

TM 9-4940-403-14&P

TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT
SUPPORT, AND GENERAL SUPPORT MAINTENANCE
MANUAL INCLUDING REPAIR PARTS LIST
FOR
TEST STAND, ROTARY ACTUATOR,
MODEL NO. BDL-812121
NATIONAL STOCK NUMBER 4940-00-152-2107
(BARKLEY & DEXTER LABORATORIES, INC.)

HEADQUARTERS, DEPARTMENT OF THE ARMY

AUGUST 1981

INSTRUCTIONS FOR REQUISITIONING PARTS

NOT IDENTIFIED BY NSN

When requisitioning parts not identified by National Stock Number, it is mandatory that the following information be furnished the supply officer.

- 1 - Manufacturer's Federal Supply Code Number - 17151
- 2 - Manufacturer's Part Number exactly as listed herein.
- 3 - Nomenclature exactly as listed herein, including dimensions, if necessary.
- 4 - Manufacturer's Model Number - BDL-812121
- 5 - Manufacturer's Serial Number (End Item)
- 6 - Any other information such as Type, Frame Number, and Electrical Characteristics, if applicable.
- 7 - If DD Form 1348 is used, fill in all blocks except 4, 5, 6, and Remarks field in accordance with AR 725-50.

Complete Form as Follows:

- (a) In blocks 4, 5, 6, list manufacturer's Federal Supply Code Number - 17151 followed by a colon and manufacturer's Part Number for the repair part.
- (b) Complete Remarks field as follows:
 - Noun: (nomenclature of repair part)
 - For: NSN: 4940-00-152-2107
 - Manufacturer: Barkley & Dexter Laboratories, Inc.,
50 Frankfort St.,
Fitchburg, MA 01420
 - Model: BDL-812121
 - Serial: (of end item)

Any other pertinent information such as Frame Number, Type, Dimensions, etc.

Technical Manual

No. 9-4940-403-14&P

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 31 August 1981

**OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT,
AND GENERAL SUPPORT MAINTENANCE MANUAL
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FOR

**TEST STAND, ROTARY ACTUATOR, MODEL BDL-812121
(NSN 4940-00-152-2107)**

REPORTING OF ERRORS

You can help improve this manual . If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms), or DA Form 2028-2, located in the back of this manual direct to: Commander, US Army Armament Materiel Readiness Command, ATTN: DRSAR-MAS, Rock Island, IL 61299. A reply will be furnished directly to you.

Manufactured by: Barkley & Dexter Laboratories, Inc.
50 Frankfort St.
Fitchburg, MA 01420

Procured under Contract No. DAAA09-78-C-4864

This technical manual is an authentication of the manufacturers' commercial literature and does not conform with the format and content specified in AR 310-3, Military Publications. This technical manual does, however, contain available information that is essential to the operation and maintenance of the equipment.

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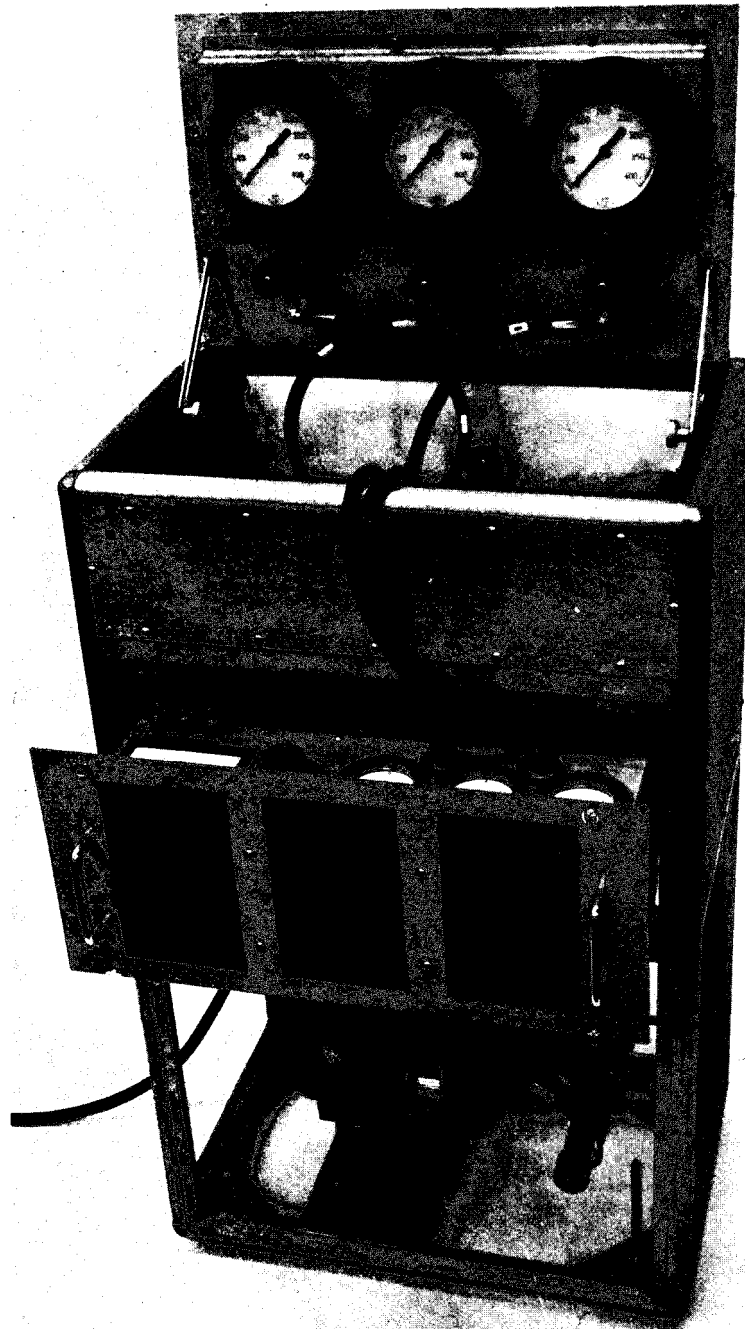


FIGURE 1

SECTION I

GENERAL INFORMATION

1-1 INTRODUCTION

This manual contains general instructions for the operation and maintenance of the Hydraulic Actuator Test Stand.

1-2 PURPOSE OF EQUIPMENT

The Hydraulic Actuator Test Stand is a "GO" - "NO-GO" test device. The Test Stand may be used for testing Military Standard Hydraulic Actuators of Styles DOD #69-600-1, 69-600-2, 69-600-3, and 69-600-4, and other applicable style numbers listed in Table 2-2. The tests provided by this stand determine the operational condition of the actuator hydraulic and electronic components.

1-3 TECHNICAL CAPABILITIES

Actuator Tests:

The Test Stand allows the following "GO" - "NO-GO" tests to be performed on the actuator:

(A) Mechanical Bias

A check to determine whether the actuator is properly biased to open or close with no current in the actuator coils.

(B) Balanced Coil Current

A check that when balanced current is applied to the coils equal hydraulic pressure is applied to the piston causing it to remain stationary.

(c) Directional Coil Current

A check that when the proper current is applied to one coil or the other that the correct hydraulic pressure is applied to the piston extending or retracting it as determined by the type of actuator being tested.

(D) Ancillary Test Circuits

Circuits have been provided to check out the Test Stand to determine that the actuator test circuits are working and that they are adjusted properly.

(E) Gauge Pressure Test

A manifold is included to compare the 0-400 psi hydraulic gauges to ascertain that they are calibrated.

1-4 PRIMARY POWER REQUIREMENTS

The Actuator Test Stand requires an input of 120 volts \pm 10% 60 Hz. 10 amps.

1-5 TEMPERATURE CAPABILITIES

The Actuator Test Stand is capable of proper operation within the temperature range of + 40°F(+4°C) to + 125°F (+52°C) at altitudes to 10,000 feet.

1-6 DESCRIPTION OF EQUIPMENT

The Hydraulic Actuator Test Stand (Figure 1) consists essentially of a hydraulic sump, electric motor driven hydraulic pump, electric controls for actuator coils, bracket to hold actuator while under tests and associated filters, plumbing, wiring, etc. The equipment operating controls and indicators are located in a control drawer and on the inside of the top cover.

The input power cable and the connectors for the pump motor and flow-meter cables are located at the rear of the control drawer.

1-7 DIMENSIONS AND WEIGHT

Height - 38 inches

Width - 24 inches

Depth - 16 inches

Weight - Approximately 176 pounds (not including hydraulic fluid)

1-8 GROUND

Grounding lugs are provided at the rear of the electronic control drawer and the flowmeter turbine mounting plate. A ground strap is provided connecting these two points.

1-9 HYDRAULIC SYSTEM

Capacity - Approximately 9 quarts

Fluid Type - MIL-H-5606 Hydraulic Fluid

Operating Temperature - (-65 to + 160°F)

Flash Point - (+200°F)

CAUTION: DO NOT OPERATE HYDRAULIC TEST STAND WITH FLUID TEMPERATURE EXCEEDING +160°F.

SECTION II

OPERATING INSTRUCTIONS

2-1 INTRODUCTION

The following operating instructions (Paragraphs 2-3 and 2-4) are identical to those which are permanently affixed to the hydraulic test stand.

It should be noted that these instructions are as brief as possible. Additional information is included in the descriptive material in the maintenance section of this manual. Table 2-1 identifies the operating controls and indicators. For the location of valves, meters, gauges, switches, etc., refer to Figures 2, 3 and 4.

