WANGCO

A UNIT OF
PERKIN-ELMER DATA SYSTEMS

SERIES-F AND SERIES-T

100/200 TPI MAGNETIC DISC DRIVE

OPERATION AND MAINTENANCE MANUAL

301245 - 001

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100/200 TPI
301245
REVISION LEVEL

Revision Letter	Description	Date
A	Original Publication	4/76
B	Revised Sections 4 and 5, and updated Appendices B and C.	5/76
C	Section 5: SVA Adjustment procedure revised to reflect WANGCO Engineering lab procedure. Section 6: Revised and rewritten. Appendix B: Updated Dwgs. 301584A-B (SVA); 301025A-C (SLB); and 301179A-B (I/O Conn.). Appendix C: Updated Schematics 301585A-B (SVA); 301026 C-E (SLB); and 301386B-D (I/O Conn.).	7/76
D	Section 5: SVA Adjustment procedure further refined to provide option of using individual steps after preliminary steps are performed. Appendix B: Updated dwg. 301157F-G (DEB). Appendix C: Updated Schematics 301158 F-G (DEB); 300498E-F (SLB). Appendix D: IPB: Revised lists and illustrations.	8/76
E	Page 5-61, para. 5.6.4, SVA ADJUSTMENT PROCEDURES, revised and rewritten. New figures 5-32, 5-34, and 5-35 added. Appendix B: Updated Dwg. 300000C-D (100 TPI-T); ML 404200H-J (200 TPI-T); Dwg. 300497C-D (200 TPI SLB); Dwg. 300586H-J (EIB).	9/76
F	Page 5-84, para. 5.6.10, Step F.3, changed voltage measuring pin. Appendix B: Updated Dwgs: 200 TPI-T, 305100E-F; SVA, 301584B-C; DCB 100 TPI, 301076C-D. Added Dwgs: Motor Filter PWB, 300226G, and Spindle Dr. Module Assy., 300612J. Additional dash version ML's included for: I/O Connector PWB, 300075; CIB, 301035; DCB, 301076; DEB, 301157; I/O Connector PWB, 301179; DIB-VFO, 301320, and SVA, 301584. Appendix C: SVA, 301585B-B1; DCB-100TPI, 301077B-C. Appendix D: Page D-18, parts list for OCP. Part numbers and quantities changed for items 15 and 16, Incandescent Lamps.	10/76
G	Section 2: Interface Requirements expanded. Pages 2-5 through 2-11 (paragraphs 2.3.2 through 2.3.7.4) revised and rewritten. Dust cover for top load drives added to packing instructions (Item 12, Figure 2-1 and Table 2-1). Appendix A: Page A-1, Item 7: Part number changed from 300946-001 to 301742-001. Page A-2, Item 3: Prefilter remark changed from 300946-001 to 301742-001. Appendix B: Illustration of SVA Board 301548 added. Updated dwgs. 301025 (SLB) C-D; 301076 (DCB) D-D1; 301157 (DEB) G-H; 301584 (SVA) C-C1. Appendix C: Updated dwgs. 301026 (SLB) E-F; 301158 (DEB) G-H; 301585 (SVA) B-B1. Appendix D: Figure D-7: Items 15 and 16 changed to agree with parts list (p. D-18).	11/76
H	Updated Appendix B: 300497 D-E, 300586 J-L, 301044 A-A1, 301170 B-C, 301320 C-D, and 301584 C1-E. Appendix C: 301585 B-C.	1/77
J	Text unchanged; ACN's still applicable. Appendix A, Master Spares List: Completely revised. Appendix B, Updated EIB Dwg. 300586 L-M; SLB Dwg. 301025 D-E; Commutator PWB 301170 C-C1. Appendix C, Updated Schematic EIB 300803 E-F; SLB 301026 F-G.	2/77

REVISION LEVEL

Revision Letter	Description	Date
K	Section 2: Table 2-2 revised. Section 5: Para. 5.3.4, Fixed Disc Cleaning second para. rewritten. Para. 5.6.3.1, Magnetic Index/Sector Transducer Adjustment: Note revised. Para. 5.6.6, Write Current Adjustment: Steps G and H revised. Para. 5.6.8, Read/Write Head Alignment: rewritten per ACN 3477. Figure 5-30: deleted: all subsequent figures renumbered. Appendix B: Updated – 100 TPI Top Load 300000-000(D–G); 100 TPI Front Load 300001-000 (C–F); 200 TPI Top Load ML 404200-000 (J–M); 200 TPI Front Load ML 414200-000 (G–K); PS 300346 (P–S); EIB 300586 (M–N); SVA 301584-001 (E–F), -002 (C–D). Appendix C: PS 300346 (P–S); SVA 301585 (C–D). Appendix D: The following figures and applicable parts lists revised to reflect new casting, shroud, and ancillary parts: D-4, D-5, D-6, D-10 and D-11.	4/77
L	Section 1: Table 1-1 revised. Paragraph 1.3.6 rewritten. Section 2: Table 2-2 revised. Revised paragraphs: 2.3.3.1, 2.3.4, 2.3.4.4, 2.3.4.5, 2.3.4.11. Added new paragraph 2.3.4.12. Revised para. 2.3.5.5, 2.3.5.6, 2.3.5.9, 2.3.5.10, 2.3.5.13, 2.3.7.1, and 2.3.7.3. Section 5: Warning added to paras. 5.4.3.1, 5.4.3.16, and 5.6.3.2. Revised paras. 5.6.3.3. Warning added to para. 5.6.8.4, and Figures 5-8 and 5-15. Deleted: Paragraph 5.6.7 and Figures 5-38, 5-39, 5-40, 5-41, and 5-42. All subsequent pages paragraphs and figures renumbered. Section 6: Text on p. 6-4 revised. Pages 6-6 through 6-21 completely revised. Table 6-3 added. Appendix B: Updated PWB dwgs and ML's: I/O Conn. 300075 (K-L); EIB 300586 (N-P); Transd. Diff. & Schem. 300921 (D-E); DEB 301157 (H-H1); I/O Conn. 301179 (B-C); Updated ML's, Spindle Dr. Reg. 301198, and DIB 301320. Eng. Dwg. replaced sketch for SVA III 301584F1. Appendix D: IPB p. D-21: Item 11 P/N changed.	6/77
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100/200 TPI
301245-001

REVISION LEVEL

Revision Letter	Description	Date
N	Section 2: Paragraph 2.2.2: Rewritten. Paragraph 2.3.7.2: Step A revised. Paragraph 2.3.7.3: Warning added. Paragraph 2.3.7.4: Step F revised (ACN 11678). Section 5: Paragraph 5.6.4.1: Step H revised (ACN 3978). Paragraph 5.6.2: Step F revised (ACN 42678). Appendix B: 100 TPI TL 300000 (J-L); 100 TPI FL 300001 (G-J); 200 TPI TL 305100 replaced by 404200; 200 TPI FL 315100 replaced by 414200 (ACN 42678); Power Supply 300346 (S-T); EIB 300586 (R-S); SLB 301025 (E-F); DIB 301320 (D-E); SVA 301584 (F-G). Appendix C: Power Supply 300346 (S-T); DIB 301321 (C-D); DCB-2 301904 (C-D). Section 6 (Logic) and Appendix D (IPB) deleted from manual. To be supplied on request.	5/78

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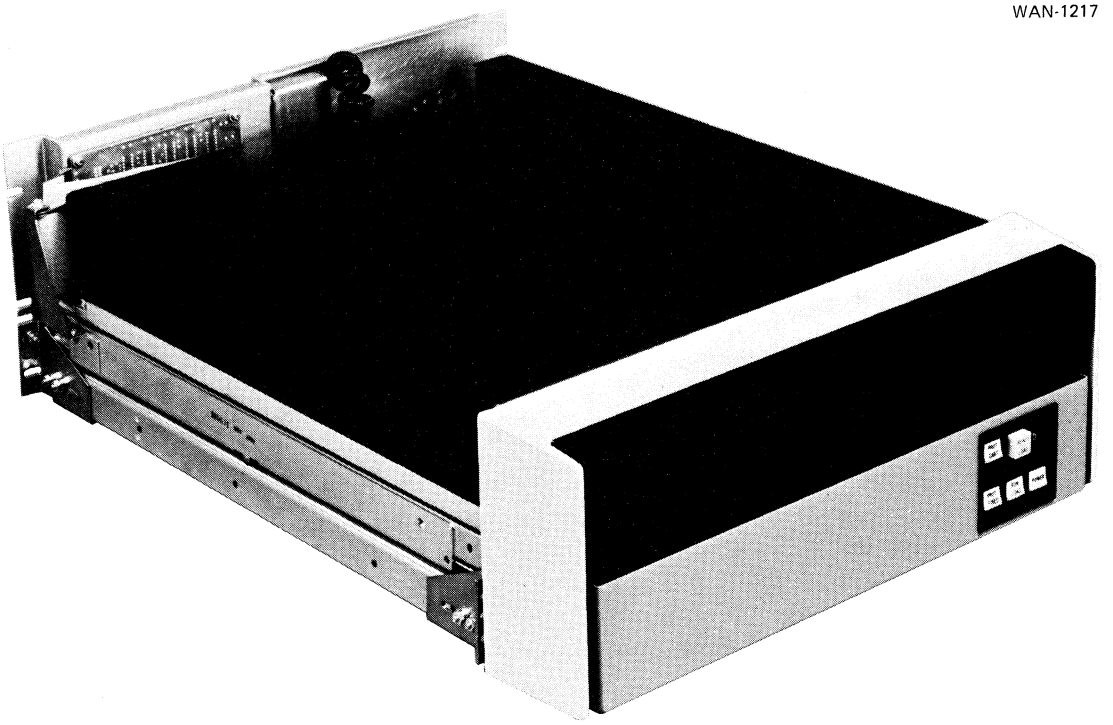
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SECTION 1

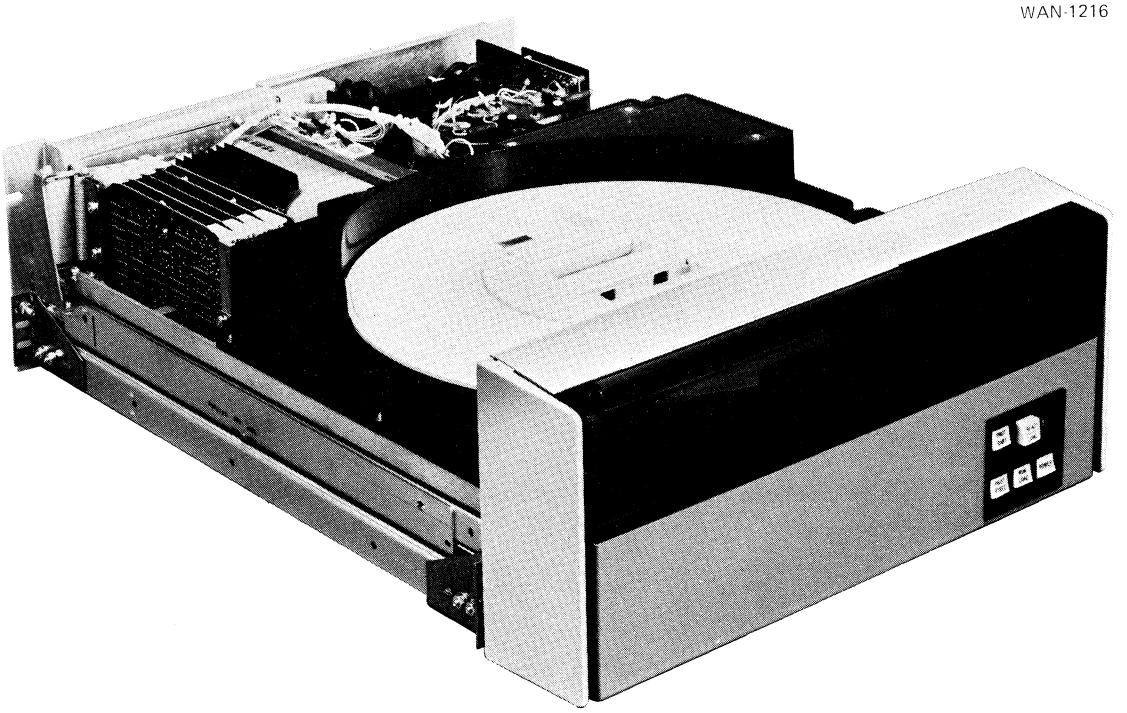
GENERAL DESCRIPTION

WAN-1217



Front Load – Series F

WAN-1216



Top Load – Series T

Frontispiece – WANGCO Series F and Series T Magnetic Disc Drives

SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

The WANGCO 100/200 TPI (tracks per 2.54 cm) Series F and Series T Magnetic Disc Drives are random-access, high-capacity data storage devices whose compact size, optimum performance, and reliability make them exceptionally suitable for use in computer systems of small and medium size. Several models are available, in each series, with a choice in storage capacities and transfer rates.

In standard versions the units incorporate, in either series, an integral permanent disc and a removable disc of the cartridge type offering a gross storage capacity of up to 100 Megabits. Maximum recording density is 2200 bits per inch (BPI) (bits per 2.54 cm).

NOTE

Throughout this manual all references to TPI or BPI are intended to relate to tracks or bits per 2.54 centimeters (cm).

The Series F Disc Drive uses a front-loading cartridge of the IBM 2315-type; the Series T Disc Drive uses a top-loading cartridge of the IBM 5440-type.

The WANGCO Disc Drives incorporate an interface compatible with, or adaptable to, controllers for most major disc file systems. Integral daisy chain provisions permit the interconnection of up to four Disc Drive units.

The drive units in either series feature modern functional exterior styling and are rack-mounted in cabinets of standard RETMA dimensions. The Series F unit requires only 7 inches (17.78 cm) of vertical rack space; the Series T unit requires only 7 3/4 inches (19.68 cm).

1.1.1 SPECIAL FEATURES

The Series F and Series T Disc Drives incorporate advanced electronic and mechanical design features that contribute to their exceptional performance and reliable operation. Routine service requirements are minimal, and corrective maintenance, should it become necessary, is facilitated through the efficient layout and accessibility of all components. Some of the notable design features include:

A. The disc spindle and the drive motor are combined in an integral assembly thus eliminating a drive belt and pulleys.

B. The spindle motor is a DC brushless unit, and its speed is held constant within ±1%, regardless of line voltage and frequency fluctuations. Therefore, the storage of data in any given sector of the discs can be maximized.

C. Either of two spindle speeds are available: 1500 or 2400 rpm.

D. The head positioning system uses a highly efficient electromagnetic actuator which although it permits fast access times, has a low power dissipation and very low flux leakage. Final head positioning is implemented through an electronic – not mechanical – detenting system.

E. Write Inhibit circuitry, selectable at the Operator's Control Panel (OCP), will protect previously recorded data on either disc.

F. The clean-air system, which continuously purges the interior of the drive unit and pressurizes it, is highly efficient. Intake air is passed through a dual filter element, purges the discs and heads, and cools the electronic assemblies before it exits the unit.

G. Internal flexible I/O signal and AC power cables interconnect the receptacles mounted on the rear panel of the drive unit with the corresponding electronic assemblies in the unit itself. This feature permits permanent mounting of the rear panel in the cabinet and makes it possible to slide the unit out without disconnecting or manipulating the external cables.

H. A built-in universal power supply allows operation on any of the world's standard AC power voltages and frequencies.

1.1.2 ORGANIZATION AND SCOPE OF THE MANUAL

This Operation and Maintenance manual is divided into seven sections:

A. Section 1 – General Description. This describes the physical features, use, and operating characteristics of the Front Loading and Top Loading version of the Disc Drive.

B. Section 2 – Installation. This section contains unpacking and inspection instructions, mounting procedures, power connections, cabling information, and interfacing data.

C. Section 3 – Operation. The front panel controls and indicators and their functions are described in this section.

D. Section 4 – Theory of Operation. The theory section is subdivided into a basic discussion of the principles of operation, the mechanical and physical operation of the Disc Drive, and operation and functions performed by each circuit board with the interconnections to other related circuits and assemblies.

E. Section 5 – Maintenance. This section is broken down into operator maintenance, cleaning and minor adjustments, assembly and disassembly procedures, critical adjustments and checkout descriptions, and a fault isolation guide for troubleshooting.

F. Section 6 – Logic. This section contains descriptions of the logic used, block diagrams and interconnection diagrams as required, and flow charts showing system operation in various modes. It also includes a description of each type of logical component.

1.2 SPECIFICATIONS

Specifications for the WANGCO 100/200 Disc Drive are listed in Table 1-1.

1.3 ARRANGEMENT AND FUNCTION OF MAJOR ASSEMBLIES

The Series F and Series T Disc Drives are constructed identically except for mechanical differences in the cartridge loading and seating mechanisms and door and cabinet locks. Assemblies and characteristics common to both series are shown and described in the following paragraphs. Three-quarters front views showing component locations are included in Section 5.

1.3.1 OPERATOR CONTROLS AND STATUS INDICATORS

Controls and associated status indicators are located on a panel below the plastic door. These include the switches with which the operator starts and stops the Disc Drive, selects the unit address (in multiple-drive installations), and places the unit in On-Line operation. The function and operation of each switch and indicator are described in Section 3.

TABLE 1-1. Specifications – Series F and Series T Disc Drive

Parameter	100 TPI	200 TPI
Gross Capacity	25 or 50 Megabits	50 or 100 Megabits
Transfer Rate	1,562,500 Kbits/sec	1,562,500 Kbits/sec
Track Density	100 TPI	200 TPI
Recording Density	2200 BPI	2200 BPI
Maximum Speed Variation	±1%	±1%
Access Times		
Track-to-track	15 msec	10 msec
Average	50 msec	50 msec
Maximum	90 msec	90 msec
Recording Mode	double frequency encoded	double frequency encoded
Disc Speed	1500 or 2400 rpm	1500 or 2400 rpm
Cartridge Unload/Load Cycle		
Load Cycle	60 seconds	90 seconds
Cartridge – Series F	IBM 2315-type	IBM 2315-type
Cartridge – Series T	IBM 5440-type	IBM 5440-type
Built-in Power Supply		
Requirements	100,110,120,130,200, 220,230,240,250,260 VAC ±10%, 47-63Hz, 250 VA	100,110,120,130,200,220, 230,240,250,260 VAC ±10%, 47-63Hz, 250 VA
Physical Dimensions		
Height – Series F	7.00 in. (17.78 cm)	7.00 in. (17.78 cm)
Height – Series T	7.75 in. (19.68 cm)	7.75 in. (19.68 cm)
Width – Series F and Series T	17.60 in. (44.7 cm)	17.60 in. (44.7 cm)
Weight	100 lb. (45.36 kg)	100 lb. (45.36 kg)
Environment, Operational		
Temperature	50-100°F (10-38°C)	50-100°F (10-38°C)
Relative Humidity	10–80%, noncondensing	10–80%, noncondensing
Environment, Shipping and Storage		
Temperature	–40° to 150°F(–40° to 65°C)	–40° to 150°F (–40° to 65°C)
Relative Humidity	5% to 95%	5% to 95%

1.3.2 DOOR ASSEMBLY

In the Series F Disc Drive, the door rotates forward approximately 60 degrees, and the cartridge is inserted through the resultant opening. When the door is opened, the carriage receiver is simultaneously elevated and advanced.

In the Series T Disc Drive, the door rotates forward approximately 30 degrees. As the door is pulled open, a locking mechanism disengages the stationary mounting slides. The unit can then be slid out of the rack and the cartridge can be loaded on the spindle as described in Section 2.

1.3.3 CARTRIDGE RECEIVER ASSEMBLY

This assembly is used only in the Series F Disc Drive. The receiver is mechanically coupled to the door-loading assembly. It holds the cartridge and automatically positions it over the spindle. The cartridge then is locked on the spindle chuck as the door is closed.

1.3.4 SPINDLE ASSEMBLY

The spindle assembly provides the mechanical coupling between the recording discs and the drive motor. The fixed disc is mounted directly on the spindle hub. The cartridge disc engages the spindle only when the cartridge is fully seated in the Disc Drive. Coupling is accomplished by means of a spindle-mounted/magnetic chuck (i.e., a ring magnet and a circular pole piece) and an armature plate fastened to the cartridge disc.

A conical point on the center of the spindle engages an identically machined opening in the center of the cartridge disc thereby aligning the disc accurately on the spindle hub. The fixed disc sector ring also is mounted on the spindle hub. The spindle motor is coupled directly to the spindle assembly without using a belt, therefore, it becomes an integral part of the spindle assembly. The spindle is dynamically braked when a stop cycle is initiated (ref. Section 3).

1.3.5 HEAD POSITIONER ASSEMBLY

The positioner mechanism positions the Read/Write heads over the selected cylinder (track) on the fixed or removable disc.

The positioner assembly contains the following components: an electromagnetic linear actuator, carriage, carriage guides, head loading/unloading cams, velocity transducer, and a position transducer.

All components of the positioner form an integral assembly that can be removed from the Disc Drive as one unit.

1.3.6 ELECTRONIC ASSEMBLIES

The Disc Drive unit contains seven plug-in circuit boards and a central interconnect board on which the connectors for the plug-in boards are mounted. The frame adjacent to the positioner assembly contains the following circuit boards (refer to Section 5 for physical locations).

A. Data Interface Board (J-1)
B. Control Interface Board (J-2)
C. Disc Control Board (J-3)
D. Servo Logic Board (J-4)
E. Servo Amplifier Board (J-5)

A differentiator circuit board is used on the Series F Disc Drive only. This is a small triangular board mounted horizontally behind the card-cage. The connector numbering is from left to right as viewed from the front of the unit (i.e., connector J-1 is located nearest to the edge of the casting). An Emergency Retract circuit board is mounted to the casting between the Positioner assembly and the Power Supply assembly.

Two circuit boards are located on the opposite side of the drive unit: Power Regulator Board (J-6) and Data Electronics Board (J-7).

Two circuit boards are mounted in the Plenum Chamber. Spindle Driver Regulator Board and Spindle Motor Power Switch Board.

The power supply assembly furnishes the operating voltages ($\pm$18V. DC unregulated; +5V. DC regulated) for all electronic assemblies, the positioner and the spindle and brush motors. DC fuses are provided on the assembly. The power supply can be removed as one integral unit. A Commutator Board is used as an integral part of the Spindle Motor Assembly.

1.3.7 REAR PANEL ASSEMBLY

The following components are mounted on the rear panel: (1) I/O connector board which contains signal input/output connectors and line drivers and receivers; (2) the AC power receptacle (with built-in line filter); and (3) the AC line fuse.

In cabinet installations, the rear panel is stationary; that is, it does not slide out with the unit but remains in the cabinet. The electrical connections between the panel and the unit are established by means of flexible cables.

1.4 FORCED-AIR CLEANING SYSTEM

The Series F and Series T Disc Drives contain a forced-air system that purges the disc and head areas with highly filtered air. This air is drawn from outside the cabinet and cools the electronic assemblies. During operation, the interior of the drive unit is at slightly elevated pressure, with respect to the ambient, which serves to keep dust from entering the unit.

The components of the forced-air system are accessible from below the base casting. The dual air filter element is contained in the rectangular cavity next to the spindle assembly. The blower fan is located on the opposite side of the spindle. Both components are covered by individual sheet metal plates (see Section 5 for the physical location of these components).

Intake air enters the drive unit at the front panel from above. With this arrangement, only fresh ambient air is circulated through the unit. The incoming air is accelerated by the blower, passes through the plenum chamber than through the filter element and over the disc surfaces. It exits via the head entry door of the cartridge and through the lower head area.

SECTION 2

INSTALLATION AND INITIAL CHECKOUT

SECTION 2

INSTALLATION AND CHECKOUT

2.1 INTRODUCTION

This section contains unpacking and installation instructions and a description of the interface for the WANGCO Series F and Series T Disc Drives.

2.2 UNPACKING AND INSPECTION

WANGCO Disc Drives are shipped in special containers designed to provide full protection under normal transit conditions. Immediately upon receipt, the shipping container should be inspected for evidence of possible damage incurred in transit. Any obvious damage to the container, and indications of actual or probable equipment damage, should be reported to the carrier company in accordance with instructions on the form included in the container.

Figure 2-1 shows an exploded view of the palletized packaging container and its parts. Table 2-1 lists the parts with full descriptions in accord with item numbers used in the figure.

To unpack the unit, open the top side of the shipping container and remove the two side liners as illustrated (ref. figure 2-1). Grip the unit along both sides of the casting while lifting it out of the container.

CAUTION

DO NOT SUPPORT THE UNIT VIA THE HANDLE ON THE FRONT PANEL. REMOVE THE PROTECTIVE PLASTIC BAG. THE FINISHED SURFACES AND THE PLASTIC PART OF THE FRONT PANEL SHOULD BE HANDLED WITH REASONABLE CARE TO AVOID MARRING.

Shipping containers and internal packing material may be retained for possible future repacking of units. A special plastic shroud cover (T-00180-007) can be ordered from the factory to keep top-load units clean when cartridges are not installed.

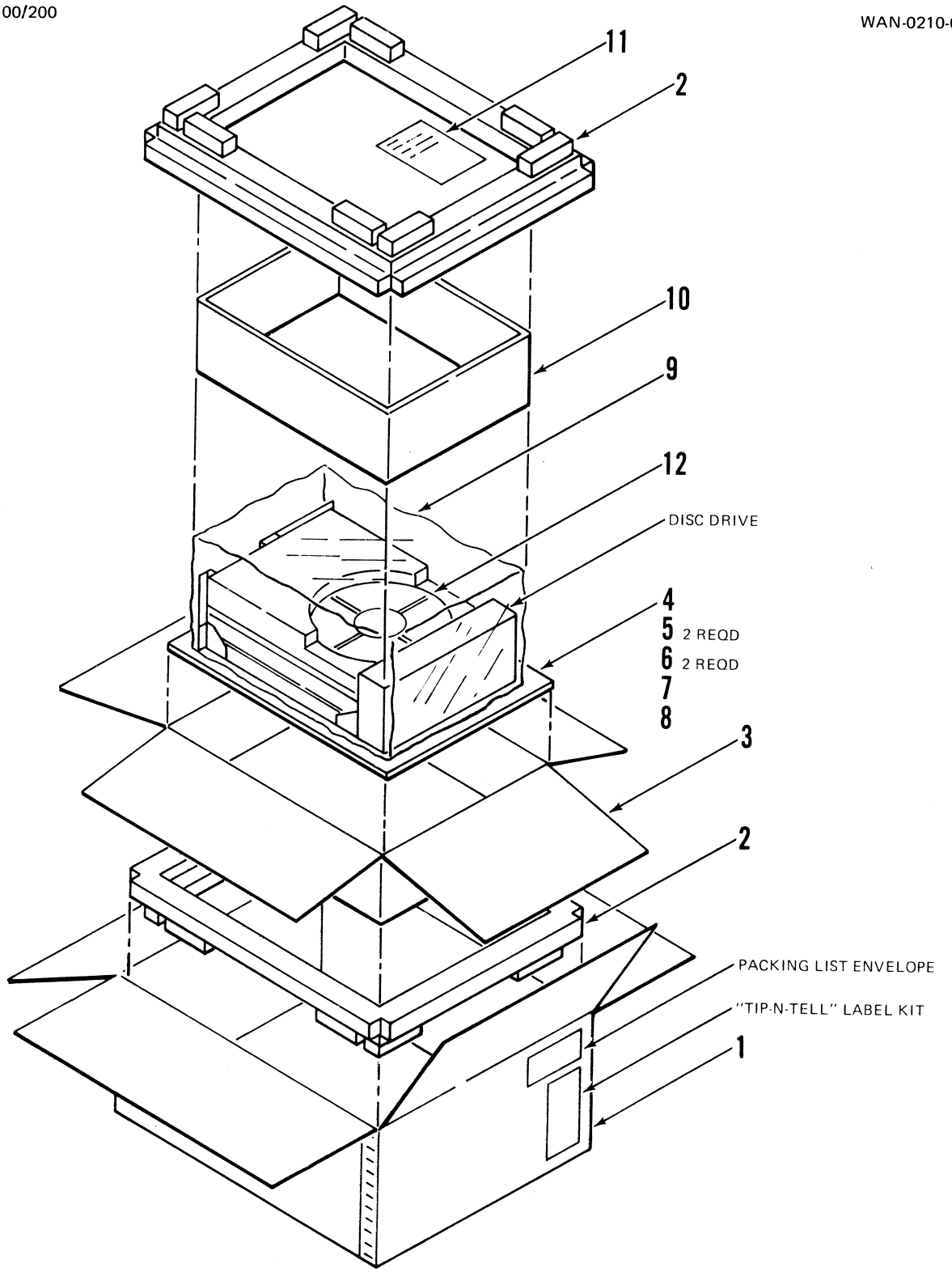


Figure 2-1. Unpacking Instructions

TABLE 2-1. Packaging Container Parts (ref. figure 2-1)

Item No.	Part No.	Description
1	T-00287-001	Outer Stitched Box
2	T-00287-002	Flotation Frame
3	T-00287-003	Inner Box
4	T-00287-004	Mounting Base
5	Bolt, Hex	¼-20 UNC x 1-1/2
6	Washer	¼ ID x 3/4 OD
7	Bolt, Hex	3/8-16 UNC x 1-1/2
8	Washer	3/8 ID x 3/4 OD
9	5003	Polystyrene Bag
10	T-00287-005	Sleeve
11	T-00128	Shipping Damage Notice Form
12	T-00180-007	Dust Cover, Shroud (Series "T" only)

NOTE

When returning Drive Units, each unit must be sealed in a plastic bag before packing in its original shipping carton.

2.2.1 INSPECTION

Inspect the Disc Drive for any damage which may have occurred in transit and for completeness of the shipment. Immediately notify the WANGCO representative and involved carrier regarding damage sustained or discrepancies observed.

2.2.2 CARRIAGE SHIPPING RESTRAINT REMOVAL

For protection during shipping, the carriage of the positioner assembly is held back against the rear stop by a shipping restraint shown in Figure 2-2. This restraint immobilizes the carriage, heads, and associated parts. Plug P16 on the Power Supply is shipped disconnected to preclude possibility of power being inadvertently applied to the Disc Drive while the shipping restraint is still installed.

The shipping restraint must be removed before the Disc Drive can be operated. To remove the shipping restraint, remove the restraint retaining screw located at the rear of the positioner. This screw is shown in the INSTALLED POSITION (ref. figure 2-2). Reinstall the shipping restraint as shown in the STOWED POSITION (ref. figure 2-2).

NOTE

The restraint retaining screw holds the carriage rear stop and must be reinstalled.

WAN-0380A-001

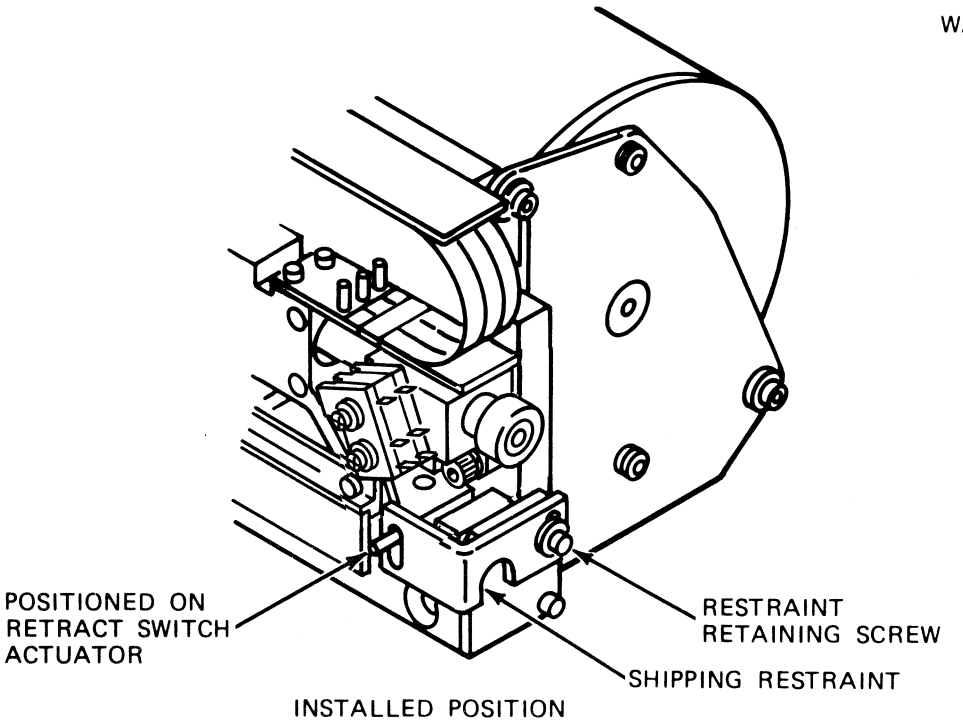


Figure 2-2. Carriage Shipping Restraint

2.3 INSTALLATION

2.3.1 INPUT POWER REQUIREMENTS

The standard WANGCO Disc Drive contains an integral power supply which can accept one of the AC input voltages listed in Table 1-1. The power supply frequency may range from 47Hz to 63Hz. The appropriate input connections are established via a voltage selection plug located next to the power transformer.

CAUTION

PRIOR TO CONNECTING THE AC LINE CORD TO THE POWER SOURCE, VERIFY THAT THE VOLTAGE PLUG IS COMPATIBLE WITH THE LINE VOLTAGE AT THE INSTALLATION SITE. EXAMINE THE POWER SPECIFICATION DECAL ON THE REAR PANEL OF THE UNIT.

2.3.2 INTERFACE REQUIREMENTS

The physical configuration and electrical requirements for the 100/200 TPI Series F and T Disc Drive are described in the following paragraphs. See Table 2-2. for interface signal pin assignments. See Tables 2-3 and 2-4 for explanation of acronyms and mnemonics used throughout this manual.

TABLE 2-2. Interface Pin Assignments

Input Line	Pin	Output Line	Pin
Cyl Add 2^0	44	Ready	11
Cyl Add 2^1	39	Seek Complete	16
Cyl Add 2^2	43	Address Acknowledge	14
Cyl Add 2^3	42	Seek Incomplete	15
Cyl Add 2^4	45	Illegal Address	13
Cyl Add 2^5	47	Attention Unit 0	20
Cyl Add 2^6	48	Attention Unit 1	17
Cyl Add 2^7	50	Attention Unit 2	19
Cyl Add 2^8	29	Attention Unit 3	18
Cyl Add Strobe	32	Read Data	7
Restore	38	Data Clock	8
Disc Select	31	Index	9
Head Select	33	Sector/Sector Address 2^5	6
Write Gate	36	Sector Address 2^0	4
Erase Gate	40	Sector Address 2^1	2
Write Data	41	Sector Address 2^2	26
Read Gate	49	Sector Address 2^3/Fixed Index	1
Unit Select 0	34	Sector Address 2^4 /Fixed Sector	3
Unit Select 1	35	Pseudo Sector	5
Unit Select 2	27	Write Check	10
Unit Select 3	28	Termination Voltage	25
Termination Voltage	25	Write Protected	12
Track Offset Fwd.	46	Ground	21
Track Offset Rev.	37	Ground	22
		Ground	23
		Ground	24
		Pseudo Sector 2000	5

TABLE 2-3. Printed Wiring Board Acronyms

Acronym	Description	Location
CIB	Control Interface Printed Wiring Board	J2
DCB	Disc Control Printed Wiring Board	J3
DEB	Data Electronics Printed Wiring Board	J7
DIB	Data Interface Printed Wiring Board	J1
EIB	Electronics Interconnect Printed Wiring Board	*
IOB	Input/Output Connector Printed Wiring Board	**
PRB	Power Regulator Printed Wiring Board	J6
SLB	Servo Logic Printed Wiring Board	J4
SVA	Servo Amplifier Printed Wiring Board	J5

* This is a Mother board upon which J1 through J7 are located.
** This board is directly mounted to the rear panel.

2.3.2.1 Cabling. Interface between Disc Drive and Controller is accomplished with one cable. The connector at the Disc Drive is Amphenol No. 57-10500-27 (WANGCO PN 101036-001). The corresponding mating connector for the cable is Amphenol No. 57-20500-31 (WANGCO PN 101037-001) and is supplied with the Drive.

I/O signal cables are 28 AWG twisted pairs. Total (system) cable length should not exceed 50 feet (12.7 meters).

2.3.2.2 Interconnection (Daisy Chaining) of Disc Drives. Daisy Chaining of up to four drives is permitted by an integral system of two connectors mounted on the I/O board as shown in Figure 2-3. The last drive in the chain must be terminated with a detachable Line Terminator Assembly (ref. figure 2-3, WANGCO PN 300095-001). A daisy chain interconnecting cable (WANGCO PN 300118-XXX, XXX = length in inches) is used to interconnect the drives. See Figure 2-4. The AC power cable is WANGCO PN 101153.

2.3.3 ELECTRICAL CHARACTERISTICS

2.3.3.1 Line Receivers. All line receivers within the Drive shall be of the high noise immunity-type 8T380 or 8836. All incoming lines are terminated with 110 ohms to 3.5V.

2.3.3.2 Line Drivers. The line driver circuit used in the Drive is of the open collector-type. In a daisy chain configuration, all output lines are terminated within the system at the last drive on the chain to minimize line reflections due to unterminated stubs. The driver is capable of sinking 50 mA in addition to that used within the Disc Drive.

TABLE 2-4. Glossary of Mnemonic Terms

Mnemonic	Signal Name	Origin
ADD1 -- 256	Track (Cylinder) Address — Binary Value	Controller
ADD ACK	Address Acknowledge	CIB
AC LOSS	Alternating Current Loss	PRB
AGC	Automatic Gain Control	Optical Trans.
ATTEN	Attention	CIB
BOT	Beginning of Travel	Optical Trans.
BRUSH MOT	Brush Motor	PRB
CAR1 -- 256	Cylinder Address Register Binary Value	SLB
COARSE SERVO EN	Coarse Servo Enable	SLB
D DAC	Digital-to-Analog Converter Output	SLB
DC LOSS	Direct Current Loss	DCB
DET EVEN	Detent Even Pulse	SVA
DET ODD	Detent Odd Pulse	SVA
DET MODE	Detent Mode	SVA
DISC SEL	Disc Select	DIB
DLY SK	Delay Seek	SLB
ERASE	Erase (enabling term)	DIB
FIDX	Fixed Index Pulse	DCB
FSTR	Fixed Sector Pulse	DCB
FWD	Forward (enabling term)	SLB
HD SEL	Head Select	DIB
IDX	Index Pulse	CIB
ILL ADD	Illegal Address	SLB
LD HD	Load Head	DCB
NAR1 -- 256	New Address Register Binary Value	SLB
RDY	Ready	CIB
RIDX	Removable Index Pulse	DCB
RSTR	Removable Sector Pulse	DCB
RTZ	Return to Zero	DCB
SAC1 -- 32	Sector Address Count Binary Value	CIB
SK COMP, SKC, SEK COMP	Seek Complete	CIB
SKINC	Seek Incomplete	CIB
SK	Seek	CIB
SP DETEC, SP DET	Speed Detect	DCB
SPM ON	Spindle Motor On	DCB
STR	Sector	CIB
TC DAC	Temperature Compensation Digital-to-Analog Voltage Conversion	SLB
TCV	Temperature Compensation Voltage	SVA
TRK OFFSET	Track Offset (forward or reverse)	Controller
UNLD	Unload	SLB
WRT	Write (enable term)	DEB
WRT CHK, WRT CHK X	Write Check	DEB
WRT PROT	Write Protect	DEB

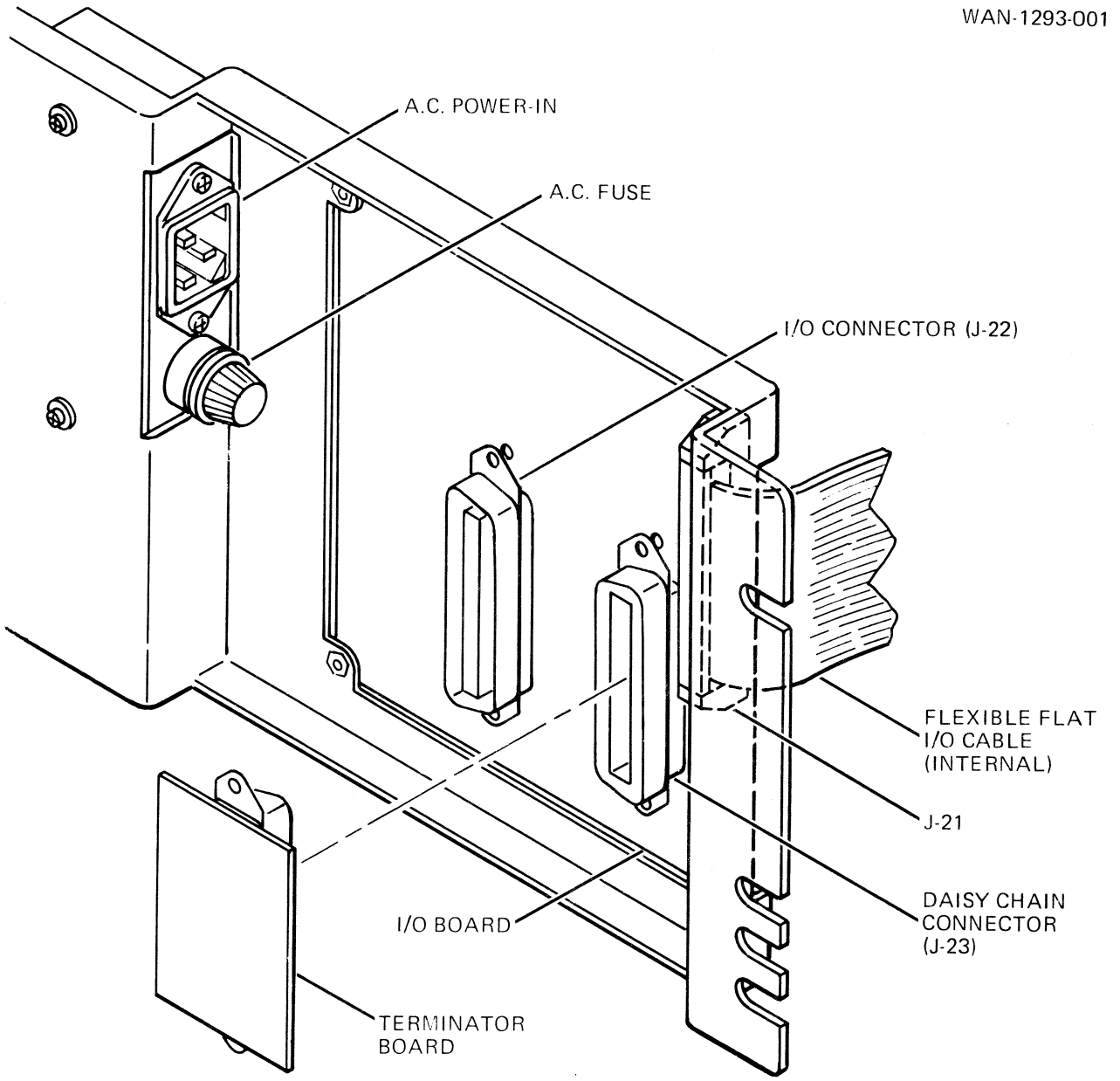


Figure 2-3. Rear Panel and I/O Connector Board

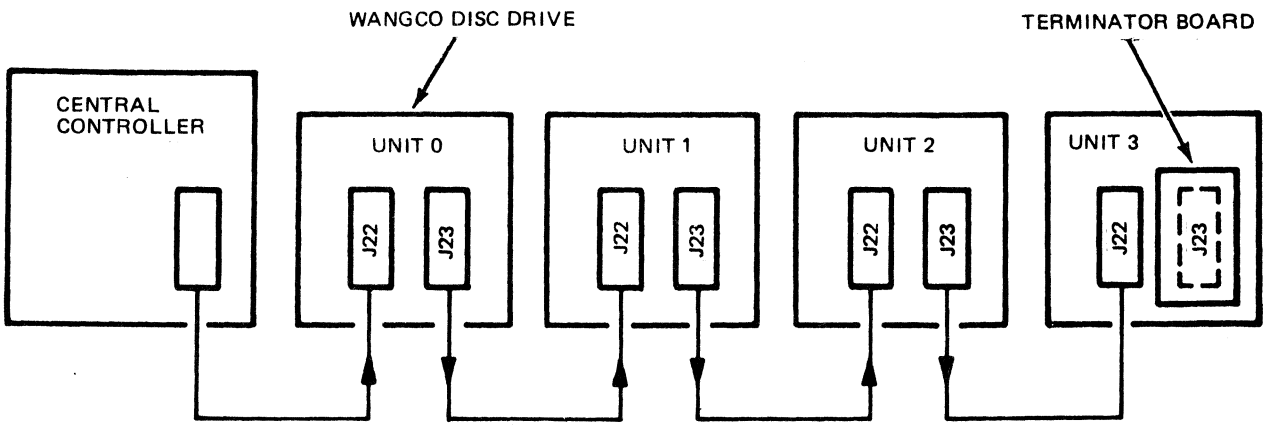


Figure 2-4. Multiple Disc Drive Installation (Daisy Chaining)

2.3.3.3 Terminating Voltage. Provision shall be made, by means of jumpers, to terminate all lines to an externally supplied voltage.

2.3.3.4 Logic Levels. Logic "0" is defined as a level between 2.5 and 5.0 V. Logic "1" is defined as a level between 0 and 0.5 V.

2.3.4 INPUT LINES

All input lines are defined as being true. "1" = TRUE = 0 V.

2.3.4.1 Cylinder Address. Eight lines which accept an absolute address from the Controller. These are strobed into an Address Register by the Cylinder Address Strobe line.

2.3.4.2 Cylinder Address Strobe. One line which strobes the Cylinder Address lines into the internal Address Register.

2.3.4.3 Restore. One line which causes the drive to reposition the heads over Cylinder "0".

2.3.4.4 Disc Select. One line which selects the disc upon which the Controller will operate. When true, (assuming all jumpers are for Disc Select standard), the Fixed Disc is Selected.

2.3.4.5 Head Select. One line which selects the disc surface to be operated upon. True level, (assuming all jumpers are for Head Select standard), selects the Upper Surface.

2.3.4.6 Write Gate. One line which turns on the Write Amplifier and allows current to flow in the selected head.

2.3.4.7 Erase Gate. One line which turns on the Erase Amplifier. No internal delay is provided to compensate for the distance between Erase and Read/Write gaps.

2.3.4.8 Write Data. One line which carries the double frequency encoded data from Controller to Drive. Each pulse on this line will cause a flux reversal to occur. If the NRZ option is chosen, this line will carry the data in level format and the double frequency encoding will be done within the Drive.

2.3.4.9 Read Gate. One line which enables the Read Data and Read Clock lines.

2.3.4.10 Unit Select. Four lines used in conjunction with the Unit Select Switch which allow any drive to be given any of four logical addresses.

2.3.4.11 Track Offset Forward. One line used during error correction and data recovery.

2.3.4.12 Track Offset Reverse. One line used during error correction and data recovery.

2.3.5 OUTPUT LINES

All outputs are defined as being true; "1" = TRUE = 0 V.

2.3.5.1 Ready. A signal on this line indicates the Drive is ready to accept external commands.

2.3.5.2 Seek Complete. When true, this line indicates the Drive has completed a Seek Operation.

2.3.5.3 Address Acknowledge. This line when true, notifies the Controller that a Seek Operation has commenced.

2.3.5.4 Seek Incomplete. One line which indicates a Seek Operation has not been completed in a predetermined time.

2.3.5.5 Illegal Address. A line which indicates that an address greater than the last valid track has been issued by the Controller. The drive will not obey such a command, and the heads will remain positioned over the previously addressed location.

2.3.5.6 Attention. Four lines which alert the Controller that the corresponding drive has completed a Seek Operation or a fault condition exists.

2.3.5.7 Read Data. One line which transmits the Read Data to the Controller. The data format is optional and selected by jumpers within the Drive. See timing diagrams for format options.

2.3.5.8 Data Clock. This line transmits the Read Clock which has been separated from the data. If the NRZ option is selected, this line also transmits the Write Clock from the Drive when the Write Gate is true.

2.3.5.9 Index Pulse. This line supplies one pulse for each disc revolution. The pulse is derived from the physical notch on the Cartridge Hub or a similar notch on the Fixed Disc Hub. Optionally, when the internal Sector Counter is not specified, the user may specify two index lines. In this case, both Fixed and Removable index pulses are supplied to the Controller.

2.3.5.10 Sector Pulse. This line supplies one pulse for each notch on the Cartridge Hub or the Fixed Disc Hub depending on the optional jumpers selected.

2.3.5.11 Sector Address. Five lines which define, in binary format, the particular sector under the Read/Write Head. The Sector Address Counter is reset by the first Sector Mark following the Index Mark.

2.3.5.12 Pseudo Sector Mark. One line which provides 2000 $\pm$20 pulses per revolution to the Controller. This line is synchronized with the Index Pulse, and may be used to subdivide the disc into any number of sectors.

2.3.5.13 Write Protect Status. One line which indicates to the Controller the status of the Write Protect Switch pertaining to the selected disc.

2.3.5.14 Write Check. One line which indicates that a Write Operation may not take place due to one of the following conditions:

A. Voltages below specified levels.
B. More than one head selected.
C. Disc speed out of tolerance.

2.3.6 RACK-MOUNTED INSTALLATION

NOTE

Head alignment, after rack installation, is not guaranteed. Read/Write head alignment should be accomplished, as outlined in Section 5, after rack installation.

The Disc Drives are equipped and shipped with standard cabinet slides; therefore, installation in a standard rack involves only mounting the stationary slide members.

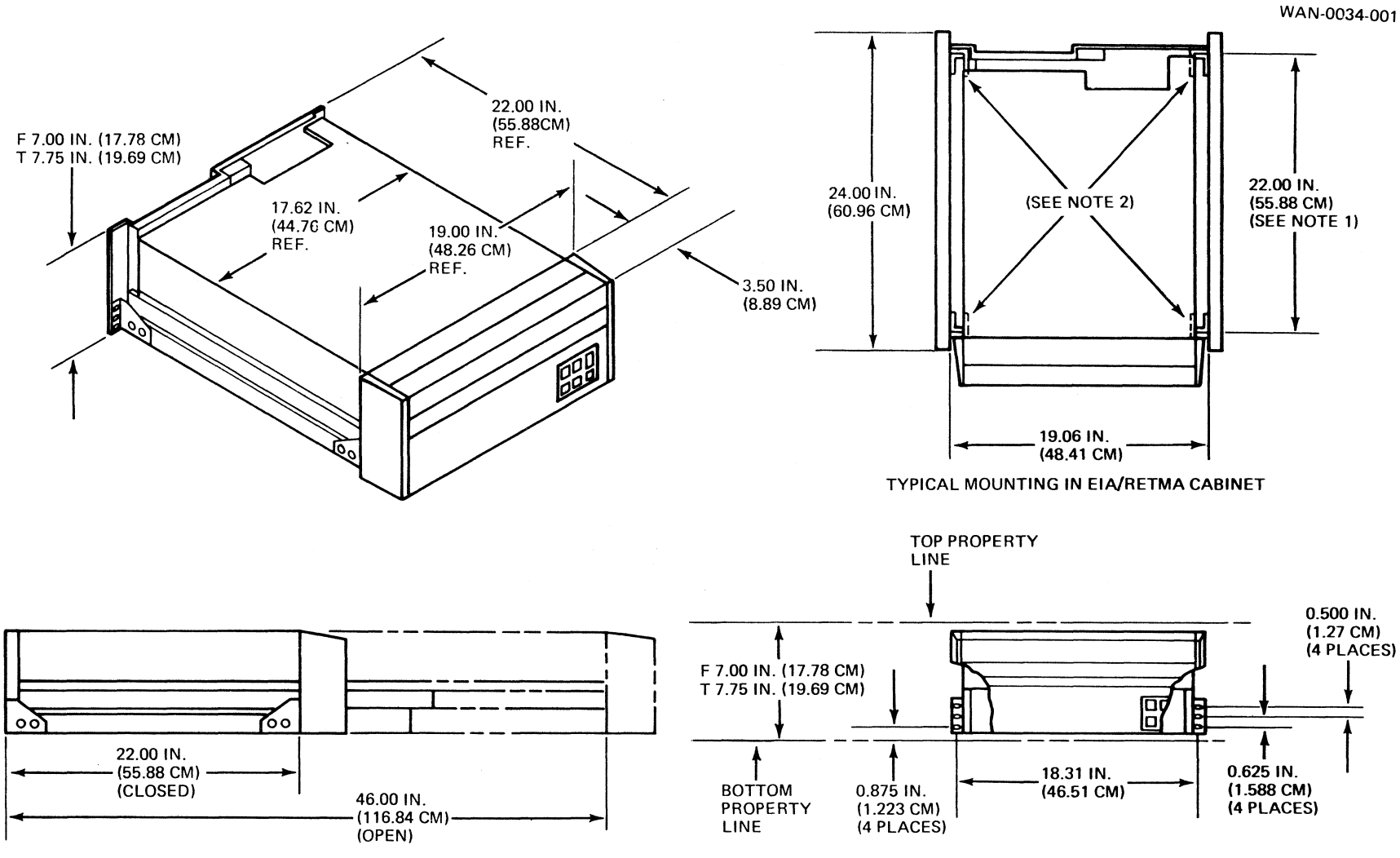
The I/O Connector Board, the AC power cord receptacle, and the AC fuse holder are mounted on the rear panel. The panel is bolted to the stationary members of the slides as shown in Figure 2-5. Therefore, this panel will remain at the rear of the rack or cabinet when the Disc Drive is pulled out on its slides. A flexible flat cable assembly, internal to the Disc Drive, provides the I/O line connections between the I/O Connector board and the Disc Drive. Similarly, a spiral-wound AC cord provides the power connection. These features facilitate unrestricted access to the unit without disrupting any internal connections.

The mounting dimensions for the Series F and Series T Disc Drives are shown in Figure 2-5. The unit should be installed in a standard rack or cabinet in accordance with the information shown in this figure.

When only one man is available to mount the Disc Drive in the rack, it will be necessary to install the slide members (ref. figure 2-5) on the rack first. Then, the Disc Drive can be lifted into position and slid into place on the slides inside the rack.

2.3.7 INITIAL CHECKOUT

2.3.7.1 Preliminary Procedure. After the Disc Drive has been installed and connected to the external Controller, all I/O cables should be rechecked to ensure correct connections. Make certain all connectors are mated securely and that the correct voltage is being supplied to the Disc Drive before applying power. This information is shown on the decal on the back panel and should be verified before the unit is installed in the rack.



NOTES:

(1) IF 30.00 IN. (76.20 CM) DEEP CABINET IS USED, POSITION REAR RETMA BOLT RAILS 22.00 IN. TO 23.00 IN. (55.88 CM TO 58.42 CM) BEHIND FRONT RAILS.

(2) SLIDE MOUNTING BRACKETS ARE NORMALLY MOUNTED ON EXTERIOR SIDE OF CABINET.

Figure 2-5. Rack-Mounted Installation Instructions

The top cover of the Disc Drive must be removed to gain access to subassemblies to be checked during initial checkout procedures. Removal of Top Cover procedures are outlined in Section 5.

2.3.7.2 Visual Inspection. Make the following checks before applying power to the drive:

A. Ascertain all plugs and connectors are properly seated except P16 (Power Supply) which must remain disconnected when using a test hub.
B. Check for proper fuses.
C. Check card cage to ensure printed wiring boards are properly seated.

2.3.7.3 Preliminary Power On Procedure. With the top cover removed and using a test hub, the cartridge interlock switch will not be activated. Power cannot be applied to the spindle drive motor. In the Series F unit, this is a button-type actuator protruding from the base. Place a piece of masking tape over the actuator. In the Series T unit, install a matchbook cover or similar device between pack sensor and switch actuator. See Figure 2-6.

WARNING

ENSURE PLUG P16 ON THE POWER SUPPLY IS STILL DISCONNECTED. THIS WILL PREVENT HEADS FROM LOADING WHEN USING THE TEST HUB.

2.3.7.4 Power-Up Sequence Check. Perform the following steps to verify proper Power-up sequencing:

A. Place POWER switch ON.
B. Verify that the door unlocks and that POWER and LOAD indicators light.
C. Place the RUN/LOAD switch to RUN.
D. Verify that the LOAD indicator extinguishes, door locks, and the spindle begins to spin ccw.
E. Verify that brushes sweep the disc once, then park underneath the receiver. The brushes should not be crushed against the casting.
F. A slight flickering of control panel indicator lamps indicates spindle speed control circuitry is active.

If a problem occurs, power down the Drive and refer to appropriate part of Section 5.

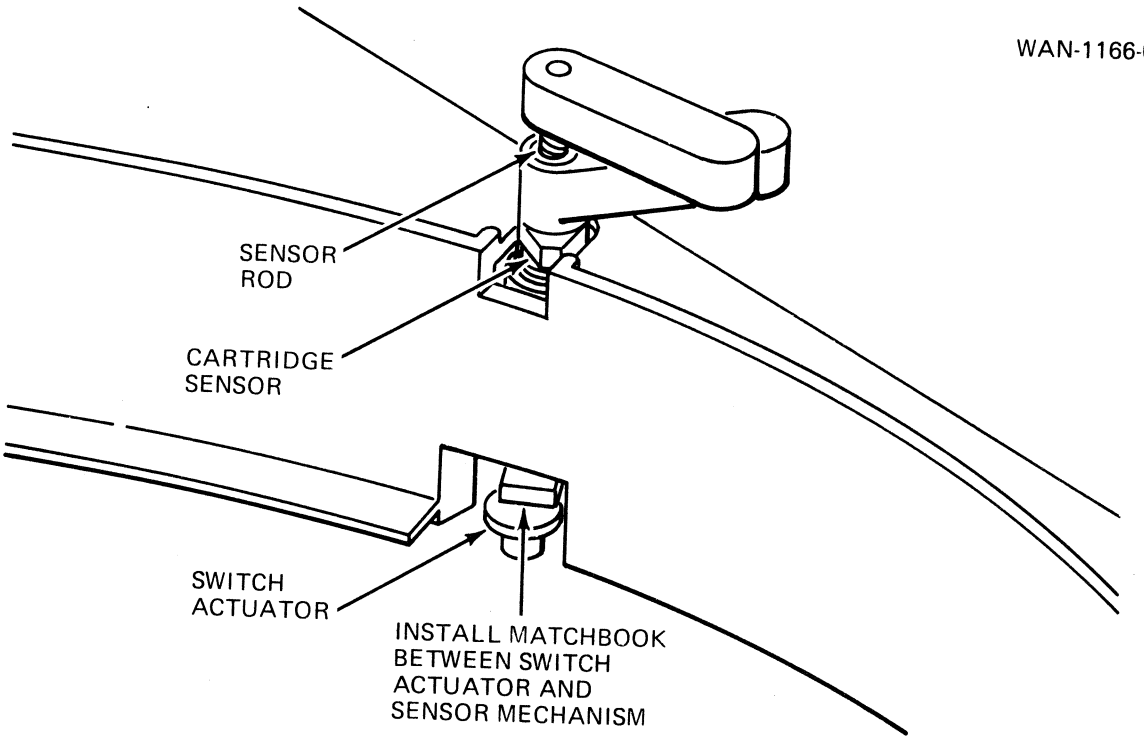


Figure 2-6. By-Passing Cartridge Interlock Switch

SECTION 3

OPERATION

SECTION 3

OPERATION

3.1 SCOPE

This section provides information for operation of the Front Loading and Top Loading Disc Drives. Description of front-panel controls and indicators and a summary of the operational commands used by the unit are included.

3.2 OPERATOR'S CONTROL PANEL

Operational controls and status indicators are mounted on a panel located on the front of the Disc Drive. Some of the controls feature integral indicator lamps which, if activated, illuminate the translucent engraved control pushbuttons. The control cluster is shown in Figure 3-1, and individual functions of the controls and indicators are described in paragraphs 3.2.1 through 3.2.6.

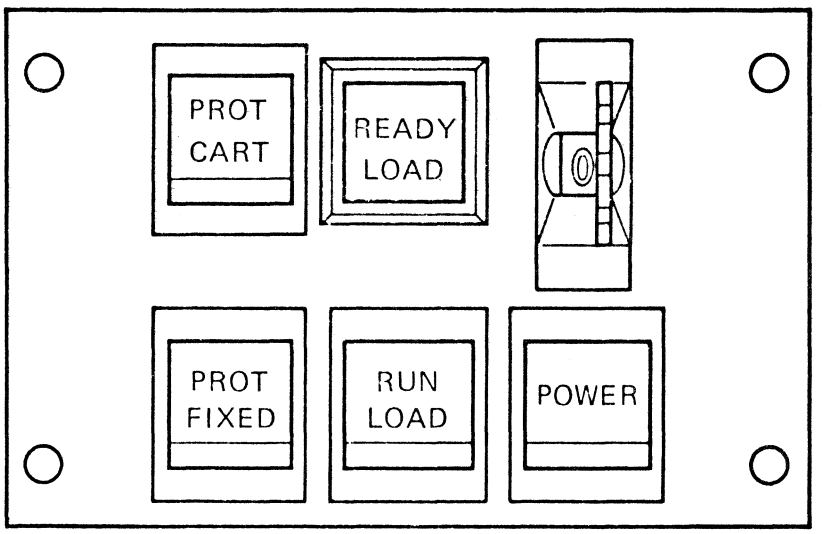


Figure 3-1. Operator Controls

3.2.1 FUNCTIONS OF OPERATOR PANEL CONTROLS

3.2.1.1 Power Switch/Indicator. This is a two-position switch/indicator marked POWER. When the switch is pressed upward, line power is applied to the Disc Drive's integral power supply. The lamp inside the switch lights and remains on until the switch is placed in its OFF (down) position.

3.2.1.2 Run/Load Switch. This is a two-position rocker switch whose upper position is marked RUN. When the upper part of the switch is depressed, the Disc Drive is in Run mode with the disc rotating and the Read/Write heads loaded. When the lower (LOAD) part of the switch is depressed, the Disc is stopped and the Disc Drive is in Load mode. At this time, the front door of a Series F Disc Drive can be opened or the lock on a Series T Disc Drive is unlocked so that the chassis can slide out of the cabinet, and the removable disc cartridge can be removed.

3.2.1.3 Ready/Load Indicator. This is a status indicator incorporating a divided lens cap. The upper portion of the lens is marked READY. When the READY portion of the switch lights, the operator is aware that the start cycle has been completed and the unit is able to accept Seek or Data Commands from the external Controller. When the LOAD portion of the switch lights, the operator is notified that the spindle has stopped rotating. At this time, the removable disc cartridge can be loaded or unloaded.

3.2.1.4 Protect Cartridge (Disc) Switch/Indicator. This switch/indicator is a two-position rocker switch marked PROT CART. When pressed upward, the switch activates associated Write Inhibit circuits. At this time, data can not be written on the cartridge disc. The lamp inside the switch also lights. When the switch is depressed downward, the lamp goes out and data can be written on the cartridge disc.

3.2.1.5 Protect Fixed (Disc) Switch/Indicator. This is a two-position rocker switch/indicator marked PROT FIXED. When the upper area of the switch is pressed, the switch activates associated Write Inhibit circuits and data can not be written on the fixed disc. The lamp inside the switch also will light. When the lower area of the switch is depressed, the lamp will go out and the Write Inhibit circuit is inactivated.

3.2.1.6 Unit Select Switch. This is a thumbwheel switch with respective markings 0, 1, 2, and 3. When the switch is set to any of these four active positions, a corresponding logical address is assigned to the Disc Drive for the purpose of external control.

3.3 CARTRIDGE LOADING

3.3.1 SERIES F DISC DRIVE

The cartridge used in the Series F Disc Drive is the IBM 2315-type. Before the cartridge can be inserted, AC power must be applied to the unit. Removable cartridge loading for both Series F and Series T is shown in Figures 3-2 and 3-3. This enables the safety interlock mechanism to be released and the loading door at the front of the Disc Drive can be opened. The turn-on and loading sequences are diagrammed on the flow chart in Figure 3-4.

CAUTION

DO NOT ATTEMPT TO FORCE OPEN THE DOOR BEFORE AC POWER HAS BEEN APPLIED TO THE DISC DRIVE OR THE DOOR ASSEMBLY MAY BE DAMAGED. WHEN THE POWER AND LOAD INDICATORS ARE ILLUMINATED, THE INTERLOCK IS RELEASED AND THE DOOR CAN BE OPENED EASILY.

To load the cartridge, perform the following steps:

A. Apply power to the Disc Drive by pressing the POWER switch. Observe that the lamp inside the switch/indicator lights.
B. When the LOAD indicator lights, pull the loading door forward and down. The cartridge receiver should then be elevated and moved to a position in which it can accept the cartridge.
C. Orient the cartridge so that its head entry opening faces the interior of the drive (12 o'clock position).
D. Push the disc cartridge into the receiver.
E. When the disc cartridge is almost inserted in the receiver, it will reach a preliminary stop at the point where the wire bail opens the small entry door in the cartridge. Continue to push the cartridge into the receiver until it comes to a final stop.
F. The loading door can now be closed and the start cycle can be initiated.

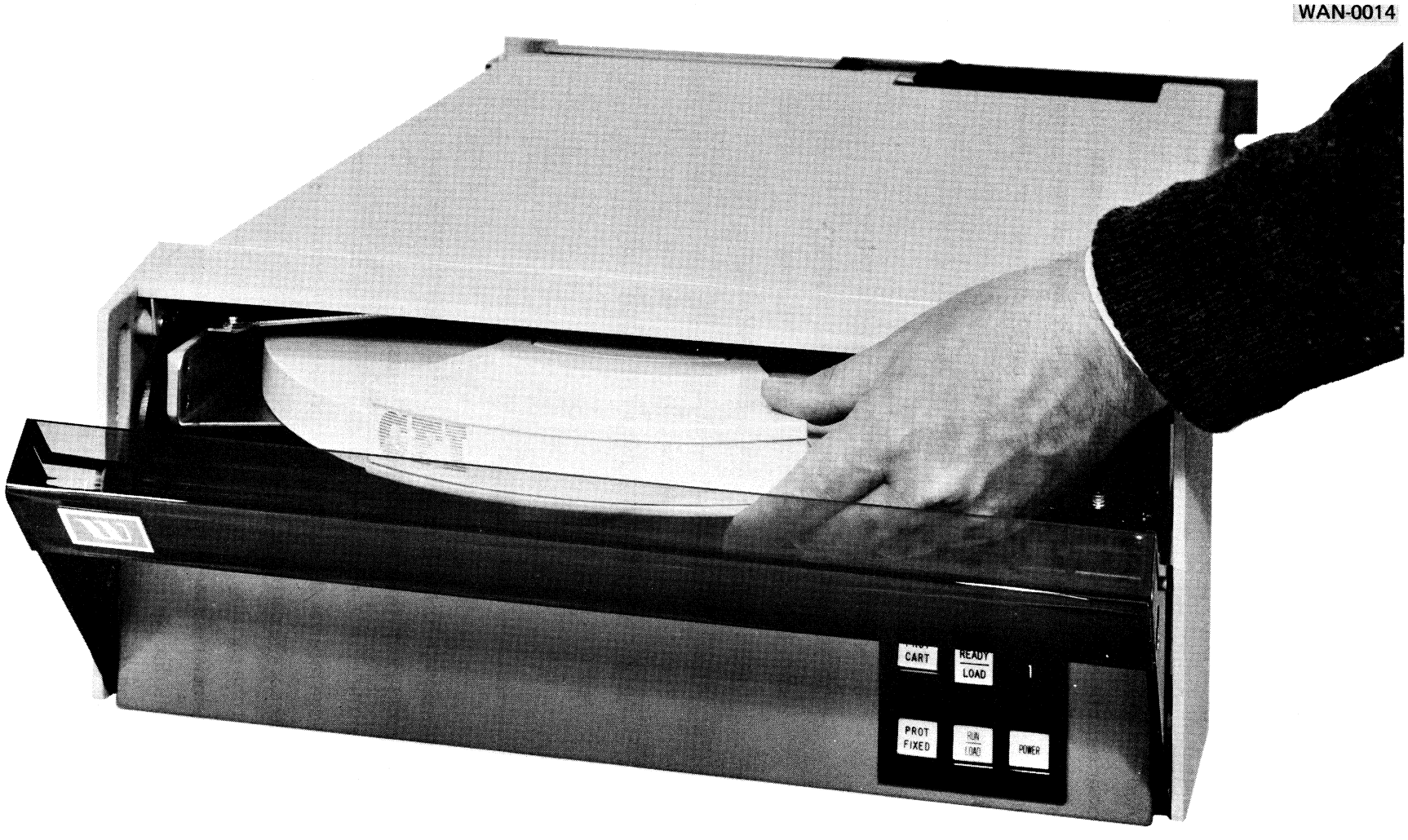


Figure 3-2. Series F Disc Drive Cartridge Loading

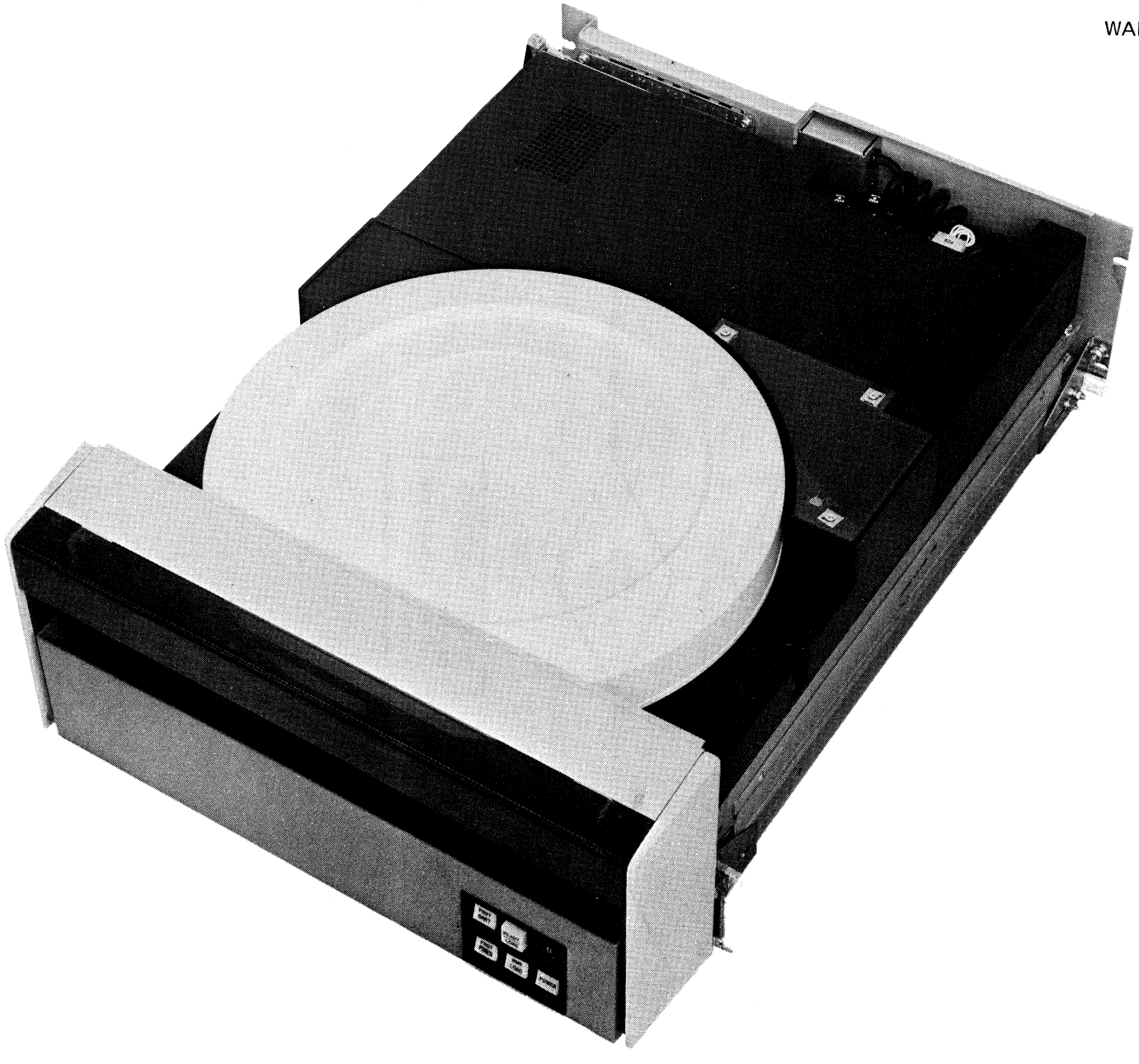


Figure 3-3. Series T Disc Drive Cartridge Loading

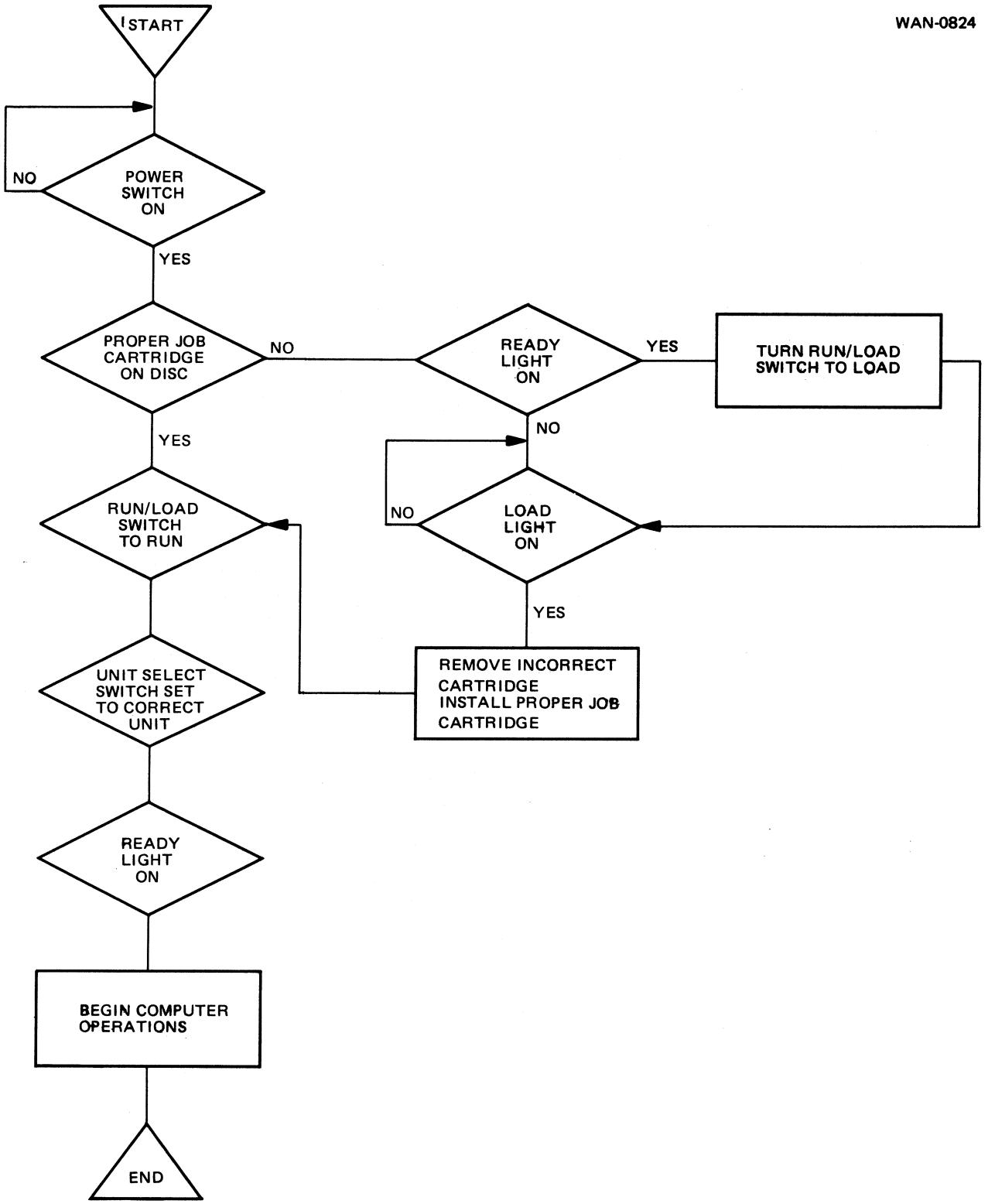


Figure 3-4. Operating the Series F or Series T Disc Drive

3.3.2 SERIES T DISC DRIVE

The cartridge used in the top-loading Series T Disc Drive is the IBM 5440-type (ref. figure 3-3). To load the cartridge, perform the following steps:

A. Apply power to the Disc Drive by pressing the POWER switch. Observe that the lamp inside the switch/indicator lights.

B. When the LOAD indicator lights, pull the Disc Drive out of the rack, its loading door should open automatically as the unit slides out.

C. Before the cartridge can be inserted, its bottom cover must be removed. Raise the cartridge handle to a vertical position while pushing the release button sideways.

D. The bottom cover is then released and can be removed. It will be installed later on top of the cartridge.

E. Orient the cartridge so that the Cartridge LOGO is facing the front of the Disc Drive. The cartridge is keyed and may be installed only if oriented correctly.

F. Lower the cartridge into the shroud and make certain it is seated firmly in the shroud.

G. Fold the cartridge handle down. This action unlocks the cartridge release button.

H. Invert the bottom cover and place it over the top of the cartridge.

NOTE

The cartridge MUST be installed as described or the start cycle can not be initiated.

I. Close the locking door by pushing the Disc Drive back into the rack. The Start cycle can then be initiated.

NOTE

In both the Series F and Series T Disc Drives, the loading door remains locked if the POWER switch is pressed downward while in the RUN mode; therefore, the cartridge can not be removed. If this occurs, the Disc Drive must again be placed in the Load mode, with power applied, to enable the loading door to be unlocked.

3.3.3 OPERATING THE DISC DRIVE

The controls on the Operator Control Panel (OCP) of the Series F and Series T Disc Drives are identical and there is no difference in operating the two types of Disc Drives.

3.3.3.1 Power On and Load Status. When AC power is supplied to the Disc Drive, two events should occur:

A. Power and Load indicator lamps should light.
B. The loading door should unlock.

At this time, the removable cartridge may be removed from, or inserted into, the Disc Drive.

NOTE

Inspect the cartridge for dirt or contamination before installing in Disc Drive.

3.3.3.2 Establishing the Ready Status from the Load Status. To initiate this operation, transfer the RUN/LOAD switch from LOAD position to RUN position. The following events should then occur:

A. The loading door should lock.
B. The discs should come up to operational speed.
C. The disc brushes should go through their cleaning cycle and return to their home position.
D. The positioner should move forward and load the heads at track 000.
E. The READY indicator should light.
   (Elapsed time should be approximately 30 seconds for 100 TPI).
   (Elapsed time should be approximately 60 seconds for 200 TPI).

Ready status is then established and the Disc Drive should respond to external commands from the Controller.

3.3.3.3 Establishing Load Status from Ready Status. To initiate this operation, transfer the RUN/LOAD switch from the RUN position to the LOAD position. The following events should occur:

A. The READY indicator should go out.
B. Disc rotation should gradually decrease until rotation stops.
C. The LOAD indicator should light (approximately 25 seconds for 100/200 TPI).
D. The loading door should unlock.

At this time, the cartridge may be removed and replaced, or power to the Disc Drive may be removed.

NOTE

When the cartridge is removed from a Series T Disc Drive, it should be placed in its cover immediately to preclude damage to, or contamination of, the cartridge. On Series F, the cartridge should be stored in a clean environment and handled in a manner that will not damage any of the critical parts of the cartridge.

3.3.3.4 Operator Maintenance. Before installing a cartridge into the Disc Drive, inspect the cartridge for contamination. On the Series F and Series T Disc Drives, inspect the spindle chuck and shroud for contamination. For cleaning techniques and frequency, check with the local customer service representative.

CAUTION

WHEN INSERTING A REPLACEMENT CARTRIDGE IN THE DISC DRIVE, MAKE CERTAIN THE CARTRIDGE HAS BEEN IN THE SAME AMBIENT CONDITIONS AS THE DISC DRIVE FOR A MINIMUM OF 2 HOURS. IF THIS PROCEDURE IS NOT FOLLOWED, "WARM UP" PROBLEMS MAY BE ENCOUNTERED ON 200 TPI UNITS.

3.3.4 TIMING

Figures 3-5 through 3-9 show typical timing relationships encountered during Disc Drive operation. In all of these figures, a high level indicates the TRUE or ON state of the particular function.

