Start of the capture phase depends on the rate of closure to the selected altitude. The altitude capture mode is armed as follows:



A slight delay of about 1.0 second will occur before the ALT CAPT switch ON light illuminates following switch depression.

The arm phase will not control the flight path of the aircraft; therefore, some other A/P mode such as pitch CWS, Mach pitch, IAS pitch, or the pitch knob must be used to direct the aircraft toward the selected altitude. When the selected altitude is approached, the capture phase begins.

The altitude capture mode should be selected prior to reaching the selected reference altitude by an amount at least one third of the current altitude rate, i.e., 1000 feet for an altitude rate of 3000 feet per minute, 330 feet for 1000 feet per minute, etc. Once the capture phase has started, do not attempt to change the selected altitude reference or transfer control from pilot to copilot or vice versa as it may result in an abrupt elevator input. If an altitude reference correction is required during the arm/capture phase, disconnect the altitude capture mode before slewing in the correction if there is any possibility that the capture phase has started.

The altitude capture mode cannot be armed if the altitude hold mode is engaged.

If altitude capture is armed too late to accomplish a normal capture, the A/P will continue in the existing mode until the reference altitude is encountered; then it will go directly into altitude hold, causing a less smooth maneuver with some overshoot.

ILS APPROACH

The combination mode, horizontal and vertical, is provided with or without the autoland feature. The following is a comparison of the modes with and without autoland.

ILS Submodes

WITH AUTOLAND	WITHOUT AUTOLAND
Localizer Capture	Localizer Capture
Glideslope (G/S) Capture	G/S Capture
Localizer Track	Localizer Track
G/S Track	G/S Track
Automatic Flare	Autopilot Computer Monitoring
Runway Align (decrab)	Yaw Autopilot Monitoring
Runway Rollout	
Autopilot Computer Monitoring	
Yaw Autopilot Monitoring	
External Sensor Monitoring	
Internal Computation Monitoring	
Automatic Disengage	

On a non-autoland approach two different setups are available to the pilot as follows:

First Setup:

Conditions	Results
VOR/ILS pressed (pilot's) VHF NAV No. 1 (ON and TUNED) Radar Altimeter No. 1 (ON) HORIZ NAV (ON) VERT NAV (ON)	The autopilot uses the No. 1 VOR/ILS receiver for ILS guidance and the No. 1 radar alimeter for G/S desensitization.

Second Setup:

Conditions	**Results**
ILS pressed (pilot's) VHF NAV No. 2 (ON and TUNED) Radar Altimeter No. 2 (ON) HORIZ NAV (ON) VERT NAV (ON)	The autopilot uses the No. 2 VOR/ ILS receiver for ILS guidance and the No. 2 radar altimeter for G/S desensitization,

It is important to note that if VOR/ILS is pressed on the pilot's NSP, ILS 1 is selected and the No. 1 radar altimeter must be on and operating properly; or if ILS is pressed, ILS 2 is selected and the No. 2 radar altimeter must be on and operating. Should these requirements not be followed, G/S tracking will be degraded such that automatic guidance should not be used.

A/P automatic tracking during non-autoland for both localizer and G/S beams are the same as autoland. However the external sensor and internal computation monitoring and automatic disengage capability are only active during autoland. The submodes and results for ILS approaches (non-autoland and autoland) are as follows:

Submode	Results
Heading Select (LOC arm)	The aircraft will be in the heading select mode until the localizer deviation is slightly less than two dots.
Localizer Capture	At slightly less than two dots deviation, localizer capture occurs.
Localizer Track	At approximately ⅔-dot deviation and less than 2 degrees of bank angle the localizer track submode engages.

G/S Capture

G/S capture and tracking is initiated when G/S deviation is reduced to approximately one pointer width of beam center. Also at G/S capture, bank angle limiting is reduced from 27 (± 4) degrees to 7.5 (± 2.5) degrees, and the yaw A/P engages to supply inputs to the rudder through the yaw augmentation system.

Localizer Nose Antenna Switching

The VOR/ILS antenna normally used is located on the vertical stabilizer, but during an ILS approach the localizer beam signal is received through an antenna located in the nose of the aircraft. It is more appropriate to fly the nose of the aircraft (instead of the tail) on the localizer beam during approach. Switching from the tail to the nose antenna is automatically accomplished when the aircraft is within 40 degrees of the selected inbound localizer course and less than ⅔-dot localizer beam deviation.

It should be noted that A/P engagement will have no affect on antenna switching as long as master power is on and the above conditions are satisfied. However, if the antenna fails to switch, failure annunciation (NOSE LOC ANT OFF) will not be provided unless the A/P is engaged and an ILS coupled approach is being made.

Fuel Savings Advisory System (FSAS) Control

The FSAS provides pitch control signals to the A/P and throttle control signals to the ATS. To engage FSAS control to the A/P, the FSAS must be set up properly and the VERT NAV switch on the AFCS control panel must be selected ON. To engage FSAS control to the ATS, the FSAS must be set up properly, the VERT NAV switch must be selected ON, and the AUTOTHROTTLE switch on the AFCS control panel must be pressed ON.

AUTOLAND

Since the autoland approach is more critical than enroute flying, input sensor, signal generation, and A/P control is monitored. A detected failure will result in the associated A/P axis (aileron and/or elevator) being automatically disconnected.

Autoland Mode

The autoland mode is an extension of the normal ILS function of the A/P. The added functions are:

Monitoring and automatic disengage

Flare

Runway alignment

Rollout

Monitoring is essential for safe A/P operation during approach to the runway and during rollout. In the event of a significant malfunction, the affected axis of the A/P will automatically disengage, illuminating the appropriate failure annunciator and master AUTO light.

To select autoland on the AFCS control panel, the following requirements must be met:

Both VHF NAV receivers tuned to an ILS frequency.

VOR/ILS (No. 1) selected on the pilot's NSP.

VOR/ILS (No. 2) selected on the copilot's NSP.

VERT NAV – ON

HORIZ NAV – ON

Pressing the AUTOLAND switch causes the autoland ON legend to illuminate, arming the autoland mode. It will not disengage unless it is pressed off, or both pitch and roll autopilot are disengaged.

Since the radar altimeters are the primary signal source for the flare computation and flare mode engagement signals, both altimeters must be on and, when below 100 feet, must be tracking each other within 14 feet.

Autoland mode engagement is indicated when the green AUTOLAND annuniciators on the pilot and copilot instrument panels illuminate.

Autothrottles are not required during autoland; however, they are very desirable. If not engaged, manual throttle control will be required to maintain airspeed during the approach and to retard throttles at flare engage. With ATS engaged this will be accomplished automatically.

The runway alignment and rollout modes use the pilot's HSI course error as the primary directional sensor input. This error is the difference between heading and the selected inbound course.

To assure that this course error input is valid, the copilot's HSI course error is used for comparison monitoring with the pilot's HSI course error. Should the electronic comparison monitor detect an out-of-tolerance condition, the yaw autopilot will disengage as indicated by illumination of the A/P YAW OFF annunicator.

Autoland Submodes

The following are submodes of the autoland mode:

Submodes	**Results**
Heading Select (LOC Arm)	Same as a normal ILS Approach
Localizer Capture	Same as a normal ILS Approach
Localizer Track	Same as a normal ILS Approach
G/S Capture	Same as a normal ILS Approach

Autoland	Before this submode is entered, all electronic fault monitors (comparators) are automatically tested. Both green AUTOLAND annunciators on the pilots' instrument panels illuminate when the submode is engaged. Once engaged, the automatic disengage feature is enabled and if a fault monitor alarms, the appropriate axis disengages. The flare, runway align, and rollout submodes are armed at autoland engage.
Flare	At 50 feet, the flare submode is engaged, as indicated by the illumination of the green inner circle of the ADI bullseye. Flare guidance is now provided by the flare computation in the pitch autopilot computer. The A/P pitch command limit in flare is 10 degrees nose up and 1 degree nose down. If the ATS is engaged, the throttles will slowly retard toward idle at flare engage.
Runway Align	At 20 feet altitude, the runway align submode engages. The crab angle is removed with rudder inputs, causing the aircraft to align with the selected inbound runway heading. During this and the rollout submodes, the roll A/P will attempt to hold the wings level.
Rollout	At wheel spin-up, the rollout submode is engaged. The nose of the aircraft is slowly lowered by the pitch A/P. Steering to the center of the localizer beam (runway center line) is provided by the yaw A/P inputs to rudder through the yaw augmentation system.

Autoland Monitoring

The monitoring and automatic disconnect functions are essential to low altitude A/P operation, and are a major difference between an autoland and non-autoland approach (see Figures 4 and 5).

The A/P autoland monitoring uses redundant roll, pitch, and yaw computation channels as monitor channels which produce no active input to the control system. The commands from the active and monitor channels are cross compared, and if the difference is beyond acceptable tolerances, the axis is disengaged. All monitors have built-in delays to prevent alarms during transient flight conditions.

In the autoland mode, automatic testing of the monitor circuits occurs. The tests will not start sooner than 20 seconds after G/S capture, even if autoland was selected before G/S capture. If autoland is not selected until 20 seconds or more after G/S capture, the test will start immediately. Each computer (pitch and roll-yaw) performs its own approach test. During the approach test, each group of comparators associated with a particular axis is tested. The test will be completed in approximately three seconds if all steps pass. If one or more steps fail, the test may take up to 15 seconds or a total time after G/S capture of 35 seconds. During the testing of the pitch axis, a comparator which is in the "bullseye" logic to the flight director is tested, causing momentary flickering of the bullseye on both ADIs as it begins to drive out of view and then return.

The green AUTOLAND annunciators illuminate when the approach tests in both the pitch and the roll-yaw computers are complete. Often the light will blink if one computer finishes the test prior to the other.

Illumination of the green AUTOLAND annunciators means that the approach test in both computers are completed and that the automatic disengage monitoring is armed.

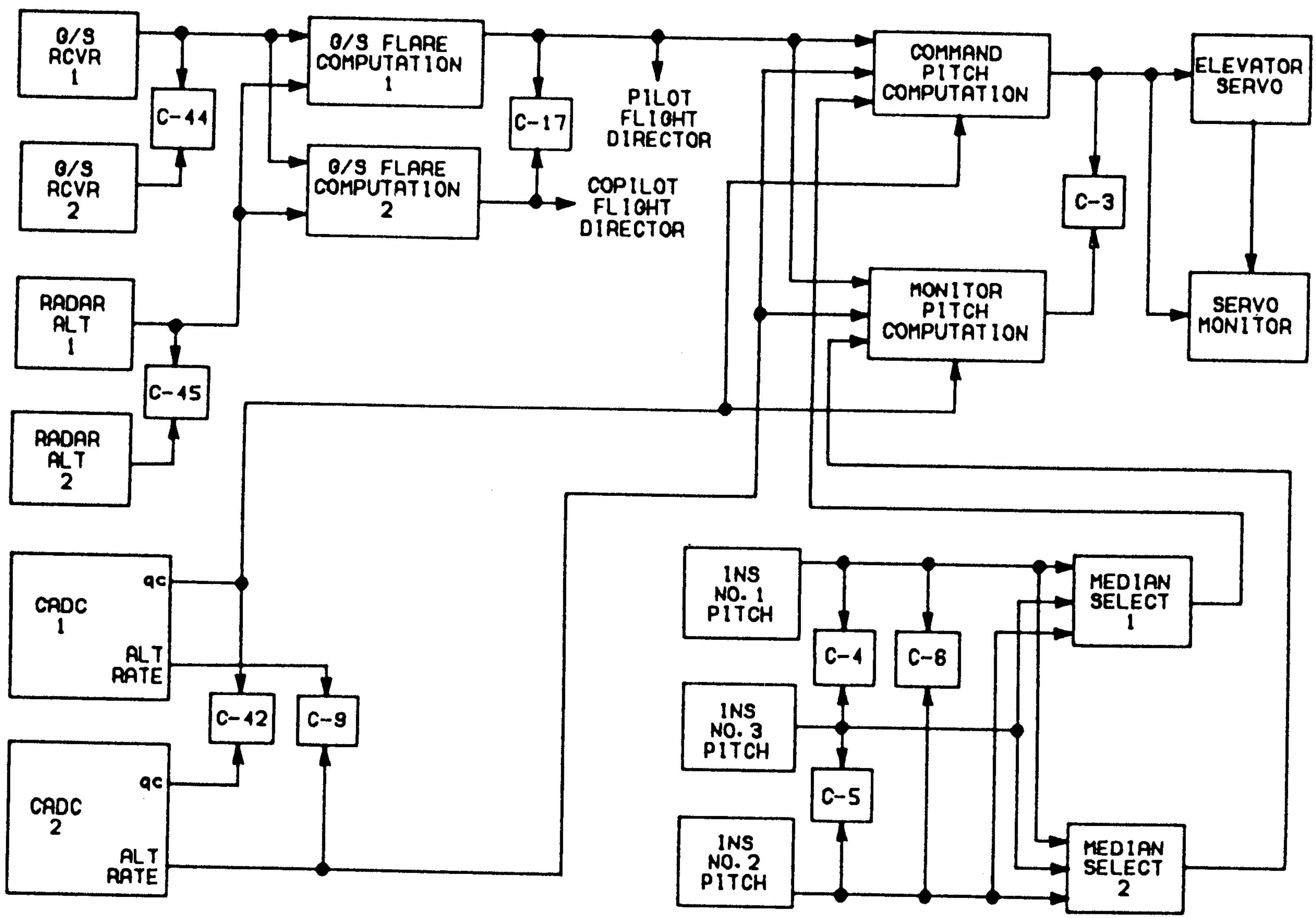
If either the roll, yaw, or pitch axis disengage because of a malfunction after completion of the test, or because the test failed, the green AUTOLAND annunciators will remain on.

The autoland automatic disconnect logic is completely dual and functionally checked by the approach test on every autoland approach. The probability of enough failures happening to jeopardize the aircraft safety due to the malfunction is remote. There are failures which can occur to degrade performance, but any failures serious enough to compromise safety will be detected by the automatic disengage system.

The total system and performance must be continually monitored by the crew during an autoland approach, with particular attention given to:

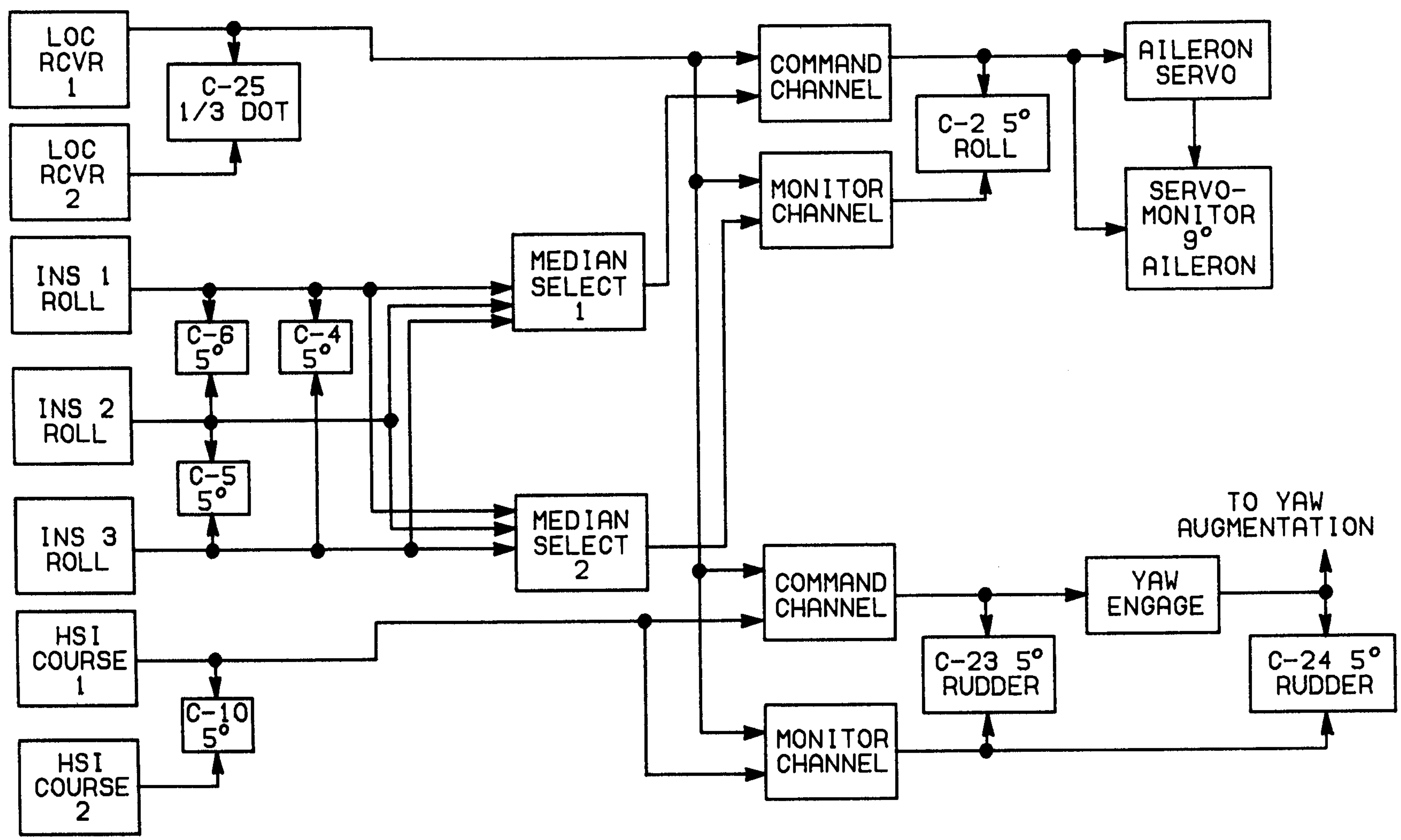
- o Does the green AUTOLAND annunciator remain illuminated?
- o Are there any ROLL A/P, PITCH A/P, or YAW A/P annunciations illuminated?
- o Are the aircraft attitudes and beam positioning satisfactory?

If the green AUTOLAND annunciators never come on when autoland has been selected, it is recommended that the approach not be continued beyond Category II minimums. Any time the roll axis disengages, it takes the yaw axis with it, but the yaw axis may disengage without affecting the roll.



AUTOLAND PITCH AUTOPILOT MONITORING

Figure 4



AUTOLAND ROLL/YAW AUTOPILOT MONITORING

Figure 5

AUTOPILOT WARNING ANNUNCIATORS

The following are eight (8) warning annunciators that are pertinent to the A/P system:

A/P PITCH OFF

Illumination of this annunciator indicates that the pitch A/P elevator servo and A/P horizontal stabilizer pitch trim control have been inadvertently disconnected from the manual elevator control cable system. The PITCH engage switch must be in the ON (engaged) positon before this annunciator will illuminate. To extinguish this annunciator press the PITCH switch on the AFCS control panel.

A/P ROLL OFF

Illumination of this annunciator indicates that the roll A/P aileron servo has been inadvertently disconnected from the manual aileron control cable system. The LATERAL engage switch must be in the ON (engaged) position before this annunciator will illuminate. To extinguish this annunciator press the LATERAL switch on the AFCS control panel.

A/P YAW OFF

Illumination of this annunciator indicates that the A/P signals to the yaw aug computer have been disconnected. It will illuminate only during an ILS approach or autoland after G/S capture. When illuminated, poor localizer tracking will occur and the autoland align and rollout modes are inhibited.

VERT NAV OFF

Illumination of this annunciator indicates that VERT NAV is selected and the pitch A/P has inadvertenly disconnected from the vertical navigation system selected on the NSP (VOR/ILS and ILS). To extinguish the annunciator, press the VERT NAV switch to deselect VERT NAV.

HORIZ NAV OFF	Illumination of this annunciator indicates that HORIZ NAV is selected and the roll A/P has inadvertently disconnected from the horizontal navigation system selected on the NSP (HDG, VOR/ILS, ILS, TACAN or I-NAV). To extingish the annunciator, press the HORIZ NAV switch to deselect HORIZ NAV.
AUTO TRIM FAULT	This annunciator illuminates to alert the pilots that the A/P horizontal stabilizer control (pitch trim) has not kept the stabilizer trim within limits.
FLARE INOP	This annunciator illuminates to alert the pilots of a malfunction of the A/P flare function. This could be caused by a malfunction in the A/P flare computation circuits or unequal radar altimeter input signals.
NOSE LOC ANT OFF	This annunciator illuminates to indicate failure to switch from the tail to the nose localizer antenna. However, it does not illuminate prior to G/S capture, but waits until then to illuminate if antenna switching has not occurred. After G/S capture it will also illuminate if antenna switching inadvertently switches back to the tail antenna.

FLIGHT DIRECTOR SYSTEM

Flight director steering has been tailored for manual flying; therefore, during A/P operation in modes other than ILS or autoland there may be some disagreement between the displayed steering and the A/P steering.

Flight Director Modes

Flight Director Test Mode

The flight director computer and certain ADI and HSI display indications are tested during the flight director self-test. The following set up is recommended for testing.

o	NSP	TACAN engaged HDG disengaged
o	HSI	Course set to aircraft heading
o	FLT DIR TEST SWITCH	Pressed

The self-test lasts approximately 40 seconds. Check that the FAULT light on the NSP illuminates and then extinguishes during the first part of the test. If it illuminates and remains illuminated, a test failure has resulted.

If a fault is detected, the test will lock in the self-test mode. To disengage, press the ILS, VOR/ILS, or I-NAV switch.

Approximately 1 second after pressing the FLT DIR TEST switch, the following indications will be displayed on the ADI, HSI, and Auxiliary Navigation Selector Panel (ANSP).

ADI	INDICATION
Bullseye	Centered
MDA Annunciator (yellow outer ring of bullseye)	Illuminated

FLARE Annunciator (green inner ring of bullseye)	Illuminated
Bank Steering Bar	Right Bank Command
Pitch Steering Bar	Pitch Up Command
Vertical Deviation Indicator	Centered
Speed Deviation Indicator	Centered
Crab Angle Indicator	Centered
HDG Mode Annunciator	Illuminated
G/A Mode Annunciator	Illuminated
FD Flag	In view
Vertical Deviation Flag	In view
Speed Deviation Flag	In view
RT and GYRO Flags	Out of view (not tested)

HSI	INDICATIONS
Course Deviation Bar	Centered
Course Deviation Flag	In view
Other Indicators	Not Tested

ANSP	INDICATIONS
ALT HOLD Legend	Not Illuminated
Altitude Hold ON Legend	Not Illuminated
VOR CRS Legend	Not Tested
VOR Cruise ON Legend	Not Tested

If the altitude hold mode is on at the start of the test, it will be disengaged and remain off at the end of the test.

NAV Aids Off Mode

This mode is engaged by pressing the NAV AIDS OFF switch on the NSP. It clears all navigational information displayed on the HSI. If HDG is not engaged on the NSP, ALT HOLD is not selected ON at the ANSP, and the go-around mode is not engaged, both steering bars will be removed from view and the ADI will only display artificial horizon and rate-of-turn presentations. The HSI will only display heading and heading set.

Heading Select Mode

This mode is engaged by pressing the HDG switch on the NSP. It takes priority over all other horizontal navigation modes, including go-around. It is also automatically engaged when the flight director is operating in one of the lateral navigation modes and prior to mode capture. Anytime the flight director is in the heading select mode, the HDG annunciator on the ADI will be illuminated. This annunciator is for the flight director only and has no relation to the A/P heading select mode.

When the HDG mode is engaged, bank steering commands will be generated to steer the aircraft onto and to maintain the heading set on the HSI heading marker. The ADI bank steering bar reflects these commands. Bank steering attitude commands are limited at 24.5 (± 2) degrees bank angle in this mode.

Altitude Hold Mode

This mode is engaged, or disengaged, by pressing the ALT HOLD mode switch on the ANSP. First the ALT HOLD legend in the switch must be illuminated to signify that the mode is valid and can be engaged. When the mode is engaged, the ON legend will also illuminate and the pitch steering bar on the ADI will come into view.

The altitude error signal for both flight directors is provided by the No. 2 CADC, making them independent of the autopilot altitude error signal supplied by the No. 1 CADC. Anytime an ALT HOLD switch for either of the flight directors or the A/P is pressed to engage the altitude hold mode, the altitude existing at that time becomes the new reference altitude to be maintained by the flight director. Flight director altitude hold engagement, however, does not change the A/P reference altitude. The altitude hold mode will be disengaged if a failure occurs or when G/S capture is engaged.

TACAN Mode

This mode is armed by pressing the TACAN switch on the NSP. TACAN, like VOR, is divided into two phases, cruise and approach. When the TACAN ground station is greater than 28 NM away, the TACAN cruise phase is engaged. If range is less than 28 NM, the approach phase is engaged. If range is not valid, the approach phase is engaged regardless of range. The following are submodes of the TACAN mode (HDG not pressed).

SUBMODE	CRUISE	APPROACH
Heading Select (TACAN Arm)	Same as the normal heading select mode except the HDG switch is not pressed.	Same as the normal heading select mode except the HDG switch is not pressed.

SUBMODE	CRUISE	APPROACH
Capture	For ranges between 28 to 150 NM from the ground station, the capture submode will be engaged at a deviation distance of 5 NM from the selected course centerline. For distance greater than 150 NM, the capture point is just less than 2 degrees (just under ½ dot deviation). At capture, a turn to a 45-degree course cut intercept angle will be attempted. As the aircraft approaches the center of the beam, a bank steering command is generated to turn the aircraft on course. Bank angle during capture is limited to 24.5 (±2) degrees.	Capture occurs at 8 degrees (about 1¾ dots) of deviation. A turn to establish a 45-degree course cut intercept will be attempted. As the aircraft approaches the center of the beam, a bank steering command is generated to turn the aircraft on course. Bank angle during capture is limited to 24.5 (±2) degrees.
Track	When the course deviation is less than ⅓ dot for 15 seconds and the difference between heading and course is less than 15 degrees, track is engaged and crosswind compensation is initiated.	Same as cruise.

SUBMODE	CRUISE	APPROACH
Overstation	When deviation fluctuates to approximately one dot for 2.5 seconds, the overstation mode will be engaged, forcing the flight director into the heading select mode as indicated by the illumination of the HDG annunciator on the ADI. When deviation settles down to less than ⅓ dot for 5 seconds, the flight director will return to the track mode and the HDG annunciator will extinguish. During the overstation submode, the bank steering signals are generated from the heading marker on the HSI as the heading select mode.	Same as cruise.

VOR Mode

This mode is armed by pressing the VOR/ILS switch on the NSP. VOR is also divided into two phases like TACAN, with the cruise mode being manually selected on the ANSP. Operation of the VOR and TACAN submodes is much the same except for the following differences:

- o During cruise, capture is engaged at one dot deviation instead of 5 NM.
- o During approach capture is engaged at approximately 1⅓ dots of deviation instead of 1¾ dots.
- o During approach, the characteristics of the turn to on course is a variable and is dependent on true airspeed from the CADC.

INS Track Steer Mode

This mode is armed by depressing the I-NAV switch. The INS supplying the guidance depends on a switch selection on the INS select panel (INS-1 or INS-3 for the pilot and INS-2 or INS-3 for the copilot). The following are submodes of the INS track steer mode:

Heading Select (I-NAV Arm)	Same as the normal heading select mode except the HDG switch is not pressed.
Capture	When the crosstrack deviation decreases to less than 4.5 NM (greater than 2 dots), the heading select mode is disengaged. The bank steering display will command a bank attempting to turn the aircraft to a 45-degree intercept of the desired I-NAV track. The period of time the steering command holds the 45-degree intercept angle before starting a turn to a intercept the INS track depends on the true airspeed of the aircraft. A track submode is not used in I-NAV.

ILS Approach Mode

This mode is armed by pressing the VOR/ILS or ILS pushbutton on the NSP. In order to provide full Category II capability for a manual approach, the following must be accomplished by the pilots:

o Pilot's VOR/ILS switch pressed (selects ILS No. 1)

o Copilot's VOR/ILS switch pressed (selects ILS No. 2)

o Both VHF NAV receivers turned to ILS frequency

o Both radar altimeters ON

o AFCS MASTER POWER ON

The bullseye will come into view at G/S capture to denote Category II capability if: the setup is proper; the A/P G/S desensitization is valid; both radar altimeters are on, valid, and tracking each other; and if both ILS receivers are on and valid.

Once the ILS approach is armed the following submodes are available:

Heading Select (LOC Arm)	Same as the normal heading select mode except the HDG switch is not pressed.
Localizer Capture	Localizer capture occurs at 2-dot deviation, disengaging the heading select mode. A turn to establish a 30-degree course cut intercept angle will be attempted. Bank limit during capture is 24.5 (± 2) degrees.
Localizer Track	When localizer deviation is less than $\frac{4}{5}$ dot for 15 seconds and the course error is less than 15 degrees, track is engaged. Following localizer track engagement G/S capture will be armed. Bank angle in localizer track is limited to 15 (± 1.5) degrees. At localizer track engagement the crab angle indicator on the ADI will come into view and display crab angle.
Glideslope Capture	When the G/S deviation is almost zero ($\frac{1}{5}$ dot) G/S capture is engaged. This results in the pitch steering bar coming into view, if not already in view, because of altitude hold being engaged. If altitude hold is on prior to G/S capture, the altitude hold mode will be disengaged and G/S pitch steering will be commanded. G/S capture will also rotate the bullseye into view. When the MDA which is set on the radar

altimeter indicator is reached, the yellow outer ring of the bullseye will illuminate. When 200 feet of radar altitude is reached, the rising runway symbol will come into view.

Flare

At 50 feet, the flare submode is engaged. When this occurs the green inner circle of the bullseye will illuminate, the bullseye vertical indicator will come to center, and the G/S deviation indicator will center. The pitch steering bar will display a commanded pitch attitude to flare the aircraft.

If an ILS receiver failure occurs either in localizer or G/S, an alternate receiver can be selected by depressing the ILS pushbutton on the NSP. Selection of ILS on the pilot's panel will provide inputs from the No. 2 VHF NAV system to the pilot's flight director and displays (ADI and HSI). If ILS is selected on the copilot's navigation selection panel, the No. 1 VHF NAV system will provide inputs to the copilot's flight director and displays.

A/P coupled ILS or autoland approach will not affect flight director steering or displays.

Go-Around Mode

This mode is engaged by pressing the G/A switch on either the pilot's or copilot's aileron control wheel. The illumination of the G/A annunciator on the ADI indicates that the mode has engaged. The ADI steering bars now display go-around pitch steering commands and, if HDG is not selected, wings-level bank steering commands. All other pitch and bank steering modes will disengage. Go-around has priority. Other indicator displays present at the time of G/A engagement are not affected. As an example, if the VOR/ILS switch is selected prior to or after selecting G/A, the HSI deviation pointer will continue to display VOR/LOC deviation. If the HDG switch is pressed prior to or after the G/A mode is engaged, the heading select mode will remain engaged or will engage, and a heading select steering command is applied to the bank steering bar, instead of wings-level. Engaging go-around disengages the A/P.

FLIGHT AUGMENTATION

Stability Augmentation Systems (SAS) are provided for the pitch, roll, and yaw axes. The engagement of all three systems is controlled by switches located on the Flight Augmentation Control Panel (Figure 3). All three systems are fail operational; that is, a single failure will not degrade operation of the system. The illumination of a PITCH AUG FAULT, LATERAL AUG FAULT or YAW AUG FAULT annunciator indicates that a single fault has occurred in that system. Should a subsequent fault occur, the system may become inoperative. Two failures that render a system inoperative will be indicated by the illumination of both the FAULT and INOP annunciators for that system. The normal disengage condition illuminates the INOP annunciator. Particular attention to the exact annunciator terminology in maintenance writeups will ease the maintenance task.

A/P stability and hardover protection is provided by the augmentation systems. INOP status of the pitch SAS will automatically disengage the pitch A/P. The same is true for the roll A/P, should the lateral or yaw augmentation go INOP.

The Active Lift Distribution Control System (ALDCS) requires that both the pitch and lateral augmentation systems be operational. INOP status on either system will disengage ALDCS.

ACTIVE LIFT DISTRIBUTION CONTROL SYSTEM (ALDCS)

The ALDCS automatically provides redistribution of wing loading, thereby reducing bending moments of the wing. This is accomplished by symmetrical movement of the ailerons with the lateral augmentation system. Since aircraft pitch axis stability is affected by symmetrical aileron movement (i.e. up ailerons cause pitch up forces), the ALDCS provides signals to the pitch augmentation system for control of the inboard elevators to counteract this effect and to provide additional bending moment reductions.

The ALDCS is a fail-passive system which disengages when a single failure affecting operation of the system occurs. An ALDCS switch on the flight augmentation control panel is used to engage/disengage the ALDCS.

INFLIGHT ANALYSIS

In order that a modern aircraft can be maintained properly, the flight crew must play a key role. Good knowledge of the proper operation of a system will enable the pilots to make writeups that allow the maintenance personnel to quickly determine and repair the faulty system. Without good professional writeups, poor and often improper maintenance actions result. Even worse than a poor writeup is no writeup at all; that is, allowing poor system performance to be acceptable.

The intent of this section is not to burden the crew with maintenance duties but to make them aware of certain conditions that will greatly affect aircraft maintenance performance. Performance degradations are often impossible to duplicate during ground maintenance, and supporting information will assist in the isolation of these problems.

The following are some guidelines for pilot writeups that will greatly aid maintenance:

Flight Conditions	Provide the altitude, airspeed, Mach, etc., at the time the malfunction occurs.
Mode of Operation	Indicate the mode of operation at the time of malfunction; that is Heading Select, VOR Capture, Altitude Hold, etc. Also indicate other submodes that may be engaged.
Flight Time	Provide flight time, time at altitude or time after mode engaged when malfunction occurred.
Airplane Configuration	Provide aircraft configuration such as gear down, approach flaps, etc., when the malfunction occurs.

AFCS TERMINOLOGY

The following is a list of terms that will aid the flight crew to better communication with maintenance.

A/P overactive – Control movement which results in overcontrol or is so fast that no aircraft response results.

A/P loose or sloppy – Wanders back and forth or up and down with no definite period or pattern.

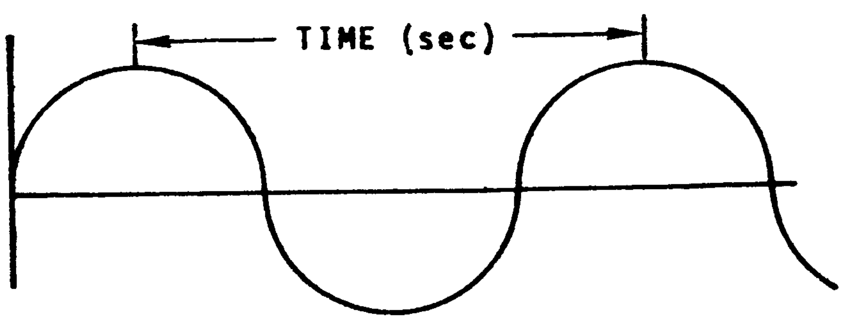
porpoising – Low-frequency oscillation in the pitch axis with a definite pattern or period. Often associated with altitude hold.

glitch or bump – A sharp or quick input to controls, usually with no aircraft attitude change. Control movement is in one direction.

hardover or runaway – Controls are driven to or towards maximum mechanical control system limit at the maximum system rate, not in response to a definite input signal.

buzz – High frequency, low amplitude control wheel or column movement with no aircraft response.

period (time) – The time in seconds between peaks or valleys of an oscillation of constant frequency and amplitude.



hangoff or standoff – Holding a position off track or heading. Magnitude should be included in writeup.

overshoot – Aircraft crosses track during capture. If capture occurs at the proper point and the turn is made at maximum bank for the engaged mode, the cause for overshoot is not due to system malfunction. In the case of heading select, no overshoot of the set heading should occur. This should be written up as an overshoot if it occurs.

false capture – Aircraft turns to capture the track during horizontal navigation or pitches to capture the G/S during ILS, before the capture point is reached. Before writing up an A/P or flight director malfunction, verify that the deviation indication was not erratic. If the problem repeats without a visual indication of the above, an A/P or flight director equipment malfunction should be written up.

fails to capture – The capture point is reached but the aircraft does not attempt to capture. If HDG is depressed on the NSP, capture will be overridden. Failure to capture in this case is an operator problem, not system failure.

SAS fault – This is indicated by a FAULT light (YAW AUG FAULT, LATERAL AUG FAULT and/or PITCH AUG FAULT). Include exact fault light identification in the writeup, using the same terminology that appears on the light.

SAS inoperative – A condition where both the SAS FAULT and INOP light illuminate. The OFF light in the engage switch will also illuminate.

Lateral Axis Performance Limit and Tolerances

MODE	FUNCTION	AUTOPILOT	FLIGHT DIRECTOR
Attitude hold	Roll rate control wheel steering	Within ±2 degrees when stabilized in the new attitude	N/A
Any mode	Turn knob bank limit	33 (±5) degrees	N/A
Heading hold	–	Within ±3 degrees	N/A
Heading select	Bank limit	27 (±4) degrees	24.5 (±2) degrees
	Turns to selected heading	Within ±3 degrees	Within ±3 degrees
VOR	Bank limit Capture, pretrack, and overstation	27 (±4) degrees	24.5 (±2) degrees
	Bank limit Track	7.5 (±2.5) degrees	24.5 (±2) degrees
VOR capture Cruise	–	1 dot	1 dot

MODE	FUNCTION	AUTOPILOT	FLIGHT DIRECTOR
VOR capture Approach	–	N/A	1⅓ dot
VOR course cut	–	45 degrees or less	45 degrees
VOR track	–	⅕ dot and less than 2 degrees roll	⅓ dot plus 15 seconds, and less than 15 degrees heading (course) error
TACAN	Bank limit Capture, pretrack, and overstation	27 (±4) degrees	24.5 (±2) degrees
	Bank limit Track	7.5 (±2.5) degrees	24.5 (±2) degrees
TACAN capture Cruise	–	1 dot	5 NM cross track
TACAN capture Approach	–	N/A	1⅓ dot
TACAN course cut	–	45 degrees or less	45 degrees

MODE	FUNCTION	AUTOPILOT	FLIGHT DIRECTOR
TACAN track	–	1/5 dot and less than 2 degrees roll	1/3 dot plus 15 seconds, and less than 15 degrees heading (course) error
I-NAV (Track Steer)	Bank limit	27 (±4) degrees	24.5 (±2) degrees
I-NAV capture	–	4½ NM cross track (exceeds deviation scale limits)	4½ NM cross track (exceeds deviation scale limits)
I-NAV track	–	0.4 NM and less than 2 degrees roll	Not used
ILS (Localizer)	Bank limit Before G/S capture	27.4 (±2) degrees	24.5 (±2) degrees before LOC track: 15 (±1.5) degrees after LOC track.
	Bank limit After G/S capture	7.5 (±2.5) degrees	24.5 (±2) degrees before LOC track: 15 (±1.5) degrees after LOC track.