2-2 PREPARATION FOR USE

(a) Place the Actuator Test Stand conveniently near a 120V, 60 Hz power outlet.

(b) Release the fasteners which retain the top cover and the control drawer.

(c) Raise the top cover and fasten it securely in place with the knurled fasteners.

(d) Open control drawer until the latches, which retain the drawer at half open position, engage.

(e) Remove the hold down brackets and level the test stand by means of the leveling screws located at each bottom corner of the stand.

(f) Check hydraulic fluid level and fill, as required, by releasing the fasteners at the front edge of the work area and raising the perforated work surface plate.

NOTE : Use MIL-H-5606 Hydraulic Fluid only. Capacity is approximately 9 quarts.

The fluid should be even with the plates which are marked, "Fluid Level" located at each end of the sump.

(g) Open Vi., V2, V3, V4 and v6.

2-3 SELF CHECK-TEST SET PERFORMANCE

(a) Connect calibrating manifold to gauges G1 to A1, G2 to A2, G3 to A3 and supply line to S. (See Figure 5).

(b) Connect connector P3, cable W3 to receptacle J3, connect connector P4, cable W4 to receptacle J4. (See Figure 5).

(c) Set T2 to approximately 70.

(d) Place flow meter switch at VOLT ADJ position.

(e) Place S1, S2 in OFF position and S3 at START.

(f) Connect power cable W1 to 120V 60 Hz power supply

(g) Place S1 in ON position and S3 in position 1. Turn flow meter adj. knob until needle coincides with V. ADJ line on meter, then set flow meter knob in FMI position.

(h) Set S3 at position 2. Adjust T2 until M2 & M3 read 0.35 amps each. M1 should read approx. 10 volts.

(i) Set S3 at position 3. Adjust R2 until M2 reads 0.70 amps.

(j) Set S3 at position 4. Adjust R3 until M3 reads 0.70 amps.

(k) Set S3 at position 1.

(l) Set S2 (Pump Switch) at ON.

(m) Adjust V5 until G1, G2, and G3 read 320 ± 3 psi.

The flow meter must read in the Green Area,

(n) Set S2 at OFF.

(o) The preceding tests and adjustments must be successfully performed to assure proper operation of the actuator test stand.

2-4 ACTUATOR TEST

(a) Remove calibration manifold and install actuator to be tested. Connect supply line and G3 to "P" through the swivel nut tee, return tube to "R", G1 to A1, G2 to A2 and cables W3 and W4 to actuator connectors. (See Figure 2).

(b) Determine the style number of the actuator being tested and refer to the appropriate table for test pressures and meter readings.

(c) Set S2 at ON.

(d) Starting with S3 in START position rotate S3 to each of the other four positions and compare all meter and gauge readings with the values specified in the table.

(e) Turn the pump (S2) off and return S3 to start position.

(f) Refer to the appropriate table and determine the actuator piston position for full fuel. Manually place the piston in the full fuel position and Meter M1 should read less than 20 volts.

(g) Move the piston gradually towards the fully closed throttle position, the transducer secondary voltage indicated on Meter M1 should increase in a linear manner to a maximum of more than 20 volts.

(h) Slowly move the actuator piston from no fuel to full fuel position and M1 should steadily decrease without changing direction of movement.

If the results obtained during the above tests do not meet the specifications, the actuator requires adjustment or repair.

2-5 SHUT DOWN PROCEDURE

- (a) Set S3 at start position
- (b) Set S2 and S1 in off position.
- (c) Close and fasten the control drawer and the cover.
- (d) If the test stand is to be transported to another location, the hydraulic fluid should be drained from the system and V1 and V6 closed, and hold down brackets installed.

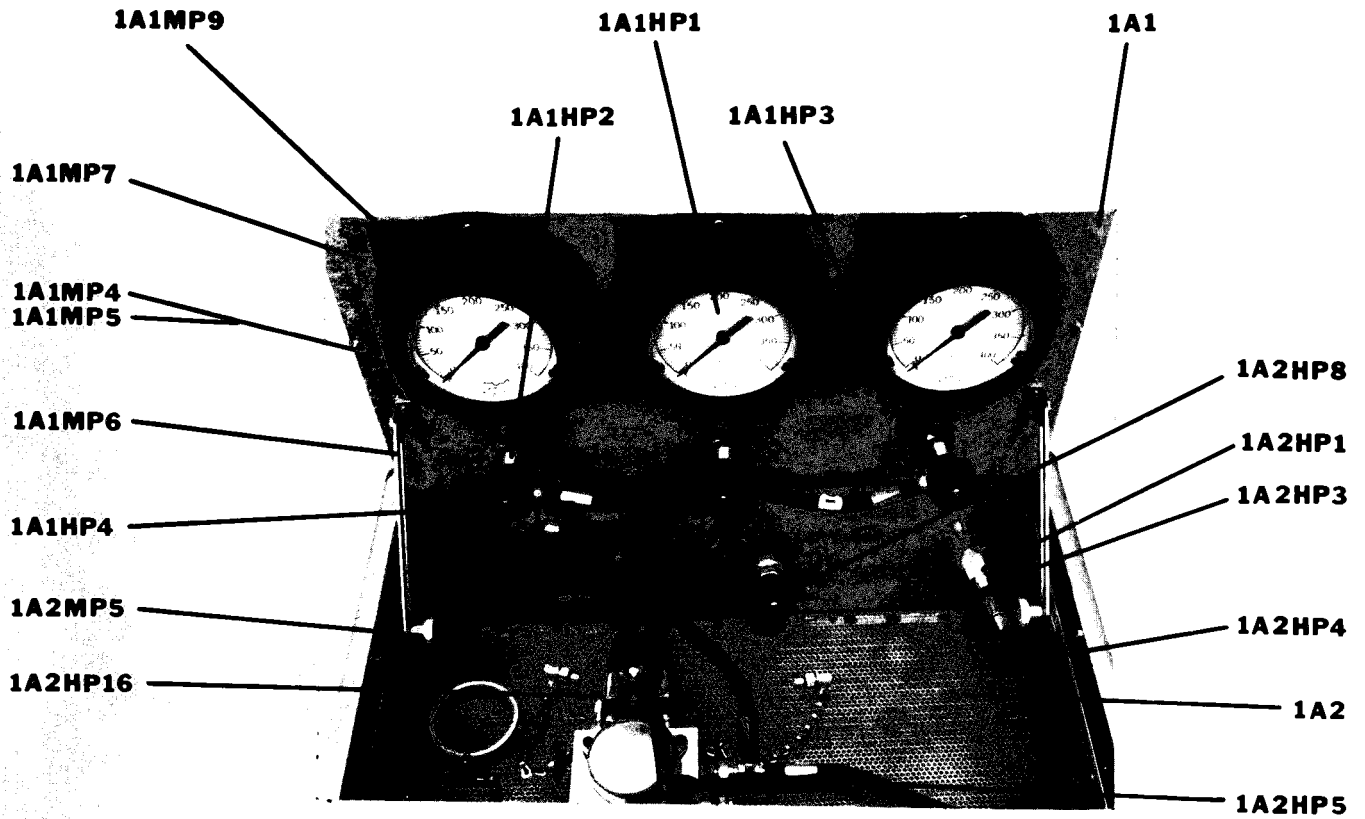


FIGURE 2

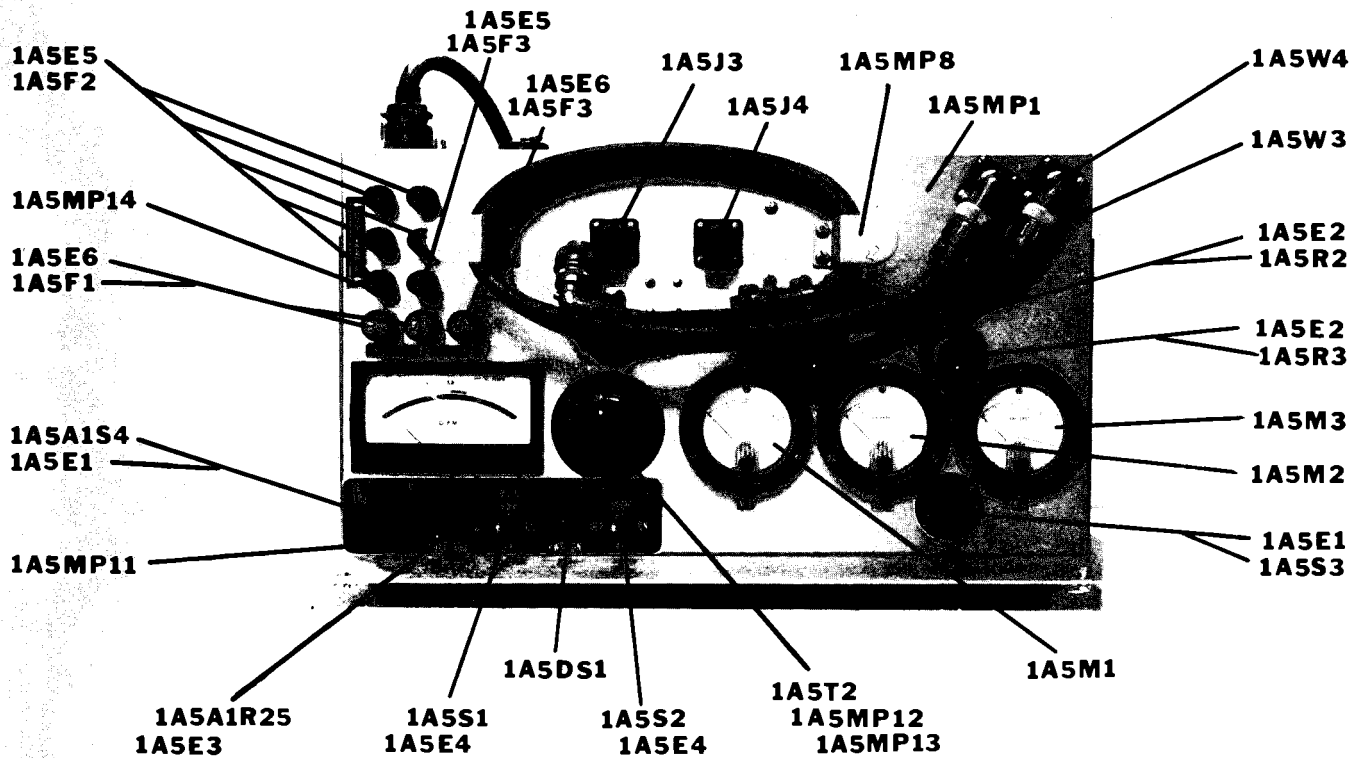


FIGURE 3

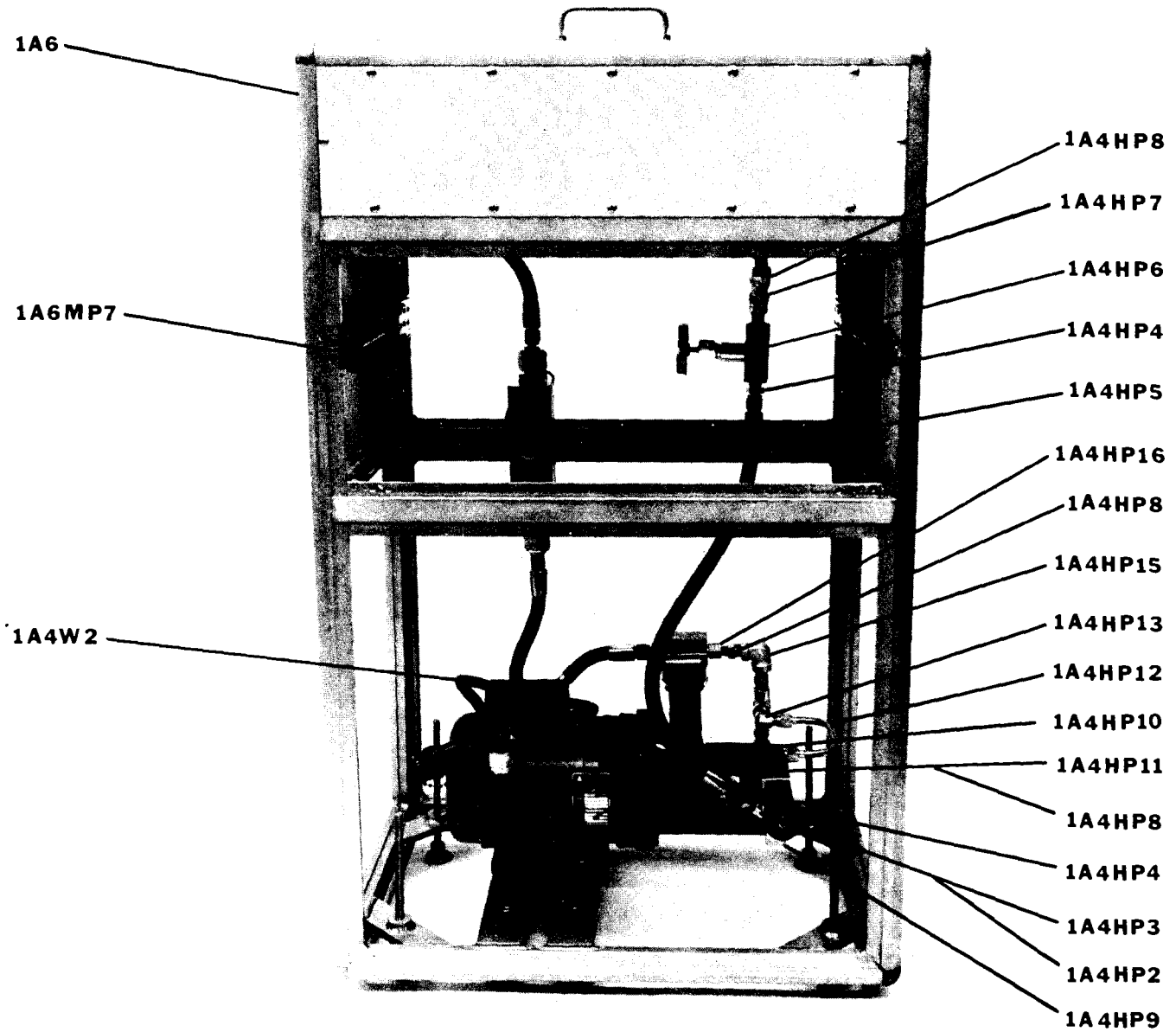


FIGURE 4

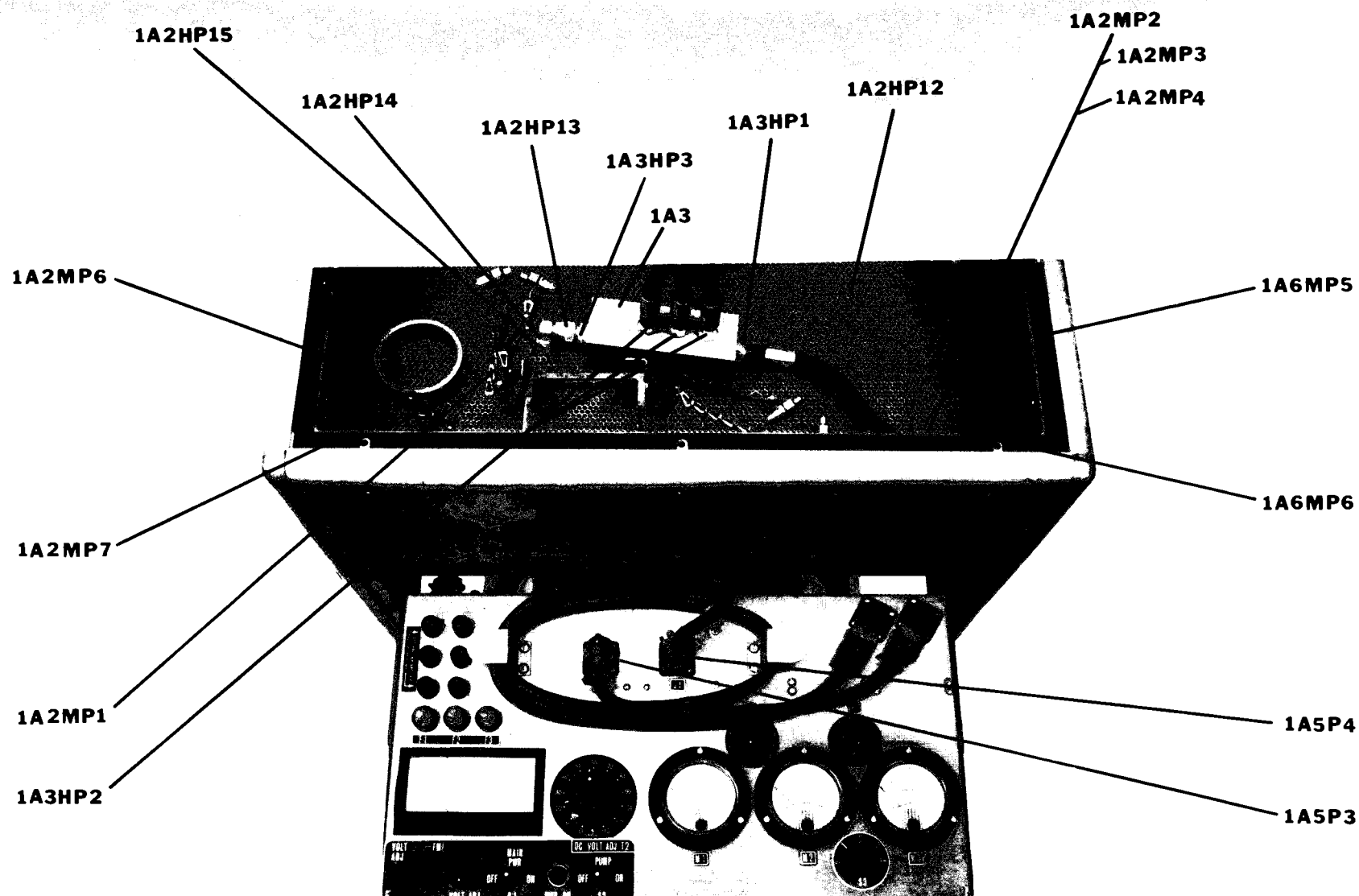


FIGURE 5

TABLE 2-1

IDENTIFICATION OF OPERATING CONTROLS AND INDICATORS

<u>CONTROL</u>	<u>REF. DESIGN</u>	<u>FUNCTIONS</u>
Main Power ON OFF switch	S1	On-Off control of test stand primary 120 volt 60 Hz power,
Pump On Off Switch	S2	On-Off control of test stand hydraulic pumping system.
Selector Switch	S3	Controls testing sequence.
Variac	T2	Provides a means of adjusting voltage to coils.
Potentiometer (coil)	R2	Adjusts current to coil AB
Potentiometer (coil)	R3	Adjusts current to coil DC
Flow Meter (calibrate)	ADJ (R25)	Adjust flow meter voltage to proper operating level.
Flow Meter Operate	Volt Adj FM1 (S4)	Selects desired function of flow meter.
Flow Meter Meter	M4	Permits observation of the flow rate of hydraulic fluid through the system
Volt Meter	M1	Displays voltage output from feedback transducer.
Ammeter	M2	Displays current applied to actuator coil AB
Ammeter	M3	Displays current applied to actuator coil DC
Gauge	G1	Indicated hydraulic pressure at test port A1 of the actuator.

Table 2-1 continued. . .

<u>CONTROL</u>	<u>REF. DESIGN</u>	<u>FUNCTION</u>
Connector	J3	Actuator coil circuit self test position.
Connector	J4	Feedback circuit selftest position.
Gauge	G2	Indicates hydraulic pressure at test port A2 of the actuator.
Gauge	G3	Indicates line pressure at "P" the actuator input port.
Needle Valve	V1	Shut off valve for G1
Needle Valve	V2	Shut off valve for G2
Needle Valve	V3	Shut off valve for G3
Needle Valve	V4	Shut off valve supply line
Needle Valve	V5	Adjusting valve for line pressure regulation.
Globe Valve	V6	Shut off valve for sump.

ACTUATOR STYLES						
69 - 600 - 1						
NO EQUIVALENT						
S3 SWITCH POSITION	COIL CURRENT		GAUGE PRESSURE			FLOW METER
	M2 (L2)	M3 (L1)	G 1	G 2	G 3	
1 MECH BIAS	0	0	200 ± 20	150 ± 20	320 ± 20	GREEN AREA
2 BAL COIL	.35 ± .02	.35 ± .02	200 ± 20	150 ± 20	320 ± 20	GREEN AREA
3 EXT PISTON	.70 ± .04	0	310 Min	40 Max	380 MAX	0
4 RET. PISTON	0	.70 ± .04	40 Max	310 Min	380 MAX	0
FULL FUEL POSITION — PISTON EXTENDED						
ACTUATOR STYLES						
69 - 600 - 2						
13217E5390-2, 32D1560G13, 1261A05G02, 1289A86G02						
S3 SWITCH POSITION	COIL CURRENT		GAUGE PRESSURE			FLOW METER
	M2 (L1)	M3 (L2)	G 1	G 2	G 3	
1 MECH BIAS	0	0	200 ± 20	150 ± 20	320 ± 20	GREEN AREA
2 BAL COIL	.35 ± .02	.35 ± .02	200 ± 20	150 ± 20	320 ± 20	GREEN AREA
3 RET PISTON	0	.70 ± .04	310 MIN	40 MAX	380 MAX	0
4 EXT PISTON	.70 ± .04	0	40 MAX	310 MIN	380 MAX	0
FULL FUEL POSITION — PISTON RETRACTED						
ACTUATOR STYLES						
69 - 600 - 3						
13217E5390-3, 32D1560G31, 32D1560G32, 1261A05G03, 1289A86G03						
S3 SWITCH POSITION	COIL CURRENT		GAUGE PRESSURE			FLOW METER
	M2 (L2)	M3 (L1)	G 1	G 2	G 3	
1 MECH BIAS	0	0	150 ± 20	200 ± 20	320 ± 20	GREEN AREA
2 BAL COIL	.35 ± .02	.35 ± .02	150 ± 20	200 ± 20	320 ± 20	GREEN AREA
3 EXT PISTON	.70 ± .04	0	310 Min	40 Max	380 MAX	0
4 RET. PISTON	0	.70 ± .04	40 Max	310 Min	380 MAX	0
FULL FUEL POSITION — PISTON EXTENDED						
ACTUATOR STYLES						
69 - 600 - 4						
13217E5390-5, 32D1560G33, 1261A05G04, 1289A86G04						
S3 SWITCH POSITION	COIL CURRENT		GAUGE PRESSURE			FLOW METER
	M2 (L1)	M3 (L2)	G 1	G 2	G 3	
1 MECH BIAS	0	0	150 ± 20	200 ± 20	320 ± 20	GREEN AREA
2 BAL COIL	.35 ± .02	.35 ± .02	150 ± 20	200 ± 20	320 ± 20	GREEN AREA
3 RET PISTON	0	.70 ± .04	310 MIN	40 MAX	380 MAX	0
4 EXT PISTON	.70 ± .04	0	40 MAX	310 MIN	380 MAX	0
FULL FUEL POSITION — PISTON RETRACTED						

TABLE 2-2

SECTION III
MAINTENANCE

3-1 GENERAL

The design of this Hydraulic Test Stand is such that a minimum of maintenance should be required. This maintenance should consist mostly of routine cleaning, visual inspections and checks. Prior to attempting any trouble shooting or corrective maintenance, operators or technicians should thoroughly acquaint themselves with the equipment's operating capabilities and controls (See Section I and Section II). When these are understood, the nature of the built-in self-checking features should enable a technician to quickly localize the trouble and effect the necessary replacement or repair. To further assist the technician, a schematic diagram of all circuits, illustrations showing the physical location of internal adjustments and functional components, calibration and adjustment procedures, trouble symptoms charts and a parts list are included in subsequent parts of this manual.

3-2 EQUIPMENT REQUIREI)

No special tools are required for the maintenance of this equipment. Test equipment recommended for trouble shooting adjustments, general maintenance and operation include:

(a) Multimeter, 20,000 ohms per volt dc and 5,000 ohms per volt ac, such as the Simpson model 260 or equivalent.

(b) Wrenches, 1/2" - 9/16" (2 req'd.) 5/8" - 11/16" and 3/4".

3-3 PERIODIC MAINTENANCE

No special preventative maintenance such as lubrication, etc. is deemed necessary for this equipment. However, a periodic check or change of the hydraulic fluid and hydraulic filters should be established. The frequency of this check will depend on the operating conditions that prevail at the location where the equipment is being operated.

3-4 RECOMMENDED SPARE PARTS LIST (EACH UNIT).

	<u>QUANTITY</u>
<u>HYDRAULIC - MECHANICAL</u>	
Filter Element	1
Adaptors (Actuator Test Ports)	4
Swivel Nut Run Tee	2
Swivel Nut Elbow	2
MIL-H-5606 Hydraulic Fluid	9 quarts
Hydraulic Hose	4
<u>ELECTRICAL</u>	
20 amp fuses	1 box (5)
4 amp fuses	1 box (5)
28V lamps	2
diodes	5
800 mfd. capacitors	2
5K resistor (Voltmeter Shunt)	1

SECTION IV
CORRECTIVE MAINTENANCE

4-1 GENERAL

This area of maintenance shall consist essentially of localizing the trouble in a defective unit, making the necessary repair or part replacement, adjusting and testing to verify that the repaired item meets performance requirements.

4-2 PREPARATION FOR TROUBLE SHOOTING

The electronic control drawer may be removed for bench testing and repairs. The line cord is attached to this drawer and may be connected to any convenient 120V 60 Hz power supply. To remove this drawer proceed as follows:

(a) Disconnect the power line to the motor, and the signal line to the flowmeter turbine. Disconnect ground strap.

(b) Extend drawer until retainers catch at halfway position. Release retainers and pull drawer to the full extension of the drawer slides.

(c) Press release buttons on the drawer slides and carefully remove control drawer.

The hydraulic system can be operated with the electronic control drawer removed by connecting the motor line cable to a 120V 60 Hz power supply.

The hydraulic system will operate immediately unless an auxiliary switch is provided.

4-3 TROUBLE SHOOTING

With a thorough understanding of the operating principles, a technician should be capable of effectively localizing trouble by using the built-in self checking features of the equipment plus the schematic and other data included in the manual.

To minimize the possibility of causing further damage to a hydraulic test stand reported to be defective, a careful visual inspection of the equipment should be made prior to applying power. If possible, obtain information from the equipment operator regarding performance at the time trouble occurred. Failure of the equipment may be caused by burned out fuses, worn or broken cords or connectors or broken wires. Faults such as burned out resistors, arcing or shorted transformers often can be located by sight, smell and hearing. Intermittent conditions can often be made to appear by lightly tapping or jarring the equipment. Loose wiring connections or faulty components can also often be located by moving them with an insulated tool. Hydraulic leaks which could cause pressure and flow problems can be visually detected.

4-4 . TROUBLE SYMPTOM CHART

This chart is intended as an aid to locate trouble or operating deficiencies.

SYMPTOM	PROBABLE CAUSE
1. Power Indicator lamp fails to illuminate with power cable connected to source, switch S1 in ON position and no F1 and F2 blown fuse indication.	Low or lack of power source voltage, poor connection, defective cord, or burned out bulb.
2. Hydraulic pump motor fails to operate with power ON, power cord connected to live source, and switches S1 and S2 ON.	Blown fuses, defective motors, open line.
3. Voltmeter M1 fails to read between 9 - 13 volts with switch S1 ON, S3 in position 2, 3 or 4, P4 connected to J4 on chassis.	Defective resistor R4, defective cable, loose terminals, defective meter or defective transformer (T1).
4. Flowmeter Volt Adj fails to reach calibration mark with S1 ON, S3 in position 1 or 2, power cable connected to live source and flow meter switch in Volt Adj position.	Flow meter 4.2 volt power supply defective, potentiometer (R25) defective, meter movement seized or loose hardware.

SYMPTOM	PROBABLE CAUSE
5. Flow meter fails to read in green area with S2 ON, S3 in position 2, flowmeter 4.2V power supply operable, G3 reading 320 ± 20 psi.	Defective turbine, hydraulic system or test manifold restricted by foreign material, hydraulic filter plugged, loose cables, defective components on flow meter printed circuit board.
6. Meters M2 and/or M3 fail to read with S1 ON, F3 not blown, S3 in positions 2, 3, or 4, P3 connected to J3 on chassis.	Defective power supply, Variac on "O", Defective Variac , defective meter.
7. Pressure gauges, G1, G2 and G3 do not read 320 ± 2 psi with test manifold connected properly, S1 and S2 ON.	Insufficient fluid in sump, V5 out of adjustment or defective, hydraulic filter obstructed, defective gauge, or pump malfunction, sump strainer clogged.

4-5 FILTER ELEMENT REPLACEMENT

To replace or inspect the hydraulic filter proceed as follows:

- (a) Place S1, S2 and S3 in OFF position.
- (b) Close V4 and v6.
- (c) Use a 3/4" wrench and remove the housing from the filter by means of the boss on the bottom of the housing.
- (d) Remove the filter element and replace, if necessary.
- (e) Re-assemble filter and open V4 and V6.

4-6 TEST AND ADJUSTMENTS

To eliminate the possibility of damage from incorrect wiring connections or loose mechanical parts, visually and physically check the equipment and its connections following any repair or replacement of parts. Refer to the schematic diagram Figure 5 and check the continuity of the circuit in which the repair was made prior to applying power. Upon completion of these tests and adjustments, refer to paragraph 2-3 and check the overall equipment performance.

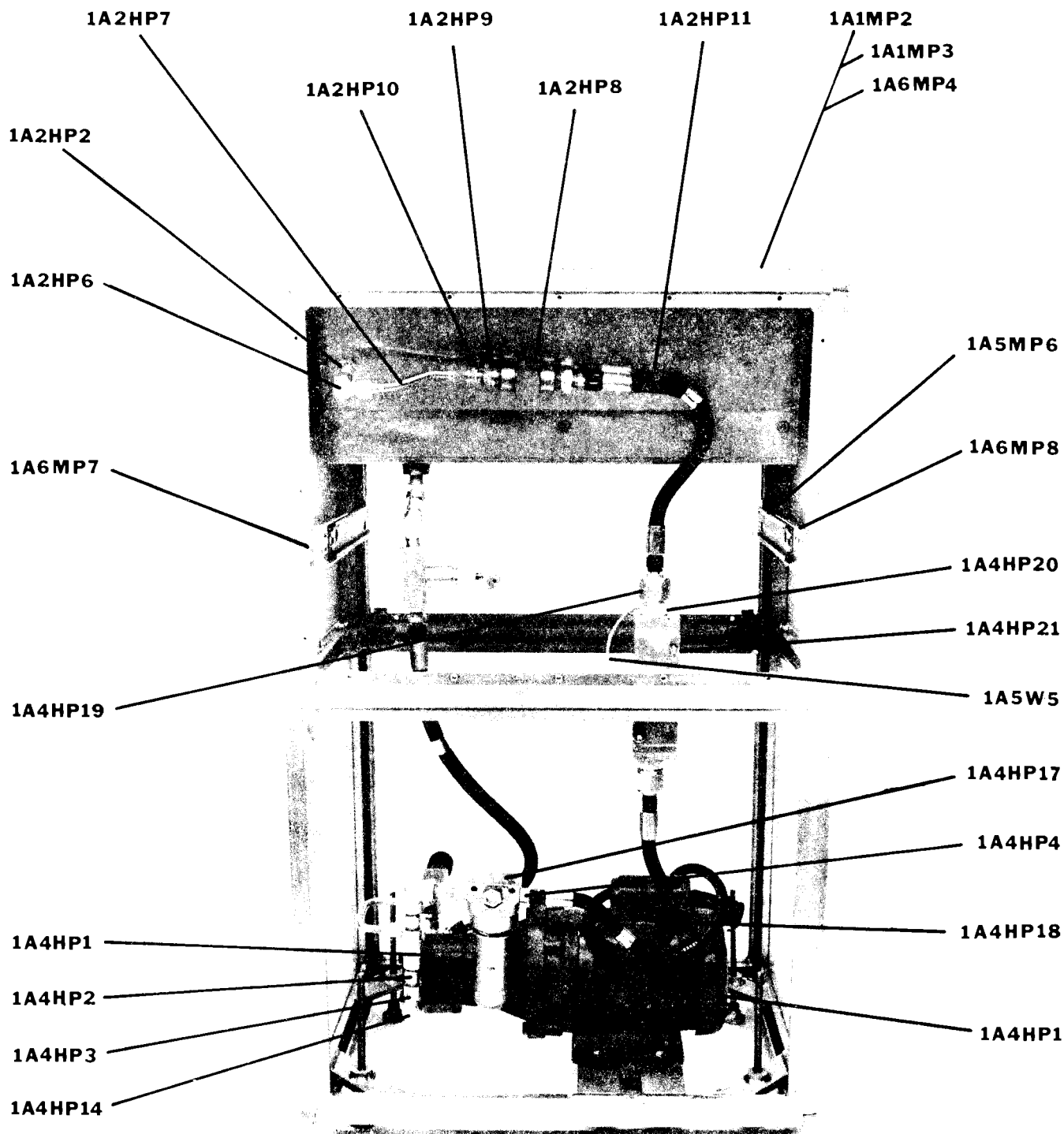
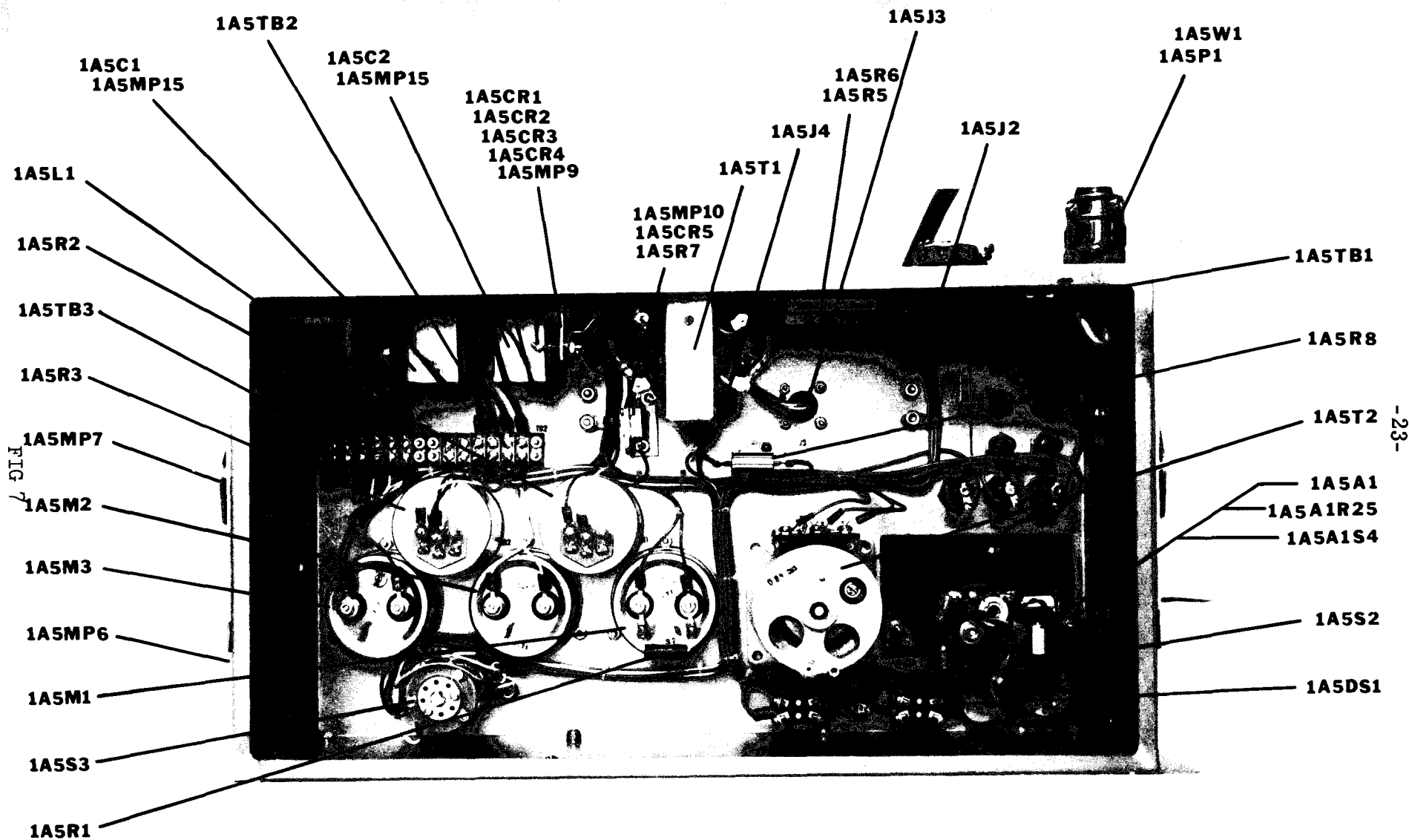


FIGURE 6



SECTION V

PARTS LIST

5-1 INTRODUCTION

This section lists and describes, sub-assemblies, and component parts of the hydraulic actuator test stand. All assemblies and parts are arranged in top-down breakdown order.

The indentation arrangement of the "DESCRIPTION" column under numbers 1 through 7 is used to show the relationship of parts and subassemblies to assemblies. For instance, a part or subassembly listed in indentation 3 will be a component of the assembly listed above it in indentation 2.

Part numbers under the "MFR & VENDOR PART NO." column are those of the hydraulic actuator test stand manufacturer (Barkley and Dexter Laboratories, Inc.). In the case of purchased parts, these part numbers are also those of the vendor or original manufacturer of the component part. Codes under the "FED. MFR. CODE" column are Federal Supply Codes for the manufacturer of the specific component parts in accordance with the Defense Supply Agency Cataloging Handbooks H4-1 and H4-2.

TABLE 5-1

CROSS REFERENCE, FEDERAL MANUFACTURERS CODES TO MANUFACTURERS

01276	Aeroquip Industrial Division 1225 W. Main Street Van Wert, Ohio 45891
01599	Reid Tool and Supply 2233 Temple Street Muskegon Heights, Michigan 49444
02660	Amphenol Corporation 2801 South 25th Avenue Broadview, Illinois 60153
03481	B. F. Goodrich Aerospace & Defense Products Division Akron, Ohio 44309
03508	General Electric Company Semi-Conductor Products Dept. Electronics Park Syracuse, New York 13201
04946	Standard Wire & Cable 3440 Overland Avenue Los Angeles, California 90034
05079	Tansitor Electronics, Inc. West Street Bennington, Vermont 05201
05972	Loctite Corporation 705 N. Mountain Road Newington, Connecticut 06111
06164	All Stainless, Inc. 342 Western Avenue Allston, Massachusetts 02134
08805	General Electric Miniature Lamp Division Nela Park Cleveland, Ohio 44101
11349	Century Electric Company 1806 Pine Street St. Louis, Missouri 63103

16164	Saxton Products, Inc. 215 N. Route 303 Congers, New York 10920
17151	Barkley & Dexter Laboratories, Inc. 50 Frankfort Street Fitchburg, Massachusetts 01420
19178	Zero Manufacturing Company East Division 288 Main Street Monson, Massachusetts 01057
23231	Flo-Tech, Inc. P. O. Box 576 Barrington, Illinois 60010
24655	General Radio Company 22 Baker Avenue West Concord, Massachusetts 01781
24681	LTV Electrosystems, Inc. Memcor Division 1320 Flaxmill Road Huntington, Indiana 46750
27193	Cutler Hammer, Inc. 4201 N. 27th Street Milwaukee, Wisconsin 53216
30058	Delta Power Hydraulic Company 1 Airport Drive Rockford, Illinois 61109
31356	JBT Instruments, Inc. New Haven, Connecticut 06510
45681	Parker Hannifin Corporation 17325 Euclid Avenue Cleveland, Ohio 44112
46384	Penn Engineering & Mfg. Corp. Old Easton Highway Doylestown, Pennsylvania 18901
49956	Raytheon Company Lexington, Massachusetts 02173
59730	Thomas & Betts Company 36 Butler Street Elizabeth, New Jersey 07207

71218	Bud Radio, Inc. 4605 E. 355th Street Willoughby, Ohio 44094
71279	Cambridge Thermionic Corporation 445 Concord Avenue Cambridge, Massachusetts 02139
71400	Bussman Mfg. Division of McGraw & Edison Company 2536 W. University St. St. Louis, Missouri 63017
71590	Centralab Division of Globe Union, Inc. Milwaukee, Wisconsin 53216
72619	Dialight Corporation 60 Stewart Avenue Brooklyn, New York 11237
72794	Dzus Fastener Company, Inc. 425 Union Blvd. West Islip, New York 11795
75282	Killark Electric Mfg. Co. 3940 Eastern Street St. Louis, Missouri 63113
75382	Kulka Electric Corporation 520 S. Fulton Avenue Mt. Vernon, New York 10550
75915	Littelfuse Incorporated 800 E. Northwest Highway Des Plaines, Illinois 60016
77221	Phaostron Instrument & Electronic Co. 151 Pasadena Avenue South Pasadena, California 91030
79470	Weatherhead Company 300 E. 131st Street Cleveland, Ohio 44108
80223	United Transformer Company 150 Varick Street New York, New York 10013

82121	Electro Switch Corporation King Avenue Weymouth, Massachusetts 01288
86632	Newton Engineering Service, Inc. 64 Needham Street Newton, Massachusetts 02161
90005	Bendix Filter Division 434 W. Twelve Mile Road P. O. Box 135 Madison Heights, Michigan 48071
90201	Mallory Capacitor Company 3029 East Washington Street P. O. Box 372 Indianapolis, Indiana 46206
91637	Dale Electronics P. O. Box 609 Columbus, Nebraska 68601
92194	Alpha Wire Corporation 711 Lidgerwood Avenue Elizabeth, New Jersey 07207
93785	Braun Manufacturing Company, Inc. 1655 N. Kostner Avenue Chicago, Illinois 60607
96120	Acme Gauge & Instruments Co. 31 Main Street Brooklyn, New York 11201
96259	Fluid Controls, Inc. P. O. Box 49 Mentor, Ohio 44060
97579	APM & Hexseal Corporation 41 Honeck Street P. O. Box 707 Englewood, New Jersey 07631
98847	Marsh Valve Company 303-713 Brigham Street Dunkirk, New York 14048
99862	Carr Lane Manufacturing Co. 4200 Krause Court St. Louis, Missouri 63119

SECTION V - PARTS LIST

TABLE 5-2.

REFERENCE DESIGNATION	DESCRIPTION 1 2 3 4 5 6 7	NO. REQ ' D.	MFGR & VDR PART NUMBER	FED. MFG. CODE
1	HYDRAULEC ACTUATOR TEST STAND		205001	17151
1A1	COVER, TEST STAND	1	205010	17151
1A1HP1	GAUGE, HYDRAULIC	3	A-381	96120
1A1HP2	VALVE, NEEDLE	3	2N11-R2-S	96259
1A1HP3	ELBOW, 90°	3	2501X4X4	79470
1A1HP4	HOSE, HYDRAULIC	3	MS28741-4-17	01276
1A1MP1	HANDLE, TEST STAND COVER	1	2720-01-22	71279
1A1MP2	HINGE, TEST STAND COVER	1	205018	17151
1A1MP3	GASKET, COVER HINGE	1	205019	17151
1A1MP4	STUD, COVER FASTENER	5	BJR-40	72794
1A1MP5	GROMMET, COVER FASTENER	5	GH3	72794
1A1MP6	SUPPORT, COVER	2	205017	17151
1A1MP7	MOUNT, HYDRAULIC GAUGE	1	205009	17151
1A1MP8	PLATE, IDENTIFICATION	1	205041	17151
1A1MP9	TAGS, IDENTIFICATION	3	205042	17151
1A2	SUMP, HYDRAULIC	1	205008	17151
1A2HP1	CONNECTOR, FEMALE BULKHEAD	1	C5275X6	79470
1A2HP2	NUT, BULKHEAD	1	306NX6	79470
1A2HP3	CONNECTOR, MALE	1	C5205X4X4	79470
1A2HP4	HOSE, HYDRAULIC	1	MS28741-4-17	01276
1A2HP5	TEE, SWIVEL NUT RUN	1	C5706X4	79470
1A2HP6	ELBOW, 90° SWIVEL NUT	1	C5506X6	79470
1A2HP7	TUBE, INPUT ASSEMBLY	1	205034	17151
1A2HP8	VALVE, HYDRAULIC NEEDLE	1	2N13R4S	96259
1A2HP9	BUSHING, REDUCING	2	C3109X8X4	79470
1A2HP10	CONNECTOR, MALE	2	C5205X6	79470
1A2HP11	HOSE, HYDRAULIC	1	MS28741-6-12 1/2	01276
1A2HP12	STRAINER, HYDRAULIC	1	C32-8	45681
1A2HP13	ELBOW, 90° SWIVEL NUT (RETURN TUBE)	2	C5506X5	79470
1A2HP14	NUT, 3 PIECE (RETURN TUBE)	2	C5105X5	79470
1A2HP15	SLEEVE, 3 PIECE (RETURN TUBE)	2	C5165X5	79470
1A2HP16	TUBE, RETURN	2	205032	17151
1A2HP17	ADAPTOR, O-RING	4	205031	17151
1A2MP1	CHAIN ADAPTOR 4	1	#35SST	06164
1A2MP2	STUD, FASTENER	2	BJR3-40	72794
1A2MP3	GROMMET FASTENER	2	GH3	72794
1A2MP4	SPRING, FASTENER	2	S3-175	72794

TABLE 5-2.

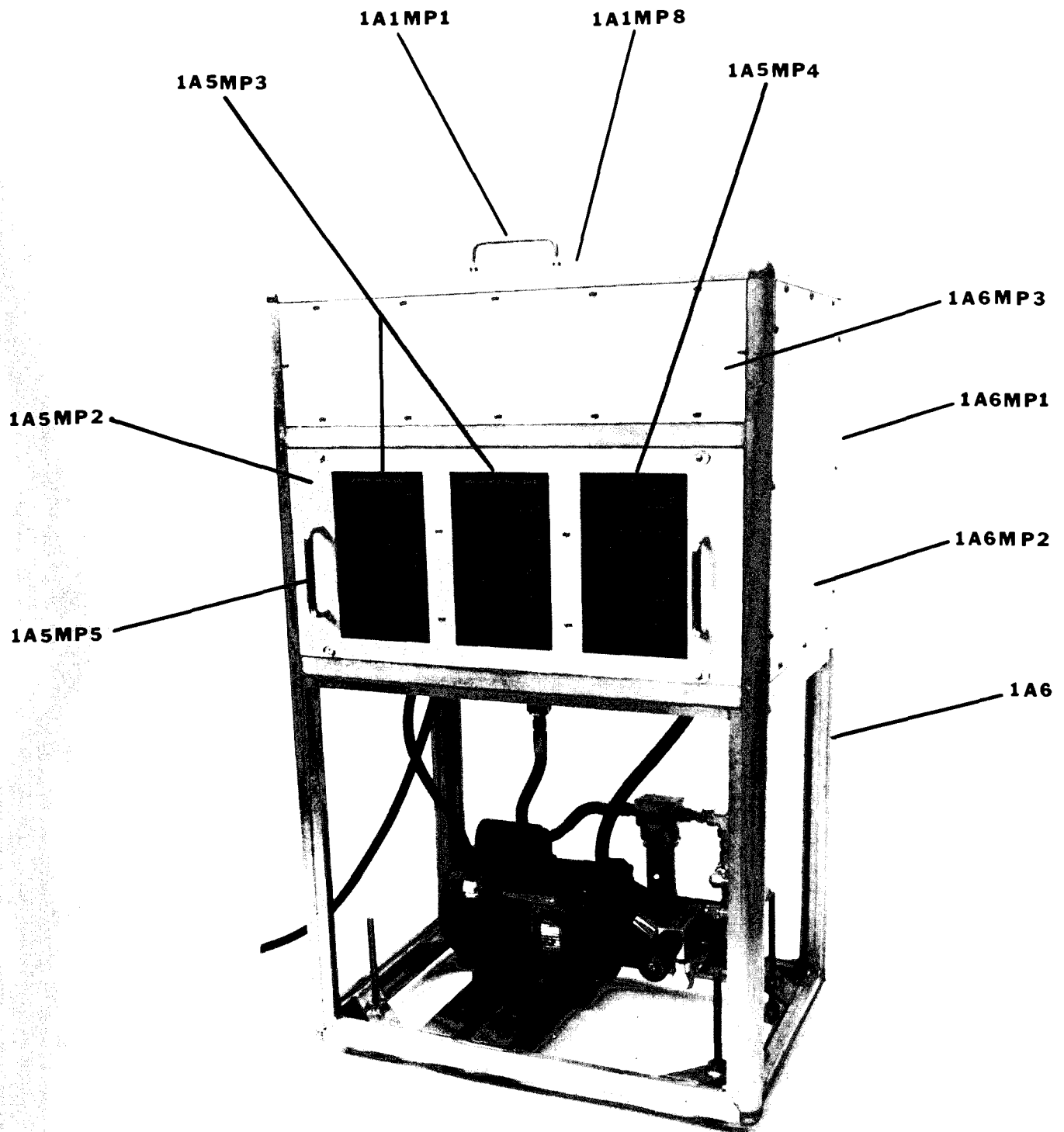
REFERENCE DESIGNATION	1	2	3	4	5	6	7	DESCRIPTION	NO. REQ'D.	MFGR & VDR PART NUMBER	FED. MFG. CODE
1A2MP5								RETAINER, COVER SUPPORT	2	205025	17151
1A2MP6								GASKET, UMP END	2	205020	17151
1A2MP7								GASKET, SUMP SIDE	2	205021	17151
1A2MP8								RING, SPLASH	1	205052	17151
1A2MP9								CHAIN, SPLASH RING	1	#35SST	06164
1A3								MANIFOLD, HYDRAULIC SELF TEST	1	205044	17151
1A3HP1								CONNECTOR, STRAIGHT THREAD O-RING	1	C5315X4X6	79470
1A3HP2								CONNECTOR, STRAIGHT THREAD O-RING	3	C5315X4	79470
1A3HP3								CONNECTOR, STRAIGHT THREAD O-RING	1	C5315X5	79470
1A4								HYDRAULIC PUMPING SYSTEM	1		
1A4HP1								PUMP-MOTOR COMBINATION	1	C6-174	30058
1A4HP2								NUPPLE, HEX	5	5404X6	22031
1A4HP3								TEE, HYDRAULIC	3	5605X6	22031
1A4HP4								CONNECTOR, MALE	3	2404X6X6	22031
1A4HP5								HOSE, HYDRAULIC	1	MS28741-6-21	01276
1A4HP6								VALVE, HYDRAULIC	1	1900FFG	98847
1A4HP7								ELBOW, STREET 45@	2	5503X6	79470
1A4HP8								NIPPLE, HEX	2	5504X6X4	79470
1A4HP9								ELBOW, 90@ STREET	1	5502X6	79470
1A4HP10								ELBOW, 90@ MALE	1	C5405X6	79470
1A4HP11								VALVE, RELIF	1	1A21-R2-15S	96259
1A4HP12								TUBE, CONNECTOR ASSEMBLY	1	205035	17151
1A4HP13								ELBOW, 90@ MALE	1	C5405X6X6	79470
1A4HP14								PLUG, PIPE	1	C3179X6	79470
1A4HP15								ELBOW, 90@ PIPE	1	C3509X6	79470
1A4HP16								ADAPTOR, STRIGHT THREAD	1	C3269X6X4	79470
1A4HP17								FISTER, HYDRAULEC (MS28720-6)	1	C569406	90005
1A4HP18								HOSE, HYDRAULIC	1	MS28741-6-13 1/2	01276
1A4HP19								REDUCER	2	2406N5X12X6	79470
1A4HP20								CONNECTOR, O-RING	2	6400X12X0	79470
1A4HP21								TURBINE, FLOWMETER	1	FS500	23231
1A4W2								CABLE, MOTOR INPUT	1	205049	17151
1A5								ASSEMBLY, CONTROL DRAWER	1	205002	17151
1A5C1								CAPACITOR, 800 MFD, 50WVDC	1	CL55BJ801MPG	05079
1A5C2								CAPACITOR, 800 MFD. 50 WVDC	1	CL55BJ801MPG	05079
1A5CR1								RECTIFIER, SILICON	1	1N1614	03508
1A5CR2								RECTIFIER, SILICON	1	1N1614	03508
1A5CR3								RECTIFIER, SILICON	1	1N1614	03508
1A5CR4								RECTIFIER, SILICON	1	1N1614	03508
1A5CR5								RECTIFIER, SILICON	1	1N1614	03508

TABLE 5-2.

REFERENCE DESIGNATION	1	2	3	4	5	6	7	DESCRIPTION	NO. REQ'D.	MFGR & VDR PART NUMBER	FED. MFG. CODE
1A5DS1								LIGHT, INDICATIONG HOLDER	1	95-1310-0931-201	72619
1A5E1								KNOB, ROTARY SWITCHES	2	MS915281P2B	49956
1A5E2								KNOB, RD., POTENTIOMETET, #90-1WD-2G2B	2	MS915282C2B	49956
1A5E3								KNOB, RD., POTENTIOMETER, #70-1WD-1C2B	1	MS915281C2B	49956
1A5E4								SEAL, SWITCH BOOT	1	N1030B	97539
1A5E5								FUSEHOLDER, PANEL MOUNT	6	HKP	71400
1A5E6								FUSEHOLDER, LAMP INDICATING	3	HKL-X	71400
1A5F1								FUSE, 20 AMP, 125V	3	F03A125V20AS	75915
1A5F2								FUSE, 20 AMP, 125V	3	F03A125V20AS	75915
1A5F3								FUSE, 4 AMP, 250V	2	F02A250V4AS	75915
1A5J2								RECEPTACLE, 3 CONTACT FEMALE	1	7-8648	02660
1A5J3								CONNECTOR, BOX	1	MS3102R-14S5P	02660
1A5J4								CONNECTOR, BOX	1	MS3102R-14S2S	02660
1A5L1								CHOKE, SWINGING 44MH AT 0.7A	1	H109	80223
1A5M1								VOSTMETER, 0-50V RECT, TYPE (SPECIAL)	1	631-16120	77221
1A5M2								AMMETER, 0-1 AMP, MODEL 2531	1	MR36W001DCAAR	77221
1A5M3								AMMETER, 0-1 AMP, MODEL 2531	1	MR36W001DCAAR	77221
1A5MP1								DRAWER, CONTROL	1	205003	17151
1A5MP2								PANEL FRONT, CONTROL DRAWER	1	205011	17151
1A5MP3								PLATE, INSTRUCTION	2	205033	17151
1A5MP4								PLATE, ACTUATOR TABLES	1	205006	17151
1A5MP5								HANDLE, CONTROL DRAWER	2	H9115	71218
1A5MP6								SLIDE, DRAWER	2	C-3005-12	19178
1A5MP7								CATCH, DRAWER	2	205007	17151
1A5MP8								BRACKET, REEL	2	205004	17151
1A5MP9								BRACKET, RECTIFIER	1	205013	19151
1A5MP10								BRACKET, BLEEDER CIRCUIT	1	205030	17151
1A5MP11								PANEL, INSTRUMENT	1	205040	17151
1A5MP12								O-RING, SHFT SEAL, VARIAC	1	2-012	45681
1A5MP13								DIAL, VARIAC	1	205036	17151
1A5MP14								MARKERS, (SPARE FUSES) (F1, F2, F3) (M1, M2, M3)	1	205037	17151
1A5MP15								BRACKET, CAPACIOR	2	CL050SD23	05079
1A5MP16								PLATE, DIAL	2	380	72619
1A5MP17								STOP ADJ., VARIAC	1	205-045	17151
1A5MP18								LAMP 28V	1	1820	08805
1A5P1								PLUG, MALE, 3 CONTACT	1	7-8649	02660
1A5P3								PLUG, FEMALE, 5 PIN	1	MS3108R14S5S	02660

TABLE 5-2.

REFERENCE DESIGNATION	1	2	3	4	5	6	7	DESCRIPTION	NO REQ'D.	MFGR & VDR PART NUMBER	FED MFG. CODE
1A5P4								PLUG, MALE, 4 PIN	1	MS3106R14S2P	02660
1A5R1								RESISTOR, 5K OHMS, 1/2 WATT		RB52CE5000	91637
1A5R2								POTENTIOMETER, 10 OHMS, 25W	1	RP161FD-100JJ	24681
1A5R3								POTENTIOMETER, 10 OHMS, 25W	2	RP161FD-100JJ	24681
1A5R5								RESISTOR, 10 OHMS, 50W	1	RE75G10R0	91637
1A5R6								RESISTOR, 10 OHMS, 50W	1	RE75G10R0	91637
1A5R7								RESISTOR, 21.5 OHMS, 10W	1	RE65G21R5	91637
1A5R8								RESISTOR, POWER, FIXED	1	RE70G1001	91637
1A5S1								SWITCH, TOGGLE, DPST	1	MS35059-22	31356
1A5S2								SWITCH, TOGGLE, DPST	1	MS35059-22	31356
1A5S3								SWITCH, ROTARY	1	MS25002-4	27193
1A5T1								TRANSFORMER, POWER	1	NES4606	86632
1A5T2								TRANSFORMER, VARIAC 0-140V 2AMPS	1	W2	24655
1A5TB1								TERMINAL BOARD, 3 POSITION	1	38TB3	75382
1A5TB2								TERMINAL BOARD, 6 POSITION	1	37TB6	75382
1A5TB3								TERMINAL BOARD, 6 POSITION	1	37TB6	75382
1A5W1								CABLE, 120VAC LINE	1	205048	17151
1A5W3								CABLE, ACTUATOR COILS	1	205050	17151
1A5W4								CABLE, ACTUATOR TRANSDUCER	1	205051	17151
1A5W5								CABLE, FLOWMETER TURBINE	1	205039	17151
1A5A1								CIRCUIT, FLOWMETER READOUT	1	FM500AC	23231
1A5A1R25								POTENTIOMETER, 500 OHM 2W	1	RV4NAYS501A	44655
1A5A1S4								SWITCH, ROTARY, MINIATURE	1	PA6011	71590
1A6								FRAME, HYDRAULIC ACTUATOR TEST STAND	1	205005	17151
1A6MP1								PANEL, BACK	1	205015	17151
1A6MP2								PANEL SIDE	2	205012	17151
1A6MP3								PANEL, FILLER	1	205014	17151
1A6MP4								SPACER, HINGE	1	205029	17151
1A6MP5								GASKET, SIDE COVER	2	205022	17151
1A6MP6								GASKET, FRONT COVER	1	205023	17151
1A6MP7								PLATE, NUT	4	205043	17151
1A6MP8								BRACKET, EXTENSION	2	ZSP-005-98	19178
1A6MP9								FOOT LEVELING	4	L-0	01599



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Chief of Staff

Official:

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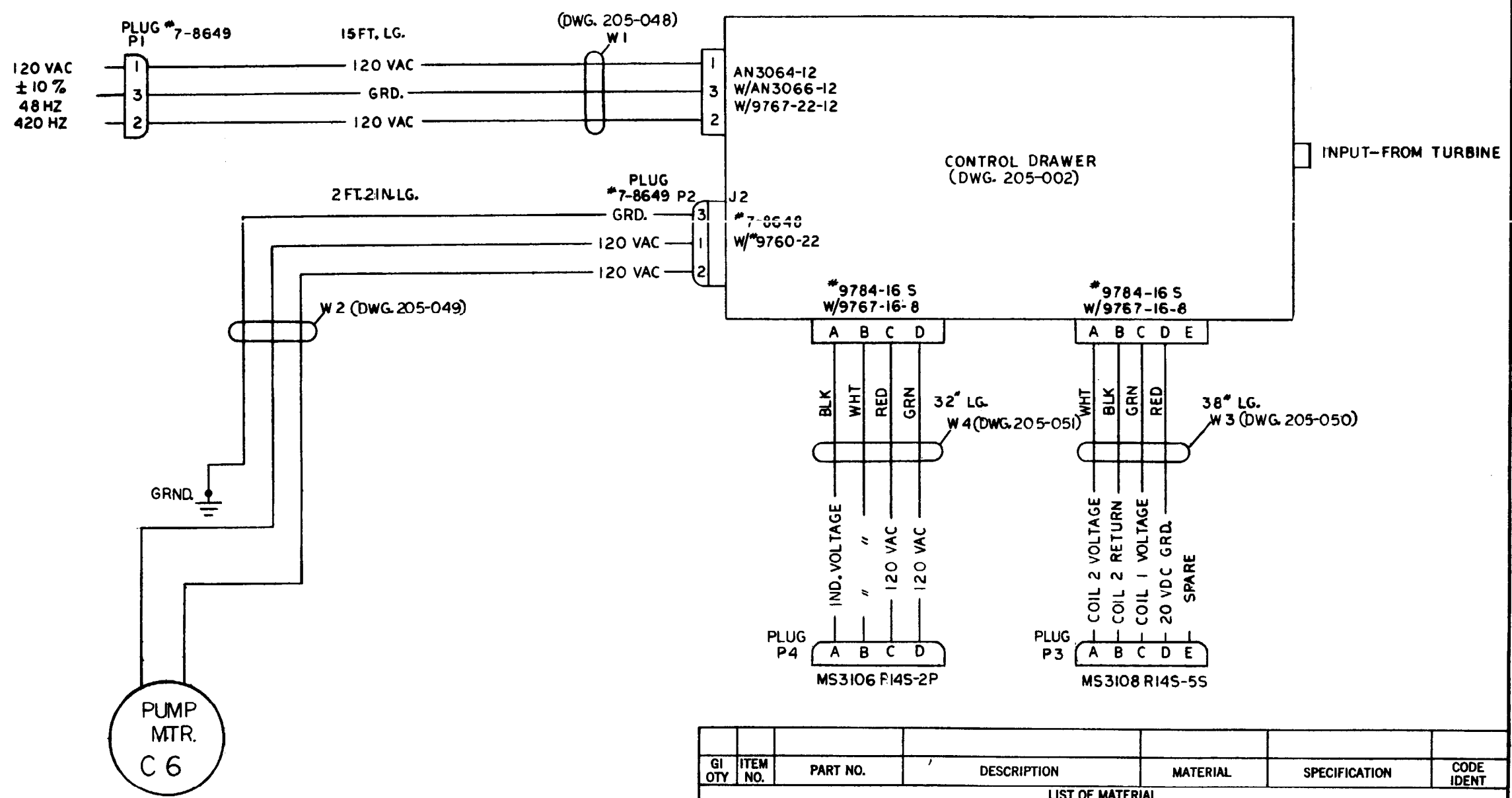
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	A	ADDED DWG. NOS., CHG'ND CABLE DW'GS., ETC.	1-8-71	M.W.M.



QTY	ITEM NO.	PART NO.	DESCRIPTION	MATERIAL	SPECIFICATION	CODE IDENT
LIST OF MATERIAL						
DIMENSIONS ARE IN INCHES TOLERANCES ON FRACTIONS DECIMALS ANGLES ± ± ±			CONTRACT ACTIVITY NO.		BARKLEY & DEXTER LABORATORIES INC. FITCHBURG, MASSACHUSETTS, 01420	
MATERIAL NOTED ON DWGS.			DRAFTSMAN RWB	DATE 9/69	DIAGRAM, INTERCONNECTION, ELECTRICAL, HYDRAULIC ACTUATOR TEST STAND	
TREATMENT			CHECKER M.W.M.	10/69		
			ENGINEER M.W.M.	10/69		
			APPROVED			
NEXT ASSY			DO NOT SCALE		SIZE C	CODE IDENT NO. 17151
USED ON					205-039	
APPLICATION					REV. A	
			SCALE		WT.	SHEET: / OF /

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