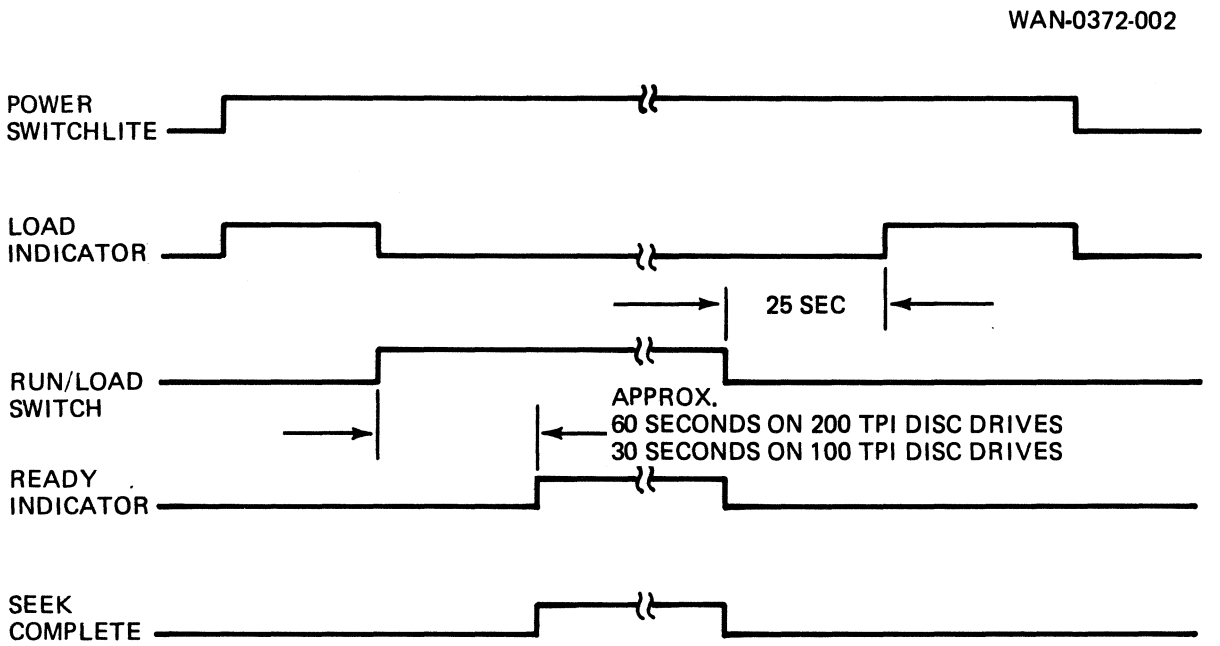


Figure 3-5. Power On/Off Timing Sequence

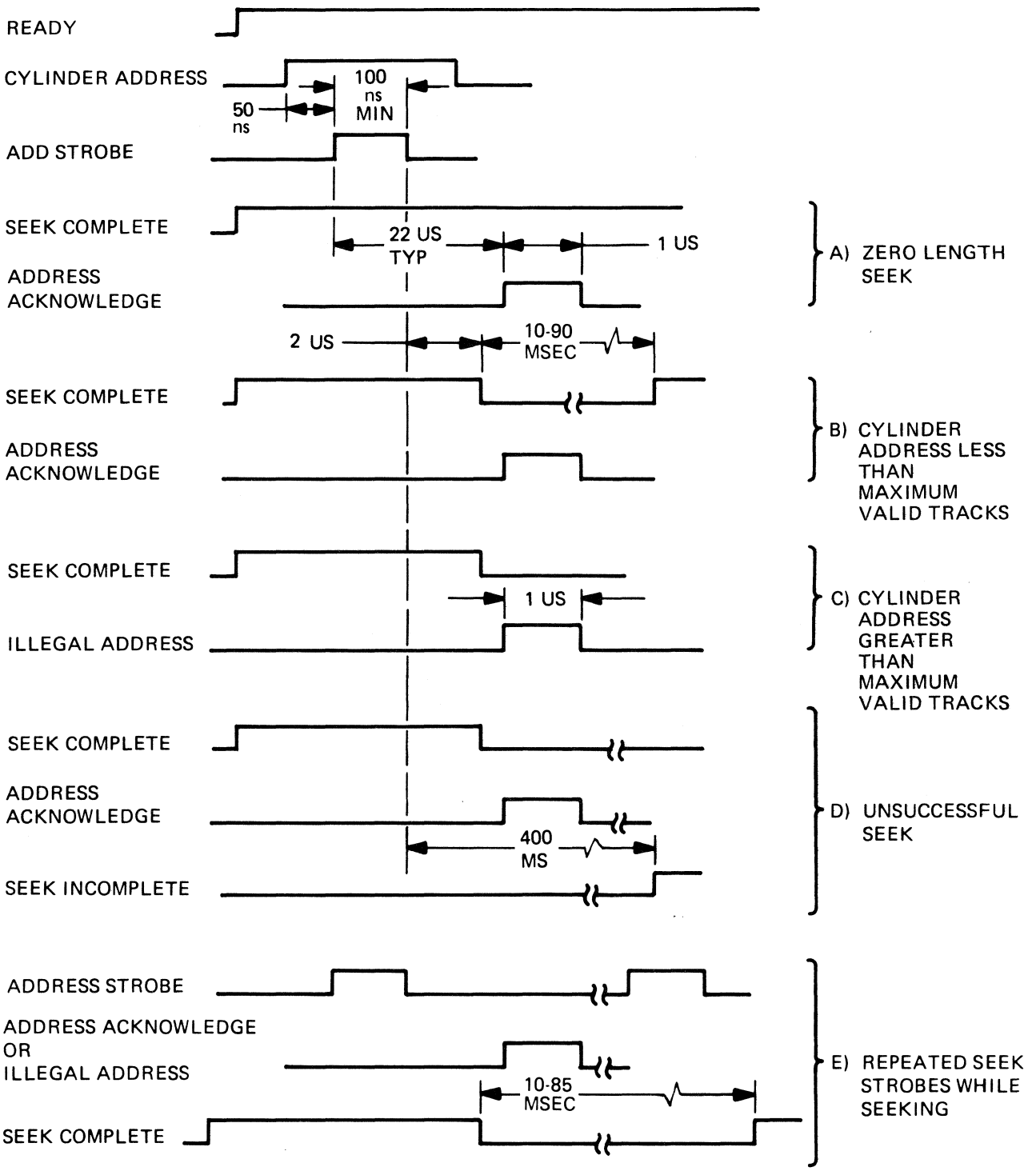


Figure 3-6. Seek Operation Timing Sequence

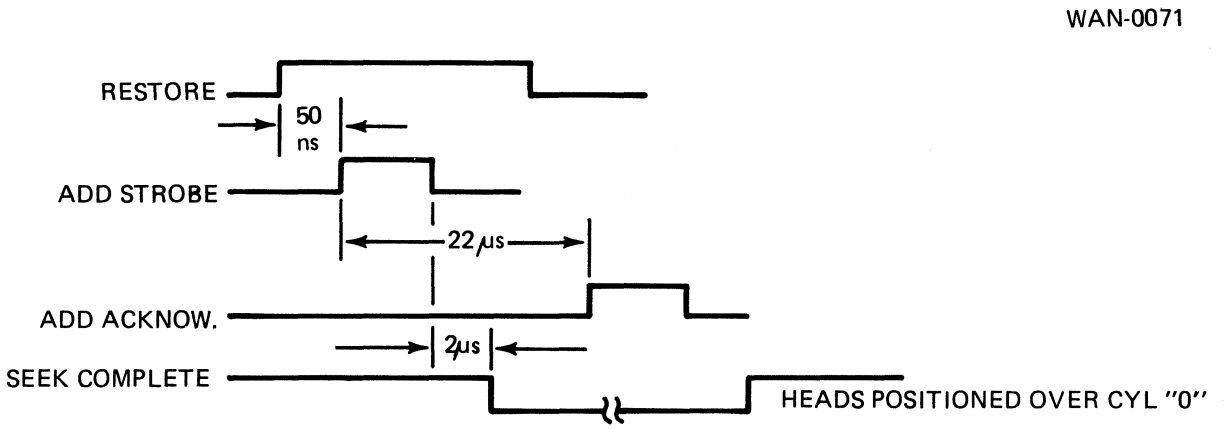


Figure 3-7. Restore Operation Timing Sequence

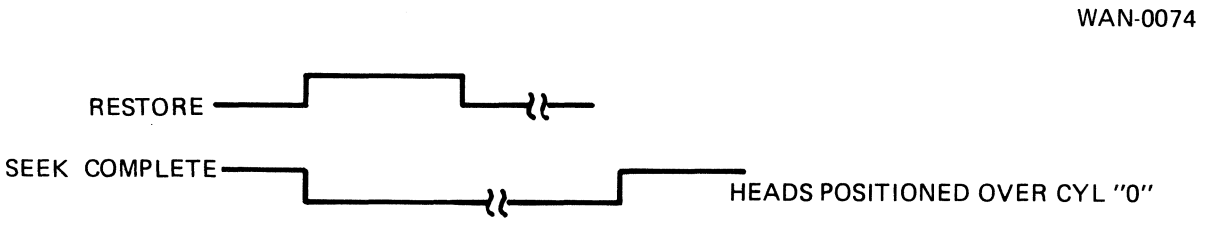
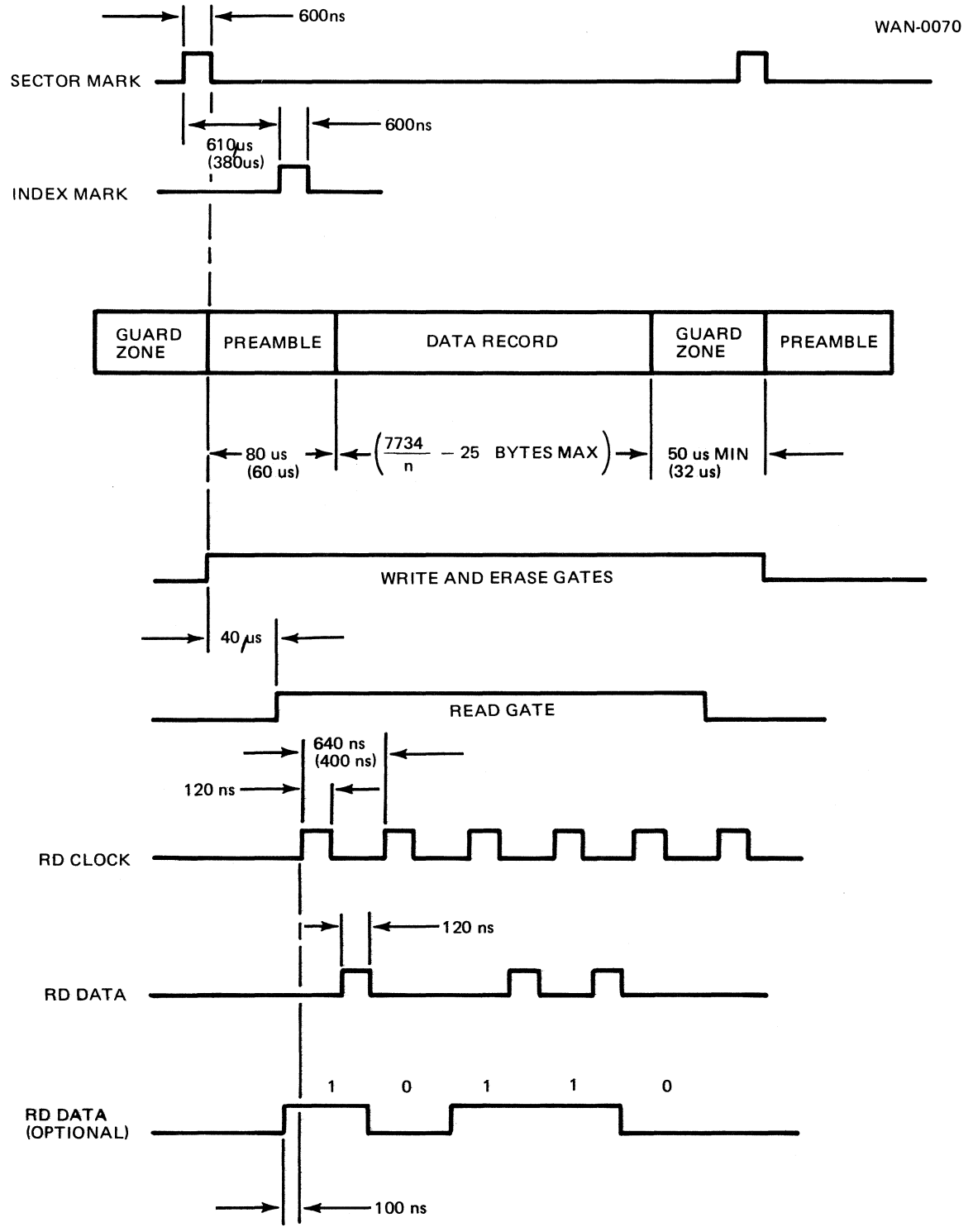


Figure 3-8. Restore Operation Timing Sequence (Optional)



NOTES:

1. TIME SPECIFICATIONS IN ( ) ARE FOR 2400 rpm
2. n = NUMBER OF SECTORS

Figure 3-9. Data Transfer Timing Sequence

SECTION 4

THEORY OF OPERATION

SECTION 4

THEORY OF OPERATION

4.1 INTRODUCTION

The WANGCO Series F and Series T Magnetic Disc Drives are designed to provide auxilliary memory storage on an oxide-coated disc by magnetically recording double frequency-encoded data onto concentric tracks on the disc surface, and by reading the data previously recorded. The basic configuration of both the Series F and the Series T Disc Drive is similar except in the method of loading the removable disc cartridge. Both series' are available with two track densities: 100 tracks per inch and 200 tracks per inch. The 200 TPI model also has temperature compensation circuitry. Optional spindle drive speeds of 1500 rpm or 2400 rpm are available in both the Series F and Series T. The spindle rotational speed variation is accomplished by changing the speed control oscillator circuitry.

Air flow and purging, as well as the data protection features are described in Sections 1 and 2 with Section 3 including operating instructions. Modular construction of circuitry is maintained throughout the unit and in most cases with components comprising specific circuit functions mounted on one circuit board.

4.2 SCOPE

This section is divided into two principal parts: the mechanical operation theory and the electronic theory. Explanation of the mechanical features is included as a prerequisite to the theory of operation of the electronic circuits. The electronic theory portion of the section is further subdivided into a basic discussion of the system and is keyed to a functional block diagram followed by a circuit analysis of each major circuit board. The basic block diagram of the Disc Drive is shown in Figure 4-1.

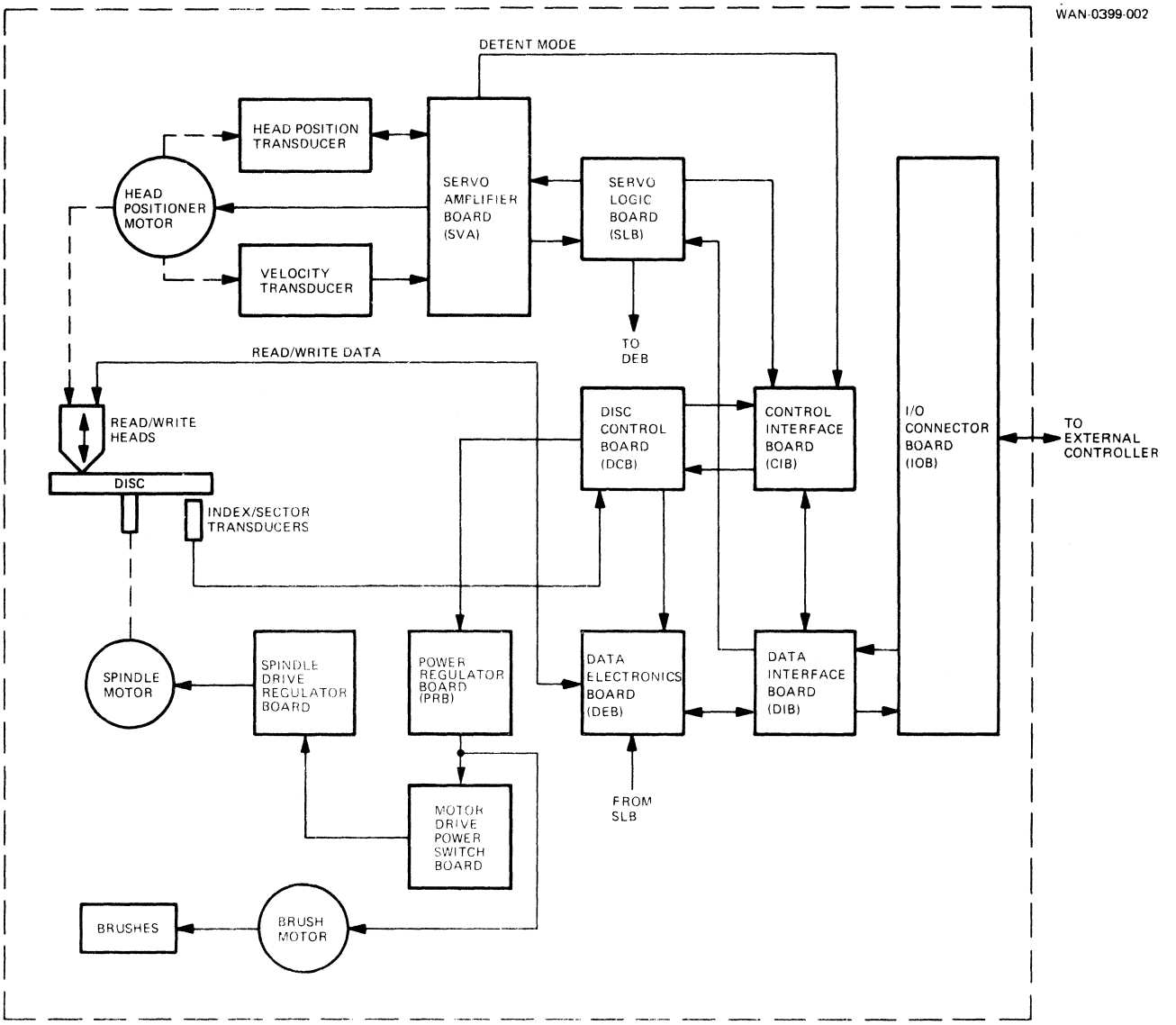


Figure 4-1. Simplified Block Diagram

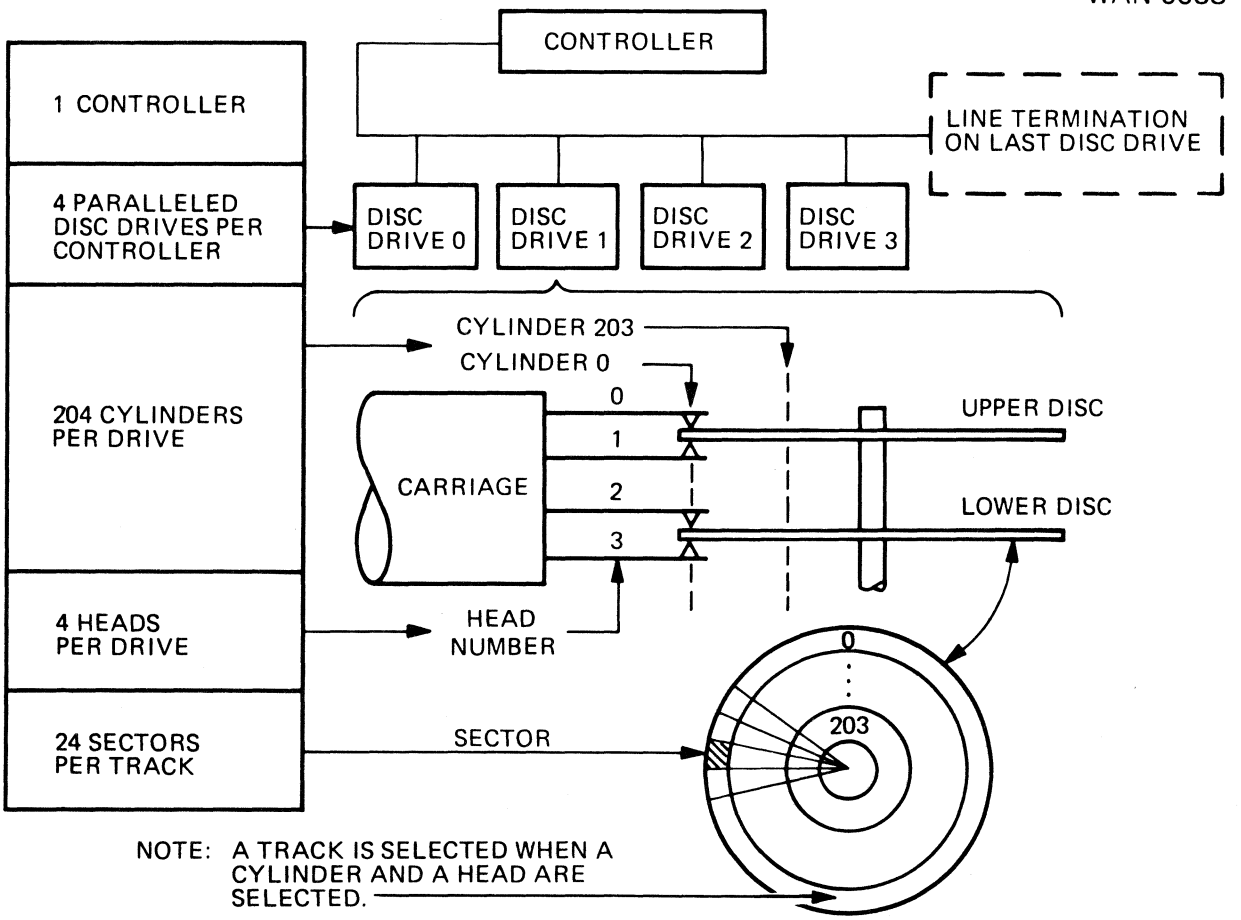
4.3 MECHANICAL OPERATION

4.3.1 SPINDLE AND READ HEAD OPERATION

4.3.1.1 Spindle Control. The magnetic fixed disc is secured to, and rotates with, the spindle. The spindle is driven by a DC motor. The removable disc cartridge is locked onto the spindle assembly, as described in Section 1, for both the front-loading and top-loading units. The spindle drive motor also drives the squirrel-cage blower motor with a seamless belt. Brush assemblies are included on both the spindle and blower shafts to dissipate electrical noise. Motor speed is accurately controlled (±1%) by a speed control circuit described later in the section. The drive belt and pulley assemblies are shown in the bottom view of the Disc Drive chassis, Figure 5-5.

4.3.1.2 Addressing and Daisy Chaining. Figure 4-2 is a diagram showing how the Disc Drive is addressed by an external Controller or Formatter. A feature of the Series F and Series T units is the capability for up to four Disc Drives to be connected to one Controller. In a daisy-chain configuration, a UNIT SELECT switch on the Operator Control Panel permits the receipt of instructions and data addressed only to the unit. Note that a line termination assembly is required after the last Disc Drive in the daisy-chain for terminating the line (ref. figure 4-2). Up to 204 tracks (for the 100 TPI unit) are available for positioning the Read/Write heads with the innermost track referred to as Track 203 and the track nearest the edge of the disc referred to as Track 000. In 200 TPI units, up to 408 tracks are available for storage of data. In this typical example, the disc is divided into 24 sectors. However, this is a customer-designated option as explained in the discussion of the Index/Sector pulse generation theory in later paragraphs. When the Disc Drive has been selected, the Controller sends a command which includes the selection of either the fixed disc or removable cartridge as well as either the upper or lower surface of the addressed disc. The signal from the Controller also includes the cylinder (track) address and enabling signals.

4.3.1.3 Head Positioning Servo System. The head positioning servo system drives the carriage assembly by moving the heads over the surface of the disc and detents (locks) the Read/Write heads over the designated (or addressed) concentric recording track. Figure 4-3 shows the positioner and its components. The head positioner is a linear electromagnetic actuator driven by an electronic servo system.



ADDRESSING STRUCTURE OF A STORAGE SYSTEM CONTAINING UP TO FOUR DISC DRIVES, EACH WITH TWO DISCS RECORDED ON BOTH SIDES AND DIVIDED INTO 24 SECTORS. THE HEADS MAY BE POSITIONED TO ANY OF 204 TRACKS.

Figure 4-2. Levels, Addressing Component Configuration

4.3.2 CARRIAGE MOVEMENT AND OPTICAL DETENT

The Read/Write heads mount on a carriage assembly which rides on ball bearings over precision guide rails. Extending or retracting the positioner assembly moves the heads radially across the disc surface. An optical position transducer produces the necessary analog signals. This optical unit contains a Light Emitting Diode (LED) and a lens and reticle assembly. The reticle assembly has a PCB with photo diodes and a glass mask with a series of vertical lines. A mask with a corresponding series of vertical lines, which moves between the lens and reticle assembly, is mounted on the carriage assembly.

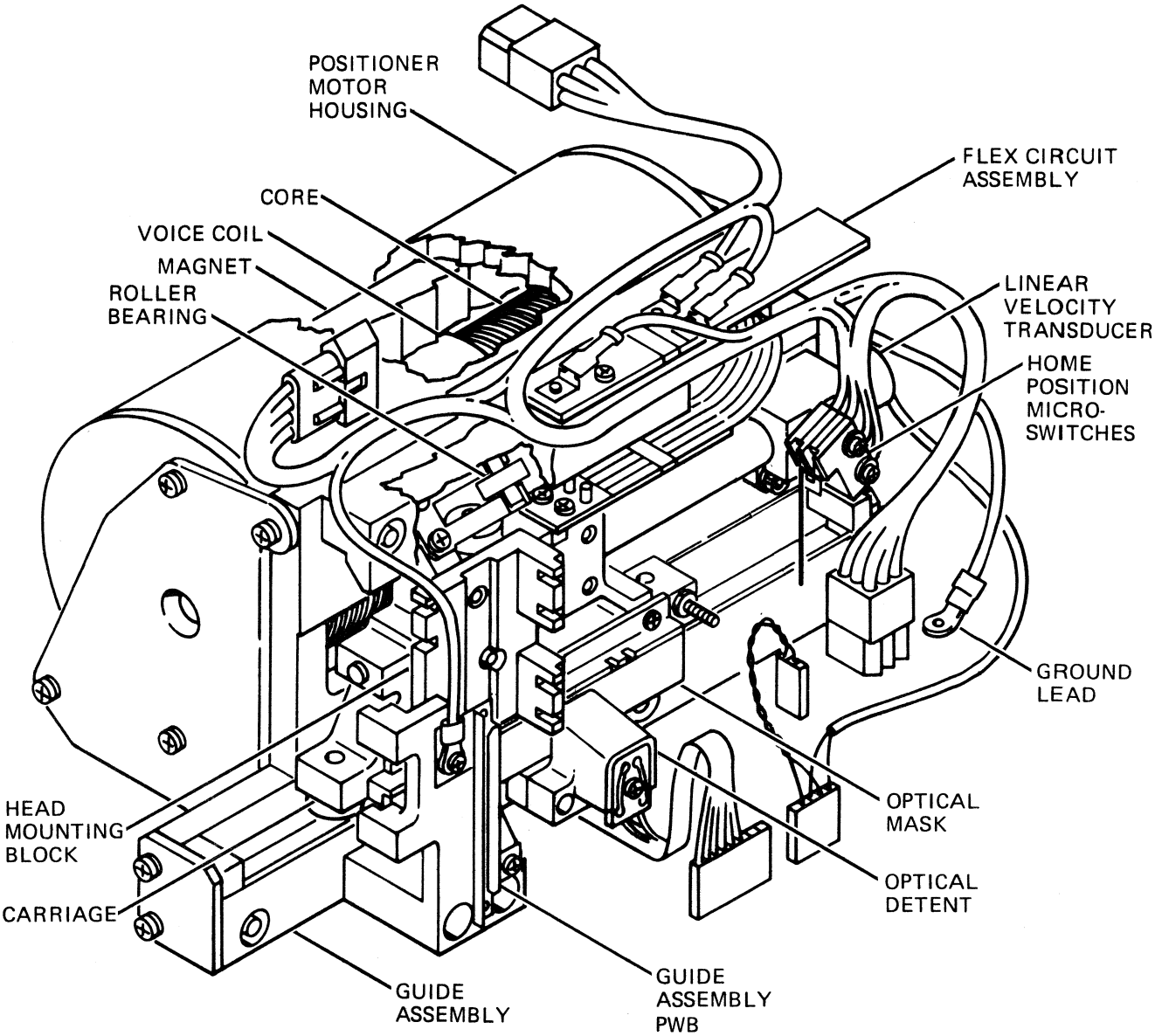


Figure 4-3. Positioner Assembly

The lines on each piece of glass comprise an optical grid made up of alternate dark and clear lines. The arrangement of these lines is such that when maximum light is allowed to impinge on one of these solar cells, the other is cut off as shown in Figure 4-4.

The outputs of the solar cells are summed to provide a modified sine-wave input to an amplifier circuit, described in the circuit analysis portion of this section. A null point (marked X on figure 4-4), or the point at which both of the solar cells conducts equally is identified as the crossing of a track. The detected track crossing signal is shaped and routed to a counter circuit, the Current Address Register (CAR). Note that all Read and Write operations are performed when the null point has been detected indicating that the heads are directly over the addressed track.

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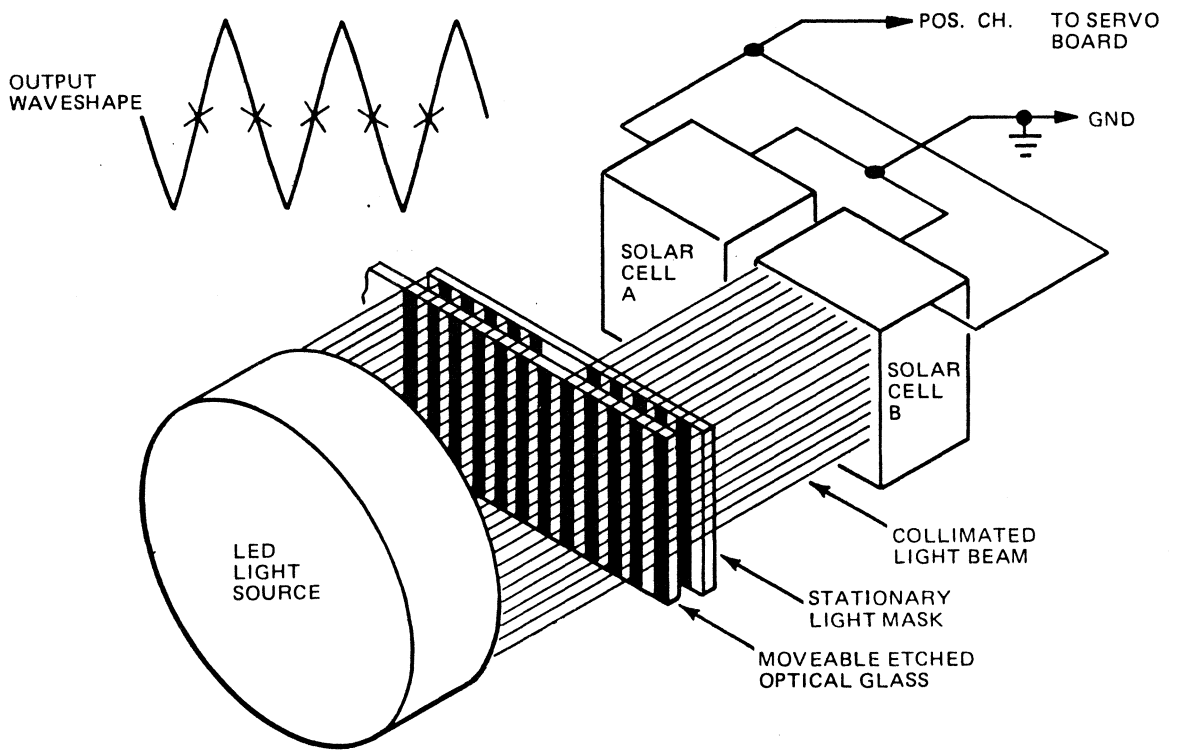


Figure 4-4. Optical Transducer Diagram

4.3.3 READ/WRITE OPERATION

The Read/Write heads "fly" over the recording track with the clearance ranging from 80 microinches (0.002032 mm) at the innermost concentric track to 130 microinches (0.003302 mm) at the outermost track. The difference in head clearance is due to increased surface speed at the outer tracks and causes increased pressure against the heads. Note that approximately two inches (5.08 cm) of the disc area is actually used for recording data in both the 100 TPI and 200 TPI models; however, the tracks in the 200 TPI model are spaced twice as close together. In Read operation, the head picks up data previously recorded on the addressed track. In Write operation, the head magnetizes the area directly below the head.

As shown in Figure 4-5, the head assembly contains a Read/Write/Erase core whose center tap is energized when the head is selected for either a Read or Write operation. The remaining components include a ceramic shoe, a head support arm which is used to attach the head assembly to the carriage, and a gimbal spring which allows the head to follow the disc contour. The use of the mechanical ramp is explained in the next paragraph, and the functions performed by circuits associated with the Read or Write operations are included in the discussions of these circuits as associated with the circuit analysis descriptions of the applicable circuits.

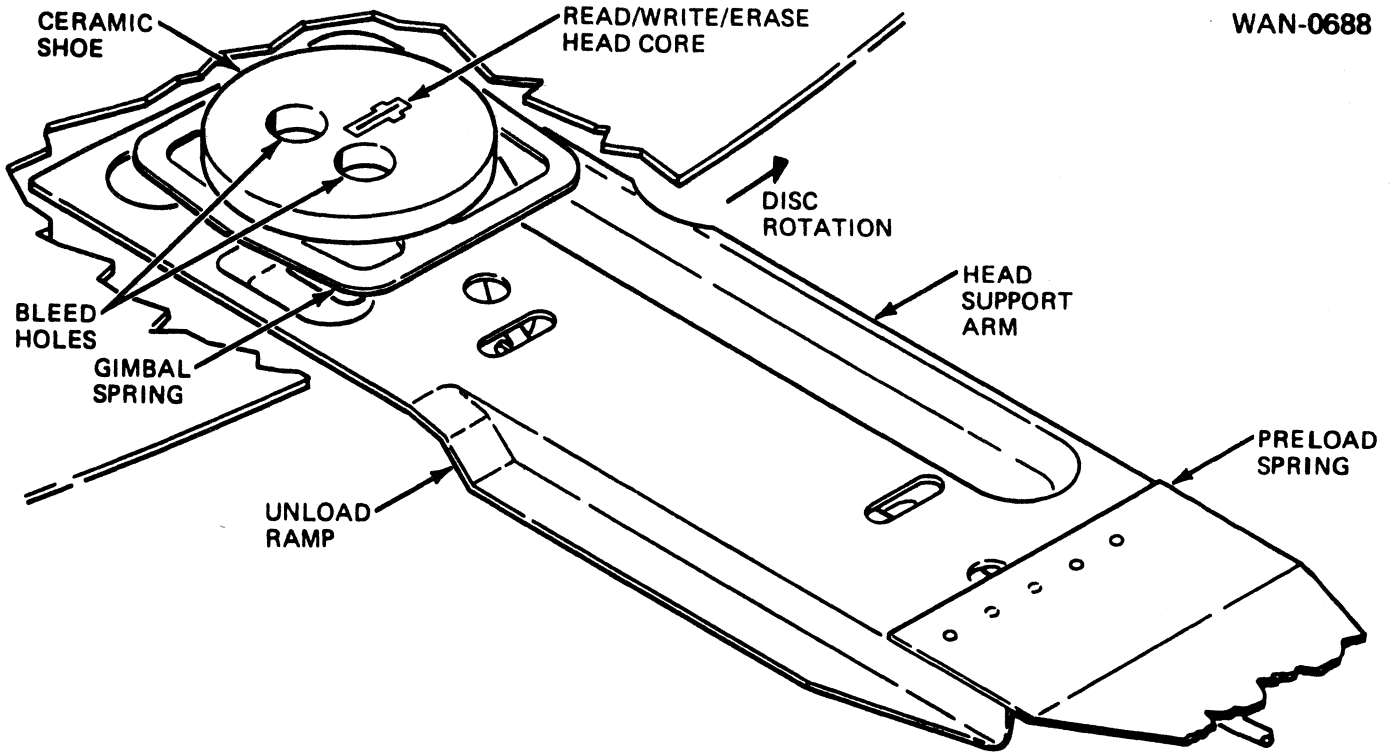


Figure 4-5. Read/Write Heads

4.3.4 SAFETY FEATURES

To protect user's data as well as the disc surface and recording components, several safety features have been designed into the unit. A voltage-sensing circuit constantly monitors both the AC and DC operating voltages, and if any voltage drops below a preset limit, the carriage is retracted and the heads are unloaded automatically.

The Read/Write heads are automatically unloaded during a power-down procedure. The Read/Write heads are ramp-loaded, a technique requiring minimal components while retaining close control over rate of head load. The assembly rides up a mechanical ramp when retracted, and is lifted further away from the disc surface. Figure 4-6 shows the ramp-loaded heads in the unloaded position. As the heads move forward, they slide down the ramps and are loaded directly over the surface of the disc.

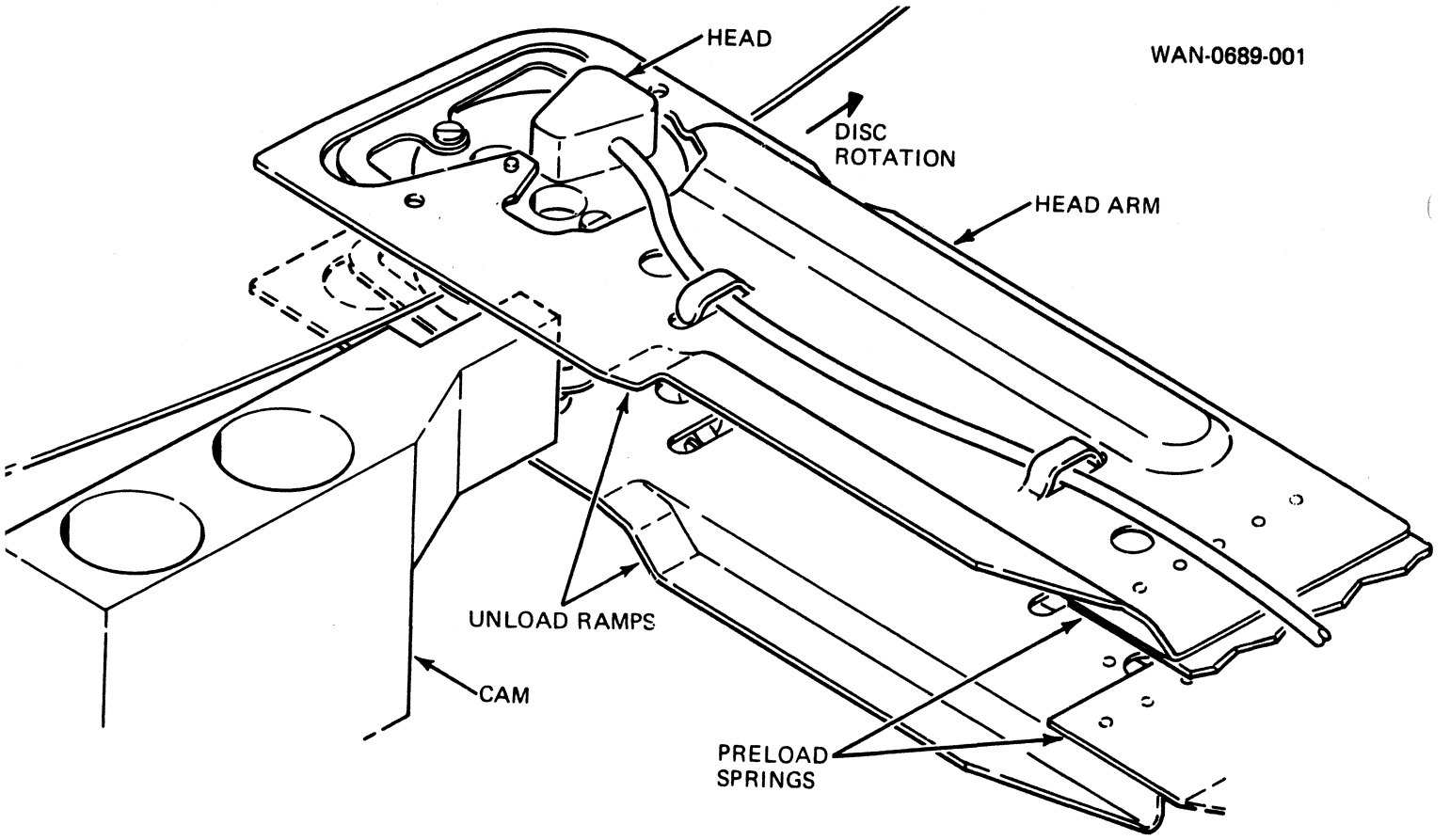


Figure 4-6. Head Unloading Mechanism

4.4 SYSTEM ELECTRONIC THEORY

4.4.1 FUNCTIONAL BLOCK DIAGRAM DESCRIPTION

4.4.1.1 100 TPI and 200 TPI Similarities. Since the 100 TPI and 200 TPI Disc Drives are basically similar, the following theory discussion will apply to both types of Disc Drives. Operating principles are identical except for the Track density achieved in the 200 TPI model by spacing of the concentric recording tracks. The 200 TPI unit also incorporates a temperature compensation circuit.

4.4.1.2 Introduction to Circuit Theory. Figure 4-7 is a functional block diagram of the Disc Drive showing interconnecting signals and the functions performed by the circuit boards contained in the unit. The block diagram should be used as a reference when following the circuit functions described; in addition, the basic block diagram of the Disc Drive can be referred to (ref. figure 4-1). The mechanical operational theory also should be used as a reference.

4.4.1.3 Basic System Operation. When the POWER switch on the OCP is pressed, control circuits, registers, and counters are preset to a desired initial state. The applicable DC working voltages are generated, and the circuits which drive the DC spindle drive motor are enabled. Note that the Start, Stop, Run/Load mode selection, as well as activation of the Write protection circuits, are made by actuation of front-panel switches. Conversely, the Seek, Restore, Read, and Write operations are initiated by the external Controller through data, control, timing, and status signals transmitted through the I/O interconnecting cable.

Once the disc rotational speed has reached 1500 or 2400-rpm nominal value specified by the customer, the Read/Write heads are loaded automatically as the positioner carriage on which the heads are mounted is driven from its Home position to track 000. When the heads have settled over this track, a READY status signal is sent to the Controller.

The Controller may now initiate a Seek (SK) Command followed by the cylinder address to which the carriage is to be moved. This information is routed to the Servo Logic board, where the cylinder (track) address is strobed into the New Address Register. This binary number then is compared to the value stored in the Current Address Register. This register consists of up/down binary counters containing the binary value representing the present positioner carriage location. These two values are compared and a difference value is obtained which represents the difference between these two binary numbers. This difference value is applied to a D-A converter to provide an analog drive signal which is sent to the Servo Amplifier Board. A simplified block diagram of the head positioning system is shown in Figure 4-8.

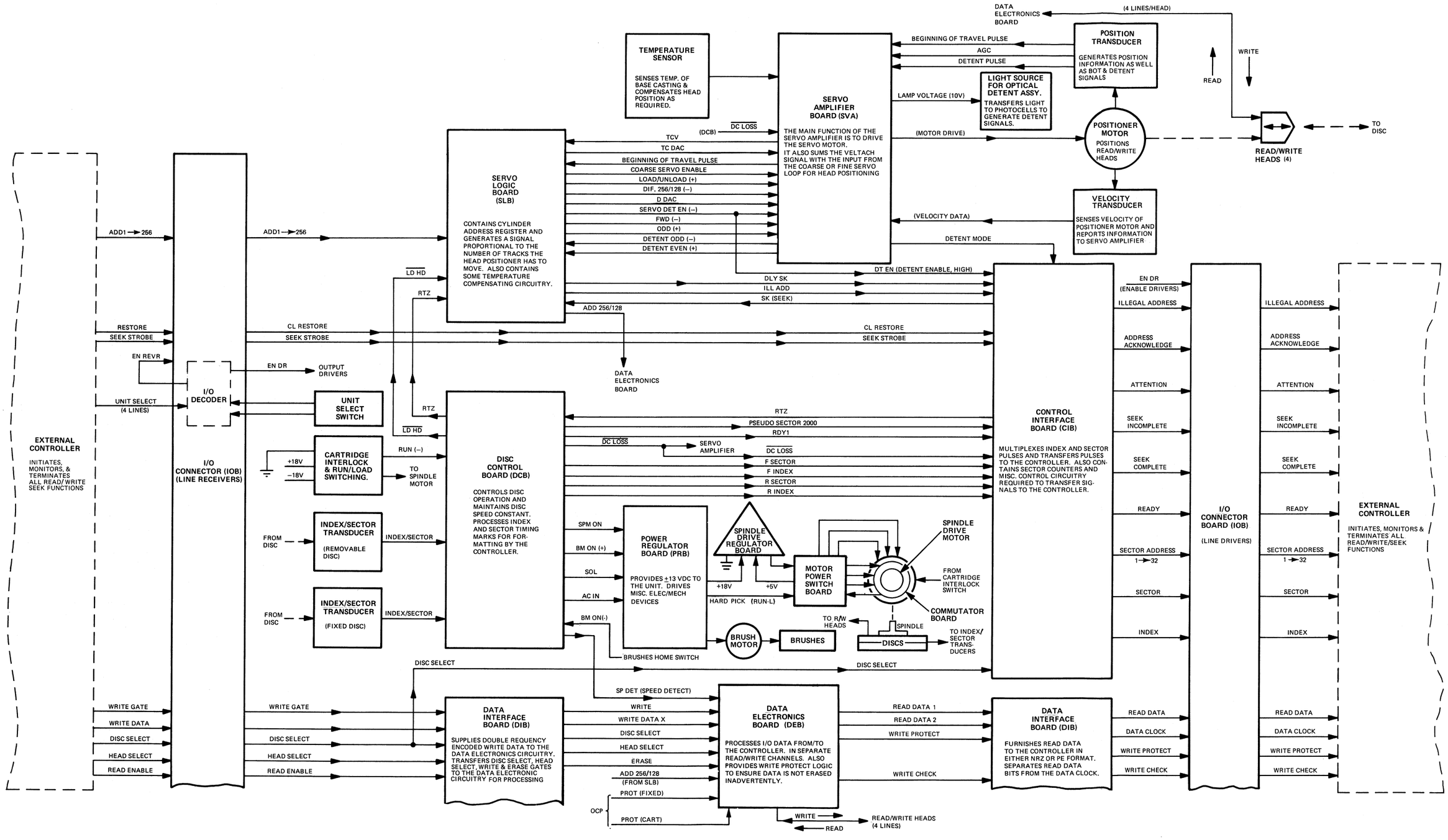


Figure 4-7. Block Diagram – 100/200 TPI Disc Drive (major signal lines)

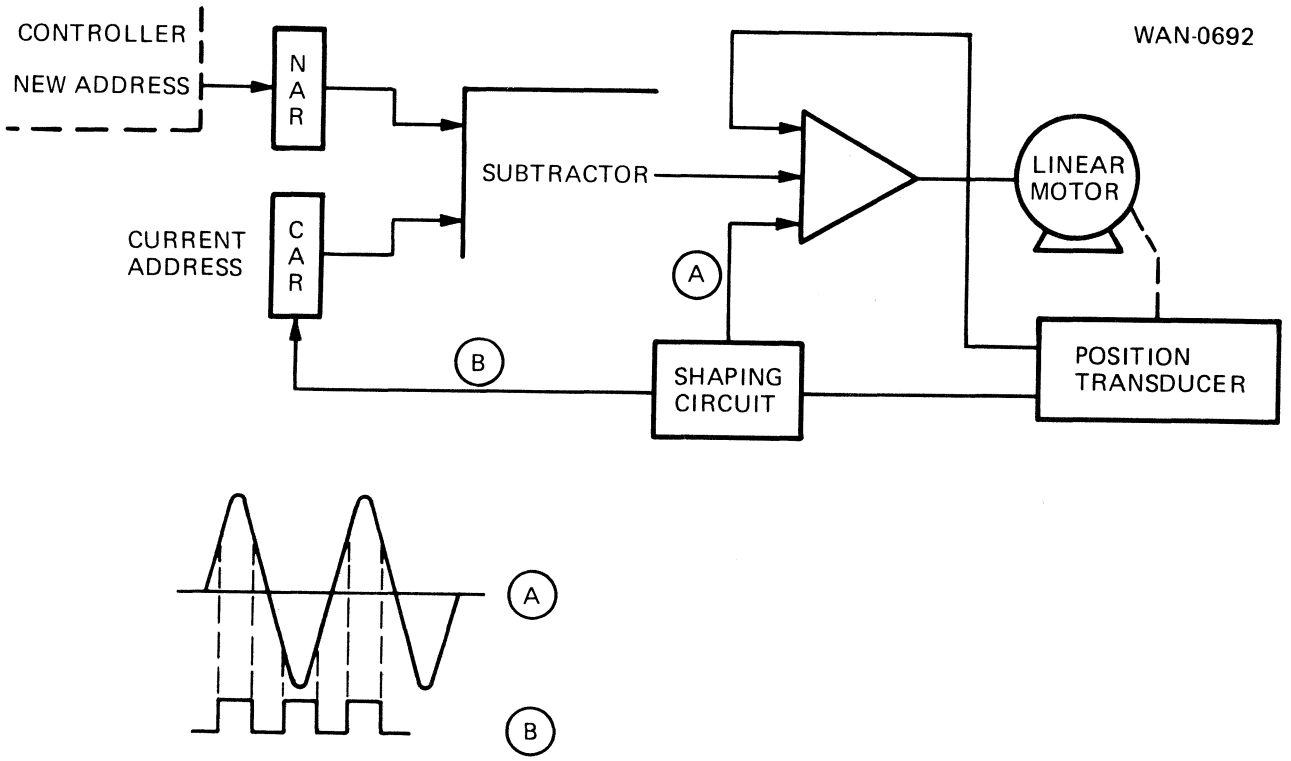


Figure 4-8. Functional Block Diagram – Head Positioning System

The circuits on the Servo Amplifier board route the analog signal through the board to the linear DC positioning motor, and the carriage is moved toward the new address at a speed proportionate to the number of tracks to be crossed. The position transducer detects the crossing of each track as described in the discussion of mechanical operation of the head positioning system. The Current Address Counter is updated with the counter being incremented or decremented as required. Once the value in the Current Address Register is equal to that in the New Address Register, the DETENT MODE signal is sent to the Control Interface board. A status signal SEEKCOMP, is generated on this board and transmitted to the Controller signifing that the addressed track has been reached and that the Read/Write heads are settled over the desired track and locked or detented in place.

When the SEEK COMP signal is received by the Controller, a Write or Read operation may be initiated. A functional block diagram showing the logic circuits associated with the Read and Write operations is shown in Figure 4-9. The same heads are used to read and write data with a decoding matrix on the Data Electronics board determining whether the fixed disc or the removable cartridge will be selected and whether the upper or lower surface will be selected. The Write data from the Controller then is routed through the I/O Connector board and the Data Interface board to the Data Electronics board. For a Read operation, the data flow is reversed. The fine servo loop on the Servo Amplifier circuit board is used to lock the carriage over the addressed data track during either a Write or Read operation.

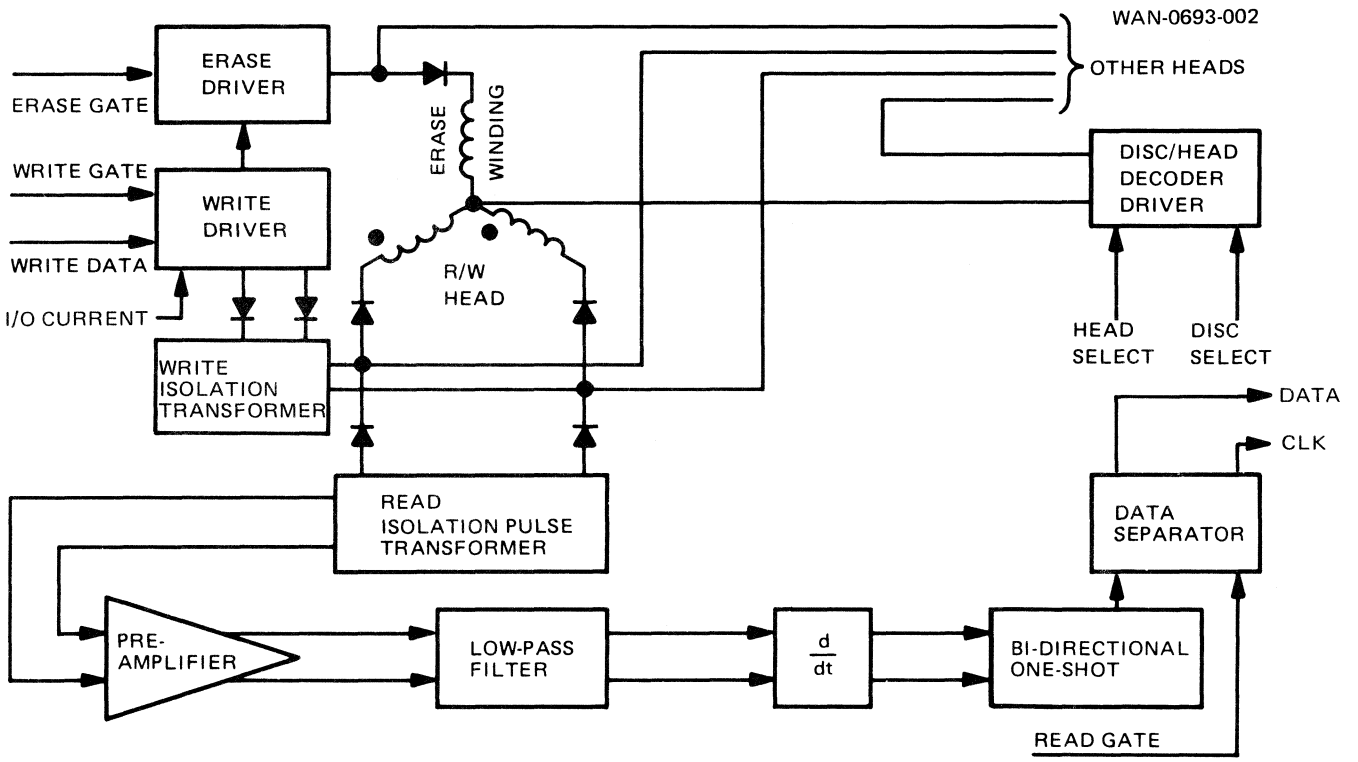


Figure 4-9. Functional Block Diagram– Read/Write Circuit

4.5 LOGIC BOARD CIRCUIT ANALYSIS

4.5.1 I/O CONNECTOR BOARD (IOB)

4.5.1.1 Board Functions. The main functions performed by the logic circuits on this board include:

A. Line Receivers
B. Line Drivers
C. Daisy Chaining

4.5.1.2 Line Receivers. The command and data signal lines from the I/O cable enter the Disc Drive through connector J22 which is wired in parallel, pin-by-pin, with daisy-chain connector J23. Each input is connected to one input terminal of its associated line receiver. These lines are also connected to a terminating bias by a resistive network. The second input to each line receiver is a common enabling signal, EN RECV. A block diagram of this I/O Connector Board, showing the line receivers and drivers, is shown in Figure 4-10.

The input signals from the Controller are low-true signals; i.e., a logical "1" is defined as a level between 0 and 0.5 V. The inverting line receivers furnish high-true signals (logical "1" is represented by a level of approximately +4 VDC to the drive system). The receiver outputs are routed to the Data Interface Board (DIB) through connector J21 and the flexible interconnecting ribbon cable assembly.

4.5.1.3 Line Drivers. The status and data signals generated in the Disc Drive are routed to the IOB through the ribbon cable and connector J21. Each signal is routed to one input of the corresponding line driver. The second input to each line driver is a common enabling signal, ENDR. The low-true outputs from the line drivers are transmitted to the Controller through I/O connector J22 and the interconnecting cable.

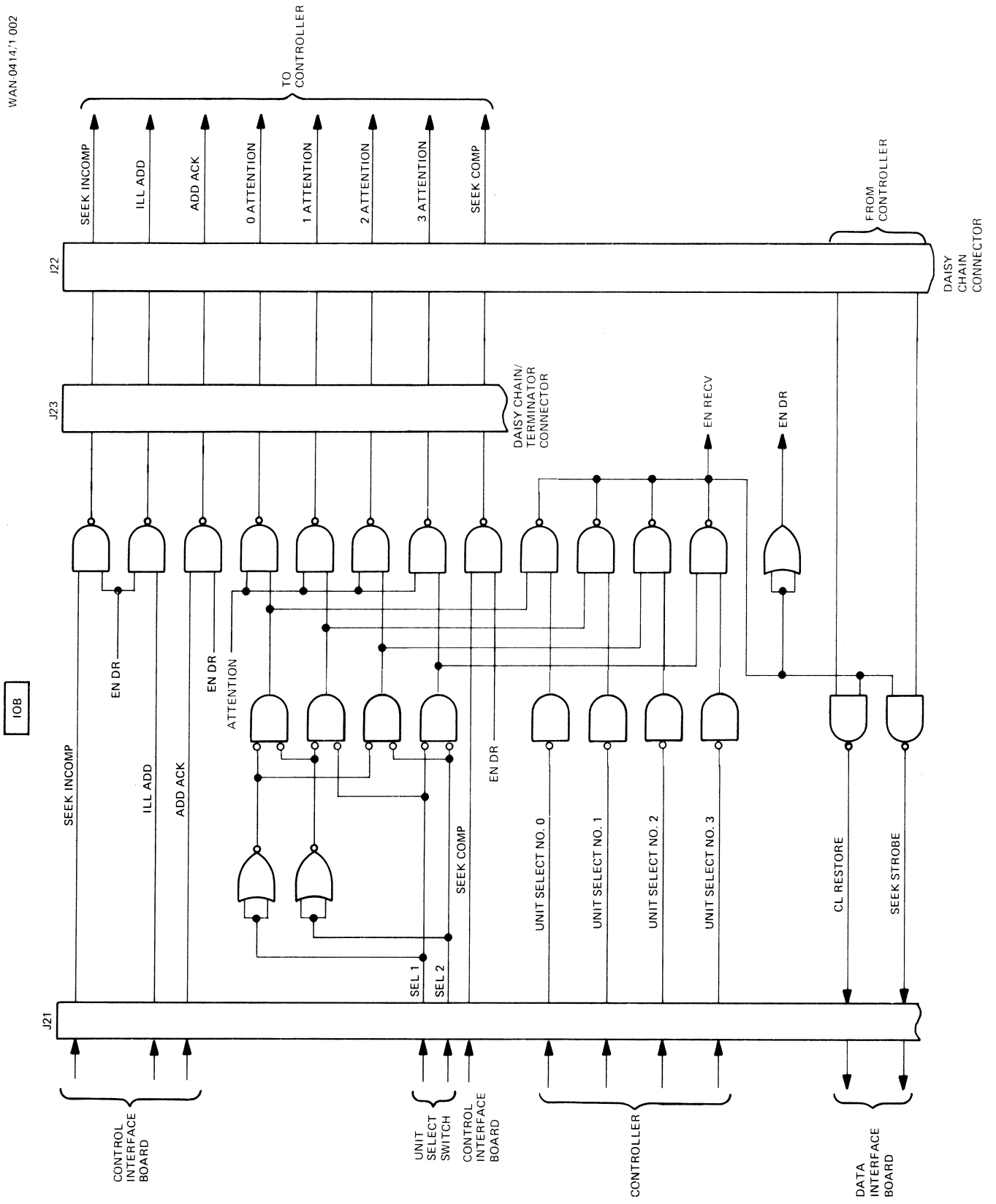


Figure 4-10. Block Diagram – I/O Board (continued)

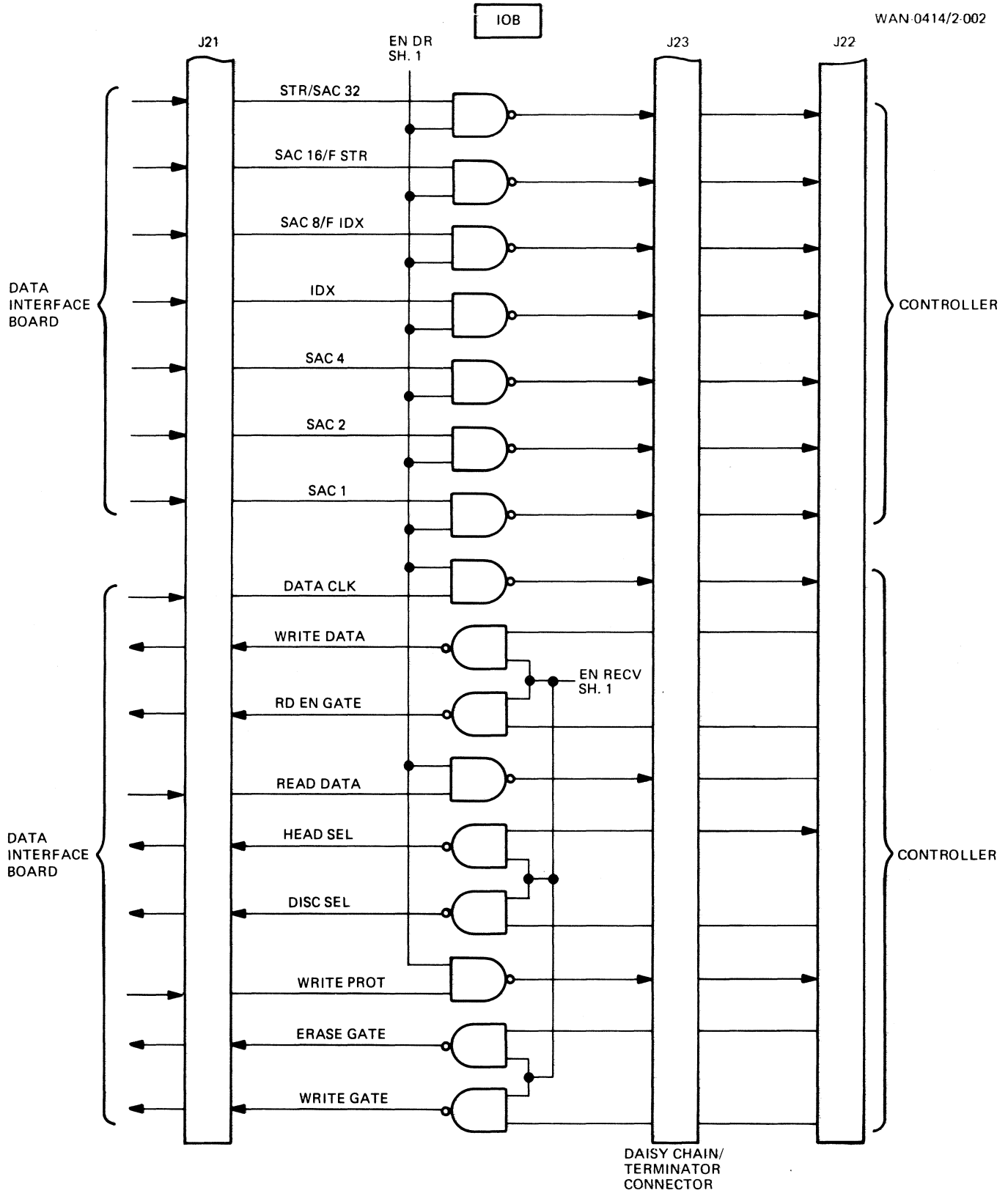


Figure 4-10. Block Diagram – I/O Board (concluded)

4.5.1.4 Driver Enable Circuits. A control circuit on the IOB generates the enable signals for the line receivers and line drivers as a function of the UNIT SELECT provision and the ATTENTION signal. The logical address signal for selection of one of the four daisy-chained Disc Drives is received from the Controller via the I/O cable and connector J22. This signal is inverted and applied to two NAND gates. The second input to each of these gates is furnished by the SEL1/SEL2 decoder. The decoder is supplied by the four-position UNIT SELECT switch which is located on the control panel of the particular Disc Drive. The inputs on lines SEL1 and SEL2 are encoded by the UNIT SELECT switch mechanism.

When both inputs to any one of the gates are high, indicating matching selection (remote and local of the unit address), the output of that particular gate will be low; therefore, the EN REC signal is low. This low-level signal enables all line receivers. The EN REC signal is inverted to a high level and the resultant EN DR signal is used to enable all line drivers.

The decoder outputs are further used to generate the ATTENTION status signal. Depending on which gate is enabled by the high-level output of the decoder, a low level will be placed on the respective ATTENTION line when the internal ATTENTION signal is received.

4.5.1.5 Daisy Chaining. The daisy chaining provision is implemented with the two parallel-wired connectors J22 and J23. The I/O connector J22 (a male connector) mates with the interface I/O cable. The entire communications link between the Disc Drive and the Controller is established via this cable. The parallel (pin by corresponding pin) daisy chain connector, J23 (a female receptacle), mates with one end of a daisy-chain cable whose other end mates with I/O connector J22 of the second Disc Drive, etc. Up to four drives can be interconnected with the Controller in this manner.

4.5.2 ELECTRONICS INTERCONNECT BOARD

The Electronics Interconnect Board (EIB) is basically a mother board into which the other circuit boards are inserted. The interconnecting diagram for this circuit board is in the schematic drawings of Appendix C. Since this circuit board is used only to provide interconnecting signal paths, no further information is included.

4.5.3 DISC CONTROL (DCB)

4.5.3.1 Board Functions. The principal functions performed by the logic circuits on this circuit board include:

A. Generation of disc control signals.
B. Maintenance of constant disc speed.
C. Separation of index and sector pulses.
D. Generation of LOAD HEADS signal.
E. Solenoid signal circuit.
F. Automatic disc cleaning brush cycle.

4.5.3.2 Spindle Speed Detect Circuit. The spindle motor speed detect circuit on the DCB is used to monitor the speed of the spindle motor, to provide a clock signal of 2000 pulses for each disc revolution (for either 1500 or 2400 rpm discs), and to generate the SPINDLE MOTOR ON (SPM ON) signal. The block diagram for the speed detect circuit is shown in Figure 4-11.

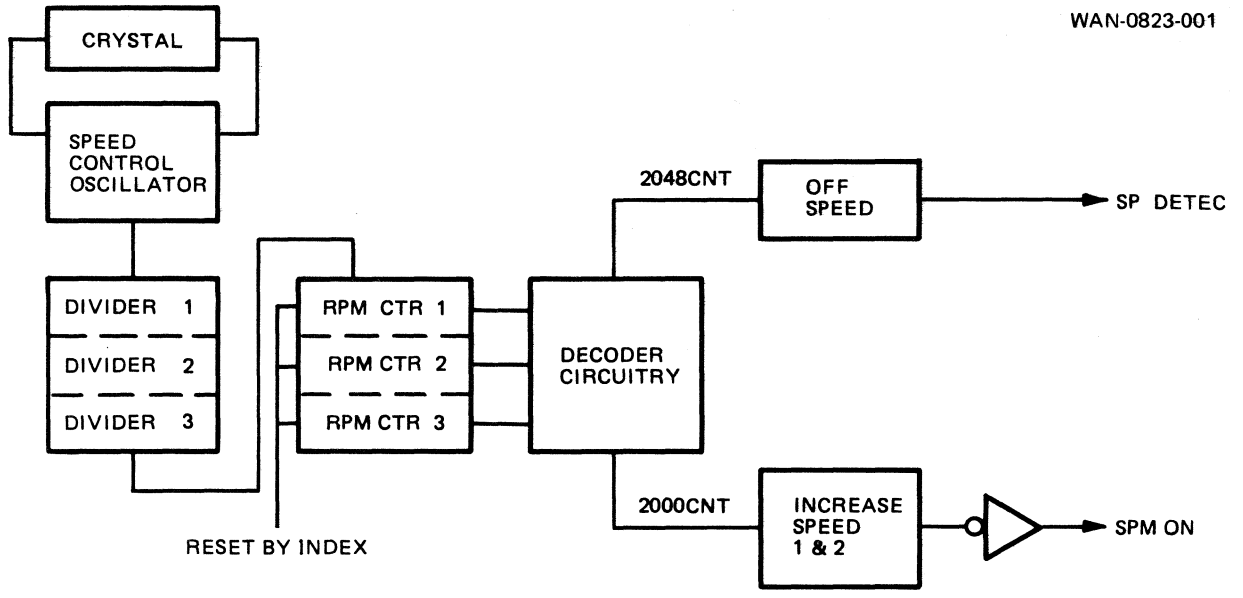


Figure 4-11. Motor Speed Detect Circuit Block Diagram

4.5.3.3 Maintenance of Constant Spindle Rotational Speed. The PSEUDO SECTOR 2000 line provides 2000 pulses per disc revolution to the external Controller. The output of the 3.2-MHz crystal-controlled oscillator is divided into 200 KHz (for 1500 rpm units) or 320 KHz (for 2400 rpm units). This output is then further divided to 50 KHz (1500 rpm) or 80 KHz (2400 rpm), thus providing a stable crystal-controlled signal of 2000 pulse per disc rotation to the Controller.

The SPEED DETECT (SP DETEC) signal is generated if the spindle rotational speed deviates more than ±1% from the specified value. The 3.2-MHz crystal-controlled oscillator signal supplies the reference input for the spindle motor speed detect logic, and the index pulses represent the error signal required to correct the motor speed. If spindle speed falls below 1% of the 1500 rpm or 2400 rpm rate, more than 2000 clock pulses will occur during one rotation. The 2000th pulse will activate the spindle control logic thereby generating a correction signal to speed up the spindle motor. When the motor reaches the correct speed, the counter is cleared by the next index pulse following the 2000th clock pulse. The spindle motor will not be activated, and no correction signal will be sent to the motor.

Drive current is routed to the Spindle Motor Power Switch Board through the Power Regulator Board as shown in Figure 4-12. Another input to the Spindle Drive Motor Power Switch Board is from the Spindle Drive Regulator Board which is located in the air filter cavity with the Motor Power Switch Board. The SPINDLE MOTOR ON (SPM ON) line from the DCB to the PRB becomes HARD PICK to the Spindle Motor Power Switch board and then is applied to the motor armature as RUN (L). On 200 TPI units, this should not occur until the spindle has reached approximately 70% of its nominal rotational speed. The SPM ON signal will be present until the spindle has reached its rated operational speed, at which time, the signal will be turned off. The SPM ON signal will not be generated again unless spindle rotational speed drops at least 1% below its nominal operational speed.

4.5.3.4 Separation of Sector and Index Pulses

The Sector/Index logical circuit shapes and separates the intermixed sector and index pulses received from the transducers. The circuit blocks and interconnecting signal paths for both the fixed disc and removable cartridge transducers are shown in Figure 4-13.

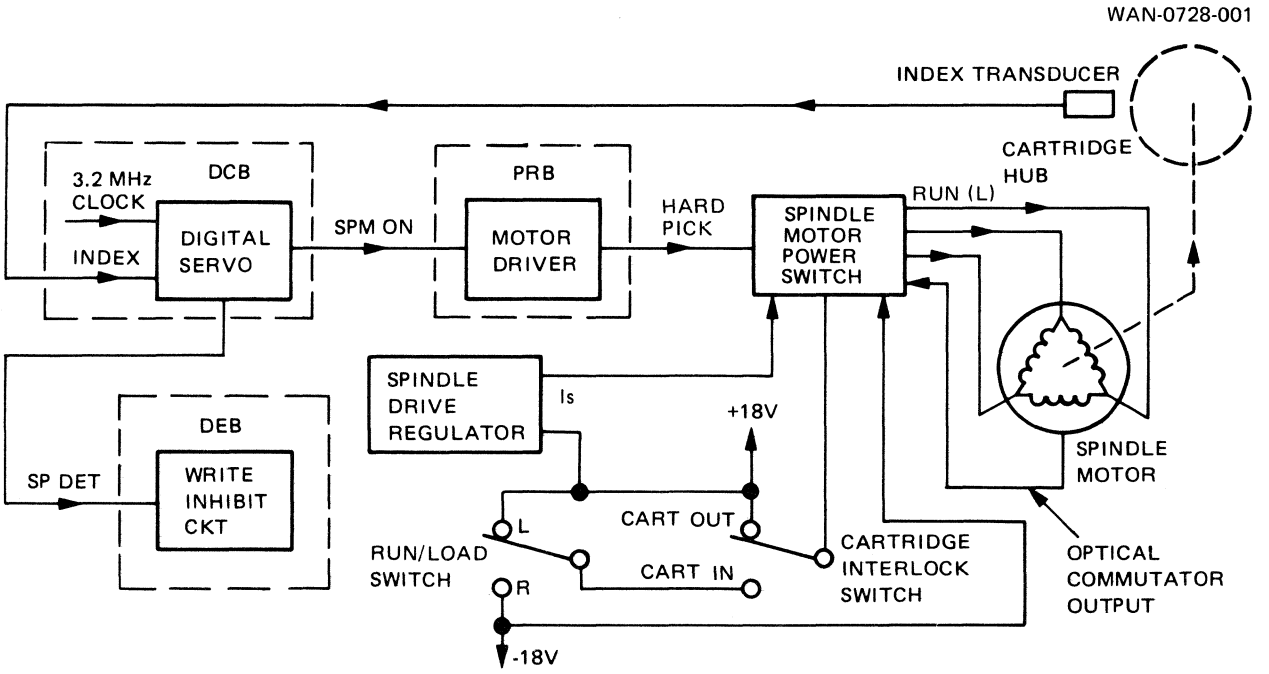


Figure 4-12. Spindle Speed Control Servo System

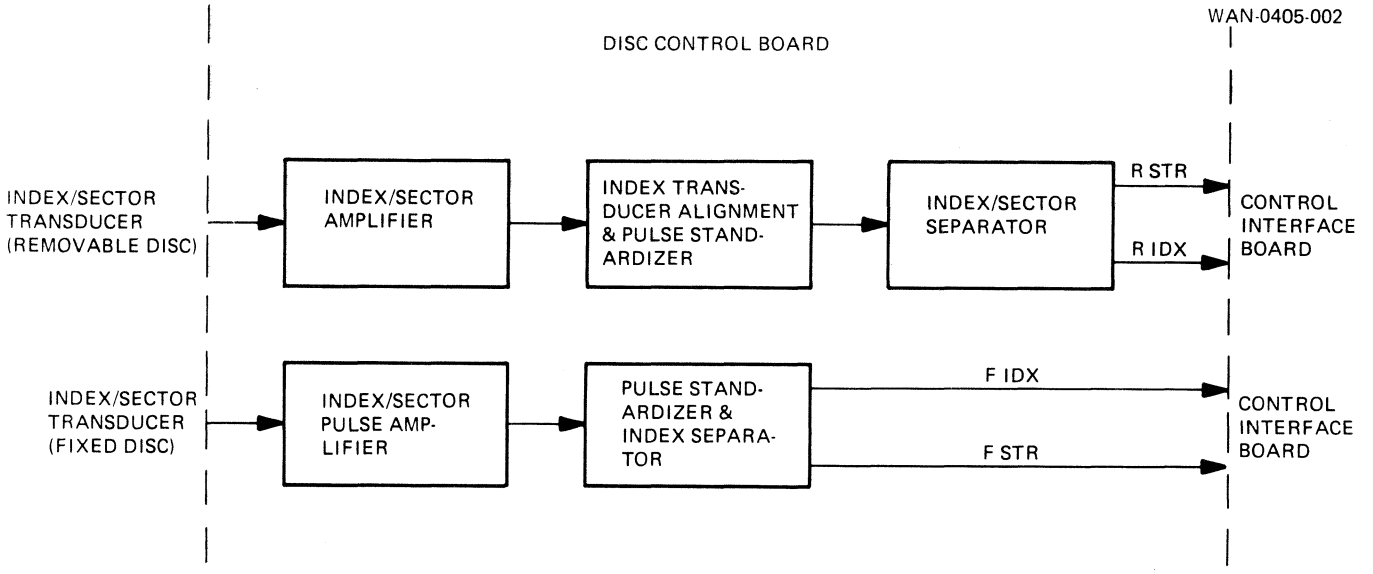


Figure 4-13. Block Diagram of Index/Sector Logic Circuit

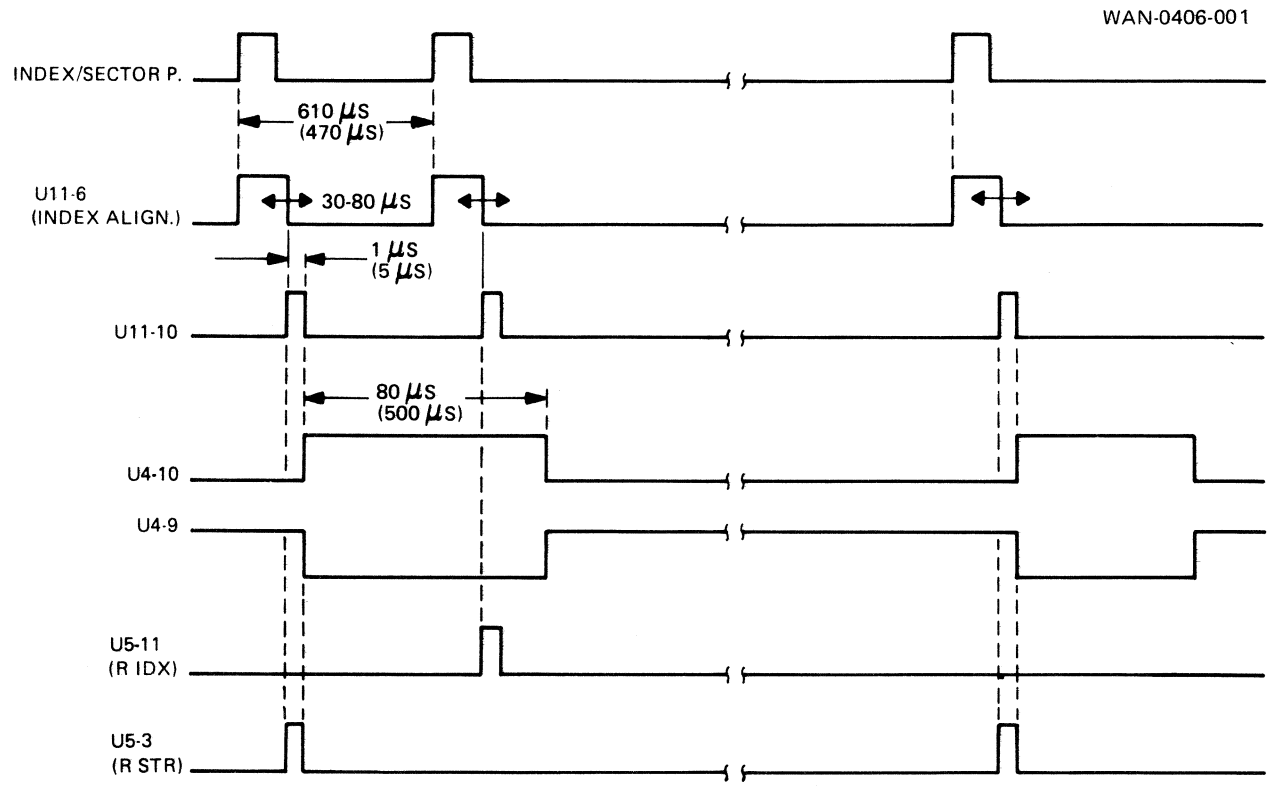
The origination of signals and functions performed by the Index/Sector logic are described in the following sub-paragraphs.

4.5.3.4.1 Removable Disc Index Pulses. The transducer pulses received by this circuit board are applied to the Index/Sector circuit where they are amplified in a Schmitt trigger. The resultant output is used to trigger a one-shot. When this one-shot times out, it fires another one-shot which has a fixed time delay that standardizes the pulse width to a selected time duration. The index and sector pulses then are separated by two AND gates, one of whose input is the output of a one-shot. A jumper option is used to provide the capability of selecting optional circuit configurations. A table showing the circuit options is included on the schematic for the DCB. Since there is a specific delay between the corresponding transducer pulses, which is different for 1500-rpm and 2400-rpm units, the one-shot delay is preset by inserting a precision resistor to ensure separation of the two pulses.

4.5.3.4.2 Timing Relationships. When the sector pulse preceding the index pulse triggers the two one-shots, the second one-shot times out, and its trailing edge triggers the standardizing one-shot used to enable the pulse separation AND gates. Although the other input to the Removable Disc Sector (RIDX) AND gate is high during the duration of the output pulse from this one-shot, the other input remains low until changed by the trailing edge of that pulse. Therefore, the sector pulse will not be passed by this AND gate. The delay of the one-shot is long enough so that the output will be high when the index pulse triggers the two preceding flip-flops which causes the output of the second one-shot to go high again.

Since both inputs to the AND gate are now high simultaneously, the standardized index pulse will be passed, and the RIDX output will be high. When the index pulse from the standardizing one-shot appeared at the second input to each of the two AND gates, the output of the third one-shot was still low and the two gates were not enabled. Therefore, the index pulse is not passed and does not appear on the RIDX line. A timing diagram showing the sequence of events occurring during the Index/Sector separation process is shown in Figure 4-14.

4.5.3.4.3 Removable Disc Sector Pulses. The standardized sector pulses will be passed by the Removable Disc Sector (RSTR) AND gates since the trailing edge of these pulses triggers the standardizing one-shot. Therefore, during the sector event, one input to this gate will be high due to the sector pulse, and the other input will be high since the standardizing one-shot has not yet been triggered. When this one-shot is fired, it will time out prior to the arrival of the next sector pulse; therefore, the second output to the RSTR AND gate will be high during that pulse. The index pulses (RIDX) and sector pulses (RSTR) are routed to the Control Interface Board (CIB) for processing.



NOTE: TIME SPECIFICATIONS IN PARENTHESIS ARE FOR 2400 RPM.

Figure 4-14. Removable Disc, Index/Sector Separation

4.5.3.4.4 Fixed Disc Index and Sector Pulses. The index and sector pulses developed by the transducer and associated with the sector ring mounted on the fixed disc are amplified, shaped, and separated in essentially the same manner as the removable disc pulses. These pulses are amplified and shaped by a Schmitt trigger circuit before being standardized by a one-shot and separated. The Fixed Disc Index pulses (FIDX) and sector pulses (FSTR) are routed to the CIB for further processing.

4.5.3.5 Load Head Logic

The load head logic circuit initiates the Run mode by generating three signals as described in the following paragraphs.

4.5.3.5.1 RTZ. A Return To Zero carriage return signal is generated during the power-on sequence to ensure that the carriage is retracted before the loading door can be opened. With the RUN/LOAD switch in LOAD position, the input from the switch is inverted and routed through an OR gate to clear the RDY DLY 1 flip-flop. The false output of this flip-flop is routed through two NOR gates and signal RTZ is high. A jumper option is included to permit the customer to select an inverted RTZ output signal. However, the jumper is hardwired in the position shown on the schematic when the unit is shipped from the factory. A basic block diagram of the load head logic circuit is shown in Figure 4-15. If the RUN/LOAD switch is placed in RUN position, the complement output of the CNT 2048 flip-flop in the retract circuit is low whenever the spindle speed is more than one percent below the specified figure. This causes the RDY DLY 1 flip-flop to clear and the RTZ line to be high. The RTZ signal is routed to the Servo Logic board where it is used as the determined Set Signal for the Unload flip-flop.

At this time, the data terminal of the CNT 2048 flip-flop in the solenoid logic circuit goes low as determined by the output of the rpm counter in the spindle motor speed detect circuit. The up-to-speed index pulse sets the CNT 2048 flip-flop causing one input to the AND gate at the clock input to the RDY DLY 1 flip-flop to go high. At the end of the brush cycle, when the disc brushes have been returned to Home position, the brush motor flip-flop is cleared by the output pulse from a 40-millisecond one-shot. This one-shot is triggered by the low-high transition of the inverter in the brush motor logic circuit. This signal is generated in response to the closing of the brush Home switch as described in the discussion of the brush motor circuit operation. As a result, the clear and data terminals of the RDLY 1 flip-flop will now be set by the next index pulse, while the $\overline{Q}$ output of the flip-flop goes low. This level is inverted, forcing signal RTZ low. This signal will remain low unless one of these conditions is present:

A. The RETURN ZERO command is received from the Control Interface board.
B. The spindle rotational speed varies more than $\pm$1% above or below the specified value.
C. The RUN/LOAD switch is placed in LOAD position.

As the result of any of these conditions, signal RTZ will go high and the carriage will be retracted.

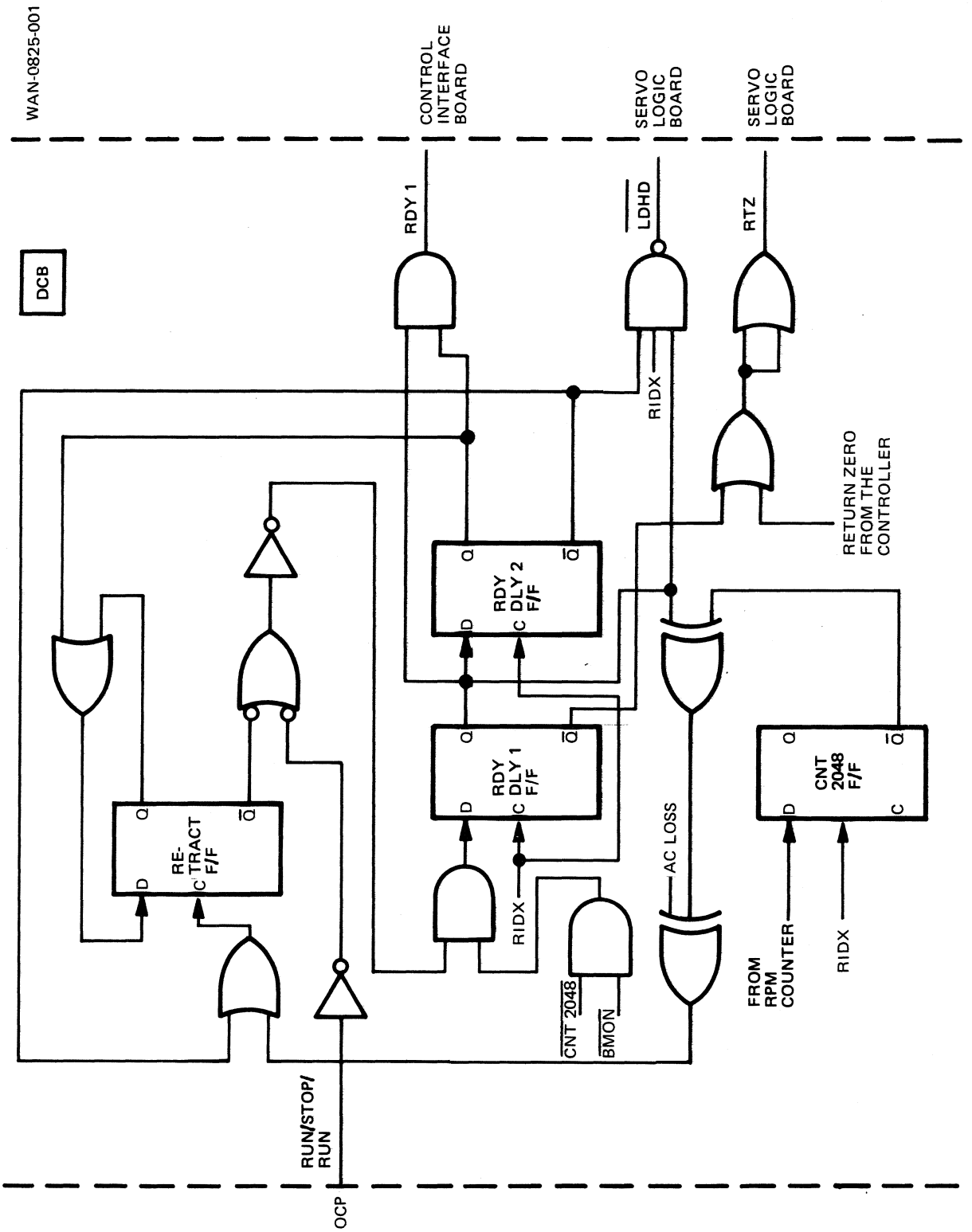


Figure 4-15. Block Diagram of Head Load Logic

4.5.3.5.2 LD HD (L). This is a pulse used to initiate the Initial Seek to track 000 which includes the head loading operation. This signal will be an active low for exactly the time duration of one Removable Index pulse (RIDX) and will be generated in the following manner (ref. figure 4-15):

A. The RDY DLY 1 flip-flop will be clocked reset by the same RIDX pulse that is the first to arrive soon enough to reset the RPM counters before they reach a count of 2048.
B. The same RIDX pulse will clock the RDY DLY 2 flip-flop set. This enables two legs of the LD HD (L) NAND gate. The next RIDX to arrive will generate LD HD (L) and it will be exactly the width of an RIDX pulse. This last RIDX pulse also clocked the RDY DLY 2 flip-flop set; therefore, additional LD HD (L) pulses will not be generated.

4.5.3.5.3 RDY 1. The Ready 1 signal is sent to the CIB for internal processing and the generation of the READY status signal and transmission of this signal to the Controller. This signal is produced when the true output of the RDY DLY 2 flip-flop goes high following generation of the LD HD pulse. Both inputs to the AND gate will be high and the gate will conduct. Thus, a RDY 1 signal is sent to the CIB. Signal RDY 1 will terminate in response to the same conditions that generate the RTZ signal, except for the external RETURN ZERO command from the Controller.

4.5.3.6 Solenoid Logic Circuit

The basic function of the solenoid logic circuit is to provide a solenoid signal (SOL) for unlocking the cartridge loading door.

4.5.3.6.1 SOL. When loading the cartridge, the brush Home microswitch is open. This causes the SOL line to go high with current being provided to actuate the door lock solenoid. Energizing the solenoid releases the locking mechanism, and the cartridge loading door can be opened. The SOL line remains high until the RUN/LOAD switch is placed in RUN position. In the Run mode, the preset terminal of the solenoid flip-flop goes low. This forces the solenoid to drop out, and the cartridge loading door will be locked for the duration of the Run mode.

4.5.3.6.2 POWER RESET. When power is applied to the unit, a power reset pulse is generated by a one-shot.

4.5.3.7 Brush Motor Logic. The brush motor logic circuit controls the motor used to cycle the disc cleaning brushes. When the BMON output goes high, a return path is provided for the brush motor current. As this condition occurs, the brush motor is activated and the brush cycle starts. A block diagram of the brush motor circuit is shown in Figure 4-16.