MODE	FUNCTION	AUTOPILOT	FLIGHT DIRECTOR
ILS (LOC) capture	–	2 dots	2 dots
ILS (LOC) course cut	–	23 degrees	30 degrees
ILS (LOC) track	–	$\frac{2}{3}$ dot and less than 2 degrees roll	$\frac{4}{5}$ dot plus 15 seconds and less than 15 degrees heading (course) error

Pitch Axis Performance Limits and Tolerances

MODE	FUNCTION	AUTOPILOT	FLIGHT DIRECTOR
Attitude Hold	Pitch control wheel selected attitude	Within ± 2 degrees when stabilized on the new attitude	N/A
	Pitch wheel selected attitude	Within ± 2 degrees	N/A
IAS PITCH	Selected airspeed	Within ± 5 knots	N/A
MACH PITCH	Selected Mach	Within ± 0.02 Mach	N/A

MODE	FUNCTION	AUTOPILOT	FLIGHT DIRECTOR
ALT CAPTURE	Captures selected altitude	Within 24 feet: maximum overshoot of 100 feet or 10 percent of altitude rate at time of engagement	N/A
ALT HOLD	Selected altitude Straight flight	Within ±40 feet	Same as A/P
	Selected altitude Up to 30 degrees bank	Within ±60 feet or 0.3 percent of altitude, whichever is greater	Same as A/P
	Selected altitude 30 to 35 degrees bank	Within ±90 feet or 0.4 percent of altitude, whichever is greater	Same as A/P
	Selected altitude During speed or configuration changes	Should not exceed ±200 feet of selected altitude	Same as A/P

MODE	FUNCTION	AUTOPILOT	FLIGHT DIRECTOR
ILS (Glideslope) Capture	With AFCS desensitized G/S	One G/S pointer width (with nose down bias added)	1/5 dot
	Failed AFCS desensitized G/S	N/A	2/5 dot

Auto Throttle Performance Limits and Tolerances

MODE	FUNCTION	VALUES
IAS HOLD	Selected airspeed	Within ±5 knots IAS
MACH HOLD	Selected Mach	Within ±0.02 Mach
ALPHA HOLD (use in approach to landing only)	Angle of attack at time of engagement	Within ±2 degrees

GO-AROUND ATTITUDE SUBSYSTEM

The following table shows computed go-around angle-of-attack commands in column 2 for various rates of climb shown in column 1. Airspeeds required to produce these angles of attack for various aircraft gross weights are shown in column 3 through 8. These airspeeds are only valid for the 40 percent flaps configuration and less than 15 degrees pitch up limit of the go-around computer.

1 Rate of Climb (FPM)	2 AOA CMD (degrees)	3 350,000 LB GW	4 400,000 LB GW	5 450,000 LB GW	6 500,000 LB GW	7 550,000 LB GW	8 600,000 LB GW
150	11.0	99	106	113	119	125	130
400	10.0	102	109	116	122	128	134
600	9.1	104	113	118	125	131	137
800	8.2	107	115	121	128	134	140
1,000	7.3	111	119	126	132	139	145
1,200 and up	6.5	114	123	129	137	143	150

FPM = Feet Per Minute
AOA CMD = Angle-of-Attack Command
LB WT = Gross Weight in Pounds

MISCELLANEOUS NAVIGATIONAL SYSTEMS DATA

ADF System (DF-206)

(a) Self Test: 45 (±3) degrees bearing.

(b) Bearing Accuracy: ±5 degrees of the measured bearing to the station.

VHF Navigational System (ARN-127)

(a) Self-Test 315 (±5) degrees bearing.

(b) Bearing Accuracy: ±5 degrees of the measured bearing to the station.

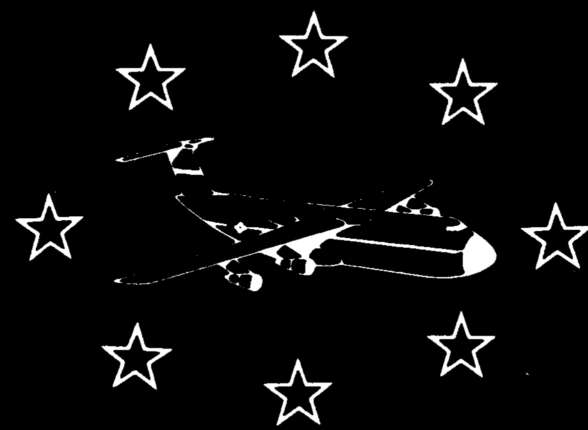
Tacan System (ARN-118)

(a) Self-Test: 270 then 180 (±4) degrees bearing and 000 (±0.5) miles distance.

(b) Bearing Accuracy: ±4 degrees of the measured bearing to the station.

(c) DME Accuracy: ±1.0 miles slant range.

(d) Range: 400 miles (line of sight)



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MADAR II

OPERATIONAL HANDBOOK

MADAR II

OPERATIONAL HANDBOOK

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May 1987

Customer Training Department
Lockheed-Georgia Company
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MALFUNCTION DETECTION, ANALYSIS, AND RECORDING (MADAR) II SYSTEM

GENERAL

The malfunction detection, analysis, and recording (MADAR) system was designed to aid C-5A flight crews and maintenance personnel in the detection and isolation of malfunctions. MADAR II is an enhanced version of the original, using state of the art hardware and software which will allow the original design to reach its full potential.

In addition to malfunction detection and isolation, the MADAR II system is also used to collect and record data from selected points throughout the aircraft. The data is analyzed to establish long term operating and failure trends useful in logistics requirement planning. As a management tool, this data can significantly reduce aircraft unscheduled downtime. Selected flight critical data are provided to the flight incident recorder (FIR) system, which records up to 25.2 hours of data on six bidirectional tracks.

MADAR II answers the universal need for better and faster aircraft troubleshooting by monitoring the performance of selected subsystems, including itself. Monitored subsystems include:

- o Propulsion
- o Environmental
- o Secondary power
- o Flight controls
- o Instrumentation
- o Radar (altimeter)
- o Communications
- o Mechanical (ramps and doors - landing gear)
- o Loads environment spectra survey (five aircraft only)

If failure or marginal operation occurs, MADAR senses, locates, and identifies the fault much more quickly than manual methods.

The main task of MADAR, of course, is to help flight and ground maintenance crews detect and isolate troubles. More than that, it:

- o Helps predict LRU failures.

- Cuts flight line AGE requirements.
- Cuts organizational meantime to troubleshoot.
- Enables aircraft troubleshooting independent of base facilities.

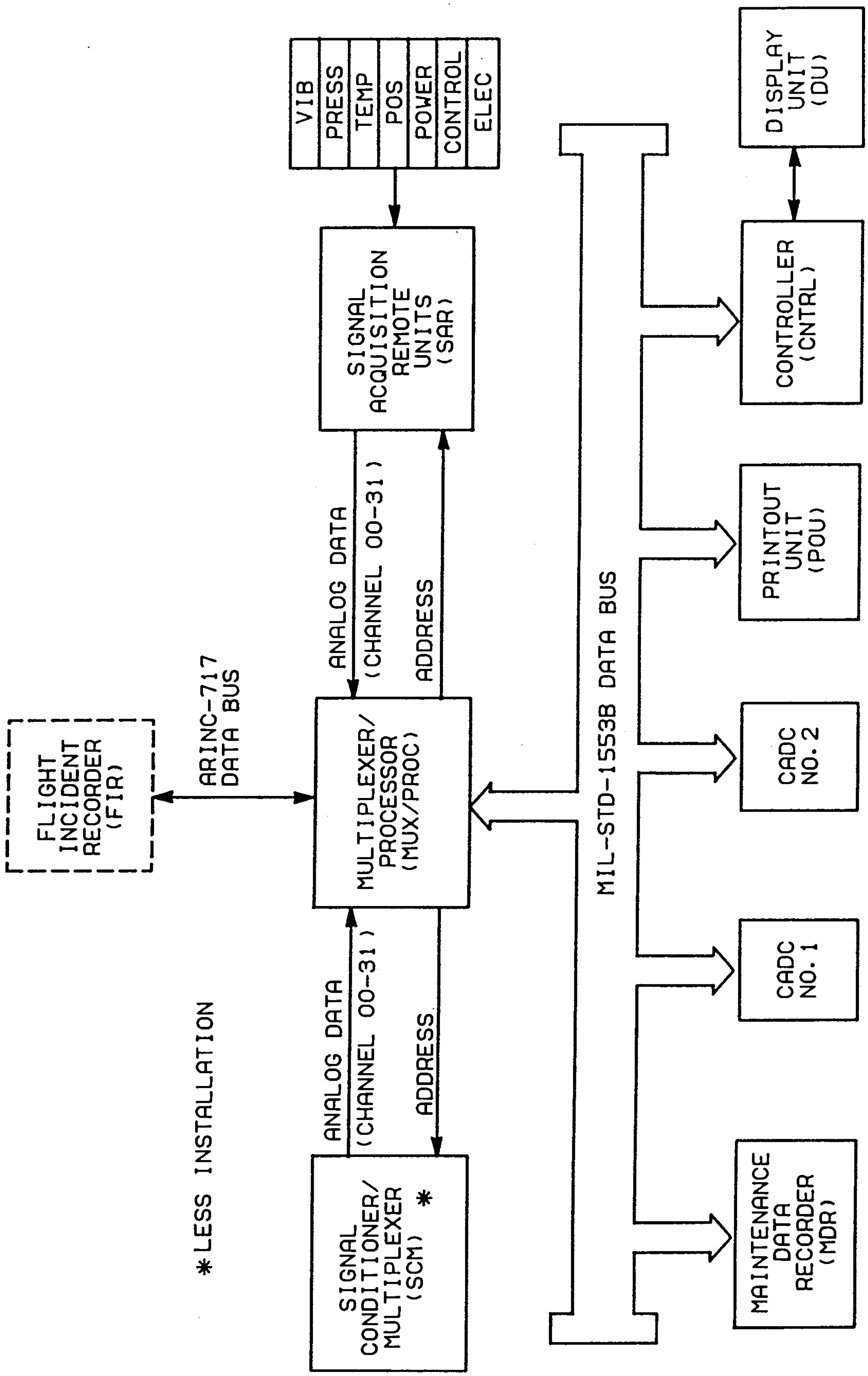
Designed specifically for the C-5B, MADAR II electronically scans and analyzes over 750 test points throughout the aircraft. It then reports its findings visually to the operator; it also records fault code failures on paper and magnetic tape. C-5 test points are quite varied, and report on such things as temperature, pressure, pressure differential, vibration, position, switch contacts, and voltage waveforms. If a signal is electrical, MADAR is wired directly to that point. If not electrical, such as engine turbine vibration, transducers convert the information.

Data in the form of analog or discrete voltages are inputted to signal acquisition remote (SAR) units which amplify, attenuate, or isolate the signal for use by the multiplexer/processor (MUX/PROC). (See figure 1.) Each SAR has thirty input channels. Any one of these channels can be addressed for output as well as two additional reference channels. At present, 23 hardware SARS are installed, although the MUX/PROC will accept input signals from as many as 44.

Test point acquisition is accomplished by the MUX/PROC. The MUX/PROC sequentially addresses (via five separate address buses) the SAR units by channel number. The SAR units output the channel data, which is then selected by the MUX/PROC, digitized, and stored in memory for use by the various parts of the program. Each test point is sampled at least once per second depending on program requirements. (See T.O. C-5A-102-1 for detailed software information.) Communications between the MUX/PROC, controller (CNTRL), printout unit (POU), maintenance data recorder (MDR), and central air data computer (CADC) take place over a MIL-STD-1553B data bus. This is a two wire serial data bus with redundant backup. Selected data is formatted and transmitted to the FIR via the ARINC 717 data bus. INS data and certain data acquired via the 1553B bus are stored in the MUX/PROC and assigned as software SAR and channel number, and is accessed in the same way as an installed hardware SAR. Operator input to the system is accomplished using the CNTRL. The CNTRL is used for mode control, accessing test points, calling up manual diagnostic display frames, acknowledging fault codes, manually reporting fault codes, etc. The CNTRL interfaces directly with the display unit (DU).

The DU alerts the operator to a fault condition by displaying a flashing fault code (FC). Time, system operating mode, event messages, test point voltage readings, waveform displays, fault

Figure 1. Simplified Block Diagram



code nomenclature, diagnostic routines, and operating procedures are also displayed.

Special functions of the system include a four function calculator with memory and a scratch pad function. The scratch pad function allows the operator to write and edit messages for display on the DU. The scratch pad is retained in memory after power shutdown and can be recalled for display by the next operator after power is again applied to the system.

Functions

The MADAR II operates in two distinct functional categories: computer controlled and operator controlled. The following paragraphs describe the two functional categories.

Computer Controlled.

The MADAR II is programmed to sample information in the form of electrical analogs, logic levels and discrete signals at intervals varying from nineteen times per second to once per second. MUX/PROC software contains algorithms which compare the voltage value of selected inputs to predetermined values and make good/bad decisions based on these comparisons. If the input from a specific test point is determined to be bad, the operator is alerted by means of a flashing alphanumeric message (fault code) on the display unit. In a similar manner, if a test point input previously determined to be bad becomes good, the operator will be informed.

A second feature of the computer controlled function is the recording of selected test point signals on magnetic tape in the maintenance data recorder. The magnetic tape is housed in a cartridge similar to a VHS video cassette. The tape cartridge is removed after flight and is processed for data reduction in the ground processing system (GPS). The data is then available for use in determining operational trends, aircraft performance, structural integrity and failure analysis. The computer controlled function also provides the flight critical information required by the FIR.

Operator Controlled

The operator controlled function allows the operator to select any desired test point waveforms or voltages for viewing and analysis. This is normally done to investigate the condition of a subsystem or LRU when a malfunction is detected by either standard instrumentation/annunciator lights or MADAR II. Procedures for selecting test point information are contained on display frames stored in the MUX/PROC mass memory and presented to the operator on the DU. These procedures also contain instructions for using nonMADAR indications during fault isolation. Additional operator controlled capabilities include:

vibration analysis, engine health analysis, fault code nomenclature, and flight report data.

Modes

Mode Selection

MADAR II has three operating modes which are operator selected and/or automatically selected. These are standby (STBY), test (TEST), and operate (OPER). When power is applied, the system will begin operating in the operating mode at the time of the last power shutdown (normally standby) unless any engine N2 is more than 60 percent or the touchdown switch is in the airborne position, in which case the system automatically defaults to the operate mode. After power is applied, any mode can be operator selected if the N2 of all four engines is less than 60 percent and the touchdown switch is in the ground position. The system will automatically switch to the operate mode from standby or test modes when any engine N2 goes above 60 percent or the touchdown switch switches to the airborne position.

Standby Mode

STBY is the normal mode entered upon startup. In STBY the MUX/PROC processes keyboard inputs and performs automatic self test. No output data is sent to the MDR and the MUX/PROC is essentially idling. The system should be set to the standby mode by the operator before shutdown.

Test Mode

All manual and automatic functions of the MUX/PROC are enabled with the exception of MDR recording. TEST allows checkout of the MUX/PROC algorithms without recording nuisance malfunctions caused by these checkouts.

Operate Mode

OPER is the normal MADAR operating mode in which all manual and automatic functions, including recording, are enabled.

Component Locations and Description

The control and display group (CDG), located at the flight engineer station, consists of a keyboard controller unit, display unit, and printout unit. (See figures 2 and 3.) The CDG provides all of the operator contact with MADAR II during normal operation.

Controller (CNTRL)

The CNTRL is the operator input interface into MADAR II. (See figures 3 and 4.) The CNTRL front panel contains a full

Figure 2. Component Location

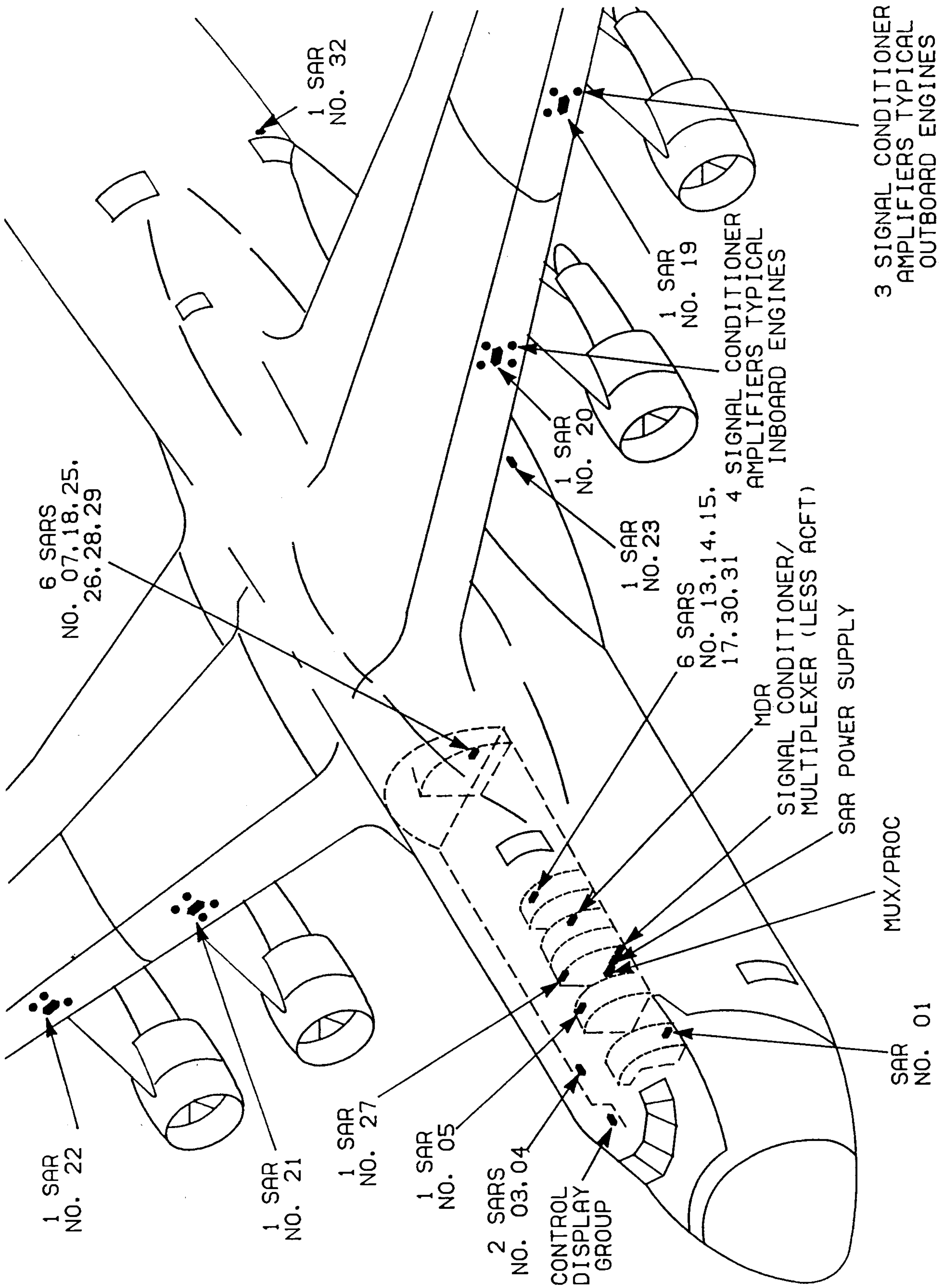


Figure 3. Control Display Group LRUs

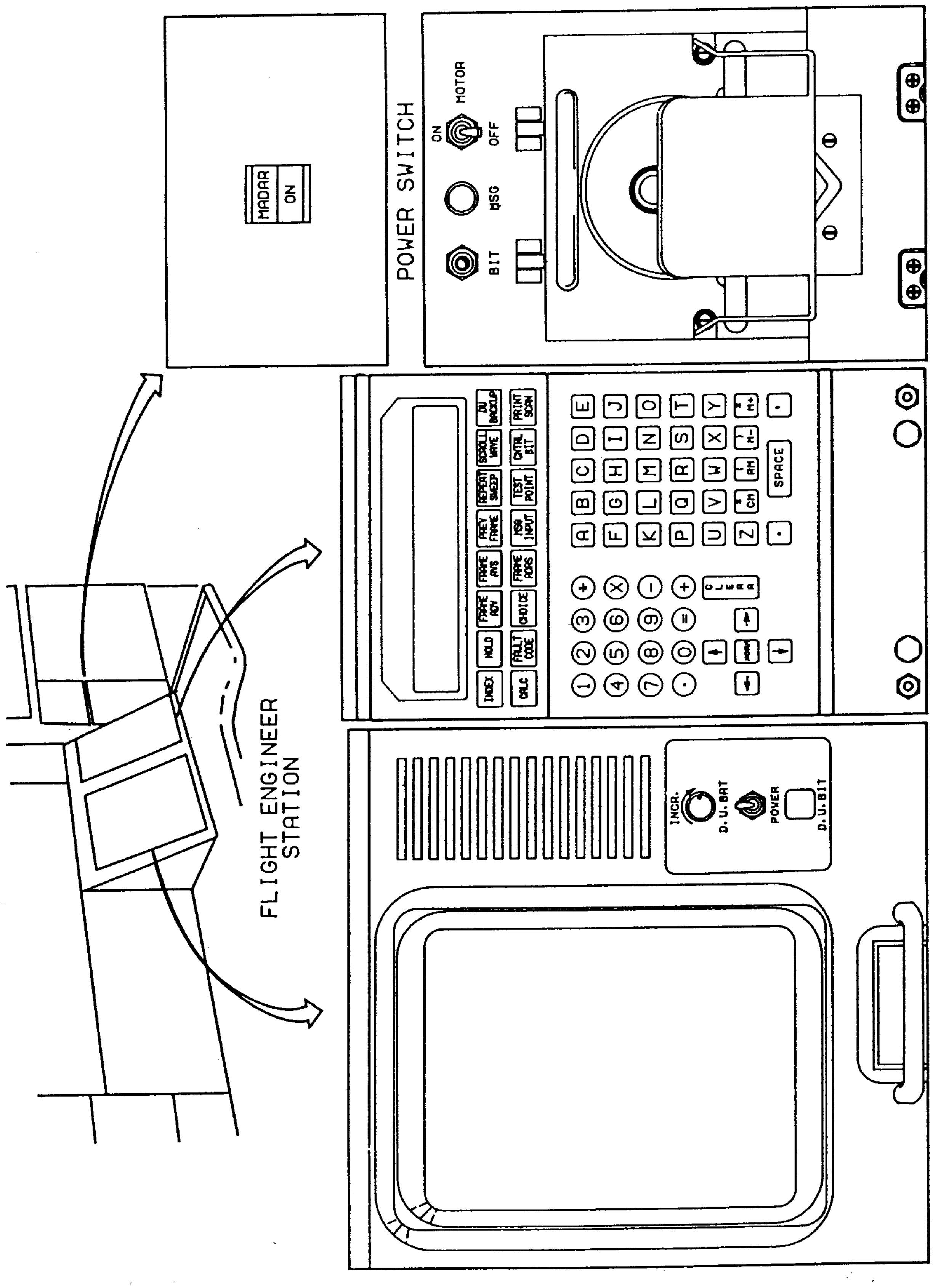


Figure 4. Major Component Location Chart

UNIT	PART NUMBER	LOCATION
Printout Unit	4K97501-101( )	Flight Engineer Station
Controller	4K97505-101( )	Flight Engineer Station
Display Unit	4K97503-101( )	Flight Engineer Station
Multiplexer/Processor	4K97500-101( )	
	(Bubble Memory)	Avionics Rack #2
	or	
	4K97500-103( )	
	(CMOS Memory)	Avionics Rack #2
SAR Power Supply	4K97507-101( )	Avionics Rack #2
Maintenance Data Recorder	4K97502-101( )	Avionics Rack #3
Signal Conditioner Multiplexer ⚠1	4V10004-101( )	Avionics Rack #2
SAR #01	4L00014-141( )	Behind Panel Under NAV Table
SAR #03	4L00014-145( )	Under Forward Bunk
SAR #04	4L00014-147( )	Under Forward Bunk
SAR #05	4L00014-149( )	Avionics Rack #1
SAR #07	4L00014-151( )	Aft ELEC Equipment Rack LH
SAR #13	4L00014-155( )	Avionics Rack #4
SAR #14	4L00014-157( )	Avionics Rack #4
SAR #15	4L00014-159( )	Avionics Rack #4
SAR #17	4L00014-155( )	Avionics Rack #4
SAR #18	4L00014-161( )	Aft ELEC Equipment Rack LH
SAR #19	4L00014-163( )	#1 Eng SAR Panel
SAR #20	4L00014-163( )	#2 Eng SAR Panel
SAR #21	4L00014-163( )	#3 Eng SAR Panel
SAR #22	4L00014-163( )	#4 Eng SAR Panel
SAR #23	4L00014-165( )	Cargo Compartment Left (FS1318, WL192, BL143L)
SAR #25	4L00014-167( )	Aft ELEC Equipment Rack LH
SAR #26	4L00014-169( )	Aft ELEC Equipment Rack LH
SAR #27	4L00014-171( )	Avionics Rack #2
SAR #28	4L00014-173( )	Aft ELEC Equipment Rack LH
SAR #29	4L00014-175( )	Aft ELEC Equipment Rack LH
SAR #30	4L00014-155( )	Avionics Rack #4
SAR #31	4L00014-155( )	Avionics Rack #4
SAR #32	4L00014-177( )	Aft Loadmaster Panel (FS1889, WL240, BL140L)
⚠1 Installed On Aircraft With LESS Installation		

alphanumeric keyboard in addition to 16 special function keys. The CNTRL contains the circuitry necessary to convert the incoming MUX/PROC signals into video signals for display on the DU. The CNTRL also has sufficient internal memory to store frames of information containing instructions for use in the event of MUX/PROC or communication failure.

Removable cooling air filters are installed on the bottom of the CNTRL and on the CNTRL front panel. These filters should be replaced at periodic intervals in accordance with T.O. 1C-5A-6.

Display Unit (DU)

The DU is the primary output interface between MADAR II and the operator. (See figures 3 and 4.) The DU houses a 13 inch, vertically oriented, color CRT. Operator selected frames contain information such as operating procedures, subsystem diagnostic routines, and test point indexes. Additional display information includes: dual channel digital voltmeter readings, dual channel near real time waveform displays, fault code presentations and CNTRL keyboard echo. The CNTRL/DU interface also allows manual scrolling of selected waveforms and text. The screen is divided into four display areas. These are:

- o Frame display area
- o Events display area
- o Data display area
- o Entry line area

The frame display area occupies the upper portion of the screen. The events display area is below the frame display area on the lefthand side of the screen. The data display area is below the frame display area and on the righthand side of the screen with the entry line area just below it. These screen area allocations, as well as the messages displayed in each area, are further defined under the heading SYSTEM OPERATION.

A removable cooling air filter is installed on the DU front panel and should be replaced at periodic intervals in accordance with T.O. 1C-5A-6.

Printout Unit (POU)

The POU produces semipermanent information, electrostatically on metal impregnated paper. (See figures 3 and 4.) The POU has full alphanumeric capability and, for normal operations, produces a 58 column printout. The POU batch prints when its buffer, which contains up to 44 messages, is full or prints on operator demand. A DU backup function is available which provides immediate printout in a 16 column format.

Other major MADAR LRUs not located in the CDG are the MUX/PROC, MDR, SARs, and SAR Power Supply. Also, five C-5B aircraft have been designated for special structural monitoring and have a load environment spectra survey (LESS) system installed. The LESS system ties into the MADAR through a signal conditioner/ multiplexer (SCM).

Multiplexer/Processor (MUX/PROC)

The MUX/PROC is a MIL-STD-1705A processor and is the heart of MADAR II. (See figures 4 and 5.) Located in avionics bay No. 2, the MUX/PROC contains a two megaword (16 bit) bubble or complimentary metal oxide semiconductor (CMOS) memory for mass storage, 128 kiloword (KW) of random access memory (RAM), and a 2 KW startup read only memory (ROM). Growth provisions have been provided for an additional 128 KW of RAM. The mass memory on earlier MUX/PROCs uses bubble memory devices while the later versions use CMOS memory devices. The MUX/PROC mass memory hereafter will be referred to as safestored memory. The operating, or fight program, is stored in safestored memory and is transferred to RAM by the startup ROM at turn on. The MUX/PROC performs data acquisition and compression, analog to digital conversion, trend calculations, and determines LRU/subsystem status.

Maintenance Data Recorder (MDR)

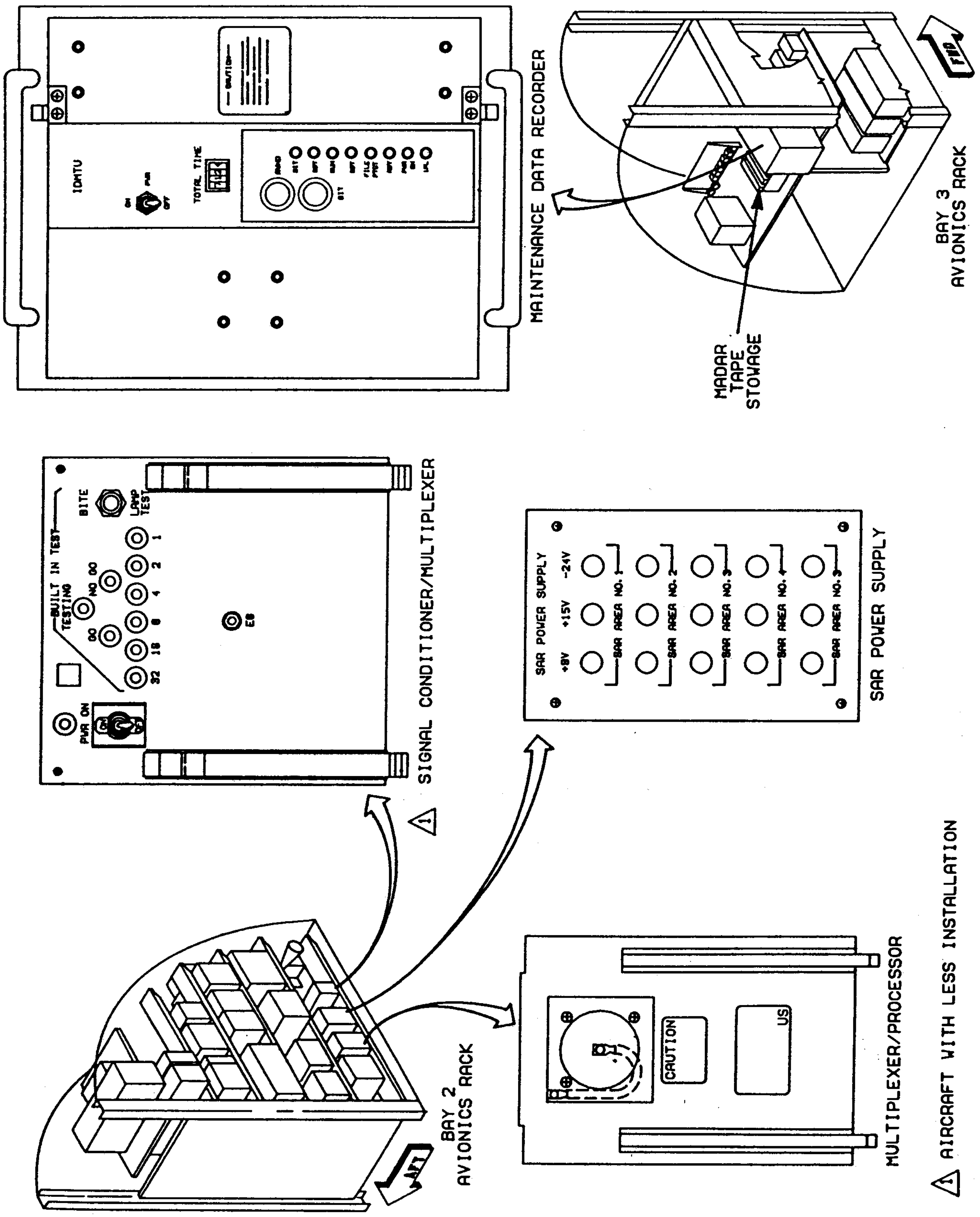
Located in avionics bay No. 3, the MDR writes information supplied by the MUX/PROC onto magnetic tape. (See figures 4 and 5.) The recording format is nine track phase encoded, with a recording density of 1600 bits per inch. The formatted tape capacity is five megabytes. After flight, this tape is removed and processed into the GPS by the data formatting equipment (DFE) section. The data is then available for use by maintenance and supply, as well as management personnel. A second function of the MDR is to read data from a special programming tape and supply that information to the MUX/PROC to load the mass memory.

Storage is provided for four magnetic tapes in avionics bay No. 3. An aircraft will normally have one program tape, and two record tapes on board.

Signal Acquisition Remote (SAR) Units

There are 23 hardware SAR units located throughout the aircraft. (See figures 2 and 4.) These units select, condition, and transmit signals to the MUX/PROC. Each unit is a 32 channel analog signal conditioner and multiplexer. Thirty channels are available for differential analog data inputs from the aircraft subsystems, although not all channels of each unit are used. The remaining two channels are used for selection of an internally supplied calibrate signal which is part of the automatic self test feature of MADAR II.

Figure 5. LRUs



SAR Power Supply

Located in avionics bay No. 2, the SAR power supply provides regulated +9, +15 and -24 VDC operating voltages to the SAR units. (See figures 4 and 5.) There are five individual SAR areas and the voltages are supplied in parallel to each SAR in a particular SAR area.

Transducers

There are transducers installed throughout the aircraft. (See figure 6.) The transducers are of four types: pressure, temperature, position, and vibration. Each transducer converts the measured parameter into an electrical analog signal for input into the MUX/PROC. This input is through a SAR and/or a signal conditioner amplifier.

Signal Conditioner Amplifiers (SCAs)

There are 14 SCAs on the aircraft. (See figures 2 and 6.) There are four SCAs for each inboard engine and three SCAs for each outboard engine. The SCAs receive inputs from the individual type transducer. These inputs are amplified or attenuated, filtered, and sent to a SAR. The SCAs are located in the wing leading edge just inboard of each engine pylon.

Load Environment Spectra Survey (LESS)

Five aircraft (840062, 850001, 850002, 850003, 850004) have been designated as LESS aircraft. These aircraft have special strain gages installed at critical structural load locations and position transmitters on selected control surfaces. Signals from these sensors are sent to the MUX/PROC through a signal conditioner/multiplexer to be recorded. Additional aircraft parameters, such as bank angle, fuel weight, etc., which could be useful for structural monitoring are also recorded. Data derived from analyzing these signals is used to indicate structural changes during the life cycle of the aircraft. Such changes may result from various conditions of use, changing environments, operating procedures, or aging.

Signal Conditioner/Multiplexer (SCM)

The SCM is located in avionics bay No. 2. (See figures 4 and 5.) The SCM receives signals from the sensing devices and conditions and multiplexes them for input into the MUX/PROC. The SCM is essentially two SARs in one LRU and is addressed as such by the MUX/PROC (SAR 08 and SAR 09). The SCM contains a manual built in test (BIT) which exercises each channel and announces failures through lamps on the SCM front panel. The MUX/PROC also evaluates the calibrate channels through an automatic diagnostic routine.

Figure 6. Amplifier and Transducer Locations

UNIT	PART NUMBER	LOCATION
Vibration Amplifier (4 ea) Pressure Amplifier (4 ea) Temperature Amplifier (4 ea) Position Amplifier (2 ea)	4V10012-103A 4L90509-115A 4L90508-119A 4L90511-101B	1 in each engine SAR panel 1 in each engine SAR panel 1 in each engine SAR panel 1 in each inboard engine SAR panel
Bleed Air Temp Transducer (4 ea)	4L90508-125A	1 in each pylon
Compressor Inlet Temp Transducer (4 ea)	4L90508-123A	Fwd LH side of each engine
Hyd Oil Temp Transducer (4 ea)	4L90508-117A	#1 Hyd Service Center (FS 1249) LH Fuselage #2 Hyd Service Center (FS 1128) LH Fuselage #3 Hyd Service Center (FS 1128) RH Fuselage #4 Hyd Service Center (FS 1250) RH Fuselage
Vibration Transducer (4 ea) Vibration Transducer (4 ea)	7118M61P05 7118M61P06	1 per engine in Compressor Area 1 per engine in Turbine Area
VSV Transducer (4 ea)	4L90511-105A	Fwd RH side of each engine
Absolute Pressure Transducer (PTO)	4L90509-113A	Avionics Rack #3
Triaxial Accelerometer	3001-01	FS1383, WL 306, BL 4.00 left.
Engine Driven Pump Case Drain Flow Transducer (8 ea)	4H90513-105H	2 per engine 25 in. above Hyd. Pumps
Hyd. PTU Case Drain Flow Transducer (6 ea)	4H90513-107A	2 on PTU BL 0 FS 1347 Ctr Wing Beam
		1 ea. FS 1244, WL 170 & FS 1200, WL 170 in left fwd MLG Fairing
		1 ea. at FS 1235, WL 170 & FS 1170, WL 170 in rt. fwd. MLG Fairing
ATM Driven Hyd. Pump Case Drain Flow Transducer (2 ea)	4H90513-107A	1 ea. on left & right side at FS 1152, WL 152 under walkway
Throttle Lever Position Pot. (4 ea)	751-7022	Center Console 2 ea. in Pilot & Copilot Control Pedestal

Significant Specifications

Multiplexer/Processor

Instruction set	MIL-STD-1750A
Main memory	128K words of RAM
MASS memory	2 megawords of bubble or CMOS memory
Start up PROM	2K words
Memory expansion	128K words of RAM
Data bus input/output	MIL-STD-1553B dual redundant
Serial output	ARINC-717
Analog inputs	44 differential inputs (23 used)
	4 three wire synchro (3 used)
Addressing	5 buses of 5 lines each
Built In TEST (BIT)	Startup and continuous

Controller

Input/output	MIL-STD-1553B
BIT	Continuous and Manual
Discrete output	2 (DU valid - CNTRL valid)

Display Unit

Display	13 inch multicolor CRT (vertically oriented)
Resolution	512 Pixels Horizontal x 640 Pixels Vertical
Refresh rate	50 Hz
BIT	Continuous and Manual

Printout Unit

Recording process	Electrostatic direct printing
Character set	ASCII
Paper supply	200 feet
Input/output	MIL-STD-1553B
BIT	Continuous and Manual

Maintenance Data Recorder

Input/output	MIL-STD-1553B
Tape	Cartridge
Tape capacity	5 Megabytes formatted
Recording format	9 track phase encoded
Recording density	1600 bits per inch
Record speed	25 inches per second
Rewind speed	50 inches per second
BIT	Continuous and manual

Signal Acquisition Remote Units

Input channels	30
Output channels	32

Power Requirements

Aircraft power required for the MADAR II system operation is 115 VAC, three phase, 400 Hz; 26 VAC, single phase, 400 Hz; and 28 VDC. (See figures 8, 9, 10, and 11.) Circuit breakers which must be closed for system operation are listed in figure 7.

With the MADAR Control circuit breaker closed, 28 VDC is applied to the MADAR power switch, lighting the MADAR portion of the switch. (See figure 8.) Pressing the switch will apply 28 VDC to relay K64C and K64B. Relay K64C will be energized if avionics cooling fan No. 1 is operating, while K64B will be energized if avionics cooling fan No. 2 is operating. If either condition exists, 28 VDC will pass through the energized contact of the appropriate relay to the MADAR power switch, causing the ON portion of the MADAR power switch to light. The coil of relay K1PU is energized by application of 28 VDC. With relay K1PU energized, 115 VAC, three phase power is applied to the MUX/PROC and SAR power supply. Phase A and phase B power is applied to the SCM, while phase C is applied to the POU and MDR. With the flight engineer cooling fan operating, 28 VDC power is applied through relay K1PU to the coil of K64D. This will energize K64D, causing 115 VAC phase A power to be applied to the CNTRL and 115 VAC phase B power to be applied to the DU. The triaxial accelerometer, flap position transducer, and LESS system power is shown in figure 8.

Battery power from the INS No. 1, INS No. 2, and INS No. 3 batteries is applied to the MUX/PROC through circuit breakers located in avionics bay 3. This power is used to assure that the operational flight program is retained in the MUX/PROC mass memory with aircraft power off. Use of a shop aid which plugs into the front of the MUX/PROC allows removal of the MUX/PROC from the aircraft rack without loss of the operational flight program from mass memory.

