BARFIELD
MIAMI, FLORIDA
ATLANTA, GEORGIA

TECHNICAL MANUAL

for

1811D/E
PITOT-STATIC
TEST SET

P/N's 101-00153 & 101-00164

Originally Issued Oct. 1, 1981

OPERATION AND MAINTENANCE

Barfield
INSTRUMENT CORPORATION

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April 30, 1985

1811 SERIES PITOT-STATIC TEST SET INFORMATION LETTER

The BARFIELD INSTRUMENT CORPORATION 1811 Series Pitot-Static Testers are not advertised for use to comply with FAR 91.171.

These Test Sets fully meet the requirements for DOT Advisory Circular 43-203B for performing Altimeter and Static System Tests and Inspections.

However, the personnel requirements and some of the technical aspects of actual testing place a sizeable burden on the person(s) performing the test.

Therefore, BARFIELD INSTRUMENT CORPORATION has taken the position of advertising its 1811 series Test Sets as general purpose trouble-shooting testers. When it comes to compliance with FAR 91.171 we feel that the customer should first be aware of **ALL** the requirements for performing these test in the field. Having reached this decision, we stand ready to offer advice and assistance to the customer in accomplishing the required test.

In short, BARFIELD INSTRUMENT CORPORATION 1811 Series Pitot-Static Testers meet the requirements for compliance with FAR 91.171, but it is important that the customer be sure that the use of the test set will be in compliance with the regulations.

Available from BARFIELD INSTRUMENT CORPORATION is a test procedure guide, 60-101-00150, Altimeter and Static Test Procedure, for use in compliance with FAR 91.171.

2/15/85

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1 GENERAL INFORMATION

1.1 INTRODUCTION

This Technical Manual provides operation and maintenance instructions for the 1811D-(*) and 1811E-(*) Pitot Static Test Sets manufactured by Barfield Instrument Corporation, Miami, Florida.

*The three digit dash number designates the panel instrument combination installed in the test set. (See 1.3.3 for dash number listing)

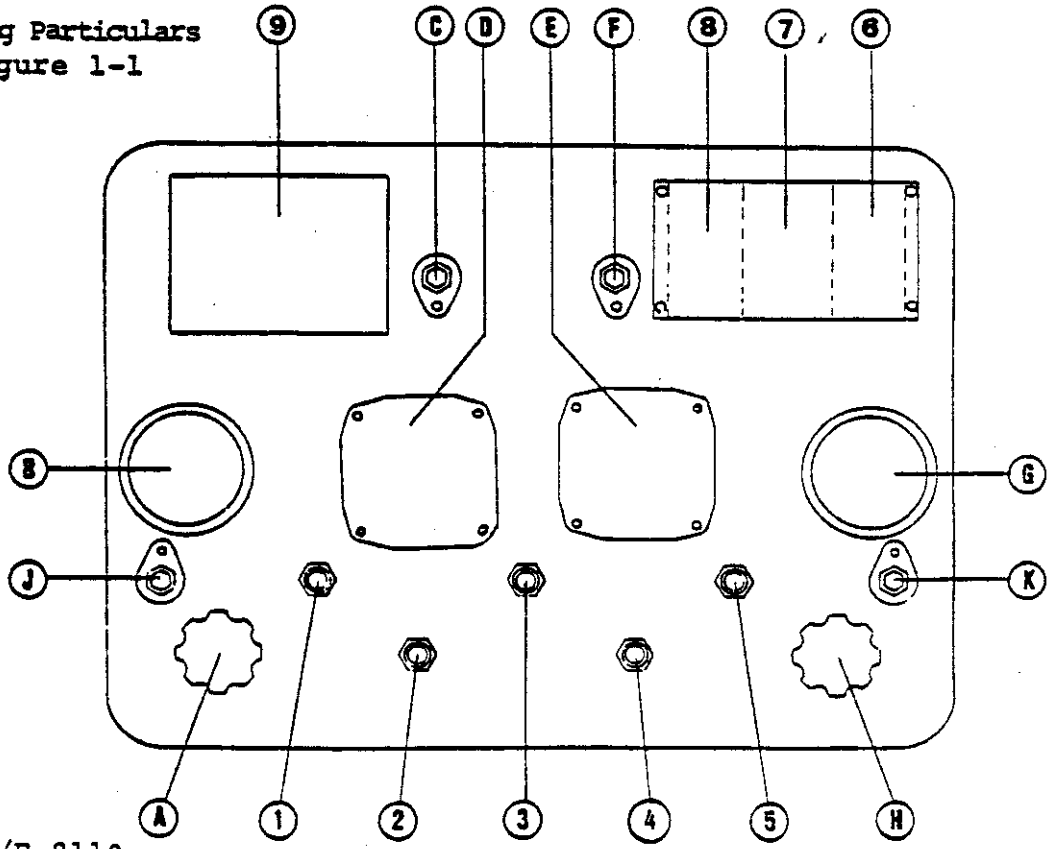
1.2 PURPOSE

The 1811 Pitot Static Test Set (T/S) is intended for testing aircraft Pitot and Static Systems for leaks and also for testing the operation and calibration of airspeed, altimeter, engine pressure ratio, manifold pressure indicators, and other vacuum or low pressure units.

1.3 DESCRIPTION

1.3.1 Leading Particulars - See Figure 1-1 for illustration and Table 1-1 for leading particulars.

Leading Particulars
Figure 1-1



REF. NO.	PANEL DESIGNATION	DESCRIPTION	FUNCTION
A	PRESSURE PUMP A	Hand Operated Piston Pump	Integral pressure source for all tests
1	PRESSURE 1	Pressure Source Needle Valve	To control pressure source
2	PRESSURE VENT 2	Pressure Vent Needle Valve	To release pressure to ambient atmosphere
3	CROSSBLEED 3	Crossbleed Needle Valve	To control pressure difference between pitot and static
4	VACUUM VENT 4	Vacuum Vent Needle Valve	To release vacuum to ambient atmosphere
5	VACUUM 5	Vacuum Source Needle Valve	To control vacuum source
H	VACUUM PUMP H	Hand Operated Piston Pump	Integral vacuum source for all tests
J	EXTERNAL PRESSURE J	1/8-27 NPT Female Bulkhead Fitting	Port for external pressure source
G	G VACUUM TANK	0-30 Inches of Mercury Vacuum Gauge	Monitor vacuum available in vacuum reservoir tank

(Cont)

Leading Particulars
Table 1-1

REF. NO.	PANEL DESIGNATION	DESCRIPTION	FUNCTION
E	E	Altimeter	Monitor pressure altitude at vacuum-static side of T/S
6	(ALTIMETER)	Calibration Card	Provides altimeter calibration correction
7	(HYSTERESIS)	Calibration Card	Lists altimeter hysteresis at selected altitudes
8	(AIRSPEED)	Calibration Card	Provides airspeed calibration correction
F	F VACUUM PORT	1/8-27 NPT Female Bulkhead Fitting	Port for connection to aircraft Static System or other vacuum test application
C	C PRESSURE PORT	1/8-27 NPT Female Bulkhead Fitting	Port for connection to aircraft Pitot System or other application
D	D	Airspeed Indicator	Monitor differential pressure in terms of airspeed between pitot and static

(Cont)

Leading Particulars
Table 1-1 (Continued)

Table 1-1 Continued

REF. NO.	PANEL DESIGNATION	DESCRIPTION	FUNCTION
9	-	Decal	Provides instructions for pretesting T/S
B	B PRESSURE TANK	0-30 P.S.I. Pressure Gauge	Monitor pressure available from pressure reservoir tank
K	EXTERNAL VACUUM K	1/8-27 NPT Female Bulkhead Fitting	Port for external vacuum source

Leading Particulars
Table 1-1 (Continued)

1.3.2 General - The 1811 T/S has a 50 to 650 knot Sensitive airspeed and is available with either a 35,000 or 50,000 ft. altimeter. Panel mounted hand pumps are equipped with reservoir tanks to supply pressure and vacuum. Metering valves are provided for control of all pneumatic functions, and ports are provided for external connections.

1.3.3 Part Number Variations - The 1811D is housed in a plastic carrying case and the 1811E is housed in an aluminum case. The three digit code following the basic part number identifies the altimeter supplied as follows:

PART NO.	RANGE	BARO. SCALE
1811 ( )-101	0-50,000 FT.	In. Hg
1811 ( )-104	0-35,000 FT.	In. Hg
1811 ( )-106	0-50,000 FT.	Mb.
1811 ( )-107	0-35,000 FT.	Mb.

2 PRINCIPLES OF OPERATION

2.1 GENERAL

2.1.1 Composition - The test set is a portable unit enclosed in a carrying case: Vinyl for 1811D and Metal for an 1811E set. The tester consists of a hand-operated vacuum pump, hand-operated pressure pump, vacuum and pressure gauges, 5 control valves, an altimeter, and airspeed indicator. There are fittings and accessories to enable connecting the aircraft pitot and static lines.

2.1.2 Operation - The entire test procedure can be performed manually although external pressure and vacuum connections are available for use of external sources. The hand-operation pressure pump is capable of producing a pressure of 20 P.S.I. and the hand vacuum pump can supply 25 inches Hg.

2.1.3 Operational Schematic Diagrams - Figure 2-1 and 2-2 present the operational schematic diagrams of the lines and fittings in the tester. Refer to Figure 2-1 for the 1811D model and to Figure 2-2 for the 1811E model.

2.1.4 Theory of Operation - With the crossbleed and vent valves closed, the pressure source needle valve will admit pressure from the tank into the system and cause a reaction in both the tester master instrument and the instrument being tested through the pitot connection. The vacuum source valve similary controls the vacuum system of the tester. The two vent valves equalize their respective systems with atmospheric pressure. The crossbleed valve controls the pressure difference in the pressure and vacuum lines of the tester.

2.1.5 "Plumbing" Schematic Diagrams - Figures 2-3 and 2-4 depict the plumbing line and tee fitting connectors in the tester.