The Brush Motor Logic sets and turns the Brush Motor on when the RUN/LOAD switch is placed in RUN position. The motor operates a cam that cycles the brushes and controls the brush switch. When the brushes are in Home position, this switch is open and BRUSH MOTOR ON (–) is high. As the motor starts, the switch closes and the BRUSH MOTOR ON (–) goes low. This resets the Brush Motor flip-flop but retains the Brush Motor On (BM ON (+) signal high until the brush cycle is complete and the brushes return Home again.

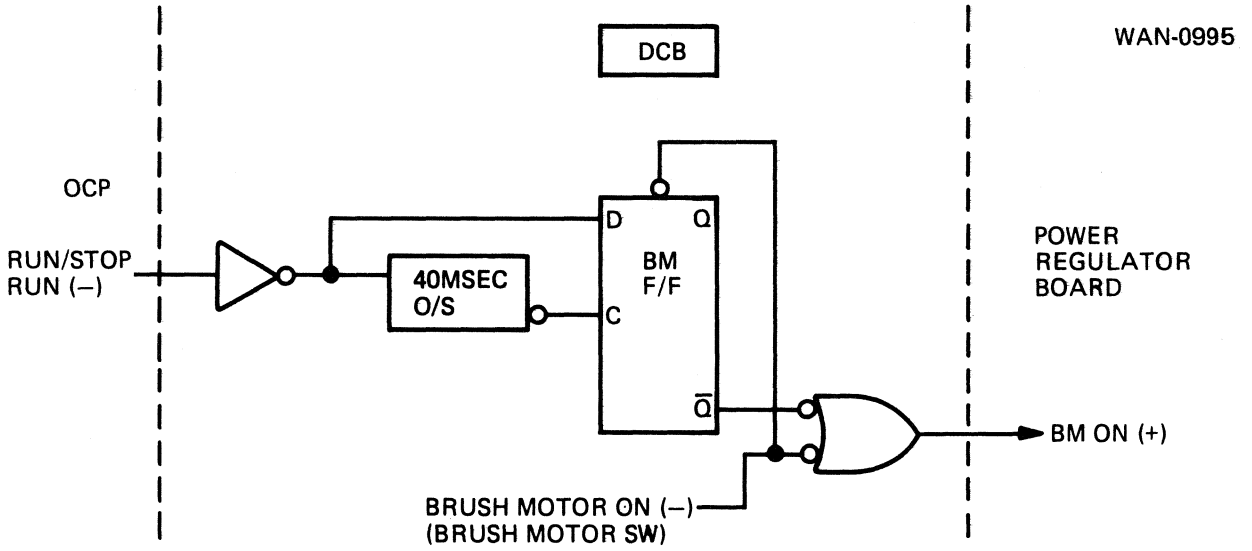


Figure 4-16. Block Diagram of Brush Motor Logic Circuit

4.5.4 POWER REGULATOR BOARD (PRB)

4.5.4.1 Board Functions. A block diagram of the PRB is shown in Figure 4-17. The main functions performed by the logic circuits on this circuit board are:

A. Regulate ±13 V. DC voltages.
B. Energize solenoid.
C. Enable brush motor circuit.
D. Generate HARD PICK signal.
E. Energize READY and LOAD indicators
F. Detect AC Loss.

4.5.4.2 Cartridge Interlock Solenoid. When the solenoid signal (SOL) from the RUN/LOAD logic circuit is high, the LOAD indicator on the OCP is illuminated. A transistor is turned on simultaneously with lighting of the lamp to supply current to the door lock solenoid. The solenoid releases the locking mechanism, and the cartridge loading door can be opened.

4.5.4.3 Brush Motor Control. When signal BM ON in the brush motor control cycle is high, the output of the NAND gate to the BRUSH MOTOR line is low, and a path is provided for the brush motor current. The brush motor starts to turn thus rotating the cam which cycles the cleaning brushes and actuates the brush control switch. This operation is performed in conjunction with the circuits on the Disc Control Board.

4.5.4.4 Generation of Hard Pick. In 1500-rpm units, signal HARD PICK is generated immediately when power is applied, and this line remains high until the spindle has attained full speed. In 2400-rpm units, signal SPM ON is not generated until the spindle has reached approximately 70% of its full speed. The HARD PICK signal is developed from the speed control circuits whenever the spindle speed drops 1% below the specified speed of the disc drive being used.

4.5.4.5 Ready Indicator. When the READY line on the Control Interface board is high, the READY lamp driver is turned on. Current then is applied to the READY indicator lamp.

4.5.4.6 AC Loss. An 18V. RMS voltage is transferred from the power supply to the Power Regulator board. This voltage is rectified and used to turn on a transistor. In the event of loss of AC input power, the capacitor at the input to the transistor discharges, turns off the transistor, and isolates the circuit from ground. This occurs approximately 20 milliseconds following a loss of AC power. The DC voltages are still applied due to the charge stored in the power supply capacitors.

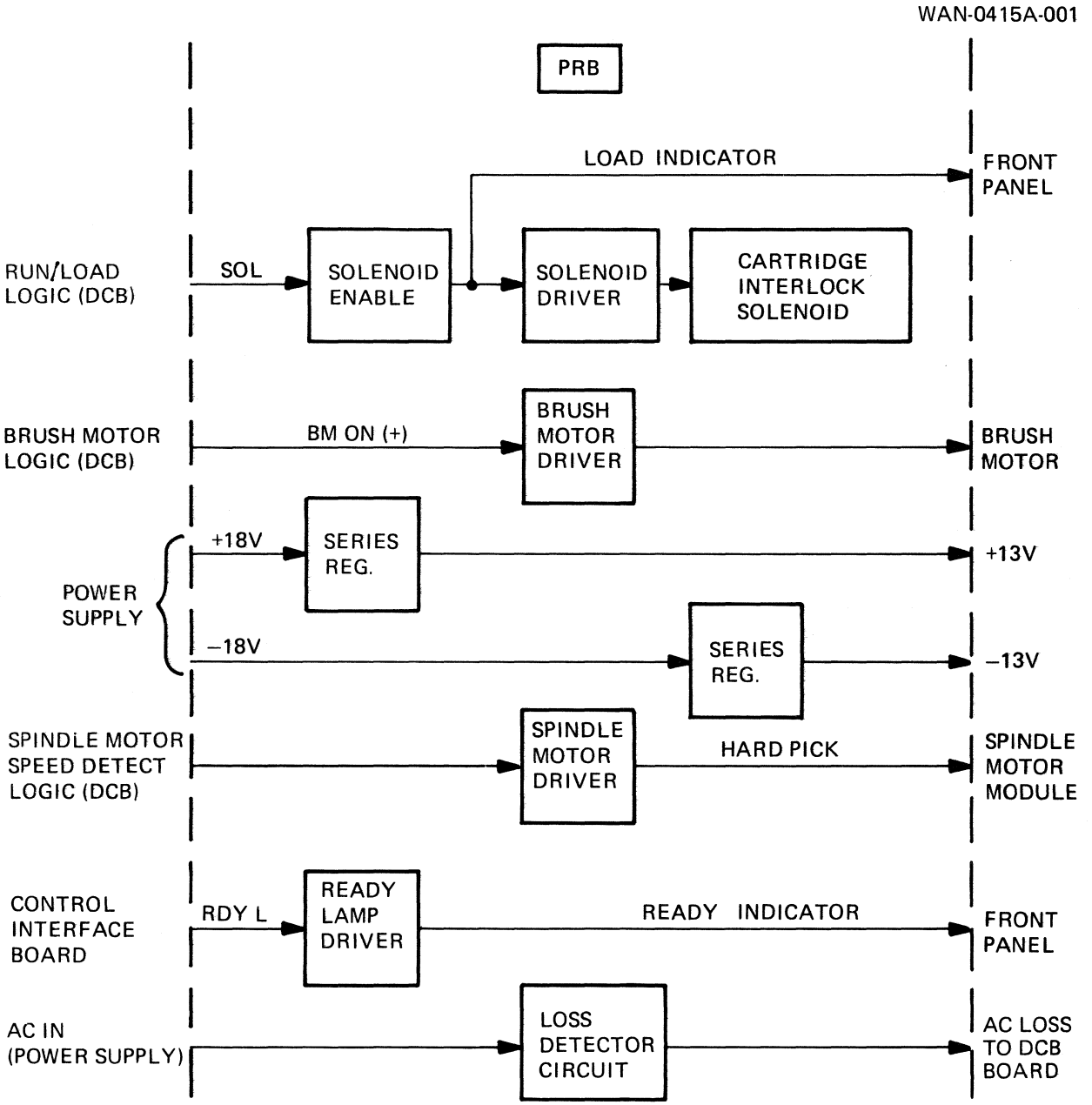


Figure 4-17. Block Diagram of Power Regulator Board

4.5.5 TRANSDUCER DIFFERENTIATOR CIRCUIT BOARD

This circuit board is included in the Series F Disc Drives only. The sole purpose of this board is to convert the output signal from the index/sector transducer to be compatible with that of the Series T unit. Both the outline drawing and schematic for this circuit board are included on drawing 300921 in Appendix C.

4.5.6 SERVO LOGIC BOARD (SLB)

4.5.6.1 Circuit Board Functions. The principal functions performed by the logic circuits on this board include:

A. Store new cylinder address.
B. Decode illegal address.
C. Store current positioner address.
D. Generate and condition difference signal.
E. Utilize BOT signal and detent pulses.
F. Generate positioner control signals.
G. Temperature compensation (200 TPI units only).

4.5.6.2 New Address Register (NAR). The SLB contains the New Address Register into which the desired cylinder address is loaded at the start of a Seek operation. The binary value stored in the Current Address Register (CAR) subsequently is compared to the value in the NAR, and a difference value is obtained. This value is converted to an analog signal proportional to the number of tracks to be crossed. The heads must be loaded and the RDY status line to the Controller must be true to notify the Controller that the Disc Drive is ready to receive operational commands. The NAR is cleared when the BOT 1 flip-flop is set, and the cylinder address is strobed into the NAR by the Delay Seek one-shot. A block diagram of the Servo Logic Board is shown in Figure 4-18.

The cylinder address from the Controller is routed to the SLB via the Input/Output Connector Board (IOB) and the Data Interface Board (DIB) on the input lines labeled ADD 1 through ADD 256. These inputs are supplied to flip-flops which comprise the NAR on the SLB. Signal SK, a positive-going pulse, is used to trigger a one-shot, the output of which is applied to the clock input of the flip-flops in the NAR.

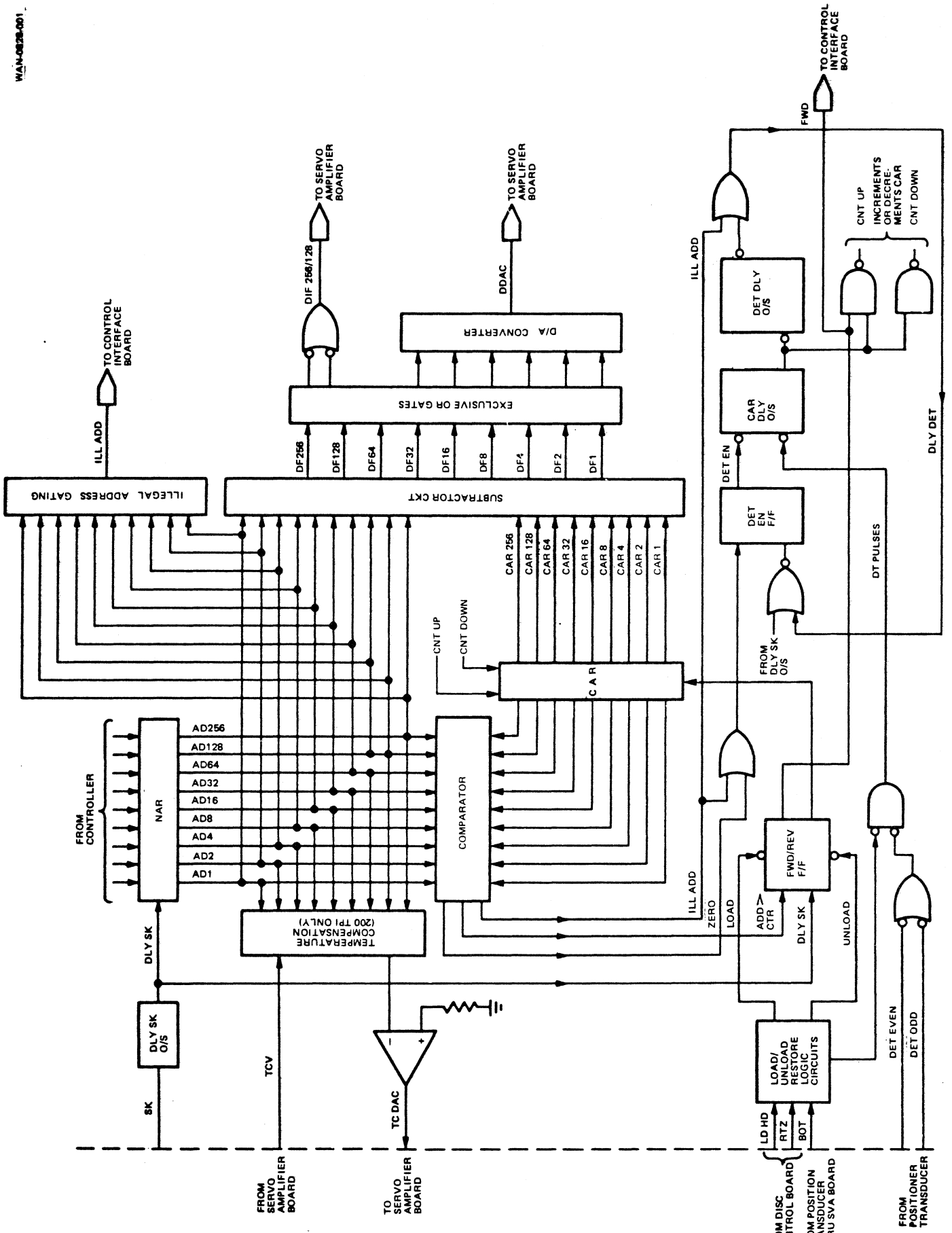


Figure 4-18. Block Diagram of Servo Logic Board

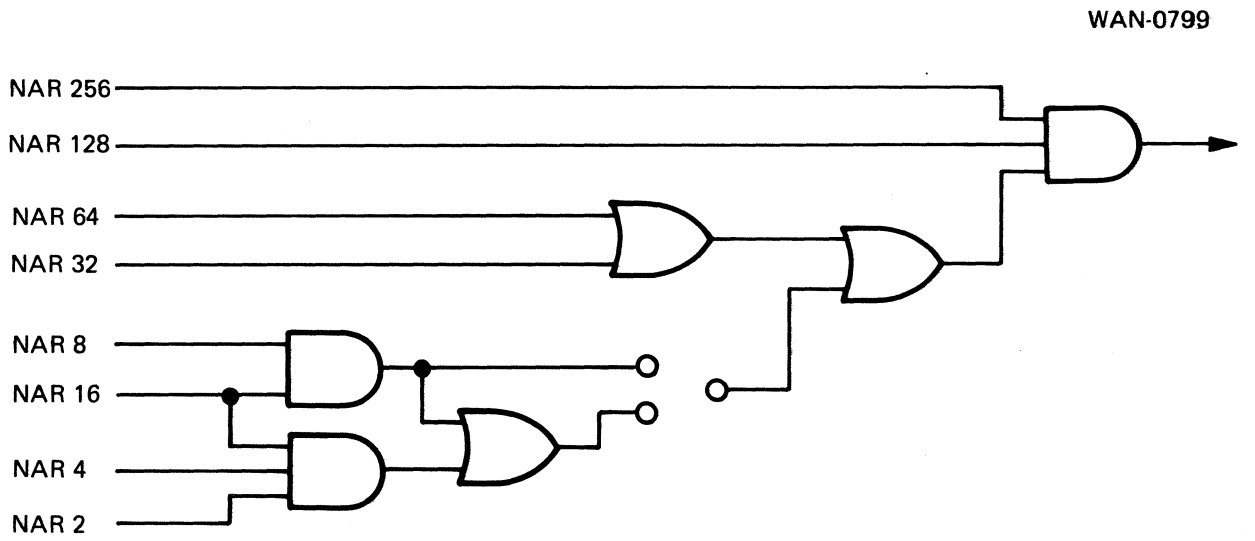
4.5.6.3 Illegal Address (ILL AD). The Q outputs of the NAR flip-flops are applied to a decoder circuit. Both the decoder circuits for the 100 TPI and the 200 TPI Disc Drive are shown in Figure 4-19. If the value of the binary number is greater than the number of valid tracks for the disc, an ILL AD status signal is generated. The address is ignored by the Disc Drive, and the carriage remains in its present position. Legal addresses are indicated for values less than octal 625 or 627 on the 200 TPI Disc Drive. On the 100 TPI Disc Drive, cylinder addresses up to either octal 312 or 313 (internally selectable) are accepted.

4.5.6.4 Current Address (CAR). The CAR is made up of three four-bit up/down counters. This register receives COUNT UP or COUNT DOWN pulses from the CAR DLY one-shot through the applicable NAND gate. The output of the counter represents the movement of the carriage on which the Read/Write heads are mounted as they move radially across the concentric recording tracks. The counters are cleared by a CLR CNTR (100 TPI) or CLR CAR (200 TPI) signal from the set side of the BOT 1 flip-flop.

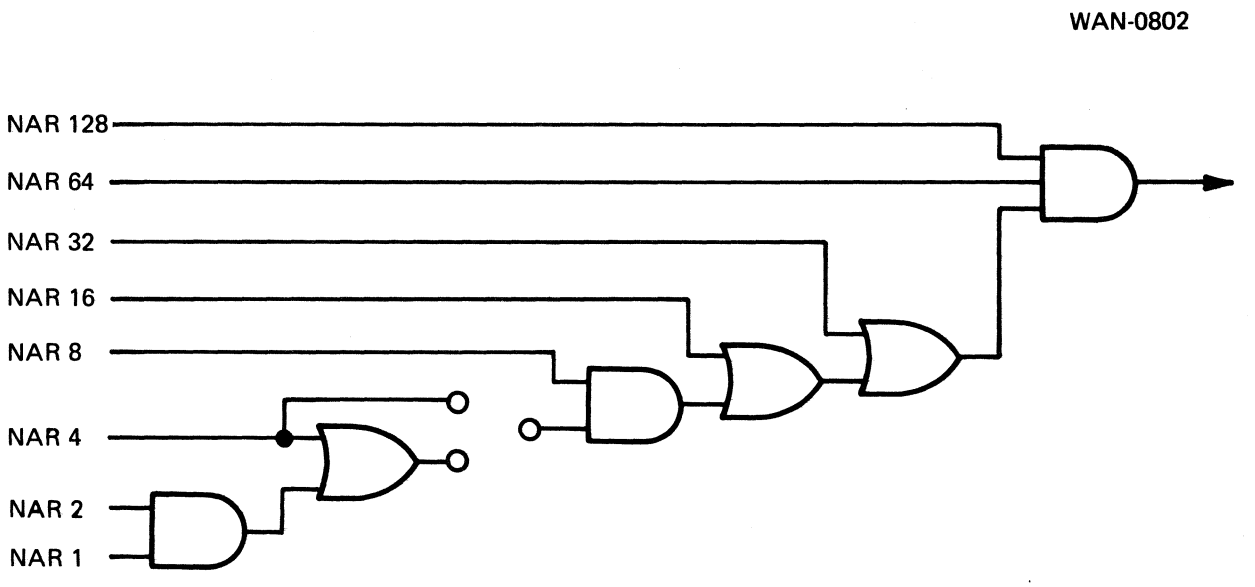
4.5.6.5 Subtractor Circuit. The outputs of the CAR are applied to a subtractor made up of full adders. In the subtractor circuits, these inputs are subtracted from the NAR outputs. The full adders in the subtractor circuit are configured with exclusive OR gates as a binary subtractor, using the 1's complement to obtain the difference figure. The CAR and NAR outputs are also used to generate the ZERO and NAR CAR signals by comparing their values in comparator circuits COMP-1 and COMP-2.

The subtractor circuit used in the 100 TPI Disc Drive is shown in Figure 4-20; the circuit used in the 200 TPI Disc Drive is shown in Figure 4-21. The outputs of the subtractor are the lines from the exclusive OR gates. All these lines, except the two highest order positions, are applied to a digital-to-analog converter with the analog output, signal D DAC, being routed to the Servo Amplifier Board (SVA).

4.5.6.6 Generation of LOAD Signal. The LD HD signal is generated automatically as the disc comes up to speed. This negative-going pulse has a width equal to that of the index pulse. When this pulse is received from the DCB, it direct sets the LOAD flip-flop, and the LOAD/UNLOAD signals are generated and routed to the SVA. There, the generated signal selects an FET whose output establishes the speed at which the heads may load. Simultaneously, the negative-going LOAD (—) pulse is routed to the determined set input of the FWD flip-flop. Signal FWD is routed to the SVA to be used in the initial Seek operation as described in the discussion of the SVA board.



a. ILL ADD Decoder – 200 TPI



b. ILL ADD Decoder – 100 TPI

Figure 4-19. Illegal Address Gating Circuits

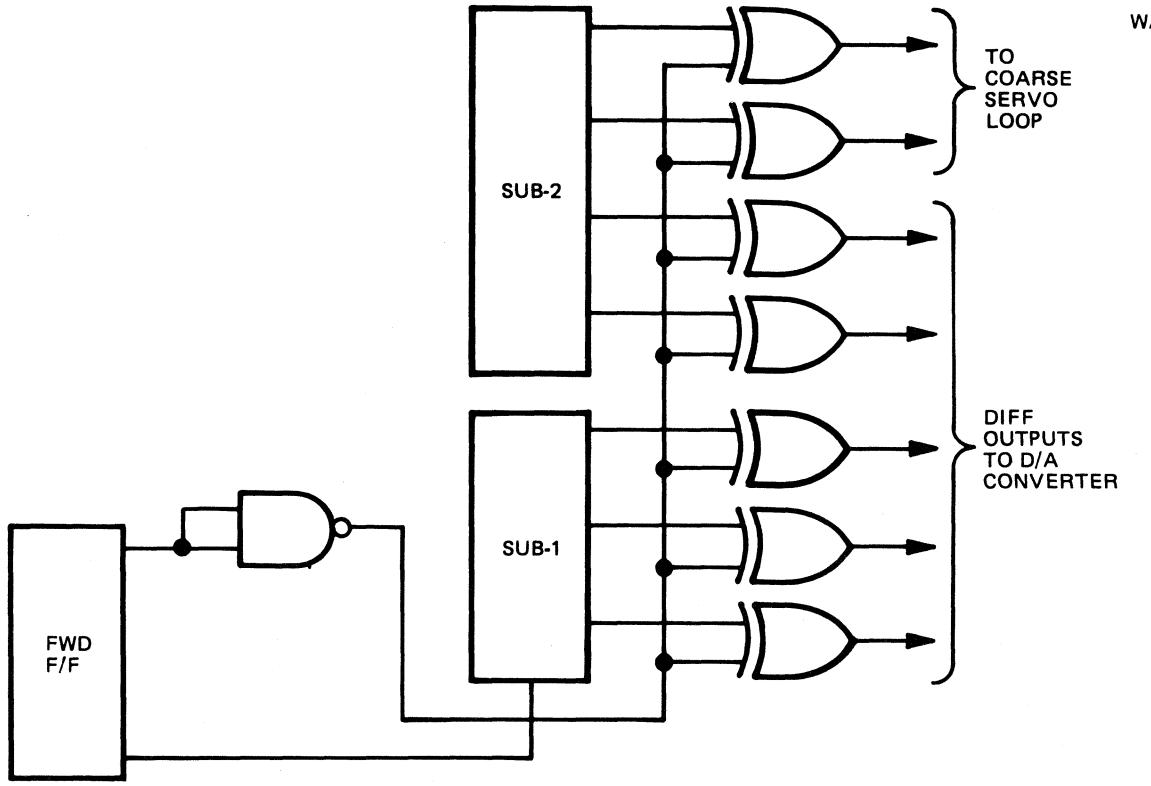


Figure 4-20. Subtractor Circuit — 100 TPI

4.5.6.7 Beginning of Travel Pulse. The Beginning of Travel pulse is developed by the position transducer two tracks before the carriage reaches track 000 position. This negative going pulse is developed on the SVA board and is routed to the Servo Logic Board (SLB). There, the positive transition of the signal is used to clear the LOAD flip-flop and to set the BOT 1 flip-flop. The output from the clear side of the BOT 1 flip-flop maintains the positive LOAD/UNLOAD signal to the SVA board and ensures that forward motion will be continued. The second detent pulse after the BOT pulse causes signal DETENT ODD to go low thus setting the DETENT flip-flop. The output of the DETENT flip-flop clears the BOT 1 flip-flop thus removing the LOAD/UNLOAD signal, and the positioner is detented (locked) at track 000.

4.5.6.8 Detent Operation. Track 000 is defined as the position of the carriage (and heads) at which the second odd detent signal is detected and takes place between the termination of the second and start of the third detent pulse. At this point, the detent signal has a positive slope; e.g., it is negative and rising toward zero. Therefore, the positioner slows down rapidly to approximately zero forward speed as it approaches the addressed concentric recording track. Because of the moving-mass inertia, some overshoot will occur, but the positioner is driven backward toward track 000 (the zero crossing of the detent signal) by the positive excursion of the detent signal. When the carriage is locked over track 000, eventually the signals SEEK COMP and READY are generated.

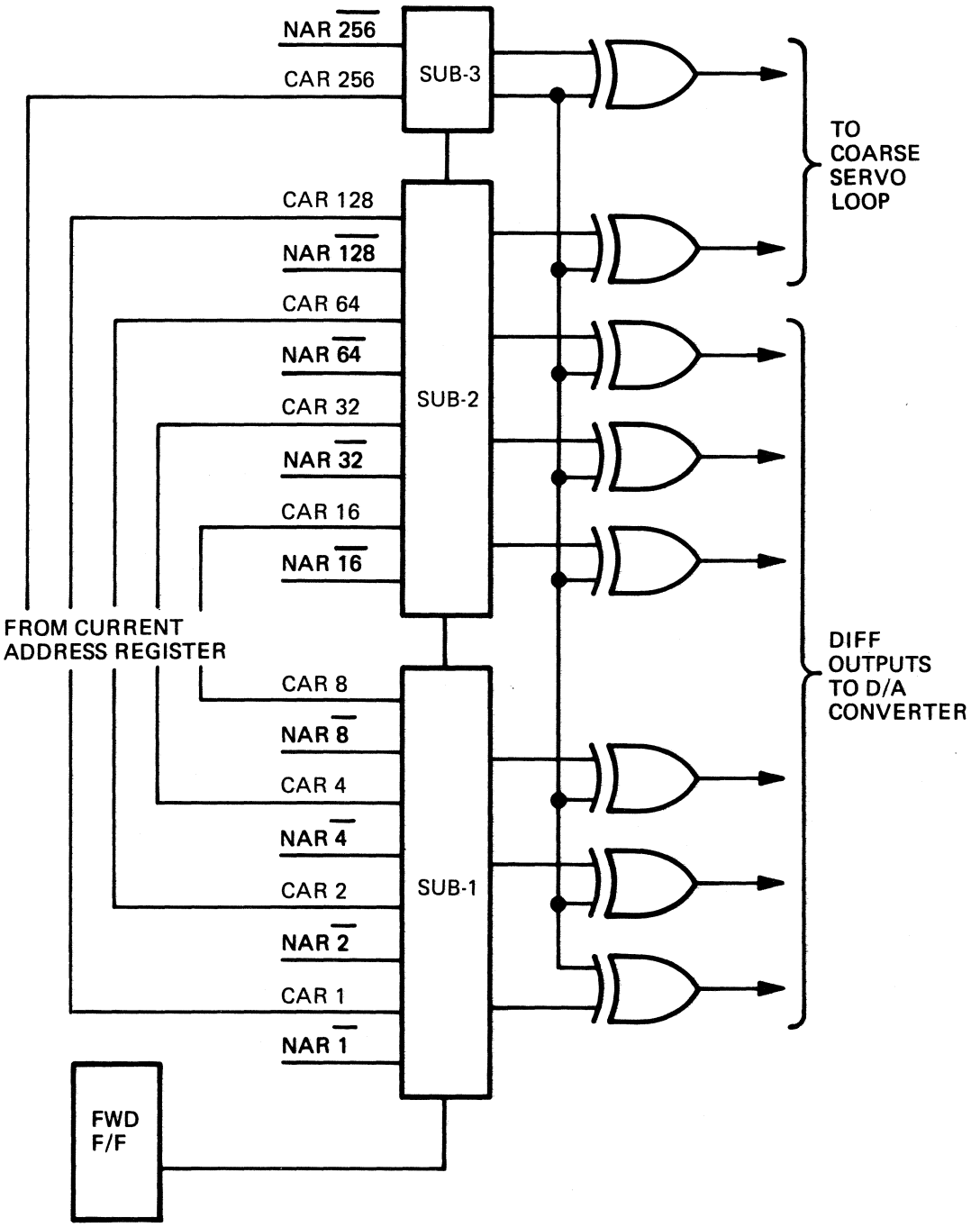


Figure 4-21. Subtractor Circuit – 200 TPI

4.5.6.9 Detent Pulses. As the carriage moves the R/W heads radially across the concentric recording tracks, the optical position transducer detects the track crossing as described in the mechanical description of the head positioning servo system. The position transducer transmits a series of modified sinewave signals to the SVA board (ref. figure 4-8). There, the pulses are shaped and amplified; then, depending on the phase of the modified sinewave, the DET ODD or DET EVEN pulses are decoded to produce DT P pulses. These pulses trigger the CAR DLY O/S whose output is gated with the selected output of the FWD flip-flop to produce the signal required to increment or decrement the Current Address Register.

4.5.6.10 Zero Difference. The updated output from the CAR is constantly compared to the binary cylinder address stored in the NAR during a Seek operation by the two halves of the comparator (COMP-1 and COMP-2). When the comparator detects that the current value in the CAR equals that stored in the NAR, a ZERO signal is generated. This signal enables the set input of the Detent flip-flop, and this flip-flop will be clock-set when the Delay Detent one-shot times out.

4.5.6.11 Temperature Compensation Voltage (TCV). The TCV signal (used on the 200 TPI Disc Drive only) provides temperature compensation consisting of an analog signal proportional to the ambient temperature within the Disc Drive. This is accomplished by processing the output of a thermistor located on the base of the chassis. The analog signal is set at zero tolerance at the midpoint of the operating range. A procedure to be used in monitoring operation of the temperature compensation circuit is described in Section 5.

4.5.7 SERVO AMPLIFIER BOARD (SVA)

4.5.7.1 Board Functions. The main functions performed by the logic circuits on this circuit board include:

A. Provide drive current to positioner motor.
B. Generate BOT and Detent pulses.
C. Energize Servo motor relay.

A block diagram of the SVA circuit board showing the principal signal paths and functional blocks is shown in Figure 4-22.

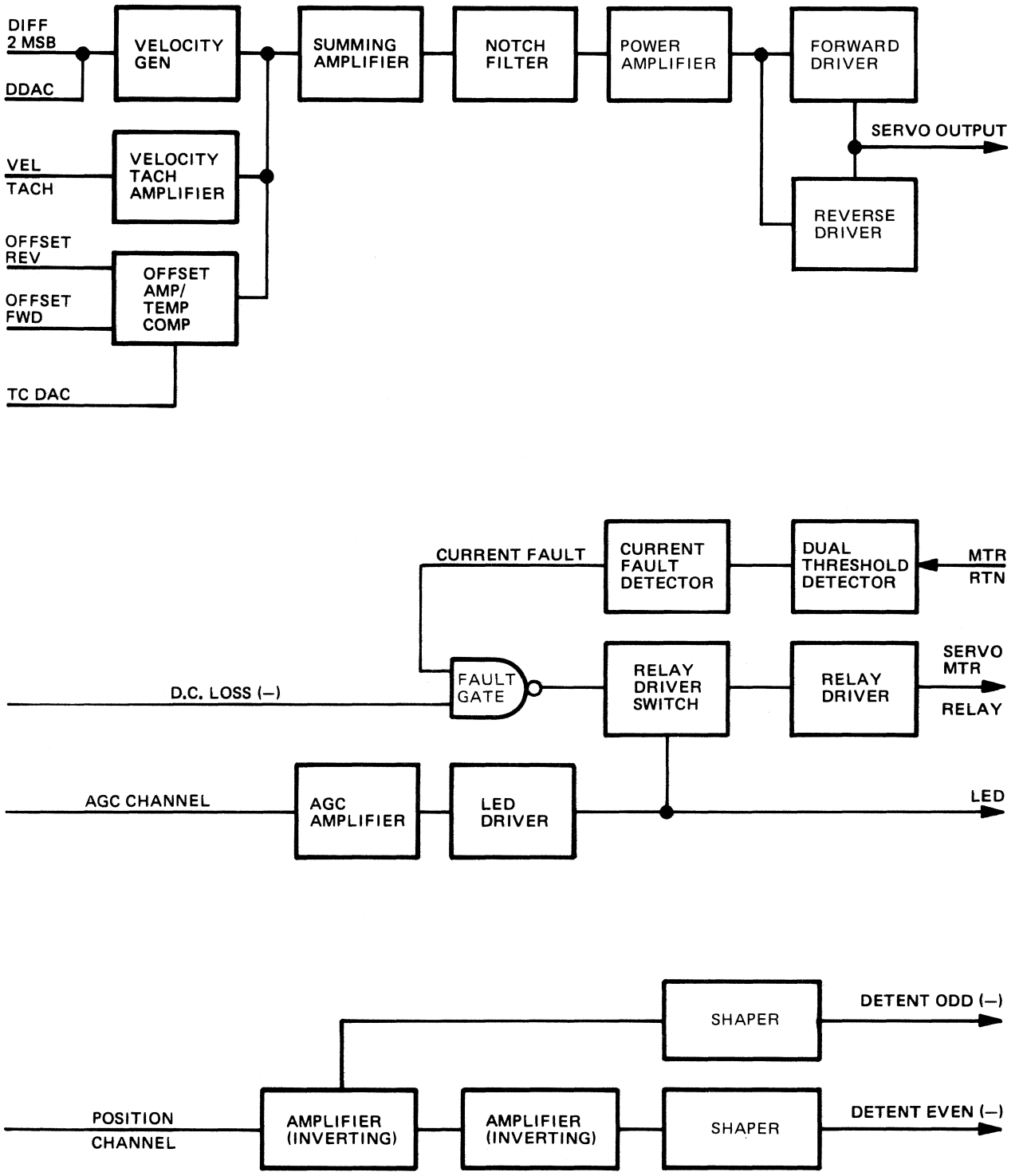


Figure 4-22. Block Diagram of Servo Amplifier Board

4.5.7.2 Drive Control Signal Generation. This operational cycle is initiated by signals generated on the Servo Logic Board (SLB) as described in the circuit analysis of that board. Figure 4-23 is a timing diagram showing the sequence of events occurring during the initial Track 000 Seek operation with the abbreviations of the source of each input. The FWD signal from the SLB is inverted and used to ground an FET used as an electronic switch. The positive current is amplified and applied to a comparator which enables either the FWD driver or the REV driver depending on the direction in which the positioner is to move. The SERVO AMPLIFIER OUTPUT signal then is routed to the power amplifier on the Power Regulator Board (PRB) through the harness assembly, and is used as a drive control signal to actuate the positioner. The COARSE SERVO ENABLE input from the SLB also grounds the gate of an FET, and the carriage (and heads) begins to move. The FET's on the SVA set up signal paths for direction of positioner travel and associated drive signal control functions. A notch filler with an emitter follower output is used to eliminate mechanical resonances.

4.5.7.3 DDAC Input. The SVA receives several inputs from the SLB. As described in the discussion of that circuit board, the difference figure obtained from subtracting the current binary in the CAR from that in the NAR is applied to a digital-to-analog converter. This difference signal, DDAC, is applied to the Velocity Ramp generator on the SVA. Note that the DIF 2 MSB signal is applied to the amplifier in parallel with the DDAC input. This signal constitutes the two most significant digits in the Difference Output. As long as the signal is high, the profile amplifier will be saturated, and the carriage will move forward (or backward) at maximum speed. When this input goes low, the output of the digital-to-analog converter will determine the speed at which the positioner moves the carriage toward the addressed track. The speed will decrease in steps, as shown in Figure 4-24, the timing diagram for the New Address Seek operation. A Digital-to-Analog converter in conjunction with a ramp generator are used to decrease the Servo Amp output exponentially.

4.5.7.4 Velocity Generator Operation. The analog output of the D-A converter is applied to the velocity generator circuit. The output of this circuit is slightly aided or inhibited by the electronic tach output. The SERVO AMPLIFIER OUTPUT signal then is routed to the linear positioner motor. The output of the electronic tach circuit is used as a reference voltage. If the positioner carriage is moving as fast as the coarse servo amplifier logic circuits have programmed it to go, no correctional voltage will be generated. However, if the SERVO AMPLIFIER OUTPUT signal does not drive the positioner at the correct rate of motion, the correction voltage will be sent to either the FWD or REV FET.

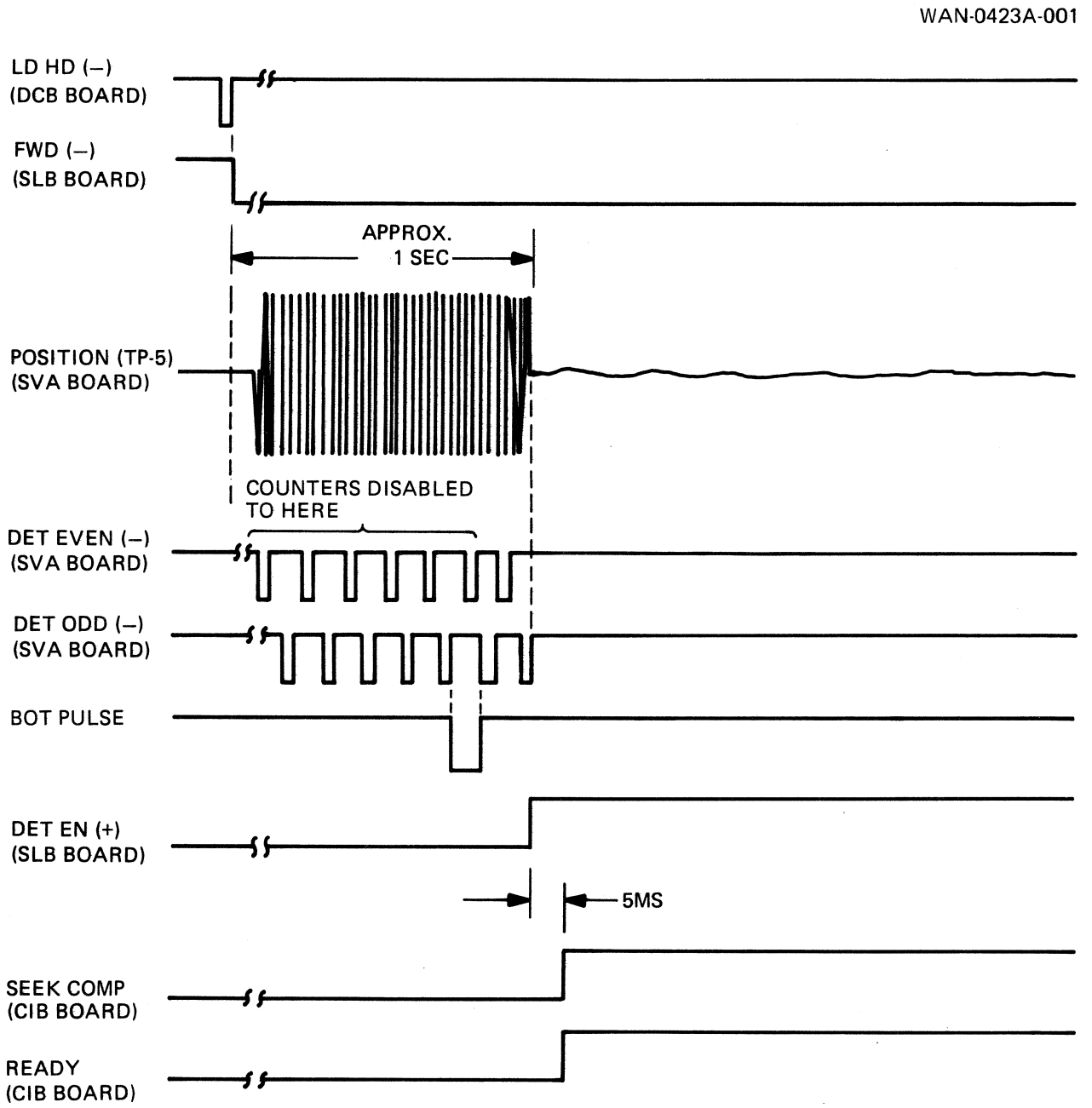


Figure 4-23. Initial Address Seek Operation Waveforms

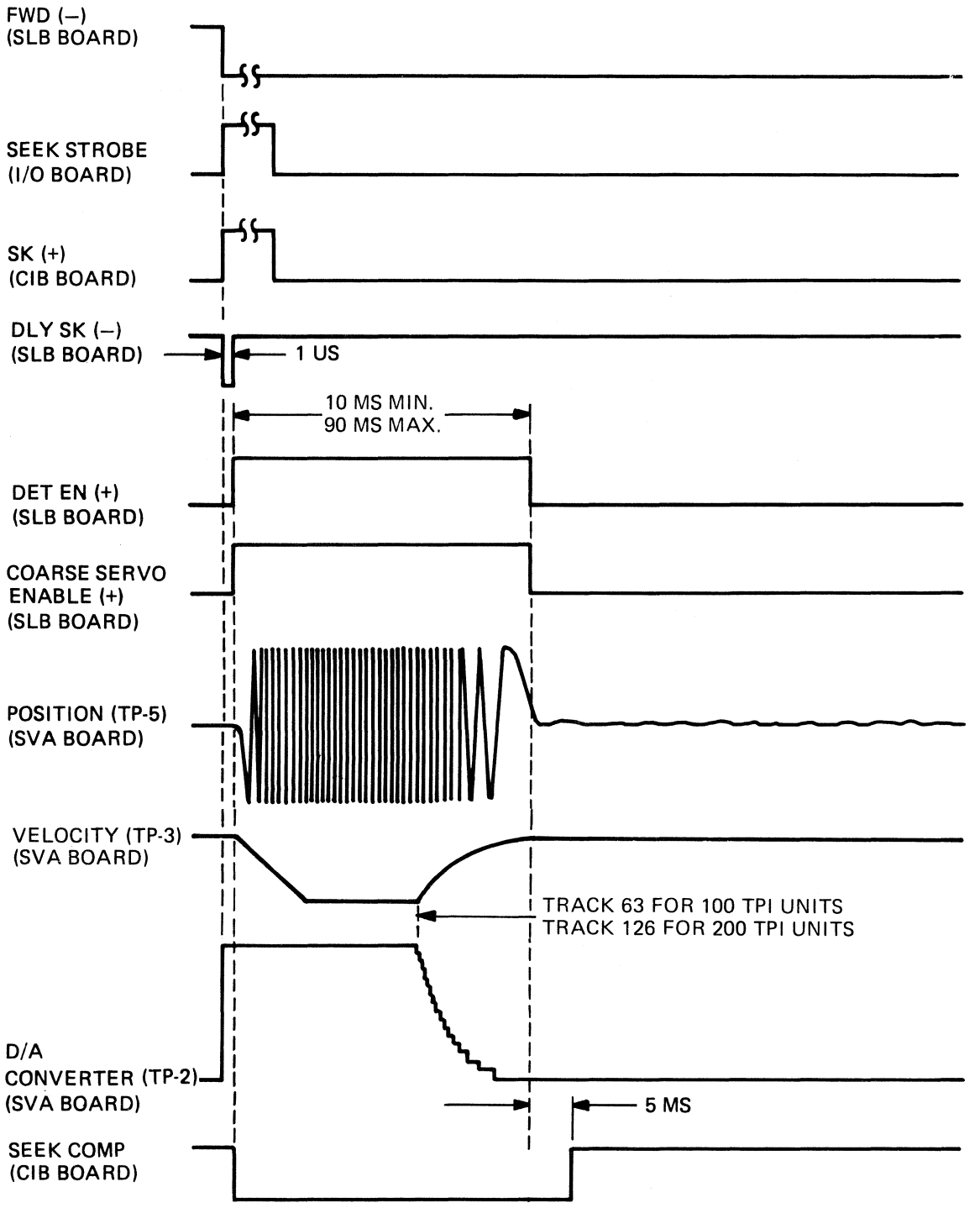


Figure 4-24. New Address Seek Operation Waveforms

4.5.7.5 Positioning Servo System. Head positioning to a desired track is accomplished by means of the positioner servo system. This system, a block diagram of which is shown in Figure 4-25, consists of a positioner motor, a coarse servo loop, a fine servo loop, a FET multiplexer, a summing junction and amplifier, and a servo amplifier. When the spindle motor comes up to speed, the IDX pulses set the RDY 1 flip-flop and cause signal LD HD to be generated with the LOAD/UNLOAD line going high. The FWD signal is generated on the Servo Logic Board (SLB) when the contents of the Current Address Counter (CAR) equals the binary value stored in the New Address Register (NAR). When the FWD and LOAD/UNLOAD lines go high, the servo amplifier is activated.

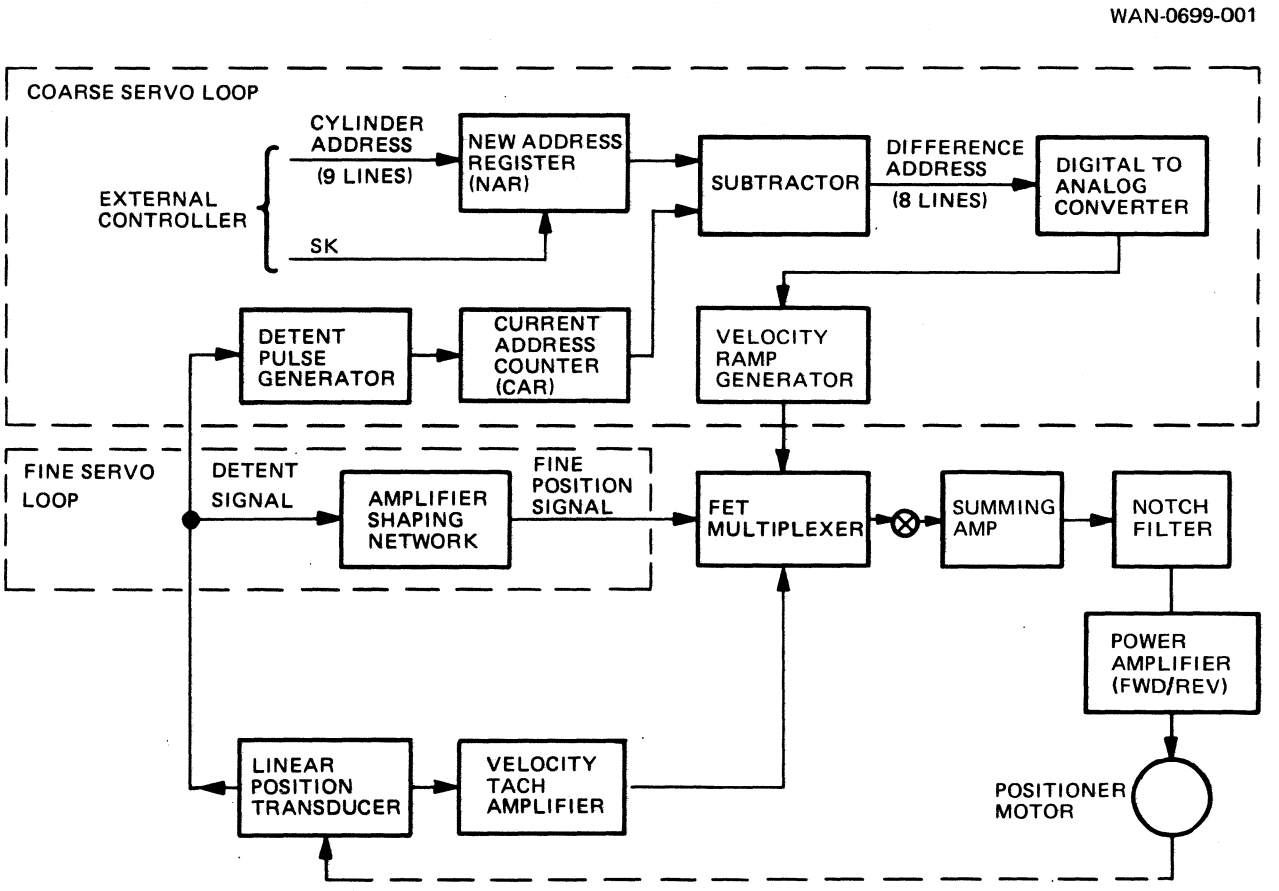


Figure 4-25. Positioner Servo

4.5.7.6 Final Detent. The coarse servo loop signal is applied through the servo amplifier and FWD or REV circuits until the positioner is within one track of the cylinder address stored in the NAR. At this time the SERVO DETENT ENABLE signal is generated. The comparator sets the Detent Enable flip-flop which enables the fine servo loop. The coarse servo loop is disabled when the fine servo loop is activated (and vice versa). The servo detents (locks) the heads in place over the selected track. If the last track address is even, detenting takes place on the positive slope of the position transducer signal (even track). If the last address bit is odd, detenting takes place on the negative slope of the position transducer signal (odd track). With the fine servo loop activated, final lock-on is implemented as the DET ODD and DET EVEN inputs to the Servo Logic Board (SLB) cause the final increment of the CAR. When the CAR is sampled following the final counter increment/decrement, final detent is accomplished. When the heads have settled over the addressed track for 5 milliseconds (minimum), the SEEK COMP status signal is transmitted to the Controller as described in the discussion of the Control Interface Board. Normal retraction of the positioner carriage occurs if the RUN/LOAD switch is placed in LOAD position. This activates a multiplex switch which applies a specific input to the servo amplifier to effect full retraction of the positioner.

4.5.7.7 Track Offset, Forward, and Reverse. The 100/200 TPI Disc Drive has the ability to retrieve marginal data. Two lines from the Controller allow the positioner to be offset by a predetermined amount, approximately ½ mil (0.0127 mm), in the selected direction in either FWD or REV. A simplified logic diagram of the offset circuit is shown in Figure 4-26. These lines can be used to recover marginal data during a Read operation and must not be used when writing. Offsetting is accomplished by injecting a small amount of current into the main servo summing junction as shown on the SVA schematic (Appendix C).

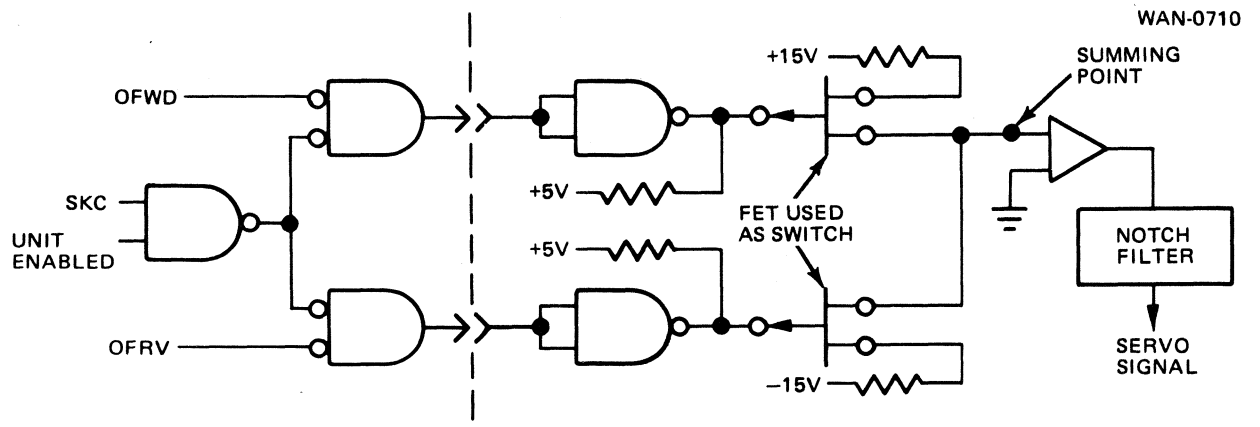


Figure 4-26. Servo Offset Signals

4.5.8 DATA ELECTRONICS BOARD (DEB)

4.5.8.1 Introduction. The Data Electronics board contains the circuitry for processing I/O data to and from the external Controller on separate Read and Write channels and provides the necessary Write Protect logic to ensure that data is neither improperly written nor erased. A block diagram of the DEB showing signal paths and circuit components is shown in Figure 4-27. Refer to the schematic of the Data Electronics board (Appendix C) when following the circuit analysis.

4.5.8.2 Disc/Head Selection. The four cable assemblies from the Read/Write heads plug into receptacles mounted on this circuit board. The diodes shown next to the connectors on the schematic are selection diodes. The head activated is selected by decoding the HD SEL and DISC SEL inputs from the Controller. Jumpers are included to provide customer options. The NAND gates at the output of the decoder circuit are drivers used to ground the center point of the selected head. A logic diagram illustrating the decoding circuit is shown in Figure 4-28.

4.5.8.3 Read Operation. In a Read operation, the sinusoidal output from the selected head coils is passed through an isolation transformer and then amplified. Diodes provide overload protection for the Read amplifier. Correct termination of the Read/Write coils is provided by an RC termination network. The output of the Read Amplifier is passed through a low-pass filter for noise suppression and is differentiated. The output of the differentiator then is shaped in a two stage limiter, which delivers square-wave pulses. The limiter outputs, READ DATA 1 and READ DATA 2, are sent to the Data Interface Board for further processing including separation of data and clock pulses. A simplified logic diagram of the Read/Write amplifier is shown in Figure 4-29. (Refer to figure 3-8 for a timing diagram showing data transfer characteristics.)

4.5.8.4 Write Operation. The Write data is received from the external Controller on the WRITE DATA line. It is first processed by circuitry on the Data Interface Board then sent to the Write circuits on the Data Electronics Board (DEB). The WRITE DATA signal toggles the Write flip-flop; the true or false outputs of which, are routed to the two Write current drivers. The WRITE flip-flop is enabled or disabled by WRITE signal. Other ways the Write Operation can be inhibited are when any of the following conditions exist:

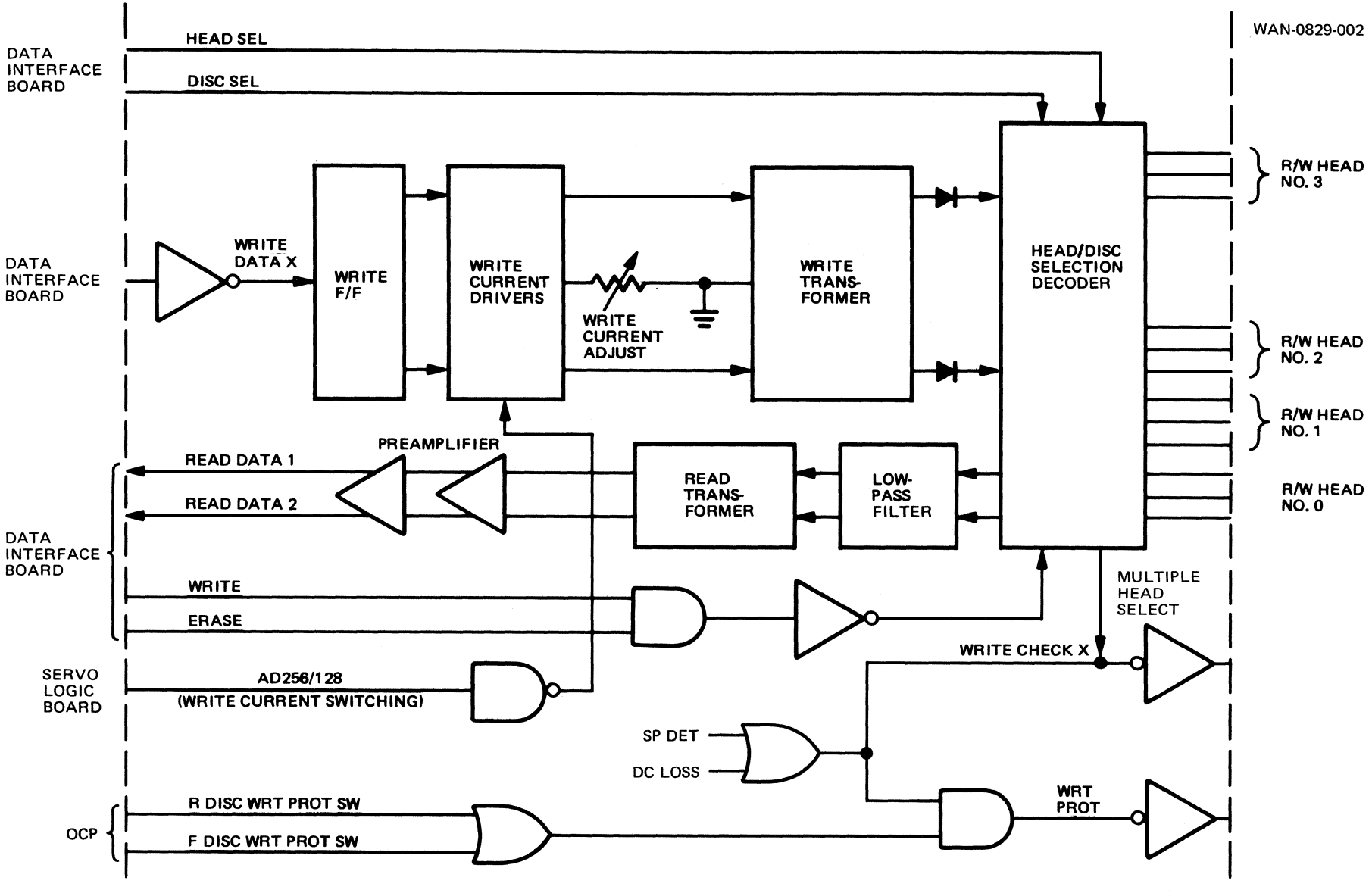


Figure 4-27. Block Diagram of Data Electronics Board

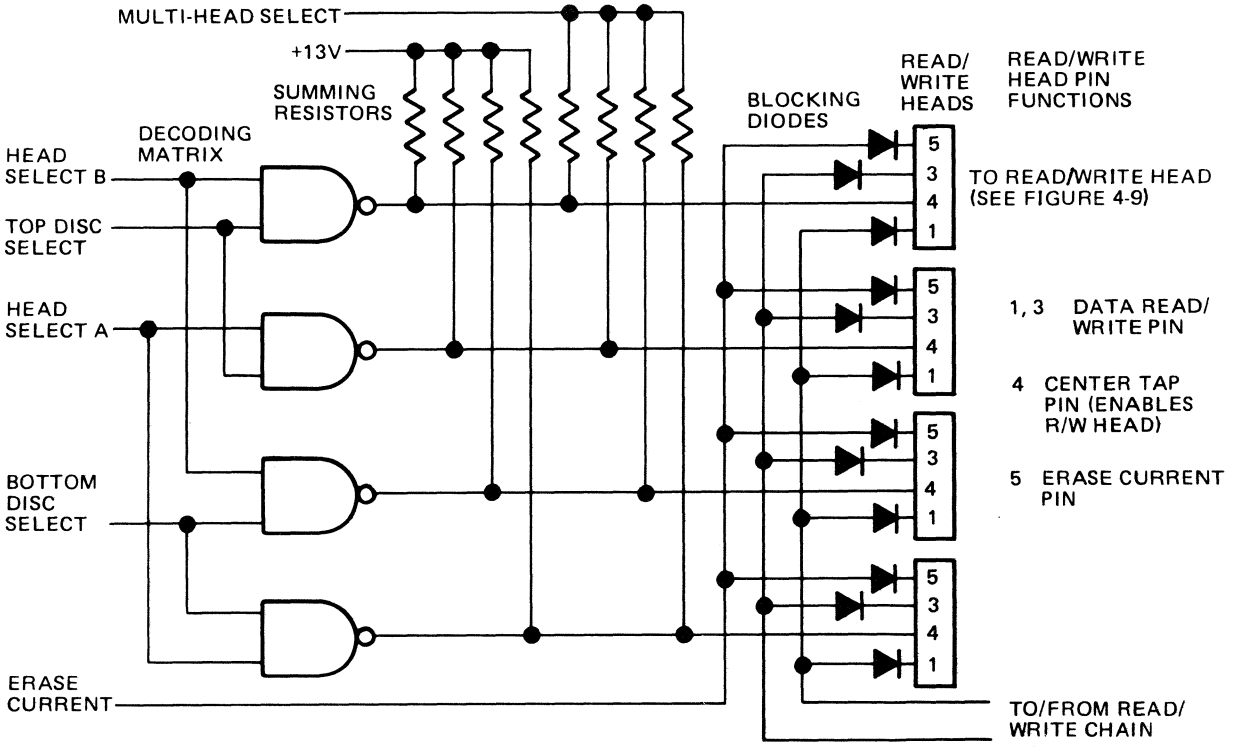


Figure 4-28. Disc/Head Selection Decoder

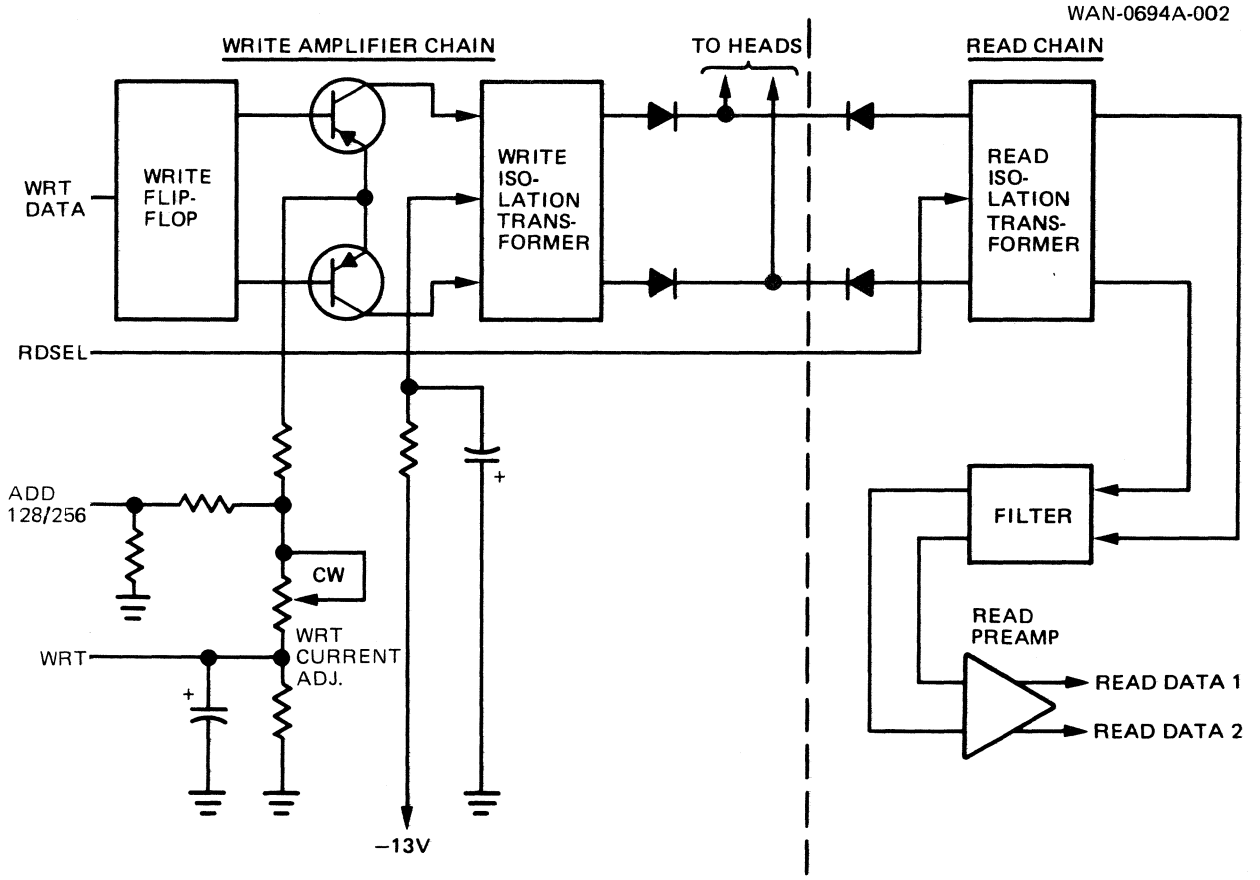


Figure 4-29. Block Diagram of Read/Write Amplifier

A. The fixed disc PROT FIXED switch on the OCP is depressed and the fixed disc is selected.

B. The removable cartridge PROT CART switch is depressed and the removable disc is selected.

C. The SP DETEC input from the Disc Control Board (DCB) is high and/or two or more Read/Write heads are selected simultaneously.

NOTE

Conditions A, B, or C, in any combination, can occur simultaneously.

If none of the inhibiting conditions exist, the Write Operation will be enabled. The Write flip-flop will change state for every Write data pulse and will supply base drive to one of the two transistors. Whichever transistor is gated on will deliver Write current into the write transformer. Output voltage from the transformer causes one of the two diodes to be forward biased, and Write current flows into the selected head. A timing diagram showing the relative waveshapes of Read and Write data is shown in Figure 4-30.

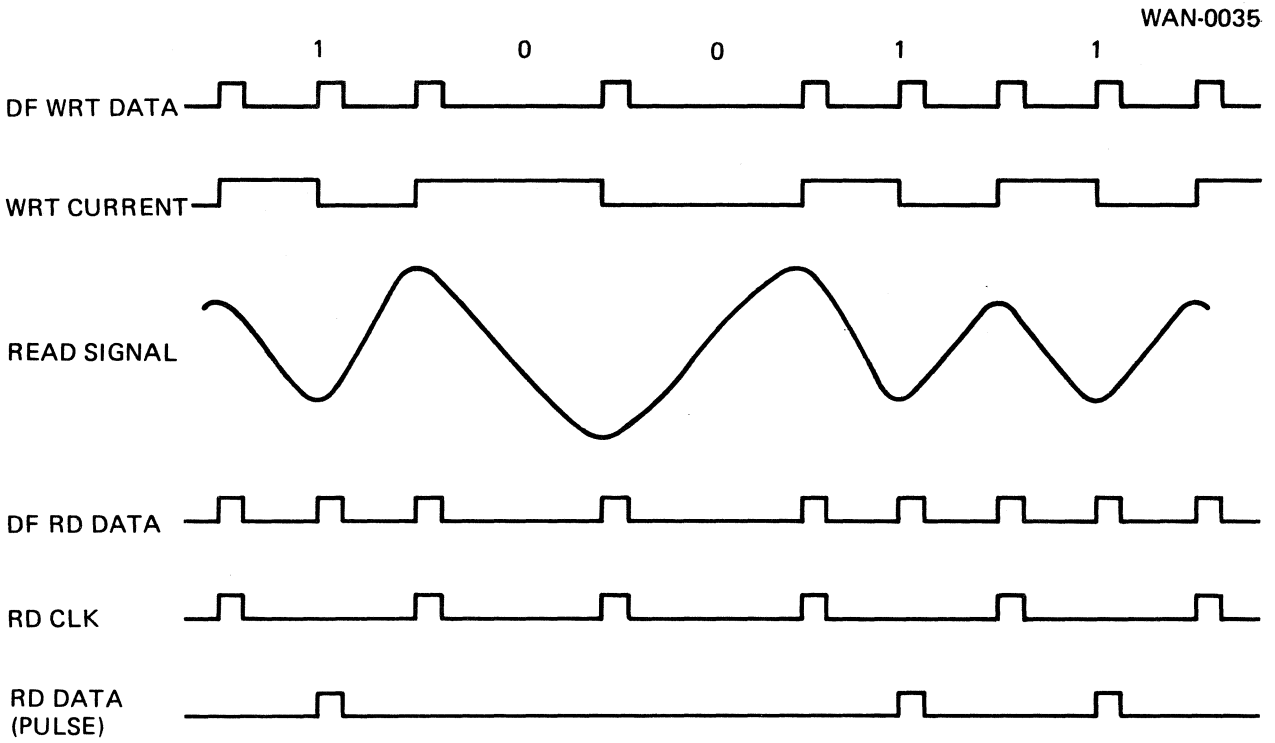


Figure 4-30. Read and Write Signals – Relative Timing

4.5.8.5 Erasing. Drive current for the erase coil is supplied by the Erase Driver which is gated on by an AND gate in the ERASE input line. The erase coil is energized automatically during a Write operation. The output of the gate turns on a transistor whose output is routed to, and activates, the erase windings on the Read/Write heads. The erase gap on each side of the data track is used to erase both edges of the Written track to improve reliability of the written data as shown in Figure 4-31.

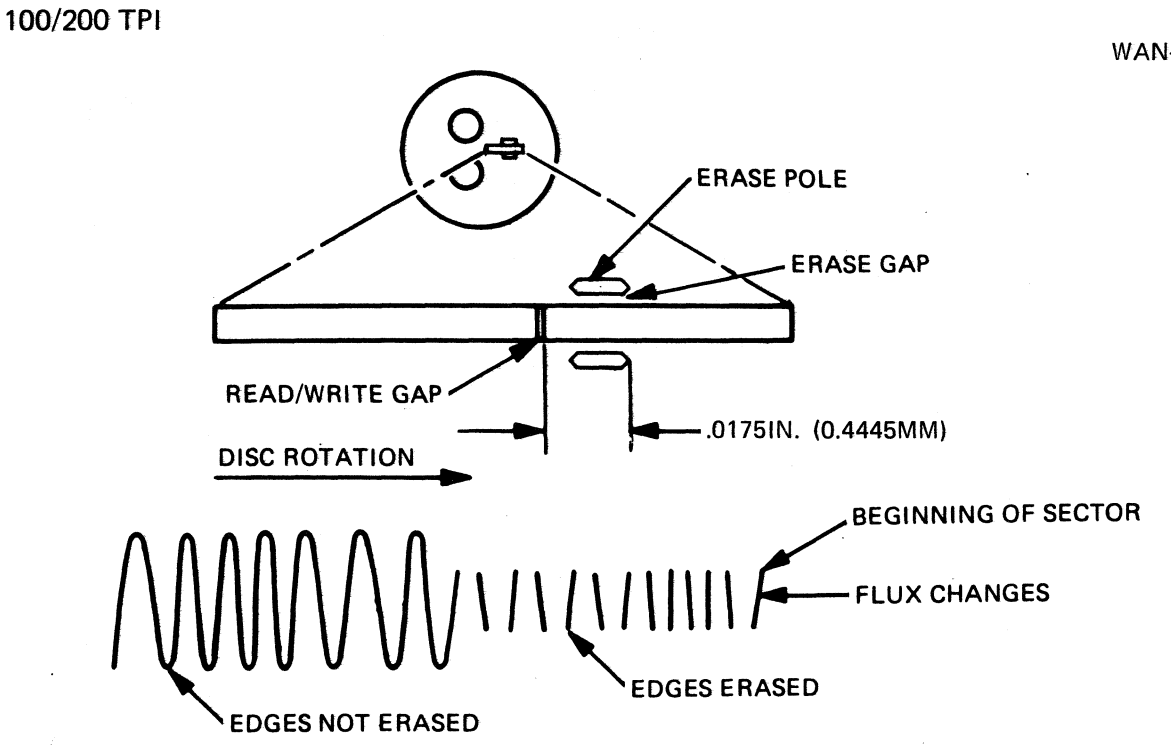


Figure 4-31. Edge Erasing

4.5.8.6 Write Current Switching. During a Write operation, the current to the write coil in the Read/Write head is increased as the most significant output line from the Current Address Counter (CAR) goes high. This will be the AD256 line on 200 TPI Disc Drives or AD128 on 100 TPI units. Specifically, tracks 0 through 255 (127) are written with a higher current (approximately 35 milliamperes) than tracks 256 through 408 (128 through 204). The Write current on these tracks is decreased to approximately 30 milliamperes. Since recording density increases in proportion to the track number, improved bit resolution is obtained if the inside tracks are written with a lower level of Write current. The process is performed in the following manner: the most significant bit of the new cylinder address is routed to the Servo Amplifier Board (SVA) from the Servo Logic Board (SLB). This signal goes high when the head changes from track 255 to track 256 (127 to 128). As a result, when signal AD256 (AD128) goes high, less Write current is caused to flow into the emitters of the two Write amplifiers, and the remainder is shunted to ground. The Write current potentiometer is used to preset the Write current level.

Conversely, when the head position changes from track 256 to 255 (128 to 127), the output of the NAND gate goes high. Thus, the Write amplifier current drivers are switched back to the higher current level.

4.5.8.7 Write Protection. If writing is conditionally inhibited because of a spindle speed deviation of more than 1% or because of multiple head selection, a corresponding status signal, WRITE CHECK, is transmitted to the Controller. The internal signal, WRT CHK X is developed at the output of the inverter. If writing is unconditionally inhibited by means of the PROT CART or PROT FIXED control switches, a corresponding status signal, WRITE PROT is transmitted to the external Controller. The internal signal for this function is designated WRT PROT.

4.5.9 CONTROL INTERFACE BOARD (CIB)

4.5.9.1 Introduction. The Control Interface Board provides a means for transferring separated index and sector pulses to the external Controller. It also contains circuitry for controlling the signals described in the following paragraphs.

4.5.9.2 Seek Complete. The DETENT MODE signal, generated on the Servo Amplifier Board (SVA) when the fine servo loop is activated, is routed to the CIB and starts the Seek Complete Delay 5-millisecond timer. Before the low-high transition of the Detent Enable (DET EN) pulse, the clear terminal of the Seek Complete flip-flop was held low. Therefore, the SEEK COMP output is low until the timeout period expires and the flip-flop is set (assuming jumper connections M to L and KK to MM). When signal DET EN is high, the clear and data terminals of the Seek Complete flip-flop are high. This flip-flop now can be triggered by an output from the ADD ACK Delay and Pulse width flip-flops, in which case, the SEEK COMP line will go high. The negative input terminal to the SKC Delay one-shot receives triggers from the PSEUDO SECTOR 2000 line at approximately 20-microsecond intervals (depending on spindle rotational speed). This 5-millisecond one-shot will start timing at power turn-on; however, it can not time out since it is successively retriggered. When the DETENT MODE signal inhibits these trigger pulses, the time-out period starts, and the Seek Complete flip-flop is set after 5 milliseconds allowing the heads time to settle over the addressed recording track.

As the carriage moves forward and detent pulses are developed, the DETENT MODE signal will be low. After the last detent pulse has been detected and the positioner has settled, signal DETENT MODE will go high. The timer will generate a 5-millisecond pulse after the low-high transition of the DETENT MODE signal; and at the trailing edge of the pulse from the SKC Delay one-shot, the Seek Complete flip-flop is set. The SEEK COMP line will remain high until a SEEK STROBE Command is received from the Controller.

4.5.9.3 Ready Signal. When the Seek Complete flip-flop is toggled and its true output terminal goes high, this signal is routed to a NAND gate to remove the clock input to the Ready flip-flop. This gate is enabled by the Removable Cartridge Index pulse (RIDX) from the Disc Control Board (DCB) and before the Seek Complete flip-flop is set; thus, the Ready flip-flop will set with the RDY 1 signal from the DCB. The false output is inverted and causes the READY status signal to be transmitted to the Controller. At the same time, the Ready Light (RDY L) line goes high, and this signal lights the READY indicator on the OCP. The READY line will go low if:

A. The RDY 1 input from the DCB goes low, or:
B. A fault condition exists causing loss of operating voltage.

Figure 4-32 is a timing diagram of the events required to generate the READY status signal.

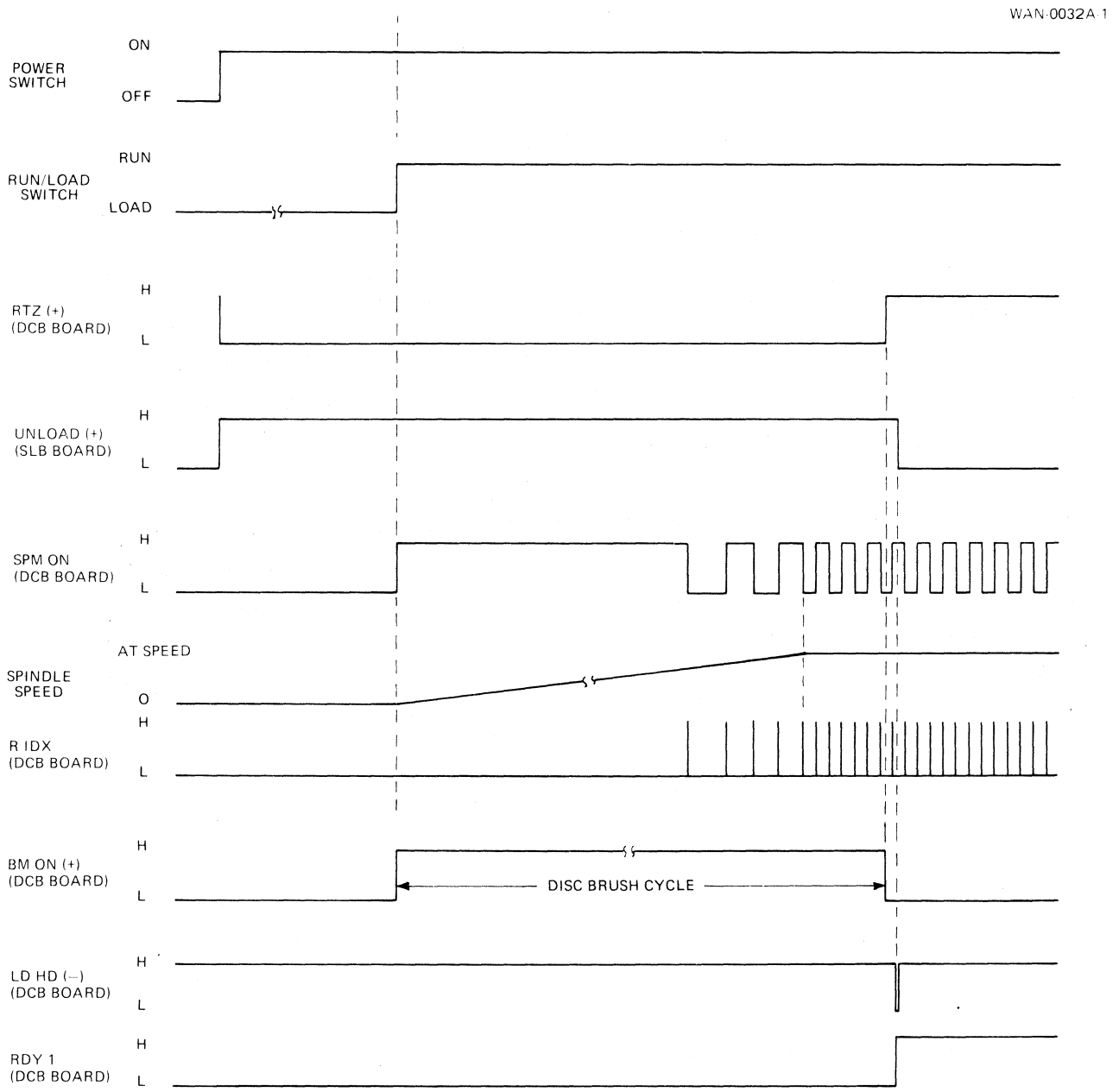


Figure 4-32. Events to Produce READY Signal

4.5.9.4 Seek Strobe. The SEEK STROBE command from the Controller is applied to a three-input AND gate on the Control Interface Board (CIB). One of the other two inputs is the output of the Ready flip-flop, so the Disc Drive must be ready to receive inputs before this gate is enabled. The third possible input is the LOAD/UNLOAD pulse from the Servo Logic Board (SLB) which is generated during a LOAD or RESTORE Command cycle. Note that jumper provisions are provided for the LOAD/UNLOAD signal as described in the table on the CIB schematic (Appendix C). When no fault conditions are present, the SEEK (SK) output will go high during a Seek strobe. The output of this gate also starts the Seek Incomplete timer as described in paragraph 4.5.9.5. A block diagram showing control signal paths in the CIB is presented in Figure 4-33.

4.5.9.5 Seek Incomplete. The leading edge of the SEEK pulse triggers the 400-millisecond Seek Incomplete timer, which is connected to the clock input of the Seek Incomplete flip-flop, and the timer is started by the high-low transition. If the Seek Incomplete timer times out before the Seek Complete flip-flop is set by the DETENT MODE input, the Seek Incomplete flip-flop will be set and the SEEK INCOMP line will go high. This status signal is transmitted to the Controller to indicate an incompleted Seek operation. Since the maximum time to access the innermost track is approximately 90 milliseconds, the Seek Complete flip-flop normally will be set, and the Seek Incomplete timer will not finish its timeout period.

4.5.9.6 Return To Zero. When the Seek Incomplete flip-flop is set, the output of the flip-flop is ORed with numerous signals. The output of the OR gate fires the RTZ one-shot whose positive-going output sends a pulse to the Disc Control Board (DCB) on the RETURN ZERO line. There, the RTZ signal is developed, and the retraction of the carriage is initiated.

4.5.9.7 Restore Operation. When the CL RESTORE pulse enters the Control Interface Board (CIB), it is applied to a three-input AND gate. One of the other inputs is the output of the Ready flip-flop, so the Disc Drive must be Ready to implement commands from the Controller before this gate is enabled. The third input is comprised of many variable signals but must be high at this time. The leading edge of the positive-going pulse at the output of this gate fires the 2-millisecond RTZ one-shot. The low-high output of the one-shot then is transmitted to the DCB on the RETURN ZERO line. A timing diagram of the Restore operation is shown in Figure 4-34.

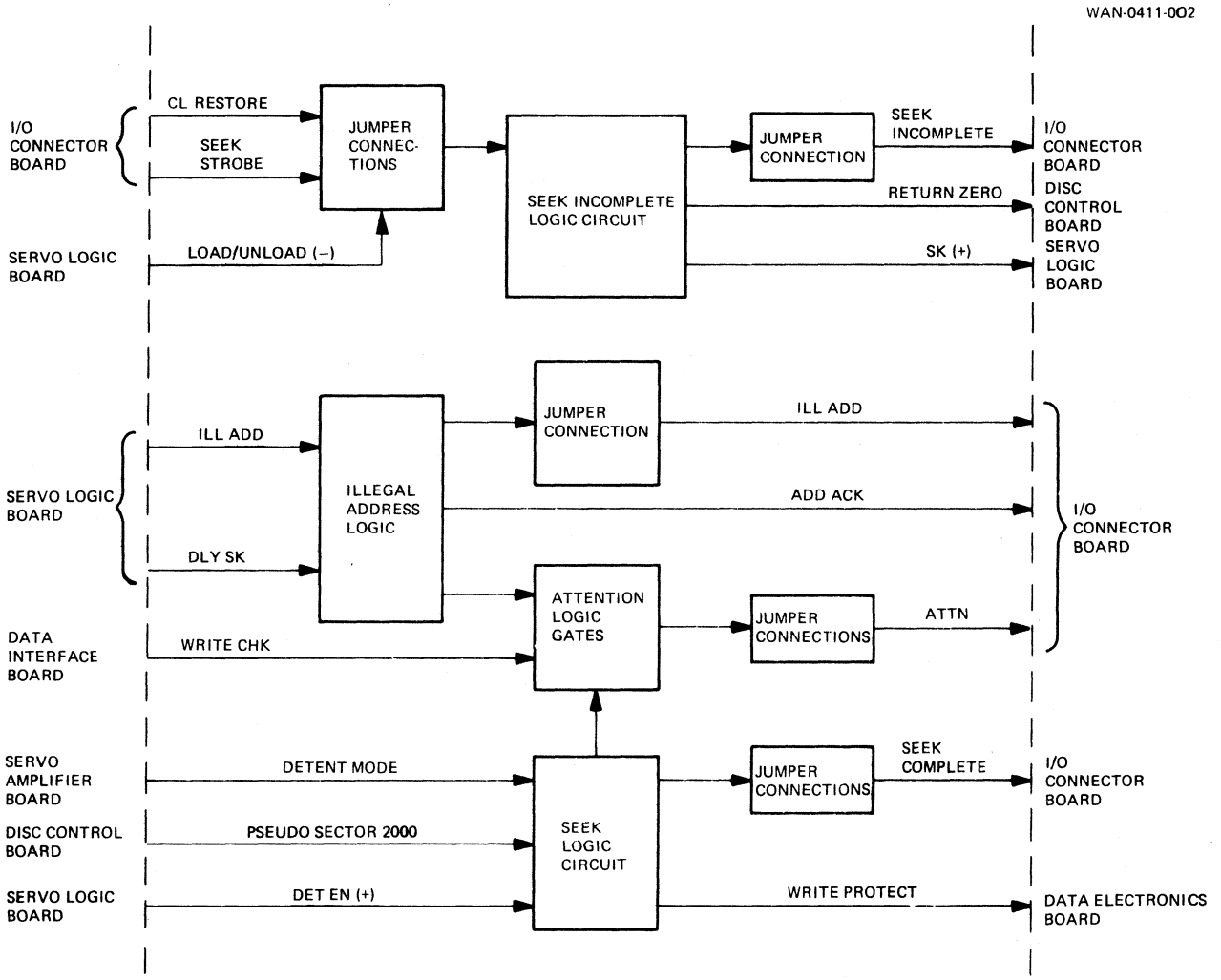


Figure 4-33. Block Diagram – Control Interface Board (CIB) Control Logic Circuits

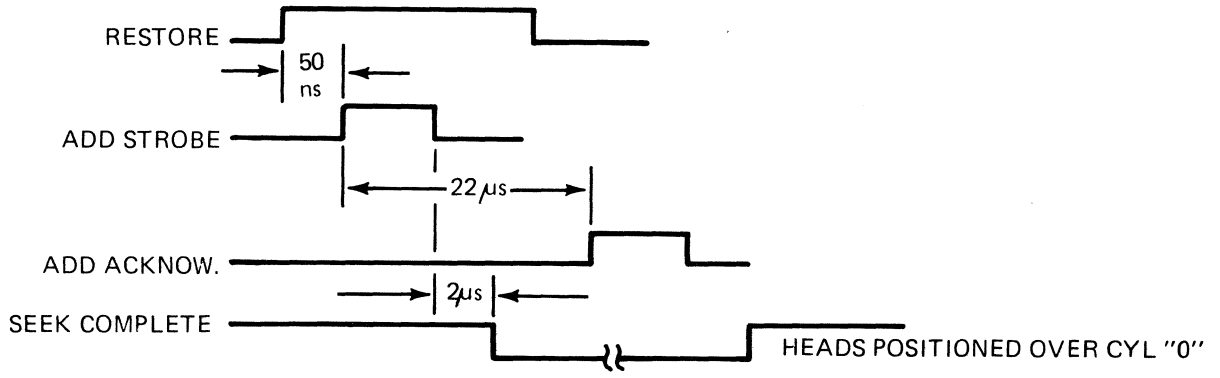


Figure 4-34. Restore Operation Timing Diagram

4.5.9.8 Illegal Address/Acknowledge Address. The ILL ADD input is received from the SLB (refer to paragraph 4.5.6.2) and makes the Data input of the Illegal Address flip-flop go high. The trailing edge of the DLY SK pulse clock-sets the flip-flop, and the ILL ADD line goes high. A jumper pad is included to provide customer-designated options.

