TECHNICAL MANUAL

HANDBOOK

OPERATION AND SERVICE INSTRUCTIONS

WITH

ILLUSTRATED PARTS BREAKDOWN

VACUUM-PRESSURE TEST SET

PART NO. IDC-VPT-7A

STOCK NO. R4920-588-2856-T030

(Intercontinental Dynamics Corporation)

HEADQUARTERS, DEPARTMENT OF THE ARMY

3 OCTOBER 1980

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OPERATION AND SERVICE INSTRUCTIONS
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VACUUM-PRESSURE TEST SET

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TABLE OF CONTENTS

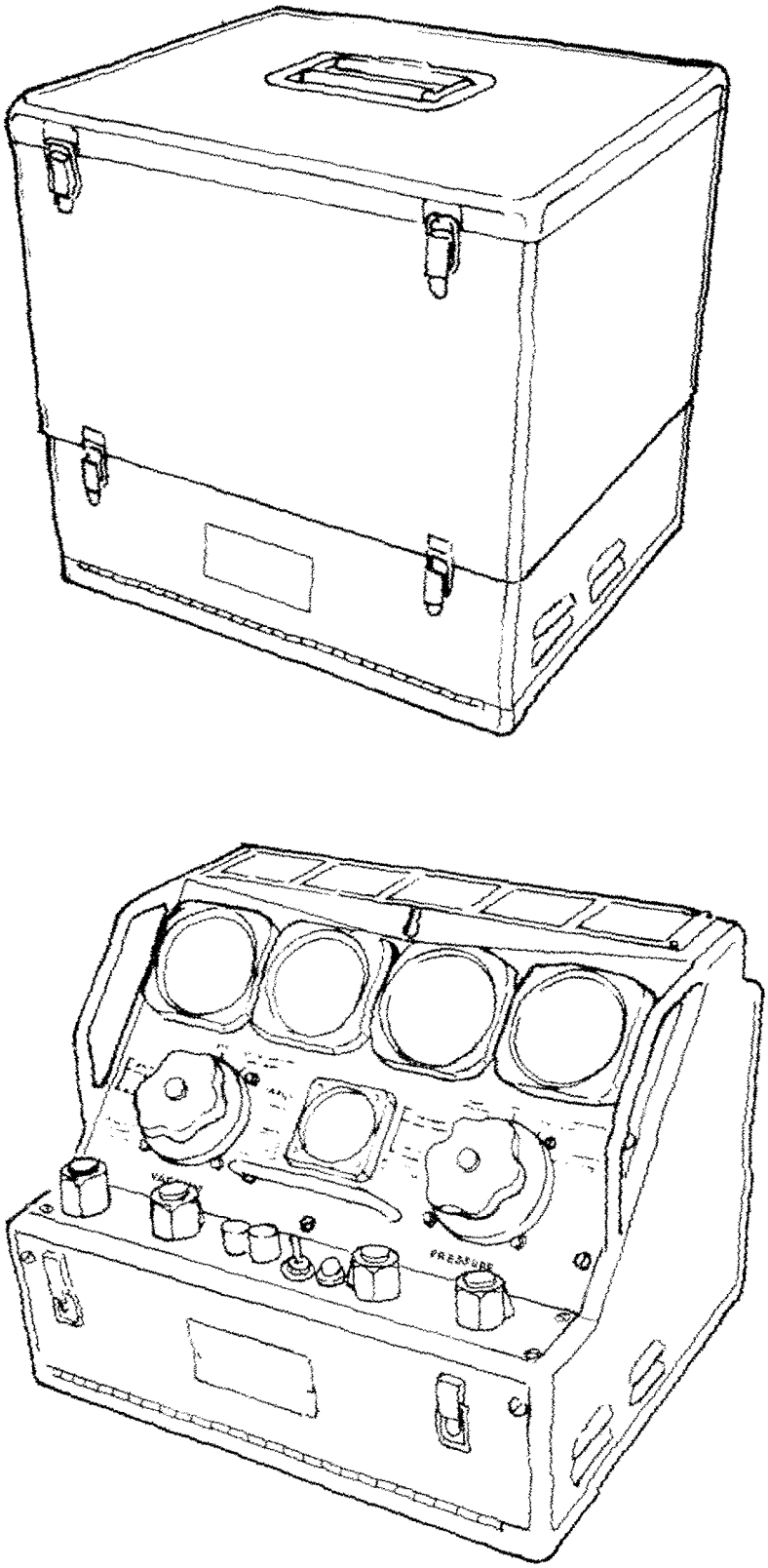


Figure 1-1. Vacuum Pressure Test Set

SECTION I

INTRODUCTION AND DESCRIPTION

1-1. GENERAL.

1-2. This handbook contains operation, maintenance and service instructions for Vacuum-Pressure Test Set VPT-7A (see figure 1-1) manufactured by Intercontinental Dynamics Corporation, Englewood, New Jersey.

1-3. PURPOSE OF EQUIPMENT.

1-4. Vacuum-Pressure Test Set VPT-7A is a portable, self-contained pressure and vacuum test set whose primary function is the testing of aircraft instruments such as altimeters, rate-of climb indicators, airspeed indicators, manifold pressure gauges and fuel pressure gauges. In the performance of this function, the test set accurately simulates engine or atmospheric pressures and vacuums such as are met in the normal operation of an aircraft. Simulation of these pressures and vacuums is accomplished by means of a small high speed pump capable of producing pressures up to 50 pounds per square inch and a vacuum equivalent of an altitude of 80,000 feet or more. Accessories which will operate in conjunction with this test set will be available in the future for testing Mach indicators.

1-5. DESCRIPTION.

1-6. The overall size of the VPT-7A is 16-1/2 inches wide by 14-1/32 inches deep by 14-3/4 inches high. This includes a removable cover which contains all the accessories and tools necessary for proper operation of the test set. With the cover removed, all of the major operating components of the test set are visible. These consist of five aircraft instruments representative of the types to be tested: two multiple function selector valves, one for vacuum and one for pressure tests; four micrometer needle valves used for fine or vernier control of vacuum and pressure; a power switch for the pump motor, along with an indicator lamp and fuses. At the rear of the test set are four self-sealing quick-couplings for connecting test air lines and a multi-terminal AN receptacle for electrical connections. Along the top of the instrument are a row of cards which give the latest calibration corrections for the master instruments on the test set panel. Under this row of cards, accessible by lifting the narrow aluminum cover, are five small selector valves used for self-checking of the test set master instruments during calibration and recalibration of these instruments. For convenient access to components of the test set, the main panel is hinged at the top and may be opened by turning the five Dzus fasteners accessible from the front. When the main panel is opened the motor pump assembly, air-oil reservoir, and the electrical power supply components are visible. In addition, the side doors and the lower front panel are hinged and secured with Dzus fasteners. These doors provide access to the reservoir, with its drain refill valve and hose, and the filter sumps in the vacuum and pressure systems. The lower front panel provides access to the three vacuum and three pressure safety relief valves. The test set is designed to operate from either a 28 V dc or 115 V ac source. The line frequency of the 115 V ac source may be from 50 to 500 cycles.

1-7. ACCESSORIES SUPPLIED WITH TEST SET. The operating accessories supplied with the VPT-7A Vacuum-Pressure Test Set are illustrated in figure 1-2, and listed in Table 1-1 by part number, quantity, nomenclature and use.

TABLE 1-1

ACCESSORIES ASSEMBLY (IDC #10471) (For net higher assembly, see figure 9-1)

Part No.	Figure 1-2 Index No.	Qty	Nomenclature	Use
10494	11	1	Clamp Assembly, Pitot Static, Round (ICDM)	Pitot System Tests
10493	12	1	Clamp Assembly, Pitot Static, Oblong (ICDM)	Pitot System Tests
10487-1	13	1	Sleeve Assembly, Pitot Pressure, Round (ICDM)	Pitot System Tests

TABLE 1-1 (Cont)

ACCESSORIES ASSEMBLY (IDC #10471) (For next higher assembly, see figure 9-1)

Part No.	Figure 1-2 Index No.	Qty	Nomenclature	Use
10487-2	14	1	Sleeve Assembly, Pitot Pressure, Oblong (ICDM)	Pitot System Tests
10324	9	1	AC Power Cable Assembly, AN 1 Phase to test unit (8 ft.) (ICDM)	1 Phase Operation
10297	6	1	AC Power Cable Adapter, AN 1 Phase to AN 3 Phase (8 in.) (ICDM)	3 Phase Operation
10323	7	1	AC Power Cable Adapter, AN 1 Phase to Standard Bench (9 in.) (ICDM)	1 Phase Operation
10338	1	1	AC Power Cable Assembly-Extension (25 ft.) (ICDM)	Extension Cable
10325	8	1	DC Power Cable Assembly-AN DC to Test Unit (8 ft.) (ICDM)	DC Operation
AN6270-3-300	2	1	25 Feet 3/16" Hose Assembly	Instrument Test Connections
AN6270-3-72	4 & 5	2	6 Feet 3/16" Hose Assembly	Instrument Test Connections
AN6270-3-24	3	1	2 Feet 3/16” Hose Assembly	Instrument Test Connections
10326	10 & 16	2	Quick-Coupling Assembly (ICDM)	Hose Connections
AVEC-4-2F	17	1	Coupling (SNC)	Spare
AN816-3D	21	2	Nipple, 1/8 Pipe to 3/16 Flared Tube	Instrument Hose Connection
AN806-3D	23	1	Plug, 3/16 Flared Tube	Hose Leak Test
AN933-1D	22	1	Plug - 1/8 Pipe	Coupling Leak Test
AN919-2D	18	1	Union, Reducer, 1/4 Flared Tube to 3/16 Flared Tube	Hose Connections
AN815-3D	19 & 20	2	Union, 3/16 Flared Tube to 3/16 Flared Tube	Hose Connections
AN737-48	15	1	Clamp, Sleeve	Clamp for Pitot Pressure Sleeve Assembly
10354-1	26	1	Container (High Temp. Oil) (ICDM)	Pump Lubrication
10354-2	25	1	Container (Low Temp. Oil) (ICDM)	Pump Lubrication
10372	28	1	Wrench, Open End 3/8 x 7/16 (ICDM)	Fabrication of Test Hoses
10373	29	1	Wrench, Open End 7/16 x 1/2 (ICDM)	Fabrication of Test Hoses

TABLE 1-1 (Cont)

ACCESSORIES ASSEMBLY (IDC #10471) (For next higher assembly, see figure 9-1)

Part No.	Figure 1-2 Index No.	Qty	Nomenclature	Use
10374	30	1	Wrench, Open End 9/16 x 5/8 (ICDM)	Fabrication of Test Hoses
10375	31	1	Wrench, Open End 11/16 x 7/8 (ICDM)	Fabrication of Test Hoses
10376	32	1	Wrench, Allen #8 (ICDM)	Operation of Case Leak Test Valves
10277-2	24	12	Calibration Card-Rate-of-Climb (ICDM)	Instrument Calibration
10293-2	24	12	Calibration Card-Altimeter (ICDM)	Instrument Calibration
10294-2	24	12	Calibration Card-Air Speed (ICDM)	Instrument Calibration
10295-2	24	12	Calibration Card-Manifold Pressure (ICDM)	Instrument Calibration
10296-2	24	12	Calibration Card-Fuel Pressure (ICDM)	Instrument Calibration
NAVAER 17-15C-539	27	2	VPT-7A Manual	Service and Operation Data

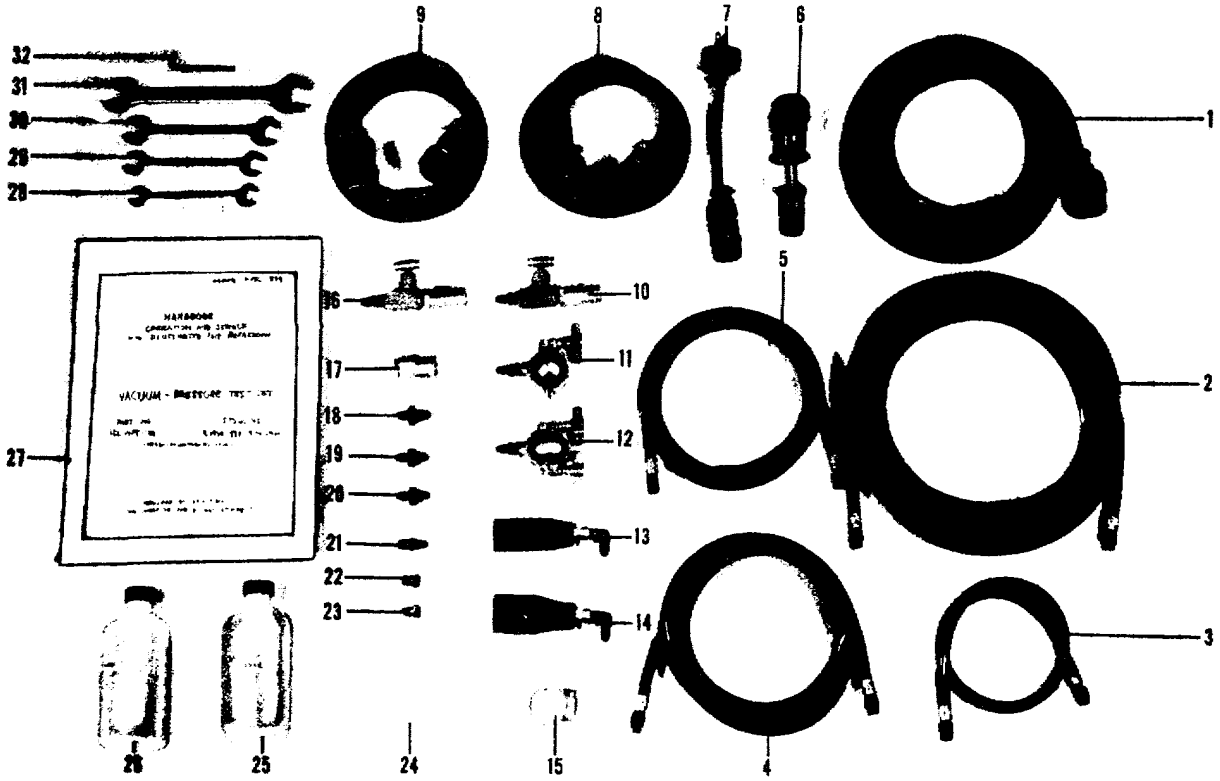


Figure 1-2. Accessories for Vacuum Pressure Test Set VPT-7A

1-8. PERFORMANCE.

1-9. Table 1-2 lists supply requirements, performance data and other leading particulars.

TABLE 1-2

PERFORMANCE DATA

Type	Vacuum-Pressure Test Set
Model	VPT-7A
Power Requirements	28 V dc at 2.2A
	115 V ac 1∅ 50-500 cps
	115 V ac 3∅ 50-500 cps at 0.75A rms
Operating Temperatures	-40°F to ≠ 150°F
	(-40°C to ≠65°C)
Max Pressure Produced	50 lb/in.^{2}
Max Vacuum Produced	-29.5 in. Hg
Net Weight	57-1/2 lb
Shipping Weight Minus Overseas Packing	67 lb
Oil Sump Capacity	8 fluid oz.
Dimensions	
Depth	14-1/32 in.
Height	14-3/4 in.
Width	16-1/2 in.
Storage Temperatures	-54°C to ≠ 84°C
	(-65°F to ≠ 183°F)
Pump Speed	12,000 RPM
Rate-of-Climb Indicator	0-6,000 ft/min (max)
	climb or descent
Altimeter Range	-1,000 to 80,000 ft
Airspeed Indicator Range	50-650 knots
Manifold Pressure Indicator Range	10 to 75 in.
	of Hg Absolute
Fuel Pressure Gauge Range	0-25 lb/in.^{2}
Life	2,000 Hrs

1-10. DESCRIPTION OF THE MAJOR COMPONENTS.

1-11. GENERAL. The VPT-7A is composed of a number of major components. These are grouped into two systems for convenience and ease of analysis. They are as follows:

a. Electrical system.
b. Vacuum system and pressure system.

Minor components, not discussed in paragraphs 1-13 to 1-14 are subordinate to one of these systems and are discussed at an appropriate place in the handbook.

1-12. ELECTRICAL SYSTEM (Figures 1-3 and 1-4).

1-13. The electrical system is designed for a wide range of power inputs. The tester will operate on 28 V dc or 115 V ac, 50 to 500 cycles, single phase or three phase line. Major components of the system are a step-down transformer (1, figure 1-3), selenium rectifier (2, figure 1-3) and an electrolytic capacitor (3, figure 1-3). The electrical system is energized through a multi-pin AN connector (4, figure 1-3) and power switch (7, figure 4-1). The internal connections of the power cables and test set are such that when the special cables provided are used for the power sources specified, the motor is automatically connected for proper operation. This feature prevents connection of the test set to the wrong power source.

1-14. VACUUM AND PRESSURE SYSTEM (Figure 1-5).

1-15. The principal components of the vacuum-pressure system are as follows:

a. A compact dual-purpose motor-pump assembly (1 and 2, figure 1-6). The motor section of the assembly is a 12,000 rpm, 1/30 horsepower, continuous duty, series wound 28 V dc motor. The pump section is a direct drive, positive displacement, rotary type pump with multiple porting.

b. An air-oil reservoir (3, figure 1-6), connected to the pressure side of the pump, feeds filtered air under pressure to the pressure control valves (4, figure 1-7). The vacuum side of the pump is connected to the vacuum control valves (3, figure 1-7).

c. Two banks of relief valves (1 and 2, figure 1-7); three for vacuum and three for pressure. Their function is to protect the master instruments (8, 9, 10, 11, 12, figure 4-1) and aircraft instruments under test from excessive pressure or vacuum.

d. The vacuum and pressure selector valves (1 and 2, figure 4-1). These selector valves switch multiple pneumatic circuits. For each selector valve test position all necessary inlet and outlet, pressure and vacuum lines, control valves and instruments are properly connected.

e. A bank of simple plug valves (1, 2, 3, 4, 5, figure 4-2). These plug valves are located under the calibration card cover. They provide means for checking and calibrating master panel instruments in the tester and are not used during routine testing.

1-16. THEORY OF OPERATION (Refer to figure 1-5).

1-17. PRESSURE SECTION. The pump (1) serves the dual function of developing pressure as well as vacuum for the operation of the test set. In the pressure section a mixture of air and oil is pumped into the reservoir (2) where the oil and air are separated. The separated oil drops to the bottom of the reservoir where some is fed to the pump for lubrication purposes, the air being forced out at the top of the reservoir under pressure. The pressurized air, after going through a check-valve (3), whose function it is to prevent oil from entering instrument lines during transportation, enters an oil sump (4) and passes through a filter which Is an integral part of the sump. Air from the sump flows through two pressure control valves (5) and (6). The pressure increase valve (C3) controls the amount of air permitted in the system. The pressure decrease valve (6) opens the line to the outside ambient air allowing system pressure to bleed off. Proper setting of these two valves enables the operator to maintain a pressure at any desired level within the limitations specified in Table 1-2. The available pressure level, as fixed by the control valves, is sent to the pressure relief valve PR-3 (10), and pressure selector valve (7). Setting the pressure selector valve at the desired test position then completes the circuit to the instrument under test and simultaneously connects the instrument under test and the master Instrument to one of pressure relief valves

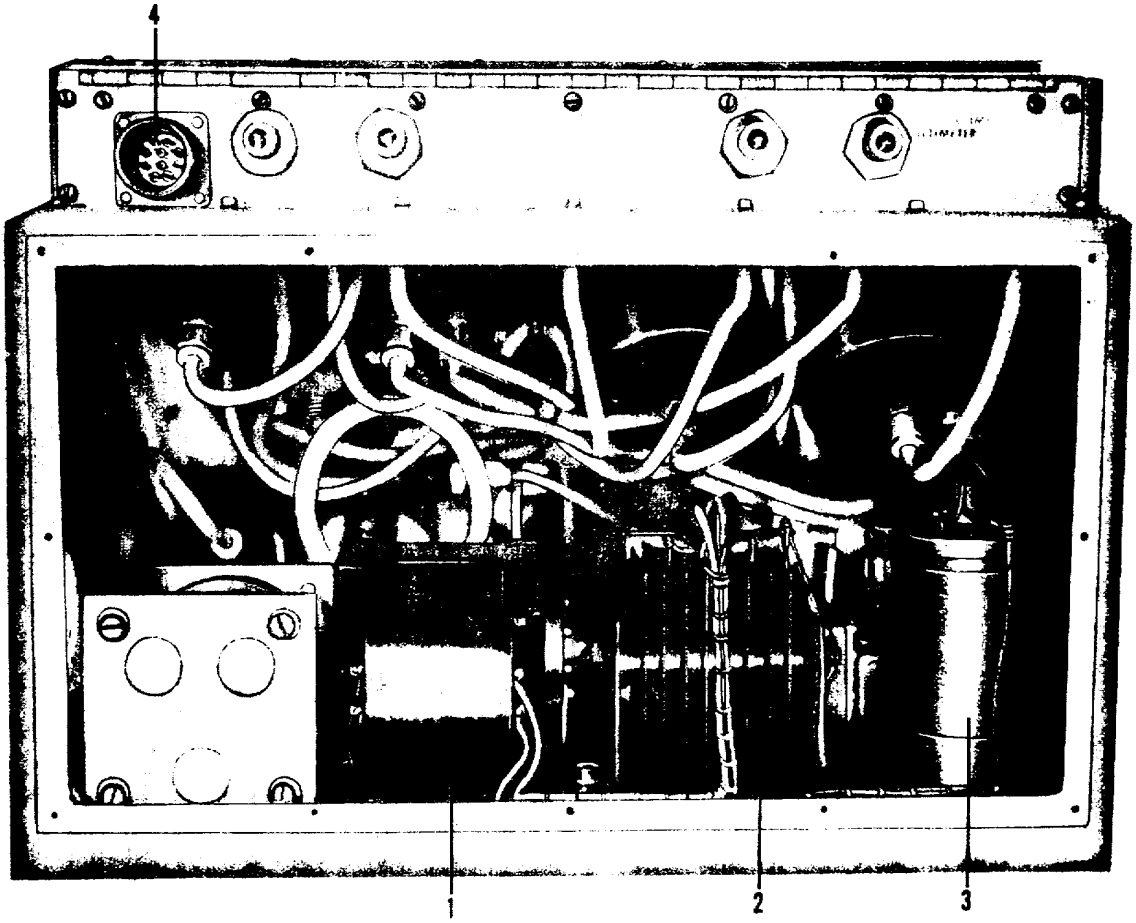
PR-1 or PR-2 (8 and 9). PR-3 is in the line at all times which protects the instruments from pressure overload.

1-18. VACUUM SECTION. The vacuum section of the test set uses the same pump to develop vacuum. Evacuated air from the vacuum section passes through an oil sump (11, figure 1-5), a filter which is an integral part of the sump, and a check-valve (12, figure 1-5). The check valve prevents oil from entering the instrument lines. Two vacuum control valves (13 and 14, figure 1-5) control the amount of vacuum developed in the test set in a manner similar to the pressure controls described in paragraph 1-17. Setting the vacuum selector valve (15, figure 1-5) at the desired test position completes the circuit to the instrument under test and simultaneously connects the instrument under test and the master instrument to one of three vacuum relief valves (16, 17, and 18, figure 1-5) which protect the instruments from vacuum overloads.

1-19. The output ports of the vacuum and pressure selector valves connect the vacuum and pressure sections to the master instruments on the test set panel and to the self-sealing quick couplings (19, 20, 21, and 22, figure 1-5) on the rear of the test set.

1-20. A group of selector valves (23, 24, 25, 26 and 27, figure 1-5) on the top of the test set, under the calibration card panel, provide isolation for the master instruments of the test set. These valves serve a dual function; namely, to permit case leak tests and/or calibration of the master instruments without removing them from the test set.

1-21. The instruments to be tested are connected to tie test set by means of hoses to the quick couplings described in paragraph 1-19. By adjusting the vacuum and/or pressure level as described in paragraphs 1-17 and 1-18 both instruments, master and aircraft, should show the same indication.