The SAR power supply supplies +9 VDC, +15 VDC, and -24 VDC to the SAR units via five separate buses. (See figure 9.) These three voltages are supplied to SAR No. 27 as input channel information and to the MUX/PROC for monitoring purposes.

Power interconnect for SCAs transducers and control valves is shown in figures 10 and 11.

System Interface

The MADAR II System interfaces with monitored subsystems, the flight incident recorder, and the LESS system. (See figure 12.) Subsystems interface with the MADAR SAR units directly from a test point, from a transducer, or from a transducer via a signal conditioner amplifier.

Figure 7. Circuit Breaker Location Chart

LOCATION		
CIRCUIT BREAKER PANEL	BUS	CIRCUIT BREAKER
Flight Engineer Circuit Breaker Panel #1	Fwd Main AC Bus #3	Flt Eng Cooling Fan Avionics Cooling Fan #1 Avionics Cooling Fan #2
Flight Engineer Circuit Breaker Panel #3	Fwd Main AC Bus #4	MADAR Phase A, MADAR Phase B MADAR Phase C
	Fwd Main AC Bus #3	MADAR Absolute Pressure Transducer
Flight Engineer Circuit Breaker Panel #4	Fwd Main AC Bus #2	26 Vac Instrument Transformer MADAR Flap Position Transducer
Flight Engineer Circuit Breaker Panel #5	Main DC Bus #2	MADAR Transducer REFRG Avionics Cooling Duct Overheat Ind. Lt.
		Avionics Cooling Fan #2 Control
Flight Engineer Circuit Breaker Panel #6	Main DC Bus #1	MADAR Control
		Avionics Cooling Fan #1 Control
Navigator Circuit Breaker Panel	26 VAC Bus #1	MADAR Synchro Conv Exc
	NAV Bus No. 2	26 VAC. NAV Trans.
	Avionics AC Bus #1 Phase A	NAV Bus #2
AC Load Ctr Circuit Breaker Panel #2	Aft Main AC Bus #1	MADAR XDUCER Eng #1
	Aft Main AC Bus #2	MADAR XDUCER Hyd Sys #1 & #2 MADAR XDUCER Eng #2 MADAR XDUCER Refrg
AC Load Ctr Circuit Breaker Panel #3	Aft Main AC Bus #3	MADAR XDUCER Hyd #3 & 4 MADAR XDUCER Eng #3 MADAR XDUCER Compt Temp
	Aft Main AC Bus #4	
MUX/PROC Memory J-Box Avionics Bay #3	INS-1 Battery	Multiplexer/Processor Memory No. 1
	INS-2 Battery	Multiplexer/Processor Memory No. 2
	INS-3 Battery	Multiplexer/Processor Memory No. 3
Avionics Bay #2		SAR Power Supply (15 Circuit Breakers on front of unit) * LESS SCM (1 circuit breaker on front of unit)

* Aircraft with LESS Installation Only

Figure 8. Power Interconnection (Sheet 1 of 4)

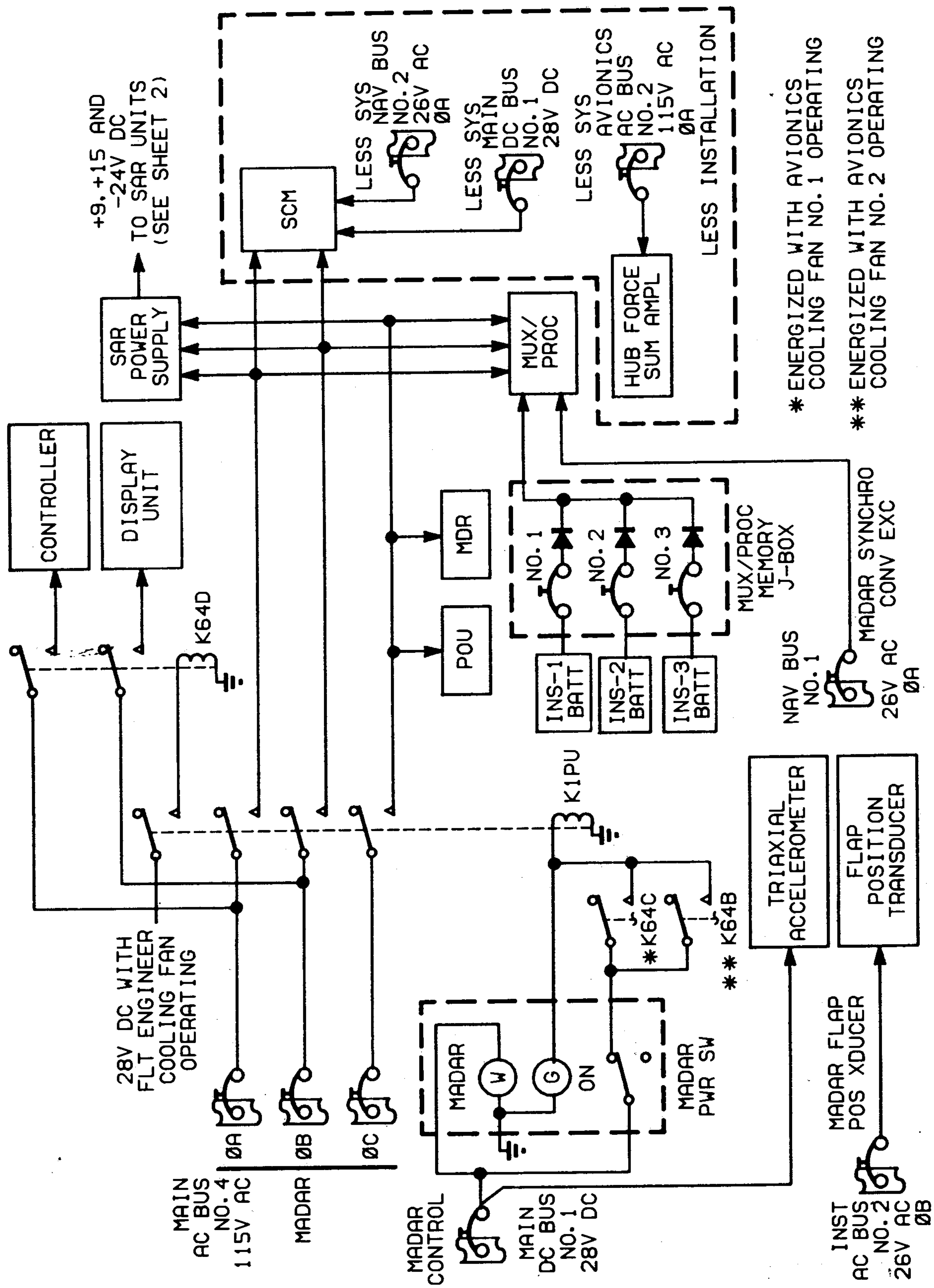


Figure 9. Power Interconnection (Sheet 2 of 4)

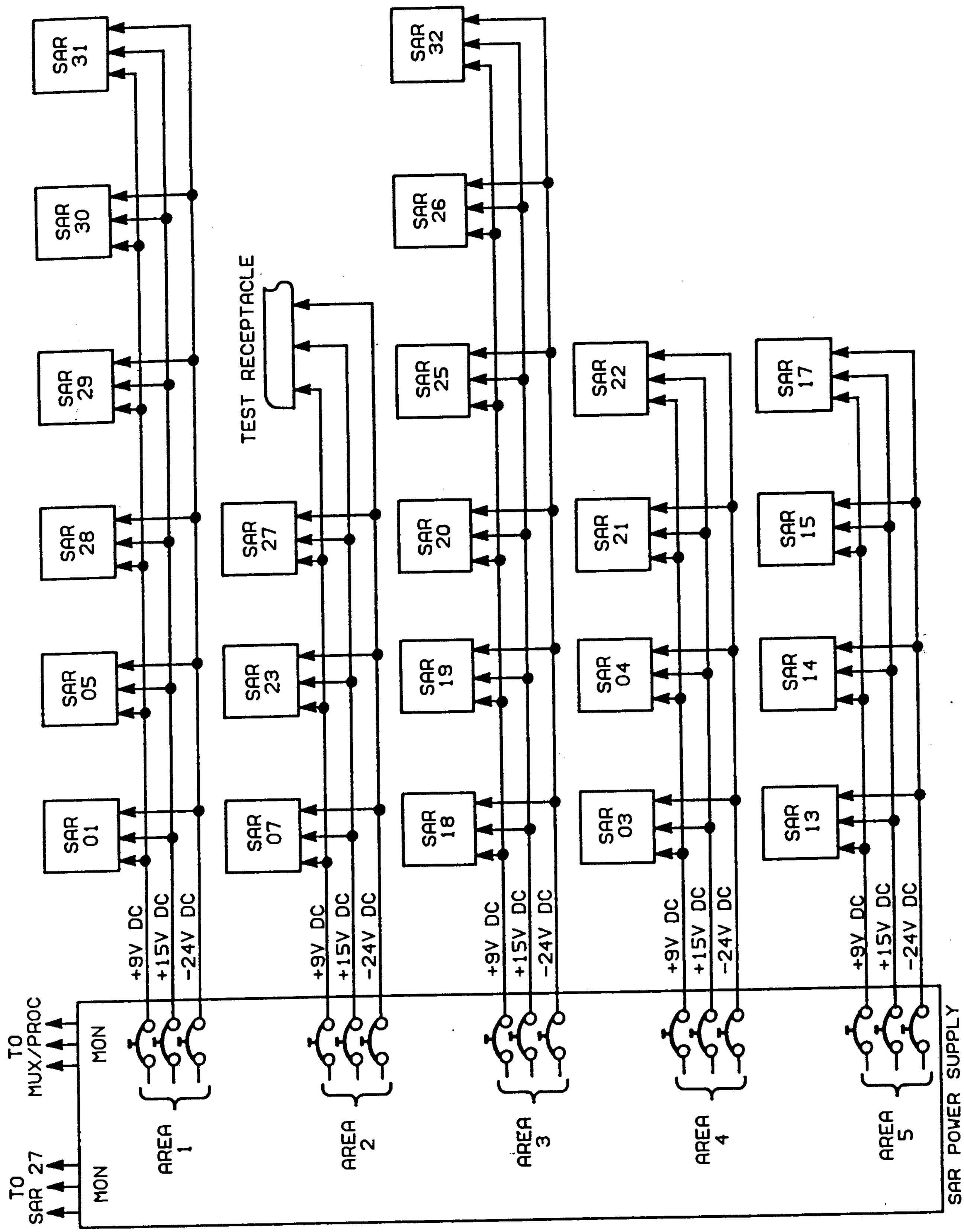


Figure 10. Power Interconnection (Sheet 3 of 4)

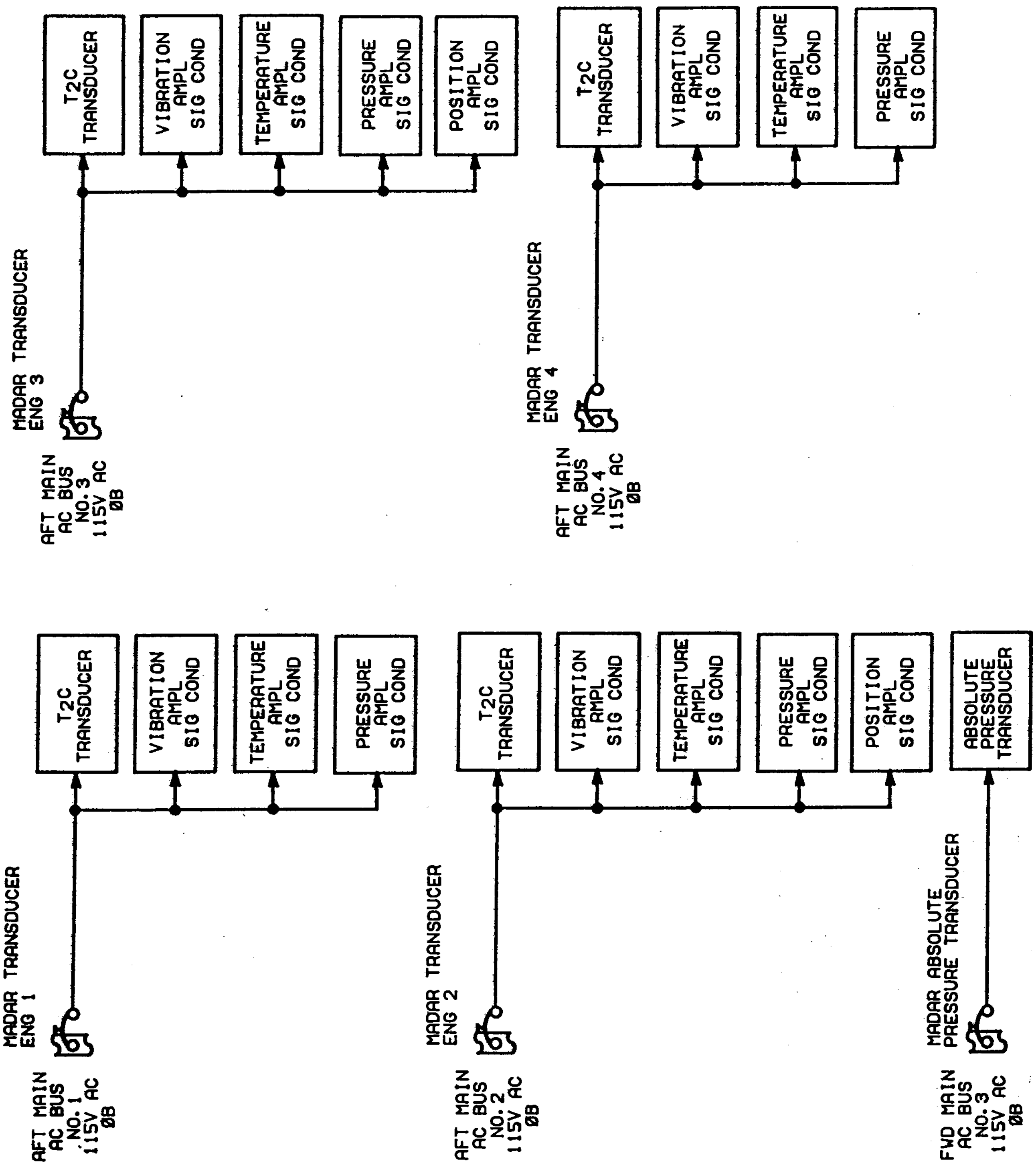
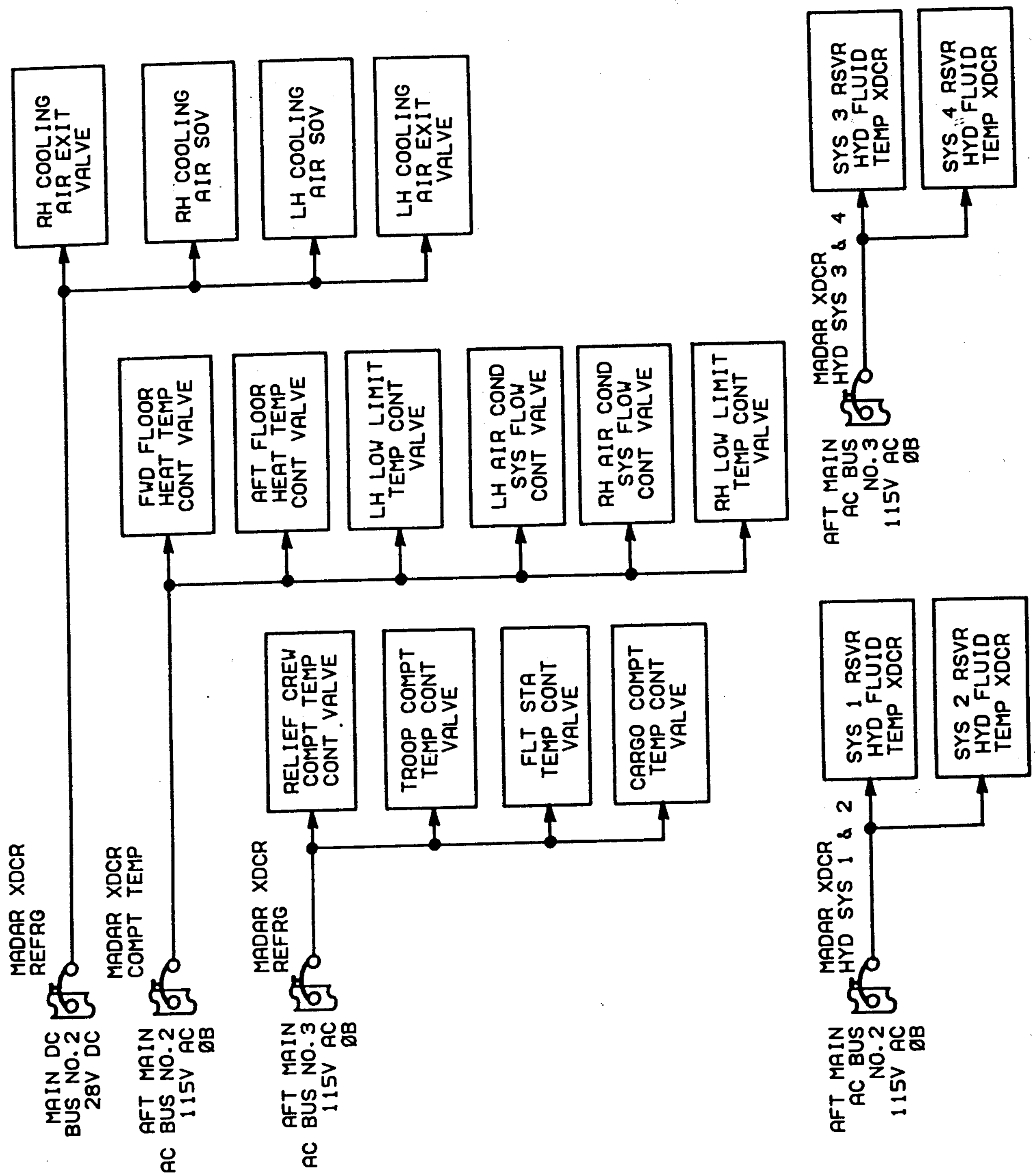


Figure 11. Power Interconnection (Sheet 4 of 4)



MADAR/FIR Interface

The FIR interfaces with the MADAR via the ARINC 717 digital data bus. (See figure 13.) Data collected and formatted by the MUX/PROC is transmitted to the FIR, where it is recorded. This data is collected by the MUX/PROC from the central air data computer via the 1553 bus, the inertial navigation system (INS), and aircraft subsystem data acquired through SAR units. The attitude and heading synchro inputs to the MUX/PROC are from either INS 1 or INS 3.

The following MADAR components are essential for a complete data interface between FIR and MADAR.

- MUX/PROC
- SAR units 01, 03, 04, 05, 13, 14, 17, 18, 19, 20, 21, 22, 27, 28, and 29
- SAR power supply
- CADC 1 and 2
- INS 1 and 3

MADAR/LESS Interface

Five C5-B aircraft are equipped with the LESS system. This system interfaces with the MADAR II system through a signal conditioner/multiplexer (SCM), which is assigned SAR addresses 08 and 09. The purpose of this system is to provide structural stress data. (See figure 14.) This data, along with other aircraft data, is stored in the MUX/PROC and recorded on the MDR for trending and analysis. The serial numbers of the five aircraft with LESS installed are stored as part of the flight program. If the aircraft serial number input by the operator is the same as one of those serial numbers, the LESS parameters are recorded. If not, that part of the program is ignored.

Maintenance Concepts

Organizational maintenance of the MADAR II system consists of an operational checkout of the system and periodic cleaning of the MDR recorder head and capstan and the POU print head. Periodic replacement of the DU and CNTRL cooling air filters is also required. When a malfunction is detected, special and general purpose test equipment are utilized for further testing. Interfacing systems must be operational for the checkout. Repair consists of component replacement and adjustment of some interfacing equipment.

Figure 12. Interface Diagram

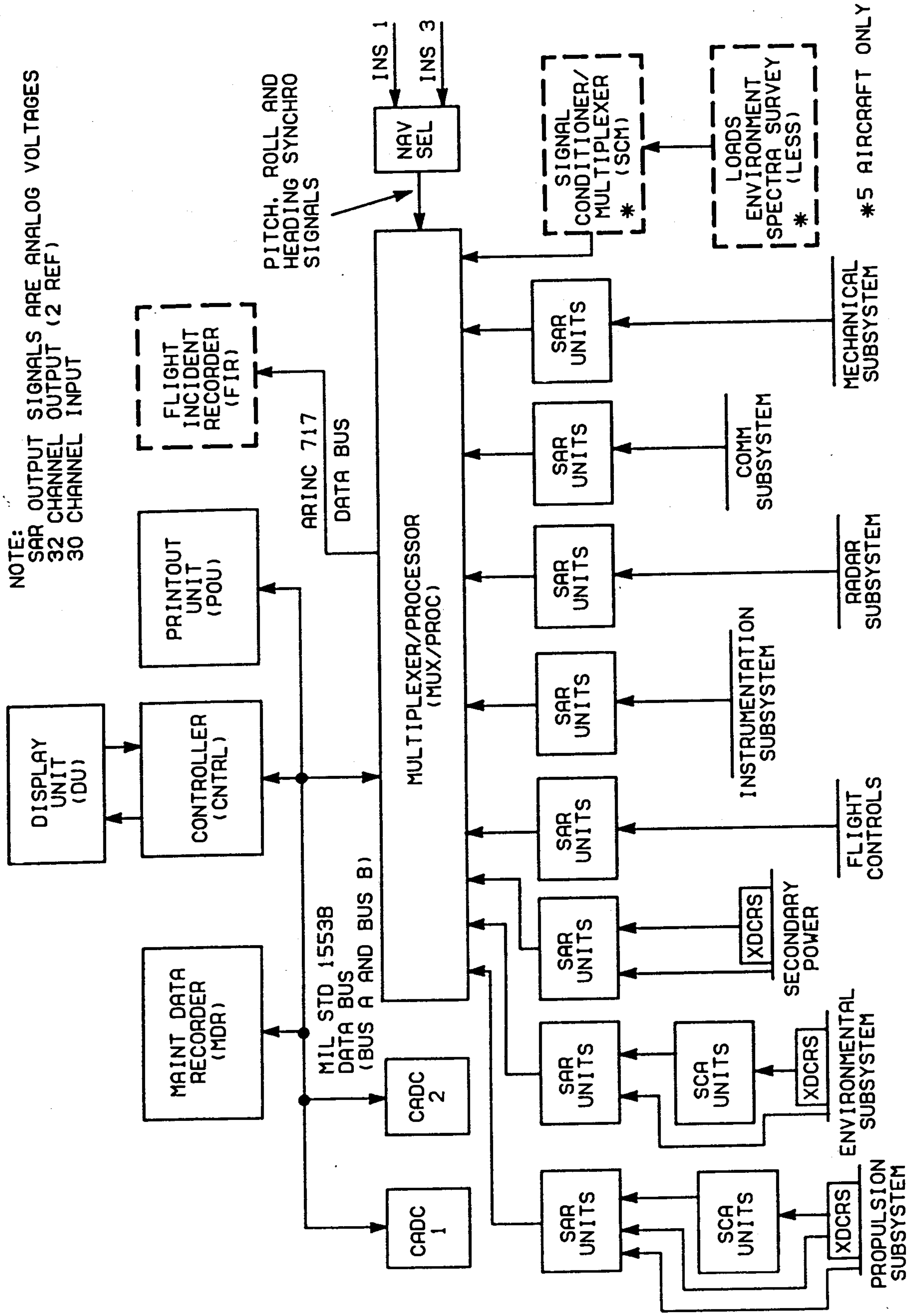


Figure 13. FIR/MADAR Interface

SAR	CHANNEL	DATA
05	21	VERTICAL ACCEL
05	22	LATERAL ACCEL
05	08	HF 1 KEY
05	09	HF 2 KEY
05	10	VHF 1 KEY
05	11	VHF 2 KEY
05	12	UHF 1 KEY
05	13	UHF 2 KEY
05	23	LONGITUDINAL ACCEL
13	18	AOA SIGNAL
28	15	PMG VOLTAGE GEN 1
28	20	PMG VOLTAGE GEN 2
28	03	PMG VOLTAGE GEN 3
29	16	PMG VOLTAGE GEN 4
27	16	AC ELEC SYS VOLTAGE MON
01	03	GEAR HANDLE
01	12	P/AP SERVO CLUTCH
14	28	R/AP SERVO CLUTCH
17	01	ATS ENGAGE SW STATUS
05	19	RADAR ALTITUDE NO.1
19	18	TR SW 1 & 2 ENG NO.1
19	19	TR SW 3 & 4 ENG NO.1
20	18	TR SW 1 & 2 ENG NO.2
20	19	TR SW 3 & 4 ENG NO.2
21	18	TR SW 1 & 2 ENG NO.3
21	19	TR SW 3 & 4 ENG NO.3
22	18	TR SW 1 & 2 ENG NO.4
22	19	TR SW 3 & 4 ENG NO.4
73	26	CADC NO.1 STATUS
73	20	CAS CADC NO.1
73	16	ALTITUDE CADC NO.1
73	25	FINE ALTITUDE CADC NO.1
73	24	SAT CADC NO.1
77	26	CADC NO.2 STATUS
77	20	CAS CADC NO.2
77	16	ALTITUDE CADC NO.2
77	25	FINE ALTITUDE CADC NO.2
77	24	SAT CADC NO.2
27	22	SQUAT SW
01	16	LOW OIL PRESS. SW. ENG 1
01	17	LOW OIL PRESS. SW. ENG 2
01	18	LOW OIL PRESS. SW. ENG 3
01	19	LOW OIL PRESS. SW. ENG 4

SAR	CHANNEL	DATA
03	10	CABIN-CARGO SMOKE DET
03	09	CABIN LOW PRESS.
04	14	FAN RPM N1. ENG 1
04	13	FAN RPM N1. ENG 2
04	01	FAN RPM N1. ENG 3
04	10	FAN RPM N1. ENG 4
04	09	CORE RPM N2. ENG 1
04	02	CORE RPM N2. ENG 2
04	06	CORE RPM N2. ENG 3
04	05	CORE RPM N2. ENG 4
04	29	TIT. ENG 1
04	25	TIT. ENG 2
04	26	TIT. ENG 3
04	30	TIT. ENG 4
03	22	FUEL FLOW. ENG 1
03	18	FUEL FLOW. ENG 2
03	26	FUEL FLOW. ENG 3
03	30	FUEL FLOW. ENG 4
01	30	THROTTLE ANGLE. ENG 1
01	29	THROTTLE ANGLE. ENG 2
01	26	THROTTLE ANGLE. ENG 3
01	25	THROTTLE ANGLE. ENG 4
03	07	LUBE OIL PRESS. ENG 1
03	03	LUBE OIL PRESS. ENG 2
03	05	LUBE OIL PRESS. ENG 3
03	01	LUBE OIL PRESS. ENG 4
01	02	LE WING SLAT SW RETRACTED
01	01	LE WING SLAT SW EXTENDED
18	29	TE FLAP POSITION
01	13	INS SELECT NO.1 OR NO.3
-	-	HOURS (MISSION ELAPSED TIME)
-	-	MINUTES (MISSION ELAPSED TIME)
-	-	SECONDS (MISSION ELAPSED TIME)
78	02	PITCH
78	05	ROLL
78	08	HEADING

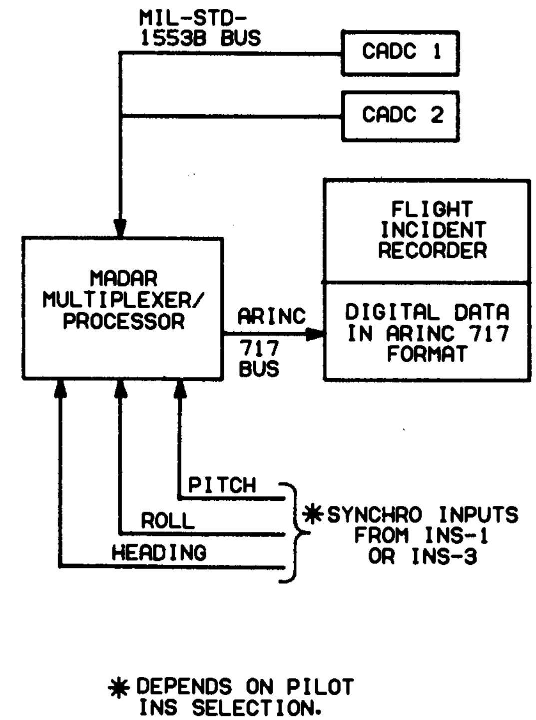


Figure 14. LESS Parameters

TEST POINT DESCRIPTION	PARAMETER ID	SAR/CHANNEL	
Pitch A/P Engage	PIT	01	12
Throttle Angle Engine 4	TA-4	01	25
Throttle Angle Engine 3	TA-3	01	26
Throttle Angle Engine 2	TA-2	01	29
Throttle Angle Engine 1	TA-1	01	30
Fuel Flow Engine 1	FF-1	03	22
Fuel Flow Engine 2	FF-2	03	18
Fuel Flow Engine 3	FF-3	03	26
Fuel Flow Engine 4	FF-4	03	30
Compressor RPM Engine 1	N2-1	04	09
Compressor RPM Engine 2	N2-2	04	02
Compressor RPM Engine 3	N2-3	04	06
Compressor RPM Engine 4	N2-4	04	05
Vertical Accel At CG	VA/CG	05	21
Mach Number	MACH	73	19
Altitude	PR ALT	73	16
Spoiler Position	SPOIL	08	01
Air Refueling	AR	08	03
Air Drop	AD	08	04
Fuel Weight	FUEL	08	13
Upper Rudder Position	UP RUD	08	17
Inboard Elevator Position	IN EL	08	18
Right Aileron Position	AILER	08	19
Ground Speed	VG	08	21
Strain, Wing Upper IWBRS 281	UAST	08	24
Strain, Wing Lower IWBRS 281	LAST	08	25
Strain, IWBRS 138	LAST 2	08	26
Strain, Wing Upper OWBRS 64	UP PNL	08	28
26V AC Monitor	26V AC	08	29
Strain, Right Horiz BL 83.5	RH 83.5	09	05
Strain, Vertical Tail WL 475	V475	09	06
Strain, Vertical Tail WL 705.5	V705.5	09	07
Strain, Fus Crown FS 1660	F1660	09	08
Strain, Fus Crown FS 2182	F2182	09	09
Strain, Main Frame Outer Cap FS 1383	MO 1383	09	10
Strain, Frame Stick Outer Cap FS 1383	SO 1383	09	11
Strain, Fus Main Frame Inner FS 1383	MI 1383	09	12
Roll Angle	BANK	09	13
Heading	HEAD	09	14
Hub Force Sensor P/CP	HUB FO	09	15
Left Aileron Position	LT AIL	09	16
Strain, Wing Lwr Aft OWBRS 409	L409A	09	17
Flap Position	FLAP	18	29
Outboard Thrust Reversers	OUT TR	19	18
Inboard Thrust Reversers	IN TR	20	18
Touchdown Switch	TD/SW	27	22
ALDCS Engage	AL	14	10
ALDCS Validity	AL	14	29

Intermediate level (shop maintenance) consists of testing system components with the aid of special testers and general test equipment. In this environment, each individual circuit can be tested and minor repair performed.

Beyond on aircraft and shop effort, maintenance requiring component disassembly, cleaning, replacement, and reassembly is performed at depot level.

Reference Data

The following manuals furnish detailed organizational maintenance and inspection instructions:

- T.O. 1C-5A-2-6, Organizational Maintenance, Instruments.
- T.O. 1C-5A-102-1, Operating Instructions, Malfunction, Detection, Analysis, and Recording System (MADARS).
- T.O. 1C-5A-2-11-2, Airplane Wiring Diagrams.
- T.O. 1C-5A-6, Scheduled Inspection and Maintenance Requirements.

SYSTEM OPERATION

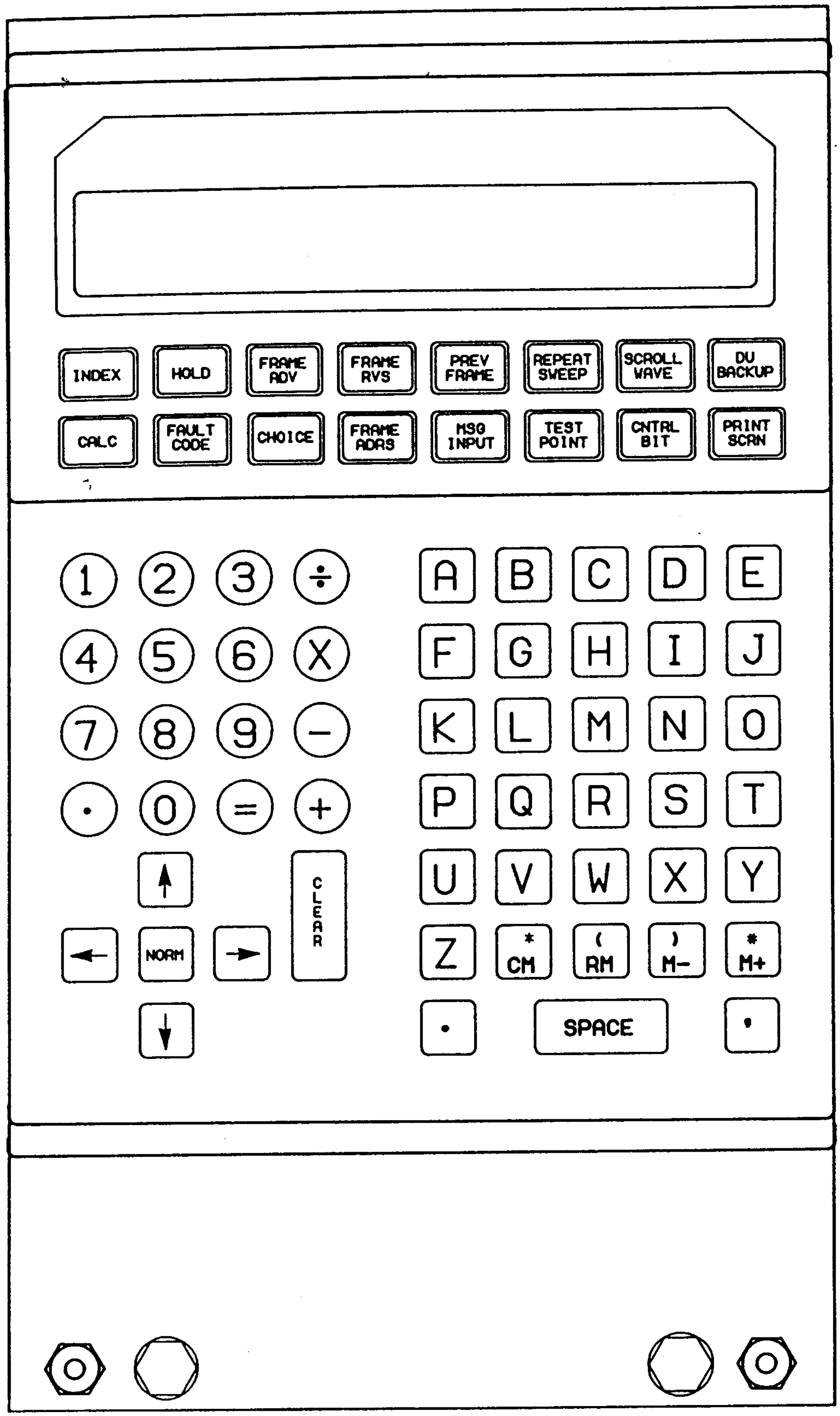
The following paragraphs provide a detailed description of the MADAR II control display group, located at the flight engineer station as shown in figure 3 and the MDR. The control display group provides the operator/MADAR interface and consists of the CNTRL, DU, and POU. The following paragraphs will provide information on the operation of all operator accessible controls on units in the control display group and the MDR. Commands associated with the message input function, as well as the DU display formats and POU printout formats, are also explained.

Controller

The CNTRL provides control of MADAR II through use of the function and alphanumeric keys. (See figure 15.) The CNTRL interfaces directly with the DU and the MUX/PROC. The DU interface is via dedicated video and logic lines. The MUX/PROC interfaces via the data bus. The CNTRL interfaces with the POU through the MUX/PROC.

Operator accessible controls on the front panel of the CNTRL include 16 function keys, 22 numeric keyboard keys, and 33 alphabetic keyboard keys. The following paragraphs explain the operation of these keys.

Figure 15. Controller



Function Keys

INDEX - This key allows the operator to locate any desired index quickly. Pressing the INDEX key displays the index frame (frame 00002), which lists all indexes for subsystems (propulsion, environmental, secondary power, etc.) monitored by MADAR. Entering the first three letters of a subsystem title and pressing the index key will display the desired subsystem index frame. When a letter (A to Z) is entered prior to pressing the INDEX key, the alphabetical index of MADAR manual routines for the entered letter is displayed. When MSG is entered prior to pressing the INDEX key, the index frame of controller keyboard commands (frame 04501) is displayed. Individual SAR data frames may be accessed by entering the two digit SAR address number and pressing the INDEX key. Any other entry prior to pressing the INDEX key results in INDEX UNASGND being displayed at the right end of the entry line.

HOLD - This key allows storage of up to five identification (ID) codes (bookmarks) and display frame numbers in the MUX/PROC memory for future recall. When a one to four alphanumeric character ID code is entered prior to pressing the HOLD key, the ID code and the presently displayed frame are stored for recall. If more than five ID codes are entered, the oldest codes are automatically deleted from the hold table memory. If previously stored, entering the ID code and pressing the HOLD key recalls the stored frame and erases the ID code and the recalled frame address from memory. When pressing the HOLD key without preceding it with the entry of an ID code, a list of the presently stored ID codes and display frames is displayed in the data display area.

FRAME ADV - Pressing the FRAME ADV (advance) key results in the next higher numbered display frame appearing in the frame display area. If frame 20000 is being displayed when the FRAME ADV key is pressed, no frame advance occurs.

FRAME RVS - Pressing the FRAME RVS (reverse) key results in the next lower numbered display frame appearing in the frame display area. If frame 00001 is being displayed when the FRAME RVS key is pressed, no frame reverse occurs.

PREV FRAME - Pressing the PREV (previous) FRAME key recalls the frame which was displayed prior to the presently displayed frame. When pressed again, the frame previous to that is displayed. This process may be repeated to recall the last 30 frames displayed or until the end of the previous frame table is reached, whichever occurs first. When the last frame in the table is reached, the display frame no longer changes when the PREV FRAME key is pressed.

REPEAT SWEEP - When a waveform is present on a display frame grid, pressing the REPEAT SWEEP key for less than 0.5 second results in a single update of the waveform. Pressing and holding the REPEAT SWEEP key results in a continuous update of the waveform until the key is released. The repeat sweep function is not programmed to operate with the waveforms on all display frame grids.

CALC - Pressing the CALC (calculator) key activates a four function calculator capable of addition, subtraction, multiplication, and division. When the calculator function is enabled, CALC is displayed in the upper right corner of the event display area. Activating the calculator enables the lower case memory keys on the alpha keyboard to provide a single memory location for storage of data and disables the alphabet (A-Z), comma, space, and all function keys except CALC and CNTRL BIT. The five mathematic keys (plus, minus, multiply, divide, equals) become active and are no longer displayed when pressed. The period and decimal point keys are used interchangeably to indicate the decimal point. Pressing the CLEAR key once clears the entry line and pressing it twice clears the calculation in progress. The entry line is used to input data and the results are read on the entry line. If the result of a calculation is larger than 99999999, LESS THAN - 99999999 or if an illegal operation is attempted, ERROR is displayed on the left end of the entry line. The CALC key is used to clear all previous calculations and to disable the calculator function. The calculator function is used in the standby, test, and operate modes.