If the cylinder address is legal (406 or 408 – 200 TPI) (202 or 203 – 100 TPI), the Seek operation will begin at the DLY SK event, and the Address Acknowledge (ADD ACK) signal will go high. This status line will then be transmitted to the Controller. Note that either the ILL ADD or ADD ACK signal will be high, since these outputs constitute the Q and $\overline{Q}$ outputs of the Illegal Address flip-flop respectively. The setting of this flip-flop is a function of the DLY SK pulse (described in paragraph 4.5.9.9).

4.5.9.9 Delay Seek. The trailing edge of the DLY SK pulse strobes the cylinder address into the New Address Register (NAR). At the same time, the 2-microsecond (or 27-microsecond, depending on customer options) Address Acknowledge Delay one-shot is triggered. The low-high pulse from the one-shot fires the Address Acknowledge Pulse Width 5-microsecond one-shot. The delay period is required to allow for checking for an illegal address and performance of associated internal timing functions. The output of the Address Acknowledge one-shot is a narrow negative-going pulse.

Since the ILL ADD input from the Servo Logic Board (SLB) is low, the Illegal Address flip-flop will not be set by the trailing edge of the SK DLY pulse, and the output of the $\overline{Q}$ terminal will be high. The pulse from the Address Acknowledge Pulse Width one-shot then is sent to the Controller as a status signal that the Seek operation has begun.

4.5.9.10 Index/Sector Pulse Separation. The removable Index (R IDX), removable Sector (RSTR), Fixed Index (F IDX), and Fixed Restore (FSTR) inputs are generated on the Disc Control Board (DCB) as described in the circuit analysis of the DCB. Note that the RIDX signal also is routed to the Ready logic circuit to generate the READY signal. The two Index counter circuits are identical with the input index and sector pulses inasmuch as they are routed to a series of counters through an AND gate. The output of the counters is routed through two multiplexer circuits, and these outputs are routed to the Controller. Thus, the Controller is made aware of what sector is passing under the Read/Write head at any time. Note that jumper options are included in the output lines to accommodate customer requirements.

4.5.10 DATA INTERFACE BOARD (VFO)

4.5.10.1 Introduction. The Data Interface board supplies double frequency-encoded Write data from the external Controller to the DEB. Other signals pass through this board coming from, or going to, the Controller. In addition, the conversion of NRZ-coded data to double frequency-encoded format for writing on the disc, or from double frequency-encoded data back to the original NRZ format after it is read from the disc is accomplished on this board. This function is performed by the Variable Frequency Oscillator (VFO); the block diagram of which is shown in Figure 4-35.

4.5.10.2 Edge Discriminator Operation. At the point where the Read data first enters the DIB, it is essentially a square-wave input. The first stage of the bidirectional one-shot (shown as the edge discriminator in figure 4-35) is a differential amplifier which is used as a limiter. The second portion is used to form pulses on each edge of the input pulse as shown in Figure 4-36. Thus, a pulse is generated for each flux reversal that was recorded on the disc during a previous Write operation. In effect, the output from the edge discriminator is representative of the double frequency-encoded data written on the disc. The first clock pulse received from the edge discriminator after the first gating flip-flop, RD SYNC A, is enabled by the internal RD EN GATE signal. The second clock pulse then sets the second gating flip-flop RD SYNC B. The width of the output pulses from the edge discriminator is 150 to 160 nanoseconds for a 1500 rpm Disc Drive, 100 to 110 nanoseconds for a 2400 rpm Disc Drive.

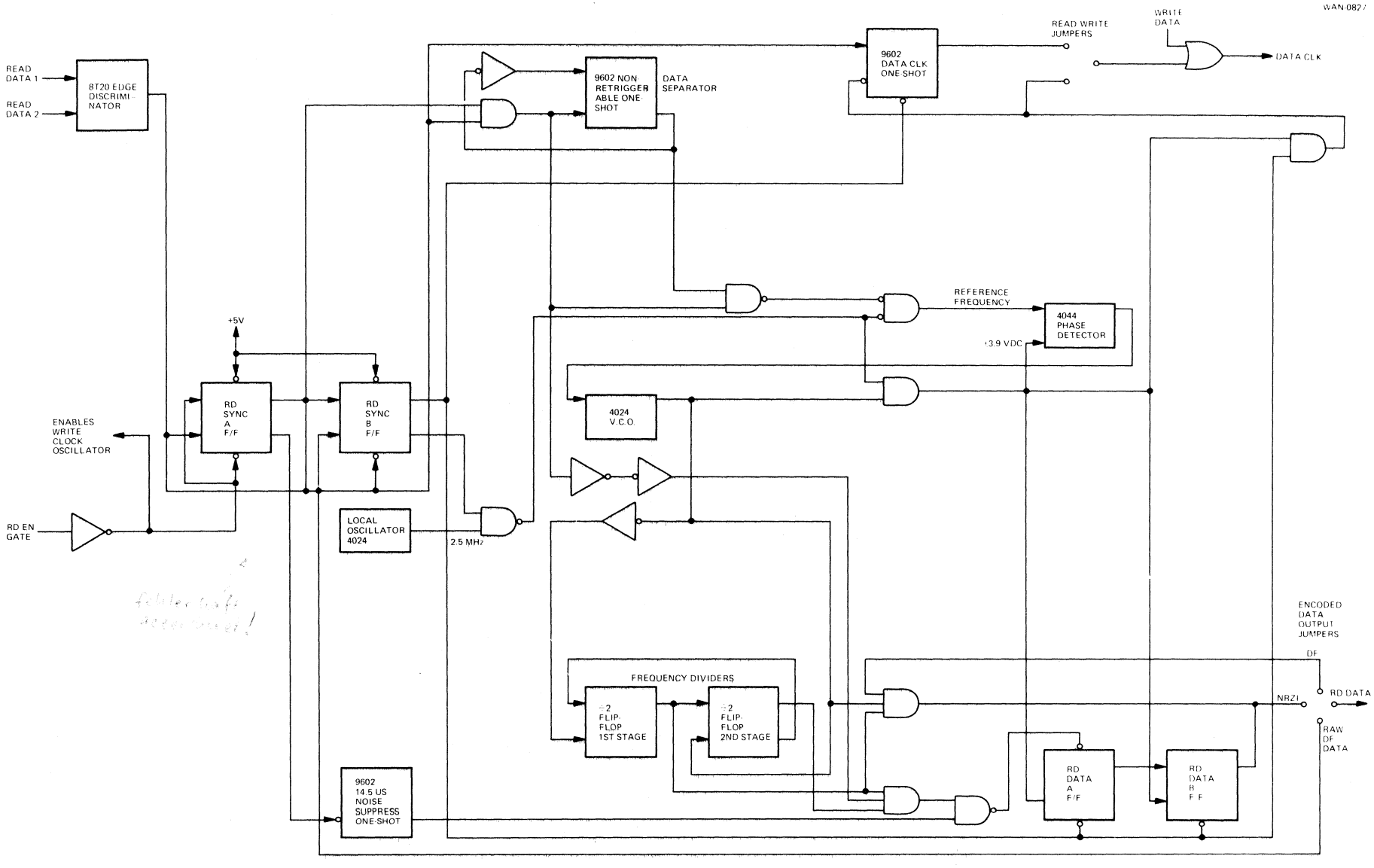


Figure 4-35. Block Diagram of Variable Frequency Oscillator (VFO)

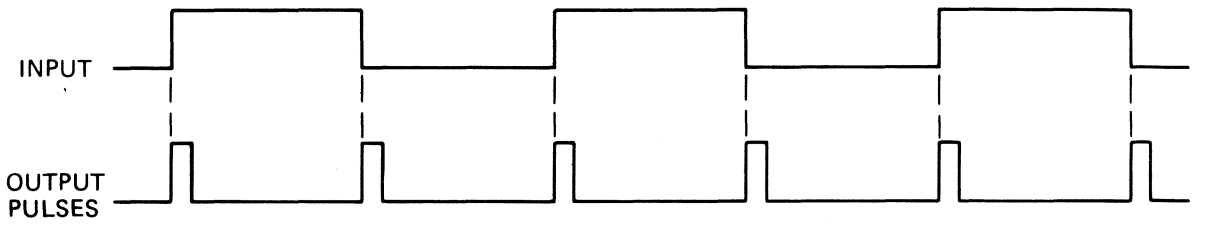


Figure 4-36. Output of Double-Edge Discriminator

4.5.10.3 Variable Frequency Oscillator Operation. Signals RD DAT 1 and RD DAT 2 from the Data Electronics Board (DEB) are applied to the edge discriminator in order to form the pulse characteristics (ref. figure 4-29). The output pulse of this unit will have the desired pulse width due to the external RC timing network. The value of the components comprising this network will be determined by the bit cell time. The output of the bidirectional one-shot constitutes raw data (clock signal intermixed with data) which will be used as the clock term for the RD SYNC A and RD SYNC B flip-flops.

During Standby or Write operations, the output of the local oscillator is ANDed with the RD SYNC B flip-flop $\overline{Q}$ output to provide a reference frequency to the phase detector. This input will be compared to the phase lock loop made up of the voltage-controlled oscillator and frequency-divider circuit. Any phase difference will generate a correction voltage to the VCO.

When the RD EN GATE signal goes true, the enabling RD SYNC A flip-flop will be set on the next pulse from the bidirectional one-shot. The $\overline{Q}$ output of the RD SYNC A flip-flop will start the data one lock-out which will determine the setting of data sync until the second pulse out of the bidirectional one-shot after Read Enable. This delay also provides time for the first pulse from the bidirectional one-shot to set up the voltage-controlled oscillator output referenced to the Alpha clock.

With the second pulse from the bidirectional one-shot, the Data Sync B flip-flop output will be ANDed with the Alpha clock for the second input to the phase detector. If a phase difference exists between the two inputs to the phase detector, a correction voltage is sent to the voltage-controlled oscillator. The output of the VCO will increase or decrease due to this correction voltage. The output of the VCO is inverted and used as the clock term for the VCO frequency divider. The false output of the frequency divider network is ANDed with that of the VCO, and this term is used to provide a clock input for the RD DATA A and RD DATA B flip-flops.

The true output of the RD DATA B flip-flop supplies data in NRZ format to the Controller when this option is selected. If DF (pulse) format is selected, the true output of the RD DATA B flip-flop is ANDed with the Alpha clock, and double frequency-encoded data is sent to the Controller via the EIB and IOB logic circuits. As shown in Figure 4-37, a clock pulse initiates the writing or reading of each bit cell. If a digital "1" is to be recorded, a second pulse will occur in the center of the bit cell and a flux reversal will occur. If a digital "0" is to be recorded, no pulse will occur during the bit cell time, and no flux reversal will occur until the clock pulse that initiates the next bit cell period.

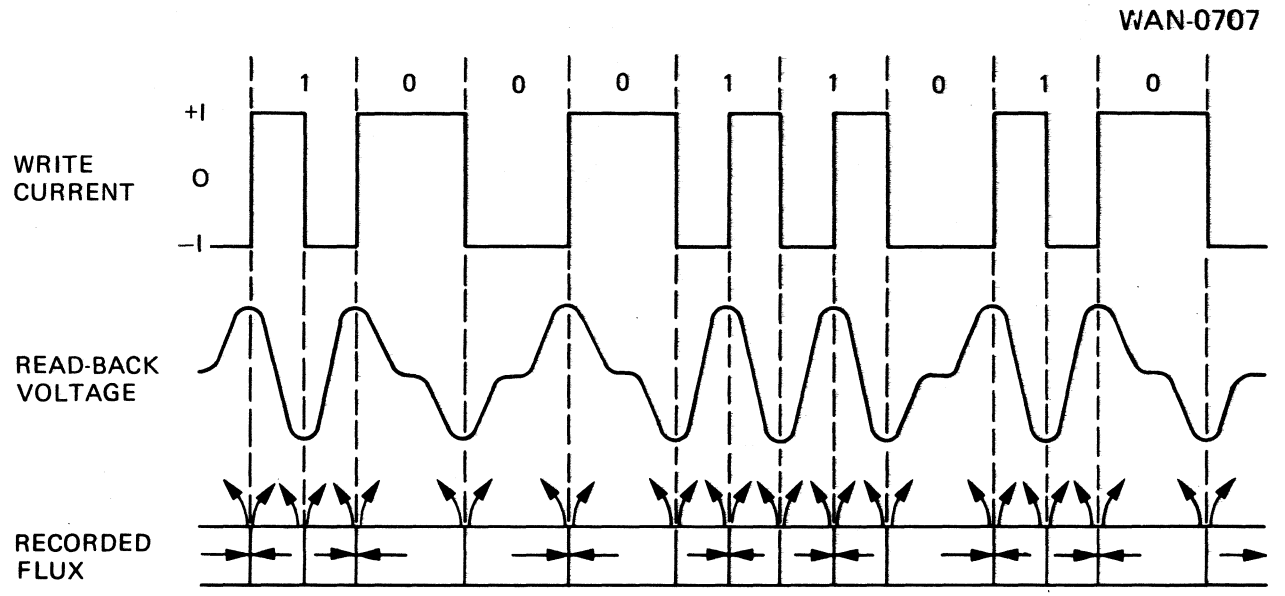


Figure 4-37. Double Frequency-Modulated Waveshape

4.5.10.4 Read Operation Complete. When the Read operation has been completed, the Controller notifies the Disc Drive. The RD EN GATE line drops thus inhibiting further reading from the disc. At this time, the output of the free-running oscillator again will become the reference frequency for the phase detector.

4.5.11 SPINDLE DRIVE REGULATOR BOARD

This board, which is located in the plenum chamber next to the Motor Power Drive Power Switch Board, is a current source that provides constant motor current. Two transistors are conducting at all times when power is applied. The other two transistors conduct in proportion to the operational requirements of the Disc Drive to provide a constant current output.

NOTE

There are two outputs, I_S and +5V. The +5-volt output of a series regulator on this board provides the operating voltage for the TTL logic in the spindle drive and associated control circuits.

4.5.12 MOTOR DRIVE POWER SWITCH BOARD

4.5.12.1 Introduction. The Motor Drive Power Switch Board operates in conjunction with the commutator board to supply drive current to the spindle motor.

4.5.12.2 Board Operation. Refer to the schematic of the Commutator board in Appendix B when following the circuit analysis of spindle drive motor control.

The three CELL outputs from the Commutator Board are applied to the Motor Drive Power Switch Board at pins 4, 5, and 6 on J36. These inputs are routed to an auxilliary output which is required on some Disc Drives. These three signals are applied to a multiplexer.

When the Disc Drive is in Run mode, the inputs are coupled directly through the multiplexer, as shown in Figure 4-38; that is, from input pin 2 to output pin 4, from pin 5 to pin 7, and from pin 14 to pin 12. The three outputs from the multiplexer are then decoded in the decoder. Thus, one of the three motor phases is turned on according to which of the three CELL inputs is high, and the motor rotates. When the Disc Drive is operating in Brake mode, the three CELL inputs are decoded so that they are slightly out of phase with the motor phase requirements. Thus, the current inputs tend to brake the spindle motor.

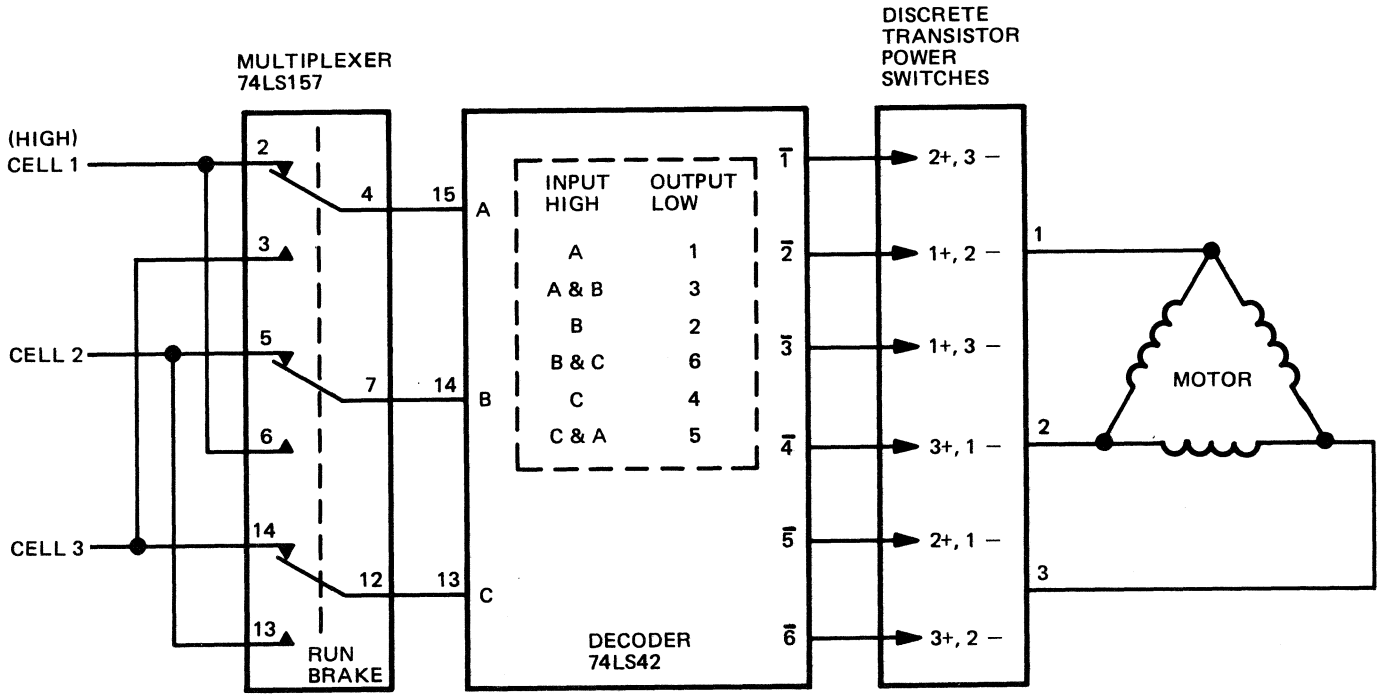


Figure 4-38. Simplified Diagram of Brushless Motor Circuit

4.5.13 COMMUTATOR BOARD

The Commutator board is secured to the rear of the spindle drive motor assembly. The motor shaft protrudes through the hole in the center of the board. Three interruptor switches are mounted on the commutator board. Each interruptor switch consists of a Light Emitting Diode (LED) on one side and a photo transistor on the other as shown on the schematic of the circuit board (Appendix C). A shutter is attached to the shaft of the spindle motor and rotates with it. As the shutter successively cuts off the light flow to two of the interruptor switches and allows the third switch to conduct, the three output lines labeled CELL 1, CELL 2, and CELL 3 are activated in turn. The output of the activated switch is routed through a comparator circuit to the Motor Drive Power Switch Board through connector P36 and turns on the applicable power phase.

Table 4-1 is an aid to troubleshooting the spindle drive motor. For example, if input lines CELL 1 and CELL 2 are high (cells seeing light while CELL 3 line remains inactive), the decoder will cause the No. 3 input to the three-phase motor to be low and lines 1 and 2 to be high (ref. figure 4-38).

TABLE 4-1. Normal Run Switching Sequence

	Cell High Seeing Light	Decoder In	Decoder Out (low)	Motor Leads +	Motor Leads −
180° Mechanical Rotation	1	A	1 (Pin 2)	2	3
	1 & 2	A & B	3 (Pin 4)	1	3
	2	B	2 (Pin 3)	1	2
	2 & 3	B & C	6 (Pin 7)	3	2
	3	C	4 (Pin 5)	3	1
	3 & 1	C & A	5 (Pin 6)	2	1
	Repeat				

4.5.14 EMERGENCY RETRACT BOARD

The Emergency Retract Circuit board is used to retract the carriage automatically in event of abnormal conditions. The schematic of this circuit board (Appendix C) shows the location of components on the board. During normal operation, the relay is energized, and the output of the FWD or REV Drive on the Servo Amplifier Board (SVA) is connected to the DC positioner motor via the LINEAR MOTOR HOT line. The components shown in the lower portion of the schematic comprise two power supply circuits used to supply a ±15 VDC output from the −18V. and +18V. inputs. A zener diode and capacitor in each circuit perform the rectifying, regulating, and filtering functions. The −18V. power supply circuit is used to supply a working voltage to the operational amplifier shown at the left hand side of the schematic. The +18V. input also is routed through the relay contacts to the emitter of the FWD Driver transistor on the SVA board.

When the Disc Drive enters the Emergency Retract mode, the relay drops. The +18V. line is disconnected and the FWD driver transistor is cut off. The inputs from the linear velocity transducer (jumpered on the EIB to connector J34 of the Emergency Retract Board) are amplified by the operational amplifier, and the positioner retracts the carriage with the rate of retraction accelerating to approximately 10 fps. At this time, the current from the transducer is summed with the reference voltage from the −15V. source dropped through the 1.5-megohm resistor, and the rate of backward movement is constant. When the carriage is fully retracted, the positioner retracting mechanism hits Home switch S8 and opens the switch. The transistor continues to conduct but is disconnected. Since the system loses its operating voltage, the positioner remains inoperative and in fully retracted position.

SECTION 5

MAINTENANCE

SECTION 5

MAINTENANCE

5.1 INTRODUCTION

The WANGCO Series F and Series T Magnetic Disc Drives have been designed for exceptional serviceability. The clean, functional layout and interconnection of major assemblies, subassemblies, and associated components afford superior accessibility, and simplify preventive maintenance, replacement, and adjustment procedures. Advanced electronic and mechanical design and conservative component rating contribute to the high performance and reliability featured in these units.

Field servicing of the WANGCO Disc Drive will, in most instances, be confined to infrequent preventive maintenance measures and routine performance verification. Should replacement of a part of an assembly be required, removal and reinstallation of the respective item will present no difficulties because of the modular construction and good accessibility.

Alignment procedures are straightforward, and adjustment and test points are within easy reach when the top cover has been removed. Certain replacement procedures necessitate access to the bottom area of the Disc Drive. Since in most cases the chassis will be mounted on slides, such access is easily accomplished by pulling the unit out of the cabinet as far as required. The internal flexible I/O signal cable, which interconnects the stationary I/O connector panel to the slideable unit, allows the Disc Drive to be on-line even when the unit is partially removed from its mounting rack.

5.2 SCOPE OF MAINTENANCE

Servicing of the Series F and Series T Disc Drives can be broadly divided into preventive and corrective maintenance. The service work intended to preclude certain malfunctions is of a minor, periodic nature and is summarized in Table 5-1.

Corrective maintenance concerns itself mainly with service on the assembly level. That is, it will consist of the substitution, after appropriate diagnosis, of integral subassemblies such as plug-in boards, Read/Write heads, etc. It also will include follow-up calibration or adjustment where required.

In regard to individual (and possibly critical) parts, it is recommended that such work be done only after a careful study of the appropriate circuit description in Secion 4. This theory study should be observed in conjunction with consultation with one of the factory field engineers in order to guarantee the continued integrity of the Disc Drive.

Problem diagnosis can be performed on-line and will be limited only be diagnostic program capabilities. Off-line diagnosis may be accomplished with a field exerciser card with positioning capabilities but no data interfacing capabilities. A self-contained bench-type exerciser unit, available from WANGCO, Inc., provides comprehensive test and diagnostic capabilities.

This section of the manual provides instructions for the removal and replacement of major assemblies and adjustment and calibration procedures that can be performed on-site.

5.3 PREVENTIVE MAINTENANCE

5.3.1 INTRODUCTION

In Disc Drive installations, preventive maintenance is performed only at infrequent intervals, since all moving parts (including the recording medium) are normally enclosed, and are purged continuously by a clean-air system. However, some contamination of the system is inevitable, especially during changing of a removable cartridge. The cartridge itself is a potential source of some contamination unless it is maintained in a clean condition.

5.3.2 PREVENTIVE MAINTENANCE SCHEDULE

Note in Table 5-1 that 1 year of operation is equivalent to 2,000 operating hours based on a single-shift day. This schedule should be modified to shorter intervals if one of the following situations prevails:

A. Operation in excess of normal on-time.
B. Frequent cartridge exchange.
C. Adverse environment.

TABLE 5-1. Preventive Maintenance Schedule

ITEM	INTERVAL	OPERATION
Detent Output Signal	6 months	Check and verify that the signal conforms with the specifications outlined in paragraph 5.6.5.1
Disc Cleaning Brushes	6 months	Inspect condition (see figure 5-20). Replace brushes if necessary.
Positioner Carriage Guide Rails	6 months	Clean with alcohol-saturated swab. Remove all cotton residue.
Read/Write Heads	6 months	Check retraction of positioner carriage. Inspect and if necessary clean as outlined in paragraph 5.3.3.
Spindle Chuck and Cone	6 months	Clean surfaces, using alcohol-moistened kim-wipes. Remove ferrous particles (if any) from chuck and magnet ring through application of masking tape.
Fixed Disc	6 months	Clean with an alcohol-saturated swab through access hole at the front of the unit (see figure 5-1).
Air Filter:		
Prefilter	1 year	Replace prefilter (see figure 5-16).
Main Filter	1 year	Inspect main filter.
Blower Ground Brush	1 year	Replace brush assembly.
Spindle Ground Brush	1 year	Replace brush assembly.
Blower Drive Belt	1 year	Replace belt (see CAUTION below).

CAUTION

WHEN REPLACING O-RING BELTS, PRE-STRETCHING BY HAND MUST BE AVOIDED. WHEN STRETCHED, BELTS "SET" AND BE-COME LOOSE WHICH CAN AFFECT MACHINE PERFORMANCE AND SHORTEN BELT LIFE. INSTALL BELTS BY ROLLING THEM INTO PLACE WHILE SLOWLY ROTATING PULLEY.

CAUTION

WHEN REPLACING PC BOARDS WITH MINIATURE DIP SWITCHES, CHECK LABEL BEHIND FRONT TRIM PANEL TO VERIFY PROPER SWITCH SETTING FOR THE CON-FIGURATION.

5.3.3 READ/WRITE HEAD INSPECTION AND CLEANING

Because of the very small clearance between head and disc surfaces, it is imperative that the heads (as well as the disc) be kept clean. When in the flying altitude, the heads are separated from the disc surface by only a few microns; and because of the high disc speed, even small particles adhering to the heads may cause damage to the heads or to the disc surface.

To inspect the head surfaces for accumulation of dust or oxide particles, remove the cartridge and illuminate the head area with a suitable light source. The upper heads may be viewed with the aid of a small dental-type mirror.

CAUTION

DO NOT TOUCH THE HEAD SURFACE OR BRING THEM INTO CONTACT WITH ANY OBJECT OTHER THAN THE CLEANING APPLICATOR.

To clean the head surfaces, wipe them with an alcohol-saturated swab*. Use 91% isopropyl alcohol (IPA) only. Apply very light pressure to the head during this operation. The following cleaning aids should be used in cleaning the discs and R/W heads:

A. Cleaning fluid: 91% isopropyl alcohol (IPA) in solution with 9% distilled water. Do not use any other type of fluid.

B. Applicator: Lint-free tissue or cotton swabs*.

5.3.4 FIXED DISC CLEANING

To gain access to the fixed disc, snap out the trim panel at the front of the unit, and remove the two 4-40 screws securing the small access cover as shown in Figure 5-1. This cover is located above the air intake grate at the left-hand side of the center of the Disc Drive. Then lift out that cover.

Unplug connector P15 located near the top of the Servo Amplifier Board. This will inhibit the servo system and prevent loading of the R/W heads. Install a "scratch" cartridge to obtain disc speed control. If a test hub is used, the cartridge interlock switch must be manually activated in the following manner. For Series F units, depress the button-type switch (protrudes from the base), and keep it depressed by placing masking tape over it. For Series T units, install a matchbook cover between the pack sensor and switch actuator. See Figure 5-2.

*Wangco recommends Foam Floss-tipped swabs which leave no residue. Order PN TX700 (qty. 50) or TX700B (qty. 500) from Texwipe Co., 51 Prospect Pl., P.O. Box 278, Hillsdale, N.J. 07642.

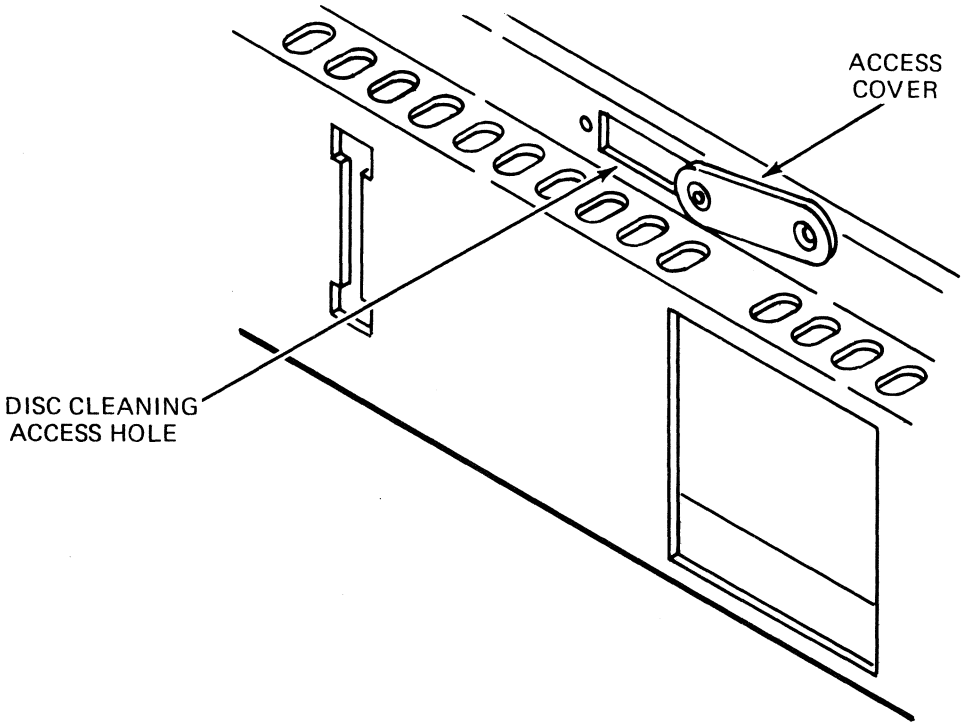


Figure 5-1. Disc Cleaning Hole Location

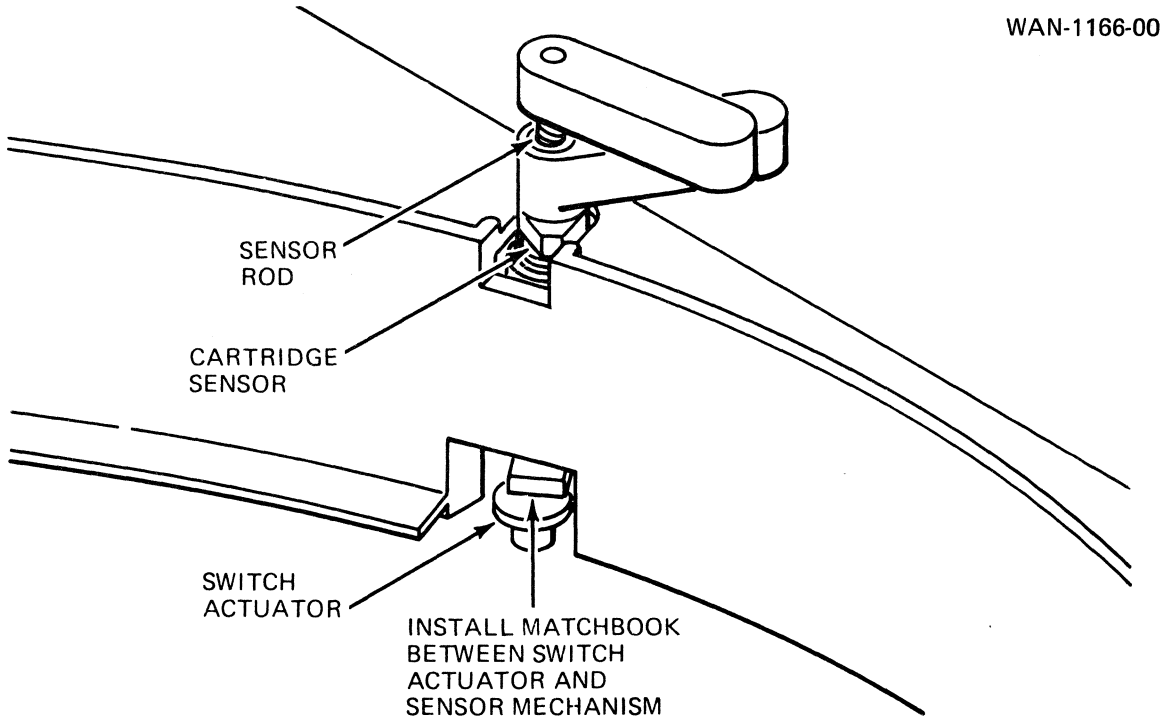


Figure 5-2. Cartridge Interlock Switch Actuation – Series T

Insert an alcohol-saturated cotton swab* through the access hole in the front of the Disc Drive (ref. figure 5-1), and lightly move it across both the upper and lower surfaces of the disc. Repeat this operation, using a new swab each time, until the swab remains clean. Then secure the small panel over the access hole with the two 4-40 screws.

CAUTION

USE CARE TO AVOID ANY CONTACT BETWEEN THE DISC AND THE SWAB STICK. MAKE SURE THAT NO COTTON RESIDUE IS LEFT WITHIN THE DISC DRIVE AFTER CLEANING.

5.3.5 CARTRIDGE REMOVAL AND HANDLING

Review the procedure for cartridge loading and removal in Section 3. Load only cartridges that are known to be without defects. Keep the cartridge housing as clean as possible. When the cartridge is not installed, its air and head entry doors should remain closed at all times. The cover of the top loading cartridge should remain in place.

5.3.6 DISC DRIVE TOP COVER REMOVAL

5.3.6.1 Introduction. When carrying out the preventive maintenance work, the top cover of the Disc Drive must be removed in order to gain access to the various assemblies. The removal of this cover differs some what in the Series F and Series T Disc Drives.

5.3.6.2 Series F. To make the top cover fully accessible, open the loading door and pull the unit out of the cabinet. Refer to paragraph 5.4.1.1 for the procedures for releasing the door-locking mechanisms.

Remove the six screws on the top surface of the cover. Remove the three screws along the front lip of the cover. These screws secure this part of the cover to the filler panel between the end caps. The top cover can now be lifted off the Disc Drive.

*Wangco recommends Foam Floss-tipped swabs which leave no residue. Order PN TX700 (qty. 50) or TX700B (qty. 500) from Texwipe Co., 51 Prospect Pl., P.O. Box 278, Hillsdale, N.J. 07642.

5.4 CORRECTIVE MAINTENANCE

In this part of Section 5, the Series F and Series T Disc Drives are illustrated and described with emphasis on assembly configuration and location. The main mechanical differences between the two series of drives are identified. Procedures for the removal and replacement of assemblies and related components, and adjustment and calibration procedures, are presented.

5.4.1 GENERAL DESCRIPTION

The majority of assemblies and components in the Series F and Series T Disc Drives are interchangeable; the units differ essentially only in the cartridge-loading arrangement and the related electro-mechanical parts. The Series F Disc Drive incorporates a cartridge receiver that is mechanically coupled to the loading door at the front of the unit. The Series T unit requires no receiver since the cartridge is simply inserted at the top of the unit. These mechanical differences are apparent in the photographic views of the two units in Figures 5-3 and 5-4.

Note in Figure 5-3 that only the Series F Disc Drive has a Differentiator Board. Assemblies and components accessible from the bottom of the Disc Drive are mounted identically on both the Series F and Series T. Figure 5-5 shows these components and assemblies with the major components and assemblies identified.

Figure 5-6 is a simplified front view of the Series F Disc Drive. It identifies those components that either are not visible on the preceding figures or are contained only in the Series F. Figure 5-7 is a similar simplified front view of the Series T Disc Drive.

5.4.1.1 Front Door and Cabinet Lock, Series F. The locking mechanism on the Series F Disc Drive locks the loading door, and also the cartridge receiver, in place when conditions are unsafe for cartridge removal or loading. This locking device also is activated in the event of power failure as explained in the discussion of this feature in Section 4.

The locking mechanism is partially illustrated in Figure 5-6. The locking action is implemented by a locking solenoid mounted on the side of the loading door. The solenoid plunger carries a latch that engages a pawl when the solenoid is de-energized. The pawl is mounted on a rotatable plate which is connected to the door and cartridge receiver assemblies. When energized, the solenoid latch disengages the pawl, and the plate is free to rotate forward. This allows the cartridge loading door to be pulled open and down. Mechanical connections simultaneously elevate the cartridge receiver and move it forward.

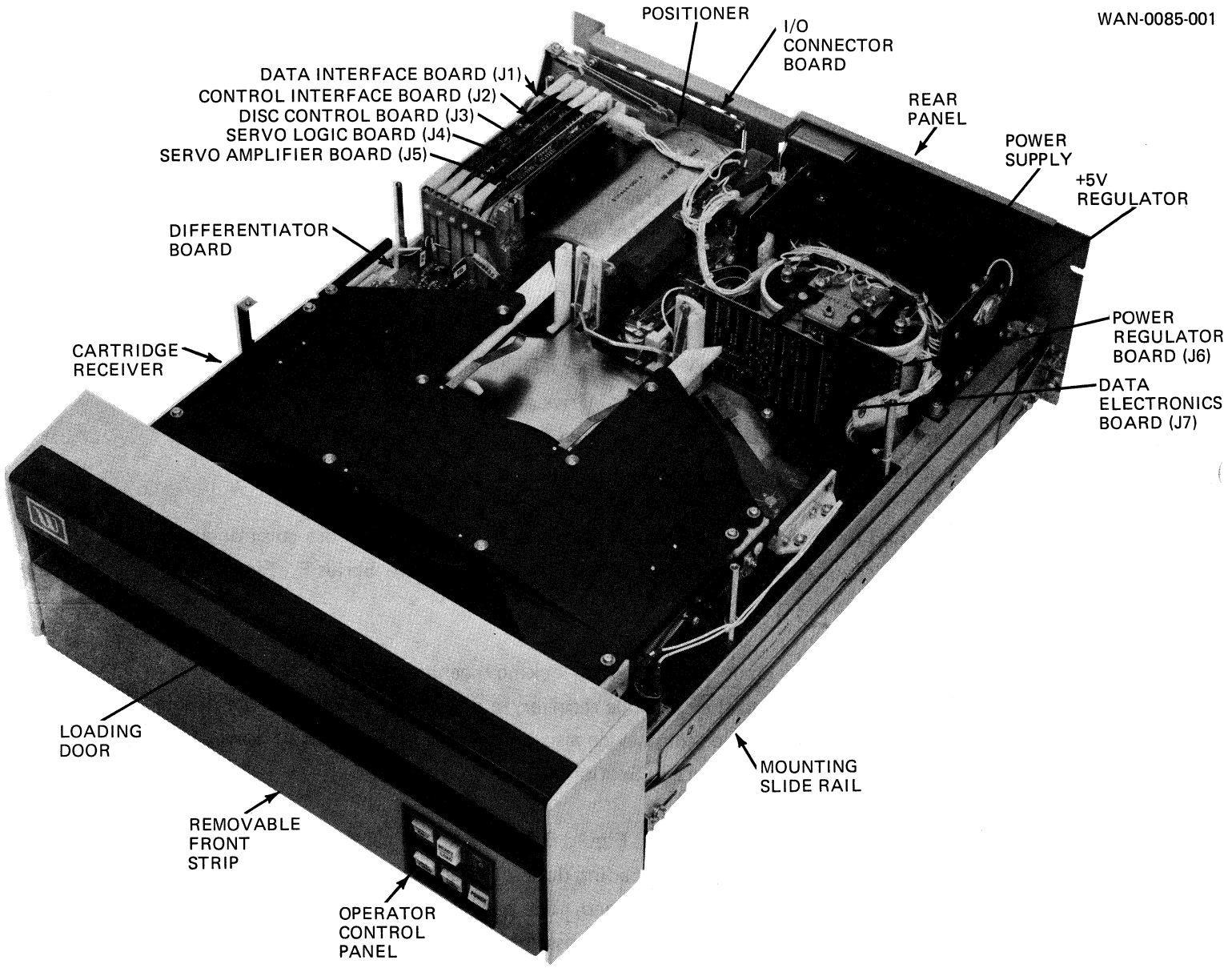


Figure 5-3. Series F (Front Loader) With Cover Removed

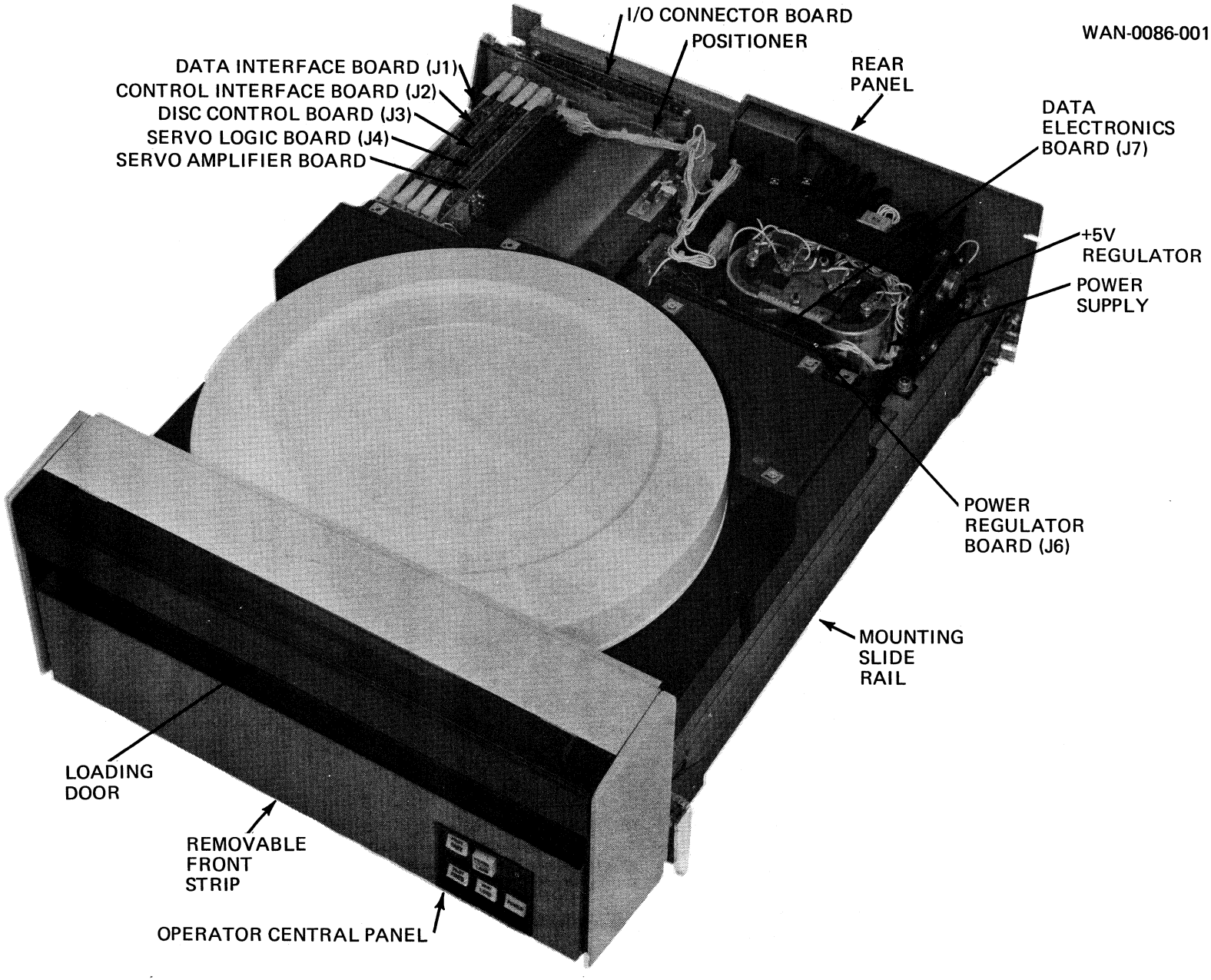


Figure 5-4. Series T (Top Loader) with Cover Removed

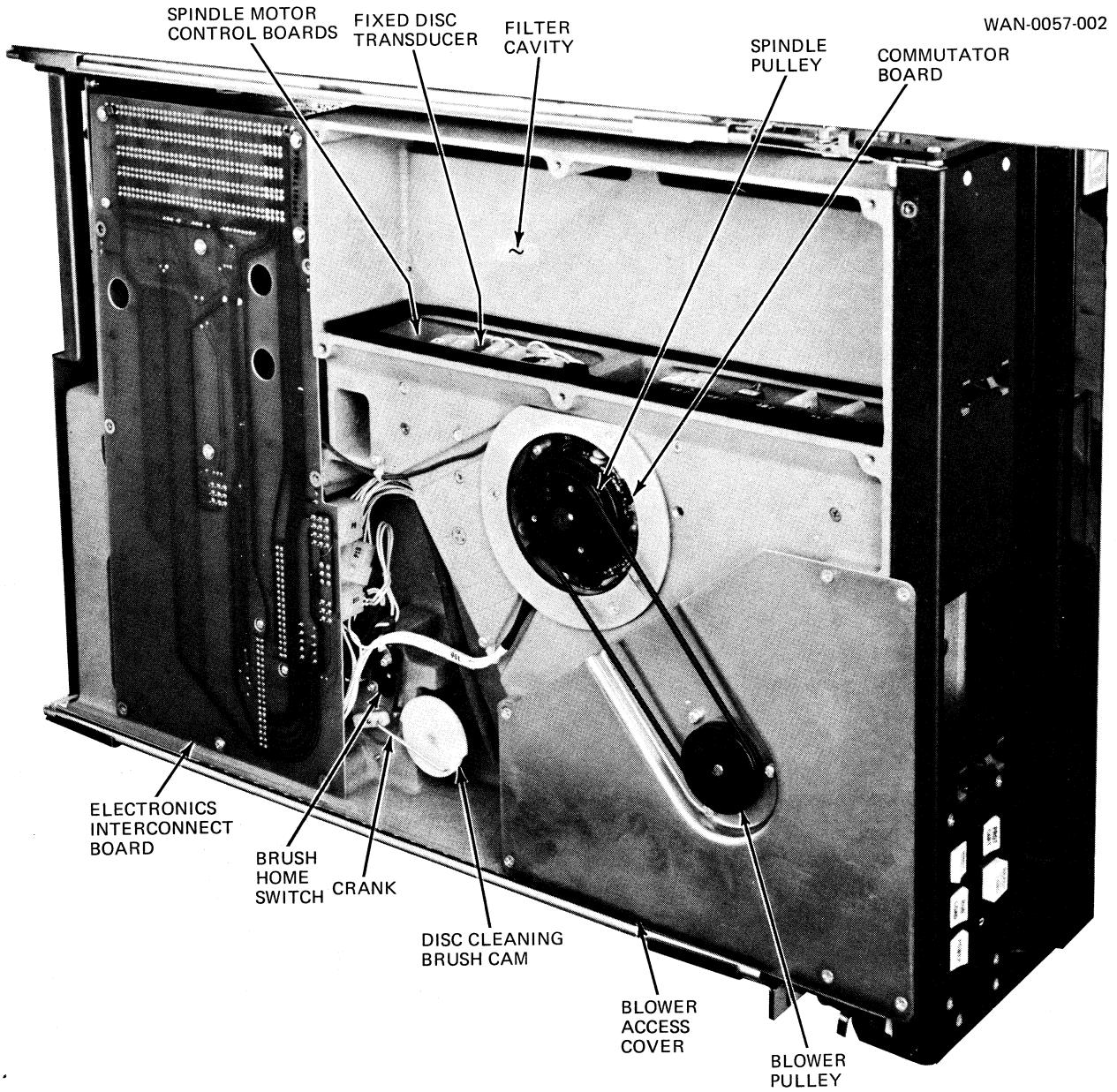


Figure 5-5. Series F and Series T Disc Drives, Assembly Identification — Bottom View

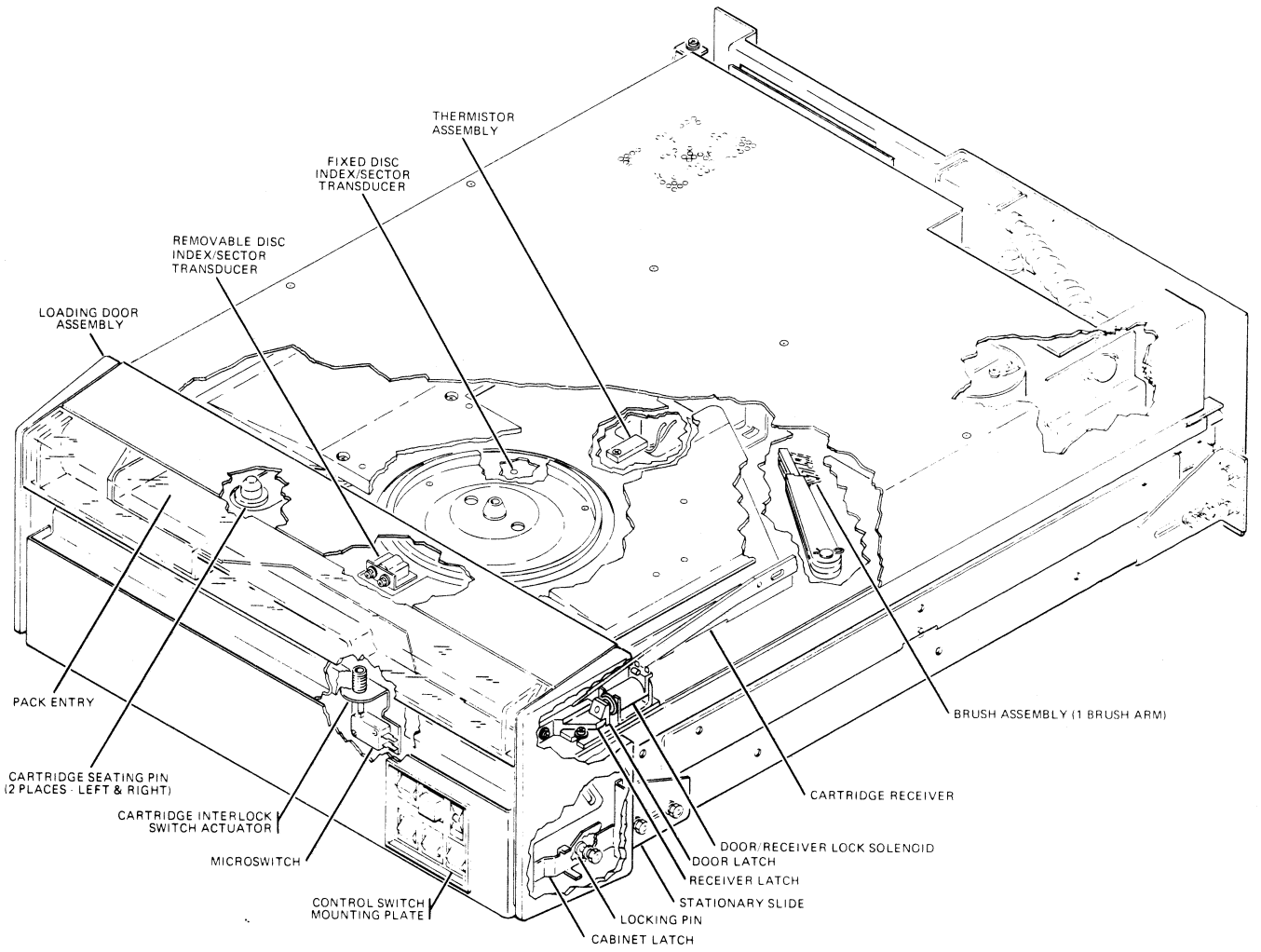


Figure 5-6. Series F Disc Drive – Simplified Front View

WAN-0198-05

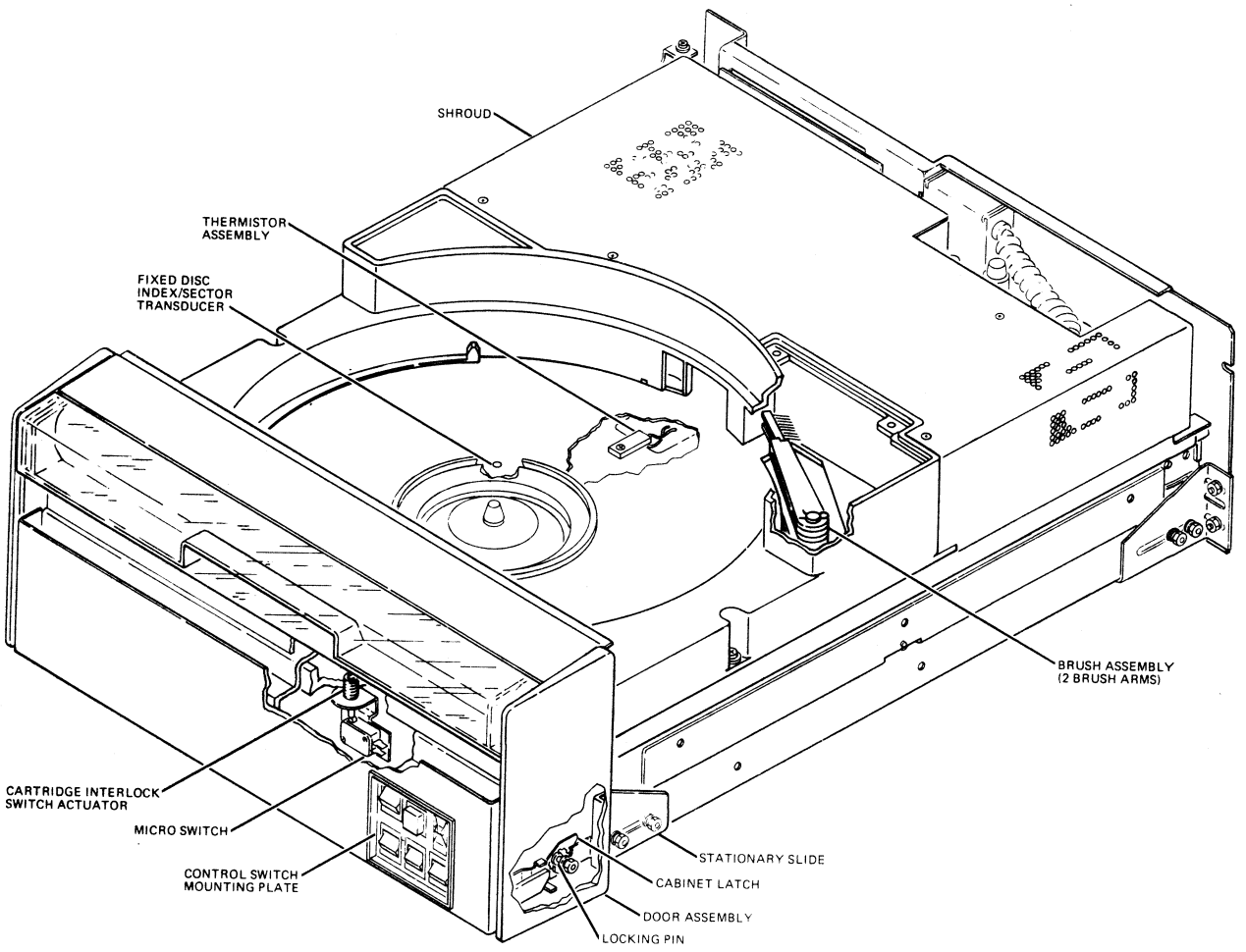


Figure 5-7. Series T Disc Drive – Simplified Front View

The Disc Drive is locked into the cabinet by mechanical means. Opening the cartridge loading door will not release the unit from the cabinet. Two additional latches, one on each side of the door assembly, lock pins, they must be tripped manually; a slot is provided in each latch for this purpose. The painted front trim panel must be snapped out to gain access to the front part of the latch. The latch is depressed, and thus released, by applying a downward force on the slot in the latch.

5.4.1.2 Front Door and Cabinet Lock, Series T. The Series T Disc Drive incorporates a locking mechanism similar to the Series F Disc Drive. Since the Series T unit contains no receiver, the locking action involves only the door assembly and the cabinet slides.

The latching mechanism is partially illustrated in Figure 5-7. When the door is closed and the Load mode is not established, the solenoid plungers engage pins mounted to the door assembly. Simultaneously with closure of the door, the latches slide over and engage the slide-mounted locking pins which lock the Disc Drive into the cabinet. Then the unit can not be pulled out of the cabinet until the solenoids are energized (releasing the pins on the door assembly).

5.4.1.3 Test Equipment. Test equipment and tools used in maintenance of the Disc Drive are listed in Table 5-2. The following equipment is required for use in alignment or calibration procedures and in diagnostic routines.

A. Oscilloscope
B. Current Probe
C. Digital Voltmeter (suggested)
D. Volt-Ohmmeter
E. Bench Exerciser (suggested)

5.4.2 REMOVAL AND REPLACEMENT OF MAJOR ASSEMBLIES

5.4.2.1 Introduction. In the following paragraphs, the procedures for removal of major assemblies for servicing or exchange are outlined in detail. The chart in Figure 5-8 summarizes the operations and their sequence. This chart indicates that where the disc is involved, the removal operations preceding the disc removal differ somewhat between the Series F and Series T Disc Drives.

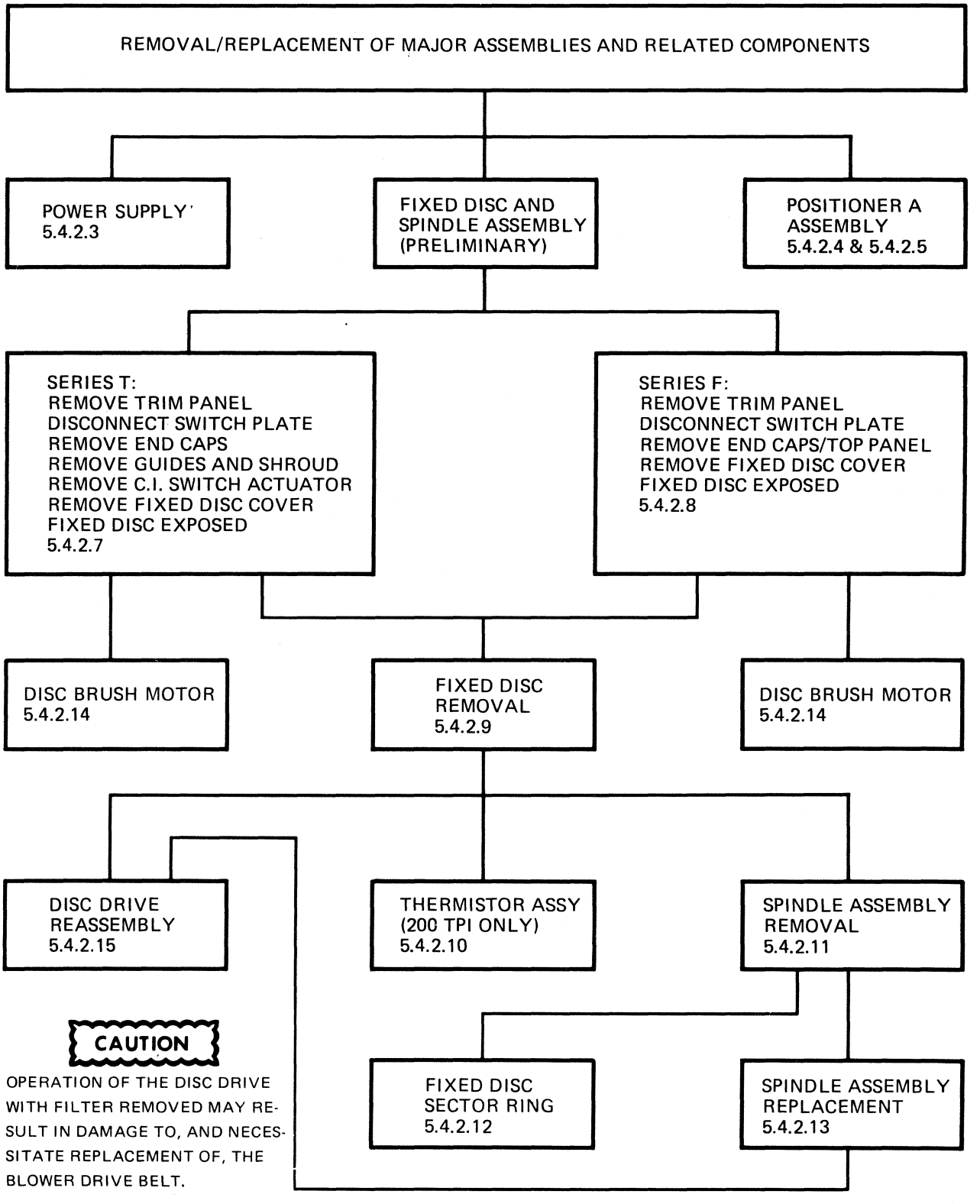


Figure 5-8. Removal/Replacement Guide -- Major Assemblies

TABLE 5-2. Standard and Special Accessories and Service Aids (continued)

Description	Manufacturer	Part No.
Allen wrench, 1/16 in.	Handi Hex Key	–
Allen wrench, 3/32 in.	Handi Hex Key	–
Crescent wrench, adjustable, 4 in.	Claude Michael	AC14
Screwdriver Set	XceLite	TS88
Screwdriver, potentiometer alignment	Walpo Electronics	2525
Screwdriver, torque	Utica Tool	TS30
Screwdriver, ball point, 5/32 in.	Bondhus	BS-5/32
Screwdriver, ball point, 3/16 in.	Bondhus	BS-3/16
Oscilloscope, dual-trace	Tektronix	453 (or equiv.)
Probe, (X10)	Tektronix	P6065A
Probe (X1)	Tektronix	P6011
Probe, current	Tektronix	P6021 (or equiv.)
Viewing Hood	Tektronix	016-0180-00
Digital Voltmeter (suggested)	Digitic	Z202 (or equiv.)
VOM	Triplett	800 (or equiv.)
Cable Extractor	3M	3438
IC Extender, 14-pin (suggested)	A.P., Inc.	TC14
IC Extender, 16-pin (suggested)	A.P., Inc.	TC16
Disc Exerciser, Bench-type (suggested)	WANGCO	300303
Torque wrench, head alignment	WANGCO	T00425
Filler Panel, 1 in., Top Load (fills gap above "T" in cabinet), XX=paint color	WANGCO	300905-1XX
Shipping bracket, left (used if customer does not want cabinet slides)	WANGCO	300608-001
Shipping bracket, right (used if customer does not want cabinet slides)	WANGCO	300608-002

TABLE 5-2. Standard and Special Accessories and Service Aids (continued)

Description	Manufacturer	Part No.
Test Hub, Front Load (service aid), XX = no. of sectors	WANGCO	101179-0XX
Test Hub, Top Load (service aid), XX = no. of sectors	WANGCO	101180-0XX
Cartridge, Front Load, 2200 BPI with .020-in. (.508 mm) sector slots, XX=no. of sectors	WANGCO	100442-0XX
Cartridge, Top Load, 2200 BPI with .020-in. (.508 mm) sector slots, XX=no. of sectors	WANGCO	100443-0XX
C.E. Alignment Cartridge, Front Load, 2200 BPI Tri-Bit Type	WANGCO	301488-001
C.E. Alignment Cartridge, Top Load, 2200 BPI Tri-Bit Type	WANGCO	301488-002
C.E. Alignment Cartridge, Front-Load, Cat-Eye Type (customer request only)	WANGCO	300805-001
C.E. Alignment Cartridge, Top Load, (not for 4400 BPI)	WANGCO	300807-001
PWB Extender Board (service aid)	WANGCO	300034-001
DEB PWB Extender Board (service aid)	WANGCO	300145-001
PRB PWB Extender Board (service aid)	WANGCO	300403-001
Power Supply Extender Cable (service aid)	WANGCO	300985-001 or 300985-002
SVA PWB Extender Cable (service aid)	WANGCO	300789-001
Head Extender Cable (adapter for testing Write current)	WANGCO	101183-001
Head Extender Cable	WANGCO	300289
Daisy Chain Cable (standard twisted pair), XXX = length in inches	WANGCO	300118-XXX
Daisy Chain Cable Kit (flat 3M cable), XXX = length in inches	WANGCO	300917-XXX
I/O Adapter (part of Daisy Chain Cable Kit), J22 standard to 3M cable	WANGCO	300915-001
I/O Adapter (part of Daisy Chain Cable Kit), J23 standard to 3M cable	WANGCO	300916-001
Cable, flat, 50 conductor (part of Daisy Chain Cable Kit), XXX = length in inches	WANGCO	300944-XXX
Cable, Interface, Front Load, W to D-30 – Male, XXX = length in inches	WANGCO	300119-XXX
Cable, Interface, W to Caelus	WANGCO	300127-001

TABLE 5-2. Standard and Special Accessories and Service Aids (concluded)

Description	Manufacturer	Part No.
Cable, Interface, W to D-40, XXX = length in inches	WANGCO	300377-XXX
Cable, Interface, W to Data General (Logicon), XXX = length in inches	WANGCO	300423-XXX
Cable, Interface, W to D-30 – Special, XXX = length in inches	WANGCO	300566-XXX
Cable, Interface, W to D-30 – Female	WANGCO	300795-001
Field Exerciser Board (suggested)	WANGCO	Available upon request

5.4.2.2 Top Cover Replacement. In the procedures outlined in the removal and alignment paragraphs, it is assumed that the unit has been shut down and disconnected from the AC power source. If rack-mounted, the Disc Drive will have been pulled out of the rack on its slides. The cartridge will have been removed, as well as the top cover. The removal of the top cover differs in the two series of Disc Drives as described in paragraph 5.3.6. To reinstall the top cover on the Series F disc drive, insert all six screws loosely to permit slight shifting of the cover for hole alignment. Then tighten each of the six screws evenly.

CAUTION

TO PREVENT DAMAGE TO THE TOP COVER ON THE SERIES T DISC DRIVE, THE FOLLOWING HOLE ALIGNMENT PROCEDURE SHOULD BE FOLLOWED.

To reinstall the top cover on the Series T Disc Drive, perform the following steps:

A. Set the top cover in place, and insert the mounting screw in the access hole located toward the rear of the unit, as shown in Figure 5-9.
B. Check alignment of the holes in the top cover over the threaded standoffs, and if all holes align, insert and tighten all four mounting screws.
C. If all three front holes are not aligned with the threaded standoffs, loosen the two screws through the horizontal fuse mounting bracket on the power supply assembly (ref. figure 5-9).
D. Shift the chassis slightly to align all three front access holes, then insert the three mounting screws.
E. Tighten all four mounting screws and the two screws securing the horizontal fuse mounting bracket.

5.4.2.3 Power Supply Removal and Replacement. To remove the power supply, refer to Figure 5-10 and perform the following steps:

A. Disconnect connectors P10, P18, P9, and P16 (on the end of the positioner harness).
B. Remove the two ¼-20 screws that fasten the power supply to the top edge of the casting.

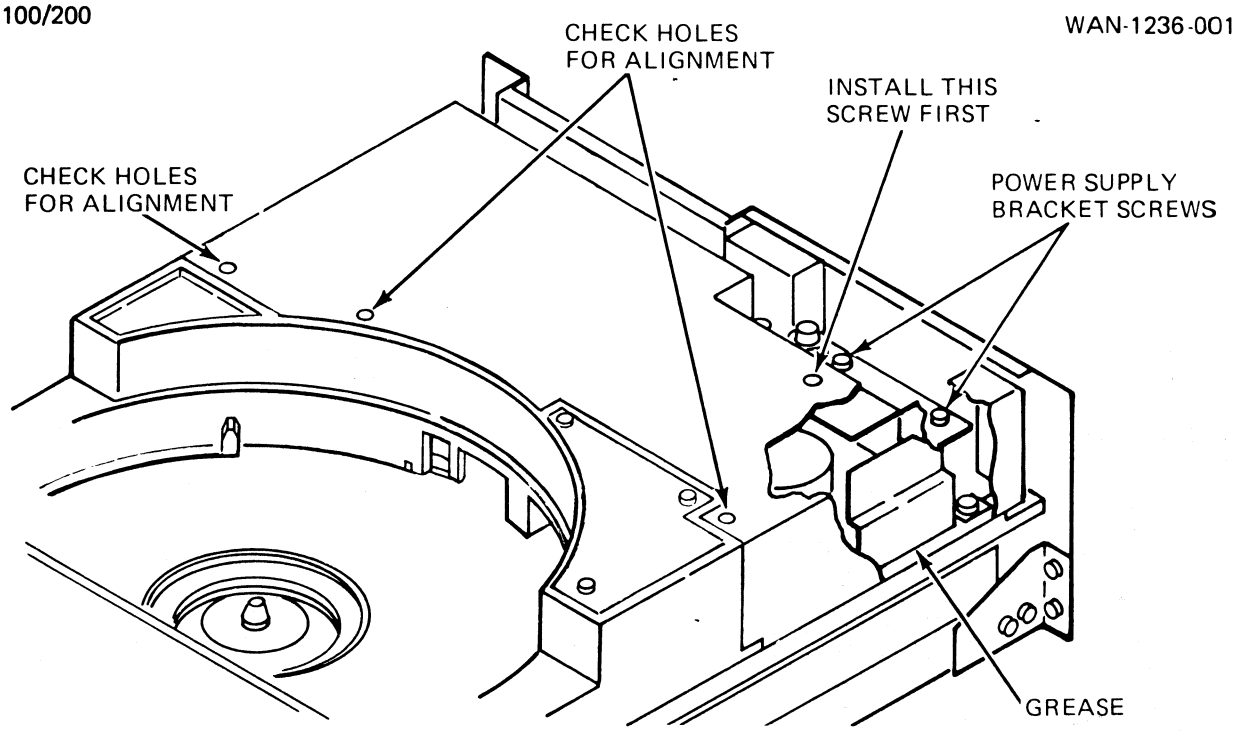


Figure 5-9. Top Cover Hole Alignment

C. Loosen the captive screw located at the base of the power supply. Access is through a hole in the bracket (near the fuse holders) at the top of the power supply. The power supply can now be lifted from the Disc Drive.

D. To replace the power supply, apply silicon grease or casting, tighten the captive screw at the base of the power supply and install the two ¼-20 screws to fasten the power supply to the top edge of the casting.

E. Reconnect plugs P10, P18, P9, and P16.

F. Apply power and perform the power supply check outlined in paragraph 5.6.2.

5.4.2.4 Positioner Assembly Removal. To remove the positioner assembly, refer to Figure 5-11 and perform the following steps:

A. Install the shipping restraint (ref. figure 2-2).

B. Remove the power supply (ref. figure 5-8).

C. Disconnect connectors P14, P15, P16, P28, P30, and P24 through P27.

D. Remove the DEB.

E. Remove the EIB cover on the bottom of the Disc Drive by removing the six 6-32 Phillips-head screws.

F. Remove the three 10-32 cap screws used to fasten the Positioner Assembly to the casting. Access is from the bottom of the unit through the three access holes in the EIB.

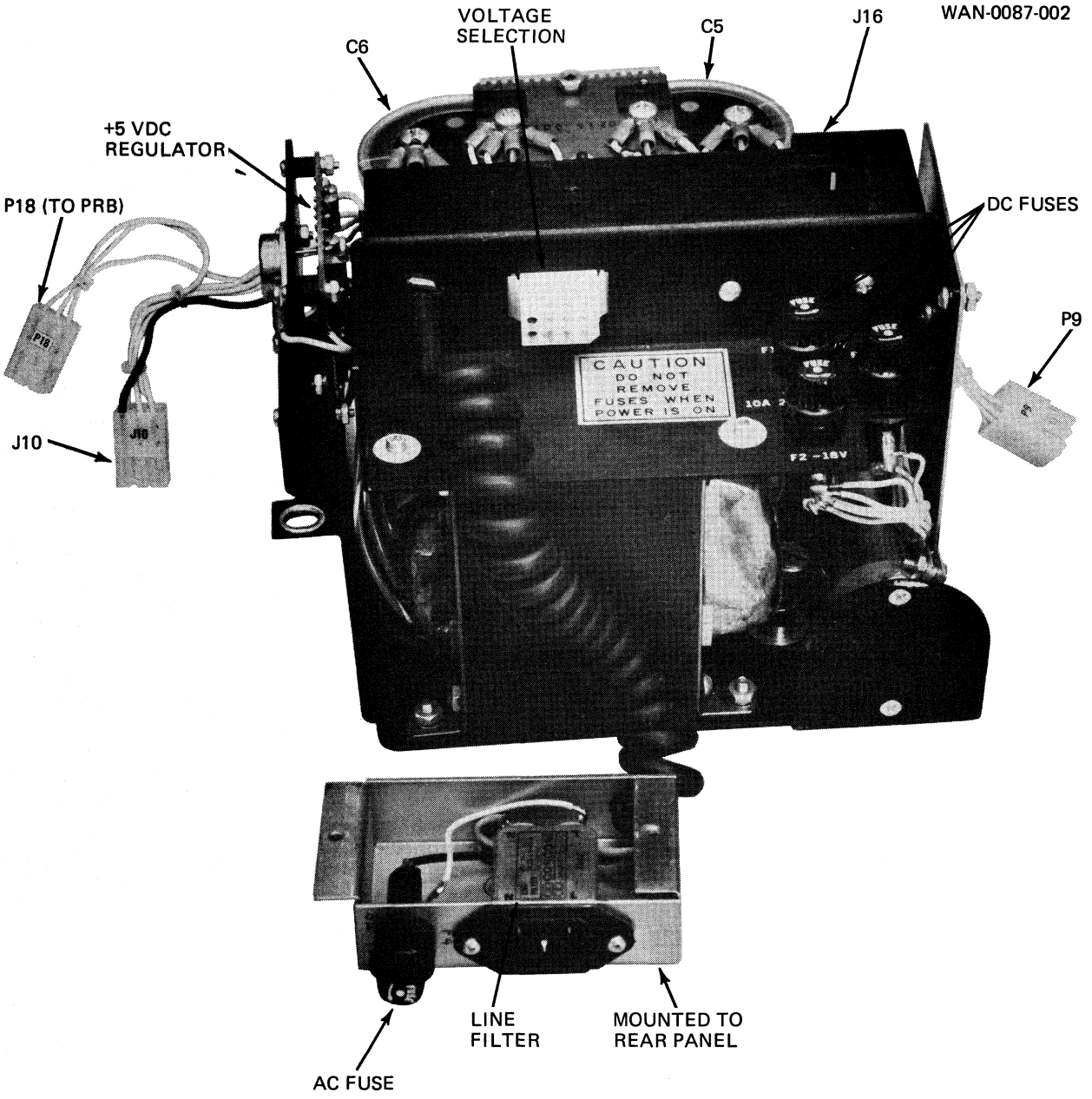


Figure 5-10. Power Supply Assembly

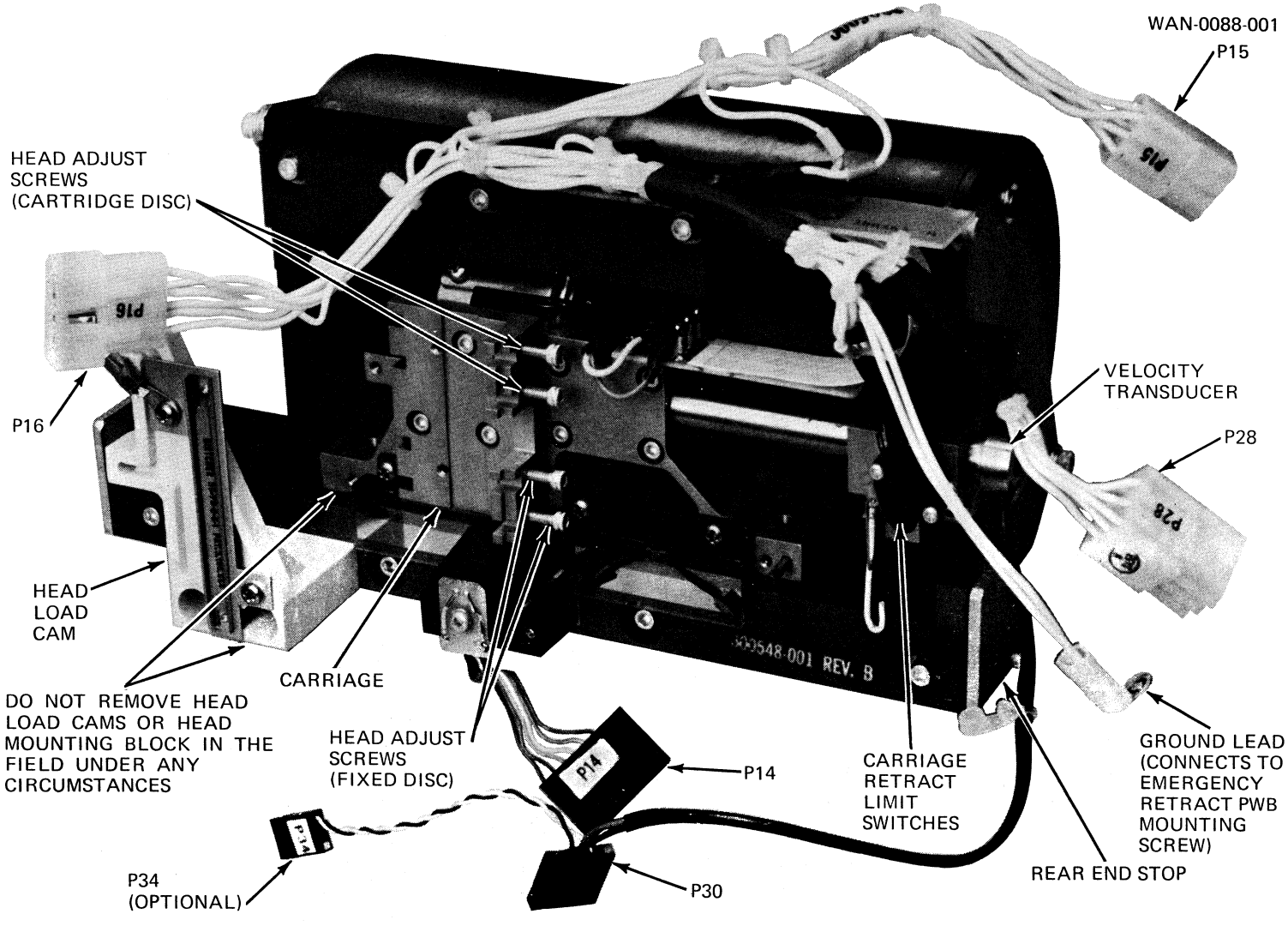


Figure 5-11. Positioner Assembly

CAUTION

DO NOT REMOVE HEAD LOAD CAMS OR HEAD MOUNTING BLOCK IN THE FIELD FOR ANY REASON.

CAUTION

DURING THE REMOVAL OF THE POSITIONER, CONTACT BETWEEN THE CARRIAGE FRONT END STOP AND THE FIXED DISC MUST BE AVOIDED. DO NOT LIFT THE POSITIONER BY THE HEAD LOAD CAM OR THE VELOCITY TACHOMETER. FOLLOW THE PROCEDURE BELOW.

G. Lift the positioner slowly off the casting while constantly observing clearance between the carriage end stop and the disc. Gradually slant the positioner rear end upward and lift it from the unit toward the rear.

NOTE

Two guide pins approximately 1/8-inch (3.175 mm) long protrude from the base of the positioner into the casting.

5.4.2.5 Positioner Assembly Replacement. To replace the positioner assembly, perform the following steps:

A. Follow the reverse order of the procedure in paragraph 5.4.2.4. Observe the same caution in regard to clearance as practiced during removal.

B. After the positioner assembly has been completely installed, perform the following adjustments:

1) SVA Adjustment (5.6.4)
2) Run-To-Load Adjustment (5.6.5)
3) Write Current Adjustment (5.6.6)
4) Read/Write Head Alignment (paragraph 5.6.7)
5) Index Alignment (paragraph 5.6.8)
6) Temperature Compensation Check (200 TPI only) (paragraph 5.6.9)

5.4.2.6 Fixed Disc Removal (Preliminary Operations). The fixed disc should be removed prior to removal of the spindle assembly.

NOTE

Data written on the fixed disc can not be recovered when the disc is removed from the spindle because the sector identity will be lost. If such data is to be retained, it should be transferred to a "scratch cartridge" prior to removal of the fixed disc. If the disc is to be reused, extreme care must be used to ensure that the disc remains clean and does not touch hard surfaces.

5.4.2.7 Series T. The preliminary disassembly, leading to the exposure of the fixed disc, differs somewhat between the two series of Disc Drives. To remove the Series T fixed disc assembly, perform the following steps:

A. Remove the colored trim panel on the front of the unit.

B. Remove the four 6-32 flat-head screws retaining the operator's control switch plate, but leave the switch plate in place.

C. Remove the single 6-32 screw (facing upward) inside the vertical end caps on each side of the bottom of the unit.

D. Remove the two 6-32 screws at the top of each end cap used to fasten each end cap mounting to the shroud. The end caps and upper mounting brackets now can be removed from the Disc Drive.

E. Disconnect the guides by removing the last mounting screw (one of three). The guides will be connected only to the door which can now be opened only part way.

F. Remove the shroud as follows: take off the three standoffs and the remaining screws around the perimeter of the shroud. Disconnect the solenoid wires at the mating plug and jack receptacles inside the shroud, and lift the shroud off the Disc Drive.

G. Remove the actuator for the cartridge interlock microswitch as follows: the vertical actuator, which engages the microswitch, is held in place by a retaining ring. Remove the retaining ring, and lift out the actuator through the top of the sheet metal strip.

H. Remove the fixed disc cover as follows: this black sheet metal piece, which covers the fixed disc, extends down the front and wraps underneath the casting. Remove all screws and stand-offs around the perimeter of the cover, as well as the three 6-32 flat-head screws on the bottom of the cover. Unplug connector F12 for the cartridge motor transducer, and remove the cover. The fixed disc in the Series T Disc Drive is now exposed.

5.4.2.8 Series F. Prior to removing the fixed disc assembly on the Series F Disc Drive, refer to Figure 5-12, and perform the following steps:

A. Remove the colored trim panel and the retaining screws on the operator's control switch plate by the same procedure as in Step B of paragraph 5.4.2.7.

B. Remove the two 6-32 screws (one for each end cap) directly below the end caps on the bottom of the unit. Remove the end caps and the top panel connecting the caps.

C. Remove the screws and stand-offs around the perimeter of the fixed disc cover as well as the three screws on the bottom front part of the cover (ref. figure 5-12). Unplug connector P12 for the cartridge sector transducer. Disconnect and tag the solenoid leads.

D. Remove the front screw on the solenoid mounting plate. The fixed disc cover can now be lifted off the unit, and the fixed disc in the Series F Disc Drive is now exposed.

5.4.2.9 Fixed Disc Removal. When the preliminary steps have been performed, remove the fixed disc as follows:

A. Remove the six 6-32 nuts and washers on the perimeter of the spindle. Remove the fixed disc clamp ring.

B. Remove the disc from the spindle assembly.

C. If removal of the spindle assembly is not required, disregard paragraphs 5.4.2.10 through 5.4.2.13 and proceed to paragraph 5.4.2.14.