1811D Rear View

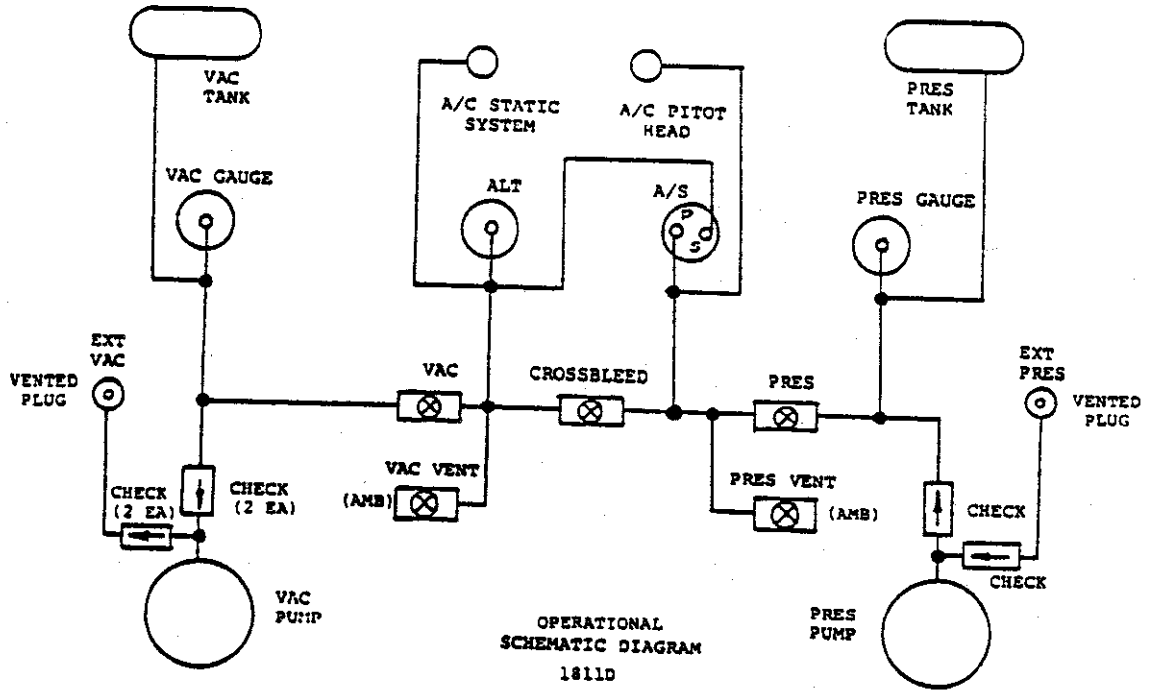


Figure 2-1

1811E Rear View

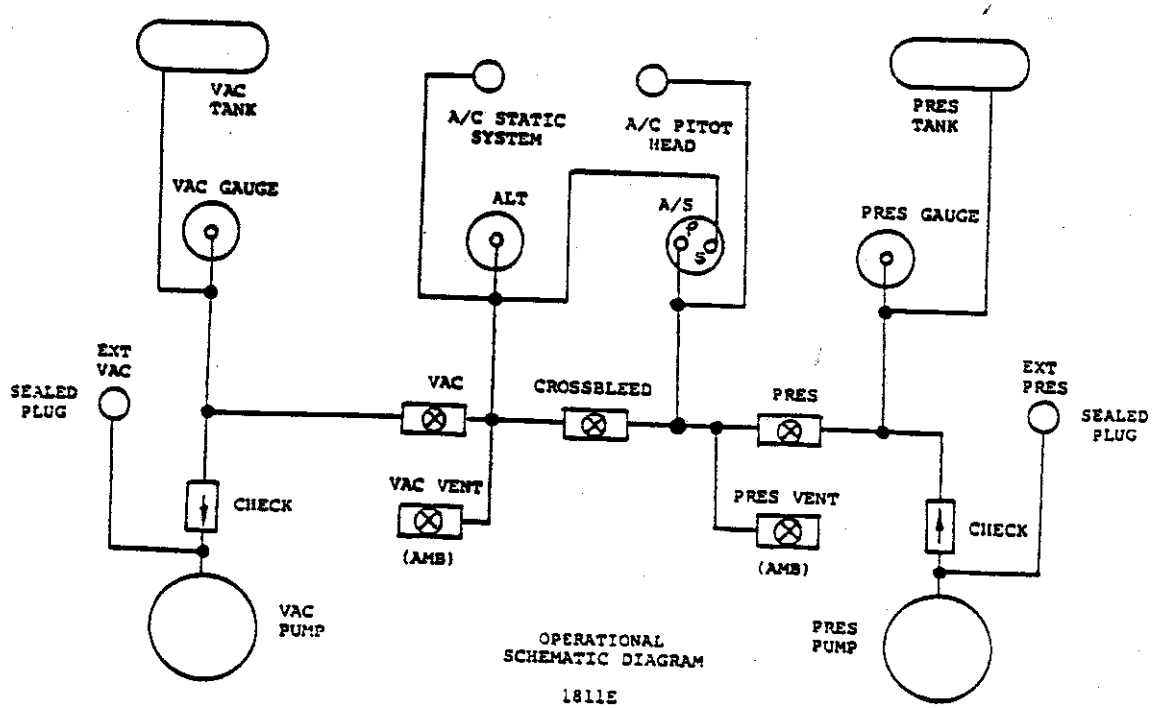
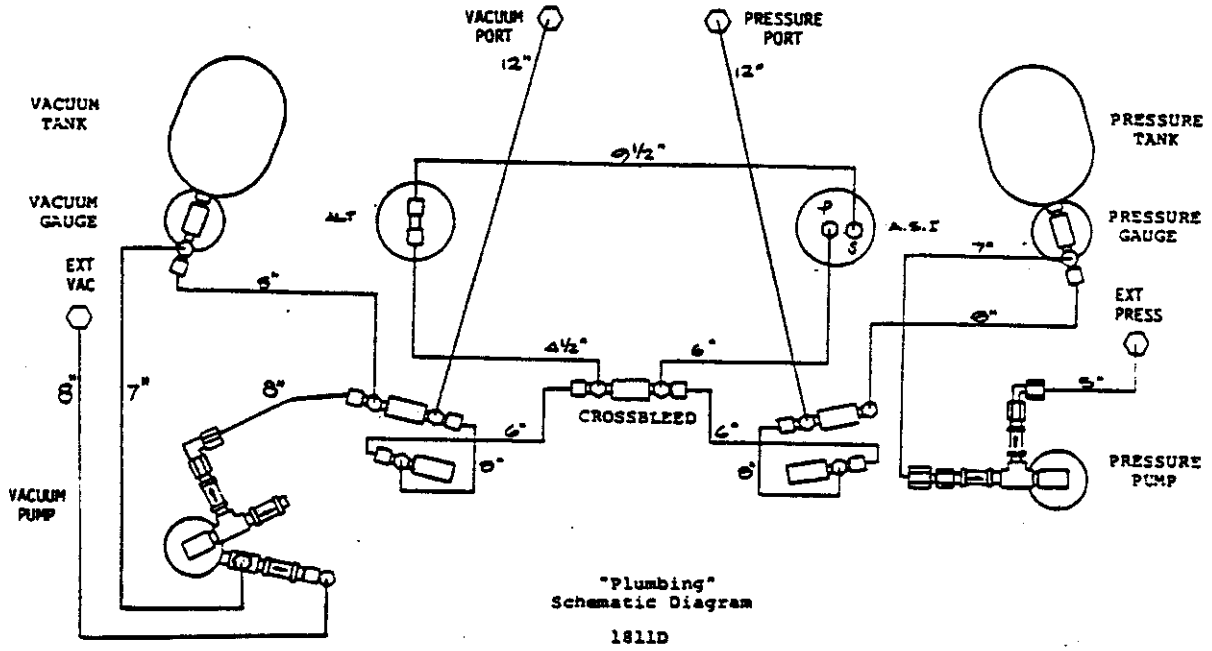


Figure 2-2

1811D Rear View



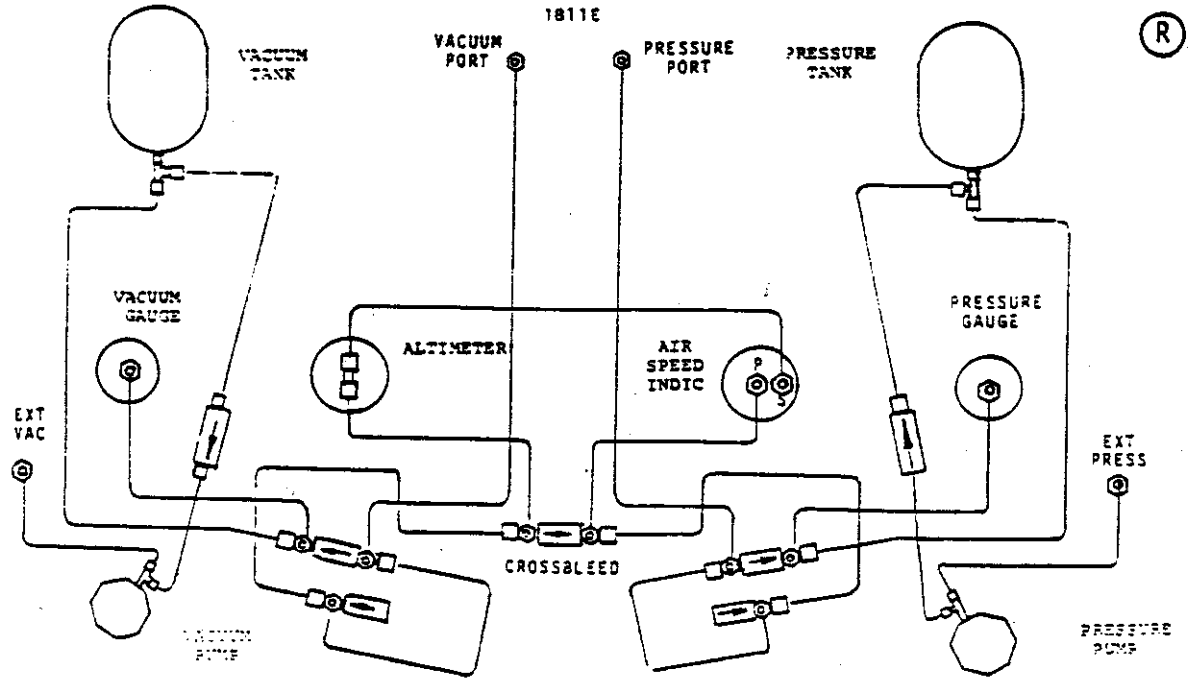
"Plumbing"
Schematic Diagram
1811D

Figure 2-3

1811E Rear View

Figure 2-4

"Plumbing"
Schematic Diagram
1811E



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3 OPERATION

3.1 GENERAL

The user should become familiar with the 1811 T/S as described in the earlier chapters before attempting any tests. The test procedures described herein are in lieu of any specifications to the contrary by either the airframe or instrument manufacturer. Particular attention should be addressed to the following preliminary procedures to avoid erroneous test results, and to avoid the danger of damaging any of the aircraft or T/S instruments.

3.2 PRELIMINARY

CAUTION: DO NOT USE UNNECESSARY FORCE TO CLOSE ANY T/S VALVE. BEGINNING WITH 1811D S/N 234 AND ON ALL TEST SETS RETURNED TO B.I.C. FOR SERVICE, POSITIVE STOP SPACERS HAVE BEEN INSTALLED ON ALL NEEDLE VALVES. THIS PERMITS FIRM CLOSING OF THE VALVE WITHOUT DAMAGE. HOWEVER, EXCESSIVE FORCE CAN OVERCOME THE KNOB SET SCREW RESULTING IN VALVE DAMAGE. (R)

Each T/S is completely calibrated and tested before shipment, but to ensure the integrity of the sensitive tests to be made, the pretests of 3.2.1 and 3.2.2 should be performed immediately prior to each use. For user convenience, these tests are repeated on the T/S panel decal (9). The letters and figures in parentheses in the following procedures refer to panel mounted components as illustrated in Figure 1-1.

3.2.1 Pitot Pretest - Proceed as follows:

a. Close all ports and valves.

b. Pump pressure to 20 psi and vacuum to 20 in. Hg with pumps (A) and (H).

c. Open pressure valve (1) until airspeed indicates 300 knots. Close valve and observe airspeed for 1 minute. Airspeed should not fall more than 2 knots. Record leak rate.

d. Open pressure vent valve (2) to return airspeed to ambient pressure, then close.

NOTE: The term "ambient" will occur frequently in these instructions. It refers to the existing atmospheric pressure in the area where the tests are being performed.

3.2.2 Static Pretest - Proceed as follows:

a. Open crossbleed valve (3) fully.

b. Open vacuum valve (5) to bring altimeter to 20,000 Ft. (pump additional vacuum, if required). Close vacuum valve and observe altimeter for 1 minute. Altimeter shall not fall more than 100 Ft. Record leak rate.

c. Open PRESSURE VENT VALVE (2) to return altimeter to ambient.

> CAUTION: DO NOT OPEN VACUUM VENT VALVE (4) OR AIRSPEED INDICATOR MAY BE QUICKLY DAMAGED.

3.2.3 Applying Leak Correction - If leak rate does not exceed 2 knots or 100 Ft. in 1 minute, the recorded leak rate should be added to that observed in any aircraft leak tests to determine the actual aircraft system leak rate.

3.2.4 Instrument Calibration Correction - Make certain that instrument correction card calibration dates are within approved recertification periods before attempting calibration checks of aircraft insturments.

NOTE: Calibration cards are based on tests performed with the instruments mounted vertically (face up) and at a temperature of 75°F (25°C). Change of attitude of more than 30° from level and/or a temperature difference of more than 15°F (9°C) may effect the precise calibration accuracy. (R)

3.2.5 External Pressure and Vacuum - To use external pressure and vacuum source, remove the vented plugs on the D model from ports (J) and (K), or the sealed plugs on the E model. Install appropriate connecting fittings and connect to pressure and vacuum sources. Raise handle of PRESSURE PUMP (A) before applying external pressure. Pump handle will suddenly rise when external pressure is applied.

> CAUTION: DO NOT EXCEED 20 PSI EXTERNAL PRESSURE.

3.3 PITOT SYSTEM TEST

NOTE: If desired to test for static system leak only, and the aircraft is non-pressurized type, skip to step 3.4.1.

3.3.1 Pitot System Connection - Using specific aircraft plumbing diagram, connect PRESSURE PORT (C) to aircraft pitot system making certain that no aircraft component will be adversely affected by the test.