1. Step-down Transformer
2. Selenium Rectifier
3. Electrolytic Filter Capacitor
4. Power Input Connector

Figure 1-3. Electrical System

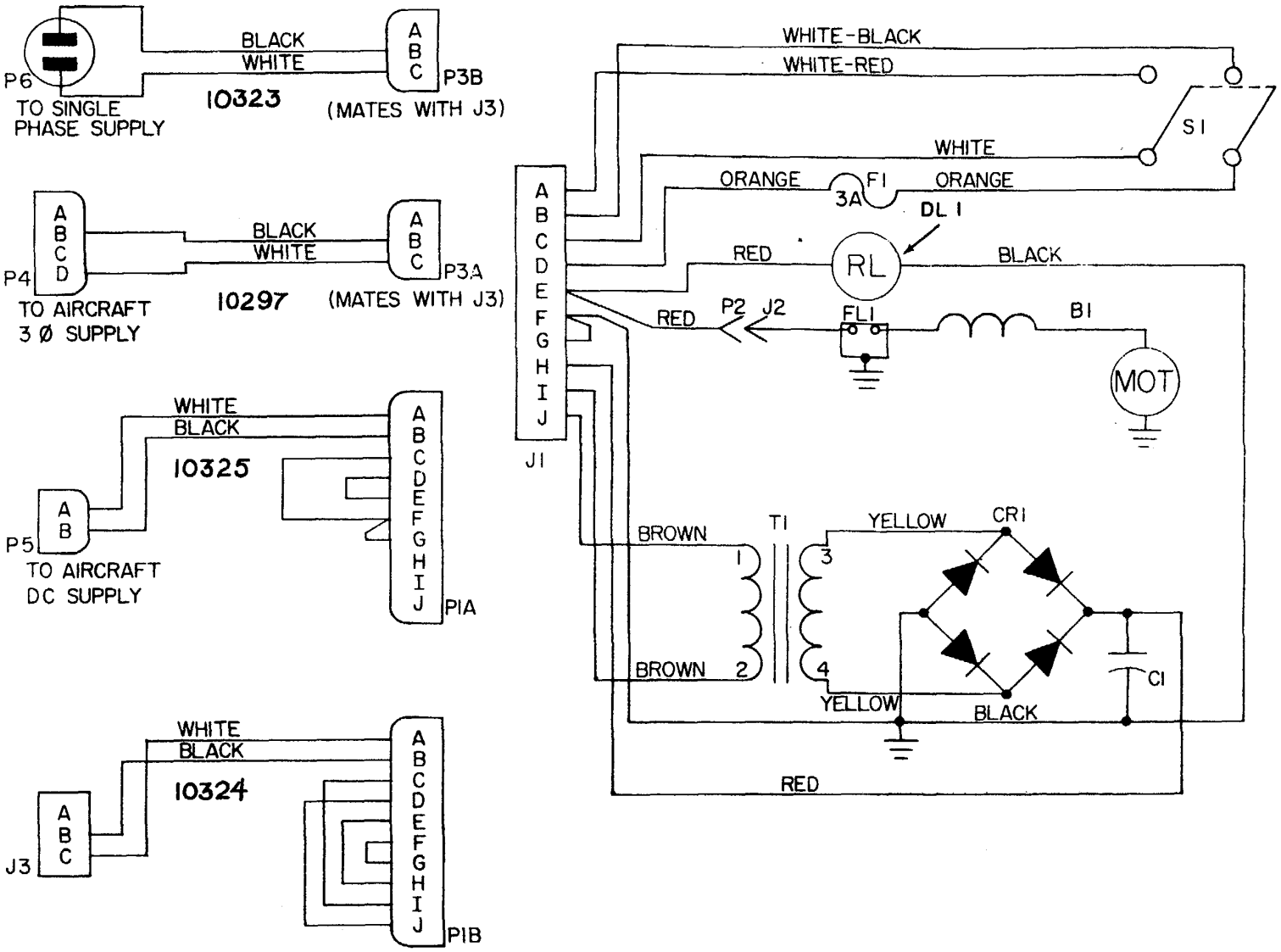
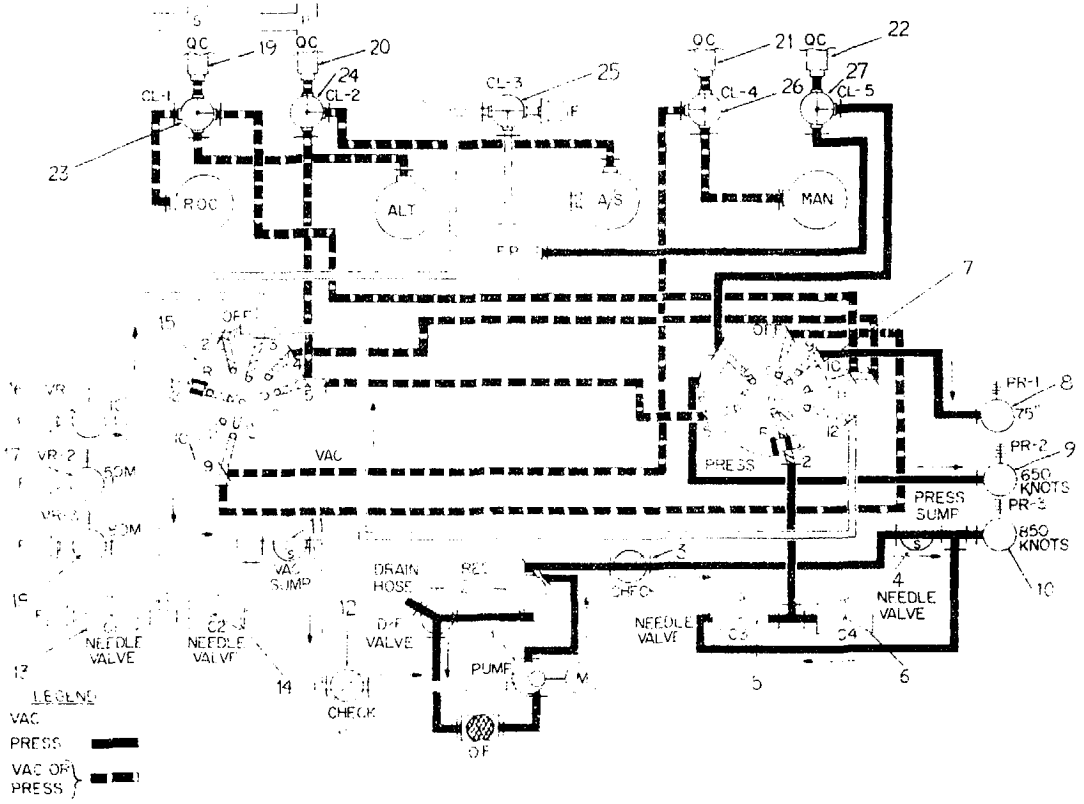
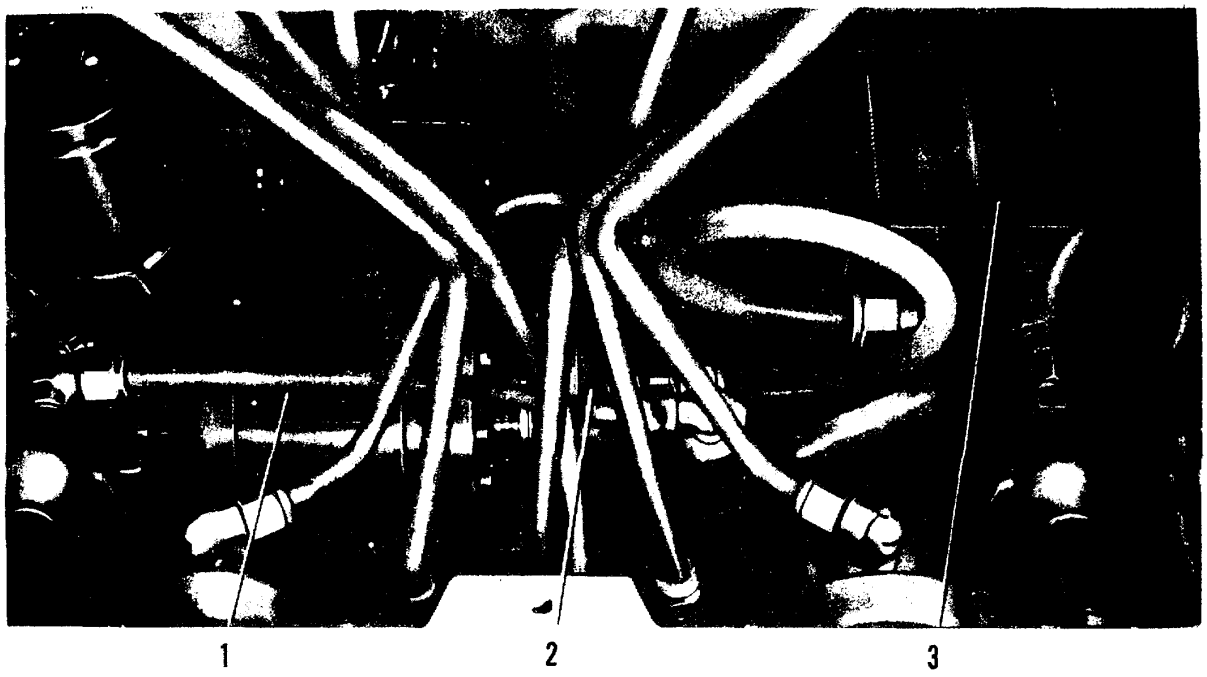


Figure 1-4. Electrical Schematic Diagram



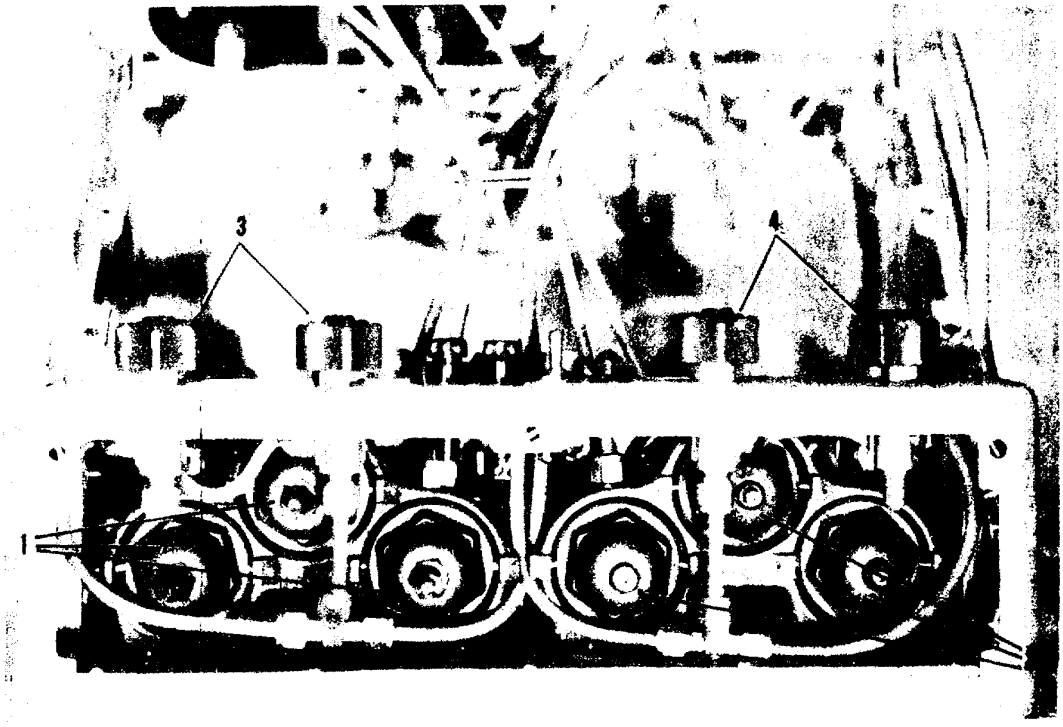
1. Pump
2. Reservoir
3. Check Valve
4. Oil Sump
5. Pressure Control Valve
6. Pressure Control Valve
7. Pressure Selector Valve
8. Pressure Relief Valve
9. Pressure Relief Valve
10. Pressure Relief Valve
11. Oil Sump
12. Check Valve
13. Vacuum Control Valve
14. Vacuum Control Valve
15. Vacuum Selector Valve
16. Vacuum Relief Valve
17. Vacuum Relief Valve
18. Vacuum Relief Valve
19. Quick Coupling
20. Quick Coupling
21. Quick Coupling
22. Quick Coupling
23. Selector Valve
24. Selector Valve
25. Selector Valve
26. Selector Valve
27. Selector Valve

Figure 1-5. Vacuum and Pressure System



1. Motor
2. Pump
3. Reservoir

Figure 1-6. Components of the Vacuum and Pressure System



1. Vacuum Relief Valves
2. Pressure Relief Valves
3. Vacuum Control Valves
4. Pressure Control Valves

Figure 1-7. Vacuum and Pressure Relief and Control Valves

SECTION II

SPECIAL TOOLS

2-1. GENERAL. There are no special tools required to operate and service the VPT-7A Vacuum-Pressure Test Set.

SECTION III

PREPARATION FOR USE, STORAGE OR SHIPMENT

3-1. PREPARATION FOR USE, ON ARRIVAL FROM DEPOT.

3-2. UNPACKING. No special unpacking procedures are required.

3-3. INSPECTION. A complete visual inspection of the unit should be made by operating personnel. Inspect for security of attachment and condition of tubing and fittings, wiring harness and general condition of all components. Examine the unit for burrs, scratches, dents, loose screws and nuts, improper or damaged safety wire. Check the multiple selector valves and control valves for ease of operation to make sure that they have not become stuck during storage or shipment. Multiple selector valves have a tendency to stick when not used for some time. If these selector valves tend to stick, no damage will result, if considerable torque is applied to valves in order to free them. Use a quick-coupling to check the coupling nipples at the rear of the test set for ease of operation.

3-4. POWER REQUIREMENTS. Power requirements for operation of test set are listed in Section I, Table 1-2.

3-5. OIL SUPPLY REQUIREMENTS. The test sets are shipped from the manufacturer with the reservoir fully drained. The reservoir holds approximately 8 fluid ounces of oil. Oil requirements vary depending upon environmental conditions. Two different types of oil are supplied for use with the test set; one of these, the HT-1 Hydraulic Oil, is used for operation in the normal operating range of -32° to 71°C (0 to 160°F), the other LT-1, is used for operation in the range from -40°C to 0°C (-40° to +32°F).

3-6. FILLING THE RESERVOIR (See figure 3-1). When reservoir is to be filled with oil, proceed as follows:

a. Connect proper power cable to receptacle (4) at the rear of the test set.
b. Open right-hand door by releasing the Dzus fasteners along door edge, and pull out DRAIN-FILL hose (3).
c. Turn DRAIN-FILL selector valve (2) to FILL.
d. Dip the end of DRAIN-FILL hose into the container of oil.
e. Open all four control valves (5).
f. Set VACUUM and PRESSURE selector valves (6) at OFF.
g. Throw power switch (7, figure 4-1) to ON.
h. Run pump until reservoir level is at index marks on reservoir casting.
i. Lift end of DRAIN-FILL hose out of the oil and hold in upward position until all the oil is sucked out of the hose.
j. Turn DRAIN-FILL selector valve to RUN.
k. Throw power switch to OFF.
l. Place DRAIN-FILL hose in storage compartment; close door and engage Dzus fasteners.

3-7. DRAINING THE RESERVOIR (See figure 3-1). To drain reservoir, proceed as follows:

a. Connect proper power cable to receptacle at rear of test set.
b. Open right-hand door by releasing the Dzus fasteners along door edge and pull out DRAIN-FILL hose.
c. Turn DRAIN-FILL selector valve to RUN.
d. Dip the end of DRAIN-FILL hose into suitable receptacle.
e. Open vacuum control valves.
f. Close pressure control valves.
g. Set PRESSURE selector at FUEL PRESSURE.
h. Set VACUUM selector at OFF.
i. Throw power switch to ON.
j. Open pressure control valve until fuel gage reads approximately 20 psi.
k. Throw power switch to OFF.
l. Turn DRAIN-FILL selector valve to DRAIN.
m. If reservoir does not drain completely, repeat procedure.
n. Turn DRAIN-FILL selector valve to RUN.
o. Collect oil in a suitable container and discard.

3-8. PRE-STARTING INSPECTION. For pre-starting inspection refer to Section IV, paragraphs 4-24 and 4-25 of this handbook.

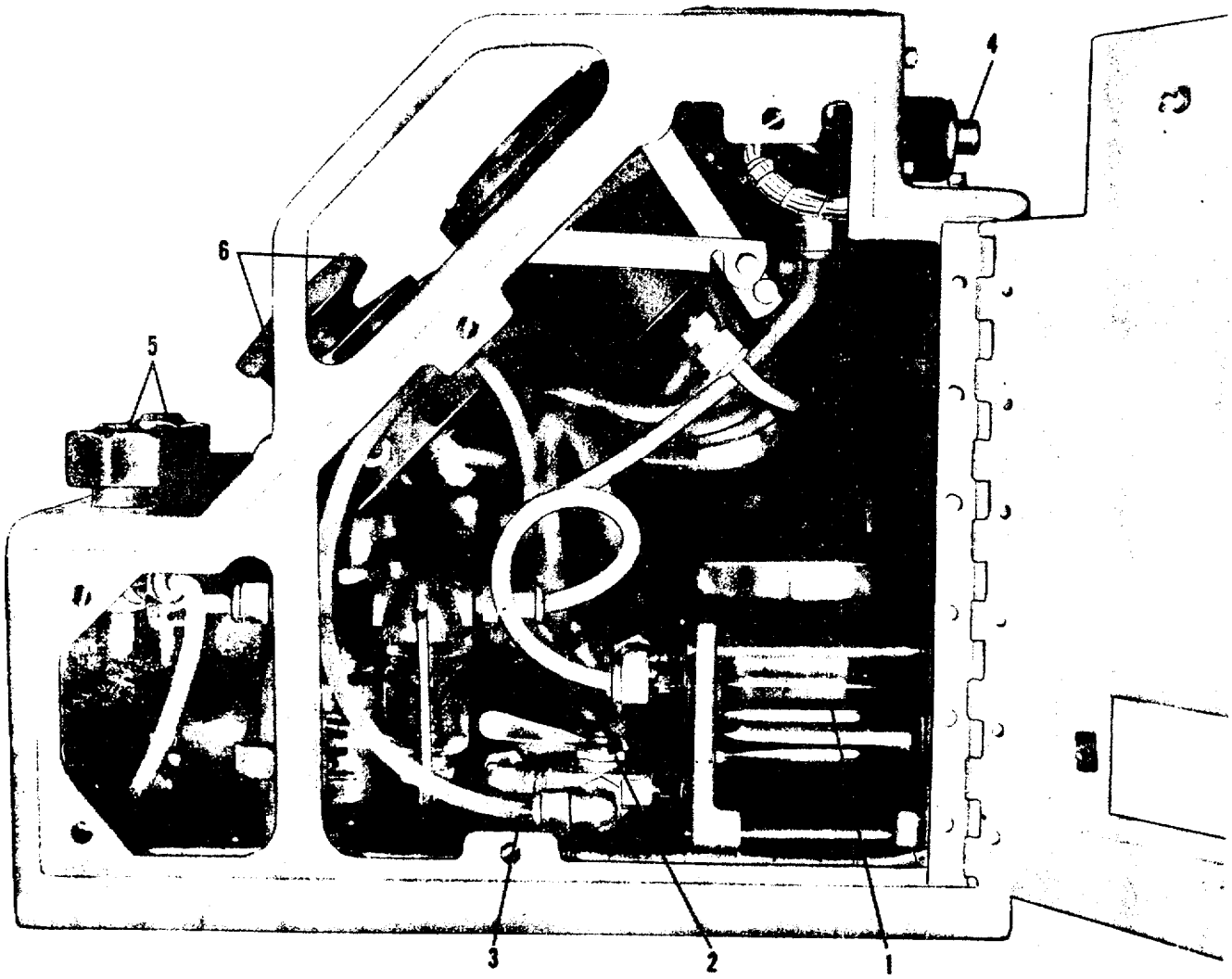
3-9. PREPARATION FOR STORAGE AND SHIPMENT. The following special procedures are required prior to shipment or storage.

a. Drain reservoir (refer to paragraph 3-7).

b. Clean and replace vacuum and pressure sump bowls and filters, if necessary (refer to Section V, paragraph 5-20).

3-10. MAINTENANCE IN STORAGE. Units may be stored indefinitely without harm after the procedures in paragraph 3-9 are followed. When units are stored in humid areas, they are to be packaged in accordance with Specification MIL-P-116B, method 2B. Every thirty days the humidity indicator must be checked and four desiccant bags replaced if indicator shows need for replacement.

3-11. SHIPMENT. For detailed procedures for packaging for shipment, refer to Specification MIL-P-116B, method 2B.



1. Reservoir
2. Drain-fill Valve
3. Drain-fill Hose
4. Power Receptacle
5. Vacuum and Pressure Control Valves
6. Vacuum and Pressure Selector Valves

Figure 3-1. Oil Reservoir

SECTION IV

OPERATION INSTRUCTIONS

WARNING

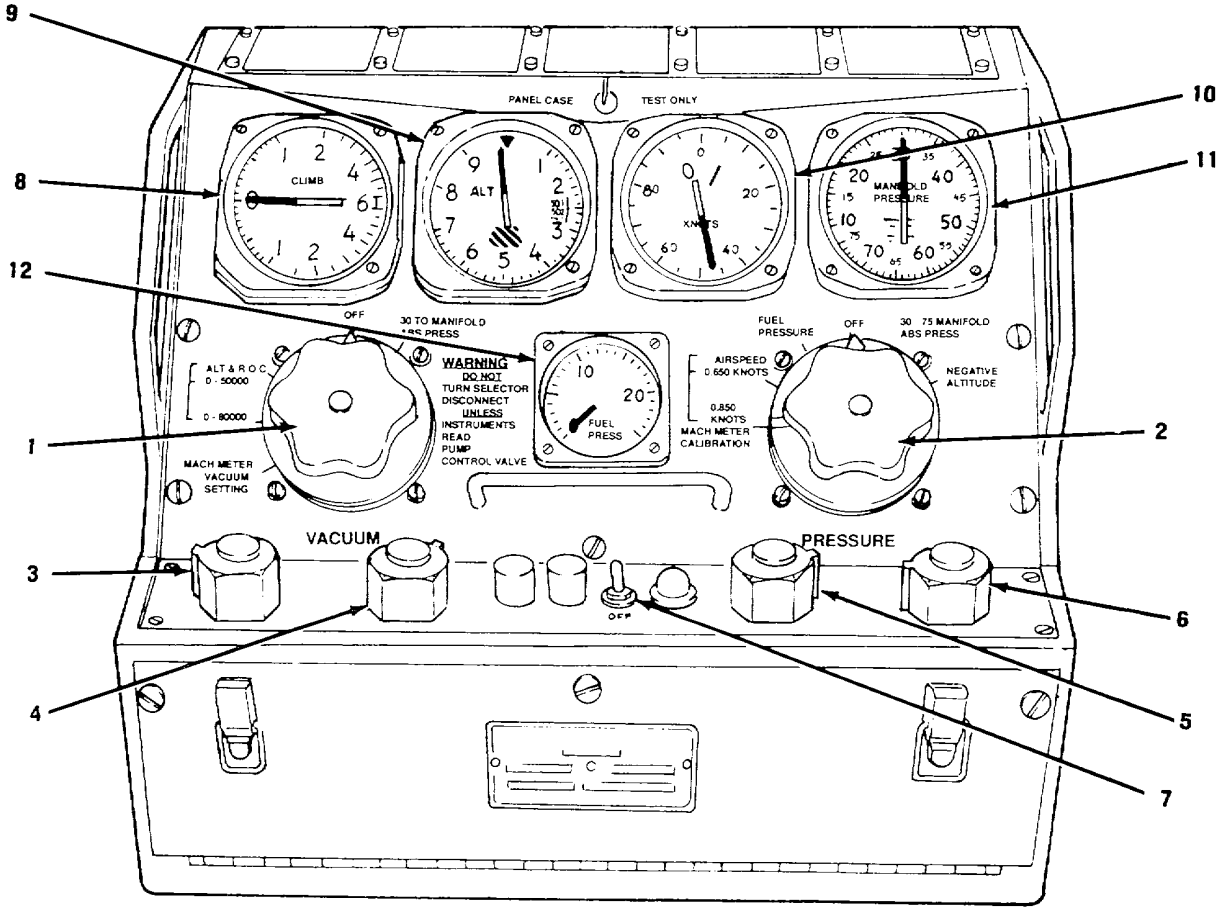
Do not operate the tester unless all access panels are in place. Injury could result from shattering of the glass reservoir or other malfunction of the tester.

4-1. GENERAL.

4-2. Operation procedures of the VPT-7A Vacuum-Pressure Test Set are given in this section.

4-3. FUNCTION OF CONTROLS AND INDICATORS.

4-4. DESCRIPTION. Operation of the VPT-TA Vacuum-Pressure Test-set is simple if the functions of the various controls and indicators are thoroughly understood. The following paragraphs explain the functions of controls and indicators on the test set's front and top panels. All operating controls and indicators are illustrated in figures 4-1 and 4-2.



1. Vacuum Selector Valve
2. Pressure Selector Valve
3. Vacuum Decrease Valve
4. Vacuum Increase Valve
5. Pressure Increase Valve
6. Pressure Decrease Valve
7. Power Switch
8. Rate-of-Climb Indicator
9. Altimeter
10. Airspeed Indicator
11. Manifold Pressure Indicator
12. Fuel Pressure Indicator

Figure 4-1. Operating Controls and Indicators

4-5. OPERATING CONTROLS.

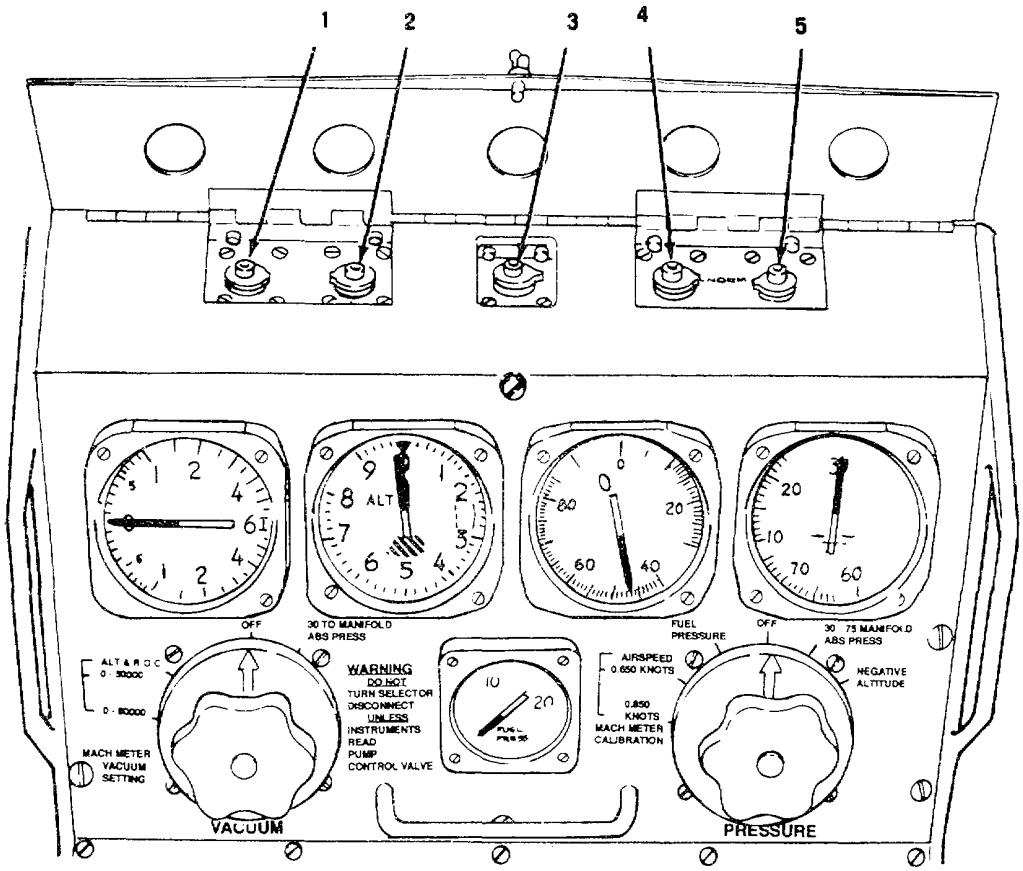
4-6. VACUUM SELECTOR (1, figure 4-1). The vacuum selector functions as a single control manifold and as such, sets up various vacuum-pressure systems (as shown in figure 1-5) required to test and/or calibrate certain types of aircraft instruments. The particular vacuum-pressure configurations are dependent on the position of the selector.