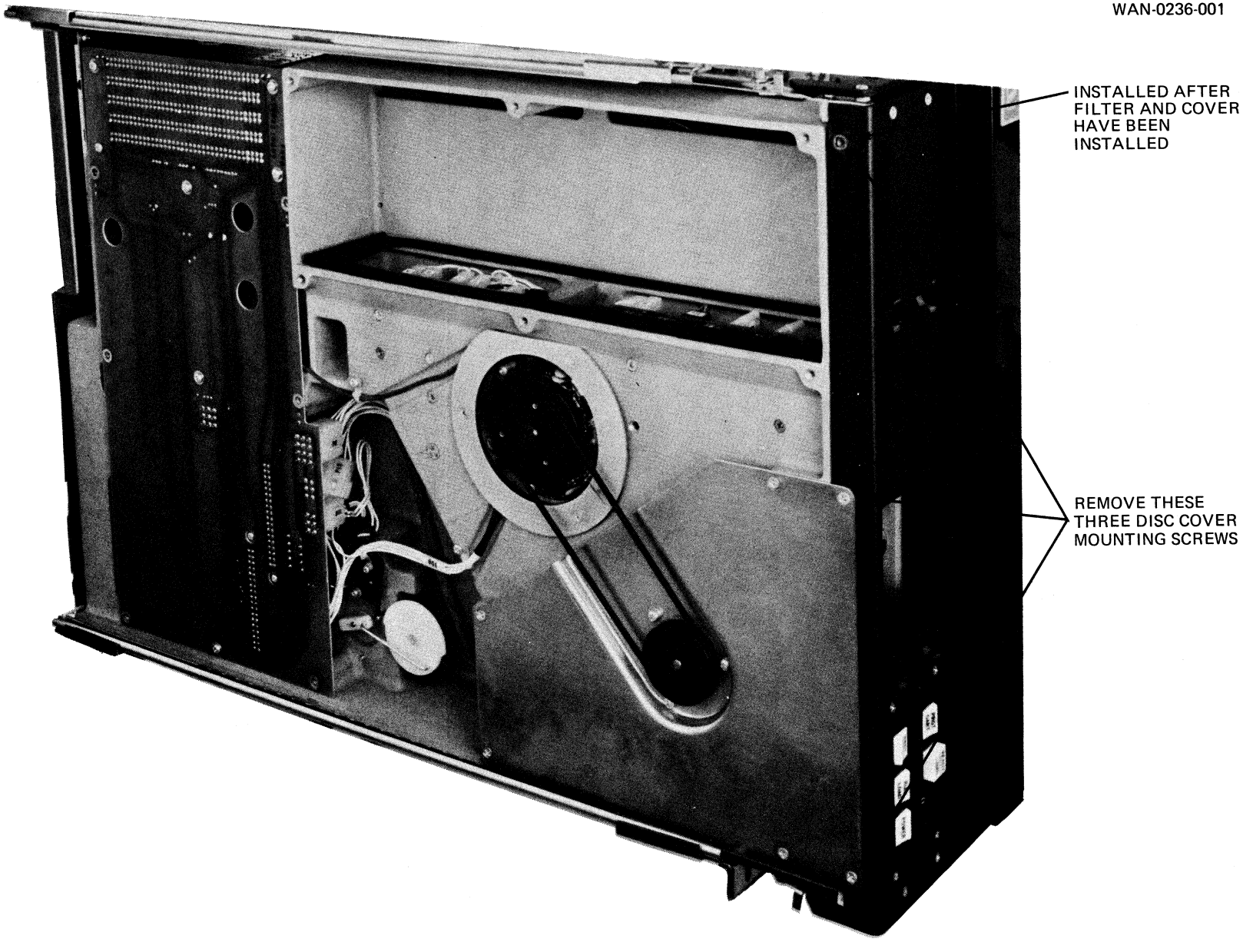


Figure 5-12. Lower Disc Cover Mounting Screws

5.4.2.10 Thermistor Assembly Removal (200 TPI Units Only). To remove the thermistor assembly, perform the following steps:

A. Remove the 6-32 screw securing the assembly (ref. figure 5-7).
B. Disconnect plug P31, and remove the assembly.
C. Reverse steps for replacement. Apply silicon grease to the lower side of the assembly prior to its installation.

5.4.2.11 Spindle Assembly Removal. To remove the spindle assembly, see **Figure 5-13 (ref. figure 5-5) and perform the following steps:**

A. Lift the belt off the two pulleys at the bottom of the Disc Drive.
B. Remove the three 6-32 screws used to fasten the gasket cover to the base, and remove the gasket.
C. Remove the air filter access cover, loosen the wedge-shaped filter clamps, and remove the air filter (ref. figure 5-17).
D. Disconnect the spindle motor plugs from the Power Switch Board located in the plenum chamber (ref. figure 5-18).
E. Remove the three ¼-20 cap screws used to fasten the spindle assembly to the casting. Access is through three corresponding holes in the casting. The spindle assembly can now be lifted from the Disc Drive.
F. At this point, the fixed disc sector ring can be removed if it is to be replaced (to change the number of sectors). If removal of the fixed disc sector ring is not required, disregard paragraph 5.4.2.12 and proceed to paragraph 5.4.2.13.

WARNING

REPLACEMENT SPINDLE ASSEMBLIES ARE SHIPPED WITH COMMUTATOR PWB INSTALLED. DISC DRIVES WITH SERIAL NUMBERS PRIOR TO 6000 REQUIRE COMPLIANCE WITH INSTRUCTIONS ON FIELD NOTICE TAG, SHOWN IN FIGURE 5-14 PRIOR TO INSTALLATION OF A NEW SPINDLE ASSEMBLY.

5.4.2.12 Fixed Disc Sector Ring Removal. The sector ring is mounted to the bottom side of the fixed disc hub by means of the same six 6-32 screws used to secure the fixed disc. Remove these six screws, and lift off the sector ring.

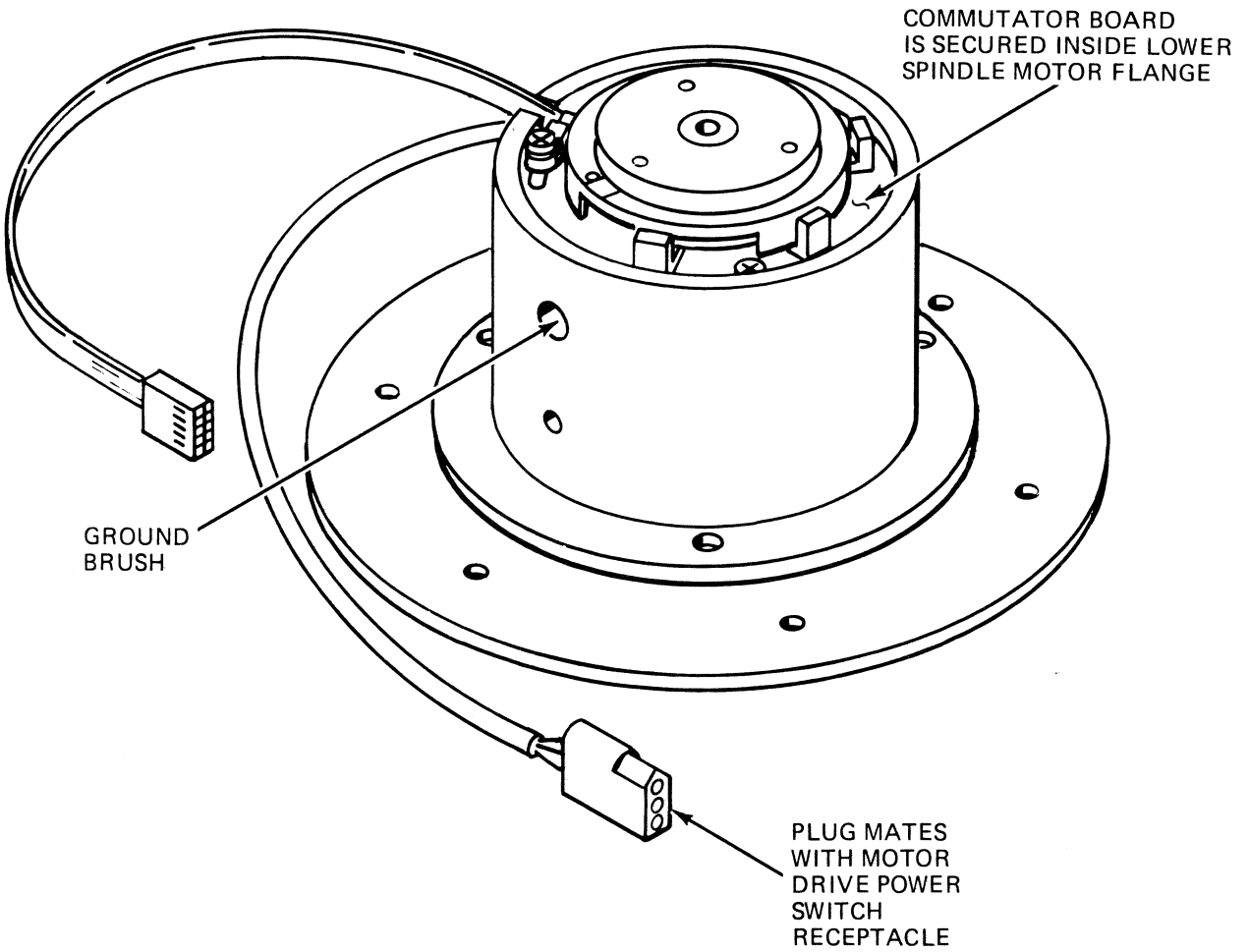
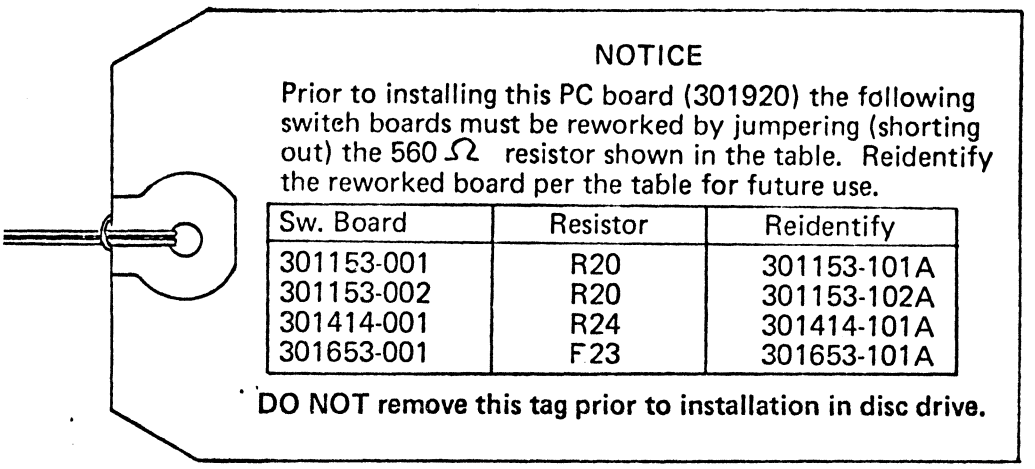


Figure 5-13. Spindle Assembly



NOTICE

Prior to installing this PC board (301920) the following switch boards must be reworked by jumpering (shorting out) the 560 Ω resistor shown in the table. Reidentify the reworked board per the table for future use.

Sw. Board	Resistor	Reidentify
301153-001	R20	301153-101A
301153-002	R20	301153-102A
301414-001	R24	301414-101A
301653-001	F23	301653-101A

DO NOT remove this tag prior to installation in disc drive.

Figure 5-14. Field Notice Tag

5.4.2.13 Spindle Assembly Replacement. To replace the spindle assembly, perform the following steps:

A. Seat the spindle assembly in the casting, and replace the three ¼-20 cap screws securing the assembly.

NOTE

The spindle assembly fits snugly into the casting hole. When inspecting the spindle assembly, make certain that it is inserted perfectly straight. No undue force should be used (or necessary) when performing this operation.

B. Reconnect the spindle motor plugs.

5.4.2.14 Disc Brush Motor Replacement. To replace the disc brush motor, refer to Figure 5-15 and perform the following steps:

A. Extract leads from plugs P11-6 and P11-1 or P11-4. An alternate method is to unsolder the two leads on the motor housing on top of the base plate.

B. Loosen the 6-32 Allen head set screw located at one end of the plastic crank. Lift the crank off the motor shaft.

C. Remove the two 4-40 screws used to secure the motor to the casting (top side of the base plate), and lift out the motor.

NOTE

100 and 200 TPI motors differ and are so marked

100 TPI – 4 rpm

200 TPI – 1 rpm

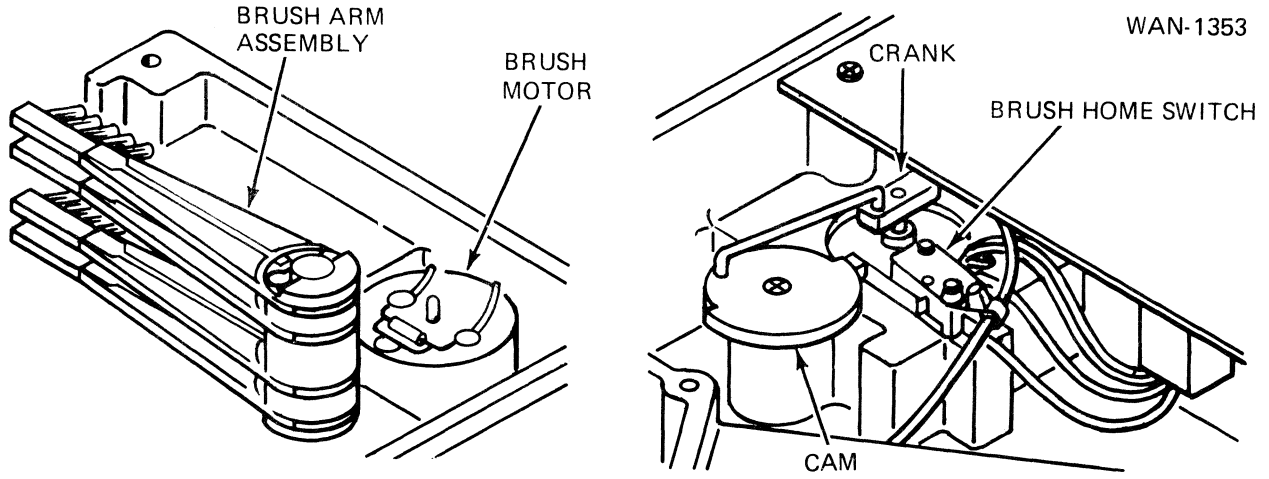


Figure 5-15. Disc Brush Drive Mechanism

5.4.2.15 Reassembly of Disc Drive. To reassemble the Disc Drive, perform the following steps:

A. Clean the casting cavity; a vacuum cleaner and suitable nozzle can be used for this purpose.

B. Install the fixed disc on the six 6-32 studs on the spindle hub; hold the disc by its edges. Make sure that the disc is perfectly clean (no dust or finger prints) and that any marking (serial number, etc.) on the inner uncoated area of the disc is facing up. The disc must be properly seated on the guide ridge of the spindle hub.

C. Install the clamp ring, replace the six nylon washers with new washers, and install the 6-32 nuts. Tighten the nuts alternately in a criss-cross pattern, and tighten **each nut to 8 inch-pounds (20.32 cm/0.4536 kg) with a torque wrench.**

D. Reassemble the Disc Drive in the reverse order of its disassembly as previously described. Verify both transducer outputs and align the heads and index to data.

5.4.3 REMOVAL AND REPLACEMENT OF SUBASSEMBLIES

In the following paragraphs, removal for servicing or replacement of subassemblies and associated components is described in detail. Figure 5-16 summarizes these operations.

5.4.3.1 Air Filter. The air filter, as shown in Figure 5-17, is located in the rectangular cavity in the bottom side of the base casting adjacent to the spindle assembly. It is retained by a sheet metal cover. To remove this assembly, perform the following steps:

CAUTION

OPERATION OF THE DISC DRIVE WITH THE AIR FILTER REMOVED MAY CAUSE DAMAGE TO, AND NECESSITATE REPLACEMENT OF, THE BLOWER DRIVE BELT.

A. Remove the seven 6-32 flat-head screws used to secure the air filter cover to the casting, and remove the air filter cover.
B. Loosen the two wedge-shaped clamps on the filter, remove the filter element, and inspect. Replace the filter element if necessary.
C. If only the prefilter element is to be replaced, peel this part off the filter element and apply a new prefilter (on same side of main filter).
D. To reinstall the filter element, perform these steps in the reverse order used for air filter removal.

5.4.3.2 Filter Element Replacement. When reinstalling the filter element, make sure that the arrow label (which indicates the direction of air flow) on the filter case points toward the outside wall of the casting. The prefilter will face the spindle assembly.

NOTE

If the following parts are to be replaced, perform these operations before reinstalling the filter element:

1. Fixed Disc Sector Transducer.
2. Motor Drive Power Switch Circuit Board.
3. Spindle Drive Regulator Circuit Board.

5.4.3.3 Fixed Disc Sector Transducer. The Fixed Disc Sector Transducer is screwed into the casting in the plenum chamber and is accessible from the air filter cavity. If the air filter is in place, first remove that component. Then perform the following steps:

WAN-1102-004

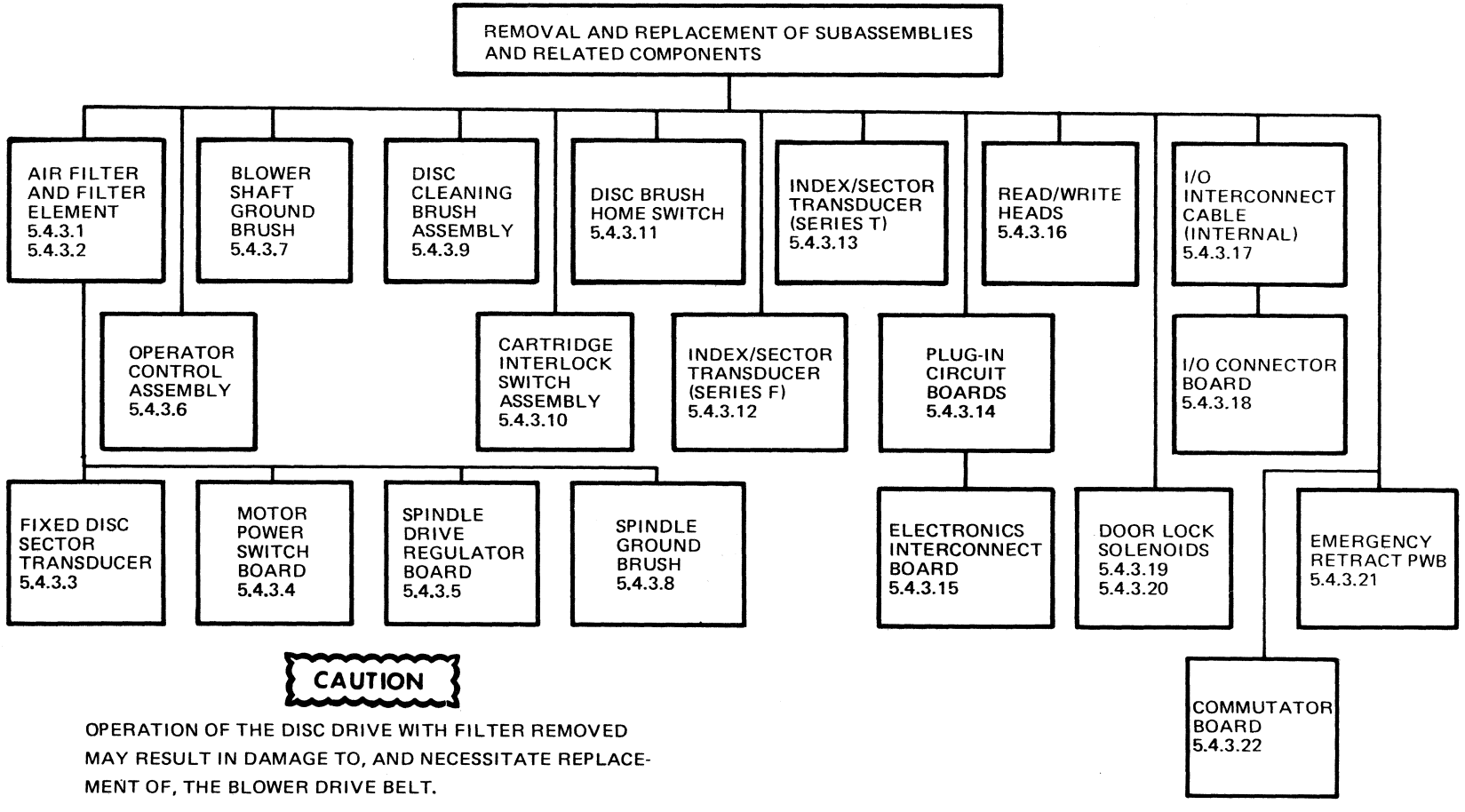


Figure 5-16. Removal/Replacement Guide – Subassemblies

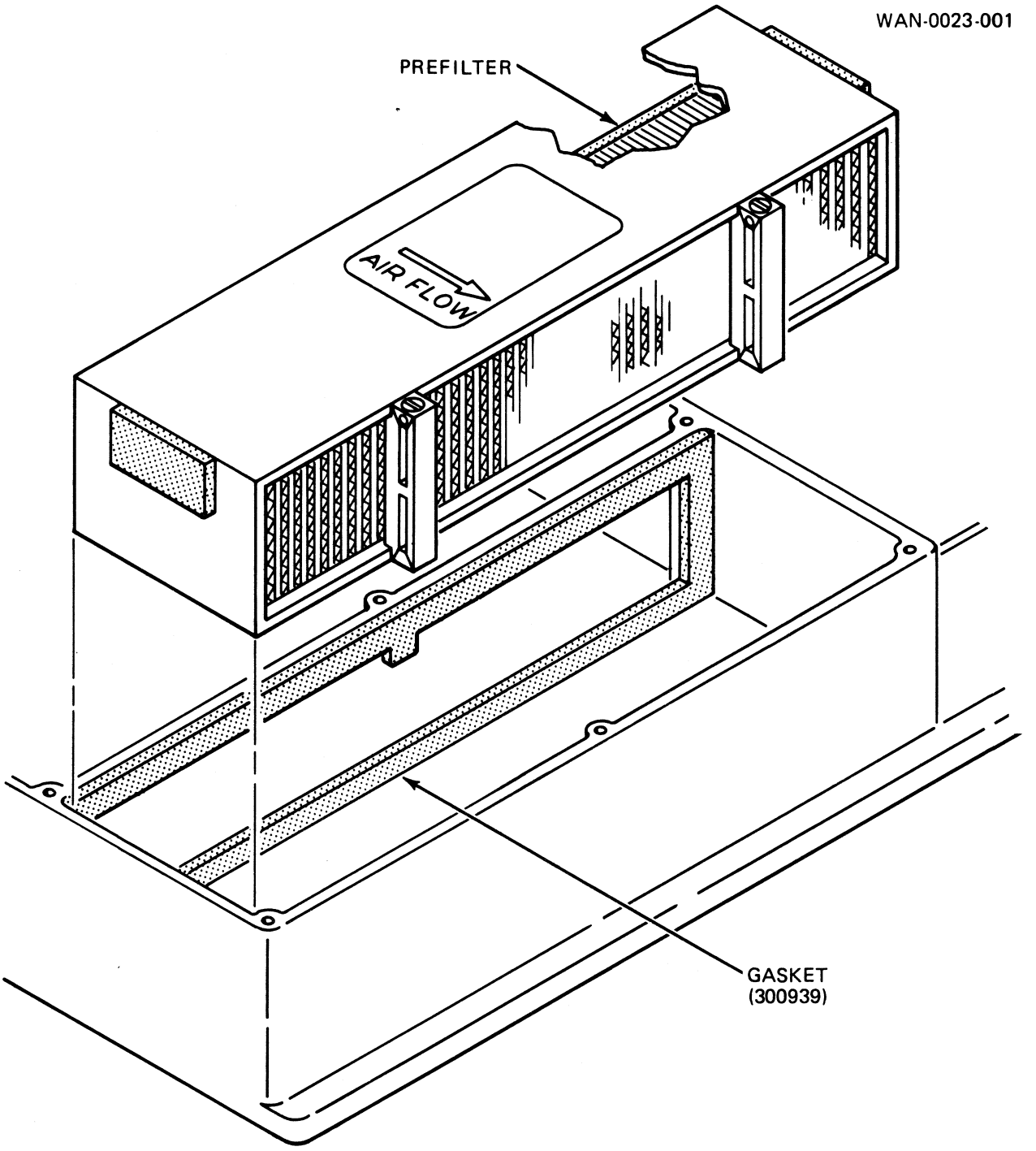


Figure 5-17. Air Filter Installation

A. To remove the sector transducer, unplug connector P13, loosen the jam nut that locks the transducer body, and screw the transducer out of the casting.

B. After the transducer has been replaced, its position relative to the fixed disc sector ring must be adjusted. To adjust the transducer position, place an 0.005-inch (0.127 mm) shim between the transducer tip and the sector ring. Screw the transducer toward the sector ring until the 0.005-inch (0.127 mm) clearance is obtained. Tighten the jam nut to secure the transducer to the casting, and remove the shim.

NOTE

This mechanical adjustment of the transducer can be performed only if the fixed disc has been removed. If it is in place, the alternate procedures outlined in steps C and D must be used, since it is not possible to insert the shim with the disc in place.

C. Alternate Transducer Adjustment: Screw the transducer into the casting until it just touches the fixed disc sector ring. Then back off the transducer (counterclockwise) approximately one-quarter turn.

D. Perform the transducer adjustment procedure described in paragraph 5.4.3.12.

5.4.3.4 Motor Drive Power Switch Board. This circuit board is located in the plenum chamber, next to the spindle assembly, and is accessible from the air filter cavity. In the air filter is in place, first remove this component. To remove the Motor Drive Power Switch Board, unplug all electrical connectors from the board. Remove the two 6-32 screws which are available from below the base plate and which are used to mount the heatsink to the casting. The board then may be lifted out of the chamber. Refer to Figure 5-18 for the location of this circuit board. Apply a liberal coating of silicon grease of the base of the heatsink on the Motor Drive Power Board.

5.4.3.5 Spindle Drive Regulator Board. This circuit board is located in the plenum chamber, as shown in Figure 5-18, and is accessible from the air filter cavity. If the air filter is in place, first remove this component. To remove the circuit board, disconnect the electrical leads and take out the four 6-32 machine screws that mount the heatsink to the casting. When installing this circuit board, apply a generous coating of silicon grease to the base of the heatsink prior to mounting. This is necessary to ensure adequate heat transfer to the casting.

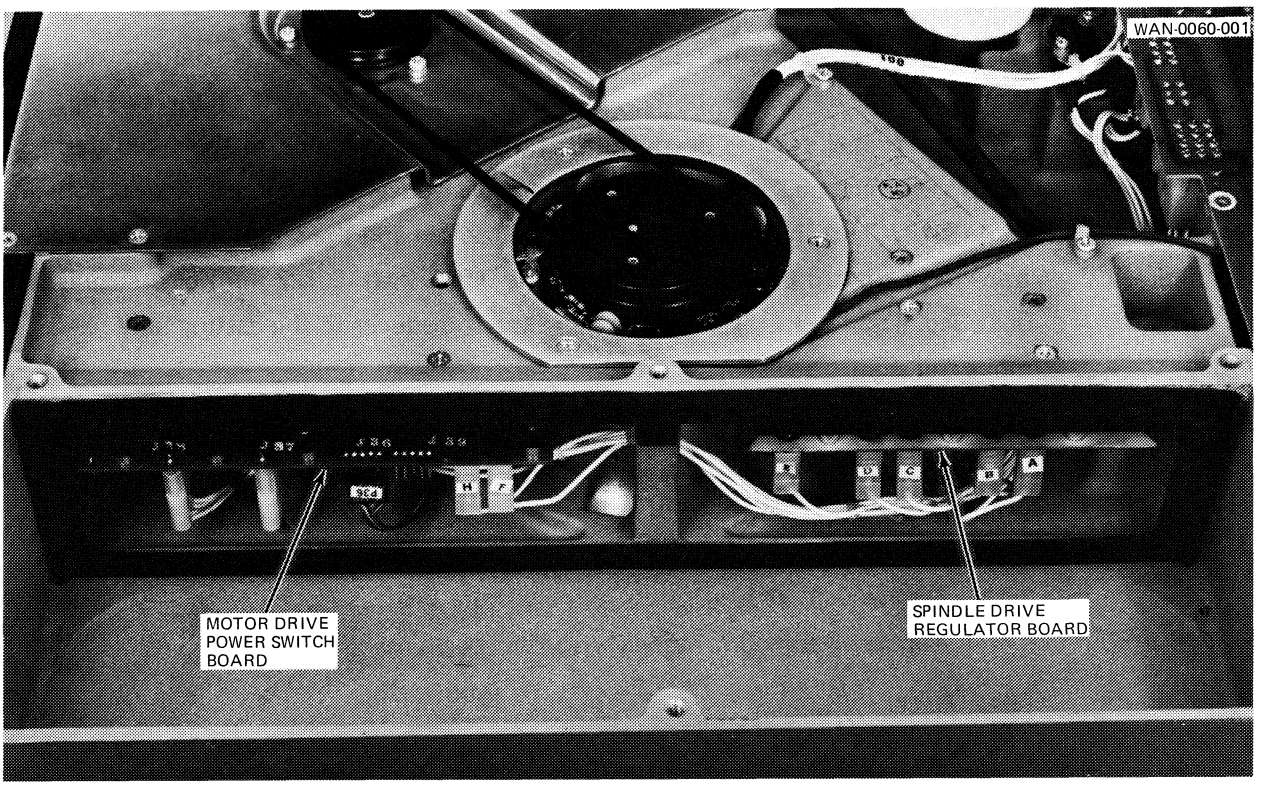


Figure 5-18. Spindle Motor Control Boards

5.4.3.6 Operator's Control/Indicator Assembly. This assembly consists of a metal plate on which the control switches and indicators are mounted. The assembly is mounted to the vertical sheet metal panel (part of the fixed disc cover) across the front of the chassis with four 6-32 flat-head screws. The wire harness that connects the control assembly with the Electronics Interconnect Board is routed through the casting behind the blower access cover.

To remove the OCP (Operator's Control Panel), perform the following steps:

A. Remove the four 6-32 screws used to secure the control assembly plate to the Disc Drive chassis.

B. Remove the two 6-32 set screws in the rim of the blower pulley; then slide the pulley off its shaft. See Figure 5-19.

C. Remove the nine 6-32 screws that fasten the blower access cover. These include the three screws around the pulley which are used to hold the bearing assembly to the cover. Remove the access cover.

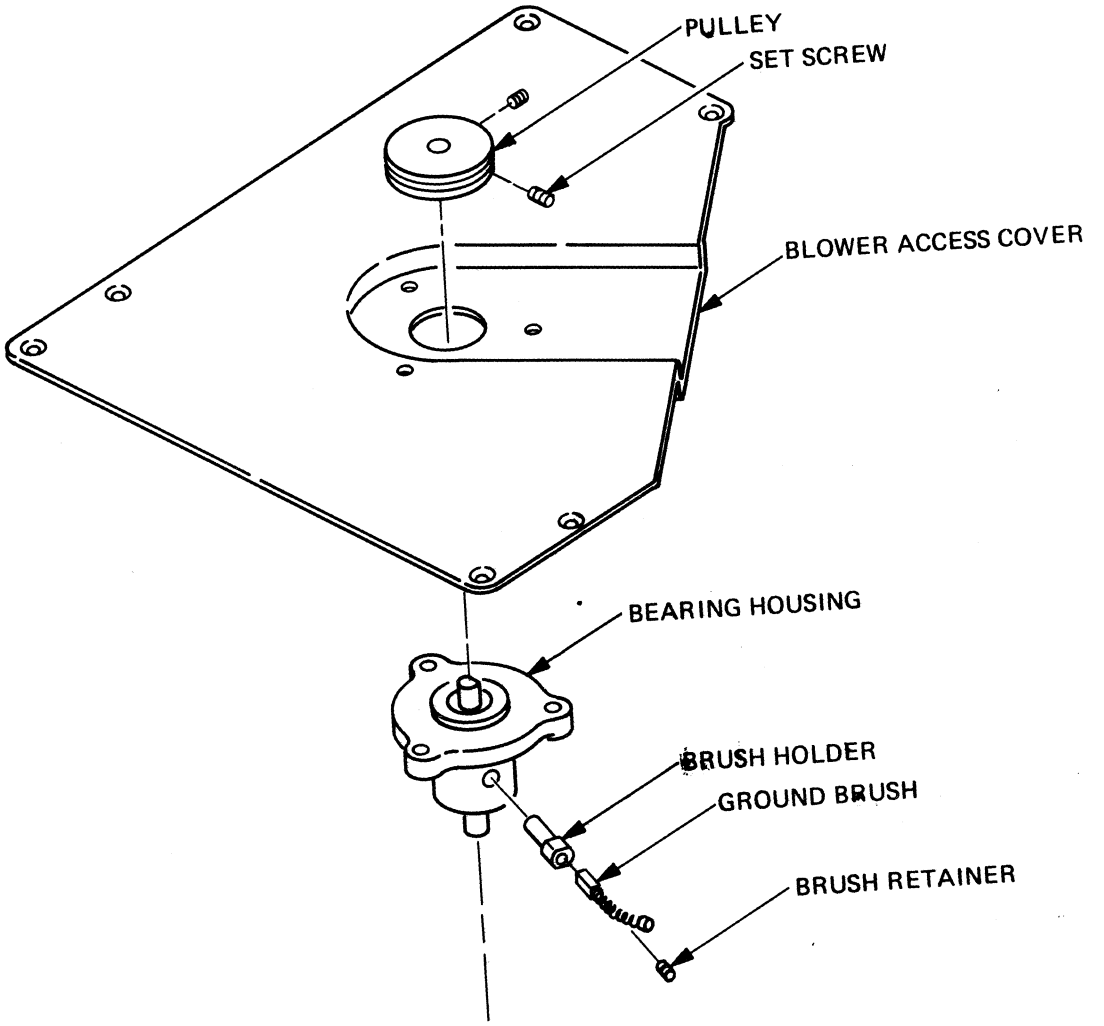


Figure 5-19. Blower Shaft Ground Brush – Mounting

D. Unplug connector P8 (on the other end of the harness) from the Electronics Interconnect Board, and unplug connector P19. Remove the three wires from cartridge interlock switch S9. Then remove the harness and control assembly from the Disc Drive.

E. To replace the control assembly, follow in reverse order the procedure used for disassembly.

NOTE

If the blower shaft ground brush is to be replaced, this should be done prior to reinstalling the blower access cover and the blower pulley.

5.4.3.7 Blower Shaft Ground Brush. The blower shaft ground brush is mounted in the bearing housing of the blower. The brush is to be replaced if the resistance between the blower shaft and the casting exceeds 1.5 Ohms (with the shaft rotating). To replace the brush, remove the slotted screw at the back of the brush holder, remove the brush, and substitute a new brush. Figure 5-19 shows the configuration of the brush assembly mounting.

5.4.3.8 Spindle Ground Brush. The spindle ground brush is mounted on the side of the spindle motor. Brush replacement is indicated if the resistance between the spindle shaft and the casting exceeds 1.5 Ohms (with the shaft rotating). To remove the spindle ground brush, remove the air filter and remove the screw securing the brush in the spindle assembly, as shown in Figure 5-20. Take out the brush. To replace the ground brush, reverse the procedure.

5.4.3.9 Disc Cleaning Brush Assembly. The Disc Drive contains cleaning brushes that sweep the disc(s) once during the start operating cycle. The Series F units contain a set of two brushes which are used to sweep the disc surface. The Series T units contain two sets, each of which contains four brushes, one set being used to sweep the fixed disc and one set for the cartridge disc. If the brushes are not in good condition (bristle tips are not touching), they must be replaced. See Figure 5-21 for correct mounting of the cleaning brushes.

Access to the brush assembly is through an opening on top of the fixed disc cover in the Series F Disc Drive and a similar opening on top of the shroud in the Series T Disc Drive. These openings are normally closed by covers. To remove the cleaning brushes, perform the following steps:

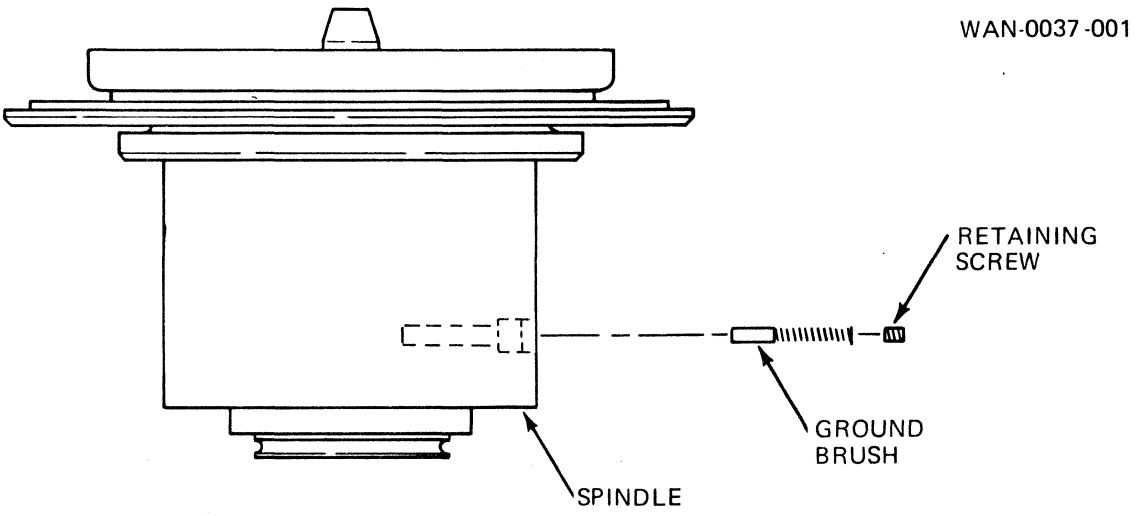


Figure 5-20. Spindle Shaft Ground Brush – Mounting

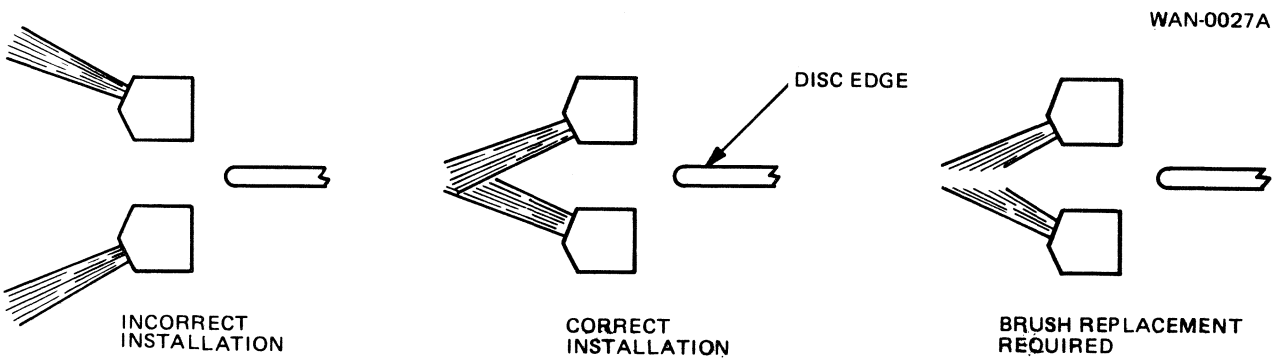


Figure 5-21. Disc Cleaning Brushes – Installation/Replacement Guide

A. Remove the two 6-32 screws that secure the cover, and take off the cover.

B. Remove the hair-pin shaped clip located on top of the hub assembly, and lift off the assembly.

C. To replace the brush arm assemblies, pull them (one at a time) from the hub. Install new brush arm assembly. Also observe proper keying of the brush arm assemblies; there are two types of brushes, a right-hand brush and a left-hand brush.

5.4.3.10 Cartridge Interlock Switch. This mechanism consists of a microswitch and a plunger-type actuator on its upper end. When the disc cartridge housing is seated in the Disc Drive, the actuator is engaged. The switch is located at the left-hand side of the control/indicator mounting plate and is accessible when the trim panel at the front of the unit is removed. A photo of the cartridge interlock switch is included in Figure 5-22.

To remove the cartridge interlock switch subassembly, perform the following steps:

A. If the actuator is to be taken off, remove the retaining ring with which it is secure. Then lift the actuator through the top of the fixed disc cover.

B. To remove the microswitch, unplug the leads from the switch terminals and remove the two 4-40 screws used to fasten the switch to its mounting plate.

C. After the switch has been replaced, verify the proper operation of the switch/actuator. If necessary, the switch position should be adjusted.

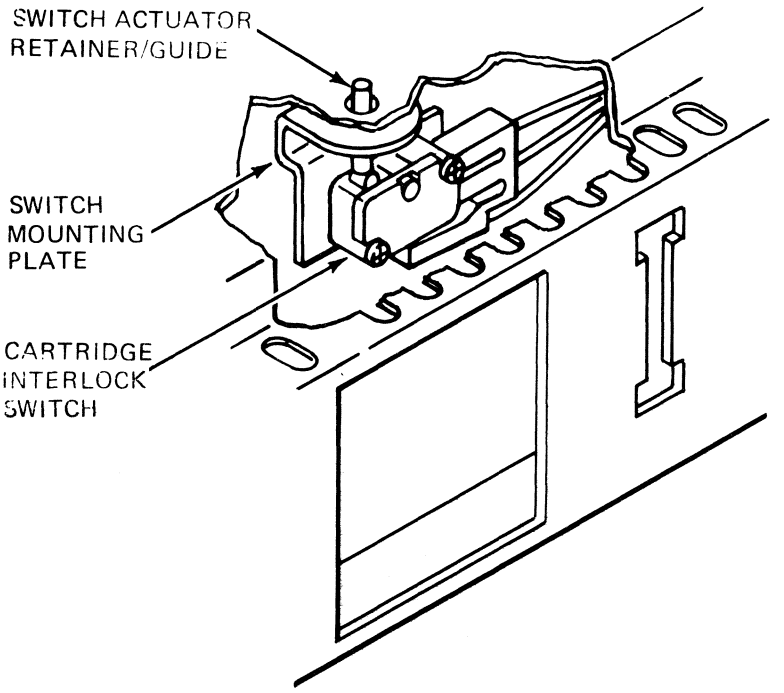


Figure 5-22. Cartridge Interlock Switch Assembly

D. To adjust the microswitch position, slightly loosen the two switch mounting screws. Install a disc cartridge and close the door. On the Series T Disc Drive the bottom cover must be installed on the cartridge.

E. Move the switch against the actuator until it clicks, indicating that the switch has been actuated. Tighten the switch mounting screws while holding the switch securely in the adjusted position.

NOTE

Some small travel should remain in the switch after it has been adjusted. That is, the actuator plunger should not press the switch mechanism to its stop when the cartridge is seated.

5.4.3.11 Disc Brush Home Switch. This microswitch is located next to the cam of the disc brush drive mechanism below the base plate (ref. figure 5-15). To remove the microswitch, perform the following steps:

A. Unplug the two leads from the switch terminals, and remove the two 4-40 screws used to secure the switch to the base.
B. After the switch has been replaced, verify proper operation, and adjust switch position if necessary.
C. To adjust the microswitch position, bend the actuator arm so that it actuates the switch as indicated by a click in the switch as the switch arm is halfway up the cam.

CAUTION

WHEN TESTING AND ADJUSTING THE SWITCH MECHANISM, DO NOT ROTATE THE CAM BY HAND UNLESS THE LINKAGE TO THE BRUSH MOTOR (ref. figure 5-15) HAS BEEN DISCONNECTED. DAMAGE TO THE MOTOR HEAD WILL RESULT IF THE LINKAGE IS DRIVEN MANUALLY.

5.4.3.12 Index/Sector Transducer, Series F. The index/sector transducer is a magnetic pickup device that is mounted on the top side of the fixed disc cover near the spindle hub as shown in Figure 5-23.

To remove the transducer, perform the following steps:

A. Remove the two 4-40 screws. Note or mark the position of the transducer on the bracket. This will facilitate index alignment.
B. When reinstalling the transducer, line it up to its original position mark as noted in step A. After replacement, perform the removable disc Index/Sector transducer check. This procedure is outlined in paragraph 5.6.3.3 and alignment is outlined in paragraph 5.6.9.

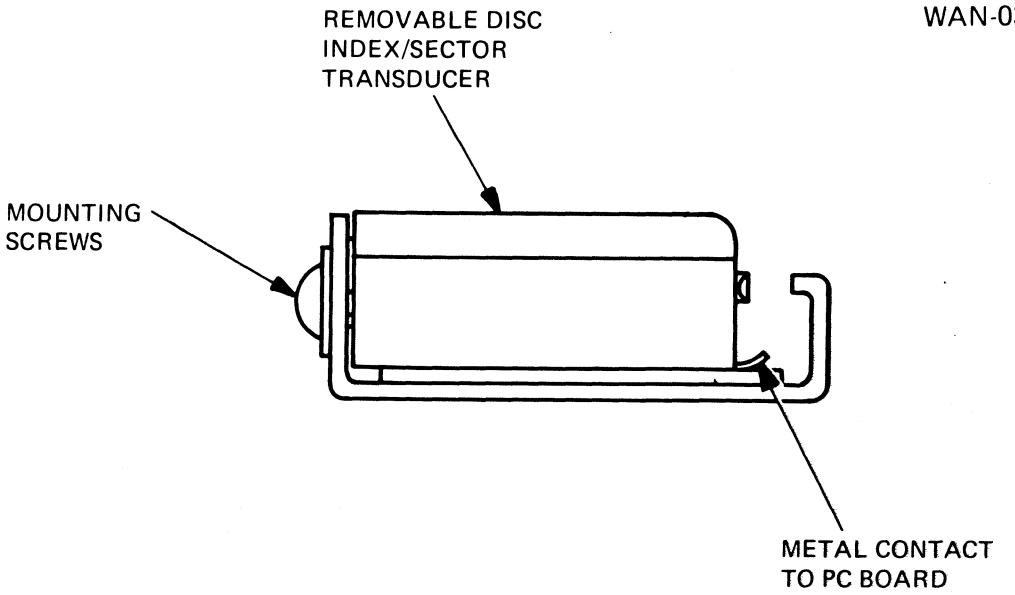


Figure 5-23. Index/Sector Transducer, Series F

5.4.3.13 Index/Sector Transducer, Series T. The index/sector transducer in the Series T Disc Drive is a magnetic pickup device mounted on top of the fixed disc cover near the spindle hub as shown in Figure 5-24.

To remove the transducer, perform the following steps:

A. To check the transducer for continuity of its winding, disconnect connector P12 from the Electronics Interconnect Board and remove the disc cartridge. Using an ohmmeter, measure the resistance between the two contacts of P12. If this measurement indicates an open winding, the transducer must be replaced.

B. To replace the transducer, loosen the 6-32 set screw in the side of the transducer mounting block. Remove the leads from the housing of connector P12. Turn the transducer counterclockwise until it is completely removed from the mounting block.

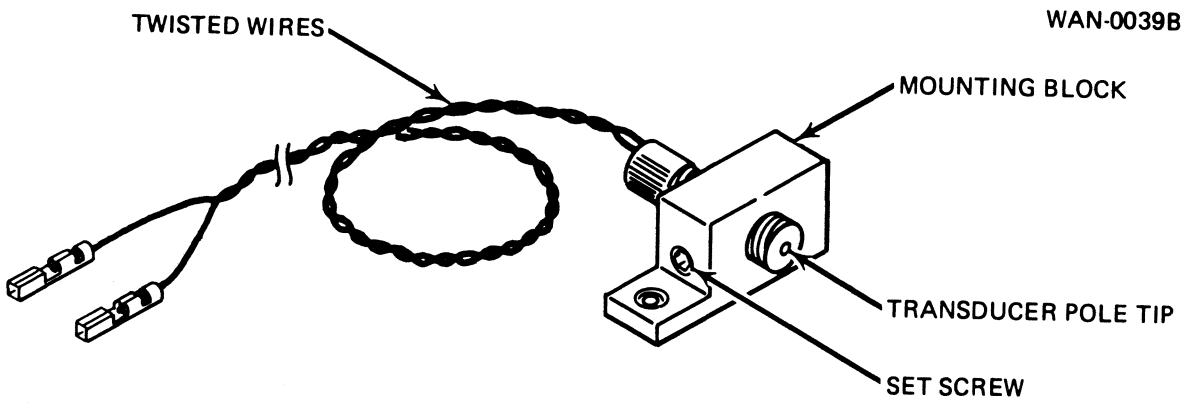


Figure 5-24. Index/Sector Transducer – Series T

C. Install a test hub on the spindle. Screw the replacement transducer into the mounting block (clockwise rotation) until it just touches the sector ring. Back off the transducer slightly, and with the aid of a shim, adjust the clearance between the transducer pole tip and the sector ring to 0.005 inch (0.127 mm). Reroute the transducer leads, insert the leads in the housing of connector P12.

D. Perform the removable transducer adjustment as described in paragraph 5.6.3.1 and the alignment procedures outlined in paragraph 5.6.9.

5.4.3.14 Plug-In Circuit Boards. The Disc Drive contains seven plug-in circuit boards (which are identified in figures 5-3 and 5-4). To remove the printed circuit boards, perform the following steps:

A. To remove any of the five boards in the card cage next to the positioner assembly, simultaneously lift up the two extractor levers on the top edge of the board being removed. The circuit board will be automatically extracted from its receptacle.

CAUTION

TURN OFF THE POWER SWITCH ON THE OPERATOR CONTROL PANEL BEFORE REMOVING ANY OF THE CIRCUIT BOARDS.

B. After removing the Data Interface Board, unplug I/O cable connector P20 from the board using 3M extracting tool No. 3438 (WANGCO PN 108200).

C. Before the Servo Amplifier Board is removed, the harness connector (plug P15) Must be disconnected.

D. The two boards adjacent to the power supply assembly are removed by pulling them straight up out of their connectors and vertical guides. Prior to removing the Power Regulator Board, unplug connector P18 from that circuit board.

E. After replacement of the following circuit boards, the respective adjustment and alignment procedures should be performed as outlined in the following paragraphs.

1) Data Interface Board – Perform the Data Separator Adjustment procedure, paragraph 5.6.7.

2) Disc Control Board – Perform the Run to Load Adjustment procedure, paragraph 5.6.5, also perform the Head Alignment procedures outlined in paragraph 5.6.8.

3) Servo Amplifier Board – Perform the S.V.A. Adjustment procedure, paragraph 5.6.4, and the Head Alignment procedure, paragraph 5.6.8.

4) Data Electronics Board – Perform the Write Current Adjustment, paragraph 5.6.6 and the Data Separator Adjustment, paragraph 5.6.7.

5.4.3.15 Electronics Interconnect Board. This circuit board (mother board) incorporates the connecting receptacles for all seven plug-in boards as well as connecting pins for various harness cable connectors (ref. the interconnect drawing). The Electronics Interconnect Board is located below the base plate (ref. figure 5-5). To take out the Electronics Interconnect Board, perform the following steps:

A. Remove the seven plug-in circuit boards.

B. Unplug all cable connectors.

C. Remove the two 6-32 screws that fasten each of the two brackets used to secure the card cage to the base casting. Then disconnect the two brackets from the frame but not from the casting.

D. Remove all screws that fasten the Electronics Interconnect Board to the casting. The screws are accessible from the bottom of the Disc Drive (ref. figure 5-5).

NOTE

The card cage and the vertical guides on connectors J6 and J7 should not be removed from the Electronics Interconnect Board under normal conditions.

5.4.3.16 Read/Write Head Assemblies. Each Read/Write head assembly consists of a circular ceramic pad that contains the Read/Write and Erase coils, a gimbal spring used to support the head pad on the head arm, and the head arm which is mounted to the positioner carriage. A highly flexible four-wire cable interconnects each head with the Data Electronics Board. Each of the four conductors carries a five-pin connector on its free-end which plugs into a corresponding receptacle on the Data Electronics Board. See Figure 5-25 for a line drawing of a Read/Write head assembly.

Replacement of the head assemblies is simplified if the power supply assembly is temporarily removed from the Disc Drive to obtain unrestricted access to the head area. However, it is possible to remove the Read/Write heads with the power supply in place.

NOTE

Prior to removal of the heads associated with the fixed disc (the lower pair of heads), data written on the fixed disc should be transferred to a "scratch cartridge" since such data may not be recoverable after head replacement.

WARNING

WHEN REPLACING FIXED DISC HEADS, ENSURE THEY ARE OPPOSING EACH OTHER (SAME LOCATION IN MOUNTING SLOTS) AND STAGGERED APPROXIMATELY .075 (1.90 mm) TO .100-IN. (2.54 mm) FORE OR AFT OF CARTRIDGE DISC HEADS. THIS WILL ENSURE RELIABLE EMERGENCY RETRACT UNDER ALL CONDITIONS.

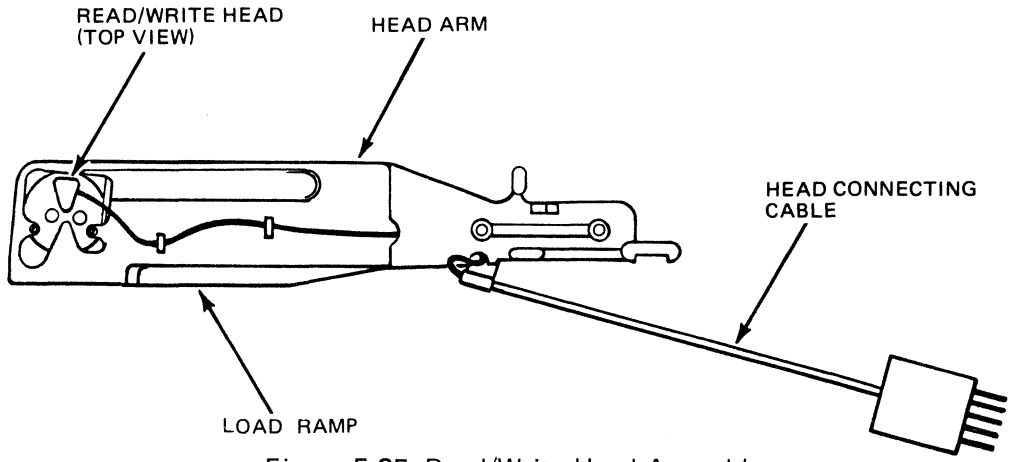


Figure 5-25. Read/Write Head Assembly

To remove the Read/Write heads, perform the following steps:

A. Remove the power supply unit (ref. paragraph 5.4.2.3) after making sure that the line cord has been removed from the wall outlet.
B. Unplug the head cable connectors from the Data Electronics Board.
C. Remove the two 4-40 cap screws used to secure the head clamp for the upper head pair to the carriage, and remove the head clamp.
D. Carefully lift the upper head arm off the ramp, and remove it from the cartridge. Then remove the lower head assembly in the same manner.
E. Repeat the procedures performed in C and D to remove the lower head pair.

CAUTION

DURING THE REPLACEMENT OF THE HEAD ASSEMBLIES, BE SURE TO AVOID CONTACT BETWEEN THE HEAD PADS AND ANY OTHER OBJECT. DO NOT BEND THE HEAD BEING REMOVED BEYOND THE CAM HEIGHT TO AVOID DAMAGE TO THE HEAD.

To replace the head assemblies, reassemble per disassembly order of steps D through B of the procedure used for head removal. Start with the lower head of the fixed disc head pair, and proceed upward to the upper head of the removable cartridge head pair.

After replacement of a head assembly, perform the following procedures:

A. Data Separator adjustments, paragraph 5.6.7.
B. Head alignment, paragraph 5.6.8.

5.4.3.17 I/O Interconnect Cable. This flexible cable provides input/output signal connections between the I/O Connector Board (mounted on the rear panel of the Disc Drive) and the Data Interface Board (mother board). The cable is terminated with a 50-pin connector at each end; these connectors mate with pins on the Data Interface Board and the I/O Connector Board.

To remove the I/O interconnect cable, disconnect the two 50-pin connectors at each of the two circuit boards. Use the 3M extracting tool for this operation to facilitate removal of the two connectors. Remove the upper screws from the vertical rod in the cable guide bracket. Then unsnap the cable clamps, tilt the rod, and slide out the I/O interconnect cable assembly.

5.4.3.18 I/O Connector Board. This circuit board is mounted on the rear panel of the Disc Drive. It incorporates the input/output line connectors and line drivers and receivers (ref. figure 2-3).

To remove the I/O Connector Board, take out the four mounting screws (one at each corner) used to fasten the circuit board to the rear panel, and lift out the board and its mylar cover. Unplug the I/O interconnecting cable from the board using the IBM extracting tool to facilitate disconnection without damage.

5.4.3.19 Door Lock Solenoid, Series F. This solenoid is located near the right-hand edge of the base plate (ref. figure 5-6) and is mounted on a small mounting plate that is bolted to the fixed disc cover. To remove the door lock solenoid, perform the following steps:

A. Prior to disconnecting the leads from the solenoid, record and tag the polarity of the connections; one of the solenoid terminals is color-coded, and the leads must be reconnected in the same configuration.
B. Unplug the two leads from the terminal tabs on the solenoid.
C. Remove the two 6-32 screws used to secure the mounting plate to the fixed disc cover. The mounting plate and the solenoid can now be lifted off the fixed disc cover.
D. Remove the two 6-32 screws that secure the solenoid to the mounting plate.

5.4.3.20 Door Lock Solenoid, Series T. These solenoids are located behind the door assembly (ref. figure 5-7) and are mounted on two small mounting plates that are bolted to the top of the shroud. To remove a door lock solenoid, perform the same steps used to remove the door lock solenoid for the Series F in the preceding paragraph. Make sure that the attaching plug is disconnected. If only one solenoid is to be replaced, unsolder the leads and tag each lead to indicate its polarity as described in step A of paragraph 5.4.3.19.

5.4.3.21 Emergency Retract PWB Assembly. This printed circuit board is located at the rear side of the Disc Drive, and is mounted next to the positioner assembly. To replace this circuit board, see Figure 5-26 and perform the following steps:

A. Disconnect plug P28 and remove the four 4-40 screws used to secure the board. Disconnect the positioner ground wire and remove the board assembly.

B. To install the board assembly, reverse the steps used to remove the board. Ensure that the positioner ground wire is connected to the same screw as the one from which it was removed.

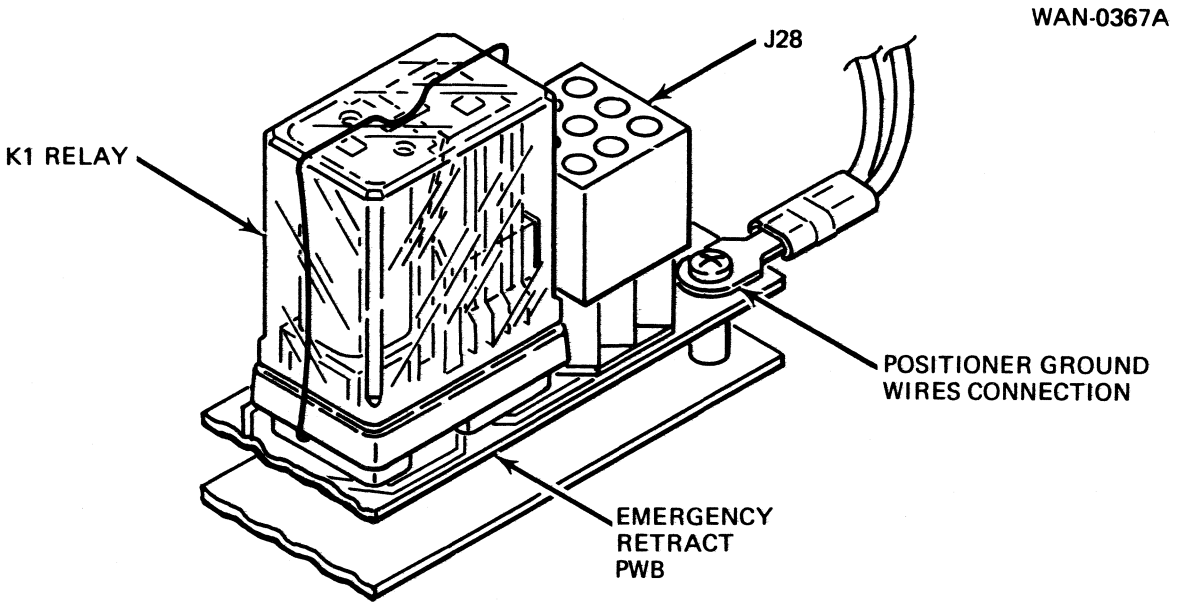


Figure 5-26. Emergency Retract PWB Assembly

5.4.3.22 Commutator Board Removal. This circuit board is mounted on the rear of the spindle motor assembly with the spindle motor shaft extending through the center of the doughnut-shaped Commutator Board. To replace this circuit board, perform the following steps:

WARNING

DISC DRIVES WITH SERIAL NUMBERS BELOW 6000 REQUIRE COMPLIANCE WITH THE INSTRUCTIONS CONTAINED ON THE FIELD NOTICE TAG, SHOWN IN FIGURE 5-27 , PRIOR TO INSTALLATION OF A NEW COMMUTATOR PWB.

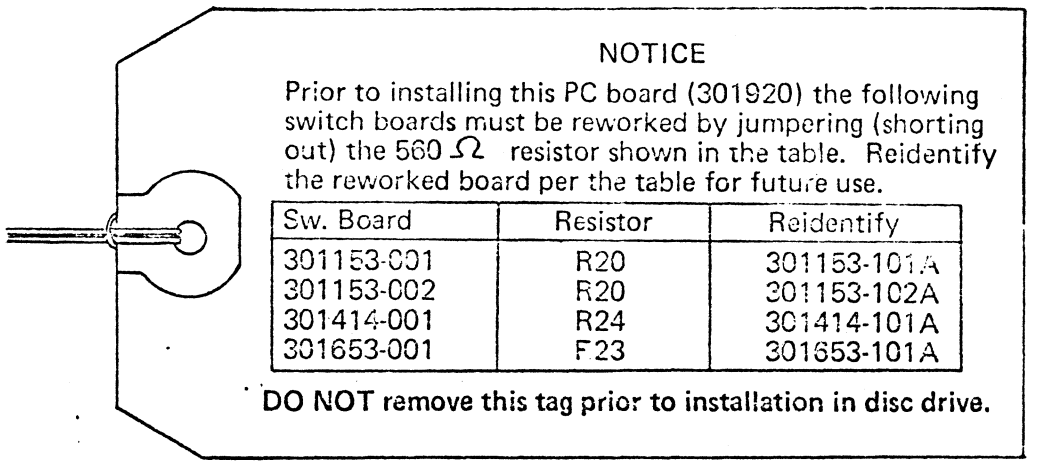


Figure 5-27. Field Notice Tag

A. Slide the Disc Drive out of the rack, and remove the Allen-head screw in the center of the spindle motor drive pulley.

B. When the pulley is removed, the three Phillips-head screws used to fasten the Commutator Board to the spindle assembly are accessible. Remove the three screws.

C. Replacement is done by reversing the steps used in removal.

D. Replace the defective Commutator Board if required, and/or loosen the pulley of the interrupter cup.

E. Disconnect plug P37 (spindle motor leads) from the spindle motor Power Switch Board, and plug Phasing Harness (301396) J37 into plug P37 (spindle motor leads).

NOTE

Early models of spindle phasing harnesses had J37 marked P37.

F. Connect the alligator clip of the phasing harness to the copper plate on top of the power supply as shown in Figure 5-28.

G. Actuate the POWER switch on the Disc Drive, and touch the harness contact pin to the (+) side of capacitor C5 shown on the schematic showing the harness connections in Figure 5-28. The spindle should rotate and lock in position.

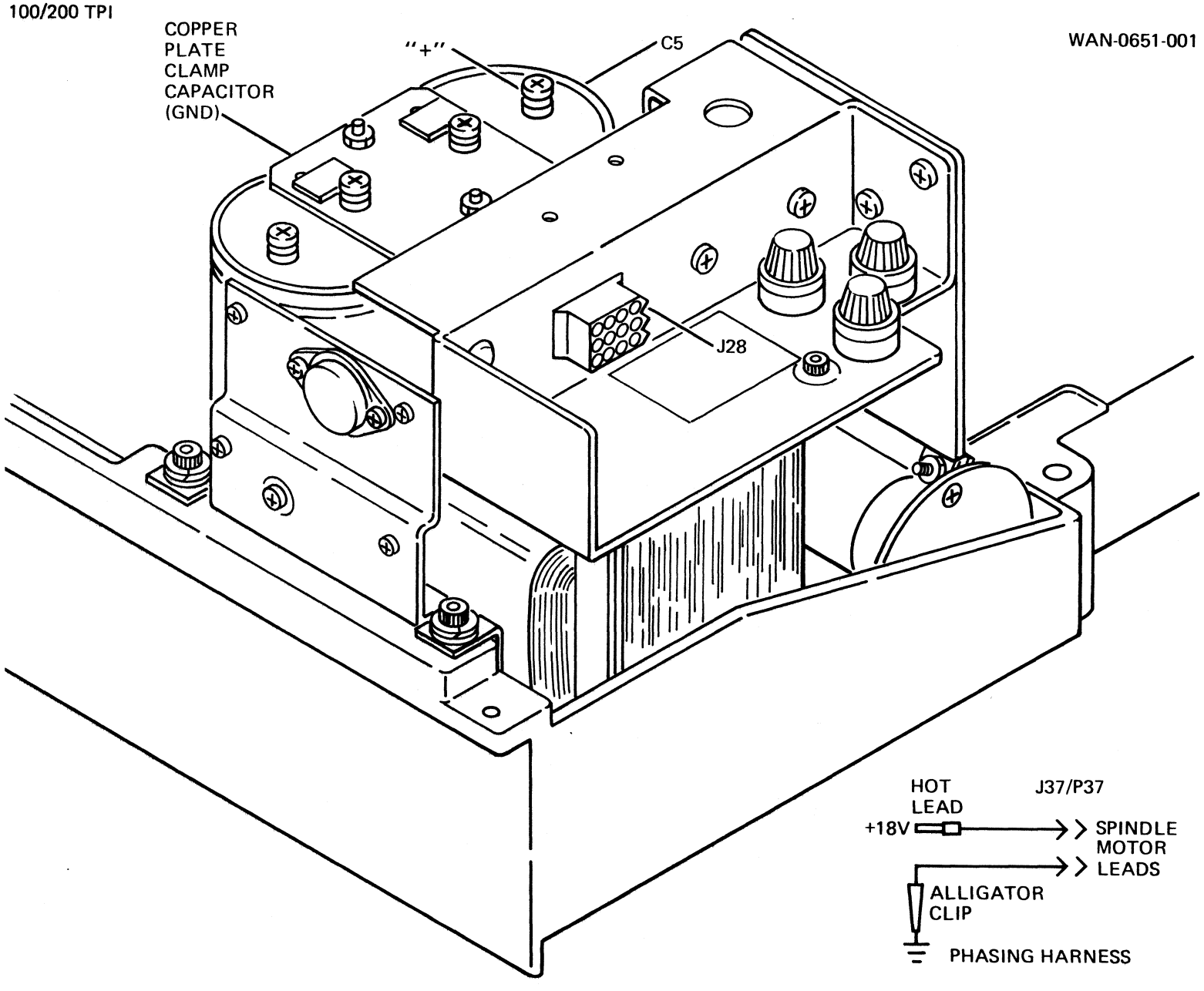


Figure 5-28. Power Supply Connections – Commutator Board Phasing Adjustment

CAUTION

DO NOT TOUCH CONTACT PIN LONGER THAN 3 SECONDS.

H. Ensure that the spindle does not move while adjusting the interrupter cup as shown in Figure 5-29.

I. Hold the interrupter cup with one hand, and tighten the pulley screw to 24 inch-pounds of torque.

J. Rotate the spindle shaft approximately 45 degrees, and repeat Step D. Ensure that the phasing is correct (ref. figure 5-29).

K. Actuate the POWER switch on the OCP to OFF position, disconnect the phasing harness, and reconnect plug P37 to J37 on the Spindle Motor Power Switch Board.

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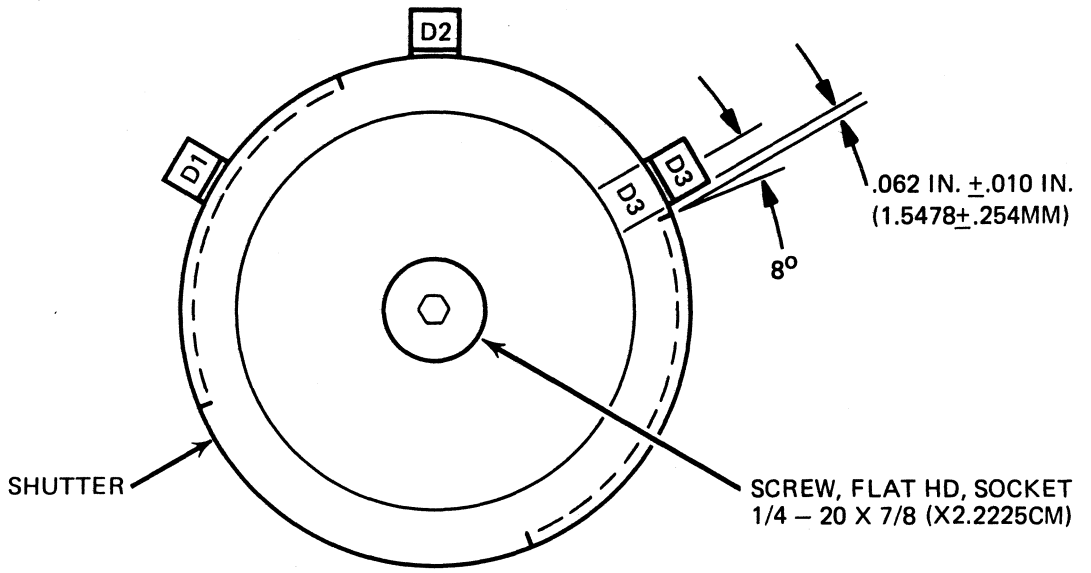


Figure 5-29. Shutter Adjustment – Commutator Board

5.5 FIELD EXERCISER FUNCTIONS AND OPERATION

5.5.1 GENERAL DESCRIPTION

The WANGCO Field Exerciser (WANGCO P/N 300382) is an economical off-line test device that provides manual and automatic control of the Read/Write positioning servo in both the Series F and Series T Disc Drives. The Field Exerciser plug-in unit is used in the alignment and calibration procedures. It also may be used within limitations in off-line trouble diagnosis of the positioning servo electronics. The Field Exerciser will not read or write any data patterns, and for this reason, cannot be used for diagnosis procedures requiring comparison.

The Field Exerciser components are mounted on a printed circuit board which is inserted in location J1 in the card cage when the Data Interface Board has been removed. It is fully operational when it has been inserted in its receptacle and power is applied to the Disc Drive. Installation of the Field Exerciser automatically puts the Disc Drive in off-line operation since removal of the DIB interrupts the I/O lines to the remote controller.

The Field Exerciser circuitry is implemented with TTL integrated circuits. Its various functions are programmed and activated by means of eight switches which are mounted along the upper edge of the board. Head position is indicated by nine CYLINDER ADDRESS lights mounted below the control switches. Two test points (SEEK COMPLETE and INDEX) and a SEEK COMPLETE indicator lamp also are mounted on the circuit board. See Figure 5-30 for a line drawing of the Field Exerciser Board.

5.5.2 OPERATING CONTROLS – FIELD EXERCISER

5.5.2.1 RESTORE (S1). A momentary-contact pushbutton switch which initiates a Restore operation.

5.5.2.2 DISC SELECT, REM/FIX (S2). A two position toggle switch that selects either the head pair associated with the cartridge disc or the head pair associated with the fixed disc.

5.5.2.3 HEAD SELECT,TOP/BOT (S3). A two position toggle switch that selects the upper or lower head of the head pair selected by switch S2.

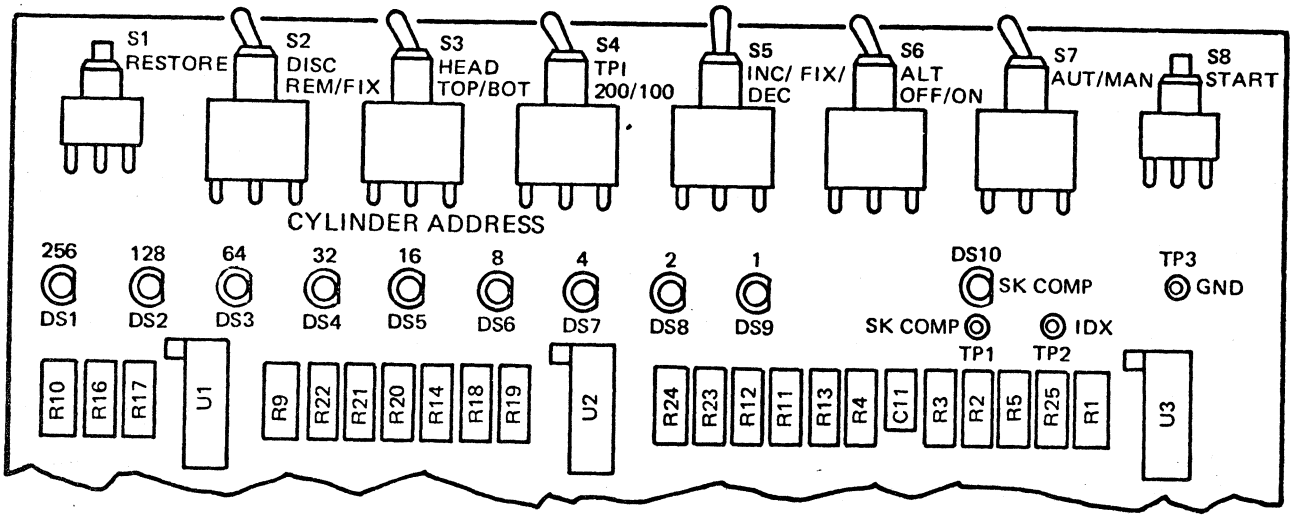


Figure 5-30. Field Exerciser Controls, Indicators and Test Points

5.5.2.4 100/200 TPI (S4). A two position toggle switch that selects access of 200 or 400 tracks depending on whether the Field Exerciser is using a 100 or 200 tracks-per-inch unit.

5.5.2.5 INC/FIX/DEC (S5). A three position toggle switch which selects the positioning mode. In the INC position, the Field Exerciser programs the positioning servo for successive incrementing of the heads, one track at a time, in the forward direction (toward the innermost track). In the DEC position, the heads will decrement, one track at a time, in the reverse direction (toward track 000). In the FIX position, the positioning servo will keep the heads over a given track. The access speed is governed by the setting of switch S6.

5.5.2.6 ALT, OFF/ON (S6). A two position toggle switch which enables the servo to alternate between track 000 and any selected track. When switch S6 is in OFF position, the access mode is governed by the setting of switch S5. When switch S6 is in ON position, the head carriage will travel, in alternating fashion, from a track accessed by switch S5 to track 000 and then back to the selected track, etc.

5.5.2.7 AUT/MAN (S7). A two-position toggle switch which selects automatic or manual operation. With switch S7 in the AUT position, the accessing mode, selected by switches S5 and S6, proceeds automatically and is synchronized to the Index pulses. When switch S7 is in the MAN position, the accessing mode selected will be under control of switch S8 the START push-button switch.

5.5.2.8 START (S8). A momentary-contact pushbutton switch which initiates the accessing operations. It operates in conjunction with switch S7.

5.5.3 INDICATORS AND TEST POINTS – FIELD EXERCISER

The nine indicator lights located below the control switches signal the track position (cylinder address). The readout is in binary format. The indicator lamp above TP1 furnishes a SEEK COMPLETE indication.

Test point TP1 (Seek Complete) permits convenient measurement of access time. Test point TP2 (Index) permits oscilloscope synchronization to the Index Pulse. Test point TP3 is the circuit ground connection.

5.5.4 INSTALLATION – FIELD EXERCISER

To install the Field Exerciser, perform the following steps:

A. Turn off power to the Disc Drive.
B. Extract the Data Interface Board (DIB) from its receptacle (refer to paragraph 5.4.3.14).
C. Insert the Field Exerciser board into the DIB connector location J1. Both the DIB and the Field Exerciser are keyed so that when the Field Exerciser board is installed correctly, the controls and indicators face the positioner assembly.

5.5.5 OPERATION – FIELD EXERCISER

Select the disc (cartridge or fixed) to be read out with switch S2. Select the upper or lower head for that particular disc with switch S3. Select the appropriate tracks/inch access with switch S4. The programming of the accessing mode is illustrated in the following:

For example, if a 64-track seek is to be implemented, perform the following steps:

A. Place switch S6 in OFF position.
B. Place switch S5 in INC (increment) position.
C. Place switch S7 in AUT (automatic) position.
D. Press and release switch S8 to indicate a Seek Operation.
E. When the address indication of 64 is obtained, place switch S5 in FIX position; the positioner carriage will stop at this track position (cylinder address).

An alternate mode can now be implemented by placing switch S6 in ON position. The positioner carriage will now extend to track position 64. It will then retract to track 000, again access to track 64, etc.

In another example, the mode is to be changed to a 000-track 50 alternating access. In this case, stop the process at cylinder address 64 by switching S6 to the OFF position. Next, decrement to track 50 by placing switch S7 in MAN position, switch S5 in DEC position, and press and release switch S8 until address 50 is obtained. Then return switch S5 to FIX position, switch S6 in ON position, etc.

5.6 ADJUSTMENT AND CALIBRATION PROCEDURES

5.6.1 INTRODUCTION

The procedures for all adjustments and calibrations that can be performed at the installation site are outlined in the following paragraphs. The procedures are listed in the sequential order to be followed if a complete calibration of the Disc Drive is to be performed.

All test equipment items required for maintenance and adjustment of the Disc Drive are listed in Table 5-2. It is suggested that the paragraphs outlining procedures to be followed in removal and replacement of major components and subassemblies be reviewed before performing the adjustment and calibration procedures.

5.6.2 POWER SUPPLY ADJUSTMENT

To perform the power supply adjustment, perform the following steps:

A. Place the POWER switch on the OCP in OFF position.
B. Remove the Disc Control Board (DCB) in card cage location J3. Insert an extender board, and insert the DCB in the extender board.
C. Place the POWER switch in ON position.
D. Using a VOM, measure the +5V. DC output at pin D of the DCB connector.
E. Adjust the +5V. DC potentiometer located on the Power Supply +5V. Regulator Assembly for a +5V. DC indication.
F. Using a VOM, measure the +13V. DC on pin C and the -13V. DC on pin B of the DCB. Adjustment for +13V. DC and -13V. DC is R-34 and R-31 respectively, on the Power Regulator Board (PRB).
G. Shut off power; remove the extender card, and replace the DCB in its receptacle.
H. If the voltage indication cannot be brought to exactly +5V. DC, replace the PRB or the power supply as described in paragraph 5.4.2.3.

5.6.3 MAGNETIC INDEX/SECTOR TRANSDUCER ADJUSTMENT

5.6.3.1 Cartridge Disc Sector Transducer Alignment (Series T). The Series T cartridge disc transducer alignment procedure is outlined in the following steps. The fixed disc transducer alignment procedure involves a sequence of similar steps (refer to paragraph 5.6.3.2). After the mechanical adjustment of the transducer, described in paragraph 5.4.3.13, perform the final positioning of the transducer as follows making sure that power has been removed from the Disc Drive.

A. Remove the DCB, insert an extender board, and place the Disc Control Board in the extender board.

B. Connect the oscilloscope probe to pin $\overline{M}$ of the extender board connector.

C. If a cartridge disc is installed, remove it and install the test hub on the spindle chuck.

D. Unplug connector P15, and manually rotate the spindle 360 degrees to ensure that the hub does not rub against the transducer pole tip. If rubbing occurs, refer to paragraph 5.4.3.13.

E. Place the POWER switch in ON position.

F. Manually actuate the cartridge interlock switch.

G. Place the RUN/LOAD switch in RUN position and allow the spindle to reach operational speed.

H. The waveform at pin $\overline{M}$ of the extender card should have a minimum output of 300 millivolts base-to-peak with a maximum overshoot (baseline noise) of 50 millivolts as shown in Figure 5-31. This will also be the waveform at the output of the differentiator board on the Series F.

I. If an output having a minimum amplitude of 300 millivolts can not be attained, the transducer should be replaced. If overshoot is in excess of 50 millivolts, the transducer may be positioned further from the test hub by rotating it counter-clockwise. However, the minimum amplitude of the output signal must be maintained. If the output is acceptable, proceed to step X.

NOTE

These figures are for adjustment using narrow-slot, 0.020-inch wide (0.508 mm) hubs only.

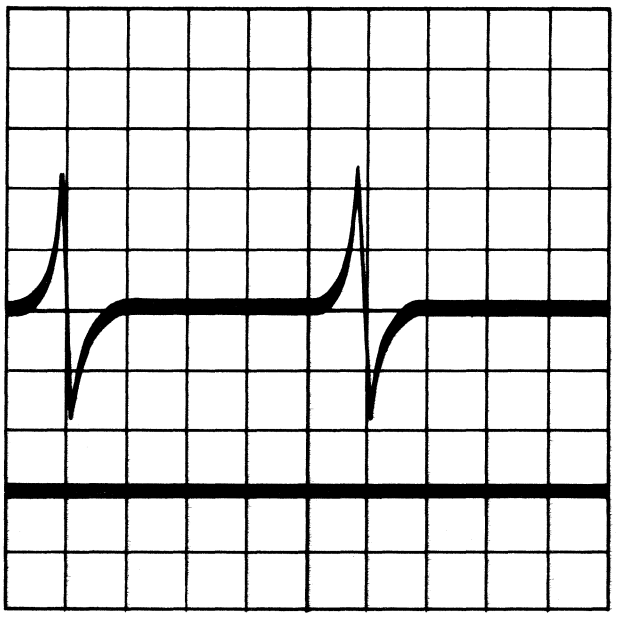


Figure 5-31. Cartridge Sector/Index Alignment Waveshape

J. If the waveform polarity does not agree with that shown in Figure 5-31, reverse the position of the two transducer leads on connector P12.

K. When using wide-slot, 0.080-inch wide (2.032 mm) hubs, the minimum output is 1-volt base-to-peak with a maximum overshoot of 50 millivolts. The same procedures as those previously described are used to obtain these outputs. At no time may the transducer be placed closer than 0.005-inch (0.127 mm) from the hub.

L. Overshoot sometimes may be caused by a metal chip near the pole tip. A piece of masking tape can be used to remove the magnetized metal chip.

M. The 1-volt minimum requirement for the wide-slot hub is necessary to ensure proper operation when using a narrow-slot disc cartridge.

N. Place the POWER switch in OFF position.

O. If the set screw used to lock the transducer in place has been tightened, loosen it enough so that the transducer can just be rotated.

P. If the transducer is moved closer to the hub, manually rotate the test hub and spindle assembly one complete revolution to ascertain that the transducer pole tip does not contact the sector ring at any time.

Q. Place the POWER switch in ON position.

R. Manually actuate the interlock switch (ref. figure 5-2).

S. Place the RUN/LOAD switch in RUN position and allow the spindle to reach normal operational speed.

T. Observe the waveshape on the oscilloscope as described in step H. To increase the amplitude of the output signal, turn the transducer clockwise very gradually while monitoring the output signal on the oscilloscope. Make sure that a minimum clearance of 0.005-inch (0.127 mm) is maintained between the transducer and the sector ring.

U. After the final adjustment, place the POWER switch in OFF position and carefully tighten the set screw on the transducer assembly.

V. Repeat steps D, E, F, and G, in that order, to verify that tightening the jam nut did not change the clearance between the transducer and the sector ring.

W. Place the POWER switch in OFF position, remove the test equipment, replace the DCB in card cage location J3, and plug in connector P15.

X. Perform the Index alignment outlined in paragraph 5.6.9.

5.6.3.2 Fixed Disc Index/Sector Transducer Adjustment (Series F and Series T). In both series of Disc Drives, the index/sector transducer is mounted near the spindle in the filter plenum chamber (refer to paragraphs 5.4.3.12 and 5.4.3.13). If this transducer has been replaced, its position relative to the fixed disc sector ring should be checked by one of the procedures in paragraph 5.4.3.3. To verify or adjust the final position of the transducer, perform the following steps:

CAUTION

OPERATION OF THE DISC DRIVE WITH THE AIR FILTER REMOVED MAY CAUSE DAMAGE TO, AND NECESSITATE REPLACEMENT OF, THE BLOWER DRIVE BELT.

A. Place the POWER switch in OFF position.

B. Remove the Disc Control Board in card cage location J3, insert an extender card in its place, and insert the DCB in the extender card.

C. Insert a cartridge disc as previously outlined.

D. Connect the oscilloscope vertical input to pin P of the extender board card-edge connector.

E. Place the POWER switch in ON position.

F. Place the RUN/LOAD switch in RUN position and allow the spindle to reach normal operational speed.

G. After the spindle has come up to speed, verify that the waveform at pin P is clean with a minimum amplitude of 300 millivolts base-to-peak. (Ref. figure 5-31 for a picture of a normal oscilloscope display.) The pulses should be positive-going. Use logic ground at the top of C7 and/or C14 for a reference.

H. If the amplitude of the output waveform does not have the specified minimum value, turn the transducer clockwise very gradually while observing the display on the oscilloscope until the amplitude of the signal is within limits.

I. Place the POWER switch in OFF position and carefully tighten the jam nut on the transducer assembly. Verify that the position of the transducer has not changed during the tightening process. Use glyptal to hold the jam nut in place.

J. Remove the card extender and replace the DCB in card cage location J3. Remove the test equipment.

5.6.3.3 Cartridge Disc Index/Sector Adjustment, Series F. If this transducer has been replaced as described in paragraph 5.4.3.12, perform the following steps to check for a satisfactory output signal.

