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PROJECT MERCURY MAINTENANCE MANUAL

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McDONNELL Aircraft Corporation

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on 6-7-84
by Michael E. Collins

15 DECEMBER 1959

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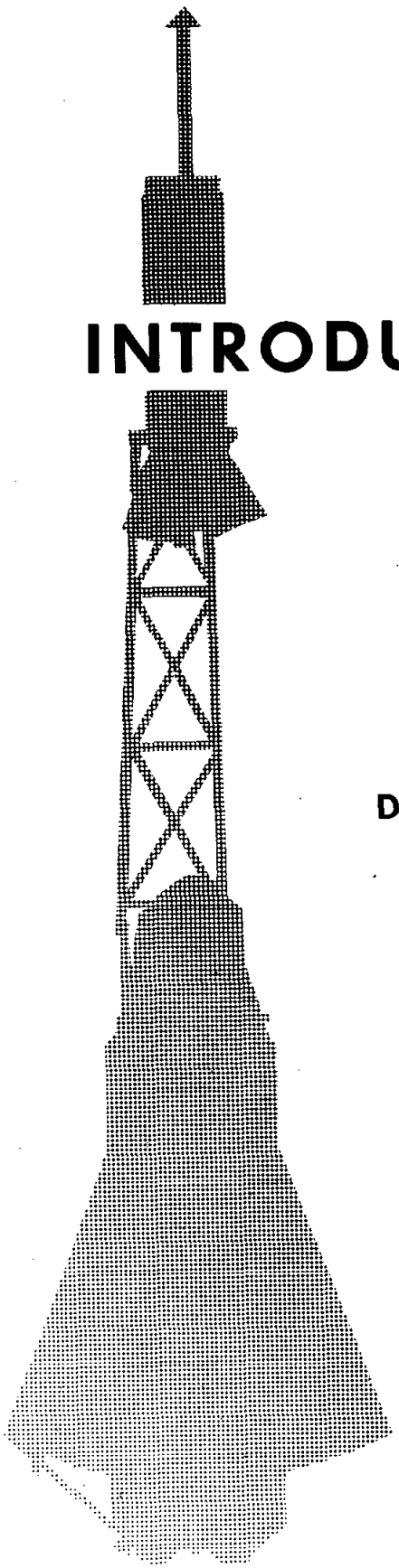

SECTION I

INTRODUCTION

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I. INTRODUCTION

1-1. PURPOSE

Project Mercury Maintenance Manual provides procedures, diagrams, illustrations and charts to facilitate system trouble shooting and component replacement and adjustment. It should be noted that not all system components are covered in the Replacement and Adjustment section. In the absence of such procedures it may be assumed that the particular procedure involved is either obvious and does not warrant a detailed explanation or engineering information is not complete. Subsequent revisions to the Maintenance Manual will include C.C.P. changes and revised engineering.

1-2. SUPPORT EQUIPMENT

The following abbreviated list of all support equipment, with a brief description of the use of same, has been included in this section to acquaint personnel with the over-all Project Mercury support equipment. The list is catagorized by system and is further divided to indicate if the equipment is McDonnell designed, government furnished, or vendor designed.

1-3. GENERAL

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4583002-1	Air Conditioner, Portable	Provides cool air to control capsule temperature and humidity during check-out and hangar operations.
MDE4583012-1	Nozzle Assy., Air Actuated Vacuum	Used to clean capsule interior, deflate flotation bags and drain condensate tanks.
MDE4587047-1	Balancing Circuit, Battery	Provides a controlled discharge rate on capsule batteries after initial charging.
MDE4590033-1	Power Supply, 6 Volt DC	For trailer component checks and pad use.
MDE4590034-1	Power Supply, 12 volt and 18 volt DC	For trailer component checks and pad use.
MDE4590044-1	Power Supply, 12 volt and 18 volt DC	For trailer component checks and pad use.
MDE4590046-1	Battery Charger	For charging batteries.

Government Furnished Equipment (GFE)

(Not Applicable.)

Vendor

[illegible]A-A76-A295-A1-A264-A15	Vacuum Cleaner (with attachments)	For general cleaning in and around capsule.
6670-527-7364	Spring Scale	Used for general measurements requiring a scale of this type.

1-4. COMMUNICATIONS SYSTEM

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4587010-1	Audio Generator	For modulation and audio signal substitution.
MDE4587011-1	H.F. Signal Generator	For signal substitution.
MDE4587012-1	C-Band Generator	For signal substitution.
MDE4587013-1	S-Band Generator	For signal substitution.
MDE4587014-1	Dual Pulse Generator	Provides triggering pulses to the C and S-Band generators.
MDE4587016-1	U.H.F. Signal Generator	For signal substitution.
MDE4587017-1	Power Bridge	For R.F. power measurements.
MDE4587018-1	Headset Mike	Used in conjunction with various test set-ups.
MDE4587019-1	A.F. Distortion Meter	To determine audio distortion
MDE4587020-1	Test Panel	For control and testing of capsule equipment.
MDE4587021-1	Speaker Panel	For reproducing audio signals.
MDE4587022-1	V.T.V.M. Panel Assy.	Contains two V.T.V.M. for general measurement usage.
MDE4587023-1	Transfer Oscillator	Used in conjunction with other equipment for frequency determination.
MDE4587024-1	Frequency Counter	For frequency determination.
MDE4587026-1	F.M. Generator	For signal substitution.
MDE458702801	U.H.F. Receiver	Receives signals transmitted from capsule equipment.
MDE4587029-1	Receiver Range Extender	Extends the frequency range of the U.H.F. receiver.
MDE4587030-1	Tape Recorder	To record test signals and test data.
MDE4587031-1	Unit Test Harness Assy.	Used to complete the various test set-ups.

P/N	NOMENCLATURE	USAGE
MDE4587032-1	Coaxial Test Cable Assy.	Used to complete the various test units.
MDE4587034-1	Receiver Patch Panel	Connects the receiver to the desired test equipment.
MDE4587035-1	Readout Tester Assy.	Used in conjunction with the various test set-ups.
MDE4587036-1	Antenna Probe Assy.	Used in conjunction with the various test set-ups.
MDE4587037-1	Unit Tester	Used in conjunction with the various test set-ups.
MDE4587038-1	H.F. Antenna Assy.	Used in conjunction with the various test set-ups.
MDE4587040-1	Junction Box	Located inside the capsule for power cabling.

Government Furnished Equipment (G.F.E.)

The following equipment is used for system and component checkout of communication equipment.

P/N	NOMENCLATURE
802 B	"C" and "S" Band Frequency Meter
5820-538-2555	H.F. Receiver
6625-149-6301	Multimeter
6625-305-7213	Slotted Line Carriage
AT 256/ARC	Blade Antenna
HP 805 A	Slotted Line
PRD 219	Standing Wave Ratio Indicator

Vendor

The following equipment is used for system and component checkout of communication equipment.

P/N	NOMENCLATURE	VENDOR
BCC-6	Command Coder	Babcock Radio Eng. Co.
Model 80 A	R.F. Load	Bird Electronic Corp.
Model 80 F	R. F. Load	Bird Electronic Corp.
REFB551-50	Attenuator	Daven Co.
TR36-4M	Power Supply	Engineering Research Associates
726C	Klystron	General Radio Co.
6115	Klystron	General Radio Co.
GR583A	Audio Power Meter	General Radio Co.
GR874-G6	Attenuator	General Radio Co.
GR874 G10	Attenuator	General Radio Co.
GR874G20B	Attenuator	General Radio Co.
GR874-Ga	Attenuator	General Radio Co.
GR874-R34	Patch Cords	General Radio Co.
GR874-VQ	Voltmeter Detector	General Radio Co.
GR874-WM	Matched Termination	General Radio Co.
GR1201B	Power Supply, 300V DC Reg. to Ma. 6.3 V AC 4 Amp. unreg.	General Radio Co.
GR1208B	Oscillator	General Radio Co.
GR1211B	Oscillator	General Radio Co.
GR1220A	Klystron Oscillator	General Radio Co.
HP130BR	Oscilloscope	Hewlett Packard
HP420A	Xtal Detector Mounting	Hewlett Packard
HP444A	Probe	Hewlett Packard
HP477B	Thermistor	Hewlett Packard
HP608A-95A	Fuse Holder	Hewlett Packard

P/N	NOMENCLATURE	VENDOR
HP767D	Coupler	Hewlett Packard
750	Loading Coil Antenna	Master Mobile
Model 88	Lower Section Antenna	Master Mobile
Model 100-965	Whip Antenna	Master Mobile
Model 232-SSC	Mounting Antenna	Master Mobile
TA-5MT	R.F. Load	M.C. Jones Electronic Co.
MW-108	Minitrack V.H.F. Antenna	Mosley Electronics, Inc.
Model 263.3	V.S.W.R. and Power Meter	Microlab, Inc.
Model 757-6	Attenuator	NARDA Corp.
Model 757-20	Attenuator	NARDA Corp.
Model 6757-10	Attenuator	NARDA Corp.
Model 3004-20	Coaxial Detector Mounting	NARDA Corp.
100J-24H1/4	24 Hour Digital Clock	Pennwood Industries
Model 250A	R.F.Probe Broad Band	Polytechnic Research and Development Co., Inc.
14S383	Band Pass Filter	Sprague Elect. Co.
TEK RM45	Oscilloscope	Tektronix Inc.
TEK RM53/54A	Plug-in Amplifier	Tektronix Inc.
10-10	Attenuator	Weinschel Engineering
50-20	Attenuator	Weinschel Engineering
Model 535 FT	Termination	Weinschel Engineering
Model 535 MT	Termination	Weinschel Engineering

1-5. ENVIRONMENTAL CONTROL SYSTEM

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4583001-1	Cooling Assy., Pre-Launch	Used to cool capsule structure and interior during pre-launch operations.
MDE4583003-1	Tester, Capsule Leakage	Provides cool air to control capsule temperature and humidity during check out and hangar operations.
MDE4583005-1	Servicing Unit, Water Cooling Tank	Used to service capsule and crewman simulator water containers with distilled water.
MDE4583017-1	Adapter, Oxygen Bottle Charging	Used to replenish capsule oxygen supply.
MDE4583018-1	Checkout Kit, Oxygen System	Used to check when capsule emergency oxygen supply is activated during system checkout.
MDE4583021-1	Adapter, Condensate Removal	Used to adapt vacuum nozzle to condensate tank for tank draining.
MDE4583022-1	Adapter, Carbon Dioxide Servicing	Used to replenish crewman simulator CO_2 supply.
MDE4583023-1	Adapter, Suit Cooling	Adapts NASA supplied cooling unit to astronaut's pressure suit for suit ventilation prior to astronaut's entry into capsule.
MDE4583024-1	Adapter Assy., Charging, O_2 Bottle, Coolant Indicator System	Used to service the coolant indicator system O_2 bottle.
MDE4583026-1	Checkout Kit, Crewman Simulator	For calibration of crewman simulator heat and water output.
MDE4583027-1	Flowmeter Kit, Carbon Dioxide	Used to check crewman simulator CO_2 output.
MDE4588502-1	Crewman Simulator	Simulates crewman heat, water and CO_2 output during preliminary capsule missions.

P/N	NOMENCLATURE	USAGE
MDE459001-1	Servicing Unit, High Pressure Oxygen	Converts liquid oxygen to gaseous oxygen for servicing capsule oxygen bottles.
MDE4590043-1	Bottle Assy., Oxygen System Top-off.	For topping off capsule O_2 bottles to their maximum capacity.
	Government Furnished Equipment (GFE)	
8120-282-6618	Cylinder, Compressed Air	For storing nitrogen or air for capsule leakage checks.
8120-285-4763	Purging Equipment, Oxygen Bottle.	Supplies capsule suit circuit with O_2 for purging and leakage checks.
	Vendor	
24-210A	Leak Detector (Consolidated Electro-Dynamics, Inc.)	Used to isolate source of leakage during capsule and suit circuit leakage checks.

1-6. GROUND HANDLING EQUIPMENT

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4532002-1	Sling Assy., Capsule Vertical Hoisting	Used to hoist capsule in the vertical position for installation onto booster and various checkout fixtures.
MDE4532003-1	Sling Assy., Capsule Horizontal	Used to hoist capsule, in the horizontal position, for capsule installation into various checkout fixtures. Also used to hoist sled dolly assembly.
MDE4532004-1	Sled Dolly, Capsule Shipping and Testing.	This device enables horizontal and vertical positioning of the capsule and is also utilized to support the capsule during ground checkout and transportation.
MDE4532005-1	Transportation Trailer, Capsule, Sled Dolly and Escape System	Provides mobility for the capsule and escape system.
MDE4533001-1	Ring Assy., Booster Stretch	Used to hoist capsule-booster adapter and prevent adapter distortion during Atlas booster stretch loading when adapter is installed.
MDE4534001-1	Cover, Capsule Hatch Ring	Seals capsule interior from harmful environmental conditions during capsule checkout operation.
MDE4551007-1	Sling Assy., Escape System Vertical	Used to hoist the escape system while in the vertical position.
MDE4551010-1	Cradle Assy., Escape System	A stand for holding the completed escape system.
MDE4551018-1	Sling Assy., Escape System Horizontal	Used to hoist the escape system while in the horizontal position.
MDE4551019-1	Blast Deflector, Escape and Jettison	A safety device to protect personnel from injury should the escape or jettison rocket be accidentally ignited.
MDE4572004-1	Kit Assy. Safety Tools	Tools of non-sparking materials to be used on the gantry.

P/N	NOMENCLATURE	USAGE
MDE4580001-1	Seat, Capsule Service	Used in lieu of astronaut's support couch during capsule checkout, maintenance and servicing.
MDE4582002-1	Workstand, Capsule Entry	Allows entry into capsule when capsule is installed on booster and gantry is in position.
MDE4582003-1	Handling Equipment, Pallet, Crewman Simulator and Primate Couch.	Enables installation of pallet, crewman simulator, and primate couch into capsule.
MDE4585006-1	Pip Pin Assy., Destabilizer Flap	Retains destabilizer flap against antenna fairing to prevent damage to flap during capsule ground handling.
MDE4586001-1	Cover, Periscope Optics	A cover to protect the periscope lenses while the periscope is extended on the ground.
MDE4590015-19	Packing Boxes, Main and Reserve Chutes	Rigid supports for shaping chutes during the packing operation.
MDE4590025-1	Cover Assy., Capsule	Prevents damage to capsule exterior from ground handling and checkout operations and harmful environmental conditions.
MDE4590026-1	Cover Assy., Atlas Adapter	Prevents damage to adapter exterior from ground handling and checkout operations and harmful environmental conditions.
MDE4590027-1	Cover Assy., Pylon and Plenum Chamber	A cover to protect the pylon and static ports from damage.
MDE4590028-1	Cover Assy., Ballast and Aerodynamic Spike	A cover to protect the aero spike and ballast.
MDE4590039	Cover Assy., Atlas Adapter	Prevents damage to adapter exterior from ground handling and checkout operations and harmful environmental conditions.
MDE4590047-1	Kit Assy., Protective Clothing, H_2O_2	Clothing to protect personnel handling concentrated Hydrogen Pyroxide.

Government Furnished Equipment (G.F.E.)

(Not Applicable.)

Vendor Equipment

(Not Applicable.)

1-7. INSTRUMENTATION

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4500005	Semi-Trailer, Over-The-Road, Air Conditioned	Provides portable protection and storage of checkout equipment which must accompany the capsule to various test areas.
MDE4578005-1	Spool, Ground - Test Cable	A device for storage of ground test cables.
MDE4587003-1	Drawer Assy., Capsule Checkout Power Supply	To supply test voltages to power components.
MDE4588001	Telemetry Trailer	Housing for instrumentation system and checkout equipment.
MDE4588001-A3	Electrical Installation Telemetry Trailer	Provides wiring in the trailer for connection of power to the checkout equipment racks, and connection of the racks to checkout wiring disconnects.
MDE4588001-A5	Hardware Installation Telemetry Trailer	To supply the required hardware to equip the trailer with the checkout equipment.
MDE4588002-1	Signal Simulation Unit, Capsule Instrumentation	Simulates transducer inputs to the instrumentation packages.
MDE4588003-1	Harness Simulation Unit, Capsule Instrumentation	Allows connection to instrumentation components for bench check.
MDE4588007-1	Panel Assy., Instrumentation Control	Provides system control from remote facilities.
MDE4588008-1-3	Cabinet Assy., Electonic Equipment	Provides convenient, secure mounting facilities in the trailer for checkout equipment.
MDE4588022-1	Panel Assy., Telemetry Trailer Junction Box	Provides a central location for all trailer input and output wiring.
MDE4588025-1	Bench Assy.	Provides a convenient working surface for general usage.
MDE4588026-1	Cable Assy., Instrumentation Package "A" Monitor.	To be installed in capsule for check and power control purposes.

P/N	NOMENCLATURE	USAGE
MDE4588027-1	Panel Assy., Telemetry Trailer Test Jack	A patch panel for inter-connecting patch panels.
MDE4588028-7	Dehumidifier Assy.	Allows humidity control independent of trailer air conditioner.
MDE4588049-1	Jack Panel, Telemetry Trailer Test Jack	Provides for antenna switching.
MDE4588050-1	Panel Assy., Timer Counter, Instrumentation	To keep a log of operation time of various capsule systems.
MDE4590018-1	Communications System Telemetry	The receiving system for telemetry R.F.
MDE4590018-3	Phase-Lock Receiver	For reception of signals from telemetry transmitter.
MDE4590018-7	Variable Frequency Oscillator	To extend the frequency range of the receiver.
MDE4590019-1	Discriminator System Telemetry	This system accepts the multiplexed output of the telemetry receiver and reduces the signal to the IRIG sub-carrier channel outputs. This system includes input sub-carrier frequency filters, discriminators and output filters.
MDE4590020-1	Decommutator System, Telemetry	Accepts PAM and PDM pulse train inputs and provide simultaneous readout of any or all of the 88 channels of data. The system consists of sync circuits, individual channel gate circuits, patch panels and readout devices.
MDE4590021-1	Strip Chart Recorder System, Telemetry	Allows simultaneous visual readout and recording of eight channels of analog data. This system consists of signal amplifiers, pen mechanisms and recording paper transport.
MDE4590022-1	Tape Recorder System, Telemetry	This system allows recording and reproduction of 7 channel tape data. The system consists of signal amplifiers, tape transport, tape speed, speed control, oscillators and power supplies.

P/N	NOMENCLATURE	USAGE
MDE4590024-1	Oscillograph Recording System, Telemetry	Used to permanently record readout data.
	Government Furnished Equipment (G.F.E.)	
10-202	Degausser, Automatic Tape	Allows bulk erasing of tape.
4210-270-4511	Fire Extinguisher, CO_2	Required for emergency uses.
4210-288-9060	Bracket, Fire Extinguisher	A bracket on which to hang the CO_2 fire extinguisher.
6625-360-2493	Vacuum Tube Voltmeter	Used for general measurements.
6625-564-9488	Plug-in Preamplifier	Signal amplifier for scope presentation.
6625-593-5360	Plug-in Preamplifier	Signal amplifier for scope presentation.
AT-256/ARC	Antenna (225 mc-260 mc)	Roof mounted telemetry receiving antenna.
	Vendor	
DMP-4	Meter Panel (Arnoux Corp.)	A data readout meter panel.
225B	Universal Counter Timer (Counter Measurements Corp.)	For frequency measurement.
HP-AC-2B	Dual Rack Mount (Hewlett Packard)	Rack mounting provisions for two voltmeters.
HP 200TR	Telemetry Oscillator (Hewlett Packard)	For signal comparison and substitution.
HP202CR (FSN 6625-606-9727)	Low Frequency Oscillator (Hewlett Packard)	For signal simulation.
50B	AC/DC Digital Voltmeter (Kintel, Div. of Cohu)	Provides accurate voltage measurements.
EB 32-20-RM	DC Power Supply (New Jersey Electronics Corp.)	To supply voltages to power components.

P/N	NOMENCLATURE	USAGE
Type 123	Pre-Amplifier (Tektronix Inc.)	A signal amplifier for scope presentation.
RM 35-S1	Oscilloscope	To observe wave patterns.

1-8. NAVIGATIONAL AIDS

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4581005-1	Tester, Satellite Clock	Used to perform checkout tests on the satellite clock.
MDE4590006-3	Fixture, Optical Checkout	Used to check the optical performance, boresight alignment and altitude measuring device of the satellite periscope.
MDE4590006-7	Flushing Kit	Used to flush the periscope upper housing to free it of all moisture.
MDE4590006-9	Cleaning Kit, Optical	Used to clean all the optical surfaces on the satellite periscope
MDE4590006-11	Hand Tool Kit	Consists of all the standard and special tools necessary for servicing and adjusting the periscope.
MDE4590006-13	Cable and Box, Electrical Test	Used to operate the extension-retraction mechanism and the reticle lamps of the capsule periscope, electrically independent of capsule power or controls.

Government Furnished Equipment (GFE)

(Not Applicable.)

Vendor

(Not Applicable.)

1-9. PYROTECHNICS

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4572008-1	Simulator Device, Squib	Used to simulate action of squibs during sequence system checkout.
MDE4590036-1	Wrench, Explosive Bolt Holding	Used to prevent explosive bolts from turning while tightening nuts.

Government Furnished Equipment (GFE)

(Not Applicable.)

Vendor

477-81300	Igniter Wrench (Grand Central Rocket)	Used to install the igniter in the escape rocket.

1-10. REACTION CONTROL SYSTEM

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4561050-1	Protractor, Manual Control Stick	For rigging the control stick limit switches and position potentiometers.
MDE4578001-1	RCS Monitor Panel	Provides blockhouse monitor of all RCS solenoids, also monitors decomposition (pressure build-up) of H_2O_2.
MDE4590005-3	Reaction Control System Servicing Trailer	Provides helium, peroxide, and distilled water source for servicing and testing of the RCS system. Also provides vacuum pump.
MDE4590005-5	RCS Functional Check-out Drawer	Provides portable thermocouple harness and millivolt indicator used to monitor RCS nozzle firing during system check.
MDE4590005-7	RCS H_2O_2 Decomposition Monitoring Drawer	Used to monitor pressure build-up in the manual and automatic H_2O_2 systems due to decomposition.
MDE4590047-1	Protective Clothing Kit	Provides assortment of protective (compatible) clothing to be worn when handling Hydrogen Peroxide.
MDE4590049	Portable Helium Top Off Unit	Used to top-off helium system prior to launch.

Government Furnished Equipment (GFE)

FSN 4920-587-7490	Helium Leak Detector	Used to determine leakage rate of Reaction Control system lines, fittings, and components. (When filled with helium.)

Vendor

(Not Applicable.)

1-11. SEQUENTIAL SYSTEM

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4500013	Weighing Kit, Capsule Accessories	Contains scales and general accessories for weighing of late installation or replacement items.
MDE4541001-1	Fitting Assy., Capsule Static Port	For adapting one of the four static ports to the vacuum test line.
MDE4541003-1	Plug Assy., Capsule Static Port	Used to plug three of the four static ports during landing system testing.
MDE4541007-1	Recovery System Panel	To monitor capsule signals during testing through the umbilical. Used in blockhouse and checkout trailer.
MDE4541008-1	Sensor Assy., Capsule Landing System Tester, Static	A device for indicating actual altitude being sensed by the capsule plenum chamber.
MDE4541009-1	Recovery System Sequence Tester	Used to check response of landing sequence system when descent from altitude is simulated.
MDE4541010-1	Portable Recovery System Squib Tester	To check all landing system squibs after installation for no-fire continuity.
MDE4550001-1	Fixture Assy., Optical Alignment	Used to weigh capsule in the vertical position to determine C.G. for escape and re-entry modes. Also to aim thrust centerline of all rockets.
MDE4550002-1	Fixture Assy., Weight and C.G.	Used to determine horizontal C.G. of capsule and pylon.
MDE4550004-1	Tooling Kit, Indexing and Optical	Contains equipment required to perform rocket set-up and alignment procedure.
MDE4572001-1	Sequence System Tester	To simulate booster inputs, accelerometer functions and mechanical happenings from launch to retrograde.
MDE4572015-1	Tester, Thrust Cutoff Sensor	To bench test thrust cutoff sensor for continuity and discontinuity.

P/N	NOMENCLATURE	USAGE
MDE4572016-1	Sequence System - Escape Panel	To monitor capsule signals during testing through the umbilical. Used in blockhouse and checkout trailer.
MDE4582001-1	Fixture Assy., Crewman Center-Of-Gravity	To locate astronaut and support couch C.G.
MDE4590002	Direct-Writer Recorder	For recording ON-OFF functions.
MDE4590015-7	Static Calibration Equipment Drawer	For simulating altitude ascent and descent to capsule static system.
MDE4590015-19	Packing Box, Main Parachute	For packing and stowing of main chute prior to installation.
MDE4590015-23	Packing Box, Reserve Parachute	For packing and stowing of reserve chute prior to installation.
WKS 45-00001-505TD	Work Stand, Optical Alignment Fixture	To provide access to necessary levels of capsule and pylon when in the optical alignment fixture.
SPDL 45-50001-501TD	Splice Dolly, Retro-Rockets	Used to raise and lower retro-rockets during aligrment and final installation.

Government Furnished Equipment (GFE)

(Not Applicable.)

Vendor

477-27700	Boroscope, Illuminated	A device used for inspecting the propellant grain of the various rockets used in the escape and re-entry systems.

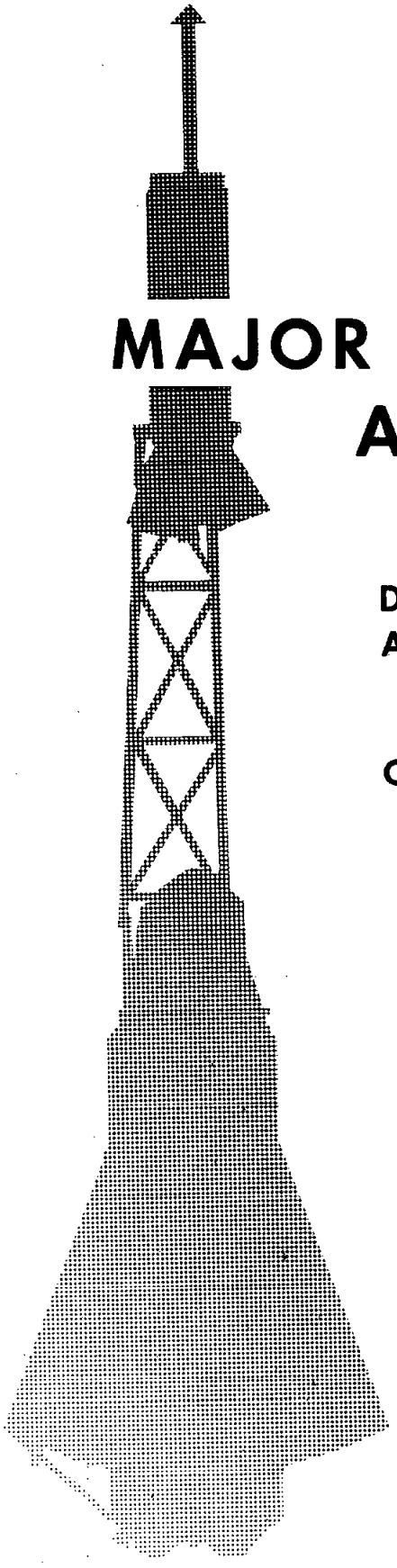
1-12. AUTOMATIC STABILIZATION CONTROL SYSTEM

McDonnell Designed Equipment (MDE)

P/N	NOMENCLATURE	USAGE
MDE4561001-1	ASCS Test Fixture	Used to rotate Capsule in yaw, roll and pitch planes, thereby providing a confidence check of the entire ASCS system under actual flight conditions of attitude and rate after installation on capsule.
MDE4561037-1	Adapter	Provides method of mechanically attaching and aligning the Horizon Motion Simulator to the capsule during system test.
MDE4561051-1	ASCS Monitor Panel	Used to monitor gyro spin motors and synchro outputs during time critical period of countdown. Also provides pre-launch gyro torqueing facilities.
MDE4561052-1	Horizon Scanner Cover	Provides protection to Horizon Scanner Germanium window when installed in capsule. Also assures that scanner will scan constant temperature area with Horizon Motion Simulator removed, thereby initiating void signal. This permits checkout of scanners individually with one simulator.
MDE4561053-1	Cabling, ASCS System	Cabling between checkout trailer and capsule to connect G.S.E. equipment to ASCS system.
MDE4590010-3	Pre-Launch Tester	Provides semi-automatic checkout of the ASCS system after installation in capsule. Used in both staging and pad areas.
MDE4590010-5	Amplifier-Calibrator Tester	Provides complete semi-automatic checkout of the Amplifier-Calibrator unit.
MDE4590010-9	Electrical Tester	Provides interconnection and central control between wobble table, strip chart recorders, and attitude gyros during drift check and other gyro tests.

P/N	NOMENCLATURE	USAGE
MDE4590010-13	Dividing Head and Stand	Facilitates accurate positioning of the Attitude Gyros in all axes during bench check.
MDE4590010-15	Rateof Turn Table	Provides accurately measured rate input to permit testing of rate gyros under actual rate conditions.
MDE4590010-17	Strip Chart Recorder	Used to record output of Attitude Gyros during drift test so that gyro drift rate may be determined over a period of time.
MDE4590010-35	Electrical Tester	Used in conjunction with Rate of Turn Table to bench check Rate Gyro Spin Motor and sector switching.
MDE4590010-37	Wobble Table	Provides three axis oscillation of Attitude Gyros necessary for proper drift test.
MDE4590011-3	Horizon Motion Simulator	Provides a simulated "horizon tilt" signal input for bench check of scanner. Also provided same function during system checkout.
MDE4590011-5	Horizon Scanner Evaluator	Used in conjunction with Horizon Motion Simulator to evaluate output of Scanner during bench test.
	Government Furnished Equipment (G.F.E.)	
5950-235-2086	Variable Transformer	Provides method of adjusting voltage applied to Gyro Spin Motors and other equipment during bench checkout.
6625-153-4029	Vacuum Tube Voltmeter	Accurately measures various voltages during Amplifier-Calibrator and Gyro tests.
6625-232-1071	A-C Ammeter	Accurately monitors gyro spin motor current.
6625-519-2885	Cathode Ray Oscilloscope	Used to monitor dynamic response of the Amplifier-Calibrator repeaters during checkout of the Amplifier-Calibrator unit. Also used to measure noise output of Scanner during bench test.

Vendor (Not Applicable.)



SECTION II

MAJOR STRUCTURAL ASSEMBLIES

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II. MAJOR STRUCTURAL ASSEMBLIES

2-1. ADAPTERS

2-2. Atlas Adapter

2-3. Removal

(a) (See Figure 2-1 for parts nomenclature.) Install Booster Stretch Ring Assembly (MDE4533001-1) on adapter assembly.

(b) Remove retaining bolts from Lox vent tube adapter.

(c) Disconnect capsule electrical connectors.

(d) Remove retaining bolts from adapter lower attach ring.

(e) Attach hoist to hoist ring assembly and raise adapter assembly straight upward.

CAUTION

Do not let adapter swing from side to side.

2-4. Installation

See Figure 2-1 for adapter installation.

2-5. Redstone Adapter

2-6. Removal

For removal of adapter use the reverse of procedures in Paragraph 2-7.

2-7. Installation

NOTE

Installation procedures for the Redstone Adapter are similar to Atlas Adapter installation procedures (Figure 2-1), only that the Redstone missile does not have a LOX relief valve that would require attachment to the Redstone Adapter as in the case with the Atlas missile.

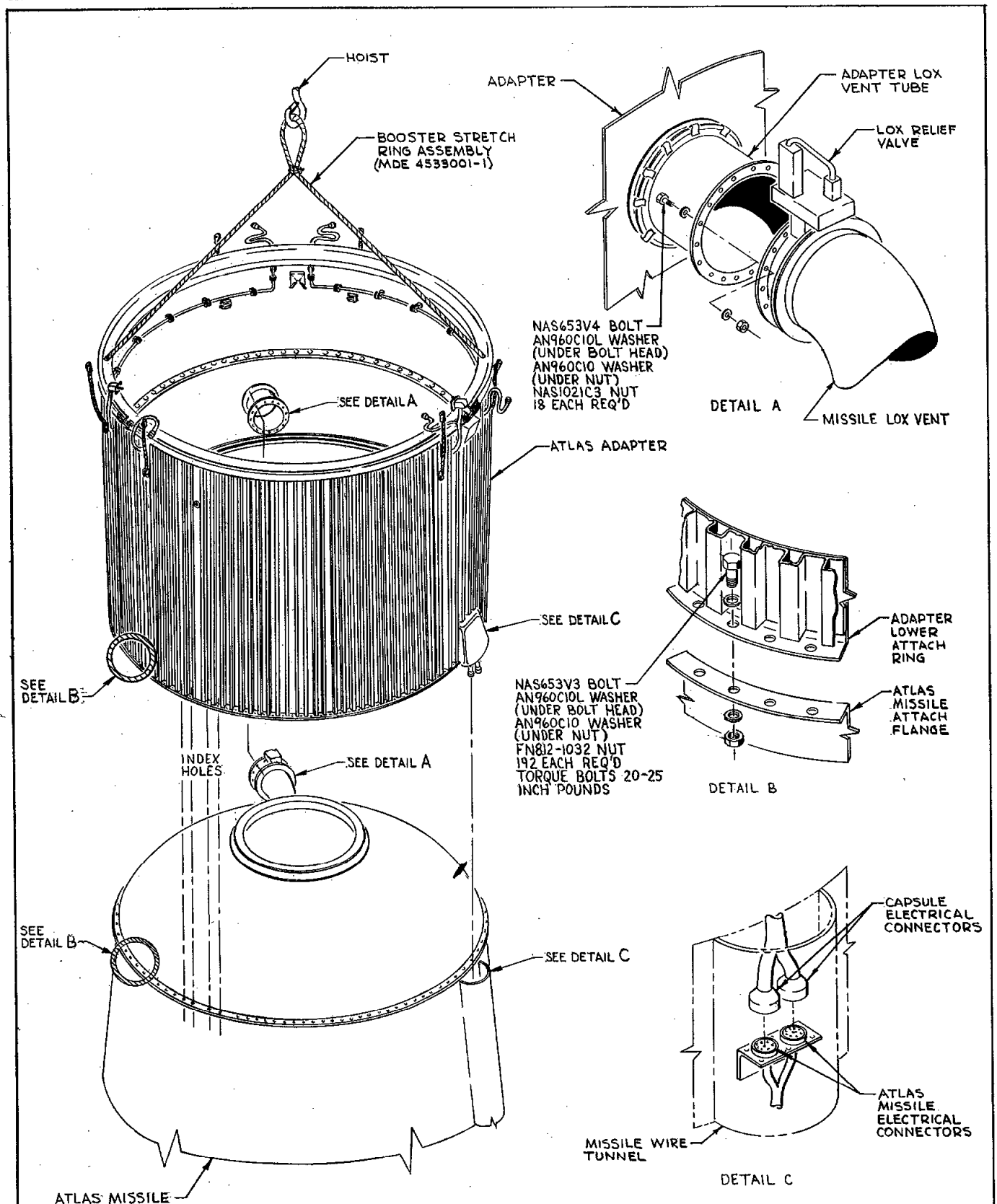

FIGURE 2-1 MISSILE ADAPTER INSTALLATION

MH45-36

(a) Attach hoist to Booster Stretch Ring Assembly (MDE4533001-1) sling, and vertically raise adapter.

(b) Visually check the matching surfaces of the booster section and the adapter.

(c) Position the adapter over the booster section so that bolt patterns align.

NOTE

Align the adapter lower ring index hole (offset bolt hole), with the booster mating surface index hole (offset bolt hole).

(d) Lower adapter onto the booster.

(e) Install attach bolts. Torque bolts 20 to 25 inch-pounds.

(f) Connect interface wire bundles (2) and note the following:

(1) Proper length of bundles.

(2) General condition, etc.

(3) Proper connection.

(g) Note condition of explosive bolts electrical leads (5).

(h) Check adapter - capsule electrical leads and connectors (2).

2-8. CAPSULE

2-9. Retro-Package Dome - Capsule

2-10. Removal

Removal is the reverse of installation procedures Paragraph 2-11.

INSTALLATION

A POSITION DOME ASSY (45-50001) ON HEAT SINK, ENSURING THAT THE BOSS IN THE CENTER OF THE HEAT SINK FITS INTO THE TUBE OF THE DOME ASSY.

B POSITION THE RETENTION STRAPS (45-72030) IN THE THREE BRACKETS PROVIDED ON THE CAPSULE PERIPHERY, ADJACENT TO HEAT SHIELD.

C POSITION STRAPS OVER DOME ASSEMBLY AND INSTALL EXPLOSIVE BOLT (45-72704) SNUG TIGHT.

CAUTION

DO NOT CONNECT ELECTRICAL LEAD TO EXPLOSIVE BOLT. REFER TO SECTION VIII.

D TORQUE STRAP TURNBUCKLES ALTERNATELY, INCREASING IN 10 INCH-LBS. INCREMENTS TO A VALUE OF 130-140 INCH-LBS.

E TORQUE EXPLOSIVE BOLT TO 240-260 INCH-LBS.

F BEND UP FIVE TABS ON LOCK WASHER.

G DO NOT CONNECT ELECTRICAL LEAD TO BOLT (OR UMBILICAL DISCONNECTS) UNTIL AUTHORIZED BY CAPSULE CONFIGURATION ENGINEER. REFER TO SECTION VIII FOR ELECTRICAL HOOK-UP

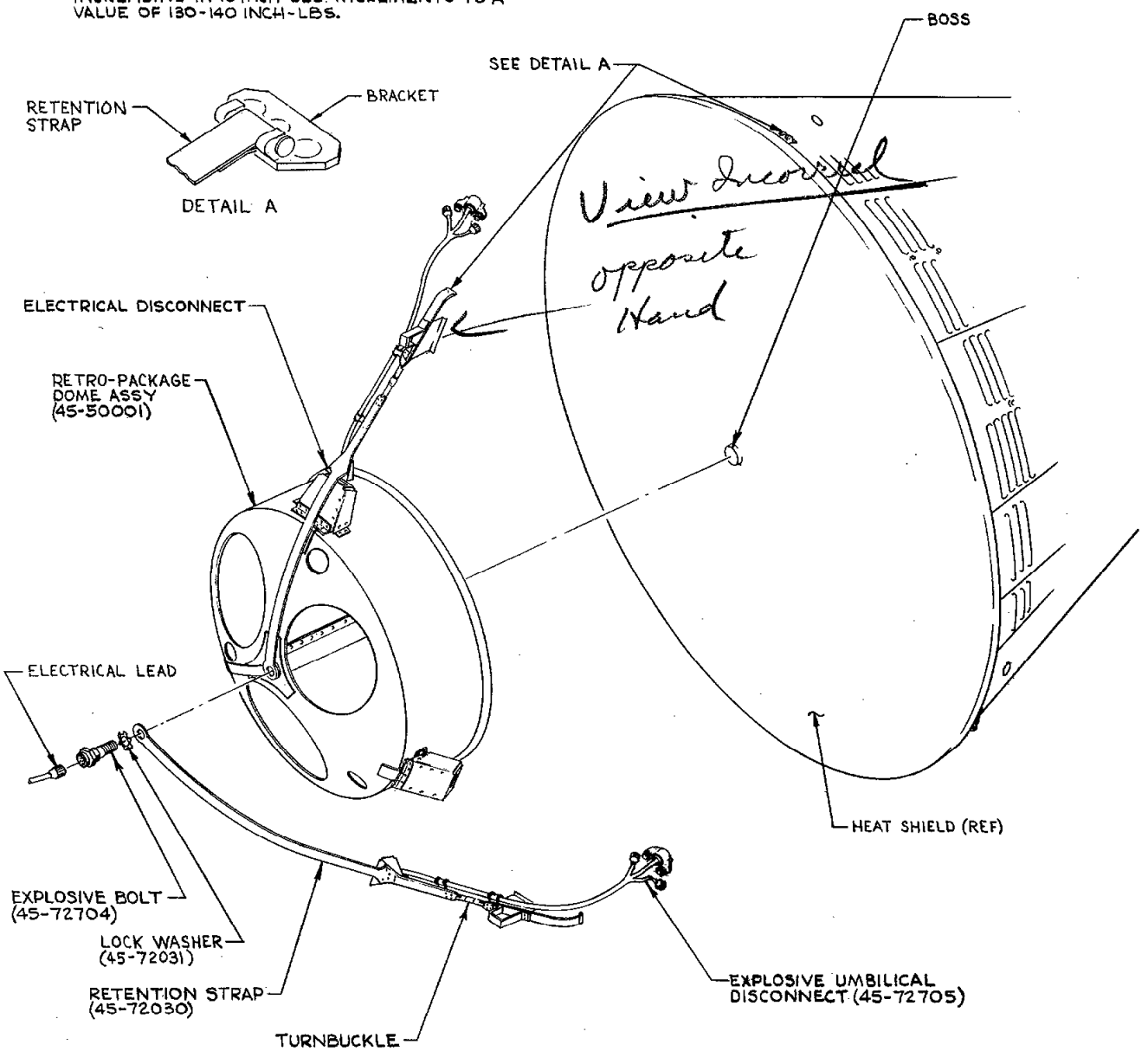

FIGURE 2-2 RETROGRADE PACKAGE DOME INSTALLATION MH45-95

NOTE

Install shorting clips on pyrotechnics immediately following disconnecting of electrical leads.

2-11. Installation

See Figure 2-2 for retro-package dome installation.

2-12. Capsule - Adapter

2-13. Removal

For capsule removal from adapter, use reverse of procedures in paragraph 2-14.

2-14. Installation

(a) (See Figure 2-3.) Install Capsule Vertical Hoist Sling (MDE4532002-1) onto capsule.

(b) Using the winch on the sled dolly, allow capsule to raise to vertical position.

(c) Using hoist, position capsule over adapter, rotating capsule as required to align slots in adapter upper ring with retrograde package retaining straps on capsule.

(d) Lower capsule into contact with the adapter clamp ring flange.

Note the following:

(1) Alignment of "Indexing" marks on capsule and adapter.

(2) Angular Alignment. (See Figure 2-3.) Check alignment with MDE _____ Template at 4 points 90° apart. With template contacting capsule fiberglass attach ring and adapter upper ring, measure gap between template and shim. Gap shall be .000 to .020.

CAUTION

DO NOT remove shim stock to correct angular mis-alignment. Although some removal of shim stock may be required at initial mating of capsule and adapter, this is normally considered to be a factory operation requiring the use of optical alignment facilities, etc.

(e) Check electrical test connections as follows:

(1) Capsule to adapter (2 places)

(2) Capsule to retro package (3 places)

(3) Capsule to escape system (2 places)

Ascertain that cables lengths are adequate and that all connections are of the proper type.

(f) Visually check each segment of the clamp ring for damage.

(g) Apply anti-sieze compound (MIL-T-5544) to inner surface of clamp ring section.

(h) Position the 3 section filler strip around the capsule heat shield. The filler strips are centered under the clamp ring sections.

(i) Lubricate the clamp ring bolts spherical seat washers with anti-sieze compound (MIL-T-5544).

(j) Position the "capsule" portion of the two mechanical electrical disconnects.

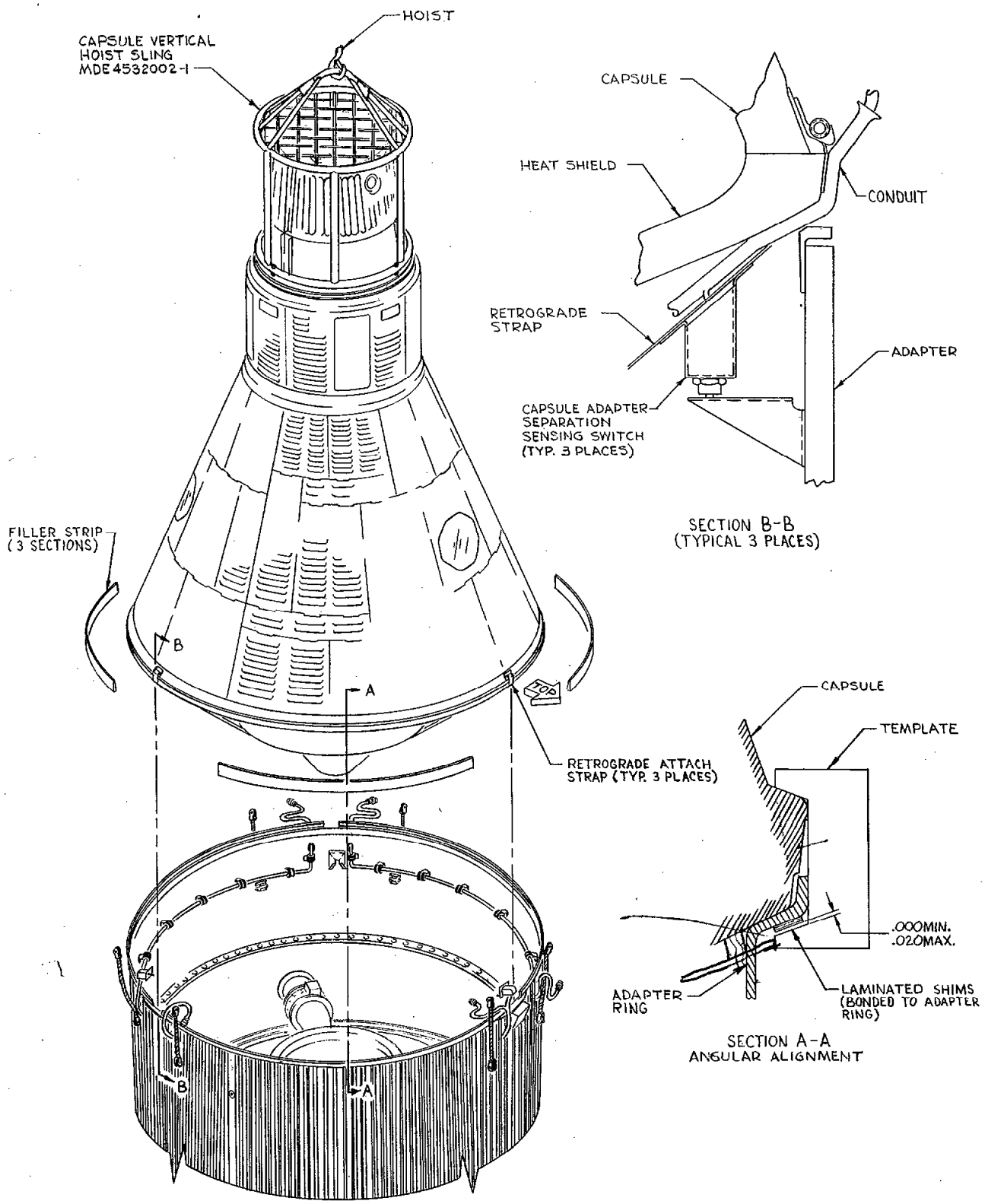

FIGURE 2-3 CAPSULE TO ADAPTER INSTALLATION (SHEET 1 OF 3)

MH45-35-1

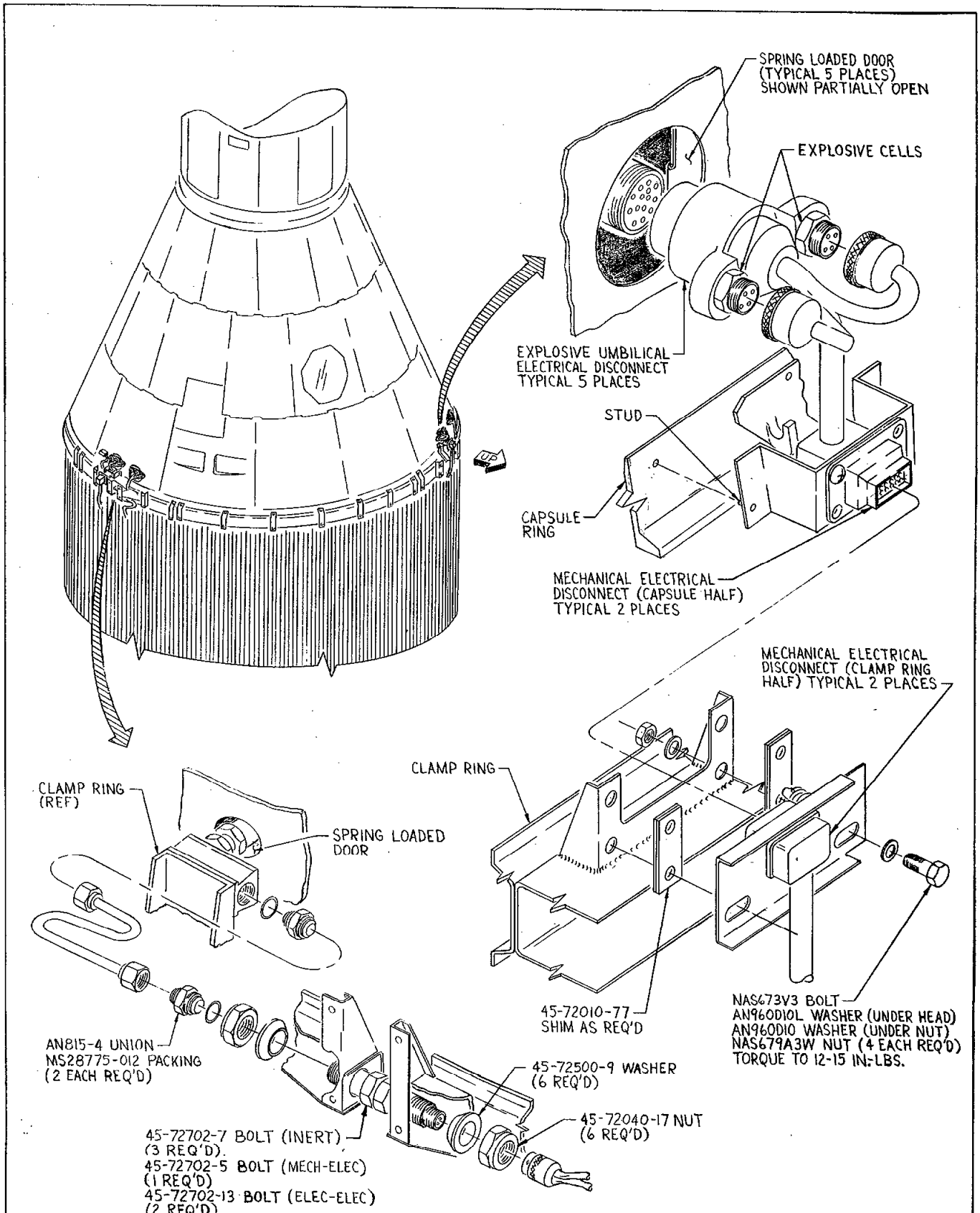

FIGURE 2-3 CAPSULE TO ADAPTER INSTALLATION (SHEET 2 OF 3)

MH45-35-2

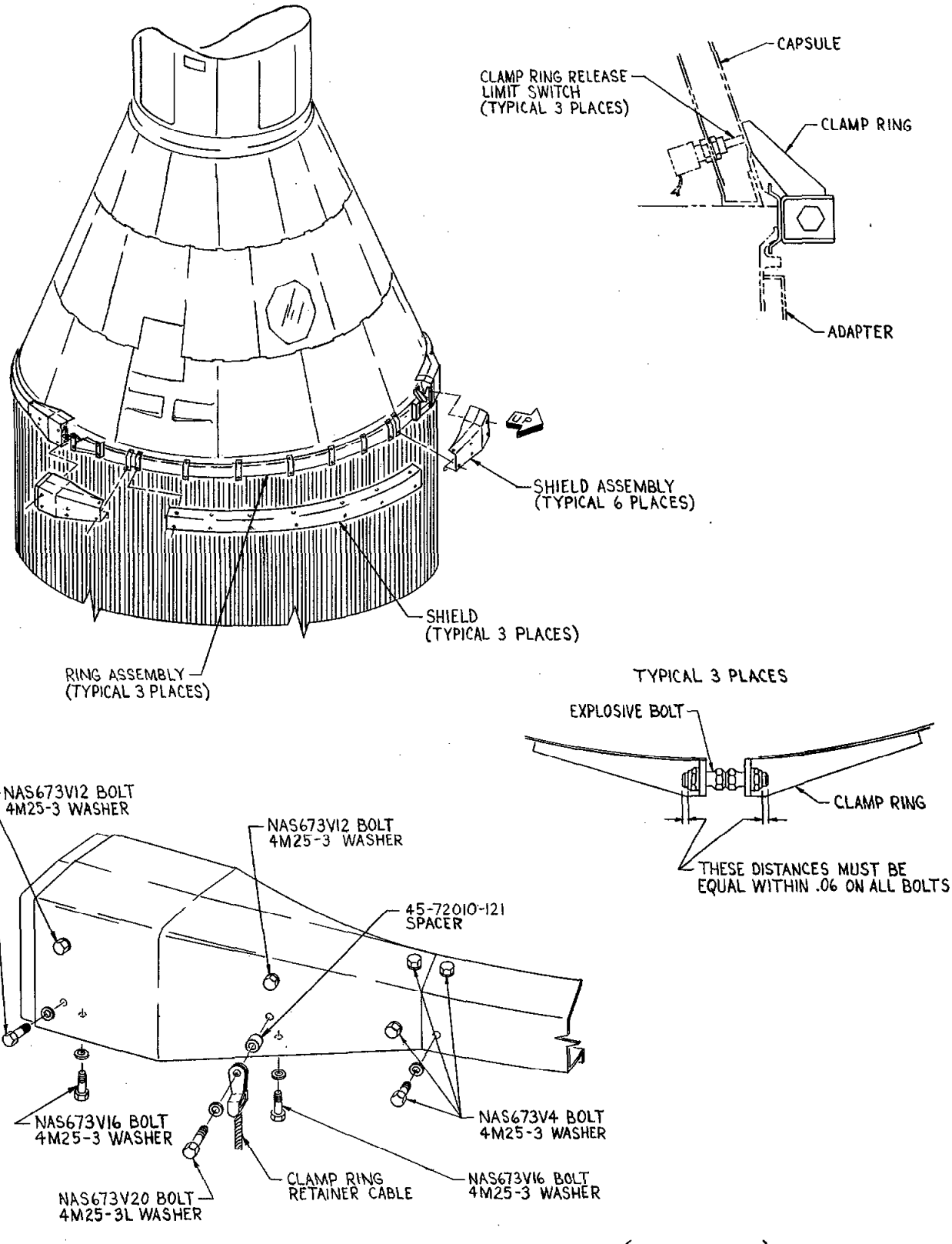

FIGURE 2-3 CAPSULE TO ADAPTER INSTALLATION (SHEET 3 OF 3)

MH45-35-3

(k) Install the clamp ring over the filler strips taking care to align the mechanical electrical disconnects halves. Exercise care also not to damage the limit switches (3 places) which are actuated by the clamp ring.

(l) Attach clamp ring segments using inert explosive bolts (45-72702-7).

NOTE

For live explosive bolts installation refer to Section VIII.

(m) Torque nuts to approximately 320 (275 ft. lbs) in/lbs. Tap ring segments with a mallet along their length, then torque nuts to 775 ± 20 (65 ft. lbs) in/lbs. Tap ring segments again and retorque nuts to 775 ± 20 in/lbs. Repeat until the torque value remains constant at 775 ± 20 in/lbs.

NOTE

Distance from end of nut to end of bolt must be equal within .06" for all bolts. Safety attach nuts with MS20995N51 lockwire.

(n) Connect wire bundles between the mechanical electrical disconnects and the pyrotechnic disconnects (2 places). Note wire bundles with regard to length, physical condition, condition of connectors, etc. (For explosive cells installation (in pyrotechnic disconnects) refer to Section VIII.)

(o) Ascertain that the explosive bolt leads are of adequate length and are fitted with the proper connectors.

(p) Install pneumatic line, containing initiator, between fitting under retractable door in capsule and clamp ring bolt. Note fit of line with regard to adequate length, proper bends, etc.

(q) Check each segment of the clamp ring heat shield for security of insulation and bushings.

NOTE

Except for fit checks, heat shield repairs, etc., do not install clamp ring heat shield until live explosive bolts are installed.

(r) Install the shield over the clamp ring segment, noting that each section is properly contoured, and that all bolt holes align.

(s) Check each shield assembly for security of insulation and bushing.

(t) Install shield assemblies at clamp ring joints.

NOTE

With respect to any particular clamp ring joint, the "right" shield assembly must be installed first. Torque bolts 12-15 in/lbs.

2-15. Antenna Fairing

2-16. Removal

(a) Remove capsule pylon tower. Refer to Paragraph 2-18.

(b) Remove antenna fairing attach bolt, accessible through the antenna fairing loading rod, utilizing special tool (MDE).

WARNING

During the removal of the antenna fairing from the capsule, extreme caution should be observed to ensure that no electrical power is attached to the capsule and also that capsule batteries are inactivated. Failure to comply could result in firing of the antenna fairing ejector gun with subsequent damage to equipment and injury or death of personnel.

(c) Lift the antenna fairing off the capsule recovery compartment.

NOTE

During the removal of the antenna fairing do not twist or turn the fairing.

INSTALLATION

1. ENSURE THAT CAPSULE RECOVERY COMPARTMENT EQUIPMENT IS PROPERLY INSTALLED
2. LOWER ANTENNA FAIRING ONTO CAPSULE RECOVERY COMPARTMENT FLANGE, ENSURING THAT THE FAIRING ELECTRICAL CONNECTOR ALIGNS WITH THE RECOVERY COMPARTMENT RECEPTACLE.
3. CHECK THAT ANTENNA FAIRING SHEAR PINS MATE WITH THE RECOVERY COMPARTMENT SUPPORT FITTINGS.

CAUTION

DURING ANTENNA FAIRING INSTALLATION, EXTREME CAUTION SHOULD BE OBSERVED TO ENSURE NO ELECTRICAL POWER IS CONNECTED TO CAPSULE AND THAT CAPSULE BATTERIES ARE INACTIVATED. FAILURE TO COMPLY COULD RESULT IN DAMAGE TO FAIRING AND INJURY TO PERSONNEL.

4. ATTACH ANTENNA FAIRING TO FAIRING EJECTOR GUN WITH WASHERS AND BOLT.
5. TORQUE BOLT TO 350 INCH POUNDS.

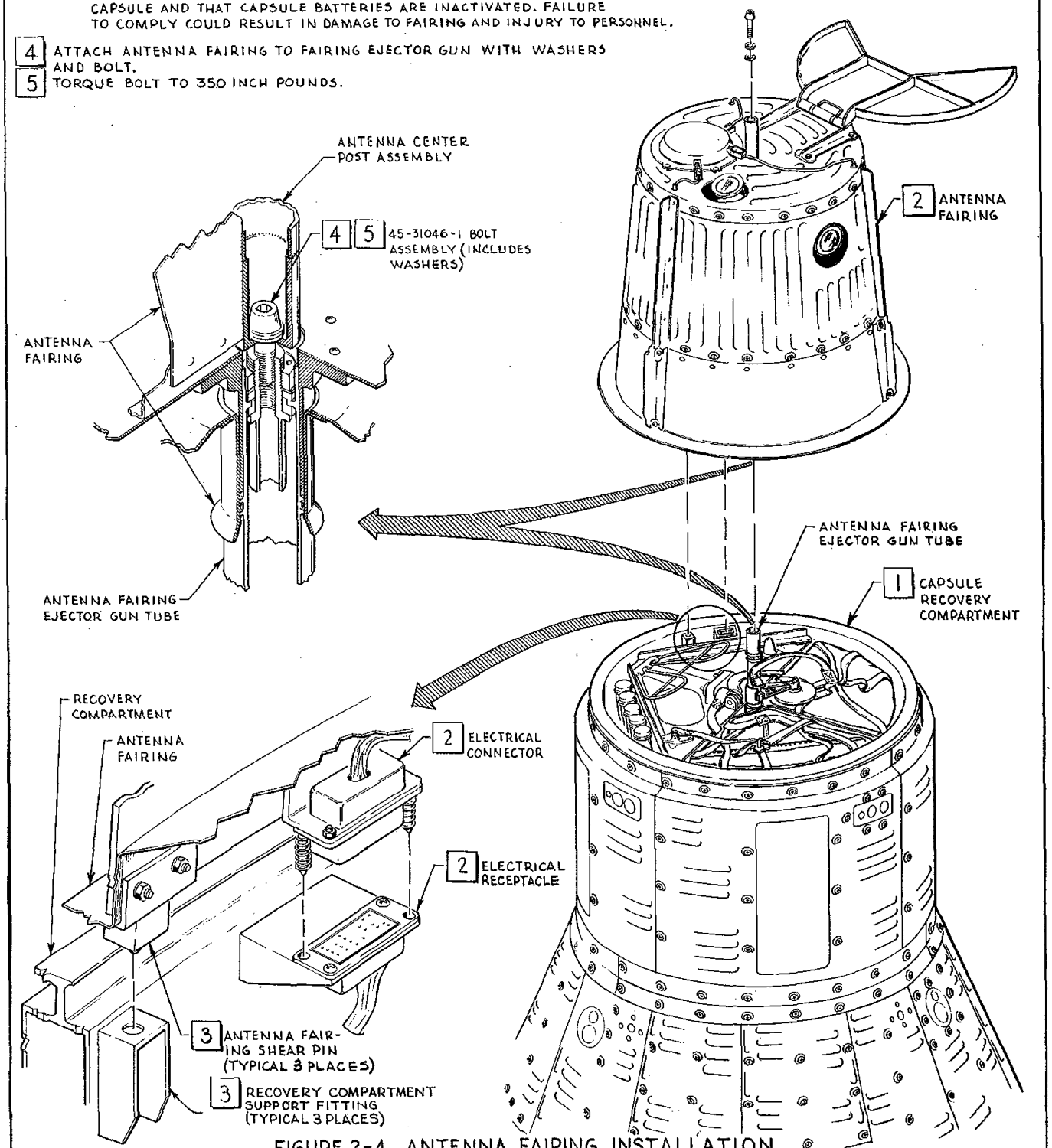

FIGURE 2-4 ANTENNA FAIRING INSTALLATION

MH45-5

2-17. Installation

(See Figure 2-4, for antenna fairing installation.)

2-18. Pylon

2-19. Removal

For removal of Pylon use the reverse of procedures in Paragraph 2-20.

2-20. Installation

(a) Attach hoist to the Escape System Cradle Frame Assembly, MDE4551014-1, forward clamp ring and rotate frame assembly to vertical position.

NOTE

Cradle frame assembly is installed on the Capsule/Escape System Trailer. Secure cradle assembly to vertical position with the support brace provided.

(b) Remove hoist and disassemble cradle frame assembly forward clamp ring.

(c) Detach cradle frame assembly aft clamp.

(d) Disassemble cradle frame base plate and remove trailer.

(e) Install Escape System Vertical Hoist Sling Assembly, MDE4551007-1 to the pylon escape rocket attach lugs.

(f) Attach hoist to vertical hoist sling.

(g) Detach cradle frame base plate clamp ring.

(h) Vertically raise the pylon and visually check the mating surfaces of the pylon and the capsule recovery system compartment.

ITEM	NOMENCLATURE
1	45-72040-7 NUT (6)
2	45-72500-9 WASHER (6)
3	45-72702-7 (INERT) EXPLOSIVE BOLT (3) 45-72702-5 EXPLOSIVE BOLT } (1) 45-72702-13 EXPLOSIVE BOLT } (2)
4	45-72042 CLAMP RING ASSEMBLY
5	4M25-3L WASHER (48)
6	3M33-3-6A BOLT (12)
7	3M33-3-5A BOLT (24)
8	3M33-3-3A BOLT (6)
9	4M25-3 WASHER (12)
10	3M33-3-11A BOLT (6)

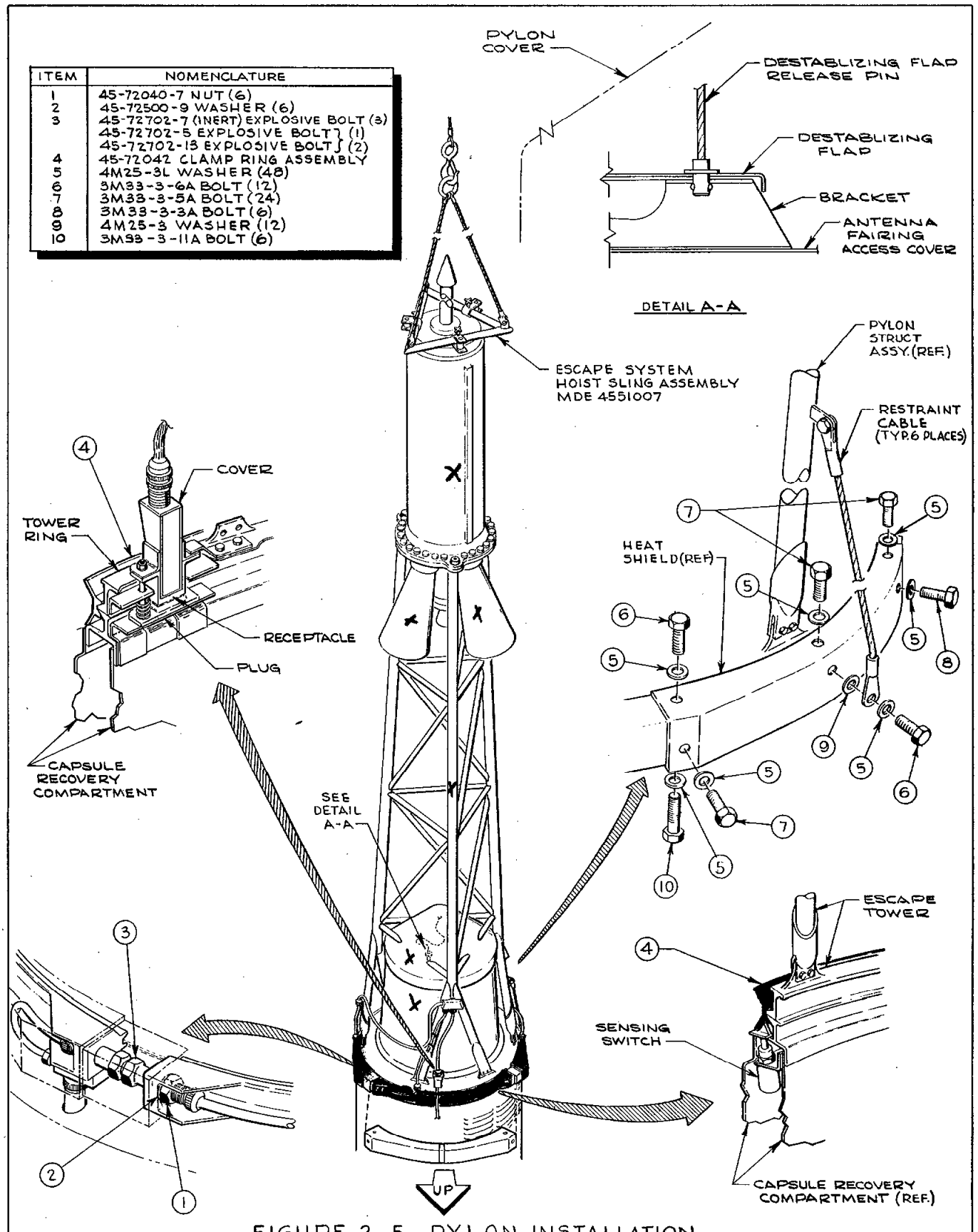

FIGURE 2-5 PYLON INSTALLATION

MH 45-87

NOTE

Prior to final installation of the pylon, the antenna fairing must be installed.

(i) Position the pylon over the installed antenna fairing, aligning the electrical receptacles of the pylon attach flange with the electrical receptacles of the capsule recovery system compartment attach flange. If antenna fairing is installed, depress the destabilizing flap and secure with pip pin from pylon. (See Fig. 2-5.)

(j) Lower pylon onto capsule.

Note the following:

(1) Clearance between pylon and antenna fairing.

(2) Mating of pylon and capsule attach flange.

(3) Fit of pylon antenna fairing cover to the top of antenna fairing.

(4) Mating of two electrical disconnects.

(k) Inspect pylon-capsule clamp ring segments for damage.

(l) Lubricate inner section of clamp ring segments with anti-seize compound (MIL-T-5544).

(m) Install clamp ring segments onto mated pylon-capsule flanges, aligning the pylon explosive bolt electrical leads with each end of clamp ring segment. Exercise care not to damage limit switches (3 places) during clamp ring installation.

(n) Attach clamp ring segments with inert Explosive Bolts (45-72072-7) and attach nuts.

NOTE

For live bolts installation refer to Section VIII.

NOTE

Lubricate clamp ring bolts spherical seat washer with Anti-Seize Compound (MIL-T-5544).

(o) Torque nuts to approximately 320 in/lbs. Tap ring segments with a mallet along their length, then torque nuts to 775 ± 20 in/lbs. Tap ring segments again, and retorque nuts to 775 ± 20 in/lbs. Repeat until the torque remains constant at 775 ± 20 in/lbs.

NOTE

Distance from end of nut to end of bolt must be equal within ± .06" for all bolts. (Safety attach nuts with MS20995N51 lockwire.)

(p) Ascertain that pylon explosive bolt leads are of proper length and are equipped with proper connectors.

(q) Install pneumatic line, containing initiator, between clamp ring bolt and capsule fitting. Note fit of line.

(r) Check clamp ring heat shield segments for general condition.

NOTE

Except for fit checks, heat shield repair, etc., do not install clamp ring heat shield until live explosive bolts are installed.

(s) Install shields over clamp ring segments noting that all bolt holes align.

(t) Attach shields to clamp ring segments and torque attach bolts 12 to 15 in/lbs.

2-21. Heat Shield

2-22. Removal

(a) Position capsule on the Crewman Weight and Center of Gravity Fixture Assembly (MDE4582001-1).

NOTE

Utilize the Capsule Vertical Hoisting Sling Assembly (MDE4532002-1), to install capsule

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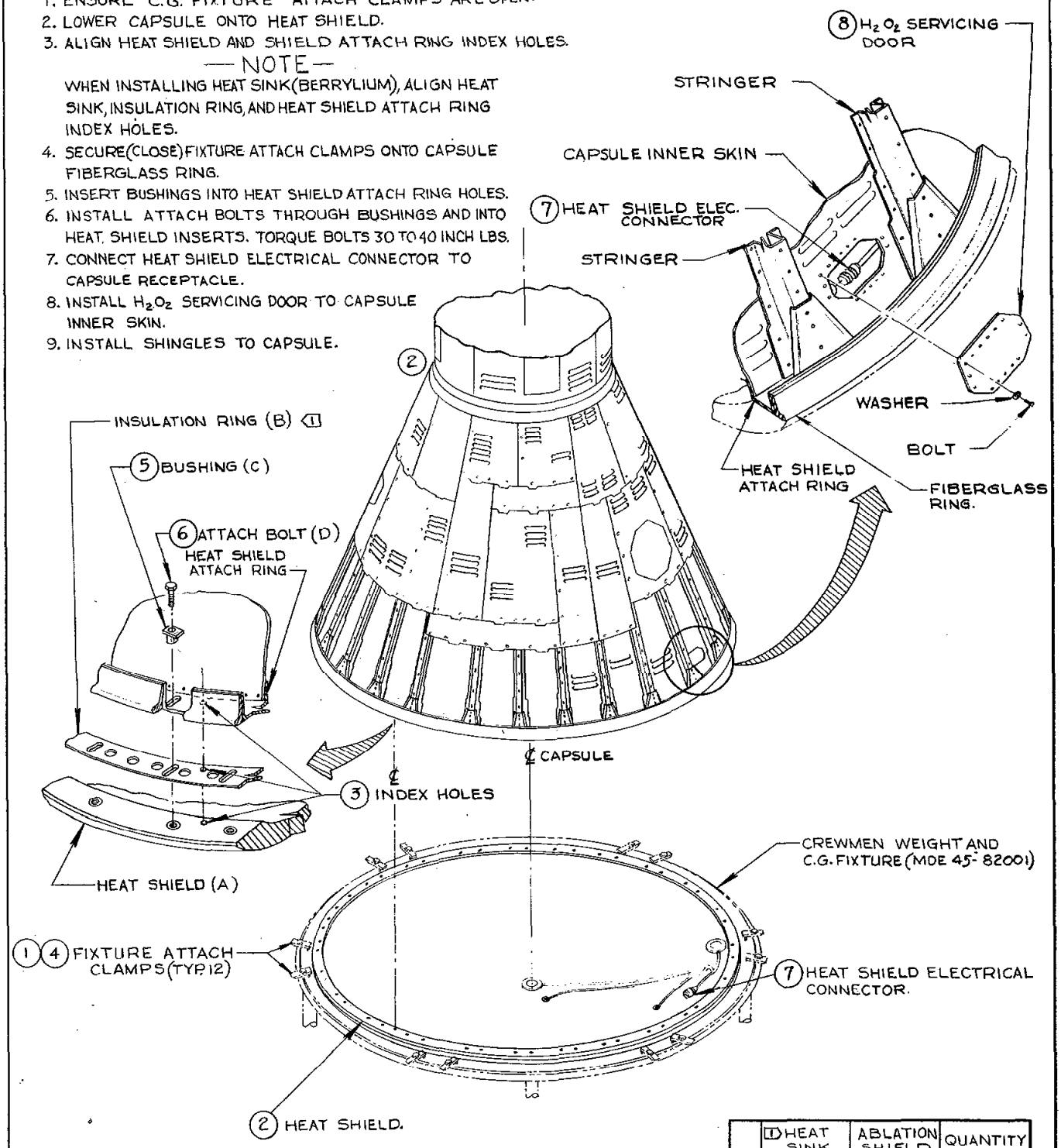
INSTALLATION

1. ENSURE C.G. FIXTURE ATTACH CLAMPS ARE OPEN.
2. LOWER CAPSULE ONTO HEAT SHIELD.
3. ALIGN HEAT SHIELD AND SHIELD ATTACH RING INDEX HOLES.

— NOTE —

WHEN INSTALLING HEAT SINK(BERRYLIUM), ALIGN HEAT SINK, INSULATION RING, AND HEAT SHIELD ATTACH RING INDEX HOLES.

4. SECURE(CLOSE) FIXTURE ATTACH CLAMPS ONTO CAPSULE FIBERGLASS RING.
5. INSERT BUSHINGS INTO HEAT SHIELD ATTACH RING HOLES.
6. INSTALL ATTACH BOLTS THROUGH BUSHINGS AND INTO HEAT SHIELD INSERTS. TORQUE BOLTS 30 TO 40 INCH LBS.
7. CONNECT HEAT SHIELD ELECTRICAL CONNECTOR TO CAPSULE RECEPTACLE.
8. INSTALL H_2O_2 SERVICING DOOR TO CAPSULE INNER SKIN.
9. INSTALL SHINGLES TO CAPSULE.



	(1) HEAT SINK	ABLATION SHIELD	QUANTITY
A	45-32051	45-32052	1
B	45-32131		8 SEGEMENTS
C	45-32053-3	45-32053-5	48
D	3M33-4-4A	3M33-4-3A	48

(1) EFFECTIVE CAPSULES-2, 5, 7, 10, 11, 14, 15, 16, 17

FIGURE 2-6 HEAT SHIELD INSTALLATION MH45-2

to weight and center of gravity fixture.

(b) Secure capsule to weight and center of gravity fixture by locking fixture adapter clamps (12).

(c) Remove capsule shingles located adjacent to capsule fiberglas attach ring (that is utilized to attach capsule to missile adapter).

(d) Remove attach bolts and bushings (48 each), that attach the capsule heat shield attach ring to the heat shield

NOTE

Bushings do not necessarily have to be removed, if they fit tightly into the heat shield attach ring. Bushings may be removed after capsule is removed from heat shield attach ring.

(e) Remove H_2O_2 servicing access door, located in the capsule structural skin adjacent to the heat shield attach ring and in line with the capsule lower window.

(f) Disconnect heat shield electrical connector located in the H_2O_2 servicing access door.

(g) Unlock weight and center of gravity fixture adapter clamps.

(h) Hoist capsule vertically off of heat shield.

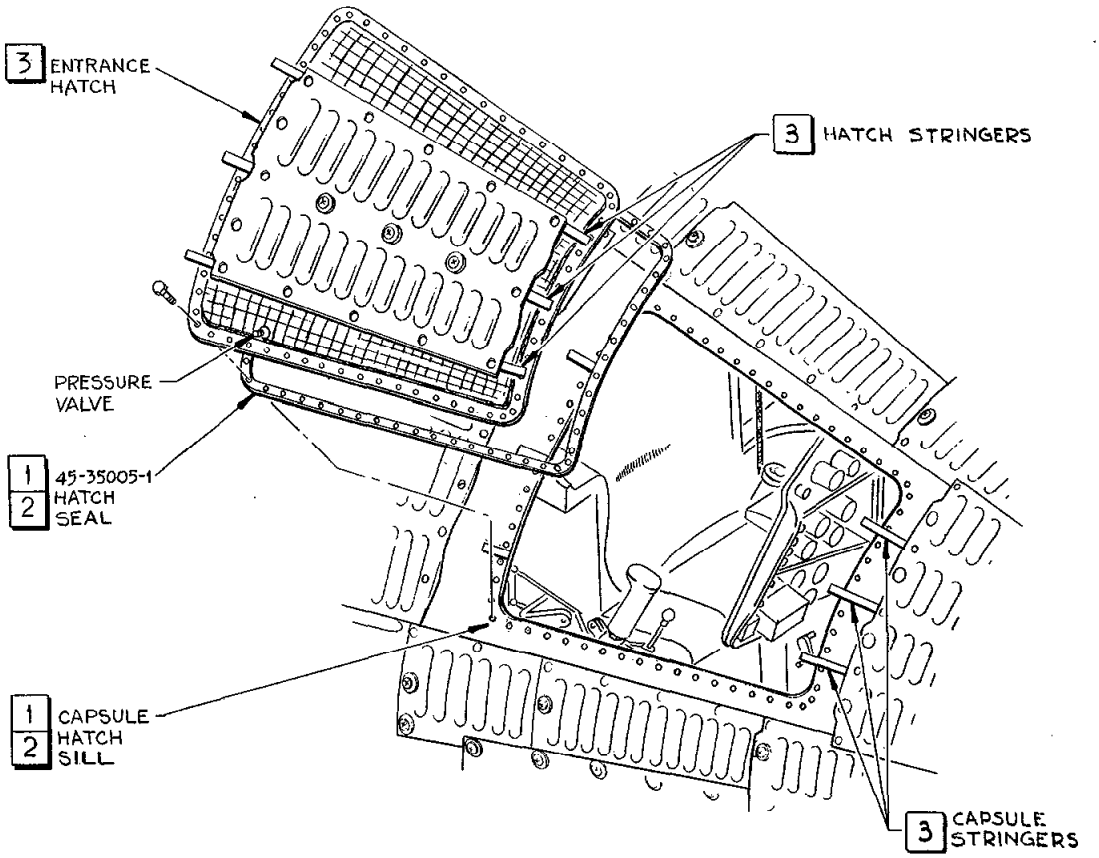
2-23. Installation

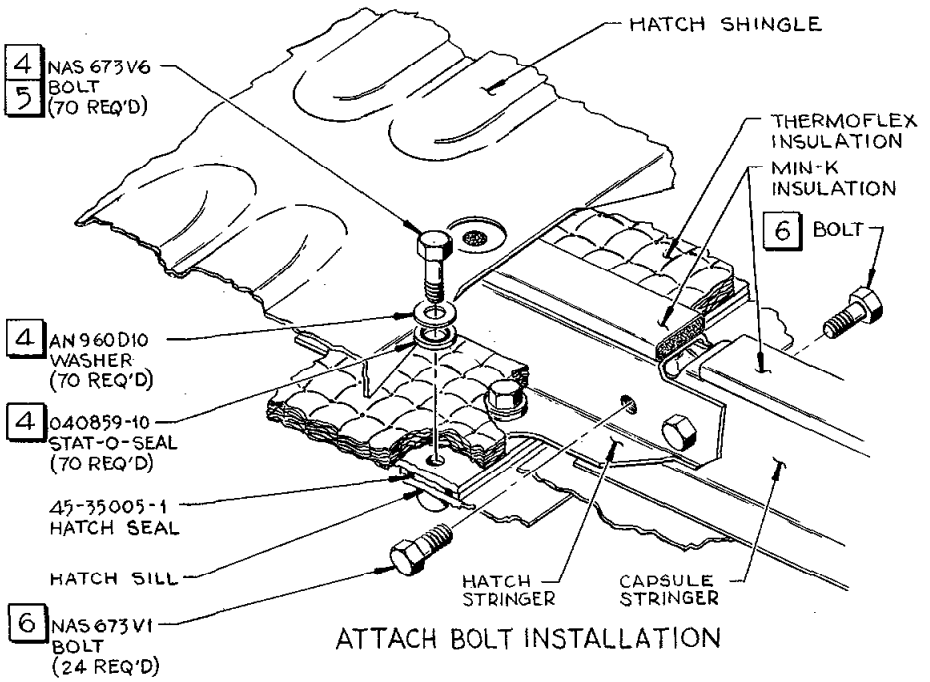
(a) See Figure 2-6, for installation of heat shield to capsule.

2-24. Entrance Hatch

2-25. Removal

(a) Remove the entrance hatch shingles (4) that enclose the entrance hatch.





ATTACH BOLT INSTALLATION

INSTALLATION

1. PLACE HATCH SEAL ON CAPSULE HATCH (OPENING) SILL.
2. ALIGN HATCH SEAL AND CAPSULE HATCH SILL ATTACHMENT HOLES.
3. PLACE ENTRANCE HATCH ONTO HATCH SEAL AND ALIGN ENTRANCE HATCH, HATCH SEAL, AND CAPSULE HATCH SILL ATTACHMENT HOLES.

NOTE
DURING ALIGNMENT OF HATCH, SEAL, AND SILL MATE THE HATCH STRINGERS WITH THE CAPSULE STRINGERS.

4. ATTACH HATCH TO CAPSULE SILL WITH BOLTS, WASHERS AND STAT-O-SEALS.
5. TORQUE ATTACH BOLTS 30-35 INCH POUNDS.

NOTE
TO OBTAIN PROPER HATCH SEALING, TORQUE EVERY OTHER BOLT AND THEN TORQUE REMAINING BOLTS.

6. INSTALL AND FIRMLY TIGHTEN BOLTS INTO MATED HATCH AND CAPSULE STRINGER ATTACHMENT HOLES.

FIGURE 2-7 ENTRANCE HATCH INSTALLATION (SHEET 1 OF 2)

MH45-3-1

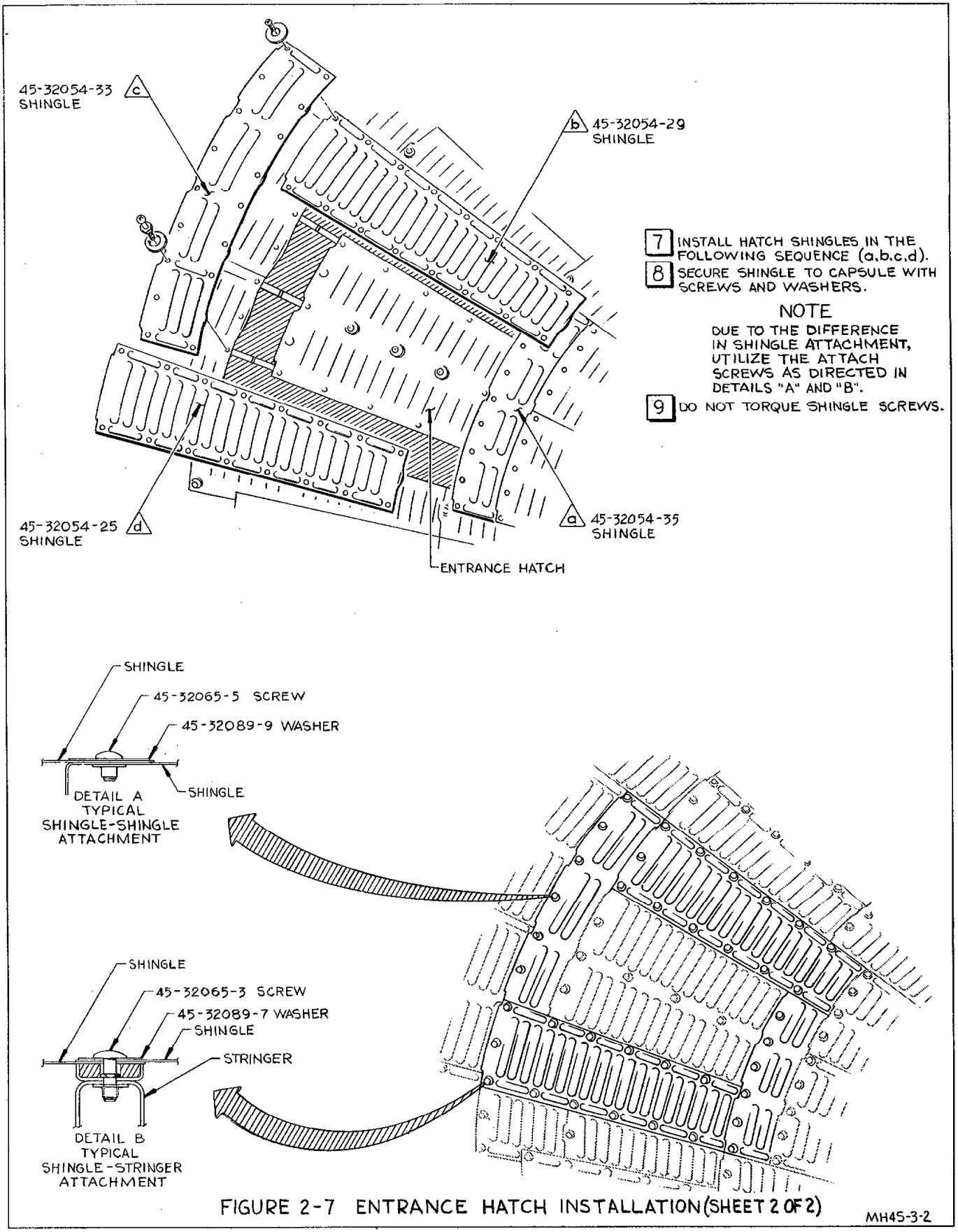


FIGURE 2-7 ENTRANCE HATCH INSTALLATION (SHEET 2 OF 2)

MH45-3-2

NOTE

To prevent possible injury to personnel, in the event the capsule has been pressurized, remove the pressure valve cover and depress pressure valve (located in entrance hatch).

(b) Remove entrance hatch from capsule by removing the hatch attach bolts (94), and lifting off hatch.

(c) Remove the capsule entrance hatch seal.

NOTE

Entrance hatch seal is removed to prevent damage to seal and also to enable the installation of the Capsule Hatch Ring Cover (MDE4535001-1), to capsule.

2-26. Installation

See Figure 2-7 for entrance hatch installation.

2-27. Escape Hatch

2-28. Removal

(a) Remove escape hatch control handle safety pin.

(b) Actuate escape hatch handle downward.

NOTE

Firmly support escape hatch during control handle actuation.

(c) Remove escape hatch, by pulling hatch toward the capsule large pressure bulkhead.

2-29. Installation

(a) (See Figure 2-8). Position escape hatch into small pressure bulkhead opening.

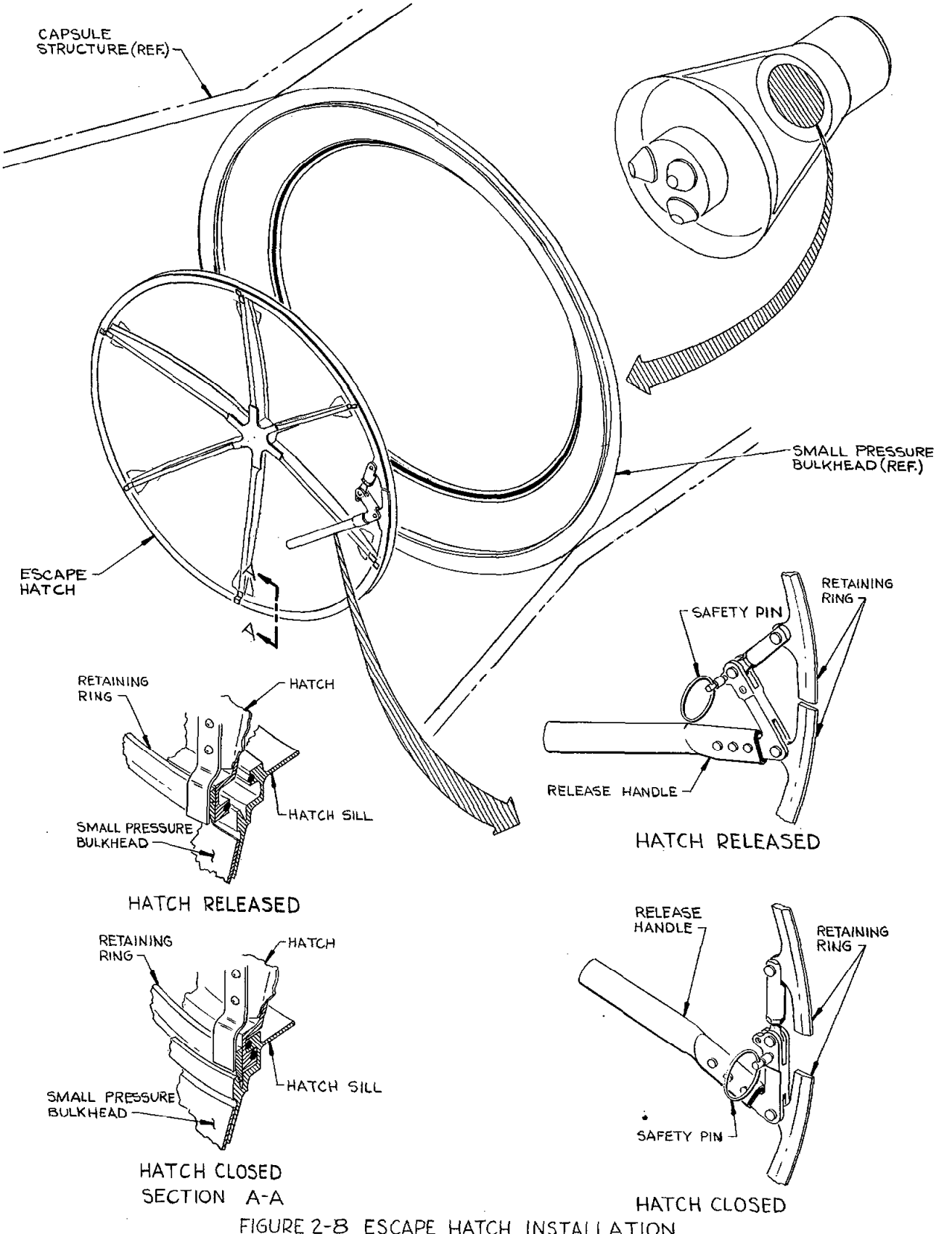


FIGURE 2-8 ESCAPE HATCH INSTALLATION

MH45-90

(b) Rotate escape hatch so that control handle will be located in the right of the bulkhead (adjacent to cabin air inlet valve).

(c) Remove escape hatch control handle safety pin.

(d) With hatch firmly seated in small pressure bulkhead hatch sill, move the handle upward until the handle linkage holes align.

(e) Install safety pin in control handle linkage.

2-30. Capsule Window

NOTE

Removal and installation procedures for all capsule windows are very similar. The procedure described herein will pertain to lower window , but may be considered "typical".

2-31. Removal

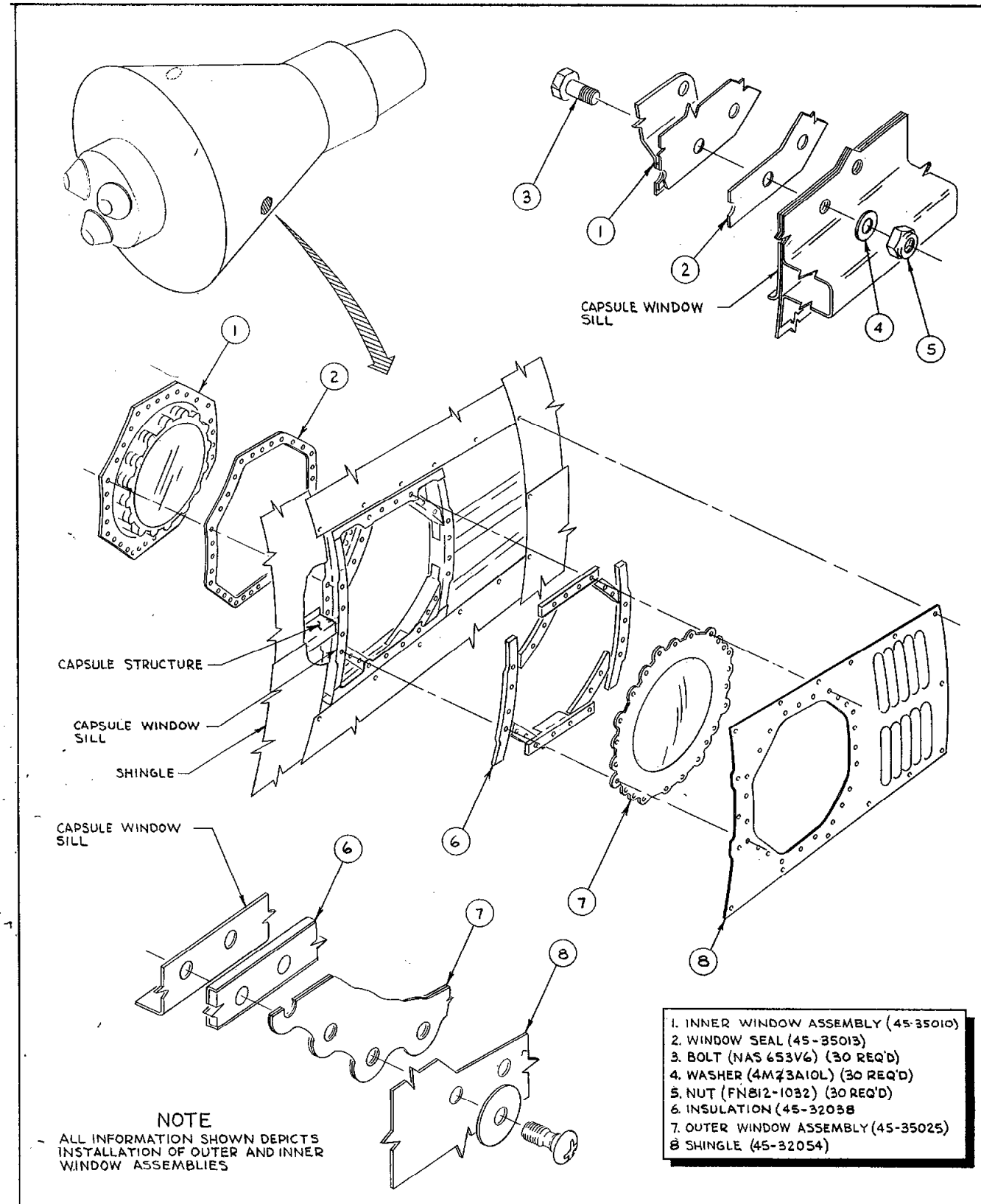
(a) (See Figure 2-9 for parts nomenclature.) Remove the screws from the outer edge of the shingle that encloses the capsule outer window assembly.

(b) Remove the screws from the shingle adjacent to the window.

NOTE

The outer window assembly is retained by this shingle. During removal of shingle screws adjacent to window, support the window. Then remove shingle, outer window assembly, and insulation strips.

(c) Remove the Earth and Sky Camera Assembly (lower window only) located in the capsule adjacent to the capsule inner window assembly



NOTE
- ALL INFORMATION SHOWN DEPICTS INSTALLATION OF OUTER AND INNER WINDOW ASSEMBLIES

FIGURE 2-9 WINDOW INSTALLATION

MH45-4

(d) Remove bolts and nuts that attach the inner window assembly to the capsule.

NOTE

Remove seal located between window assembly and capsule structure.

2-32. Installation

(a) (See Figure 2-9.) Place inner window assembly onto capsule window sill structure.

NOTE

Install seal between window assembly and window sill structure.

(b) Attach inner window assembly and seal to capsule window sill structure with bolts, washers, and nuts. (See Figure 2-9.)

NOTE

Ensure that stat-o-seal washers are in between the window attach flange and support clips, located on the top and bottom of window assembly.

(c) Torque bolts ~~20~~ to ~~25~~ inch pounds. 30-35

(d) Place outer window assembly into capsule outer window sill.

NOTE

Ensure that insulation strips are in between outer window assembly and capsule window sill structure.

(e) Place shingle over outer window assembly and secure with shingle screws.

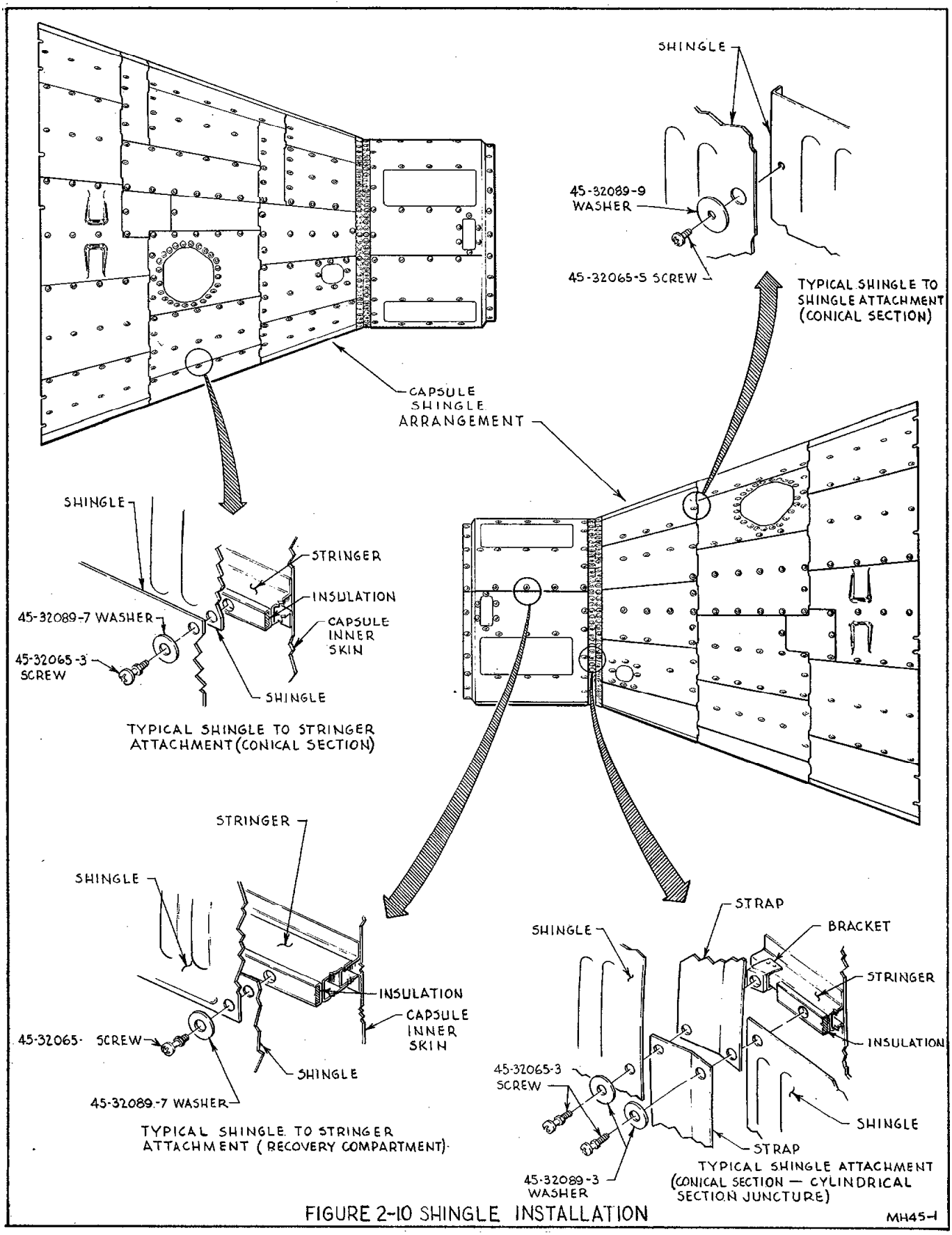


FIGURE 2-10 SHINGLE INSTALLATION

MH45-1

NOTE

Install screws into shingle attach holes that are adjacent to window. This will secure shingle, window assembly, and insulation strips to the capsule window sill structure.

(f) Secure shingle outer edges by installing screws through shingle to capsule structure.

2-33. Capsule Shingles

2-34. Removal

(a) Remove the screws around the shingle to be removed. (Since the shingles overlap, adjacent shingles will be loosened when the screws are removed.)

2-35. Installation

See Figure 2-10 for shingle installation.

2-36. Main Panel (Removable Section)

2-37. Removal

(a) Move main panel removable section release handle out and upward.

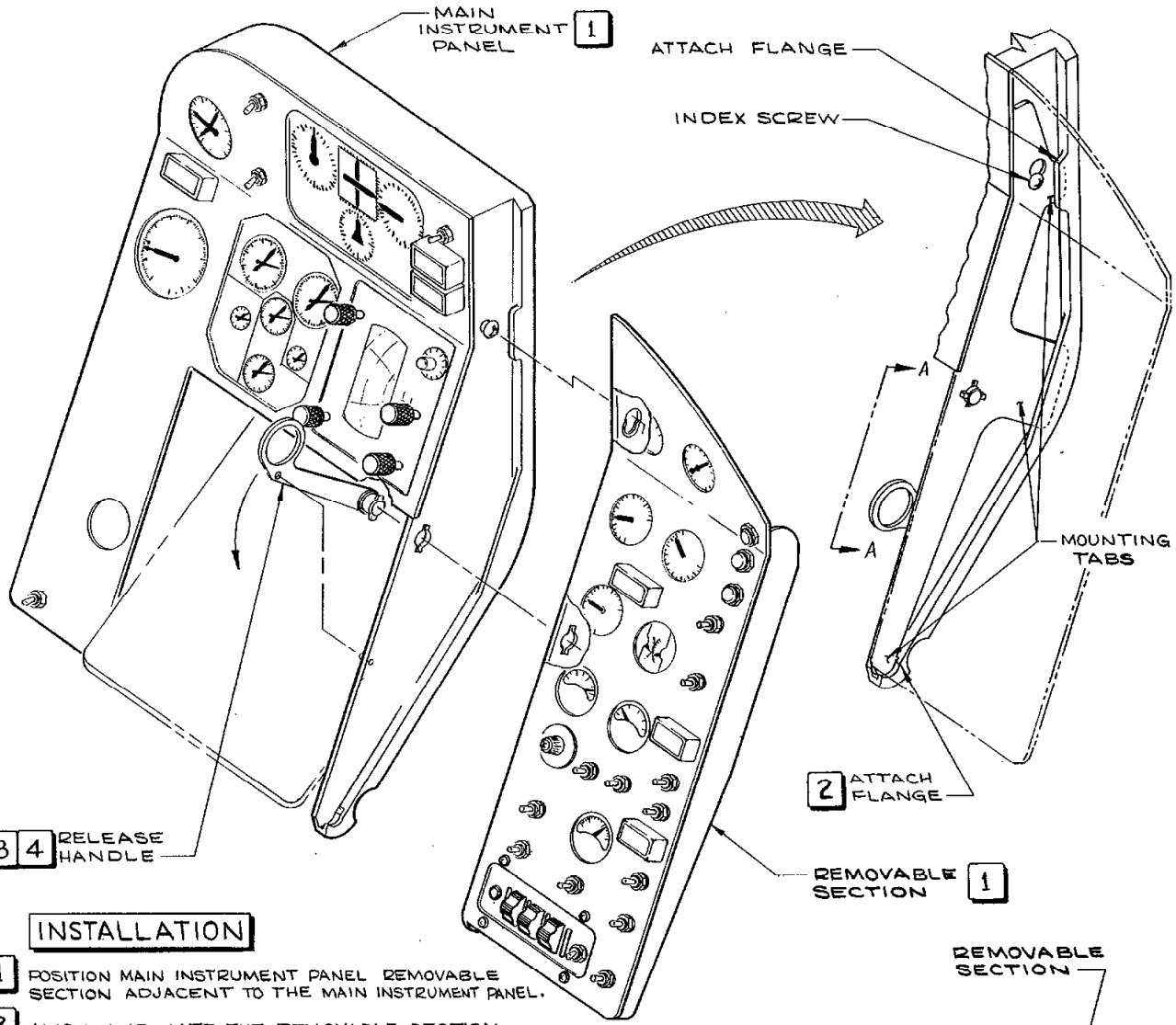
NOTE

Support main panel removable section during removal operation.

(b) Remove release handle from main panel assembly.

(c) Move removable section downward so that main panel index screw bottoms on the top of the elongated hole in removable section.

(d) Move removable section away from main panel so that mounting tabs are free from main panel mounting flanges.



INSTALLATION

1 POSITION MAIN INSTRUMENT PANEL REMOVABLE SECTION ADJACENT TO THE MAIN INSTRUMENT PANEL.

2 ALIGN AND MATE THE REMOVABLE SECTION THREE MOUNTING TABS INTO THE MAIN PANEL ATTACH FLANGE.

NOTE

DURING THE INSTALLATION OF THE REMOVABLE SECTION TO THE MAIN PANEL, MATE MAIN PANEL INDEX SCREW WITH THE REMOVABLE SECTION ELONGATED HOLE AND MOVE REMOVABLE SECTION UPWARD.

3 PLACE REMOVABLE SECTION RELEASE HANDLE SHAFT THROUGH THE HOLE, PROVIDED ON THE RIGHT SIDE OF THE MAIN PANEL, AND INTO THE REMOVABLE SECTION.

4 WITH THE REMOVABLE SECTION FIRMLY MATED WITH THE MAIN PANEL, ROTATE THE RELEASE HANDLE DOWNWARD AND SECURE HANDLE BY MATING HANDLE DETENT WITH MAIN PANEL LOCK PIN.

NOTE

THE RELEASE HANDLE LOCKNUT SHOULD BE TORQUED TO ALLOW HANDLE TO BE MOVED DOWNWARD WITH A 20-30 POUNDS PULL

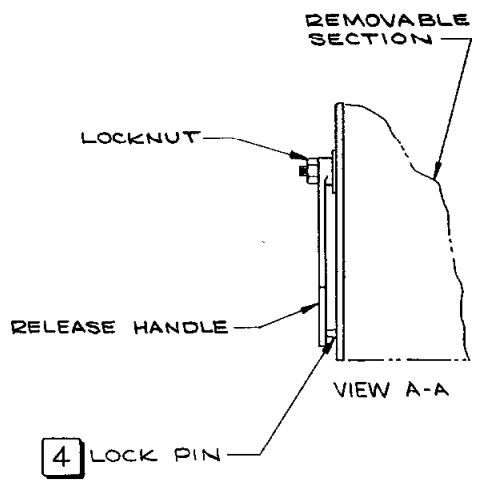


FIGURE 2-11 MAIN PANEL (REMOVABLE SECTION) INSTALLATION

MH45-47

(e) Remove section.

NOTE

Due to interconnecting wiring, removable section cannot be completely removed from capsule.

2-38. Installation

See Figure 2-11 for removable section installation.

2-39. Crewman Simulator

2-40. Removal or Installation

See Figure 2-12 for Crewman Simulator removal or installation.

2-41. Primate Couch

2-42. Removal or Installation

See Figure 2-13 for Primate Couch removal or installation.

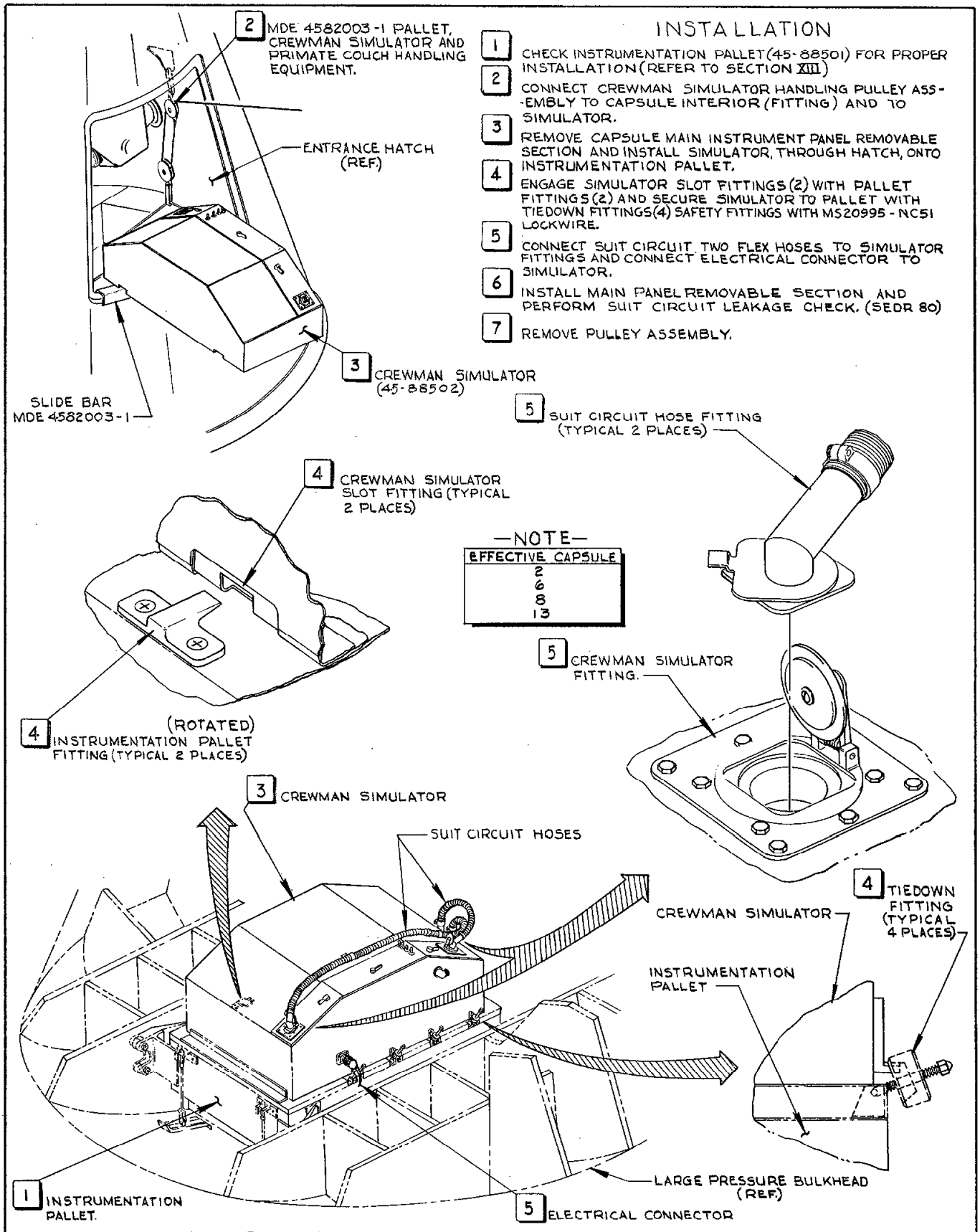
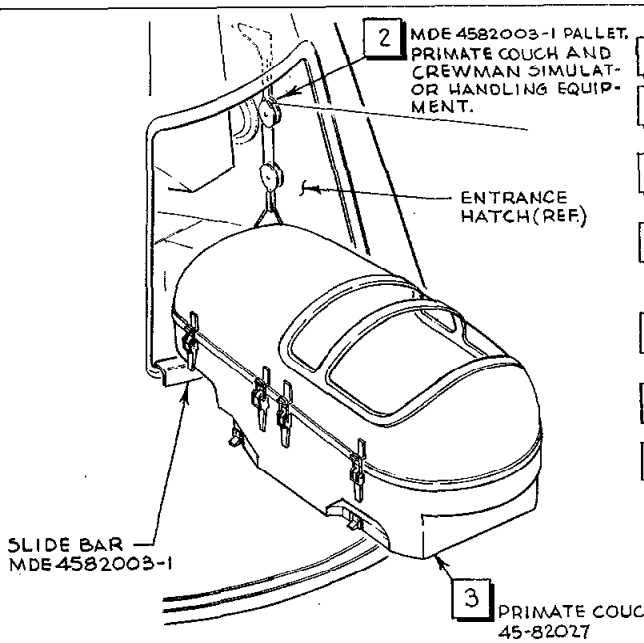


FIGURE 2-11 CREWMAN SIMULATOR INSTALLATION

MH 45-56



INSTALLATION

1. CHECK INSTRUMENTATION PALLET (45-88501) FOR PROPER INSTALLATION (REFER TO SECTION XIII).
2. CONNECT PRIMATE COUCH HANDLING PULLEY ASSEMBLY TO CAPSULE INTERIOR (FITTING) AND TO PRIMATE COUCH.
3. REMOVE CAPSULE MAIN INSTRUMENT PANEL REMOVABLE SECTION AND INSTALL COUCH THROUGH HATCH, ONTO INSTRUMENTATION PALLET.
4. ENGAGE COUCH ANGLE FITTINGS (2) WITH PALLET FITTINGS (2) AND SECURE COUCH TO PALLET WITH TIEDOWN FITTINGS (4) SAFETY FITTINGS WITH MS 20995-NC51 LOCKWIRE.
5. CONNECT SUIT CIRCUIT TWO FLEX HOSES TO COUCH FITTINGS AND CONNECT ELECTRICAL CONNECTORS TO COUCH.
6. INSTALL MAIN INSTRUMENT PANEL REMOVABLE SECTION AND PERFORM SUIT CIRCUIT LEAKAGE CHECK (SEDR 80).
7. REMOVE PULLEY ASSEMBLY.

- NOTE -

EFFECTIVE CAPSULE
3
7

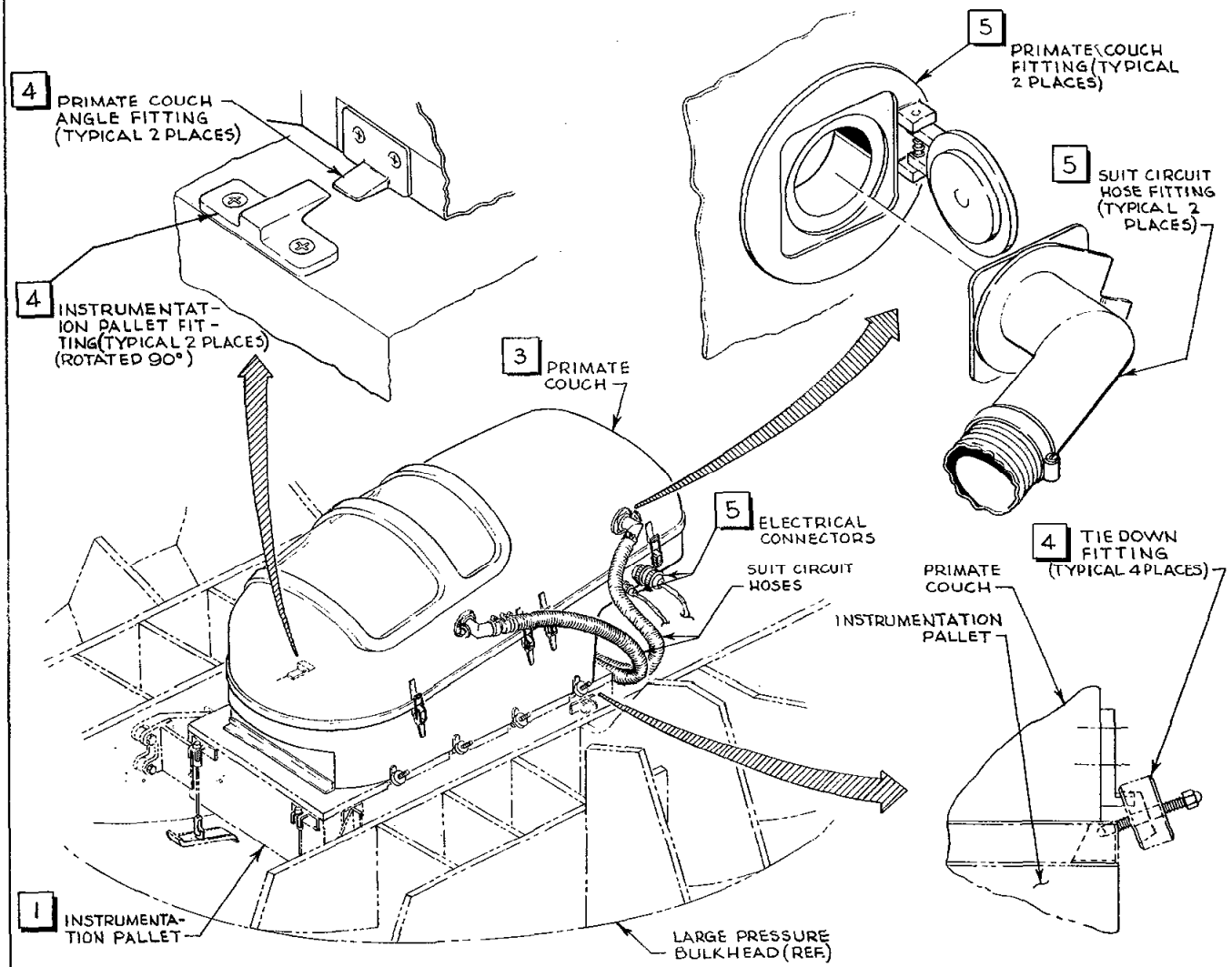
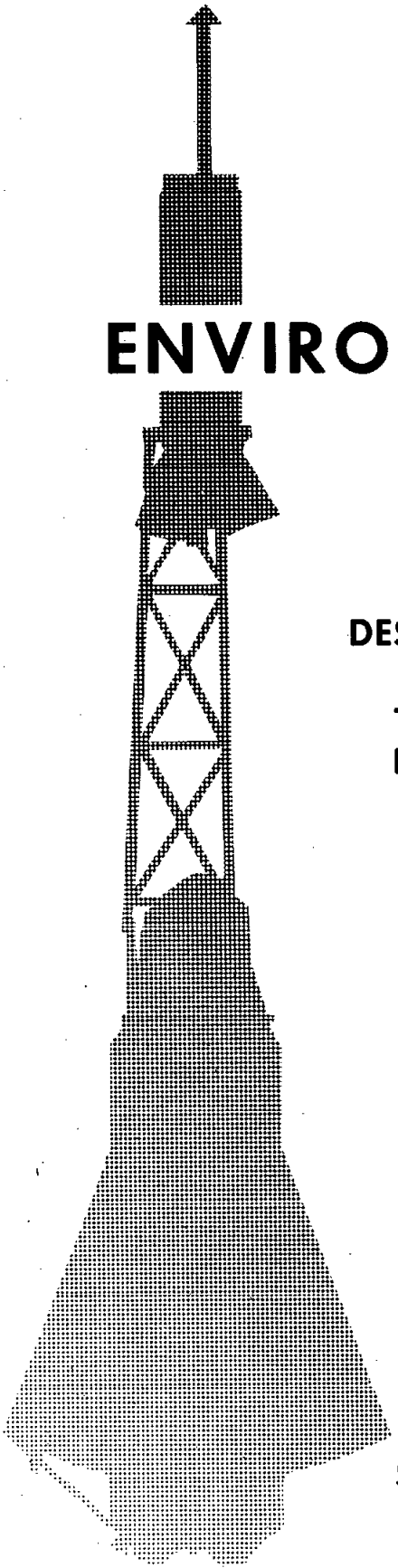


FIGURE 2-12 PRIMATE COUCH INSTALLATION

MH45-57



SECTION III

ENVIRONMENTAL CONTROL SYSTEM

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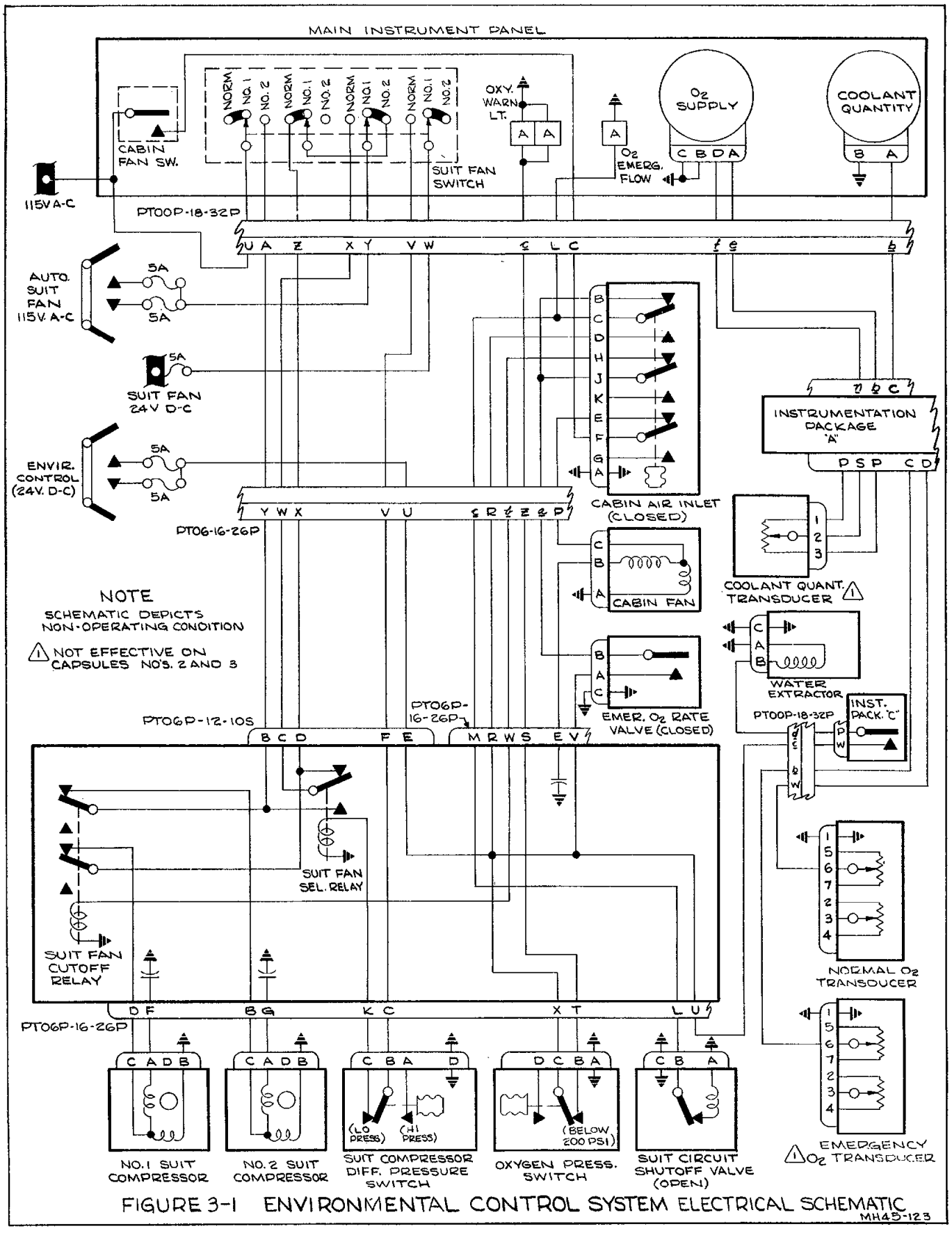
III. ENVIRONMENTAL CONTROL SYSTEM

3-1. GENERAL

Section 3 provides procedures, diagrams, illustrations and charts to facilitate system trouble shooting and component replacement and adjustment. It is noted that all system components are not necessarily covered within the Replacement and Adjustment areas. In the absence of such procedure it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

3-2. TROUBLE SHOOTING

The following trouble shooting charts are provided to enable a rapid method for determining the cause for system erratic operation, and also procedures to isolate and correct the malfunctioning component or condition. These charts are to be utilized in conjunction with the simplified environmental control system electrical schematic (Figure 3-1).



NOTE

SCHEMATIC DEPICTS NON-OPERATING CONDITION

⚠1 NOT EFFECTIVE ON CAPSULES NO'S. 2 AND 3

FIGURE 3-1 ENVIRONMENTAL CONTROL SYSTEM ELECTRICAL SCHEMATIC

MH45-123

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
(1) #1 suit compressor does not operate with SUIT FAN switch in #1 or NORMAL position (Electrical power applied to capsule).	AUTO SUIT FAN switch fuse in off (center) position.	Visual check	Depress switch fuse.
	AUTO SUIT FAN switch fuse defective (burned).	Depress switch fuse to standby (#2) position. (Fan should operate.)	Check that fan current load is not in excess of fuse rating (5 Amps), then replace burned fuse.
	SUIT FAN switch in NORMAL, upon initial application of power, or when #1 compressor output pressure is low. (This is a normal condition-only when switch is in NORMAL position.)	#2 suit compressor operating.	Place SUIT FAN switch to #1 position upon initial application of power (or when #1 compressor output pressure is low), then place switch to NORMAL.
	Emergency Oxygen Rate Valve open. (Cabin Air Inlet Valve closed.)	EMERG. O_2 control handle in EMERG. position, O_2 EMERG. FLOW light illuminated.	Place EMERG. O_2 handle to NORMAL and SUIT FAN switch to #1 position (#1 compressor should operate).
	#1 suit compressor inoperative.	Check compressor for internal short (continuity check).	Replace defective suit compressor.
	Defective SUIT FAN switch.	SUIT FAN switch continuity check.	Replace defective SUIT FAN switch.
	Defective Suit Fan Cut-off Relay.	Continuity check between pin D (-26S connector) and pin D (-10P connector) on Environmental Control Box.	Replace Environmental Control Box if relay is defective.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Defective Suit Fan Selector Relay. (SUIT FAN switch - NORMAL)	Continuity check between pin D (-26S connector) and pin C (-10P connector) on Environmental Control Box.	Replace Environmental Control Box if relay is defective.
	Defective suit compressor circuit wiring.	Continuity check.	Repair wiring as necessary.
(2) #2 suit compressor does not operate with SUIT FAN switch in #2 position. (Electrical power applied to capsule.)	Emergency Oxygen Rate Valve open.	EMERG. O_2 control handle in EMERG. position, O_2 EMERG. FLOW light illuminated.	Place EMERG O_2 handle to NORMAL.
	#2 suit compressor inoperative.	Check compressor for internal short (continuity check).	Replace defective compressor.
	Defective SUIT FAN switch.	SUIT FAN switch continuity check.	Replace defective SUIT FAN switch.
	Defective Suit Fan Cut-off Relay.	Continuity check between pin B (-26S connector) and pin B (-10P connector) on Environmental Control Box.	Replace Environmental Control Box if relay is defective.
	Defective suit compressor circuit wiring.	Continuity check.	Replace wiring as necessary.
(3) #2 suit compressor does not operate when #1 suit compressor is failed (stopped). SUIT FAN switch in NORMAL.	SUIT FAN fuse defective (burned).	Visual check.	Check that current load (to Pressure Differential Switch and Suit Fan Selector Relay) is not in excess of fuse rating (5 amps), then replace burned fuse.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Defective Pressure Differential Switch.	Continuity check between pins B and C on pressure switch.	Replace defective pressure switch.
	Defective Suit Fan Selector Relay.	Continuity check between pin C (-10P connector) on Environmental Control Box and pin C (-4S connector) at #2 suit compressor. (Power applied to SUIT FAN Switch.)	Replace Environmental Control Box if relay is defective.
	#2 suit compressor inoperative.	Check compressor for internal short (continuity check).	Replace defective compressor.
(4) #1 suit compressor operates when power is initially applied. (SUIT FAN switch in NORMAL)	Defective Pressure Differential Switch.	Continuity check between pins B and C on pressure switch.	Replace defective pressure switch.
	Defective SUIT FAN switch.	SUIT FAN switch continuity check.	Replace defective SUIT FAN switch.
	Defective Suit Fan Selector Relay.	Continuity check between pin B and C (-10P connector) on Environmental Control Box. (Power applied to SUIT FAN switch.)	Replace Environmental Control Box, if relay is defective.
(5) Suit compressor (#1 or #2) does not stop operating when EMERG. O_2 control handle is in EMERG. position. (Cabin Air Inlet Valve closed.)	Environmental Control switch fuse in off (center) position. (Indicated by failure of O_2 EMERG. FLOW light to illuminate)	Visual check.	Depress switch fuse (ON).
	Environmental Control switch fuse defective (burned). Indicated by failure O_2 EMERG. FLOW light to illuminate.	Depress switch fuse to standby (#2) position. (Fan should operate.)	Check that current load (to Emergency Rate Valve and Suit Fan Cutoff Relay) is not in excess of fuse rating (5 Amps), then replace burned fuse.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Emergency Oxygen Rate Valve limit switch defective. (Indicated by failure of O_2 EMERG. FLOW light to illuminate.)	Continuity check between pin A and B on Emergency Oxygen Rate Valve.	Replace defective emergency rate valve.
	Defective Suit Fan Cutoff Relay.	Continuity check between pin C (-4S connector) at suit compressor (#1 or #2) and pin C (-10P connector) on Environmental Control Box. Power applied to emergency rate valve. (There should be no indication of continuity.)	Replace Environmental Control Box, if relay is defective.
	Defective Cabin Air Inlet Valve limit switch.	Continuity check between pin H and J on Cabin Air Inlet Valve.	Replace defective valve.
(6) Suit compressor (#1 or #2) stops operation with Cabin Air Inlet Valve open.	Defective Cabin Air Inlet Valve limit switch.	Continuity check between pins K and J (-10S connector) on valve.	Replace defective valve.
(7) Cabin fan inoperative with CABIN FAN switch in NORMAL and electrical power applied to capsule.	Cabin Air Inlet Valve open.	Visual check.	Reset Cabin Air Inlet Valve (closed).
	Defective Cabin Air Inlet Valve switch.	Continuity check between pins E and F (-10P connector) on Cabin Air Inlet Valve.	Replace defective Cabin Air Inlet Valve.
	Defective CABIN FAN switch.	Perform continuity check on switch.	Replace defective CABIN FAN switch.
	Defective Cabin Fan	Check fan for internal short (continuity check).	Replace defective CABIN FAN.

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INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Defective cabin fan circuit wiring.	Continuity check of fan circuit wiring.	Repair wiring as necessary.
(8) Cabin fan continues to operate when Cabin Air Inlet Valve is open. (CABIN FAN switch in NORMAL.)	Defective Cabin Air Inlet Valve switch.	Continuity check between pins G and F (-10P connector) on Cabin Air Inlet Valve.	Replace defective Cabin Air Inlet Valve.
(9) Suit Circuit Shutoff Valve does not close when EMER. O_2 control handle is in EMER. position.	Environmental Control switch fuse off (center position). Indicated by failure of O_2 EMERG. FLOW light to illuminate.	Visual check.	Depress switch fuse (ON).
	Environmental Control switch fuse blown. (Indicated by failure of O_2 EMERG. FLOW light to illuminate.)	Depress switch fuse to standby (#2) position. (Shutoff Valve should close.)	Check emergency rate valve circuitry for current load in excess of fuse rating (5 Amps), then replace burned fuse.
	Defective emergency oxygen rate valve switch.	Continuity check between pins A and B on emergency oxygen rate valve.	Replace defective emergency oxygen rate valve.
	Defective Suit Circuit Shutoff Valve solenoid, or defective limit switch (not closed).	Continuity check between pins A and B on valve.	Replace defective valve.
	Cabin Air Inlet Valve limit switch improperly adjusted.	Continuity check between pins B and C (-10P connector) on Cabin Air Inlet Valve (valve closed).	Replace valve if limit switch is improperly adjusted.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
(10) Suit Circuit Shutoff Valve does not close when Cabin Air Inlet Valve is opened.	Environmental Control switch fuse is off (center position).	Visual check.	Depress switch fuse (ON).
	Environmental Control switch fuse defective (burned).	Depress switch fuse to standby (#2) position. (Shutoff Valve should close.)	Check circuitry for current load in excess of fuse rating (5 Amps), then replace burned fuse.
	Defective Suit Circuit Shutoff Valve solenoid, or defective limit switch (not closed).	Continuity check between pins A and B on valve.	Replace defective valve.
	Cabin Air Inlet Valve limit switch improperly adjusted.	Continuity check between pins D and C (-10 connector) on Cabin Air Inlet Valve (Valve open).	Replace valve if limit switch is improperly adjusted.
(11) Suit Circuit Shutoff Valve does not open when EMER O_2 control handle is placed in NORMAL position.	Cable between emergency oxygen rate valve and suit circuit shutoff valve not connected.	Visual check.	Connect cable.
	Cable between emergency oxygen rate valve and suit circuit shutoff valve improperly adjusted.	Visual check.	Adjust cable.
	Defective suit circuit shutoff valve (quadrant sheared from valve shaft).	Manually turn quadrant and note torque. (Normally, torque should be very great.)	Replace defective valve.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
(12) Emergency oxygen rate valve does not open when EMER. O_2 control handle is placed in EMER position.	Cable between control handle and valve not connected.	Visual check.	Connect cable.
(13) Emergency Oxygen Rate Valve does not open when Cabin Air Inlet Valve is opened.	Cabin between Suit Circuit Shutoff Valve and Emergency Oxygen Rate Valve not connected.	Visual check.	Connect cable.
	Cable between Suit Circuit Shutoff Valve and Emergency Rate Valve improperly adjusted.	Visual check.	Adjust cable.
	Suit Circuit Shutoff Valve not closing when Cabin Air Inlet Valve is opened.	Refer to Item (10).	Refer to Item (10).
(14) O_2 EMER. FLOW light does not illuminate when EMER. O_2 control handle is placed in EMER. position.	Defective lamp.	Place SIGNAL LIGHTS TEST SWITCH to TEST position. (Light should illuminate.)	Replace defective lamp.
	Environmental Control switch fuse off (center position).	Visual check.	Depress switch fuse (ON).
	Environmental Control switch fuse blown.	Depress switch fuse to standby (#2) position. (Light should illuminate.)	Check O_2 EMERG. FLOW light for current load in excess of fuse rating (5 Amps), then replace burned fuse.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Emergency oxygen rate valve switch defective (not closing).	Continuity check between pin A and B on emergency oxygen rate valve.	Replace defective emergency oxygen rate valve.
	Defective light circuit wiring.	Continuity check.	Repair wiring as necessary.
(15) Cabin Air Inlet and Outflow Valves do not open when SNORKEL "T" handle is pulled out.	"T" handle cable not connected to valves.	Visual check.	Connect cable to valves.
	Cable to valves improperly adjusted.	Visual check.	Adjust cable.
(16) Cabin Air Inlet Valve or Outflow Valve does not open when capsule altitude is simulated at 2000 ± 300 feet, during capsule re-entry. (Applicable altitude chamber checks.)	Cabin Air Inlet Valve or Cabin Outflow Valve defective, or valve aneroids are improperly adjusted.	Lower altitude conditions to sea level and note if and when valve opens.	Replace valve, if valve does not open at specified altitude, or does not open at all.
(17) Suit Circuit Water Extractor does not operate. (Power applied to capsule.)	Environmental Control Switch fuse is off (center) position.	Visual check.	Depress switch fuse (ON).
	Environmental Control switch fuse defective (burned).	Depress switch fuse to standby (#2) position.	Check current load (to water extractor solenoid) is not in excess of fuse rating (5 Amps), then replace burned fuse.
	Capsule oxygen supply shutoff valve closed or oxygen supply depleted.	Visually check position of shutoff valve and observe Oxygen Quantity Indicator.	Open shutoff valve or replenish oxygen supply.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Instrumentation programmer (Package "C") inoperative.	Voltage check at pin B (-3S connector) at extractor solenoid valve. (There should be a voltage indication for 30 seconds every 30 minutes.)	Refer to Section XIII.
	Defective water extractor solenoid valve (solenoid).	Continuity check at pin A and B (-3P connector) on valve.	Replace defective valve.
	Defective water extractor solenoid valve circuit wiring.	Continuity check.	Repair wiring as necessary.
(18) Oxygen Quantity gage indication does not change during suit circuit operation.	Defective oxygen pressure transducer.	Perform continuity check on transducer.	Replace defective transducer.
	Defective Oxygen Quantity gage.	Continuity check on gage.	Replace defective gage.
	Defective wiring in Instrument Package "A".	Refer to Section XIII.	Refer to Section XIII.
(19) Coolant Quantity Indicator does not indicate 100%.	Capsule water tank supply depleted.	Utilize water servicing unit to check water content. (Refer to SEDR 82.)	Re-service capsule water tank, if empty.
	Coolant indicating system oxygen bottle shutoff valve closed.	Visual check.	Open shutoff valve.
	Coolant indicating system oxygen bottle supply depleted or partially depleted.	Connect pressure gage (servicing unit) into oxygen bottle service valves and observe pressure.	Re-service oxygen bottle if pressure is below 500 psi. (Refer to SEDR 82.)

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INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Defective coolant pressure transducer.	Perform continuity and resistance check on transducer.	Replace defective transducer.
	Defective coolant quantity indicator.	Check (continuity) indicator.	Replace defective indicator.
	Defective Instrumentation Package "A".	Refer to Section XIII.	Refer to Section XIII.
(20) OXYGEN WARNING light does not illuminate when normal oxygen supply pressure drops below 200 psi. (Power applied to capsule.)	Environmental Control switch fuse in off (center) position.	Visual check.	Depress switch fuse (ON).
	Environmental Control switch fuse defective (burned).	Depress switch fuse to standby (#2) position. (Light should illuminate.)	Check current load (to oxygen pressure switch and light) is not in excess of fuse rating (5 Amps), then replace fuse.
	Lamp defective.	Place SIGNAL LIGHTS TEST switch to TEST. (Light should illuminate.)	Replace defective lamp.
	Defective oxygen pressure switch.	Continuity check between pins B and C (-4S connector) on switch.	Replace defective switch.
	Defective light circuit wiring.	Continuity check.	Repair wiring as necessary.
(21) Capsule will not pressurize, during Capsule Leakage Check and Altitude Chamber check.	Cabin Air Inlet and Outflow Valves open.	Visual check.	Manually reset (close) valves.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Defective Cabin Pressure Relief Valve solenoid or wiring to valve. (Applicable Capsule Leakage Check only.	Continuity check between pins A and B on relief valve.	Replace defective relief valve.
		Continuity check between pins 37 and 38 on capsule umbilical receptacle.	Repair defective wiring as necessary.
	Entrance hatch leaking.	Check hatch for leakage per SEDR 80.	Retorque hatch bolts.
		Check hatch seal for damage.	Replace damaged seal.
	Escape hatch leaking.	Check hatch for leakage per SEDR 80.	Adjust escape hatch release handle linkage.
		Check hatch seal for damage.	Replace damaged seal.
	Cabin Pressure Relief Valve, Cabin Air Inlet Valve or Cabin Outflow Valve defective.	Check for leakage at Snorkel Valves screens, and relief Valve port per SEDR 80.	Replace defective valve.
	Leakage at battery vent line connectors.	Perform battery vent leakage check per SEDR 80.	Tighten battery vent connectors.
	Cabin Pressure Relief Valve defective (not closing during ascent at approximately 25,000 feet altitude-applicable altitude chamber check).	Perform Capsule Leakage Check (SEDR 80) and ensure leakage does not exist. (This will isolate probable defective Cabin Pressure Relief Valve.)	Replace valve, if defective.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
(22) Suit circuit will not pressurize during ground check. (Suit circuit inlet and outlet ducts inter-connected and external oxygen pressure supplied.)	Suit circuit ground test shutoff valve open. (Pressure will relieve through Suit Pressure Regulator Relief valve.)	Visual check.	Close shutoff valve.
	Defective suit circuit relief valve. (Valve not seating.)	Check for leakage at suit circuit relief valve during Suit Circuit Leakage Check (SEDR 80).	Replace defective valve.
	Excessive leakage in circuit plumbing and connections.	Isolate source of leak (SEDR 80 - Suit Circuit Leakage Check).	Repair leaking plumbing or tighten leaking connectors.

3-3. REPLACEMENT AND ADJUSTMENT

WARNING

During system operation and capsule flight, the environmental system components will be exposed to an environment of pure oxygen. Therefore, any maintenance required on the environmental system should be performed under "oxygen clean" conditions. Tools, components, and personnel required to perform maintenance should be pre-cleaned to ensure oxygen cleanliness. Failure to comply could result in injury to personnel and damage to capsule.

3-4. CABIN AIR INLET VALVE AND SNORKEL VALVE

NOTE

The cabin air inlet valve and the snorkel valve are attached to the small pressure bulkhead with partially common hardware. The air valve can be removed without removing the snorkel valve. The air valve must be removed if the snorkel valve is to be removed.

3-5. Removal

(See Figure 3-2 for parts nomenclature.)

(a) Remove escape hatch.

(b) Remove the clamp that secures the suit circuit duct hose to the cabin air inlet valve duct and remove hose.

(c) Disconnect the cabin valve pyrotechnic electrical connector from the bracket mounted receptacle, located on the small pressure bulkhead adjacent to valve.

(d) Disconnect cabin valve electrical connector.

(e) Remove clevis pin that attaches the cabin valve manual control cable to the valve. (Cotter pin secures clevis pin.)

(f) Remove the bolts that attach the cabin valve to the small pressure bulkhead. The valve will come free.

(g) If necessary the valve can be separated from the adapter by merely removing the attaching bolts.

(h) Remove bolt that secures snorkel valve case to the bracket on capsule structure.

(i) Remove the three bolts attaching snorkel valve to small pressure bulkhead.

CAUTION

Exercise caution in handling snorkel valve to prevent damage to the wire screen.

(j) Remove the small structural support (45-32003-159) which obstructs valve. Valve will then be free.

NOTE

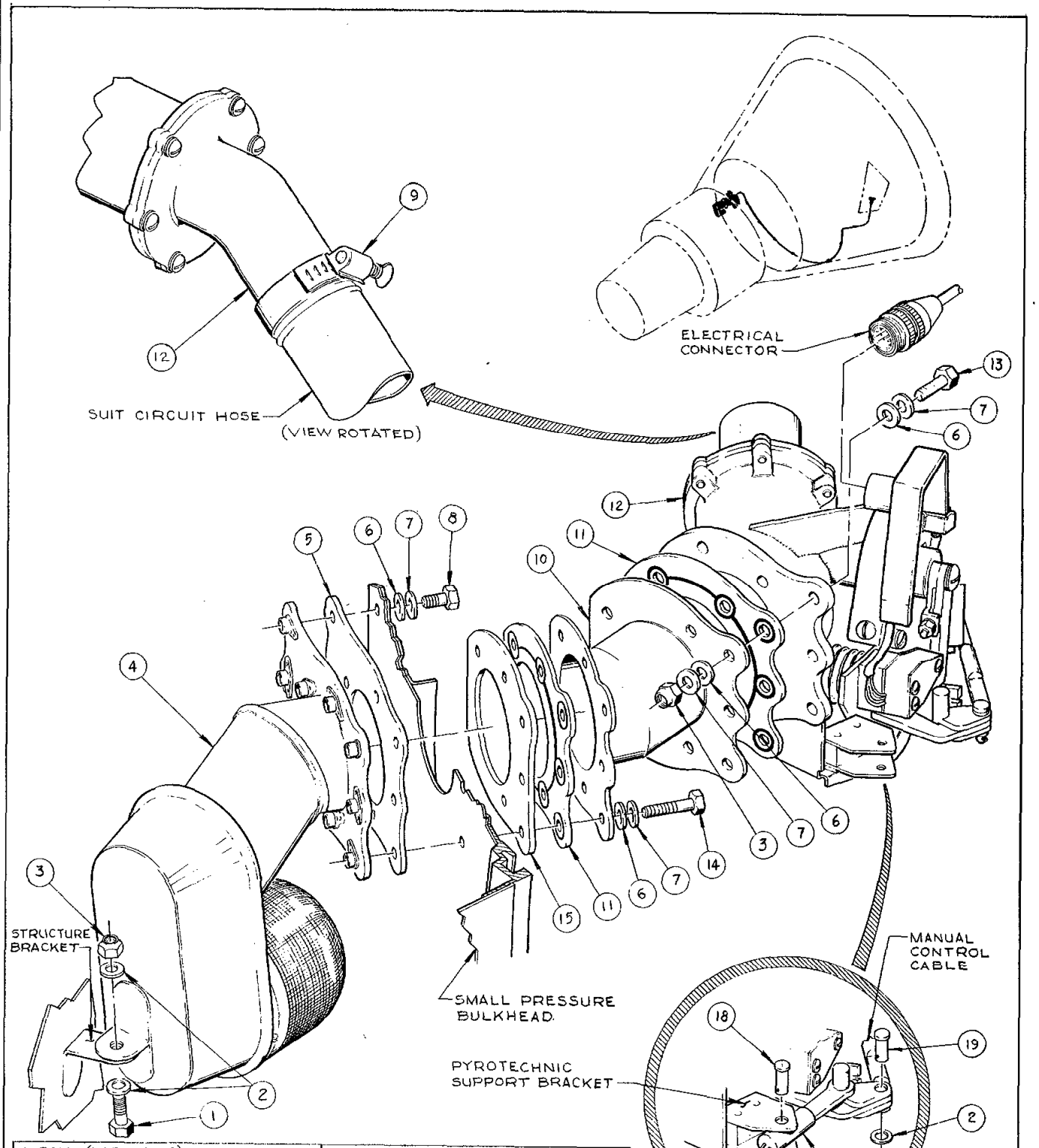
Use sealant thinner to loosen valve or snorkel spacers which stick to capsule structure.

3-6. Installation

(a) Attach adapter to cabin air inlet valve. (See Figure 3-2.)

CAUTION

Make certain that seals, seal washers, and flat



1. BOLT (NAS 673-V2)	11. SEAL (45-83016-3) (2)
2. WASHER (AN 960 D10L) (3)	12. CABIN AIR INLET VALVE (45-83700-95)
3. NUT (AN 364-1032 (8)	13. BOLT (NAS 673-V8) (7)
4. SNORKEL VALVE (45-83700-99)	14. BOLT (NAS 673-V11) (7)
5. SPACER (45-83021-5)	15. SPACER (45-83020-5)
6. SEAL 040859-10 PARKER SEALCO (24)	16. COTTER PIN (AN 380-2-1)
7. WASHER (AN 960 D10) (24)	17. PYROTECHNIC (45-79013-1)
8. BOLT (NAS 673-V4) (3)	18. CLEVIS PIN (MS 20392-1-15)
9. CLAMP (AN 737)	19. CLEVIS PIN (MS 20392-2-15)
10. ADAPTER (45-83040-1)	20. COTTER PIN (AN 380-2-2)

FIGURE 3-2 CABIN AIR INLET VALVE AND SNORKEL VALVE INSTALLATION MH45-16

washers are assembled in the sequence shown.

(b) Torque nuts 20 to 25 inch pounds.

(c) Clean mating surfaces of snorkel valve spacer and capsule structure with MMS-401 Metal Cleaning Solvent.

NOTE

The contoured side of the spacer is placed against the structure.

(d) Coat cleaned mating surfaces with XS4004 Primer followed by RTV-90 Silicone Sealer.

(e) Align the snorkel valve and spacer with the holes in the structure, and install the three (3) attaching bolts. Torque bolts 20-25 inch pounds.

NOTE

Apply Permacel P-211 Tape Silicone Glass Cloth to both sides of spacer prior to spacer installation.

(f) Clean and coat mating surfaces of air inlet valve spacer and structure with the materials previously mentioned.

(g) Align the inlet valve adapter, seal, spacer, structure and the snorkel valve and spacer, and install the seven (7) attaching bolts. Torque all bolts to 20-25 inch pounds.

NOTE

Apply Permacel P-211 Tape Silicone Glass Cloth to contoured side of spacer.

(h) Install the bolt attaching the snorkel valve to the bracket on capsule structure. Torque to 20-25 inch pounds.

(i) Install the structural support (45-32003-159) immediately adjacent to the snorkel valve.

(j) Connect capsule electrical connector to cabin valve.

(k) Connect manual control cable to cabin valve with clevis pin and secure clevis pin with cotter pin.

(l) Attach the suit circuit hose to the cabin vent duct with clamp. Firmly tighten clamp. (See Figure 3-2.)

(m) Install pyrotechnic to bracket provided on cabin air inlet valve.

NOTE

Refer to Section VIII for pyrotechnic installation.

(n) Do not connect pyrotechnic electrical connector at this time.

(o) Perform air valve functional and capsule leakage checks. (Refer to SEDR 80.)

3-7. CABIN AIR OUTFLOW VALVE AND SNORKEL VALVE

NOTE

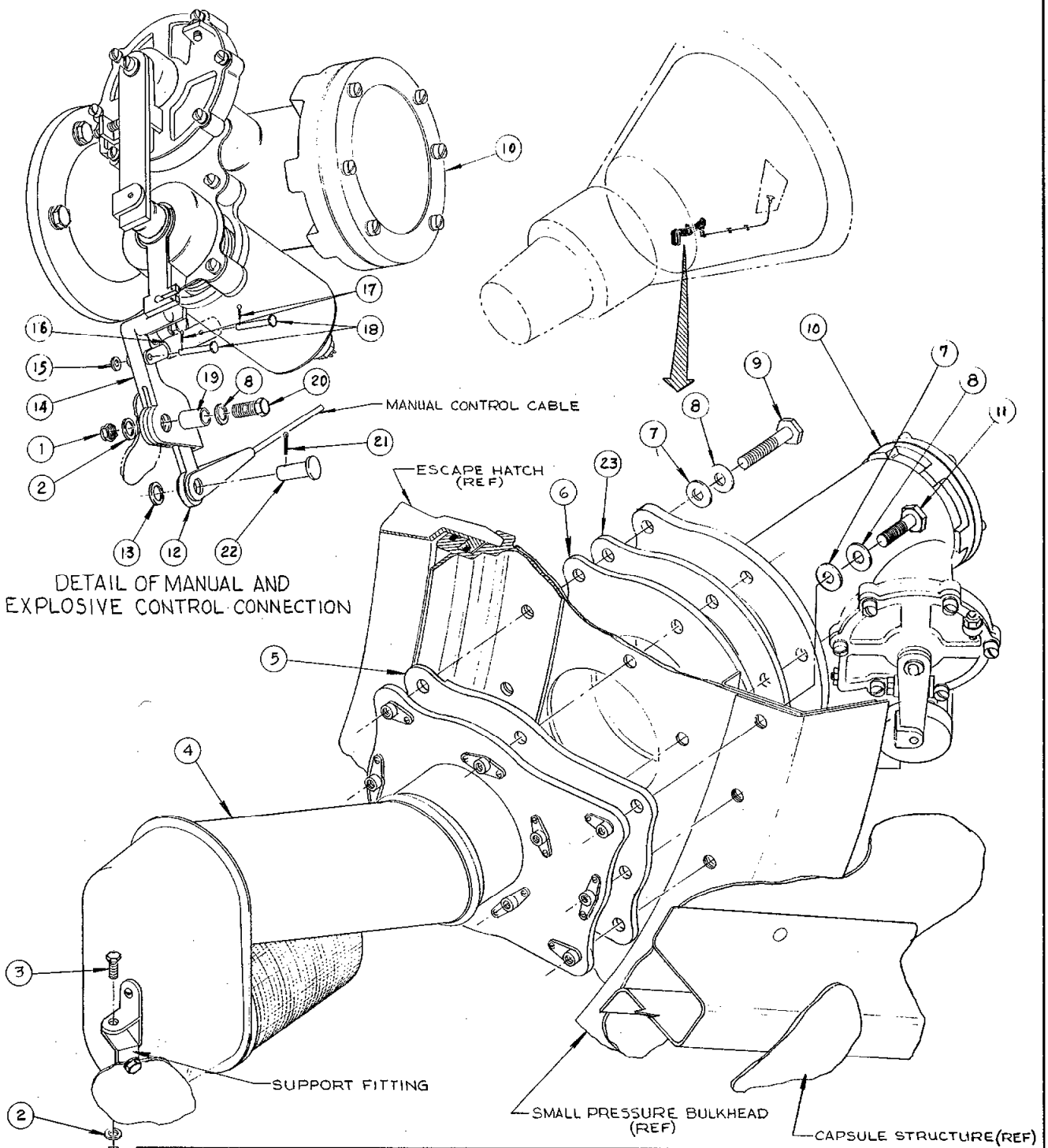
The cabin air outflow valve and snorkel valve are attached to the small pressure bulkhead with partially common hardware. The air valve can be removed without removing the snorkel valve. The air valve must be removed before removing the snorkel valve.

3-8. Removal

(See Figure 3-3 for parts nomenclature.)

(a) Remove escape hatch.

(b) Disconnect the cabin valve pyrotechnic electrical connector from



1. NUT (AN364-1032) (2)	9. BOLT (NAS673-V11) (7)	16. PYROTECHNIC (45-79013-1)
2. WASHER (AN960D10L) (2)	10. CABIN AIR OUTFLOW VALVE (45-83700-79)	17. COTTER PIN (AN380-2-1) (2)
3. BOLT (NAS673-V2	11. BOLT (NAS673-V4) (3)	18. CLEVIS PIN (MS20392-1-13) (2)
4. SNORKEL VALVE (45-83700-101)	12. LINK (45-83044-11)	19. BUSHING (4M46-3-8)
5. SPACER (45-83021-3)	13. WASHER (AN960C10)	20. BOLT (NAS673-V6)
6. SPACER (45-83020-3)	14. ARM (45-83044-9)	21. COTTER PIN (AN380-2-2)
7. SEAL WASHER (04-0859-10) (10)	15. WASHER (AN960C4)	22. CLEVIS PIN (MS20392-2-9)
8. WASHER (AN960-D10) (10)		23. SEAL (45-83016-1)

FIGURE 3-3. CABIN AIR OUTFLOW VALVE AND SNORKEL VALVE INSTALLATION

MH45-20

the bracket mounted receptacle, located on the small pressure bulkhead.

(c) Remove clevis pin that attaches cabin valve manual control cable to valve. (Cotter pin secures clevis pin.)

(d) Remove bolts that attach cabin valve to the small pressure bulkhead.

(e) Remove snorkel valve, if necessary, by removing the 3 bolts attaching valve to structure and the short structural support which obstructs the valve. Also remove bolt that secures snorkel valve case to capsule structure.

CAUTION

Exercise care in handling valve to prevent damaging wire screen.

NOTE

Use sealant thinner to loosen valve or snorkel spacers which stick to capsule structure.

3-9. Installation

(a) Clean mating surfaces of snorkel valve, spacer, and structure with MMS-401 Metal Cleaning Solvent.

NOTE

The contoured side of the spacer is placed against the structure.

(b) Coat the cleaned mating surfaces with XS4004 Primer followed by RTV-90 Silicone.

(c) Align the snorkel valve and spacer with the holes in the structure and install the three (3) attaching bolts. Torque to 20-25 inch

pounds. (See Figure 3-3.)

NOTE

Apply Permacel P-211 Tape Silicone Glass Cloth to both sides of spacer prior to spacer installation.

(d) Clean and coat the mating surfaces of outflow valve spacer and structure with the materials previously mentioned.

(e) Align the outflow valve, seal, spacer and structure and the snorkel valve and spacer, and install the seven (7) attaching bolts. Torque to 20-25 inch pounds.

NOTE

Apply Permacel P-211 Tape Silicone Glass Cloth to contoured side of spacer.

(f) Install the bolt attaching the snorkel valve case to the bracket on capsule structure. Torque to 20-25 inch pounds.

(g) Install the structural support (45-32003-159) immediately adjacent to the snorkel valve.

(h) Connect manual control cable to cabin valve with clevis pin and cotter pin. (See Figure 3-3.)

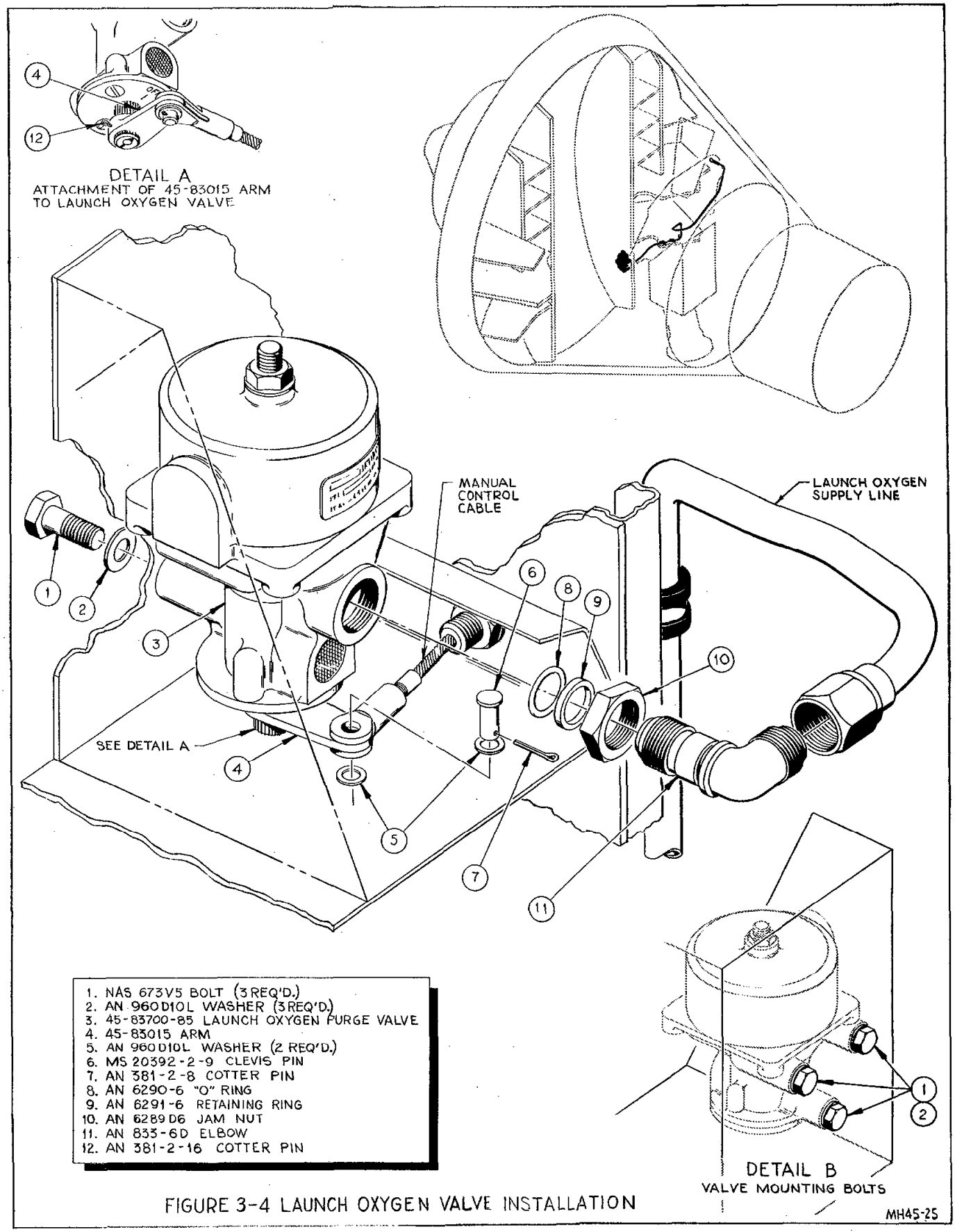
(i) Install pyrotechnic to bracket provided on valve.

NOTE

Refer to Section VIII for pyrotechnic installation.

(j) Do not connect pyrotechnic electrical connector at this time.

(k) Perform air valve functional and capsule leakage checks. (Refer to SEDR 80.)



1. NAS 673V5 BOLT (3 REQ'D.)
2. AN 960D10L WASHER (3 REQ'D.)
3. 45-83700-85 LAUNCH OXYGEN PURGE VALVE
4. 45-83015 ARM
5. AN 960D10L WASHER (2 REQ'D.)
6. MS 20392-2-9 CLEVIS PIN
7. AN 381-2-8 COTTER PIN
8. AN 6290-6 "O" RING
9. AN 6291-6 RETAINING RING
10. AN 6289D6 JAM NUT
11. AN 833-6D ELBOW
12. AN 381-2-16 COTTER PIN

FIGURE 3-4 LAUNCH OXYGEN VALVE INSTALLATION

3-10. LAUNCH OXYGEN VALVE

(See Figure 3-4 for parts nomenclature.)

3-11. Removal

(a) Remove the clevis pin and washer that secures the launch oxygen valve manual control cable to the valve shaft arm. (Cotter pin retains clevis pin.)

(b) Disconnect the launch oxygen supply line at the launch oxygen valve.

CAUTION

Ascertain all pressure has been relieved in the oxygen system.

(c) Remove the bolts that secure the valve to the capsule structural web.

(d) Remove launch oxygen valve.

(e) Remove elbow fitting from the launch oxygen valve.

(f) Remove valve shaft arm from the valve. (Cotter pin retains arm to shaft.)

3-12. Installation

(See Figure 3-4.)

(a) Install valve shaft arm on valve shaft and secure arm with a cotter pin.

(b) Install elbow fitting assembly ("O" ring, washer, nut) into launch oxygen valve, and keep jam nut turning with the fitting until "O" ring contacts the boss of the valve (noted by increase in torque).

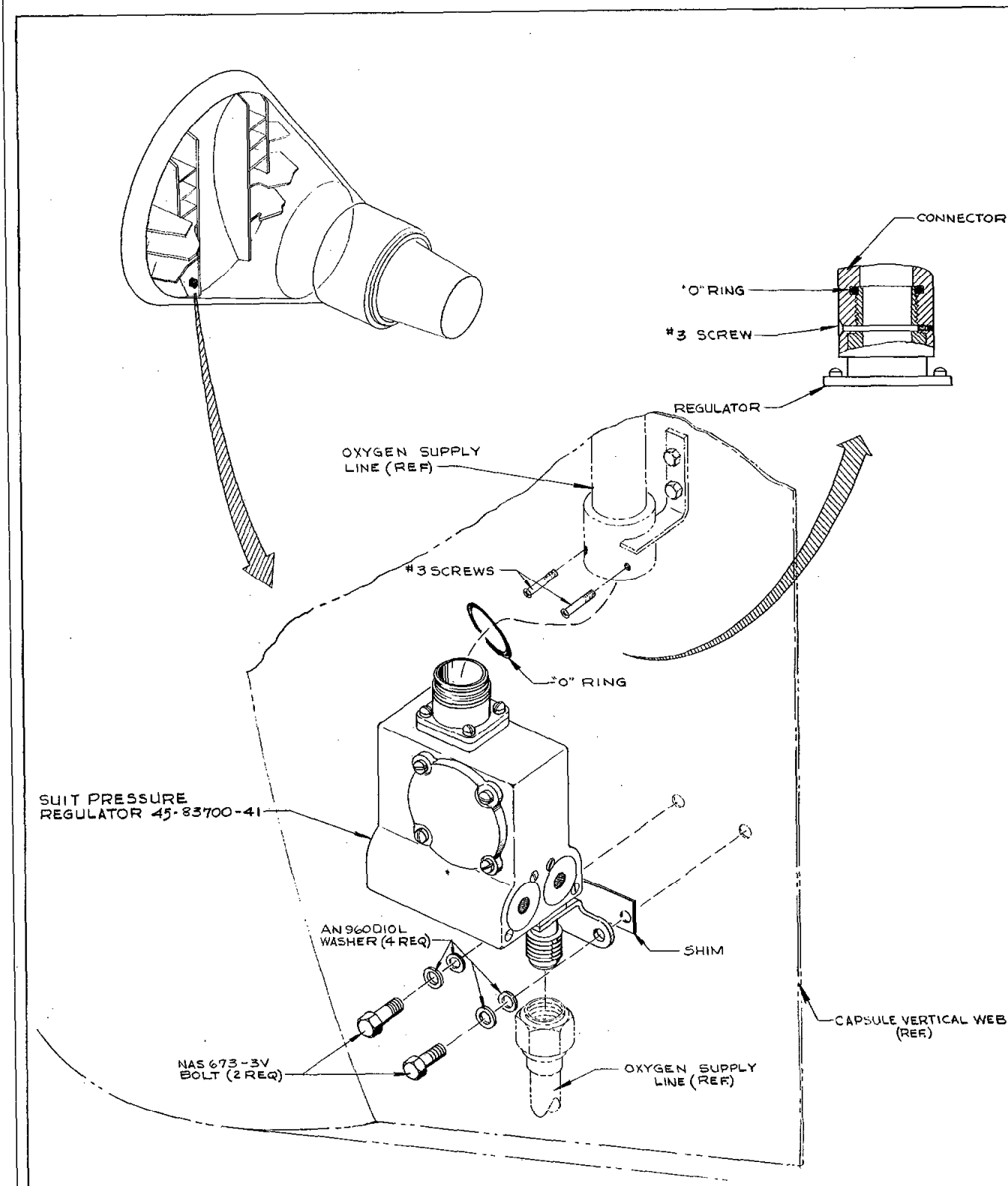


FIGURE 3-5 SUIT PRESSURE REGULATOR INSTALLATION

MH45-23

NOTE

Apply Oxygen Anti-Seize Compound (MIL-T-5542B) to elbow fitting prior to fitting installation.

(c) Put a wrench on the jam nut (to prevent nut turning) and thread fitting in 1½ turns.

(d) Place launch oxygen valve below honeycomb shelf, outboard of the suit circuit attach ducts, and adjacent to web structure.

(e) Install attach bolts and washers through web structure into the valve attach holes.

(f) Torque bolts 20 to 25 inch pounds.

(g) Attach manual release cable swaged terminal end to the launch valve shaft arm with a clevis pin, and secure clevis pin with washer and cotter pin.

(h) Align the launch oxygen supply line with the launch valve elbows fitting.

NOTE

If fitting does not align with the supply line, hold fitting jam nut in place and turn fitting in not more than one turn to align fitting with supply line.

(i) Hold elbow fitting and turn jam nut down tightly against valve boss.

(j) Connect launch oxygen supply line coupling nut to valve elbow fitting, and firmly tighten coupling nut.

NOTE

Apply oxygen system Anti-Seize and Sealing Compound

(MIL-T-5542 B) to elbow fitting

3-13. SUIT PRESSURE REGULATOR

3-14. Removal

(See Figure 3-5 for parts nomenclature.)

CAUTION

Prior to the removal of the suit pressure regulator, ensure that no pressure is present in the suit circuit.

(a) Disconnect the capsule oxygen supply line from the suit pressure regulator inlet (lower) fitting.

(b) Remove the two screws that retain the regulator outlet (upper) fitting to the suit circuit supply line coupling. (These screws are located in the suit circuit supply line coupling.)

(c) Remove the bolts that attach the pressure regulator mounting bracket to the capsule vertical web.

(d) Remove suit pressure regulator bracket assembly by moving regulator down away from supply line coupling. (This is slip-type joint.)

(e) Remove bolts that attach regulator to bracket.

3-15. Installation

(See Figure 3-5.)

(a) Ensure that suit pressure regulator fittings and capsule supply lines attach fittings are clean.

(b) Install "O" ring onto pressure regulator outlet (upper) fitting. ("O" ring is inserted in the first (top) groove on fitting.)

NOTE

Apply Oxygen System Anti-Seize Compound (MIL-T-5542B) to "O" ring.

(c) Attach regulator to bracket with bolts. Firmly tighten bolts.

(d) Engage the pressure regulator outlet (upper) fitting with the suit circuit supply line coupling fitting.

(e) Align the suit pressure regulator bracket attachment holes with the attach holes in capsule vertical web.

(f) Attach suit pressure regulator bracket assembly to capsule vertical web with bolts and washers.

NOTE

Prior to installing attach bolts, insert laminated shim between regulator attach flange and capsule vertical web. (Attach bolts, also attach shim to web.)

(g) Torque attach bolts 20 to 25 inch pounds.

(h) Connect the capsule oxygen supply line to the suit pressure regulator inlet (lower) fitting.

NOTE

Prior to fitting connection, apply oxygen system Anti-Seize and Sealing Compound (MIL-T-5542B) to fitting.

(i) Torque supply line coupling nut 40 to 65 inch pounds.

(j) Perform a capsule suit circuit leakage check. (Refer to SEDR 80.)

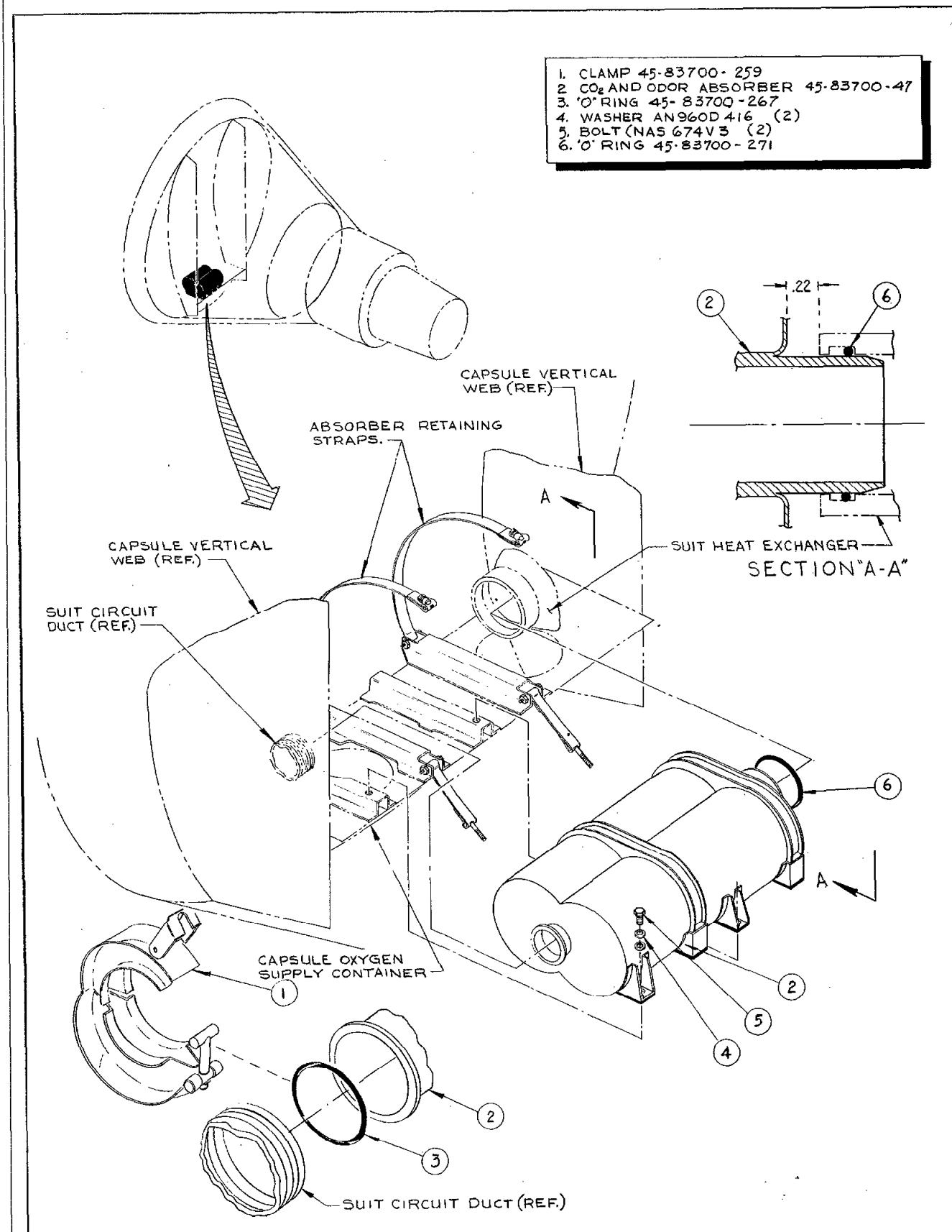


FIGURE 3-6 CO_2 AND ODOR ABSORBER INSTALLATION

MH 45-48

3-16. CO_2 AND ODOR ABSORBER

3-17. Removal

(See Figure 3-6 for parts nomenclature.)

(a) Disconnect the two retaining straps that retain the absorber.

(b) Remove Marman clamp that connects the suit circuit duct to the absorber inlet flange.

(c) Remove the absorber mounting flanges attach bolts.

(d) Remove CO_2 and Odor Absorber.

NOTE

To enable removal of the absorber, the absorber must be moved horizontally toward the suit compressor outlet duct to enable disengagement of the absorber outlet fitting from the suit heat exchanger inlet duct. (This is a slip-type joint.)

3-18. Installation

(See Figure 3-6.)

(a) Place "O" ring seal in the groove provided in the absorber outlet duct.

NOTE

Apply Oxygen System Anti-Seize Compound (MIL-T-5542B) to "O" ring.

(b) Position the absorber between the capsule vertical webs, so that the absorber inlet and outlet ducts align with the suit compressor outlet duct and suit heat exchanger inlet duct.

(c) Move absorber horizontally toward the suit heat exchanger inlet duct to engage the absorber outlet duct into the suit heat exchanger inlet duct. (This is a slip-type joint.)

NOTE

To ensure a proper sealing of the absorber-suit heat exchanger joint, check that the gap between the face of the absorber housing and the face of the suit exchanger duct does not exceed .22 inch. (See Figure 3-6.)

(d) Align the absorber mounting flanges attach holes with the holes provided in the capsule oxygen bottles container.

(e) Attach absorber to oxygen container with bolts.

(f) Torque bolts 20 to 25 inch pounds.

(g) Attach the suit circuit duct to absorber inlet duct with Marman clamp. (Install "O" ring on absorber inlet duct.)

NOTE

Apply Oxygen System Anti-Seize Compound (MIL-T-5542B) to "O" ring.

(h) Torque clamp nut 20 to 25 inch pounds.

(i) Attach the absorber retaining straps.

(j) Torque retaining straps 20 to 25 inch pounds.

(k) Record CO_2 and absorber installation in capsule log book.

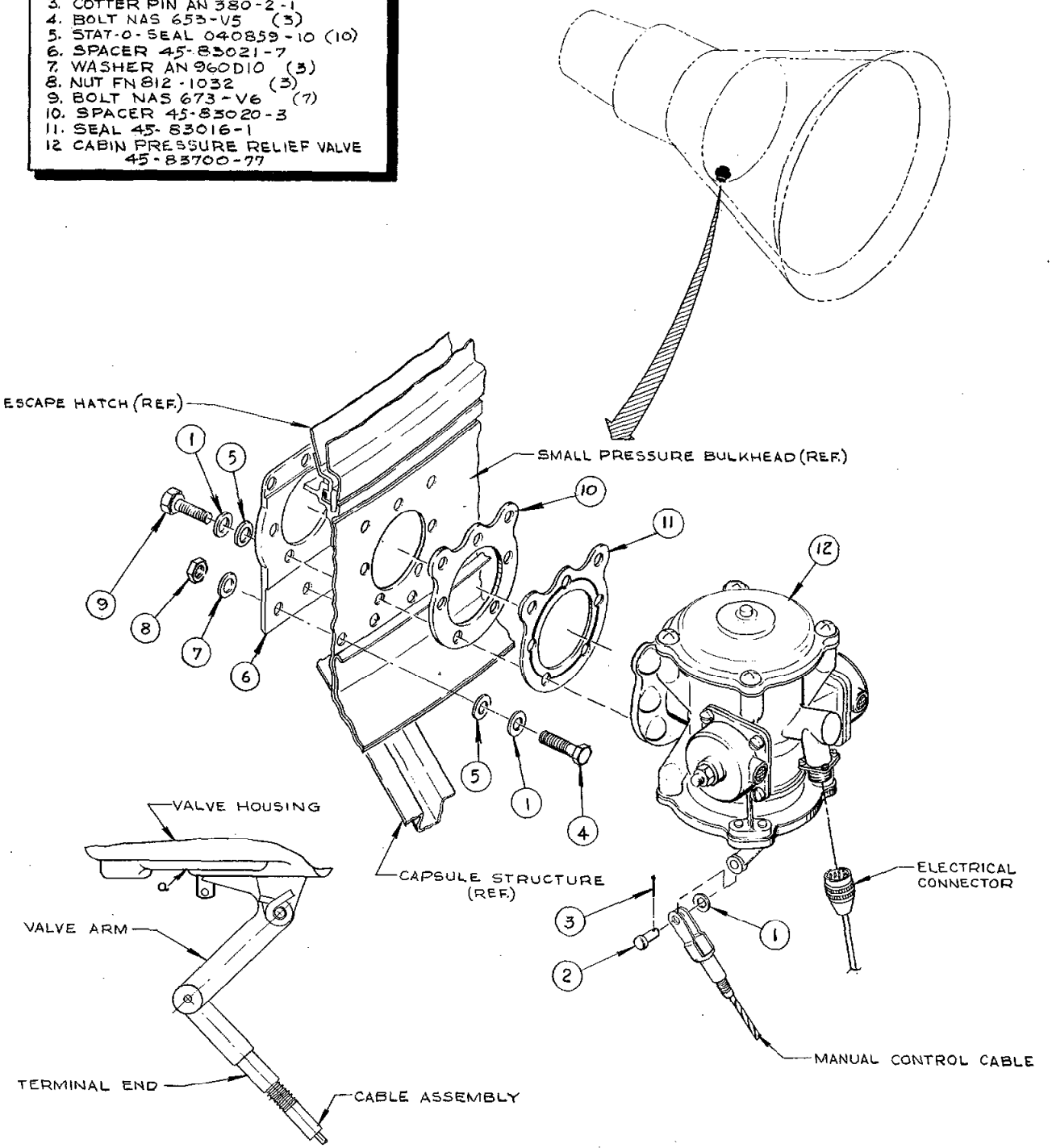
(l) Perform suit circuit leakage check. (Refer to SEDR 80.)

3-19. CABIN PRESSURE RELIEF VALVE

3-20. Removal

(See Figure 3-7 for parts nomenclature.)

1. WASHER AN960D10L (11)
2. CLEVIS PIN MS20392-2-15
3. COTTER PIN AN 380-2-1
4. BOLT NAS 653-V5 (3)
5. STAT-O-SEAL 040859-10 (10)
6. SPACER 45-83021-7
7. WASHER AN960D10 (3)
8. NUT FN812-1032 (3)
9. BOLT NAS 673-V6 (7)
10. SPACER 45-83020-3
11. SEAL 45-83016-1
12. CABIN PRESSURE RELIEF VALVE 45-83700-77



CABLE ADJUSTMENT

ADJUST CABLE ASSEMBLY TERMINAL END UNTIL VALVE ARM MECHANISM (a) BOTTOMS AGAINST VALVE HOUSING, WITH THE "DECOMPRESS" T HANDLE, LOCATED ON THE LEFT CONSOLE, PUSHED IN.

FIGURE 3-7 CABIN PRESSURE RELIEF AND DECOMPRESSION VALVE INSTALLATION MH45-19

(a) Remove escape hatch.

(b) Disconnect the electrical connector from cabin pressure relief valve.

(c) Remove clevis pin that attaches manual control cable to valve. (Cotter pin secures clevis pin.)

(d) Remove the attaching bolts.

NOTE

Bolts are accessible through the unpressurized side of small pressure bulkhead.

(e) Remove cabin pressure relief valve.

(f) Remove bolts and nuts to remove spacer attached to the unpressurized side of small pressure bulkhead.

NOTE

Cabin pressure relief valve spacers may adhere to small pressure bulkhead due to sealant used during installation. Apply thinner to remove spacers.

3-21. Installation

(See Figure 3-7.)

(a) Clean mating surfaces of spacers and structure using MMS-401 Metal Cleaning Solvent.

(b) Coat cleaned mating surfaces with XS4004 Primer and with RTV-90 Silicone Sealer.

(c) Align forward spacer (unpressurized area) with structure and install the three (3) attaching bolts. Torque to 20-25 inch pounds. (See Figure 3-7.)

NOTE

Apply Permacel P-211 Tape Silicone Glass Cloth to contoured side of spacer only prior to spacer installation. Take care to assemble bolt, washers, and Stat-O-Seals in the sequence shown.

(d) Clean and coat mating surfaces of the valve spacer and structure using the materials previously mentioned.

(e) Align valve, seal, spacer and structure and install attaching bolts. Torque bolts to 20-25 inch pounds.

NOTE

Apply Permacel P-211 Tape Silicone Glass Cloth to contoured side of space only prior to spacer installation. Take care to assemble bolt, washer and Stat-O-Seals in the sequence shown.

(f) Connect the manual control cable to the valve arm.

NOTE

Prior to cable attachment ensure that cable assembly is properly adjusted. (See Figure 3-7.)

(g) Connect electrical connector to valve receptacle.

(h) Perform capsule leakage check. (Refer to SEDR 80.)

3-22. CABIN HEAT EXCHANGER AND FAN INSTALLATION

3-23. Removal

(See Figure 3-8 for parts nomenclature.)

(a) Disconnect freon and water supply lines from heat exchanger fittings.

NOTE

Ensure all freon and water pressures are relieved prior to disconnecting lines.

(b) Remove clamp that attaches heat exchanger exhaust port with the steam exhaust duct.

(c) Disconnect electrical connector from cabin fan receptacle.

(d) Remove the web structure, mounted forward of the environmental system.

NOTE

The web structure is located below astronaut's support couch and aft of leg supports.

(e) Tilt web structure forward and remove bolts attaching cabin heat exchanger to web structure. (Support exchanger during removal.)

NOTE

During heat exchanger removal, exchanger must be moved horizontally away from steam exhaust duct to enable cabin fan to pass through capsule vertical web.

(f) Remove clamp that attaches cabin fan to heat exchanger.

3-24. Installation

(See Figure 3-8.)

(a) Install cabin fan to cabin heat exchanger with clamp. Torque clamp 20 to 25 inch pounds.

(b) Tilt top of web structure forward.

(c) Position heat exchanger so that cabin fan emerges through hole

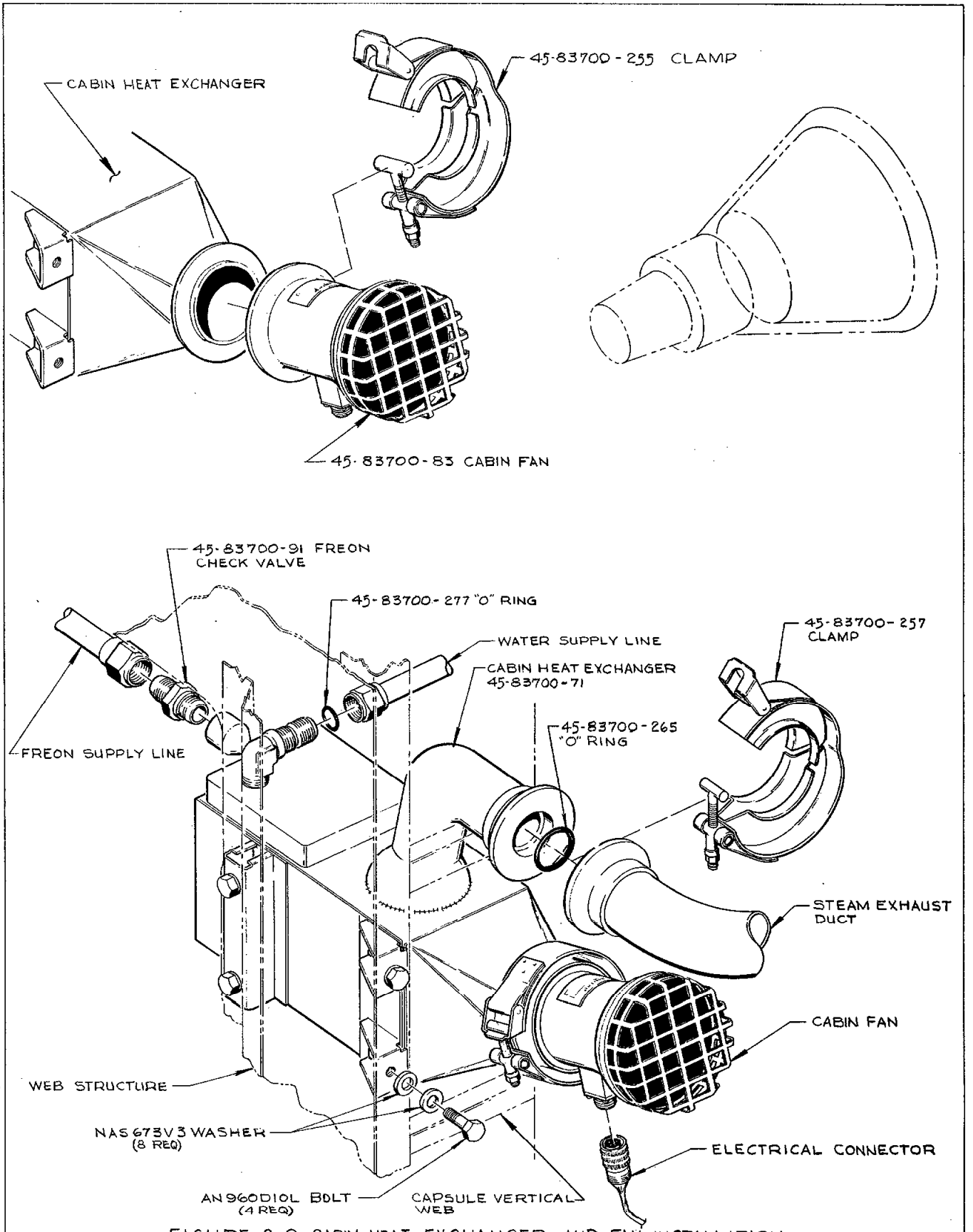


FIGURE 3-8 CABIN HEAT EXCHANGER AND FAN INSTALLATION

MH45-85

provided in capsule vertical web. (Exchanger duct also fits through vertical web.)

(d) Attach heat exchanger to web structure.

(e) Torque bolts 20 to 25 inch pounds.

(f) Place web structure into position against capsule vertical web structure and attach web to vertical webs with bolts.

(g) Torque bolts 20 to 25 inch pounds.

(h) Attach water supply line to inlet fitting.

NOTE

Use "O" ring on this joint connection.

(i) Install freon check valve into inlet fitting. (Do not torque check valve.)

(j) Connect freon supply line to freon check valve.

NOTE

Apply oxygen systems Anti-Seize and Sealing Compound (MIL-T-5542B) to water supply and freon check valve inlet fittings prior to connection of supply lines.

(k) Connect electrical connection to cabin fan.

(l) Connect steam exhaust duct to cabin heat exchanger duct with clamp. (See Figure 3-8.)

NOTE

Insert "O" ring between flanges of steam exhaust duct and heat exchanger duct.

(m) Torque clamp nut 20 to 25 inch pounds.

(n) Perform cabin fan operational check. (Refer SEDR 80.)

3-24. SUIT COMPRESSOR

NOTE

The normal (#1) and standby (#2) suit compressors are interchangeable and their installation in the suit circuit is the same, except that the #1 suit compressor is interconnected to the suit compressors differential pressure switch with a pressure line. Procedures contained herein will refer to #1 suit compressor.

3-25. Removal

(See Figure 3-9 for parts nomenclature.)

(a) Disconnect electrical connector from the suit compressor receptacle.

(b) Disconnect pressure lines (2) from the reducer on the suit compressor and the elbow fittings on compressor inlet duct.

NOTE

To enable removal of suit compressor, the pressure lines to the differential pressure switch, may have to be removed.

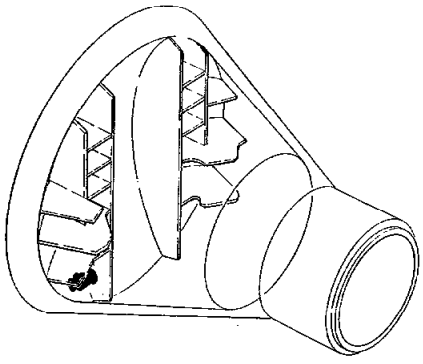
(c) Remove the clamps (2) that secure the compressor to the suit circuit inlet and outlet ducts.

(d) Remove suit compressor from suit circuit.

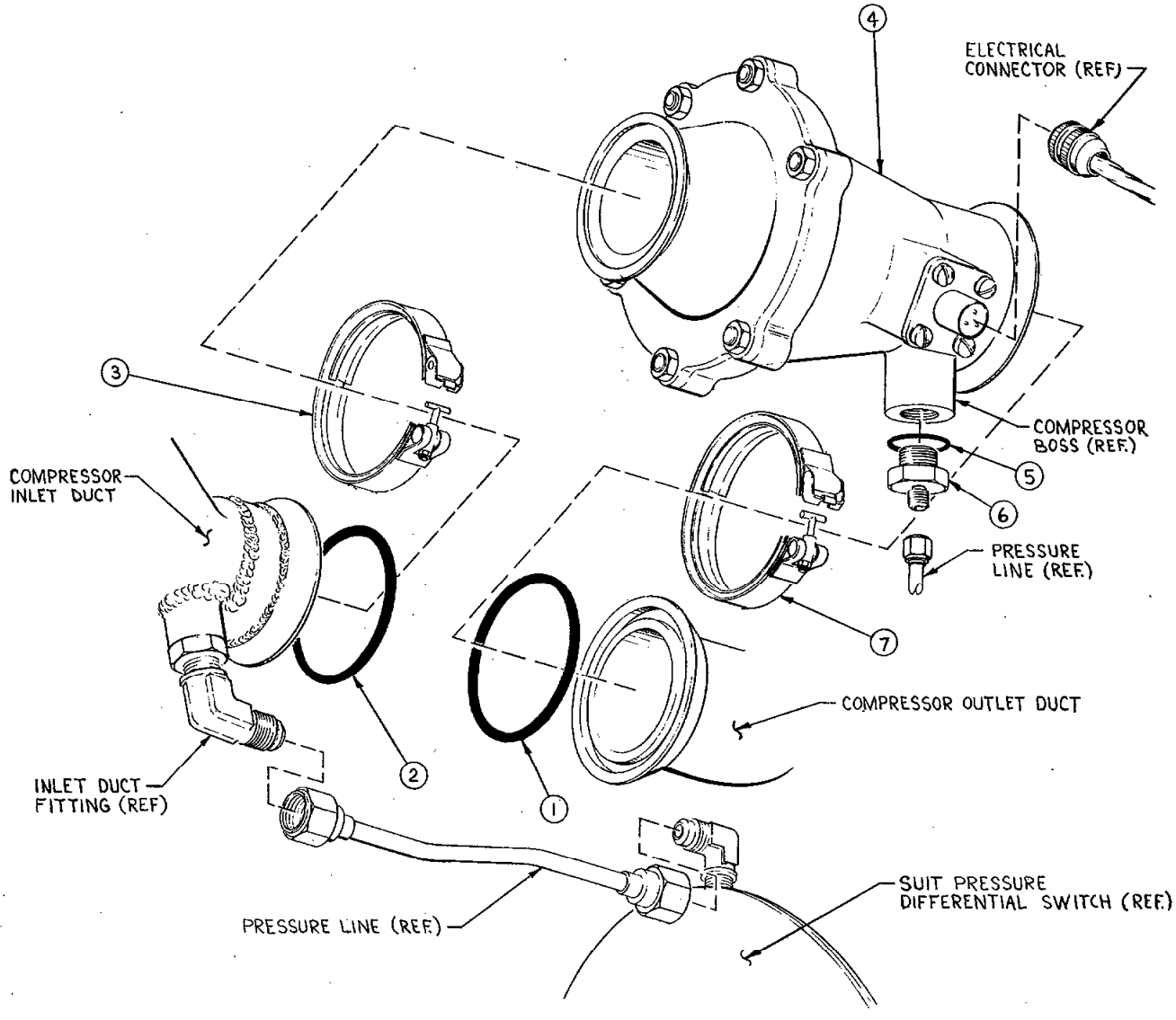
(e) Remove reducer fitting from suit compressor.

3-26. Installation

(a) Install "O" ring and reducer fitting to suit compressor. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to "O" ring and



ITEM	NOMENCLATURE
1	45-83700-267 "O" RING
2	45-83700-265 "O" RING
3	45-83700-257 CLAMP
4	45-83700-49 SUIT COMPRESSOR
5	45-83700-279 "O" RING
6	45-83700-287 REDUCER
7	45-83700-261 CLAMP



NOTE:
ILLUSTRATION DEPICTS INSTALLATION OF #1 SUIT COMPRESSOR

FIGURE 3-9 SUIT COMPRESSOR INSTALLATION

MH45-32

fitting.) See Figure 3-9.

NOTE

Reducer should be turned in on the suit compressor bosses until the reducer contacts the compressor boss.

(b) Position suit compressor between inlet and outlet ducts.

NOTE

Insert "O" rings between compressor inlet duct and suit compressor, and between suit compressor and compressor outlet duct. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to "O" rings.) See Figure 3-9.

(c) Secure compressor to inlet and outlet ducts with clamps and torque clamps 20 to 25 inch pounds.

(d) Connect pressure lines, from differential pressure switch, to the elbow fitting on the inlet duct and the reducer on the suit compressor. (See Figure 3-9.)

NOTE

Apply Oxygen System Anti-Seize Compound (MIL-T-5542B) to the elbow and reducer fittings prior to pressure lines connections.

(e) Torque pressure line fittings 20 to 25 inch pounds.

(f) Connect electrical connector to suit compressor receptacle. (See Figure 3-9.)

(g) Perform a suit circuit leakage check and suit compressor operational check. (Refer to SEDR 80.)

3-27. EMERGENCY O_2 RATE VALVE

3-28. Removal

(See Figure 3-10 for parts nomenclature.)

(a) Disconnect electrical connector from the oxygen rate valve.

(b) Remove clevis pins (2) that attaches the two control cables to rate valve shaft arm.

NOTE

The emergency oxygen rate valve and the Emergency and Purge Oxygen Pressure Regulator Assembly (45-83700-121) are flow calibrated together. Therefore, replacement of the emergency O_2 rate valve requires a flow calibration with the Emergency and Purge Oxygen Pressure Regulator. (Refer to SEDR 79 for flow calibration procedure.)

(c) Disconnect the two lines from the O_2 rate valve.

(d) Remove the bolts that secure the O_2 rate valve mounting bracket to the capsule vertical web, and remove O_2 rate valve - bracket assembly.

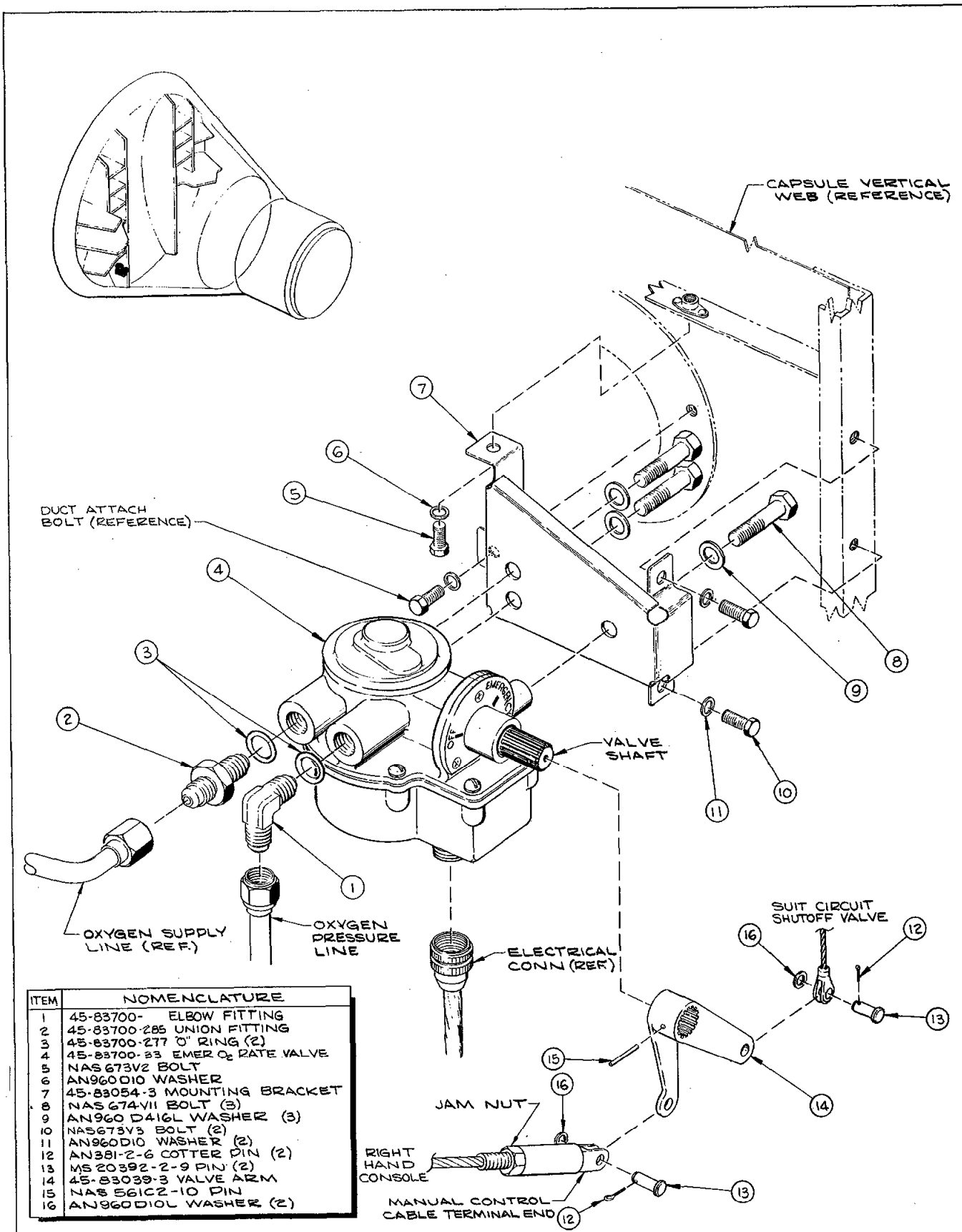
(e) Disassemble O_2 rate valve from bracket by removing attach bolts.

(f) Remove cotter pin that secures O_2 rate valve shaft arm to valve body, and remove shaft arm.

(g) Remove fittings from the valve body.

3-29. Installation

(a) Install "O" rings and union fitting into valve boss. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to "O" ring and fitting.) See Figure 3-10.



ITEM	NOMENCLATURE
1	45-83700- ELBOW FITTING
2	45-83700-285 UNION FITTING
3	45-83700-277 "O" RING (2)
4	45-83700-33 EMER O_2 RATE VALVE
5	NAS 673V2 BOLT
6	AN960D10 WASHER
7	45-83054-3 MOUNTING BRACKET
8	NAS 674V11 BOLT (3)
9	AN960 D416L WASHER (3)
10	NAS673V3 BOLT (2)
11	AN960D10 WASHER (2)
12	AN381-2-6 COTTER PIN (2)
13	MS 20392-2-9 PIN (2)
14	45-83039-3 VALVE ARM
15	NAS 561C2-10 PIN
16	AN960D10L WASHER (2)

FIGURE 3-10 EMERGENCY O_2 RATE VALVE INSTALLATION MH45-22

NOTE

Union fitting should be turned into valve boss until the union fitting flange contacts valve boss.

(b) Install "O" ring and elbow fitting into valve boss. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to "O" ring and fitting.) See Figure 3-10.

NOTE

Thread elbow fitting into valve (jam nut turning with fitting) until "O" ring contacts the valve boss (indicated by an increase in torque). Put a wrench on jam nut (to prevent nut turning) and thread fitting in $1\frac{1}{2}$ more turns.

(c) Install valve shaft arm onto valve shaft and secure with clevis pin, washer, and cotter pin. (See Figure 3-10.)

(d) Attach valve to mounting bracket with bolts and torque bolts 20 to 25 inch pounds. (See Figure 3-10.)

(e) Attach valve mounting bracket to capsule vertical web with bolts. Torque bolts 20-25 inch pounds.

(f) Apply Oxygen System Anti-Seize Compound (MIL-T-5542B) to union and elbow fittings.

(g) Connect the two oxygen plumbing lines to the O_2 rate valve union and elbow fittings.

NOTE

If the plumbing line does not align with the elbow fitting, hold the elbow fitting jam nut

with a wrench, and turn fitting in not more than 1 turn to align fitting with plumbing line.

(h) Hold elbow fitting and tighten jam nut firmly against valve boss.

(i) Torque plumbing line fittings 40 to 65 inch pounds.

(j) Connect electrical connector to valve receptacle.

3-30. Adjustment

(a) Connect the rate valve control cables to valve shaft arm and secure with clevis pin and cotter pin. (See Figure 3-10.)

NOTE

Prior to connecting cable, from right console to the O_2 rate valve shaft arm, place EMER O_2 control handle to NORMAL position so that the control handle body is parallel to the right console forward panel within $\pm \frac{1}{2}^{o}$. Also ensure that O_2 rate valve is in the closed position (noted by alignment of arrow on end of valve shaft to CLOSED on valve body plate).

(b) If the control cable (from right console) terminal end does not align with O_2 rate valve shaft arm, back off terminal end jam nut and adjust (thread) terminal end. Firmly tighten jam nut. (See Figure 3-10.)

(c) Check the control cable from Suit Circuit Shutoff Valve (45-83700-45) for proper adjustment. (Refer to Suit Circuit Shutoff Valve.)

(d) Perform a suit circuit leakage check and O_2 rate valve operational check. (Refer to SEDR 80.)

3-31. SUIT CIRCUIT SHUTOFF VALVE

3-32. Removal

(See Figure 3-11 for parts nomenclature.)

(a) Place EMERG O_2 control handle (right console) to the NORMAL position.

(b) Disconnect electrical connector from the shutoff valve receptacle.

(c) Remove control cable from the shutoff valve through the slot provided in the shutoff valve quadrant bearing.

(d) Remove the bolts that secure the control cable guide bracket to the shutoff valve.

(e) Remove the 2 clamps that secure the shutoff valve to the suit circuit ducts, and remove shutoff valve.

3-33. Installation

(a) Place suit circuit shutoff valve between suit circuit ducts and secure valve to ducts with clamps. (Install "O" rings between ducts and shutoff valve.) See Figure 3-11.

NOTE

Coat "O" rings with Oxygen System Anti-Seize Compound MIL-T-5542B. Shutoff valve may have to be rotated to enable clamps installation.

(b) Torque clamps 20 to 25 inch pounds.

(c) Install control cable, from oxygen rate valve, through slot provided in shutoff valve quadrant bearing. (See Figure 3-11.)

NOTE

Prior to control cable attachment to shutoff valve, place shutoff valve control arm to the open (latched) position. This enables ease of

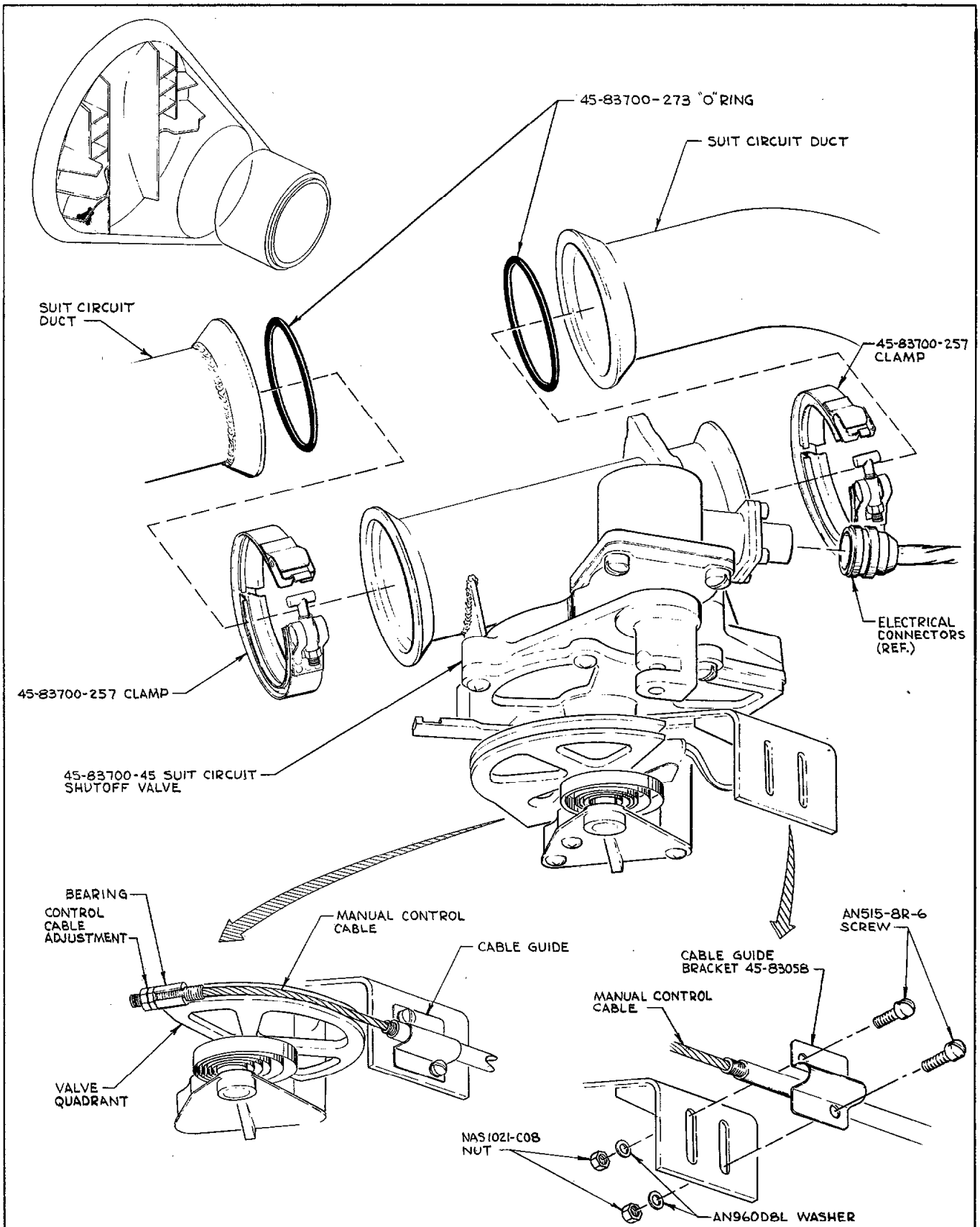


FIGURE 3-11 SUIT CIRCUIT SHUTOFF VALVE INSTALLATION

MH45-26

cable installation into shutoff valve quadrant bearing.

(d) Check EMERG O_2 control handle is in NORMAL position. (With control handle in this position, emergency oxygen rate valve should be closed.)

(e) Adjust control cable terminal end fitting so that shutoff valve quadrant bearing is firm against stop. (Backoff terminal end jam nut, adjust the cable adjustment nut, then tighten jam nut.)

(f) Connect electrical connector to shutoff valve receptacle.

(g) Perform a suit circuit leakage check and a suit circuit shutoff valve operation check. (Refer to SEDR 80.)

3-34. NORMAL OXYGEN PRESSURE REGULATOR ASSEMBLY

NOTE

The Normal Oxygen Pressure Regulator Assembly (45-83700-119) and the Emergency and Purge Oxygen Pressure Regulator Assembly (45-83700-121) are basically the same, and their installation to capsule are the same. The emergency oxygen rate valve and the Emergency and Purge Oxygen Pressure Regulator Assembly (45-83700-121) are flow calibrated together. Therefore, replacement of the emergency O_2 rate valve requires a flow calibration with the Emergency and Purge Oxygen Pressure Regulator. (Refer to SEDR 79 for flow calibration procedure.) Procedures contained herein will refer to the Normal Oxygen Pressure

INSTALLATION

1. ALIGN THE OXYGEN PRESSURE REGULATOR ASSEMBLY MOUNTING HOLES(4) WITH THE MOUNTING BRACKET ATTACHED TO CAPSULE OXYGEN BOTTLES CONTAINER.
2. INSTALL PRESSURE REGULATOR ASSEMBLY ATTACH BOLTS AND NUTS.
3. TORQUE BOLTS 20 TO 25 INCH POUNDS.

—NOTE—
APPLY OXYGEN SYSTEM ANTI-SEIZE COMPOUND (MIL-T-5542B) TO PRESSURE REGULATOR FITTINGS. (3)

4. CONNECT THE PRESSURE REGULATOR OUTLET SUPPLY LINE TO THE PRESSURE REGULATOR.
5. TORQUE SUPPLY LINE FITTING 40 TO 65 INCH POUNDS.
6. CONNECT PRESSURE WARNING SWITCH SUPPLY LINE FITTING TO PRESSURE REGULATOR ASSEMBLY OUTLET FITTING.
7. TORQUE PRESSURE WARNING SWITCH SUPPLY LINE FITTING 45 TO 55 INCH POUNDS.
8. CLAMP FREON SUPPLY LINE TO PRESSURE REGULATOR ASSEMBLY BRACKET WITH BOLTS AND NUTS.
9. CONNECT PRESSURE LINE FITTINGS TO PRESSURE REGULATOR ASSEMBLY INLET ELBOW FITTING AND TO THE NORMAL OXYGEN BOTTLE ELBOW FITTING DOWNSTREAM OF SHUTOFF VALVE (APPLY OXYGEN SYSTEM ANTI-SEIZE COMPOUND (MIL-T-5542B) TO NORMAL OXYGEN BOTTLE SUPPLY LINE ELBOW FITTING.)
10. TORQUE PRESSURE LINE FITTINGS 135 TO 150 INCH POUNDS.
11. CHECK FOR LINE CONNECTION LEAKAGE BY OPENING NORMAL OXYGEN BOTTLE SHUTOFF VALVE AND APPLYING SHERWOOD LEAK DETECTION SOLUTION AROUND ALL FITTINGS CONNECTED DURING PRESSURE REGULATOR ASSEMBLY INSTALLATION.

— NOTE —
NORMAL OXYGEN BOTTLE MUST BE PARTIALLY SERVICED (AT LEAST 300 PSIG) TO ENABLE LEAKAGE CHECK. (REFER TO SEDR 82)

12. CLOSE NORMAL OXYGEN BOTTLE SHUTOFF VALVE.

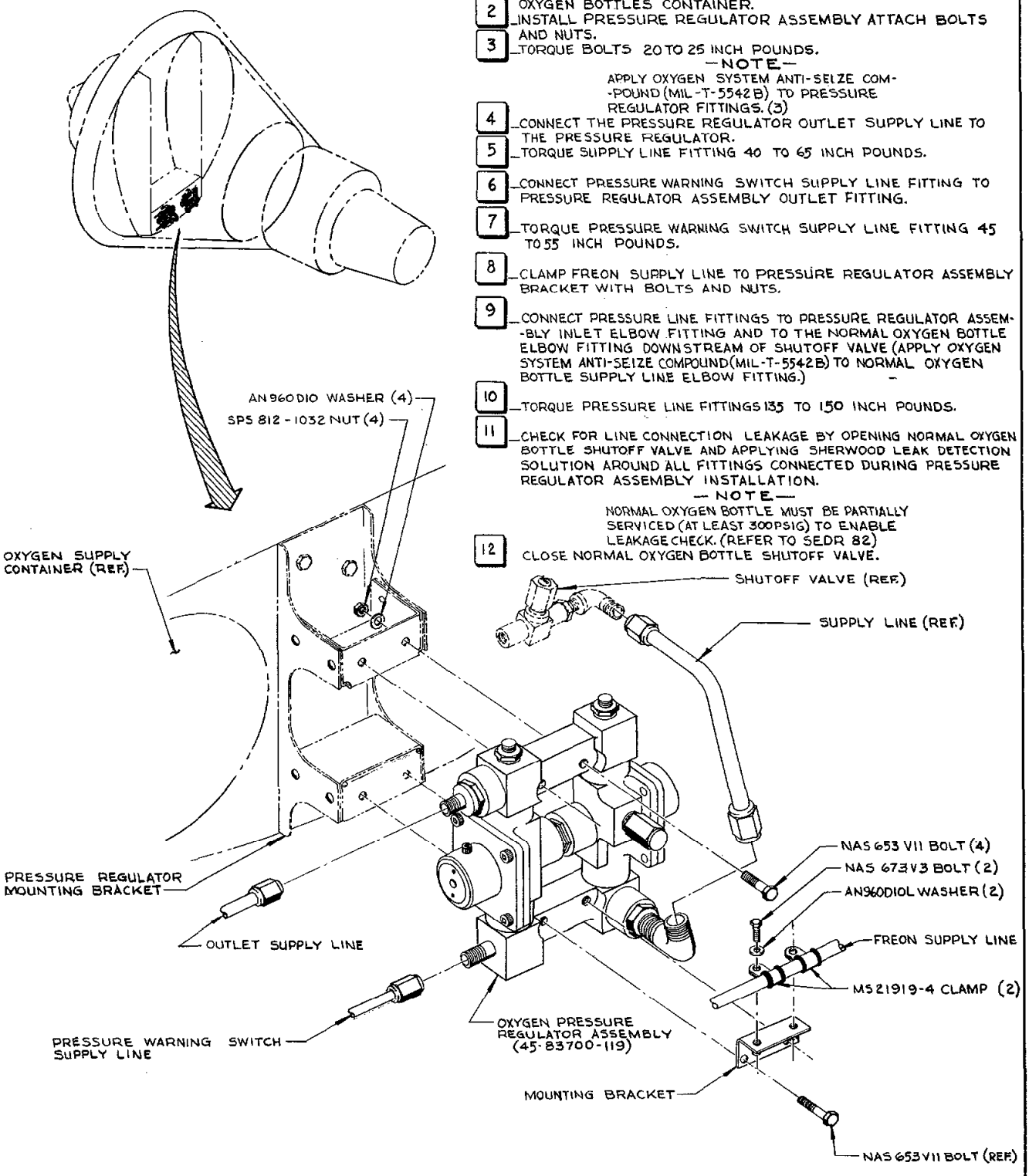


FIGURE 3-12 OXYGEN PRESSURE REDUCER ASSEMBLY INSTALLATION

MH45-89

Regulator Assembly.

3-35. Removal

(See Figure 3-12 for parts nomenclature.)

(a) Close the normal and emergency oxygen bottles shutoff valves.

(b) Bleed off pressures in the suit circuit by placing the EMERG. O_2 control handle (right console) to the EMERG. position.

NOTE

Suit circuit inlet (to pressure suit) duct should be uncovered to enable pressure bleed off.

(c) Reposition EMERG O_2 control handle to NORMAL.

(d) Cover suit circuit inlet duct.

(e) Disconnect pressure line fittings at normal pressure regulator assembly inlet elbow fitting and at the normal oxygen bottle outlet elbow fitting (downstream of shutoff valve) and remove pressure lines.

(f) Disconnect the pressure regulator assembly outlet supply line fitting.

(g) Disconnect the supply line (to pressure warning switch) fitting from the pressure regulator assembly.

(h) Remove the screws (2) that attach the freon supply line clamps to the pressure regulator assembly bracket.

(i) Remove bolts and nuts (4 each) that attach the pressure regulator assembly to the bracket mounted on capsule oxygen bottles container, and remove pressure regulator assembly.

3-36. Installation

(See Figure 3-12 for oxygen pressure regulator assembly installation.)

3-37. CABIN PRESSURE CONTROL VALVE

(See Figure 3-13 for parts nomenclature.)

(a) Disconnect the manual control cable from the cabin pressure control valve by removing clevis pin that attaches control cable to valves.

(b) Disconnect oxygen supply line (to cabin valve) fitting from cabin valve tee fitting.

(c) Disconnect pressure line fitting at cabin valve tee fitting.

(d) Remove cabin pressure control valve and bracket assembly by removing the three bolts that attach bracket to condensate tank.

(e) Remove the fitting from cabin pressure control valve.

(f) Remove bolts that secure cabin pressure control valve to mounting bracket.

(g) Remove valve shaft arm from valve shaft.

3-39. Installation

(a) Install "O" ring and tee fitting into cabin pressure control valve boss. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to "O" ring and tee fitting threads. (See Figure 3-13.)

NOTE

Thread elbow fitting into valve (jam nut turning with fitting), until "O" ring contacts valve boss (noted by increase in torque). Put wrench on jam nut (to prevent jam nut turning) and thread elbow fitting in 1½ more turns.

(b) Attach cabin valve to mounting bracket with bolts and torque bolts 20 to 25 inch pounds. (See Figure 3-13.)

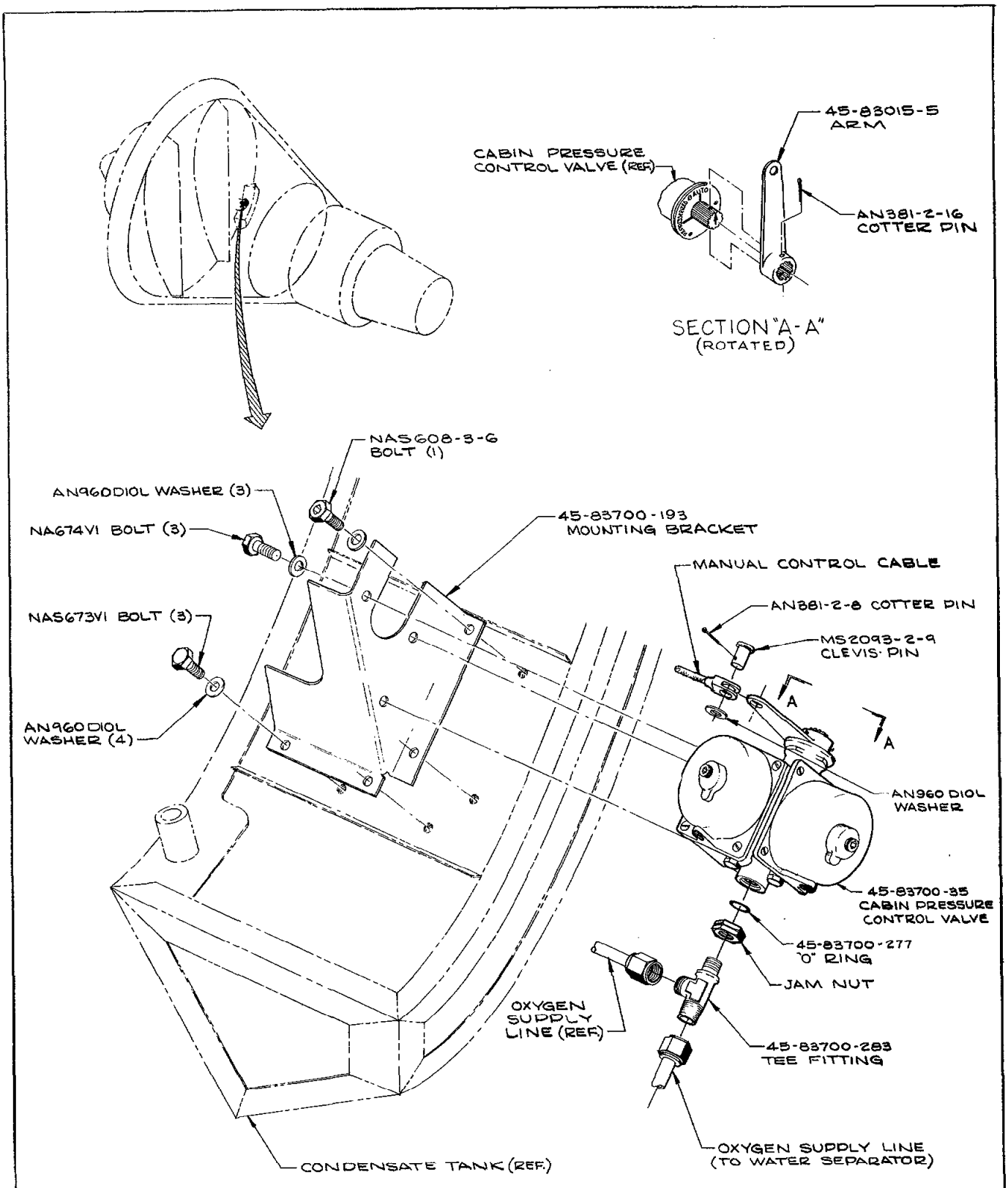


FIGURE 3-13 CABIN PRESSURE CONTROL VALVE INSTALLATION

MH45-18

(c) Attach cabin valve control arm to cabin valve shaft and secure with cotter pin. (See Figure 3-13.)

(d) Attach cabin valve - mounting bracket assembly to condensate tank with bolts. (See Figure 3-13.)

NOTE

One of the bolts used to attach valve to condensate tank is an allen head bolt. This enables installation of bolt. (See Figure 3-13.)

(e) Connect suit circuit pressure lines to cabin valve tee fittings and torque line fittings 45 to 55 inch pounds. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to tee fitting threads.

NOTE

In the event tee fitting does not align with pressure lines, place a wrench on jam nut (to prevent its turning) and turn fitting into valve boss not more than 1 turn to align tee fitting with pressure lines.

(f) Hold fitting and tighten jam nut firmly against valve boss.

(g) Place valve shaft control arm to closed.

(h) Place capsule RE-PRESSURIZE "T" handle to the in position.

(i) If cabin pressure control valve manual control cabin terminal end does not align with cabin valve control arm, adjust cabin terminal end.

(j) Secure cable to cabin valve shaft arm with clevis pin.

(k) Open emergency oxygen bottle shutoff valve and check for leakage by applying Sherwood Leak Detection Solution around fittings con-

nected during cabin valve installation.

NOTE

The emergency rate valve, suit circuit ground test shutoff valve must be closed and emergency oxygen bottle partially serviced to enable leakage check. (Refer to SEDR 82 for servicing procedures.)

(l) Open ground test shutoff valve and emergency oxygen rate valve.

(m) Close emergency oxygen bottle shutoff valve.

3-40. WATER SEPARATOR

3-41. Removal

(See Figure 3-14 for parts nomenclature.)

(a) Disconnect water separator drain line from the top of the water separator.

NOTE

Suit circuit ducting (outboard of capsule vertical web and forward of water separator) and cabin fan must be removed to enable access to water separator. Also remove bracket that supports lower end of condensate tank to capsule vertical web.

(b) Remove oxygen supply line that is connected to the water separator inlet fitting and the cabin pressure control valve tee fitting.

(c) Disconnect oxygen supply line (interconnected with water separator solenoid valve) from the water separator inlet fitting (located at base of separator.)

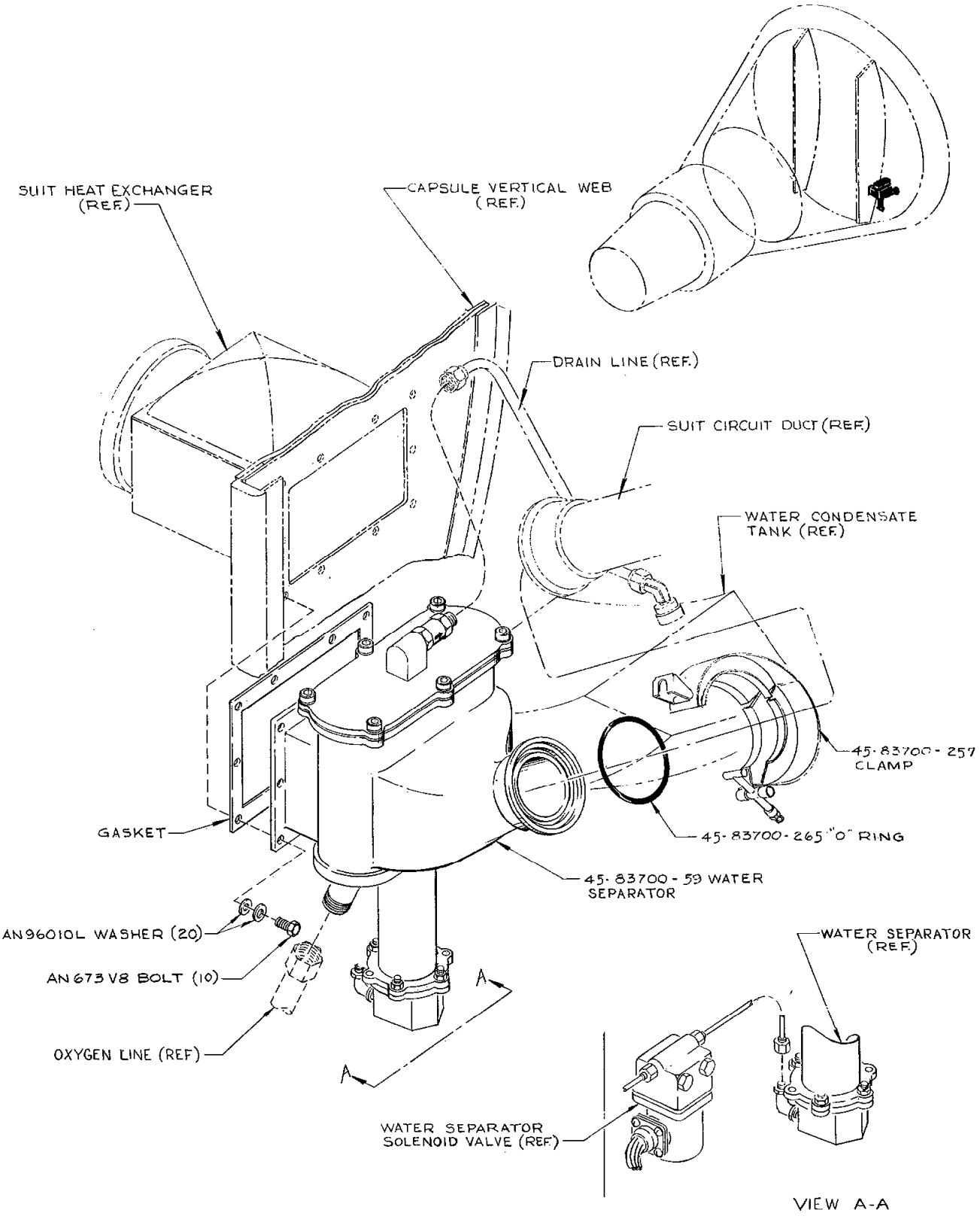


FIGURE 3-14 WATER SEPARATOR

MH45-34

(d) Remove drain line connected to condensate tank and condensate tank removal valve (attached to capsule vertical web outboard of launch oxygen purge valve).

(e) Remove clamp that attaches the water separator outlet to suit circuit duct.

(f) Remove bolts that attach the water separator inlet flange to capsule vertical web.

NOTE

Bolts that attach water separator to capsule web are anchored in the outlet flange of suit circuit heat exchanger. Therefore, support suit circuit heat exchanger during water separator removal.

3-42. Installation

(a) Attach water separator inlet flange to capsule vertical web with bolts. (See Figure 3-14.)

NOTE

Water separator attach bolts must be inserted through capsule vertical web and threaded into suit circuit heat exchanger outlet flange. Therefore heat exchanger must be aligned with water separator attach holes, during water separator installation.

(b) Connect water separator outlet duct to suit circuit duct with "O" ring and clamp. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to separator fitting.) See Figure 3-14.

(c) Torque clamp 20 to 25 inch pounds.

(d) Connect water separator drain line to fitting located at the top of separator. (Apply Oxygen System Anti-Seize Compound MIL-T-5542B to separator fitting.) See Figure 3-14.

(e) Torque drain line fitting 45 to 55 inch pounds.

(f) Connect oxygen supply line fittings to cabin pressure control valves tee fitting and water separator inlet fitting. Apply Oxygen System Anti-Seize Compound MIL-T-5542B to supply line fittings. See Figure 3-14.

(g) Torque fittings 45 to 55 inch pounds.

(h) Connect oxygen supply line (from water separator solenoid valve) fitting to elbow fitting located at the base of water separator. Apply Oxygen System Anti-Seize Compound MIL-T-5542B to elbow fitting. (See Figure 3-14.)

NOTE

If the elbow fitting does not align with supply line, place wrench on elbow fitting jam nut (to prevent jamnut turning) and thread elbow fitting with supply line. Hold fitting and firmly tighten jam nut.

(i) Torque supply line fitting 20 to 30 inch pounds.

(j) Install hardware that was removed to enable accessibility for water separator replacement.

(k) Perform a suit circuit leakage check and water separator operational check. (Refer to SEDR 80.)

3-43. SERVICING

3-44. WATER COOLING TANK

(See Figure 3-15 for water cooling tank servicing.)

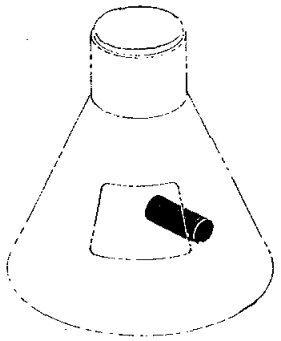
3-45. OXYGEN SUPPLY

3-46. Servicing Set-Up

(a) Obtain the following:

(1) High Pressure Oxygen Servicing Unit (MDE4590001-1)

(2) O_2 Purge Equipment (FSN 8120-285-4763)

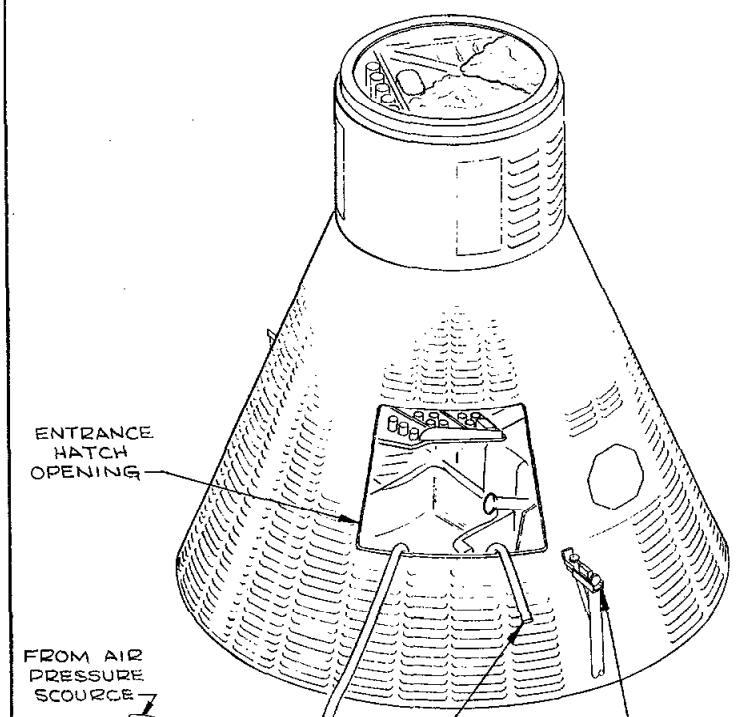


1. CONNECT WATER COOLING TANK SERVICING UNIT SUPPLY LINE TO CAPSULE WATER TANK "FILL" PORT. (SEE DETAIL A)
2. CONNECT SERVICING UNIT VENT LINE TO CAPSULE WATER TANK "VENT" PORT (SEE DETAIL A)
3. CONNECT AIR PRESSURE SOURCE TO SERVICING UNIT INLET FITTING. (SEE DETAIL B)
4. APPLY AIR PRESSURE TO SERVICING UNIT PRESSURE REGULATOR UNTIL 5 PSI PRESSURE FLOW IS INDICATED ON THE PRESSURE REGULATOR GAGE.
5. SERVICE CAPSULE WATER COOLING TANK UNTIL WATER LEVEL APPEARS IN THE VENT (TRANSPARENT) LINE, AND THEN CLOSE THE VENT LINE VALVE.
6. ALLOW THE PRESSURE WITHIN THE CAPSULE WATER COOLING TANK TO BUILD UP TO 5 PSI, TO ENSURE THE FULL EXPANSION OF THE TANK DIAPHRAM.
7. CLOSE THE SERVICING UNIT FILL LINE VALVE AND OPEN THE VENT LINE VALVE.
8. IF THE WATER LEVEL, WITHIN THE VENT (TRANSPARENT) LINE, DROPS, REPEAT STEPS 4 THROUGH 7.
9. WHEN THE WATER LEVEL, WITHIN VENT (TRANSPARENT) LINE, REMAINS UNCHANGED, DISCONNECT AIR PRESSURE SOURCE FROM THE WATER COOLING TANK SERVICING UNIT.
10. DISCONNECT SERVICING UNIT SUPPLY AND VENT LINES FROM THE CAPSULE WATER TANK "FILL" AND "VENT" FITTINGS.

NOTE

WIPE DRY ANY WATER THAT MAY HAVE SPILLED DURING SERVICING OF THE CAPSULE WATER COOLING TANK

11. REMOVE SERVICING UNIT VENT AND SUPPLY LINE AND SECURE SERVICING UNIT.
12. INSTALL CAPSULE WATER TANK "FILL" AND "VENT" PORT COVERS.



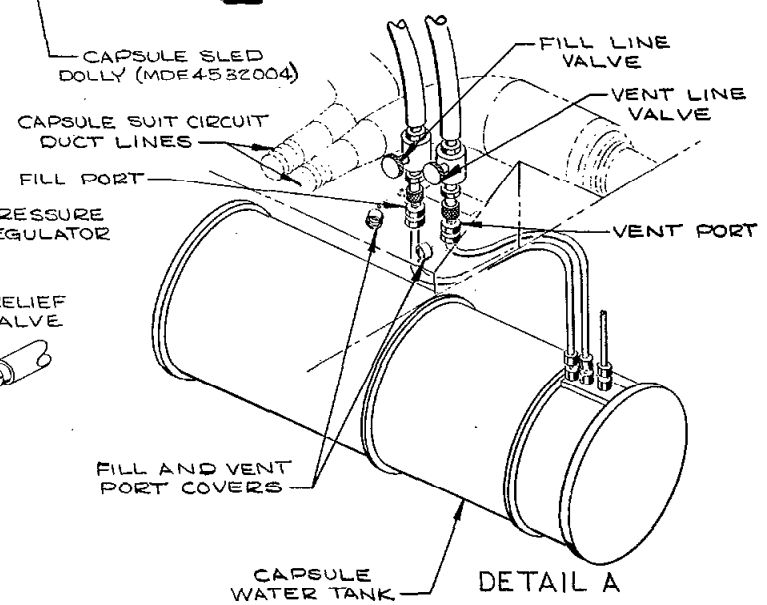


FIGURE 3-15 WATER COOLING TANK SERVICING

MH45-17

(b) Manually open the capsule periscope door.

(c) Install instrumentation fuse block in capsule.

(d) Connect ground umbilical plug to capsule umbilical receptacle, and apply 24 V d-c power to capsule.

NOTE

This servicing set-up is identical for all oxygen servicing operations.

3-47. Servicing Procedure

3-48. Launch Oxygen Bottle

CAUTION

Personnel must be fully acquainted with the operation of the High Pressure O_2 Servicing Unit (MDE4590001-1) prior to attempting servicing of the capsule launch oxygen bottle.

(a) Connect servicing unit static ground wire to ground.

(b) Remove the dust cap from the capsule launch oxygen bottle service valve.

(c) Ensure that launch oxygen bottle shutoff valve is closed.

WARNING

Ensure that capsule launch oxygen service valve and the servicing unit supply line attach fitting are free from grease, dirt, oil or film.

(d) Connect the servicing unit supply line to the capsule launch oxygen bottle service valve.

(e) Connect servicing unit electrical cable to a source of 220 Volt, 60 cycle 3 phase a-c power.

(f) Operate servicing unit to service capsule launch oxygen bottle to 3000 psig pressure.

NOTE

During oxygen servicing, ambient temperature and oxygen temperature should be observed, and pressure to the launch oxygen bottle should be regulated in accordance with the pressure values specified on the conversion charts for a given temperature.

(g) When the servicing unit pressure gage stabilizes (3000 psig at 70° F), stop servicing operation.

(h) Slowly bleed off servicing unit supply line excess pressure and disconnect supply line from the launch oxygen bottle service valve.

(i) Secure servicing unit.

(j) Replace dust cap on launch oxygen bottle service valve.

3-49. Normal Oxygen Bottle

CAUTION

Personnel must be fully acquainted with the operation of the High Pressure O_2 Servicing Unit (MDE4590001-1) prior to attempting servicing of the capsule normal oxygen bottle.

(a) Connect the servicing unit static ground wire to ground.

(b) Remove the dust cap from the capsule normal oxygen bottle service valve.

(c) Ensure that normal oxygen bottle shutoff valve is closed.

WARNING

Ensure that the capsule normal oxygen bottle service valve and the servicing unit supply line attach fitting are free from grease, dirt, oil, or film.

(d) Connect the high pressure oxygen servicing unit supply line to the capsule normal oxygen bottle service valve.

(e) Connect servicing unit electrical cable to a source of 220 Volts, 60 cycle, three-phase a-c power.

(f) Operate servicing unit to service capsule oxygen bottle to 3000 psig pressure.

NOTE

During oxygen servicing, ambient temperature and oxygen temperature should be observed, and pressure to the normal oxygen bottle should be regulated in accordance with the pressure valve specified in the conversion chart for a given temperature.

(g) During oxygen servicing compare the capsule OXYGEN QUANTITY indicator value with the oxygen quantity instrumentation value. (Refer to SEDR 65.)

NOTE

Values should be within 5% of each other.

(h) When the capsule OXYGEN QUANTITY indicator indicates 100% and the servicing unit pressure gage stabilizes (3000 psig at 70°F), stop service operations.

(i) Slowly bleed off servicing unit supply lines excess pressure and disconnect supply line from normal oxygen bottle service valve.

(j) Secure servicing unit.

(k) Replace dust caps on normal oxygen bottle service valve.

(l) Replace capsule instrumentation fuse block with dummy instrumentation fuse block.

(m) Remove ground umbilical plug from the capsule umbilical receptacle.

(n) Manually close periscope door.

3-50. CREWMAN SIMULATOR SERVICING

3-51. Servicing Set-Up

NOTE

Following procedures pertains to servicing of a crewman simulator not installed in the capsule. Servicing procedure for a capsule installed simulator would be similar, only that precautions would have to be taken when purging the simulator water container, so that water would not be spilled inside the capsule.

(a) Obtain the following:

Water Cooling Tank Servicing Unit (MDE4583005-1)

Carbon Dioxide Servicing Adapter (MDE4583022-1)

(b) Connect the Water Cooling Tank Servicing Unit (MDE4583005-1) supply line to the crewman simulator H_2O FILL valve port.

(c) Connect an external air pressure source to servicing unit.

(d) Check that simulator H_2O shutoff valve and H_2O FILL valve are closed.

(e) Check that all simulator switches are OFF.

(f) Check that all simulator vents and ports are capped.

(g) Remove simulator EXHAUST fitting dust cap.

(h) Check that CO_2 VENT valve is closed.

3-52. Servicing Procedure

3-53. Water Container

(a) Disconnect simulator water supply line at the simulator heater compartment.

NOTE

Water supply line is disconnected to enable faster purging of simulator H_2O container, in the event H_2O container still contained a partial supply of water. If the H_2O container is known not to contain any water, it is not necessary to disconnect supply line, as air in the container can be easily purged through the heater compartment.

(b) Connect 24 V d-c electrical power to simulator.

(c) Open H_2O shutoff valve.

(d) Turn CO_2 VALVE switch to ON position.

(e) Turn CO_2 VALVE switch to OFF, when water stops flowing from the disconnected simulator water supply line.

NOTE

If water supply line is not disconnected, and air is believed to be in H_2O container, turn CO_2 VALVE switch to OFF when air pressure stops flowing from the simulator EXHAUST fitting.

(f) Close H_2O shutoff valve.

(g) Uncap the CO_2 VENT PORT.

(h) Open the H_2O FILL valve.

(i) Apply air pressure to water tank servicing unit and service the simulator water container with approximately 7 pints of distilled water.

NOTE

Water tank servicing unit will regulate water to simulator at a 5 psig pressure.

(j) When simulator container if fully serviced, close off external air pressure to servicing unit and close simulator H_2O FILL valve.

(k) Disconnect servicing unit supply line from crewman simulator and secure servicing unit.

(l) Connect simulator water supply line to heater compartment.

(m) Cap all simulator vents and ports.

(n) Disconnect electrical power from simulator.

3-54. CO_2 Container

(a) Remove depleted CO_2 container from the crewman simulator.

(b) Connect the Carbon Dioxide Servicing Adapter (MDE4583022-1) to the CO_2 container.

(c) Check that adapter shutoff valve is closed.

(d) Connect a low pressure source of CO_2 to the CO_2 adapter.

(e) Open the CO_2 adapter shutoff valve.

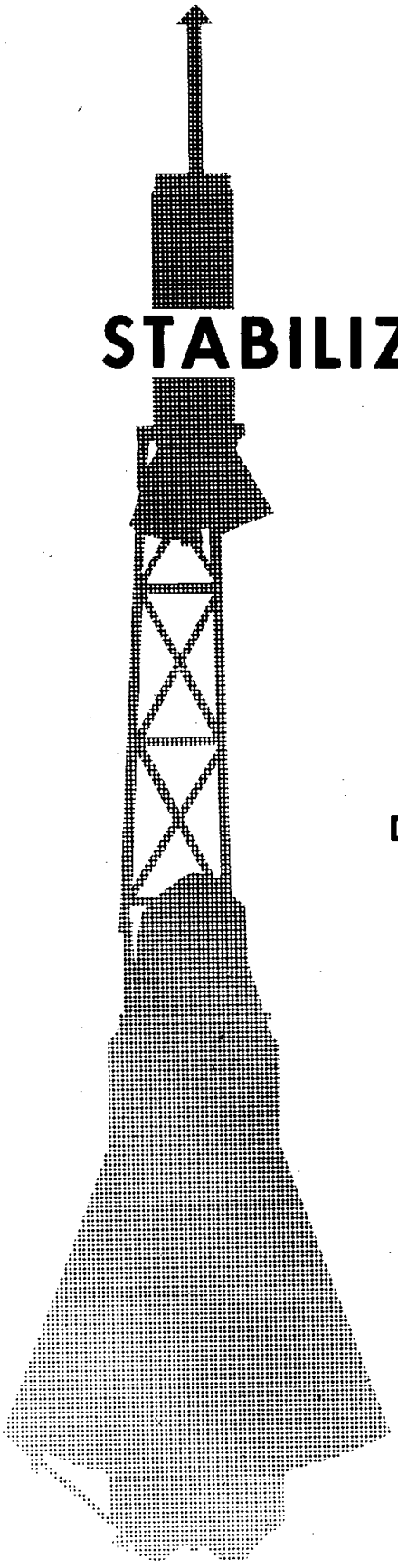
(f) Apply low pressure source of CO_2 to the adapter and service the CO_2 container until CO_2 adapter pressure gage stabilizes at 2000 psig pressure. (Container content is 2.6 lbs.)

(g) Close adapter shutoff valve and disconnect CO_2 source from the adapter.

(h) Disconnect CO_2 adapter from the CO_2 container.

(i) Install serviced CO_2 container into crewman simulator.

(j) Secure service adapter.



SECTION IV

STABILIZATION CONTROL SYSTEMS

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IV. STABILIZATION CONTROL SYSTEMS

4-1. GENERAL

Section 4 provides procedures, diagrams, illustrations and charts to facilitate system trouble shooting and component replacement and adjustment. It is noted that all system components are not necessarily covered within the Replacement and Adjustment areas. In the absence of such procedure it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

4-2. AUTOMATIC STABILIZATION CONTROL SYSTEM

4-3. TROUBLE SHOOTING

The following trouble shooting charts concerning the ASCS system are to be utilized in conjunction with the simplified wiring diagrams appearing in Figures 4-1 through 4-8. In general, malfunctions may be traced to one of three probable causes: (1) component failure, (2) wiring error or failure, (3) operator error. The following trouble shooting charts disregard the possibility of operator error and provide a method of locating a malfunction to a replaceable component or a faulty section of wiring.

4-4. It is noted that the important factor of reliability is proportional (to a degree) to the amount of component disassembly, electrical disconnection, and Capsule "in and out" traffic after initial component installation. In view of this fact a thorough investigation of all obvious causes should be carried out prior to more extensive trouble shooting. As an example: (1) inspect the component involved for obvious damage, (2) check to see that all accessible electrical

connections are secure and free of obvious damage, (3) re-run test to eliminate possibility of operator error.

4-5. The simplified wiring diagrams 4-1 through 4-8 are all basically -303 assemblies. Differences existing between these (-303) and -305 assemblies are as noted on diagrams. The following table shows capsule effectivity vs assembly numbers.

Capsule No.	Assembly No.
2	305
3 through 20	303

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Vertical Gyro Spin Motor indication zero (Pre-Launch Tester)	(1) Power Failure	(a) Remove vertical gyro connector, check for 115 VAC between pins B & A.	If voltage at pins A & B is correct, proceed to next probable cause. If voltage is not present, proceed to step (b).
		(b) Remove Amp-Cal connector P3. Check for 115 VAC between pin P and ground of disconnected cable.	If voltage is correct at pin P, proceed to step (c). If voltage is not present, proceed to step (d).
		(c) Continuity check wiring between Amp-Cal connector P3-BB and gyro connector pin B. Continuity check gyro connector pin A to ground.	Wiring check abnormal - repair as necessary.
		(d) Check for 115 VAC at TB-P_2(1).	If voltage is correct, wiring malfunction is indicated between TB-P_2(1) and Amp-Cal connector P3-P. Repair wiring as necessary. If voltage is not present, proceed to step (e).
		(e) Check for 115 VAC at TB-Q_1(17).	If voltage is correct, wiring malfunction exists between TB-Q_1(17) and TB-P_2(1) or .05G Relay #1 (Power sys relay panel) has malfunctioned.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			Repair or replace as necessary. If voltage is not present, malfunction exists in AC power distribution system. Refer to Section 10.
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
	(3) Defective GSE equipment (Pre-Launch-Tester)	Disconnect 6P4 (Rear of Pre-Launch Tester). Check for 2 VAC between pins g and h.	If voltage is correct, malfunction is in Pre-Launch tester. Refer to Pre-Launch Tester Maintenance Manual.
	(4) Defective GSE equipment (Capsule to Trailer Cabling)	(a) Disconnect Amp-Cal connector P7. Check for 2 VAC between pins t and r of J7.	If voltage is correct, proceed to step (b). If voltage is not present, proceed to next probable cause.
		(b) Continuity check wiring between Amp-Cal connector P7 and umbilical connector.	Wiring checks normal - malfunction is indicated in capsule to trailer cabling. Repair as necessary.
	(5) Defective Amp-Cal unit.	Perform the following Resistance checks on the Amp-Cal unit: P3-P to P7-r (8 ohms) P3-P to P3-BB (8 ohms)	Resistance check abnormal - remove and repair or replace Amp-Cal unit.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Directional Gyro Spin Motor indication zero (Pre-Launch Tester)	(1) Power Failure	(a) Remove directional gyro connector, check for 115 VAC between pins B & A.	If voltage at pin A & B is correct, proceed to next probable cause. If voltage is not present, proceed to step (b).
		(b) Remove Amp-Cal connector P3. Check for 115 VAC between pin P and ground of disconnected cable.	If voltage is correct at pin P, proceed to step (c). If voltage is not present, proceed to step (d).
		(c) Continuity check wiring between Amp-Cal connector P3-cc and gyro connector pin B. Continuity check gyro connector pin A to ground.	Wiring check abnormal - repair as necessary.
		(d) Check for 115 VAC at TB-P_2(1).	If voltage is correct, wiring malfunction is indicated between TB-P_2 (1) and Amp-Cal connector P3-P. Repair wiring as necessary. If voltage is not present, proceed to step (e).
		(e) Check for 115 VAC at TB-Q_1(17).	If voltage is correct, wiring malfunction exists between TB-Q_1(17) and TB-P_2(1) or .05G Relay #1 (Power sys.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			relay panel) has malfunctioned. Repair or replace as necessary. If voltage is not present, malfunction exists in AC power distribution system. Refer to Section 10.
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
	(3) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (Rear of Pre-Launch Tester). Check for 2 VAC between pins f and h.	If voltage is correct, malfunction is in Pre-Launch tester. Refer to Pre-Launch Tester Maintenance Manual.
	(4) Defective GSE equipment (Capsule to Trailer Cabling)	(a) Disconnect Amp-Cal connector P7. Check for 2 VAC between pins n and t of J7.	If voltage is correct, proceed to step (b). If voltage is not present, proceed to next probable cause.
		(b) Continuity check wiring between Amp-Cal connector P7 and umbilical connector.	Wiring checks normal - malfunction is indicated in capsule to trailer cabling. Repair as necessary.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(5) Defective AMP-CAL unit	Perform the following Resistance checks on the Amp-Cal unit: P3-P to P7-n (8 ohms) P3-P to P3-cc (8 ohms)	Resistance check abnormal - remove and repair or replace Amp-Cal unit.
Vertical gyro pitch synchro output inoperative at Pre-Launch Tester (Gyro spin motor ind. normal).	(1) Snychro excitation failure	(a) Disconnect vertical gyro connector and check for 13 VAC between pins M & L, K & L.	If voltage is correct, proceed to probable cause No. 2. If voltage is not present, proceed to step (b).
		(b) Check continuity between gyro connector pins L, M, K and Amp-Cal connector P4 pins T, c and d respectively.	Wiring checks normal - malfunction is in Amp-Cal unit. Remove and repair or replace same.
	(2) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (Rear of Pre-Launch Tester). Connect a variable AC source to pins D & E of J6P4. Vary AC source from zero to 10 VAC. Check pitch indicator on Pre-Launch Tester for corresponding change in indication.	If pitch indicator reading responds to A-C input, proceed to probable cause No. 3. If pitch indicator fails to respond, malfunction is within Pre-Launch Tester. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(3) Defective GSE equipment (Capsule to Trailer cabling).	Disconnect capsule umbilical connector. Connect a variable source of A-C to pins 28 & 29. Vary A-C source from zero to 10 VAC. Check pitch indicator on Pre-Launch Tester for corresponding change in indication.	If pitch indicator reading responds to A-C input, proceed to probable cause No. 4. If pitch indicator fails to respond, a malfunction exists in capsule to trailer cabling.

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INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			Repair wiring as necessary.
	(4) Defective wiring (Capsule)	(a) Continuity check wiring between Amp-Cal connector P7 H & J and umbilical connector pins 28 & 29 respectively.	Wiring checks normal - proceed to step (b). Wiring checks abnormal - repair wiring as necessary.
		(b) Continuity check wiring between vertical gyro connector pins T, F, H, and Amp-Cal connector P4-AA, z, and p respectively.	Wiring checks normal -proceed to probable cause No.5. Wiring checks abnormal - repair wiring as necessary.
	(5) Defective Vertical Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro. If malfunction still exists, proceed to next probable cause.
	(6) Defective Amp-Cal unit.	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
Vertical Gyro roll synchro output inoperative at Pre-Launch Tester (Gyro spin mtr. ind. normal).	(1) Synchro excitation failure.	(a) Disconnect vertical gyro connector and check for 13 VAC between pins M & L, K & L.	If voltage is correct, proceed to probable cause No.2. If voltage is not present, proceed to step (b).

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INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(b) Check continuity between gyro connector pins L, M, K and Amp-Cal connector P4 pins T, c, and d respectively.	Wiring checks normal - malfunction is in Amp-Cal unit. Remove and repair or replace same.
	(2) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (rear of Pre-Launch Tester). Connect a variable AC source to pins X and K of J6P4. Vary A-C source from zero to 10 VAC. Check roll indicator on Pre-Launch Tester for corresponding change in indication.	If roll indicator reading responds to A-C input, proceed to probable cause No.3. If roll indicator fails to respond, malfunction is within Pre-Launch Tester. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(3) Defective GSE equipment (Capsule to Trailer wiring)	Disconnect capsule umbilical connector. Connect a variable source of A-C to pins 35 & 36. Vary A-C source from zero to 10 VAC. Check roll indicator on Pre-Launch Tester for corresponding change in indication.	If roll indicator reading responds to A-C input, proceed to probable cause No.4. If roll indicator fails to respond, a malfunction exists in capsule to trailer cabling. Repair wiring as necessary.
	(4) Defective wiring (Capsule)	(a) Continuity check wiring between Amp-Cal connector P7 d & e and umbilical connector pins 35 & 36 respectively.	Wiring checks normal - proceed to step (b). Wiring checks abnormal - repair wiring as necessary.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
		(b) Continuity check wiring between vertical gyro connector pins E, J, N and Amp-Cal connector P4 n, m, and V respectively.	Wiring checks normal - proceed to probable cause No.5. Wiring checks abnormal - repair wiring as necessary.
	(5) Defective Vertical Gyro.	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro. If malfunction still exists, proceed to next probable cause.
	(6) Defective AMP-CAL unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
Directional Gyro yaw synchro output inoperative at Pre-Launch Tester (Gyro spin mtr. ind. normal).	(1) Synchro excitation failure.	(a) Disconnect directional gyro connector and check for 13 VAC between pins M & L, and K & L.	If voltage is correct, proceed to probable cause No.2. If voltage is not present, proceed to step (b).
		(b) Check continuity between gyro connector pins L, M, K and Amp-Cal connector P3 pins z, q, and h respectively.	Wiring checks normal- malfunction is in Amp-Cal unit. Remove and repair or replace same.
	(2) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (rear of Pre-Launch Tester). Connect a variable A-C source to pins J & T of J6P4. Vary A-C source from zero to 10 VAC. Check yaw indicator on Pre-	If yaw indicator reading responds to A-C input, proceed to probable cause No.3. If yaw indicator fails to

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		Launch Tester for corresponding change in indication.	respond, malfunction is within Pre-Launch Tester. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(3) Defective GSE equipment (Capsule to Trailer cabling).	Disconnect capsule umbilical connector. Connect a variable source of A-C to pins 32 & 33. Vary A-C source from zero to 10 VAC. Check yaw indicator on Pre-Launch Tester for corresponding change in indication.	If yaw indicator reading responds to A-C input, proceed to probable cause No.4. If yaw indicator fails to respond, a malfunction exists in capsule to trailer cabling. Repair wiring as necessary.
	(4) Defective wiring (Capsule)	(a) Continuity check wiring between Amp-Cal connector P7 N & P and umbilical connector pins 32 & 33 respectively.	Wiring checks normal - proceed to step (b). Wiring checks abnormal - repair wiring as necessary.
		(b) Continuity check wiring between Directional gyro connector pins T, F, H, and Amp-Cal connector P4-Y, X, and W respectively.	Wiring checks normal - proceed to probable cause No.5. Wiring checks abnormal - repair wiring as necessary.
	(5) Defective Directional Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro. If malfunction still exists, proceed to next probable cause.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(6) Defective AMP-CAL unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
Directional Gyro roll synchro output inoperative at Pre-Launch Tester (Gyro spin mtr. ind. normal).	(1) Synchro excitation failure.	(a) Disconnect Directional gyro connector and check for 13 V. A-C between pins M & L, K & L.	If voltage is correct, proceed to probable cause No.2. If voltage is not present, proceed to step (b).
		(b) Check continuity between gyro connector pins L, M, K and Amp-Cal connector P3 pins z, q, and h respectively.	Wiring checks normal - malfunction is in Amp-Cal unit. Remove and repair or replace same.
	(2) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (rear of Pre-Launch Tester). Connect a variable AC source to pins F & H of J6P4. Vary A-C source from zero to 10 V. A-C. Check roll indicator on Pre-Launch Tester for corresponding change in indication.	If roll indicator reading responds to A-C input, proceed to probable cause No.3. If roll indicator fails to respond, malfunction is within Pre-Launch Tester. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(3) Defective GSE equipment (Capsule to Trailer cabling)	Disconnect capsule umbilical connector. Connect a variable source of A-C to pins 30 & 31. Vary A-C source from zero to 10 V. A-C. Check roll indicator on Pre-Launch Tester for corresponding change in indication.	If roll indicator fails to respond, a malfunction exists in capsule to trailer cabling. Repair wiring as necessary.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(4) Defective wiring (Capsule)	(a) Continuity check wiring between Amp-Cal connector P7 K & M and umbilical connector pins 30 & 31 respectively.	Wiring checks normal - proceed to step (b). Wiring checks abnormal - repair wiring as necessary.
		(b) Continuity check wiring between directional gyro connector pins E, J, N, and Amp-Cal connector P4 pins r, q, and Z respectively.	Wiring checks normal - proceed to probable cause No.5. Wiring checks abnormal - repair wiring as necessary.
	(5) Defective Directional gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro. If malfunction still exists, proceed to next probable cause.
	(6) Defective Amp-Cal unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
Directional Gyro will not cage.	(1) Defective wiring	(a) Remove Directional gyro connector. Place gyro switch to CAGE position, check 24 V. D-C between pin P and ground of disconnected cable.	If voltage is correct, proceed to probable cause No.2. If voltage is not present, proceed to step (b).
		(b) Continuity check wiring between gyro connector pin P and Amp-Cal connector P3-p.	Wiring checks normal -proceed to probable cause No. 3. Wiring checks abnormal-repair wiring as necessary.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(2) Defective gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
	(3) Defective Amp-Cal unit (Internal Wiring)	Check continuity between J3-p and J3-m on Amp-Cal unit.	Wiring checks abnormal - remove Amp-Cal unit and repair or replace.
Vertical Gyro will not cage.	(1) Defective wiring.	(a) Remove vertical gyro connector. Place gyro switch to CAGE position, check 24 V. D-C between pin P and ground.	If voltage is correct, proceed to probable cause No.2. If voltage is not present, proceed to step (b).
		(b) Continuity check wiring between gyro connector pin P and Amp-Cal unit connector P3-n.	Wiring checks normal - proceed to probable cause No.3. Wiring checks abnormal - repair wiring as necessary.
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
	(3) Defective Amp-Cal unit (internal wiring)	Check continuity between J3-n and J3-m on Amp-Cal unit.	Wiring checks abnormal - remove Amp-Cal unit and repair or replace.
Vertical Gyro Spin Motor current indicator pegged continuously. (Pre-Launch Tester).	(1) Spin Motor monitor wiring shorted to ground.	(a) Disconnect Vertical Gyro Connector.	If malfunction is corrected, proceed to probable cause No. 2. If Spin Motor current indicator still indicates a voltage reading, proceed to step (b).

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(b) Disconnect Amp-Cal connector P3. Jumper 115 V. A-C to J3P. (Voltage present at P3P.)	If malfunction is corrected, grounded lead is between Gyro connector and Amp-Cal connector P3. Repair wiring as necessary. If malfunction still exists, proceed to step (c).
		(c) Reconnect P3 to Amp-Cal unit. Disconnect Amp-Cal connector P7. Connect an a-c voltmeter between pins r & t of J7 on Amp-Cal unit. Observe voltmeter for voltage previously indicated by Spin Motor indicator on Pre-Launch Tester.	If voltmeter indicates zero, proceed to step (d). If voltmeter indicates malfunction still exists, malfunction is in Amp-Cal unit. Remove and repair or replace Amp-Cal unit.
		(d) Disconnect capsule umbilical connector. Continuity check Amp-Cal connector P7r to ground for infinite resistance. Also check P7r (for possible short) to all other pins in P7.	Continuity check normal - malfunction is in GSE trailer to capsule cabling or Pre-Launch tester. Repair as necessary. Continuity check abnormal - repair as necessary.
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
Directional Gyro Spin Motor current indicator pegged continuously.	(1) Spin Motor monitor wiring shorted to ground.	(a) Disconnect Directional Gyro connector.	If malfunction is corrected, proceed to probable cause No. 2.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			If Spin Motor current indicator still indicates a voltage reading, proceed to step (b).
		(b) Disconnect Amp-Cal connector P3. Jumper 115 V. A-C to J3P. (Voltage present at P3P.)	If malfunction is corrected, grounded lead is between Gyro connector and Amp-Cal connector P3. Repair wiring as necessary. If malfunction still exists, proceed to step (c).
		(c) Reconnect P3 to Amp-Cal unit. Disconnect Amp-Cal connector P7. Connect an A-C voltmeter between pins n & t of J7 on Amp-Cal unit. Observe voltmeter for voltage previously indicated by Spin Motor indicator on Pre-Launch Tester.	If voltmeter indicates zero, proceed to step (d). If voltmeter indicates malfunction still exists, malfunction is in Amp-Cal unit. Remove and repair or replace Amp-Cal unit.
		(d) Disconnect capsule umbilical connector. Continuity check Amp-Cal connector P7n to ground for infinite resistance. Also check P7n to (for possible short) all other pins in P7.	Continuity check normal - malfunction is in GSE trailer to capsule cabling or Pre-Launch tester. Repair as necessary. Continuity check abnormal - repair as necessary.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
Gyro excessively noisy.	Defective Gyro bearings.		Replace gyro.
Excessive Gyro drift	(1) Defective Gyro bearings.	Place Gyro switch to FREE position	If malfunction is corrected, proceed to probable cause No. 2. If Gyro drift persists, replace gyro.
	(2) Defective Amp-Cal unit (slaving section).	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove Amp-Cal unit and replace Slaving section.
Spin Motor current does not stabilize (Attitude or Rate gyro).	(1) Low A-C voltage	Check 0-150 V A-C meter on gyro spin motor panel (Pre-Launch Tester) for 115 $\pm$ 5% V. A-C.	Refer to Section 10 for correction of low voltage.
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
Rate Gyro (Roll) Spin Motor indication zero (Pre-Launch Tester)	(1) Power failure	(a) Remove Roll Rate gyro connector, check for 115 V. A-C between pins b & A.	If voltage at pins b & A is correct, proceed to next probable cause. If voltage is not present, proceed to step (b).

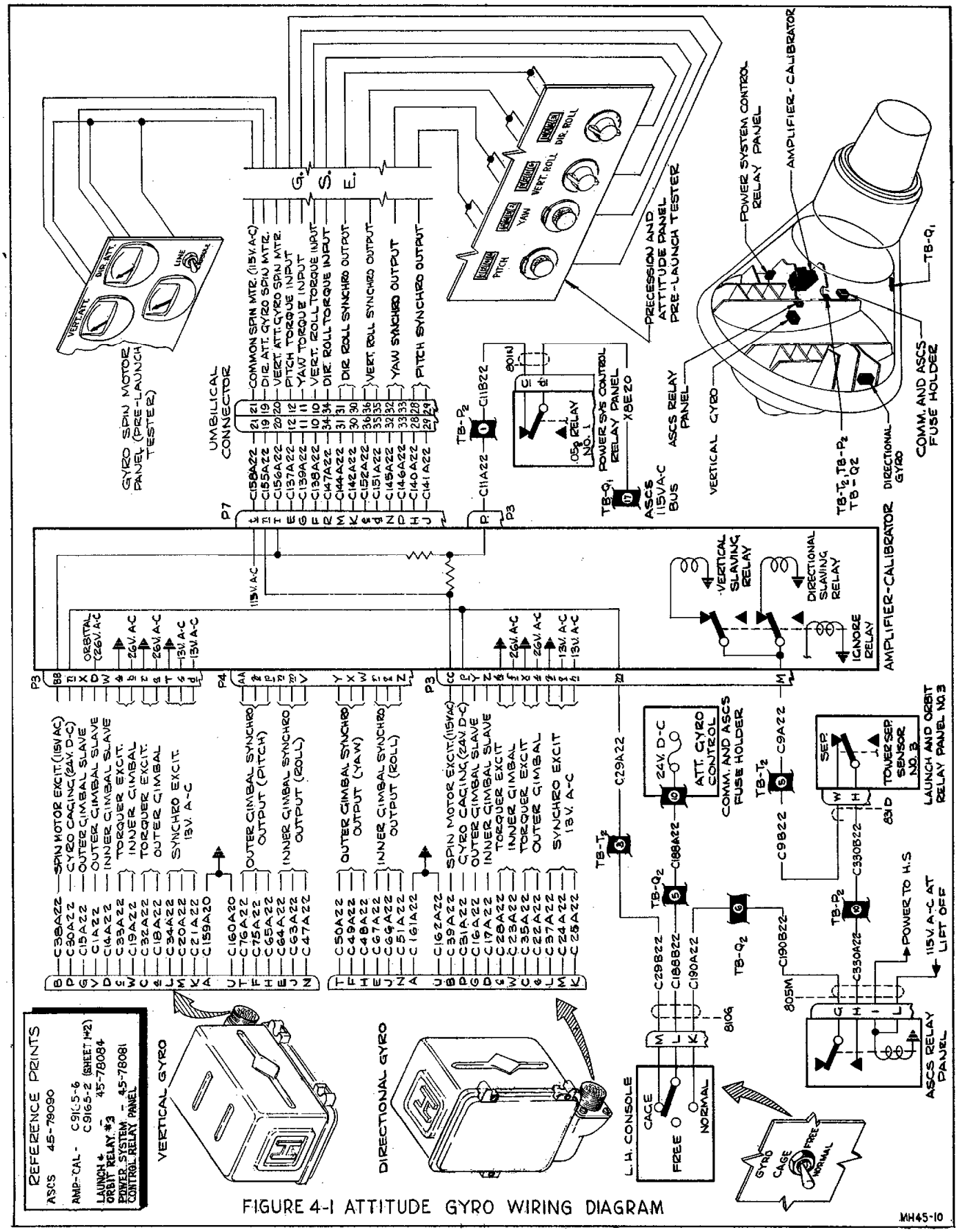

FIGURE 4-1 ATTITUDE GYRO WIRING DIAGRAM

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INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(b) Remove Amp-Cal connector P3. Check for 115 V. A-C between pin GG and ground.	If voltage is correct at pin GG, proceed to step (c). If voltage is not present, proceed to step (d).
		(c) Continuity check wiring between Amp-Cal connector P3 GG and gyro connector pin b. Continuity check pin A to ground.	Wiring checks abnormal - repair wiring as necessary.
		(d) Ascertain that 0-150 V. A-C meter on Pre-Launch Tester reads 115 V. A-C in the CAPSULE position. If indication is correct, malfunction is in Amp-Cal unit.	Remove and repair or replace Amp-Cal unit.
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
	(3) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (rear of Pre-Launch Tester). Check for 1.2 V. A-C between pin Z and h of P6P4.	If voltage is correct, malfunction is in Pre-Launch Tester. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(4) Defective GSE equipment (Capsule to Trailer cabling)	(a) Disconnect Amp-Cal connector P7. Check for 1.2 V A-C between pins k and t of J7.	If voltage is correct, proceed to step (b). If voltage is not present, proceed to next probable cause.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(b) Continuity check wiring between Amp-Cal connector P7 and umbilical connector.	Wiring checks normal - malfunction is indicated in capsule to trailer cabling. Repair as necessary.
	(5) Defective Amp-Cal unit	Perform the following resistance check on the Amp-Cal unit. P7-k to P3GG (zero ohms) P7-k to P3y (8 ohms) P7-k to P3R (8 ohms)	Resistance checks abnormal-remove and repair or replace Amp-Cal unit.
Rate Gyro (Yaw) Spin Motor indication zero (Pre-Launch Tester)	(1) Power failure	(a) Remove Yaw Rate gyro connector, check for 115 V. A-C between pins b & A.	If voltage at pins b & A is correct, proceed to next probable cause. If voltage is not present, proceed to step (b).
		(b) Remove Amp-Cal connector P3. Check for 115 V. A-C between pin HH and ground.	If voltage is correct at pin HH, proceed to step (c). If voltage is not present, proceed to step (d).
		(c) Continuity check wiring between Amp-Cal connector P3 HH and gyro connector pin b. Continuity check pin A to ground.	Wiring checks abnormal - repair wiring as necessary.
		(d) Ascertain that 0-150 V. A-C meter on Pre-Launch Tester reads 115 V. A-C in the CAPSULE position. If indication is correct, malfunction is in Amp-Cal unit.	Remove and repair or replace Amp-Cal unit.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
	(2) Defective Gyro	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro.
	(3) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (rear of Pre-Launch Tester). Check for 1.2 V. A-C between pins s and t of P6P4.	If voltage is correct, malfunction is in Pre-Launch Tester. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(4) Defective GSE equipment (Capsule to Trailer cabling)	(a) Disconnect Amp-Cal connector P7. Check for 1.2 V. A-C between pins s and t of J7.	If voltage is correct, proceed to step (b). If voltage is not present, proceed to next probable cause.
		(b) Continuity check wiring between Amp-Cal connector P7 and umbilical connector.	Wiring checks normal - malfunction is indicated in capsule to trailer cabling. Repair as necessary.
	(5) Defective Amp-Cal unit	Perform the following resistance checks on the Amp-Cal unit. P7-s to P3HH (zero ohms) P7-s to P3y (8 ohms) P7-s to P3R (8 ohms)	Resistance checks abnormal - remove and repair or replace Amp-Cal unit.
Rate Gyro (Pitch) Spin Motor indicator zero (Pre-Launch Tester)	(1) Power failure	(a) Remove Roll Rate Gyro connector, check for 115 V. A-C between pins b & A.	If voltage at pins b & A is correct, proceed to next probable cause. If voltage is not present, proceed to step (b).

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(b) Remove Amp-Cal connector P3. Check for 115 V. A-C between pin DD and ground.	If voltage is correct at pin DD, proceed to step (c).
		(c) Continuity check wiring between Amp-Cal connector P3 DD and Gyro connector pin b. Continuity check pin A to ground.	Wiring checks abnormal - repair wiring as necessary.
		(d) Ascertain that 0-150 V. A-C meter on Pre-Launch tester reads 115 V. A-C in the CAPSULE position. If indication is correct, malfunction is in Amp-Cal unit.	Remove and repair or replace Amp-Cal unit.
	(2) Defective Gyro	Substitute a Gyro known to be operative.	If malfunction is corrected, replace gyro.
	(3) Defective GSE equipment (Pre-Launch Tester)	Disconnect 6P4 (rear of Pre-Launch Tester). Check for 1.2 V. A-C between pin t and h of P6P4.	If voltage is correct, malfunction is in Pre-Launch Tester. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(4) Defective GSE equipment (Capsule to Trailer cabling)	(a) Disconnect Amp-Cal connector P7. Check for 1.2 V. A-C between pins m and t of J7.	If voltage is correct, proceed to step (b). If voltage is not present, proceed to next probable cause.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(b) Continuity check wiring between Amp-Cal connector P7 and umbilical connector.	Wiring checks normal - malfunction is indicated in capsule to trailer cabling. Repair as necessary.
	(5) Defective Amp-Cal unit.	Perform the following Resistance checks on the Amp-Cal unit. P7m to P3DD (zero ohms) P7m to P3y (8 ohms) P7m to P3R (8 ohms)	Resistance checks abnormal - remove and repair or replace Amp-Cal unit.
Roll Rate Gyro Spin Motor current indicator pegged continuously. (Pre-Launch Tester).	(1) Spin Motors monitor wiring shorted to ground.	(a) Disconnect Roll Rate Gyro connector.	If malfunction is corrected, proceed to probable cause No. 2. If Spin Motor current indicator still indicates a voltage reading, proceed to step (b).
		(b) Disconnect Amp-Cal connector P3. Jumper 115 V. A-C to J3R. (Voltage present at P3R with ASCS MODE SEL switch in NORMAL position.)	If malfunction is corrected, grounded lead is between gyro connector and Amp-Cal connector P3. Repair wiring as necessary. If malfunction still exists, proceed to step (c).

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
		(c) Reconnect P3 to Amp-Cal unit. Disconnect Amp-Cal connector P7. Connect a voltmeter between pins R & t of J7 on Amp-Cal unit. Observe voltmeter for voltage previously indicated by Spin Motor indicator on Pre-Launch Tester.	If voltmeter indicates zero, proceed to step (d). If voltmeter indicates malfunction still exists, malfunction is in Amp-Cal unit. Remove and repair or replace Amp-Cal unit.
		(d) Disconnect Capsule umbilical connector. Continuity check Amp-Cal connector P7k for infinite resistance to ground. Also check P7k (for possible short) to all other pins in P7.	Continuity check normal - malfunction is in GSE trailer to capsule cabling or Pre-Launch Tester. Repair as necessary. Continuity check abnormal - repair as necessary.
	(2) Defective gyro	Substitute a Gyro known to be operative.	If malfunction is corrected, replace gyro.
Pitch Rate Gyro Spin Motor current indicator pegged continuously. (Pre-Launch Tester).	(1) Spin Motor monitor wiring shorted to ground.	(a) Disconnect Pitch Rate Gyro connector.	If malfunction is corrected, proceed to probable cause No. 2. If Spin Motor current indicator still indicates a voltage reading, proceed to step (b).

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
		(b) Disconnect Amp-Cal connector P3. Jumper 115 V. A-C to Amp-Cal J3R. (115 V. A-C present at P3R with ASCS MODE SEL switch in NORMAL position.)	If malfunction is corrected, grounded lead is between Gyro connector and Amp-Cal connector P3. Repair wiring as necessary. If malfunction still exists, proceed to step (c).
		(c) Reconnect P3 to Amp-Cal unit. Disconnect Amp-Cal connector P7. Connect a voltmeter between pins m & t of J7 on Amp-Cal unit. Observe voltmeter for voltage previously indicated by Spin Motor current indicator on Pre-Launch Tester.	If voltmeter indicates zero, proceed to step (d). If voltmeter indicates malfunction still exists, malfunction is in Amp-Cal unit. Remove and repair or replace Amp-Cal unit.
		(d) Disconnect capsule umbilical connector. Continuity check Amp-Cal connector P7 m for infinite resistance to ground. Also check P7m (for possible short) to all other pins in P7.	Continuity check normal - malfunction is in GSE trailer to capsule cabling or Pre-Launch Tester. Repair as necessary. Continuity check abnormal-Repair as necessary.
	(2) Defective Gyro	Substitute a Gyro known to be operative.	If malfunction is corrected, replace Gyro.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
Yaw Rate Gyro Spin Motor current indicator pegged continuously. (Pre-Launch Tester).	(1) Spin Motor monitor wiring shorted to ground.	(a) Disconnect Roll Rate Gyro connector.	If malfunction is corrected, proceed to probable cause No. 2. If Spin Motor current indicator still indicates a voltage reading, proceed to step (b).
		(b) Disconnect Amp-Cal connector P3. Jumper 115 V. A-C to J3R (115 V. A-C present at P3R with ASCS MODE SEL switch in NORMAL position).	If malfunction is corrected, grounded lead is between Gyro connector and Amp-Cal connector P3. Repair wiring as necessary. If malfunction still exists, proceed to step (c).
		(c) Reconnect P3 to Amp-Cal unit. Disconnect Amp-Cal connector P7. Connect a voltmeter between pins s & t of J7 on Amp-Cal unit. Observe voltmeter for voltage previously indicated by Spin Motor current indicator on Pre-Launch Tester.	If voltmeter reads zero, proceed to step (d). If voltmeter indicates malfunction still exists, malfunction is in Amp-Cal unit. Remove and repair or replace Amp-Cal unit.
		(d) Disconnect Capsule umbilical connector. Continuity check Amp-Cal connector P7s for infinite resistance to ground. Also check P7s (for possible shorts) to all other pins in P7.	Continuity check normal-malfunction is in GSE trailer to Capsule cabling or Pre-Launch Tester. Repair as necessary. Continuity check abnormal - repair as necessary.

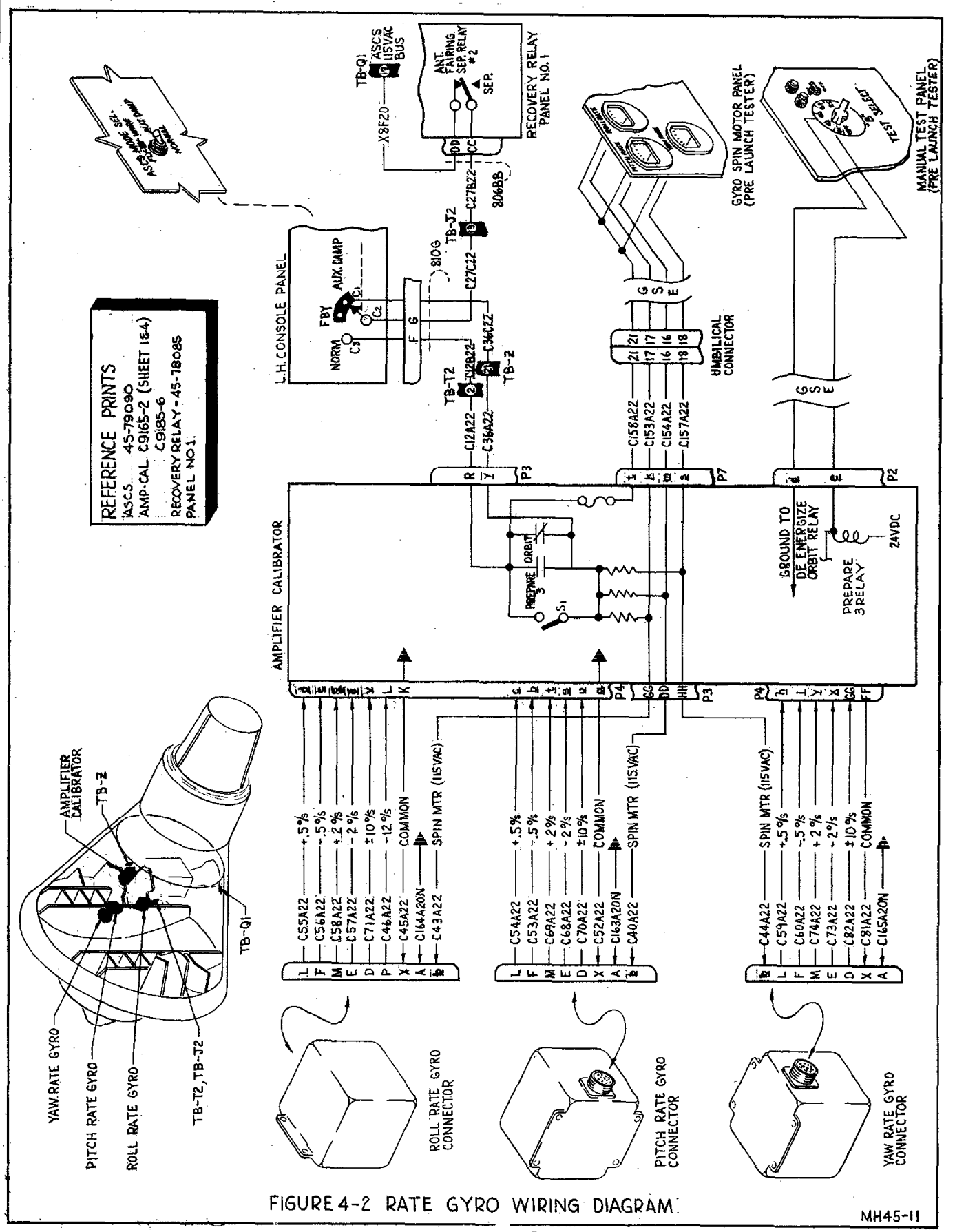


FIGURE 4-2 RATE GYRO WIRING DIAGRAM

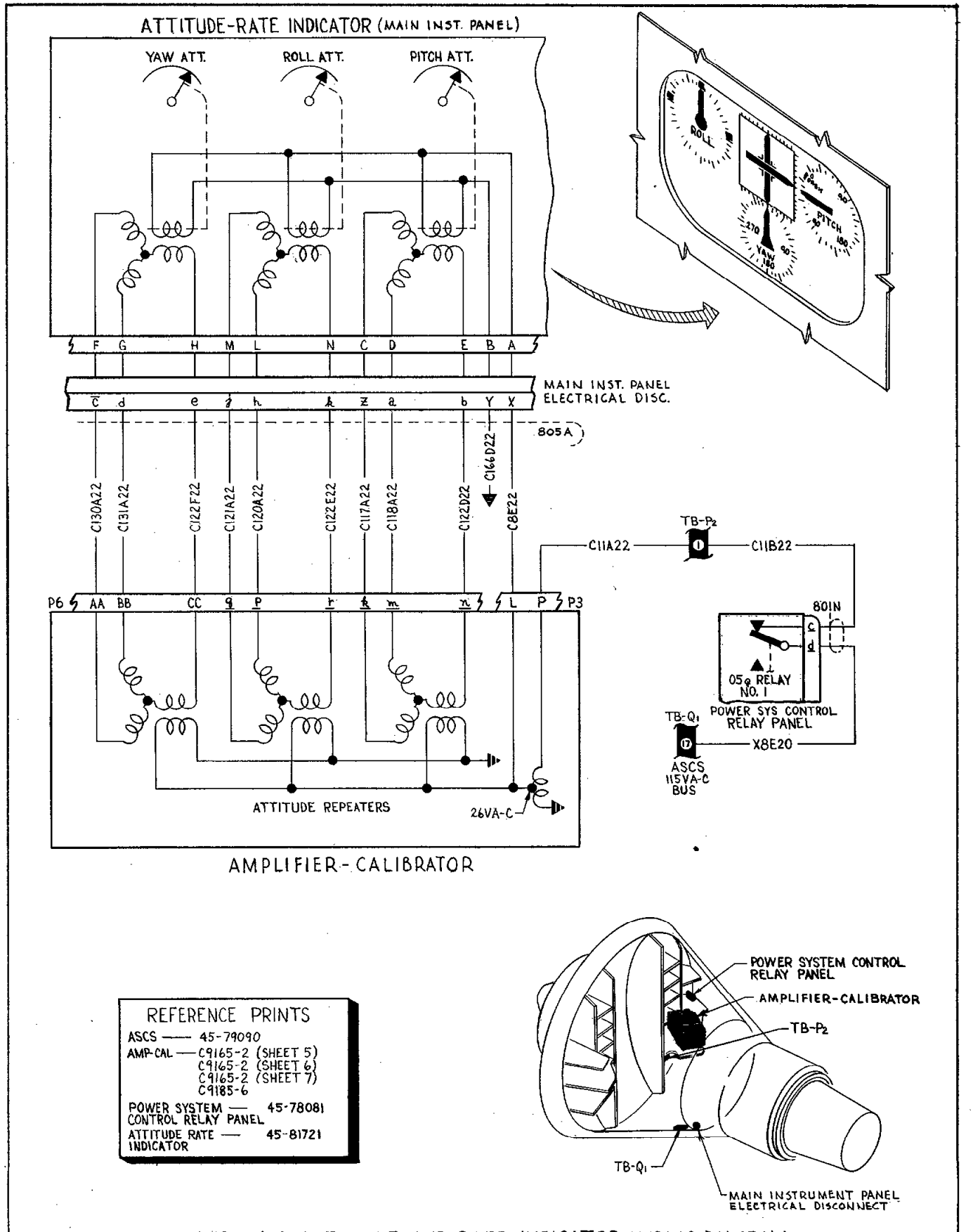
MH45-11

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
	(2) Defective Gyro	Substitute a Gyro known to be operative.	If malfunction is corrected, replace Gyro.
Capsule Yaw Attitude Indicator inoperative.	(1) Defective wiring (Amp-Cal to indicator.)	(a) Check Pre-Launch tester Yaw gimbal indicator for normal Gyro output indication.	If Pre-Launch tester indication is abnormal, refer to pg. 4-11 for corrective action. If Pre-Launch tester indication is normal, proceed to step (b).
		(b) Disconnect Attitude Rate Indicator Electrical connector. Utilize the Pre-Launch Tester and slave the Directional Gyro Yaw gimbal 180 from zero deg. Monitor voltage between pins F & G, F & H, and G & H of the indicator electrical connector during slaving. Voltage between any two pins should vary between zero and 11.8 V. A-C. Check for 26 V. A-C between indicator electrical connector pins A & B.	If voltage is normal, proceed to probable cause No. 2. If voltage is not present, proceed to step (c).
		(c) Disconnect Amp-Cal connections P6 & P3. Check continuity between Amp-Cal and Attitude Rate Indicator as follows: Indicator — P6 F — AA G — BB H — CC B — Ground	Continuity check normal - proceed to probable cause No. 3. Continuity check abnormal - repair wiring as necessary.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		Indicator / P3: A / L	
	(2) Defective Attitude Rate Indicator	Substitute a unit known to be operative.	If malfunction is corrected, replace Attitude Rate Indicator.
	(3) Defective Amp-Cal unit.	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal.
Capsule Roll Attitude Indicator inoperative.	(1) Defective wiring (Amp-Cal to Indicator).	(a) Check Pre-Launch Tester Roll gimbal indicator for normal Gyro output indication.	If Pre-Launch Tester indication is abnormal, refer to pg. 4-9 for corrective action. If Pre-Launch Tester indication is normal, proceed to step (b).
		(b) Disconnect Attitude Rate Indicator electrical connector. Utilize the Pre-Launch Tester and slave the Vertical Gyro Roll Gimbal 60° from zero deg. Monitor voltage between pins M & L, M & N and L & N of the indicator electrical connector during slaving. Voltage between any two pins should vary between zero and 3.9 V. A-C. Check for 26 V. A-C between Indicator electrical connector pins A & B.	If voltage is normal, proceed to probable cause No. 2. If voltage is not present, proceed to step (c).

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(c) Disconnect Amp-Cal connectors P6 & P3. Check continuity between Amp-Cal and Indicator as follows: Indicator — P6 M — q L — p N — r B — Ground Indicator — P3 A — L	Continuity check normal - proceed to probable cause No. 3. Continuity check abnormal - repair wiring as necessary.
	(2) Defective Attitude Rate Indicator.	Substitute a unit known to be operative.	If malfunction is corrected, remove and replace Attitude Rate Indicator.
	(3) Defective Amp-Cal unit.	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
Capsule Pitch Attitude Indicator inoperative.	(1) Defective wiring (Amp-Cal to indicator)	(a) Check Pre-Launch Tester Pitch gimbal indicator for normal Gyro output indication.	If Pre-Launch tester indication is abnormal, refer to pg. 4-8 for corrective action. If Pre-Launch Tester indication is normal, proceed to step (b).
		(b) Disconnect Attitude Rate Indicator electrical connector. Utilize the Pre-Launch Tester and slave the Vertical Gyro Pitch gimbal 90° from zero	If voltage is normal, proceed to probable cause No. 2. If voltage is not present, proceed to step (c).

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		deg. Monitor voltage between pins F & G, F & H, and G & H of the Indicator electrical connector during slaving. Voltage between any two pins should vary between zero and 5.9 V. A-C. Check for 26 V. A-C between Indicator electrical connector pins A & B.	
		(c) Disconnect Amp-Cal connectors P6 & P3. Check continuity between Amp-Cal and Indicator as follows: Indicator P6 D m E n C k B Ground Indicator P3 A L	Continuity check normal - proceed to probable cause No. 3. Continuity check abnormal - repair wiring as necessary.
	(2) Defective Attitude Rate Indicator	Substitute a unit known to be operative.	If malfunction is corrected, replace Attitude Rate Indicator.
	(3) Defective Amp-Cal unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace AMP-CAL unit.
All Capsule Attitude Rate Indicators inoperative (Pre-Launch Tester indication normal).	(1) Indicator Synchro excitation failure.	(a) Disconnect Attitude Rate Indicator electrical connector. Check between pins A & B for 26 V. A-C.	If voltage is normal, proceed to probable cause No. 2. If voltage is not present, proceed to step (b).



REFERENCE PRINTS

ASCS — 45-79090
AMP-CAL — C9165-2 (SHEET 5)
C9165-2 (SHEET 6)
C9165-2 (SHEET 7)
C9185-6
POWER SYSTEM CONTROL RELAY PANEL — 45-78081
ATTITUDE RATE INDICATOR — 45-81721

FIGURE 4-3 ATTITUDE AND RATE INDICATOR WIRING DIAGRAM MH45-45

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
		(b) Disconnect Amp-Cal connector P3. Continuity check between Amp-Cal and indicator as follows: Indicator — P3 A — L B — Ground	Continuity check normal, proceed to probable cause No. 3. Continuity check abnormal, repair wiring as necessary.
	(2) Defective Attitude Rate Indicator. (Broken lead on pin A or B)	Substitute a unit known to be operative.	If malfunction is corrected, remove and repair or replace Attitude Rate Indicator.
	(3) Defective Amp-Cal unit. (Broken wire on J3L)	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
.05G Command inoperative as indicated by the following conditions: (1) Pre-Launch Tester .05G switch in OPERATE. (2) .05G light on tester does not illuminate.	(1) GSE equipment failure	Disconnect Amp-Cal connector P2. Check for presence of ground at P2w with Pre-Launch Tester. 05G switch in OPERATE position.	If ground is present, proceed to probable cause No. 2. If ground is not present, malfunction is indicated in Pre-Launch Tester or GSE cabling. Refer to Pre-Launch Tester Maintenance Manual for corrective action.
	(2) Defective Amp-Cal unit.	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
.05G Command inoperative from .05G Accelerometer	(1) Defective .05G Accelerometer.	(a) Place Capsule Emergency .05G Fuse switch ON. Actuate Capsule .05G switch (left console).	If .05G command operates correctly from capsule .05G switch, proceed to step (b). If .05G command does not operate correctly from .05G switch, proceed to probable cause No. 2.
		(b) Disconnect Amp-Cal connector P4. Check for ground at P4k. NOTE Capsule must be positioned 10° (min) up pitch from horizontal and Retro Package separation simulated from sequential tester (checkout trailer). These conditions are necessary to arm and actuate the .05G Acceleration switch.	If ground is present, proceed to probable cause No. 2. If ground is not present, proceed to step (c).
		(c) Disconnect the ASCS Relay Panel electrical connector, jumper pins j and k of disconnected cable. Check for ground at Amp-Cal P4k.	If ground is present, malfunction is indicated in ASCS Relay Panel. (Acceleration Arm Relay). If ground is not present, proceed to step (d).
		(d) Disconnect .05G Acceleration Switch electrical connector. Check for continuity between pins A & B of switch with Capsule positioned as in step (b).	Continuity check normal - wiring malfunction between .05G Acceleration Switch and Amp-Cal unit. Check per Figure 4-4.

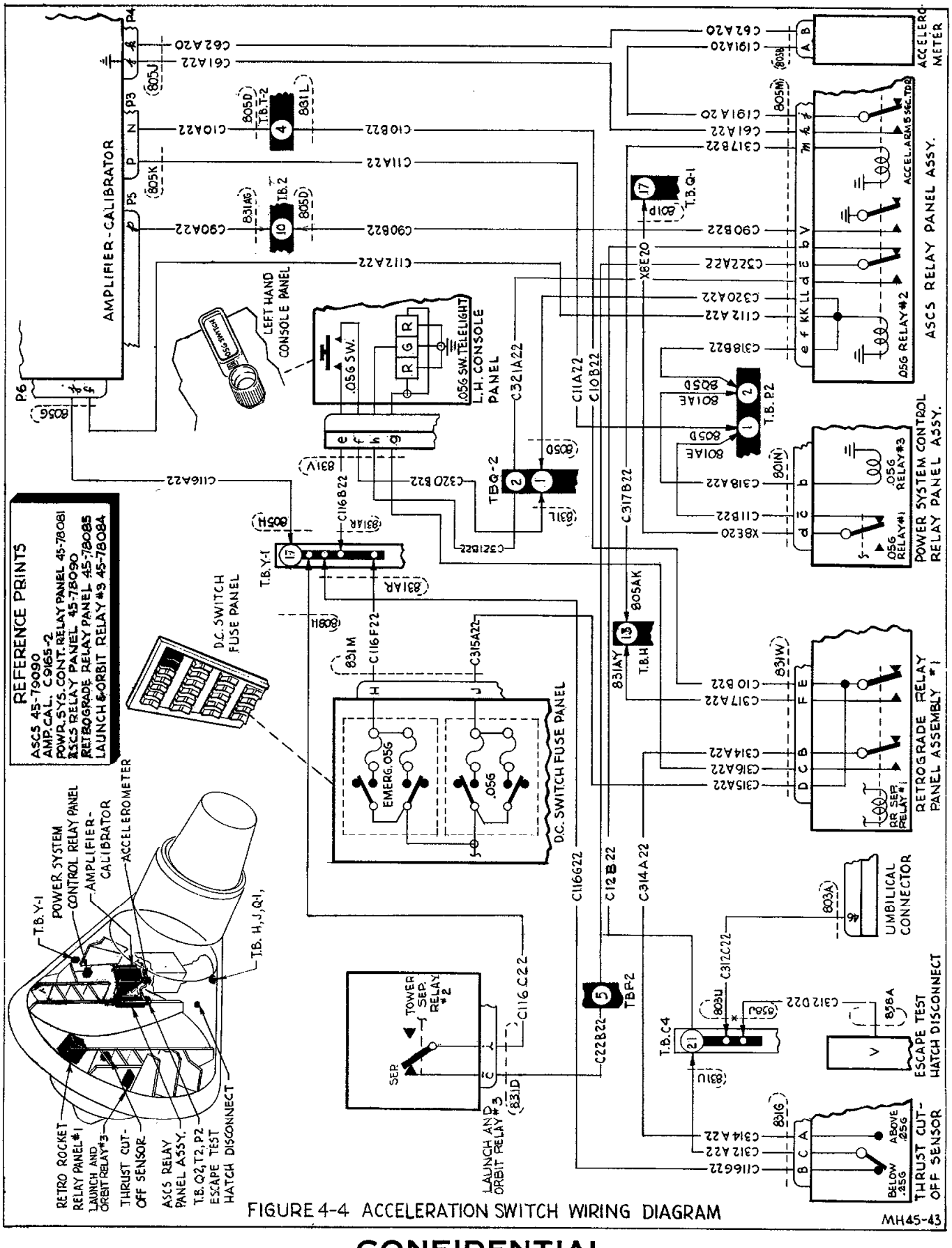


FIGURE 4-4 ACCELERATION SWITCH WIRING DIAGRAM

MH45-43

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			Continuity check abnormal - remove and replace .05G Acceleration Switch.
	(2) Defective Amp-Cal unit.	If .05G Command is inoperative from both .05G Accelerometer and Capsule .05G switch, malfunction is indicated in Amp-Cal unit. Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
T_g command inoperative from Capsule Sequential System (Function normal from Pre-Launch Tester).	(1) Damping Signal Relay contact failure (Launch and Orbit Relay Panel No. 4).	(a) Disconnect Launch and Orbit Relay Panel No. 4 electrical connector. Check for presence of ground at pin T of disconnected cable.	If ground ispresent, proceed to step (b). If ground is not present, proceed to probable cause No.2
		(b) Jumper pins T and U of disconnected cable. With jumper connected, disconnect Amp-Cal connector P5 and check for presence of ground at pin U of P5.	If ground is present, malfunction is indicated in Launch and Orbit Relay Panel No. 4. Refer to Launch and Orbit Relay Panel No. 4 Schematic, 45-78084. If ground is not present, proceed to probable cause No. 2.
	(2) Defective wiring between Amp-Cal and Launch and Orbit Relay No. 4.	Perform continuity checks between Amp-Cal and Launch and Orbit Relay No. 4 as follows: Relay Panel — P5 T — AA U — U	Continuity check normal-proceed to probable cause No. 3. Continuity check abnormal - repair wiring as necessary.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
	(3) Defective Amp-Cal unit.	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
T_s command does not drop out after five seconds.	Five second time delay relay in Launch and Orbit Relay Panel No. 4 has malfunctioned.	None	Remove and replace five second time delay relay.
T_s+5 command inoperative from Capsule Sequential System (function normal from Pre-Launch Tester).	(1) Orbit Orient Latch Relay failure (Launch and Orbit Relay Panel No. 4).	(a) Disconnect Launch and Orbit Relay No. 4 electrical connector. Jumper pins V and T. Disconnect Amp-Cal connector P5. Check for presence of ground at pin w of P5.	If ground is present, malfunction is indicated in Launch and Orbit Relay Panel No. 4. Refer to Launch and Orbit Relay Panel No. 4 Schematic, 45-78084. If ground is not present, proceed to probable cause No. 2.
	(2) Aux Damp Relay No. 1 failure (ASCS Relay Panel Assembly)	(a) Disconnect the ASCS Relay Panel Assembly electrical connector. Check for presence of ground at pin EE. (Jumper installed as in probable cause No. 1).	If ground is present, proceed to step (b). If ground is not present , proceed to probable cause No. 3
		(b) Jumper pins EE and DD of cable disconnected from ASCS Relay Panel. Check for presence of ground at Amp-Cal connector P5w.	If ground is present, malfunction is indicated in ASCS Relay Panel. Proceed to step (c). If ground is not present, proceed to probable cause No. 3.

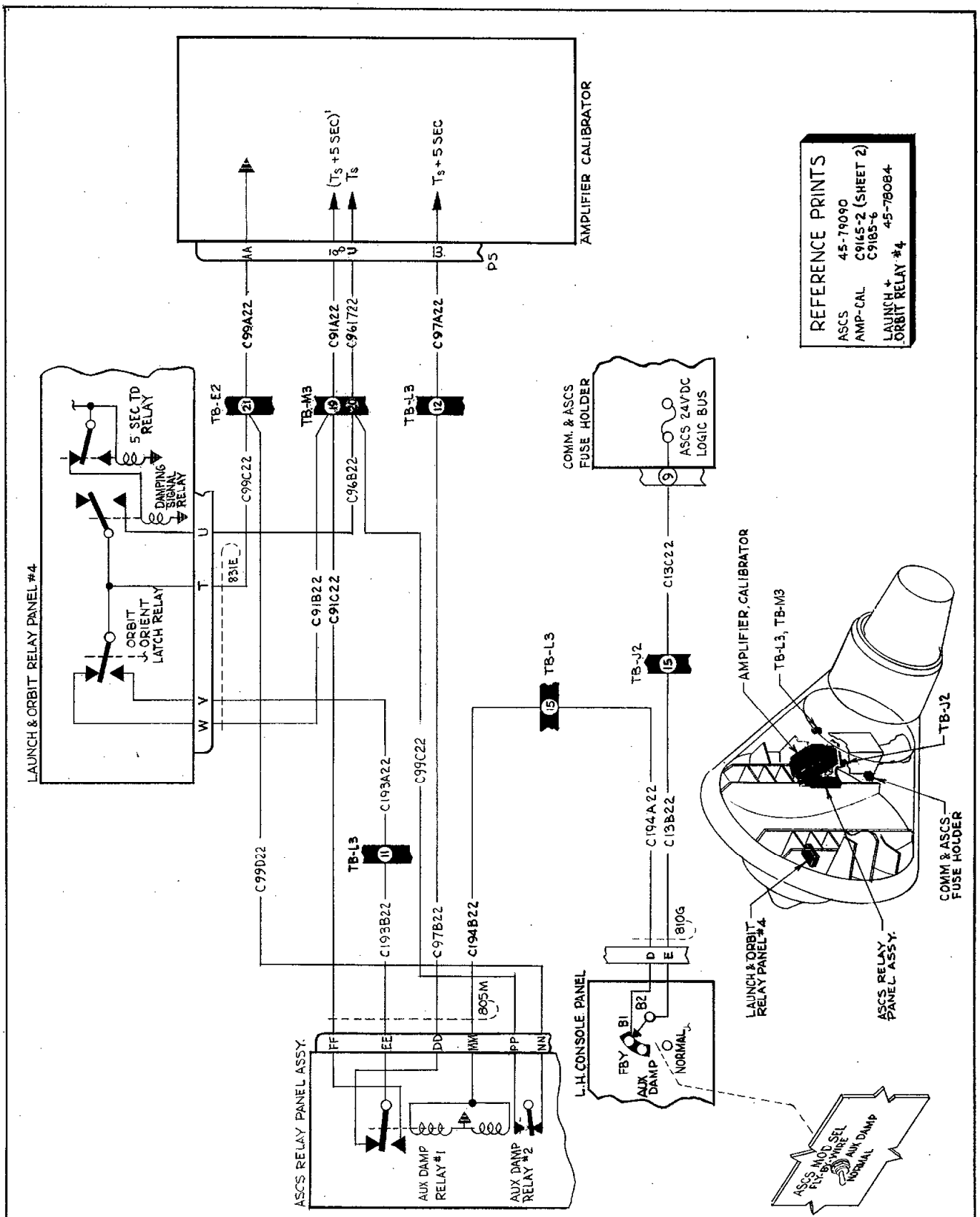


FIGURE 4-5 ASCS EXTERNAL SEQUENCE (TS AND TS+5 COMMAND)

MH45-12

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		(c) Check for presence of 24 V. D-C at pin MM of cable disconnected from ASCS Relay Panel. Voltage should not be present with MODE SEL switch in NORMAL.	If voltage is present, wiring malfunction is indicated between ASCS Relay Panel and MODE SEL switch, proceed to probable cause No. 3. If voltage is not present, Aux Damp Relay in ASCS panel has malfunctioned, remove and replace relay.
	(3) Capsule wiring malfunction.	Continuity check Capsule wiring between Amp-Cal connector P5, ASCS Relay Panel, and Launch and Orbit Relay Panel No. 4. Ref. Figure 4-5.	Continuity check normal-proceed to probable cause No. 4. Continuity check abnormal - repair wiring as necessary.
	(4) Defective Amp-Cal unit.	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
Retrograde (T_F command) inoperative from Capsule Sequential system. (T_F normal when simulated by Pre-Launch Tester).	(1) Retro Attitude Command Relay contact failure. (Retro-Grade Relay Panel No.2)	(a) Disconnect Retro-Grade Relay Panel No. 2 electrical connector. Check for presence of ground on pin z of disconnected cable.	If ground is present, proceed to step (b). If ground is not present, proceed to probable cause No. 2.
		(b) Jumper pin z of disconnected cable to pin H. With jumper connected, disconnect Amp-Cal connector P5. Check for presence of ground at P5x.	If ground is present, malfunction is indicated in Retro-Grade Relay Panel No. 2. Refer to Retro Grade Relay No. 2 Schematic, 45-78085.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			If ground is not present, proceed to probable cause No. 2.
	(2) Defective wiring between Amp-Cal and Retro-Grade Relay No. 2.	Perform continuity checks between Amp-Cal and Retro-Grade Relay Panel No. 2 as follows: Relay Panel — P5 z — AA H — x	Continuity checks normal, proceed to probable cause No. 3. Continuity checks abnormal, repair wiring as necessary.
	(3) Defective Amp-Cal unit. (Broken wire at J5x)	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
Retrograde (T_4 command) inoperative from both capsule Sequential System and Pre-Launch Tester.	(1) Defective Amp-Cal unit.	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
T_4+d4 command inoperative from Capsule Sequential System (function normal from Pre-Launch Tester)	(1) Retro-Fire Signal Relay contact failure (Retrograde Relay Panel No. 2)	(a) Disconnect Retro Grade Relay Panel No. 2 electrical connector. Check for presence of ground at pin z of disconnected cable.	If ground is present, proceed to step (b). If ground is not present, proceed to probable cause No. 2.
		(b) Jumper pin z of disconnected cable to pin AA. With jumper connected, disconnect Amp-Cal connector P5 and check for presence of ground at P5i.	If ground is present, malfunction is indicated in Retro-Grade Relay Panel No. 2. Refer to Retro-Grade Relay No. 2 Schematic, 45-78085.

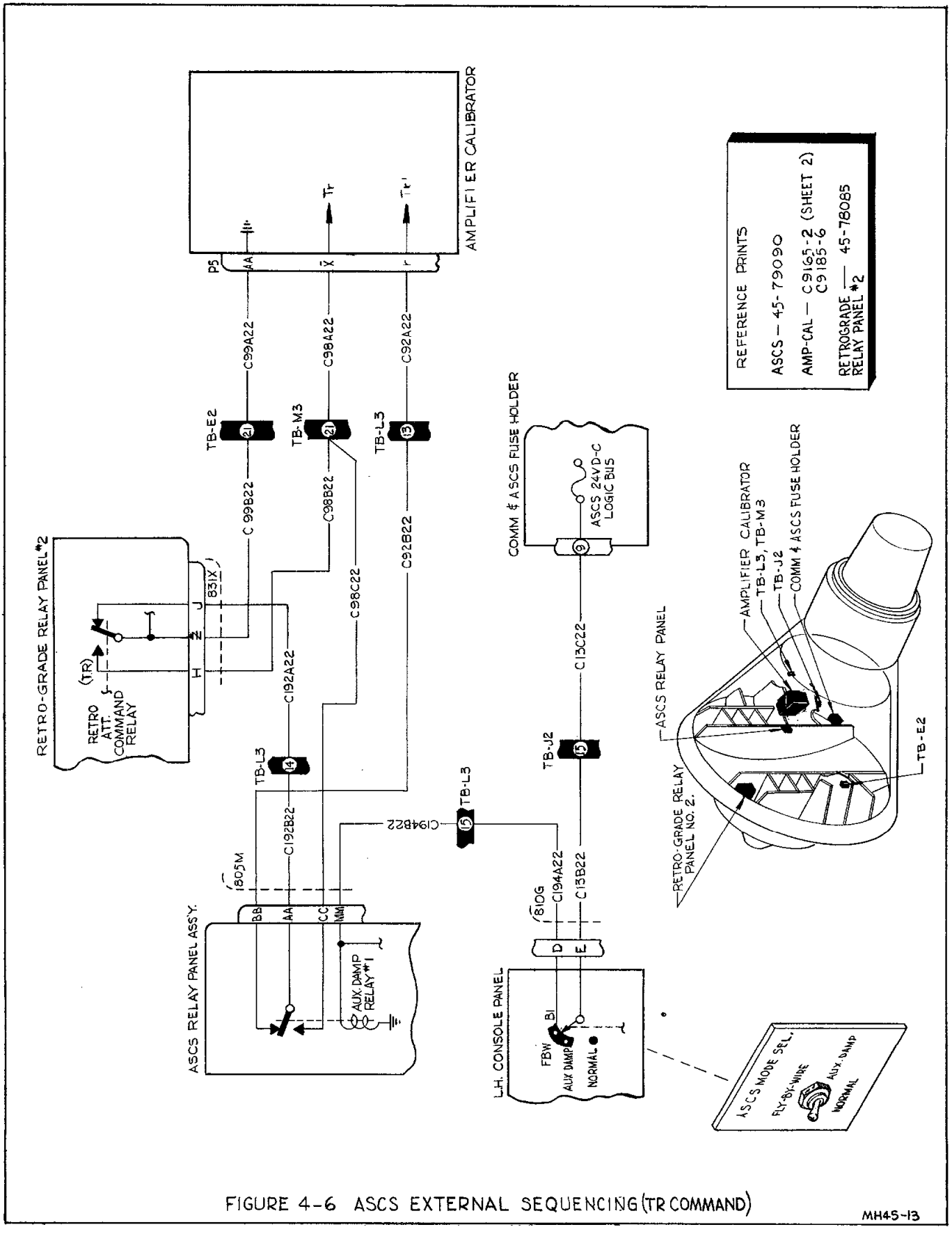


FIGURE 4-6 ASCS EXTERNAL SEQUENCING (TR COMMAND)

MH45-13

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			If ground is not present, proceed to probable cause No. 2.
	(2) Defective wiring between Amp-Cal and Retro-Grade Relay Panel No.2.	Perform continuity checks between Amp-Cal and Retro-Grade Relay Panel No. 2 as follows: Relay Panel — P5 z — AA AA — f	Continuity check normal-proceed to probable cause No.3. Continuity check abnormal - repair wiring as necessary.
	(3) Defective Amp-Cal unit (Broken wire at P5i)	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
T_r+d4 command inoperative from both Capsule Sequential and Pre-Launch Tester.	(1) Defective Amp-Cal unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.
T_{ab} Command inoperative from Capsule Sequential System (function normal from Pre-Launch Tester).	(1) Abort Rate Damping Signal Relay failure	(a) Disconnect the Launch and Orbit Relay Panel No. 4 electrical connector. Check for presence of ground at pin T of disconnected cable.	If ground is not present, proceed to probable cause No.2. If ground is present, proceed to step (b).
		(b) Jumper pin T of disconnected cable to pin R. With jumper connected, disconnect Amp-Cal connector P5 and check for presence of ground at P5j.	If ground is present, malfunction is indicated in Launch and Orbit Relay Panel No. 4. Refer to Launch and Orbit Relay Panel No. 4 Schematic, 45-78084.

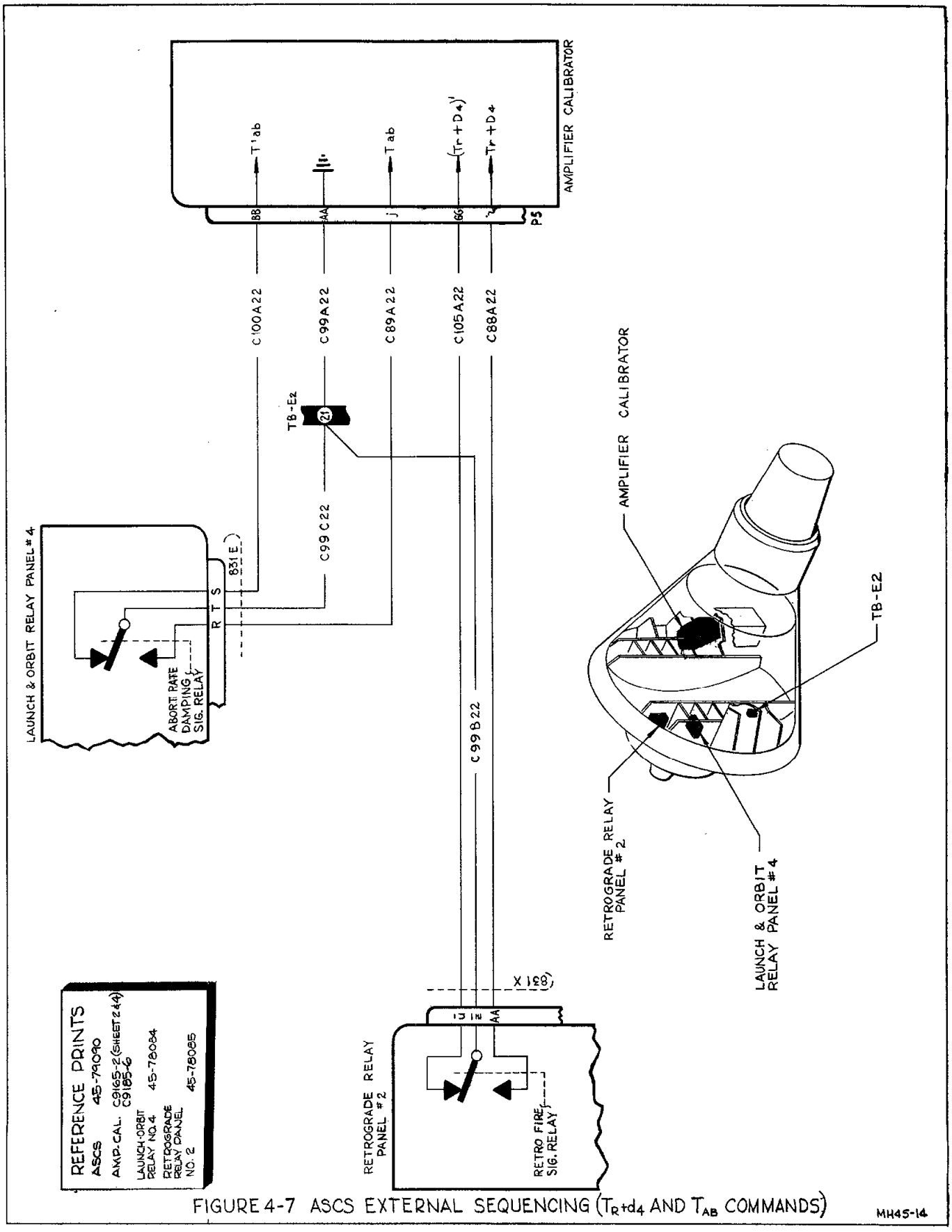


FIGURE 4-7 ASCS EXTERNAL SEQUENCING (T_R+d_4 AND T_{AB} COMMANDS)

MH45-14

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			If ground is not present, proceed to probable cause No. 2.
	(2) Defective wiring between Amp-Cal and Launch and Orbit Relay Panel No. 4.	Perform continuity check between Amp-Cal and Launch and Orbit Relay Panel No. 4 as follows: Relay Panel — P5 R — j T — AA	Continuity check normal, proceed to probable cause No. 3. Continuity check abnormal - repair wiring as necessary.
	(3) Defective Amp-Cal unit (Broken wire at J5j)	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and replace or repair Amp-Cal unit.
Tab Command inoperative from both Capsule Sequential System and Pre-Launch Tester.	Defective Amp-Cal unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove and repair or replace Amp-Cal unit.

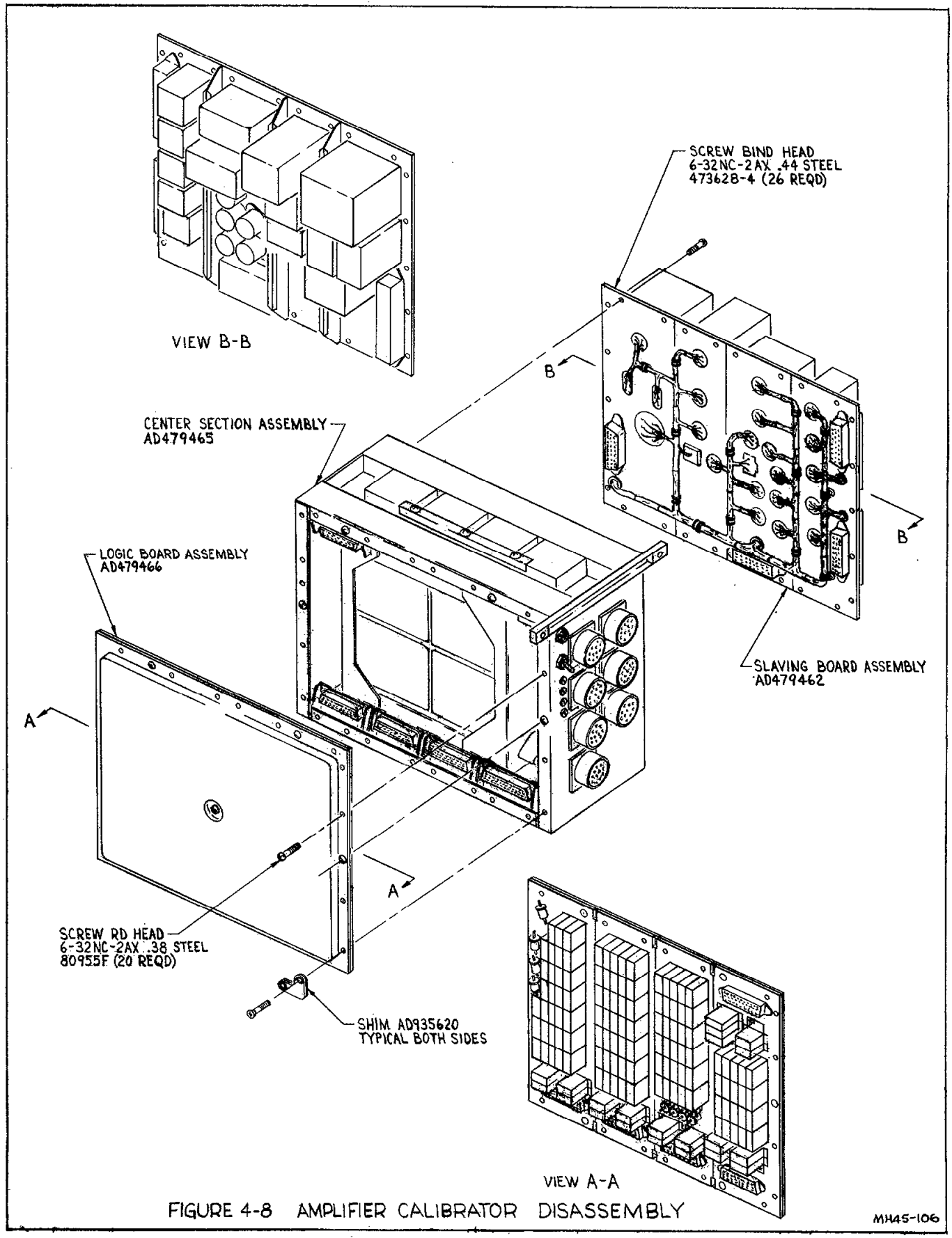


FIGURE 4-8 AMPLIFIER CALIBRATOR DISASSEMBLY

MH45-106

4-6. REPLACEMENT AND ADJUSTMENT

NOTE

Figures 4-9 through 4-11 are effective capsules 2 through 6.

4-7. Amplifier Calibrator

The Amplifier Calibrator is located on the bottom shelf, outboard of the left vertical web and immediately inboard of the Capsule inner wall. See Figure 4-9. Unit mounting is accomplished by two horizontal bars that extend across the forward end of the equipment and secure to the Capsule structure.

4-8. Removal

(a) The following equipment must be removed for access prior to actual removal of the Amplifier Calibrator.

(1) Main Instrument Panel (45-81000-1) Ref. Sec. 2.

(2) Satellite Periscope (45-86701-3) Ref. Sec. 12.

(3) Tape Recorder (45-88707) Ref. Sec. 13.

(b) Remove Panel Assembly (45-87700-3) for access by removing the two support mounting bolts.

(c) Swing the Panel Assembly aside and secure to Capsule structure.

(d) Disconnect the Amplifier Calibrator electrical connectors (5). Protect electrical connectors with plastic bags.

(e) Remove mounting nuts from bottom hold-on bar and remove bar.

(f) Remove mounting nuts from top hold-on bar.

(g) Remove both upper and lower (inboard side) hold-on brackets.

NOTE

Step (g) is necessary to allow front end of

Amplifier Calibrator to swing inboard, thereby allowing removal by sliding unit from between shelves.

(h) Remove Amplifier Calibrator from Capsule.

(i) Account for the following mounting hardware upon leaving Capsule.

(1) NAS 673V3 bolt

(1) NAS 673V10 bolt

(2) AN 960 DIOL washers

(4) NAS 673V2 bolts

(1) Hold-on bar and mounting nuts

(2) Hold-on brackets

4-9. Installation

See Figure 4-9.

4-10. Adjustment

This information will be supplied when available.

4-11. Directional Gyro

The Directional Gyro is located on the bottom shelf outboard of the right vertical web and immediately inboard of the Capsule inner wall. See Figure 4-10. The Directional Gyro is secured to a mounting bracket by three screws that attach to nut plates on the mounting bracket.

4-12. Removal

(a) The following equipment must be removed for access prior to actual removal of the Directional Gyro.

(1) Main Instrument Panel (45-81000-1) Ref. Sec. 2.

(2) Multiplexer (45-85700-45) Ref. Sec. 13.

(b) Disconnect the Directional Gyro electrical connector.

INSTALLATION

1. POSITION UNIT CORRECTLY ON SHELF
2. ASCERTAIN THAT ALIGNMENT PINS MATE WITH HOLES IN AMP-CAL UNIT
3. ASCERTAIN THAT SERRATED BRACKET MATES PROPERLY
4. INSTALL UPPER AND LOWER (INBOARD) HOLD-ON BRACKETS
5. INSTALL UPPER AND LOWER HOLD-ON BARS
6. CONNECT ELECTRICAL CONNECTORS
7. INSTALL PANEL ASSEMBLY 45-78090-1
8. PERFORM ASCS STATIC TEST PER SRDR 69

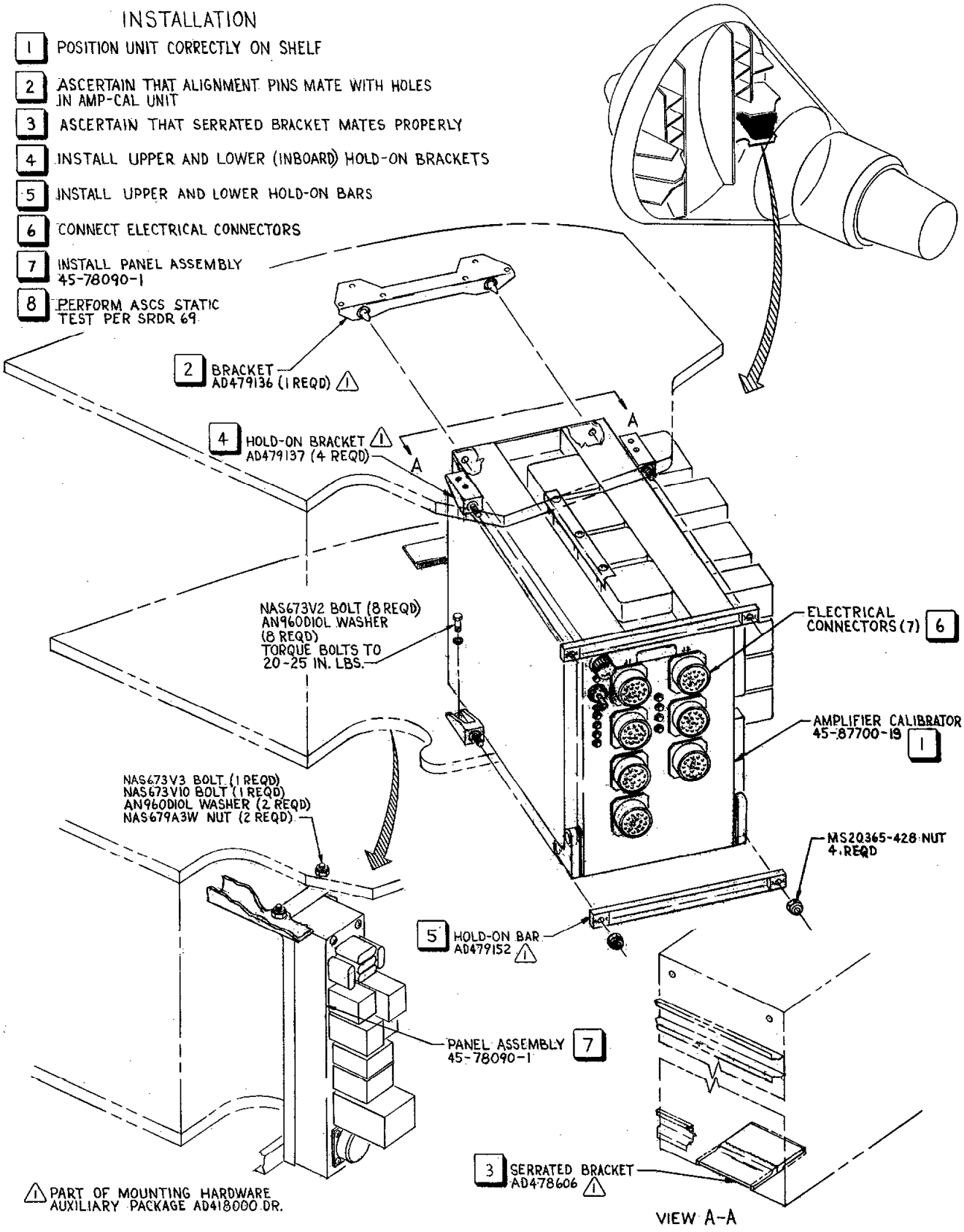


FIGURE 4-9 AMPLIFIER CALIBRATOR INSTALLATION MH45-29

(c) Protect the end of the electrical connector with a plastic bag.

(d) Remove the three AN 515C81216 mounting screws from the mounting bracket and remove gyro.

NOTE

Account for the following mounting hardware upon leaving capsule.

(3) AN515C8R16 screws

(3) AN 96008L washers

4-13. Installation

See Figure 4-10.

4-14. Adjustment

(a) Install Capsule in the ASCS Test Fixture (MDE45-61001-1).

(b) Make the following electrical connections between the Capsule and the MDE45-00007-1 Checkout Trailer.

(1) Umbilical Cable (Trailer to Capsule)

(2) ASCS GSE cabling to AMP-CAL connectors J1 and J2 (Trailer to Capsule through Hatch).

(3) Trailer to external power source (208 V. 60 cps).

(4) Trailer and Capsule to common earth ground.

(c) Connect the ASCS Test Fixture to external power source, 28 V. D-C, 115 V. 400 cps, and 220 V. 60 cps.

(d) Position the Capsule to zero Roll and Pitch as indicated by the Test Fixture Attitude indicators.

(e) Apply external power to Capsule and energize the ASCS system. (Gyros CAGED.)

(f) Allow six minute warm-up period.

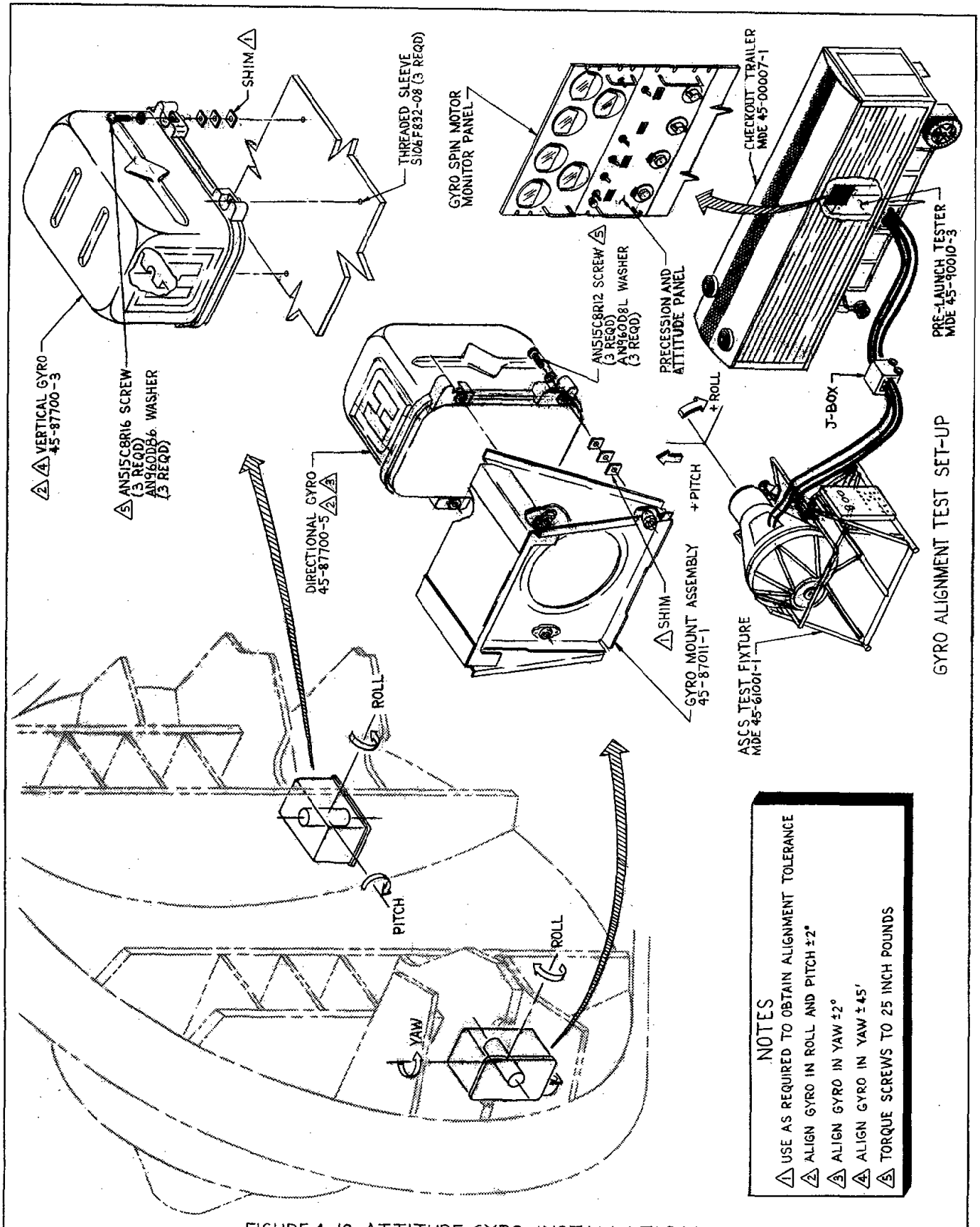


FIGURE 4-10 ATTITUDE GYRO INSTALLATION

MH45-46

(g) Check Gyro spin motors stabilized as indicated by the spin motor monitors on the Pre-Launch tester.

(h) Cycle the ASCS Test Fixture through the attitudes indicated by the following table 4-1. In each instance note the gyro output on the Pre-Launch Tester.

NOTE

Table 4-1 provides a method of checking Gyro alignment. As an example, if the Capsule is rotated in the roll plane, misalignment of the Directional Gyro in the X and Y axes becomes a function of yaw. Consequently, the misalignment (if any) will be indicated by the Pre-Launch Tester Yaw indicator. In the event an out-of-tolerance condition exists, the Gyro may be realigned by shimming of the mounting screws. See Figure 4-10.

TABLE 4-1

Plane of Rotation	Rotational Limit (Deg)	Dir. Roll Indication (Tol. in Deg.)	Yaw Indication (Tol. in Deg.)
ROLL	± 30	± 30	*
CAGE GYROS, ROTATE CAPSULE TO 90° CW ROLL POSITION			
Plane of Rotation	Rotational Limit (Deg.)	Dir. Roll Indication (Tol. in Deg.)	Yaw Indication (Tol. in Deg.)
YAW	± 30	*	± 30

* This information will be supplied when available.

(i) Remove Capsule from the ASCS Test Fixture.

(j) Secure all GSE equipment.

4-15. Vertical Gyro

The Vertical Gyro is located adjacent to the large pressure bulkhead on the bottom shelf, immediately outboard of the left vertical web. See Figure 4-10. The Vertical Gyro is mounted directly on the shelf by three mounting screws that attach to threaded sleeves embedded within the thickness of the shelf.

4-16. Removal

(a) The following equipment must be removed for access prior to actual removal of the Vertical Gyro.

(1) Main Instrument Panel (45-81000-1) Ref. Sec. 2.

(2) Satellite Periscope (45-86701-3) Ref. Sec. 12.

(3) Amplifier Calibrator (45-87700-19) Ref. Sec. 4.

(b) Disconnect the Vertical Gyro electrical connector.

(c) Protect the end of the electrical connector with a plastic bag.

(d) Remove the three AN515C8R16 mounting screws.

(e) Remove Gyro from capsule.

NOTE

Account for the following mounting Hardware upon leaving Capsule.

(3) AN515C8R16 screws

(3) AN96008L washers

4-17. Installation

See Figure 4-10.

4-18. Adjustment

(a) Install Capsule in the ASCS Test Fixture (MDE45-61001-1).

(b) Make the following electrical connections between the Capsule and the MDE45-00007-1 Checkout Trailer.

(1) Umbilical Cable (Trailer to Capsule).

(2) ASCS GSE cabling to AMP-CAL connectors J1 and J2 (Trailer to Capsule through Hatch).

(3) Trailer to external power source (208 V. 60 cps).

(4) Trailer and Capsule to common earth ground.

(c) Connect the ASCS Test Fixture to external power source, 28 V. D-C, 115 V. 400 cps, 220 V. 60 cps.

(d) Position the Capsule to zero Roll and Pitch as indicated by the Test Fixture attitude indicators.

(e) Apply external power to Capsule and energize the ASCS system. (Gyros CAGED.)

(f) Allow six minute warm-up period.

(g) Check gyro spin motors stabilized as indicated by spin motor monitors on the Pre-Launch Tester (Checkout Trailer).

(h) Cycle the ASCS Test Fixture through the attitudes indicated by the following Table 4-2. In each instance note the Gyro output on the Pre-Launch Tester.

NOTE

Table 4-2 provides a method of checking gyro alignment. As an example, if the capsule is rotated in the roll plane, misalignment of the Vertical Gyro in the y and z axes becomes a

function of pitch. Consequently, the misalignment (if any) will be indicated by the Pre-Launch Tester Pitch indicator. In the event an out-of-tolerance condition exists, the Gyro may be realigned by shimming of the mounting screws. See Figure 4-10.

TABLE 4-2

Plane of Rotation	Rotational Limit (Deg.)	Pitch Indication (Tol. in Deg.)	Directional Roll Indication (Tol. in Deg.)
ROLL	± 30	*	± 30
PITCH	± 30	± 30	

* This information will be supplied when available.

(i) Remove Capsule from ASCS Test Fixture.

(j) Secure all GSE equipment.

4-19. Rate Gyros

The rate gyros are mounted outboard of the left vertical web, between the two bottom shelves, in the vicinity of the Amplifier Calibrator. See Figure 4-11. All three gyros employ simple four point mounting. The yaw and pitch gyros attach to threaded sleeves embedded within the thickness of the mounting shelf. The Roll gyro, due to its orientation, is attached to a mounting bracket, which in turn is secured to the mounting shelf.

4-20. Removal - Yaw

(a) Prior to actual removal of the yaw rate gyro, the following equipment must be removed for access.

(1) Amplifier-Calibrator 4587700-19. Ref. Section 4.

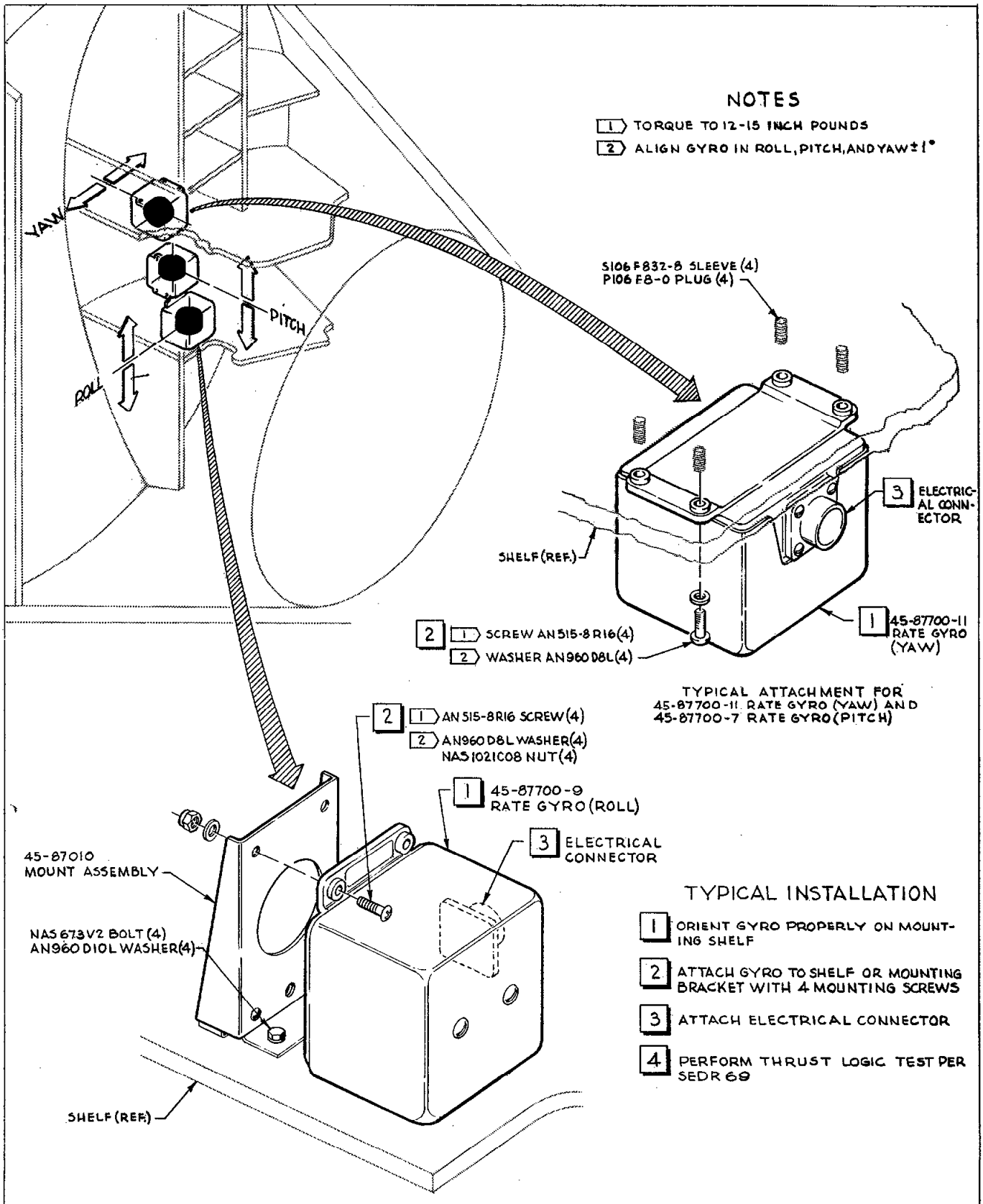


FIGURE 4-11 RATE GYRO INSTALLATION

MH45-117

(b) Disconnect the gyro electrical connector. Protect the electrical connector with a plastic bag.

(c) Remove the four mounting screws that attach unit to shelf.

(d) Remove gyro from Capsule.

NOTE

Account for the following hardware upon leaving Capsule.

(4) AN5158R16 screws

(4) AN960D8L washers

4-21. Installation - Yaw

See Figure 4-11.

4-22. Removal - Roll

(a) Prior to actual removal of the roll rate gyro, the following equipment must be removed for access.

(1) Panel Assembly 4578090-1. Ref. Section 4.

(b) Disconnect the gyro electrical connector. Protect the electrical connector with a plastic bag.

(c) Remove the four mounting screws that secure unit to mounting bracket.

(d) Remove gyro from Capsule.

NOTE

Account for the following hardware upon leaving capsule.

(4) AN515-8R16 screws

(4) AN960D8L washers

(4) NAS 1021C08 nuts

4-23. Installation - Roll

See Figure 4-11.

4-24. Removal - Pitch

(a) Prior to actual removal of the pitch rate gyro, the following equipment must be removed for access.

(1) Panel Assembly 4578090-1. Ref. Section 4.

(b) Disconnect the gyro electrical connector. Protect the electrical connector with a plastic bag.

(c) Remove the four mounting screws that secure unit to mounting shelf.

(d) Remove gyro from Capsule.

NOTE

Account for the following hardware upon leaving Capsule.

(4) AN5158R16 screws

(4) AN960D8L washers

4-25. Installation - Pitch

See Figure 4-11.

4-26. HORIZON SCANNER SYSTEM

4-27. TROUBLE SHOOTING

The following trouble shooting charts are to be utilized in conjunction with Figure 4-12, Horizon Scanner Wiring Diagram. Figure 4-12 is basically a -303 assembly with -305 deviations noted. Assembly effectivity vs capsule number is as follows:

Capsule No.	Assembly No.
2	305
3 through 20	303

Prior to commencing the more detailed trouble shooting procedures, the following items should be checked.

(1) Check all accessible electrical connectors secure and free of obvious damage.

(2) Check the suspected component for obvious damage.

(3) Re-run test to prevent the possibility of operator error.

(4) Verify that GSE equipment is operating correctly.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Horizon Scanner will not slave vertical gyro pitch gimbal.	(1) Defective scanner	(a) Attempt to slave vertical pitch gimbal with Pre-Launch Tester.	If pitch gimbal slaves from Pre-Launch Tester, proceed to step (b). If pitch gimbal fails to slave from Pre-Launch Tester, proceed to probable cause No. 2.
		(b) Substitute a pitch scanner known to be operative.	If malfunction is corrected, replace scanner. If malfunction still exists, a wiring malfunction is indicated between scanner and Amp-Cal unit. Refer to Figure 4-12.
	(2) Defective Gyro (Vertical)	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro. If malfunction still exists, proceed to probable cause No. 3.
	(3) Defective Amp-Cal Unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove Amp-Cal unit, repair or replace. If malfunction still exists, proceed to probable cause No. 4.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(4) Defective wiring between gyro and Amp-Cal unit	Continuity check torquer excitation wiring (outer gimbal) and outer gimbal slaving wiring per Figure 4-1.	Repair wiring as necessary.
Horizon Scanner will not slave vertical gyro roll gimbal.	(1) Defective scanner	(a) Attempt to slave Vertical Roll gimbal with Pre-Launch Tester.	If pitch gimbal slaves from Pre-Launch Tester, proceed to step (b). If pitch gimbal fails to slave from Pre-Launch Tester, proceed to probable cause No. 2.
		(b) Substitute a pitch scanner known to be operative.	If malfunction is corrected, replace scanner. If malfunction still exists, a wiring malfunction is indicated between scanner and Amp-Cal unit. Refer to Figure 4-12.
	(2) Defective Gyro (Vertical)	Substitute a gyro known to be operative.	If malfunction is corrected, replace gyro. If malfunction still exists, proceed to probable cause No. 3.
	(3) Defective Amp-Cal Unit	Substitute an Amp-Cal unit known to be operative.	If malfunction is corrected, remove Amp-Cal unit, repair or replace.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			If malfunction still exists, probable cause No. 4.
	(4) Defective wiring between gyro and Amp-Cal unit.	Continuity check torquer excit. wiring (outer gimbal) and outer gimbal slaving wiring per Figure 4-1.	Repair wiring as necessary.
Scanner head rotation does not commence at time zero.	(1) Time zero relay failed to energize (Launch & Orbit Relay No. 3).	Disconnect Launch & Orbit Relay No. 3 electrical connector. Check for 115 V. AC between pin k and ground of disconnected cable. Bypass Time Zero Relay by jumpering pin j to k and Z to g of disconnected cable. Scanner head should rotate.	If scanner head rotates, malfunction is indicated in Launch & Orbit Relay No. 3. Refer to Launch and Orbit Relay No. 3 Schematic, 45-78084. If scanner does not rotate, proceed to probable cause No. 2.
	(2) Retro Rocket separation relay contact failure.	Disconnect Retrograde Relay Panel No. 1 electrical connector. Jumper pins y & z of disconnected cable. Scanner head should rotate.	If scanner head rotates, malfunction is indicated in Retro Grade Relay Panel No. 1. Refer to Retrograde Relay Panel No. Schematic, 45-78085. If scanner head does not rotate, proceed to probable cause No. 3.
	(3) Defective wiring in ASCS Relay Panel.	Disconnect ASCS Relay Panel electrical connector. Jumper pins L & i of disconnected cable. Scanner head should rotate.	If Scanner head rotates, malfunction is indicated in ASCS Relay Panel. Continuity check per Figure 4-12.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Horizon Scanner Slaving function inoperative at time of tower separation.			If scanner head does not rotate, proceed to probable cause No. 4.
	(4) Wiring malfunction between Scanner and A-C bus.	Continuity check wiring per Figure 4-12.	Repair wiring as necessary.
	(1) Tower Separation Sensor Relay No. 2 failure.	(a) Place Pre-Launch Tester "B" Test Select and H.S. Signal switches to B1 and ON positions.	If gyro slaves, proceed to step (b).
		(b) Remove Launch & Orbit Relay Panel No. 3 electrical connector. Jumper the following pins on the disconnected cable. h-w j-k z-q Disconnect Amp-Cal connector P3. Check for 24 V. DC at P3M.	Voltage present at P3M - malfunction is indicated in Launch and Orbit Relay Panel No. 3. Refer to Launch and Orbit Relay No. 3 Schematic, 45-78084. Voltage not present at P3M - proceed to probable cause No. 2.
	(2) Defective H.S. 30 Second time delay Relay (ASCS Relay Panel)	(a) Disconnect ASCS Relay Panel electrical connector. Jumper pins h and g of disconnected cable. Check for 24 V. dc at Amp-Cal connector P3M.	Voltage present at P3M - malfunction is indicated in ASCS Relay Panel. Refer to figure 4-12. Voltage not present - proceed to probable cause No. 3.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(3) Wiring malfunction between Amp-Cal connector and attitude gyro bus.	Continuity check wiring per Figure 4-12.	Repair wiring as necessary.
Scanner "ON-OFF" orbital programming inoperative.	(1) Programmer failure (Instrumentation Package "C")	Disconnect Instrumentation Package "C" electrical connector (Branch No. 802K). Jumper pins z and j of disconnected cable (Capsule in orbit mode) check for Scanner head rotation.	Scanner head rotates - malfunction is indicated in Package "C" programmer. Refer to section 13 for corrective action.
Void signal inoperative from scanner.	Defective scanner	(a) Disconnect Amp-Cal connector P4. With Scanner fully operational, check for 6 V. D-C at pins w (roll) and DD (pitch) of disconnected cable. NOTE Scanner Germanium window should be covered with constant temperature material to assure void signal output.	Void signal not present - proceed to step (b).
		(b) Check continuity between Scanner and Amp-Cal connector P4.	Continuity check normal - remove and replace scanner. Continuity check abnormal - repair wiring as necessary.

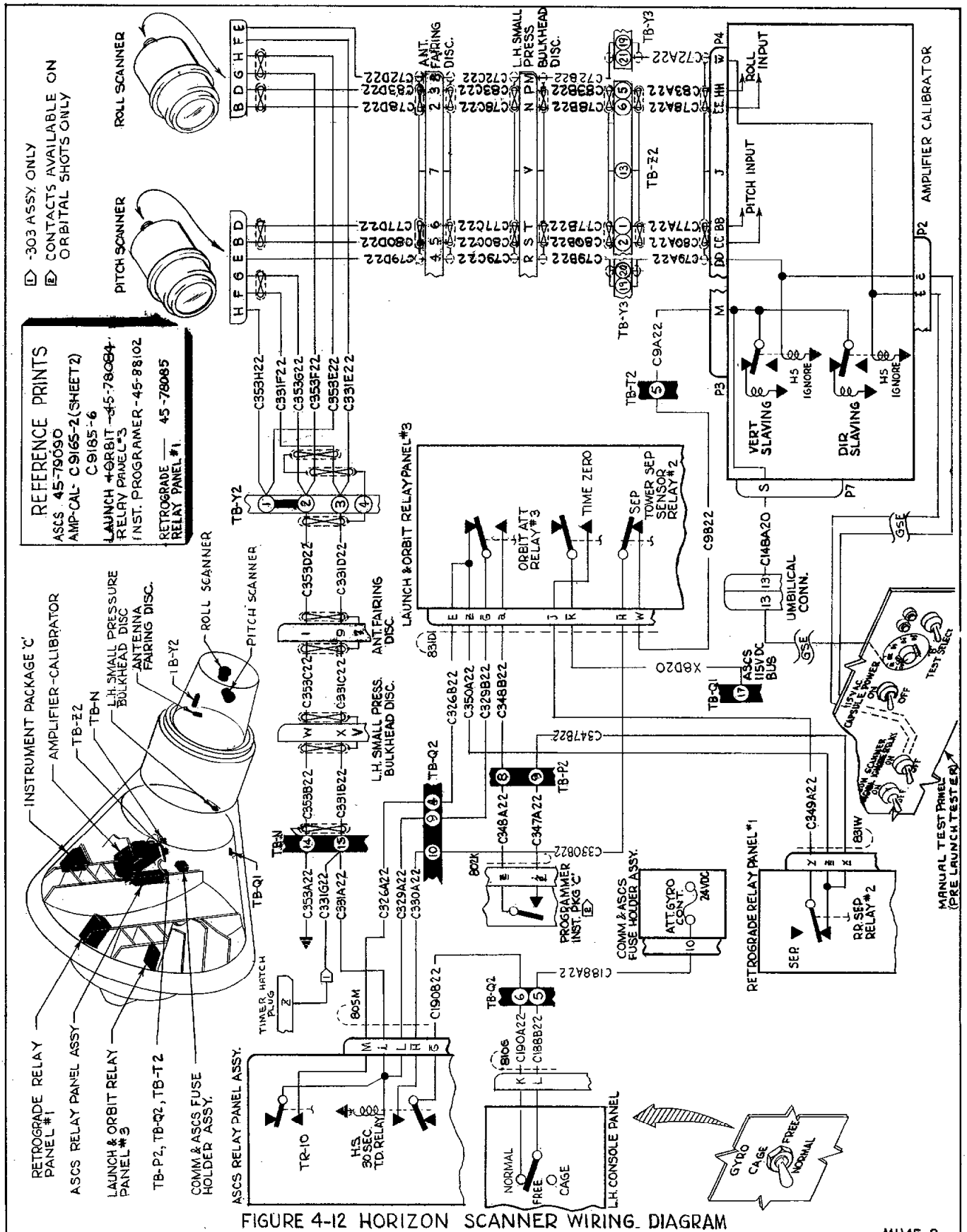


FIGURE 4-12 HORIZON SCANNER WIRING DIAGRAM

MH45-8

4-28. REPLACEMENT AND ADJUSTMENT

4-29. Pitch - Scanner

The Pitch Scanner is located in the forward end of the Antenna Fairing Assembly (right side as viewed by the Astronaut). Bracket type mounting is employed. The Pitch Scanner is accessible through the Antenna Fairing front end only, requiring removal of the front cover assembly. See Figure 4-13.

4-30. Removal

(a) Remove the four mounting bolts that secure the De-Stabilizing flap to the Antenna Fairing.

(b) Remove the four mounting screws from the Drogue Shoot cover.

(c) Remove the 24 screws that encircle the outer edge of the Antenna Fairing front cover assembly.

(d) Remove Antenna Fairing front cover assembly.

(e) Disconnect the Pitch Scanner electrical connector.

(f) Remove the six mounting bolts that secure the scanner to the mounting bracket.

(g) Remove Scanner from Antenna Fairing.

4-31. Installation

See Figure 4-13.

4-32. Roll Scanner

The Roll Scanner is located in the forward end of the Antenna Fairing Assembly (top right side as viewed by the Astronaut). Bracket type mounting is employed. The Roll Scanner is accessible through the Antenna Fairing front end only, requiring removal of the front cover assembly. See Figure 4-13.

4-33. Removal

(a) Remove the four mounting bolts that secure the De-Stabilizing flap to the Antenna Fairing.

(b) Remove the four mounting screws from the Drogue Shoot cover.

(c) Remove the 24 screws that encircle the outer edge of the Antenna Fairing front cover.

(d) Remove Antenna Fairing front cover assembly.

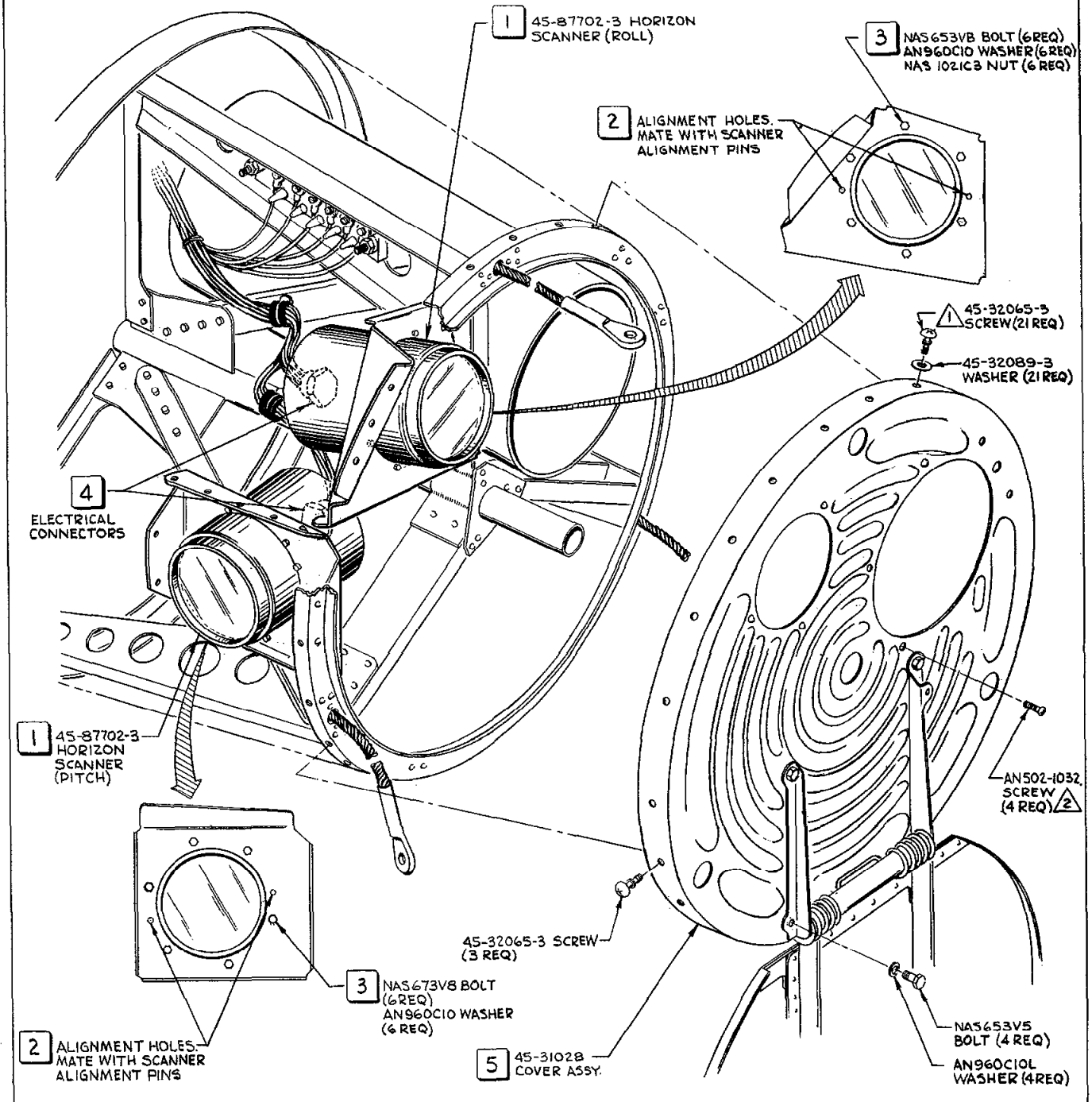
(e) Disconnect the Roll Scanner electrical connector.

(f) Remove the six mounting bolts that secure the scanner to the mounting bracket.

(g) Remove Scanner from Antenna Fairing.

4-34. Installation

See Figure 4-13.



1. POSITION SCANNER IN MOUNTING BRACKET
2. MATE SCANNER ALIGNMENT PINS WITH BRACKET ALIGNMENT HOLES
3. SECURE SCANNER TO MOUNTING BRACKET WITH (6) MOUNTING BOLTS
4. CONNECT ELECTRICAL CONNECTORS
5. INSTALL COVER ASSEMBLY 45-31028
6. PERFORM HORIZON SCANNER CHECKS, SEDR 69

NOTES
1. TORQUE 15 TO 25 IN. LBS.
2. TORQUE TO 6 IN. OUNCES

FIGURE 4-13 HORIZON SCANNER INSTALLATION

MH49-30

4-35. REACTION CONTROL SYSTEM

4-36. TROUBLE SHOOTING

The following trouble shooting charts are to be utilized in conjunction with the simplified wiring diagrams shown in Figures 4-14 and 4-15.

CAUTION

In some instances, trouble shooting of the RCS system involves handling H_2O_2 "conditioned" lines and components. In such an event, the precautions and handling procedures listed in Paragraph 4-37 should be observed.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Fuel Quantity Indicator inoperative. (Auto or manual.)	(1) Pressure Transducer has failed.	(a) Disconnect transducer electrical connector. Check resistance between pins A and C of transducer (5K ohms). Ascertain that some resistance other than infinity exists between pins B-C and B-A of transducer.	Resistance check normal - proceed to step (b). Resistance check abnormal - remove and replace transducer.
		(b) Connect variable pressure source to transducer. Vary pressure from 0 to 3000 psi. Check corresponding Resistance change between pins B-C, and B-A.	Resistance check normal - proceed to probable cause No.2. Resistance check abnormal - remove and replace transducer.
	(2) Loss of excitation to transducer.	(a) Disconnect transducer electrical connector. With telemetry power on, check for 3 V. D-C between pins C and A of disconnected cable.	Voltage check normal - proceed to probable cause No. 3. Voltage check abnormal-proceed to step (b).
		(b) Continuity check wiring between transducer and Instrument Package "A". See Figure 4-14.	Continuity check normal - malfunction indicated in Instrument Package "A". Refer to Section 13 for corrective action. Continuity check abnormal - repair wiring as necessary.

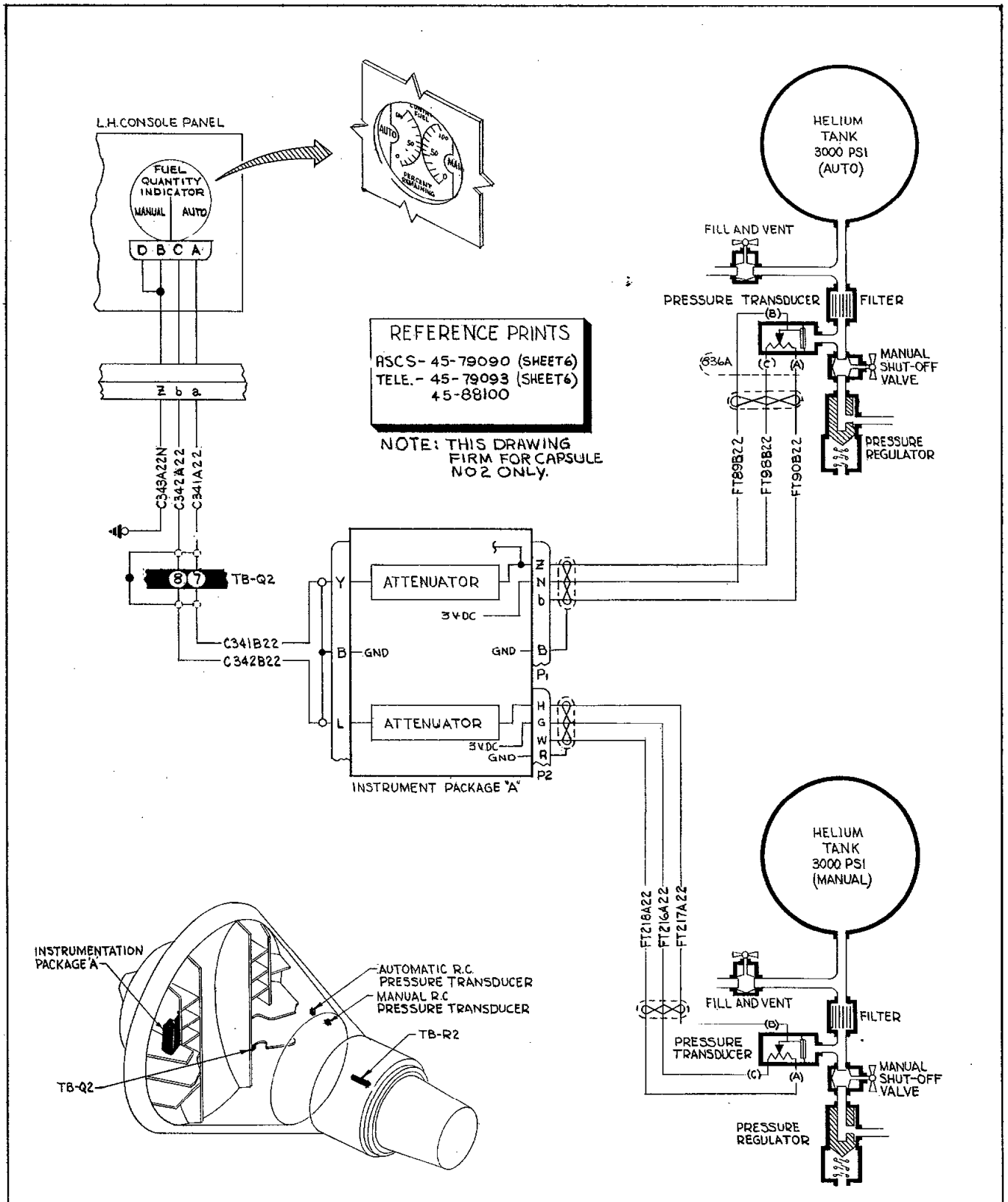


FIGURE 4-14 RCS GAS QUANTITY INDICATOR WIRING DIAGRAM

MH45-44

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(3) Defective wiring between Instrument Package "A" and Fuel indicator.	Continuity check wiring per Figure 4-14.	Continuity check normal-proceed to probable cause No. 4. Continuity check abnormal-repair wiring as necessary.
	(4) Defective Fuel Quantity Indicator.	Substitute an indicator known to be operative.	If malfunction is corrected-replace indicator.
Thrust nozzle does not fire when commanded by control stick (fly by wire mode). Nozzle functions normal from ASCS (normal mode). NOTE Procedure is typical for any nozzle failure (auto system).	(1) Limit Switch Failure	Check continuity across the applicable switch contacts with Control Handle positioned such that contacts should be closed. See Figures 4-15 and 4-17.	Continuity check normal - proceed to probable cause no. 2. Continuity check abnormal - remove and replace limit switch. NOTE Prior to replacement of switch, check possibility of incorrect installation or adjustment of same. Repair wiring as necessary.
	(2) Defective wiring between Amp-Cal unit and Limit Switch.	Continuity check wiring per Figure 4-15.	
All nozzle firing inoperative from Control Stick (fly by wire mode).	Fly-By-Wire fuse blown (communication and ASCS fuse holder).	None	Replace fuse block.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Yaw nozzle (low left, auto sys) fails to fire when commanded from ASCS and control stick (fly by wire position). NOTE Isolation procedure is typical for any nozzle failure under specified conditions	Solenoid control valve has malfunctioned.	NOTE Prior to commencing trouble shooting of the RCS circuitry, ascertain that the applicable light on the Automatic Test Panel (checkout van) or the RCS monitor panel (blockhouse) did illuminate when command was given. This will assure that trouble is in RCS system and not ASCS.	
		(a) Remove shingle covering yaw thrust nozzle. Break the H_2O_2 line connection between the solenoid valve and thrust chamber. Use compatible line and connect output of solenoid to a container such that flow of H_2O_2 from solenoid may be monitored. Repeat test and observe output of solenoid.	If flow of H_2O_2 through solenoid is normal, proceed to probable cause No. 2. If there is no flow of H_2O_2 through solenoid, proceed to step (b).
		(b) Disconnect solenoid electrical connector. Repeat test and check for 24 V. D-C between pins A and B of disconnected cable when command is given.	If voltage is not present, proceed to probable cause No. 3. If voltage is present, remove and replace solenoid valve. NOTE Further assurance that solenoid valve has malfunctioned may be determined by checking resistance between pins A and B of solenoid (approximately 32 ohms).

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	(2) Thrust chamber catalyst bed failure.	See step (a) above.	Remove and replace thrust chamber.
	(3) Defective wiring between Amp-Cal unit and solenoid control valve	Continuity check wiring per Figure 4-15.	Repair wiring as necessary.
Expulsion of air at bubbler device does not cease during Bladder Permeability Test.	Ruptured Bladder (Hydrogen Peroxide Tank)	None	Remove and replace bladder.
Vacuum indication does not hold during Bladder Permeability Test.	Ruptured Bladder (Hydrogen Peroxide Tank)	(a) Disconnect the RCS Servicing Trailer from Capsule. Ascertain that the trailer vacuum pump and associated plumbing will hold a vacuum.	If the Trailer vacuum pump and associated plumbing show no evidence of leakage, proceed to step (b). If the Servicing Trailer does not hold a vacuum, repair as necessary and repeat Bladder Permeability Test.
		(b) Remove heat shield. Connect Service Trailer vacuum source directly to H_2O_2 tank peroxide outlet. Rerun Bladder Permeability Test.	Vacuum does not hold - remove and replace bladder. Vacuum holds - malfunction is down stream of tank. Isolate down stream lines in sections to locate leak. Repair as necessary.
"Out-of-Tolerance" leakage indicated during H_2O_2 system Hydrostatic Leak Test (Automatic Sys.)	(1) H_2O_2 pressure relief valve has failed ($\frac{1}{4}$" yaw or pitch).	(a) Check for visible sign of water at common overboard drain for Yaw and Pitch relief valve. See Figure 4-19 for location of drain.	If leakage is indicated at drain, proceed to step (b). If no leakage is indicated at drain, proceed to probable

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			cause No. 2.
		(b) Break connection at downstream side of both relief valves and check for indication of leakage.	Remove and replace valve as applicable. Repeat Hydrostatic Leak Test.
	(2) H_2O_2 pressure relief valve has failed (3/8" or $\frac{1}{4}$" roll)	(a) Check for visible sign of water at common overboard drain for the Main and Roll relief valves. See Figure 4-20 for location of drain.	If leakage is indicated at drain, proceed to step (b). If no leakage is indicated at drain, proceed to probable cause No. 3.
		(b) Remove heat shield. Break connection at down-stream end of both Main and Roll relief valves and check for indication of leakage.	Remove and replace valve as applicable. Repeat Hydrostatic Leak Test.
	(3) Solenoid control valve has failed.	(a) Remove the Automatic System thrust nozzle pressure plugs one at a time. In each instance check for visible sign of water in nozzle.	In the event leakage is indicated at a thrust nozzle, proceed as follows: (1) Pulse the applicable solenoid valve 3 times. (2) Dry nozzle thoroughly. (3) Re-run Hydrostatic Leak Test. (4) If leakage is still indicated at nozzle, replace the applicable solenoid valve and repeat Hydrostatic Leak Test.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			If no leakage is indicated at thrust nozzles, proceed to step (b).
		(b) Place the Yaw, Roll, and Pitch manual push-pull shut-off valves in the PULL-OFF position.	If the leak persists, leakage up stream of the manual shut-off valves is indicated. If the leak stops, proceed to step (c).
		(c) Open one push-pull valve at a time.	If the leak recurs, it is then isolated to that particular branch of the system. Remove the necessary cover and/or equipment and repair the leak. Repeat Hydrostatic leak test to verify fix.
"Out-of-Tolerance" leakage indicated during H_2O_2 Hydrostatic Leak Test (manual system).	(1) H_2O_2 Relief Valve has failed (down stream on manual push-pull valve).	(a) Check for visible sign of water at overboard drain for relief valve. See Figure 4-19 for location.	If leakage is indicated at drain, remove and replace relief valve. Repeat Hydrostatic Leak Test. If leakage is not indicated at overboard drain, proceed to probable cause No. 2.
	(2) H_2O_2 relief valve has failed (up stream of Manual push-pull shutoff valve).	(a) Check for visible sign of water at overboard drain for relief valve. See Figure 4-20 for location of drain.	If leakage is indicated at overboard drain, remove heat shield and replace relief valve. Repeat Hydrostatic Leak Test.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
			If leakage is not indicated at overboard drain, proceed to probable cause No. 3.
	(3) Manual proportional control valve leaking.	(a) Remove the Manual system thrust nozzle pressure plugs one at a time and check for visible sign of water in nozzle.	If leakage is indicated at a nozzle, proceed to step (b). If no leakage is indicated at thrust nozzles, proceed to step (c).
		(b) Check the applicable proportional control valve for proper rigging. See Paragraph 4-56.	If the proportional control valve rigging is correct, proceed as follows: (1) Cycle the Control Handle through the applicable plane such that the proportional valve is actuated through its entire range. (2) Dry thrust nozzle thoroughly. (3) Repeat Hydrostatic Test. (4) If leak persists, replace the proportional control valve. (5) Repeat Hydrostatic Test to verify fix.
		(c) Place the Manual push-pull valve in the PULL-OFF position.	If the leak persists, leakage upstream of the manual push-pull shutoff valve is indicated.

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CORRECTIVE ACTION	If the leak stops, it is isolated between the push-pull valve and the proportional control valves. Remove the necessary cover and/or equipment and repair the leak. Repeat Hydrostatic Test to verify fix.
ISOLATION PROCEDURE	
PROBABLE CAUSE	
INDICATION	

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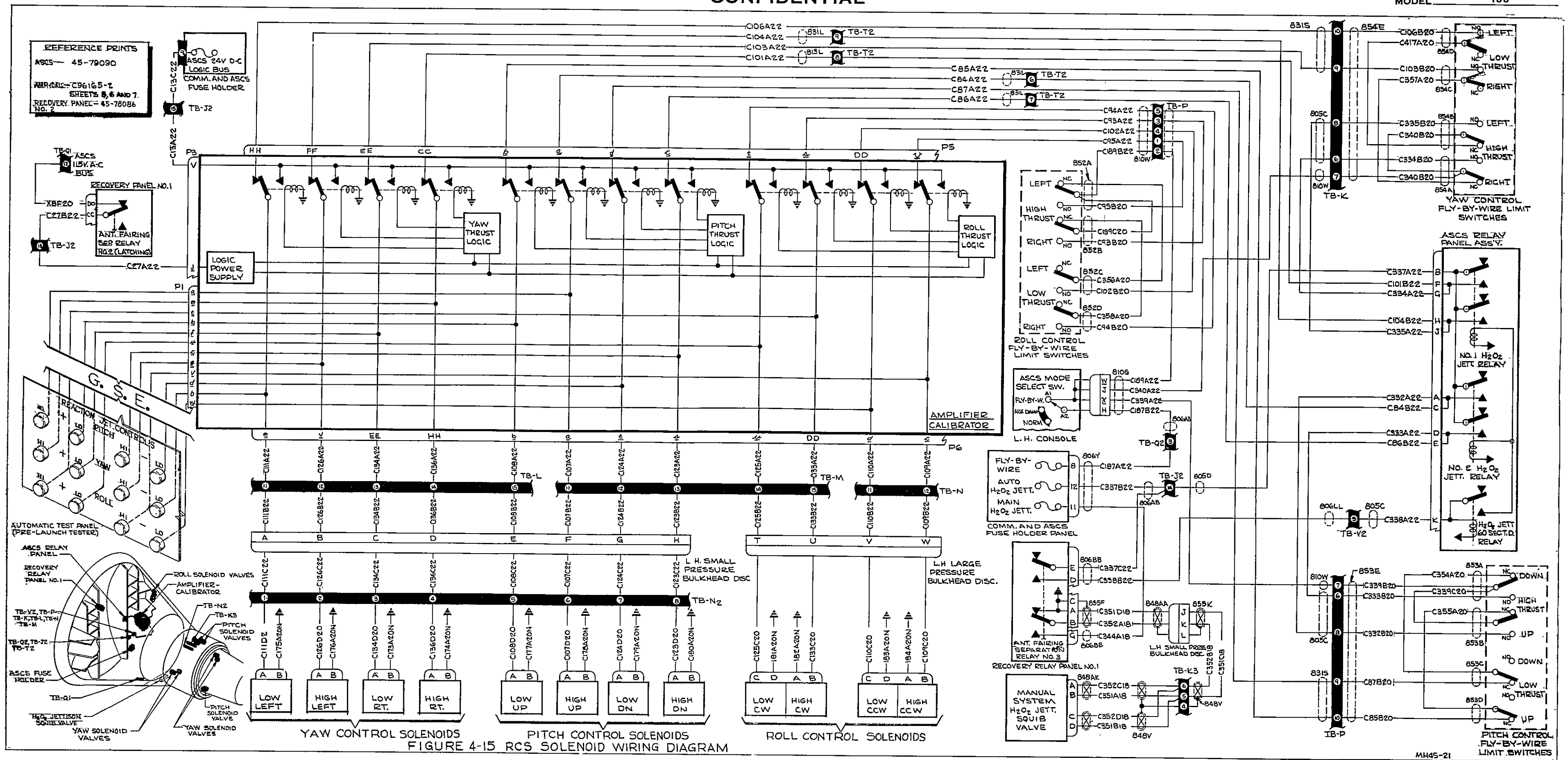

FIGURE 4-15 RCS SOLENOID WIRING DIAGRAM

MH45-21

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4-37. REPLACEMENT AND ADJUSTMENT

4-38. General

The removal and installation of various components in the RCS system is a relatively simple process once the proper access has been accomplished. In general, detailed removal and installation procedures are omitted in lieu of a brief outline in conjunction with illustrations. Major components of the RCS system are broken up into four basic groups, according to their location in the Capsule: components mounted on the large pressure bulkhead, Pressurization (helium system) components located between the large and small pressure bulkhead on the Capsule inner wall, thrust chambers, and those components mounted in the recovery compartment, between the inner wall and shingles. These areas are covered in Figures 4-16 through 4-20.

4-39. Although the actual mechanical process involved during removal and installation of components is relatively simple, the special handling techniques and precautions involved are quite the opposite. The necessity of "cleanliness" while handling components cannot be over-emphasized. It is to be noted that a single dirty thumbprint contains the potential of rendering a complete system non-useable and may cause many hours of delay while the cause of excessive decomposition is located. The following Paragraph, 4-40, specifies the minimum precautionary measures to be taken when removing, handling, and installing RCS system components.

4-40. Standard Practices and Precautions

(a) Exercise extreme care against contaminating wetted surfaces during removal and installation.

NOTE

A "wetted surface" is one that is subjected to H_2O_2 when installed in the system. Example: inside of a valve or line.

(b) Wear sterilized rubber gloves when handling H_2O_2 components.

(c) Wash all tools used on H_2O_2 components in Nacconal detergent solution, dry thoroughly and place on tray covered with clean aluminum foil.

(d) Tools of non-compatible materials such as lead or brass must not be used on H_2O_2 components.

(e) Cover all ports, fittings and tube assemblies with aluminum foil or peroxide conditioned caps of compatible material immediately upon disconnect to prevent possible contamination of wetted surfaces.

(f) Lubricate all threaded fittings and gaskets with Fluorolube FS light grade oil.

(g) Torque all nuts, bolts and fittings per respective Torque Tables unless otherwies specified. See Tables 4-3 through 4-7.

(h) Extreme care should be exercised to minimize applied torque loads and bending moments to weld joints and bracketing when installing system components.

(i) Tube fittings should not be tightened more than "finger tight" until both ends of the line and all interconnecting lines are in position. Refer to tables 4-3 and 4-4 unless otherwise specified.

(j) Extreme care should be exercised to prevent damage to installed

lines and hardware during subsequent installation or removal of components.

CAUTION

When working in area common to Explosive jettison valves, remove valve electrical connector and install shorting plug.

4-41. Conditioning of Contaminated Components

In the event a component is suspected of being contaminated due to mishandling or accidental contact with surfaces incompatible with H_2O_2, the following procedure shall be used to determine the degree of contamination.

Degree of contamination.

(a) Using passivated tongs, wash suspected part in Nacconal detergent solution.

(b) Rinse in distilled H_2O a minimum of three times.

(c) Place suspected part in a clear glass continer of 90% H_2O_2 for a minimum period of two hours. In case of functional components, only normally wetter surfaces shall be subjected to H_2O_2.

NOTE

If there is no evolution of gas during this period, the part may be considered compatible and therefore satisfactory for use with 90% H_2O_2. If there is evolution of bubbles during this surveillance period, the component shall be pre-treated and reconditioned per Paragraphs 4-42 and 4-43.

NOTE

In general, the more complicated components with various working parts, should be replaced and returned to the vendor for reconditioning.

4-42. Pretreatment

Pretreatment refers to the cleaning of parts by degreasing and treatment with alkali and/or acid to remove all surface impurities which will affect compatibility with 90% H_2O_2. Pretreatment instructions are given for the various material types used in the system as follows:

Aluminum - Untreated

(a) Vapor degrease to remove surface oil and dirt. Allow part to dry. Handle with clean, dry gloves.

(b) Immerse part in solution of 0.4% sodium hydroxide (by weight) in distilled water for 60 minutes at room temperature.

NOTE

If machined or lapped surfaces are on the component, immerse for five minutes only.

(c) Thoroughly rinse in potable (drinking) water only. Shake off excess water.

(d) Immerse part in a dilute nitric acid solution (equal parts commercial 80% nitric acid and distilled water) for one hour at room temperature.

(e) Rinse thoroughly in distilled water.

(f) Blow dry with filtered (oil and water free) nitrogen.

(g) Package in polyethylene bag until ready for conditioning.

Aluminum - Anodized and Aluminate Hardkoted

(a) Vapor degrease only sufficiently to remove any oils or grease from handling.

(b) Wash, with agitation, in approximately 1% Nacconal solution at 100° - 120° for 20 minutes.

(c) Rinse thoroughly in distilled water.

(d) Blow dry with filtered (oil and water free) nitrogen.

(e) Package in polyethylene bag until ready for conditioning.

CAUTION

Caustic or acid solutions should never come in contact with anodized or handkoted surfaces.

Stainless Steel - Cast and Welded Parts

(a) Vapor degrease to remove oil and grease.

(b) Allow to air dry.

(c) Immerse in Oakite alkaline cleaner for five minutes at 180° F.

(d) Rinse thoroughly in hot potable (drinking) water. Handle with clean rubber gloves. Drain excess water.

(e) Immerse in pickling solution of 30 ± 5% HNO_3 with 2.2 ± .2% HF in water for 60 minutes at 130° F.

(f) Rinse in cold potable (drinking) water.

(g) Immerse in concentrated nitric acid (commercial 70% by weight) for five hours.

(h) Rinse in distilled water.

(i) Blow dry with filtered (oil and water free) nitrogen.

(j) Place part in polyethylene bag until ready for conditioning.

NOTE

If castings contain machined surfaces (lapped seats), then treat according to procedure for non-welded and machined parts.

Stainless Steel - Non-Welded and Machined Parts

(a) Vapor degrease to remove oil and grease.

(b) Allow to air dry.

(c) Immerse in Oakite alkaline cleaner for five minutes at 180° F.

(d) Rinse thoroughly in potable (drinking) water. Handle with clean gloves.

(e) Immerse in concentrated nitric acid (commercial 70% by weight) for five hours.

(f) Rinse thoroughly in distilled water.

(g) Blow dry with filtered (oil and water free) nitrogen.

(h) Package in polyethylene bag until ready for conditioning.

Plastics

All plastic materials are washed with agitation in a 1% (approximate) solution of Nacconal NR at 110° - 120° F for 10 minutes. Handle with clean tongs or clean rubber gloves and rinse thoroughly in distilled water. Shake excess water from surface and blow dry with clean, filtered nitrogen.

4-43. Conditioning

Conditioning refers to the exposure of pretreated parts to dilute and concentrated Hydrogen Peroxide. Exposure to dilute (35%) peroxide determines the reliability of the pretreatment process and will indicate whether the part is satisfactory for further exposure to con-

centrated (90%) H_2O_2.

35% H_2O_2 Conditioning

The pretreated parts will be exposed to 35% H_2O_2 in special polyethylene or pyrex containers or trays. The parts will be arranged in such a manner that a minimum of $1\frac{1}{2}$ inches remains between each part. The trays will then be covered with aluminum foil or polyethylene sheeting to prevent dirt and dust from falling into peroxide. Except for periodic inspection and removal of failed parts, the conditioning baths will not be disturbed for 24 hours.

(a) Fill clean tray with 35% H_2O_2 sufficient to cover parts at least $\frac{1}{2}$ inch. Check to see that no foreign matter is in tray to cause decomposition.

(b) Remove pretreated part from polyethylene bag with clean tongs or clean, rubber gloves and lower part into the H_2O_2.

NOTE

There will be an initial period of gassing and bubbling when parts are first wetted by H_2O_2.

(c) Cover tray with clean aluminum foil or polyethylene sheet.

(d) At the end of 45-60 minute period, examine parts without removing them from solution. It is permissible to "rock" the part with clean tongs to release accumulated gas bubbles. Note whether "streamers" of gas are forming from the part. If no streamers appear, parts will be checked approximately once an hour for first 5 to 6 hours. If streamers appear during first hour, the part should be closely watched. Should streaming continue from a

"wetted" surface or increase during second hour, the part should be removed for inspection and reprocessing. If streamers stop during the second hour, the part need not be removed. Strong gassing from an "unwetted" surface will be grounds to remove a part so as not to contaminate the H_2O_2 and spoil the conditioning of other parts. Conditioning in 35% H_2O_2 shall last 24 hours.

(e) Parts which have successfully passed conditioning in the 35% H_2O_2 will then be conditioned in 90% H_2O_2. Handle the part with clean tongs or clean rubber gloves, flush in distilled water and shake excess water from part.

NOTE

Not more than one hour should elapse between removal of part from 35% H_2O_2 conditioning and placing them in 90% H_2O_2. If more than one hour must elapse between operations, parts must be completely dried by blowing with clean, dry filtered nitrogen and packaged in polyethylene bags.

90% H_2O_2 Conditioning

Parts will be conditioned separately in 90% H_2O_2. Small components may be placed in individual beakers or polyethylene trays.

(a) Place the part in 90% H_2O_2 using clean tongs or clean rubber gloves. Cover container with aluminum foil or clean polyethylene sheet.

NOTE

There will be an initial reaction which may last for approximately 30 minutes.

(b) Once initial gassing ceases, the H_2O_2 will remain calm except for an occasional bubble. Streamers or excessive gassing should not appear. Remove any part which does not calm down after one hour.

(c) Conditioning in 90% H_2O_2 will last for 24 hours.

(d) At the end of 24 hour period, remove part and flush thoroughly with fresh, distilled water.

(e) Blow dry with clean, filtered nitrogen.

(f) Package in polyethylene bag.

4-44. Thrust Chambers

The Pitch and Yaw thrust chambers are mounted in the forward end of the Capsule cylindrical section, and are positioned such that the desired reaction is obtained upon nozzle firing. See Figure 4-16. The Roll thrust chambers are mounted on each side of the Capsule conical section, adjacent to the heat shield. Simple clamp and bracket type mounting is employed. Although the actual removal and installation procedure is relatively simple, the precautions involved in handling H_2O_2 components must be observed. See Paragraph 4-37.

4-45. Removal

The following procedure is a brief outline to be used in conjunction with Figure 4-16.

Typical - Yaw and Pitch

(a) Ascertain that the RCS system is "dry".

(b) Remove the applicable shingle. Reference Section 2.

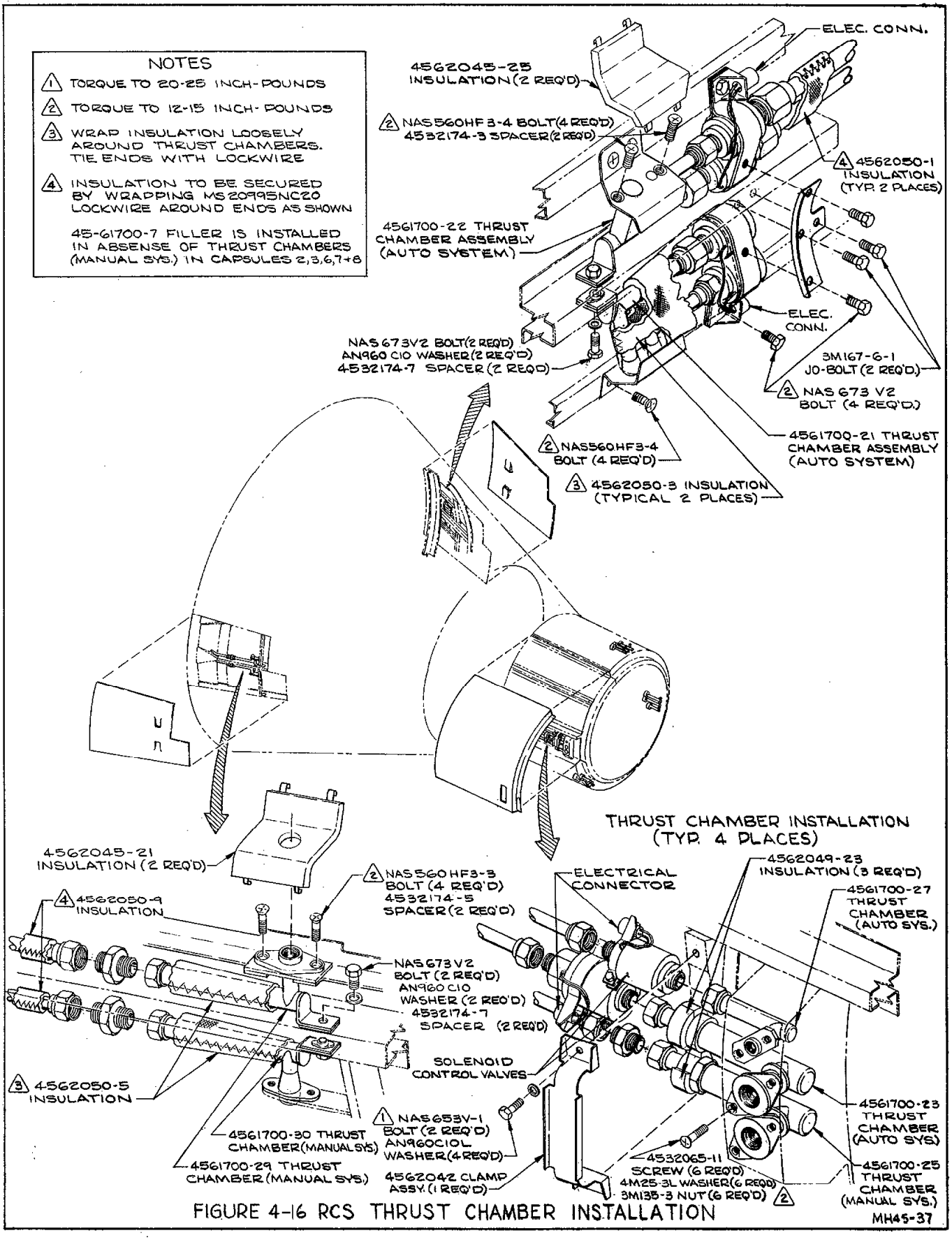

FIGURE 4-16 RCS THRUST CHAMBER INSTALLATION

(c) Remove clamp assembly, upstream end of thrust chamber.

(d) Remove nozzle mounting bolts that attach nozzle to the capsule structure.

(e) Disconnect the thrust chamber coupling nut between the thrust chamber and solenoid valve or H_2O_2 supply line as applicable.

(f) Remove thrust chamber.

CAUTION

Protect disconnected ends of lines and components with clean aluminum foil or compatible protective cap.

Typical - Roll (Auto Sys.)

(g) Ascertain that the RCS system is "dry".

(h) Remove the applicable shingle. Reference Section 2.

(i) Remove thrust chamber insulation.

NOTE

The one and six pound nozzles are removed as a shingle unit.

(j) Remove mounting screws that secure the nozzles to clamp assembly.

(k) Remove the mounting bolt that attaches the downstream end of the thrust chamber to the capsule structure.

(l) Disconnect both thrust chamber coupling nuts between chamber and solenoid valve.

(m) Slide thrust chamber assembly from under clamp and remove from Capsule.

CAUTION

Protect disconnected ends of lines and components with clean aluminum foil or compatible protective cap.

Typical - Roll (Manual Sys.)

(n) Ascertain that the RCS system is "dry".

(o) Remove the applicable shingle. Reference Section 2.

(p) Remove thrust chamber insulation.

(q) Remove mounting screws that attach nozzle to mounting bracket.

(r) Remove mounting bolt that secures thrust chamber to capsule structure.

(s) Disconnect coupling nut between thrust chamber and H_2O_2 supply line.

(t) Slide thrust chamber free of slot in mounting bracket and remove from Capsule.

CAUTION

Protect disconnected ends of lines and components with clean aluminum foil or compatible protective cap.

4-46. Installation

See Figure 4-16.

4-47. Fly-By-Wire Limit Switches

The Fly-By-Wire Limit Switches are bracket mounted to the manual control linkage. See Figure 4-17. Due to the simple type of mounting employed , detailed removal procedures are not necessary, and may be accomplished by referring to Figure 4-17.

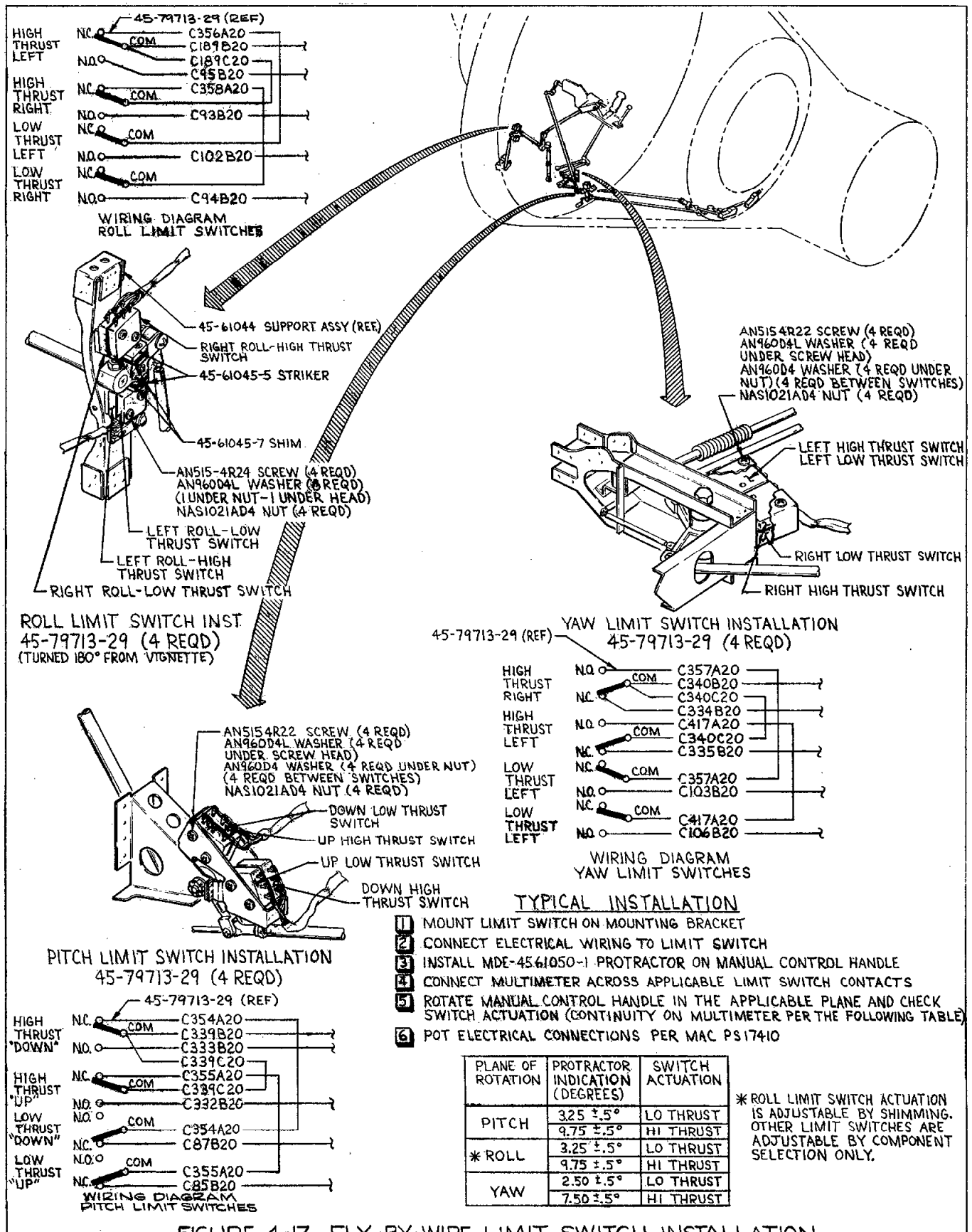

FIGURE 4-17 FLY-BY-WIRE LIMIT SWITCH INSTALLATION

4-48. Removal

See Figure 4-17

4-49. Installation

See Figure 4-17.

4-50. RCS Pressurization Components

The RCS system pressurization components are located on the Capsule inner wall, left side, immediately behind the main instrument panel. See Figure 4-18. All pressurization components are located in this area with the exception of two helium relief valves and two jettison valves mounted on the large pressure bulkhead. See Figure 4-20.

4-51. Removal

Due to the relatively simple type mounting employed, detailed removal and installation procedures are unnecessary. All components are accessible upon removal of the main instrument panel and periscope. See sections 2 and 12 for removal of these items.

4-52. Installation

See Figure 4-18.

4-53. RCS Components - Conical Section

The RCS Components - conical section are those components mounted in the extreme forward end of the Capsule conical section, immediately forward of the small pressure bulkhead. See Figure 4-19. Simple clamp and bracket type mounting is utilized for all components.

4-54. Removal

Due to the relatively simple type of mounting utilized, detailed removal procedures are unnecessary. In general, the area of component location is accessible from inside the capsule; in some cases it may

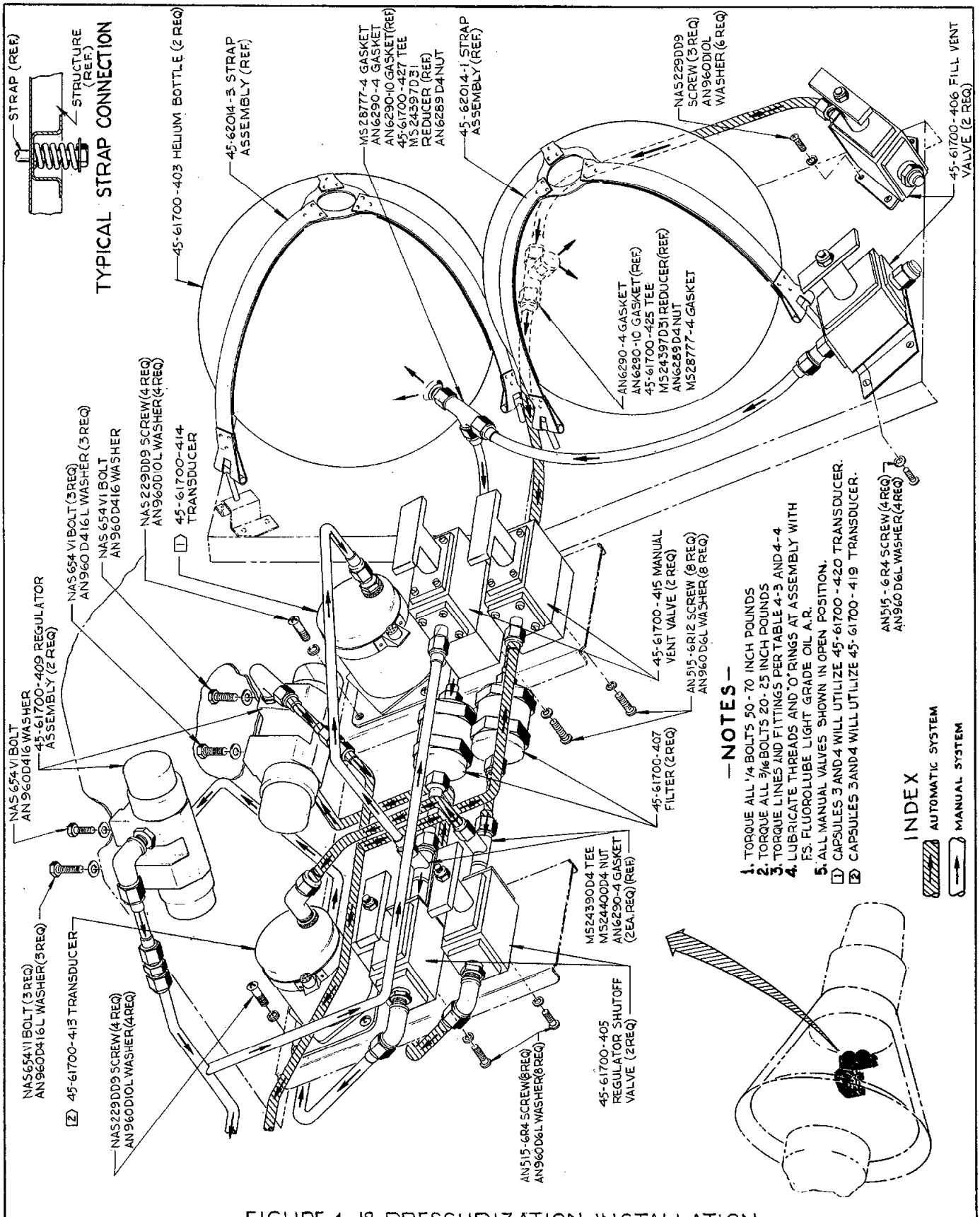

FIGURE 4-18 PRESSURIZATION INSTALLATION

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become desirable to remove the applicable shingle such that a particular part is accessible for both sides. If desirable, depending upon the particular part being removed, the main instrument panel and periscope may be removed for access. See Sections 2 and 12.

CAUTION

When removing and installing H_2O_2 components and lines, observe all precautions specified in Paragraph 4-37.

4-55. Installation

See Figure 4-19.

4-56. Adjustment

Upon replacement of a Proportional Control Valve (Figure 4-19), the following adjustment should be performed to determine the correct alignment of the input arm (bell crank) with the valve shaft at the operational flow neutral valve position.

(a) With the input arm (bell crank) positioned on the valve shaft, rotate the shaft in either direction until the motion is arrested by the valve stop.

(b) Mark this point through the input arm clevis hole.

(c) Rotate the shaft in the opposite direction from that of step (a) until further motion is arrested by the valve stop.

(d) Mark this point through the input arm clevis hole.

NOTE

These points are reference fixes and represent

ITEM	PART NUMBER	NOMENCLATURE
1	45-61700-51	H_2O_2 CHECK VALVE
2	45-61700-45	H_2O_2 PROPORTIONAL CONTROL VALVE
5	45-61700-41	MANUAL PUSH-PULL SHUTOFF VALVE
6	45-61700-49	H_2O_2 RELIEF VALVE
8	45-61700-49	H_2O_2 RELIEF VALVE
10	45-61700-45	H_2O_2 PROPORTIONAL CONTROL VALVE
11	45-61700-47	H_2O_2 JETTISON VALVE (SQUIB ACTUATED)
3 & 7		H_2O_2 SUPPLY TO YAW THRUST CHAMBERS
4 & 9		H_2O_2 SUPPLY TO PITCH THRUST CHAMBERS

NOTES

MANUAL SYSTEM EFFECTIVE CAPSULE *4&5

AUTOMATIC SYSTEM EFFECTIVE CAPSULES *2,3,4,5,6,7,8

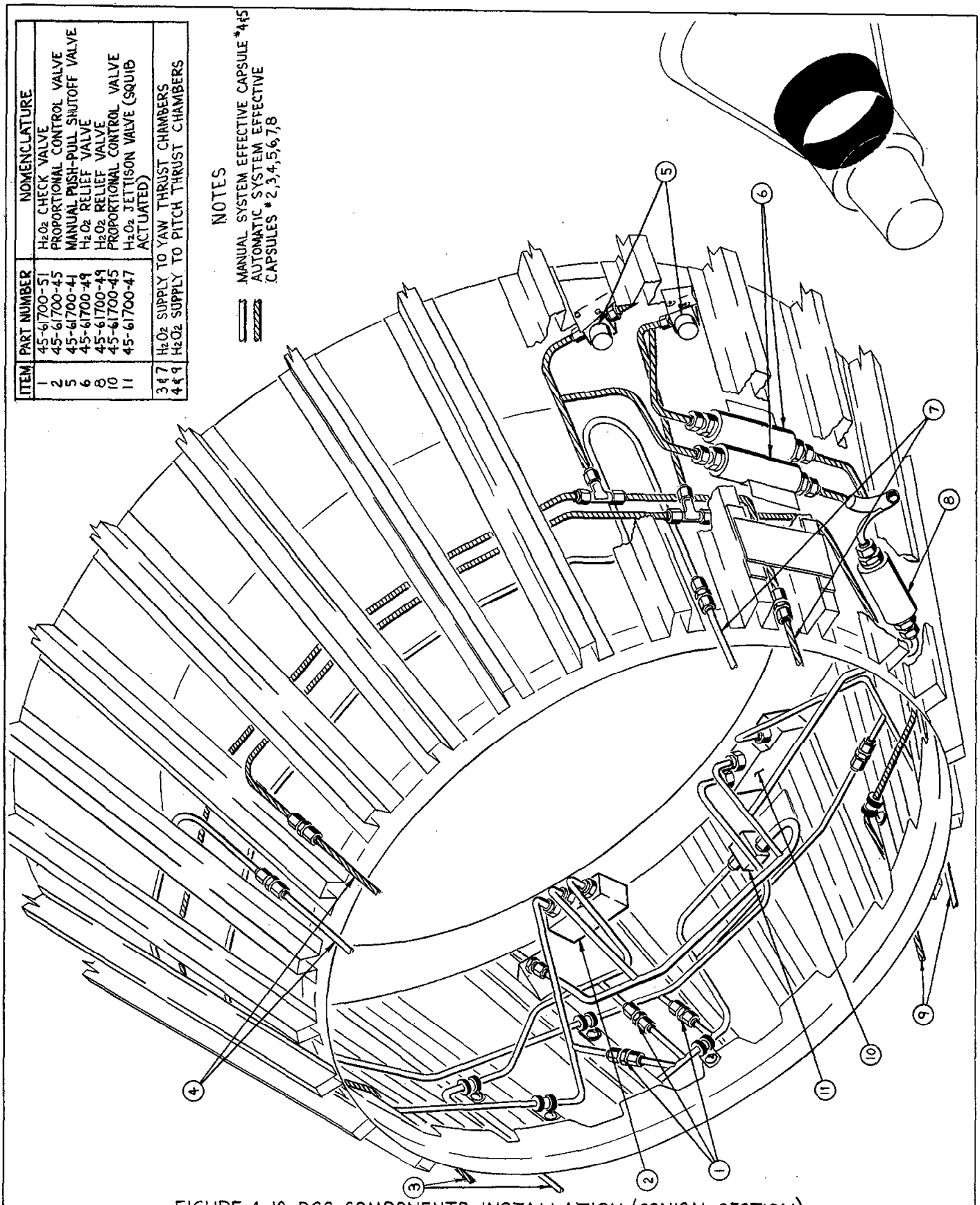


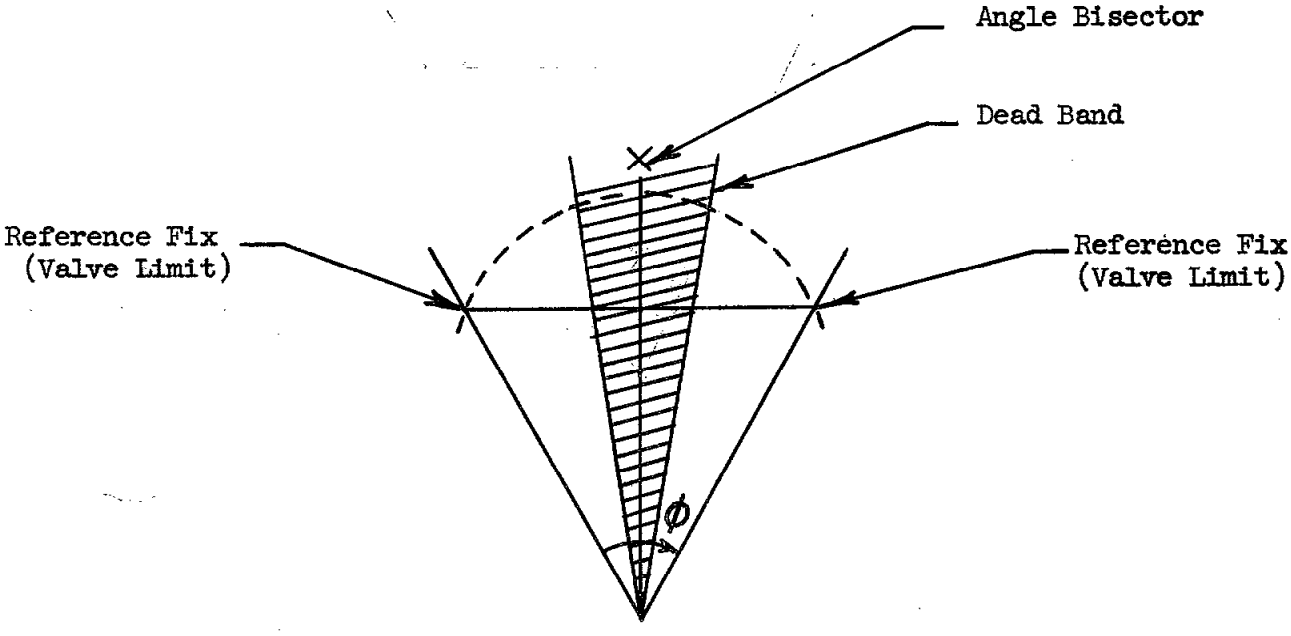
FIGURE 4-19 RCS COMPONENTS INSTALLATION (CONICAL SECTION)

MH45-42

the points of maximum rated flow through the respective sides of the valve.

(e) Bisect the angle formed by the reference fixes and the center of the valve shaft. This angle (ϕ) should approximate $33.4 \pm .2^{\circ}$.

(f) Rotate the valve shaft by means of the input arm until the clevis hole center line coincides with the angle bisector constructed from the reference fix points.



(g) The valve is now in a flow neutral as well as a mechanically neutral position with the input arm clevis hole directly over the center of the dead band area.

(h) Connect a source of helium to the Capsule H_2O_2 fill drain disconnect.

(i) Connect a bubbler device to the two applicable thrust chamber nozzles.

ITEM	PART NUMBER	NOMENCLATURE
1	45-61700-35	H_2O_2 FILL DRAIN DISCONNECT
2	45-61700-41	PUSH-PULL SHUTOFF VALVE
3	45-61700-31	H_2O_2 TANK ASSEMBLY
4	45-61700-47	He JETTISON VALVE (SQUIB ACTUATED)
5	45-61700-411	He RELIEF VALVE (3/8")
6	45-32117	CLAMP (TYP. 5 PLACES)
7	45-61700-39	PUSH-PULL SHUTOFF VALVE
9	45-61700-43	PROPORTIONAL CONTROL VALVE
10	45-62045-31&32	INSULATION (1 REQD)
11	45-61700-33	H_2O_2 TANK ASSEMBLY
12	45-32117	CLAMP (TYP. 4 PLACES

ITEM	PART NUMBER	NOMENCLATURE
13	45-62045-29&30	INSULATION (1 REQD)
14	45-61700-37	H_2O_2 RELIEF VALVE (3/8")
15	45-61700-49	H_2O_2 RELIEF VALVE (1/4")
16	45-62045-35	INSULATION (2 REQD)
[1] 17	45-62045-15	INSULATION (1 REQD)
[1] 18	45-62045-7	INSULATION (1 REQD)
[1] 19	45-62045-3	INSULATION (2 REQD)
[2] [1] 20	P-211	3/4" PERMACEL TAPE
[1] 21	45-62045-19	INSULATION (4 REQD)
[1] 22	45-62045-5	INSULATION (1 REQD)
[1] 23	45-62045-11	INSULATION (1 REQD)
8	MANUAL SYSTEM H_2O_2 OVERBOARD DRAIN	

[1] UTILIZED WITH HEAT SINK ONLY
[2] WRAP WITH APPROXIMATELY 4" LEAD AND DOUBLE WRAP AT ENDS OF INSULATION

CAPSULE	2	3	4	5	6	7	8
	□	○	○▽	○▽	○	□	○

○ AUTO SYS. ABLATION SHIELD
□ AUTO SYS. HEAT SINK
▽ MAN. SYS. ABLATION SHIELD

AUTO. SYSTEM
MANUAL SYSTEM

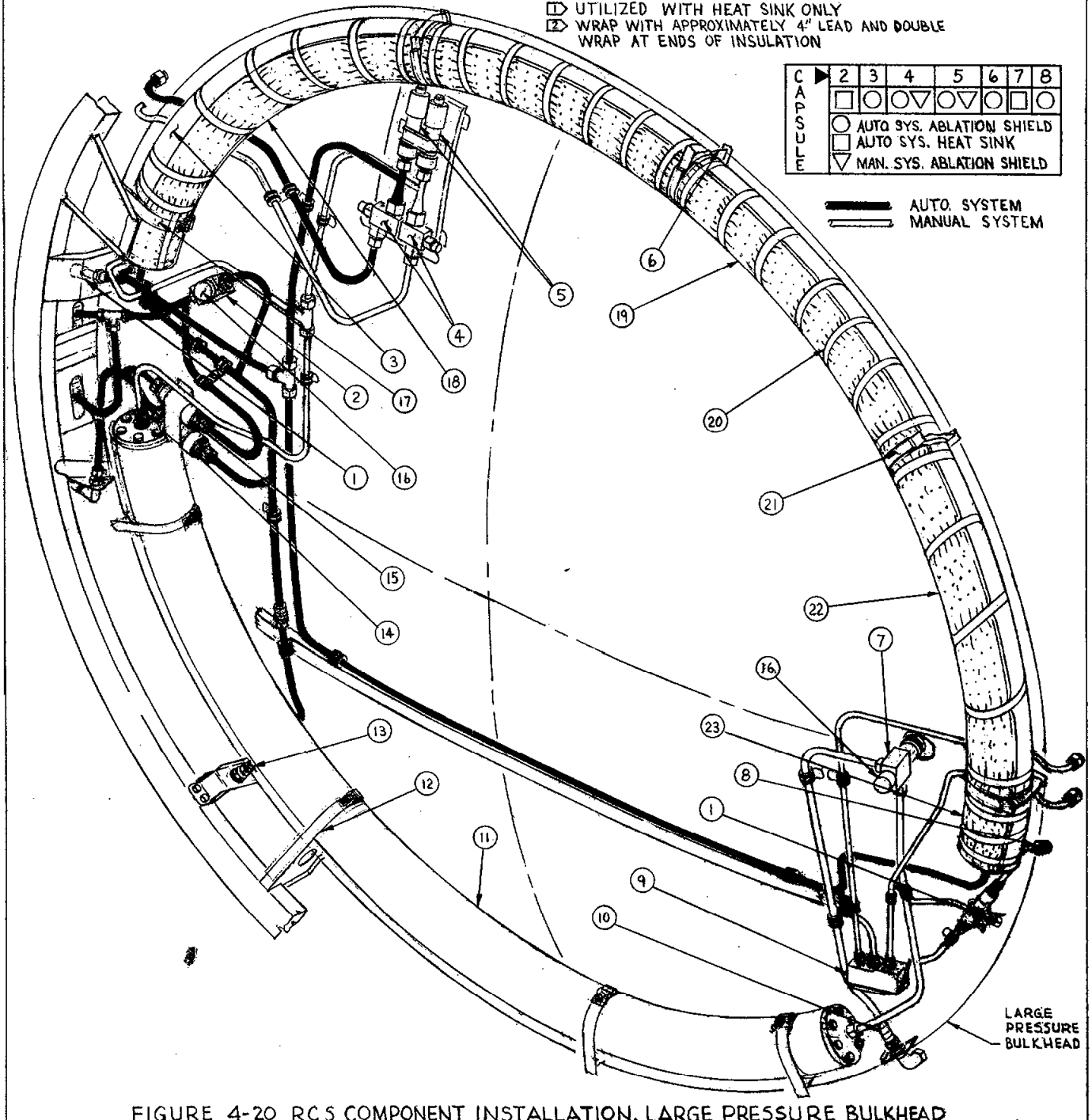


FIGURE 4-20 RCS COMPONENT INSTALLATION, LARGE PRESSURE BULKHEAD MH45-39

(j) Place the Capsule manual push-pull valve in the PUSH-ON position.

(k) Adjust the Helium source to 10 psig.

(l) Slowly rotate the input arm until bubbling starts. Mark this point through the clevis hole center line.

(m) Repeat step (l) for the opposite thrust chamber.

NOTE

Both of these points represent the limits of the valve dead band and should be equidistant from the angle bisector constructed in step (e).

(n) Return the input arm to the position of step (f).

(o) Check Astronaut's manual control handle in the "locked" position.

(p) Connect the Capsule mechanical linkage to the input arm.

(q) Repeat steps (l) and (m), utilizing the Astronaut's manual control handle to rotate the valve.

(r) Secure Helium source and bubbler device.

4-57. RCS Components - Large Pressure Bulkhead

The RCS components mounted on the large pressure bulkhead are shown in Figure 4-20.

4-58. Removal

Due to the relatively simple type of mounting utilized, detailed removal and installation procedures are unnecessary. The area of component location is accessible only upon removal of the heat shield. Details involving the removal of the heat shield are covered in Section 2.

CAUTION

When removing and installing H_2O_2 components

and lines, observe all precautions specified in Paragraph 4-37.

4-59. Installation

See Figure 4-20.

4-60. SERVICING

Detailed servicing procedures for the reaction control system are specified in SEDR 73.

TABLE 4-3

TORQUE VALUES FOR FLARED TUBE FITTINGS

DASH NOS. REF.	TUBING OD INCHES	WRENCH TORQUE FOR TIGHTENING AN818 NUT (IN. LBS.)							
		ALUMINUM ALLOY TUBING FLARE AND10061 (SINGLE) OR AND10078 (DOUBLE) *		STEEL TUBING FLARE AND10061		ALUMINUM ALLOY TUBING (FLARE AND10078) FOR USE IN OXYGEN LINES ONLY		HOSE END FITTINGS FOR HOSE ASSEMBLIES (IN. LBS.) MS28740 AN6292	
		MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
-	1/8	-	-	-	-	-	-	-	-
-3	3/16	-	-	90	100	-	-	70	100
-4	1/4	40	65	135	150	-	-	70	120
-5	5/16	60	80	180	200	100	125	85	180
-6	3/8	75	125	270	300	-	-	100	250
-8	1/2	150	250	450	500	-	-	210	420
-10	5/8	200	350	650	700	-	-	300	480
-12	3/4	300	500	900	1000	-	-	500	850
-16	1	500	700	1200	1400	-	-	700	1150
-20	1-1/4	600	900	-	-	-	-	-	-
-24	1-1/2	600	900	-	-	-	-	-	-

* Double flares shall not be fabricated on tubes that exceed 1/2 inch OD.

TABLE 4-4

BULKHEAD-TYPE TUBE FITTING

TUBE SIZE	FITTING THREAD SIZE	TORQUE LIMITS (INCH-POUNDS)	
		MIN.	MAX.
1/8	5/16 - 24	40	50
3/16	3/8 - 24	70	80
1/4	7/16 - 20	110	130
5/16	1/2 - 20	140	160
3/8	9/16	220	250
1/2	3/4	270	320
5/8	7/8	350	450
3/4	1 - 1/16	500	700
1	1 - 5/16	700	900

NOTE

Table 4-4 gives acceptable torque limits for nuts and fittings which require use of "O" rings or gasket-type seals. Examples of these nuts and fittings are as follows: AN814, 815, 832, 893, 894, 919, 924 and 6289.

TABLE 4-5

TORQUE VALUES FOR STEEL NUT-BOLT (SCREW) COMBINATIONS-COARSE THREAD SERIES

BOLTS AND SCREWS			
AN73 through AN81 AN503 AN509 AN525			
NUTS			
TENSION		SHEAR	
AN256 AN361 (NAS1024) AN362 (NAS1023) AN363 (NAS1021) AN365 (NAS1021) AN366 (NAS1023) AN373 (NAS1024)		AN364 (NAS1022)	
NUT-BOLT SIZE	TORQUE LIMITS (INCH/LBS)			
	MIN.	MAX.	MIN.	MAX.
8 - 32	12	15	7	9
10 - 24	20	25	12	15
1/4 - 20	40	50	25	30
5/16 - 18	80	90	48	55
3/8 - 16	160	185	95	110
7/16 - 14	235	255	140	155
1/2 - 13	400	480	240	290
9/16 - 12	500	700	300	420
5/8 - 11	700	900	420	540
3/4 - 10	1150	1600	700	950
7/8 - 9	2200	3000	1300	1800
1 - 8	3700	5000	2200	3000
1-1/8 - 8	5500	6500	3300	4000
1-1/4 - 8	6500	8000	4000	5000

NOTE: Part numbers in parenthesis supersede adjacent AN part numbers.

TABLE 4-6

TORQUE VALUES FOR STEEL NUT-BOLT (SCREW) COMBINATIONS-FINE THREAD SERIES

	BOLTS AND SCREWS		BOLTS AND SCREWS	
	AN3 through AN20 AN42 through AN49 AN73 through AN81 AN173 through AN186 AN502 through AN525 AN509 Bell Std. 6Z1		MS20004 through MS20024 NAS144 through NAS158 NAS172 NAS333 through NAS340 NAS464 (Shear) NAS583 through NAS590	
	NUTS		NUTS	
	TENSION	SHEAR	TENSION	SHEAR
	AN256 AN310 AN315 AN361(NAS1024) AN362(NAS1023) AN363(NAS1021) AN365(NAS1021) AN366(NAS1023) AN373(NAS1024)	AN320 AN364(NAS1022)	AN256 AN310 AN315 AN361(NAS1024) AN362(NAS1023) AN363(NAS1021) AN365(NAS1021) AN366(NAS1023) AN373(NAS1024)	AN320 AN364(NAS1022)

NUT-BOLT	TORQUE LIMITS INCH/LBS.		TORQUE LIMITS INCH/LBS.		TORQUE LIMITS INCH/LBS.		TORQUE LIMITS INCH/LBS.	
SIZE	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.
8 - 36	12	15	7	9	-	-	-	-
10 - 32	20	25	12	15	25	30	15	20
1/4 - 28	50	70	30	40	80	100	50	60
5/16 - 24	100	140	60	85	120	145	70	90
3/8 - 24	160	190	95	110	200	250	120	150
7/16 - 20	450	500	270	300	520	630	300	400
1/2 - 20	480	690	290	410	770	950	450	550
9/16 - 18	800	1000	480	600	1100	1300	650	800
5/8 - 18	1100	1300	660	780	1250	1550	750	950
3/4 - 16	2300	2500	1300	1500	2650	3200	1600	1900
7/8 - 14	2500	3000	1500	1800	3550	4350	2100	2600
1 - 14	3700	5500	2200	3300	4500	5500	2700	3300
1-1/8 - 12	5000	7000	3000	4200	6000	7300	3600	4400
1-1/4 - 12	9000	11000	5400	6600	11000	13400	6600	8000

NOTES: (a) NAS144 through NAS158 and NAS172 have been superseded by MS20004 through MS20024.

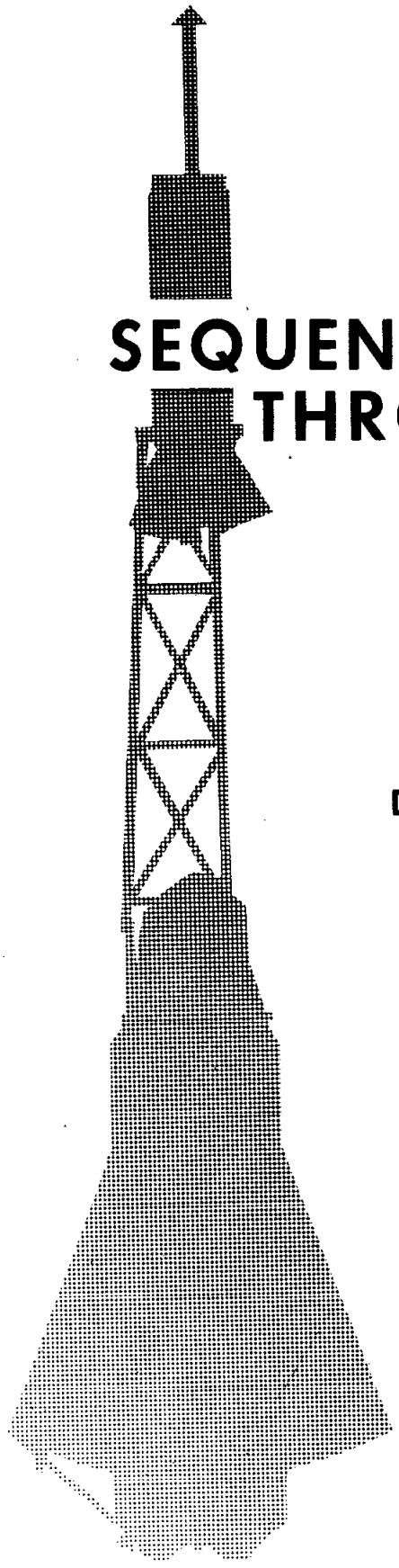
(b) NAS part numbers in parenthesis supersede adjacent AN part numbers for design.

TABLE 4-7

TORQUE VALUES FOR ALUMINUM NUT-BOLT (SCREW) COMBINATIONS - FINE THREAD SERIES

	ALUMINUM BOLTS AND SCREWS AN3DD through AN20DD AN509DD AN525D			
	NUTS			
	TENSION		SHEAR	
	AN310D AN365D(NAS1021) AN366D(NAS1023)		AN320D AN364D(NAS1022)	
	FINE THREAD SERIES			
NUT-BOLT SIZE	TORQUE LIMITS (INCH/LBS)		TORQUE LIMITS (INCH/LBS)	
	MIN.	MAX.	MIN.	MAX.
8 - 36	5	10	3	6
10 - 32	10	15	5	10
1/4 - 28	30	45	15	30
5/16 - 24	40	65	25	40
3/8 - 24	75	110	45	70
7/16 - 20	180	280	110	170
1/2 - 20	280	410	160	260
9/16 - 18	380	580	230	360
5/8 - 18	550	670	270	420
3/4 - 16	950	1250	560	880
7/8 - 14	1250	1900	750	1200
1 - 14	1600	2400	950	1500
1-1/8 - 12	2100	3200	1250	2000
1-1/4 - 12	3900	5600	2300	3650

NOTE: Part numbers in parenthesis supersede adjacent AN part numbers.



SECTION V

SEQUENCE SYSTEM, LAUNCH THROUGH RETROGRADE OR ABORT

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V SEQUENCE SYSTEM, LAUNCH THROUGH RETROGRADE OR ABORT

5-1. GENERAL

Section V provides procedures, diagrams and illustrations to facilitate system trouble shooting and component replacement and adjustment. It is noted that all system components are not necessarily covered within the Replacement and Adjustment areas. In the absence of such procedure it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

5-2. TROUBLE SHOOTING

Trouble shooting of the sequence system may be partially accomplished by use of the sequence system tester, MDE4572001. (Refer to SEDR 90-2.) This tester will indicate the component or general area where the trouble exists. To isolate the trouble either refer to Master Schematic Wiring Diagram, 45-79084, or the following simplified component schematics:

(a) Jettison Rocket Igniter Schematic (See Figure 5-1)

(b) Escape Rocket Igniter Schematic (See Figure 5-2)

All sequence system components will be covered by simplified schematics at a latter date.

5-3. REPLACEMENT AND ADJUSTMENT

5-4. Launch and Orbit Relay Boxes

There are four launch and orbit relay boxes located within the capsule's pressurization section. See Figure 5-3 for exact location.

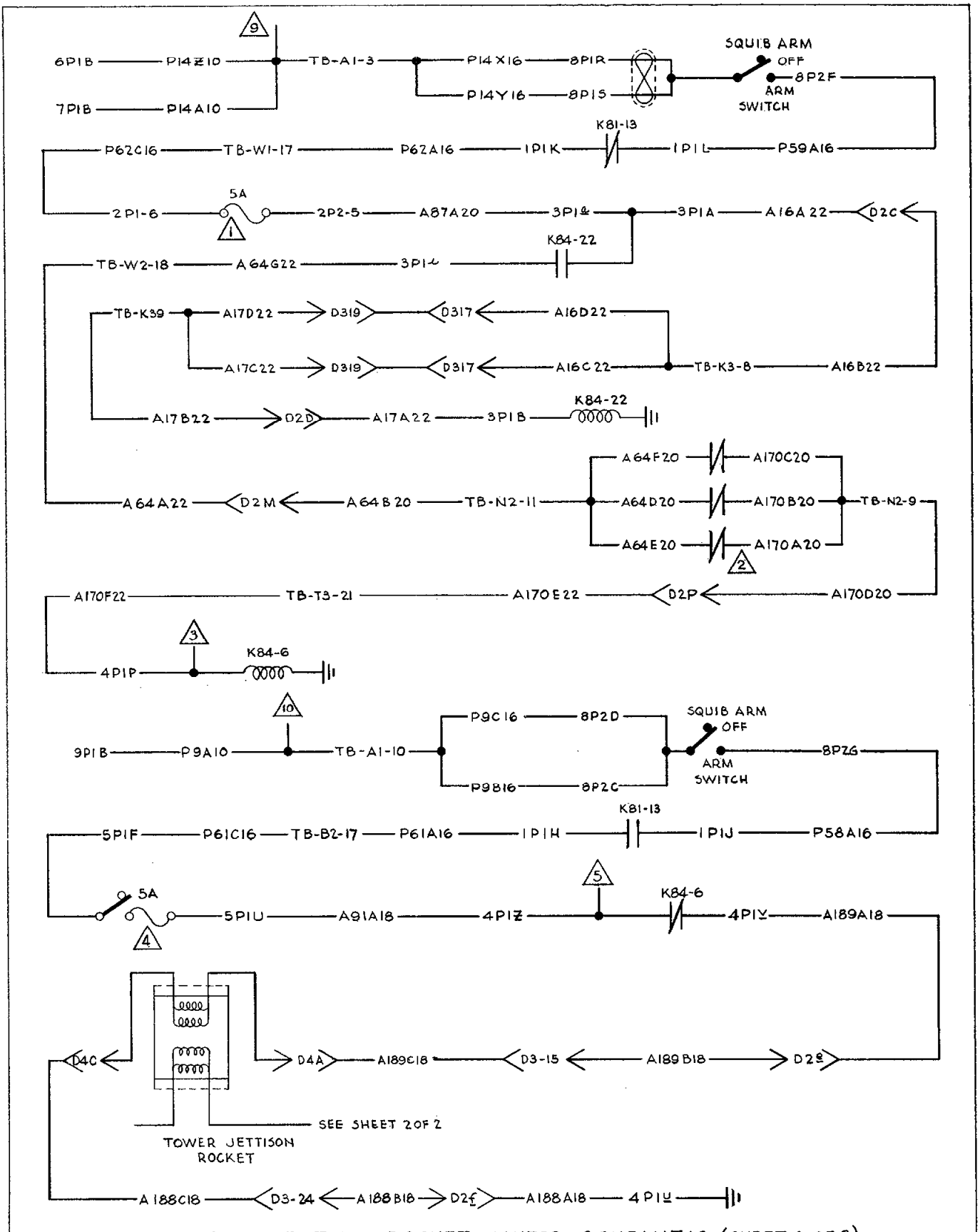
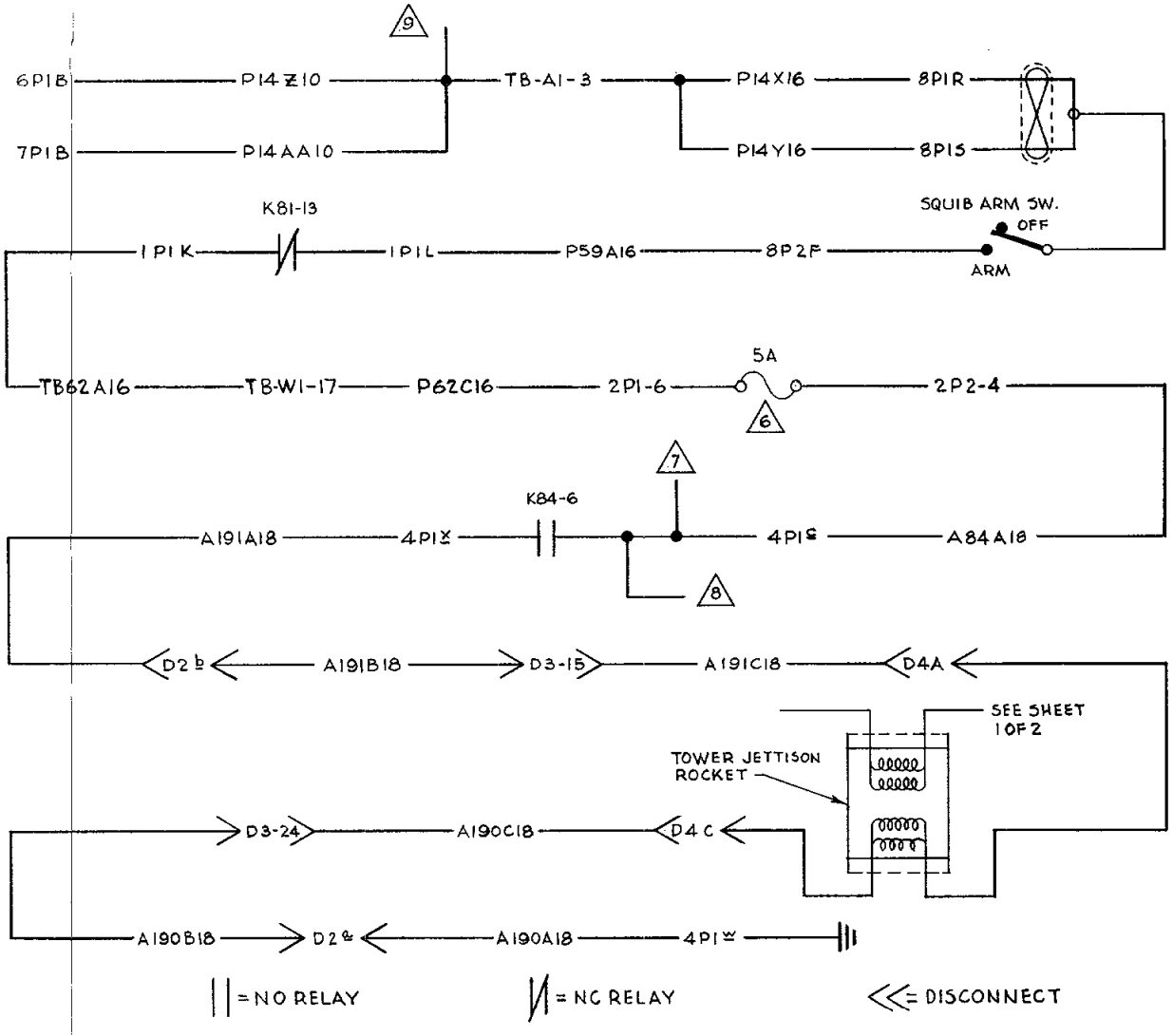


FIGURE 5-1 JETTISON ROCKET IGNITER SCHEMATIC (SHEET 1 OF 2)

MH45-120-1



COMPONENT	
1P1	POWER SYSTEM CONTROL PANEL
2P1	LAUNCH, ORBIT AND ESCAPE F.H. 804A
2P2	LAUNCH, ORBIT AND ESCAPE F.H. 831AV
3P1	LAUNCH, ORBIT RELAY BOX 3
4P1	LAUNCH, ORBIT RELAY BOX 2 PT06P-22-555X
5P1	SWITCH FUSE PANEL PT06P-18-32P
6P1	MAIN BATTERY 3000 W-H 801B
7P1	MAIN BATTERY 3000 W-H 801C
8P1	MAIN INSTRUMENT PANEL PT00P-22-21S
8P2	MAIN INSTRUMENT PANEL PT00P-22-21SW
9P1	ISOLATED BATTERY 1500 W-H

DISCONNECTS	
D1	PT00P-22-21W (MAIN INSTRUMENT PANEL
D2	PT07P-20-41S, PT06-20-41P (L.H. FWD. PRESS BHD.)
D3	CAPSULE-TOWER DISCONNECT
D4	JUNCTION BOX

RELAYS	
K81-13	SQUIB ARM RELAY
K84-22	TOWER SEPARATION SENSOR RELAY #1
K84-6	JETTISON ROCKET FIRE RELAY

1. TOWER SEPARATION CONTROL
2. TOWER RING LIMIT SWITCHES (RING GONE)
3. GROUND TEST UMBILICAL, PIN 55
4. EMERGENCY TOWER JETTISON
5. GROUND TEST UMBILICAL PIN 53
6. TOWER JETTISON ROCKET
7. GROUND TEST UMBILICAL, PIN 52
8. K84-6 ENERGIZED ON SHEET 1 OF 2
9. GROUND TEST UMBILICAL PIN 103
10. GROUND TEST UMBILICAL PIN 105

FIGURE 5-1 JETTISON ROCKET IGNITER SCHEMATIC (SHEET 2 OF 2) MH45-1202

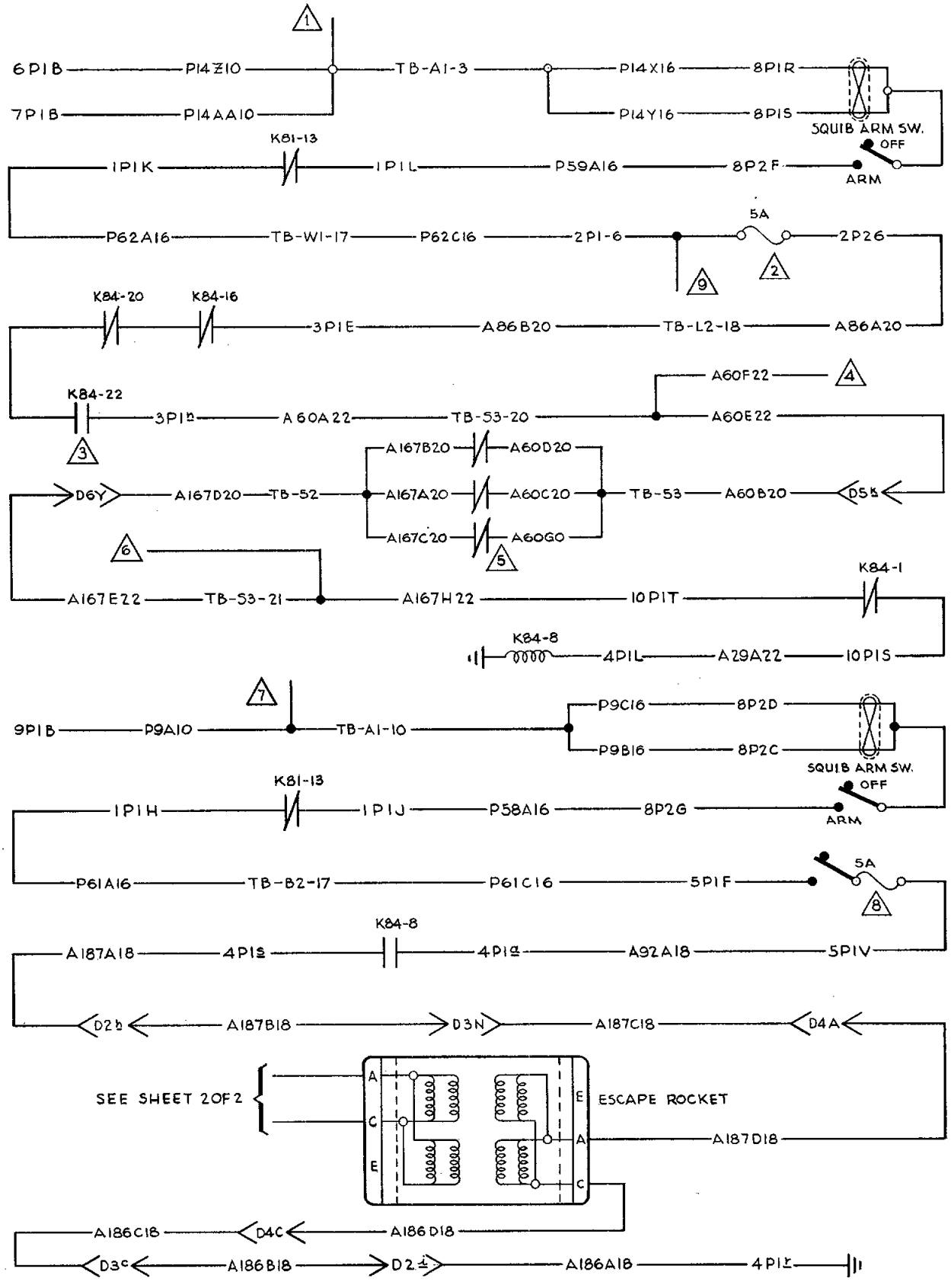
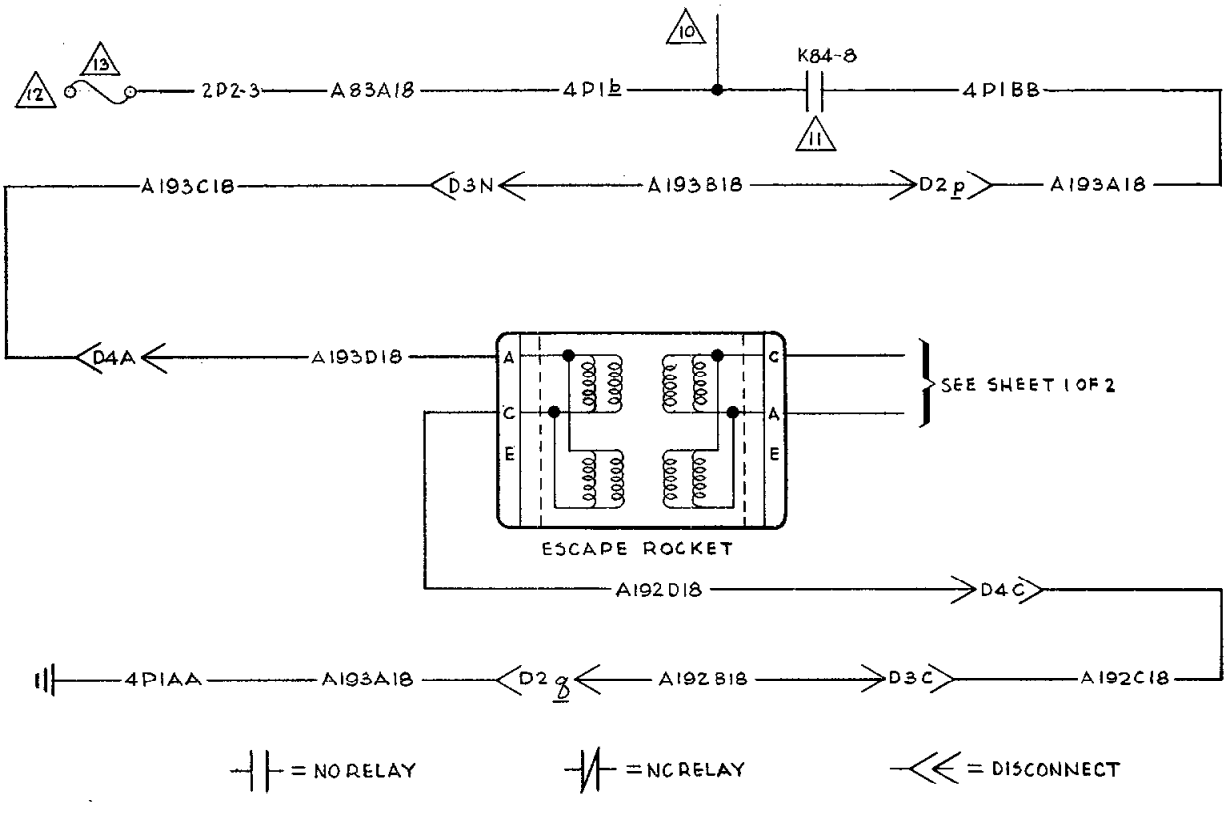


FIGURE 5-2 ESCAPE ROCKET IGNITER SCHEMATIC (SHEET 1 OF 2)

MH45-121-1



= NO RELAY = NC RELAY = DISCONNECT

COMPONENTS	
6P1	MAIN BATTERY 3000 W-H 801B
7P1	MAIN BATTERY 3000 W-H 801C
8P1	MAIN INSTRUMENT PANEL PT00P-22-21S
8P2	MAIN INSTRUMENT PANEL PT00P-22-21SW
1P1	POWER SYSTEM CONTROL PANEL
2P1	LAUNCH, ORBIT AND ESCAPE F.H. 804A
2P2	LAUNCH, ORBIT AND ESCAPE F.H. 831AV
3P1	LAUNCH AND ORBIT RELAY BOX 3 PT06P-24-61SW
10P1	LAUNCH, ORBIT AND ESCAPE RELAY BOX 1
4P1	LAUNCH AND ORBIT RELAY BOX 2 PT06P-22-55SX
9P1	ISOLATED BATTERY 1500 W-H

1. GROUND TEST UMBILICAL PIN 103
2. CAPSULE SEPARATION CONTROL
3. SEE FIGURE 5-1 FOR ENERGIZING CIRCUIT
4. ESCAPE SYSTEM HATCH TEST DISCONNECT ("Y")
5. CAPSULE ADAPTER SEP. RING LIMIT SWITCHES (RING GONE)
6. ESCAPE SYSTEM HATCH TEST DISCONNECT ("b")
7. GROUND TEST UMBILICAL PIN 105
8. EMERGENCY TOWER JETTISON
9. SEE SHEET 2 OF 2 FOR MAIN BATTERY POWER CIRCUIT TO ESCAPE ROCKET
10. GROUND TEST UMBILICAL PIN 56
11. SEE SHEET 1 OF 1 FOR ENERGIZING CIRCUIT
12. SEE SHEET 1 OF 2 (2P16) FOR POWER CIRCUIT FROM BATTERIES
13. ESCAPE ROCKET

RELAYS	
K81-13	SQUIB ARM RELAY
K84-16	ORBIT ATTITUDE RELAY #1
K84-20	CAPSULE SEPARATION SENSOR RELAY #1
K84-1	GROUND TEST UMBILICAL RELAY
K84-8	ESCAPE ROCKET FIRE RELAY
K84-22	TOWER SEPARATION SENSOR RELAY #1

DISCONNECTS	
D2	L.H. FORWARD PRESSURE BULKHEAD
D3	CAPSULE TOWER
D4	JUNCTION BOX
D5	PRESSURE BULKHEAD PT07P-22-55P, PT06P-22-55G
D6	PRESSURE BULKHEAD PT06P-24-61SW, PT07P-22-61PW

FIGURE 5-2 ESCAPE ROCKET IGNITER SCHEMATIC (SHEET 2 OF 2)

MH45-121-2

5-5. Launch and Orbit Relay Box No. 1

Relay box No. 1 consists of the following relays:

(a) Ground Command Abort Signal - K84-40.

(b) Posigrade Rocket Fire - K84-2.

(c) Emerg. Posigrade Rocket Fire - K84-3.

(d) Ground Test Umbilical - K84-1.

To bench test relay box refer to sheet 3, -17 wire assembly, on 45-78084 and record results on Test Data Sheet of SEIR 89. Note that relay K84-40 is of the latching type, therefore, when testing is complete power must be applied to pin A in order to reset the relay.

5-6. Installation

(a) Access must be gained by removing the 1500 W-H Battery located on the L-X side. Refer to Section X for battery removal.

(b) Disconnect the one electrical plug from relay box and remove the four NAS 673V16H bolts.

(c) Install replacement relay box using same bolts and AN960D10L washers.

(d) Reconnect capsule plug (PT06P-22-555) to box receptacle and safety with NC 32 lockwire.

5-7. Launch and Orbit Relay Box No. 2

Relay box No. 2 consists of the following relays:

(a) Tower Separation Bolts Power - K84-4.

(b) Emerg. Tower Separation Bolts Power - K84-5.

(c) Jettison Rocket Fire - K84-6.

(d) Emerg. Jettison Rocket Fire - K84-7.

(e) Escape Rocket Fire - K84-8.

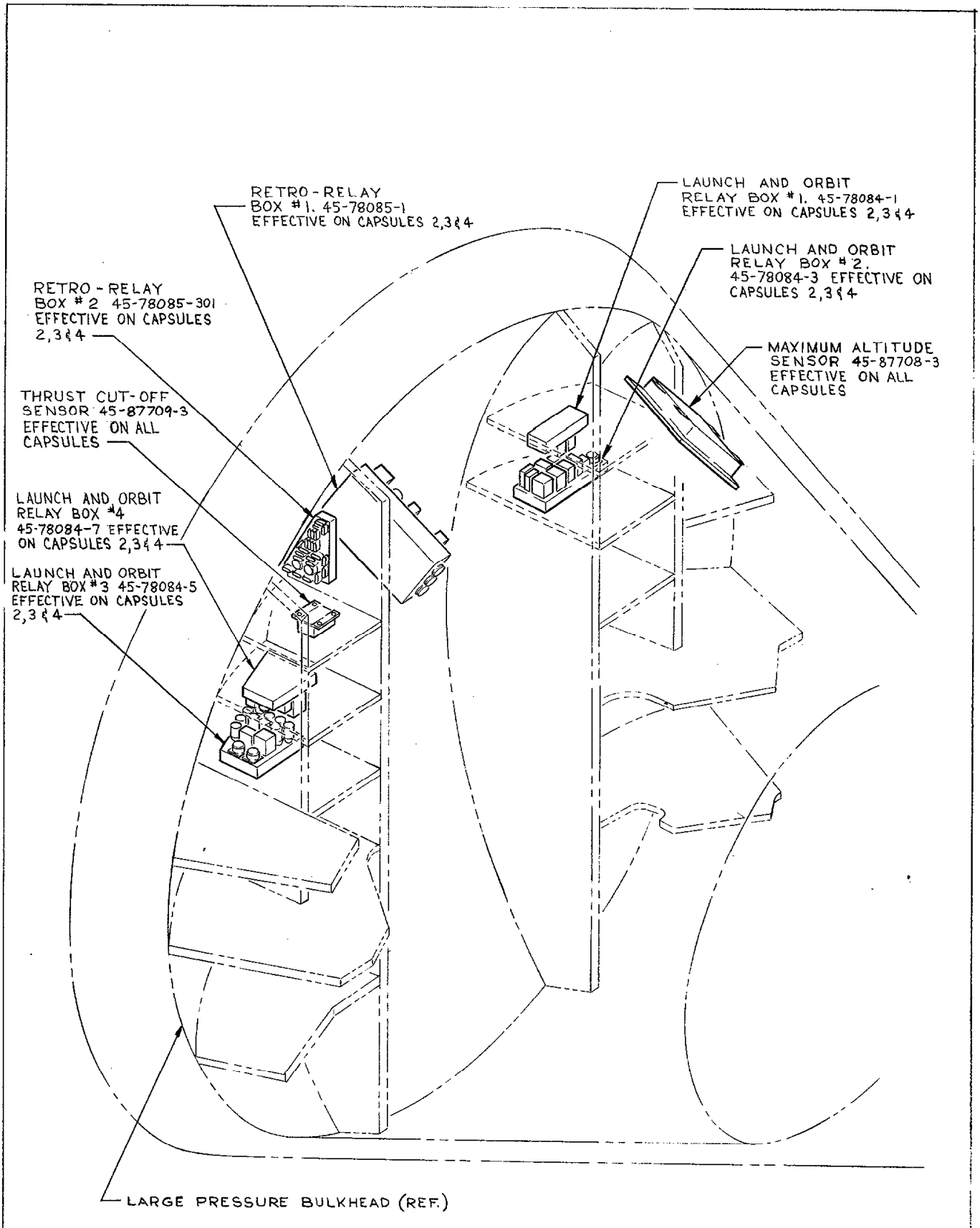


FIGURE 5-3 SEQUENTIAL COMPONENTS LOCATION

MH45-6

(f) Emerg. Escape Rocket Fire - K84-9.

(g) Capsule Separation Bolts Power - K84-10.

(h) Emerg. Capsule Separation Bolts Power - K84-11.

(i) Booster Engine Separation Sensor - K84-12.

(j) Sustainer Cut-off - K84-13.

(k) Booster Engine Cut-off - K84-14.

(l) Thrust cut-off Time Delay - K84-15.

To bench test relay box refer to sheet 3, -19 wire assembly, on 45-78084 and record results on Test Data Sheet in SEDR 89. Note that relays K84-13 and K84-14 are latching relays and therefore must be reset after testing. Both relays must be reset by applying power to points V or g on receptacle PT02P-22-55PW.

5-8. Installation

(a) Access must be gained by removing the 1500 W-H battery located on the L-X side. Refer to Section X for battery removal.

(b) Disconnect the two electrical disconnect plugs, PT06P-22-55SX and PT06P-22-55SW, and remove the five NAS673V16H volts.

(c) Install new relay box using same bolts and AN960D10L washers.

(d) Connect both electrical plugs to receptacles PT06P-22-55PX and PT06P-22-55PW.

5-9. Launch and Orbit Relay Box No. 3

Relay box No. 3 consists of the following relays:

(a) No. 1 Orbit Attitude - K84-16.

(b) No. 2 Orbit Attitude - K84-17.

(c) No. 3 Orbit Attitude - K84-18.

(d) Time Zero - K84-19.

(e) No. 1 Capsule Separation Sensor - K84-20.

(f) No. 2 Capsule Separation Sensor - K84-21.

(g) No. 1 Tower Separation - K84-22.

(h) No. 2 Tower Separation Sensor - K84-23.

(i) No. 3 Tower Separation Sensor - K84-24.

(j) No. 1 Mayday Alarm - K84-25.

(k) No. 2 Mayday Alarm - K84-26.

(l) No. 3 Mayday Alarm - K84-27.

To bench test relay refer to sheet 3, -21 wire assembly, on 45-78084 and record results on Test Data Sheet of SEDR 89. Note that relays K84-16 through K84-21 are latching relays. After completing a test these relays must be reset by applying power to either pin b or c.

5-10. Installation

(a) Access must be gained by removing the bottom 1500 W-H battery located on the R-X side. Refer to Section X for battery removal.

(b) Disconnect the two electrical plugs PT06P-24-61SW and PT06P-24-61S, and remove the four NAS 673V20H bolts.

(c) Install new relay box using same bolts and AN960D10L washers.

(d) Reconnect the two plugs to receptacles PT06P-24-61PW and PT06P-24-61P.

(e) Safety with NC32 lockwire.

5-11. Launch and Orbit Relay Box No. 4

Relay box No. 4 consists of the following relays:

(a) Booster Cut-off 10 Second Time Delay - K84-28

(b) Booster Abort Signal Disarm - K84-29

(c) Capsule Adapter Disconnect Squib Fire - K84-30

(d) Damping Signal - K84-31

(e) Orbit Orient - K84-32

(f) Damping Signal 5 Second Time Delay - K84-33

(g) Warning Light 2 Second Time Delay - K84-34

(h) Tower Jettison Warning Light - K84-35

(i) Orbit 5 Minute Time Delay - K84-36

(j) No. 1 Catastrophic Fail - K84-37

(k) No. 2 Catastrophic Fail - K84-38

(l) No. 1 Tower Separation Abort Interlock - K84-39

(m) Abort Rate Damping - K84-41

To bench test the relay box refer to sheet 3, -23 wire assembly, on 45-78084, and record results on Test Data Sheet of SEDR 89. Note that relays K84-29, K84-32 and K84-39 are latching relays. After testing is complete these relays must be reset by applying power to pin u.

5-12. Installation

(a) Access must be gained by removing the bottom 1500 W-H battery located on the R-X side. Refer to Section X for battery removal.

(b) Disconnect the PT06P-22-55S plug and remove the four NAS 673V20H bolts.

(c) Install the new relay box using same bolts and AN960D10L washers.

(d) Connect the electrical plug to the PT02P-22-55P receptacle and safety with NC32 lockwire.

5-13. Maximum Altitude Sensor

5-14. Installation

The sensor is bracket mounted to the structure directly above the switch fuse panel on the L-X side.

(a) Disconnect the PT06P-14-15S electrical plug and remove the four NAS 673V4 bolts.

(b) Install new sensor using same bolts and AN960D10L washers.

(c) Refer to SEDR 90 for post installation checkout. Capsule identification No. will determine dash No. of SEDR.

5-15. Thrust Cut-off Sensor

5-16. Installation

(a) Access must be gained by removing the top 1500 W-H battery located on the R-X side. Refer to Section X for battery removal.

(b) Disconnect the PT06P-14-195 electrical plug and remove the four NAS 673V3H bolts.

(c) Install new sensor using same bolts and AN960D10L washers.

(d) Safety with NC32 lockwire.

5-17. Retrograde Relay Boxes

Two retrograde relay boxes are located within the capsules pressurization section. See Figure 5-3 for exact location.

5-18. Retro Relay Box No. 1

Relay box No. 1 consists of the following relays:

(a) Retro Rocket Assembly Separation No. 1 - K85-1

(b) Retro Rocket Assembly Separation No. 2 - K85-2

(c) Retro Fire Signal Disengage - K85-8

(d) Retro Rocket Sequential Fire - K85-9

(e) No. 3 Retro Rocket No Fire Warning Light - K85-10

(f) No. 2 Retro Rocket No Fire Warning Light - K85-11

(g) No. 1 Retro Rocket No Fire Warning Light - K85-12

(h) Retro Rocket No Fire Warning - K85-13

(i) Retro Rocket Assembly Jettison - K85-19

(j) Jettison Retro Warning Light - K85-20

(k) No. 1 Retro Fire - K85-5

(l) Emergency No. 1 Retro Fire - K85-4

(m) Retro Assembly Jettison - K85-5

(n) Emergency Retro Rocket Assembly Over-ride - K85-6

(o) Retro Rocket Assembly Umbilical Separation - K85-7

(p) No. 3 Retro Rocket Fire - K85-14

(q) Emergency No. 3 Retro Rocket Fire - K85-15

(r) No. 2 Retro Rocket Fire - K85-16

(s) Emergency No. 2 Retro Rocket Fire - K85-17

To bench test relay box refer to sheet 2, -13 wiring assembly, on 45-78085, and record results on Test Data Sheet of SEDR 89. Note that relays K85-1, K85-2 and K85-6 are latching relays and must be reset after completing test. To reset, apply power to pin HH of receptacle PT02P-22-55PX.

5-19. Installation

The No. 1 relay box is installed on the large pressure bulkhead at an R-X location. See Figure 5-3 for exact location.

(a) Disconnect the three electrical plugs and remove the two NAS 673V31 bolts and SPSFN812 - 1032 nuts.

(b) Remove relay box and replace, installing the new box with same bolts and nuts and four AN960D10L washers.

(c) Reconnect the three electrical plugs.

5-20. Retro Relay Box No. 2

Relay box No. 2 consists of the following relays:

(a) Retro Fire Signal - K85-21

(b) Retro Command No. 1 - K85-22

(c) Start Retro Attitude Command No. 1 - K85-23

(d) Start Retro Attitude Command No. 2 - K85-24

(e) G.C. Attitude Permission By-Pass - K85-26

(f) Attitude Permission By-Pass No. 1 - K85-27

(g) Attitude Permission By-Pass No. 2 - K85-28

(h) Emergency Retro Fire - K85-29

(i) Retro Fire Signal - K85-30

(j) Retro Attitude Command - K85-31

(k) Retro Command No. 2 - K85-32

(l) Retro Command No. 3 - K85-34

(m) Attitude Permission No. 1 - K85-34

(n) Attitude Permission No. 2 - K85-35

(o) #3 Retro Rocket Gone No. 1 - K85-36

(p) #3 Retro Rocket Gone No. 2-- K85-37

(q) #3 Retro Rocket Gone No. 3 - K85-38

(r) #2 Retro Rocket Gone No. 1 - K85-39

(s) #2 Retro Rocket Gone No. 2 - K85-40

(t) #2 Retro Rocket Gone No. 3 - K85-41

(u) #1 Retro Rocket Gone No. 3 - K85-42

(v) #1 Retro Rocket Gone No. 2 - K85-43

(w) #1 Retro Rocket Gone No. 1 - K85-44

To bench test relay box refer to sheet 2, -15 wiring assembly, on 45-78085, and record results on Test Data Sheet of SEDR 89. Note that relays K85-21, K85-23 through K85-29 and K85-33 are latching relays. After test is complete reset all latching relays by applying power to pin q of receptacle PTO2P-22-55PZ.

5-21. Installation

(a) Access must be gained by removing the Instrumentation Package B, refer to Section 13 for removal. (See Figure 5-3.)

(b) Disconnect the two electrical plugs and remove the four NAS673V19 bolts.

(c) Remove relay box and replace, installing the new box with same bolts and four AN960D10L washers.

(d) Reconnect the two electrical plugs.

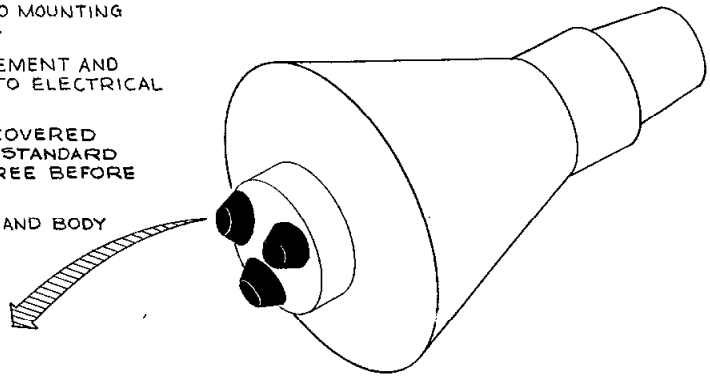
5-22. Retro Rocket Heaters

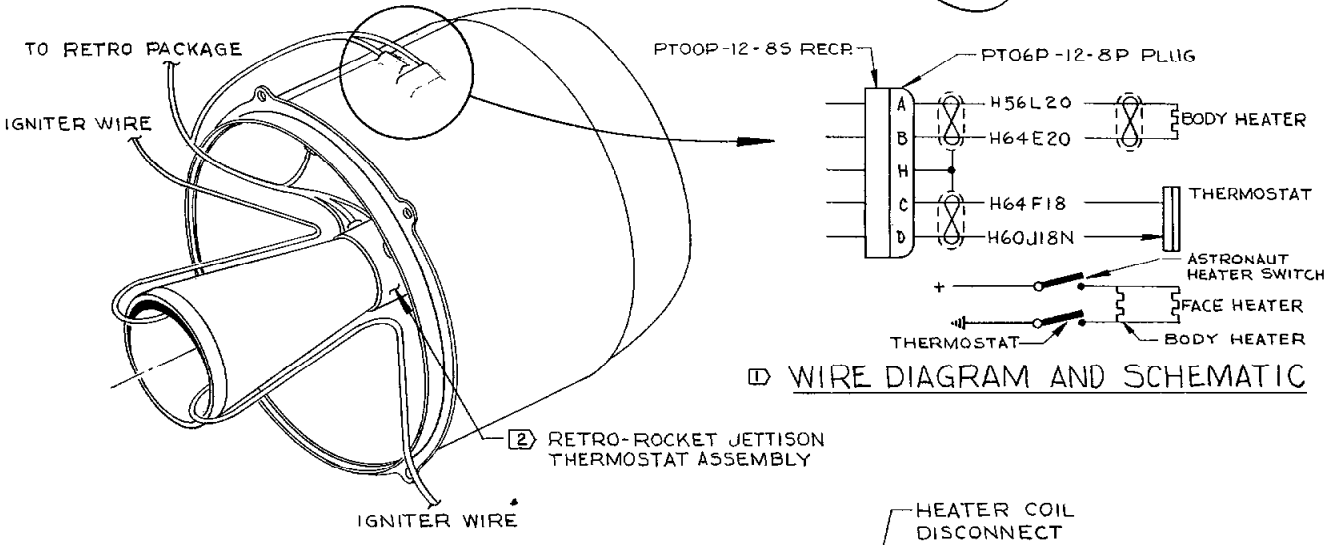
Installation

See Figure 5-4.

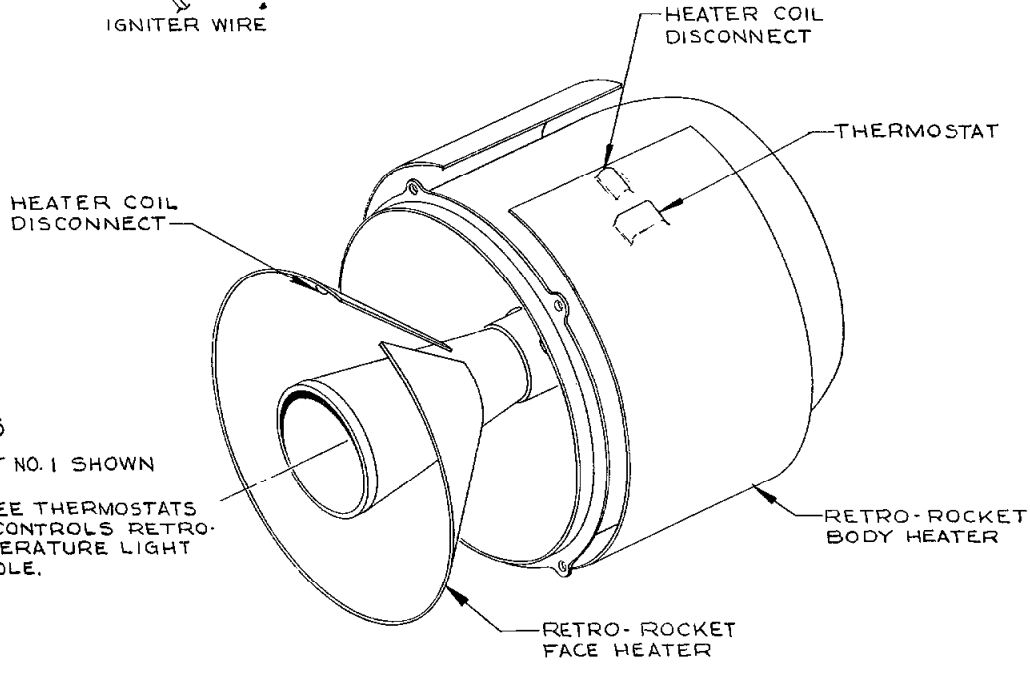
INSTALLATION PROCEDURES

1. DETERMINE THE BEST POSITION IN RELATION TO MOUNTING STUDS AND HOLE FOR ROCKET INSTALLATION.
2. INSTALL BOTH BLANKET HEATERS WITHOUT CEMENT AND DETERMINE THEIR BEST LOCATION IN RELATION TO ELECTRICAL CONNECTIONS.
3. PREPARE ROCKET SURFACE WHICH IS TO BE COVERED BY BLANKET HEATERS BY CLEANING WITH A STANDARD TYPE SOLVENT. AREA MUST BE CLEAN AND OIL-FREE BEFORE APPLYING CEMENT.
4. CEMENT BLANKET HEATERS TO ROCKET FACE AND BODY USING MIL-C-4003 (E.C. 847) CEMENT.





1 WIRE DIAGRAM AND SCHEMATIC



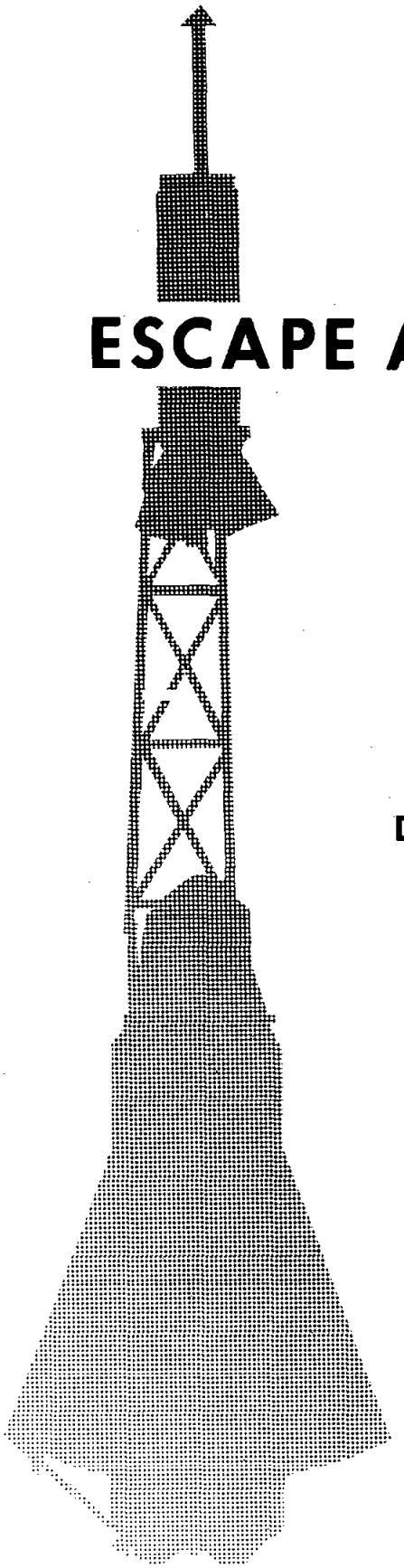
NOTES

1 RETRO-ROCKET NO. 1 SHOWN

2 CONTAINS THREE THERMOSTATS ONE OF WHICH CONTROLS RETRO-ROCKET TEMPERATURE LIGHT ON LEFT CONSOLE.

FIGURE 5-4 RETRO-ROCKET BLANKET HEATERS

MH 45-86



SECTION VI

ESCAPE AND JETTISON ROCKET SYSTEMS

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VI. ESCAPE AND JETTISON ROCKETS SYSTEM

6-1. GENERAL

Section VI provides procedures and illustrations which facilitate component replacement. It will be noted that not all system components are covered within the Replacement and Adjustment areas. In the absence of such procedures, it may be assumed that the procedure is obvious and does not warrant a detailed explanation or illustration.

6-2. TROUBLE SHOOTING

Trouble shooting the rocket firing circuits and their sequencing is covered in SEDR 90. Any remaining trouble shooting would consist of nothing more than continuity tests of the wiring between the rockets and the capsule electrical disconnect.

6-3. REPLACEMENT AND ADJUSTMENT

6-4. Escape Rocket

6-5. Installation

See Figure 6-1. The installation procedure assumes that the necessary physical and electrical checks on the rocket and igniter have already been performed.

6-6. Removal

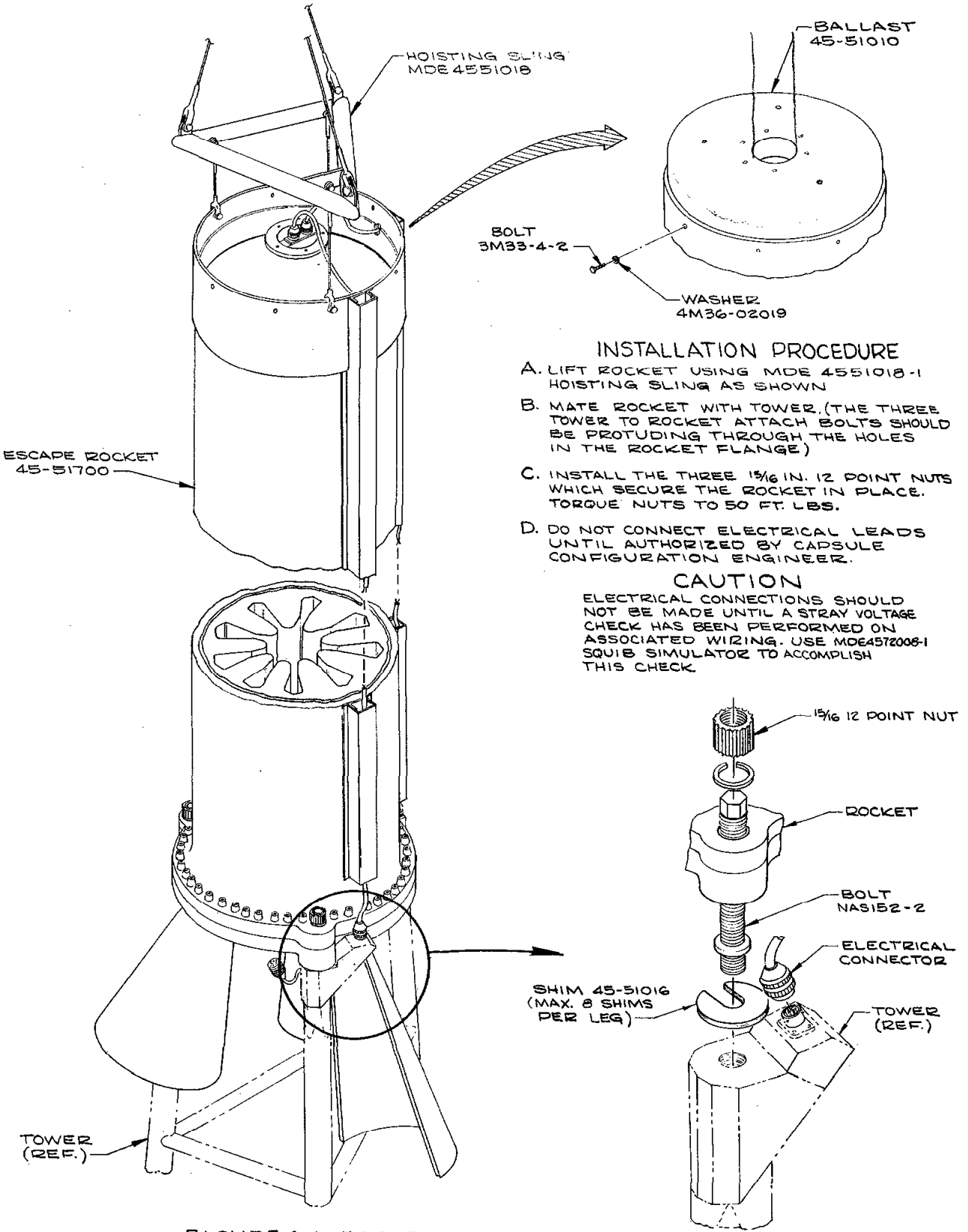
Removal of the Escape Rocket is the reverse of the installation procedure.

6-7. Escape Rocket Igniter

6-8. Installation

CAUTION

Do not install igniter until authorized by Capsule Configuration Engineer.



INSTALLATION PROCEDURE

A. LIFT ROCKET USING MDE 4551018-1 HOISTING SLING AS SHOWN

B. MATE ROCKET WITH TOWER. (THE THREE TOWER TO ROCKET ATTACH BOLTS SHOULD BE PROTUDING THROUGH THE HOLES IN THE ROCKET FLANGE)

C. INSTALL THE THREE 15/16 IN. 12 POINT NUTS WHICH SECURE THE ROCKET IN PLACE. TORQUE NUTS TO 50 FT. LBS.

D. DO NOT CONNECT ELECTRICAL LEADS UNTIL AUTHORIZED BY CAPSULE CONFIGURATION ENGINEER.

CAUTION

ELECTRICAL CONNECTIONS SHOULD NOT BE MADE UNTIL A STRAY VOLTAGE CHECK HAS BEEN PERFORMED ON ASSOCIATED WIRING. USE MDE4572008-1 SQUIB SIMULATOR TO ACCOMPLISH THIS CHECK.

FIGURE 6-1 ESCAPE ROCKET INSTALLATION

MH 45-93

To install the escape rocket igniter proceed as follows:

(a) Lubricate head cap, igniter threads and O-ring with Gredag No. 62 grease.

(b) Screw head cap into place and tighten with a spanner wrench. (Grand Central Rocket #477-81300). Check that head cap bottoms out on its seat, metal to metal.

(c) Do not connect electrical leads unless authorized by Capsule Configuration Engineer. Leave shorting clips installed.

CAUTION

Prior to connecting electrical leads, perform a stray voltage check on associated wiring using MDE4572008-1 Squib Simulator and MDE4541010 Squib Tester.

6-9. Pylon Jettison Rocket

6-10. Installation

See Figure 6-2. The installation procedure on Figure 6-2 assumes that the necessary physical and electrical checks on the rocket and igniter have been performed.

6-11. Removal

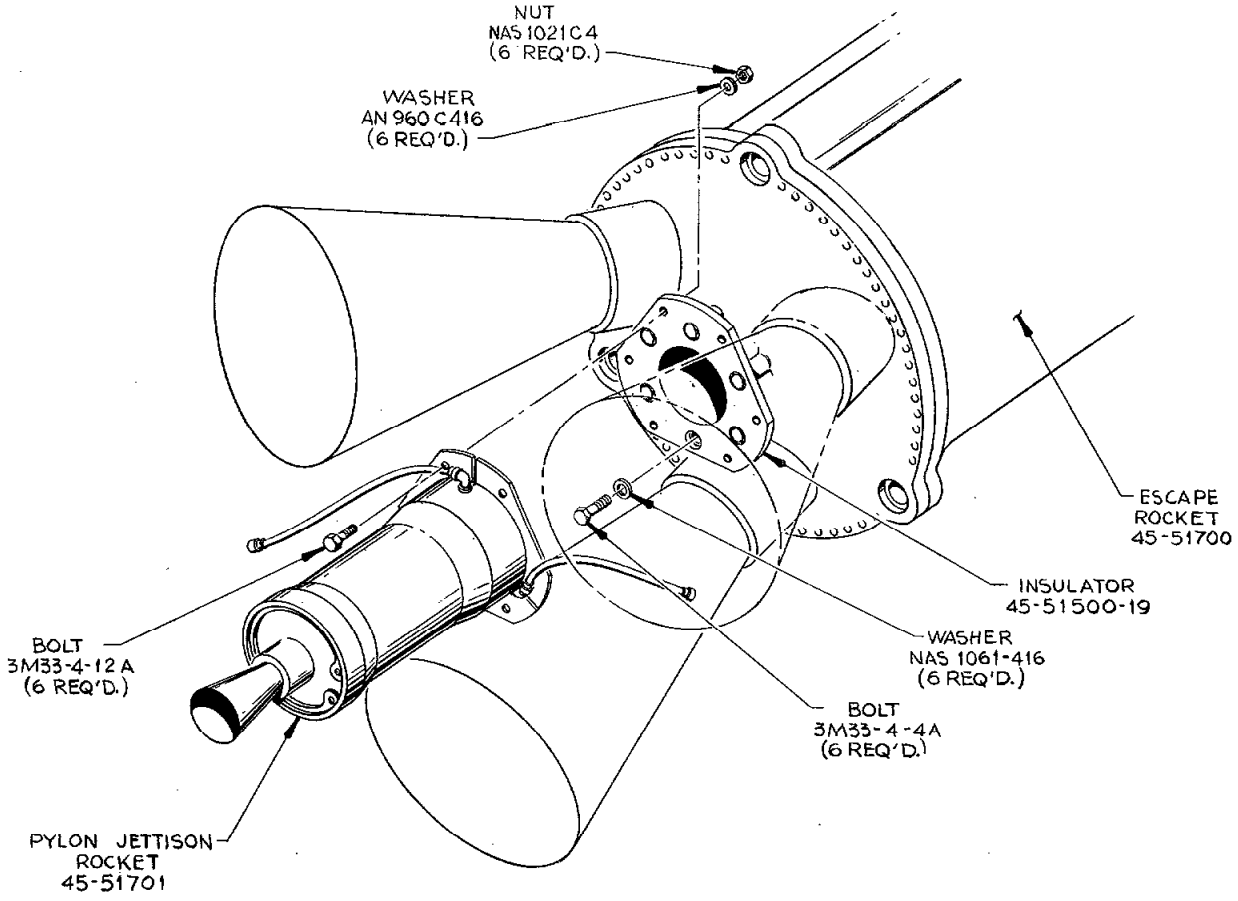
Removal of the jettison rocket is the reverse of the installation procedure.

6-12. Pylon Jettison Rocket Igniter

6-13. Installation

CAUTION

Do not install igniter until authorized by Capsule Configuration Engineer.



INSTALLATION

A BOLT PHENOLIC INSULATOR TO ESCAPE ROCKET WITH SIX BOLTS AS SHOWN.

B BOLT PYLON JETTISON ROCKET TO INSULATOR WITH SIX BOLTS AS SHOWN.

C CONNECT ELECTRICAL LEADS TO VEHICLE WIRING IF REQUIRED.

CAUTION

BEFORE CONNECTING ELECTRICAL LEADS, A STRAY VOLTAGE CHECK SHOULD BE ACCOMPLISHED USING MDE-4572008-1 SQUIB SIMULATOR.

FIGURE 6-2 JETTISON ROCKET INSTALLATION

MH45-94

(a) Unscrew plastic shipping cap in head end of rocket.

(b) Screw igniter into head end, threading it tightly against its gasket by applying a hook spanner wrench in the holes provided in the igniter body.

(c) Remove the shorting plug from the igniter lead connector and, with a testing device producing not more than .020 amp current, measure the resistance of the igniter circuit. Resistance should be _____ ohms.

(d) Replace the igniter shorting plug.

(e) Remove the weather seal from the nozzle and install the jettison rocket in the escape rocket. (See Figure 6-2.)

(f) Just prior to connecting the igniter leads into the vehicle circuitry, re-check igniter resistance again using a test current of not more than .020 amps.

CAUTION

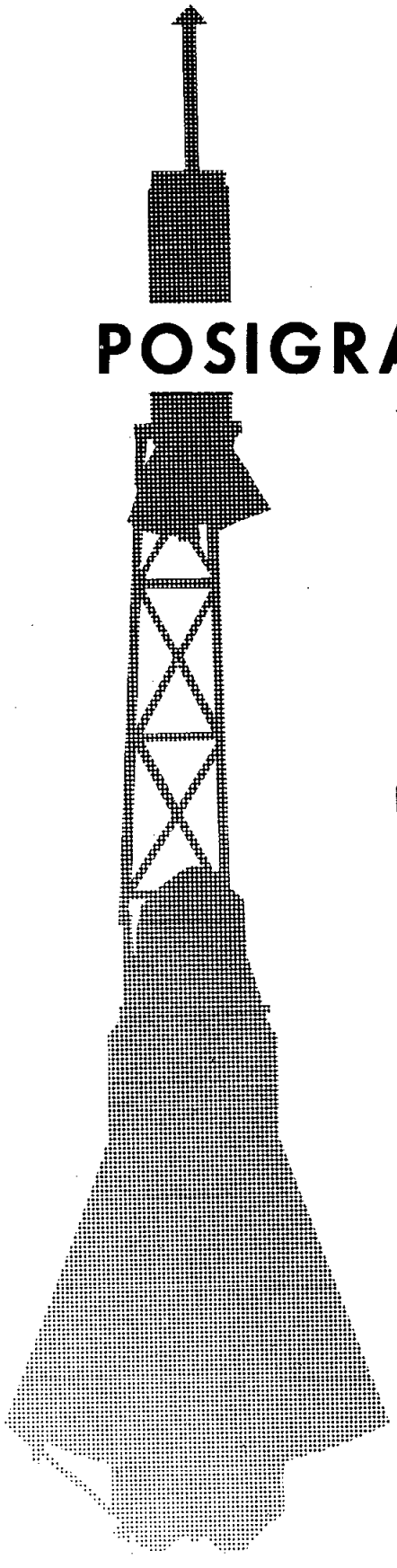
Do not connect any electrical leads until authorized by Capsule Configuration Engineer.

6-14. Igniter Removal

Removal of the igniter is the reverse of the installation procedure.

NOTE

Install shorting clips on squibs immediately after removal.



SECTION VII

POSIGRADE AND RETROGRADE ROCKET SYSTEMS

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VII. POSIGRADE AND RETROGRADE ROCKETS

7-1. GENERAL

Section VII provides procedures and illustrations which facilitate component replacement. It will be noted that not all system components are covered within the Replacement and Adjustment areas. In the absence of such procedure, it may be assumed that the procedure is obvious and does not warrant a detailed explanation or illustration.

7-2. TROUBLE SHOOTING

Trouble shooting the rocket firing circuits and their sequencing is covered in SEDR 90. Any remaining trouble shooting would consist of nothing more than continuity tests of the wiring between the rockets and the capsule electrical disconnect.

7-3. REPLACEMENT AND ADJUSTMENT

7-4. POSIGRADE ROCKET

7-5. Installation. See Figure 7-1.

7-6. Removal

Removal of the Posi-Rocket is the reverse of the installation procedure.

7-7. RETROGRADE ROCKET

7-8. Installation. (Ref. Figure 7-2.)

The following steps outline the procedure for installing the retro-rockets, assuming that the necessary physical and electrical checks on rocket and igniter have already been performed.

(a) Install blanket heaters on retro-rockets prior to rocket installation. (Ref. Section V.)

(b) Place spacers over attach bolts.

INSTALLATION NOTE

THE POSIGRADE ROCKETS MUST BE INSTALLED PRIOR TO THE RETRO-GRADE ROCKETS FOR ACCESSIBILITY REASONS.

1. PLACE POSIGRADE ROCKETS ON MOUNTING BRACKET.
2. SECURE ROCKET TO BRACKET. TORQUE BOLTS TO 20-25 IN. LBS.
3. CONNECT ELECTRICAL PLUGS TO RECEPTACLES.

CAUTION

DO NOT MAKE ANY ELECTRICAL CONN--ECTIONS UNTIL A STRAY VOLTAGE CHECK HAS BEEN ACCOMPLISHED ON ASSOCIATED WIRING.

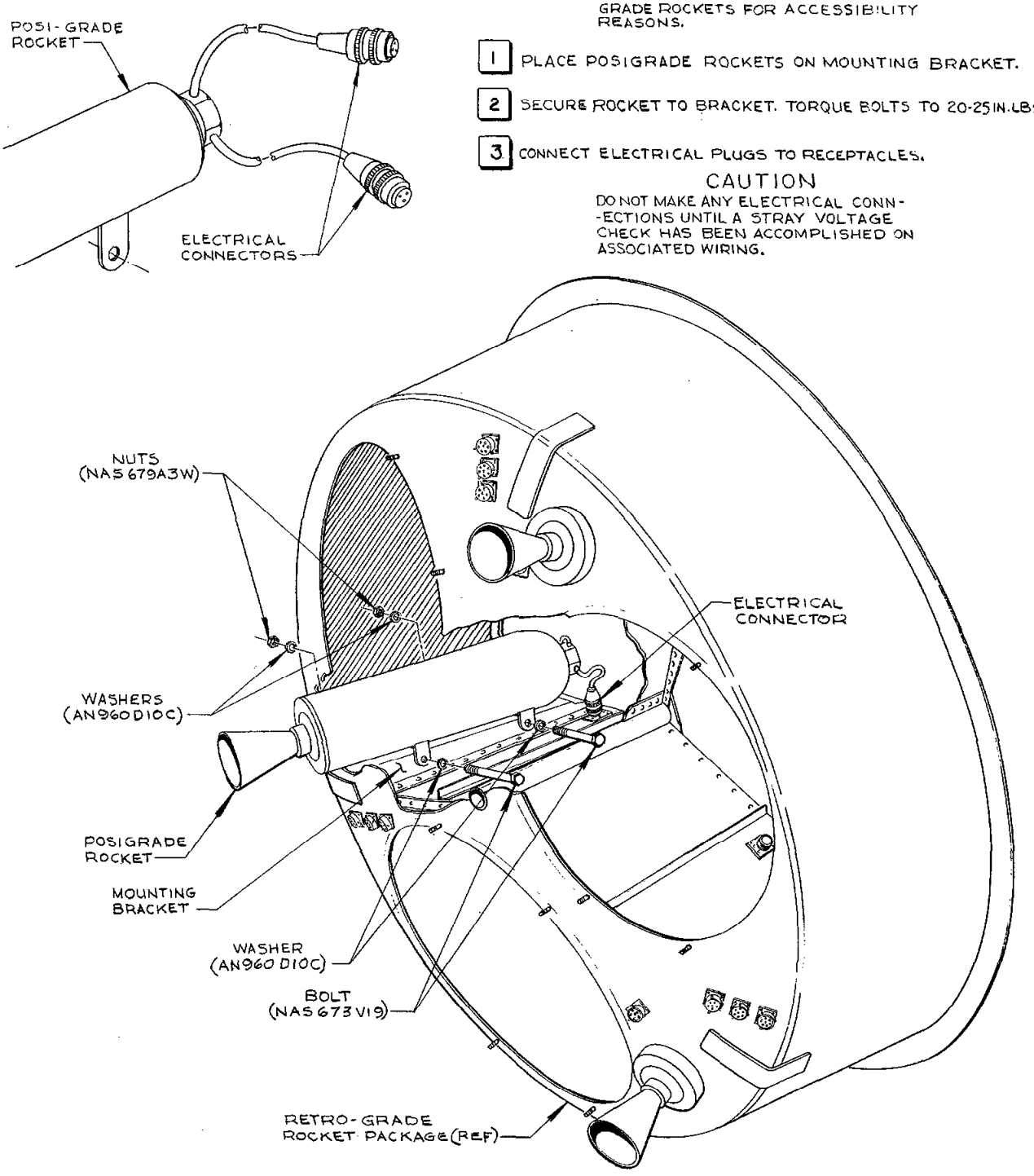
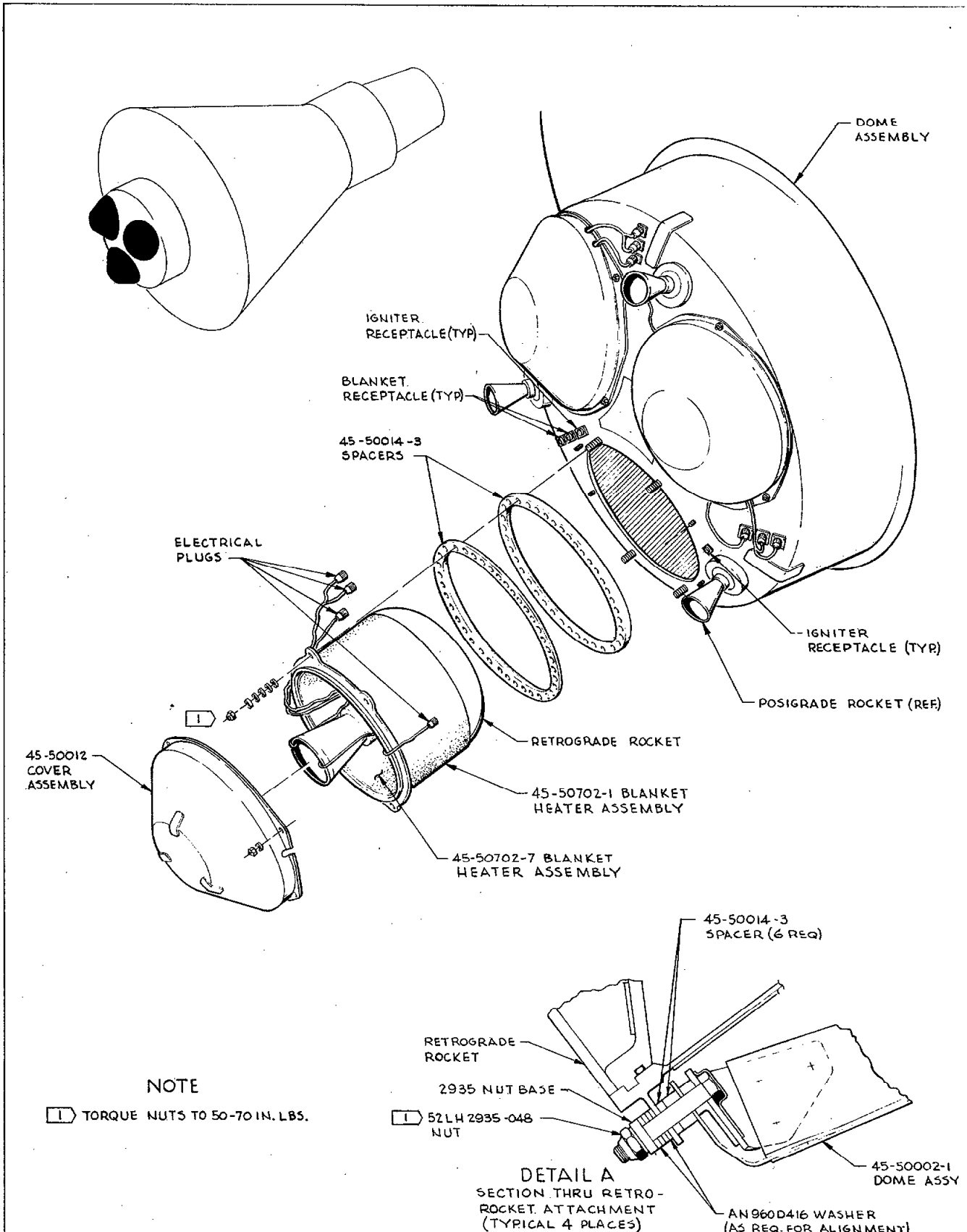


FIGURE 7-1 POSIGRADE ROCKET INSTALLATION

PM45-92



NOTE

1 TORQUE NUTS TO 50-70 IN. LBS.

DETAIL A
SECTION THRU RETRO-ROCKET ATTACHMENT (TYPICAL 4 PLACES)

FIGURE 7-2 RETROGRADE ROCKET INSTALLATION

MH45-91

(c) Place rocket in position over attach bolts and secure. (Ref. Detail A, Figure 7-2.)

CAUTION

Ensure shorting clips are installed on squib leads before installation.

(d) Insert igniter into rocket motor using igniter insertion tool No. _____.

CAUTION

Do not install igniter until authorized by Capsule Configuration Engineer.

(e) Align rockets per SEDR 93.

(f) Secure rockets to dome assembly, torqueing attaching nut 50-70 inch-pounds.

(g) Install cover assembly.

(h) Do not connect electrical plugs to connectors on dome assy. until authorized by Capsule Configuration Engineer. (Ref. Figure 7-2.)

CAUTION

Before connecting electrical leads, a stray voltage check of associated wiring should be accomplished.

7-9. Removal

To remove Retro-Rocket proceed as follows:

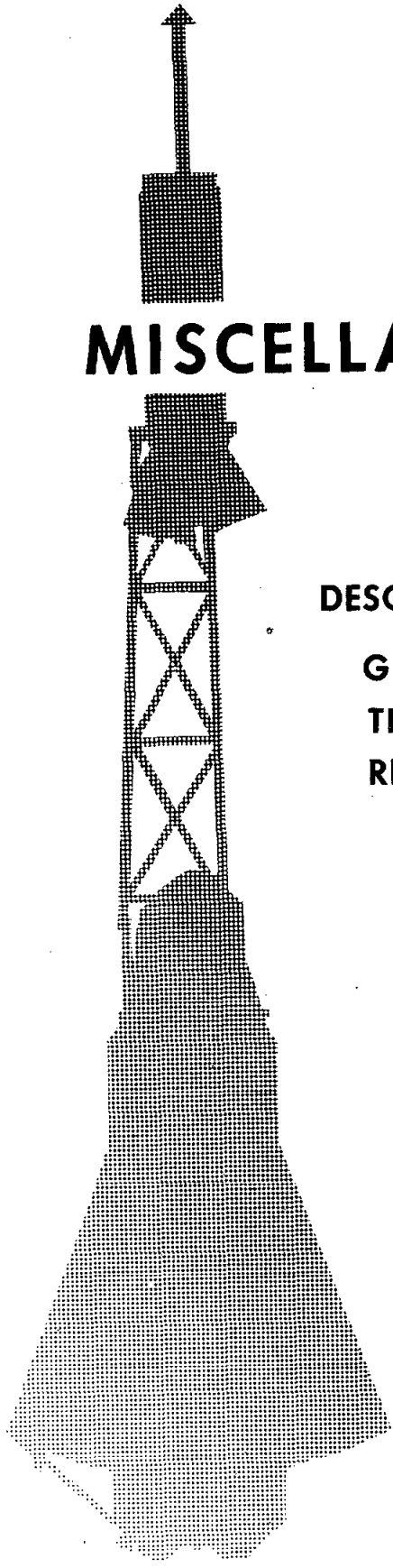
(a) Disconnect electrical connections.

CAUTION

Immediately upon disconnection, shorting plugs must be installed on all connectors.

(b) Remove igniter using special tool _____.

(c) Remove nuts attaching rocket to dome assembly and remove rocket.



SECTION VIII

MISCELLANEOUS PYROTECHNICS

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20. ESCAPE ROCKET & IGNITER
21. JETTISON ROCKET & IGNITER
22. CABIN AIR OUTLET VALVE
23. HELIUM JETTISON VALVES

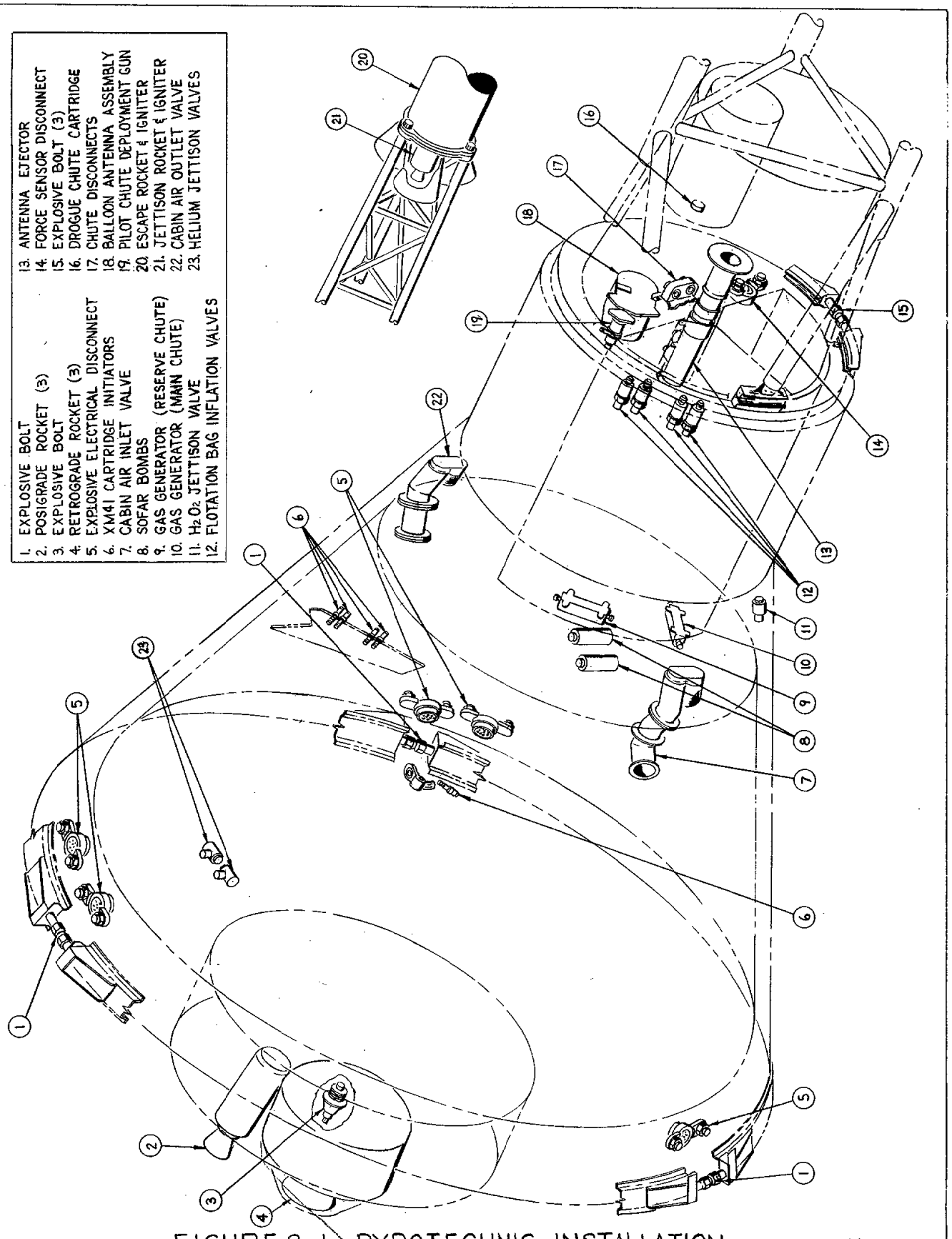


FIGURE 8-1 PYROTECHNIC INSTALLATION

MH45-96

VIII. MISCELLANEOUS PYROTECHNICS

8-1. GENERAL

Section VIII provides procedures and illustrations which facilitate component replacement. It will be noted that not all system components are covered within the Replacement and Adjustment areas. In the absence of said procedure, it may be assumed that the procedure is obvious and does not warrent a detailed explanation or illustration.

8-2. TROUBLE SHOOTING

Trouble Shooting the rocket firing circuits and their sequencing is covered in SEDR 90. Any remaining trouble shooting would consist of nothing more than continuity tests of the wiring between the rockets and the capsule electrical disconnect.

8-3. Removal and Replacement

All installation procedures in this section assume that the electrical and physical integrity of the pyrotechnic devices has already been checked. (Ref. SEDR 112 for checkout procedures.)

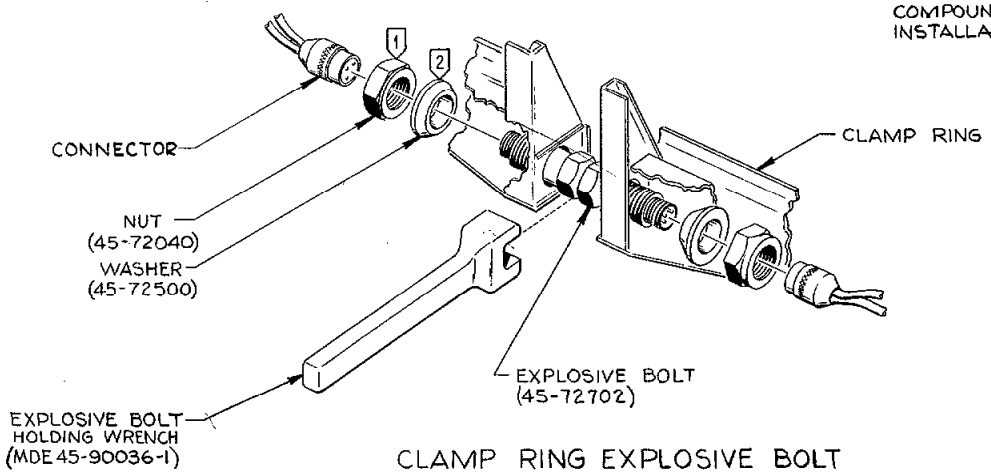
8-4. Clamp Ring Explosive Bolts

8-5. Installation

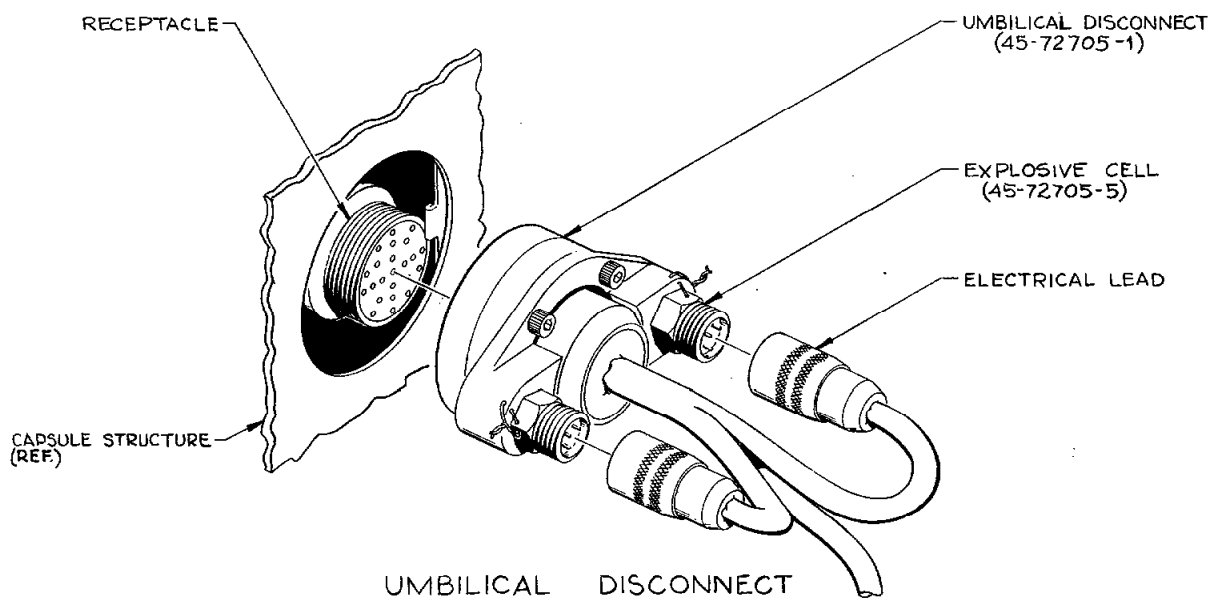
The following procedure is applicable to the explosive bolts used in both the tower-to-capsule clamp ring and the capsule-to-adapter clamp ring. An explosive bolt holding tool (MDE4590036-1) is supplied to assist in installing the bolts. This tool prevents the bolt from turning while the nuts are being torqued. Prior to installing the bolts, lubricate the threads with LOX compatible lubricant (supplied by Convair) and lubricate the spherical seat washer with anti-seize compound (MIL-T-5544).

[1] REF. PARAGRAPH 8-3 FOR TORQUE DATA.

[2] LUBRICATE WITH MIL-T-5544 ANTI-SEIZE COMPOUND UPON INSTALLATION.



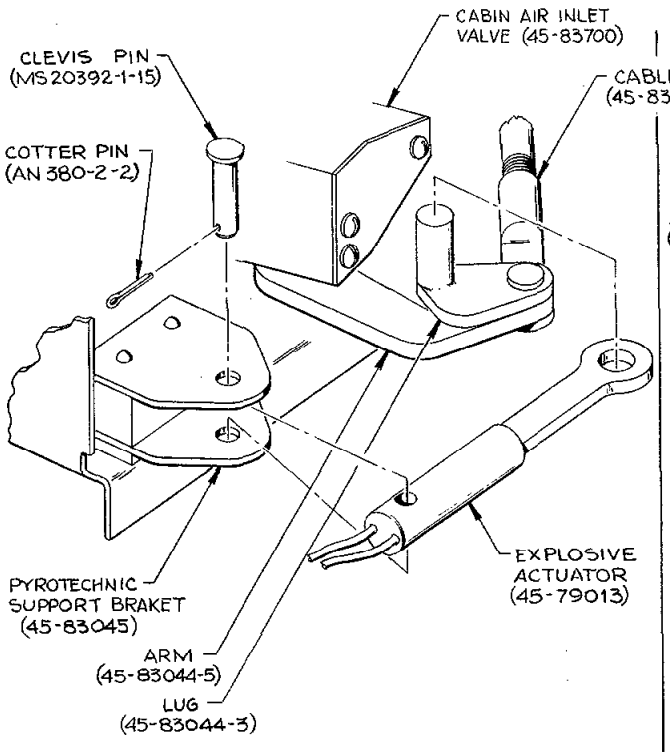
CLAMP RING EXPLOSIVE BOLT



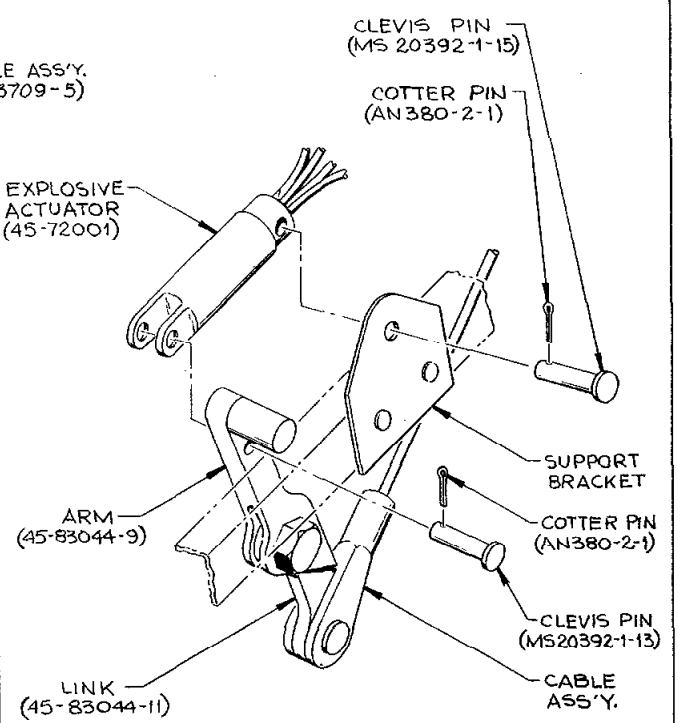
UMBILICAL DISCONNECT

FIGURE 8-2 MISCELLANEOUS PYROTECHNICS, INSTALLATION PROCEDURES. (SHEET 1 OF 3)

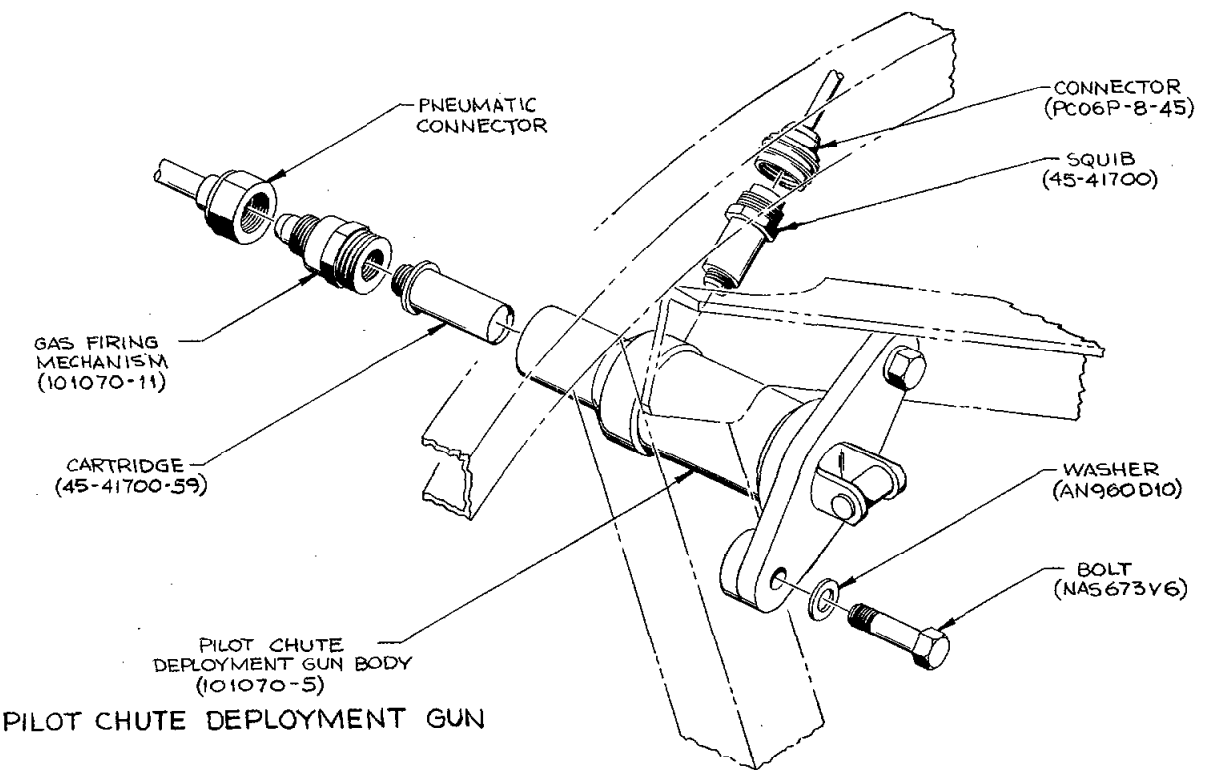
MH45-119-1



CABIN AIR INLET VALVE



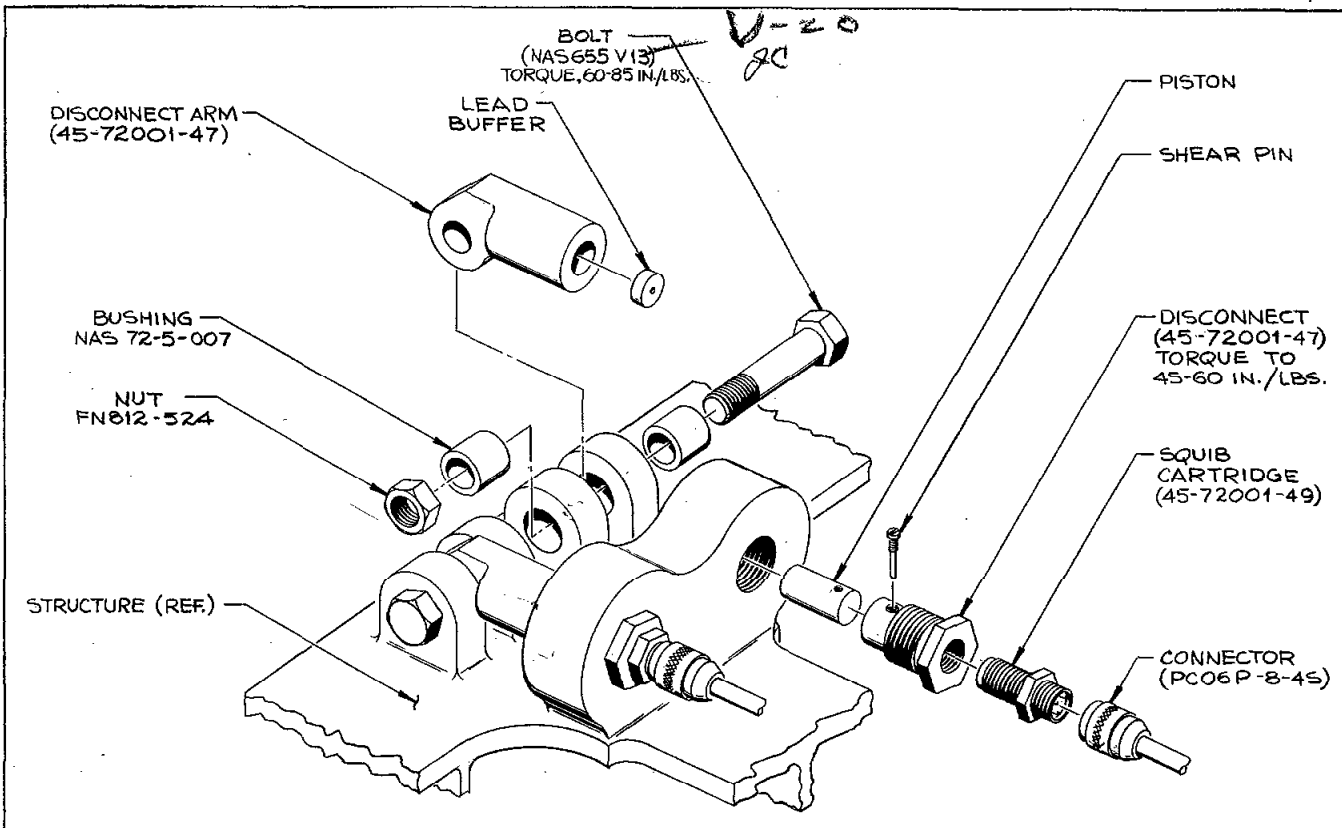
CABIN AIR OUTLET VALVE



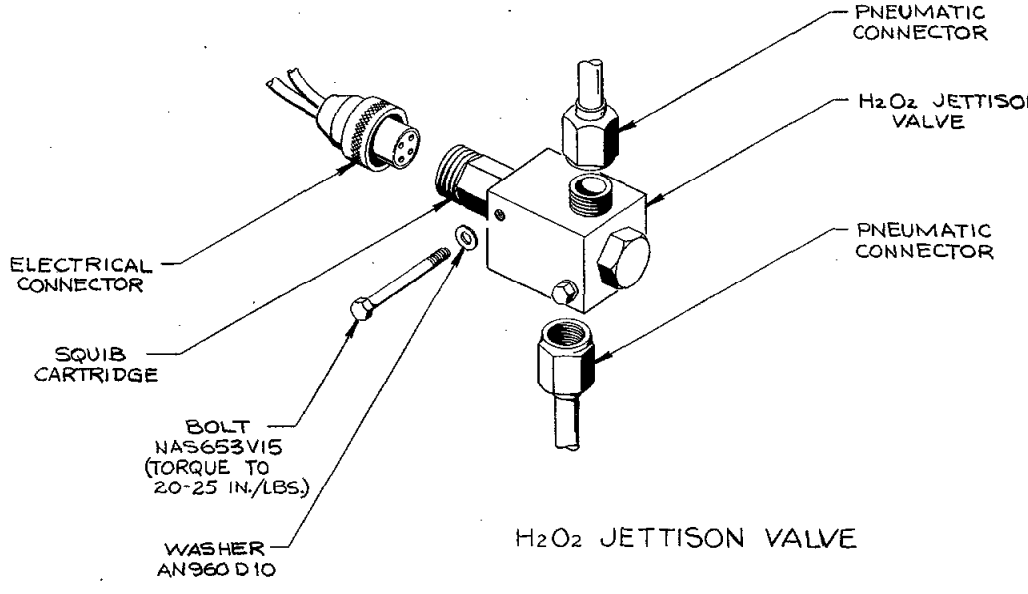
PILOT CHUTE DEPLOYMENT GUN

FIGURE 8-2 MISCELLANEOUS PYROTECHNICS - INSTALLATION PROCEDURES. (SHEET 2 OF 3)

MH 45-119-2



MAIN AND RESERVE CHUTE DISCONNECTS



H_2O_2 JETTISON VALVE

FIGURE 8-2 MISCELLANEOUS PYROTECHNICS, INSTALLATION PROCEDURES. SHEET 3 OF 3

MH45-119-3

(a) Torque nuts to approximately 320 in.-lbs. tap ring segments along their length with a mallet, then torque nuts to 775 ± 20 in.-lbs.

(b) Tap ring segments again and retorque to 775 ± 20 in.-lbs. Repeat until torque remains constant at 775 ± 20 in.-lbs.

NOTE

Distance from end of nut to end of bolt must be equal within ± .06 in. for all bolts. Safety attach nuts with lockwire (MS20995N51).

(c) Ascertain that explosive bolt electrical leads are of proper length and are equipped with proper connectors.

(d) Install pneumatic line (when applicable), containing initiator, between clamp ring bolt and capsule fitting. Note fit of line.

(e) Check clamp ring heat shield segments for general condition and install over clamp ring segments noting that each section is properly contoured and that all bolt holes align. Torque all bolts to 12 to 15 in.-lbs.

CAUTION

Do not connect electrical leads until a stray voltage check has been performed on associated wiring. Use MDE4572008-1 Squib Simulator and MDE4541010 Squib Tester for this purpose.

8-6. Retrograde Package Explosive Bolt

8-7. Installation

(a) The explosive bolt (45-72704) is installed during installation of the retro-package dome assy. See Figure 2-2.

(b) After the bolt has been torqued and prior to connecting electrical leads, a stray voltage check should be performed using MDE4572008 Squib Simulator and MDE4541010 Squib Tester.

(c) Connect electrical leads only upon authorization of the C.C.E.

8-8. Removal

Removal of the retrograde package explosive bolt is the reverse of the installation procedure.

8-9. Antenna Fairing Ejector

8-10. Installation

The Antenna Fairing Ejector Assembly (45-72703), Tube Assembly (45-72021) and Fitting Assembly (45-72024) are all installed at McDonnell prior to capsule shipment. (Ref. Print No. 45-72020). The ejector is installed in the center of the cylindrical section of the capsule. (See Figure 8-1.) Attachment to the capsule structure is by means of six nuts and bolts; two NAS624-8 bolts, four NAS624-10 bolts and six 42FW-428 nuts. The four lower attach bolts are also utilized to attach the breech and cylinder assembly. The tube and fitting assembly are attached to the ejector by means of one eyebolt (45-72027-3) and one nut (NAS679A6) and one standard bolt (AN 5-21A) and nut (NAS679A5). The remaining items to be installed are the pyrotechnics which will be installed in the hangar at Cape Canaveral. These are installed in the appropriate openings as follows:

(a) Two cartridges (Olin-Matheson ARD 863) are installed in the side of the 45-72703 breech assy.

(b) One cartridge (Frandford Arsenal M-67) is installed in the bottom of the 45-72703 breech assy.

(c) One cartridge (McCormick-Selph 2561) is installed in the bottom of the ejector assembly. Torque to 100 in.-lbs. and lockwire to the NAS-509-12 nut using .032 in. dia. safety wire.

(d) Do not connect electrical leads until authorized by the Capsule Configuration Engineer.

CAUTION

Do not make any electrical connections until a stray voltage check has been performed on associated wiring. Use MDE4572008 Squib Simulator and MDE4541010 Squib Tester for the purpose.

8-11. Removal

Removal is the reverse of the installation procedure. Install shorting clips on pyrotechnics immediately.

8-12. Electrical Umbilical Disconnect

8-13. Installation

To install disconnect (Ref. Figure 8-2) and proceed as follows:

(a) Mate pins in disconnect assy. with pins in receptacle (receptacle is keyed for this purpose).

(b) Thread the disconnect body onto the receptacle. The entire disconnect body is free to rotate for this purpose.

CAUTION

Perform the following steps only when specifically instructed to do so by Capsule Configuration Engineer.

(c) Install explosive cells in disconnect body and safety, with lockwire.

(d) Make a stray voltage check at each cell lead using MDE4541010 tester.

(e) Do not connect electrical leads until authorized by the Capsule Configuration Engineer.

CAUTION

Do not connect electrical leads to squibs until a stray voltage check has been accomplished on associated wiring. Use MDE4572008 Squib Simulator and MDE4541010 Squib Tester for this purpose.

8-14. Removal

Removal is the reverse of the installation procedure. Install shorting clips immediately.

8-15. Cabin Air Inlet Valve

8-16. Installation

For installation of the inlet valve itself, refer to Section III. For pyrotechnic installation proceed as follows:

(a) Place the rod end of the 45-83043 arm assembly over the pin on the 45-83644-3 lug. (See Figure 8-2.)

(b) Slide the opposite end of the 45-83043 arm assembly into the 45-83045 support bracket and secure with an MS20392-1-15 clevis pin and AN380-2-1 cotter pin.

(c) Do not connect electrical leads until authorized by the Capsule Configuration Engineer.

CAUTION

Do not connect any electrical leads until a stray voltage check has been accomplished on associated wiring. Use MDE4572008 Squib Simulator and MDE4541010 Squib Tester for this purpose.

8-17. Removal

Removal is the reverse of the installation procedure. Install shorting clip immediately.

8-18. Cabin Air Outlet Valve

8-19. Installation

For installation of the outlet valve itself, refer to Section III. For installation of the pyrotechnic proceed as follows:

(a) Slide the squib end of the 45-79013 explosive actuator in the 45-83045 support bracket and secure in position with an MS20392-1-15 clevis pin and an AN380-2-1 cotter pin. (See Figure 8-2.)

(b) Connect the opposite end to the 45-83044 arm in the same manner.

(c) Do not connect electrical leads until authorized by the Capsule Configuration Engineer.

CAUTION

Do not connect any electrical leads until a stray voltage check has been performed. Use MDE4572008 Squib Simulator and MDE4541010 Squib Tester for this purpose.

8-20. Removal

Removal is the reverse of the installation procedure. Install shorting clips immediately.

8-21. Flotation Bag Vent Valves

8-22. Installation

The flotation bag vent valves are located in the recovery compartment near the small pressure bulkhead. (See Figure 8-1.) These valves are threaded into the tee fittings immediately downstream of the check valves. (Ref. Print No. 45-62002.) Keep shorting clips installed until electrical connections are made. Following installation, do not connect electrical leads to vent valves until authorized by the Capsule Configuration Engineer.

CAUTION

Before connecting electrical lead, perform a continuity check on associated wiring using MDE4572008 Squib Simulator and MDE4541010 Squib Tester.

8-23. Removal

Removal is the reverse of the installation procedure. Install shorting clips immediately.

8-24. Drogue Mortar

8-25. Installation

(a) Remove antenna fairing cover. (Ref. Section IV.)

(b) Install squib in drogue mortar.

(c) Connect electrical lead to squib only upon authorization of the Capsule Configuration Engineer.

CAUTION

Prior to connecting any electrical leads, perform a stray voltage check using MDE4572008 and MDE4541010.

8-26. **Pilot Chute Deployment Gun**

8-27. Installation

(a) Attach the Deployment Gun assembly to the capsule structure with two AN3 (3/16 in.) bolts. (See Figure 8-2.)

(b) Screw the electric cartridge into the side of the gun and torque to 30-45 in. lbs. Safety wire the cartridge into gun body with 1/32 in. diameter safety wire.

(c) Screw the main cartridge into the firing mechanism and torque to 30-45 in. lbs.

(d) Screw the firing mechanism (including the main cartridge) into the gun body and torque to 45-60 in. lbs.

(e) Connect the nut on the end of the gas generator tubing to the lower end of the deployment gun and torque to 45-60 in. lbs.

(f) Do not connect electrical lead to electric cartridge until authorized by the Capsule Configuration Engineer.

CAUTION

Do not connect electrical leads until a stray voltage check has been accomplished on associated wiring. Use MDE4572008-1 Squib Simulator and MDE4541010 Squib Tester.

8-28. Removal

Removal procedure is the reverse of the installation procedure.

8-29. Main and Reserve Chute Disconnects

8-30. Installation

(a) Insert end of piston into bushing. (See Figure 8-2.)

(b) Align the shear pin holes in the bushing and piston and install shear pin through holes. Screw the shear pin into place.

(c) Place the main chute riser loop over the hinged arm of the chute disconnect.

(d) Insert lead buffer into arm recess to maximum depth. Tap lightly with punch so that lead buffer will deform to provide a press fit.

NOTE

Ensure that only one lead buffer is installed. Otherwise the disconnect unit will not function properly.

(e) Depress the hinged arm to the load carrying position (as shown) and insert the piston and bushing into the receptacle.

NOTE

Hinged arm attach bolt should be torqued to 60-85 in. lbs.

(f) Screw the piston and bushing into place and torque to 45-60 in. lbs.

(g) Safety wire cartridge to capsule structure with 1/32 in. diameter wire.

(h) Do not connect electrical lead to squib cartridge until authorized by the Capsule Configuration Engineer.

CAUTION

Do not make electrical connection until a stray voltage check has been accomplished using MDE4572008-1 Squib Simulator and MDE4541010-1 Squib Tester.

8-31. Removal

Chute disconnect removal is the reverse of the installation procedure. Install shorting clip on squib immediately.

8-32. Parachute Reefing Cutters

The reefing cutters are installed during parachute packing. Refer to Section IX for details.

8-33. Parachute Ejector Gas Generator

8-34. Installation

Both the main and reserve chute gas generators are installed in the same manner. Proceed as follows:

(a) Attach generator to fiberglas chute can by means of the four mounting lugs provided. Secure with four AN-3 bolts.

(b) Connect the gas entry tube to the generator.

NOTE

Ensure that the gas entry tube is installed in such a manner that the astronaut can readily remove it for exit.

(c) Do not connect electrical lead until authorized by the Capsule Configuration Engineer.

CAUTION

Before making electrical connections, a stray voltage check should be performed on associated wiring using MDE4572008-1 Squib Simulator.

8-35. Removal

Removal is the reverse of the installation procedure. Install shorting clips on squibs immediately.

8-36. Balloon Antenna Assembly

8-37. Installation

The balloon antenna assembly is delivered, as a unit, to Cape Canaveral. Since live squibs are a part of this unit, the whole assembly is handled and stored as a pyrotechnic. Keep shorting clips installed until electrical connections are made. Installation consists of attaching assembly to the capsule structure and connecting the electrical leads. (See Figure 8-2.) The procedure is as follows:

CAUTION

Ensure that shorting clips are installed on all squibs during installation.

(a) Attach antenna assembly (45-85700-53) to capsule structure by means of the mounting lugs provided on the assembly.

(b) Use two NAS 673V8 bolts and AN960 DIOL washers on the two inboard attaching points.

(c) Use NAS673V4 bolts and two AN 960 DIOL washers on the two outboard attach points.

(d) Do not connect electrical leads until authorized by the Capsule Configuration Engineer.

CAUTION

Before connecting electrical leads, perform a stray voltage check on associated wiring using MDE4572008-1 Squib Simulator and MDE4541010 Squib Tester.

8-38. Removal

Removal is the reverse of the installation procedure. Install shorting clips on pyrotechnics immediately.

8-39. Hydrogen Peroxide (H_2O_2) Jettison Valve

8-40. Installation

The H_2O_2 Jettison Valve is secured just forward of the small pressure Bulkhead by means of two NAS 653V15 volts and two AN 960D10 washers. (See Figure 8-2.) Following installation of the valve, connect the two 1/4 in. lines at the appropriate fittings. The last step is to connect the squib electrical lead upon authorization of the Capsule Configuration Engineer.

CAUTION

Do not connect electrical lead until a stray voltage check has been performed on associated wiring. Use MDE4572008-1 Squib Simulator and MDE4541010 Squib Tester.

8-41. Removal

Removal is the reverse of the installation procedure. Install shorting clips on squib immediately.

8-42. Sofar Bombs

8-43. Installation

One SOFAR bomb will be placed adjacent to the main parachute and will be deployed by inserting it into a loop on the antenna lanyard which is deployed on antenna separation/main parachute ejection at 10,000 feet of altitude. This method of installation flips the SOFAR bomb clear of the capsule and has been NASA tested to insure that the SOFAR bomb is set to trigger sounding at a depth of 3,500 feet. The second, and remaining, SOFAR bomb will be mounted to the capsule structure and set to trigger

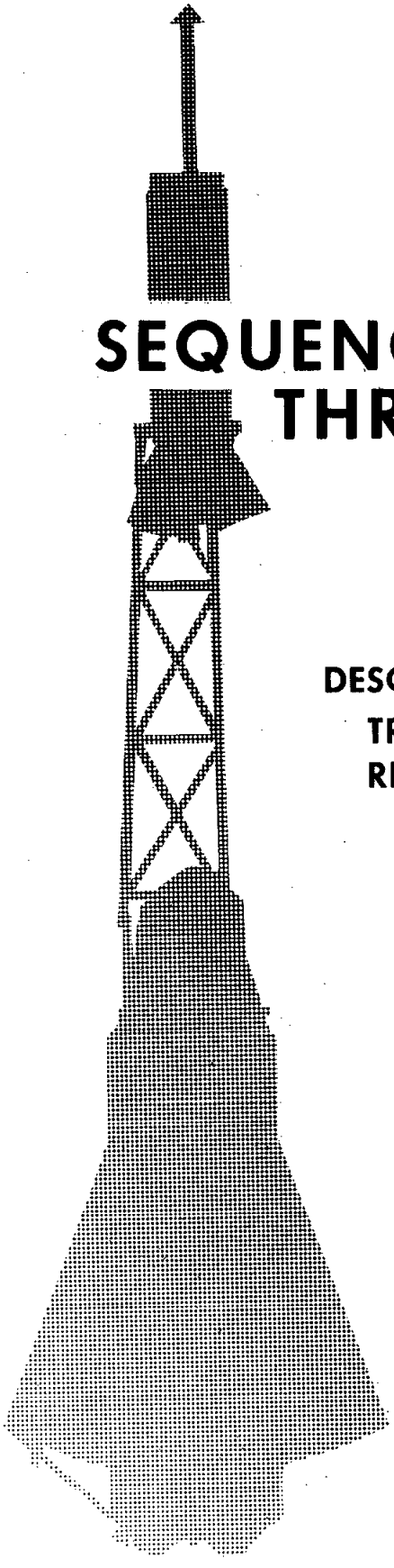
sounding at a depth of 4000 feet, thereby denoting that the capsule is sufficiently below the water's surface to render it non-recoverable.

8-44. Removal

Removal is the reverse of the installation procedure.

NOTE

This unit must be installed before balloon antenna assembly for accessibility reasons.



SECTION IX

SEQUENCE SYSTEM LANDING THROUGH RECOVERY

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IX. SEQUENCE SYSTEM, LANDING THROUGH RECOVERY

9-1. GENERAL

Section 9 provides procedures, diagrams and illustrations to facilitate system trouble shooting and component replacement and adjustment. It is noted that all system components are not necessarily covered within the Replacement and Adjustment areas. In the absence of such procedure, it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

9-2. TROUBLE SHOOTING

To aid in landing system trouble shooting individual single line schematics are specified for each electrical component. The schematics show the components electrical power source and initiating circuitry with respect to the overall system. Components presently covered by single line schematics are as follows:

(a) Drogue Chute Deployment Squib.

(b) Antenna Fairing Ejector Squib.

All remaining components of the landing system will be covered at a later date.

9-3. REPLACEMENT AND ADJUSTMENT

9-4. Parachutes

Parachutes should be stored in the unpacked condition in closed containers. The shipping containers are satisfactory for this purpose and should be located in a reasonably cool, dry areas where they are not exposed to sunlight. When parachutes are shipped in the packed condition, they must be left in their shipping container to retain the pre-installation shape. Packed parachutes must be inspected each 30 days and re-

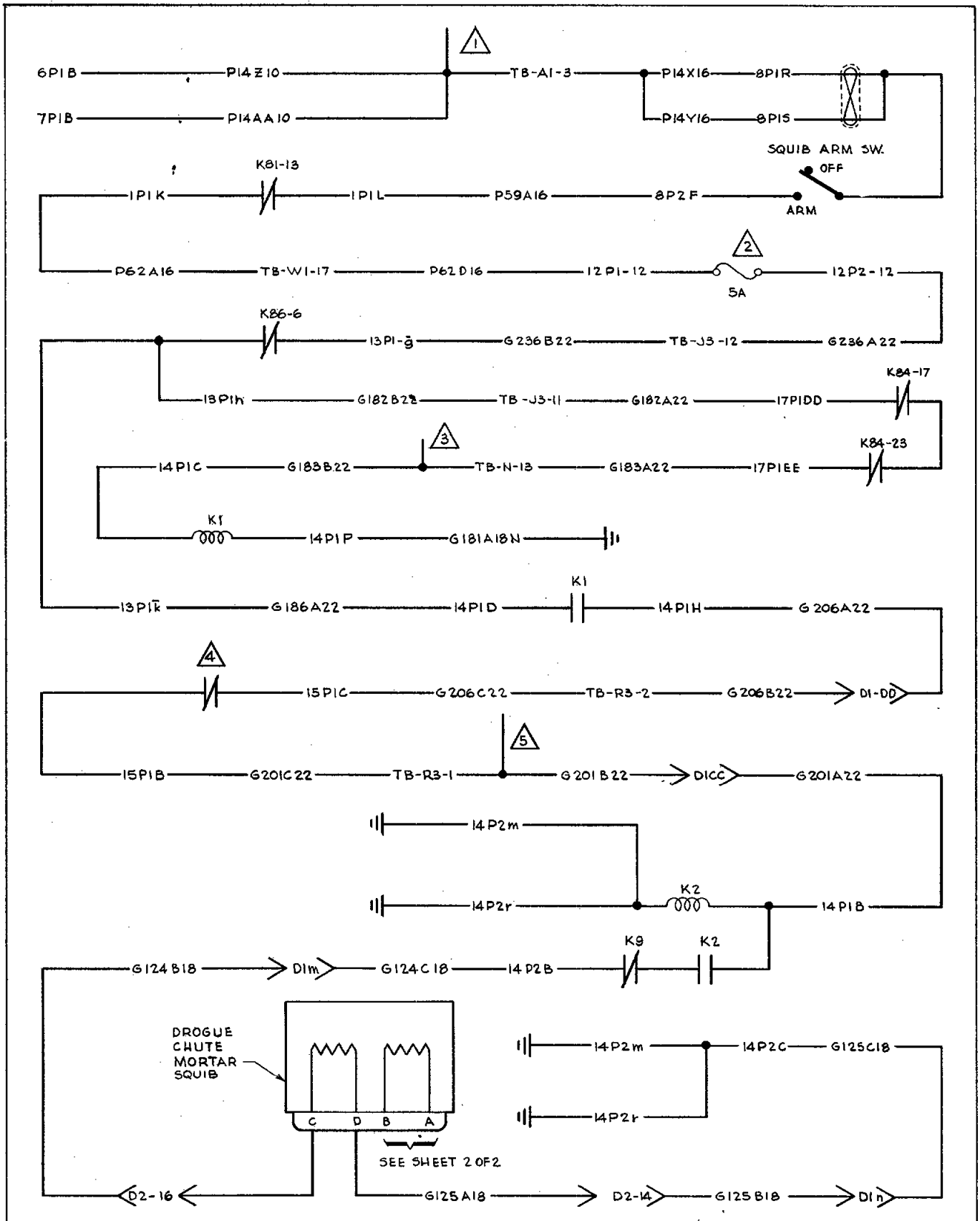
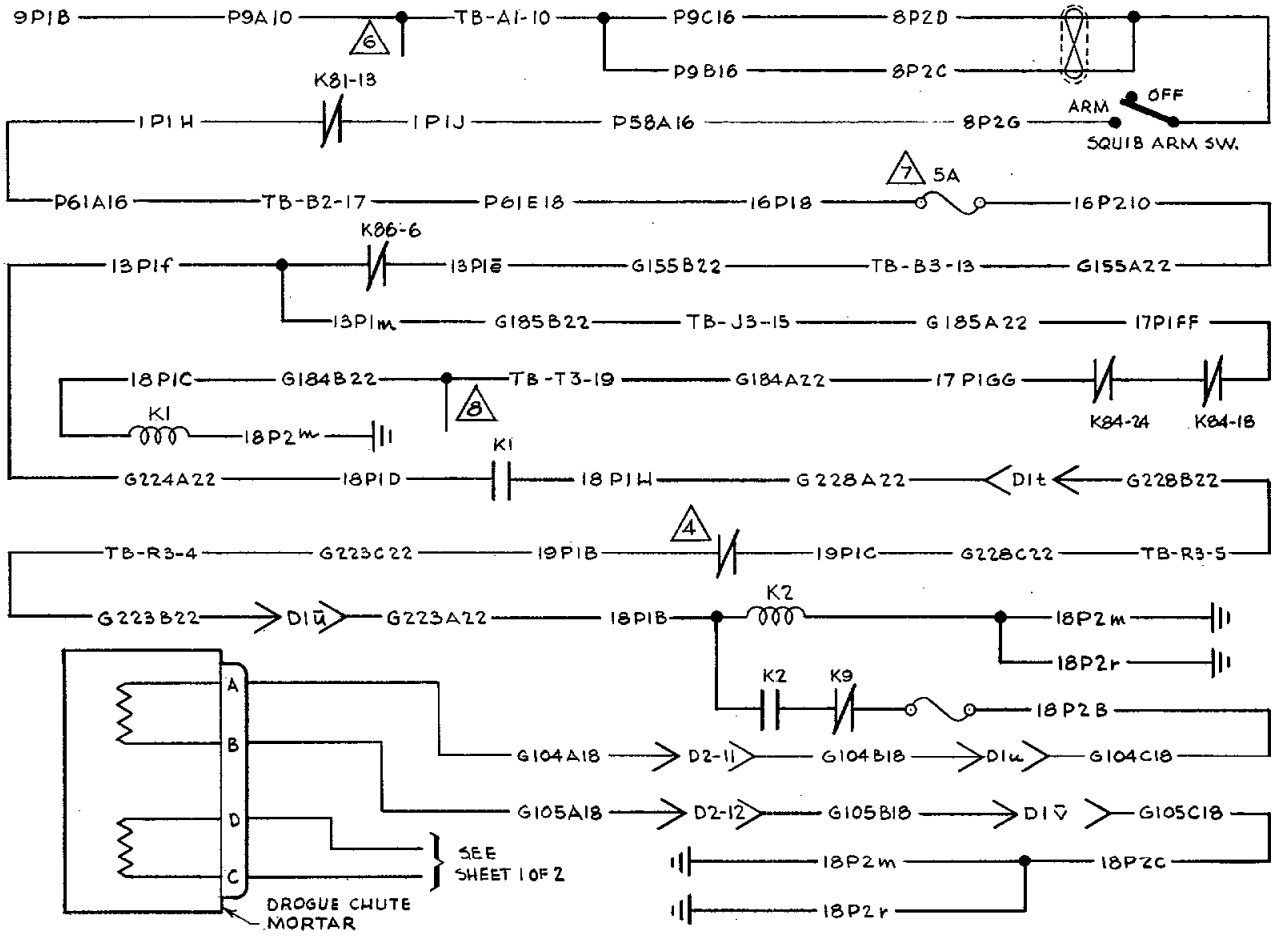


FIGURE 9-1 DROGUE CHUTE DEPLOYMENT SQUIB SCHEMATIC (SHEET 1 OF 2) MH45-1141



COMPONENTS	
6P1	MAIN BATTERY 3000W-H 801B
7P1	MAIN BATTERY 3000W-H 801C
8P1	MAIN INSTRUMENT PANEL PTOOP-22-21S
8P2	MAIN INSTRUMENT PANEL PTOOP-22-21SW
1P1	POWER SYSTEM CONTROL PANEL
12P1	NO.1 RETROGRADE & RECOVERY F.H. 801J
12P2	NO.1 RETROGRADE & RECOVERY F.H. 810F
13P1	RECOVERY RELAY BOX 1 PT06P-22-55S
14P1	SYSTEM A SEQUENCE CONTROLER PT06P-20-39S
14P2	SYSTEM A SEQUENCE CONTROLER PT06P-20-39SW
15P1	42,000 FOOT ANEROID, SYSTEM A
9P1	ISOLATED BATTERY 1500 WH
16P1	NO.2 RETROGRADE & RECOVERY F.H. 801AD
16P2	NO.2 RETROGRADE & RECOVERY F.H. 810T
18P1	SYSTEM B SEQUENCE CONTROLER PT06P-20-39S
18P2	SYSTEM B SEQUENCE CONTROLER PT06P-20-39SW
17P1	LAUNCH & ORBIT RELAY BOX NO.3 PT06P-24-61SW
19P1	42,000 FOOT ANEROID, SYSTEM B

RELAYS	
K81-13	SQUIB ARM RELAY
K86-6	IMPACT RELAY NO.1
K84-17	NO.2 ORBIT ATTITUDE RELAY
K84-23	NO.2 TOWER SEPARATION RELAY
K1	THREE SECOND TIME DELAY RELAY
K84-18	NO.3 ORBIT ATTITUDE RELAY
K84-24	NO.3 TOWER SEPARATION RELAY
K2	DROGUE SQUIB SHORT (AUTO)
K9	DROGUE O'RIDE (MANUAL)

=NC RELAY =NO RELAY = DISCONNECT

1. GROUND TEST UMBILICAL PIN 103
2. AUTO LANDING SYSTEM A
3. HATCH CABLE DISCONNECT PTOOP-18-32S, PIN u
4. BELOW 42,000 FEET
5. CIRCUIT TO 42,000 FOOT ANEROID SYSTEM B
6. GROUND TEST UMBILICAL PIN 105
7. AUTO LANDING SYSTEM B
8. HATCH CABLE DISCONNECT PTOOP-18-32S, PINK

DISCONNECTS	
D1	SMALL PRESSURE BULKHEAD
D2	ANTENNA FAIRING DISCONNECT

FIGURE 9-1 DROGUE CHUTE DEPLOYMENT SQUIB SCHEMATIC (SHEET 2 OF 2) MH45-114-2

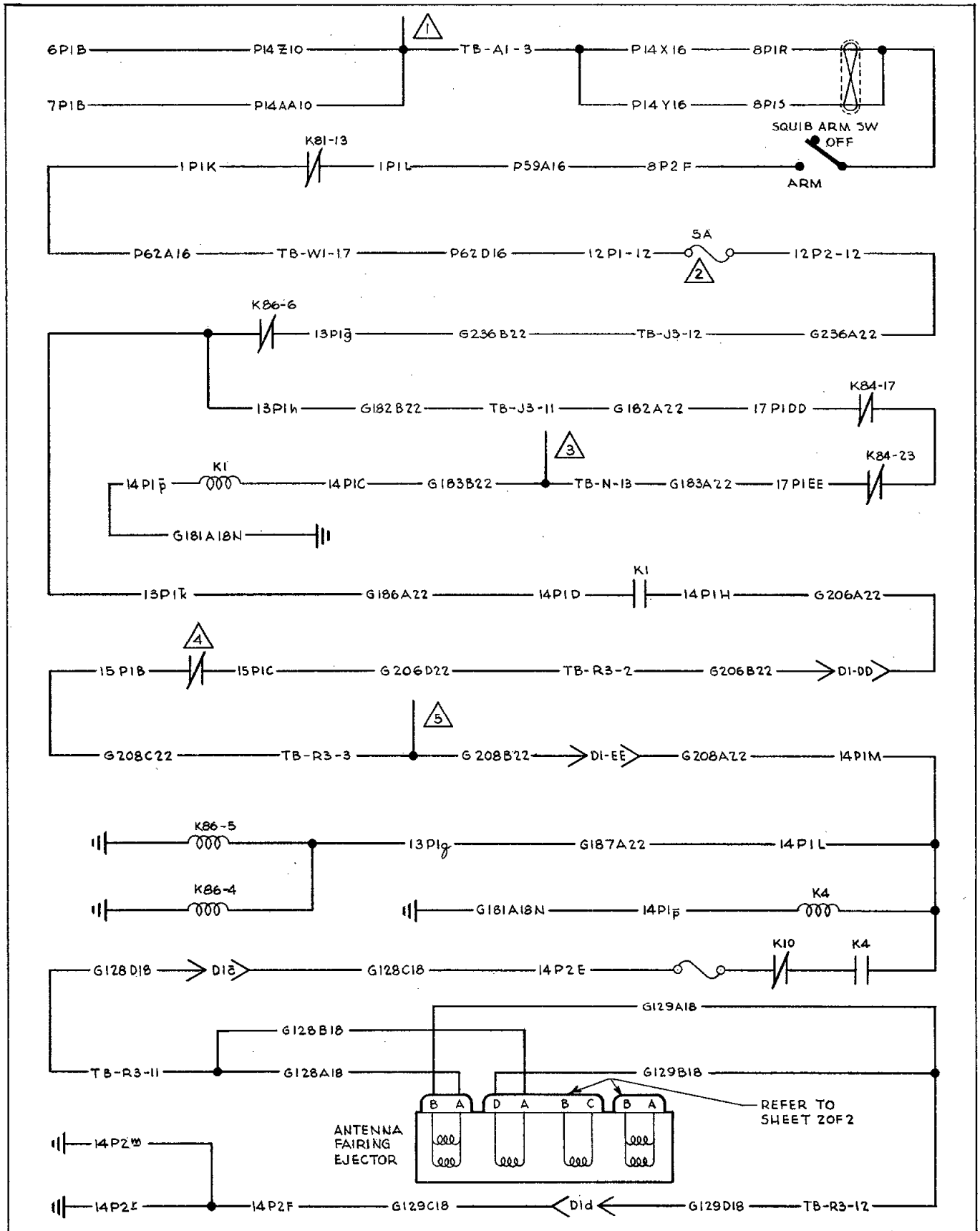
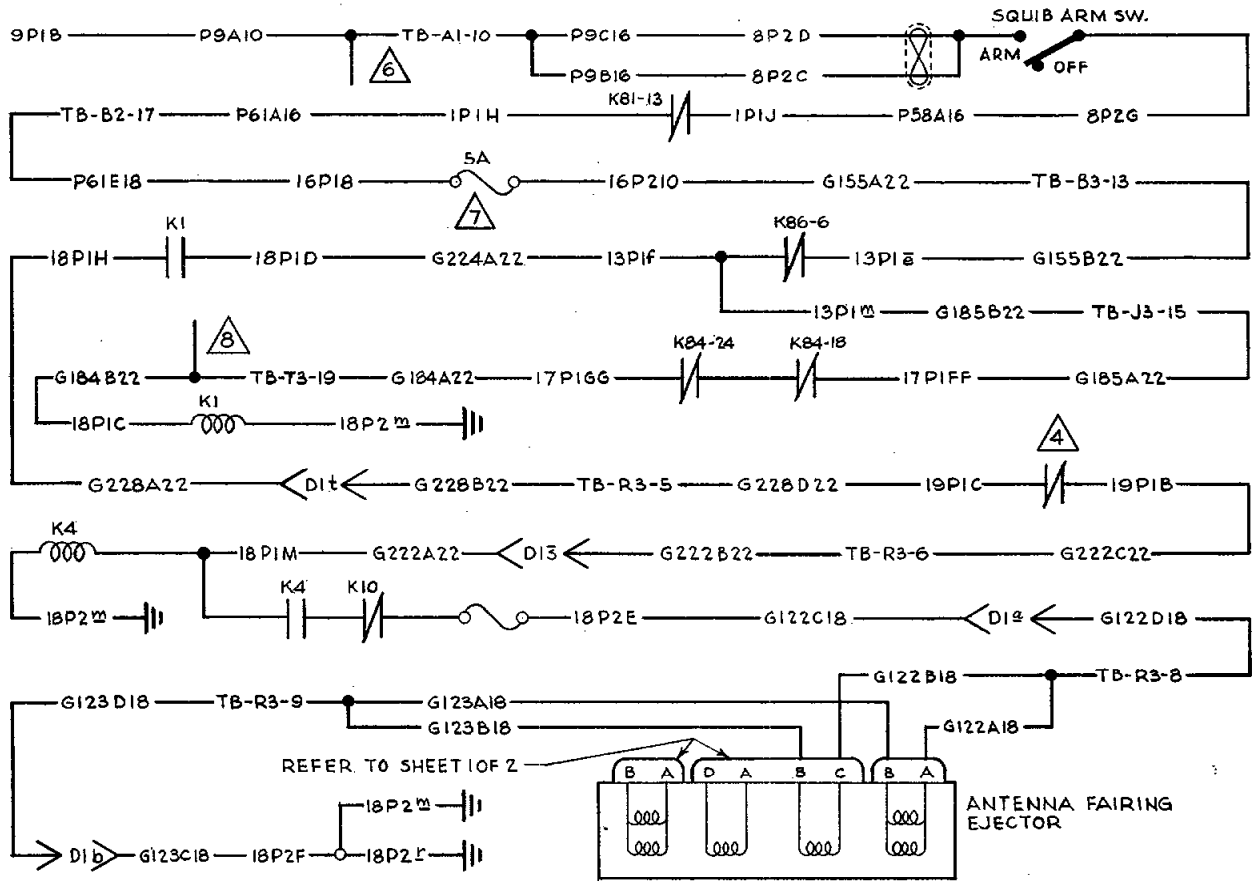


FIGURE 9-2 ANTENNA FAIRING EJECTOR SQUIB SCHEMATIC (SHEET 1OF2) MH45-122-1



COMPONENTS	
6P1	MAIN BATTERY 3000 W-H 801B
7P1	MAIN BATTERY 3000 W-H 801C
8P1	MAIN INSTRUMENT PANEL PT00P-22-215
8P2	MAIN INSTRUMENT PANEL PT00P-22-215W
1P1	POWER SYSTEM CONTROL PANEL
12P1	NO.1 RETROGRADE AND RECOVERY F.H. 801J
12P2	NO.1 RETROGRADE AND RECOVERY F.H 810F
13P1	RECOVERY RELAY BOX 1 PT06P-22-555
14P1	SYSTEM A SEQUENCE CONTROLER PT06P-20-395
14P2	SYSTEM A SEQUENCE CONTROLER PT06P-20-395W
15P1	10,000 FOOT ANEROID, SYSTEM A
9P1	ISOLATED BATTERY 1500 W-H
16P1	NO.2 RETROGRADE AND RECOVERY F.H. 801AD
16P2	NO.2 RETROGRADE AND RECOVERY F.H. 810T
17P1	LAUNCH AND ORBIT RELAY BOX NO.3 PT06P-24-615W
18P1	SYSTEM B SEQUENCE CONTROLER PT06P-20-395
18P2	SYSTEM B SEQUENCE CONTROLER PT06P-20-395W
19P1	10,000 FOOT ANEROID SYSTEM B

RELAYS	
K81-13	SQUIB ARM RELAY
K86-6	IMPACT RELAY NO.1
K84-17	NO.2 ORBIT ATTITUDE RELAY
K84-23	NO.2 TOWER SEPARATION RELAY
K1	THREE SECOND TIME DELAY RELAY
K86-5	10K FOOT DESCENT RELAY NO.2
K86-4	10K FOOT DESCENT RELAY NO.1
K4	MAIN SQUIB SHORT (AUTO)
K10	MAIN O'RIDE (HANDLE #1 SLAVE) (MANUAL)
K84-18	NO.3 ORBIT ATTITUDE RELAY
K84-24	NO.3 TOWER SEPARATION RELAY

⊣⊢ = NO RELAY ⊣/⊢ = NC RELAY << = DISCONNECT

DISCONNECTS	
D1	SMALL PRESSURE BULKHEAD

1. GROUND TEST UMBILICAL PIN 103
2. AUTO LANDING SYSTEM A
3. HATCH CABLE DISCONNECT PT00P-18-325, PIN U
4. BELOW 10,000 FEET
5. TO SYSTEM B 10,000 FOOT ANEROID (REDUNDANT CIRCUIT IF SYSTEM B ANEROID FAILED
6. GROUND TEST UMBILICAL PIN 105
7. AUTO LANDING SYSTEM B
8. HATCH CABLE DISCONNECT PT00P-18-325, PIN K

FIGURE 9-2 ANTENNA FAIRING EJECTOR SQUIB SCHEMATIC (SHEET 2 OF 2)
MH45-122-2

packed after 60 days.

9-5. Drogue Parachute

9-6. Folding Canopy

Place the drogue parachute on the packing table and anchor the apex. Remove any twists in the suspension lines and riser. Anchor the riser loop and apply a slight tension; again check for twisted lines and riser. Divide lines in two groups, one (1) through four (4) on one side and five (5) through eight (8) on the other. Fold the gores neatly outward in two groups, gores one (1) through four (4) forming the left hand group and five (5) through eight (8) the right hand group. Do not accordion-fold the gores inward to achieve a narrow fold.

9-7. Straightening The Vent

Straighten the upper lateral band and neatly arrange the vent lines.

9-8. Stowing Canopy

Free the apex and riser loop. Gather the drogue canopy between both hands and insert, apex first, into the deployment bag. Tamp the canopy after each fold is inserted to compact it. Continue stowing the canopy in this manner, making S-shaped accordion folds.

9-9. Stowing Lines

Fold the suspenion lines in S-shaped bights (approximately 6" in length), and stow each bight in the bag on top of the canopy.

9-10. Stowing Riser

Starting at the line-riser joint, fold the riser in S-shaped bights (approximately 6" in length), and tie each bight with one turn of 3-cord cotton.

CAUTION

The bight must contain only two folds of webbing. If three folds of webbing are tied together in the bight, the possibility exists that the drogue may not function properly at low air speeds. Do not tie the lower 10 feet of the riser. Stow the riser crosswise in the deployment bag. Tie the bights to the hesitator loops inside the bag.

Trim the ends of the 3-cord ties. Successive layers of folds are placed in different directions across the bag. The loop attached 18 inches from the lower end of the riser is positioned just outside the bag mouth.

9-11. Pre-Installation Procedure.

Before installing drogue chute, the drogue chute mortar assembly must be prepared and built up. The mortar tube and attached gas cartridge are installed during manufacture and the sabot is stored inside the tube. Remove the sabot and grease the inner well of mortar tube with Versilube 9-300 or equal. Inspect "O" ring of sabot to assure proper seating and insert sabot into tube. Two small holes in the "O" ring groove will allow air to escape as sabot is depressed to the bottomed out position. Refer to Section VIII for installation of squib into gas cartridge, and electrical hook-up.

9-12. Installation

(a) Connect the drogue riser which is colored olive drab to the longer cable fitting on the antenna fairing.

(b) Connect the other two drogue risers, the ends of which are covered with white tape, to the two short steel cable attachments on the

antenna fairing.

(c) Insert the packed drogue parachute in the drogue mortar, with the glass-cloth insulated end up. The three risers must issue from the mortar in the proper location to match with the three cutouts in the mortar cover.

(d) Force the drogue chute down into the mortar, flush with the top at the mortar.

(e) Install the chaff packet and mortar cover, first removing the pressure sensitive tape from the outside of the chaff packet and placing the chaff packet on top of the drogue chute.

(f) Place the mortar cover, containing Thermoflex insulation, in position on the antenna fairing and attach it with four AN520-1032 screws.

(g) Torque the screws to six inch-ounces.

NOTE

If drogue chute gas cartridge squib is NOT installed at time of drogue chute installation, the chaff pack should be left out and so noted. This is to prevent chaff pack from being disturbed when antenna cover assembly is removed for squib installation.

9-13. Main Parachute

9-14. Straightening Canopy and Lines

Secure the canopy apex at one end of the packing table and secure the riser loop to the opposite end of the table and apply slight tension. Grasp suspension lines No. 1 and No. 48 at canopy skirt and trace to

connector links, removing turns, twists and tangles. Determine that suspension lines and connector links are in proper order. Straighten upper lateral band and neatly arrange apex lines.

9-15. Installing Reefing Cutters And Reefing Line.

Remove the safety cotter pin from the side of two Type OA-C2-4 (4-second) Reefing Cutters.

CAUTION

Do not pull the arming ring from the end of the cutter as this will fire it.

Insert cutters into mounting plates at skirt on gores No. 1 and No. 25, from the skirt direction. Align groove in cutter with slot in mounting plate. Secure cutter in mounting with Tru-Arc lock ring No. 5103-31. Place lines No. 24 and No. 25 in adjacent slots of a line separator. Facing the apex of the canopy, throw the lines and gores of the right hand group over the left-hand group. If available, place a 30-inch diameter pedestal fan about 10 feet from the skirt and about 6 feet to the right of the canopy. Point the fan at the canopy so that air stream will partly inflate it. The reefing line is a piece of 750-pound braided coreless nylon line (MIL-C-7515, Type III) cut to a length of 275 inches and marked 6 inches from one end. The reefing line length is marked under 5 pounds tension. In order to facilitate insertion of the reefing line through the hole in the reefing cutter, either or both ends may be tightly wrapped with masking or cellophane tape. Remove tape before splicing ends together.

9-16. Inserting Reefing Line.

(a) Starting at reefing ring No. 13, thread the reefing line through

the reefing rings on gores No. 13 through No. 24 leaving a small amount of slack line between each ring. (This prevents all the slack from being at the splice.)

(b) At gore No. 25, insert the reefing line through the reefing pocket grommet (or buttonhole), the cutter, then the opposite grommet (or buttonhole), being careful not to form a half hitch with the line. The end of the reefing line is then passed through the rings on gores No. 26 through No. 48 in the manner as for No. 13 through No. 24.

(c) Insert the reefing line through the pocket and cutter on gore No. 1 in the same manner as on gore No. 25. Continue passing the reefing line through the reefing rings No. 2 through No. 12.

(d) The two ends of the reefing line are spliced between rings No. 12 and No. 13.

NOTE

Extreme care must be exercised to keep the reefing line inside the canopy and suspension lines. If the reefing line is permitted to pass outside of the suspension lines, malfunction and failure of the parachute may occur in use.

(e) Overlap the two flaps on each of the reefing cutter pockets.

(f) Using single 100-pound nylon cord, lace the reefing line cutter pockets closed.

9-17. Folding Canopy

(a) Fold the right hand group of gores, No. 25 through No. 48, placing each suspension line in the line separator in numerical sequence.

(b) Place shot bags on the right hand group of gores.

(c) Fold the left hand group of gores, No. 24 through No. 1, placing each suspension line in the line separator in inverted numerical sequence. Shot bags may be used to separate the lines if a line separator is unavailable.

(d) Place shot bags on the left hand group of gores.

9-18. Stowing Canopy.

(a) Install approximately 80-100 rubber bands on the four tapes provided inside the mouth of the bag.

(b) Place the deployment bag R-5116 into the packing box. Tie the mouth of the deployment bag to the top of the packing box to prevent it from sloughing down into the packing box during stowage of the canopy.

(c) With the shot bags still applied, release the canopy apex and the riser loop and move the parachute, apex first, to the end of the packing table where the packing box is.

(d) Grasp the canopy between the hands and stow it into the bag. Stow it compactly in order to have the entire canopy below the canopy closing flaps. Tamp each successive accordion fold after it is placed in the bag, using a loaded baseball bat or other suitable smooth heavy bar.

9-19. Arming Reefing Cutters

After stowing the canopy and before closing the canopy flaps, the reefing actuator cords must be tied off. These are located on suspension lines No. 1 and No. 25, near the skirt. The free end of this cord

is passed through the brass arming ring of the reefing cutter and is pulled taut (with care) while the suspension line, in the area adjacent to the skirt, is slack. A bowline knot should be used to secure the cord to the arming ring.

9-20. Stowing Suspension Lines.

(a) Bring the suspension lines out between the center of the canopy closing flaps, then close the flaps.

(b) The locking loop of flap No. 1 is inserted through the locking hole in flap No. 2, then the locking loops of flaps No. 1 and No. 2 are inserted through the locking holes of flaps No. 3 and No. 4.

(c) The suspension lines are now stowed through first, one locking loop then the other. Starting at one corner of the bottom row of rubber bands, stow the suspension lines in bights. Use three turns each of two rubber bands around each bight.

(d) Stow the bights of line back and forth across the bag until approximately half of the suspension lines have been secured by the bottom row of rubber bands. Continue stowing the remainder of the suspension lines, using the top row of rubber bands.

9-21. Closing Bag

(a) Thread a 4 foot length of 375 pound (MIL-C-5040, Type II) nylon cord through the loops on the outside of the deployment bag mouth.

(b) Thread the end of the cord through all of the connector links.

(c) Draw the mouth of the bag closed and tie the cord securely with a surgeons knot.

(d) Leave the parachute in the packing box as long as possible prior

to flight in order to retain the parachute in the shape of the capsule parachute compartment.

9-22. Installation

(a) Place the main parachute on a convenient stand or table immediately adjacent to the open end of the main chute compartment.

(b) Tie the end of the 100-pound nylon cord attached to the ejector bag, to a loop at the lower end of the deployment bag.

(c) Position the riser toward the center line at the capsule and insert the packed main parachute into its compartment, with the insulated end at the open end of the compartment.

(d) Connect the riser loop to the main parachute disconnect device for manned flights and to the force sensor for un-manned flights.

(e) Attach the 30 foot antenna lanyard to the loop in the handle of the deployment bag by slipping the entire lanyard through the loop, in such a manner as to form a square knot.

(f) Thread the small cord attached to the chute riser through the hole directly above the main chute deployment sensor switch.

(g) Wrap several turns of cord around switch arm and secure with square knot.

9-23. Reserve Parachute

9-24. Packing procedure for the reserve parachute assembly is identical to that of the main parachute assembly, with the exception of the use of the R-5117 deployment bag.

9-25. Installation

(a) Place the reserve parachute assembly on a convenient stand or table immediately adjacent to the open end of the reserve parachute compartment.

(b) Tie the end of the 4-ft. length of 100-lb. cord attached to the ejector bag, to a loop at the lower end of the deployment bag.

(c) Insert the packed parachute into the reserve chute compartment.

(d) Pass the smaller end of the loop of the R-5136 30-ft. pilot chute lanyard through the loop in the handles of the deployment bag.

(e) Attach the 30-ft. pilot chute lanyard to the loop in the handles of the deployment bag by passing the entire lanyard through the loop in such a manner as to form a square knot.

(f) Pass the larger end loop of the 30-ft. pilot chute lanyard through the loop at the bottom of the pilot chute, then pass the entire pilot chute through the pilot chute end loop, starting from the top of the pilot chute. This attaches the pilot chute to the lanyard in the form of a square knot.

(g) Attach the pilot chute bridle (P/N R-5153) to the loop at the top of the pilot chute in such a manner as to form a square knot.

(h) Fold the 30-ft. pilot chute lanyard in 8-12 inch bights and stow the lanyard end pilot chute within the pilot chute flaps on the end of the reserve deployment bag.

(i) Close the pilot chute flaps in the sequence indicated by the numbers on the flaps, bringing the pilot chute bridle out of the closed flaps near their center.

(j) Pass the locking loop on pilot chute flap No. 1 through locking holes in flaps No. 2 and No. 3 and secure with a temporary locking pin.

(k) As an aid to packing, pass a 3-ft. length of 375-pound nylon cloth

through the locking loop and through the grommets in the ends of the two R-5194 retaining straps.

(l) Remove the temporary locking pin and pull the locking loop through the grommets in the ends of the retainer straps with the aid of the 375-pound cord.

(m) Make a short fold in the pilot chute bridle and insert the bight into the locking loop.

(n) Remove the 275-pound pull-up cord.

(o) Force the reserve chute into its compartment as far as it will go and tighten the adjustable retainer straps.

(p) Connect end loop of R-5153 bridle to the clevis pin at the upper end of the pilot chute deployment gun.

(q) Thread the small cord attached to the chute riser through the hole directly above the reserve chute deployment sensor switch.

(r) Wrap several turns at cord around switch arm and secure with a square knot.

9-26. Parachute Disconnect Assembly

9-27. Parachute Disconnect Arm.

Attach the two R-5127-3 hinged arms to the mounting lugs which are a part of the upper capsule structure, using two NAS655V13 bolts, two FN812-524 nuts and four NAS72-5-007 bushings. Torque to 60-85 inch pounds. Refer to Section VIII for final installation of squibs after parachute risers have been connected.

9-28. Pilot Chute Deployment Gun

9-29. Pre-Installation Procedure

Refer to Figure 9-3 for instructions of assembling deployment gun.

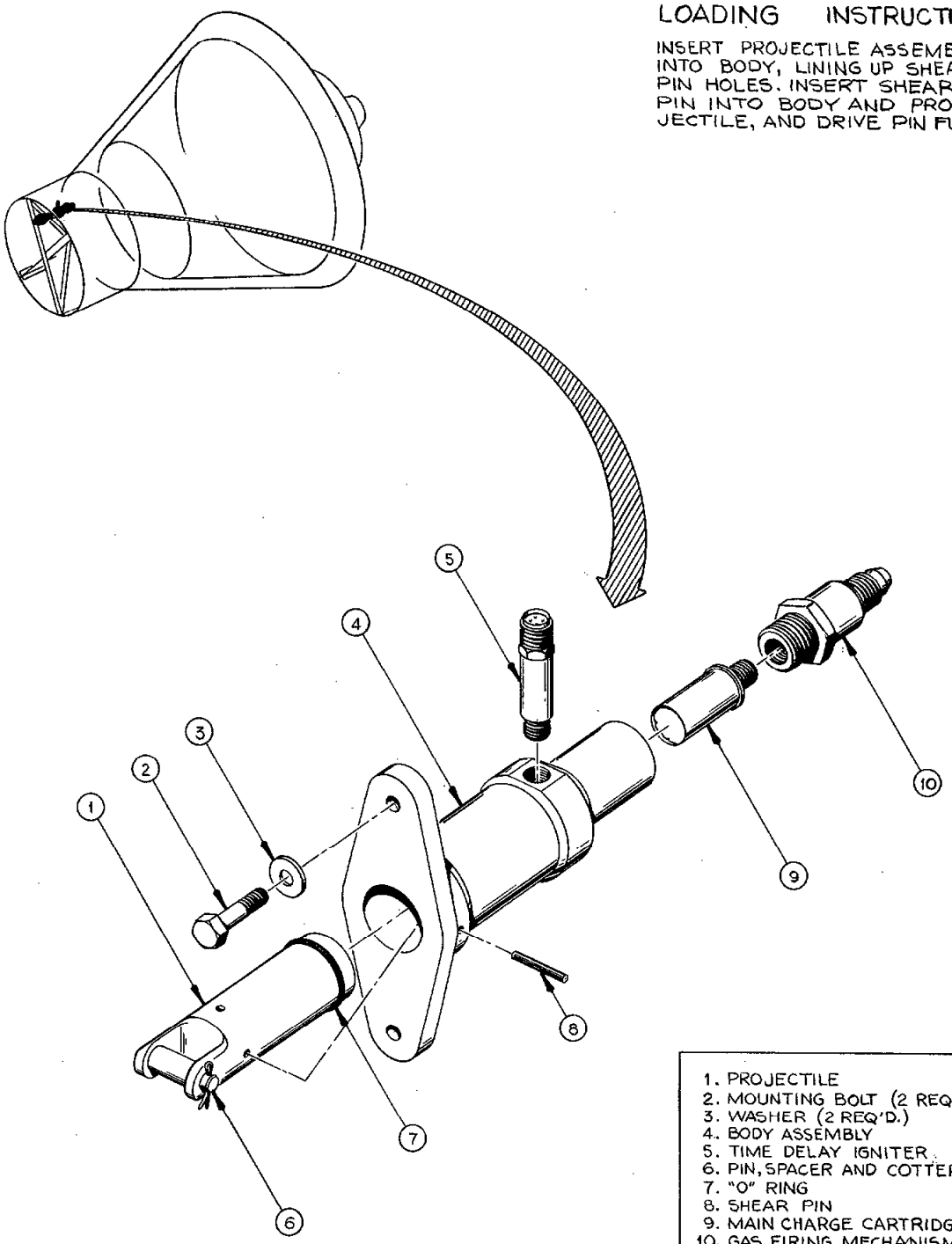


FIGURE 9-3 PILOT CHUTE DEPLOYMENT GUN

MH45-107

9-30. Installation

Refer to Section VIII for installation details.

9-31. Repair

The deployment gun assembly is reuseable upon replacement of the main and igniter cartridges, gas firing mechanism, the projectile assembly, and the shear pin, all of which are expended each time the gun is fired.

9-32. Ejector Bags

9-33. Pre-installation Procedure

Blow a small amount of air into the ejector bag. Compress the top and bottom of the ejector bag, exhausing the air out of the bag until the fiberglass cup at the bottom of the bag nests into the fiberglass cup on the top of the bag. Care must be taken in this operation not to entrap any folds of the rubberized nylon fabric between the two fiberglass cups. Exhaust the air from the bag.

NOTE

A vacuum cleaner or vacuum pump may be used for this operation.

Secure the ejector bag in the collapsed position by attachment of two pieces of 1 inch width paper masking tape around the ends. Tie a 4 foot length of 100 pound nylon cord (Specification MIL-C-5040, Type I or IA) to the loop at the upper end of the ejector bag, using a bowline and half hitch.

9-34. Installation

(a) Install the main and reserve ejector bags in the bottom of the main and reserve parachute compartments, orienting the bag as indicated by the marking "outboard" on the top of the ejector bags.

(b) Insert the stainless steel gas generator tube through the grommet in the bottom of the ejector bag and position the cup in the center of the fiberglass deflector, in such a manner that the tube is visible through the fiberglass cup in the top of the bag.

CAUTION

The stainless steel tube must be so positioned that no folds at the rubberized ejector bag are caught between the end of the tube and the fiberglass deflector.

9-35. Flotation Bags

9-36. Pre-Installation Procedure

Loosely fold the flotation bag into the dimension of the flotation bag compartment (7 x 16 inches). Connect a vacuum pump or vacuum cleaner to the filler hose and evacuate all air from the bag. Secure the bag in the collapsed position by attachment of two pieces of 1 inch paper masking tape around the bag.

9-37. Installation.

Install each flotation bag into flotation bag compartment using the following hardware in conjunction with the plastic spacers.

45-32160-23 spacer
45-32160-25 spacer
45-32160-27 spacer
45-32160-29 spacer
NAS673V2 bolt 4 req.
NAS673V3 bolt 18 req.

NAS673V2 bolt 4 req.
SPSFIV812-1032 nut 4 req.
AN960DIOL washer 4 req.
NAS673V3 bolt 2 req.
SPS FN812-1032 nut 2 req.
AN960DIOL washer 2 req.
NAS549H10 washer 2 req.

(a) Connect flotation bag tube to pressurization and vent line.

(b) Clamp tube to line using AN735D6 clamp, NAS653V-2 bolt, AN960DIOL washer (under head), AN960DIO washer (under nut) and FIV812-1032 nut.

(c) With the flotation bag installed in its compartment, rig the door assembly per the instructions in the following paragraph. Also, refer to MAC print 45-32160.

9-38. Rigging Procedure

(a) Adjust the 45-32172 pin to bear against the Bi-conical antenna. Lock pin with check nut.

(b) Adjust the 45-32178 retainer so that the 45-32154 bolt will release with a pull of 150 lbs. ± 15 lbs. applied along the centerline of bolt before 45-32064 shingle is installed. Lock with 45-32179 nut.

(c) Add or delete 4M38C10 washer laminations as required to maintain .118 + .004 - .000 dimension.

9-39. Sequence Controller

9-40. Pre-Installation Procedure

Before installing a new sequence controller the unit should be tested per the instructions contained in SEDR 94.

9-41. Installation (System A)

To install a new system A sequence controller, access must be gained in the area of, and on the same level as, the upper left 3000w/h battery, Z station 118.0.

(a) Remove survival kit and disconnect two electrical plugs (855C and 855D) from sequence controller.

(b) Remove the six 10-32 screws that secure controller package to bulkhead and remove controller unit.

(c) Install new controller unit and connect the two Bendix PT receptacles to the two 855C and 855D wire bundle plugs.

(d) The receptacles are clocked differently to prevent misconnecting.

9-42. Installation (System B)

To install a new system B sequence controller, access must be gained in the area beneath the astronaut's seat. General location of unit is approximately Z station 118.0 and is mounted to a bracket which is mounted to two hat sections, directly beneath the ASCS amplifier calibrator.

(a) Remove the access panel which is behind the leg supports of the astronaut's couch and remove unit by reaching through access opening.

(b) Remove sequence controller and install new unit as stated in previous paragraph.

(c) Wire bundles are designated as 855A and 855B.

9-43. Dye Marker

9-44. Installation.

(a) With the reserve chute installed, insert the dye marker packet between the reserve chute and the outboard bulkhead of the reserve chute compartment with the steel wire end up. Do not insert packet more than halfway down.

(b) Route the steel cable around the edge of the reserve chute at the top of the compartment and attach the cable end to suitable structure.

(c) Coil any excess cable in a small diameter loop and secure into position with one turn only of $\frac{1}{2}$ inch width paper masking tape.

9-45. Sofar Bombs

9-46. Installation

There are two sofar bombs that need be installed in the capsule, one is a 4,000 foot type and the other a 3,500 foot type. Both bombs are shipped directly to Cape Canaveral and installed in the recovery compartment during parachute installation. Install the 3,500 foot bomb into the main chute compartment per detail instructions of Section VIII. Install the 4,000 foot bomb to the structure of the recovery compartment. Refer to Section VIII for details of installation.

9-47. Antenna Fairing Ejector

9-48. Installation USE 45-72703 SH 20-19

The antenna fairing ejector is installed during manufacturing per 45-72020. Refer to this print for hardware requirements if removal and installation become necessary. At specified times during recovery compartment build-up, two squibs and two cartridges must be installed. The two squibs are installed prior to the parachute canister being installed due to necessity of access. The two cartridges and cap assembly are installed just prior to antenna fairing installation.

9-49. Balloon Antenna

9-50. Installation

The balloon antenna assembly with two pre-installed squibs must be installed into the capsule during recovery compartment build-up at the launch site hanger. Installation and hook-up may be accomplished from the top of the recovery compartment.

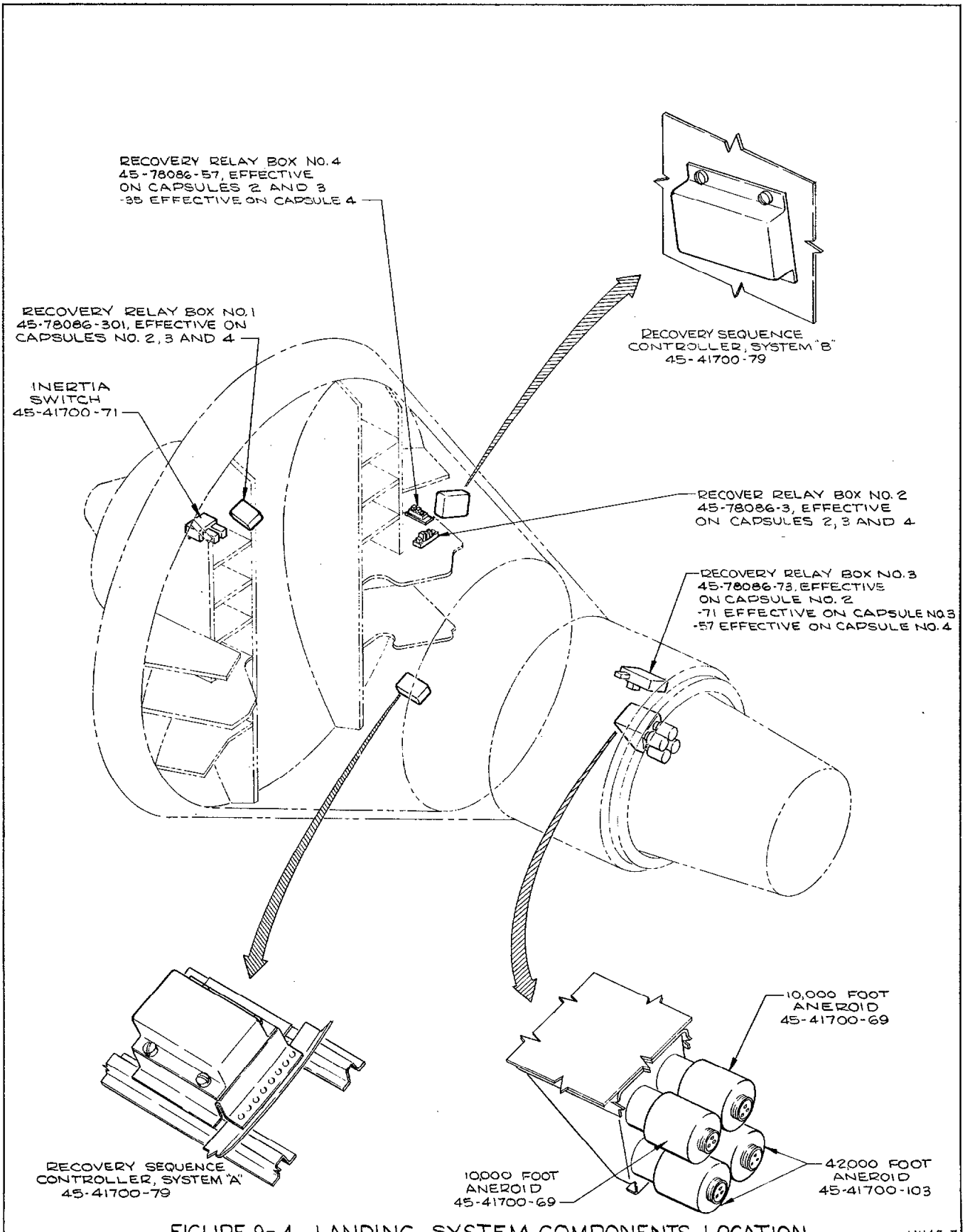


FIGURE 9-4 LANDING SYSTEM COMPONENTS LOCATION MH45-7

(a) Install the assembly using two NAS673V4 bolts (outboard), two NAS673V8 (inboard), four FN812-1032 nuts and four AN960D10 washers.

(b) Torque the bolts to 20 to 25 inch pounds.

(c) Connect the helium line and antenna coax. connector, safety wiring the latter with NC20 lockwore.

(d) Connect the PT06P-10-6S plug to the only electrical disconnect on the assembly which delivers power to both the cover squib and the tether squib.

9-51. LANDING AND RECOVERY SYSTEM BUILD-UP

9-52. General

The landing and recovery system components must be installed in a definite order and at definite times in order to provide for proper accessibility and avoid the dangers of early pyrotechnic installations. The following components are presented in the order of installations:

PRIOR TO ALTITUDE CHAMBER TEST

(a) Antenna fairing ejector:

Arm with 2 squibs and electrically connect. DO NOT install cap assembly, 77003-113 or the two cartridges.

(b) Main and reserve parachute container:

Install and electrically connect gas generators.

(c) Flotation bags vent valves:

Electrically connect the (4) squib valves.

(d) Small pressure bulkhead:

Install per instructions of Section II.

AFTER ALTITUDE CHAMBER TEST

(a) Main and reserve parachute ejector bags:

Install

(b) Pilot chute deploy gun:

Install, arm and electrically connect.

(c) Main and reserve parachutes:

Install and connect all lanyards.

(d) Main and reserve chute disconnects:

Install, arm and electrically connect.

(e) Sofar bombs:

Insert and install.

(f) Dye marker:

Insert and secure.

(g) Antenna fairing gun extension:

Install and secure.

(h) Balloon antenna:

Install, arm and electrically connect.

(i) Antenna Fairing Ejector:

Install cap assembly, 77003-113, and two cartridges.

(j) Drogue chute:

Install, insert chaff and connect cover and lanyards.

(k) Drogue chute mortar:

Insert squib and electrically connect.

(l) Antenna fairing:

Install and torque.

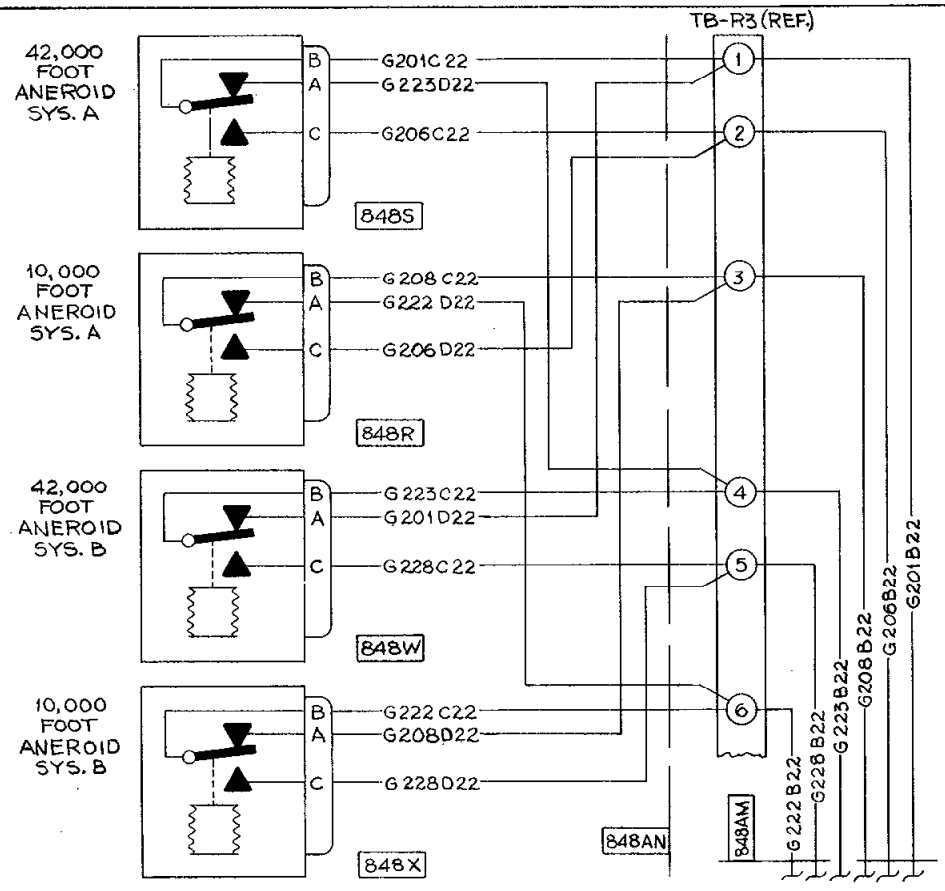
9-53. STATIC SYSTEM

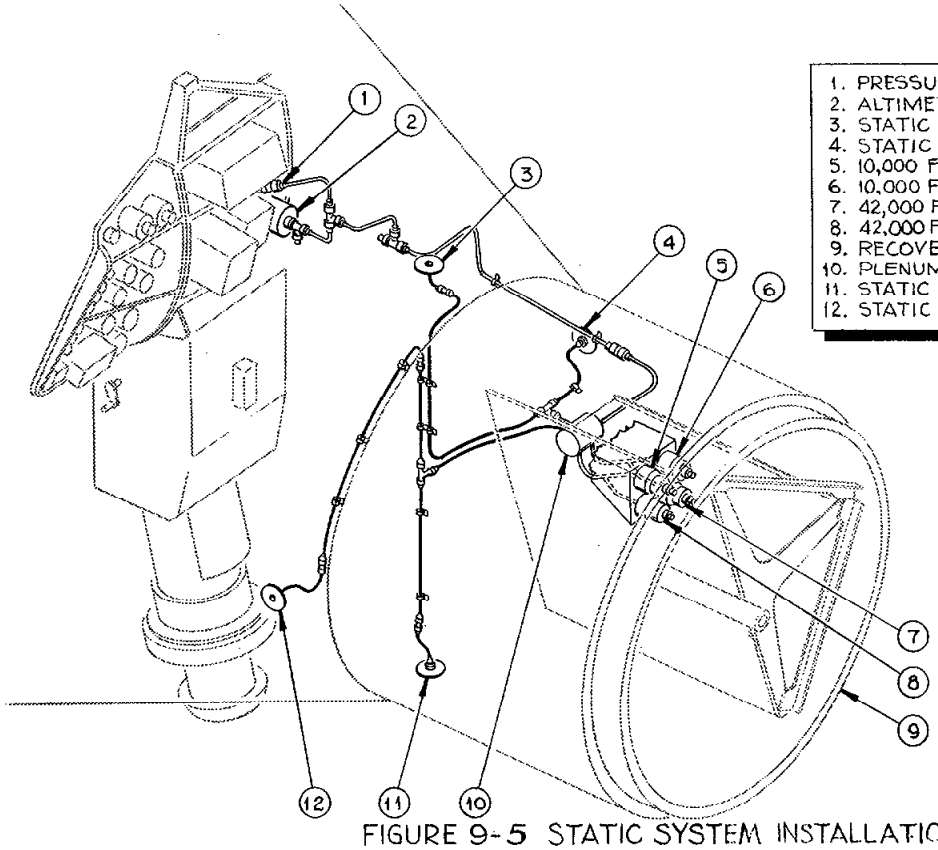
9-54. General

The static system consists of four externally mounted ports, interconnecting lines and a plenum chamber. Ambient pressure sensed through the ports is collected in the plenum chamber and distributed to the four aneroid switches, the altimeter and the pressure transducer. Effective on capsule 5, 7 and up, a rate of descent indicator will be installed and connected to the static system. Refer to Figure 9-5.

9-55. Leakage Test

If a leak is present in the static system, it will be detected during the Landing System Checkout Procedures, SEDR 95-2. To isolate the leak the small pressure bulkhead must be removed and a pressure test conducted. Install the three static port plugs and the one static port fitting, MDE4541003 and MDE4541001 respectively. Connect a compressed gas cylinder (FSN8120-286-6618) to the static port fitting with a mercury manometer and regulator valve located in the line. Apply pressure to 10 psi and hold for 10 minutes. There should be no pressure drop.





1. PRESSURE TRANSDUCER
2. ALTIMETER
3. STATIC PORT, T-Y REF.
4. STATIC PORT, L-X REF.
5. 10,000 FOOT ANEROID, SYS. B
6. 10,000 FOOT ANEROID, SYS. A
7. 42,000 FOOT ANEROID, SYS. A
8. 42,000 FOOT ANEROID, SYS. B
9. RECOVERY COMPARTMENT
10. PLENUM CHAMBER
11. STATIC PORT, B-Y REF.
12. STATIC PORT, R-X REF.

FIGURE 9-5 STATIC SYSTEM INSTALLATION

MH45-108

9-58. FLOTATION BAGS VENT AND PRESSURIZATION SYSTEM

9-59. General

The vent and pressurization system for the four flotation bags consists of a single line installation from each flotation bag compartment to a normally open squib valve. This allows the flotation bags to be vented to ambient pressure until landing impact when they must be pressurized and inflated. At this time the four squib valves are fired closed. Five seconds after the astronaut selects the "Rescue Aids Switch" the No. 1 and No. 2 flotation bags start inflating, 150 seconds thereafter flotation bags No. 3 and No. 4 are inflated. The air pump which inflates No. 3 and No. 4 bags is automatically shutoff 10 minutes after it is started. Refer to Figure 9-6.

9-60. Leakage Test

If it is deemed necessary to perform a leakage test, it should first be determined if the squib valves are open or closed. This is accomplished by applying a low rate of air pressure at the flotation bag disconnects and watching for air exit at the appropriate squib valve. If valves are open they must be plugged in order to test. Individually apply 10 psi air pressure at each flotation bag disconnect and visually check for leakage. It is not recommended that pressure be held without detection of leakage due to the check valves located down stream of each squib valve which would produce a seapage rate. Also, the nature of the system is not critical in regard to small leakage rates due to its' being functional only after landing and for a short period of time.

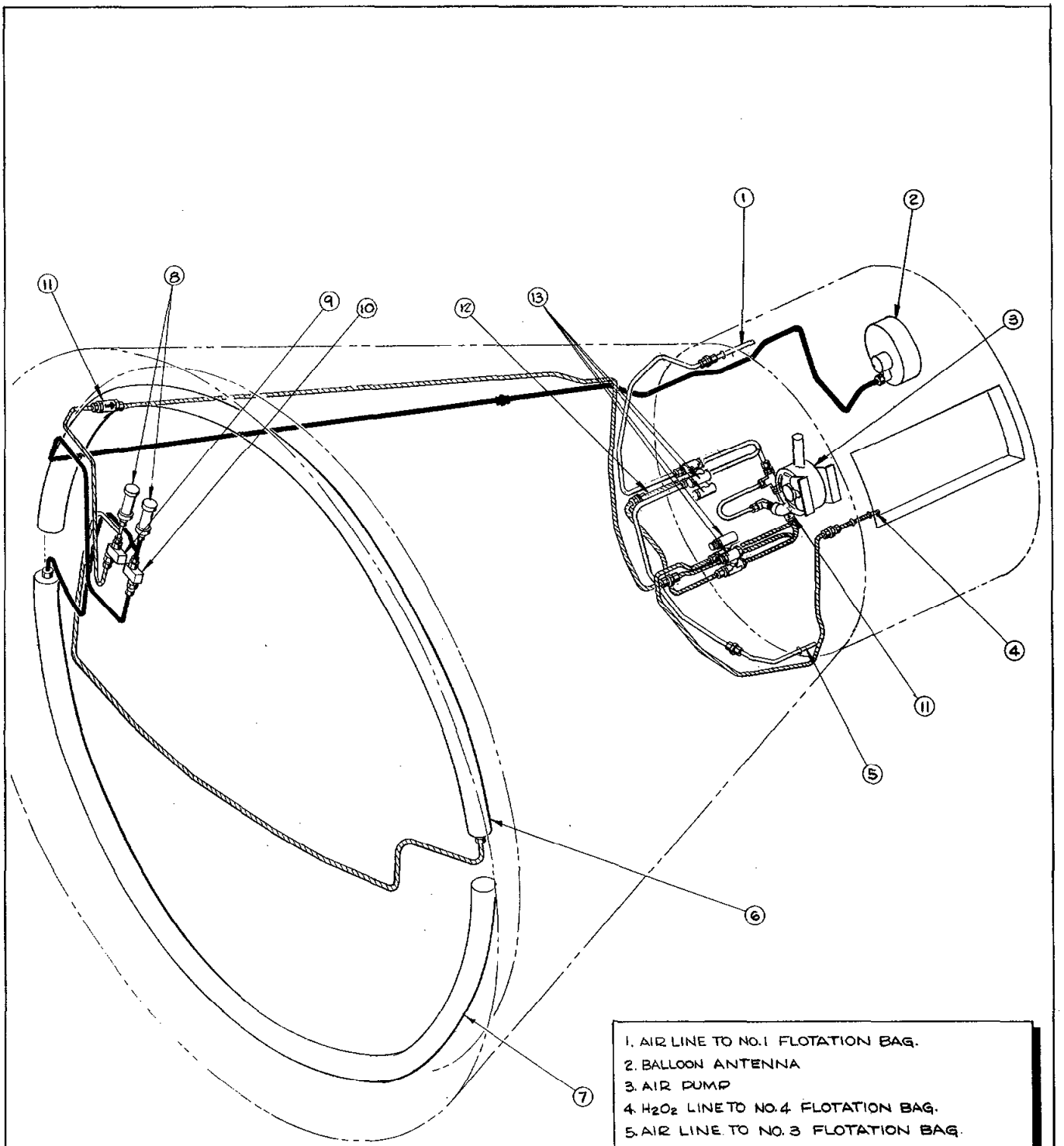
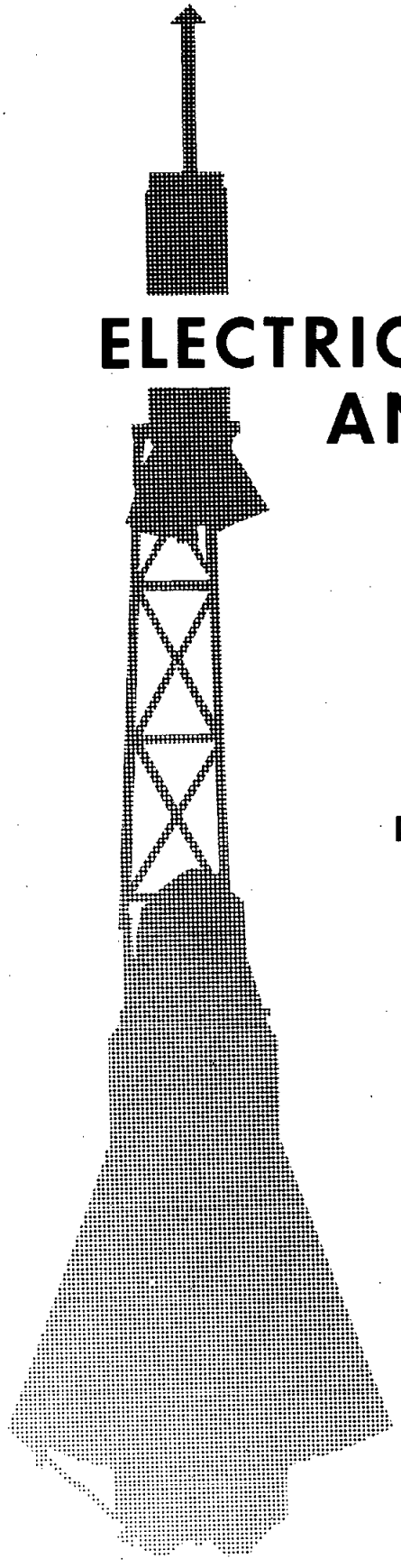


FIGURE 9-6 FLOTATION BAGS VENT AND PRESSURIZATION INSTALLATION

MH45-109



SECTION X

ELECTRICAL POWER SUPPLY AND LIGHTING SYSTEMS

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DESCRIPTION	PAGE
TROUBLE SHOOTING	10-2
REPLACEMENT AND ADJUSTMENT	10-11
SERVICING	10-19

X. ELECTRICAL POWER SUPPLY AND LIGHTING SYSTEMS

10-1. GENERAL

Section X provides procedures, diagrams, illustrations and charts to facilitate system trouble shooting component replacement and adjustment. It is noted that all system components are not necessarily covered within the Replacement and Adjustment areas. In the absence of such procedure, it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

10-2. ELECTRICAL POWER SUPPLY

10-3. TROUBLE SHOOTING

The following trouble shooting charts for the electrical power and control system are to be utilized in conjunction with the simplified wiring diagrams. Figures 10-1 and 10-2. Malfunctions may generally be attributed to:

(a) Component failure.

(b) Capsule wiring error.

(c) Operator error.

The trouble shooting charts in most cases do not consider the possibility of operator error or the obviously simple trouble shooting procedures.

WARNING

When any electrical connection is made to the battery, it should be done in such a manner as to eliminate the possibility of a short circuit. Use of a mating connector with suitably insulated leads should prove adequate.

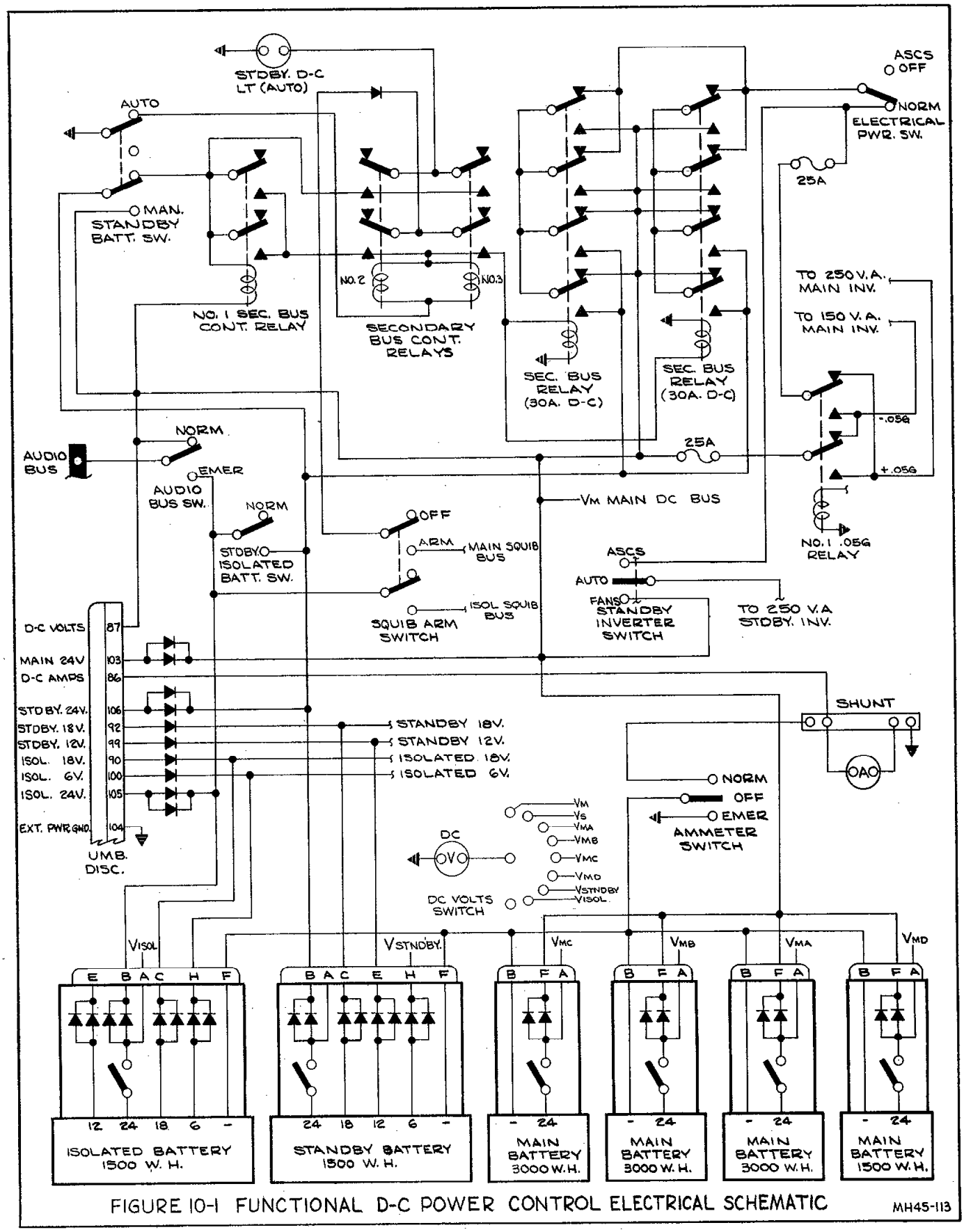

FIGURE 10-1 FUNCTIONAL D-C POWER CONTROL ELECTRICAL SCHEMATIC MH45-113

10-4. BATTERY TROUBLE SHOOTING (PRESSURE)

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
Pressure relief valve fails to open at 5.5 to 14 psig.	Pressure relief valve malfunction.	Vent system fitting fails to exhaust nitrogen.	Increase pressure to 14.7 psig max. check for opening of valve then recheck for proper opening pressure at 5.5 to 14 psig.
Battery fails to hold pressure (without vent fitting cap installed).	Pressure relief valve seat leaks.	Install vent fitting cap and check battery for leaks at 14 psig. If no leak occurs, valve seat was leaking. Check fittings for leaks with water or soap suds. Do not submerge battery.	Blow nitrogen through vent system at 14.7 psig for several seconds, then recheck for valve seat leak at 5 psig. Tighten fittings or replace gage.
	Leak in compressed nitrogen source fittings or gage.		
Battery fails to hold pressure (with vent fitting cap installed).	Leak in battery cell cases, manifold, or internal vent lines.	Indicated if all fittings, caps, gages, and valve seat show no leaks.	Not repairable.
	Leak in compressed nitrogen source fitting, gage or vent fitting cap.	Check fittings for leaks with water or soap suds. Do not submerge battery.	Tighten fittings or replace gage.

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10-5. D-C TROUBLE SHOOTING EXTERNAL POWER APPLIED

NOTE

Capsule ammeter will not give an indication of current flow when external power is used.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
Zero voltage in one of the Vma, Vmb, Vmc Vmd, Visol, Vstdby positions.	One or more cells of battery not activated.	Visually check cells for electrolyte.	Activate cell and check battery.
	No external power applied to battery affected (capsule loads draining battery).	Check external power voltages.	Apply the correct external power voltages and charge or replace battery.
	Battery switch not in the ON position.	Visually check battery switches.	Place to ON position.
	Defective battery switch or open circuit in battery.	Check battery for output through pins A and F with battery switch in the ON position.	Replace battery.
Low or slowly decreasing battery voltage, as read on capsule meter positions.	One or more external d-c power source not operating or adjusted to proper voltage.	Check external power source.	Turn power source to ON or adjust to proper voltage. Charge or replace battery.
	Defective diode (or diodes) in capsule external power diode	Check for defective diode at battery connector. package.	Replace diode assembly.

10-6. AC AND DC TROUBLE SHOOTING, CAPSULE BATTERY POWER

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTION ACTION
Zero voltage in anyone of the D-C voltmeter switch positions.	Battery switch not in the ON position.	Visually check battery switches.	Place switch to ON position.
	Defective battery switch or battery internal fault.	Check voltage at battery connector pin F to pin B (checks diode), and pin F to pin A (checks switch and internal wiring).	Replace battery.
Low or no ammeter reading, although power is flowing to capsule loads.	Shorted negative bus wiring, to ground.	Pull each battery connector and observe ammeter. If ammeter current does not increase to a normal level, check capsule negative bus wiring.	Correct fault in capsule wiring.
	Shorted negative lead of battery internal wiring.	Pull each battery connector and note ammeter reading. Defective battery is indicated by an increase in ammeter reading when connector is pulled.	Replace defective battery.
	Ammeter switch is in EMERG position.	Visually check ammeter switch.	Place switch to NORM position.
Secondary D-C bus not energized with the STANDBY BATT switch in the AUTO position.	Low voltage in the main battery.	Check voltage of main battery voltage difference of approximately 6 volts between the main D-C bus and the standby battery will cause the automatic changeover to standby battery.	Replace or recharge battery.
	Defective power control relay panel.	Substitute with a relay panel of known quality.	Replace relay panel.

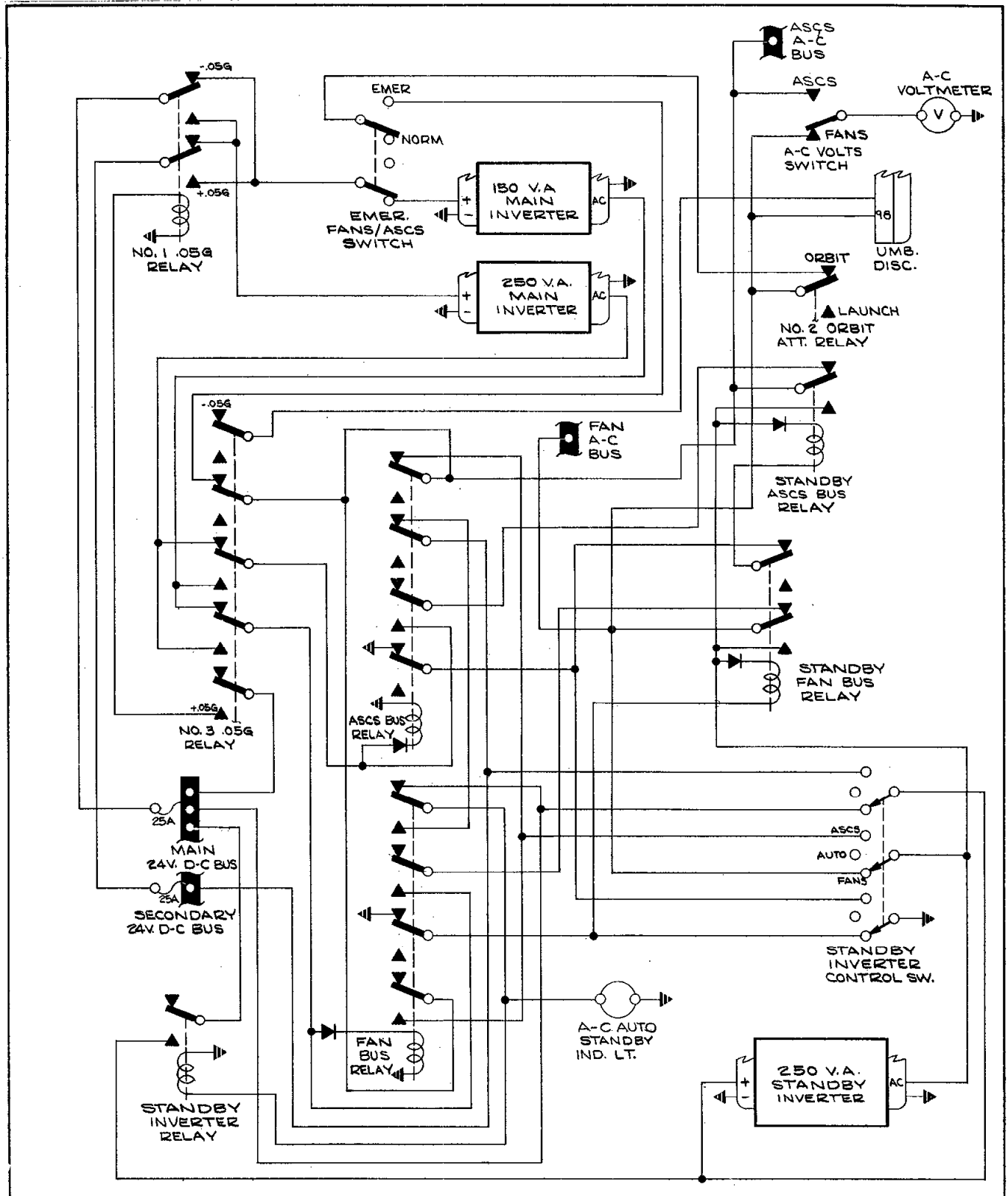

FIGURE 10-2 FUNCTIONAL A-C POWER CONTROL ELECTRICAL SCHEMATIC
MH45-112

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
	Defective STANDBY-BATT switch	Multimeter check of switch.	Replace switch.
	Defective capsule wiring.	Multimeter check of capsule wiring. See MAC drawing 45-79081.	Correct wiring defect.
Main D-C bus not energized with the STANDBY BATT switch in the MAN position. (Place main battery switches to OFF position for this check.)	Defective STANDBY-BATT switch.	Multimeter check of switch.	Replace switch.
	Defective capsule wiring	Multimeter check of capsule wiring.	Correct wiring defect.
	Standby battery discharged.	Check battery voltage on capsule voltmeter, Vstdby.	Recharge or replace battery.
Main D-C bus not energized with the ISOL BATT switch in the ISOL BATT position, (standby and main battery switches to OFF position for this check).	Defective ISOL BATT switch.	Multimeter check of switch.	Replace switch.
	Defective capsule wiring.	Multimeter check of capsule wiring.	Correct wiring defect.
	Isolated battery discharged.	Check battery voltage on capsule voltmeter, Visol.	Recharge or replace battery.

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NOTE

For the following AC trouble shooting, external d-c power is applied and all power control switches placed in the ON, NORM, or AUTO position as applicable.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
STANDBY A-C AUTO light is energized.	Failure in either main inverter output due to d-c input failure to either main inverter.	Check Vm and Vs D-C voltmeter readings.	Correct fault in d-c system. (See D-C Trouble Shooting procedures.)
	#4, 25 ampere fuse (250VA inverter) blows or D-C POWER switch is defective.	Place EMERG A-C POWER switch to EMERG amd read A-C VOLTS in the ASCS position. No FANS voltage will be read if #4, 25 ampere fuse is blown.	Replace Miscellaneous Fuse Holder (10 and 25A) or defective D-C POWER switch.
	#3, 25 ampere fuse (150 VA inverter) blown.	Pull fuse block and make an ohmmeter check of fuse.	Replace fuse block if defective.
	Failed 150VA or 250VA main inverter.	Audible detection of the failed inverter. (Operating inverters will be audible.)	Replace defective inverter.
	Failed 250VA main inverter.	With the A-C VOLTS switch in the FANS position and the STDBY INV SW in ASCS ONLY, place the EMERG A-C PWR SW to EMERG FANS ASCS. If the meter goes to zero the 250VA inverter has failed.	Replace 250VA inverter.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURES	CORRECTIVE ACTION
	Failed 150VA main inverter.	Hold the A-C VOLTS switch in the ASCS position and place the ELEC PWR SW to ASCS OFF and the STDBY INV SW to FANS ONLY position. If the meter goes to zero, the 150VA inverter has failed.	Replace 150VA inverter.
A-C voltmeter gives no a-c voltage indication on either or both the FANS or ASCS positions.	A-C VOLTS switch defective or open circuit in capsule wiring.	Multimeter check of A-C voltmeter circuit.	Replace defective switch or correct capsule wiring defect.
	NOTE The Power Control Relay Panel fault symptoms and causes can be so numerous and varied that the best method of fault detection is the performance of a complete component check on panel (See SEDR 75.) or by substitution of the panel itself.		
STANDBY A-C AUTO light is energized but no a-c voltage is present in the FANS bus.	Failed standby inverter.	Audible detection, substitution with a good unit.	Replace defective standby inverter.

10-7. Capsule Lighting

Trouble Shooting for Capsule Lighting is most readily accomplished by referring to the Lighting System drawing 45-79088, Sheet 6.0.

10-8. REPLACEMENT AND ADJUSTMENT

10-9. Batteries Left Side

To remove the batteries located on the left hand shelf, it will be necessary to disassemble and remove certain capsule components. To remove or install a battery or batteries proceed as outlined in the following paragraph .

10-10. Removal

(a) Remove the Switch-Fuse panel assembly. (See Switch-Fuse Panel removal in this section).

(b) Remove the Switch Fuse panel mounting rack.

(c) Place the BATT. ON-OFF switch to the OFF position and disconnect the switch linkage to the battery switch.

(d) Disconnect the battery electrical connector.

(e) Disconnect battery vent lines.

(f) Remove the hardware securing the battery rails to the capsule and remove battery.

10-11. Installation

See Figure 10-3. Perform checks necessary to ascertain that any disturbed systems are operative. Perform Capsule Leakage Test, SEDR 80.

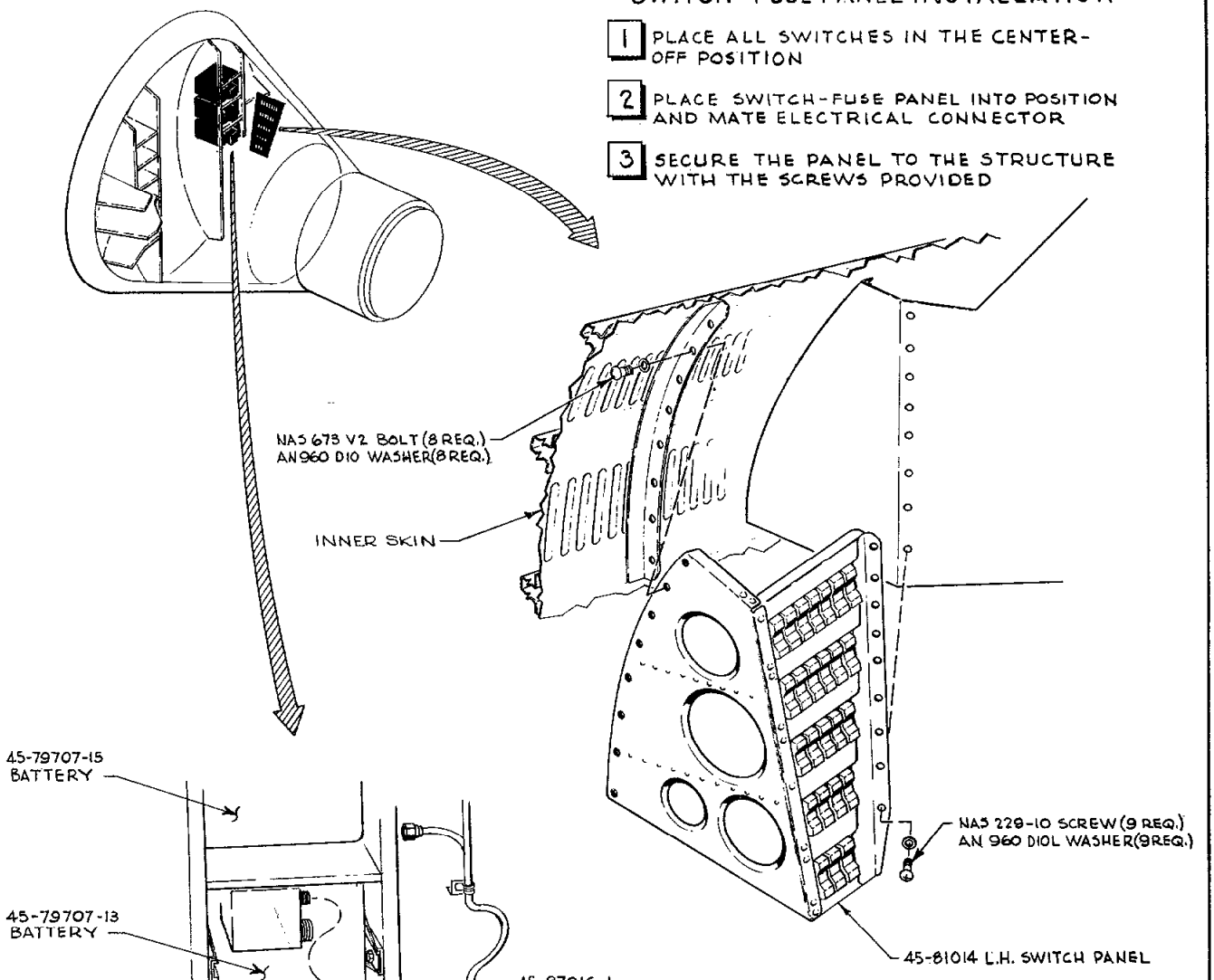
10-12. Batteries Right Side

The only battery on the right side requiring other removals is the lower battery. To remove the lower battery proceed as in Para. 10-13.

10-13. Removal

SWITCH-FUSE PANEL INSTALLATION

1. PLACE ALL SWITCHES IN THE CENTER-OFF POSITION
2. PLACE SWITCH-FUSE PANEL INTO POSITION AND MATE ELECTRICAL CONNECTOR
3. SECURE THE PANEL TO THE STRUCTURE WITH THE SCREWS PROVIDED



BATTERY INSTALLATION

1. WITH THE BATTERY ON-OFF SWITCH IN THE OFF POSITION, INSTALL THE PROPER BATTERY AS SHOWN
2. INSPECT ELECTRICAL CONNECTOR FOR FOREIGN MATTER OR DAMAGE, AND SECURE CONNECTOR TO BATTERY
3. INSTALL BATTERY VENT TUBE AND PERFORM LEAKAGE TEST
4. ASSEMBLE BATTERY ON-OFF SWITCH ASSEMBLY
5. PERFORM STEPS 1, 2, AND 3 (SWITCH-FUSE PANEL INSTALLATION)

FIGURE 10-3 SWITCH-FUSE PANEL AND L H BATTERY INSTALLATION MH 45-116

(a) Remove the UHF coaxial switch mounting hardware and swing the switch away.

(b) Remove the terminal strip mounting hardware so that terminal strip will clear the battery when removed.

(c) Place the Batt ON-OFF switch to the OFF position and disconnect the switch linkage to the battery switch.

(d) Disconnect the battery electrical connector.

(e) Remove the hardware securing the battery rails to the capsule and remove battery. The removal of the remaining batteries on the right side is obvious.

10-14. Installation

(a) Insert the battery into the rail slots and secure with bolts.

(b) With the BATT SWITCH in the OFF position, connect the electrical connector.

(c) Connect the switch linkage (See Figure 10-3).

(d) Install the terminal strip and the UHF coaxial switch.

(e) Perform capsule leakage test, SEDR 80.

10-15. 250VA Main Inverter

To remove the main inverter, it will be necessary to remove certain components to gain access to the 250VA main inverter. For removal, proceed as outlined in the following paragraph.

10-16. Removal

(a) Remove the Switch-Fuse panel.

(b) Remove the Switch-Fuse panel supporting structure.

(c) Remove the lower left hand 3000 WH battery. (See L.H. battery removal.)

(d) Remove the relay panel adjacent to the 250VA standby inverter and then remove the standby inverter.

(e) Remove the Instrumentation Package C (Programmer) on the shelf over the main 250VA inverter.

(f) Loosen mounting bolts in the 250VA main inverter and remove main inverter from the shelf.

10-17. Installation

To install the 250VA inverter proceed as follows:

(a) Secure the inverter to the shelf with the bolts provided with the inverter.

(b) Install the Instrumentation Package C (Programmer) on the shelf over the 250VA inverter.

(c) Install the relay panel adjacent to the 250VA standby inverter location and then install the standby inverter.

(d) Install the lower left hand 3000 WH battery.

(e) Install the switch-fuse panel supporting structure. (See Figure 10-3.)

(f) Install the switch-fuse panel.

(g) Perform a system check on all systems disturbed during installation.

10-18. 250VA Standby Inverter

The 250VA Standby Inverter is mounted to the left of the astronaut's seat on an intercostal. To gain access to the inverter requires the removal of other items of equipment as outlined in the following paragraph.

10-19. Removal

(a) Remove the switch-fuse panel. (See Figure 10-3.)

(b) Remove the switch-fuse panel supporting structure.

(c) Remove the lower left hand 3000 WH battery. (See L.H. Battery Removal in this section.)

(d) Remove the relay panel adjacent to the 250VA standby inverter.

(e) Loosen the mounting bolts securing the standby inverter, and remove the inverter.

10-20. Installation

(a) Secure the inverter to its mounting location with the screws supplied with the inverter.

(b) Install the relay panel adjacent to the 250VA standby inverter.

(c) Install the lower left hand 3000 WH battery.

(d) Install the switch-fuse panel supporting structure. (See Figure 10-3.)

(e) Install the switch-fuse panel and perform system checks on systems disturbed during installation.

10-21. 150VA Inverter

The 150VA Inverter is mounted under the lower shelf and towards the rear portion of the shelf. To gain access to this inverter it will be necessary to remove other items of capsule equipment as outlined in the following paragraphs.

10-22. Removal

(a) If necessary remove the capsule seat.

(b) Remove the roll rate gyro located under the lower left hand shelf.

(c) Remove the pitch rate gyro adjacent to the roll rate gyro.

(d) Loosen the mounting bolts on the inverter and remove the inverter.

10-23. Installation

To install the 150VA inverter proceed as follows:

(a) Secure the inverter to its shelf with the mounting bolts provided on the inverter.

(b) Install the pitch rate gyro adjacent to the roll rate gyro.

(c) Install the roll rate gyro under the lower left hand shelf.

(d) Install capsule seat and perform system checks on the ASCS system and A-C power control system.

10-24. Main Instrument Panel, Right Side

The right hand portion of the main instrument panel is a quick release type of panel (for astronaut egress). If access need be gained to the rear of the panel follow the procedure in the following paragraph.

10-25. Removal

(a) Remove all D-C power from capsule by placing battery switches to OFF and removing external power to capsule.

(b) Pull the quick release handle where the removable instrument panel section joins the permanent section of the main instrument panel.

(c) Rotate the panel to expose back panel wiring.

(d) Disconnect the component to be removed and insulate any exposed conductors.

10-26. Installation

After performing maintenance on the electrical power control components on the removable section of the main instrument panel, install the panel as follows:

(a) Make sure all D-C power is removed from the capsule by placing the battery switches to OFF and removing external power from capsule.

(b) Place the panel in position so that latch pins mate with the fixed portion of the latch mechanism. Actuate the latch upward to lock the panel in place.

10-27. Left Console

The left console is secured to the console support structure by screws along the upper, lower and left hand edge of the panel. The pull-rings which project through the panel are not a portion of the panel assembly.

10-28. Removal

(a) Remove all D-C power from capsule by placing the battery switches to OFF and removing external power to capsule.

(b) Remove the screws securing panel on the top, left side and bottom.

(c) Carefully withdraw the panel outward so as to not disturb the various pull-rings which protrude through the panel face. Disconnect electrical connection and remove panel.

10-29. Installation

To install the left console proceed as follows:

(a) Connect the electrical connectors to the left console assembly.

(b) Secure the panel to capsule mounting provisions carefully so as to not disturb the pull-rings.

(c) Perform system checks on systems disturbed and perform warning lights test (depress SIGNAL LIGHTS TEST SW).

10-30. Power System Control Relay Panel

The mounting location for the Relay Panel is on the lower left hand shelf at the extreme left hand side of the shelf. The panel is secured to the shelf by four bolts which thread into threaded inserts in the shelf assembly.

10-31. Removal

To remove the power system control relay panel, proceed as follows:

(a) Remove all D-C power from the capsule by placing the individual battery ON-OFF switches to OFF and removing all external D-C power from

the capsule.

(b) Perform removal of both 250VA inverters. (See Paragraphs 10-15 and 10-18.)

(c) Remove power system control relay panel.

10-32. Installation

To install the Power System Control Relay Panel, proceed as follows:

(a) Install relay panel with bolts secured to panel.

(b) Install both 250VA inverters. (See Paragraphs 10-17 and 10-20.)

(c) Perform system checks on any disturbed systems.

10-33. Switch-Fuse Panel

The Switch-Fuse Panel is located to the left of the astronauts couch. The panel is secured to mounting structure by a series of screws along the panel's edge.

10-34. Removal

To remove the Switch-Fuse Panel proceed as follows:

(a) Remove all external power from capsule and place the battery OFF-ON switches to OFF.

(b) Place all switches on the switch-fuse panel to the center OFF position.

(c) Remove mounting hardware securing the switch-fuse panel. (See Figure 10-3.)

(d) Withdraw switch-fuse panel carefully andr emove connector and remove panel.

10-35. Installation

See Figure 10-3 for Switch-Fuse Panel Installation. After completion of installation, perform checks necessary to ascertain that any disturbed circuits are operative.

10-36. SERVICING

10-37. General

Since all electrical equipment in the capsule is dependent upon the batteries as a power source, it is highly important that the greatest care be exercised in handling, servicing, and discharging of these batteries. To be avoided are overcharging, overheating, discharging to dangerously low voltages and careless or improper filling of the battery cells with electrolyte.

10-38. Shipping and Dry Storage

Batteries in the dry charged state, as received from the factory should remain in the sealed drums with the silica-gel desicant until time of activation. High relative humidity or high temperatures (110°) or both should be avoided, as these conditions may seriously reduce the battery capabilities. The battery may be removed from its container for inspection but should be replaced in the desicated container and sealed, as soon as possible. If kept in dry cool air (below 110°F), the battery may be stored indefinitely. Storage in the direct rays of the sun should be avoided even through the air temperature surrounding the containers is well below the 110°F maximum

10-39. Periodic visual inspection of the silica-gel desicant should be made to ascertain that the battery is being properly protected. An indication of discolored silica-gel requires the immediate replacement of the gel and a thorough check of the seal on the container be made.

10-40. Battery Activation, MAR 4027, 3000 WH

Battery activation should be performed four to twenty-four hours prior to use for optimum results, and never more than 48 hours prior to use.

WARNING

The battery electrolyte is poisonous and extremely corrosive. If electrolyte is spilled on the skin or clothing, the effected area should be rinsed immediately in cold water and then in a mild acid such as vinegar.

The electrolyte used to activate the battery consists of a 40 percent solution of reagent grade potassium hydroxide and distilled water having a specific gravity 1.400. Prior to placing the electrolyte in the battery, the electrolyte should be tested with a hydrometer to be sure the electrolyte meets the required 1.400 specific gravity.

CAUTION

Use only electrolyte supplied with battery. Electrolyte should not be spilled on the exterior of the battery at any time. Spillage could result in dangerous corrosion of vent lines, switches and wiring. If spillage should occur, the contaminated area should be thoroughly cleaned and dried.

To activate the MAR 4027, 3000WH battery, proceed as follows:

(a) Remove the two strips of tape covering the 16 small holes on top of the battery.

(b) Tilt the battery by placing a block about two inches thick under one side of the unit parallel to the rail.

(c) Using the Luer-Lock hypodermic syringe furnished with the battery, fill the syringe to the 65 cubic centimeter mark.

(d) Insert the hypodermic needle into the first battery filler hole and allow the electrolyte to flow into the cell SLOWLY. Refill the syringe to the 50 cc mark and complete the battery filling. Approximately two minutes shall be allowed for filling each cell.

CAUTION

The hypodermic needle furnished has a tapered flexible plastic guard which will prevent inserting the needle too far into the electrolyte fill holes and further serves in keeping the electrolyte from overflowing during the filling operation. When held firmly in position, it will also seal the fill holes during this operation.

(e) Repeat the filling sequence as outlined in steps a through d, for the remainder of the fill holes.

(f) After the battery filling operation is complete, the hypodermic should be thoroughly washed in water and dried.

CAUTION

The hypodermic syringe should be thoroughly washed in water and dried after use or the assembly will be damaged for further use.

10-41. Battery Activation MAR 4028, 1500 WH

Activation procedure for this battery is the same as for the 3000 WH battery except for the amount of electrolyte used, with only 63 cc of electrolyte being used in the smaller battery (MAR 4028).

10-42. Voltage Tests, (Activated)

The following no-load voltmeter checks should be made before installing plastic electrolyte fill hole plugs or prior to discharge on recycling. A 1000 ohms per volt 2% accurate D-C voltmeter shall be used.

(a) Voltage Pin A to Pin F, 29.6 max 28.5 volts min.

(b) Voltage Pin B to Pin F, 29.3 max 28.0 volts min.

10-43. Installation of Plastic Hole Plugs

A waiting period of approximately two hours should be allowed after electrolyte has been added to the battery. After two hours the plastic fill plugs may be installed in the battery. Installation is accomplished by soaking the plugs in the ethylene dichloride furnished with each battery for 20 minutes prior to installation and hand pressed firmly in place in each fill hole. The battery should set two hours before moving the battery or applying any gas pressure to the battery vent system.

CAUTION

The two hour delay period after filling the cells with electrolyte must be allowed to premit gases to escape and prevent electrolyte being forced out the vent system.

10-44. Pressure Testing (Activated)

(a) Connect a compressed nitrogen source, variable from 0 to 14.7 psig to the battery vent system. Slowly increase the air pressure to the battery and check for proper operation of the pressure relief valve. Proper operation should lie somewhere between 5.5 psig and 14.0 psig. Gas should exhaust at the vent line fitting on the connector box.

CAUTION

Do not exceed 14.7 psig during the pressure check as the cells or vent system may be damaged.

(b) Make a static pressure check with the compressed nitrogen source still connected and reduce the static gauge pressure to five pounds per square inch. After the pressure has stabilized, the battery should remain at 5 psig minus 0.1 psig for a five minute period. If leakage is indicated, refer to Paragraph 10-4, Trouble Shooting. After completing the battery leakage check, remove the vent system fitting cap and reinstall the vent system pressure check plug after completing the pressure tests. The check plug should be torqued to 25 inch pounds.

WARNING

If the static pressure check indicates leakage, the battery should not be considered for capsule use.

WARNING

When any electrical connection is made to the battery, it should be done in such a manner as to eliminate the possibility of a short circuit. Use of a mating connector with suitability insulated leads should prove adequate.

NOTE

The ON-OFF toggle switch located on the battery connector box must be in the ON position during any charging of the battery.

10-45. Recharging The Battery, (MAR-4027, 300 WH Battery)

With the ON-OFF battery switch in the ON position, charging of the battery should be through pins A and F, with A connected to the positive terminal and F connected to the negative terminal of the charging system. The initial charging rate should be 10 amperes for the first 6 hours or until the charge voltage reaches 33 volts. When 33 volts is reached, reduce the charge rate to 3 amperes for at least 20 hours or until the charge voltage again reaches 33 volts, whichever occurs first. If the battery has undergone charged storage of 80°F or higher the battery should be given a booster charge before attempted use.

10-46. Recharging The Battery (MAR-4028, 1500 WH Battery)

The recharging procedure for the MAR-4028, 1500 WH battery is similar to the procedure for the MAR-4027, 3000 WH battery except for the following

differences. Since the 1500 WH battery may be discharged through intermediate taps. Care must be taken not to discharge any group of cells below the following voltages at the design discharge rate of 40 hours.

(a) Pins A to F, 22.40 volts.

(b) Pins I to F, 18.20 volts.

(c) Pins D to F, 12.62 volts.

(d) Pins G to F, 7.0 volts.

Discharge at rates faster than the 40 hour designed discharge schedule should not exceed the following end voltages.

(a) Pins A to F, 21.0 volts.

(b) Pins I to F, 17.07 volts.

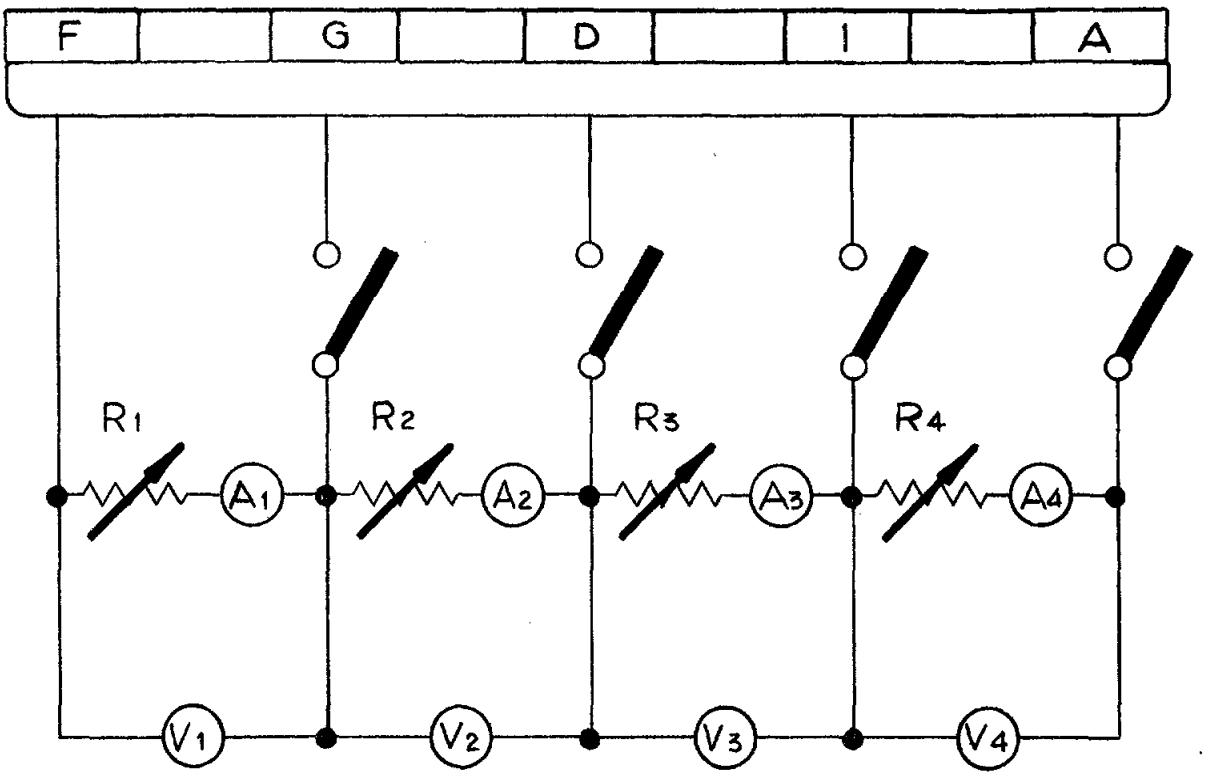
(c) Pins D to F, 11.82 volts.

(d) Pins G to F, 6.57 volts.

Since the battery cannot be properly recharged with unequal states of charge existing on different groups of cells, all groups must be brought to the same state of discharge before the entire battery is recharged. A discharge balancing circuit is shown in Figure 10-4. Discharged battery balancing voltages for use with Figure 10-4 are as given in the following table:

V1	(Pins G to F)	7.00 volts
V2	(Pins D to G)	5.60 volts
V3	(Pins I to D)	5.60 volts
V4	(Pins A to I)	4.20 volts

The charging rate for the first 3 hours should be 10 amperes or until the charge voltage reaches 33 volts. When 33 volts is reached (or 20 hours) is reached, reduce the charge rate to 2 amperes for the next 20



A1, A2, A3, A4, D-C AMMETERS, 0 TO 5 AMP. 2% ACCURACY.

V1, V2, V3, V4, D-C VOLTMETERS, 0 TO 10 VOLTS. 2% ACCURACY.

R1, R2, R3, R4, VARIABLE RESISTORS, 0 TO 5 OHMS, APPROXIMATELY 25 WATT.

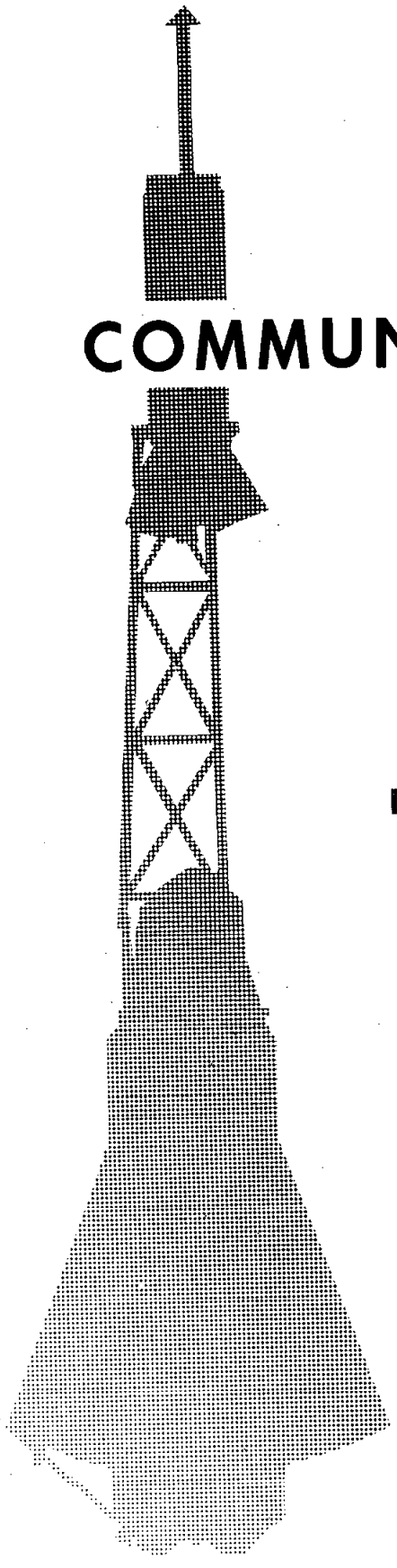
FIGURE 10-4 CELL DISCHARGE BALANCING CIRCUIT

MH45-111

hours or until the charge voltage reaches 33 volts, whichever occurs first.

10-47. Wet Storage And Booster Charge

Optimum storage temperature for a wet charged battery is 40 degrees F, or lower, with a reliable wet shelf life of approximately six months. If a battery has undergone charged storage of 80 degrees F or higher, the battery should be given a booster charge before attempted use. The booster charge should be at two amperes until the charge voltage reaches 33 volts.



SECTION XI

COMMUNICATION

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XI. COMMUNICATIONS

11-1. GENERAL

Section 11 provides procedures, diagrams, illustrations and charts to facilitate system trouble shooting and component replacement and adjustment. It is noted that all system components are not necessarily covered within the Replacement and Adjustment areas. In the absence of such procedure, it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

11-2. TROUBLE SHOOTING

The following trouble shooting charts for the communications are to be utilized in conjunction with the wiring diagram 45-79089. Malfunctions may generally be attributed to:

(a) Component Failure

(b) Capsule wiring error

(c) Operator error

The trouble shooting charts do not consider the possibility of operator error.

11-3. Power distribution malfunctions often cause system troubles. Should a malfunction be attributed to power distribution, refer to Section X of this Manual.

11-4. TROUBLE SHOOTING (Audio Checks)

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
24 V DC AUDIO 1 or 24 V DC AUDIO 2 not present in Audio Checks	Fuse in Communications Fuse Holder blown.	Use of Audio Checks SEDR 61.	Replace defective Fuse Holder.
	Defective, open or short circuit in Capsule wiring.	Visually check capsule wiring using 45-79089 drawing.	Repair or replace wiring defect.
No. 1 or No. 2 Headset Amplifier output low or no output.	Defective Comm Control Panel.	Substitution of panel known good.	Replace panel.
	Defective Audio Center.	Substitution of Audio Center known to be good.	Replace panel.
	Defective, shorted or open capsule wiring.	Check out wiring against drawing 45-79089.	Repair or replace wiring in capsule.
No. 1 or No. 2 Microphone amplifier output low or no output.	Defective Audio Center.		
	Defective, shorted or open capsule wiring.	Visually check capsule wiring using 45-79089 drawing.	Repair or replace wiring defect.
24 V DC HF COMM not present at test panel.	HF Comm fuse blown in Communications Fuse Holder.	Main HF Voice T/R checks SEDR 61.	Replace complete fuse holder.
	Defect, open or short circuit in Capsule wiring.	Visual or ohm meter check of capsule wiring.	Repair wiring defect.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
HF Receiver frequency calibration not within acceptable limits.	Defective HF Comm T/R unit.	Performance of Main HF Voice T/R, checks SEDR 61.	Replace Main HF Comm T/R.
Improper AGC readings.	Defective HF Comm T/R unit.	Substitution of defective HF Comm T/R unit.	Replace HF Comm T/R unit.
	Excessive signal loss in Multiplexer (defective).	Bypass multiplexer with a jumper coax cable.	Replace multiplexer.
	Defective capsule coax cable or connector (open or short circuit).	Ohm meter check of cable.	Repair or replace cable.
Low receiver sensitivity readings.	Defective HF Comm T/R unit.	Substitution of defective HF Comm T/R unit.	Replace HF Comm T/R unit.
	Excessive signal loss in multiplexer (defective).	Bypass multiplexer with a jumper coax cable.	Replace multiplexer.
	Defective capsule coax cable or connector (open or short circuit).	Ohm meter check of cable.	Repair or replace cable.
High audio distortion level.	Defective HF Comm T/R unit.	Substitute HF Comm T/R unit.	Replace HF Comm T/R unit.
	Defective Comm Control Panel.	Substitute Comm Control Panel	Replace Comm Control Panel.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Capsule wiring between HF Comm T/R Unit and Comm Control Panel or between Comm Control Panel and Main Tape Recorder.	Make an ohm meter check of capsule wiring. Refer to drawing 45-79089.	Repair or replace defect in capsule wiring.
HF Volume control is defective or erratic in operation.	Defective volume control.	Compare operation to UHF Volume Control.	Replace defective Comm Control Panel.
24 V DC to UHF Comm. T/R not present.	UHF fuse in Comm. fuse holder blown.	UHF Voice Receiver checks SEDR 61.	Replace defective Comm fuse holder.
UHF frequency calibration not within acceptable limits.	Defective UHF Comm. T/R unit.	UHF Voice Receiver check SEDR 61.	Replace defective UHF Comm T/R unit.
Improper AGC readings.	Defective UHF Comm T/R unit.	Substitution of defective UHF Comm T/R unit.	Replace UHF Comm T/R unit.
	Excessive signal loss in multiplexer.	Bypass multiplexer with a jumper coax cable.	Replace Multiplexer.
	Defective Capsule coax cable or connector (open or short circuit).	Ohm meter check of cable.	Repair or replace cable.
Low UHF receiver sensitivity.	Defective UHF Comm T/R unit.	Substitution of defective UHF Comm T/R unit.	Replace UHF Comm T/R unit.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Excessive signal loss in multiplexer (defective).	Bypass multiplexer with a jumper coax cable.	Replace multiplexer.
	Defective capsule coax cable or connector (open or short circuit).	Ohm meter check of cable.	Repair or replace cable.
High audio distortion level only on UHF receiver use.	Defective UHF Comm T/R unit.	Substitute UHF Comm T/R unit.	Replace UHF Comm T/R unit.
	Defective Comm Control Panel.	Substitute Comm Control Panel.	Replace Comm Control Panel.
UHF Volume control operation is defective or erratic in operation.	Defective Volume Control.	Compare operation to HF Volume Control.	Replace defective Comm Control Panel.
	Defect, open or short circuit in capsule wiring.	Visual or ohm meter check of capsule wiring.	Repair wiring defect.
		NOTE The remaining trouble shooting for the Back Up UHF Voice Receiver is the same as the trouble shooting for the UHF Receiver.	

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NOTE

The following 24 V DC, C and S-Band Beacon control circuit trouble shooting is applicable to the separate C Band Beacon checkout or the S Band Beacon checkout.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
No C Band Beacon or S Band Beacon, 24V DC at test panel jacks 3 and 4 when Command Receiver input is energized.	C Band fuse blown in Comm and ASCS Fuse Holder.	Place BEACON SWITCH to CONT and check for 24 V DC. If not present, check Fuse Holder for blown C or S Band Beacon suse. (Place BEACON SWITCH back to GND COMD.)	Replace Fuse Holder.
	Blown fuse in RCVR DECODER A Switch-Fuse.	Visually check Switch-Fuse.	Replace fuse in Switch-Fuse.
	Defective Impact Sensor Relay in Recovery Relay Box #1.	Substitute a unit known to be good.	Replace Recovery Relay Box #1.
	Faulty Beacon Relay in ASCS Relay Box.	Place BEACON SWITCH to CONT. If 24 V DC appears at test panel, BEACON RELAY in ASCS Relay Box.	Replace ASCS Relay Box.
	Faulty wiring from C Band or S Band fuses to C or S Band Beacons.	Refer to Dwg. 45-79089.	Repair wiring defect.
	Faulty C Band Beacon or S Band Beacon.	Substitute a unit known to be good.	Replace defective unit.

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INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
With No. 2 Test Receptacle Switch in the 24 V DC C Band Beacon or S Band Beacon position, 24 V DC will not read 0 V DC across Test Points 3 and 4 when modulation is removed from carrier signal.	Faulty Beacon Relay in ASCS Relay Box	Substitute an ASCS Relay Box known to be good.	Replace ASCS Relay.
	Faulty Command Receiver and Decoder A	Substitute a Command Receiver-Decoder known to be good.	Replace Command Receiver- Decoder.
	Capsule wiring defect possibly Beacon Relay energized from a short circuit to 24 V DC.	Refer to dwg. 45-79089.	Repair capsule wiring defect.

Command Receiver, Voice Channel

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Low or zero milliwatts audio output from voice channel operation of Command Receiver A. NOTE Command Receiver B trouble shooting is identical to "A".	Faulty Command Receiver-Decoder A.	Substitute a unit known to be good.	Replace Command Receiver-Decoder A.
	Short or open circuit in capsule wiring (wiring to Ground Support Equipment connector from Command Receiver A or the audio connection between Command Receiver A and Audio Control Center.	Visual and ohm meter check of capsule wiring. Refer to drawing 45-79089.	Correct wiring defect.
	Defect in Audio Center.	Pull Connector P1 on Audio Center. If audio level increases, Audio Center is probably defective.	Replace Audio Center.

HF Comm T/R

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Transmitter frequency not within acceptable limits.	Fault in HF Comm T/R unit	Substitute a unit known to be good.	Replace HF Comm T/R unit.
Transmitter power output low	Fault in HF Comm T/R unit	Substitute a unit known to be good.	Replace HF Comm T/R unit.
No modulation on transmitter rf output.	Faulty HF Comm T/R unit (also see Audio Checks in the first part of this chart.	Substitute a unit known to be good.	Replace HF Comm T/R unit.

UHF Comm T/R

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
UHF transmitter frequency not within acceptable limits	Fault in UHF Comm T/R unit	Substitute a unit known to be good.	Replace UHF Comm T/R unit.
UHF transmitter power output low (UHF-DF switch in OFF position).	Fault in UHF Comm T/R unit.	Substitute a unit known to be good.	Replace UHF Comm T/R unit.
	Fault in UHF Power Amplifier.	Substitute a unit known to be good.	Replace UHF Power Amplifier.
UHF transmitter power output low (UHF-DF switch in ON).	Fault in UHF Comm T/R unit.	Substitute a unit known to be good.	Replace UHF Comm T/R unit.
Transmitter will not key in VOX operated mode.	Audio Center VOX threshold control mal-adjusted	Check adjustment of threshold control.	Adjust threshold control on Audio Center.
	Faulty Audio Center	Substitute Audio Center known to be good.	Replace Audio Center.
	Faulty Filament Power Relay in Special Instrumentation Relay Box	Make a continuity check of relay in Special Instrumentation Box.	Replace or repair Special Instrumentation Box.

Backup UHF Voice Transmitter

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Backup UHF Transmitter not within acceptable frequency limits.	Fault in UHF Backup T/R unit	Substitute a unit known to be good.	Replace Backup UHF unit.
Transmitter not within acceptable power output limits.	Fault in UHF Backup T/R unit.	Substitute a unit known to be good.	Replace Backup UHF T/R unit.
Transmitter output is distorted (poor intelligibility on speech).	Fault in audio circuits in Audio Center	Check speech on Main UHF transmitter. If Main UHF Transmitter is distorted, substitute Audio Center.	Replace Audio Center.
	Fault in audio circuits in UHF Backup T/R unit.	Check speech on Main UHF Transmitter. If Main UHF Transmitter is undistorted and clear, trouble is probably in the Backup UHF T/R unit. To ascertain Backup UHF T/R unit is faulty, substitute a unit known to be good.	Replace defective Backup UHF T/R unit.
DF mode of operation fails to energize transmitter when UHF/DF switch is in ON position.	Faulty Communications Control Panel	Substitute Comm Control Panel known to be good.	Replace Control Panel.
	Faulty Audio Center.	Substitute Audio Center known to be good.	Replace Audio Center.
	Faulty Impact Sensor Relay #3, in Recovery Relay Box No. 1.	Make continuity check of box with drawing 45-79089.	Repair or replace Recovery Relay Box No. 1.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Transmitter will not de-energize with the capsule UHF/DF switch to the R/T position and the test panel UHF/DF switch to ON	Wiring defect between pins s, t of P1 in Comm Control panel and q and j on Audio Center. Also pin u of P1 to pin i in Recovery Relay Box.	Continuity check against drawing 45-79089.	Repair wiring defect.
	Faulty Communications Control Panel	Substitute Comm Control Panel known to be good.	Replace Control Panel.
	Faulty Audio Center	Substitute Audio Center known to be good.	Replace Audio Center.
	Faulty Impact Sensor Relay #3, in Recovery Relay Box No. 1.	Make continuity check of box with drawing 45-79089.	Repair or replace Recovery Relay Box No. 1.
	Wiring defect between pins s, t of P1 in Comm Control panel and q and j on Audio Center. Also pin u of P1 to pin i in Recovery Relay Box.	Continuity check against drawing 45-79089.	Repair wiring defect.

Telemetry Transmitter (Low Frequency)

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
No filament 6.3 VAC HI TM	No 24 V DC getting to Hi Freq Telemetry Pwr Supply.	Check No. 1 Tele Transmitter Switch-Fuse.	If fuse is blown, correct cause and replace fuse.
	Short circuit or open circuit in capsule wiring	Refer to drawing 45-79092.	Correct fault in capsule wiring.
	Faulty Telemetry Power Supply	Substitute unit known to be good.	Replace unit.
	Faulty Telemetry A Transmitter (Hi Freq)	Substitute a unit known to be good.	Replace unit.
No B+ 200 V DC HI TM at Test Panel	No 24 V DC getting to Hi Freq Telemetry Pwr Supply	Check No. 1 Tele Transmitter Switch-Fuse.	If fuse is blown, correct cause and replace fuse.
	Short circuit or open circuit in capsule wiring.	Refer to drawing 45-79092.	Correct fault in capsule wiring
	Faulty Telemetry Power Supply	Substitute unit known to be good.	Replace unit.
	Faulty Telemetry A Transmitter (Hi Freq)	Substitute a unit known to be good.	Replace unit.
Telem A Transmitter frequency not within required limits.	Faulty Telemetry A Transmitter (Hi Freq)	Substitute unit known to be good.	Replace unit.
	Faulty Power Supply (Hi Freq)	Substitute unit known to be good.	Replace unit.

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INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Transmitter power output not up to required power output.	Faulty Telemetry A Transmitter (Hi Freq)	Substitute unit known to be good.	Replace unit.
	Faulty Power Supply (Hi Freq)	Substitute unit known to be good.	Replace unit.

Telemetry Transmitter (Hi Frequency)

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
No Filament 6.3 VAC LO TM	No 24 V DC getting to the Low Frequency Telemetry Power Supply.	Check Instrumentation Fuse Holder (45-79092) for a faulty fuse.	Replace Fuse Holder.
	Short circuit or open circuit in Capsule wiring.	Refer to drawing 45-79092.	Correct fault in capsule wiring.
	Faulty Telemetry Power Supply.	Substitute a unit known to be good.	Replace unit.
	Faulty Telemetry B Transmitter (Lo Freq)	Substitute a unit known to be good.	Replace unit.
No B+ 200 V DC LO TM at Test Panel.	No 24 V DC getting to the Low Frequency Telemetry Power Supply.	Check Instrumentation Fuse Holder (45-79092) for a faulty fuse.	Replace Fuse Holder.
	Short circuit or open circuit in capsule wiring.	Refer to drawing 45-79092.	Correct fault in capsule wiring.
	Faulty Telemetry Power Supply.	Substitute a unit known to be good.	Replace unit.
	Faulty Telemetry B. Transmitter (Lo Freq)	Substitute a unit known to be good.	Replace unit.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Telem B Transmitter frequency not within required limits.	Faulty Telemetry B Transmitter (Lo Freq)	Substitute a unit known to be good.	Replace unit.
	Faulty Power Supply (Lo Freq)	Substitute a unit known to be good.	Replace unit.
Transmitter power output not up to required power output.	Faulty Telemetry B Transmitter (Lo Freq)	Substitute a unit known to be good.	Replace unit.
	Faulty Power Supply (Lo Freq)	Substitute a unit known to be good.	Replace unit.

UHF Recovery Beacon

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
UHF Recovery Beacon frequency is not within required limits.	Faulty UHF Recovery Beacon	Substitute unit known to be good.	Replace unit.
UHF Recovery Beacon average power output is below required power output.	Faulty UHF Recovery Beacon	Substitute unit known to be good.	Replace unit.
UHF Recovery Beacon Peak power output is below acceptable limit.	Faulty UHF Recovery Beacon	Substitute unit known to be good.	Replace unit.

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Recovery HF Voice Receiver

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
No 24 V DC on circuit voltage test at test points 3 and 4, Test switch in HF REC	Blown HF Recovery Fuse in Comm Fuse Holder.	Ohm meter check of fuse holder.	Replace Comm Fuse Holder.
	Faulty Impact Sensor Relay	Refer to drawing 45-79089.	Repair or replace Relay Box.
	Faulty capsule wiring	Refer to drawing 45-79089.	Repair wiring fault.
Receiver frequency not within acceptable limits.	Faulty HF Recovery T/R unit	Substitute unit known to be good.	Replace HF Recovery T/R unit.
Receiver sensitivity low.	Faulty receiver section	Substitute HF Recovery T/R unit.	Replace faulty unit.
	Short or open circuit in coax cable.	Refer to drawing 45-79089 and make ohm meter and visual check of cable.	Repair or replace faulty cable.
	Faulty multiplexer	Substitute Multiplexer known to be good.	Replace Multiplexer.
HF Volume Control operation erratic	Faulty volume control	Substitute Comm Control Panel .	Replace Comm Control Panel.
Receiver sound is distorted (headphone check)	Faulty Recovery HT T/R unit	Check HF Comm T/R receiver. If audio is good, distortion probably occurs in Recovery Receiver.	Replace HF Recovery T/R unit.

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Recovery HF Voice Transmitter (diplexer)

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Transmitter frequency not within tolerance.	Faulty HF Recovery T/R unit.	Substitute unit known to be good.	Replace HF Recovery T/R unit.
Transmitter power output low	Faulty HF Recovery T/R unit.	Substitute unit known to be good.	Replace HF Recovery T/R unit.
	Defective coax cabling.	Ohm meter checks of cables, refer to drawing 45-79089.	Repair or replace cabling.
	Faulty Recovery Diplexer	Substitute unit known to be good.	Replace Recovery Diplexer.
Transmitter speech distorted (receiver check).	Faulty HF Recovery T/R unit	Substitute unit known to be good.	Replace HF Recovery T/R unit.
	Faulty Audio Center	Substitute unit known to be good.	Replace Audio Center.

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HF Recovery Beacon

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
No 12 V DC at test panel, test receptacles 1 and 2 REC BCN test.	HF Beacon fuse blown in Comm Fuse Holder.	Check fuse holder for continuity.	Replace fuse holder.
	Faulty Impact Sensor Relay #3 In Recovery Relay Box #1	Make a continuity check of Relay Box. Refer to drawing 45-79089.	Repair or replace relay box.
	Capsule wiring fault	Make visual and continuity check of wiring against drawing 45-79089.	Repair wiring fault.
No 6 V DC at test receptacles 5 and 6 MOD REC BCN (HF)	UHF Beacon fuse blown in Comm Fuse Holder	Check fuse holder for continuity.	Replace fuse holder.
	Faulty Antenna Fairing Sep. Sensor relay in Recovery Relay Box No. 1.	Make continuity check of Recovery Relay Box No. 1 or substitute box.	Repair or replace box.
	Short or open circuit in capsule wiring.	Make a continuity check of wiring. Refer to drawing 45-79089.	Repair wiring fault.
No modulation from HF Recovery Beacon	Faulty HF - UHF Recovery Beacon	Substitute a unit known to be good	Replace HF - UHF Recovery Beacon.
No CW output from HF beacon	Faulty HF - UHF Recovery Beacon	Substitute a unit known to be good	Replace HF - UHF Recovery Beacon.

Antenna Checks

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
High VSWR readings	Faulty coax cabling	Continuity check of coax cables	Repair or replace faulty cabling.
	Faulty Multiplexer, Diplexer, Antenna Switch or Coax Switch.	Substitute unit suspected as faulty.	Replace faulty unit.
	Faulty in antenna being checked.	Visually inspect antenna for fault causing high VSWR, Foreign matter, bent elements, etc.	Correct fault.

11-5. REPLACEMENT AND ADJUSTMENT

The replacement of communications equipment is generally obvious. Where access to a unit is obstructed by other equipment, the system engineer associated with this equipment must be notified. Due to the mission of the capsule, the equipment must be handled with extreme care. Connectors which must be disconnected to allow equipment removal shall be capped and the wiring secured to the structure in such a manner as to preclude damage. All components shall be kept clean. For mounting hardware, refer to Table 11-1.

11-6. Communications system components, to be installed in the capsule, shall be tested and adjusted as per the requirements of Pre-Installation Acceptance Tests For Communications System Components (SEDR 60). Replacement of a component requires performance of Communications System Checkout Procedures (SEDR 61), unless otherwise noted.

TABLE 11-1

MOUNTING HARDWARE REQUIRED PER UNIT

	EQUIPMENT	BOLTS OR SCREWS	WASHERS	NUTS
1.	Command Receiver	4-AN515-8R8	4-AN960-D8L	
2.	Command Decoder	4-AN515-8R8	4-AN960-D8L	
3.	Low Frequency Telemetry	4-AN500A6-6	4-AN960-D6L	
4.	Low Frequency Transmitter Assembly (to tank)	4-NAS673V2	8-AN960-D10L	
5.	High Frequency Telemetry	4-AN500A6-6	40AN960-D6L	
6.	High Frequency Transmitter Assembly (to tank)	4-NAS673V2	8-AN960-D10L	
7.	Telemetry Power Supply	4-AN515-8R10	4-AN960-D8L	
8.	C-Band Beacon Transponder	6-NAS608C4-24	6-AN960-D416L	
9.	S-Band Beacon Transponder	3-NAS608C4-24 3-NAS608C4-28	6-AN960-D416L	3-FN812-428
10.	Communications Control Unit	4-AN515-8R10	4-4M23-A8L	4-NAS679A08
11.	S and C-Band Antenna Unit	2-NAS673V-1 6-NAS673V-2	8-AN960-D10L	
12.	C-Band Power Divider	4-AN515C-8R7	4-AN960-D8L	
13.	S-Band Power Divider	2-NAS673V2	2-AN960-D10L	
14.	Bicone Multiplexer	4-NAS608C3-8	4-AN960-D10L	
15.	UHF Descent Antenna	2-NAS654V9	2-AN960-D416	2-FN812-428
		1-NAS653V11	1-AN960-D10L	1-FN812-1032
		2-NAS653V3	2-AN960-D10L	2-FN812-1032
16.	UHF Coaxial Switch (to bracket)	4-NAS673V2	4-AN960-D10L	
17.	UHF Coaxial Switch Assembly (to shelf)	4-NAS653V9	4-AN960-D10L	4-FN812-1032
18.	Antenna Coaxial Switch	4-AN509-10R13		
19.	HF Recovery Balloon Antenna	2-NAS673V4	2-AN960-D10L	2-FN812-1032
		2-NAS673V8	2-AN960-D10L	2-FN812-1032
20.	Play Back Tape Recorders	To be supplied when available.		
21.	Play Back Recorder Container			

11-7. HF Voice Transmitter Receiver (Installation Print 45-80002, 45-80003, 45-80004)

The HF voice transmitter receiver is located to the astronaut's right, on an aft pressure bulkhead, center right shelf. The unit is mounted forward on the underside of this shelf, adjacent to the inner capsule skin. The unit is held in place by four captive, socket head screws, threaded into the shelf. Replacement procedures are obvious.

11-8. HF Recovery Voice Transmitter Receiver (Installation Print 45-80002, 45-80003, 45-80004)

The HF recovery voice transmitter receiver is located to the astronaut's right, on an aft pressure bulkhead, center right shelf. The unit is mounted aft on the underside of this shelf, adjacent to the vertical web. The unit is held in place by four captive, socket head screws, threaded into the shelf. Replacement procedures are obvious

11-9. UHF Voice Transmitter Receivers (Installation Print 45-80002, 45-80003, 45-80004)

The two UHF voice transmitter receivers are located to the astronaut's right, on an aft pressure bulkhead, lower right shelf. The units are mounted aft on the top of this shelf, adjacent to the aft pressure bulkhead. Each unit is held in place by four captive, socket head screws, threaded into the shelf. The UHF/HF Recovery Beacon must be removed to gain access to these units. Replacement procedures are obvious.

11-10. Audio Center (Installation Print 45-80002, 45-80003, 45-80004)

The audio center is located to the astronaut's right, on an aft pressure bulkhead, center right shelf. The unit is mounted forward on the top of this shelf, adjacent to the inner capsule skin. The unit is held in place by four captive, socket head screws, threaded into the

shelf. Replacement procedures are obvious.

11-11. The adjustment controls on the audio center are to be used during Communication System Checkout Procedures (SEDR 61).

11-12. Command Receivers (Installation Print 45-80002, 45-80003, 45-80004) The two command receivers are located to the astronaut's left, on the upper, outboard side of the vertical beam. The "A" unit is mounted adjacent to the forward edge of the beam. The "B" unit is mounted on the beam, immediately aft of the "A" unit. Each unit is held in place by four Frearson head screws, with washers, threaded into plate nuts which are installed on the beam. Replacement procedures are obvious.

11-13. Command Decoders (Installation Print 45-80002, 45-80003, 45-80004) The two command decoders are located to the astronaut's left, on the upper, outboard side of the vertical beam. The "A" unit is mounted above the Command Receivers while "B" unit is mounted immediately aft of the Command Receivers. Each unit is held in place by four Frearson head screws, with washers, threaded into plate nuts which are installed on the beam. Replacement procedures are obvious.

11-14. Telemetry Transmitters (Installation Print 45-80002, 45-80004) The low frequency and high frequency telemetry transmitters are located below the seat area on the Water Cooling Tank. The low frequency transmitter is mounted to the right forward surface of the tank, on the upper curve. The high frequency unit is mounted on the right forward surface of the tank on the lower curve. Each unit is secured to a mounting plate by four screws, with washers. The mounting plate is held in place by four bolts threaded into mounting bracket plate nuts. Refer to Figure 11-1.

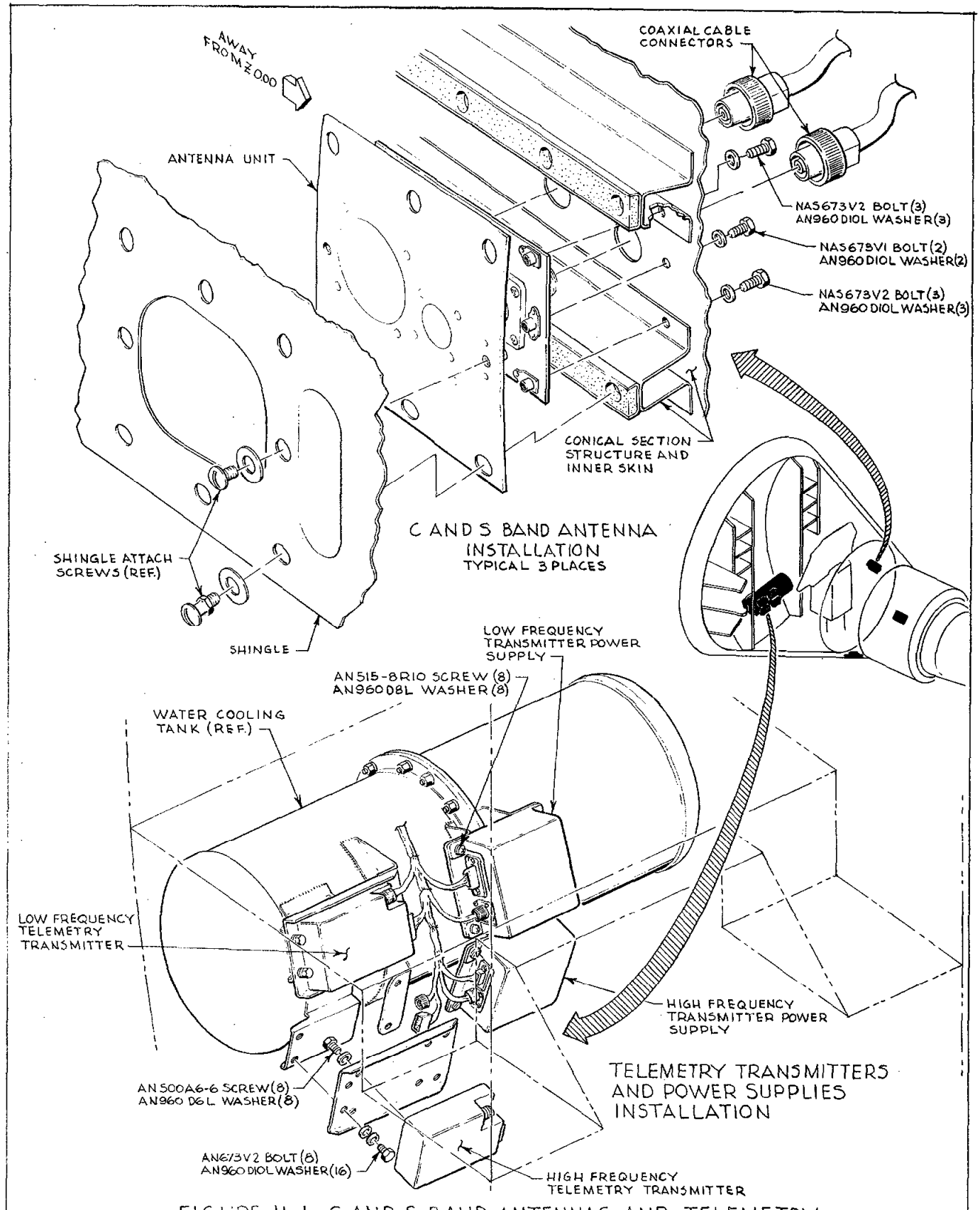


FIGURE 11-1 C AND S BAND ANTENNAS AND TELEMETRY TRANSMITTERS AND POWER SUPPLIES INSTALLATION

MH45-125

11-15. Removal

(a) Notify the Environmental Control System Engineer that the area forward of the Water Cooling Tank must be cleared. This involves removal of the leg couches on applicable capsules, removal of 45-32151 web and stiffeners, removal of the solids trap, removal of five lines assemblies, etc.

(b) Disconnect the wire bundles and coax connectors from the high and low frequency transmitters. Cap the connectors and secure the wire bundles.

(c) Remove the four bolts securing the high frequency transmitter to the mounting bracket, and remove the transmitter.

(d) Remove the four bolts securing the low frequency transmitter assembly to the mounting bracket, and remove the transmitter assembly.

11-16. Installation

(a) Locate the low frequency transmitter assembly on the upper mounting bracket and secure with four bolts and eight washers.

(b) Locate the high frequency transmitter assembly on the lower mounting bracket and secure with four bolts and eight washers.

(c) Connect wire bundles and coax cables, as indicated on 45-79093, to the two connectors of each transmitter.

(d) Perform a check of the installed units per Communications System Checkout Procedure (SEDR 61).

(e) Notify the Environmental Control System Engineer that the area forward of the Water Cooling Tank is ready for re-assembly.

11-17. Telemetry Power Supplies (Installation Print 45-80002, 45-80003, 45-80004)

The two telemetry power supplies are located along the capsule center line, below the seat area, on the Water Cooling Tank. The low frequency transmitter power supply is mounted on the upper curve of the tank forward surface, while the high frequency transmitter power supply is on the lower curve of the tank forward surface. Each unit is held in place by four screws threaded into the mounting bracket plate nuts. Refer to Figure 11-1.

11-18. Removal

(a) Notify the Environmental Control System Engineer that the area forward of the Water Cooling Tank must be cleared. This involves removal of the leg couches on applicable capsules, removal of 45-32151 web and stiffners, removal of the solids trap, removal of five lines assemblies, etc.

(b) Disconnect the wire bundle connectors from the two power supplies.

(c) Remove the four screws securing the high frequency transmitter power supply to the mounting bracket, and remove the power supply.

(d) Remove the four screws securing the low frequency transmitter power supply to the mounting bracket, and remove the power supply.

11-19. Installation

(a) Locate the low frequency transmitter power supply on the upper mounting bracket and secure with four bolts and four washers.

(b) Locate the high frequency transmitter power supply on the lower mounting bracket and secure with four bolts and four washers.

(c) Connect wire bundles, as indicated on 45-79092, to the two connectors of each power supply.

(d) Perform a check of the installed units per Communications System Checkout Procedure (SEDR 61).

(e) Notify the Environmental Control System Engineer that the area forward of the Water Cooling Tank is ready for re-assembly.

11-20. C-Band Beacon Transponder (Installation Print 45-80002, 45-80003, 45-80004)

The C-Band beacon is located to the astronaut's right, on the aft pressure bulkhead, lowest right shelf. The unit is mounted on the top of the shelf, adjacent to the right vertical beam. The unit is held in place by six socket head cap screws, with washers, threaded into the shelf. On capsules equipped with the hand controller, linkages must be removed to gain access to the transponder. Removal of these linkages shall be covered in Section IV of this manual. Replacement procedures for the transponder are obvious.

11-21. S-Band Beacon Transponder (Installation Print 45-80002, 45-80003, 45-80004)

The S-Band beacon is located to the astronaut's right, on an aft pressure bulkhead, lower right shelf. The unit is mounted on the underside of this shelf, adjacent to the right vertical beam. The unit is held in place by six socket head cap screws, with washers. The outboard three screws are threaded into the shelf, while the inboard three screws are secured on the top of the shelf with three nuts. On capsules equipped with the hand controller, linkages must be removed to gain access to the transponder. Removal of these linkages shall be covered in Section IV of this manual. Replacement procedures for the transponder are obvious.

11-22. UHF/HF Recovery Beacon (Installation Print 45-80002, 45-80003, 45-80004)

The UHF/HF Recovery Beacon is located to the astronaut's right, on an aft pressure bulkhead, lower right shelf. The unit is mounted on the top of the shelf, along the forward edge. The unit is held in place by four captive, socket head screws, threaded into the shelf. Replacement procedures are obvious.

11-23. The adjustment controls on the audio center is to be used during the Communication System Checkout Procedures (SEDR 61).

11-24. Communications Control Unit (Installation Print 45-81000)

The Control Unit is located on the lower section of the main instrument, to the right of the capsule center line. The unit is held in place by four Frearson head screws, with washers, and secured on the back of the panel by four nuts. Replacement procedures are obvious.

11-25. S and C-Band Antennas (Installation Print 45-41001)

Three S and C-Band Antenna units are equally spaced about the periphery of the capsule conical section near the junction of this section and the cylindrical section. Each unit is installed from the outside, between two stringers. The base of the unit is secured from inside, with eight bolts and washers, through structure, and threaded into plate nuts on the unit. Each stringer area is then covered with a shingle. Eight bolts and washers, through the shingle from the outside secure the antenna unit. The edge of the shingle is then bolted in place to complete the installation. Refer to Figure 11-1

11-26. Removal

(a) Notify the Structures Engineer that 45-32054 shingles (-43 for

the right side, -57 for the top and -65 for the left side) must be removed.

(b) Remove the mounting bolts from the appropriate shingle, per Section II of this manual. Remove the shingle.

(c) Gain access to the recovery compartment and disconnect the two coax cable connectors from the antenna unit. Cap these connectors and secure the wire bundles.

(d) Working from the recovery compartment, remove the eight bolts securing the antenna unit to the capsule structure. From the outside, remove the antenna unit.

CAUTION

Before removing these bolts, station one man outside the capsule to hold the antenna unit.

11-27. Installation

(a) Place the antenna unit, with the small antenna forward, between the proper stringers.

(b) Working from the recovery compartment, install three NAS 673V-2 bolts, with washers, along each stringer edgeof the unit. Install NAS673V-1 bolts with washers in the two remaining, fore and aft, holes.

(c) Connect the two coax connectors per 45-41001.

(d) Install the shingle per Section II of this manual and notify the Structures Engineer upon completion.

11-28. C-Band Power Divider - Including Matched Cables (Installation Print 45-41001)

The C-Band power divider is located to the astronaut's upper left side

of the recovery compartment, just forward of the small pressure bulkhead. Three cables extend from the divider, one to each C-Band antenna section. The divider is secured to the capsule structure by four Frearson head screws, with washers, threaded into plate nuts installed on the outside of the inner capsule skin. The cables are clamped in place, along their routing, with MS21919DH clamps secured by NAS673V bolts. Replacement procedures are obvious.

11-29. S-Band Power Divider - Including Matched Cables (Installation Print 45-41001)

The S-Band power divider is located to the astronaut's upper left side of the recovery compartment, just forward of the small pressure bulkhead. Three cables extend from the divider, one to each S-Band antenna section. The divider is rivited to a plate which in turn is secured to the capsule structure by two bolts, with washers. The bolts are threaded into plate nuts installed on the outside of the adjacent stringers. The cables are clamped in place, along their routing, with MS21919 DH clamps secured by NAS673V bolts. Replacement procedures are obvious.

11-30. Bicone Multiplexer (Installation Print 45-80002, 45-80003, 45-80004)

The multiplexer is located to the astronaut's lower right, on a bracket installed vertically between two aft pressure bulkhead shelves. The unit is mounted onthe inboard side of this vertical bracket and is held in place by four socket head cap screws, with washers. These screws are installed through the bracket and threaded into plate nuts on the outboard side. On capsules equipped with the hand controller, linkages must be removed to gain access to the multiplexer. Removal

of these linkages shall be covered in Section IV of this manual. Replacement procedures for multiplexer are obvious.

11-31. UHF Descent Antenna (Installation Print 45-41001)

The UHF descent antenna is located to astronaut's left side, on the open face of the recovery compartment. The unit is mounted on the forward side of the parachute support fitting at the junction of this fitting and the two truss fittings. The antenna base is held in place by three bolts, with washers, secured on the aft side of the fittings. The extender mechanism base is held to the forward side of the parachute support fitting by two bolts, with washers. The bolts are secured by nuts on the aft side of the fitting. The antenna pigtail cable connector is installed on a clip which is secured to the parachute support fitting with a bolt, washer and nut. Replacement procedures are obvious.

11-32. Coaxial Switch - UHF (Installation Print 45-80002, 45-80003, 45-80004)

The UHF coaxial switch is located to the astronaut's right, on an aft pressure bulkhead, lower right shelf. The unit is secured on a bracket by four bolts, with washers, through the bracket into threaded holes in the unit. The assembly is then installed on the top, forward edge of the shelf with bolts, nuts and washers. Replacement procedures are obvious.

11-33. Coaxial Switch - Antenna (Installation Print 45-80002, 45-80003, 45-80004)

The antenna coaxial switch is located to the astronaut's right, on an aft pressure bulkhead, lower right shelf. The unit is mounted forward, on the underside of the shelf, adjacent to the inner capsule skin. The

unit is held in place with four screws through the shelf into threaded holes in the unit. The UHF/HF recovery beacon must be removed to gain access to this unit.

11-34. HF Recovery Balloon Antenna (Installation Print 45-41001)

The recovery balloon antenna compartmentis located to the astronaut's center left, on the open face of the recovery compartment. The unit is mounted in the triangle formed by the parachute support fitting and the upper truss fitting. The unit is held in place with four bolts, with washers, which thread into plate nuts installed on the fittings. For replacement, refer to Section IX.

WARNING

Squibs are contained in the recovery balloon antenna compartment. Care must be exercised to prevent application of voltage to the electrical connector pins.

11-35. HF Recovery Diplexer (Installation Print 45-80002, 45-80003, 45-80004)

The diplexer is located to the astronaut's center right, on the aft pressure bulkhead vertical web. The unit is mounted on the outboard side of the web and held in place with four screws threaded into plate nuts installed on the web. Replacement procedures are obvious.

11-36. Play Back Tape Recorders (Installation Print 45-88104)

Two play back recorders are installed in a recorder container. Instructions for replacement of these recorders will be supplied when available.

11-37. Play Back Recorder Container (Installation Print 45-88510)

The play back recorder container is located in the special instrumentation pallet. The container is mounted to the pallet cover shelf. The

container is secured with two bolts, with washers and nuts, along the top edge, and two screws, with washers and nuts, at the bottom.

11-38. Removal

(a) Notify the Instrumentation System Engineer that the 45-88503 shelf must be removed from the special instrumentation pallet. This consists of removing the crewman simulator or primate couch, and removing the shelf hold down fasteners.

(b) Disconnect the wire bundle connector from the recorder container. Cap the connectors and secure the wire bundle. Remove the shelf.

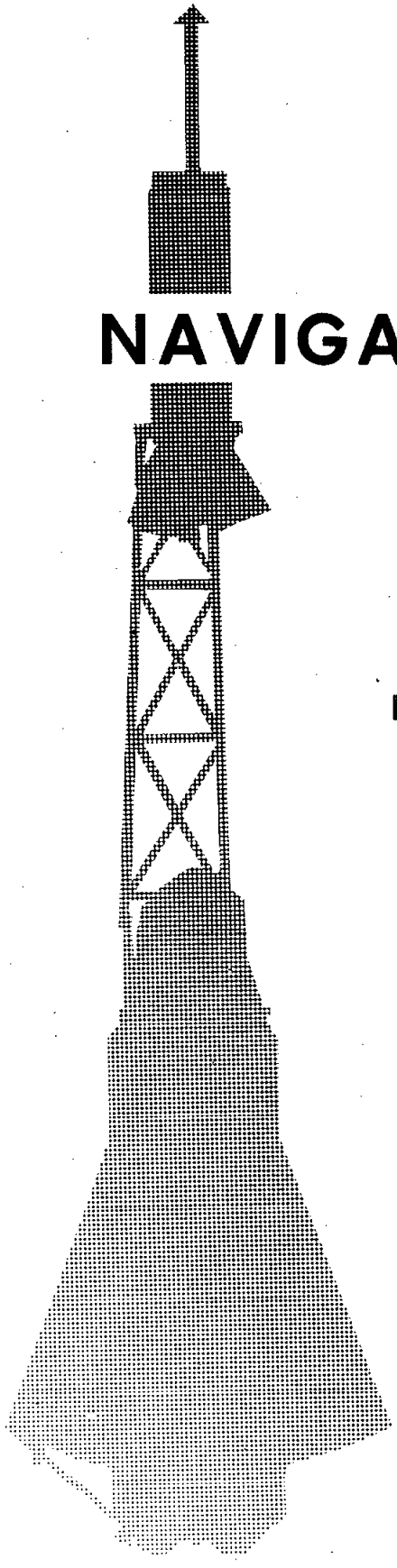
(c) Remove the four bolts securing the container to the shelf and remove the container.

11-39. Installation

(a) Locate the recorder container on the shelf and install the four bolts, washers and nuts.

(b) Install the shelf on the pallet, connecting the wire bundles as per 45-79089 and 45-79097.

(c) Notify the Instrumentation System Engineer that the shelf is ready to be secured to the special instrumentation pallet.



SECTION XII

NAVIGATIONAL AIDS

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XII. NAVIGATIONAL AIDS

12-1. GENERAL

Section 12 provides procedures, illustrations and charts which facilitate system trouble shooting and component replacement and adjustment. It will be noted that not all system components are covered within the Replacement and Adjustment areas. In the absence of such procedures, it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

12-2. TROUBLE SHOOTING

In general, malfunctions may be traced to one of three probable causes (1) component failure, (2) wiring error or failure, (3) operator error. The following trouble shooting charts disregard the possibility of operator error and provide a method of locating a malfunction to a replaceable component or a faulty section of wiring.

12-3. Satellite Periscope

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Periscope will not extend.	Faulty extend limit switch.	Check continuity across limit switch. (Ref. Perkin-Elmer print No. 539-0031).	Adjust or replace limit switch.
Periscope will not retract.	Faulty retract limit switch.	Check continuity through pins in motor box receptacle. (Ref. Perkin-Elmer Print No. 539-0031).	Adjust or replace limit switch.
Motor continues operating after scope is fully extended.	Extend limit switch defective or out of adjustment.	Check switch continuity and adjustment. (Ref. Perkin-Elmer Print No. 539-0031.)	Adjust or replace limit switch.
Motor continues to operate after scope is fully retracted.	Retract limit switch defective or out of adjustment.	Check switch continuity and adjustment. (Ref. Perkin-Elmer Print No. 539-0031.)	Adjust or replace limit switch.
Reticle lights will not illuminate.	Faulty reticle light limit switch.	Check continuity across limit switch. (Ref. Perkin-Elmer Print No. 539-0031.)	Adjust or replace limit switch.
Foggy display.	Moisture condensed on lens.	Check dessicator	Flush upper housing. (Ref. SEDR 99.)
	Dirty display glass.	Visually inspect glass for grease smears, oil, etc. NOTE Maintenance on the periscope assembly should be accomplished by, or under the guidance of, Perkins-Elmer representatives.	Clean glass. (Ref. SEDR 99.)

12-4. Satellite Clock

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Clocks not running.	Clocks not wound (exclude ELAPSED TIME FROM LAUNCH indicator).		Wind clocks.
ELAPSED TIME FROM LAUNCH indicator not running after electrical pulse.	Open circuit.	Check electrical connector for looseness.	Tighten connector.
		Check capsule wiring (Ref. Print No. 45-79094).	Correct wiring if necessary.
	Defective indicator.	Check clock wiring through connector pins (Ref. Print No. 45-79094).	Replace clock.

12-5. Altimeter

If during altimeter checkout (Ref. SEDR 99), the altimeter malfunctions, it is an indication of two possible troubles; either the static system is leaking or the altimeter itself is not functioning properly. If a subsequent check of the static system indicates that static system integrity is within limits, (Ref. SEDR 95), replace the altimeter with a new unit.

12-6. Earth Path Indicator

The earth path indicator consists of a spherical map (globe) of the earth gimballed and rotating in a manner to indicate ground position under the capsule. The indicator is spring motor powered and is capable of running 48 hours without re-winding. Should this unit not function properly after winding, it should be replaced with a new or overhauled unit.

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12-7. Angular Rate Indicator

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
No indication in pitch, roll or yaw.	No power from 115 V a-c fan bus.	Ask electrician for voltage verification on 115 V a-c fan bus.	Check capsule wiring (Ref. Print No. 45-79090).
		Check voltage from pin B to ground on instrument panel disconnect (bundle 805A).	
		Check continuity through rate indicator switch with switch in manual position. (Receptacle pins A and B.)	Replace switch.
Erratic or no indication in pitch.	Malfunctioning pitch gyro.	Check voltage from pin S to T on rate indicator plug.	Check wiring from pitch gyro.
		Check voltage from pin A to B of pitch gyro plug.	Replace pitch gyro.
Erratic or no indication in yaw.	Malfunctioning yaw gyro.	Check voltage from pin U to V of yaw gyro.	Check wiring from yaw gyro.
		Check voltage from pin A to B of yaw gyro plug.	Replace yaw gyro.
Erratic or no indication in roll	Malfunctioning roll gyro.	Check voltage from pin P to R.	Check wiring from roll gyro.
		Check voltage from pin A to B of roll gyro plug.	Replace roll gyro.

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12-8. REPIACEMENT AND ADJUSTMENT

12-9. Satellite Periscope

12-10. Removal (Upper housing)

See Figure 12-1.

12-11. Installation (Upper housing)

Installation is the reverse of the removal procedure. Torque instrument panel attach bolts to 60-85 inch pounds.

12-12. Adjustment

This information will be supplied when available.

12-13. Removal (Lower housing)

Removal of the lower housing assembly destroys the thermal integrity of the capsule. Therefore, this unit should not be removed unless deemed absolutely necessary. If removal must be accomplished, proceed as follows:

(a) Extend periscope and disconnect periscope mechanism from periscope door.

(b) Retract periscope to full retract position.

(c) Remove periscope upper housing. Refer to Paragraph 12-4.

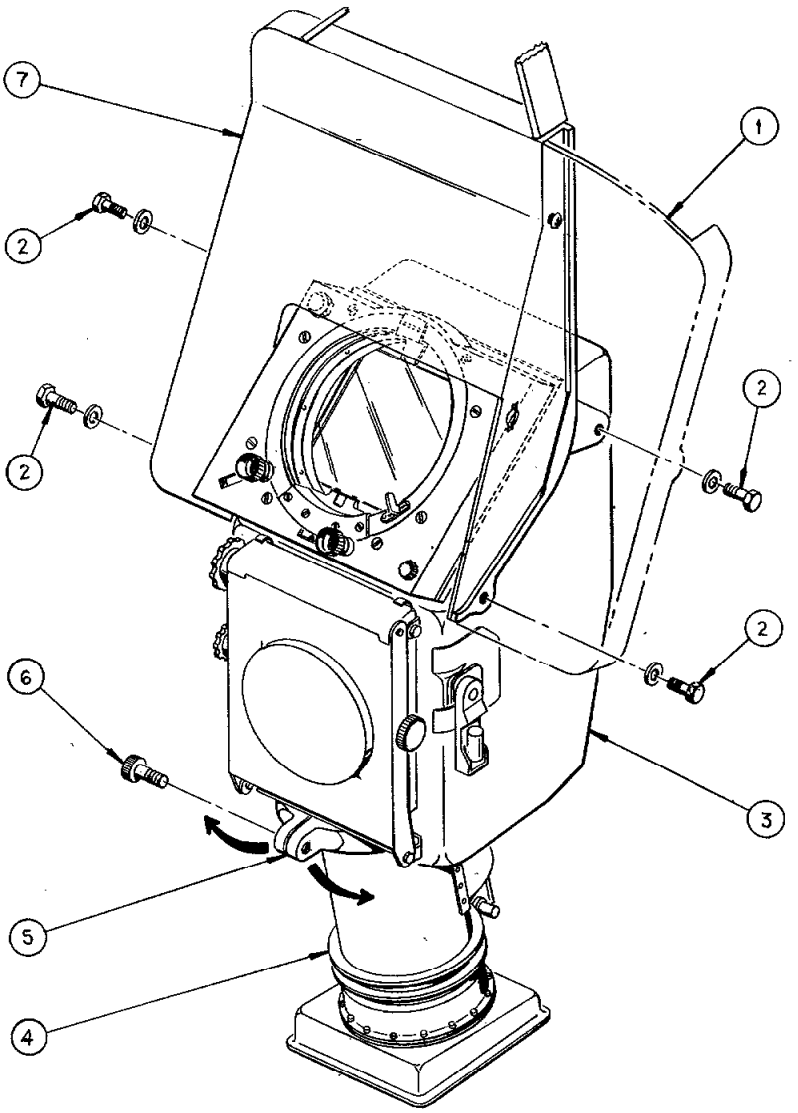
(d) Disconnect electrical connector from right side of lower housing.

(e) Remove the bolts attaching the lower housing to the periscope and umbilical disconnect sill.

(f) Using extreme care, remove the lower housing from the capsule. (This unit weighs approximately 15 pounds.)

12-14. Installation (Lower housing)

Installation of the lower housing is the reverse of the removal procedure with the following additions:



1. INSTRUMENT PANEL (DETACHABLE SECTION)
2. ATTACH BOLT
3. UPPER HOUSING ASS'Y.
4. LOWER HOUSING ASS'Y.
5. CLAMP RING
6. CLAMP RING BOLT
7. INSTRUMENT PANEL

PERISCOPE UPPER HOUSING ASSEMBLY REMOVAL

A REMOVE THE DETACHABLE SECTION OF THE INSTRUMENT PANEL (1)

B REMOVE THE ATTACH BOLTS (2) SECURING THE INSTRUMENT PANEL (7) TO THE PERISCOPE.

C DISCONNECT ELECTRICAL CONNECTOR FROM LEFT SIDE OF UPPER HOUSING.

CAUTION

PRIOR TO ACCOMPLICHING STEP C OBTAIN THE HELP OF AN ASSISTANT TO SUPPORT THE UPPER HOUSING ASS'Y. (3) WHILE THE LAST SECURING DEVICE IS REMOVED. THIS UNIT WEIGHS APPROXIMATELY 20 LBS.

D USING A 7/32" ALLEN WRENCH, REMOVE THE CLAMP RING BOLT (6) SECURING THE UPPER HOUSING (3) TO THE LOWER HOUSING ASS'Y. (4) AND SPREAD CLAMP RING (5).

CAUTION

USE EXTREME CARE WHEN REMOVING THE UPPER HOUSING ASS'Y. IMPRUDENT HANDLING DURING REMOVAL COULD DAMAGE ONE OF THE LENSES WHICH PROJECTS SLIGHTLY FROM THE LOWER HOUSING ASS'Y.

E REMOVE THE UPPER HOUSING ASS'Y. FROM THE CAPSULE.

F WHILE THE UPPER HOUSING IS REMOVED, COVER THE LOWER HOUSING TO PREVENT DIRT, DUST AND FOREIGN MATTER FROM ENTERING THE LENS AREA.

FIGURE 12-1 PERISCOPE INSTALLATION

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(a) Replace seal assembly between housing and disconnect sill with a new seal.

(b) Torque attach bolts to 20-25 inch pounds.

12-15. Adjustment

Any adjustments to the lower housing should be accomplished by, or under the guidance of, the vendor or a designated representative.

NOTE

This also applies to any trouble shooting of this assembly.

12-16. Periscope Flushing

Moisture which may have accumulated in the periscope upper housing is removed by flushing the area with dry nitrogen. A Flushing Kit (MDE4590006-7) has been provided for this purpose. The flushing procedure is as follows:

(a) Remove the two plugs in the periscope upper housing.

(b) Insert the flushing hose into one of the openings.

(c) Adjust nitrogen pressure to 2 psi (normally the relief valve will relieve pressures higher than 2 psi).

CAUTION

Do not exceed 2 psi. Higher pressures will result in damage to the periscope structure. Check that relief valve actually relieves above 2 psi.

(d) Flush upper housing with nitrogen.

(e) Turn off nitrogen and remove hose.

(f) Install fresh moisture indicator.

(g) Replace plugs in periscope body.

NOTE

Occasionally, some of the moisture will mix with the nitrogen. Therefore, the flushing cycle must be repeated. The flushing frequency will be determined through experience under local field conditions.

12-17. Periscope Optical Cleaning

To clean surfaces that are merely dusty, gently brush the loose dust from the exposed optical surface with a clean camel hair brush, and blow the dust from the surface with an ear syringe. (Materials and equipment for cleaning are provided in MDE459006-9 Optical Cleaning Kit.) To clean oily or greasy surfaces, proceed as follows:

(a) Wet a pad of absorbent cotton with detergent solution. Pad should be well moistened but not dripping wet.

NOTE

Detergent solution consists of one part Orvus to 9 parts distilled water or 1 teaspoonful Tide to 1 quart distilled water. (Orvus and Tide manufactured by Procter and Gamble Co., Cincinnati, Ohio.)

(b) Gently swab the optical surface using a spiral motion from the center to the edge.

(c) Wipe up excess moisture with cheesecloth or lens tissue.

CAUTION

Throw away used pads. Never re-use a pad or piece of lens tissue.

(d) Dampen a clean pad with methyl alcohol. Wipe the optical surface in one continuous spiral motion from center to edge. Wipe dry with a clean pad or lens tissue.

(e) When the optical surface is free of oil or grease marks, loosen any lint that may remain with a clean camel hair brush, and blow the surface clean with an ear syringe.

12-18. Satellite Clock

12-19. Removal

The Satellite Clock is accessable from the back of the instrument panel and is removed as follows:

(a) Disconnect electrical connector from back of clock case.

(b) Remove the four NAS 229 screws securing the clock.

(c) Remove clock from instrument panel.

12-20. Installation

Clock installation is the reverse of the removal procedure.

12-21. Adjustment

In addition to the obvious means of clock adjustment on the face of the indicator, one other adjustment feature is incorporated. The ELAPSED TIME FROM LAUNCH indicator may be reset by use of special tool No. _____.

12-22. Altimeter

12-23. Removal

The altimeter is accessable from behind the instrument panel and may be removed as follows:

(a) Disconnect static line connection at back of altimeter case.

(b) Remove the four screws (AN 515-8) and nuts (NAS 679A08) securing the antenna.

(c) Remove the altimeter from the instrument panel.

12-24. Installation

Installation of the altimeter is the reverse of the removal procedure. Check static system integrity following altimeter installation.

12-25. Adjustment

There is no external adjustment feature on this altimeter other than the obvious adjustment on the front of the indicator for dialing in desired pressure altitude settings.

12-26. Earth Path Indicator

12-27. Removal

The earth path indicator is accessible from behind the instrument panel and can be removed by removing the four screws (NAS 229) attaching the unit to the instrument panel. The unit may then be removed from the instrument panel.

12-28. Installation

Installation of the earth patch indicator is the reverse of the removal procedure.

12-29. Adjustment

The only external adjustments to the earth path indicator are the obvious adjustments on the front of the indicator.

12-30. Angular Rate Indicator

12-31. Removal

The angular rate indicator is accessible from the back of the instrument panel. Removal is accomplished by first disconnecting the electrical

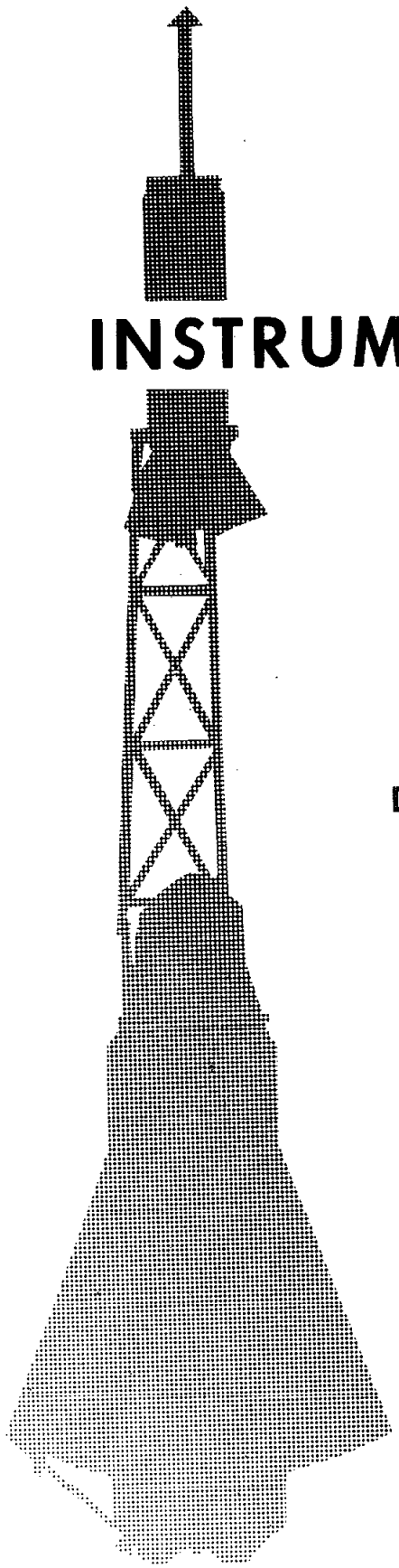
connector at the back of the instrument case and then removing the four bolts securing the indicator to the instrument panel.

12-32. Installation

Installation of the indicator is the reverse of the removal procedure.

12-33. Adjustment

There are no external adjustments provided on the angular rate indicator. If any adjustments to this unit are required, they should be accomplished by, or under the supervision of the vendor representative.



SECTION XIII

INSTRUMENTATION

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SECTION XIII. INSTRUMENTATION SYSTEM

13-1. GENERAL

Section 13 provides procedures, diagrams, illustrations and charts to facilitate system trouble shooting and component replacement and adjustment. It is noted that all system components are not necessarily covered within the Replacement and Adjustment areas. In the absence of such procedure it may be assumed that the particular procedure involved is obvious and does not warrant a detailed explanation or illustration.

13-2. SYSTEM TROUBLE SHOOTING

13-3. The following trouble shooting tables have been constructed in conjunction with the instrumentation system check as described in SEDR 65. When a step in the checkout procedure does not provide the result specified, an appropriate symptom is present in the applicable trouble shooting table. Electrical schematics are included after the trouble shooting tables.

13-4. CAMERA AND TAPE RECORDER TROUBLE SHOOTING (See Figure 13-29.)

The following trouble shooting table lists indications which may appear during performance of the Cameras and Tape Recorder Check described in SEDR 65. If the corrective action column of the table calls for replacement or adjustment of a component, refer to the replacement and adjustment section for proper procedures. Upon replacement of the component, perform appropriate portions of the capsule system test to verify operation.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Boresight area does not appear centered in ground glass view	Camera mirror not adjusted properly.	Obvious	Adjust mirror per Paragraph 13-45.
Capsule RECORDING lamp and trailer TAPE RECORDER lamp fail to light.	Tape supply expended or tape broken.	Remove cover and observe tape supply.	Remove recorder and reload per Paragraph
	Faulty tape recorder	Disconnect plug from J1 and jumper pin A to pin B on plug. Observe indicating lamps.	If lamps light, remove recorder for repair. Install spare recorder.
	Tape recorder fuse blown.	Disconnect 802AG bundle plug from instrumentation control relay box and check for 24 volts d-c between pin D on plug and ground.	If voltage is not present, replace instrumentation fuse holder.
	Defective wiring.	Make point to point continuity checks. (See Figure 13-13.)	Repair wiring.
Capsule RECORDING lamp or trailer TAPE RECORDER ON lamp fails to light.	Defective wiring.	Make point to point continuity checks of appropriate lamp circuit.	Repair wiring.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
All CAMERA OPERATION lamps fail to blink.	Blown fuse in PROGRAMMER switch-fuse.	Place switch fuse to position 2.	If operation returns to normal, replace fuse.
	Blown Instrumentation No. 6 fuse.	Disconnect 802AG bundle plug from instrumentation control relay panel and check for presence of 24 volts d-c between pin H of plug and ground.	If voltage is not present, replace instrumentation fuse holder.
One CAMERA OPERATION lamp fails to blink.	Film expended in appropriate camera.	Check film supply of camera.	Remove camera and reload per SEDR 100.
	Faulty camera.	Check for proper voltage on appropriate pins of plug attached to camera.	If voltages are proper, remove camera for repair. Install spare camera.

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13-5. COMMUTATOR OUTPUT TROUBLE SHOOTING

The following trouble shooting table lists indications which may appear during performance of the Commutator Output check as described in SEDR 65. If the corrective action column of the table calls for replacement or adjustment of a component, refer to the replacement and adjustment section for proper procedures. Upon replacement of the component, perform appropriate portions of the integrated system check to verify system operation.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Commutator A waveshape in trailer indicates low or no PAM output but waveshape in capsule indicated PDM output A is satisfactory.	Mixer-Power Supply A not operating requires adjustment.	In trailer, observe A channel attitude change rate waveshape at output of discriminators.	If waveshape indicates low or no PAM output, replace Mixer-Power Supply card A.
	10.5 kc VCO A not operating or requires adjustment.	In trailer, observe A channel attitude change rate waveshape at output of discriminators.	If waveshapes of these channels are satisfactory and commutated data is weak, adjust 10.5 kc VCO A card in CH26 of instrumentation package B. If necessary, replace 10.5 kc VCO A card.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	PAM output from commutator-keyer record amplifier A is not present.	Disconnect P2 from instrumentation package B and connect oscilloscope between pins C and R of plug. (Refer to Figure 13-25.)	If PAM output is low or not present, replace commutator-keyer-record amplifier A in instrumentation package A.
	Defective coax between instrumentation package B and umbilical.	Check coax for open or short. (Refer to Figure 13-25.)	Replace faulty coax.
Commutator B waveshape in trailer indicates low or no PAM output but waveshape in capsule indicates PDM output B is satisfactory.	Mixer-Power Supply B not operating.	In trailer, observe B Channel attitude change rate waveshapes at output of discriminators.	If waveshape indicates low or no PAM output, replace Mixer-Power Supply card B.
	10.5 kc VCO A not operating or requires adjustment.	In trailer, observe B channel attitude change rate waveshapes at output of discriminators.	If waveshapes of these channels are satisfactory and commutated data is weak, adjust 10.5 kc VCO B card in CH18 of instrumentation package B. If necessary replace VCO B card.
	PAM output from commutator-keyer-record amplifier B is not present.	Disconnect P1 from instrumentation package B and connect an oscilloscope between pins Z and M on plug. (Refer to Figure 13-26.)	If PAM output is low or not present, replace commutator-keyer-record amplifier B in instrumentation package A.
	Defective coax between instrumentation package B and umbilical.	Check coax for open or short. (Refer to Figure 13-26.)	Replace faulty coax.

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CORRECTIVE ACTION	Repair contact or shielding.
ISOLATION PROCEDURE	Use oscilloscope to trace noise to source.
PROBABLE CAUSE	Bad electrical contact or faulty shielding.
INDICATION	Noise present in waveshape.

13-6. SIGNAL SIMULATION TROUBLE SHOOTING

The following trouble shooting table lists indications which may appear during performance of the Signal Simulation Check as described in SEDR 65. Verify that the Commutator Output Check as described in SEDR 65 has been performed and satisfactory results have been obtained prior to using this trouble shooting table. If the corrective action column of the table calls for replacement or adjustment of a component, refer to the replacement and adjustment section for proper procedures. Upon replacement of the component, perform appropriate portions of the integrated system check to verify system operation.

13-7. As an aid to localizing trouble, the power applied to the instrumentation packages and the outputs of the instrumentation power supplies should be monitored constantly. Readout devices connected to the following telemetry channels will provide indications of the presence of the system voltages.

Telemetry Channel	Parameter
1	3V D-C Reference
2	Zero Reference
3	7 Volt, 400 CPS
41	115 Volt, 400 CPS
64	Calibration on Monitor
83	24 Volts D-C

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
No 3 volt reference voltage at simulator test jacks.	3 volt line to simulator shorted or open.	Measure resistance between 3V and COMMON jacks on simulator. Value should be between 55 to 65 ohms.	If open or shorted, repair wiring. (Refer to Figure 13-27.)
	3 volt power supply inoperative.	In trailer, observe channel 1 and 2 outputs.	If no output is observed, replace 45-88203 card in CH 1 of instrumentation package A.
3 volt reference voltage is out of tolerance.	Improper load on power supply.	Measure resistance between 3V and COMMON jacks on simulator. Value should be between 55 to 65 ohms.	If resistance is out of limits specified, continuity check 3 volt power distribution. (Refer to Figure 13-27.)
	Faulty power supply card.	Substitute a valid 45-88203 card in CH1 of instrumentation package A.	If trouble is corrected, repair faulty card.
Both channel 1 outputs as read out in trailer are improper, voltage measured at simulator is proper.	Faulty 3 volt d-c power distribution.	Continuity check 3 volt power distribution. (See Figure 13-27.)	Repair wiring.
One channel 1 output as read out in trailer is improper.	Faulty commutator-keyer-record amplifier.	Substitute a valid commutator-keyer-record amplifier.	Repair faulty commutator-keyer-record amplifier.
Channel 4 output is at some level and fails to move to proper value or zero as CALIBRATE switch is operated.	Faulty calibrate circuit.	Observe circuit action for channels 6 and 7 as CALIBRATE switch is operated. Also observe output of channel 64.	If circuit action is not proper, repair calibrate control circuit. (See Figure 13-31.)
	Faulty package temperature amplifier.	If circuit action is proper in preceding step, substitute a valid amplifier card in instrumentation package A. (See Figure 13-2.)	If trouble is corrected, repair faulty amplifier.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Channel 4 output as read out in trailer is improper.	No 6.3 volt a-c applied to amplifier choppers.	Observe channel 41 output in telemetry trailer.	If channel 41 output is satisfactory, make continuity check of 6.3 volt distribution. (See Figure 13-29.) If channel 41 output is low or zero, check 115 volt distribution. (See Figure 13-29.)
	Faulty package temperature amplifier.	Substitute a valid amplifier card. (See Figure 13-2.)	If trouble is corrected, repair faulty card.
Output from channels 5, 12, 27, 49 and 71 of commutator A or B is improper with simulated signal applied.	Faulty accoustical and vibration data analyzer.	Substitute a valid data analyzer.	If trouble is corrected, repair faulty data analyzer.
	Faulty wiring.	Continuity check capsule wiring. (See Figure 13-3.)	Repair wiring.
Channel 6A or 6B indicates improper output in telemetry trailer at all times.	Faulty 45-88715-5 card amplifier.	Substitute a valid amplifier card. (See Figure 13-4.)	If trouble is corrected, repair faulty amplifier card.
	Faulty wiring.	Check circuit wiring. (See Figure 13-4.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a valid commutator-keyer-record amplifier.	If trouble is corrected, repair faulty commutator-keyer-record amplifier.
Channel 6A or 6B indicates low output.	Gain of amplifier requires adjustment.	Visual	Adjust amplifier gain per SEDR 64.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Channel 7A or 7B indicates improper output when CALIBRATE switch is placed to FULL; operates properly with simulated signal.	Faulty amplifier card.	Substitute a valid amplifier card. (See Figure 13-4.)	If trouble is corrected, repair amplifier card.
	Faulty wiring.	Check circuit wiring. (See Figure 13-4 and Figure 13-31.)	Repair wiring.
Channel 7 output as read out in trailer is improper.	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative. (See Figure 13-4.)	If trouble is corrected, repair faulty commutator-keyer-record amplifier.
	Faulty wiring in instrumentation package A.	Check wiring. (See Figure 13-4.)	Repair wiring.
Channel 8 or 9 output as read out in trailer is improper.	Faulty wiring.	Check input circuit for open. (See Figure 13-5.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator-keyer-record amplifier.
Channel 10 or 11 output improper as CALIBRATE switch is operated.	Faulty cabin air temperature amplifier card.	Substitute a card known to be operative. (See Figure 13-6.)	Repair faulty card.
	Faulty calibrate control circuit.	Check calibrate control circuit. (See Figures 13-6 and 13-31.)	Repair wiring or replace component as necessary.
Improper output for channel 13, 14, 15, 23, 24, 43, 44, 45, 73, 74 or 75 or combinations of these channels.	Faulty wiring.	Check circuit wiring for open or short. If combination of channels is inoperative, list inoperative channels as an aid in determining wire fault. (See Figure 13-7.)	Repair faulty wiring.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator - keyer-record amplifier.
Improper output for channel 16, 17, 18 or 84.	Faulty wiring.	Check circuit wiring for open or short. (See Figure 13-8.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator-keyer-record amplifier.
Improper output for 19, 20, or 21 with simulated signal applied or with calibrate signal applied.	Faulty 45-88207 card assembly in instrumentation package A.	Substitute a card assembly known to be operative. (See Figure 13-9.)	Repair faulty card assembly.
	Faulty wiring.	Check circuit wiring for open or short. (See Figure 13-9.)	Repair wiring.
Channel 22 as read out in trailer is zero.	Faulty wiring.	Check circuit wiring for open or short. (See Figure 13-10.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator-keyer-record amplifier.
Channel 39 or 40 output in trailer is zero.	Faulty wiring.	Check wiring for open or short. (See Figure 13-13.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator-keyer-record amplifier.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Channel 42 output in trailer reads improperly with simulated signal or with calibrate signal.	Faulty 45-88215 card assembly.	Substitute a card assembly known to be operative. (See Figure 13-14.)	Repair faulty card.
	Faulty wiring.	Check circuit wiring for open or short. (See Figure 13-14.)	Repair wiring.
Channel 82 or 83 output in trailer is improper.	Faulty wiring.	Check circuit wiring for open or short. (See Figure 13-22.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator-keyer-record amplifier.
Channel 86 or 88 outputs in trailer is improper with simulated signal or calibrate signal.	Faulty 45-88212 card	Substitute a card assembly known to be operative. (See Figure 13-11)	Repair faulty card.
	Faulty wiring.	Check circuit wiring. (See Figure 13-16.)	Repair wiring.
Outputs from 1.3, 1.7, and 2.3 kc oscillators are all improper with simulated signal or calibrate signal.	Mixer-power supply card faulty.	Substitute valid mixer-power supply card. (Refer to Paragraph 13-71 and Figure 13-25.)	Repair or replace mixer-power supply card.
Output from 1.3 or 1.7 or 2.3 kc subcarrier oscillator is improper with simulated signal or calibrate signal.	Oscillator card faulty or requires adjustment.	Substitute valid oscillator card or adjust card in circuit. (Refer to Paragraph 13-64, 66 or 68 and Figure 13-26.)	Repair or adjust oscillator card.
On-off type of instrumented channel provides improper output indication.	Faulty wiring or defective component.	Refer to appropriate circuit schematic and perform voltage and resistance checks.	Repair fault.

13-8. CAPSULE ELECTRICAL POWER INSTRUMENTATION TROUBLE SHOOTING

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Instrument panel meter and instrumentation value of channel 83 are both zero.	Faulty capsule electrical power system.	Notify capsule electrical maintenance personnel.	
Instrumentation value of channel 83 is zero, instrument panel meter reading is satisfactory.	Open instrumentation power supply fuse or broken wire in 24 volt distribution circuit.	Check for presence of 24 volts d-c between pin J of CH1 and ground. (See Figure 13-28.	Replace fuse block or repair wiring.
	Open R9 or shorted C2 on 45-88203 card in CH1 of instrumentation package A.	Use ohmmeter to check card. R9 is a 45K resistor. (See Figure 13-22)	Replace faulty component.
	Pin H of CH1 shorted to ground.	Check for presence of short. (See Figure 13-22.)	Repair wiring.
Instrumentation value of channel 83 remains at our near full scale at all times.	Open input circuit to commutator-keyer-record amplifier.	Check continuity of channel 83 input circuit. (See Figure 13-22.)	Repair wiring.
	Open R10 on 45-88203 card in CH1 of instrumentation package A.	Measure R10, 5K resistor.	
Instrument panel meter current reading is satisfactory, instrumentation value of channel 42 is improper for commutators A and B.	Loss of 6.3 volt 400 cps chopper excitation.	Observe channel 41 output. If not proper, check 115 volt, 400 cps distribution circuit. (See Figure 13-30.) If channel 41 output is proper, check for presence of 6.3 volts, 400 cps between pin EE of P2 on instrumentation package C	Repair wiring or replace faulty component as required.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
		and ground. (See Figure 13-30.)	
	Open wiring between shunt and d-c amplifiers.	Check continuity of wiring. (See Figure 13-14.)	Repair wiring.
Instrument panel meter current reading is satisfactory, instrumentation value of channel 42 is improper for commutator A or B.	Faulty amplifier card assembly.	Substitute a valid card assembly. (See Figure 13-14.)	Repair faulty card.
	Faulty wiring.	Check circuit wiring (See Figure 13-14.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator-keyer-record amplifier.
STANDBY BATTERIES ON lamp lights, but channel 63 output fails to move to upper scale for commutators A and B.	Open R17 on 45-88205 card in instrumentation package C.	Measure value of R17. R17 is a 170K resistor. (See Figure 13-18.)	Replace R17.
	Faulty secondary bus relay No. 2 or faulty wiring.	Make voltage measurements to verify relay operation. Continuity check circuit. (See Figure 13-18.)	Repair as required.
STANDBY BATTERIES ON lamp lights, but channel 63 output is improper for commutator A or B.	Faulty commutator-keyer-record amplifier.	Substitute a valid commutator-keyer-record amplifier.	Repair faulty commutator-keyer-record amplifier.
	Faulty wiring.	Check wiring. (See Figure 13-18.)	Repair wiring.
Channel 63 output read full or near full scale at all times.	Open R18 on 45-88205 card assembly in instrumentation package C.	Measure value of R18. R18 is a 20K resistor. (See Figure 13-18.)	Replace R18.

INDICATION	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Instrument panel meter reading proper, instrumentation value of channel 41 is zero for commutators A and B.	Faulty 45-88203 card assembly in CH1 of instrumentation package A.	Observe channel 42 output and compare to instrument panel d-c current indications. If channel 42 provides proper output, substitute a 45-88203 card assembly known to be operative. (See Figure 13-14.)	Repair faulty card assembly.
	Faulty 115/6.3 volt transformer or faulty wiring.	Observe channel 42 output and compare to instrument panel d-c current indication. If channel 42 output is zero, make voltage checks of 115/6.3 volt distribution circuit. (See Figure 13-30.)	Replace faulty transformer or repair wiring.
Channel 41 output is full scale or near full scale at all times for both commutators.	Open input circuit to commutator-keyer-record amplifier.	Check resistance from pin 41 of P1B to ground. (See Figure 13-14.)	Repair wiring or replace card assembly as required.
STANDBY INVERTER ON lamp lights but channel 62 output fails to move to upper scale for commutators A and B.	Open 120K resistor in power and control relay box, faulty standby inverter relay or faulty wiring.	Check for presence of 2.5 volts (nominal) between pin q of P4 on instrumentation package A and ground. If voltage is not present, make continuity check of circuit to localize trouble. (See Figure 13-18.)	Make repairs as required.
STANDBY INVERTER ON lamp lights but channel 62 output is improper for commutator A or B.	Faulty input wiring to commutator-keyer-record amplifier.	Check wiring. (See Figure 13-18.)	Repair wiring.
	Faulty commutator-keyer-record amplifier.	Substitute a commutator-keyer-record amplifier known to be operative.	Repair faulty commutator-keyer-record amplifier.

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INDICATIONS	PROBABLE CAUSE	ISOLATION PROCEDURE	CORRECTIVE ACTION
Channel 62 output remains at near full scale at all times for both commutator outputs.	Open 12K resistor in power and control relay box or open wiring between relay box and instrumentation package A.	Make continuity checks to localize trouble.	Make repairs as required.

13-9. INSTRUMENTATION POWER SUPPLIES INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-1.

13-10. CALIBRATION ON INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-19.

13-11. STATIC PRESSURE INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-10.

13-12. PERISCOPE RETRACT AND 0.05G RELAY INSTRUMENTATION TROUBLE SHOOTING

See Figures 13-21 and 13-23.

13-13. CAPSULE ACCELERATION INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-7.

13-14. NOISE LEVEL INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-3.

13-15. VIBRATION INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-3.

13-16. STRUCTURAL TEMPERATURE INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-9.

13-17. ENVIRONMENTAL CONTROL SYSTEM INSTRUMENTATION TROUBLE SHOOTING

See Figures 13-4, 13-5, 13-6 and 13-22.

13-18. REACTION CONTROL SYSTEM INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-13.

13-19. HORIZON SCANNER INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-11.

13-20. ATTITUDE INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-8.

13-21. REACTION CONTROL SYSTEM SOLENOID VOLTAGE INSTRUMENTATION

See Figure 13-20.

13-22. ATTITUDE CHANGE RATE INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-26.

13-23. SATELLITE CLOCK INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-12.

13-24. PACKAGE TEMPERATURE INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-2.

13-25. NORMAL LAUNCH SEQUENCE INSTRUMENTATION TROUBLE SHOOTING

See Figures 13-15 and 13-16.

13-26. EMERGENCY ESCAPE INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-15.

13-27. LANDING SYSTEM INSTRUMENTATION TROUBLE SHOOTING

See Figure 13-17.

13-28. INSTRUMENTATION-TELEMENTRY COMPATIBILITY TROUBLE SHOOTING

See Figures 13-24, 13-25 and 13-26.

13-29. SCHEMATICS

The schematics provided in the sub-section are representative of circuitry in capsules 2 and 3. Effectivities are noted in the figure titles and in the field of the drawings. If no effectivity notes are present, the schematic is effective for both capsules.

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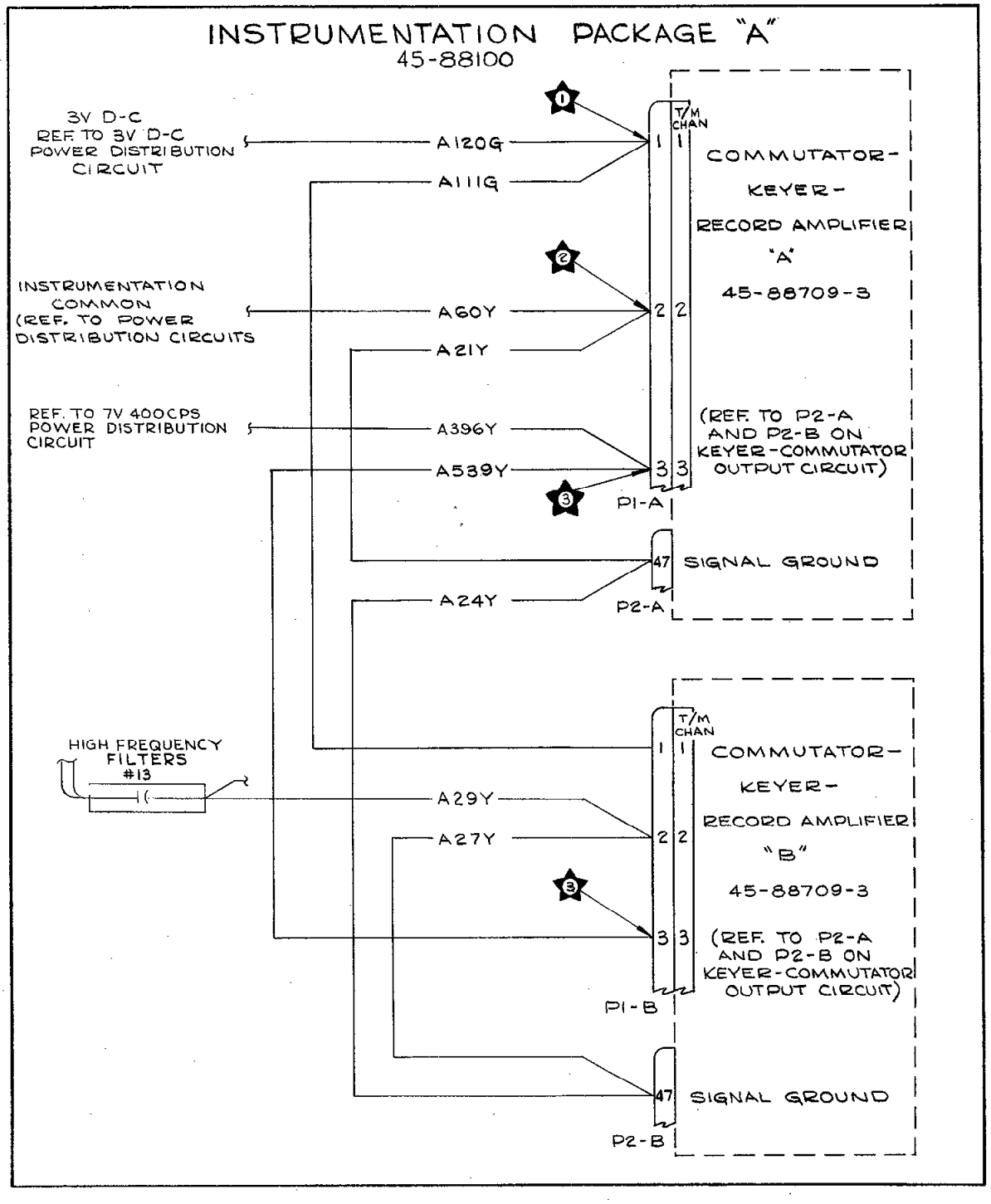

NOTE

SIGNAL SIMULATOR UNIT MDE458800I DOES NOT SIMULATE SIGNALS FOR T/M CHANNELS 1,2 AND 3. HOWEVER, TEST JACKS ON THE SIMULATOR MAY BE UTILIZED TO VERIFY PRESENCE OF 3V D-C IN THE SYSTEM.

FIGURE 13-1 3 VOLT REFERENCE, GROUND REFERENCE AND 7 VOLT 400 CPS POWER SUPPLY INSTRUMENTATION CIRCUITS (CHANNELS 1,2,3)

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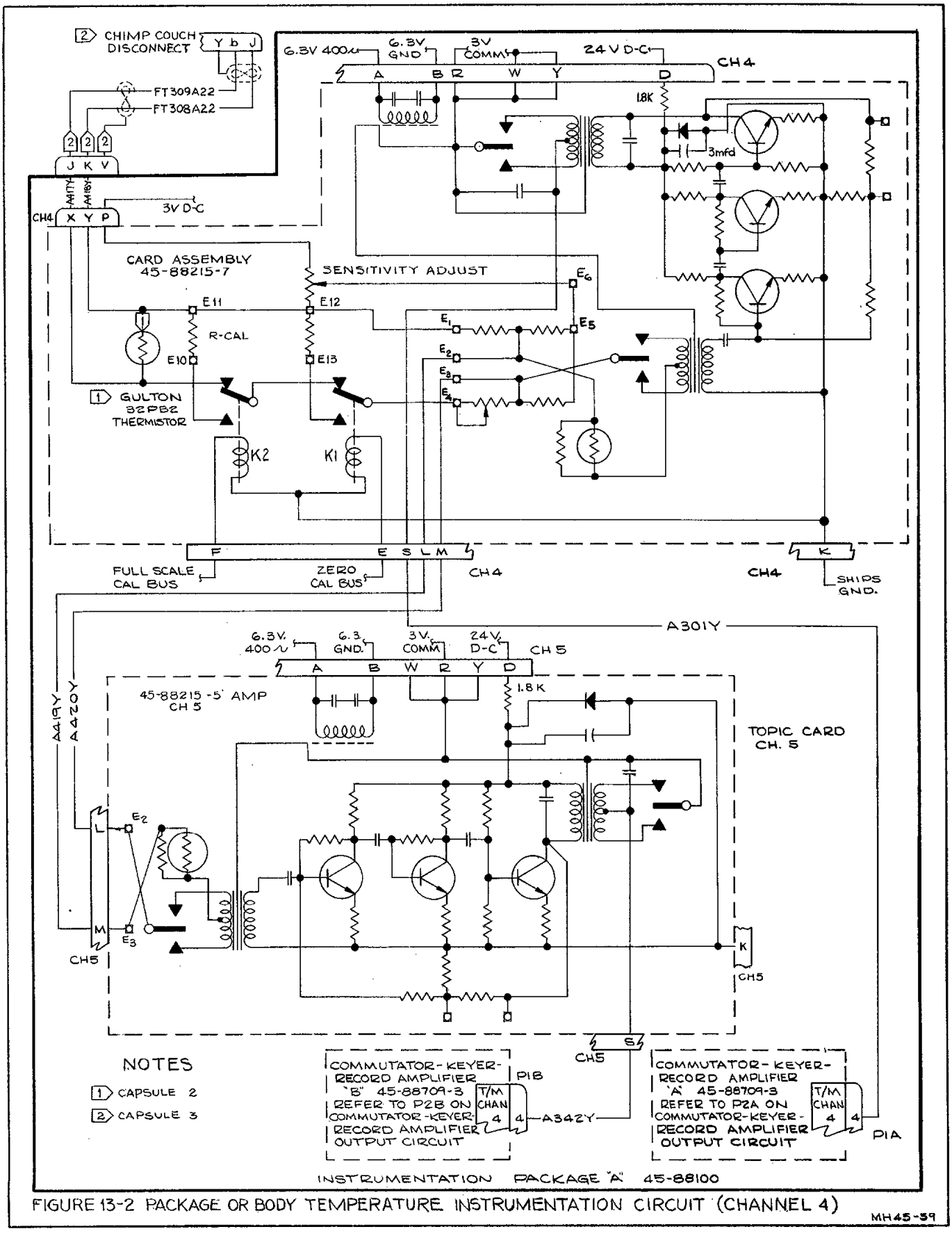
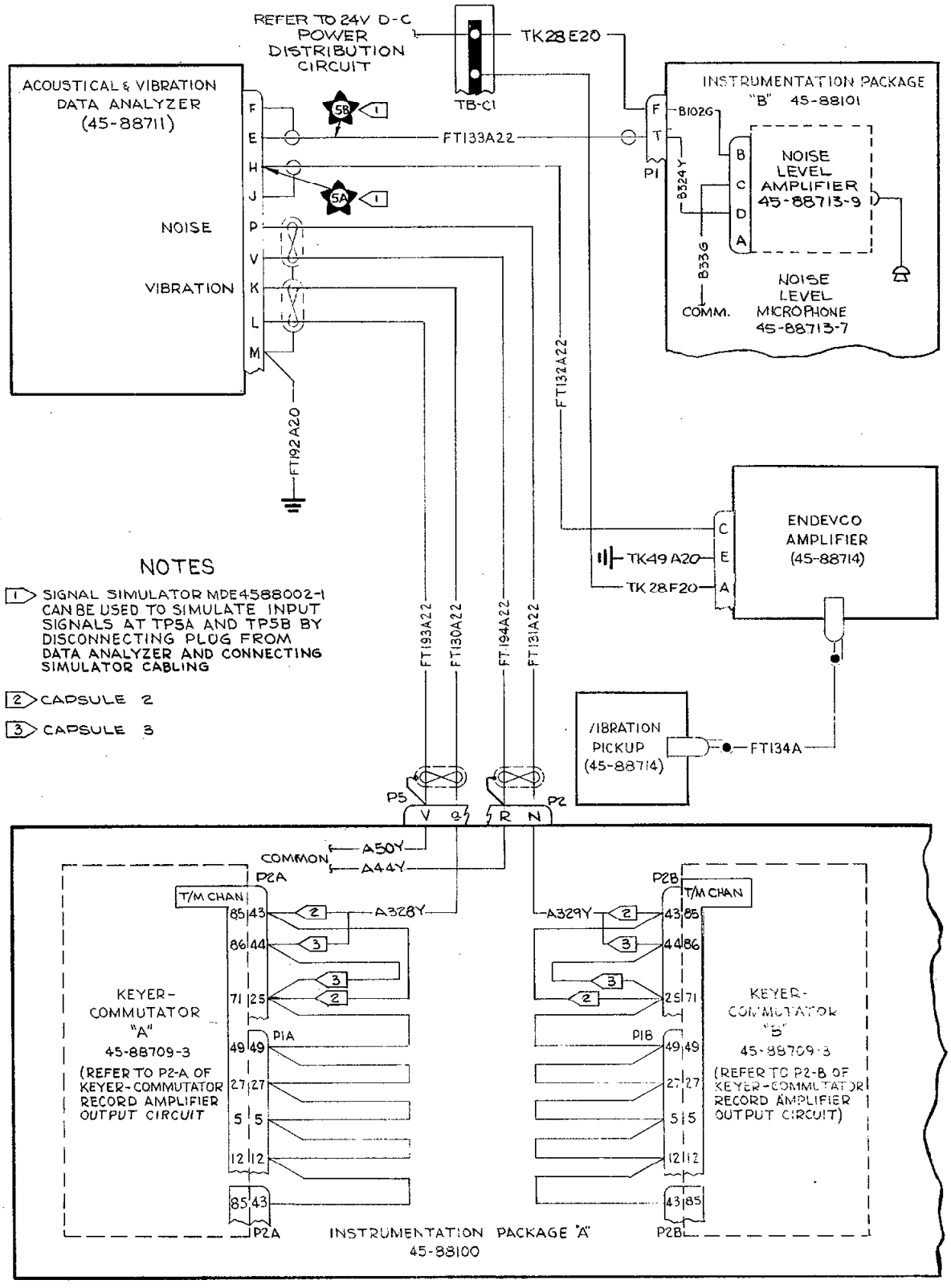


FIGURE 13-2 PACKAGE OR BODY TEMPERATURE INSTRUMENTATION CIRCUIT (CHANNEL 4)

MH45-59



NOTES

1. SIGNAL SIMULATOR MDE4588002-1 CAN BE USED TO SIMULATE INPUT SIGNALS AT TP5A AND TP5B BY DISCONNECTING PLUG FROM DATA ANALYZER AND CONNECTING SIMULATOR CABLING
2. CAPSULE 2
3. CAPSULE 3

FIGURE 13-3 VIBRATION AND NOISE LEVEL INSTRUMENTATION CIRCUIT

MH45-60

2. CHANNELS 5, 12, 27, 49, 71 AND 85
3. CHANNELS 5, 12, 27, 49, 71 AND 86

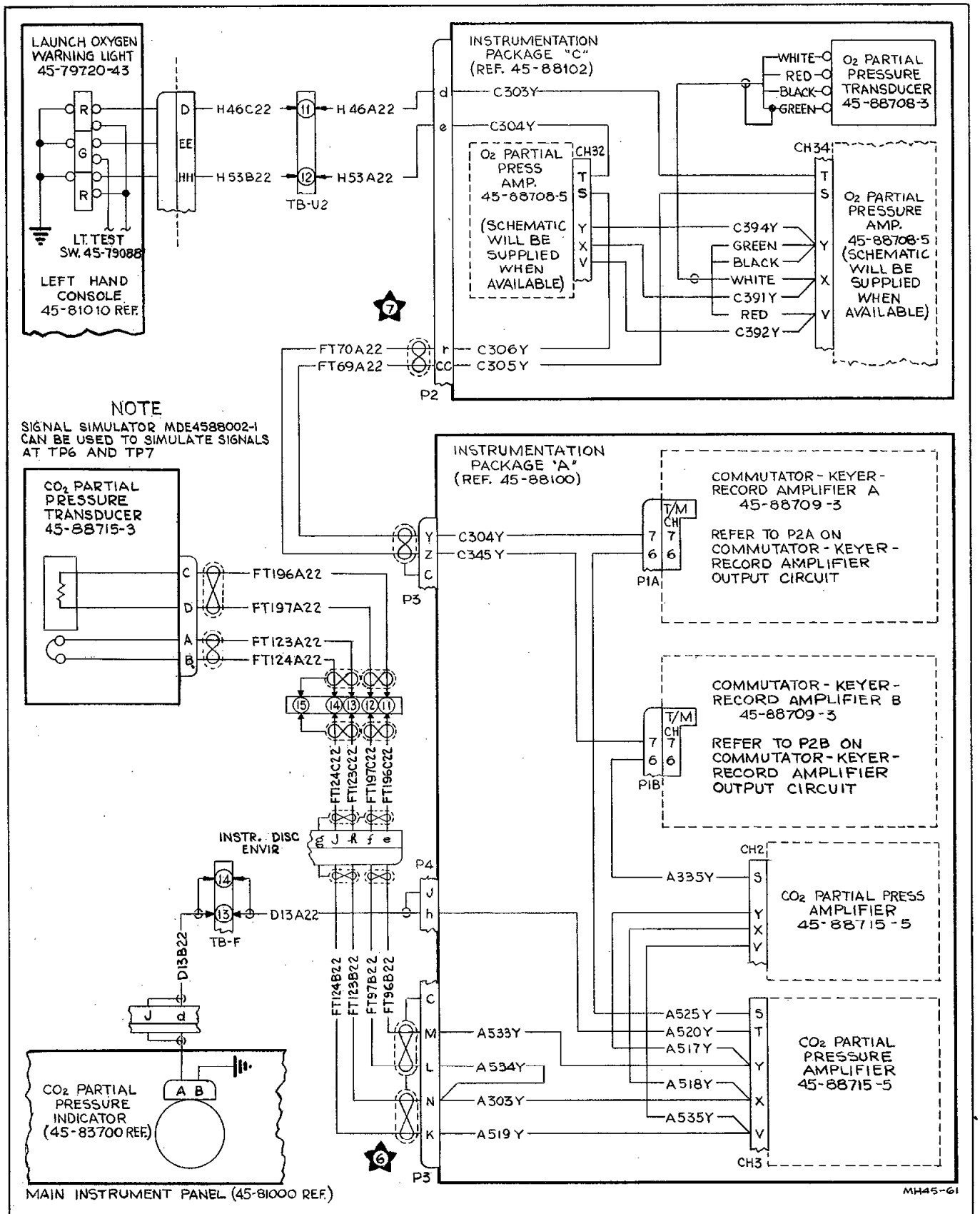


FIGURE 13-4 CO_2 AND O_2 PARTIAL PRESSURE INSTRUMENTATION CIRCUITS (CHANNELS 6, 7,)

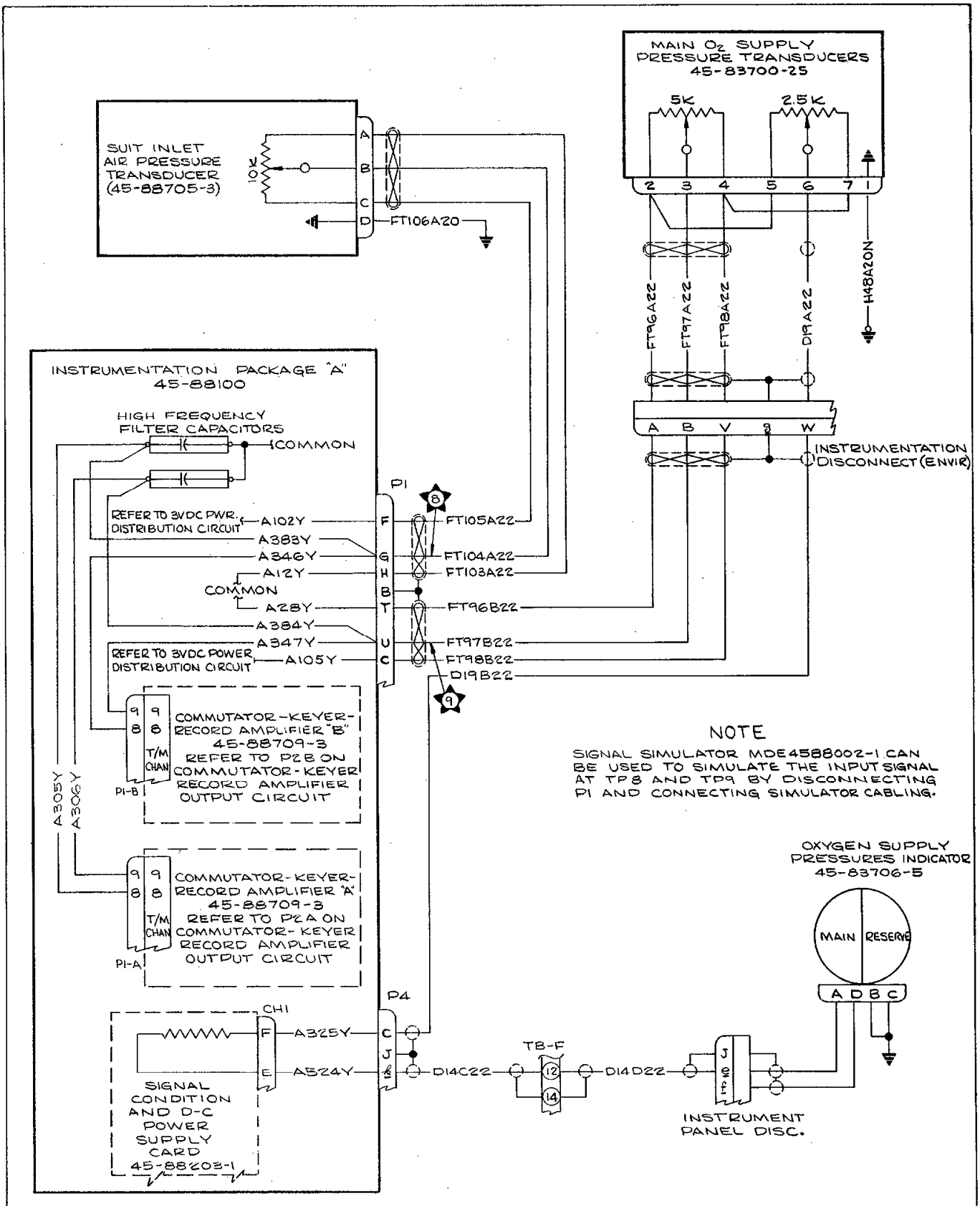


FIGURE 13-5 SUIT INLET AIR PRESSURE AND MAIN O_2 SUPPLY PRESSURE INSTRUMENTATION CIRCUITS (CHANNEL 8,9)

MH45-62

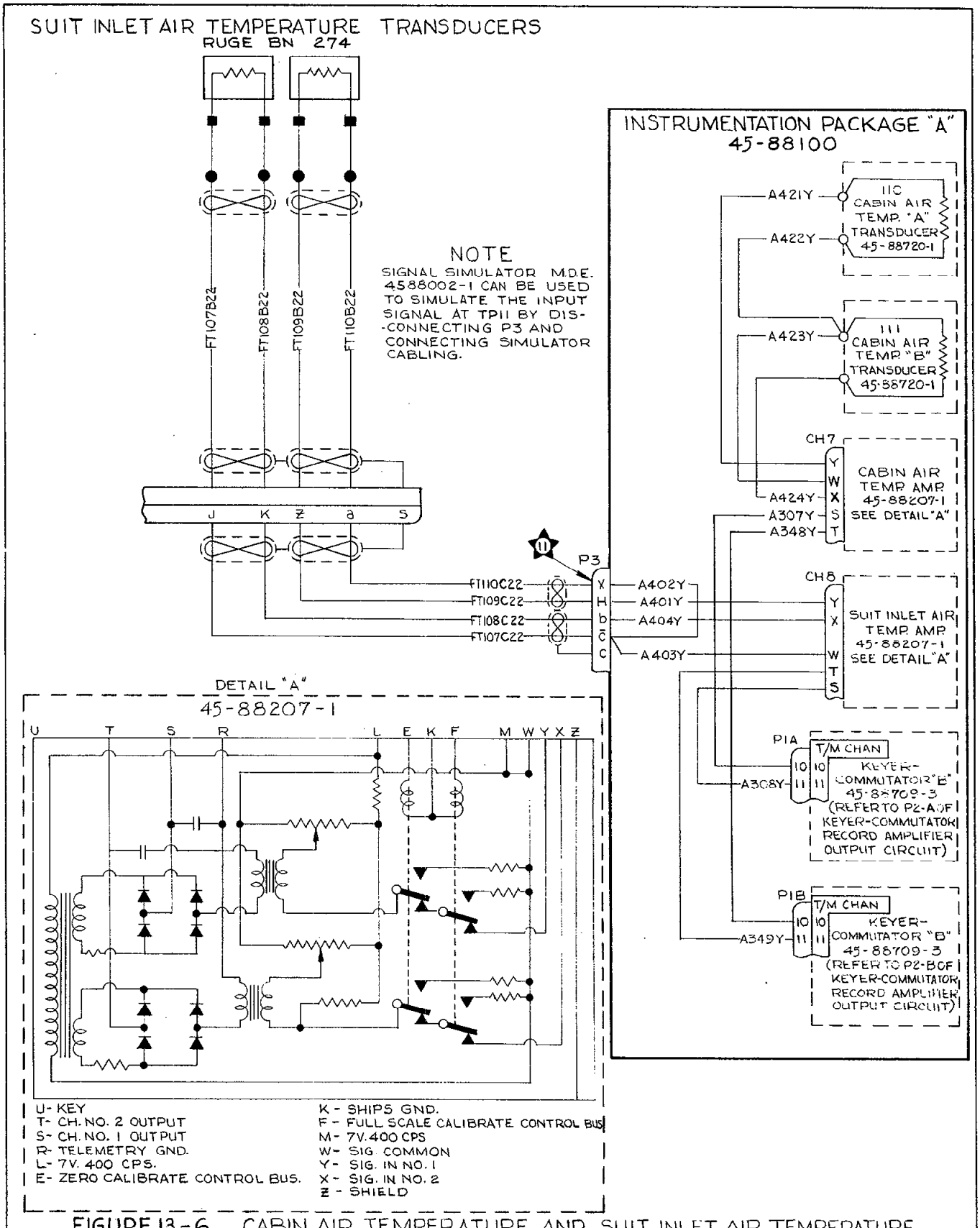


FIGURE 13-6 CABIN AIR TEMPERATURE AND SUIT INLET AIR TEMPERATURE INSTRUMENTATION CIRCUITS (CHANNELS 10 AND 11)

MH45-63

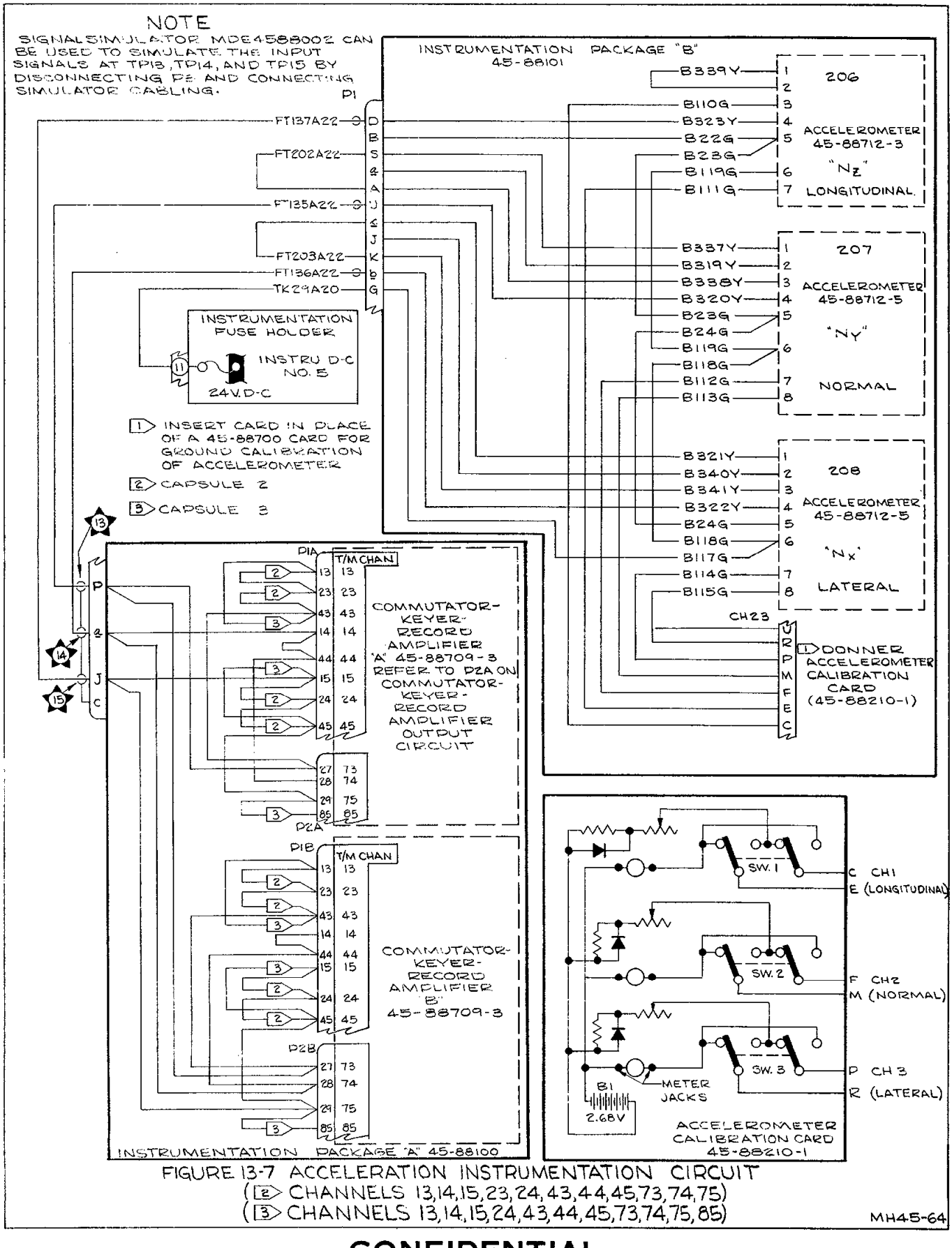


FIGURE 13-7 ACCELERATION INSTRUMENTATION CIRCUIT
(2 CHANNELS 13,14,15,23,24,43,44,45,73,74,75)
(3 CHANNELS 13,14,15,24,43,44,45,73,74,75,85)

MH45-64

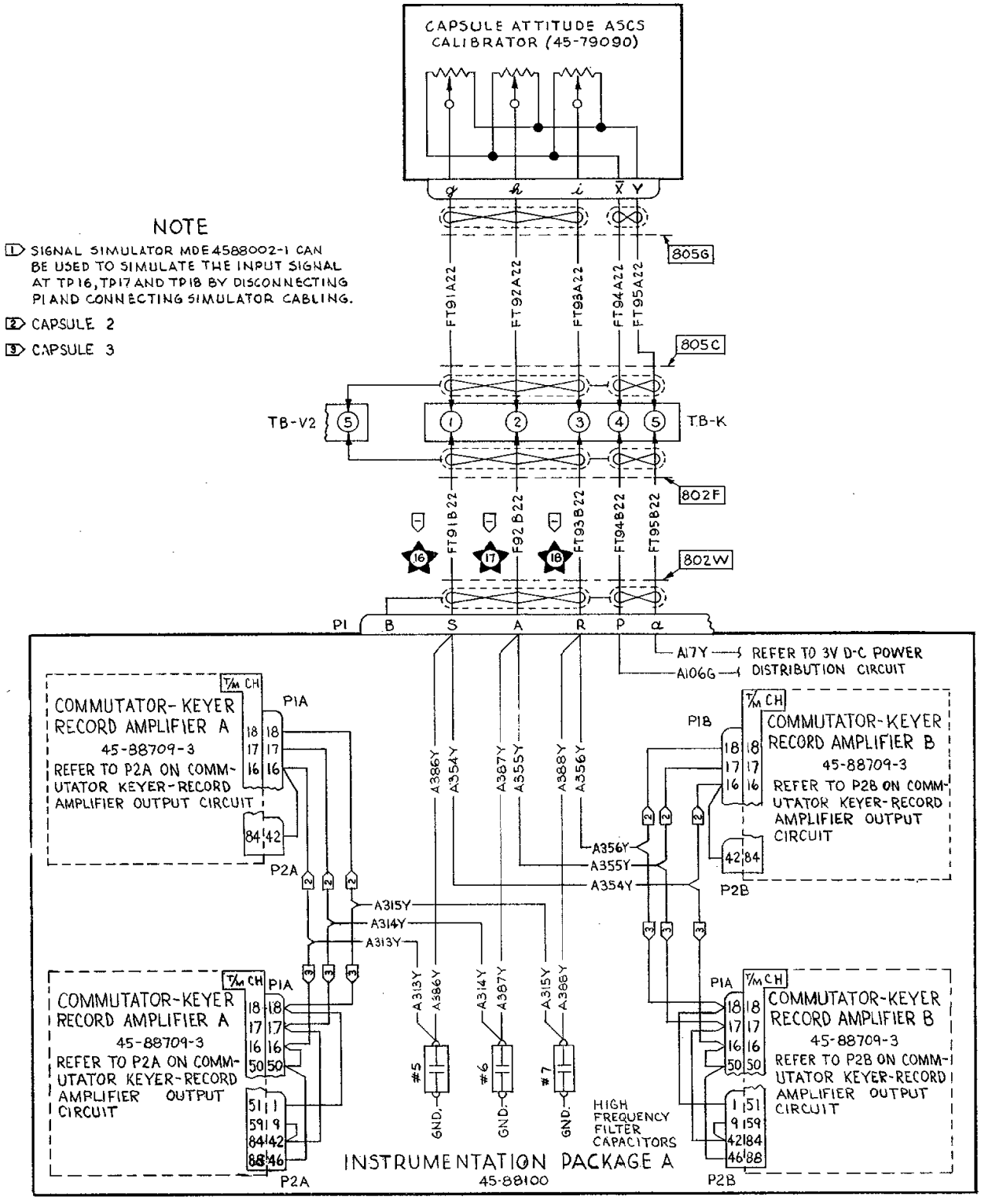


FIGURE 13-8 ATTITUDE INSTRUMENTATION CIRCUIT
2 (CHANNELS 16, 17, 18, 84)
3 (CHANNELS 16, 17, 18, 50, 51, 59, 84, 88)

MH45-65

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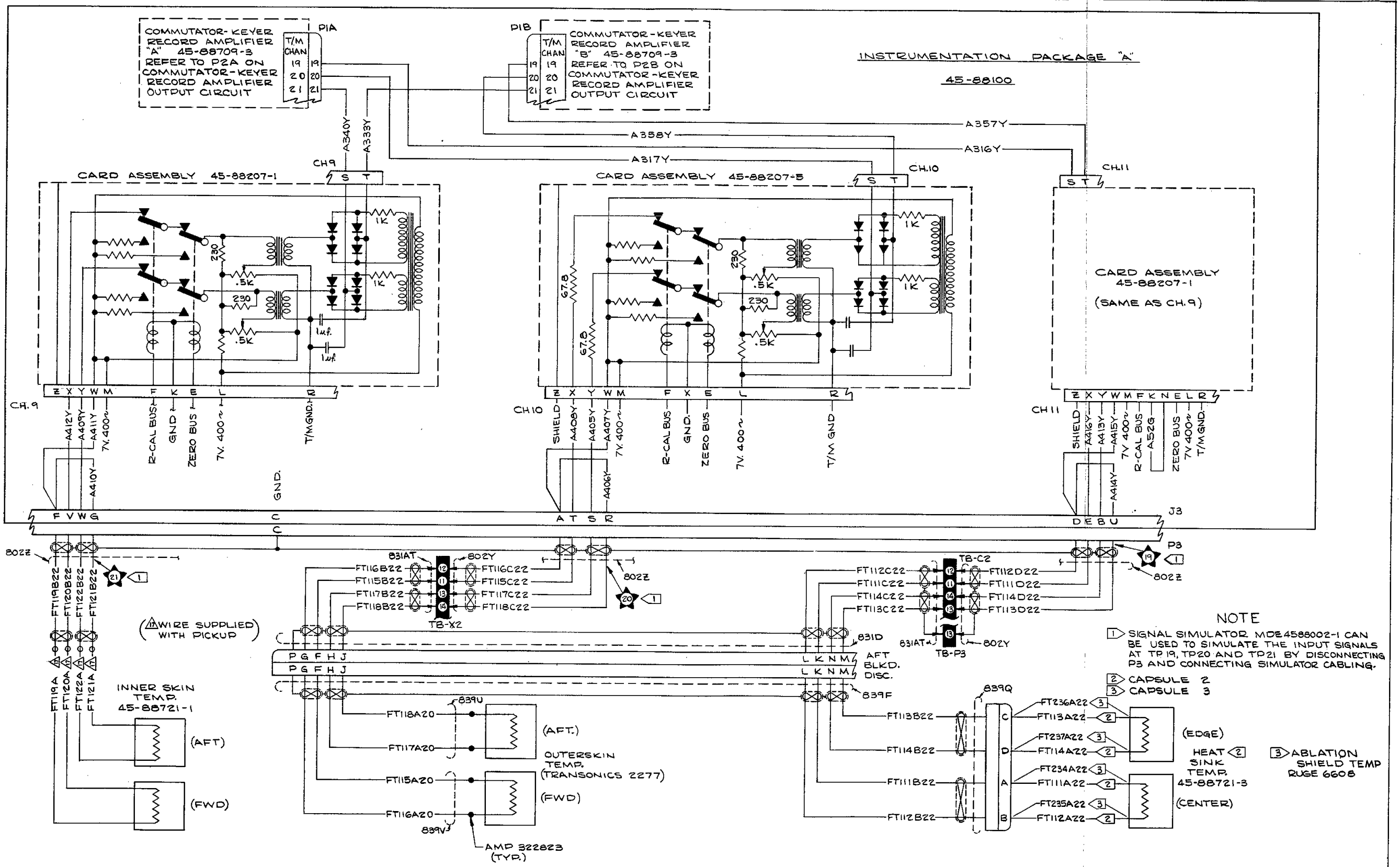

FIGURE 13-9 STRUCTURE TEMPERATURES INSTRUMENTATION CIRCUITS (CHANNELS 19, 20, 21)

MH45-66

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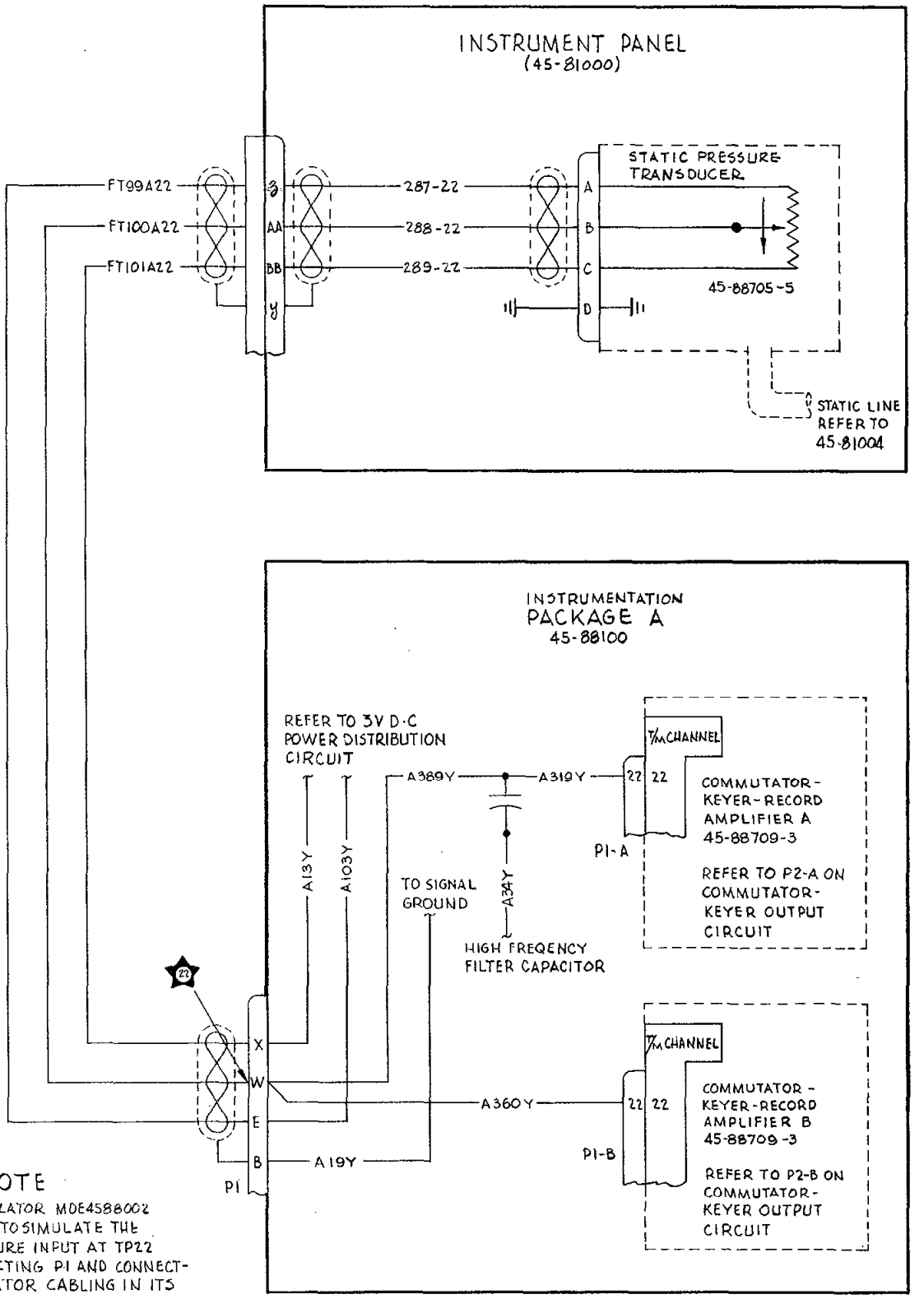
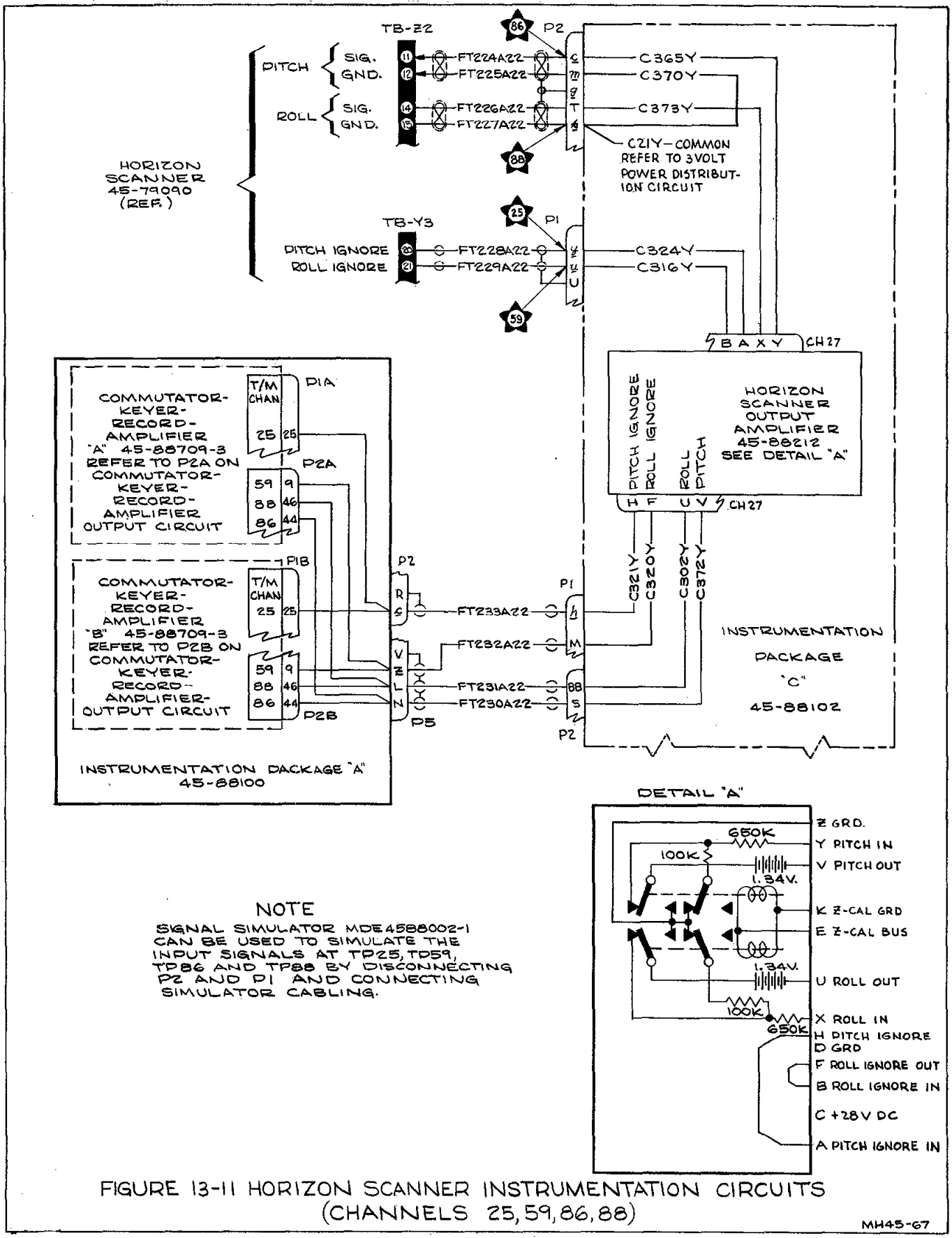


NOTE

SIGNAL SIMULATOR MDE4588002 CAN BE USED TO SIMULATE THE STATIC PRESSURE INPUT AT TP22 BY DISCONNECTING P1 AND CONNECTING SIMULATOR CABLING IN ITS PLACE

FIGURE 13-10 STATIC PRESSURE INSTRUMENTATION CIRCUIT (CHANNEL 22)

MH45-54

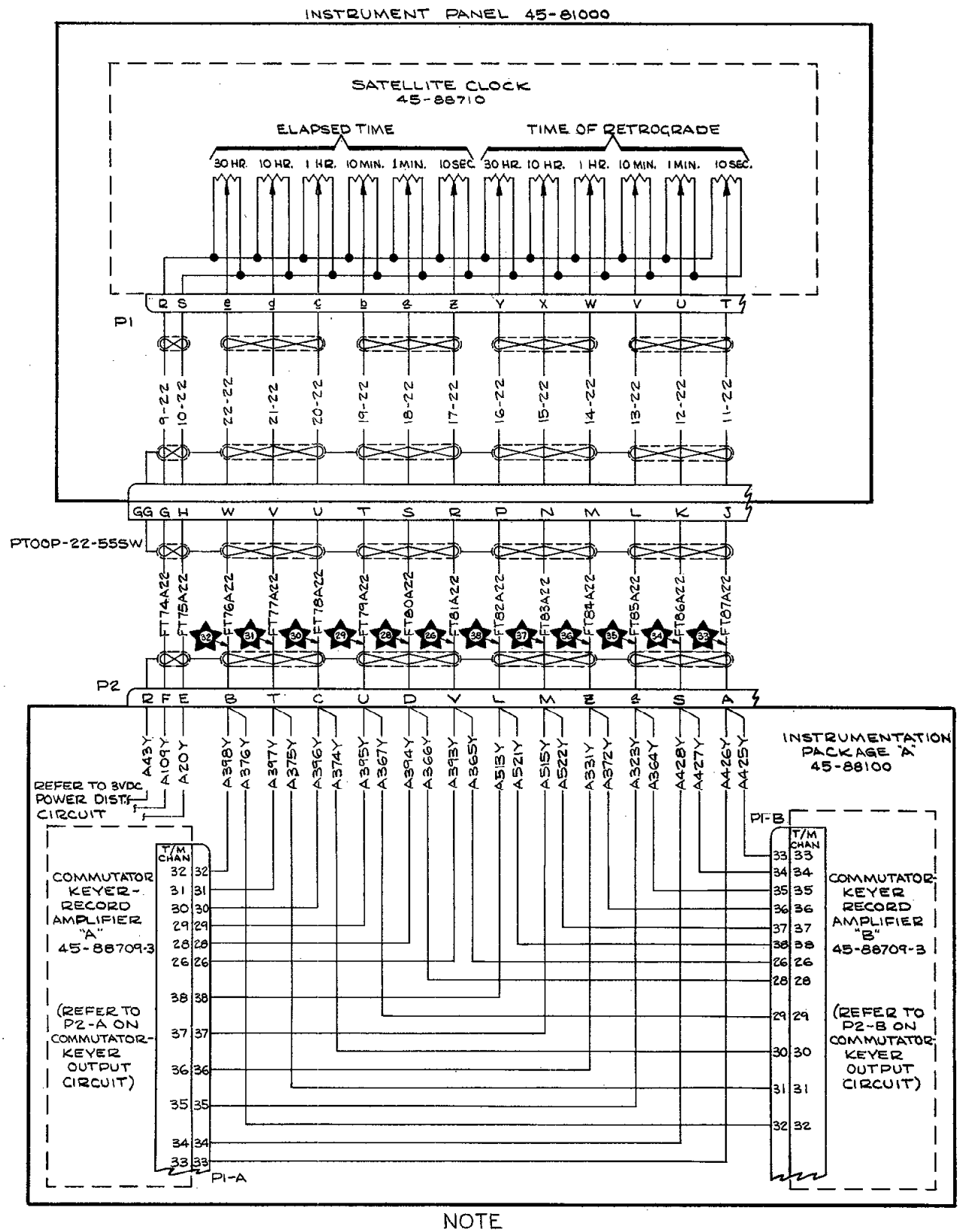


NOTE

SIGNAL SIMULATOR MDE4588002-1 CAN BE USED TO SIMULATE THE INPUT SIGNALS AT TP25, TP59, TP86 AND TP88 BY DISCONNECTING P2 AND P1 AND CONNECTING SIMULATOR CABLING.

FIGURE 13-11 HORIZON SCANNER INSTRUMENTATION CIRCUITS (CHANNELS 25, 59, 86, 88)

MH45-67



NOTE

SIGNAL SIMULATOR MDE4588002 CAN BE USED TO SIMULATE CLOCK INPUTS AT THE TEST POINTS INDICATED BY DISCONNECTING P2 AND CONNECTING SIMULATOR CABLING

MH45-53

FIGURE 13-12 SATELLITE CLOCK INSTRUMENTATION CIRCUIT (CHANNELS 26,28,29,30,31,32,33,34,35,36,37,38)

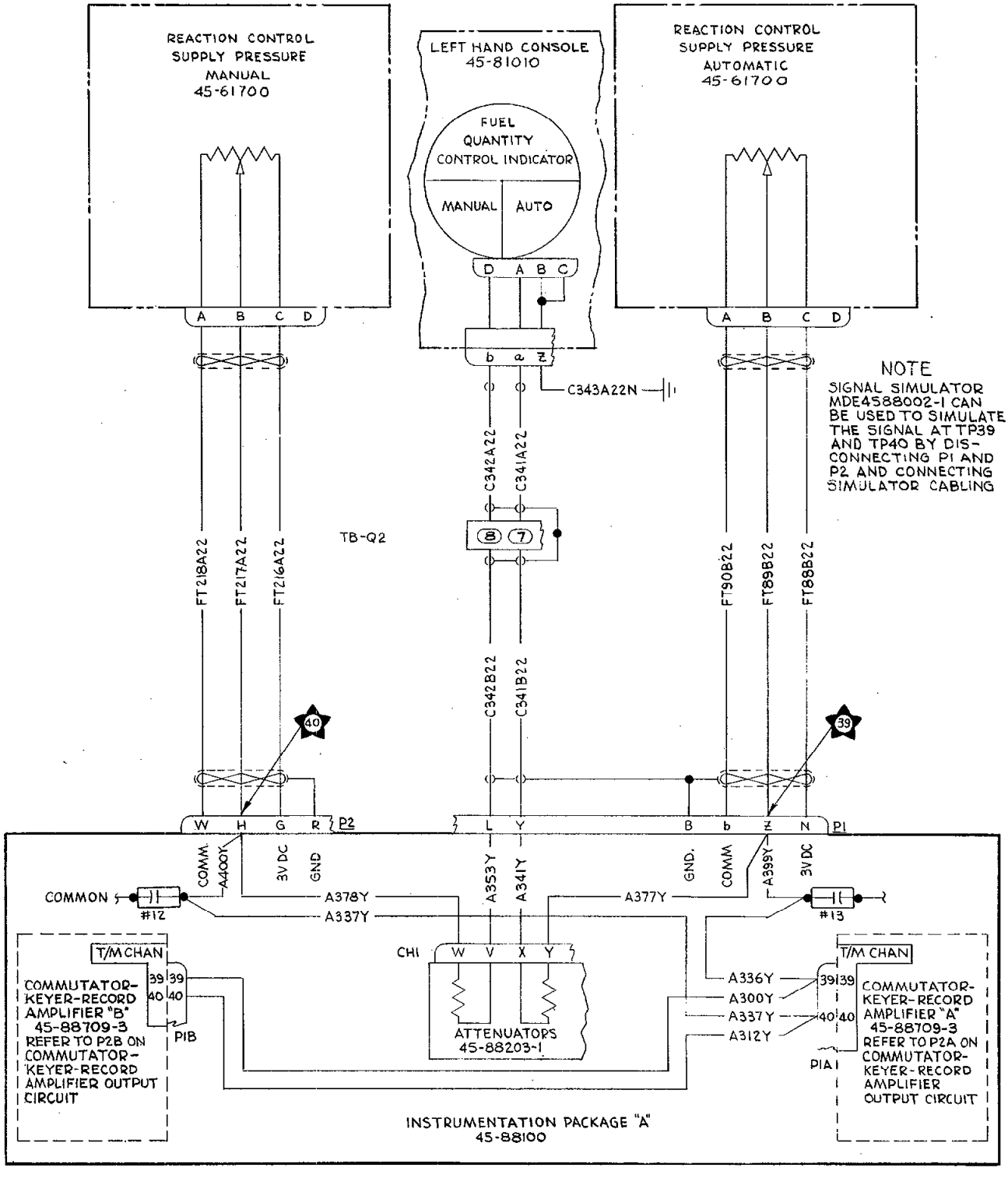
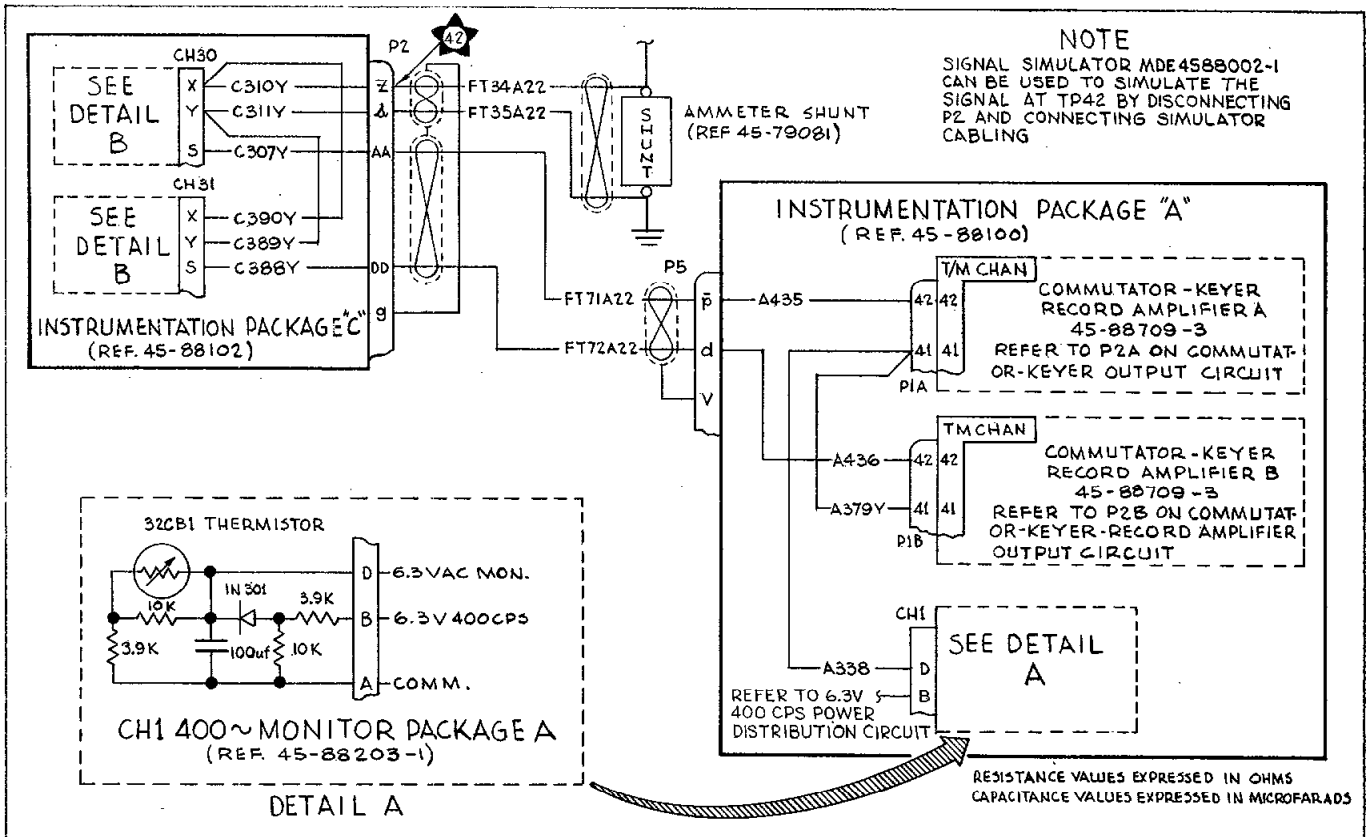


FIGURE 13-13 REACTION CONTROL SUPPLY PRESSURE INSTRUMENTATION CIRCUITS (CHANNEL 39,40)

MH45-68



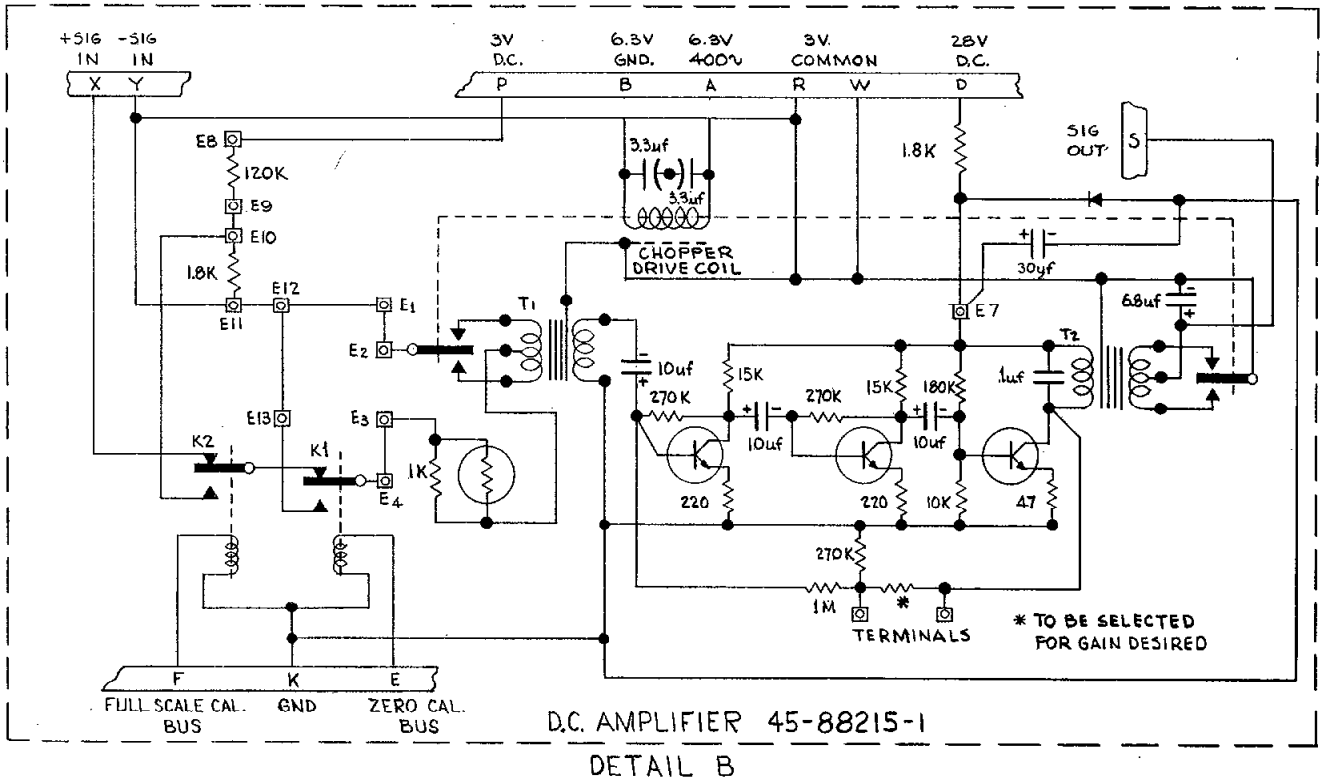


FIGURE 13-14 115V, 400 CPS VOLTAGE AND D-C CURRENT MONITOR INSTRUMENTATION CIRCUITS

MH45-69

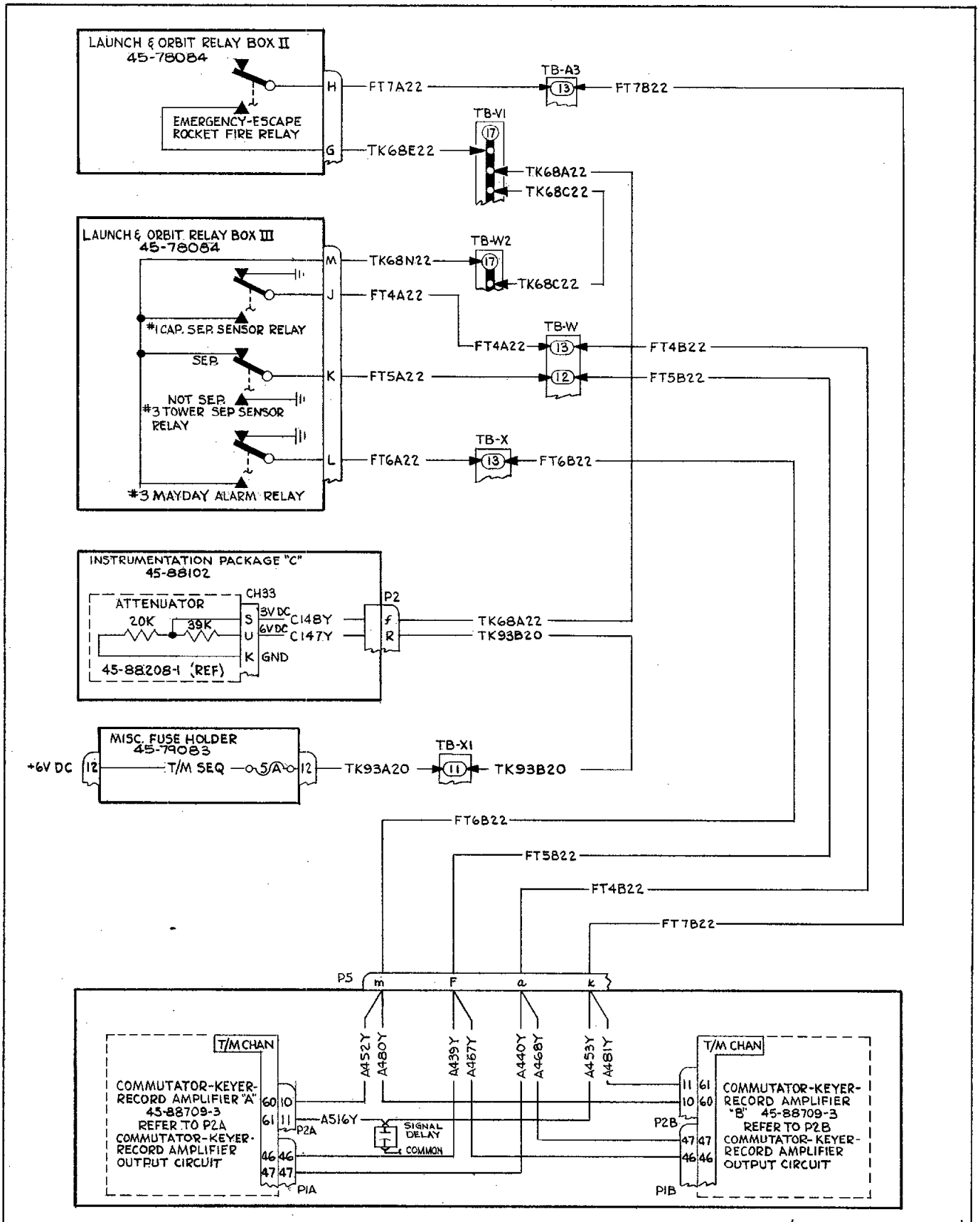


FIGURE 13-15 SEQUENCE OF OPERATION AND ESCAPE SYSTEM INSTRUMENTATION CIRCUITS (CHANNELS 46,47,60,61)

MH45-70

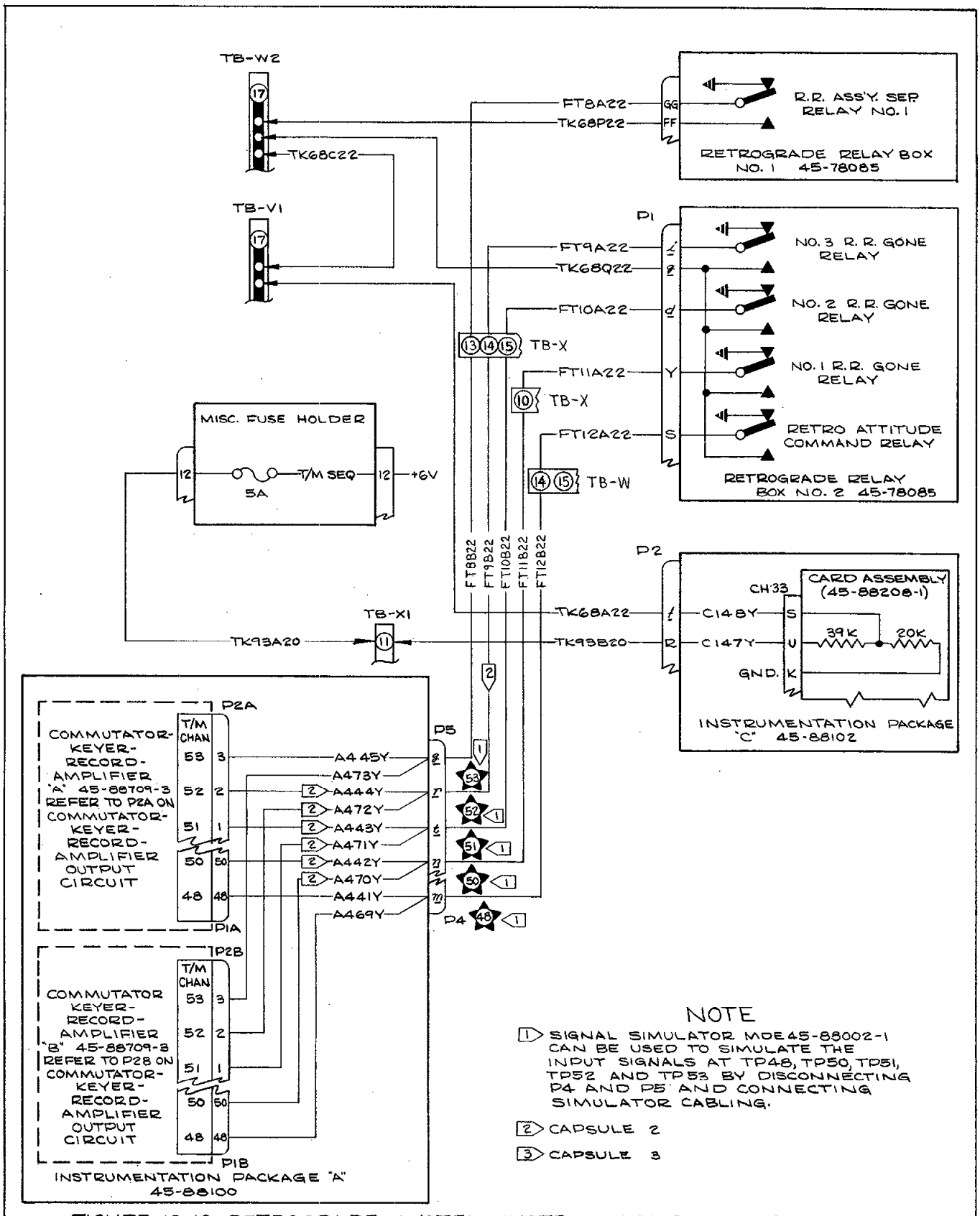


FIGURE 13-16 RETROGRADE SYSTEM INSTRUMENTATION CIRCUIT
(2) CHANNELS 48, 50, 51, 52, 53)
(3) CHANNELS 48 AND 53)

MH45-71

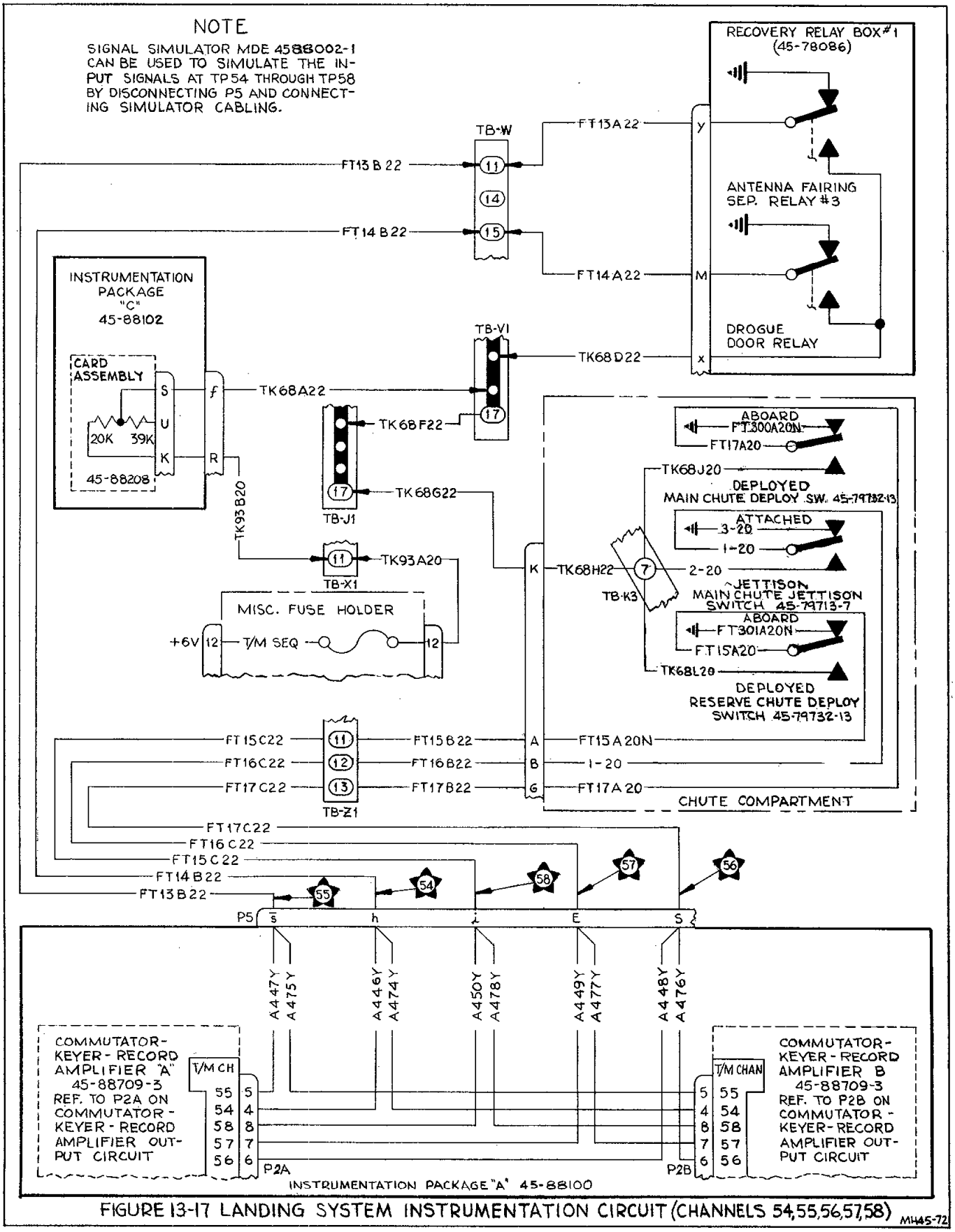
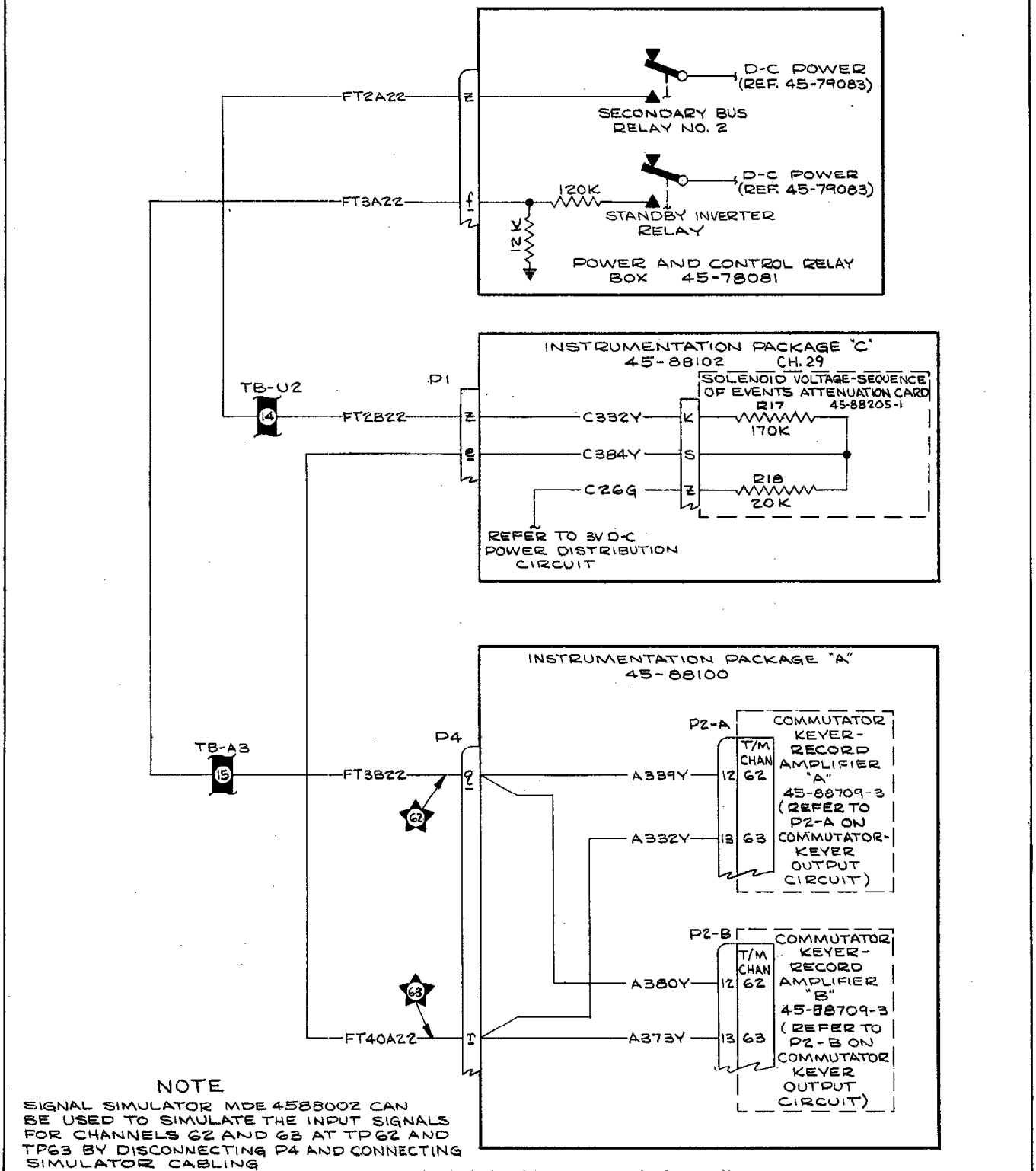


FIGURE 13-17 LANDING SYSTEM INSTRUMENTATION CIRCUIT (CHANNELS 54,55,56,57,58) MH45-72

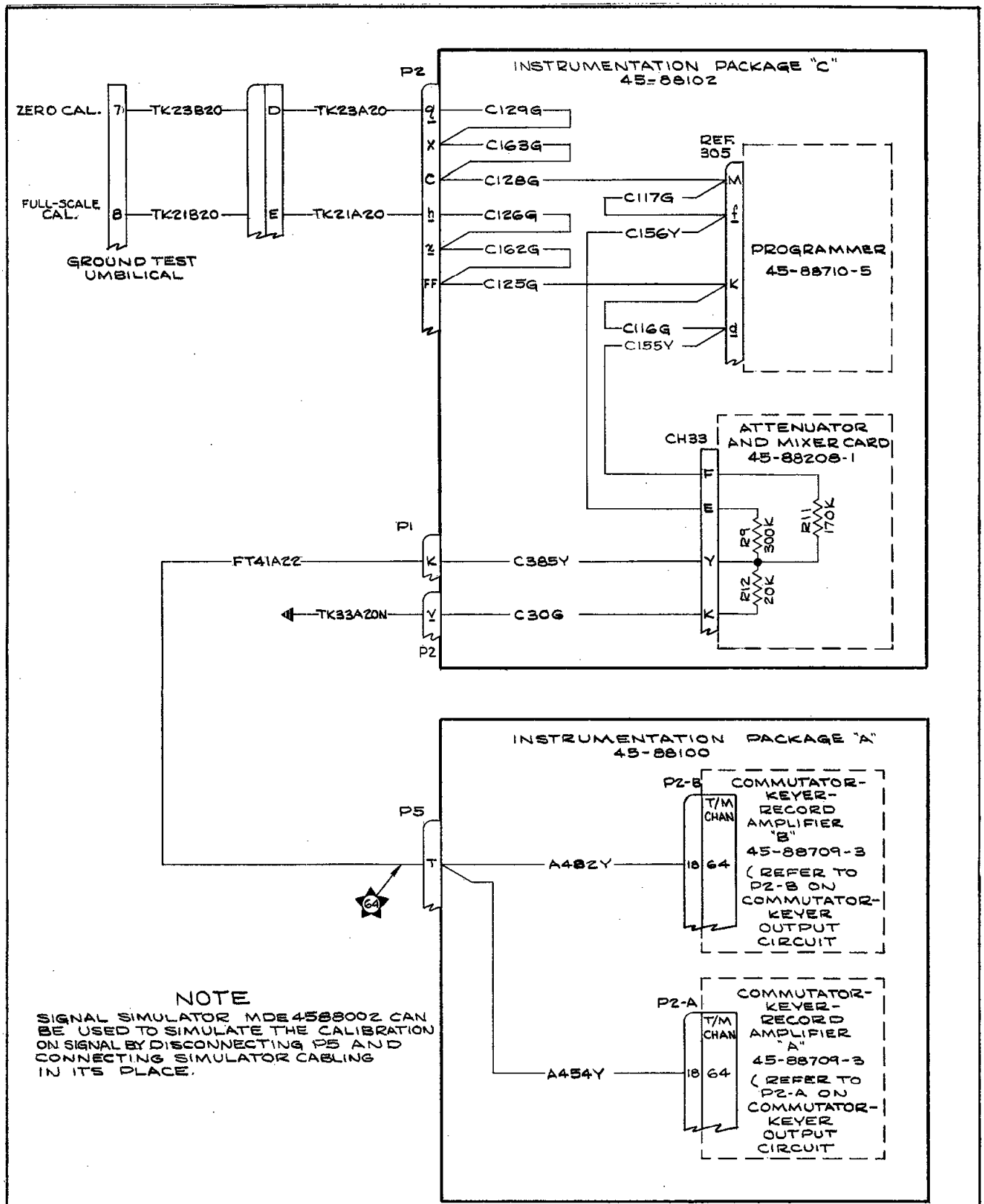


NOTE

SIGNAL SIMULATOR MDE 4588002 CAN BE USED TO SIMULATE THE INPUT SIGNALS FOR CHANNELS 62 AND 63 AT TP62 AND TP63 BY DISCONNECTING P4 AND CONNECTING SIMULATOR CABLING

FIGURE 13-18 STANDBY INVERTER ON AND STANDBY BATTERY ON INSTRUMENTATION CIRCUIT (CHANNEL 62,63)

MH45-55



NOTE

SIGNAL SIMULATOR MDE4588002 CAN BE USED TO SIMULATE THE CALIBRATION ON SIGNAL BY DISCONNECTING P5 AND CONNECTING SIMULATOR CABLING IN ITS PLACE.

FIGURE 13-19 CALIBRATION ON MONITOR INSTRUMENTATION CIRCUIT (CHANNEL 64)

MH45-58

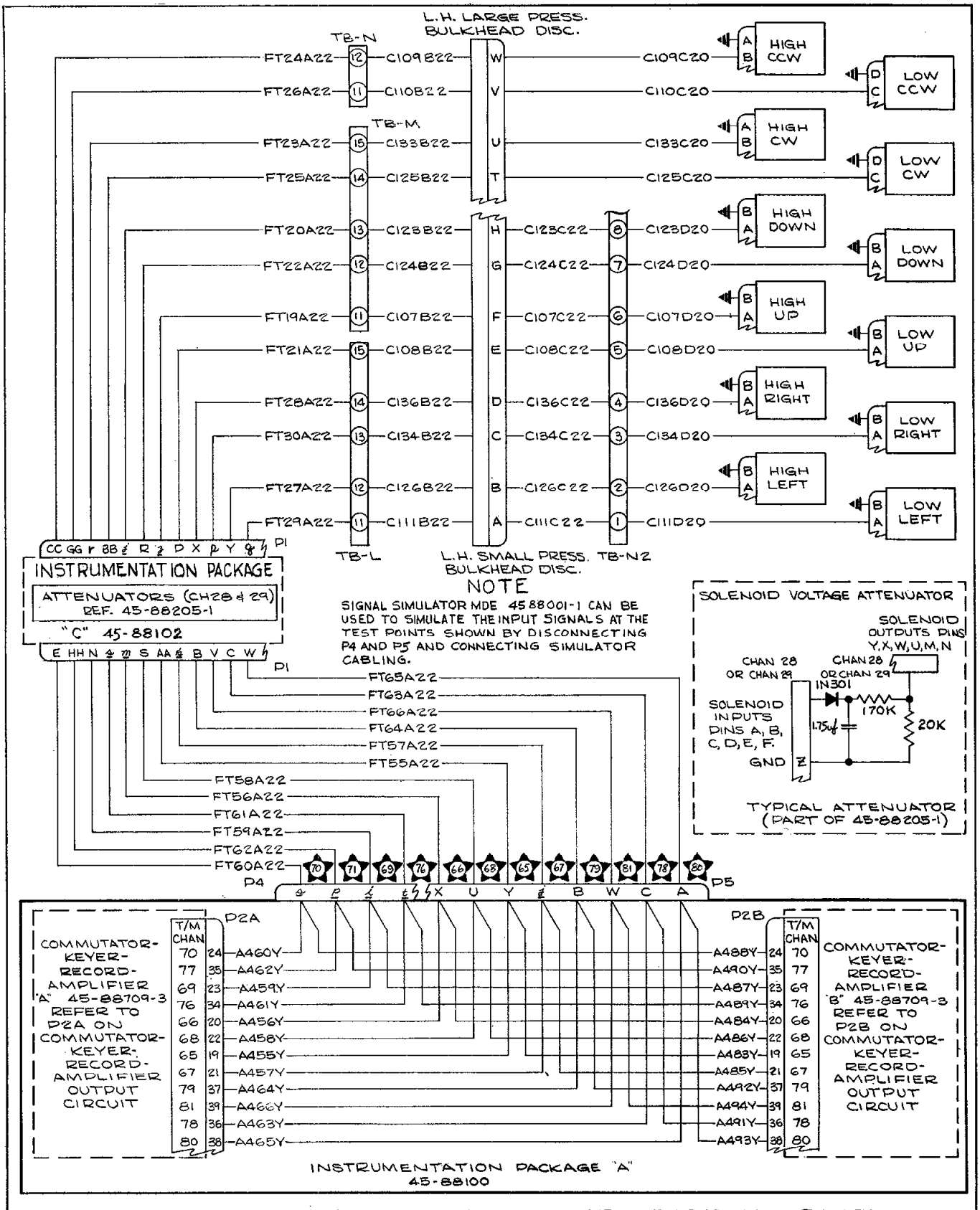
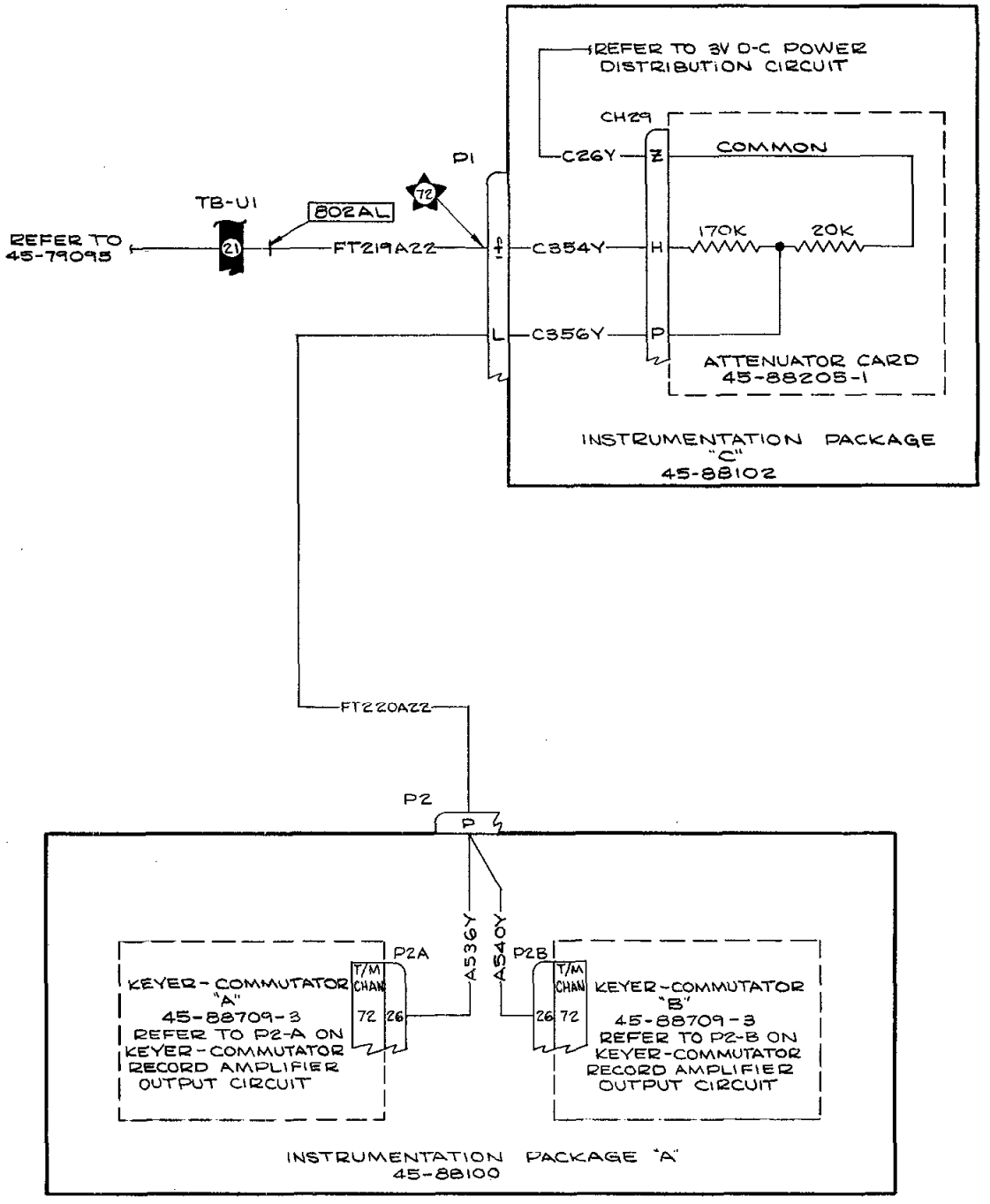


FIGURE 13-20 RCS SOLENOID VALVE POSITIONS INSTRUMENTATION CIRCUIT CHANNELS 65, 66, 67, 68, 69, 70, 76, 77, 78, 79, 80, 81

MH45-73

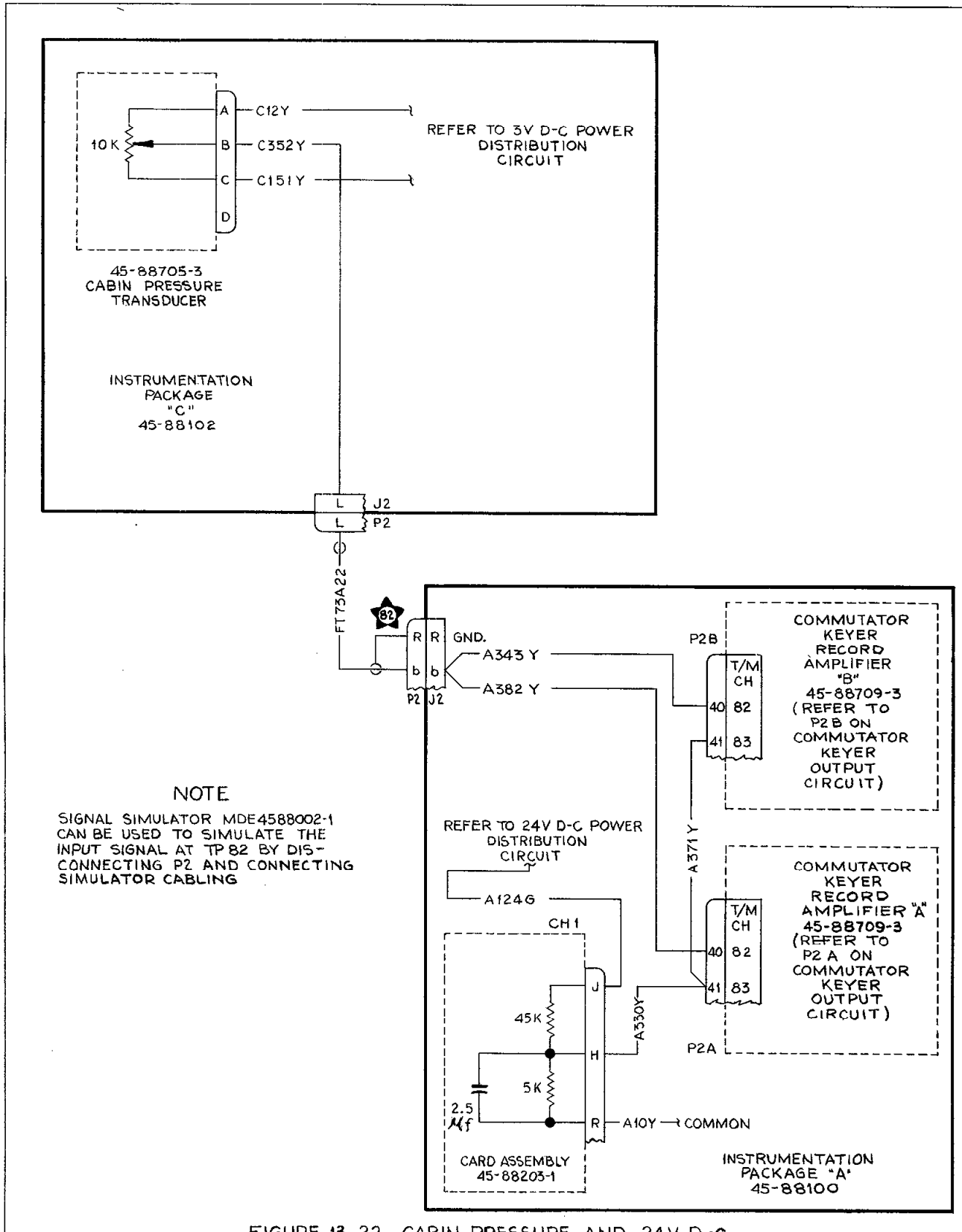


NOTE

SIGNAL SIMULATOR MDE 4588002 CAN BE USED TO SIMULATE THE PERISCOPE RETRACT SIGNAL AT TP72 BY DISCONNECTING P1 AND CONNECTING SIMULATOR CABLING

FIGURE 13-21 PERISCOPE RETRACT INSTRUMENTATION CIRCUIT (CHANNEL 72)

MH45-74



NOTE

SIGNAL SIMULATOR MDE4588002-1 CAN BE USED TO SIMULATE THE INPUT SIGNAL AT TP 82 BY DISCONNECTING P2 AND CONNECTING SIMULATOR CABLING

FIGURE 13-22 CABIN PRESSURE AND 24V D-C VOLTAGE MONITOR INSTRUMENTATION CIRCUIT

MH45-75

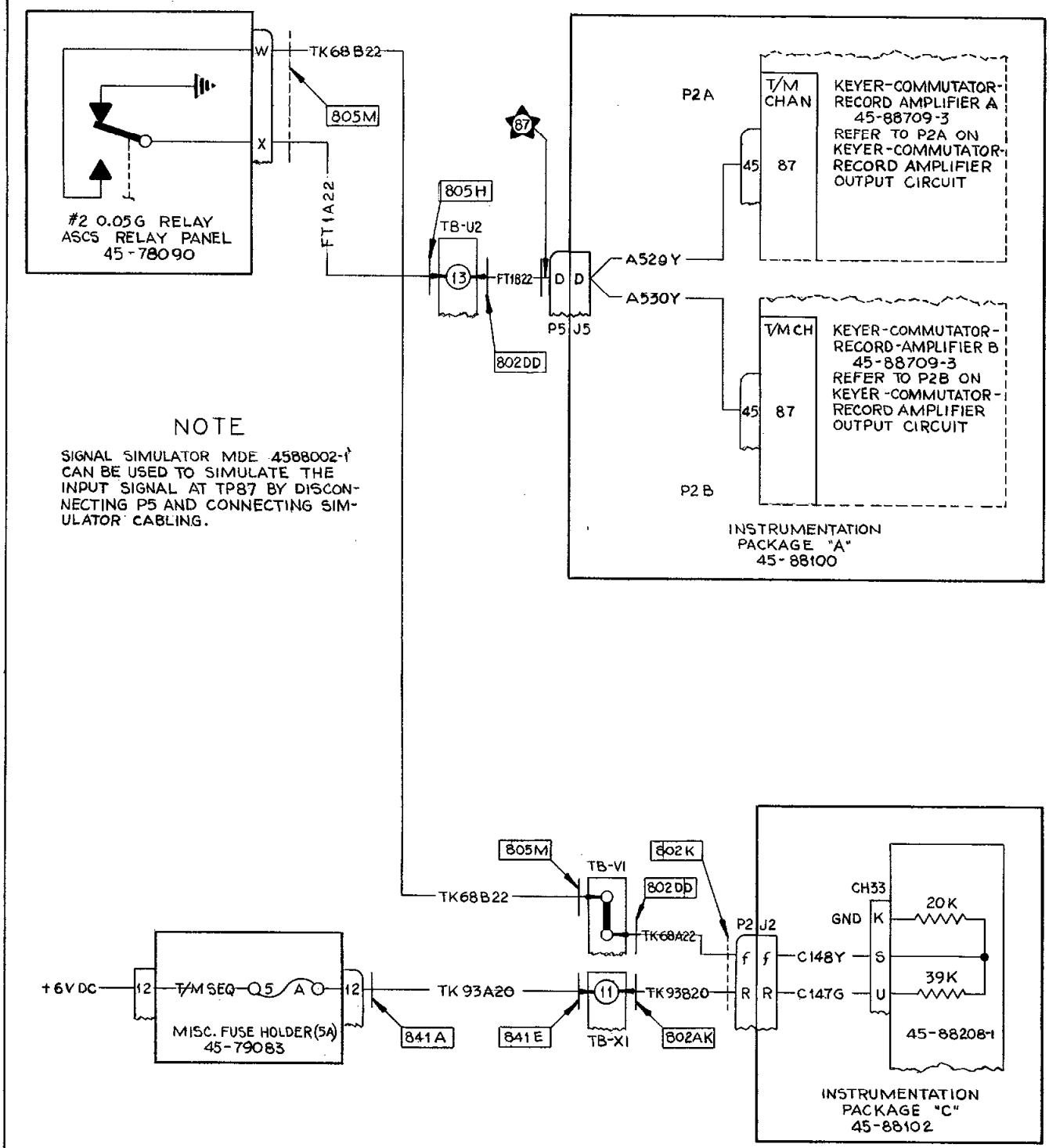


FIGURE 13-23 005g RELAY ACTUATION INSTRUMENTATION CIRCUIT (CHANNEL 87) MH45-78

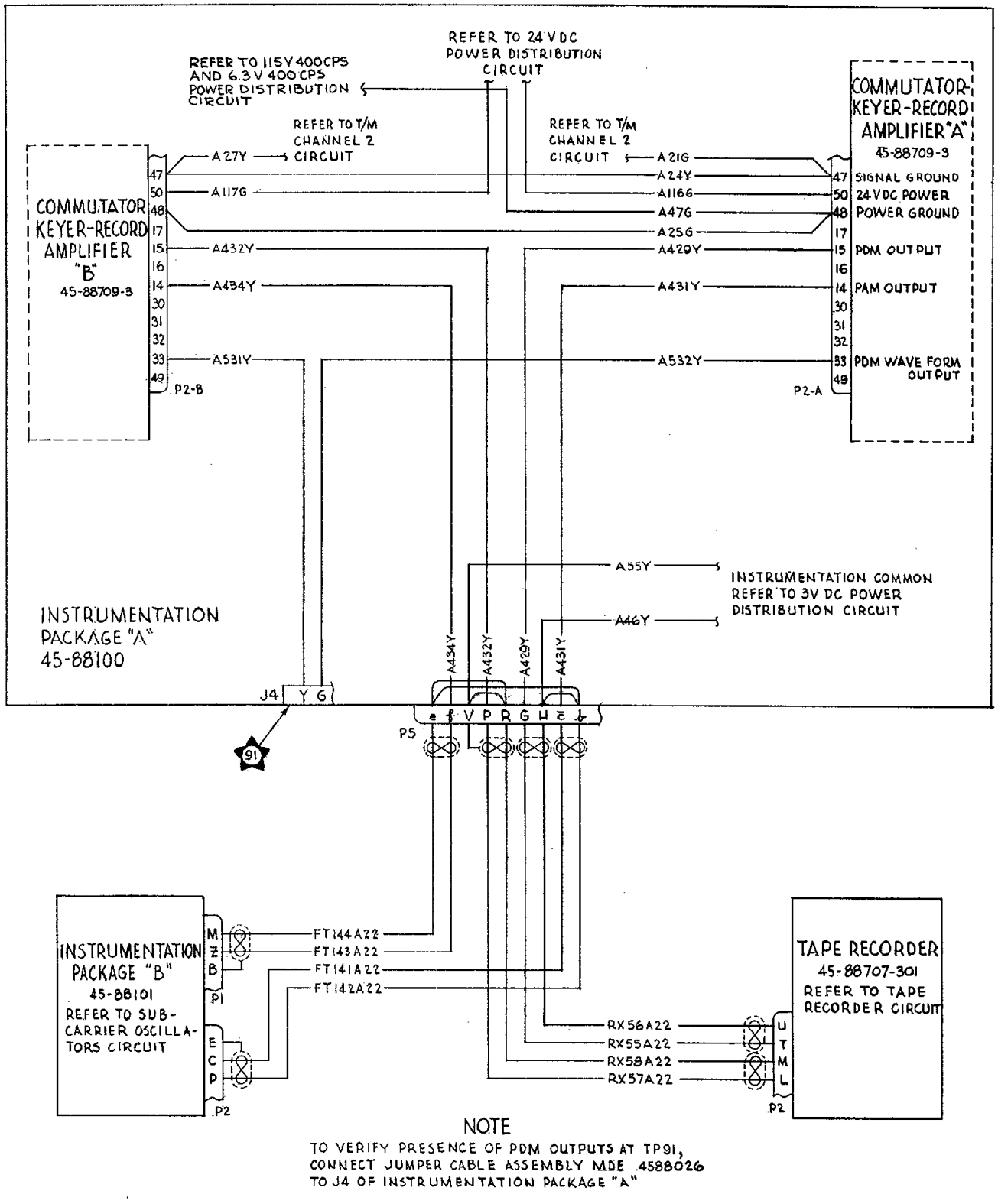


FIGURE 13-24 COMMUTATOR-KEYER-RECORD AMPLIFIER OUTPUT CIRCUIT

MH45-50

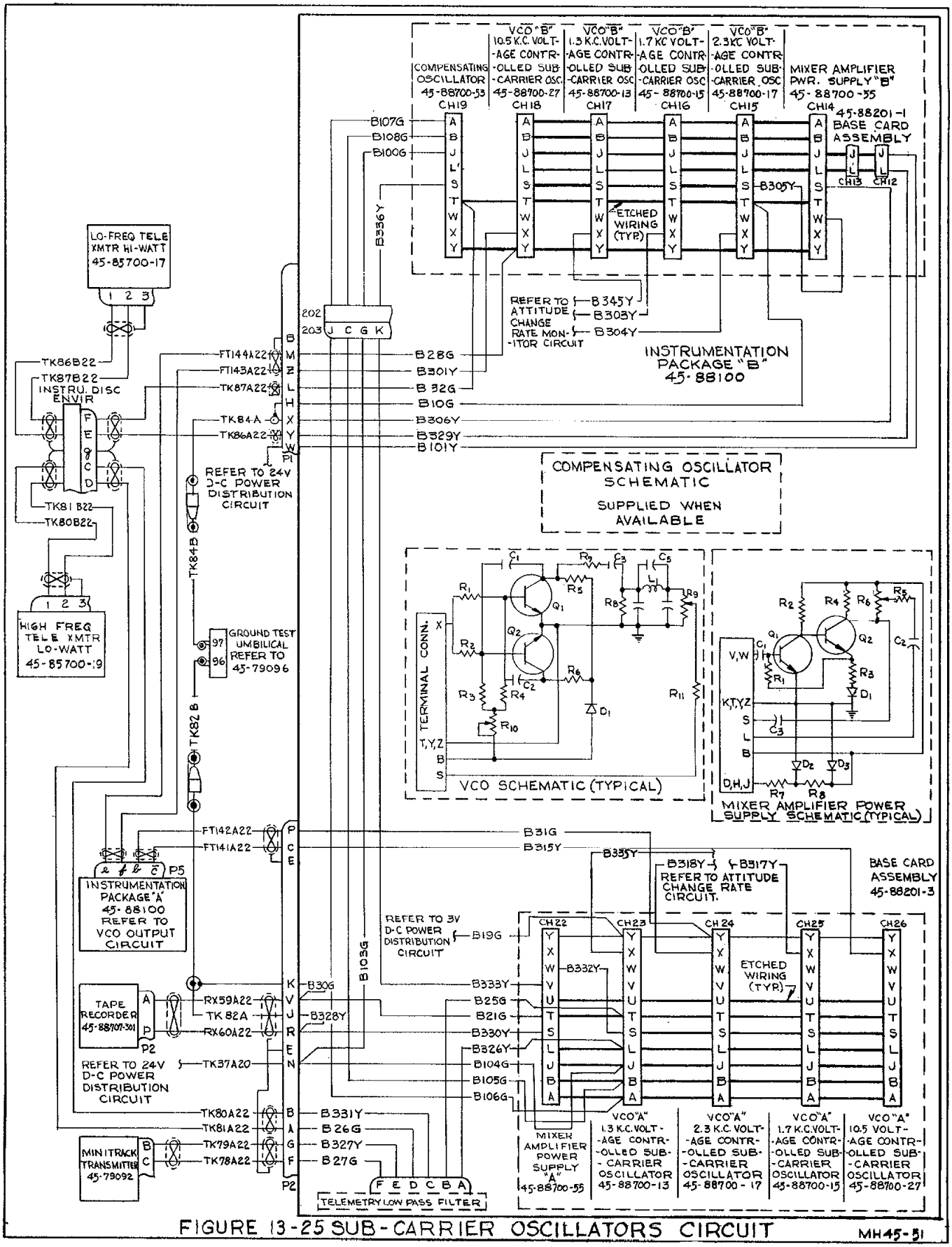


FIGURE 13-25 SUB-CARRIER OSCILLATORS CIRCUIT MH45-51

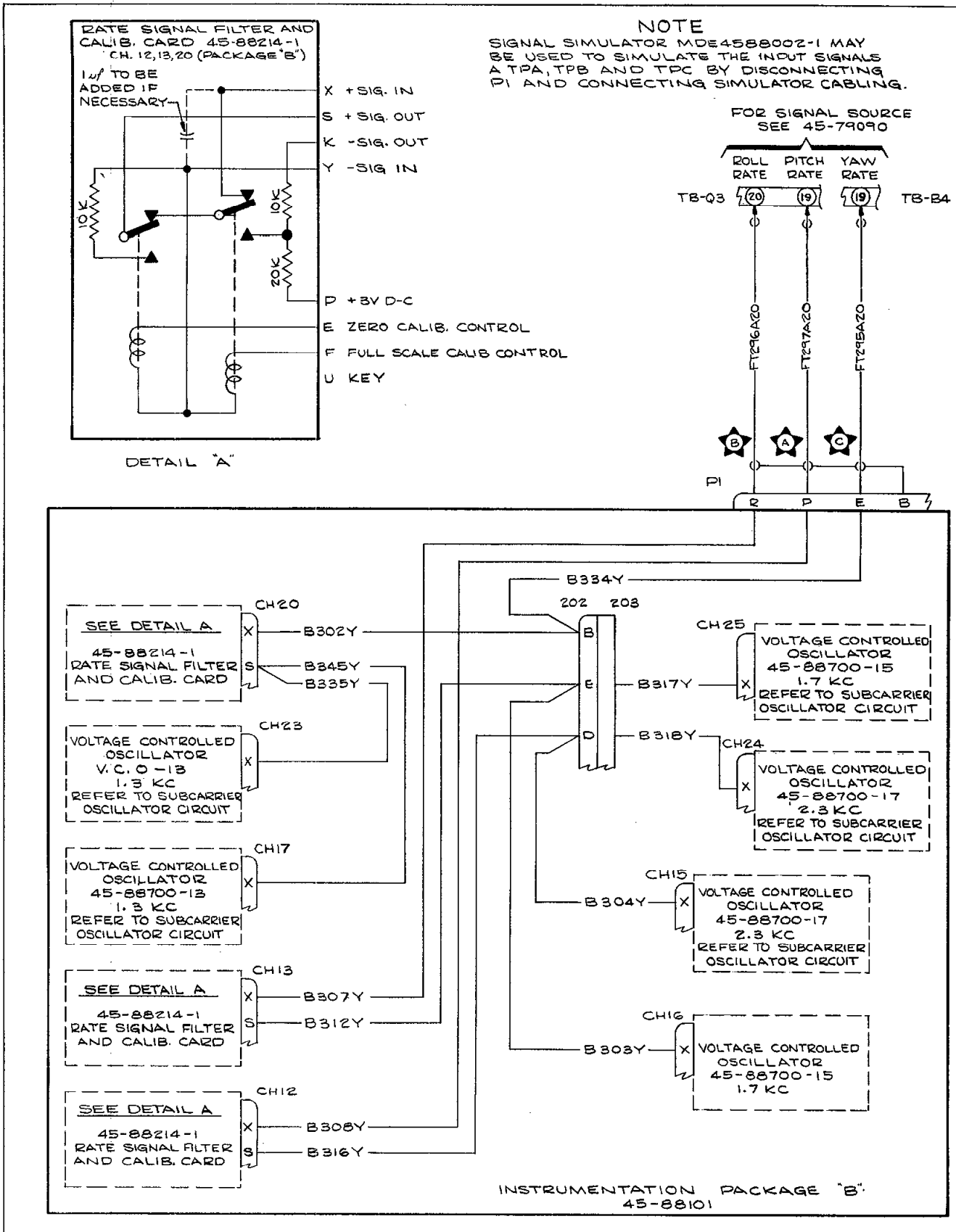


FIGURE 13-26 ATTITUDE CHANGE RATE INSTRUMENTATION CIRCUITS (CAPSULE 2)

MH45-79

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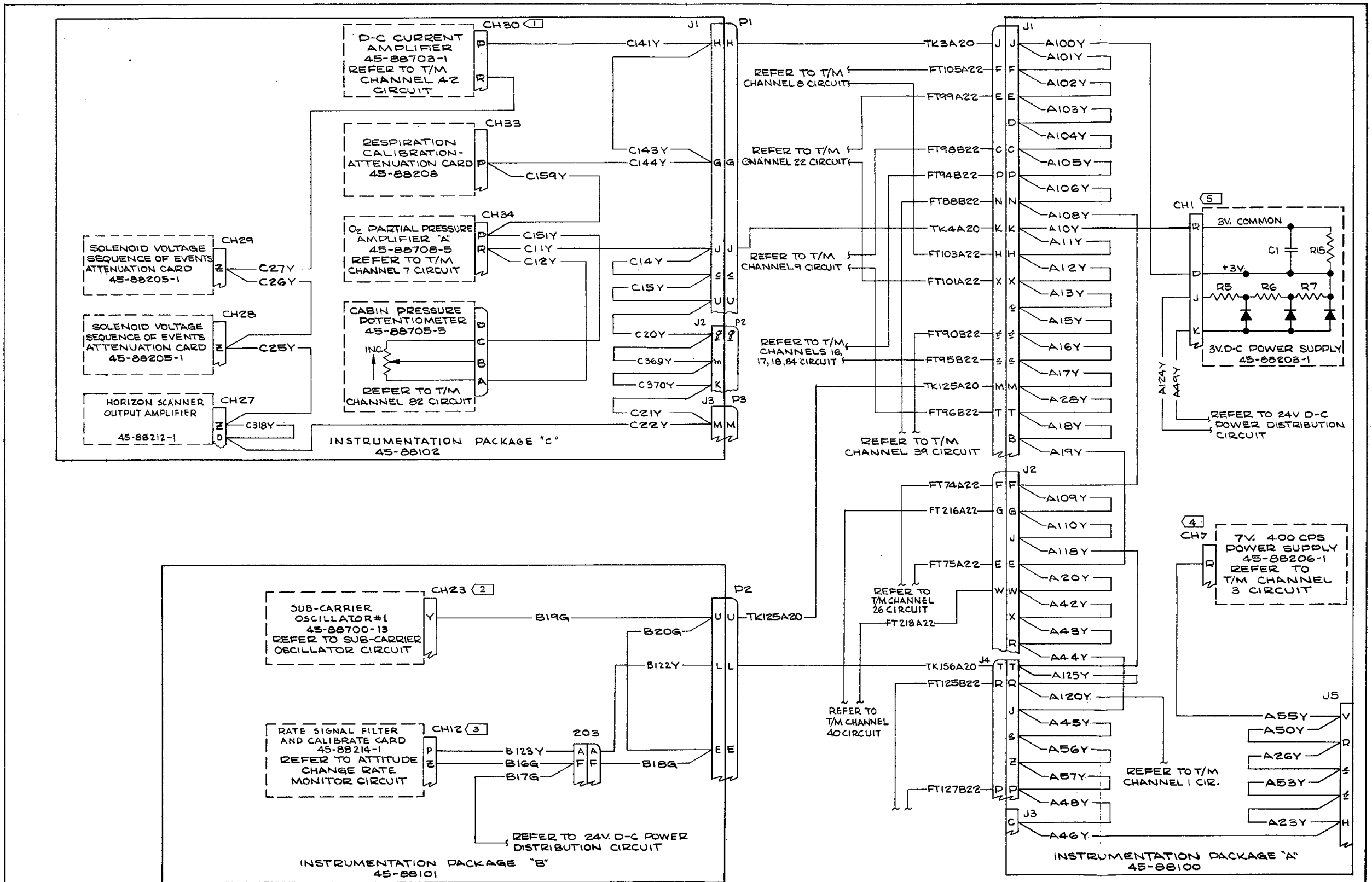


1 PINS P AND R OF CH30 ARE JUMPERED TO PINS P AND R, RESPECTIVLY OF CH31 AND CH32 BY BASE CARD ASSEMBLY 45-88202-1

2 PIN Y OF CH23 IS JUMPERED TO PIN Y OF CH22, CH24, CH25, AND CH26 BY BASE CARD ASSEMBLY 45-88201-3

3 PINS P AND Z ARE JUMPERED TO PINS P AND Z, RESPECTIVLY OF CH13, CH14, CH15, CH16, CH17, CH18, CH19, CH20, AND CH21 BY BASE CARD ASSEMBLY 45-88210-1

4 PIN R OF CH7 IS JUMPERED TO PIN Y OF CH6, CH8, CH9, CH10, AND CH11 BY BASE CARD ASSEMBLY 45-88200-3

5 PINS R AND P OF CH1 ARE JUMPERED TO PINS R AND P, RESPECTIVLY OF CH2, CH3, CH4, AND CH5

FIGURE 13-27 3V D-C POWER DISTRIBUTION CIRCUIT

MH45-80

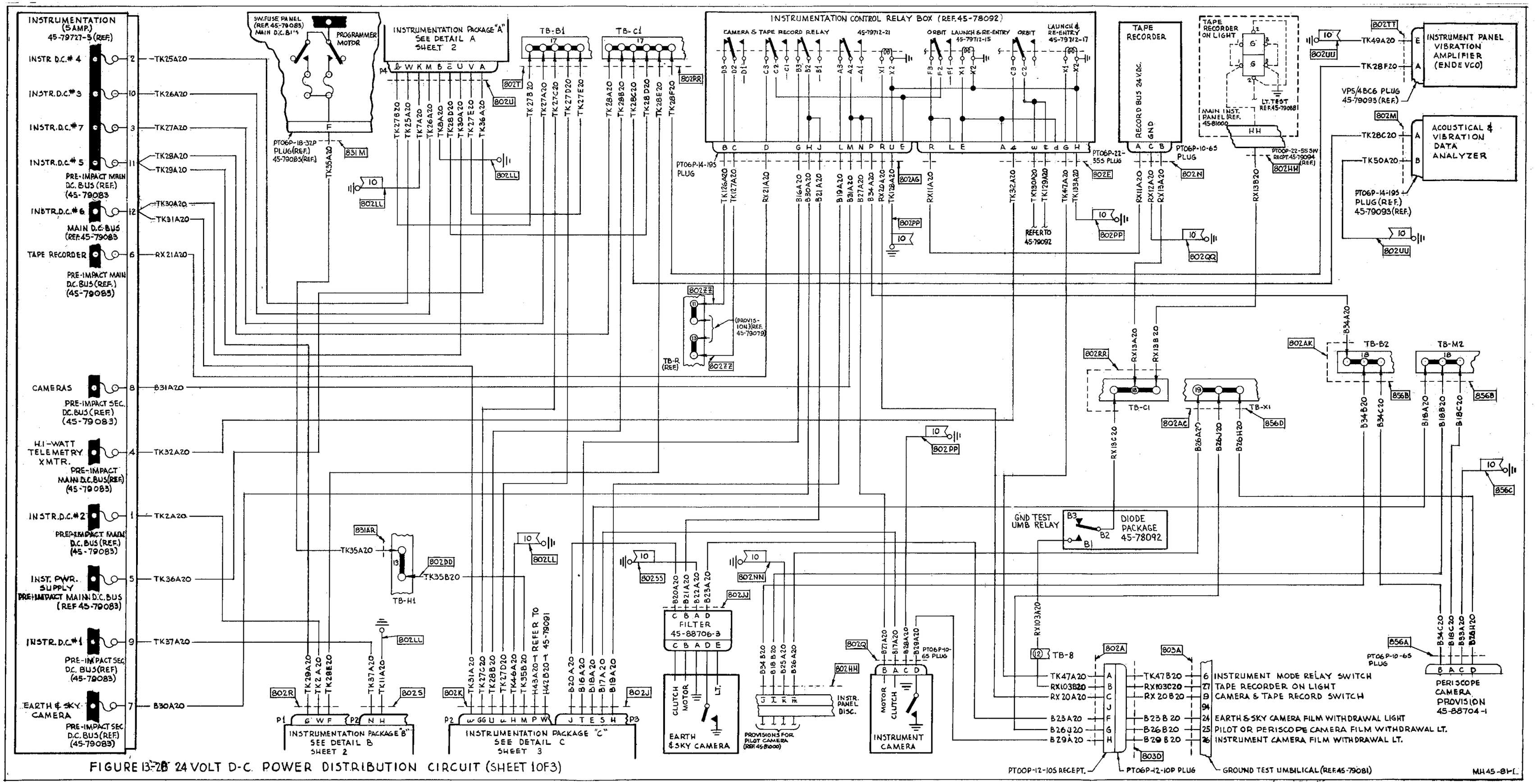
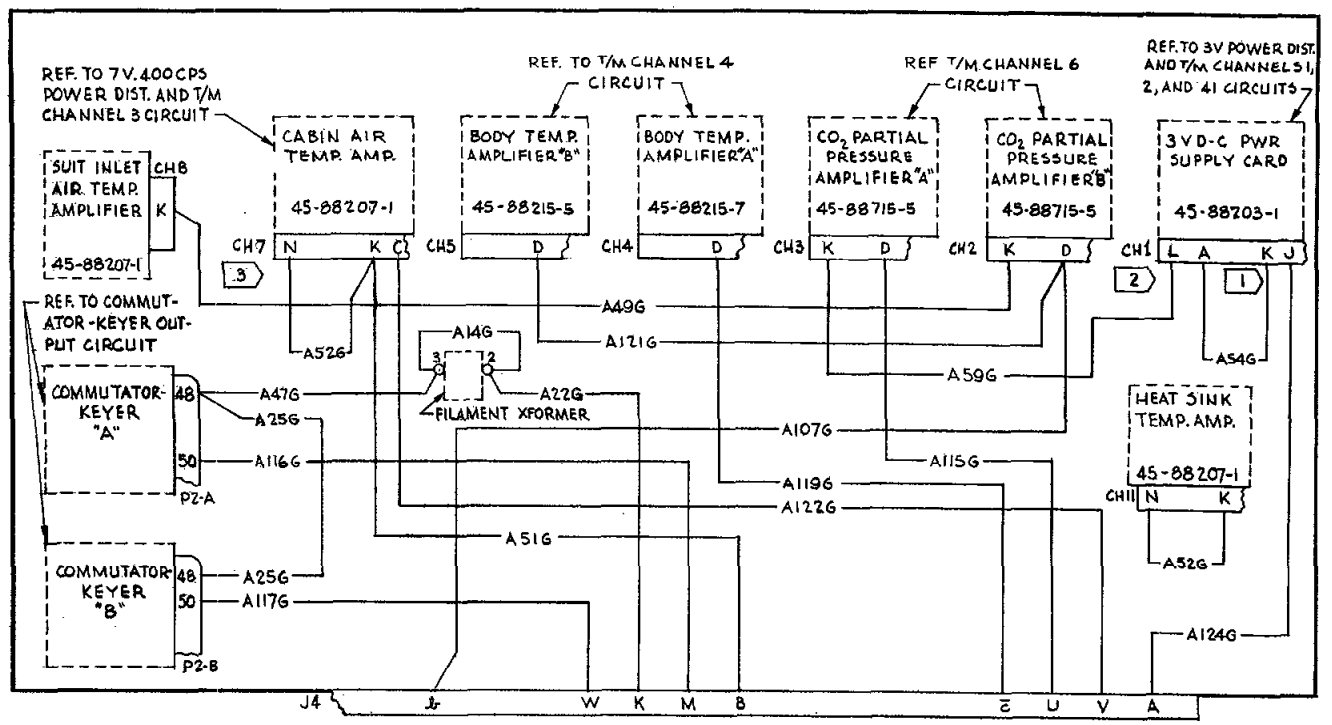
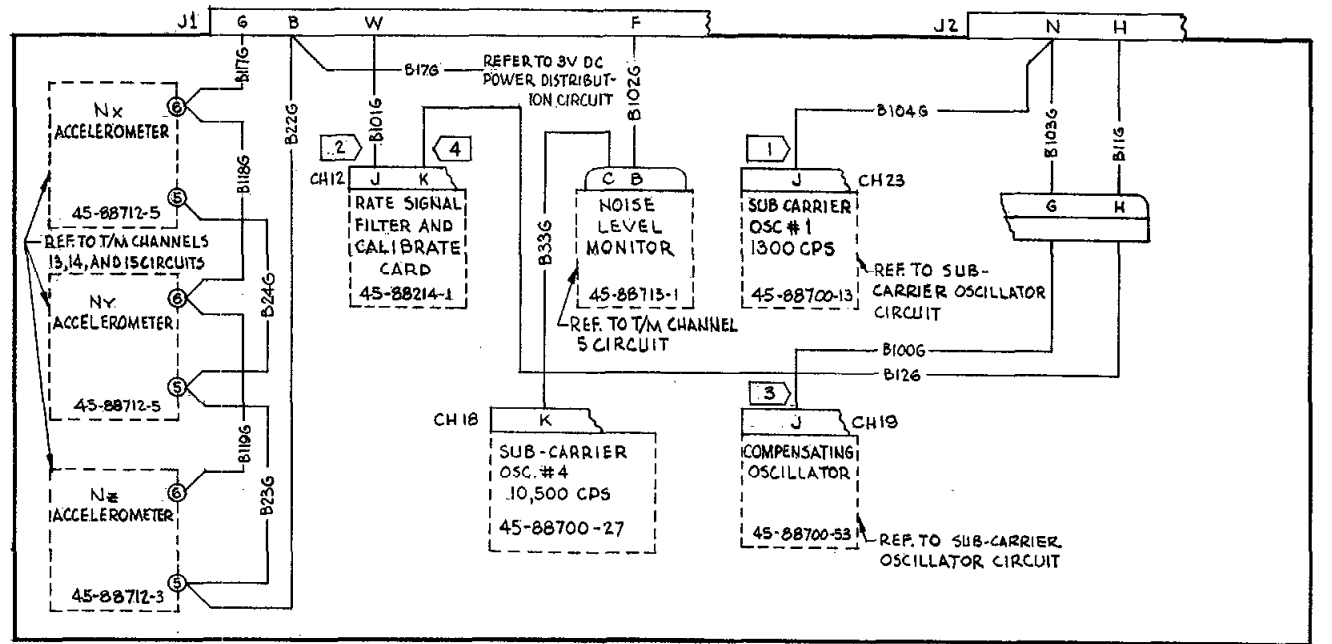


FIGURE 13-28 24 VOLT D-C. POWER DISTRIBUTION CIRCUIT (SHEET 1 OF 3)



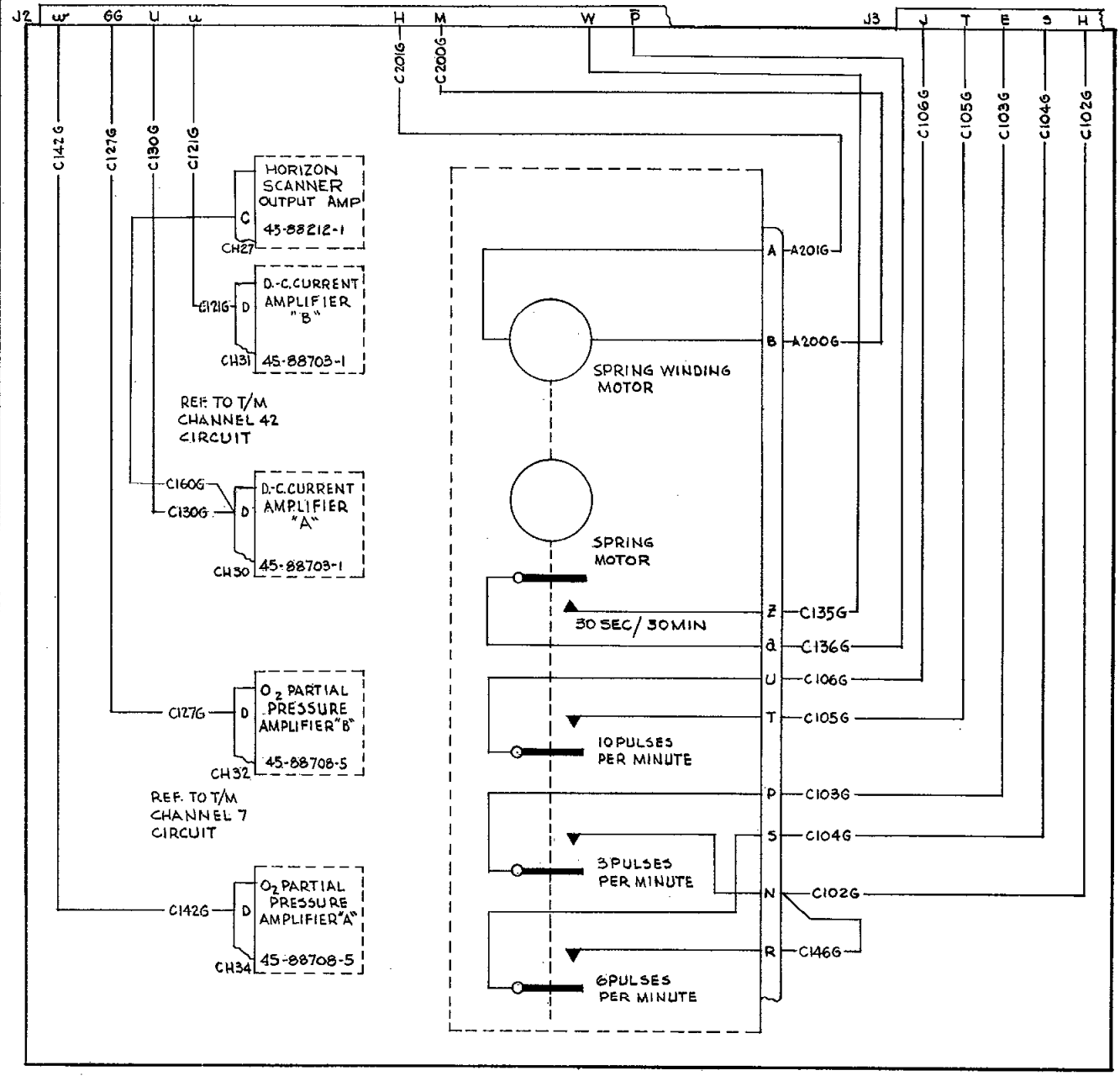
DETAIL A INSTRUMENTATION PACKAGE "A"



DETAIL B INSTRUMENTATION PACKAGE "B"

FIGURE 13-28 24 VOLT D-C POWER DISTRIBUTION CIRCUIT (SHEET 2 OF 3)

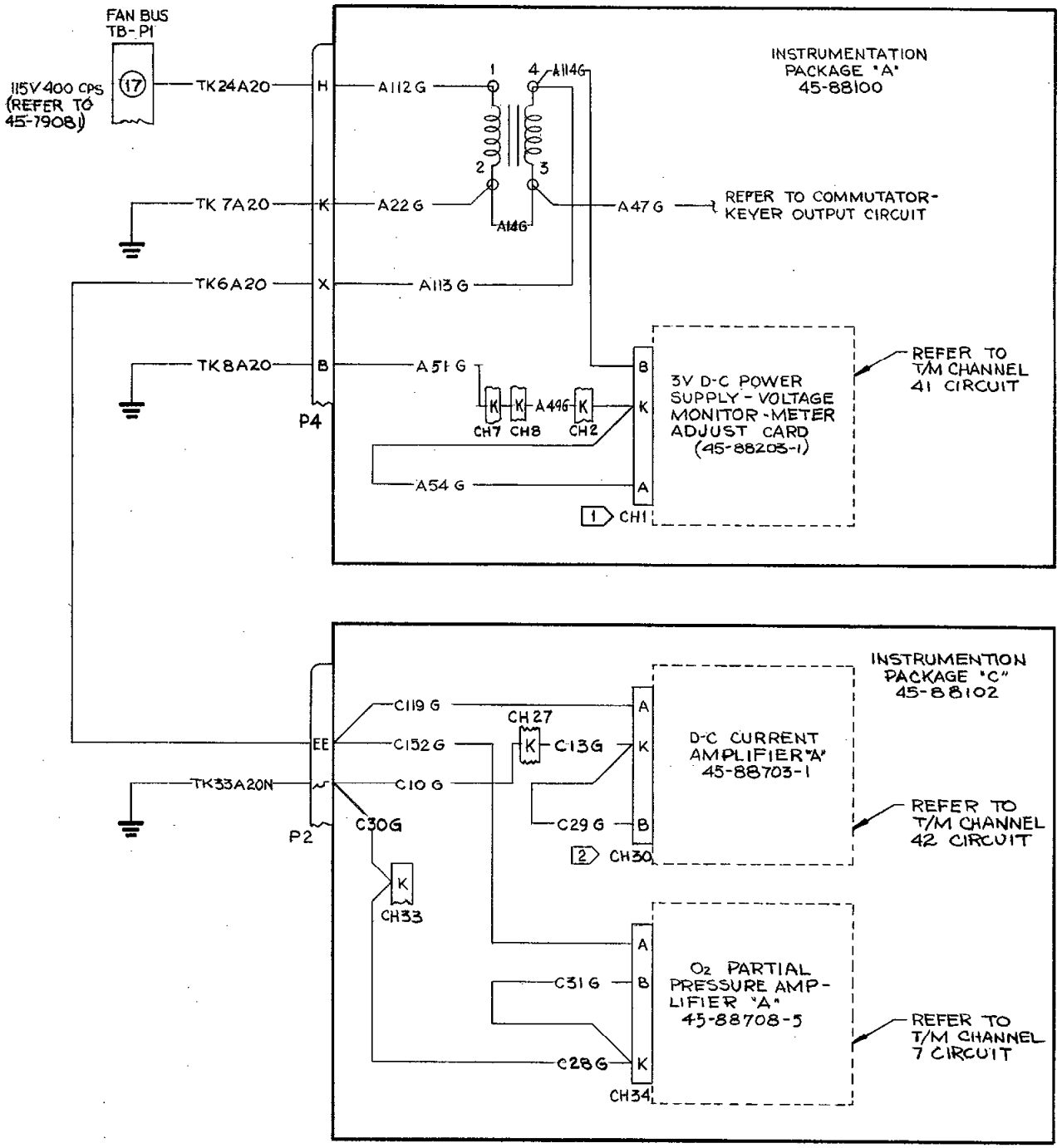
MH45-81-2



DETAIL C INSTRUMENTATION PACKAGE "C"

FIGURE 13-28 24 VOLT D-C POWER DISTRIBUTION CIRCUIT (SHEET 3 OF 3)

MH45-81-3



1 PINS A, B AND K OF CH1 ARE JUMPERED TO PINS A, B AND K, RESPECTIVELY, OF CH2, CH3, CH4 AND CH5 BY BASE CARD ASSEMBLY 45-88200-1. THE CARDS WHICH PLUG INTO CH2, CH3, CH4 AND CH5 ARE PARTS OF CIRCUITS FOR T/M CHANNELS 4 AND 6.

2 PINS A, B AND K OF CH30 ARE JUMPERED TO PINS A, B AND K RESPECTIVELY, OF CH31 AND CH32 BY BASE CARD ASSEMBLY 45-88202-1. THE CARDS WHICH PLUG INTO CH31 AND CH32 ARE PARTS OF CIRCUITS FOR T/M CHANNELS 7 AND 42.

FIGURE 13-29 115 VOLT AND 6.3 VOLT 400 CPS POWER DISTRIBUTION CIRCUIT

MH45-82

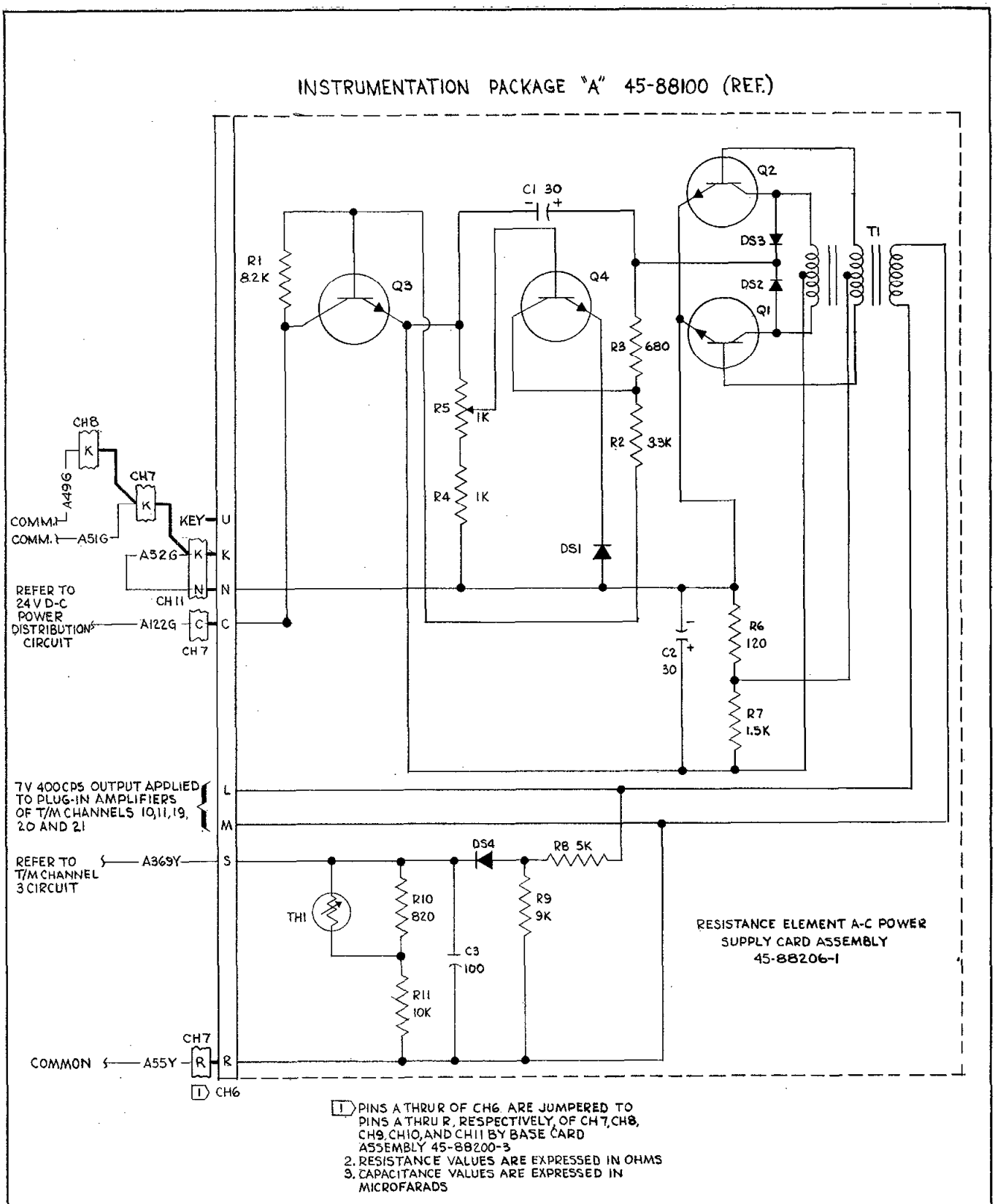


FIGURE 13-30 7V 400CPS POWER DISTRIBUTION CIRCUIT

MH45-83

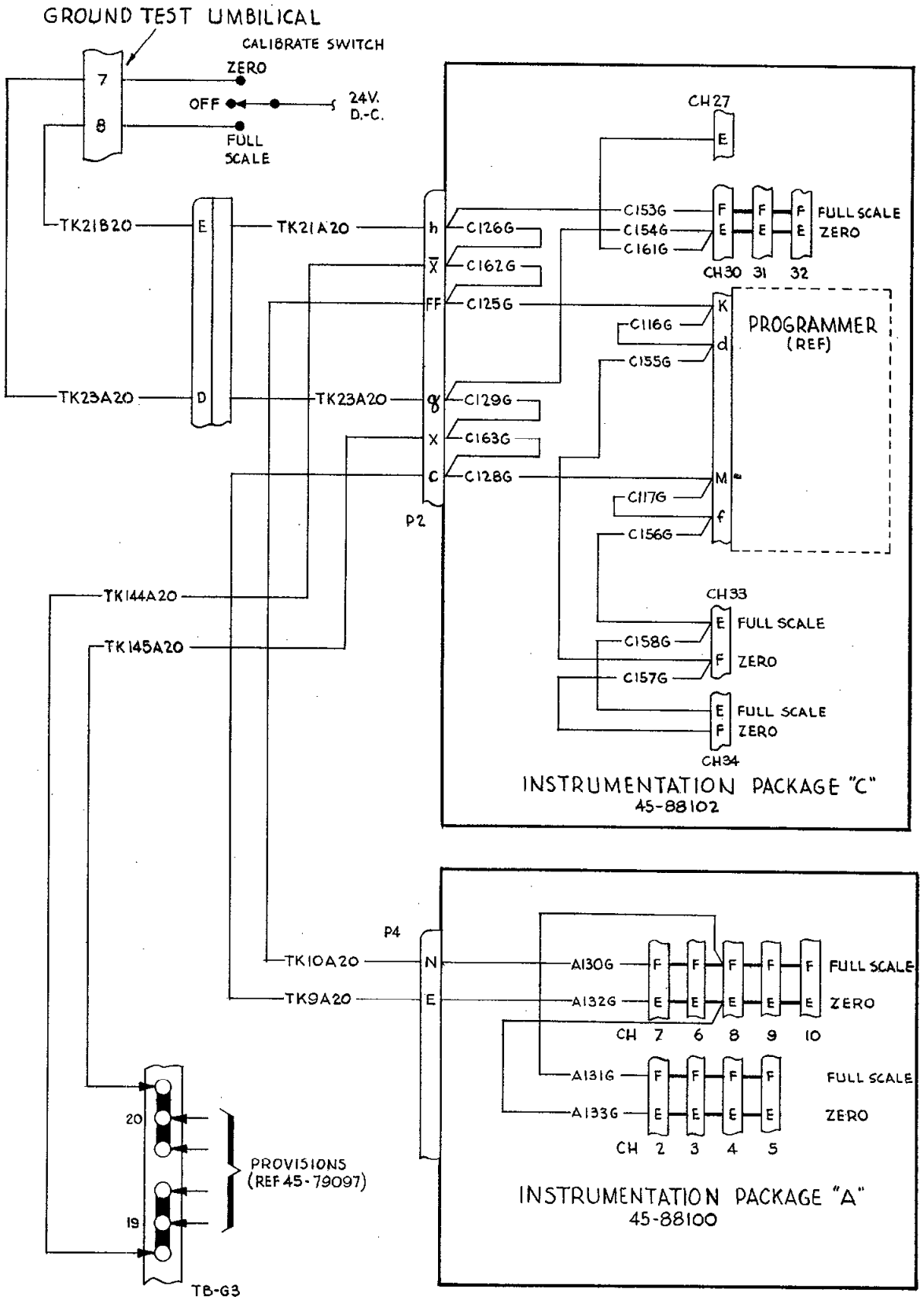


FIGURE 13-31 CALIBRATE CONTROL CIRCUIT

MH45-84

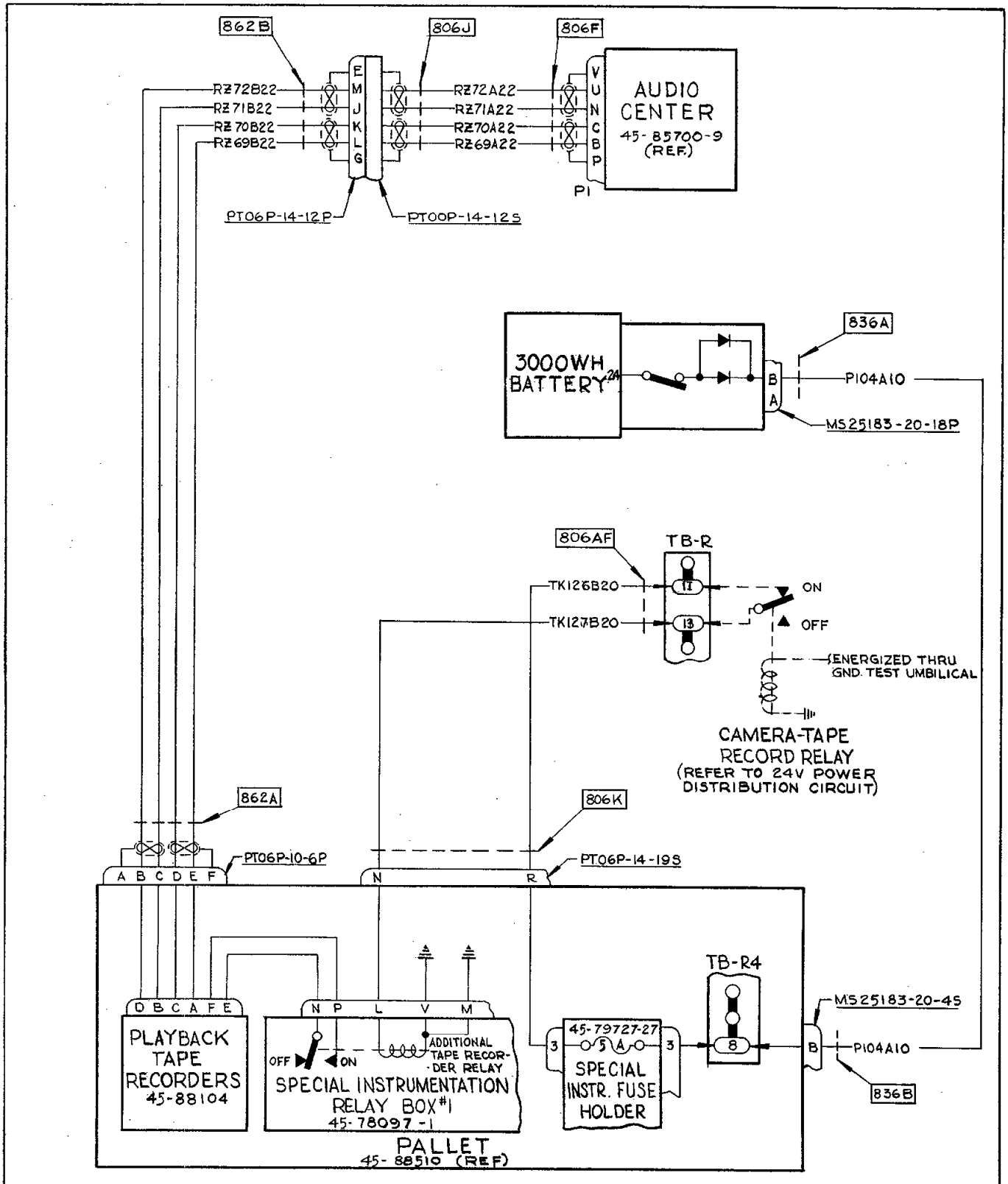
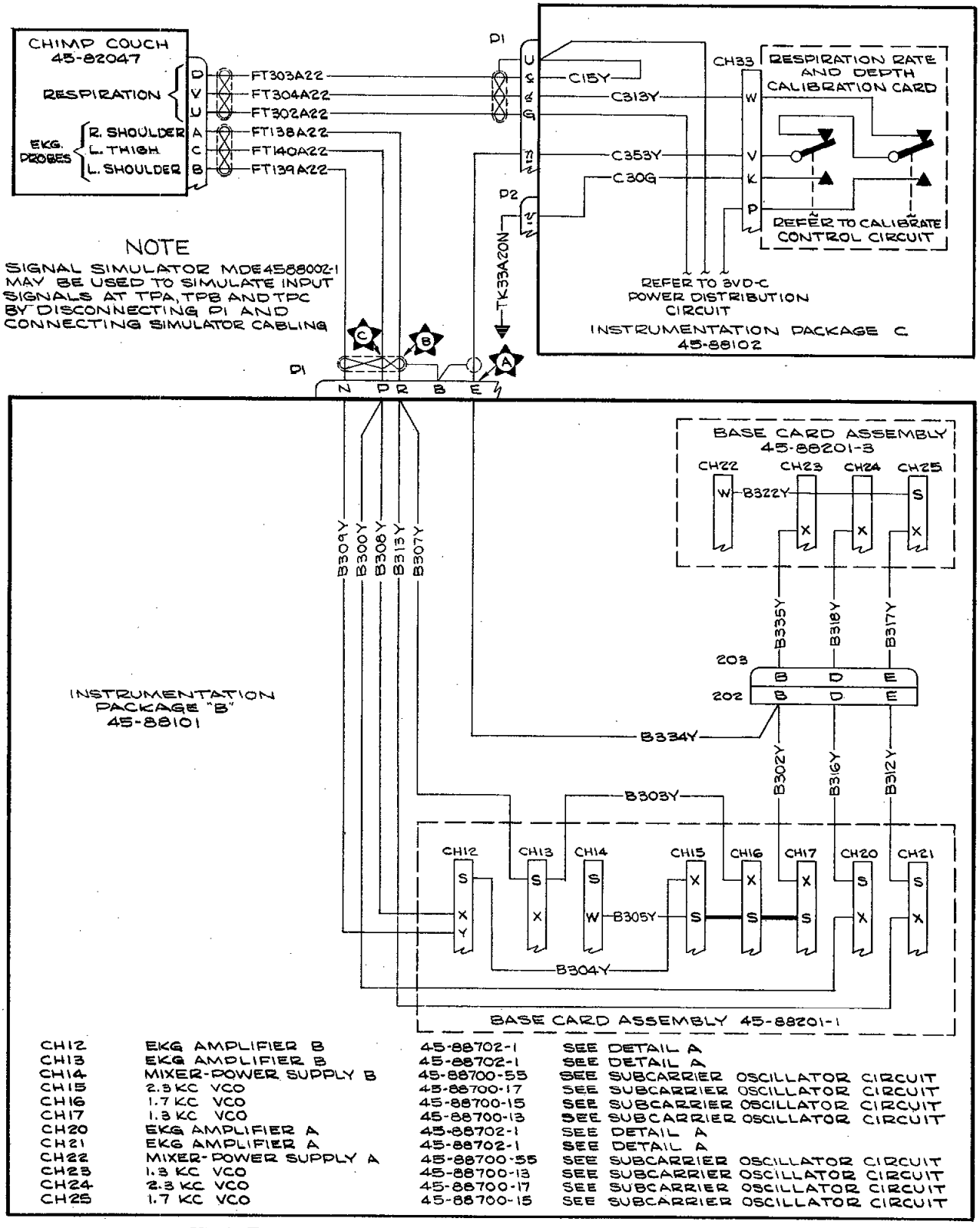


FIGURE 13-32 PLAYBACK TAPE RECORDER CONTROL CIRCUIT

MH45-118



CH12	EKG AMPLIFIER B	45-88702-1	SEE DETAIL A
CH13	EKG AMPLIFIER B	45-88702-1	SEE DETAIL A
CH14	MIXER-POWER SUPPLY B	45-88700-55	SEE SUBCARRIER OSCILLATOR CIRCUIT
CH15	2.3 KC VCO	45-88700-17	SEE SUBCARRIER OSCILLATOR CIRCUIT
CH16	1.7 KC VCO	45-88700-15	SEE SUBCARRIER OSCILLATOR CIRCUIT
CH17	1.3 KC VCO	45-88700-13	SEE SUBCARRIER OSCILLATOR CIRCUIT
CH20	EKG AMPLIFIER A	45-88702-1	SEE DETAIL A
CH21	EKG AMPLIFIER A	45-88702-1	SEE DETAIL A
CH22	MIXER-POWER SUPPLY A	45-88700-55	SEE SUBCARRIER OSCILLATOR CIRCUIT
CH23	1.3 KC VCO	45-88700-13	SEE SUBCARRIER OSCILLATOR CIRCUIT
CH24	2.3 KC VCO	45-88700-17	SEE SUBCARRIER OSCILLATOR CIRCUIT
CH25	1.7 KC VCO	45-88700-15	SEE SUBCARRIER OSCILLATOR CIRCUIT

FIGURE 13-33 AEROMEDICAL INSTRUMENTATION CIRCUIT (CAPSULE 3)

MH45-124

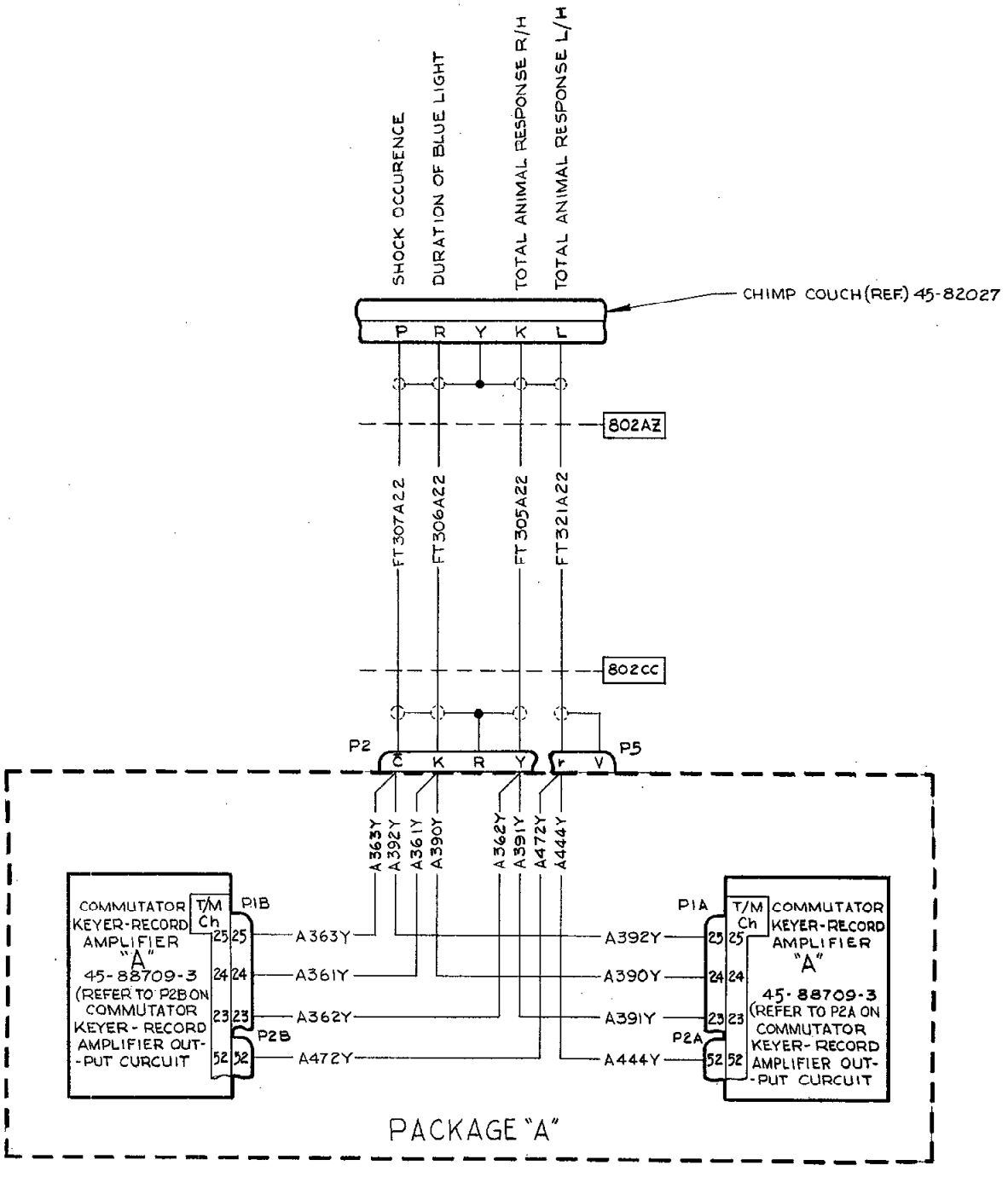


FIGURE 13-34 CHIMP RESPONSE INSTRUMENTATION CIRCUIT (CAPSULE 3)

MH45-126

13-30. REPLACEMENT AND ADJUSTMENT

This sub-section contains information covering replacement and adjustments of various instrumentation system assemblies and subassemblies. Since system reliability is decreased by disturbance of components and electrical wiring, assembly replacement should be kept at a minimum. Prior to replacement of any assembly, establish the necessity of performing replacement. Data is valid for capsule 2 only.

13-31. Instrumentation Control System Relay Panel Assembly (45-78092-1)

The instrumentation control system relay panel assembly is attached to a bracket on the underside of the upper shelf on the left side of the capsule. Replacement procedures for the relay panel are obvious. Upon replacement of the relay panel, perform the Cameras and Tape Recorder Check as described in Paragraph 2-15 of SEDR 65.

13-32. Pilot Observer Camera (45-88704-1)

The pilot observer camera is mounted on the lower left side of the instrument panel.

13-33. Removal

(a) Disconnect electrical connector from the camera.

(b) Grasp camera firmly from underside of panel and remove bolts.

(c) Carefully move camera away from instrument panel until lens is clear of panel, then move camera down and under the instrument panel.

13-34. Adjustment

The following clearances must be adjusted when found out of tolerance or when warranted by faulty camera performance.

(a) Film Pressure Plate Buttons. The clearance between the film aperture plate and the film pressure plate buttons of the film gate assembly, shall be maintained to between 0.005 and 0.006 inches. This clearance may be checked with a feeler guage. To make the adjustment, the film guide assembly must be removed and each pressure button adjusted independently. The gate assembly is then replaced and the clearance checked again. If further adjustment is needed the gate assembly must again be removed and the adjustment procedure repeated.

(b) Upper Take-up Sprocket Guide. The clearance between the upper take-up sprocket guide and the upper take-up sprocket must be maintained at 0.010 ± 0.002 inches. This adjustment may be made by loosening the two screws which hold the upper take-up guide mount to the gear plate and moving the mount until the necessary clearance has been attained. Make sure the sprocket guide is in its closed position while making clearance check.

(c) Lower Take-up Sprocket Guide. The clearance between the lower take-up sprocket guide and the lower take-up sprocket must be maintained to 0.010 ± 0.002 inches. This adjustment may be made by loosening the two screws that hold the lower take-up sprocket guide mount to the gear plate and moving the mount until the necessary clearance has been attained. Make sure the sprocket guide is in its closed position while making clearance check.

(d) Feed Sprocket Guide. The clearance between the feed sprocket and the feed sprocket guide must be maintained at 0.010 ± 0.002

inches. This adjustment may be made by moving the adjustment arm untilthe necessary clearance is attained. To loosen the screw that secures the adjustment arm, the pin drive shield must be removed.

(e) Motor Cam. Move the shuttle to engage shuttle claw tips fully into film perforations. Set and lock cam in a position just past opening of S1. Test operate the camera to check that the shuttle always stops with shuttle claw tips fully engaged into film perforations.

13-35. Installation.

(a) Place camera behind instrument panel and insert lens through hole in panel.

(b) Align holes in camera bosses with holes in instrument panel. Insert four bolts and secure.

(c) Attach electrical connector to camera.

(d) Perform Cameras and Tape Recorder Check as described in SEDR 65.

13-36. Instrument Panel Observer Camera (45-88704-3)

The instrument panel observer camera is installed on the inboard side of the webbing to the left of the vertical centerline near the upper edge of the large pressure bulkhead.

13-37. Removal

(a) Disconnect the electrical connector.

(b) Supporting the camera with one hand, remove the two bolts on the forward outboard end of the camera.

(c) Slide the camera forward and remove from the capsule.

13-38. Adjustment

Same as described for pilot observer camera in Paragraph 13-34.

13-39. Installation

(a) Place the camera between the angle supports attached to the webbing. (Have film magazine on inboard side.)

(b) Slide the camera aft until the guide pins on the aft face of the camera are firmly seated. (Note that the threaded inserts in the forward outboard end of the camera are aligned with the holes in the angle brackets.)

(c) Insert a bolt through each of the holes through the angle bracket and secure the camera. Use two washers under the head of each bolt.

(d) Connect the electrical connector.

(e) Perform the Cameras and Tape Recorder Check as described in SEDR 65.

13-40. Earth and Sky Camera (45-88706-1)

The earth and sky camera is installed adjacent to the capsule window.

13-41. Removal

(a) Disconnect the electrical connector.

(b) Remove the two upper mounting bolts.

(c) Loosen the two lower mounting bolts and slide the camera up to bring the heads of the lower bolts to the large circular area at the upper end of the slots. Lift camera face and remove from capsule.

(d) Place lens cap over lens.

13-42. Adjustment

If the negative is overexposed at the beginning of each frame, the shutter slit is opening too early. If the negative is underexposed at the beginning of each frame, the shutter slit is opening too late. To correct either of these conditions make the following adjustments.

(a) Remove left camera cover on side to which cable is attached.

(b) Pulse camera. Adjust S3 into heavy or light engagement with the switch lever assembly. Moving S3 away from (lighter engagement) the lever assembly causes the curtain to open later and the curtain slit becomes wider at the start of exposure. Moving S3 closer to the lever assembly (heavy engagement) causes the curtain to open sooner and the curtain slit becomes narrower at the start of the exposure.

NOTE

Engaging S3 and the lever assembly in too heavily causes double or continuous cycling. Engaging too lightly stops camera operation. If preceding steps do not correct exposure, perform remaining steps.

(c) Remove right cover.

(d) Loosen curtain spring adjustment locking screw.

(e) Turn curtain spring adjustment screw clockwise to increase shutter velocity and counter clockwise to decrease velocity. Do not turn

screw more than five turns in either direction.

(f) Tighten locking screw and install covers.

13-43. To adjust shutter width perform the following procedure.

(a) Remove cover from side opposite cable and separate cover from camera body.

(b) Loosen two locking screws on slit adjustment bar.

(c) Turn slit adjusting screw clockwise to widen slit or counter-clockwise to narrow slit. One quarter turn of the screw changes slit width approximately 0.015 inches.

(d) Hand cycle the camera to take out lost motion.

(e) Tighten slit adjustment bar locking screws.

(f) Install cover.

13-44. Whenever a camera is put aside for storage, set shutter at "500" and operate the handcrank until the shutter trip off and the slit is at the end of its movement. These adjustments allow camera storage with a minimum of stress on the curtain springs.

13-45. Installation and Boresighting

(a) Insert a bolt with a washer in each of the two threaded inserts in the camera magazine. Use inserts on side which does not have a shielded input cable recessed in the magazine. Leave a space of about 1/8 of an inch between the washer and the face of the camera.

(b) Align camera with the mounting bracket and insert the heads of the protruding bolts through the circular area above the lower slots in the mounting bracket.

(c) Slide the camera down to where the bolts bottom in the slots.

(d) Place a bolt with a washer through each of the upper holes in the mounting bracket and secure.

(e) Tighten lower mounting bolts.

(f) Remove lens cap.

(g) Connect the electrical connector.

(h) Perform Earth and Sky Observer Camera Boresight Check as described in Paragraph 2-14 in SEDR 65[illegible]. If boresighting is incorrect, adjust mirror to center desired camera target. Lock the mirror in this new position.

(i) Check the camera for operation as described in Paragraph 2-15 of SEDR 65[illegible].

13-46. Instrumentation Package A (45-88100)

Instrumentation Package A is installed near the large pressure bulkhead aft of the hatch.

13-47. Removal

(a) Disconnect the electrical connectors.

(b) Remove the three bolts along the inboard edge of the package.

(c) Remove the package cover.

(d) Remove all TOPIC cards from the package. Store the TOPIC cards in a container that will protect them from dirt, damage, etc.

(e) Remove the six bolts securing the package and remove the package from the capsule.

13-48. Installation

(a) Remove the cover from the package.

(b) Remove all TOPIC cards. Store cards in a container that will protect them from dirt, damage, etc.

(c) Position the package and secure with six bolts. Safety wire the four bolts which secure the package to the honeycomb shelf.

(d) Install the TOPIC cards.

(e) Install and secure package covers.

(f) Connect the electrical connectors.

(g) Perform an Integrated System Check as described in Paragraph 2-16 of SEDR 65.

13-49. Instrumentation Package B (45-88101)

Instrumentation Package B is attached to the webbing near the large pressure bulkhead in the upper right section of the capsule.

13-50. Removal

(a) Disconnect electrical connectors.

(b) Remove the cover from the package.

(c) Remove all TOPIC cards from the package. Store the TOPIC cards in a container that will protect them from dirt, damage, etc.

(d) Remove the six bolts secureing the package and remove the package from the capsule.

13-51. Installation

(a) Remove the cover from the package.

(b) Remove the TOPIC cards from the package and store in a container that will protect the cards from dust, damage, etc.

(c) Position the package in the webbing and secure to structure with 6 bolts.

(d) Install the TOPIC cards.

(e) Install the package cover.

(f) Connect the electrical connectors.

(g) Perform an Integrated System Check as described in SEDR 65.

13-52. Instrumentation Package C (45-88102)

Instrumentation Package C is installed near the large pressure bulkhead aft and above the switch fuse panel.

13-53. Removal

(a) Disconnect electrical connectors.

(b) Remove the cover from the package.

(c) Remove all TOPIC cards from the package. Store the TOPIC cards in a container that will protect the cards from dirt, damage, etc.

(d) Remove the bolts securing the package assembly and remove the package from the capsule.

13-54. Installation

(a) Remove the covers from the package.

(b) Remove all TOPIC cards from the package. Store the TOPIC cards in a container that will protect the cards from dirt, damage, etc.

(c) Position the package in the capsule and secure with bolts.

(d) Install all TOPIC cards.

(e) Replace package cover.

(f) Connect electrical connectors.

(g) Perform the following portions of the Integrated Systems Check as described in SEDR 65*.

Capsule Electrical Power Instrumentation

Calibration On Instrumentation

0.05G Relay Instrumentation

Environmental Control System Instrumentation

Reaction Control System Solenoids Instrumentation

13-55. Signal Condition and 3 Volt D-C Power Supply Card (45-88203-1)

The signal condition and 3 volt d-c power supply card is installed in CH1 of instrumentation package A. To replace the card, remove the cover from instrumentation package A and remove the card. Prior to installing a new card, observe the values of R1, R2, R3, R4, R8, and R15 on old

assembly. Verify that these resistors on the new card are of the same values, respectively. If component must be changed, apply No. 747-5 moisture and fungus resistant varnish (MIL-V-173A Type 1) to new component and wiring. Insert the new card in CH1 of instrumentation package A and replace cover. Perform the following parts of the Integrated System Check as described in SEDR 65 :

(a) Instrumentation Power Supply Instrumentation

(b) Environmental Control System Instrumentation

(c) Reaction Control System Instrumentation

13-56. Voltage Monitor Card (45-88205)

Two voltage monitor cards are used. They are installed in instrumentation package C in CH28 and CH29. To replace a card, remove the package cover. Upon replacement of either card, perform the Reaction Control System Solenoid Instrumentation Check per SEDR 65 .

13-57. Resistance Element A-C Power Supply Card (45-88206)

The resistance element a-c power supply card is installed in CH6 of instrumentation package A. To replace this card, the cover of the instrumentation package assembly must be removed. The card which is to be installed must be adjusted according to SEDR 64 prior to installation. After installing new card perform the following parts of the Integrated System Check as described in SEDR 65 :

(a) Instrumentation Power Supplies Instrumentation

(b) Package Temperature Instrumentation

13-58. Resistance Element Amplifier Card (45-88207)

Five resistance element amplifier cards are installed in instrumentation package A. Four of these cards are 45-88207-1 assemblies. These cards are installed in CH7, CH8, CH9, and CH11. The fifth card is a 45-88207-5

assembly. It is installed in CH10. A replacement card must be adjusted per SEDR 64 prior to installation. Upon installation, make a 10 point calibration check of the new card. Record the calibration information and store in the telemetry trailer for future use during reduction of data.

13-59. Respiration Rate and Depth Calibration Attenuator and Mixer Card (45-88208)

The respiration rate and depth calibration attenuator and mixer card is installed in CH33 of instrumentation package C. To replace this card, remove the package cover. Upon replacement of this card perform the Normal Launch System Instrumentation Check as described in SEDR 65.

13-60. Special Instrumentation Package (45-88510)

The special instrumentation package is installed near the center of the large pressure bulkhead under the crewman simulator.

13-61. Removal

(a) Remove the crewman simulator as described in Section II.

(b) Disconnect the electrical connectors from the package.

(c) Loose the bolts securing the cables at each corner of the package and slide the cable end fittings out of the slots on the package.

(d) Remove the package from the capsule.

13-62. Installation

See Figure 13-35.

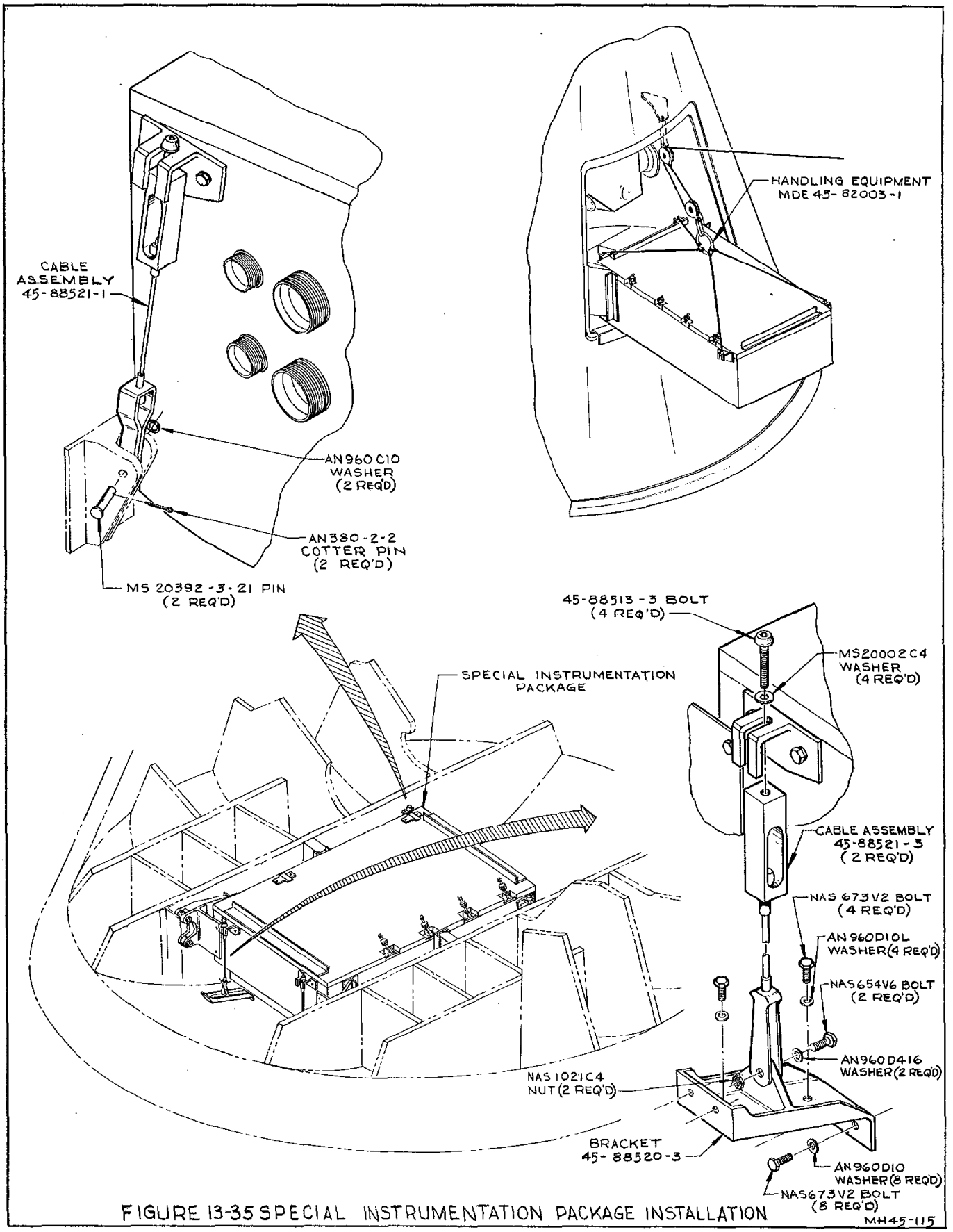


FIGURE 13-35 SPECIAL INSTRUMENTATION PACKAGE INSTALLATION

MH45-115

13-63. 1.3 KC. Voltage Controlled Subcarrier Oscillator (45-88700-13)

Two 1.3 kc. voltage controlled subcarrier oscillators are installed in CH17 and CH23 of instrumentation package B. The cover of this package must be removed to gain access to these cards. Upon replacement of a card, perform an Attitude Change Rate check as described in SEDR 65-[illegible].

13-64. Adjustment

During various checkout procedures, the center frequency of this oscillator is checked. If center frequency is not within tolerance, the oscillator must be adjusted. To make this adjustment, perform the following procedure.

(a) In the telemetry trailer, connect a frequency counter to the output of the 1.3 kc. filter. (Zero output from the discriminator may be used as an indication of center frequency.)

(b) In the capsule, adjust the centering potentiometer on the card. This control is the potentiometer nearest the outside edge of the card. Coordinate adjustment via intercom to obtain an output frequency of 1.3 kc.

13-65. 1.7 KC. Voltage Controlled Subcarrier Oscillator (45-88700-15)

Two 1.7 kc. voltage controlled subcarrier oscillators are installed in CH16 and CH25 of instrumentation package B. The cover of this package must be removed to gain access to these cards. Upon replacement of a card, perform an Attitude Change Rate Check as described in SEDR 65-[illegible].

13-66. Adjustment

During various checkout procedures, the center frequency of this oscillator is checked. If center frequency is not within tolerance, the oscillator must be adjusted. To make this adjustment, perform the following procedure.

(a) In the telemetry trailer, connect a frequency counter to the output of the 1.7 kc. filter. (Zero output from the discriminator may be used as an indication of center frequency.)

(b) In the capsule, adjust the centering potentiometer on the card. This control is the potentiometer nearest the outside edge of the card. Coordinate adjustment via intercom to obtain an output frequency of 1.7 kc.

13-67. 2.3 KC. Voltage Controlled Subcarrier Oscillator (45-88700-17)

Two 2.3 kc. voltage controlled subcarrier oscillators are installed in CH15 and CH24 of instrumentation package B. The cover of this package must be removed to gain access to these cards. Upon replacement of a card perform an Attitude Change Rate Check as described in SEDR 654.

13-68. Adjustment

During various checkout procedures, the center frequency of this oscillator is checked. If center frequency is not within tolerance, the oscillator must be adjusted. To make this adjustment, perform the following procedure.

(a) In the telemetry trailer, connect a frequency counter to the output of the 2.3 kc. filter. (Zero output from the discriminator may be used as an indication of center frequency.)

(b) In the capsule, adjust the centering potentiometer on the card. This control is the potentiometer nearest the outside edge of the card. Coordinate adjustment via intercom to obtain an output frequency of 2.3 kc.

13-69. 10.5 KC. Voltage Controlled Subcarrier Oscillator (45-88700-2)

Two 10.5 kc. voltage controlled subcarrier oscillators are installed in CH18 and CH26 of instrumentation package B. The cover of this package must be removed to gain access to these cards. Upon replacement of a card, perform a zero and full scale calibrate. Evaluate readout of the following instrumentation channels.

CHANNEL	PARAMETER
4	Package Temperature
6	CO_2 Partial Pressure
7	O_2 Partial Pressure
10	Cabin Air Temperature
11	Suit Inlet Air Temperature
19	Heat Sink Temperature
20	Outside Skin Temperature
21	Inside Skin Temperature
42	D-C Current
	Pitch Rate
	Roll Rate
	Yaw Rate

Compare instrumentation values with actual zero and full scale calibrate levels. If the instrumentation values are within $\pm$ 5% of the full scale calibrate value and zero level is obtained with zero calibrate signal, the new card is acceptable.

13-70. 3.125 KC. Compensating Oscillator (45-88700-53)

The 3.125 compensating oscillator is installed in CH19 of instrumentation package B. The cover of this package must be removed to gain access to this card. Upon replacement of this card, perform the Subcarrier Oscillators Check as described in SEDR 65.

13-71. Mixer-Power Supply (45-88700-55)

Two mixer-power supplies are installed in CH14 and CH22 of instrumentation package B. The cover of this package must be removed to gain access to these cards. Upon replacement of a card, perform the Commutator Output Check and the Attitude Change Rate Check as described in SEDR 65.

13-72. Signal Sources

13-73. 7 Volt, 400 CPS Rectifier and Attenuator

The 7 Volt, 400 cps rectifier and attenuator are located on the 7V, 400 cps power supply card in CH6 of instrumentation package A. (See Figure 13-30.) To replace the rectifier or attenuator, replace the entire 45-88206-1 card assembly. (Refer to Paragraph 13-57.)

13-74. Package Temperature Transducer

A Gulton 32PB2 thermistor on the 45-88215-7 card assembly in CH4 of instrumentation package A serves as the package temperature transducer. To replace the transducer, replace the entire 45-88215-7 card assembly. Upon replacement of the card assembly, perform the Package Temperature check as described in SEDR 65.

13-75. Vibration Pickup (45-88714-9)

The vibration pickup is a piezo-electric crystal installed in the upper left corner of the main instrument panel. Replacement procedures for

the transducer are obvious. Upon replacement of the transducer, perform the Vibration Instrumentation check as described in SEDR 65.

13-76. Sound Pickup

A piezo-electric/diaphragm microphone installed in instrumentation package B is used for sound pickup. Replacement procedures for the sound pickup are obvious. Upon replacement, perform the Sound Level Instrumentation Check as described in SEDR 65.

13-77. CO_2 Partial Pressure Transducer

Installation provisions for two CO_2 partial pressure transducers are present in the ductwork below and to the left of the couch area. If only one transducer is utilized, it is installed in the inboard fitting and a dummy transducer is installed in the outboard fitting. Prior to installation the transducer must be serviced per SEDR 100. Electrolyte life is approximately 40 hours. The transducer screws into a threaded fitting. Replacement procedures are obvious. Upon replacement of the transducer perform the Suit Circuit Leak check as described in SEDR 80 and observe the instrumentation value of CO_2 partial pressure to verify that it is proper.

13-78. O_2 Partial Pressure Transducer

The O_2 partial pressure transducer is installed in instrumentation package C. Replacement procedures for the transducer are obvious. Upon replacement of the transducer, observe the instrumentation value of O_2 partial pressure to verify proper operation.

13-79. CALIBRATION

The majority of instrumentation system calibration is performed prior to installation of system components in the capsule. However, calibration should be checked periodically and upon replacement of a system component. A quick check of calibration is provided for some of the instrumentation channels by the zero and full scale calibrate circuit. This circuit applies zero and upper scale signals to these channels. Reference to the calibration cards or to Table 13-1 will translate readout indications to pertinent units of measure. A more detailed calibration check can be made by affecting transducer conditions in a calibrated manner and comparing instrumentation value to the conditions the transducer is sensing. New calibration data should be recorded in Table 13-1. Equipment not directly associated with an individual parameter is listed in Table 13-2.

13-80. Meter Resistors

Oxygen supply, coolant quantity and fuel quantity instrumentation circuits supply signals to the instrument panel indicators associated with these functions. The outputs from these transducers are applied through attenuator resistors to the meters. Meter resistance is not a constant. Consequently, the value of the attenuator resistor is a function of the individual meter and transducer involved. Upon replacement of either of these components, a change in the meter attenuator may also be necessary. To determine the proper value of the attenuator, use the following procedure. The work may be performed on the bench or in the capsule.

(a) Connect a precision digi-dial potentiometer (50K) between trans-

ducer wiper and one side of meter. Set potentiometer to 30K.

(b) Connect other side of meter to negative side of transducer.

(c) Apply three volts d-c to transducer end terminals.

(d) Exercise transducer with pressure equal to upper limit of parameter being monitored.

(e) Adjust precision potentiometer to obtain full scale deflection on meter. Record value of resistance.

(f) Complete a ten point calibration curve. Record and file calibration information.

(g) Install a fixed resistor on 45-88203-1 card of the same value as recorded in step (e).

(h) Perform appropriate part of instrumentation system check as described in SEDR 65. Compare system operation with calibration curve plotted in step (f).

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TABLE 13-1 PARAMETER AND EQUIPMENT LOG

Parameter	Equipment	Range	Scale Factor	SCD	Vendor	Vendor P/N	R/Cal Value
3 Volts DC							
	Topic Card	3V	33 1/3% F.S.= 1 volt	4588203-1	MAC	4588203-1	
0 Volt Reference			0% F.S.= 0 volts				
AC Amplifier Power Supply	Topic Card	7 Volts @ 400 cps	1.4% F.S.= 0.1 VAC	45-88206	MAC	45-88206	
*Package Temperature			2.2% F.S.-1° F				
	D-C Amplifier			88215-5	MAC	4588215-5	
	D-C Amplifier			88215-7	MAC	4588215-7	
	Sensor	75-120°F			Gulton	32PB2	
Vibration		10-2000 cps 40G P-P					
	Accelerometer			88714-3	Endevco	2829	
	Amplifier			88714-11	Endevco	2620-1	
	Analyzer	0 to 3 V		88711-1	ASCOP	SA-40	
Noise Level							
	Pickup	110-140 db		88101	Gulton		
	Pickup	37.5-9600 cps		88101	Gulton		
	Amplifier			88101			
CO_2 Partial Pressure							
	Sensor	1 to 20 mmHg		88715-3	Beckman	71200	
	Amplifier	0 to 3 V		88715-5	TAPCO	04-600370 Mod.	
	Amplifier	0 to 3 V		88715-5	TAPCO	04-600370 Mod.	
	Indicator			83703-3	Weston	183542	
O_2 Partial Pressure			.39% F.S.= 1mm Hg.				
	Sensor	0 to 253 mm Hg.		88708-1	NeVille		
	Amplifier	0 to 3 V		88708-5	TAPCO	04-600380 Mod.	

TABLE 13-1 PARAMETER AND EQUIPMENT LOG

Parameter	Equipment	Range	Scale Factor	SCD Dwg. No. 45	Vendor	Vendor P/N	R/Cal Value
	Amplifier	0 to 3 V		88707-5	TAPCO	04-600380 Mod.	
Suit Pressure			4% F.S.= 1 psia				
	Pot. (10K)	0 to 25 psia		88705-3	CEC	4-380MU-25A	
O_2 Supply Pressure		0 to 7,500 psi	.1% FS= 10 psi				
	Pot. (5K)	0 to 10,000 psi		83700	Fairchild	41PE8669	
	Pot. (2.5K)						
	Attenuator			88203	MAC		
	Indicator	0 to 100%		83706-5	Weston	183541	
Cabin Air Temp.		0 to 200°F	.5% FS = 1°F				
	Probe	216-316 ohms		88720-3	Transonics	1182B	
	Amplifier AC	0 to 3V		88721-1	MAC	4588207-1	
				83708-3			
	Ind			88708-3	Weston	183513	
Suit Inlet Air Temp.		32° to 100°F	1.47% FS = 1°F				
	Probe				Ruge	BN-274	
	AC Amplifier	0-3V			MAC	4588207-1	
Acceleration Y Axis			12% FS = 1g				
	Accelerometer	± 4g		88712-5	Donner	4310-2	
	Indicator	Ny, Nx, Nz		81721-11		JG282A-1	
Acceleration X Axis			12% FS = 1g				
	Accelerometer	± 4g		88712=5	Donner	4310-2	
Acceleration Z Axis			1.67% = 1g				
	Accelerometer	± 30g		88712-3	Donner	4310-1	
Attitude Pitch							
	Pot. (10K)	+130° to 190°		81721-5	M/H	GG134A-1	

TABLE 13-1 PARAMETER AND EQUIPMENT LOG

Parameter	Equipment	Range	Scale Factor	SCD Dwg. No. 45	Vendor	Vendor P/N	R/Cal Value
	Ind. (3 axis)	.P.R.Y		81721-11		JG282A-1	
Attitude Roll	Pot (10K)	+130° to -190°		81721-7	M/H	GG134A-2	
Attitude Yaw	Pot (10K)	+70 to 250		81721-9	M/H	GG134A-3	
Structural Temp Heat Sink #1			.177% FS = 1°F				
	Probe	-65-500°F		88721-3	Ruge	3173	
	AC Amp.	0-3V			MAC	4588207-1	
Heat Sink #2			.177% FS = 1°F				
	Probe	-65-500°F		88721-3	Ruge	3173	
	AC Amp.	0-3V			MAC	4588207-1	
Outer Skin #1			.177% FS = 1°F				
	Probe	-65 to 800°F			Transonics	2277	
	AC Amp.	0-3V			MAC	4588207-5	
Outer Skin #2			.177% FS = 1°F				
	Probe	-65 to 800°F			Transonics	2277	
	AC Amp.	0-3V			MAC	4588207-5	
Inner Skin #1			.33% FS = 1°F				
	Probe	0 to 300°F		88721-1	Ruge	3172	
	AC Amp.	0-3V			MAC	4588207-1	
Inner Skin #2			.33% FS = 1°F				
	Probe	0 to 300°F		88721-1	Ruge	3172	
	AC Amp.	0-3V			MAC	4588207-1	
	Res Element Power Supply				MAC	4588206-1	

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TABLE 13-1 PARAMETER AND EQUIPMENT LOG

Parameter	Equipment	Range	Scale Factor	SCD Dwg. No. 45	Vendor	Vendor P/N	R/Cal Value
Static Pressure			6.7% FS = 1 psi				
	Pot (10K)	0 to 15 psi		88705-5	CEC	4-380MU-15A	
	Aneroid Ind.	0-999K ft.		81704			
Horizon Scanner			26.7% FS = "on" (Ignore Signal is Generated)				
Pitch Ignore	Horizon Scanner "on"-off			87702-3	Barnes	13-130	
	Topic Card	feed thru			MAC	4588212-1	
Time Since Launch							
	10 sec	0 to 10 sec	10% FS = 1 sec				
	1 min	0 to 1 min	" = .1 min				
	10 min 10K	0 to 10 min	" = 1 min	88710-3	Waltham	40087	
	1 hr Pots	0 to 1 hr	" = .1 hr				
	10 hr	0 to 10 hr	" = 1 hr				
	30 hr	0 to 30 hr	3.3% FS = 1 hr				
Retrograde Time							
	10 sec	0 to 10 sec	10% FS = 1 sec				
	1 min	0 to 1 min	" = 1 min				
	10 min	0 to 10 min	" = 1 min				
	1 hr	0 to 1 hr	" = 1 hr				
	10 hr	0 to 10 hr	" = 1 hr				
	30 hr	0 to 30 hr	3.3% FS = 1 hr	Same	Same	40087	
Reaction Control Supply Pressure (Auto.)			.3% FS = 10 psia				
	Pot (7.5K)	0 to 3500 psia			Transonics	77-23	
	Atten.	0 to 3V			MAC	4588203	
	Ind.	0 to 100%		71719-7		183540	
Reaction Control Supply Pressure (Manual)			.3% FS = 10 psia				
	Pot (7.5K)	0 to 3500 psia			Transonics	77-23	
	Atten	0 to 3V			MAC	4588203	
	Ind.	0 to 100%		81719-7		183540	

TABLE 13-1 PARAMETER AND EQUIPMENT LOG

Parameter	Equipment	Range	Scale Factor	SCD Dwg. No. 45	Vendor	Vendor P/N	R/Cal Value
AC Voltage Monitor			.83% FS - 1 VAC				
	P4 and Rect.	0 to 120VAC			MAC	4588203	
	Ind	0 to 150VAC		81718			
DC Current Monitor			2% FS - 1 mv @ 1A				
	Shunt	50 mv @ 50A			Project Item		
	DC Amplifier	0 to 3 VAC		88703-1	MAC	4588215-1	
	" "	" "		88703-1	"	"	
	Ind.			81717-3			
Sequence of Events	Tower Release						
	Capsule Separation						
	Retro Angle Command						
	Retro Rocket	#1 Fire					
	" "	#2 Fire					
	" "	#3 Fire	Some + %				
	Retro Rocket Ass'y	Jettison	to 100% =				
	Drogue Chute	Deploy	"on" signals				
"on"	Antenna Fair.	Release					
or	Main Chute	Deploy					
"off"	" "	Jettison					
	Reserve Chute	Deploy					
	Mayday						
	Tower Escape	Rkts.					
	Standby Inv.	On					
	" Batt.	On					
	Calib. on Sig.						
	Periscope Retract						
	05G Relay						
	Calibrate				MAC	4588208-1	
Horizon Scanner			26.7% FS = on (Ignore Signal is Generated)				
Roll Ignore	Horizon Scanner	on-off		87702-3	Barnes	13-130	
	Topic Card	feed thru			MAC	4588212-1	

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TABLE 13-1 PARAMETER AND EQUIPMENT LOG

Parameter	Equipment	Range	Scale Factor	SCD Dwg. No. 45	Vendor	Vendor P/N	R/Cal Value
Voltages from ASCS (Auto Control Solenoid Valve Positions.) Pitch Hi up		on-off	100% FS = on				
Hi dwn.		"					
Lo up		"					
Lo dwn		"					
Roll Hi CW		"					
Hi CCW		"					
Lo CW		"					
Lo CCW		"					
Yaw Hi left		"					
Hi right		"					
Lo left		"					
Lo right		"					
	Voltage Monitor Card				MAC	4588205-1	
Cabin Pressure			4% FS = 1 psia				
	Pot (10K)	0 to 25 psia		88705-3	CEC	4-380MU-25A	
	Anneroid Ind	0 to 15 psia		88707-3	Weton	A33681-10-001	
DC Voltage Monitor			3.3% FS = 1V DC				
	P/U & Attenuator	0 to 30V DC			MAC	4588203	
	Indicator	0 to 3V DC		81716-3		183537	
Horizon Scanner Pitch Output	Attenuator	-66.5° to 42°	.92% FS = 1 deg.	87903-3	Barnes	13-130	
Roll Output	"	"	"	"	MAC	4588212-1	"

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TABLE 13-1 PARAMETER AND EQUIPMENT LOG

Parameter	Equipment	Range	Scale Factor	SCD Dwg. No. 45	Vendor	Vendor P/N	R/Cal Value
Attitude Rate							
Pitch	P/U @ ASCS	± 6°/sec					
	Gyro						
	Amplifier				MAC	4588214-1	
	VCO (2) reqd.	2.3KC±7.5%		88700-17	Dorsett	0-8M2-3	
Roll	P/U @ ASCS						
	Gyro	± 6°/sec					
	Amplifier				MAC	4588214-1	
	VCO (2) reqd.	1.7KC±7.5%		88700-15	Dorsett	0-8M1.7	
Yaw	P/U @ ASCS						
	Gyro	± 6°/sec					
	Amplifier				MAC	4588214-1	
	VCO (2) reqd.	1.3KC±7.5%		88700-13	Dorsett	8-8M1.3	
	Angular Rate Ind.	RPY		81721-11		JG282A-1	
Coolant Quantity	Ind	0-100%		83701-3		183543	

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TABLE 13-2 ASSOCIATED EQUIPMENT LOG

Item	Description	Vendor	S/N	SCD Dwg. No. 45-	Vendor P/N
Tape Recorder	7 track 2 head x 1 7/8 ips	CEC		88707	
Reels		CEC		88707-17	
Tape	4800 ft 1 Mil Mylar	3M		88707-19	
Record Amplifier		CEC			
Camera					
Instr. Panel		Milliken		88704-3	DBM8
Lens	10mm	Milliken			
Film					
Earth & Sky	75mm	Mauer		88706	220G
Lens		Mauer			
Film					
Pilot		Milliken		88704-1	DBM7
Lens	10mm	Milliken			
Film					
Telemetering		General Devices			
Commutator A				88709-3	1208D-2B
" B				88709-3	1208D-2B
Mixer Amplifier				88700-55	PSM-8M
Compensating Oscillator		Dorsett		88700-53	20-8M
Amplifier				88214	
Low Pass Filter				85700-59	
VCO	10.5 KC ± 7.5%	Dorsett		88700-27	0-8M 10.5KC
VCO	2.3KC "	"		88700-17	0-8M 2.3KC
VCO	1.7KC "	"		88700-15	0-8M 1.5KC
VCO	1.3KC "	"		88700-13	0-8M 1.3KC
Play Back Tape Recorder		Mohawk			#400

13-81. SERVICING

13-82. EARTH AND SKY OBSERVER CAMERA

13-83. Refer to SEDR 100, X-1 Day Servicing, for servicing procedures pertinent to the earth and sky observer camera.

13-84. INSTRUMENT PANEL OBSERVER CAMERA

13-85. Refer to SEDR 100, X-1 Day Servicing, for servicing procedures pertinent to the instrument panel observer camera.

13-86. TAPE RECORDER

13-87. Refer to SEDR 100, X-1 Day Servicing, for servicing procedures pertinent to the tape recorder.

13-88. PLAYBACK TAPE RECORDER

13-89. Refer to SEDR 100, X-1 Day Servicing, for servicing procedures pertinent to the playback tape recorder.

13-90. CO_2 PARTIAL PRESSURE TRANSDUCER

13-91. Refer to SEDR 100, X-1 Day Servicing, for servicing procedures pertinent to the CO_2 partial pressure transducer.