> CAUTION: MAKE CERTAIN THAT CONNECTIONS BETWEEN T/S AND AIRCRAFT ARE SECURE. A SUDDEN BREAK OR LEAK MAY CAUSE SEVERE INSTRUMENT DAMAGE.

3.3.2 Pitot Leak Test - Proceed as follows:

a. Make certain EXTERNAL PRESSURE PORT (J) and EXTERNAL VACUUM PORT (K) are vented on the D model, sealed on the E model (if not connected to an external source).

b. Open both the PRESSURE VENT (2) and VACUUM VENT (4) fully counterclockwise (C.C.W.).

c. Close PRESSURE (1), CROSSBLEED (5), and VACUUM (5) valves fully clockwise (C.W.).

d. Operate PRESSURE PUMP (A) to develop 10 psi on PRESSURE TANK gauge (B).

3.3.2
(Cont.)

e. Close PRESSURE VENT valve (2).

> CAUTION: SHOULD ANY SUBSEQUENT STEP FAIL, CLOSE PRESSURE VALVE (1) FULLY C.W., THEN OPEN PRESSURE VENT VALVE (2) GENTLY C.C.W. TO RETURN SYSTEM TO AMBIENT BEFORE DISCONNECTING T/S.

f. Observe aircraft and T/S airspeed (D) while gently opening PRESSURE valve (1) until aircraft airspeed reaches approximately 3/4 of full range.

NOTE: Aircraft airspeed may be compared with T/S airspeed for calibration by applying T/S calibration card corrections where applicable.

g. Close PRESSURE valve (1) fully. After instrument indications have come to rest, observe airspeed (D) for one minute. Airspeed must not decrease by more than 2 knots plus any T/S leak rate determined in Pitot Pretest (Refer to step 3.2.1).

> CAUTION: DO NOT PERMIT AIRSPEED TO FALL BEYOND ITS NORMAL REST POSITION OF 20 TO 40 KNOTS AT ANY TIME OR AIRSPEED WILL BE DAMAGED.

h. Gently open PRESSURE VENT (2). The T/S airspeed shall return to its normal position between 20 and 40 knots, then fully open PRESSURE VENT valve (2).

i. Gradually open PRESSURE valve (1) to bleed off supply.

3.4 STATIC SYSTEM TEST

> CAUTION: IF EXCESSIVE PITOT LEAK RATE WAS DETECTED IN PREVIOUS TEST, DO NOT PROCEED UNTIL AIRCRAFT PITOT LEAK IS CORRECTED.

3.4.1 Preliminary - Using specific aircraft plumbing schematic, connect VACUUM PORT (F) to aircraft Static System making certain that no aircraft component will be adversely affected by the test, then proceed as follows:

a. If an external vacuum source is used, connect it to EXTERNAL VACUUM port (K). If not, make certain this port is vented on the D model, sealed on the E model.

b. Open both PRESSURE VENT (2) and VACUUM VENT (4) valves fully.

c. Close PRESSURE (1), CROSSBLEED (3), and VACUUM (5) valves fully.

d. Operate VACUUM PUMP (H) or external pump to develop 20 in. Hg. on VACUUM TANK gauge (G). (If vacuum needs replenishing, close valve (5) before operating hand pump.)

e. Close VACUUM VENT (4) fully.

f. Set both T/S and aircraft altimeter barometric scales to 29.92 In. (1013.3 MB). Note altimeter reading after setting barometric scales.

3.5 STATIC LEAK TEST (Non-Pressurized Aircraft only)

NOTE: Test not to exceed 1,000 ft. increase above field level ambient or if aircraft airspeed indicator has a range of 150 KNOTS (175 MPH) or less. Both the pitot and static systems must be connected as in Sec. 3.3.1. During this test both the aircraft and Test Set airspeed indicators will increase as the altitude increases. DO NOT ALLOW THE AIRCRAFT AIRSPEED TO EXCEED FULL SCALE TRAVEL.

CAUTION: SHOULD ANY SUBSEQUENT STEP FAIL, CLOSE VACUUM VALVE (5) FULLY C.W., THEN GENTLY OPEN CROSSBLEED VALVE (3) TO RETURN SYSTEM TO AMBIENT BEFORE DISCONNECTING T/S.

3.5.1 Leak Test - Proceed as follows:

a. Do not exceed range of aircraft vertical speed indicator (VSI) while gently opening VACUUM valve (5) to produce an altimeter reading 1,000 Ft above original reading in step 3.4.1. f, then close valve fully.

b. After instrument indications have stabilized, observe altimeter (E) for one minute. Altimeter must not decrease by more than 100 Ft plus any leak rate determined in Static Pretest of step 3.2.2.

c. After test is completed, take care not to exceed vertical speed indicator range while gradually opening CROSSBLEED valve (3) to return system to ambient.

d. When system has returned to ambient pressure, open CROSSBLEED (3) and VACUUM VENT (4) fully. Disconnect aircraft line from VACUUM PORT (F).

e. Gradually open VACUUM valve (5) to bleed off vacuum supply. When VACUUM TANK gauge (G) has returned to zero, close VACUUM valve (5) fully.

3.6 STATIC LEAK TEST (Pressurized Aircraft or for altitude indication test more than 1,000 ft. above field level ambient).

3.6.1 Preliminary - Tests prescribed in Sections 3.2 through 3.4.1 must be performed first, and no significant leak observed. Verify that all Pitot System tests from Sections 3.3.1 through 3.3.2.h. are satisfactory.

a. If an external vacuum source is used, connect it to EXTERNAL VACUUM port (K). If not, make certain this port is vented on the D model, sealed on the E model.

b. Open VACUUM VENT (4) and CROSSBLEED (3) valves fully.

c. Close all other valves fully.

d. Operate VACUUM PUMP (H) or external pump to develop 20 in. Hg. on VACUUM TANK gauge (G). (If vacuum needs replenishing, close valve (5) before operating hand pump.

e. Close VACUUM VENT (4) fully.

> CAUTION: SHOULD ANY SUBSEQUENT STEP FAIL, CLOSE VACUUM VALVE (5) FULLY C.W., THEN GENTLY OPEN PRESSURE VENT VALVE (2) TO RETURN SYSTEM TO AMBIENT BEFORE DISCONNECTING T/S.

NOTE: If T/S is used outside of aircraft connect an auxiliary vertical speed indicator (VSI) to VACUUM PORT (F) to observe so that the aircraft VSI range is not exceeded. Aircraft altimeter accuracy may be verified in the following procedure by comparing readings with the T/S altimeter with calibration card corrections applied. (R)

(R)

3.6.2 Negative Altitude Tests - If the test to be accomplished requires altitude readings below field elevation (above ambient pressure), proceed as follows:

a. Gently open PRESSURE valve (1) until the altimeter (E) reaches the desired test point, then close PRESSURE valve (1).

> CAUTION: DO NOT EXCEED -1000 FEET ON ALTIMETER (E).

3.6.2 (Cont)

b. When negative altitude test is completed, gently open VACUUM VENT valve (4) to return the system to ambient.

c. Close VACUUM VENT (4) fully. (R)

3.6.3 Leak Test - Proceed as follows: (R)

a. Taking care not to exceed the aircraft VSI full scale range, gently open VACUUM valve (5) until altimeter has reached desired reading, then close VACUUM valve (5) fully. (If vacuum needs replenishing, close VACUUM valve (5) before operating hand pump.

b. After all instruments have stabilized, observe T/S altimeter (E) for one minute. Altimeter reading must not decrease by more than 100 Ft, or 2% of indicated altitude, whichever is greater.

NOTE: If system shows leakage, very carefully observe T/S airspeed (D) and be prepared to open CROSSBLEED valve (3) as soon as perceptable movement of the airspeed pointer is noted when the CROSSBLEED valve (3) is gradually closed.

CAUTION: DO NOT PERMIT AIRSPEED TO DROP MORE THAN 10 KNOTS OR SEVERE DAMAGE MAY RESULT.

c. If airspeed pointer indication increases, leakage is in pitot system; if it decreases, leakage is in static system. Return CROSSBLEED valve (3) to full open.

d. After test is completed, take care not to exceed vertical speed indicator range while gradually opening PRESSURE VENT (2) to return system to ambient.

3.6.3 (Cont.)

e. When system has returned to ambient pressure, open PRESSURE VENT (2) and VACUUM VENT (4) fully. Disconnect aircraft lines from PRESSURE (C) and VACUUM (F) ports. (R)

f. Gradually open VACUUM (5) and PRESSURE (1) valves to bleed off supply tanks.

g. When PRESSURE TANK (B) and VACUUM TANK (G) have returned to zero, close PRESSURE (1) and VACUUM (5) valves fully.

3.7 COMBINED PITOT (Airspeed)/STATIC (Altitude) TEST

3.7.1 Application - This procedure is applicable for mechmeters, engine pressure ratio indicators, flight recorders, etc.

> CAUTION: THIS PROCEDURE MUST BE PERFORMED IN THE EXACT SEQUENCE IN WHICH IT IS PRESENTED WITHOUT EXCEPTION.

3.7.2 Preliminary - Proceed as follows:

a. Tests prescribed in Sections 3.2 through 3.5 or 3.6 must be performed first, and all leaks corrected.

b. Using specific aircraft plumbing diagram, connect PRESSURE PORT (C) to aircraft pitot system (Hi port) and VACUUM PORT (F) to aircraft static system (Lo port). Make certain that there are no components in the aircraft system that will be adversely affected by the test.

c. Close all T/S valves and operate PRESSURE PUMP (A) to develop 10 psi and operate VACUUM PUMP (H) to develop 20 in Hg.

d. Verify that T/S and aircraft altimeters are set at 29.92 IN Hg (1013.3 Mb).

3.7.3 Below Field Elevation Test - If no altitude tests below field elevation, skip to 3.7.4. For testing below field elevation, proceed as follows:

a. Open CROSSBLEED (3) fully, then take care not to exceed aircraft VSI full scale range while gently opening PRESSURE valve (1) until desired downscale altimeter test point is reached, then fully close PRESSURE valve (1) and CROSSBLEED (3).

b. Airspeed test points may be established ONLY ABOVE THE NORMAL RESTING POSITION OF POINTER. Taking care not to overshoot, carefully open PRESSURE valve (1) until airspeed (D) increases to the desired test point.

NOTE: If an airspeed test point is inadvertently exceeded, gently open CROSSBLEED (3) until airspeed is 10 knots below desired test value. Some altitude change will occur. To restore altitude, gently open VACUUM valve (5) to return altimeter (E) to correct test point, and close again. Raise airspeed to test point by carefully opening PRESSURE valve (1) until desired airspeed is reached. Proceed as in previous step for higher airspeed test points as desired and, when highest test point is achieved, gently open CROSSBLEED (3) to return airspeed (D) to its normal pointer rest position of 20 to 40 knots, then close CROSSBLEED (3). Proceed as in step 3.7.4 next for increasing altitude tests.

3.7.4 Above Field Elevation Tests - Proceed as follows:

CAUTION: IT IS MOST IMPORTANT THAT THE FOLLOWING STEPS BE ACCOMPLISHED IN THE SEQUENCE AND MANNER PRESCRIBED.

NOTE: User technique is required in the following Steps to constantly adjust as necessary the metering valves to establish and maintain the desired instrument readings. To avoid instrument damage or overshoot of test point, operate valves gently and proceed gradually from one test point to another.

3.7.4
(Cont.)

a. Taking care not to exceed VSI range, gently open VACUUM valve (5) to increase airspeed up to about 10 knots below desired test point. Gently open CROSSBLEED (3) to maintain airspeed below test point until desired altitude is reached, then close both valves.

NOTE: If altitude will no longer increase, close VACUUM and CROSSBLEED valves and operate VACUUM PUMP (H) to establish more vacuum.

b. When test altitude is reached and valves are closed, gently open PRESSURE valve (1) to bring airspeed (D) to test point.

c. Gently open PRESSURE valve (1) to bring airspeed up to 10 knots below next higher airspeed test point.

d. To correct altitude upward, operate VACUUM valve (5); to lower altitude operate VACUUM VENT (4).

e. Bring airspeed exactly up to test point with PRESSURE valve (1).

f. Repeat steps from c. to e. for each higher airspeed test point until highest desired airspeed test is completed at this altitude.

g. When highest airspeed test has been performed at this altitude, select lowest airspeed to be tested at next higher altitude.

h. Reduce airspeed to 10 knots below this next test point by gently opening CROSSBLEED (3).

i. Raise altitude to next test point by gently opening VACUUM valve (5) while maintaining airspeed below test point by simultaneously adjusting CROSSBLEED. When altitude is reached, close both valves.

j. Repeat steps b. through i. until every airspeed test has been made at every altitude desired.

k. Proceed as in 3.7.5 next to return system to ambient.

3.7.5 Returning Pitot/Static Test to Ambient - To return system to ambient excercise caution as follows:

> **CAUTION: THIS PROCEDURE MUST BE PERFORMED IN THE EXACT SEQUENCE AND MANNER IN WHICH IT IS PRESENTED WITHOUT EXCEPTION.**

a. Gently open CROSSBLEED (3) until airspeed (D) returns to normal rest position of 20 to 40 knots, then open valve fully.

b. Monitor VSI so as not to exceed VSI scale range while gently opening PRESSURE VENT (2).

> **CAUTION: DO NOT USE VACUUM VENT TO BLEED SYSTEM OR SEVERE INSTRUMENT DAMAGE WILL RESULT!**

c. When altimeter (E) has reached ambient pressure, as indicated by no further decrease in altitude indication, open PRESSURE VENT (2) and VACUUM VENT (4) fully.

d. Gently open PRESSURE valve (1) and VACUUM valve (5) to bleed off pressure and vacuum as indicated by respective pressure and vacuum gauges (B) and (G).

3.8 MACHMETER TEST

3.8.1 Test Procedure - Refer to Table 3-1 and establish respective altitude and airspeed combinations by following procedures as described in Sec. 3.7.

AIRSPEED (IN KNOTS) (FROM NTIS #62-71396)								
ALTITUDE (IN FEET)	MACH NO. .50	.60	.70	.75	.80	.82	.85	.90
10K	277	334	391	420	449	---	---	---
15K	247	298	350	376	403	414	429	---
20K	228	275	324	348	373	383	398	424
25K	205	248	292	315	338	347	361	384
29K	188	228	269	289	311	319	332	354
33K	172	207	246	265	285	292	304	324
37K	157	190	224	242	260	267	278	297
41K	142	173	204	220	237	243	253	277
45K	---	157	186	201	216	222	231	246
49K	---	143	169	183	196	202	210	225
51K	---	---	161	174	187	193	201	214

AIRSPEED (IN KNOTS)
VERSUS MACH NUMBER

Machmeter Test Table

Table 3-1

3.9 ENGINE PRESSURE RATIO (EPR) TEST

3.9.1 Test Procedure - Proceed as follows:

a. Connect PRESSURE PORT (C) to Pt7 (Hi) port of E.P.R. to be tested.

b. Connect VACUUM PORT (F) to Pt2 (Lo) port of E.P.R. to be tested

c. Refer to Table 3-2 and establish respective altitude and airspeed combinations by following procedures as described in 3.7.

ENG PRESS RATIO	AIRSPEED (KNOTS) Pt7 (Hi) PORT	ALTITUDE (FEET) Pt2 (Lo) PORT
3.4	650	25,870
3.4	546	35,000
3.0	650	21,650
3.0	504	35,000
2.5	650	14,690
2.5	534	25,870
2.5	444	35,000
2.0	650	4,210
2.0	500	20,000
2.0	369	35,000
1.5	478	5,000
1.5	365	20,000
1.5	265	35,000

Engine Pressure Ratio Test Table

Table 3-2

3.10 MANIFOLD PRESSURE GAUGE TEST

3.10.1 Test Procedure - Proceed as follows:

a. Plug or cap PRESSURE PORT (C).

b. Connect VACUUM PORT (F) to manifold gauge to be tested.

c. Close all T/S valves then open CROSSBLEED valve (3) fully and leave open for the remainder of this procedure.

d. Verify that altimeter (E) is set at 29.92 IN (1013.3 MB).

e. Operate VACUUM PUMP (H) and PRESSURE PUMP (A) as required.

f. Refer to Table 3-3 for respective altitude and In. Hg. mainfold pressure readings.

MANIFOLD PRESS. INCHES OF MERCURY	ALTITUDE (FEET)
31	-985
30	- 75
29	+860
28	1,825
27	2,815
26	3,835
25	4,890
20	10,730
15	17,905
10	27,375

Manifold Pressure Versus Altitude

Table 3-3

3.10.1 (Cont.)

g. Gradually open PRESSURE valve (1) for test points below field elevation and VACUUM valve (5) for test points above field elevation.

h. To return system to ambient, close PRESSURE (1) and VACUUM (5) valves and bleed system with PRESSURE VENT valve (2).

3.11 LOW PRESSURE TESTS

NOTE: The following provides tests in the range of 0-12 PSI, 0-25 In. Hg, or 1-340 In. H_2O.

3.11.1 Test Procedure - Refer to Table 3-4 for equivalent airspeed readings and proceed as follows:

a. Connect PRESSURE PORT (C) to pressure unit to be tested. (VACUUM PORT (F) is not used.)

b. Close all T/S valves, then open VACUUM VENT valve (4) fully and leave open for the remainder of this procedure.

c. Operate PRESSURE PUMP (A) as required.

AIRSPEED EQUIVALENT (KNOTS) FOR DIFFERENTIAL PRESSURE/VACUUM

INCHES WATER	INCHES MERCURY	POUNDS SQ. IN.	AIRSPEED (KNOTS)	INCHES WATER	INCHES MERCURY	POUNDS SQ. IN.	AIRSPEED (KNOTS)
1.000	0.073	0.036	39	55.416	4.072	2.000	285
2.000	0.146	0.072	55	68.045	5.000	2.466	314
3.000	0.220	0.108	68	81.654	6.000	2.947	342
4.000	0.294	0.144	78	83.124	6.108	3.000	355
5.000	0.367	0.180	87	95.263	7.000	3.438	368
6.000	0.441	0.216	96	108.872	8.000	3.929	391
7.000	0.514	0.252	103	110.832	8.144	4.000	395
8.000	0.587	0.289	110	122.481	9.000	4.420	413
9.000	0.661	0.325	117	136.090	10.000	4.912	433
10.000	0.734	0.361	123	138.540	10.180	5.000	437
12.000	0.881	0.433	135	163.308	12.000	5.894	470
13.609	1.000	0.481	144	166.248	12.216	6.000	474
14.000	1.028	0.505	146	190.526	14.000	6.876	504
16.000	1.175	0.577	155	193.955	14.252	7.000	508
18.000	1.322	0.649	165	217.744	16.000	7.859	534
20.000	1.468	0.721	174	221.663	16.288	8.000	538
25.000	1.836	0.901	194	244.962	18.000	8.841	561
27.218	2.000	0.982	203	249.371	18.324	9.000	565
27.707	2.036	1.000	204	272.180	20.000	9.823	587
30.000	2.202	1.082	212	277.079	20.360	10.000	591
35.000	2.570	1.262	229	299.398	22.000	10.806	611
40.000	2.937	1.443	244	304.787	22.396	11.000	615
40.827	3.000	1.473	246	326.616	24.000	11.788	633
45.000	3.304	1.623	258	332.495	24.432	12.000	638
50.000	3.671	1.803	271	340.225	25.000	12.279	644
54.436	4.000	1.965	283				

Table 3-4

d. Gradually open PRESSURE valve (1) to establish desired reading on airspeed (D) for equivalent pressure in Table 3-4.

e. To lower airspeed reading or to return to ambient, gradually open PRESSURE VENT valve (2).

3.12 VACUUM TESTS

NOTE: The following provides tests in the range of 0-12 PSI, 0-25 In. Hg, or 1-340 In. H_2O.

3.12.1 Test Procedure - Refer to Table 3-4 for equivalent airspeed readings and proceed as follows:

a. Connect VACUUM PORT (F) to vacuum unit to be tested. (PRESSURE PORT (C) is not used.)

b. Close all T/S valves, then open PRESSURE VENT valve (2) fully and leave open for the remainder of this procedure.

c. Operate VACUUM PUMP (H) as required.

NOTE: Altimeter (E) will operate during this test but the readings are not used. However, test sets with 35,000 Ft. altimeter range will have a slightly reduced test range.

CAUTION: DO NOT EXCEED 35,000 FT. READING ON TEST SETS EQUIPPED WITH 35,000 FT. ALTIMETER RANGE.

d. Gradually open VACUUM valve (5) to establish airspeed equivalents for desired reading on airspeed (D) for equivalent vacuum in Table 3-4.

e. To lower airspeed reading or to return to ambient, gradually open VACUUM VENT valve (4).

4 MAINTENANCE

4.1 PERIODIC INSPECTION

4.1.1 Required Inspection - The following maintenance and lubrication attention should be performed during the following inspection periods:

Period	Required Inspection
Each Use	Leakage Test See Paragraphs 3.2.1 and 3.2.2
6 Months	Check Altimeter for scale error and hysteresis at room temperature per Table 4-2 and Table 4-3. Check Airspeed for scale error at room temperature per Table 4-4. Rewrite calibration card if necessary.
Note: If Test Set is to be used for compliance with F.A.R. 91.170 and Part 43, Appendix E, "Altimeter System Tests and Inspections," refer to F.A.A. Advisory Circular AC 43-203B (or subsequent) for approved inspection intervals and procedures.	
12 Months	All of the preceding plus: Check pressure and vacuum gauges for accuracy and friction. Either gauge accuracy is 3% of scale range for upper and lower third, 2% for the center third. Friction tolerance is one scale division. Check vacuum and pressure hand pumps for leakage and capacity.

Required Periodic Inspections

Table 4-1

ALTIMETER SCALE ERROR TOLERANCES

Table 4-2

Altitude (feet)	35,000 Sensitive	50,000 Sensitive
-1,000	± 50	± 50
0	50	50
500	50	50
1,000	75	75
1,500	75	75
2,000	100	100
3,000	100	100
4,000	100	100
5,000	100	100
6,000	100	100
8,000	150	175
10,000	150	175
12,000	200	200
14,000	200	225
16,000	200	240
18,000	200	275
20,000	200	300
22,000	300	340
25,000	300	375
30,000	300	450
35,000	300	525
40,000		600
45,000		675
50,000		750
55,000		

Test Points	Standard Altitude in feet		Equivalent Atmospheric Pressure (mm Hg)		Permissible Variation from Scale Error (ft)		Elapsed Time At Test Pressure Before Reading
	35,000 ft Altimeter	50,000 ft Altimeter	35,000 ft Altimeter	50,000 ft Altimeter	35,000 ft Altimeter	50,000 ft Altimeter	
First hysteresis test point	16,000	20,000	411.8	349.1	Recorded scale error	Recorded scale error	5 minutes
Second hysteresis test point	18,000	25,000	379.4	281.9	Recorded scale error	Recorded scale error	5 minutes
Upper limits of range	35,000	50,000	178.7	87.3	——	——	1 minute
Third hysteresis test point	18,000	25,000	379.4	281.9	70 feet from "UP" reading	150 feet from "UP" reading	10 minutes
Fourth hysteresis test point	16,000	20,000	411.8	349.1	70 feet from "UP" reading	150 feet from "UP" reading	10 minutes
Fifth hysteresis test point (after effect)	——	——	Existing pressure at ground level		50 feet from reading at start	60 feet from reading at start	5 minutes

ALTIMETER TEST REQUIREMENTS

Table 4-3

SPEED KNOTS	PRESSURE INCHES OF WATER	ALLOWABLE SCALE ERRORS KNOTS
40	1.045	4.0
50*	1.634	3.0
60	2.354	2.0
70	3.207	2.0
80*	4.192	2.0
90	5.310	2.0
100	6.563	2.0
110	7.951	2.0
120*	9.475	2.0
130	11.14	2.0
140	12.94	2.5
150*	14.87	2.5
160	16.95	2.5
170	19.17	2.5
180*	21.54	2.5
190	24.05	2.5
200	26.71	3.0
210	29.51	3.0
220	32.47	3.0
230	35.58	3.0
240	38.84	3.0
250*	42.27	3.0
260	45.85	4.0
270	49.59	4.0
280	53.50	4.0
290	57.58	4.0
300*	61.82	4.0
310	66.24	4.0
320	70.83	4.0
330	75.61	4.0
340	80.56	4.0
350*	85.70	4.0

SPEED KNOTS	PRESSURE INCHES OF WATER	ALLOWABLE SCALE ERRORS KNOTS
360	91.04	4.0
370	96.56	4.0
380	102.28	4.0
390	108.20	4.0
400*	114.33	4.0
410	120.66	4.0
420	127.2	4.0
430	134.0	4.0
440	141.0	4.0
450*	148.2	4.0
460	155.6	4.0
470	163.3	4.0
480	171.2	4.0
490	179.4	4.0
500*	187.8	4.0
510	196.5	5.0
520	205.5	5.0
530	214.7	5.0
540	224.2	5.0
550*	234.0	5.0
560	244.1	5.0
570	254.4	5.0
580	265.1	5.0
590	276.1	5.0
600*	287.4	5.0
610	299.0	5.0
620	311.0	5.0
630	323.3	5.0
640	336.0	5.0
650*	349.0	5.0
FRICTION		3.5

* Test points.

AIRSPEED SCALE ERRORS

Table 4-4

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5 REPAIRS

5.1 TROUBLE SHOOTING

5.1.1 Troubles from probable causes can be remedied as follows:

Trouble	Probable Cause	Remedy
Line Leakage	Loose Fitting Damaged Needle Damaged Valve Seat	Tighten all Fittings Replace Valve Replace Valve
Instrument Leakage	Case or Diaphragm Leak	Check Instruments
Tank Leakage	Loose Connection Defective Check Valve	Tighten Fitting and Gauges Replace Check Valve
Insufficient Pump Capacity	Defective Pump	Replace Pump

Table 5-1

5.2 REPAIR

5.2.1 Locate and correct any leaks.

5.2.2 Replace any defective valves, fittings, pumps, or instruments.

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6 ILLUSTRATED PARTS LIST

6.1 INTRODUCTION

6.1.1 General - This chapter contains information for ordering replacement parts. Each section lists parts in the order of their reference designations shown in the applicable illustrations preceding the section. The manufacturer's five digit code is their Federal Supply Code for manufacturers taken from the Defense Logistics Agency microfiche. Such source of supply is shown for the part number listed. Other vendors' replacement parts may be substituted, provided they offer equal or improved specifications.

6.1.2 REF. NO. Suffix Letters - The suffix letter(s) following the reference number or the part number in the parts list breakdown indicates the effectivity or the applicable model number.

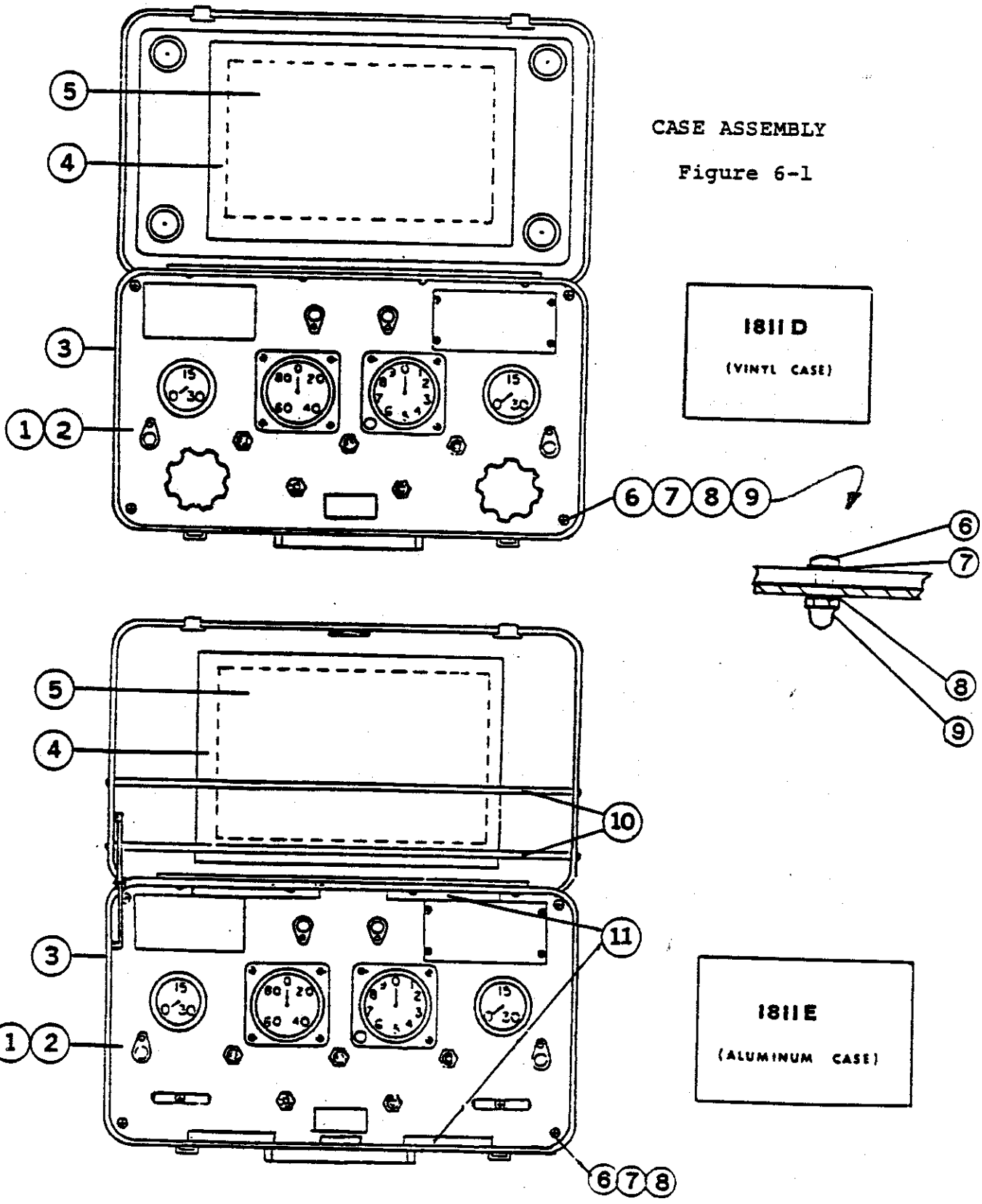
6.1.3 Replacement Parts - Address an order or inquiry to:

BARFIELD INSTRUMENT CORPORATION
4101 N.W. 29th Street
P.O. BOX 420-537
Miami, Florida 33142
U.S.A.

Be sure to identify test set model, part and serial number when ordering parts.

6.1.4 Non-Listed Parts - To obtain a part that is not listed, include information on model number, serial number, description of part, function and location of the part. Standard hardware, nuts, screws and washers are of standard, universal sizes and function, and may be obtainable at any local outlet.

6.1.5 Change - Barfield Instrument Corporation reserves the right to change or substitute original manufacturer and type, subject to availability, quality and improved specifications without notice.



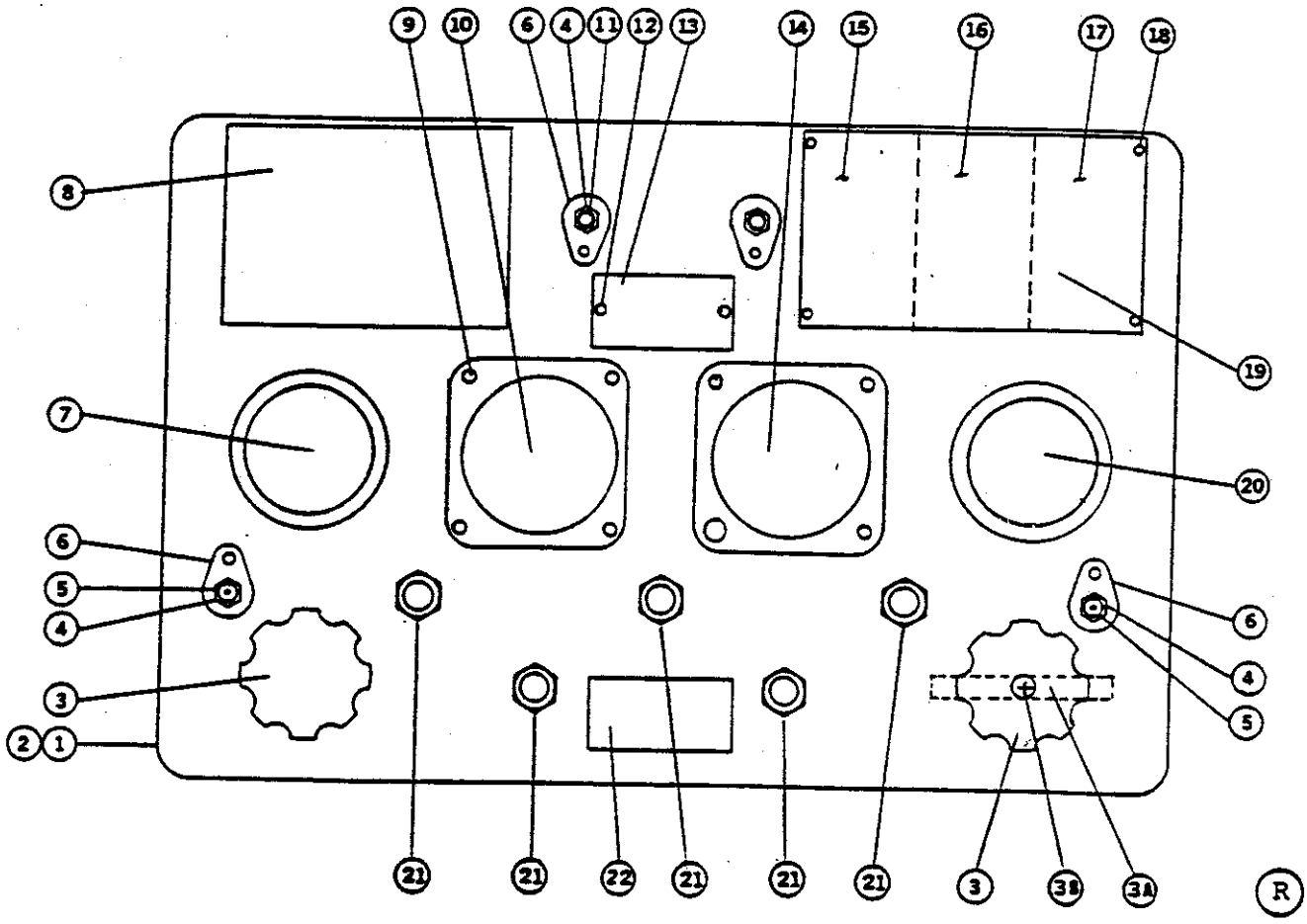
CASE ASSEMBLY

Figure 6-1

(9) does not exist on E model.

ILLUSTRATED PARTS LIST
CASE ASSEMBLY

REF. NO.	PART NO.	MODEL NO.	DESCRIPTION	QTY	MFG CODE
See FIG 6-1	1811( )		Pitot-Static System Field Test Set		
1	101-00164	D	In Vinyl Case		21844
1	101-00153	E	In Aluminum Case		21844
2	115-00203	D	Panel Assembly		21844
2	115-00060	E	Panel Assembly		21844
3	194-00024	D	Case Assembly (Vinyl)		21844
3	115-00067	E	Case Assembly (Aluminum)		21844
4	245-00034	D/E	Caution Decal Valve Positions		21844
5	380-00003	D/E	Plastic Laminate (Loose)		21844
5	345-00008L	D	Operator Instructions, System Leak Test Procedure		21844
5	345-00005L	E	Operator Instructions, System Leak Test Procedure		21844
-	452-00005	D	Polyurethane Foam Pad	(2 ea)	Coml
-	452-00003	E	Polyurethane Foam Pad	(2 ea)	Coml
6	MS51957-29	D	Cross Recessed, Pan Head Screws	(4 ea)	Coml
6	MS51957-45	E			
7	MS15795-805	D	#6 Flat Washers	(4 ea)	Coml
7	MS15795-807	E	#8 Flat Washers	(4 ea)	Coml
8	MS35333-71	D	#6 Internal Tooth Lockwashers		Coml
8	MS35338-137	E	#8 Spring Lockwashers	(4 ea)	Coml
9	MS24679-21	D	#6 Low Crown Cap Nut	(4 ea)	Coml
10	550-00002	E	Hose Kit Holder	(2 ea)	21844
11	150-00006	E	Rear Brackets	(4 ea)	21844



1811D/E

PANEL ASSEMBLY

FRONT VIEW

Figure 6-2

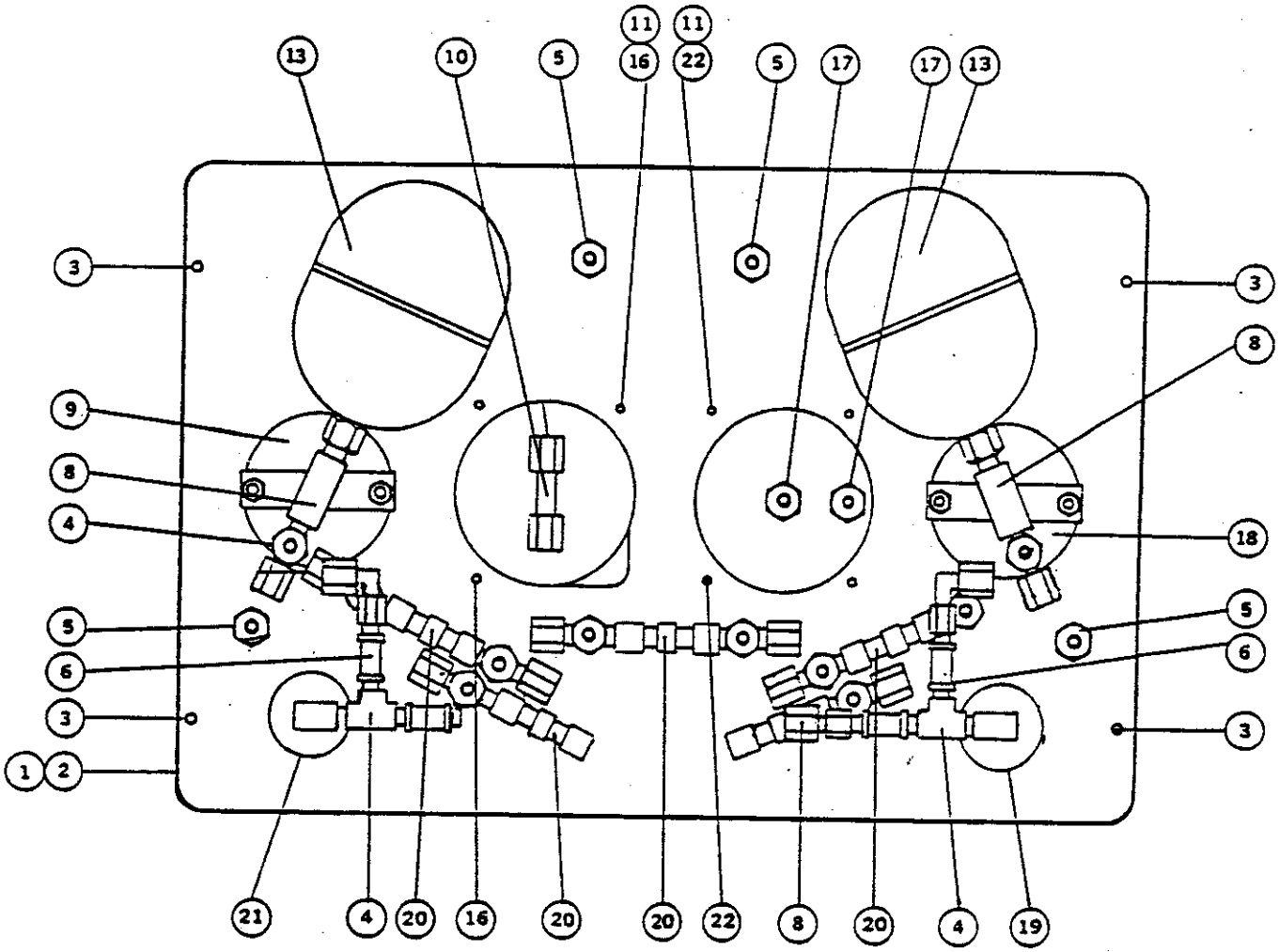
ILLUSTRATED PARTS LIST
PANEL ASSEMBLY - FRONT VIEW

REF. NO.	PART NO.	MODEL NO.	DESCRIPTION	QTY	MFG CODE
See FIG 6-2	1811( )		Pitot-Static System Field Test Set		21844
1	115-00203	D	Panel Assembly		21844
1	115-00060	E	Panel Assembly		21844
2	451-00043N4	D	Panel		21844
2	451-00003N4	E	Panel		21844
3	# 231	D	Phenolic Knob	(2 ea)	80813
3A	322-00001N3	E	Pump Handle (Steel Bar)	(2 ea)	21844
3B	MS519958-43	E	Panhead Machine Screws #10-32 x 1/2	(2 ea)	Coml
4	284-00004	D/E	Bulkhead Female Connector Brass Tube Fitting	(4 ea)	21844
5	287-00002	D	Pipe Plug Fitting, Hex	(2 ea)	21844
5	287-00001	E	Pipe Plug Fitting, Hex	(2 ea)	21844
6	508-00003	D/E	Retainer Female Bulkhead Connector	(4 ea)	21844
7	304-00107	D/E	Pressure Gauge 0-30 psi		21844
8	245-00023	D/E	Caution Decal: General Instruction		21844
9	MS51957-34	D/E	Panhead Machine Screws #6-32 x 1" (Altimeter)	(3)	Coml
9	MS51957-35	D/E	#6-32 x 1 1/4 (A/S)	(4)	Coml
9	MS15795-806	D/E	Plain Flat Washers	(7 ea)	Coml
10	336-00001	D/E	Airspeed Indicator, Sensitive 50-650 Knot Range		21844
11	287-00001	D/E	Pipe Plug Fitting, Solid Hex	(2 ea)	21844
12	523-00005	D/E	"B" Slotted, Recess #2 Self Tapping Screws	(2 ea)	Coml
13	459-00015	D/E	Identification Plate		21844

(Continued)

ILLUSTRATED PARTS LIST
PANEL ASSEMBLY - FRONT VIEW
(Continued)

REF NO.	PART NO.	MODEL NO.	DESCRIPTION	QTY	MFG CODE	
14	Customer's Choice of·	D/E	Altimeter		21844	
14	124-00001	D/E	50,000 ft, Inches of Mercury Baro Scale		21844	
14	124-00004	D/E	35,000 ft, Inches of Mercury Baro Scale		21844	
14	124-00006	D/E	50,000 ft, Millibar Baro Scale		21844	
14	124-00007	D/E	35,000 ft, Millibar Baro Scale		21844	
15	193-00006	D/E	Airspeed Calibration Card		21844	
16	193-00005	D/E	Altimeter Hysteresis Card		21844	
17	193-00004	D/E	Altimeter Calibration Card		21844	
18	MS51957-13	D/E	Panhead Screw, Cross #4-40 x 1/4 (Corr'n Card)	(4 ea)	Coml	
19	225-00005	D/E	Acrylic Plastic Cover		21844	
20	304-00106	D/E	Vacuum Gauge 0-30" Hg		21844	
21	641-00108	D/E	Metering Valve Bulkhead Mount	(5 ea)	21844	(R)
22	245-00024	D/E	Caution Decal: Valve Operation		21844	
Not Shown	5010552	D/E	Sealube, Anti-Seize Thread Compound		Coml	

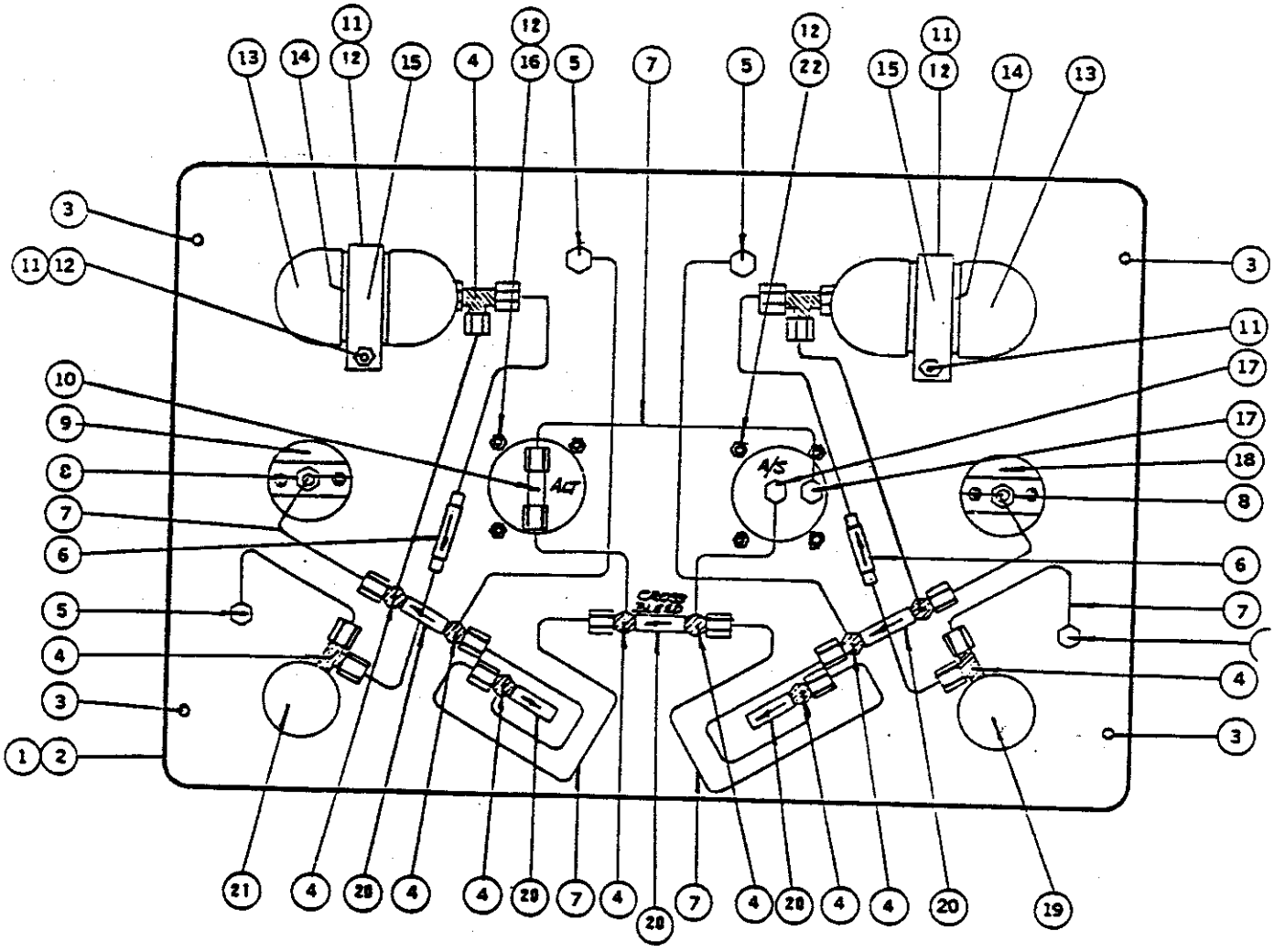


1811D

PANEL ASSEMBLY

REAR VIEW

Figure 6-3



1811E

PANEL ASSEMBLY

Rear View

Figure 6-4

ILLUSTRATED PARTS LIST
PANEL ASSEMBLY - REAR VIEW

REF. NO.	PART NO.	MODEL NO.	DESCRIPTION	QTY	MFG CODE
See FIG 6-3 and 6-4	1811( )		Pitot-Static System Field Test Set		21844
1	115-00203	D	Panel Assembly		21844
1	115-00060	E	Panel Assembly		21844
2	451-00043N4	D	Panel		21844
2	451-00003N4	E	Panel		21844
3	MS51957-13	D	Panhead Screws, Cross Recess #4 - 40 x 1/4	D-(4 ea)	Coml
3	MS51957-28	E	#6 - 32 x 3/8	E-(4 ea)	Coml
4	3750 x 2	D	Street Tee	D- (5 ea)	79470
4	75-4-2-N-0	E	Male Run Tee	E-(12 ea)	52547
5	284-00004	D/E	Bulkhead Female Connector	(4 ea)	21844
6	B-2C21/3	D	Check Valve 1/3 psi	D-(6 ea)	18034
6	B-4C 1/3	E	Cracking Pressure	E-(2 ea)	18034
7	623-00001	D/E	Polyethylene Tubing 1/8 ID x 1/16 Wall Length as required		Coml
8	25-4-4-N-0	D/E	Female Connector	D-(4 ea)	52547
				E-(2 ea)	52547
9	304-00106	D/E	Vacuum Gauge 0-30 Inches of Mercury		72100
10	60-4-2-N-0	D/E	Male Branch Tee		52547
11	MS15795-806	D/E	Washer, Flat #6	D-(7 ea)	Coml
				E-(4 ea)	Coml
11	MS35338-136	D/E	Lockwasher, Spring #6	D-(7 ea)	Coml
				E-(4 ea)	Coml
12	MS35649-264	E	Hex Nut #6-32	(4 ea)	Coml
12	MS24693-C28	E	Flat Panhead Screws #6 - 32 x 1/2 100° Sink, Cross Recess	(2 ea)	Coml

(Continued)

ILLUSTRATED PARTS LIST
PANEL ASSEMBLY - REAR VIEW
(Continued)

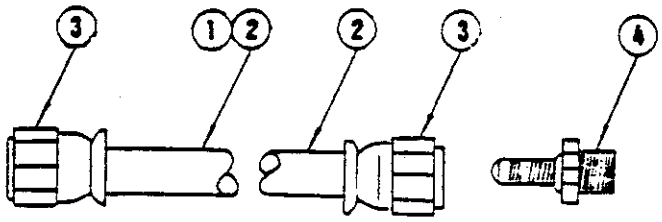
REF. NO.	PART NO.	MODEL NO.	DESCRIPTION	QTY	MFG CODE
13	603-00004	D/E	Tank Assembly - Metal	(2 ea)	21844
13	115-00054	E	Tank Assembly - PVC When Restrictors Used (E Model Only)	(2 ea)	21844
14	452-00003	E	Poly Foam Pad	(2 ea)	21844
15	577-00001Y2	E	Strap, Tank, PVC	(2 ea)	21844
15	577-00001Y3	E	Strap, Tank, Metal	(2 ea)	21844
16	MS51957-34	D/E	Panhead Screws with Cross Recess (for Altimeter #6 - 32 x 1)	(3 ea)	Coml
17	10-4-2-N-0	D/E	Male Connector	(2 ea)	52547
18	304-00107	D/E	Pressure Gauge 0-30 lbs per sq. inch		72100
19	DAV 125-3	D	Air Cylinder 1 1/4" Bore - 3" Stroke		07939
19	469-00009	E	Pump Assembly, Pressure with Tee		21844
20	B-2M4-303	D/E	Metering Valve 1/8 NPT	(5 ea)	18034
21	DAV 125-3	D	Air Cylinder 1 1/4" Bore - 3" Stroke		07939
21	469-00010	E	Pump Assembly, Vacuum with Tee		21844
22	MS51957-35	D/E	Panhead Screws with Cross Recess #6 - 32 x 1-1/4 (for Airspeed Indicator)	(4 ea)	Coml
At 12	ANS-632	D/E	Nut Serts	(7 ea)	Coml

ILLUSTRATED PARTS LIST
TEST SET ACCESSORIES

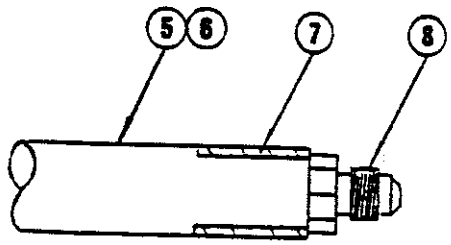
REF. NO.	PART NO.	MODEL NO.	DESCRIPTION	MFG CODE
See FIG 6-5			1811 SERIES KITS	21844
	115-00056	D/E	Hose and Adapter Kit (Issued with each T/S) consists of: 2 ea 115-00058, (25) ft of hose assembly 1 ea 115-00057, pitot-tube adapter assy	21844
	115-00218	D/E	Hose and Adapter Kit (Optional at customer's request consists of: 2 ea 115-00219, (40) ft of hose assembly 1 ea 115-00057, pitot-tube adapter assy	21844
1	115-00058	D/E	Hose Assembly - 25 ft length 2 ea -OR-	21844
1	115-00219	D/E	Hose Assembly - 40 ft length 2 ea, both of the above consists of:	21844
2	RLB-1060-6	D/E	Vinyl Tubing 3/8 OD x 1/4 ID, #6 Clear, as req'd	08230
3	284-00003	D/E	Tube Fitting Connector Internal Flare (2 ea)	21844
4	284-00001	D/E	Tube Fitting Connector External Flare 1/8 - 27 NPT (1 ea)	21844

1811 SERIES
HOSE ASSEMBLY

Figure 6-5



ILLUSTRATED PARTS LIST
TEST SET ACCESSORIES
(Continued)



1811 SERIES

PITOT TUBE
ADAPTER ASSEMBLY

Figure 6-6

REF. NO.	PART NO.	MODEL NO.	DESCRIPTION	MFG CODE
See FIG 6-6			1811 SERIES KITS (Cont)	
5	11-00057	D/E	Pitot-Tube Adapter Assembly consists of:	21844
6	17624-125	D/E	Surgical Tubing (6 inches) 1/2 ID x 1/8 Wall	58029
7	RLB-1060-12	D/E	Vinyl Tubing (3 inches) 1/2 OD x 3/8 ID, #12 Clear	08230
8	208-00004	D/E	Connector, Modified	21844
Not Shown	05074	D/E	Lubricating Spray, Aerosol	Com1
		D/E	General Purpose Adhesive As required	Com1

FEDERAL SUPPLY CODE FOR MANUFACTURERS
From Defense Logistics Agency Microfiche

REF MFG CODE
IN PARTS LISTS

Code	Manufacturer
03614	Bussman, Div McGraw-Edison St. Louis, MO
07858	Arrow Hart of Canada, Ltd Scarborough, Canada
07939	Air-Mite Devices, Inc. Chicago, IL
08230	Thermoplastic Processing Sterling, NJ
11649	Cajon Company Solon, OH
12623	Whitey Highland Heights, OH
18034	Nupro Company Willoughby, OH
20969	Essex Brass Corp Detroit, MI
21844	Barfield Instrument Corp Miami, FL
24123	Gast Manufacturing Group Benton Harbor, MI
52547	Jaco Manufacturing Co. Berea, OH
53909	Columbia Electronic Cables Pawtucket, RI
58029	American Hospital Supply Decatur, GA
72100	Marshalltown Instruments Marshalltown, IA
75915	Littelfuse, Inc. Des Plaines, IL
79470	The Weatherhead Co. Cleveland, OH
80813	Dimco-Gray Centerville, OH
81640	Cutter-Hammer, Inc. Milwaukee, WI
83330	H.H. Smith, Inc. Brooklyn, NY

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BARFIELD
MIAMI, FLORIDA
ATLANTA, GEORGIA

INSTRUCTION MANUAL
for
1811 SERIES
VALVE
LEAKAGE TEST

AIR DATA and PITOT-STATIC TEST SETS

VALVE ADJUSTMENT PROCEDURE

P/N's 101-00150 through 101-00154, -00156, -00159, and -00164 through -00170

Originally Issued July 1, 1982 as SI-1811-8207

Barfield INSTRUMENT CORPORATION
P.O. BOX 420537
MIAMI, FLORIDA 33242-0537
U.S.A.
TLX. 51-8808

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Users are kindly requested to notify the manufacturer of any discrepancy, omission or error found in this manual. Please send your comments to:

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P. O. Box 420537
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METERING VALVE ADJUSTMENT PROCEDURE

PART ONE

VALVE LEAK TEST

CAUTION: BEFORE PERFORMING VALVE LEAK TEST CHECK FOR SYSTEM AND INSTRUMENT LEAKAGE. (REF. MAINTENANCE MANUAL)

PART ONE and PART TWO of this procedure should be read in their entirety before commencing any test.

PART TWO must be used in conjunction with PART ONE when performing valve adjustments.

1. PRESSURE VALVE TEST

A. Close all valves except "VACUUM VENT".

B. Plug "PRESSURE" and "VACUUM PORTS". (Single action pumps only.)

C. Pressurize "PRESSURE TANK" to 15 PSI.

D. Monitor AIRSPEED INDICATOR for one (1) minute.

(1) If any increase in airspeed is noted continue to monitor for an additional five (5) minutes.

(2) If at anytime, during this period, the increase exceeds five (5) knots a leak exist at the "PRESSURE" valve.

E. Correct leak before proceeding (See PART TWO).

2. PRESSURE VENT AND CROSSBLEED VALVE TEST

A. Close all valves except "VACUUM VENT".

B. Plug "PRESSURE" and "VACUUM PORTS". (Single action pumps only.)

CAUTION: DO NOT OVER PRESSURE AIRSPEED.

C. Apply sufficient pressure to the "PRESSURE TANK" to provide FULL SCALE AIRSPEED INDICATOR TRAVEL.

D. Gently open "PRESSURE" valve, increase AIRSPEED to FULL SCALE.

(1) Close "PRESSURE" valve.

(2) Monitor AIRSPEED INDICATOR for one (1) minute, any decrease in excess of two (2) knots indicates leakage at either the "PRESSURE VENT" or "CROSSBLEED" valves.

(3) FULLY close "VACUUM VENT" and monitor BOTH the AIRSPEED INDICATOR and ALTIMETER.

(4) If the ALTIMETER moves down scale, Leakage is at the "CROSSBLEED" valve.

(5) If the ALTIMETER does not move, but the AIRSPEED continues to decrease, leakage is at the "PRESSURE VENT" valve.

E. Correct leak(s) before proceeding (see PART TWO).

3. **VACUUM VENT TEST**

A. Close all valves except "CROSSBLEED".

B. Plug "PRESSURE" and "VACUUM PORTS". (Single action pumps only.)

C. Evacuate "VACUUM TANK" to at least 20 inches.

D. Monitor ALTIMETER for one (1) minute.

NOTE: Any increase in ALTITUDE indicates leakage at the "VACUUM" valve.

E. Correct the leak before proceeding (see PART TWO).

4. **VERTICAL SPEED VALVE TEST (Applicable Models)**

A. Close all valves except "CROSSBLEED".

B. Plug "PRESSURE" and "VACUUM PORTS". (Single action pumps only.)

C. Evacuate and MAINTAIN "VACUUM TANK" at 20 inches.

D. Gently open "VACUUM" valve.

(1) Monitor the VERTICAL SPEED indicator while increasing altitude to 20,000 ft.

(2) Any increase in VERTICAL SPEED indicates leakage at the "VERTICAL SPEED" valve.

E. Correct the leak before proceeding (see PART TWO).

5. **VACUUM VENT VALVE TEST**

A. Close all valves except "CROSSBLEED".

B. Plug "PRESSURE" and "VACUUM PORTS". (Single action pumps only.)

C. Evacuate and MAINTAIN "VACUUM TANK" at 20 inches.

D. Gently open "VACUUM" valve.

(1) Increase altitude to 20,000 ft.

(2) Close "VACUUM" valve.

(3) Monitor ALTIMETER for one (1) minute.

(4) An increase of altitude of more then 100 ft. indicates leakage at the "VACUUM" valve.

E. Correct the leak before proceeding (see PART TWO).

PART TWO

RESETTING NEEDLE VALVE POSITIVE STOP

PART ONE must be used in conjunction with PART TWO when performing valve adjustments.

CAUTION: BEFORE PERFORMING EITHER PART ONE OR PART TWO CHECK TOTAL SYSTEM FOR LEAKS AT LOCATIONS OTHER THAN VALVE SEATS, i.e., CONNECTIONS, GENERAL PLUMBING AND INSTRUMENTS.

Positive stop spacers are installed, on some models, to provide a positive stop permitting firm closing of the valves without damage to the valve needles or their seats. On other models the valve body provides this stop. The positive shut-off is carefully set and adjusted at the time of manufacture or factory recalibration. However, if the valves should develop a slight leak from repeated use, the following steps should be used to reset.

CAUTION: WITH THE EXCEPTION OF THE PRESSURE AND VACUUM CONTROL VALVES ANY LEAKAGE OBSERVED COULD BE FROM SOME SOURCE OTHER THAN THE VALVES. DO NOT TIGHTEN ANY VALVE BEYOND THE CLOSING POINT DESCRIBED BELOW.

1. Perform PART ONE in exact sequence listed.

2. When it has been determined a valve is leaking, correct that Leak before continuing.

3. Firmly close the valve against it's positive stop.

A. With a 5/64" (.078") hex wrench, loosen the knob set screw.

(1) Raise the knob approximately 1/32" above the valve body or spacer, re-tighten set screw.

(2) Gently turn the knob clockwise, not exceeding one quarter (1/4) rotation, or until positive resistance is felt.

CAUTION: **DO NOT, UNDER ANY CONDITION EXCEED ONE HALF (1/2) ROTATION. IF LEAK PERSISTS, LEAK IS ELSEWHERE, OR VALVE IS DEFECTIVE.**

(3) If (2) above stopped leakage, loosen the knob setscrew, remove knob.

NOTE: **IF, INSTALLED, DO NOT REMOVE ANY SPACERS.**

(4) On valve stem, locate setscrew mark.

(5) Align the setscrew to a new location.

(6) Push the knob firmly down against valve body or spacer.

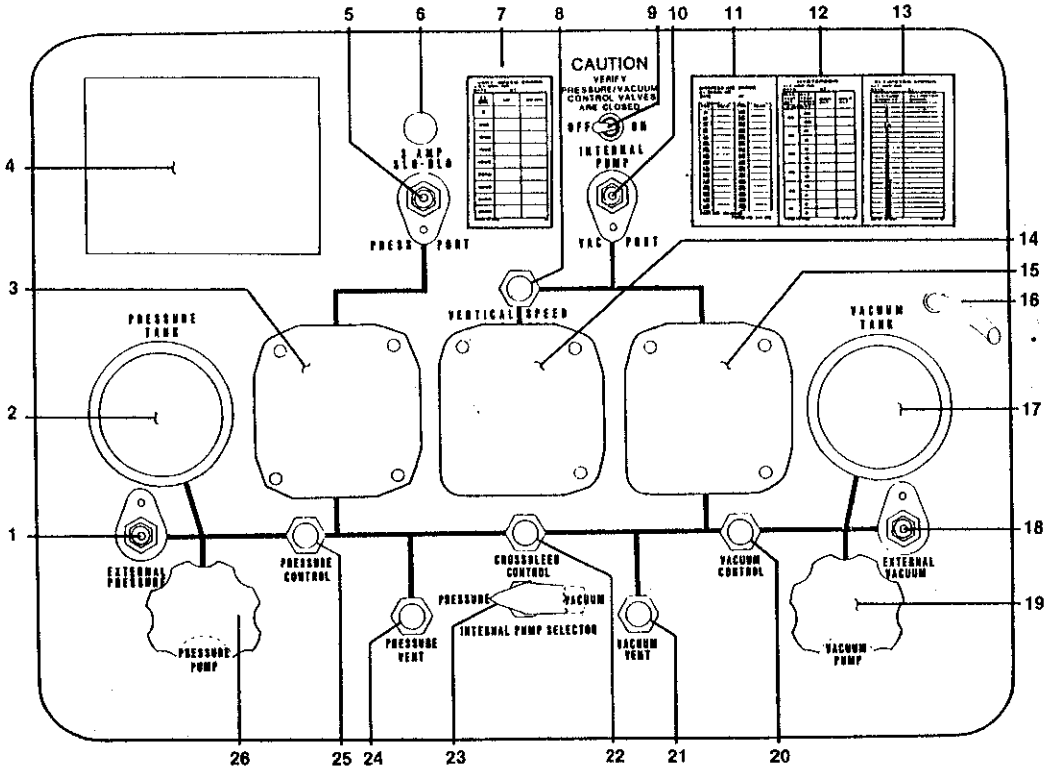
(7) Hold down while tightening setscrew.

(8) Open valve one quarter (1/4) rotation, then close firmly. Positive shut off should now exist.

B. If leakage persist continue tests for remaining valves or until no leakage is encountered.

BARFIELD 1811 SERIES

PITOT-STATIC SYSTEM LEAK TEST PROCEDURE



CAUTION

1. **MAKE CERTAIN ALL CONNECTIONS FROM TEST SET TO AIRCRAFT SYSTEM ARE SECURE BEFORE OPERATING. PORTS (1) AND (18), IF NOT USED MUST BE VENTED.**
2. **DO NOT OVER TIGHTEN VALVES. LIGHT PRESSURE IS SUFFICIENT TO CLOSE ALL VALVES. REPEATED EXCESSIVE TIGHTENING WILL CAUSE PERMANENT DAMAGE.**
3. **NEVER PERMIT AIRSPEED INDICATOR TO BE DRIVEN TO ZERO (0). REFERENCE MAINTENANCE MANUAL FOR POINTER REST POSITION.**
4. **"VERTICAL SPEED" VALVE (8) SHOULD REMAIN CLOSED EXCEPT AS NEEDED. (UNITS WITH VSI).**

PRELIMINARY OPERATION

1. Open **"PRESSURE VENT"** valve (24) and **"VACUUM VENT"** valve (21) fully counterclockwise.
2. Insure **"PRESSURE CONTROL"** valve (25), **"CROSSBLEED CONTROL"** valve (22), **"VACUUM CONTROL"** valve (20) and **"VERTICAL SPEED"** valve (8) are closed, fully clockwise.
3. To use an external pressure supply, raise **"PRESSURE PUMP"** handle (26) fully, then connect a thirty [30] psi max. source to **"EXTERNAL PRESSURE"** port (1).
4. To use external vacuum source, connect external vacuum source to **"EXTERNAL VACUUM"** port (18).

   CAUTION: **FOR TEST SETS SO EQUIPPED, DO NOT OPERATE "INTERNAL PUMP" WITH SELECTOR (23) IN THE VERTICAL POSITION. BE SURE THAT "PRESSURE CONTROL" VALVE (25) AND "VACUUM CONTROL" VALVE (20) ARE FULLY CLOSED BEFORE OPERATING THE "INTERNAL PUMP."**
5. To use internal pressure supply, set **"INTERNAL PUMP SELECTOR"** (23) to **"PRESSURE"**, connect POWER CORD (16) to an appropriate electrical outlet and place **"INTERNAL PUMP"** switch (9) to **"ON"**. (Internal pump is regulated to fifteen [15] psi for airspeeds above two hundred [200] kts. and to five [5] psi for airspeeds below two hundred [200] kts. [Factory installed.])
6. For internal vacuum, rotate **"INTERNAL PUMP SELECTOR"** valve (23) to **"VACUUM"**.
7. Connect **"PRESS PORT"** (5) to Aircraft pitot system and **"VAC PORT"** (10) to Aircraft static system.
8. To use hand pressure pump, operate **"PRESSURE PUMP"** handle (26) to develop fifteen [15] psi for airspeeds above two hundred [200] kts. or five [5] psi for airspeeds below two hundred [200] kts. on **"PRESSURE TANK"** gauge (2).
9. To use hand vacuum pump, operate **"VACUUM PUMP"** handle (19) to develop twenty [20] in. Hg on **"VACUUM PUMP"** gauge (17).
10. Close **"PRESSURE VENT"** valve (24).

PITOT LEAK TEST

1. Perform all preceding **PRELIMINARY** steps first.

   CAUTION: **SHOULD ANY SUBSEQUENT STEPS FAIL, REFER TO "RETURNING SYSTEM TO AMBIENT" BEFORE DISCONNECTING ANY CONNECTIONS.**
2. Observe Airspeed Indicator (3) and Aircraft Airspeed Indicators while GENTLY opening **"PRESSURE CONTROL"** valve (25) until Aircraft Airspeed Indicators reach approximately three quarters [3/4] of full range of travel.
3. Close **"PRESSURE CONTROL"** valve (25) fully. After all instruments have stabilized, Airspeed Indicator (3) must not decrease more than two [2] knots in one minute.

   CAUTION: **IF LEAK RATE EXCEEDS TWO [2] KNOTS PER MINUTE, LEAK MUST BE CORRECTED BEFORE CONTINUING.**

   NOTE: **Aircraft Airspeed Indicator readings may now be compared with corrected Test Set Airspeed Indicator readings, corrected I/A/W (In Accordance With) "AIRSPEED IND ERROR" card (11).**
4. Open **"CROSSBLEED CONTROL"** valve (22) fully and Airspeed Indicator (3) should return to normal rest of fifteen [15] to forty-five [45] knots.

STATIC LEAK TEST

1. Perform all preceding tests first. Pitot system must not leak while testing static system.
2. Close **"VACUUM VENT"** valve (21) fully.
3. To test Aircraft VSI, GENTLY open **"VERTICAL SPEED"** valve (8) so as not to exceed full scale travel of VSI (14) pointer. When VSI pointer returns to zero [0], valve (8) must be fully opened.
4. Observe Aircraft and Test Set VSI pointers so as not to exceed full scale travel while GENTLY opening **"VACUUM CONTROL"** valve (20).

   NOTE: **Set Aircraft and Test Set altimeter barometric scales to 29.92 in. Hg., [1013.2 mb.]. Aircraft Altimeter and VSI readings may now be compared with Test Set corrected Altimeter and VSI indicator readings, corrected I/A/W "ALTIMETER ERROR" card (13), and "VERT SPEED ERROR" card (7).**

   If vacuum tank needs replenishing, close "VACUUM CONTROL" valve (20) fully clockwise before operating the "VACUUM PUMP" handle (19), or placing the "INTERNAL PUMP" switch (9) to "ON".
5. When the desired altitude on the Altimeter (15) is reached, close **"VACUUM CONTROL"** valve (20) fully clockwise. After all instrument readings have stabilized, observe the Altimeter (15) reading must not fall more than one hundred [100] feet (or two [2]% of indicated altitude, whichever is greater) in one (1) minute.

   NOTE: **If system leaks, CAREFULLY close "CROSSBLEED CONTROL" valve (22) while observing Airspeed Indicator (3) and open quickly when direction is noted. If Airspeed Indicator increases, pitot system leaks, If Airspeed Indicator decreases, static system leaks.**

   CAUTION: **DO NOT ALLOW AIRSPEED INDICATOR (3) TO DECREASE BY MORE THAN TEN [10] KNOTS OR SEVERE DAMAGE TO AIRCRAFT AND/OR TEST SET AIRSPEED INDICATORS MAY RESULT.**

RETURNING SYSTEM TO AMBIENT

1. Open **"CROSSBLEED CONTROL"** valve (22) fully. Operate **"PRESSURE VENT"** valve (24) so as to lower altitude on the Altimeter (15) at a rate not to exceed full scale of VSI (14). Also observe Airspeed - do not exceed its limits.
2. When system has returned to ambient, open both **"PRESSURE VENT"** valve (24) and **"VACUUM VENT"** valve (21) fully. Disconnect lines between test set and aircraft. Close **"VERTICAL SPEED"** valve (8) fully.
3. GENTLY open **"VACUUM CONTROL"** valve (20) and **"PRESSURE CONTROL"** valve (25) to bleed off supply tanks.
4. When **"PRESSURE TANK"** and **"VACUUM TANK"** gauges (2) and (17) respectively have returned to zero [0], close **"PRESSURE CONTROL"** valve (25) and **"VACUUM CONTROL"** valve (20) fully.

   CAUTION: **TO PREVENT DAMAGE TO THE TEST SET INSTRUMENTS FROM ATMOSPHERIC PRESSURE CHANGES IT IS MANDATORY THAT FOR SHIPMENT AND OR STORAGE OPEN VALVES (21), (22) AND (24), "VACUUM VENT", "CROSSBLEED CONTROL" AND "PRESSURE VENT" RESPECTIVELY. CLOSE VALVES (8), (20), AND (25) "VERTICAL SPEED", "VACUUM CONTROL" AND "PRESSURE CONTROL" RESPECTIVELY.**

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