A. Place the POWER switch in OFF position.

B. Use a disc cartridge or test hub on the spindle chuck.

C. Unplug connector P15.

D. Manually actuate the cartridge interlock switch, if test hub is used.

E. Press the POWER switch. Then press the LOAD/RUN switch and allow the spindle to come up to speed.

F. Place the oscilloscope vertical probe on pin 2 of J32 on the Differentiator Board connector. This board is mounted near the front of the card cage (ref. figure 5-3) and is available when the top cover is removed. The input signal (130 millivolts) to the differentiator board should appear as shown in Figure 5-32.

G. If the input signal to the differentiator circuit is not approximately as shown in Figure 5-32, replace or check operation of the transducer.

H. Verify that the waveform on J33 pin 1 of the differentiator PWB is clean as shown in Figure 5-31. The waveform amplitude should be 300 millivolts base-to-peak (minimum).

I. Place the POWER switch in OFF position, remove test equipment and plug in connector P15.

J. Perform the index alignment check outlined in paragraph 5.6.9. If alignment can not be accomplished, the transducer may be moved slightly to the left to advance the signal or slightly to the right to retard the signal. This can be done by loosening the 4-40 screws on the transducer mounting bracket and sliding the transducer slightly in its mounting bracket.

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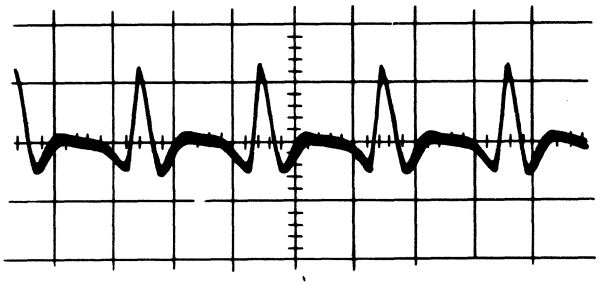


Figure 5-32. Input to Differentiator Board (Series F)

5.6.4 SVA ADJUSTMENT PROCEDURES

These procedures pertain to SVA boards 301584 revisions A, B, and C. SVA adjustments must be accomplished with the Drive in two separate modes. Initial adjustment is required with P15 on the SVA board disconnected and manual movement of the Positioner. Final adjustment is accomplished with P15 on the SVA board connected and using either a maintenance program or an Exerciser to control Positioner movement.

CAUTION

THESE PROCEDURES ARE DESIGNED TO BE ACCOMPLISHED IN SEQUENCE; HOWEVER, IF MAINTENANCE PERSONNEL DEEM IT NECESSARY TO PERFORM INDIVIDUAL CHECKS OR ADJUSTMENTS WITHIN THESE PROCEDURES, THE FOLLOWING MUST BE OBSERVED:

A. Check initial procedure conditions i.e., POWER ON/OFF, jumpers installed/removed.

B. Verify if P15 is connected or disconnected depending upon whether or not positioner is to be manually moved.

5.6.4.1 LED Voltage Adjustment. To accomplish this adjustment, perform the following steps:

A. Place POWER switch in OFF position.

B. Unplug P15 on SVA in card cage location J5.

C. Remove SVA and insert a card extender in its place.

D. Place a jumper wire from TP6 to TP4 (ground). This disables the current fault circuit.

E. Place the SVA in card extender.

F. Place POWER ON/OFF switch to ON; place RUN/LOAD switch to RUN.

G. Using a digital voltmeter, measure voltage across R125 (TP7 negative lead and TP8 positive lead).

H. **Adjust AGC potentiometer (R96) for maximum, but do not exceed 7.5V.**

I. Place a scope probe on BOT ANALOG AMP (U22 pin 1).

J. Load heads by hand and move positioner back and forth across disc surface (near ramp) while observing scope.

K. Adjust AGC ADJ. potentiometer (R96) until BOT ANALOG AMP output is +5V with reference to ground. See Figure 5-33.

L. Stop moving positioner; remove scope probe from U22 pin 1, and again measure voltage across R125 (TP7 and TP8). It should be +8.0V (max).

M. Remove digital voltmeter.

N. Manually retract heads to Home position.

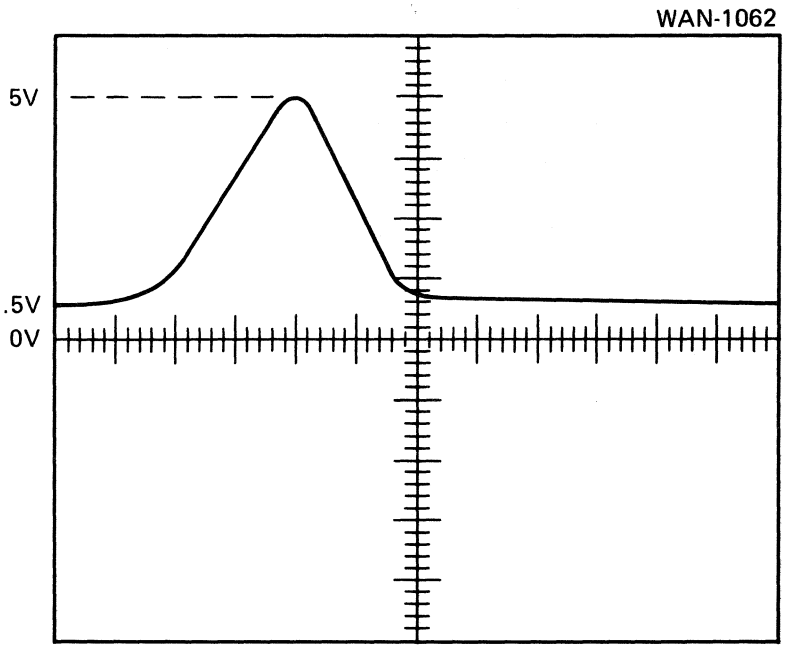


Figure 5-33. BOT Analog Amplitude Output

5.6.4.2 Preliminary Amplitude and Balance Adjustment. To accomplish this adjustment, perform the following steps:

A. Connect scope probe to TP5 on SVA and set scope controls as follows:
   1) DC
   2) 2V/cm (actual value).
B. Place POWER ON/OFF switch to ON position.
C. Place RUN/LOAD switch to RUN. When disc is up to speed, manually load heads.
D. While moving positioner by hand, adjust AMPLITUDE (R53) and BALANCE (R49) potentiometers until DETENT signal is approximately 10V. p-p, and balanced around ground. See Figure 5-34.

WAN-0004

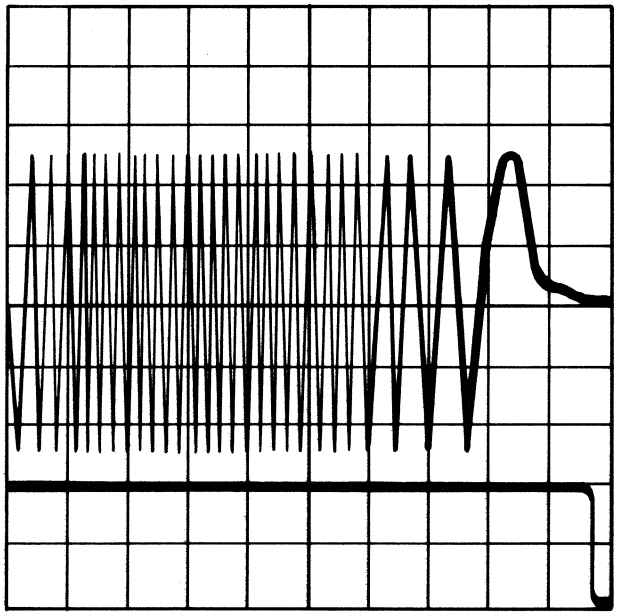


Figure 5-34. Detent Signal Output Waveform (manual)

E. Manually unload heads by moving positioner to home position.
F. Place RUN/LOAD switch to LOAD position.
G. Place POWER switch to OFF.

5.6.4.3 Phasing Adjustment. This adjustment checks for proper phasing between the BOT (Beginning of Travel) pulse and the Detent pulse. To adjust phasing, perform the following steps:

NOTE

When moving positioner forward, try to simulate normal positioner motion (moving the positioner too slowly will cause erroneous adjustment).

A. Verify preliminary procedure outlined in paragraph 5.6.4.2 (A through F).

B. Connect oscilloscope channel 1 probe (trigger) to TP9 ($\overline{\text{BOT}}$ pulse).

C. Connect oscilloscope channel 2 probe to TP5 (Detent) and center ground reference.

D. Manually load heads and while moving carriage back and forth, monitor scope and trigger channel 1 on the positive-going edge of the BOT pulse.

E. When moving carriage forward from home position the first Detent signal should start going negative from the base line (ground reference) as shown in Figure 5-35 (not more than −0.5V).

WAN-0206

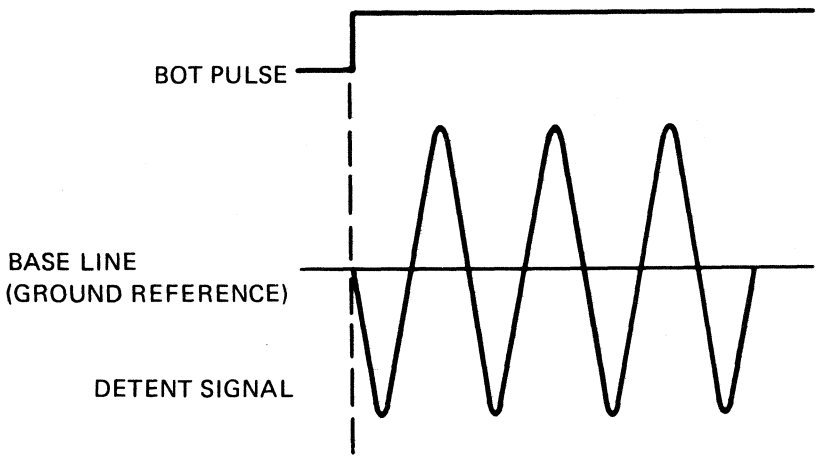


Figure 5-35. Waveform – Phasing Adjustment

F. If preceding steps are verified, correct phasing is completed. Proceed to INJECTION VELOCITY adjustment.

NOTE

If preceding steps are NOT verified, proceed with the following steps.

G. Manually retract heads to Home position.

H. Place RUN/LOAD switch to LOAD.

I. Place POWER ON/OFF switch to OFF.

J. Remove Power Supply from Disc Drive and connect extender cable harness to Power Supply.

K. Place POWER ON/OFF switch to ON and RUN/LOAD switch to RUN.

L. Loosen the two mounting screws on Optical Detent Assembly. See Figure 5-36.

M. Manually load heads. To obtain correct phasing while moving carriage forward from its Home position, gently pivot the Inner Block (ref. figure 5-36) on the axis of the fixed pin until the desired waveform is obtained (ref. figure 5-35). Detent signal should be slightly below, but not more than, −0.5V from base line when output at TP9 goes high.

N. Tighten the two mounting screws and recheck waveform. If necessary, repeat alignment procedure.

O. Manually retract heads to Home position.

P. Place RUN/LOAD switch to LOAD.

Q. Place POWER ON/OFF switch to OFF.

R. Reinstall Power Supply into Disc Drive.

5.6.4.4 Injection Velocity Adjustment. The first portion of this procedure is accomplished with P15 of the SVA disconnected and the jumper between TP6 and TP4 installed. The second portion is accomplished with P15 connected and the jumper removed. Perform the following steps:

CAUTION

FAILURE TO PERFORM STEPS A THROUGH F CAN RESULT IN CATASTROPHIC DAMAGE TO THE HEADS, MEDIA, AND POSITIONER MECHANISM.

A. With POWER OFF, remove Servo Logic Board (SLB) from J4.

B. Place scope probe on VELOCITY RAMP test point (TP2) on SVA.

C. Place POWER ON/OFF switch to ON.

D. Adjust INJECTION VELOCITY potentiometer (R127) to approximately −0.25V.

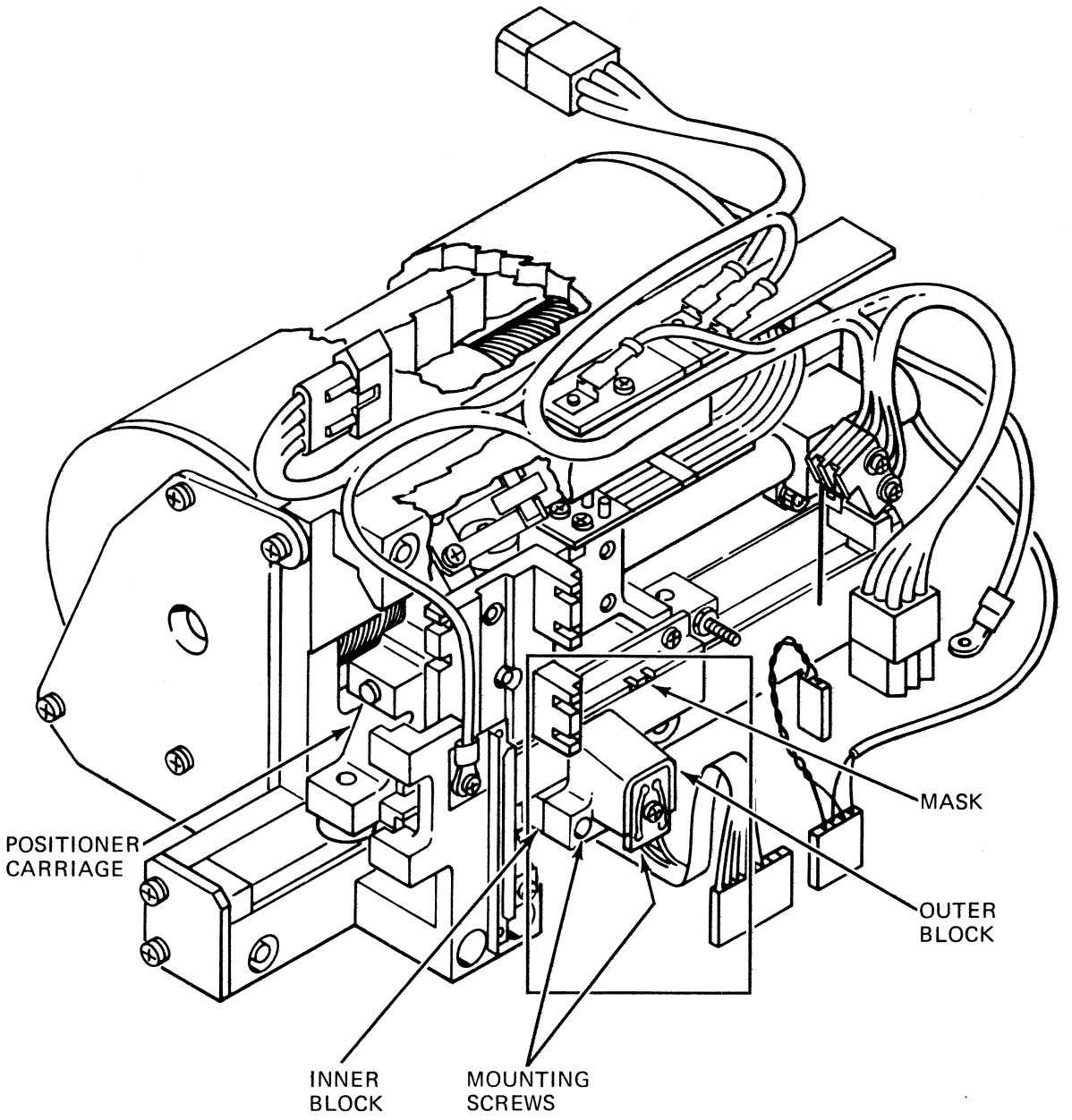


Figure 5-36. Optical Detent Assembly – Phasing Adjustment

E. Place POWER ON/OFF switch to OFF.
F. Reinstall SLB in J4.
G. Remove jumper between TP6 and TP4 on SVA.
H. Connect P15 on SVA to J15.
I. Remove scope probe from TP2 on SVA, and connect a digital voltmeter from TP2 to ground.
J. Place POWER switch ON and RUN/LOAD switch to RUN.
K. After heads load, readjust INJECTION VELOCITY potentiometer (R127) to −0.25V ±0.01V if necessary.
L. Remove digital voltmeter.

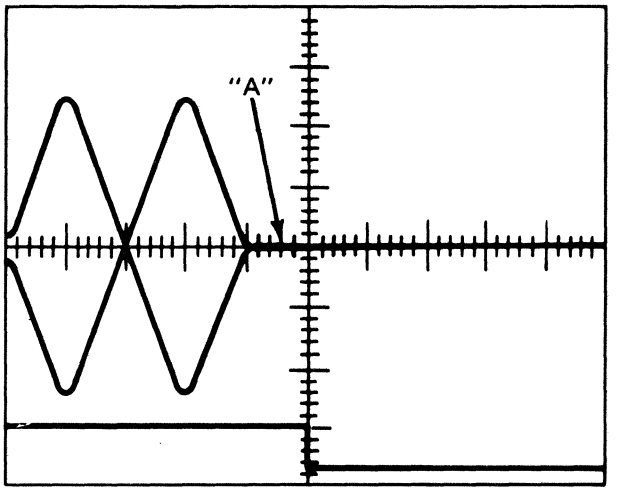
5.6.4.5 Final Amplitude and Balance Adjustment. This procedure is accomplished using either a maintenance program or an Exerciser. Perform the following steps:

NOTE

On 200 TPI Disc Drives, remove jumpers K to L and M to N (temperature compensation) when performing the following adjustment:

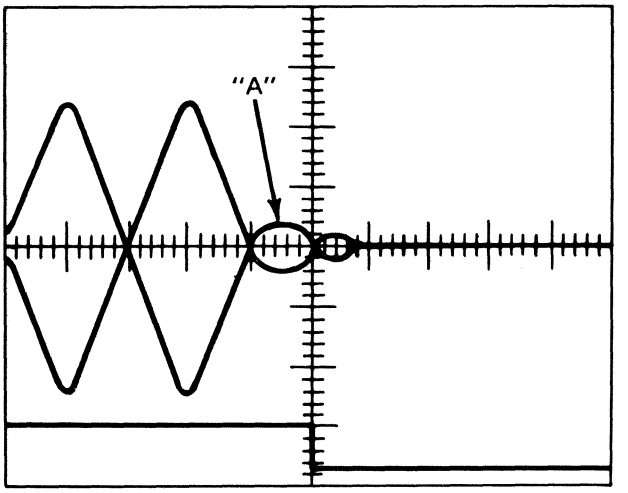
A. Connect channel 1 scope probe to DETEN SIG (TP5).
B. Connect channel 2 scope probe to SEEK COMPLETE (SKC) signal on the Exerciser; or, if using a maintenance program, to TP1 of SVA. When using Exerciser, set scope to trigger internally on positive-going edge of SEEK COMPLETE (negative-going edge of SEEK COMPLETE when using TP1 on SVA).
C. Set scope sweep rate to 2MS/div.
D. For 100 TPI Disc Drives only: Command alternate track seeks from track 000 to 001. This should allow representation of the alternate seeks superimposed on the scope — one a positive-going DETENT signal and the other negative-going as shown in Figure 5-37. Perform step F, then check for the same results while commanding alternate track seeks from track 201 to 202.
E. For 200 TPI Disc Drives only: Command forward-incrementing single track seeks. This should allow representation of the incrementing seeks superimposed on the scope — one a positive-going DETENT signal and the other negative-going as shown in Figure 5-38. This representation after performing step F, should be the same from track 000 through track 405.
F. Adjust BALANCE (R49) and AMPLITUDE (R53) potentiometers until the Detent signal is 10V p-p and balanced either side of ground within ±0.1V. Replace temperature compensation jumpers if offset adjustment is not to be accomplished next.

WAN-1024



CHAN 1 ON TP5 – DETENT SIGNAL
CHAN 2 on TP1 – SEEK COMPLETE (EXERCISER)

INCORRECT ADJUSTMENT – OVERDAMPED RESPONSE WILL CAUSE POWER AMP TO OVER HEAT.

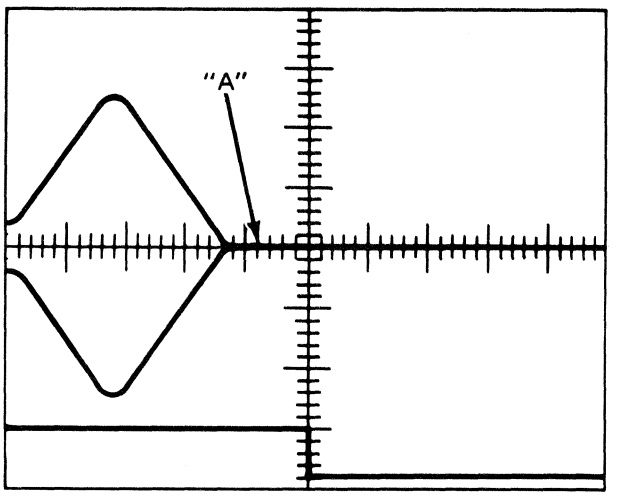


CHAN 1 ON TP5 – DETENT SIGNAL
CHAN 2 ON TP1 – SEEK COMPLETE (EXERCISER)

CORRECT ADJUSTMENT – SLIGHTLY UNDER-DAMPED RESPONSE MAXIMIZES RELIABILITY.

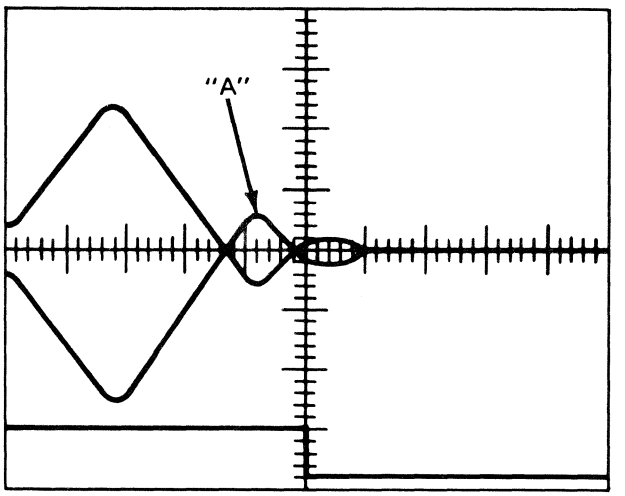
Figure 5-37. 100 TPI Drive – DETENT Waveform – Alternate One Track Seek

WAN-1023



CHAN 1 ON TP5 – DETENT SIGNAL
CHAN 2 ON TP1 – SEEK COMPLETE (EXERCISER)

INCORRECT ADJUSTMENT – OVERDAMPED RESPONSE WILL CAUSE POWER AMP TO OVERHEAT.



CHAN 1 on TP5 – DETENT SIGNAL
CHAN 2 ON TP1 – SEEK COMPLETE (EXERCISER)

CORRECT ADJUSTMENT – SLIGHTLY UNDER-DAMPED RESPONSE MAXIMIZES RELIABILITY.

Figure 5-38. 200 TPI Drive – DETENT Waveform – Incrementing One Track Seek

5.6.4.6 Offset Adjustment. While doing alternate or single track seeks for 100 TPI or 200 TPI Disc Drives (respectively), center base line (ground ref.) of channel 1 to center of scope.

NOTE

On 200 TPI Disc Drives, remove jumpers K to L and M to N (temperature compensation) when performing the following adjustment:

A. Set channel 1 scale to 0.2V/cm (actual value).

B. Adjust OFFSET potentiometer (R130) for adjacent track overshoot (see CAUTION for overshoot) to be symmetrical above and below ground and less than 0.3V p-p in amplitude for Revision B and C (0.5V p-p for Revision A).

CAUTION

THE OVERSHOOT IS THE DETENT SIGNAL AFTER SEEK COMPLETE. i.e., THE DETENT SIGNAL WHEN THE SCOPE IS TRIGGERED ON THE POSITIVE-GOING EDGE OF SKC ON TP1 (NEGATIVE-GOING EDGE OF SKC IF USING EXERCISER).

REFER TO "A" IN FIGURE 5-37 AND 5-38; A SMALL UNSETTLED DETENT SIGNAL BEFORE SEEK COMPLETE IS NECESSARY. ELIMINATION OF THIS UNSETTLED DETENT SIGNAL BEFORE SEEK COMPLETE WILL RESULT IN OVER-STRESSING POWER TRANSISTORS.

C. Replace temperature compensation jumpers (K to L and M to N).

5.6.4.7 Seek Complete Timing Adjustment. While commanding a maximum length seek (for 100 TPI or 200 TPI), perform the following:

A. Set scope sweep rate to 10 msec/cm.

B. Set channel 1 scale to 2V/cm.

C. Trigger channel 2 of scope on negative-going edge of SKC if using TP1 on SVA or positive-going edge of SKC if using Exerciser.

D. Adjust SPEED ADJ. potentiometer (R126) for seek length of 84 $\pm$1 msec on channel 2 as shown in Figure 5-39.

E. Command the carriage to track 000.

F. Adjustment of SVA Board is completed.

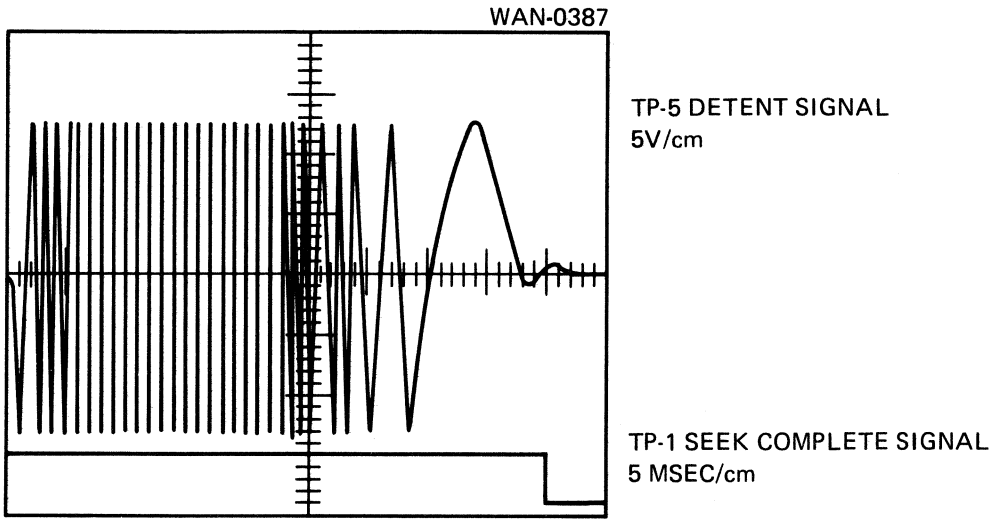


Figure 5-39. Waveform – Speed Adjustment

5.6.5 RUN-TO-LOAD ADJUSTMENT

To make the run-to-load adjustment, perform the following steps:

A. Place the POWER switch in OFF position.
B. Remove the Disc Control Board from card cage location J3 and insert the card extender in its place. Then place the DCB in the card extender.
C. Ensure that the RUN/LOAD switch is in LOAD position and press the POWER switch.
D. Press the POWER switch. Install a disc cartridge and place the RUN/LOAD switch in RUN position.
E. With the READY indicator lit, press the LOAD portion of the RUN/LOAD switch. Verify that the lamp inside the LOAD portion of the switch does not light until at least 5 seconds after the disc has stopped rotating.
F. If necessary, adjust RUN/LOAD Delay potentiometer R31 on the Disc Control Board until the proper delay time is attained.
G. Shut off power, remove the card extender from location J3 in the card cage, and insert the DCB in its place.

5.6.6 WRITE CURRENT ADJUSTMENT

To adjust write current, perform the following steps:

A. Place the unit on-line and use a Write Diagnostic program. If a bench-type Disc Exerciser is to be used, connect this unit to the Disc Drive as a substitute for the Write Diagnostic program procedure.
B. Install a scratch cartridge as described in Section 2.

C. Press the POWER switch. Then place the RUN/LOAD switch in RUN position and allow the spindle to come up to normal operational speed.

D. Select the upper head of the removable (scratch) cartridge.

E. Write an all-zeroes pattern at track 000.

F. Place the POWER switch in OFF position.

G. Remove the Read/Write head cable from receptacle J24 on the Data Electronics Board and connect the Write Current Adapter (WANGCO PN 101183) to J24.

H. Connect the head cable to the Write Current Adapter.

I. Connect the oscilloscope channel 1 input probe from channel 1 to the wire loop on the Write Current Adapter.

J. Press the POWER switch. Then place the RUN/LOAD switch in RUN position and allow the spindle to come up to normal operational speed.

K. Using an offset screwdriver, adjust Write Current potentiometer R-71 on the Data Electronics Board for a peak-to-peak waveform of 34 to 36 milliamperes while writing all zeroes to disc. Waveform should appear as shown in Figure 5-40.

L. Access the innermost track and verify that the peak-to-peak waveform is between 29 and 31 milliamperes, as shown in Figure 5-41. If necessary adjust the Write Current potentiometer to bring the waveform within limits.

M. Access to track 000 and verify that the write current is between 34 and 36 milliamperes.

N. Place the RUN/LOAD switch in LOAD position.

O. Place the POWER switch in OFF position and remove the Write Current Adapter. Reconnect the head cable to receptacle J24 when the Write Cable Adapter is removed.

P. Replace the "scratch cartridge" with a new cartridge.

WAN-0005

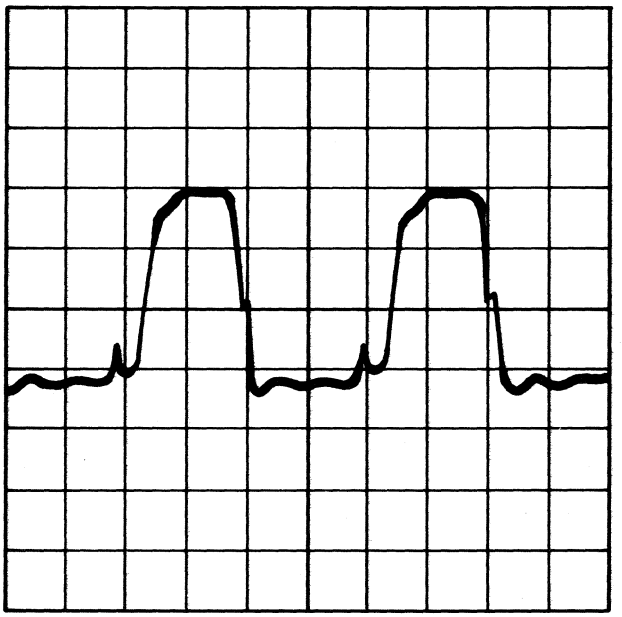


Figure 5-40. Write Current Waveform – Track 000

WAN-0007

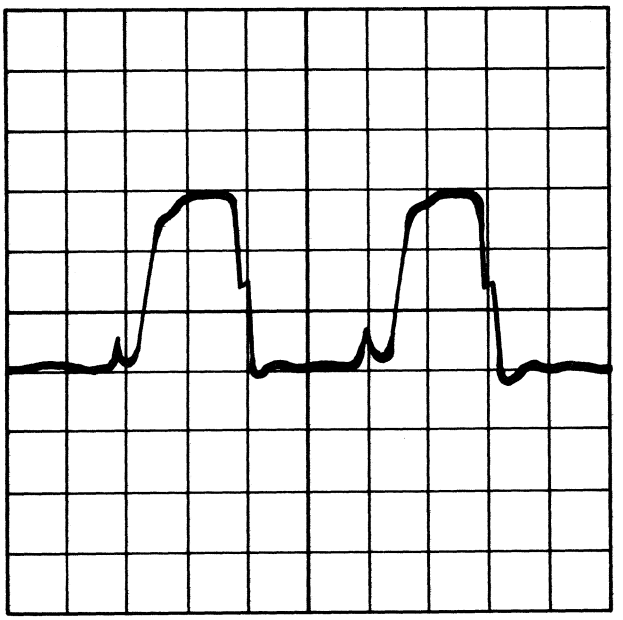


Figure 5-41. Write Current Waveform – Innermost Track

5.6.7 READ/WRITE HEAD ALIGNMENT

5.6.7.1 Introduction. R/W head alignment involves adjusting the position of the head arms relative to the carriage after it has been accessed to a specific alignment track.

The procedures outlined in the following paragraphs describe the alignment of both removable (cartridge) and fixed disc heads. The power supply must be in place to perform the procedures correctly.

5.6.7.2 Customer Engineer (CE) Alignment Cartridge Types. Either of two types of CE alignment cartridges may be used. The two types are:

A. Cats Eye – The output waveform of this CE cartridge is two loops resembling cats eyes which must be adjusted until both loops are equal in length. See Figure 5-42a.

B. Tribit – This CE cartridge uses a technique which records two adjacent tracks with opposite polarity bits. Correct head alignment is (between these two tracks) when the adjacent bits are of equal amplitude (ref. figure 5-42b).

5.6.7.3 Removable Disc Head Alignment Using Cat's Eye CE Cartridge. If only verification of head alignment is intended, perform steps E through J, and select first the lower head of the pair, then the upper while observing waveforms; then, perform steps P and Q. For head alignment, perform entire procedure.

A. Place POWER switch to OFF position. For ST drives, see DCB switch setting chart on front of drive behind trim panel. If cartridge has only one notch on sector ring, set for INDEX ONLY.

B. Slightly loosen the two cap screws used to secure the upper head pair clamp; the clamp itself should not be loose.

C. Slide the upper (cartridge) pair of head arms fully to the rear of the mounting block slots of the carriage (away from the spindle).

D. Ensure head arm adjustment screws are not touching the head arms. If they are, back them away (CCW), and repeat step C.

E. Connect both the SYNC input and CHAN 1 scope probes to REMIDX test point (TP1) on the DCB. Use 50 or 100 mV/cm with AC coupling.

CAUTION

PLACE THE PROT CART SWITCH TO ON POSITION TO PRECLUDE THE POSSIBILITY OF ACCIDENTAL ERASURE OF DATA ON THE CE CARTRIDGE.

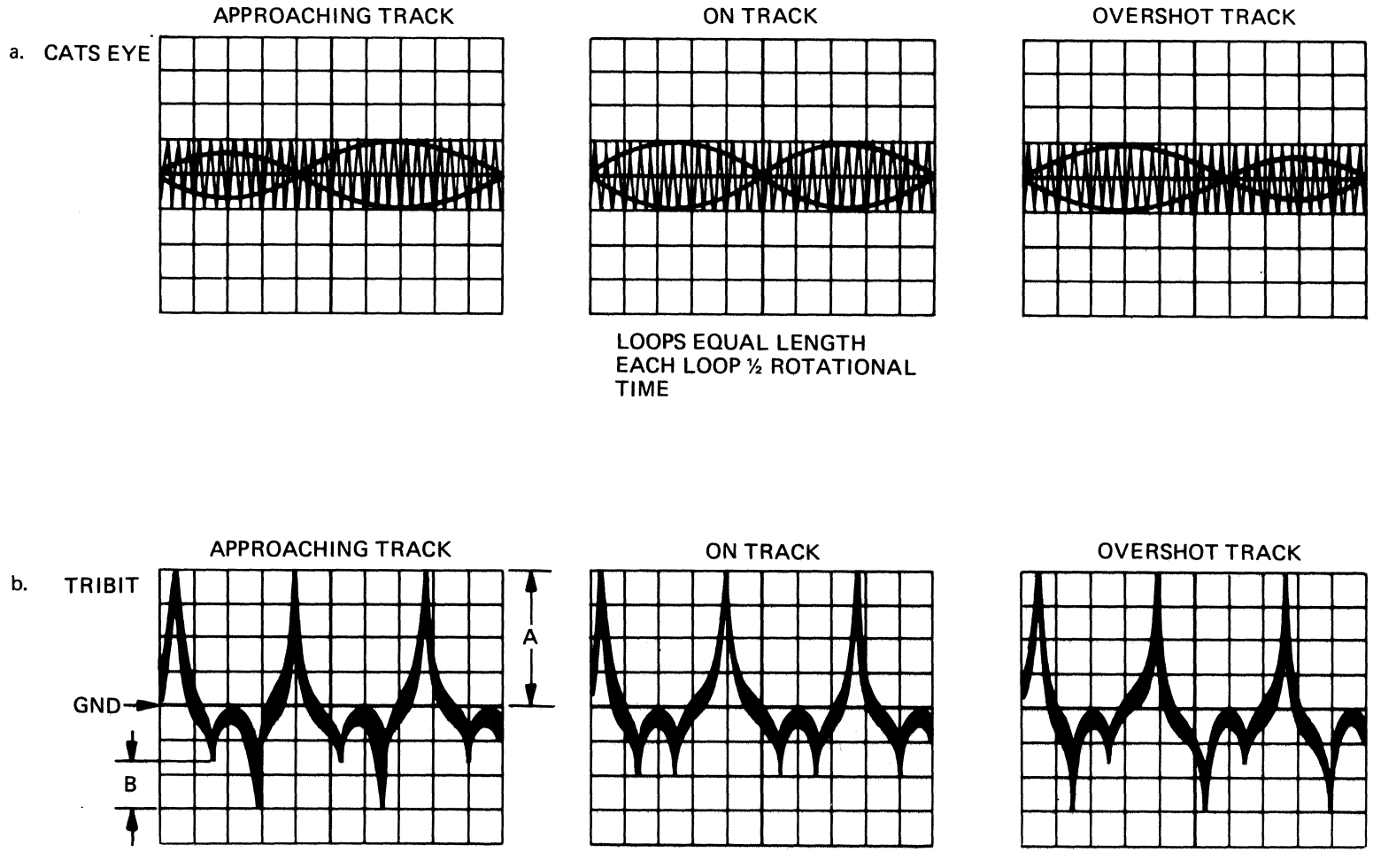


Figure 5-42. Read/Write Head Alignment Waveforms (Removable Disc)

F. Place POWER switch to ON, and RUN/LOAD switch to LOAD. Load the Cat's Eye-type CE cartridge.

G. Place RUN/LOAD switch to RUN, and allow Disc Drive to run for 15 minutes.

NOTE

The CE cartridge must have been in the same environment as the Disc Drive for at least 2 hours prior to use.

H. Uncalibrate the scope, and adjust the display to show only two index pulses 10 cm apart (full screen).

I. Move the CHAN 1 probe to R/W head test point (TP2) on the DEB in location J7.

J. Using an Exerciser or Controller, seek to appropriate alignment track listed in Table 5-3.

TABLE 5-3. CE Cartridge Head Alignment Tracks

CE Cartridge Type	Disc Drive Series	Alignment Track		Alternate* Alignment Track	
		100TPI	200TPI	100TPI	200TPI
Cat's Eye	F	105 **	200	110	210
Cat's Eye	T	73	146	–	–
Tri Bit	F	105	200	110	210
Tri Bit	T	73	146	2	4

* on some packs

** Series F 100 TPI drives aligned to IBM 2310 standards have heads aligned at track 100 and index at track 095.

K. Select the lower R/W head of the cartridge disc pair. Check whether or not Head and/or Disc Select inverted options have been incorporated. If so, this should be taken into consideration when checking output waveforms.

L. Turn the adjustment screw for the lower R/W head clockwise until the correct waveform is obtained (ref. figure 5-42a).

M. Select the upper R/W head of the cartridge disc pair, and turn the adjustment screw clockwise until the correct waveform is obtained (ref. figure 5-42a).

N. Use torque wrench (PN T-00425) to tighten the head clamp screws to 6 in-lb. (15.24 cm/0.5436 kg). See Figure 5-43.

O. Access track 000, then once again, access the alignment track. Verify that head alignment has not changed during tightening of clamp screws. If necessary, repeat the alignment procedure.

P. Place RUN/LOAD switch to LOAD, POWER switch to OFF, and reset DCB switch on Series T drives if moved.

Q. Remove CE cartridge and disconnect test equipment.

5.6.7.4 Removable Disc Head Alignment Using Tribit CE Cartridge. The procedure for head alignment with the Tribit CE cartridge is the same as for Cat's Eye-type except for scope use and the use of a formula for figuring misalignment measurement. Use the following scope setup and formula to determine head misalignment.

WARNING

WHEN REPLACING FIXED DISC HEADS, ENSURE THEY ARE OPPOSING EACH OTHER (SAME LOCATION IN MOUNTING SLOTS) AND STAGGERED APPROXIMATELY .075 (1.90 mm) TO .100-IN. (2.54 mm) FORE OR AFT OF CARTRIDGE DISC HEADS. THIS WILL ENSURE RELIABLE EMERGENCY RETRACT UNDER ALL CONDITIONS.

A. Trigger the scope internal (source channel 1).

CAUTION

TRIGGER MUST NOT BE ON INDEX, OR ONLY ONE SEGMENT OF THE TRACK WILL BE ALIGNED.

B. Set vertical sensitivity to 50 mV/cm, and sweep to 2 usec/cm.

C. Place CHAN 1 scope probe on R/W head test point (TP2) on the DEB, and adjust heads per paragraph 5.6.7.3 excluding scope setting instructions. Adjust for minimum difference in length between adjacent peaks (ref. figure 5-42b).

The following equation may be used to determine head misalignment (ref. figure 5-42b):

$$\frac{BY}{2A} \times 1000 = \text{microinches (misalignment)}$$

Y = 4 for 200 TPI Drives.
Y = 7 for 100 TPI Drives.

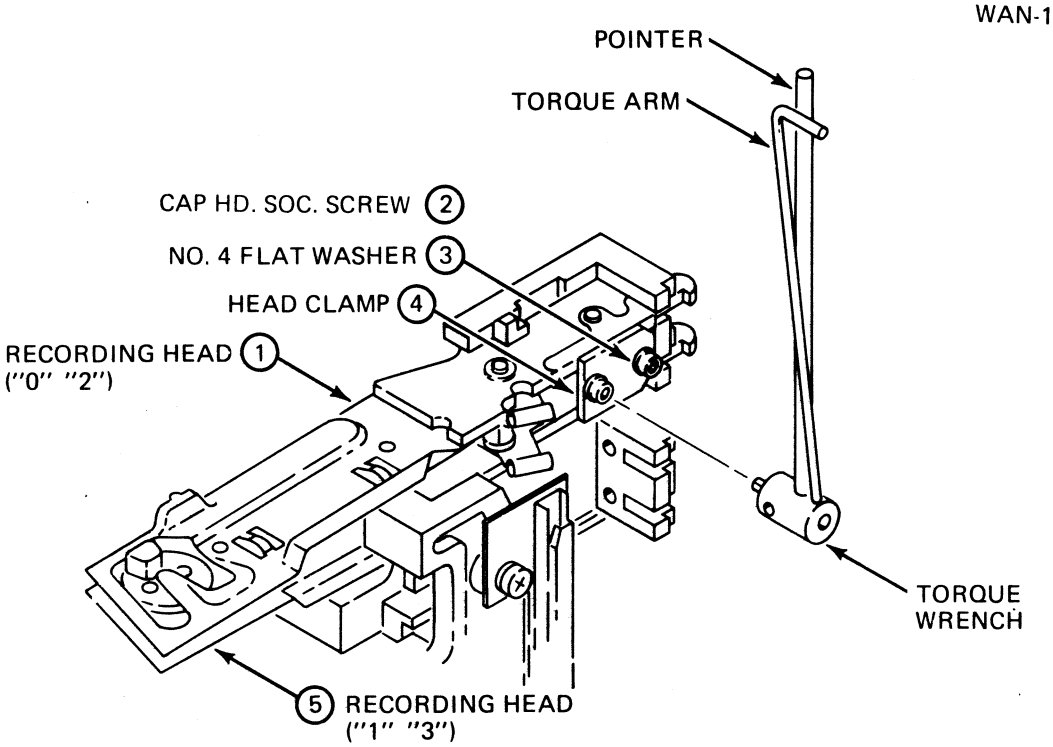
$$\frac{10 \times 4}{2 \times 300} \times 1000 =$$

Example for 200 TPI Drive:
A = 300 mV.
B = 10 mV.

$$\frac{40}{600} \times 1000 =$$

.066 x 1000 = 66 microinches (0.0016764 mm)

To convert microinches to millimeters multiply by 0.0000254.



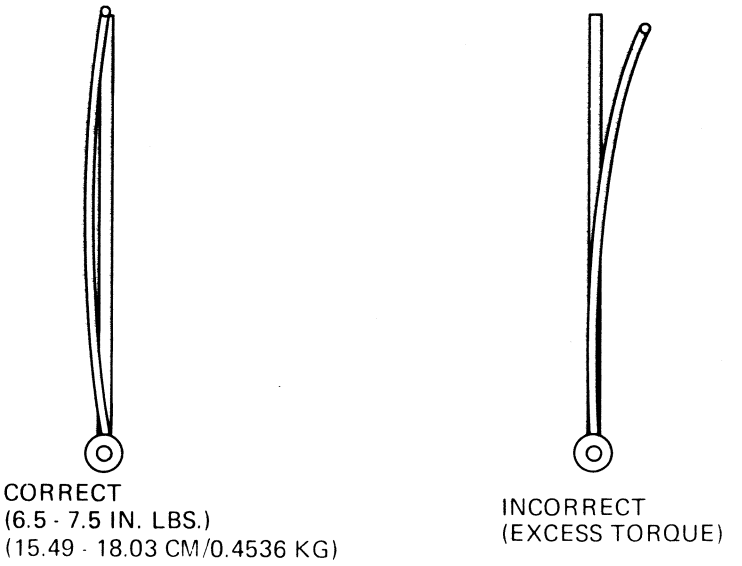


Figure 5-43. Torque Wrench No. T-00425 Application

5.6.7.5 Fixed Disc Head Alignment. If this alignment is to be accomplished independently (not preceded by alignment of the cartridge disc heads), and if data on the disc is not to be recovered, perform steps A through E of the following procedure. If data previously written on the fixed disc is to be recovered, perform the entire procedure.

A. Place POWER switch in OFF position.
B. Loosen the two cap screws used to secure the head clamp of the fixed disc R/W head pair just enough so heads can be moved.
C. Slide the two lower head arms fully back (away from the spindle) into the head mounting block slots. Ensure that the head arm adjustment screws do not touch the head arms.
D. Slowly turn each screw clockwise until it just touches the head arm; then turn each screw clockwise one-half turn.
E. If the remainder of the procedure is not to be performed, use the torque wrench (PN T-00425) to tighten the head clamp screws to 6 in.-lb. (15.24 cm/0.4536 kg) (ref. figure 5-43).
F. If data on the fixed disc is to be recovered, the head position will be changed as described in the following steps until data on the fixed disc can be read accurately. This procedure may be performed On-Line.
G. If Controller is not to be used, install an Exerciser.
H. Place POWER switch to ON position. Install a scratch cartridge. Place RUN/LOAD switch to RUN.
I. Connect CHAN 1 scope probe to R/W head test point (TP2) on the DEB. Sync at the REMIDX test point (TP1) on the DCB.
J. Select the upper head of the pair, and turn the adjustment screw clockwise until the R/W signal (TP2) is maximum amplitude.
K. Alternately position the heads further in or out with the adjustment screw to obtain minimum Read errors. If track 000 data does not verify, or is not what it should be, the head may have been adjusted off track or to an adjacent track. Repeat adjustment until data verifies and no errors occur during Read operation.
L. Select the lower head and repeat the adjustment procedure using the lower head adjustment screw.
M. Tighten the head clamp screws to 6 in.-lb. (15.24 cm/0.4536 kg).
N. Disconnect all test equipment.
O. With the Disc Drive On-Line, check data recovery characteristics on all tracks.

5.6.8 INDEX ALIGNMENT

NOTE

For Series T "index slot only" CE packs, move the jumper for index only from points G and H to points F and H on the Disc Control Board in card cage location J3.

A. Place the POWER switch in OFF position.

B. Remove the Data Interface Board from card cage location J1 and insert the Field Exerciser board in its place.

C. Connect the SYNC input of the oscilloscope to the index test point TP1 on the Disc Control Board. Set the vertical sensitivity for 50 mV/cM or 100 mV/cM with AC coupling.

D. Connect the oscilloscope vertical input probe to R/W test point TP1 on the Data Electronics Board in location J7.

E. Select a time base of 5 microseconds/division.

F. Place the CART PROT switch in up (ON) position.

G. Press the POWER switch. Insert the CE cartridge. The cartridge must have been in the same ambient conditions as the Disc Drive for at least 2 hours.

H. Place the RUN/LOAD switch in RUN position and allow the unit to run for 5 minutes.

I. Access the carriage to the appropriate track as defined (ref. table 5-3).

J. Adjust index alignment potentiometer R8 on the Disc Control Board in card cage location J3 to obtain the specified time relationship for the appropriate waveform as shown in Figure 5-44. Ensure that the oscilloscope is being triggered on the leading edge of the index pulse.

K. Select the other R/W head and verify that the oscilloscope display on both heads is within $\pm$10 microseconds of each other (1500 rpm) or 6 microseconds (2400 rpm).

L. Adjust the delay by turning portentiometer R8 so that the single pulses (upper and lower heads) are equally spaced to the left and right-handed sides of the 30-microsecond line (1500) or the 19-microsecond line (2400 rpm).

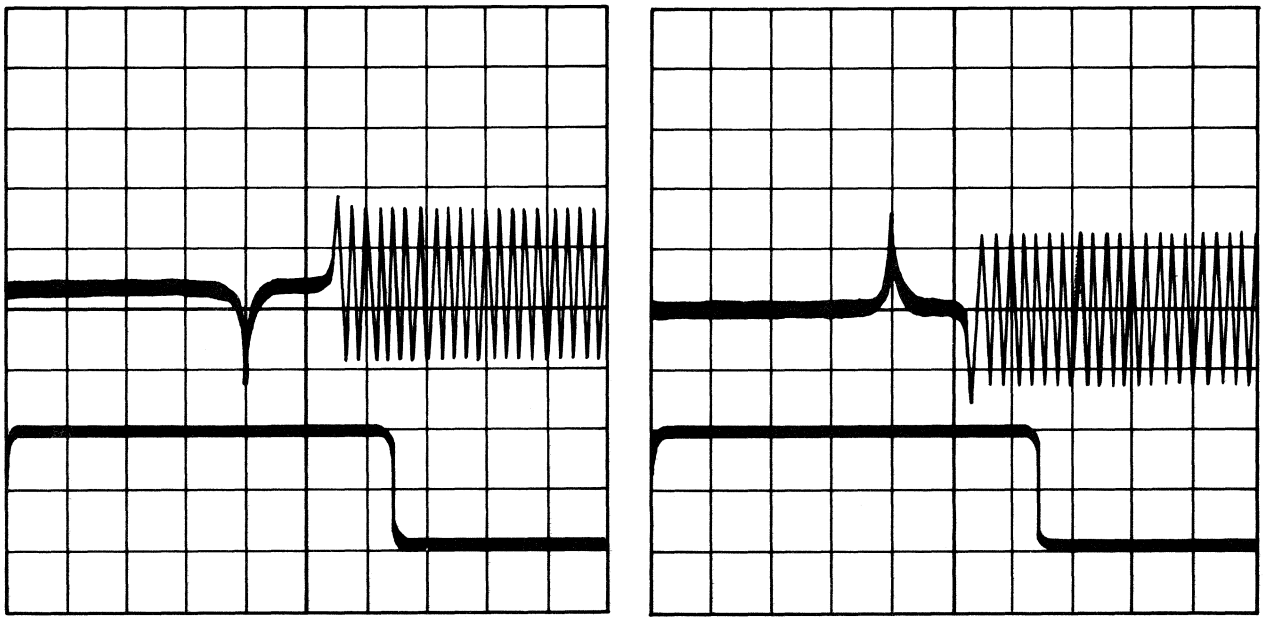


Figure 5-44. Index-to-Data Alignment

M. If the specifications noted in step K cannot be attained, the R/W heads should be replaced. If replacement by heads known to be functioning normally will not produce satisfactory operation, replacement of the positioner is indicated.

N. If both heads cannot be adjusted to the correct position with respect to the index pulse, either the transducer or the DCB components should be investigated.

NOTE

In Series F Disc Drives, additional adjustment may be attained by shifting the transducer block (refer to paragraph 5.6.3.3).

O. After completion of the index alignment, remove power from the Disc Drive and take out the CE Cartridge.

P. Remove the Field Exerciser board from card cage location J1 and insert the Data Interface Board. Remove all test equipment.

Q. On Series T Disc Drives, re-jumper the DCB if changed for the alignment.

5.6.9 TEMPERATURE COMPENSATION CHECKS

This procedure is used with 200 TPI Disc Drives only since temperature compensation is not incorporated on 100 TPI Disc Drives. To perform this check, perform the following steps:

A. Place the POWER switch in OFF position.

B. Remove the Data Interface Board from card cage location J1 and insert the Field Exerciser board.

C. Remove the Servo Amplifier Board from card cage location J5, insert a card extender in its place, and put the SVA board in the card extender.

D. Press the POWER switch; then place the RUN/LOAD switch in RUN position and allow the spindle to come up to operational speed.

E. With the Field Exerciser incrementing or decrementing one track at a time, verify that the base line of the detent signal is not changing level on any track.

NOTE

Step E can be verified only if jumpers are removed from points K-L and M-N on the Servo Amplifier board.

F. To perform the temperature compensation check:

1) Access track 400.

2) Measure the voltage at pin 12 of connector P5 on the SVA board. The voltage should be between +2 and +4 V. DC.

3) Measure the voltage at pin N of connector P5. Voltage should be within $\pm$10% of the value given by the formula:

$$V \text{ pin } N = 5 (V \text{ pin } 12) - 13.3$$

4) Measure the voltage at pin P of connector P5. This voltage should be twice the value measured at pin N in step 3, but negative. Reference the formula:

$$V \text{ pin } p = -2(V \text{ pin } N)$$

5) Access to track 200:

$$V \text{ pin } p = -1(V \text{ pin } N)$$

6) Access to track 000:

$$V \text{ pin } P = 0$$

7) Install temperature compensating jumers on K to L and M to N on the Servo Amplifier Board.

8) Program the Field Exerciser for an incrementing one-track Seek operation and watch for base line shift.

9) The voltage level shift at track 400 should be equal and opposite from that at track 000. Adjacent odd and even tracks should have essentially equal and opposite voltages (e.g., tracks 000 and 001, tracks 400 and 401, etc.).

G. Press the POWER switch. Remove all test equipment.

H. Remove the Field Exerciser board from card cage location J1 and insert the Data Interface Board.

I. Remove the card extender from card cage location J5 and insert the Servo Electronics Board.

5.7 TROUBLESHOOTING TABLE

Use Troubleshooting Table 5-4 as an aid in identifying, locating and correcting possible malfunctions of the more common type. The last (Remedy) column on the table specifies the applicable component or circuit to be checked for probable cause of the symptom.

Part numbers for replacement parts or assemblies will be found in the Illustrated Parts List for mechanical and electronic components and subassemblies.

TABLE 5-4. Fault Isolation Chart (continued)

Item	Symptom	Probable Cause	Remedy
1	POWER indicator lamp does not light when switch is pressed	Line cord disconnected	Plug in line cord
		Line fuse open	Replace line fuse F4
		Line filter open	Replace line filter on rear panel
		+18V. DC fuse open	Replace +18V. DC fuse F1
		POWER switch and/or indicator/amp defective	Replace power switch and/or indicator lamp
		Bad connection at OCP or at P10 from power supply	Reseat connector P8, or connection P10/J10 from power supply
2	LOAD indicator does not light when POWER switch is turned on	LOAD indicator bad	Replace indicator lamp
		OCP cable loose	Reseat connector P8
		+5V. DC absent	Check +5V. DC fuse F3
		+13V, −13V inputs absent	Reseat Power Regulator Board in J6
		Defective component on Disc Control Board	Replace Disc Control Board
		Brush switch S6 defective or plug P11 not seated on Interconnect Board	Replace brush switch or reseat connector P11 on Interconnect Board
3	Handle does not unlock when unit is powered up	Solenoid plunger caught on latch	Readjust door latch mechanism
		Defective component on Power Regulator Board	Replace Power Regulator Board
		Solenoid open	Replace solenoid
4	LOAD indicator lamp does not go out and handle does not lock when RUN portion of RUN/LOAD switch is pressed	RUN/LOAD switch defective, or poor connection at plug P8	Replace switch S2 or reseat plug P8 on cable from OCP
		Cartridge interlock switch misadjusted	Adjust or replace S9

TABLE 5-4. Fault Isolation Chart (continued)

Item	Symptom	Probable Cause	Remedy
5	Disc does not start to turn when RUN portion of switch is pressed	±18V. DC absent	Check ±18V.DC fuses F1 and F2 Check P8/J8, P10/J10, P19/J19 and P18/J18
		Defective spindle drive circuit boards	Check connections to, or replace Motor Drive Power Switch Board, Spindle Drive Regulator Board, or Commutator Board on spindle
		Defective spindle motor	Replace spindle assembly
6	READY indicator does not light after completion of initial cycle	If heads do not load, brush cycle may not have been completed	Check operation of brush motor, driver chip U3 on Power Regulator Board, brush motor S6 and brush motor cam linkage
		If heads do not load, spindle may not have come up to speed	Check +13V. DC and −13V. DC outputs on Power Regulator Board and connections on P18
		Lack of input to Disc Control Board	Verify that transducer is plugged into connector P12 on Interconnect Board and that output is normal. If so check for loose or broken O-ring belt. If o.k., replace Disc Control Board
		If heads do not load, but brush cycle and spindle speed are o.k., may have poor connection in positioner harness	Verify that connector P15 is plugged in at SVA board, and that P16 is plugged in at power supply
		If heads do not load, but other symptoms are normal, may have defective Servo Logic Board	Replace Servo Logic Board
		If heads do not load, other indications are normal and replacement of Servo Logic Board does not correct trouble, Servo Amplifier Board may be defective	Replace Servo Amplifier Board

TABLE 5-4. Fault Isolation Chart (continued)

Item	Symptom	Probable Cause	Remedy
6 (con't.)		If heads load, READY lamp may be defective	Replace READY indicator lamp
		If heads load, READY lamp driver defective	Replace driver chip U3 on Power Regulator Board
		If heads load, defective IC on Control Interface Board	Replace Control Interface Board
7	READY indicator goes out after completion of initial cycle and successful operation of unit	Defective lamp	Replace indicator lamp
		Defective lamp driver	Replace or check chip U3 on Power Regulator Board
		Defective IC on Control Interface Board	Replace Control Interface Board
		If heads also retract, READY indicator may be following a valid or invalid indication such as: 1) Low spindle speed 2) Current sense 3) AC loss 4) DC loss	Fault indications may be isolated by observing the characteristics of these signals and the generated outputs on the Disc Control Board. If abnormal, replace DCB (refer to Section 4)
8	Disc Drive will not respond to external position commands	Interface cable or line terminator may be loose at the I/O Connector Board	Reseat connector or terminator assembly on I/O Connector Board
		UNIT SELECT switch in wrong position	Reset switch S3
		Defective receiver(s) on I/O Connector Board	Replace I/O Connector Board
		Interconnect cable from I/O board to Data Interface may be loose or damaged	Reinsert cable connectors or replace cable
		Defective IC on Control Interface Board	Replace Control Interface Board
		Defective component on Servo Amplifier Board	Replace Servo Amplifier Board. Check signals (refer to Section 4)

TABLE 5-4. Fault Isolation Chart (continued)

Item	Symptom	Probable Cause	Remedy
9	Previously recorded data can not be read out	Heads dirty or head connectors not properly seated	Clean R/W heads or reseat heads in Data Electronics Board
		READ ENABLE line inoperative	Check for high signal on Data Interface Board. If present, replace Data Interface Board
		HEAD SELECT or DISC SELECT line inoperative	Check for high inputs on Data Electronics Board. If present, replace DEB
		READ DATA or READ CLOCK line inoperative	If no READ DATA input, replace Data Interface Board
		Data timing misadjusted	Readjust pulse width potentiometer on Data Interface Board
		Fixed disc transducer misadjusted or defective (if errors on fixed disc only)	Perform fixed disc index/sector transducer adjustment (refer to para. 5.6.3.2). Replace transducer
		Defective component in analog read data chain	Replace Data Electronics Board. Check write current (refer to para. 5.6.6)
10	Data error rate too high	Cartridge, heads, or fixed disc dirty	Replace cartridge, clean heads and fixed disc
		Dirty or damaged air filter	Check and replace air filter
		Write current misadjusted	Perform write current check (paragraph 5.6.6)

TABLE 5-4. Fault Isolation Chart (concluded)

Item	Symptom	Probable Cause	Remedy
10 (con't)		Bad spindle or blower grounding brushes	Replace grounding brushes
		Servo not settling properly	Perform SVA adjustment (para. 5.6.4)
		Defective component in read data chain	Replace Data Electronics board and perform write current check (5.6.6)
		Defective component in digital read chain	Replace Data Electronics board.
11	Positioner will not retract upon pressing the LOAD portion of RUN/LOAD	If READY indicator does not go out, RUN/LOAD switch defective or Disc Control Board is defective	Check operation of, or replace RUN/LOAD switch or replace Disc Control Board
		If READY indicator goes out, bad SVA board or Emergency Retract Board	Replace Servo Amplifier board or Emergency Retract Board
12	LOAD indicator will not light and/or will not release door after completion of stop cycle	Defective component on Disc Control Board or Power Regulator Board (probably driver)	Replace Disc Control or Power Regulator Board
		Defective lamp	Replace indicator lamp
		Defective solenoid	Replace solenoid
		Solenoid plunger caught on latch	Readjust solenoid latch mechanism

5.8 SIGNAL DISTRIBUTION TABLE FOR DISC DRIVE

The signal distribution Table 5-5 on the following pages is an alphabetical compilation of logic signals in the disc drive system. For any given signal, the distribution to the various circuit boards is tabulated, which offers a considerable convenience in signal tracing. In addition, the signal origin and destination is indicated as follows:

A. ● signifies that the signal is generated in the circuitry of the assembly listed at the top of the particular column.

B. * signifies that the signal is furnished to the circuitry of the assembly listed at the top of the particular column.

This table is furnished as an aid, not as a formal document. Any question as to the accuracy of a given entry should be resolved by consulting the corresponding circuit schematic in Appendix C. Refer to Table 6-5, Glossary of Mnemonic Terms, for a description of each input and output signal. Also refer to Tables 2-1 and 2-2 for a brief description of each input and output signal.

TABLE 5-5. Signal Distribution (continued)

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SIGNAL DESIGNATION	I/O BRD	DIB	CIB	DCB	SLB	SVA	DEB	PRB	I/O* CABLE	I/O● CABLE	OTHER
AC IN								P6-6*			POWER ● SUPPLY
AC LOSS				P3-K*				P6-9●			
ATTENTION	J21-14*	P1-$\overline{J}$	P2-$\overline{J}$*								
AD 256					P4-31●		P7-12*				
ADD ACK	J21-10*	P1-$\overline{L}$*	P2-$\overline{L}$●						P22-14		
ADD 1	J21-47*	P1-W*			P4-W*					P22-44	
ADD 2	J21-48*	P1-X*			P4-X*					P22-39	
ADD 4	J21-34*	P1-Y*			P4-Y*					P22-43	
ADD 8	J21-37*	P1-Z*			P4-Z*					P22-42	
ADD 16	J21-42*	P1-$\overline{A}$*			P4-$\overline{A}$*					P22-45	
ADD 32	J21-24*	P1-$\overline{B}$*			P4-$\overline{B}$*					P22-47	
ADD 64	J21-23*	P1-$\overline{C}$*			P4-$\overline{C}$*					P22-48	
ADD 128	J21-22*	P1-$\overline{D}$*			P4-$\overline{D}$*					P22-50	
ADD 256	J21-32*	P1-34*			P4-34*					P22-29	
ATTENTION 0	J22-20*								P22-20		
ATTENTION 1	J22-17*								P22-17		
ATTENTION 2	J22-19*								P22-19		
ATTENTION 3	J22-18*								P22-18		
BM ON (+)				P3-P●				P6-J*			
BRUSH MOTOR								P6-8●			BRUSH* MOTOR
RESTORE	J21-45*	P1-16*	P2-16*							P22-38	
DC LOSS (–)			P2-$\overline{C}$*	P3-$\overline{C}$●		P5-$\overline{C}$*					
DLY SK (–)				P2-$\overline{M}$*	P4-$\overline{M}$●	P5-K*					
DIF.256/128 (+)					P4-K●						
DDAC					P4-M●	P5-M*					
TCDAC					P4-P●	P5-P*					
TCV					P4-N*	P5-N●					
DET ODD (–)					P4-R*	P5-R●					
DET EVEN (–)					P4-S*	P5-S●					
SERVO MOTOR RELAY COIL						P15-6*					POSIT ● TRANSDUCER
DET EN (+)			P2-$\overline{N}$*		P4-$\overline{N}$●						
COARSE SERVO ENABLE (–)					P4-V●	P5-V*					
DATA CLK	J21-26*	P20-26*							P22-8		
BEGINNING OF TRAVEL PULSE (–)					P4-$\overline{E}$*	P5-$\overline{E}$●					
DISC SEL	J21-12*	P1-R*	P2-R*				P7-15*			P22-31	
ERASE		P1-F●					P7-T*				
ERASE GATE	J21-36*	P20-36*								P22-40	
FIDX			P2-30*	P3-30●							
FSTR			P2-31*	P3-31●							
FWD (–)					P4-$\overline{L}$●	P5-$\overline{L}$*					
F DISC WRT PROT SW							P7-F*				WRT ● PROT SW
HD SEL	J21-13*	P1-30*					P7-N*			P22-33	
LIGHT SOURCE						P5-F*					OPTICAL POSIT. TRANSDUCER●
BRUSH MOTOR ON (–)				P3-$\overline{A}$●							BRUSH MOT.*
IDX	J21-15*	P1-15*	P2-15●						P22-9		
ILL AD	J21-11*	P1-14*	P2-14●						P22-13		
ILL ADD (+)			P2-$\overline{K}$*		P4-$\overline{K}$●						
LD HD ( )				P3-$\overline{H}$●	P4-$\overline{H}$*						

TABLE 5-5. Signal Distribution (continued)

WAN-0377/2

SIGNAL DESIGNATION	I/O BRD	DIB	CIB	DCB	SLB	SVA	DEB	PRB	I/O* CABLE	I/O • CABLE	OTHER
SOL				P3-$\overline{D}$•				P6-H*			
LOAD IND								P6-7•			LOAD INDICAT*
ODD (+)					P4-T•	P5-T*					
DETENT MODE (+)			P2-11*			P5-11•					
TRK OFFSET FWD.	J21-41*	P1-10*				P5-10*				P22-37	
TRK OFFSET REV.	J21-40*	P1-9*				P5-9*				P22-46	
SERVO AMPLIFIER OUTPUT RELAY						P15-4*					POSIT. TRANSDUCER•
POWER SUPPLY GROUND						P15-3					POSIT. TRANSDUCER•
PSEUDO SECTOR 2000	J21-25*	P1-S*	P2-P*	P3-S•					P22-5		
R DISC WRT PROT SW							P7-H*				WRT PROT SW•
RD DATA	J21-27*	P20-27•							P22-7		
RD DATA 1		P1-E*					P7-U•				
RD DATA 2		P1-5*					P7-17•				
RD EN GATE	J21-39*	P20-39*								P22-49	
RDY 1			P2-U*	P3-U•							
RDY L			P2-S•					P6-11*			
READY	J21-7*	P1-13*	P2-13•						P22-11		
READY INDICATOR								P6-M•			READY LAMP*
BEGINNING OF TRAVEL						P5-U*					OPTICAL POSIT. TRANSDUCER•
RIDX			P2-V*	P3-V•							
RSTR			P2-29*	P3-29•							
RTZ (+)				P3-$\overline{F}$•	P4-$\overline{F}$*						
RUN/STOP RUN (–)				P3-$\overline{B}$*							RUN/STOP• SW – OCP
RETURN ZERO			P2-N•	P3-N*							
SAC 1	J21-17*	P1-28*	P2-28•						P22-4		
SAC 2	J21-18*	P1-$\overline{F}$*	P2-$\overline{F}$•						P22-2		
SAC 4	J21-19*	P1-27*	P2-27•						P22-26		
SAC/8 F IDX	J21-20*	P1-$\overline{E}$*	P2-$\overline{E}$•						P22-1		
SAC/16 F STR	J21-21*	P1-26*	P1-26•						P22-3		
POSITION CHANNEL						P5-7*					OPTICAL POSIT. TRANSDUCER•
POSITION COMMON						P5-8*					OPTICAL POSIT. TRANSDUCER•
SECTOR IN (FIXED)				P3-$\overline{P}$*							MAGNETIC • TRANSDUCER
SECTOR IN (REM)				P3-$\overline{M}$*							MAGNETIC • TRANSDUCER
SECTOR RTN (FIXED)				P3-$\overline{N}$*							MAGNETIC • TRANSDUCER
SECTOR RTN (REM)				P3-$\overline{L}$*							MAGNETIC • TRANSDUCER
SEEK COMP	J21-9*	P1-32*	P2-32•						P22-16		
SEEK INCOMP	J21-33*	P1-K*	P2-K•						P22-15		
SEEK STROBE	J21-46*	P1-18*	P2-18*							P22-32	
SEK COMP		P1-6*	P2-6•			P5-L*					
SEL 1	J21-43*	P1-U*									UNIT SEL SWITCH•
SEL 2	J21-44*	P1-17*									UNIT SEL SWITCH•
SK (+)			P2-33•		P4-33*						
SOL				P3-$\overline{D}$•				P6-H*			
SOLENOID								P6-F•			PACK INTER. SOLENOID *

TABLE 5-5. Signal Distribution (concluded)

WAN-0377/3

SIGNAL DESIGNATION	I/O BRD	DIB	CIB	DCB	SLB	SVA	DEB	PRB	I/O* CABLE	I/O• CABLE	OTHER
SP DET EC				P3-Z•			P7-P*				
SPM ON				P3-M•				P6-4*			
HARD PICK								J18-3•			SPINDLE DRIVE MODULE •
STR/SAC 32	J21-16*	P1-$\overline{H}$*	P2-$\overline{H}$•						P22-6		
TACH						P5-5*					LINEAR VELOC. TRANSDUCER •
TACH RTN						P5-E*					LINEAR VELOC. TRANSDUCER •
UNIT SELECT 0	J22-34*									P22-34	
UNIT SELECT 1	J22-35*									P22-35	
UNIT SELECT 2	J22-27*									P22-27	
UNIT SELECT 3	J22-38*									P22-28	
LOAD/UNLOAD (+)					P4-27•	P5-27*					
LOAD/UNLOAD (–)			P2-17*		P4-17•						
SERVO DET.EN.(–)					P4-$\overline{P}$•	P5-$\overline{P}$					
WRITE		P1-H•					P7-16*				
WRITE DATA X		P1-7 •					P7-J*				
WRT CHK	J21-8*	P1-29• P20-8	P2-$\overline{D}$*						P22-10		
WRT CHK X		P1-$\overline{M}$*					P7-M•				
WRT DATA	J21-28*	P20-38*								P22-41	
WRT GATE	J21-29*	P20-29*								P22-36	
WRT PROT	J21-6*	P1-$\overline{N}$*					P7-L•		P22-12		
AGC						P5-W*					OPTICAL POSIT. TRANSDUCER •
TEMP						P5-12*					TEMP SENSOR •
MOTOR RETURN						P15-5*					POSIT. TRANSDUCER •
FUSED SWITCHED						P15-1*					POSIT. TRANSDUCER•
+18V FUSED						P15-2*					POSIT. TRANSDUCER •
AD 256 (+)					P4-31•		P4-12*				

• signifies that the signal is generated in the circuitry of the assembly listed at the top of the particular column.

* signifies that the signal is furnished to the circuitry of the assembly listed at the top of the particular column.

APPENDIX A

MASTER SPARES LIST

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER | REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 1 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	SUB-ASSEMBLIES:					
1	Assy. Power Supply	300346-201	1			
2	Assy. Positioner	300600-001	1			200 TPI, Some Models
	Assy. Positioner	" -002	1			All 100 TPI, Some 200 TPI
3	Assy. Spindle Motor	301217-001	1			100 TPI Only
	Assy. Spindle Motor	" -002	1			100 or 200 TPI
4	Assy. Power Cord	300607-001	1			Used on 300346
5	Assy. OCP	300376-002	1			
6	Assy. Transducer	300311-001	1			Fixed Disc
7	Assy. Filter Replacement Kit	301742-001	1			300946-001 Filter Assy. and Gasket
8	Assy. Thermistor	300467-001	1			200 TPI Only
9	Assy. Sector Transducer	300606-001	1			Series T Only
10	Assy. Door Latch Solenoid	300388-001	1			Series T Only
11	Assy. Door Latch Solenoid	300433-001	1			Series F Only
12	Assy. Brush Motor	300323-001	1			Disc Cleaning, 100 TPI Only
13	Assy. Brush Motor	300323-002	1			Disc Cleaning, 200 TPI Only
14	Assy. Velocity Transducer	300771-001	1			Used on 300600
15	AC Line Cord	101153-001	1			

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER | REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 2 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	MISCELLANEOUS ITEMS:					
1	Magnetic Recording Head	300132-001	2			100 TPI, 1500 RPM (UPPER)
	" " "	-002	2			" " (LOWER)
	" " "	-003	2			" 2400 RPM (UPPER)
	" " "	-004	2			" " (LOWER)
2	Magnetic Recording Head	300397-001	2			200 TPI, 1500 RPM (UPPER)
	" " "	-002	2			" " (LOWER)
	" " "	-003	2			" 2400 RPM (UPPER)
	" " "	-004	2			" " (LOWER)
3	Air Filter	300387	1			Pre-Filter on 301742-001
4	Shipping Restraint	300790	1			Positioner Carriage
5	Key, Polarization	101127-001	10			Used on 300586
6	Transformer	101060-001	1			Used on 301157
	"	-002	1			Used on 301157
7	'O' Ring	100410-001	1			1500 RPM
8	'O' Ring	-005	1			2400 RPM
9	Brush, Disc Cleaning	101095-001	1			Upper
	" " "	-002	1			Lower
10	Brush, Ground (Spindle)	101701-001	1			Used on 301217
11	Clip, Hitch Pin	101121-001	1			Used with 101095
12	Sector Transducer	300679-001	1			Series F Only
13	Brush, Ground (Blower)	101118-001	1			

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER | REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 3 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	PRINTED WIRING BOARDS					
1	Assy. I/O Connector PWB	300075-XXX				Basic. See unit CCL for dash nos.
2	Assy. Line Terminator PWB	300095-001	1			
3	+5V Regulator PWB	300200-001	1			
4	Assy. Servo Logic PWB	300497-000				Basic
		-001	1			200TPI, Top Load Illegal Address Track 408
		-002	1			200 TPI, Front Load Illegal Address Track 406
5	Assy. Elect. Interconnect PWB	300586-001	1			
6	Assy. Power Regulator PWB	301002-001	1			
7	Assy. Disc Control PWB	301018-XXX				Basic. See unit CCL for dash nos.
8	Assy. Servo Logic PWB	301025-000	1			Basic (100 TPI ONLY)
		-001	1			Front Load, ILL ADD 203.
		-002	1			Top Load, ILL ADD 204.
9	Assy. Control Interface PWB	301035-XXX				Basic. See unit CCL for dash nos.
10	Assy. Disc Control PWB	301076-XXX	1			Basic. See unit CCL for dash nos.
11	Assy.Spindle Motor Power Switch	301153-102	1			
12	Assy. Spindle Drive Regulator	301198-002	1			
13	Assy. Data Electronics PWB	301157-XXX				Basic. See unit CCL for dash nos.
14	Assy. I/O Connector PWB	301179-000				Basic
		-001	1			Attn. Lines: Negative
		-002	1			Attn. Lines: Positive
15	Assy. Data Interface VFO, PWB	301320-XXX				Basic. See unit CCL for dash nos.
16	Assy. Servo Amplifier PWB	301584-001	1			100 TPI F & T
		-002	1			200 TPI F & T, With Track
						Offset and Temperature
						Compensation.

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER | REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 4 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	POWER SUPPLY & OCP ITEMS					
1	Fuse 3 amp	100235-018	1			Used on 300346-101 & -201
2	Fuse 5 amp	100028-020	1			" " " "
3	Fuse 10 amp	-027	2			" " " "
4	Bridge, Diode MDA-980-2	101033-002	2			" " 300346-101 & -201
5	Rocker Switch	101077-001	3			Used on 300376 OCP
		-002	1			" " "
6	Bezel, Switch	101078-001	4			" " "
7	Lens, "POWER"	101079-001	1			" " "
8	Lens, "RUN/LOAD"	-002	1			" " "
9	Lens, "PROTECT CART"	-003	1			" " "
10	Lens, "PROTECT FIXED"	-004	1			" " "
11	Indicator. "READY/LOAD"	101081-001	1			" " "
12	Lamp, 28V	101082-003	3			Used with Items 7-10
13	Lamp, 28V	101083-002	2			Used with Item 11
14	Switch, Thumbwheel	101137-001	1			

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER | REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 5 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	ELECTRONIC COMPONENTS: (continued)					
1	IC. Volt. Reg. 723	100108	2			Used on 301002 Assy.
2	IC. Dual Monostable 9602	100234	1			" " 301320 "
			4			" " 301076 "
			4			" " 301018 "
			3			" " 301035 "
			2			" " 301025 "
			2			" " 300497 "
3	IC. Quad 2 Input NAND 7400	100328	1			" " 301320 "
			2			" " 301076 "
			2			" " 301018 "
			1			" " 301035 "
			3			" " 301025 "
			3			" " 300497 "
4	IC. Quad 2 Input NOR 7402	100329	3			" " 301076 "
			3			" " 301018 "
			1			" " 301035 "
			3			" " 301025 "
			3			" " 300497 "
5	IC. Hex Inverter 7404	100330	1			" " 301076 "
			1			" " 301018 "
			3			" " 301035 "
6	IC. Quad 2 Input AND 7408	100332	4			" " 301076 "
			3			" " 301018 "
			5			" " 301035 "
			1			" " 301025 "
			1			" " 300497 "
7	IC.Triple 3 Input NAND 7410	100333	1			" " 301076 "
			1			" " 301018 "

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER | REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 6 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	ELECTRONIC COMPONENTS (continued)					
8	IC.Dual-D, Flip-Flop 7474	100339	7			Used on 301076 Assy.
			7			" " 301018 "
			5			" " 301035 "
			8			" " 301025 "
			8			" " 300497 "
9	IC.Quad.2 Input.Excl.OR 7486	100341	1			" " 301076 "
			1			" " 301018 "
			2			" " 301025 "
			2			" " 300497 "
10	IC.Dual Volt. Control 4024	100344	1			" " 301320 "
11	IC.Phase Freq.Detector 4044	100345	1			" " 301320 "
12	IC.Quad.2 Input NOR 8T380	100347	8			" " 300075 "
			8			" " 301179 "
13	IC.Trip.3-Input.AND 7411	101009	2			" " 301076 "
			2			" " 301018 "
			1			" " 301035 "
			1			" " 301025 "
			1			" " 300497 "
14	IC.Quad.2-Input NAND 7426	101011	1			" " 301584 "
			3			" " 301157 "
15	IC.Quad.2-Input OR 7432	101012	2			" " 301076 "
			2			" " 301018 "
			2			" " 301035 "
			1			" " 301025 "
			1			" " 300497 "
16	IC.4-Bit Full Adder 7483	101013	2			" " 301025 "
			3			" " 300497 "

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER — REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 7 OF ___

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	ELECTRONIC COMPONENTS:	(continued)				
17	IC.Quad 2 Input M/P 9322	101017	2			Used on 301035 Assy.
18	IC.5-Bit Comparator 9324	101018	2			" " 301025 "
			2			" " 300497 "
19	IC.Up/Dwn Dec. Cntr. 74192	101019	1			" " 301076 "
			1			" " 301018 "
20	IC.Up/Dwn Dec. Cntr. 74193	101020	4			" " 301076 "
			4			" " 301018 "
			2			" " 301035 "
			2			" " 301025 "
			3			" " 300497 "
21	IC.Operational Amp. 301	101021	1			" " 301044 "
22	IC.Voltage Comp. 311	101022	3			" " 301584 "
			2			" " 301076 "
			2			" " 301018 "
			1			" " 301157 "
			3			" " 301170 "
23	IC.Timer 555V	101023	1			" " 301076 "
			1			" " 301018 "
24	IC.Bl.Direct One Shot. 8T20B	101024	1			" " 301320 "
25	IC.Dual Op-Amp. 5558	101026	8			" " 301584 "
			1			" " 301025 "
			1			" " 300497 "
			1			" " 300921 "
26	IC.Analog Sw. 1H5020	101029-003	4			" " 301584 "
			3			" " 300497 "

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER — REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 8 OF ___

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	ELECTRONIC COMPONENTS:	(continued)				
27	IC.Dual NAND Driver 75452	101031	4			Used on 301584 Assy.
			4			" " 300075 "
			14			" " 301179 "
			2			" " 301157 "
			2			" " 301025 "
			2			" " 300497 "
			2			" " 301002 "
28	IC.Video Amp. 592	101032	2			" " 301157 "
29	IC.D/A Converter 1406	101088	1			" " 301025 "
			1			" " 300497 "
30	IC.Dual AND Driver 75451	101139	2			" " 300075 "
			2			" " 301179 "
			1			" " 301157 "
			3			" " 301153 "
31	IC.Hex Inverter 7414	123001	3			" " 301157 "
32	IC.Dual D Flip-Flop 74S74	123023	1			" " 301320 "
			1			" " 301157 "
33	IC.Quad 2-Input NAND 74LS00	123029	1			" " 301320 "
34	IC.Quad 2-Input AND 74LS08	123032	2			" " 301320 "
35	IC.Triple 3-Input AND 74LS11	123034	1			" " 301320 "
36	IC.Quad 2-Input OR 74LS32	123035	2			" " 301320 "
37	IC.Quad D Flip-Flop 74LS74	123036	3			" " 301320 "
			1			" " 301153 "
38	IC.4-Line to 10-Line Decoder	123037	1			" " 301153 "
39	IC.Quad 2-Input Mux. 74LS157	123040	1			" " 301153 "
40	IC.Hex Inverter 74S04	123046	1			" " 301320 "
41	IC.Quad 2-Input AND 74S08	123050	1			" " 301320 "

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER — REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 9 OF ___

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	ELECTRONIC COMPONENTS:	(continued)				
42	IC.Triple Line Receiver	125000	1			Used on 301157 Assy.
43	IC.Voltage Reg. 78M05	125005-005	1			" " 301320 "
		-006	1			" " 301157 "
		-008	1			" " 301157 "
44	IC.Neg.3Terminal Reg. 79M08AHC	125007-006	1			" " 301157 "
45	IC.Op-Amp. Precision LM308	125009	1			" " 301584 "
46	Transistor, PNP MPS-U51	100083	1			" " 301584 "
47	Transistor, PNP TIP42A	101048	3			" " 301002 "
48	Transistor, NPN 2N2222A	101052	3			" " 301584 "
			1			" " 301076 "
			1			" " 301018 "
			3			" " 301157 "
			1			" " 301002 "
			1			" " 301153 "
49	Transistor, PNP 2N2907A	101053	2			" " 301584 "
			7			" " 301157 "
			1			" " 301002 "
			1			" " 301044 "
			3			" " 301153 "
50	Transistor, NPN EP2179(TIP140)	151003-001	1			" " 301584 "
	" " " "		1			" " 301044 "
	" " " "	151003-001	3			" " 301153 "
51	Transistor, PNP EP2180(TIP145)	151004-001	3			" " 301153 "
	" " " "	" "	4			" " 301198 "
	" " " "	" "	1			" " 301584 "
52	Diode-Rect. .200V 1N4003	100127	1			" " 300586 "
	" " " "	"	2			" " 300075 "
53	Diode-Rect. 1N5624	107026-001	3			" " 300586 "

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER — REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 10 OF ___

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	ELECTRONIC COMPONENTS:	(continued)				
54	Diode-Rect. .200V 1N4003	100127	2			Used on 301179 Assy.
			4			" " 301157 "
			2			" " 301044 "
			6			" " 301153 "
			1			" " 301198 "
55	Diode, Signal 1N5317	101034	8			" " 301584 "
			1			" " 301076 "
			1			" " 301018 "
			1			" " 301018 "
			22			" " 301157 "
			1			" " 301002 "
			1			" " 301044 "
56	Diode, Zener 6.8V 1N5235B	101058-010	1			" " 301584 "
	10V 1N5240B	-015	1			" " 301584 "
	5.1V 1N5231B	-006	1			" " 301320 "
			1			" " 301002 "
	4.7V 1N5230B	-005	2			" " 301076 "
			2			" " 301018 "
			1			" " 301153 "
	22V 1N5251B	-016	1			" " 301076 "
			1			" " 301018 "
	1N5245B	-019	2			" " 301044 "
57	Diode, Zener 500mw 1%	107040-009	1			" " 301198 "
58	Inductor, 5%, 27 uh	101074-001	6			" " 301157 "
	Inductor, 5%, 1.5uh	-003	1			" " 301157 "
59	Inductor, 5%, 220uh	122500-001	2			" " 301157 "
			1			" " 301002 "

MASTER SPARES LIST

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER — REV. B

TITLE 100/200 TPI DISC DRIVES MODEL F & T DATE 2-16-77 SHEET 11 OF ___

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	ELECTRONIC COMPONENTS:	(concluded)				
60	Crystal 3.200MHz.	101059-001	1			Used on 301076 Assy.
			1			" " 301018 "
	3.125MHz.	-002	1			" " 301320 "
	5.000MHz.	-003	1			" " 301320 "
	3.177MHz.	-004	1			" " 301320 "
61	Resistor, Variable 10K	100163-103	4			" " 301584 "
	5K	-502	1			" " 301584 "
62	Resistor, Variable 20K	101006-203	1			" " 301076 "
			1			" " 301018 "
63	Resistor, Variable 100	101148-101	1			" " 301157 "
	10K	-103	1			" " 301584 "
	1 Meg.	-105	1			" " 301076 "
			1			" " 301018 "

APPENDIX B

ASSY. DWGS. & MATL. LISTS

APPENDIX B

100/200 TPI DISC DRIVE

ASSY. DWGS. AND MATL. LIST INDEX

Title	Drawing	Page
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I/O Connector PWB	300075	B-13
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Power Supply	300346	B-19
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Spindle Drive Module and Schematic	300612	B-33
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XXX SEE BUILD M/L FOR TABULATION.