FAULT CODE - Pressing the FAULT CODE key results in the table of presently failed fault codes being displayed in the data display area in numerical sequence by category (general automatic, special automatic, manual). When a valid fault code number or event message is entered and the FAULT CODE key is pressed, the fault code/event message is cleared (erased) from the event display area and displayed in the data display area along with its nomenclature. If an invalid fault code/event message is entered and the fault code key is pressed, F CODE UNASGND is displayed on the right end of the entry line. The failed fault code table and fault code nomenclature are scrollable as indicated by a "caret" symbol in the upper right corner of the data display whenever additional data is available for viewing but not visible.

CHOICE - Entering a number from 1 to 10 and pressing the CHOICE key results in the programmed display frame being displayed or the programmed fault code failure being recorded. If the choice number entered is not assigned, if it is greater than 10, an alpha character, or if no entry is made and the CHOICE key is pressed, CHOICE UNASSGND is displayed at the right end of the entry line.

SCROLL WAVE - This key allows the operator to scroll a displayed waveform or scroll the data in the data display area depending on the selection. Entering a 1 (A trace), 2 (B trace), or B (both traces) to designate the waveform(s) to be positioned, then pressing the SCROLL WAVE key enables this function. The waveforms are refreshed such that there is the appearance of horizontal movement from right to left as long as the key is pressed. Entering (+) plus or (-) minus, then pressing the SCROLL WAVE key results in scrolling of the data in the data display area either up (for +) or down (for -) one line each time the symbol is entered and the SCROLL WAVE key is pressed. If the SCROLL WAVE key is pressed for longer than one second after the symbol is entered, scrolling at the rate of one line per second will continue until the key is released or the end of the data is reached. Data which is scrollable is identified by a "caret" symbol in the upper right corner of the data display area. Entry of any other alpha or numeric character and pressing the SCROLL WAVE key results in INPUT ERROR being displayed at the right end of the entry line. The scroll wave function is not programmed to operate with waveforms on all display frame grids.

DU BACKUP - Pressing the DU BACKUP key places the POU in a real time mode of operation such that it prints all messages as they occur rather than when the POU buffer is full or when requested by the operator. When this function is enabled, BKUP is displayed in the upper right corner of the event display area, the printed POU messages are rotated 180 degrees from the nonDU backup mode to allow reading from the flight engineer position, and the MSG light on the POU comes on when a message is printed.

FRAME ADRS - Pressing the FRAME ADRS (address) key results in the display frame area being cleared (blanked out). Entering one to five numeric characters and pressing FRAME ADRS displays the entered frame in the frame display area. If the requested frame number does not exist and FRAME ADRS is pressed, FRAME UNASGND is displayed at the right end of the entry line.

MSG INPUT - This key is used by the operator to input various commands such as operational mode changes, engine test, engine vibration analysis, etc. entry of specific keyboard commands consisting of not more than 10 alphanumeric characters and pressing the MSG INPUT key enables this function. (See Message Input Commands in this handbook.) Data resulting from message input commands is displayed in the data display area. When not preceded by an alphanumeric code, the data display area is cleared (blanked out). When used following the entry into the initialization update operation each time the MSG INPUT key is pressed, the new data is entered and the cursor is advanced to the next data field in the data display area. When used following the entry into the scratch pad operation, pressing the MSG input key stores the displayed data in safestored memory for future recall and returns the cursor to the entry line. If a command code not contained in the keyboard command index is used, INPUT ERROR is displayed on the right end of the entry line.

TEST POINT - This key is used by the operator to request test point information for display on the digital voltmeter (DVM) and/or on a display frame waveform grid. Entry of a SAR and channel number or a SAR and channel number followed by A, then pressing the TEST POINT key results in display of test point data on the upper DVM (DVM-A) and/or on the display frame grid as the A trace waveform.

Entry of a SAR and channel followed by B, then pressing the TEST POINT key results in display of test point data on the lower DVM (DVM-B) and/or on the display frame grid as the B trace waveform. DVM displays of test point data are updated every two seconds. Use of the TEST POINT function key overrides automatically programmed test points. When not preceded by a SAR and channel number, pressing the TEST POINT key clears (blanks out) both DVM displays. If an unassigned SAR (SS) number, an unassigned channel (cc) number, or an alpha character is entered as a SAR number, TEST PT UNASGND is displayed on the right end of the entry line. If the channel number entered is anything other than 00 through 31, INPUT ERROR is displayed on the right end of the entry line.

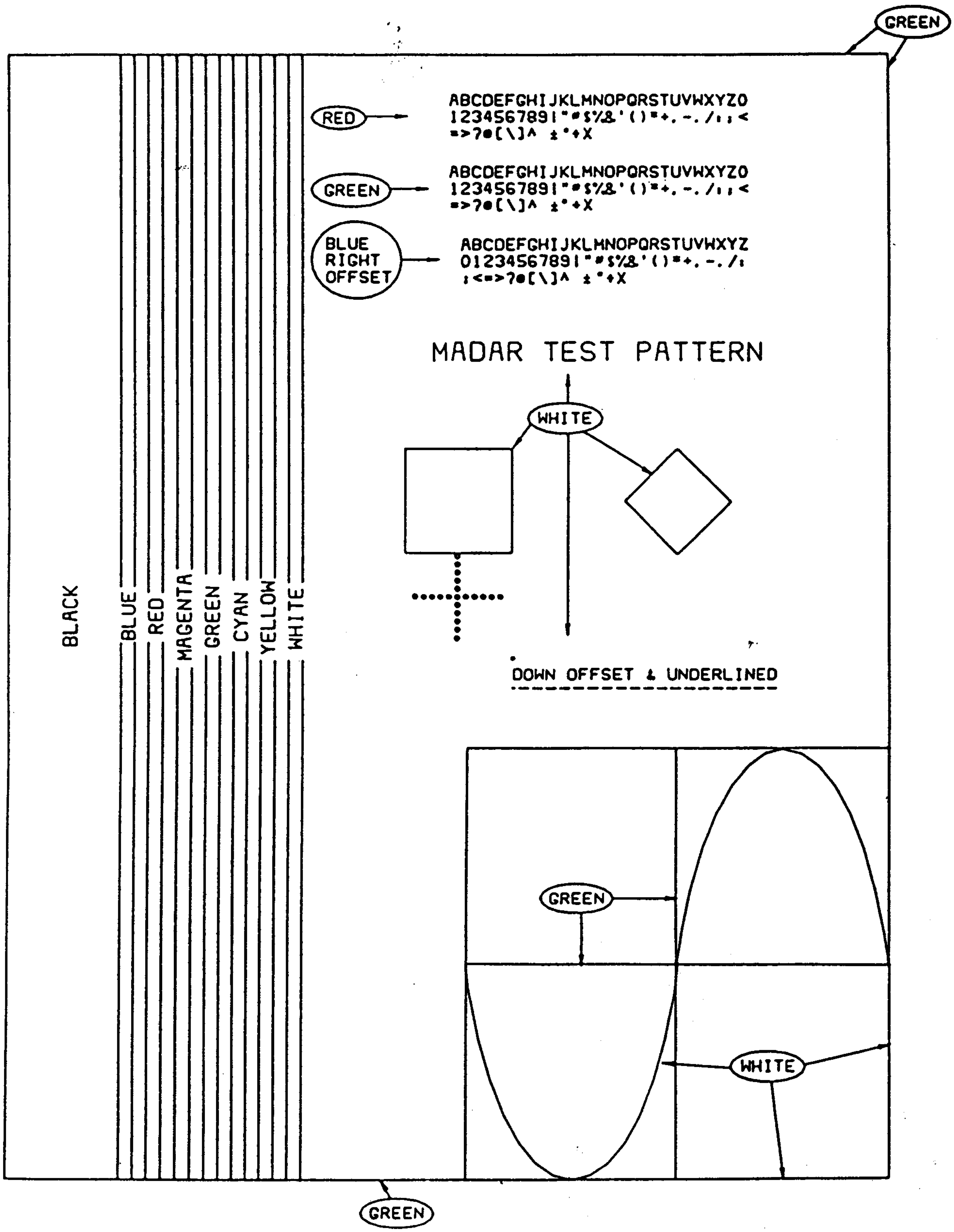
CNTRL BIT - **This key initiates an internal self test of the** controller used to check the status of the controller, to unlock the keyboard if it is rendered inoperative or in troubleshooting. Pressing the CNTRL (controller) BIT (built in test) key results in display of a controller test pattern on the display unit (DU) for 5 seconds. (See figure 16.) If the CNTRL BIT key is pressed twice within 5 seconds, the test pattern remains on the DU until cleared (blanked out) by pressing the CLEAR key. The CNTRL BIT function reinitializes the controller; therefore, any frame previously displayed is cleared and will not reappear upon exiting this function.

PRINT SCRN - This key is used by the operator to print the information currently displayed in the data display area. Pressing the PRINT SCRN key will cause the POU to print the current contents of the POU buffer followed by the data presently in the data display buffer. If the DU backup function has been selected, pressing the PRINT SCRN key turns off the POU MSG light but does not cause any printing on the POU.

Numeric Keyboard Keys

Numbers - Ten keys labeled 0 (zero) through 9 are used to input numeric data on the entry line. This data may be in the form of keyboard commands used in conjunction with the function keys or numeric values used in conjunction with the calculator mode of operation. These keys are also used to input data in the data display area after using the INIT (initialization) command and the PAD (scratch pad) command.

Figure 16. Controller BIT Pattern



Mathematical Symbols - Five keys labeled with the symbols for addition, subtraction, multiplication, division and equals are used to select the desired mathematical operation when using the calculator. These keys do not display their symbols when using the calculator, but display their symbols when used to input data on the entry line and in the data display when the calculator is not active. The addition and subtraction keys are also used in conjunction with the SCROLL WAVE function key. For details, see Scroll Wave under the heading Function Keys in this chapter.

Decimal Point - This key is used as a decimal point when using the calculator and serves as a period when data is inputted on the entry line and in the data display area when the calculator is not active.

Arrows - Four keys labeled with symbols for up, down, left, and right are used for repositioning of waveforms on the display grid and for moving within the data display area when using the scratchpad as well as for moving the cursor either left or right on the entry line or within a specific data field in the data display area when updating the initialization data.

Entering a 1 (A trace), 2 (B trace) or B (both traces) to designate the waveform to be positioned then pressing the appropriate arrow key maneuvers the selected waveform in the requested direction. When the cursor is on the entry line or in the data display area, pressing the left and right pointing arrows moves the cursor in the desired direction. When the initialization data is being displayed, the cursor moves within the selected data field. There is a wrap-around feature at the borders of the data display area and at the end of the entry line such that the cursor will move from the bottom to the top or vice versa or from the end of the line to the beginning of the same line if the cursor is advanced beyond the border.

NORM - Pressing the NORM (normal) key repositions the cursor from its present position on the entry line, in the scratchpad area, or in any field of the initialization data in the data display area to the left margin (first character space) on the entry line.

CLEAR - Pressing the CLEAR key clears (blanks out) data on the entry line, when using the scratchpad or will clear the data block where the cursor is resting when updating the initialization data. This key is also used to erase the controller BIT pattern from the display unit after the CNTRL BIT key has been pressed twice within a five second period.

Non-Numeric Keys

Letters - Twenty-six keys labeled A through Z are used to input data on the entry line or in the data display area. These keys are not operational in the calculator function.

Symbols - Four upper case keys labeled asterisk (*), lefthand parenthesis ((), righthand parenthesis ()), and number/pound (#) are used to input data on the entry line and in the data display area.

CM - This lower case key is used when the calculator function is operational. Pressing the clear memory (CM) key clears all data in the calculator memory location.

RM - This lower case key is used when the calculator function is operational. Pressing the RM (recall memory) key causes the data stored in the calculator memory location to be displayed in the calculator display on the left end of the entry line.

M- - This lower case key is used when the calculator function is operational. Pressing the M- (memory minus) key causes the data displayed in the calculator display to be subtracted from the data stored in the calculator memory location.

M+ - This lower case key is used when the calculator function is operational. Pressing the M+ (memory plus) key causes the data displayed in the calculator display to be added to the data stored in the calculator memory location.

Period - This key is used to input data on the entry line and in the data display area. It is used as a decimal point when the calculator is active.

Comma - This key is used to input data on the entry line and in the data display area. The comma key is not operational in the calculator function.

Space - This key is used to input data on the entry line and in the data display area. Pressing the space key allows insertion of a space between characters or erasing a character if the cursor is placed over an existing character.

Message Input Commands

Table I defines the function of each keyboard command associated with the MSG INPUT button on the CNTRL. These commands are divided into four categories - operational modes, update memory, data retrieving, and recordkeeping. (See figure 17.) Each command is activated by entering the listed alphanumeric code or numeric code, if applicable, and pressing the MSG INPUT key on the CNTRL. In some cases a numeric code can be entered; however, since this is not applicable to all commands, the alphanumeric code is preferred. Many commands cause a display on the DU. The format of the display is explained in the display format section.

Figure 17. Message Input Commands

KEYBOARD COMMAND		RESULT
OPERATIONAL MODE COMMANDS		
STBY	1000001	Go to Standby Mode
TEST	1000002	Go to Test Mode
OPER	1000003	Go to Operate Mode
UPDATE MEMORY COMMANDS		
ZERO	1000011	Zero Flight Report
NEWPROGRAM		NEW Program Loading Instructions
LOAD		Load Program Tape
RECORD		Return to Normal Operation after Program Loading
RESTART		Program Restart
FEaaxxxx		Update Flight Engineer's I.D.
ORGxxxx		Update Flight Engineer's Organization
DAddmmyy	5ddmmyy	Update Date
TIMhhmmss	6hhmmss	Update Time
ASxxxxxx		Update Airplane Serial Number
AHxxxxxx		Update Airframe Hours
ESnxxxx	13nxxxx	Update Engine n Serial Number
EHnxxxxx		Update Engine n Hours
EFBnbb	16n00bb	Update Engine n Index Bolt Number
DATA RETRIEVING COMMANDS		
FLTR	1000021	Output Flight Report
INIT	1000022	Output/Update Initialization Data
SUPP	1000023	Output Table of Suppressed Fault Codes
SDss	17000ss	Output SAR Dump
ETrpmn	200rpmn	Perform Engine n Health Test
EPttn	2100ttn	Output Engine n Parameters
VRFsscc		Output Engine Resonant Vibration Fan Data
VRCsscc		Output Engine Resonant Vibration Core Data
VAsscc	818sscc	Perform Engine Vibration Analysis
FTBn	819ss08	Perform Engine Fan Trim Balancing
PREV		Output Table of Previous Frames
EVENT		Output Table of All Unacknowledged Events
UTP		Output Table of Unstable Test Points
TAPE		Output Percentage of MDR Tape Remaining
PAPER		Output Percentage of POU Paper Remaining
RECORD KEEPING COMMANDS		
Rxxxxx	92xxxxx	Report Fault Code xxxxx Replacement or Recovery
Fxxxxx	99xxxxx	Report Fault Code xxxxx Failure
STxxxxx	93xxxxx	Output Status of Fault Code xxxxx
Sxxxxx	94xxxxx	Suppress Fault Code xxxxx
Uxxxxx	95xxxxx	Unsuppress Fault Code xxxxx
RVnc	9600nc	Reset Vibration Monitoring
RVR		Reset Engine Resonant Vibration Data
RG		Reset G-Limit Monitoring
RP		Reset POU Paper Counter
PAD		Enable Scratchpad Operation
CPAD		Clear Scratchpad and Enable Operation
OATzxx		Input Runway Temperature
RPMxxx		Input Takeoff Static N_1 RPM
TITxxx		Input Predicted TIT
TOtt		Input Type of Takeoff

Table I. Keyboard Commands and Functions

Command	Command Action
Mode Commands	
STBY or 1000001	**Go To The Standby Mode.** This command places the MUX/PROC in a nonoperational mode. The system does not cycle through the various malfunction routines, thus no failure and recovery messages are output while in this mode. The word STBY appears in the upper right corner of the event display area while in this mode and the POU header message is terminated with the abbreviation STBY. Keyboard commands requesting data, frames, live test point data, etc., may be input while in this mode. The MADAR start up entries are made while in this mode. As a safeguard, the system automatically goes to the operate mode when any engine N2 RPM reaches 60 percent or above, or the airplane is jacked and the error message MODE NOT ALLOWED is displayed if the STBY command is entered under these conditions.
TEST or 1000002	**Go To The Test Mode.** This command places the system in a fully operational mode except that no operational data is transmitted to the MDR. However, when the system is commanded to the test mode, the MUX/PROC tests the ability of the MDR to record and read data without error. The status of all automatic fault codes is set to good and the system then cycles through the fault code routines to determine the status of each. The test mode is primarily provided for ground maintenance. All other commands may be input while in this mode. The word TEST appears in the upper right corner of the event display area and the POU header message is followed by the word TEST. As a safeguard, the system automatically goes to the operate mode when any engine N2 RPM reaches 60 percent or above, or the airplane is jacked and the error message MODE NOT ALLOWED is displayed if the TEST command is entered under these conditions.
OPER or 1000003	**Go To The Operate Mode.** This command allows the MADAR to become fully operational. Since the MDR records in this mode, it is used only to obtain flight data or in specially controlled ground tests. When the system is commanded to the operate mode, the MUX/PROC

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
	sets the status of all automatic fault codes to good and then cycles through the fault code routines to determine the states of each. The word OPER appears in the upper right corner of the event display area. As a safeguard, the system goes to operate mode when any engine N2 rpm reaches 60 percent or when the touchdown relay senses an airborne condition. Under these conditions, the error message MODE NOT ALLOWED is displayed if the STBY or TEST command is entered.
Update Memory Commands	
ZERO or 1000011	**Zero Flight Report.** This command is entered during home station preflight to clear the MUX/PROC memory of information recorded during the last mission or ground maintenance. This command zeroes the following MUX/PROC memory tables: flight report, suppressed fault codes, failed fault codes (auto and manual), unstable test points and the POU page counter. The data display and the POU show a flight report which is void of data. Entering this command in other than the standby mode will result in MODE NOT STBY being displayed on the right end of the entry line.
NEWPROGRAM	**Newprogram Loading Instructions.** This command causes frame 00103 (stored in the CNTRL memory) to be displayed on the DU approximately 10 seconds after MSG INPUT is pressed. (Note - NEW PROGRAM will remain on the entry line during this time). Frame 00103 contains the step by step procedures for programming the MUX/PROC. Do not enter this command unless programming is desired; as once accessed, frame 00103 cannot be cleared unless the steps on frame 00103 are followed or the MADAR system is turned off then on.
LOAD	**Load Program Tape.** This command causes the MDR to initiate loading of the program cartridge data into the safestored memory of the MUX/PROC. The program cartridge contains the executive routines and the data base information on a single tape.

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
RECORD	**Return To Normal Operation After Program Loading.** This command causes the MADAR to resume its normal systems monitoring functions and the MDR to resume recording following MUX/PROC programming and recording cartridge replacement.
RESTART	**Restart Flight Program.** This command is used only when the operator suspects that the MUX/PROC has entered a stalled condition (a command will not leave the entry line or a function cannot be performed and CNTRL BIT did not correct the situation). This command forces the MUX/PROC to reload the flight program from safestored memory and cycle through the start up self test. If this command is used, the operator makes additional entries to verify that the problem is corrected.
FEXXXXXX	**Update Flight Engineer I.D. (LL-NNNN).** The first XX denotes the first two letters of the last name and the remaining XXXX denotes the last four numbers of the social security number. The dash is programmed to display by the executive routine. Example: FEBE5780 displays as FLT ENGR ID BE-5780
ORGXXXX	**Update Flight Engineer Organization (NNNN).** The XXXX denotes the unit of assignment/attachment left adjusted with zeros as necessary. Example: ORG0009 displays as FLT ENGR ORG 0009
DAXXXXXX or 5ddmmyy	**Update Day/Month/Year (DD/MM/YY). Zulu Date.** The XXXXXX denotes the day, month, and year. The diagonals are programmed to display by the executive routine. Example: DA010985 displays as Z DATE (DDMMYY) 01/09/85

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
TIMXXXXXX or 6hhmmss	**Update Hour/Minute/Second (HH:MM:SS). Zulu Time.** The xxxxxx denotes the hour, minute, and second. The colons (:) are programmed to display by the executive routine. Normally, the seconds are updated to 00 but may be updated to the exact second when necessary. Example: TIM234500 displays as 23:45:00
ASXXXXXX	**Update Airframe Serial Number (NN-NNNN).** The airplane serial number must be updated whenever the MUX/PROC is initially installed or reprogrammed. It should be verified during the flight engineer pre/thru flight by entering the command INIT. The XXXXXX denotes the full serial number (not the tail number). The dash after the first XX is programmed to display by the executive routine. Example: AS831285 displays as AIRPLANE SERIAL 83-1285
AHXXXXXX	**Update Airframe Hours (NNNNN.N).** The XXXXXX is for airplane hours from the AFTO FORM 781J. The decimal point is programmed to display by the executive routine. Example: AH227522 displays as AIRFRAME HOURS 22752.2
ESXXXXX or 13nxxxx	**Update Engine (N) Serial Number (NNNN).** This entry contains two pieces of information. The first X designates the engine position (1,2,3 or 4) and the following XXXX are the last four numbers of the engine serial number from the AFTO FORM 781J. Example: ES43603 displays as ENG 4 SERIAL NO. 3603
EHXXXXXX	**Update Engine (N) Hours (NNNN.N).** This entry contains two pieces of information. The first X designates the engine position and the following XXXXX designates the engine hours from the AFTO FORM 781J. The decimal point is programmed to display by the executive routine.

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
	Example: EH443560 displays as ENG 4 HOURS 4356.0
EFBXXX or 16n00BB	**Update Engine (N) Fan Index Bolt Number (NN).** This entry contains two pieces of information. The first X designates the engine position and the following XX designates the index bolt number from the AFTO FORM 781J. Example: EFB313 displays as ENG 3 INDEX BOLT 13
Data Retrieving Commands	
FLTR or 1000021	**Display/Print Flight Report.** This command is entered as part of the shutdown procedure. This entry commands a display/printout of all events that have occurred since the flight report was last zeroed. The display/printout of events includes the program number, the number of takeoffs and landings, the number of times the MADAR system was powered up and the number of mode changes, a table of fault code failures, the number of times they failed and recovered and their final status (failed, recovered, suppressed). The fault code table is divided into three groups: general automatic (auto) fault code failures based on auto test data parameters; special automatic fault code failures based on the executive routine; and manual fault codes input by the operator. The listed failures in each group appear in numerical order. The flight report is scrollable as indicated by a "caret" symbol in the upper right corner of the data display whenever data is available for viewing but not visible.
INIT or 1000022	**Display Initialization Data.** This entry commands a display of initialization data that is stored in the MUX/PROC. The initialization data consists of the following: the program ID number, the date, A/C serial number, airframe hours, flight engineer ID and organization, engine serial numbers, hours, and fan index bolt numbers. This data must be checked

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
	for accuracy and updated, if necessary, during each pre/thru flight.
SUPP or 1000023	**Display Suppressed Fault Code Table.** This entry will command a display of fault codes that have been suppressed. the fault codes are listed in ascending numerical order from top to bottom and from left to right. The table capacity is 60 fault codes.
SDXX or 17000SS	**SAR Dump (SS), Display Calibrated Voltages from SAR XX.** When a SAR dump is commanded, the MUX/PROC reads the signal conditioned output voltages from all channels of the addressed SAR. if the calibrate channel voltages are within ± 0.25 volts of the nominal values of +4.0 on channel 31 and -4.0 on channel 00, the MUX/ PROC calibrates the voltages on channels 01 through 30 and displays them on the DU along with the uncalibrated voltages from channels 01 and 31. If either calibrate channel voltage is not within tolerance, -5.38 volts is shown for all channels regardless of actual SAR output voltages. If an individual test point is unstable, -5.38 volts is shown for that channel regardless of the actual test point output voltage. The XX denotes the program/unit number of the SAR to be interrogated. The SAR dump format gives the voltages in eight lines of four channels per line. The channel number is followed by the voltage given to two decimal places.
ETXXXX or 200rpmn	**Perform Engine (Health) Test and Display/Print Engine Test Data (RPM) (N).** The engine test routine samples selected propulsion and air data parameters and compares this data with stored performance curves for engine assessment. XXX (rpm) is the reading of the flight engineer N1 instrument (example: 95.3 percent is entered as 953) and the final X is the engine position. See frame 131 for the engine test introduction and index.
EPXXX or 2100ttn	**Display/Print Engine Parameters (TT) (N).** This entry commands a display/printout of selected propulsion and air data parameters with a time delay XX (TT) from 00 to 99 seconds for engine X (N) position (1 = engine No. 1, 2 = engine

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
	No. 2, 3 = engine No. 3, 4 = engine No. 4, and 0 = all four engines).
VRFXXXX	**Display Engine Resonant Vibration Data (SSCC).** This command initiates fan vibration analysis of test point SSCC at a rate of once per second for 60 seconds. This command is most useful in determining the rpm at which peak engine fan vibration (resonant rpm) occurs during engine ground runs and inflight by providing continuous vibration analysis data while the engine rpm is varied. (NOTE - The "VR" MILS values will normally be higher than the "VA" or "FTB" MILS values due to the changing rpm.) The first "XX" (SS) denotes the engine SAR number and the last "XX" (CC) denotes the channel number. Analysis can be terminated at any time by entering the command "RVR". The engine resonant vibration data is scrollable as indicated by a "caret" symbol in the upper right corner of the data display whenever additional data is available for viewing but not visible. This command will not display a waveform.
VRCXXXX	**Display Engine Resonant Vibration Core Data (SSCC).** This command performs the same function as above for the engine core.
VAXXXX or 818SSCC	**Engine Vibration Analysis (SSCC) and Display/ Record Test Point Burst Data.** This command displays engine vibration analysis data on the DU and records engine vibration burst data on the MDR for ground analysis. Upon entry of this command, the computer samples the specified test point 512 times in 0.16 seconds, provides a vibration data summary to the operator and records the data on the MDR. The first XX (SS) denotes the SAR number and the last XX (CC) denotes the channel number.
FTBX or 819SS08	**Engine Fan Trim Balance (N).** This command initiates engine fan vibration analysis using the turbine rear frame vibration transducer (channel 08). Through this analysis, the MUX/PROC determines the magnitude of the fan vibration (measured in waveform grid divisions and MILS), measures the phase angle between the fan signal and the N1 tachometer signal

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
	zero reference point, computes the bolt number to which the fan balancing weight is to be attached, and displays this data on the DU data display. Fan trim balancing is normally performed concurrently with engine fan vibration analysis but may be accomplished whenever fan vibration reaches 8 mils or greater at the fan resonant RPM.
PREV	**Display Previous Frames Table.** This command displays a chronological listing of the last display frames accessed up to a maximum of 30.
EVENT	**Display Table of All Unacknowledged Events.** This command displays a chronological listing of all messages output to the event display that have not been acknowledged by the operator. This table is scrollable as indicated by a "caret" symbol being displayed in the upper right corner of the data display whenever additional data is available for viewing but not visible.
UTP	**Display Table of Unstable Test Points.** This command displays a list of up to 45 test points which the MUX/PROC has declared as unstable due to excessive voltage variations.
TAPE	**Display Percent of MDR Tape Remaining.** This command displays the amount of MDR recording tape remaining to the nearest one percent.
PAPER	**Display Percent of POU Paper Remaining.** This command displays the amount of POU paper remaining to the nearest one percent.
Record Keeping Commands	
RXXXXX or 92xxxxx	**Report Fault Code XXXXX Replacement or Recovery.** When a manually reported fault code condition is corrected or no longer exists, this command is entered to clear the fault code from the failed fault code table. If this command is entered for an automatically reported fault code, F CODE NOT MANUAL is displayed on the right end of the entry line. When an automatic fault code condition is corrected, the fault code recovers automatically.

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
FXXXXX or 99xxxxx	**Report Fault Code XXXXX Failure.** When the fault code of a failed system is known, the operator may report the malfunction with this command. If this command is entered for an automatically monitored fault code, F CODE NOT MANUAL is displayed on the right end of the entry line.
STXXXXX or 93xxxxx	**Display the Status of Fault Code XXXXX.** When this command is entered, the present status (failed or recovered) is displayed as FXXXXX or RXXXXX on the data display.
SXXXXX or 94xxxxx	**Suppress Reports of Automatic Fault Code XXXXX.** This command is used to suppress display of fault code failures to prevent repeated failure messages when an intermittent condition exists or after a failure has been reported in the AFTO 781. Only entry of general automatic fault codes are accepted. Entry of special automatic or manual fault codes results in INPUT ERROR being displayed on the right end of the entry line. A fault code may be suppressed in the test and operate modes only. Once suppressed, a fault code remains suppressed until manually unsuppressed (command UXXXXX) or the flight report is zeroed. Fault code data continues to be recorded on the MDR and the flight report failure/recovery counters. The suppressed fault code table contains up to 60 fault codes. Entries exceeding this number result in TABLE FULL being displayed on the right end of the entry line.
UXXXXX or 95xxxxx	**Unsuppress Reports of Automatic Fault Code XXXXX.** This command unsuppresses a fault code that has been suppressed by a SXXXXX command and normal failure/recovery messages will resume.
RVXX or 9600nc	**Reset Vibration Monitoring (N) (C).** This command resets all engine vibration and vibration system fault codes associated with the entered vibration channel. The first X (N) denotes the engine number and the last X (C) denotes the channel number (8 or 9). Entries other than engine numbers 1 through 4 and/or

Table I. Keyboard Commands and Functions (Cont)

Command	Command Action
	channel numbers 8 and 9 result in INPUT ERROR being displayed on the right end of the entry line.
RVR	**Discontinue Displaying Engine Resonant Vibration Data.** This command terminates the engine resonant vibration analysis and display of data.
RG	**Reset Vertical Acceleration G Limit Monitoring.** This command resets the G limit monitoring routine after it has been inhibited. G limit monitoring is inhibited after display of the message F51507 FNL G, which occurs at detection of the fourth g limit exceedance. The message F51507 G-LIM is displayed at the first three exceedances.
RP	**Reset POU Paper Counter.** This command resets the counter which determines the percent of POU paper remaining on the printout unit supply reel.
PAD	**Enable the Scratchpad and Display the Scratchpad Data.** This command displays the contents of the scratchpad buffer in the data display area and positions the cursor for editing the data. After editing the scratchpad data, pressing the MSG INPUT key stores the data in the scratchpad buffer and returns the cursor to the entry line.
CPAD	**Clear the Scratchpad and Enable Scratchpad Operation.** This command clears the data in the scratchpad buffer and positions the cursor in the data display area for scratch pad use. After editing the scratch pad data, pressing the MSG INPUT key stores the data in the scratch pad buffer and returns the cursor to the entry line.

USAF Special Data

Note: The following commands are to be used as defined in Air Force technical orders. These commands allow the operator to input various airplane data into the MADAR system for storing on the MDR tape.

I. Keyboard Commands and Functions (Cont)

Command	Command Action
OATXXX	**Record Predicted Runway Temperature in Degrees Celsius (±NN).** This command records the predicted runway temperature in degrees Celsius upon which the takeoff performance data is based. The first X denotes + (plus) or - (minus) and the last XX denotes the numeric value.
RPMXXX	**Predicted Takeoff Static N1 RPM.** This command records the predicted takeoff static N1 RPM listed on the TOLD card worksheet. (Example: 98.8 percent is entered as 988.)
TITXXX	**Record Predicted Check TIT.** This command records the predicted check TIT listed on the TOLD card worksheet. The XXX denotes the turbine inlet temperature in degrees Celsius.
TOXX	**Record Type of Takeoff.** This command records the type of takeoff from the list below. The XX denotes one of the following: Reduced Rolling = RR Reduced Standing = RS TRT Rolling = TR TRT Standing = TS

Display Unit

The DU displays text and graphic information stored in the MUX/PROC. (See figure 18.) The DU receives digital and video information directly from the CNTRL. All subsystem test point data is available for display on the DU.

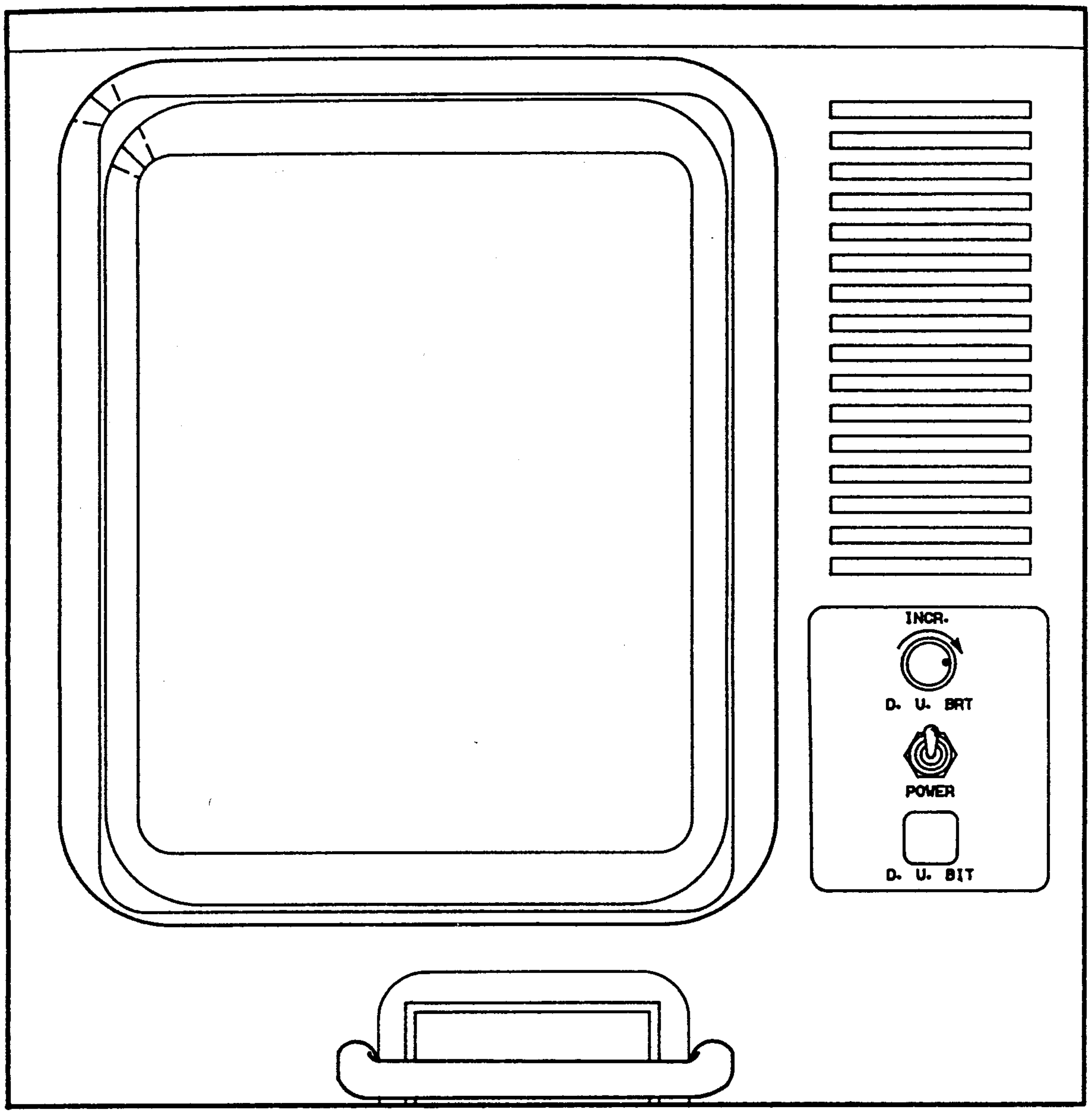
Display Unit Controls

DU BRT Control - The DU BRT (brightness) control allows the operator to vary the display intensity from full brightness (clockwise) to off (counterclockwise).

POWER Switch - The POWER switch is a switch type circuit breaker for the DU.

DU BIT Push Button - This pushbutton switch lights when engaged, and causes an internally generated BIT pattern to be displayed on the DU. (See figure 19.) When disengaged, the BIT pattern is replaced by the previously displayed frame.

Figure 18. Display Unit



DU Screen Area Allocations

The DU screen is divided into four areas: frame display, event display, data display, and entry line. (See figure 20.) The location of data within these four areas is defined by row and column numbers, using a numbering system of 0 through 63 for rows and 0 through 72 for columns.

Entry Line Area - The entry line occupies a single row of 58 columns at the bottom of the screen, beginning with column 15. This area is normally used for two purposes, echo of keyboard input messages and display of error message associated with keyboard input. When in CALC mode, calculations and entries are observed in this area.

Frame Display Area - The frame display area occupies the rectangular area 49 rows high by 73 columns wide at the top of the display screen. This area provides the indexes, operating procedures, and diagnostic routines called from the MUX/PROC data base in response to the operator keyboard commands. Selected display frames provide test point waveform displays in the lower right section of the frame display area.

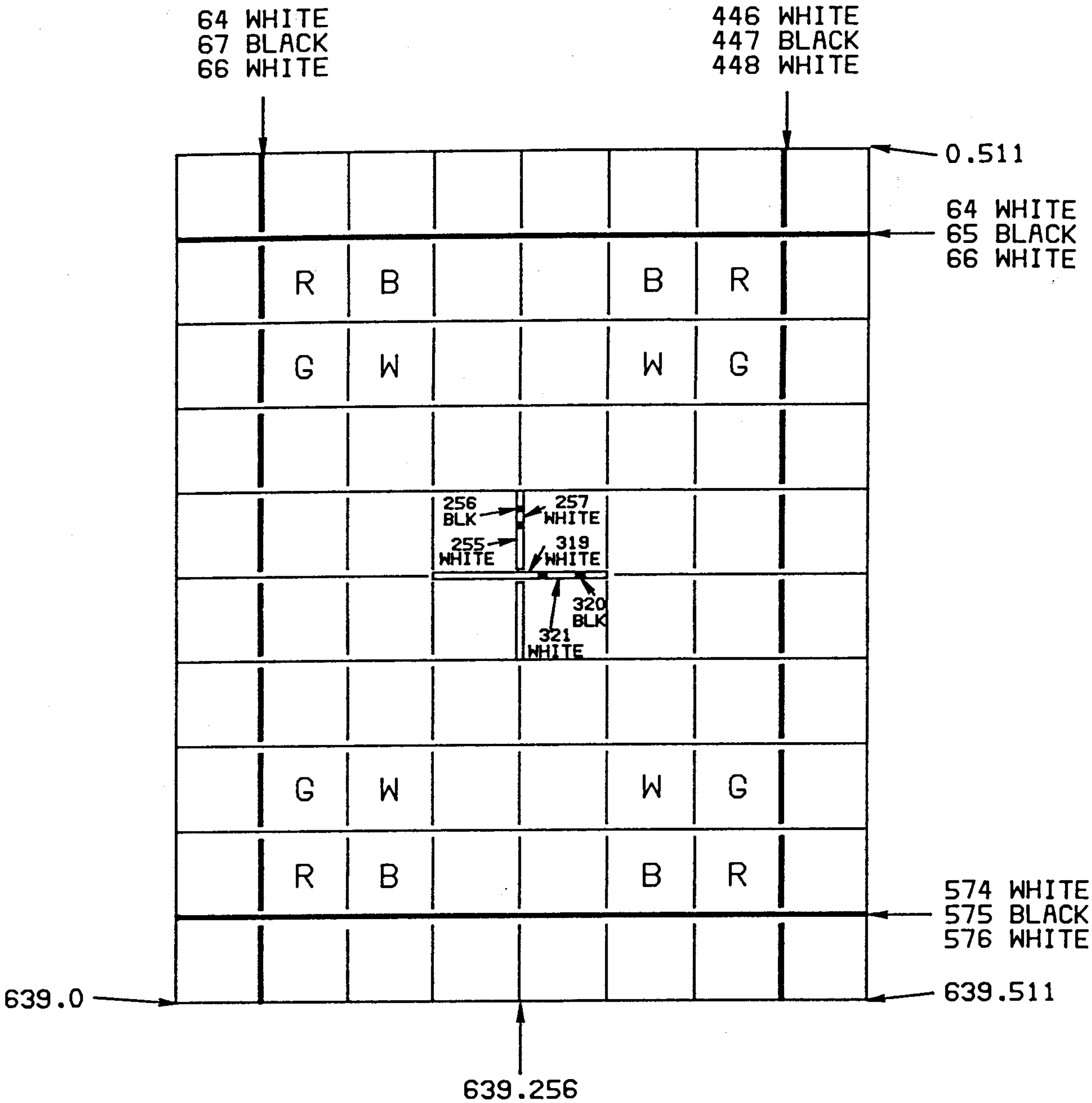
Event Display Area - The event display area is located on the lower left corner and is 14 rows high and 14 columns wide. (See figure 21.) The event display area is used to present the time of day, current mode of operation, digital voltmeter readings, and a variety of event messages, including LRU failure or recovery reports. The content and format of this display area is shown in figure 21. Row 50 displays time of day in hours, minutes, and seconds as indicated with the operating mode in columns 10 through 13. The time readout is updated once per second. The allowable mode codes are OPER (operate), TEST, STBY (standby), CALC (calculator), and BKUP (DU backup). The CALC and BKUP modes can be entered while the system is in STBY, TEST, or OPER modes.

Rows 52 through 54 are reserved for presentation of voltmeter channel A (DVM-A) when specified by the display frame or requested by the operator.

Rows 55 through 57 are utilized for digital voltmeter channel B (DVM-B) when specified or requested, but are not reserved for this purpose. If the DVM is not active, these rows will be utilized as part of the event message area. The most recent message appears at the top of this area and, if necessary, space is cleared by scrolling other messages one row toward the bottom of the screen and scrolling the oldest message off the screen. The most recent message blinks for thirty seconds and continues to be displayed until cleared by operator acknowledgement. There are four types of event messages displayed.

- o Fault codes with no addendum

Figure 19. DU BIT Pattern



R = BLOCK FILLED WITH RED (64 X 64 PIX)
G = BLOCK FILLED WITH GREEN (64 X 64 PIX)
B = BLOCK FILLED WITH BLUE (64 X 64 PIX)
W = BLOCK FILLED WITH WHITE (64 X 64 PIX)

ALL NUMBERS REFER TO PIXEL AND LINE LOCATIONS

Figure 20. Display Screen Area Allocations

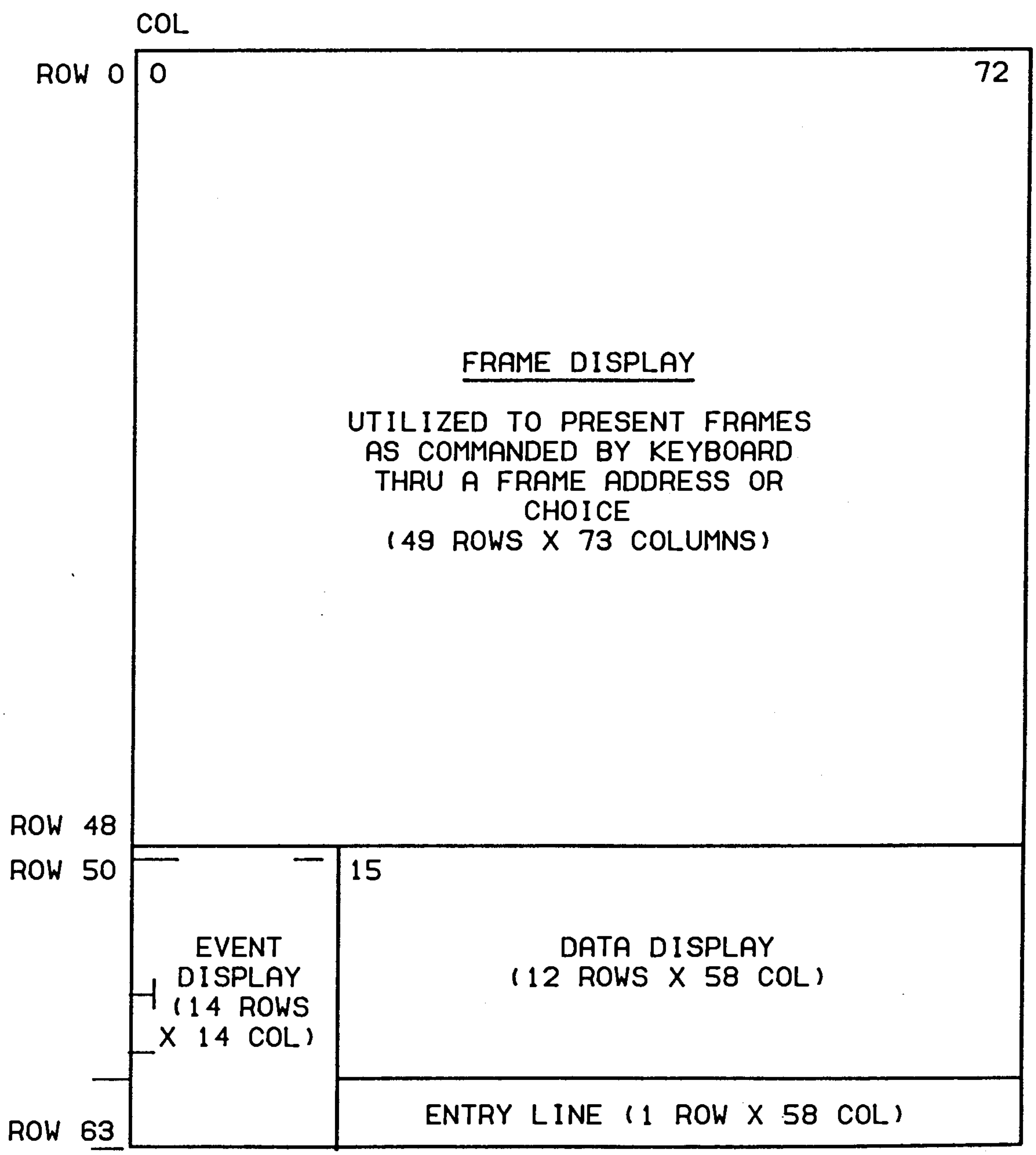
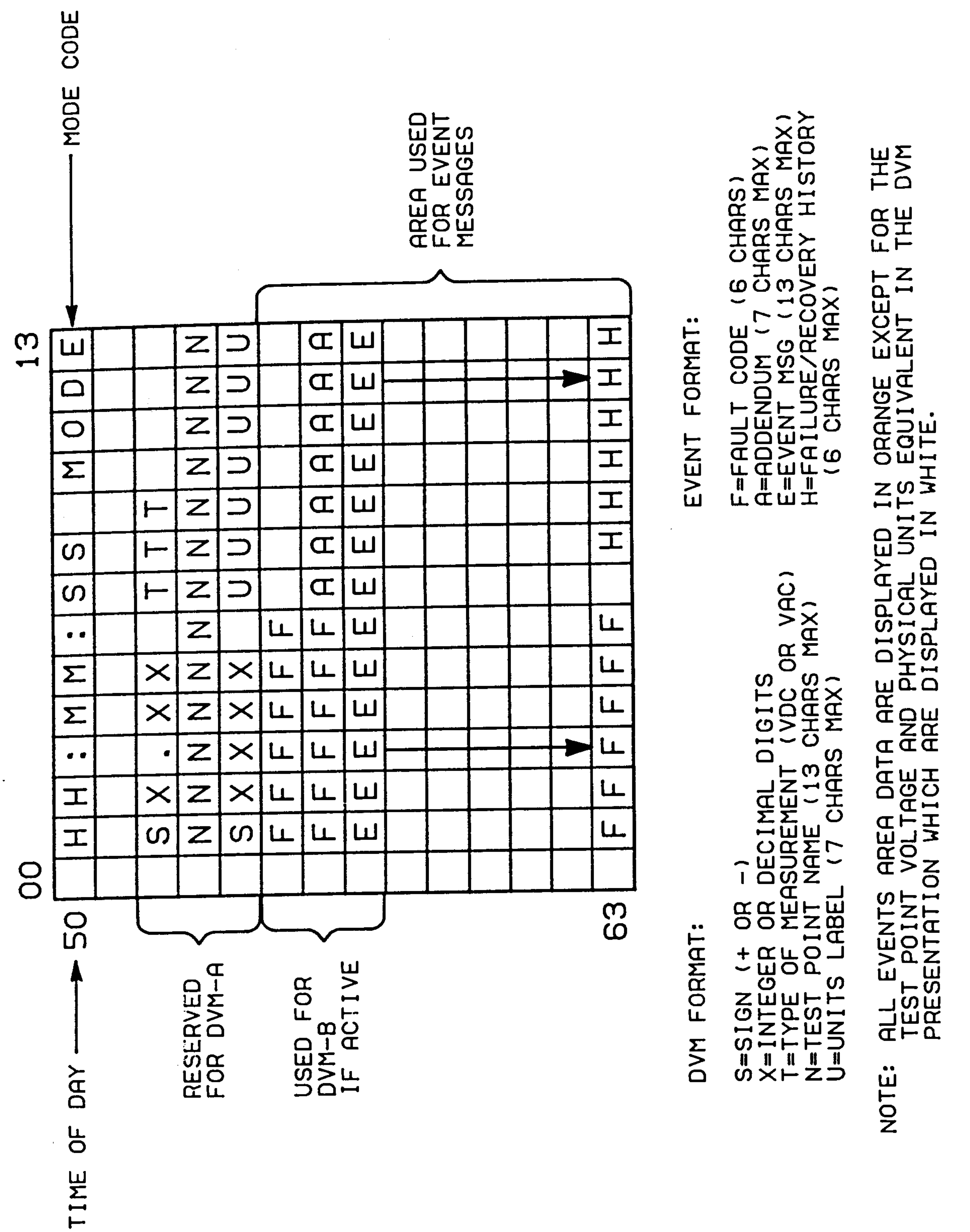


Figure 21. Event Display Area Format



Example F50210

o Fault codes followed by up to six failure/recovery histories. If more than six failure/recoveries occur, the greater than symbol appears in column 13.

Example 1 FXXXXX RFR
Example 2 FXXXXX RFRFR>

NOTE: X indicates 5 digit fault code

o Fault codes with addenda. This message type requires special identification to ensure immediate operator attention. Listed below are the four messages of this type.

FXXXXX E V1B
FXXXXX S MALF
FXXXXX FNL G
FXXXXX G L1M

o The fourth message type is a nonfault code event message which may contain up to 13 characters.

Example: ENG TEST

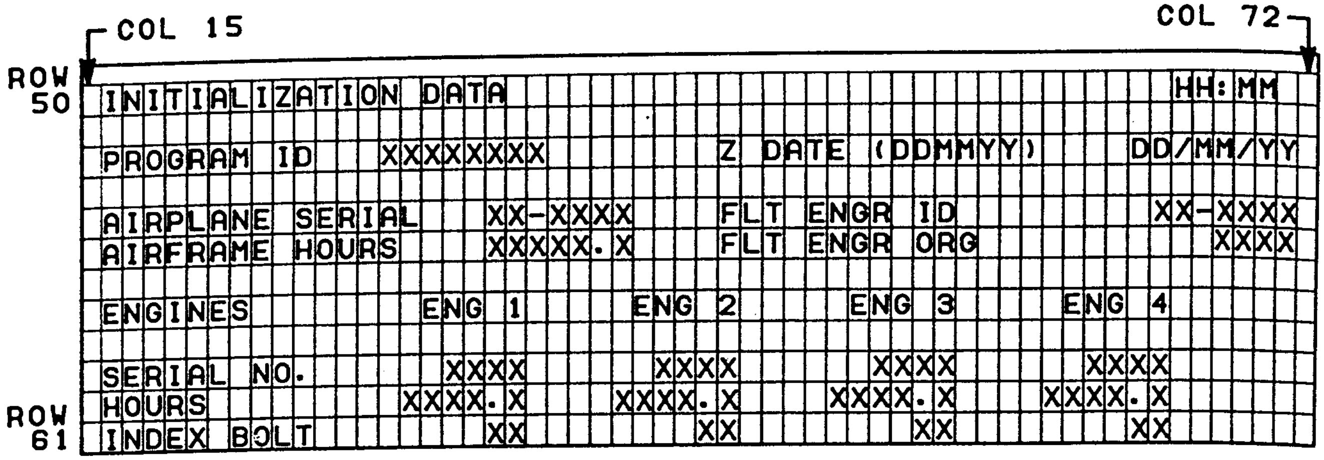
NOTE: This message commands the operator to perform an engine test. It is displayed fifty minutes after takeoff and every four hours thereafter.

Data Display Area - The data display area is 12 rows high and 58 columns wide. Data display formats are generated by message inputs, acknowledgement of fault codes, pressing the HOLD button, or pressing the FAULT CODE key. The following paragraphs describe the data display formats.

Display Formats

Initialization Data Format - The initialization data display format presents information originally input manually by an operator at the time of system initialization, subsequently updated automatically by the flight program on a periodic basis, and corrected manually by the operator through keyboard input. (See figure 22.) This format is displayed in response to the INIT command. All information is presented in orange and the operator cursor is placed at the start of the data field for possible update. As new data is inputted from the keyboard, this data is displayed in white until it is transmitted to the MUX/PROC for processing. When the MUX/PROC echos this data back to the display, it is presented in orange to indicate that storage has been updated.

Figure 22. Initialization Data Format



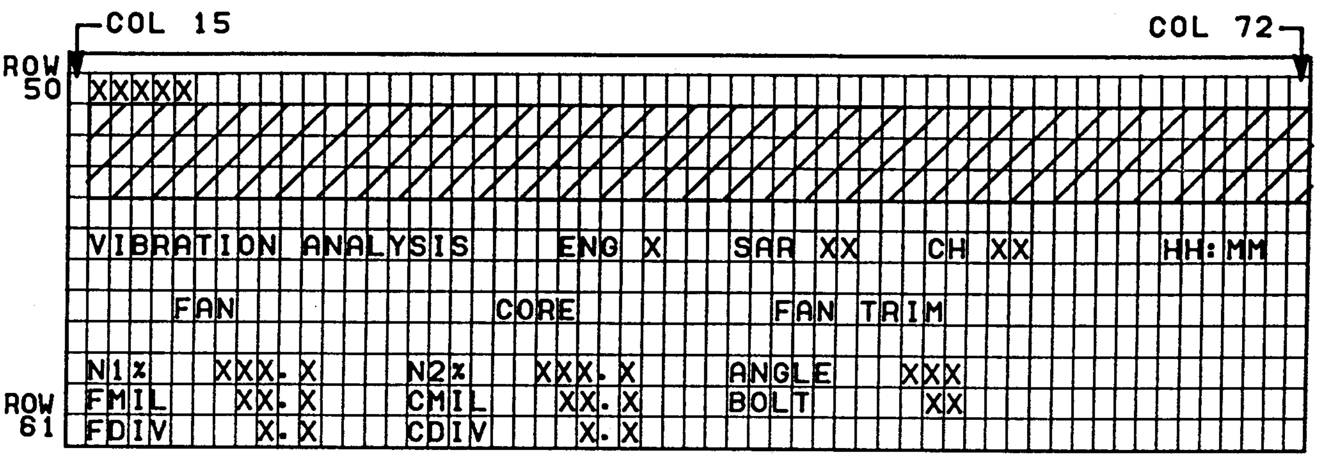
Vibration Analysis Data Format - The vibration analysis data format shown in figure 23 is utilized for display of analyses in the following three cases.

- o Acknowledgement of a fault code message - This acknowledged fault code is listed on row 50 and fault code nomenclature is presented in rows 51 through 53. Fan trim titles and data are displayed only when using the fan trim balancing command. A format title line containing the SAR, channel, and engine number to which the analysis applies, together with the time of day when the analysis was performed, is displayed on row 55. The remaining contents vary according to the fault code category. If the fault code relates to a system malfunction condition detected during automatic vibration processing, the N1 and N2 values are presented under the fan and core data categories. If the fault code relates to an out of limits vibration condition, all data in the fan and core categories are presented.

- o Manual vibration processing - No fault code or fault code nomenclature is presented. The analysis is requested by operator input and the display is generated as quickly as the analysis is completed. The title line, together with the fan and core data categories, are presented unless a system malfunction condition is noted. In such a case, only the N1 and N2 parameters are included under the fan and core labels.

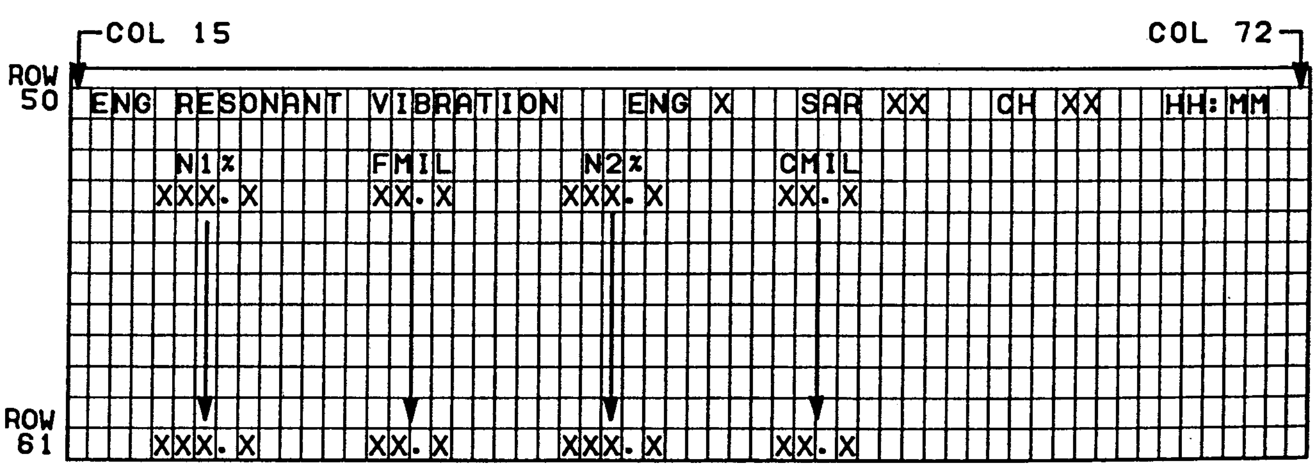
- o Use of the fan trim balancing command as a message input - All core category data are omitted from the format, as are the fault code and fault code nomenclature. The display consists of the title line together with the fan and fan trim data categories. The titles, labels, fault codes, fault code nomenclature, and time of day are all presented in orange. The remaining variable data are presented in white.

Figure 23. Vibration Analysis Data Format



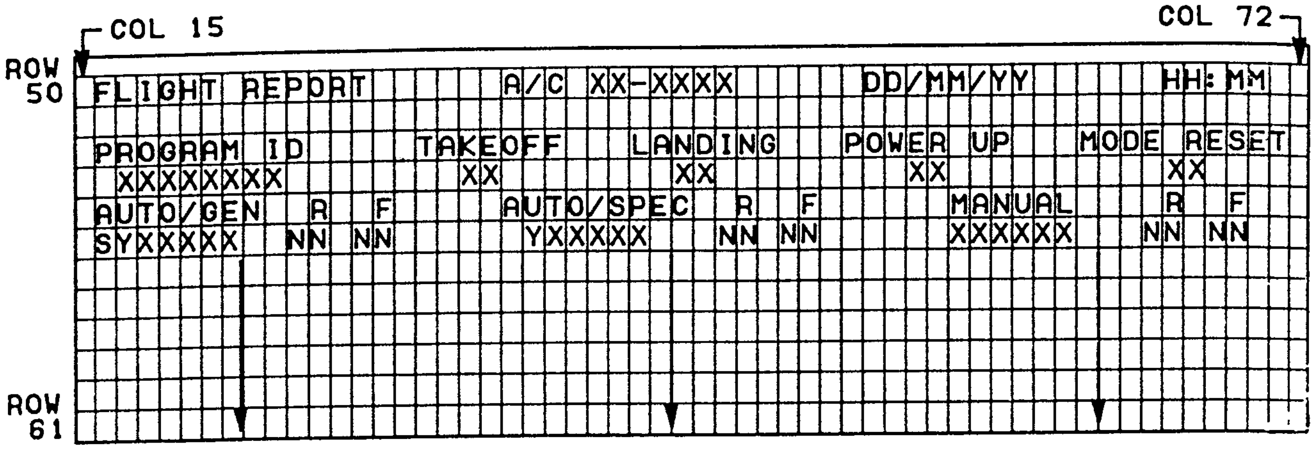
Engine Resonant Vibration Data Format - A title line is presented on row 50 with a column label line appearing on row 52. (See figure 24.) Both of these lines are displayed in orange except for the variable data fields of engine number, SAR, and channel number, which are presented in white. The analysis data produced in each of 60 one second intervals is presented in orange on rows 53 through 61 with new data added at the bottom. The data contained on row 53 through 61 are scrolled from bottom to top at the average rate of one row per second with the appearance of continuous motion. After nine lines of data have been generated, the oldest line will be scrolled off the screen to make room for subsequent data. After 60 seconds of engine run analysis is completed, the data can be manually scrolled up or down using the scroll function on the CNTRL.

Figure 24. Engine Resonant Vibration Data Format



Flight Report Data Format - The flight report data format presents a summary of significant activities occurring since the flight report was last zeroed (cleared). (See figure 25.) A title line located on row 50 contains the airplane serial number, date, and time of day when the report was generated. Rows 52 and 53 present the identification code of the flight program, together with a tabulation of the takeoffs, landings, MADAR powerups, and failed fault code resets due to mode changes. A record of fault code failures is presented in numerical order in a manually scrollable area which spans rows 56 through 61. The fault codes are categorized as general automatic, special automatic, or manual. Each entry contains the five digit fault code preceded by the current failure/recovery status (Y character) and followed by the number of recoveries and failures that have been recorded for the fault code. Additionally, the general automatic fault code entries show the suppressed state (S character), if applicable, preceding the current status. The format is displayed in orange except for the variable fields, which are shown in white.

Figure 25. Flight Report Data Format



<u>**SAR Dump Data Format**</u> - The SAR dump display format is used for display of test point voltages produced by the SAR dump command. (See figure 26.) A title line appears as its variable fields. The test point voltages are displayed as signed numbers to three significant digits (one integer and two decimal digits) and are to the right of the channel numbers. The format is presented in orange except for the signed voltage values, which are presented in white.

<u>**Suppressed Fault Code Report Format**</u> - This format is presented in response to the SUPP message input command. (See figure 27.) The title line contains the time of day when the report was compiled. All suppressed fault codes are listed in ascending numerical order from top to bottom and left to right. The entire format is in orange.

<u>**Failed Fault Code Report Format**</u> - This format is presented in response to pressing the FAULT CODE key on the CNTRL. (See figure 28.) The title line showing the time of day when the report was

Figure 26. SAR Dump Data Format

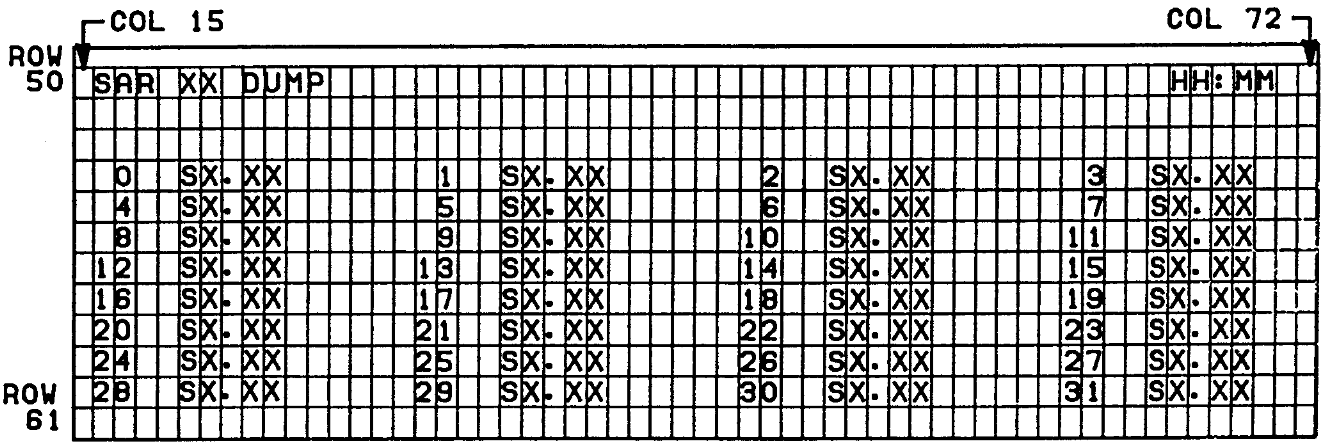


Figure 27. Suppressed Fault Code Report Format

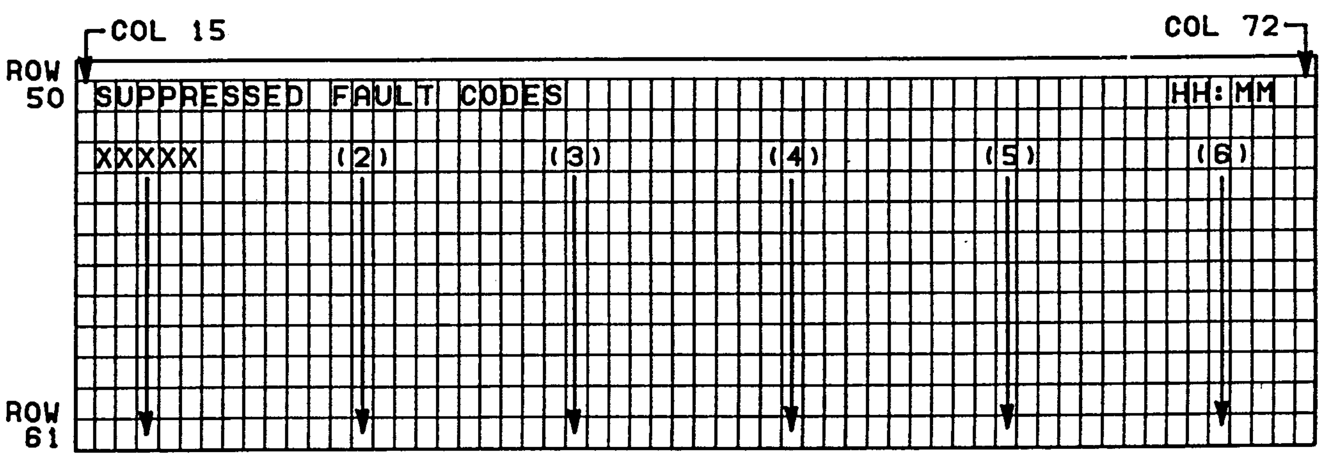
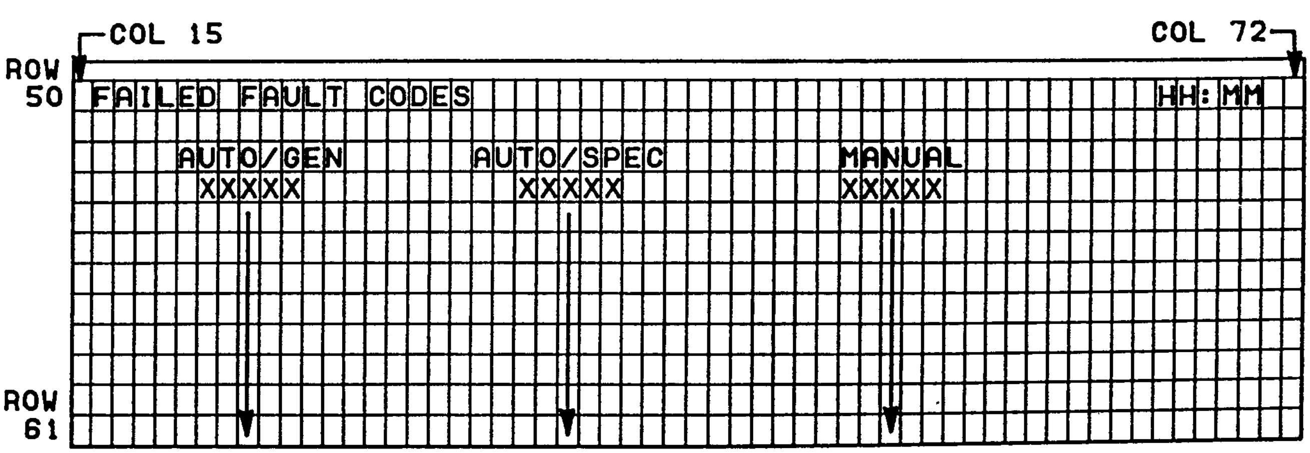


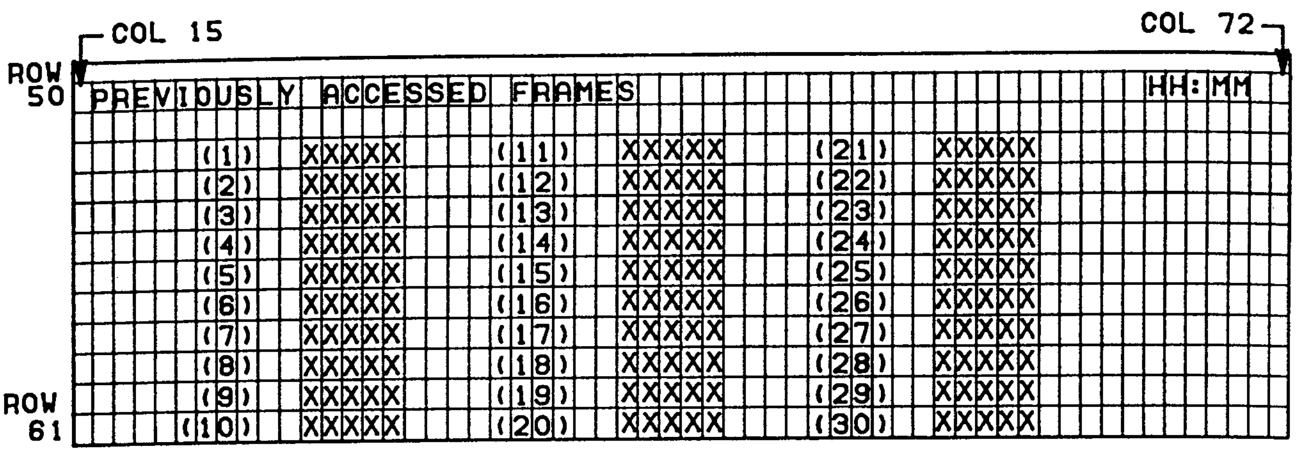
Figure 28. Failed Fault Code Report Format



generated is presented on line 50, and header labels for the three fault code categories are presented on line 52. Lines 54 through 61 are used for display of fault codes which are presently in a failed state. The display can be manually scrolled, and the entire format is presented in orange.

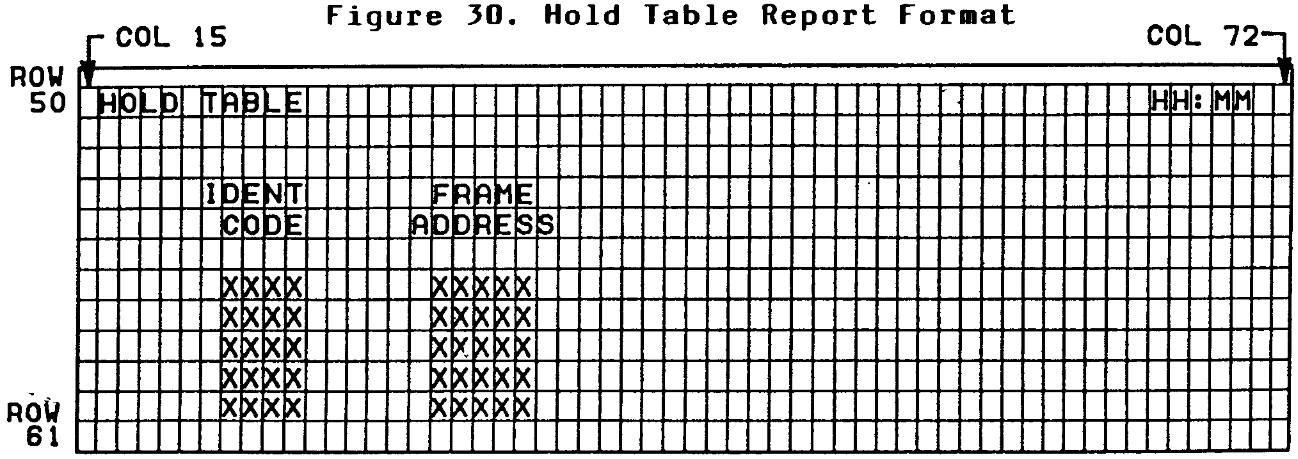
Previously Accessed Report Format - This format is presented in response to the previous frame message input. (See figure 29.) The title line containing the time of day when the report was generated is displayed on line 50. A chronological listing of the last 30 (maximum) display frames accessed is displayed from top to bottom and left to right in three columns. The entire format is presented in orange.

Figure 29. Previously Accessed Frame Report Format



Hold Table Report Format - This format is presented when pressing the HOLD key without preceding it with an ID code. (See figure 30.) It displays frame addresses that have been designated for storage/retrieval. A title line is displayed on row 50 with the time of day of the report. Parameter labels are presented on rows 53 and 54. The held frame numbers are displayed on rows 56

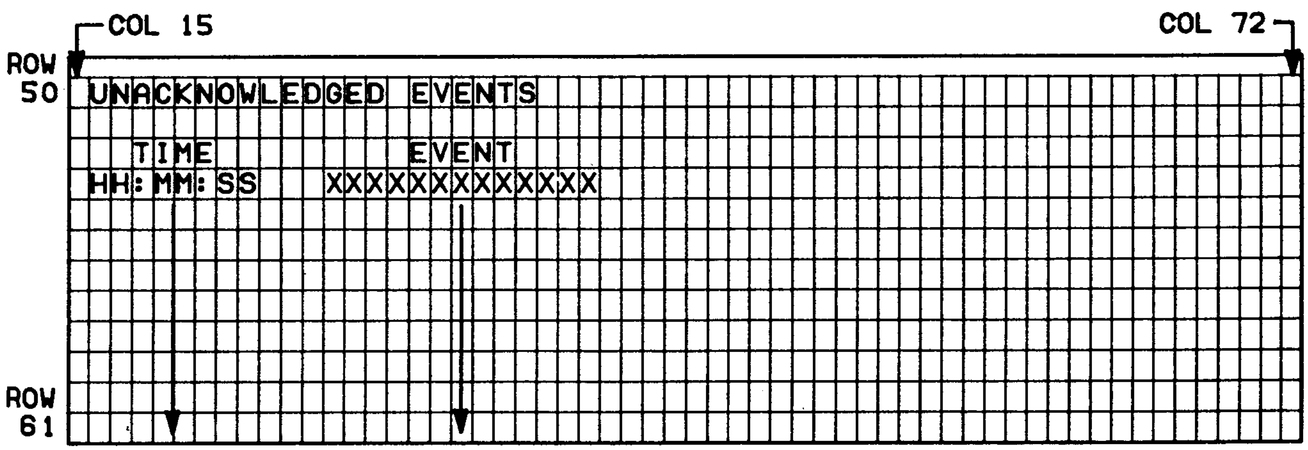
Figure 30. Hold Table Report Format



through 60, together with the four character alphanumeric identification code assigned by the operator to the held frame. The order of the frame numbers is chronological, with the most recently added number appearing at the top. The entire format is presented in orange.

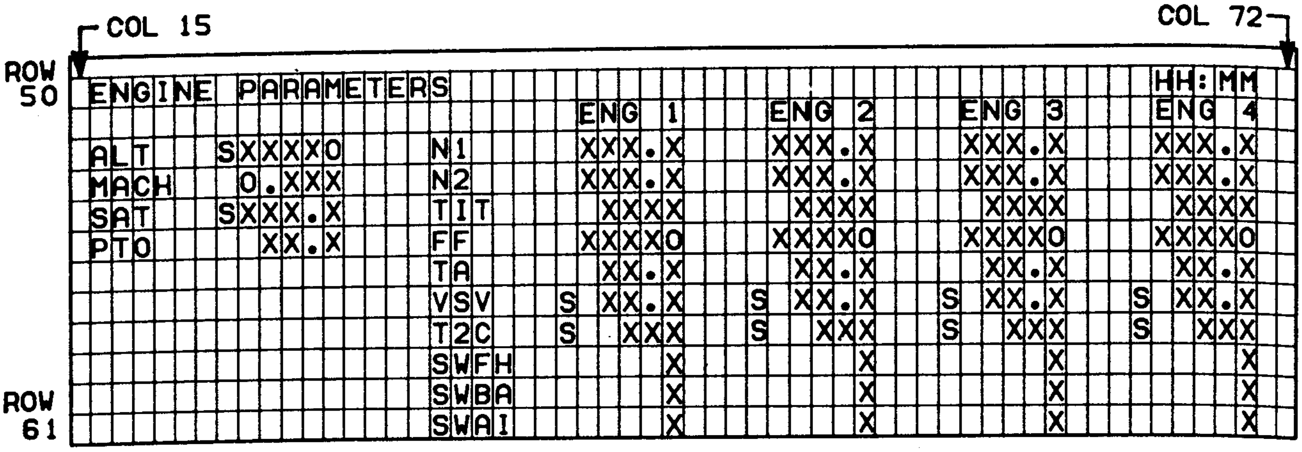
Unacknowledged Events Report Format - This format is presented in response to the unacknowledged event message input. (See figure 31.) The entire format is presented in orange with a title line on row 50. A label line appears on row 52 with the event information occupying rows 53 through 61 as required. The time of day at which the event was initially reported is presented on the left with the event itself (fault code or message) appearing on the right in the same format as that which is currently presented in the event display area. The messages are arranged in chronological order according to the time in the left column, with the most recent message appearing at the top of the area. The event messages are manually scrollable.

Figure 31. Unacknowledged Events Report Format



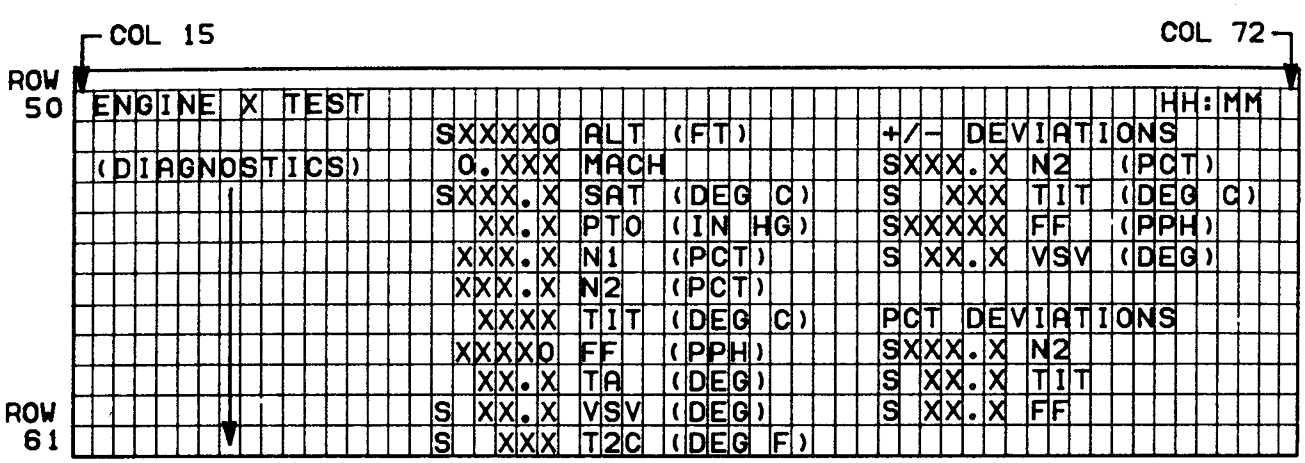
Engine Parameters Report Format - This format is presented in response to the engine parameter message input. (See figure 32.) A format title line appears on row 50 and includes the time of day at which the report was generated. The parameters acquired for a specified engine, together with identifying labels, are presented on the remaining rows. The figure illustrates the case of the four engine request. If data from a single engine is requested, this data appears in columns 38 through 43 with the engine label of row 51 reflecting the correct engine number. The airplane parameters are presented in columns 22 through 27 and appear for both the single and four engine case. All parameters except discretes are presented to three significant digits with a sign appended in the case of negative numbers. All titles and labels are presented in orange, with only the parameter values displayed in white.

Figure 32. Engine Parameters Report Format



Engine Test Report Format - This report is presented in response to the engine test message input. (See figure 33.) A title line specifying the applicable engine and the time of report generation is shown on row 50, and the remaining space is divided into three areas of approximately equal size for presentation of test results. The center area contains parameter values displayed in white followed by parameter and unit labels presented in orange. The right area contains data on the deviation of measured parameters from standard conditions, both in terms of absolute values and percentages. The numerical values are presented in white and the titles and labels in orange. The left area is used

Figure 33. Engine Test Report Format



for diagnostic messages which are presented in orange. The possible diagnostic messages which are to be displayed under condition A or condition B are:

A. Diagnostics Only

1. BLEED ON

2. BAD CADC

3. 04 BAD SAR

4. XXX NOT CRUISE (XXX is any of the following parameter codes: ALT, M, N1K, or T25). If N1K prints, it is accompanied by SET N1 YY MIN where YY is a number from 90 to 99.

5. N1 ERROR

B. Diagnostics With Parameters

1. XXX ERRATIC (XXX is any of the following parameter codes: T2C, N1, N2, FF, TIT, TA, VSV OR PTO)

2. XXX UNSTABLE (XXX is any of the following parameter codes: ALT, M, SAT, T2C, N1, N2, FF, TIT, TA VSV OR PTO)

3. XX BAD SAR (XX is the SAR number)

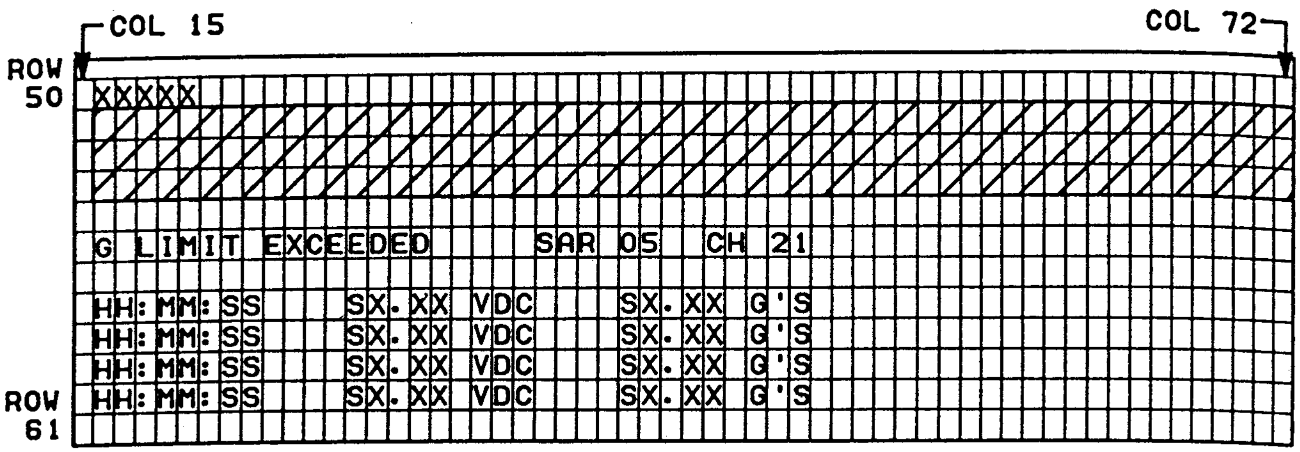
4. PTO BAD

5. TEMP BAD

If more than 10 diagnostic messages are to be displayed, the diagnostics area is manually scrollable.

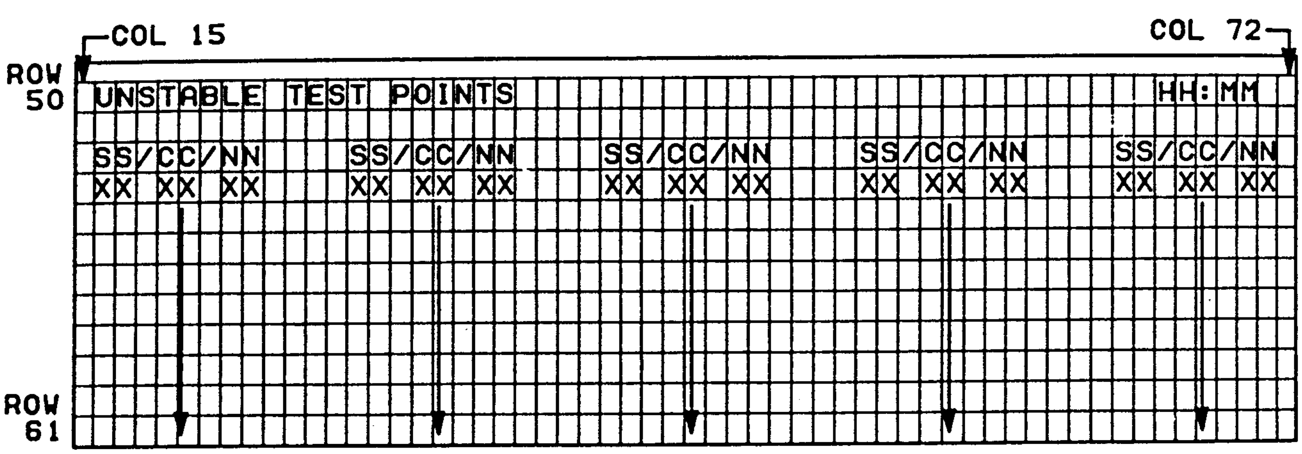
G Limit Exceeded Report Format - This display is called in response to operator acknowledgement of an associated fault code. (See figure 34.) The acknowledged fault code appears on row 50, followed by fault code nomenclature in the cross hatched area of rows 51 to 53. The statement G LIMIT EXCEEDED appears on row 55 together with the identification SAR 05 CH 21. The time when the condition occurred, the stored test point voltage, and physical unit conversion are displayed on row 57. If the fault code has occurred more than once without being acknowledged, earlier data will be presented on lines 58 through 60. All titles, labels, and data are presented in orange except for the test point voltage and physical unit values, which are displayed in white.

Figure 34. G Limit Exceed Report Format



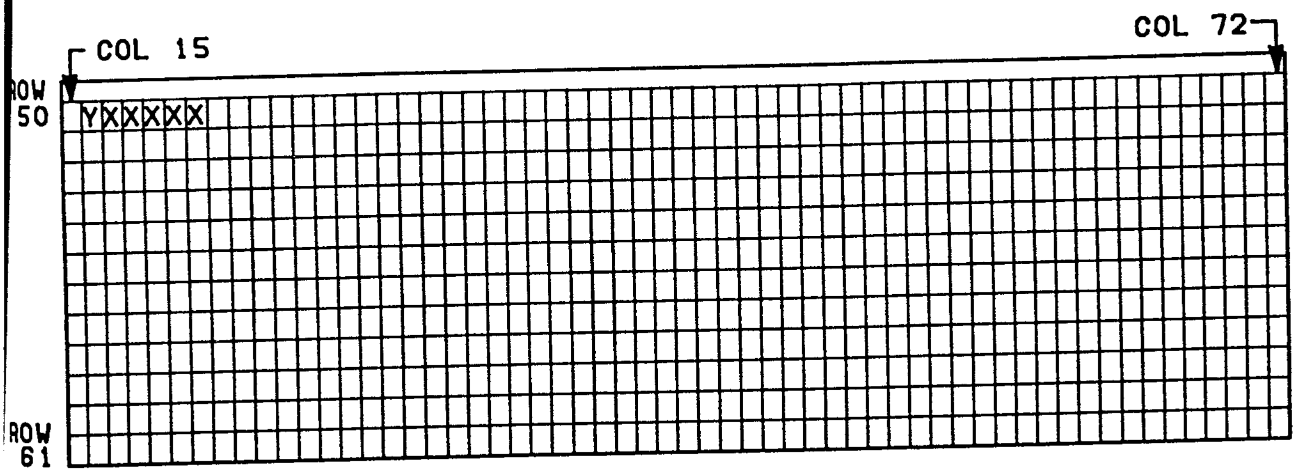
__Unstable Test Point Report Format__ - This report is presented in response to the unstable test point message input. (See figure 35.) A title line presented on row 50 lists the title of the display and the time of day when the report was assembled. Row 51 is left blank for separation purposes and a column header row is placed on row 52 to identify SAR, channel, and count columns. The list of test points whose unstable flags have been set between 10 and 99 is presented in up to five columns of 9 entries each, starting on row 53. The list is arranged in numerical order of SAR, and then channel number from top to bottom and left to right. For each entry, the SAR number is shown on the left, channel number in the center, and the number of times the unstable flag has been set on the right. The entire format is displayed in orange.

Figure 35. Unstable Test Point Report Format



FAULT Code Status Report Format - This report is presented in response to the output fault code status message input. (See figure 36.) A single word consisting of the current state (F for failed or R for recovered) in the character position represented by Y and the five digit fault code in the character positions represented by the Xs comprise the report format. The status word is presented in orange.

Figure 36. Fault Code Status Report Format



MDR Tape/POU Paper Remaining Report Format - The MDR tape remaining report format is presented in response to the TAPE message input. (See figures 37 and 38.) The POU paper remaining report format is presented in response to the PAPER message input. Both formats are single line reports with an identifying statement followed by the percentage of the resource computed to be available. Both values are reported to the nearest one percent with the entire format presented in orange.

Figure 37. MDR Tape Remaining Report Format

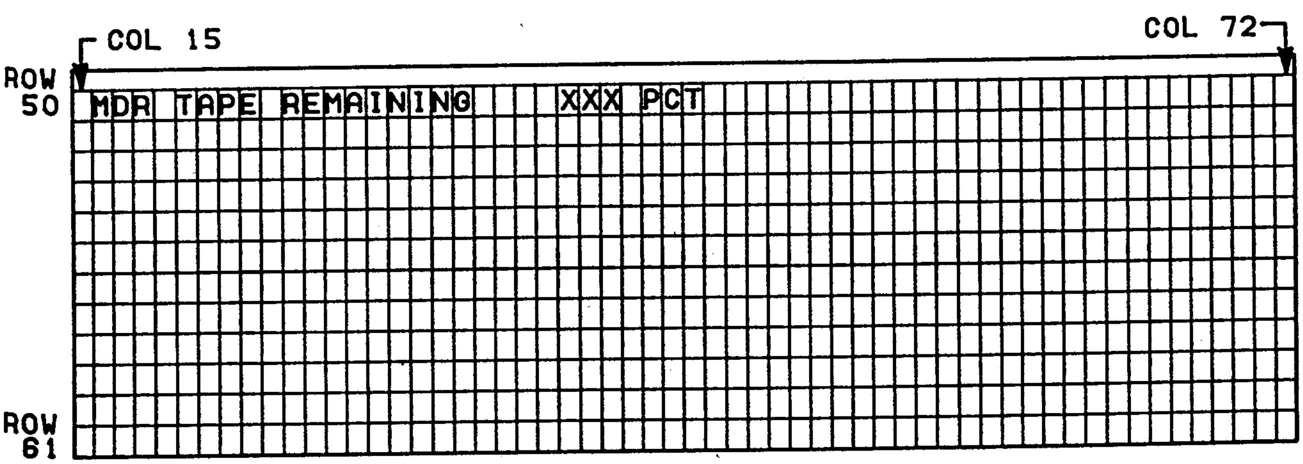
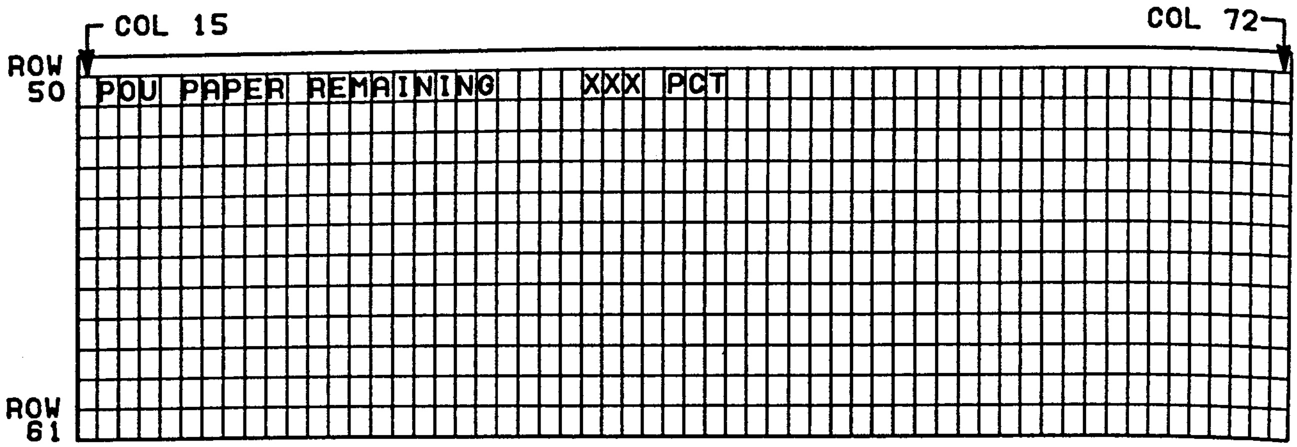
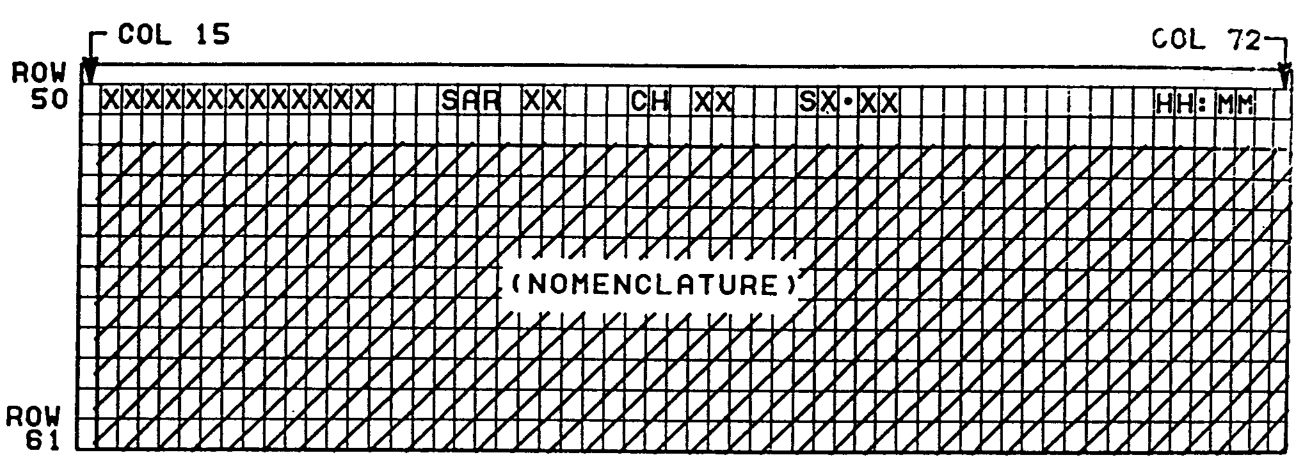


Figure 38. POU Paper Remaining Report Format



Event Message Nomenclature Format - This format is presented in response to operator acknowledgment of a fault code (entering the fault code number and pressing the FAULT CODE key). (See figure 39.) The title line is displayed on row 50 and consists of the 5 to 13 character fault code/event message to which the nomenclature applies, the SAR and channel number of the test point which led to the fault code failure declaration (if applicable), the voltage of the test point at the time of failure declaration (if applicable), and the time of day when the failure was declared. The nomenclature stored in the data base for the fault code/event message is presented following the title line in a format of up to 57 columns by 24 rows of text data. The nomenclature text is manually scrollable, if required, and the entire format is presented in orange.

Figure 39. Event Message Nomenclature Format



ENGVIB Prerequisite Failure Message Format - The format used for display/printing of the diagnostic message in the event of a prerequisite test failure during manually initiated engine vibration (ENGVIB) monitoring is illustrated by figure 40. Row 50 contains that part of the failure message specifying the manually initiated task being performed when a prerequisite test failure was noted together with the time of day when the failure message was generated. The variable part of this message line, represented by the field "AAAAAAAAAAAAAAAA", will contain the appropriate one of the following three labels:

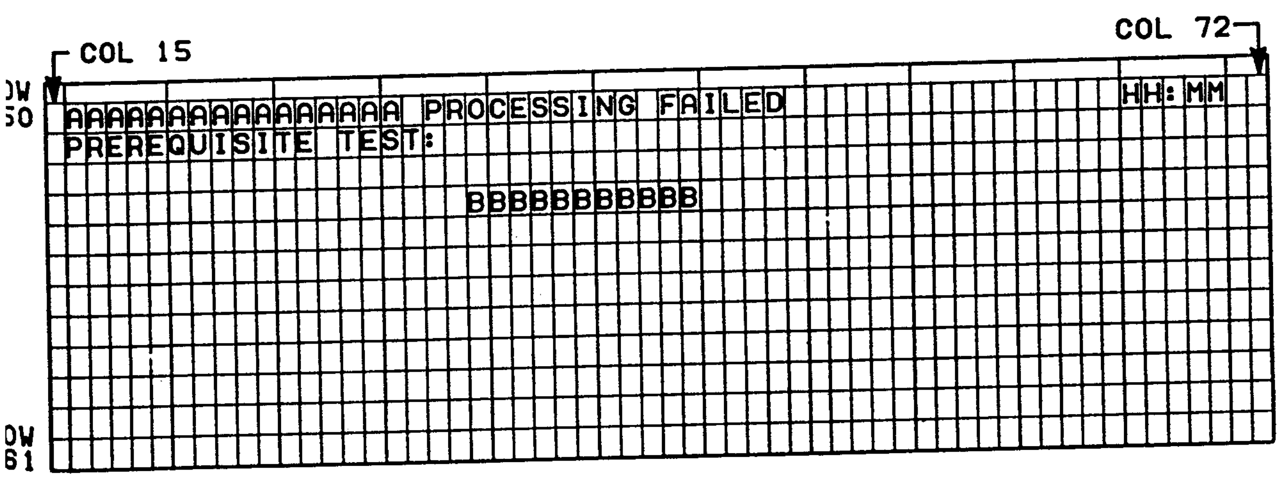
ENGINE RESONANCE
MANUAL VIBRATION
FAN TRIM BALANCE

Additional variable fields appear on rows 53 thru 56, represented by "BBBBBBBBBBB", which will contain the appropriate of the following labels according to which prerequisite test failed:

SAR XX BAD
N2 <XX.XPCT

The variable field in the "SAR bad" message is the SAR number and will be either 03, 04, 19, 20, 21, or 22. The variable field in the other message is the numerical value of the data constant N2MIN (60.0 percent). The entire format is presented in orange with no requirements for scrolling or dynamic update. This format will be displayed in the data display area when a prerequisite test failure is noted for manually initiated ENGVIB processing.

Figure 40. ENGVIB Prerequisite Message Format



Operator Scratch Pad Display Format - This format is presented in response to the enable scratch pad operator message input. The operator scratch pad display format consists of the entire data display area of 12 rows by 58 columns. When the scratch pad is called for display, the current contents of the scratch pad buffer are recalled from safestored memory and presented in orange as a 12 by 58 character matrix. The operator cursor is positioned at the same location it occupied when the buffer was

Table II. Summary of DATA Formats

Output	Figure	Generated By Enter	Press	DU	POU
Initialization Data	22	INIT	MESSAGE INPUT	X	P
Vibration Analysis (AUTOVIB detected system malfunction)	23	Fault Code Number XXXXX	FAULT CODE	X	P
Vibration Analysis (AUTOVIB detected out of limit vibration level)	23	Fault Code Number XXXXX	FAULT CODE	X	P
Vibration Analysis (MANVIB)	23	VAsscc	MESSAGE INPUT	X	P
Vibration Analysis (FANBAL)	23	FTBn	MESSAGE INPUT	X	P
Engine Run Vibration Data (ENGRUN)	24	VRFsscc or VRCsscc	MESSAGE INPUT	X	P
Flight Report	25	FLTR	MESSAGE INPUT	X	X
SAR Dump	26	SDss	MESSAGE INPUT	X	P
Suppressed Fault Code Report	27	SUPP	MESSAGE INPUT	X	P
Failed Fault Code Report	28	No Entry	FAULT CODE	X	P
Previously Accessed Frame Report	29	PREV	MESSAGE INPUT	X	P
Hold Table Report	30	No Entry	HOLD	X	P
Unacknowledged Event Report	31	EVENT	MESSAGE INPUT	X	P
Engine Parameters Report	32	EPttn	MESSAGE INPUT	X	X
Engine Test Report	33	ETrpmn	MESSAGE INPUT	X	X
G Limit Exceeded Report	34	Fault Code Number XXXXX	FAULT CODE	X	P
Unstable Test Point Report	35	UTP	MESSAGE INPUT	X	P
Fault Code Status Report	36	STXXXXX	MESSAGE INPUT	X	P
MDR Tape Remaining Report	37	TAPE	MESSAGE INPUT	X	P
POU Paper Remaining Report	38	PAPER	MESSAGE INPUT	X	P
Event Message Nomenclature	39	Fault Code Number XXXXX	FAULT CODE	X	P

Table II. Summary of DATA Formats (Cont)

Output	Figure	Generated By		DU	POU
		Enter	Press		
ENGVIB Prerequisite Failure Message Format	40	VAsscc, FTBN, VRFsscc, or VRCsscc	MESSAGE INPUT and Prerequisite Test Failure Occurs	X	P
Scratchpad Display	None	PAD	MESSAGE INPUT	X	P

X = output immediately
P = output only if PRINT SCRN is pressed

last stored. The operator may then edit existing data or enter new data, repositioning the cursor as required. All newly entered data is presented in white by the controller until such time as the operator causes the data to be returned to the MUX/PROC with the MSG INPUT key. The new set of scratch pad data is safestored in memory and echoed back to the display screen as a regeneration of the current display with the color of all text changed to orange. A summary of the DU display formats is shown in table II.

Printout Unit

The POU provides a permanent data record for inflight reference and ground maintenance purposes. (See figure 41.) The DU is the primary display for the operator and messages are printed by the POU in a 58 column format only when the POU buffer is full. However, in the event of DU failure, the DU backup (DU BKUP) mode can be selected and messages in a 16 column format are printed by the POU as they occur. The text is rotated 180 degrees so that it can easily be read by the operator.

POU Controls

Motor Switch - The motor ON/OFF switch located on the front panel is used to turn the printer motor off should a runaway paper feed condition occur.

Message Light - The amber message light comes on when the DU BKUP mode is selected and a message is printed on the printer. Pressing the PRINT SCRN key on the CNTRL turns off the light.

BIT Button - When the BIT button is pressed, the message light illuminates and when the button is released, the message light extinguishes and the POU prints out a standard printout which verifies all POU printing capabilities. (See figure 42.) The message light flashes if the POU fails the self test.

Percent of Paper Remaining - The percent of paper remaining in the POU is accessed by the keyboard by entering PAPER and pressing the MSG INPUT key.

End of Paper Detection - In addition to a color marking appearing on the last 20-25 feet of paper, there is electronic detection of end of paper which causes a fault code to be displayed on the DU event display area.

POU Message Formats

When operating in the normal state, the DU is the primary operator interface with the MADAR system. A DU BKUP state of operation can be selected where the POU is the primary interface with the operator. This is used if the DU is no longer functioning normally. The POU message format depends upon which state is selected.

Figure 41. Printout Unit

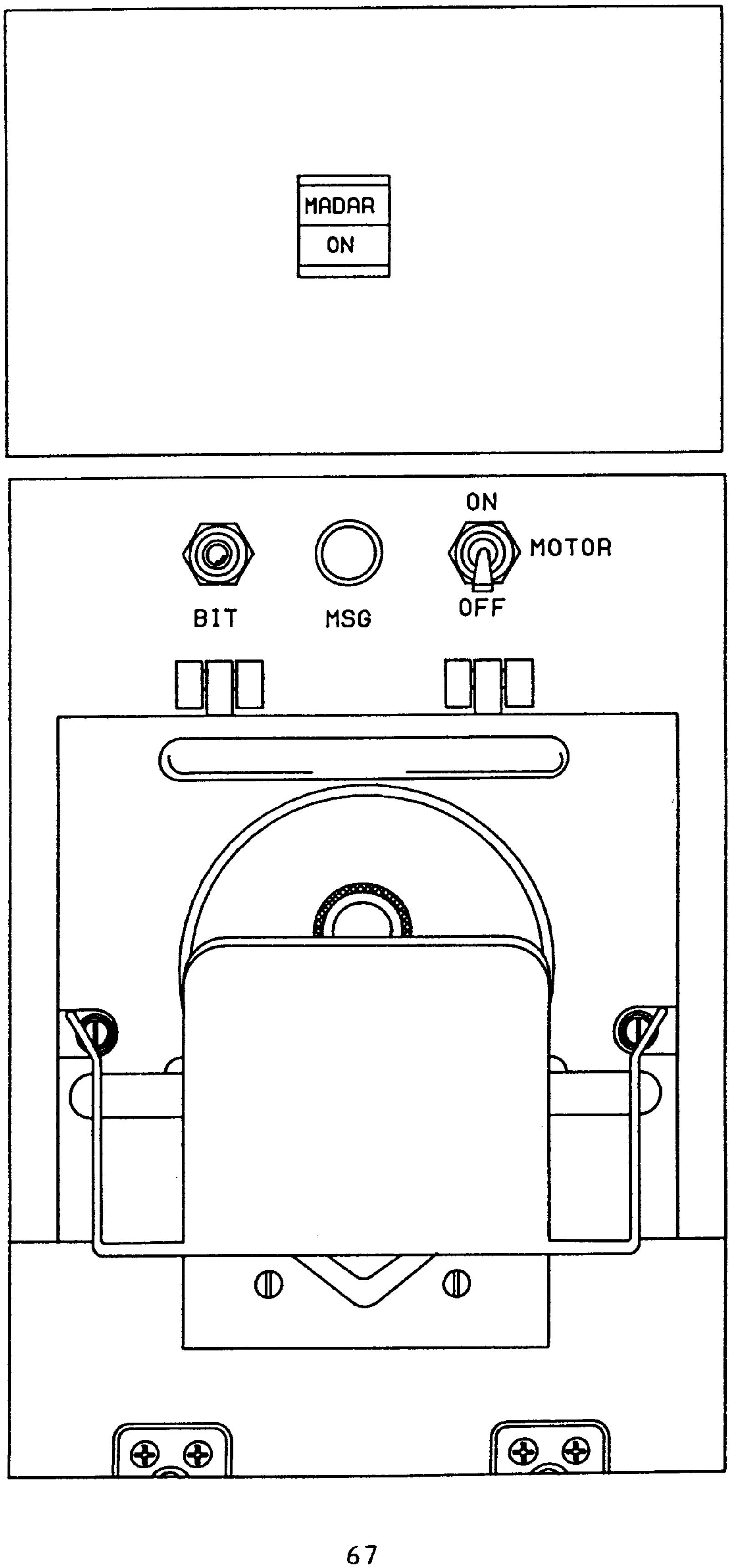


Figure 42. POU BIT Pattern

```
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ
```

Normal Mode POU Messages - In the normal mode, messages are printed on a 58 character (column) page with a header message on the top of every page. (See figure 43.) The header message contains:

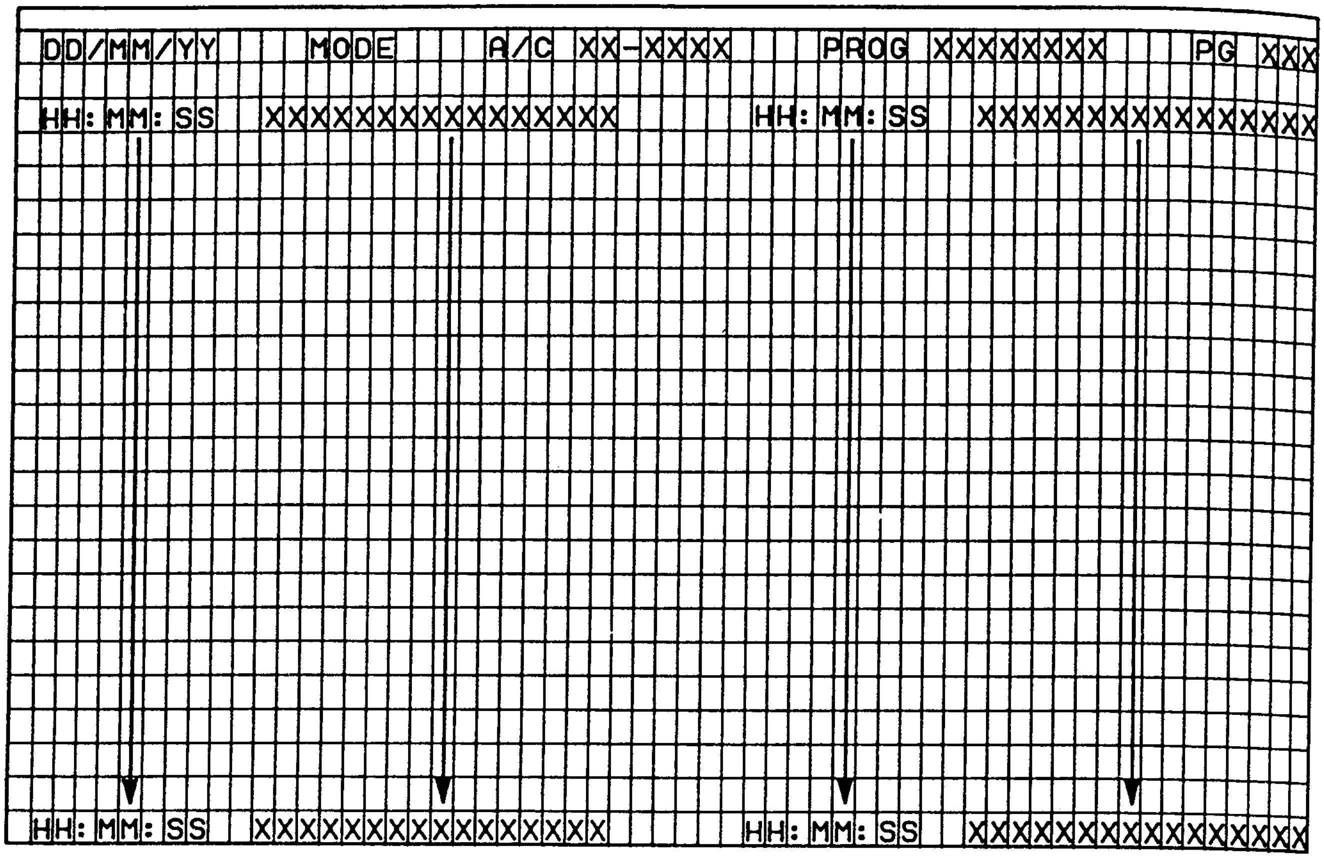
- o Date
- o Mode
- o Airplane serial number
- o MADAR program identification number
- o Page number

The header data reflects the state of the MADAR system at the time the last message of the previous page was generated. The page number is reset to 001 by the zero flight report command. A printed page in the normal mode contains up to 44 messages structured in two 22 line fields. the size of the page in the normal mode is 24 lines (rows) by 58 columns. The POU prints messages under the following conditions:

- o Certain message input commands - Prints only after the POU buffer is full (44 messages).
- o Event messages (POWER ON, STBY, etc.) - Prints only after the POU buffer is full.
- o Event Messages (FXXXXX E VIB - FXXXXX S MAL - FXXXXX G L1M-FXXXXX FNL G) - These four messages cause a printout as in figure 44. This is a 58 column printout of data in the POU buffer, followed by a 58 column printout of data in the data display buffer. The POU buffer does not have to be full and the printout is immediate.
- o Pressing PRINT SCRN - this causes a printout of everything in the data display buffer.
- o Accessing A Test Point - This is printed only after the buffer is full.

DU Backup Mode - In the backup mode, the size and format of a page differs from the normal mode. A page in the backup mode will be either 16 characters (columns) or 58 characters. The print will be rotated 180 degrees from normal to enable viewing from the seated position. The 58 character printed pages in the backup mode are those pages of information that originate from the data display buffer and are of the same format as what is displayed in the data display area.

Figure 43. Normal Mode POU Message Format




```
04/07/84    STBY      A/C 85-0001      PROG 00085343     PG 024

08:21:32  OPER                                   ENG 3 N1 RPM
08:21:33  F12345                                 99.6 PERCENT
08:21:33  F12456                       09:09:30  F18191
08:21:33  F21205                       09:10:00  TP0400 -3.98 VDC
08:28:20  TAKEOFF                                SAR04 NEG CAL
08:29:01  GEAR HNDLE UP
08:40:16  F43021                       09:11:12  F31202
08:40:17  R43021                       09:11:15  F41365
08:40:18  F43021                       09:13:20  F42011
08:40:19  R43021                       09:15:09  R41365
08:40:20  S43021                       09:15:27  F16500
08:42:15  TP0322 -1.4 VDC              09:17:52  GEAR HNDLE DN
          ENG 1 FUELFLO                09:18:50  LANDING
          6200 PPH                     09:19:00  TAKEOFF
08:42:58  TP0318 -0.98 VDC             09:20:10  F16420
          ENG 2 FUELFLO                09:21:10  R16420
          6430 PPH                     09:22:12  F16420
08:43:19  F18191
08:46:20  F31200
08:48:03  F31627
08:51:23  R18191
09:05:51  TP0401  4.02V DC
```

NORMAL MODE POU MESSAGE FORMAT

Figure 44. Joint POU Message/Data Display Output Example

```
04/07/84     STBY       A/C 85-0001       PROG 00085343     PG 024

08:21:32   OPER                                     ENG 3 N1 RPM
08:21:33   F12345                                   99.6 PERCENT
08:21:33   F12456                        09:09:30   F18191
08:21:33   F21205                        09:10:00   TP0400 -3.98 VDC
08:28:20   TAKEOFF                                  SAR04 NEG CAL
08:29:01   GEAR HNDLE UP
08:40:16   F43021                        09:11:12   F31202
08:40:17   R43021                        09:11:15   F41365
08:40:18   F43021                        09:13:20   F23097 E VIB
08:40:19   R43021
08:40:20   S43021
08:42:15   TP0322 -1.14 VDC
           ENG 1 FUELFLO
           6200 PPH
08:42:58   TP0318 -0.98 VDC
           ENG 2 FUELFLO
           6430 PPH
08:43:19   F18191
08:46:20   F31200
08:48:03   F31627
08:51:23   R18191
09:05:51   TP0401  4.02 VDC
```

```
04/07/84     OPER       A/C 85-0001       PROG 00085343     PG 024



VIBRATION ANALYSIS        ENG 4   SAR 22     CH 09       09:13


   FAN                  CORE

 N1%    81.3          N2%   96.2
 FMIL   23.1          CMIL   5.5
 FDIV    4.2          CDIV   1.1
```

JOINT POU MESSAGE/DATA DISPLAY OUTPUT EXAMPLE

Examples of message formats in the DU backup mode are shown in figure 45. printouts in the DU backup mode are caused by:

- Certain Message Inputs - 16 column printout. (See figures 45(B) and (C).)
- Certain Message Inputs - 58 column printout (INIT, FLTR, SDSS, etc.).
- Accessing Test Point - 16 column printout. (See figure 45(D).)
- Fault Code Detected - 16 column printout. (See figures 45(B), (C), (D), and (E).)
- Fault Codes - FXXXXX E VIB, FXXXXX S MALF, FXXXXX G LIM, FXXXXX FNL G; 16 column printout followed by 58 column printout.
- Acknowledging Fault Code - 16 column printout as in figure 45(E), followed by 58 column printout of fault code nomenclature.
- Fault Code Report - 16 column printout followed by 58 column printout.

Maintenance Data Recorder

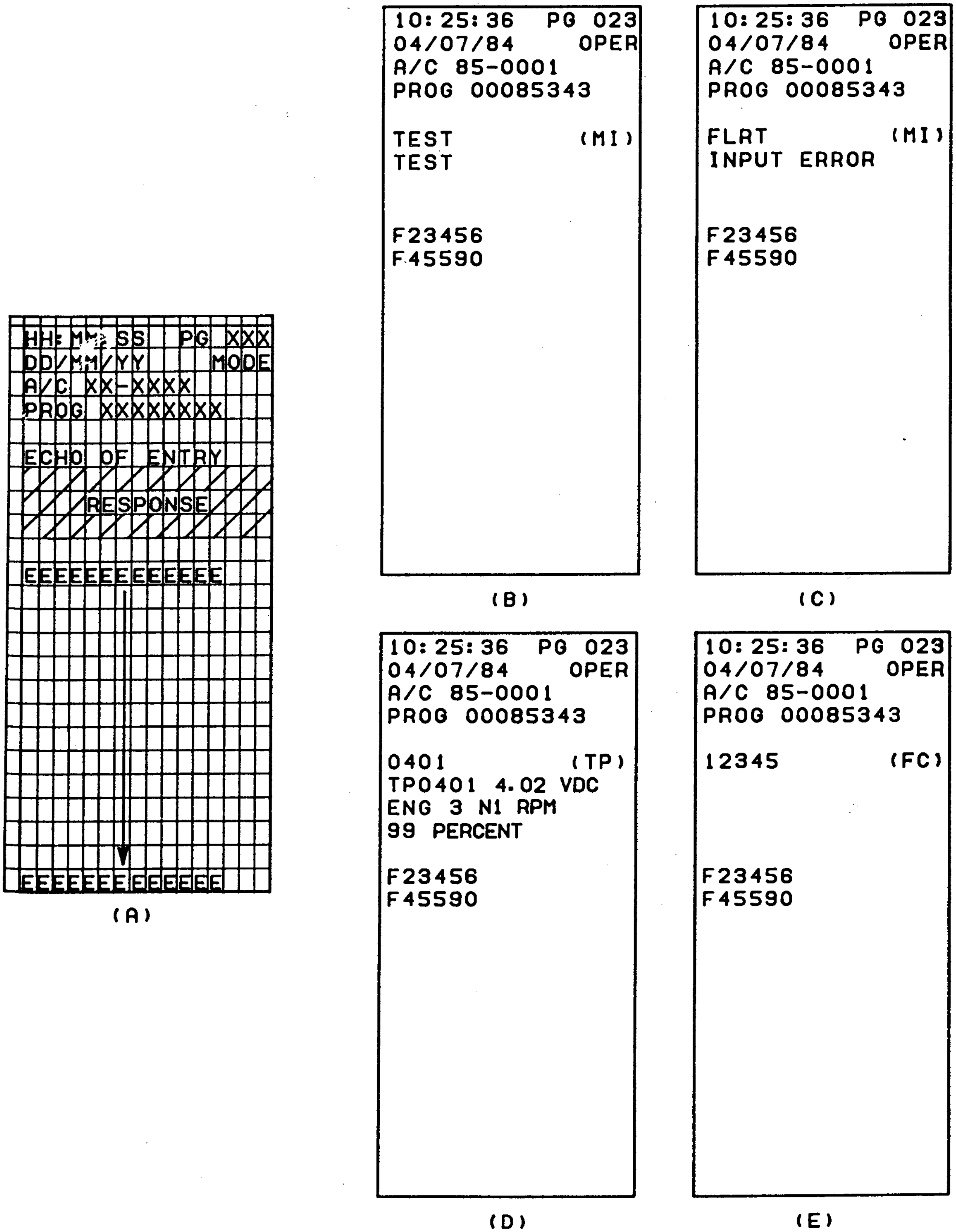
Data is transferred from the MUX/PROC to the MDR for recording only when the MADAR is in the operate mode. No data is recorded in the test or STBY modes. The MADAR system automatically switches to operate mode when any engine N2 is more than 60 percent or the touchdown switch is in the airborne position. This allows recording of data during a ground engine run. The recorded data is processed by a ground processing system and is used in support of maintenance, logistics planning, and operations. Self test features alert the operator to an MDR failure by the appropriate message on the DU.

MDR Controls and Indicators

The controls and indicators located on the front of the MDR (figure 46) are as follows:

- Power ON/OFF switch and circuit breaker. Controls primary power to MDR.
- PWR ON indicator. Comes on to indicate that power is on and power supply voltages are good.
- RWND switch. Actuates high speed reverse. Not functional when tape is already in motion.

Figure 45. DU Backup POU Message Format



- o BIT switch. Actuates built in self test. Acts as a lamp test when pressed (all lamps come on). Initiates test upon release.

- o Total Time indicator. Activated when power is applied and the unit is on. Indicates total power on time.

- o BIT indicator. This indicator is normally off. It comes on amber when the BIT switch is pressed and remains on while test is in progress (test begins when BIT switch is released). Test is completed in approximately 2 seconds and the BIT indicator goes out. The BIT indicator remains on if a failure is detected.

- o BOT indicator. This indicator comes on when the installed cartridge is at the beginning of tape marker.

- o RUN indicator. The RUN indicator comes on when the tape drive is running.

- o EOT indicator. This indicator comes on when the installed cartridge is at the end of tape marker.

- o FILE PTCT indicator. This indicator comes on when the installed cartridge has write protect (SAFE) engaged.

- o RDY indicator. This indicator comes on when the cartridge is loaded and the access door is closed.

- o IPL indicator. This indicator comes on when the MDR is in the program load mode as commanded by the MUX/PROC.

OPERATING PROCEDURES

The following paragraphs provide operating information for the MADAR II. Once the startup procedure has been performed, the various operating procedures are obtained through use of display frames displayed on the DU screen. Examples of often used display frames are included in the Appendix in numerical order and are referred to in the text that follows.

Startup Procedures

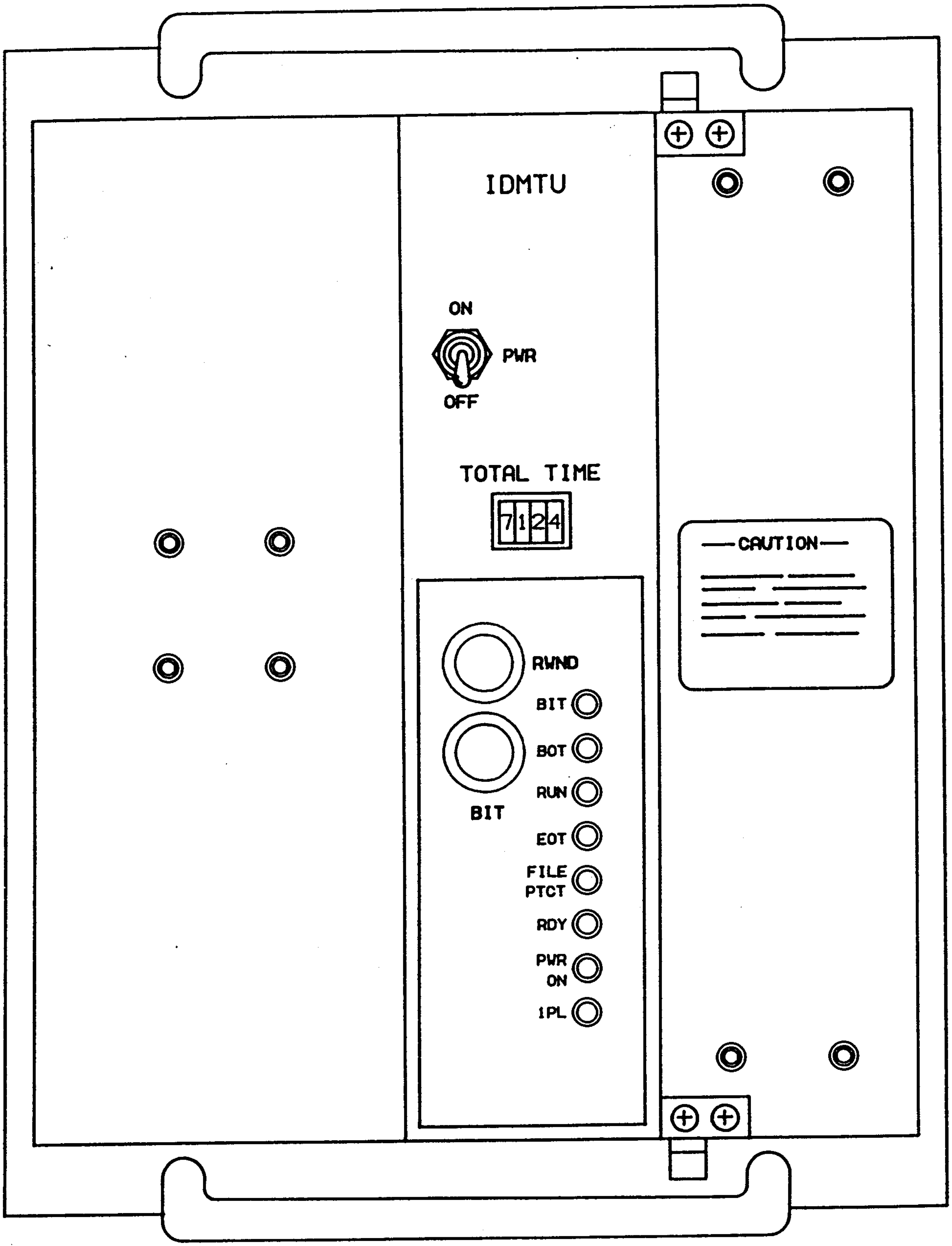
1. Ensure that circuit breakers listed in figure 7 are closed. The MADAR portion of the MADAR power switch should be on.

2. Ensure that the DU power switch is on.

3. Rotate the DU BRT control on the DU fully CW.

4. Ensure that the POU motor switch is on.

Figure 46. Maintenance Data Recorder



5. Press the MADAR power switch. The ON portion of the switch lights up. The MADAR then performs a self test. After successful completion of the self test (approximately 22 seconds), display frame 00001 appears in the frame display area and STBY appears in the events display area.

NOTE: If the MADAR was shut down prior to this startup in any mode other than STANDBY, display frame 00909 appears and the mode annunciated in the events display area indicates the mode at last shutdown.

If the aircraft is on jacks, airborne, or any engine N2 is more than 60 percent, the system goes directly to OPERATE mode.

6. Adjust the DU BRT control for optimum display brightness. The system can now be switched to TEST or OPER mode as required.

NOTE: Some display frames are stored in the controller memory and system loader. If the MADAR does not pass the power up self test, one of these frames appears. Follow the instructions on this displayed frame. (See Appendix.)

An index of these frames appears on frame 00098. (See Appendix.) If one of these frames is called by the operator, SAMPLE ONLY NO FAILURE appears on the frame. When one of these frames appears as a result of a self test failure, these words do not appear on the frame.

7. If MDR recording is required, perform the following steps:

- o Ensure that MDR switch is in the ON position.
- o Enter INIT and press MSG INPUT to display initialization data.
- o Verify and update the data as required.
- o Enter OPER and press MSG INPUT at the time data is to be recorded.
- o Enter TEST or STBY and press MSG INPUT when data recording is complete.

Index Frames

A master index, alphabetical master index, and subsystem index are contained on display frames. The operator should become familiar with these frames in order to use the MADAR efficiently. The master index (frame 00002) lists all subsystem index frames.

The master index is accessed in the following three ways:

1. At startup frame 00001 appears. Press FRAME ADV to advance one frame to 00002.

2. Enter 2 and press FRAME ADRS.

3. Press the INDEX key.

The subsystem index frame number is obtained also by entering the first three letters of the subsystem and pressing INDEX.

SAR data display frames can be displayed by entering the two digit SAR number and pressing INDEX.

Operating Procedures for Ground Crews

1. Perform startup procedure. Frame 00001 is displayed.

2. Press INDEX key. Frame 00002 is displayed.

3. Enter 7, press CHOICE. Frame 00896 is displayed.

4. Enter 2, press CHOICE. Frame 00924 is displayed.

5. Follow instructions on frame 00924.

6. Press FRAME ADV. Frame 00925 is displayed.

7. Follow instructions on frame 00925.

Operating Procedures for Flight Engineers

1. Perform startup procedure. Frame 00001 is displayed.

2. Press INDEX key. Frame 00002 is displayed.

3. Enter 7, press CHOICE. Frame 00896 is displayed.

4. Enter 1, press CHOICE. Frame 00898 is displayed.

5. Enter the choice number and press CHOICE. The applicable frame for the desired procedure is displayed.

   - MADAR PREFLIGHT - Frame 00904
     Frame 00905

   - MADAR PRE-ENGINE START - Frame 00906

   - MADAR BEFORE TAKEOFF - Frame 00907

   - MADAR LINEUP - Frame 00908

   - MADAR SHUTDOWN - Frame 00910

6. Follow the instructions on the displayed frame for the desired procedure.

POU Paper Loading Instructions

1. Perform startup procedure. Frame 00001 is displayed.

2. Press INDEX key. Frame 00002 is displayed.

3. Enter 7, press CHOICE. Frame 00896 is displayed.

4. Enter 10, press CHOICE. Frame 04520 is displayed.

5. Follow instructions on frames 04520 and 04521.

NOTE: If the number of the POU paper loading instructions frame is remembered, enter the number (4520) and press FRAME ADRS.

MDR Cartridge Removal Instructions

1. Perform startup procedure. Frame 00001 is displayed.

2. Press index key. Frame 00002 is displayed.

3. Enter 7, press choice. Frame 00896 is displayed.

4. Press FRAME ADV. Frame 00897 is displayed.

5. Enter 5, press CHOICE. Frame 04518 is displayed.

6. Follow the instructions on frame 04518.

MDR Cartridge Loading Instructions

1. Perform startup procedure. Frame 00001 is displayed.

2. Press index key. Frame 00002 is displayed.

3. Enter 7, press choice. Frame 00896 is displayed.

4. Press FRAME ADV. Frame 00897 is displayed.

5. Enter 4, press CHOICE. Frame 04515 is displayed.

6. Follow the instructions on frame 04515 and 04516.

MUX/PROC Program Loading Instructions

1. Perform startup procedure. Frame 00001 is displayed.

2. Press index key. Frame 00002 is displayed.

3. Enter 7, press choice. Frame 00896 is displayed.

4. Press FRAME ADV. Frame 00897 is displayed.

5. Enter 2, press CHOICE. Frame 04505 is displayed.

6. Follow the instructions on frame 04505.

General Information Frames

General information on the CNTRL keyboard commands and the CNTRL, DU, POU, AND MDR controls can be found on MADAR display frames. To display the desired information, branch through the indexes until frame 00899 is displayed, then select the appropriate choice.

Fault Code Acknowledgment

A malfunction is reported to the operator by a flashing fault code in the event display area of the DU. When the operator enters the fault code number and presses the FAULT CODE key, the message is removed from the screen and the fault code nomenclature is displayed in the data display area of the DU screen. The nomenclature in the data display area instructs the operator to access specific display frames which contain diagnostic routines. These routines include directions for reading voltages of specific test points using the DVM and/or waveform display. Use of these routines isolates the malfunction.

Manually Reporting Fault Codes

When a failure is detected by observing aircraft instrumentation and/or operation and there is no fault code displayed, the failure is reported manually. Investigation of a failure of this nature should be accomplished by pressing the INDEX key. This action accesses the master index for all subsystems. The operator then branches to the applicable malfunction analysis frame and completes the specified routine to isolate and record the failure. By following the displayed diagnostic routine and pressing the applicable choice, the applicable fault code is recorded.

If the fault code of a failed unit is known, the fault code is recorded by entering FXXXXX and pressing MSG INPUT. Likewise, the replacement of a failed unit is recorded by entering RXXXXX and pressing MSG INPUT.

Accessing Test Points

Subsystem test point voltages are displayed on one of two DVMs on the DU. Waveforms can also be displayed in the frame display area of the DU. This method of reading subsystem test points is much faster than the manual method. With a thorough knowledge of the subsystem under investigation and by using MADAR diagnostic routines, troubleshooting time is greatly reduced.

Subsystem test point information can be found in Section IX of T.O. 1C-5A-102-1. Information such as test point entry, test point voltages for specified conditions, associated display frames, associated fault codes, and subsystem interconnect are provided in this publication.

SAR data sheets are found in Section X of T.O. 1C-5A-102-1. These data sheets provide data on each SAR installed in the aircraft. Information such as signal nomenclature, electrical characteristics, channel assignments, and connector data are listed in this publication.

Cross reference to MADAR to aircraft systems interface drawings in Section IX are also listed.

Test points may be accessed by performing the following steps.

1. Perform the startup procedures.

2. On the controller keyboard, enter TEST and press MSG INPUT. This places the MADAR in the test mode for ground test operations.

3. Enter the frame number required for display of the desired test point.

4. Press FRAME ADRS to call the frame which enables the DVM and/or waveform display functions.

5. Enter the message number SSCC, where SS is the SAR number and CC is the channel number. Press TEST POINT to complete the command entry.

6. The test point voltage is displayed on the DVM and/or the waveform display.

There are many display frames that automatically enable the DVM and waveform display functions. Index frames which list general address and operational data are shown in table III. These frames contain information which direct the operator to other frames with more detailed display instructions.

Any frame which controls the DU for a particular type of test point may be used to display all test points which have the same electrical characteristics. Any frame that automatically enables the waveform display for display of one subsystem test point may be used to display test points for any other system. The operator need only enter the desired test point address and press the TEST POINT key.

Table III. General Address and Operational Data

FRAME NO.	TITLE
04000	TEST POINT DISPLAY
04001	Single Trace Display (Channel A) - Repeat Sweep
04051	Single Trace Display (Channel A) - Scroll Wave
04100	Dual Trace Display - Repeat Sweep
04200	Dual Trace Display - Scroll Wave

Familiarity with the general purpose frames is beneficial to the operator in making the best use of MADAR capabilities.

It should be noted that although the waveform presentation has the appearance of an oscilloscope presentation, it is not a real time display. It is a software generated representation of the test point waveform at the time of test point acquisition; however, the waveform is continuously refreshed if the repeat sweep function is used. The waveform is scrolled from right to left by using the scroll wave function. A particular display frame may be programmed to enable the repeat sweep function or the scroll wave function but not both.

DVM-A and DVM-B are activated by display frames or by use of the TEST POINT function. See the explanation under the heading TEST POINT Key in this handbook. The DVM is updated once every two seconds.

Shutdown Procedures

Correct shutdown procedures should always be followed. The shutdown procedures are listed on display frame 00910. (See Appendix.) This frame is displayed by entering 910, then pressing FRAME ADRS.

If the frame number is not remembered, branch through the index frames as follows:

1. Press INDEX. Frame 00002 is displayed.
2. Enter 7, press CHOICE. Frame 00896 is displayed.
3. Enter 1, press CHOICE. Frame 00898 is displayed.
4. Enter 5, press CHOICE. Frame 00910 is displayed.
5. Follow the instructions on frame 00910.

Engine Performance Monitoring

The MADAR system monitors engine performance in a variety of subroutines. The following message input commands are associated with engine performance:

- ETxxxx
- EPxxx
- VAsscc
- VRFsscc (FAN) or VRCsscc (core)
- FTBx

These commands, as well as the display format associated with each command, are explained in this chapter.

The computer routines associated with engine performance monitoring are:

- Engine Vibration Monitoring
- Engine Test

Engine Vibration Monitoring

The engine vibration modules contain five vibration test routines:

- Automatic Analysis
- Manual Vibration Analysis
- Automatic Resonance Analysis
- Engine Resonant Vibration Analysis
- Engine Fan Balance

Automatic Analysis - The automatic test program is executed at a rate of one per second for each engine. This is a pretest to determine if any of the four vibration signal levels are greater than a specified level. When the amplitude of a vibration signal is determined to be out of limit, more detailed analysis is performed and high sample rate data is output to the MDR for post flight analysis. This routine runs continuously until an abnormal condition is detected. Then the program branches to more detailed test routines to aid the operator in resolving the abnormal condition. A data format as shown in figure 23 is displayed in response to the operator acknowledgment of an associated fault code.

Manual Vibration Analysis - The manual vibration analysis program offers the operator the capability to command an engine vibration test. In response to the VAsscc command, this routine is executed one time and temporarily interrupts the automatic analysis routine. This procedure samples and analyzes the vibration signal for the operator selected accelerometer on the particular engine of interest. The test results are output to the data display area for operator viewing, as shown in figure 23 to the POU buffer, and to the MDR.

Automatic Resonance Sampling - Automatic resonance sampling is initiated automatically by the MUX/PROC on a cyclic basis; 50 minutes after takeoff and every 4 hours thereafter while the aircraft is airborne. (4 hours is the AUTORES interval.) When prerequisite conditions are satisfied, a resonant data burst will be acquired and recorded on the MDR for each of eight vibration channels at each of four rpm conditions (a maximum of 32 bursts each AUTORES interval). Only one resonant burst is recorded in any 1 second interval as a higher priority substitute task for the automatic vibration analysis that would normally be performed. The four rpm conditions, representing natural frequencies of the engine, are N1 between 77 and 83 percent, N1 between 88 and 94 percent, N2 between 77 and 83 percent, and N2 between 88 and 94 percent. The data burst is a short sample of test data consisting of 512 values sampled with a uniform interval between samples of 318 microseconds. The recording of the data burst message is immediately preceded by a fault code message which identifies the vibration channel and the fact that automatic resonance sampling was the cause of the burst message. No data is presented on the DU or POU as a result of automatic resonance sampling.

Engine Resonant Vibration Analysis - Engine resonant vibration analysis is initiated by manual input of the command VRFsscc for fan or VRCsscc for core, where ss specified SAR number 19, 20, 21, or 22, and cc specifies channel 08 or 09. The test point identified by sscc is analyzed by the MUX/PROC over a 60 second period to determine vibration signal levels at 1 second intervals during engine acceleration/deceleration operations. This task is performed as a higher priority substituted for automatic vibration analysis. Software computes fan and core vibration components in mils, together with corresponding N1 or N2 values, and presents this data in near real time in the data display area of the DU. The format of this display is shown in figure 24.

Engine Fan Balance - The fan balance subroutine permits balancing of the fan section with the engine on the airplane. The program is initiated when the operator executes the FTBX message input command. While this routine is running, the automatic analysis routine is interrupted. See figure 23 for the fan trim portion of the format. The purpose of this routine is to determine the location of the balancing weight necessary to correct fan imbalance. This program samples the vibration and tachometer signals and calculates the angle of rotation between them. The result of the calculation is the angle between the vibration peak amplitude and the positive going zero crossover point of the tachometer signal. The angle, when measured with respect to the reference fan bolt, determines the bolt location at which the balance weight should be installed. The data is displayed for operator information.

Engine Test

The engine test program is executed upon operator command. The operator is prompted to command the test 50 minutes after takeoff and at 4 hour intervals thereafter. The operator can command the test at any time. The engine test command ETxxxx is explained in table I and the resulting display format is shown in figure 33.

The primary objectives of the engine test program are to:

- o Provide the flight crew with the engine data necessary to perform an engine to engine performance comparison on a real time basis in flight.
- o Provide the flight crew with the means to identify engine instrumentation deficiencies.
- o Record engine performance data on the MDR for subsequent central data bank analysis.

Engine test is divided into two phases. The first is a preprocessing diagnostic routine. The second samples performance data and compares the results with standard day normalized values. The preprocessing diagnostic phase is accomplished by sampling test points for validity and stability, determining that the airplane is in a specific cruise condition, and then delaying 60 seconds to allow all test points to stabilize. When all conditions are valid, the engine test is accomplished. An error message is output if all conditions are not valid. The data comparison test is accomplished by sampling test points at a rate of one per second for 32 seconds. An average of the 32 seconds of data is computed, using corrected test point values. A set of performance equations is generated for comparison with performance characteristics normalized to standard day performance values. Engine performance is evaluated by comparing measured N2, fuel flow, TIT and VSV with standard values. Data output consists of the measured values and percent deviations of measured values from standard values. This data is displayed for operator viewing and recorded by the MDR.

To complete the engine test procedures successfully the following fundamentals should be understood.

A set of normalized standard day performance curves for the TF-39 engine have been established for evaluating engines currently in service. These curves show the relationship of N2, TIT, fuel flow, and VSV angle with respect to N1 for an average engine. This data is stored in the onboard MADAR MUX/Processor.

To perform engine test, the operator first establishes steady state, no bleed airplane operation. Upon input of the engine test command, the MUX/PROC delays for one minute to ensure engine parameter stability. After one minute, the test points are sampled for 32 seconds and average values are output to the data display, POU, and MDR. Certain items of this data are corrected to standard day, sea level conditions. Based on these corrections, FF, TIT, N2, and VSV angle deviations and percent deviations from the stored performance data are also output to the data display, POU, and MDR. If abnormal system operation is detected, one or more diagnostic messages precede the engine test data.

The flight engineer evaluates the engine test data by comparing the 32 second average values with flight station instrumentation readings, if available. Since absolute deviation limits have not been established for an individual engine, an engine to engine comparison is useful in detecting abnormal engine performance. In evaluating engine test data, consideration must first be given to diagnostic messages which indicate certain data are erroneous.

If MADAR or flight station instrument malfunctions are observed or engine performance deterioration is suspected, the operator should make a detailed AFTO Form 781 entry referencing the data display/POU data and any other pertinent observations.

The following information is a step by step explanation of engine test execution.

- o An event display message and/or POU message ENG TEST indicates engine test is to be performed.

- o Enter ENG TEST and press FAULT CODE key to acknowledge the engine test message, and follow the instructions displayed in the data display area. These instructions will instruct the operator to enter 131 and press FRAME ADRS.

- o Frame 00131 is displayed. This is the engine test introduction frame. It contains the following information.

WARNING: **The engine test procedure does not take precedence over normal safe airplane operation. Failure to observe this warning may result in injury to personnel or damage to the airplane.**

NOTE: Engine test should be accomplished once each flight segment.

Engine Test Index	Frame Adrs
Operating Instructions	132
Diagnostic Messages and Troubleshooting Index	133
Discrepancy Between 32 - Second Average and Flight Station Instrument	134
Sample Engine Test Data	135
Instrumentation Checkout	145
General Discussion of Engine Test	146

o Press FRAME ADV. Frame 00132 is displayed. This is the engine test operating instruction frame. The following instructions are contained on this frame.

CAUTION: Engine test should not be performed if icing conditions exist.

1. Enter INIT, then press MSG INPUT and verify that engine serial numbers and engine hours (±0.1 hour) are correctly stored in the computer. If necessary, update engine serial numbers and engine hours, then continue.

2. The airplane must be in a stable condition in straight and level flight at an altitude of 27,000 feet and above. Mach number 0.74 and above, and N1 of 92 percent and above for the engine being tested.

3. Turn off the fuel heater switch, anti-ice switch, and the bleed air switch for the engine under test and disengage autothrottles.

4. Enter ETXXXX and press MSG INPUT, where XXXX is the flight engineer N1 instrument reading (XXX) followed by the position of the engine (X) under test. For example, if N1 reads 93.9 and engine No. 4 is under test, enter ET9394. For N1 greater than 99.9, enter 999. (For N1 greater than 99.9, if diagnostic message N1 ERROR is displayed, delay engine test until N1 is 99.9 or less.

5. Allow 90 seconds after executing step 4 for engine test completion and display of engine test data. Diagnostic messages, if any, precede engine test data.

6. If any diagnostic messages were displayed, ensure that steps 2 through 4 were followed and repeat engine test.

7. Compare N2, TIT, FF, MACH, and altitude instrument readings with respective 32-second averages. If readings differ by more than the tolerances on frame 145, select CHOICE 1 (frame 00134) for troubleshooting, then return to this frame and continue.

8. If all engines have been tested, perform an engine to engine comparison of deviation and percent deviation data for engines for which no diagnostics were printed.

9. If any diagnostic messages were printed when engine test was repeated or if there were significant differences between instrument readings and 32 second averages, press FRAME ADV for troubleshooting.

Fault Codes with Addenda

Certain fault code messages when displayed in the event display area will be followed by addenda. Such messages require immediate operator attention. These are:

- FXXXXX S MALF
- FXXXXX E VIB
- FXXXXX G LIM
- FXXXXX FNL G

The FXXXXX S MALF message indicates that a system malfunction has occurred in the automatic vibration (AUTOVIB) processing routine. Two conditions can cause this message to be displayed. They are:

1. No signal.

2. Non-comparison channel.

The FXXXXX E VIB message indicates that an abnormal engine vibration condition has occurred. Subsequent AUTOVIB processing for the accelerometer causing the fault code is inhibited. The fault code should be acknowledged and further investigated. The AUTOVIB processing is reset using the reset vibration monitoring command.

The FXXXXX G LIM message indicates that the limit has been exceeded (i.e. two or more samples within one second are outside a range of 0.00 to 2.00 gs).

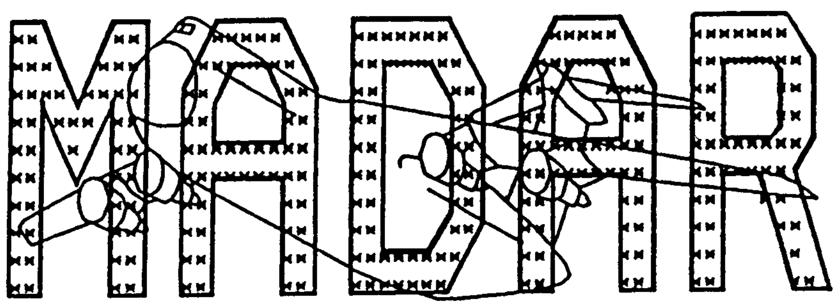
The FXXXXX FNL G message is displayed upon the fourth occurrence of the failure described in the preceding paragraph. The G limit processing is inhibited when this condition occurs. G limit processing can be reset with the reset G limit monitoring command.

APPENDIX

Display Frame 00001 (Typical)

MALFUNCTION DETECTION, ANALYSIS,

AND RECORDING SUBSYSTEM



USAF SERIES C-5B AIRCRAFT

Lockheed
-Georgia Company

F 33657-82-C-2117, P00001

COMPUTER PROGRAM
IDENTIFICATION NUMBER (CPIN)

81A-MADARSII/C5B-F001-00A-001

PUBLISHED UNDER THE AUTHORITY OF
THE SECRETARY OF THE AIR FORCE

25 JUL 86 REV. 02 00001

Display Frame 00002 (Typical)

INDEX

ENTER THE CHOICE NUMBER CORRESPONDING TO THE SUBSYSTEM
AND PRESS "CHOICE" TO ACCESS THE DESIRED SUBSYSTEM INDEX

SUBSYSTEM	CHOICE	
PROPULSION	1	(FR 00128)
ENVIRONMENTAL	2	(FR 00256)
SECONDARY POWER	3	(FR 00384)
MECHANICAL	4	(FR 00512)
FLIGHT CONTROLS	5	(FR 00640)
INSTRUMENTATION	6	(FR 00768)
MADAR	7	(FR 00896)
RADAR	8	(FR 01152)
COMMUNICATIONS	9	(FR 01280)
NAVIGATION	10	(FR 01408)
ALPHABETICAL MASTER INDEX	ENTER FIRST LETTER OF THE SYSTEM AND PRESS "INDEX"	

END OF INDEX

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00002

Display Frame 00098(Typical)

CONTROLLER/LOADER
STORED DISPLAY FRAMES

NOTE

THE DISPLAY FRAMES LISTED ON THIS INDEX ARE STORED IN THE CONTROLLER MEMORY OR PROGRAM LOADER SOFTWARE FOR DISPLAY WHEN A SYSTEM MALFUNCTION OCCURS. THIS INDEX PROVIDES ACCESS TO SAMPLES OF THESE STORED FRAMES FOR INFORMATION AND TRAINING ONLY.

SELECT THE CHOICE CORRESPONDING TO THE DESIRED DISPLAY FRAME

MUX/PROCESSOR MEMORY FAILURE	CHOICE 1 (FR 00100)
* MUX/PROCESSOR MEMORY VALID	CHOICE 2 (FR 00101)
* MDR PROGRAM CARTRIDGE FAILURE	CHOICE 3 (FR 00102)
MUX/PROCESSOR NEWPROGRAM LOADING INSTRUCTIONS	CHOICE 4 (FR 00103)
COMMUNICATIONS FAILURE BETWEEN CONTROLLER AND MUX/PROCESSOR	CHOICE 5 (FR 00104)
* MUX/PROCESSOR FLIGHT PROGRAM LOADING SEQUENCE	CHOICE 6 (FR 00105)

* PROGRAM LOADER STORED FRAME

PRESS "FRAME ADV" FOR CONTINUATION OF INDEX

MADAR SUBSYSTEM 24 OCT 86 REV. 03 00098

Display Frame 00099 (Typical)

CONTROLLER/LOADER
STORED DISPLAY FRAMES

NOTE

THE DISPLAY FRAMES LISTED ON THIS INDEX ARE STORED IN THE CONTROLLER MEMORY OR PROGRAM LOADER SOFTWARE FOR DISPLAY WHEN A SYSTEM MALFUNCTION OCCURS. THIS INDEX PROVIDES ACCESS TO SAMPLES OF THESE STORED FRAMES FOR INFORMATION AND TRAINING ONLY.

SELECT THE CHOICE CORRESPONDING TO THE DESIRED DISPLAY FRAME

CONTROLLER FAILURE	CHOICE 1 (FR 00106)
CONTROLLER FAILURE	CHOICE 2 (FR 00107)
CONTROLLER FAILURE	CHOICE 3 (FR 00108)
* MUX/PROCESSOR FAILURE	CHOICE 4 (FR 00109)
MDR FAILURE DURING PROGRAM LOADING	CHOICE 5 (FR 00111)
* MDR FAILURE DURING PROGRAM LOADING	CHOICE 6 (FR 00112)

* PROGRAM LOADER STORED FRAME

END OF INDEX

MADAR SUBSYSTEM 31 MAY 88 REV. 05 00099

Display Frame 00100 (Typical)

MADAR POWER-UP SELF-TEST

(THIS FRAME STORED IN CONTROLLER MEMORY)

MUX/PROCESSOR MEMORY FAILURE

REMOVE THE RECORD CARTRIDGE
AND INSTALL THE PROGRAM
CARTRIDGE IN THE MDR
(AVIONICS BAY NO. 3)

↓

ON THE MADAR CONTROLLER,
ENTER "LOAD" AND PRESS
"MSG INPUT" TO PROGRAM
THE MUX/PROCESSOR MEMORY

↓

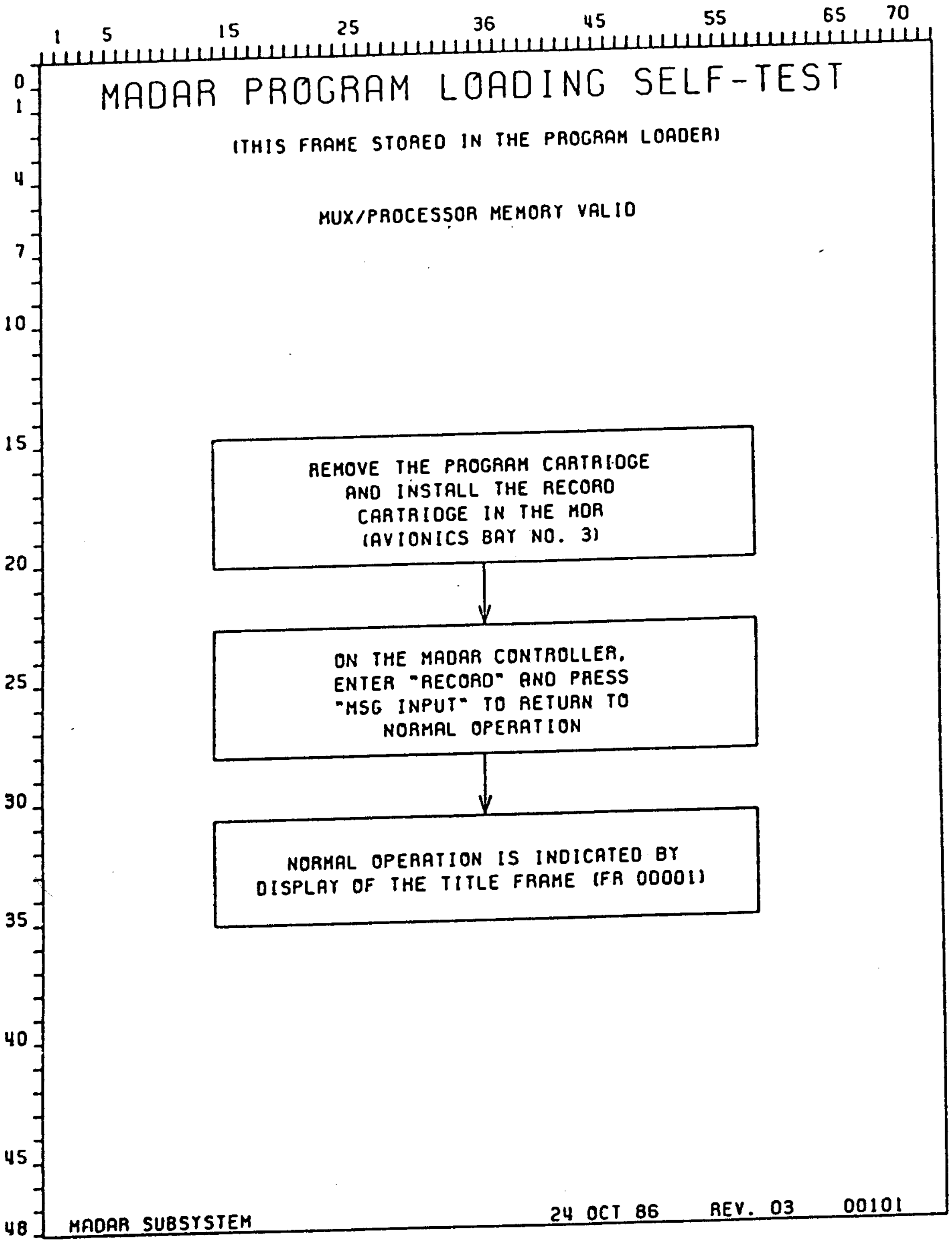
A SUCCESSFUL PROGRAM LOAD
IS INDICATED BY DISPLAY OF
FRAME 00101 WITHIN 8 MINUTES

↓

IF THIS FRAME REAPPEARS FOLLOWING
THE FLIGHT PROGRAM LOADING SEQUENCE,
REPORT FAULT CODE F55547 IN 781A
WRITEUP
(MUX/PROCESSOR FAILURE)

MADAR SUBSYSTEM 31 MAY 88 REV. 05 00100

Display Frame 00101 (Typical)



Display Frame 00102 (Typical)

MADAR PROGRAM LOADING SELF-TEST

(THIS FRAME STORED IN THE PROGRAM LOADER)

F55364 MDR PROGRAM CARTRIDGE FAILURE

REMOVE THE PROGRAM CARTRIDGE
AND INSTALL ANOTHER PROGRAM
CARTRIDGE IN THE MDR
(AVIONICS BAY NO. 3)

↓

ON THE MADAR CONTROLLER,
ENTER "LOAD" AND PRESS
"MSG INPUT" TO PROGRAM
THE MUX/PROCESSOR MEMORY

↓

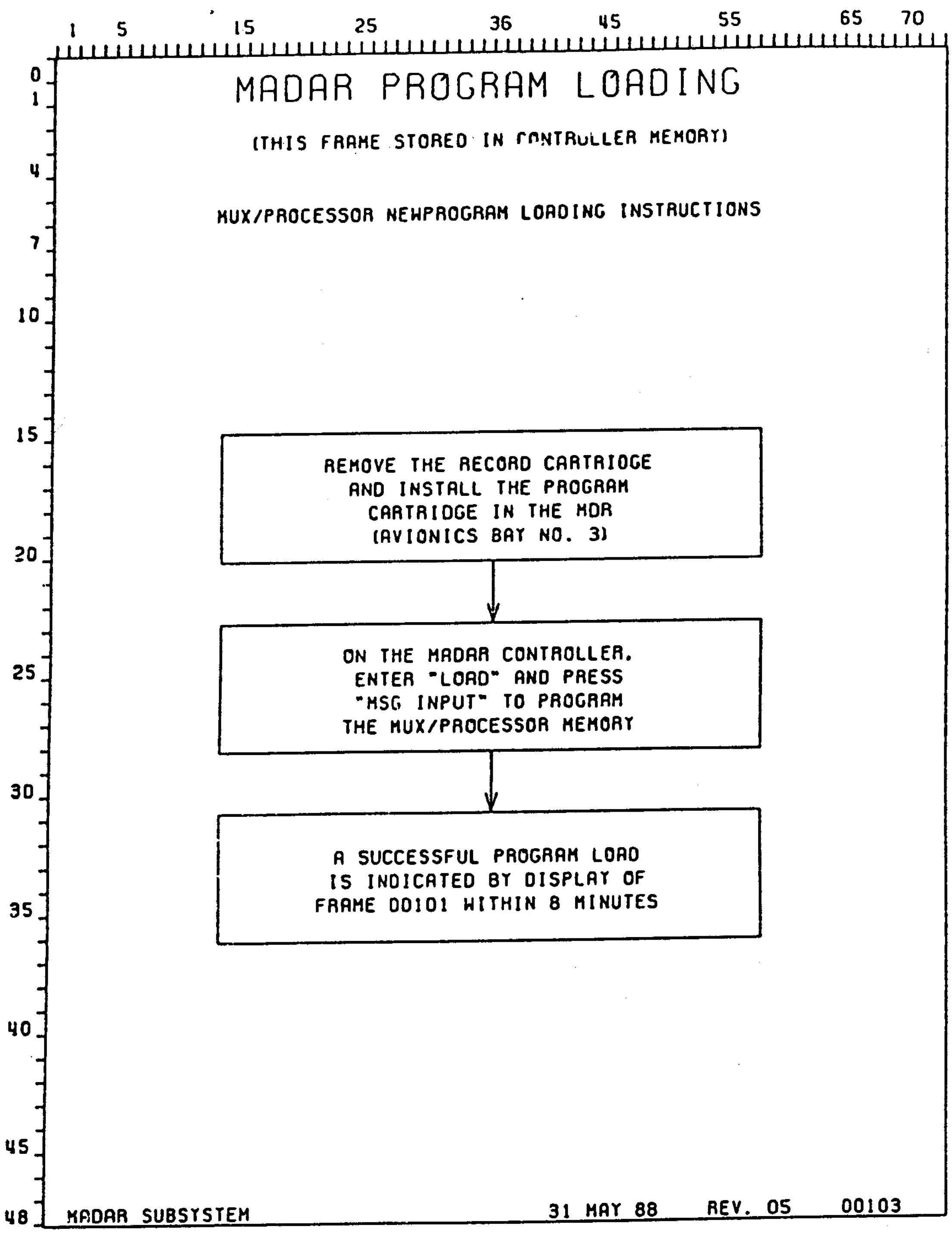
A SUCCESSFUL PROGRAM LOAD
IS INDICATED BY DISPLAY OF
FRAME 00101 WITHIN 8 MINUTES

↓

IF THIS FRAME REAPPEARS FOLLOWING
THE FLIGHT PROGRAM LOADING SEQUENCE,
REPORT FAULT CODE F55442 IN 781A
WRITEUP
(MDR FAILURE)

MADAR SUBSYSTEM 24 OCT 86 REV. 03 00102

Display Frame 00103 (Typical)



MADAR PROGRAM LOADING

(THIS FRAME STORED IN CONTROLLER MEMORY)

MUX/PROCESSOR NEWPROGRAM LOADING INSTRUCTIONS

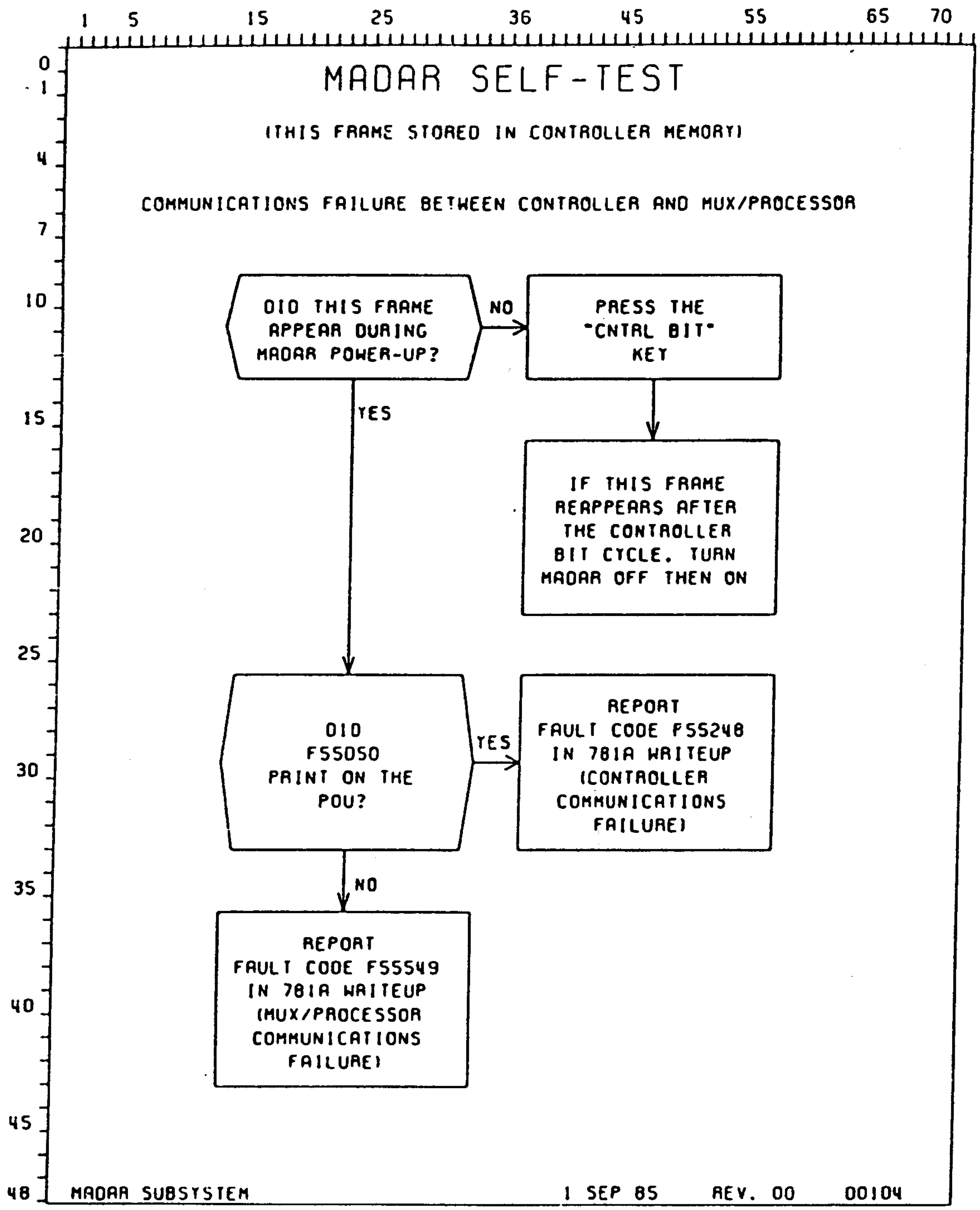
REMOVE THE RECORD CARTRIDGE
AND INSTALL THE PROGRAM
CARTRIDGE IN THE MDR
(AVIONICS BAY NO. 3)

ON THE MADAR CONTROLLER,
ENTER "LOAD" AND PRESS
"MSG INPUT" TO PROGRAM
THE MUX/PROCESSOR MEMORY

A SUCCESSFUL PROGRAM LOAD
IS INDICATED BY DISPLAY OF
FRAME 00101 WITHIN 8 MINUTES

MADAR SUBSYSTEM 31 MAY 88 REV. 05 00103

Display Frame 00104 (Typical)



Display Frame 00105 (Typical)

MADAR PROGRAM LOADING

(THIS FRAME STORED IN THE PROGRAM LOADER)

MUX/PROCESSOR FLIGHT PROGRAM LOADING SEQUENCE

LOADING OF THE MADAR FLIGHT PROGRAM FROM THE MDR PROGRAM CARTRIDGE HAS BEEN INITIATED. EACH MESSAGE WILL BE SEQUENTIALLY DISPLAYED ON THE ENTRY LINE TO INDICATE THE PROGRESS OF THE LOADING OPERATION. THE APPROXIMATE DURATION OF THE FLASHING OF EACH MESSAGE IS SHOWN AT RIGHT.

MESSAGE	DURATION
LOADING MUX/PROCESSOR FROM TAPE	4 - 7 MINUTES
REWINDING MDR TAPE	30 - 50 SECONDS

> A SUCCESSFUL PROGRAM LOAD
> IS INDICATED BY DISPLAY OF
> FRAME 00101 WITHIN 8 MINUTES

MADAR SUBSYSTEM 31 MAY 88 REV. 05 00105

Display Frame 00106 (Typical)

MADAR SELF-TEST

(THIS FRAME STORED IN CONTROLLER MEMORY)

CONTROLLER FAILURE

REPORT
FAULT CODE F55245
IN 781A WRITEUP
(CONTROLLER CPU
FAILURE)

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00106

Display Frame 00107 (Typical)

MADAR SELF-TEST

(THIS FRAME STORED IN CONTROLLER MEMORY)

CONTROLLER FAILURE

REPORT
FAULT CODE F55246
IN 781A WRITEUP
(CONTROLLER
MEMORY FAILURE)

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00107

Display Frame 00108 (Typical)

MADAR SELF-TEST

(THIS FRAME STORED IN CONTROLLER MEMORY)

CONTROLLER FAILURE

REPORT
FAULT CODE FS5247
IN 781A WRITEUP
(CONTROLLER DATA
BUS RAM FAILURE)

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00108

Display Frame 00109 (Typical)

MADAR PROGRAM LOADING SELF-TEST

(THIS FRAME STORED IN THE PROGRAM LOADER)

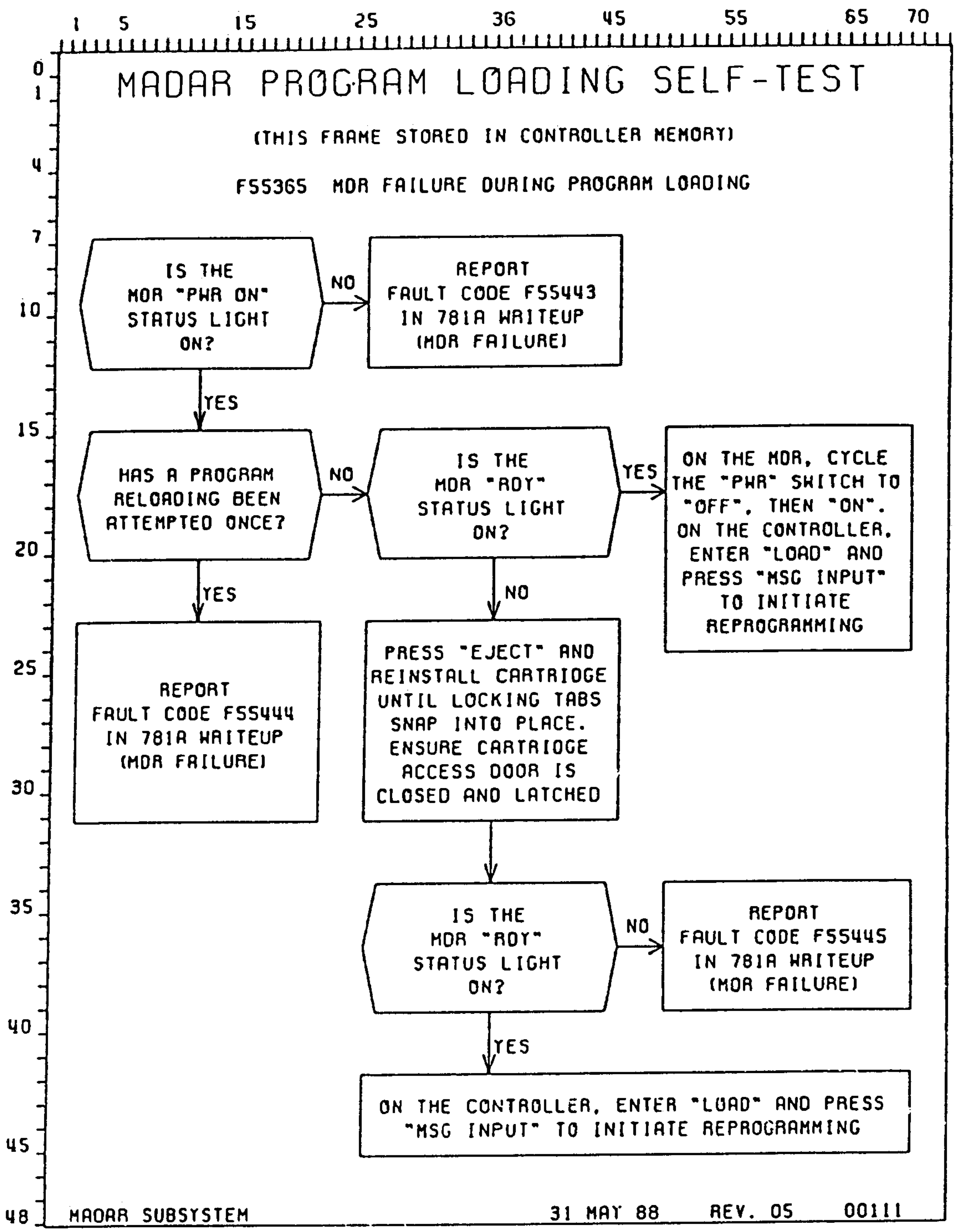
REFER TO THE BOX BELOW CONTAINING
THE DISPLAYED FAULT CODE AND CONTINUE

F55470 - THE BUBBLE MEMORY CONTROLLER HAS FAILED AND THE PROGRAM LOADING HAS BEEN TERMINATED. REPORT FAULT CODE F55470 IN 781A WRITEUP
(MUX/PROCESSOR FAILURE)

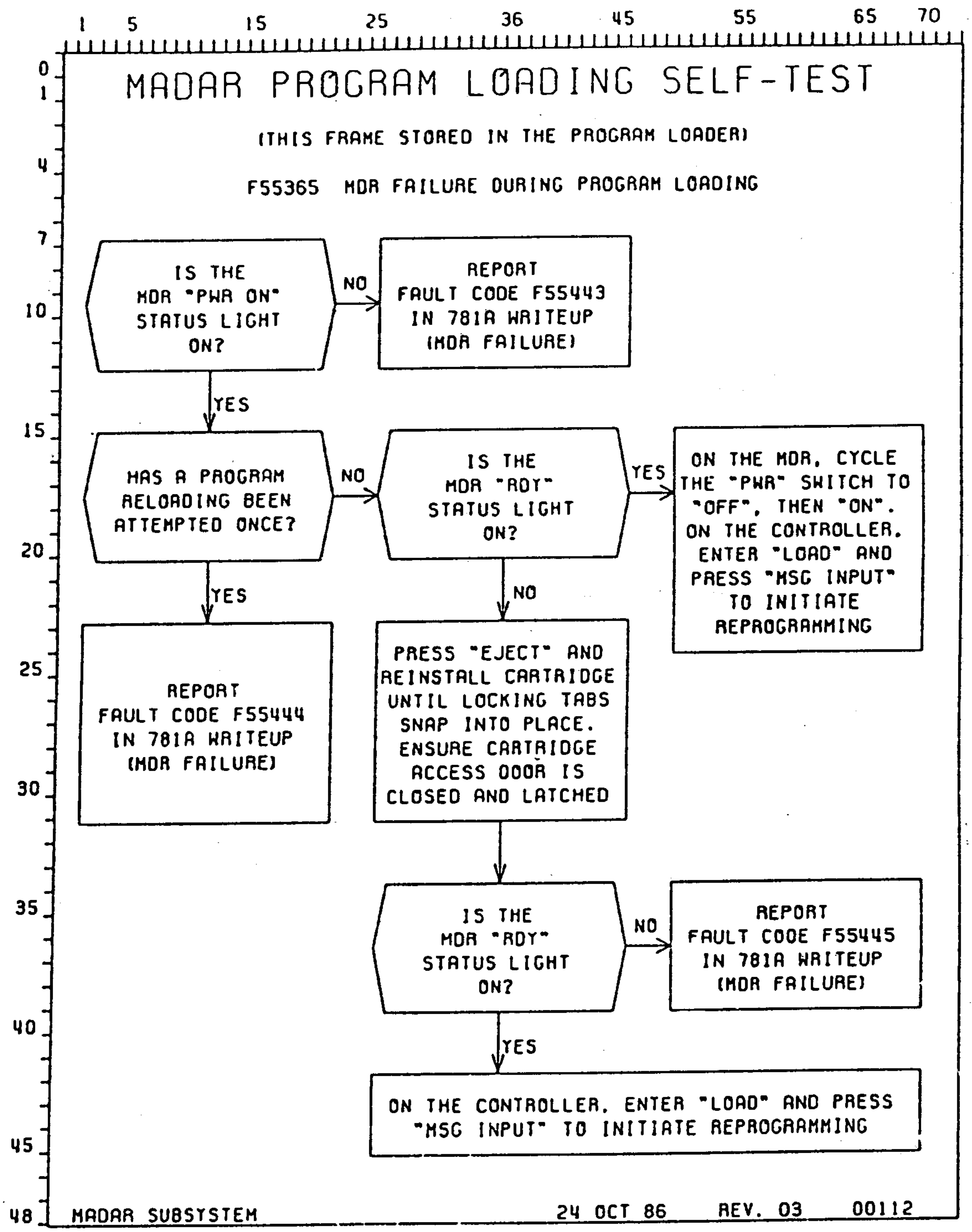
F55471 - THE BUBBLE MEMORY HAS FAILED AND PROGRAM LOADING HAS BEEN TERMINATED. ATTEMPT TO RELOAD THE PROGRAM (ENTER "LOAD" AND PRESS "MSG INPUT"). IF FAULT CODE F55471 IS DISPLAYED DURING PROGRAM RELOADING, REPORT FAULT CODE F55546 IN 781A WRITEUP
(MUX/PROCESSOR FAILURE)

MADAR SUBSYSTEM 24 OCT 86 REV. 03 00109

Display Frame 00111 (Typical)



Display Frame 000112 (Typical)



Display Frame 00896 (Typical)

MADAR INDEX

SELECT THE CHOICE OR FRAME ADDRESS CORRESPONDING
TO THE DESIRED INFORMATION AND CONTINUE

FLIGHT ENGINEER PROCEDURES	CHOICE 1 (FR 00898)
OPERATIONAL CHECKOUT (GROUND CREW)	CHOICE 2 (FR 00924)
DISPLAY UNIT (DU)	CHOICE 3 (FR 04701)
DU BIT	CHOICE 4 (FR 04850)
CONTROLLER (CNTRL)	CHOICE 5 (FR 04721)
CONTROLLER KEYBOARD COMMANDS	CHOICE 6 (FR 04501)
CONTROLLER STORED DISPLAY FRAMES (SAMPLE) .	CHOICE 7 (FR 00098)
CNTRL BIT	CHOICE 8 (FR 04855)
PRINTOUT UNIT (POU)	CHOICE 9 (FR 04741)
POU PAPER LOADING INSTRUCTIONS	CHOICE 10 (FR 04520)
POU BIT	FRAME ADRS 4860

PRESS "FRAME ADV" FOR CONTINUATION OF INDEX

MADAR SUBSYSTEM 25 JUL 86 REV. 02 00896

Display Frame 00897 (Typical)

MADAR INDEX

SELECT THE CHOICE OR FRAME ADDRESS CORRESPONDING
TO THE DESIRED INFORMATION AND CONTINUE

MUX/PROCESSOR (MUX/PROC)	CHOICE 1 (FR 04801)
MUX/PROCESSOR PROGRAM LOADING INSTRUCTIONS .	CHOICE 2 (FR 04505)
MAINTENANCE DATA RECORDER (MDR)	CHOICE 3 (FR 04781)
MDR CARTRIDGE LOADING INSTRUCTIONS	CHOICE 4 (FR 04515)
MDR CARTRIDGE REMOVAL INSTRUCTIONS	CHOICE 5 (FR 04518)
SAR POWER SUPPLY/SARS	CHOICE 6 (FR 04811)
SAR DATA	CHOICE 7 (FR 03900)
ENGINE VIBRATION INSTRUMENTATION	CHOICE 8 (FR 04551)
GENERAL INFORMATION	CHOICE 9 (FR 00899)
TEST POINT INDEX	CHOICE 10 (FR 00985)
GENERAL TEST POINT DISPLAY (DVM & WAVEFORM) . (GENERAL PURPOSE DISPLAY FRAMES)	FRAME ADRS 4000

END OF INDEX

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00897

Display Frame 00898 (Typical)

FLIGHT ENGINEER PROCEDURES

INDEX

ENTER THE CHOICE NUMBER AND PRESS "CHOICE"

END OF INDEX

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00898

Display Frame 00899 (Typical)

GENERAL INFORMATION

SELECT THE CHOICE CORRESPONDING TO THE
DESIRED INFORMATION AND CONTINUE

CONTROLLER KEYBOARD COMMANDS	CHOICE 1 (FR 04601)
CONTROLLER CONTROLS	CHOICE 2 (FR 04604)
DISPLAY UNIT CONTROLS	CHOICE 3 (FR 04630)
PRINTOUT UNIT CONTROLS	CHOICE 4 (FR 04635)
MAINTENANCE DATA RECORDER CONTROLS . .	CHOICE 5 (FR 04640)

END OF INDEX

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00899

Display Frame 00904 (Typical)

MADAR PREFLIGHT

ENTER THE KEYBOARD COMMAND AND PRESS "MSG INPUT"

1. GO TO STANDBY - "STBY"

2. UPDATE GMT (ZULU) TIME (HHMMSS) - "TIMXXXXXX"

3. DISPLAY INITIALIZATION DATA - "INIT"

4. INITIALIZATION DATA - CHECKED AND UPDATED

   IF DATA UPDATE IS REQUIRED:
   A. INPUT DATA AS NECESSARY
   B. PRESS "MSG INPUT" TO ENTER DATA AND/OR ADVANCE TO NEXT DATA FIELD
   C. RECHECK DATA FOR ACCURACY
   D. PRESS "NORM" TO RETURN CURSOR TO ENTRY LINE

   IF NO DATA UPDATE IS REQUIRED:
   PRESS "NORM" TO RETURN CURSOR TO ENTRY LINE

5. DISPLAY SUPPRESSED FAULT CODE TABLE - "SUPP" (OTHER THAN HOME STATION)

* 6. DISPLAY ZERO FLIGHT REPORT - "ZERO" (HOME STATION ONLY)

> * ZERO FLIGHT REPORT WILL ALSO ZERO THE SUPPRESSED FAULT CODE TABLE, THE FAILED FAULT CODE TABLE, THE PREVIOUS FRAME TABLE AND THE PDU PAPER PAGE COUNTER.

PRESS "FRAME ADV" AND CONTINUE

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00904

Display Frame 00905 (Typical)

MADAR PREFLIGHT

ENTER THE KEYBOARD COMMAND AND PRESS "MSG INPUT"

7. DISPLAY PERCENT OF MDR TAPE REMAINING - "TAPE"

8. MDR TAPE REMAINING - ADEQUATE FOR FLIGHT

   IF REQUIRED:
   A. ENTER AN IDENTIFICATION CODE AND PRESS "HOLD"
   B. ENTER 4515 AND PRESS "FRAME ADRS" FOR MDR TAPE CARTRIDGE LOADING INSTRUCTIONS

9. DISPLAY PERCENT OF POU PAPER REMAINING - "PAPER"

10. POU PAPER REMAINING - ADEQUATE FOR DEPARTURE

    IF REQUIRED:
    A. ENTER AN IDENTIFICATION CODE AND PRESS "HOLD"
    B. ENTER 4520 AND PRESS "FRAME ADRS" FOR POU LOADING INSTRUCTIONS

11. POU BIT TEST - COMPLETED

12. SPARE POU PAPER - ADEQUATE FOR MISSION

13. GO TO TEST - "TEST"

14. RESOLVE ALL FAILED FAULT CODES INDICATED ON DU

    REMAIN IN TEST MODE A MINIMUM OF 30 SECONDS TO ENSURE ALL FAILED FAULT CODES HAVE BEEN DISPLAYED

15. GO TO STANDBY - "STBY"

THIS COMPLETES THE MADAR PREFLIGHT PROCEDURE

NOTE
ENSURE THAT THE MADAR IS SET TO OPERATE PRIOR TO ENGINE START

PRESS "FRAME ADV" TO ACCESS MADAR PRE-ENGINE START PROCEDURE

MADAR SUBSYSTEM   31 MAY 88   REV. 05   00905

Display Frame 00906 (Typical)

MADAR PRE-ENGINE START

NOTE: SET THE MADAR SYSTEM TO OPERATE
PRIOR TO ENGINE START

ENTER THE KEYBOARD COMMAND AND PRESS "MSG INPUT"

<u>COMMAND</u>	<u>ENTRY</u>
GO TO OPERATE	OPER

THIS COMPLETES THE MADAR
PRE-ENGINE START PROCEDURE

PRESS"FRAME ADV" FOR MADAR
BEFORE TAKEOFF PROCEDURE

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00906

Display Frame 00907 (Typical)

MADAR BEFORE TAKEOFF

U.S.A.F. SPECIAL DATA ENTRY

ENTER THE KEYBOARD COMMAND AND PRESS "MSG INPUT"

<u>COMMAND</u>	<u>ENTRY</u>
1. PREDICTED OAT (DEG C) (±NN)	OATXXX
2. PREDICTED TAKEOFF STATIC N1 RPM (NNN)	RPMXXX
3. PREDICTED CHECK TIT (NNN)	TITXXX
4. TYPE OF TAKEOFF (LL) (SELECT ONE BELOW)	TOXX

REDUCED ROLLING . . . . RR
REDUCED STANDING . . . RS
TRT ROLLING . . . . TR
TRT STANDING . . . . . . TS

THIS COMPLETES THE BEFORE TAKEOFF PROCEDURE

PRESS "FRAME ADV" TO ACCESS
MADAR LINEUP PROCEDURE

MADAR SUBSYSTEM 25 JUL 86 REV. 02 00907

Display Frame 00908 (Typical)

MADAR LINEUP

ENTER THE KEYBOARD COMMAND AND PRESS "MSG INPUT"

COMMAND	ENTRY
DISPLAY/PRINT ENGINE TAKEOFF PARAMETERS	EP250

THIS COMPLETES THE LINEUP PROCEDURE

MADAR SUBSYSTEM   1 SEP 85   REV. 00   00908

Display Frame 00909 (Typical)

MADAR POWER INTERRUPTION

A MADAR SUBSYSTEM

POWER INTERRUPTION

HAS OCCURRED

NOTE TO FLIGHT ENGINEER

RECHECK INITIALIZATION DATA

SELECT CHOICE 1 (FR 00904)

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00909

Display Frame 00910 (Typical)

MADAR SHUTDOWN

ENTER THE KEYBOARD COMMAND AND PRESS "MSG INPUT"

COMMAND	ENTRY
1. PRINT FLIGHT REPORT	FLTR
2. GO TO STANDBY	STBY
3. MADAR - OFF	

MADAR SUBSYSTEM   1 SEP 85   REV. 00   00910

Display Frame 00924 (Typical)

OPERATIONAL CHECKOUT (GROUND CREW)

> **WARNING**
>
> OBSERVE ALL WARNINGS, CAUTIONS AND PROCEDURES OUTLINED IN APPLICABLE 1C-5A-SERIES TECHNICAL ORDERS PRIOR TO PERFORMING ANY MAINTENANCE TROUBLESHOOTING

BEFORE THE MADAR CAN BE USED IN GROUND MAINTENANCE TROUBLESHOOTING PROCEDURES, PERFORM THE FOLLOWING:

1. ENSURE THAT THE MADAR CLOCK IN THE EVENT DISPLAY AREA IS OPERATING (CHECK THE SECONDS COUNTER ADVANCING IN ONE SECOND INCREMENTS).

2. ENSURE THAT THE DU BIT PATTERN IS CORRECTLY DISPLAYED.

   PRESS THE "DU BIT" BUTTON ON THE DU AND COMPARE THE DISPLAYED TEST PATTERN WITH THE SAMPLE TEST PATTERN IN T.O. 1C-5A-102-1, SECTION III, THEN PRESS THE "DU BIT" BUTTON AGAIN TO RETURN TO THIS FRAME.

3. ENSURE THAT THE CONTROLLER BIT PATTERN IS CORRECTLY DISPLAYED.

   ENTER AN ID CODE AND PRESS THE "HOLD" BUTTON AND UPON COMPLETION OF THIS STEP ENTER THE SAME ID CODE AND PRESS THE "HOLD" BUTTON TO RETURN TO THE OPERATIONAL CHECKOUT PROCEDURE.

   PRESS THE "CNTRL BIT" BUTTON TWICE (WITHIN 5 SECONDS) AND COMPARE THE DISPLAYED TEST PATTERN WITH THE SAMPLE TEST PATTERN IN T.O. 1C-5A-102-1, SECTION III. PRESS THE "CLEAR" KEY, THEN ENTER THE ID CODE AND PRESS THE "HOLD" BUTTON TO RETURN TO THIS FRAME.

PRESS "FRAME ADV" AND CONTINUE

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00924

Display Frame 00925 (Typical)

OPERATIONAL CHECKOUT (GROUND CREW)
(CONTINUED)

4. ENSURE THAT THE POU "MSG" LIGHT COMES ON AND THE POU BIT PATTERN IS CORRECTLY PRINTED.

   PRESS AND RELEASE THE "BIT" BUTTON ON THE POU. NOTE THAT THE "MSG" LIGHT COMES ON WHILE THE BUTTON IS DE-PRESSED AND THE POU BIT IS EXECUTED WHEN THE BUTTON IS RELEASED. COMPARE THE POU PRINTOUT WITH THE SAMPLE POU BIT PATTERN IN T.O. 1C-5A-102-1, SECTION III.

5. ENTER THE COMMAND "TEST" AND PRESS THE "MSG INPUT" BUTTON.

6. OBSERVE THE EVENT DISPLAY AREA FOR FAULT CODE MESSAGES IN THE RANGE OF F55000 THROUGH F55807 AND RESOLVE THESE FAULT CODES, THEN CONTINUE.

7. THE MADAR SYSTEM CAN NOW BE USED FOR GROUND MAINTENANCE TROUBLESHOOTING.

END OF OPERATIONAL CHECKOUT

MADAR SUBSYSTEM 1 SEP 85 REV. 00 00925

Display Frame 04505 (Typical)

MUX/PROCESSOR PROGRAM LOADING INSTRUCTIONS

1. ENTER "NEWPROGRAM" AND PRESS "MSG INPUT" TO ACCESS FRAME 00103 (STORED IN THE CONTROLLER MEMORY).

NOTE

"NEWPROGRAM" WILL REMAIN ON THE ENTRY LINE FOR APPROXIMATELY 10 SECONDS THEN DISAPPEAR AND FRAME 00103 WILL BE DISPLAYED.

2. FOLLOW THE INSTRUCTIONS ON FRAME 00103 TO INITIATE PROGRAM LOADING.

3. FOLLOW THE INSTRUCTIONS ON FRAME 00101 (STORED IN THE CONTROLLER MEMORY) TO RETURN TO NORMAL OPERATION.

END OF INSTRUCTIONS

MADAR SUBSYSTEM 1 SEP 85 REV. 00 04505

Display Frame 04515 (Typical)

MDR CARTRIDGE LOADING INSTRUCTIONS

NOTE

NORMALLY THE MADAR SYSTEM SHOULD BE POWERED DURING MDR CARTRIDGE LOADING TO MAINTAIN PROPER TENSION ON THE TAPE.

1. FILL IN THE REQUIRED PORTION OF THE "MDR FLIGHT DATA" DECAL ON THE MDR CARTRIDGE.

2. OPEN THE CARTRIDGE ACCESS DOOR (RELEASE THE TWO FASTENERS AND SWING THE DOOR OPEN 90 DEGREES UNTIL THE DOOR STOP LATCH ENGAGES).

3. HOLD THE CARTRIDGE IN ONE HAND SO THAT THE REAR EDGE OF THE CARTRIDGE (THE EDGE CONTAINING THE "UP" DECAL) IS TOWARD YOU AND THE "UP" DECAL ARROW IS POINTING UP.

4. FIT THE CARTRIDGE TO THE CARTRIDGE ACCESS DOOR SO THAT THE CARTRIDGE GUIDES (AT TOP LEFT AND BOTTOM LEFT EDGES OF THE TAPE CARTRIDGE) ENTER THE CARTRIDGE GUIDE BLOCKS MOUNTED ON THE ACCESS DOOR. OBSERVE THE FRONT EDGE OF THE CARTRIDGE DURING THE FIRST INCH OF INSERTION TO ENSURE THAT BOTH CARTRIDGE TAPE ACCESS DOORS OPEN PROPERLY.

CAUTION

DO NOT TIP THE TAPE CARTRIDGE IN THE VERTICAL PLANE DURING INSERTION. ONE OR BOTH OF THE CARTRIDGE DOORS MAY NOT OPEN PROPERLY RESULTING IN DAMAGE TO THE MDR AND/OR THE TAPE CARTRIDGE.

NOTE

THE TAPE CARTRIDGE HAS TWO SPRING-LOADED DOORS THAT OPEN DURING CARTRIDGE INSERTION AND CLOSE UPON REMOVAL FROM THE MDR TO PROTECT THE MAGNETIC TAPE FROM DUST AND HANDLING.

PRESS "FRAME ADV" AND CONTINUE

MADAR SUBSYSTEM 1 SEP 85 REV. 00 04515

Display Frame 04516 (Typical)

MDR CARTRIDGE LOADING INSTRUCTIONS
- CONTINUED -

5. PRESS THE CARTRIDGE FIRMLY INTO PLACE IN THE TAPE TRANSPORT RECEPTACLE BY APPLYING PRESSURE AT THE CENTER OF THE BACK EDGE OF THE TAPE CARTRIDGE OR BY APPLYING EQUAL PRESSURE AT THE TOP AND BOTTOM OF THE TAPE CARTRIDGE BACK EDGE. WHEN PROPERLY INSERTED, TWO LOCKING TABS WILL "SNAP" INTO PLACE TO LOCK BOTH ENDS OF THE CARTRIDGE IN PLACE. THE TAPE TRANSPORT WILL NOT OPERATE PROPERLY UNLESS BOTH ENDS OF THE CARTRIDGE ARE PROPERLY LATCHED.

CAUTION

DAMAGE TO THE TAPE CARTRIDGE AND/OR THE TAPE TRANSPORT CAN OCCUR IF THE MDR IS OPERATED WITHOUT BOTH LOCKING TABS FULLY ENGAGED.

6. RELEASE THE DOOR STOP LATCH, CLOSE THE CARTRIDGE LOADING DOOR AND LOCK THE TWO FASTENERS.

7. IF THE MADAR SYSTEM IS POWERED, ENSURE THE MDR "BOT" LIGHT IS ON. IF NOT ON, PRESS THE "RWND" PUSHBUTTON TO REWIND.

NOTE

IF CARTRIDGE HAS BEEN PARTIALLY RECORDED; TO PREVENT OVERWRITING RECORDED DATA, OMIT STEP 7.

8. WHEN LOADING A RECORD CARTRIDGE AFTER HAVING REPLACED AND/OR PROGRAMMED/REPROGRAMMMED THE MUX/PROCESSOR, ENTER "RECORD" AND PRESS "MSG INPUT" TO RESUME MDR RECORDING.

END OF INSTRUCTIONS

PRESS "FRAME ADV" FOR MDR CARTRIDGE REMOVAL INSTRUCTIONS

MADAR SUBSYSTEM 24 OCT 86 REV. 03 04516

Display Frame 04518 (Typical)

MDR CARTRIDGE REMOVAL INSTRUCTIONS

NOTE

NORMALLY THE MADAR SYSTEM SHOULD BE POWERED DURING MDR CARTRIDGE REMOVAL TO MAINTAIN PROPER TENSION ON THE TAPE.

1. OPEN THE CARTRIDGE ACCESS DOOR (RELEASE THE TWO FASTENERS AND SWING THE DOOR OPEN 90 DEGREES UNTIL THE DOOR STOP LATCH ENGAGES).
2. DEPRESS THE "EJECT" BAR (LOCATED AT THE LEFT EDGE OF THE TAPE TRANSPORT RECEPTACLE) TO RELEASE THE LOCKING TABS AND THE TAPE CARTRIDGE WILL EJECT APPROXIMATELY 1/2 INCH.
3. REMOVE THE CARTRIDGE FROM THE TAPE TRANSPORT RECEPTACLE.

NOTE

THE TAPE CARTRIDGE HAS TWO SPRING-LOADED DOORS THAT OPEN DURING CARTRIDGE INSERTION AND CLOSE UPON REMOVAL FROM THE MDR TO PROTECT THE MAGNETIC TAPE FROM DUST AND HANDLING.

4. RELEASE THE DOOR STOP LATCH. CLOSE THE CARTRIDGE LOADING DOOR AND LOCK THE TWO FASTENERS.
5. FILL IN THE REMAINING PORTION OF THE "MDR FLIGHT DATA" DECAL ON THE MDR CARTRIDGE.
6. PLACE THE MDR CARTRIDGE IN ITS PROTECTIVE CONTAINER AND STORE IN THE MDR CARTRIDGE STOWAGE BOX (AVIONICS BAY NO. 3).

END OF INSTRUCTIONS

PRESS "FRAME RVS" TWO TIMES
FOR MDR CARTRIDGE LOADING INSTUCTIONS

MADAR SUBSYSTEM 1 SEP 85 REV. 00 04518

Display Frame 04520 (Typical)

POU PAPER LOADING INSTRUCTIONS

1. PLACE THE POU "MOTOR" SWITCH TO "OFF".
2. LOOSEN THE FOUR THUMBSCREWS AND SLIDE THE PRINTER OUT OF THE MOUNTING CASE.
3. ROTATE THE PRINTER UPSIDE DOWN AND PLACE ON A FLAT SURFACE.
4. LOOSEN THE PAPER ROLL SLIDE LOCK AND ROTATE THE HINGED SIDE PLATE OPEN.
5. ROTATE THE HALF-MOON SHAPED PAPER COVER OPEN.
6. SLIDE ANY REMAINING PAPER OUT OF THE PRINTER AND REMOVE THE PAPER ROLL.
7. INSTALL A NEW ROLL OF PAPER SUCH THAT THE PAPER COMES OFF THE ROLL IN A COUNTERCLOCKWISE DIRECTION.
8. ROTATE THE HINGED SIDE PLATE CLOSED AND FASTEN THE SLIDE LOCK.
9. UNROLL APPROXIMATELY 12 INCHES OF PAPER AND TEAR OFF AN APPROXIMATE 45 DEGREE CORNER.
10. ROUTE THE PAPER OVER THE GUIDE BAR, ACROSS THE CURVED SURFACE AND THROUGH THE CURVED SLOT SO THE PAPER EXTENDS BEYOND THE FRONT OF THE POU APPROXIMATELY 3 INCHES.

CAUTION

TO AVOID PERMANENT DAMAGE TO THE PRINT HEAD WHEN POWER IS APPLIED, BE SURE ALL SHARP CREASES OR TEARS IN THE PAPER HAVE EXITED THE PRINTER BEFORE RE-INSTALLING THE PRINTER.

PRESS "FRAME ADV" AND CONTINUE

MADAR SUBSYSTEM 31 MAY 88 REV. 05 04520

Display Frame 04521 (Typical)

POU PAPER LOADING INSTRUCTIONS (CONTINUED)

11. ROTATE THE PAPER COVER CLOSED AND LATCHED.

NOTE

ENSURE THE PAPER DOES NOT
GET PINCHED AT EITHER EDGE.

12. ROTATE THE PRINTER RIGHTSIDE UP AND SLIDE IT INTO THE MOUNTING CASE AND FASTEN THE FOUR THUMBSCREWS.

13. ENTER "RP" AND PRESS "MSG INPUT" TO RESET THE PAPER REMAINING COUNTER.

14. PLACE THE POU "MOTOR" SWITCH TO "ON".

15. PRESS POU BIT BUTTON TWICE.

16. THREAD POU PAPER UNDER THE TAKE-UP SPOOL.

17. FOLD OVER THE END OF THE PAPER APPROXIMATELY 1/2 INCH AND CREASE THE PAPER AT THE FOLD.

18. INSERT THE CREASED EDGE INTO THE SLOT OF THE TAKE-UP SPOOL.

19. TURN TAKE-UP SPOOL THRUMBWHEEL COUNTERCLOCKWISE TO TAKE UP THE LOOSE PAPER.

20. PERIODICALLY REPEAT STEP 19 DURING OPERATION OF THE POU.

NOTE

EXCESSIVE BUILDUP OF LOOSE PAPER
MAY CAUSE THE PAPER TO JAM THE POU.

END OF INSTRUCTIONS

MADAR SUBSYSTEM 31 MAY 88 REV. 05 04521