

CONTROL DATA[®] 6603 A-C
DISK SYSTEM

BRYANT SERIES 4000 DISK FILE

SERVICE HANDBOOK

CONTROL DATA
CORPORATION

CUSTOMER ENGINEERING MANUAL

CONTROL DATA[®] 6603 A-C DISK SYSTEM

BRYANT SERIES 4000 DISK FILE

SERVICE HANDBOOK

THIS MANUAL REPRINTED WITH PERMISSION
OF BRYANT COMPUTER PRODUCTS DIVISION
OF EX-CELLO CORPORATION

RECORD of REVISIONS

REVISION	NOTES
A (6-23-66)	Publication Change Order 13964, no Product Designation change. This edition obsoletes all previous editions. See page iv for list of effective pages.
B (10-6-66)	Publication Change Order 14955, no Product Designation change. Pages iv, ix, ixA/B, xiii, xiv, xv, 1-28, 2-20, 4-18, 5-81, 6-2, 6-4, 6-7, 6-65, 6-66, 6-67, 6-68, and 6-69 revised. Section 7 added.

Pub. No. 60127000
 October, 1966
 Copyright 1966 by Ex-Cell-O Corporation
 All Rights Reserved
 Printed in the United States of America

Address comments concerning this manual to:
 Control Data Corporation
 Technical Publications Department
 4201 North Lexington Avenue
 St. Paul, Minnesota 55112
 or use Comment Sheet in back of this manual.

PREFACE

This manual is reprinted with permission of Bryant Computer Products Division of Ex-Cell-O Corporation and is based on their manual BCPH-110-6-66. Certain modifications to the 4000 Series Disk File for use in Control Data 6603 Disk Systems are not detailed herein.

Ex-Cell-O Corporation in publishing this Service Handbook and its associated data assumes no responsibility for any patent or other rights of a third party and no license is granted by implication, or otherwise, under any patent, patent rights or proprietary rights of Ex-Cell-O Corporation.

Copyright 1966 by Ex-Cell-O Corporation. All rights reserved.

Publication No. BCPH-110-6-66
First Printing June 15, 1966

FOREWORD

This Service Handbook contains information for the guidance of personnel responsible for the installation, operation and maintenance of Model 1 Series 4000 Disc Files manufactured by Bryant Computer Products — a Division of Ex-Cell-O Corporation — 850 Ladd Road, Walled Lake, Michigan, 48088.

It is assumed that personnel responsible for the performance of the procedures contained herein are familiar with the operation and maintenance of high-precision electro/hydraulic/mechanical equipment. Appendices at the back of this handbook provide data pertinent to the specific file purchased by the customer.

CHANGE PAGE

This Service Handbook is subject to change as additional information becomes available and as engineering improvements are incorporated into production equipment.

LIST OF EFFECTIVE PAGES

Insert Latest Change Pages.
Destroy Superseded Pages.

Page	Issue
i through iii	Original
iv	9-15-66
v through viii	Original
ix	9-15-66
ix A/B (added)	9-15-66
x through xii	Original
xiii through xv	9-15-66
xvi	Original
1-1 through 1-27	Original
1-28	9-15-66
1-29 through 1-32	Original
2-1 through 2-19	Original
2-20	9-15-66
2-21 through 2-26	Original
3-1 through 3-18	Original
4-1 through 4-17	Original
4-18	9-15-66
4-19 through 4-28	Original
5-1 through 5-80	Original
5-81	9-15-66
5-82 through 5-84	Original
6-1	Original
6-2	9-15-66
6-3	Original
6-4	9-15-66
6-5 through 6-6	Original
6-7	9-15-66
6-8 through 6-64	Original
6-65 and 6-66	9-15-66
6-67 through 6-70 (added)	9-15-66
7-1 through 7-81 (added)	9-15-66

TABLE OF CONTENTS

Paragraph		Page
	TITLE PAGE	i
	FOREWORD	iii
	CHANGE PAGE	iv
	TABLE OF CONTENTS	v
	LIST OF ILLUSTRATIONS	ix
	LIST OF TABLES	xiv

SECTION 1

DESCRIPTION

1-1	Introduction	1-1
1-2	Description	1-1
1-2-1	B- and C-Frame Disc Files	1-1
1-2-2	A-Frame Disc File	1-23
1-3	Characteristics and Requirements	1-23
1-3-1	Physical Characteristics	1-23
1-3-2	Environmental Requirements	1-26
1-3-3	Power Requirements	1-27
1-3-4	Recording Characteristics	1-27

SECTION 2

RECEIVING, STORAGE OR INSTALLATION, AND SHIPPING INSTRUCTIONS

2-1	Introduction	2-1
2-1-1	Personnel Qualifications	2-1
2-1-2	Special Tools and Accessories Supplied	2-1
2-1-3	Special Equipment Recommended But Not Supplied	2-3
2-2	Special Receiving Instructions	2-3
2-3	Storage Instructions	2-5
2-4	Installation Instructions	2-6
2-4-1	Procedures	2-6
2-4-2	Checks	2-19
2-5	Preparation For Shipment Or Extended Storage	2-20
2-5-1	A-Frame Files	2-21

TABLE OF CONTENTS (Cont.)

Paragraph		Page
2-5-2	B- and C-Frame Files	2-23
2-6	Special Shipping Instructions	2-26

SECTION 3

OPERATING INSTRUCTIONS

3-1	Introduction	3-1
3-2	Controls and Indicators	3-1
3-2-1	Pushbutton Station Assembly	3-1
3-2-2	Accumulator Manifold Assembly	3-5
3-2-3	Power Control Panel	3-7
3-2-4	Hydraulic Power Supply	3-9
3-2-5	Solenoid Driver Power Supply	3-9
3-3	Procedures	3-11
3-3-1	Automatic Operation	3-11
3-3-2	Manual Operation	3-14

SECTION 4

PRINCIPLES OF OPERATION

4-1	Introduction	4-1
4-2	General Over-All System Operation	4-1
4-2-1	Automatic Operation	4-1
4-2-2	Manual Operation	4-3
4-3	Starting Control System	4-3
4-3-1	Automatic Operating Mode	4-3
4-3-2	Manual Operating Mode	4-12
4-4	Hydraulic System	4-18
4-4-1	Disc File Operating in Automatic Mode	4-18
4-4-2	Disc File Operating in Manual Mode	4-21
4-5	Data Head Positioning System	4-23
4-5-1	Seven-Bit Input Character	4-23
4-5-2	Solenoid Driver Power Supply	4-23
4-5-3	Digital Actuator/Boost Assembly	4-25
4-6	Write/Read Enable System	4-25
4-6-1	Head Selection	4-25
4-6-2	Write Enable	4-27
4-6-3	Read Enable	4-27
4-7	Bits of Data	4-27

TABLE OF CONTENTS (Cont.)

Paragraph		Page
SECTION 5		
PREVENTIVE MAINTENANCE		
5-1	Introduction	5-1
5-1-1	Personnel Qualifications	5-1
5-1-2	Maintenance Philosophy	5-1
5-1-3	Preventive Maintenance Performance Schedule	5-1
5-1-4	General Warnings and Cautions	5-3
5-2	Daily Procedures	5-4
5-2-1	General Inspection	5-4
5-2-2	Hydraulic System Pressure and Fluid Level Check	5-5
5-2-3	Disc Motor R.P.M. Check	5-8
5-2-4	Disc Buffing	5-8
5-2-5	Disc File Automatic Turn-On Check	5-12
5-3	Weekly Procedures	5-12
5-3-1	Boost Pin Lubrication	5-12
5-3-2	Digital Actuator/Boost Boot Inspection	5-13
5-4	Monthly Procedures	5-13
5-4-1	Oilite Bearing Lubrication	5-13
5-4-2	Disc Motor Drive Belt Check	5-16
5-4-3	Hydraulic Fluid Contamination Level Check	5-17
5-5	Semi-Annual Procedures	5-20
5-5-1	Filler Breather Cap and Strainer Cleaning	5-20
5-6	Annual Procedures	5-22
5-6-1	Hydraulic Power Supply Reservoir and Magnetic Strainer	5-22
5-6-2	Hydraulic Motor/Gear Pump Lubrication	5-26
5-6-3	Hydraulic Power Supply 1/2 Micron Filter, Radiator Fan and Auxiliary Compartment	5-27
5-6-4	10-Micron Filter	5-31
5-6-5	20-Micron Filter	5-35
5-6-6	5-Micron Filter	5-39
5-7	Biennial Procedures	5-42
5-7-1	Hydraulic Power Supply Hose Replacement	5-42
5-7-2	Boost Hose Replacement	5-50
5-7-3	Accumulator, Pressure Gage Adapter, and Pressure Gage Replacement	5-52
5-8	Site Determined Preventive Maintenance Intervals	5-58
5-8-1	Inspecting Access Panel Air Filters	5-58
5-8-2	Disc Cleaning	5-61
5-8-3	Head Pad Cleaning	5-65
5-8-4	Over-All Inspection	5-68

TABLE OF CONTENTS (Cont.)

Paragraph		Page
5-9	As Required Procedures	5-70
5-9-1	Filling Hydraulic Power Supply Reservoir	5-70
5-9-2	Hydraulic System Purging	5-71
5-9-3	Charging Accumulators	5-78
5-9-4	Data Head Bar Retraction and Insertion	5-80

SECTION 6

CORRECTIVE MAINTENANCE

6-1	Introduction	6-1
6-1-1	Personnel Qualifications	6-1
6-1-2	Maintenance Philosophy	6-1
6-1-3	Corrective Maintenance Performance Schedule	6-1
6-1-4	General Warnings and Cautions	6-2
6-2	Solenoid Driver Power Supply	6-3
6-2-1	Special Equipment Required	6-4
6-2-2	Removal and Installation Procedures	6-4
6-2-3	Adjustment Procedure	6-5
6-3	Reservoir Fluid Level Sight Gage O-Rings	6-9
6-3-1	Special Equipment Required	6-9
6-3-2	Replacement Procedures	6-9
6-4	Head and Positioner Valve Assemblies A15S1 and A15S3	6-9
6-4-1	Special Equipment required	6-9
6-4-2	Electrical Solenoid Replacement	6-11
6-4-3	O-Ring Replacement	6-11
6-4-4	Valve Assembly Replacement	6-13
6-5	Duplex Pressure Switch A15S2	6-13
6-5-1	Special Equipment Required	6-13
6-5-2	Replacement Procedure	6-14
6-5-3	Adjustment Procedure	6-14
6-6	Tachometer/Temperature Meter Box and Temperature Probe	6-15
6-6-1	Special Equipment Required	6-17
6-6-2	Replacement Procedure	6-17
6-6-3	Adjustment Procedure	6-19
6-7	Tachometer Probe	6-21
6-7-1	Special Equipment Required	6-21
6-7-2	Replacement Procedure	6-21
6-7-3	Adjustment Procedure	6-23

TABLE OF CONTENTS (Cont.)

7-3-3	Storage Instructions	7-10
7-3-4	Installation Instructions	7-10
7-3-5	Preparation for Shipment or Extended Storage	7-23
7-4	Operating Instructions	7-27
7-4-1	Controls and Indicators	7-27
7-4-2	Procedure	7-34
7-5	Principles of Operation	7-35
7-5-1	General Over-All System Operation	7-35
7-5-2	Starting Control System	7-37
7-5-3	Environmental Control System	7-45
7-5-4	Hydraulic System	7-52
7-5-5	Data Head Positioning System and Write/Read Enable System	7-52
7-6	Preventive Maintenance	7-52
7-6-1	Daily Procedures	7-55
7-6-2	Weekly Procedures	7-58
7-6-3	Monthly Procedures	7-58
7-6-4	Semi-Annual	7-61
7-6-5	Annual	7-63
7-6-6	Biennial Procedures	7-67
7-6-7	Site-Determined Preventive Maintenance Intervals	7-70
7-6-8	As Required Procedures	7-72
7-7	Corrective Maintenance	7-74
7-7-1	Dual Level Float Switch	7-76
7-7-2	Leak Pump	7-77
7-7-3	Accumulator Charge/Monitor Lines and Boost Pin Lubrication Lines	7-78
7-7-4	ECU Refrigeration Unit	7-80

LIST OF ILLUSTRATIONS

SECTION 1 DESCRIPTION

Figure	Description	Page
1-1	Bryant Model 1, Series 4000 Disc File Configurations	xvi
1-2	Model 1, Series 4000B Disc File, Front View	1-2
1-3	Disc File Cabinet Assembly, Front Interior View — Location of Major Components	1-2
1-4	Pushbutton Station Assembly A11, Interior View — Location of Connectors and Tachometer/Temperature Meter Box	1-4
1-5	Disc File Cabinet Assembly, Front Interior View — Location of Major Components of Pedestal Assembly A15	1-4
1-6	Disc Motor, Disc Spindle Assembly, and Rocker Arm Support — Installed Configuration in Forming Pedestal Assembly	1-6

TABLE OF CONTENTS (Cont.)

Paragraph		Page
6-8	Disc Motor Drive Belts	6-24
6-8-1	Special Equipment Required	6-24
6-8-2	Replacement Procedures	6-25
6-8-3	Adjustment Procedures	6-26
6-9	Positioning System	6-26
6-9-1	Breakaway Pressure Test	6-27
6-9-2	Positioning System Time Test	6-31
6-9-3	Variable Orifice Adjustment	6-34
6-9-4	Friction Clamp Adjustment	6-36
6-9-5	Positioning Repeatability Test	6-38
6-10	Head Bar Assemblies	6-40
6-10-1	Data Head Bar Assembly	6-40
6-10-2	Clock Head Bar Assembly	6-47
6-10-3	Head Pad Adjustment	6-51
6-11	Disc Assemblies	6-56
6-11-1	Special Equipment Required	6-56
6-11-2	Replacement Procedures	6-57
6-12	Access Panels	6-65
6-13	Hydraulic Oil Low Level, Over-Temperature, and High Pressure Switches	6-65
6-13-1	Special Equipment Required	6-65
6-13-2	Hydraulic Oil Low Level Switch	6-66
6-13-3	Hydraulic Fluid Over-Temperature Switch	6-67
6-13-4	Hydraulic High Pressure Switch	6-67
6-14	Miscellaneous Electro/Hydraulic Components	6-69
6-14-1	Electric Motors	6-69
6-14-2	Electrical Components	6-69
6-14-3	Hydraulic Components	6-69

SECTION 7

MODEL 1, SERIES 4000 DISC FILES WITH 2-TON ENVIRONMENTAL CONTROL UNITS

7-1	Introduction	7-1
7-2	Description	7-1
7-2-1	B- and C-Frame Disc File Modifications	7-1
7-2-2	A-Frame Disc File Modifications	7-5
7-2-3	Environmental Control Unit Cabinet Assembly	7-7
7-3	Receiving, Storage or Installation, and Shipping Instructions	7-7
7-3-1	General	7-7
7-3-2	Special Receiving Instructions	7-10

LIST OF ILLUSTRATIONS (Cont.)

Figure		Page
1-7	Disc Spindle Assembly, Front Interior View – Installed View of Disc RPM Probe A15AG1	1-6
1-8	Disc File Cabinet Assembly, Front Interior View – Identification of Nameplates	1-6
1-9	Disc File Cabinet Assembly, Rear Center Interior View – Location of Major Components of Pedestal Assembly A15	1-7
1-10	Digital Actuator/Boost Assembly, Component Locations	1-10
1-11	Digital Actuator Variable Orifice Valve – Locational View	1-11
1-12	Digital Actuator/Boost Assembly, Installed View of Boost without Boots	1-11
1-13	Disc File Cabinet Assembly – Right Rear Interior View – Location of Leak Bottle	1-12
1-14	Rocker Arm Support – Identification of Major Components	1-12
1-15	Accumulator Manifold Assembly, Identification of Major Components	1-14
1-16	Accumulator Manifold Assembly – Identification of Nameplates	1-15
1-17	Power Control Unit Cabinet Assembly, Front Interior View – Location of Major Components	1-15
1-18	Power Control Panel, Interior View – Location of Major Components	1-16
1-19	Power Control Unit Cabinet Assembly, Interior Rear View – General Location of Major Components	1-18
1-20	Power Control Unit Cabinet Assembly, Side Interior View – Location of Major Components in Lower Compartment of Hydraulic Power Supply	1-20
1-21	Hydraulic Power Supply Reservoir – Location of Major Components	1-20
1-22	Hydraulic Power Supply Auxiliary Compartment – Location of Major Components	1-21
1-23	Solenoid Driver Power Supply, Top View – Location of Major Components	1-21
1-24	Model 1 Series 4000A Disc File, Front Interior View – Location of Major Components	1-22
1-25	Model 1 Series 4000A Disc File, Rear Interior View – Location of Major Components	1-24
1-26	Model 1 Series 4000A Disc File, View of Major Components in Lower Compartment of Hydraulic Power Supply	1-25
1-27	Model 1 Series 4000 Disc Files with 208-Volt Three-Phase Motors – Total Number of Discs Vs. Running Current	1-28
1-28	Model 1 Series 4000 Disc Files with 440-Volt, Three-Phase Motors – Total Number of Discs Vs. Running Current	1-28
1-29	Model 1 Series 4000 Disc Files with 208/440 Volt, Three-Phase Motors – Total Number of Discs Vs. Heat Dissipated	1-29
1-30	Model 1 Series 4000 Disc File – Disc Zones Vs. Track Capacity	1-29

LIST OF ILLUSTRATIONS (Cont.)

Figure		Page
SECTION 2		
RECEIVING, STORAGE OR INSTALLATION, AND SHIPPING INSTRUCTIONS		
2-1	Model 1 Series 4000B Disc File Sealed for Shipment – Typical Sealing of All Files	2-4
2-2	Model 1 Series 4000B Disc File Cabinet Assembly, Front View Showing Interior Packing – Typical of All Files	2-4
2-3	Dimensional Locations of Ducts in Base of A-Frame File	2-8
2-4	Leveling Pad of Disc File Cabinet in the Shipping Position	2-8
2-5	Leveling Pad of Disc File Cabinet in the Operating Position	2-8
2-6	Dimensional Location of Ducts in Base of B- and C-Frame Files	2-10
2-7	Power Control Unit Cabinet Assembly, Front View Showing Interior Packing	2-12
2-8	Power Control Panel – Customer and B- or C-Frame Disc File Inter-connecting Cables	2-14
2-9	Electrical Cables Entering Disc File Cabinet Through Rear Duct	2-15
2-10	Routing of Cable to Pushbutton Station Through Cable Clamp	2-15
2-11	Power Control Unit – Routing of Electrical Cable and Hydraulic Lines Through Side Duct	2-16
2-12	Hydraulic Hoses Entering Disc File Cabinet Through Rear Duct and Connected to Accumulator Manifold Assembly	2-18
SECTION 3		
OPERATING INSTRUCTIONS		
3-1	Pushbutton Station Assembly, Front Panel View – Identification of Normal Operating Controls and Indicators	3-2
3-2	Accumulator Manifold Assembly – Normal Operating Indicators	3-6
3-3	Power Control Panel, Front View – Identification of Normal Operating Controls and Indicators	3-8
3-4	Power Control Panel, Front Interior View – Identification of Normal Operating Controls	3-8
3-5	Hydraulic Power Supply – Identification of Normal Operating Controls and Indicators	3-10
3-6	Solenoid Driver Power Supply – Identification of Normal Operating Controls	3-10

LIST OF ILLUSTRATIONS (Cont.)

Figure		Page
SECTION 4		
PRINCIPLES OF OPERATION		
4-1	Model 1 Series 4000 Disc Files Without ECU – Functional Block Diagram Depicting Operating Modes	4-2
4-2	Model 1 Series 4000 Disc File without ECU, Starting Control System – Schematic Diagram	4-5
4-3	Model 1 Series 4000 Disc File without ECU, Hydraulic System – Schematic Diagram	4-19
4-4	Digital Actuator Solenoid Selection Circuits – Logic Diagram	4-22
4-5	Write/Read Head – Simplified Sectional Diagram	4-24
4-6	Typical Waveforms of Some of the Methods of Magnetic Recording	4-26
4-7	Recorded Data – An Example of a Typical Bit of Information	4-28
SECTION 5		
PREVENTIVE MAINTENANCE		
5-1	Covering Paddle End of a Typical Cleaning Tool – Surgical Gauze Application Not Shown	5-10
5-2	Cleaning Disc Surfaces Using Properly Prepared Cleaning Tool	5-10
5-3	Boost Pin Grease Fittings – Locational View	5-14
5-4	Rocker Arm Shaft Oilite Bearing Lubrication Fittings – Locational View	5-15
5-5	Hydraulic Power Supply, Top View – Solenoid Driver Power Supply and Compartment Bottom Plate Removed	5-24
5-6	Hydraulic Power Supply – Motor/Gear Pump Installation Details	5-28
5-7	B- and C-Frame Disc File Accumulator Manifold Assembly – Installation Details of Lower Components	5-34
5-8	Accumulator Manifold Assembly – 20-Micron Filter Installation Details	5-36
5-9	A-Frame Disc File Accumulator Manifold Assembly – Installation Details of Lower Components	5-38
5-10	5-Micron Filter – Installation Details	5-40
5-11	A-Frame File Power Supply Compartment – Pressure and Return Hose Installation Details	5-44
5-12	Coupler Body – Sectional View Showing Location of O-Rings	5-44
5-13	Coupler Nipple – Sectional View Showing Location of O-Ring	5-44
5-14	B- or C-Frame File Power Supply Compartment – Pressure and Return Hose Installation Details	5-48

LIST OF ILLUSTRATIONS (Cont.)

Figure		Page
5-15	Accumulator Manifold Assembly, Accumulator, Pressure Gage Adapter, and Pressure Gage — Installation Details	5-54
5-16	Access Panel Air Filter Shown Being Removed	5-60
5-17	Cleaning Data Head Pads	5-66
5-18	Cleaning Clock Head Pads	5-66
5-19	Purging Unit Connected into Return Line of Hydraulic System	5-72
5-20	Head Bars Retracted From Disc File	5-82

SECTION 6

CORRECTIVE MAINTENANCE

6-1	Solenoid Driver Power Supply, Top View — Adjustment and Test Points	6-6
6-2	Accumulator Manifold Assembly, Interior View of Junction Box and Solenoid — Wiring and Adjustment Points	6-10
6-3	Head or Positioner Valve Assembly A15S1 or A15S3, Exploded View	6-12
6-4	Duplex Pressure Switch A15S2, Wiring Connections Within Junction Box of Accumulator Manifold Assembly	6-12
6-5	Hydraulic Power Supply — Location of Relief Valve Output Pressure Adjustment	6-16
6-6	Tachometer/Temperature Meter Box, Rear View — Adjustment Points	6-16
6-7	Tachometer/Temperature Meter Box, Interior View — Location of Mounting Hardware	6-18
6-8	Disc Motor Compartment, Interior View — Adjustment Point	6-22
6-9	Tachometer Probe — Location of Mounting Hardware	6-22
6-10	Positioning Time Chart	6-30
6-11	Data Head Bar Assembly Removed from Rocker Arm	6-42
6-12	Using Head Adjustment Tool to Adjust Head Pad	6-44
6-13	Clock Head Bar Installed in File	6-48
6-14	Location for Performing Installation Check of a Disc Nearest Pedestal — Typical of Either Side of Pedestal	6-58
6-15	Installation of a Disc Nearest Pedestal — Hardware Required	6-62

SECTION 7

MODEL 1, SERIES 4000 DISC FILES WITH 2-TON ENVIRONMENTAL CONTROL UNITS

7-1	Model 1, Series 4000 Disc File with ECU Installed, Front View	7-2
7-2	ECU Separated From Rear of Disc File Cabinet Assembly	7-2
7-3	Disc File Cabinet Assembly Modifications to Accommodate ECU Installation	7-3
7-4	Power Control Unit Cabinet Assembly — Installed View of ECU Power and Control Cable	7-4

LIST OF ILLUSTRATIONS (Cont.)

Figure		Page
7-5	ECU Cabinet Assembly Component Location, Front View — Access Panels Installed	7-4
7-6	ECU Cabinet Assembly, Rear View — Access Panels Installed	7-6
7-7	ECU Cabinet Assembly Component Location, Rear View — Access Panels Removed	7-6
7-8	ECU Component Location, Rear View — Compartment Covers Removed	7-8
7-9	ECU Refrigeration Unit Component Location, Rear View	7-8
7-10	ECU Refrigeration Unit Component Location, Front View	7-9
7-11	Disc File Cabinet Assembly Showing Internal Packaging, Rear View	7-12
7-12	ECU Cabinet Assembly Packaged for Shipment	7-12
7-13	ECU Cabinet Assembly Showing Interior Packaging, Front View	7-13
7-14	ECU to Disc File Cabinet Assembly Interconnecting Lines and Cables	7-14
7-15	Securing ECU Cabinet Assembly to Disc File Cabinet Assembly	7-16
7-16	ECU Maintenance Panel, Front View — Identification of Controls and Indicators	7-22
7-17	Rear of a Model 1, Series 4000 Disc File Cabinet Assembly Prepared for Shipment	7-28
7-18	ECU Blower Compartment, Partial Interior View — Identification of Controls	7-30
7-19	Model 1 Series 4000 Disc File with ECU — Functional Block Diagram Depicting Operating Modes	7-36
7-20	Model 1 Series 4000 Disc File with ECU, Starting Control System — Schematic Diagram	7-39
7-21	Environmental Control System, Open Loop Operation — Simplified Air Flow Diagram	7-46
7-22	Environmental Control System, Closed Loop Operation — Simplified Air Flow Diagram	7-46
7-23	Environmental Control System, Refrigerant Flow Diagram	7-48
7-24	Hot Gas By-pass Valve, Sectional View — Refrigerant Flow Path	7-50
7-25	Expansion Valve, Simplified Diagram Showing Control Paths	7-50
7-26	Model 1 Series 4000 Disc File With ECU, Hydraulic System — Schematic Diagram	7-53
7-27	ECU Maintenance Panel, Rear View Showing Connections	7-66

LIST OF TABLES

Table	DESCRIPTION	Page
SECTION 1		
1-1	Physical Characteristics	1-23
1-2	Environmental Requirements	1-26
SECTION 2		
RECEIVING, STORAGE OR INSTALLATION AND SHIPPING INSTRUCTIONS		
2-1	Special Tools and Accessories Supplied With All Standard Bryant Disc Files	2-1
2-2	Additional Special Tools and Accessories Supplied With Standard B- and C-Frame Disc Files	2-2
2-3	Special Equipment Recommended But Not Supplied	2-3

LIST OF TABLES (Cont.)

SECTION 3

OPERATING INSTRUCTIONS

3-1	Pushbutton Station Assembly — Function of Controls and Indicators	3-1
3-2	Power Control Panel — Function of Controls and Indicators	3-7
3-3	Hydraulic Power Supply — Function of Controls and Indicators	3-9

SECTION 5

PREVENTIVE MAINTENANCE

5-1	Preventive Maintenance Schedule	5-2
5-2	Contamination Level Limits	5-20

SECTION 6

CORRECTIVE MAINTENANCE

6-1	Corrective Maintenance Schedule	6-2
6-2	Comparison of Static Playback With Positioning System Repeatability Playback	6-39
6-3	Positioning System Repeatability Playback	6-39
6-4	Initial Data Head Pad Adjustments	6-53
6-5	Initial Clock Head Pad Adjustments	6-54
6-6	Data Head Pads — Permissible Additional CW Adjustments	6-55
6-7	Clock Head Pads — Permissible Additional CW Adjustments	6-56

SECTION 7

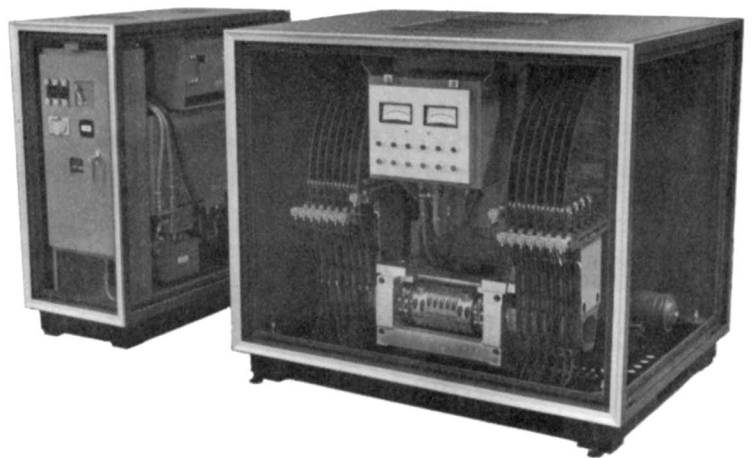
MODEL 1, SERIES 4000 DISC FILES WITH 2-TON

ENVIRONMENTAL CONTROL UNITS

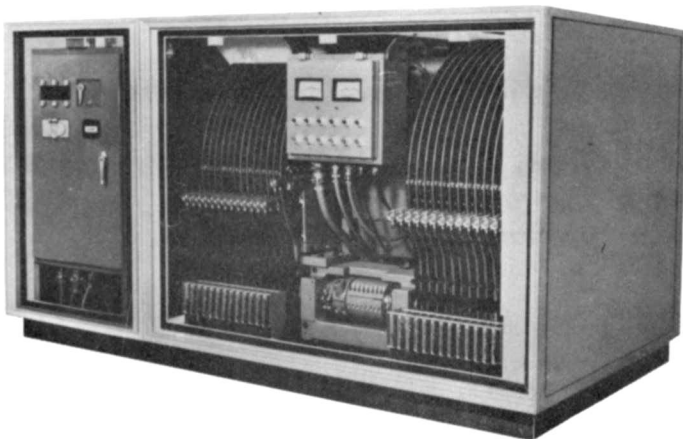
7-1	Additional Special Tools and Accessories Supplied with ECU Equipped Disc Files	7-10
7-2	ECU Maintenance Panel — Function of Gages, Fittings and Indicators	7-29
7-3	ECU Blower Compartment — Function of Controls	7-32
7-4	Special ECU Controls and Indicators — Functional Data (To Be Used For Reference Only)	7-32
7-5	Preventive Maintenance Schedule	7-55
7-6	Corrective Maintenance Procedures	7-75



A-FRAME DISC FILE



B-FRAME DISC FILE



C-FRAME DISC FILE

Figure 1-1 Bryant Model 1 Series 4000 Disc File Configurations

SECTION 1

DESCRIPTION

1-1 INTRODUCTION

This service handbook contains the information required to operate and maintain a standard Bryant Computer Products' Model 1 Series 4000 Disc File without, or with, an environmental control unit (ECU). Individual sections are devoted to disc files without ECUs. These sections include a general description; receiving, storage or installation, and shipping instructions; operating instructions; principles of operation; preventive maintenance instructions; and corrective maintenance instructions. Similar coverage is provided in separate sections of this handbook for disc files with ECUs; however, the information of these separate sections is prepared in a manner that only delineates differences, where applicable, in the overall information included for a disc file without an ECU. Also included are appendices covering specific data for the purchased file; for example, power input requirements, disc motor speed, special control requirements, etc. Though the appendices are furnished to add to the flexibility of this handbook, it must be realized that information is furnished relative to only a standard disc file. If a Bryant option – for example, the purchase of a Bryant electronics interface option – is selected, maintenance information for the interface can be provided. However, due to the complexity – or nature – of this type of equipment, such information would have to be incorporated in a separate, specially prepared volume.

1-2 GENERAL DESCRIPTION

The Model 1 Series 4000 Disc File is a modular, random access, mass memory storage device designed to store and retrieve digital computer data sequentially or randomly. Storage is accomplished by magnetically coupling data from digitally positionable write/read heads onto the surfaces of rotating magnetic oxide coated discs mounted within a disc file cabinet assembly. There are three basic disc file configurations available. These are designated A-, B-, and C-frame (see Figure 1-1). In the case of an A-frame file, only one cabinet is utilized. In the case the B- and C-frame files, there are two cabinets, namely the disc file cabinet assembly and the power control unit cabinet assembly. Though the cabinets of the latter disc file configurations are physically separated from each other, the cabinets are interconnected by cables and hydraulic hoses. Though only consisting of one cabinet, the components that make up the A-frame disc file are essentially the same as those making up the two cabinet file configurations. For this reason and because of the convenience of the two cabinet configuration to delineate the partitioning of components of the A-frame disc file, the following description of the disc files first considers the two cabinet configurations followed by the single cabinet configuration.

1-2-1 B- AND C-FRAME DISC FILES – Except for the number of discs and related elements that can be accommodated within the disc file cabinet assembly, the B-frame disc file (see Figure 1-2) and C-frame disc file are both exactly identical. In the case of the B-frame disc file, as many as one to 14 discs can be accommodated. In the case of the C-frame disc file, as many as one to 26 discs can be accommodated. In either case, the quantity of discs

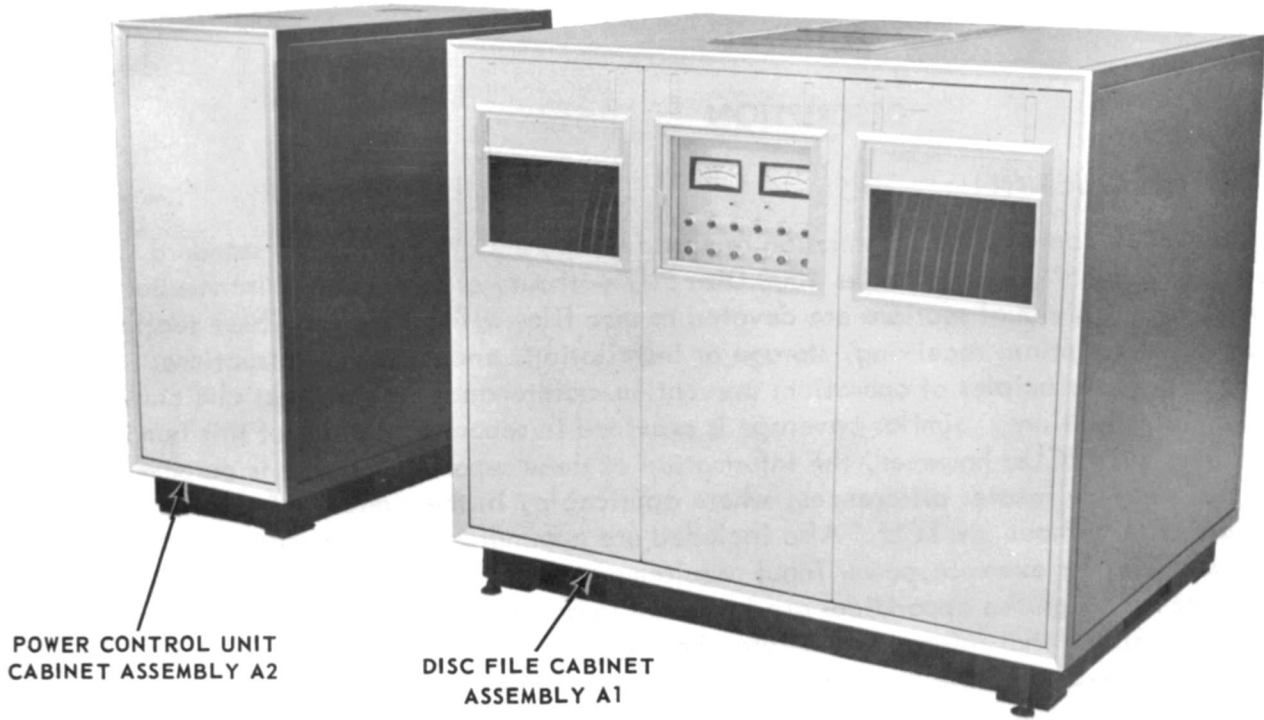


Figure 1-2 Model 1, Series 4000B Disc File, Front View

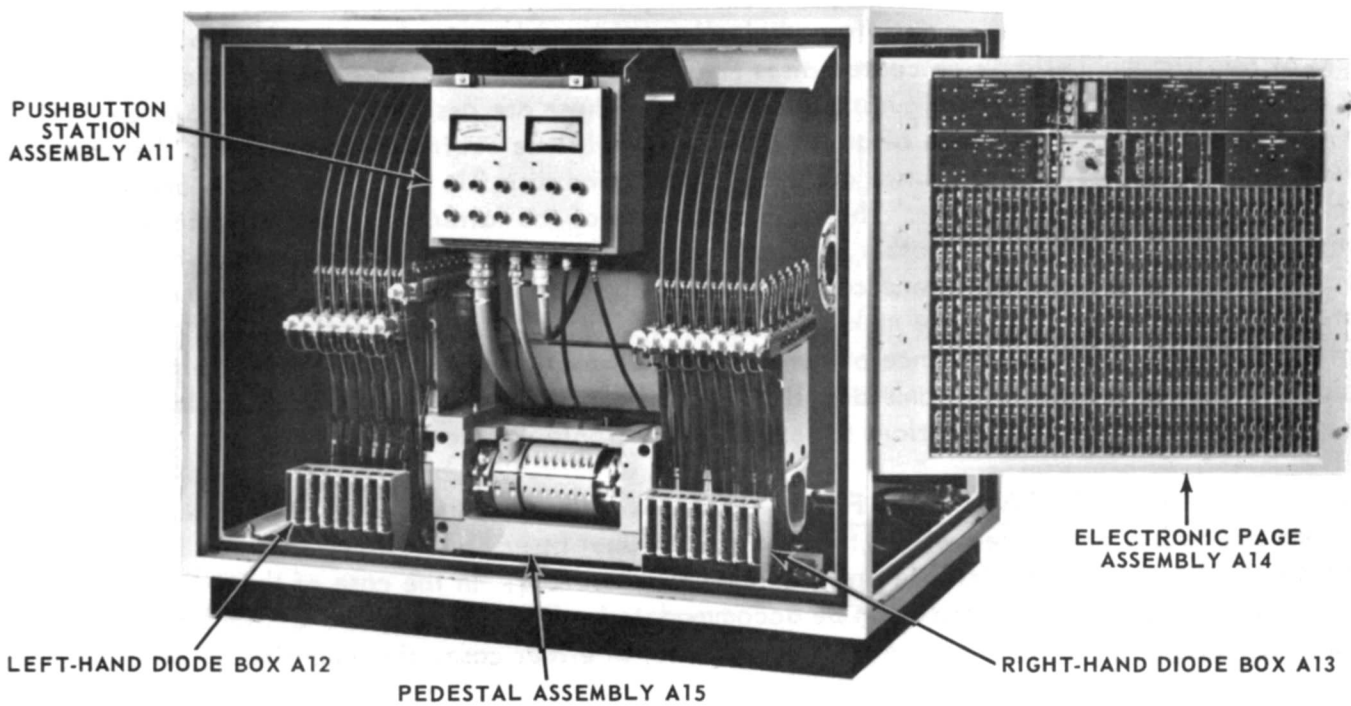


Figure 1-3 Disc File Cabinet Assembly, Front Interior View—Location of Major Components

1-2-1 B- AND C-FRAME DISC FILES (Cont.)

furnished with a specific disc file configuration will depend on the customers' needs, which — of course — are directly related to his data storage capacity requirements. Because both the B- and C-frame disc files are identical, the following description generally applies to either file. Delineation of one file from the other is made only where necessary.

1-2-1-1 Disc File Cabinet Assembly — The disc file cabinet assembly is generally divided into five major areas (see Figure 1-3). Included in the cabinet are the elements that enable the storing and retrieval of digital computer data. Removable front, rear, side and top access panels enable access to the components mounted within the cabinet.

NOTE

The electronic page, A-14, is not included as a part of the standard file and is therefore not discussed in this handbook. The diode boxes, A-12 and A-13, are furnished as a part of the standard file if so desired by the customer. These boxes enable central interconnection of data from the computer to the storage positions of the file.

a. Pushbutton Station Assembly — The pushbutton station assembly (see Figure 1-3) contains, with the exception of a main input power circuit breaker mounted on a power control panel of the power control unit cabinet assembly (see Figure 1-2), all the controls necessary to normally operate the disc file locally in either automatic or manual mode; these controls are functionally described in Sections 3 and 4. In addition, a tachometer/temperature meter box is mounted within the pushbutton station assembly (see Figure 1-4). The function of the tachometer/temperature meter circuits, which are connected by cables to a temperature probe and a disc rpm probe, is to enable continuous automatic monitoring of disc file cabinet temperature and disc motor speed. Through logic circuits within the box, a sensed over/under cabinet temperature condition and/or over/under disc motor speed condition can be used to automatically inhibit disc file operation.

NOTE

Unless otherwise specified, all subsequent components make up the pedestal assembly of the disc file (see Figure 1-3).

b. Disc Motor — The disc motor, which is mounted in the disc motor compartment (see Figure 1-5), forms the top of the pedestal assembly (see Figure 1-6). The motor compartment, which is insulated in order to prevent the heat of the motor from entering the disc sections of the file cabinet, is vented to atmospheric air through a louvered access panel that is installed on the upper, center section of the cabinet. A 5 hp and 10 hp motor — both types rated for 208/440 volt, three-phase, 50/60 cycle, three-wire operation — are required for 900 rpm and 1200 rpm disc files, respectively. A sheave of the motor is connected through a group of drive belts to a sheave mounted on a spindle of the disc spindle assembly.

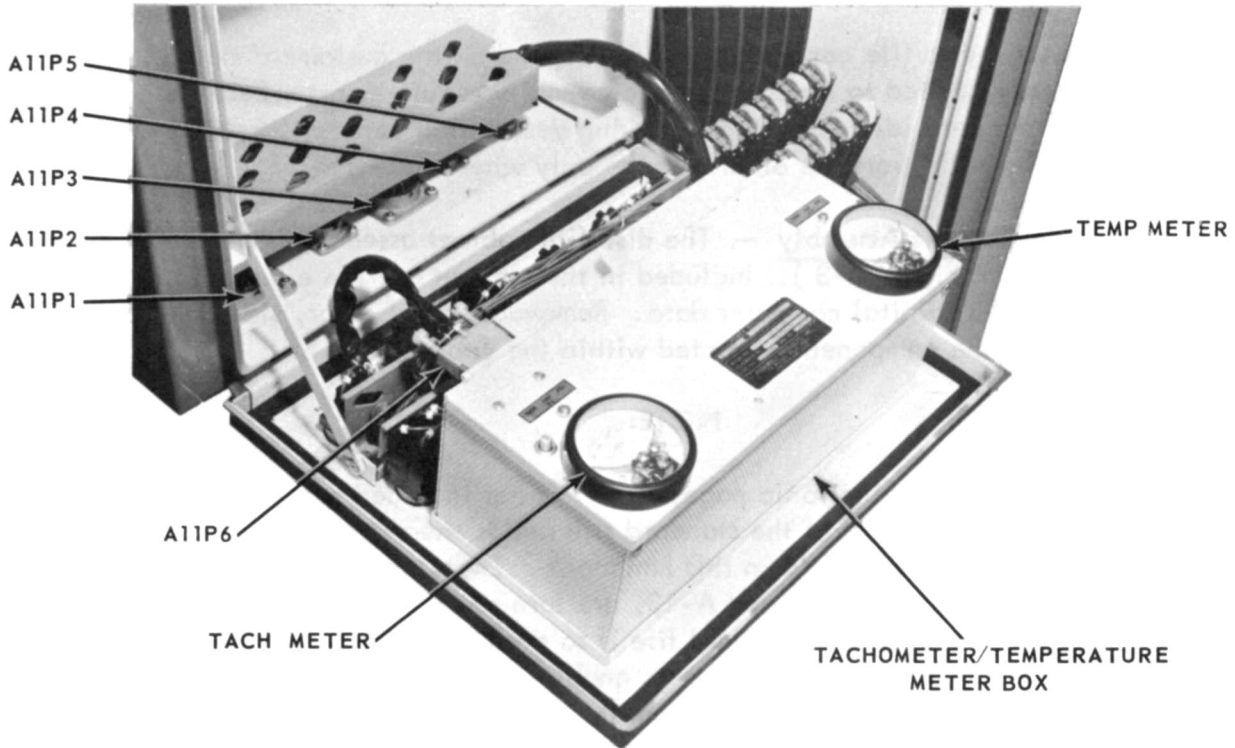


Figure 1-4 Pushbutton Station Assembly A11, Interior View—Location of Connectors and Tachometer/Temperature Meter Box

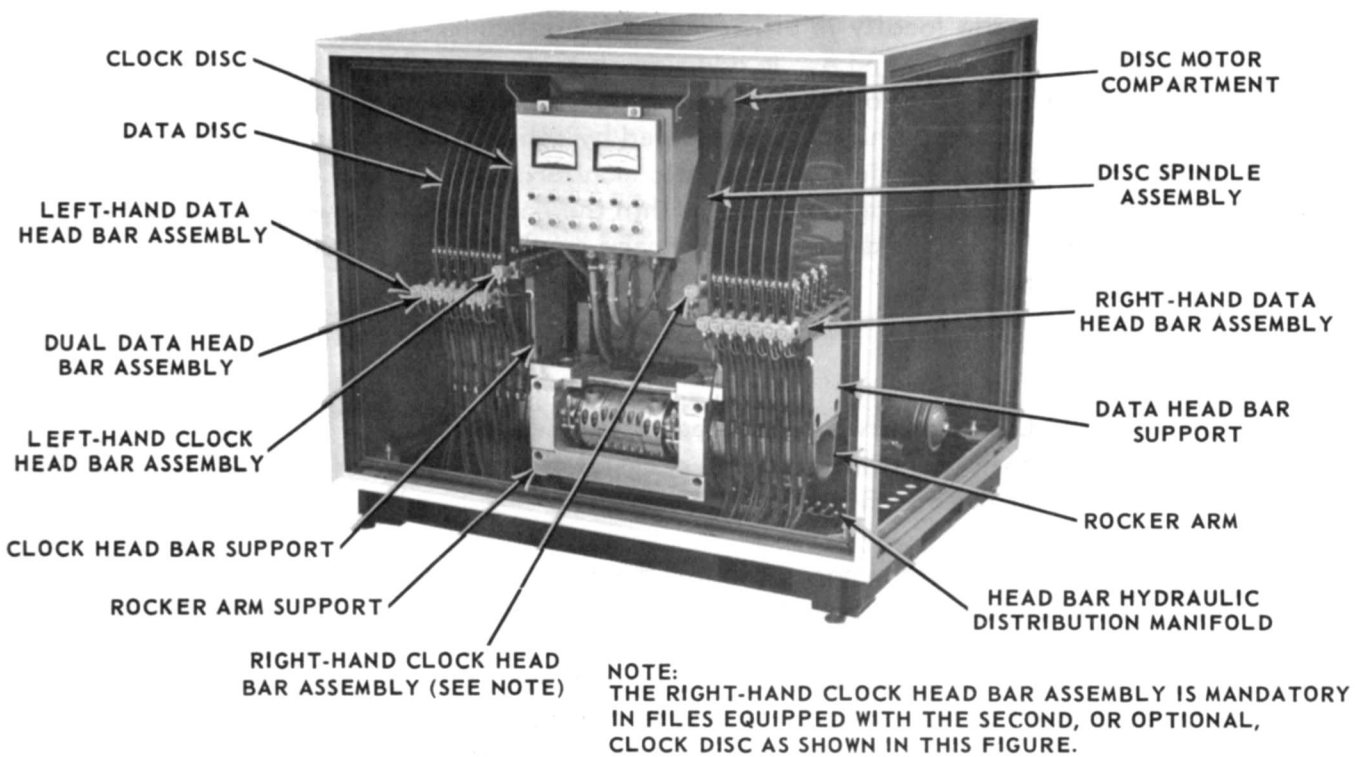


Figure 1-5 Disc File Cabinet Assembly, Front Interior View—Location of Major Components of Pedestal Assembly A15

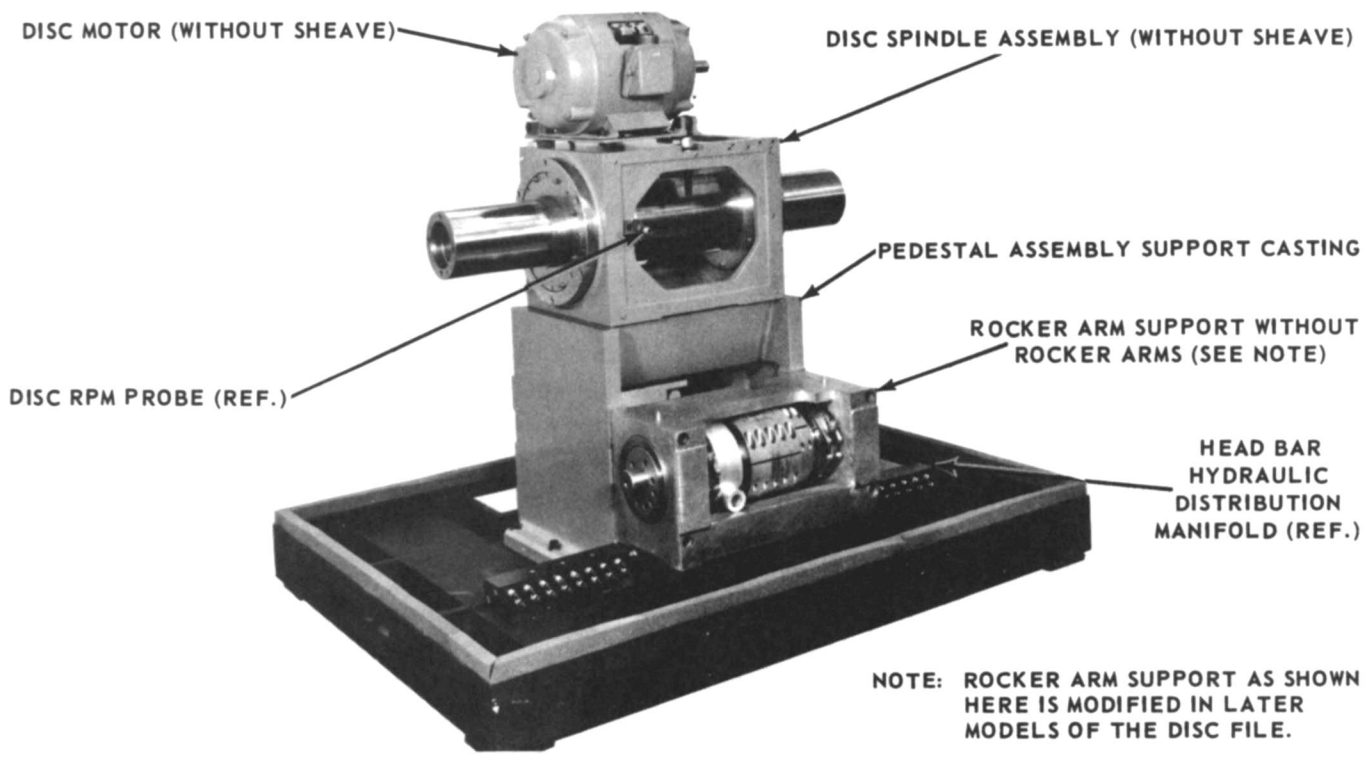
1-2-1-1 Disc File Cabinet Assembly (Cont.)

c. Disc Spindle Assembly — The disc spindle assembly (see Figure 1-6), consists of a spindle that is mounted in the bearings of a support casting. Ends of the spindle protruding from either side of the support casting each support a group of discs (see Figure 1-5) that are magnetically coated to enable the recording and subsequent retrieval of the data of a digital computer. A disc rpm probe — secured to a bracket mounted to the front of the disc spindle assembly casting opposite a 60 tooth gear installed on the spindle of the disc spindle assembly (see Figure 1-7) is connected by a cable through the pushbutton station assembly (see paragraph b.) to the tachometer/temperature meter box. A nameplate for the probe is mounted to the front of the pedestal assembly (see Figure 1-8). A temperature probe secured to the rear of the disc spindle assembly (see Figure 1-9) is also connected by a cable through the pushbutton station to the tachometer/temperature meter box. The probes — in conjunction with the circuits of the tachometer/temperature meter box — enable monitoring the over/under speed limits of the disc motor and the over/under temperature limits of the interior of the disc file cabinet assembly.

d. Discs — The data capacity of Bryant disc files is variable depending on the number of discs ordered with the disc file. B-frame disc files can be ordered with anywhere from one to as many as 14 discs. On the other hand, C-frame disc files can be ordered with anywhere from one to as many as 26 discs. Of the two types of discs available — a clock disc and a data disc (see Figure 1-5), one clock disc is always furnished with each disc file; a second clock disc (as shown in Figure 1-5) can be specially ordered by a customer at extra cost, should there be a special need. Aside from a difference in thickness of the clock and data discs, all discs of the file are otherwise identical in that they are all 39 inches in diameter and each is coated with the same proprietary Bryant magnetic oxide coating.

- (1) Clock Disc — The clock disc is always mounted adjacent to the disc spindle assembly. The inner surface — or surface facing the disc spindle assembly — of the disc is used exclusively for prerecorded clocks and/or for fast access data, depending on customer requirements. The opposite surface of a clock disc is used for storing data. Since the number of head pads of a clock head bar assembly serving the clock surface of the disc generally exceed the number of head pads of a data head bar assembly serving the data surface of the disc, the clock disc is made 1/2-inch thick. This thickness is found to be sufficient to prevent flexing of the disc due to the different loadings existing on either surface of the disc when the head pads of the head bars are actuated to the "flying attitude".
- (2) Data Disc — The data disc is mounted on the spindle so that an equal number of data head pads serve each of its surfaces. In this configuration, the slight differences that may exist in normal head pad loading on either surface of the disc when the head pads of the head bars are actuated to the "flying attitude" enables the use of a disc that is only 1/4-inch thick.

e. Head Bar Assemblies — The disc file contains clock and data head bar assemblies. The clock head bar assemblies (see Figure 1-5) are mounted on head bar supports that are in turn secured to the nonmoving casting of the rocker arm support. It should be noted that in



NOTE: ROCKER ARM SUPPORT AS SHOWN HERE IS MODIFIED IN LATER MODELS OF THE DISC FILE.

Figure 1-6 Disc Motor, Disc Spindle Assembly, and Rocker Arm Support—Installed Configuration in Forming Pedestal Assembly

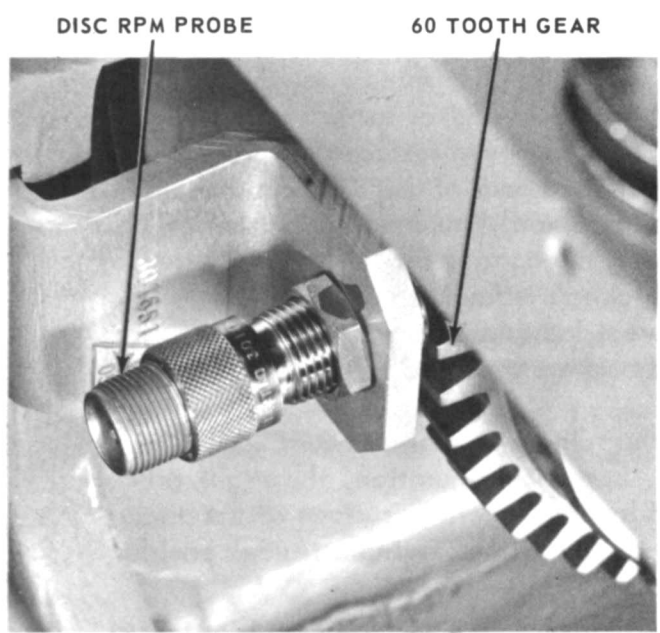


Figure 1-7 Disc Spindle Assembly, Front Interior View—Installed View of Disc RPM Probe A15AG1

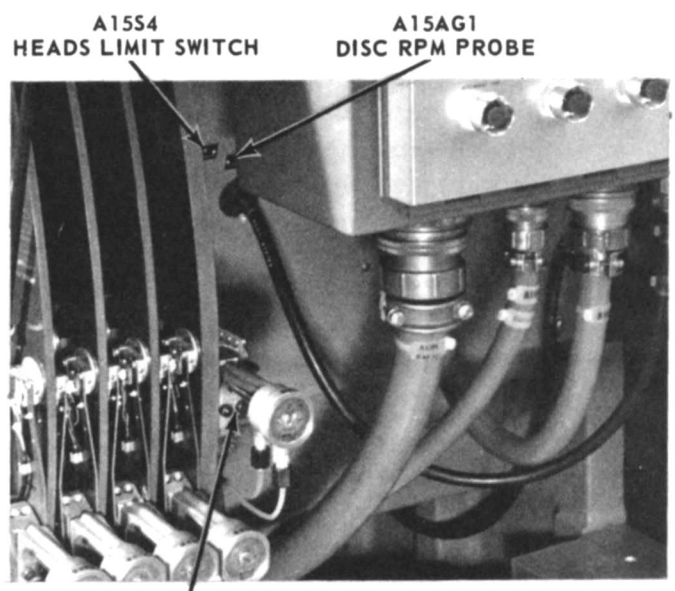


Figure 1-8 Disc File Cabinet Assembly, Front Interior View—Identification of Nameplates

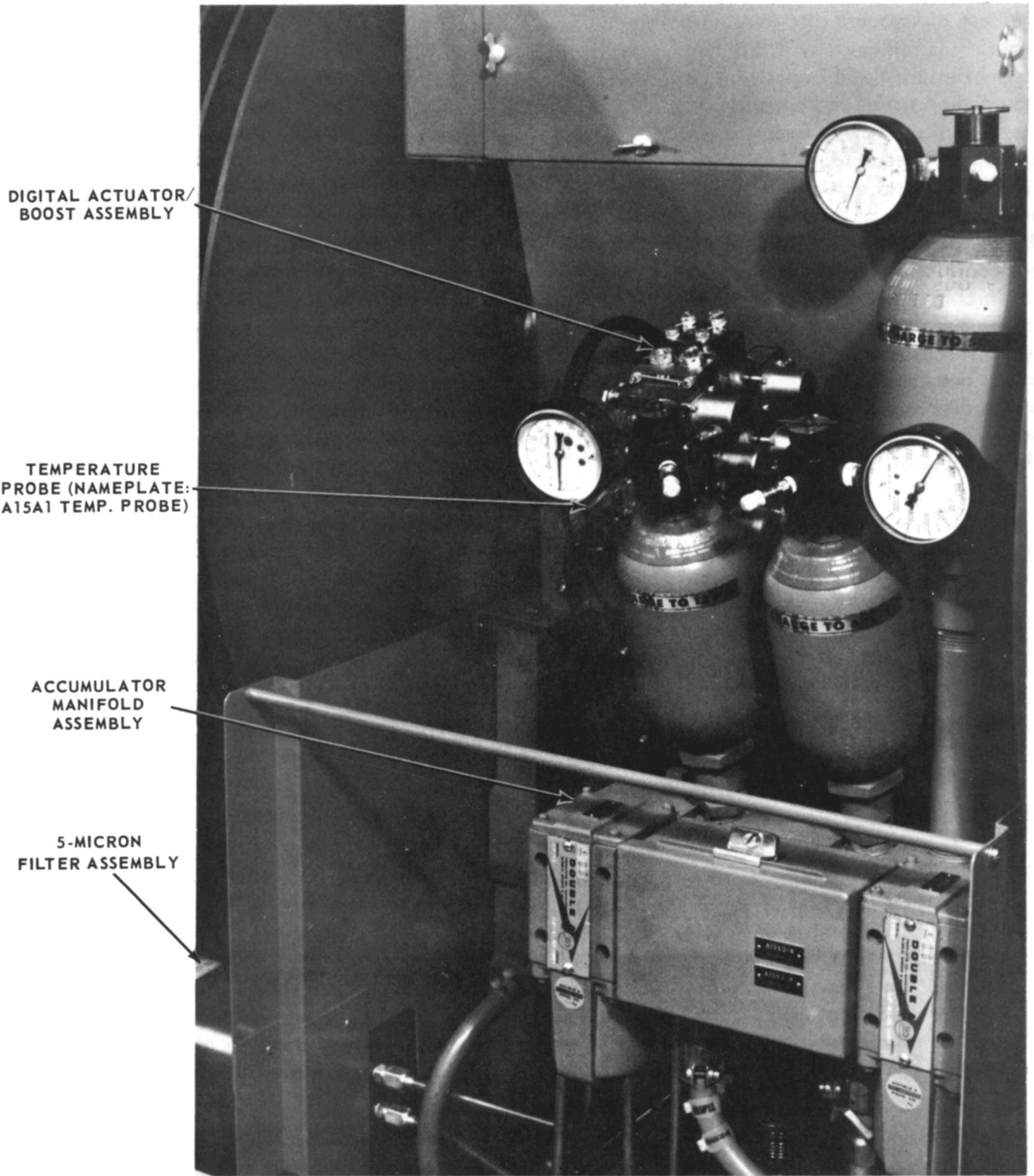


Figure 1-9 Disc File Cabinet Assembly, Rear Center Interior View—
Location of Major Components of Pedestal Assembly A15

1-2-1-1 Disc File Cabinet Assembly (Cont.)

the case of standard disc files with only one clock disc, the right-hand clock head bar assembly is replaced by a left-hand data head bar assembly. Wherein all clock head bar assemblies are fixed in position, all data head bar assemblies on the other hand are mounted on data head bar supports, which are mounted on rocker arms. The rocker arms are in turn secured to opposite ends of a bearing mounted spindle (located in the rocker arm support, see Figure 1-6), which is positionable through mechanical linkage that is tied to a digital actuator/boost assembly. There are two types of clock head bar assemblies and three types of data head bar assemblies available for use with the disc file. Though differing in detail, the basic elements of all head bars are the same. That is, each head bar contains an hydraulic cylinder, a piston connected to a ball slide, and flexible reeds to which are attached head pads. Hydraulic lines interconnect the hydraulic cylinders of the bars with the head bar hydraulic distribution manifold (see Figure 1-5) serving the respective sides of the file. The function of the head bar assemblies is to enable positioning of the head pads of the bars to a "retracted" or a "flying attitude" with respect to the surface of the disc that they serve. It is only when the discs are rotating and the head pads are positioned to the "flying attitude", however, that data can be stored on or retrieved from the surfaces of the discs.

- (1) Clock Head Bar Assemblies — The two types of clock head bar assemblies are identical, except: their reed and head pad assemblies are mounted along opposite edges of the bar so as to enable the head pads to be positioned toward the disc surface that they serve; and a Heads Limit Switch A15S4 is secured to the rear of the left-hand clock head bar assembly. A nameplate for the Heads Limit Switch A15S4 is secured to the front of the pedestal (see Figure 1-8). As many as eight reed and head pad assemblies can be mounted on the bar. Also, as many as two pole pieces (to enable the recording of two tracks of clocks or data) can be accommodated in each head pad. All head pads are prewired for customer functions through a connector mounted on the side of the head bar. The limit switch of the left-hand clock head bar assembly is connected directly through a cable to a connector located in the bottom of the pushbutton station (see Figure 1-3). The switch is normally open so as to inhibit operation of the solenoid driver power supply of the power control cabinet assembly until the head pads of the disc file are actuated to the "flying attitude".
- (2) Data Head Bar Assemblies — The three types of data head bar assemblies are identical except that they are equipped with only one row of reed and head pad assemblies or a dual row of reed and head pad assemblies. As many as six reed and head pad assemblies can be included in each row; however, the number of such assemblies in a row shall be the same for all head bars within the file. In the case of the two available single row configurations, the reed and head pad assemblies are mounted along opposite edges of the bar so that when installed adjacent to the single surfaces of the extreme outer and/or inner discs of the file the head pads can be positioned toward the disc surface that they serve. In the case of the available dual row configuration, the reed and head pad assemblies are mounted along each side of the bar so that when installed between discs

1-2-1-1 Disc File Cabinet Assembly (Cont.)

the head pads can be positioned toward the surfaces of the two adjacent discs that they serve. The head pads of the data head bars are prewired through a cable to a connector that facilitates interconnection with a logic interface; these connections can be made through the appropriate diode boxes mounted in the front of the disc file cabinet (see Figure 1-3) if desired by the user. Each head pad serves what is called a zone on the disc surface. Thus, a head bar with six head pads serves the equivalent of six zones on a disc surface.

f. Digital Actuator/Boost Assembly, Actuator Arm and Rocker Arm Support — The digital actuator/boost assembly is mounted to the back of the pedestal assembly of the disc file (see Figure 1-9). The digital actuator in conjunction with the boost and actuating arm (see Figure 1-10) enables — through the rocker arm support (see Figure 1-5) — the positioning of the head pads of the data head bar assemblies to any one of 128 discreet positions or tracks; total movement of the head pads at the disc surfaces is equivalent to 1.905 inches.

- (1) Digital Actuator — The digital actuator — a proprietary hydraulic assembly — is secured to a riser block (see Figure 1-10) mounted on the lower casting of the pedestal. Generally speaking, the actuator contains seven solenoid valves, with each valve controlling the porting of hydraulic fluid into cylinders located in the main body of the actuator. The seven valves of the actuator represent an accumulative binary count of 128, or a count of zero to 127. Through the proper actuation of the solenoids (which are electrically actuated through the solenoid driver power supply of the power control unit cabinet assembly), hydraulic fluid is ported into the main body of the digital actuator. This fluid — which is under pressure — positions pistons within the actuator's cylinders such that a linear movement proportional to the binary count applied to the solenoids is reflected as an accumulative longitudinal movement at the lower end of the actuators' pistons. A variable orifice valve connected to the input pressure line of the digital actuator (see Figure 1-11) provides a means of varying the critical damping of the head positioning system when setting the system up during positioning time and repeatability tests. The valve also enables locking the digital actuator/boost assembly at any one of its' 127 accessible positions; this action, which will prevent accidental positioning of the heads to track zero due to file shutdown, is intended to protect personnel during maintenance.
- (2) Boost — The boost — also a proprietary hydraulic assembly — amplifies the digital actuator output commands. The H-Link, which is enclosed by a boot that is in turn connected by a leak line down to the boost as shown in Figure 1-10, secures the upper-rear eyebolt of the boost to the eyebolt installed on the lower end of the digital actuator's pistons (see Figure 1-12). The boost's upper-forward eyebolt, which is mounted on the end of the boost's power piston, is secured to the riser block of the pedestal by means of a pin about which the boost can pivot during positioning operations of the digital actuator. A boot encloses the upper end of the power piston (see Figure 1-10); leakage into the boot is allowed to drain down through a port within the boost to the connecting point of the leak line from the

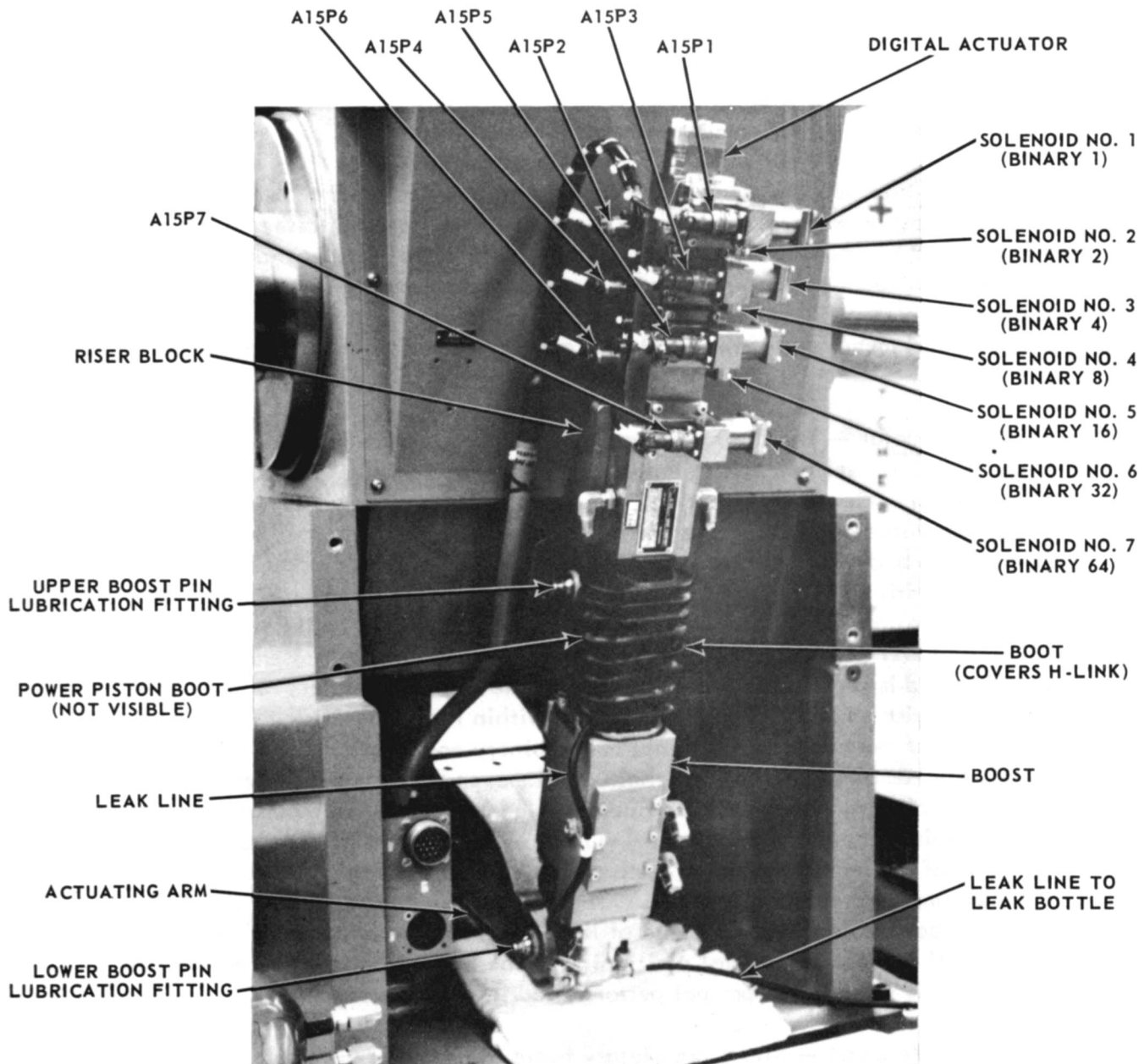


Figure 1-10 Digital Actuator/Boost Assembly, Component Locations

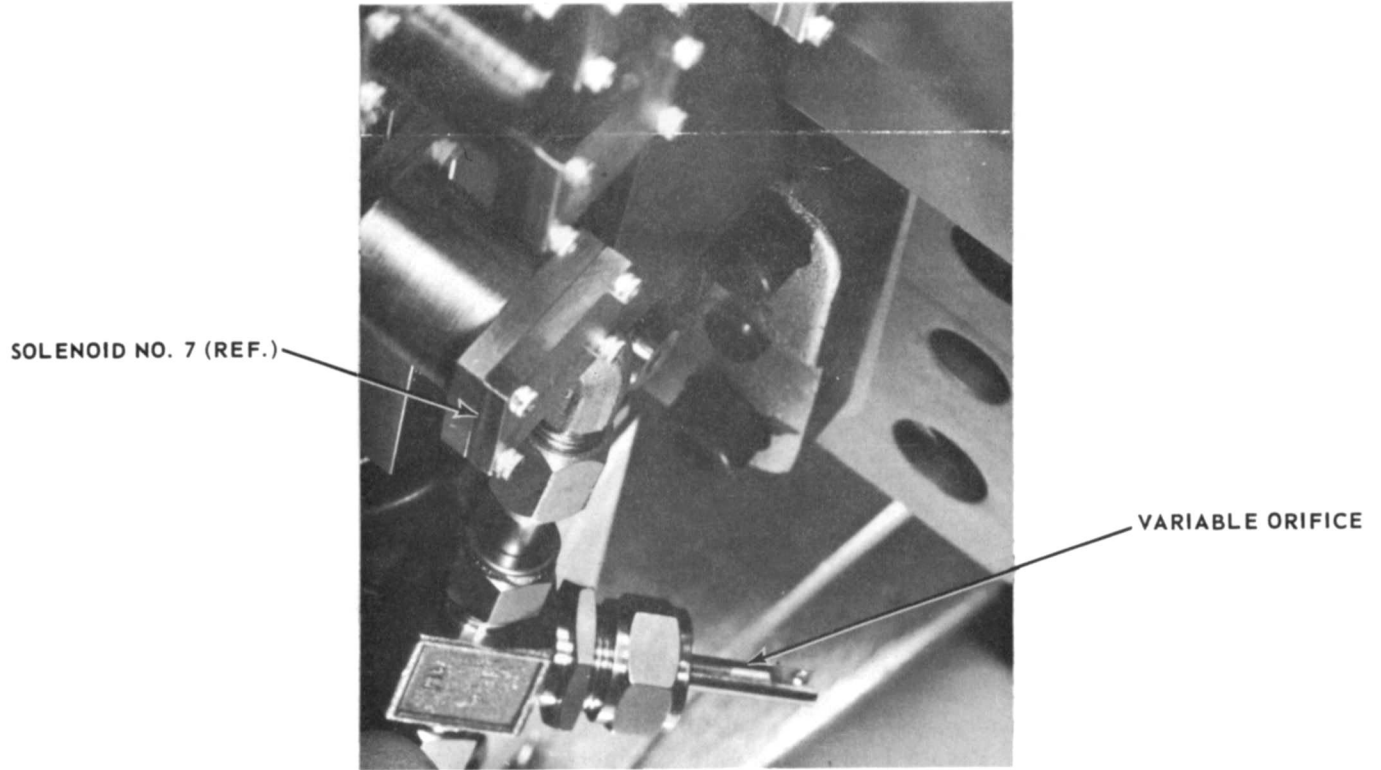


Figure 1-11 Digital Actuator Variable Orifice Valve—Locational View

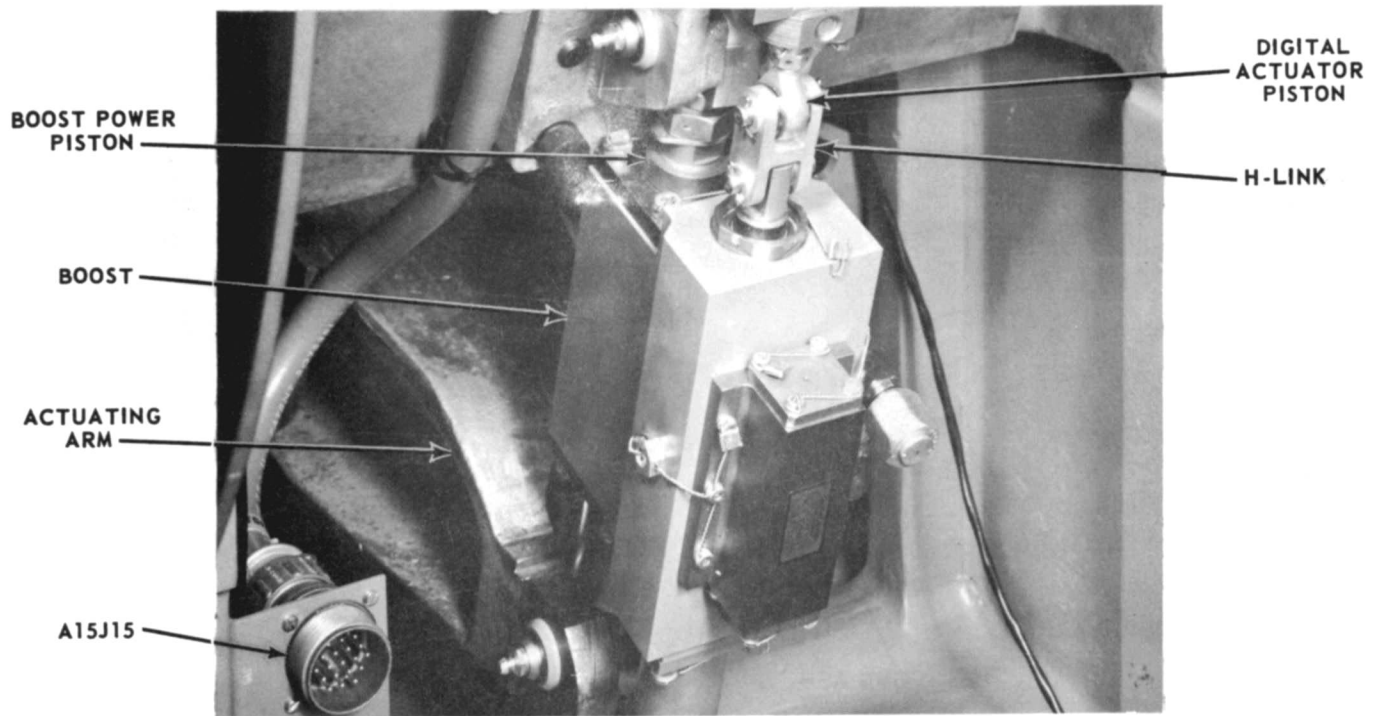


Figure 1-12 Digital Actuator/Boost Assembly, Installed View of Boost Without Boots

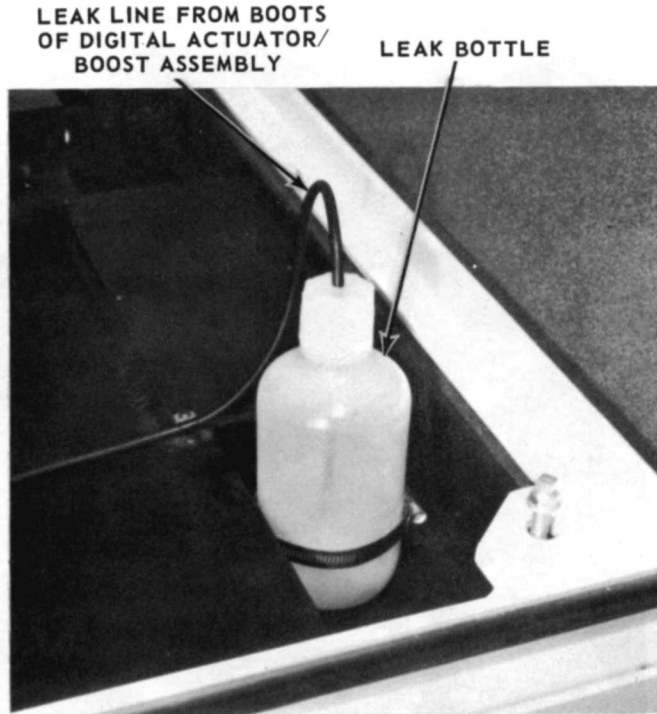


Figure 1-13 Disc File Cabinet Assembly—Right Rear Interior View—Location of Leak Bottle

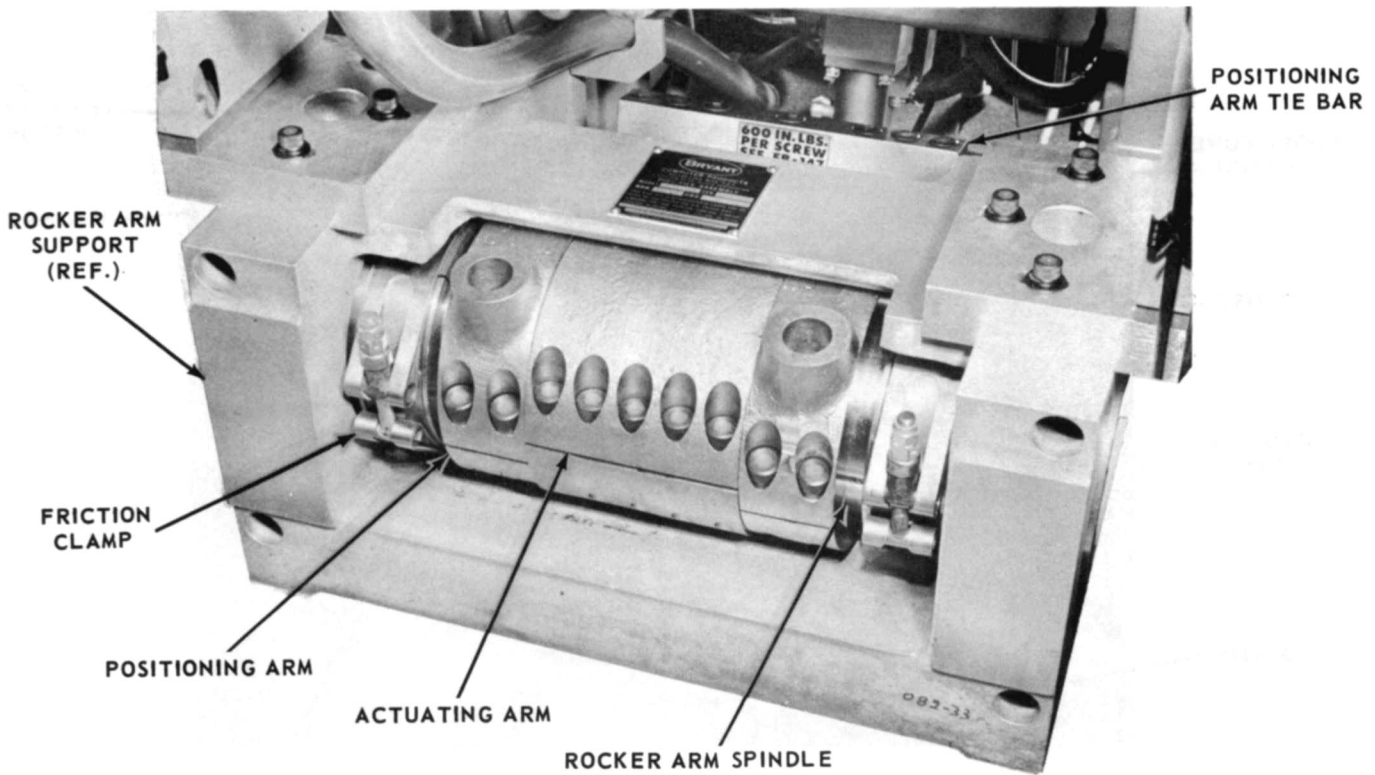


Figure 1-14 Rocker Arm Support—Identification of Major Components

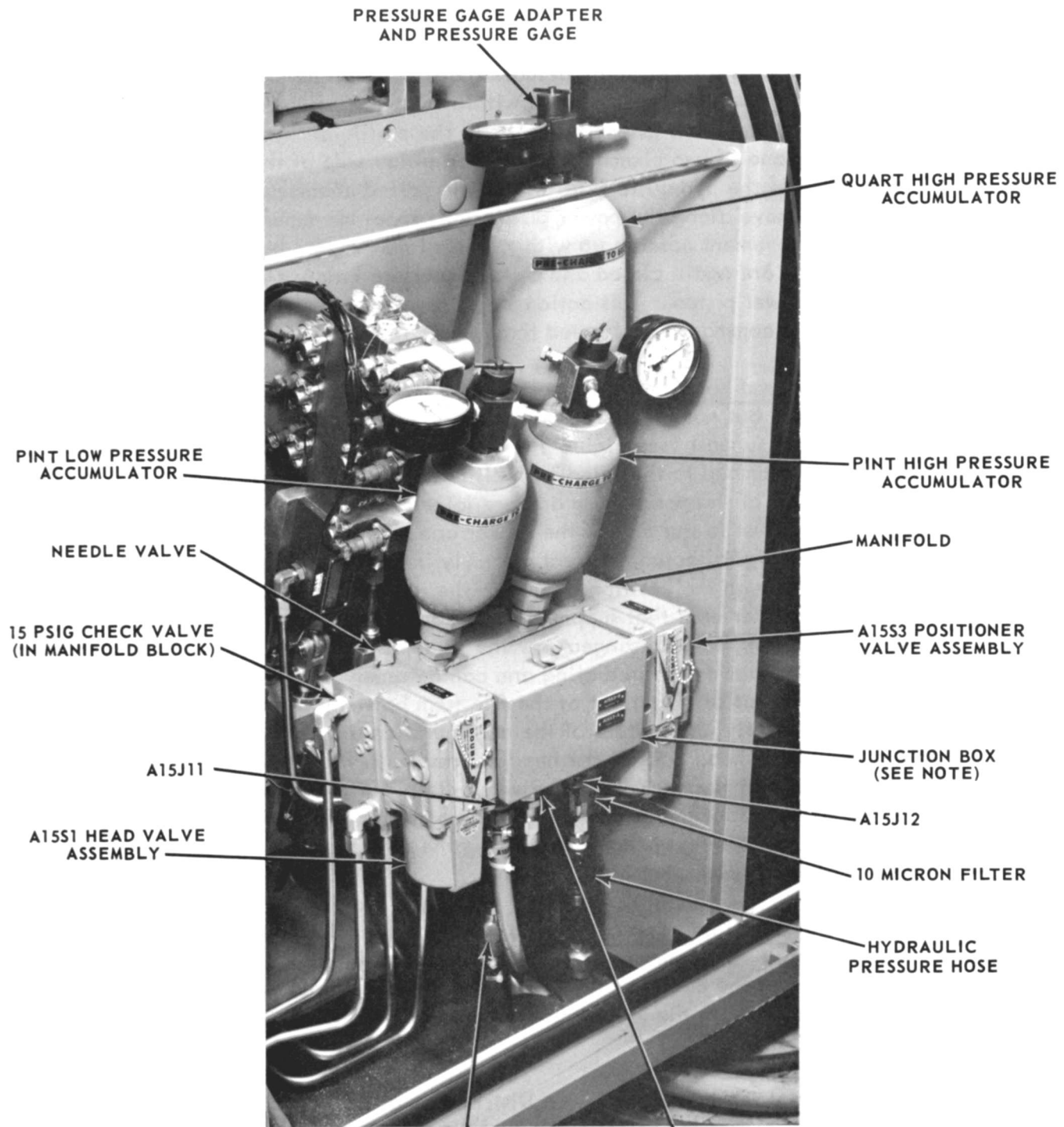
1-2-1-1 Disc File Cabinet Assembly (Cont.)

boot covering the H-Link. Normal hydraulic fluid leakage occurring at both the power piston and actuator/boost H-Link junctures is applied from the connecting junctions at the bottom of the boost boot through a second leak line to a leak bottle located in the right rear side of the cabinet (see Figure 1-13). The lower end of the boost is secured to an actuating arm. Longitudinal motion of the digital actuator output drives a spool within the boost assembly. The positioning of the spool in the boost assembly results in the porting of hydraulic fluid under pressure into one of two chambers located on either side of the boost's power piston. The pressure of the hydraulic fluid within the ported chamber forces the body of the boost to move along the power piston until spool movement stops. The instant boost body movement catches up with the spool movement, both of the boost chamber ports are again closed and a static pressure balance takes place on each side of the power piston. This action stops the movement of the boost's body until the next command is reflected through spool movement.

- (3) Actuator Arm and Rocker Arm Support — The front end of the actuating arm is installed over, but not secured to, a rocker arm spindle mounted in bearings of the rocker arm support (see Figure 1-14). The front halves of a positioning arm are securely clamped to the spindle on either side of the actuating arm; in turn, the rear halves of the positioning arm are joined by a tie bar that is bolted to the actuating arm just to the rear of the rocker arm support. In this configuration, motion of the digital actuator/boost assembly imparted to the actuating arm is transmitted through the positioning arm to the rocker arm spindle, to which are secured the rocker arms that support the data head bar assemblies of the disc file. Through this installation arrangement, the three bolts that secure the tie bar of the positioning arm to the actuating arm can be removed to enable the racking of the data head bars as a unit out of the file from between the discs for maintenance purposes; similarly, the nature of the configuration ensures a fixed reference for the return of the head pads of the head bar assemblies to track when the heads are reindexed to their normal position between discs. Friction clamps are provided with the assembly for use as an emergency means of varying the critical damping of the head positioning system when setting the system up during positioning time and repeatability tests.

g. Accumulator Manifold Assembly, Head Bar Hydraulic Distribution Manifolds, and 5-Micron Filter Assembly — The accumulator manifold and 5-micron filter assemblies are mounted in the rear section of the cabinet (see Figure 1-9). One head bar hydraulic distribution manifold is mounted beneath the rocker arms located on either side of the rocker arm support (see Figure 1-5).

- (1) Accumulator Manifold Assembly — Distribution of hydraulic fluid to the components of the disc file is controlled through the accumulator manifold assembly (see Figure 1-15). Switches mounted within and valve assemblies mounted on the junction box make up a part of the disc file circuits that control this distribution. Nameplates identifying the switches and solenoids are mounted on the assembly (see Figure 1-16). Accumulators on the assembly serve to maintain hydraulic pressure to the components of the disc file relatively constant regardless



NOTE: A 35 PSIG CHECK VALVE AND DUPLEX PRESSURE SWITCH A15S2 ARE MOUNTED WITHIN THE JUNCTION BOX

Figure 1-15 Accumulator Manifold Assembly, Identification of Major Components

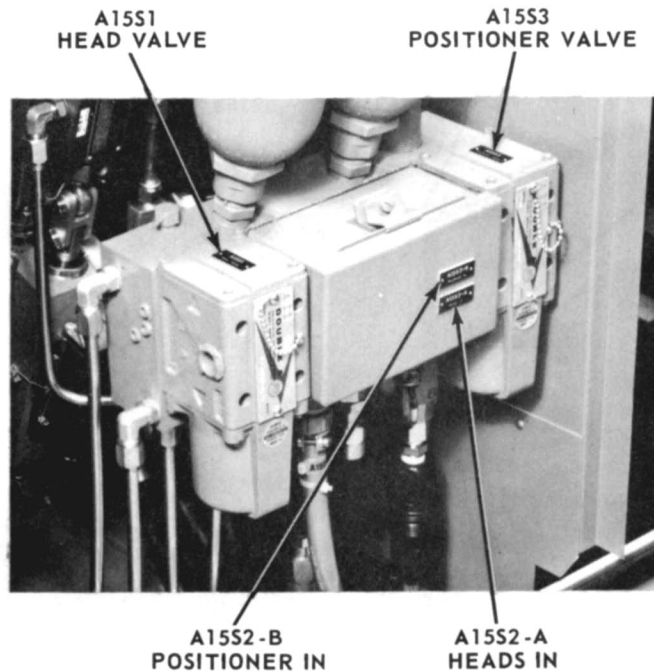


Figure 1-16 Accumulator Manifold Assembly—
Identification of Nameplates

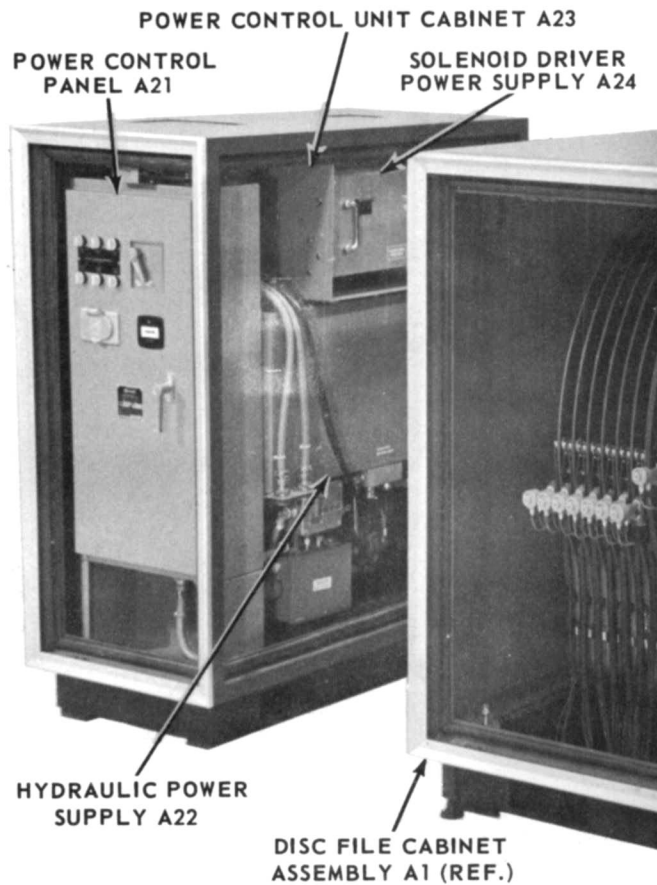
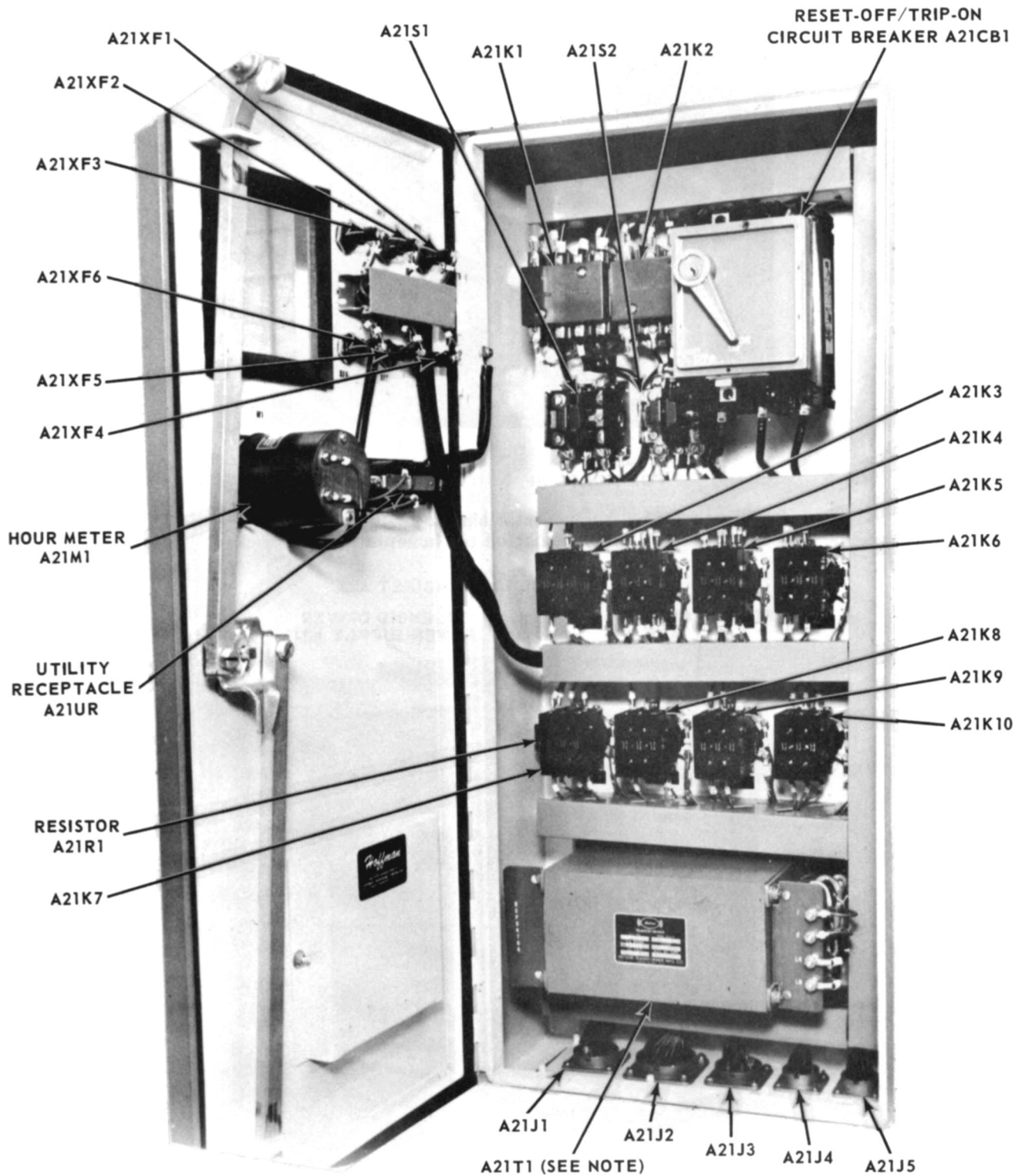


Figure 1-17 Power Control Unit Cabinet Assembly,
Front Interior View—Location of
Major Components



NOTE: IN THE CASE OF A NEUTRAL POWER SOURCE, TRANSFORMER A21T1 IS REPLACED WITH A TERMINAL BOARD A21TB1 ON CUSTOMERS REQUEST.

Figure 1-18 Power Control Panel, Interior View—Location of Major Components

1-2-1-1 Disc File Cabinet Assembly (Cont.)

of transient system pressure surges. In addition, one accumulator assures that the head pads of the disc file are returned to the "retracted attitude" as another accumulator assures that the digital actuator/boost assembly is returned to the "track zero" condition when the hydraulic power supply of the file is shutdown. A 10-micron filter (not included in A-frame files) is placed in the pressure line of the assembly and serves to filter out minute particles that may be in the hydraulic fluid as it is received from the hydraulic power supply. A 20-micron filter included in the output pressure line to the digital actuator/boost assembly serves to filter out particles that may have been picked up within the manifold. Four check valves are mounted in the manifold of the assembly. The valves are all installed in a manner that allows fluid to only flow out of the manifold; valve action inhibits reverse fluid flow.

NOTE

The positioner identification on the nameplates applies to the digital actuator/boost assembly.

- (2) Head Bar Hydraulic Distribution Manifolds — The head bar hydraulic distribution manifolds serve to enable central distribution of hydraulic fluid to the head bars they serve. This action minimizes the number of hoses that would otherwise be required for directly connecting the accumulator manifold assembly to each head bar mounted in the file.
- (3) 5-Micron Filter Assembly — Before being returned to the reservoir of the hydraulic power supply, part of the hydraulic fluid applied through the digital actuator/boost assembly is passed through the 5-micron filter assembly. This is done to aid in reducing the amount of contamination that would otherwise accumulate within the reservoir of the hydraulic power supply.

1-2-1-2 Power Control Unit Cabinet Assembly — The power control unit cabinet assembly is generally divided into four major areas (see Figure 1-17). Included in the cabinet are the elements that provide the hydraulic and electrical control of disc file operation.

a. Power Control Panel — The power control panel contains a majority of the controls and relay switching circuits necessary to activate the electrical starting control system of the disc file. The function of the controls and indicators mounted on the door of the panel and within the panel (see Figure 1-18) are described in Section 3 and 4.

b. Hydraulic Power Supply — The hydraulic power supply is a self-contained unit that provides the hydraulic fluid pressure requirements for enabling the control system actuation of the heads of the disc file and for positioning the digital actuator/boost assembly. All components shown in Figure 1-19 through 1-22, except for those preceded by the designators A21, A23 and A24, form a part of the hydraulic power supply A22. A brief functional description of the components making up the hydraulic power supply follows:

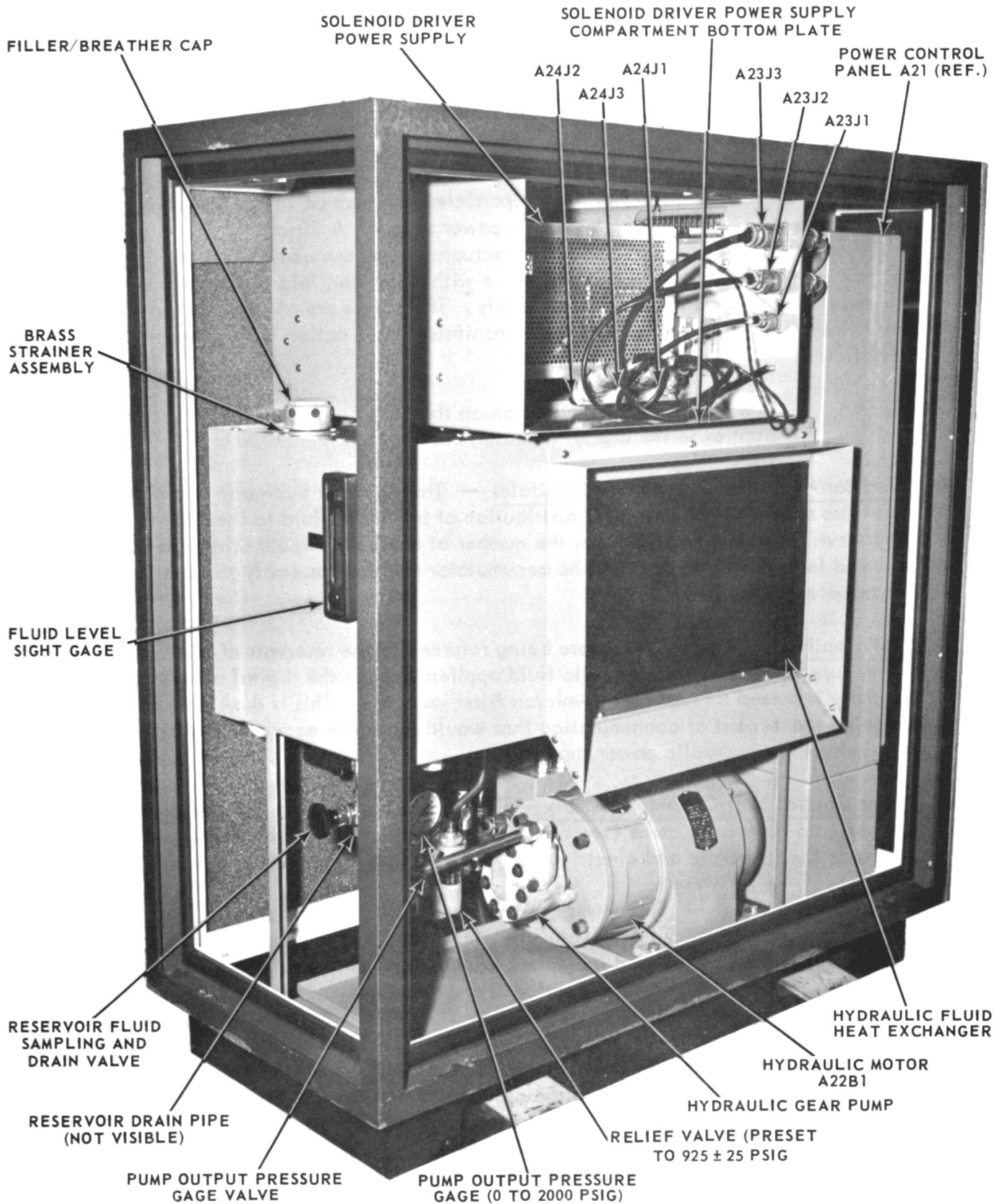


Figure 1-19 Power Control Unit Cabinet Assembly, Interior Rear View—General Location of Major Components

1-2-1-2 Power Control Unit Cabinet Assembly (Cont.)

- (1) The filler/breather cap (see Figure 1-19) contains a filter that is used to keep airborne contaminants from the reservoir proper while simultaneously allowing the system hydraulic fluid store to remain at atmospheric pressure.
- (2) The fluid level sight gage enables a visual indication of the fluid level within the reservoir of the hydraulic power supply.
- (3) The taking of fluid samples from and the draining of the reservoir is accomplished through the reservoir fluid sampling and drain valve.
- (4) Hydraulic fluid level in the reservoir is monitored by normally closed hydraulic oil low level switch A22S2 (see Figure 1-21), which opens if the hydraulic fluid level within the reservoir falls below a predetermined level.
- (5) Hydraulic fluid before flowing from the reservoir to the hydraulic pump is pre-filtered by the magnetic strainer assembly located in the reservoir of the supply.
- (6) Hydraulic motor A22B1 (see Figure 1-19) is a 5 hp, three phase, 50/60 cycle, 208/440 volt, drip-proof electric motor which drives an hydraulic gear pump.
- (7) The hydraulic gear pump is a fixed-volume type, capable of delivering hydraulic fluid to the hydraulic system of the file at a rate of 4-1/2 gallons per minute.
- (8) The pressure of the fluid out of the pump is controllable through the relief valve; the adjustment of its outlet pressure is monitored through the pump output pressure gage.
- (9) Hydraulic fluid pressure out of the pump is monitored by the normally closed hydraulic high pressure switch A22S3, (see Figure 1-20) which opens if the pump outlet pressure exceeds a preset pressure level of 1350 ± 50 psig.
- (10) Fluid is applied to and returned from the disc file through the distribution manifold of the hydraulic power supply.
- (11) The hydraulic fluid returned from the disc file is filtered by the 1/2-micron filter (see Figure 1-22) before being returned to the reservoir via the fan-cooled hydraulic fluid heat exchanger (see Figure 1-19) containing hydraulic fan A22B2 (see Figure 1-22).
- (12) The 5-psig and 10-psig check valves on the outlet and return pressure lines of the system, respectively, prevent reverse fluid pressure flow from occurring in the associated lines.
- (13) The temperature of the hydraulic fluid in the reservoir is monitored through normally closed hydraulic fluid over temperature switch A22S1-B (see Figure 1-20) which opens if the hydraulic fluid temperature sensed through the probe protruding into the reservoir (see Figure 1-21) exceeds a preset temperature of $140 \pm 5^{\circ}\text{F}$.

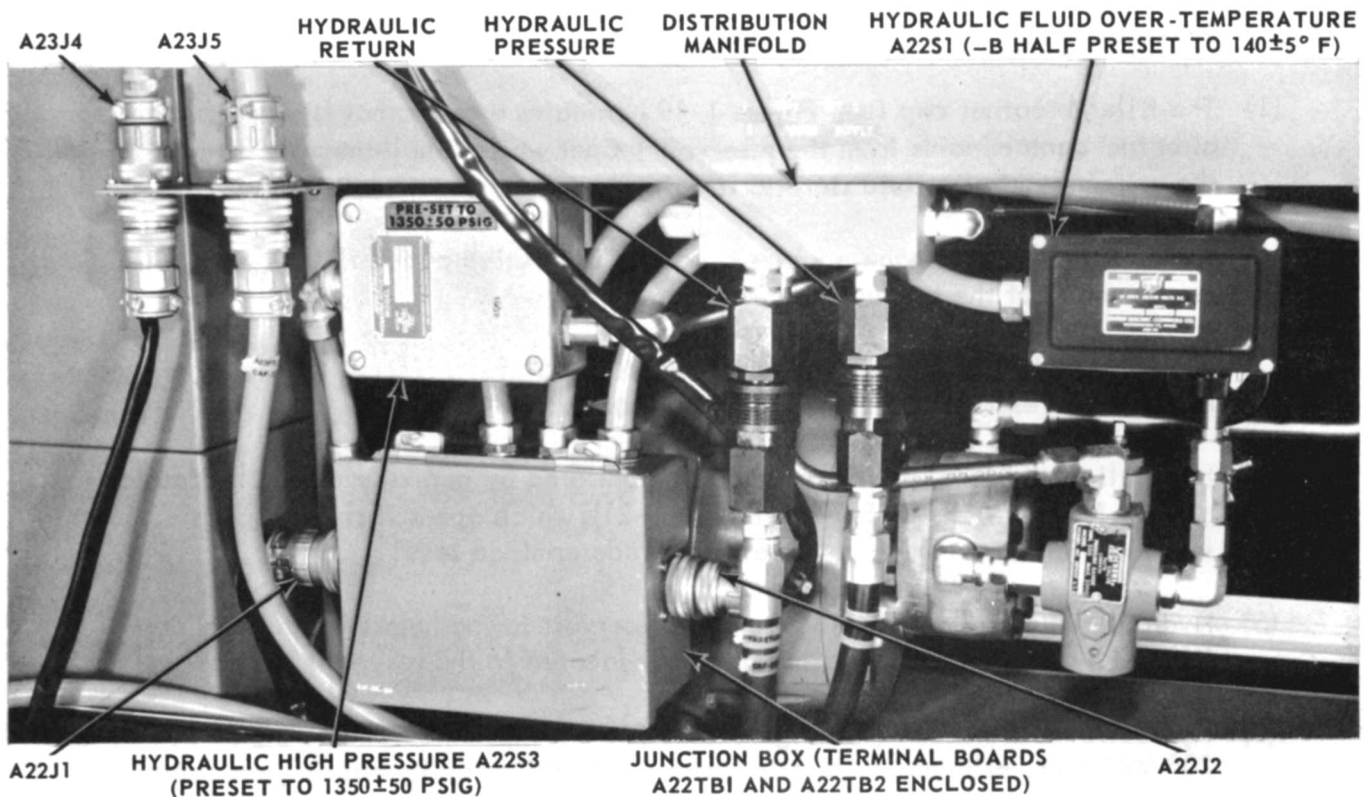


Figure 1-20 Power Control Unit Cabinet Assembly, Side Interior View—Location of Major Components in Lower Compartment of Hydraulic Power Supply

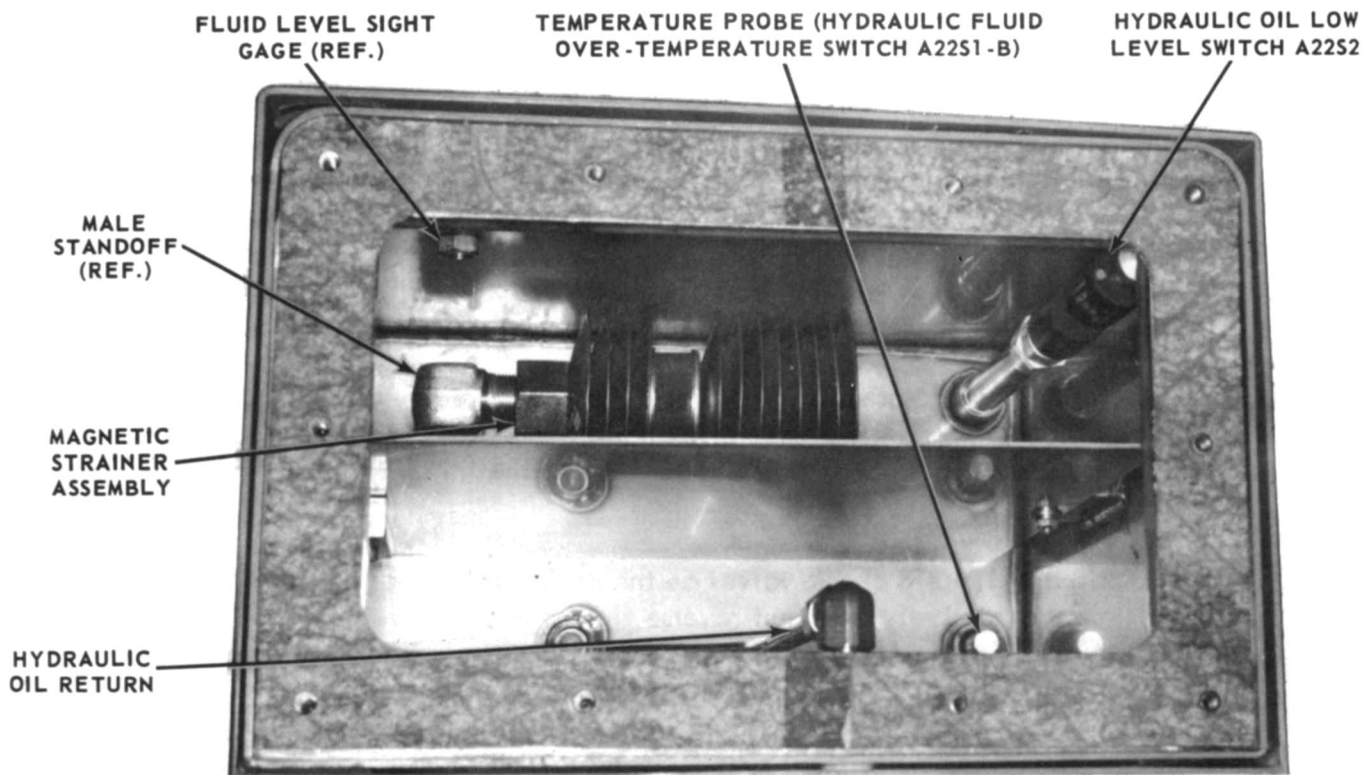


Figure 1-21 Hydraulic Power Supply Reservoir—Location of Major Components

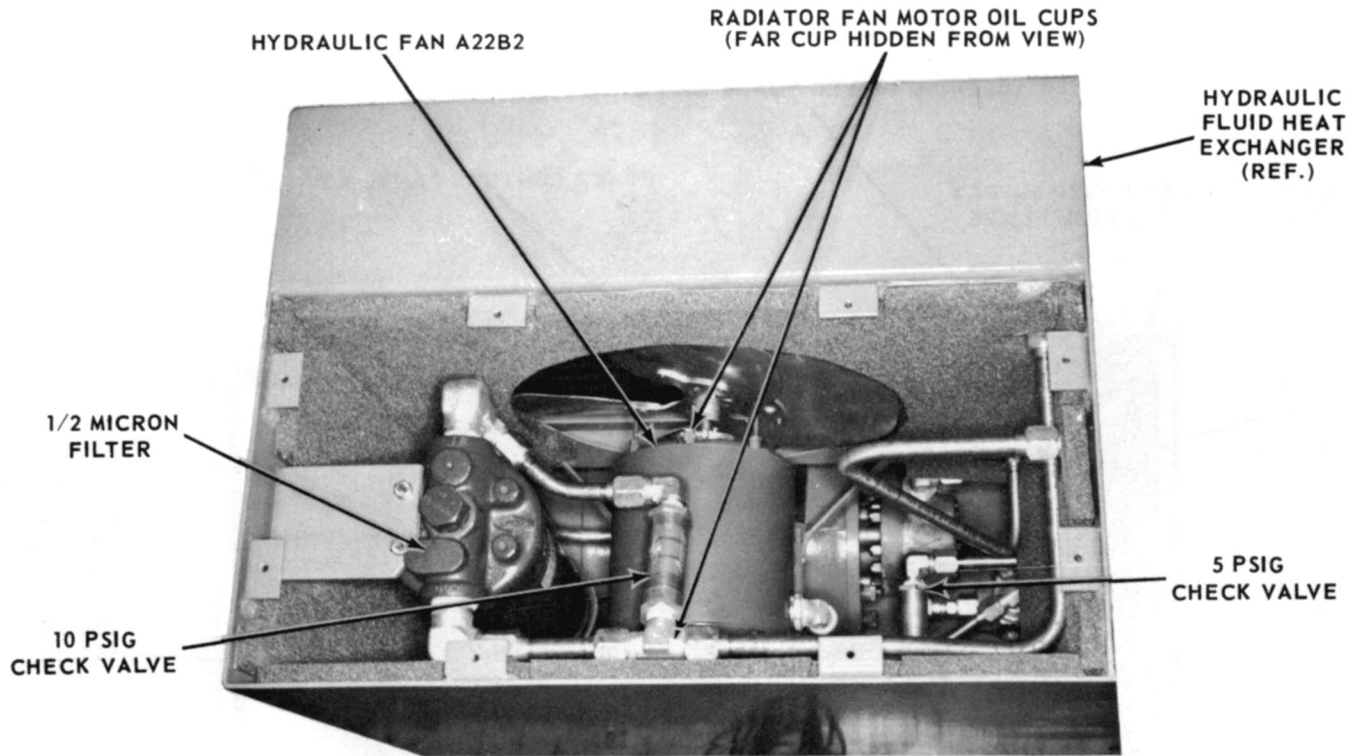


Figure 1-22 Hydraulic Power Supply Auxiliary Compartment—Location of Major Components

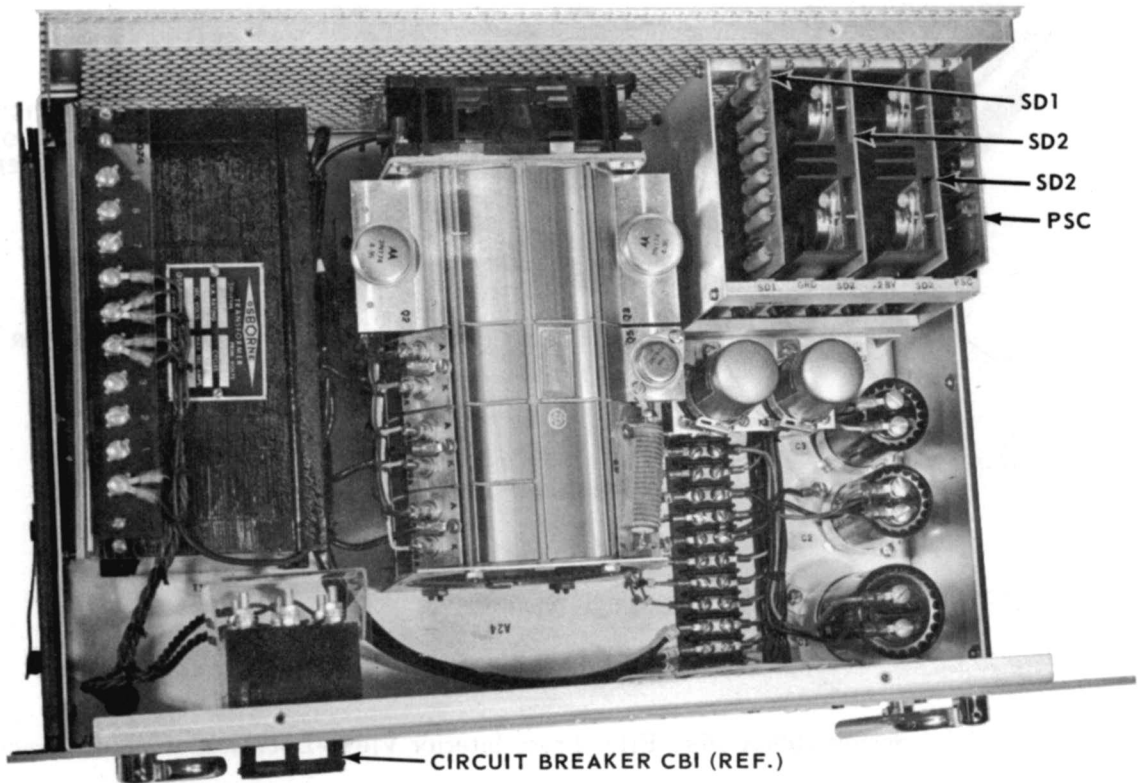


Figure 1-23 Solenoid Driver Power Supply, Top View—Location of Major Components

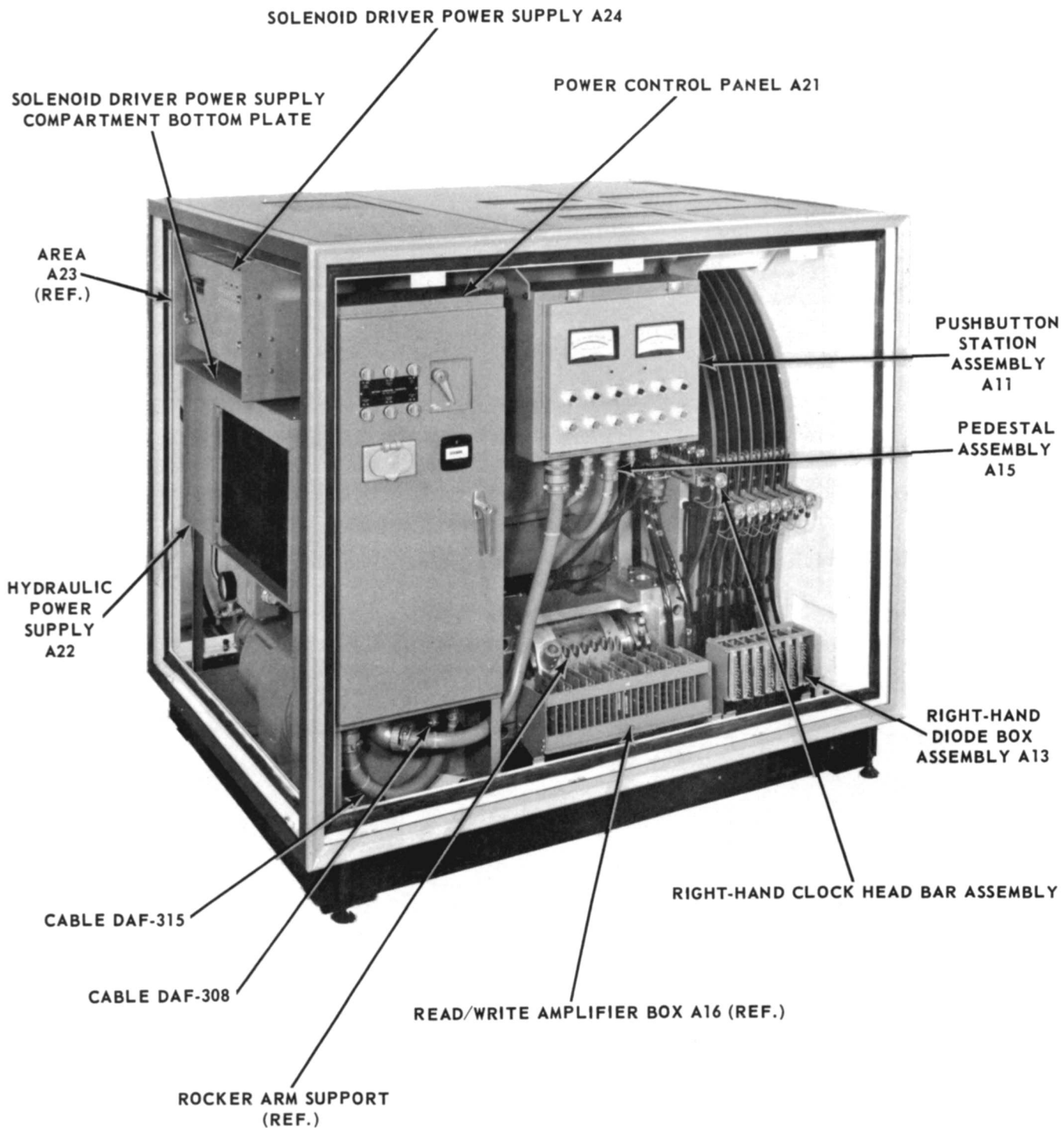


Figure 1-24 Model 1 Series 4000A Disc File, Front Interior View—Location of Major Components

1-2-1-2 Power Control Unit Cabinet Assembly (Cont.)

(14) All electrical connections to the hydraulic power supply are made through the junction box (see Figure 1-20).

c. Solenoid Driver Power Supply — The solenoid driver power supply (see Figure 1-17) provides the power requirements of the solenoids of the digital actuator. Input to the supply is 220/440 volt, three phase, 50/60 cycle, three-wire power; output of the supply is -28 and +7 vdc. Major components of the solenoid driver power supply are identified in Figure 1-23. Their functions are described in Sections 3 and 4.

1-2-2 A-FRAME DISC FILE — The A-frame disc file contains the same basic elements as the B- and C-frame disc files except that: all components are mounted in a single cabinet (see Figure 1-24); the file will accommodate only from one to seven discs and there is no 10-micron filter (see Figure 1-15) connected at the input pressure port of the accumulator manifold assembly. Essentially, the A-frame disc file is a B-frame disc file; however, the power control unit elements of the file are mounted in the left side of the file cabinet. Figure 1-25 is a rear view of the A-frame disc file cabinet assembly with covers removed showing the similarity of component packaging with that of the disc file cabinet (see Figure 1-9) and power control unit cabinet (see Figure 1-19). Figure 1-26 shows the difference in the arrangement of components mounted in the lower compartment of the power control unit portion of the A-frame file with that of the power control unit cabinet of B- or C-frame files (see Figure 1-20); one notable difference is the absence of the hydraulic power supply's junction box.

1-3 CHARACTERISTICS AND REQUIREMENTS

The physical characteristics, environmental requirements, power requirements and recording characteristics of Bryant Model 1 Series 4000 Disc Files without environmental control units (ECUs) are discussed in the following paragraphs.

1-3-1 PHYSICAL CHARACTERISTICS — The physical characteristics of A-, B-, and C-frame Model 1, Series 4000 Disc Files without ECUs are specified in Table 1-1. It is recommended that the cabinets making up the disc file assembly be separated by at least four feet on all sides from other facility equipment; this action will facilitate the performance of most disc file maintenance requirements.

TABLE 1-1 PHYSICAL CHARACTERISTICS

Disc File Configuration	Assembly	Measurements			
		Width (inches)	Depth (inches)	Height (inches)	Weight * (pounds)
A-frame	Disc File Cabinet (7 discs, max.)	60	46	52	3000
B-frame**	Disc File Cabinet (14 discs, max.)	60	46	52	2644
	Power Control Unit	22	46	52	910

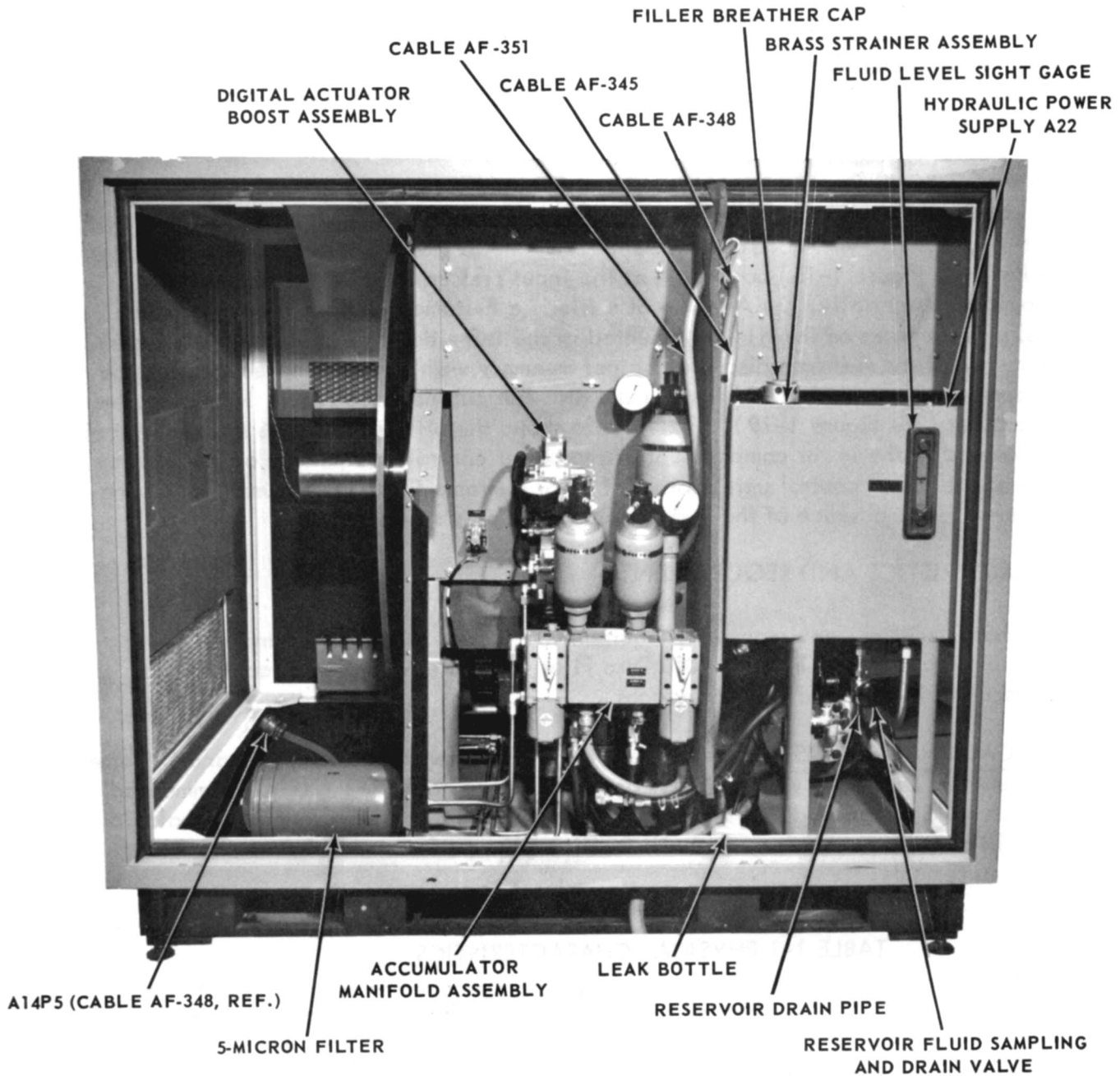


Figure 1-25 Model 1 Series 4000A Disc File, Rear Interior View—Location of Major Components

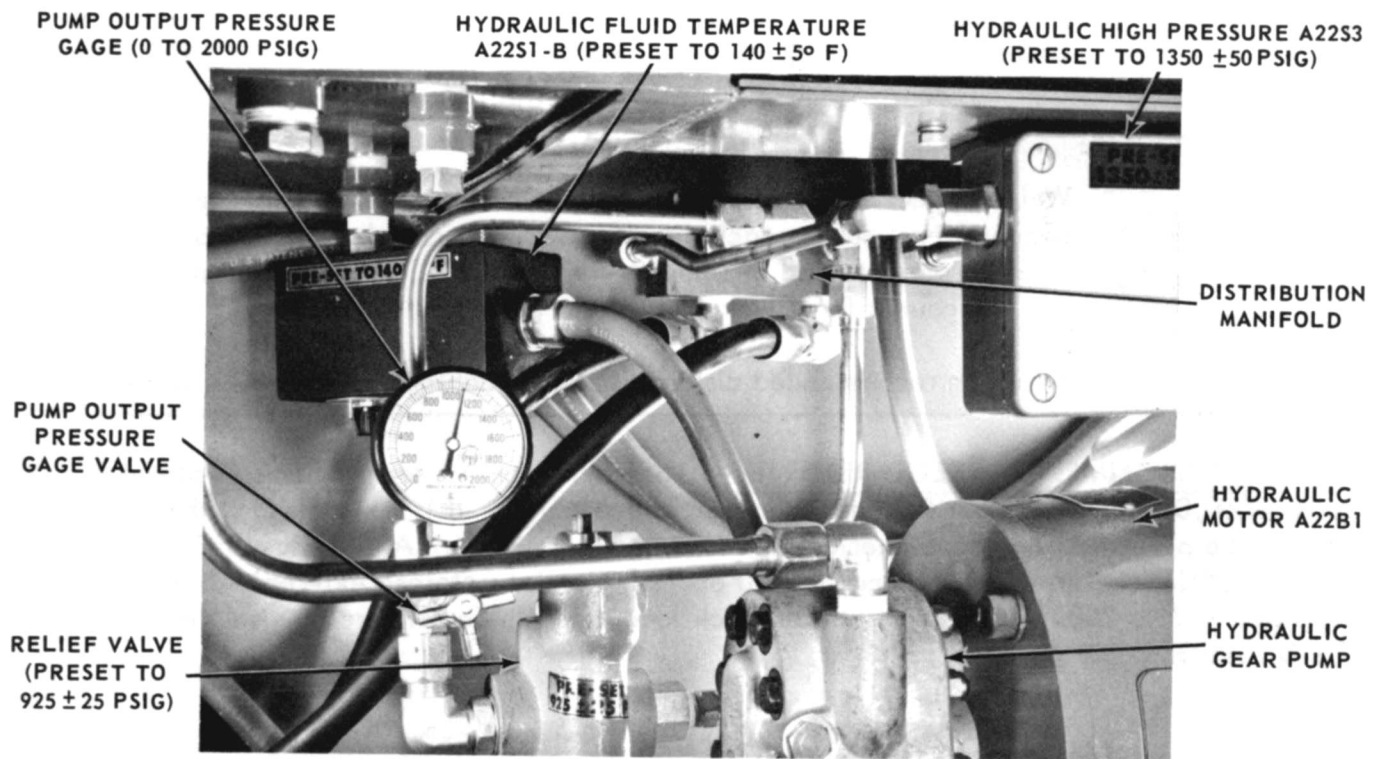


Figure 1-26 Model 1 Series 4000A Disc File, View of Major Components in Lower Compartment of Hydraulic Power Supply

1-3-1 PHYSICAL CHARACTERISTICS (Cont.)

TABLE 1-1 PHYSICAL CHARACTERISTICS (Cont.)

Disc File Configuration	Assembly	Measurements			
		Width (inches)	Depth (inches)	Height (inches)	Weight * (pounds)
C-frame **	Disc File Cabinet (26 discs, max.)	70	46	52	3340
	Power Control Unit	22	46	52	910
NOTES:					
* Weights specified are installed weights with full disc complement; deduct 33 pounds for each disc less from full complement. For shipping weight, add 275 pounds for the disc file cabinet pallet; add 115 pounds for power control unit pallet.					
** Minimum recommended distance between cabinets of assembly, 3 feet.					

1-3-2 ENVIRONMENTAL REQUIREMENTS — The environmental requirements of Model 1 Series 4000 Disc Files without ECU are specified in Table 1-2. It is recommended that the disc file be operated in an atmospheric controlled environment with ASTM Class 3 Clean Room Conditions. The disc file is capable of operating under sustained external vibrations of 0.25G — 5 to 2000 cps. The maximum shock load that can be tolerated by the disc file is 0.25G.

TABLE 1-2 ENVIRONMENTAL REQUIREMENTS

Parameter	Operating	Non-Operating
Temperature	+ 10°F within the limits of 65° to 85° F. *	-30° to 130° F.
Barometric Pressure	32 to 24-inches of Hg (Sea Level to 6000 ft.)	32 to 11-inches of Hg (Sea Level to 25,000 ft.)
Humidity	10 to 85%	0 to 90%
NOTE:		
* Maximum permissible linear temperature gradient, 20°F/Hr.		

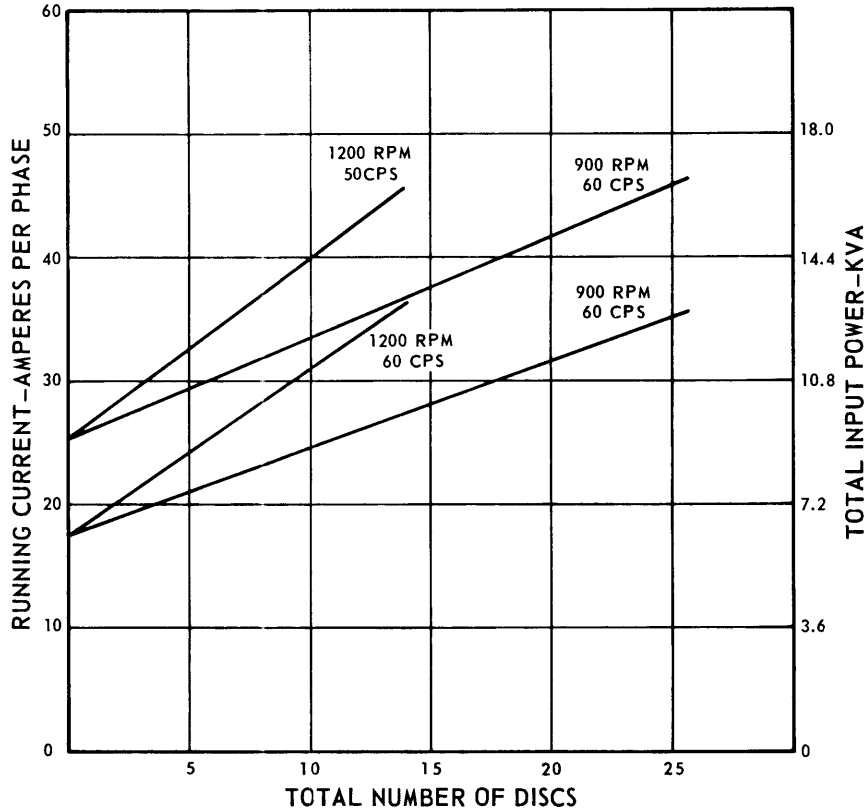
1-3-3 POWER REQUIREMENTS — The disc file can be operated using a 208/440 vac $\pm 10\%$, three phase, 50/60 cycle power source. Running current requirements and heat dissipation of the various disc file configurations for different voltages, frequencies and disc combinations are shown in Figures 1-27, 1-28 and 1-29.

1-3-4 RECORDING CHARACTERISTICS — The following discussion is intended to provide general background on the recording characteristics of a disc file. Included are the methods by which one can determine the data storage capacity of a purchased file; a brief dissertation on some of the available write/read recording techniques that can be used with the file; and a discussion on the affects that coefficient of thermal expansion of components can have on playback.

1-3-4-1 Storage Capacity — The data storage capacity of a disc file is variable depending on the number of discs purchased with a particular file configuration, whether all six available recording zones of the data disc surfaces are utilized, what recording method is used, what packing densities — in bits per inch (BPI) — are selected for each recording zone of the disc surfaces, what frequencies are selected for each recording zone of the disc surfaces, etc. By knowing the speed of the disc file and the bit packing density to be used in each recording zone of the disc file, however, the total storage capacity for any purchased Bryant disc file can be determined from the information furnished in Figure 1-30. For example, take the case of a B-frame Bryant disc file with the following parameters: full complement of 13 data discs and 1 clock disc; a desired packing density of 300 BPI per recording zone; six recording zones per disc surface (six head pads per data head bar assembly — see paragraph 1-2-1-1 g. (2)); and a disc motor with a speed of 900 rpm. The data bit capacity of the file would then be computed from the information of Figure 1-30 as follows:

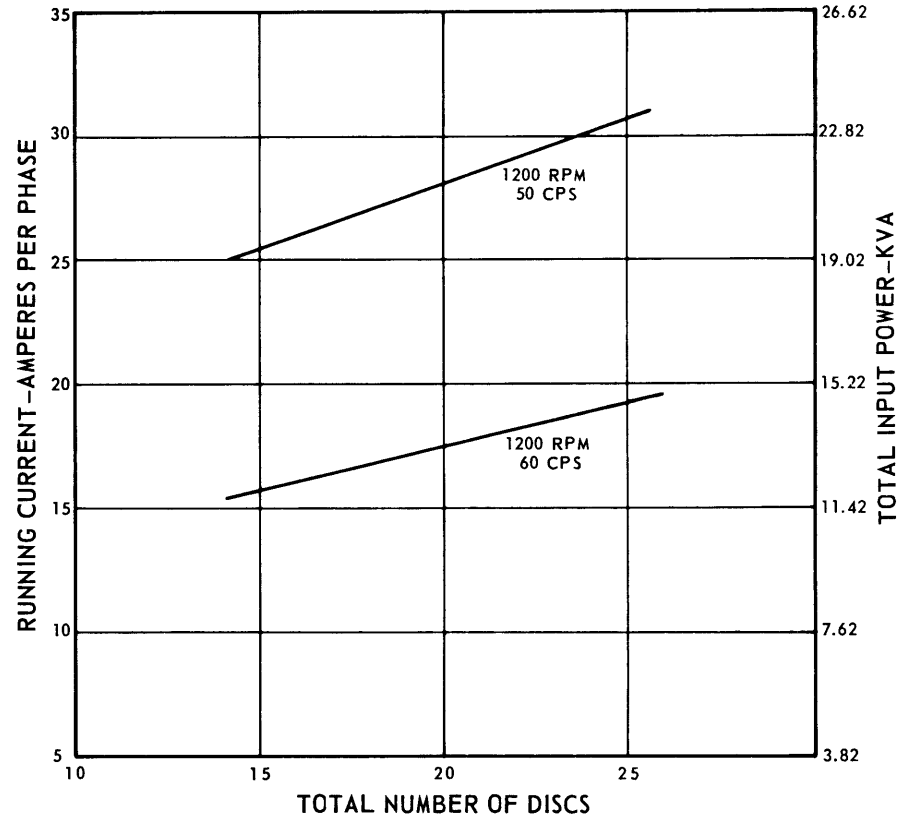
a. The write/read frequency of the signals to each zone are computed by multiplying the packing density of the zone — in bits per inch (BPI) — by the speed of the innermost track of the zone — in inches per second. Since only one frequency is to be used for all 128 tracks of the zone, the number of bits stored in each track of the zone will be the same even though the speed of the tracks of the zone — as the tracks become longer because of their displacement out from the center of the disc — becomes greater; as a result, the bit packing density of all tracks other than the innermost track of the zone, will decrease as the track circumference becomes greater. Using Figure 1-30 as a basis, frequency of the zones for the packing density of the example are:

- (1) Zone 1, $300 \times 572 = 171.6 \text{ Kc.}$
- (2) Zone 2, $300 \times 770 = 221.0 \text{ Kc.}$
- (3) Zone 3, $300 \times 970 = 281.0 \text{ Kc.}$
- (4) Zone 4, $300 \times 1168 = 350.4 \text{ Kc.}$
- (5) Zone 5, $300 \times 1368 = 410.4 \text{ Kc.}$
- (6) Zone 6, $300 \times 1567 = 460.1 \text{ Kc.}$



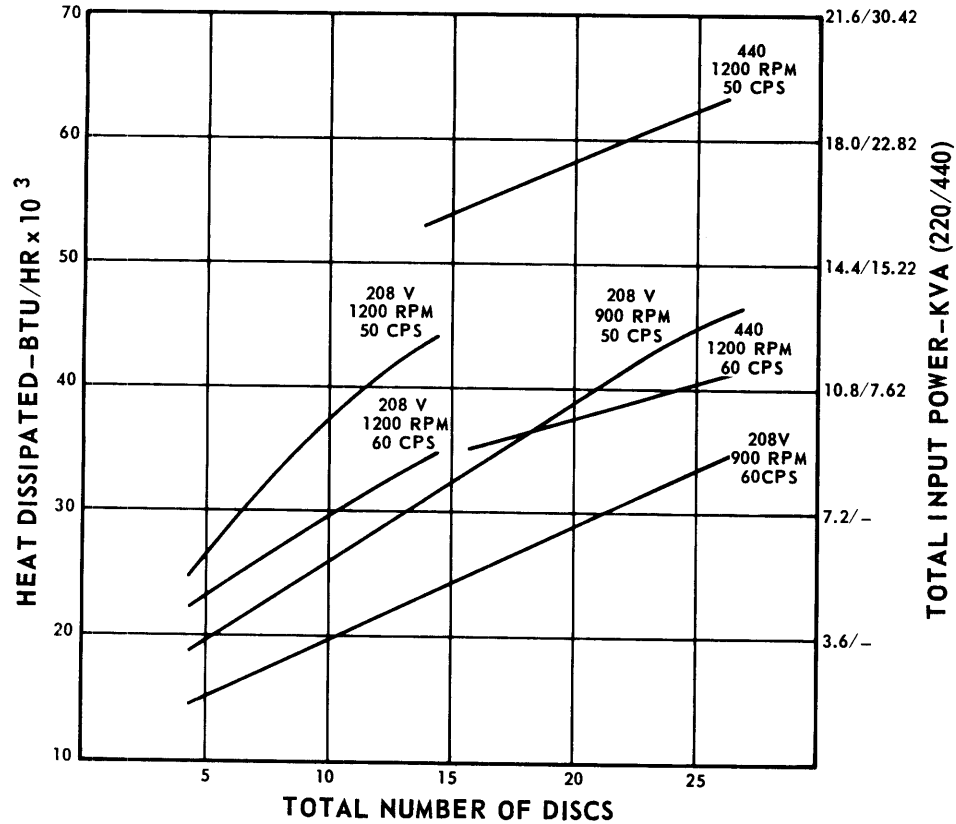
NOTES:
 1-CURVES ARE BASED ON 208 VAC \pm 10%, THREE PHASE, 50/60 CPS POWER SOURCE
 2-SUBTRACT 2 AMPERES (0.9 KVA) FOR FILES WITHOUT ELECTRONICS
 3-MAXIMUM SURGE CURRENT: 125 AMPERES AT 60 CPS; 135 AMPERES AT 50 CPS.

Figure 1-27 Model 1 Series 4000 Disc Files With 208-Volt Three-Phase Motors—Total Number of Discs Vs. Running Current



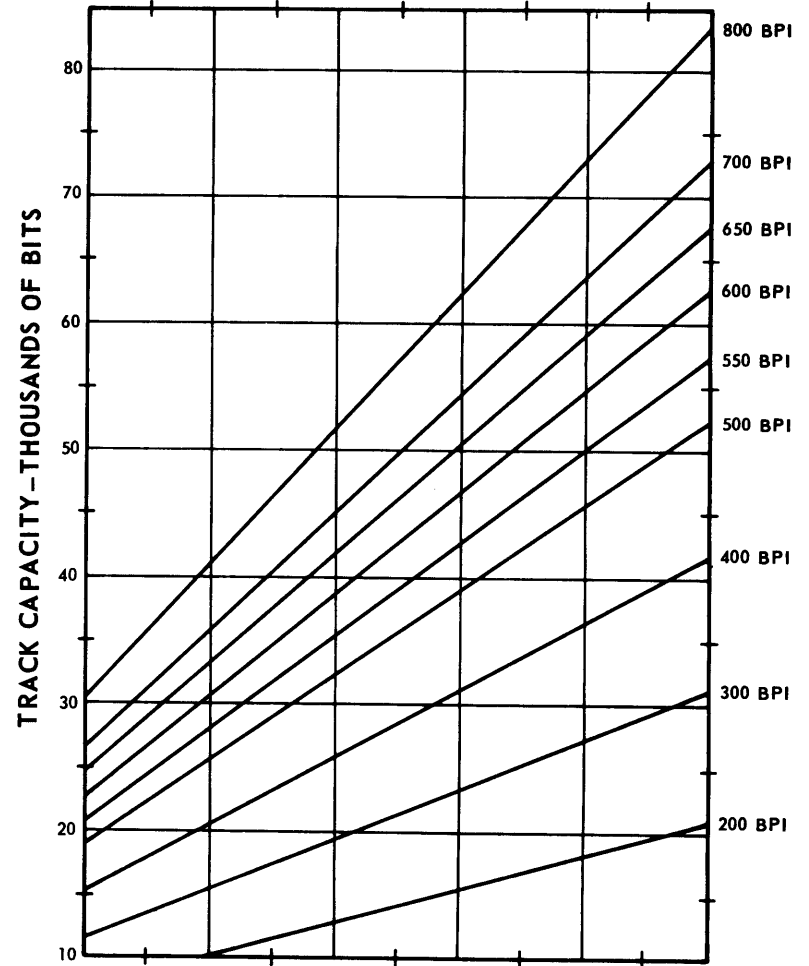
NOTES:
 1-CURVES ARE BASED ON 440 VAC \pm 10%, THREE PHASE, 50/60 CPS POWER SOURCE;
 2-SUBTRACT 1 AMP, 0.9 KVA FOR FILES WITHOUT ELECTRONICS
 3-MAXIMUM SURGE CURRENT: 85 AMPERES AT 60 CPS; 100 AMPERES AT 50 CPS.

Figure 1-28 Model 1 Series 4000 Disc Files With 440-Volt, Three-Phase Motors—Total Number of Discs Vs. Running Current



NOTE: CURVES ARE BASED ON 208/440 VAC ± 10%, THREE PHASE, 50/60 CPS POWER SOURCE.

Figure 1-29 Model 1 Series 4000 Disc Files With 208/440 Volt, Three Phase Motors—Total Number of Discs Vs. Heat Dissipated



ZONE NO.	1	2	3	4	5	6
INNER TRACK LENGTH	38.2	51.4	65.0	78.0	91.2	104.5
TRACK SPEED (1200 RPM)	764	1028	1293	1558	1826	2090
TRACK SPEED (900 RPM)	572	770	970	1168	1368	1567

NOTES:
 1—INNER TRACK LENGTH IS IN INCHES; TRACK SPEED IS IN INCHES/SECOND;
 BPI INDICATES BITS PER INCH
 2—TRACK CAPACITY = TRACK LENGTH x BPI
 3—FREQUENCY = TRACK SPEED x BPI

Figure 1-30 Model 1 Series 4000 Disc File—Disc Zones Vs. Track Capacity

1-3-4-1 Storage Capacity (Cont.)

b. Because it is convenient to use one frequency for each recording zone of the file and because the tightest packing density will always occur on the smallest, or innermost track of the 128 tracks of a zone to which the head pads of the head bar assemblies can be positioned through the digital actuator/boost assembly (see paragraph 1-2-1-1 f.), the following number of bits can be recorded in each track of a zone for the specified packing density.

NOTE

Values are obtained from the intersecting points of the 300 bpi line and the vertical inner track length line of Figure 1-30.

- (1) Zone 1, 12.5×10^3
- (2) Zone 2, 15.5×10^3
- (3) Zone 3, 19.5×10^3
- (4) Zone 4, 23.5×10^3
- (5) Zone 5, 27×10^3
- (6) Zone 6, 31×10^3

c. Since each head pad of the disc file is positionable through 128 tracks, which make up a zone, the number of bits that can be stored in each zone of a disc surface can be computed by multiplying the number of bits of a track by the number of tracks of the zone. Using the bit values recorded in step b., the number of bits per zone are:

- (1) Zone 1, $12.5 \times 10^3 \times 128 = 1.63 \times 10^6$
- (2) Zone 2, $15.5 \times 10^3 \times 128 = 1.98 \times 10^6$
- (3) Zone 3, $19.5 \times 10^3 \times 128 = 2.50 \times 10^6$
- (4) Zone 4, $23.5 \times 10^3 \times 128 = 3.01 \times 10^6$
- (5) Zone 5, $27 \times 10^3 \times 128 = 3.46 \times 10^6$
- (6) Zone 6, $31 \times 10^3 \times 128 = 3.97 \times 10^6$

d. By adding the number of bits of each of the zones of a disc surface, the total number of bits that can be stored on a disc surface can be determined. From step c., then, the total number of bits that can be stored on the surface of a disc in the example are 16.55×10^6 bits.

1-3-4-1 Storage Capacity (Cont.)

e. Since there are 13 data discs and one clock disc in the file, there are 27 surfaces on which data can be stored; one surface of the clock disc is used for clocks (see paragraph 1-2-1-1 d. (1)). Thus, by multiplying the number of disc surfaces by the number of bits that can be stored on a surface — as computed in step d. — the capacity of the disc file in this example is: $27 \times 16.55 \times 10^6$, or 446.85×10^6 bits.

f. Note that in order to maintain the bit packing density constant in each of the recording zones, the write/read frequency used in each of the recording zones of the example have differed because of necessity. If it would have been desired to use varying bit densities in each of the zones or a fixed frequency for all zones, the capacity of the file could be determined for whatever parameters are desired. It must be realized, however, that limitations of the data capacity of the file will be effected by the frequency capability of the interface electronics, the design parameters of the write/read recording heads, the thickness of the magnetic oxide coating, the recording method used, the head-to-disc surface spacing, etc.

1-3-4-2 Recording Techniques — The capability of the magnetic system of a file depends not only upon the individual characteristics of the coating and the heads, but also upon the recording mode chosen for the file and the signal retrieval characteristics of the playback circuits.

a. The Bryant disc file is capable of accommodating standard state-of-the-art recording methods such as non-return-to-zero (NRZ), phase modulation (PM), modified return-to-bias (MRB), and return-to-zero (RZ). Computer systems requiring the use of selective-alteration of a single bit, or bit interlacing, restricts the capabilities of the magnetic system. However, where such a system application is utilized, Bryant's modified return-to-bias (MRB) recording technique with clocked, amplitude-threshold controlled playback circuits is recommended. Where computer systems require the use of parallel or serial operation, Bryant recommends the use of the "phase modulation" mode of recording.

b. "Drop outs" can be minimized, or completely eliminated, by using phase modulation recording with a self-clocked, peak detection read amplifier capable of accommodating 80% localized signal modulation (where $\% \text{ Modulation} = \frac{E_{\text{max.}} - E_{\text{min.}}}{E_{\text{max.}} + E_{\text{min.}}} \times 100$). A "minimum defined drop-out" of 5 millivolts peak-to-peak can be provided for such a system. Even when such techniques are used to provide a "drop-out free" system, however, an automatic error correction system should be incorporated into the electronic system; this action will provide backup to the system should accidental damage occur to a disc surface or should "marginal conditions" exist in a field. A number of appropriate automatic error correction techniques are described in Bryant's Specification ES-208.

c. Discs installed on Bryant's disc files contain no more than five "defined drop-out tracks" per disc. A drop-out track is defined as a track where the signal falls below a given high threshold, or a noise spike rises above a given low threshold, with the operating threshold set between the two. These drop-outs may or may not be detectable at the operating threshold; however, they must be considered as potentially detectable. During assembly of the disc files, discs are selected to provide no more than one "defined drop-out track" per track position per head row.

1-3-4-3 Temperatures' Affect on Playback — The variation of the thermal expansion coefficient of the different components in the recording and head positioning elements of the disc file, though minimized by the use of matching materials where possible, can seriously affect the level of the readout of data written into the files should the temperature of the disc file cabinet vary outside predetermined minimum or maximum limits. Such temperature change affects the position of the head pole piece with respect to a written track. As a rule of thumb, the pole piece of a head pad of a data head bar assembly will be displaced approximately 0.0001 inch from a previously written track for every 1°F. change in temperature — within a 10°F. range — that occurs from the time at which the track was written; or, playback is reduced by approximately one percent for every 1°F. change in temperature within the 10°F. temperature range. For this reason, it is recommended that the upper and lower temperature limits of the temperature monitoring circuits of the disc file's tachometer/temperature meter box be set to within +5°F. of the recorded disc file cabinet operating ambient as measured in the facility in which the file is installed (see paragraph 6-6-3 v.); a warning interlock circuit that will indicate when these limits are exceeded is available for customer use.

SECTION 2

RECEIVING, STORAGE OR INSTALLATION, AND SHIPPING INSTRUCTIONS

2-1 INTRODUCTION

This section provides the procedures to be followed when receiving, storing, installing, preparing for shipment and shipping a Standard Bryant, Model 1 Series 4000 Disc File, without environmental control unit. All such procedures shall be performed by qualified technicians. If assistance is required, Bryants' qualified staff of servicemen are always on call to perform such customer service.

2-1-1 PERSONNEL QUALIFICATIONS — Personnel responsible for performing the procedures of this section shall be technically qualified; also, it is recommended that each individual shall have participated in Bryant's disc file and familiarization training program. One man shall be selected to coordinate all activities as well as to assure that all possible caution is taken to protect both personnel and equipment. In addition, each individual performing the procedures contained herein shall be thoroughly familiar with the manual and automatic turn-on and turn-off procedures as discussed in Section 3.

2-1-2 SPECIAL TOOLS AND ACCESSORIES SUPPLIED — Special tools and accessories supplied depend on whether an A-frame disc file or a B- or C-frame disc file is involved. Table 2-1 identifies those items that are supplied in the accessory boxes of all standard disc files. Table 2-2 identifies those additional items that are supplied in the accessory box of standard B- or C-frame files.

TABLE 2-1 SPECIAL TOOLS AND ACCESSORIES SUPPLIED
WITH ALL STANDARD BRYANT DISC FILES *

Nomenclature	Quantity	Bryant Part No.	First Use Paragraph
Data Head Adjustment Tool	1	D-AF-411-1	6-10-1-2r.
Clock Head Adjustment Tool	1	D-AF-411-2	6-10-2-2k.
Head Bar Removal Wrench	1	C-301103	6-10-1-2k.
Torque Wrench	1	A-56840	5-6-2-2e.
Modified Torque Wrench Adapter	1	A-302682	5-9-4-3d.
Head Retraction Tool	1	B-302700	5-9-4-2g.

2-1-2 SPECIAL TOOLS AND ACCESSORIES SUPPLIED (Cont.)

TABLE 2-1 SPECIAL TOOLS AND ACCESSORIES SUPPLIED
WITH ALL STANDARD BRYANT DISC FILES*(Cont.)

Nomenclature	Quantity	Bryant Part No.	First Use Paragraph
Boost Grease Gun	1	C-AF-156	5-3-1-2d.
Bearing Lubrication Gun	1	C-AF-234	5-4-1-2d.
Whitey Valve Adjusting Handle	1	B-56877	6-9-3-3b.
Disc Cleaning Kit	1	A-AF-197	5-2-4-1
Facility Power Cable**	1	D-AF-315	2-4-1-1o.
Ground Strap**	1	C-301122-13	As Required
Power Control Panel to Computer Cable Assembly**	1	C-AF-308	2-4-1-1m.
Mating Connector For Cable C-AF-308**	1	B-54697-30	2-4-1-1m.
Cable Clamp For Connector B-54697-30**	1	B-54050-7	2-4-1-1m.
NOTE:			
* All parts are included in Standard Tool Kit, Bryant Part No. A-AF-235, except those marked with a double asterisk (**) which are included in Standard Tool Kit, Bryant Part No. A-AF-246.			

TABLE 2-2 ADDITIONAL SPECIAL TOOLS AND ACCESSORIES SUPPLIED
WITH STANDARD B- AND C-FRAME DISC FILES *

Nomenclature	Quantity	Bryant Part No.	First Use Paragraph
Power Control Panel to Pushbutton Station Cable Assembly	1	C-AF-361	2-4-1-2k.
Solenoid Driver Power Supply to Digital Actuator Solenoid Valves	1	C-AF-324	2-4-1-2l.
Hydraulic Hose Assembly (Pressure)	1	C-AF-259-1	2-4-1-2n.
Hydraulic Hose Assembly (Return)	1	C-AF-259-2	2-4-1-2m.
NOTE:			
* Part of Standard Tool Kit, Bryant Part No. A-AF-246.			

2-1-3 SPECIAL EQUIPMENT RECOMMENDED BUT NOT SUPPLIED — Special equipment recommended but not supplied is listed in Table 2-3.

TABLE 2-3 SPECIAL EQUIPMENT RECOMMENDED BUT NOT SUPPLIED

Nomenclature	Quantity	Bryant Part No.	First Use Paragraph
GO/NO GO Gage	1	B-25425	6-10-1-2v.
Torque Wrench (0 to 150-inch pounds), Snap-on Tools Co. Part No. TQ-12B, or equivalent.	1		As Required
Veelos Belt Tool, Manheim Manufacturing and Belting Co., or equivalent.	1	_____	6-8-2f.
Flood Lamp Assembly, consisting of: Flood Light Housing, Colortron Part No. LQK6/DS (Dual 650) United Laboratories Approved Clamp, Smith-Victor Part No. RL Kelvin Quartz Lamp, 650 Watt-3200 Westinghouse Part No. B6-32	1	_____	5-8-2-4f.
Hydraulic Oil Sampling Kit	1	A-AF-407	5-4-3-1
Supplemental Oil Sampling Kit	1	A-AF-455	5-4-3-1
Purging Unit	1	D-AF-483	5-9-2-2e.
Clamping Ring	1	D-25060-1	6-11-2l.
Backup Plate	1	D-25060-2	6-11-2l.
A.C. Erase Tool	1	D-AF-243	6-10-1-2b.

2-2 SPECIAL RECEIVING INSTRUCTIONS

Extreme caution shall be exercised to ensure that the wheels of the road carrier used to transport the file are properly blocked and the vehicle's brakes are fully applied before any attempt is made to remove the file cabinet(s) from the carrier. When using a fork lift truck to move the disc file cabinet assembly, it is recommended that the fork lift, with cabinet, be moved from the van on 1/4-inch thick, 18-inch wide magnesium strips, or equivalent. The strips shall be of sufficient length to ensure reduced floor loading up to the point where the cabinet rests on the van's bed. This action should eliminate the possibility of the failure of an understrengthened van bed, which — should such failure occur — could cause damage to the file.



Figure 2-1 Model 1 Series 4000B Disc File Sealed for Shipment—Typical Sealing of All Files

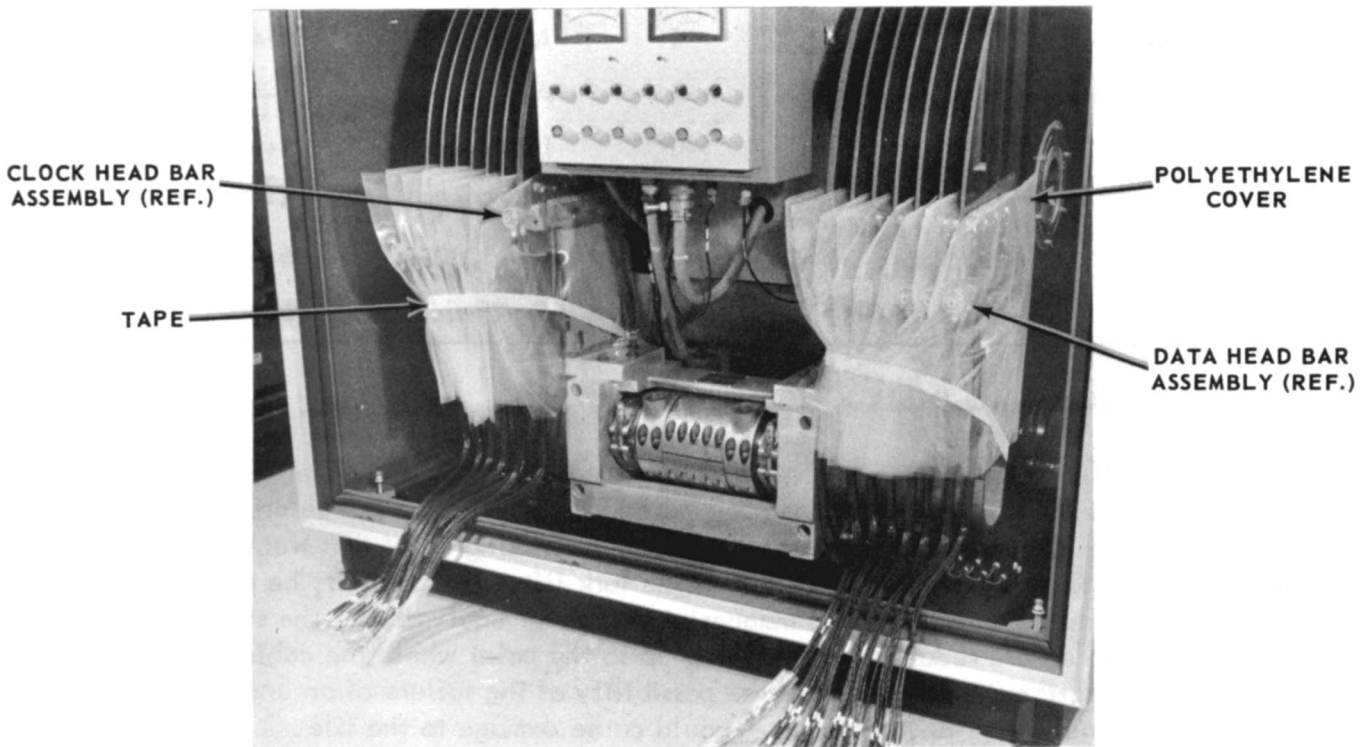


Figure 2-2 Model 1 Series 4000B Disc File Cabinet Assembly, Front View Showing Interior Packing—Typical of All Files

2-3 STORAGE INSTRUCTIONS

CAUTION

Files that are to be stored shall be prepared as directed for preparation for shipment prior to storage .

Files initially received at a site and not immediately installed or files that are not to be used for extended periods of time shall be stored as follows:

2-3-1 If a disc file is not to be installed and operated for a week or more following initial receipt, it is recommended that its cabinet remain sealed as received (see Figure 2-1) until such installation and operation is ensured; this includes leaving the polyethylene cover on the cabinet(s). Exceptions to this rule are the performance of the procedures specified in paragraphs 2-3-4 through 2-3-6.

2-3-2 Using a fork lift truck with a 4500-pound capacity, move the disc file cabinet(s) to the storage area .

2-3-3 If the cabinet containing the discs is to be removed from its shipping skid for storage, it is recommended that the cabinet be supported on eight blocks, with each block at least 4 x 4-inch in size (the blocks shall be positioned under the isomode pads located under the disc file base); also, the file shall be stored on a concrete or otherwise reinforced floor that is flat within 2 degrees of horizontal.

2-3-4 To ensure proper lubricant application to spindle bearings, perform the following preventive maintenance procedure once every two weeks following the last use of the disc file or storage period.

- a. Review the preventive maintenance introductory information of paragraph 5-1 before performing the subsequent procedures .
- b. Remove the polyethylene cover from the disc file cabinet .

CAUTION

Never touch discs with bare hands or objects that can score disc surfaces. Rotate discs only in the direction specified.

- c. With respect to facing the front of the file, remove the right-side access panel of the disc file cabinet .
- d. Remove the three front access panels from the file cabinet.
- e. Remove the tape placed across the front of the head bars (see Figure 2-2) and retract the data heads from the disc file cabinet as directed in paragraph 5-9-4-2 steps f .

2-3 STORAGE INSTRUCTIONS (Cont.)

and g.; this action protects discs from polyethylene covers on head bar assemblies when discs are being rotated.

f. While wearing rubber gloves and while facing the opening of the file of step c., rotate the discs of the disc file ccw by hand for a minimum of 20 revolutions.

g. Insert the data heads back into the disc file cabinet as directed in paragraph 5-9-4-3 steps b. through e. and reinstall tape across the front of the head bar assemblies.

h. Reinstall disc file cabinet access panels.

i. Reinstall and tie polyethylene cover on disc file cabinet.

2-3-5 If the cabinet(s) are to remain in a sealed, unused condition for a month or more, it is recommended that desiccant and humidity indicators be placed in the critical areas of the cabinet(s) in accordance with accepted commercial practice.

NOTE

For the purposes of this handbook, operation of the disc file in the following step is not considered part of normal routine service.

2-3-6 It is recommended that the hydraulic system of the disc file be operated at least once every three months; this will generally necessitate the performance of the installation procedures — except for removing the cabinets from their skids and the making of computer connections — and the operation of the file in all of its operating modes — including head positioning — for at least 15 minutes. This action will enable lubrication of seals which may otherwise tend to dry out. Following the performance of this procedure the disc file will be returned to its storage condition.

2-4 INSTALLATION INSTRUCTIONS

Included herein are the procedures for installing disc file without electronics and the required checks that must be performed following installation. Before proceeding, however, review paragraph 5-1.

2-4-1 PROCEDURES — Because of the single cabinet concept of A-frame files, installation of the A-frame file is covered separately from that of the installation of the dual cabinet B- and C-frame files.

2-4-1-1 A-frame Files — Install A-frame files as follows:

a. Using a fork lift truck with a 4500-pound capacity, move the disc file cabinet to the area in which it is to be installed; the surface of the area on which the file is to be installed shall be flat and horizontal within two degrees.

b. Thoroughly clean the installation area.

2-4-1-1 A-Frame Files (Cont.)

- c. Carefully remove the polyethylene cover from the cabinet.
- d. Remove the kick plate packages secured to the rear of the skid.
- e. Remove the cabinet from its shipping skid and set the cabinet in its permanent installation position (for location of the floor ducts of the cabinet, see Figure 2-3).

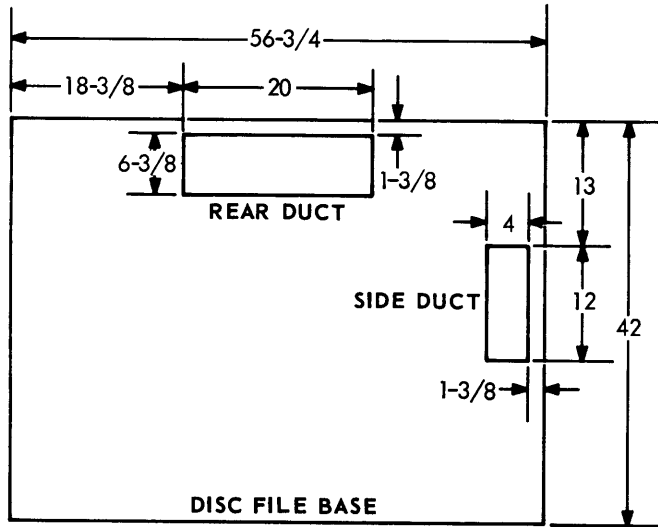
CAUTION

The area surrounding the cabinet shall remain clean as long as the cabinet access panels are removed.

f. Remove the front, rear, and both side access panels from the cabinet as directed in paragraph 6-12 and strip off sealing covers from panel windows. Maintain contents of envelope that was secured to window of center-front access panel of cabinet in a safe place; this material shall always be retained with the disc file as a permanent record. Keys for the RESET OFF/TRIP ON circuit breaker and the door lock of the power control panel are contained in a maintenance log holder secured to the inside of the left-front access panel of the cabinet. The maintenance log in the envelope should reflect the maintenance schedule contained in Section 5 of this handbook. Modify the schedule as necessary.

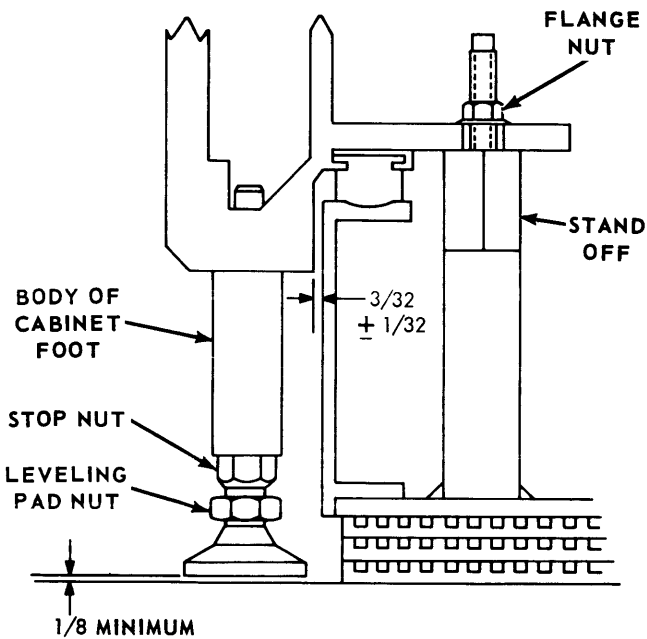
g. Level the cabinet as follows:

- (1) Referring to Figure 2-4, turn the flange nut of the standoff at each corner of the cabinet ccw until each nut is $3/8$ to $1/2$ -inch off the cabinet flange.
- (2) Position the cabinet so that its' lower vertical edges are within $3/32 \pm 1/32$ -inch of the vertical channel of the base at all four corners.
- (3) Turn the stop nut at each of the four corners of the cabinet until they are backed off the body of the cabinet foot.
- (4) Referring to Figure 2-5, adjust the leveling pad nut of each cabinet foot until the corners of the cabinet are each lifted $1/4 \pm 1/16$ -inch off the standoff.
- (5) Check that the cabinet is level with respect to the floor of the installation. If the cabinet is not level, adjust the leveling pad nuts at the appropriate corners of the cabinet until the cabinet is level. Ensure that the leveling is accomplished with the tolerances of steps (2) and (4) maintained.
- (6) With the cabinet leveled, hold the leveling pad nut of each cabinet foot stationary and turn the stop nut up against the body of the cabinet foot.



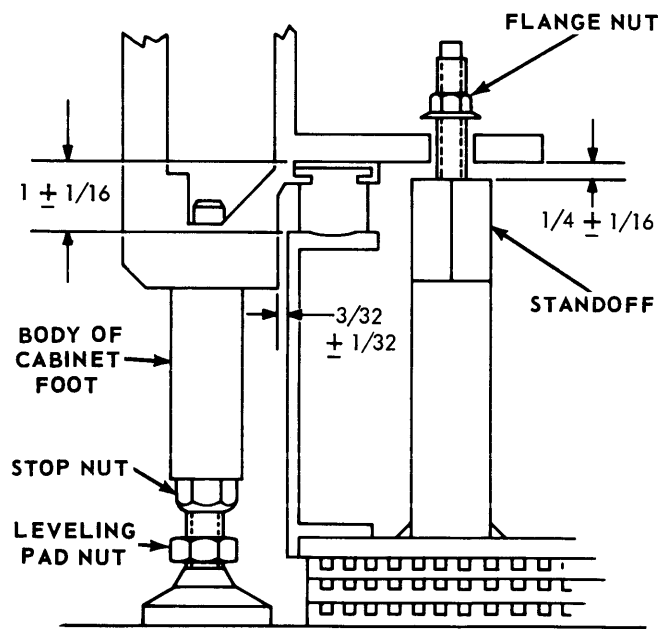
- NOTES:**
- 1-MEASUREMENTS ARE MADE WITH RESPECT TO THE PEDESTAL BASE.
 - 2-DIMENSIONS ARE IN INCHES AND MEASUREMENTS ARE APPROXIMATE.
 - 3-ONLY REAR DUCT OF PEDESTAL BASE IS USED ON STANDARD FILES. A METAL PLATE IS SECURED OVER SIDE DUCT; THE PLATE CAN BE REMOVED FOR OPTIONAL APPLICATIONS, AS REQUIRED.

Figure 2-3 Dimensional Locations of Ducts in Base of A-Frame File



NOTE: ALL DIMENSIONS ARE IN INCHES

Figure 2-4 Leveling Pad of Disc File Cabinet in the Shipping Position



NOTE: ALL DIMENSIONS ARE IN INCHES

Figure 2-5 Leveling Pad of Disc File Cabinet in the Operating Position

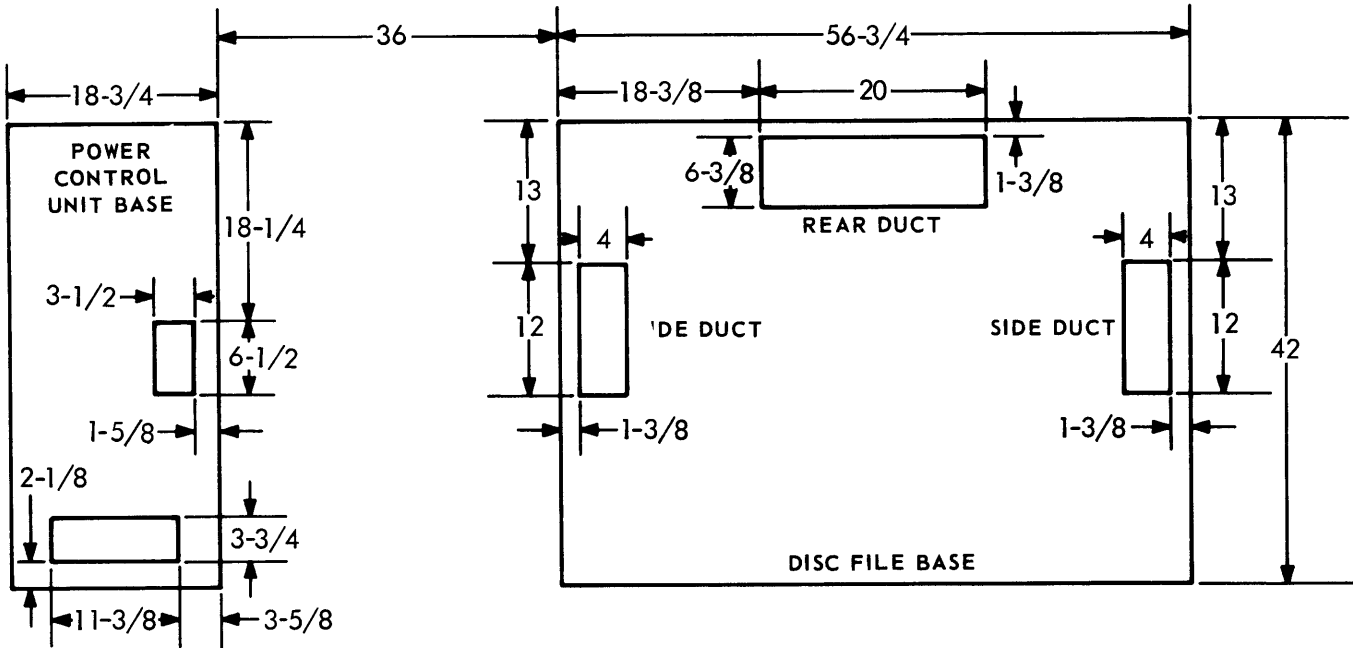
2-4-1-1 A-Frame Files (Cont.)

- h. Remove the covers from the data head bars as follows:
 - (1) Remove the tape placed across the front of the head bars (see Figure 2-2, packaging example).
 - (2) Retract the data head bars from the cabinet as directed in paragraph 5-9-4-2 f. and g.
 - (3) Carefully remove the polyethylene covers from all the data head bar assemblies (see Figure 2-2, packaging example).
 - (4) Insert the data head bars into the cabinet as directed in paragraph 5-9-4-3 b. through e., as applicable; ensure that all head pads are vertically oriented (parallel to the disc surfaces) before proceeding with insertion.
- i. Carefully remove the polyethylene cover from the fixed clock head bars (see Figure 2-2 packaging example).

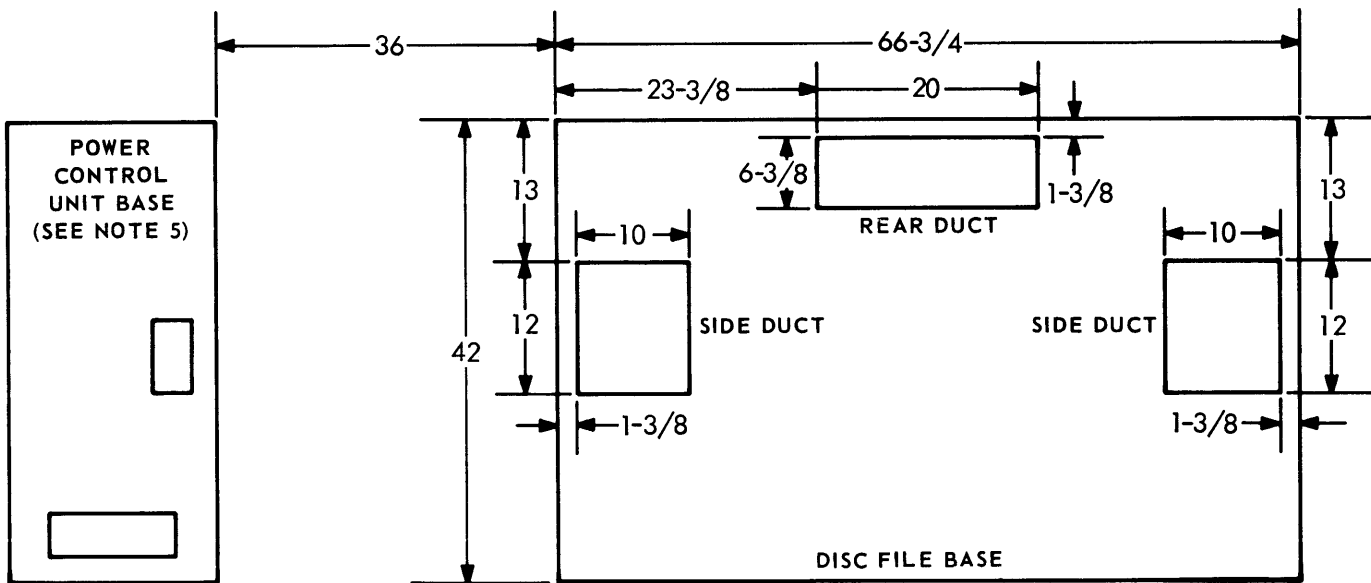
CAUTION

Exercise extreme care to ensure that no dirt enters the reservoir during the next step.

- j. When facing the right-rear access opening of the cabinet, remove the filler/breather cap (see Figure 1-25) from the reservoir of the hydraulic power supply and remove the polyethylene insert from the filler cap; reinstall the cap. Also, remove the cardboard covering the rear and side ducts of the file cabinet (see Figure 2-3).
- k. When facing the left-front access opening of the cabinet, lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-24) in the RESET OFF position.
- l. For machines without the electronics options, check that the computer by-pass connector, Bryant Part No. 549682, is installed on connector A21J5 located in the bottom of the power control panel (see Figure 1-18).
- m. Remove the power control panel to computer cable, Bryant Part No. DAF-308, from the accessory box supplied with the file. Connect A21P4 of cable DAF-308 (see Figure 1-24) to A21J4 located under the power control panel. Route the cable out the rear duct located in the base of the file (see Figure 2-3) to the computer. Attach connector, Bryant Part No. B-54697, and cable clamp, Bryant Part No. B-54050-7, to the computer end of the cable, as applicable.



B-FRAME DISC FILE



C-FRAME DISC FILE

NOTES:

- 1-MEASUREMENTS ARE MADE WITH RESPECT TO BASE OF CABINETS.
- 2-DIMENSIONS ARE IN INCHES AND MEASUREMENTS ARE APPROXIMATE.
- 3-ONLY REAR DUCT OF DISC FILE CABINET BASE IS USED ON STANDARD FILES. A METAL PLATE IS SECURED OVER SIDE DUCTS; THE PLATE CAN BE REMOVED FOR OPTIONAL APPLICATIONS, AS REQUIRED.
- 4-BOTH DUCTS OF POWER CONTROL UNIT ARE USED.
- 5-THE SAME POWER CONTROL UNIT BASE IS USED WITH THE B-AND C-DISC FILE FRAMES.

Figure 2-6 Dimensional Location of Ducts in Base of B- and C-Frame Files

2-4-1-1 A-Frame Files (Cont.)

n. Connect computer cables, as applicable. The digital actuator command input cable connection is through the side duct to connector A14P5 of cable AF-348 (see Figure 1-25). Head selection and write/read command connections are made through the right-hand diode box assembly located in the lower front of the file (see Figure 1-24). Clock or fast access data connections are made through connector(s) of the right-hand clock head bar assembly.

o. Remove the facility power cable, Bryant Part No. AF-315, from the accessory box supplied with the disc file. Connect A21P1 of cable AF-315 (see Figure 1-24) to A21J1 located under the power control panel (see Figure 1-18). Route the cable out the side duct located in the base of the cabinet, (see Figure 2-3) and connect the cable to facility power specified for the file.

p. Install the kick plates — removed as directed in step d. — along the lower edges of the cabinet base.

q. Perform the installation checks of paragraph 2-4-2.

2-4-1-2 B- and C-frame Files — Install B- and C-frame files as follows:

a. Using a fork lift truck with a 4500 pound capacity, move the disc file and power control unit cabinets (see Figure 2-1) to the area in which they are to be installed.

b. Thoroughly clean the installation area.

c. Carefully remove the polyethylene cover protecting each cabinet.

d. Remove the kick plate packages secured to the rear of the skid.

e. Remove the cabinets from their shipping skids and set the cabinets in their permanent installation positions (for locations of the floor ducts of the cabinets, see Figure 2-6); with respect to facing the front of the file, the power control unit cabinet shall be located to the left of the disc file cabinet.

CAUTION

The area surrounding the cabinet shall remain clean as long as the cabinet access panels are removed.

f. Remove the front, rear and side access panels from both cabinets as directed in paragraph 6-12 and strip off sealing covers from panel windows; remove cardboard covers from duct openings (see Figure 2-6) in base of both cabinets. Maintain contents of envelope that was secured over window of center access panel in a safe place; log contents shall always be retained with the disc file as a permanent record. Keys for the RESET OFF/TRIP ON circuit breaker and the door lock of the power control panel are contained in the maintenance log holder secured to inside of the front access panel of the power control unit (see Figure 2-7). The maintenance log in the envelope should reflect the maintenance schedule contained in Section 5 of this handbook. Modify the schedule as necessary.

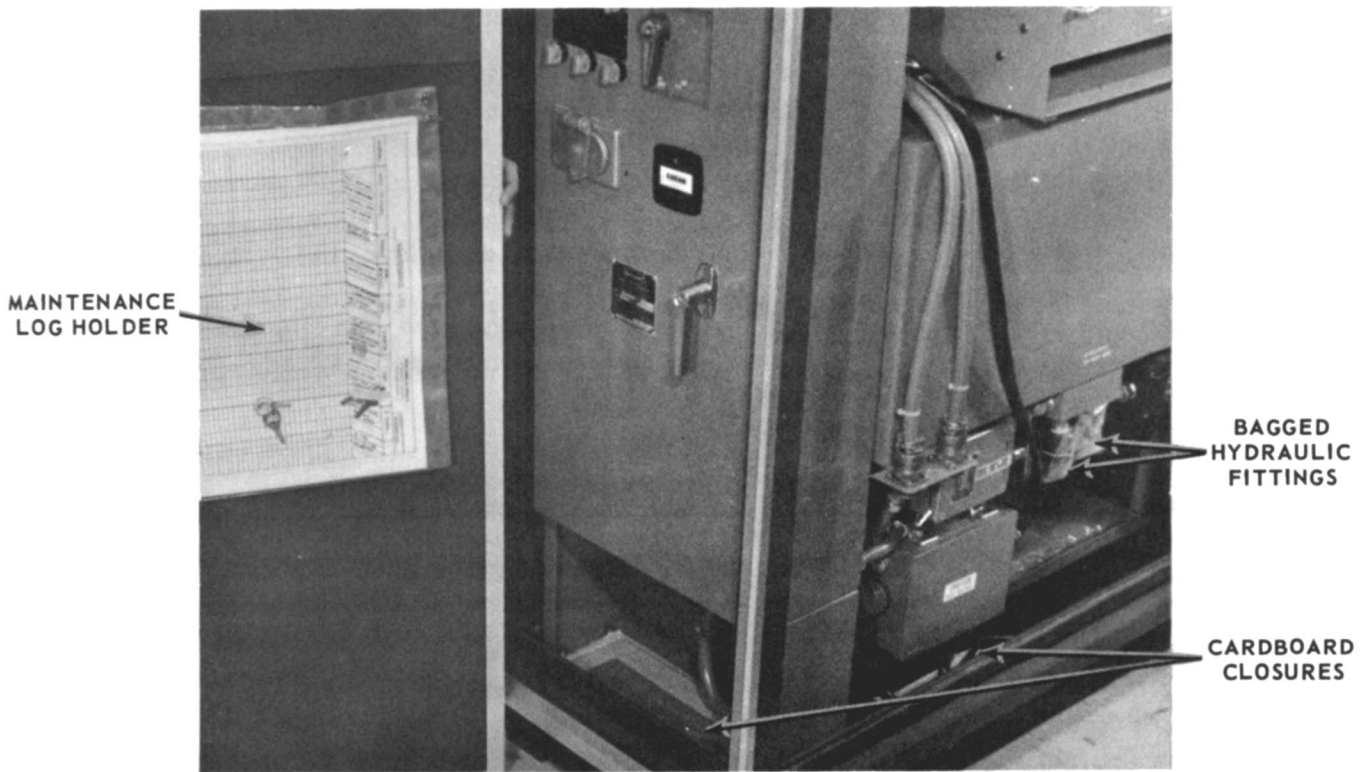


Figure 2-7 Power Control Unit Cabinet Assembly, Front View Showing Interior Packing

2-4-1-2 B- and C-Frame Files (Cont.)

g. Level the disc file cabinet as directed in paragraph 2-4-1-1 g.

h. Remove the covers from the data and clock head bars of the disc file cabinet as directed in paragraph 2-4-1-1 h. and i.

CAUTION

Exercise extreme care to ensure that no dirt enters the reservoir during the next step.

i. At the rear of the power control unit cabinet, remove the filler/breather cap (see Figure 1-19) from the reservoir of the hydraulic power supply and remove the polyethylene insert from the cap; reinstall the cap.

j. At the front of the power control unit cabinet, lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17) in the RESET OFF position.

k. Electrically connect the power control panel of the power control unit cabinet with the pushbutton station of the disc file cabinet as follows:

- (1) Obtain Bryant Cable Part No. AF-361 from the accessory box supplied with the cabinets.
- (2) Working from the duct located beneath the power control panel of the power control unit cabinet, (see Figures 1-17 and 2-8) route the cable to the duct located beneath the accumulator manifold assembly in the rear of the disc file cabinet (see Figure 1-15). Carefully draw the cable (see Figure 2-9) up into the file cabinet through the appropriate slot in the foam protective cover that seals the duct.
- (3) From the center-front access opening of the file, loosen the screw securing the cable support clamp located beneath the pedestal support casting (see Figure 2-10) and slide the clamp to the right.
- (4) Guide connector A11P1 of the cable through the slot of the clamp and connect the cable to A11J1 located in the undersurface of the pushbutton station assembly (see Figure 1-3).
- (5) Slide the cable support clamp — with all applicable cables retained in the clamp slot — to the left and secure the clamp.
- (6) Connect A21P2 of the other end of the cable to A21J2 located in the undersurface of the power control panel (see Figure 2-8).

RESET OFF/TRIP ON
CIRCUIT BREAKER



CABLE AF-315
CABLE AF-361
A21J4 (CONNECTION FOR
CABLE AF-308, NOT VISIBLE)
A21P5
(NOT VISIBLE)

Figure 2-8 Power Control Panel—Customer
and B-or C-Frame Disc File
Interconnecting Cables

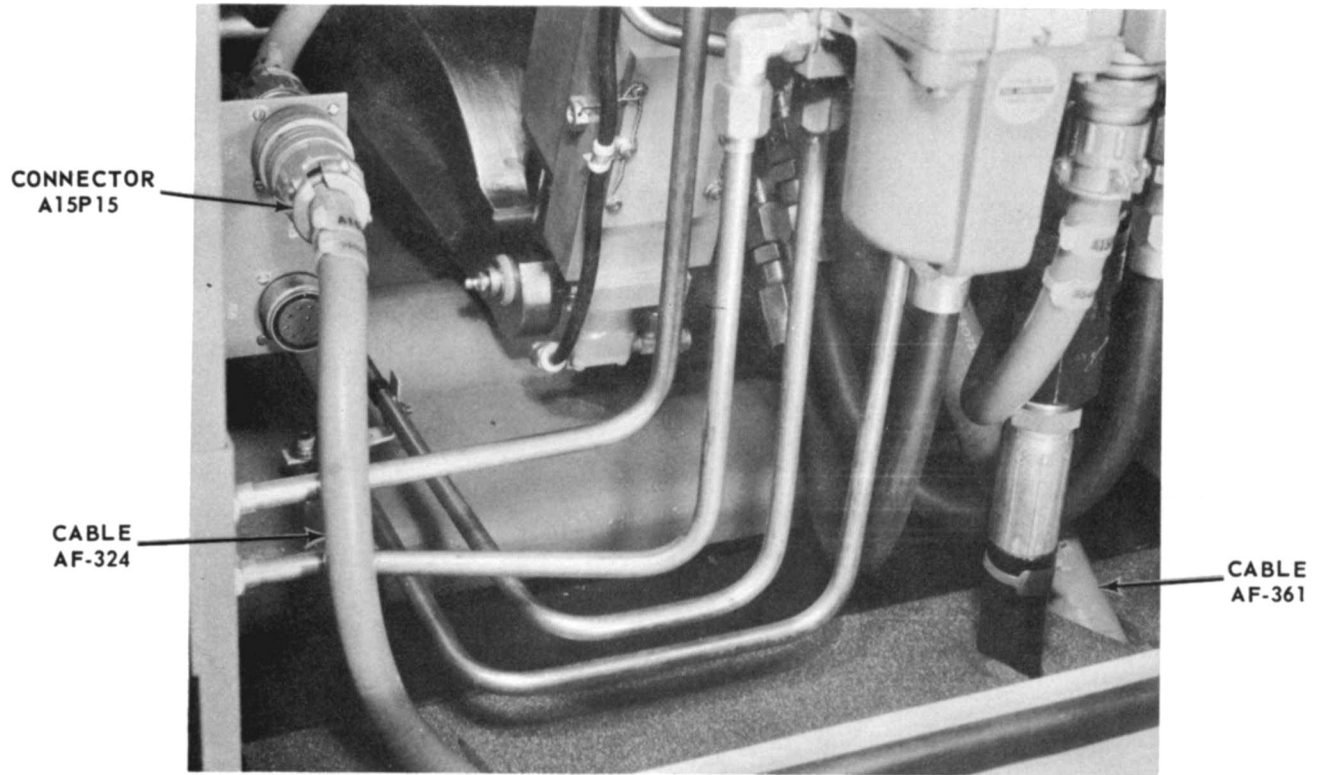


Figure 2-9 Electrical Cables Entering Disc File Cabinet Through Rear Duct

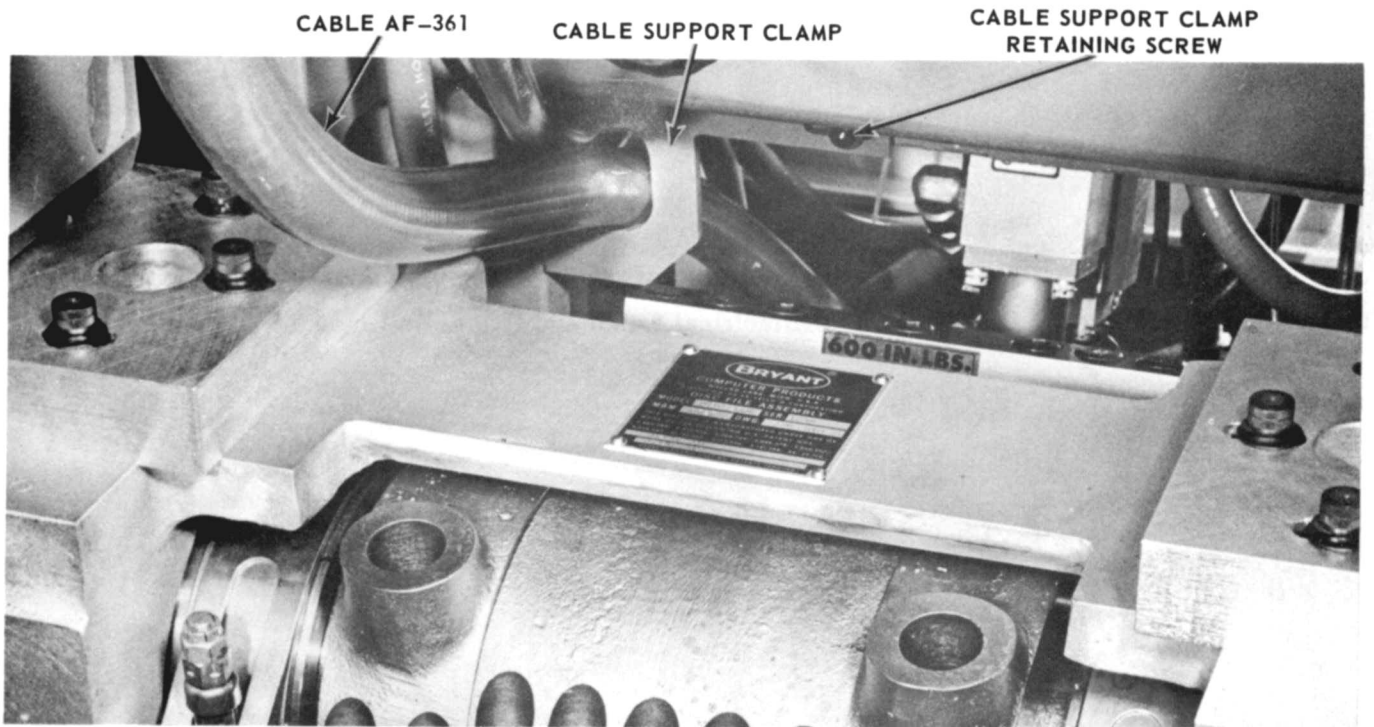


Figure 2-10 Routing of Cable to Pushbutton Station Through Cable Clamp

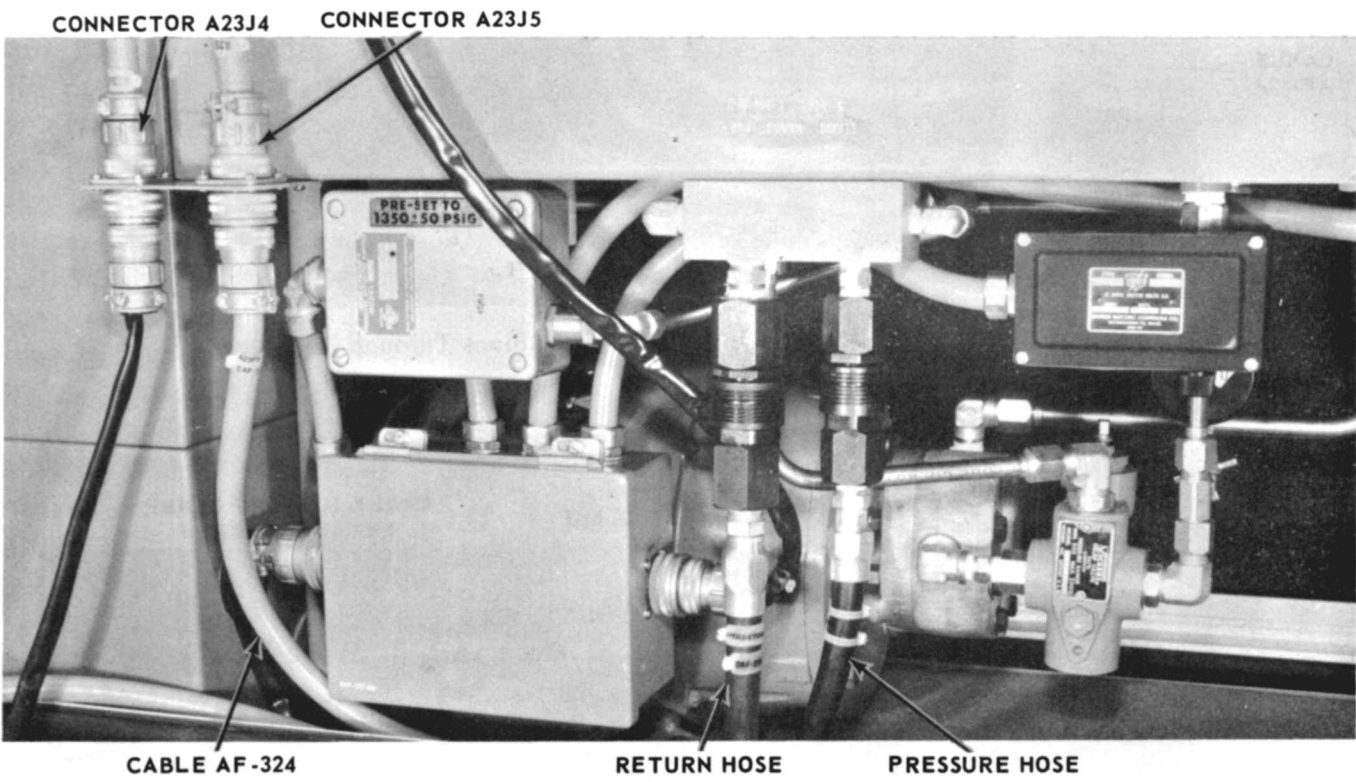


Figure 2-11 Power Control Unit—Routing of Electrical Cable and Hydraulic Lines Through Side Duct

2-4-1-2 B- and C-Frame Files (Cont.)

l. Electrically interconnect the solenoid driver power supply of the power control unit cabinet with the disc file connector serving the digital actuator solenoid valves of the disc file cabinet as follows:

- (1) Obtain cable Bryant Part No. AF-324 from the accessory box supplied with the cabinets.
- (2) Working from the duct located beneath the hydraulic power supply manifold of the power control unit cabinet (see Figure 2-11), route the cable to the duct located beneath the accumulator manifold assembly (see Figure 2-9). Carefully draw the cable up into the file cabinet through foam protective cover that seals the duct and connect A15P15 of the cable to connector A15J15 of the disc file cabinet.
- (3) Connect A23P5 of the cable to connector A23J5 in the power control unit cabinet (see Figure 2-11).

m. Connect the return hydraulic hose between the power control unit and disc file cabinets as follows:

CAUTION

The area surrounding the disc file shall be maintained clean when connecting hoses. Plastic covers on the hose connector body and nipples shall be removed only immediately before making the hydraulic connection. Also, to protect the low pressure hydraulic components of the system, always connect the return hose first and then connect the pressure hose.

- (1) Obtain the hydraulic hose from the accessory box supplied with the cabinets.
- (2) Working from the duct located beneath the hydraulic power supply manifold of the power control unit cabinet (see Figure 2-11), route the hose to the duct located beneath the accumulator manifold assembly in the rear of the disc file cabinet (see Figure 2-12). Carefully draw the hose up through the appropriate slot in the foam protective cover that seals the duct.

CAUTION

Immediately before connecting hydraulic fittings, thoroughly clean the fittings with Freon.

- (3) In the file, remove the plastic bags from the hydraulic fittings of the hose, clean the fittings with Freon, draw the sleeve of the coupler body of the hose down, and firmly seat the body on the appropriate coupler nipple of the manifold. With the body firmly seated in the nipple, the mere release of the sleeve engages the coupler body with the nipple to complete the installation.

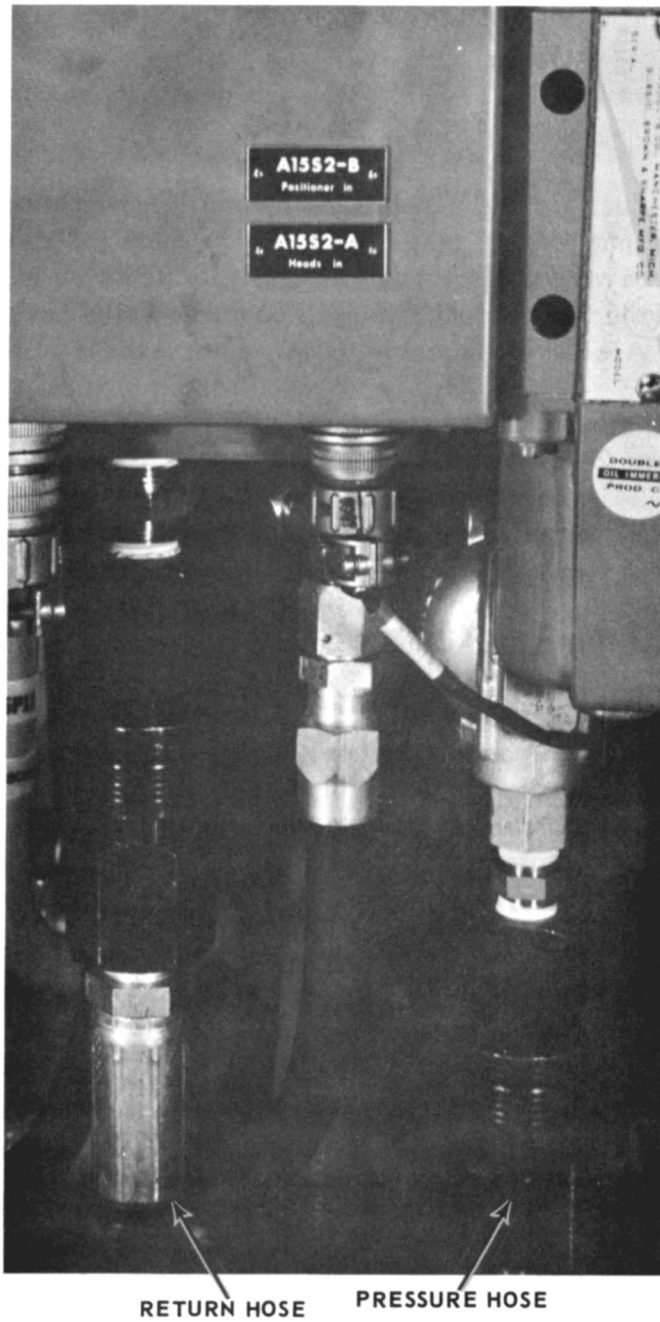


Figure 2-12 Hydraulic Hoses Entering Disc File Cabinet Through Rear Duct and Connected to Accumulator Manifold Assembly

2-4-1-2 B- and C-Frame Files (Cont.)

- (4) Secure the coupler body of the other end of the hose to the coupler nipple of the hydraulic power supply manifold (see Figure 2-11) as described for the file connection in step (3).
- n. Connect the pressure hydraulic hose between the power control unit and disc file cabinets as described for the return hose in paragraph m.
- o. For machines without the electronics options, check that the computer by-pass connector, Bryant Part No. 549682, is installed in connector A21J5 located under the power control panel (see Figure 2-8).
- p. Connect computer cables, as applicable. Digital Actuator command input cable connection is through connector A23J4 (see Figure 2-11). Head selection and write/read command connections are made through the diode boxes located in the lower front of file (see Figure 1-3). Clock or fast access data connections are made through the connector(s) of the available clock head bar assemblies (see Figure 1-5).
- q. Remove the power control panel to computer cable, Bryant Part No. AF-308, from accessory box supplied with the file. Connect A21P4 of cable AF-308 to A21J4 (see Figure 2-8) located under the power control panel. Route the free end of the cable down through the duct beneath the panel to the computer. Attach connector, Bryant Part No. B54697-30, and cable clamp, Bryant Part No. 54050-7, to the computer end of the cable, as applicable, and connect the cable to the computer.
- r. Remove the facility power cable, Bryant Part No. AF-315, from the accessory box supplied with the disc file. Connect A21P1 of cable AF-315 (see Figure 2-8) to connector A21J1 located under the power control panel. Connect the other end of the cable to facility power specified for the file.
- s. Install the kick plates — removed from the cabinet floor as directed in step d. — along the lower edges of the appropriate cabinet bases.
- t. Perform the installation checks of paragraph 2-4-2.

2-4-2 CHECKS — The disc file assembly shall be checked out immediately following installation.

CAUTION

If the disc file was stored at a temperature extremely different than that in which it is to be used, allow the file to temperature stabilize in the new environment for 24-hours before operating it.

2-4-2-1 Perform the following procedures to ensure that disc motor rotation is proper.

a. Thoroughly review the operating instructions of Section 3 before proceeding with the installation checks.

b. Place the file in the manual operating mode.

c. Momentarily press the DISC MOTOR ON pushbutton and then the DISC MOTOR OFF pushbutton. With respect to facing the front of the file, observe that discs rotate cw when facing the left side of the cabinet. If rotation is improper, switch two of the three phase input power leads at the facility power source and again check for proper rotation.

d. With one man observing the hydraulic gear pump (see Figure 1-19 or 1-26), momentarily press the HYDRAULIC MTR ON pushbutton and the instant pump rotation starts, immediately press the HYDRAULIC MTR OFF pushbutton; observe that pump rotates in the direction of the arrow that is embossed on the lower end of the pump surface that faces the rear of the cabinet. If pump rotation is improper, contact your field service representative.

2-4-2-2 If the disc file has been in storage or otherwise out of routine operation for one or more months, proceed as follows before placing it in operation:

a. If the disc file has been out of routine operation for one to nine months, purge the hydraulic system as directed in paragraph 5-9-2.

b. If the disc file has been out of routine operation for over nine months, clean the hydraulic power supply reservoir and magnetic strainer as described in paragraph 5-6-1; references in paragraph 5-6-1 for performing the procedures of paragraph 5-6-2 and the like can be disregarded at this time as long as the one year operation maintenance interval for the related parts is not being exceeded.

2-4-2-3 After reviewing the preventive maintenance introductory information of paragraph 5-1, perform the over-all inspection of paragraph 5-8-4.

2-4-2-4 Perform the applicable preventive maintenance routines of Section 5. It is mandatory that all daily procedures be performed at this time. Weekly and monthly procedures will be performed as applicable.

2-4-2-5 Install all access panels on the disc file cabinet(s).

2-4-2-6 Place the disc file in the automatic operating mode. Allow 1-1/2 hours (A- and B-frame files) to 2-1/2 hours to 3 hours (C-frame files) of operation to ensure temperature stabilization within the disc file cabinet assembly. Before using the file with the computer complex into which it is integrated, set upper and lower limits of the TEMP meter of the tachometer/temperature meter box as directed in paragraph 6-6-3k. and v.

2-5 PREPARATION FOR SHIPMENT OR EXTENDED STORAGE

Because of the single cabinet concept of A-frame files, preparation of the A-frame file for shipment or extended storage is covered separate from that of the dual cabinet B- and C-frame files.

2-5-1 A-FRAME FILES — Prepare A-Frame files for shipment or extended storage as follows:

a. Shutdown the disc file and thoroughly clean the area in which the disc file cabinet is installed.

b. When discs stop rotating, remove the front, rear and side access panels from the cabinet.

c. Set the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-24) in the TRIP ON position.

d. Perform the data head bar retraction procedures of paragraph 5-9-4-2.

e. Remove the kick plates mounted along the lower edges of the base of the cabinet and wrap the kick plates.

f. After disconnecting the file from facility power, disconnect A21P1 of the facility power cable AF-315 from A21J1 located under the power control panel. Carefully withdraw the cable from the center-rear cabinet duct, seal the connectors of the cable in plastic bags and place the cable in the file's accessory box.

g. Disconnect A21P4 of cable AF-308 from A21J4 located under the power control panel. Disconnect the other end of the cable from the computer and carefully withdraw the cable from the center-rear cabinet duct of the file cabinet; seal the connectors of the cable in plastic bags and place the cable in the file's accessory box. Disconnect all other computer cables that were connected in paragraph 2-4-1-1 n.

CAUTION

Exercise extreme care to ensure that no dirt enters the reservoir during the next step.

h. When facing the right-rear access opening of the cabinet, remove the filler/breather cap (see Figure 1-25) from the reservoir of the hydraulic power supply and insert a piece of clean polyethylene in the cap; reinstall cap.

CAUTION

Exercise care to ensure that discs are not inadvertently struck or head pad reads unduly flexed when performing the following procedures.

2-5-1 A-FRAME FILES (Cont.)

i. Carefully install a polyethylene cover over the clock head bar assemblies (see Figure 2-2, packaging example).

j. Carefully install polyethylene covers over the data head bar assembly.

k. Carefully insert the data head bars back into the cabinet as directed in paragraph 5-9-4-3 steps b. through e., as applicable, and apply tape across the front of the head bar assemblies.

l. Retract the leveling pads of the file (see Figure 2-5) to the shipping position (see Figure 2-4) as follows:

- (1) While retaining the leveling pad nut of the cabinet foot of each corner stationary, turn the stop nut until it is backed approximately 3/8 to 1/2-inch off the body of the cabinet foot.
- (2) Turn the leveling pad nut of each cabinet foot until the leveling pad is 1/8-inch (minimum) off the floor on which the cabinet is resting.
- (3) Turn the stop nut of each cabinet foot until it rests snugly against the cabinet foot.
- (4) Turn the flange nut of each standoff until it rests snugly against the cabinet flange.
- (5) Check that the leveling pads at each corner of the file are off the floor to the extent specified in step (2); if they are not, release the stop nut, adjust the spacing, and then again tighten the stop nut.

m. Cover the window of the center cabinet panel using Kimpak Type K-41 packing, or equivalent; use masking tape to hold the packing in place. Secure the maintenance log holder with keys and preventive maintenance schedule (see paragraph 2-4-1-1 f.) to the inside of the left-access panel of the cabinet (see Figure 2-7, for packaging example). After sealing all openings in the base of the cabinet (see Figure 2-3) with cardboard, install all access panels on the cabinet frame. Specify that GLASS is covered by Kimpak placed on the center panel (see Figure 2-1). Secure envelope with "Final Check List, Playback Forms, Error Map and QCT-219 Forms" (saved in step 2-4-1-1 f.) over window of center front access panel.

n. Place all special tools, kits, etc. initially supplied with the file as indicated on the packing list (see Tables 2-1 and 2-2) in the files accessory box and seal the box.

o. Using a fork lift truck with a 4500-pound capacity, prepare the disc file for shipment or storage by placing it on and securing it to its shipping skid; cover the cabinet with its polyethylene cover and secure the cover by drawing up on the covers draw string. Secure the kick plates to the rear of the file cabinet, resting them on the skid. If the cabinet is not to be stored on a shipping skid, store the cabinet as directed in paragraph 2-3. If the cabinet is to be shipped, proceed as directed in paragraph 2-6.

2-5-2 B-AND C-FRAME FILES — Prepare B- and C-frame files for shipment as follows:

- a. Shutdown the disc file and thoroughly clean the area in which the disc file cabinets are installed.
- b. When discs stop rotating, remove the front, rear, and side access panels from both cabinets.
- c. Set the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17) in the TRIP ON position.
- d. Perform the data head bar retraction procedures of paragraph 5-9-4-2.
- e. Remove the kick plates mounted along the lower edges of the base of both cabinets and wrap the two sets of kick plates separately.
- f. After disconnecting the file from facility power, disconnect A21P1 of the facility power cable from A21J1 located under the power control panel. Carefully withdraw the cable from the cabinet duct, seal the connectors of the cable in plastic bags and place the cable in the files' accessory box.
- g. Disconnect A21P4 from A21J4 located under the power control panel. Disconnect the other end of the cable from the computer and carefully withdraw the cable from the duct of the power control unit; seal the connector of the cable in plastic bags and place the cable in the files' accessory box. Disconnect and remove all other computer cables that were connected to the disc file in paragraph 2-4-1-2 p.

CAUTION

Exercise extreme care to ensure that no dirt enters the hydraulic hose during the next step.

- h. Remove the pressure hydraulic hose between the disc file and power control unit cabinet as follows:

CAUTION

The area surrounding the file should be maintained clean when performing the following procedures. Also, to prevent damage to low pressure components when disconnecting hydraulic lines, always disconnect pressure line first, then disconnect return line.

- (1) Through the center-rear access panel opening of the disc file cabinet, disconnect the line from accumulator manifold assembly (see Figure 2-12) by retracting the coupler body sleeve of the hose and pulling the coupler body down free of the coupler nipple. Use absorbent cloths to wipe up any fluid leakage.

2-5-2 B- and C-FRAME FILES (Cont.)

- (2) Through the right side access panel opening of the power control unit (see Figure 2-11), remove the other end of the line from the hydraulic power supply manifold as described for the file disconnect in step (1).
- (3) Without damaging the foam protective cover in the base of either cabinet and while working from the power control unit duct opening, carefully draw the hose out of the duct.

CAUTION

Immediately before covering hydraulic fittings, thoroughly clean the fittings with Freon.

- (4) Clean the fittings of the hoses with Freon and immediately seal the fittings in plastic bags; perform the same procedure on the coupler nipples of both manifolds. Place the hose in the files accessory box.
 - i. Disconnect the return hydraulic hose between the power control unit and disc file cabinets as described for the pressure hose in paragraph h.
 - j. Disconnect the solenoid driver power supply and digital actuator solenoid valve interconnecting cable AF-324 as follows:
 - (1) Disconnect A15P15 of the cable from connector A15J15 (see Figure 2-9) of the disc file cabinet.
 - (2) Disconnect A23P5 at the other end of the cable from A23J5 in the power control unit cabinet (see Figure 2-11).
 - (3) Without damaging the foam protective cover in the base of either cabinet and while working from the power control unit duct opening, carefully draw the cable out of the duct.
 - (4) Seal the connectors of both ends of the cable in plastic bags and place the cable in the files accessory box.
 - k. Disconnect the power control panel and pushbutton station interconnecting cable AF-361 as follows:
 - (1) From the center front access opening of the file, loosen the screw securing the cable support clamp (located beneath the pedestal support casting, (see Figure 2-10) and slide the clamp to the right.

2-5-2 B- and C-FRAME FILES (Cont.)

- (2) Disconnect A11P1 from A11J1 located in the bottom of the pushbutton station (see Figure 1-3). Draw A11P1 of the cable toward the rear of the file out from the cable support clamp of step (1).
- (3) Slide the cable support clamp — with all applicable cables retained in the slot — to the left and secure the clamp.
- (4) Disconnect A21P2 of cable from A21J2 located in the under surface of the power control panel (see Figure 2-8).
- (5) Without damaging the foam protective cover in the base of either cabinet and while working from the power control unit duct opening, carefully draw the cable out of the duct.
- (6) Seal the connectors of both ends of the cable in plastic bags and place the cable in the files accessory box.

l. When facing the rear of the power control unit cabinet, remove the filler/breather cap (see Figure 1-19) from the reservoir on the hydraulic power supply and insert a piece of clean polyethylene in the cap; reinstall cap.

CAUTION

Exercise care to ensure that discs are not inadvertently struck or head pad reads unduly flexed when performing the following procedures.

- m. Carefully install a polyethylene cover over the clock head bar(s) (see Figure 2-2).
- n. Carefully install polyethylene covers over the data head bars.
- o. Carefully insert the data head bars back into the cabinet as directed in paragraph 5-9-4-3 b. through e., as applicable.
- p. Retract the leveling pads of the disc file cabinet to shipping position as directed in paragraph 2-5-1 l.
- q. Cover the windows of the cabinet panels using Kimpak Type K-41 packing, or equivalent; use masking tape to hold the packing in place. Secure the maintenance log holder with keys and preventive maintenance schedule (see paragraph 2-4-1-2 f.) to inside of front access panel of power control unit cabinet assembly (see Figure 2-7). After

2-5-2 B- and C-FRAME FILES (Cont.)

sealing all duct openings in the base of the cabinets (see Figure 2-6) with cardboard, install all access panels on the cabinet frames. Specify that GLASS is covered by the Kimpak placed on the panels (see Figure 2-1). Secure envelope with "Final Check List, Playback Forms, Error Map, and QCT-219 Forms" (saved in paragraph 2-4-1-2 f.) over the packing that covers the window of the disc file cabinets center access panel.

r. Place all special tools, kits, etc. — initially supplied with the file as indicated on the packing lists (see Tables 2-1 and 2-2) — in the files accessory box and seal the box.

s. Using a fork lift truck with a 4500 pound capacity, prepare the disc file for shipment or storage (see Figure 2-1) by placing the cabinets on and securing the cabinets to their shipping skids; cover the cabinets with their polyethylene covers and secure the covers by drawing up on the covers' drawstrings. Secure the kick plates of the cabinets (removed in paragraph e.) to the rear of the file cabinet resting them on the skid. If the cabinet is to be stored on the shipping skid, store the cabinet as directed in paragraph 2-3. If the cabinet is to be shipped, proceed as directed in paragraph 2-6.

2-6 SPECIAL SHIPPING INSTRUCTIONS

CAUTION

Serious damage can result to equipment if the following procedures are not carefully followed.

The bed of the carrying vehicle shall be flat; angular deviations during shipment shall not exceed 30 degrees from the horizontal. When transported by road carrier, only an enclosed vehicle, equipped with air ride suspension shall be used. Before loading, the wheels of the carrying vehicle shall be suitably blocked and brakes shall be fully applied to ensure that the vehicle will not inadvertently move during the loading operation. When using a fork lift truck to move the disc file cabinet assembly, it is recommended that the fork lift, with cabinet, be moved into the van on 1/4-inch thick, 18-inch wide magnesium strips, or equivalent. The strips shall be of sufficient length to ensure reduced floor loading up to the point where the cabinet is to be set on the van's bed. This action should eliminate the possibility of the failure of an under strengthened van bed, which — should such failure occur — could cause damage to the file.

SECTION 3

OPERATING INSTRUCTIONS

3-1 INTRODUCTION

This section provides the procedures to be followed when operating the Model 1, Series 4000 Disc File without environmental control unit. All such procedures shall be performed by qualified technicians. One man shall be selected to coordinate all activities as well as to assure that all possible caution is taken to protect both personnel and equipment.

3-2 CONTROLS AND INDICATORS

Before discussing the operation of the disc file, an examination of the various controls and indicators provided with the file will first be made. The location of the controls and indicators and their function are discussed in the following paragraphs. Since the controls and indicators of A-frame disc files are identical to those of B- and C-frame disc files, the following descriptions are only against the main components of the respective files.

3-2-1 PUSHBUTTON STATION ASSEMBLY — The controls and indicators of the pushbutton station assembly (see Figures 1-3 or 1-24, depending on file configuration) are shown in Figure 3-1. Access to the controls is through a hinged glass door, mounted on the center front access panel of the disc file cabinet. The name, reference designation, and function of each control and indicator of the panel are listed in Table 3-1.

TABLE 3-1 PUSHBUTTON STATION ASSEMBLY —
FUNCTION OF CONTROLS AND
INDICATORS (see Figure 3-1)

Control or Indicator	Reference Designator	Function
AUTOMATIC ON (Control; pushbutton)	A11S6	When pressed, enables automatic start of disc file operation and inhibits MANUAL ON disc file operation. When in starting sequence, glows dim red and when sequence is satisfactorily completed, glows bright red; extinguishes when automatic operation is interrupted.
AUTOMATIC OFF	A11S12	When pressed, interrupts automatic disc file operation and enables either return to automatic operation or selection of manual operation.

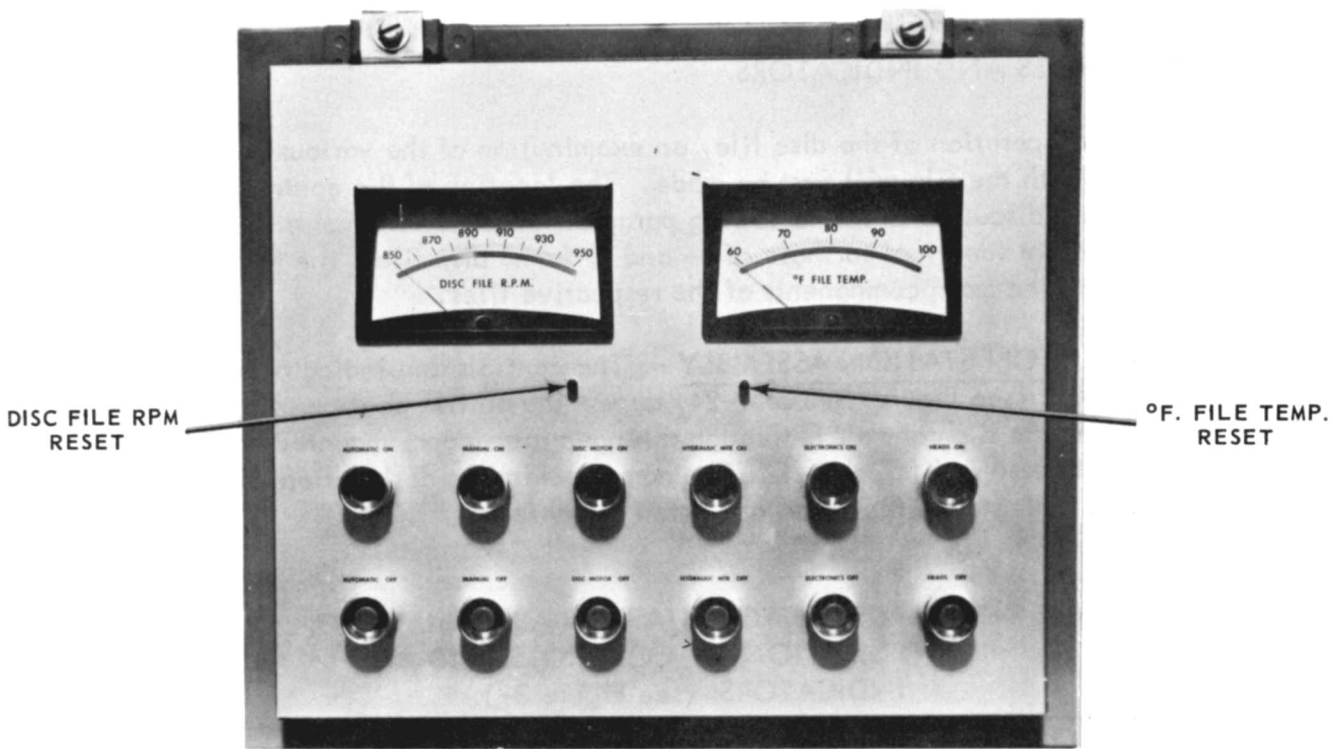


Figure 3-1 Pushbutton Station Assembly, Front Panel View—Identification of Normal Operating Controls and Indicators

TABLE 3-1 PUSHBUTTON STATION ASSEMBLY —
FUNCTION OF CONTROLS AND
INDICATORS (Cont.)

Control or Indicator	Reference Designator	Function
MANUAL ON (Control; pushbutton)	A11S5	When pressed, enables manual start of disc file operation and inhibits AUTOMATIC ON disc file operation. Glows blue when operation is enabled; extinguishes when manual operation is interrupted.
MANUAL OFF	A11S11	When pressed, totally interrupts manual disc file operation and enables either return to manual or selection of automatic operation.
DISC MOTOR ON (Control; pushbutton)	A11S4	Functional only when disc file MANUAL ON operation is enabled and when heads on operation is inhibited. When pressed, enables start of the disc file's disc motor. Glows green when disc file automatic operation or manual and disc motor operation is initiated; extinguishes when automatic, manual, or disc motor operation is interrupted.
DISC MOTOR OFF (Control; pushbutton)	A11S10	Functional only when disc file MANUAL ON operation is enabled. When pressed, interrupts disc motor operation and, through the tachometer/temperature meter box circuits, HEADS ON operation, as applicable; also, interrupts solenoid driver power supply operation, if initiated.
HYDRAULIC MTR ON (Control; pushbutton)	A11S3	Functional only when disc file MANUAL ON operation is enabled. When pressed, enables the start of the disc file's hydraulic motor. Glows green when disc file manual or automatic operation is initiated (during automatic operation, glow occurs only after discs have achieved a predetermined speed); extinguishes when automatic, manual or hydraulic motor operation is interrupted.
HYDRAULIC MTR OFF (Control; pushbutton)	A11S9	Functional only when disc file MANUAL ON operation is enabled. When pressed, interrupts hydraulic motor operation; also interrupts HEADS ON and solenoid driver power supply operation, if initiated.

TABLE 3-1 PUSHBUTTON STATION ASSEMBLY —
FUNCTION OF CONTROLS AND
INDICATORS (Cont.)

Control or Indicator	Reference Designator	Function
HEADS ON (Control; pushbutton)	A11S1	Functional only when disc file MANUAL ON operation is enabled. When pressed, enables operation of the heads of the file to the "flying attitude" provided the disc motor is off, or DISC MOTOR ON is enabled and discs have achieved a pre-established speed, and HYDRAULIC MOTOR ON is enabled. Glows green when disc file automatic operation is initiated or when manual and hydraulic operation is initiated, disc motor is up to speed or at zero speed, and heads operation is initiated (during automatic operation, glow occurs only when heads are enabled to operate to the "flying attitude"); extinguishes when automatic, manual, disc motor, hydraulic, or head operations are inhibited.
HEADS OFF (Control; pushbutton)	A11S7	Functional only when disc file MANUAL ON operation is enabled. When pressed, interrupts heads operation; also, interrupts solenoid driver power supply operation, if initiated.
ELECTRONICS ON (Control; pushbutton)	A11S2	Functional only when disc file MANUAL ON operation is enabled. When pressed, enables operation of the solenoid driver power supply provided DISC MOTOR ON, HYDRAULIC MTR ON, and HEADS ON operations are all enabled. Glows green when disc automatic operation or manual and electronic operation is initiated (during automatic operation, glow occurs only when heads are enabled to actuate to the "flying attitude"); extinguishes when automatic, manual, or electronics operations are inhibited.
ELECTRONICS OFF (Control; pushbutton)	A11S8	Functional only when disc file MANUAL ON operation is enabled. When pressed, interrupts solenoid driver power supply operation.

NOTE

The following controls and indicators are a part of the tachometer/temperature meter box mounted within the pushbutton station.

TABLE 3-1 PUSHBUTTON STATION ASSEMBLY —
FUNCTION OF CONTROLS AND
INDICATORS (Cont.)

Control or Indicator	Reference Designator	Function
DISC FILE R.P.M. (Meter; calibrated 850 to 950 or 1150 to 1250 rpm, depending on motor used.)		Needle deflects across a graduated scale to indicate disc motor speed as sensed by the tachometer probe (see Figure 1-6). Dial glows white when disc motor speed is within preset minimum and maximum limits as established through the tachometer/temperature meter box circuits; dial glows red when motor speed is outside these limits.
Disc File R.P.M. Reset (Control; pushbutton)		Functional when Disc File R.P.M. meter dial glows red. When pressed, resets tachometer circuit of tachometer/temperature meter box.
°F FILE TEMP. (Meter; calibrated 60 to 100°F.)		Needle deflects across a graduated scale to indicate disc file cabinet temperature as sensed by the temperature probe (see Figure 1-9). Dial glows white when temperature of the cabinet is within preset minimum and maximum limits as established through the tachometer/temperature meter box; dial glows red when temperature is outside these limits.
°F File Temp Reset (Control; pushbutton)		Functional when °F FILE TEMP dial glows red. When pressed, resets temperature circuit of tachometer/temperature meter box.

3-2-2 ACCUMULATOR MANIFOLD ASSEMBLY — The nitrogen precharge pressure gages of the accumulator manifold assembly (see Figure 3-2) are accessible through the rear-center access panel of the disc file cabinet assembly (see Figures 1-9 and 1-25). The function of each gage is to indicate the precharge — in pounds per square inch — of the accumulators they serve. The high pressure gages are calibrated from zero to 2000 and the low pressure gage is calibrated from zero to 60. The precharge of the accumulators maintains the pressure of the hydraulic fluid to the elements of the disc file relatively constant, regardless of transient surges of system pressure. In addition, the precharge of the quart high pressure accumulator serves to return the heads to the "retracted attitude" when the file is shutdown; the precharge of the pint high pressure accumulator serves to return the digital actuator/boost assembly to track zero when the file is shutdown.

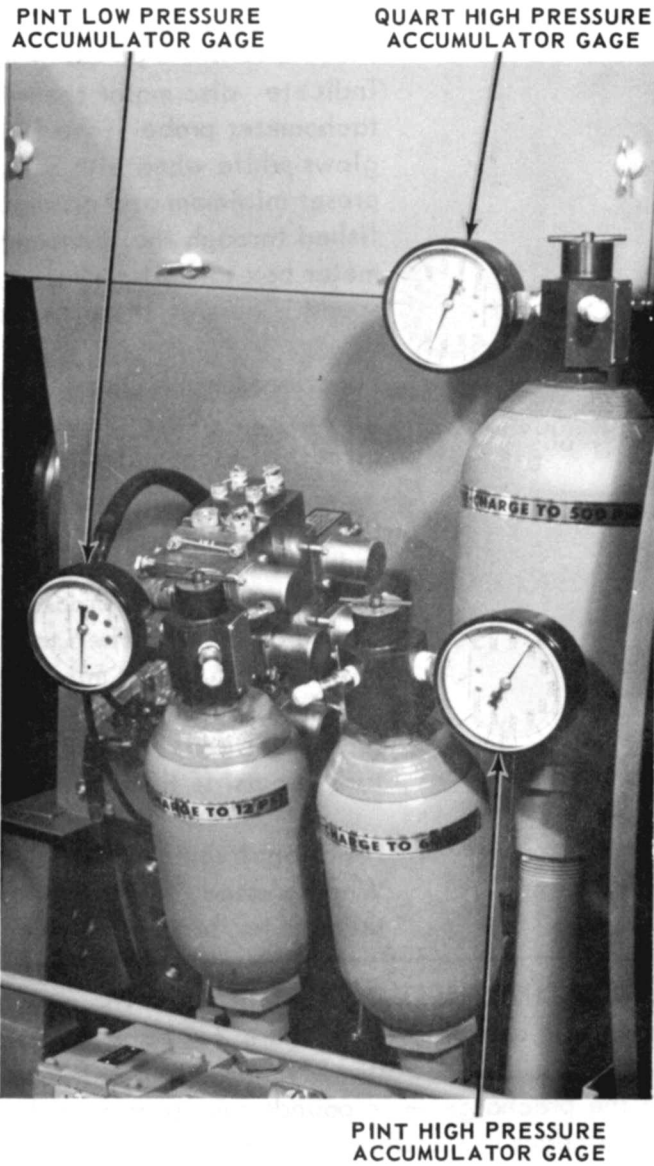


Figure 3-2 Accumulator Manifold Assembly—
Normal Operating Indicators

3-2-3 POWER CONTROL PANEL — The controls and indicators of the power control panel (see Figures 1-17 or 1-24, depending on file configuration) are shown in Figures 3-3 and 3-4. Removal of the appropriate access panels of the associated cabinet enables access to the components on the door of the panel. Components within the panel are accessible by opening the panel door. The name, reference designation, and function of each control and indicator of the panel are listed in Table 3-2.

TABLE 3-2 POWER CONTROL PANEL — FUNCTION OF CONTROLS AND INDICATORS.
(See Figures 3-3 and 3-4)

Control or Indicator	Reference Designator	Function
RESET OFF/TRIP ON (Control; circuit breaker .	A21CB1	When closed, enables application of three phase power to the starting control circuits of the disc file .
HOURS (Meter; digital indication, zero to 9999)	A21M1	Indicates accumulated, elapsed operating time of file .
F1 15A, MAIN CONTROL (Fuse; 15 amperes)	A21F1	Protects overall starting control system of disc file .
F2 3A, HYDRAULIC FAN (Fuse; 3 amperes)	A21F2	Protects hydraulic fan A22B2 located in auxiliary compartment of hydraulic power supply (see Figure 1-22).
F3 1A, HEAD VALVE (Fuse; 1 ampere)	A21F3	Protects solenoid A15S1 of the head valve assembly of the accumulator manifold assembly (see Figure 1-15).
F4 1A POSITIONER VALVE (Fuse; 1 ampere)	A21F4	Protects solenoid A15S3 of the positioner valve assembly (see Figure 1-15).
F5 3A ELECTRONIC PRIMARY (Fuse; 3 amperes)	A21F5	Used only with machines equipped with an electronics interface .
F6 1A ELECTRONIC FAN (Fuse; 1 ampere)	A21F6	Used only with machines equipped with an electronics interface .
Utility Receptacle	UR	Includes two 115 vac power outlets made available for equipment maintenance .

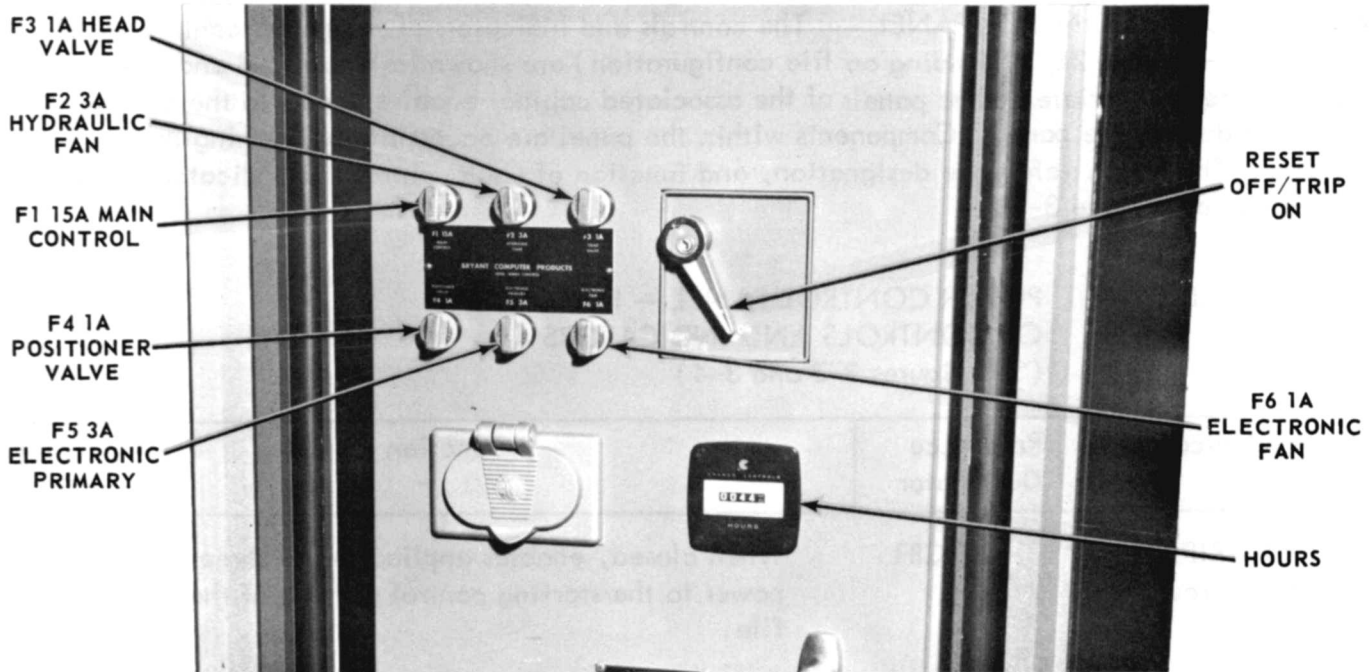


Figure 3-3 Power Control Panel, Front View—Identification of Normal Operating Controls and Indicators

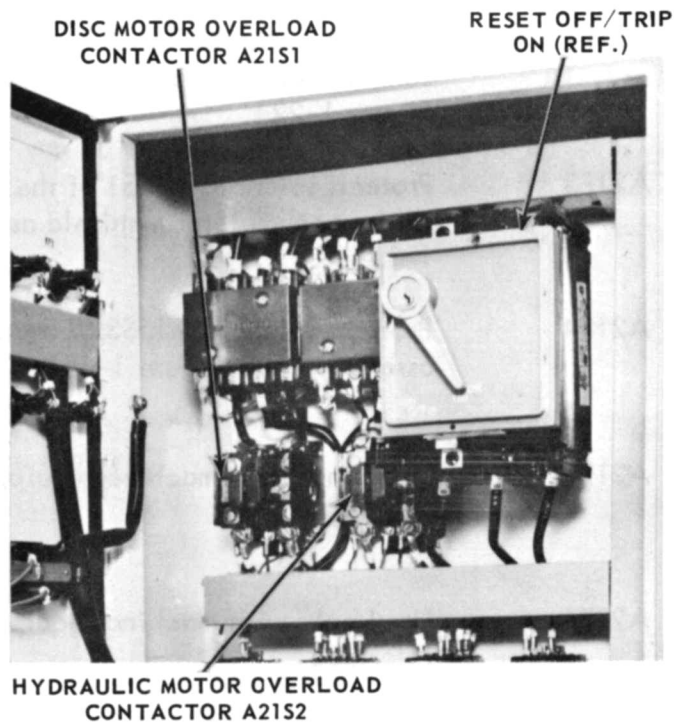


Figure 3-4 Power Control Panel, Front Interior View—Identification of Normal Operating Controls

TABLE 3-2 POWER CONTROL PANEL — FUNCTION OF CONTROLS AND INDICATORS (Cont.)

Control or Indicator	Reference Designator	Function
Disc Motor Overload Contactor	A21S1	Protects the disc motor from overload currents; must be pressed manually to reset after being tripped by an overcurrent condition.
Hydraulic Motor Overload Contactor	A21S2	Protects the hydraulic motor from overload conditions.

3-2-4 HYDRAULIC POWER SUPPLY — The control and indicators of the hydraulic power supply (see Figure 1-17 and 1-24, depending on file configuration) are shown in Figure 3-5. Removal of the appropriate access panels of the associated cabinet enables access to the components of the hydraulic power supply. The name and function of each control and indicator of the supply are listed in Table 3-3.

TABLE 3-3 HYDRAULIC POWER SUPPLY — FUNCTION OF CONTROLS AND INDICATORS (see Figure 3-5)

Control or Indicator	Reference Designator	Function
Fluid Level Sight Gage (Gage; low level mark)		Indicates the level of the hydraulic fluid in the reservoir of the hydraulic power supply.
Pump Output Pressure Valve (Control; rotary)		Normally closed to ensure that surge pressure at the start of pump operation will not damage pressure gage. When opened, enables pump output pressure gage to indicate output pressure of pump.
Pump Output Pressure Gage (Gage; pressure, hydraulic, calibrated to 2000 psi)		Normally inoperative; indicates only when hydraulic pump is operating and pump output pressure valve is opened.

3-2-5 SOLENOID DRIVER POWER SUPPLY — The controls and test points of the solenoid driver power supply (see Figure 1-17 or 1-24, depending on file configuration) are shown in Figure 3-6. Removal of the appropriate access panel from the associated cabinet enables access to these items. Circuit breaker CBI, designated A24CB1, enables local shut-off of the supply during maintenance functions; normally the circuit breaker is left in the ON position. The test points labeled +7V, -28V, GRD, and READY SIG. are tied directly to the

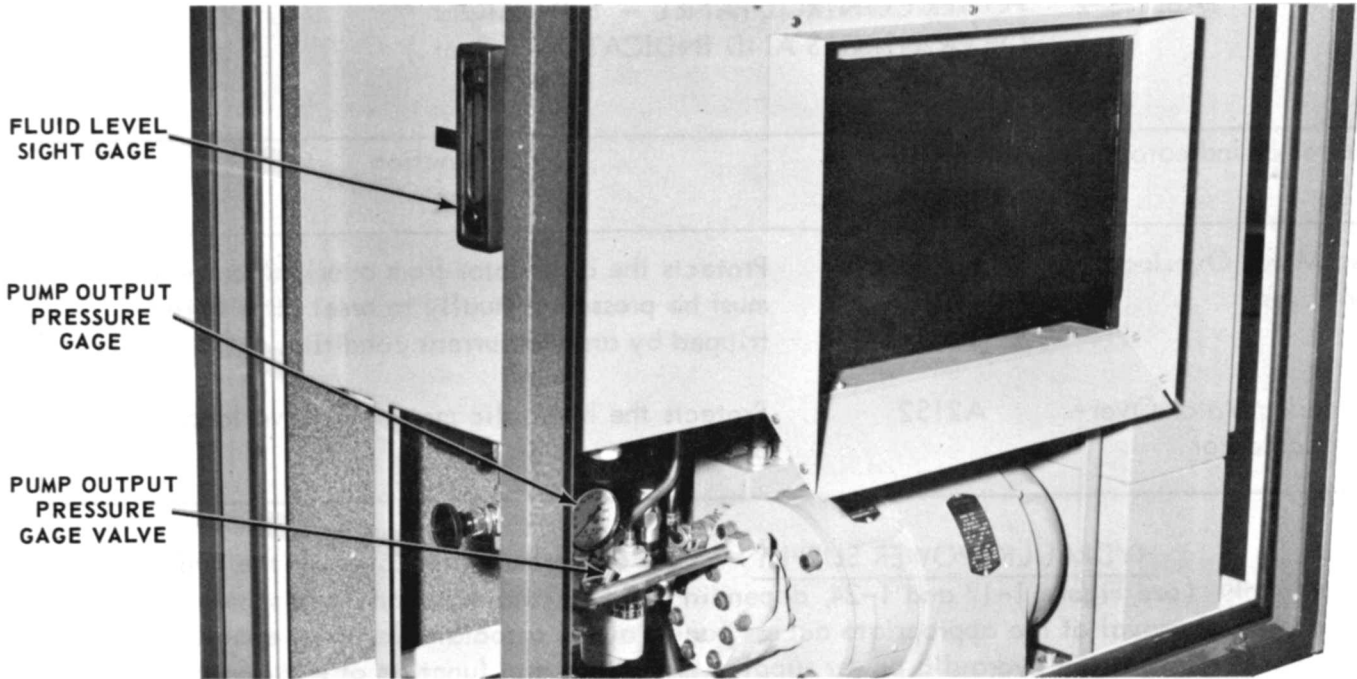


Figure 3-5 Hydraulic Power Supply—Identification of Normal Operating Controls and Indicators

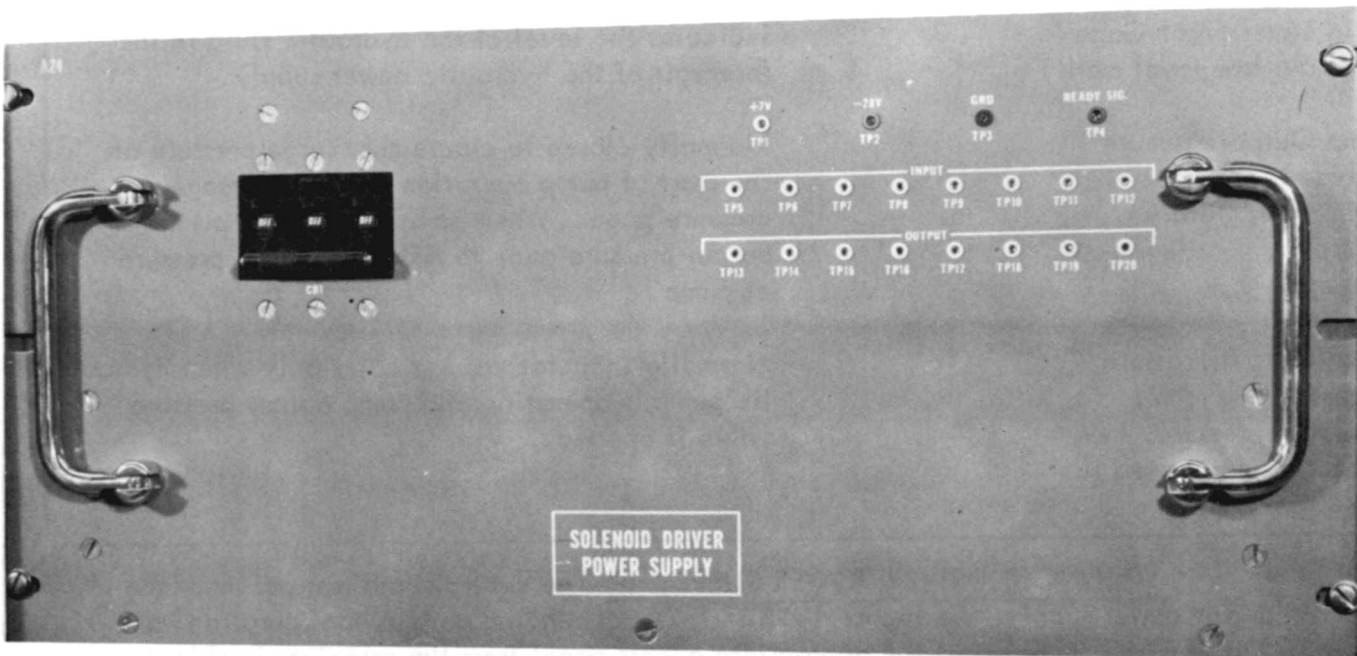


Figure 3-6 Solenoid Driver Power Supply—Identification of Normal Operating Controls

3-2-5 SOLENOID DRIVER POWER SUPPLY (Cont.)

circuits of the power supply to enable the monitoring of supply output and status. Input test points TP5 through TP12 enable the grounding of the inputs to the solenoid driver circuits of the power supply to simulate the application of commands from a computer and thereby enable actual positioning of the digital actuator/boost assembly locally. OUTPUT test points TP13 through TP20 enable local monitoring of the outputs of the solenoid driver circuits to solenoid No's. 1 through 7, respectively, of the digital actuator (see Figure 1-10).

3-3 PROCEDURES

The disc file can be operated in automatic or manual modes. Unless a maintenance function requiring panel removal is being performed, all cabinet access panels shall be installed during file operation. However, if maintenance is to be performed, observe applicable cautions and warnings of paragraph 5-1 or 6-1.

NOTE

If the file has been in storage or otherwise inoperative for one or more months, perform the procedures of paragraphs 2-4-2-2 and 2-4-2-3. Applicable preventive maintenance procedures of Section 5 will be performed as required during each start up period.

3-3-1 AUTOMATIC OPERATION — In the Automatic operating mode, all file operations are enabled in the proper, automatic sequence.

3-3-1-1 Starting Procedures — Place the disc file into the automatic operating mode as follows:

- a. Thoroughly clean the area surrounding file before opening cabinet enclosures.

CAUTION

Area surrounding the disc file cabinet(s) shall be maintained thoroughly cleaned as long as cabinet enclosures are open.

- b. Remove the cabinet access panel that enables access to the solenoid driver power supply (see Figures 1-17 or 1-24, depending on file configuration) and set circuit breaker CBI (see Figure 3-6) to ON.

- c. Remove the cabinet access panel that enables access to the hydraulic power supply (see Figure 1-19 or 1-24, depending on file configuration) and check that pump output pressure gage valve (see Figures 3-5 or 1-26) is rotated to the fully clockwise position.

3-3-1-1 Starting Procedures (Cont.)

- d. Remove the cabinet access panel that enables access to the power control panel (see Figures 1-17 or 1-24, depending on file configuration), unlock the RESET OFF/TRIP ON circuit breaker (see Figure 3-3) and set the circuit breaker to the TRIP ON position.
- e. Reinstall the access panels removed in the earlier steps, as applicable.
- f. Open the glass door of the center front access panel of the disc file cabinet assembly; this enables access to the pushbuttons of the pushbutton station assembly (see Figures 1-3 or 1-24) without removing the panel.

NOTE

Automatic operation of the disc file is inhibited if the file is in the manual operating mode.

g. Observe that MANUAL ON pushbutton indicator of the pushbutton station assembly (see Figure 3-1) is extinguished. If it is glowing blue, momentarily press the MANUAL OFF pushbutton and observe that MANUAL ON pushbutton indicator extinguishes.

h. Momentarily press the AUTOMATIC ON pushbutton of the pushbutton station assembly and observe — by means of the pushbutton indicators — that the following events occur in proper sequence:

- (1) Immediately, AUTOMATIC ON pushbutton glows dim red and DISC MOTOR ON pushbutton glows green; disc motor can be heard to start to operate. The dial of the °F FILE TEMP. meter glows white if the temperature of the disc file cabinet is within the prescribed limits; if the temperature is outside of the prescribed limits, the dial will glow red.
- (2) Within approximately 30 seconds, observe that dial of the DISC FILE RPM meter glows white and that the HYDRAULIC MOTOR ON pushbutton glows green.

NOTE

If DISC FILE R.P.M. meter dial glows red, momentarily press Disc File R.P.M. Reset pushbutton of the pushbutton station assembly (see Figure 3-1). If meter dial again glows red, troubleshooting will be required.

- (3) Within approximately 2 seconds, the HEADS ON pushbutton followed by the ELECTRONICS ON pushbutton both glow green and if the dial of the °F FILE TEMP meter is glowing white the AUTOMATIC ON indicator switches to bright red. However, if the dial of the °F FILE TEMP meter is glowing red, proceed as follows:
 - (a) Momentarily press the °F File Temp Reset pushbutton (see Figure 3-1) and observe that dial of °F FILE TEMP meter switches to a white glow and that AUTOMATIC ON indicator switches to bright red.

3-3-1-1 Starting Procedures (Cont.)

- (b) If meter dial continues to glow red and if it is definitely ascertained that an initially low room temperature is the cause of the problem, proceed to steps (4) and (5). However, if a high temperature condition is suspected of being the cause of trouble, either shutdown the disc file and allow it to cool, or consult Bryant's Field Service Department.
- (4) Close the glass door of the front center access panel of the disc file cabinet assembly.
- (5) Allow the disc file to operate until the disc file cabinet temperature stabilizes; in a normal 70°F. room environment, 1-1/2 hours of operation is generally required in the case of A- or B-frame files and 2-1/2 to 3 hours is required in the case of C-frame files. The stabilizing temperature shall be preferably that recorded in the disc file log during installation; regardless, the temperature shall be within $\pm 5^{\circ}\text{F}$. of this temperature. Again, if the dial of the °F FILE TEMP. meter is glowing red, open the glass door enabling access to the pushbutton station assembly, and repeat the procedures of step (3) as applicable.
- (6) If — during start or normal operation — the dials of the DISC FILE R.P.M. or °F FILE TEMP. meters glow red, proceed as follows:
 - (a) If the dial of the DISC FILE R.P.M. meter is glowing red, and only the AUTOMATIC ON and DISC MOTOR ON pushbuttons glow red and green, respectively, momentarily press the Disc File R.P.M. Reset pushbutton (see Figure 3-1) and observe that the dial of the meter stops glowing and then glows white, also observe that all other pushbuttons of the pushbutton station — except for the MANUAL ON pushbutton — glow green. If dial continues to glow red, a trouble exists in the equipment and corrective maintenance is required.
 - (b) If the dial of the °F FILE TEMP. meter is glowing red, perform the procedures of step (3), as applicable

3-3-1-2 Shutdown Procedures — Stop automatic disc file operation as follows:

CAUTION

Always position data head pads of data head bar assemblies to track zero before shutting down the file.

- a. Thoroughly clean the area surrounding the file before opening cabinet enclosures.

CAUTION

Areas surrounding the disc file cabinet(s) shall be maintained thoroughly cleaned as long as cabinet enclosures are open. When possible,

3-3-1-2 Shutdown Procedures (Cont.)

disc file operation should be performed only with enclosures buttoned up.

b. Open the glass door of the center access panel of the disc file cabinet assembly and momentarily press the AUTOMATIC OFF pushbutton of the pushbutton station assembly (see Figure 3-1). Observe that all pushbutton station indicators extinguish. Close the glass door.

c. Observe through windows of front access panels that heads of the head bars (see Figure 1-5) have moved away from disc surfaces to the "retracted attitude."

d. Remove the cabinet access panel that will enable access to the power control panel (see Figures 1-17 or 1-24, depending on file configuration) and, if no immediate disc file operation is contemplated, set the RESET OFF/TRIP ON circuit breaker to the RESET OFF position. It is recommended that the circuit breaker be locked in the RESET OFF position; store the key in a safe and readily available location.

3-3-2 MANUAL OPERATION — Manual operation of the disc file enables individual selection of the various operating modes of the disc file. Through logic circuits, however, the operation of the file in one manual operating mode can inhibit selection of another manual operating mode.

3-3-2-1 Starting Procedures — Place the disc file in the manual operating mode as follows:

a. Perform the procedures of paragraph 3-3-1-1, steps a. through f.

NOTE

Manual operation of the disc file is inhibited if the file is in the automatic operating mode.

b. Observe that AUTOMATIC ON pushbutton indicator of the pushbutton station assembly (see Figure 3-1) is extinguished. If it is glowing red, momentarily press the AUTOMATIC OFF pushbutton and observe that AUTOMATIC ON pushbutton indicator extinguishes.

c. Momentarily press the MANUAL ON pushbutton of the pushbutton station assembly and observe that pushbutton glows blue. Operate the file in the various manual operating modes as follows:

(1) Disc Motor — Disc motor operation can be initiated only if the HEADS ON pushbutton indicator is extinguished.

(a) If the HEADS ON pushbutton indicator glows green momentarily press the HEADS OFF pushbutton and observe that the HEADS ON pushbutton indicator extinguishes.

(b) Momentarily press the DISC MOTOR ON pushbutton. Observe that pushbutton indicator immediately glows green; also, listen for the start of the disc file motor.

Starting Procedures (Cont.)

- (c) Within approximately 30 seconds, observe that dial of DISC FILE R.P.M. meter glows white.
- (2) Hydraulic Motor — Initiate hydraulic motor operation by momentarily pressing the HYDRAULIC MOTOR ON pushbutton. Observe that pushbutton indicator glows green; also, listen for the start of hydraulic motor operation.
- (3) Heads — The heads of the disc file can be operated to the "flying attitude" only when the pressure of the fluid of the hydraulic system is above a preset minimum level and when the discs of the disc file are stationary or are rotating at a speed within a predetermined rpm range. Initiate head operation as follows:
 - (a) Turn on the hydraulic motor as directed in step (2) and allow approximately two seconds of hydraulic power supply operation.
 - (b) If the dial of the DISC FILE R.P.M. meter glows red and the heads of the file are to be operated with the disc motor on, momentarily press the Disc File R.P.M. Reset pushbutton (see Figure 3-1) and observe that dial of meter glows white.
 - (c) With disc rotation completely stopped for approximately 100 seconds, or with the discs up to speed as indicated by the white glow of the DISC FILE R.P.M. meter dial — see step (1) (c), momentarily press the HEADS ON pushbutton. Observe that pushbutton indicator glows green; also, listen for or observe that the head pads of the head bars have moved toward the disc surfaces to the "flying attitude."
- (4) Electronics (Solenoid Driver Power Supply) — In standard disc files, wherein no electronics are provided, the initiating of the electronics operation alone is of no consequence. However, with the disc motor, hydraulics, and heads operating modes — procedures (1) through (3) — all initiated, solenoid driver power supply operation can be initiated through the initiation of electronics operation as follows:
 - (a) Turn on the disc motor as directed in paragraph (1).
 - (b) Turn on the hydraulic motor as directed in paragraph (2).
 - (c) Turn on the heads as directed in paragraph (3).
 - (d) Momentarily press the ELECTRONICS ON pushbutton and observe that ELECTRONICS ON pushbutton indicator glows green. Determination of whether the solenoid driver power supply is operating can be made by use of a voltmeter applied across the respective voltage test jacks provided on the front of the panel (see Figure 3-6). Local control of the positioning of the digital actuator/boost assembly can be accomplished through the front panel of the solenoid driver power supply (see paragraph 3-2-5).

3-3-2-2 Shutdown Procedures — The various manual operating modes can be stopped in total by momentarily pressing the **MANUAL OFF** pushbutton of the pushbutton station assembly (see Figure 3-1), or they can be individually stopped by momentarily pressing the associated functions 'OFF' pushbutton. With the area surrounding the cabinet enclosures maintained thoroughly clean, totally shutdown the disc file as directed in paragraph a. below, or shutdown individual functions as directed in paragraph b.

CAUTION

Always position data head pads of head bar assemblies to track zero before shutting down the file. Areas surrounding the disc file cabinet(s) shall be maintained thoroughly cleaned as long as cabinet enclosures are open.

a. If it is desired to completely shutdown the disc file, open the glass door of the center access panel of the disc file cabinet assembly and momentarily press the **MANUAL OFF** pushbutton of the pushbutton station assembly (see Figure 3-1). Observe that all pushbutton station indicators extinguish. Also, observe that head pads of the head bar assemblies (see Figure 1-5) have moved away from the disc surfaces to the retracted attitude. Close the glass door and proceed to paragraph c.

b. If it is desired to shutoff the individual manual operating modes of the disc file, proceed as follows:

- (1) Electronics (Solenoid Driver Power Supply) — To shutdown the electronics circuit of the disc file, momentarily press the **ELECTRONICS OFF** pushbutton and observe that the **ELECTRONICS ON** pushbutton indicator extinguishes. Solenoid driver power supply operation is definitely inhibited at this time.
- (2) Heads — To shutdown the heads circuit of the disc file, momentarily press the **HEADS OFF** pushbutton and observe that **HEADS ON** pushbutton indicator is extinguished. Observe that head pads of head bars (see Figure 1-5) have moved away from the disc surfaces to the "retracted attitude". Heads shutdown simultaneously inhibits solenoid driver power supply operation, even though the **ELECTRONICS ON** pushbutton indicator is still glowing.
- (3) Hydraulic Power Supply — To shutdown the hydraulic power supply, momentarily press the **HYDRAULIC MOTOR OFF** pushbutton and observe that **HYDRAULIC MOTOR ON** pushbutton indicator is extinguished. Listen for hydraulic motor operation to stop. Also, if heads and/or electronics operation were enabled up until this time, observe that the events of step (2) occur even though the **HEADS OFF** pushbutton is not pressed. Heads operation is always automatically inhibited when the pressure of the fluid of the hydraulic system falls below a preset minimum level.

3-3-2-2 Shutdown Procedures (Cont.)

- (4) Disc Motor — To shutdown the disc motor, momentarily press the DISC MOTOR OFF pushbutton and observe that the DISC MOTOR ON pushbutton indicator extinguishes. Listen for disc motor operation to stop. Also, if heads and/or electronics operations were enabled up until this time, observe that the events of step (2) occur even though the HEADS OFF pushbutton is not pressed. Heads operation is always inhibited when the discs of the disc file are rotating at a speed that is below a preset minimum rpm.

c. With the disc file shutdown as directed in paragraph a., remove the cabinet access panel that will enable access to the power control panel (see Figures 1-17 or 1-24, depending on file configuration) and, if no immediate disc file operation is contemplated, set the RESET OFF/TRIP ON circuit breaker to the RESET OFF position. It is recommended that the circuit breaker be locked in the RESET OFF position; store the key in a safe and readily available location.

SECTION 4

PRINCIPLES OF OPERATION

4-1 INTRODUCTION

Functionally, the Model 1, Series 4000 Disc File without an environmental control unit (ECU) consists of an electrical starting control system, a hydraulic system, a data head positioning system, and a write/read enable system. Collectively, the systems enable the storage of "bits of data" on and subsequent retrieval of "bits of data" from rotating, magnetic oxide coated disc surfaces.

4-2 GENERAL OVER-ALL SYSTEM OPERATION

The disc file can be operated either automatically or manually. Except for the inability to generate a file ready for use command, all automatic functions can be duplicated during the manual mode of disc file operation. Simplified functional block diagrams, depicting both operating modes, are shown in Figure 4-1. The following paragraphs generally describe the sequence of disc file operation in each operating mode.

4-2-1 AUTOMATIC OPERATION — Initiation of the automatic mode of disc file operation enables the following events to occur in sequence:

- a. The disc motor starts to operate and a tachometer monitor circuit starts to monitor disc spindle speed.
- b. When the speed of the disc spindle reaches a pre-established limit — as determined by the tachometer monitor, a circuit operates and enables the start of hydraulic motor operation.
- c. Within approximately 2 seconds hydraulic system pressure is sufficient to enable actuation of the head pads of the head bar assemblies to the "flying attitude."
- d. Movement of the head pads to the flying attitude sequentially enables the start of electronics, solenoid driver power supply, and digital actuator/boost operation.
- e. With the temperature of the disc file cabinet assembly within prescribed limits — as determined by the temperature monitor — a circuit is operated that generates a file ready for use command.
- f. The file ready for use command enables the digital actuator/boost assembly, a part of the data-head positioning system. The data heads of the disc file are then positioned to the track that is selected by the customer for write/read operation.
- g. With disc file ready, the write/read system of the file is enabled; that is, "bits of data" can be written on or read off the disc surfaces through the heads of the disc file. Prerecorded clocks and track verification information along with required electronic interfacing for performing this function are available from Bryant at the customer's option.

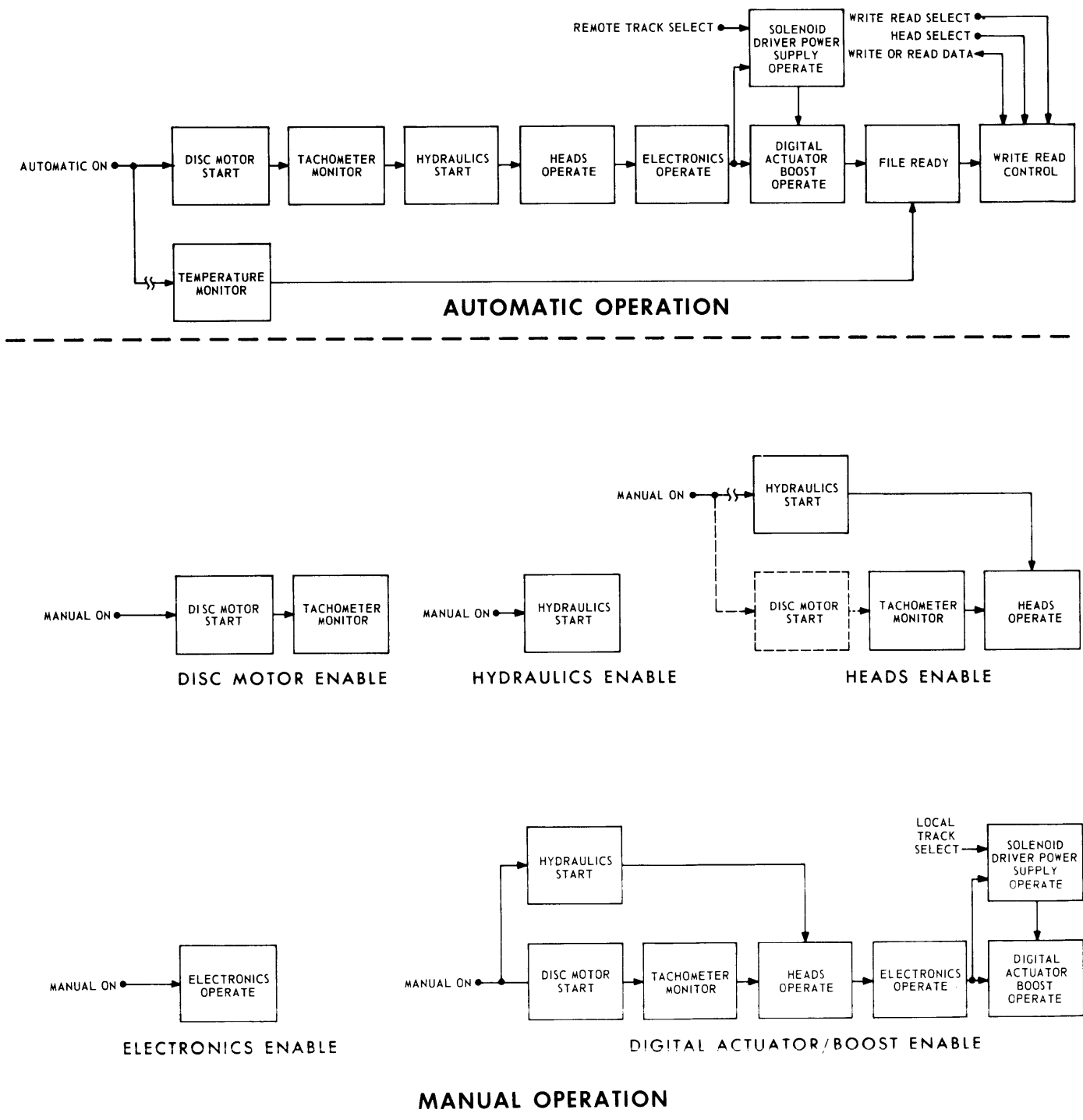


Figure 4-1 Model 1 Series 4000 Disc Files Without ECU—Functional Block Diagram Depicting Operating Modes

4-2-2 MANUAL OPERATION — Various independent modes of operation of the disc file are enabled with the initiation of manual operation. A discussion of these modes follows.

a. The disc motor, hydraulic system and electronic system can be operated independently or as a unit. It should be noted, however, that no real function is performed through the electronics operate mode in any of these available configurations if there is no electronics interface provided with the file. It should also be noted that the heads operate mode must be inhibited in order to initially allow the disc motor operate mode.

b. Operation of the heads mode is enabled only when hydraulic motor operation is enabled; at this time, the tachometer monitor circuit must detect a disc spindle speed of zero rpm or a disc spindle speed that has reached a pre-established lower limit before the heads can be operated to the "flying attitude". If disc spindle speed was detected as zero rpm when the heads were operated to the "flying attitude", disc motor operation in the manual mode is inhibited until the head operate mode is inhibited (heads operated to the "retracted attitude").

c. To operate in the digital actuator/boost mode during manual disc file operation, manual selection of operating modes in the order shown in Figure 4-1 is necessary. This enables the digital actuator/boost assembly to position the heads of the disc file at any one of 128 tracks selected. Selection is attained through the solenoid driver power supply panel.

4-3 STARTING CONTROL SYSTEM

Components making up the electrical starting control system are mounted in both cabinets of the B- and C-frame files and in both sections of the A-frame file. It should be noted that the reference designations of components mounted in the two sections of the A-frame file correspond to the reference designations of identical components mounted in the separated cabinets making up the B- and C-frame files. For this reason, the subsequent discussion applies equally to all three file configurations regardless of the number of cabinets in each. The automatic and manual operating modes of the disc file are selected through the AUTOMATIC ON and MANUAL ON pushbuttons of the pushbutton station assembly (see Figure 3-1). A schematic diagram of the starting control system is shown in Figure 4-2.

4-3-1 AUTOMATIC OPERATING MODE — The automatic starting and shutdown sequences of the disc file are discussed in the following paragraphs.

4-3-1-1 Starting Sequence — Automatic operation of the disc file is enabled when RESET OFF/TRIP ON circuit breaker A21CB1 of the power control panel (see Figure 3-3) is set to the TRIP ON position and AUTOMATIC ON pushbutton A11S6 of the pushbutton station assembly (see Figure 3-1) is momentarily pressed. The following events then occur automatically in proper sequence (see Figure 4-2).

NOTE

If the disc file is in the manual operating mode, automatic operation will be inhibited as specified in paragraph 4-3-2-1 a., (1) (b). In four wire 208 volt systems, one of the input phases and neutral can be used in place of transformer A21T1 of the starting control circuit.

4-3-1-1 Starting Sequence (Cont.)

a. The 115 vac from transformer A21T1 of the power control panel (see Figure 1-18) is applied through the momentarily closed AUTOMATIC ON pushbutton to HOUR meter A21M1, disc motor on relay A21K1, automatic on relay A21K3, the power supply of the tachometer/temperature meter box (see Figure 1-4), and through resistor A21R1 (see Figure 1-18) to the indicator lamp of AUTOMATIC ON pushbutton A11S6. HOUR meter A21M1 and circuits of the tachometer/temperature meter box immediately operate, the AUTOMATIC ON pushbutton glows dim red (because of the limiting action of A21R6), and both relays A21K3 and A21K1 energize.

(1) The energizing of relay A21K3 causes the following events to simultaneously occur:

- (a) One set of contacts close and shunt the AUTOMATIC ON switch, thereby enabling 115 vac power to be maintained to the starting control system even though the pushbutton is released.
- (b) Another set of contacts open and inhibit the application of 115 vac to manual on relays A21K4 and A21K5, which are utilized in the manual operating mode of disc file operation; this action inhibits manual operation of the file.

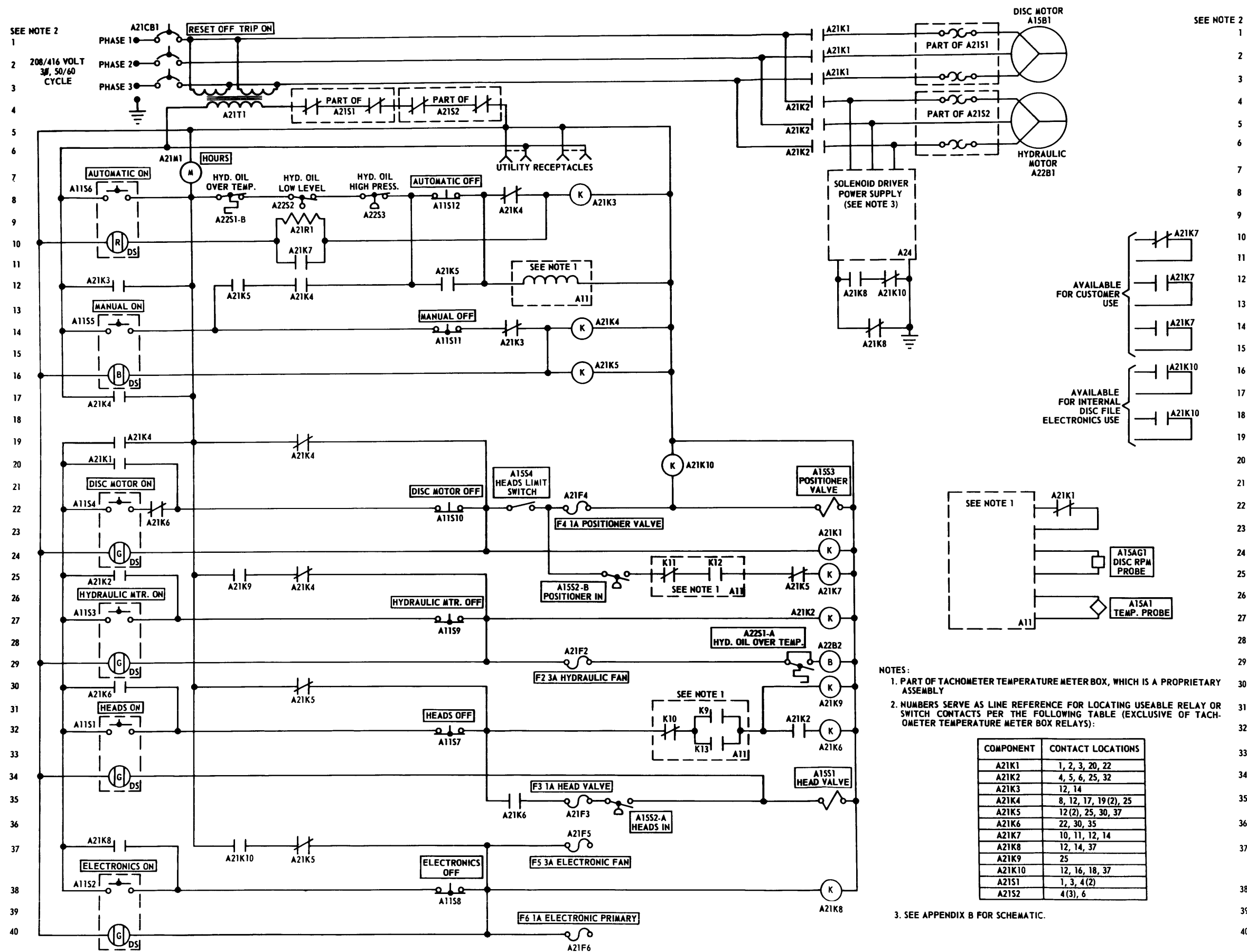
(2) The energizing of relay A21K1 causes the following events to simultaneously occur:

- (a) Three sets of contacts close to enable application of three phase power to disc motor A15B1 (see Figure 1-6) which operates and starts to rotate the disc spindle of the disc file.
- (b) A fourth set of contacts close and shunt DISC MOTOR ON pushbutton A11S4; however, with relay A21K4 maintained de-energized (see step (1) (b)), the shunting action serves no function during automatic operation.
- (c) A fifth set of contacts open to enable operation of the tachometer circuits of the tachometer/temperature meter box.

b. Disc speed — as sensed through the "A15AG1 Disc RPM Probe" (see Figure 1-6) — is monitored through the circuits of the tachometer/temperature meter box (see Figure 1-4). When this speed reaches a pre-established minimum level, relay A11K9 within the tachometer/temperature meter box energizes and causes the following events to occur:

NOTE

The tachometer/temperature meter box is a proprietary assembly and is not discussed in this handbook except in terms of generalities as it applies to basic disc file starting control system operation.



SEE NOTE 2
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40

- NOTES:
1. PART OF TACHOMETER TEMPERATURE METER BOX, WHICH IS A PROPRIETARY ASSEMBLY
2. NUMBERS SERVE AS LINE REFERENCE FOR LOCATING USEABLE RELAY OR SWITCH CONTACTS PER THE FOLLOWING TABLE (EXCLUSIVE OF TACHOMETER TEMPERATURE METER BOX RELAYS):

COMPONENT	CONTACT LOCATIONS
A21K1	1, 2, 3, 20, 22
A21K2	4, 5, 6, 25, 32
A21K3	12, 14
A21K4	8, 12, 17, 19(2), 25
A21K5	12(2), 25, 30, 37
A21K6	22, 30, 35
A21K7	10, 11, 12, 14
A21K8	12, 14, 37
A21K9	25
A21K10	12, 16, 18, 37
A21S1	1, 3, 4(2)
A21S2	4(3), 6

3. SEE APPENDIX B FOR SCHEMATIC.

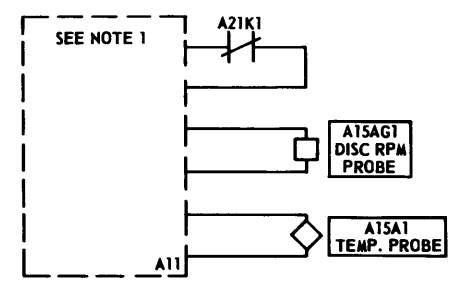
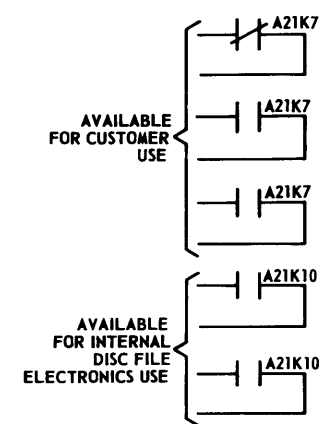


Figure 4-2 Model 1 Series 4000 Disc File Without ECU, Starting Control System—Schematic Diagram

4-3-1-1 Starting Sequence (Cont.)

- (1) A set of contacts of A11K9 in the box close and connect 115 vac to hydraulic motor enable relay A21K9. Relay A21K9 — located in the power control panel (see Figure 1-18) — energizes.
- (2) Contacts of another relay within the box close and cause the dial of the DISC FILE R.P.M. meter in the front of the pushbutton station (see Figure 3-1) to glow white.

c. The energizing of relay A21K9 causes a set of contacts to close and connect 115 vac to hydraulic motor on relay A21K2, hydraulic fan A22B2 — located in the auxiliary compartment of the hydraulic power supply (see Figure 1-22), and to the indicator lamp of HYDRAULIC MTR ON pushbutton A11S3. Hydraulic fan A22B2 immediately operates, the HYDRAULIC MTR ON pushbutton glows green, and relay A21K2 energizes. The energizing of relay A21K2 causes the following events to simultaneously occur:

- (1) Three sets of A21K2 contacts close to enable application of three phase power to hydraulic motor A22B1 (see Figure 1-19), which operates and starts to pressurize the hydraulic fluid of the hydraulic system; though this same three phase power is applied to the solenoid driver power supply, the supply remains, in effect, inoperative at this time because of the grounding of its output.
- (2) A fourth set of A21K2 contacts close and shunt HYDRAULIC MTR ON pushbutton A11S3; however, with relay A21K4 maintained de-energized (see paragraph a. (1) (b)), the shunting action serves no function during automatic disc file operation.
- (3) A fifth set of A21K2 contacts close and connect 115 vac to heads on relay A21K6, which energizes.

d. The energizing of relay A21K6 causes the following events to simultaneously occur:

- (1) A set of A21K6 contacts close and shunt the HEADS ON switch A11S1 as a second set of contacts open to inhibit the DISC MOTOR ON switch control circuit; however, with relay A21K4 maintained de-energized (see paragraph a. (1) (b)), these contacts serve no function during automatic operation.
- (2) A third set of A21K6 contacts close and connect 115 vac to the "A15S2-A Heads in" pressure switch mounted in the junction box of the accumulator manifold assembly (see Figure 1-15).

e. "A15S2-A Heads in" pressure switch closes when hydraulic system pressure becomes sufficient to sustain heads on operation; though serving a function in the starting control circuit, the "Heads in" switch is primarily used as a protective device which is preset to open and cause the heads of the disc file to move th the "retracted attitude" when — during disc file shutdown — hydraulic system pressure decreases to 700 ± 5 psig. The closing of the switch — which generally

4-3-1-1 Starting Sequence (Cont.)

occurs within approximately two seconds of the start of hydraulic motor operation — enables connection of 115 vac to the indicator lamp of the HEADS ON pushbutton A11S1 and the "A15S1 Head Valve" solenoid secured to the manifold of the accumulator manifold assembly (see Figure 1-15). The HEADS ON pushbutton glows green and solenoid A15S1 energizes.

f. The energizing of solenoid A15S1 causes the reversal of hydraulic fluid flow to the hydraulic cylinders of the files clock and data head bar assemblies; the reversal of hydraulic fluid flow causes the sliders of the head bar assemblies to actuate and force the head pads of the head bar assemblies the the "flying attitude". Simultaneously, movement of the slider of the left-hand clock head bar assembly (see Figure 1-5) of the file causes the "A15S4 Heads Limit Switch" — which is mounted on the rear of the clock head bar of the file — to close.

g. The closing of the "A15S4 Heads Limit Switch" causes 115 vac to be connected to the "A15S3 Positioner Valve" solenoid secured to the accumulator manifold assembly (see Figure 1-15) and to positioner on relay A21K10 of the power control panel (see Figure 1-18). Solenoid A15S3 and relay A21K10 both energize. The energizing of solenoid A15S3 enables the application of hydraulic fluid under pressure to the digital actuator/boost assembly. This action — enables positioning of the head pads of the head bar assemblies to any one of 128 tracks as selected by the customer through the solenoid driver power supply and digital actuator/boost assembly:

- (1) One set of A21K10 contacts open and ready the solenoid driver power supply (see Figure 1-17) for operation.
- (2) A second set of A21K10 contacts close and connect 115 vac to the indicator lamp of ELECTRONICS ON pushbutton A11S2 and to electronics on relay A21K8. The ELECTRONICS ON pushbutton glows green and relay A21K8 energizes. With relay A21K8 energized, the following events simultaneously occur:
 - (a) One set of relay contacts across the output of the solenoid driver power supply opens as another set of contacts close. With relay A21K10 energized, the output of the solenoid driver power supply is removed from ground and positioning of the head pads of the disc file to a selected track through the digital actuator/boost assembly via customer or local commands applied to the solenoid driver power supply is enabled.
 - (b) A third set of A21K8 contacts close and shunt ELECTRONICS ON pushbutton A11S2; however, with relay A21K4 de-energized (see paragraph a. (1) (b)), the shunting action serves no function during automatic disc file operation.
- (3) Two other sets of A21K10 contacts, which are prewired to a connector of the power control panel, close. The contacts are provided for use with disc files that are custom ordered with electronic interfaces. They are, of course, also available for use with the customers' electronics interface should there be a need.

4-3-1-1 Starting Sequence (Cont.)

h. Almost immediately after energizing the "A15S3 Positioner Valve", sufficient hydraulic system pressure build up occurs to enable the "A15S2-B Positioner In" pressure switch mounted on the junction box of the accumulator manifold assembly (see Figure 1-15) to close and connect 115 vac to the temperature monitoring circuits of the tachometer/temperature meter box/ though switch A15S2-B serves a function in the starting control circuit, the switch is preset to open and interrupt a file ready for use indication when — during disc file shutdown — hydraulic system pressure decrease to 725 ± 5 psig.

i. Disc file cabinet temperature — as sensed through the "A15A1 Temp. Probe" (see Figure 1-9) — is monitored through the circuits of the tachometer/temperature meter box (see Figure 1-4). When cabinet temperature is within prescribed upper and lower limits, relay A11K12 within the tachometer/temperature meter box energizes and causes the following events to sequentially occur:

NOTE

The tachometer/temperature meter box is a proprietary assembly and is not discussed in this handbook except in terms of generalities as it applies to basic disc file starting control system operation.

- (1) A set of contacts of A11K12 in the box close and connect 115 vac to file ready for use relay A21K7 of the power control panel (see Figure 1-18). Relay A21K7 energizes.
 - (2) Contacts of another relay within the box close and cause the dial of the °F FILE TEMP. meter in the front of the pushbutton station assembly (see Figure 3-1) to glow white.
- j. The energizing of relay A21K7 causes the following events to simultaneously occur:
- (1) One set of A21K7 contacts close and shunt current limiting resistor A21R1 (see paragraph a.). The resultant full current flow to the indicator lamp of AUTOMATIC ON pushbutton A11S6 causes the AUTOMATIC ON pushbutton to glow bright red.
 - (2) Two other sets of A21K7 contacts close and one other set of contacts open. These contacts, which are prewired to a connector on the power control panel, are available for use with disc files custom ordered with electronic interface. They are, of course, also available for use with the customers' electronic interface should they be needed.

4-3-1-2 Shutdown Sequence — Normal shutdown of the disc file is enabled when AUTOMATIC OFF pushbutton A11S12 of the pushbutton station assembly (see Figures 3-1 and 4-2) is momentarily pressed. This action interrupts the holding voltage applied to relay A21K3 of the power control panel (see Figure 1-18), which de-energizes and opens the holding contacts shunting AUTOMATIC ON pushbutton A11S6. This action removes the 115 vac to the starting control circuits, shutting down the file. Several failure control circuit elements are also included in the disc file operating circuits. These are discussed in the following paragraphs.

a. The disc file is also automatically shutdown by interruption of the holding voltage to A21K3 should any of the following open due to the failure of the function that they monitor: MAIN CONTROL fuse A21F1 and overload contacts A21S1 and A21S2 all mounted in the power control panel (see Figure 1-18); hydraulic oil over-temperature switch A22S1-B and hydraulic oil high pressure switch A22S3 both installed on the hydraulic power supply (see Figure 1-20); and hydraulic oil low level switch A22S2; mounted in the reservoir of the hydraulic power supply (see Figure 1-21). Functions monitored by these circuit elements are as follows:

- (1) Fuse A21F1 opens when the current drawn by the starting control circuits exceeds 15 amperes.
- (2) Overload contactor A21S1 and A21S2 are temperature sensitive and will open if the disc motor or hydraulic motor are exposed to frequent start/stop cycling operation, or if the motors draw excessive current during operation.
- (3) Hydraulic oil over-temperature switch A22S1-B is preset to open when the temperature of the hydraulic fluid within the reservoir of the hydraulic power supply reaches 140 ± 5 °F.
- (4) Hydraulic oil low level switch A22S2 is preset to open when the quantity of hydraulic fluid within the reservoir decreases $6 \pm \frac{1}{2}$ gallons.
- (5) Hydraulic oil high pressure switch A22S3 is preset to open when the pressure of the fluid out of the gear pump exceeds 1350 ± 50 psig.

b. Should disc spindle speed monitored as described in paragraph 4-3-1-1 b. vary outside the lower and upper limits preset through the tachometer monitor circuits of the tachometer/temperature meter box, the dial of the DISC FILE RPM meter (see Figure 3-1) glows red and relay A11K10 located within the box energizes and opens the 115 vac power circuit to heads on relay A21K6 and hydraulic motor enable relay A21K9 (see Figure 1-18). Both relays simultaneously de-energize and cause all disc file operation — except for the disc motor A15B1 (see Figure 1-6) and tachometer/temperature meter box (see Figure 1-4) — to stop:

- (1) The "A15S1 Head Valve" (see Figure 1-15) and hydraulic motor on relay A21K2 both de-energize; hydraulic fan A22B2 (see Figure 1-22) stops; and indicators of the HEADS ON and HYDRAULIC MTR ON pushbuttons extinguish.

4-3-1-2 Shutdown Sequence (Cont.)

- (a) The de-energizing of solenoid A15S1 results in the reversal of the flow of hydraulic fluid to the hydraulic cylinders of the files clock and data head bar assemblies; the reversal of hydraulic fluid flow causes the sliders of the head bar assemblies to retract and force the head pads of the head bar assemblies to the "retracted attitude." Simultaneously, retraction of the slider of the clock head bar assembly of the file causes the "A15S4 Head Limit Switch" — which is mounted on the rear of the left-hand clock head bar of the file (see Figure 1-5) — to open.
 - (b) The de-energizing of relay A21K2 results in shutting down hydraulic motor A22B1 of the solenoid driver power supply (see Figure 1-19).
- (2) The opening of A15S4 causes file ready for use relay A21K7 to de-energize and switch the indicator of the AUTOMATIC ON pushbutton back to dim red; the file ready for use interlock connections between the electronic interface and computer open to reflect the not ready status of the file; the "A15S3 Positioner Valve" (see Figure 1-15) de-energizes and inhibits the flow of hydraulic fluid to the digital actuator/boost assembly; and positioner on relay A21K10 de-energizes.
 - (3) The de-energizing of relay A21K10 immediately grounds the output of the solenoid driver power supply (see Figure 1-17); at this time, the precharge of the pint high pressure accumulator (see Figure 1-15) enables the digital actuator/boost assembly to return the head pads of the data head bar assemblies to track zero. Coincidentally, relay A21K8 de-energizes and maintains the output of the solenoid driver power supply grounded; also, the indicator of the ELECTRONICS ON pushbutton extinguishes.
 - (4) Reset of the tachometer circuit is enabled by the momentary pressing of the Disc File RPM Reset pushbutton of the tachometer/temperature meter box; the pushbutton protrudes from the front of the pushbutton station (see Figure 3-1). By pressing the reset pushbutton, relay A11K10 of the tachometer circuit of the box is de-energized, thereby allowing automatic restart of the disc file. However, if the speed failure condition persists, the file again reverts to the partially shutdown condition; troubleshooting must then be initiated to determine the cause of failure.
- c. Should the disc file cabinet temperature monitored as described in paragraph 4-3-1-1 i. vary outside the lower and upper limits preset through the temperature monitor circuits of the tachometer/temperature meter box, the dial of the °F FILE TEMP. meter (see Figure 3-1) glows red and relay A11K11 located within the box energizes and opens the 115 vac power circuit to file ready for use relay A21K7. The de-energizing of relay A21K7 causes indicator A11DS6 to again glow dim red; simultaneously, file ready for use interlock connections between the electronic interface and computer are opened to reflect the change of file status to that of "not ready." Reset of the temperature circuit is enabled by the momentary pressing of the Disc File Temp Reset pushbutton of the tachometer/temperature meter box. By pressing the reset pushbutton, relay A11K11 of the temperature circuit of the

4-3-1-2 Shutdown Sequence (Cont.)

box is de-energized thereby allowing automatic reset of the file ready for use circuit. However, if temperature failure persists, the file reverts to not ready and the file must be allowed to cool before it can be returned to a ready status through the reset switch.

4-3-2 MANUAL OPERATING MODE — The manual starting and shutdown sequences of the disc file are discussed in the following paragraphs.

NOTE

If the disc file is in the automatic operating mode, manual operation will be inhibited as specified in paragraph 4-3-1-1 a. (1) (b).

4-3-2-1 Starting Sequence — Manual operation of the disc file is enabled when RESET OFF/TRIP ON circuit breaker A21CB1 (see Figure 3-3) is set to the TRIP ON position and MANUAL ON pushbutton A11S5 (see Figure 3-1) is momentarily pressed. The following events are then enabled (see Figure 4-2):

NOTE

In four wire 208-volt systems, one of the input phases and neutral can be used instead of transformer A21T1 of the starting control circuit.

a. The 115 vac from transformer A21T1 of the power control panel (see Figure 1-18) is applied through the MANUAL ON pushbutton to HOUR meter A21M1, manual on relays A21K4 and A21K5, the power supply of the tachometer/temperature meter box (see Figure 1-4), and the indicator of MANUAL ON pushbutton A11S5. HOUR meter A21M1 and circuits of the tachometer/temperature meter box immediately operate, indicator A11DS5 of the MANUAL ON pushbutton glows blue, and both relays A21K4 and A21K5 energize.

(1) The energizing of relay A21K4 causes the following events to simultaneously occur:

- (a) One set of contacts close and shunt the MANUAL ON switch thereby enabling 115 vac power to be maintained to the starting control system even though the pushbutton switch is released.
- (b) A second set of contacts open and inhibit the application of 115 vac to automatic on relay A21K3, which is used in the automatic mode of disc file operation; this action inhibits automatic operation of the file.
- (c) A third set of contacts close to enable the application of 115 vac to normally open DISC MOTOR ON pushbutton A11S4, HYDRAULIC MTR ON pushbutton A11S3, HEADS ON pushbutton A11S1, and ELECTRONICS ON pushbutton A11S2.

4-3-2-1 Starting Sequence (Cont.)

- (d) A fourth and fifth set of contacts open to inhibit application of 115 vac to disc motor on relay A21K1 and hydraulic motor on relay A21K2.
 - (e) A sixth set of contacts — which are connected in series with a set of closed contacts of energized relay A21K5 — close to maintain relays A21K4 and A21K5 energized by means of the holding voltage applied through interlock switches A22S1-B, A22S2 and A22S3.
- (2) The energizing of relay A21K5 causes the following events to simultaneously occur:
- (a) One set of contacts close and enable the function described in step (1) (e).
 - (b) A second set of contacts close and shunt AUTOMATIC OFF switch A11S12; this action maintains 115 vac to the power supply of the tachometer/temperature meter box, thereby prohibiting the opening of switch A11S12 from effecting tachometer/temperature meter box operation during manual operation of the disc file.
 - (c) A third set of contacts open to inhibit operation of the file ready for use relay A21K7 during manual disc file operation.
 - (d) A fourth and fifth set of contacts open to inhibit application of 115 vac holding voltage to heads on relay A21K6 and electronics on relay A21K8.
- b. With the manual mode of disc file operation initiated, initiation of independent modes of disc file operation can be accomplished as follows:

NOTE

If the heads of the file have been actuated to the flying attitude, heads on relay A21K6 is energized and a set of its normally closed contacts are opened thereby inhibiting actuation of the disc motor.

- (1) If the heads of the file have not been actuated to the flying attitude, the momentary pressing of DISC MOTOR ON pushbutton A11S4 (see Figure 3-1) enables the connection of 115 vac to disc motor on relay A21K1 (see Figure 1-18) and the indicator lamp of DISC MOTOR ON pushbutton A11S4. DISC MOTOR ON pushbutton A11S4 glows green and relay A21K1 energizes and causes the following events to occur:

Starting Sequence (Cont.)

- (a) The set of contacts close and shunt DISC MOTOR ON pushbutton A11S4, thereby enabling 115 vac power to be maintained to relay A21K1 even though the pushbutton is released. Simultaneously, three other sets of contacts close to enable application of three phase power to disc motor A15B1 (see Figure 1-6), which operates and starts to rotate the disc spindle of the disc file; a fifth set of contacts open to enable operation of the tachometer circuits of the tachometer/temperature meter box.
 - (b) Disc speed — as sensed through the A15AG1 Disc RPM Probe (see Figure 1-6) — is monitored through the circuits of the tachometer/temperature meter box (see Figure 1-4). When this speed reaches a pre-established minimum level, a relay within the box energizes and its contacts close and cause the dial of the DISC FILE RPM meter in the front of the pushbutton station (see Figure 3-1) to glow white; simultaneously, relay A11K9 within the box energizes and readies one part of the manual heads on circuits of the disc file for operation.
- (2) The momentary pressing of the HYDRAULIC MTR ON pushbutton A11S3 (see Figure 3-1) enables the connection of 115 vac to hydraulic motor on relay A21K2 (see Figure 1-18), the indicator of HYDRAULIC MTR ON pushbutton A11S3, and hydraulic fan A22B2 — located in the auxiliary compartment of the hydraulic power supply (see Figure 1-22). Hydraulic fan A22B2 immediately operates, the HYDRAULIC MTR ON pushbutton glows green, and relay A21K2 energizes. The energizing of relay A21K2 causes the following events to simultaneously occur:
- (a) One set of contacts close and shunt HYDRAULIC MTR ON pushbutton A11S3 thereby enabling 115 vac power to be maintained to relay A21K2 even though the pushbutton is released. Three other sets of contacts close to enable application of three phase power to hydraulic motor A22B1 (see Figure 1-19), which operates and starts to pressurize the hydraulic fluid of the hydraulic system. Though this same three phase power is applied to the solenoid driver power supply, the supply remains, in effect, inoperative at this time because of the grounding of its output. A fifth set of A21K2 contacts close and ready connection of 115 vac to heads on relay A21K6; this action readies one part of the manual heads circuits of the disc file for operation.
 - (b) Within approximately two seconds, hydraulic system pressure is sufficient to close the "A15S2-A Heads in" pressure switch (see Figure 1-15). This action readies the disc file for manual operation of the head circuits.
- (3) Head circuit operation can be initiated only when the hydraulic power supply is operating as specified in step (2) and when the discs are rotating at proper speed as specified in step (1) or when the discs are at zero speed. The momentary pressing of HEADS ON pushbutton A11S1 (see Figure 3-1) enables the connection of 115 vac

Starting Sequence (Cont.)

through the normally closed contacts of de-energized relay A11K10 of the tachometer/temperature meter box (see Figure 1-4) to normally open contacts of relays A11K9 and A11K13. If disc motor operation is enabled (see paragraph (1)), relay A11K9 is energized and its normally open contacts are closed to enable the 115 vac from A11K1 to be applied to relays A21K6 and A21K9 (see Figure 1-18). On the other hand, if disc motor operation is not enabled, relay A21K1 is de-energized and the one set of its normally closed contacts connected to the tachometer/temperature meter box remain closed to enable a zero speed sensing circuit within the box; with the spindle of the disc file not rotating, the zero speed circuit operates within approximately one minute — provided disc motor operation is not enabled — and relay A11K13 within the circuit energizes and closes its normally open contacts to enable the 115 vac from A11K10 to be applied to relays A21K6 and A21K9. In either event, both relays A21K6 and A21K9 energize. Though relay A21K9 serves no function during manual disc file operation because of the opening of normally closed contacts of relay A21K4, the energizing of relay A21K6 causes the following events to occur:

- (a) One set of contacts close and shunt the HEADS ON switch A11S1, thereby enabling 115 vac power to be maintained to relay A21K6 even though the pushbutton is released. A second set of contacts in series with DISC MOTOR ON pushbutton A11S4 open to inhibit turn on of the disc motor if motor operation has not been enabled at this point in time; this protection is mandatory, since the heads — when actuated to the "flying attitude" — rest firmly against the surfaces of the non-rotating discs. A third set of contacts close and connect 115 vac to the "A15S2-A Heads in" pressure switch (see Figure 1-15), which was closed as described in paragraph (2)(b.).
 - (b) The 115 vac through A15S2-A then enables the head pads of the head bars to move to the "flying attitude"; simultaneously, the HEADS ON pushbutton A11S1 glows green, the "A15S1 Head Valve" solenoid energizes, and the "A15S4 Heads Limit Switch" closes (see paragraph 4-3-1-1e. and f.)
 - (c) If disc motor operation is manually initiated as directed in paragraph (1), 115 vac through the closed A21K1 contacts shunting DISC MOTOR ON pushbutton A11S4 is applied through the closed "A15S4 Heads Limit Switch" to the "A15S3 Positioner Valve" solenoid and the positioner on relay A21K10. Both the solenoid and relay energize. Though the digital actuator/boost assembly is readied for operation, positioning cannot be initiated unless the electronics operation is manually initiated as directed in step (4).
- (4) Though electronics operation can be initiated at any point in time during manual operation, it serves a functional purpose only when manual disc motor, hydraulic motor, and heads operation — as described in paragraphs (1) through (3) — have been initiated. Under these conditions, the momentary pressing of ELECTRONICS ON

4-3-2-1 Starting Sequence (Cont.)

pushbutton A11S2 (see Figure 3-1) enables connection of 115 vac to electronics on relay A21K2 (see Figure 1-18) and the indicator of ELECTRONICS ON pushbutton A11S2. The ELECTRONICS ON pushbutton immediately glows green and relay A21K8 energizes. The energizing of electronics on relay A21K8 causes the following events to simultaneously occur:

- (a) One set of relay contacts across the output of the solenoid driver power supply (see Figure 1-17) opens as another set of contacts close. With relay A21K10 energized with the initiation of head circuit operation (paragraph (3)), the output of the solenoid driver power supply is removed from ground and positioning of the head pads of the disc file to a selected track through the digital actuator/boost assembly via local commands applied to the solenoid driver power supply is enabled (see paragraph 4-3-1-1 g.).
- (b) A third set of A21K8 contacts close and shunt ELECTRONICS ON pushbutton A11S2, thereby enabling 115 vac power to be maintained to relay A21K8 even though the pushbutton is released.

4-3-2-2 Shutdown Sequence — Shutdown of the disc file during manual operation can be accomplished normally through the pressing of the individual OFF pushbuttons of the pushbutton station assembly, or individual functions can be automatically shutdown by failure control circuits.

a. Normal Shutdown — The file can be totally shutdown or the individual functions can be shutdown as described in the following paragraphs (see Figure 4-2).

- (1) Total shutdown of the disc file during manual operation is enabled by momentarily pressing MANUAL OFF pushbutton A11S11 (see Figure 3-1). This action interrupts the holding voltage applied to relays A21K4 and A21K5 (see Figure 1-18), which de-energize. The de-energizing of A21K4 opens its holding contacts that shunt MANUAL ON pushbutton A11S5. This action removes the 115 vac to the starting control circuits shutting down the file; all disc file pushbutton indicators extinguish.
- (2) Shutdown of the disc motor of the disc file is enabled by momentarily pressing DISC MOTOR OFF pushbutton A11S10. This action interrupts the holding voltage applied to relay A21K1. Relay A21K1 de-energizes and opens its holding contacts shunting DISC MOTOR ON pushbutton A11S4. The opening of the holding contacts interrupts the 115 vac power to the disc motor control circuits (the indicator of DISC MOTOR ON pushbutton A11S4 extinguishes) and the three phase power to the disc motor. If heads operation was initiated, relay A21K10 de-energizes and one set of its contacts in series with a set of A21K8 contacts close; if electronics operation was enabled, relay A21K8 is energized and its series contacts are closed. In this manner, the output of the solenoid driver power supply is immediately grounded, causing the digital actuator/boost assembly to automatically position the head pads of the data head bar assemblies back to track zero. Subsequently, the decrease of disc motor speed to a minimum level causes relay A11K10 in the tachometer/temperature meter box to energize and open its contacts that connect 115 vac power to heads in relay A21K6, which de-energizes and causes the following events to occur:

- (a) A21K6 holding contacts shunting HEADS ON pushbutton A11S1 open to maintain A21K6 de-energized; the indicator of HEADS ON pushbutton A11S1 extinguishes. A second set of contacts close to again enable the manual disc motor operating circuits. A third set of contacts open and interrupt 115 vac to the "A15S1 Head Valve" solenoid (see Figure 1-15), which de-energizes.
 - (b) De-energizing of A15S1 results in a reversal of hydraulic fluid flow to the hydraulic cylinders of the disc file's clock and data head bar assemblies; the reversal of hydraulic fluid flow causes the sliders of the head bar assemblies to retract and force the head pads of the head bar assemblies to the "retracted attitude." Simultaneously, retraction of the slider of the clock head bar assembly of the file causes the "A15S4 Head Limit Switch" — which is mounted on the rear of the left-hand clock head bar assembly (see Figure 1-5) — to open.
 - (c) The opening of A15S4 causes the "A15S3 Positioner Valve" (see Figure 1-15) to de-energize, though this action in no way affects circuit operation since the opening of relay A21K1 holding contacts at the beginning of disc motor shutdown caused relay A21K10 to open and ground the output of the solenoid driver power supply.
- (3) Shutdown of the hydraulic system of the disc file is enabled by momentarily pressing HYDRAULIC MTR OFF pushbutton A11S9. This action interrupts the holding voltage applied to relay A21K2. Relay A21K2 de-energizes and opens its holding contacts shunting HYDRAULIC MTR ON pushbutton A11S3. Opening the holding contacts interrupts the 115 vac power to the hydraulic motor control circuits (the indicator of HYDRAULIC MTR ON pushbutton A11S2 extinguishes) and the three phase power to the hydraulic motor A22B1 (see Figure 1-19). If heads operation was initiated, the opening of another set of A21K2 contacts interrupts the 115 vac to heads on relay A21K6, which de-energizes.
- (a) The de-energizing of relay A21K6 inhibits head operation as described in paragraph (2) (a) and (b).
 - (b) Also, the opening of the "A15S4 Heads Limit Switch" interrupts the 115 vac to relay A21K10, which de-energizes, and one set of A21K10 contacts in series with a set of A21K8 contacts closes; if electronics operation was enabled, relay A21K8 is energized and its series contacts are closed. In this manner, the output of the solenoid driver power supply is grounded causing the digital actuator/boost assembly to automatically position the head pads of the data head bar assemblies back to track zero.
- (4) Shutdown of the heads system of the disc file is enabled by momentarily pressing HEADS OFF pushbutton A11S7. This action interrupts the holding voltage to relay A21K6. Relay A21K6 de-energizes and inhibits head operation as described in paragraph (2) (a) and (b). Also, solenoid driver power supply operation is inhibited as described in paragraph (3) (b).

4-3-2-2 Shutdown Sequence (Cont.)

- (5) Shutdown of the electronics circuits is enabled by momentarily pressing ELECTRONICS OFF pushbutton A11S8. This action interrupts the holding voltage to relay A21K8. Relay A21K8 de-energizes and opens its holding contacts shunting ELECTRONIC ON pushbutton A11S2. Opening the holding contacts interrupts the 115 vac power to the electronics operating circuits (the indicator of ELECTRONICS ON pushbutton A11S2 extinguishes); also, a set of relay A21K8 contacts close and ground the output of the solenoid driver power supply.

b. Failure Shutdown — The disc file when operating in the manual mode can be automatically shut down in its entirety or in its individual operating modes as described in paragraph 4-3-1-2 a. and b. except that in paragraph a. holding voltage to relays A21K4 and A21K5 — rather than to relay A21K3 — is interrupted.

4-4 HYDRAULIC SYSTEM

Components making up the hydraulic system are located in the power control unit cabinet and in the disc file cabinet. A schematic of the hydraulic system is shown in Figure 4-3. The system can be operated in both the automatic and manual operating modes. Except for minor differences, the hydraulic systems for A-, B- and C-frame disc files are essentially the same.

4-4-1 DISC FILE OPERATING IN AUTOMATIC MODE — Operation of the hydraulic system is automatically enabled at a predetermined time during the starting sequence of automatic turn on of the disc file (see paragraph 4-3-1-1 c.). The following events then occur (see Figure 4-3):

a. Hydraulic motor A22B1 (see Figure 1-19) starts and drives the hydraulic gear pump. The pump draws hydraulic fluid from the hydraulic power supply reservoir through a magnetic strainer (see Figure 1-21), compresses the fluid, and then applies the fluid under pressure through a 5-psig check valve (see Figure 1-22), the hydraulic power supply distribution manifold (see Figure 1-20), and a 10-micron filter (see Figure 1-15) to the accumulator manifold assembly of the disc file.

NOTE

A-frame disc files are not equipped with the 10-micron filter at the input of the accumulator manifold assembly.

- (1) The pressure of the fluid to the disc file is limited to 925 + 25 psig through the presetting of a relief valve (see Figure 1-19). Shunting fluid flow through the valve in order to maintain system pressure at the preset level is through a 1/2-micron filter (see Figure 1-22) and the heat exchanger (see Figure 1-19) to the reservoir; a 10-psig check valve (see Figure 1-22) shunts the filter to provide an alternate flow path to the reservoir should the filter become plugged.
- (2) Pressure monitoring is enabled through the pump output pressure gage (see Figure 1-19), which indicates only when its valve is manually opened.

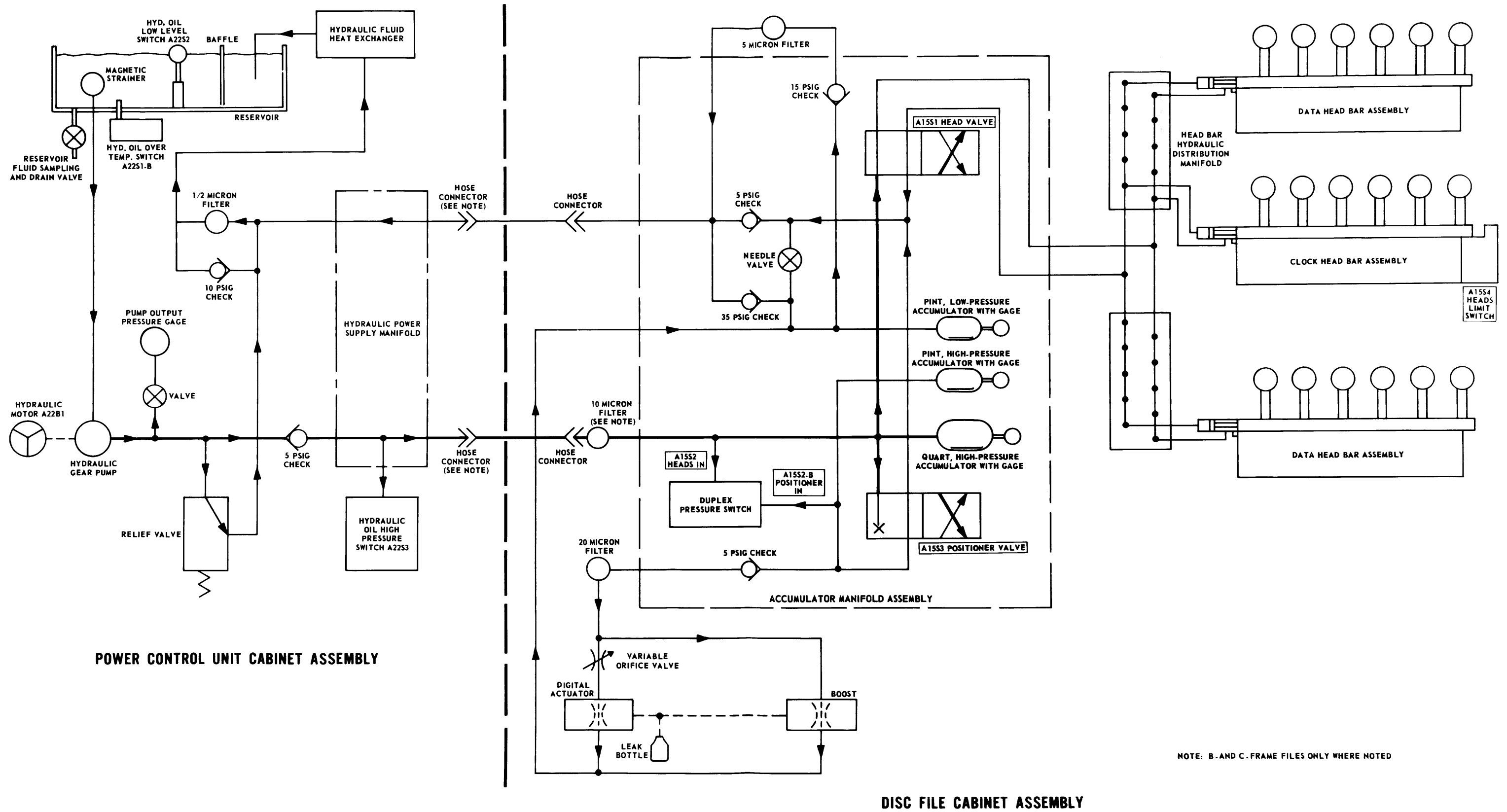


Figure 4-3 Model 1 Series 4000 Disc File Without ECU, Hydraulic System—Schematic Diagram

b. The head pads of the data and clock head bar assemblies remain in the "retracted position" until the "A15S2-A Heads in" pressure switch in the junction box of the accumulator manifold assembly (see Figure 1-15) of the starting control system closes (see paragraph 4-3-1-1 e.). At this instant, the "A15S1 Head Valve" solenoid (see Figure 1-15) energizes and reverses the direction of hydraulic fluid flow to the cylinders of the head bar assemblies causing the slider of the assemblies to move and force the head pads of the bars to the "flying attitude."

c. The instant the head pads of the file operate to the "flying attitude" the "A15S4 Heads Limit Switch" of the starting control system closes and causes the "A15S3 Positioner Valve" to energize (see paragraph 4-3-1-1 g.). The energizing of A15S3 enables the application of hydraulic fluid under pressure through a 20-micron filter (see Figure 1-15) to the digital actuator/boost assembly to enable the functioning of the data head positioning system of the disc file. It should be noted that routing of the fluid to the digital actuator is through the variable orifice valve (see Figure 1-11). This valve serves the function of enabling critical damping of the positioning system of the disc file; it can also be closed to inhibit the application of hydraulic fluid to the positioning system, thereby preventing the accidental movement of the heads to track zero should the file be inadvertently shut-down during maintenance. It should also be noted that fluid leakage accumulating in the boots of the digital actuator/boost assembly is collected in a leak bottle.

d. The accumulators of the accumulator manifold assembly serve to absorb transient pressure surges occurring in the hydraulic lines. In addition, return of the head pads of the head bar assemblies of the file to the "retracted attitude" when the hydraulic power supply of the file is shutdown is assured by the 500 psig precharge of the quart high pressure accumulator (see Figure 1-15); also, return of the digital actuator/boost assembly to the zero track reference position when the hydraulic power supply is shutdown is assured by the 600 psig precharge of the pint high pressure accumulator.

e. Hydraulic fluid from the manifold of the accumulator manifold assembly is returned to the manifold of the hydraulic power supply through check valves mounted in the bottom of the manifold. The head bar return is through a 5 psig check valve. Hydraulic fluid from the digital actuator/boost assembly is through a 15 psig check valve in the manifold and a 5-micron filter mounted on the base of the file (see Figure 1-9); in the event the 5-micron filter is plugged up, however, an alternate path is provided through a 35 psig check valve mounted in the side of the manifold.

f. From the manifold, the hydraulic fluid is applied through the 1/2-micron filter — or shunting 10-psig check valve — and heat exchanger to the reservoir (see paragraph a. (1)).

g. The normally closed hydraulic fluid over-temperature switch A22S1B, hydraulic oil low level switch A22S2, and hydraulic oil high pressure switch A22S3 open and inhibit hydraulic system operation should the conditions described in paragraph 4-3-1-2 a. (3) through (5) occur.

4-4-2 DISC FILE OPERATING IN MANUAL MODE — In the manual mode of disc file operation, the hydraulic pump can be operated alone or with the heads operated the the "flying attitude" as described in paragraph 4-3-2-1 b. (2) and (3); if positioner operation is desired,

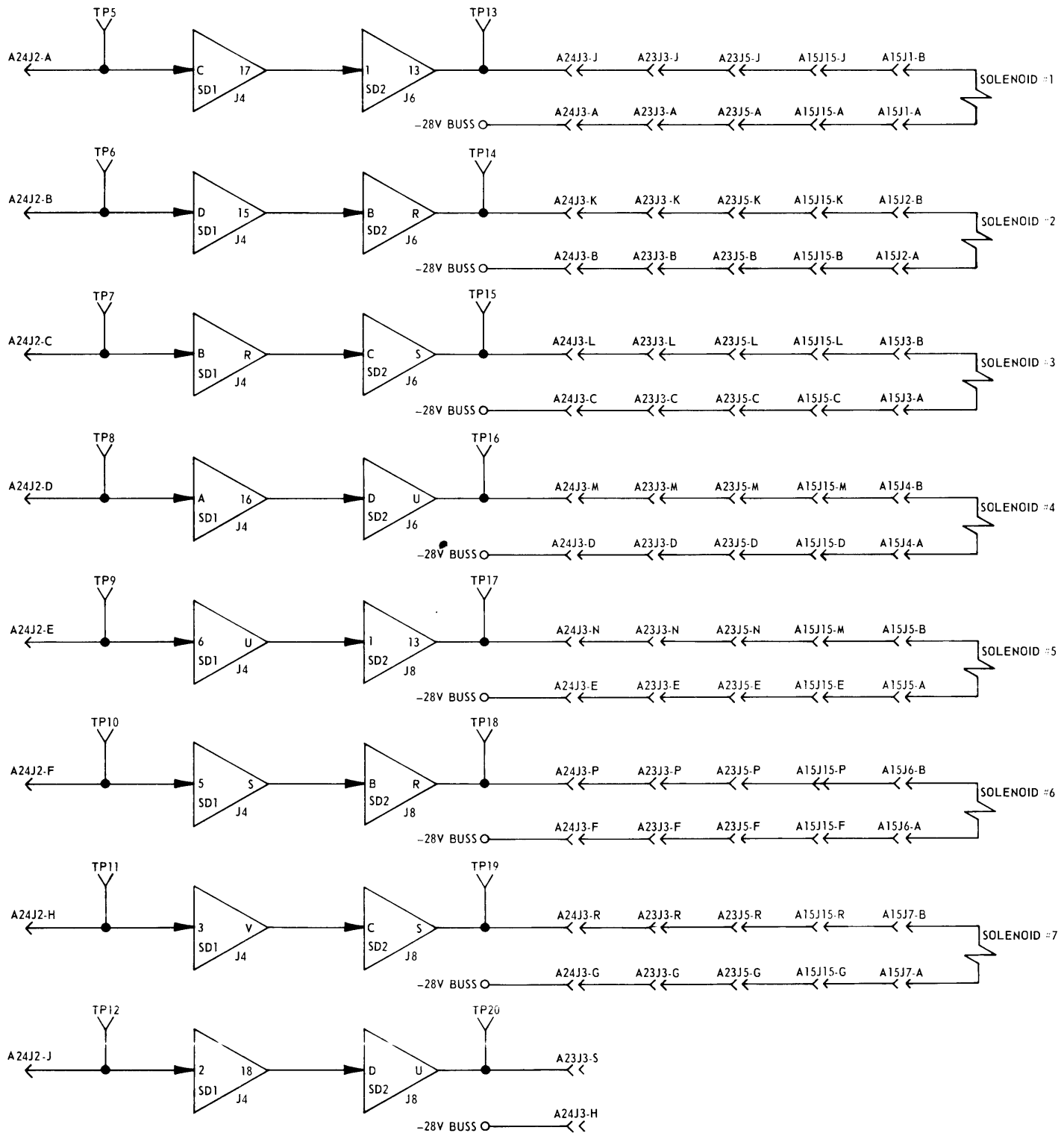


Figure 4-4 Digital Actuator Solenoid Selection Circuits—Logic Diagram

4-4-2 DISC FILE OPERATING IN MANUAL MODE (Cont.)

electronics operation must be initiated as described in paragraph 4-3-2-1 b. (4). In these operating configurations hydraulic system operation is identical to that described in paragraph 4-4-1, except that the functions are selected manually rather than initiated automatically.

4-5 DATA HEAD POSITIONING SYSTEM.

Positioning of the data heads of the disc file to any one of 128 track positions through the digital actuator/boost assembly (see Figure 1-9) is controlled either remotely by application of a customer furnished, seven-bit binary input character or locally by grounding the appropriate input test jacks of the solenoid driver power supply (see Figure 3-6). The bits of the remotely or locally originated input character are resolved in the solenoid driver power supply into levels that enable the energizing of appropriate solenoids of the actuator that enables hydraulic fluid flow to position pistons within the actuator. Subsequent movement of the pistons is amplified into power motion by the boost, which moves and drives a mechanical linkage that simultaneously positions all the data heads of the file to the track selected by the input command character.

4-5-1 SEVEN-BIT, INPUT CHARACTER — A seven-bit, input character applied in parallel by a customer or locally through the input jacks of the solenoid driver power supply represent a binary count of from zero to 127. To minimize the elements making up the circuits of the solenoid driver power supply in the selection of tracks, zero vdc and -4 vdc input levels are used to represent logical "1" and "0" bits, respectively, at the inputs of the circuits. Thus, when all seven bits of the input character are at a -4 vdc level, the binary count is zero — that is, "0000000" — and track zero of the disc file will be selected for a write/read operation. When all seven bits of the input character are at a zero vdc level, the binary count is 127 — that is "1111111" — and track 127 is selected for a write/read operation.

4-5-2 SOLENOID DRIVER POWER SUPPLY — The solenoid driver power supply consists of chassis mounted components, a Power Supply Control (PSC) Electronic Circuit Module, one Solenoid Driver One (SD1) Electronic Circuit Module, and two Solenoid Driver Two (SD2) Electronic Circuit Modules (see Figure 1-23). The function of the circuits of the power supply in conjunction with those of the electronic circuit modules is briefly described below. For detailed data relative to each of these items, refer to the Service Sheets of Appendix B of this handbook.

a. The turn on of the solenoid driver power supply (see paragraph 4-3-1-1 g. (2) (a)) enables the chassis mounted circuit components of the power supply — in conjunction with the circuits of the PSC electronic circuit module — to provide the -28 vdc and +7 vdc power requirements of the SD1 and SD2 electronic circuit modules.

b. With power to the solenoid drivers enabled, customer or local track selection for a write/read operation is enabled through the circuits of the solenoid drivers SD1 and SD2 (see Figure 4-4). The solenoids of the schematic correspond to those of the digital actuator of the file (see Figure 1-10). Test points of the figure correspond to those of the panel of the solenoid driver power supply (see Figure 3-6). Operation of a typical solenoid is as follows:

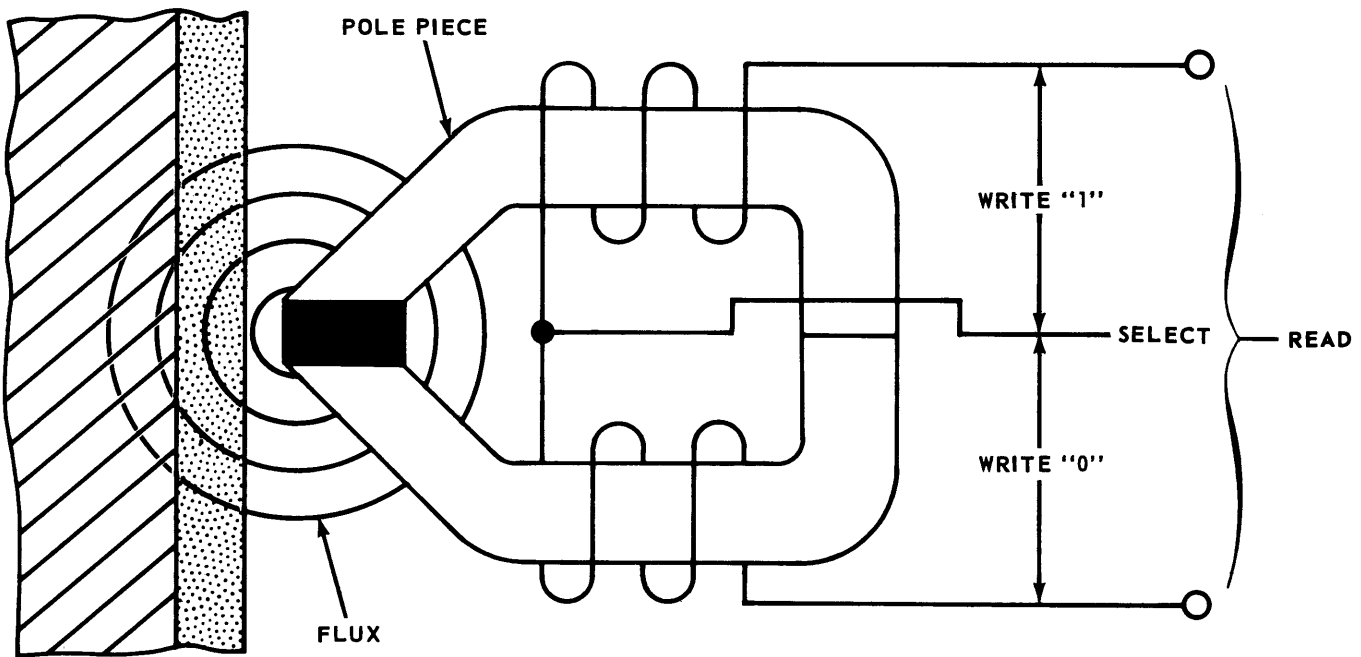


Figure 4-5 Write/Read Head—Simplified Sectional Diagram

4-5-2 SOLENOID DRIVER POWER SUPPLY (Cont.)

- (1) When the customer or test point (TP) input to a logic circuit is -4 vdc, SD1 of the logic circuit turns on and grounds the input to SD2. SD2 turns off and opens the ground connection to -28 vdc through the coil of the solenoid it serves. This action causes the solenoid to de-energize and remain de-energized until the state of the input signal to the circuit is changed.
- (2) When the customer or TP input to a logic circuit is switched to ground, SD1 turns off and connects a negative input to SD2. SD2, in turn, turns on and connects the -28 vdc to ground through the coil of the solenoid it serves. This action causes the solenoid to energize and remain energized until the state of the input signal is again changed.

4-5-3 DIGITAL ACTUATOR/BOOST ASSEMBLY — The energized or de-energized state of the solenoids of the digital actuator causes the flow of hydraulic fluid through the solenoids to position the pistons of the digital actuator in such a manner as to produce a longitudinal movement that corresponds to the track selected through the seven-bit input character of paragraph 4-5-1. This motion, which is amplified by the boost connected to the bottom of the digital actuator, is applied through a mechanical linkage to the data heads (see paragraph 1-2-1-1 f.(3)), which in turn are positioned to the track where a write/read operation is to be performed.

4-6 WRITE/READ ENABLE SYSTEM

The write/read enable system generally consists of the logic circuits necessary to enable data write or read operation through a specific write/read head (serial operation), or write/read heads (parallel operation), contained within the disc file. Also included in the system can be special head switching circuits, track verification circuits, alarm circuits, etc., depending on customer needs. Since the write/read system is available at customer option and since each customer's logic requirements can differ, coverage of only the functioning of the write/read head itself is included herein. Subsequent maintenance coverage of a total system ordered by a customer can be provided under separate cover following the format of this publication; however, since each system is peculiar to a particular customers' needs, a special handbook must be prepared.

NOTE

For the effects of temperature on the recording characteristics of a disc file, see paragraph 1-3-4-3.

4-6-1 HEAD SELECTION — A schematic representation of a typical write/read head used in the disc file is shown in Figure 4-5. With the heads of the file positioned to the flying attitude (see paragraph 4-3-1-1 f.) and to the selected track (see paragraph 4-5), writing or reading through one or more of the heads of the file is enabled by the application of a head select command (from a write/read enable system) to the center tap of the head(s).

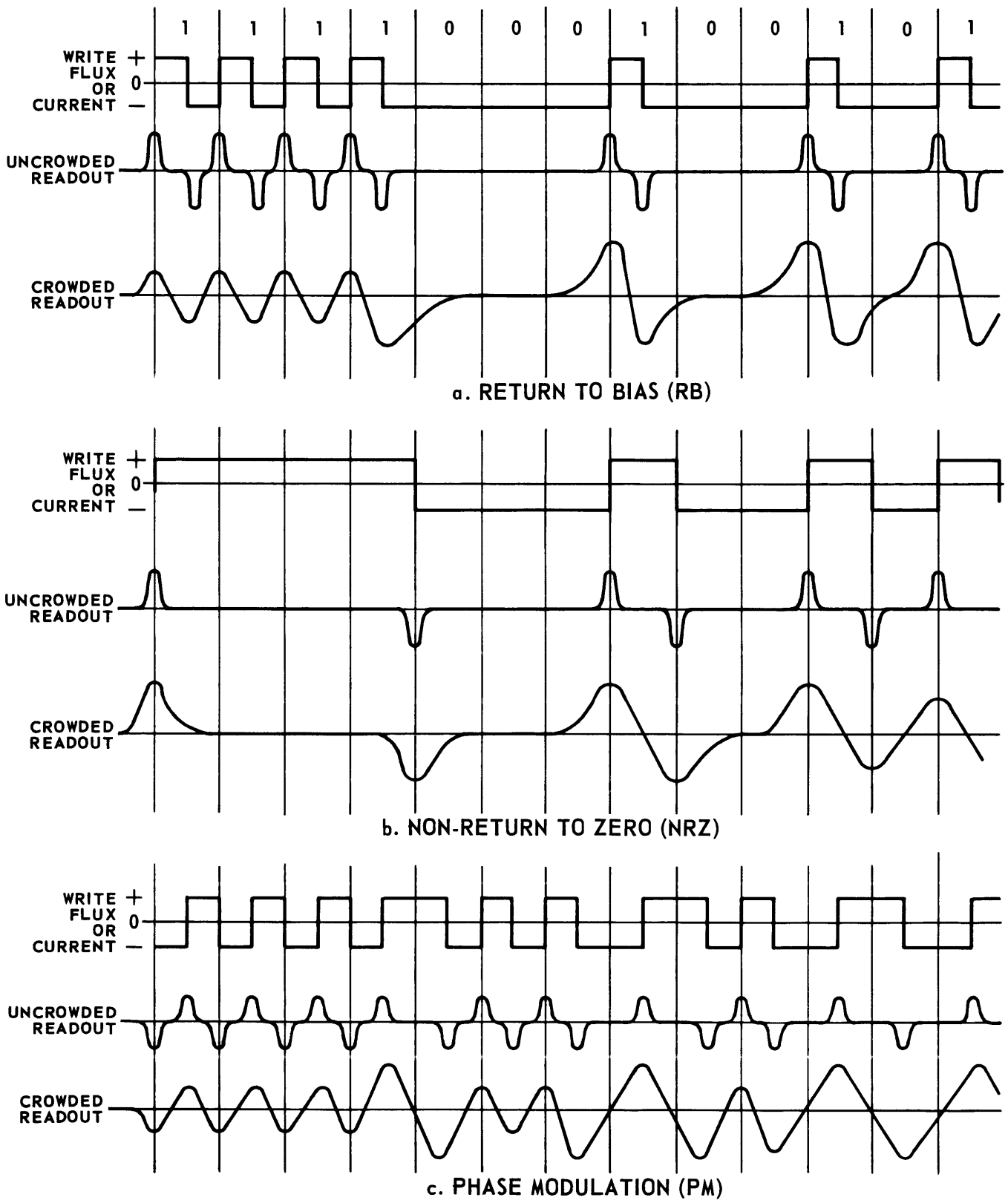


Figure 4-6 Typical Waveforms of Some of the Methods of Magnetic Recording

4-6-2 WRITE ENABLE — Voltage levels in the form of square waves representing logical "1" or "0" bits are generally used as inputs to the write amplifiers that control the flow of write current to the coil of the head through which writing of data is to be accomplished. The outputs of the write amplifier are tied to the extremities of the coil such that current flow can be enabled in the appropriate half of the head's coil — with respect to the center tap — to write the logical "1" or "0" bit that is applied to the write amplifier. The resultant switch in polarity from one side of the coil to the other establishes the direction of flux flow across the gap of the pole piece. The fringing of flux is sufficient to magnetize the disc surface to represent the logical "1" or "0" bit being written. Examples of write flux, or current, wave forms for different write/read record methods are illustrated in Figure 4-6.

4-6-3 READ ENABLE — As in the case of the write amplifier, the extremities of the coils of the heads are connected to the inputs of the write amplifiers. However, during a read operation with the head select command applied, the magnetization of the disc surface during writing is sufficient to induce — across the entire coil of the head — a voltage that is representative of the bit that was previously written. With suitable amplification, this induced voltage can be restored to the level of the original written pulse (square wave), be it a logical "1" or a logical "0". Examples of the form in which the readout signals off the disc surface will appear prior to being amplified through the read amplifier are shown for different write/read record modes in Figure 4-6. The uncrowded and crowded conditions shown can be the result of using, for example, one write frequency and disc speed in the case of the uncrowded condition and the use of the same write frequency but slower disc speed in the crowded condition. Though it may at first appear that uncrowded recording would be the most desirable, crowded recording is in reality very desirable in certain recording modes.

4-7 BITS OF DATA

To manufacturers and users of magnetic data storage devices, a written magnetic bit has real substance. Defined, a bit is a single magnetically polarized spot in a group of spots. In the case of Bryant's disc files, these spots are magnetically recorded in concentric tracks on rotating disc surfaces.

4-7-1 The writing of the data on and subsequent reading of data from the disc surfaces is accomplished through as many as six magnetic write/read heads serving each disc surface. The data heads are simultaneously positioned to any one of 128 tracks through the digital actuator/boost assembly; the 128 tracks served by each of the heads constitute a recording zone. Thus, with six recording zones, a total of 768 tracks of data can be recorded on a single Bryant disc surface.

4-7-2 Figure 4-7 is a photograph of data as actually recorded in the six zones of a data disc surface. The data was made visible by applying a volatile solution containing micron-sized iron particles to the surface of a disc on which data had been previously written. The iron particles in the solution were attracted to the magnetic areas of the surface such that following evaporation of the base material only the iron particles — depicting the bit patterns — remained. Shown in the figure are the actual bit patterns as recorded in the individual zones of the disc surface. Also shown are the bit patterns of the tracks of two recording zones magnified 12-1/2 times (observe track and zone separations) and the appearance of several bits of a single track of one of the recording zones magnified 1000 times.

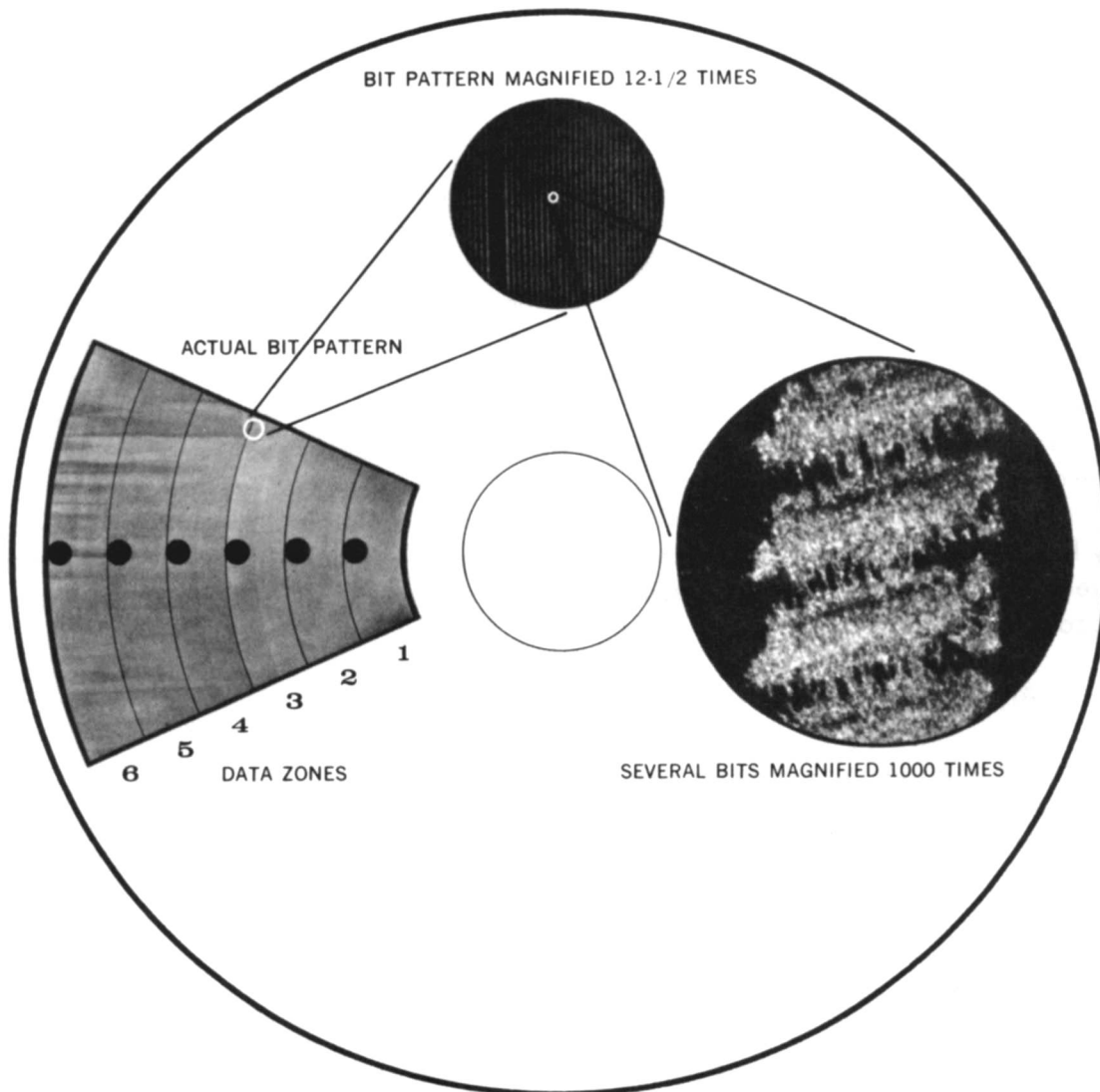


Figure 4-7 Recorded Data—An Example of a Typical “Bit” of Information

SECTION 5

PREVENTIVE MAINTENANCE

5-1 INTRODUCTION

This section provides the procedures necessary to enhance continuous extended periods of troublefree disc file operation. Though the prescribed maintenance can be performed by qualified technicians, Bryant recommends that required maintenance be performed by Bryant's qualified staff of servicemen who are always on call to perform such customer service.

CAUTION

If an installed file is not to be operated for two or more weeks, perform the procedures of paragraphs 2-3-4, 2-3-6, and 2-4-2-2, as applicable.

5-1-1 PERSONNEL QUALIFICATIONS — Personnel responsible for maintaining the disc file shall be technically qualified. One man shall be selected to co-ordinate all preventive maintenance activities — including establishment of sufficient lead time to assure that special equipment required in a procedure is available — as well as to assure that all possible caution is taken to protect both personnel and equipment. In addition, each individual performing the preventive maintenance procedures contained herein shall be thoroughly familiar with the manual and automatic turn-on and turn-off procedures as discussed in Section 3.

5-1-2 MAINTENANCE PHILOSOPHY — If required responses — including those during normal disc file manual or automatic turn-on/turn-off procedures — are not obtained when performing a preventive maintenance routine, note the deficiency for subsequent troubleshooting and corrective maintenance; only in those cases where required action is obvious are corrective maintenance procedures specifically called out in the routine. Since qualified technicians should have their own tool kits, standard tools — such as wrenches, screwdrivers, and the like — are not specifically called out as equipment required in the individual routines.

5-1-3 PREVENTIVE MAINTENANCE PERFORMANCE SCHEDULE — Preventive maintenance is performed daily, weekly, monthly, semiannually, annually, and biennially. Additional procedures fall into the category of "site determined preventive maintenance intervals" and "as required preventive maintenance intervals." Table 5-1 indentifies the routines that fall within the aforementioned inspection periods.

- a. Fixed Maintenance Intervals — The interval for performance is self-explanatory.
- b. Site Determined Preventive Maintenance — The intervals at which these procedures will be performed is dependent on the environment in which the disc file assembly is to be operated. Such intervals can be less or more frequent than the minimum recommended in the applicable procedure. If requested, Bryant Field Service personnel can evaluate the facility in which the equipment is to be used and — on the basis of their evaluation — establish firm intervals for such preventive maintenance.

c. As Required Preventive Maintenance Intervals — These procedures apply to those areas in which maintenance is not performed at fixed intervals, such as the procedures necessary to gain access to component(s) requiring preventive maintenance — for example, the retraction and insertion of data head bars — or the procedures necessary to bring the equipment back to operational suitability — for example, filling the hydraulic power supply reservoir.

TABLE 5-1 PREVENTIVE MAINTENANCE SCHEDULE

Interval	Function	Paragraph
Daily	General Inspection	5-2-1
	Hydraulic System Pressure and Fluid Level Check	5-2-2
	Disc Motor RPM Check	5-2-3
	Disc Buffing	5-2-4
	Disc File Automatic Turn-on Check	5-2-5
Weekly	Boost Pin Lubrication	5-3-1
	Digital Actuator/Boost Boot Inspection	5-3-2
Monthly	Oilite Bearing Lubrication	5-4-1
	Disc Motor Drive Belt Check	5-4-2
	Hydraulic Fluid Contamination Level Check	5-4-3
Semi-Annual	Reservoir Filler/Breather Cap and Strainer Cleaning	5-5-1
Annual	Hydraulic Power Supply Reservoir and Magnetic Strainer Cleaning	5-6-1
	Hydraulic Motor/Gear Pump Lubrication	5-6-2
	Hydraulic Power Supply 1/2 Micron Filter, Radiator Fan and Auxiliary Compartment Maintenance	5-6-3

TABLE 5-1 PREVENTIVE MAINTENANCE SCHEDULE (Cont.)

Interval	Function	Paragraph
Annual (Cont.)	10-Micron Filter Replacement	5-6-4
	20-Micron Filter Replacement	5-6-5
	5-Micron Filter Replacement	5-6-6
Biennial	Hydraulic Power Supply Hose Replacement	5-7-1
	Boost Hose Replacement	5-7-2
	Accumulator, Pressure Gage Adapter, and Pressure Gage Replacement	5-7-3
Site Determined	Access Panel Air Filter Inspection	5-8-1
	Disc Cleaning	5-8-2
	Head Pad Cleaning	5-8-3
	Over-All Inspection	5-8-4
As Required	Filling Hydraulic Power Supply Reservoir with Hydraulic Fluid	5-9-1
	Hydraulic Power Supply Purging Procedures	5-9-2
	Charging Accumulator Bottles	5-9-3
	Data Head Bar Retraction and Insertion	5-9-4

5-1-4 GENERAL WARNINGS AND CAUTIONS — The performance of preventive maintenance often necessitates entrance into areas that are not directly affected by the procedure that is being performed, but which could pose a hazard to personnel and equipment. For this reason the following shall be observed when performing preventive maintenance procedures:

- a. Before access panels are removed, thoroughly clean the area surrounding the disc file cabinet(s). Then — throughout maintenance, maintain the area as dust free as possible.
- b. Whenever possible, wait for discs to stop rotating before removing disc file cabinet access panels. Keep file operation at a minimum when access panels are removed.

GENERAL WARNINGS AND CAUTIONS (Cont.)

c. When maintenance is being performed, always notify the remote operating station — if used. The best protection is to lock the TRIP ON/RESET OFF circuit breaker of the power control unit panel to the RESET OFF position or place the file in the manual operating mode.

d. Never touch disc surfaces with bare hands; always wear gloves. Never allow objects that can cause damage to contact disc surfaces.

e. As a general rule, exercise extreme care when working around bare electrical wiring, rotating discs, or longitudinally moving mechanical members — such as the digital actuator or boost.

f. Whenever hydraulic lines are disconnected, always disconnect the pressure line first and then the return line. When reconnecting hydraulic lines, always connect the return line first and then the pressure line.

g. Whenever a hydraulic line is disconnected, spray the disconnected ends with Freon — prefiltered to ASTM Class 3 Contamination Level — and cover the connections. Before reconnecting the lines, again spray the fittings with prefiltered Freon.

h. Never leave cabinet interiors unnecessarily exposed. Always install all access panels on disc file cabinet(s) when required preventive maintenance is completed or when the preventive maintenance procedures are to be interrupted for a period of time.

i. Never operate the file on-line with access panels removed.

j. Always check to ensure that tools or other loose objects are not left in the cabinet before installing access panels.

DAILY PROCEDURES

Daily preventive maintenance should be performed in the order established in the following paragraphs. Before performing the procedures, review the information contained in paragraph 5-1 and related sub-paragraphs.

5-2-1 GENERAL INSPECTION — Perform a routine inspection of the disc file daily.

a. Shutdown the disc file.

b. When disc rotation stops and with the area surrounding the file thoroughly cleaned, remove the three rear access panels from the file cabinet.

5-2-1 GENERAL INSPECTION (Cont.)

c. Observe the level of the waste hydraulic oil in the leak bottle located on the cabinet floor as shown in Figures 1-25 (A-frame file) and 1-13 (B- and C-frame files). If the bottle is over half full, loosen the clamp band, remove the bottle from the clamp, and unscrew and remove cap with flexible tube from top of bottle. Discard the waste fluid in the bottle and reinstall the bottle in the file by reversing the removal procedure.

d. Inspect the floor of the file. There shall be no excessive accumulation of hydraulic fluid. Wipe up small accumulations of fluid that may form as a normal occurrence in all hydraulic systems.

e. Remove the three front panels of the disc file cabinet and perform the inspection of step d.

f. With respect to facing the front of an A-frame file, remove the left side access panel of the file and perform the procedure of step d. In the case of B- and C-frame files, remove one of the side panels of the power control unit cabinet and perform the procedure of step d.

g. Record in the disc file log the time indicated on the HOURS meter of the power control panel of the power control unit (see Figures 1-17 or 1-24). Also, record the date the time is recorded and the total accumulated time to that date.

5-2-2 HYDRAULIC SYSTEM PRESSURE AND FLUID LEVEL CHECK — Perform the hydraulic system pressure and fluid level check daily.

CAUTION

The following procedures apply to only those disc files equipped with a Borg Warner gear pump.

5-2-2-1 Precharge Pressure Check of Accumulators — Check accumulator precharge pressures as follows:

NOTE

If indicated charge is not correct, recharge the accumulator as directed in paragraph 5-9-3.

a. Shutdown the disc file.

b. When disc rotation stops and the area surrounding the disc file is thoroughly cleaned, remove the center-rear access panel of the disc file cabinet to enable access to the accumulator manifold assembly (see Figure 1-9 or 1-25, depending on file configuration).

NOTE

When checking precharge pressure of an accumulator, the T-valve located in the pressure gage adapter at top of bottle must be turned fully cw before the gage of the accumulator will indicate. These valves shall always be left in the full cw position. Also, the hydraulic pump motor must be completely shutdown — to ensure proper pressure indications — before proceeding to the following step.

- c. Rotate needle valve located on top of the accumulator manifold assembly (see Figure 1-15) two turns ccw and observe that pressure gage of pint, low-pressure accumulator indicates 12 ± 2 psig. Then rotate the needle valve cw until valve just closes; do not over-tighten.
- d. Observe that pressure gage of quart high-pressure accumulator indicates 500 ± 25 psig.
- e. Observe that pressure gage of pint high-pressure accumulator indicates 600 ± 25 psig.

5-2-2-2 Hydraulic Fluid Level Check — Check the level of fluid in the hydraulic power supply reservoir as follows:

- a. Remove cabinet access panels that will enable access to the fluid level sight gage (see Figure 1-19 or 1-25) and the pump output pressure gage valve (see Figure 1-19 or 1-26) of the hydraulic power supply (see Figure 1-17 or 1-24).
- b. With the file inoperative, observe hydraulic fluid level indicated on fluid level sight gage. If level is above the bottom of the word HIGH, reservoir is adequately filled. If level is in line with or below the bottom of the word HIGH, add hydraulic fluid as directed in paragraph 5-9-1.

5-2-2-3 Hydraulic System Pressure Check — Check the system operating pressures as follows:

- a. With the area surrounding the file thoroughly cleaned, remove the access panel from the cabinet that will enable access to the power control panel (see Figure 1-17 or 1-24).
- b. Remove fuse A21F3 from the door of the power control panel.
- c. With file inoperative, open the door of the power control panel and connect a jumper between the A2 contact of relay A21K2 (see Figure 1-18) and the "1" pin of fuse A21XF4.

5-2-2-3 Hydraulic System Pressure Check (Cont.)

WARNING

Power control panel is a high voltage device. When disc file is turned on, exercise extreme care when working in the vicinity of the panel when the panel door is open.

- d. Place the file in the manual operating mode.
- e. Press the HYDRAULIC MTR ON pushbutton.
- f. After approximately two seconds of hydraulic pump operation, slightly crack pump output pressure gage valve ccw and observe that pump pressure gage indicates 925 ± 25 psig; to get an accurate indication, gage body may have to be held to reduce the effects of vibration.

CAUTION

Exposing pressure gage to continuous operating pressure is not recommended as excessive wear on the gage mechanism will result. Also, rapid increase in pressure when the hydraulic pump is started will damage the gage. Therefore, in the next step ensure that gage valve is turned fully cw.

- g. Rotate pump output pressure valve cw until valve just closes (do not overtighten).

NOTE

When checking operating pressure of an accumulator, the valve located in the pressure gage adaptor at top of accumulator must be turned full cw before gage will indicate.

- h. With the center-rear access panel of the disc file cabinet removed, observe that high pressure gages of the quart and pint high pressure accumulators (see Figure 1-15) each indicate 925 ± 25 psig, and that low pressure gage of pint low pressure accumulator indicates between 25 and 35 psig.
- i. Shutdown the disc file.
- j. Remove the jumper connected in step c.
- k. Reinstall fuse A21F3 in door of power control panel.

5-2-3 DISC MOTOR R.P.M. CHECK — Perform the spindle rpm check daily.

- a. Place the file in the manual operating mode.
- b. After installing all disc file cabinet access panels, press the DISC MOTOR ON pushbutton.

NOTE

Only MANUAL ON and DISC MOTOR ON pushbutton must be glowing before proceeding to step c.

c. Following at least 25 minutes of disc motor operation (to permit temperature stabilization), observe that the nominal speed indicated on the DISC FILE R.P.M. meter of the pushbutton station is 1200 ± 24 rpm or 900 ± 18 rpm (the speed indicated depends on whether the file is a 1200 or a 900 rpm machine).

- d. Press the HYDRAULIC MTR ON pushbutton.
- e. After one minute press the HEADS ON pushbutton.
- f. With heads flying and during a 5 minute period, observe that the speed indicated on the DISC FILE R.P.M. meter does not vary from its nominal value (step c.) by more than ± 2 rpm.
- g. Press HEADS OFF pushbutton. Observe that heads retract from discs.
- h. Shutdown the disc file.

5-2-4 DISC BUFFING — Buff the discs after every 24 hours of normal disc file operation or immediately prior to reinstallation of the access panels on the file following exposure of the discs to a contaminated environment.

5-2-4-1 Special Equipment Required — Obtain the following special equipment from the disc cleaning kit, Bryant Part No. A-AF-197.

- a. One terry cloth cleaning pad, Bryant Part No. C302478-1.
- b. One cotton cloth pad, Bryant Part No. C302478-2.
- c. One roll of surgitube gauze, Bryant Part No. B56646.
- d. Green buffing tool labeled "BUFF", Bryant Part No. C302477-3.
- e. Plastic tube, Bryant Part No. B302691.
- f. Scissors, Bryant Part No. B56664.

5-2-4-2 Preparing BUFF Tool For Use — Cover the BUFF tool as follows:

- a. Cover the paddle end of the green BUFF tool with the terry cloth pad, C302478-1 (see Figure 5-1). Pull the drawstrings tight and tie securely; cut off excess string ends to prevent their entanglement with the disc hub screws.
- b. Apply the lintfree cotton pad, C302478-2, over the terry cloth pad. Pull the drawstrings tight and tie securely; cut off excess string ends to prevent their entanglement with the disc hub screws.
- c. Cut off a length of surgitube gauze 2-1/2 times the length of the green cleaning tool handle (stretch gauze during this measurement).
- d. Push the entire cut length of surgitube gauze onto the plastic tube.
- e. Insert the handle end of the cleaning tool into the plastic tube until the tool's paddle is within 3 inches of the tube.
- f. Slide a short length of gauze from the plastic tube onto the handle and butt the gauze against the paddle.
- g. While holding the gauze firmly in place on the handle with one hand, pull the plastic tube toward the end of the handle with the other hand while stretching and slightly twisting the gauze. When the plastic tube just clears the end of handle, stop pulling and put a twist in the surgitube gauze by rotating the plastic tube one-half turn.
- h. While stretching and slightly twisting the gauze, pull the plastic tube in the opposite direction toward the paddle end. When the plastic tube is about 3 inches from the paddle, slide a short length of gauze from the plastic tube to evenly cover the gauze already on the handle.
- i. Repeat the procedures of steps g. and h. until all the gauze is on the handle.

5-2-4-3 Disc Buffing Procedure — Buff the discs as follows:

WARNING

Exercise extreme care while working close to rotating discs.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the following procedures.

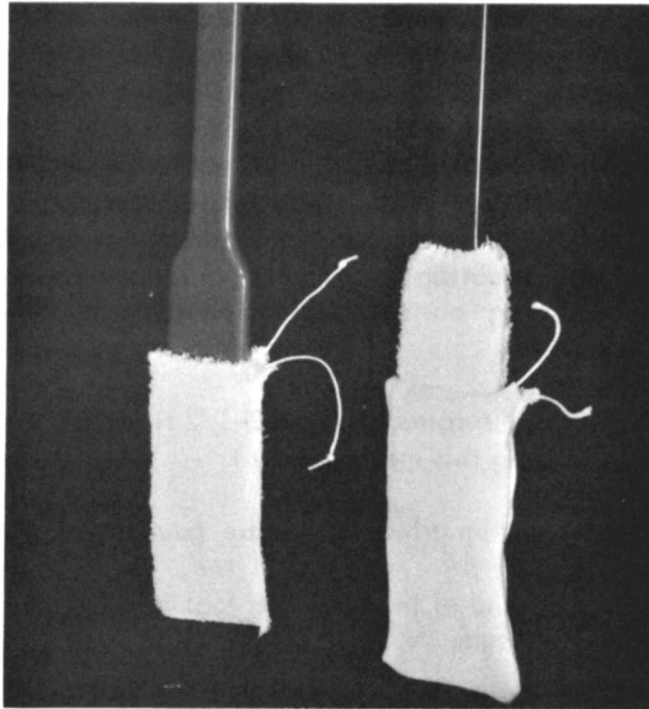


Figure 5-1 Covering Paddle End of a Typical Cleaning Tool—Surgical Gauze Application Not Shown

**BUFF TOOL (SURGITUBE
GAUZE COVERING HANDLE)**

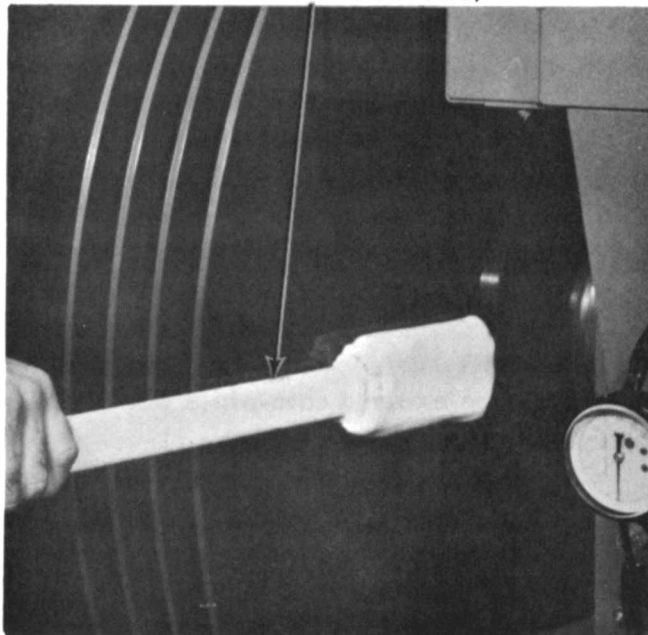


Figure 5-2 Cleaning Disc Surfaces Using Properly Prepared Cleaning Tool

5-2-4-3 Disc Buffing Procedure (Cont.)

a. After thoroughly cleaning the area surrounding the disc file, remove cabinet access panels as follows:

- (1) In the case of "A" frame files when facing the rear of the file, remove center- and left-rear access panels from the file cabinet.
- (2) In the case of "B" and "C" frame files, remove all three rear access panels from the file cabinet.

b. Place the file in the manual operating mode.

CAUTION

Only MANUAL ON pushbutton shall be glowing before proceeding to step c. Never buff discs at maximum speed. Heads shall NOT be operated to the "flying attitude" during disc buffing operation. Keep the covered handle of the BUFF tool free of the edges of the discs when buffing. Reposition the gauze on the handle if a hole appears in the gauze due to accidental contact with the disc edge.

c. With disc rotation stopped, press DISC MOTOR ON pushbutton and after approximately 15 seconds of disc motor operation, press DISC MOTOR OFF pushbutton.

NOTE

As the following procedure is being performed, check that disc surfaces have no score marks or other damage and that the surfaces are cleaning satisfactorily. Record any required corrective maintenance.

d. Using the BUFF tool — prepared in paragraph 5-2-4-2 — buff each disc surface from the rear of the file (see Figure 5-2). Apply a light pressure to the tool using a smooth, constant in-and-out motion. Extra care should be taken to assure disc area near the spindle is buffed. As disc speed decreases to zero rpm, proceed as follows until all disc surfaces are cleaned.

CAUTION

Do NOT turn disc motor on and off in rapid succession when performing the subsequent procedures.

5-2-4-3 Disc Buffing Procedure (Cont.)

- (1) When disc motor speed decreases to near zero rpm, momentarily energize the disc motor as directed in step c. and continue to buff the disc surfaces until all discs are cleaned.

WARNING

Power control panel is a high voltage device .
When disc file is turned on, exercise extreme
care when working in the vicinity of the panel
when the panel's door is open .

- (2) If disc motor will not start because the thermal overloads have dropped out, remove the cabinet access panel that will enable access to the power control panel (see Figure 1-17 or 1-24). Following a 15-minute cooling period, open the door of the power control panel and momentarily press the reset buttons of A21S1 (see Figure 3-4). With A21S1 reset, close the door of the power control panel and repeat the procedures of step (1).

5-2-5 DISC FILE AUTOMATIC TURN-ON CHECK — Perform the automatic turn-on procedures of Section 3 and observe that required responses occur in proper sequence .

5-3 WEEKLY PROCEDURES

The weekly preventive maintenance procedures can be performed in any sequence desired . Before performing the procedures, review the information contained in paragraph 5-1 and related subparagraphs .

5-3-1 BOOST PIN LUBRICATION — Lubricate the two power boost pins once a week .

5-3-1-1 Special Equipment Required — Obtain the following special equipment:

a. A Boost Grease Gun, Bryant Part No. C-AF-156, filled with K-2 grease, Bryant Part No. A56861 .

b. A lint free cloth .

5-3-1-2 Procedure — Lubricate the boost pins as follows:

a. Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17 or 1-24) in the RESET OFF position .

WARNING

The disc file shall not be turned on until the
following procedures are completed .

5-3-1-2 Procedure (Cont.)

- b. When the discs stop rotating and with the area surrounding the disc file thoroughly cleaned, remove the center-rear access panel of the disc file cabinet.
- c. Use absorbent cloth to wipe both boost pin grease fittings (see Figure 5-3) clean.
- d. Using the grease gun, lubricate both fittings by pumping handle until it can no longer be comfortably pumped by hand.
- e. Use absorbent cloth to wipe away any excess grease that may be on the two boost pin fittings.

5-3-2 DIGITAL ACTUATOR/BOOST BOOT INSPECTION — Inspect the two boots — one of which is visible in Figure 5-3 — of the digital actuator/boost system for damage. Damage shall not be evident.

5-4 MONTHLY PROCEDURES

Monthly preventive maintenance procedures should be performed in the order established in the following paragraphs. Before performing the procedures, review the information contained in paragraph 5-1 and related subparagraphs.

5-4-1 OILITE BEARING LUBRICATION — Lubricate the two rocker arm shaft Oilite bearings once each month.

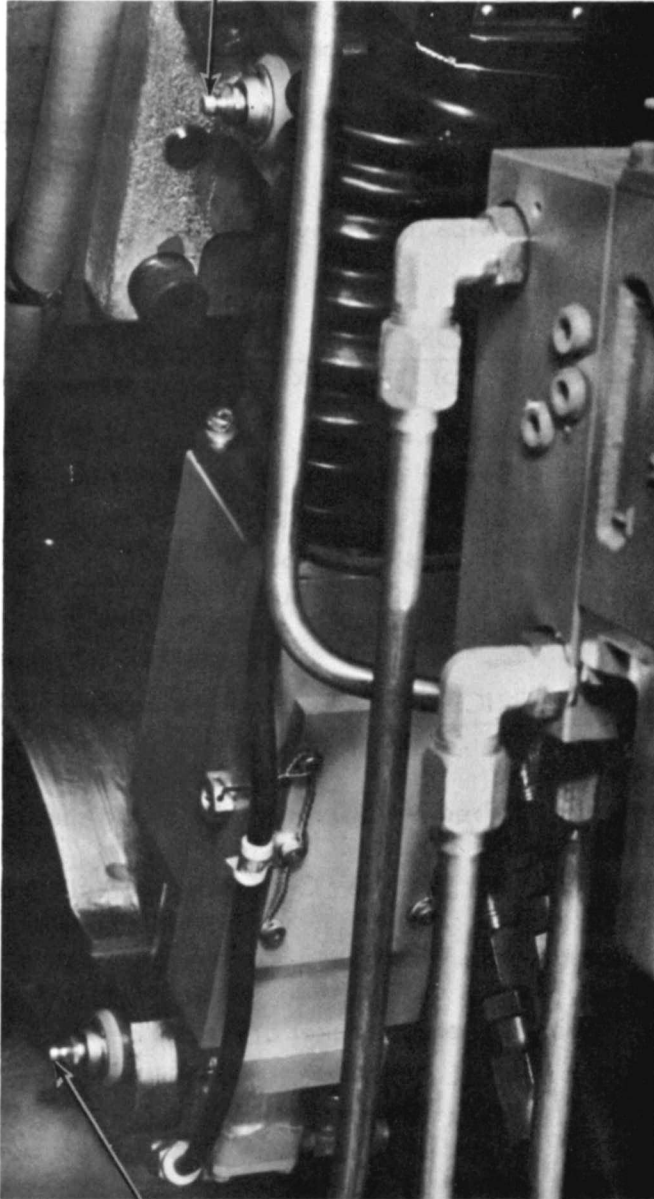
5-4-1-1 Special Equipment Required — Obtain the following special equipment:

- a. A lubrication gun, Bryant Part No. C-AF-234, containing grade SAE 30 weight oil.
- b. Lint free absorbent cloths.

5-4-1-2 Procedure — Lubricate the two rocker arm shaft bearings as follows:

- a. Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17 or 1-24) in the RESET OFF position.
- b. When disc rotation stops and with the area surrounding the cabinet thoroughly cleaned, remove the center-front access panel from the disc file cabinet.
- c. Use absorbent cloth to wipe the two fittings (see Figure 5-4) of the rocker arm shaft assembly clean.
- d. Wipe the nozzle of the lubrication gun clean; then rotate handle of gun cw until the oil inside gun is under pressure as evidenced by slight leakage at the nozzle.

BOOST PIN GREASE FITTING



BOOST PIN GREASE FITTING

Figure 5-3 Boost Pin Grease Fittings—
Locational View

OILITE BEARING LUBRICATION FITTINGS

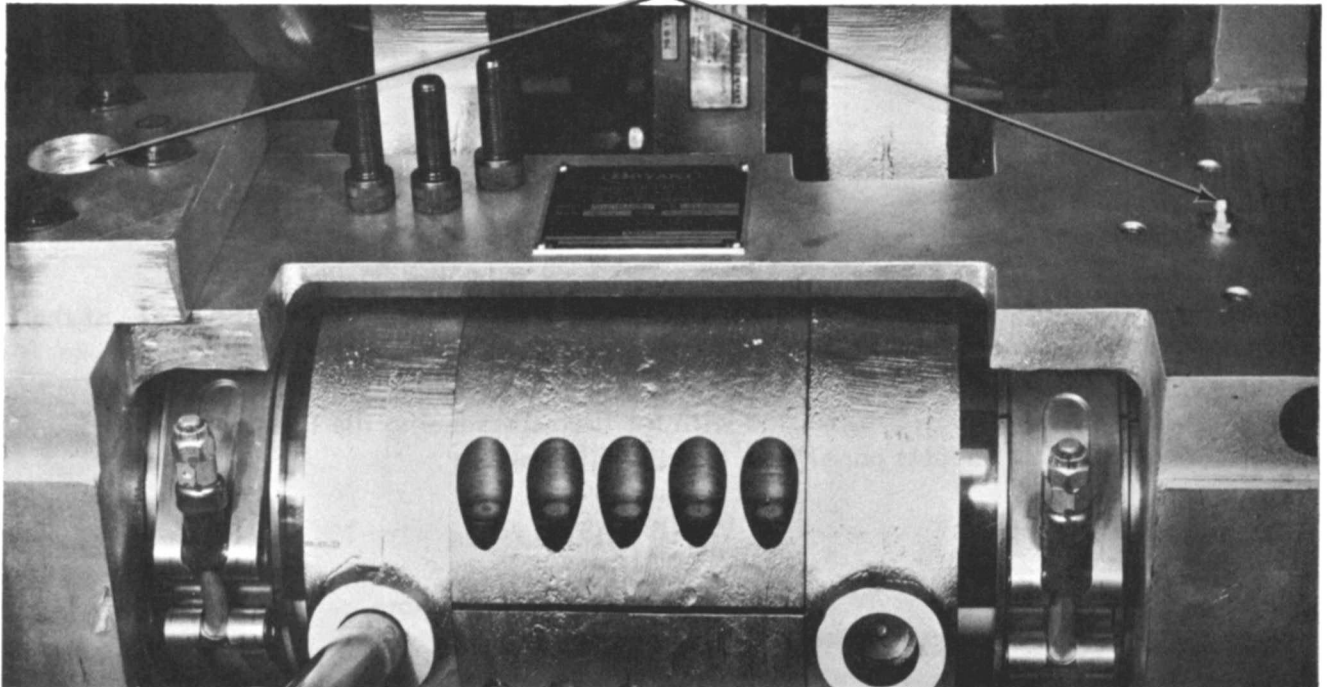


Figure 5-4 Rocker Arm Shaft Oilite Bearing Lubrication Fittings—Locational View

5-4-1-2 Procedure (Cont.)

e. Using the lubrication gun, lubricate both fittings by turning the gun handle cw. Use moderate hand pressure until increased resistance is felt or until oil is observed to flow from the bearing.

f. Use absorbent cloth to wipe excess oil from fittings and wipe up any leakage that may be found on rocker shaft assembly or base of cabinet.

5-4-2 DISC MOTOR DRIVE BELT CHECK — Check the disc motor drive belts once each month.

5-4-2-1 Special Equipment Required — Obtain the following special equipment:

- a. Freon, Dupont 113—prefiltered to ASTM Class 3 Contamination Level, or equivalent.
- b. Rubber gloves.
- c. Clean, lint free cloths.

5-4-2-2 Procedure — Check the disc motor drive belts as follows:

a. Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17 or 1-24) in the RESET OFF position.

b. When disc rotation stops and with the area surrounding the file thoroughly cleaned, remove the upper-center access panel from the disc file cabinet.

WARNING

Be sure discs have stopped rotating before performing the next steps.

c. While wearing rubber gloves, rotate discs through 360 degrees by hand and observe disc motor drive belt links through upper opening in file. Link wear shall not be evident.

d. Through the upper access panel opening of the file and by using the thumb of a hand, press in on each of the disc motor drive belts and observe that each belt deflects approximately the same amount for approximately the same pressure. There should be no noticeable difference in the deflection of any of the belts. If a noticeable difference exists, replace the belts as directed in paragraph 6-8.

WARNING

Freon can cause frostbite if care is not exercised in handling.

5-4-2-2 Procedure (Cont.)

e. Using a cloth dampened with Freon, wipe out interior of disc motor compartment; allow the compartment to air dry.

5-4-3 HYDRAULIC FLUID CONTAMINATION LEVEL CHECK — Perform a contamination level check of the hydraulic fluid used in the disc file at least once each month.

5-4-3-1 Special Equipment Required — Obtain the following special equipment:

CAUTION

The bottles used in the subsequent procedures shall have been precleaned and sealed before use. Bottles purchased with Bryant's hydraulic oil sampling kits are already precleaned and sealed and should be opened only when so specified in the procedures.

NOTE

Items a. through g. are included in Bryant's basic hydraulic oil sampling kit, Part No. AF-407. Part numbers given are Bryant's, except in the case of solvent types. A supplemental kit, Part No. AF-455, containing triple quantities of preconditioned items a. through c. is available, if desired.

a. Two, 100 milliliter (4 ounce) hydraulic oil sampling bottles, Part No. B-56935, each precleaned to Bryant's standards and containing 10 milliliters of Freon 113 — prefiltered to ASTM Class 3 Contamination Level — and each closed with a cap into which is inserted a 3-inch square, plastic tissue, Part No. B-56941, for sealing.

b. Three 2 x 4-inch gummed labels, Part No. B-56936.

c. One self-mailing carton (for use with samples that are to be returned to Bryant for analysis), Part No. B-56938.

d. One gallon of GROW solvent — prefiltered to ASTM Class 3 Contamination Level — in a one gallon can precleaned to Bryant's standards.

e. An oil drain pan, Part No. B-56939.

f. A washing bottle, Part No. B-56940.

g. A plastic bag.

h. Rubber gloves.

5-4-3-2 Filling Wash Bottle — Fill the wash bottle with prefiltered GROW solvent whenever fluid level of bottle drops below 1/4 full.

WARNING

GROW solvent is toxic and flammable. Use solvent in well ventilated areas. Always wear rubber gloves when working with the solvent. Do not smoke in area.

CAUTION

The following procedures shall be performed in as dust free an area as possible. Time during which containers are left open will be kept to a minimum.

- a. While wearing rubber gloves, remove threaded cap from wash bottle.
- b. Remove cap from gallon container that holds filtered GROW solvent and fill the wash bottle with the solvent.
- c. Immediately install the caps on their respective containers; caps shall be removed from the containers only when filling of the bottle must be repeated.

5-4-3-3 Contamination Check Procedures — Conduct the contamination check as described in the subsequent paragraphs.

CAUTION

Dirt in the area can cause an erroneous contamination check. Thoroughly clean area before starting the procedures; maintain a clean area throughout the procedure.

- a. With the area surrounding the disc file thoroughly cleaned, remove the cabinet access panels that will enable access to the reservoir fluid sampling and drain valve of the hydraulic power supply (see Figure 1-19 or 1-25).
- b. Place the file in the manual operating mode.

CAUTION

Only MANUAL ON pushbutton shall be glowing before proceeding to step c.

5-4-3-3 Contamination Check Procedures (Cont.)

- c. Press HYDRAULIC MTR ON pushbutton to start the hydraulic pump motor.
- d. Position the oil drain pan under the reservoir drain pipe.
- e. With the hydraulic pump operating for at least 5 minutes, perform the following procedures as rapidly as possible:
 - (1) Using the wash bottle, thoroughly saturate the interior and exterior surfaces of the reservoir drain pipe with GROW solvent.
 - (2) Rotate knob of sampling valve ccw until hydraulic fluid starts to flow from drain pipe of the reservoir.
 - (3) Position one of the sampling bottles near the drain pipe. When approximately 1-pint of fluid has drained into the drain pan, remove the cap from the sampling bottle and inject the bottle into the stream of hydraulic fluid; the instant the bottle is filled, remove the bottle from the fluid stream and immediately install the cap (with plastic square) on the bottle.
 - (4) Rotate knob of sampling valve full cw to stop the flow of fluid from the reservoir.
- f. Press HYDRAULIC MTR OFF pushbutton.
- g. Attach a gummed label to the sample bottle and identify the fluid sample with the following information:
 - (1) Date
 - (2) Company name, file location, and file serial number.
 - (3) Accumulated operating hours as indicated in the maintenance log of the file (see paragraph 5-2-1 g.)
 - (4) Identify whether sample is the result of normal monthly sampling, or otherwise.
- h. Submit filled sample bottle to a qualified laboratory for analysis; or, if desired, place sample in self-mailing carton and forward to Bryant for analysis. If sent to a qualified laboratory, it is recommended that the laboratory perform the analysis using the procedure described in Bryants Engineering Bulletin EB-196.

NOTE

Unless there is known trouble, normal file operation can continue until the laboratory analysis is returned.

5-4-3-3 Contamination Check Procedures (Cont.)

i. Maximum tolerable contamination for various micron ranges are listed in Table 5-2. If the analyzed sample is within tolerance, operation can continue until the next monthly check. However, if the results of the analysis reveal that the fluid contamination levels exceed the tolerances established in the table, perform the applicable procedures specified in the table.

TABLE 5-2 CONTAMINATION LEVEL LIMITS

Particle Size (Microns)	Contamination Levels *	Maximum Tolerable Contamination Levels		
		Light **	Medium **	Heavy ***
5-10	24000	32000	87000	128,000
10-25	5360	10700	21400	42,000
25-50	780	1510	3130	6,500
50-100	110	225	430	1,000
100	11	21	41	92

NOTES:

- * As per ASTM Class 3 Contamination Level
- ** If contamination is greater than value indicated, purge system as directed in paragraph 5-9-2.
- *** If contamination is greater than level indicated, contact Bryant Field Service.

j. The facility performing the analysis should decontaminate the sample bottle following sample analysis and should seal the decontaminated bottle in the same manner as that specified in paragraph 5-4-3-1 a.

5-5 SEMI-ANNUAL PROCEDURES

Before performing the procedure, review the information contained in paragraph 5-1 and related sub-paragraphs.

5-5-1 FILLER BREATHING CAP AND STRAINER CLEANING — Clean the filler breather cap and strainer assembly of the hydraulic power supply at least once every six months.

5-5-1-1 Special Equipment Required — Obtain the following special equipment:

- a. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent.
- b. Lint free cloths.

5-5-1-1 Special Equipment Required (Cont.)

- c. Rubber gloves .
- d. A one-gallon container for use in flushing components .

5-5-1-2 Procedure — Clean the breather cap and strainer assembly as follows:

- a. Shutdown the disc file .

CAUTION

The disc file shall remain inoperative when performing the following procedures .

- b. With the area surrounding the disc file thoroughly cleaned, remove the cabinet access panels that will enable access to the filler/breather cap of the hydraulic power supply (see Figure 1-19 or 1-25).

CAUTION

Be particularly careful to ensure that no contaminants fall into the reservoir when performing the subsequent procedures . Area shall be maintained as dust free as possible .

- c. Remove cap from the filler port of the reservoir cover plate .
- d. Remove three screws securing brass strainer assembly to hydraulic power supply reservoir cover plate and carefully lift brass strainer from cover plate filler hole .

WARNING

Freon can cause frostbite if care is not exercised in handling .

- e. Use Freon to thoroughly flush the breather cap, strainer and brass strainer mounting screws . Shake excess solvent from components and allow the components to air dry in as dust free an area as possible .
- f. With the components dried, carefully install brass strainer in filler hole of reservoir cover plate and secure with three screws .
- g. Install and secure breather cap on filler port strainer .
- h. Using dust free cloth, wipe up any spilled accumulations of fluid .

5-6 ANNUAL PROCEDURES

The annual procedures — when started — will be performed in their entirety. These procedures include replacing and/or cleaning the oil filters of the hydraulic system and changing the hydraulic fluid in the systems reservoir. It is recommended that the procedures be performed consecutively, if possible, though some procedures can be conducted concurrently with planning. Before performing the procedures, review the information contained in paragraph 5-1 and related sub-paragraphs.

5-6-1 HYDRAULIC POWER SUPPLY RESERVOIR AND MAGNETIC STRAINER — Drain all hydraulic fluid from the reservoir of the supply, clean the interior of the reservoir — including magnetic strainer — lubricate the splined shaft of the gear pump, and refill the reservoir with clean hydraulic fluid (taken from sealed cans) at least once each year.

5-6-1-1 Special Equipment Required — Obtain the following special equipment:

CAUTION

Hydraulic fluid containers shall remain sealed until otherwise directed in a procedure.

- a. Twelve gallons of Hydraulic Fluid, MIL-H-5605A (NATO H-15) prefiltered to ASTM Class 3 Contamination Level.
- b. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent.
- c. A one-gallon container.
- d. A twelve-gallon container.
- e. Flexible tube, 3/8-inch inner diameter x 24-inches long.

5-6-1-2 Procedure — Clean the reservoir as follows:

- a. Shutdown the disc file.

WARNING

The disc file shall remain inoperative when performing the following procedures:

CAUTION

The work area shall be maintained clean and as dust free as possible.

5-6-1-2 Procedure (Cont.)

b. With the area surrounding the file thoroughly cleaned, remove the cabinet access panels that will enable as complete access as possible to the compartment in which the solenoid driver power supply is located (see Figure 1-17 or 1-24).

WARNING

Hydraulic fluid is toxic and flammable.
Avoid prolonged contact with skin.
Do not smoke in area.

c. Connect flexible tube to reservoir drain pipe of the power control unit (see Figure 1-19 or 1-25); place the free end of the tube into the 12-gallon container.

d. Rotate reservoir fluid sampling and drain valve ccw to full open position and allow all the fluid in the reservoir to drain into container.

e. When the reservoir is completely drained, rotate sampling valve cw to full closed position. Discard the fluid drained into the container as waste.

f. Remove solenoid driver power supply from cabinet as directed in paragraph 6-2-2-1.

g. Remove solenoid driver power supply compartment bottom plate (see Figure 1-19 or 1-24).

NOTE

With both the solenoid driver power supply and its compartment bottom plate removed, the hydraulic power supply 1/2-micron filter, radiator fan, and auxiliary compartment maintenance of paragraph 5-6-3 can be conducted — if not already done — concurrent with those procedures herein.

h. Be sure the area surrounding the cabinet(s) is thoroughly clean.

i. Remove the reservoir cover plate (see Figure 5-5) and cover plate gasket from hydraulic power supply. Carefully set cover plate and gasket aside in as dust free an area as possible.

CAUTION

In the next step, be sure that permanent magnet of magnetic strainer is always handled as far from the magnetic surfaces of the file's discs as possible.

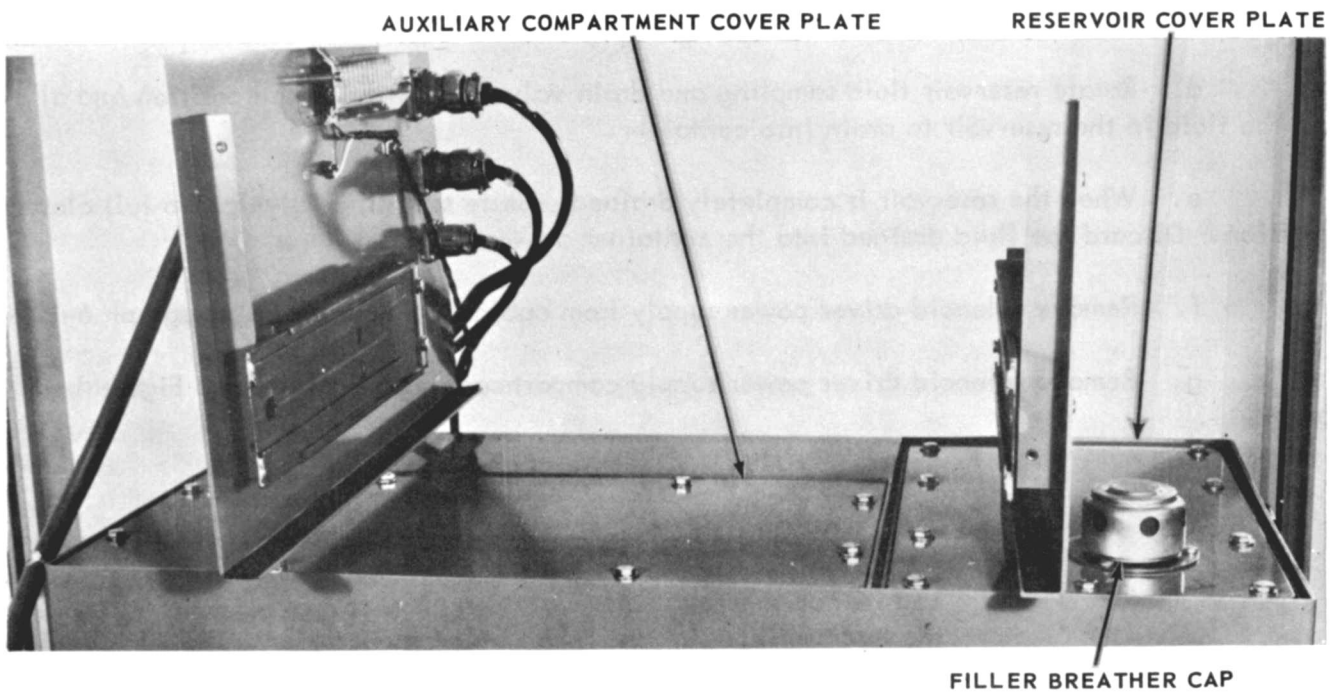


Figure 5-5 Hydraulic Power Supply, Top View—Solenoid Driver
Power Supply and Compartment Bottom Plate Removed

5-6-1-2 Procedure (Cont.)

j. Remove magnetic strainer assembly (see Figure 1-21) from male standoff by rotating assembly counterclockwise.

k. Remove nut and washer from the normally free end of magnetic strainer; then slide eight discs and screens, the permanent magnet, and four remaining discs and screens off the threaded stud.

WARNING

Freon can cause frostbite if care is not exercised in handling.

l. While wearing rubber gloves, use Freon to clean the discs, screens, magnet, and nut and washer of the magnetic strainer; particles on the magnet will probably have to be brushed and picked off during cleaning. Following cleaning, flush the components using clean Freon. Set the components in as dust free an area as possible to air dry.

m. Wash down the inner surface of the reservoir cover plate. Flush the surface with clean Freon and set the cover in as dust free an area as possible to air dry.

n. While wearing rubber gloves, use as little Freon as necessary to clean the interior of the reservoir as follows:

- (1) Place the free end of the flexible tube — connected to the reservoir drain pipe in step c. — in a one-gallon container.
- (2) While wearing rubber gloves, wash down the upper edges and the inner walls of the reservoir. Rub solidified traces of hydraulic fluid from surfaces.
- (3) Drain the fluid from the reservoir as directed in step d. and close the drain as directed in step e.
- (4) Repeat steps (2) and (3) until the interior of the reservoir is clean.

o. Starting with a disc of the magnetic strainer assembly, alternately install four of the discs and screens of step k. onto the threaded stud of the assembly; then, install the magnet and — starting with a disc — alternately install the remaining eight discs and screens of step k. on the stud. Secure the assembly with the washer and nut of step k.

p. Reinstall magnetic strainer assembly on male standoff in reservoir.

q. Carefully position reservoir cover plate gasket — set aside in step i. — over cover plate mounting holes of hydraulic power supply and position cleaned reservoir cover plate over gasket. Secure the plate and gasket in place using screws and washers removed in step i.

5-6-1-2 Procedure (Cont.)

- r. Temporarily, install filler breather cap — cleaned as directed in step 5-5-1 — in filler port of reservoir cover plate.
- s. Perform the remaining annual and, if applicable, biennial maintenance procedures, starting with paragraph 5-6-2.

CAUTION

When filling the reservoir with hydraulic fluid, open fluid container only as required; since any fluid left over in a can shall be immediately discarded as waste.

- t. With all applicable annual and biennial maintenance procedures completed, remove the filler breather cap and fill the reservoir with clean MIL-H-5606A hydraulic fluid as directed in paragraph 5-9-1; approximately 10 gallons of fluid will be required to fill the reservoir.
- u. Install the filler breather cap in filler port of reservoir in reservoir cover plate.

5-6-2 HYDRAULIC MOTOR/GEAR PUMP LUBRICATION — Lubricate the spline of the electric motor and gear pump of the hydraulic power supply at least once every year.

5-6-2-1 Special Equipment Required — Obtain the following special equipment:

- a. Hydraulic fitting caps B-56882-6 and B-56882-7.
- b. Hydraulic fitting plugs B-56881-6 and B-56881-7.
- c. Orelube K2 grease with a molydisulphide base.
- d. Torque wrench, Bryant Part No. 56840.
- e. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent.

5-6-2-2 Lubrication Procedures — Lubricate the electric motor and gear pump spline as follows:

- a. Conduct the procedures detailed in paragraph 5-6-1-2, steps a. through e., if not already done; if the procedure is being conducted on other than a preventive maintenance schedule, cover the reservoir so as to prevent the entrance of contaminants.

CAUTION

As hydraulic lines are disconnected, cap or cover the lines to protect them from contamination.

5-6-2-2 Lubrication Procedures (Cont.)

b. Remove the hydraulic fittings from the pressure and tank ports of the relief valve (see Figure 5-6); remove the 5/8 - inch hydraulic fitting from the inlet port of the gear pump. Cap or otherwise cover the lines and fittings.

c. Remove the four 1/2-13 socket head screws from the end bell of the electric motor and remove the gear pump, relief valve, gage, and pressure gage adapter as a complete assembly from the power control unit.

d. Completely fill the spline cavity in the end of the electric motor shaft and liberally coat the external surfaces of the gear pump spline using Orelube K2 grease.

e. Install the assembly removed in step c. on the electric motor being sure that the dowel pins are properly engaged. Tighten the socket head screws finger tight. Then tighten each of the four screws to 250 inch-pounds.

WARNING

Freon can cause frostbite if care is not exercised in handling.

CAUTION

Just before connecting the fittings in the next step, thoroughly clean the fittings with Freon.

f. Connect fittings of step b.

g. Conduct the remaining procedures of paragraph 5-6-1-2 as applicable.

5-6-3 HYDRAULIC POWER SUPPLY 1/2 MICRON FILTER, RADIATOR FAN, AND AUXILIARY COMPARTMENT — Replace the filter element of the 1/2-micron filter, lubricate the radiator fan, and clean the auxiliary compartment in which they are housed at least once a year.

5-6-3-1 Special Equipment Required — Obtain the following special equipment:

a. One 1/2-micron filter element, Bryant Part No. B-56952 as received precleaned and sealed by Bryant.

b. Two gaskets, Bryant Part No. B-56577, as received precleaned and sealed by Bryant.

c. One gasket, Bryant Part No. B-56609, as received precleaned and sealed by Bryant.

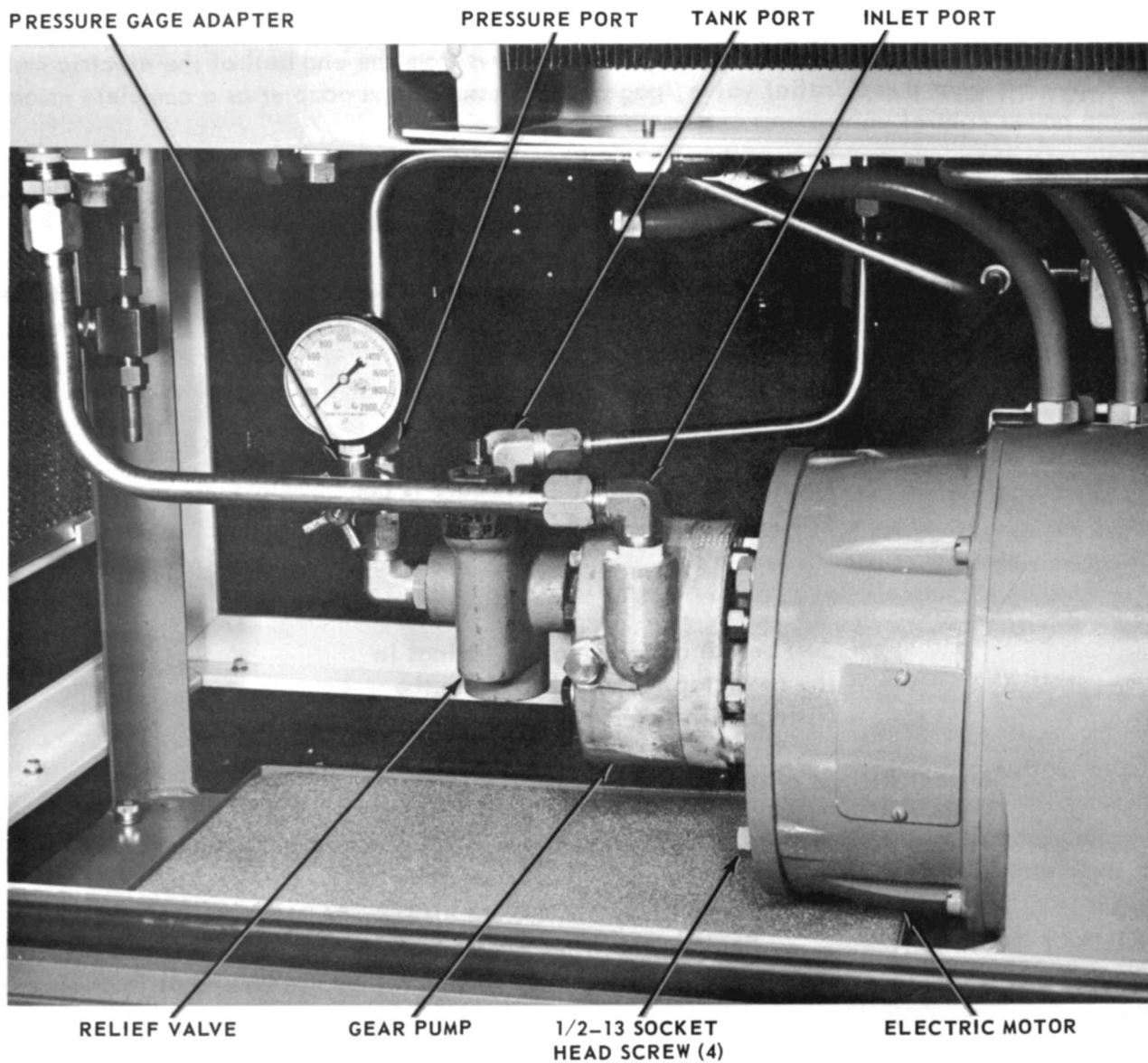


Figure 5-6 Hydraulic Power Supply—Motor/Gear Pump Installation Details

5-6-3-1 Special Equipment Required (Cont.)

- d. An oil can with SAE 20 weight oil.
- e. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent.
- f. Caps or plastic bags for protecting ends of hydraulic line fittings.
- g. Lint free cloths.
- h. A one-gallon container.

5-6-3-2 Procedure — Perform the following procedures:

- a. Shutdown the disc file.

CAUTION

The disc file shall remain inoperative when performing the following procedures. The work area shall be maintained clean and as dust free as possible.

- b. With the area surrounding the file thoroughly cleaned, remove cabinet access panels that will enable as complete access as possible to the compartment in which the solenoid driver power supply is located (see Figure 1-17 or 1-24).
- c. Remove solenoid driver power supply from cabinet as directed in paragraph 6-2-2-1.
- d. Remove solenoid driver power supply compartment bottom plate (see Figure 1-19 or 1-24).

NOTE

With both the solenoid driver power supply and its compartment bottom plate removed, hydraulic power supply reservoir and magnetic strainer maintenance (paragraph 5-6-1) can be conducted — if not already done — concurrent with the procedures herein.

- e. Remove auxiliary compartment cover plate (see Figure 5-5).

WARNING

Hydraulic fluid is toxic and flammable.
Avoid prolonged contact with the skin.
Do not smoke in the work area.

CAUTION

As lines are disconnected, cap or otherwise cover them to protect from contamination.

f. While wearing rubber gloves, position a gallon container under IN port of 1/2 micron filter assembly (see Figure 1-22) and disconnect two female couplings from IN port elbow (lower coupling is not visible in figure); similarly disconnect one female coupling from the OUT port of the assembly. Cap or otherwise cover the ends of the disconnected lines.

g. With the bottom of the filter supported in the palm of one hand, remove filter assembly from compartment bracket. While maintaining the filter as vertical as possible to prevent spilling of fluid, carefully withdraw the filter assembly from the compartment.

h. Remove drain plug from bottom cover and drain hydraulic fluid into container.

i. While holding the assembly over the container, remove hexhead nut from the top of the assembly and remove the long retaining screw, bottom cover, filter element, and outer housing from the top cover.

j. Discard gaskets — Bryant Part No. B-56577 — located in the lower and upper covers of the filter and discard gasket — Bryant Part No. A-56609 — located in the hexhead nut hole of the upper cover. Also, discard the filter element and the fluid that was drained into the one gallon container.

WARNING

Freon can cause frostbite if care is not exercised in handling.

k. While wearing rubber gloves and while working in as dust free an environment as possible, thoroughly clean the filter components using Freon. Following cleaning, allow components to air dry.

l. With all components dry, install replacement gaskets — Bryant Part No. B-56577 — in top and bottom covers of assembly; install replacement gasket — Bryant Part No. B-56609 — in screw hole of the upper surface of the top cover. Also, reinstall cleaned drain plug in bottom cover.

5-6-3-2 Procedure (Cont.)

m. Install outer housing on gasket of upper cover, install new, Bryant-precleaned, filter element — Part No. B-56952 — in housing; and seat gasket of bottom cover firmly against housing. Insert long retaining screw into bottom of assembly. Secure the assembly by installing hexhead nut (removed in paragraph i.) on threaded end of long screw protruding from the top of the assembly.

n. With the IN port positioned toward the radiator assembly, secure the filter assembly to the auxiliary compartment bracket (see Figure 1-22).

CAUTION

Just before line fittings are connected,
thoroughly clean the fittings with Freon.

o. Connect two female couplings to the IN fittings of the top cover and connect the one female fitting to the OUT fitting of the top cover.

p. Apply a few drops of SAE 20 weight oil in both oil cups of the radiator fan motor (see Figure 1-22).

q. Using a vacuum cleaner, clean the interior of the auxiliary compartment and the components located within it.

r. Dampen a length of lint free absorbent cloth with Freon; squeeze excess moisture from cloth and wipe the surfaces of the auxiliary compartment interior and hydraulic power supply surfaces clean. Use a clean, dry cloth to wipe surfaces dry.

s. Use a lint free cloth to clean the compartment cover plate and top surfaces of the compartment.

t. After inspecting interior of compartment to ensure that no tools or other loose objects have been left inside, set the compartment cover plate over the compartment, but do not secure it.

u. If this procedure is performed as a normal function of annual preventive maintenance, continue with the procedures starting with paragraph 5-6-1-2s. However, if individual replacement is being performed, continue with the procedures starting with paragraph 5-6-1-2t.

5-6-4 10-MICRON FILTER — Replace components of the 10-micron filter (see Figure 1-15) at least once a year.

NOTE

The 10-micron filter is furnished only with B- and C-frame files. If an A-frame file is involved, proceed immediately to the 20-micron filter replacement of paragraph 5-6-5.

5-6-4-1 Special Equipment Required — Obtain the following special equipment:

- a. One 10-micron filter, Bryant Part No. B-56164-1, as received precleaned and sealed by Bryant.
- b. One O-ring, Bryant Part No. C-54149-38, as received precleaned and sealed by Bryant.
- c. One O-ring, Bryant Part No. C-54149-39, as received precleaned and sealed by Bryant.
- d. One back-up ring, Bryant Part No. B-56576, as received precleaned and sealed by Bryant.
- e. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent.
- f. Plastic bags for covering hydraulic line fittings.
- g. A shallow, one-gallon container.
- h. Lint free, absorbent cloths.
- i. Rubber gloves.
- j. Petroleum jelly.

5-6-4-2 Procedure — Replace the components of the 10-micron filter as follows:

- a. Shutdown the disc file.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the subsequent procedures.

- b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove center-and right-rear access panels from the file cabinet.

WARNING

Freon can cause frostbite if care is not exercised in handling.

- c. Disconnect hydraulic hoses as follows:
 - (1) Disconnect cable connectors A15J11 and A15J12 from the junction box of the accumulator manifold assembly.

5-6-4-2 Procedure (Cont.)

CAUTION

Always disconnect pressure line first, then disconnect return line.

- (2) Disconnect the hydraulic pressure hose from the 10-micron filter (see Figure 5-7) by retracting the sleeve of the hose coupler body and then pulling the coupler body down free of the coupler nipple. Use absorbent cloths to wipe up any fluid leakage. After cleaning with Freon, seal both the coupler body and nipple with a plastic bag.
- (3) Disconnect the hydraulic return hose from accumulator manifold assembly fitting as directed in step (1) for the hydraulic pressure hose.

NOTE

If this procedure is being performed on the normal annual schedule, 20-micron filter replacement (paragraph 5-6-5) can be performed concurrently, if desired.

- d. Place the one-gallon container under the Bendix filter assembly.
- e. Using a 3/4-inch wrench, reach behind the filter assembly and engage the wrench with the hexnut configuration on the bottom of the filter bowl. Remove the bowl from pressure line adapter head by rotating the bowl ccw.
- f. Remove stainless steel filter element from bowl; remove O-ring from filter element and remove outer O-ring and back-up ring from bowl.
- g. Discard filter element, O-rings, and back-up ring.
- h. Using Freon, clean interior of filter bowl and – if possible – the interior of the Bendix filter pressure line adapter head.

NOTE

Lubricate each O-ring with petroleum jelly before installing.

- i. Insert the new O-ring, Bryant Part No. C-54149, in the recess inside new filter element, Bryant Part No. B-56164-1; insert filter element (closed end first) into bowl.
- j. Place back-up ring, Bryant Part No. B-56576, on threaded end of bowl with the hair side of ring facing up (away from flange). Place O-ring, Bryant Part No. C-54149-39, on threaded end of bowl over the back-up ring and push the rings together against the flange.

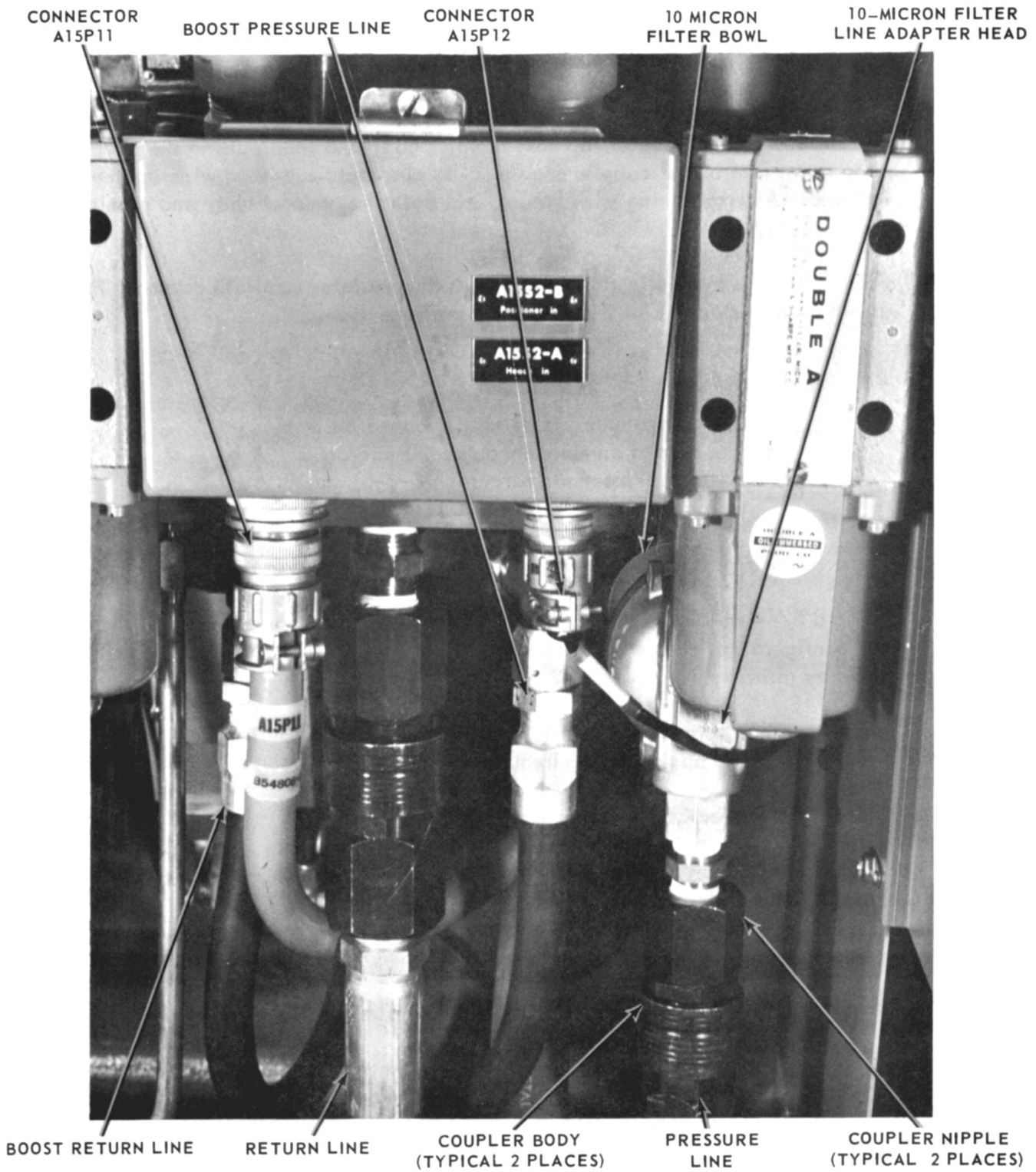


Figure 5-7 B- and C-Frame Disc File Accumulator Manifold Assembly—
Installation Details of Lower Components

5-6-4-2 Procedure (Cont.)

k. Screw bowl (containing filter element) cw onto pressure line adapter head of filter assembly, and tighten, using a 3/4-inch wrench.

l. If this procedure is being performed as a part of normal annual preventive maintenance, replace the 20-micron filter as directed in paragraph 5-6-5 before proceeding to step m.

m. Connect the hoses to the accumulator manifold assembly as follows:

CAUTION

When installing hydraulic lines, always connect return line first and then connect pressure line. Just before line fittings are connected, thoroughly clean them with Freon.

- (1) Retract the sleeve of the return hose coupler body and install the coupler body on the return hose coupler nipple of the accumulator manifold assembly (see Figure 5-7); with coupler body fully seated on the coupler nipple, secure the assembly by releasing the sleeve of the coupler body.
- (2) Connect the hydraulic pressure line coupler body to the coupler nipple attached to the 10-micron filter (see Figure 5-7) as directed in step (1) for the return hose.
- (3) Reconnect cable connectors A15J11 and A15J12 to the junction box of the accumulator manifold assembly.

n. If the procedure is performed as a normal function of annual preventive maintenance, continue with the procedures starting with paragraph 5-6-1-2 s. However, if only individual component replacement is being performed, purge the system as directed in paragraph 5-9-2.

5-6-5 20-MICRON FILTER — Replace the 20-micron filter (see Figures 1-15 and 5-8) at least once a year.

NOTE

If this procedure is performed on a normal annual basis, it is recommended that it be performed during replacement of the 10-micron filter as directed in paragraph 5-6-4-2 l.; this, of course, applies only to B- and C-frame files since A-frame files do not have the 10-micron filter.

5-6-5-1 Special Equipment Required — Obtain the following special equipment:

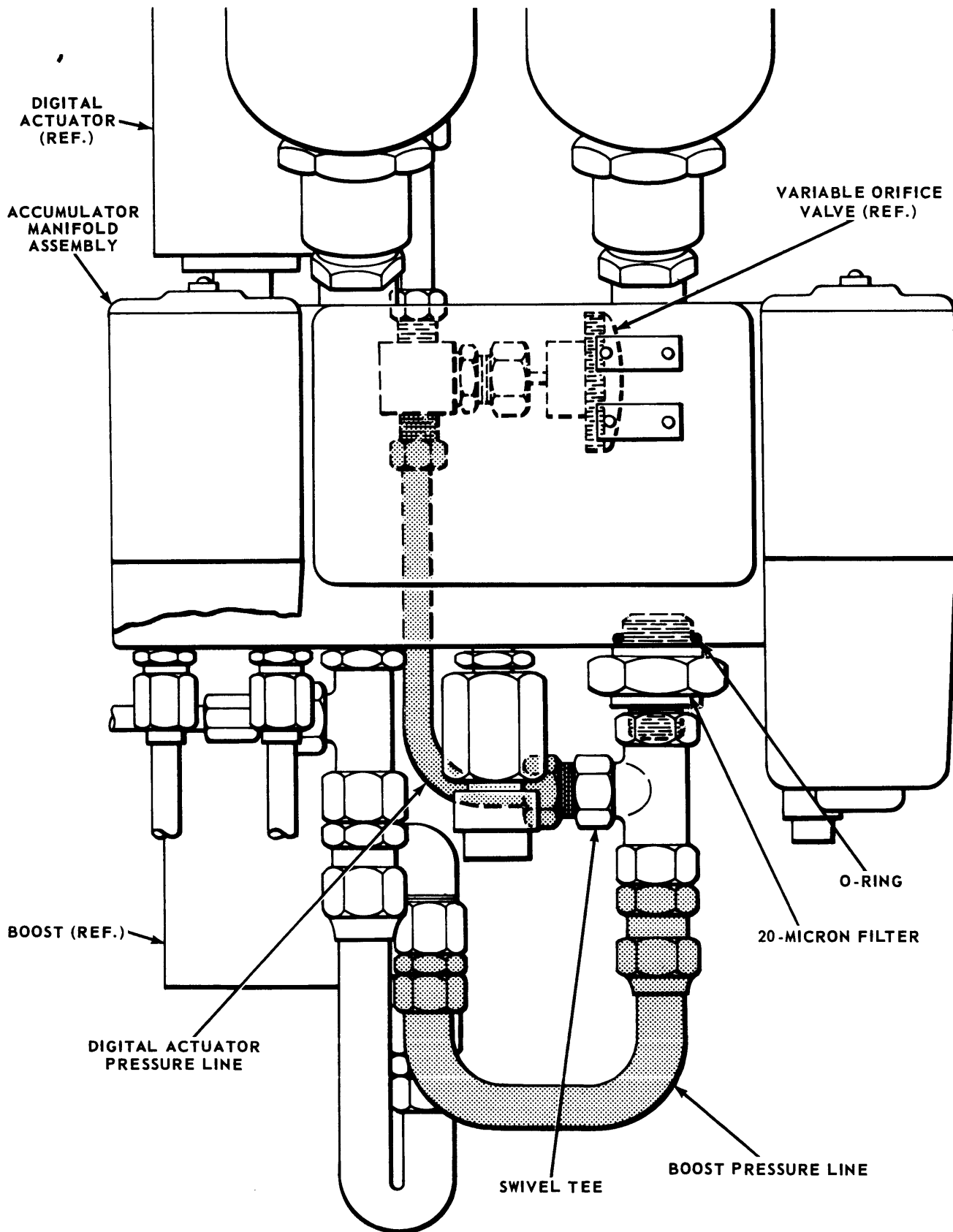


Figure 5-8 Accumulator Manifold Assembly—20-Micron Filter Installation Details

5-6-5-1 Special Equipment Required (Cont.)

- a. One 20-micron, microporous filter, Bryant Part No. B-57142-1, as received pre-cleaned and sealed by Bryant.
- b. O-ring, Bryant Part No. C-54149-4, as received precleaned and sealed by Bryant.
- c. One roll of 1/4-inch Teflon tape.
- d. Freon, Dupont 113 – prefiltered to ASTM Class 3 Contamination Level – or equivalent.
- e. A shallow, one gallon container.
- f. Lint free absorbent cloths.
- g. Plastic bags and plugs for covering hydraulic line fittings as they are disconnected.
- h. Rubber gloves.
- i. Petroleum jelly.

5-6-5-2 Procedures – Replace the 20-micron filter as follows:

- a. Perform the procedures of paragraph 5-6-4-2 a. through c., if not already done; however, in steps c(2), see Figure 5-9 for the A-frame disc file accumulator manifold installation.
- b. Disconnect boost pressure line from swivel-tee fitting of accumulator manifold assembly (see Figure 5-8); cap the end of the tube.
- c. Disconnect pressure tubing of variable orifice valve from the tube reducer at the swivel-tee fitting; cap the end of the tube.
- d. Remove the swivel-tee from the 20-micron filter.
- e. Remove the 20-micron filter and O-ring from the manifold of the assembly. Discard the filter and O-ring.
- f. Install the new O-ring on the squared-off, threaded end of the new 20-micron filter.
- g. Apply two overlapping turns of 1/4-inch Teflon tape to the threads on either side of the filter body; apply the tape approximately one to three turns from the ends of the threads of the filter.

CAUTION

Just before line fittings are connected,
thoroughly clean the fittings with Freon.

- h. Thread the filter into the manifold of the accumulator assembly until the O-ring rests snugly against the block (see Figure 5-8).

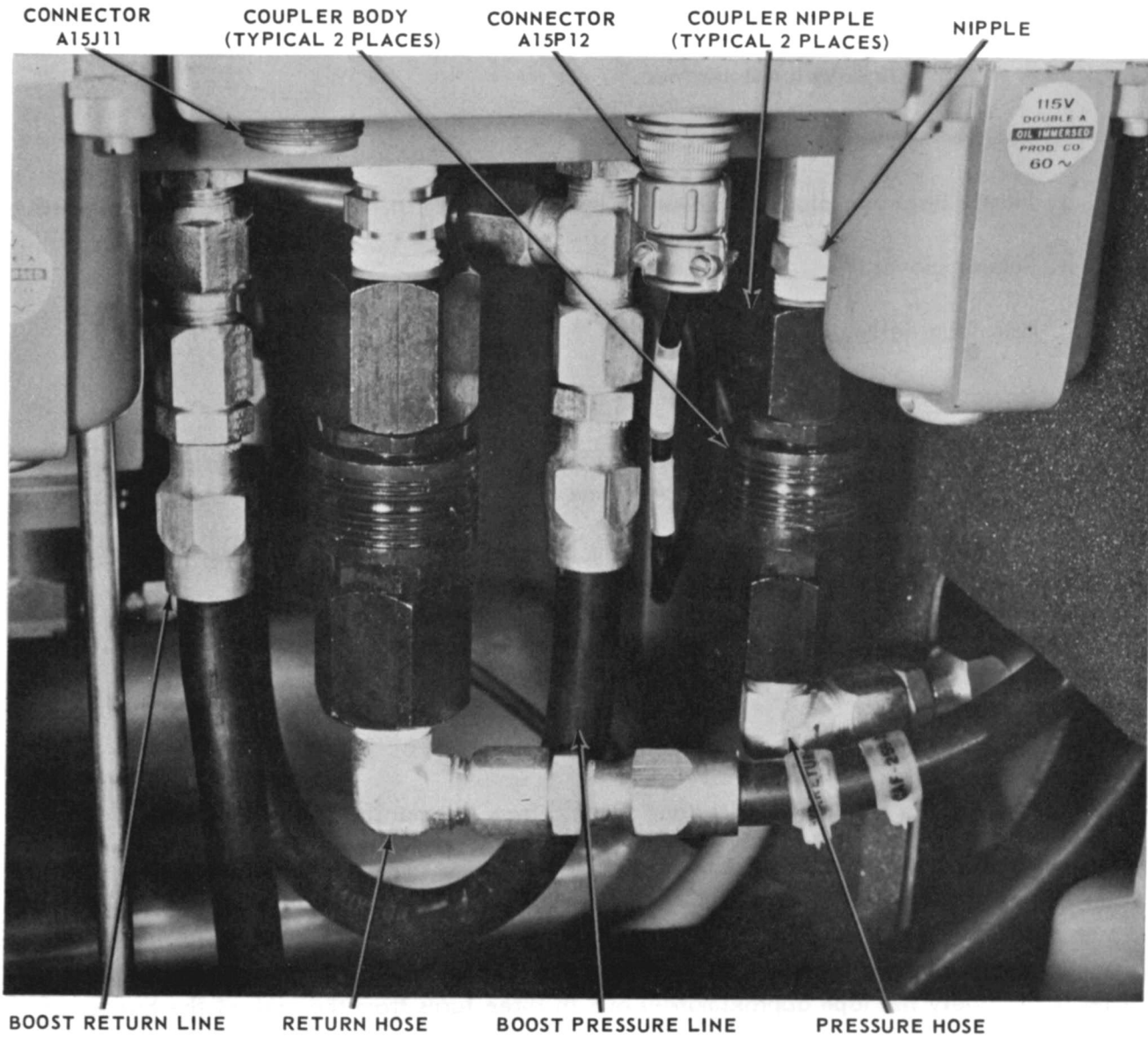


Figure 5-9 A-Frame Disc File Accumulator Manifold Assembly—
Installation Details of Lower Components

5-6-5-2 Procedures (Cont.)

- i. Thread the swivel-tee onto the filter body.
- j. Connect pressure tubing of variable orifice valve to tube reducer of the swivel-tee.

k. If this procedure is performed as a normal function of annual preventive maintenance, replace the 5-micron filter as directed in paragraph 5-6-6. However, if only individual component replacement is being performed, connect the boost pressure line to the swivel-tee, reconnect the hydraulic return and pressure lines to the accumulator manifold assembly as directed in paragraph 5-6-4-2m., and then purge the system as directed in paragraph 5-9-2.

5-6-6 5-MICRON FILTER — Replace the 5-micron filter (see Figure 5-10) at least once a year.

NOTE

If this procedure is performed on a normal annual basis, it is recommended that it be performed during the replacement of the 20-micron filter as directed in paragraph 5-6-5-2j.

5-6-6-1 Special Equipment Required — Obtain the following special equipment:

- a. Filter element, Bryant Part No. B-56652-1, as received precleaned and sealed by Bryant.
- b. Gasket, Bryant Part No. B-56899, as received precleaned and sealed by Bryant.
- c. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent.
- d. Caps for protecting ends of hydraulic line fittings.
- e. A shallow, one-gallon container.
- f. Lint free, absorbent cloths.
- g. Rubber gloves.

5-6-6-2 Procedure — Replace the 5-micron filter as follows:

- a. Perform the procedures of paragraph 5-6-4-2a. through c. if not already done; however, in step c.(2), see Figure 5-9 for the A-frame disc file accumulator manifold installation.

CAUTION

Ensure that disc surfaces are not stuck or otherwise damaged when performing the following procedures.

- b. Remove two straps holding the 5-micron filter assembly to the disc file base.

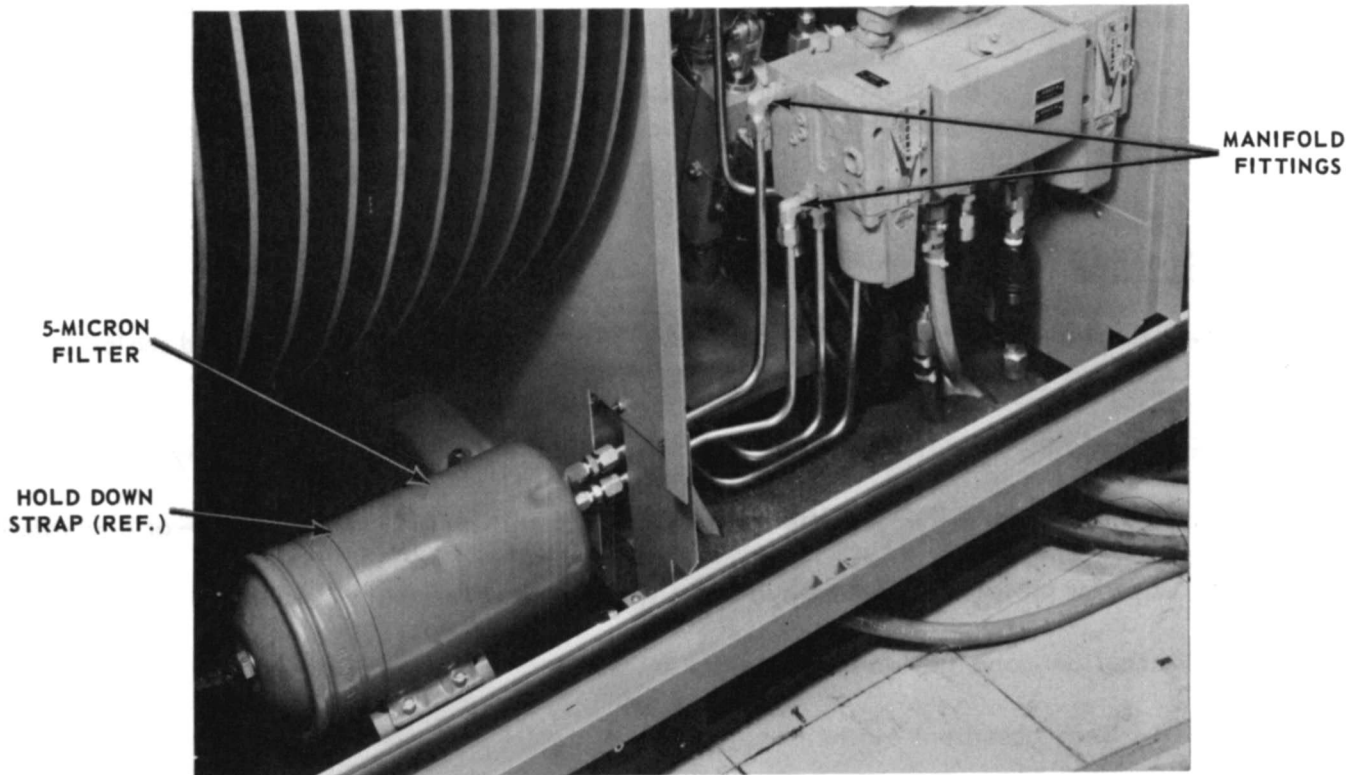


Figure 5-10 5-Micron Filter—Installation Details

5-6-6-2 Procedure (Cont.)

WARNING

Hydraulic fluid is toxic and flammable.
Avoid prolonged contact with the skin.
Do not smoke in work area.

- c. While wearing rubber gloves and with a quart container positioned under the fittings, disconnect filter inlet and outlet lines from 90-degree elbows in the left side of the accumulator manifold assembly (see Figure 5-10). Lay absorbent rags under the filter and lines to soak up any excess fluid that may be dripping from the lines. Immediately cap the exposed ends of the lines and fittings.
- d. Carefully remove filter and attached hydraulic lines from the file cabinet. Remove the drain plug from the filter housing and drain all fluid from the filter and lines into the one-gallon container.
- e. Rotate female fittings of inlet and outlet tubing assemblies and remove tubing assemblies from filter case; immediately cap the exposed ends of the tubing.
- f. Remove hold-down hexhead bolt from filter end cover and remove cover. Screw retaining plate and filter element out of housing and remove gasket from the cover; discard filter element and gasket.

WARNING

Freon can cause frostbite if care is not exercised in handling.

- g. Using Freon, thoroughly clean interior of filter case, retaining plate, hydraulic lines, cover, and hold-down hexhead bolt. Allow components to air dry.

CAUTION

Overtightening hexhead bolt in the next paragraph could damage filter and cover.

- h. Screw a new filter element, Part No. B-56652-1, and the old retaining plate into the filter case and install a new gasket, Part No. B-56899, in the filter cover. Secure cover to case with the hexhead bolt; do not overtighten bolt. Install drain plug.

CAUTION

Just before line fittings are connected, thoroughly clean the fittings with Freon.

5-6-6-2 Procedure (Cont.)

i. Reconnect inlet and outlet tubing assemblies to filter case as shown in Figure 5-10. Tighten fittings only enough to temporarily hold lines in place.

j. While guiding the hydraulic lines through the slot in the vertical partition of the file, set filter assembly on mounting bracket located in bottom of file. Position retaining straps over filter assembly and loosely secure each side of the straps using two roundhead screws.

k. Connect inlet and outlet lines of filter to 90-degree elbows on side of accumulator manifold assembly and tighten securely.

l. Tighten fittings on filter end of inlet and outlet lines securely. Tighten the four screws securing filter retaining straps.

m. Wipe excess hydraulic fluid from hydraulic lines and filter assembly; wipe up all fluid that may have been spilled while performing this procedure.

n. Reconnect the hydraulic hoses and electrical cables to the accumulator manifold assembly as described in paragraph 5-6-4-2 m.

o. If this procedure is performed as a normal function of annual preventive maintenance, and biennial preventive maintenance is to be performed, replace the hydraulic hoses of the disc file as directed in paragraph 5-7-1. However, if only individual component replacement has been performed, purge the system as directed in paragraph 5-9-2.

5-7 BIENNIAL PROCEDURES

The biennial procedures — when started — will be performed in their entirety. These procedures include replacement of the hydraulic hoses interconnecting the hydraulic power supply with the disc file's accumulator manifold assembly, replacement of the accumulators along with their pressure gages and pressure gage adapters, and replacement of the hydraulic hoses interconnecting the disc file's accumulator manifold assembly and the boost of the digital actuator assembly. It is recommended that the procedures of paragraph 5-7-2 and 5-7-3 be conducted concurrently or consecutively, as desired. Before performing the procedures, review the information contained in paragraph 5-1 and related subparagraphs.

5-7-1 HYDRAULIC POWER SUPPLY HOSE REPLACEMENT — Replace the pressure and return hoses interconnecting the hydraulic power supply with the accumulator manifold assembly of the disc file at least once every two years. Since the installation configuration of the A-frame file differs from that of the B- and C-frame files, individual procedures are provided for the two file configurations.

NOTE

If this procedure is performed on a normal biennial basis, it is recommended that it be performed following replacement of the 5-micron filter as directed in paragraph 5-6-6-2 o.

5-7-1-1 Special Equipment Required — The special equipment required depends on whether the file is an A-frame or B- and C-frame file.

a. A-frame Files — The following special equipment will be required when replacing the hydraulic power supply hoses in an A-frame file.

CAUTION

Items (1) through (4) are available precleaned and sealed by Bryant to Bryant specifications. Do not unseal items until parts are to be used.

- (1) For hoses required in replacement, remove center-rear access panel of the file cabinet. Check tag number on pressure and return hoses from hydraulic power supply to the accumulator manifold assembly (see Figure 5-9). It is recommended that the hoses be ordered through Bryant. If new hoses have new coupler bodies, none of item (3) and only one of items (2) and (4) below are required.
- (2) Three O-rings, Bryant Part No. C-54149-37.
- (3) One O-ring, Bryant Part No. C-54149-38.
- (4) Four O-rings, Bryant Part No. C-54149-36.
- (5) One roll of 1/2-inch Teflon tape.
- (6) Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level or equivalent.
- (7) One jar of white petroleum jelly.
- (8) Lint free cloths.
- (9) A shallow one-gallon container.
- (10) Plastic bags, caps and plugs for sealing separated hydraulic components.

b. B- and C-Frame Files — The following special equipment will be required when replacing the hydraulic power supply hoses in B- and C-frame files.

CAUTION

Items (1) through (4) are available precleaned and sealed by Bryant to Bryant specifications. Do not unseal items until parts are to be used.

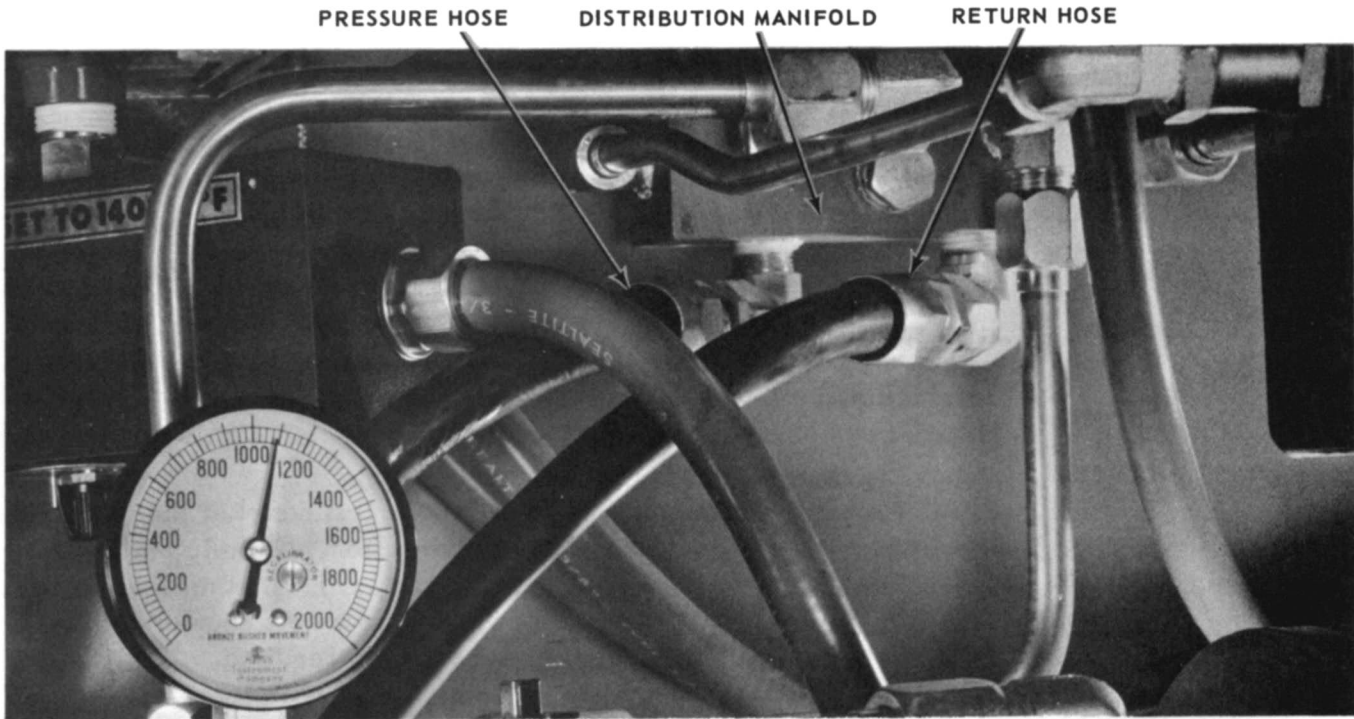
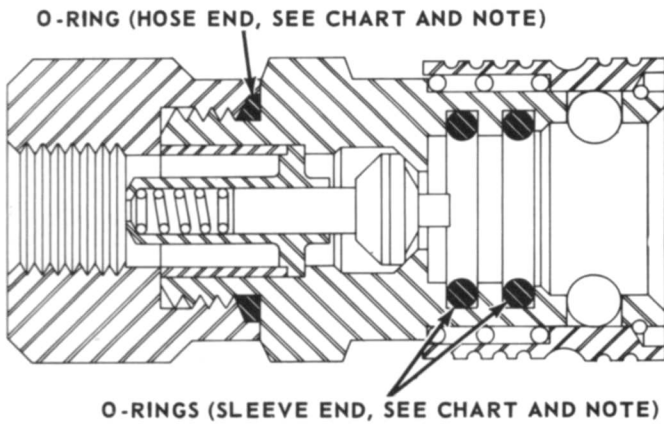


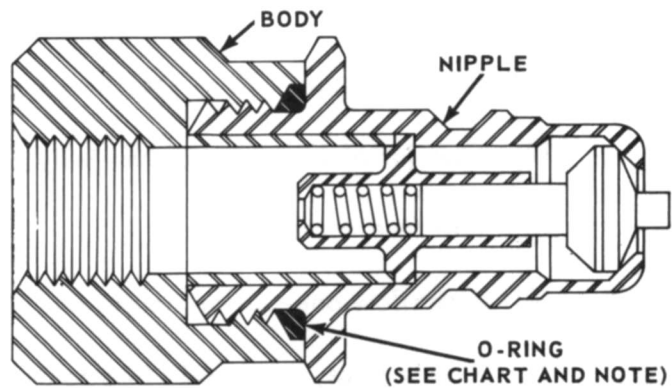
Figure 5-11 A-Frame File Power Supply Compartment—Pressure and Return Hose Installation Details



NOTE:
O-RINGS DIFFER DEPENDING ON WHETHER FITTING BE-
ING WORKED ON IS FOR A PRESSURE OR RETURN HOSE

HOSE	COUPLER BODY	O-RING	
		HOSE END	SLEEVE END
PRESSURE	B-56181-1	C-54149-38	C-54149-37
RETURN	B-56181-2	C-54149-36	C-54149-36

Figure 5-12 Coupler Body—Sectional View Showing Location of O-Rings



NOTE:
O-RINGS DIFFER DEPENDING ON WHETHER FITTING BE-
ING WORKED ON IS FOR A PRESSURE OR RETURN HOSE

HOSE	COUPLER NIPPLE	O-RING
PRESSURE	B-56180-1	C-54149-37
RETURN	B-56180-2	C-54149-36

Figure 5-13 Coupler Nipple—Sectional View Showing Location of O-Ring

5-7-1-1 Special Equipment Required (Cont.)

- (1) For hoses required in replacement, remove center-rear access panel of the file cabinet. Check tag number on pressure and return hoses from hydraulic power supply to accumulator manifold assembly (see Figure 5-7). It is recommended that the hoses be ordered through Bryant. If new hoses have new coupler bodies, none of item (3) and only 2 each of items (2) and (4) are required.
- (2) Six O-rings, Bryant Part No. C-54149-37.
- (3) Two O-rings, Bryant Part No. C-54149-38.
- (4) Eight O-rings, Bryant Part No. C-54149-36.
- (5) Those items listed in paragraph a. (5) through (10).

5-7-1-2 A-Frame File — With the procedures of paragraph 5-6-1-2 a. through r. and, as applicable, s. completed during normal annual procedures, replace the hydraulic power supply hoses of A-frame files as follows:

- a. Perform the procedures of paragraph 5-6-4-2 a. through c. if not already done; however, see Figure 5-9 for the A-frame accumulator manifold installation.
- b. Through the side access panel opening of the file, rotate the female fitting connecting the pressure hose (see Figure 5-11) to the elbow of the hydraulic power supply distribution manifold ccw until the hose is free of the elbow; seal the elbow with a plastic bag to protect it from dirt. Then remove the hose assembly from the file. Allow fluid in hose to drain into gallon container.
- c. Disconnect the return hose from the hydraulic power supply distribution manifold as directed in step b. for the hydraulic pressure hose.
- d. If a coupler body is provided on the new pressure hose, discard the old hose and proceed to step f. However, if a coupler body is not supplied with the new pressure hose, proceed as follows:
 - (1) Remove the coupler body (see Figure 5-12) from the elbow of the removed hose by rotating the threaded end of the body ccw. Discard the hose.
 - (2) Remove the sleeve end of the coupler body from the hose end.
 - (3) Using a non-metallic scribe, pop out the two O-rings located in the sleeve end of coupler body and discard the O-rings; remove the one O-ring from the hose end of the coupler body.

WARNING

Freon can cause frostbite if care is not exercised in handling.

5-7-1-2 A-Frame File (Cont.)

- (4) Use Freon to thoroughly clean the sleeve and hose ends of the coupler body.
- (5) Apply white petroleum jelly to new O-rings and then install O-rings in the sleeve and hose ends of coupler body as shown in Figure 5-12.

CAUTION

Since O-rings are installed, only use Freon to clean the fittings in the next step.

- (6) Thoroughly clean both ends of the coupler with Freon, and install the sleeve end of the body on the hose end.
- (7) Apply two overlapping turns of 1/2-inch Teflon tape to the threads of the elbow of the new hose on which the coupler body is to be installed; apply the tape approximately three threads from the open end of the fitting.
- (8) Install the coupler body on the elbow of the new hose prepared as directed in step (7); if the body is not to be immediately connected to the accumulator manifold assembly, seal it in a plastic bag.

e. If a coupler body is provided on the new return hose, discard the old hose and proceed to step f. However, if a coupler body is not provided with the new return hose, proceed as directed in paragraph d. (1) through (8).

f. If hose replacement is a part of the normal biennial preventive maintenance, replace the O-ring of each of the two coupler nipples located on the accumulator manifold assembly (see Figure 5-9) as follows:

CAUTION

Do not allow threaded end of coupler nipple to rotate in the next step. This action protects the Teflon seal of the nipple used to join the coupler to the accumulator manifold assembly.

- (1) Position the shallow one-gallon container under the nipples.
- (2) Remove coupler nipple (see Figure 5-13) from the manifold nipple on which it is installed.
- (3) Remove the nipple of the assembly from the body and remove and discard O-ring.

WARNING

Freon can cause frostbite if care is not exercised in handling.

5-7-1-2 A-Frame File (Cont.)

- (4) Use Freon to thoroughly clean the nipple and manifold fitting ends of the coupler nipple.
- (5) Apply petroleum jelly to new O-ring and then carefully install O-ring on threaded end of nipple; be as careful as possible to ensure that O-ring is not damaged by nipple threads. Then install the nipple on the body.
- (6) Remove the Teflon tape from the nipple of the manifold and apply two turns of new 1/2-inch Teflon tape to the nipple; apply the tape approximately three threads from the end of the nipple.
- (7) After thoroughly cleaning the ends of the coupler and the manifold nipple with Freon, install the body end of the coupler on the manifold nipple. Protect the nipple end with a plastic bag if the coupler body is not to be immediately installed.
- (8) Wipe up all accumulation of hydraulic fluid.

g. If this procedure is being performed as a part of normal biennial preventive maintenance, replace the boost hydraulic hoses as directed in paragraph 5-7-2 before proceeding to step h.

CAUTION

Always connect return line first, and then connect pressure line.

- h. Install the new return hose with the cleaned return coupler body as follows:

CAUTION

Remove protective covers from hydraulic fittings only when a connection is to be made.

- (1) Facing the hydraulic power supply compartment of the disc file cabinet, route the elbow fitting end of the hose with coupler body through the slot in the vertical partition of the file's thermal and dust protection kit; then remove protective covers from the hose fittings.

CAUTION

Immediately before connecting hydraulic fittings, thoroughly clean with Freon.

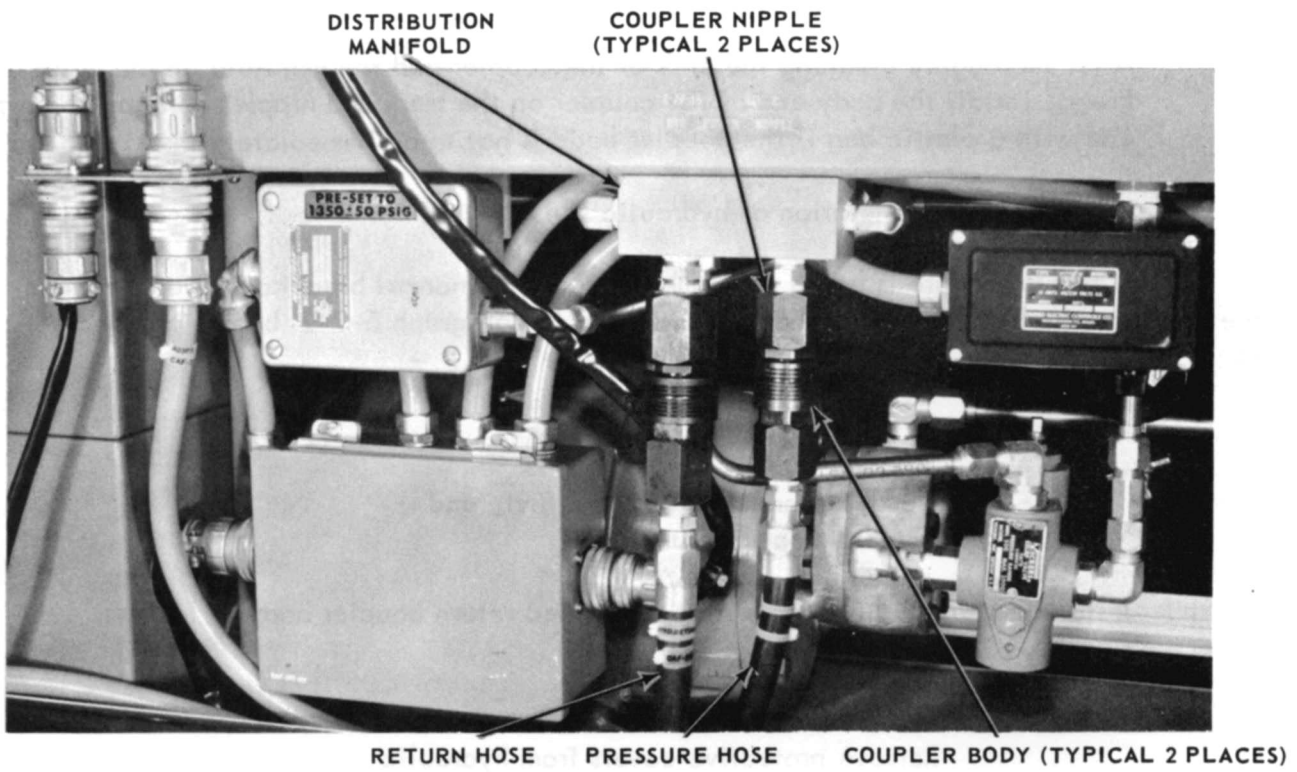


Figure 5-14 B-or C-Frame File Power Supply Compartment—Pressure and Return Hose Installation Details

5-7-1-2 A-Frame File (Cont.)

- (2) Remove protective covers from appropriate elbows of the hydraulic power supply manifold (see Figure 5-11). Connect the female fitting on the hydraulic power supply compartment end of the hose to the elbow of the manifold.
- (3) Connect the coupler body end of the hose to the appropriate coupler nipple as directed in paragraph 5-6-4-2 m.
 - i. Install the new pressure hose with the cleaned pressure coupler body as directed in step h. (1) through (3).
 - j. If this procedure is performed as a normal function of biennial preventive maintenance, continue with the procedures starting with paragraph 5-6-4-2 l. However if only an individual component replacement is being performed, purge the system as directed in paragraph 5-9-2.

5-7-1-3 B- and C-Frame Files — With the procedures of paragraph 5-6-1-2 a. through r. and, as applicable, s., completed, replace the hydraulic power supply hoses of B- and C-frame files as follows:

- a. Perform the procedures of paragraph 5-6-4-2 a. through c., if not already done.
- b. Disconnect the pressure and the return hoses from the manifold of the hydraulic power supply (see Figure 5-14) following the same general procedure of paragraph 5-6-4-2 c. (2) and (3).
- c. Working at the power control unit, carefully withdraw the pressure hose from the ducting beneath the cabinets; use care to ensure foam coverings in bottom of cabinets are not damaged.
- d. If the new hose is equipped with a coupler body on each end discard the old hose and proceed to step e. However, if coupler bodies are not supplied with the new hose, remove the coupler body from each end of the old hose by rotating the hose end of the body (see Figure 5-12) ccw. Replace the O-rings of each coupler body as directed in paragraph 5-7-1-2 step d., except that in step (8) install the body on the nipple, rather than the elbow end, of the hose.
- e. Remove the return hose from the disc file assembly as directed for the pressure hose assembly in step c.; perform the procedure of step d. as applicable, and then proceed to step f.
- f. If hose replacement is a part of normal biennial preventive maintenance, replace the O-ring of each of the four coupler nipples — one nipple of each mounted on the 10-micron filter and manifold of the accumulator manifold assembly (see Figure 5-7) and the remaining two nipples mounted to the manifold of the power control unit (see Figure 5-14) — as directed in paragraph 5-7-1-2, step f.

5-7-1-3 B- and C-Frame Files (Cont.)

g. If this procedure is being performed as a part of the normal biennial preventive maintenance procedures, replace the boost hydraulic hoses as directed in paragraph 5-7-2 before proceeding to step h.

CAUTION

Always connect return line first, then connect pressure line .

h. Install the new return hose in the file as follows:

CAUTION

Remove protective covers from hydraulic fittings only when a connection is to be made .

- (1) Working at the power control unit, carefully route the new hose to the disc file cabinet through the ducting located beneath the cabinets . Be sure that the hose is routed beneath the appropriate manifold fittings .

CAUTION

Before connecting hydraulic fittings, thoroughly clean the fittings with Freon to ensure their cleanliness .

- (2) Connect the coupler body end at each end of the hose to the appropriate coupler nipple of the accumulator manifold assembly of the disc file cabinet (see Figure 5-7) and of the manifold assembly of the power control unit cabinet (see Figure 5-14), as directed in paragraph 5-6-4-2 m.

i. Install the new pressure hose with the two cleaned pressure coupler bodies as directed in step h. (1) and (2).

j. If this procedure is performed as a normal function of biennial preventive maintenance, continue with the procedures of paragraph 5-6-4-2 n.

5-7-2 BOOST HOSE REPLACEMENT — Replace the pressure and return hoses interconnecting the boost of the digital actuator assembly with the accumulator manifold assembly (see Figure 5-7) at least once every two years .

NOTE

If this procedure is performed on a normal biennial basis, it is recommended that it be performed during replacement of the hydraulic power supply hoses as directed in paragraph 5-7-1-2g. or 5-7-1-3g., as applicable.

5-7-2-1 Special Equipment Required – Obtain the following special equipment:

CAUTION

Hoses are available precleaned and sealed by Bryant to Bryant specifications. Sealed bags shall not be opened until the part is to be installed.

- a. One return hose, Bryant Part No. B-56204-3.
- b. One pressure hose, Bryant Part No. B-56204-4.
- c. Caps and plastic bags for sealing separated hydraulic lines.
- d. Freon, Dupont 113 prefiltered to ASTM Class 3 Contamination Level – or equivalent.
- e. Lint free cloths.
- f. Rubber gloves.
- g. A one gallon container.
- h. Plastic bags.

5-7-2-2 Procedure – Replace the boost pressure and return hoses as follows:

NOTE

If the pressure and return lines of the hydraulic power supply are disconnected from the accumulator manifold assembly, proceed to step b.

a. Perform the procedures of paragraph 5-6-4-2a. through c. if not already done; however, see Figure 5-9 for the A-frame accumulator manifold installation.

5-7-2-2 Procedure (Cont.)

b. Rotate the female fitting of the boost pressure hose ccw and remove the hose from the male tee fitting of the accumulator manifold assembly; allow the contents of the hose to drain into the container while simultaneously freeing the female fitting of the other end of the hose from the elbow of the boost.

c. Disconnect the boost return hose as directed in step b. for the boost pressure hose.

d. Cap or otherwise cover fittings until hose connections are to be made.

e. Unseal the protected ends of the new return hose and pressure hose.

CAUTION

Just before line fittings are connected, thoroughly clean the ends of the fittings with Freon.

f. Connect the return hose from the boost's return elbow to the accumulator manifold assembly return tee; before each end of the hose is connected, spray the mating fittings with Freon to ensure cleanliness.

g. Connect the pressure hose from the boost's pressure elbow to the accumulator manifold assembly pressure tee as described for the return hose in paragraph f.

h. If this procedure is performed as a normal function of biennial preventive maintenance, replace the accumulator pressure gage adapter, and pressure gage, as directed in paragraph 5-7-3. However, if only individual component replacement has been performed, purge the system as directed in paragraph 5-9-2.

5-7-3 ACCUMULATOR, PRESSURE GAGE ADAPTER, AND PRESSURE GAGE REPLACEMENT — Replace the three accumulators, pressure gage adapters and pressure gages of the accumulator manifold assembly of the disc file at least once every two years.

NOTE

If this procedure is performed on a normal biennial basis, it is recommended that it be performed during replacement of the boost hoses as directed in paragraph 5-7-2-2h.

5-7-3-1 Special Equipment Required -- Obtain the following special equipment:

CAUTION

Items a. through e. are available pre-cleaned and sealed by Bryant to Bryant specifications. Do not unseal items until parts inside are to be used.

5-7-3-1 Special Equipment Required (Cont.)

- a. Two high pressure gages (zero to 2000 psi), Bryant Part No. C-56556-5.
- b. One low pressure gage (zero to 60 psi), Bryant Part No. B-56556-4.
- c. Three gage adapters, Bryant Part No. B-56600.
- d. One 1-quart accumulator, Bryant Part No. C-56207-1; and one label (500 PSI), Bryant Part No. C-302690-2.
- e. Two 1-pint accumulators, Bryant Part No. C-54360-1; and one label each, Bryant Part No. C-302690-1 (600 PSI) and C-302690-9 (12 PSI).
- f. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent.
- g. 3/8 - and 1/2-inch Teflon tape.
- h. Rubber gloves.
- i. Lint-free absorbent cloths.

5-7-3-2 Procedures — Replace the accumulators, pressure gage adapters, and pressure gages of the accumulator manifold assembly (see Figure 5-15) as follows:

- a. Perform the procedures of paragraph 5-6-4-2-a. through c. if not already done.
- b. Remove two No. 10-32 x 3/8-inch slotted panhead screws, two No. 10 lock-washers, and remove tie rod.
- c. Remove the pint, low-pressure accumulator of the accumulator manifold assembly as follows:

WARNING

Because of the high pressure of the gas in the accumulator, initially discharge the gas through the bleed valve (see Figure 5-15) — NOT the air valve — of the assembly.

- (1) Using a 7/16-inch open end wrench, rotate the bleeder valve fitting on the pressure gage adapter ccw and allow the nitrogen charge of the accumulator to bleed to zero pressure as indicated by a zero psi indication on the pressure gage.

WARNING

The accumulator shall be completely discharged before proceeding to the next step.

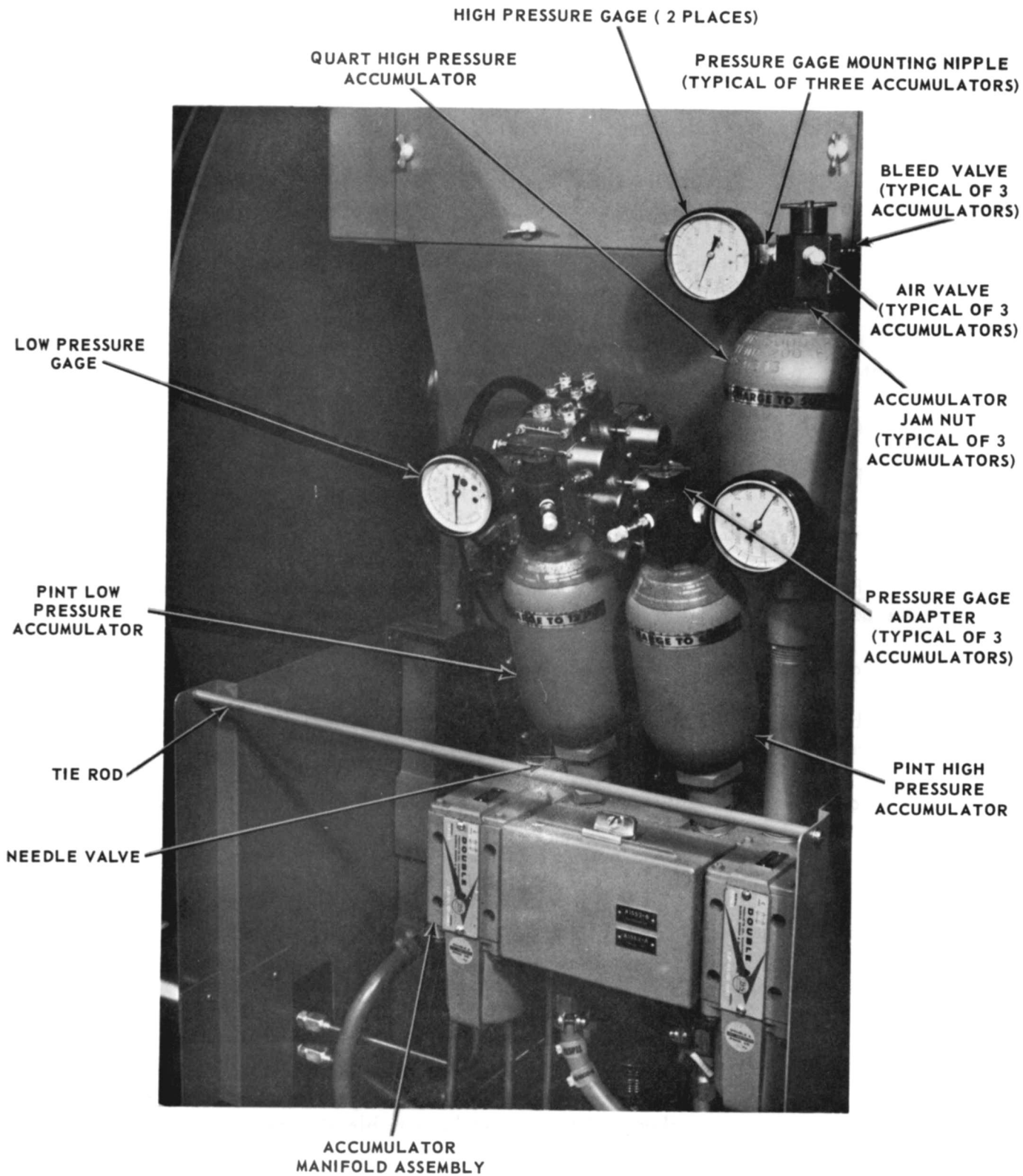


Figure 5-15 Accumulator Manifold Assembly, Accumulator, Pressure Gage Adapter, and Pressure Gage—Installation Details

NOTE

Direction of rotation of the pressure gage adapter in the next step considers only the accumulator manifold assembly installation as shown in Figure 5-15.

- (2) Rotate pressure gage of accumulator ccw until gage is free of pressure gage adapter. If there is insufficient clearance, rotate accumulator jamnut (located under the pressure gage adapter) approximately one turn ccw and then rotate pressure gage adapter ccw until there is sufficient clearance for gage removal; repeat this procedure, as required, until gage can be removed.
- (3) Rotate pressure gage adapter of accumulator ccw until adapter is free; if the air valve, bleed valve, and pressure gage fitting interfere with removal, remove them by rotating each ccw until they are free of adapter.

WARNING

Hydraulic fluid is toxic and flammable. Wear rubber gloves to avoid prolonged contact with the skin. Do not smoke in the area.

- (4) Place absorbent cloths around bottom of accumulator.
- (5) While using a wrench to hold the hex nipple joining the accumulator manifold, rotate accumulator ccw until it is free of manifold fitting.
- (6) Wipe hydraulic fluid from accumulator and then set pressure gage, pressure gage adapter, and accumulator aside for subsequent return to Bryant for rework; reinstall air valve and pressure gage fittings in the pressure gage adapter if they were removed in step (3).

d. Perform the procedures of paragraph d. steps (1) through (6) for the pint high pressure accumulator except in step (3) — after rotating the jamnut — rotate the adapter cw until there is sufficient clearance for gage removal.

e. Perform the procedures of paragraph d. steps (1) through (6) for the quart, high-pressure accumulator.

f. Install new quart high-pressure accumulator with pressure gage adapter and high-pressure gage on accumulator manifold assembly (see Figure 5-15) as follows:

CAUTION

Do not remove parts from plastic bags until they are to be installed. If procedures are to be discontinued for any period of time, seal open hydraulic fittings with plastic. Be sure to remove plastic when installing components.

- (1) Strip old Teflon tape from accumulator mounting end of the nipple protruding from the manifold. Clean the threads of the fitting using Freon while simultaneously exercising care to ensure that no contaminants fall into the end of the fitting. Then, apply two overlapping turns of new 1/2-inch Teflon tape to end of fitting; apply the tape approximately three threads from the end of the fitting.
- (2) Remove pressure gage adapter from its plastic bag and remove air valve, bleed valve, and pressure gage mounting nipple from the adapter. Strip Teflon tape from the fittings (if present) and then apply two overlapping turns of 3/8-inch Teflon tape to the threads of the three fittings; apply the tape approximately three threads from the adapter ends of the fittings.
- (3) Remove accumulator from its plastic bag and remove the sealing nut from the upper fitting of the accumulator. Then, install O-ring of pressure gage adapter on the upper fitting of accumulator.
- (4) Remove pressure gage from its plastic bag. Then apply two overlapping turns of 3/8-inch Teflon tape to the threads of the gage fitting; apply the tape approximately three threads from the end of the fitting.

CAUTION

Before connecting hydraulic fittings, spray the fittings with Freon to ensure their cleanliness.

- (5) Thread the pressure gage adapter (without its air valve, bleed valve or pressure gage fitting) cw onto upper fitting of accumulator. With the adapter seated snugly against O-ring on upper fitting of accumulator, start to thread the accumulator cw onto the appropriate nipple protruding from accumulator's manifold.

- (6) Rotate accumulator cw until it is within three turns of covering the lower end of the Teflon tape of the accumulator manifold fittings. Then rotate the accumulator cw until the pressure gage fitting hole of the pressure gage adapter points directly to the rear of the file (toward the assembler).
- (7) Rotate pressure gage mounting nipple cw into pressure gage adapter. Stop rotation when the nipple is within three turns of the end of its Teflon tape.
- (8) Rotate pressure gage cw onto its mounting nipple. When the gage is within approximately three turns of end of the Teflon tape on the nipple's threads, rotate the gage one more turn so that its dial is visible to the right (with respect to facing the rear of the file).
- (9) Rotate accumulator approximately 1/4-turn cw so that the dial of the pressure gage faces directly to the rear of the file; apply 500 PSI label.
- (10) Rotate air valve cw into pressure gage adapter. Stop rotation when valve is within approximately two turns of end of the valve's Teflon tape.
- (11) Rotate bleed valve cw into pressure gage adapter. Stop rotation when valve's within approximately two turns of end of the valve's Teflon tape.

g. Install pint high-pressure accumulator (composed of one of the accumulators, a pressure gage adapter, and the remaining high pressure gage) on accumulator manifold assembly (see Figure 5-15) as follows:

- (1) Perform the procedures of paragraph g., steps (1) through (7).
- (2) Rotate pressure gage cw onto its mounting nipple. When the gage is within approximately three turns of end of the Teflon tape on the nipple's threads, rotate the gage one more turn so that its dial is visible to the left (with respect to facing the rear of the file).
- (3) Rotate accumulator jamnut (located under the pressure gage adapter) approximately one-turn ccw and then rotate pressure gage adapter approximately 1/4 turn ccw, or until the dial of the pint high pressure accumulator gage faces directly to the rear of the file. With the dial of the gage so positioned, rotate accumulator jamnut cw until it is tightened snugly against the accumulator body; apply 600 PSI label to accumulator.
- (4) Perform the procedures of paragraph g., steps (10) and (11).

5-7-3-2 Procedures (Cont.)

h. Install pint low-pressure accumulator (composed of the remaining new pint accumulator, pressure gage adapter and low pressure gage) on accumulator manifold assembly (see Figure 5-15) as directed in paragraph g., steps (1) through (11) except in step (9) apply 12 PSI label.

i. Charge the three accumulators as directed in paragraph 5-9-3.

j. Install tie rod between vertical partitions of thermal and dust protection kit and secure rod using two screws and washers removed in step b.

k. If this procedure is performed as a normal function of biennial preventive maintenance, continue with the procedures starting with paragraph 5-7-1-2h. or 5-7-1-3h. as applicable.

5-8 SITE DETERMINED PREVENTIVE MAINTENANCE INTERVALS

Performance of the subsequent procedures may be required on a daily basis in an extremely dusty environment or perhaps once every six months in an extremely clean environment. It is recommended that Bryant Field Service personnel be consulted as to frequency of performance for a given installation. Before performing the procedures, review the information contained in paragraph 5-1 and related subparagraphs.

5-8-1 INSPECTING ACCESS PANEL AIR FILTERS — It is generally recommended that air filters be inspected at least once every two weeks. Air filters for the A-frame disc files are inspected as directed in paragraph 5-8-1-2 and those for the B- and C-frame files are inspected as directed in paragraph 5-8-1-3.

CAUTION

The following procedures apply to only thermal kit equipped files. That is, files in which the disc motor compartment is sealed from the disc file cabinet proper.

5-8-1-1 Special Equipment Required — Obtain the following special equipment:

a. RP Super Handi-Koter Spray, Research Products Corp., or equivalent.

b. For any 900 rpm file or for any 1200 rpm A- or B- frame file without electronics, obtain two Bryant C-AF-148-1 (0.3 micron) air filters; for all other files, obtain two Bryant C-AF-2 (1 micron) air filters.

c. Air compressor.

d. Freon, Dupont 113, or equivalent.

e. Clean absorbent cloths.

5-8-1-1 Special Equipment Required (Cont.)

f. Rubber gloves.

5-8-1-2 A-Frame Files — Remove, inspect, and install air filters of the A-frame files as follows:

a. Shutdown the disc file.

CAUTION

The file shall not be operated when performing this procedure. The work area shall be maintained clean and as dust free as possible throughout the procedure.

b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the center-rear access panel from the file cabinet and perform the following inspection:

- (1) Remove the filter(s) in the panel by pressing the lower edge of the filter up and then rotating the lower edge of the filter out of the access panel frame (see Figure 5-16).
- (2) Put on rubber gloves. Using a cloth dampened with Freon, wipe inside of access panel paying particular attention to the area adjoining filter(s). Wipe surfaces dry with a cloth.
- (3) Inspect filter(s). If matted accumulations of foreign matter are visible, discard filter(s) and replace with the proper new filter(s).
- (4) Install acceptable filter(s) in filter frame(s) by reversing the removal procedures of step (1); be sure that filter is not installed backwards.

c. With respect to facing the rear of the file, remove the right rear access panel from the cabinet and perform the following inspection:

- (1) Perform the procedures of paragraph b. steps (1) and (2).
- (2) Inspect each filter. If matted accumulations of foreign matter are visible on either filter, remove both filters from the vicinity of the file cabinet and wash the filters with clean water using a brush or cloth. After rinsing each filter with clean water, use an air compressor to thoroughly dry the filters and then coat each filter with RP Super Handi-Koter Spray.

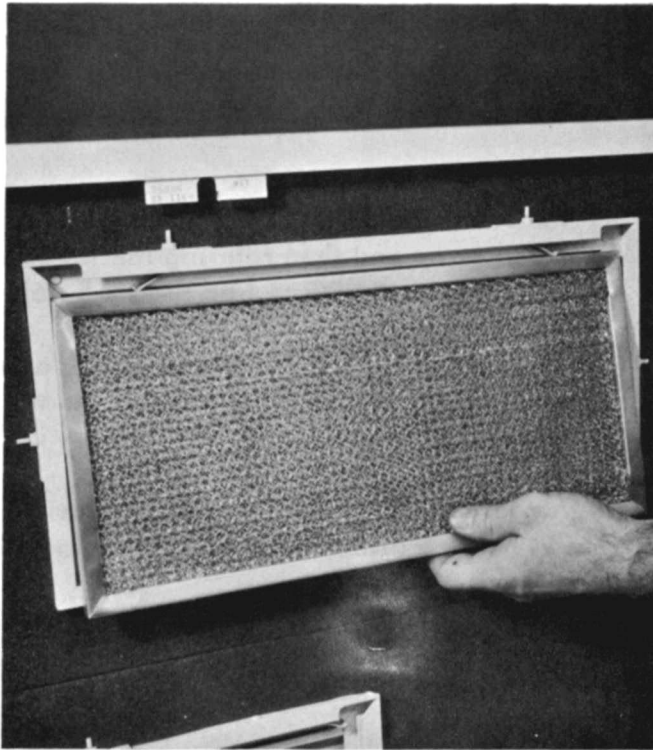


Figure 5-16 Access Panel Air Filter Shown Being Removed

5-8-1-2 A-Frame Files (Cont.)

(3) Install inspected filter in the frame from which it was removed by reversing the removal procedure of paragraph b. step (1); if air flow is marked on the filter, install in proper direction.

d. With respect to facing the rear of the file, remove right-side access panel from cabinet and inspect the filter as directed in step c.

e. Install all cabinet access panels, as required.

5-8-1-3 B- and C-Frame Files — Remove, inspect, and install air filters of the B- and C-frame files as follows:

a. Shutdown the disc file.

CAUTION

The file shall not be operated when performing this procedure. The work area shall be maintained clean and as dust free as possible throughout the procedure.

b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the center-rear access panel from the disc file cabinet and perform air filter inspection as directed in paragraph 5-8-1-2b. steps (1) through (4).

c. Remove rear access panel from the power control unit cabinet and perform air filter inspection as directed in paragraph 5-8-1-2c. steps (1) through (3).

d. With respect to facing the front of the power control unit, remove left-side access panel from cabinet and inspect the filters as directed in paragraph 5-8-1-2c. steps (1) through (3).

e. Install all cabinet access panels, as required.

5-8-2 DISC CLEANING — It is generally recommended that discs be cleaned at least once every two weeks.

5-8-2-1 Special Equipment Required — Obtain the following special equipment:

NOTE

Items a. through m. are included in Bryant's cleaning kit, Part No. A-AF-197. Part numbers given are Bryants.

5-8-2-1 Special Equipment Required (Cont.)

- a. One 12 ounce bottle of protective coating concentrate ES-235, Part No. A-AF-250.
- b. Three terry cloth cleaning pads Part No. C302487-1.
- c. Three lint free cotton cleaning pads, Part No. C302487-2.
- d. One roll of surgitube gauze, Part No. B-56646.
- e. Red cleaning tool labeled "WASH", Part No. C302477-1.
- f. Blue cleaning tool labeled "RINSE", Part No. C302477-2.
- g. Green cleaning tool labeled "BUFF", Part No. C302477-3.
- h. Plastic tube, Part No. C302691.
- i. Scissors, Part No. B-56664.
- j. Rubber gloves, Part No. B-56663.
- k. One-gallon plastic bottle labeled "ES-235 SOLUTION", Part No. B-AF-194-1.
- l. One-gallon plastic bottle labeled "DISTILLED WATER", Part No. B-AF-194-2.
- m. Measuring spoon set, Part No. B-56636.
- n. One gallon of distilled water.

5-8-2-2 Preparing Cleaning Tools For Use — Cover the red, blue, and green plastic cleaning tools as directed in paragraph 5-2-4-2.

5-8-2-3 Preparing ES-235 Concentrate Solution For Use — Mix ES-235 concentrate solution as follows:

- a. Pour two quarts of lukewarm distilled water into the one-gallon plastic bottle labeled "ES-235 SOLUTION".
- b. Add four level teaspoons (2 ounces) of ES-235 concentrate to the water.
- c. Cap the bottle and shake contents until solution is thoroughly mixed and milky in appearance.

5-8-2-4 Disc Cleaning Procedure — Clean the discs as follows:

- a. Shutdown the disc file.
- b. Pour about two quarts of distilled water into the one-gallon plastic bottle labeled distilled water.
- c. Retract data head bars from disc file as directed in paragraph 5-9-4-2; head pads can be cleaned per paragraph 5-8-3 concurrent with disc cleaning, if desired.

CAUTION

Never return data head bars to operating position when file discs are rotating.

- d. Remove the three rear access panels from the disc file cabinet.
- e. Saturate pad of red WASH tool — prepared in paragraph 5-8-2-2 — with diluted ES-235 solution; using rubber gloves to protect the hands, squeeze out excess moisture until pad is just damp. Similarly, saturate pad of blue RINSE tool — prepared in paragraph 5-8-2-2 — with distilled water; squeeze out excess moisture until pad is just damp.
- f. Clean a disc surface as follows:

CAUTION

Be sure discs are completely stopped before rotating them by hand in the following step. Do not needlessly touch disc surfaces with bare hands; to ensure protection, wear rubber gloves when touching disc surfaces.

NOTE

The use of a flood lamp will facilitate checking the cleanliness of the disc surface during the performance of these procedures.

- (1) While wearing rubber gloves and while standing at the rear of the file, hand rotate discs clockwise (with respect to facing rear-right side of file); as the discs are rotated, wash the outer surface of one of the end discs (as a starting point) using the ES-235 solution-dampened, red WASH tool of step e. During cleaning, hold tool as shown in Figure 5-2 and apply a medium pressure; use a smooth, constant in-and-out motion until entire disc surface is wet. Extra care should be taken to assure disc area near spindle is cleaned.

CAUTION

Steps (2) through (4) should be performed as soon as possible following ES-235 solution application; this is to prevent, if possible, the drying of the solution on the disc surface.

- (2) Place the file in the manual operating mode.

CAUTION

Only MANUAL ON pushbutton shall be glowing before proceeding to step h. Never buff discs at maximum speed. Heads shall NOT be operated to the "flying attitude during disc cleaning operation". Keep the covered handle of the RINSE cleaning tool free of the edges of the discs when buffing. Reposition the gauze on the handle if a hole appears in the gauze due to accidental contact with the disc edge.

- (3) With disc rotation stopped, press DISC MOTOR ON pushbutton and after approximately 15 seconds of disc motor operation press DISC MOTOR OFF pushbutton.

NOTE

As the following procedure is being performed check that disc surfaces have no score marks or other damage and that the surfaces are cleaning satisfactorily. Record any required corrective maintenance.

- (4) Using the RINSE tool dampened with distilled water in step e., immediately rinse ES-235 solution from the cleaned, rotating disc surface. During rinsing, apply a light pressure to the tool. Use a smooth, constant, in-and-out motion until entire disc surface has been rinsed; take extra care to assure that the area of the disc near the spindle is thoroughly rinsed. If disc speed decreases to zero rpm, and the motor must again be turned on, perform the procedures of paragraph 5-2-4-3d.(1) and (2), as applicable, observing the caution preceding step (1).

5-8-2-4 Disc Cleaning Procedure (Cont.)

(5) Use the green BUFF tool to dry and buff the rinsed disc surface. Exercise the same care with the BUFF tool as was used with the RINSE tool.

g. After discs come to a complete stop, repeat the procedures of step f. for each disc surface (adjacent disc surfaces may be simultaneously cleaned, rinsed and buffed, if desired).

h. When disc rotation stops, insert data head bars to the operating position as directed in paragraph 5-9-4-3 provided there are no subsequent maintenance procedures requiring rocker arm retraction.

i. With all disc surfaces cleaned, rinsed and buffed and with heads returned to the operating position, press DISC MOTOR ON pushbutton and allow disc motor to operate at full speed for approximately two minutes (this will expel any moisture that may have collected under disc retaining rings); then, press DISC MOTOR OFF pushbutton and allow spindle to slow down to a speed approximately equal to that attained by 15 seconds of running time and re-buff all disc surfaces as directed in step f. (5).

j. When all disc surfaces are clean, perform the disc file manual turn-off procedure, if applicable.

5-8-3 HEAD PAD CLEANING — It is generally recommended that data and clock head pads be cleaned at least once every two weeks.

5-8-3-1 Special Equipment Required — Obtain the following special equipment:

NOTE

Items a. through f. below are included in Bryant's cleaning kit, Part No. A-AF-197.

A-AF-250. a. One 12 ounce bottle of protective coating concentrate ES-235, Part No.

b. Rubber gloves, Part No. B-56663.

c. One-gallon plastic bottle labeled "ES-235 SOLUTION", Part No. B-AF-194-1.

d. One-gallon plastic bottle labeled "DISTILLED WATER", Part No. B-AF-194-2.

e. Measuring spoon set, Part No. B-56636.

f. Three cleaning pads, Part No. C302487-2.

g. One gallon of distilled water.

h. Glossy-backed blotters, Part No. B-302617.

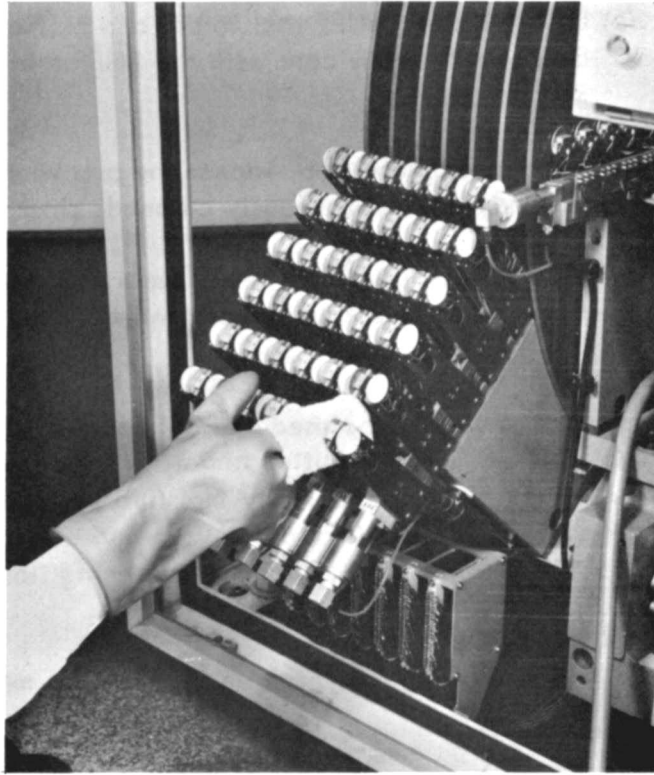


Figure 5-17 Cleaning Data Head Pads



Figure 5-18 Cleaning Clock Head Pads

5-8-3-2 Mixing ES-235 Concentrate Solution For Use — Mix the ES-235 concentrate solution as directed in paragraph 5-8-2-3.

5-8-3-3 Data Head Pad Cleaning Procedure — Clean data head pads as follows:

a. Pour about 2 quarts of distilled water into the one-gallon plastic bottle labeled "DISTILLED WATER".

WARNING

Exercise care when working in vicinity of rotating discs.

CAUTION

Never return data head bars to operating position when discs are rotating.

b. Retract data head bars from file as directed in paragraph 5-9-4-2.

c. Saturate a cleaning pad (C302487-2) with diluted ES-235 solution; using rubber gloves to protect the hands, squeeze out excess moisture until pad is just damp. Similarly, saturate another cleaning pad with distilled water.

CAUTION

Exercise extreme care to avoid getting the cleaning solution on the back side of the head pads or on the pivot blocks. Also, support the head pad so as to ensure that the reeds are not unduly flexed during cleaning.

d. Starting with one of the end data head bars and while wearing rubber gloves, clean the head pads as follows:

(1) Use the ES-235 solution dampened pad to clean off all traces of discoloration appearing on each of the head pads of the data head bar (see Figure 5-17).

(2) Using the distilled water dampened pad, rinse scum from pad faces.

(3) Using a clean, dry cleaning pad (C302478-2), dry buff head pads to a high gloss.

e. Repeat the procedures of paragraph d. steps (1) through (3) until all head pads of all head bars have been cleaned, rinsed and buffed.

5-8-3-3 Data Head Pad Cleaning Procedure (Cont.)

f. Return data head bars to operating position as directed in paragraph 5-9-4-3 provided disc cleaning is completed and there are no subsequent maintenance procedures requiring rocker arm retraction.

5-8-3-4 Clock Head Pad Cleaning Procedure — Clean clock head pads as follows:

a. Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17 or 1-24) in the RESET OFF position.

b. Moisten a blotter with diluted ES-235 solution.

WARNING

Be sure discs are completely stopped before performing the following procedures. Do not needlessly touch disc surfaces with bare hands; to ensure protection, wear rubber gloves when touching disc surfaces.

c. While wearing rubber gloves, place blotter against clock disc with absorbent side out in line with clock head pads (see Figure 5-18); hold blotter in position against disc with one gloved hand while using fingers of the other hand to press individual head pad against the absorbent surface of blotter. While using only enough finger pressure to obtain a small amount of friction between head pad and blotter, slowly rock disc back and forth to create a rubbing action between head pad and blotter thus cleaning face of head pad. Clean all remaining clock head pads in this manner.

d. Moisten a blotter with distilled water and repeat step c. with distilled water instead of ES-235 solution.

e. Using a dry cleaning pad (C302487-2), repeat step c. to dry buff head pads to a high gloss.

5-8-4 OVER-ALL INSPECTION — An over-all inspection should be performed on the disc file at least once every month.

5-8-4-1 Special Equipment Required — Obtain lint free cloths and/or a portable vacuum sweeper for use in cleaning dust from the interior of the disc file cabinet(s). Obtain absorbent cloths for use in wiping up oil that is found on surfaces.

5-8-4-2 Procedures — Inspect the power control unit cabinet (used with B- and C-frame files only) and disc file cabinet as directed in the subsequent steps.

WARNING

During inspection, remain clear of rotating discs and bare electrical wiring when the disc file is operating. Whenever any corrective maintenance — including wipe up — is required in the vicinity of rotating discs or "hot" electrical wiring, shutdown file.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the subsequent procedures.

NOTE

Whenever evidence of a defective component exists, try to determine the extent and/or cause of the malfunction and note the deficiency for subsequent corrective maintenance.

a. Before removing disc file access panels, thoroughly clean the area surrounding the file.

b. In the case of B- and C- frame files, observe that exterior surfaces of the power control unit cabinet assembly (see Figure 1-2) are free of damage. Next, remove the front, rear and both side access panels from the cabinet. After observing that each panel is free of damage, inspect the cabinet interior (see Figure 1-17) as follows:

- (1) Wipe up all visible accumulations of hydraulic fluid from component surfaces. Look for source of any serious oil leaks; record for corrective maintenance, as required.
- (2) Remove all visible accumulations of dust from component surfaces and observe that there are no loose electrical connections, frayed wire insulation, or damaged components.
- (3) Withdraw the solenoid driver power supply from cabinet as directed in paragraph 6-2-2-1 and perform the procedures of step (2) for both the power supply and its compartment. Then, reinsert the supply into its compartment as directed in paragraph 6-2-2-2.

WARNING

The power control panel is a high voltage device. Exercise extreme care when working within proximity of it.

- (4) Open the door of the power control panel (see Figure 1-17) at the front of the unit and perform the procedure of step (2) for the panel interior. Then, close and secure the power control panel door.

c. Shutdown the disc file.

5-8-4-2 Procedures (Cont.)

d. Observe that exterior surfaces of disc file cabinet are free of damage. Next, after discs stop rotating, remove the three front, three rear, and both side access panels from the cabinet. After observing that each panel is free of damage, inspect the disc file cabinet interior as follows:

- (1) In the case of an A-frame file, inspect the power control unit portion of the file (see Figure 1-24) as directed in paragraph b(1) through (4).
- (2) Wipe up all visible accumulations of hydraulic fluid from component surfaces. Look for source of any serious oil leaks. Record for corrective maintenance if required.
- (3) Remove all visible accumulations of dust from component surfaces and observe that there are no loose electrical connections, frayed wiring insulation, or damaged components; this is exclusive of disc surfaces.
- (4) Open the front panel of the pushbutton station (see Figure 1-3 or 1-24) by loosening the screws and clamps used to secure the panel in the closed position; raise the clamps and gently lower the cover. Inspect the interior of the station as directed in paragraph (3). Then, close and secure the cover in its normal operating position.

5-9 AS REQUIRED PROCEDURES

Performance of the subsequent procedures is required when a preventive or corrective maintenance function so necessitates action. Before performing the procedures, review the information contained in paragraph 5-1 and related subparagraphs.

5-9-1 FILLING HYDRAULIC POWER SUPPLY RESERVOIR — Whenever it is determined that the hydraulic fluid level in the reservoir of the hydraulic power supply is below acceptable limits, the reservoir shall be filled with hydraulic fluid that has been prefiltered to the ASTM Class 3 Contamination Level and is sealed in cans.

5-9-1-1 Special Equipment Required — Obtain MIL-H-5606B hydraulic fluid that is prefiltered to ASTM Class 3 Contamination Level, Bray Oil Company, Brayco-756C or 756D, or equivalent.

5-9-1-2 Filling Procedures — Add hydraulic fluid to the reservoir of the hydraulic power supply as follows:

CAUTION

The area surrounding the file shall be maintained clean and as dust free as possible when performing the following procedures.

a. With the area surrounding the cabinet thoroughly cleaned, remove the filler-breather cap from the reservoir of the hydraulic power supply of the power control unit (see Figure 1-19 or 1-25).

5-9-1-2 Filling Procedures (Cont.)

CAUTION

Be sure not to overfill the reservoir, since overfilling will reduce the air space necessary for thermal expansion of the fluid.

b. Add hydraulic fluid to first raise the visible level even with the bottom line of the word HIGH on the fluid level sight gage; then add 4 additional quarts of hydraulic fluid.

c. After filling the reservoir, reinstall the filler-breather cap.

d. If the reservoir was drained and then refilled, perform the purging procedure of paragraph 5-9-2.

5-9-2 HYDRAULIC SYSTEM PURGING — The hydraulic system should be purged to remove the contamination which inevitably occurs whenever entry is made into any part of the hydraulic system, except — perhaps — for removal of the filler breather cap of the reservoir and the taking of fluid samples. Purging should also be performed when the taking of fluid samples (see paragraph 5-4-3) indicates an unsatisfactory contamination level in the system.

5-9-2-1 Special Equipment Required — A purging unit, Bryant Part No. D-AF-483 (see Figure 5-19), or equivalent, is required when performing this procedure on B- or C-frame disc files. A modified version of this unit is available for use when performing this procedure on A-frame disc files. Also, a supply of Freon Dupont 113-prefiltered to an ASTM Class 3 Contamination Level — or equivalent, is required.

5-9-2-2 Procedure — Purge the hydraulic system as follows:

a. Shutdown the disc file.

CAUTION

The work area shall be maintained clean and as dust free as possible whenever cabinet access panels are removed in the following procedures.

b. With the area surrounding the file thoroughly cleaned, connect the purging unit to the hydraulic system as follows:

CAUTION

The file shall remain inoperative during the performance of the following procedures.

(1) In the case of B- and C-frame disc files, remove the access panels of the power control unit cabinet assembly that will enable access to the distribution manifold of the cabinet (see Figure 5-14). It may also be

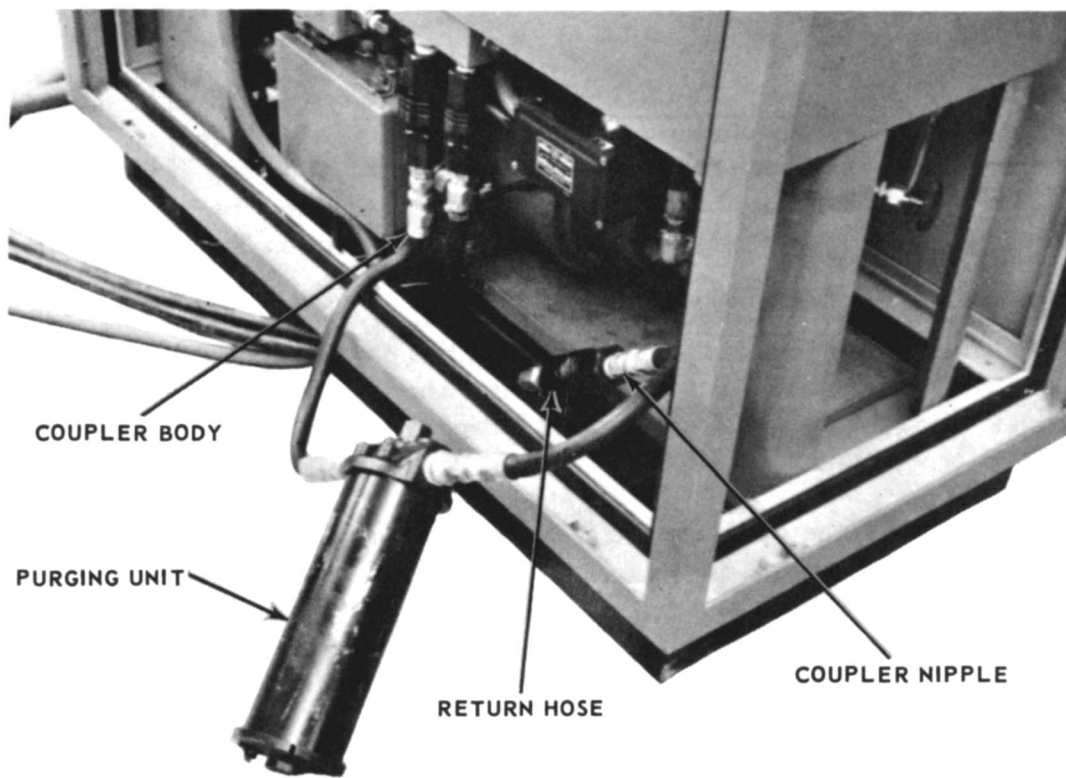


Figure 5-19 Purging Unit Connected into Return Line of Hydraulic System

helpful to remove the rear access panel of the cabinet. Connect the purging unit to the hydraulic system as follows:

CAUTION

Always disconnect pressure line first and then disconnect return line.

- (a) Disconnect the hydraulic pressure hose to the distribution manifold by retracting the sleeve of the hose coupler body and then pulling the coupler body down free of the coupler nipple. Use absorbent cloths to wipe up any fluid leakage.
- (b) Disconnect the hydraulic return hose from distribution manifold.

WARNING

Freon can cause frostbite if care is not exercised during handling.

CAUTION

When connecting hydraulic lines, always connect return line first and then connect pressure line. Just before connecting line fittings, thoroughly clean the fittings with Freon.

- (c) Retract the sleeve of the return hose coupler body and install the coupler body on the coupler nipple of purging unit (see Figure 5-19); with the coupler body fully seated on the coupler nipple, secure the assembly by releasing the sleeve of the coupler body.
 - (d) Connect the coupler body of the purging unit to the return coupler nipple of the distribution manifold.
 - (e) Connect the coupler body of the pressure hose to the pressure coupler nipple of the distribution manifold.
 - (f) Set the purging unit in on the base of the power control unit beneath the relief valve (see Figure 5-6).
- (2) In the case of A-frame disc files, remove the center-rear access panel of the file to gain access to the accumulator manifold assembly (see Figure 5-9); also remove the access panels that will enable access to that portion of the hydraulic power supply located beneath the relief valve (see Figure 5-6); connect the purging unit to the hydraulic system as follows:

CAUTION

Always disconnect pressure line first and then disconnect return line .

- (a) Disconnect the hydraulic pressure hose to the accumulator manifold assembly (see Figure 5-9) by retracting the sleeve of the hose coupler body and then pulling the coupler body down free of the coupler nipple . Use absorbent cloths to wipe up any fluid leakage .
- (b) Disconnect the hydraulic return hose from the accumulator assembly and draw the hose from the disc file compartment through the partition slot into the hydraulic power supply compartment (see Figure 5-6) .

WARNING

Freon can cause frostbite if care is not exercised during handling .

CAUTION

When connecting hydraulic lines, always connect return line first and then connect pressure line . Just before connecting line fittings, thoroughly clean the fittings with Freon .

- (c) Working from the side of the disc file cabinet, retract the sleeve of the return hose and install the coupler body on the coupler nipple of the purging unit (see Figure 5-19); with the coupler body fully seated on the coupler nipple, secure the assembly by releasing the sleeve of the coupler body .
- (d) Rest the purging unit on the base of the hydraulic power supply beneath the relief valve (see Figure 5-6) while simultaneously guiding its hose with coupler body into the disc file compartment through the slot in the partition separating the two sections of the cabinet .
- (e) Connect the coupler body of the purging unit to the return coupler nipple of the accumulator manifold assembly (see Figure 5-9) .
- (f) Connect the coupler body of the pressure hose to the coupler nipple of the accumulator manifold assembly .

5-9-2-2 Procedure (Cont.)

c. With all hydraulic connections made and with the reservoir filled with hydraulic fluid, place the file in the manual operating mode.

d. Press the HYDRAULIC MTR ON pushbutton.

e. Check to ensure that there are no hydraulic leaks in the system. If a leak is detected, immediately shutdown the disc file and perform the required corrective maintenance.

f. If no leakage is detected after five minutes of hydraulic system operation, shutdown the disc file.

g. If the hydraulic fluid of the reservoir was replaced as directed in paragraph 5-6-1-2 and if it is assured that there are no hydraulic leaks in the system, secure the auxiliary compartment bottom plate — loosely set over the auxiliary compartment in paragraph 5-6-3-2t. — to the supply (see Figure 5-5).

h. Place the file in the automatic operating mode. If no leakage is detected five minutes after operation, proceed to step i.

i. With the procedures of step h. satisfactorily completed, the disc file can then be operated in any mode desired; however, if the manual mode is selected, hydraulics must be operated in order to purge the hydraulic system. Purge the system as follows:

(1) Place the disc file in the desired mode of operation.

(2) After five minutes of hydraulic power supply operation, perform the hydraulic fluid level contamination check procedures of paragraph 5-4-3.

(3) Install all access panels of the disc file. If purging is being performed for a reason other than the results of a contamination level check, operate the file for eight hours before proceeding to step j. However, if the performance of the hydraulic fluid contamination level check of paragraph 5-4-3 is the cause of performing these procedures, operate the file for the intervals specified below before proceeding to step j.

(a) If a light contamination level was detected, operate the disc file for eight hours.

(b) If a medium contamination level was detected, operate the disc file for 24 hours.

(c) If a heavy contamination level was detected, operate the disc file for eight hours following replacement of the hydraulic filters of the system.

j. Following the performance of the proper hydraulic power supply operating interval as directed in step i., repeat the hydraulic fluid level contamination check procedures of paragraph 5-4-3.

k. Continue to operate the hydraulic power supply with purging filter attached until the results of the contamination level check are received from the laboratory. Then proceed as follows:

- (1) If the laboratory results indicate that the contamination level of the fluid is below the minimum acceptable level specified in Table 5-2, proceed to step l.
- (2) If the laboratory results indicate that the contamination level is still above the minimum level, but below the maximum level, repeat the procedures starting with step i.(3) (a) or (b) as applicable.
- (3) If the contamination level is above the maximum level, immediately consult Bryant's Field Service Department.

l. With the conditions of step k. (1) achieved and with the area surrounding the file thoroughly cleaned, shutdown the disc file and disconnect the purging unit from the disc file as follows:

CAUTION

The file shall remain shutdown during performance of the following procedure.

NOTE

It is recommended that the purging unit be removed from the system following its successful use. In addition to reducing the frequency of replacing the filter of the unit, such action will also assure an immediately available unit that can be used to clean up a contaminated system.

- (1) In the case of B- and C-frame disc files, remove the access panels of the power control unit cabinet assembly that will enable access to the distribution manifold (see Figure 5-14) of the cabinet. It may also be helpful to remove the rear access panel of the cabinet. Then, disconnect the purging unit from the hydraulic system as follows:

CAUTION

Always disconnect pressure line first and then disconnect return line.

- (a) Disconnect the hydraulic pressure hose to the distribution manifold (see Figure 5-14) by retracting the sleeve of the hose coupler body and then pulling the coupler body down free of the coupler nipple. Use absorbent cloths to wipe up any fluid leakage.

- (b) Disconnect the coupler body of the purging unit from the nipple of the distribution manifold.
- (c) Disconnect the return line of the hydraulic system from the coupler nipple of the purging unit.

WARNING

Freon can cause frostbite if care is not exercised during handling.

CAUTION

When connecting hydraulic lines, always connect return line first and then connect pressure line. Just before connecting line fittings, thoroughly clean the fittings with Freon.

- (d) Retract the sleeve of the hydraulic system's return hose coupler body and install the coupler body on return nipple of distribution manifold.
 - (e) Connect the coupler body of the pressure hose to the pressure coupler nipple of the distribution manifold.
- (2) In the case of A-frame disc files, remove the center-rear access panel of the file to gain access to the accumulator manifold assembly (see Figure 5-9); also, remove the access panels that will enable access to that portion of the hydraulic power supply located beneath the relief valve (see Figure 5-6). Then disconnect the purging unit from the system as follows:

CAUTION

Always disconnect pressure line first and then disconnect return line.

- (a) Disconnect the hydraulic pressure hose to the accumulator manifold assembly (see Figure 5-9) by retracting the sleeve of the hose coupler body and then pulling the coupler body down free of the coupler nipple. Use absorbent cloths to wipe up any fluid leakage.
- (b) Disconnect the coupler body of the purging unit from the nipple of the accumulator manifold assembly.

5-9-2-2 Procedure (Cont.)

- (c) Disconnect the return line of the hydraulic system from the coupler nipple of the purging unit.

WARNING

Freon can cause frostbite if care is not exercised during handling.

CAUTION

When connecting hydraulic lines, always connect return line first and then connect pressure line. Just before connecting line fittings, thoroughly clean the fittings with Freon.

- (d) Retract the sleeve of the hydraulic system's return hose coupler body and install the coupler body on the return nipple of the accumulator manifold assembly.

- (e) Connect the coupler body of the pressure hose to the pressure coupler nipple of the distribution manifold.

m. With all hydraulic connections made, place the file in the manual operating mode.

n. Press the HYDRAULIC MTR ON pushbutton.

o. Check to ensure that there are no hydraulic leaks in the system. If a leak is detected, immediately shutdown the disc file and perform the required corrective maintenance procedures.

p. If no leakage is detected after five minutes of hydraulic system operation, proceed to operate the file as required.

5-9-3 CHARGING ACCUMULATORS — The accumulators will be recharged whenever their precharge is found to be low.

5-9-3-1 Special Equipment Required — Obtain the following special equipment or their equivalent:

a. Main nitrogen bottle, cylinder style "C".

b. Nitrogen valve, National Cylinder Gas Co. Part No. M-204, or equivalent; valve will have a 3/4-inch inlet and CGA 580 outlet.

c. Regulator valve, Linde Division Part No. 103 x 25 Group R-89, or equivalent; valve will have a CGA 580 inlet and a B-size outlet with RH 9/16-18 right hand threaded nut to fit male elbow.

5-9-3-1 Special Equipment Required (Cont.)

d. One 10-foot charging hose, with a swivel nut on the end to fit adapter valve accumulator and a B-size nut on the other end for connecting to the regulator valve. The hose assembly can be constructed using the following parts, or their equivalents:

- (1) Swivel connector, Greer Olaer Products, Part No. A-768-217.
- (2) Hose, Greer Olaer Products, Part No. A-768-214-1.
- (3) 1/4 NPT coupling, Greer Olaer Products, Part No. A-768-266.
- (4) Tubing, 1/4 NPT to 3/8 tube (9/16-18 ST. THD.).
- (5) Male elbow tube fitting, Parker Part No. 6CBTX-S.

5-9-3-2 Charging Procedures — Precharge the disc file accumulators as follows:

a. Perform the precharge pressure check of the accumulators as directed in paragraph 5-2-2-1 steps a. through e. If low pressure readings are observed, continue with the next step.

b. Prepare the charging equipment as follows:

- (1) Install the nitrogen valve on the nitrogen bottle.
- (2) Connect the regulator valve — with its pressure gage — to the nitrogen valve.
- (3) Connect the male elbow of the hose to the regulator valve.

c. Charge the pint, low-pressure accumulator (see Figure 5-15) as follows:

- (1) Connect the swivel connector of the hose to the air valve of the accumulator.
- (2) Turn the control handle of the regulator valve full ccw.
- (3) Turn the valve of the main nitrogen bottle ccw and observe that high pressure gage on regulator valve indicates at least 1100 psi. If under 1100 psi, obtain a new bottle.
- (4) Gradually turn the control handle of the regulator valve cw until the pressure gage on the low pressure accumulator indicates 40 psig.
- (5) Turn the valve of the main nitrogen bottle full cw and then turn the control handle of the regulator valve full ccw.
- (6) Turn the needle valve on the accumulator manifold assembly two turns ccw.

5-9-3-2 Charging Procedures (Cont.)

- (7) Using a 7/16-inch open-end wrench, rotate the bleeder valve — NOT the air valve — fitting on the pressure gage adapter slightly ccw and bleed the pint, low-pressure accumulator to 12 ± 2 psig; then close the bleeder valve by rotating it cw.

CAUTION

Do not overtighten the needle valve in the next step.

- (8) With bleeding complete, close the needle valve on the accumulator manifold assembly snugly by hand.
- (9) Remove the swivel connector of the hose from the air valve of the accumulator. Install the yellow cap on the air valve and tighten it snugly by hand.

d. Charge the quart high pressure accumulator (see Figure 5-15) as follows:

- (1) Perform the procedures of paragraph c. steps (1) through (5) except in step (4) charge the accumulator to 550 psig.
- (2) Using a 7/16-inch open-end wrench, rotate the bleeder valve — NOT the air valve — fitting on the pressure gage adapter slightly cw and bleed the quart, high-pressure gage accumulator to 500 ± 25 psig; then close the bleeder valve by rotating it ccw.
- (3) Perform the procedure of paragraph c. step (9).

e. Charge the pint high pressure accumulator (see Figure 5-15) as follows:

- (1) Perform the procedures of paragraph c. steps (1) through (5) except in step (4) charge the accumulator to 650 psig.
- (2) Using a 7/16-inch open-end wrench, rotate the bleeder valve — NOT the air valve — on the pressure gage adapter slightly cw and bleed the pint high-pressure accumulator to 600 ± 25 psig; then close the bleeder valve by rotating it ccw.
- (3) Perform the procedure of paragraph c. step (9).

5-9-4 DATA HEAD BAR RETRACTION AND INSERTION — Whenever corrective or preventive maintenance calls for the retraction of the data head bar assemblies, conduct the following procedure:

5-9-4-1 Special Equipment Required — Obtain the following special equipment from the special tools supplied with the disc file:

- a. Positioner bar, Bryant Part No. B-302700.

5-9-4-1 Special Equipment Required (Cont.)

- b. Torque wrench, Bryant Part No. 56840, with adapter, Bryant Part No. 302682

5-9-4-2 Retracting Procedures — Retract the data head bars from the file as follows:

- a. Place the file in the manual operating mode.
- b. Press the HYDRAULIC MTR ON pushbutton.
- c. After approximately two seconds of hydraulic motor operation, press the HEADS ON pushbutton; then press the HEADS OFF pushbutton. This action ensures that the data heads of the head bars are squared parallel to the disc surfaces.
- d. Shut down the disc file and lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17 or 1-24) in the RESET OFF position.

CAUTION

Disc motor operation in the manual mode, never in the automatic operating mode, is permitted only after the heads are fully retracted from the file and only when so specified in a procedure. Turn-on time shall be limited to a maximum of 20 seconds from a complete stop, or a maximum disc speed of 400 rpm, whichever is less. Also, the work area shall be maintained clean and as dust free as possible when performing the subsequent procedures.

- e. When disc rotation stops and with the area surrounding the disc thoroughly cleaned, remove the three access panels from the front of the disc file cabinet.
- f. Remove the four screws securing each of the diode boxes A12 and 13 (see Figure 1-3) to the disc file cabinet frame and pivot the boxes out of the file cabinet

CAUTION

Do not remove wax sealed screws.

- g. Remove the three 1/2-20 x 1-1/2 lg. socket head cap screws securing the positioning system control arm to the systems actuating arm (see Figure 5-20); with the head retraction tool inserted into either boss of the positioning arm, retract the data heads and rocker arms from the file by pulling out and down on the bar.

5-9-4-3 Insertion Procedures — Insert the data head bars into the file as follows:

- a. Shut down the disc file and lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17 or 1-24) in the RESET OFF position.

WARNING

Unless otherwise directed in a procedure, the disc file shall not be turned on until the heads are fully inserted and secured within the disc file.

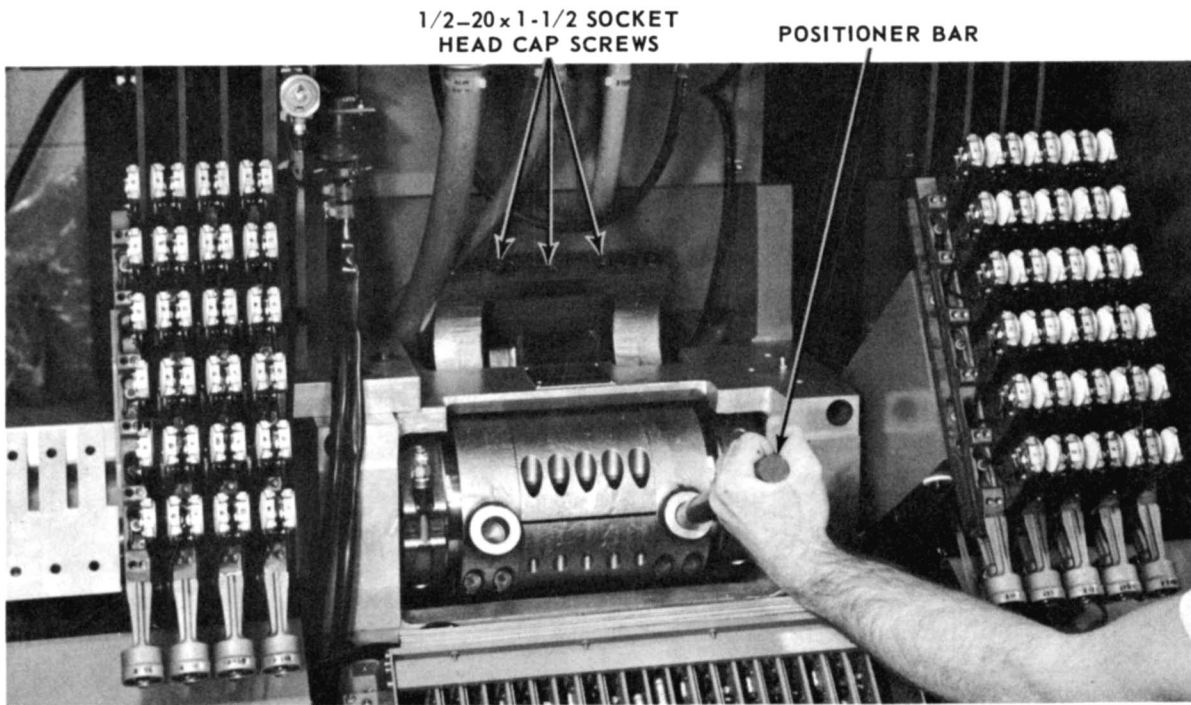


Figure 5-20 Head Bars Retracted From Disc File

5-9-4-3 Insertion Procedures (Cont.)

- b. Before positioning the rocker arms back to the operating position, make sure that all the head pads are stationed in a vertical position.
- c. When the discs stop rotating, insert data heads and rocker arms into the file by pushing in and up on the head retraction tool; just before each row of heads is inserted between the discs, again check to ensure all heads are squared to the disc surfaces.
- d. With the heads fully inserted into the disc file, install the three screws removed in paragraph 5-9-4-2 step g. Using the torque wrench with adapter, tighten all three screws evenly and in small increments starting with the center screw and working from the right screw to the left screw. Torque all three screws to 600 inch pounds.
- e. Reinstall the diode boxes by pivoting them back into position and securing them with the hardware removed in paragraph 5-9-4-2 step f.

CAUTION

Disc motor operation shall not be enabled until the completion of step h.

- f. Place the disc file in the manual operating mode.
- g. Press HYDRAULIC MTR ON pushbutton.
- h. After approximately 2 seconds of hydraulic motor operation, press the HEADS ON pushbutton; this action ensures that the data heads of the head bars are squared parallel to the disc surfaces.
- i. Shutdown the disc file, as applicable.

SECTION 6

CORRECTIVE MAINTENANCE

6-1 INTRODUCTION

Corrective maintenance is limited to those parts that are not classified as proprietary by Bryant, or to those parts in which special or elaborate factory type equipment is not required. This section provides, in part, the procedures for correcting deficiencies incurred in the disc file during normal operation. Procedures for correcting other deficiencies — such as damaged hydraulic hoses, which are replaced every two years on a preventive maintenance schedule — will be found in Section 5. Procedures for correcting deficiencies requiring special training will be found in engineering bulletins, which are furnished customer personnel who participate in Bryant's "Special Factory Training" Program. Though the prescribed maintenance can be performed by qualified technicians, Bryant recommends that required maintenance be performed by Bryant's qualified staff of servicemen who are always on call to perform customer service.

6-1-1 PERSONNEL QUALIFICATIONS — Personnel responsible for maintaining the disc file shall be technically qualified and shall have participated in Bryant's disc file familiarization and training program. When performing corrective maintenance, one man shall be selected to co-ordinate all corrective maintenance activities including establishment of sufficient lead time to assure that all special equipment required in a procedure is available — as well as to assure that all possible caution is taken to protect both personnel and equipment. In addition, each individual performing the corrective maintenance procedures contained herein shall be thoroughly familiar with the manual and automatic turn-on and turn-off procedures as discussed in Section 3.

6-1-2 MAINTENANCE PHILOSOPHY — Corrective maintenance shall be performed based on the individual's knowledge of the operation of the disc file. Such knowledge can be obtained by reading this publication and by participation in Bryant's General and Special Factory Training Programs.

6-1-3 CORRECTIVE MAINTENANCE PERFORMANCE SCHEDULE — It is not intended that this publication give all details as to the replacement of parts within a file, particularly where replacement of the part is obvious or where replacement is based on standard accepted procedures, such as the replacement of an electrical component where wires must be unsoldered or removed from terminal lugs and where some minor mounting hardware must be removed to free the unit from the chassis on which it is mounted. Prime coverage is devoted to the "not so obvious" procedures that one might encounter in the maintenance of the disc file. Areas in which corrective maintenance can be performed by a customer are listed in Table 6-1. If the function is general in nature, reference is made to the applicable engineering bulletin, which is issued to all personnel who attend Bryant's Special Factory Training School.

NOTE

When corrective maintenance is performed, record the action taken, date performed, and operating time of the file; accumulated operating time can be determined as directed in the daily preventive maintenance procedure of paragraph 5-2-1 step g.

TABLE 6-1 CORRECTIVE MAINTENANCE SCHEDULE

Components	Paragraph	Engineering Bulletin (EB)
Solenoid Driver Power Supply	6-2	
Hydraulic Motor/Gear Pump		187
Hydraulic Pump Relief Valve		181
Reservoir Fluid Level Sight Gage-O-Rings	6-3	
Reservoir Magnetic Strainer	5-6-1	
1/2 Micron Filter	5-6-3	
10-Micron Filter	5-6-4	
20-Micron Filter	5-6-5	
5-Micron Filter	5-6-6	
Hydraulic Power Supply Hoses	5-7-1	
Boost Hoses	5-7-2	
Accumulator, Pressure Gage Adapter, and Pressure Gage	5-7-3	
Head and Positioner Valve Assemblies A15S1 and A15S3	6-4	
Duplex Pressure Switch A15S2	6-5	
Tachometer and Temperature Meter Box	6-6	
Tachometer Probe	6-7	
Disc Motor Drive Belts	6-8	
Digital Actuator		136
Digital Actuator Solenoid Valves		136
Digital Actuator End Cap and Seals		128, 193
Power Boost		136
Positioning System	6-9	
Head Bar Assemblies	6-10	
Head Bar Assembly Hydraulic Cylinder		188, 189
Individual Head Pads		161, 162
Disc Assemblies	6-11	
Access Panels	6-12	
Hydraulic Oil Low Level, Over-Temperature and High Pressure Switches	6-13	
Miscellaneous Electro/Hydraulic Components	6-14	

6-1-4 GENERAL WARNINGS AND CAUTIONS – The performance of preventive maintenance often necessitates entrance into areas that are not directly affected by the procedure that is being performed, but which could pose a hazard to personnel and equipment. For this reason the following shall be observed when performing preventive maintenance procedures:

6-1-4 GENERAL WARNINGS AND CAUTIONS (Cont.)

- a. Before access panels are removed, thoroughly clean the area surrounding the disc file cabinet(s). Then — throughout maintenance, maintain the area as dust free as possible.
- b. Whenever possible, wait for discs to stop rotating before removing disc file cabinet access panels. Keep file operation at a minimum when access panels are removed.
- c. When maintenance is being performed, always notify the remote operating station — if used. The best protection is to set the RESET OFF -TRIP ON circuit breaker of the power control unit's panel to RESET OFF or place the file in the manual operating mode.
- d. Never touch disc surfaces with bare hands; always wear gloves. Never allow objects to contact disc surfaces.
- e. As a general rule, exercise extreme care when working around bare electrical wiring, rotating discs, or longitudinally moving mechanical members — such as the digital actuator or boost.
- f. Whenever hydraulic lines are disconnected, always disconnect the pressure line first and then the return line. When reconnecting hydraulic lines, always connect the return line first and then the pressure line.
- g. Whenever a hydraulic line is disconnected, spray the disconnected lines with Freon — prefiltered to ASTM Class 3 Contamination Level — and cover the connections. Before reconnecting the lines, again spray the fittings with prefiltered Freon.
- h. Never leave cabinet interiors unnecessarily exposed. Always install all access panels on disc file cabinet(s) when required corrective maintenance is completed or when the corrective maintenance procedures are to be interrupted for a period of time.
- i. Never operate the file on-line with access panels removed.

6-2 SOLENOID DRIVER POWER SUPPLY

Repair of the solenoid driver power supply (see Figure 1-17 or 1-24) shall be accomplished based on the users knowledge of the principle of operation of the supply and their capability of exercising standard electronic component troubleshooting and repair techniques. In lieu of this maintenance philosophy, the procedures herein shall be limited to only the replacement and adjustment of the supply.

NOTE

Component adjustments are generally accessible through the grille provided across the top of the assembly. To replace the components on the assembly, it is generally necessary to only remove the grille; before removing the grille, however, it is recommended that the supply be shutdown.

6-2 SOLENOID DRIVER POWER SUPPLY (Cont.)

The electronic circuit modules — SD1, SD2, and PSC — provided on the supply are plug-in types and can be removed by pulling them up and out of the connectors into which they are inserted.

6-2-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

- a. Standard Ohmmeter and d-c voltmeter
- b. Jumper wires adaptable to the front panel test points of the solenoid driver power supply (see Figure 3-6).

6-2-2 REMOVAL AND INSTALLATION PROCEDURES — The following procedures cover the complete removal of the solenoid driver power supply from either the power control unit cabinet of B- and C-frame files or from the disc file cabinet of A-frame files. However, it is not necessary to completely remove the drawer from the cabinet to conduct internal adjustments or card replacement.

6-2-2-1 Removal Procedure — Remove the solenoid driver power supply drawer from the cabinet as follows:

- a. Shut down the disc file.
- b. With the area surrounding the cabinet thoroughly cleaned, remove the cabinet panels that will enable access to the supply (see Figure 1-17 or 1-24).
- c. Remove the two screws securing the front left- and right-sides of the supply to the cabinet enclosure.
- d. Pull the drawer out along the metal frame tracks until the drawer locks in the extended position.

NOTE

In the next step, removal of the top access panel may facilitate connector removal and installation.

- e. Remove the three electrical connectors secured to the rear connectors of the drawer, remove the ground lead secured to the left-rear flange of the undersurface of the supply, and remove the ground lead.

WARNING

Because of the weight of the power supply, two men should be used in removing the supply from the cabinet.

6-2-2-1 Removal Procedure (Cont.)

f. Press the pushbuttons that protrude from the sides of the drawer to release the detent locking action and remove the solenoid driver power supply drawer assembly from the cabinet.

6-2-2-2 Installation Procedure — Install the solenoid driver power supply by reversing the removal procedures; be sure to press the fold-in handles in against the front panel before attempting to install the side access panel of the cabinet.

6-2-3 ADJUSTMENT PROCEDURE — After repair or replacement of power supply control (PSC) card, Bryant Part No. 6161, perform the following tests and adjustments.

- a. Withdraw the supply from the cabinet as directed in paragraph 6-2-2-1 steps a. thru d.
- b. Set main circuit breaker CBI on front panel of solenoid driver power supply to OFF.
- c. Remove cannon plugs P2 and P3 from the rear of the supply.
- d. Adjust overcurrent trip control variable resistor R14 on power supply control (PSC) card (see Figure 6-1) full cw.
- e. Using an ohmmeter, check between test points READY SIG TP4 and GRD TP3 located on front panel of solenoid driver power supply and observe that there is some measurable resistance; disconnect ohmmeter.

WARNING

Operation of the disc file in manual mode in the next step ensures — provided the file ready for use interlock of the starting control system is properly used — that only local commands will enable selection of positioning of the digital actuator.

CAUTION

Be sure ohmmeter is disconnected from circuit prior to step f.

f. Place the file in the manual operating mode. Then, initiate DISC MOTOR ON, HYDRAULIC MTR. ON, HEADS ON, and ELECTRONICS ON OPERATION, in sequence.

- g. Set main circuit breaker CBI of the solenoid driver power supply to ON.

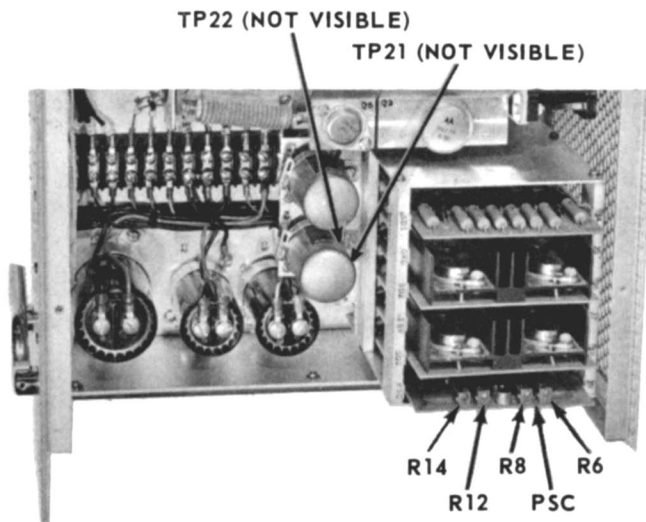


Figure 6-1 Solenoid Driver Power Supply, Top View—Adjustment and Test Points

h. Using test point GRD TP3 as reference, check voltage outputs at the following test points on front panel of solenoid driver power supply.

- (1) At test point +7VTP1, observe a meter indication of +7 volts \pm 1 volt.
- (2) Connect voltmeter to test point -28VTP2; while adjusting voltage output control variable resistor R12 located on power control card (see Figure 6-1), observe that full cw and ccw settings cause the voltmeter to indicate from -25 to -32 volts. After observing range limits, set R12 for an output voltage of -28 volts.

i. Establish the operational current level of the supply just above the trip point. This action provides overcurrent protection for the solenoids while avoiding false release of the circuit trip gate that may result from normal turn-on surge currents. During the test, monitor the -28 volt at test point -28V TP2 using the d-c voltmeter.

- (1) Set main circuit breaker CB1 of the solenoid driver power supply to OFF.
- (2) Adjust overcurrent trip R14 full ccw.
- (3) Set main circuit breaker CB1 to ON.
- (4) Observe voltage indicated on the voltmeter. If the voltmeter indicates some value less than -28 volts, proceed to step (5). If the voltmeter indicates -28 volts, proceed to step (6).
- (5) Repeat steps (1) through (4), except in step (2) adjust R14 in small increments cw until -28 volts is indicated on the voltmeter.
- (6) Jumper test point READY SIG TP4 to test point GRD TP3; observe that the -28 volts decreases to -5 volts as indicated on the voltmeter.
- (7) Remove the jumper connected in step (6) and observe that the -5 volts return to -28 volts as indicated on the voltmeter. If the -28 volt value fails to indicate on the voltmeter, adjust R14 one-half turn ccw and continue to repeat step (6) and this step until the -28 volts is indicated on the voltmeter.

j. Establish the under/over trip points of the supply as follows:

NOTE

This procedure need not be performed if under/over voltage sensing is not required in the user's logic circuits.

- (1) At the front panel of the solenoid driver power supply, connect a voltmeter to test point -28V TP2; connect an ohmmeter between test points TP21 and TP22 (see Figure 6-1). Maintain these connections throughout the adjustment procedures.

ADJUSTMENT PROCEDURE (Cont.)

- (2) Adjust voltage output control R12 ccw until the voltmeter indicates -26 volts.
- (3) Adjust under/over-voltage trip control variable resistors R6 and R8 on power control card full cw.
- (4) Adjust under-voltage trip control R6 ccw until relay contacts close as indicated on ohmmeter.
- (5) Adjust under-voltage trip control R6 cw until relay contacts just open as indicated on ohmmeter and leave at this setting.
- (6) Adjust voltage output control R12 cw until voltmeter indicates -30 volts. Observe ohmmeter to check that relay contacts are closed at this time.
- (7) Adjust over-voltage trip control R8 ccw until relay contacts just open as indicated on the ohmmeter.
- (8) Adjust voltage output control R12 ccw until voltmeter indicates -28 volts. Observe that the relay contacts are closed at this time as indicated on the ohmmeter.

k. Check the operation of the solenoid driver cards SD1 and SD2 (see Figure 1-23) as follows:

- (1) Set main circuit breaker CBI of the solenoid driver power supply to ON.
- (2) On the front panel of the solenoid driver power supply, ground INPUT test points TP5 through TP 11 and observe that zero volts is indicated on a voltmeter when connected to each of the OUTPUT test points TP13 through TP 19.
- (3) Remove the ground from INPUT test points TP5 through TP 11 and observe that -27.5 volts is indicated on a voltmeter when connected to each of the OUTPUT test points TP13 through TP 19.
- (4) If an improper voltage indication was observed in step (2) or (3), replace the solenoid driver card associated with the corresponding test point failure and repeat the test.

l. Set main circuit breaker CBI of solenoid driver power supply to OFF and reconnect Cannon connectors P2 and P3 to the rear of the supply.

6-3 RESERVOIR FLUID LEVEL SIGHT GAGE O-RINGS

Replacement of the reservoir fluid level sight gage O-rings is a time consuming job and should be performed when sufficient maintenance time is available.

6-3-1 SPECIAL EQUIPMENT REQUIRED — Obtain six O-rings, Bryant Part No. B-54149-9, or equivalent.

6-3-2 REPLACEMENT PROCEDURES — Replace the O-rings of the reservoir fluid level sight gage as follows:

- a. Perform the preventive maintenance procedure of paragraph 5-6-1-2 steps a. through i.
 - b. Remove two nuts and flat washers from the back of the fluid level sight gage (see Figure 1-21).
 - c. Remove sight gage by removing retaining bolts.
 - d. Replace the three O-rings of each retaining bolt and re-install sight gage.
 - e. Continue with the preventive maintenance procedure of paragraph 5-6-1-2 steps j. through q. and t. and u; steps r. through s. of paragraph 5-6-1-2 shall be performed only as applicable.

6-4 HEAD AND POSITIONER VALVE ASSEMBLIES A15S1 and A15S3

The following replacement procedures apply to either the Head Valve A15S1 or the Positioner Valve A15S3 assemblies secured to the manifold on either side of the junction box of the accumulator manifold assembly (see Figure 6-2). When replacing a defective electrical solenoid, or a complete valve assembly, be sure to order a solenoid, or an assembly with a solenoid, that conforms to the site-power line frequency (either 50 or 60 cycle). The subsequent procedures consider replacement of the electrical solenoid of the valve assembly, replacement of the O-rings of the valve assembly, or replacement of the complete valve assembly.

6-4-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

a. If only the electrical solenoid of the assembly is to be replaced, obtain either of the following, depending on the frequency of the power source available at the facility:

(1) Solenoid, 115 volt/60 cycle, Bryant Part No. C-56182-3, with gasket, Bryant Part No. B56869-2.

(2) Solenoid, 115 volt/50 cycle, Bryant Part No. C-56182-4, with gasket, Bryant Part No. B56869-2.

b. If the valve is to be replaced as an entire assembly, obtain either of the following, depending on the frequency of the power source available at the facility (parts shall be as received precleaned and sealed by Bryant).

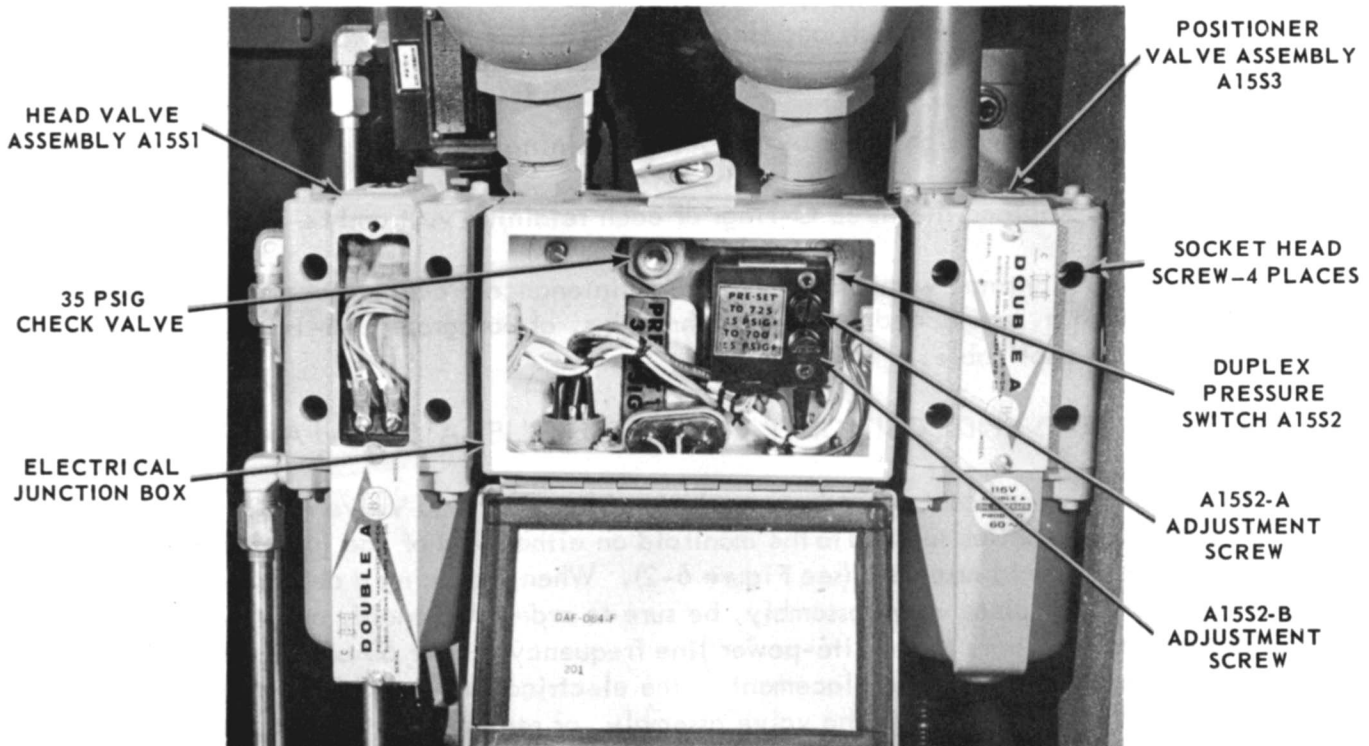


Figure 6-2 Accumulator Manifold Assembly, Interior View of Junction Box and Solenoid—Wiring and Adjustment Points

6-4-1 SPECIAL EQUIPMENT REQUIRED (Cont.)

(1) Valve, 115 volt/60 cycle, Bryant Part No. C-56182-1.

(2) Valve, 115 volt/60 cycle, Bryant Part No. C-56182-2.

c. If only the O-rings between the valve body and the manifold block are to be replaced, obtain five O-rings, Bryant Part No. B-54149-14 as received precleaned and sealed by Bryant.

d. If the items of steps b. or c. are to be replaced, obtain the torque wrench, Bryant Part No. A-56840, from the special tools supplied with the disc file.

e. White petroleum jelly.

6-4-2 ELECTRICAL SOLENOID REPLACEMENT — Replace the electrical solenoid portion of the valve assembly as follows:

a. Shutdown the disc file and lock the RESET OFF/ TRIP ON circuit breaker in the RESET OFF position.

b. When disc rotation stops and with the area surrounding the disc file thoroughly clean, remove the center-rear access panel from the file cabinet.

c. Remove four screws and lockwashers securing the defective electrical solenoid of the appropriate valve assembly (see Figure 6-2) to the underside of the valve body (see Figure 6-3) and carefully remove the solenoid from the mating electrical connector in the valve body.

d. Install the new electrical solenoid by reversing the removal procedures being careful when mating the electrical connector of the solenoid to the connector of the valve body.

6-4-3 O-RING REPLACEMENT — Replace the O-rings of the valve assembly as follows:

a. Shutdown the disc file.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the subsequent procedures.

b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the center-rear access panel of the disc file cabinet.

c. Remove the upper screw securing the DOUBLE A nameplate to the valve body of the valve assembly on which work is to be performed and rotate the nameplate out of position (see Figure 6-2).

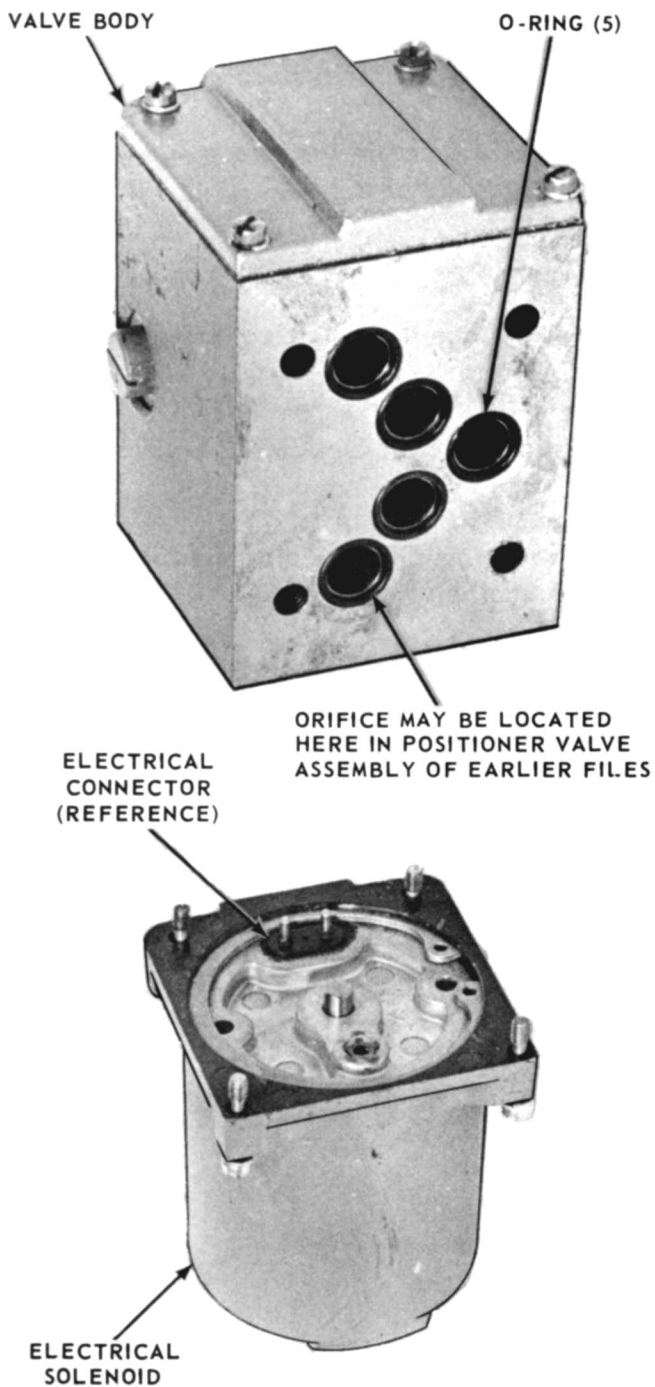


Figure 6-3 Head or Positioner Valve Assembly A15S1 or A15S3, Exploded View

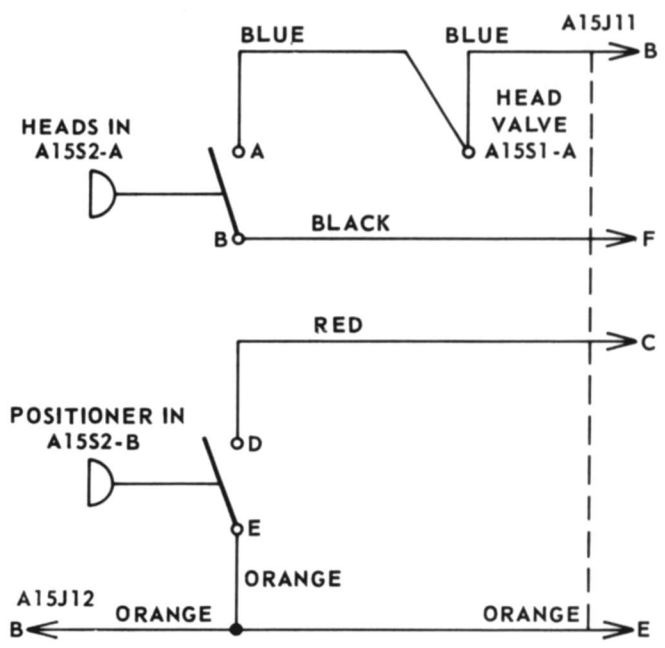


Figure 6-4 Duplex Pressure Switch A15S2, Wiring Connections Within Junction Box of Accumulator Manifold Assembly

6-4-3 O-RING REPLACEMENT (Cont.)

d. Remove and tag the electrical wires (see Figure 6-2) attached to the terminals located inside the valve body (see Figure 6-3).

e. Open the hinged cover of the electrical junction box of the accumulator manifold assembly and draw the wires removed in step d. into the junction box.

f. From within the junction box, remove the nipple, bushing and gasket joining the valve assembly and junction box.

g. Remove four socket head screws and associated lockwashers securing the valve assembly to the manifold of the accumulator manifold assembly. As the valve assembly is withdrawn from the manifold, use lint free cloths to absorb oil.

h. Replace the five O-rings in the machined face of the valve body (see Figure 6-3); before installing the O-rings, coat each ring with white petroleum jelly.

i. Reinstall the valve assembly on the accumulator manifold assembly by reversing the removal procedures; torque each of the socket head screws of step g. to 70 to 80 inch pounds.

j. Place the file in the automatic operating mode.

k. Allow the file to operate for approximately 15 minutes to enable the hydraulic system to purge itself of air. During operation observe that the valve on which corrective maintenance was performed is not leaking.

l. Shutdown the disc file, as applicable.

6-4-4 VALVE ASSEMBLY REPLACEMENT — Replacement of the entire valve assembly is accomplished in the same manner as that of paragraph 6-4-3 except that in step h. coat each of the O-rings supplied with the replacement valve with petroleum jelly. Also, remove the appropriate plug from the side of the valve body (the plug that is to be removed depends on the side of the electrical junction box on which the valve is to be installed); attach the nameplate of the old valve assembly to the top of the replacement valve assembly; and if corrective maintenance is being performed on an early model disc file, remove orifice provided in the "A15S3 Positioner Valve" assembly being replaced (see Figure 6-3) and insert the orifice in the same part of the replacement valve assembly.

6-5 DUPLEX PRESSURE SWITCH A15S2

Replace the duplex pressure switch "Heads In A15S2-A" and "Positioner In A15S2-B" located in the electrical junction box of the accumulator manifold assembly (see Figure 6-2) by performing the subsequent procedures.

6-5-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

a. Absorbent cloth.

b. Duplex pressure switch, Bryant Part No. B-56171, with PRE-SET label, Bryant Part No. C-302690-5.

6-5-2 REPLACEMENT PROCEDURES — Remove the defective duplex pressure switch and install a new one in its place as follows:

- a. Shutdown the disc file.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the subsequent procedure.

- b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the rear-center access panel from the file cabinet.

- c. Open the hinged cover of the electrical junction box of the accumulator manifold assembly (see Figure 6-2).

- d. Position absorbent cloth around the duplex switch, remove two socket head screws, and remove the switch from the junction box.

- e. Remove the upper screw securing the DOUBLE A nameplate to the Head Valve A15S1 and rotate nameplate out of position.

- f. Disconnect the electrical wires of the duplex switch A15S2 from the terminal connections inside the junction box and from the one connection to the Head Valve A15S1.

- g. Install PRE-SET label on new duplex pressure switch and install switch in junction box by reversing steps f. through d. Refer to the schematic wiring diagram (see Figure 6-4) for proper electrical connections.

- h. Place the disc file in the manual operating mode.

- i. Press the HYDRAULIC MTR ON pushbutton.

- j. After two minutes of hydraulic pump operation, check that there is no oil leakage around the newly installed duplex pressure switch.

- k. With no leaks observed, proceed to the adjustment procedures of paragraph 6-5-3.

6-5-3 ADJUSTMENT PROCEDURES — Adjust the duplex pressure switch as follows:

- a. Perform the procedures of paragraph 6-5-2a. through c. if not already accomplished.

- b. Adjust the screw of the Heads-in pressure switch A15S2-A (see Figure 6-2) full ccw.

- c. When facing the front of the file, remove the access panel from the left side of the power control unit on B- and C-frame files or from the left side of the disc file cabinet on A-frame files.

6-5-3 ADJUSTMENT PROCEDURES (Cont.)

d. Place the file in the manual operating mode and initiate DISC MOTOR ON, HYDRAULIC MTR ON, and HEADS ON operation. Observe that the head pads of the file move into the "flying attitude". If not, replace the duplex pressure switch A15S2 as directed in paragraph 6-5-2.

e. With the procedure of step "d" satisfactorily completed, observe that pressure gage of the quart high pressure accumulator of the accumulator manifold assembly (see Figure 1-15) indicates 925 ± 25 psig .

f. Turn the adjustment nut of the relief valve (see Figure 6-5) of the hydraulic power supply (see Figure 1-19 or 1-26) ccw until the pressure gage of the quart accumulator indicates 700 psig.

g. Slowly adjust the screw of the Heads-in pressure switch A15S2-A (see Figure 6-2) cw until the heads are observed to move to the retracted attitude (away from the disc surfaces).

h. Turn the adjusting nut on the relief valve (see Figure 6-5) cw until the pressure gage of the quart accumulator indicates 800 psig; then, turn the adjusting nut ccw until the head pads just come away from the disc surfaces. Record the hydraulic pressure gage indication at the time this happens; this indication shall be 700 ± 5 psig.

i. If the indication of step h. is not correct, incrementally adjust A15S2-A in the appropriate direction to compensate for an over- or under- indication and repeat step h.

j. Adjust the screw of the Positioner-In pressure switch A15S2-B (see Figure 6-2) full ccw.

k. Turn the adjustment nut of the relief valve (see Figure 6-5) cw until the pressure gage of the quart accumulator indicates 800 psig or until heads move to the "flying attitude); then, turn the adjustment nut ccw until the pressure gage of the quart accumulator indicates 725 psig.

l. Turn the adjusting screw of the Positioner-In pressure switch A15S2-B (see Figure 6-2) cw until the AUTOMATIC ON pushbutton of the pushbutton station glows dim red.

m. Turn adjusting nut of the relief valve (see Figure 6-5) cw until the hydraulic system pressure gage indicates 800 psig or until the AUTOMATIC ON pushbutton glows bright red. Then turn adjusting nut of relief valve ccw until button again glows dim red; record the indication of the pressure gage of the quart accumulator at the time this happens. This indication shall be 725 ± 5 psig.

n. If the indication of step m. is not correct, incrementally adjust A15S2-B in the appropriate direction to compensate for an over- or under- indication and repeat step m.

6-6 TACHOMETER/TEMPERATURE METER BOX AND TEMPERATURE PROBE

The tachometer/temperature meter box is included as a subassembly within the pushbutton station assembly. The circuits within the box are impedance matched to a temperature probe

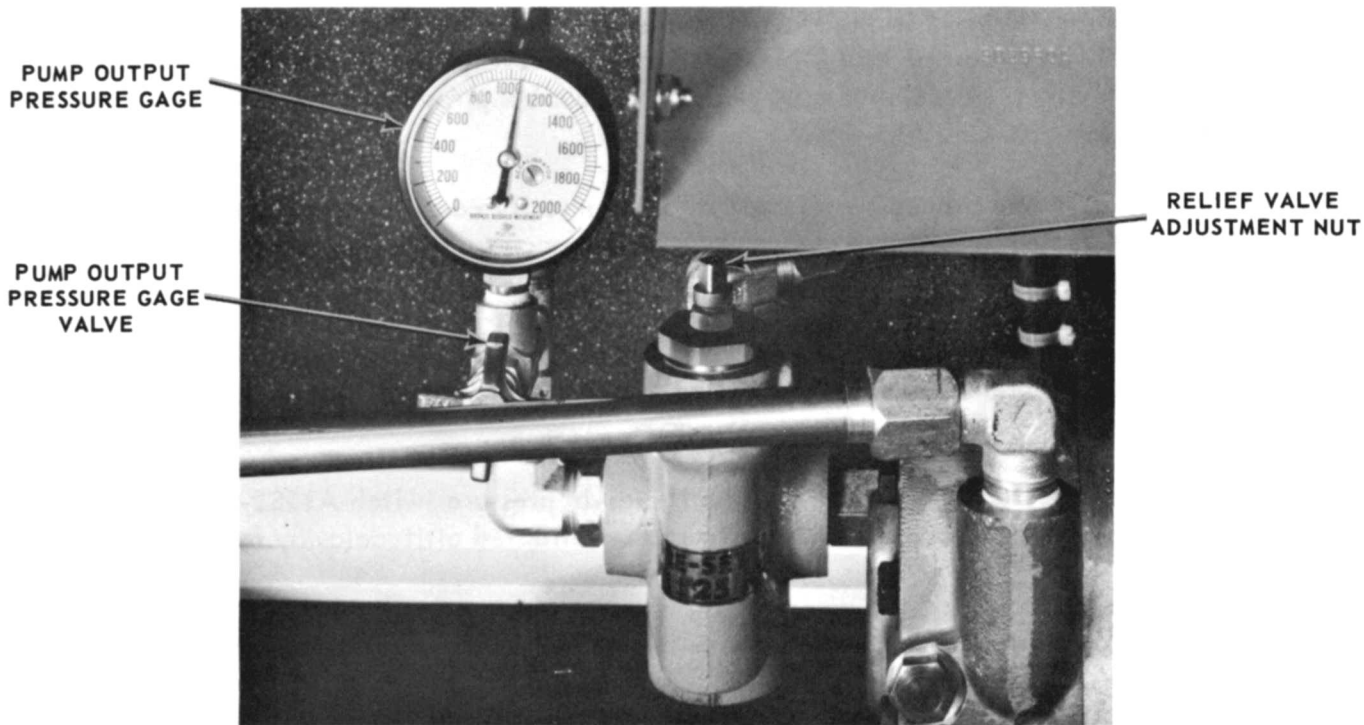


Figure 6-5 Hydraulic Power Supply—Location of Relief Valve Output Pressure Adjustment

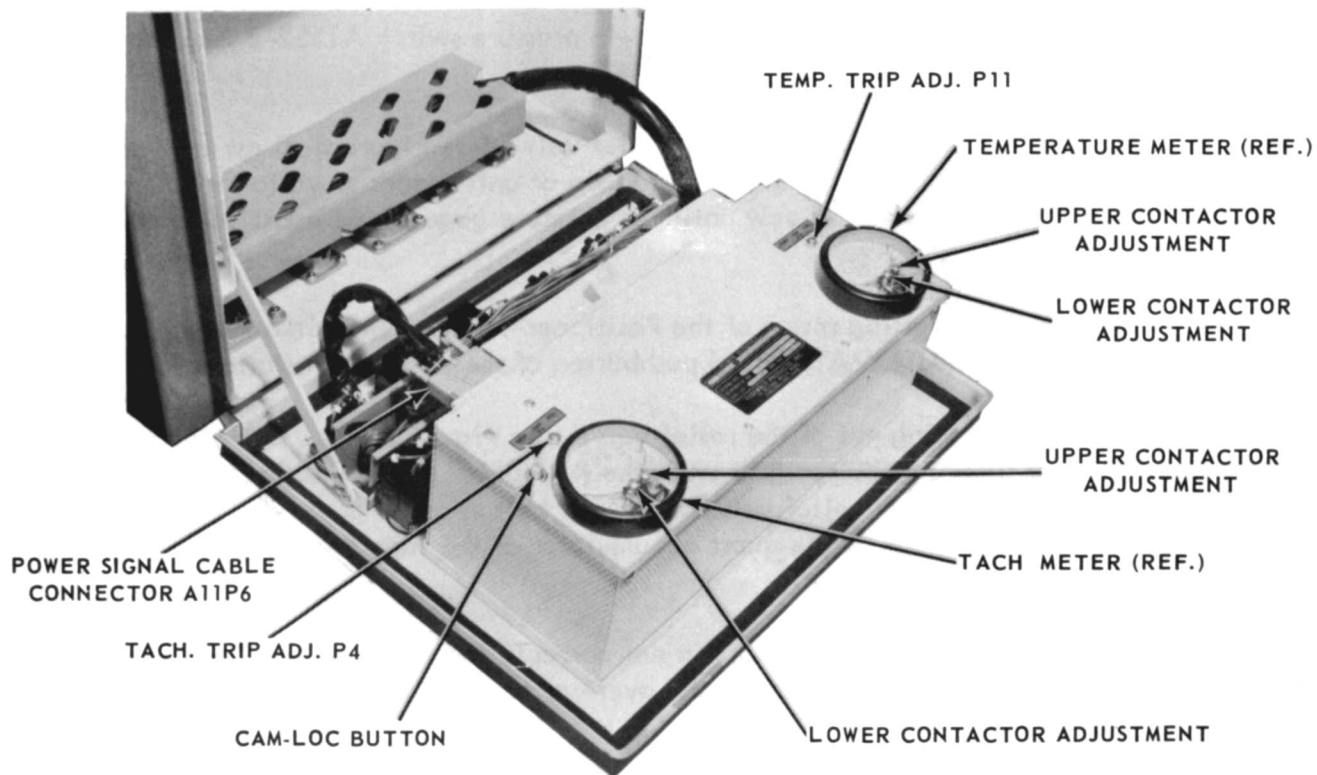


Figure 6-6 Tachometer/Temperature Meter Box, Rear View—Adjustment Points

6-6 TACHOMETER/TEMPERATURE METER BOX AND TEMPERATURE PROBE (Cont.)

so that only the one box and probe can be used together. Should either the probe or box fail, both items must be replaced by another matched pair. The tachometer probe, which is not so matched to the circuits within the box, can be replaced with the entire unit or on an individual basis as described in paragraph 6-7.

6-6-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

- a. Simpson Multimeter, Series 269, or equivalent.
- b. Set of feeler gages.
- c. Tachometer/Temperature Meter Assembly, Bryant Part No. D-56184-1 (900 rpm machine) or Bryant Part No. D-56184-2 (1200 rpm machine).

6-6-2 REPLACEMENT PROCEDURES — Replace the defective tachometer/temperature meter box and temperature probe as follows:

- a. Shutdown the disc file.
- b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove front-center access panel from file cabinet.
- c. Loosen the two latches securing the top edge of the pushbutton station assembly and lower the hinged front panel.
- d. Depress and rotate the two Cam-Loc buttons protruding from the rear of the tachometer and temperature meter box (see Figure 6-6) and open the hinged back panel of the box (see Figure 6-7).
- e. Disconnect the two wires from both the DISC FILE R.P.M. and °F FILE TEMP. meters. Tag the wires for subsequent reassembly of the meter to the box.

NOTE

Meters are withdrawn from the front of the pushbutton station panel in the next steps.

- f. Remove two screws and two retaining springs that secure each of the two meters of step e. to the pushbutton station front panel. By applying pressure to the back of each meter and while supporting the front of the meter, carefully push each meter out of the front panel of the pushbutton station.
- g. Loosen two screws and remove the power signal cable connector A11P6 (see Figure 6-6) from the bottom of the box.
- h. Remove plastic caps from reset buttons (see Figure 3-1) protruding from front panel below the meter openings of the pushbutton station assembly.

RETAINING
NUTS (4)

DISC FILE R.P.M.
METER

°F FILE TEMP.
METER

METER RETAINING SPRING
(TWO PER METER)

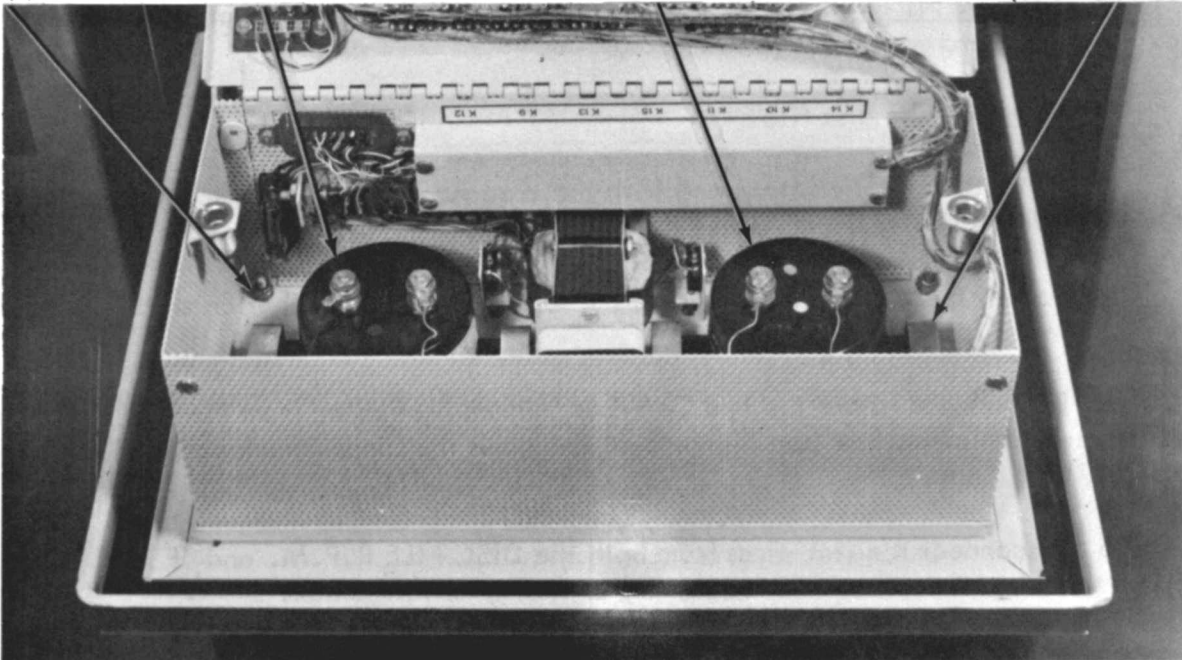


Figure 6-7 Tachometer/Temperature Meter Box, Interior View—Location of Mounting Hardware

6-6-2 REPLACEMENT PROCEDURES (Cont.)

- i. Remove four retaining nuts (see Figure 6-7) securing box to studs inside of pushbutton station and carefully lift the tachometer and temperature meter box from the pushbutton station assembly.
- j. Remove two electrical leads from the file Temp Probe A15A1 (see Figure 1-9). Remove the four screws securing the probe to the pedestal and remove the probe from the file.
- k. Assemble the DISC FILE R.P.M. and °F. FILE TEMP. meters to the removed tachometer/temperature meter box and prepare the box along with the "A15A1 File Temp Probe" for shipment back to Bryant for refund evaluation.
- l. Install the new tachometer/temperature meter box and matched "A15A1 File Temp Probe" by essentially reversing the order of removal (steps k. through c.).

6-6-3 ADJUSTMENT PROCEDURES — Test and adjust the various components of the tachometer/temperature meter assembly as follows:

- a. Shutdown the disc file.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the following procedures.

- b. When disc rotation stops and with the area surrounding the file thoroughly cleaned, remove the center-front access panel from the file cabinet.
- c. Disconnect the tachometer probe cable connector A11P4 from the undersurface of the pushbutton station assembly.
- d. Place the file in the manual operating mode.
- e. Press the DISC MOTOR ON pushbutton.
- f. Set the multimeter to the 10-vac range and connect the meter across cable connector A11P4 pins A and B.
- g. With the disc motor up to speed, observe that voltmeter indicates 4 volts ± 1 v rms. If this value is above or below the prescribed limits and if it is assured that the disc motor is performing satisfactorily and that its drive belts are sufficiently taught, adjust the tachometer probe as directed in paragraph 6-7-3 steps a. through l. or until the desired indication is achieved.
- h. With the indication of step g. achieved, shutdown the disc file.
- i. Connect tachometer cable connector A11P4 to A11J4 in the bottom of the pushbutton station assembly.

6-6-3 ADJUSTMENT PROCEDURES (Cont.)

j. Remove front access panel of the power control unit of B- and C- frame files or the left-front panel of the A-frame file; remove HEADS-IN fuse A21F3 from the power control panel of the unit.

k. Loosen the two top latch screws located on the pushbutton station assembly and lower the hinged front panel.

l. Set upper and lower contactors on both the TACH and TEMP meters (see Figure 6-6) to the limits prescribed for the site. Bryant standard settings are: low tachometer contactor is set 30 rpm below running speed and high tachometer contactor is set 10 rpm above running speed; low temperature contactor is set at 70°F. and high temperature contactor is set at 90°F.

CAUTION

TEMP TRIP ADJ. P11 (see Figure 6-6) is factory set and shall not be adjusted.

m. Adjust TACH TRIP ADJ. P4 full ccw.

n. Place file in manual operating mode.

o. Press DISC MOTOR ON pushbutton.

p. With the disc motor up to speed, adjust P4 cw until the rear meter speed needle makes contact with the upper limit contactor; then adjust P4 an additional two turns cw.

q. Press DISC MOTOR OFF pushbutton.

r. When disc motor speed decreases below the minimum speed indicated on the front panel DISC FILE R.P.M. meter, press DISC MOTOR ON pushbutton.

CAUTION

Never set "heads-in" speed for more than 20 rpm below optimum running speed.

s. While maintaining HEADS ON pushbutton depressed, observe the speed at which the needle of the front panel DISC FILE R.P.M. meter hesitates. The needle hesitation point indicates the speed at which the heads of the file will be placed into the "flying attitude". Adjust control P4 and repeat the procedures starting with step q. to establish the desired speed at which the heads will be placed into the flying attitude.

t. Shutdown the disc file.

u. With all power off, install HEADS-IN fuse A21F3 in power control panel of power control unit.

6-6-3 ADJUSTMENT PROCEDURES (Cont.)

v. Place the file in the automatic operating mode and allow file to remain fully operational for 1-1/2 hours in the case of A- and B- frame files or 2-1/2 to 3 hours in the case of C- frame files. With the temperature thermally stabilized, record optimum temperature indicated by the TEMP meter (see Figure 6-6) in the disc file log. Reset upper and lower limits of TEMP meter to within ± 5 degrees of the stabilizing temperature recorded in the log.

6-7 TACHOMETER PROBE

The tachometer probe can be replaced independent of the tachometer and temperature meter box.

6-7-1 SPECIAL EQUIPMENT REQUIRED — Obtain a tachometer probe, Bryant Part No. B-56124.

6-7-2 REPLACEMENT PROCEDURES — Replace the tachometer probe as follows:

a. Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker in the RESET OFF position.

WARNING

The discs shall not be rotating when performing the following procedures.

CAUTION

Two technicians are required for the next step; one should hold the pushbutton station assembly as the other removes attaching hardware. Also, the area shall be maintained thoroughly clean and as dust free as possible.

b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the front access panels of the file.

c. Remove screws attaching the pushbutton station to the support brackets of the file cabinet and lower the assembly onto a suitable support. Leave the cables connected to the bottom of the assembly to enable local, manual operation.

d. Loosen the quick-disconnect button screws and remove the dust panel from the front of the disc motor compartment (see Figure 6-8) of the pedestal assembly.

e. Remove cable connector A15P14 from the tachometer probe.

f. By reaching down between the pedestal and lower-front dust cover of the pedestal, loosen locking nut of tachometer probe (see Figure 6-9) and unscrew the probe from the pedestal standoff bracket.

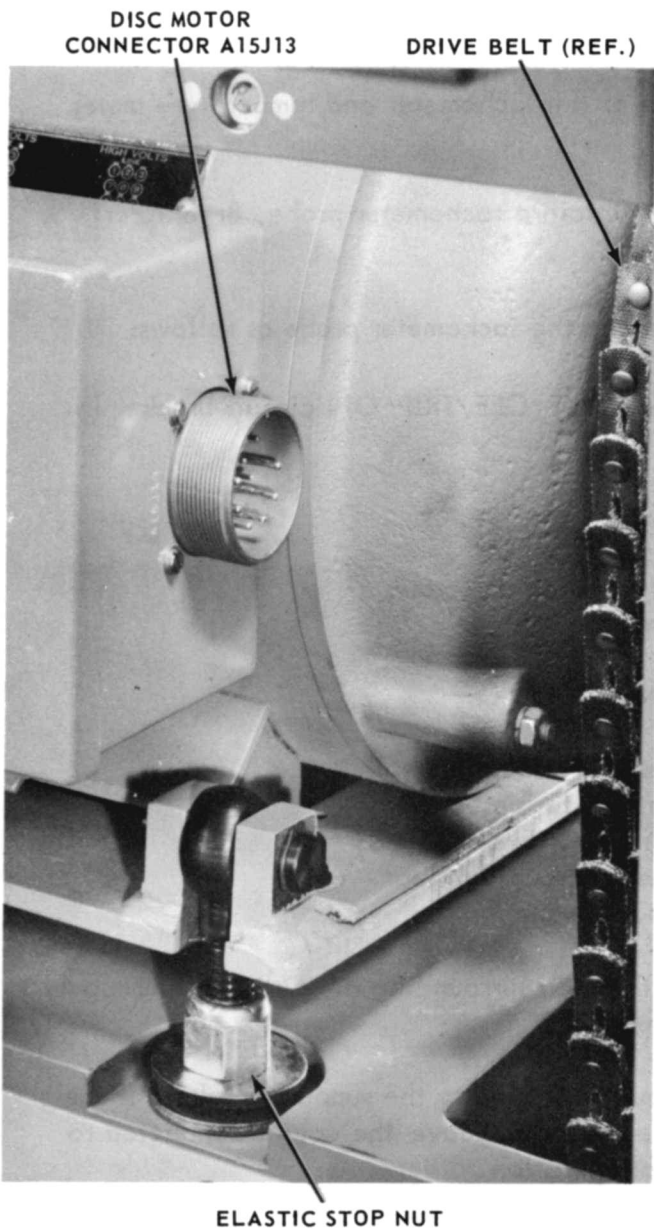


Figure 6-8 Disc Motor Compartment, Interior View—Adjustment Point

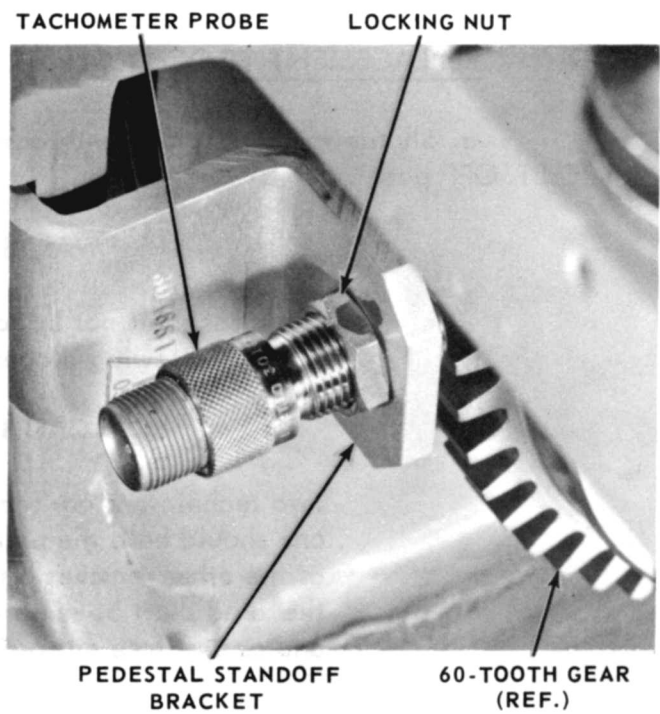


Figure 6-9 Tachometer Probe—Location of Mounting Hardware

6-7-2 REPLACEMENT PROCEDURES (Cont.)

CAUTION

In the next step, ensure that the locking nut secures the probe in place before proceeding to probe mounting.

g. Install the new tachometer probe in the pedestal standoff bracket. Turn the tachometer probe body to within 0.015 inch — as indicated by use of a feeler gage — of one of the projecting teeth of the 60 tooth gear mounted on the spindle. Then, using the locking nut of the probe, secure the probe to the pedestal standoff bracket.

h. Install cable connector A15P14 on the new tachometer probe.

i. Check the tachometer probe playback as described in paragraph 6-7-3 starting with step b.

6-7-3 ADJUSTMENT PROCEDURES — Adjust the tachometer probe as follows:

a. Perform the procedures of paragraph 6-7-2a. through e., as applicable.

b. Place the file in the manual operating mode.

c. Press the DISC MOTOR ON pushbutton.

d. With the disc motor up to speed, connect a multimeter — set to the 10 vac range — across pins A and B of the tachometer probe. Observe that voltmeter indicates 4 volts ± 1 rms. If the indication is unsatisfactory, proceed to step e. Otherwise, proceed to step f.

e. If the indicated tachometer probe voltage was out of tolerance, proceed as follows:

(1) Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker in the RESET OFF position.

WARNING

The discs shall not be rotating when performing the procedures of steps (2) and (3).

(2) Reaching down between the pedestal casting and the lower-front dust cover of the pedestal, loosen the locking nut of the tachometer probe (see Figure 6-9).

CAUTION

In order to prevent damage to the magnetic head of the probe during spindle rotation, the gap between the magnetic head and the 60-tooth gear should never be adjusted to less than 0.005 inch.

If the voltage of the probe is insufficient with this close an adjustment, replace the probe with a new probe.

- (3) If the voltage from the probe was low, rotate the probe slightly cw; if the voltage was high, rotate the probe slightly ccw.

CAUTION

Be sure that the locking nut of the probe is secure in the next step before proceeding to disc motor turn on.

- (4) Tighten the locking nut of the tachometer probe.

- (5) Repeat the procedure of steps b. through d. until the indication of step d. is obtained.

f. With the indication of step d. achieved, shutdown the disc file.

g. Reinstall the dust panel on the disc motor compartment of the spindle assembly.

h. Reinstall the pushbutton station assembly between the support brackets from which it was removed.

i. Connect the tachometer probe cable connector A15P14 to the tachometer probe.

j. Perform the disc motor rpm check of paragraph 5-2-3.

6-8 DISC MOTOR DRIVE BELTS

Drive belts will be replaced when they are found worn.

6-8-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

a. Spring scale, zero to 10 pounds.

b. Depending on drive belt installed (21/32-inch or 1/2-inch wide) obtain the appropriate type from stock as follows:

(1) Type B, oil proof Veelos belt for high temperature drives, 21/32" wide, Bryant Part No. B-54434-1.

(2) Type A, oil proof Veelos belt for high temperature drives, 1/2" wide, Bryant Part No. B-54434-2.

6-8-2 REPLACEMENT PROCEDURES — Replace the defective belts as follows:

- a. Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker in the RESET OFF position.
- b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the center-front, -top, and -rear access panels from the disc file cabinet.
- c. Release the quick-disconnect button fasteners and remove the front and back thermal dust protection cover plates from the motor compartment (see Figure 6-8) of the pedestal assembly.
- d. Working through the top of the file, rotate the elastic stop nut on the motor mounting plate eyebolt ccw until the disc drive motor is lowered as far as possible.

NOTE

It is recommended that when one drive belt requires replacement all drive belts be replaced.

- e. Work the drive belts off of the motor pulley one at a time.
- f. Uncouple and remove each drive belt from the spindle area as follows:

NOTE

The use of a Veelos belt tool will facilitate the performance of the following procedure.

- (1) Hold the drive belt with one hand and insert a screwdriver blade underneath the top link as far as the brass button.
 - (2) While holding the link firmly over the screwdriver blade, slip the tip of the screwdriver blade over the brass button head and pry the belt link loose; remove the belt from the file.
- g. After obtaining the appropriate drive belts from stock, make up the necessary number of drive belts for the machine involved. Each drive belt installed shall contain the same number of brass buttons as those counted in the removed belts. Make all new drive belts the same number of links to form a matched set.
 - h. Install and couple the ends of each new drive belt around the spindle as follows:
 - (1) Bring the end brass button up through the enlarged hole in the drive belt link and pull the brass button down the slot to its proper position.

6-8-2 REPLACEMENT PROCEDURES (Cont.)

- (2) While holding the drive belt ends together with the thumb and index finger, bend the drive belt link and force the next brass button head down through the enlarged hole in the belt link; then straighten the drive belt and pass the brass button through the slot to its proper position.

CAUTION

Always rotate spindle by hand in direction of normal disc rotation to avoid possible damage to the spindle bearings. With respect to the front of the file, rotation is ccw when facing the right side of the file.

- i. Work the new drive belts into their respective grooves of the motor and spindle sheaves by slowly rotating the spindle in the direction of normal disc rotation. When all drive belts are installed, refer to the adjustment procedures in paragraph 6-8-3.

6-8-3 ADJUSTMENT PROCEDURES — Whenever it becomes necessary to adjust the drive belt tension either because of a drive belt replacement or a reduced-speed indication on the tachometer, proceed as follows:

- a. Repeat steps a. through c. of paragraph 6-8-2 if not already accomplished.
- b. Hook a spring scale around one of the drive belts and adjust the elastic stop nut (see Figure 6-8) on the disc drive motor mounting plate eyebolt ccw until a tension of approximately seven pounds is required to deflect the belt 1/4-inch; check that each of the remaining belts deflect 1/4-inch under a tension of approximately seven pounds.
- c. When each drive belt meets satisfactory tension requirements, perform the disc motor rpm check of paragraph 5-2-3.

6-9 POSITIONING SYSTEM

NOTE

Replacement of the digital actuator and/or a boost is covered in EB-136. Therefore, only positioning system test and adjustment is covered herein.

Positioning system test and adjustments are performed when a digital actuator or boost are replaced in a positioning system, when positioning system repeatability — as indicated by a high error rate in playback — is ascertained to be poor, or when noise is detected in the vicinity of the positioning system elements. In all cases, the breakaway pressure test will be performed first. Upon satisfactorily completing the breakaway pressure test, the positioning time test will then be conducted followed by the repeatability test.

CAUTION

Positioning system repeatability can be effected by operating the file at an unsatisfactory ambient room temperature, by a defective head pad, by a defective solenoid valve mounted in the digital actuator, by a defective solenoid driver power supply, or by an improperly installed digital actuator or boost. Only when it is definitely ascertained that these factors are not affecting system operation shall the following procedures be performed.

6-9-1 BREAKAWAY PRESSURE TEST — The breakaway pressure test will normally be conducted after a replacement of a digital actuator, power boost, or any hydraulic component that plays a critical part in the hydraulic positioning circuit. This test can also be used in the field to determine the cause of malfunctions such as poor repeatability, long access time, noise from boost area, and high error rate. The test is divided into the digital actuator breakaway pressure test and the power boost breakaway pressure test.

6-9-1-1 Special Equipment Required — The head retraction tool, Bryant Part No. B-302700 from the special tools supplied with the disc file is required in this procedure.

6-9-1-2 Digital Actuator/Boost Breakaway Pressure Test — Perform the digital actuator/boost breakaway pressure test as follows:

- a. Shutdown the disc file.
- b. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove cabinet access panels as follows:
 - (1) In the case of "A" frame files when facing the front of the file cabinet, remove the three front access panels, the left-side access panel, the center-rear access panel, and the top-center access panel.
 - (2) In the case of "B" and "C" frame files when facing the front of the file, remove the three front access panels, the center-rear access panel, and the top-center access panel from the file cabinet. Remove the front and left side access panels from the power control unit.
- c. Through the top-center opening of the file cabinet, disconnect cable connector A15P13 from the disc motor connector A15J13 (see Figure 6-8).
- d. Remove the F3 1A HEAD VALVE fuse from the power control panel (see Figure 1-17 or 1-24) of the power control unit.

6-9-1-2 Digital Actuator/Boost Breakaway Pressure Test (Cont.)

e. Open the door of the power control panel and connect a jumper between pin 1 of the F1 15A MAIN CONTROL fuse and pin 1 of the F4 1A POSITIONER VALVE fuse. This enables subsequent energizing of the positioner relay A21K10 without turning on the disc motor or actuating the heads to the flying attitude.

f. Address track 127 of the disc file; this can be accomplished locally by grounding the seven INPUT test points A24TP5 through A24TP11 of the solenoid driver power supply (see Figure 3-6).

g. Set circuit breaker CB1 on the front panel of the solenoid driver power supply to "ON".

h. Place the file in the manual operating mode.

i. Press the HYDRAULIC MTR ON and ELECTRONICS ON pushbuttons.

j. Within approximately two seconds, observe that the digital actuator/boost assembly actuate and position the head pads of the data head bars to track 127 (track closest to spindle).

k. Turn the pump output pressure valve of hydraulic power supply unit (see Figure 6-5) ccw until the pump output pressure gage just indicates a pressure. Observe that pressure indicated is 925 ± 25 psig; it may be necessary to firmly hold the valve to obtain an accurate reading.

l. At the relief valve of the hydraulic power supply unit, turn the relief valve adjustment nut ccw to reduce system hydraulic-pressure — as indicated on the pump output pressure gage — to 150 psig or until ccw rotation no longer reduces pressure.

NOTE

Perform the next step only after it is assured that system pressure has decreased to its minimum level.

m. A decrease in system pressure can generally be detected by a hissing sound. The instant this sound ends, or within a minimum of four minutes of the performance of step l., address track zero of the disc file (this is equivalent to removing ground from all the test points of step f.).

n. Turn the adjusting nut of the relief valve cw in 25 psig increments as indicated on the pump output pressure gage until the head pads are positioned to track zero. Record the pressure gage indication at the moment the head pads break from track 127 and are repositioned to track zero.

o. If breakaway pressure occurred at 400 psig or less, proceed immediately to step p. However, if the pump output pressure gage indication was in excess of 400 psig, proceed as follows:

6-9-1-2 Digital Actuator/Boost Breakaway Pressure Test (Cont.)

- (1) If the digital actuator was recently replaced or a new end cap was installed, check the installation procedures to see that all cabling and hydraulic lines are not causing some obstruction to the movement of the digital actuator.
- (2) Readdress track 127 and repeat the procedures of step (l.) through (n.). If the hydraulic system pressure gage indication remains in excess of 400 psig, check power boost breakaway as specified in paragraph 6-9-1-3.

p. Turn the adjusting nut of the relief valve cw until the pump output pressure gage indicates 925 ± 25 psig.

q. Address track zero if addressing was done locally, this will entail the removing of ground from the test points of step f.

CAUTION

The pump output pressure gage valve shall be closed immediately following file shutdown. If this is not done, subsequent turn on of the file could severely damage the gage.

r. Shutdown the disc file. When the pump output pressure gage indicates zero psig, rotate its valve full cw.

s. Remove the jumper of step e., reinstall fuse of step d., and reconnect A15P13 of step c.

t. With the breakaway pressure test satisfactorily completed, proceed immediately to the positioning system time test of paragraph 6-9-2.

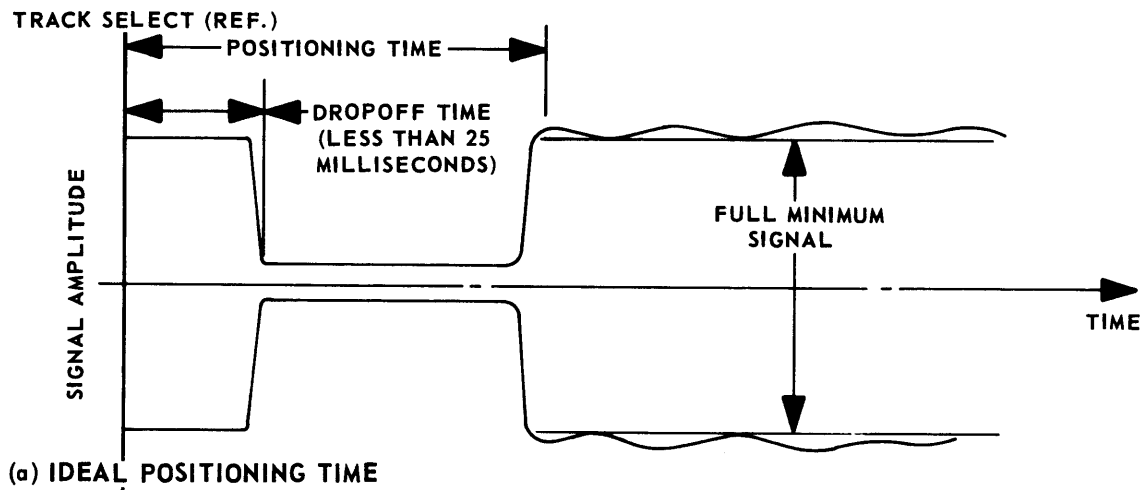
6-9-1-3 Boost Breakaway Pressure Test — Perform the power boost breakaway pressure test only if the positioning system fails the digital actuator/boost breakaway pressure test of paragraph 6-9-1-2a. through o.

a. Immediately following completion of the procedure of paragraph 6-9-1-2o., reduce system hydraulic pressure to 150 psig as directed in paragraph 6-9-1-2l.

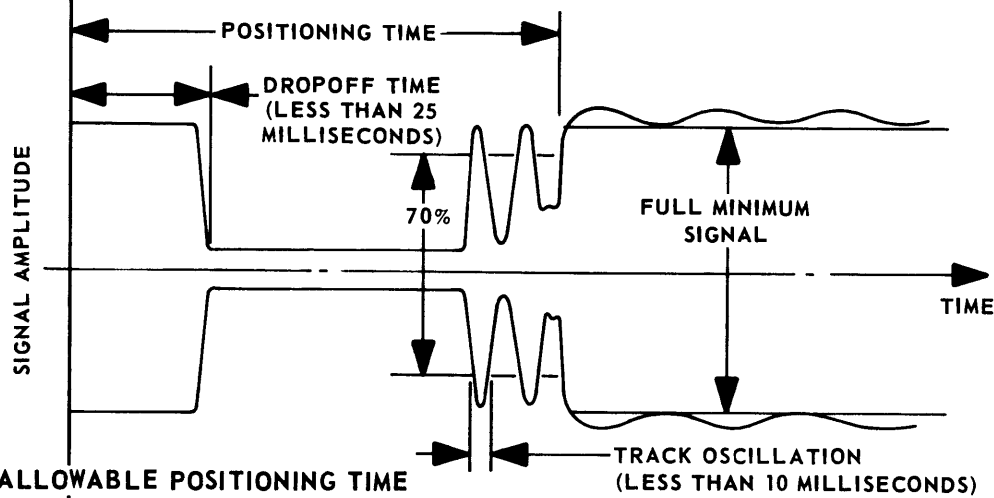
b. Insert the head retraction tool into one of the boss' of the positioning control arm (see Figure 1-14) and retract the rocker arms toward track zero until the head pads have been repositioned approximately 1/4-inch. Remove the tool from the boss.

WARNING

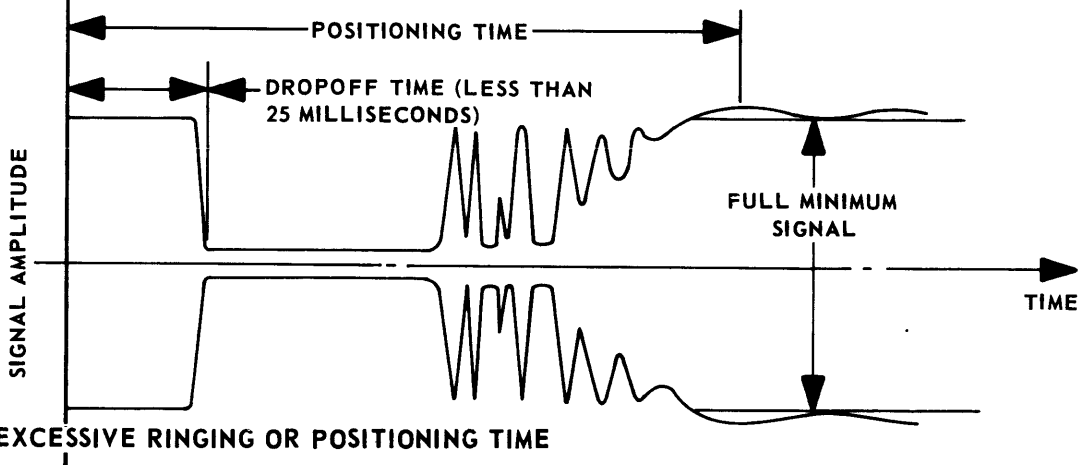
Before performing the next step, be sure retraction tool is removed from the positioning arm boss.



(a) IDEAL POSITIONING TIME



(b) ALLOWABLE POSITIONING TIME



(c) EXCESSIVE RINGING OR POSITIONING TIME

Figure 6-10 Positioning Time Chart

6-9-1-3 Boost Breakaway Pressure Test (Cont.)

c. Turn the adjusting nut of the relief valve (see Figure 6-5) ccw in 25 psig increments — as indicated on the pump output pressure gage — until the head pads are positioned back to track 127 (track closest to spindle). Record the pump output pressure gage indication at the moment the heads break back to track 127.

d. If breakaway pressure occurred at 200 psig, or less, proceed immediately to step e. However, if the value was greater than 200 psig, proceed as follows:

- (1) If the power boost was recently replaced, check that no cabling or hydraulic lines are causing the obstruction.
- (2) Repeat the procedures of steps a. through d. If the hydraulic system pressure gage indication remains in excess of 200 psig, proceed to step e.

NOTE

Failure to pass the breakaway pressure test can be attributable to the introduction of excessive friction through the positioning system's variable orifice adjustment (see paragraph 6-9-3) or through friction clamp adjustment (see paragraph 6-9-4).

e. Perform the procedures of paragraph 6-9-1-2p. through s. Then, immediately consult your own field service department or Bryant's Field Service Department as to the remedial action that has to be taken in view of the positioning system's failure to pass the digital actuator/boost breakaway pressure test; also, inform them as to the results of the boost breakaway pressure test.

6-9-2 POSITIONING SYSTEM TIME TEST — The positioning system time test is performed after satisfactorily completing the breakaway pressure tests of paragraph 6-9-1-2. The positioning system time test ensures that the system is critically damped; that is, that the systems' positioning time is maintained minimal while simultaneously maintaining track oscillation time durations at a minimum until full, minimum signal playback is achieved.

6-9-2-1 Special Equipment Required — The special equipment required must enable selection of the head to be used in test and must be capable of enabling a write/read operation through the head. Also required is an oscilloscope, Tektronix Model 555 with type D preamplifier, or equivalent.

6-9-2-2 Wave Pattern Positioning Specification — The following time limits form an electrical summary of typical positioning system standards. Figure 6-10 is a pictorial representation of these standards. Factors taken into account during the positioning time check are as follows:

a. Drop-off time should be less than 25 milliseconds (or 30 milliseconds in the case of some older files).

6-9-2-2 Wave Pattern Positioning Specification (Cont.)

b. Maximum positioning times for the various total disc configurations of A-, B-, and C- frame files, respectively, are as follows:

- (1) 120 ms for a 1 to 8 total disc configuration.
- (2) 140 ms for a 9 to 14 total disc configuration.
- (3) 165 ms for a 15 to 26 total disc configuration.

c. The time interval (duration) between the start of track oscillations until the signal amplitude reaches 70% of its maximum value continuously should be less than 10 milliseconds.

NOTE

It should be noted in step c. that a track oscillation duration time of 10 milliseconds is the allowed duration time, but a higher selected value would provide a greater safety factor against occasional false track verification. The chance of false verification is reduced by selecting a higher duration time in the read-out circuits than that normally allowed.

6-9-2-3 Test — Perform the following procedures to determine system positioning time.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the subsequent procedures.

- a. With the area surrounding the file thoroughly cleaned, remove the front access panels of the disc file cabinet.
- b. Place the disc file in the automatic operating mode and allow 1-1/2 hours of operation in the case of A- and B- frame files and 2-1/2 to 3 hours operation in the case of C- frame files.
- c. With cabinet temperature stabilization achieved, select the data head pad to be used in this test. If data stored in the zone served by the selected head pad is to be retained, transfer the data from the entire zone to another storage area.
- d. The suggested track address pattern to be used in writing and reading in this test is as follows:

NOTE

Any write/read pattern can be used. If special preference or problem tracks exist, change the following pattern to conform to the desired pat-

6-9-2-3 Test (Cont.)

tern. Also, the possibility of crossover signals on the oscilloscope when the combination of step (4) is run is not to be misinterpreted as ringing.

- (1) 0 to 127 and 127 to 0
- (2) 0 to 64 and 64 to 0
- (3) 0 to 63 and 63 to 0
- (4) 63 to 64 and 64 to 63
- (5) 0 to 32 and 32 to 0
- (6) 0 to 16 and 16 to 0
- (7) 0 to 8 and 8 to 0
- (8) 0 to 4 and 4 to 0
- (9) 0 to 2 and 2 to 0
- (10) 0 to 1 and 1 to 0

CAUTION

Always discharge any test probe prior to connecting the probe to any terminals that are connected directly to the head pads.

e. Connect the vertical input of the oscilloscope to the test point that is most convenient — in the system into which the file is integrated — for monitoring the output of the head selected in step c; connect the horizontal input of the oscilloscope to the pulse train that is to be used as the trigger.

f. Arrange for a means of establishing the write/read address pattern to be used with regard to the head selected in step c. and the track patterns selected in step d.

CAUTION

Position the test equipment leads away from the disc file in such a manner as to avoid possible contact with the rotating discs.

g. Through the head selected, perform a write operation on all tracks of the pattern selected in step d.

h. Perform reading operations changing the address alternately between two tracks for each pattern viewed. Repeat the alteration of addresses enough times in order to establish the amplitude peaks, drop-off time, oscillation time, and positioning time. Compare the results of each step with the wave pattern positioning specifications of Figure 6-10b. From the comparisons, determine if the system is critically damped, overdamped or underdamped as described below:

NOTE

The duration of track ringing at the playback level specified in Figure 6-10b. does not necessarily apply to all production machines particularly where the playback is small thereby making oscilloscope measurements extremely difficult. In such instances, consult Bryant field service or engineering for recommended procedures in circumventing this problem

- (1) The positioning system is critically damped when the applicable positioning time of paragraph 6-9-2-2b is met and when — in the case of the example of Figure 6-10b — track oscillation times at the 70% playback level remain less than 10 milliseconds in duration before achieving the full minimum signal level. If the results indicate that critical damping is achieved, erase all data recorded in the zone used in test and proceed to the positioning repeatability test of paragraph 6-9-5.
- (2) The positioning system is overdamped when the applicable positioning time of paragraph 6-9-2-2b is exceeded. If the results indicate that overdamping exists, proceed to the variable orifice adjustment of paragraph 6-9-3; or, if there is no variable orifice, proceed to the friction clamp adjustment of paragraph 6-9-4.
- (3) The positioning system is underdamped when the applicable positioning time of paragraph 6-9-2-2b is met, but — in the case of the example of Figure 6-10(b) — track oscillation times at the 70% playback level are 10 milliseconds or greater in duration before achieving full minimum signal. If the results indicate that underdamping exists, proceed to the variable orifice adjustment of paragraph 6-9-3; or, if there is no variable orifice, proceed to the friction clamp adjustment of paragraph 6-9-4.

6-9-3 VARIABLE ORIFICE ADJUSTMENT — This procedure shall be performed only if the positioning system fails the time test of paragraph 6-9-2. It is recommended that the fixed orifice in the boost be replaced before any consideration be given to adjustment of the variable orifice (see Figure 1-11) of the digital actuator/boost assembly (see Figure 1-9). Normally, the adjustment is at least two full turns ccw from its furthest cw position. However, to expedite file operation during critical times, variable orifice adjustment can serve as a temporary means for correcting underdamping. In such a situation, however, it shall be recognized that the action is temporary and that replacement of the fixed orifice in the boost shall be accomplished as soon as practical thereafter. At such time, replacement of the fixed orifice shall be made only after returning the variable orifice to at least two turns ccw from its furthest cw position. For the procedures to be followed in the replacement of the fixed orifice in the boost, consult your own field service department or Bryant's Field Service Department.

NOTE

If there is no positioning system variable adjustment included in the file, refer to the friction clamp adjustments for the procedures required to correct an overdamping or underdamping condition in file operation.

6-9-3-1 Special Equipment Required — The Whitey valve adjusting handle, Bryant Part No. B-56877, from the tools supplied with the file is required in this procedure.

6-9-3-2 Adjustment Guide Lines — It should be recognized that the variable orifice adjustment significantly affects only the time of the longer strokes made by the positioning system. For example, if the track zero to track 127 stroke is found to be of 350 milliseconds duration, the shorter track zero to track 1 stroke would remain approximately the same duration as it was before adjustment. Furthermore, when a positioning system requirement of 120 milliseconds maximum is set at 130 milliseconds maximum, the average access time will not increase sufficiently to be noticeable.

6-9-3-3 Adjustment Procedure — Perform the variable orifice adjustment as follows:

- a. Shutdown the disc file.
- b. Through the rear-center opening of the disc file cabinet, install the Whitey valve adjusting handle obtained from tool kit A-AF-235 on the variable orifice valve shaft (see Figure 1-11). Secure the handle to the shaft using the handle's set screw.
- c. Loosen the packing nut on the valve and adjust the valve as follows to compensate for an overdamped or underdamped system.

NOTE

To eliminate much unnecessary adjustment in the next steps, only the last two turns cw (approximate) of the variable orifice valve shaft will produce any useable change in positioning time. If the shaft is determined to be a full two turns ccw or more from its full cw position and friction is still excessive, consult Bryant field engineering as to the remedial action that is required.

(1) An overdamped system is a system having excessive friction, which increases system positioning time. To compensate for excessive friction in a system, immediately check that the friction clamps (see Figure 1-14) — as viewed through the front-center access panel of the file — are tightened only finger tight (that is, the clamps can be rotated on the shaft by hand). Then, proceed as follows:

- (a) If the clamps are found to be tightened beyond finger tight, proceed immediately to the friction clamp adjustment procedures of paragraph 6-9-4.
- (b) If the clamps are found to be only finger tight, rotate the variable orifice valve shaft incrementally ccw — repeating the positioning time test of paragraph 6-9-2-3 after each adjustment — until the critical damping requirements of paragraph 6-9-2-3 are met.

6-9-3-3 Adjustment Procedure (Cont.)

- (2) An underdamped system is a system having insufficient friction, which decreases system positioning time but increases track oscillation time. Rotate the variable orifice valve shaft incrementally cw — repeating the positioning time test of paragraph 6-9-2-3 after each adjustment — until the critical damping requirements of paragraph 6-9-2-3 are met. If the adjustment afforded by the variable orifice valve is insufficient to obtain critical damping and if it is impractical to immediately consult with Bryant as to other remedial action, rotate the variable orifice valve shaft a full two turns ccw or more from its full cw position and perform the friction clamp adjustment of paragraph 6-9-4.

6-9-4 FRICION CLAMP ADJUSTMENT — This procedure shall be performed only when the positioning system fails the time test of paragraph 6-9-2. It is recommended that the fixed orifice in the boost be replaced before any consideration be given to adjustment of the friction clamps of the file. Normally, the clamps are adjusted only to where they are finger tight. However, to expedite file operation during critical times, friction clamp adjustment can serve as a temporary means for correcting underdamping as revealed by an unsatisfactory attempt to improve system positioning time through the positioning system variable orifice adjustment of paragraph 6-9-3. In such a situation, however, it shall be recognized that the action is temporary and that replacement of the fixed orifice in the boost shall be accomplished as soon as practical thereafter; at such time, replacement of the fixed orifice shall be made only after returning the friction clamps to their original finger tight condition. For the procedures to be followed in the replacement of the fixed orifice in the boost, consult your own field service personnel or Bryant's Field Service Department.

6-9-4-1 Special Equipment Required — Obtain the following special equipment:

- a. One 6-inch crescent wrench. .
- b. One spring scale, zero to 10 pounds.

6-9-4-2 Adjustment Procedure — Adjust the friction clamps (see Figure 1-14) as follows:

- a. Shutdown the disc file.
- b. If the system was found to be overdamped because the friction clamp nuts were found to be tightened beyond finger tight, proceed as follows:

CAUTION

The maximum allowable torque that shall be applied to the clamps is 36-inch pounds.

6-9-4-2 Adjustment Procedure (Cont.)

- (1) Place the crescent wrench on the hexnut of one of the rocker arm friction clamps; insert the hook of the spring scale into the hole of the crescent wrench handle and then — using the scale as the tightening tool — draw the hexnut of the friction clamp cw until the hexnut is observed to just start to rotate. Observe and record the spring scale indication. This indication shall be no greater than 6 pounds (which is equivalent to 36-inch pounds of torque). If a greater indication is observed, immediately consult Bryant for engineering advice.
- (2) Repeat the procedure of step (1) for the other friction clamp.
- (3) If the indications of steps (1) and (2) were satisfactory (less than 36-inch pounds), use the crescent wrench to rotate the nut of each friction clamp ccw until both are completely loose; then tighten the nut of each friction clamp finger tight until the clamps can be just rotated on the shaft by hand without binding.
- (4) Proceed to step c.

c. Place the crescent wrench on the hexnut of one of the rocker arm friction clamps; insert the hook of the spring scale into the hole of the crescent wrench handle and then — using the scale as the tightening tool — draw the hexnut of the friction clamp cw until the scale indicates 1 pound (which is equivalent to 6-inch pounds of torque). Repeat the procedure for the hexnut of the other clamp.

d. With equal torque applied to both friction clamp nuts and with the crescent wrench removed from the clamps, repeat the positioning time test of paragraph 6-9-2.

CAUTION

A maximum of 36-inch pounds of torque can be applied to the friction clamp screws. If this torque limit must be exceeded to fulfill the positioning time tolerances, immediately consult Bryant for engineering advice.

NOTE

Always perform the positioning system variable orifice adjustment procedure of paragraph 6-9-3 before applying additional torque to the friction clamps to increase damping.

e. If the system again failed to pass the positioning time test, the friction clamps can be adjusted in individual 6-inch pound increments until a maximum of 36-inch pounds is achieved. If the system still will not pass the positioning time test, shutdown the file and consult your own field service personnel or Bryant's Field Service Department.

6-9-5 POSITIONING REPEATABILITY TEST — The positioning repeatability test is performed in order to determine whether random playback of prewritten data will fall within a suitable level when compared with playback of the same data that was readout under static conditions immediately after a write operation.

6-9-5-1 Special Equipment Required — The special equipment required must enable addressing the head selected for use in this test and enable write/read operation through the selected head; also required is a Tektronix Model 555 with type D preamplifier, or equivalent.

6-9-5-2 Test Procedures — Proceed as follows:

CAUTION

The area shall be maintained clean and as dust free as possible when performing the following procedures.

- a. With the area surrounding the file thoroughly cleaned, remove the front access panels of the disc file cabinet.
- b. Place the file in the automatic operating mode and allow the unit to operate for 1-1/2 hours in the case of A- and B- frame files and 2-1/2 to 3 hours in the case of C- frame files to assure temperature stabilization within the cabinet.
- c. With cabinet temperature stabilization achieved, select one outermost head (zone six) of the outermost disc and transfer data from all tracks of the selected zone to another storage area.

CAUTION

Always discharge any test probe prior to connecting the probe to any terminals that are connected directly to the head pads.

- d. Connect the vertical input of the oscilloscope to the test point that is most convenient in the system into which the file is integrated — for monitoring the output of the head selected in step c.; connect the horizontal input of the oscilloscope to the pulse train that is to be used as the trigger.
- e. Arrange for a means of establishing the write/read address pattern to be used with regard to the head selected in step c.
- f. Perform the operations called for in Table 6-2 using the head pad selected in step c. That is, position from track zero to track one and perform a write operation on track one; with the head static at track one, read back the written data and record the amplitude in the space provided in Table 6-2. Also, record the disc file enclosure and room ambient temperatures. Repeat this procedure for tracks 64 and 126. Then compute and record acceptance limit in Table 6-2.

TABLE 6-2 COMPARISON OF STATIC PLAYBACK WITH POSITIONING SYSTEM REPEATABILITY PLAYBACK

Track	Playback-Read After Write (millivolts)	Acceptance Limit (96% of Playback - Read-After-Write)	File Ambient	Room Ambient
0	N/A	N/A		
1				
64				
126				

g. Position the unit through the sequence of steps 1 through 18 as shown in Table 6-3 and record the playback amplitude at each track that was written on in step f.

NOTE

The percentage playback level under the repeatability test does not necessarily apply to all production machines, particularly where the playback is small thereby making measurements extremely difficult. In such instances, consult BryantField Service or Engineering for recommended procedures in circumventing these problems.

TABLE 6-3 POSITIONING SYSTEM REPEATABILITY PLAYBACK

Steps	Track	Playback (millivolts)	Steps	Track	Playback (millivolts)
1	0	N/A	10	1	
2	1		11	127	N/A
3	2	N/A	12	126	
4	1		13	63	N/A
5	126		14	64	
6	64		15	125	N/A
7	1		16	126	
8	64		17	65	
9	126		18	64	

h. Compare the values recorded in Table 6-3 with the accepted limit values associated to the corresponding track in Table 6-2. For example, there are four comparisons for each of the three tracks, 1, 64, and 126. The values recorded in Table 6-3 should be at least 96% of the values originally recorded for the corresponding track in Table 6-2 under static conditions.

i. If the values recorded in Table 6-3 do not conform to the required playback levels and if it is felt that the positioning time test of paragraph 6-9-2 was satisfactory, ascertain that the system to which the file is tied is operating correctly. If repeatability is still unsatisfactory, consult Bryant for further engineering advice.

6-9-5-2 Test Procedures (Cont.)

j. If the positioning system variable orifice adjustment of paragraph 6-9-3 was performed, perform the following procedures upon satisfactorily completing the positioning repeatability test:

- (1) Tighten the packing nut on the variable orifice valve shaft (see Figure 1-11) and place a spot of Glyptol at the junction of the shaft and packing nut.
- (2) Loosen the set screw on the end of the Whitey valve adjusting handle connected to the valve shaft, remove the handle, and return the handle to the special tool kit supplied with the file.

k. Remove all test equipment.

6-10 HEAD BAR ASSEMBLIES

Either data or clock head bar assemblies can be replaced. Adjustments of the head pads of the head bars shall be accomplished after such replacement or whenever playback from a head pad is found to be unsatisfactory.

6-10-1 DATA HEAD BAR ASSEMBLY — Replacement of a data head bar can result in the loss of data stored on the disc surfaces served by the head bar. Therefore, before proceeding to replacement, a suitable storage device should be made available for the transfer of data from all operable heads of the head bar.

6-10-1-1 Special Equipment Required — Obtain the following special equipment:

- a. Soft absorbent cloth.
- b. Hydraulic plug caps to fit the lines and connectors of the head bar hydraulic cylinder.
- c. Nylon flat braided lacing tape - 3/32 inch, 50 pound strength, micro-crystalline wax finish - Alpha Lacing Corporation, Part No. LC 136/Black, or equivalent.
- d. Head bar removal wrench, Bryant Part No. C-301103, from special tools supplied with the file.
- e. GO/NO-GO gage, Bryant Part No. B-25435.
- f. Torque wrench, 0 to 25 pound range.
- g. Data head adjustment tool, Bryant Part No. AF-411-1, from special tools supplied with the file.
- h. The Bryant data head bar specified for the machine being used.
- i. A.C. Erase Tool, Bryant Part No. D-AF-243 and Bryant's EB-184.

6-10-1-1 Special Equipment Required (Cont.)

j. Dupont Freon 113, or equivalent, prefiltered to ASTM Class 3 Contamination Level.

6-10-1-2 Replacement Procedures — Replace the defective data head bar by performing the following procedures:

a. With the defective data head bar assembly isolated, set up appropriate electronic equipment to transfer data from all operable head pads of the bar to another storage device.

NOTE

If the data head bar assembly contains twelve head pads serving adjacent storage disc surfaces, then the data on adjacent disc surfaces must be stored for subsequent rewriting on the file after the defective data head bar assembly has been replaced.

CAUTION

Never allow the A.C. Erase Tool to be continuously operated in the vicinity of disc surfaces that are not to be erased.

b. Place the disc file in the automatic operating mode. When the disc file cabinet temperature stabilizes (1-1/2 hours for A- and B- frame files or 2-1/2 to 3 hours for C- frame files), read off and store — in another device — all data previously written on the disc surface(s) served by the head bar to be removed. With the access panels removed from the rear of the disc file cabinet, erase the data from the disc surface(s) served by the head bar using the A.C. Erase Tool in accordance with Bryant's EB-184.

c. Shutdown the disc file.

WARNING

The disc file shall be operated only when so specified during the performance of this procedure.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing this procedure.

d. When the discs stop rotating and with the work area thoroughly cleaned, remove the three front access panels from the disc file cabinet.

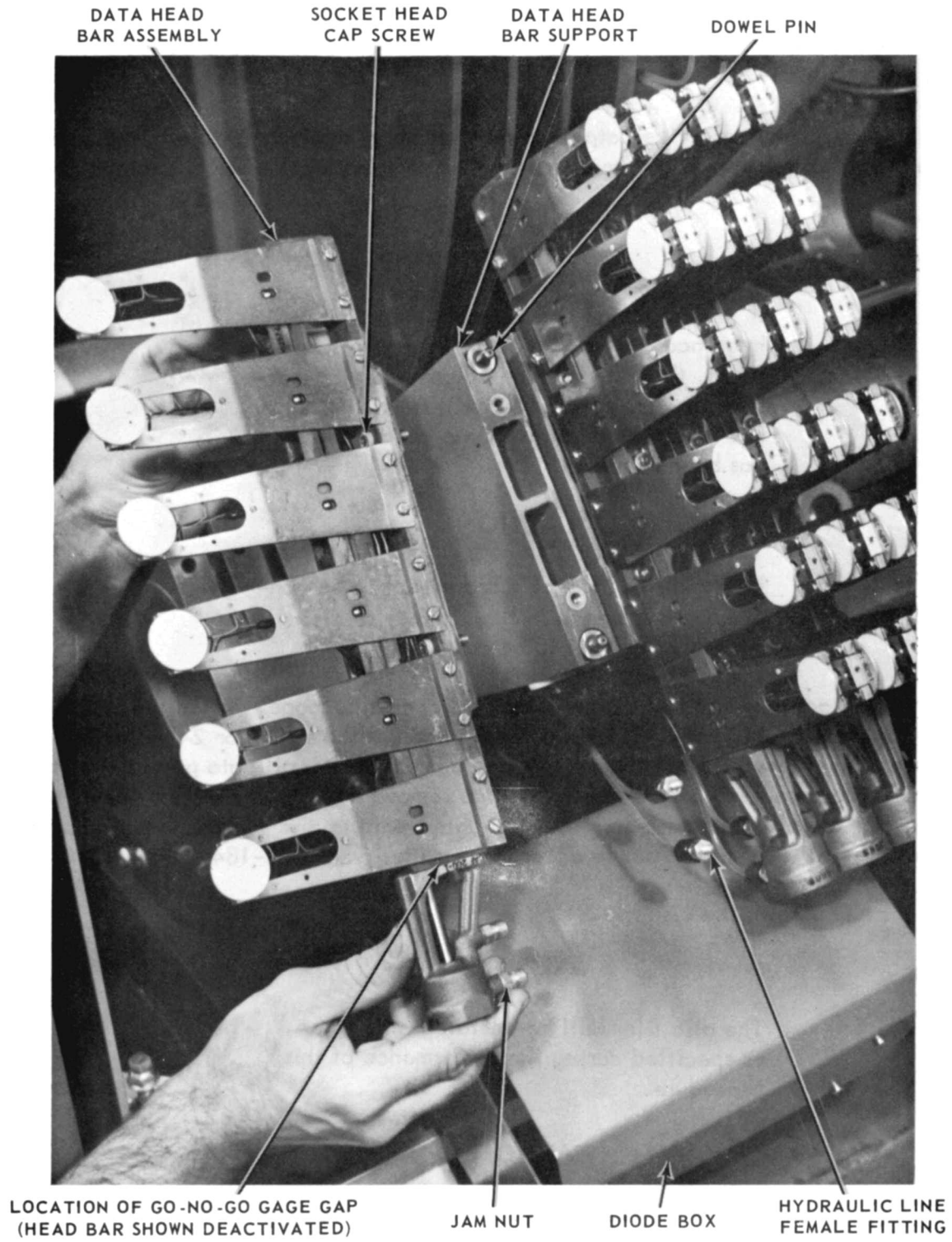


Figure 6-11 Data Head Bar Assembly Removed From Rocker Arm

6-10-1-2 Replacement Procedures (Cont.)

e. If the disc file is equipped with diode boxes (see Figure 1-3), remove the two screws, two flatwashers and two spring lockwashers that secure the diode board connector (of the head bar to be replaced) to the diode box.

f. Using the rocker arm retraction procedure of paragraph 5-9-4-2, retract the rocker arm assemblies until only the second row of head pads protrude from between the discs.

g. Cut the lacing tape securing the data head cable to the two brackets on the front of the rocker arm.

CAUTION

Failure to exercise care during step h. may result in damage to the hydraulic seal and washer located behind the 3/8-inch jamnut of the hydraulic cylinder assembly of the head bar assembly. Such damage will cause hydraulic fluid leakage. Be sure to cap or otherwise cover all open hydraulic fittings and connections to avoid contamination of the hydraulic system.

WARNING

Freon can cause frostbite if care is not exercised during handling.

h. Using a 3/8-inch wrench to retain the jamnut attached to the head bar assembly (see Figure 6-11) in a stationary position, use a 7/16-inch open-end wrench to disconnect the female fittings of the hydraulic pressure and return lines from the male ends of the hydraulic cylinder assembly of the head bar. After cleaning each line and head bar fitting with Freon, immediately cap the fitting.

i. Feed the hydraulic lines through the slot provided in the data head bar cables.

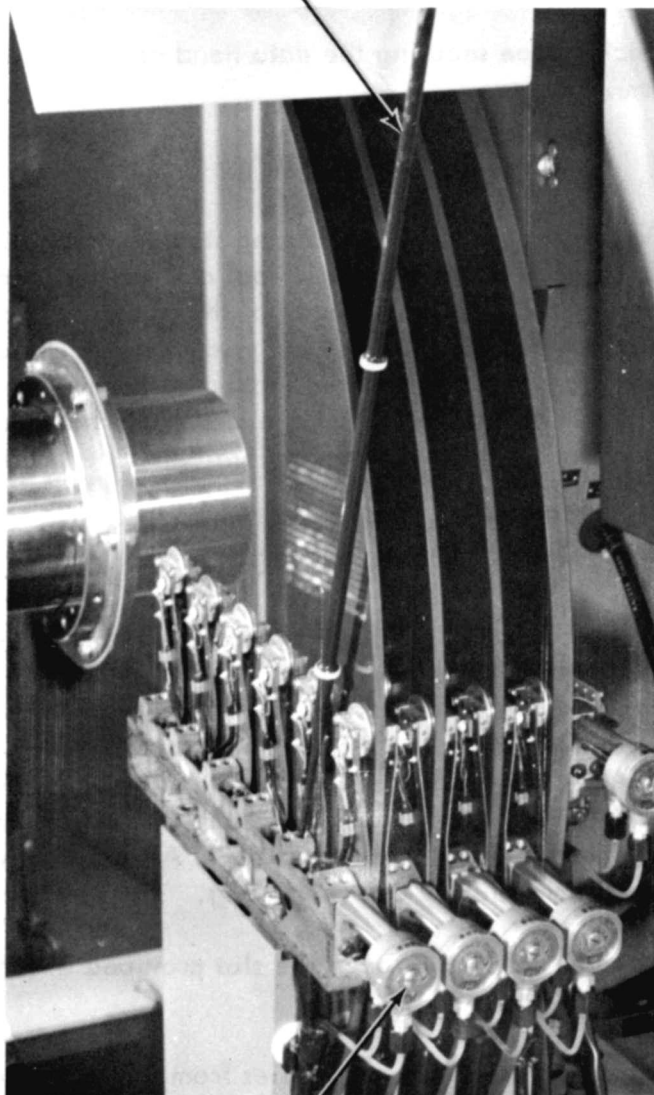
j. Fully retract the rocker arm assemblies from the file by continuing the retraction procedures of step f.

k. Using the head bar removal wrench from the compliment of special tools provided with the disc file, loosen the two socket-head capscrews that secure the data head bar assembly to the rocker arm until both screws are free of the rocker arm.

CAUTION

Use extreme care upon removal and replacement of the data head bar assembly to avoid damage to the storage discs or to data head pads.

HEAD ADJUSTMENT TOOL



SCREW PROTECTING SLIDER
TRAVEL ADJUSTMENT

Figure 6-12 Using Head Adjustment Tool to
Adjust Head Pad

6-10-1-2 Replacement Procedures (Cont.)

l. To free the data head bar from the close fit created by the dowel pins protruding from the rocker arm, pull up on the head bar assembly and simultaneously apply pressure to one side of the head bar and then to the other side until the head bar assembly comes free of the rocker arm.

CAUTION

Never allow head pads to touch any surface during handling.

- m. Stand the defective head bar in an upright position.
- n. Carefully mount the replacement head bar on the rocker arm by reversing the procedure of step l. and then secure the head bar in place by tightening the hardware removed in step k. to a torque of 20 inch pounds.
- o. Perform the rocker arm insertion procedures of paragraph 5-9-4-3 except only the first two rows of head pads are to be inserted between the disc surfaces.
- p. Feed the hydraulic lines up through the slot provided in the cabling of the new head bar; after thoroughly cleaning the fittings with filtered Freon, connect the lines to the hydraulic cylinder assembly by reversing the procedures of step h.
- q. Fully retract the data head bars by performing the head bar retraction procedures of paragraph 5-9-4-2, as applicable.
- r. Using the data head adjustment tool (see Figure 6-12), turn the set screw associated with each head pad and reed assembly on the new data head bar one full turn ccw.
- s. Place the disc file in the manual operating mode.
- t. Press the HYDRAULIC MTR ON pushbutton.
- u. After approximately two seconds, press the HEADS ON pushbutton.
- v. Using the GO/NO GO gage, check the distance through which the slider bar of the head bar traveled by inserting the gage into the gap formed by the hydraulic cylinder casting face and the slider bar face (see Figure 6-11).
 - (1) If one end of GO/NO GO gage fits and the other end does not fit, the slider bar on the new data head bar is satisfactory; therefore continue to step w.
 - (2) If neither end of GO/NO GO gage fits or if both ends of the gage fit, adjust the slider gap as follows:

6-10-1-2 Replacement Procedures (Cont.)

NOTE

Except in the case of very early designed disc files, there are two basic hydraulic cylinder configurations mounted on the head bars. In one instance, a screw must be removed to get at the slider adjustment (see Figure 6-12). In the case of a later hydraulic cylinder design, the slider adjustment is immediately accessible through a port provided in the same location as the screw in the former design.

- (a) Press the HEADS OFF and HYDRAULIC MTR OFF pushbuttons and wait for the system hydraulic pressure to reduce to zero. This can generally be detected by the occurrence of an audible hiss, or by waiting for approximately four minutes following hydraulic system shutdown.

WARNING

If adjustment of the slider travel of a head bar equipped with the earlier hydraulic cylinder configuration is to be attempted, removal of the screw to gain access to the adjustment shall not be attempted until system pressure is reduced to zero psig. This action is mandatory since removal of the screw with the system under pressure will expose the technician to a spray of hydraulic fluid that could cause injury.

- (b) With system pressure decreased, remove the screw from the slider adjustment port of the earlier cylinder head bar configuration. Subsequent adjustment, whether of the old or new hydraulic cylinder configuration, is identical except that in the new cylinder configuration the adjustment screw is spring loaded necessitating the application of pressure to overcome the loading when performing the adjustment.

NOTE

The difference in the thickness of the GO end of the gage is 0.0030 to 0.0040-inch from that of the NO-GO end.

- (c) If neither end of the GO/NO GO gage fits into the slider gap, use a 1/8-inch Allen head screwdriver to rotate the adjustment screw slightly ccw to increase the size of the gap. On the other hand if both ends of the gage fit into the slider gap, rotate the adjustment screw slightly cw to decrease the size of the gap.

6-10-1-2 Replacement Procedures (Cont.)

(d) In the case of the earlier hydraulic cylinder configuration, thoroughly clean the screw and slider adjustment port with Freon, and install the screw in the port.

(e) Repeat the procedures of starting with step t. above until the requirements of step v. (1) are met.

w. Shutdown the disc file.

x. Attach the diode box connector of the head bar to the diode box using the hardware removed during step e.

y. Using lacing tape, lace the data head cable to the cable brackets located on the rocker arm. Ascertain that lacing, sleeving and cabling are pulled in sufficiently to allow clearance when the head bars are inserted between the discs.

CAUTION

Step z. requires strict compliance to avoid the possibility of damaging the disc surfaces when rotation occurs.

z. Insert and secure the rocker arms to their full operational position as directed in paragraph 5-9-4-3 and observe that hydraulic lines, cables, sleeving and lacing do not touch the discs. It may be necessary to rock the positioning handle while checking for clearance between disc surfaces.

CAUTION

Do not start the disc motor without performing the head pad adjustment procedures.

aa. Adjust the head pads as directed in paragraph 6-10-3.

6-10-2 CLOCK HEAD BAR ASSEMBLY — Clock head bar replacement should be performed only when absolutely necessary since it will generally result in a complete loss of data throughout the entire file. This is caused by the incremental mismatch that will probably exist between the positions of the head pads on a new head bar with respect to the same head pads on the head bar being replaced. Such loss of data may be reduced if — through use of all available good clocks — data can be transferred to another storage medium before removing the head bar. Since the old clocks will — in all probability — be lost with regard to installation of a new clock head bar assembly, a clock writer shall be available before performing the procedures.

6-10-2-1 Special Equipment Required — Obtain the following special equipment:

a. Those items specified in paragraph 6-10-1-1 steps a. through f.

b. Clock head adjustment tool, Bryant Part No. AF 411-2 from special tools supplied with the file.

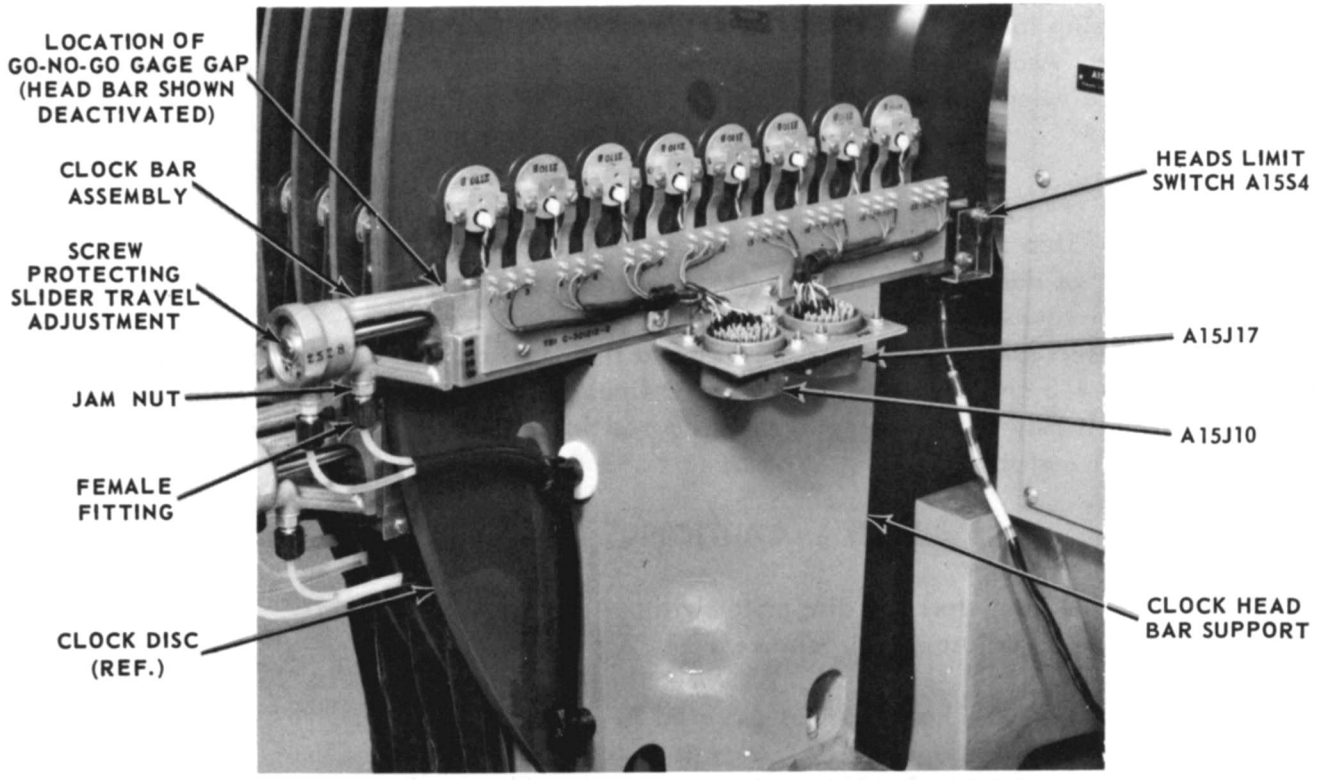


Figure 6-13 Clock Head Bar Installed in File

6-10-2-1 Special Equipment Required (Cont.)

- c. Two sheets of 42" square, heavy-duty wrapping paper.
- d. The Bryant clock head bar specified for the machine being used.
- e. A.C. Erase Tool, Bryant Part No. D-AF-243, and Bryant's EB-184.
- f. Electronic clock writing equipment.
- g. Dupont Freon 113, or equivalent, prefiltered to ASTM Class 3 Contamination Level.

6-10-2-2 Replacement Procedures — Replace the clock head bar (see Figure 6-13) by performing the following procedures:

- a. If it is possible to retrieve useful data from the file, place the disc file in the automatic operating mode. When the disc file cabinet temperature stabilizes (1-1/2 hours for A- and B- frame files or 2-1/2 to 3 hours for C- frame files), read off and store — in another device — all data that can be retrieved. With the access panels removed from the rear of the disc file cabinet, erase the data and clocks from all disc surfaces of the file using the A.C. Erase Tool in accordance with Bryant's EB-184.
- b. Shutdown the disc file and lock the RESET OFF/TRIP ON circuit breaker in the RESET OFF position.
- c. When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the center-front and top access panels from the disc file cabinet.
- d. Place a sheet of 42" square wrapping paper between the surface of the clock disc and clock head bar assembly. Tape the paper to the nearest metal frame.

CAUTION

Never apply tape to disc surface.

- e. Disconnect the clock head cable connector(s) A15P10 and, if applicable, A15P17 from the connector(s) of the clock head bar.

WARNING

Freon can cause frostbite if care is not exercised during handling.

CAUTION

Failure to exercise care during step f. may result in damage to the hydraulic seal and washer located behind the 3/8-inch jamnut of the hydraulic cylinder assembly of the head bar assembly. Such

6-10-2-2 Replacement Procedures (Cont.)

damage will cause hydraulic fluid leakage. Be sure to cap or otherwise cover all open hydraulic fittings and connections to avoid contamination of the hydraulic system.

f. Using a 3/8-inch wrench to retain the jamnut attached to the head bar assembly in a stationary position, use a 7/16-inch open-end wrench to disconnect the female fittings of the hydraulic pressure and return lines from the male ends of the hydraulic cylinder assembly of the head bar. After spraying each cap and fittings with Freon, cap each hydraulic line as it is removed.

g. Using the head bar removal wrench, alternately loosen — in approximately equal stages — the two socket-head capscrews (location is similar to that of a data head bar assembly, see Figure 6-11) that secure the clock bar to the fixed rocker arm until both screws are free of the rocker arm. Be careful to avoid binding.

CAUTION

Use extreme care upon removal and replacement of the clock head bar assembly to avoid damage to the clock disc or to the clock head pads. Never allow head pads to touch any surface during handling.

h. To free the clock head bar from the close fit created by the dowel pins protruding from the stationary rocker arm, pull up on the head bar assembly and simultaneously apply pressure to one side of the head bar and then to the other side until the head bar assembly comes free of the rocker arm; then, remove and tag the wires to the limit switch of the rocker arm and set the rocker arm aside in an upright position.

i. Carefully mount the replacement head bar on the rocker arm by reversing the procedure of step h. and then secure the head bar in place by tightening the hardware removed in step g. to a torque of 20 inch pounds in approximately equal increments.

j. After thoroughly cleaning the fittings with filtered Freon, connect the lines to the hydraulic cylinder assembly of the head bar by reversing the procedures of step f.

k. Using the clock head adjustment tool, turn the set screw associated with each head pad and reed assembly on the new clock head bar (location is similar to that of a data head bar assembly as shown in Figure 6-12) one full turn ccw.

CAUTION

The disc motor shall not be turned on in the following procedure.

l. Remove the paper placed over the clock disc.

m. Place the disc file in the manual operating mode.

6-10-2-2 Replacement Procedures (Cont.)

- n. Press the HYDRAULIC MTR ON pushbutton.
- o. After approximately two seconds, press the HEADS ON pushbutton.
- p. Perform the slider gap check of paragraph 6-10-1-2v. on the clock head bar assembly (see Figure 6-13).
- q. Connect the clock head cable connector(s) A15P10 and, if applicable, A15J17 to the mating J connector(s) of the clock head bar.
- r. Adjust the head pads as directed in paragraph 6-10-3.

6-10-3 HEAD PAD ADJUSTMENT — Perform the head pad adjustment procedures whenever an individual head pad, data head bar, or clock head bar has been replaced or whenever low playback amplitudes are detected.

6-10-3-1 Special Equipment Required — Obtain the following special equipment:

- a. Data head adjusting tool, Bryant Part No. AF-411-1, or clock head adjusting tool, Bryant Part No. AF-411-2.
- b. Whitey valve adjusting handle, Bryant Part No. B-56877, from the special tools supplied with the file.
- c. Oscilloscope, Tektronix, Model No. 555, or equivalent.
- d. Preamplifier, Tektronix plug-in type Model-D, or equivalent.
- e. Read/write electronic equipment of the particular installation.
- f. Dupont Freon 113, or equivalent, prefiltered to ASTM Class 3 Contamination Level.
- g. Soft absorbent cloth.

6-10-3-2 Adjustment Procedures — Adjust the head pads by performing the following procedures:

CAUTION

Poor playback can be due to operating the file outside its preset temperature limits (see paragraph 6-6-3v.) or because of unsatisfactory positioning system operation (see paragraph 6-9). Only when it is definitely ascertained that these factors are not affecting system operation shall the following procedures be performed.

- a. Shutdown the disc file.

6-10-3-2 Adjustment Procedures (Cont.)

b. When disc rotation stops and with the area surrounding the file thoroughly cleaned, remove the three-front access panels and the top-center access panel from the disc file cabinet.

c. Through the top-center opening of the file cabinet, disconnect cable connector A15P13 from the disc motor connector A15J13 (see Figure 6-8).

WARNING

Disconnecting the hydraulic lines before hydraulic system pressure has bled off will expose the technician to a spray of hydraulic fluid that could cause injury.

CAUTION

Failure to exercise care during step d. may result in damage to the hydraulic seal and washer located behind the 3/8-inch jamnut of the hydraulic cylinder assembly of the head bar assembly. Such damage will cause hydraulic fluid leakage. Also, maintain the area as dust free as possible to ensure that dirt does not inadvertently enter the hydraulic system when lines are disconnected. Before connecting a line to a fitting, thoroughly clean both the line and fitting with Freon.

d. Wait for approximately four minutes from the time the file was shutdown; then, using a 3/8-inch wrench to retain the jamnut attached to the head bar assembly (see Figure 6-11 or 6-13) in a stationary position, use a 7/16-inch wrench to disconnect the female fittings of the hydraulic pressure and return lines from the male end of the hydraulic cylinder assembly of the head bar with heads to be adjusted. Exercising the same caution as in removal, reverse and reconnect these hydraulic lines to the hydraulic cylinder so that the pressure line is connected to the rear port and the return line is connected to the front port.

CAUTION

When placing the head adjusting tool between the discs exercise care to ensure that disc surfaces are not struck.

NOTE

If a head bar was replaced per instructions in paragraph 6-10-1 or 6-10-2, proceed to step f.

e. Using the head adjusting tool (see Figure 6-11 for a typical example) turn the set screw associated with each head pad and reed assembly of the head bar to be adjusted one turn ccw.

6-10-3-2 Adjustment Procedures (Cont.)

CAUTION

Be sure discs are not inadvertently rotated when performing the following procedures.

f. Place the file in the manual operating mode.

g. Press the HYDRAULIC MTR ON pushbutton and observe that the head pads of the head bar of step d. have moved to a flying attitude with respect to the disc surface(s).

NOTE

The use of a floodlamp positioned behind the heads will facilitate the following adjustment procedure

h. Starting with innermost head pad(s) on the head assembly (head pad(s) closest to the spindle), turn the set screw on the slider bar assembly cw until head pad just makes contact with disc surface so that no light is visible between the disc and head pad. This can best be accomplished by rocking the set screw in and out (cw and ccw) until proper contact is achieved.

i. Proceeding to the next innermost head pad(s), repeat step h. for all the head pads on the head bar before proceeding to the next step.

j. Press HEADS OFF and HYDRAULIC MTR OFF pushbuttons and wait for system hydraulic pressure to reduce to zero. This can generally be detected by occurrence of an audible hiss, or by waiting approximately four minutes following hydraulic system shutdown.

k. Reverse the connections of the hydraulic lines to the head bar under adjustment so that the pressure line is connected to the rear port of the hydraulic cylinder; use the wrenches as directed in step d. These connections should now conform to all other head bar hydraulic cylinder connections across the file.

l. Press the HYDRAULIC MTR ON pushbutton and observe that the head pads retract on the head bar of which the hydraulic lines were reversed in step k.

m. With the head pads retracted, initially adjust each head of the head bar by turning the appropriate set screw cw to the amount shown in Table 6-4 or 6-5, depending on whether data or clock head pads are being adjusted.

TABLE 6-4 INITIAL DATA HEAD PAD ADJUSTMENTS

Head Position	Zone	Head Pad Setting (cw)
1 and 7	1 (Innermost)	1/4 Turn
2 and 8	2	1/4 Turn
3 and 9	3	3/8 Turn
4 and 10	4	3/8 Turn
5 and 11	5	1/2 Turn
6 and 12	6 (Outermost)	1/2 Turn

TABLE 6-5 INITIAL CLOCK HEAD PAD ADJUSTMENTS

Head Position	Zone	Head Pad Setting (cw)
1	1 (Innermost)	1/4 Turn
2	2	1/4 Turn
3	3	3/8 Turn
4	3	3/8 Turn
5	4	3/8 Turn
6	5	1/2 Turn
7	5	1/2 Turn
8	6 (Outermost)	1/2 Turn

n. When all head pads are at their proper setting, alternately actuate the HEADS ON and HEADS OFF pushbuttons several times and check that there is no visible indication of disc deflection. This can be caused by unbalanced head pad pressure. If an unbalance is detected, shutdown the disc file and repeat the above procedures starting with step d.

o. Through the center-top opening of the file cabinet, reconnect cable connector A15P13 to disc motor connector A15J13.

p. Place the file in the automatic operating mode and observe that the head pads of the head bar being adjusted are flying properly.

q. Connect the read/write equipment to the head pad or head bar that was adjusted and check for playback. The playback required per head pad is determined by the customer's read/write techniques, load requirements, and playback amplitude and frequency requirements. Check the amplitude of the signals originating at the replaced head bar position and compare these with standard test data furnished with the file. If signal amplitudes are insufficient, additional head adjustment to bring the amplitude into tolerance is possible as directed in step s. However, if a track other than zero is to be used, first perform the procedures of step r., and then proceed to step s.

WARNING

During the final adjustment of the head pads of a head bar, adjustment is generally accomplished at track 127. While on this track, or for that matter on any other track except track zero, a power failure will — or human error could — cause the positioning system to instantly position the heads back to track zero and result in serious injury to the individual performing head adjustment. To prevent this from happening, the actuator can be effectively locked in position by performing procedures of paragraph r.

6-10-3-2 Adjustment Procedures (Cont.)

r. When performing head adjustments with the positioning system at other than track zero, position the head to the desired track and lock the positioning system in place by performing the following procedures:

- (1) Remove the rear-center access panel from the file cabinet. Also, when facing the front of the file, remove the left-side access panel from the A-frame file cabinet, or the right-side access panel of the power control unit cabinet of the B- or C-frame file.
- (2) Through the rear center opening of the file cabinet, install the Whitey valve adjusting handle on the shaft of the variable orifice (see Figure 1-11). Secure the handle to the shaft using the handle's setscrew.
- (3) Reference mark the valve shaft with respect to the valve housing; loosen the packing nut on the valve, and count the number of turns cw required to close the valve. The closing of the valve locks the positioning system at the track addressed. Record the number of turns required to close the valve.
- (4) Through the side opening of the cabinet, set circuit breaker CBI of the solenoid driver power supply (see Figure 1-17 or 1-24) to OFF — this action prevents the overheating of any solenoid valves actuated while performing head adjustments at the track selected.

NOTE

In the following step, the additional turns made should be sufficient to bring the signal amplitude to within playback tolerances and no more.

s. If the signal amplitude is insufficient, additional head adjustments can be made up to the limits allowed in Table 6-6 or 6-7, depending on whether data head pads or clock pads are being adjusted.

TABLE 6-6 DATA HEAD PADS — PERMISSIBLE ADDITIONAL CW ADJUSTMENT

Zone	Dual Data Bar		Single Data Bar	
	900 rpm	1200 rpm	900 rpm	1200 rpm
1	+0	+1/8	+1/16	+1/4
2	1/8	1/8	1/4	1/4
3	1/8	3/16	1/4	3/8
4	1/8	3/16	1/4	3/8
5	3/16	1/4	7/16	1/2
6	(+)3/16	(+)1/4	(+)7/16	(+)1/2

TABLE 6-7 CLOCK HEAD PADS — PERMISSIBLE ADDITIONAL CW ADJUSTMENT

Zone	1/4 - 20 Screw *		10 - 32 Screw *	
	900 rpm	1200 rpm	900 rpm	1200 rpm
1 (Innermost)	+0	+1/8	+3/16	+7/16
2	+1/8	+1/8	+7/16	+7/16
3	+1/8	+3/16	+9/16	+11/16
4	+1/8	+3/16	+9/16	+11/16
5	+1/4	+5/16	+3/4	+13/16
6 (Outermost)	+1/4	+5/16	+3/4	+13/16

* To determine the type of screw used on the clock bar, compare the screws of the clock bar with the 1/4-20 setscrews used on a data head bar.

t. If the positioning system was locked during head adjustment, unlock the positioning system after head adjustment as follows:

- (1) Through the side opening of the cabinet, set circuit breaker CBI of the solenoid driver power supply to ON.
- (2) Using the number of turns recorded in step r.(3) as a guide, rotate the handle on the shaft of the variable orifice ccw until the reference marks placed on the shaft and valve housing in step r.(3) are aligned.
- (3) Remove the Whitey valve adjusting handle from the shaft and store the handle.

u. Perform the positioning repeatability test of paragraph 6-9-5.

6-11 DISC ASSEMBLIES

Replacement of disc assemblies necessitates removal of all discs up to and including the disc that is to be replaced and then — during reinstallation of the discs — checking to ensure that the runout of each disc is proper before installation of the next disc. Either data or clock discs can be replaced. However, before replacing a data disc, a suitable storage medium shall be available for storing all data contained on the discs that are to be removed. If a disc containing prerecorded information which is to be only read, such as clock or track verification data, is to be removed, a suitable clock writer shall be available before performing the procedures.

6-11-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

- a. A runout meter consisting of a Pher gage — with a scale range of at least zero to 0.020 inch — and a Starrett holder, or equivalent.
- b. A Norton sharpening stone (Sandstone block) Part No. MB-24, manufactured by the Behr Manning Co., Troy, New York, or equivalent.

6-11-1 SPECIAL EQUIPMENT REQUIRED (Cont.)

c. Torque wrench, Bryant Part No. A-56840, from the special tools supplied with the file.

d. If a clock disc or a data disc mounted on the innermost (pedestal) position of the spindle is to be replaced, a Clamping Ring, Bryant Part No. D25060-1, and Backup Plate, Bryant Part No. D25060-2, are required.

e. A.C. Erase Tool, Bryant Part No. DAF-243, and Bryant's EB-184.

f. Freon, Dupont 113, prefiltered to ASTM Class 3 Contamination Level.

g. A grease pencil.

h. Soft absorbent cloths.

i. Rubber gloves.

6-11-2 REPLACEMENT PROCEDURES — Replace the discs of the disc file as follows:

a. Construct a disc storage rack by securing a 2- x 4-inch board to the top of a work bench; allow a good portion of the 2- x 4-inch board to overhang to facilitate the storage of several discs.

b. Place the disc file in the automatic operating mode. When the disc file cabinet temperature stabilizes (1-1/2 hours for A- and B- frame files or 2-1/2 to 3 hours for C- frame files), read off and store — in another device — all data previously written on the surfaces of the discs that are to be removed. Also, remove the data from the surface of the disc that is adjacent to the last disc to be removed; this action is mandatory since an erase tool, which could destroy the data on the surface, is to be subsequently used in the procedure.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the following procedures.

c. With the area surrounding the file thoroughly cleaned, remove the three rear access panels from the disc file cabinet.

CAUTION

Never allow the A.C. Erase Tool to be continuously operated in the vicinity of disc surfaces that are not to be erased.

d. Through the access openings in the rear of the disc file cabinet, erase the data from the surfaces of the discs using the A.C. Erase Tool in accordance with the procedures of Bryant's EB-184.

CHECK ROCKER ARM
SLOT-TO-DISC
GAP HERE

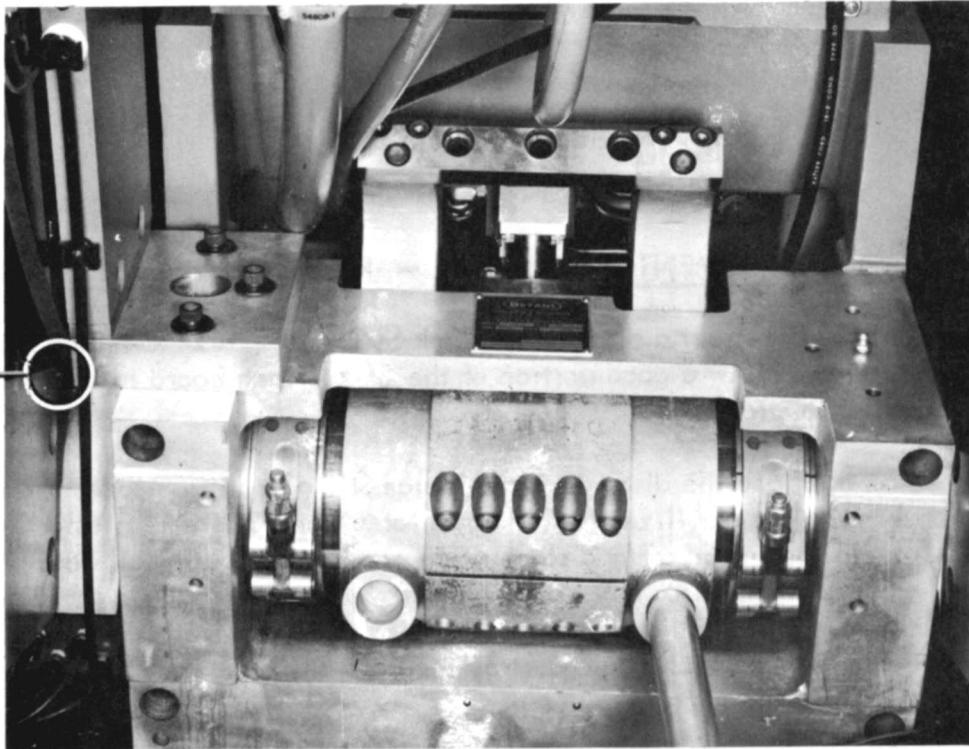


Figure 6-14 Location for Performing Installation Check of a Disc Nearest Pedestal—Typical of Either Side of Pedestal

6-11-2 REPLACEMENT PROCEDURES (Cont.)

e. Shutdown the disc file and perform the head retraction procedures as follows:

- (1) Perform the procedures of paragraph 5-9-4-2a. through d.

WARNING

The disc file shall not be operated until the disc replacement procedure is completed in its entirety.

CAUTION

When checking spacing in the next step, never use an object that can score or otherwise damage the disc surface.

- (2) If the disc next to the pedestal assembly is to be replaced, wait for disc rotation to stop. Then, use a group of data processing cards — each 0.007 inch thick — to check the space between the slot in the rocker arm and the disc (see Figure 6-14). Record the size of space; this information is for reference when installing a new disc next to the pedestal.
- (3) With disc rotation stopped, retract the data heads from the disc file as directed in paragraph 5-9-4-2f. through g.

f. Remove the side access panel from the disc file cabinet that will enable removal of the discs from the spindle.

g. Using a grease pencil, make a series of marks (one mark on the edge of each disc) corresponding to an imaginary straight line extending horizontally across the combined edges of the grouping of discs to be removed. This action could subsequently aid in returning the discs to a position that produced the best runout indication during initial assembly.

h. Remove the discs from the spindle until the defective disc is removed by performing the following procedures:

CAUTION

Never touch discs with bare hands. Exercise care to ensure that disc surfaces are not scratched or otherwise damaged during and following handling.

- (1) For only those disc files that have a special end disc equipped with a special hub that does not include a lip, remove three socket head screws that secure the disc to the next disc. While wearing rubber gloves, carefully slide the disc off the end of the spindle and immediately place the disc on the available storage rack.

6-11-2 REPLACEMENT PROCEDURES (Cont.)

(2) Remove all other discs — up to and including the defective disc — from the spindle as follows:

- (a) Remove the three socket head screws that secure the disc to the next disc.
- (b) Remove the three socket head set screws and brass inserts that secure the disc hub to the spindle.
- (c) While wearing rubber gloves, carefully slide the disc off the spindle and immediately place the disc on the available storage rack; when the defective disc is removed, return the disc to stock for subsequent return to Bryant for credit or resurfacing.
- (d) If the disc immediately adjacent to the pedestal is removed, remove whatever spacer that may be on the spindle. Carefully sandstone both faces of the spacer and the face of the hub of the spindle against which the spacer is positioned and then carefully reinstall the spacer on the spindle.

i. Obtain a replacement disc from stock and place it on the end of the disc storage rack.

j. Prior to installation of the new disc on the spindle, lightly sandstone the hub face of the disc as follows:

- (1) Slide the disc to the edge of the storage rack so that the hub forms a lip over the rack's edge.
- (2) Lightly run the sandstone in a circular motion over the entire hub face.
- (3) Turn the disc around on the disc storage rack and repeat the procedure of steps (1) and (2) for the other side of the hub face.

k. After the hub is sandstoned, use a soft cloth dampened with Freon 113 to wash the spindle surface of the disc file and the inner portion of the disc's hub.

l. Install the new disc on the spindle in the position previously occupied by the defective disc using the following procedure:

- (1) If the first disc to be installed is the one located immediately adjacent to the pedestal proceed as follows (otherwise proceed immediately to step (2)):
 - (a) Slide the disc onto the spindle until it rests firmly against either the hub of the pedestal or the spacer that may have been reinstalled as directed in step h. (2)(d).

REPLACEMENT PROCEDURES (Cont.)

- (b) Slide the backup plate and clamping ring onto the spindle as shown in Figure 6-15 and rest them firmly against the disc's hub. Secure the ring to the spindle using the two socket head screws provided, and hand tighten the four oval-point set screws of the ring against the plate. Using a wrench, turn each screw approximately 1/2 turn clockwise (cw); this action ensures that the disc is firmly seated in position.
- (c) Perform the procedures of step m. (1) and (2). While observing the runout meter, rotate the spindle cw — with respect to facing the left front of the disc file cabinet — by hand through 360 degrees and record the highest runout value indicated; proper runout is indicated when the total runout value is less than 0.005 inch but never more than 0.010 inch. If runout is proper, immediately proceed to step (e). Otherwise proceed to step (d).
- (d) If runout in step (c) was unsatisfactory, loosen the clamping ring and rotate the disc — independent of the spindle — approximately 45 degrees cw and repeat the procedures starting with step (b) until the required runout indication is achieved. If erroneous indications occur throughout 360 degrees of rotation and no other incremental setting will provide the desired indication, return the disc to stock, obtain a new disc, and repeat the procedures starting with step (a).
- (e) With the conditions of step (c) achieved, use three brass-tipped set screws to secure the disc to the spindle; a long Allen head wrench or a head adjusting tool can be used to tighten the screw.
- (f) Remove the clamping ring and backing plate from the spindle.
- (g) Repeat the runout check of step (c) and record the indication. This final value should be equal to or better than that previously recorded.

CAUTION

When checking the spacing in the next step never use an object that can score or otherwise damage a disc surface.

- (h) Remove the runout meter from the rocker arm and slowly index the head bars into the file following the procedures of paragraph 5-9-4-3a. through c. However, be careful to ensure that the newly installed disc properly indexes into the rocker arm slot. Then, using data processing cards, or equivalent, check that the space between the rocker arm slot and disc is within 0.007 inch of the value recorded in step e. (2). If the difference is within the required tolerance, proceed to step (p). Otherwise, consult Bryant Field Service for subsequent action to be taken.

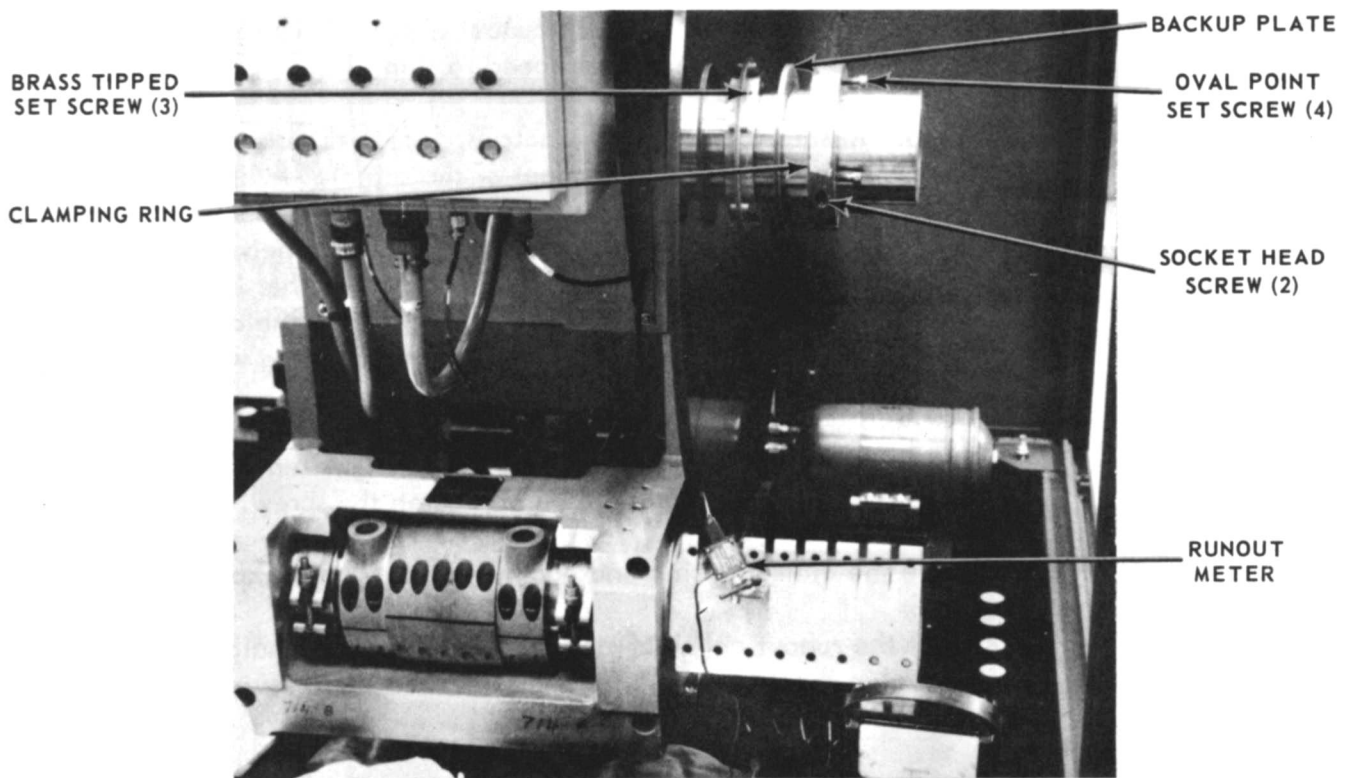


Figure 6-15 Installation of a Disc Nearest Pedestal—Hardware Required

REPLACEMENT PROCEDURES (Cont.)

- (i) Retract the head bar assemblies from the file and proceed to step (2).
- (2) In the case of installing all discs other than the disc nearest the pedestal, proceed as follows:
 - (a) Slide the disc onto the spindle until it rests firmly against the hub of the disc already on the spindle.
 - (b) Align the mounting holes in the hub of the disc with the holes of the previously installed disc and use three socket head screws to secure the discs together; install the screws in 120 degree intervals. Tighten the screws snugly, but do not overtighten. Repeat the tightening procedure to ensure equal torque application to each of the screws.
 - (c) Proceed to step m.
- m. Perform a runout test on the disc to determine the amount of wobble present during disc rotation. Set up the runout meter and record the runout value as follows:
 - (1) Setup the runout meter within 3/16 inch of the outer periphery of the disc. Use the retracted steel rocker arm shaft to support the magnetic holder of the runout meter.
 - (2) Preload the runout meter to 0.010 inch. With meter preloaded, readjust meter needle to zero.

CAUTION

To eliminate errors that can occur due to flexing the disc, always rotate discs by turning the spindle of the disc file rather than the disc itself.

- (3) While observing the runout meter, rotate the spindle cw — with respect to facing the left-front of the disc file cabinet — by hand through 360 degrees and record the highest runout value indicated on the meter; proper runout is indicated when the runout value remains less than a total of 0.010 inch. If this value is achieved, record the maximum runout observed and proceed to the final runout check, step o. However, if an improper reading is obtained, attempt to remedy the situation as directed in step n.
- n. If the runout indication of step m. was improper, proceed as follows:
- (1) Remove the three socket head screws securing the disc to the adjacent disc and position the disc to the next set of screw holes located 60 degrees cw from the initial position; resecure the one disc to the adjacent disc as directed in step l. (2)(b).

6-11-2 REPLACEMENT PROCEDURES (Cont.)

- (2) Repeat the runout test described in step m. (1) through (3). If runout indication improves, continue to advance the disc 60 degrees cw until the correct runout indication is achieved. If the indication worsens as a result of the initial change in disc position as performed in step (1), rotate the disc 120 degrees ccw and continue in the same direction at 60 degree increments until a correct indication is obtained.
- (3) If erroneous readings occur in all six possible positions, return disc to stock, obtain a new disc and repeat the procedures starting with step l.(2), until the runout is within the proper limitation.

o. Perform a final runout check of the disc as follows:

- (1) Tighten each of the three socket head screws of step l.(2)(b) to a torque of 165-inch pounds in approximately equal increments.
- (2) Insert three brass inserts and three socket head set screws into the appropriate hub holes over the spindle and tighten the screws using a long Allen wrench or head adjusting tool.
- (3) Repeat the runout test of step l. and record the indication. This final value should be improved as compared with the preliminary indication recorded in step m. (3).

p. Remove the runout meter from the rocker arm.

q. Each time a disc is installed, slowly index the head bars into the file following the procedure of paragraph 5-9-4-3a. through c. However, be careful to ensure that the disc is approximately centered within the rocker arm slot; a maximum difference of 0.007 inch can exist in the measurement of one side of the slot with respect to the other side of the slot. With the measurement satisfactory, retract the head bar assemblies from the file.

NOTE

If the last disc installed is the special disc of step h.(1), special brass inserts and socket head screws are not required and step o.(2) is not applicable for this one disc.

r. Repeat steps j. through q. for each of the remaining discs to be installed on the spindle. After installation of the first of these discs and the establishment of proper runout, alignment of the grease pencil marks placed on the edges of the discs in step g. with the mark of the previously installed disc will generally ensure proper runout alignment of all subsequent discs installed; however, the runout shall still be checked for each disc installed.

s. When all discs have been returned to the spindle, slowly insert the head bars into the disc file cabinet observing that data heads are free of disc surfaces; perform the procedure as directed in paragraph 5-9-4-3.

6-11-2 REPLACEMENT PROCEDURES (Cont.)

t. Remove all tools and materials from the inside of the cabinet area.

u. Reverse the action taken in step b., as applicable, and check the entire file for proper playback.

6-12 ACCESS PANELS

The front, rear and side access panels of the disc file cabinets are indexed to the bottom frame member of the cabinet on which they are installed and are secured to the top frame member of the cabinet by snap-out type latches. The top panels of the cabinets are indexed to the rear frame member of the cabinet and are secured to the front frame member of the cabinet by snap-out latches.

6-12-1 During removal of the three front or rear panels of the disc file cabinet, the center access panel must always be removed first; during installation, the center access panel must be replaced last.

6-12-2 The top access panels of the file can be removed in any order desired. However, care shall be exercised to ensure that air ducting located on the inside of the following top panel is not allowed to contact disc surfaces:

CAUTION

When removing the following top access panels from the cabinets, lift the panels straight up and off. Care shall be exercised to ensure that panel does not drop into the cabinet when performing the procedure.

a. When facing the front of an A-frame file, the right-top access panel of the file is equipped with air ducting.

b. The two outer-top access panels of B- and C-frame files are equipped with air ducting.

6-13 HYDRAULIC OIL LOW LEVEL, OVER-TEMPERATURE, AND HIGH PRESSURE SWITCHES

The hydraulic oil low level, hydraulic fluid over-temperature and hydraulic high pressure switches can be replaced independent of one another or, if more than one switch must be replaced, they can and should be replaced at the same time.

6-13-1 SPECIAL EQUIPMENT REQUIRED — Obtain the following special equipment:

a. Depending on the part to be replaced, obtain the following:

CAUTION

The following items are available precleaned and sealed by Bryant to Bryant specifications. Do not unseal items until parts are to be used.

SPECIAL EQUIPMENT REQUIRED (Cont.)

- (1) Hydraulic oil low level switch, Bryant Part No. B-56551-(Tab No.)
 - (2) Hydraulic fluid over-temperature switch, Bryant Part No. B-54765-2, with label "PRESET TO $140 \pm 5^{\circ}$ F," Bryant Part No. C302690-4
 - (3) Hydraulic high pressure switch, Bryant Part No. C-56554 with label "PRESET TO 1350 ± 50 PSIG", Bryant Part No. C-302690-8; also a one-quart container
- b. Roll of 1/4-inch Teflon tape
- c. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level, or equivalent.

6-13-2 HYDRAULIC OIL LOW LEVEL SWITCH — Replace the hydraulic oil low level switch (see Figure 1-21) as follows:

- a. Obtain the equipment specified in paragraph 5-6-1-1.
- b. Drain the reservoir as directed in paragraph 5-6-1-2a. through i.
- c. Depending on the disc file, proceed as follows:
 - (1) In the case of an A-frame disc file, remove the disc file panel that will enable access to the power control panel (see Figure 1-24) and open the panel. At terminal Board A21TB1 mounted on the right inside wall of the panel, disconnect the leads of the switch as connected to TB1-7 and TB1-6. Use a piece of string approximately four foot long to tie the leads together; this string can be used to draw the leads of the replacement switch back through the flexible tubing into the power control panel for subsequent connection to TB1.
 - (2) In the case of B- or C-frame disc files, open the cover of the junction box mounted on the hydraulic power supply (see Figure 1-20). At terminal board TB2 disconnect the leads of the switch as connected to TB2-7 and TB2-8. Use a piece of string approximately six foot long to tie the leads together; this string can be used to draw the leads of the replacement switch back through the flexible tubing into the junction box for subsequent connection to TB2.
- d. In the reservoir of the power supply, remove the hydraulic oil low level switch from the coupler mounted on the top of the stand-off. Then carefully draw the switch with its leads (see paragraph c.) out of the reservoir.
- e. Apply two turns of Teflon tape to the threaded end of the switch.
- f. After thoroughly cleaning the coupling of the reservoir standoff and the pipe fitting end of the switch with Freon, install the replacement switch by reversing the removal procedures of steps c. and d.

6-13-2 HYDRAULIC OIL LOW LEVEL SWITCH (Cont.)

g. Continue with the reservoir cleaning procedures of paragraph 5-6-1-2 starting with step j.

6-13-3 HYDRAULIC FLUID OVER-TEMPERATURE SWITCH — Replace the hydraulic fluid over-temperature switch (see Figure 1-20 or 1-26) as follows:

- a. Obtain the equipment specified in paragraph 5-6-1-1.
- b. Drain the reservoir as directed in paragraph 5-6-1-2a. through i.
- c. Remove the four screws securing the side panel on the switch and remove the panel.
- d. After noting the terminals to which the two leads from the flexible tubing are connected, disconnect the leads to the terminal board within the switch enclosure.
- e. Remove the flexible tubing to the switch housing.
- f. Turn the switch out of the bottom of the reservoir
- g. Install Teflon tape on the pipe threads of the replacement switch.
- h. After thoroughly cleaning the opening in the bottom of the reservoir and the temperature probe end of the switch with Freon, remove the side cover of the switch by removing the four screws, and install the switch by reversing the removal instructions of steps c. through f.
- i. Install the instruction label PRE-SET TO $140 \pm 5^{\circ}$ F. and set the switch on the assembly to the specified value on the label.
- j. Continue with the reservoir cleaning procedures of paragraph 5-6-1-2 starting with step j.

6-13-4 HYDRAULIC HIGH PRESSURE SWITCH — Replace the hydraulic pressure switch as follows:

- a. Shut down the disc file .

CAUTION

The area shall be maintained clean and as dust free as possible when performing the subsequent procedures .

- b. When disc rotation stops and with the area surrounding the file thoroughly cleaned, perform the following procedures as applicable .

- (1) In the case of an A-frame disc file, remove the center-rear access panel from the disc file cabinet and disconnect the hydraulic pressure hose and then the return hose from the accumulator manifold assembly as directed in paragraph 5-6-4-2 c.(2) and (3); however, refer to Figure 5-9 for the A-frame file which does not have a 10-micron filter. Also, with respect to the rear of the A-frame file cabinet, remove the cabinet's right side access panel to gain access to the hydraulic high pressure switch (see Figure 1-26).
- (2) In the case of a B- or C-frame disc file with respect to facing the front of the power control unit cabinet, remove the right side access panel of the cabinet. Disconnect the pressure hose and then the return hose from the manifold of the hydraulic power supply (see Figure 5-14) following the same general procedure of paragraph 5-6-4-2 c. (2) and (3).
 - c. Remove the hydraulic tubing connected to the elbow of the hydraulic high pressure switch; use the one-quart container to catch the fluid flowing from the tube.
 - d. Remove the four screws securing the side panel on the switch and remove the panel.
 - e. After noting the terminals to which the two leads from the flexible tubing are connected, disconnect the leads from the terminal board within the switch enclosure.
 - f. Remove the flexible tubing to the switch housing.
 - g. Remove the two screws securing the upper-rear part of the switch to the bracket of the hydraulic power supply and remove the switch.
 - h. Remove the elbow from the coupling of the switch housing, strip the old Teflon tape off the elbow, and install new tape in its place.
 - i. After thoroughly cleaning the elbow and the coupler of the new switch with Freon, install the elbow on the coupler of the new switch.
 - j. Install the new switch in the file by reversing the removal procedures of steps c. through g.
 - k. Reconnect the return and then the pressure hose to the appropriate manifold of the disc file (see paragraph b.) generally following the procedures of paragraph 5-6-4-2 m.(1) and (2).
 - l. Place the disc file in the manual operating mode.
 - m. Press HYDRAULIC MTR ON pushbutton.

n. After approximately one minute of pump operation, slightly loosen the fitting that connects the tubing of step c. to the elbow of the switch and allow the air that may be in the tube to bleed out. Bleeding is complete when frothing liquid ceases to seep out of the fitting. The instant bleeding is complete, retighten the fitting and wipe up any oil accumulation in the file.

Many miscellaneous electro/hydraulic components can be replaced in the disc file. These include relays, switches, electrical contactors, hydraulic lines, manifolds, and the like. The following paragraphs generally state the special procedures or cautions that should be recognized when replacing such parts.

6-14-1 ELECTRIC MOTORS — When replacing the disc motor, check that disc rotation cw with respect to viewing the disc through the left-front access opening of the file cabinet; when replacing the motor that drives the hydraulic pump, check that pump rotation is in the direction of the arrow on the pump. If the direction of rotation of either motor after replacement is improper, change the power connectors to the motor not the site input power connections. During assembly of the disc file, all motors in the file are viewed, one with respect to another, to ensure proper rotation for a particular input power phasing. When replacing a motor at the site at which the input power phasing was originally connected properly, it is important that the motor phasing — rather than the input power phasing — be changed to correct improper motor rotation.

6-14-2 ELECTRICAL COMPONENTS — When replacing electrical components, each pin or contact of an assembly from which an electrical lead is removed must be tagged with the corresponding designation marked on the electrical lead. Reconnection of a corresponding replacement part into the file can then be properly made by using the tagged pins and contacts of the removed assembly as a reference.

6-14-3 HYDRAULIC COMPONENTS — When replacing hydraulic components (e.g., metal or plastic hydraulic lines, check valves of the hydraulic power supply (see Figure 5-12), or check valves in the manifold block of the disc file accumulator manifold assembly), the area surrounding the disc file should be thoroughly cleaned before starting maintenance. The following procedures shall then be performed:

a. If a line or component is to be disconnected from the bottom of the reservoir, drain the reservoir first per paragraph 5-6-1-2 steps a. through i.

b. If an hydraulic line or component in the disc file is to be replaced, disconnect the pressure and return hoses to the accumulator manifold assembly before proceeding with the replacement. This action prevents the drainage of the reservoir when components below the reservoir level are removed. Disconnect the pressure and the return hoses as directed in paragraph 5-6-4-2a. through c.; at the completion of replacement, connect the return and the pressure hoses as directed in paragraph 5-6-4-2m. Note that if an A-frame file is involved, no 10-micron filter is included in the installation (see Figure 5-9).

- c. The fittings within the file and those of the replacement component shall be handled as described in paragraph 6-1-4 g.
- d. Before connecting tapered pipe fittings, apply Teflon tape to the male end of the fitting approximately three threads from the end of the fitting.
- e. If the reservoir was drained, perform the procedures of paragraph 5-6-1-2 steps j. through q. and fill the reservoir as directed in paragraph 5-9-1.
- f. Following completion of installation of an hydraulic component in the disc file, perform the purging procedures as directed in paragraph 5-9-2.

SECTION 7

MODEL 1, SERIES 4000 DISC FILES WITH 2-TON ENVIRONMENTAL CONTROL UNITS

7-1 INTRODUCTION

The performance and maintainability of Bryant Model 1, Series 4000 Disc Files have been significantly improved by the addition of an environmental control unit (ECU) to the disc file cabinet. A typical installation of a 2-ton ECU on a B-frame disc file is shown in Figures 7-1 and 7-2. The file — in this new configuration — performs the same functions as the earlier files; however, the addition of the ECU enables filtration and temperature control of the air entering the disc file cabinet as well as pressurization of the air within the cabinet. Air prefiltered just before entering the disc file cabinet assures maximum cleanliness of the air surrounding the recording elements of the file. Temperature control of the air within the disc file cabinet reduces the tendency of thermal expansion or contraction of the recording elements of the file when relatively large variations of room ambient temperatures occur; thus, information written into the file at one room ambient temperature can still be read out at a much different room ambient temperature (in comparison with files without ECUs) with significantly less chance of a loss of the originally written information. Positive pressurization of the air within the cabinet inhibits the entrance of room air that may be contaminated.

7-2 DESCRIPTION

The disc file with environmental control unit (ECU) is identical to a disc file without ECU as described in paragraph 1-2, except that a second cabinet is added to the A-frame configuration and a third cabinet is added to the B- and C-frame configurations; also, minor changes are made to the basic, original cabinet configuration. The added cabinet in each configuration is identified as the environmental control unit cabinet assembly (see Figures 7-1 and 7-2).

7-2-1 B- AND C-FRAME DISC FILE MODIFICATIONS — To accommodate installation of the ECU on a B- or C-frame disc file, modifications are made to elements of both the disc file and the power control unit cabinets.

7-2-1-1 Disc File Cabinet Assembly — Modification of the disc file cabinet assembly includes the addition of a leak pump (see Figure 7-3) and related modifications to the pushbutton station assembly; modification of the accumulator manifold assembly; relocation of the lubrication fittings of the boost grease pins; and the elimination of air inlet and exhaust louvers from the front, rear, and outer top panels of the cabinet.

a. Leak Pump — The leak pump (see Figure 7-3) replaces the leak bottles formerly used in the basic B- and C-frame disc file configurations (see Figure 1-13). The pump is connected through a line with a 5 psig check valve to the return outlet of the accumulator manifold assembly. The pump functions automatically to return fluid that has leaked from the boots of the digital actuator/boost assembly to the reservoir of the hydraulic power supply of the file via the manifold. This addition eliminates the previous, periodic need to open the file to empty the leak bottle.

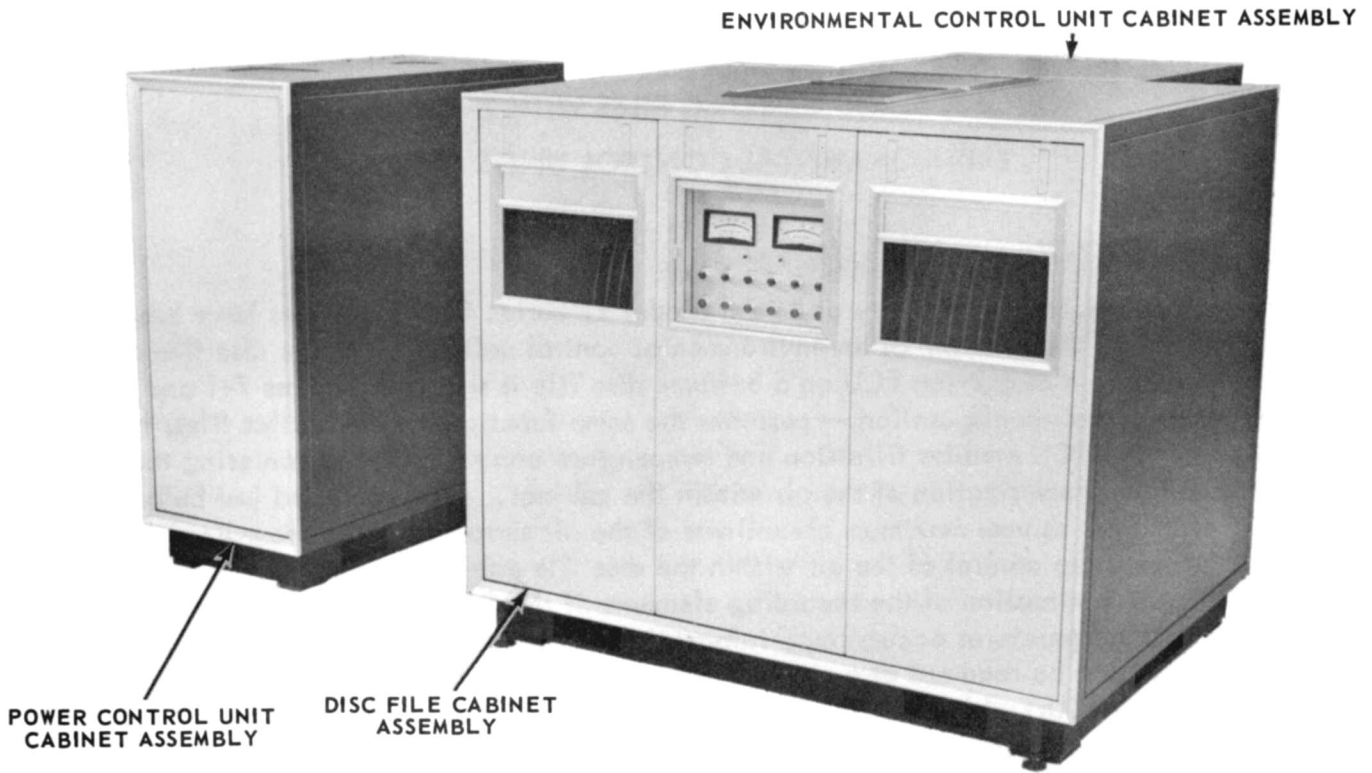


Figure 7-1 MODEL 1, Series 4000 Disc File with ECU Installed, Front View

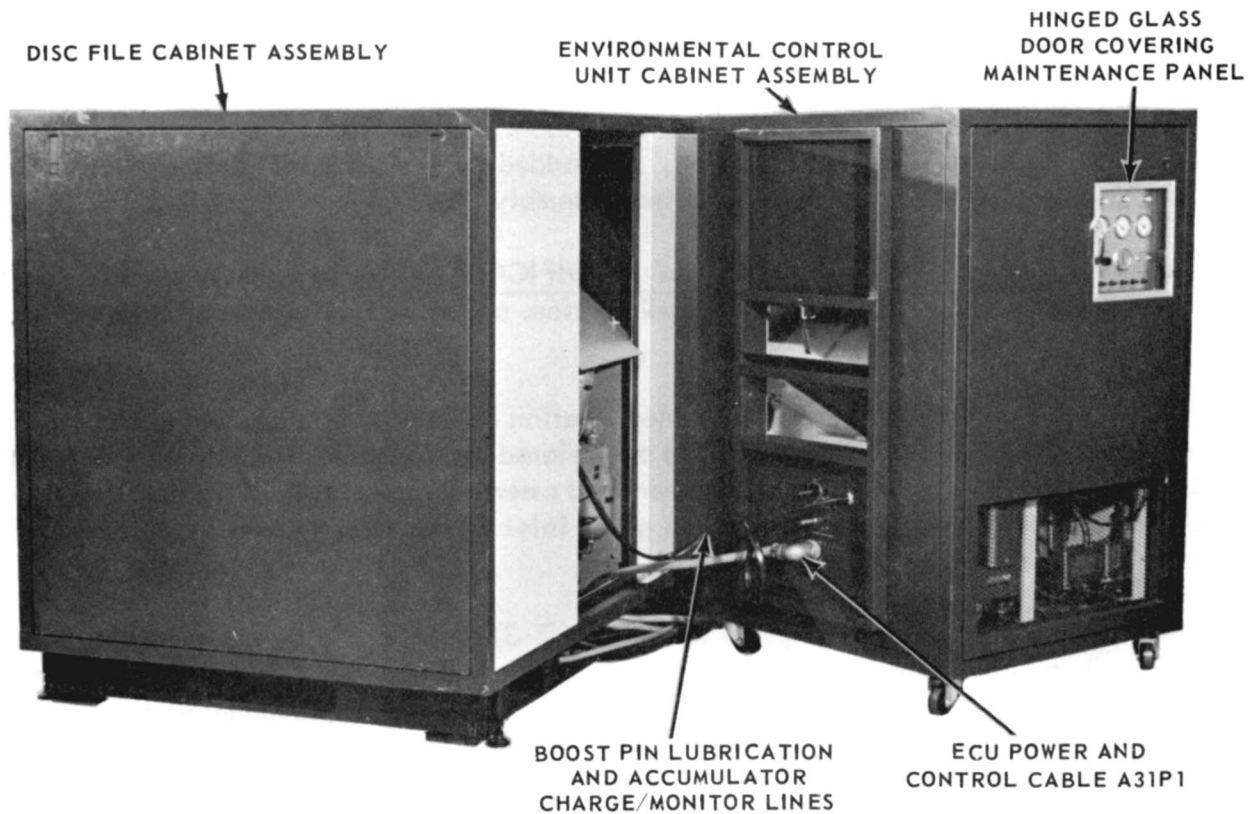


Figure 7-2 ECU Separated From Rear of Disc File Cabinet Assembly

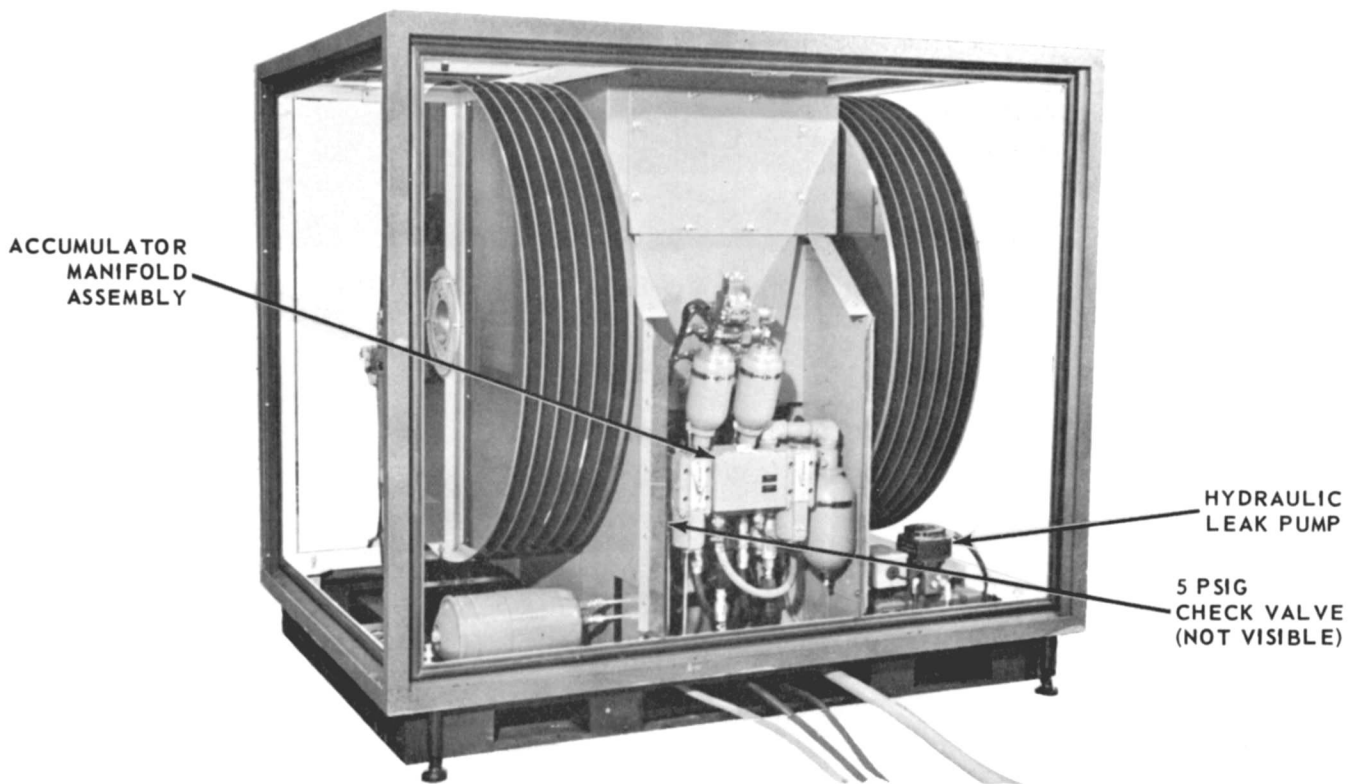
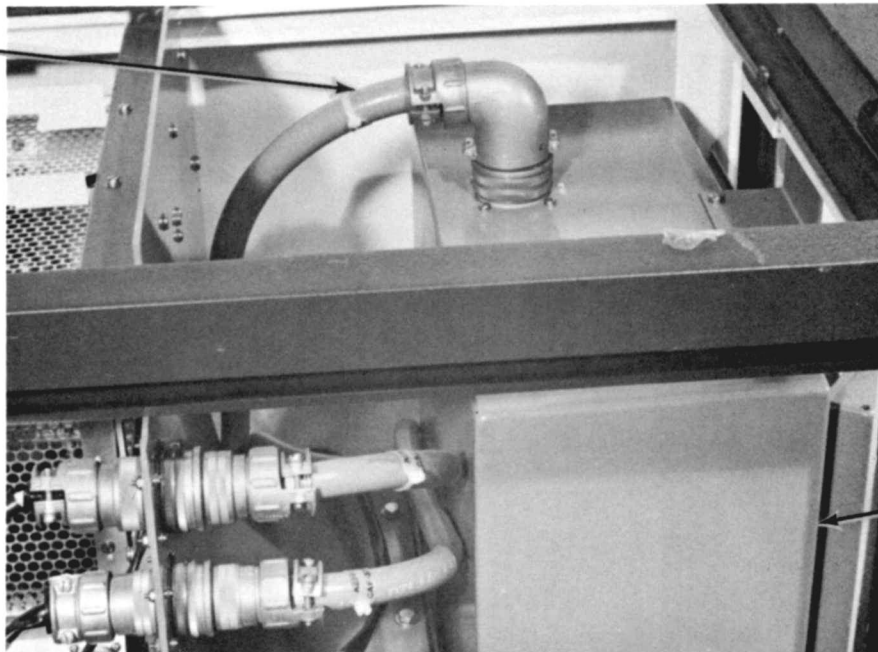


Figure 7-3 Disc File Cabinet Assembly Modifications to Accommodate ECU Installation

ECU CABLE
(CONNECTOR
A21P6)



POWER
CONTROL
PANEL
(REF.)

Figure 7-4 Power Control Unit Cabinet Assembly—Installed View of ECU Power and Control Cable

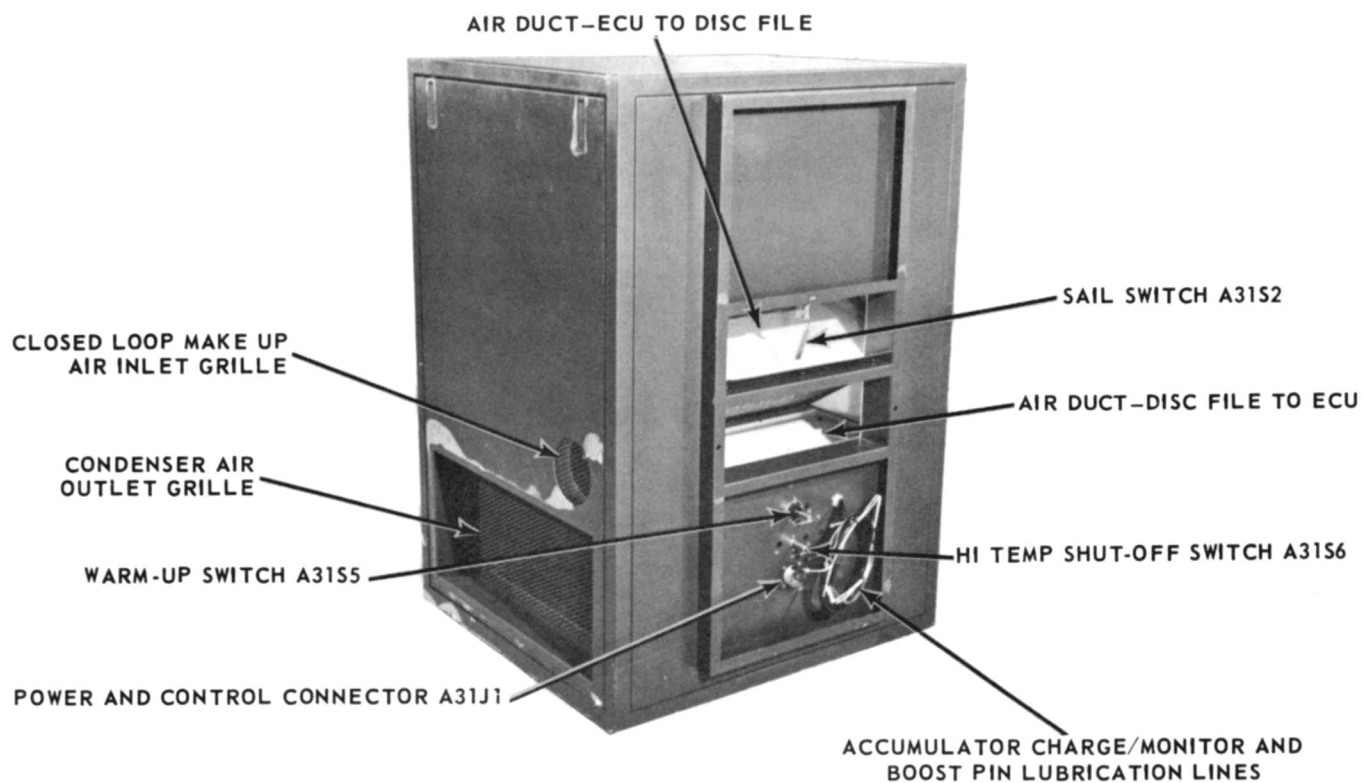


Figure 7-5 ECU Cabinet Assembly Component Location, Front View—Access Panels Installed

7-2-1-1 Disc File Cabinet Assembly (Cont.)

b. Pushbutton Station Assembly — A terminal board is mounted on the back inner wall of the pushbutton station assembly (see Figure 1-3). The terminal board accommodates the power and control wiring for the leak pump. Power is routed from the terminal board out through the rear wall of the station to the pump.

c. Accumulator Manifold Assembly — The accumulator manifold assembly (see Figure 7-3) is modified from that of the original assembly (see Figure 1-15). The modification includes the relocation of the installed position of the quart accumulator, elimination of the pressure gage adapters of all accumulators, and relocation of all accumulator pressure gages. The relocation of the quart accumulator enables the installation of a baffle plate over the accumulators; by use of the baffle plate, the flow of cooled air from the environmental control unit (ECU) into the file cabinet is separated from the flow of heated air from the file cabinet back into the ECU cabinet. Relocation of the pressure gages of the accumulators to the maintenance panel of the ECU (see Figure 7-2) enables periodic remote pressure monitoring and charging of the accumulators without the need of opening the disc file cabinet.

d. Boost Pin Lubrication Fittings — The boost pin lubrication fittings (see Figure 1-10) are mounted on the maintenance panel of the ECU. This mounting enables periodic, remote lubrication of the fittings of the boost without the need of opening the disc file cabinet.

7-2-1-2 Power Control Unit Assembly — The hydraulic oil low level switch located in the reservoir of the hydraulic power supply (see Figure 1-21) is replaced with a dual level float switch; this switch — furnishing the same low level shutoff features as the original switch — also furnishes a low hydraulic fluid level warning indication. The power control panel of the power control unit cabinet assembly is also rewired to accommodate power and control cable wiring for ECU installation. The wiring to the ECU is terminated at a connector mounted in the top of the panel (see Figure 7-4). The cable assembly carrying the power and control commands from this connector is routed through the disc file cabinet where it terminates at a connector that is designed to mate with a connector located in the front of the ECU.

7-2-2 A-FRAME DISC FILE MODIFICATIONS — With the addition of required grommeted openings, a partition completely seals the power control unit section of the A-frame disc file cabinet from the pedestal section of the cabinet (see Figure 1-24). With the exclusion of a leak pump, changes made to the A-frame file to accommodate the installation of the ECU are essentially the same as those for B- and C-frame files except that the power and control cable for the ECU is connected to a prewired connector A21J3, which is located in the bottom of the power control panel of the power control unit section of the cabinet. Cables and hydraulic lines interconnecting the two sections of the cabinet are routed through the appropriate grommeted openings of the cabinet's partition so that only the air in the disc portion of the cabinet is filtered, temperature controlled, and pressurized. Leakage from the boots of the digital actuator boost assembly of an A-frame file is still handled by a leak bottle which may be located either outside the cabinet or inside the power control unit section of the cabinet. In either of these latter installations, the routing of the leak line of the boots through grommeted openings enables emptying the leak bottle without opening the pedestal section of the cabinet.

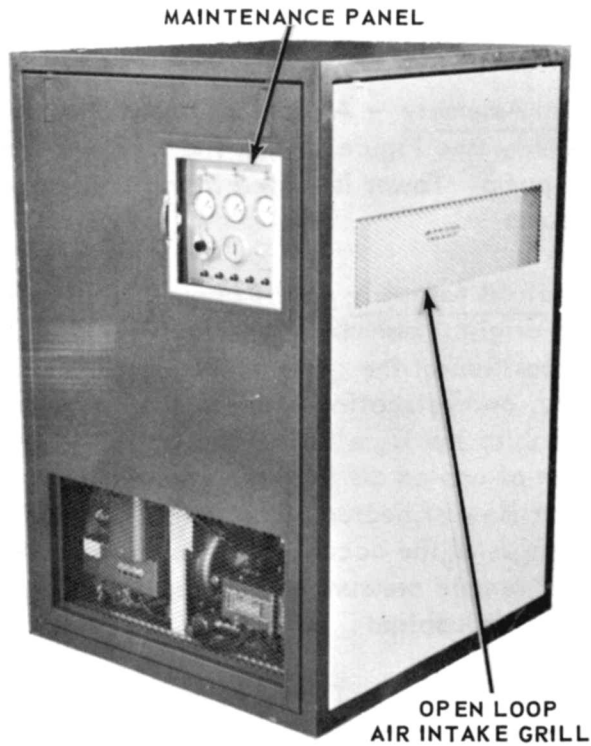


Figure 7-6 ECU Cabinet Assembly, Rear View—Access Panels Installed

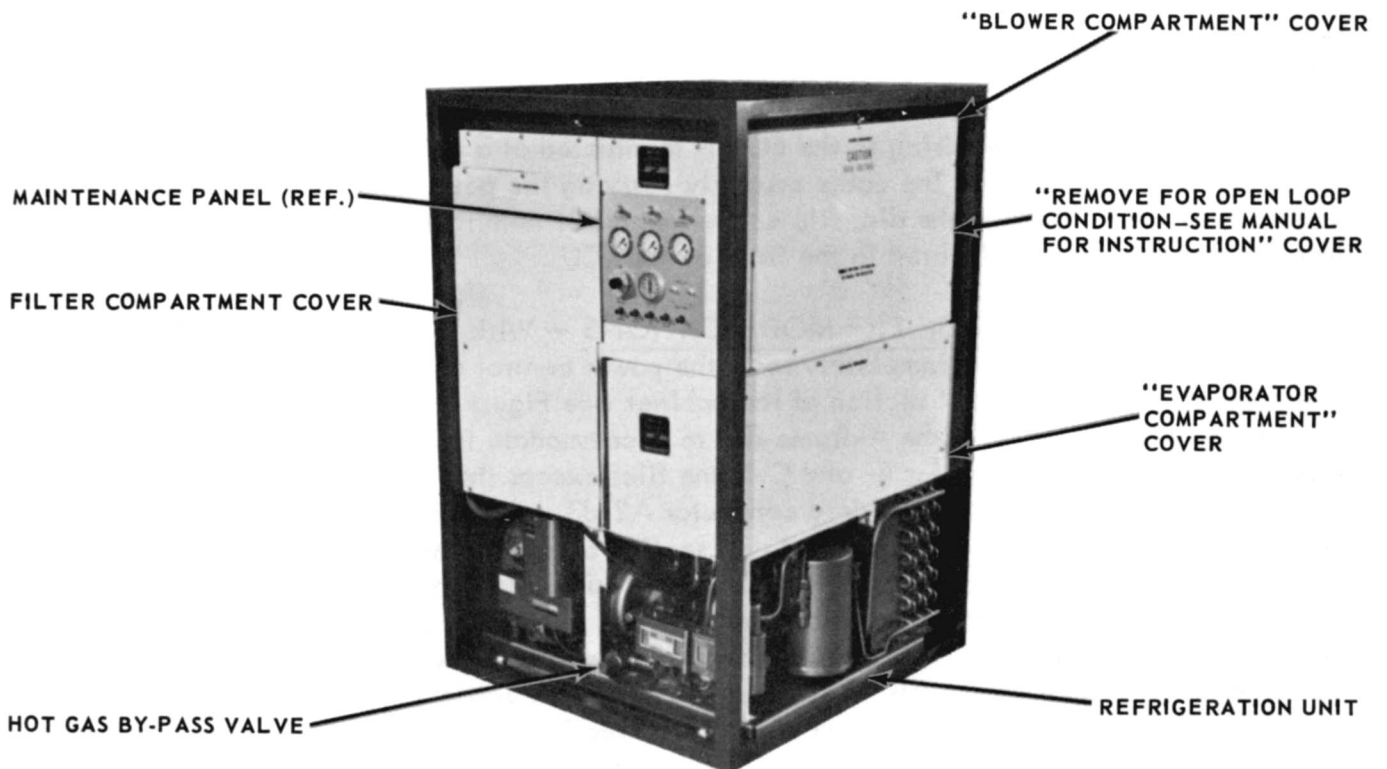


Figure 7-7 ECU Cabinet Assembly Component Location, Rear View—Access Panels Removed

7-2-3 ENVIRONMENTAL CONTROL UNIT CABINET ASSEMBLY — The environmental control unit (ECU) cabinet assembly (see Figures 7-5 and 7-6) includes the components that enable the control of the internal temperature of the disc file cabinet to within $+3^{\circ}\text{F}$ — best case for a 900 rpm B-frame disc file — for a room ambient temperature change of $+10^{\circ}\text{F}$ between the limits of from 60 to 100°F ; this control is enabled with the adjustment of a hot gas by-pass valve and the temperature sensing capability of an expansion valve arrangement. The ECU also includes a blower, which provides positive pressurization of the disc file cabinet interior with respect to atmospheric air pressure and a filter, which ensures the cleanliness of the air before it enters the disc file cabinet. Positive pressurization of the air within the disc file cabinet ensures that dust and other foreign matter in the surrounding atmosphere will not enter the cabinet during disc file operation. Essentially, the cabinet contains a maintenance panel, blower compartment, filter compartment, and refrigeration unit (see Figure 7-7).

7-2-3-1 Maintenance Panel — The maintenance panel (see Figure 7-6) enables the performance of normal daily and weekly preventive maintenance procedures on disc file cabinet components without the necessity of opening the disc file cabinet. Mounted on the panel are gages, valves, lubrication fittings, indicator lamps, and a control.

7-2-3-2 Blower Compartment — The blower compartment (see Figure 7-7) houses the blower motor and blower (see Figure 7-8) used to pressurize the air supplied by the ECU to the disc file cabinet. Also contained in the compartment are the blower motor overload contactor and a delay timer.

7-2-3-3 Filter Compartment — The filter compartment (see Figure 7-7) contains a main filter (see Figure 7-8). This filter is an absolute filter assembly that is rated as 100 percent effective at one micron. Earlier models of the ECU were also equipped with a furnace type filter that was used to prefilter room ambient air before application to the ECU's normal air flow path. However, it was discovered that the function performed by this filter was negligible and it was dropped from subsequent configurations.

7-2-3-4 Refrigeration Unit — The refrigeration unit (see Figure 7-7) is a Freon, semi-hermetic, sealed motor/compressor type unit. The unit — components of which are also shown in Figure 7-9 and 7-10 — functions to maintain the air entering the disc file cabinet assembly at a relatively constant temperature over fairly wide variations in room ambient temperatures.

7-3 RECEIVING, STORAGE OR INSTALLATION, AND SHIPPING INSTRUCTIONS

This paragraph provides the procedures to be followed when receiving, storing or installing, preparing for shipment, and shipping a standard Bryant Model 1, Series 4000 Disc File with environmental control unit (ECU). All such procedures shall be performed by qualified technicians. If assistance is required, Bryant's qualified staff of servicemen are always on call to perform such customer service.

7-3-1 GENERAL — Personnel qualifications for performing the subsequent procedures, special tools and accessories supplied for performing the procedures, and special equipment recommended for performing the procedures, but which are not supplied, are discussed in the following paragraphs.

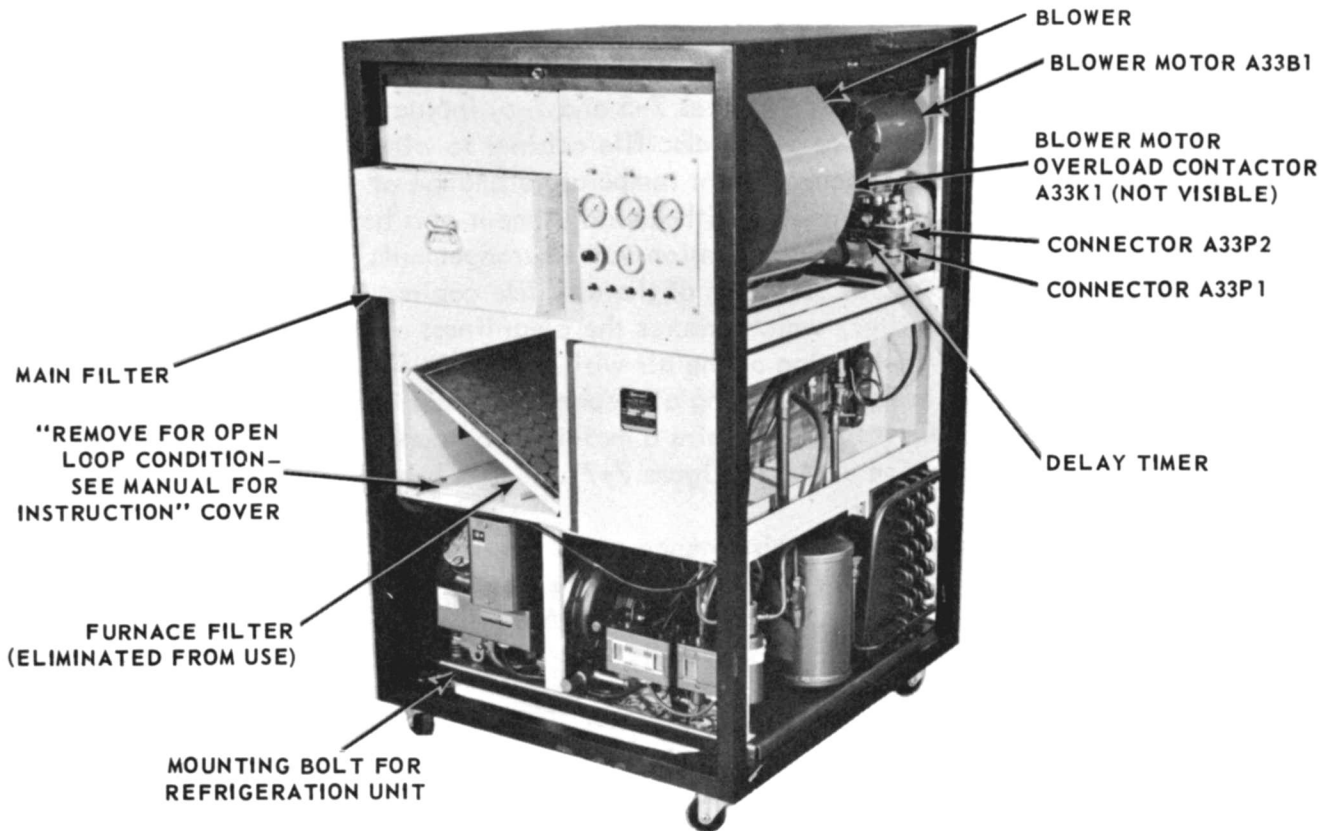


Figure 7-8 ECU Component Location, Rear View—Compartment Covers Removed

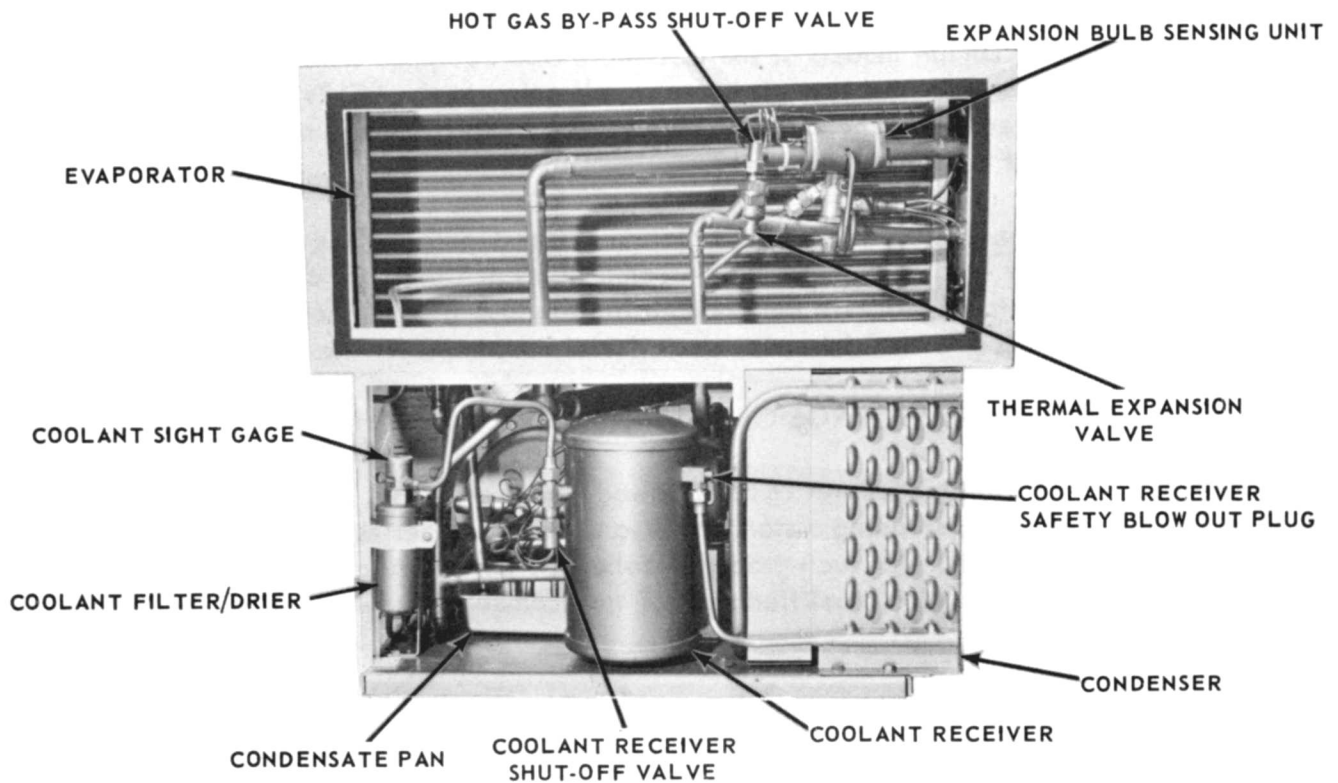


Figure 7-9 ECU Refrigeration Unit Component Location, Rear View

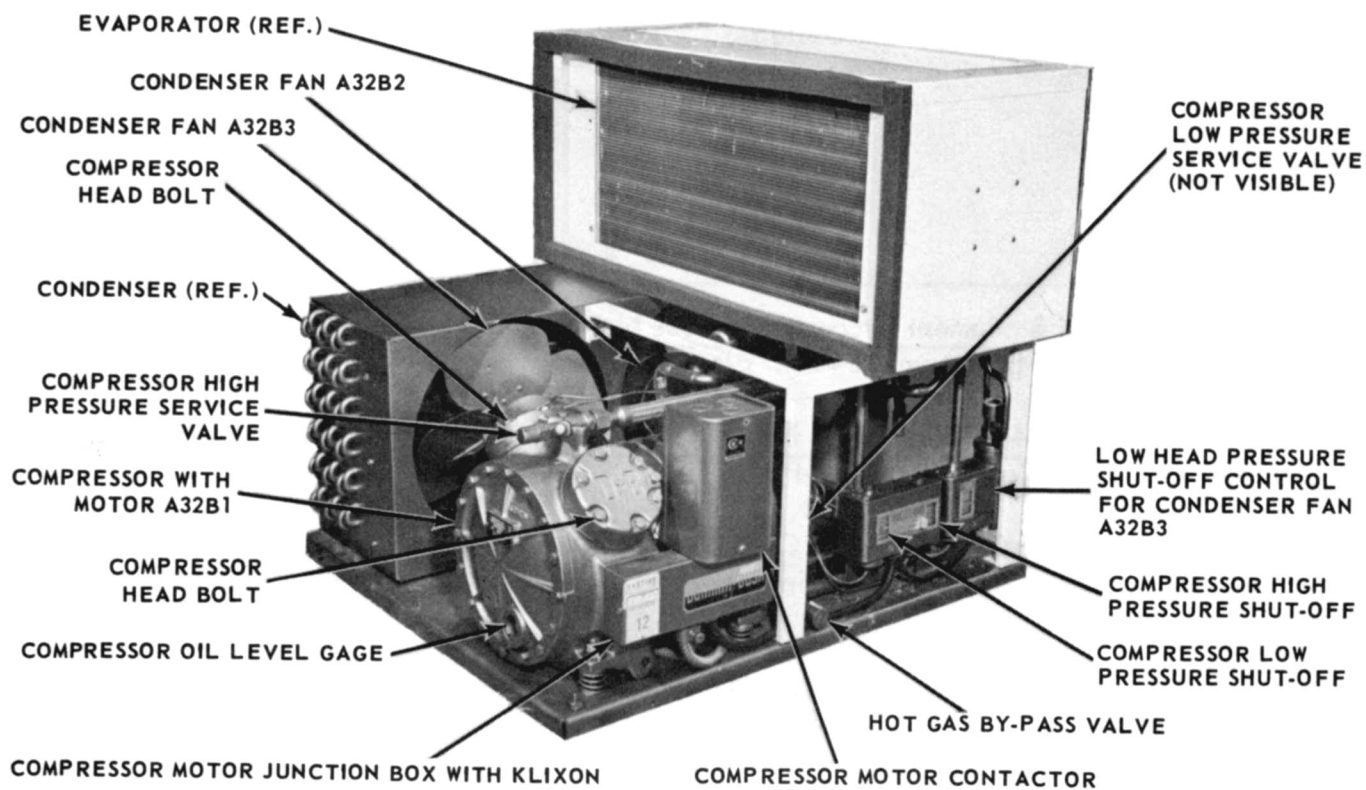


Figure 7-10 ECU Refrigeration Unit Component Location, Front View

7-3-1-1 Personnel Qualifications — The qualifications of personnel performing the subsequent procedures are covered in paragraphs 2-1-1 and 7-4.

7-3-1-2 Special Tools and Accessories Supplied — Special equipment and tools supplied with the ECU equipped disc files include the applicable items of paragraph 2-1-2 and the items listed in Table 7-1.

TABLE 7-1 ADDITIONAL SPECIAL TOOLS AND ACCESSORIES
SUPPLIED WITH ECU EQUIPPED DISC FILES

Nomenclature	Quantity	Bryant Part No.	First Use Paragraph
Cable Assembly (B- and C-frame files only; in the case of A-frame files, the cable remains a part of the disc file cabinet assembly).	1	C-AF-482	7-3-4-1 <u>m.</u>
Clamping Bolts	2	B-AF-562	7-3-4-1 <u>r.</u>
Casters	4	B-57004	7-3-4-1 <u>g.</u>

7-3-1-3 Special Equipment Recommended But Not Supplied — Special equipment recommended but not supplied with ECU equipped disc files includes the applicable items of paragraph 2-1-3.

7-3-2 SPECIAL RECEIVING INSTRUCTIONS — The cautions of paragraph 2-2 shall be observed when receiving a disc file with an ECU.

7-3-3 STORAGE INSTRUCTIONS — Storage of a disc file with an ECU is accomplished in the same manner as that described in paragraph 2-3, except that an extra cabinet, namely the ECU, is included.

7-3-4 INSTALLATION INSTRUCTIONS — Included herein are the procedures for installing a disc file with ECU and the required checks that must be performed following installation. Before proceeding, however, review the information of paragraphs 5-1 and 7-4.

7-3-4-1 Procedures — Install disc files with ECUs as follows:

a. Except for the ECU cabinet, install the disc file cabinet(s) in accordance with procedures of paragraph 2-4-1-1 a. through p. or paragraph 2-4-1-2 a. through s., as applicable, except in step f. of each procedure, remove packing material from the rear-center access panel opening of the disc file cabinet.

CAUTION

Exercise extreme care to ensure that disc surfaces are not inadvertently stuck in the following step.

b. Install all but the rear access panels on the disc file cabinet. Then, without striking

7-3-4-1 Procedures (Cont.)

the discs of the file, carefully remove the baffle plate from over the accumulator manifold assembly of the file (see Figure 7-11). Also, remove the accumulator elbow and O-ring packet from the junction box of the accumulator manifold assembly.

- c. Move the ECU to the disc file installation area immediately to the rear of the disc file cabinet.
- d. Remove the polyethylene cover from the ECU (see Figure 7-12) and remove the rear and both side access panels from the cabinet.
- e. Remove tape and packing material from the glass door of the access panel of the ECU and the front opening of the ECU.
- f. Remove the hold-down bolts securing the ECU to the 4x4s used as a skid (see Figure 7-13) and use a fork lift to raise the ECU onto the 1x3 slats.
- g. Obtain the four ECU casters from the special tools and accessories supplied with ECU equipped files and immediately install the casters on the ECU; carefully set the ECU on the floor.

NOTE

It is recommended that the hold-down bolts, 4x4s, and 1x3s be stored for future use in file shipments.

- h. Aline the flanged front of the ECU with the rear opening of the disc file cabinet as follows:
 - (1) Install the two outer rear panels on the disc file cabinet.
 - (2) Carefully move the ECU up to the rear of the file cabinet (see Figure 7-2) and check to see that the flange edge of the front of the ECU will index all the way into the rear of the disc file cabinet without unnecessarily binding. If it won't, adjust the height of the ECU's casters until the desired indexing is achieved.
 - (3) With the caster height properly adjusted, move the ECU away from the disc file cabinet assembly, and remove the rear panels from the disc file cabinet.

CAUTION

Be very careful not to damage the sail switch during the next portion of the procedure.

- i. Carefully remove shipping tape from the sail switch (see Figure 7-13) and remove the shipping block forced under the compressor. Then compress the springs — which are used as resilient mounts for the compressor — 1/16-inch, by tightening the spring retaining bolts.

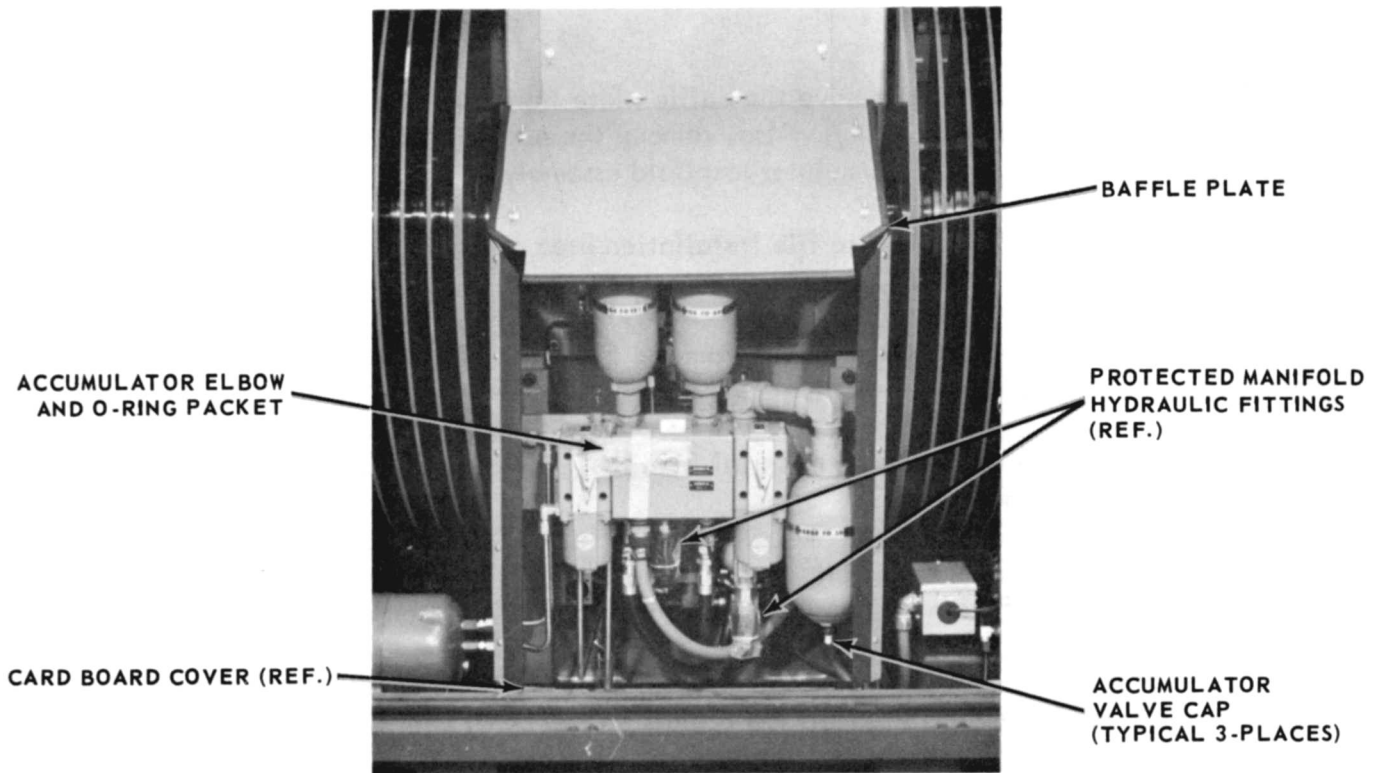


Figure 7-11 Disc File Cabinet Assembly Showing Internal Packaging, Rear View



Figure 7-12 ECU Cabinet Assembly Packaged for Shipment

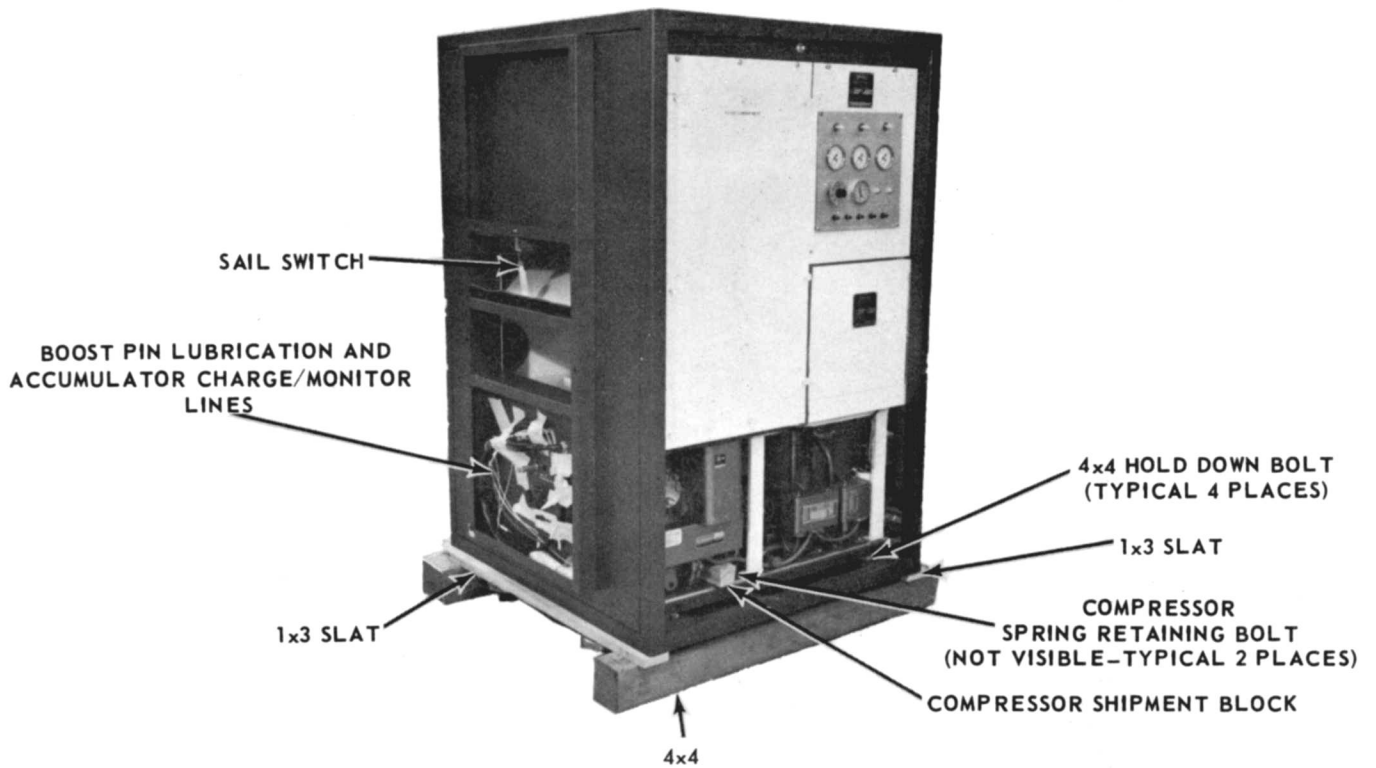


Figure 7-13 ECU Cabinet Assembly Showing Interior Packaging, Front View

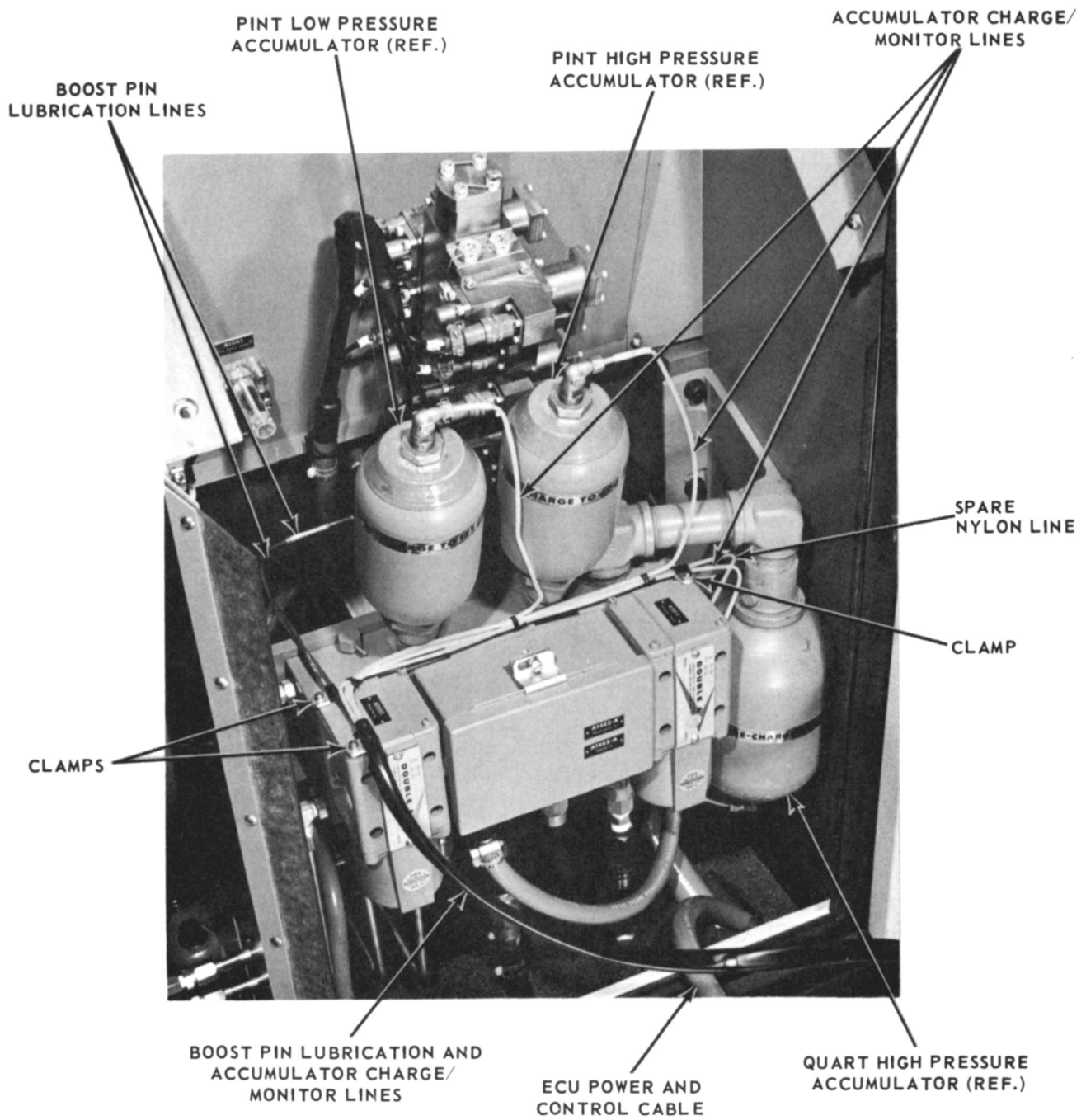


Figure 7-14 ECU to Disc File Cabinet Assembly Interconnecting Lines and Cables

7-3-4-1 Procedures (Cont.)

j. Position the ECU behind the disc file cabinet as shown in Figure 7-2.

k. Attach the boost pin lubrication lines from the ECU to the boost pin lube fittings of the disc file (see Figures 5-3 and 7-14). Route the lines so that they can be secured in position to the accumulator manifold assembly with the clamps provided.

l. Attach the accumulator charge/monitor lines of the ECU to the accumulators of the disc file's accumulator manifold assembly as follows:

- (1) Remove the valve cap from valve stem of each accumulator (see Figure 7-11). As each cap is removed, depress the valve core installed in the accumulator to enable bleed-off of the gas precharge in the accumulator's bladder. Then, remove the valve core from the accumulator and store the core for future use in disc file shipment.

NOTE

The valve core removed in step (1) merely maintains a charge of inert gas in the accumulator during shipment. Do not reinstall the removed valve core in the accumulator since subsequent charging of the accumulator through the ECU maintenance panel will otherwise be inhibited.

- (2) Remove O-rings and elbows from plastic bag attached to accumulator manifold assembly junction box (see Figure 7-11) and install one O-ring and elbow on each accumulator fitting in place of the valve core.

NOTE

One of the four accumulator charge/monitor lines is provided as a spare.

- (3) Attach the accumulator pressure lines to the accumulators (see Figure 7-14). Secure the quart accumulator and spare lines to the manifold using the available manifold clamp.

m. Connect the ECU power and control cable of the disc file to the ECU as directed in the following applicable procedure:

- (1) In the case of an A-frame disc file, connect A31P1 of the cable extending from the partitioned power control unit section into the rear of the pedestal section of the file to connector A31J1 of the ECU (see Figure 7-2); this cable originates from connector A21J3 mounted on the underside of the power control panel of the power control unit section of the A-frame disc file cabinet assembly.

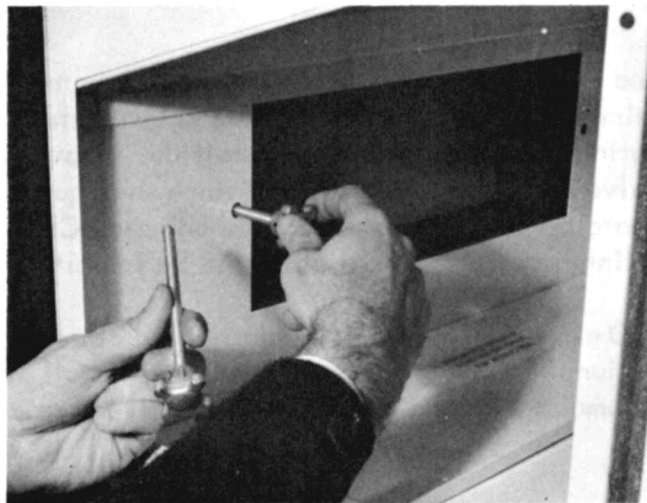


Figure 7-15 Securing ECU Cabinet Assembly to Disc File Cabinet Assembly

7-3-4-1 Procedures (Cont.)

- (2) In the case of B- and C-frame disc files, electrically interconnect the ECU and disc file as follows:
 - (a) Obtain the ECU power control cable from the special tools and accessories supplied with the disc file.
 - (b) Connect A21P6 of the cable to A21J6 located in the top of the power control unit cabinet assembly (see Figure 7-4).
 - (c) Route the cable down and out the side duct opening of the cabinet. Continue to route the cable over to the center-rear duct opening of the disc file cabinet assembly. Then carefully route connector A31P1 of the cable up through the appropriate slot in the foam protective cover that seals the duct and connect the cable to connector A31J1 of the ECU.
- n. Install the baffle plate over the accumulator manifold assembly of the disc file cabinet assembly (see Figure 7-11).
- o. Install the rear-outer access panels on the disc file cabinet assembly.
- p. Set the WARM UP SWITCH A31S5 (see Figure 7-5) to 50.

NOTE

The HI TEMP SHUTOFF SWITCH is factory pre-set and will not be changed.

- q. Remove the FILTER COMPARTMENT cover from the ECU (see Figure 7-7).

CAUTION

Ensure that none of the interconnecting lines between the ECU and disc file cabinet assembly are pinched or otherwise damaged during the performance of the next step.

- r. Carefully index the front of the ECU into the rear of the disc file cabinet assembly and secure the two cabinets using the clamping bolts (see Figure 7-15) obtained from the special tools and accessories supplied with the ECU equipped files.
- s. Reinstall the FILTER COMPARTMENT cover on the ECU.
- t. Remove the valve caps from the accumulator charging fittings of the ECU maintenance panel (see Figure 7-7) and observe that valve cores are inserted in the valve stems; if none are installed, use the ones removed from the accumulators (see step l. (1)). Then, charge the three accumulators as directed in paragraph 7-6-8-3.

7-3-4-1 Procedures (Cont.)

- u. Lubricate the boost pins of the disc file cabinet assembly as directed in paragraph 7-6-2.
- v. Install the power control units' access panels (as applicable) and the ECU's access panels.
- w. Perform the installation checks of paragraph 7-3-4-2.

7-3-4-2 Preliminary Installation Checks — The disc file assembly shall be checked out immediately following installation.

- a. Check that disc motor rotation is proper.
 - (1) Thoroughly review the operating instructions of paragraph 7-4 before proceeding with the installation checks.
 - (2) Place the file in the manual operating mode.
 - (3) Press DISC MOTOR ON pushbutton and, the instant disc rotation is observed to start, immediately release the on pushbutton and press the DISC MOTOR OFF pushbutton; observe that discs rotate cw with respect to viewing into the left-front side of the cabinet. If disc rotation does not occur within 10 seconds of pressing the on pushbutton, press the off pushbutton and switch two of the three phase input power leads at the facility power source; again, check for proper disc rotation. If disc rotation is improper, consult your field service representative.
 - (4) Remove the cabinet access panel that will enable the viewing of the hydraulic gear pump of the hydraulic power supply (see Figure 1-19 or 1-26). With one man observing the pump, momentarily press the HYDRAULIC MTR ON pushbutton and the instant pump rotation starts, immediately press the HYDRAULIC MTR OFF pushbutton; observe that pump rotates in the direction of the arrow that is embossed on the lower end of the pump surface that is at the rear of the cabinet. If pump rotation is improper, contact your field service representative.
- b. If the disc file has been in storage or otherwise inoperative for one or more months, proceed as follows before placing the file in operation.
 - (1) If the disc file has been inoperative for one to nine months, purge the hydraulic system as described in paragraph 7-6-8-2.
 - (2) If the disc file has been inoperative for over nine months, clean the hydraulic power supply reservoir and magnetic strainer as described in paragraph 5-6-1; references in paragraph 5-6-1 for performing the procedures of paragraph 5-6-2 and 5-6-3 can be disregarded at this time as long as the one year operation maintenance interval for the related parts is not being exceeded.
- c. Perform the over-all inspection of paragraph 7-6-7-1 and 7-6-7-2 except it is not necessarily required to clean disc surfaces at this time.

7-3-4-2 Preliminary Installation Checks (Cont.)

d. Perform the installation adjustment of the ECU as directed in paragraph 7-3-4-3.

7-3-4-3 Installation Adjustment of the ECU — The ECU can be adjusted for use depending on whether the disc file is installed in an environmentally controlled facility or in a non-environmentally controlled facility. If the facility is non-environmentally controlled, proceed immediately to step b., disregarding step a. However, if the temperature of the facility is maintained at $75 \pm 5^{\circ}$ F, it is recommended that the procedures of step a. be performed.

a. Temperature Controlled Facilities Only — If the temperature of the facility in which the file is to be used is maintained at $75 \pm 5^{\circ}$ F, operate the file "open loop" as follows:

NOTE

The following procedure is not mandatory. However, if performed, it is possible — if the room ambient remains within the specified limits — that the disc file can be operated with the ECU in open loop configuration whenever refrigeration unit maintenance is required.

- (1) With respect to facing the rear of the ECU, remove the rear and left-side access panels from the cabinet (see Figure 7-7).
- (2) Remove FILTER COMPARTMENT cover.
- (3) From the compartment located beneath the filter drawer (see Figure 7-8) remove cover stenciled REMOVE FOR OPEN LOOP CONDITION — SEE MANUAL FOR INSTRUCTION. Set this cover aside.
- (4) From the rear of the ECU, remove cover stenciled REMOVE FOR OPEN LOOP CONDITION — SEE MANUAL FOR INSTRUCTION (see Figure 7-7).
- (5) Through the access opening of step (4), disconnect cable connector A33P1 from A33J1 (see Figure 7-8) and lower the cable into the evaporator compartment (this action inhibits turn on of the compressor of the refrigeration unit), and set the access panel removed in step (4) over opening in bottom of the BLOWER COMPARTMENT. This action ensures that room ambient air is drawn directly into the ECU through the grill provided in its rear panel rather than through the evaporator in the lower compartment.
- (6) Install the side and rear access panels on the ECU.
- (7) Place the disc file in the automatic operating mode and allow the file to operate with the ECU in open loop for four hours.
- (8) Following the four hours of operation, observe $^{\circ}$ F FILE TEMP gage on pushbutton station (see Figure 1-3 or 1-24) of the disc file cabinet assembly. Record the gage indication in the disc file log. Also, record the indication of the FILE TEMPERATURE IN gage of the ECU maintenance panel (see Figure 7-7).

7-3-4-3 Installation Adjustment of the ECU (Cont.)

- (9) Shut down the disc file .
- (10) Remove the ECU access panels of step (1).
- (11) Through the opening in the BLOWER COMPARTMENT panel in the rear of the ECU, remove the panel stenciled REMOVE FOR OPEN LOOP CONDITION — SEE MANUAL FOR INSTRUCTION from opening in bottom of blower compartment .
- (12) Connect connector A33P1 to connector A33J1 of the blower compartment and install the cover removed in step (11) on the cover stenciled BLOWER COMPARTMENT (see Figure 7-7).
- (13) Remove cover stenciled FILTER COMPARTMENT from the side of the ECU.
- (14) Install the cover set aside in step (3) over the opening in the bottom of the compartment located beneath the filter drawer (see Figure 7-8).
- (15) Install the rear access panel on the ECU.
- (16) Install cover stenciled FILTER COMPARTMENT.
- (17) If the °F FILE TEMP gage indication of step (8) was 95°F or less, proceed as directed in the following steps; otherwise, proceed to paragraph b.
 - (a) Shut down the disc file .
 - (b) With respect to facing the rear of the ECU cabinet, remove the left side access panel .
 - (c) During initial installation, carefully adjust the adjusting stem of the hot gas by-pass valve (see Figure 7-7) all the way cw, without allowing it to bottom. Then rotate valve six full turns ccw; this constitutes an approximate temperature control setting of the valve .
 - (d) Place the file in the automatic operating mode .
 - (e) After approximately 20 minutes of ECU operation, observe the disc file push-button station °F FILE TEMP gage indication. The indication shall correspond to that recorded in step (8). If the indication is found to vary from the recorded level, adjust the hot gas bypass valve as follows until the desired level is achieved.

NOTE

As a rule of thumb, each half-turn of the valve causes approximately a 2°F change in the disc file input air temperature .

7-3-4-3 Installation Adjustment of the ECU (Cont.)

1. If the temperature indicated on the disc file pushbutton station °F FILE TEMP gage is observed to be rising above that recorded in step (8), incrementally adjust the valve ccw. After 20 minutes of operation following each incremental setting, observe that temperature has stabilized at the desired level.
 2. If the temperature indicated on the disc file pushbutton station °F FILE TEMP gage is observed to be dropping below that recorded in step (8), incrementally adjust the hot gas bypass valve cw. After 20 minutes of operation following each setting, observe whether the temperature has stabilized at the desired level.
- (f) After one hour of ECU operation, observe that the disc file pushbutton station °F FILE TEMP gage indication remains constant within ± 1 °F of indication recorded in step (8). If it varies, repeat the adjustment procedures of step (e) until the temperature fluctuations stop.
- (g) With the condition of step f. achieved, set the ADJ. TEMP WARNING control of the ECU maintenance panel (see Figure 7-16) to the temperature indicated on the TEMPERATURE FILE IN gage of the ECU maintenance panel.
- (h) Install the side access panel on the ECU cabinet.
- (i) With the disc file continuing to operate in the automatic mode, and before initially using the file with the computer complex into which it is integrated, set the upper and lower limits of the TEMP meter of the tachometer/temperature meter box as directed in paragraph 6-6-3k. and v.

b. Non-Temperature Controlled Facility — If the facility in which the disc file is to be operated is not environmentally controlled as specified in paragraph a., or if the temperature recorded in paragraph a. step (8) exceeded 95 °F, proceed as follows:

- (1) Shut down the disc file.
- (2) With respect to facing the rear of the ECU cabinet, remove the left side access panel.
- (3) Carefully adjust the adjusting stem of the hot gas bypass valve (see Figure 7-6) full cw, ensuring that it is not bottomed. Then rotate valve six full turns ccw; this constitutes an approximate temperature control setting of the valve.
- (4) Place the disc file in the automatic operating mode.
- (5) Operate the ECU closed loop. After approximately every 20 minutes of operation, observe the disc file pushbutton station °F FILE TEMP gage indication. The

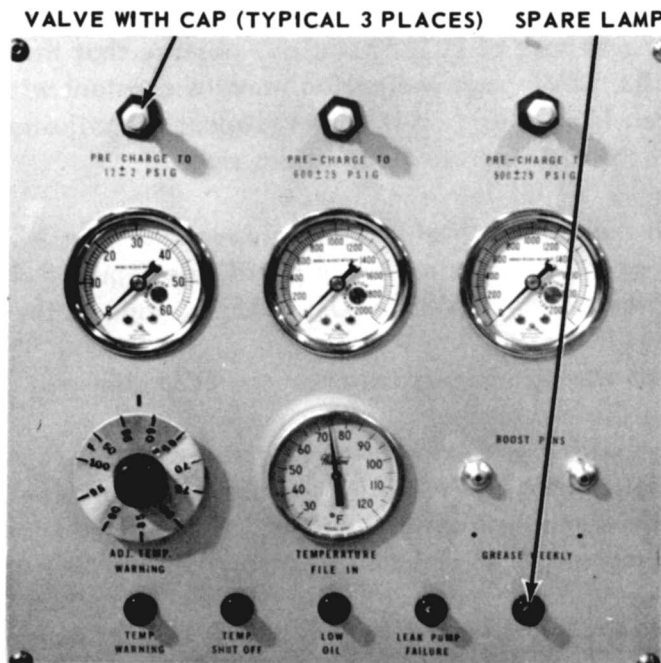


Figure 7-16 ECU Maintenance Panel, Front View—Identification of Controls and Indicators

7-3-4-3 Installation Adjustment of the ECU (Cont.)

indication shall be 85 to 90°F optimum, 95°F maximum. Record the temperature finally selected for control in the disc file log. If the indication is varying from the desired range, adjust the hot gas bypass valve as follows until the desired indication is achieved.

CAUTION

Though it is desired to operate the disc file as cool as possible, it is recommended that the hot gas bypass valve never be adjusted to its maximum ccw position unless absolutely necessary.

NOTE

As a rule of thumb, each half-turn of the valve causes approximately a 2°F change in disc file input air temperature.

- (a) If the temperature indicated on the disc file pushbutton station °F FILE TEMP. gage is observed to be rising above that desired, incrementally adjust the valve ccw. After 20 minutes of operation following each incremental setting, observe whether the temperature has stabilized at the desired level.
- (b) If the temperature indicated on the disc file pushbutton station °F FILE TEMP. gage is observed to be dropping below that desired, incrementally adjust the valve cw. After 20 minutes of operation following each incremental setting, observe whether the temperature has stabilized at the desired level.
- (6) After one hour of disc file operation, observe that disc file pushbutton station °F FILE TEMP. gage indication remains constant ($\pm 1^\circ\text{F}$). If it varies, repeat the adjustment procedures of step (5) until the temperature fluctuations stop.
- (7) With the condition of step (6) achieved, set the ADJ. TEMP. WARNING control of the ECU maintenance panel (see Figure 7-16) to the temperature indicated on the TEMPERATURE FILE IN gage of the ECU maintenance panel.
- (8) Install the side panel on the ECU.
- (9) With the disc file continuing to operate in the automatic mode and before initially using the file with the computer complex into which it is integrated, set the upper and lower limits of the TEMP. meter of the tachometer/temperature meter box as directed in paragraph 6-6-3k. and v.

7-3-5 PREPARATION FOR SHIPMENT OR EXTENDED STORAGE — Included herein are the procedures for preparing a Model 1, Series 4000 Disc File with ECU for shipment or extended storage. Before proceeding, however, review applicable procedures of paragraph 5-1 and 5-4.

WARNING

Carefully observe the applicable warnings and cautions of paragraph 5-1-4.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the subsequent procedures.

a. Shut down the disc file.

b. After thoroughly cleaning the area in which the disc file cabinets are installed, and when disc rotation stops, remove the rear and both side access panels from the ECU cabinet. Also perform the following procedure:

NOTE

The ECU shall be shipped or stored only in the closed loop configuration. If the ECU was operated in the open loop configuration, return the ECU to closed loop configuration by performing the procedures of paragraph 7-3-4-3a.(11) through (16).

(1) For A-frame files, remove the front access panels from the file cabinet and immediately lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-24) in the RESET OFF position.

(2) For B- and C-frame files, remove the front access panel from the power control unit cabinet and immediately lock the RESET OFF/TRIP ON circuit breaker of the power control panel (see Figure 1-17) in the RESET OFF position.

c. Remove the cover stenciled FILTER COMPARTMENT (see Figure 7-7).

d. Remove the clamping bolts that retain the ECU to the disc file cabinet assembly (see Figure 7-15) and roll the ECU out from the rear of the file cabinet. Place the removed bolts in with the disc file's special tools and accessories; reinstall the cover stenciled FILTER COMPARTMENT.

e. Remove the two rear access panels from the disc file cabinet assembly.

- f. Without striking the discs of the file, carefully remove the baffle plate from over the accumulator manifold assembly of the file (see Figure 7-11).
- g. Disconnect the ECU power and control cable of the disc file from the ECU as directed in the following applicable procedures.
- (1) In the case of an A-frame disc file, disconnect A31P1 from connector A31J1 of the ECU (see Figure 7-2). Secure a plastic bag over the cable connector and rest the cable neatly in the bottom of the disc file cabinet assembly. Secure the cable in place using masking tape, or equivalent.
 - (2) In the case of B- and C-frame disc files, electrically disconnect the ECU and disc file as follows:
 - (a) Disconnect cable connector A31P1 from the mating connector of the ECU (see Figure 7-2) and carefully route the cable down through the protective foam cover in the base of the file.
 - (b) With respect to facing the rear of the disc file, remove the left-side and top access panels from the power control unit cabinet assembly.
 - (c) Disconnect cable connector A21P6 from its mating connector located in the top of the power control panel (see Figure 7-4) and withdraw the cable from the cable duct and power control unit cabinet assembly.
 - (d) Cover the connectors of the cable with plastic bags and store the cable with the other disc file special tools and accessories.
- h. Remove the valve caps from the accumulator charging fittings of the ECU maintenance panel (see Figure 7-7) and bleed the charge from the disc file accumulators by depressing the valve core in each charge fitting.

WARNING

Perform the following procedure only when it is definitely ascertained that the precharge has been bled from the accumulators.

- i. With the precharge bled from the accumulators, remove the accumulator charge/monitor lines of the ECU from the accumulators of the disc file's accumulator manifold assembly as follows:
- (1) Detach the lines from the elbows of the accumulators (see Figure 7-14). After releasing all applicable clamps, carefully remove the lines from the disc file cabinet.
 - (2) Remove the elbow and O-ring installed on the charging end of each accumulator.

Discard the O-rings and store the elbows and new O-rings in a plastic bag and secure the bag to the accumulator manifold assembly junction box (see Figure 7-11).

- (3) Install valve cores in the charging ends of the accumulators and precharge each of the accumulators with nitrogen to approximately 10 psig by performing the applicable procedures of paragraph 7-6-8-3. Note that the charge is only 10 psig for a shipping or storage configuration of the file.

j. Detach the boost pin lubrication lines from the ECU to the boost pin lube fittings of the disc file (see Figures 5-3 and 7-14). After releasing the lines from the cable clamp, carefully remove the lines from the disc file cabinet.

k. Install the baffle plate over the accumulator manifold assembly of the disc file cabinet assembly (see Figure 7-11).

l. Carefully move the forks of a fork lift under the ECU cabinet (see Figure 7-13); before raising the forks, position a 1x3 slat under the outer edges of the ECU cabinet as shown in the figure, and then raise the forks so as to support the weight of the cabinet on the 1x3s.

m. With the weight of the ECU completely supported by the fork lift, remove the castors from the corners of the ECU cabinet.

n. Position two 4x4s (saved from when the file was installed) under the 1x3s (see Figure 7-13) and carefully lower the ECU down onto the 4x4s being careful to align the holes in the 4x4s with those in the ECU cabinet base. Secure the ECU cabinet to the 4x4s, using the four hold-down bolts saved after installation of the disc file.

o. Wrap the lubrication fitting ends of the boost pin lubrication lines of the ECU in plastic bags and secure the lines to the front of the ECU.

p. Wrap the accumulator fitting ends of the accumulator charge monitor lines of the ECU in plastic bags and secure the lines to the front of the ECU.

q. Install the compressor shipping block (see Figure 7-13) under the compressor of the refrigeration unit and tighten the two compressor spring retaining bolts until there is no deflection in the compressor's mounting springs.

r. Without causing undue deflection, secure the sail switch in position using masking tape, or equivalent, as shown in Figure 7-13.

s. Install the rear and both side access panels on the ECU cabinet.

t. Cover the glass door of the ECU's maintenance panel with Kimpak type K-14 packing, or equivalent, and cardboard and retain in place with masking tape (see Figure 7-12). Identify that there is glass under the packing.

- u. Cover the front of the ECU with pre-cut cardboard and retain in place with masking tape.
- v. Install the polyethylene cover over the ECU cabinet and draw the draw string at the bottom of the cover tight.
- w. Package the remaining disc file cabinet(s) as follows:
 - (1) For B- and C-frame disc files, remove the three front access panels from the disc file cabinet assembly, remove the two side and rear access panels from the power control unit cabinet assembly, and then proceed to package the disc file and power control unit cabinet assemblies as directed in paragraph 2-5-2, steps d. through s. except that, since there are only two outer panels installed on the rear opening of the cabinet, seal the center rear opening of the cabinet with pre-cut sections of cardboard; secure the cardboard in place using masking tape (see Figure 7-17).
 - (2) For A-frame files, remove the left-side access panel (with respect to facing the front of the file cabinet) and proceed to package the file as directed in paragraph 2-5-1 steps d. through o. except that, since there are only two outer panels installed on the rear of the cabinet, seal the center rear opening of the disc file cabinet with pre-cut sections of cardboard; secure the cardboard in place using masking tape (see Figure 7-17 for packing example).

OPERATING INSTRUCTIONS

This paragraph provides the procedures to be followed when operating the Model 1 Series 4000 Disc File with a 2-ton Environmental Control Unit (ECU). All such procedures shall be performed by qualified technicians. One man shall be selected to coordinate all activities as well as to assure that all possible caution is taken to protect both personnel and equipment.

7-4-1 CONTROLS AND INDICATORS — Except for the addition of the ECU and leak pump and removal of the pressure gages from the original accumulators of the accumulator manifold assembly, the controls and indicators of the disc file with ECU are identical to those described in paragraph 3-2 for a disc file without ECU. Therefore, only ECU controls and indicators are discussed in the following paragraphs.

7-4-1-1 ECU Maintenance Panel — All daily and weekly preventive maintenance functions can be normally performed through the ECU maintenance panel (see Figure 7-16) thereby eliminating the necessity of frequently opening the disc file cabinet and exposing the cabinet interior to environmental contamination. Access to the components of the maintenance panel is through a hinged glass door mounted on the side panel of the ECU (see Figure 7-2). The name, reference designation (as applicable), and function of each gage, fitting, and indicator of the panel are listed in Table 7-2.

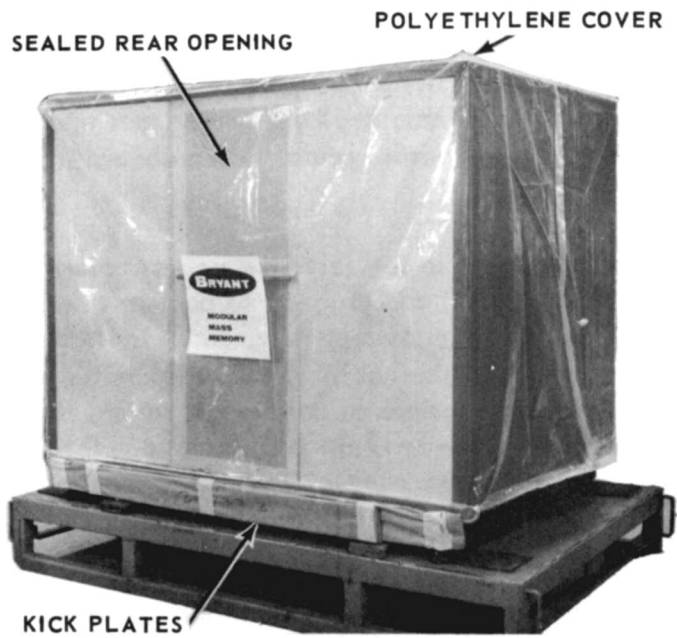


Figure 7-17 Rear of a MODEL 1, Series 4000
Disc File Cabinet Assembly
Prepared for Shipment

TABLE 7-2 ECU MAINTENANCE PANEL — FUNCTION OF GAGES, FITTINGS AND INDICATORS (see Figure 7-16)

Control, Fitting or Indicator	Reference Designator	Function
PRE-CHARGE TO 12 ± 2 PSIG (gage, pressure, nitrogen; calibrated zero to 60 psig).		Enables remote monitoring of the nitrogen charge in the pint low pressure accumulator of the accumulator manifold assembly (see Figure 7-14)
PRE-CHARGE TO 12 ± 2 PSIG (valve, charging, nitrogen)		Enables remote charging of the pint low pressure accumulator of the accumulator manifold assembly.
PRE-CHARGE TO 600 ± 25 PSIG (gage, pressure, nitrogen; cali- brated zero to 2000 psig.)		Enables remote monitoring of the nitrogen charge in the pint high pressure accumulator of the accumulator manifold assembly.
PRE-CHARGE TO 600 ± 25 PSIG (valve, charging, nitrogen)		Enables remote charging of the pint high pressure accumulator of the accumulator manifold assembly.
PRE-CHARGE TO 500 ± 25 PSIG (gage, pressure, nitrogen; cali- brated zero to 2000 psig.)		Enables remote monitoring of the nitrogen charge in the quart high pressure accumulator of the accumulator manifold assembly.
PRE-CHARGE TO 500 ± 25 PSIG (valve, charging, nitrogen)		Enables remote charging of the quart high pressure accumulator of the accumulator manifold assembly.
TEMPERATURE FILE IN (Gage, temperature; calibrated 25 to 125°F)		Indicates the temperature of the air flowing from the ECU into the disc file cabinet.
ADJ. TEMP. WARNING (Con- trol, temperature sensing with dual switch; calibrated 50 to 100°F .)	A33S3-1 and -2	Preset to temperature indicated on TEMPERATURE FILE IN gage following the disc file cabinet temperature stabilization monitoring procedure — see paragraph 7-3-4-3a.(17)(g) or 7-3-4-3b.(7); should temperature of air into the disc file cabinet vary $\pm 3^{\circ}\text{F}$ from this setting, switches in the control close and cause illumination of the TEMP. WARNING indicator of the panel.

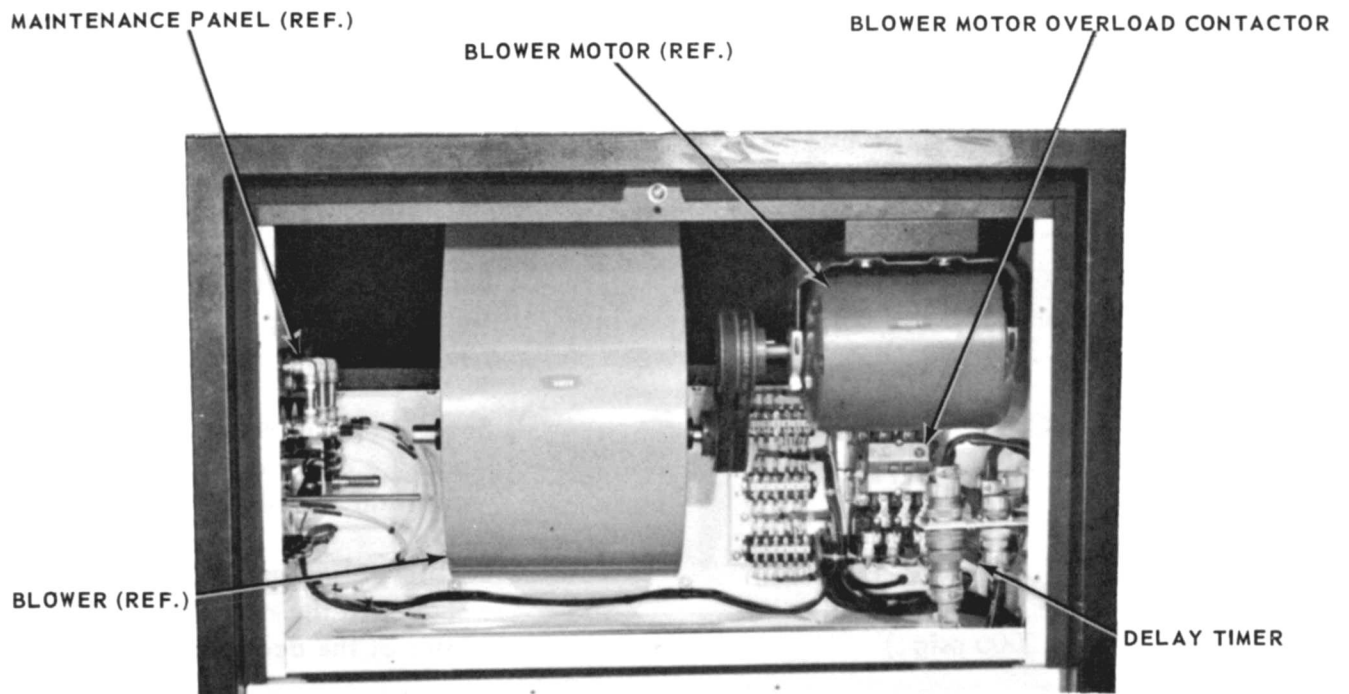


Figure 7-18 ECU Blower Compartment, Partial Interior View—Identification of Controls

7-4-1-1 ECU Maintenance Panel (Cont.)

TABLE 7-2 ECU MAINTENANCE PANEL — FUNCTION OF GAGES, FITTINGS AND INDICATORS (Cont.)

Control, Fitting or Indicator	Reference Designator	Function
TEMP. WARNING (Indicator, red; press-to-test)	A33DS1	When glowing, indicates that the temperature variation of the air from the ECU into the disc file cabinet is outside the $\pm 3^{\circ}\text{F}$ range desired for optimum disc file operation.
TEMP. SHUT OFF (Indicator, red; press-to-test)	A33DS2	When glowing, indicates that the file is shutdown because the temperature of the air from the disc file cabinet into the ECU has exceeded the factory preset 105°F setting of the HI TEMP SHUT OFF switch A31S6 (see Figure 7-5).
LOW OIL (Indicator, red; press-to-test)	A33DS3	When glowing, indicates that the level of the hydraulic fluid in the reservoir (see Figure 1-21) of the hydraulic power supply (see Figures 1-17 and 1-24) is low and that maintenance is required; this low fluid level is sensed by the upper switch of the dual level float switch which replaces the hydraulic oil low level switch (see paragraph 7-2-1-2).
LEAK PUMP FAILURE (Indicator, red; press-to-test)	A33DS4	When glowing, indicates that leak pump reservoir is filled and that pump is not automatically returning fluid to reservoir of hydraulic power supply.
BOOST PINS (Lubrication fittings)		Enable remote lubrication of the boost pins of the digital actuator boost assembly (see Figure 1-10).

7-4-1-2 ECU Blower Compartment — Controls of the blower compartment of the ECU (see Figure 7-7) are shown in Figure 7-18. Access to the control is through the rear access panel of the ECU and then through the blower compartment cover. The name, reference designation, and function of each control are listed in Table 7-3.

7-4-1-2 ECU Blower Compartment (Cont.)

TABLE 7-3 ECU BLOWER COMPARTMENT — FUNCTION OF CONTROLS (see Figure 7-18)

Control or Indicator	Reference Designation	Function
Blower Motor Overload Contractor (Control; current sensing)	A33K1/S1	Protects the blower motor of the ECU from overload currents; must be pressed manually to reset after being tripped by an overcurrent condition.
Delay Timer (Timer, electrical, adjustable from zero to 150 seconds)		Enables presetting the delay of the start of the ECU's compressor motor with respect to the start of the disc motor of the disc file; preset at factory for approximately 40 seconds delay.

7-4-1-3 Special ECU Controls and Indicators — Several other controls and indicators provided on the ECU are either preset upon installation or are preset at the factory. Since these controls are not touched on a day-to-day basis or are not to be touched at all except by qualified, trained refrigeration technicians, the information provided in Table 7-4 is provided for information purposes only and shall not be construed as authorization to perform said adjustments.

NOTE

Since the use of the service valves will be apparent to qualified refrigeration unit maintenance personnel, the valves are not described in Table 7-4.

TABLE 7-4 SPECIAL ECU CONTROLS AND INDICATORS — FUNCTIONAL DATA (TO BE USED FOR REFERENCE ONLY)

Control or Indicator	Reference Designation	Function
WARM UP SWITCH (Control, temperature sensitive; calibrated 50 to 100°F — see Figure 7-5)	A31S5	Preset during installation to establish minimum temperature at which ECU compressor will be enabled to operate — normal setting is 50°F.

TABLE 7-4 SPECIAL ECU CONTROLS AND INDICATORS — FUNCTIONAL DATA
(TO BE USED FOR REFERENCE ONLY) (Cont.)

Control or Indicator	Reference Designation	Function
HI TEMP. SHUT OFF SWITCH (Control, temperature sensitive — see Figure 7-5)	A31S6	Factory preset to inhibit disc file operation when the temperature of the air from the disc file cabinet into the ECU exceeds 105° F.
Coolant Sight Gage; (Gage, humidity indicating — see Figure 7-9)		Indicates moisture content of coolant used in refrigeration unit. Normal color of indicator used is green or blue; excessive moisture content is indicated by one or the other turning pink.
Hot Gas By-Pass Valve (Control, valve — see Figure 7-10)		Preset during installation to control flow of coolant used in refrigeration unit; this action, in effect, then controls temperature of the air flowing from the ECU into the disc file cabinet.
Compressor Low Pressure Shutoff (Control, pressure sensing with switch; calibrated from -10 to 100 psi — see Figure 7-10)		Factory preset. Inhibits compressor operation when the pressure of the refrigeration unit coolant becomes insufficient; preset to trip at 25 psi (minimum).
Compressor High Pressure Shutoff (Control, pressure sensing with switch; calibrated from 100 to 400 psi — see Figure 7-10)		Factory preset. Inhibits compressor operation when the pressure of the refrigeration unit coolant becomes excessive; preset to trip at 200 psi (maximum).
Low Head Pressure Shutoff (Control, pressure sensing with switch; calibrated from 100 to 300 psi — see Figure 7-10)		Factory preset. Inhibits operation of condenser fan A32B3 when pressure of refrigeration unit coolant falls below 110 psi. Enables operation of condenser fan A32B3 when pressure of refrigeration unit coolant rises above 130 psi.

7-4-2 PROCEDURE — The disc file with ECU can be operated in either a closed or open loop configuration, though the open loop configuration shall be used only in emergencies. Essentially, operation of the file is identical to that of a file without ECU (see paragraph 3-3). Therefore, the following procedures shall consider only the differences that exist because of the addition of the ECU.

7-4-2-1 Closed Loop Operation of the Disc File — The file can be operated in a closed loop configuration in either the automatic or manual mode.

CAUTION

Closed loop operation of the file shall be "initiated" only when it is ascertained that equipment temperature has stabilized at 70°F or higher. This action ensures that damage to the refrigeration unit's compressor will not occur upon unit start.

a. Automatic Operation — In the automatic operating mode, all file operations are enabled in proper, automatic sequence.

NOTE

Preventive maintenance procedures of paragraph 7-6 will be performed as required during the initial daily start up of the disc file.

- (1) Starting Procedures — The disc file with ECU is placed into the automatic operating mode as described in paragraph 3-3-1-1, except that in step h. the AUTOMATIC ON pushbutton must be held pressed until the DISC MOTOR ON indicator glows green. Also, for the file with ECU, the events of paragraph 3-3-1-1 change as follows:
 - (a) In step h.(1), the blower motor of the ECU can be immediately heard to start to operate; following a brief time delay, the DISC MOTOR ON indicator glows green and the disc motor can be heard to start to operate. Within approximately 40 seconds of the start of disc motor operation, the compressor of the refrigeration unit can be heard to start to operate.
 - (b) In step h.(5), the temperature of the disc file cabinet assembly — when the system is operated closed loop and when cabinet components are at room ambient temperature — should stabilize within + 3°F of that recorded in the disc file log. When operated open loop, the ± 5°F tolerance of step h. (5) applies.
- (2) Shutdown Procedures — Automatic shutdown of a disc file with an ECU is identical to that described in paragraph 3-3-1-2 for a disc file without ECU. However, to avoid needless exposure of the interior of the A-frame disc file cabinet, it shall not be necessary to lock the RESET OFF/TRIP ON circuit breaker of the power control panel (step d.) in the RESET OFF position unless personnel would be exposed to danger or unless it is otherwise specified in a procedure.

7-4-2-1 Closed Loop Operation of the Disc File (Cont.)

b. Manual Operation — Manual operation of the disc file enables individual selection of the various operating modes of the disc file. Through logic circuits, however, the operation of the file in one manual operating mode can inhibit selection of another manual operating mode.

- (1) Starting Procedures — The disc file with ECU is placed into the manual operating mode as described for a disc file without ECU in paragraph 3-3-2-1 except that in step c.(1)(b) the DISC MOTOR ON pushbutton must be held pressed until the DISC MOTOR ON indicator glows green. Also, for the file with ECU, the events of paragraph 3-3-2-1 c.(1) change as follows: the blower motor can be immediately heard to operate; following a brief time delay, the DISC MOTOR ON indicator glows green and then disc motor operation is heard; following a time delay of approximately 40 seconds, compressor motor operation is heard.
- (2) Shutdown Procedures — Manual shutdown of the disc file with an ECU is identical to that described in paragraph 3-3-2-2 for a disc file without ECU; however, it shall not be necessary to lock the RESET OFF/TRIP ON circuit breaker of the power control panel (step c.) in the RESET OFF position unless personnel would otherwise be exposed to danger or unless it is specified in a procedure.

7-4-2-2 Open Loop Operation — Should the refrigeration unit of the environmental control unit require maintenance, the disc file can be operated open loop on an emergency basis as preparations are made to repair or replace the refrigeration unit. However, such operation is allowed only if the procedures of paragraph 7-3-4-3a. were being performed during installation; also, facility temperature must be within at least $+5^{\circ}\text{F}$ of that "originally" used as a basis for performing the procedures of 7-3-4-3a. Under these conditions, shut down the disc file and prepare the disc file for open loop operation as directed in paragraph 7-3-4-3a.(1) through (8). If the temperature indicated in step (8) stabilizes within $+5^{\circ}\text{F}$ of the temperature originally recorded in step (8), normal operation of the disc file in automatic or manual mode can then continue under open loop conditions. However, it is recommended that the refrigeration unit of the ECU be repaired or replaced as soon as possible so that the disc file can be returned to closed loop operation.

7-5 PRINCIPLES OF OPERATION

Functionally, the Model 1 Series 4000 Disc File with an environmental control unit (ECU) consists of an electrical starting control system, an environmental control system, a hydraulic system, a data head positioning system, and a write/read enable system.

7-5-1 GENERAL OVER-ALL SYSTEM OPERATION — The disc file can be operated either automatically or manually. All automatic functions except for the ability to generate a file ready for use command, can be duplicated during the manual mode of disc file operation. Simplified functional block diagrams depicting both operating modes are shown in Figure 7-19. The following paragraphs generally describe the sequence of disc file operation in each operating mode.

7-5-1-1 Automatic Operation — Initiation of the automatic mode of disc file operation enables the following events to occur in sequence:

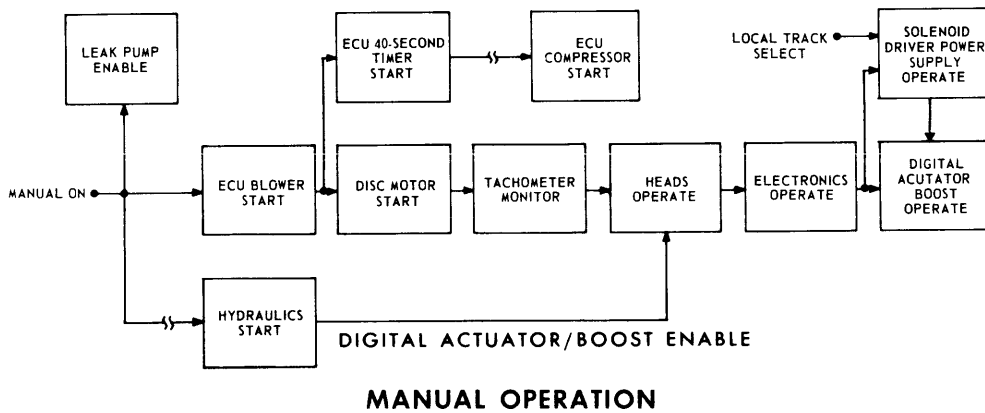
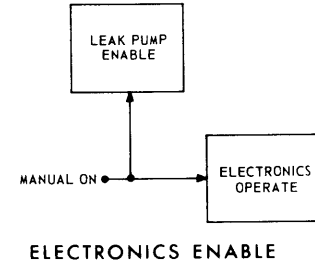
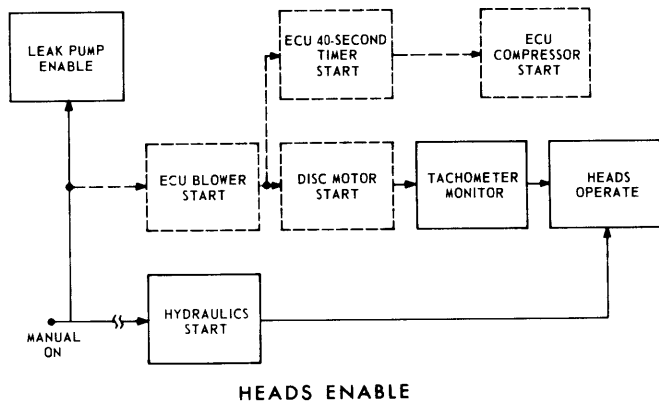
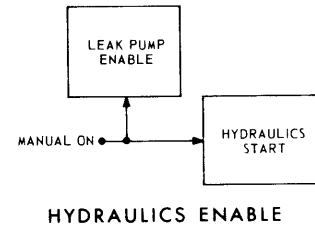
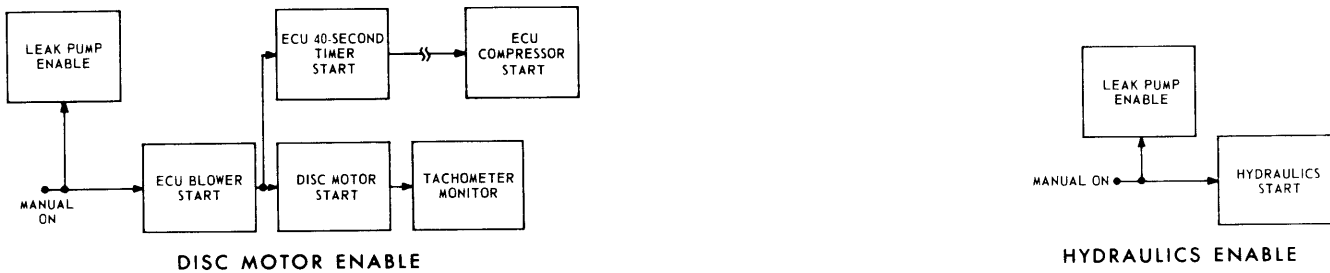
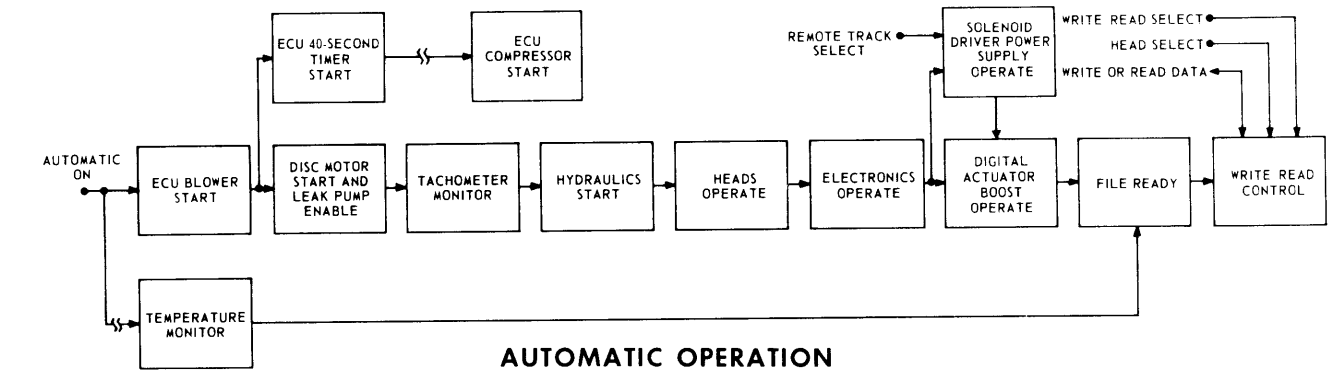


Figure 7-19 Model 1 Series 4000 Disc File With ECU—Functional Block Diagram Depicting Operating Modes

7-5-1-1 Automatic Operation (Cont.)

a. The blower motor of the environmental control unit (ECU) starts to operate .

b. Within approximately 2 seconds of the start of blower motor operation, disc motor operation starts — a tachometer monitor circuit starts to monitor disc spindle speed — and leak pump operation is enabled. Simultaneously, a 40-second timer in the ECU starts to operate; this timer inhibits the start of the compressor motor operation during the time that the disc motor is drawing heavy surge current .

NOTE

ECU compressor operation can occur before,
during, or after the start of the hydraulic motor .

c. When the time delay of the ECU's timer ends, the compressor of the ECU starts and cooling air is applied to the interior of the disc file cabinet .

d. Subsequent automatic operation of the disc file with an ECU is identical to that of a file without ECU as described in paragraph 4-2-1 b. through g.

7-5-1-2 Manual Operation — Various independent modes of operation of the disc file are enabled with the initiation of manual operation. These modes are identical to those discussed in paragraph 4-2-2, except that, in the case of disc files equipped with environmental control units (ECUs), the ECU operates just before the disc motor is turned on; the leak pump of the disc file is enabled the instant manual operation is initiated; and the ECU's compressor operates following the preset 40 second time delay from the start of the initiation of disc motor operation

7-5-2 STARTING CONTROL SYSTEM — Components making up the electrical starting control system are mounted in the three cabinets of the B- and C-frame files and in both cabinets of the A-frame file . It should be noted that the reference designations of components mounted in the two sections of disc file cabinet assembly of the A-frame file correspond to the reference designations of identical components mounted in the disc file cabinet assembly and power control unit cabinet assembly making up the B- and C-frame disc files . For this reason, the subsequent discussion applies equally to all three file configurations regardless of the number of cabinets making each up . The automatic and manual operating modes of the disc file are selected through the AUTOMATIC ON and MANUAL ON pushbuttons of the pushbutton station assembly (see Figure 1-3 or 1-24) . A schematic diagram of the starting control system is shown in Figure 7-20 .

7-5-2-1 Automatic Operating Mode — The automatic starting and shutdown sequences of the disc file are discussed in the following paragraphs .

a. Starting Sequence — With RESET OFF/TRIP ON circuit breaker A21CB1 set to the TRIP ON position and with customer three phase, four wire, 208 vac power applied (in three wire, 208 or 416 volt systems, a stepdown transformer is used to provide the 115 vac requirements of the starting control system), "phase 3" input power is applied through a series of interlocks — including the F1 15A MAIN CONTROL fuse — and HIGH TEMP. SHUTOFF switch A31S6 of the environmental control unit (ECU, see Figure 7-5) to normally open AUTOMATIC ON push-

7-5-2-1 Automatic Operating Mode (Cont.)

button A11S6 and MANUAL ON pushbutton A11S5 of the pushbutton station assembly (see Figure 1-3 or 1-24). Automatic operation of the disc file is then enabled by the pressing of AUTOMATIC ON pushbutton A11S6. This action causes the following events to automatically occur in proper sequence (see Figure 7-20).

- (1) The 115 vac "phase 3" input power is applied through the pushbutton to HOURS meter A21M1 (see Figure 1-18), the power supply of the tachometer/temperature meter box (see Figure 1-4), automatic on relay A21K3, ECU blower motor overload contactor A33K1 (see Figure 7-8) of the environmental control unit and through resistor A21R1 to indicator A11DS6 of AUTOMATIC ON pushbutton A11S6. HOUR meter A21M1 and the circuits of the tachometer/temperature meter box immediately operate, indicator A11DS6 of AUTOMATIC ON pushbutton A11S6 glows dim red (because of the dropping action of A21R6), and relay A21K3 and contactor A33K1 both energize.
 - (a) The energizing of relay A21K3 enables the shunting of the AUTOMATIC ON pushbutton and the inhibiting of the manual operating mode of the disc file as discussed in paragraph 4-3-1-1 a.(1).
 - (b) The energizing of contactor A33K1 causes three sets of its contacts to close and enable application of three phase power to blower motor A33B1 (see Figure 7-8), which operates.
- (2) Within approximately two seconds of the start of blower operation, air flow from the ECU into the disc file cabinet assembly is sufficient to cause the closing of sail switch A31S2 (see Figure 7-5). This action enables the connection of 115 vac "phase 3" power to disc motor on relay A21K1, indicator A11DS4 of DISC MOTOR ON pushbutton A11S4, and the ECU delay "timer". DISC MOTOR ON pushbutton A11S4 glows green, relay A21K1 energizes, and timer operation starts. The AUTOMATIC ON pushbutton can then be released.
 - (a) Three sets of A21K1 contacts close to enable application of three phase power to disc motor A15B1 (see Figure 1-5 for compartment location), which operates and starts to rotate the disc spindle of the disc file. A fourth set of A21K1 contacts close and shunt DISC MOTOR ON pushbutton A11S4. This action connects 115 vac holding voltage through DISC MOTOR OFF pushbutton A11S10 to the leak pump. Subsequent operation of the leak pump is then controlled by the level of the hydraulic fluid in its reservoir.
 1. When the fluid in the reservoir of the pump reaches a predetermined level, switch S1-A of the pump closes and connects 115 vac to relay K1 which energizes. A set of K1 contacts close and connect 115 vac to motor B1 which operates and pumps the fluid in the pump's reservoir back to the reservoir of the hydraulic power supply.
 2. When the level of the fluid in the pump's reservoir drops to a sufficiently

7-5-2-1 Automatic Operating Mode (Cont.)

low level, switch S1-A opens, relay K1 de-energizes, and pump motor B1 operation stops.

3. The action of steps 1. and 2. repeat each time the reservoir level rises to the predetermined level to which S1-A is preset.

NOTE

Compressor operation — after the fixed time delay as described in the following paragraph — occurs at some time during that portion of the starting sequence referenced in paragraph (3). In open loop operation, the compressor control relay is disconnected to inhibit compressor operation as directed in paragraph 7-3-4-3 a. (5).

- (b) The ECU timer inhibits operation of the compressor of the ECU's refrigeration unit for 40 seconds following the initiation of disc motor operation. This action ensures that the surge current requirements of the compressor occur well after the surge current requirements of the disc motor end. With the completion of the delay interval, the timer operates and closes a set of its contacts, which, in turn, connects 115 vac "phase 3" power to relay A32K1. Relay A32K1 energizes and three sets of its contacts close and connect three phase power to compressor A32B1. The compressor then operates and enables the supplying of cooled air to the interior of the disc file cabinet assembly. Simultaneously, condenser fan A32B2 operates. Also, condenser fan A32B3 operates if the head pressure of the refrigerant is high; if the pressure of the refrigerant is low, low head pressure shutoff switch A32S2 opens to inhibit the operation of fan A32B3.
- (3) With disc motor operation initiated, subsequent disc file operation is identical to that described in paragraph 4-3-1-1 b. through j.
- (4) Several failure indicators are provided on the ECU's maintenance panel (see Figure 7-2). These lamps glow red during normal disc file operation should the functions they monitor fail.
 - (a) Should the oil level in the reservoir of the hydraulic power supply drop to approximately 7-1/2 gallons, low oil level switch A22S4 (added to the hydraulic power supply in the modification of the file as described in paragraph 7-2-1-2) closes and connects 115 vac to LOW OIL lamp A33DS3 (see Figure 7-16), which then glows red to indicate that oil should be added to the reservoir. A check should also be made to determine if there is any excessive hydraulic leakage in the system; if excessive leakage is detected, remedial action should be taken immediately.

7-5-2-1 Automatic Operating Mode (Cont.)

- (b) If the temperature of the air from the ECU into the disc file cabinet varies by more than + 3^oF from the value to which the ADJ. TEMP. WARNING control of the ECU maintenance panel was set during installation adjustment of the ECU — see paragraph 7-3-4-3a.(17)(g) or 7-3-4-3b.(7) — the high or low temperature switch A33S3-1 or -2 closes and connects 115 vac to TEMP. WARNING indicator A33DS1, which then glows red. Such an indication can serve as an alert as to the possible cause of trouble during write/read operation of the file.
- (c) If the leak pump motor fails to operate when the level of the fluid in the reservoir of the pump reaches the preset level of S1-A, the continuation of the rise of the fluid within the reservoir to the preset level of S1-B causes S1-B to close and connect 115 vac to LEAK PUMP FAILURE indicator A33DS4, which then glows red; immediate remedial action is recommended.
- (d) If the temperature of the air returned from the disc file cabinet assembly to the ECU should reach 105^oF, the HIGH TEMP. SHUTOFF switch A31S6 operates and connects 115 vac to TEMP. SHUTOFF indicator A33DS2, which then glows red. Simultaneously, the entire file is automatically shut down as described in paragraph b.(1).

b. Shutdown Sequence — The disc file with ECU, when operating in automatic mode, is shut down in the same manner as a disc file without ECU as described in paragraph 4-3-1-2a. through c. It can also be shut down through the action of the following control circuits:

- (1) Total file shutdown can be automatically initiated when the temperature of the air returned from the disc file cabinet assembly to the ECU rises to 105^oF. This action causes the HIGH TEMP. SHUTOFF switch A31S6 to operate and interrupt the 115 vac "phase 3" holding voltage to relay A21K3 thereby inhibiting all file operation. Observe that as long as facility power is applied and as long as the overtemperature condition persists, TEMP. SHUTOFF indicator A33DS2 of the ECU maintenance panel continues to glow red to indicate the cause of shutdown.
- (2) Shutdown of all file functions including operation of the ECU's compressor will occur should operation of blower motor A33B1 of the ECU stop. The stopping of the motor causes the opening of sail switch A31S2 (see Figure 7-5), which in turn interrupts the 115 vac "phase 3" holding voltage applied to the coil of disc motor on relay A21K1 and to the ECU timer.
 - (a) Relay A21K1 de-energizes and the indicator of DISC MOTOR ON pushbutton A11S4 extinguishes. As long as the sail switch remains open, disc motor operation is inhibited and the conditions of paragraph 4-3-1-2b. occur; observe, however, that in this case the indicator of the DISC MOTOR ON pushbutton A11S4 will also be extinguished along with those of other pushbuttons.

7-5-2-1 Automatic Operating Mode (Cont.)

- (b) ECU timer operation stops and its contacts open. This action interrupts the 115 vac "phase 3" holding voltage to relay A32K1, which de-energizes and interrupts the three phase power to the compressor. Compressor operation immediately stops.
 - (c) Though all functions of the disc file are inhibited at this time, relay A21K3 will still be energized and only the indicator of the AUTOMATIC ON pushbutton will be glowing (dim red). This type of indication isolates the cause of file shutdown as due to the opening of the sail switch.
- (3) Compressor operation can be inhibited should the pressure of its refrigerant decrease below or rise above the preset limits of the compressor low or high pressure shutoff switches (see Figure 7-10). The opening of either switch interrupts the 115 vac "phase 3" power to relay A32K1, which de-energizes. This action opens the three phase power to the compressor and compressor operation stops. With the air entering the disc file cabinet no longer being cooled during closed loop operation, the disc file will very likely be shut down by the occurrence of the events of paragraph (1).

7-5-2-2 Manual Operating Mode — The manual starting and shutdown sequence of the disc file are discussed in the following paragraphs.

a. Starting Sequence — With the RESET OFF/TRIP ON circuit breaker A21CB1 set to the TRIP ON position and with customer three phase, four wire, 208 vac power applied (in three wire, 208 or 416 volt systems, a stepdown transformer is used to provide the 115 vac requirement of the starting control system), "phase 3" input power is applied through a series of interlocks — including the F1 15A MAIN CONTROL fuse — and HIGH TEMP. SHUTOFF switch A31S6 of the environmental control unit (ECU, see Figure 7-5) to normally open AUTOMATIC ON pushbutton A11S6 and MANUAL ON pushbutton A11S5 (see Figure 3-1). Manual operation of the disc file is then enabled by the momentary pressing of MANUAL ON pushbutton A11S5. The following events are then enabled (see Figure 7-20).

- (1) The 115 vac "phase 3" power is applied through the MANUAL ON pushbutton to HOUR meter A21M1 (see Figure 1-18), manual on relays A21K4 and A21K5, the power supply of the tachometer/temperature meter box (see Figure 1-4), and to indicator A11DS5 of MANUAL ON pushbutton A11S5. HOUR meter A21M1 and circuits of the tachometer/temperature meter box immediately operate, indicator A11DS5 of the MANUAL ON pushbutton glows blue, and both relay A21K4 and A21K5 energize. The energizing of relays A21K4 and A21K5 causes the events of paragraph 4-3-2-1 a. (1) and (2) to occur; also, the closing of the set of contacts identified in paragraph 4-3-2-1 a. (1) (c) connects 115 vac to the leak pump, which is then enabled as described in paragraph 7-5-2-1 a. (2) (a).
- (2) With the manual mode of disc file operation initiated, initiation of independent modes of disc file operation can be accomplished as follows:

7-5-2-2 Manual Operating Mode (Cont.)

- (a) If the heads of the file have not been actuated to the flying attitude, disc motor operation is initiated as follows:
 1. The pressing of DISC MOTOR ON pushbutton A11S4 (see Figure 3-1) enables connecting of 115 vac to ECU blower motor overload contactor A33K1 (see Figure 7-8). Contactor A33K1 energizes and three sets of its contacts close and connect three phase power to ECU blower motor A33B1, which operates.
 2. Within approximately two seconds of the start of blower operation, air flow from the ECU into the disc file cabinet assembly is sufficient to cause the closing of sail switch A31S2 (see Figure 7-5). This action enables the connection of 115 vac "phase 3" power to disc motor on relay A21K1, indicator A11DS4 of DISC MOTOR ON pushbutton, and the ECU delay timer. DISC MOTOR ON pushbutton A11S4 glows green, relay A21K1 energizes causing the events of paragraph 4-3-2-1 b. (1) (a) and (b) to occur, and the ECU timer starts to operate. The DISC MOTOR ON pushbutton can then be released.
 3. Following 40 seconds of timer operation, operation of the ECU's compressor is enabled as described in paragraph 7-5-2-1 a. (2) (b).
- (b) Hydraulic motor, heads, and electronics operations are enabled in the same manner as that described in paragraph 4-3-2-1 b. (2) through (4); in these paragraphs where disc motor operation is referenced back to paragraph (1), however, it should be remembered that disc motor operation in the case of ECU equipped files is as described in paragraph (a), above.

b. Shutdown Sequence — Shutdown of the disc file during manual operation can be accomplished normally through the pressing of the individual OFF pushbuttons provided or the file can be automatically shut down by failure control circuits.

- (1) Normal Shutdown — The file can be totally shut down or the individual functions can be shut down as described in the following paragraphs:
 - (a) Total shutdown of the disc file during manual operation can be accomplished by momentarily pressing MANUAL OFF pushbutton A11S11. This action causes the events of paragraph 4-3-2-2 a. (1) to occur.
 - (b) Shutdown of the disc motor of the disc file is enabled by momentarily pressing DISC MOTOR OFF pushbutton. This action interrupts the holding voltage applied to ECU blower motor contactor A33K1, which de-energizes and interrupts the three phase power to blower motor A33B1. When airflow into the disc file becomes sufficiently reduced, sail switch A31S2 of the ECU opens and interrupts the holding voltage to disc motor on relay A21K1 and the timer of the ECU. Relay A21K1 de-energizes and causes the events of paragraph

7-5-2-2 Manual Operating Mode (Cont.)

4-3-2-2 a. (2) to occur. Timer operation stops, its contacts open, and holding voltage to compressor motor on relay A32K1 is interrupted. Relay A32K1 de-energizes and interrupts the three phase power to compressor A32B1. Compressor operation stops.

(c) Shutdown of the hydraulic system, heads system and electronics circuits of the file is accomplished in the same manner as that described in paragraph 4-3-1-2 a. (3) through (5).

(2) Failure Shutdown — The disc file when operating in the manual mode can be automatically shut down in the same manner as that described in paragraph 4-3-1-2 a. and b. for failure shutdown of the disc file operating in the automatic mode except that in paragraph a., voltage to relays A21K4 and A21K5 — rather than to relay A21K3 — is interrupted. Disc motor and compressor operation can also be inhibited should the events of paragraph 7-5-2-1 b. (1) through (3) occur except that in step (1), holding voltage to relays A21K4 and A21K5 — rather than to relay A21K3 — is interrupted.

7-5-3 ENVIRONMENTAL CONTROL SYSTEM — Components making up the environmental control system are located in the environmental control unit (ECU) cabinet assembly. Operation of the system — that is, blower operation — begins the instant the file is placed in the automatic mode of operation (see paragraph 7-5-2-1 a. (1)) or when the disc motor is operated during the manual mode of operation (see paragraph 7-5-2-2 a. (2) (a)). With preliminary functions performed, the disc file can be operated with the system set up in either an open or closed loop configuration; Figures 7-21 and 7-22 show the flow path of air through the ECU when the ECU is operated in the respective configurations.

7-5-3-1 Open Loop Operation — Disc file operation with the ECU in the open loop configuration is an emergency operating arrangement and is used only when the refrigeration unit requires maintenance. In this configuration — wherein the refrigeration unit is disconnected, the ECU supplies filtered and pressurized ambient room air to the disc file cabinet's interior. Since cooling of the air is not possible in this configuration, the ambient room air must be cool enough to maintain the air in the disc file cabinet within + 5°F of the temperature at which the data was previously written. This action eliminates any possibility of loss of such data due to thermal expansion of components (see paragraph 1-3-4-3). Open loop operation of the environmental control system is enabled when various panels making up the ECU are switched and when connector A33P1 is disconnected from connector A33J1 — see paragraph 7-3-4-3 a. (1) through (6).

a. With the panels of the ECU properly switched and with blower motor operation initiated, air is drawn directly from the room into the blower compartment through the grille in the back panel of the ECU (see Figure 7-6 and 7-21). The air is then forced through the main filter (see Figure 7-8) into the disc file cabinet assembly where it is circulated and then returned to atmospheric air through the ECU. It is the initial flow of air into the disc file cabinet that causes the sail switch (see Figure 7-5 and 7-21) to close and enable the start of disc motor operation; with the flow of air maintained, the sail switch stays closed and enables disc motor operation to continue.

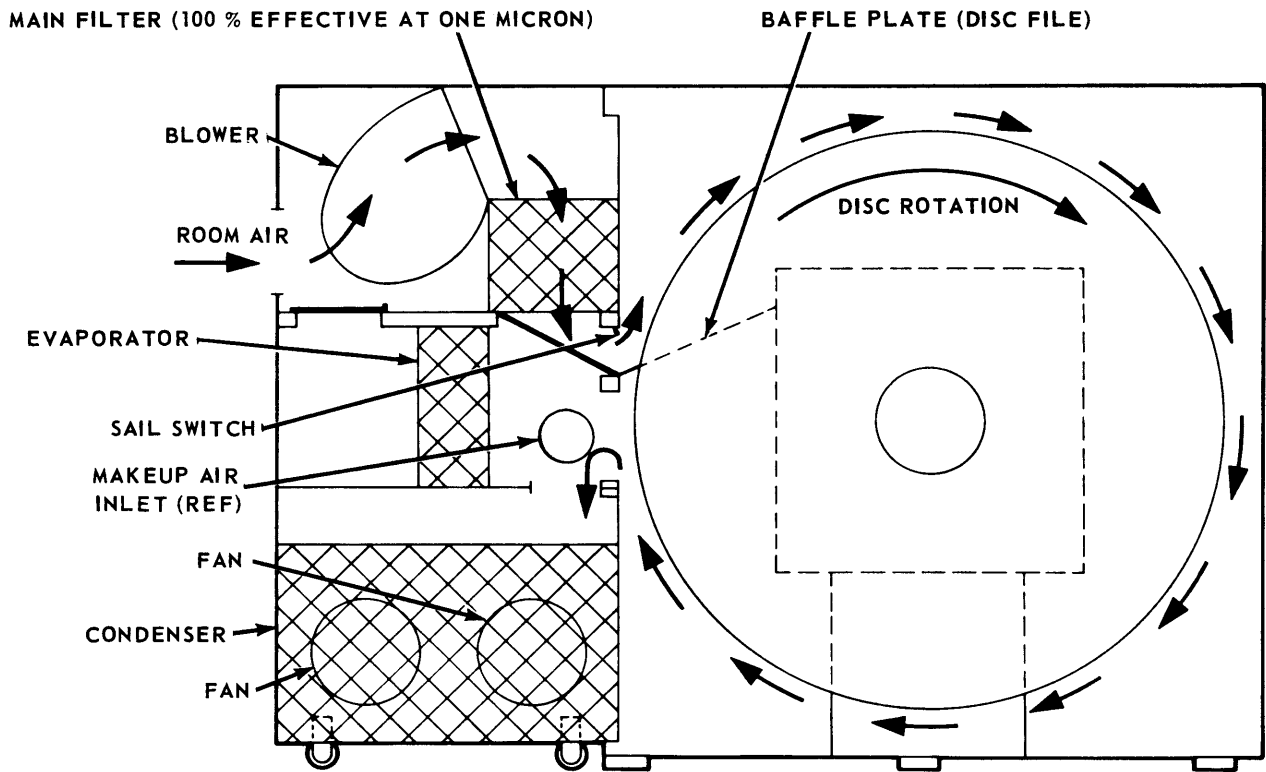


Figure 7-21 Environmental Control System, Open Loop Operation—Simplified Air Flow Diagram

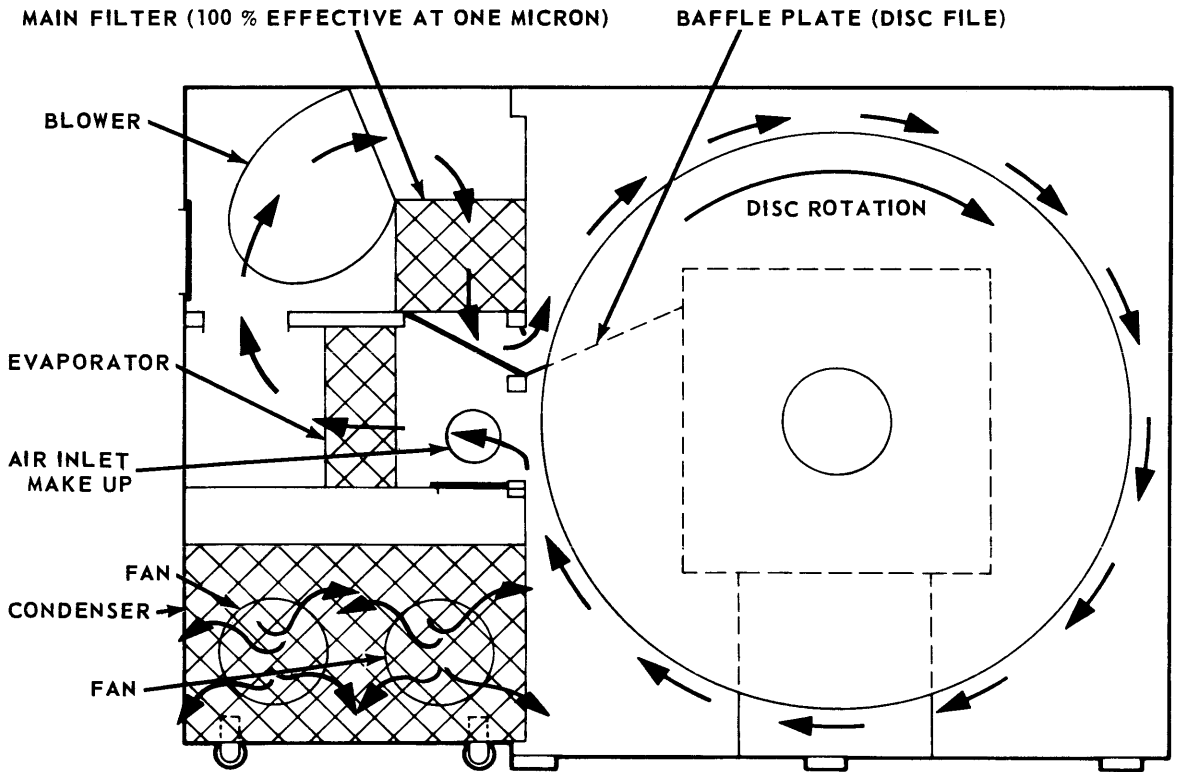


Figure 7-22 Environmental Control System, Closed Loop Operation—Simplified Air Flow Diagram

7-5-3-1 Open Loop Operation (Cont.)

b. The power that would normally be connected through a set of contacts of a delay timer to the compressor control relay A32K1 — see paragraph 7-5-2-1 a.(2) (b) — is prevented from such application by the disconnecting of connector A33P1. This action inhibits operation of the ECU's refrigeration unit during open loop operation of the environmental control system.

7-5-3-2 Closed Loop Operation — Disc file operation with the ECU in the closed loop configuration is the normal operating arrangement of the environmental control system; that is, operation of the refrigeration system is normally mandatory. Closed loop operation of the environmental control system is enabled when various panels making up the ECU are in their normally installed location and when connector A33P1 is connected to connector A33J1 — see paragraph 7-3-4-3 a. (9) through (16). With the panels properly installed and with the blower motor operation initiated, air is forced through the main filter of the ECU into the disc file cabinet assembly where it is circulated. Unlike open loop operation wherein the air out of the file is returned to atmospheric, the air is then returned through the evaporator to the blower compartment for subsequent recirculation through the file (see Figure 7-22). Air that is lost through the openings of the file due to the positive pressurization of the cabinet is made up from room air, which is drawn through a make-up air inlet grille provided in the side panel of the ECU (see Figure 7-5). It is the continuous flow of air into the disc file cabinet that causes the sail switch (see Figure 7-5 and 7-22) to close and allow immediate turn-on of the disc motor of the file and delayed turn-on of the refrigeration unit of the ECU; the continuous flow of air then maintains the sail switch closed to enable continuation of disc motor and subsequent refrigeration unit operation. Following a 40 second delay after the start of disc motor operation, a delay timer operates and enables the start of the compressor of the ECU's refrigeration unit. The air in the system is then cooled as described in paragraph a. below. Control of the cooling is described in paragraph b.

a. With the start of the compressor operation, refrigerant in a liquid form is forced under pressure from a receiver through a sight glass/filter drier assembly and a thermal expansion valve to the evaporator where the air out of the disc file is directed (see Figures 7-22 and 7-23). The flow of the refrigerant through the expansion valve results in a decrease in pressure of the refrigerant as it enters the evaporator. It is this decrease in the pressure of the refrigerant as it flows from the valve into the evaporator that causes the refrigerant to absorb the heat of the file air flowing through the evaporator; this cooled air is then recirculated through the file. As a result of absorbing the heat of the air flowing through the evaporator, the refrigerant is changed to a gas which is applied through an expansion bulb sensing unit to the refrigerant low pressure shutoff switch and the suction side of the compressor. The compressor pressurizes the gas, which — after being monitored by the high pressure shutoff switch and the low head pressure shutoff switch A32S2 — is forced from the head side of the compressor through a condensate pan to the condenser coils of the system. With the refrigerant gas under high pressure, the flow of ambient room air through the condenser — due to operation of the condenser's fan(s) — absorbs the heat of the pressurized gas causing the gas to be returned to the receiver as liquid refrigerant for recycling through the system.

- (1) The sight glass of the sight glass/filter drier assembly provides a means of monitoring the dryness of the refrigerant in the system; the filter drier is used to filter out any impurities and slight traces of moisture that may accumulate in the refrigerant before it is recirculated in the system.

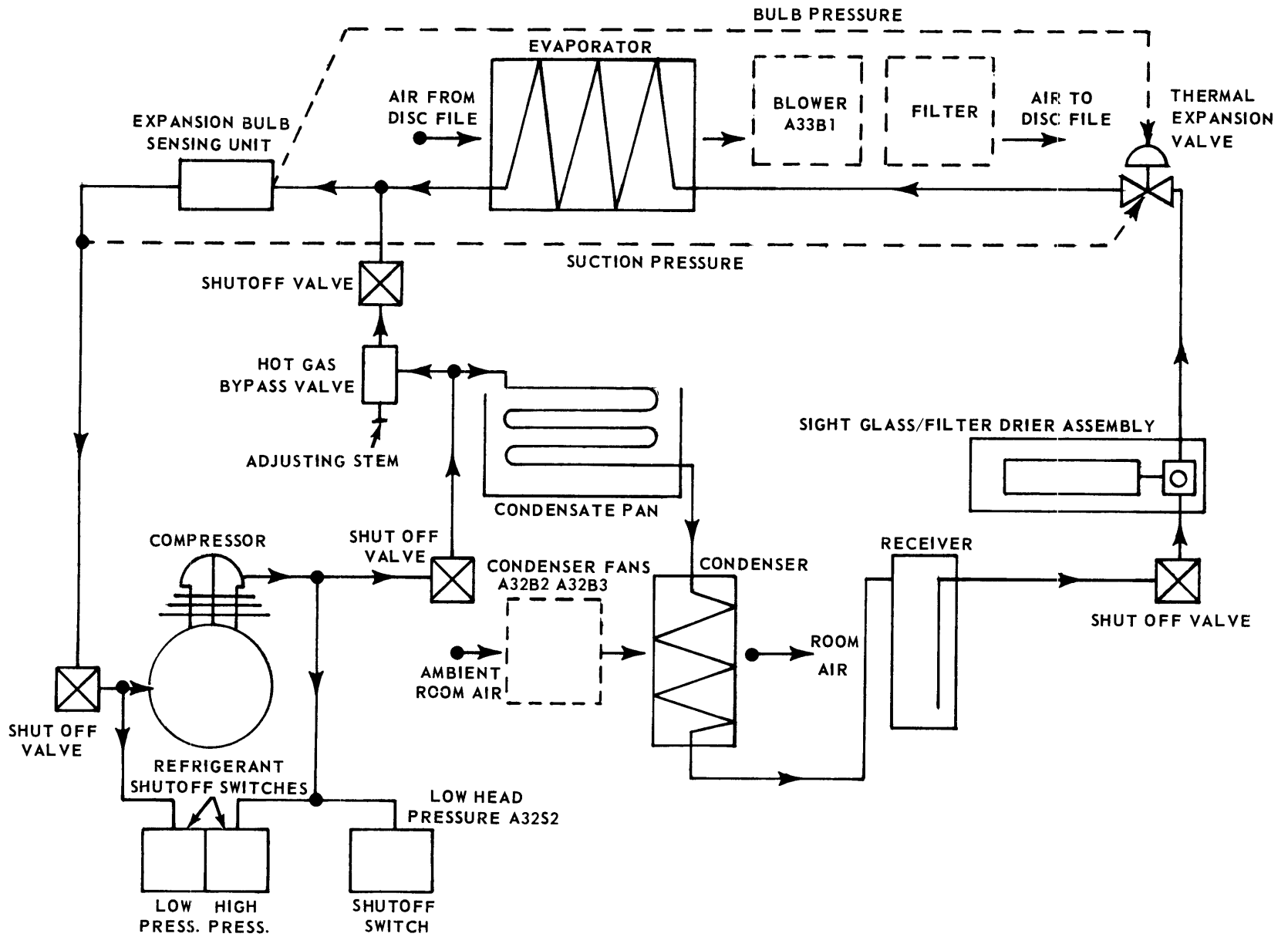


Figure 7-23 Environmental Control System, Refrigerant Flow Diagram

7-5-3-2 Closed Loop Operation (Cont.)

- (2) The refrigeration low and high pressure shutoff switches are a part of the starting control system wherein a low pressure condition on the suction side of the compressor or a high pressure condition on the head side of the compressor will cause the associated switch to open and interrupt compressor operation — see paragraph 7-5-2-1 b. (3). This action protects the valve plates of the compressor under pressure extremes.
- (3) Low head pressure shutoff switch A32S2 is a part of the starting control system wherein a low pressure condition on the head side of the compressor will cause the switch to open and interrupt the operation of condenser fan A32B3 — see paragraph 7-5-2-1 a. (2) (b). This action which allows the refrigerant pressure to rise to a limit that will again cause the switch to close and restart A32B3 serves to maintain the pressure of the refrigerant in the system within preset limits.
- (4) The condensate pan serves to catch any moisture that may drop off the evaporator, which is subject to frosting under high humidity conditions. The flow of the hot gas from the compressor through the condensate pan aids in evaporation of this moisture.

b. The temperature of the air through the evaporator is controllable by the amount of the refrigerant that is allowed to pass through the evaporator. There are two means by which this control is enabled. In one case, the pressure of the system at the receiver is controlled by introducing a false load to the compressor through the use of a hot gas bypass valve; this false load, though maintaining the pressure across the compressor constant regardless of changes in air temperature (load changes) across the evaporator, reduces or increases the pressure of the refrigerant to the receiver, thereby controlling the flow of refrigerant to the evaporator. In the second case, refrigerant temperature changes — as sensed by an expansion bulb sensing unit — and refrigerant pressure changes — as sensed in the suction line of the compressor — are both reflected back to the expansion valve, which is thermal and pressure sensitive. These changes regulate the size of the openings of the valve to control the amount of refrigerant of the system that is passed through to the evaporator.

- (1) Major control of the flow of refrigerant through the system is enabled by adjustment of the hot gas bypass valve. This valve must be preset to enable control of the temperature of the air in the disc file cabinet to within $\pm 3^{\circ}\text{F}$ for room ambient temperature changes of up to $\pm 10^{\circ}\text{F}$. The valve operates as a result of a pressure differential across it. That is, an increasing or decreasing pressure at the suction side of the valve causes the valve opening to become smaller or greater, respectively.

NOTE

To maintain the temperature of the air of the disc file cabinet within $\pm 3^{\circ}\text{F}$, the hot gas bypass valve must be readjusted should the temperature of room ambient vary outside the $\pm 10^{\circ}\text{F}$ range to which the valve was originally preset.

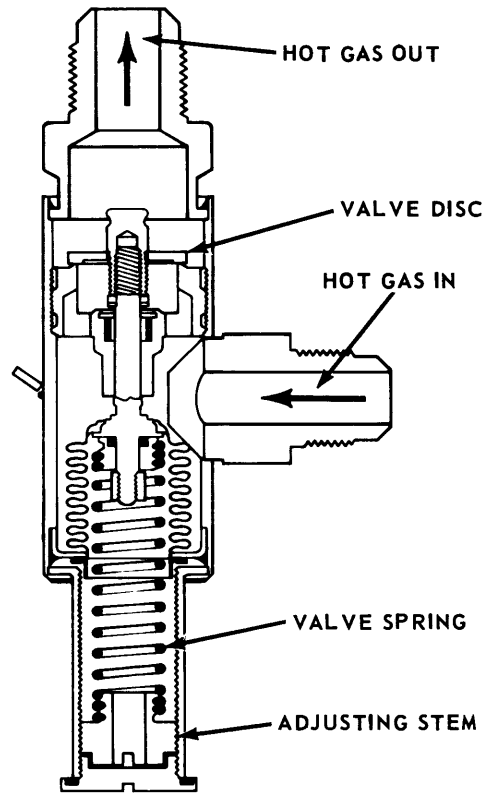


Figure 7-24 Hot Gas By-pass Valve, Sectional View—Refrigerant Flow Path

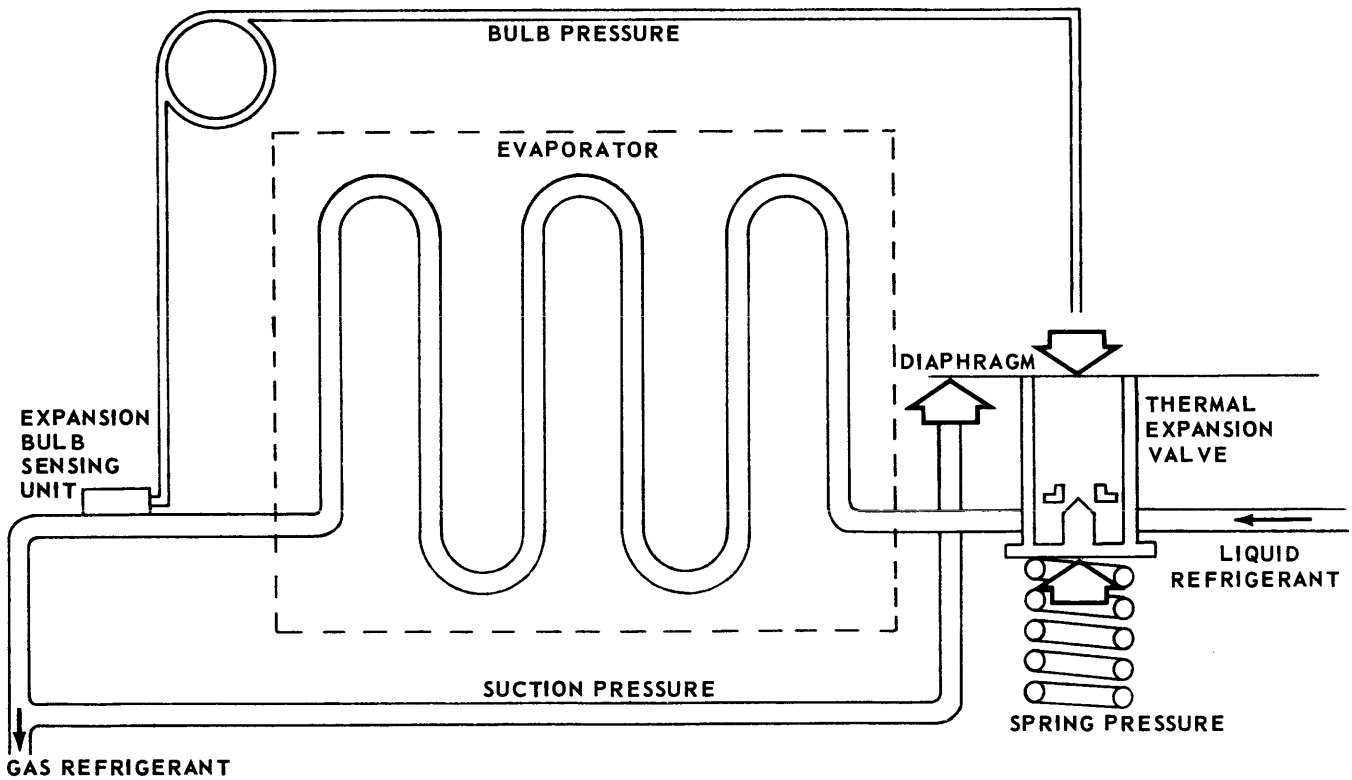


Figure 7-25 Expansion Valve, Simplified Diagram Showing Control Paths

7-5-3-2 Closed Loop Operation (Cont.)

- (a) An increase in the temperature of the air from the file causes an increase in the load across the evaporator of the ECU. This, in turn, causes an increase in the pressure of the refrigerant in the form of a gas-flowing from the evaporator. The increased pressure of the gas working against the valve disc of the hot gas bypass valve (see Figures 7-23 and 7-24) plus the manually preset loading of the valve's spring — see paragraph 7-3-4-3a. (17) or b.— causes the valve opening to become smaller, thereby allowing less hot gas to be applied from the head to the suction side of the compressor. With flow of hot gas to the suction side of the compressor restricted, the head pressure of the compressor increases and, in turn, increases the pressure exerted on the refrigerant in the receiver. The increased pressure exerted on the refrigerant of the receiver results in forcing more refrigerant through the expansion valve. It is this increased flow of refrigerant that enables absorption of more heat from the file air thereby maintaining the temperature of the air returned to the file relatively constant within the prescribed temperature range.
- (b) A decrease in the temperature of the air from the file causes a decrease in the load across the evaporator of the ECU. This, in turn, causes a decrease in the pressure of the refrigerant — in the form of gas-flowing from the evaporator. The decreased pressure of the gas working against the valve disc of the hot gas bypass valve (see Figure 7-23 and 7-24) plus the preset loading of the valve's spring — see paragraph 7-3-4-3a. (17) or b. — causes the valve opening to become larger, thereby allowing more hot gas to be applied from the head to the suction side of the compressor. With flow of hot gas to the suction side of the compressor increased, the head pressure of the compressor decreases and, in turn, decreases the pressure exerted on the refrigerant in the receiver. The decreased pressure exerted on the refrigerant in the receiver results in the forcing of less refrigerant through the expansion valve. This decreased flow of refrigerant enables absorption of less heat from the exiting file air thereby maintaining the temperature of the air returning to the file relatively constant over the prescribed temperature range.
- (2) Minor control of the flow of refrigerant through the system is enabled through a factory-adjusted, externally-equalized, expansion valve. An expansion bulb — containing a refrigerant matching that used in the refrigeration system and installed in the refrigeration outlet side of the evaporator — is connected by a tube to one side of the diaphragm of the expansion valve (see Figures 7-23 and 7-25). A tube from the suction side of the compressor (refrigerant outlet side of the evaporator) is connected to the opposite side of the diaphragm of the expansion valve such that its pressure is additive to the force exerted by a factory preset spring included in the assembly. In this configuration, operation of the expansion valve is dependent upon the relationship of three fundamental pressures. That is, bulb pressure acting on top of the diaphragm must exceed the sum of the reference force established by the compressor suction pressure and pressure of the spring — both acting on the bottom of the diaphragm — in order for refrigerant to flow in the

7-5-3-2 Closed Loop Operation (Cont.)

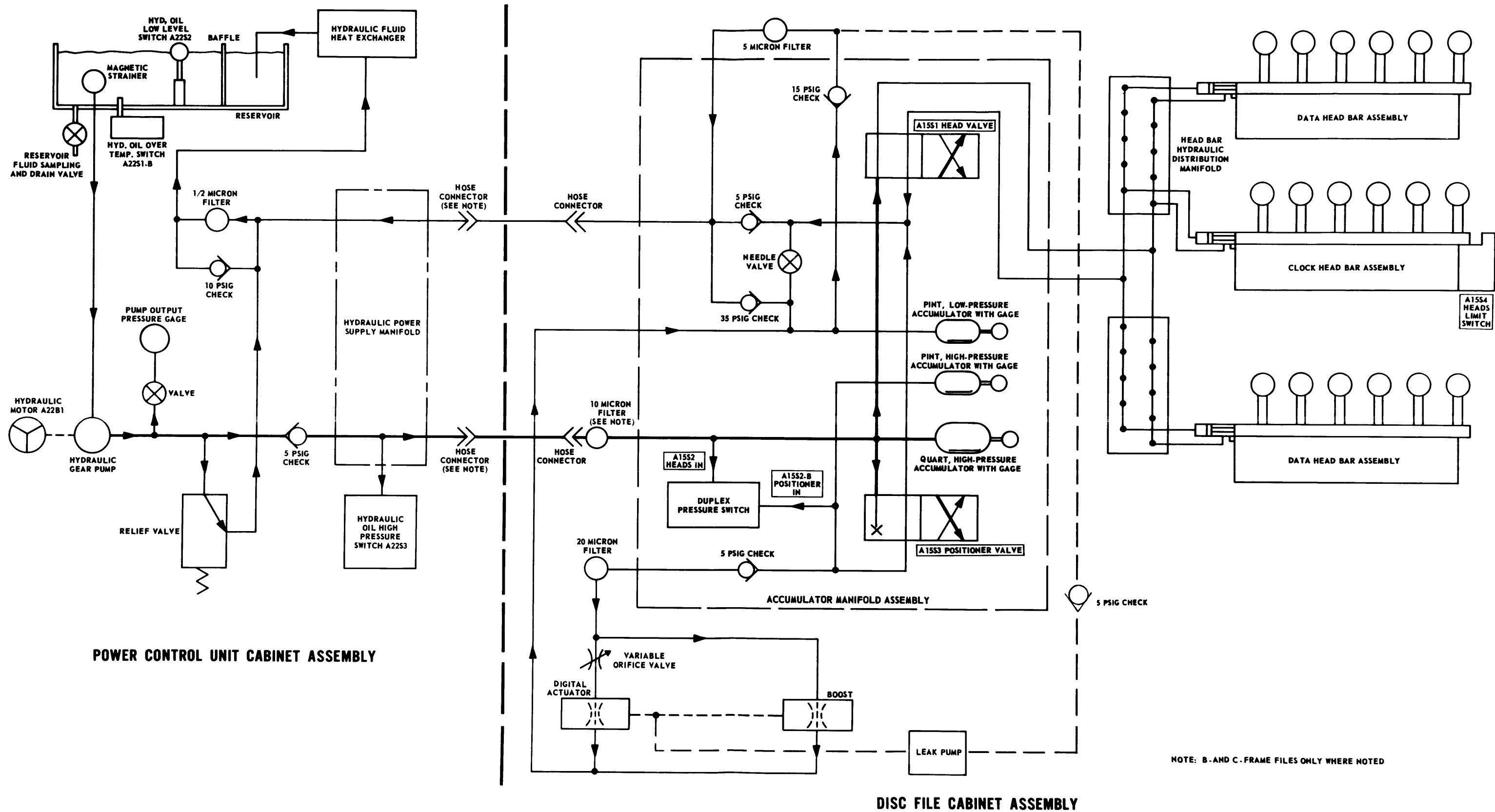
system. Thus, as an increase in the temperature of the air from the file causes an increase in the load across the evaporator, an increase in refrigerant temperature out of the evaporator is reflected — through the expansion bulb — as an increased pressure acting on the upper surface of the expansion valve's diaphragm. This action increases the size of the opening of the valve so that more refrigerant flows from the receiver into the evaporator to aid in the cooling of the air flowing through the evaporator. Similarly, as a decrease in the temperature of the air from the file causes a decrease in the load across the evaporator, a decrease in refrigerant temperature out of the evaporator is reflected — through the expansion bulb — as a decreased pressure acting on the upper surface of the expansion valve's diaphragm. This action decreases the size of the opening of the valve so that less refrigerant flows from the receiver into the evaporator to reduce the cooling of the air flowing through the evaporator.

7-5-4 HYDRAULIC SYSTEM — The hydraulic system of a disc file with an ECU (see Figure 7-26) is functionally identical to that of a disc file without an ECU (see Figure 4-3) except that a leak pump with a 5 psig check valve (see Figure 7-3) replaces the leak bottle (see Figure 1-13) connected to the digital actuator/boost assembly. Leak pump operation is enabled as described in paragraph 7-5-2-1a. (2) (a) during automatic disc file operation or as described in paragraph 7-5-2-2a. (1) during manual disc file operation. With the file in either operating mode, operation of the pump causes the fluid in its reservoir to be pumped through a 5 psig check valve, the 5-micron filter of the disc file cabinet assembly, and the 1/2-micron filter and hydraulic fluid heat exchanger of the power control unit cabinet assembly to the reservoir of the system. All other system operation is identical to that described in paragraph 4-4.

7-5-5 DATA HEAD POSITIONING SYSTEM AND WRITE/READ ENABLE SYSTEM — Operation of the data head positioning system and write/read enable system of an ECU equipped file is identical to that described in paragraphs 4-5 and 4-6 for a disc file without ECU.

7-6 PREVENTIVE MAINTENANCE

This paragraph provides the procedures necessary to enhance continuous, extended periods of trouble-free operation of the disc files with ECUs. Essentially, personnel qualifications and maintenance philosophy is identical to that described in paragraphs 5-1-1 and 5-1-2 for disc files without ECUs. The preventive maintenance performance schedule is as described in paragraph 5-1-3 except that the frequency of performing various routines differs as indicated in Table 7-5; also, the preventive maintenance schedule is modified to include those areas changed because of the addition of the ECU. Essentially, the warnings and cautions of paragraph 5-1-4 apply and shall be adhered to without deviation; as in the case of a disc file without ECU where in operation of the file shall be kept to a minimum when access panels are removed, operation of a file when the ECU is separated from it shall also be kept to an absolute minimum.



NOTE: B- AND C- FRAME FILES ONLY WHERE NOTED

Figure 7-26 Model 1 Series 4000 Disc File With ECU, Hydraulic System—Schematic Diagram

TABLE 7-5 PREVENTIVE MAINTENANCE SCHEDULE

Interval	Function	Paragraph
Daily	General Inspection	7-6-1-1
	Disc Motor RPM Check	7-6-1-2
	Disc File Automatic Turn-on Check	7-6-1-3
Weekly	Boost Pin Lubrication	7-6-2
Monthly	Oilite Bearing Lubrication	7-6-3-1
	Disc Motor Drive Belt Check	7-6-3-2
	Hydraulic Fluid Contamination Level Check	7-6-3-3
	Environmental Control Unit Checks	7-6-3-4
	Disc Buffing and Leak Pump Fuse Check	7-6-3-5
Semi-Annual	Filler-Breather Cap and Strainer Cleaning	7-6-4-1
	Environmental Control Unit Checks	7-6-4-2
Annual	Hydraulic Power Supply Maintenance	7-6-5-1
	10-, 20-, and 5-Micron Filter Replacement	7-6-5-2
	ECU Blower Motor Lubrication	7-6-5-3
	Pressure Gage Maintenance	7-6-5-4
Biennial	Hydraulic Power Supply Hose Replacement	7-6-6-1
	Boost Hose Replacement	7-6-6-2
	Accumulator Replacement	7-6-6-3
	Accumulator Pressure Gage Replacement	7-6-6-4
Site-Determined	Inspecting Power Control Unit Portion of Disc File	7-6-7-1
	Disc File Cabinet Inspection and Disc Cleaning	7-6-7-2
	Head Pad Cleaning	7-6-7-3
As Required	Filling Hydraulic Power Supply Reservoir With Hydraulic Fluid	7-6-8-1
	Hydraulic Power Supply Purging Procedures	7-6-8-2
	Charging Accumulators	7-6-8-3
	Data Head Bar Retraction and Insertion	7-6-8-4

7-6-1 DAILY PROCEDURES — Daily preventive maintenance should be performed in the order established in the following paragraphs. Before performing the procedures, review the information contained in paragraph 7-6, as applicable.

7-6-1-1 General Inspection — Perform the following routines daily:

- a. Shut down the disc file.

7-6-1-1 General Inspection (Cont.)

b. At the maintenance panel of the ECU (see Figure 7-6), perform the following checks after hydraulic motor operation stops.

NOTE

If indicated charge is not correct, recharge the accumulators as directed in paragraph 7-6-8-3.

- (1) Observe that gage labeled PRE-CHARGE TO 12 ± 2 PSIG (see Figure 7-16) indicates within the prescribed limits.
- (2) Observe that gage labeled PRE-CHARGE TO 600 ± 25 PSIG indicates within the prescribed limits.
- (3) Observe that gage labeled PRE-CHARGE TO 500 ± 25 PSIG indicates within the prescribed limits.

CAUTION

The disc file cabinet assembly (see Figure 7-1) shall not be opened when performing normal daily or weekly preventive maintenance.

7-6-1-2 Disc Motor RPM Check — Perform the disc motor rpm check as follows:

- a. Place the file in the manual operating mode.
- b. After installing all disc file cabinet access panels, press the DISC MOTOR ON pushbutton.

NOTE

Only MANUAL ON and DISC MOTOR ON pushbuttons must be glowing before proceeding to step c. The glass panel of the pushbutton station shall remain closed except when executing an operating function.

c. Following at least 25 minutes of disc motor operation (to permit temperature stabilization of disc file cabinet assembly), observe that the nominal speed indicated on the DISC FILE RPM meter (see Figure 3-1) of the pushbutton station assembly is 1200 ± 24 rpm or 900 ± 18 rpm (the speed indicated depends on whether the file is a 1200 or 900 rpm machine).

- d. Press the HYDRAULIC MTR ON pushbutton.
- e. After one minute, press the HEADS ON pushbutton

7-6-1-2 Disc Motor RPM Check (Cont.)

f. With heads flying and during a 5 minute period, observe that the speed indicated on the DISC FILE R.P.M. meter does not vary from its nominal value (step c.) by more than ± 2 rpm.

g. Press HEADS OFF pushbutton. Observe that heads retract from discs.

7-6-1-3 Disc File Automatic Turn-On Check — Perform the automatic turn-on procedures as directed in paragraph 7-4-2-1. With the starting operation satisfactorily completed, perform the following monitoring functions at the maintenance panel of the ECU (see Figure 7-6):

NOTE

It is recommended that periodic monitoring of the indicators of step a. be made during the course of the day.

a. Observe that LOW OIL, TEMP. WARNING, TEMP. SHUTOFF, and LEAK PUMP FAILURE indicators (see Figure 7-16) are all extinguished. If a lamp is on, proceed as follows, as applicable:

- (1) If the LOW OIL indicator is glowing, shut down the disc file and inspect the interior of the cabinets for fluid leakage. With any cause of hydraulic system fluid leakage remedied, fill the reservoir of the hydraulic power supply as directed in paragraph 5-9-1.
- (2) If the TEMP. WARNING indicator is glowing, observe that the $^{\circ}\text{F}$ FILE TEMP. meter (see Figure 3-1) of the tachometer/temperature meter box (see Figure 1-3 or 1-24) indicates within $+3^{\circ}\text{F}$ of that recorded in the disc file log as directed in paragraph 7-3-4-3 a. (8) or b. (5). If the deviation is $+3^{\circ}\text{F}$ or greater, it is recommended that the hot gas bypass valve (see Figure 7-7) be adjusted to compensate for the indicated temperature deviation. In an environmentally controlled facility, adjust the valve as indicated in paragraph 7-3-4-3 a. (17), steps (b) and (e) through (i) except in step (e) disregard the 20 minute delay when making the initial adjustment of the valve; observe the delay before performing any subsequent adjustments. In a non-temperature controlled facility, adjust the valve as directed in paragraph 7-3-4-3 b. steps (2) and (5) through (9) except that in step (5) disregard the 20 minute delay when making the initial adjustment of the valve; observe the delay before performing any subsequent adjustment. Change log.
- (3) If the TEMP. SHUTOFF indicator is glowing, disc file shutdown has occurred because of an excessive temperature rise of the air out of the disc file cabinet. This temperature rise is sensed by the HI TEMP. SHUTOFF switch A31S6 (see Figure 7-5). Such a large temperature rise could be attributable to failure of the ECU's refrigeration unit. Open loop operation of the file can then be performed as directed in paragraph 7-4-2-2 as the refrigeration unit of the compressor is being replaced (see paragraph 7-7-4) provided all conditions of paragraph 7-4-2-3 are met.

7-6-1-3 Disc File Automatic Turn-On Check (Cont.)

(4) If the LEAK PUMP FAILURE indicator is glowing, inspect the leak pump as directed in paragraph 7-6-3-5. If fuse of the pump is glowing, replace the fuse; if not glowing, replace the pump as directed in paragraph 7-7-2.

b. Observe that the pressure gages of the panel indicate as follows:

(1) The gage labeled PRECHARGE TO 12 ± 2 PSIG shall indicate between 25 and 35 psig.

(2) The gage labeled PRECHARGE TO 600 ± 25 PSIG shall indicate 925 ± 25 psig.

(3) The gage labeled PRECHARGE TO 500 ± 25 PSIG shall indicate 925 ± 25 psig.

7-6-2 WEEKLY PROCEDURES — Weekly preventive maintenance consists of lubricating the boost pin lubrication fittings of the digital actuator/boost assembly.

7-6-2-1 Special Equipment Required — Obtain the following special equipment:

a. A Boost Grease Gun, Bryant Part No. C-AF-156, filled with K-2 grease, Bryant Part No. A56861

b. A lint-free cloth

7-6-2-2 Procedure — Lubricate the boost pins through the fittings located on the maintenance panel of the ECU (see Figure 7-16) as follows:

a. Use absorbent cloth to wipe both boost pin grease fittings clean.

b. Using the grease gun, lubricate both grease fittings by pumping the handle of the gun until it can no longer be comfortably pumped by hand.

c. Use absorbent cloths to wipe away any excess grease that may be on the two boost pin grease fittings.

7-6-3 MONTHLY PROCEDURES — Monthly preventive maintenance procedures should be performed in the order established in the following paragraphs. Before performing the procedures, review the information contained in paragraph 7-6, as applicable.

7-6-3-1 Oilite Bearing Lubrication — Lubricate the oilite bearings of the disc file once a month as directed in paragraph 5-4-1.

7-6-3-2 Disc Motor Drive Belt Check — Check the disc motor drive belts once a month as directed in paragraph 5-4-2.

7-6-3-3 Hydraulic Fluid Contamination Level Check — The hydraulic fluid contamination

7-6-3-3 Hydraulic Fluid Contamination Level Check (Cont.)

level check for a B- or C-frame disc file with separate power control unit cabinet (see Figure 1-19) is performed in the same manner as that described in paragraph 5-4-3 for a disc file without ECU. For A-frame disc files, with respect to facing the front of the disc file cabinet, remove the left side access panel from the disc file cabinet proper (see Figure 1-24) and take an hydraulic fluid sample as described in the applicable procedures of paragraph 5-4-3.

7-6-3-4 Environmental Control Unit Checks — Inspect the environmental control unit at least once each month.

a. Special Equipment Required — Obtain the following special equipment:

- (1) Absolute filter, Bryant Part No. C-56977, if applicable — see paragraph b.(9) following
- (2) Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level, or equivalent
- (3) Rubber gloves
- (4) Clean, lint-free cloths
- (5) Vacuum cleaner

b. Procedure — Inspect the ECU as follows:

- (1) Shut down the disc file.

CAUTION

The disc file shall remain inoperative when performing the following procedures. The area shall be maintained meticulously clean.

- (2) When disc rotation stops and with the area surrounding the file thoroughly cleaned, remove the rear and both side access panels from the ECU.
- (3) Remove cover stenciled BLOWER COMPARTMENT (see Figure 7-7).
- (4) Check that the blower motor and blower pullies within the compartment (see Figure 7-8) are alined and that the drive belt is free of wear. Check that the drive belt(s) are free of slack and that they fit snugly about the pullies. Perform corrective maintenance as required.
- (5) Using Freon, thoroughly clean the interior of the blower compartment and allow the compartment to air dry.

7-6-3-4 Environmental Control Unit Checks (Cont.)

- (6) Reinstall cover stenciled BLOWER COMPARTMENT.
- (7) Using a vacuum cleaner and/or cloths, thoroughly clean any accumulation of dust from the refrigeration unit components (see Figure 7-7); check that moisture indicator of sight gage (see Figure 7-9) indicates dry; if a wet indication exists, notify Bryant Computer Products Field Service personnel or a licensed refrigeration unit technician for required maintenance.
- (8) Remove the cover stenciled FILTER COMPARTMENT (see Figure 7-7).
- (9) Pull out and inspect drawer stenciled FILTER (see Figure 7-8). There should be no evidence of matted accumulation of contamination or of tearing of filter media; if such indications exist, replace the filter with a new absolute filter, Bryant Part No. C-56977.
- (10) Using Freon, thoroughly clean interior of compartment located immediately below the drawer stenciled FILTER and allow the compartment to air dry.
- (11) With respect to facing the rear of the disc file, reinstall the right side access panel on the ECU and perform the disc buffing procedures of the following paragraph.

7-6-3-5 Disc Buffing and Leak Pump Fuse Check — Buff the discs and check the fuse of the leak pump at least once a month.

NOTE

If other preventive maintenance routines (such as annual, biennial and site determined) must be performed within the disc file cabinet, complete such routines before proceeding to disc buffing.

- a. Obtain the equipment specified in paragraph 5-2-4-1 and prepare the BUFF tool for use as described in paragraph 5-2-4-2.

CAUTION

The file shall be operated only when so directed during this procedure. The whole area shall be maintained clean and as dust free as possible during the procedure.

- b. Shut down the disc file.

- c. With respect to facing the rear of the disc file, remove the left side access panel from the ECU cabinet assembly.

7-6-3-5 Disc Buffing and Leak Pump Fuse Check (Cont.)

d. With the area surrounding the file thoroughly cleaned and when the discs stop rotating, remove the panel stenciled FILTER COMPARTMENT from the ECU (see Figure 7-7).

CAUTION

In the subsequent procedures, the file and ECU cabinet assemblies must remain interconnected. Therefore, when access is required to one or the other side of the file, the ECU must be positioned toward the opposite side of the file in a manner similar to that shown in Figure 7-2. Exercise care to ensure that no undue strain is applied to the lines interconnecting the cabinets when moving the ECU.

e. Remove the clamping bolts that retain the ECU to the disc file cabinet assembly (see Figure 7-15) and carefully roll the ECU out from the rear of the file cabinet.

f. Remove the outer access panel(s) from the rear of the disc file cabinet assembly.

WARNING

Exercise extreme care while working close to rotating discs.

CAUTION

The work area shall be maintained clean and as dust free as possible when performing the following procedures.

g. Buff the disc surfaces of the file as directed in paragraph 5-2-4-3b. through d.; during the procedure when the file is in the manual operating mode, observe that fuse mounted on the front of the junction box of the leak pump assembly (see Figure 7-3) is extinguished.

h. When the procedures are completed, reinstall the outer rear access panels on the disc file cabinet, reinsert and secure the ECU to the rear of the cabinet, reinstall the panel labeled FILTER COMPARTMENT on the ECU and install the side access panel on the ECU.

7-6-4 SEMI-ANNUAL — Before performing the procedures, review the information contained in paragraph 7-6.

7-6-4-1 Filler Breather Cap and Strainer Cleaning — Clean the filler breather cap of the reservoir as described in paragraph 5-5-1. However, in the case of an A-frame disc file (see Figure 1-25), remove the side panel of the disc file cabinet to access the assembly if the ECU is not to be removed from the rear of the disc file for the purpose of performing any other maintenance functions.

7-6-4-2 Environmental Control Unit Checks — The refrigerant charge and the oil level of the compressor of the ECU are checked once every six months. Also, the torque of the bolts on the heads of the compressor is checked at this time.

a. An offset (dental type) mirror and a flashlight are required in the performance of this procedure.

b. Check the refrigerant charge, the oil level, and torque of the compressor head bolts as follows:

- (1) With respect to facing the rear of the file, remove the left side and rear access panels from the ECU.
- (2) Place the disc file in the manual operating mode.
- (3) Press the DISC MOTOR ON pushbutton.
- (4) Observe that compressor motor starts to operate within approximately 40 seconds of the start of disc motor operation.
- (5) Remove the cover stenciled EVAPORATOR COMPARTMENT (see Figure 7-7) from the rear of the ECU. Close the hot gas bypass shutoff valve (see Figure 7-9) by rotating it full clockwise and reinstall the evaporator compartment panel.
- (6) Immediately observe the sight gage of the refrigeration unit (see Figure 7-9). Although bubbling of the refrigerant may be immediately visible, all signs of bubbling should disappear within no more than five minutes of the start of performing the check. If bubbling persists, contact Bryant Computer Products Field Service or a licensed refrigeration unit technician for required maintenance.
- (7) With the procedure of step (6) satisfactorily completed, remove the cover stenciled EVAPORATOR COMPARTMENT and open the hot gas bypass shutoff valve (see Figure 7-9) by rotating it full counterclockwise. After using a cloth dampened with Freon to clean out the compartment, reinstall the compartment cover.
- (8) With respect to facing the rear of the disc file, remove the left side access panel from the ECU cabinet assembly.
- (9) With the compressor operating for at least 15 minutes, position a mirror so that the oil level gage of the compressor of the refrigeration unit (see Figure 7-10) is visible; gage is located immediately adjacent to the forward partition of the ECU cabinet.
- (10) With the mirror positioned as described in step (9), shut down the disc file and observe that the oil level gage settles to a point that is between one-quarter and one-half of the height of the sight glass. Any subsequent rise in the level will be of no consequence.

7-6-4-2 Environmental Control Unit Checks (Cont.)

WARNING

Before performing the next step, be sure heads of compressor have cooled sufficiently to prevent injury to those conducting the procedures.

CAUTION

In the following step, avoid torquing those bolts wherein tubing could be damaged during the procedure.

- (11) When the pressure heads of the compressor have had a chance to cool, use a torque wrench to torque the bolts of both heads (see Figure 7-10) to 150 in. lbs — in the case of 1/4-inch bolts — or 200 inch pounds in the case of 5/16 inch bolts. With respect to facing the front of the ECU, access to one of the heads is through the side of the ECU (see Figure 7-8). Access to the head near the condenser is through the front of the ECU; by sliding back the panel stenciled REMOVE FOR OPEN LOOP CONDITION — SEE MANUAL FOR INSTRUCTION (see Figure 7-8), the bolts of the second head are accessible.
- (12) If no further maintenance is to be performed, reinstall all access panels on the ECU.

7-6-5 ANNUAL — Annual preventive maintenance procedures should be performed in the order established in the following paragraphs. Before performing the procedures, review the information contained in paragraph 7-6, as applicable.

7-6-5-1 Hydraulic Power Supply Maintenance — Clean the hydraulic power supply reservoir and magnetic strainer as directed in paragraph 5-6-1; lubricate the hydraulic motor/gear pump assembly as directed in paragraph 5-6-2, and perform applicable maintenance on the hydraulic power supply 1/2-micron filter, radiator fan, and auxiliary compartment as directed in paragraph 5-6-3.

7-6-5-2 10-, 20-, and 5-Micron Filter Replacement — These filters are replaced as directed in paragraphs 5-6-4 through 5-6-6 except that the ECU must be removed from the rear of the disc file cabinet instead of the center-rear access panel. Removal of the ECU is accomplished as directed in paragraph 7-6-3-5 steps b. through e.; reinstallation is accomplished as directed in paragraph 7-6-3-5 h., as applicable.

7-6-5-3 ECU Blower Motor Lubrication — The blower motor located in the blower compartment of the ECU is to be lubricated at least once a year.

- a. Equipment required — Obtain a can of SAE 10 weight oil, or equivalent.
- b. Procedure — Lubricate the motor as follows:

7-6-5-3 ECU Blower Motor Lubrication (Cont.)

- (1) Shut down the disc file.
- (2) With the area surrounding the file thoroughly cleaned and when disc rotation stops, remove the rear access panel of the ECU.
- (3) Remove cover stenciled BLOWER COMPARTMENT (see Figure 7-7).
- (4) Apply a few drops of oil in the capped oil fittings located at each end of the blower motor (see Figure 7-8). Do not over lubricate.
- (5) Replace pressure gages as directed in paragraph 7-6-5-4.

7-6-5-4 Pressure Gage Maintenance — Pressure gages of the ECU maintenance panel (see Figure 7-7) shall be calibrated at least once each year and replaced every two years. The gages must be removed regardless of whether replacement or calibration is to be performed.

- a. Special Equipment Required — Obtain the following special equipment:

NOTE

Items (1) and (2) are specified should it be preferred to replace the gages to be calibrated with previously calibrated gages.

- (1) Two high pressure gages (zero to 2000 psig), Bryant Part No. C-56556-6
- (2) One low pressure gage (zero to 60 psig), Bryant Part No. C-56556-4
- (3) Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination Level — or equivalent
- (4) Lint-free cloths
- (5) Rubber gloves
- (6) Plastic bags
- (7) 1/4-inch Teflon tape

b. Procedure — Remove and install the pressure gages on the ECU maintenance panel as follows:

- (1) Remove rear access panel from ECU.
- (2) Remove cover stenciled BLOWER COMPARTMENT.

7-6-5-4 Pressure Gage Maintenance (Cont.)

- (3) Remove the valve caps from the valve stems of the ECU maintenance panel (see Figure 7-16). Then, bleed precharge from each accumulator by depressing the related valve core.

WARNING

Accumulators must be bled of their precharge before removing gages from the maintenance panel.

- (4) Disconnect pressure lines from accumulator gage fittings located inside blower compartment (see Figure 7-27). Wrap ends of lines in plastic bags to avoid possible contamination.
- (5) Disconnect grease lines from lubrication fittings. Wrap ends of lines in plastic bags to avoid possible contamination.
- (6) Remove wires marked No. 1 and No. 3 from rear of ADJUST TEMP. WARNING switch A33S3 of ECU maintenance panel.
- (7) Remove indicator lamps DS1 through DS5 from the ECU maintenance panel.
- (8) Remove the hardware securing the maintenance panel to the ECU and remove the panel.
- (9) Remove the charging pipe from the 90-degree elbow of the piping to each gage by loosening the rear nut that secures the pipe to the panel.
- (10) Remove the clamps securing each gage to the rear of the panel and draw the gage and its piping out of the front of the panel.
- (11) Remove piping from rear of gages.
- (12) If the gages have been in use for only one year, have them recalibrated; if the gages have been in use two years, discard them and obtain new gages.
- (13) Strip the old Teflon tape from the threads of the pipes that were removed, or were otherwise rotated. With all tape removed, clean the fitting with Freon and apply two overlapping turns of new 1/4-inch Teflon tape approximately two threads from the end of the fitting.
- (14) Install properly calibrated gages on the panel and install the panel on the ECU by reversing the procedures of steps (4) through (11).
- (15) Grease boost pins as specified in paragraph 7-6-2.

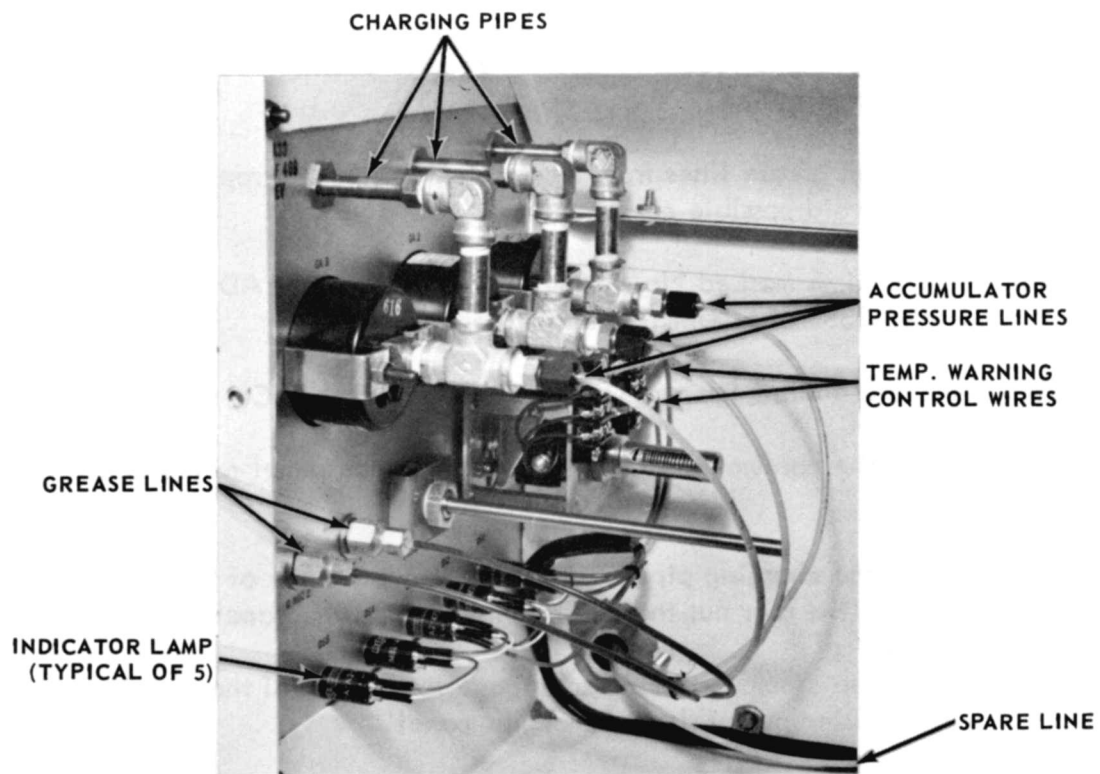


Figure 7-27 ECU Maintenance Panel, Rear View Showing Connections

7-6-5-4 Pressure Gage Maintenance (Cont.)

- (16) Precharge the accumulators through the maintenance panel as directed in paragraph 7-6-8-3. After precharging, perform the disc file automatic turn on check as directed in paragraph 7-6-1-3.

7-6-6 BIENNIAL PROCEDURES — The biennial procedures, when started, will be performed in their entirety. These procedures include replacement of the hydraulic hoses interconnecting the hydraulic power supply with the disc file's accumulator manifold assembly, replacement of the accumulators along with their pressure gages, and replacement of the hydraulic hoses interconnecting the disc file's accumulator manifold assembly and the boost of the digital actuator assembly. It is recommended that the procedures of paragraph 7-6-6-1 through 7-6-6-3 be conducted concurrently or consecutively, as desired. Before performing the procedures, review the information contained in paragraph 7-6 as applicable.

7-6-6-1 Hydraulic Power Supply Hose Replacement — Replace the pressure and return hoses interconnecting the hydraulic power supply with the accumulator manifold assembly of the disc file at least once every two years. Except for separating the ECU from the rear of the disc file cabinet as directed in paragraph 7-6-3-5b. through e. and reinstalling the ECU on the disc file cabinet at the completion of maintenance, hose replacement shall be accomplished as directed in paragraph 5-7-1.

7-6-6-2 Boost Hose Replacement — Replace the pressure and return hoses interconnecting the boost of the digital actuator assembly with the accumulator manifold assembly at least once every two years. Except for separating the ECU from the disc file cabinet as directed in paragraph 7-6-3-5b. through e. and reinstalling the ECU on the disc file cabinet, hose replacement shall be accomplished as directed in paragraph 5-7-2.

7-6-6-3 Accumulator Replacement — Replace the three accumulators of the disc file at least once every two years.

- a. Special Equipment Required — Obtain the following special equipment:

CAUTION

Items (1), (2), and (7) are available precleaned and sealed by Bryant to Bryant specifications. Do not unseal items until parts inside are to be used.

- (1) One 1-quart accumulator, Bryant Part No. C-56207-1, and one label (500 PSI), Bryant Part No. C-302690-2
- (2) Two 1-pint accumulators, Bryant Part No. C-54360-1, and one label each, Bryant Part No. C-302690-1 (600 PSI) and C-302690-9 (12 PSI)
- (3) Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination level or equivalent

7-6-6-3 Accumulator Replacement (Cont.)

- (4) 3/8- and 1/2-inch Teflon tape
- (5) Rubber gloves
- (6) Lint-free absorbent cloths
- (7) Three O-rings, Bryant Part No. C-54149-8

b. Procedures — Replace the accumulators of the accumulator manifold assembly as follows:

- (1) Shut down the disc file.

WARNING

The disc file shall not be operated during this procedure. The work area shall be maintained clean and as dust free as possible when performing the subsequent procedures.

- (2) With the area surrounding the disc file thoroughly clean and when disc rotation stops, separate the ECU from the disc file as directed in paragraph 7-6-3-5b. through e.
- (3) Remove the baffle plate from the rear of the disc file (see Figure 7-11).
- (4) Disconnect the hydraulic pressure and return hoses to the accumulator manifold assembly as directed in paragraph 5-6-4-2a. through c., if not already done. Note that in A-frame files, there is no 10-micron filter (see Figure 5-9).
- (5) Remove the pint, low-pressure accumulator of the accumulator manifold assembly (see Figure 7-14) as follows:
 - (a) Remove the cap from the valve located immediately above the PRECHARGE TO 12 + 2 PSIG label of the ECU maintenance panel (see Figure 7-6) and bleed the precharge from the accumulator by depressing the valve core.

WARNING

The accumulator shall be completely discharged before proceeding to the next step.

- (b) Remove accumulator charge/monitor line from the elbow on the top of the accumulator.
- (c) Remove elbow fitting with O-ring from top of the accumulator and discard O-ring.

WARNING

Hydraulic fluid is toxic and flammable. Wear rubber gloves to avoid prolonged contact with the skin. Do not smoke in the area.

- (d) With absorbent cloths placed around the bottom of the accumulator and while using a wrench to hold the hex nipple joining the accumulator to the accumulator manifold, rotate accumulator ccw until it is free of manifold fitting.
- (e) Wipe hydraulic fluid from accumulator and then set the accumulator aside for subsequent return to Bryant for rework.
- (6) Perform the procedures of paragraph (5) (a) through (e) for the pint high pressure accumulator except in step (a), bleed the accumulator through the valve located above the PRECHARGE TO 600 \pm 25 PSIG label at the ECU maintenance panel.
- (7) Perform the procedures of paragraph (5) (a) through (e) for the quart-high pressure accumulator except in step (a), bleed the accumulator through the valve located above the PRECHARGE TO 500 \pm 25 PSIG label of the ECU maintenance panel.
- (8) Install new quart-high pressure accumulator on accumulator manifold assembly (see Figure 7-14) as follows:

WARNING

Freon can cause frostbite if care is not exercised during handling.

CAUTION

Do not remove parts from plastic bags until they are to be installed. If procedures are to be discontinued for any period of time, seal open hydraulic fittings with protective plastic or caps, as applicable. Before connecting hydraulic fittings, spray the fittings with Freon to ensure their cleanliness.

- (a) Strip old Teflon tape from the elbow on which the quart accumulator is to be installed. Clean threads of the elbow with Freon. Then, apply two overlapping turns of new 1/2-inch Teflon tape to end of elbow; apply the tape approximately three threads from the end of the elbow.
- (b) Bleed off any precharge that may have been in the accumulator for shipment and remove valve core from accumulator. Thread quart accumulator onto freshly taped elbow.

7-6-6-3 Accumulator Replacement (Cont.)

CAUTION

Valve core must not be replaced in accumulator.
This valve core is for shipping and storage only.

- (c) Install elbow and new O-ring to which the accumulator charge/monitor line is to be connected on end of accumulator.
 - (d) Attach pressure line to elbow of accumulator.
 - (e) Apply PRECHARGE TO 500 \pm 25 PSIG label to accumulator.
- (9) Install pint high pressure accumulator on accumulator manifold assembly as directed in paragraph (8) except in step (a) strip old Teflon tape from accumulator mounting end of the manifold's double ending male fitting and, in step (e), apply PRECHARGE TO 600 \pm 25 PSIG label to accumulator. Clean the threads of the fittings using Freon.
- (10) Install pint low pressure accumulator manifold as directed in paragraph (8) except in step (a) strip old Teflon tape from accumulator mounting end of the manifold's double ended male fitting, and, in step (e), apply PRECHARGE TO 12 \pm 2 PSIG label to accumulator.
- (11) Clean up any hydraulic fluid that may have leaked during accumulator replacement.
- (12) Recharge accumulators as specified in paragraph 7-6-8-3.
- (13) Reconnect the return and the pressure hose to the accumulator manifold assembly as directed in paragraph 5-6-4-2m. Note that in the case of an A-frame file, there is no 10-micron filter (see Figure 5-9).
- (14) Replace baffle plate in the rear of the disc file and secure ECU to the rear of the disc file cabinet as directed in paragraph 7-6-3-5h., as applicable.

7-6-6-4 Accumulator Pressure Gage Replacement — Replace the pressure gages of the ECU maintenance panel at least once every two years. Replace the gages as directed in paragraph 7-6-5-4, discarding the replaced gages.

7-6-7 SITE-DETERMINED PREVENTIVE MAINTENANCE INTERVALS — Performance of the subsequent procedures may be required on a monthly basis in an extremely dusty environment or, perhaps, once every six months in an extremely clean environment. It is recommended that Bryant Field Service personnel be consulted as to frequency of performance for a given installation. Before performing the procedures, review the information contained in paragraph 7-6.

7-6-7-1 Inspecting Power Control Unit Portion of Disc File — It is generally recommended that the interior of the power control unit of the disc file be inspected once every month.

- a. Obtain the equipment specified in paragraph 5-8-1-1.
- b. In the case of an A-frame disc file, proceed as follows:
 - (1) When disc rotation stops and with the area surrounding the disc file thoroughly cleaned, remove the ECU and outer access panels from the rear of the disc file cabinet as directed in paragraph 7-6-3-5b. through f.
 - (2) Inspect the air filters of the panels of the power control unit section of the A-frame disc file cabinet assembly (see Figure 1-24) as directed in paragraph 5-8-1-2c. and d.; also inspect the interior of the section as directed in paragraph 5-8-4-2b.
 - (3) Perform disc buffing or cleaning procedures as directed in paragraph 7-6-3-5a., g., and h. or 7-6-7-2b. and d. through g., as applicable.
- c. In the case of a B- or C-frame disc file, inspect the air filters of the panels of the power control unit cabinet assembly (see Figure 1-17) as directed in paragraph 5-8-1-3c. and d. Also, inspect the interior of the cabinet as directed in paragraph 5-8-4-2b.

7-6-7-2 Disc File Cabinet Inspection and Disc Cleaning — It is generally recommended that the interior of the disc file cabinet be inspected and discs cleaned at least once every three months.

NOTE

If other preventive maintenance routines (such as annual and biennial) must be performed within the disc file cabinet, complete such routines before proceeding to disc cleaning.

- a. Shut down the disc file.
- b. Obtain the equipment specified in paragraph 5-8-2-1 and prepare the red, blue, and green plastic cleaning tools as directed in paragraph 5-2-4-2; also, prepare the ES-235 concentrate solution for use as directed in paragraph 5-8-2-3.
- c. Prepare the disc file for the cleaning procedure as directed in paragraph 7-6-3-5b. through f.

WARNING

Exercise extreme care while working close to rotating discs.

7-6-7-2 Disc File Cabinet Inspection and Disc Cleaning (Cont.)

CAUTION

The work area shall be maintained clean and as dust-free as possible when performing the following procedures.

d. With the front panels of the disc file cabinet assembly removed, inspect the interior of the disc file cabinet as directed in paragraph 5-8-4-2d. steps (2) through (4).

e. Inspect the boots of the digital actuator/boost assembly as directed in paragraph 5-3-2.

f. Clean the disc surfaces of the file as directed in paragraph 5-8-2-4a. through c. and e. through j.

g. When the procedures are completed, reinstall the outer rear access panels on the disc file cabinet; also, reinsert and secure the ECU to the rear of the cabinet, reinstall the panel labeled FILTER COMPARTMENT on the ECU, and reinstall the side access panel on the ECU.

7-6-7-3 Head Pad Cleaning — Clean the head pads of the disc file at least once every three months as directed in paragraph 5-8-3.

7-6-8 AS REQUIRED PROCEDURES — Performance of the subsequent procedures is required when a preventive or corrective maintenance function so necessitates action. Before performing the procedures, review the information contained in paragraph 7-6.

7-6-8-1 Filling Hydraulic Power Supply Reservoir With Hydraulic Fluid — Whenever it is determined that the hydraulic fluid level in the reservoir of the hydraulic power supply is below acceptable limits, fill the reservoir as specified in paragraph 5-9-1.

7-6-8-2 Hydraulic Power Supply Purging Procedures — The hydraulic power supply shall be purged as directed in paragraph 5-9-2. However, whenever the center rear access panel is removed from the A-frame file, the ECU must be separated instead as directed in paragraph 7-6-3-5 b. through f., when the center access panel is called for installation, the ECU must be installed instead as directed in paragraph 7-6-3-5 h.

7-6-8-3 Charging Accumulators — The accumulators will be recharged whenever their precharge is found to be low.

a. Obtain the special equipment specified in paragraph 5-9-3-1 except in the case of item d., obtain a charging hose with a swivel nut that will fit the valve of the ECU maintenance panel (see Figure 7-6).

b. Charge the disc file accumulators as follows:

(1) Perform the precharge pressure check of the accumulators as directed in paragraph

7-6-8-3 Charging Accumulators (Cont.)

7-6-1-1. If low pressure readings are observed, open the hinged glass door covering the ECU maintenance panel (see Figure 7-2) and continue with the next step.

- (2) Prepare the charging equipment as follows:
 - (a) Install the nitrogen valve on the nitrogen bottle.
 - (b) Connect the regulator valve — with its pressure gage — to the nitrogen valve.
 - (c) Connect the male elbow of the hose to the regulator valve.
- (3) Charge the pint low-pressure accumulator as follows:
 - (a) Remove the cap from the valve located immediately above the PRECHARGE TO 12 ± 2 PSIG label of the ECU maintenance panel (see Figure 7-16) and connect the swivel connector of the charging hose to the valve.
 - (b) Turn the control handle of the regulator valve full ccw.
 - (c) Turn the valve of the main nitrogen bottle ccw and observe that high pressure gage on regulator valve indicates at least 1100 psi. If under 1100 psi, obtain a new bottle.
 - (d) Gradually turn the control handle of the regulator valve cw until the pressure gage on the low pressure accumulator indicates 40 psig.
 - (e) Turn the valve of the main nitrogen bottle full cw and then turn the control handle of the regulator valve full ccw.
 - (f) Remove the swivel connector of the hose from the air valve of the ECU maintenance panel.
 - (g) After 5 minutes, bleed the pint low-pressure accumulator down to 12 ± 2 psig by depressing the valve on the panel until the desired charge is indicated on the panel gage.
 - (h) Install the yellow cap on the air valve and tighten it snugly by hand.
- (4) Charge the quart high-pressure accumulator as follows:
 - (a) Perform the procedures of paragraph (3)(a) through (f) except in step (a) connect the swivel connector to the valve located immediately above the PRECHARGE TO 500 ± 25 PSIG label of the panel and, in step (d), charge the the accumulator to 550 psig.

7-6-8-3 Charging Accumulators (Cont.)

- (b) After 5 minutes, bleed the quart high-pressure accumulator down to $500 + 25$ psig by depressing the valve on the panel until the desired charge is indicated on the panel gage.
 - (c) Install the yellow cap on the air valve and tighten it snugly by hand.
- (5) Charge the pint high pressure accumulator as follows:
- (a) Perform the procedures of paragraph (3)(a) through (f) except in step (a) connect the swivel connector to the valve located immediately above the PRE-CHARGE TO $600 + 25$ PSIG label of the panel and in step (d) charge the accumulator to 650 psig.
 - (b) After 5 minutes, bleed the pint high-pressure accumulator down to $600 + 25$ psig by depressing the valve on the panel until the desired charge is indicated on the panel gage.
 - (c) Install the yellow cap on the air valve and tighten it snugly by hand.

7-6-8-4 Data Head Bar Retraction and Insertion — Whenever corrective or preventive maintenance calls for the retraction of the data head bar assemblies, perform the retraction and insertion procedures as directed in paragraph 5-9-4.

7-7 CORRECTIVE MAINTENANCE

Corrective maintenance is limited to those parts that are not classified proprietary by Bryant or its vendors, or to those parts in which special or elaborate factory type equipment is not required. The paragraph provides, in part, the procedures for correcting deficiencies incurred in the disc file during normal operation. Procedures for correcting other deficiencies — such as damaged hydraulic hoses, which are replaced every two years on a preventive maintenance schedule — will be found in Section 5 or in paragraph 7-6, as applicable. Procedures for correcting deficiencies requiring special training will be found in engineering bulletins, which are furnished customer personnel who participate in Bryant's "Special Factory Training Program." Though the prescribed maintenance can be performed by qualified technicians, Bryant recommends that required maintenance be performed by Bryant's qualified staff of servicemen who are always on call to perform such customer service. Essentially, personnel qualifications and maintenance philosophy is identical to that described in paragraphs 6-1-1 and 6-1-2 for disc files without ECUs. Corrective maintenance that can be performed by personnel is as described in paragraph 6-1-3 though reference shall be made to Table 7-6 for ECU equipped disc files. Essentially, the warnings and cautions of paragraph 6-1-4 apply and shall be adhered to without deviation; as in the case of a disc file without ECU wherein operation of the file shall be kept to a minimum when access panels are removed, operation of a file when the ECU is separated from it shall also be kept to an absolute minimum.

TABLE 7-6 CORRECTIVE MAINTENANCE PROCEDURES

Component(s)	Paragraph	Engineering Bulletin (EB)
Solenoid Driver Power Supply	6-2	6-2
Hydraulic Motor/Gear Pump		187
Hydraulic Pump Relief Valve		181
Reservoir Fluid Level Sight Gage O-Rings	6-3	
Reservoir Magnetic Strainer	5-6-1	
1/2-Micron Filter	5-6-3	
10-, 20-, and 5-Micron Filters	7-6-5-2	
Hydraulic Power Supply Hoses	7-6-6-1	
Boost Hoses	7-6-6-2	
Accumulator Replacement	7-6-6-3	
Accumulator Pressure Gages	7-6-6-4	
Head and Positioner Valve Assemblies A15S1 and A15S3	6-4*	
Duplex Pressure Switch A15S2	6-5*	
Tachometer/Temperature Meter Box	6-6	
Tachometer Probe	6-7	
Disc Motor Drive Belts	6-8	
Digital Actuator		136
Digital Actuator Solenoid Valves		136
Digital Actuator End Cap and Seals		128, 193
Power Boost		136
Positioning System	6-9*	
Head Bar Assemblies	6-10	
Head Bar Assembly Hydraulic Cylinder		188, 189
Individual Head Pads		161, 162
Disc Assemblies	6-11	
Access Panels	6-12	

TABLE 7-6 CORRECTIVE MAINTENANCE PROCEDURES (Cont.)

Component(s)	Paragraph	Engineering Bulletin (EB)
Hydraulic Oil Over-Temperature, Low Level, and High Pressure Switches	6-13**	
Miscellaneous Electro/Hydraulic Components	6-14	
Dual Level Float Switch	7-7-1	
Leak Pump Assembly	7-7-2	
Accumulator Charge/Monitor Lines and Boost Pin Lubrication Lines	7-7-3	
ECU Filter	7-6-3-4	
ECU Refrigeration Unit	7-7-4	
<p>NOTES:</p> <p>* When removal of the center-rear access panel is called for in the case of disc files without ECUs, remove the ECU from the rear of the file as directed in paragraph 7-6-3-5b. through e.; following the procedure, the ECU is reinstalled in the rear of the disc file cabinet as directed in paragraph 7-6-3-5h.</p> <p>** Disregard the low oil level switch replacement procedure in the case of B- and C-frame disc files with ECUs since a dual level float switch is used in place of the low oil level switch (see paragraph 7-7-1).</p>		

7-7-1 DUAL LEVEL FLOAT SWITCH — The dual level float switch used in B- and C-frame files with ECUs can be replaced independently of or, if necessary, in conjunction with the hydraulic over-temperature and high pressure switches.

7-7-1-1 Special Equipment Required — Obtain the following special equipment:

- a. Dual level Float Switch, Bryant Part No. C-56947, precleaned and sealed to Bryant specifications.
- b. Roll of 1/4-inch Teflon tape
- c. Freon, Dupont 113 — prefiltered to ASTM Class 3 Contamination level, or equivalent

7-7-1-2 Procedure — Replace the dual level float switch as follows:

- a. Since the reservoir must be drained, obtain the equipment specified in paragraph 5-6-1-1.
- b. Drain the reservoir as directed in paragraph 5-6-1-2a. through i.
- c. Open the cover of the junction box mounted on the hydraulic power power supply (see Figure 1-20). At terminal board TB1, disconnect the leads of the switch as connected to the "B" side of TB2-6 and TB2-7. Use a piece of string approximately six feet long to tie the leads together; this string can be used to draw the leads of the replacement switch back through the flexible tubing for subsequent connection in the junction box.
- d. In the reservoir of the power supply, remove the hydraulic oil low level switch from the coupler mounted on the top of the stand-off. Then carefully draw the switch with its leads (see paragraph c.) out of the reservoir.
- e. Apply two turns of Teflon tape to the threaded end of the replacement switch.
- f. After thoroughly cleaning the coupling of the reservoir stand off and the pipe fitting end of the switch with Freon, install the replacement switch by reversing the removal procedures of steps c. and d.
- g. Continue with the applicable reservoir cleaning procedures of paragraph 5-6-1-2 starting with step j.

7-7-2 LEAK PUMP — The leak pump used in B- and C-frame files is replaced as an assembly.

7-7-2-1 Special Equipment Required — Obtain the following special equipment:

- a. Hydraulic Leak Pump Assembly, Bryant Part No. R-AF-484-1, precleaned to Bryant specifications
- b. Two quarts of MIL-H 5606B hydraulic fluid, Bray Oil Company, Brayco-756C or 756D, or equivalent; the oil shall be prefiltered to ASTM Class 3 Contamination Level and shall be in sealed cans
- c. Lint-free, absorbent cloths
- d. Plastic bags
- e. Freon 113, Dupont, or equivalent, prefiltered to ASTM Class 3 Contamination Level

7-7-2-2 Procedure — Replace the leak pump as follows:

7-7-2-2 Procedure (Cont.)

CAUTION

Do not touch disc surfaces during the following procedures .

a. Remove the ECU from the rear of the disc file cabinet as directed in paragraph 7-6-3-5 b. through e.; also remove the right-rear access panel from the disc file cabinet .

WARNING

The disc file shall be operated only when so directed for these procedures .

b. Remove the hardware securing the pump to the bracket on the base of the disc file cabinet assembly (see Figure 7-3).

c. Disconnect the two hydraulic lines to the pump and immediately cover the ends of the lines with protective plastic covers .

d. Draw the assembly out of the cabinet as far as its wiring permits, remove the cover from the junction box mounted on the top of the pump, and remove the leads designated 1A2, 1A3, and 1A4 from terminal board TB1A-2, -3, and -4.

e. Install the new pump by reversing the procedures of steps b. through d. Just before each hydraulic line is connected, however, thoroughly clean the fittings with Freon .

f. Remove the filler cap of the pump's reservoir, add hydraulic fluid until the level is within 1/2-inch of the top of the reservoir, and reinstall the filler cap.

g. Before proceeding to step h., allow 15 minutes for the oil to lubricate the pump motor elements .

h. Place the disc file in the manual operating mode (only MANUAL ON pushbutton should be glowing) and observe that leak pump operates. Check that there are no leaks in the pump installation.

i. When pump operation stops, reinstall the ECU on the rear of the disc file cabinet as directed in paragraph 7-6-3-5 h.

7-7-3 ACCUMULATOR CHARGE/MONITOR LINES AND BOOST PIN LUBRICATION LINES — Included with each ECU is one spare nylon line (see Figure 7-14 and 7-27) that can be used in place of either a damaged accumulator charge/monitor line or boost pin lubrication line. However, if more than one line fails, a new line must be inserted.

7-7-3-1 Special Equipment Required — If the spare line has been used, obtain 15 feet of 1/8-inch nylon tubing for each failed line plus an additional 15 feet for a new spare line .

7-7-3-2 Connecting Spare Nylon Line — Connect the spare nylon line in place of a damaged line as follows:

- a. Remove the ECU from the rear of the disc file cabinet as directed in paragraph 7-6-3-5
- b. through e.
 - b. Remove the rear access panel from the ECU.
 - c. Remove cover stenciled BLOWER COMPARTMENT.
 - d. If the line to be replaced is an accumulator charge/monitor line, bleed off accumulator pressure charge by depressing the appropriate valve core in front of the ECU maintenance panel (see Figure 7-2).
 - e. Disconnect the damaged line from the appropriate fitting in the blower compartment side of the ECU maintenance panel and from the fitting to which it is connected in the disc file.
 - f. Remove the spare line from the applicable clamp(s) on the accumulator manifold assembly of the file and trim the line to a length that will enable connection to the fittings served by the damaged line.
 - g. Remove the tubing connectors from each end of the damaged line.
 - h. Install the tubing connectors on the spare line and connect the spare line to the fittings of the disconnected damaged line.
 - i. If the replaced line is an accumulator charge/monitor line, charge the accumulator to the appropriate pressure as directed in paragraph 7-6-8-3 and observe that the charge holds. If the replaced line is a boost pin lubrication line, lubricate the boost pin as directed in paragraph 7-6-2 and observe that lubricant is not leaking from the lines or fittings. After verifying that there are no leaks in the new line, install the ECU in the rear of the disc file as directed in paragraph 7-6-3-5 h.

7-7-3-3 Installing New Nylon Line — If the spare nylon line has been used and subsequent lines fail, replace the failed line(s) and install a new spare line as follows:

- a. Perform the procedures of paragraph 7-7-3-2 a. through e. and g.
- b. Remove the damaged lines — including the damaged line that was originally replaced by the spare — as follows:
 - (1) At the blower compartment, fuse a new 15-foot section of line(s) to the line(s) to be replaced. Do the same to the line that was replaced by the original spare.
 - (2) Working at the front of the ECU, withdraw the lines to be replaced from the grommetted opening in the front surface of the ECU (see Figure 7-5). Continue to draw the line from the ECU until there is just sufficient length to connect them to the appropriate fittings in the blower compartment. Take the spare line to the

7-7-3-3 Installing New Nylon Line (Cont.)

bottom of the compartment. Separate the new lines from the old lines at the fused junctions.

- (3) Remove the appropriate clamps from the accumulator manifold assembly of the disc file cabinet (see Figure 7-14) and remove the damaged lines from the installation; disconnect the damaged lines.
- (4) Trim the spare line to a length that will allow it to be connected to the farthest point of the assembly, namely the fitting of the quart high-pressure accumulator (see Figure 7-14). Trim the other replacement line(s) to a length that will enable connection to the fittings served by damaged line(s).

c. Install the tubing connectors removed from the damaged line(s) on the replacement line(s) and connect the new line(s) to the fittings of the removed, damaged line(s).

d. Perform the procedure of paragraph 7-7-3-2*i.*, as applicable.

7-7-4 ECU REFRIGERATION UNIT — Maintenance of the refrigerant portion of the ECU refrigeration unit (see Figure 7-7) shall be performed by only a qualified, licensed refrigeration technician. If such a technician is not available, the refrigeration unit of the disc file shall be replaced in its entirety.

CAUTION

The technician that is to perform maintenance of the refrigerant portion of the disc file shall be notified that the unit is equipped with a hot-gas bypass valve.

7-7-4-1 Special Equipment Required — If there is no qualified technician available to perform corrective maintenance on the refrigerant portion of the refrigeration unit, obtain a spare refrigeration unit, Bryant Part No. D-56978.

7-7-4-2 Procedure — Replace the refrigeration unit as follows:

- a. Shut down the disc file.
- b. With the area surrounding the file thoroughly cleaned, remove both side access panels and the rear access panel from the ECU.
- c. Remove the cover stenciled BLOWER COMPARTMENT from the rear of the ECU.
- d. In bottom of blower compartment, remove panel stenciled REMOVE FOR OPEN LOOP CONDITION — SEE MANUAL FOR INSTRUCTION.

7-7-4-2 Procedure (Cont.)

- e. Disconnect connector A33P1 (see Figure 7-8) and lower the cable harness through the panel opening of step d. to the shelf of the evaporator compartment of the refrigeration unit.
- f. Disconnect connector A33P2 (see Figure 7-8) and draw the cable harness out the left side (with respect to facing the rear of the cabinet) of the ECU.
- g. Remove the four mounting bolts that secure the refrigeration unit to the lower channels of the ECU (see Figure 7-8).
- h. Slide the unit from the ECU cabinet assembly.

NOTE

With the refrigeration unit removed, the disc file can be operated open loop as directed in paragraph 7-4-2-3, provided the conditions of the paragraph are met.

- i. With the disc file shut down, install a new refrigeration unit in the cabinet or the re-conditioned original unit by reversing the procedures of steps f. through h.
- j. With the new refrigeration unit installed, install the right side access panel (with respect to facing the rear of the file) on the ECU cabinet and proceed with the installation instructions for the ECU as follows:
 - (1) If the facility is temperature controlled and if it is desired to have the ECU open loop operation option, perform the applicable procedures of paragraph 7-3-4-3a.
 - (2) If the facility is not temperature controlled, or if it is not desired to have the ECU open loop operating option, continue with the reversal of the procedures of steps b. through e. except do not install the left side access panel on the ECU cabinet. Then perform the applicable procedures of paragraph 7-3-4-3b.

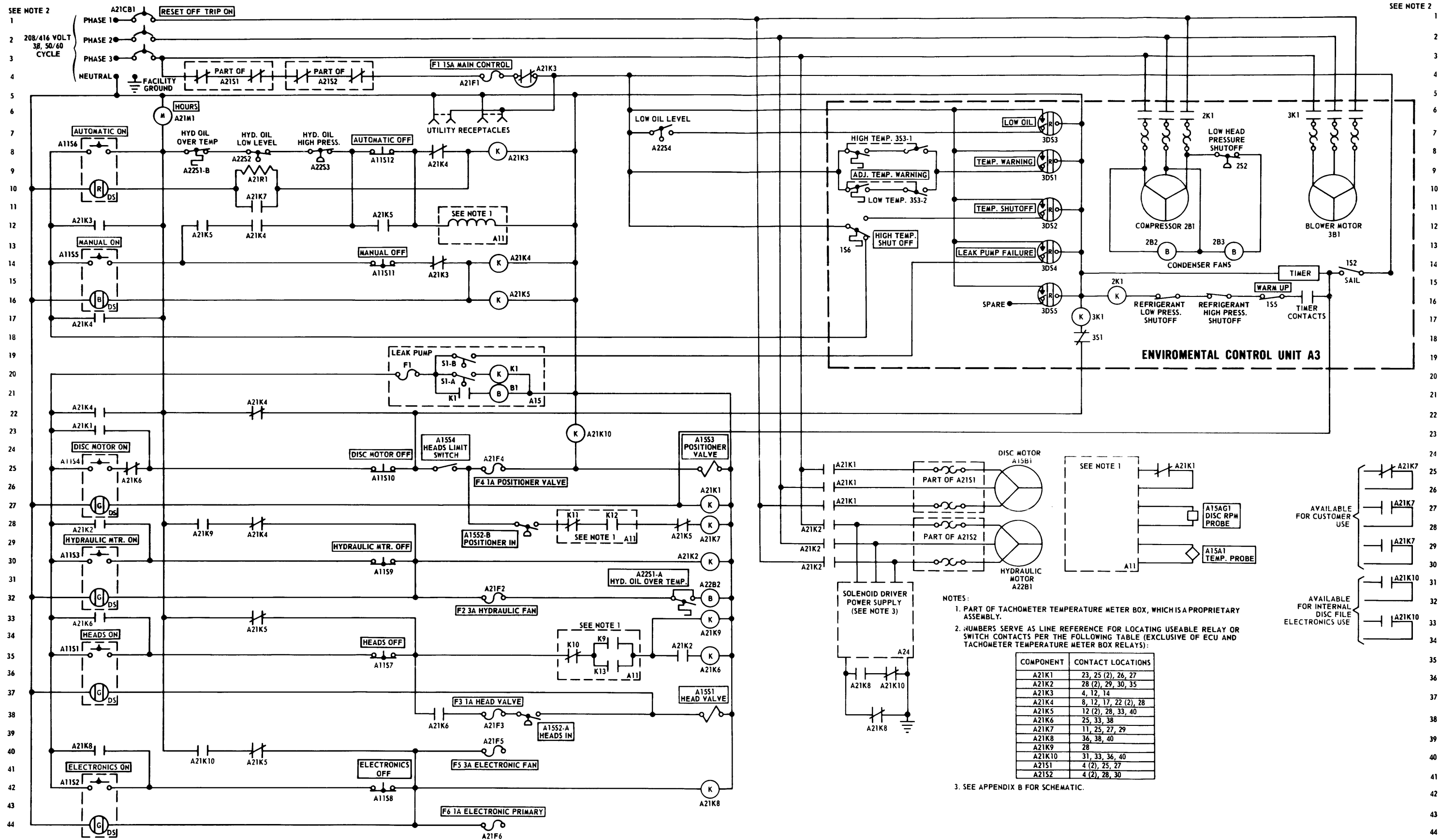


Figure 7-20 Model 1 Series 4000 Disc File With ECU, Starting Control System—Schematic Diagram

COMMENT SHEET

CONTROL DATA
6603-C Disk System, Bryant Series 4000 Disk File
Service Handbook
Pub. No. 60127000

FROM: NAME: _____

BUSINESS
ADDRESS: _____

THESE COMMENTS REFER TO REV. _____ OF THIS MANUAL.

COMMENTS: (DESCRIBE ERRORS, SUGGESTED ADDITIONS OR
DELETIONS, ETC. INCLUDE PAGE NUMBER.)

CUT ALONG LINE

FORM CA 231 REV. 1-66

NO POSTAGE STAMP NECESSARY IF MAILED IN U.S.A.

FOLD ON DOTTED LINES AND STAPLE

STAPLE

STAPLE

FOLD

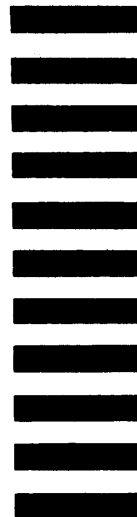
FOLD

FIRST CLASS
 PERMIT NO. 8241
 MINNEAPOLIS, MINN.

BUSINESS REPLY MAIL
 NO POSTAGE STAMP NECESSARY IF MAILED IN U.S.A.

POSTAGE WILL BE PAID BY
CONTROL DATA CORPORATION
8100 34TH AVENUE SOUTH
MINNEAPOLIS, MINNESOTA 55440

ATTN: TECHNICAL PUBLICATIONS DEPT.
PLANT TWO



CUT ALONG LINE

FOLD

FOLD

STAPLE

STAPLE



>>> CUT OUT FOR USE AS LOOSE-LEAF BINDER TITLE TAB



8100 34th AVE. SO., MINNEAPOLIS, MINNESOTA 55440