WANGCO INCORPORATED — MATERIAL LIST

CODE D101 | PART NUMBER 300000-000 | REV. /

TITLE ASSY. DISC DRIVE 100TPI. OPTICAL - TOP LOAD. MODEL _____ DATE 9/19/75 SHEET 1 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Assy. Elect/Int. Pwb.	300586-001	1			
2	Assy. Servo Amplifier Pwb.	301584-001	1			
3	Assy. I/O Connector Pwb.		0			
4	Assy. Line Terminator Pwb.		0			
5	Assy. VFO Pwb.		0			
6	Assy. Disc Control Pwb.	301903-XXX	0			
7	Assy. Data Electronics Pwb.		0			
8	Assy. Control Interface Pwb.		0			
9	Assy. Servo Logic Pwb.	301025-XXX	0			
10	— — — — — — — —					
11						
12						
13	Assy. Voltage Plug.	300324-XXX	0			
14						
15						
16						
17	Ring, Sector.	302310-XXX	0			
18	Pulley, Blower.	300110-XXX	0			
19	Spec. Proc. Recording Head.	300132-XXX	0			
20	Spec. " " "	-XXX	0			
21	Panel, Filler	300157-XXX	0			
22						
23						
24	Fuse.	100235-XXX	0			F4.
25	'O' Ring	100410-XXX	0			1500 RPM=-001: 2400 RPM=-005
26						
27						
28	Assy. Power Regulator Pwb.	301902-001	1			S/N.
29	Assy. Emergency Retract Pwb.	301044-001	1			S/N.
30	Assy. Spindle Mtr Pwr sw. Pwb.	301153-102	1			S/N.
31	Assy. Spindle Drive Reg. Pwb.	301198-002	1			S/N.
32						
33						

WANGCO INCORPORATED — MATERIAL LIST

CODE D101 | PART NUMBER 300000-000 | REV. /

TITLE ASSY. DISC DRIVE 100TPI. OPTICAL - TOP LOAD. MODEL _____ DATE 9/19/75 SHEET 2 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
34						
35	Assy. Brush.	300223-001	1			
36	Assy. Cable - Interconnect.	300274-001	1			
37	Assy. Transducer.	300311-001	1			
38	Assy. DC. Motor.	300323-001	1			
39	Assy. Power Supply.	300346-201	1			
40	Assy. OCP.	300376-002	1			
41	Assy. Bearing Housing.	300396-001	1			
42	Assy. Slide - Left Hand.	300412-001	1			
43	Assy. Slide - Right Hand.	-002	1			
44	Assy. Solenoid & Brush Cable.	300413-004	1			
45	Assy. Positioner.					
46	Assy. Fixed Disc Cover.	302035-001	1			
47	Assy. Filter.	300946-002	1			
48	Assy. Shroud, Top Load.	302034-001	1			
49	Assy. Spindle.Motor Brushless	301217-003	1			Or use - 004
50	Assy. Harness Spindle Drive.	301250-001	1			
51	— — — — — — — —					
52	— — — — — — — —					
53						
54	Ring, Adhesive	302365-001	1			
55	Screw, Sector Ring	302370-001	2			
56						
57	Nameplate, 'W' Logo.					
58	Label, Model.	201347-001	2			
59	Label, Warning.	202375-001	1			
60						
61	Rod, Handle Spacer	300283-001	1			
62						
63	Ring, Inlet Blower	301177-001	1			
64	Crank.	300039-001	1			
65	Rod, Linkage.	300040-001	1			
66	Cam.	300043-001	1			

WANGCO INCORPORATED — MATERIAL LIST

CODE D101 | PART NUMBER 300000-000 | REV. /

TITLE ASSY. DISC DRIVE 100TPI. OPTICAL - TOP LOAD. MODEL _____ DATE 9/19/75 SHEET 3 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
67	Support, Card Guide.	300051-001	1			
68	Cover, Blower.	300865-001	1			
69	Cover, Filter Plate.	300082-002	1			
70	Cover, Brush Access.	301218-001	1			
71	Plate, Motor Gasket.	300086-001	1			
72	Gasket, Motor.	300088-001	1			
73						
74	Disc, Magnetic Recording.	300133-001	1			(6)
75	— — — — — — — —					
76	Cover, Top.	301221-001	1			
77						
78	Pin, Pack Ejector.	300202-001	1			
79	Clamp, Disc Plate.	300204-001	1			
80	Housing, Switch Actuator.	300227-001	1			
81	Bracket, Switch Mounting.	300228-001	1			
82	Actuator, Switch.	300230-001	1			
83	Nut, Plate.	300231-001	1			
84	Cap, End.					
85	Cap, "					
86	Bezel, Switch.	300245-001	1			
87	Bracket, Guide.	300280-001	1			
88	Bracket, "	-002	1			
89	Bushing.	300284-001	2			
90	Bracket, End Cap. Mounting.	300287-001	2			
91	Panel, Rear.	300344-001	1			
92	Cover, Interconnect Pwb.	300384-001	1			
93	Deck, Machined Casting.	300669-001	1			
94	Cover, I/O Connector Pwb.	300503-001	1			
95	Retainer, Pwb.	300597-001	2			
96	Plate, Mtg. Emerg. Retract.	300616-002	1			
97	Panel, Front Trim.					
98	Bracket, Ret. Pos Carriage.	300790-001	1			For Shipping Purposes Only
99	Label, Caution.	300827-001	1			

WANGCO INCORPORATED — MATERIAL LIST

CODE D101 | PART NUMBER 300000-000 | REV. /

TITLE ASSY. DISC DRIVE 100TPI. OPTICAL - TOP LOAD. MODEL _____ DATE 9/19/75 SHEET 4 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
100	Label, Carriage Restraint.	300828-001	1			
101	Gasket, Filter.	300939-001	1			
102	Bushing, Actuator.	300962-001	2			
103	Actuator, Door.	300963-001	2			
104	Pin, Door Latch.	300986-001	2			
105	Gasket, Disc. Access.	301237-001	1			
106	— — — — — — — —					
107	— — — — — — — —					
108	Bkt., Card Cage Support	301786-001	1			
109						
110						
111						
112	Fuse. 10amp.	100028-027	2			F1,F2.
113	Strap, Cable.	100031-001	2			
114	Fastener.	108610-001	2			
115						
116	Ring, Gripping.	100133-011	2			
117	Ring, Crescent Retaining.	144000-003	1			
118	Cement.	100303-004	A/R			
119	Cement	100303-002	A/R			
120	Impeller.	100411-001	1			
121	Switch, Snap Action.	101097-001	1			
122	Switch, " "	101098-001	1			
123						
124	Bearing, Thrust.	101125-001	1			
125	Spring, Compression.	147700-003	2			
126						
127						
128						
129						
130						
131	Screw, Pan Head.	100036-203	2			4-40 X 3/16"
132	Screw, " "	-209	4			4-40 X 9/16"

WANGCO INCORPORATED — MATERIAL LIST

CODE 0101 | PART NUMBER 300000-000 | REV. /

TITLE ASSY. DISC DRIVE 100TPI. OPTICAL - TOP LOAD. MODEL _____ DATE 9/19/75 SHEET 5 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
133	Screw, Pan Head.	100036-212	4			4-40 X 3/4"
134	Screw, " "	-304	6			6-32 X ⅜"
135	Screw, " "	-306	48			6-32 X 3/8"
136	Screw, " "	-308	6			6-32 X ½"
137	Screw, " "	-506	4			10-32 X 3/8"
138	Screw, " "	-509	2			10-32 X 9/16"
139	Screw, " "	-332	8			6-32 X 2"
140	Screw, " "	100263-306	7			6-32 x 3/8 Black
141						
142						
143	Screw, Nylon Pan Head.	101172-304	1			6-32 X ¼"
144	Screw, " " "	-306	2			6-32 X 3/8"
145						
146						
147	Screw, Flat Head.	100040-208	2			4-40 X ½
148	Screw, " "	-305	26			6-32 X 5/16"
149	Screw, " "	-308	4			6-32 X ½"
150	Screw, " "	100074-304	4			6-32 X ¼" (Black).
151	Screw, " "	100040-306	2			6-32 x 3/8
152						
153						
154						
155	Screw, Socket Head Cap.	100041-208	4			4-40 X ½"
156	Screw, " " "	-507	3			10-32 X 7/16"
157	Screw, " " "	-608	5			½-20 X ½"
158						
159						
160						
161	Screw, Set.	100049-302	2			6-32 X 1/8"
162						
163						
164	Washer, Split Lock.	100042-200	12			No. 4.
165	Washer, " "	-300	40			No. 6.

WANGCO INCORPORATED — MATERIAL LIST

CODE 0101 | PART NUMBER 300000-000 | REV. /

TITLE ASSY. DISC DRIVE 100TPI. OPTICAL - TOP LOAD. MODEL _____ DATE 9/19/75 SHEET 6 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
166	Washer, Split Lock.	100042-500	9			No. 10
167	Washer, " "	-600	2			¼"
168						
169						
170						
171						
172	Washer, Flat.	100047-300	10			No. 6.
173	Washer, "	-500	6			No. 10
174						
175						
176	Washer, Flat Reduced O. D.	100251-300	2			No. 6.
177						
178						
179	Washer, Flat Nylon.	100050-100	4			No. 4.
180	Washer, " "	101185-001	6			No. 6. x .015 THK.
181	Washer, " "	100050-200	4			No. 6.
182	Nut,Self Locking	136003-006	2			6-32
183	Nut, Hex.	100043-200	2			4-40.
184	Nut, "	-300	8			6-32.
185	Nut, "	-500	2			10-32
186	Nut, "	-510	1			¼-28.
187	Nut, "	-800	1			3/8 X 16.
188						
189						
190						
191	Insert, Heli-Coil	122601-001	1			½-20
	Specification,Product.Design.	300400-001	0			

XXX SEE BUILD M/L FOR TABULATION.

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 300001-000 REV. J

ASSY. DISC DRIVE 100TPI.
TITLE OPTICAL-FRONT LOAD. MODEL _____ DATE 9/19/75 SHEET 1 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Assy. Elect/Int. Pwb.	300586-001	1			
2	Assy. Servo Amplifier Pwb.	301584-001	1			
3	Assy. I/O Connector Pwb.		0			
4	Assy. Line Terminator Pwb.		0			
5	Assy. VFO Pwb.		0			
6	Assy. Disc Control Pwb.	301903-XXX	0			
7	Assy. Data Electronics Pwb.		0			
8	Assy. Control Interface Pwb.		0			
9	Assy. Servo Logic Pwb.	301025-XXX	0			
10	Assy. Differentiator Pwb.	300921-XXX	0			
11						
12						
13	Assy. Voltage Plug.	300324-XXX	0			
14						
15						
16						
17	Ring, Sector.	302310-XXX	0			
18	Pulley, Blower.	300110-XXX	0			
19	Spec. Proc. Recording Head.	300132-XXX	0			
20	Spec. " " "	-XXX	0			
21	———	———	—			
22						
23						
24	Fuse.	100235-XXX	0			F4.
25	'O' Ring	100410-XXX	0			-001=1500 RPM; -005=2400 RPM
26	Ring, Adhesive	302365-001	1			
27	Screw, Sector Ring	302370-001	2			
28	Assy. Power Regulator Pwb.	301908-001	1			S/N.
29	Assy. Emergency Retract Pwb.	301044-001	1	A		S/N.
30	Assy. Spindle Mtr Pwr sw. Pwb.	301153-102	1	B		S/N.
31	Assy. Spindle Drive Reg. Pwb.	301198-002	1	C		S/N.
32						

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 300001-000 REV. J

ASSY. DISC DRIVE 100TPI.
TITLE OPTICAL-FRONT LOAD. MODEL _____ DATE 9/19/75 SHEET 4 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
100	Label, Carriage Restraint.	300828-001	1			
101	Gasket, Filter.	300939-001	1			
102	———					
103	———					
104	———					
105	Gasket, Disc. Access.	301237-001	1			
106	Panel, Filler.					
107	Support, Top Cover.	300421-001	1			
108	Bkt., Card Cage Support	301786-001	1			
109						
110						
111						
112	Fuse. 10amp.	100028-027	2			F1,F2.
113	Strap, Cable.	100031-001	2			
114	Fastener.	108610-001	2			
115			1			
116	Ring, Griping.	100133-011	2			
117	Ring, Crescent Retaining.	144000-003	1			
118	Cement.	100303-004	A/R			
119	———	———	—			
120	Impeller.	100411-001	1			
121	Switch, Snap Action.	101097-001	1			
122	Switch, " "	101098-001	1			
123						
124	Bearing, Thrust.	101125-001	1			
125	———					
126						
127						
128						
129						
130						
131	Screw, Pan Head.	100036-203	11			4-40 X 3/16"

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 300001-000 REV. J

ASSY. DISC DRIVE 100TPI.
TITLE OPTICAL-FRONT LOAD. MODEL _____ DATE 9/19/75 SHEET 2 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
34						
35	Assy. Brush.	300222-001	1			
36	Assy. Cable - Interconnect.	300274-001	1			
37	Assy. Transducer.	300311-001	1			
38	Assy. DC. Motor.	300323-001	1			
39	Assy. Power Supply.	300346-201	1			
40	Assy. OCP.	300376-002	1			
41	Assy. Bearing Housing.	300396-001	1			
42	Assy. Slide - Left Hand.	300412-001	1			
43	Assy. Slide - Right Hand.	-002	1			
44	Assy. Solenoid & Brush Cable.	300413-001	1			
45	Assy. Positioner.					
46	Assy. Fixed Disc Cover.	300630-001	1			
47	Assy. Filter.	300946-002	1			
48	———					
49	Assy. Spindle.Motor Brushless	301217-003	1			Or use - 004
50	Assy. Harness Spindle Drive.	301250-001	1			
51	Assy. Cable-Differentiator.	300925-001	1			
52	———					
53						
54						
55						
56						
57	Nameplate, 'W' Logo.					
58	Label, Model.	201347-001	2			
59	Label, Warning.	202375-001	1			
60						
61	———	———	—			
62	———	———	—			
63	Ring Inlet Blower	301177-001	1			
64	Crank.	300039-001	1			
65	Rod, Linkage.	300040-001	1			
66	Cam.	300043-001	1			

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 300001-000 REV. J

ASSY. DISC DRIVE 100TPI.
TITLE OPTICAL-FRONT LOAD. MODEL _____ DATE 9/19/75 SHEET 5 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
133	Screw, Pan Head.	100036-212	4			4-40 X 3/4"
134	Screw, " "	-304	2			6-32 X ¼"
135	Screw, " "	-306	28			6-32 X 3/8"
136	Screw, " "	-308	8			6-32 X ½"
137	Screw, " "	-506	4			10-32 X 3/8"
138	Screw, " "	-509	2			10-32 X 9/16"
139						
140						
141						
142						
143	Screw, Nylon Pan Head.	101172-304	1			6-32 X ¼"
144	———					
145						
146						
147	———					
148	Screw, Flat Head.	100040-305	31			6-32 X 5/16"
149	Screw, " "	-308	10			6-32 X ½"
150						
151	———	———	—			
152						
153						
154						
155	Screw, Socket Head Cap.	100041-208	4			4-40 X ½"
156	Screw, " " "	-507	3			10-32 X 5/8"
157	Screw, " " "	-608	5			⅜-20 X ½"
158						
159						
160						
161	Screw, Set.	100049-302	2			6-32 X 1/8"
162						
163						
164	Washer, Split Lock.	100042-200	10			No. 4.

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 300001-000 REV. H

ASSY. DISC DRIVE 100TPI.
TITLE OPTICAL-FRONT LOAD. MODEL _____ DATE 9/19/75 SHEET 3 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
67	Support, Card Guide.	300051-001	1			
68	Cover, Blower.	300865-001	1			
69	Cover, Filter Plate.	300082-002	1			
70	———					
71	Plate, Motor Gasket.	300086-001	1			
72	Gasket, Motor.	300088-001	1			
73						
74	Disc, Magnetic Recording.	300133-001	1			(6)
75	Spacer, Cover.	300138-001	3			
76	Cover, Top.	300134-001	1			
77						
78	———					
79	Clamp, Disc Plate.	300204-001	1			
80	Housing, Switch Actuator.	300227-001	1			
81	Bracket, Switch Mounting.	300228-001	1			
82	Actuator, Switch.	300229-001	1			
83	Nut, Plate.	300231-001	1			
84	Cap, End.					
85	Cap, "					
86	Bezel, Switch.	300245-001	1			
87	———					
88	———					
89	———					
90	———					
91	Panel, Rear.	300344-001	1			
92	Cover, Interconnect Pwb.	300384-001	1			
93	Deck, Machined Casting.	300669-001	1			
94	Cover, I/O Connector Pwb.	300533-001	1			
95	Retainer, Pwb.	300597-001	2			
96	Plate, Mtg. Emcrg. Retract.	300616-002	1			
97	Panel, Front Trim.					
98	Bracket, Pet. Pos Carriage.	300790-001	1			For Shipping Purposes Only
99	Label, Caution.	300827-001	1			

CODE D101

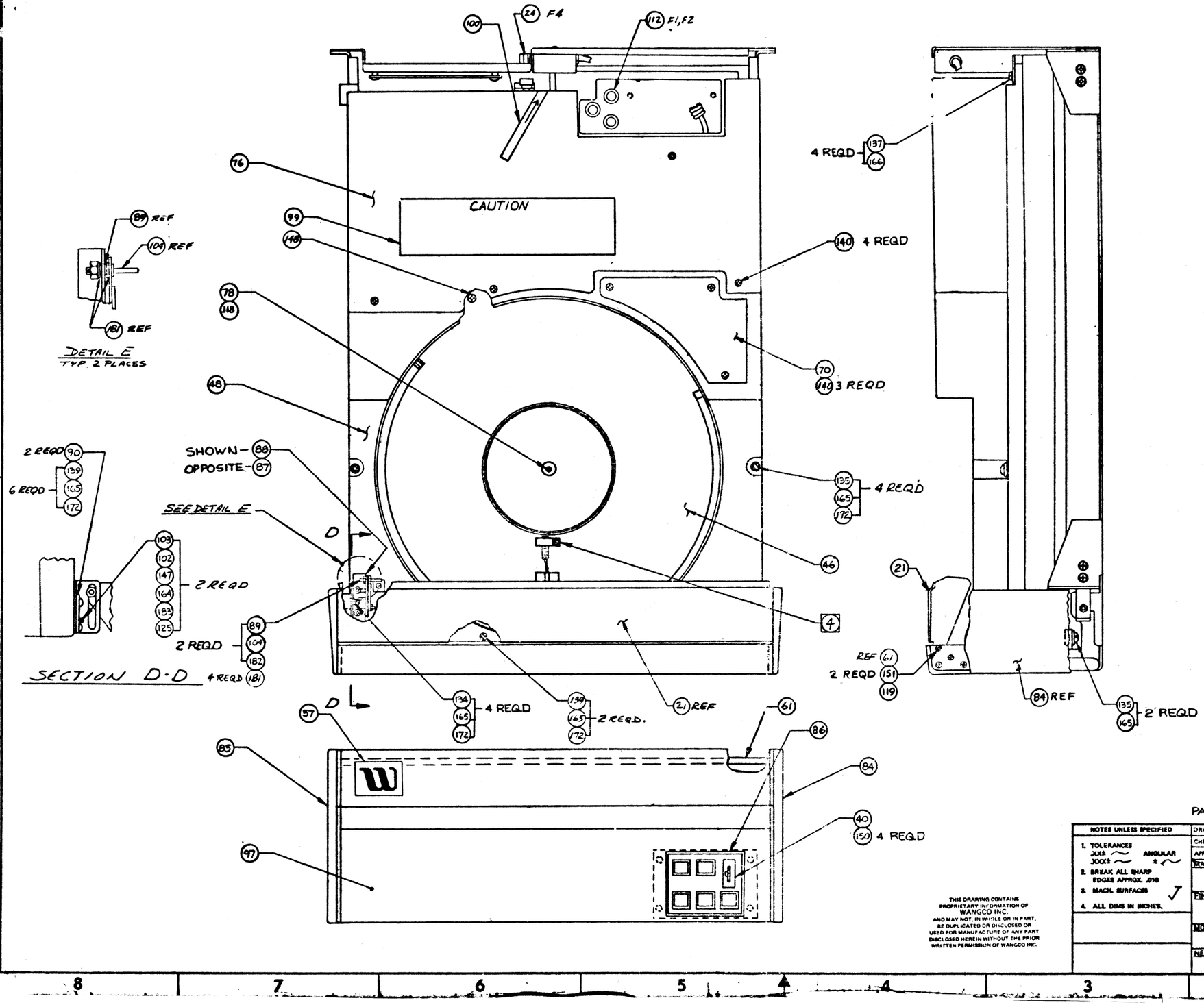
WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 300001-000 REV. J

ASSY. DISC DRIVE 100TPI.
TITLE OPTICAL -FRONT LOAD. MODEL _____ DATE 9/19/75 SHEET 6 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
166	Washer, Split Lock.	100042-500	9			No. 10
167	Washer, " "	-600	2			¼"
168						
169						
170						
171						
172	Washer, Flat.	100047-300	12			No. 6.
173	Washer, "	-500	6			No. 10
174						
175						
176	Washer, Flat Reduced O. D.	100251-300	2			No. 6.
177						
178						
179	Washer, Flat Nylon.	100050-100	4			No. 4.
180	Washer, " "	101185-001	6			No. 6.
181						
182						
183	Nut, Hex.	100043-200	2			4-40.
184	Nut, "	-300	10			6-32.
185	Nut, "	-500	2			10-32
186	Nut, "	-510	1			¼-28.
187	Nut, "	-800	1			3/8 X 16.
188						
189						
190						
191	Insert, Heli-Coil	122601-001	1			¼-20
	Specification,Product.Design.	300300-001	0.			

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
K	CR/O 7496	AP	7/88	AP
L	CR/O 7751	AP	7/89	AP
L1	CR/O 7766	AP	7/89	AP
M	CR/O 7781	AP	10/89	AP
N	CR/O 7815 & 8000	AP	3/90	AP
P	CR/O 8247 & 8265	AP	5/91	AP
R	CR/O 8470	AP	7/92	AP



6 TOTAL INDICATED RUN-OUT (TIR) TO BE MEASURED AT 6.50 IN. RADIUS ON UPPER SURFACE OF FIXED DISC. MAXIMUM ALLOWABLE TIR EQUALS 0.011 IN. FOR 2200 BPI (.050 THICK DISC) AND 0.006 IN. FOR 4400 BPI (.075 THICK DISC).

5 TORQUE HARDWARE AS SPECIFIED.
A- 45 IN. LBS D- 1 IN. LBS
B- 22 IN. LBS E- 10 IN. LBS
C- 6 IN. LBS

4 MAINTAIN A .005 AIR GAP BETWEEN TRANSDUCER AND SECTOR RING ON TEST HUB 101180.

3 MAINTAIN A .005 AIR GAP BETWEEN TRANSDUCER AND SECTOR RING.

2 TIGHTEN NUTS, ITEM 184, ALTERNATELY (CRISS-CROSS PATTERN) & EQUALLY TO OBTAIN A TORQUE WRENCH READING OF 8 INCH-POUNDS.

1 APPLY SILICON GREASE TO UNDERSIDE OF MTG SURFACE PRIOR TO ASSEMBLY.

NOTES: UNLESS OTHERWISE SPECIFIED.

PART NO. 404200-XXX ASSY SEE TABULATED M/L

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC. AND MAY NOT, IN WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC.

NOTES UNLESS SPECIFIED	DRAWN	[illegible]	6-29-92
1. TOLERANCES XX± ~ ANGULAR, XXX± ~ ± ~	CHECK		
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.	[illegible]	7/31/92
3. MACH. SURFACES ✓	MATERIAL		
4. ALL DIMS IN INCHES.	FINISH		
	MODEL No.	T 200 TPI	
	NEXT ASSY		

Wangco Incorporated

ASSY, D.SC DRIVE 200TPI TOP LOAD

DWG NO. 101 | QTY REQ'D 1

SCALE 1:2 | SIZE D | 404200 | R

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 7 OF 8

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
—	SEE SHEET 7 OF 8			

2 PLACES (98, 166, 188)
2 REQ'D 2 PLACES (173)
4 REQD (4, 3, 94, 138, 165)
(34)
(108, 168, 174, 185)
(5, 8, 6, 9, 2)
(98)
SHIPPING POSITION
VIEW C-C
(67, 135, 165, 176, 136, 165, 172, 184)
(45, 19, 20) REF SEE M/L
200TPI DRIVES ONLY (1) (52, 148)
(143, 165, 184)
2 REQD (135, 165)
(58)
(91)
(58)
C C
(13)
(13)
(74)
(79, 17, 54) 2 REQD (55)
(82, 117) INSTALL AFTER (46)
(149, 184, 180) 6 REQD (2)
(93)
(157, 167) 2 REQ'D (1)
(95, 144) 2 REQD
(92, 134) 6 REQD
(99)
(28)
(7)
(38, 131, 164) 2 REQD
(35, 124)
(122, 133, 164, 179) 2 REQD
(191) INSTALL FROM FARSIDE
(123) 2 REQ'D
(1, 132) 3 REQD
(44)
(52, 64, 162) 2 REQD
(65, 116) 2 REQD
(66, 148)
(50)
(50, 156, 146) 3 REQ'D
(113, 135) 2 PLACES
(50, 31, 1, 149) 4 REQD
(37, 184, 3)
(47)
(101)
(DIRECTION OF AIR FLOW)
(30, 1, 148) 3 REQD
(71, 148) 3 REQD
(25)
(69, 148) 7 REQD
(46) REF
(43, 135, 165) 5 REQD
(54, 157, 167) 3 REQD
(72)
(68, 148) 6 REQD
(18, 161) 2 REQD
(68) REF
(41, 135, 165) 3 REQ'D
(120)
.10 ±.02
SECTION A-A
RECORDING HEADS, ITEMS 19 & 20 TO BE INSTALLED BY FINAL TEST
(5c) TYP
VIEW 13-13
(135) 4 REQD
HEAD CLAMPS & MOUNTING HARDWARE SUPPLIED WITH POSITIONER, ITEM 45
(114) 2 PLACES
(42)
(103)
(80, 187)
(81)
(179) 2 REQD
(121)
(83)
(133, 164) 2 REQD
(23)

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NOTES UNLESS SPECIFIED
1. TOLERANCES
.XXX ANGULAR
.XXX ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES

DRAWN Glapa 6-29-78
CHECK
APPR.
MATERIAL
FINISH
MODEL No.
NEXT ASSY

Wangco Incorporated

ASSY DISC DRIVE 200 TPI TOP LOAD

CODE D 101
QTY. REQ'D 1
SCALE 1/2
SIZE D
404200
R
DO NOT SCALE THIS DRAWING
WEIGHT
SHEET 8 OF 8

XXX SEE BUILD M/L FOR TABULATION

CODE D101

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 404200-000 REV. -

ASSY. DISC DRIVE 200TPI
TITLE TOP LOAD MODEL 7 DATE 11-16-76 SHEET 1 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Assy. Elect/Int. PWB	300586-001	1			
2	Assy. Servo Amplifier PWB	301584-002	1			
3	Assy. I/O Connector PWB		0			
4	Assy. Line Terminator PWB		0			
5	Assy. VFO PWB		0			
6	Assy. Disc Control PWB	301903-XXX	0			
7	Assy. Data Electronics PWB		0			
8	Assy. Control Interface PWB		0			
9	Assy. Servo Logic PWB	300497-XXX	0			
10						
11						
12						
13	Assy. Voltage Plug	300324-XXX	0			
14						
15						
16						
17	Ring, Sector	302310-XXX	0			
18	Pulley, Blower	300110-XXX	0			
19	Spec.Proc. Recording Head	300397-XXX	0			
20	Spec. " " "	-XXX	0			
21	Panel, Filler	300157-XXX	0			
22						
23						
24	Fuse	100235-XXX	0			F4
25	'O' Ring	100410-XXX	0			1500RPM= -001;2400RPM= -005
26						
27						
28	Assy. Power Regulator PWB	301908-001	1			S/N
29	Assy. Emergency Retract PWB	301044-001	1			S/N
30	Assy. Spindle Mtr Pwr Sw. PWB	301153-102	1			S/N
31	Assy. Spindle Drive Reg. PWB	301198-002	1			S/N
32						
33						

CODE D101

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 404200-000 REV. -

ASSY. DISC DRIVE 200TPI
TITLE TOP LOAD MODEL DATE 11-16-76 SHEET 2 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
34						
35	Assy. Brush	300223-001	1			
36	Assy. Cable - Interconnect	300274-001	1			
37	Assy. Transducer	300311-001	1			
38	Assy. DC Motor	300323-002	1			
39	Assy. Power Supply	300346-201	1			
40	Assy. OCP	300376-002	1			
41	Assy. Bearing Housing	300396-001	1			
42	Assy. Slide - Left Hand	300412-001	1			
43	Assy. Slide - Right Hand	-002	1			
44	Assy. Solenoid & Brush Cable	300413-004	1			
45	Assy. Positioner					
46	Assy. Fixed Disc Cover	302035-001	1			
47	Assy. Filter	300946-002	1			
48	Assy. Shroud, Top Load	302034-001	1			
49	Assy. Spindle Motor Brushless	301217-004	1			
50	Assy. Harness Spindle Drive	301250-001	1			
51	— — — — — — — —					
52	Assy. Thermistor	300467-001	1			
53						
54	Ring, Adhesive	302365-001	1			
55	Screw, Sector Ring	302370-001	2			
56						
57	Nameplate, 'W' Logo					
58	Label, Model	201347-001	2			
59	Label, Warning	202375-001	1			
60						
61	Rod, Handle Spacer	300283-001	1			
62						
63	Ring, Inlet Blower	301177-001	1			
64	Crank	300039-001	1			
65	Rod, Linkage	300040-001	1			
66	Cam	300043-001	1			

CODE D101

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 404200-000 REV. -

ASSY. DISC DRIVE 200TPI
TITLE TOP LOAD MODEL DATE 11-16-76 SHEET 3 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
67	Support, Card Guide	300051-001	1			
68	Cover, Blower	300865-001	1			
69	Cover, Filter Plate	300082-002	1			
70	Cover, Brush Access	301218-001	1			
71	Plate, Motor Gasket	300086-001	1			
72	Gasket, Motor	300088-001	1			
73						
74	Disc, Magnetic Recording	300133-001	1			(6)
75	— — — — — — — —					
76	Cover, Top	301221-001	1			
77						
78	Pin, Pack Ejector	300202-001	1			
79	Clamp, Disc Plate	300204-001	1			
80	Housing, Switch Actuator	300227-001	1			
81	Bracket, Switch Mounting	300228-001	1			
82	Actuator, Switch	300230-001	1			
83	Nut, Plate	300231-001	1			
84	Cap, End					
85	Cap, "					
86	Bezel, Switch	300245-001	1			
87	Bracket, Guide	300280-001	1			
88	Bracket, "	-002	1			
89	Bushing	300284-001	2			
90	Bracket, End Cap. Mounting	300287-001	2			
91	Panel, Rear	300344-001	1			
92	Cover, Interconnect PWB	300384-001	1			
93	Deck, Machined Casting	300669-001	1			
94	Cover, I/O Connector PWB	300603-001	1			
95	Retainer, PWB	300597-001	2			
96	Plate, Mtg. Emerg. Retract	300616-002	1			
97	Panel, Front Trim					
98	Bracket, Ret. Pos. Carriage	300790-001	1			For Shipping Purposes Only
99	Label, Caution	300827-001	1			

CODE D101

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 404200-000 REV. -

ASSY. DISC DRIVE 200TPI
TITLE TOP LOAD MODEL DATE 11-16-76 SHEET 4 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
100	Label, Carriage Restraint	300828-001	1			
101	Gasket, Filter	300939-001	1			
102	Bushing, Actuator	300962-001	2			
103	Actuator, Door	300963-001	2			
104	Pin, Door Latch	300986-001	2			
105	Gasket, Disc Access	301237-001	1			
106	— — — — — — — —					
107	— — — — — — — —					
108	Bkt. Card Cage Support	301786-001	1			
109						
110						
111						
112	Fuse 10 amp	100028-027	2			F1,2
113	Strap, Cable	100031-001	2			
114	Fastener	108610-001	2			
115						
116	Ring, Gripping	100133-011	2			
117	Ring, Crescent Retaining	144000-003	1			
118	Cement	100303-004	A/R			
119	Cement	100303-002	A/R			
120	Impeller	100411-001	1			
121	Switch, Snap Action	101097-001	1			
122	Switch, " "	101098-001	1			
123						
124	Bearing, Thrust	101125-001	1			
125	Spring, Compression	147700-003	2			
126						
127						
128						
129						
130						
131	Screw, Pan Head	100036-203	2			4-40 x 3/16"
132	" " "					

CODE D101

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 404200-000 REV. -

ASSY. DISC DRIVE 200TPI
TITLE TOP LOAD MODEL DATE 11-16-76 SHEET 5 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
133	Screw, Pan Head	100036-212	4			4-40 x 3/4"
134	Screw, " "	-304	6			6-32 x ¼"
135	Screw, " "	-306	48			6-32 x 3/8"
136	Screw, " "	-308	6			6-32 x ½"
137	Screw, " "	-506	4			10-32 x 3/8"
138	Screw, " "	-509	2			10-32 x 9/16"
139	Screw, " "	-332	8			6-32 x 2"
140	Screw, P.H.	100263-306	7			6-32 x 3/8 Black
141						
142						
143	Screw, Nylon Pan Head	101172-304	1			6-32 x ¼"
144	Screw, " " "	-306	2			6-32 x 3/8"
145						
146						
147	Screw, Flat Head	100040-208	2			4-40 x ½"
148	Screw, " "	-305	26			6-32 x 5/16"
149	Screw, " "	-308	4			6-32 x ½"
150	Screw, " "	100074-304	4			6-32 x ¼" (Black)
151	Screw, " "	100040-306	2			6-32 x 3/8
152						
153						
154						
155	Screw, Socket Head Cap.	100041-208	4			4-40 x ½"
156	Screw, " " "	-507	3			10-32 x ½"
157	Screw, " " "	-608	5			⅜-20 x ½"
158						
159						
160						
161	Screw, Set	100049-302	2			6-32 x 1/8"
162						
163						
164	Washer, Split Lock	100042-200	2			No. 4.

CODE D101

WANGCO INCORPORATED

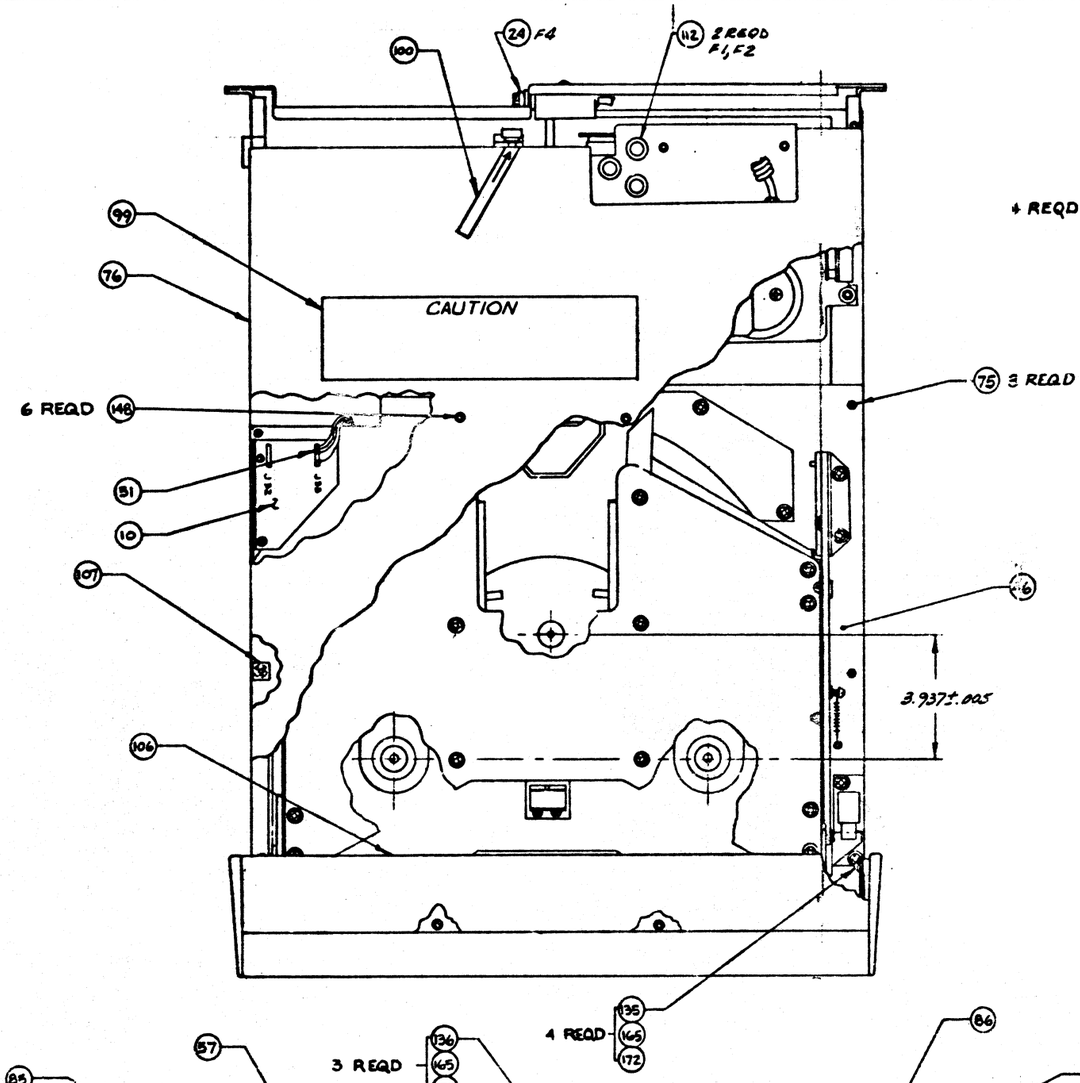
MATERIAL LIST

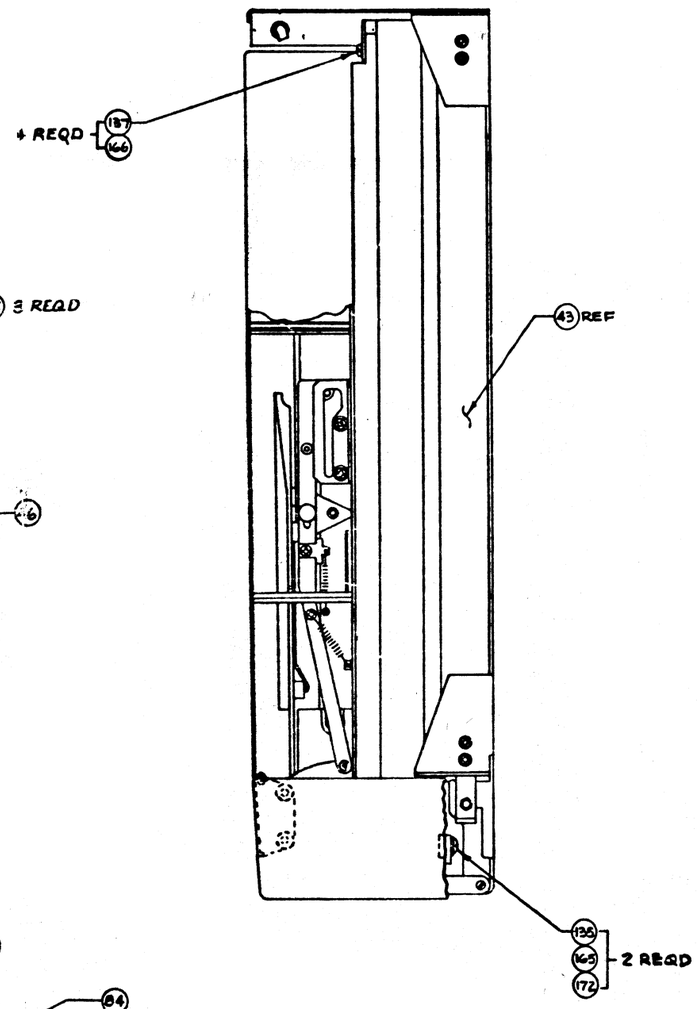
PART NUMBER 404200-000 REV. -

ASSY. DISC DRIVE 200TPI
TITLE TOP LOAD MODEL DATE 11-16-76 SHEET 6 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
166	Washer, Split Lock	100042-500	9			No. 10
167	Washer, " "	-600	2			¼"
168						
169						
170						
171						
172	Washer, Flat	100047-300	10			No. 6
173	Washer, "	-500	6			No. 10
174						
175						
176	Washer, Flat Reduced O.D.	100251-300	2			No. 6
177						
178						
179	Washer, FLAT NYLON	100050-100	4			No. 4
180	Washer, " "	101185-001	6			No. 6 x .015 Thk.
181	Washer, " "	100050-200	4			No. 6
182	Nut, Self Locking	136003-006	2			6-32
183	Nut, Hex.	100043-200	2			4-40
184	Nut, "	-300	8			6-32
185	Nut, "	-500	2			10-32
186	Nut, "	-510	1			¼-28
187	Nut, "	-800	1			3/8 x 16
188						
189						
190						
191	Insert, Heli-Coil	122601-001	1			
	Specification,Product Design	300400-001	0			

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
H	CR/O 7490			
J	CR/O 7767			
K	CR/O 7781			
L	SEE CR/O 7920			
M	CR/O 8247 & 8255			
N	CR/O 8243			





6 TOTAL INDICATED RUN-OUT (TIR) TO BE MEASURED AT 6.50 IN. RADIUS ON UPPER SURFACE OF FIXED DISC. MAXIMUM ALLOWABLE TIR EQUALS 0.011 IN. FOR 2200 BPI (0.50 THICK DISC) AND 0.006 IN. FOR 4400 BPI (.075 THICK DISC).

5 TORQUE HARDWARE AS SPECIFIED:
A- 45 IN. LBS D- 1 IN. LBS
B- 22 IN. LBS E- 10 IN. LBS
C- 6 IN. LBS

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC. AND MAY NOT, IN WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC.

3 MAINTAIN A .005 AIR GAP BETWEEN TRANSDUCER AND SECTOR RING.

2 TIGHTEN NUTS, ITEM 184, ALTERNATELY, (CRISS-CROSS PATTERN), EQUALLY TO OBTAIN A TORQUE WRENCH READING OF 8 INCH POUNDS.

1 APPLY SILICON GREASE TO UNDERSIDE OF MTG SURFACE PRIOR TO ASSEMBLY.

NOTES: UNLESS OTHERWISE SPECIFIED.

PART NO. 414200-XXX ASSY SEE TABULATED M/L

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XXX ANGULAR .XXXX ±	DRAWN	GRAD	6-27-76
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		7-15-77
3. MACH. SURFACES ✓	APPR.	J FULMINI	8/17/77
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	F 200 TPI	
	NEXT ASSY		

Wangco Incorporated

ASSY, DISC DRIVE 200TPI FRONT LOAD

CODE D 101

SCALE 1:2 | SIZE D | 414200 | N

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 7 OF 8

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
—	SEE SHEET 7 OF 8			

A14200

2 PLACES (138, 166, 183)
2 REQD 2 PLACES (173)
4 REQD (4, 3, 94, 134, 145)
2 REQD (135, 165)
(143, 163, 184)
(58)
(91)
(13)
(56)
(36)
(108, 163, 174, 195)
(5, 8, 6, 9, 2)
(157, 167) 2 REQD [1]
(95, 144) 2 REQD
(92, 132) 6 REQD
(39)
(28)
(7)
(38, 131, 164) 2 REQD
(35, 124)
(67, 135, 165, 176)
(135, 165, 172, 180)
(45, 19, 20) REF SEE M/L
(98)
SHIPPING POSITION
VIEW C-C
200 TPI DRIVES ONLY (1, 52, 148)
(93)
(74)
(79, 17, 26, 27) 2 REQD
(82, 117) INSTALL AFTER (46)
(149, 184, 180, 2) 6 REQD
(179, 121, 83, 133, 164) 2 REQD
(114) 2 PLACES
(103)
(80, 187)
(81)
(92)
(155) 4 REQD
RECORDING HEADS, ITEMS 19 & 20 TO BE INSTALLED BY FINAL TEST
(52) TYP
VIEW 13-13
HEAD CLAMPS & MOUNTING HARDWARE SUPPLIED WITH POSITIONER, ITEM 45
(191) INSTALL FROM PARK SIDE
(123) 2 REQD
(50, 64, 162) 2 REQD
(65, 116) 2 REQD
(44)
(1, 135) 3 REQD
(122, 133, 164, 179) 2 REQD
(66, 148)
(52)
(60)
(71, 148) 3 REQD
(25)
(50, 156, 144) 3 REQD
(113, 135) 2 PLACES
(50, 31, 1, 149) 4 REQD
(37, 184, 3)
(47)
(141)
(30, 1, 148) 3 REQD
(69, 148) 7 REQD
(63, 135, 165) 5 REQD
(49, 157, 147) 3 REQD
(72)
(68, 148) 6 REQD
(46) REF
(DIRECTION OF AIR FLOW)
(68) REF
(18, 161) 2 REQD
(91, 135, 165) 3 REQD
(120)
.10 TOL
SECTION A-A

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC. AND MAY NOT BE WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC.

NOTES UNLESS SPECIFIED
1. TOLERANCES
.XXX ANGULAR
.XXXX ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES

DRAWN 6-29-
CHECK
APPR.
MATERIAL
FINISH
MODEL NO.
NEXT ASSY

Wangco Incorporated

ASSY DISC DRIVE 200 TPI FRONT LOAD

CODE D 101
DWG REV 1
SCALE
SIZE D 414200 N
SHEET 8 OF 8

XXX SEE BUILD M/L FOR TABULATION

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 414200-000 REV. N

ASSY. DISC DRIVE 200TPI
TITLE FRONT LOAD MODEL _____ DATE 11-18-76 SHEET 1 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Assy. Elect/Int. PWB	300586-001	1			
2	Assy. Servo Amplifier PWB	301584-002	1			
3	Assy. I/O Connector PWB		0			
4	Assy. Line Terminator PWB		0			
5	Assy. VFO PWB		0			
6	Assy. Disc Control PWB	301903-XXX	0			
7	Assy. Data Electronics PWB		0			
8	Assy. Control Interface PWB		0			
9	Assy. Servo Logic PWB	300497-XXX	0			
10	Assy. Differentiator PWB	300921-XXX	0			
11						
12						
13	Assy. Voltage Plug	300324-XXX	0			
14						
15						
16						
17	Ring, Sector	302310-XXX	0			
18	Pulley, Blower	300110-XXX	0			
19	Spec. Proc. Recording Head	300397-XXX	0			
20	Spec. " " "	-XXX	0			
21	———	———	—			
22						
23						
24	Fuse	100235-XXX	0			F4
25	'O' Ring	100410-XXX	0			1500RPM= -001;2400RPM= -005
26	Ring, Adhesive	302365-001	1			
27	Screw, Sector Ring	302370-001	2			
28	Assy. Power Regulator PWB	301908-001	1			S/N
29	Assy. Emergency Retract PWB	301044-001	1	A		S/N
30	Assy. Spindle Mtr Pwr Sw. PWB	301153-102	1	B		S/N
31	Assy. Spindle Drive Reg. PWB	301198-002	1	B		S/N
32						
33						

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 414200-000 REV. N

ASSY. DISC DRIVE 200TPI
TITLE FRONT LOAD MODEL _____ DATE 11-18-76 SHEET 2 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
34						
35	Assy. Brush	300222-001	1			
36	Assy. Cable - Interconnect	300274-001	1			
37	Assy. Transducer	300311-001	1			
38	Assy. DC Motor	300323-002	1			
39	Assy. Power Supply	300346-201	1			
40	Assy. OCP	300376-002	1			
41	Assy. Bearing Housing	300396-001	1			
42	Assy. Slide - Left Hand	300412-001	1			
43	Assy. Slide - Right Hand	-002	1			
44	Assy. Solenoid & Brush Cable	300413-001	1			
45	Assy. Positioner					
46	Assy. Fixed Disc Cover	300630-001	1			
47	Assy. Filter	300946-002	1			
48	— — — — — — —					
49	Assy. Spindle Motor Brushless	301217-004	1			
50	Assy. Harness Spindle Drive	301250-001	1			
51	Assy. Cable-Differentiator	300925-001				
52	Assy. Thermistor	300467-001	1			
53						
54						
55						
56						
57	Nameplate, 'W' Logo					
58	Label, Model	201347-001	2			
59	Label, Warning	202375-001	1			
60						
61	———	———	—			
62	———	———	—			
63	Ring, Inlet Blower	301177-001	1			
64	Crank	300039-001	1			
65	Rod, Linkage	300040-001	1			
66	Cam	300043-001	1			

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 414200-000 REV. N

ASSY. DISC DRIVE 200TPI
TITLE FRONT LOAD MODEL _____ DATE 11-18-76 SHEET 3 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
67	Support, Card Guide	300051-001	1			
68	Cover, Blower	300865-001	1			
69	Cover, Filter Plate	300082-002	1			
70						
71	Plate, Motor Gasket	300086-001	1			
72	Gasket, Motor	300088-001	1			
73						
74	Disc, Magnetic Recording	300133-001	1			(6)
75	Spacer, Cover	300138-001	3			
76	Cover, Top	300134-001	1			
77						
78	— — — — — — —					
79	Clamp, Disc Plate	300204-001	1			
80	Housing, Switch Actuator	300227-001	1			
81	Bracket, Switch Mounting	300228-001	1			
82	Actuator, Switch	300229-001	1			
83	Nut, Plate	300231-001	1			
84	Cap, End					
85	Cap, "					
86	Bezel, Switch	300245-001	1			
87	— — — — — —					
88	— — — — — —					
89	— — — — — —					
90	— — — — — —					
91	Panel, Rear	300344-001	1			
92	Cover, Interconnect PWB	300384-001	1			
93	Deck, Machined Casting	300669-001	1			
94	Cover, I/O Connector PWB	300503-001	1			
95	Retainer, PWB	300597-001	2			
96	Plate, Mtg. Emerg. Retract	300616-002	1			
97	Panel, Front Trim					
98	Bracket, Ret. Pos. Carriage	300790-001	1			For Shipping Purposes Only
99	Label, Caution	300827-001	1			

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 414200-000 REV. N

ASSY. DISC DRIVE 200TPI
TITLE FRONT LOAD MODEL _____ DATE 11-18-76 SHEET 4 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
100	Label, Carriage Restraint	300828-001	1			
101	Gasket, Filter	300939-001	1			
102	— — — — — — —					
103	— — — — — — —					
104	— — — — — — —					
105	Gasket, Disc Access	301237-001	1			
106	Panel, Filler	———	—			
107	Support, Top Cover	300421-001	1			
108	Bkt. Card Cage Support	301786-001	1			
109						
110						
111						
112	Fuse 10 amp	100028-027	2			F1,2
113	Strap, Cable	100031-001	2			
114	Fastener	108610-001	2			
115						
116	Ring, Gripping	100133-011	2			
117	Ring, Crescent Retaining	144000-003	1			
118	Cement	100303-004	A/R			
119	———	———	—			
120	Impeller	100411-001	1			
121	Switch, Snap Action	101097-001	1			
122	Switch, " "	101098-001	1			
123						
124	Bearing, Thrust	101125-001	1			
125	— — — — — — —					
126						
127						
128						
129						
130						
131	Screw, Pan Head	100036-203	11			4-40 x 3/16"
132	Screw, " "	-209	4			4-40 x 9/16"

CODE D101

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 414200-000 REV. N

ASSY. DISC DRIVE 200TPI
TITLE FRONT LOAD MODEL _____ DATE 11-18-76 SHEET 5 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
133	Screw, Pan Head	100036-212	4			4-40 x 3/4"
134	Screw, " "	-304	2			6-32 x ½"
135	Screw, " "	-306	28			6-32 x 3/8" 1 for Shipping
136	Screw, " "	-308	8			6-32 x ½"
137	Screw, " "	-506	4			10-32 x 3/8"
138	Screw, " "	-509	2			10-32 x 9/16"
139						
140						
141						
142						
143	Screw, Nylon Pan Head	101172-304	1			6-32 x ½"
144						
145						
146						
147						
148	Screw, Flat Head	100040-305	31			6-32 x 5/16"
149	Screw, " "	-308	4			6-32 x ½"
150						
151	———	———	—			
152						
153						
154						
155	Screw, Socket Head Cap	100041-208	4			4-40 x ½"
156	Screw, " " "	-507	3			10-32 x ⅜"
157	Screw, " " "	-608	5			¼-20 x ½"
158						
159						
160						
161	Screw, Set	100049-302	2			6-32 x 1/8"
162						
163						
164	Washer, Split Lock	100042-200	10			No. 4
165	Washer, " "	-300	44			No. 6

CODE D101

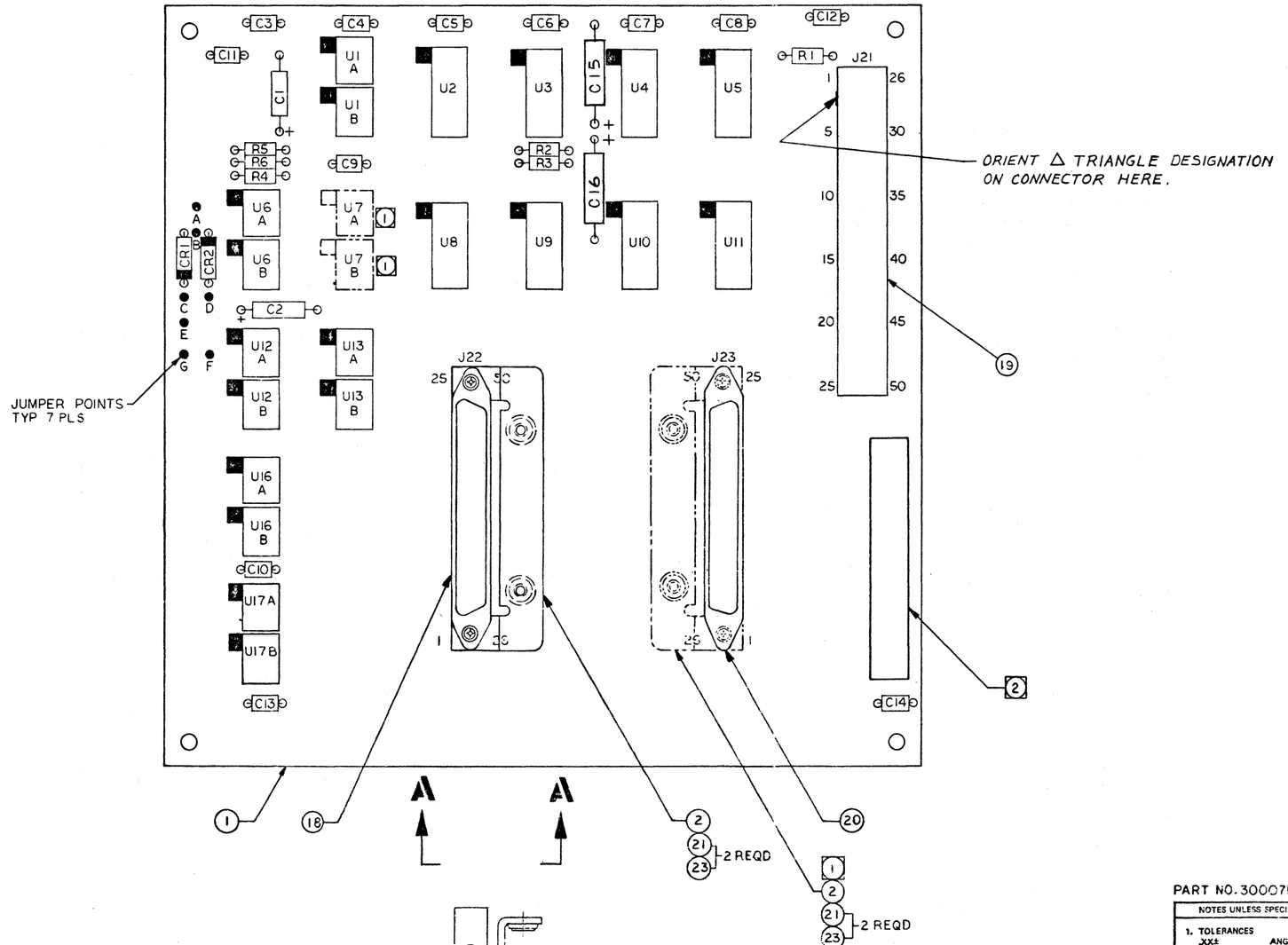
WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 414200-000 REV. N

ASSY. DISC DRIVE 200TPI
TITLE FRONT LOAD MODEL _____ DATE 11-18-76 SHEET 6 OF 8

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
166	Washer, Split Lock	100042-500	9			No. 10
167	Washer, " "	-600	2			¼"
168						
169						
170						
171						
172	Washer, Flat	100047-300	12			No. 6
173	Washer, "	-500	6			No. 10
174						
175						
176	Washer, Flat Reduced O.D.	100251-300	2			No. 6
177						
178						
179	Washer, Flat Nylon	100050-100	4			No. 4
180	Washer, " "	101185-001	6			No. 6
181						
182						
183	Nut, Hex	100043-200	2			4-40
184	Nut, "	-300	10			6-32
185	Nut, "	-500	2			10-32
186	Nut, "	-510	1			¼-28
187	Nut, "	-800	1			3/8 x 16
188						
189						
190						
191	Insert, Heli-Coil	122601-001	1			
	Specification, Product Design	300300-001	0			

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	ENG. REL.			
B	ADD C11-C14 .1UF MIN 100 VOLT 10% CLARIFIED TERMINAL NOMENCLATURES REDRAWN FOR CLARITY			
C	MFG REL NO CHG SEE E.O.			
D	SEE REV EO (DCR 1915)			
E	SEE REV E.O 2084			
F	SEE REV E.O. 2116			
G	SEE CR/O 3071			
H	SEE CR/O 3845			
J	SEE CR/O 5014			
K	CR/O 6112			
L	CR/O 7784			



3. FOR SCHEMATIC REF DWG SEE 300076

[2] MARK PART NUMBER APPROPRIATE DASH NUMBER ASSY, S/N, AND LATEST REVISION LETTER, .13 HIGH WHITE CHARACTERS PER WANGCO SPEC 100037.

[1] COMPONENT SHOWN IN PHANTOM LINES ARE VARIABLE, SEE M/L.

NOTES: UNLESS OTHERWISE SPECIFIED

PART NO. 300075-XXX SEE TABULATED M/L ASSY

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± ANGULAR .XXX± ±	DRAWN		
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES	APPR.		
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No. DISC	SCALE	SIZE D
	NEXT ASSY	DO NOT SCALE THIS DRAWING	WEIGHT

Wangco Incorporated

ASSEMBLY P.W.B. I.O. CONNECTOR

CODE 01120

300075 L

SHEET 2 OF 2

CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-000	L

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200TPI F & T DATE 4/30/75 SHEET 1 OF 2

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
1	Board, Processed.	300073-001	1	D		
2	Retainer, Connector, Bottom	300589-001	1			J22
3						
4	IC 8T380	100347-001	8			U2,3,4,5,8,9,10,11.
5	IC 75452	101031-001	12			U1A,1B,6A,6B,12A,12B,13A,
						U13B,16A,16B,17A,17B.
6						
7						
8	Diode. 1N4003	100127-001	2			CR1,2.
9						
10	Capacitor, 100V .01uf	101042-103	8			C3,4,5,6,7,8,9,10.
11	Capacitor. .1uf	100364-104	4			C11,12,13,14.
12	Capacitor, 20V 15uf	101002-156	2			C1,2.
13	Capacitor, 6V 56uf	101001-566	2			C15,16.
14	Resistor, 5%, ¼W. 75	101156-750	1			R1.
15	Resistor, " " 1K	-102	4			R2,3,4,5.
16						
17						
18	Connector, Male 50 Pin	101036-001	1			J22.
19	Connector, Male 50 Pin.	101040-001	1			J21.
20	Connector, Female 50 Pin.	101037-001	1			J23.
21	Screw, Pan Head.	100036-103	2			2-56 x 3/16"
22						
23	Washer, Flat.	100047-100	2			No.2.
24						
25						
26	Wire, Solid.	100248-924	A/R			Jumper J2 from C to D
						Jumper J3 from E to F
						Jumper J4 from E to G
27						
28	Schematic	300076-001	0			
29	Artwork, Master	300074-001	0			
30	Procedure, Test	900000-001	0			

TERMINATION VOLTAGE: INTERNAL. INTERFACE: D-31. CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-007	J

TITLE ASSY. I/O CONNECTOR PWB. MODEL Disc. DATE 1/17/74 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300075-000		L		NEXT ASSEMBLY/USED ON
6	IC. 75452	101031-001	2			U7A,U7B. Add.
26	Wire, Solid.	100248-924	A/R			Jumper J1 A to B. Add.
						Jumper J5 U8-12 to
						U9-10. Add.

TERMINATION VOLTAGE: Internal. INTERFACE: D-40. C-300/200. P-3000 CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-002	K

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200TPI F & T DATE 2/26/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300075-000		L		NEXT ASSEMBLY/USED ON
6	I.C. 75452	101031-001	2			U7A. 7B. (Add)
26	Wire, Solid	100248-924	A/R			Add Jumper J1 from A to B.

TERMINATION VOLTAGE: Internal. Attention lines D-31 negative. CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-005	K

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200TPI F & T DATE 2/26/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300075-000		L		NEXT ASSEMBLY/USED ON
6	IC. 75451	101139-001	2			U7A,U7B. Add.
26	Wire, Solid.	100248-924	A/R			Jumper J1 A to B. Add.

TERMINATION VOLTAGE: External Attention lines D-33 Negative. CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-008	C

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200 TPI F & T DATE 2/26/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300075-000		L		NEXT ASSEMBLY/USED ON
6	I.C. 75451	101139-001	2			U7A. 7B. (ADD)

TERMINATION VOLTAGE: INTERNAL. INTERFACE: CD-22. CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-010	C

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200TPI F & T DATE 2/11/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300075-000		L		NEXT ASSEMBLY/USED ON
						NONE
6	I.C. 75452	101031-001	2			U7A.7B. ADD.
26	Wire, Solid.	100248-924	A/R			Add. Jumper J1. From A to B
						Jumper J7. From
						U12A-5 to U4-10.
						NOTE: Jumper J7 connects
						the illegal address to the
						restore. This Jumper must
						be removed when tested on
						WANGCO Computer Diagnostic.

TERMINATION VOLTAGE: External. INTERFACE: D-40. C-300/200. P-3000. CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-004	K

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200TPI F & T DATE 2/26/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300075-000		L		NEXT ASSEMBLY/USED ON
6	I.C. 75452	101031-001	2			U7A. 7B. (Add)

TERMINATION VOLTAGE: Internal. INTERFACE: Special. S1 Controller. CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-006	K

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200 TPI F & T LOAD DATE 2/26/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300075-000		L		NEXT ASSEMBLY/USED ON
6	I.C. 75452	101031-001	2			U7A. 7B. (ADD)
26	Wire, Solid	100248-924	A/R			Add Jumper J1 from A to B.
						Add Jumper J5 from U8-12 to
						U9-10.
						Add Jumper J6 from U8-9 to
						U8-10.

TERMINATION VOLTAGE: INTERNAL. INTERFACE: SPECIAL: DAISY CHAIN. CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-009	C

TITLE ASSY. I/O CONNECTOR PWB. MODEL 100 & 200 TPI F & T DATE 2/5/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:	300075-000		L		NEXT ASSEMBLY/USED ON
6	I.C. 75452	101031-001	2			U7A. 7B. ADD.
26	Wire, Solid.	100248-924	A/R			Add. Jumper J1 from A to B.

TERMINATION VOLTAGE: Internal. INTERFACE: D-40, C-300/200. P-3000 CODE D120

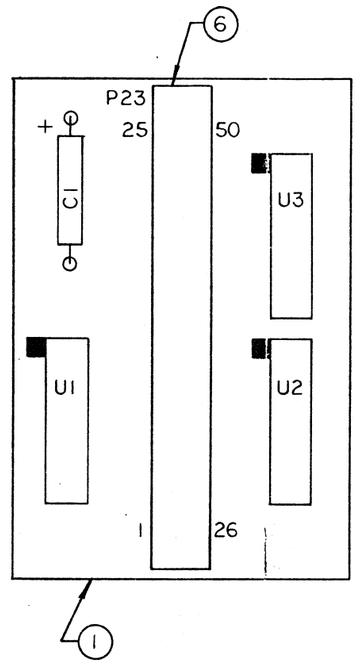
WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
300075-102	F

TITLE ASSY. I/O CONNECTOR PWB. MODEL F & T DATE 10-29-75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:	300075-000		L		NEXT ASSEMBLY/USED ON 414212-201
2	Retainer Conn. Bottom	300589-001	1			J23
6	I.C. 75452	101031-001	2			U7A. 7B.
21	Screw Pan Hd.	100036-103	2			2-56 X 3/16"
23	Washer Flat	100047-100	2			No. 2
26	Wire, Solid	100248-924	A/R			Jumper J1 A to B.

REVISIONS			300095	D
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	ENG. REL.		1/24/73	
B	C1 VALUE FROM 6.8UF TO 15UF ADD CALLOUTS TO PINS		1/31/73	
C	CHANGED J1 CALLOUT TO P23		3/2/73	
D	MFG. REL. NO CHG. SEE E.O. REDRAWN FOR CLARITY		4/2/73	



NOTES UNLESS SPECIFIED	DRAWN	M. Miyasato	7/18/73
1. TOLERANCES .XX± ANGULAR .XXX± ±	CHECK		
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.		
3. MACH. SURFACES √	MATERIAL		
4. ALL DIMS IN INCHES.	FINISH		
	MODEL No.	DISC	
	NEXT ASSY	300050 300250	

Wangco Incorporated

ASSEMBLY, P.W.B. LINE TERMINATOR

CODE D 100

QTY. REQ'D. 1

SCALE	SIZE		
2:1	C	300095	D
DO NOT SCALE THIS DRAWING	WEIGHT	SHEET 3 OF 3	

10-13-75

REV. A

DRAWING NO. 300095

ML

WANGCO INCORPORATED

MATERIAL LIST

ML | DRAWING NO. 300095-001 | REV. D1

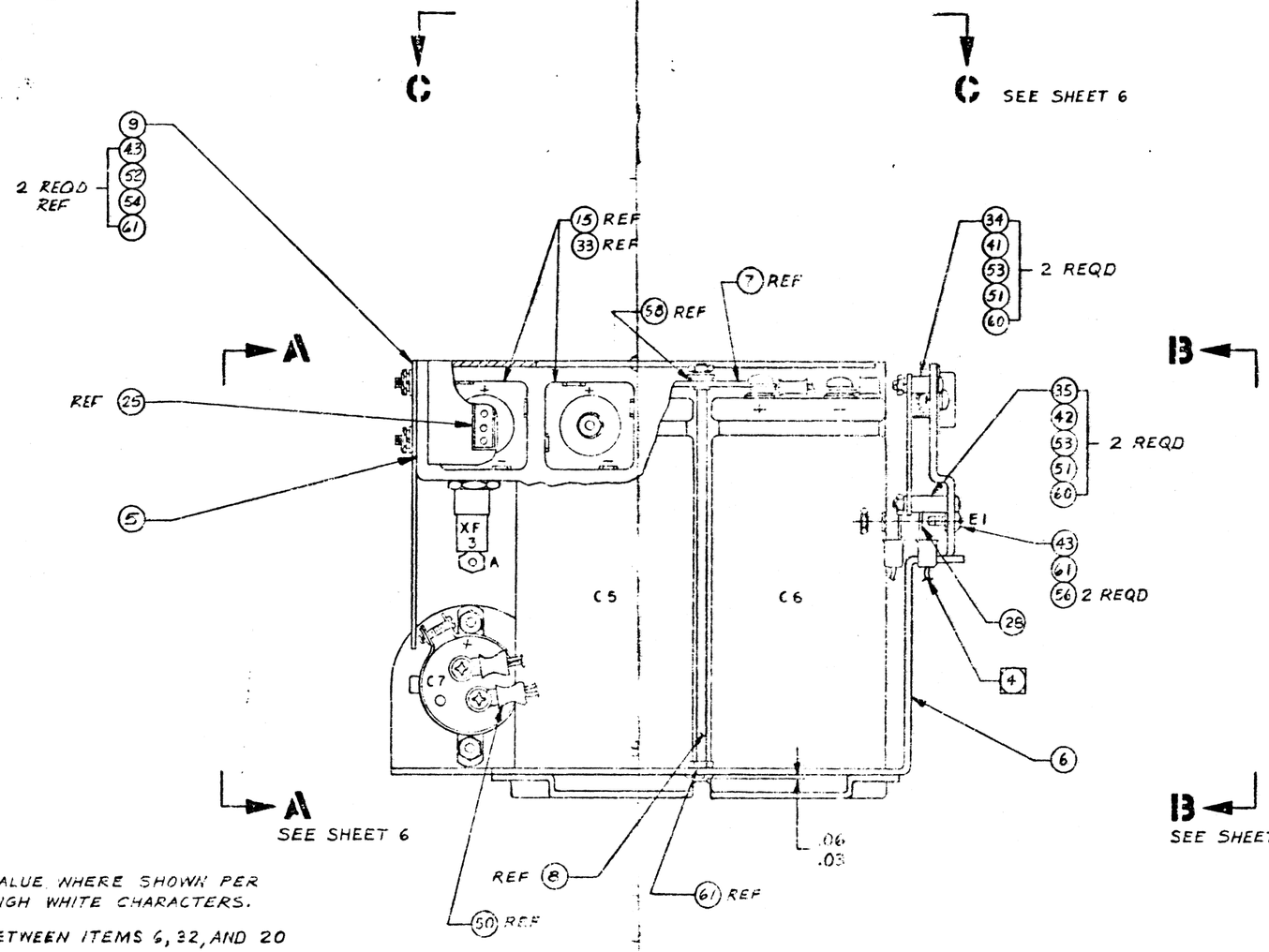
DRAWING TITLE: ASSY, PWB LINE TERMINATOR

MODEL NO. Disc DATE 1/24/73 SHEET 1 OF 3

Item No.	Drawing Title	Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
1	Board, Processed.	300094-001	D	1	
2					
3					
4	IC, Resistor Network 110	101000-001		3	U1,2,3.
5					
6	Connector, Male 50 Pin	101036-001		1	P23.
7					
8	Capacitor 20V. 15uf	101002-156		1	C1.
9					
10	Printed Master.	300096-001		0	

TABULATION BLOCK	
PART NO.	FUSE VALUE [7]
300346-101	6 A 1500 RPM 10 A 2400 RPM
-201	10 A 1500 RPM 10 A 2400 RPM

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
F	REVISED AND REDRAWN SEE CR/O 3181 & 3205			
F	SEE CR/O 3253			
G	SEE CR/O 3457			
H	SEE CR/O 3930			
J	SEE CR/O 4081			
J	SEE CR/O 4000 & 4047			
K	SEE CR/O 4319			
L	SEE CR/O 4388			
L	SEE CR/O 5055			
M	SEE CR/O 5316			
N	CR/O 5415			
P	CR/O 6785			
R	CR/O 7617			
S	CR/O 7659			
T	CR/O 8311			



[7] RUBBER STAMP FUSE VALUE WHERE SHOWN PER TABULATION CHART .12 HIGH WHITE CHARACTERS.

[6] APPLY SILICON GREASE BETWEEN ITEMS 6, 32, AND 20 AT TIME OF ASSEMBLY.

5.

[4] CONNECT AC AND AND DC GROUND WIRES BETWEEN STAR WASHERS AS SHOWN.

3. WIRE PER WIRE LIST 300399.

[2] REFERENCE DESIGNATIONS ARE FOR WIRING PURPOSES ONLY.

[1] MARK PART NUMBER AND APPROPRIATE DASH NUMBER AND LATEST REVISION LETTER WHERE SHOWN, .12 HIGH CHARACTERS, COLOR WHITE PER WANGCO SPEC 100037.

NOTES: UNLESS OTHERWISE SPECIFIED

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC. AND MAY NOT, IN WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC.

PART NO. 300346-XXX ASSY SEE TABULATION

NOTES UNLESS SPECIFIED	DRAWN
1. TOLERANCES XX± .03 ANGULAR XXX± — ± —	CHECK
2. BREAK ALL SHARP EDGES APPROX. 010	APPD
3. MACH. SURFACES ✓	MATERIAL
4. ALL DIMS IN INCHES.	FINISH
	MODEL No. F & T
	NEXT ASSY 301500 311500

Wangco Incorporated

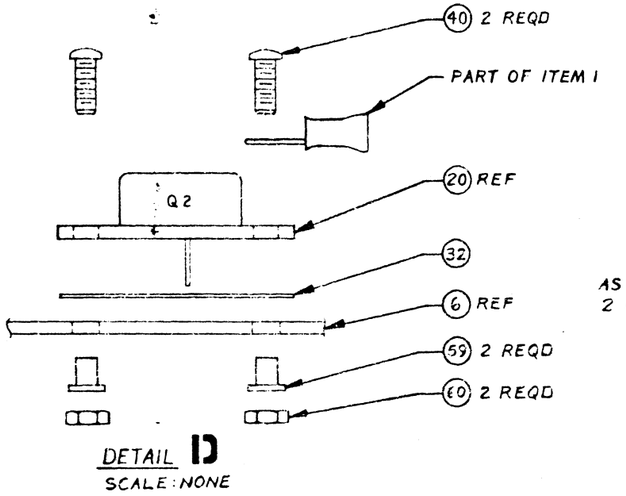
ASSEMBLY, POWER SUPPLY

CODE D100 | QTY. REQ'D 1

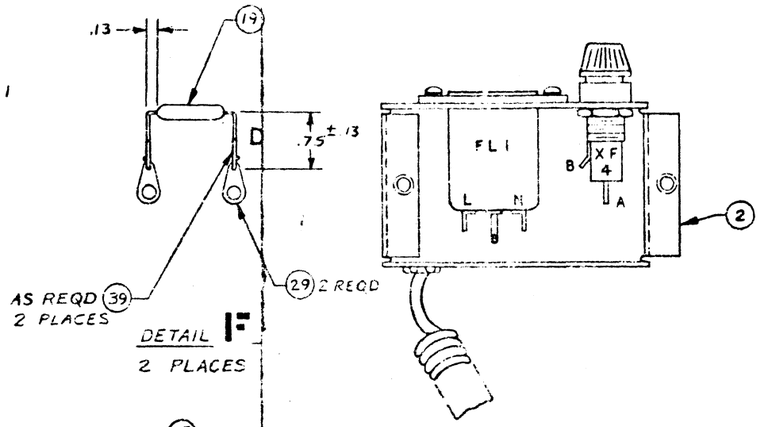
SCALE 1:1 | SIZE D | 300346 | CHART D | T

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 4 OF 6

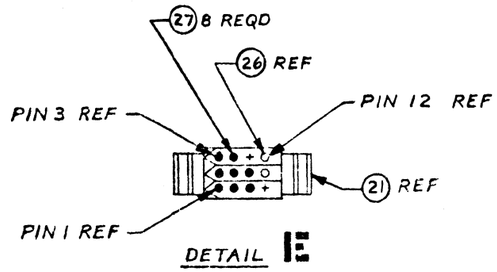
REVISIONS					300346
REV.	DESCRIPTION	CHK.	DATE	APPROVED	
—	SEE SHEET 4	—	—	—	



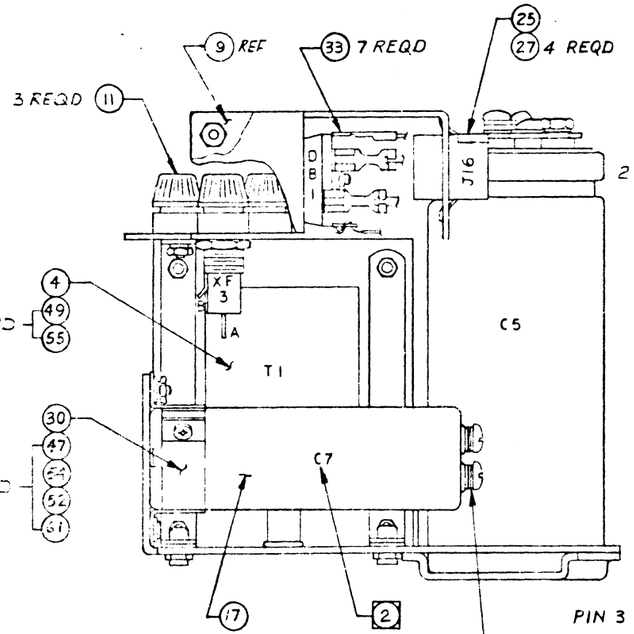
DETAIL D
SCALE: NONE



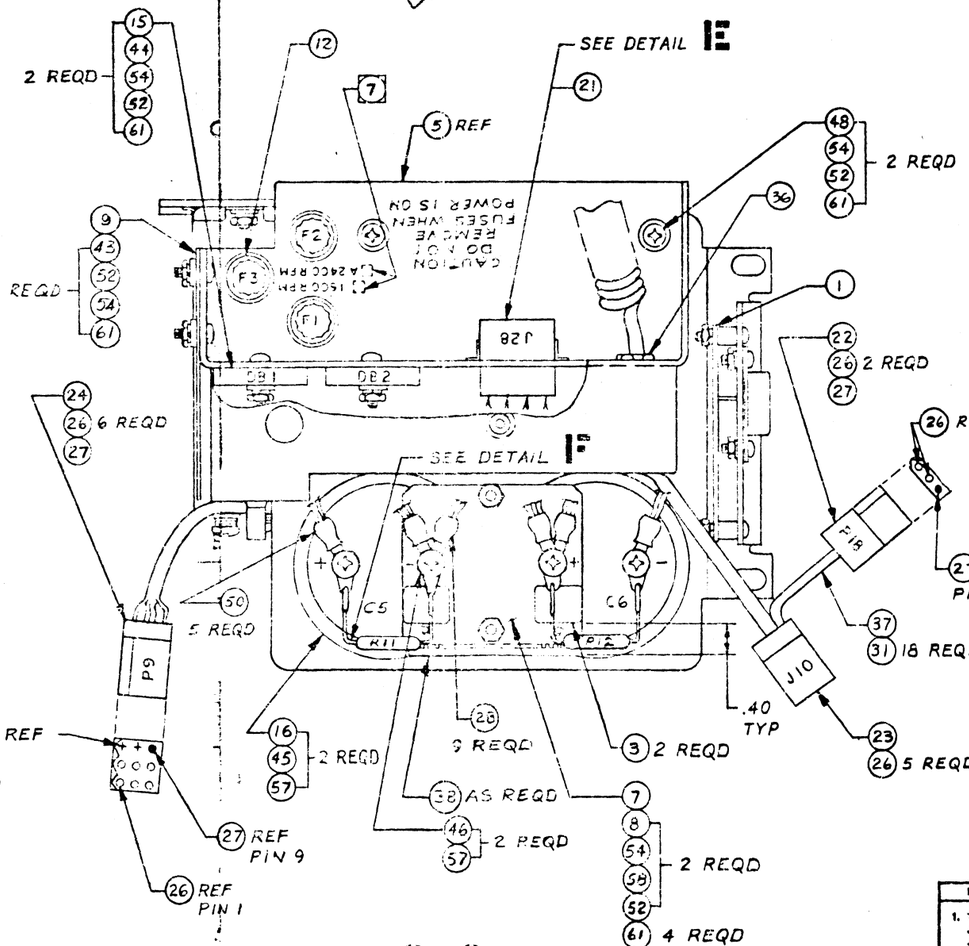
DETAIL F
2 PLACES



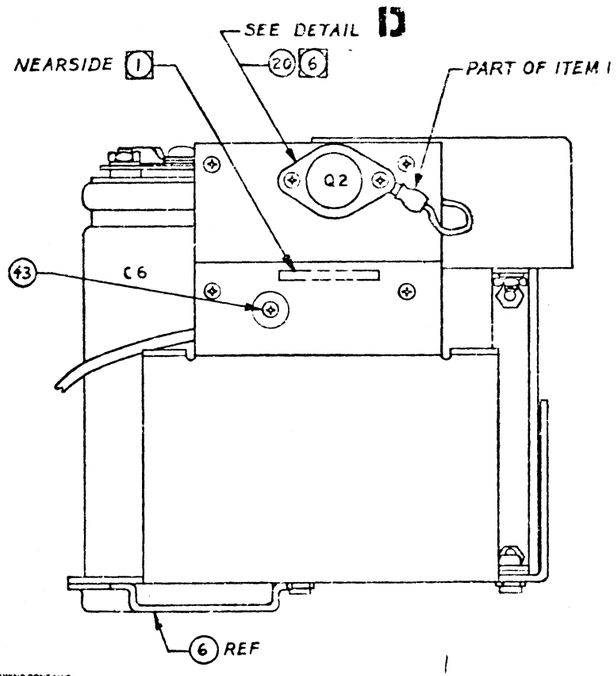
DETAIL E



VIEW A-A
ITEM 9, SHIELD, OMITTED FOR CLARITY.



VIEW C-C



VIEW B-B

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NOTES UNLESS SPECIFIED			
1. TOLERANCES XX± — ANGULAR XXX± — ± —	DRAWN	D. Corkery	5 23 73
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES √	APPR.		
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.		
	NEXT ASSY		

Wangco Incorporated

ASSEMBLY, POWER SUPPLY

SCALE	SIZE	300346	SCALE DWG
1:1	D	CHANGE T	QTY REQ'D 1
DO NOT SCALE THIS DRAWING	WEIGHT		SHEET 5 OF 6

USE WITH BRUSH TYPE SPINDLE MOTOR

CODE D100

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 300346-101 REV. F

TITLE ASSY, POWER SUPPLY MODEL F-T DATE 2-26-76 SHEET 1 OF 3

REV. F | PART NUMBER 300346-101 | DATE 2-27-76 | APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Assy, Pwb, +5v Regulator	300200-001	1	K		
2	Assy, Line Filter	300607-001	1			
3	Pad, Retainer	300598-001	2			
4	Spec. Proc. Transformer	300150-002	1			T1
5	Bracket, Fuse Mounting	300214-001	1			
6	Chassis, Power Supply	300215-001	1			
7	Plate, Clamp-Capacitor	300216-001	1			
8	Rod, Capacitor Clamp	300217-001	2			
9	Shield, Power Supply	300809-001	1			
10						
11	Fuseholder	100027-001	3			XF1 thru XF3
12	Fuse 5 amp	100028-020	1			F3
13						
14						
15	Bridge, Diode, MDA, 980-2	101033-002	2			DB1, DB2
16	Capacitor, Elec, 25VDC					
	83,000uf	101066-001	2			C5, C6
17	Capacitor, Elec, 20VDC,					
	27Kuf	102606-001	1			C7
18						
19	Resistor, 5%, 5W 330	100111-331	2			R11,R12
20	Transistor,NPN- 2N3771	100173-001	1			Q2
21	Connector, 12 pin	100010-018	1			J28
22	Connector, 3 pin	100010-003	1			P18
23	Connector, 6 pin	100010-020	1			J10
24	Connector, 9 pin	100010-009	1			P9
25	Connector, 4 pin	100010-016	1			J16
26	Pin, Female	100021-006	13			
27	Pin, Male	100021-007	14			
28	Terminal,Ins. Ring Tongue	100057-008	14			
29	Lug, Solder	100138-004	4			

CODE D100

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 300346-101 REV. F

TITLE ASSY, POWER SUPPLY MODEL F-T DATE 2-26-76 SHEET 2 OF 3

REV. F | PART NUMBER 300346-101 | DATE 2-27-76 | APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
30	Clamp, Capacitor	100025-001	1			Use with Item 17
31	Strap, Cable	100171-001	18			
32	Insulator, Transistor	100151-001	1			Use with Item 20
33	Terminal, Quick Disconnect	100139-001	7			
34	Spacer, Fibre	100391-001	2			
35	Spacer, Fibre	-003	2			
36	Bushing, Strain Relief	101122-001	1			
37	Wire, Insulated	101090-918	A/R			
38	Grommet, Flexible - Nylon	100141-002	A/R			
39	Tubing, Teflon	100226-020	A/R			
40	Screw, Pan Head	100036-206	2			4-40 x 3/8
41	Screw, Pan Head	-210	2			4-40 x 5/8
42	Screw, Pan Head	-214	2			4-40 x 7/8
43	Screw, Pan Head	-306	3			6-32 x 3/8
44	Screw, Pan Head	-312	2			6-32 X 3/4
45	Screw, Pan Head	-506	4			10-32 x 3/8
46	Screw, Pan Head	-508	2			10-32 x 1/2
47	Screw, Flat Head, 82°	100040-306	2			6-32 x 3/8
48	Screw, Pan Head	100036-307	2			6-32 x 7/16
49	Screw, Pan Head	-406	4			8-32 x 3/8
50						
51	Washer, Split Lock	100042-200	4			No. 4
52	Washer, Split Lock	-300	10			No. 6
53	Washer, Flat Reduced O.D.	100251-200	4			No. 4
54	Washer, Flat	100047-300	10			No. 6
55	Washer, Flat	-400	4			No. 8
56	Washer, Lock, Int. Tooth	100059-300	2			No. 6
57	Washer, Lock, Int. Tooth	-500	6			No. 10
58	Washer, Nylon Shoulder	100063-003	2			
59	Washer, Nylon Shoulder	-012	2			Use with Item 20
60	Nut, Hex	100043-200	6			4-40
61	Nut, Hex	-300	13			6-32

CODE D10B

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
300346-101	F

REV. F | PART NUMBER 300346-101 | DATE 2-27-76 | APPROVED

TITLE ASSY, POWER SUPPLY MODEL F-T DATE 2-26-76 SHEET 3 OF 3

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
62						
63	List, Wire - Power Supply	300389-001	0			
64	Test Procedure	900076-001	0			
65	Specification, Power Supply	301127-001	0			
	See Note (7) & Tabulation	Block				(Stamp 8A for F1,F2)

USE WITH BRUSHLESS TYPE SPINDLE MOTOR

CODE D10B

WANGCO INCORPORATED

MATERIAL LIST

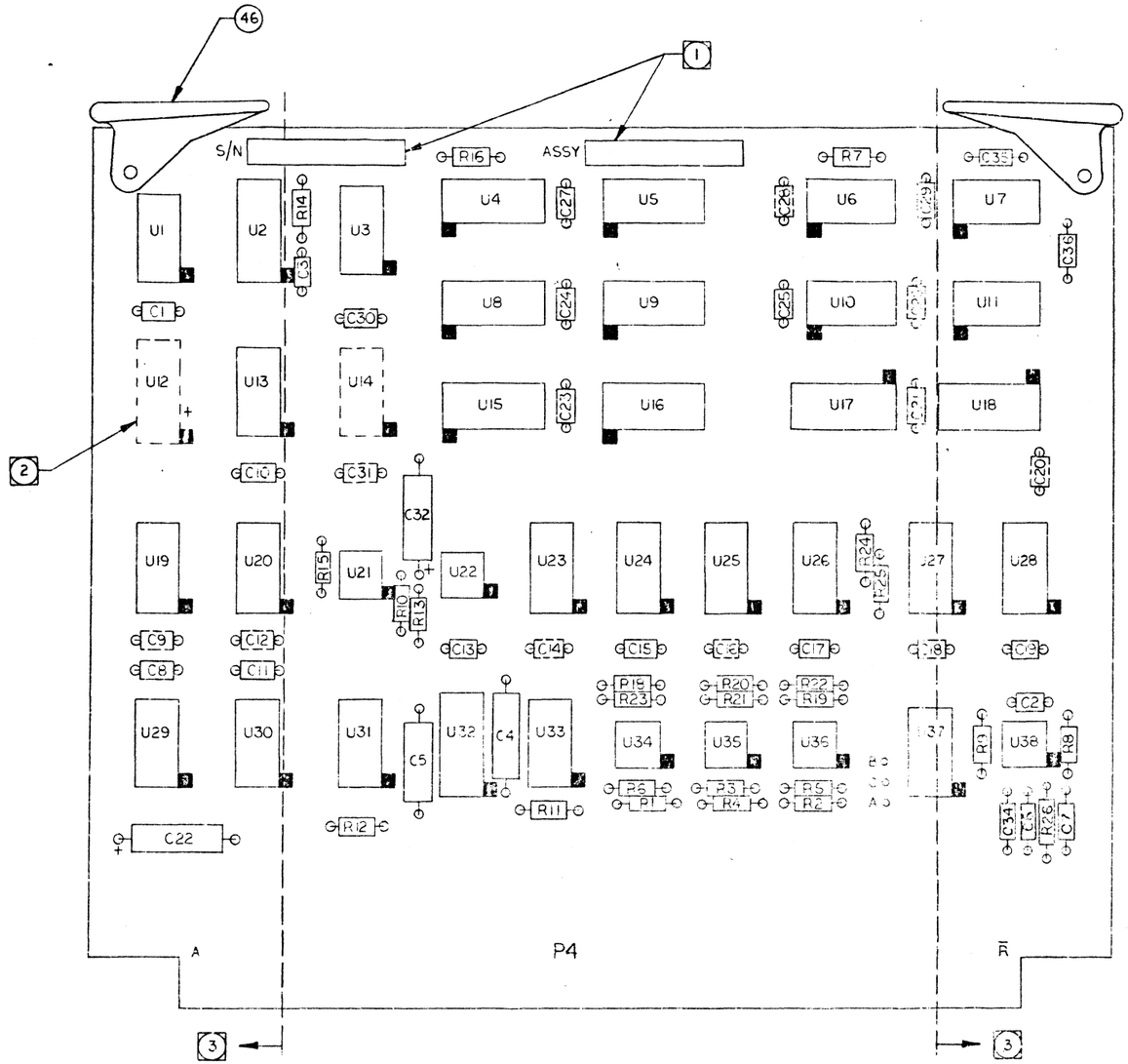
PART NUMBER	REV.
300346-201	D

REV. D | PART NUMBER 300346-201 | DATE 2-27-76 | APPROVED

TITLE ASSY. POWER SUPPLY MODEL F-T DATE 2-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST EXCEPT:	300346-101		F		
	See Note (7) and Tabulation	Block				Stamp 10A for F1, F2

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT RELEASE			
B	MFG RELEASE PER CR/O 3384			
B	SEE CR/O 3453			
C	CR/O 4679 FOR INFORMATION ONLY			
C	CR/O 5077			
D	CR/O 7052			
E	CR/O 7431			



4. FOR SHEMATIC REF SEE 300498

[3] MAX HEIGHT OF ALL COMPONENTS WITHIN AREA OF DOTTED LINES TO BOARD EDGES SHALL BE 5/16MAX. DISC TYPE COMPONENTS MOUNTED IN THIS AREA SHALL BE ASSEMBLED LEANING AWAY FROM EDGES OF BOARD.

[2] COMPONENTS IN DASHED OUTLINE ARE SPARES AND ARE NOT USED

[1] RUBBER STAMP S/N ASSEMBLY AND REVISION LEVEL PER WANGCO SPEC 100037.

NOTES UNLESS OTHERWISE SPECIFIED

PART NO. 300497-XXX SEE TABULATED M/L

NOTES UNLESS SPECIFIED			
1. TOLERANCES XX± ANGULAR, XXX±	DRAWN		
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES ✓	APPR.		
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		

Wangco Incorporated

ASSEMBLY, P.W.B.
SERVO LOGIC-2

MODEL No.	SCALE	SIZE		CODE IDENT.
SERIES 300	2:1	D	300497	E
NEXT ASSY 402400, 412400	DO NOT SCALE THIS DRAWING	WEIGHT	SHEET 3 OF 3	

REV. E | DRAWING NO. 300497-000 | ML

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 300497-000 | REV. E

DRAWING TITLE: ASSY.PWB SERVO LOGIC-2 BASIC BOARD. MODEL NO. Disc DATE 2/22/74 SHEET 2 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
32	Resistor,1%,½W 2.32K	100155-324	1	R7
33	Resistor," " 4.64K	100155-353	1	R8
34	Resistor,5%," 5.1K	101156-512	1	R14
35	Resistor," " 7.5K	101156-752	6	R18,19,20,21,22,23
36	Resistor," " 20K	101156-203	2	R11,12
37	Resistor,1%," 49.9K	100155-452	1	R1
38	Resistor," " 63.4K	100155-462	1	R9
39	Resistor," " 100K	100155-481	1	R2
40	Resistor," " 200K	100155-510	1	R3
41	Resistor," " 402K	100155-539	1	R4
42	Resistor,5%," 820K	101156-824	1	R5
43	Resistor," " 1.6M	101156-165	1	R6
44				
45	Rework Instructions	301699	Ref	
46	Pin, Wire Wrap	100360-003	3	A,B,C or Use -001
47				
48	Wire, Solid, Insulated	100248-924	A/R	Jumper across R26
49	Extractor, Card	100354-001	2	
50	Printed Master	300495	Ref.	
51	Specification, Test		Ref.	
52	Schematic	300498	Ref.	REV "F"

REV. W | DRAWING NO. 300497-000 | ML

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 300497-000 | REV. E

DRAWING TITLE: ASSY.PWB SERVO LOGIC-2 BASIC BOARD. MODEL NO. Disc DATE 2/22/74 SHEET 1 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed	300496-001	1	REV C
2				
3				
4	IC 9602	100234-001	2	U2,32
5	IC 7400	100328-001	3	U1,20,33
6	IC 7402	100329-001	3	U3,6,13
7	IC 7408	100332-001	1	U30
8	IC 7474	100339-001	8	U19,23,24,25,26,27,29,31
9	IC 7486	100341-001	2	U10,11
10	IC 7411	101009-001	1	U28
11	IC 7432	101012-001	1	U37
12	IC 7483	101013-001	3	U5,9,16
13	IC 9324	101018-001	2	U17,18
14	IC 74193	101020-001	3	U4,8,15
15	IC 5558	101026-001	1	U38
16	IC 5020	101029-003	3	U34,35,36
17	IC 75452	101031-001	2	U21,22
18	IC 1406	101088-001	1	U7
19				
20				
21	Capacitor 33pf	100243-330	1	C35
22	Capacitor 270pf	100243-271	1	C3
23	Capacitor .0047uf	101004-472	2	C4,5
24	Capacitor .01uf	101042-103	20	C1,2,8,10,11,13,15,17,19,21,23, C24,25,27,30,29,34,36,6,7
25	Capacitor .1uf	101004-104	1	C32
26	Capacitor 15uf	101002-156	1	C22
27				
28				
29	Resistor,5%,½W 150	101156-151	1	R10
30	Resistor," " 1K	101156-102	4	R15,16,24,25
31	Resistor," " 2K	101156-202	1	R13

ILLEGAL ADDRESS TRACK 408

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
300497-001	E

TITLE ASSY. PWB. SERVO LOGIC - 2 MODEL 200TPI TOP LOAD DATE 3/4/75 SHEET 1 OF 1

REV. E | PART NUMBER 300497-001 | DATE 3-4-75 | APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300497-000		E		
47	Wire, Jumper	300648-001	1			Jumper A to B. (ADD)

FORM 209 (R.12/74)

ILLEGAL ADDRESS TRACK 406

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
300497-002	D

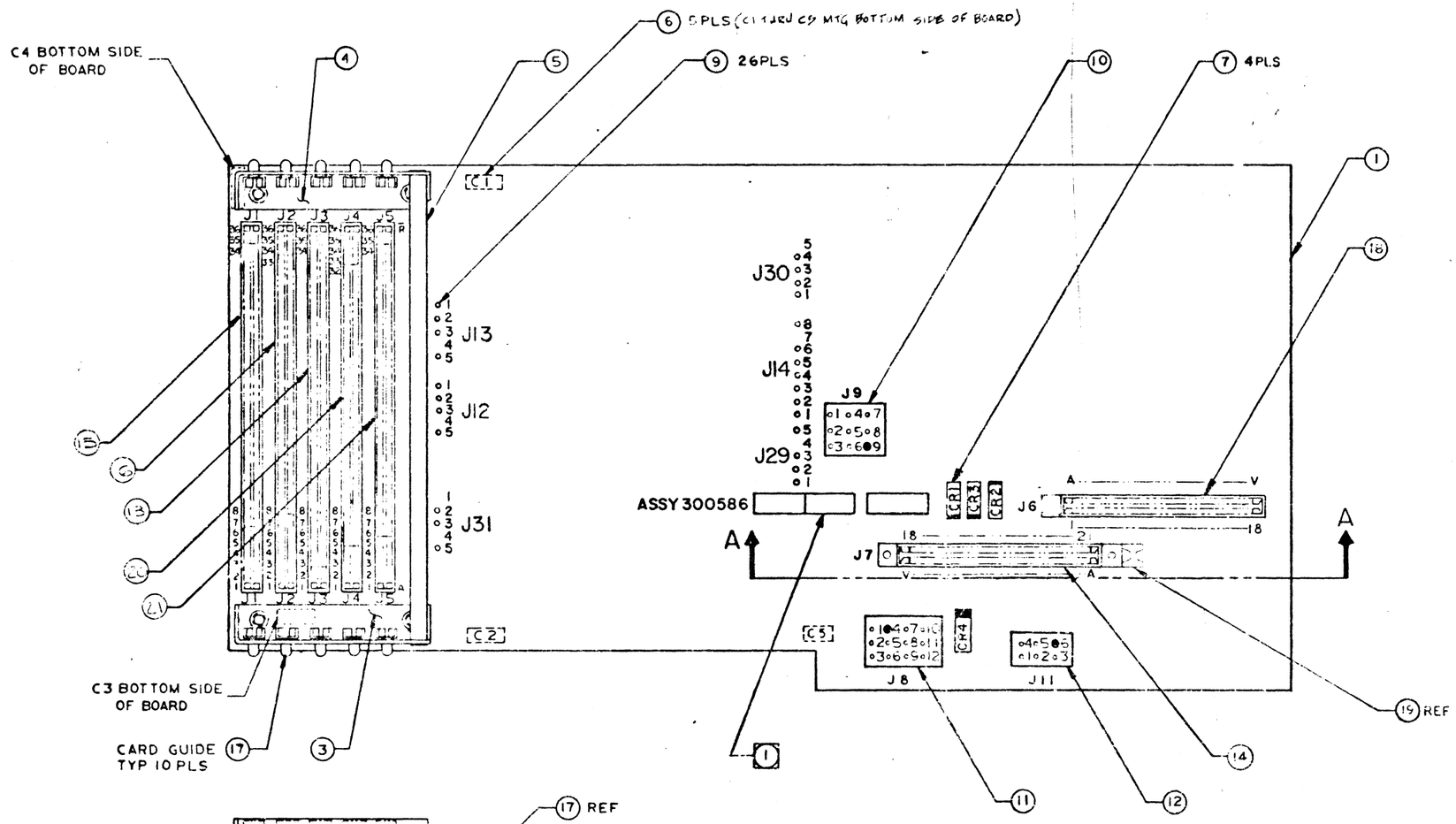
TITLE ASSY. PWB. SERVO LOGIC - 2 MODEL 200TPI FRONT LOAD DATE 3/4/75 SHEET 1 OF 1

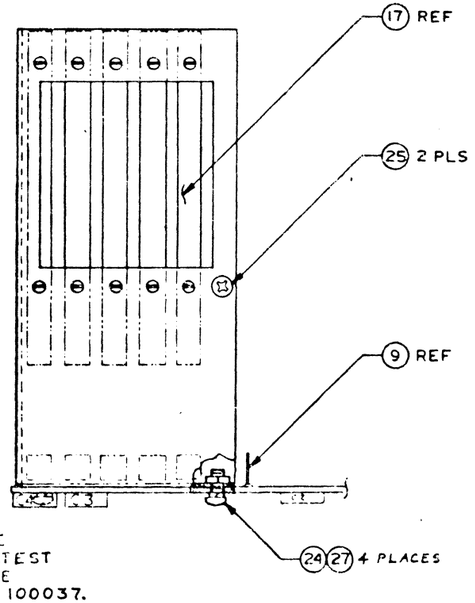
REV. D | PART NUMBER 300497-002 | DATE 3-4-75 | APPROVED

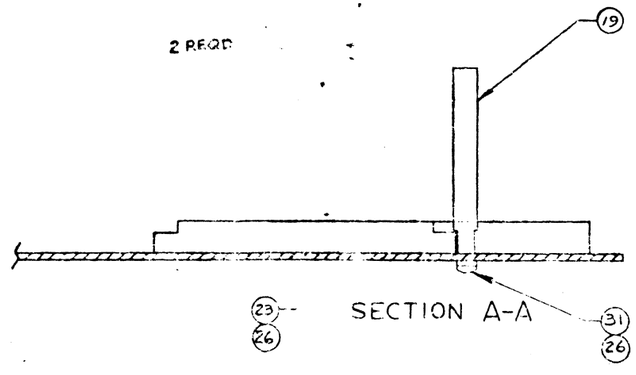
ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	300497-000		E		
47	Wire, Jumper	300648-001	1			Jumper B to C. (ADD)

FORM 209 (R.12/74)

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PL RELEASE			
B	MFG REL SEE CR/O 3342			
C	SEE CR/O 3532			
D	SEE CR/O 3850			
E	SEE CR/O 4335			
F	CR/O 4799			
G	SEE CR/O 5183			
H	CR/O 6185			
J	CR/O [illegible]			
K	CR/O 6744			
L	CR/O 7134			
M	[illegible]			
N	CR/O 7691			
P	CR/O 7879			
R	CR/O 8043			
S	CR/O [illegible]			







2. FOR SCHEMATIC REF DWG SEE 300803.

(1) MARK PART NUMBER, APPROPRIATE DASH NUMBER, ASSY, S/N AND LATEST REVISION LETTER .12 HIGH WHITE CHARACTERS PER WANGCO SPEC 100037.

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC. AND MAY NOT, IN WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC.

PART. NO. 300586-001 ASSY.

NOTES UNLESS SPECIFIED	DRAWN	Wangco Incorporated	
1. TOLERANCES XX± ANGULAR, XXX±	CHECK		CODE D120
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.	ASSEMBLY, ELECT. INTERCONNECT BD.	DWG REQ'D
3. MACH. SURFACES ✓	MATERIAL		
4. ALL DIMS IN INCHES.	FINISH		
	MODEL No. DISC SERIES 200	SCALE 1:1	SIZE D — 300586 — S
	NEXT ASSY 402400, 412400	DO NOT SCALE THIS DRAWING	WEIGHT — SHEET 2 OF 2

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
300586-001	S

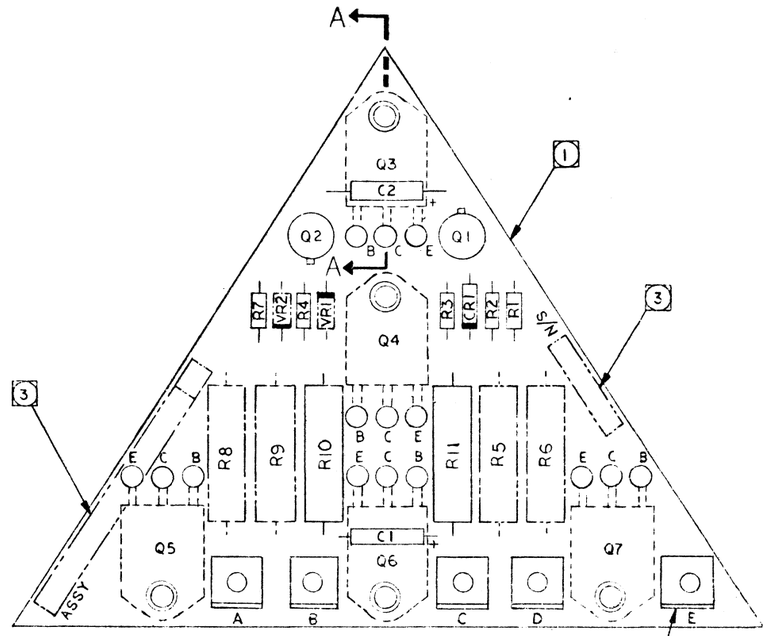
TITLE ASSY. PWB. ELECT. INTERCONNECT BD. MODEL 200TPI F & T DATE 5/21/75 SHEET 1 OF 2

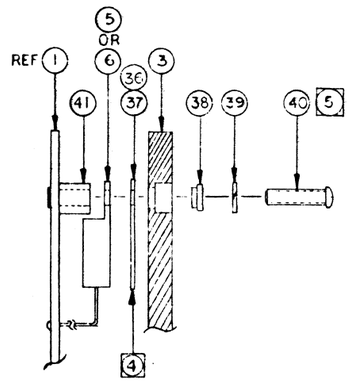
REV. S | PART NUMBER 300586-001 | DATE | APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	[redacted] REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
						402400-000, 412400-000
1	Board, Processed.	300585-001	1	H		
2						
3	End, Card Cage.	300046-001	1			
4	End, " "	-002	1			
5	Rod, " "	300043-001	1			
6	Capacitor. .1uf	100364-104	5			C1,2,3,4,5.
7	Diode. 1N5624	107026-001	4			CR1,2,3,4.
8						
9	Pin, Wire Wrap .025 sq.	100360-001	26			
10	Connector. 9 Pin.	100247-001	1			J9.
11	Connector. 12 Pin.	-012	1			J8.
12	Connector. 6 Pin.	-013	1			J11.
13	Connector 72 Pin	105024-003	1			J3
14	Connector 36 Pin.	100246-001	1			J7
15	Connector. 72 Pin.	105024-001	1			J1
16	Connector 72 Pin	105024-002	1			J2
17	Guide, Card.	101064-001	10			
18	Connector 36 Pin	100246-002	1			J6
19	Guide, Card.	101128-001	1			
20	Connector 72 Pin	105024-004	1			J4
21	Connector 72 Pin	105024-005	1			J5
22	Tubing, Teflon.	100226-018	A/R			
23						
24	Screw, " "	-305	4			6-32 x 5/16"
25	Screw, Flat.	100040-306	2			6-32 x 3/8"
26	Washer, Spring Lock.	100042-200	1			No.4.
27	Washer, " "	-300	4			No.6.
28						
29						
30						
31	Screw, Pan Head	100036-204	1			4-40 x 1/4"
	Schematic	300803-001	0	G		
	Printed Master	300584-001	0	H		

FORM 209 (R.12/74)

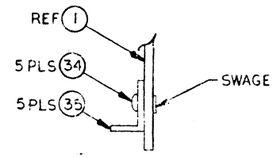
REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	FIRST RELEASE			
B	MFG REL. SEE CR/O 310			
C	SEE CR/O 3289			
D	SEE CR/O 3328			
E	SEE CR/O 3619			
F	SEE CR/O 3769			
F	SEE CR/O 3987 CORRECTED NOMENCLATURE AT PIN Ⓓ & Ⓔ			
G	SEE CR/O 4194			
H	SEE CR/O 4870			
J	CC/O 6581			

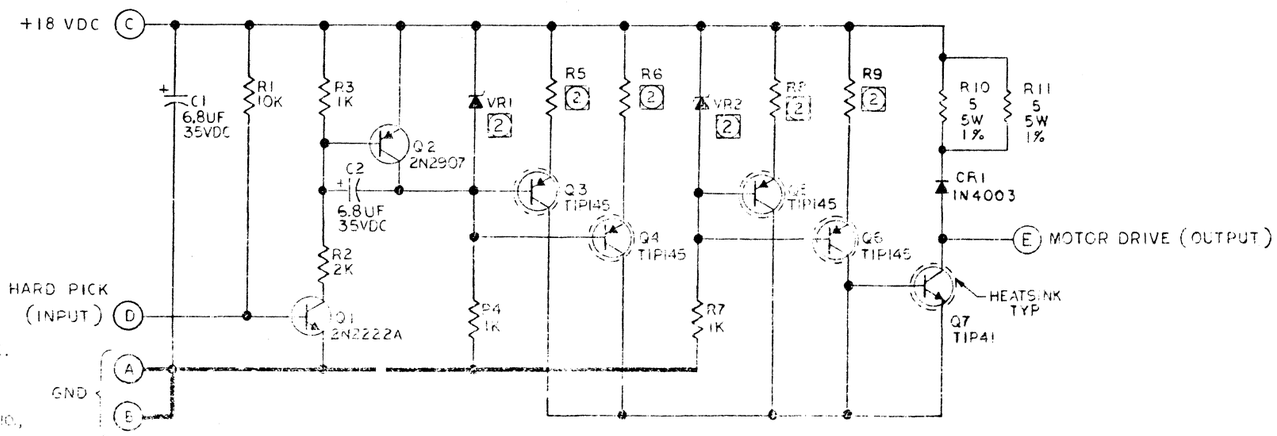




SECTION A-A
SCALE: NONE

TYP 5 PLS





5 INSERT AND TIGHTEN SCREW, ITEM 40, APPLYING 4 INCH LBS. OF TORQUE.

4 APPLY SILICON GREASE ON BOTH SIDES OF MICA WASHER.

3 MARK PART NO. APPROPRIATE DASH NO., LATEST REVISION LEVEL AND DATE CODE. WHERE THIS IS IMPRACTICAL MARK ON SOLDER BLANKET AS SPECIFIED IN NOTE 7.

2 COMPONENTS SHOWN IN PHANTOM LINES ARE VARIABLE, SEE M/L.

1. ALL RESISTORS IN OHMS, ±5%, ¼W

NOTES: UNLESS OTHERWISE SPECIFIED

PART NO. 300612-XXX ASSY SEE M/L TABULATION.

NOTES UNLESS SPECIFIED	DRAWN	Wangco Incorporated
1. TOLERANCES .XX± ANGULAR .XXX± ±	CHECK	
2 BREAK ALL SHARP EDGES APPROX. .010	APPR.	ASSEMBLY, SPINDLE DRIVE MODULE
3. MACH. SURFACES ✓	MATERIAL	
4. ALL DIMS IN INCHES.	FINISH	
	MODEL NO.	SCALE: NONE / SIZE: D / 300612 / J
	NEXT ASSY	DO NOT SCALE THIS PRINT / WEIGHT / SHEET 3 OF 3

B-33

2400 RPM DRIVES WITH CARTRIDGE & FIXED DISC

REV. J | DRAWING NO. 300612-001 | ML

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 300612-001 | REV. J

DRAWING TITLE: ASSY, PWB SPINDLE DRIVE MODULE — MODEL NO. Disc — DATE 12/19/73 SHEET 1 OF 3

ITEM NO.	DRAWING TITLE		DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed		300611	1	LEVEL "D"
2					
3	Plate, Trans. Mtg.		300614-001	1	
4					
5	Transistor	POWER	151004-001	4	Q3,4,5,6.
6	Transistor	TIP41	101047	1	Q7.
7	Transistor	2N2222A	101052	1	Q1.
8	Transistor	2N2907	101053	1	Q2.
9					
10					
11	Diode	1N4003	100127	1	CR1.
12	Diode,Zener 3.6V	1N5227B	101058-002	2	VR1,2.
13					
14					
15	Capacitor, 35V	6.8uf	101003-685	2	C1,2.
16					
17					
18					
19	Resistor, 1%,5W	3Ω	142000-006	2	R8,R9.
20	Resistor, 1%,5W.	1.5Ω	142000-003	2	R5,6.
21	Resistor, " "	5Ω	142000-008	2	R10,11
22					
23					
24	Resistor, 5%,¼w.	1K	101156-102	3	R3,4,7.
25	Resistor, " "	2K	-202	1	R2.
26	Resistor, " "	10K	-103	1	R1.
27					
28					
29					
30					
31					
32					cc

cc

REV. J | DRAWING NO. 300612-001 | ML

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 300612-001 | REV. J

DRAWING TITLE: ASSEMBLY, PWB SPINDLE DRIVE MODULE — MODEL NO. Disc — DATE 8/22/74 SHEET 2 OF 3

Item No.	Drawing Title	Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
33					
34	Rivet, Al, Univ. Hd.	100429-001		5	.095 Dia X .156 Lg.
35	Terminal.	101135		5	AMP 61407-1
36	Silicon Grease.			A/R	
37	Insulator, Mica.	100146		5	
38	Washer, Nylon Shoulder.	100063-013		5	
39	Washer, Lock.	100042-200		5	No.4.
40	Screw, Pan Head.	100036-206		5	4-40 x 3/8
41	Standoff, Swage.	147800-001		5	
42					
43					
44	Printed Master.	300610	C	Ref	

FORM 209 (5/74)

1500 RPM DRIVES WITH CARTRIDGE & FIXED DISC

D-720

REV. J | DRAWING NO. 300612-002 | ML

WANGCO INCORPORATED

MATERIAL LIST

ML | DRAWING NO. 300612-002 | REV. J

DRAWING TITLE: ASSEMBLY, PWB SPINDLE DRIVE MODULE | MODEL NO. Disc | DATE 2/4/74 | SHEET 1 OF 2

Item No.	Drawing Title		Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
1	Board, Processed.		300611	D	1	(OR REWORK A. B. OR C)
2						
3	Plate, Trans. Mtg.		300614-001		1	
4						
5	Transistor.	POWER	151004-001		4	Q3,4,5,6.
6	Transistor.	TIP41	101047		1	Q7.
7	Transistor.	2N2222A	101052		1	Q1.
8	Transistor.	2N2907	101053		1	Q2.
9						
10						
11	Diode	1N4003	100127		1	CR1.
12	Diode, Zener 5.1V	1N5231B	101058-006		1	VR2.
13	Diode, Zener 6.8V	1N5235B	-010		1	VR1.
14						
15	Capacitor, 35V	6.8uf	101003-685		2	C1,C2.
16						
17						
18						
19	Resistor, 1%, 5W.	6Ω	142000-009		1	R8.
20	Resistor, " "	5Ω	-008		3	R5,6,9.
21	Resistor, 1%, 5W.	5Ω	142000-008		2	R10,11
22						
23						
24	Resistor, 5%, ¼W.	1K	101156-102		3	R3,4,7.
25	Resistor, " "	2K	-202		1	R2.
26	Resistor, " "	10K	-103		1	R1.
27						
28						
29						
30						
31						
32						

FORM 209 (5/74)

REV. J | DRAWING NO. 300612-002 | ML

WANGCO INCORPORATED

MATERIAL LIST

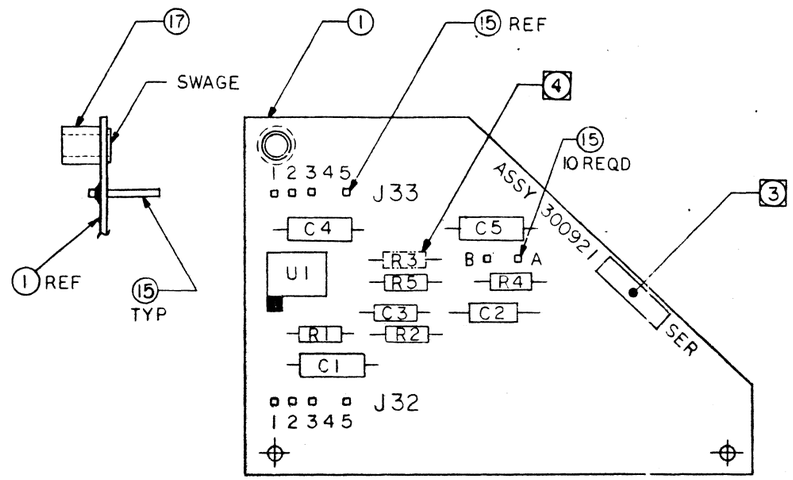
ML | DRAWING NO. 300612-002 | REV. J

DRAWING TITLE: ASSEMBLY, PWB SPINDLE DRIVE MODULE | MODEL NO. Disc | DATE 2/4/74 | SHEET 2 OF 2

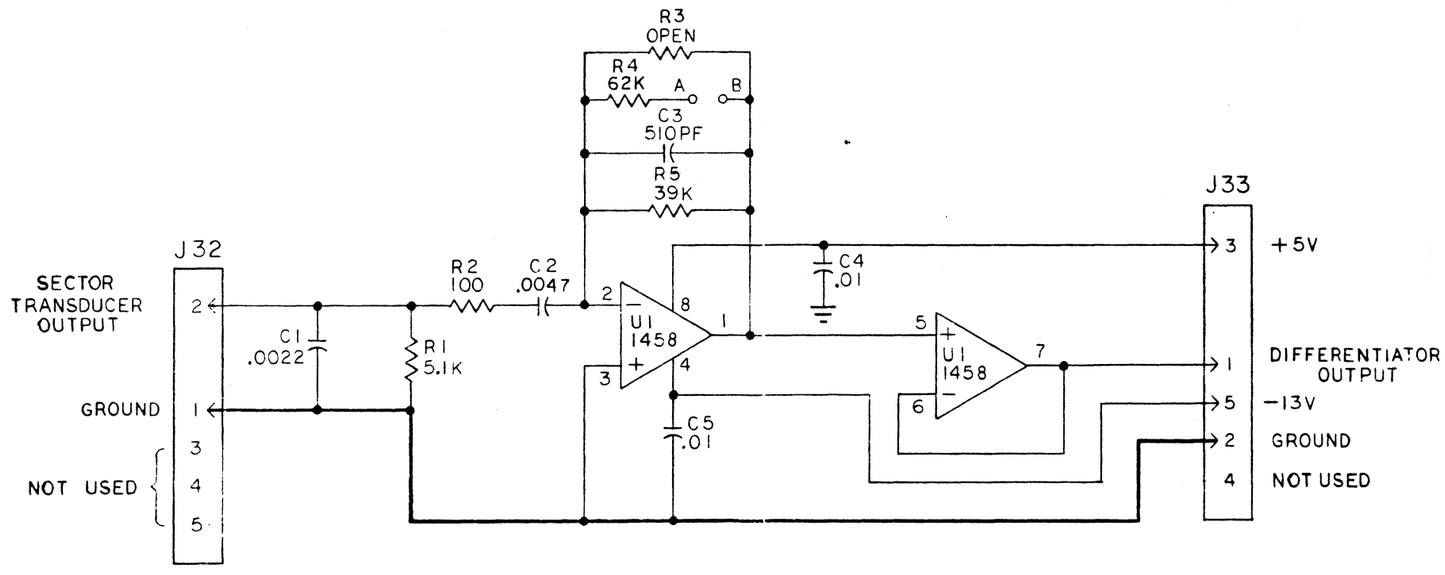
Item No.	Drawing Title	Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
33					
34	Rivet, Al, Univ. Head.	100429-001		5	.095 Dia x .156 lg.
35	Terminal.	101135		5	AMP 61407-1
36	Silicon Grease			A/R	
37	Insulator, Mica.	100146		5	
38	Washer, Nylon Shoulder.	100063-013		5	
39	Washer, Lock.	100042-200		5	No.4.
40	Screw, Pan Head.	100036-206		5	4-40 x 3/8
41	Standoff, Swage	147800-001		5	
42					
43					
44	Printed Master.	300610	C	Ref.	

FORM 209 (5/74)

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	MFG RELEASE			
B	SEE CR/O 4453			
C	SEE CR/O 4529			
D	SEE CR/O 5073			
E	CR/O 7829			



LAST USED	DELETED
U1	
C5	
R5	



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PART NO 300921-001

4 COMPONENTS SHOWN IN PHANTOM LINES ARE 'OPEN' AND ARE FOR FUTUR USE.

3 MARK LATEST REVISION LEVEL, APPROPRIATE DASH NUMBER, AND SERIAL NUMBER .12 HIGH CHARACTERS PER WANGCO SPEC 100037.

2. ALL CAPACITORS IN MICROFARDS.

1. ALL RESISTOR IN OHMS 5% 1/4 W.

NOTES UNLESS OTHERWISE SPECIFIED.

NOTES UNLESS SPECIFIED		
1. TOLERANCES XX± ANGULAR, XXX± ±	DRAWN	
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	
3. MACH. SURFACES	APPR.	
4. ALL DIMS IN INCHES.	MATERIAL	
	FINISH	
	MODEL No. F	
	NEXT ASSY	

Wangco Incorporated

ASSEMBLY, PWB-
TRANSDUCER DIFFERENTIATOR

SCALE	SIZE		
2:1	D	300921	E

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 3 OF 3

B-37

REV. E

DRAWIN NO. 300921-001

ML

WANGCO INCORPORATED

MATERIAL LIST

ML | DRAWING NO. 300921-001 | REV. E

DRAWING TITLE ASSEMBLY PWB TRANSDUCER DIFFERENTIATOR. MODEL NO. F DATE 10/24/74 SHEET 1 OF 3

Item No.	Drawing Title	Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
1	Board, Processed.	300920-001	A	1	
2					
3	I.C. 1458	101026-001		1	U1.
4					
5					
6	Capacitor, Mica. 510pf	100243-511		1	C3.
7	Capacitor, 10%,80V. .0022uf	101004-222		1	C1.
8	Capacitor, " " .01uf	" -103		2	C4, C5.
9	Capacitor, " " .0047uf	" -472		1	C2.
10					
11	Resistor, 5%,¼W. 100	101156-101		1	R2.
12	Resistor, " " 5.1K	" -512		1	R1.
13	Resistor, " " 62K	" -623		1	R4.
14	Resistor, " " 39K	" -393		1	R5.
15	Pin, Wire Wrap.	100360-003		10	J32 & J33 Jumper Points A & B.
16					
17	Standoff, Swage.	147005-003		1	
18					
19					
20	Printed Master.	300919-001	A	0	

FORM 209 (5/74)

2400 RPM FRONT LOAD

CODE D1?0

REV. D

WANGCO
PERKIN ELMER DATA SYSTEMS

MATERIAL LIST

ASSEMBLY PART NUMBER 300921-002 REV. D

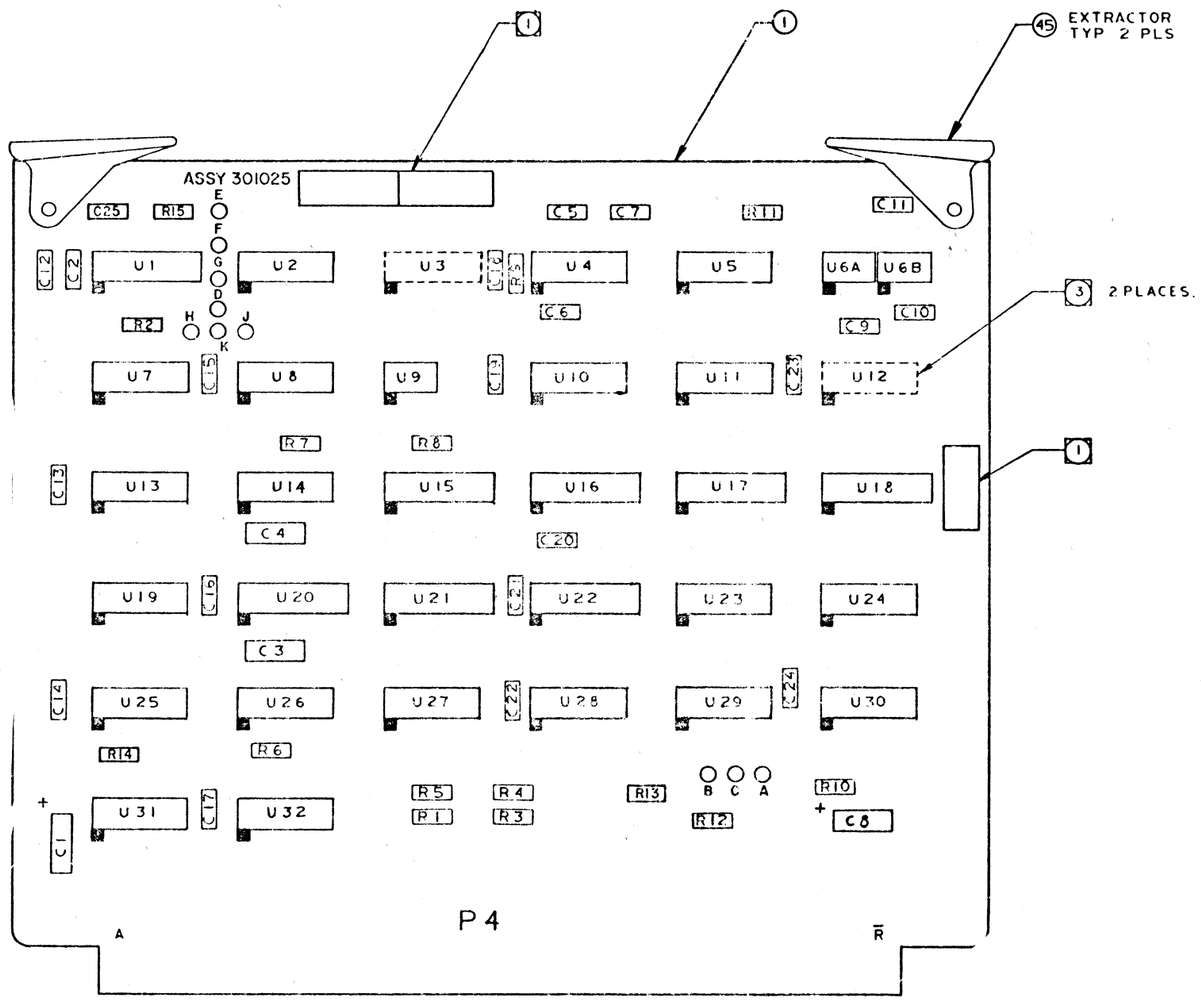
ASSEMBLY PART NUMBER 300921-002

TITLE ASSY, PWB TRANSDUCER DIFFERENTIATOR MODEL F DATE 10/24/74 SHEET 1 OF 2

ITEM	REQD	PART NO.	DESCRIPTION	REMARKS
1	1	300920-001	Board, Processed	REV A
2				
3	1	101026-001	I.C. 1458	U1
4				
5				
6	1	100243-511	Capacitor, Mica 510pf	C3
7	1	101004-222	Capacitor, 10%,80V .0022uf	C1
8	2	-103	Capacitor, " " .01uf	C4, C5
9	1	-472	Capacitor, " " .0047uf	C2
10				
11	1	101156-101	Resistor, 5%, ¼W 100	R2
12	1	-512	Resistor, " " 5.1K	R1
13	1	-623	Resistor, " " 62K	R4
14	1	-393	Resistor, " " 39K	R5
15	10	100360-003	Pin, Wire Wrap	Jumper Points A & B, J32 & J33
16				
17	1	147005-003	Standoff, Swage	
18	1	3[illegible]648-001	Jumper, Insulated	Jumper A to B
19				
20	0	300919-001	Printed Master	REV A

FORM 209 (R 3/77)

REV.	REVISION DESCRIPTION	CHK	APP	DATE APPROVED
X1	EXPERIMENTAL REL			
A	PILOT REL			
B	[illegible]			
C	CR10 6155			
D	CR/07254			
E	[illegible]			
F	CR/D 6557			



(3) COMPONENTS IN DASH LINE ARE NOT USED.

2. FOR SCHEMATIC REF SEE 301026.

(1) MARK APPROPRIATE DASH NO (OR NO.S) & LATEST REVISION LETTER IN DOUBLE BLOCK (AT TOP) .12 HIGH CHARACTERS, COLOR WHITE PER WANGCO SPEC 100057. MARK DATE IN SINGLE BLOCK (ON RIGHT OF NO).

NOTES: UNLESS OTHERWISE SPECIFIED.

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PART NO 301025-XXX ASSY

NOTES: UNLESS OTHERWISE SPECIFIED
1. TOLERANCES: .XXX ANGULAR ±, .XXXX ±
2. BREAK ALL SHARP EDGES APPROX .010
3. FINISH SURFACES √
4. ALL DIMS IN INCHES

DRAWN L. AGUIRRE 3-1-74
CHK'D
APP'D
MATERIAL
FINISH

Wangco Incorporated

ASSEMBLY
SERVO LOGIC -3

MODEL NO. FST 100 TPI
USED ON 300000 300001
SCALE 2:1
SIZE D
DRAWING NO. 301025
REV F
WEIGHT
SHEET 3 OF 3

B-41 1

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 301025-000 | REV. F

DRAWING TITLE: ASSY. PWB. SERVO LOGIC -3 | MODEL NO. F&T 100TPI | DATE 4/5/74 | SHEET 1 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed	301024-001	1	Rev "F"
2				
3				
4	IC. 9602	100234-001	2	U1,U20.
5	IC. 7400	100328-001	3	U7,U8,U32.
6	IC. 7402	100329-001	3	U5,19,31.
7	IC. 7408	100332-001	1	U13.
8	IC. 7474	100339-001	8	U2,14,23,24,25,26,27,28.
9	IC. 7486	100341-001	2	U10,11.
10	IC. 7411	101009-001	1	U29.
11	IC. 7432	101012-001	1	U30.
12	IC. 7483	101013-001	2	U16,22.
13	IC. 9324	101018-001	2	U17,18.
14	IC. 74193	101020-001	2	U15,21.
15	IC. 1458	101026-001	1	U6B.
16	IC. 75452	101031-001	2	U6A,9.
17	IC. 1406	101088-001	1	U4.
18				
19				
20	CAP Disc 82pf	100243-820	1	C25
21	Cap. Disc 33pf	100243-330	1	C5.
22	Cap. Disc 180pf	-181	1	C2.
23	Cap. Polyester .0047uf	101004-472	2	C3,4.
24	Cap. Disc 100v. .01uf	101042-103	18	C6,7,9,10,11,12,13,14,15.
				C16,17,18,19,20,21,22,23,24.
25	Cap. Tant. 35V 1uf	101003-105	1	C8.
26	Cap. Tantalum 20v. 15uf	101002-156	1	C1.
27				
28				
29	Resistor. 5% ¼w. 150	101156-151	1	R10.
30	Resistor. " " 1K	-102	6	R3,4,5,8,R13,R14
31	Resistor. " " 2K	-202	1	R12.

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 301025-000 | REV. F

DRAWING TITLE: ASSY. PWB. SERVO LOGIC - 3 | MODEL NO. F & T 100 TPI | DATE 4/5/74 | SHEET 2 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
32	Resistor. 1% ¼w. 2.32K	100155-324	1	R9.
33	Resistor. " " 4.64K	-353	1	R11.
34	Resistor. 5% ¼w. 5.1K	101156-512	2	R1, . R15
35	Resistor. " " 20K	-203	2	R6,R7.
36				
37				
38				
39				
40				
41	Pin, Wire Wrap	100360-001	10	A,B,C,D,E,F,G,H,J,K
42				
43				
44				
45	Extractor, Card	107901-001	2	
46				
47				
	Printed Master.	301023-001	0	
	Schematic	301026-001	0	REV "G"
	Test Procedure		0	
	Rework Instruction	301696-001	0	

SK DLY O/S = 400 n sec

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 301025-001 | REV. F

DRAWING TITLE: ASSY. PWB. SERVO LOGIC - 3 ILL ADD< 203 FRONT LOAD | MODEL NO. F&T 100TPI | DATE 4/19/74 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
	USE MATERIAL LIST 301025-000			REV "D"
	AND ADD THE FOLLOWING:-			
62	Resistor, 5% ¼W 7.5K	101156-752	1	R2
70	Wire Jumper.	300648-001	4	Jumper A to B
				E to G
				D to F
				H to J

SK DLY O/S = 400 n sec

WANGCO INCORPORATED — MATERIAL LIST

ML | DRAWING NO. 301025-002 | REV. E

DRAWING TITLE: ASSY. SERVO LOGIC - 3 ILL ADD>204 TOP LOAD | MODEL NO. F&T 100TPI | DATE 4/19/74 | SHEET 1 OF 1

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
	USE MATERIAL LIST 301025-000			Rev "D"
	AND ADD THE FOLLOWING:-			
62	Resistor, 5% ¼W 7.5K	101156-752	1	R2
70	Wire, Jumper.	300648-001	4	Jumper B to C
				E to G
				D to F
				H to J

SK DLY O/S = 1.0 usec

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301025-003 | REV. B

TITLE: ASSY.,PWB.SERVO LOGIC-3 ILL ADD < 203 | MODEL F 100 TPI | DATE 12/20/76 | SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEXT REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301025-000		E		
62	Resistor, 5% ¼W 20K	101156-203	1			R2
70	Wire Jumper	300648-001	4			Jumper A to B
						D to G
						E to F
						H to K

SK DLY O/S = 1.0 usec

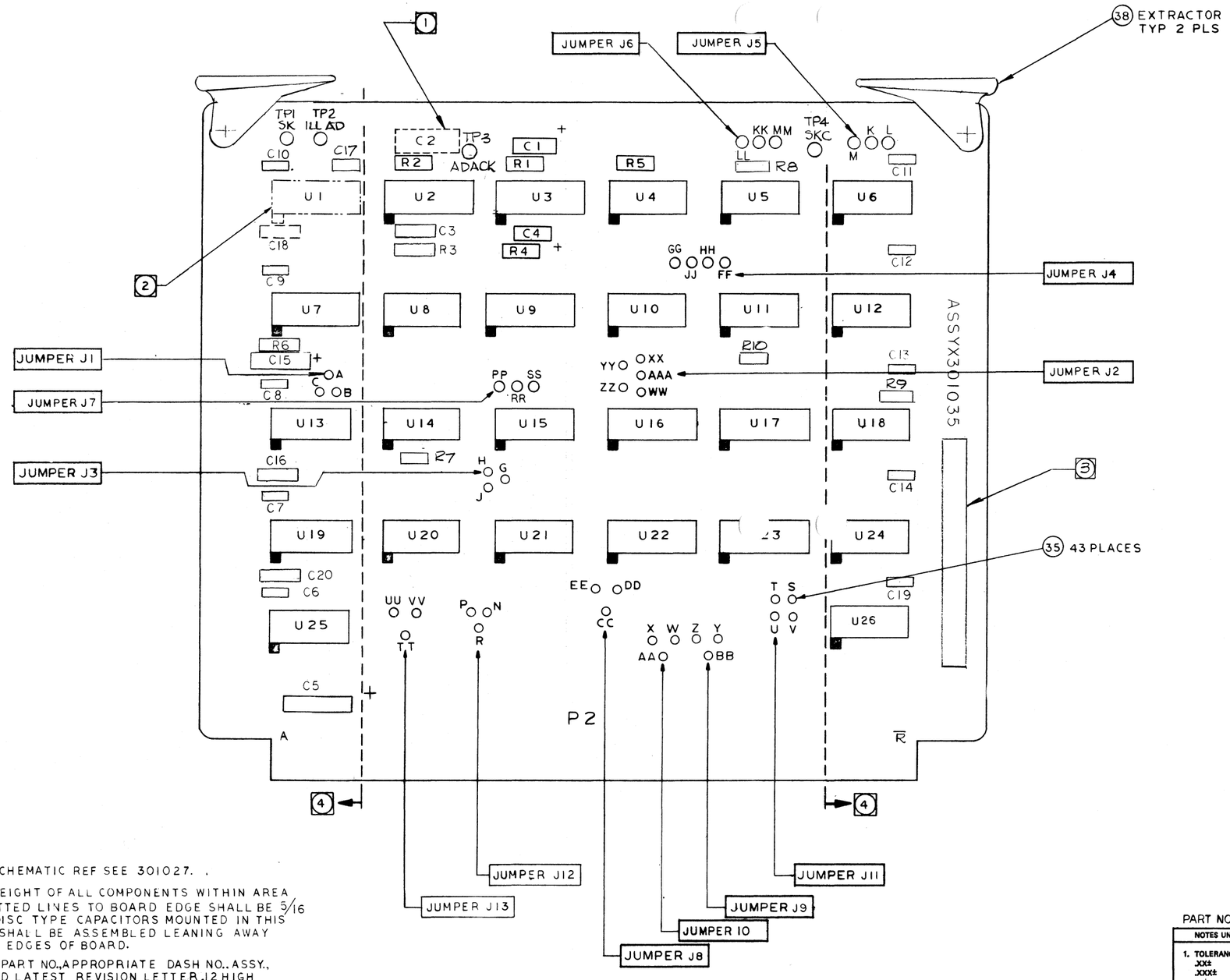
WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301025-004 | REV. B

TITLE: ASSY. SERVO LOGIC-3 ILL ADD>204 | MODEL T 100 TPI | DATE 12/20/76 | SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEXT REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301025-000		E		
62	Resistor, 5% ¼W 20K	101156-203	1			R2
70	Wire, Jumper	300648-001	4			Jumper B to C
						D to G
						E to F
						H to K

REVISIONS				301035
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT REL.	[illegible]	3/1	[illegible]
B	MFG REL SEE CR/O 3421	[illegible]	4/16	[illegible]
C	SEE CR/O 3659	[illegible]	9/4/74	[illegible]
D	CR/O 5967	[illegible]	9/4	[illegible]
E	CR/O 8019 (AUTO INSERTION)	[illegible]	9/4/77	[illegible]



5 FOR SCHEMATIC REF SEE 301027. .

4 MAX HEIGHT OF ALL COMPONENTS WITHIN AREA OF DOTTED LINES TO BOARD EDGE SHALL BE 5/16 MAX. DISC TYPE CAPACITORS MOUNTED IN THIS AREA SHALL BE ASSEMBLED LEANING AWAY FROM EDGES OF BOARD.

3 MARK PART NO., APPROPRIATE DASH NO., ASSY., S/N AND LATEST REVISION LETTER .12 HIGH WHITE CHARACTERS PER WANGCO SPEC 100037.

2 COMPONENTS SHOWN IN PHANTOM LINES ARE NOT USED (REF ONLY).

1 COMPONENTS SHOWN IN DASH LINES ARE VARIABLE COMPONENTS SEE M/L.

UNLESS OTHERWISE SPECIFIED:

PART NO. 301035-XXX SEE TABULATED M/L ASSY

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX± ANGULAR .XXX± ±	DRAWN	L. AGUIRRE	4-12-74
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES ✓	APPR.		
4. ALL DIMS IN INCHES.	MATERIAL	—	
	FINISH	—	
	MODEL No.	DISC 200 TPI	
	NEXT ASSY	402400 412400	

Wangco Incorporated

ASSEMBLY PWB CONTROL INTERFACE 200 TPI

CODE D120 CUST NO.

SCALE 2:1 | SIZE D | 301035 | E

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 3 OF 3

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 301035-000 — REV. E

DRAWING TITLE ASSY. CONTROL INTERFACE PWB. MODEL NO. 200TPI DATE 4/4/74 SHEET 1 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
1	Board, Processed.	301028-001	1	Rev "H"
2				
3	IC. 9602	100234-001	3	U2.3.7.
4	IC. 7400	100328-001	1	U26.
5	IC. 7402	100329-001	1	U9.
6	IC. 7404	100330-001	3	U4.15.24.
7	IC. 7408	100332-001	5	U6.8.12.13.20.
8	IC. 7474	100339-001	5	U5.10.11.14.18.
9	IC. 7411	101009-001	1	U19.
10	IC. 7432	101012-001	2	U21.25.
11	IC. 9322	101017-001	2	U17.23.
12	IC. 74193	101020-001	2	U16.22.
13				
14				
15	Capacitor. 510pf	100243-511	1	C17.
16	Capacitor. 180pf	-181	2	C16.20.
17	Capacitor. 270pf	-271	1	C3.
18				
19	Capacitor .01uf	101042-103	10	C6.7.8.9.10.11.12.13.14.19.
20				
21	Capacitor. Tant. 35v. 1uf	101003-105	2	C4.15.
22	Capacitor. " 15v. 20uf	101002-156	1	C5.
23	Capacitor, " 6v. 56uf	101001-566	1	C1.
24				
25				
26	Resistor. 5%.½w. 820	101156-821	1	R5.
27	Resistor. " " 5.1K	-512	1	R6.
28	Resistor. 1%.½w. 16.9K	100155-407	1	R4.
29	Resistor. 5%.½w. 12K	101156-123	1	R2.
30	Resistor. " " 15K	-153	1	R3.
31	Resistor. " " 22K	-223	1	R1.
32	Resistor 5% ½ W 1K	101156 - 102	4	R7,8,9,10

WANGCO INCORPORATED — MATERIAL LIST — ML — DRAWING NO. 301035-000 — REV. E

DRAWING TITLE ASSY. CONTROL INTERFACE PWB. MODEL NO. 200TPI DATE 4/4/74 SHEET 2 OF 3

ITEM NO.	DRAWING TITLE	DWG. NO.	NO. REQ.	REMARKS ON CKT. DESIG.
33				
34				
35	Pin, Wire Wrap.	100360-001	47	
36				
37				
38	Extractor, Card.	107901-001	2	
39				
40	Artwork, Master.	301029-001	F	
41				
42	Schematic	301027-001	F	
43				
44				
45				

INTERFACE D-30. MULTIPLEX LINES. — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-001 — REV. C

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		
46	Capacitor. .0068uf	100165-682	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add
						Jumper J2 WW to YY Add
						Jumper J3 G to J Add
						Jumper J4 GG to HH Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 PP to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10 AA to X Add
						Jumper J11 T to U Add
						Jumper J12 P to R Add
						Jumper J13 UU to VV Add

D-40 Interface. Disc Select Inverted. Multiplex Lines — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-002 — REV. C

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add
						Jumper J2 WW to ZZ Add
						Jumper J3 G to J Add
						Jumper J4 GG to HH Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 RR to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10AA to X Add
						Jumper J11 T to U Add
						Jumper J12 N to R Add
						Jumper J13 UU to VV Add

C-300/200 INTERFACE. MULTIPLEX LINES. — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-003 — REV. C

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		
46	Capacitor. .0068uf	100165-632	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to C Add
						Jumper J2 WW to XX Add
						Jumper J3 G to H Add
						Jumper J4 HH to JJ Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 PP to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10 AA to X Add
						Jumper J11 T to U Add
						Jumper J12 Not Used. Add
						Jumper J13 UU to VV Add

P-3000 INTERFACE. DISC SELECT INVERTED. MULTIPLEX LINES. — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-004 — REV. C

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		
46	Capacitor. .0068uf	100165-632	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add
						Jumper J2 AAA to WW Add
						Jumper J3 G to J Add
						Jumper J4 HH to JJ Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 RR to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10 AA to X Add
						Jumper J11 T to U Add
						Jumper J12 N to R Add
						Jumper J13 UU to VV Add

D-30 INTERFACE. NO COUNTER, INDIVIDUAL LINES. — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-005 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		
46	Capacitor. .0068uf	100165-632	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add
						Jumper J2 WW to YY Add
						Jumper J3 G to H Add
						Jumper J4 GG to HH Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 PP to SS Add
						Jumper J8 CC to EE Add
						Jumper J9 BB to Z Add
						Jumper J10 AA to W Add
						Jumper J11 U to V Add
						Jumper J12 P to R Add
						Jumper J13 UU to VV Add

C-300/200 Interface. No Counter Individual Lines. — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-006 — REV. C

TITLE ASSY. CONTROL INTERFACE PWB. MODEL Disc. DATE 2/21/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		
46	Capacitor. .0068uf	100165-682	1			C2.
47	Capacitor. 820pf	100243-821	1			C18.
48						
49	Wire, Jumper.	300648-001	A/R			Jumper J1 from A to C
						Jumper J2 " WW to XX
						Jumper J3 " G to H
						Jumper J4 " HH to JJ
						Jumper J5 " L to M
						Jumper J6 " KK to MM
						Jumper J7 " PP to SS
						Jumper J8 " EE to CC
						Jumper J9 " BB to Z
						Jumper J10 " AA to W
						Jumper J11 " U to V
						Jumper J12 " N to R
						Jumper J13 " UU to VV.

D-40 INTERFACE. NO COUNTER INDIVIDUAL LINES DISC SELECT INVERTED.

CODE D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-007 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add
						Jumper J2 WW to ZZ Add
						Jumper J3 G to J Add
						Jumper J4 GG to HH Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 RR to SS Add
						Jumper J8 CC to EE Add
						Jumper J9 BB to Z Add
						Jumper J10 AA to W Add
						Jumper J11 U to V Add
						Jumper J12 N to R Add
						Jumper J13 UU to VV Add

D-40 INTERFACE. SECTOR COUNTER, MULTIPLEX LINES.

CODE D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-008 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add
						Jumper J2 WW to ZZ Add
						Jumper J3 G to J Add
						Jumper J4 GG to HH Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 PP to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10 AA to X Add
						Jumper J11 T to U Add
						Jumper J12 N to R Add
						Jumper J13 UU to VV Add

Cd-22 INTERFACE. SECTOR COUNTER, MULTIPLEX LINES.

D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-009 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor. .0068uf	100165-682	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to C Add
						Jumper J2 WW to XX Add
						Jumper J3 G to H Add
						Jumper J4 HH to JJ Add
						Jumper J5 K to M Add
						Jumper J6 KK to MM Add
						Jumper J7 PP to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10 AA to X Add
						Jumper J11 T to U Add
						Jumper J12 Not Used. Add
						Jumper J13 UU to VV Add

INTERFACE D-30. SECTOR COUNTER MULTIPLEX LINES. HEAD SELECT INVERTED. DISC SELECT INVERTED.

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-012

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor. .0068uf	100165-632	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B
						Jumper J2 WW to YY
						Jumper J3 G to J
						Jumper J4 GG to HH
						Jumper J5 L to M
						Jumper J6 KK to MM
						Jumper J7 RR to SS
						Jumper J8 DD to EE
						Jumper J9 BB to Y
						Jumper J10 AA to X
						Jumper J11 T to U
						Jumper J12 P to R
						Jumper J13 UU to VV

C-300/200 INTERFACE. MULTIPLEX LINES. RESTORE GATED WITH STROBE.

D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-013 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor. .0068uf	100165-632	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add
						Jumper J2 WW to XX Add
						Jumper J3 G to H Add
						Jumper J4 HH to JJ Add
						Jumper J5 L to M Add
						Jumper J6 KK to MM Add
						Jumper J7 PP to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10 AA to X Add
						Jumper J11 T to U Add
						Jumper J12 Not Used. Add
						Jumper J13 UU to VV Add

Cd-22 INTERFACE. SECTOR COUNTER, MULTIPLEX LINES. OPTION I

D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-014 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 4/23/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor. .0068uf	100165-632	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to C Add
						Jumper J2 WW to XX Add
						Jumper J3 G to J Add
						Jumper J4 HH to FF Add
						Jumper J5 K to M Add
						Jumper J6 KK to MM Add
						Jumper J7 PP to SS Add
						Jumper J8 DD to EE Add
						Jumper J9 BB to Y Add
						Jumper J10 AA to X Add
						Jumper J11 T to U Add
						Jumper J12 P to R Add
						Jumper J13 UU to VV Add

D-40 INTERFACE. DISC SELECT INVERTED. MULTIPLEX LINES. CAI CONTROLLER.

CODE D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-021 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 5/6/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor. .0068uf	100165-682	1			C2. Add.
47	Capacitor. 820pf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add.
						Jumper J2 WW to ZZ Add.
						Jumper J3 G to J Add.
						Jumper J4 GG to HH Add.
						Jumper J5 L to M Add.
						Jumper J6 KK to MM Add.
						Jumper J7 RR to SS Add.
						Jumper J8 DD to EE Add.
						Jumper J9 BB to Y Add.
						Jumper J10 AA to X Add.
						Jumper J11 T to U Add.
						Jumper J12 N to R Add.
						Jumper J13 UU to VV Add.

D-40. NEG. ATTN/DAISY CHAIN. SECTOR COUNTER MULTIPLEXED LINES. DISC SELECT INVERTED.

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-023

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI F & T DATE 5/15/75 SHEET 1 OF

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301035-000		E		NEXT ASSEMBLY/USED ON 402412-009
1	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Ad
						Jumper J3 G to J Ad
						Jumper J4 GG to HH Ad
						Jumper J7 RR to SS Ad
						Jumper J8 DD to EE Ad
						Jumper J9 BB to Y Ad
						Jumper J10 AA to X Ad
						Jumper J11 T to U Ad
						Jumper J12 N to R Ad
						Jumper J13 UU to VV Ad
						Jumper J14 KK to ZZ Ad
						Jumper J15 LL to WW Ad
						Jumper J16 L to MM Ad

INTERFACE D-30 NEG ATTN LINES SECTOR COUNTER MULTIPLEXED LINES — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-024 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI DATE 8/28/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:	301035-000		E		NEXT ASSEMBLY/USED ON 404208-002
46	Capacitor .0068uf	100165-682	1			C2. Add.
47	Capacitor 820uf	100243-821	1			C18. Add.
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to B Add.
						Jumper J2 Not Used.
						Jumper J3 G to J Add.
						Jumper J4 GG to HH Add.
						Jumper J5 Not Used.
						Jumper J6 Not Used.
						Jumper J7 PP to SS Add.
						Jumper J8 DD to EE Add.
						Jumper J9 BB to Y Add.
						Jumper J10 AA to X Add.
						Jumper J11 T to U Add.
						Jumper J12 P to R Add.
						Jumper J13 UU to VV Add.
						Jumper J14 KK to ZZ Add.
						Jumper J15 LL to WW Add.
						Jumper J16 L to MM Add.

Interface D-30 Multiplex Lines. ILLA & SEEK INCOMPLETE. — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-026 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 200TPI. DATE 11/11/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor. .0068uf	100165-682	1			C2.
47	Capacitor. 820pf	100243-821	1			C18.
48						
49	Wire, Jumper.	300648-001	A/R			Jumper J1. From A to B
						Jumper J2. " WW to YY
						Jumper J3. " G to H
						Jumper J4. " GG to HH
						Jumper J5. " L to M
						Jumper J6. " KK to MM
						Jumper J7. " PP to SS
						Jumper J8. " DD to EE
						Jumper J9. " BB to Y
						Jumper J10. " AA to X
						Jumper J11. " T to U
						Jumper J12. " P to R
						Jumper J13. " UU to VV

"C" INTERFACE-NEGATTN SECTOR COUNTER, MULTIPLEX LINES — D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-032 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL 100TPI 200TPI DATE 1-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:	301035-000		E		NEXT ASSEMBLY/USED ON 314216-007
49	Wire, Jumper.	300648-001	A/R			Jumper J1 A to C
						J2 WW to LL
						J3 G to H
						J4 HH to JJ
						J5 L to M
						J6 KK to MM
						J7 PP to SS
						J8 DD to EE
						J9 BB to Y
						J10 AA to X
						J11 T to U
						J12 N to R
						J13 UU to VV

Sector Counter Multiplex Lines
Disc Select STANDARD WANGCO PDP-11 MHD — CODE D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-039 — REV. C

WANGCO PDP-11 CONTROLLER
TITLE ASSY.,CONTROL INTERFACE PWB MODEL 100/200 TPI DATE 8-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:	301035-000		E		NEXT ASSEMBLY/USED ON 404212-018
46	Capacitor .0068uf	100165-682	1			C2
47	Capacitor 820pf	100243-821	1			C18
48						
49	Wire, Jumper	300648-001	A/R			Jumper J1 A to B
						J2 Not Used
						J3 G to J
						J4 GG to HH
						J5 K to M
						J6 KK to MM
						J7 PP to SS
						J8 DD to EE
						J9 BB to Y
						J10 AA to X
						J11 T to U
						J12 p to R
						J13 UU to VV

NEGATIVE ATTENTION
P-3000 INTERFACE. DISC SELECT INVERTED. MULTIPLEX LINES. — CODE D120

WANGCO INCORPORATED — MATERIAL LIST — PART NUMBER 301035-040 — REV. B

TITLE ASSY. CONTROL INTERFACE PWB. MODEL F&T DATE 8-27-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor .0068uf	100165-682	1			C2. Add.
47	Capacitor 820pf	100243-821	1			C18. Add.
49	Wire, Jumper	300648-001	A/R			Jumper J1 A to B Add.
						" J2 AAA to KK Add.
						" J3 G to J Add.
						" J4 HH to JJ Add.
						" J5 L to MM Add.
						" J6 LL to WW Add.
						" J7 RR to SS Add.
						" J8 DD to EE Add.
						" J9 BB to Y Add.
						" J10 AA to X Add.
						" J11 T to U Add.
						" J12 N to R Add.
						" J13 UU to VV Add.

HEAD SELECT INVERTED
INTERFACE D-3C SECTOR COUNTER MULTIPLEX LINES PLESSY

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301035-036	C

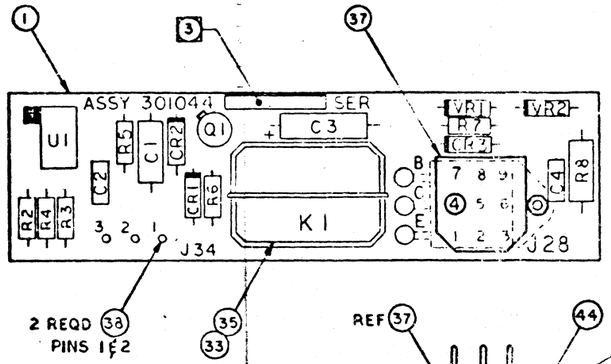
TITLE ASSY. CONTROL INTERFACE PWB. MODEL F & T DATE 3-22-76 SHEET 1 OF 1

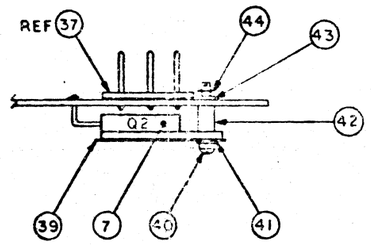
PART NUMBER 301035-036

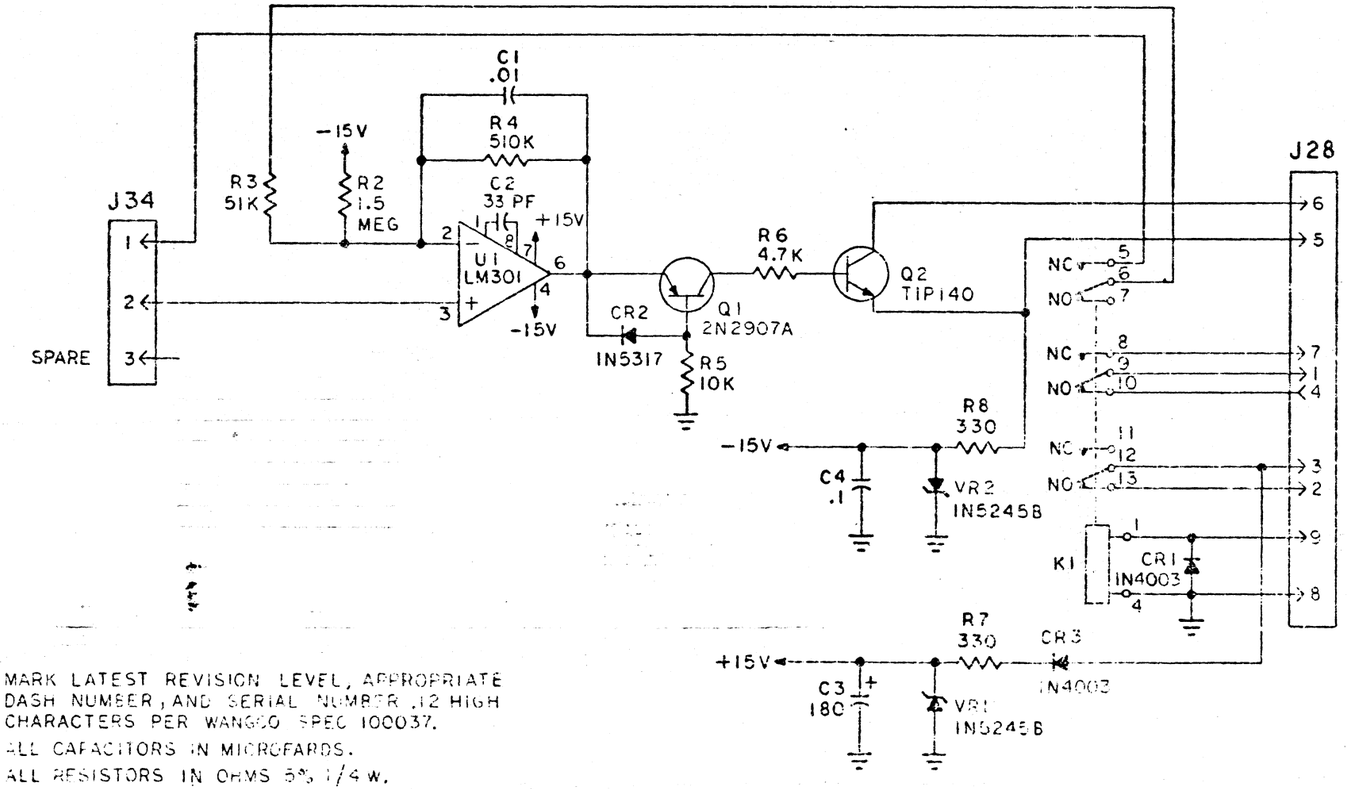
APPROVED DATE 3-22-76

ITEM NO.	DESCRIPTION	PART NO.	REQD	ENG. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:	301035-000		E		NEXT ASSEMBLY/USED ON
46	Capacitor 820pf	100243-821	1			C2.
47	Capacitor 820pf	100243-821	1			C18.
48						
49	Jumper, Insulated	300648-001	13			Jumper J1 A to B
						J2 WW to XX
						J3 G to J
						J4 GG to HH
						J5 L to M
						J6 KK to MM
						J7 PP to SS
						J8 DD to EE
						J9 BB to Y
						J10 AA to X
						J11 T to U
						J12 P to R
						J13 UU to VV

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT REL			
A	CR/O 9454			
A	MFG RELEASE NO CHANGE			
A1	CR/O 7565			
B	CR/O 8269			
B1	CR/O 8344			







LAST USED	DELETED
U1	
Q2	
C4	
CR3	
VR2	
R8	R1
K1	

3. MARK LATEST REVISION LEVEL, APPROPRIATE DASH NUMBER, AND SERIAL NUMBER .12 HIGH CHARACTERS PER WANGCO SPEC 100037.
2. ALL CAPACITORS IN MICROFARDS.
1. ALL RESISTORS IN OHMS 5% 1/4 W.

NOTES UNLESS OTHERWISE SPECIFIED.

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PART NUMBER. SEE SEPARATE MATERIAL LIST

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX ±, .XXX ± ANGULAR ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES √
4. ALL DIMS IN INCHES

DRAWN
CHECK
APPR
MATERIAL
FINISH
MODEL NO. F&T
NEXT ASSY 402400 412400

Wangco Incorporated

ASSEMBLY, PWB., EMERGENCY RETRACT

SCALE 2:1 | SIZE D | 301044-100 | REV B

PROJECTION | SHEET 1 OF 1

B-47

D120

WANGCO INCORPORATED

MATERIAL LIST

ML | DRAWING NO. 301044-001 | REV. E1

DRAWING TITLE: ASSEMBLY PWB EMERGENCY RETRACT | MODEL NO. Disc | DATE 10/16/74 | SHEET 1 OF 2

REV. | DRAWING NO. 301044-001 | ML

Item No.	Drawing Title	Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
1	Board, Processed.	301043-001	C	1	
2					
3					
4	I.C. LM301AN	101021-001		1	U1.
5					
6	Transistor, 2N2907A	101053-001		1	Q1.
7	Transistor, TIP140	101140-001		1	Q2.
8					
9					
10	Diode, Rectifier. 1N4003	100127-001		2	CR1,3.
11	Diode 1N5317	101034-001		1	CR2.
12					
13					
14					
15	Diode, Zener. 1N5245B	101058-019		2	VR1,2.
16					
17					
18	Capacitor.Mica,500V,5% 33pf	100243-330		1	C2.
19	Capacitor.Poly,80V,10% .01uf	101004-103		1	C1.
20	Capacitor.Cer.,50V,20% .1uf	101087-104		1	C4.
21	Capacitor.Tant,15V,20% 180uf	102761-187		1	C3.
22					
23					
24					
25	Resistor, 5%,½W. 330	101156-331		2	R7,8.
26	Resistor, " " 4.7K	" -472		1	R6.
27	Resistor, " " 10K	" -103		1	R5.
28	Resistor, " " 51K	" -513		1	R3.
29	Resistor, " " 510K	" -514		1	R4.
30	Resistor, " " 1.5Meg	" -155		1	R2.
31					
32					

REV. P

DRAWING NO. 301044-001

ML

WANGCO INCORPORATED

MATERIAL LIST

ML | DRAWING NO. 301044-001 | REV. P.

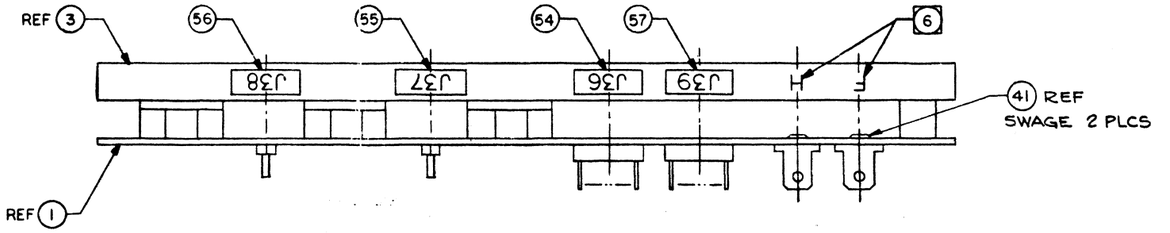
DRAWING TITLE: ASSEMBLY PWB EMERGENCY RETRACT

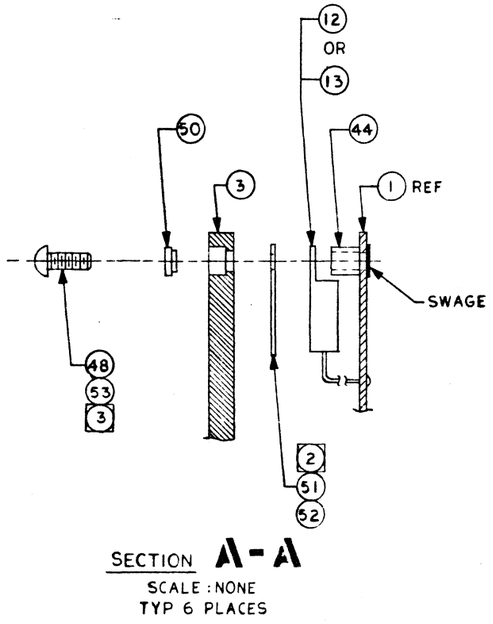
MODEL NO. DISC DATE 10/16/74 SHEET 2 OF 2

Item No.	Drawing Title	Dwg. No.	Rev.	Qty.	Remarks on Ckt. Desig.
33	Socket, Relay.	100241-001		1	
34					
35	Relay.	100240-001		1	K1.
36					
37	Connector, 9Pin.	100247-004		1	J28.
38	Pin, Conn.	100360-001		2	.025 Square
39	Insulator, Transistor.	100147-002		1	
40	Screw, Pan Hd, Nylon.	101172-208		1	4-40 x ½"
41	Washer, Nylon.	101185-001		1	
42	Spacer, Fibre.	100391-015		1	No. 4 3/16 x ¼ O.D.
43	Washer, Flat, Nylon.	100050-100		1	No. 4
44	Nut, Hex, Nylon.	136002-002		1	No. 4-40
45					
46					
47					
48					
49					
50	Printed Master.	301042-001		0	
51	Assy Dwg.	301044-100		0	

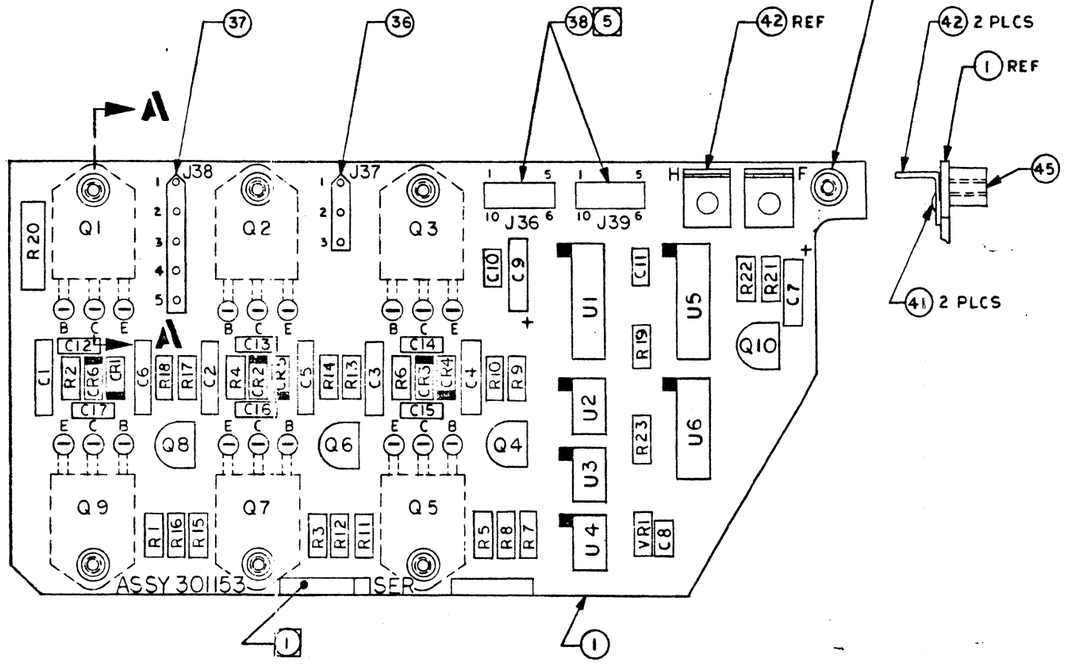
FORM 209 (5/74)

REVISIONS				301153 E
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT RELEASE	[illegible]	[illegible]	[illegible]
B	CR/O 5627	[illegible]	7/1/75	[illegible]
C	CR/O 5690 MFG RLSE	[illegible]	7/14/75	[illegible]
D	CR/O 5921	[illegible]	9/15/75	[illegible]
E	CR/O 6140	[illegible]	11/8/75	[illegible]





SECTION A-A
SCALE : NONE
TYP 6 PLACES



6 RUBBER STAMP REFERENCE DESIGNATIONS .12HIGH WHITE CHARACTERS.

5 FOR POLARIZATION OF CONNECTORS, CUT FOLLOWING PINS FLUSH WITH BASE: J36-10 AND J39-3.

4. FOR SCHEMATIC SEE DWG NO. 301154.

3 INSERT AND TIGHTEN SCREW, ITEM 48, APPLYING 6 INCH POUNDS OF TORQUE.

2 APPLY THERMAL JOINT GREASE ON BOTH SIDES OF MICA WASHER.

1 MARK APPROPRIATE DASH NUMBER, LATEST REVISION LETTER, AND SERIAL NUMBER WHERE SHOWN .12 HIGH CHARACTERS COLOR BLACK PER WANGCO SPEC 100037.

NOTES: UNLESS OTHERWISE SPECIFIED

PART NO. 301153-002 ASSY

NOTES UNLESS SPECIFIED 1. TOLERANCES .XX± —, .XXX± —, ANGULAR ± — 2. BREAK ALL SHARP EDGES APPROX. .010 3. MACH. SURFACES √ 4. ALL DIMS IN INCHES.	DRAWN [illegible] 8/14/75 CHECK APPR. [illegible]	Wangco Incorporated ASSEMBLY, PWB, BRUSHLESS DC SPINDLE MOTOR DR PWR SWITCH	CODE IDENT. 12040 QTY. REQ'D. 1
	MATERIAL — FINISH —		
	MODEL No. F & T 100/200 TPI NEXT ASSY TOP	SCALE 2:1 SIZE D 301153 WEIGHT	E SHEET 1 OF 1
	DO NOT SCALE THIS DRAWING	B-51	

USED WITH 301920 COMMUTATOR BD.

CODE D120

REV. C

ASSEMBLY PART NUMBER 301153-101

WANGCO (PERKIN ELMER DATA SYSTEMS)

MATERIAL LIST

ASSEMBLY PART NUMBER 301153-101 REV. C

TITLE ASSY, PWB BRUSHLESS SPINDLE MOTOR, DR. PWR. SW. 100/200 TPI MODEL F & T DATE 6/9/77 SHEET 1 OF 2

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
1	1	301152-001	Board, Processed		REV C
2					
3	1	301178-001	Plate, Heatsink		
4					
5					
6	1	123037-001	IC	74LS42	U1
7	3	101139-001	IC	75451	U2,3,4
8	1	123040-001	IC	74LS157	U5
9	1	123036-001	IC	74LS74	U6
10					
11					
12	3	101146-001	Transistor	TIP145	Q1,2,3
13	3	101140-001	Transistor	TIP140	Q5,7,9
14	3	101053-001	Transistor	2N2907A	Q4,6,8
15	1	101052-001	Transistor	2N2222A	Q10
16					
17					
18	6	100127-001	Diode, Rectifier	1N4003	CR1,2,3,4,5,6
19					
20	1	101058-005	Diode, Zener, 4.7V	1N5230B	VR1
21					
22					
23	3	101042-103	Capacitor, Ceramic	.01uf	C8,10,11
24	6	101004-683	Capacitor, Poly	.068uf	C1,2,3,4,5,6
25	1	101003-685	Capacitor, Tant., 35V	6.8uf	C7
26	1	101002-156	Capacitor, " 20V	15uf	C9
27					
28	3	101156-511	Resistor, 5%, ¼W	510	R1,3,5
29					
30	5	101156-102	Resistor, 5%, ¼W	1K	R8,12,16,19,23
31	12	-202	Resistor, " "	2K	R2,4,6,7,9,10,11,13,14,15,17,
					R18

FORM 209 (R 3/77)

2C

CODE D120

REV. C

ASSEMBLY PART NUMBER 301153-101

WANGCO (PERKIN ELMER DATA SYSTEMS)

MATERIAL LIST

ASSEMBLY PART NUMBER 301153-101 REV. C

TITLE ASSY, PWB BRUSHLESS SPINDLE MOTOR, DR. PWB. SW. 100/200 TPI MODEL F & T DATE 6/9/77 SHEET 2 OF 2

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
32	1	101156-302	Resistor, 5%, ¼W	3K	R21
33	1	-512	Resistor, " "	5.1K	R22
34					
35					
36	1	100247-015	Connector	3 Pin	J37
37	1	-007	Connector	5 Pin	J38
38	2	120905-001	Connector	10 Pin	J36, 39
39					
40					
41	2	100429-001	Rivet, Al., Univ. Head		.095 dia. X .156 lg.
42	2	101135-001	Terminal		AMP 61407-1
43					
44	6	147800-001	StandOff - Swage Type		.250 dia. X .187 lg.
45	1	-002	StandOff " "		.250 dia. X .250 lg.
46					
47	A/R	100051-024	Wire, