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**PRELIMINARY**  
**OPERATING AND MAINTENANCE**  
**INSTRUCTIONS FOR LAUNCHER**  
**HYDRAULIC AND PNEUMATIC SYSTEMS**  
**(B, C, D(R&D) SERIES)**

ZM-7-516A (TN)  
(This publication replaces ZM-7-516 (TN)  
dated 11 May 1959)

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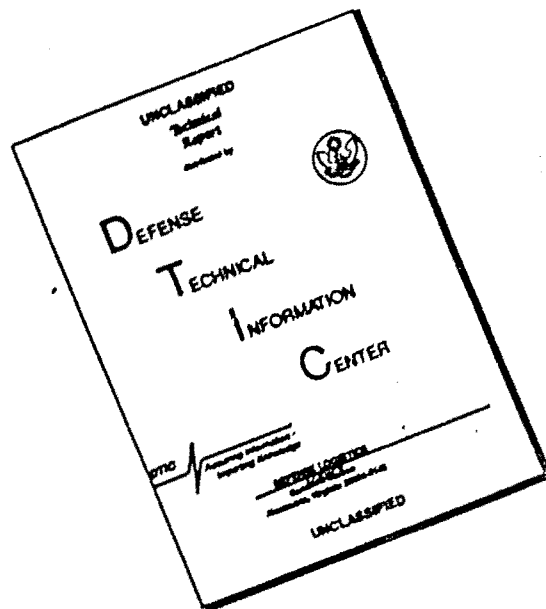
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521-65

14 December 1959

To: Holders of Preliminary Operating and Maintenance Instructions  
Manuals

From: Support Publications

Subject: Addition of Revision A to ZM-7-516, POMI for Launcher Hydraulic and  
Pneumatic Systems, B, C, D, R&D Series.

Substitute the attached title, "A", 1, and 4-1 thru 4-5 pages, dated  
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## SECTION I

### INTRODUCTION

#### 1-1. PURPOSE.

1-2. This manual provides preliminary operating and maintenance instructions for the launcher hydraulic and pneumatic systems for the B, C, and D(R&D) series missiles. The launcher systems for Sycamore 7-80-5 and -7, AFMTC 7-80-8, -9, -10, and -11, and ERB 7-80-2 and -4 are covered in this manual. The Components and pressure settings are applicable to B, C, and D(R&D) series missiles. This manual will be revised as additional information is obtained through actual operating and maintenance experience at the factory and the test sites. Complete reissues of the manual will be made periodically.

1-3. Personnel concerned with this equipment can contribute to the effectiveness of the revised manuals by forwarding comments and suggestions to the cognizant design group or to Support Publications, Convair-Astronautics.

#### NOTE

Dash numbers of part and installation drawings have been purposely omitted from the text. The applicable schematic drawing should be referred to for dash number identification.

#### 1-4. DESCRIPTION OF THE SYSTEM.

1-5. The primary functions of the launcher hydraulic and pneumatic systems are to

initiate a stabilized and captive holddown of the missile until full engine thrust is developed, supply a synchronous release and provide a controlled rate of acceleration for the first seven inches of missile travel. The secondary functions are to aid in ground handling and control of the missile during erection, to actuate retraction of the launcher auxiliary frames during missile release, to provide rise-off clearance, to aid in control of liquid nitrogen (B and C series), liquid oxygen and fuel supply to the missile, and to provide various service hydraulic, pneumatic and purge lines routing from ground stub-ups via launcher to missile disconnects.

[1-6. The missile release is accomplished by means of two pneumatic release cylinders (see figure 1-1 and 1-2) from which the pressure is released at a controlled rate. The two pneumatic release cylinders are synchronized by means of a hydraulic slaving system which is powered by a single pneumatic actuating cylinder. The pneumatic cylinder is triggered by the positioning of a solenoid valve providing nitrogen pressure to the cylinder.

1-7. Two stabilizer cylinders and a temperature compensator are mounted on the auxiliary frames (see figure 1-1 and 1-2). Their function is to provide uniform vertical support and to maintain vertical alignment of the missile when erected on the launcher. Vertical alignment and synchronization control are accomplished by hydraulic sections of the stabilizer cylinders and temperature compensator. Uniform vertical support is accom-

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Illustration to be Furnished When Available

Figure 1-1. Launcher Holddown and Release System B and C Series (7-89007 Sheet 2)

Illustration to be Furnished When Available

Figure 1-2. Launcher Holddown and Release System, D(R and D) Series, (7-89007 sheet 3)

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plished by the pneumatic sections of the stabilizer cylinders. The vertical synchronization is shown by means of visual indication on the stabilizer meter.

1-8. During missile rise-off, the auxiliary frames must be moved outward to clear the missile in the event of missile drift during the first few feet of rise. To accomplish this, the two pneumatic auxiliary support retraction cylinders (see figure 1-1 and 1-2) are preloaded to swing the frames outward as soon as the stabilizer pins are disengaged (after approximately two inches of missile rise).

1-9. Fluid lines to the missile lead from ground stubups, through flexible hoses via launcher installations, and terminate at two rise-off disconnect ground installations (B and C Series). These ground coupling installations can be raised or lowered to engage or disengage the airborne rise-off disconnects. The liquid oxygen and fuel disconnects mount separately with special control valves at the rise-off points. For B and C Series, the hydraulic reservoir charge lines are routed via the launcher and are connected to the missile with flexible hoses. For D(P and D) Series installations, the hydraulic reservoir charge line is not routed on the launcher; charging is accomplished by hose connection directly to the 7-08411 Nitrogen Charge Panel. (See POMI AZE-27-188.)

1-10. The purge system furnishes gaseous nitrogen, trichloroethylene, and lithium chloride (D(R and D) Series) by flexible hoses from the ground stubups to a control valve installation mounted in Quad I on the launcher. From this control installation, the lines are routed via the launcher to either the rise-off disconnect installations or the propellant fill and drain control valves. (See figures 2-2, 2-3, 2-4, and 2-5.)

1-11. LIST OF REFERENCES.

## 1-12. REPORTS.

AZE-27-188	POMI for Launcher Charging Panel, D series.
AZE-27-192	POMI for Launcher Hydraulic and Pneumatic System, D Series.
AZM-27-044	Checkout Procedure for Launcher Hydraulic and Pneumatic Systems, D Series.
AZM-27-046	Leak Testing Procedure for Launcher Hydraulic and Pneumatic Systems, D (R and D) Series.
ZE-7-087A	Preventative Maintenance Technical Manual, Pneumatic Booster Unit.
ZJ-7-048	POMI for Pneumatic Booster Unit, B Series.
ZJ-7-049	Checkout Procedure for Launcher Hydraulic and Pneumatic System, B Series.
ZK-7-049	Propulsion System Handbook for the XSM-65 B and C Missiles, ZK-7-049.
ZM-7-193C	Operational Data for Missile Stretch Sling.
ZM-7-200C	POMI for Erecting Missile in Tower (With the 7-89290 or 7-89366 Holddown and Release Cylinders Installed on the Launcher), Model XSM-5.

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Paragraph 1-13

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ZM-7-347B	Preliminary Procedure for Leak Testing Missile Launcher Tubing Installation, B Series, ZM-7-347B.	7-89101	Schematic Diagram, Hydraulic and Pneumatic Lines, Launcher Systems, B and C Series. (See figures 2-4 and 2-5.)
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1-13. DRAWINGS.

7-89100	Schematic Diagram, Hydraulic and Pneumatic Lines, Launcher Systems. (See figures 2-2 and 2-3.)	7-89000	Equipment Installation Drawing, Hydraulic and Pneumatic Booster Unit.
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## SECTION II

### FUNCTION

#### 2-1. FUNCTION OF MAJOR ASSEMBLIES.

#### 2-2. MISSILE HOLDDOWN AND RELEASE SYSTEM.

a. The two 7-89366 main release cylinders, in conjunction with the 7-08396 valves (controlled by the slaving system) hold the missile captive until launch, provide a synchronous release of the pneumatically applied holddown force, and control the rate of missile acceleration for the first seven seconds of travel. By the end of 0.5-seconds and approximately 7 inches of missile travel, the missile acceleration is approximately 16 feet per second<sup>2</sup>. The actual (release cylinder) piston-controlled travel is approximately 4 inches due to mechanical linkage. At the end of this 4-inch stroke, the piston is disengaged from the rod and moves freely along with the 7-49018 releasing mechanism. The release cylinder motion is stopped by the 7-49276 snubber cylinder. A line-mounted micronic filter, 93-78007-004, is installed with each cylinder as well as a venting valve for protection from dirt. Since a loss of pressure in the release cylinder could cause the loss of a missile, check valves, 88-30900-122, are installed in each line to prevent reverse flow in the event of a supply line failure.

#### 2-3. SLAVING SYSTEM. (See Figures 1-1 and 1-2.)

a. Synchronous release of holddown pressure from the two main release cylinders is

performed by the hydraulic slaving system. This system is a closed hydraulic circuit consisting of two master cylinders, 7-08263, linked together by a 7-89242 yoke hydraulically driving two 7-08264 slave cylinders. The two slave cylinders in turn actuate two 7-08396 pneumatic release valves. The power for driving the two master cylinders is from the 7-08265 pneumatic actuator cylinder. A four-way, three-position solenoid valve, 99-35002-001, when energized to position A, ports 1000 psig nitrogen to the 7-08265 pneumatic actuating cylinder. The rate of operation of the release slaving system must be controlled to give the desired rate of missile rise. Two 0.052-inch diameter hydraulic orifices are installed in the system. One of these orifices is located prior to each of the slave cylinders and aids in controlling travel rate of the release slaving system. A regulator, 7-08327, is installed to reduce the nitrogen pressure (from the 7-08352-803 booster unit) from 2000 psig to 1000 psig. The 7-08307 filter protects these pneumatic units from dirt.

b. The solenoid valve, 99-35002-001, is normally in the de-energized C position, venting both the slave cylinder and the pneumatic actuator cylinder. Valve position B returns the slaving system to the LAUNCH READY position. The A position of the valve actuates the release of the missile from the launcher.

**CAUTION**

Operating instructions for the 99-35002-001 solenoid valve must be carefully followed; improper operation could result in damage to the release cylinders or to the missile.

c. The slaving system also contains a 7-08280 compensator cylinder to allow for an oil volume change due to temperature changes. A visual scale indicates the oil level in the compensator. If the compensator should bottom out or overflow as a result of extreme temperature rise, the 7-08220 relief valve will relieve the excessive system pressure. This system is filled through the 7-08305 filter to avoid contamination. The 7-08212 check valve prevents oil loss when removing the filling connection. Hand valve, 89-34003-010, is installed to isolate the relief valve and the temperature compensator during the filling and bleeding of the release slaving system.

**CAUTION**

Hand valve, 89-34003-010, must be fully open for proper operation of the release system.

d. The return of the slave cylinders to the operating position is accomplished by energizing the 99-35002-001 solenoid valve to the B position; this action pressurizes the 7-08264 slave cylinders through a restrictor check valve, 7-08292, installed in a common return line. This installation eliminates the need to manually return the 7-08396 valves to the operating position.

**2-4. STABILIZER SYSTEM.**

a. The 7-08267 stabilizing cylinders and the 7-08279 temperature compensator are

the main components of the stabilizing system. Each of the two stabilizing cylinders contain upper and lower pistons mounted on a common rod. The upper cylinders are cross-connected and are hydraulically pressurized to provide synchronous vertical motion to the pistons to keep the missile in vertical alignment. The lower pistons of the stabilizing cylinders are pressurized on the bottom side with nitrogen to maintain auxiliary support pin contact with the missile. (See figures 1-1 and 1-2.)

b. The pressure in the hydraulic portion of the stabilizing system is maintained by the 7-08279 temperature compensator which allows for a change of oil volume due to temperature change. A tandem piston arrangement provides a pair of chambers to which the pneumatic lines are connected.

c. As the missile is loaded with fuel and liquid oxygen, the increased weight causes the launcher to deflect at the four contact points. When the missile is fully loaded, the stabilizer pistons sink approximately 0.5 inch placing them approximately 0.55 inch from the bottom of their stroke. With no wind load, the weight distribution at the stabilizing cylinders is 34,000 pounds (Series B and C), and 38,000 pounds (Series D (R and D)). At the release point, the weight distribution is 80,020 pounds (B Series), 88,870 pounds (C Series), and 83,090 pounds (D (R and D) Series).

**NOTE**

All thrust and weight figures included herein are approximate and represent nominal conditions.

d. The effect of a maximum permissible 60 miles per hour side wind load in the vertical (X-X axis) plane of the stabilizer cylinder will produce an ultimate couple of 330,000

pound-feet (B and C Series) and 375,000 pound-feet (D (R and D) Series) for stress purposes at the stabilizer points. (See figure 2-1.) At the same time the compensator is pneumatically charged to a maximum couple capacity of approximately 400,000 pound-feet, preventing total exhaustion of hydraulic chamber pressure during maximum side wind load conditions.

e. The hydraulic system, theoretically, forces synchronization of the vertical motion of the stabilizer system. Launcher structure deflection and internal friction and compressibility of the hydraulic fluid, however, actually cause minor deviations from true synchronous motion.

#### NOTE

Missile centerline deviation should not exceed 15 minutes from true vertical.

f. When the missile is fired and rises to the captive flight position, the load forces on the launcher change as follows: The downward dead weight forces become 249,030 pounds (B Series), 266,730 pounds (C Series), and 264,450 pounds (D (R and D) Series); upward load forces become 196,690 pounds (B Series), 176,840 pounds (C Series), and 201,740 pounds (D (R and D) Series). The launcher deflects relative to the four support points. The stabilizer pistons move up approximately 1.10-inch, primarily as a result of launcher deflections. The 7-08327 regulator valve attempts to maintain a constant pressure setting corresponding to a 34,000 pound stabilizer upward force (B and C Series) and a 38,630 pound stabilizer upward force (D (R and D) Series). In use, however, the regulator supplies a sagging pressure curve of force versus stabilizer rise. The pressure delay amounts to

approximately five percent of the stabilizer thrust and is not effective to the point of causing separation between the stabilizer pins and the balance support longerons.

g. During the initial missile rise, the hydraulic pistons maintain parallel alignment and balance out the wind load effects. In the captive flight position, each cylinder continues to exert the thrusts given in paragraph 2-4c, due to nitrogen pressure; this thrust insures positive contact between the stabilizer pin shoulders and the balance support longerons on the missile. In the event of a limit-condition wind load, this thrust would shift from minimum values (on one side) of 14,000 pounds (B and C Series) and 18,630 pounds (D (R and D) Series), to maximum values of 54,000 pounds (B and C Series) and 58,630 pounds (D (R and D) Series) on the opposite side. Since the stabilizers add thrust to the missile, each main release point must hold down a thrust force (per pin) of 93,340 pounds (B Series), 88,420 pounds (C Series), and 100,870 pounds (D (R and D) Series). These forces include 21,000 pounds of thrust contributed by the rise-off disconnects and exclude wind loads along the Y-Y Axis. If the missile were released under the above conditions, the stabilizing pistons would travel upward 0.1-inch to the positive uppermost stop position which is external to the cylinder. Releasing the load on the launcher would return the hydraulic pressures in the cross connections to a balanced condition; normal hydraulic pressure is 2000 psig.

h. If the missile is not released and the engine thrust decreases, the missile will move from the captive flight position approximately 1.10 inch downward to the rest position. Each stabilizer cylinder supplies increasing support during downward movement. This thrust increase is 34,000-43,500 pounds (B and C Series) and

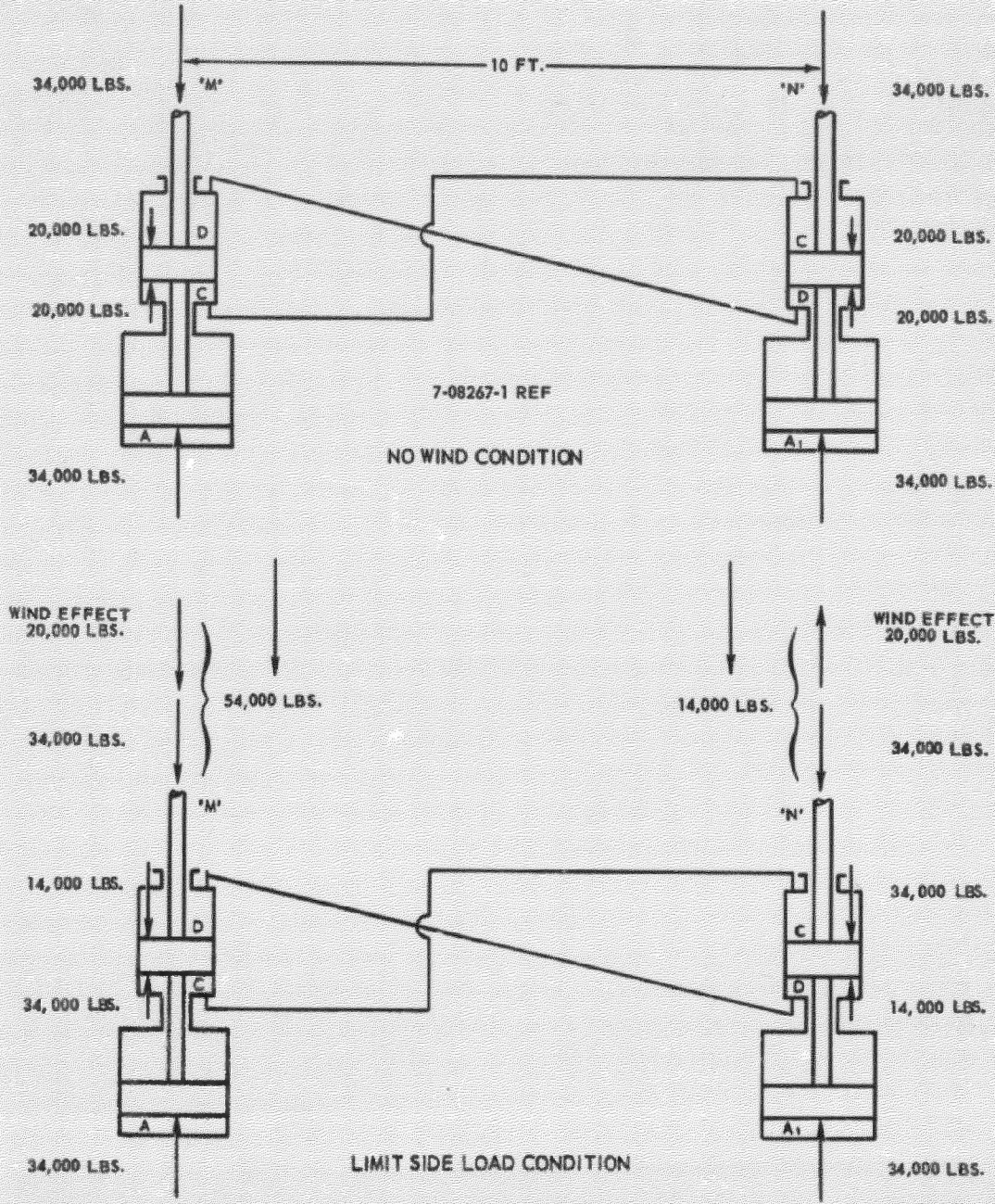


Figure 2-1. Wind Load Effect on Auxiliary Support Stabilizing Cylinders

38,630-49,500 pounds (D (R and D) Series), based on approximate isentropic compression of the nitrogen in the stabilizing cylinder and receiver. This pressure buildup has the desirable effect of decelerating the missile during downward travel.

## NOTE

Some overtravel past the fully loaded position is anticipated, but not as far as the positive stop.

i. Relief valve (part of the 7-08327 regulator) and the 7-08292 restrictor check valves allow the pressure to bleed gradually in order to return the nitrogen to its initial pressure settings of approximately 1200 psig (B and C Series) and 1365 psig (D (R and D) Series). Because of environmental temperature effects and possible internal leakage through the 7-08327 regulator, the relief valve has the additional function of preventing pressure buildup at the stabilizing cylinders.

j. A 98-88500-002 receiver, installed in the pneumatic line near the stabilizer cylinder, prevents excessive deviation from the desired pneumatic pressure. The 7-08292 restrictor check valve permits excessive, heat produced, pressure to escape to the relief valve in the 7-08327 regulator.

k. During missile erection, it is necessary to relieve the pneumatic thrust from the 7-08267 stabilizer cylinders by the following means:

1. For the B and C Series, a 7-08312 three-way control valve is installed in the pneumatic line. This valve simultaneously controls the emergency helium line which is connected through the 7-08215 check valve. This line will supply pressure to support the missile in the event of failure of normal nitrogen supply. The 7-08306 pressure switch in the normal nitrogen supply line provides

a means of detecting such a failure and also triggers a warning device.

2. For the D(R and D) Series, a three-way control valve is installed in the pneumatic line. The emergency helium supply lines of the B and C Series have been removed for the D(R and D) Series launchers. The 7-08306 pressure switch functions as in the B and C launcher installations, described above in paragraph 2-4k, 1.

1. For the B and C Series, the emergency helium line incorporates a 7-08335 orifice to prevent excessive helium consumption in the event of a nitrogen line failure. This restriction device is necessary as the helium source supplies other critical locations.

## 2-5. AUXILIARY FRAME FUNCTION.

a. The auxiliary support frames (see figures 1-1 and 1-2) are designed to swing outward during missile rise-off to provide clearance and prevent contact in the event of missile drift. The two 7-08247 actuating cylinders are preloaded and perform this outward swing automatically as soon as the 7-49006 stabilizer pins are disengaged from the missile balance fitting sockets. Retraction pressure is 2000 psig for all series.

b. To prevent damage to the auxiliary support retraction cylinder, the outlet from the actuator is connected to the 7-08291 receiver through the 7-08292 restrictor check valve. These units bring the auxiliary support frame to a smooth stop as the auxiliary support retraction cylinder stroke is completed. To prevent rebound, the flow back to the cylinder is retarded by the 7-08292 restrictor check valve. The 7-08313 restrictors have the dual purpose of preventing back flow to the relief valve on the 7-08327 regulator during the auxiliary support frame motion

Section II  
Paragraphs 2-6 to 2-7

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and insuring gradual application of source pressure during initial pressurization.

c. The 7-08327 regulator provides the correct pressure to attain full auxiliary support frame retraction while the built-in relief valve relieves pressure buildup due to retraction. This regulator normally supplies 1050 psig pressure for B and C Series and 875 psig for the D(R and D) Series; however, the system of 99-34003-001 manual vent valves and pressure valves provides means for over-riding this pressure through the 99-34975-001 shuttle valve. This over-riding function is necessary for ground handling purposes during missile erection and removal. Three 7-08276 hoses with quick disconnects, prevent inadvertent pressurization of the manual valves.

**CAUTION**

The 7-08276 hoses (red warning streamers attached) must be vented and removed before launching.

2-6. LIQUID NITROGEN FILL AND DUMP LINE, B AND C SERIES.

a. Each of the two liquid nitrogen dump valves, 99-34825-003, are controlled by a 99-35002-002 four-way, three-position, pneumatic solenoid valve. The 7-08295 regulator supplies 500 psig nitrogen to the solenoid valves. A 7-08301 restrictor is mounted prior to the 7-08295 regulator in the 7-89220 control valve installation. This restrictor reduces any gaseous nitrogen surging, preventing possible damage to the liquid nitrogen dump valve. The liquid nitrogen first and second stage supply lines (1 1/2-inch OD tube at 25 psig) are supplied from the 7-08066 ground stubup via the 7-89003 and 7-89081 lines installation; see figures 2-2, 2-3, 2-4, and 2-5, line codes U-1 and U-2.

The 99-35002-002 solenoid provides control for filling the liquid nitrogen system and for dumping prior to launch.

b. The propulsion control valve installation, mounted in Quad I of the launcher, provides the pressure source and regulation for control of the oxidizer and fuel fill drain valves; see figures 2-2, 2-3, 2-4, and 2-5. Check valves in the valve installation prevent movement of the control valves in the event of a loss of nitrogen supply pressure. From valve installation, lines are routed to disconnect panels and to oxidizer and fuel valves. For data on line nomenclature, codes, sizes, fluid types, and pressures, see figures 2-2, 2-3, 2-4, and 2-5.

2-7. LAUNCHER TO MISSILE SERVICE LINES.

NOTE

See figures 2-2, 2-3, 2-4 and 2-5 for line data and rise-off disconnects.

a. Service lines C6, A1, A2, E, and H pass from the stubups, through the 7-09224 relief valve unit (located next to the launcher in Quad III), to the rise-off disconnects via the launcher. The primary function of the 7-09224 relief valve unit is to prevent excessive pressure buildup in the missile tank pressurization system.

b. For B and C Series, a fuel start tank is mounted on the auxiliary support frame in Quad I and is pressurized to 2200 psig with gaseous nitrogen. The JP fuel travels from the tank through a flexible hose to the rise-off disconnects in Quad II; see figures 2-4 and 2-5, lines JJ and J4.

c. For B and C Series, the hydraulic reservoir pressurization lines must be manually



B

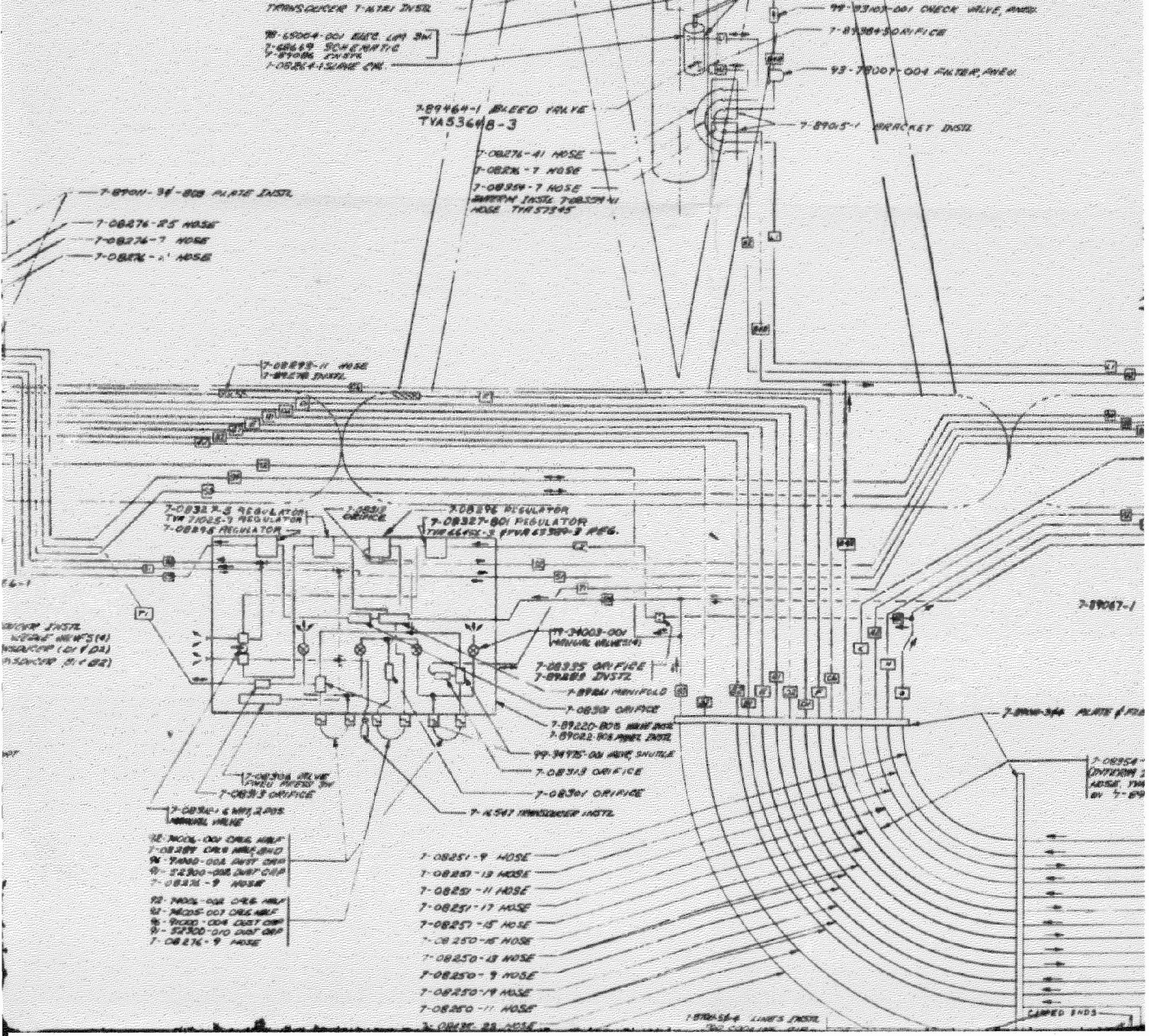
- 12 1st STAGE LINES TO SHROUD
- 11 1st STAGE LINES TO SHROUD
- 10 FUEL START LINE
- 9 2nd STAGE HYDRAULIC PRESSURE
- 8 1st STAGE HYDRAULIC PRESSURE
- 7 FUEL TANK PRESSURIZATION
- 6 FUEL TANK PRESSURE SENSING
- 5 1st STAGE HYDRAULIC RETURN
- 4 1st STAGE HYDRAULIC RETURN
- 3 HELIUM CHARGE
- 2 7-89439 OSG COVER INSTL.
- 1 7-89004 OSG INSTL. (INCLUDES FLEX HOSES)

HYDRAULIC LINES  
SEE 7-8114 SCHEMATIC  
7-89001 SCHEMATIC  
7-89002 SCHEMATIC

- SEE TABLE NO. 1 FOR DISCONNECT PART NOS
- 7-08252-13 HOSE
- 7-08252-11 HOSE
- 7-08252-7 HOSE
- 7-08252-17 HOSE
- 7-08252-12 HOSE
- 7-08252-9 HOSE

- 7-89366 CR ASST
- 7-49002 INSTL.
- 7-49193 LINE ASST
- 7-49003 INSTL.

- 7-89001-805 VALVE INSTL.
- 7-89001-807 VALVE INSTL.



- TRANSDUCER 7-4741 INSTL.
- 7-89004-001 BARGE CAP 3IN
- 7-89001-806 ORIFICE
- 7-08251-13 ORIFICE

- 7-08276-41 HOSE
- 7-08276-7 HOSE
- 7-08276-1 HOSE
- 7-08276-11 HOSE
- 7-08276-12 HOSE
- 7-08276-13 HOSE
- 7-08276-17 HOSE
- 7-08276-15 HOSE
- 7-08250-15 HOSE
- 7-08250-13 HOSE
- 7-08250-9 HOSE
- 7-08250-19 HOSE
- 7-08250-11 HOSE
- 7-08250-22 HOSE

- 7-89001-34-808 PLATE INSTL.
- 7-08276-15 HOSE
- 7-08276-7 HOSE
- 7-08276-1 HOSE

- 7-08276-11 HOSE
- 7-08276-12 HOSE

- 7-08327-801 REGULATOR
- 7-08327-802 REGULATOR
- 7-08327-803 REGULATOR
- 7-08327-804 REGULATOR
- 7-08327-805 REGULATOR
- 7-08327-806 REGULATOR
- 7-08327-807 REGULATOR
- 7-08327-808 REGULATOR
- 7-08327-809 REGULATOR
- 7-08327-810 REGULATOR
- 7-08327-811 REGULATOR
- 7-08327-812 REGULATOR
- 7-08327-813 REGULATOR
- 7-08327-814 REGULATOR
- 7-08327-815 REGULATOR
- 7-08327-816 REGULATOR
- 7-08327-817 REGULATOR
- 7-08327-818 REGULATOR
- 7-08327-819 REGULATOR
- 7-08327-820 REGULATOR
- 7-08327-821 REGULATOR
- 7-08327-822 REGULATOR
- 7-08327-823 REGULATOR
- 7-08327-824 REGULATOR
- 7-08327-825 REGULATOR
- 7-08327-826 REGULATOR
- 7-08327-827 REGULATOR
- 7-08327-828 REGULATOR
- 7-08327-829 REGULATOR
- 7-08327-830 REGULATOR
- 7-08327-831 REGULATOR
- 7-08327-832 REGULATOR
- 7-08327-833 REGULATOR
- 7-08327-834 REGULATOR
- 7-08327-835 REGULATOR
- 7-08327-836 REGULATOR
- 7-08327-837 REGULATOR
- 7-08327-838 REGULATOR
- 7-08327-839 REGULATOR
- 7-08327-840 REGULATOR
- 7-08327-841 REGULATOR
- 7-08327-842 REGULATOR
- 7-08327-843 REGULATOR
- 7-08327-844 REGULATOR
- 7-08327-845 REGULATOR
- 7-08327-846 REGULATOR
- 7-08327-847 REGULATOR
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- 7-08327-850 REGULATOR
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- 7-08327-864 REGULATOR
- 7-08327-865 REGULATOR
- 7-08327-866 REGULATOR
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- 7-08327-870 REGULATOR
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- 7-08327-883 REGULATOR
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- 7-08327-888 REGULATOR
- 7-08327-889 REGULATOR
- 7-08327-890 REGULATOR
- 7-08327-891 REGULATOR
- 7-08327-892 REGULATOR
- 7-08327-893 REGULATOR
- 7-08327-894 REGULATOR
- 7-08327-895 REGULATOR
- 7-08327-896 REGULATOR
- 7-08327-897 REGULATOR
- 7-08327-898 REGULATOR
- 7-08327-899 REGULATOR
- 7-08327-900 REGULATOR

- 7-08251-9 HOSE
- 7-08251-13 HOSE
- 7-08251-11 HOSE
- 7-08251-17 HOSE
- 7-08251-15 HOSE
- 7-08250-15 HOSE
- 7-08250-13 HOSE
- 7-08250-9 HOSE
- 7-08250-19 HOSE
- 7-08250-11 HOSE
- 7-08250-22 HOSE

- 7-08251-9 HOSE
- 7-08251-13 HOSE
- 7-08251-11 HOSE
- 7-08251-17 HOSE
- 7-08251-15 HOSE
- 7-08250-15 HOSE
- 7-08250-13 HOSE
- 7-08250-9 HOSE
- 7-08250-19 HOSE
- 7-08250-11 HOSE
- 7-08250-22 HOSE

7-89001-805 PLATE (FUEL)

7-89001-805 PLATE (FUEL)

C

NO AIRBORNE LINES  
SEE 7-8101 SCHEMATIC

ENGINE CONTROL  
LOX TANK PRESSURIZATION  
LOX TANK PRESSURE SENSING

QUAD III QUAD IV

7-89464-1 BLEED VALVE  
7-1A53648-3

7-1A53648-3

7-89464-1 BLEED VALVE  
7-89002 INSTL

7-89002-002  
ANNU REGENER  
7-89029 INSTL

SEE TABLE NO. 1  
FOR DISCONNECT  
PART NUMBERS OF

7-89005-1 OILG INSTL  
(MILITARY PLR -058)

7-89029-1 CHECK VALVE  
7-89029 INSTL

7-89492-1 ANNU CHECK VALVE  
7-89492 INSTL

7-89002-1 FILTER

7-89002-1 CHECK VALVE AND

7-89464-1 BLEED VALVE  
7-1A53645-3

7-89029-1 COMPENSATOR  
AND STR

7-89009-001 COMPENSATOR INSTL  
7-89009-002 ANNU VALVE  
7-89009 INSTL

7-89009-1 ANNU RESTROOM  
CHECK VALVE

7-89009-1 PLATE INSTL  
7-89009-1 PLATE

7-89005-1 FILTER AND

7-89005-1 HYDRAULIC OIL  
METER

7-89005-1 OIL METER AND

7-89005-1 RELIEF VALVE AND

7-89005-1 ANNU CHECK VALVE

7-89005-1 OIL METER

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89005-1 OIL METER AND

7-89026-15 HOSE  
7-89026-41 HOSE  
7-89026-7 HOSE  
7-89026-25 HOSE  
7-89026-801-801  
PLATE INSTL  
(SEE 7-89009-1 PLATE)

7-89067-1 REGULATOR INSTL  
7-89067-001 REGULATOR  
(MILITARY PLR -059)  
7-89067-01 HOSE  
7-89067-05 HOSE

7-89067-1 PLATE (FLY HOSE INSTL)  
7-89067-1 PLATE  
(CONTAINS 7-89067-01  
HOSE, 7-89067-05  
BY 5-89000)

RELIEF VALVE UNIT  
7-89005

PRESSURE SWITCH

7-89006-805 VALVE INSTL  
7-89006-807 VALVE INSTL

7-89036-1 VALVE AND OIL CR

7-89036-1 CHECK VALVE AND OIL

7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL

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7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL

7-89036-1 OIL FILTER AND OIL



D

E

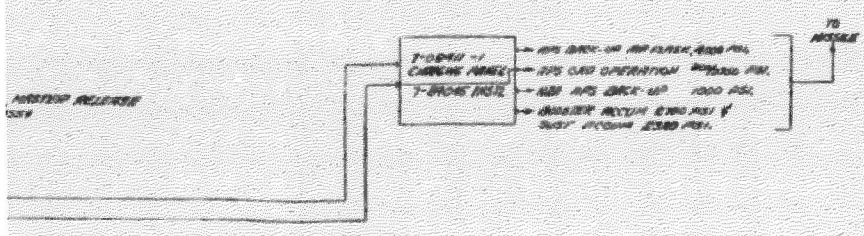
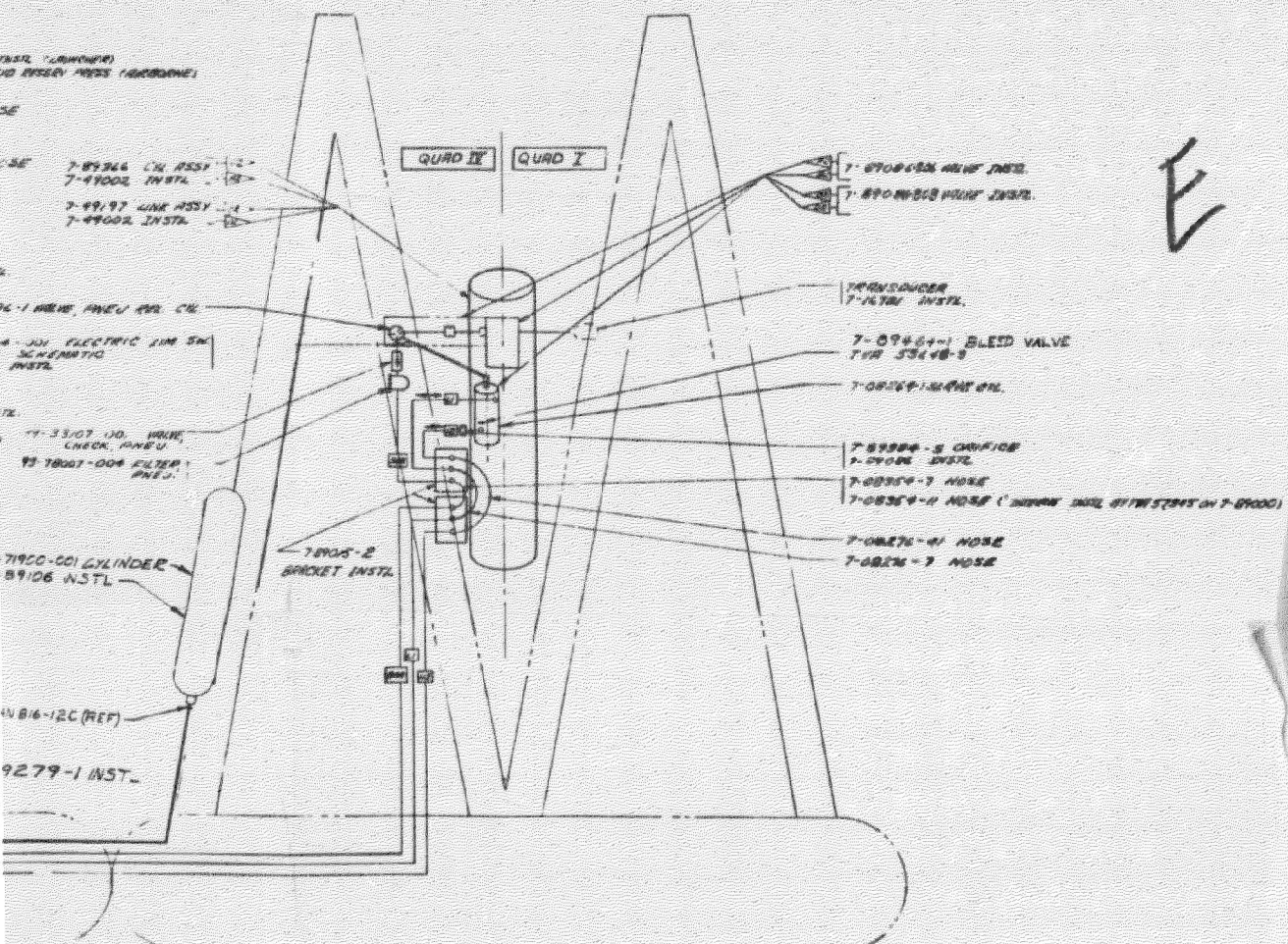


TABLE 23

LINE CODE	TYPE	SIZE (IN)	WGT (LBS)	APPROX. PRICE	APPROX. WEIGHT (LBS)	TYPE	REMARKS
01	02	0.35	0.05	1.5	0.05	0.05	0.05
02	03	0.35	0.05	1.5	0.05	0.05	0.05
03	04	0.35	0.05	1.5	0.05	0.05	0.05
04	05	0.35	0.05	1.5	0.05	0.05	0.05
05	06	0.35	0.05	1.5	0.05	0.05	0.05
06	07	0.35	0.05	1.5	0.05	0.05	0.05
07	08	0.35	0.05	1.5	0.05	0.05	0.05
08	09	0.35	0.05	1.5	0.05	0.05	0.05
09	10	0.35	0.05	1.5	0.05	0.05	0.05
10	11	0.35	0.05	1.5	0.05	0.05	0.05
11	12	0.35	0.05	1.5	0.05	0.05	0.05
12	13	0.35	0.05	1.5	0.05	0.05	0.05
13	14	0.35	0.05	1.5	0.05	0.05	0.05
14	15	0.35	0.05	1.5	0.05	0.05	0.05
15	16	0.35	0.05	1.5	0.05	0.05	0.05
16	17	0.35	0.05	1.5	0.05	0.05	0.05
17	18	0.35	0.05	1.5	0.05	0.05	0.05
18	19	0.35	0.05	1.5	0.05	0.05	0.05
19	20	0.35	0.05	1.5	0.05	0.05	0.05
20	21	0.35	0.05	1.5	0.05	0.05	0.05
21	22	0.35	0.05	1.5	0.05	0.05	0.05
22	23	0.35	0.05	1.5	0.05	0.05	0.05
23	24	0.35	0.05	1.5	0.05	0.05	0.05
24	25	0.35	0.05	1.5	0.05	0.05	0.05
25	26	0.35	0.05	1.5	0.05	0.05	0.05
26	27	0.35	0.05	1.5	0.05	0.05	0.05
27	28	0.35	0.05	1.5	0.05	0.05	0.05
28	29	0.35	0.05	1.5	0.05	0.05	0.05
29	30	0.35	0.05	1.5	0.05	0.05	0.05
30	31	0.35	0.05	1.5	0.05	0.05	0.05
31	32	0.35	0.05	1.5	0.05	0.05	0.05
32	33	0.35	0.05	1.5	0.05	0.05	0.05
33	34	0.35	0.05	1.5	0.05	0.05	0.05
34	35	0.35	0.05	1.5	0.05	0.05	0.05
35	36	0.35	0.05	1.5	0.05	0.05	0.05
36	37	0.35	0.05	1.5	0.05	0.05	0.05
37	38	0.35	0.05	1.5	0.05	0.05	0.05
38	39	0.35	0.05	1.5	0.05	0.05	0.05
39	40	0.35	0.05	1.5	0.05	0.05	0.05
40	41	0.35	0.05	1.5	0.05	0.05	0.05
41	42	0.35	0.05	1.5	0.05	0.05	0.05
42	43	0.35	0.05	1.5	0.05	0.05	0.05
43	44	0.35	0.05	1.5	0.05	0.05	0.05
44	45	0.35	0.05	1.5	0.05	0.05	0.05
45	46	0.35	0.05	1.5	0.05	0.05	0.05
46	47	0.35	0.05	1.5	0.05	0.05	0.05
47	48	0.35	0.05	1.5	0.05	0.05	0.05
48	49	0.35	0.05	1.5	0.05	0.05	0.05
49	50	0.35	0.05	1.5	0.05	0.05	0.05
50	51	0.35	0.05	1.5	0.05	0.05	0.05
51	52	0.35	0.05	1.5	0.05	0.05	0.05
52	53	0.35	0.05	1.5	0.05	0.05	0.05
53	54	0.35	0.05	1.5	0.05	0.05	0.05
54	55	0.35	0.05	1.5	0.05	0.05	0.05
55	56	0.35	0.05	1.5	0.05	0.05	0.05
56	57	0.35	0.05	1.5	0.05	0.05	0.05
57	58	0.35	0.05	1.5	0.05	0.05	0.05
58	59	0.35	0.05	1.5	0.05	0.05	0.05
59	60	0.35	0.05	1.5	0.05	0.05	0.05
60	61	0.35	0.05	1.5	0.05	0.05	0.05
61	62	0.35	0.05	1.5	0.05	0.05	0.05
62	63	0.35	0.05	1.5	0.05	0.05	0.05
63	64	0.35	0.05	1.5	0.05	0.05	0.05
64	65	0.35	0.05	1.5	0.05	0.05	0.05
65	66	0.35	0.05	1.5	0.05	0.05	0.05
66	67	0.35	0.05	1.5	0.05	0.05	0.05
67	68	0.35	0.05	1.5	0.05	0.05	0.05
68	69	0.35	0.05	1.5	0.05	0.05	0.05
69	70	0.35	0.05	1.5	0.05	0.05	0.05
70	71	0.35	0.05	1.5	0.05	0.05	0.05
71	72	0.35	0.05	1.5	0.05	0.05	0.05
72	73	0.35	0.05	1.5	0.05	0.05	0.05
73	74	0.35	0.05	1.5	0.05	0.05	0.05
74	75	0.35	0.05	1.5	0.05	0.05	0.05
75	76	0.35	0.05	1.5	0.05	0.05	0.05
76	77	0.35	0.05	1.5	0.05	0.05	0.05
77	78	0.35	0.05	1.5	0.05	0.05	0.05
78	79	0.35	0.05	1.5	0.05	0.05	0.05
79	80	0.35	0.05	1.5	0.05	0.05	0.05
80	81	0.35	0.05	1.5	0.05	0.05	0.05
81	82	0.35	0.05	1.5	0.05	0.05	0.05
82	83	0.35	0.05	1.5	0.05	0.05	0.05
83	84	0.35	0.05	1.5	0.05	0.05	0.05
84	85	0.35	0.05	1.5	0.05	0.05	0.05
85	86	0.35	0.05	1.5	0.05	0.05	0.05
86	87	0.35	0.05	1.5	0.05	0.05	0.05
87	88	0.35	0.05	1.5	0.05	0.05	0.05
88	89	0.35	0.05	1.5	0.05	0.05	0.05
89	90	0.35	0.05	1.5	0.05	0.05	0.05
90	91	0.35	0.05	1.5	0.05	0.05	0.05
91	92	0.35	0.05	1.5	0.05	0.05	0.05
92	93	0.35	0.05	1.5	0.05	0.05	0.05
93	94	0.35	0.05	1.5	0.05	0.05	0.05
94	95	0.35	0.05	1.5	0.05	0.05	0.05
95	96	0.35	0.05	1.5	0.05	0.05	0.05
96	97	0.35	0.05	1.5	0.05	0.05	0.05
97	98	0.35	0.05	1.5	0.05	0.05	0.05
98	99	0.35	0.05	1.5	0.05	0.05	0.05
99	100	0.35	0.05	1.5	0.05	0.05	0.05

SEE 7-07404 FOR STRAP-UP GEAR LOCATION & INSTL DATA



001 REC. LAB 204  
SCHEMATIC  
24-200  
4-1-5000 CN

7-8964-1 BLEED VALVE  
TVA5364B-3

7-08274-41 NOSE  
7-08276-7 NOSE  
7-08278-7 NOSE  
BYPASS INSTL 7-08274-41  
NOSE TVA5364B-3

7-8965-1 BRACKET INSTL

PS-77007-004 FILTER, 1/2 IN

7-08276-15 NOSE  
7-08276-41 NOSE  
7-08276-7 NOSE  
7-08276-25 NOSE

7-8708-2014-201  
PLATE INSTL  
(BY 7-8708-19-201)

7-11 ANNE  
DUSTL

7-11 ANNE  
DUSTL

7-08276 REGULATOR  
7-08327-801 REGULATOR  
TVA5364B-3 BY 7-8964-1

7-08385 ORIFICE  
7-08388 INSTL

7-08391 ORIFICE

7-08394 ORIFICE

7-08395 ORIFICE

7-08391 ORIFICE

7-4567 INSULATOR INSTL

7-89067-1 REGULATOR INSTL

7-08307 FILTER, 1/2 IN  
7-08327-808 REGULATED  
TVA5364B-3 BY 7-8964-1  
7-08328-21 NOSE  
7-08328-45 NOSE

7-8708-2014 PLATE & FLET NOSE INSTL

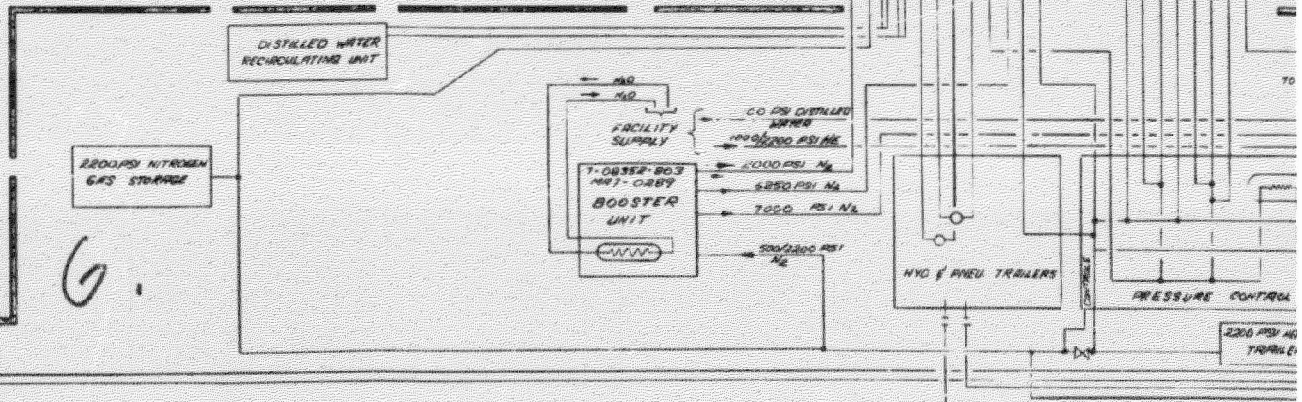
7-08354-9 NOSE  
CONTAINS 7-08354-13  
NOSE, TVA5364B-3  
(BY 7-8708-201)

7-08251-9 NOSE  
7-08251-13 NOSE  
7-08251-14 NOSE  
7-08251-17 NOSE  
7-08251-18 NOSE  
7-08251-25 NOSE  
7-08250-15 NOSE  
7-08250-18 NOSE  
7-08250-9 NOSE  
7-08250-19 NOSE  
7-08250-11 NOSE  
7-08250-23 NOSE  
7-08251-19 NOSE

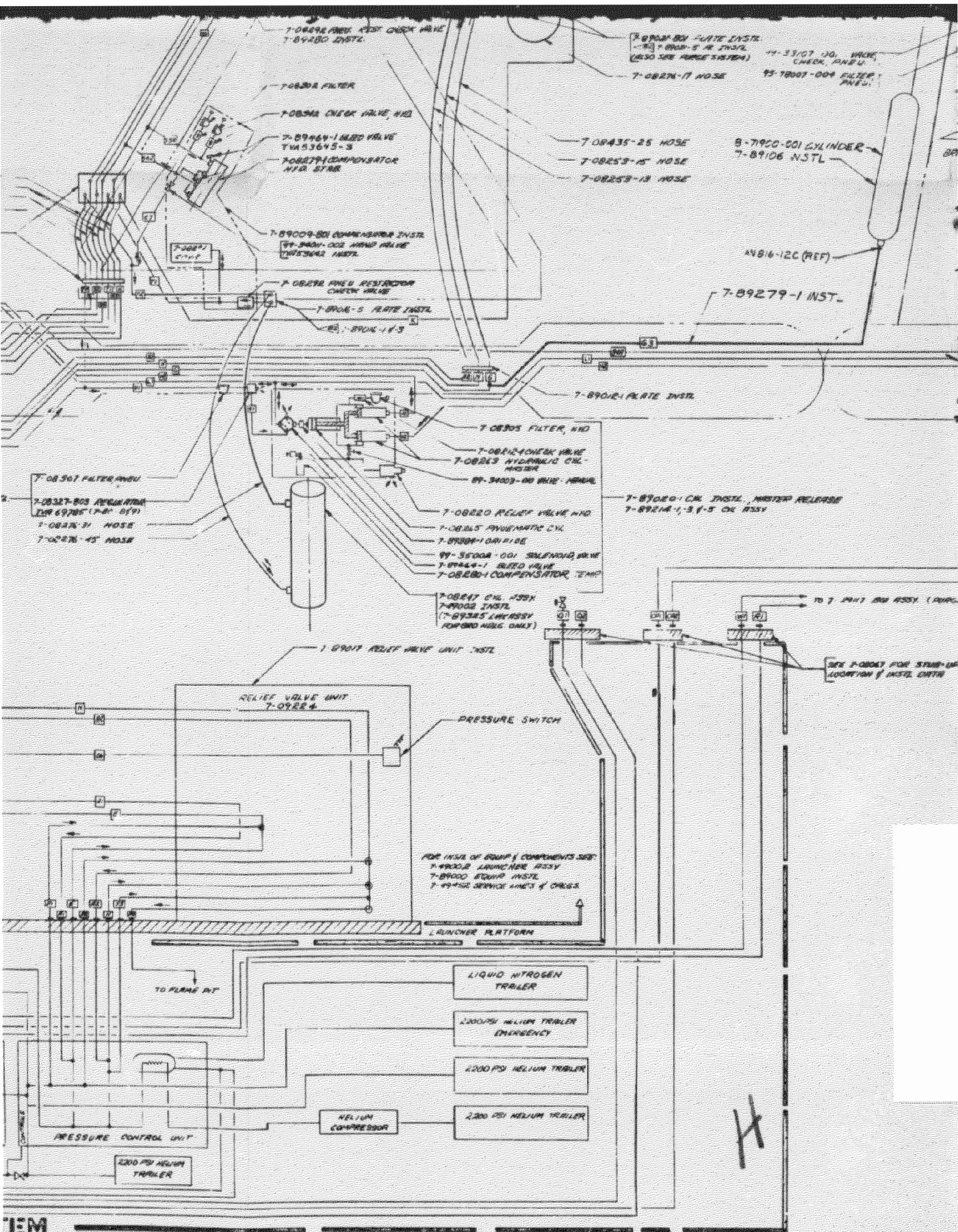
7-8708-2014 LINES INSTL  
AND COOLING, AIR  
& WATER

NOT INSTALLED - REF 7-08304 FILTER  
7-08067 STUB - 6" LINES  
DUCTING AND LINES & COOLING

CAPPED ENDS



# GRID PRESS SYSTEM



ITEM

ISSUED



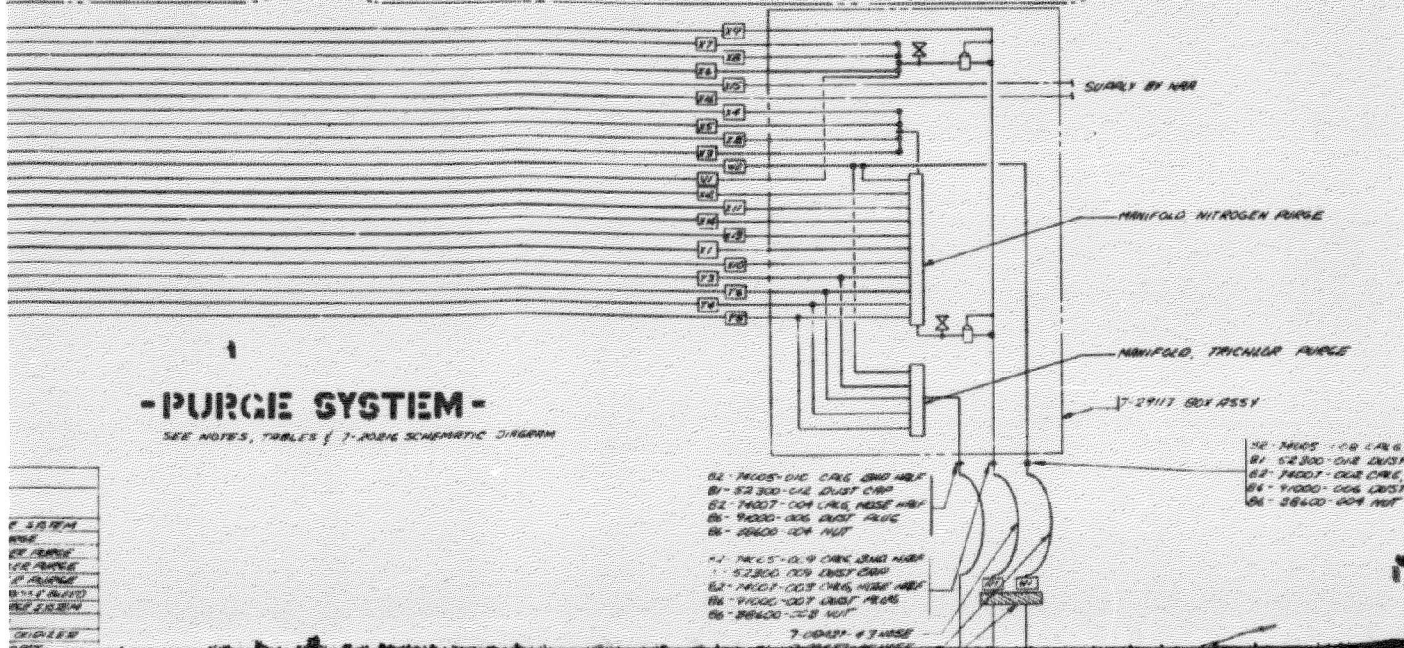
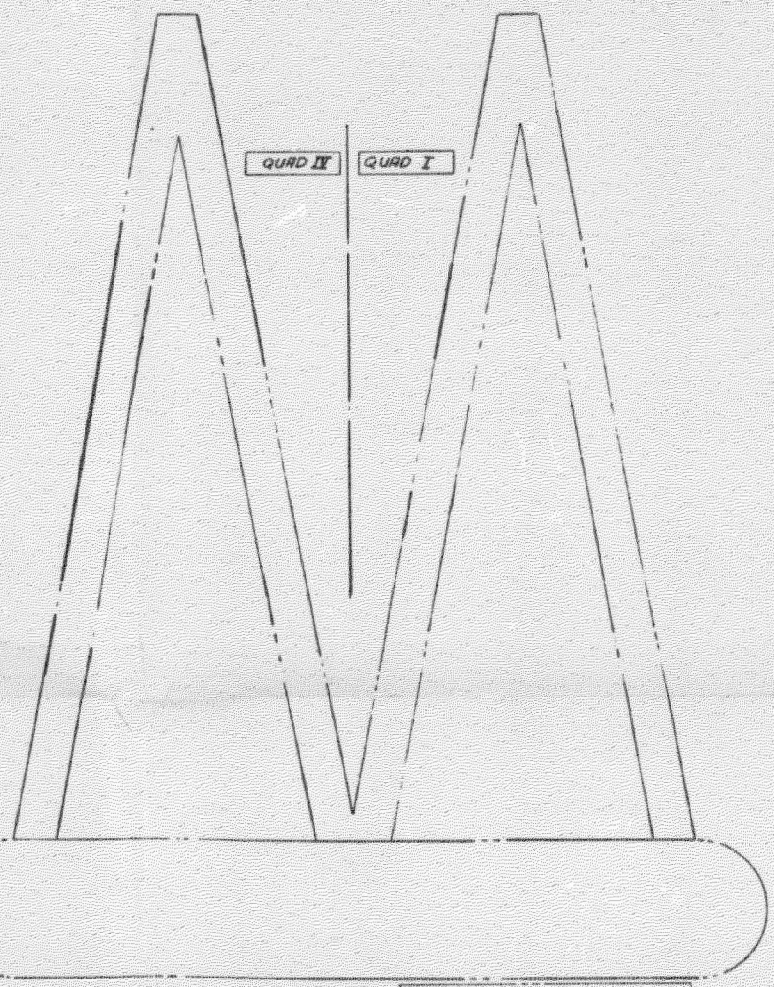


B

CREG. ASSY (6000, 14)  
 7-20408 SCHEMATIC

7-20401-801 PLATE INST.  
 7-20423-9 HOSES (8)

7-20401-801 PLATE INST.  
 7-20423-9 HOSES (8)



**-PURGE SYSTEM-**  
 SEE NOTES, TABLES ( 7-20408 SCHEMATIC DIAGRAM

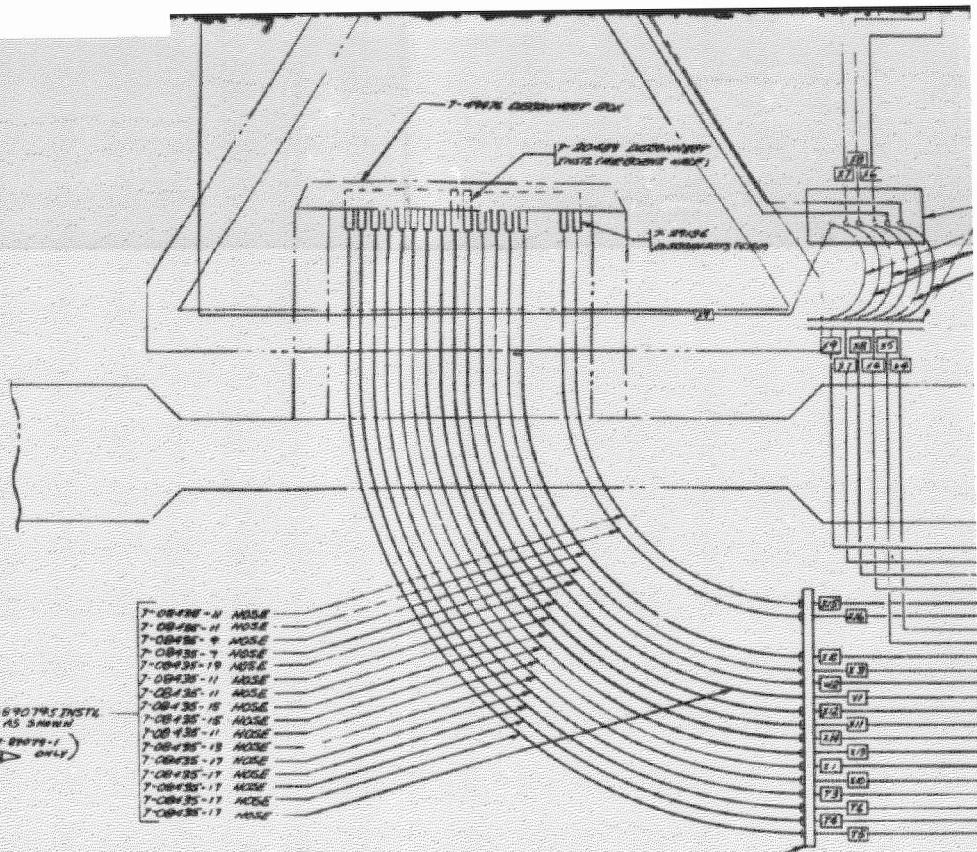
- 81- 74005-006 CABLE 2004 INST
- 82- 74007-004 CABLE HOSE INST
- 83- 74000-006 CABLE HOSE INST
- 84- 20600-004 INST

- 85- 74005-006 CABLE
- 86- 74007-004 CABLE
- 87- 74000-006 CABLE
- 88- 20600-004 INST

7-20401-801 PLATE INST.  
 7-20423-9 HOSES (8)







**TABLE 20**

WIRING NO.	LINE CODE	DESCRIPTION
7-89438-11	W	FUEL STRAT. LAMINAR
7-89438-12	W	WASTE NO. 1 STRAT. LAMINAR
7-89438-13	W	WASTE NO. 2 STRAT. LAMINAR
7-89438-14	W	WASTE NO. 3 STRAT. LAMINAR
7-89438-15	W	WASTE NO. 4 STRAT. LAMINAR
7-89438-16	W	WASTE NO. 5 STRAT. LAMINAR
7-89438-17	W	WASTE NO. 6 STRAT. LAMINAR
7-89438-18	W	WASTE NO. 7 STRAT. LAMINAR
7-89438-19	W	WASTE NO. 8 STRAT. LAMINAR
7-89438-20	W	WASTE NO. 9 STRAT. LAMINAR
7-89438-21	W	WASTE NO. 10 STRAT. LAMINAR
7-89438-22	W	WASTE NO. 11 STRAT. LAMINAR
7-89438-23	W	WASTE NO. 12 STRAT. LAMINAR
7-89438-24	W	WASTE NO. 13 STRAT. LAMINAR
7-89438-25	W	WASTE NO. 14 STRAT. LAMINAR
7-89438-26	W	WASTE NO. 15 STRAT. LAMINAR
7-89438-27	W	WASTE NO. 16 STRAT. LAMINAR
7-89438-28	W	WASTE NO. 17 STRAT. LAMINAR
7-89438-29	W	WASTE NO. 18 STRAT. LAMINAR
7-89438-30	W	WASTE NO. 19 STRAT. LAMINAR
7-89438-31	W	WASTE NO. 20 STRAT. LAMINAR
7-89438-32	W	WASTE NO. 21 STRAT. LAMINAR
7-89438-33	W	WASTE NO. 22 STRAT. LAMINAR
7-89438-34	W	WASTE NO. 23 STRAT. LAMINAR
7-89438-35	W	WASTE NO. 24 STRAT. LAMINAR
7-89438-36	W	WASTE NO. 25 STRAT. LAMINAR
7-89438-37	W	WASTE NO. 26 STRAT. LAMINAR
7-89438-38	W	WASTE NO. 27 STRAT. LAMINAR
7-89438-39	W	WASTE NO. 28 STRAT. LAMINAR
7-89438-40	W	WASTE NO. 29 STRAT. LAMINAR

**TABLE 25: PURGE SYSTEM LINES**

LINE NO.	LINE CODE	DESCRIPTION	WIRING NO.	WIRING CODE	WIRING DESCRIPTION	WIRING CODE	WIRING DESCRIPTION	WIRING CODE	WIRING DESCRIPTION
1	W	FUEL STRAT. LAMINAR	7-89438-11	W	FUEL STRAT. LAMINAR	7-89438-11	W	FUEL STRAT. LAMINAR	7-89438-11
2	W	WASTE NO. 1 STRAT. LAMINAR	7-89438-12	W	WASTE NO. 1 STRAT. LAMINAR	7-89438-12	W	WASTE NO. 1 STRAT. LAMINAR	7-89438-12
3	W	WASTE NO. 2 STRAT. LAMINAR	7-89438-13	W	WASTE NO. 2 STRAT. LAMINAR	7-89438-13	W	WASTE NO. 2 STRAT. LAMINAR	7-89438-13
4	W	WASTE NO. 3 STRAT. LAMINAR	7-89438-14	W	WASTE NO. 3 STRAT. LAMINAR	7-89438-14	W	WASTE NO. 3 STRAT. LAMINAR	7-89438-14
5	W	WASTE NO. 4 STRAT. LAMINAR	7-89438-15	W	WASTE NO. 4 STRAT. LAMINAR	7-89438-15	W	WASTE NO. 4 STRAT. LAMINAR	7-89438-15
6	W	WASTE NO. 5 STRAT. LAMINAR	7-89438-16	W	WASTE NO. 5 STRAT. LAMINAR	7-89438-16	W	WASTE NO. 5 STRAT. LAMINAR	7-89438-16
7	W	WASTE NO. 6 STRAT. LAMINAR	7-89438-17	W	WASTE NO. 6 STRAT. LAMINAR	7-89438-17	W	WASTE NO. 6 STRAT. LAMINAR	7-89438-17
8	W	WASTE NO. 7 STRAT. LAMINAR	7-89438-18	W	WASTE NO. 7 STRAT. LAMINAR	7-89438-18	W	WASTE NO. 7 STRAT. LAMINAR	7-89438-18
9	W	WASTE NO. 8 STRAT. LAMINAR	7-89438-19	W	WASTE NO. 8 STRAT. LAMINAR	7-89438-19	W	WASTE NO. 8 STRAT. LAMINAR	7-89438-19
10	W	WASTE NO. 9 STRAT. LAMINAR	7-89438-20	W	WASTE NO. 9 STRAT. LAMINAR	7-89438-20	W	WASTE NO. 9 STRAT. LAMINAR	7-89438-20
11	W	WASTE NO. 10 STRAT. LAMINAR	7-89438-21	W	WASTE NO. 10 STRAT. LAMINAR	7-89438-21	W	WASTE NO. 10 STRAT. LAMINAR	7-89438-21
12	W	WASTE NO. 11 STRAT. LAMINAR	7-89438-22	W	WASTE NO. 11 STRAT. LAMINAR	7-89438-22	W	WASTE NO. 11 STRAT. LAMINAR	7-89438-22
13	W	WASTE NO. 12 STRAT. LAMINAR	7-89438-23	W	WASTE NO. 12 STRAT. LAMINAR	7-89438-23	W	WASTE NO. 12 STRAT. LAMINAR	7-89438-23
14	W	WASTE NO. 13 STRAT. LAMINAR	7-89438-24	W	WASTE NO. 13 STRAT. LAMINAR	7-89438-24	W	WASTE NO. 13 STRAT. LAMINAR	7-89438-24
15	W	WASTE NO. 14 STRAT. LAMINAR	7-89438-25	W	WASTE NO. 14 STRAT. LAMINAR	7-89438-25	W	WASTE NO. 14 STRAT. LAMINAR	7-89438-25
16	W	WASTE NO. 15 STRAT. LAMINAR	7-89438-26	W	WASTE NO. 15 STRAT. LAMINAR	7-89438-26	W	WASTE NO. 15 STRAT. LAMINAR	7-89438-26
17	W	WASTE NO. 16 STRAT. LAMINAR	7-89438-27	W	WASTE NO. 16 STRAT. LAMINAR	7-89438-27	W	WASTE NO. 16 STRAT. LAMINAR	7-89438-27
18	W	WASTE NO. 17 STRAT. LAMINAR	7-89438-28	W	WASTE NO. 17 STRAT. LAMINAR	7-89438-28	W	WASTE NO. 17 STRAT. LAMINAR	7-89438-28
19	W	WASTE NO. 18 STRAT. LAMINAR	7-89438-29	W	WASTE NO. 18 STRAT. LAMINAR	7-89438-29	W	WASTE NO. 18 STRAT. LAMINAR	7-89438-29
20	W	WASTE NO. 19 STRAT. LAMINAR	7-89438-30	W	WASTE NO. 19 STRAT. LAMINAR	7-89438-30	W	WASTE NO. 19 STRAT. LAMINAR	7-89438-30
21	W	WASTE NO. 20 STRAT. LAMINAR	7-89438-31	W	WASTE NO. 20 STRAT. LAMINAR	7-89438-31	W	WASTE NO. 20 STRAT. LAMINAR	7-89438-31
22	W	WASTE NO. 21 STRAT. LAMINAR	7-89438-32	W	WASTE NO. 21 STRAT. LAMINAR	7-89438-32	W	WASTE NO. 21 STRAT. LAMINAR	7-89438-32
23	W	WASTE NO. 22 STRAT. LAMINAR	7-89438-33	W	WASTE NO. 22 STRAT. LAMINAR	7-89438-33	W	WASTE NO. 22 STRAT. LAMINAR	7-89438-33
24	W	WASTE NO. 23 STRAT. LAMINAR	7-89438-34	W	WASTE NO. 23 STRAT. LAMINAR	7-89438-34	W	WASTE NO. 23 STRAT. LAMINAR	7-89438-34
25	W	WASTE NO. 24 STRAT. LAMINAR	7-89438-35	W	WASTE NO. 24 STRAT. LAMINAR	7-89438-35	W	WASTE NO. 24 STRAT. LAMINAR	7-89438-35
26	W	WASTE NO. 25 STRAT. LAMINAR	7-89438-36	W	WASTE NO. 25 STRAT. LAMINAR	7-89438-36	W	WASTE NO. 25 STRAT. LAMINAR	7-89438-36
27	W	WASTE NO. 26 STRAT. LAMINAR	7-89438-37	W	WASTE NO. 26 STRAT. LAMINAR	7-89438-37	W	WASTE NO. 26 STRAT. LAMINAR	7-89438-37
28	W	WASTE NO. 27 STRAT. LAMINAR	7-89438-38	W	WASTE NO. 27 STRAT. LAMINAR	7-89438-38	W	WASTE NO. 27 STRAT. LAMINAR	7-89438-38
29	W	WASTE NO. 28 STRAT. LAMINAR	7-89438-39	W	WASTE NO. 28 STRAT. LAMINAR	7-89438-39	W	WASTE NO. 28 STRAT. LAMINAR	7-89438-39
30	W	WASTE NO. 29 STRAT. LAMINAR	7-89438-40	W	WASTE NO. 29 STRAT. LAMINAR	7-89438-40	W	WASTE NO. 29 STRAT. LAMINAR	7-89438-40

**TABLE 21: RISE-OFF DISCONNECTS**

LINE CODE	WIRING NO.	WIRING CODE	WIRING DESCRIPTION
A1	7-89438-11	7-89438-11	FUEL STRAT. LAMINAR
A2	7-89438-12	7-89438-12	WASTE NO. 1 STRAT. LAMINAR
B1	7-89438-13	7-89438-13	WASTE NO. 2 STRAT. LAMINAR
B2	7-89438-14	7-89438-14	WASTE NO. 3 STRAT. LAMINAR
C1	7-89438-15	7-89438-15	WASTE NO. 4 STRAT. LAMINAR
C2	7-89438-16	7-89438-16	WASTE NO. 5 STRAT. LAMINAR
D	7-89438-17	7-89438-17	WASTE NO. 6 STRAT. LAMINAR
E	7-89438-18	7-89438-18	WASTE NO. 7 STRAT. LAMINAR
F	7-89438-19	7-89438-19	WASTE NO. 8 STRAT. LAMINAR
G	7-89438-20	7-89438-20	WASTE NO. 9 STRAT. LAMINAR
H	7-89438-21	7-89438-21	WASTE NO. 10 STRAT. LAMINAR
J6	7-89438-22	7-89438-22	WASTE NO. 11 STRAT. LAMINAR
Q1	7-89438-23	7-89438-23	WASTE NO. 12 STRAT. LAMINAR
Q2	7-89438-24	7-89438-24	WASTE NO. 13 STRAT. LAMINAR

22.16-6.2

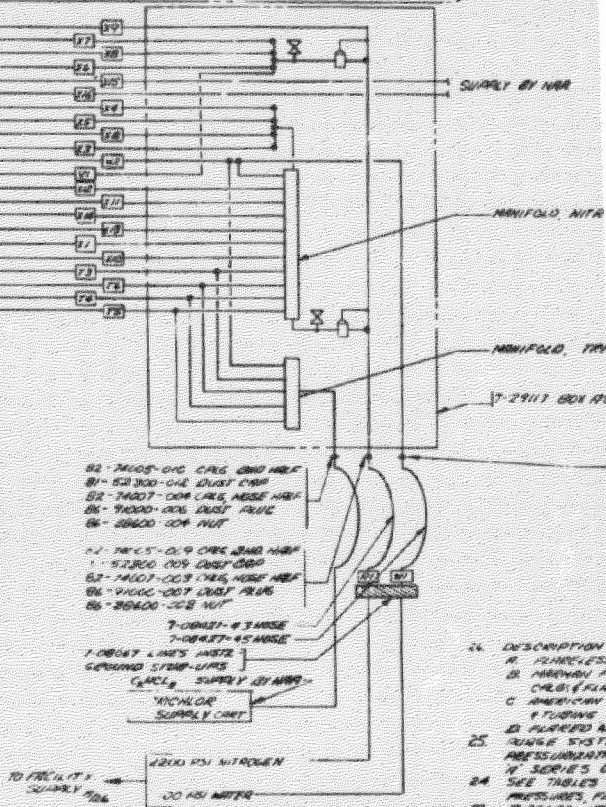
E

- 1- 8904 5/4-808
- 1- 8904 5/4-808
- 1- 8904 5/4-808
- 1- 8904 5/4-808

# -PURGE SYSTEM-

SEE NOTES, TABLES & 7-2016 SCHEMATIC DIAGRAM

LINE	DESCRIPTION
1	8904 5/4-808
2	8904 5/4-808
3	8904 5/4-808
4	8904 5/4-808
5	8904 5/4-808
6	8904 5/4-808
7	8904 5/4-808
8	8904 5/4-808
9	8904 5/4-808
10	8904 5/4-808
11	8904 5/4-808
12	8904 5/4-808
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14	8904 5/4-808
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17	8904 5/4-808
18	8904 5/4-808
19	8904 5/4-808
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22	8904 5/4-808
23	8904 5/4-808
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31	8904 5/4-808
32	8904 5/4-808
33	8904 5/4-808
34	8904 5/4-808
35	8904 5/4-808
36	8904 5/4-808
37	8904 5/4-808
38	8904 5/4-808
39	8904 5/4-808
40	8904 5/4-808
41	8904 5/4-808
42	8904 5/4-808
43	8904 5/4-808
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95	8904 5/4-808
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98	8904 5/4-808
99	8904 5/4-808
100	8904 5/4-808



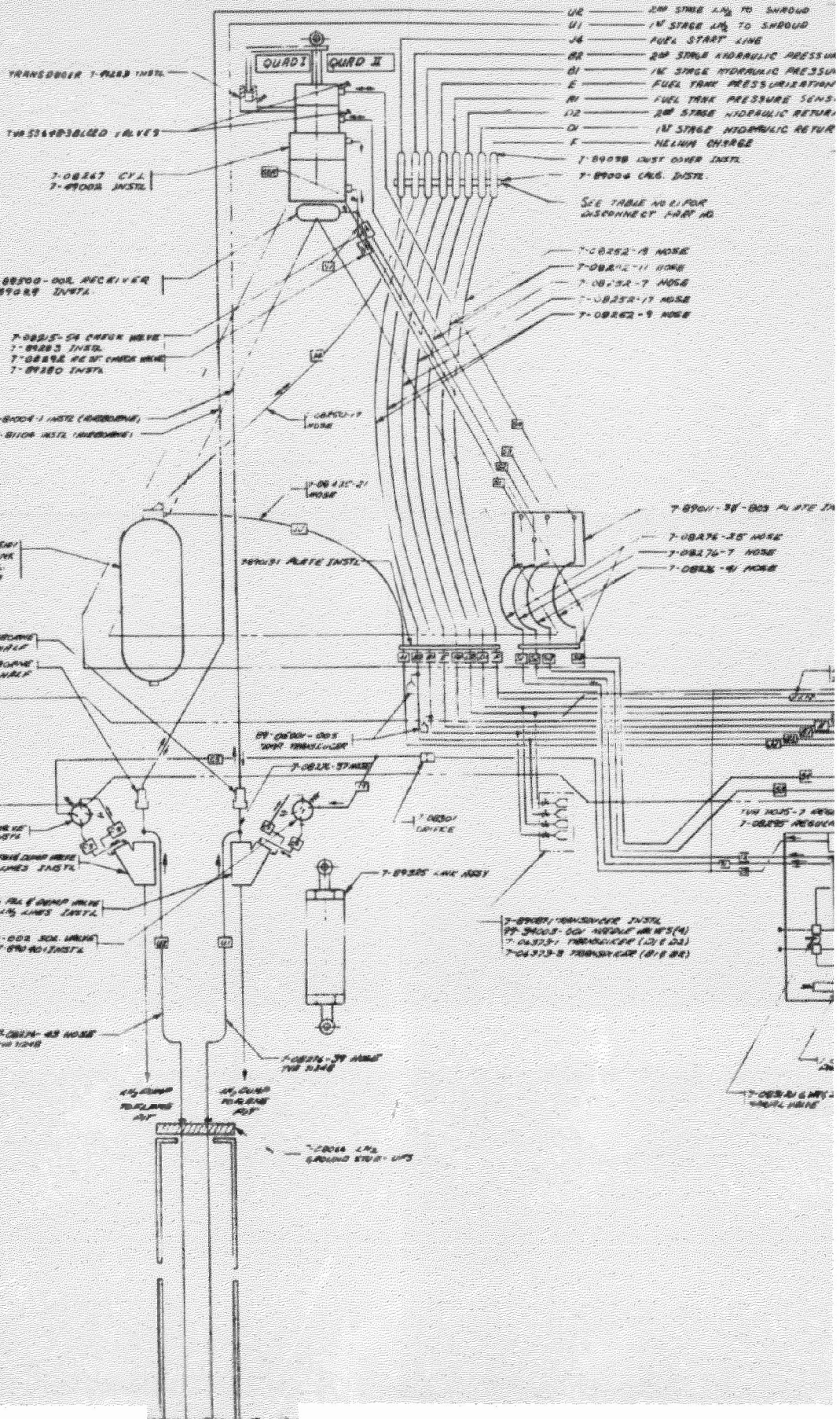
- 24. DESCRIPTION
- A. FLEXLESS
- B. MANIFOLD
- C. MANIFOLD
- D. MANIFOLD
- E. MANIFOLD
- F. MANIFOLD
- G. MANIFOLD
- H. MANIFOLD
- I. MANIFOLD
- J. MANIFOLD
- K. MANIFOLD
- L. MANIFOLD
- M. MANIFOLD
- N. MANIFOLD
- O. MANIFOLD
- P. MANIFOLD
- Q. MANIFOLD
- R. MANIFOLD
- S. MANIFOLD
- T. MANIFOLD
- U. MANIFOLD
- V. MANIFOLD
- W. MANIFOLD
- X. MANIFOLD
- Y. MANIFOLD
- Z. MANIFOLD

### NOTES:

F  
1







- UC 2ND STAGE LINES TO SHROUD
- UI 1ST STAGE LINES TO SHROUD
- JA FURA START LINE
- AR 2ND STAGE HYDRAULIC PRESSURE
- BI 1ST STAGE HYDRAULIC PRESSURE
- E FUEL TANK PRESSURIZATION
- BI FUEL TANK PRESSURE SENS.
- UI 2ND STAGE HYDRAULIC RETURN
- DI 1ST STAGE HYDRAULIC RETURN
- F HELIUM CHARGE

- 7-8909B INST OVER INSTL
- 7-8900A CABLE INSTL
- SEE TABLE A4.1 FOR DISCONNECT PART NO
- 7-08252-18 HOSE
- 7-08252-11 HOSE
- 7-08252-7 HOSE
- 7-08252-17 HOSE
- 7-08252-9 HOSE

- 7-08251-21 HOSE
- 7-08251-20 HOSE
- 7-08251-7 HOSE
- 7-08251-4 HOSE

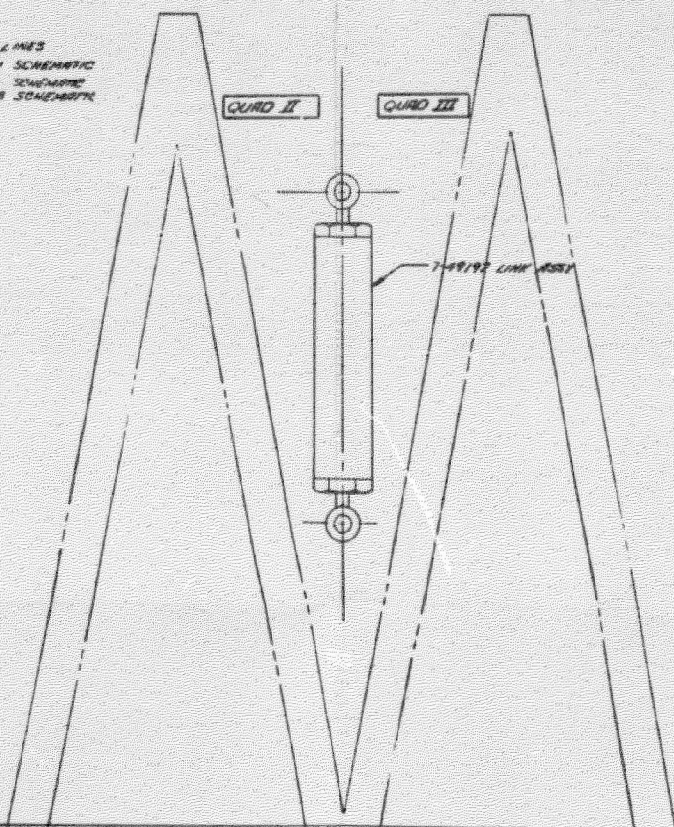
- 7-8900A CABLE INSTL
- PP-39003-001 HELIUM LINE(S)
- 7-08252-18 HOSE (2) (E 2)
- 7-08252-9 HOSE (2) (E 2)

A

B

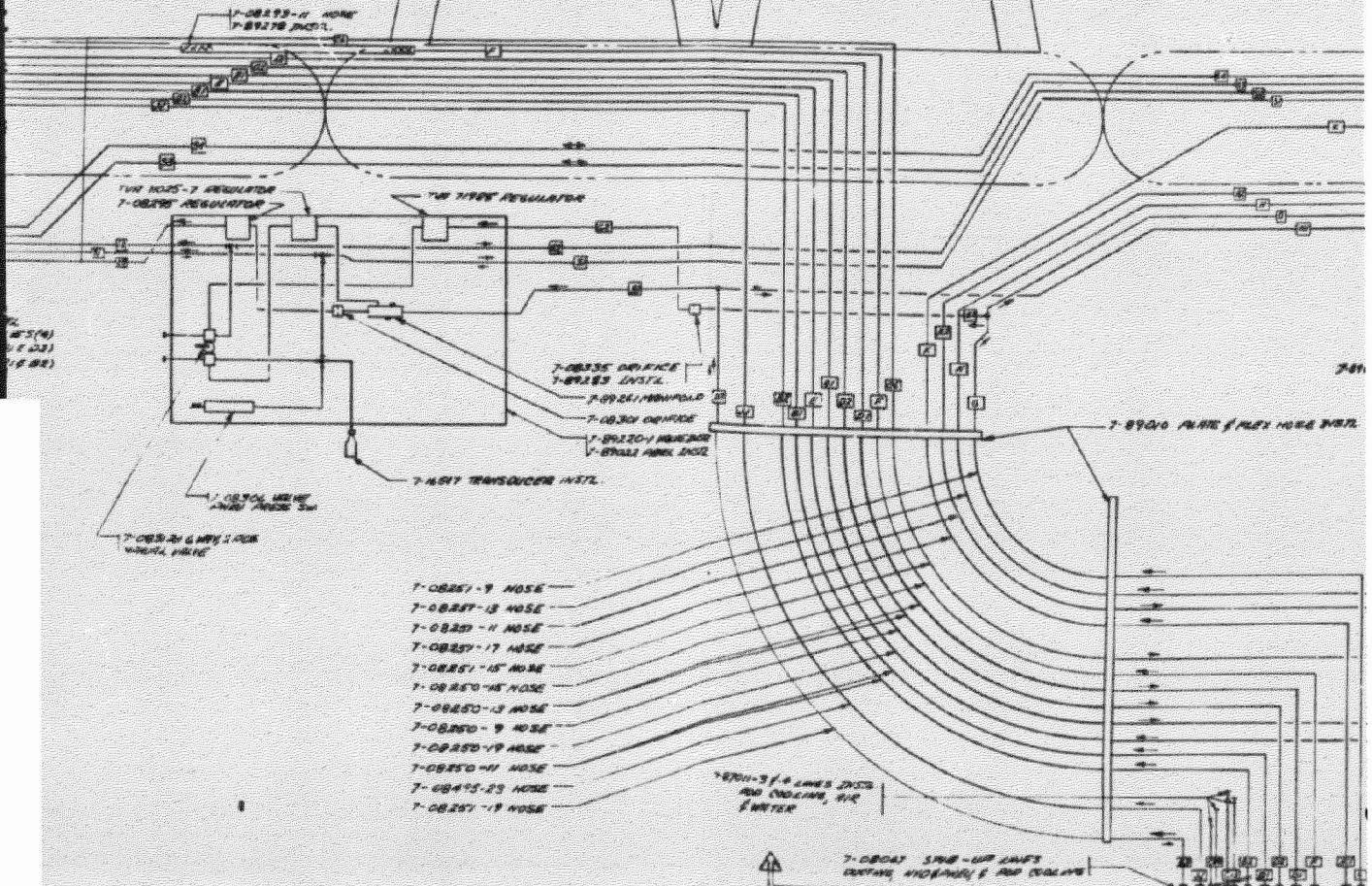
- 2ND STAGE W/D TO SHROUD
- 1ST STAGE W/D TO SHROUD
- FUEL START LINE
- 2ND STAGE HYDRAULIC PRESSURE
- 1ST STAGE HYDRAULIC PRESSURE
- FUEL TANK PRESSURIZATION
- FUEL TANK PRESSURE SENSING
- 2ND STAGE HYDRAULIC RETURN
- 1ST STAGE HYDRAULIC RETURN
- HELIUM CHARGE
- 1ST OVER INST.
- 2ND INST.
- 3RD INST.
- 4TH INST.
- 5TH INST.
- 6TH INST.
- 7TH INST.
- 8TH INST.
- 9TH INST.

AIRBORNE LINES  
SEE 7-81101 SCHEMATIC  
7-81101 SCHEMATIC  
7-20209 SCHEMATIC



- 7-89011-38-803 IN STE INST.
- 7-08476-25 NOSE
- 7-08476-7 NOSE
- 7-08431-4 NOSE

- 7-08476-15 H
- 7-08476-40 H
- 7-08476-7 H
- 7-08476-25 H
- 7-89011-38-803 IN STE INST.



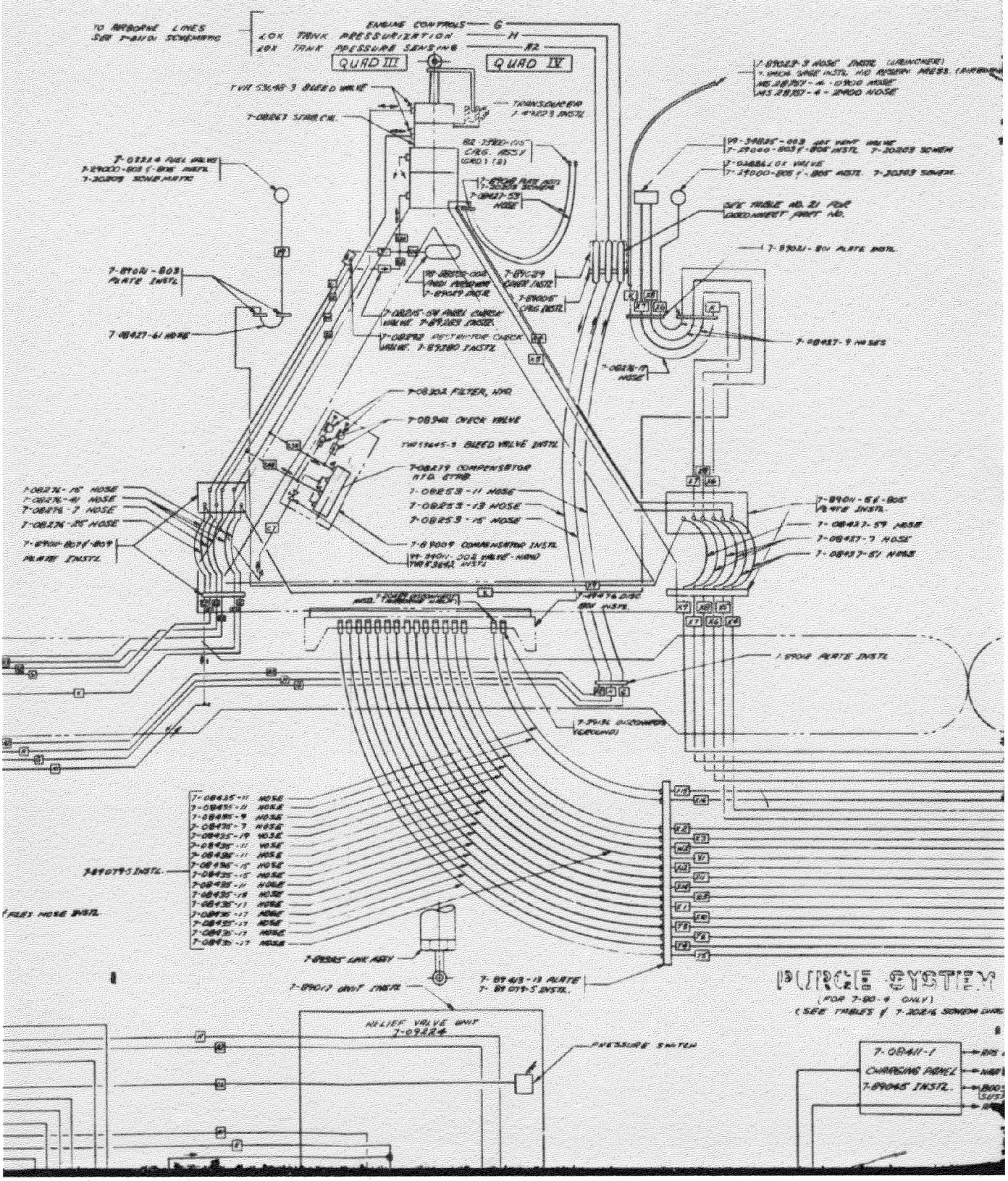
7-08476-15 H  
7-08476-40 H  
7-08476-7 H  
7-08476-25 H  
7-89011-38-803 IN STE INST.

- 7-08476-15 NOSE
- 7-08476-13 NOSE
- 7-08476-11 NOSE
- 7-08476-17 NOSE
- 7-08476-15 NOSE
- 7-08476-14 NOSE
- 7-08476-13 NOSE
- 7-08476-9 NOSE
- 7-08476-19 NOSE
- 7-08476-11 NOSE
- 7-08476-25 NOSE
- 7-08476-13 NOSE

7-89011-38-803 IN STE INST.

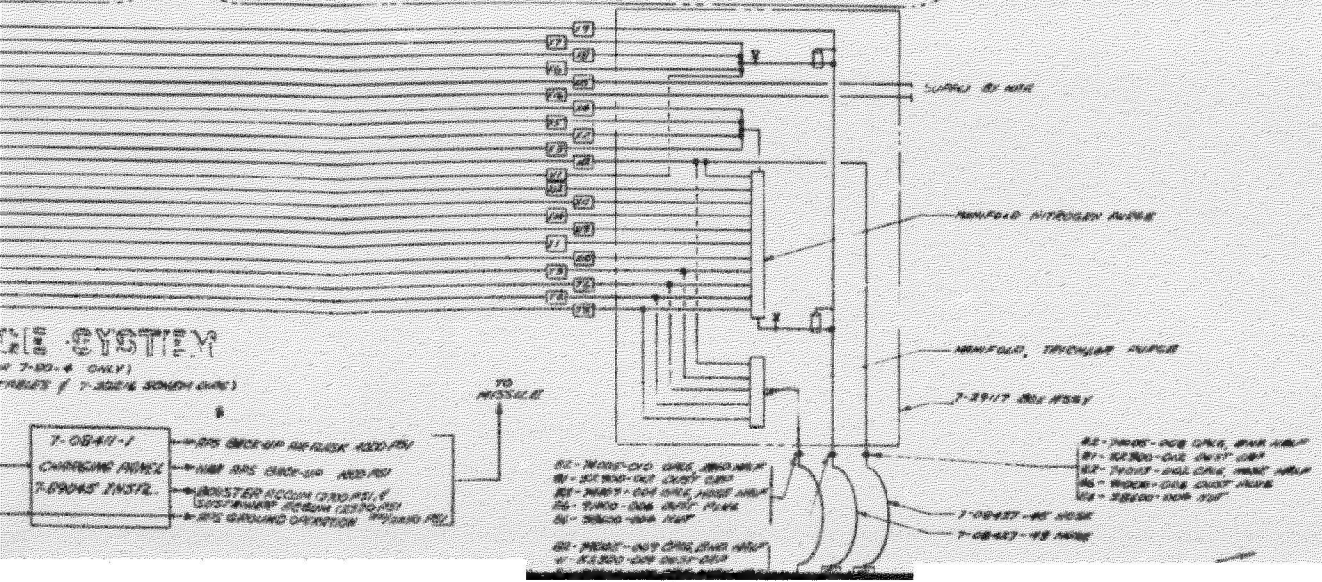
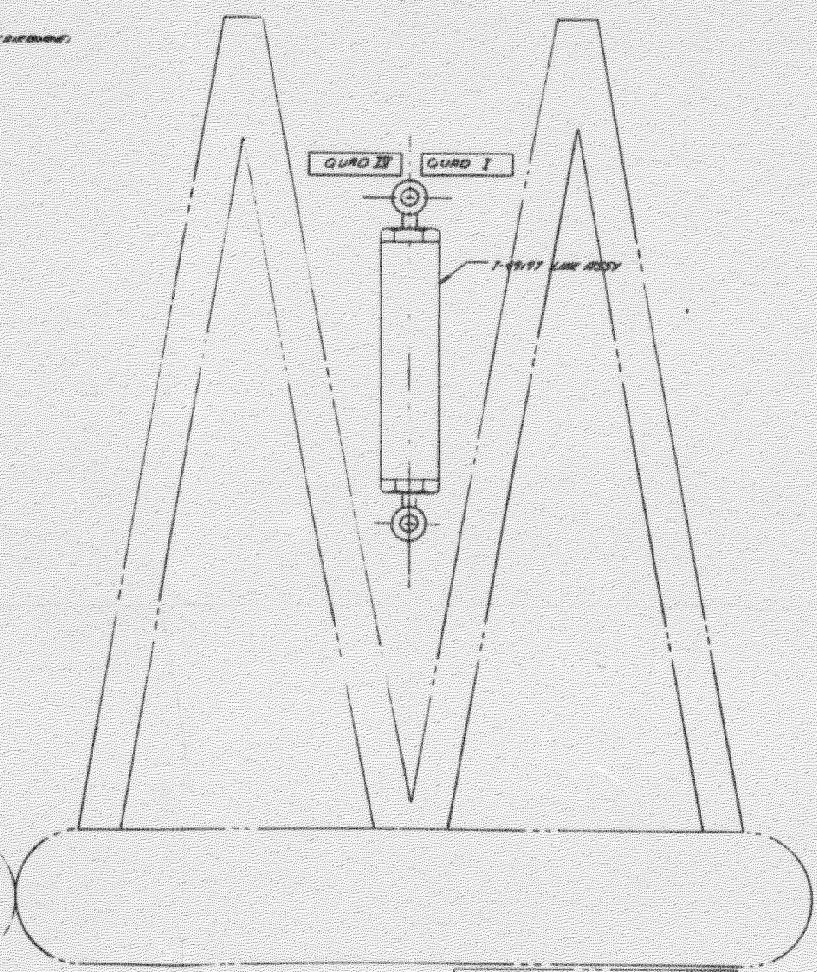
7-08476-15 NOSE

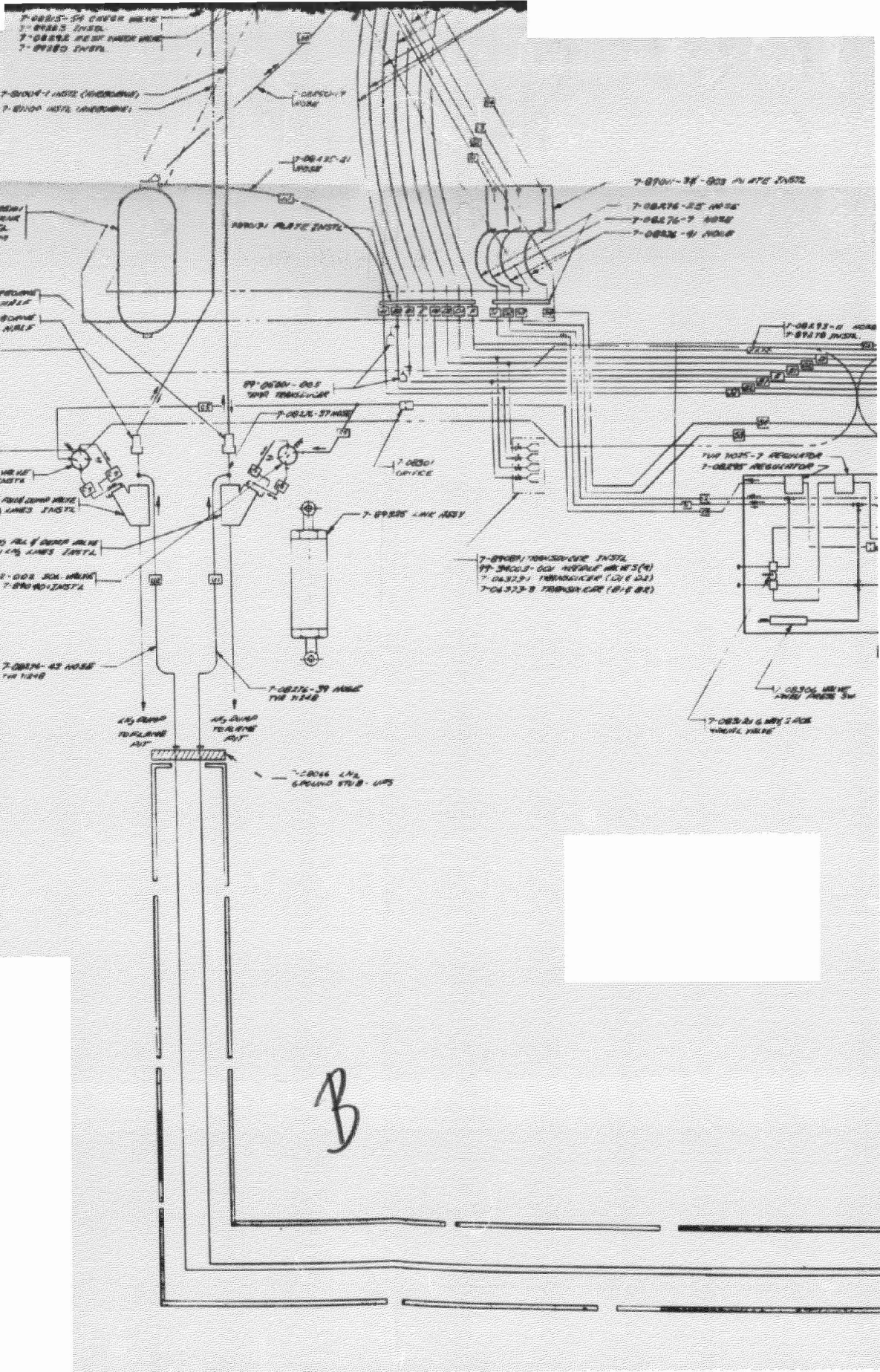
C



**SOURCE SYSTEM**  
 (FOR 7-80-8 ONLY)  
 (SEE TABLES / 7-30216 SYSTEM DIAG)

7-2021 (LAINCHER)  
 7-2022 (ROD HOSE)  
 7-2023 (ROD HOSE)  
 7-2024 (ROD HOSE)  
 7-2025 (ROD HOSE)  
 7-2026 (ROD HOSE)  
 7-2027 (ROD HOSE)  
 7-2028 (ROD HOSE)  
 7-2029 (ROD HOSE)  
 7-2030 (ROD HOSE)  
 7-2031 (ROD HOSE)  
 7-2032 (ROD HOSE)  
 7-2033 (ROD HOSE)  
 7-2034 (ROD HOSE)  
 7-2035 (ROD HOSE)  
 7-2036 (ROD HOSE)  
 7-2037 (ROD HOSE)  
 7-2038 (ROD HOSE)  
 7-2039 (ROD HOSE)  
 7-2040 (ROD HOSE)





7-0801-01  
7-0802-02  
7-0803-03

7-0804-04  
7-0805-05

7-0806-06

7-0807-07

7-0808-08

7-0809-09  
7-0810-10  
7-0811-11

7-0812-12  
7-0813-13  
7-0814-14

7-0815-15

7-0816-16  
7-0817-17  
7-0818-18  
7-0819-19

7-0820-20

7-0821-21

7-0822-22

7-0823-23

7-0824-24  
7-0825-25

7-0826-26  
7-0827-27

7-0828-28  
7-0829-29

7-0830-30  
7-0831-31

7-0832-32  
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7-0835-35

7-0836-36

7-0837-37

7-0838-38

7-0839-39

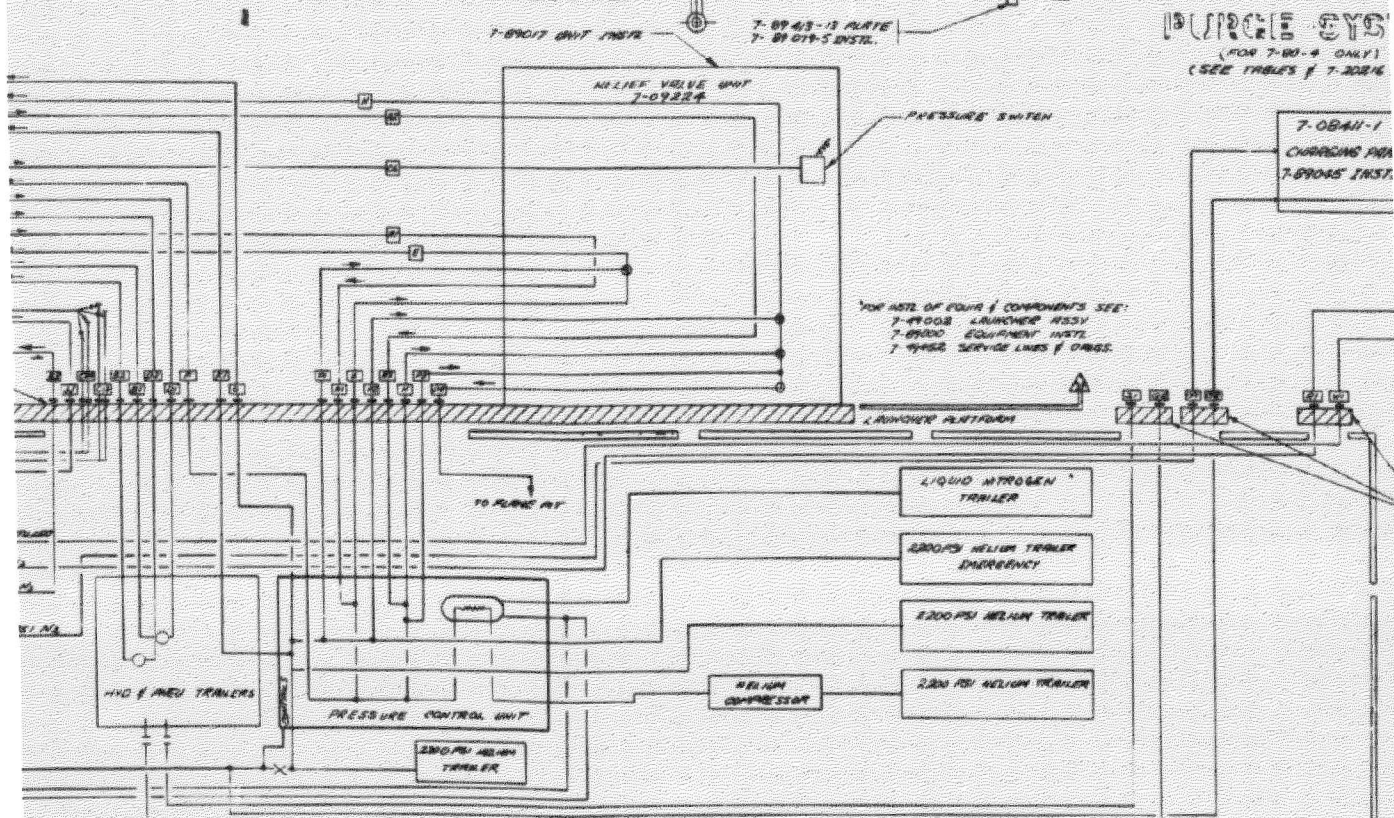
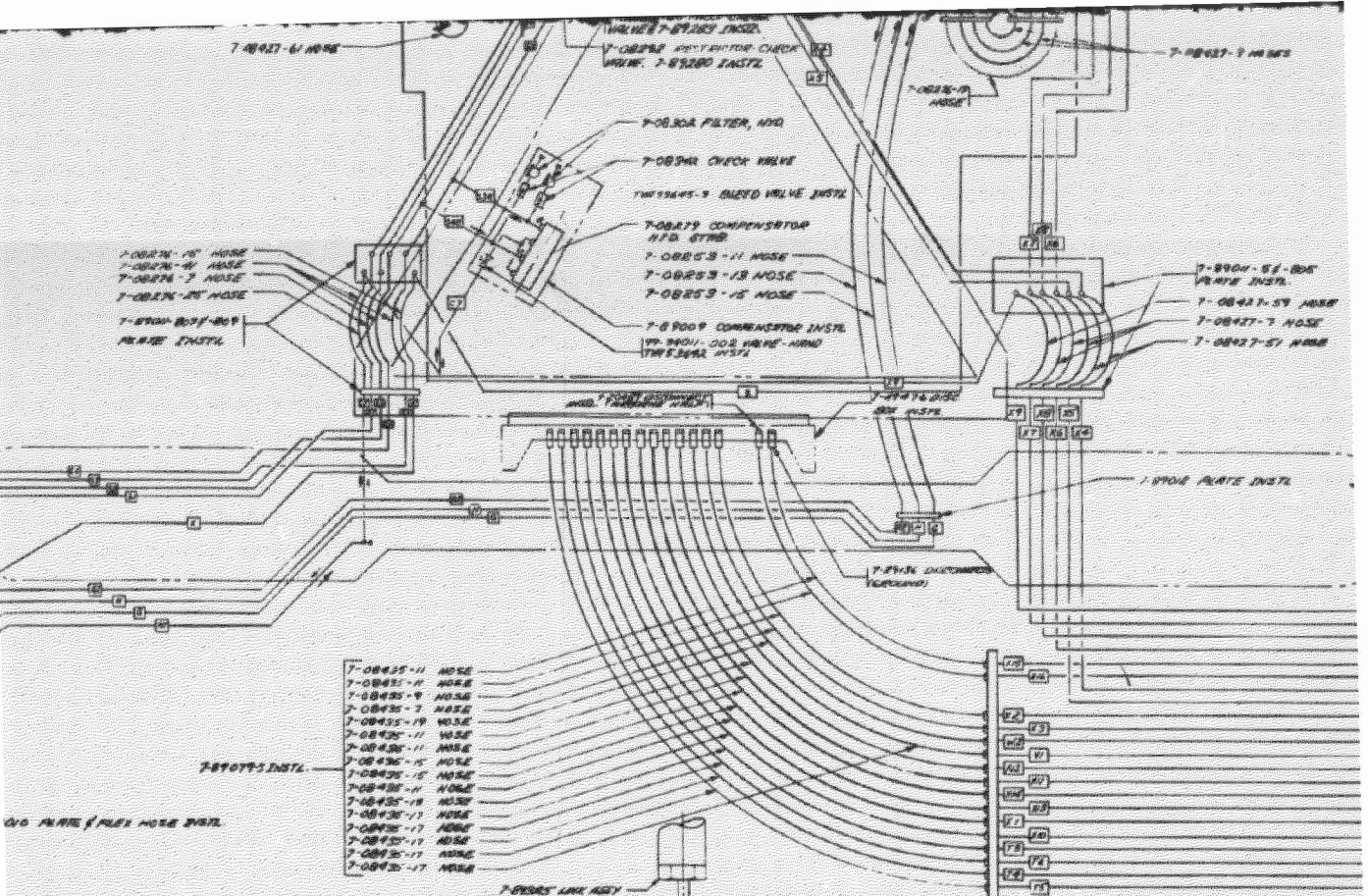
7-0840-40  
7-0841-41

7-0842-42

A

B





**PRESS. SYSTEM**

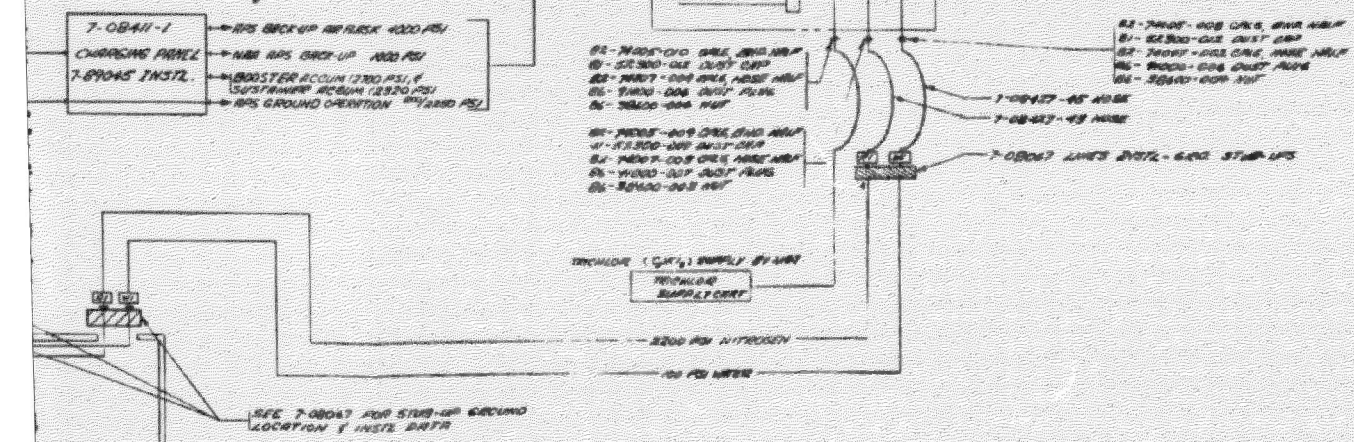
D

7-8901-57-005  
3.078 INSTE  
7-08421-57-1058  
7-08427-7-1058  
7-08427-27-1058

WASTE INSTE

### HYDRAULIC SYSTEM

(FOR 7-8901-8 ONLY)  
(TABLES 7-20216 THROUGH 20218)



SEE 7-08047 FOR STOR-UP GROUND LOCATION & INSTE DATA

E

Figure 2-4. Schematic Diagram, Hydraulic and Pneumatic Lines, Launcher Systems (7-89101), B and C Series, Static Sites (Sheet 1 of 2)

D



Section II

CONFIDENTIAL  
ZM-7-516 (TN)

B

7-08210-002	WIRE - SOL	HWY- 801874	SOUTHWESTERN WIRE		927
7-08210-003	WIRE - PRESS COP	328643-1	SOUTHWESTERN WIRE		928
7-08210-004	WIRE - SHUT OFF MFG	W2000 - 178 - 10	W.S. A. HARRIS CO.		929
7-08210-005	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		930
7-08210-006	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		931
7-08210-007	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		932
7-08210-008	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		933
7-08210-009	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		934
7-08210-010	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		935
7-08210-011	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		936
7-08210-012	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		937
7-08210-013	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		938
7-08210-014	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		939
7-08210-015	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		940
7-08210-016	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		941
7-08210-017	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		942
7-08210-018	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		943
7-08210-019	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		944
7-08210-020	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		945
7-08210-021	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		946
7-08210-022	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		947
7-08210-023	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		948
7-08210-024	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		949
7-08210-025	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		950
7-08210-026	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		951
7-08210-027	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		952
7-08210-028	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		953
7-08210-029	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		954
7-08210-030	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		955
7-08210-031	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		956
7-08210-032	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		957
7-08210-033	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		958
7-08210-034	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		959
7-08210-035	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		960
7-08210-036	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		961
7-08210-037	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		962
7-08210-038	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		963
7-08210-039	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		964
7-08210-040	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		965
7-08210-041	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		966
7-08210-042	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		967
7-08210-043	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		968
7-08210-044	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		969
7-08210-045	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		970
7-08210-046	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		971
7-08210-047	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		972
7-08210-048	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		973
7-08210-049	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		974
7-08210-050	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		975
7-08210-051	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		976
7-08210-052	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		977
7-08210-053	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		978
7-08210-054	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		979
7-08210-055	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		980
7-08210-056	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		981
7-08210-057	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		982
7-08210-058	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		983
7-08210-059	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		984
7-08210-060	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		985
7-08210-061	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		986
7-08210-062	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		987
7-08210-063	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		988
7-08210-064	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		989
7-08210-065	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		990
7-08210-066	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		991
7-08210-067	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		992
7-08210-068	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		993
7-08210-069	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		994
7-08210-070	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		995
7-08210-071	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		996
7-08210-072	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		997
7-08210-073	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		998
7-08210-074	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		999
7-08210-075	WIRE - SHUT OFF MFG	---	ELLIOT ENGINE		1000

7-89101













Section II

TABLE 31  
MATERIALS LIST

LINE NO.	DESCRIPTION	UNIT QUANTITY
11-001	ALUMINUM	100.00
11-002	STEEL	50.00
11-003	COPPER	25.00
11-004	BRASS	15.00
11-005	INCONEL	10.00
11-006	TITANIUM	5.00
11-007	MONEL	3.00
11-008	PHOSPHOR BRONZE	2.00
11-009	304 STAINLESS STEEL	1.00
11-010	316 STAINLESS STEEL	1.00
11-011	303 STAINLESS STEEL	1.00
11-012	302 STAINLESS STEEL	1.00
11-013	301 STAINLESS STEEL	1.00
11-014	304L STAINLESS STEEL	1.00
11-015	316L STAINLESS STEEL	1.00
11-016	303L STAINLESS STEEL	1.00
11-017	302L STAINLESS STEEL	1.00
11-018	301L STAINLESS STEEL	1.00
11-019	304LN STAINLESS STEEL	1.00
11-020	316LN STAINLESS STEEL	1.00
11-021	303LN STAINLESS STEEL	1.00
11-022	302LN STAINLESS STEEL	1.00
11-023	301LN STAINLESS STEEL	1.00
11-024	304LN STAINLESS STEEL	1.00
11-025	316LN STAINLESS STEEL	1.00
11-026	303LN STAINLESS STEEL	1.00
11-027	302LN STAINLESS STEEL	1.00
11-028	301LN STAINLESS STEEL	1.00
11-029	304LN STAINLESS STEEL	1.00
11-030	316LN STAINLESS STEEL	1.00
11-031	303LN STAINLESS STEEL	1.00
11-032	302LN STAINLESS STEEL	1.00
11-033	301LN STAINLESS STEEL	1.00
11-034	304LN STAINLESS STEEL	1.00
11-035	316LN STAINLESS STEEL	1.00
11-036	303LN STAINLESS STEEL	1.00
11-037	302LN STAINLESS STEEL	1.00
11-038	301LN STAINLESS STEEL	1.00
11-039	304LN STAINLESS STEEL	1.00
11-040	316LN STAINLESS STEEL	1.00
11-041	303LN STAINLESS STEEL	1.00
11-042	302LN STAINLESS STEEL	1.00
11-043	301LN STAINLESS STEEL	1.00
11-044	304LN STAINLESS STEEL	1.00
11-045	316LN STAINLESS STEEL	1.00
11-046	303LN STAINLESS STEEL	1.00
11-047	302LN STAINLESS STEEL	1.00
11-048	301LN STAINLESS STEEL	1.00
11-049	304LN STAINLESS STEEL	1.00
11-050	316LN STAINLESS STEEL	1.00
11-051	303LN STAINLESS STEEL	1.00
11-052	302LN STAINLESS STEEL	1.00
11-053	301LN STAINLESS STEEL	1.00
11-054	304LN STAINLESS STEEL	1.00
11-055	316LN STAINLESS STEEL	1.00
11-056	303LN STAINLESS STEEL	1.00
11-057	302LN STAINLESS STEEL	1.00
11-058	301LN STAINLESS STEEL	1.00
11-059	304LN STAINLESS STEEL	1.00
11-060	316LN STAINLESS STEEL	1.00
11-061	303LN STAINLESS STEEL	1.00
11-062	302LN STAINLESS STEEL	1.00
11-063	301LN STAINLESS STEEL	1.00
11-064	304LN STAINLESS STEEL	1.00
11-065	316LN STAINLESS STEEL	1.00
11-066	303LN STAINLESS STEEL	1.00
11-067	302LN STAINLESS STEEL	1.00
11-068	301LN STAINLESS STEEL	1.00
11-069	304LN STAINLESS STEEL	1.00
11-070	316LN STAINLESS STEEL	1.00
11-071	303LN STAINLESS STEEL	1.00
11-072	302LN STAINLESS STEEL	1.00
11-073	301LN STAINLESS STEEL	1.00
11-074	304LN STAINLESS STEEL	1.00
11-075	316LN STAINLESS STEEL	1.00
11-076	303LN STAINLESS STEEL	1.00
11-077	302LN STAINLESS STEEL	1.00
11-078	301LN STAINLESS STEEL	1.00
11-079	304LN STAINLESS STEEL	1.00
11-080	316LN STAINLESS STEEL	1.00
11-081	303LN STAINLESS STEEL	1.00
11-082	302LN STAINLESS STEEL	1.00
11-083	301LN STAINLESS STEEL	1.00
11-084	304LN STAINLESS STEEL	1.00
11-085	316LN STAINLESS STEEL	1.00
11-086	303LN STAINLESS STEEL	1.00
11-087	302LN STAINLESS STEEL	1.00
11-088	301LN STAINLESS STEEL	1.00
11-089	304LN STAINLESS STEEL	1.00
11-090	316LN STAINLESS STEEL	1.00
11-091	303LN STAINLESS STEEL	1.00
11-092	302LN STAINLESS STEEL	1.00
11-093	301LN STAINLESS STEEL	1.00
11-094	304LN STAINLESS STEEL	1.00
11-095	316LN STAINLESS STEEL	1.00
11-096	303LN STAINLESS STEEL	1.00
11-097	302LN STAINLESS STEEL	1.00
11-098	301LN STAINLESS STEEL	1.00
11-099	304LN STAINLESS STEEL	1.00
11-100	316LN STAINLESS STEEL	1.00

TABLE 32  
FITTINGS LIST

LINE NO.	DESCRIPTION	UNIT QUANTITY
11-101	1/2" NPT	10.00
11-102	3/4" NPT	5.00
11-103	1" NPT	3.00
11-104	1 1/2" NPT	2.00
11-105	2" NPT	1.00
11-106	1/4" NPT	20.00
11-107	3/8" NPT	15.00
11-108	1/2" NPT	10.00
11-109	5/8" NPT	5.00
11-110	3/4" NPT	3.00
11-111	1" NPT	2.00
11-112	1 1/2" NPT	1.00
11-113	2" NPT	0.50
11-114	1/4" NPT	25.00
11-115	3/8" NPT	18.00
11-116	1/2" NPT	12.00
11-117	5/8" NPT	6.00
11-118	3/4" NPT	4.00
11-119	1" NPT	3.00
11-120	1 1/2" NPT	1.50
11-121	2" NPT	0.75
11-122	1/4" NPT	30.00
11-123	3/8" NPT	22.00
11-124	1/2" NPT	15.00
11-125	5/8" NPT	8.00
11-126	3/4" NPT	5.00
11-127	1" NPT	4.00
11-128	1 1/2" NPT	2.00
11-129	2" NPT	1.00
11-130	1/4" NPT	35.00
11-131	3/8" NPT	25.00
11-132	1/2" NPT	18.00
11-133	5/8" NPT	10.00
11-134	3/4" NPT	7.00
11-135	1" NPT	6.00
11-136	1 1/2" NPT	3.00
11-137	2" NPT	1.50
11-138	1/4" NPT	40.00
11-139	3/8" NPT	30.00
11-140	1/2" NPT	20.00
11-141	5/8" NPT	12.00
11-142	3/4" NPT	8.00
11-143	1" NPT	7.00
11-144	1 1/2" NPT	3.50
11-145	2" NPT	1.75
11-146	1/4" NPT	45.00
11-147	3/8" NPT	35.00
11-148	1/2" NPT	25.00
11-149	5/8" NPT	14.00
11-150	3/4" NPT	10.00
11-151	1" NPT	9.00
11-152	1 1/2" NPT	4.50
11-153	2" NPT	2.25
11-154	1/4" NPT	50.00
11-155	3/8" NPT	40.00
11-156	1/2" NPT	30.00
11-157	5/8" NPT	16.00
11-158	3/4" NPT	12.00
11-159	1" NPT	11.00
11-160	1 1/2" NPT	5.50
11-161	2" NPT	2.75
11-162	1/4" NPT	55.00
11-163	3/8" NPT	45.00
11-164	1/2" NPT	35.00
11-165	5/8" NPT	18.00
11-166	3/4" NPT	14.00
11-167	1" NPT	13.00
11-168	1 1/2" NPT	6.50
11-169	2" NPT	3.25
11-170	1/4" NPT	60.00
11-171	3/8" NPT	50.00
11-172	1/2" NPT	40.00
11-173	5/8" NPT	22.00
11-174	3/4" NPT	16.00
11-175	1" NPT	15.00
11-176	1 1/2" NPT	7.50
11-177	2" NPT	3.75
11-178	1/4" NPT	65.00
11-179	3/8" NPT	55.00
11-180	1/2" NPT	45.00
11-181	5/8" NPT	24.00
11-182	3/4" NPT	18.00
11-183	1" NPT	17.00
11-184	1 1/2" NPT	8.50
11-185	2" NPT	4.25
11-186	1/4" NPT	70.00
11-187	3/8" NPT	60.00
11-188	1/2" NPT	50.00
11-189	5/8" NPT	26.00
11-190	3/4" NPT	20.00
11-191	1" NPT	19.00
11-192	1 1/2" NPT	9.50
11-193	2" NPT	4.75
11-194	1/4" NPT	75.00
11-195	3/8" NPT	65.00
11-196	1/2" NPT	55.00
11-197	5/8" NPT	28.00
11-198	3/4" NPT	22.00
11-199	1" NPT	21.00
11-200	1 1/2" NPT	10.50
11-201	2" NPT	5.25
11-202	1/4" NPT	80.00
11-203	3/8" NPT	70.00
11-204	1/2" NPT	60.00
11-205	5/8" NPT	30.00
11-206	3/4" NPT	24.00
11-207	1" NPT	23.00
11-208	1 1/2" NPT	11.50
11-209	2" NPT	5.75
11-210	1/4" NPT	85.00
11-211	3/8" NPT	75.00
11-212	1/2" NPT	65.00
11-213	5/8" NPT	32.00
11-214	3/4" NPT	26.00
11-215	1" NPT	25.00
11-216	1 1/2" NPT	12.50
11-217	2" NPT	6.25
11-218	1/4" NPT	90.00
11-219	3/8" NPT	80.00
11-220	1/2" NPT	70.00
11-221	5/8" NPT	34.00
11-222	3/4" NPT	28.00
11-223	1" NPT	27.00
11-224	1 1/2" NPT	13.50
11-225	2" NPT	6.75
11-226	1/4" NPT	95.00
11-227	3/8" NPT	85.00
11-228	1/2" NPT	75.00
11-229	5/8" NPT	36.00
11-230	3/4" NPT	30.00
11-231	1" NPT	29.00
11-232	1 1/2" NPT	14.50
11-233	2" NPT	7.25
11-234	1/4" NPT	100.00
11-235	3/8" NPT	90.00
11-236	1/2" NPT	80.00
11-237	5/8" NPT	40.00
11-238	3/4" NPT	34.00
11-239	1" NPT	33.00
11-240	1 1/2" NPT	16.50
11-241	2" NPT	8.25
11-242	1/4" NPT	110.00
11-243	3/8" NPT	100.00
11-244	1/2" NPT	90.00
11-245	5/8" NPT	42.00
11-246	3/4" NPT	36.00
11-247	1" NPT	35.00
11-248	1 1/2" NPT	17.50
11-249	2" NPT	8.75
11-250	1/4" NPT	120.00

TABLE 33  
LIST OF RECORDS AND SPEC. RELATED TO LAUNCHER OPERATION

DESCRIPTION	REFERENCE
CLEANING PROCEDURES, FUEL SYSTEM COMPONENTS	11-001
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-002
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-003
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-004
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-005
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-006
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-007
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-008
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-009
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-010
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-011
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-012
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-013
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-014
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-015
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-016
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-017
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-018
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-019
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-020
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-021
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-022
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-023
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-024
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-025
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-026
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-027
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-028
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-029
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-030
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-031
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-032
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-033
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-034
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-035
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-036
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-037
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-038
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-039
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-040
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-041
CLEANING PROCEDURES, LAUNCH SYSTEM COMPONENTS	11-042



connected to the missile. See 7-89023. The lines are helium pressurized to 125 psig by the pressure control unit and regulated by the hydraulic and pneumatic cart, 7-09241. From the ground stubup, the control line is routed (via the launcher) into the auxiliary frame by flexible hose, through the MS 28751-4-0900 hose, to a fitting on the 7-84005 missile valve installation.

**CAUTION**

After pressurizing the missile hydraulic reservoir, the ground charge hose installation, 7-89023, must be removed.

d. For D(R and D) Series, pressurization of the hydraulic reservoir is accomplished by the 7-08411 Nitrogen Charging Panel; see Convair Report AZE-27-188.

2-8. ASSOCIATE SYSTEMS AND EQUIPMENT.

2-9. ELECTRICAL CONTROL SYSTEM.

a. A hold-down and release READY light (green) will glow (on the test conductor's panel in the blockhouse) when the following conditions are met:

1. The two slave cylinder arms are in the ready position, actuating two limit switches.

2. The release cylinder line pressure switch is actuated, indicating a minimum pressure of 5300 psig.

3. The umbilical plug circuit selector is in the LAUNCH position.

b. A LAUNCH button of the holding type (on the test conductor's panel) will activate

the 99-35002-001 solenoid valve to initiate missile release.

c. A single warning horn and individual warning lights (red) are located at the blockhouse control station. A red light will glow and the warning horn will sound if a signal from any one of the following sources is received:

1. When the auxiliary support stabilizer system pressure drops below 900 psig (B and C Series) and 1200 psig (D(R and D) Series), the 7-08306 pressure switch breaks contact.

2. When the pressure in the 2000 psig main nitrogen gas supply drops to 1800 psig, the pressure switch breaks contact. (This line supplies pressure to the launcher systems.)

3. When the pressure in the main release cylinder line drops to 2300 psig, the pressure switch breaks contact.

4. In the event of an unsafe missile vertical alignment, the stabilizer synchronization indicator contact breaks.

5. When either of the 7-08264 slave cylinder arms moves from its ready position, the limit switch breaks contact.

d. The removable control panel at the service tower is similar to the blockhouse control panel but with the addition of a main release cylinder CHARGE and LAUNCH switch. This panel will control the launcher system during erection and prior to the time that the launcher system is to be transferred to the blockhouse. At the time of transfer, the wiring will be disconnected from the removable control panel and connected to the blockhouse control panel and the test conductor's circuit.

Section II  
Paragraph 2-10

~~CONFIDENTIAL~~  
ZM-7-516 (TN)

NOTE

The flight launchers at AFMTC (7-80, -8, 9, 10, and 11) contain all the systems previously described and are used for short duration static firings with the addition of the 7-49070 hold-down links.

2-10. STATIC SITE EQUIPMENT.

a. The static sites SAC (7-80-5 and -7) and ERB (7-80-2 and -4) require no con-

trolled missile release provisions. The static site launchers do not have operating hold-down release cylinders, slaving systems, or auxiliary support frame retraction systems. The 7-89366 hold-down release cylinder of the flight installations is replaced with a dummy cylinder in addition to the hold-down links. A static link is substituted for the 7-08247 auxiliary support retraction cylinder during missile erection. This link is removed prior to any static firings to eliminate unnecessary loads on the missile.

SECTION III

CHECK PROCEDURES PRIOR TO MISSILE ERECTION

3-1. PREPARATION FOR USE.

3-2. Before the missile can be erected, the launcher pneumatic system must be pressurized as follows:

- a. Install the three 7-08276-9 hoses.
- b. Set the four 99-34003-001 needle valves to position the auxiliary support frames so that the stabilizer pins, 7-49006, are 62 inches on either side of the centerline of the 7-49021 missile support pins (Y-Y Axis).
- c. Set the 7-08312 valve to the B (exhaust) position.
- d. Set the 99-35002-001 solenoid valve to the C (vent) position.
- e. Check the 7-08279 and 7-08280 temperature compensators; they should read within  $\pm 10$  degrees F of the ambient temperature.

**CAUTION**

Before pressurizing the launcher system, the 7-08396 main release valves must be in the EXHAUST position (7-08264 slave cylinder extended).

f. Check the missile service tower electrical control system for operational readiness; turn off the alarm switch.

3-3. The 7-08352 pneumatic booster unit is prepared for use as follows:

- a. Operate according to the instructions given in Reports ZJ-7-048 and AZE-27-192.
- b. Set the selector switch to 3200 psig nitrogen output.
- c. After activation, check the booster unit gages for the following pressures:
  1. 2000 psig outlet pressure to launcher
  2. 3200 psig outlet pressure to release system.

3-4. The electrical safety system at the missile service tower is checked as follows:

- a. Warning lights should indicate the following:
  1. 900 psig stabilizer nitrogen pressure ON.
  2. 2300 psig release cylinder pressure OFF.
- b. Vertical indication must be within limits.
- c. CHARGE-LAUNCH switch at NEUTRAL.

3-5. The launcher is checked as follows:

- a. The 7-49006 stabilizer pins must be synchronized.
- b. The 7-08279 and 7-08280 temperature compensators should read ambient temperature.
- c. Auxiliary frames in closed position (7-08247 cylinder extended).

Section III

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ZM-7-516 (TN)

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SECTION IV

OPERATION

4-1. LOADING MISSILE IN LAUNCHER.

a. Make an electrical check as follows:

1. All annunciator lights except those for the 1800 psig and 2300 psig pressure switches should be ON.
2. Stabilizer meter should be centered.

b. Erect the missile, launcher, and trailer to a vertical position, in accordance with report ZM-7-200E(TN).

c. Before trailer has been lowered to the ground, pressurize the 7-08267 stabilizer cylinders as follows:

1. Check for equal dimensions between the 7-49006 stabilizer pins and the missile.

**CAUTION**

Before shifting the 7-08312 valve as stated in paragraph 4-1c, 2, below, be certain that all four static links are in place or that the holddown release cylinder is pressurized.

2. Shift the 7-08312 valve to the A (pressure) position; this places a thrust load on the missile of approximately 34,000 pounds (B and C Series) and 38,630 pounds (D (R and D) Series) at each pin. The hydraulic component has no effect on the thrust if the stabilizer cylinders have been properly aligned and no wind loads are present.

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d. Adjust the nose stabilizer (7-93004 or 7-93059) in accordance with report ZM-7-200E(TN).

**CAUTION**

If the nose stabilizer is not used, one of the following conditions must be maintained, whether or not the missile is in stretch:

1. The stabilizer cylinders (7-08267) remain pressurized.
2. Shims installed in accordance with paragraph 4-1-e. This option may only be used if the missile is empty.

e. If shims are to be installed in lieu of leaving the stabilizer cylinders (7-08267) pressurized, the installation is as follows:

1. Pressurize the stabilizer cylinders (7-08267).
2. Install shims between the top of the auxiliary support frame cap (7-49006) and the under side of the stabilizer pin collar (7-49006). Shims are to be of sufficient thickness to leave a gap of .045± .005 inch.
3. Depressurize stabilizer cylinders.

The shim installation (27-89024) or equivalent is to be used.

NOTE

To remove shims, pressurize the stabilizer cylinders (7-08267).

f. For the B and C Series, align the quick disconnects and move the brackets (7-49132 and 7-9415) slowly to position, taking care that the disconnects engage the missile properly.

g. For D(R and D) Series, the quick disconnects are aligned and engaged during horizontal mating of the missile to the launcher.

#### 4-2. ELECTRICAL CONTROL AT MISSILE SERVICE TOWER.

a. Check the following:

1. Electrical control panel lights are out.
2. Synchronizing control centered within limits.

#### 4-3. PREPARATION FOR MISSILE RELEASE OR STATIC FIRING.

a. Switch main release switch to CHARGE and hold for five seconds.

#### CAUTION

Check both release cylinders to see that they are bottomed before charging.

b. Check the following at the missile service tower:

1. All control lights out.
2. Synchronizing indicator is centered.

c. Turn the alarm switch ON.

#### NOTE

With the alarm switch ON, the source of any malfunction monitored by the safety system will be indicated by an alarm bell and light.

d. Close the two 99-34003-001 pressure valves (auxiliary support frame control).

e. Open the two 99-34003-001 vent valves.

f. Remove the three 7-08276 hoses (red streamers attached).

g. Install dust caps where the hoses were removed.

h. Set the 7-08352 booster unit to 7000 psig. (Approximately three hours are required to raise the pressure from 3000 psig to 7000 psig).

1. Make the following electrical changes:

1. Inactivate the control unit at the missile service tower.
2. Activate the control at the blockhouse.
3. Energize the solenoid to fill the missile with fuel.

j. When the booster unit reaches hold-down pressure (gage at booster unit outlet), the 5300 psig pressure switch will indicate READY.

k. When the above conditions are met, the ready light (green) on the test conductor's panel should glow, indicating readiness of the launcher pneumatic system. (Launch button may be pressed).

#### NOTE

For operational checkout of the propulsion control valve installation, see Convair Report ZK-7-049.

#### 4-4. REMOVAL OF MISSILE FROM LAUNCHER (ABORTED FLIGHT).

a. Reset the 7-08352 booster unit to 3000 psig.

b. Change the electrical safety system operation back to the service tower.

c. Erect the missile trailer.

d. Switch from tower-missile pressurization to trailer-missile pressurization.

e. For B and C Series, lower the 7-49132, 7-49152, and 7-49476 disconnect brackets.

f. Connect the missile trailer to the missile.

g. Shift the 7-08312 valve to the B (exhaust) position before disconnecting the load cells from the launcher.

h. Inactivate the auxiliary support frame as follows:

1. Connect the 7-08276-9 hoses.
2. Close the two 99-34000-001 vent valves.
3. Open the two 99-34000-001 pressure valves.

i. Disconnect supply lines W1, R1, and T7 from the propulsion control valve installation.

j. Disconnect liquid nitrogen supply lines U1 and U2 (B and C Series) and U1 (D(R and D) Series).

k. Shift switch at the missile service tower panel to LAUNCH position (energizing solenoid 99-35002-001) in order to relieve pressure from the release cylinders.

### WARNING

Stand clear of exhaust ports on main release cylinders when the switch is shifted to LAUNCH.

#### 4-5. STANDBY PROCEDURE.

a. With the missile empty, check the following:

1. Booster unit (7-08352) set at 3200 psig.
2. Auxiliary frames are ready (7-08276 hoses removed).
3. Electrical safety system control at service tower.

b. With the missile fueled, check the following:

1. Booster unit (7-08352) set for 7000 psig.
2. Auxiliary frames are ready (7-08276 hoses removed).
3. Electrical safety system control at the blockhouse.

#### 4-6. EMERGENCY OPERATION.

a. If the stabilizing pressure drops below the safe limit with an empty missile inside the service tower, the following emergency operation applies:

1. Clear the area of all personnel except the emergency operators.
2. Turn off the alarm.
3. Secure the missile with the upper support (nose cone stabilizing bar); screw stop nuts in. (See Convair Report ZM-7-193).
4. Vent and repair the 2000 psig system.

b. If the stabilizing pressure drops below the safe limit with a full missile outside the service tower, the following emergency operation applies.

1. Turn off the alarm.
2. Empty and purge the missile of fuel and oxidizer through the fuel and oxidizer pumps.
3. Check the emergency helium pressure for 1100 psig minimum (B and C Series).
4. Bring up the missile service tower.
5. Secure the missile at the upper support.
6. Vent and repair the 2000 psig system.

c. If the main supply pressure falls below the safe limit of 1800 psig, with an empty missile inside the service tower, the following emergency operation applies:

1. Clear the area of all personnel except the emergency operators.

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2. Turn off the alarm.
3. Check the 7-08352 booster unit.
4. Secure the missile at the upper support.
5. Vent the pressure from the 2000 psig system and the emergency helium system (B and C Series); make the necessary repairs.

d. If the main supply pressure falls below the safe limit of 1800 psig, with a full missile outside the service tower, the following emergency operation applies:

1. Turn off the alarm.
2. Empty and purge the missile of fuel and oxidizer.
3. If the pressure is maintained above 1500 psig, move the service tower into place.
4. Secure the missile at the upper support.
5. Vent the pressure from the 2000 psig system and the emergency helium system (B and C Series); make any necessary repairs.

**CAUTION**

If the pressure falls below 1500 psig and the service tower and emergency upper support are not in place, the missile may lean enough to cause a tank section failure.

e. If the main release cylinder pressure falls below 2300 psig, with an empty missile inside the service tower, the following emergency operation applies:

1. Clear the area of all personnel except the emergency operators.
2. Turn off the alarm.
3. Check the 7-08352 booster unit; if the

pressure is over 2200 psig, proceed with steps 4 and 5 below.

4. Secure the missile at the upper support.
5. Vent and repair the release pressurization system.

f. If the main release cylinder pressure falls below 2300 psig with a full missile outside the service tower, the following emergency operation applies:

1. Turn off the alarm.
2. Empty and purge missile of fuel and liquid oxygen.
3. If the pressure at the 7-08352 booster unit is maintained over 2200 psig, proceed with steps 4, 5, and 6 below:
4. Bring up the service tower.
5. Secure the missile at the upper support; screw in stop nuts.
6. Vent and repair the release pressurization system.

**WARNING**

If the pressure is under 2200 psig (empty missile), do not approach it unless the pressure is restored, the upper missile support is in place, or the static firing struts are in place.

g. If the vertical alignment of the missile is beyond tolerance on the synchronization indicator, with an empty missile inside the service tower, the following emergency operation applies:

1. Clear the area of all personnel except the emergency operators.
2. Turn off the alarm.
3. Secure the missile at the upper support.

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4. Vent the 2000 psig system and make any necessary repairs.

h. If the vertical alignment of the missile is beyond tolerance on the synchronization indicator, with a full missile outside the service tower, the following emergency operation applies:

1. Turn off the alarm.
2. Empty and purge missile of fuel and liquid oxygen.
3. If the missile stays within 1/2 degree of the vertical (measured at the theodolite stations), proceed with steps 4, 5, and 6 below:

4. Bring up the missile service tower.
5. Secure the missile at the upper support; screw stop nuts in.
6. Vent the 2000 psig system and make any necessary repairs.

**NOTE**

If the main release cylinder falls below 5200 psig, launch cannot be made; (follow procedure listed under paragraph 4-6c).

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Section V  
Paragraph 5-1

SECTION V  
MAINTENANCE

5-1. PREVENTATIVE MAINTENANCE.

NOTE

For maintenance, see Preventative  
Maintenance Technical Manual  
ZE-7-087A, Pneumatic Booster Unit.

SECTION VI  
TROUBLESHOOTING

6-1. TROUBLESHOOTING.

6-2. MISSILE HOLDDOWN AND RELEASE CYLINDER CONTROL.

<u>Trouble and Probable Cause</u>	<u>Remedy</u>
<p>a. Release mechanism fails to move.</p> <p>1. Burned-out solenoids in 99-35002-001 valve.</p> <p>2. Stuck spools in 99-35002-001 valve (caused by dirt).</p> <p>3. Lack of nitrogen pressure.</p>	<p>Replace solenoids.</p> <p>Replace valve</p> <p>Check functioning of pneumatic booster unit and nitrogen charging unit.</p>
<p>b. Slave cylinders, 7-08264, do not reach full stroke or are not synchronized.</p> <p>1. Oil system not full (temperature compensator bottomed due to hydraulic leak).</p> <p>2. Air in system.</p>	<p>Correct leak and refill system with oil.</p> <p>Bleed system.</p>
<p>c. Release cylinders cannot be retracted.</p> <p>1. Cams in cylinders not engaging notches in piston rod.</p>	<p>To check, pull rod out second time; if second try fails, cylinder must be repaired or replaced.</p>

6-3. STABILIZING SYSTEM

<u>Trouble and Probable Cause</u>	<u>Remedy</u>
a. Low stabilizing pressure (below 900 psig for B & C) (below 1200 psig for D)  1. Malfunction of the 7-08327 regulator.  2. Inlet pressure too low.  3. Line, fitting, or flexible hose with a pneumatic leak.  4. Regulator pneumatic leak.  5. Temperature compensator 7-08279 pneumatic leak.  6. Stabilizer cylinder 7-08267 pneumatic leak.	  Replace regulator.  Check functioning of pneumatic booster unit and nitrogen charging unit.  Tighten or replace.  Replace regulator.  Replace temperature compensator.  Dismantle cylinder and repair leak as necessary.

6-4. SYNCHRONIZATION SYSTEM.

<u>Trouble and Probable Cause</u>	<u>Remedy</u>
a. Inability to maintain synchronization.  1. Lines, fittings or flexible hoses show hydraulic leakage.  2. Seals in 7-08279 tempera- ture compensator and 7-08267 stabilizer cylinder show leakage.  3. Low nitrogen pressure to 7-08279 temperature compensator.  4. Air in system.	  Tighten or replace.  Replace seals.  Check functioning of pneumatic booster unit and nitrogen charging panel.  Bleed system.

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Section VI  
Paragraph 6-5

6-5. AUXILIARY SUPPORT RETRACTION SYSTEM.

<u>Trouble and Probable Cause.</u>	<u>Remedy</u>
a. Rebound of the auxiliary frames after missile release indicates malfunction of the 7-08327 regulator.	Replace regulator.

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