4-7. PRESSURE SELECTOR (2, figure 4-1). The pressure selector, as in the case of the vacuum selector, also acts as a single control manifold and as such sets up various vacuum, pressure and vacuum-pressure systems (as shown in figure 1-5) required to test and/or calibrate certain types of aircraft instruments. The particular configuration is dependent on the position of this selector.

4-8. VACUUM AND PRESSURE CONTROL VALVES (3, 4, 5, and 6, figure 4-1). These valves are set up in pairs, one pair controls the vacuum level in the test set, while the other pair controls the pressure level. One valve of each pair controls the increase of vacuum or pressure while the other valve causes a decrease. These are precision valves and are designed to permit very accurate control of vacuum or pressure.

4-9. MASTER INSTRUMENT CASE LEAK TEST VALVES (1, 2, 3, 4 and 5, figure 4-2). The master case leak test valves are not used in the normal operation of the test set, but are provided for checking the master instruments for case leaks or recalibration of the master instruments without removing them from the test set.

4-10. POWER SWITCH (7, figure 4-1). This switch applies power to the motor of the pump, and an indicator lamp



1. Rate-of-Climb and Altimeter Case Leak Test Valve
2. Airspeed Case Leak Test Valve
3. Airspeed Calibrated Case Leak Test Valve
4. Manifold Pressure Case Leak Test Valve
5. Fuel Pressure Case Leak Test Valve

Figure 4-2. Case Leak Test Valves

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adjacent to the switch tells the operator that the unit is operating.

4-11. INDICATORS.

4-12. RATE OF CLIMB (8, figure 4-1). This instrument displays the rate of climb or descent in fpm according to the rate of increase or decrease of the vacuum produced by the test set. Vacuum is proportional to altitude; hence, a change in vacuum is sensed by the rate-of-climb indicator as a change in altitude. The calibrated range of the indicator is 0 ± 6000 fpm. The instrument is designed to tolerate greater rates of change for short periods of time, without damage.

CAUTION

It should be noted however that a sudden buildup to high vacuum (high altitude) or conversely a sudden drop from high vacuum to low vacuum (for example, mean sea level), can damage the instrument and render it useless.

4-13. ALTIMETER (9, figure 4-1). This altimeter has a useful range from 1,000 feet below mean sea level to 80,000 feet above mean sea level. A barometric correction scale is part of the altimeter.

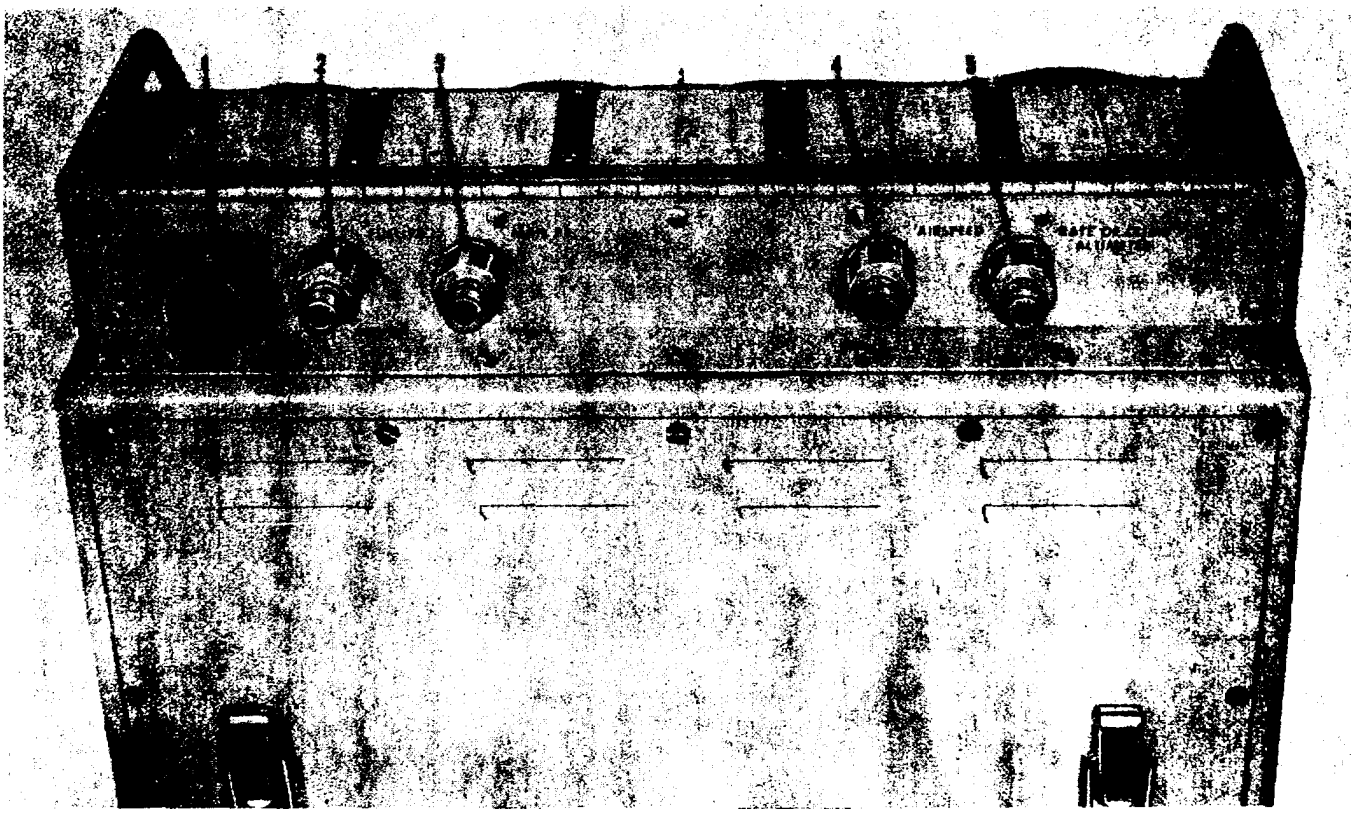
4-14. AIRSPEED (KNOTS) (10, figure 4-1). This instrument is a sensitive type which reads accurately over its full range of 50 to 650 knots.

4-15. MANIFOLD PRESSURE (11, figure 4-1). This gauge is of the absolute pressure type, reading from 10 inches to 75 inches of Hg, with 30 inches of Hg representing mean sea level. When used at sea level, an indication below 30 inches of Hg represents a vacuum in the test set. An indication above 30 inches of Hg represents a pressure in the test set.

4-16. FUEL PRESSURE (12, figure 4-1). This gauge is a direct reading instrument, calibrated from zero to 25 psig.

4-17. TEST SET CONNECTIONS.

4-18. POWER CONNECTOR (1, figure 4-3). Power



1. Power Connector
2. Fuel Pressure
3. Manifold Pressure
4. Airspeed
5. Rate-of-Climb and Altimeter

Figure 4-3. Test Set Connections

(ac or dc) is applied to this receptacle as required. In conjunction with the power cables, its internal wiring automatically adjusts the circuit of the test set to operate from the power supplies specified in Section I, Table 1-2.

4-19. FUEL PRESSURE (2, figure 4-3). This connection is used only when testing fuel pressure gauges rated up to 25 psig.

4-20. MANIFOLD PRESSURE (3, figure 4-3). This connection is used when testing manifold pressure gauges covering the range from 10 to 75 inches of Hg absolute.

4-21. AIRSPEED (4, figure 4-3). This connection is used when testing and calibrating airspeed indicators calibrated in knots or miles per hour. When checking Mach meters this connection must be used in conjunction with the altimeter connection.

4-22. ALTIMETER AND RATE OF CLIMB (5, figure 4-3). This connection is used for testing altimeters and rate-of-climb indicators; for connection to the static side of airspeed indicators when checking at altitudes other than sea level, and for checking Mach meters. It is usually convenient to simultaneously test the altimeter, rate-of-climb meter, and airspeed indicator by connecting up two hoses to the last two connectors (4 and 5).

4-23. OPERATION PROCEDURES.

4-24. PRE-OPERATION. Special hydraulic oils are required for the proper operation of VPT-7A, depending upon environmental conditions. For details see Section II, paragraph 3-5. Whenever the VPT-7A test set is used in cold weather, warm the set by operating the pump for not less than 5 minutes, with both selector valves set at OFF and the VACUUM and PRESSURE controls 1, 2, 3 and 4 fully

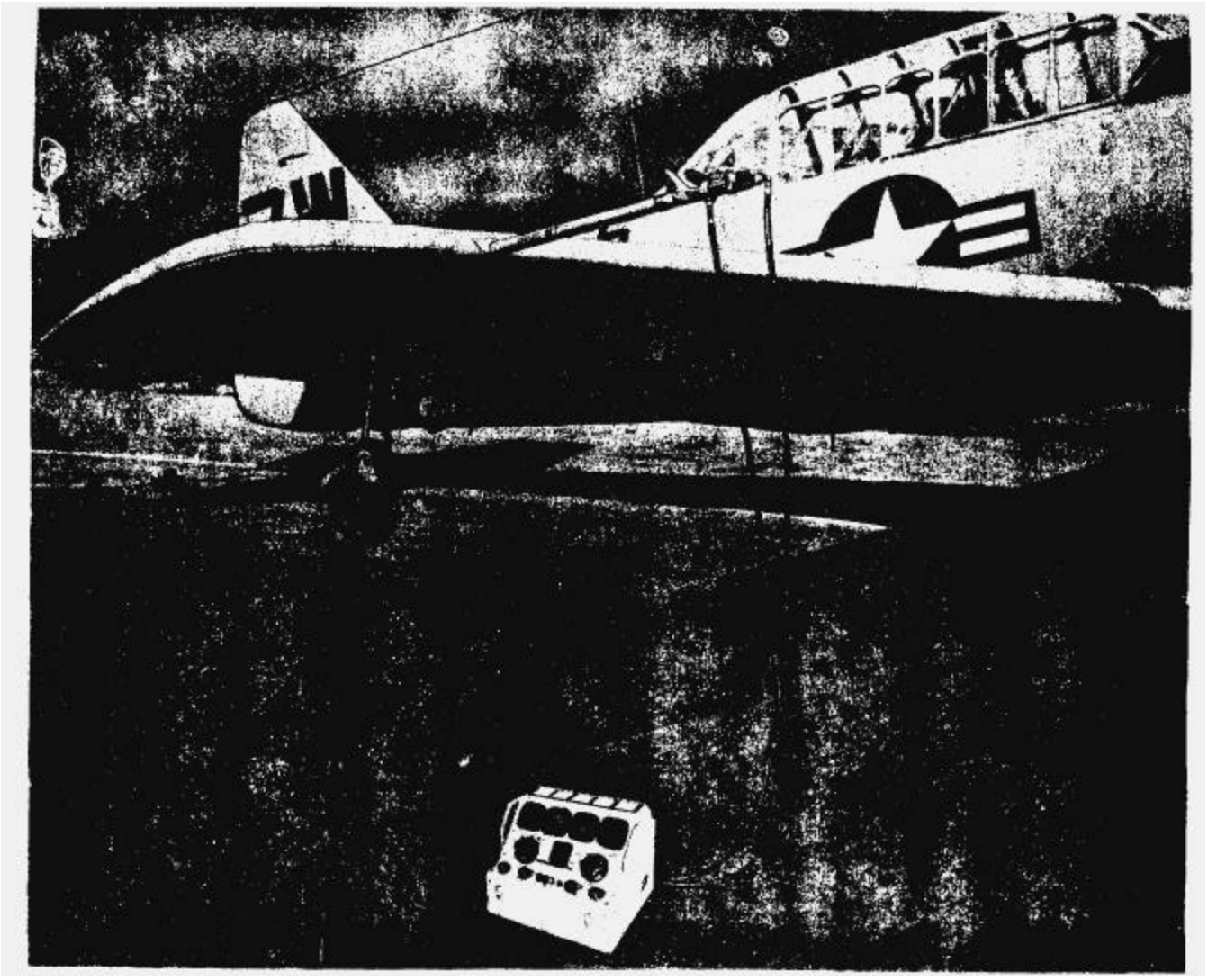


Figure 4-4. Pitot System Test

opened, before starting tests. For oil draining and filling procedures see Section III, paragraphs 3-6 and 3-7.

4-25. To prepare the VPT-7A for operation, proceed as follows:

a. Remove the cover from test set.

b. Open lid of cover and remove the desired connecting cables. (Refer to Table 1-1 and figure 1-2 for identification of accessories.)

c. Connect proper cable to power connector and plug into power supply.

d. Connect air hoses to instruments to be tested and to the proper quick-connects at the rear of the test set.

e. Before energizing unit or proceeding with any tests make sure that both VACUUM and PRESSURE selector valves are set at OFF and the VACUUM and PRESSURE control valves 1, 2, 3 and 4 are fully opened.

f. Momentarily throw power switch to ON; indicator lamp should light, and pump motor should be operating. A quick look inside the observation port in the right-hand door should show oil circulating in the oil reservoir.

g. Throw power switch to OFF.

CAUTION

During all operations and testing with the VPT-7A make sure that the Vacuum and Pressure selector valves are not moved from their test position nor air lines disconnected while the pump motor is running or while any indication other than zero can be observed on the instruments. (The indications will be zero on the rate-of-climb indicator, local ground level on the altimeter, 45 knots on the airspeed indicator, approximately 30 inches of Hg on the manifold pressure gauge, and zero on the fuel pressure gauge.) Failure to observe this will result in serious damage to the master instruments on the test set as well as to any external instruments connected to the test set.

4-26. FAMILIARIZATION AND CHECKOUT TESTS.

4-27. GENERAL. The procedures given in paragraph 4-28 through 4-32 are given to aid the operator in becoming familiar with the operation and limitations of the VPT-7A test set. The tests described in the paragraphs noted above are performed with no external connections to the test set other than power.

4-28. EXERCISING INSTRUMENTS.

CAUTION

Before making an accurate test it is advisable to run the test instruments through their complete ranges of pressure or vacuum twice. This will normalize the small amount of hyteresis in the diaphragms of the test instruments so that the correction card errors will apply when the values of the function (altitude, airspeed, absolute pressure) are approached in an increasing direction. This exercising will also provide a chance to see if any excessive friction has developed in the instruments and will tend to reduce the friction on subsequent test runs.

CAUTION

If for any reason the relief valves open during a test on any instrument, the test set shall be shut down and the readings on all instruments be returned to normal before proceeding with that particular test. If relief valve relieves before top reading is reached see Table 6-1, Item 16.

4-29. ALTIMETER AND RATE-OF-CLIMB. Procedures for altitude and rate-of-climb tests are outlined in paragraphs 4-37 and 4-43.

4-30. AIRSPEED. Procedures for airspeed tests are outlined in paragraphs 4-47 to 4-52.

4-31. MANIFOLD PRESSURE (VACUUM). Procedure for manifold pressure (vacuum) test is outlined in paragraph 4-54.

4-32. MANIFOLD PRESSURE (PRESSURE). Procedure for manifold pressure (pressure) test is outlined In paragraph 4-59.

4-33. FUEL PRESSURE. Procedure for fuel pressure test is outlined in paragraph 4-64.

4-34. TEST HOSE CONNECTIONS. The following steps illustrate the manner in which connections are made between the VPT-7A test set and aircraft instruments to be tested. When testing instruments in aircraft, disconnect the lines from the aircraft pitot tube at any convenient point.

a. If it is desired to check out one particular instrument, disconnect that instrument itself from the aircraft lines.

b. When testing altimeters and rate-of-climb indicators, connect to the instrument pitot-static line with one end of one of the test hoses provided with the test set. Couple the other end of the hose to one of the quick-connect couplings with needle valve, which is then snapped on to the ALTIMETER AND RATE OF CLIMB quick-connect nipple at the rear of the test set. Also connect, by means of the other test hose, quick-connect coupling and needle valve, from the instrument pitot-pressure line to the test set quick-connect nipple marked AIRSPEED.

c. For manifold pressure gauge tests use one of the hose assemblies from the quick-connect nipple marked MANIFOLD to the manifold pressure instrument line. Connect from the test set at the FUEL PRESSURE nipple to any convenient point on the fuel pressure line when testing fuel pressure gauges.

d. When checking instruments on the bench, connections are made directly to the fittings on the instrument cases.

NOTE

When tests have been completed, restore the original connections in the aircraft making sure that they are adequately tightened so that they will not leak or vibrate loose in flight.

4-35. For tests of the complete aircraft pitot system, the VPT-7A is connected to the pitot tube itself by means of the test hoses and special clamps and sleeves provide. (See figure 4-4.) Connection procedures are as follows:

a. Select the appropriate clamp, round or oblong, and fit it carefully over the pitot tube so that the hole leading to the clamp fitting is in line with the static hole on the pitot tube, and tighten clamp securely.

b. Attach suitable length of test hose from the clamp to the quick-connect nipple marked ALTIMETER AND RATE OF CLIMB.

c. Select appropriate sleeve, round or oblong, fit adjustable hose camp on sleeve, and push firmly over the end of pitot tube. Tighten clamp.

d. Connect appropriate length of test hose to sleeve and to quick-connect nipple marked AIRSPEED. If single hose is too short, couple two together.

e. At conclusion of tests do not fail to remove sleeve and clamp.

4-36. OPERATIONAL TESTS AND CALIBRATION OF INSTRUMENTS.

4-37. ALTIMETER AND RATE OF CLIMB TEST, 0 - 50,000 FT AND 0 - 80,000 FT. Connect the test set to the Instruments to be tested as indicated in paragraphs 4-34 and 4-35.

4-38. PROCEDURE FOR ALTIMETER AND RATE-OF-CLIMB TEST, 0 - 50,000 FT AND 0 - 80,000 FT.

a. Set barometric indicator on Altimeter to 29.92.

b. Set barometric indicator on instrum ent being tested or calibrated to 29.92.

c. Set PRESSURE selector valve at OFF.

d. Open PRESSURE control valves 3 and 4.

e. Set VACUUM selector at ALT. & R.O.C. 0 - 50,000 FT or 0 - 80,000 FT for 80,000 foot altimeter.

f. Close VACUUM control valves 1 and 2.

g. Throw power switch ON.

h. Slowly open the VACUUM increase control valve 2. The altimeter pointer will, rotate clockwise indicating an increase in simulated altitude. At the same time, the rate-of-climb indicator will move into the climb region.

i. Open the VACUUM Increase control valve 2 until the rate-of-climb indicator pointer stabilizes at the required checkpoint.

CAUTION

Do not exceed ± 6,000 fpm during this test as damage will occur to the rate-of-climb indicator.

j. Stabilize the altimeter at the required check points by adjusting the VACUUM decrease control valve 1.

k. Stabilize the rate-of-climb indicator pointer at the required check points in the DIVE region by adjusting the VACUUM decrease control valve 1.

l. After completing all check points on the altimeter and rate-of-climb indicator, throw power switch to OFF.

m. Slowly open VACUUM control valves 1 and 2 until all instruments return to normal.

n. Turn VACUUM selector valve to OFF.

o. During this test, disregard any movement on the airspeed indicator.

4-39. CALIBRATE RATE-OF-CLIMB INDICATOR (CLIMB-DIVE). Adjust VACUUM control valves 1 and 2 in accordance with paragraph 4-38. Set the master rate-of-climb indicator at each point shown on the rate-of-climb indicator calibration card. Enter the readings of the instrument under test on the calibration test card provided. If necessary, adjust the rate-of-climb indicator to exactly zero before beginning this test.

4-40. CALIBRATE ALTIMETER, 0 - 50,000 FT AND 0 - 80,000 FT. Adjust VACUUM control valves In accordance with paragraph 4-38. Set the master altimeter at each point shown on the calibration card up to and including 50,000 feet or 80,000 feet depending on altimeter. Enter the readings of the instrument under test on the calibration test card provided.

4-41. CASE LEAK TEST (RATE-OF-CLIMB AND ALTIMETER).

a. If necessary, adjust the pointer to read exactly zero on the rate-of-climb indicator being tested.

b. Adjust VACUUM control valves in accordance with paragraph 4-38 and stabilize the altimeter at 18,000 feet.

c. Close needle valve on hose assembly to instruments being tested.

d. Observe the altimeter being tested. The pointer should not move more than 100 feet in 10 seconds. A reading in excess of this indicates a possible case leak and will necessitate removal of the instrument.

e. Observe the rate-of-climb indicator being tested. The point should not indicate more than 60 fpm DIVE. Any readings in excess of this indicate a possible case leak and will necessitate the removal of the instrument being tested.

f. Slowly open needle valve on hose assembly to instruments being tested.

g. Return instruments to normal position according to instructions in paragraph 4-38.

4-42. Remove test hose connections in accordance with paragraphs 4-34 and 4-35.

4-43. ALTIMETER AND RATE OF CLIMB TEST NEGATIVE ALTITUDE. When calibrating altimeters, at a considerable height above sea level, it is necessary to provide pressure to simulate sea-level or below sea-level indications on the altimeter. For instance, NAS Denver, Colorado, is

5,280 feet above mean sea level. In a circumstance of this sort, the altimeter needle will read 5,280 feet if the barometric adjustment is properly set. Connect the test set to the instruments to be tested as indicated in paragraphs 4-34 and 4-35.

4-44. PROCEDURE FOR ALTIMETER AND RATE OF CLIMB TEST, NEGATIVE ALTITUDE.

a. Set barometric indicator on Altimeter to 29.92.

b. Set barometric indicator on Altimeter being tested or calibrated to 29.92.

c. Set PRESSURE selector valve at NEGATIVE ALTITUDE.

d. Close PRESSURE control valves 3 and 4.

e. Set VACUUM selector at OFF.

f. Open VACUUM control valves 1 and 2.

g. Throw power switch to ON.

h. Slowly open the PRESSURE increase control valve 3. The altimeter pointer will rotate counterclockwise indicating a decrease in simulated altitude. At the same time, the rate-of-climb indicator will move into the DIVE region.

CAUTION

Use extreme care when conducting this test. If the altimeter goes below -1,000 feet the altimeter will be damaged. Do not exceed ± 6,000 fpm during this test or the rate-of-climb indicator will be damaged.

i. Stabilize the altimeter at the required check points by slowly opening the PRESSURE decrease control valve 4.

j. After completing all check points listed on the altimeter calibration card, throw power switch to OFF.

k. Slowly open PRESSURE control valves 3 and 4 until all instruments return to normal.

l. Set PRESSURE selector valve at OFF.

4-45. CALIBRATE ALTIMETER, NEGATIVE ALTITUDE. Adjust PRESSURE control valves in accordance with paragraph 4-44. Set master altimeter at each point shown on calibration card down to and including -1,000 feet. Enter the readings of the instrument under test on the calibration test card provided.

4-46. Remove test hose connections in accordance with paragraphs 4-34 and 4-35.

4-47. AIRSPEED INDICATOR TEST, 50-650 KNOTS. Connect the test set to the instrument to be tested as indicated in paragraphs 4-34 and 4-35.

4-48. PROCEDURE FOR AIRSPEED INDICATOR TEST, 50-650 KNOTS.

a. Set PRESSURE selector valve at airspeed 0-650 knots.

b. Close PRESSURE control valves 3 and 4.

c. Set VACUUM selector valve at OFF.

d. Open VACUUM control valves 1 and 2.

e. Throw power switch to ON.

f. Slowly open the PRESSURE increase control valve 3. The airspeed indicator pointer will rotate clockwise indicating an increase in simulated airspeed.

g. Open the PRESSURE increase control valve 3 until the airspeed indicator pointer stabilizes at the required check point.

h. Stabilize the airspeed indicator at the required check points by opening the PRESSURE decrease control valve 4.

i. After completing all check points listed on the airspeed Indicator calibration card, throw power switch to OFF.

j. Slowly open PRESSURE control valves 3 and 4 until all instruments return to normal.

k. Set PRESSURE selector valve at OFF.

4-49. CALIBRATE AIRSPEED INDICATOR, 50-650 KNOTS. Adjust PRESSURE control valves 3 and 4 in accordance with paragraph 4-48. Set the master airspeed indicator at each point shown on the calibration card. Enter the readings of the instrument under test on the calibration test card provided.

4-50. CASE LEAK TEST, AIRSPEED INDICATOR.

a. Adjust pressure control valves in accordance with paragraph 4-48 and stabilize the airspeed indicator at 500 knots.

b. Close needle valve on hose assembly to instruments being tested.

c. Observe the airspeed indicator being tested; the pointer should not move more than 4 knots in 60 seconds. A reading in excess of this indicates a possible case leak and will necessitate removal of the instrument.

d. Slowly open needle valve on hose assembly to instruments being tested.

e. Return master instruments to normal position according to instructions in paragraph 4-48.

4-51. Remove test hose connections in accordance with paragraphs 4-34 and 4-35.

4-52. MAXIMUM ALLOWABLE AIRSPEED TEST. To test and calibrate the Maximum Allowable Airspeed point on Mach-Airspeed indicators, make use if the master panel ALTIMETER and AIRSPEED INDICATOR on the VPT-7A Test Set, and proceed as follows.

NOTE

The MACH-AIRSPEED INDICATOR with MAXIMUM ALLOWABLE AIRSPEED POINTER, to be tested and calibrated, usually has two adjustments, one at the front lower left hand corner and one at the rear. The front adjustment sets a limiting stop for the maximum allowable airspeed pointer, the rear adjustment sets the critical Mach number for the aircraft on the rim of the main outer dial. Before proceeding with tests, make sure that these two adjustments have been properly set in accordance with data supplied for the aircraft using the instrument.

a. Connect both the ALTIMETER-RATE-OF-CLIMB and AIRSPEED quick connect nipples of the Test Set to the Static and to the pressure lines respectively of the instrument

to be tested, as indicated in paragraphs 4-34 and 4-35.

b. If the altitude of the station at which the checking is done is less than 75 feet above sea level, proceed in the same manner as in paragraph 4-44 and 4-48. For a given Mach Number Setting on the outer dial of the MACH-AIRSPEED INDICATOR, the Maximum Allowable Airspeed pointer should indicate the maximum allowable airspeed corresponding to each altitude as given in Table 4-1, Col. #2.

c. If the altitude of the station at which the checking is being done is more than 75 feet above sea level, proceed by bringing the ALTIMETER to an altitude of 5,000 feet in the same manner as in paragraph 4-38. Now proceed to increase pressure in order to bring the Airspeed Indicator up to points in Column 1 in the same manner as in paragraphs 4-44 and 4-48. For a given Mach Number setting on the dial of the MACH-AIRSPEED INDICATOR under test, the Maximum Allowable Airspeed pointer should indicate the maximum allowable airspeed corresponding to each altitude as given in Table 4-1, Column 3.

TABLE 4-1

MAXIMUM ALLOWABLE AIRSPEED CALIBRATION CHART

Column 1	Column 2	Column 3
Mach No.	Knots Indicated Airspeed	
	At 0 Feet Sea Level	At 5000 Feet
.5	330	
.55	364	
.6	397	363
.65	430	390
.7	463	426
.75	497	447
.8	529	488
.85	562	519
.9	595	550
.95	628	570
1.0	661	613

4-53. CALIBRATE MAXIMUM ALLOWABLE AIRSPEED. Follow the procedure in paragraph 4-52. On the calibration card for the instrument under test, note the corresponding Maximum Allowable Airspeed pointer readings. After completing the calibration, compare the readings with those given in either the Column 2 or 3 for the critical Mach Number setting of the instrument being tested. Instruments having errors greater than ± 10 knots should be replaced.

4-54. MANIFOLD PRESSURE TEST, VACUUM 30 - 10 INCHES OF HG ABS. Connect the test set to the instruments to be tested as indicated in paragraphs 4-34 and 4-35.

4-55. PROCEDURE FOR MANIFOLD PRESSURE TEST, VACUUM 30 - 10 INCHES OF HG ABS.

a. Set PRESSURE selector valve at OFF.

b. Open PRESSURE control valves 3 and 4.

c. Set VACUUM selector valve at 30 - 10 INCHES MANIFOLD ABS. PRESSURE.

d. Close VACUUM control valves 1 and 2.

e. Throw power switch to ON.

f. Slowly open the VACUUM increase control valve 2. The manifold pressure indicator pointer will rotate counterclockwise indicating a decrease in simulated manifold pressure.

g. Open the VACUUM increase control valve until the manifold pressure indicator pointer stabilizes at the required check point.

h. Stabilize the manifold pressure indicator at the required check points, listed on the calibration card, by opening the VACUUM decrease control valve 1.

i. After completing all check points on the manifold pressure indicator, throw power switch to OFF.

j. Slowly open vacuum control valves 1 and 2 until all instruments return to normal.

k. Set VACUUM selector valve at OFF.

4-56. CALIBRATE MANIFOLD PRESSURE, VACUUM 30 - 10 INCHES OF HG ABS. Adjust VACUUM control valves in accordance with paragraph 4-54. Set the master manifold pressure indicator at each point shown on the calibration card. Enter the readings of the instrument under test on the calibration test card provided.

4-57. CASE LEAK TEST, MANIFOLD PRESSURE, VACUUM 30 - 10 INCHES OF HG ABS.

a. Adjust vacuum control valves in accordance with paragraph 4-54 and stabilize the manifold pressure indicator at 10 inches of Hg.

b. Close needle valve on hose assembly to instruments being tested.

c. Observe the manifold pressure indicator being tested; the pointer should not move more than 1/16 inch of Hg in 60 seconds. A reading in excess of this indicates a possible case leak and will necessitate removal of the instrument.

d. Slowly open needle valve on hose assembly to instruments being tested.

e. Return instruments to normal position according to instructions in paragraph 4-54.

4-58. Remove test hose connections in accordance with paragraphs 4-34 and 4-35.

4-59. MANIFOLD PRESSURE TEST, PRESSURE, 30 - 75 INCHES OF HG ABS. Connect the test set to the instruments to be tested as indicated in paragraphs 4-34 and 4-35.

4-60. PROCEDURE FOR MANIFOLD PRESSURE TEST, PRESSURE, 30 - 75 INCHES OF HG ABS.

a. Set PRESSURE selector valve at 30 - 75 INCHES MANIFOLD ABS. PRESSURE.

b. Close PRESSURE control valves 3 and 4.

c. Set VACUUM selector at OFF.

d. Open VACUUM control valves 1 and 2.

e. Throw power switch to ON.

f. Slowly open the PRESSURE increase control valve 3. The manifold pressure indicator pointer will rotate clockwise indicating an increase in simulated manifold pressure.

g. Open the PRESSURE increase control valve until the manifold pressure indicator pointer stabilizes at the required check point.

h. Stabilize the manifold pressure indicator at the required check points by opening the PRESSURE decrease control valve 4.

i. After completing all check points on the manifold pressure indicator, throw power switch to OFF.

j. Slowly open PRESSURE control valves 3 and 4 until all instruments return to normal.

k. Set PRESSURE selector valve to OFF.

4-61. CALIBRATE MANIFOLD PRESSURE INDICATOR, PRESSURE, 30 - 75 INCHES OF HG ABS. Adjust PRESSURE control valves in accordance with paragraph 4-59. Set the master manifold pressure indicator at each point shown on the calibration card. Enter the readings of the instrument under test on the calibration test card provided.

4-62. CASE LEAK TEST, MANIFOLD PRESSURE INDICATOR, PRESSURE, 30 - 75 INCHES OF HG ABS.

a. Adjust PRESSURE control valves in accordance with paragraph 4-60 and stabilize the manifold pressure indicator at 75 inches of Hg.

b. Close needle valve on hose assembly to instruments being tested.

c. Observe the manifold pressure indicator being tested. The pointer should not move more than 1/16 inch of Hg in 60 seconds. A reading in excess of this indicates a possible case leak and will necessitate removal of the instrument.

d. Slowly open needle valve on hose assembly to instruments being tested.

e. Return instruments to normal position according to instructions in paragraph 4-60.

4-63. Remove test hose connections in accordance with paragraphs 4-34 and 4-35.

4-64. FUEL PRESSURE INDICATOR TEST. Connect the test set to the instruments to be tested as indicated in paragraphs 4-34 and 4-35.

4-65. PROCEDURE FOR FUEL PRESSURE INDICATOR TEST, 0 - 25 PSIG.

a. Set PRESSURE selector valve at FUEL PRESSURE.

b. Close PRESSURE control valves 3 and 4.

c. Set VACUUM selector valve at OFF.

d. Open VACUUM control valves 1 and 2.

e. Throw power switch to ON.

f. Slowly open the PRESSURE increase control valve 3. The fuel pressure indicator pointer will rotate clockwise indicating an increase in simulated fuel pressure.

g. Open the PRESSURE increase control valve 3 until the fuel pressure indicator pointer stabilizes at the required check point.

h. Stabilize the fuel pressure indicator at the required check points by opening the PRESSURE decrease control valve 4.

i. After completing all check points on the fuel pressure indicator, throw power switch to OFF.

j. Slowly open PRESSURE control valves 3 and 4 until all instruments return to normal.

k. Set PRESSURE selector valve at OFF.

4-66. CALIBRATE FUEL PRESSURE INDICATOR. Adjust PRESSURE control valves in accordance with paragraph 4-65. Set the master fuel pressure indicator at each point shown on the calibration card. Enter the readings of the instrument under test on the calibration test card provided.

4-67. CASE LEAK TEST, FUEL PRESSURE INDICATOR.

a. Adjust PRESSURE control valves in accordance with paragraph 4-65 and stabilize the fuel pressure indicator at 25 psig.

b. Close needle valve on hose assembly to instruments being tested.

c. Observe the fuel pressure indicator being tested; the pointer should not move more than 1/2 psig in 60 seconds. A reading in excess of this indicates a possible case leak and will necessitate removal of the instrument.

d. Return instruments to normal position according to instructions in paragraph 4-65.

4-68. Remove test hose connections in accordance with paragraphs 4-34 and 4-35.

4-69. MACHMETER TESTS. Machmeters and the Mach Indicator portions of maximum allowable airspeed indicators, in the range from Mach .3 to Mach 2.5 may be tested and calibrated by means of VPT-7A Test Set using its standard panel instruments, through the simultaneous use of the pressure and vacuum sections of the test set and the altitude and airspeed settings as given in Table 4-2.

a. Connect hose between the static outlet of the instrument to be tested and the Altimeter - Rate-of-Climb quick-connect nipple of the Test Set.

b. Connect another hose between the pitot outlet of the instrument to be tested and the airspeed quick-connect nipple of the Test Set.

4-70. MACH INDICATOR TESTS.

4-71. PROCEDURES.

NOTE

Refer to Table 4-2. Determine the working part of the table applicable to the location of test and the range of the instrument to be tested as follows:

a. Determine the approximate altitude of the location at which the tests are to be performed.

b. Table 4-2 will apply only to the right of the column whose altitude is next above the approximate altitude of the location of the test. For instance, where the test station is located at an altitude of 1500 feet above sea level, the working part of the chart will fall between columns 3 to 11.

TABLE 4-2

INDICATED AIRSPEED-KNOTS vs. MACH NO. AT VARIOUS ALTITUDES

Column No.	1	2	3	4	5	6	7	8	9	10	11
Altitude Ft.	0	1,000	2,000	3,000	5,000	7,000	10,000	20,000	30,000	40,000	50,000
MACH No.	KNOTS-INDICATED AIRSPEED										
.3	198	195									
.4	265	260	255	251							
.5	330	325	319	313							
.6	397	390	383	376	363						
.7	463	455	448	440	426	412					
.8	529	520	512	504	488	482	448				
.9	595	586	577	568	550	532	505				
1.0	661	652	642	632	612	592	566				
1.2							625	578			
1.5								653	604		
2.0									643	653	
2.5											660

c. Determine the ranges of the instrument to be tested.

d. Table 4-2 will apply only to that portion between horizontal lines defined by the range of the instrument. For instance, if the Mach Indicator has a range of from .5 Mach to 2.2 Mach, the working part of the chart will fall between the horizontal lines .5 and 2.0.

e. Select approximately eight check points in Table 4-2 that fall in the working part as established in Note preceding step a. above.

f. Set VACUUM SELECTOR at MACHMETER VACUUM setting.

g. Set PRESSURE SELECTOR at MACHMETER CALIBRATION.

h. Close VACUUM CONTROL VALVES 1 & 2 and open PRESSURE CONTROL VALVES 3 & 4.

i. Set ALTIMETER barometric correction dial by means of its front lower left corner adjusting knob.

j. Throw power switch to ON.

k. Slowly open the VACUUM INCREASE CONTROL VALVE 2. The master panel ALTIMETER will start to show an increase in simulated altitude.

l. Gradually open the VACUUM INCREASE VALVE 2 until ALTIMETER needle just passes the desired altitude check point as selected from Table 4-2.

m. Slowly open the VACUUM DECREASE VALVE 1 until ALTIMETER stabilizes at the desired point.

n. Slowly close the PRESSURE DECREASE CONTROL VALVE 4 until the master panel AIRSPEED INDICATOR and the MACH INDICATOR under test begin to read.

o. Adjust the PRESSURE DECREASE CONTROL VALVE 4 to the desired check point selected in step e. above.

p. Re-adjust the VACUUM DECREASE CONTROL VALVE 1 if necessary to restabilize the ALTIMETER within 40 feet of the control altitude. Also re-adjust the PRESSURE DECREASE CONTROL VALVE 4 if necessary to re-stabilize the AIRSPEED reading.

NOTE

When calibrating MACH INDICATORS at high simulated altitudes (above 40,000 feet) it may be necessary to stabilize the ALTIMETER reading at a position with the VACUUM DECREASE VALVE 1 at its maximum position and the VACUUM INCREASE VALVE 2 at a position that will yield the simulated altitude in a manner similar to paragraph 4-71. The pressure settings are then obtained in a manner similar to those obtained in paragraph 4-71.

q. When both the ALTIMETER and the AIRSPEED indications are stabilized at the proper points, note the MACH reading on the instrument being tested and compare with the reading in Table 4-2.

r. Proceed through all the required check points, being careful to stabilize the ALTIMETER within 40 feet each time.

s. After completing all the check points, turn the power switch to OFF.

t. Slowly open all VACUUM and PRESSURE control valves until all the instruments return to normal.

u. Set VACUUM and PRESSURE selector valves to OFF.

4-72. CALIBRATE MACHMETER. Adjust VACUUM and PRESSURE Control Valves 1, 2, 3 and 4 to obtain an ALTIMETER and AIRSPEED INDICATOR as selected from Table 4-2 in paragraph 4-71, step e. Enter the readings of the instrument under test on a calibration card.

4-73. CASE LEAK TEST, MACHMETER. Operate Test Set and adjust all control valves as in paragraph 4-71 to obtain an ALTIMETER setting of 10,000 ft. and a MACHMETER setting of 1.2.

a. Close needle valves on both hose assemblies to the instrument being tested.

b. Observe the MACHMETER being tested; the pointer should not move more than .02 Mach in 60 seconds. A reading change in excess of this indicates a leak that will necessitate removal and replacement of the instrument.

c. Slowly open the needle valves on the hose assemblies to the instruments being tested.

d. Return all instruments to normal in accordance with the shut-off procedure at the end of paragraph 4-71.

e. Remove test hose connections in accordance with paragraph 4-70.

CAUTION

During all operations and testing MACH INDICATORS, extreme care must be exercised when applying pressure to the AIRSPEED INDICATOR so that the limit of the INDICATOR does not exceed 670. When making these tests the master instruments on panel are not protected by relief valves. Failure to observe extreme precaution will result in serious damage to master instruments.

SECTION V

PERIODIC INSPECTION, MAINTENANCE AND LUBRICATION

5-1. GENERAL.

5-2. This section contains inspection, maintenance and lubrication data for the VPT-7A Vacuum-Pressure Test Set and provides the necessary information to keep the test set functioning properly. It is recommended that instruments be checked for calibration every three months.

5-3. INSPECTION.

5-4. PERIODS OF INSPECTION. The test set must be subject to a constant and systematic inspection routine. Inspections are to be at the following intervals:

a. On arrival from manufacturer to depot.
b. Immediately before use.
c. Sixty day periods during use.

5-5. ON ARRIVAL FROM MANUFACTURER OR DEPOT. For detailed inspection procedures in this category, see Section III, paragraph 3-3.

5-6. PRE-OPERATION INSPECTION. Before operation, a complete visual inspection of the test set must be performed by operating personnel. For pre-operation inspection procedures, refer to paragraphs 5-7 through 5-11.

5-7. OIL RESERVOIR (see figure 5-1). A viewing port on the right side access door permits a rapid visual check of oil level and pump operations. The oil level in the reservoir must be above the index mark. If oil level is low, add oil. (See Section III, paragraph 3-6.) If oil is dirty, drain and fill reservoir. (See Section III, paragraphs 3-6 and 3-7.) For proper operation of the test set, a free flow of clean oil must be maintained. Failure to keep equipment in this condition will result in unsatisfactory operation.

5-8. OIL SUMPS (see figures 5-1 and 5-2). Viewing ports in both side doors permit inspection of pressure and vacuum sumps for presence of oil. During normal operation, no oil will be present in either sump. If oil is found in the vacuum sump, vacuum check valve is dirty and not operating properly. Clean check valve as outlined in paragraph 5-19. After cleaning check valve, disassemble vacuum sump and clean and replace filter as outlined in paragraph 5-20. If oil is found in pressure sump, disassemble and clean as outlined in paragraph 5-20.

5-9. SELECTOR VALVES (1 and 2, figure 5-3). The vacuum and pressure selector valves must be set at each position to check their operation. Inspect for binding or looseness in each selector position. A sloppy or too-tight selector must be replaced. For replacement procedures, see Item 15, Table 6-1.

CAUTION

Valves have a tendency to stick when not used for some time. If these selectors tend to stick, no damage will result if considerable torque is applied to valves in order to free them.

5-10. VACUUM AND PRESSURE CONTROL VALVES (3, 4, 5, and 6, figure 5-3). Fully open and fully close each control valve. Do not force valves past limit positions. Operation must be smooth and valve action must be firm without binding. If action is rough and binding is present, replace control valve.

5-11. INSTRUMENTS (12, 13, 14, 15 and 16, figure 5-3.) Inspect all instruments for broken glass and bent needles. Check front panel mounting screws for tightness.

5-12. CASE LEAK TEST VALVES (7, 8, 9, 10 and 11, figure 5-3). To inspect case leak test valves rotate from normal position, as shown in figure 5-3, to individual stops using the number 8 Allen wrench provided. Valves should be checked for ease of operation; sloppiness or binding is sufficient cause for removal of a valve. For removal procedures refer to Section VI of this handbook.

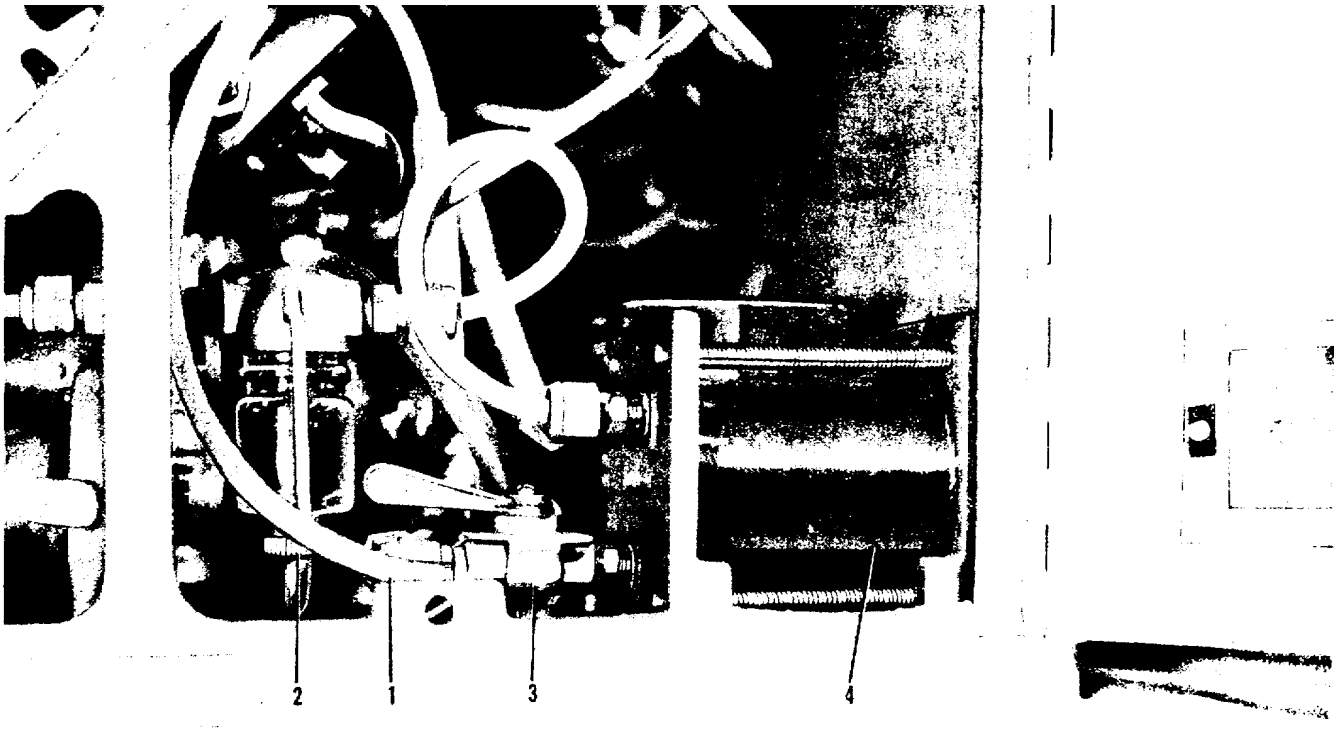
5-13. SIXTY DAY INSPECTION PERIOD. Prior to performing the procedures described for this inspection period, the procedures described in paragraphs 5-7 through 5-11 should be performed.

5-14. LINES AND FITTINGS. Visually inspect all tubing, connectors and electrical wiring for security and freedom from damage. Inspect the tubing for evidence of abrasions, punctures, deformities and cracking. Inspect the electrical wiring for frayed, burned, cracked or missing insulation.

5-15. POWER SUPPLY (figure 1-3). Inspect all components of the power supply for security of attachment and condition. Connect test set to power (115 V ac 1∅ 50- 500 cycles).

CAUTION

Do not operate test set without oil or if an excessive amount of oil is visible in the vacuum or pressure sumps, or in the reservoir. Operation with reservoir dry for more than 10 seconds, will damage the motor-pump assembly. Starting pump with oil in sumps will result in



1. Drain-Fill Hose
2. Pressure Sump
3. Drain-Fill Valve
4. Reservoir

Figure 5-1. Oil Reservoir System

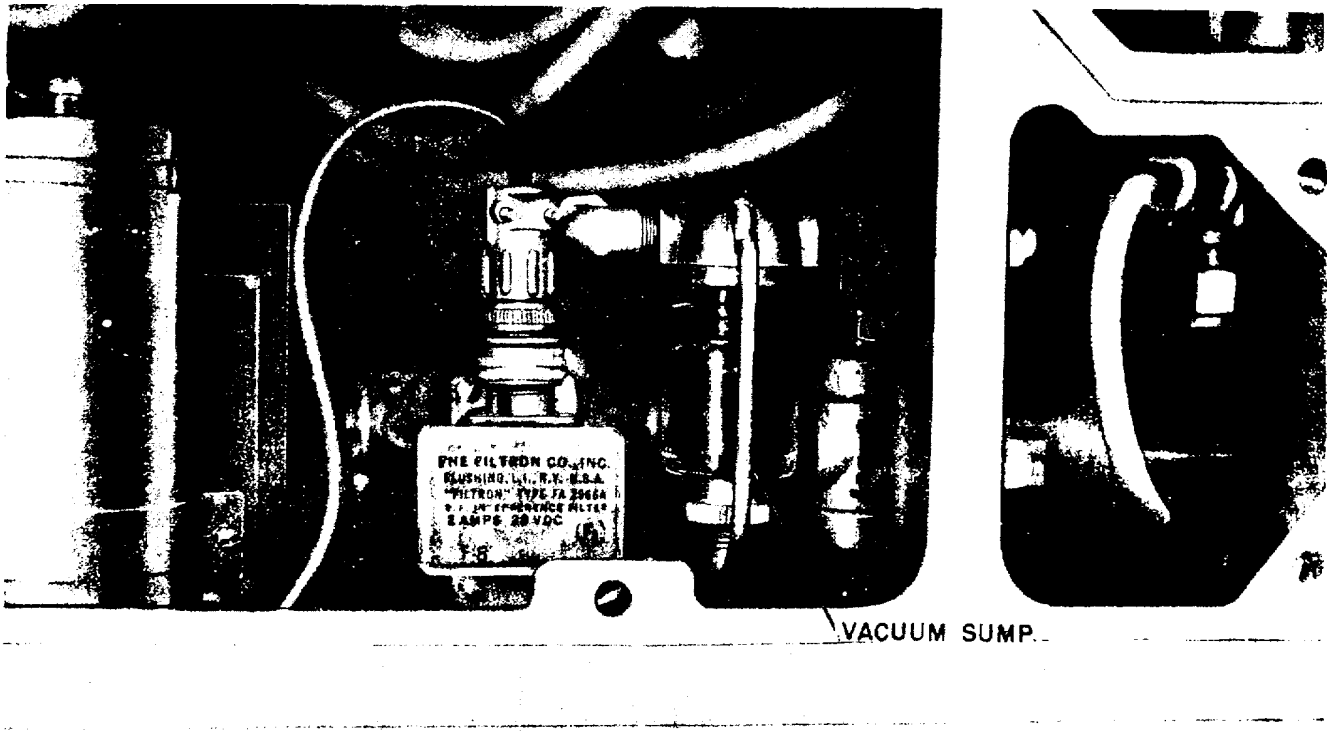


Figure 5-2. Oil Sump (Vacuum)

having oil in the pressure lines causing possible damage to instruments and valves.

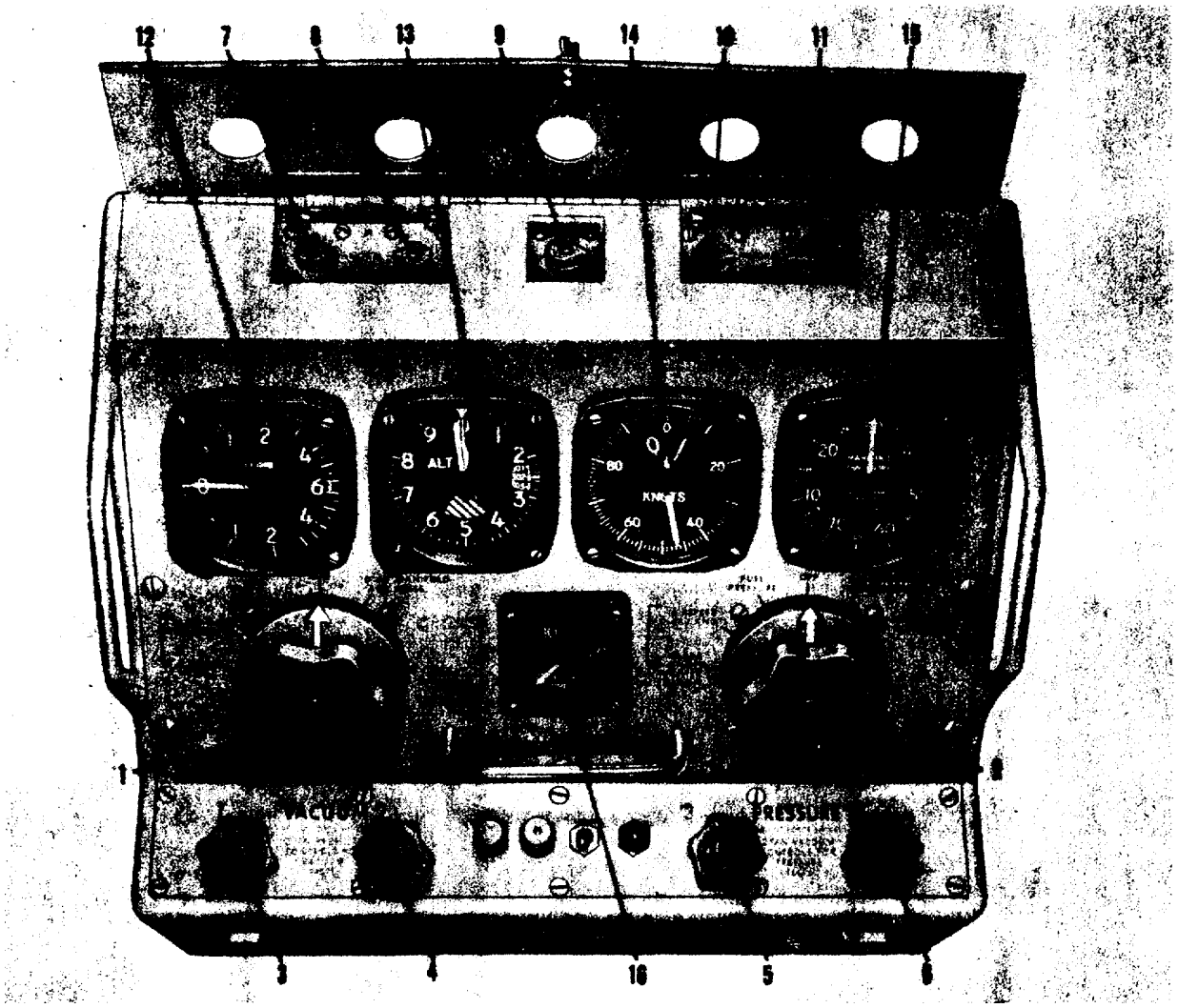
To check the power supply in operation, refer to figure 1-6 and proceed as follows:

a. Throw power switch to ON.

b Connect a voltmeter (20,000Ω/volt) between any exposed screw on the motor assembly and to the terminal marked with a red dot on top of the electrolytic capacitor; the voltage Indicated on the voltmeter should be between 23 to 33 V dc.

5-16. SELFCHECK. The performance and condition of the VPT-7A test set is readily checked by performing the selfchecks as described in paragraphs 4-52, 4-55, 4-59, 4-64.

5-17. OVERHAUL AND RECALIBRATION. It is recommended that the test set should be returned for recalibration and/or overhaul annually.



1. Vacuum Selector Valve
2. Pressure Selector Valve
3. Vacuum Decrease Valve
4. Vacuum Increase Valve
5. Pressure Increase Valve
6. Pressure Decrease Valve
7. Case Leak Test Valve
8. Case Leak Test Valve
9. Case Leak Test Valve
10. Case Leak Test Valve
11. Case Leak Test Valve
12. Rate-of-Climb Indicator
13. Altimeter
14. Airspeed Indicator
15. Manifold Pressure Indicator
16. Fuel Pressure Indicator

Figure 5-3. Instruments, Controls and Valves

5-18. MAINTENANCE.

5-19. CLEANING OF VALVES. The only valves that may be removed and cleaned are the needle valves (3, 4, 5 and 6, figure 5-3), the vacuum check valve and the pressure check valve. After removal and disassembly, the valves may be cleaned with solvent, Federal Specification P-S-661 and wiped dry with a clean lint-free cloth.

5-20. CLEANING THE SUMPS. After removal and disassembly, the vacuum and pressure sumps (2, figure 5-1 and 1, figure 5-2) may be cleaned with solvent, Federal Specification P-S-661, and wiped dry with a clean lint-free cloth.

5-21. INTERIOR AND EXTERIOR CLEANING. Thorough cleaning is necessary to insure optimum performance by preventing corrosion, rust and dirt accumulations from damaging parts or causing arc-over or low resistance leakage between voltage points and ground. Remove loose dust and dirt with a brush or water-free compressed air not exceeding 10 psi. Use a brush or cloth moistened with solvent, Federal Specification P-S-661, to remove dirt and grease which adheres to the chassis and parts.

5-22. REPLACEMENT OF MINOR PARTS.

5-21. GENERAL. The replacement of minor parts is limited to such items as gaskets, O-rings, fuses, indicator lamps and motor brushes. (Refer to Table 5-1.)

5-24. BRUSH REPLACEMENT. Occasionally brushes on the dc motor in the VPT-7A may have to be replaced after 200 hours. Before putting in the next set, the old brushes should first be examined. If the brush faces are smooth with no pitting or roughness, then a new set of brushes may be installed. If the brushes are pitted or rough, then the armature should be removed, as indicated in paragraph 5-26, for examination. A scored or pitted commutator may be refinished as described below, or, the armature may be replaced by a new one. In every case when a new armature is installed in a motor, a new set of brushes should be used.

5-25. BRUSH ADJUSTMENT. After every replacement of brushes, the motor and pump should be run for a period of 3 hours at 20 to 24 volts dc under idle conditions. After this run-in period the brushes should be removed and there should be an indication that approximately 75 percent of the brush face area is in contact with the commutator surface. If this wear is not accomplished, the brushes should be replaced and the run-in continued for two or three more hours. It is important that, after the brushes have been run in a motor, that extreme care be taken to replace the brushes in the same position and in the same brush tube which they previously occupied.

5-26. ARMATURE MAINTENANCE. If it is necessary to remove the armature (21, figure 9-8) to examine the commutator, proceed as follows:

NOTE

All figure references in the paragraph pertain to figure 9-8.

a. Remove screws (42), washers (43), and nuts (44) at the bracket (41).

b. Remove screws (29), and washers (30) from the motor base. The hoses and fittings at the end of the pump assembly should remain in place.

c. Lift the motor and pump assembly from its place.

d. Remove screws (39) and washers (40).

e. Remove pump assembly (34). The spring (35), spacer (36), packing (37), and retainer (38) will remain on the pump shaft, if the assembly is handled carefully.

f. Remove safety wire from brush cap (3). Remove set screw (2) to disassemble brush holder screw assembly (3), washer (4), brush and snapring assembly (5), and brush holder assembly (6 and 7).

g. Remove nut (11), washer (12), bracket (10), seal (13, gasket (14) and snapring (26).

h. Remove noise suppressor (31). The internal wire connection should not be unsoldered.

i. Gasket (16), snapring (17) and washers (18 and (19) can now be slipped out.

j. Remove commutator and the bearing (20) will come out with the armature assembly (21).

5-27. If the commutator is scored or pitted, proceed as follows:

a. Turn the commutator with a sharp tool, giving it a light cut, not exceeding 0.005 per cut on the diameter. Remove only the material necessary to clean and true-up the surface. The commutator should then be completely cleaned and a final 0.002 cut taken.

b. Check for clearance with the mica on all slots. If necessary, undercut to a depth of 1/32 inch. The undercutting should be accomplished before the final cut is taken.

c. Brush the commutator and remove any chips or foreign material from the slots. Polish with an Arkansas oil stone or equivalent.

d. If recutting the commutator reduces the diameter to less than 27/32 inch, replace the complete armature assembly.

5-28. MOTOR MAINTENANCE.

5-29. DISASSEMBLY. Follow the procedure in paragraph 5-26. Further disassembly, if necessary, may be accomplished by unsoldering the wire connected to noise suppressor and receptacle assembly (31). Then proceed by referring to figure 9-8.

5-30. CLEANING.

a. Clean all metallic parts of the motor except armature, bearings, brushes and field assembly, by washing in dry-cleaning solvent, Federal Specification P-S-661. Make certain all accumulations of foreign matter are removed. A small stiff-bristled brush may be used to facilitate cleaning.

When parts are thoroughly cleaned, rinse them in clean solvent and dry.

b. Clean armature by wiping with a clean cloth moistened with cleaning solvent.

c. Blow dust and foreign matter from inside field assembly with filtered dry, compressed air, then wipe inside of field assembly with a cloth moistened with cleaning solvent.

d. Clean brushes with a coarse, dry cloth if they are to be used in reassembly.

5-31. INSPECTION, REPAIR AND REPLACEMENT. (See Table 5-1 below and Troubleshooting Chart, Table 6-1.)

5-32. LUBRICATION.

5-33. MOTOR PUMP ASSEMBLY. The pump is lubricated by oil from the reservoir and the electric motor has sealed bearings; therefore, no lubrication procedures are required for the test set.

5-34. REASSEMBLY. (See figure 9-8.) Reassembly is the reverse of disassembly.

CAUTION

Care should be exercised when the noise suppressor and receptacle assembly (31) is screwed back onto the unit to tuck the wire connected to it underneath the field assembly. If this precaution is not observed, the wire may be frayed or broken by the armature as It turns.

TABLE 5-1

INSPECTION, REPAIR AND REPLACEMENT

Part	Inspect For	Repair & Replacement
Brush.	Brush chipped or cracked. Brush length less than 7/32-inch or brush spring not exerting enough pressure to give proper brush contact.	Replace.
Armature Assembly.	Damaged, or burned insulation.	Replace.
Commutator End Bearing.	Rough action or dry.	Replace.
Drive End Assembly.	Rough action or dry.	Replace.
Field Assembly.	Rough action or dry.	Replace
Commutator End Bracket.	Cracked or damaged	Replace.
Shaft End Bracket.	Cracked or damaged.	Replace.

SECTION VI

TROUBLESHOOTING

6-1. GENERAL.

6-2. Troubleshooting of the VPT-7A is limited in scope for field operations. In order to make an accurate analysis of a specific cause of trouble, a functional test stand would be required. Obviously, such a procedure does not lend itself to field operations. Therefore, the only corrective action to be taken in the field is the removal and replacement of suspected components. Removal of suspected components will be limited to major assemblies. All components removed from the units, in the event of failure, should be returned to depot for complete overhaul testing or recalibration.

6-3. TROUBLE ANALYSIS. Most frequently, trouble results from not following operating instructions. Follow operating instructions to operate test set as described in Section IV; in this manner the trouble can be located by determining which operation or operations are not giving desired results. Detailed descriptions illustrated by photographs make it possible to identify component parts and understand their function and proper place in the test set.

6-4. All of the valve assemblies, coupling assemblies, sump assemblies, reservoir assemblies, etc, have been tested for leaks before and after assembly of test set to prevent malfunctions.

6-5. The reserve capacity of the pump will offset small losses of pressure or vacuum for satisfactory operation. A fluctuating instrument needle will indicate a leak too great to be offset by the reserve capacity of the pump. A small leak in the test set will not interfere with a case leak test, since during case leak testing the instrument under test is separated from the test set.

6-6. Needle valve could leak if an O-ring under an operating handle has become badly worn. The multiple selector vacuum and pressure valves are integral units and are not to be disassembled. The knobs of the selector valves are not removable since they contain part of the switching circuit. All connections to the selector valves are made with special leakproof fittings and silicone rubber tubing.

6-7. Slow leaks in the subassemblies are a result of dirty oil sumps, check valves, and case leak valves and can be corrected by cleaning.

6-8. ELECTRICAL SYSTEM. The electrical system is concerned with supplying power to the pump motor and the indicator lamp on the front control valve deck. When an electrical trouble is suspected reference should be made to the schematic wiring diagram, figure 1-4. For the location of malfunctioning electrical components, continuity tests with an ohmmeter and voltage checks with a suitable voltmeter, using the schematic diagram as a guide, are the most rapid and efficient method.

6-9. VACUUM-PRESSURE SYSTEM. Troubles encountered in the pneumatic system will for the most part be detectable during the operational tests described in paragraphs 4-36 through 4-66. In this equipment, the possible pneumatic troubles are considerably greater than the possible electrical troubles. Maintenance personnel should refrain from making a hasty analysis of trouble.

6-10. TROUBLE ANALYSIS CHART.

6-11. Table 6-1 is a troubleshooting chart that lists symptoms, probably causes and suggested corrective action to be taken for a number of possible malfunctions. The list is not all inclusive, troubles other than those listed may arise, and maintenance personnel should try to ascertain the general nature of the trouble and take the necessary corrective action.

TABLE 6-1

TROUBLESHOOTING

TROUBLE	CAUSE	REMEDY
1. Indicator lamp out; motor runs.	Indicator lamp burned out. Open lead to indicator lamp.	Replace lamp. Repair or replace.

TABLE 6-1 (Cont)

TROUBLESHOOTING

TROUBLE	CAUSE	REMEDY
2. Line fuse blows soon after ON-OFF switch is thrown.	Shorted lead or connection in power cable.	Replace power cable or check for shorts.
	DC OPERATION	
	Shorted leads to motor or pilot light.	Leads from J1 pin E to motor connector and pilot light frayed and grounded. Repair or replace.
	Short in noise filter, or motor.	Remove connector P2 from motor. If fuse does not blow when test set is turned on, then short is either in the filter or motor. Replace motor assembly.
	AC OPERATION	
	Shorted leads to switch or fuse.	Remove mating connector to J1. With S1 open, resistance between prongs A and D or B and C on J1: Infinity. Close S1. Resistance between A and D or B and C: Zero. Resistance between A and B or C and D for S1 open or closed: Infinity. Replace or repair shorted leads.
	Shorted leads to transformer or shorted transformer primary.	Remove mating connector to J1. Resistance between prongs I and J on J1: 2.8 ohms. Resistance between either prong and chassis: Infinity. Resistance between pins 1 and 2 of transformer with both leads disconnected 2.8 ohms. Repair or replace grounded leads. Replace shorted transformer.
	Shorted transformer secondary or rectifier.	Unsolder one yellow lead from transformer. Turn on test set. If fuse does not blow, then rectifier is shorted. Replace. If fuse continues to blow, then transformer is shorted.
3. Indicator lamp out; motor does not run.	Power cable loose.	Tighten.
	Line cord not plugged into live outlet.	Trace line failure.
	DC OPERATION	
	Open lead in power cable or from power receptacle to motor and lamp.	Resistance between prongs of the line cord with OFF-ON switch in OFF position: Infinity. With OFF-ON switch in ON position: Approximately 1.7 ohms. Check continuity of all wires in power cable

TABLE 6-1 (Cont)

TROUBLESHOOTING

TROUBLE	CAUSE	REMEDY
3. Indicator lamp out; motor does not run. (Cont)	DC OPERATION (Cont)	
	Open lead in power Cable or from power receptacle to motor and lamp.	alone and from receptacle J1 to motor and lamp. Repair or replace broken wires.
	AC OPERATION	
	Open or shorted lead to connector J1 pin H from capacitor C1.	Repair or replace.
	Open or shorted lead between capacitor and rectifier.	Repair or replace.
	Open rectifier or shorted capacitor and motor.	Check RMS voltage on yellow coded lugs of rectifier. If voltage is present with no DC voltage across the red and black coded lugs, either the rectifier is open or capacitor or motor is shorted. Disconnect red leads from the rectifier and recheck voltage across red and black coded lugs of rectifier. If D.C. voltage is now present, capacitor or motor is shorted. Replace.
	Open lead between transformer and rectifier.	Check voltage across lugs 3 and 4 of transformer and across yellow coded lugs of rectifier. If voltages are not identical, there is an open lead between them. Repair or replace.
	Open transformer primary or open transformer input leads.	With mating plug to J1 disconnected, resistance check between pins 1 and 2 at T1: Approximately 2.8 ohms. If open, replace transformer. Next, resistance check on J1 between pins I and J: Approximately 2.8 ohms. If open, repair or replace defective lead.
	Open transformer secondary.	Voltage across pins 3 and 4 of T1: 25 V RMS. If zero, disconnect a lead from either pin 3 or 4 and recheck voltage. If still zero, replace transformer.
4. Indicator lamp lights; motor does not run.	Broken motor lead.	Repair or replace.
	Motor power connector not tight.	Tighten connector.

TABLE 6-1 (Cont)

TROUBLESHOOTING

TROUBLE	CAUSE	REMEDY
4. Indicator lamp lights; motor does not run. (Cont)	Commutator dirty.	Remove armature according to the procedure given in paragraph 5-26 and clean commutator.
	Worn out brushes on motor.	Replace brushes in accordance with procedure given in paragraph 5-24 and 5-25.
	Open motor armature or field.	Remove connector on motor. Resistance between motor input and ground: Approximately 1.7 ohms. If circuit is open, replace motor and return for overhaul.
5. Intermittent operation of motor and lamp.	Defective power switch.	Replace switch.
6. Motor runs slow when not pumping against a vacuum or pressure load.	Low voltage.	Filter capacitor open. Replace.
	Worn brushes.	Replace brushes.
	Poor brush contact.	Run-in to seat brushes.
	Brushes sticking in brush holders.	Clean brushes by rubbing on crocus cloth. Clean brush holders with a small brush and blow out with compressed air.
	Wrong oil in reservoir for low temperature.	
	Commutator dirty.	Remove armature and clean commutator according to paragraph 5-22.
	Defective bearings.	Replace bearings.
7. Pump is operating but no vacuum or pressure is developed.	Lack of oil in reservoir.	Fill with proper oil.
	Ball check valve stuck.	Uncouple hose from ball check valve, remove valve, clean and replace. **NOTE** **Bad leaks in the pressure system will not prevent the vacuum side from working; bad leaks in the vacuum system will not prevent pressure from building up properly.**
	Vacuum check valve stuck.	Uncouple hose from vacuum check valve, open up check valve, clean and replace.
	Clogged intake filter (decrease vacuum) control valve inlet.	Clean or replace filter.

TABLE 6-1 (Cont)

TROUBLESHOOTING

TROUBLE	CAUSE	REMEDY
7. Pump is operating but no vacuum or pressure is developed. (Cont)	Clogged oil filter of oil inlet line.	Clean or replace filter.
8. Pressure available but unable to obtain more than very little vacuum (low altitude).	Defective quick-connect nipple.	Moisten finger and hold over altimeter nipple, if suction is felt after a few moments, nipple is defective and should be replaced.
	Loose bowl on vacuum sump.	Open inspection door on left side and check to see that bowl tightening screws is tight.
	Cut hose or loose connection.	With the wrenches supplied lightly tighten each hose connection to make sure that it is not excessively loose. Note that these connections need not be more than one turn tighter than fingertight, or replace hose.
9. Unable to obtain adequate vacuum when connected to aircraft instrument lines or pitot tube.	Loose connections to lines or tubes.	Tighten connections.
	Broken instrument line.	Find and repair break.
	Opened or cracked aircraft instrument case.	Replace instrument.
10. Unable to obtain full altitude when set to 80,000 feet.	Improperly adjusted 80,000 feet vacuum relief valve.	Replace. Adjust (16, 6-1)
11. Unable to obtain full altitude to 80,000 at feet.	Improperly adjusted 50, 000 feet vacuum relief valve.	Replace. Adjust (16, 6-1)
12. Unable to obtain 10 inch vacuum reading on manifold pressure gauge.	Improperly adjusted Man. 10 inch vacuum relief valve.	Replace. Adjust (16, 6-1)
13. Unable to obtain proper pressure.	Leaky quick-connect nipple.	Hold finger over the nipple connected to the panel instrument selected by the selector switch (airspeed indicator, manifold pressure, or fuel pressure). If air pressure is felt after a few moments, nipple is leaky and should be replaced.
	Improperly adjusted pressure relief valve.	Replace. Adjust (16, 6-1)
	Leaky relief valve.	Replace relief valve.

TABLE 6-1 (Cont)

TROUBLESHOOTING

TROUBLE	CAUSE	REMEDY
14. Unable to maintain adequate pressure when test set is connected to aircraft pitot line or instrument line.	Loose connections.	Tighten connections properly.
	Leak in test line.	Fine and repair open line.
	Opened or cracked instrument cases.	Replace defective instrument.
15. Unable to obtain proper pressure with no external connections to test set.	Defective pump.	Remove and replace entire pump motor assembly.
	Loosened selector valve knob.	Tighten nut on valve shaft.
	Defective selector valve.	Remove and replace valve. (Note that this is highly unlikely. Do not replace until all other possibilities have been carefully checked.)
16. Unable to reach or maintain maximum reading on altimeter, airspeed indicator, or manifold pressure gauge.	Leaky instrument.	Perform case leak tests in accordance with procedures given in Section IV. If instrument leaks, replace it.
	Improperly adjusted relief valves.	Reset relief valves. (Refer to paragraph 6-12.)
NOTE **If instruments do not reach designated upper limit of test setting on VPT-7A tester, this may be due to relief valve setting adjusted too low for present barometric pressure. (Original setting may have been made when barometric pressure was high at factory.)**		

6-12. RESETTING THE RELIEF VALVES. The spring settings in the relief valve may have to be reset. Access to these valves is through the front door. Resetting is accomplished by a screwdriver when resetting the vacuum relief valves and a socket head wrench when resetting the pressure relief valves.

a. Set the appropriate SELECTOR VALVE to the position for checking the instrument which needs resetting of the relief valve.

b. Slowly manipulate the VACUUM and PRESSURE control valves as required and outlined under Operation of the particular instrument in Section IV.

c. Turn the stems of the appropriate relief valve so that it relieves somewhat below the point desired.

NOTE

The pressure relief valve stems are secured in position with a lock nut. The vacuum pressure relief valve stems are secured internally at the set positions.

SECTION VII

CALIBRATION

7-1. GENERAL.

7-2. Calibration of the VPT-7A Vacuum-Pressure Test Set is not practical at this level of maintenance due to specialized test equipment requirements which do not lend themselves to field maintenance. If the unit requires calibration it should be sent to the depot.

SECTION VIII

INTRODUCTION TO ILLUSTRATED PARTS BREAKDOWN

8-1. GENERAL.

8-2. This Illustrated Parts Breakdown, lists and describes the parts for the Vacuum Pressure Test Set, Model VPT-7A manufactured by the Intercontinental Dynamics Corporation, Englewood, New Jersey and is divided into four sections as shown in the Table of Contents.

8-3. GROUP ASSEMBLY PARTS LIST.

8-4. The Group Assembly Parts List, Section IX consists of the complete test set listed in ten main groups broken down into their assemblies, subassemblies, detail parts and attaching parts.

8-5. FIGURE AND INDEX NUMBER.

8-6. Parts are identified by an index number appearing in the illustration of the assembly. These numbers are arranged in the first column in their natural order, which is also the correct order of disassembly.

8-7. PART NUMBER.

8-8. The prime manufacturer's part number is given in the second column.

8-9. DESCRIPTION.

8-10. The part descriptions are arranged in standard form. The component or major assembly is listed under numeral 1, and each assembly, subassembly or part is indented in the order of its relationship to the preceding assembly, subassembly or part. For example, all items under numeral 3 are parts of the item listed under numeral 2 directly above, exclusive of attaching parts.

8-11. Attaching parts are listed immediately following the item they attach and have the same indentation. A separation symbol (----*----) follows the listing of the attaching parts to distinguish them from the subsequent listing of items with the same or subordinate indentation.

8-12. VENDORS' CODE.

8-13. The complete listing of all vendors and their codes used in the description column is given immediately following.

CODE	VENDOR
AA	AIR ASSOCIATES, INC Teterboro, New Jersey
ALW	ALPHA WIRE CORP New York, New York
BD	LAMB ELECTRIC CO INC Kent, Ohio
BBR	BIRNBACK RADIO CO New York, New York
BUS	BUSSMAN MFG CO St. Louis, Missouri
CRFI	CRAWFORD FITTING CO Cleveland, Ohio
CUT	CUTLER-HAMMER INC Milwaukee, Wisconsin
DLC	DIALIGHT CORP Brooklyn, New York
EN	ELASTIC STOP NUT CORP OF AMERICA Union, New Jersey
ICDM	INTERCONTINENTAL DYNAMICS CORP Englewood, New Jersey
JAPC	JAMES, POND CLARK CO Pasadena, California

CODE	VENDOR
RRE	RADIO RECEPTOR CO INC Brooklyn, New York
SNC	SNAP-TITE COUPLER CO Erie, Pennsylvania
USEA	U S ENGINEERING CO Glendale, California
	WEATHERHEAD CO Glendale, California

8-14. UNITS PER ASSEMBLY.

8-15. The quantity listed in the units per assembly column is the quantity required at that particular location. To obtain the quantity required for the complete unit, refer to the Numerical Index, Section X.

8-16. USABLE ON CODE.

8-17. This column has been left blank since all assemblies and components are used on all equipments.

8-18. NUMERICAL INDEX.

8-19. CLASS CODE OR STOCK NUMBERS.

8-20. Class Codes or Stock Numbers have not been assigned by the Procuring Agency. Refer to the S-00-1, Master Cross-Reference Index for items.

8-21. PART NUMBERS.

8-22. The Numerical Index, Section X, is arranged in the alphabetical and numerical order of part numbers; that is, those parts with letter prefixes are listed first, followed by the plain numbered parts in natural order moving one column at a time from left to right. The letter O is treated as a numeral zero. A part listed as "No Number" or "Comm" in the Group Assembly Parts List is listed at the beginning of the Numerical Index by the principal noun of its description.

8-23. SOURCE CODE.

8-24. The source code column of the numerical index has not been assigned by Department representatives at the time of publication.

8-25. FIGURE AND INDEX NUMBER.

8-26. The fifth column of the Numerical Index lists all figures in which the part appears together with pertinent index numbers. When the part is used several times in the same assembly under different index numbers, it is listed and described each time.

8-27. QUANTITY PER ARTICLE.

8-28. The sixth column elves the quantity of each part required for the complete equipment covered in the illustrated parts breakdown. AN hardware, i.e., bolts, screws, washers, etc, have the total quantity required listed under the first index reference for the particular hardware without further indexing.

8-29. REFERENCE DESIGNATION INDEX.

8-30. In Section XI the parts are listed in the alphabetical and numerical order of reference designations.

8-31. REFERENCE SYMBOL.

8-32. The first column lists the reference symbols assigned to electrical and electronic components.

8-33. FIGURE AND INDEX NUMBER.

8-34. The second column lists the figure and index number which applies to the specific reference symbol shown in the first column.

8-35. CLASS CODE OR STOCK NUMBERS.

8-36. Class Codes or Stock Numbers have not been assigned by the Procuring Agency. Refer to the S-00-1, Master Cross-Reference Index for items.

8-37. PART NUMBER.

8-38. The fourth column contains the AN standard or manufacturer's part number, which is the same as that in Section IX, Group Assembly Parts List and Section X, Numerical Index.

8-39. HOW TO USE THE ILLUSTRATED PARTS BREAKDOWN.

8-40. TO FIND THE PART NUMBER IF THE MAJOR ASSEMBLY IS KNOWN.

a. In the Table of Contents find the page number for the major assembly.

b. On the page indicated, locate the part in the illustration and find its index number.

c. Refer to the Group Assembly Parts List, Section IX, and locate the figure and index number in the first column; the part number will then be found in the second column.

8-41. TO FIND THE ILLUSTRATION IF THE PART NUMBER IS KNOWN.

8-42. Refer to the Numerical Index, Section X, and find the part number in the second column. The figure and index number in the adjoining column refers to the location of the part in the Illustration and in the Group Assembly Parts List.

8-43. TO FIND THE PART NUMBER IF THE REFERENCE DESIGNATION IS KNOWN.

8-44. Refer to the Reference Designation Index, Section XI, where the part number will be found in the fourth column.

SECTION IX

GROUP ASSEMBLY PARTS LIST

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-1	10454	VACUUM-PRESSURE TEST SET, Model VPT-7A (ICDM)	1	
-1	10365	. COVER ASSEMBLY (ICDM)	1	
-2	10366-4	. . STRIP, Polyethylene (ICDM)	2	
-3	106688-5	. . STRIP, Polyethylene (ICDM)	2	
		(ATTACHING PARTS)		
-4	AN505-6-5	. . SCREW	8	
		----*----		
-5	10414	. . PARTS LIST, Spare (ICDM)	1	
		(ATTACHING PARTS)		
-6	AN535-2-2	. . SCREW	6	
		----*----		
	10471	. . ACCESSORIES ASSEMBLY (see figure 1-2 for parts breakdown)	1	
-7	10143	. CASE ASSEMBLY (ICDM)	1	
-8	10285	. . CASE HOLDER ASSEMBLY (ICDM)	1	
		(ATTACHING PARTS)		
-9	10264-6	. . PIN, Hinge (ICDM)	1	
		----*----		
-10	10280	. . MAIN PANEL ASSEMBLY (ICDM)	1	
-11	10279	. . . PANEL, Main Assembly (ICDM)	1	
-12	1010	. . . HANDLE (USEA) (IDC #10147).....	1	
		(ATTACHING PARTS)		
	AN520-10-6	. . . SCREW	2	
	AN936-A10	. . . WASHER.....	2	
		----*----		
-13	10127	. . . INDICATOR AND CARD ASSEMBLY, Rate of climb (ICDM)	1	
-14	10128	. . . INDICATOR AND CARD ASSEMBLY, Altimeter (ICDM).....	1	
-15	10129	. . . INDICATOR AND CARD ASSEMBLY, Air speed (ICDM)	1	
-16	10130	. . . INDICATOR AND CARD ASSEMBLY, Manifold Pressure (ICDM)	1	
-17	10131	. . . GAUGE AND CARD ASSEMBLY, Fuel pressure (ICDM)	1	
-18	A400-2-2	. . . ELBOW MALE (CRFI) (IDC #10320).....	1	
-19	A400-1-2	. . . CONNECTOR MAIL (CRFI) (IDC #10319)	5	
		(ATTACHING PARTS)		
	AN500-6-16	. . . SCREW	14	
	AN500-6-12	. . . SCREW	4	
	AN365-D-632	. . . NUT, Stop.....	18	
		----*----		
-20	10332	. . . VALVE ASSEMBLY, Vacuum selector (ICDM)	1	
-21	10396-9	. . . HOSE ASSEMBLY. From #5 side pressure selector valve to #5 side vacuum selector valve (ICDM)	1	
-22	10396-14	. . . HOSE ASSEMBLY. From #11 side pressure selector valve to #4 side vacuum selector valve (ICDM)	1	

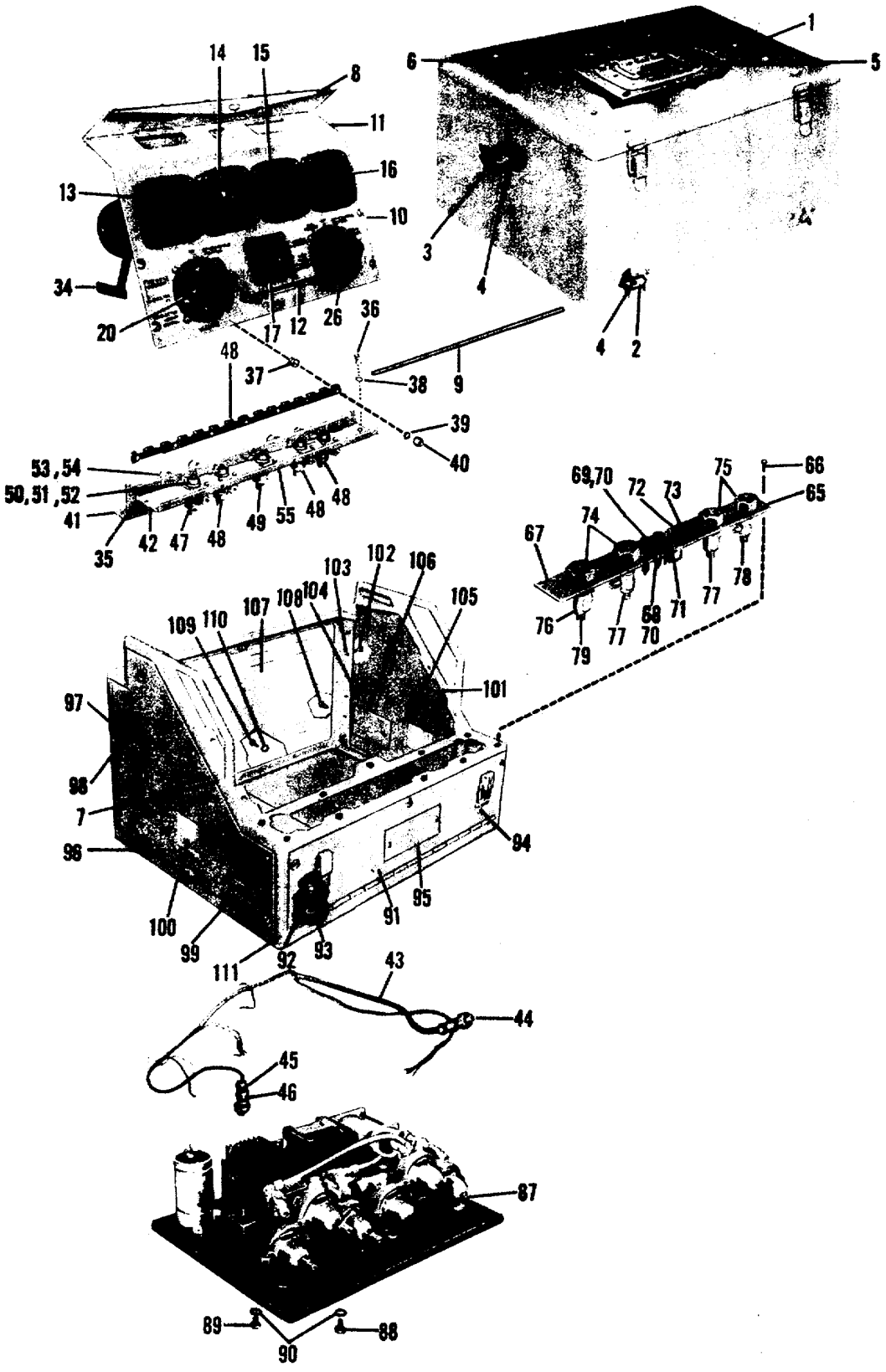


Figure 9-1. Vacuum Pressure Test Set (Sheet 1 of 2)

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-1-23	10396-17	. . . HOSE ASSEMBLY, From side #3 vacuum selector valve to vacuum relief valve #2 (ICDM)	1	
-24	10396-18	. . . HOSE ASSEMBLY, From side #10 vacuum selector valve to vacuum relief valve #3 (ICDM)	1	
-25	10396-28	. . . HOSE ASSEMBLY, From side #12 vacuum selector to bottom #2 needle valve (ICDM)	1	
		(ATTACHING PARTS)		
	AN501-10-8	. . . SCREW	4	
	AN936-A10	. . . WASHER	4	
		----*----		
-26	10333	. . . VALVE ASSEMBLY, Pressure selector (ICDM)	1	
-27	10396-8	. . . HOSE ASSEMBLY, From #2 side pressure selector valve to tee bottom needle valve #3 (ICDM)	1	
-28	10396-10	. . . HOSE ASSEMBLY, From #6 side pressure selector valve to pressure relief valve #2 (ICDM)	1	
-29	10396-11	. . . HOSE ASSEMBLY, From #7 side pressure selector valve to bottom case leak #5 (ICDM)	1	
-30	10396-12	. . . HOSE ASSEMBLY, From #9 side pressure selector valve to side #9 vacuum selector valve (ICDM)	1	
-31	10396-13	. . . HOSE ASSEMBLY, From #10 side pressure selector valve to pressure relief valve #1 (ICDM)	1	
-32	10396-15	. . . HOSE ASSEMBLY, From bottom #11 pressure selector valve to #1 case leak valve (ICDM)	1	
-33	10396-16	. . . HOSE ASSEMBLY, From #12 side pressure selector valve to #2 side vacuum selector valve (ICDM)	1	
		(ATTACHING PARTS)		
	AN501-10-8	. . . SCREW	4	
	AN936-A10	. . . WASHER	4	
		----*----		
-34	10230	. . . SUPPORT ASSEMBLY (ICDM)	2	
		(ATTACHING PARTS)		
	6/32X1/4SAE	. . . SCREW, Flat head (undercut)	4	
	AN430AD8-9	. . . RIVET	2	
	AN960-416	. . . WASHER	4	
	73-012-062-0500	. . . PIN, Roll (EN) (IDC #10407-1)	2	
		----*----		
-35	10283	. . VALVE AND COUPLING ASSEMBLY (ICDM)	1	
		(ATTACHING PARTS)		
-36	AN501-10-6	. . SCREW	4	
-37	AN500-8-6	. . SCREW	18	
-38	AN935-10	. . WASHER	4	
-39	AN935-8	. . WASHER	18	
-40	AN340-3-8	. . NUT	7	
		----*----		
-41	10281	. . . PANEL, Top-back (ICDM)	1	
-42	10282	. . . CHANNEL, Top (ICDM)	1	
-43	10392	. . . HARNESS ASSEMBLY (ICDM)	1	
-44	AN3106A-10S-2S(C)	. . . . RECEPTACLE	1	
-45	AN3057-3	. . . . CLAMP	1	
-46	AN3102A-18-1P(C)	. . . CONNECTOR	1	

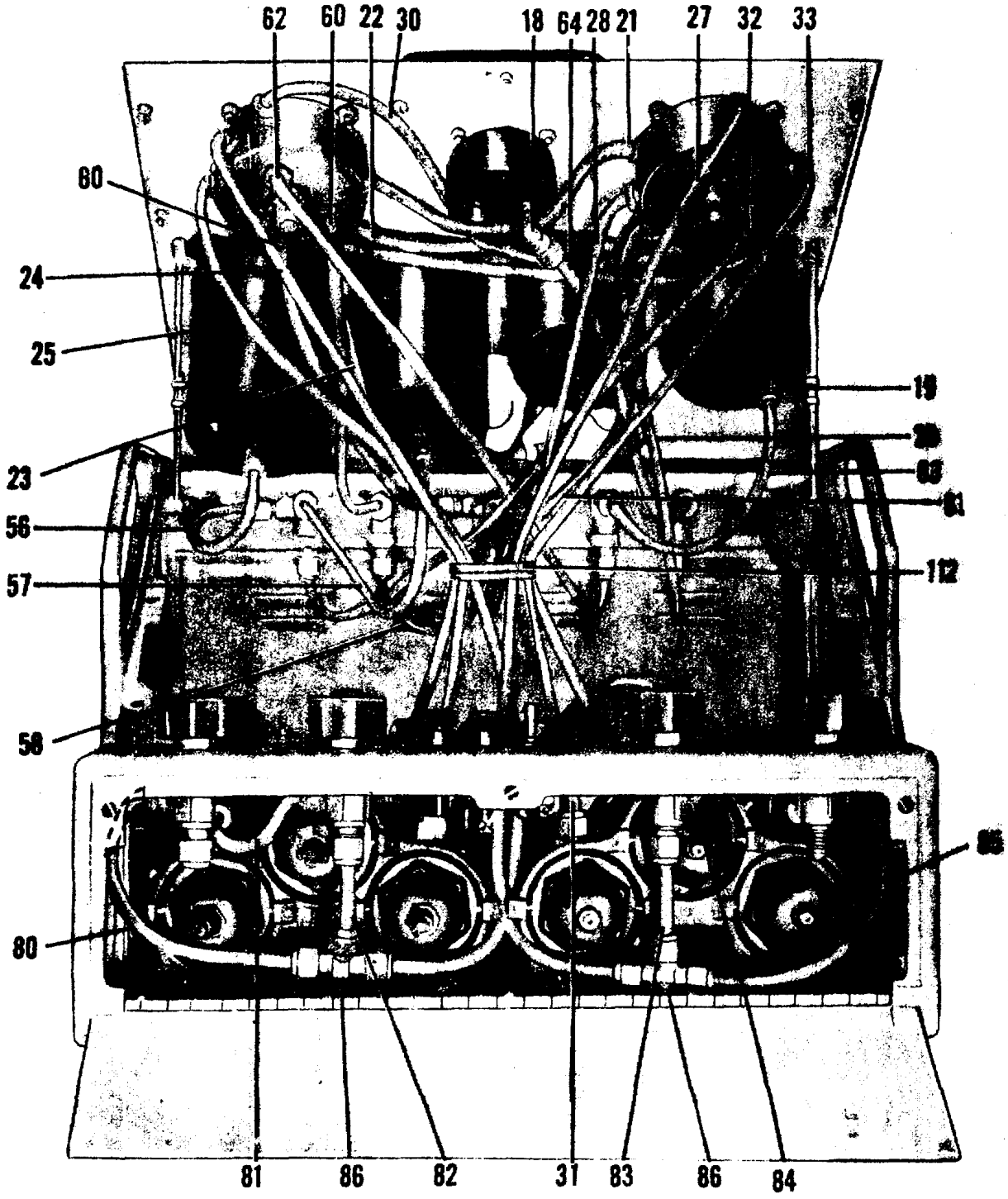


Figure 9-1. Vacuum Pressure Test Set (Sheet 2 of 2)

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-1		(ATTACHING PARTS)		
	AN500-8-4	. . . SCREW	4	
	AN935-8	. . . WASHER	4	
		----*----		
-47	10263-1	. . . VALVE, Case leak (ICDM)	1	
-48	10261	. . . VALVE, Case leak (ICDM)	3	
-49	10262-3	. . . VALVE, Case leak (ICDM)	1	
-50	10502	. . . POINTER (ICDM)	5	
-51	10408	. . . SCREW, Cap-hex socket (ICDM)	5	
-52	AN936-8	. . . WASHER	5	
-53	10148	. . . NUT, Tru-seal (ICDM)	4	
-54	10378-1	. . . NIPPLE (ICDM)	4	
-55	10284	. . . FILTER ASSEMBLY, Male (ICDM)	1	
-56	10396-19	. . . HOSE ASSEMBLY, From case leak #1 to bottom rate of climb (ICDM)	1	
-57	10396-20	. . . HOSE ASSEMBLY, From case leak #1 to altimeter (ICDM)	1	
-58	10396-21	. . . HOSE ASSEMBLY, From bottom case leak #2 to bottom pressure (air speed) (ICDM)	1	
-59	10396-22	. . . HOSE ASSEMBLY, From case leak #2 front to bottom port #5 vacuum selector (ICDM)	1	
-60	10396-23	. . . HOSE ASSEMBLY, From side case lead #3 to bottom port #2 vacuum selector (ICDM)	1	
-61	10396-24	. . . HOSE ASSEMBLY, From bottom case leak #3 to bottom static air-speed (ICDM)	1	
-62	10396-25	. . . HOSE ASSEMBLY, From bottom case leak #4 to bottom port #9 vacuum selector (ICDM)	1	
-63	10396-26	. . . HOSE ASSEMBLY, From front case leak #4 to bottom manifold pressure gage (ICDM)	1	
-64	10396-27	. . . HOSE ASSEMBLY, From front case leak #5 to fuel pressure gage (ICDM)	1	
		(ATTACHING PARTS)		
	AN526-632-4	. . . SCREW	20	
	AN935-6	. . . WASHER	20	
		----*----		
-65	10421	. . PANEL ASSEMBLY, Forward (ICDM)	1	
		(ATTACHING PARTS)		
-66	8/32X1/4SAE	. . SCREW, Flat head (undercut)	10	
		----*----		
-67	10271	. . . PANEL, Forward (ICDM)	1	
-68	HKP-EHJQLRW	. . . FUSEHOLDER (BUS)	1	
-69	HKP-A	. . . FUSEHOLDER, Spare (BUS)	1	
-70	F02D3R00B	. . . FUSE (BUS)	2	
-71	8823-K6	. . . SWITCH, Toggle (CUT)	1	
-72	111-3830-112	. . . LAMP, Holder (DLC)	1	
-73	327	. . . LAMP (DLC)	1	
-74	10133-1	. . . KNOB, Vacuum-Red (ICDM)	2	
-75	10133-2	. . . KNOB, Pressure-Blue (ICDM)	2	
		(ATTACHING PARTS)		
	AN565-D6-6	. . . SETSCREW	8	
		----*----		
-76	10308-8	. . . VALVE, Needle assembly (ICDM)	1	
-77	10308-9	. . . VALVE, Needle assembly (ICDM)	2	
-78	10308-10	. . . VALVE, Needle assembly (ICDM)	1	
-79	10284	. . . FILTER ASSEMBLY, Male (ICDM)	1	
-80	10396-1	. . . HOSE ASSEMBLY, From #1 needle valve to bottom tee (ICDM)	1	
-81	10396-2	. . . HOSE ASSEMBLY, From side #2 needle valve to vacuum sump (ICDM)	1	
-82	10396-3	. . . HOSE ASSEMBLY, From bottom #2 needle valve top of tee (ICDM)	1	
-83	10396-4	. . . HOSE ASSEMBLY, From bottom #3 needle valve to top of tee (ICDM)	1	
-84	10396-5	. . . HOSE ASSEMBLY, From #3 needle valve to pressure sump (ICDM)	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-1-85	10396-6	. . . HOSE ASSEMBLY, From #4 needle valve to bottom tee (ICDM)	1	
-86	A400-3	. . . TEE (CRFI) (IDC #10321)	2	
-87	10115	. . BASE ASSEMBLY (ICDM)	1	
		(ATTACHING PARTS)		
-88	AN500-8-4	. . SCREW	4	
-89	AN500-8-6	. . SCREW	14	
-90	AN935-8	. . WASHER	18	
		----*----		
-91	10273	. . PANEL ASSEMBLY, Front (ICDM)	1	
		(ATTACHING PARTS)		
-92	AN500-8-3	. . SCREW	5	
-93	AN935-8	. . WASHER	5	
		----*----		
-94	10272	. . . PANEL, Front (ICDM)	1	
-95	10307	. . . NAME PLATE (ICDM)	1	
		(ATTACHING PARTS)		
	AN535-2-2	. . . SCREW	2	
		----*----		
-96	10142	. . PANEL ASSEMBLY, Left side (ICDM)	1	
		(ATTACHING PARTS)		
-97	4-40X3/8SAE	. . SCREW, Binder head	6	
-98	22NC4-40	. . NUT, Clinch (EN)	6	
		----*----		
-99	10275-1	. . . PANEL, Left side (ICDM)	1	
-100	10341	. . . WINDOW, (ICDM)	1	
		(ATTACHING PARTS)		
	AN530-6-6	. . . SCREW	2	
	A1181-6Z-1	. . . SPEED NUT (AA)	2	
		----*----		
-101	10141	. . PANEL ASSEMBLY, Right side (ICDM)	1	
		(ATTACHING PARTS)		
-102	4-40X3/8SAE	. . SCREW, Binder head	6	
-103	22NC4-40	. . NUT, Clinch (EN)	6	
		----*----		
-104	10275-2	. . . PANEL, Right side (ICDM)	1	
-105	10341	. . . WINDOW (ICDM)	1	
-106	10140	. . . WINDOW (ICDM)	1	
		(ATTACHING PARTS)		
	AN530-6-6	. . . SCREW	4	
	A1181-6Z-1	. . . SPEED NUT (AA)	4	
		----*----		
-107	10276	. . PANEL, Rear (ICDM)	1	
		(ATTACHING PARTS)		
-108	8-32X1/4SAE	. . SCREW, Flat head (undercut)	7	
-109	AN500-8-6	. . SCREW	5	
-110	AN935-8	. . WASHER	5	
		----*----		
-111	10139	. . CASE ASSEMBLY, Drilling (ICDM)	1	
-112	10480	. . BAND, Rubber (ICDM)	2	

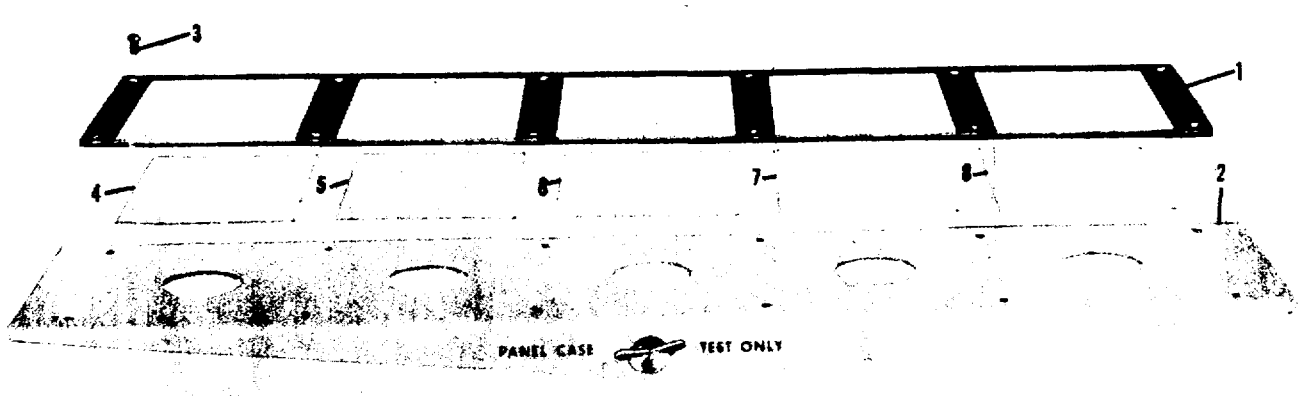


Figure 9-2. Card Holder Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-2	10285	HOLDER ASSEMBLY, Card (ICDM) (For next higher assembly, see figure 9-1-8)	Ref	
-1	10289	. WINDOW, Card holder (ICDM)	1	
-2	10137	. PANEL, Card holder assembly (ICDM)	1	
		(ATTACHING PARTS)		
-3	AN526-4-3	. SCREW	12	
		----*----		
-4	10277-1	. CARD, Rate of climb (ICDM)	1	
-5	10293-1	. CARD, Altimeter (ICDM)	1	
-6	10294-1	. CARD, Airspeed (ICDM)	1	
-7	10295-1	. CARD, Manifold pressure (ICDM)	1	
-8	10296-1	. CARD, Fuel pressure (ICDM)	1	

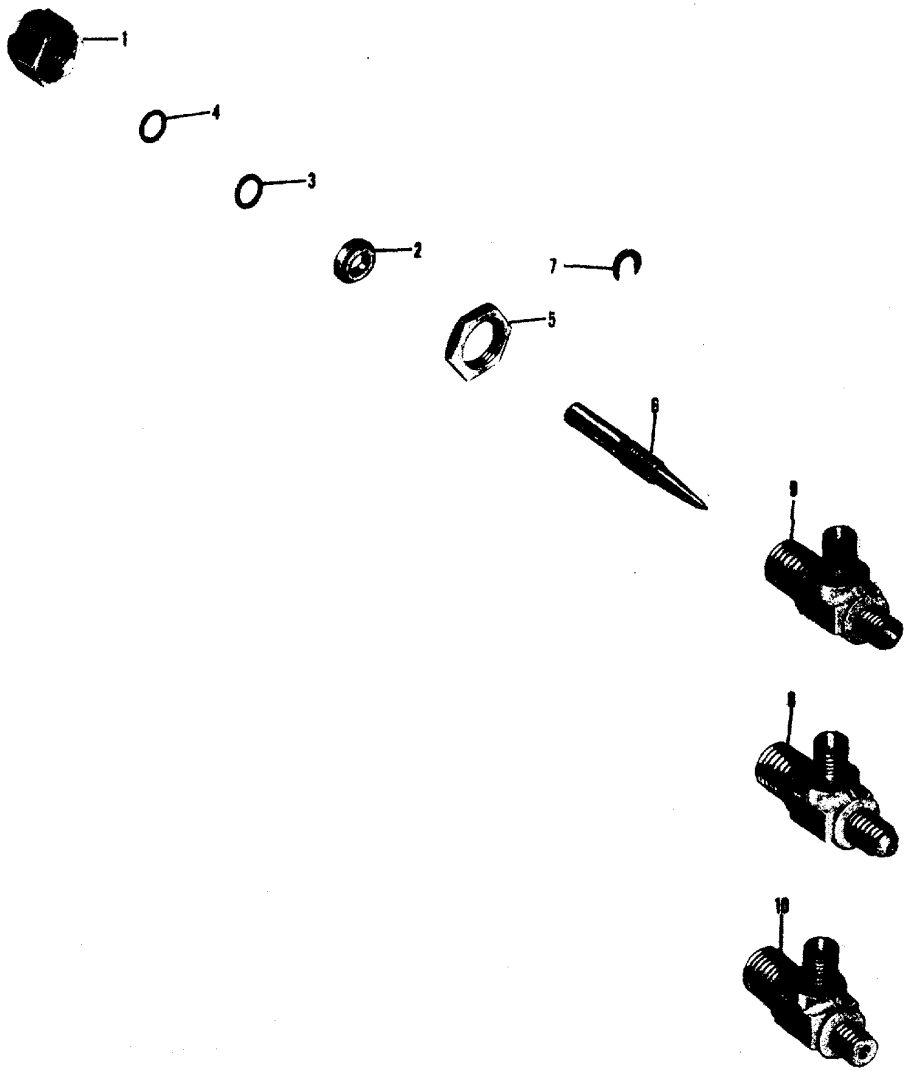


Figure 9-3. Needle Valve

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-3	10308-8	VALVE, Needle (ICDM) (For next higher assembly, see figure 9-1-76).....	Ref	
	10308-9	VALVE, Needle (ICDM) (For next higher assembly, see figure 9-1-77).....	Ref	
	10308-10	VALVE, Needle (ICDM) (For next higher assembly, see figure 9-1-78).....	Ref	
-1	10308-1	. CAP, Valve (ICDM).....	1	
-2	10308-2	. COLLAR (ICDM).....	1	
-3	10308-3	. GASKET (ICDM).....	1	
-4	AN6227B-6	. “O” RING.....	1	
-5	10308-5	. NUT, Lock (ICDM).....	1	
-6	10308-6	. NEEDLE (ICDM).....	1	
-7	10308-7	. RING, Retaining (ICDM).....	1	
-8	10260-1	. HOUSING (ICDM) (Part of valve 10308-10).....	1	
-9	10260-2	. HOUSING (ICDM) (Part of valve 10308-9).....	2	
-10	10260-3	. HOUSING (ICDM) (Part of valve 10308-8).....	1	

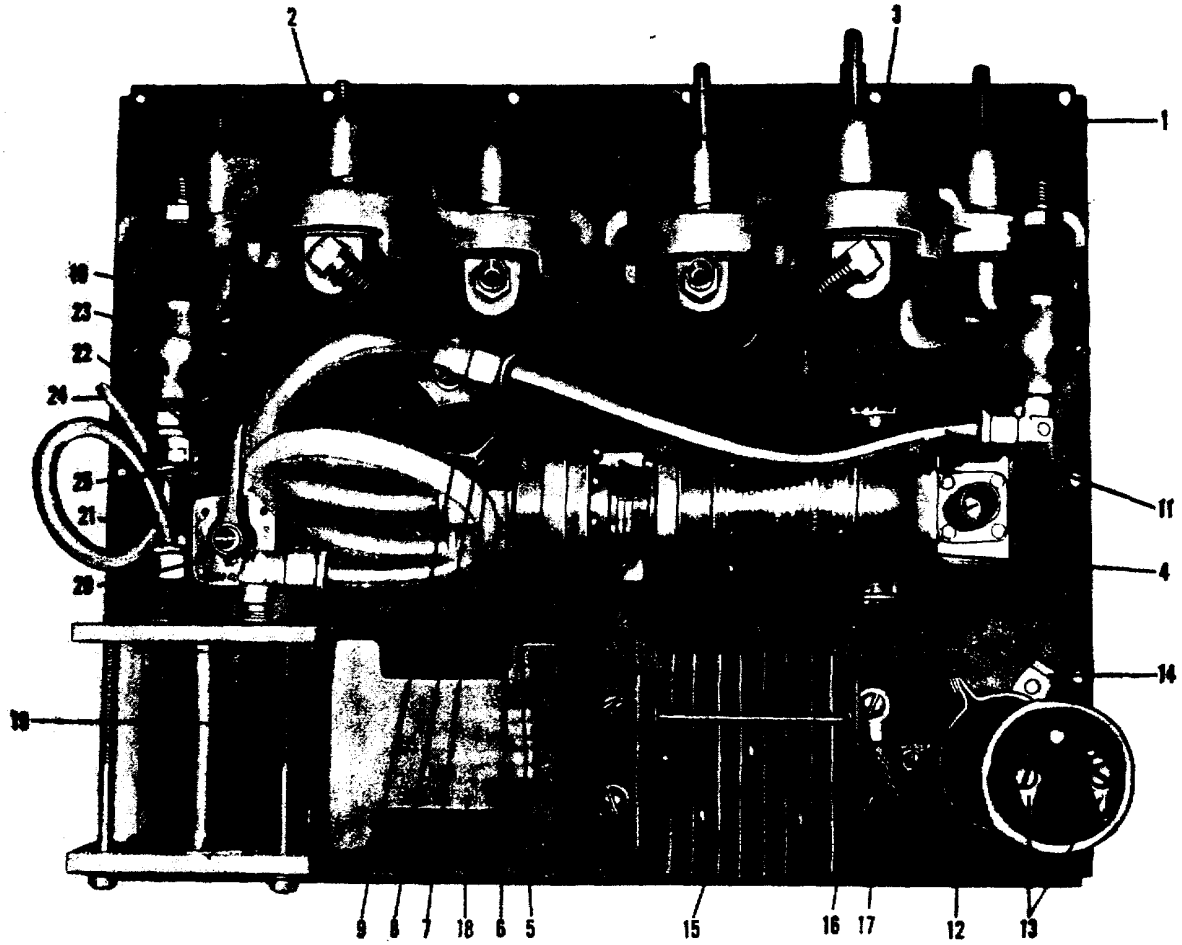


Figure 9-4. Chassis Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-4	10115	BASE ASSEMBLY (ICDM) (For next higher assembly, see figure 9-1-87).....	Ref	
-1	10335	. CHANNEL-BASE, Reinforcement assembly (ICDM)	1	
-2	10318	. VALVE & SUMP ASSEMBLY, Pressure relief (ICDM)	1	
-3	10317	. VALVE & SUMP ASSEMBLY, Vacuum relief (ICDM)	1	
		(ATTACHING PARTS)		
	AN501-10-6	. SCREW	8	
	AN936-A10	. WASHER.....	8	
		----*----		
-4	10079	. MOTOR, Pump assembly (ICDM).....	1	
-5	10355	. FILTER ASSEMBLY (ICDM).....	1	
-6	A600-1-2	. CONNECTOR MALE (CRFI) (IDC #10401).....	1	
-7	AN914-1D	. ELBOW.....	1	
-8	AN911-1D	. NIPPLE.....	1	
-9	269A-1PP-.1	. VALVE ASSEMBLY, Check (JAPC) (IDC #10090).....	1	
-10	A400-2-2	. ELBOW MALE (CRFI) (IDC #10320).....	1	
-11	10396-7	. HOSE ASSEMBLY, From pump to sump vacuum (ICDM).....	1	
-12	10118	. CAPACITOR (ICDM)	1	
-13	96	. LUG, Locking (BBR) (IDC #10405).....	2	
-14	1154	. CLAMP, Cable (BBR) (IDC #10411).....	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-4		(ATTACHING PARTS)		
	AN936-A10	. WASHER	2	
	AN500-8-6	. SCREW	3	
	AN935-8	. WASHER	3	
	AN960-8	. WASHER	3	
	AN340-3-8	. NUT	3	
		----*----		
-15	U2B1H5G	. RECTIFIER (RRE) (IDC #10120)	1	
-16	196	. LUG, Locking (BBR) (IDC #10406)	1	
-17	1230	. WIRE, Braided (ALW) (IDC #10413)	1	
		(ATTACHING PARTS)		
	AN500-416-8	. SCREW	4	
	AN960-416	. WASHER	4	
	AN935-516	. WASHER	4	
	AN340-416	. NUT	4	
		----*----		
-18	10116	. TRANSFORMER (ICDM)	1	
		(ATTACHING PARTS)		
	AN501-10-8	. SCREW	4	
	AN935-10	. WASHER	4	
	AN960-10	. WASHER	8	
	AN345-10	. NUT	4	
		----*----		
-19	10222	. RESERVOIR ASSEMBLY (ICDM)	1	
-20	10265	. VALVE DRAIN (ICDM)	1	
-21	A400-2-2	. ELBOW, Male (CRFI) (IDC #10320)	1	
-22	A600-2-2	. ELBOW, Male (CRFI) (IDC #10402)	1	
-23	10396-31	. HOSE ASSEMBLY, From drain valve to pump (ICDM)	1	
-24	10396-32	. HOSE ASSEMBLY, Drain hose (ICDM)	1	
		(ATTACHING PARTS)		
	AN501A-10-10	. SCREW	4	
	AN960-10	. WASHER	4	
	AN931-3-5	. GROMMET	4	
		----*----		
-25	833	. CABLE CLIP (Smith, Herman) (IDC #10412)	1	
		(ATTACHING PARTS)		
	AN500-8-8	. SCREW	1	
	AN960-8	. WASHER	1	
	AN935-8	. WASHER	1	
	AN345-8	. NUT	1	
		----*----		

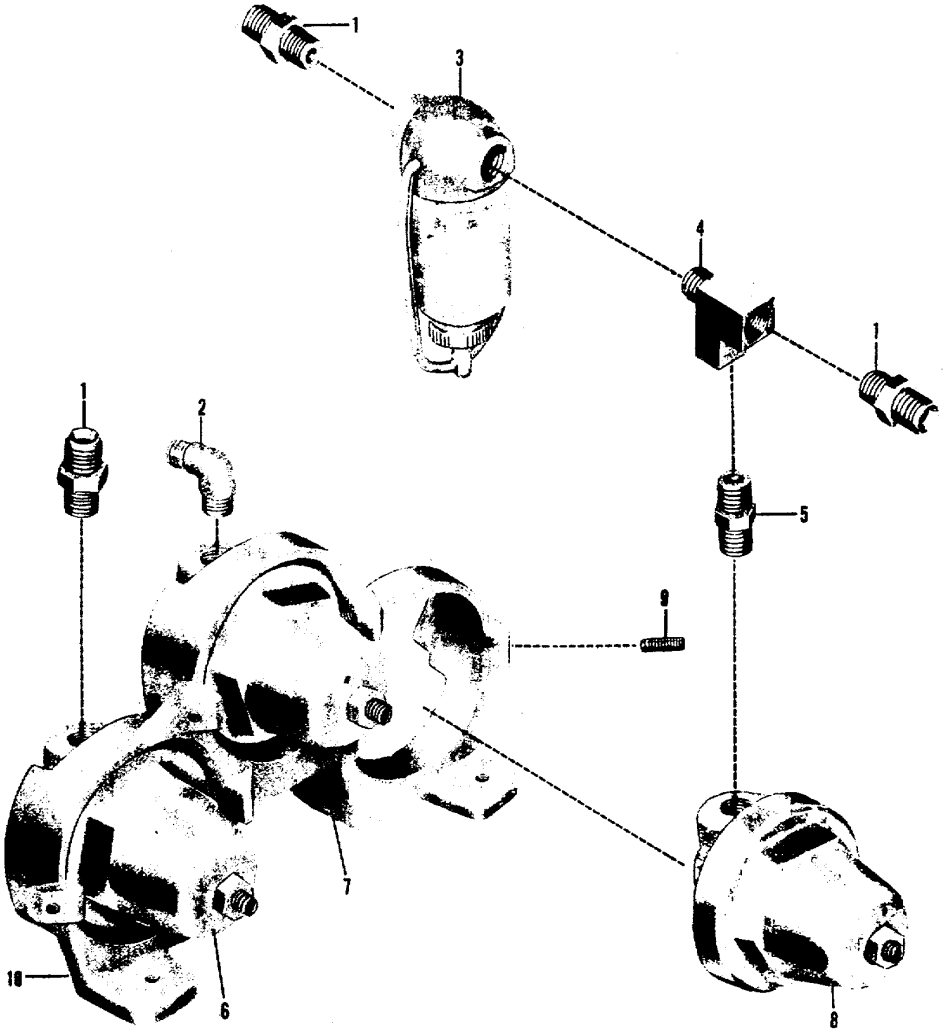


Figure 9-5. Valve and Sump Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-5	10318	VALVE AND SUMP ASSEMBLY, Pressure relief (ICDM) (For next higher assembly, see figure 9-4-2)	Ref	
-1	A400-1-2	. CONNECTOR, Male (CRFI) (IDC #10319)	3	
-2	A400-2-2	. ELBOW, Male (CRFI) (IDC #10320)	1	
-3	10134	. SUMP ASSEMBLY (ICDM) (See figure 9-7 for parts breakdown)	1	
-4	3750X2	. TEE, Street (Weatherhead Co) (IDC #10322)	1	
-5	AN911-1D	. NIPPLE	1	
-6	10235-1	. VALVE, Pressure (ICDM)	1	
-7	10235-2	. VALVE, Pressure (ICDM)	1	
-8	10235-3	. VALVE, Pressure (ICDM)	1	
		(ATTACHING PARTS)		
-9	AN565-D8-8	. SETSCREW	6	
		----*----		
-10	10256	. BRACKET (ICDM)	1	

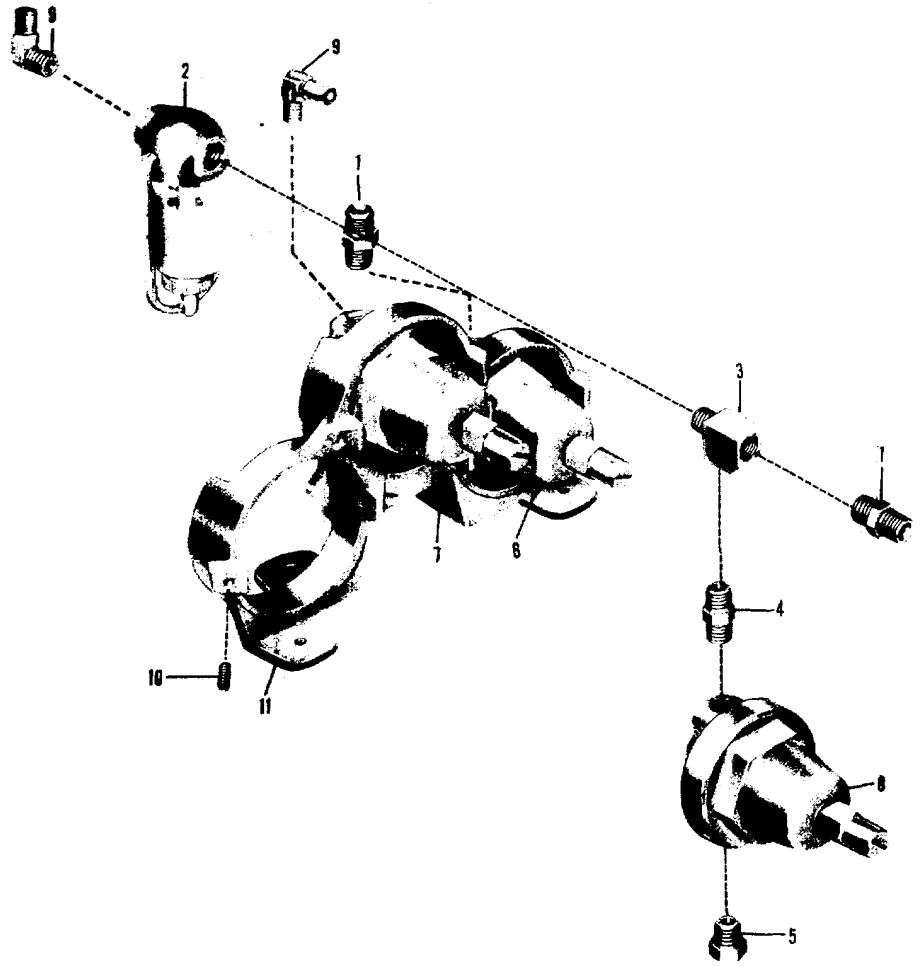


Figure 9-6. Valve and Sump Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-6	10317	VALVE AND SUMP ASSEMBLY, Vacuum relief (ICDM) (For next higher assembly, see figure 9-4-3)	Ref	
-1	A400-1-2	. CONNECTOR, Male (CRFI) (IDC #10319)	2	
-2	10134	. SUMP ASSEMBLY (ICDM) (See figure 9-7 for parts breakdown)	1	
-3	3750X2	. TEE, Street (Weatherhead Co) (IDC #10322)	1	
-4	AN911-1D	. NIPPLE, Hex	1	
-5	10287	. FILTER ASSEMBLY, Adapter nut (ICDM)	3	
-6	10236-1	. VALVE, Vacuum (ICDM)	1	
-7	10236-2	. VALVE, Vacuum (ICDM)	1	
-8	10236-3	. VALVE, Vacuum (ICDM)	1	
-9	A400-2-2	. ELBOW, Male (CRFI) (IDC #10320)	2	
		(ATTACHING PARTS)		
-10	AN565-D8-8	. SETSCREW	6	
		----*----		
-11	10256	. BRACKET (ICDM)	1	

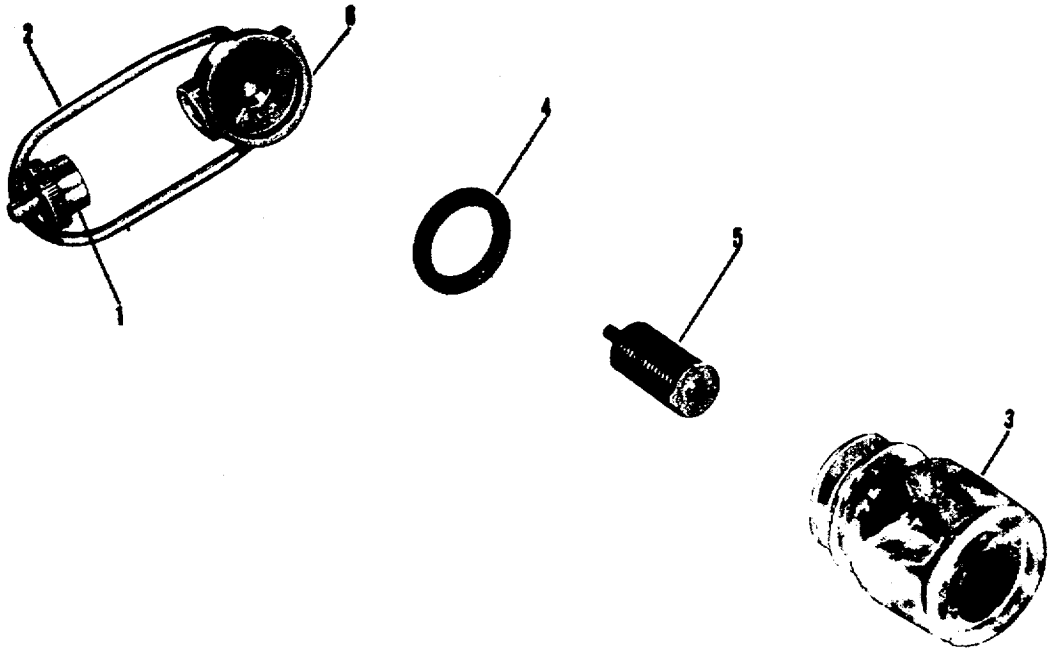


Figure 9-7. Sump Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-7	10134	SUMP ASSEMBLY (ICDM) (For next higher assemblies, see figures 9-5-3 and 9-6-2)	Ref	
-1	10134-1	. NUT, Tension (ICDM)	1	
-2	10134-2	. SPRING, Retainer (ICDM)	1	
-3	10134-3	. BOWL (ICDM)	1	
-4	10134-4	. GASKET (ICDM)	1	
-5	10507	. FILTER (ICDM)	1	
-6	10134-5	. HEAD (ICDM)	1	

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-8	10079	MOTOR PUMP ASSEMBLY (ICDM) (For next higher assembly, see figure 9-4-4)	Ref	
-1	I.S. 14846	. MOTOR ASSEMBLY (BD)	1	
-2	60-7835	. . SCREW (BD)	2	
-3	10542	. . BRUSH HOLDER SCREW ASSEMBLY (ICDM)	2	
-4	10543	. . WASHER, Copper (ICDM)	2	
-5	10509	. . BRUSH & SNAP RING ASSEMBLY (ICDM)	2	
	10544	. . . SNAP RING (ICDM)	1	
	10545	. . . BRUSH & SPRING ASSEMBLY (ICDM)	1	
-6	33203-A	. . BRUSH HOLDER ASSEMBLY (BD)	1	
-7	33202-A	. . HOLDER, Brush (BD)	1	
-8	20-7815	. . SCREW, Set (BD)	2	
-9	10-6756	. . BRACKET, Commutator end (BD)	1	
-10	0-6836	. . BRACKET, Shaft end (BD)	1	
-11	AN365D-832	. . NUT	2	
-12	0-2252	. . WASHER, Copper (BD)	2	
-13	10546	. . SEAL, Oil (ICDM)	1	
-14	10547	. . GASKET (ICDM)	1	
-15	0-5851	. . SPRING (BD)	2	
-16	0-5452	. . GASKET (BD)	1	
-17	10548	. . SNAP RING (ICDM)	1	
-18	10549	. . WASHER (ICDM)	A/R	
-19	10550	. . WASHER (ICDM)	1	
-20	10551-1	. . BEARING (ICDM)	1	
-21	10552	. . ARMATURE ASSEMBLY (ICDM)	1	
-22	10551-2	. . BEARING (ICDM)	1	
-23	2293	. . WASHER, Adj (BD)	A/R	
-24	I.S. 14846F	. . FIELD ASSEMBLY (BD)	1	
-25	0-3822	. . SLEEVE (BD)	1	
-26	3503	. . SPRING, Load (BD)	1	
-27	10-7877	. . STUD (BD)	2	
-28	10-7822	. . SCREW, Set (BD)	2	
		(ATTACHING PARTS)		
-29	AN500-416-8	. . SCREW	4	
-30	AN935-416	. . WASHER	4	
		----*----		
-31	10258	. FILTER, Noise (ICDM)	1	
-32	AN3102A-10S-2P(C)	. . CONNECTOR	1	
		(ATTACHING PARTS)		
-33	AN500A4-4	. . SCREW	4	
		----*----		
-34	10553	. PUMP ASSEMBLY (ICDM)	1	
-35	10553-1	. . SPRING, Seal (ICDM)	1	
-36	10553-2	. . WASHER, Seal (ICDM)	1	
-37	AN6227B-3	. . “O” RING, Seal Insert	1	
-38	10553-3	. . CAGE, Seal (ICDM)	1	
		(ATTACHING PARTS)		
-39	10553-4	. . SCREW (ICDM)	4	
-40	AN936-A10	. . WASHER	4	
		----*----		
-41	10342	. BRACKET, Motor mount (ICDM)	1	
		(ATTACHING PARTS)		
-42	AN500-8-6	. SCREW	2	
-43	AN935-8	. WASHER	4	
-44	AN340-3-8	. NUT	2	
-45	AN500-8-10	. SCREW	2	
-46	AN936-A10	. WASHER	2	
		----*----		

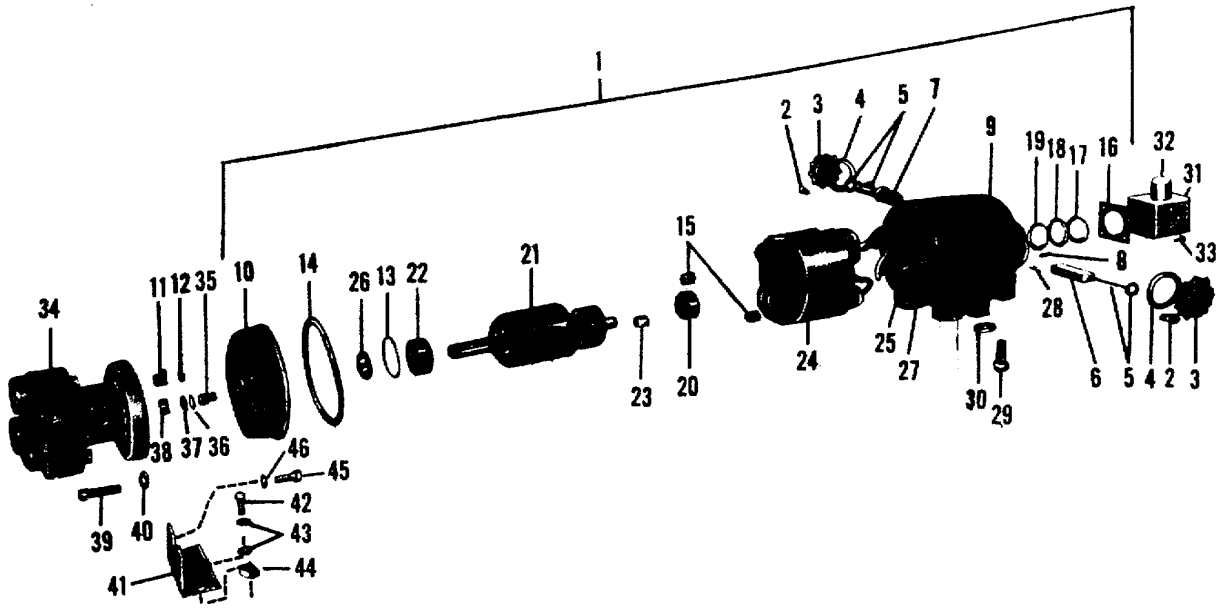


Figure 9-8. Motor Pump Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-9	269A-1PP-.1	VALVE ASSEMBLY, Check (JAPC) (IDC #10090) (For next higher assembly, see figure 9-4-9)	Ref	
-1	10090-1	. NUT, End (ICDM)	1	
-2	10090-2	. PLUNGER (ICDM)	1	
-3	AN6227V-7	. PACKING, Preformed		
-4	AN6227V-9	. PACKING, Preformed	1	
-5	10090-3	. SPRING (ICDM)	1	
-6	10090-4	. BODY (ICDM)	1	

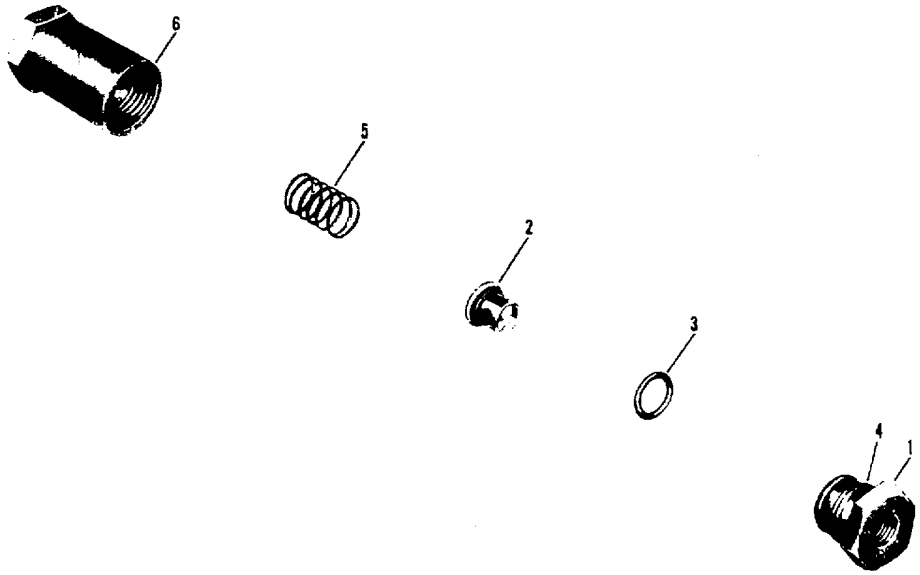


Figure 9-9. Valve Assembly

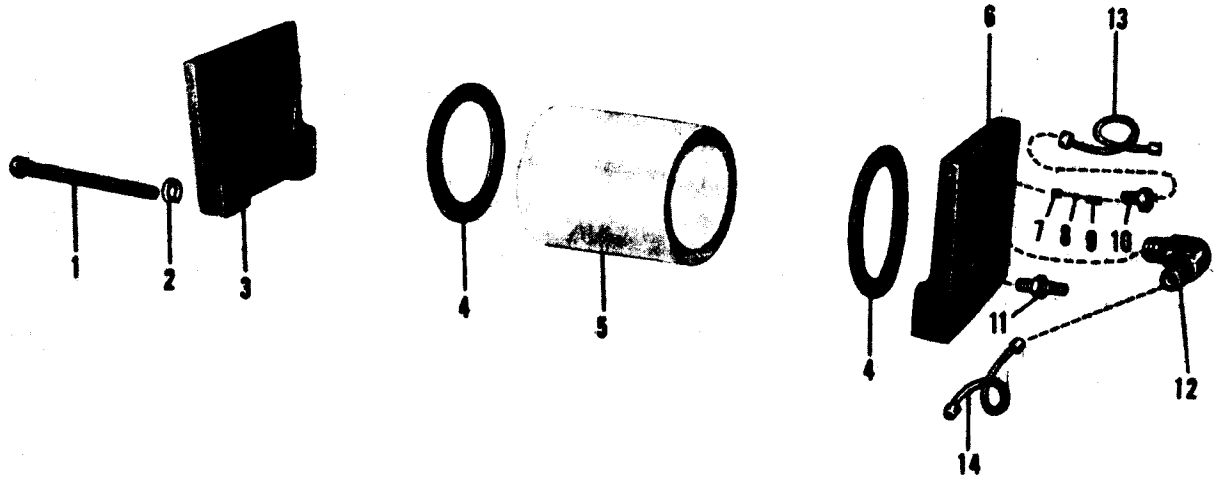


Figure 9-10. Reservoir Assembly

FIG. & INDEX NO.	PART NO.	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE
9-10	10222	RESERVOIR ASSEMBLY (ICDM) (For next higher assembly, see figure 9-4-19)	Ref	
-1	10292	. BOLT, Tie (ICDM)	4	
-2	AN935-416	. WASHER	4	
-3	10249-1	. END CASTING, Reservoir (ICDM)	1	
-4	10290	. GASKET (ICDM)	2	
-5	10291	. GLASS (ICDM)	1	
-6	10249-2	. END CASTING, Reservoir (ICDM)	1	
	10268	. VALVE ASSEMBLY, Check, Ball (ICDM)	1	
-7	10268-2	. . INSERT (ICDM)	1	
-8	10268-3	. . BALL, Bearing (ICDM)	1	
-9	10301	. . SPRING (ICDM)	1	
-10	10268-1	. . BODY, Valve (ICDM)	1	
-11	AN911-1D	. . NIPPLE, Male	1	
-12	A600-2-2	. . ELBOW, Male (CRFI) (IDC #10402)	1	
-13	10396-29	. . HOSE ASSEMBLY, From reservoir to sump pressure (ICDM)	1	
-14	10396-30	. . HOSE ASSEMBLY, From reservoir to pump pressure outlet (ICDM)	1	

SECTION X

NUMERICAL INDEX

STOCK NUMBER		PART NO.	SOURCE CODE	FIG. AND INDEX NO.	QTY PER ARTI-CLE
CLASS CODE	SERIAL NO.				
R5935	280-2194-D334	AN3057-3	P1F0C	9-1-45	1
		AN3102A-10S-2P(C)	X1	9-8-32	1
		AN3102A-18-1P(C)	P1F0C	9-1-46	1
		AN3106A-10S-2S(C)	P1F0C	9-1-44	1
		AN340-3-8	N	9-1-40	12
				9-4	
				9-8-44	
R5310	176-8139-G1AN	AN340-416		9-4	4
R5310	176-8138-G1AN	AN345-10		9-4	4
R5310	176-8136-G1AN	AN345-8		9-4	1
		AN365D-632	N	9-1	18
		AN365D-832	N	9-8-11	2
		AN430AD8-9	N	9-1	2
		AN500-416-8	N	9-4	8
				9-8-29	
		AN500-6-12	N	9-1	4
		AN500-6-16	N	9-1	14
		AN500-8-10	N	9-8-45	2
		AN500-8-3	N	9-1-92	5
		AN500-8-4	N	9-1	8
				9-1-88	
		AN500-8-6	N	9-1-37	42
				9-1-89	
				9-1-109	
				9-4	
				9-8-42	
		AN500-8-8	N	9-4	1
		AN500A4-4	N	9-8-33	4
		AN501-10-3	N	9-1-36	12
				9-4	
		AN501-10-8	N	9-1	12
				9-4	
		AN501A-10-10	N	9-4	4
		AN505-6-5	N	9-1-4	8
R5305	151-2765-G192	AN520-10-6		9-1	2
		AN526-4-3	N	9-2-3	12
		AN526-632-4	N	9-1	20
R5305	167-2940-G192	AN530-6-6		9-1	6
		AN535-2-2	N	9-1	8
				9-1-6	
		AN565-D6-6	N	9-1	8
		AN565-D8-8	N	9-5-9	12
				9-6-10	
		AN6227B-3	N	9-8-37	1
		AN6227B-6	N	9-3-4	1
		AN6227V-7		9-9-3	1
		AN6227V-9		9-9-4	1
		AN6270-3-24	AF	1-2-3	1
		AN6270-3-300	AF	1-2-2	1
		AN6270-3-72	AF	1-2-4	2
				1-2-5	
R4730	278-0411-GH80	AN737-48		1-2-15	1
		AN806-3D	P1F0C	1-2-23	1
R4730	186-9810-G250	AN815-3D		1-2-19	2
				1-2-20	
R4730	187-0085-G250	AN816-3D	P1F0C	1-2-21	2
R4730	186-7783-G250	AN911-1D		9-4-8	4
				9-5-5	
				9-6-4	
				9-10-11	
R4730	230-8739-G250	AN914-1D		9-4-7	1
R4730	187-3576-G250	AN919-2D		1-2-18	1
		AN931-3-5	N	9-4	4
		AN933-1D	P1F0C	1-2-22	1
		AN935-10	N	9-1-38	8
				9-4	
		AN935-416	N	9-4	12
				9-8-30	
				9-10-2	
R5310	639-2039-G192	AN935-6		9-1	20

STOCK NUMBER		PART NO.	SOURCE CODE	FIG. AND INDEX NO.	QTY PER ARTI-CLE
CLASS CODE	SERIAL NO.				
R5310	638-5392-G192	AN935-8	N	9-1	56
				9-1-39	
				9-1-90	
				9-1-93	
				9-1-110	
				9-4	
				9-8-43	
R5310	167-0878-G192	AN936-A10		9-1	26
				9-4	
				9-8-40	
				9-8-46	
		AN936-8	N	9-1-52	5
R5310	167-0818-G192	AN960-10		9-4	12
		AN960-416	N	9-1	8
				9-4	
R5310	515-3058-G192	AN980-8		9-4	4
R4730	626-7584-T030	AVEC-4-2F	P1F0C	1-2-17	1
		A1181-6Z-1	N	9-1	6
R4730	555-3741-T030	A400-1-2	P1F0C	9-1-19	10
				9-5-1	
				9-6-1	
R4730	555-3757-T030	A400-2-2	P1F0C	9-1-18	6
				9-4-10	
				9-4-21	
				9-5-2	
				9-6-9	
		A400-3	P1F0C	9-1-86	2
R4730	580-8170-T030	A600-1-2	P1F0C	9-4-6	1
R4730	555-3747-T030	A600-2-2	P1F0C	9-4-22	2
				9-10-12	
ES0		F02D3R00B	P1F0C	9-1-70	2
ES0		HKP-A	P1F0C	9-1-69	1
ES0		HKP-EHJQLRW	P1F0C	9-1-68	1
		I.S. 14846	X1	9-8-1	1
		I.S. 14846F	X1	9-8-24	1
		NAVAER-17-15C-539	U	1-2-27	2
		U2B1H5G	P1F0C	9-4-15	1
		0-2252	N	9-8-12	2
		0-3822	M0	9-8-25	1
		0-5452	M0	9-8-16	1
		0-5851	M0	9-8-15	2
		0-6836	X1	9-8-10	1
		10-6756	X1	9-8-9	1
		10-7822	N	9-8-28	2
		10-7877	M0	9-8-27	2
R4920	626-8139-T030	10079	P1F0R	9-4-4	1
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		10090-1	X1	9-9-1	1
		10090-2	X1	9-9-2	1
		10090-3	X1	9-9-5	1
		10090-4	X1	9-9-6	1
		1010	N	9-1-12	1
		10115	AF	9-1-87	1
				9-4	
R5950	627-4043-T030	10116	P1F0C	9-4-18	1
		10118	P1F0C	9-4-12	1
		10127	A0	9-1-13	1
		10128	A0	9-1-14	1
		10129	A0	9-1-15	1
		10130	A0	9-1-16	1
		10131	A0	9-1-17	1
R5355	584-4785-T030	10133-1	P1F0C	9-1-74	2
R5355	584-4783-T030	10133-2	P1F0C	9-1-75	2
R4920	626-3891-T030	10134	P1F0C	9-5-3	2
				9-6-2	
				9-7	
		10134-1	X1	9-7-1	2
		10134-2	X1	9-7-2	2
		10134-3	X1	9-7-3	2

STOCK NUMBER		PART NO.	SOURCE CODE	FIG. AND INDEX NO.	QTY PER ARTI-CLE
CLASS CODE	SERIAL NO.				
		10134-4	X1	9-7-4	2
		10134-5	X1	9-7-6	2
		10137	M0	9-2-2	1
		10139	X1	9-1-111	1
		10140	MF	9-1-106	1
R4920	626-4317-T030	10141	P0C	9-1-101	1
R4920	626-3882-T030	10142	P0C	9-1-96	2
		10143	X1	9-1-7	1
R4730	628-0770-T030	10148	P1F0C	9-1-53	4
		10222	AF	9-4-19	1
				9-10	
R4920	626-7587-T030	10230	P10C	9-1-34	2
R4920	626-7591-T030	10235-1	P1F0C	9-5-6	1
R4920	626-7592-T030	10235-2	P1F0C	9-5-7	1
R4920	626-7593-T030	10235-3	P1F0C	9-5-8	1
R4920	626-7594-T030	10236-1	P1F0C	9-6-6	1
R4920	626-7595-T030	10236-2	P1F0C	9-6-7	1
R4920	626-7596-T030	10236-3	P1F0C	9-6-8	1
		10249-1	X2	9-10-3	1
		10249-2	X2	9-10-6	1
		10256	X2	9-5-10	2
				9-6-11	
		10258	P1F0C	9-8-31	1
		10260-1	X1	9-3-8	1
		10260-2	X1	9-3-9	2
		10260-3	X1	9-3-10	1
R4920	626-3887-T030	10261	P1F0C	9-1-48	3
R4920	626-3889-T030	10262-3	P1F0C	9-1-49	1
R4920	626-3888-T030	10263-1	P1F0C	9-1-47	1
		10264-6	MF	9-1-9	1
R4920	626-3893-T030	10265	P1F0C	9-4-20	1
R4920	626-3892-T030	10268	P1F0C	9-10	1
		10268-1	X1	9-10-10	1
		10268-2	X1	9-10-7	1
		10268-3	X1	9-10-8	1
		10271	M0	9-1-37	1
		10272	M0	9-1-94	1
		10273	M0	9-1-91	1
		10275-1	X1	9-1-99	1
		10275-2	X1	9-1-104	1
R4920	626-3883-T030	10276	P0C	9-1-107	1
		10277-1	M0	9-2-4	1
		10277-2	MF	1-2-24	12
		10279	M0	9-1-11	1
		10280	AF	9-1-10	1
		10281	M0	9-1-41	1
		10282	M0	9-1-42	1
		10283	AF	9-1-35	1
R4920	626-7590-T030	10284	P1F0C	9-1-55	2
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		10285	M0	9-1-8	1
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R4920	626-4318-T030	10287	P1F0C	9-6-5	3
		10289	M0	9-2-1	1
R4920	541-2258-T030	10290	P1F0C	9-10-4	2
R4920	626-7597-T030	10291	P1F0C	9-10-5	1
		10292	M0	9-10-1	4
		10293-1	M0	9-2-5	1
		10293-2	MF	1-2-24	12
		10294-1	M0	9-2-6	1
		10294-2	MF	1-2-24	12
		10295-1	M0	9-2-7	1
		10295-2	MF	1-2-24	12
		10296-1	M0	9-2-8	1
		10296-2	MF	1-2-24	12
		10297	AF	1-2-6	1
		10301	X1	9-10-9	1
		10307	M0	9-1-95	1
		10308-1	X1	9-3-1	4
R4920	626-3886-T030	10308-10	P1F0C	9-1-78	1
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		10308-2	X1	9-3-2	4
		10308-3	X1	9-3-3	4
		10308-5	X1	9-3-5	4
		10308-6	X1	9-3-6	4
		10308-7	X1	9-3-7	4
R4920	626-3884-T030	10308-8	P1F0C	9-1-76	1
				9-3	
R4920	626-3885-T030	10308-9	P1F0C	9-1-77	2
				9-3	
		10317		9-4-3	1
				9-6	
		10318		9-4-2	1
				9-5	

STOCK NUMBER		PART NO.	SOURCE CODE	FIG. AND INDEX NO.	QTY PER ARTI-CLE
CLASS CODE	SERIAL NO.				
		10323	AF	1-2-7	1
		10324	AF	1-2-9	1
		10325	AF	1-2-8	1
		10326	AF	1-2-10	2
				1-2-16	
R4920	626-5136-T030	10332	P1F0S	9-1-20	1
R4920	626-4316-T030	10333	P1F0S	9-1-26	1
		10335	M0	9-4-1	1
		10338	AF	1-2-1	1
		10341	MF	9-1-100	2
				9-1-105	
		10342	M0	9-8-41	1
		10354-1	P1F0C	1-2-26	1
		10354-2	P1F0C	1-2-25	1
R4920	626-4319-T030	10355	P1F0C	9-4-5	1
R4920	626-5135-T030	10365	P2F0S	9-1-1	1
		10366-4	M0	9-1-2	2
		10366-5	M0	9-1-3	2
		10372	N	1-2-28	1
		10373	N	1-2-29	1
		10374	N	1-2-30	1
		10375	N	1-2-31	1
		10376	N	1-2-32	1
R4920	626-3890-T030	10378-1	P1F0C	9-1-54	4
		10392	MF	9-1-43	1
		10396-1	AF	9-1-80	1
		10396-10	AF	9-1-28	1
		10396-11	AF	9-1-29	1
		10396-12	AF	9-1-30	1
		10396-13	AF	9-1-31	1
		10396-14	AF	9-1-22	1
		10396-15	AF	9-1-32	1
		10396-16	AF	9-1-33	1
		10396-17	AF	9-1-23	1
		10396-18	AF	9-1-24	1
		10396-19	AF	9-1-56	1
		10396-2	AF	9-1-81	1
		10396-20	AF	9-1-57	1
		10396-21	AF	9-1-58	1
		10396-22	AF	9-1-59	1
		10396-23	AF	9-1-60	1
		10396-24	AF	9-1-61	1
		10396-25	AF	9-1-62	1
		10396-26	AF	9-1-63	1
		10396-27	AF	9-1-64	1
		10396-28	AF	9-1-25	1
R4920	627-9670-T030	10396-29	PF0C	9-10-13	1
		10396-3	AF	9-1-82	1
R4920	627-9671-T030	10396-30	PF0C	9-10-14	1
R4920	627-9672-T030	10396-31	PF0C	9-4-23	1
R4920	627-9673-T030	10396-32	P1F0C	9-4-24	1
		10396-4	AF	9-1-83	1
		10396-5	AF	9-1-84	1
		10396-6	AF	9-1-85	1
		10396-7	AF	9-4-11	1
		10396-8	AF	9-1-27	1
		10396-9	AF	9-1-21	1
		10408	N	9-1-51	5
		10414	M0	9-1-5	1
		10421	AF	9-1-65	1
R4920	588-2856-T030	10454	P1-R	9-1	1
		10471	AF	1-2	1
				9-1	
		10480	N	9-1-114	2
		10487-1	P1F0C	1-2-13	1
		10487-2	P1F0C	1-2-14	1
		10493	P1F0C	1-2-12	1
		10494	P1F0C	1-2-11	1
R4920	657-3197-T030	10502	P1F0C	9-1-50	1
		10507	X1	9-7-5	2
R4920	657-3198-T030	10509	P1F0C	9-8-5	2
		10542	PF0C	9-8-3	2
		10543	P1F0C	9-8-4	2
		10544	X1	9-8	1
		10545	X1	9-8	1
		10546	P10C	9-8-13	1
		10547	P10C	9-8-14	1
		10548	P10C	9-8-17	1
		10549	P10C	9-8-18	A/R
		10550	P10C	9-8-19	1
		10551-1	P10C	9-8-20	1
		10551-2	P10C	9-8-22	1
		10552	P10C	9-8-21	1
R4920	625-3782-T030	10553	P10C	9-8-34	1

STOCK NUMBER		PART NO.	SOURCE CODE	FIG. AND INDEX NO.	QTY PER ARTI-CLE
CLASS CODE	SERIAL NO.				
		10553-1	X1	9-8-35	1
		10553-2	X1	9-8-36	1
		10553-3	X1	9-8-38	1
		10553-4	X1	9-8-39	4
		111-3830-1112	P1F0C	9-1-72	1
		1154	N	9-4-14	1
R6145	643-0181-D334	1230		9-4-17	A/R
		196	N	9-4-16	1
		20-7815	N	9-8-8	2
		22NC4-40	N	9-1-98	12
				9-1-103	
		2293	M0	9-8-23	A/R
R4920	555-3761-T030	269A-1PP-.1	P1F0C	9-4-9	1
				9-9	
GSS0		327	P1F0C	9-1-73	1

STOCK NUMBER		PART NO.	SOURCE CODE	FIG. AND INDEX NO.	QTY PER ARTI-CLE
CLASS CODE	SERIAL NO.				
		33202-A	X1	9-8-7	1
		33203-A	X1	9-8-6	1
		3503	N	9-8-26	1
		3750X2	P1F0C	9-5-4	2
				9-6-3	
		4-40X3/8SAE	N	9-1-97	12
				9-1-102	
		6-32X1/4SAE	N	9-1	4
		60-7835	N	9-8-2	2
		73-012-062-0500	N	9-1	2
		8-32X1/4SAE	N	9-1-66	10
				9-1-108	
		833	N	9-4-25	1
R5930	642-9237-D334	8823-K6	P1F0C	9-1-71	1
		96	N	9-4-13	2

SECTION XI

REFERENCE DESIGNATION INDEX

REFERENCE DESIGNATION	FIG. & INDEX NO.	CLASS CODE OR STOCK NO.	PART NO.
B1	9-4-4	R4920 626-8139-T030	10079
CR1	9-4-15		U2B1H5G
C1	9-4-12		10118
DL1	9-1-73	GSSO	327
FL1	9-8-31		10258
F1	9-1-70	ESO	F02D3R00B
J1	9-1-46	ESO	AN3102A-18-1P(C)
J2	9-8-32		AN3102A-10S-2P(C)
J3	1-2-9	ESO	AN3106A-18-5P(C)
P1A	1-2-8	ESO	AN3106A-18-1S(C)
P1B	1-2-9	ESO	AN3106A-18-1S(C)
P2	9-1-44		AN3106A-10S-2S(C)
P3A	1-2-6	ESO	AN3101A-18-5S
P3B	1-2-7	ESO	AN3101A-18-5S
P4	1-2-6	ESO	AN3106A-20-4P(C)
P5	1-2-8	ESO	AN3106A-16-11P(C)
P6	1-2-7	R5935 501-9996-D336	9756
S1	9-1-71	R5930 642-9237-D334	8823-K6
T1	9-4-18	R5950 627-4046-T030	10116

By Order of the Secretary of the Army:

E. C. MEYER
General, United States Army
Chief of Staff

Official:

J. C. PENNINGTON
Major General, United States Army
The Adjutant General

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THEN. . JOT DOWN THE DOPE ABOUT IT ON THIS FORM, CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL!

SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)
PFC JOHN DOE
COA, 3d ENGINEER BN
FT. LEONARDWOOD, MO 63108

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
JOHN DOE, PFC (268) 317-7111

SIGN HERE John Doe
JOHN DOE

DA FORM 1 JUL 79 2028-2

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DRSTS-M Overprint 1, 1 Nov 80

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TEAR ALONG PERFORATED LINE

REVERSE OF DA FORM 2028-2 Reverse of DRSTS-M Overprint 2, 1 Nov 80

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DEPARTMENT OF THE ARMY

OFFICIAL BUSINESS

Commander
US Army Aviation Systems Command
ATTN: AMSAV-MC
4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

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SOMETHING WRONG WITH THIS PUBLICATION?

FROM (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 55-4920-416-13	21 Feb 91	Operation and Service Instructions with Illustrated Parts Breakdown Vacuum-Pressure Test Set

BE EXACT PIN-POINT WHERE IT IS

PAGE NO	PARA-GRAPH	FIGURE NO	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER

SIGN HERE

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4300 Goodfellow Boulevard
St. Louis, MO 63120-1798

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter= 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.82 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter= 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 1,076.4 sq. meters
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. decimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.365	metric tons	short tons	1.102
pound-inches	newton-meters	.11375			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C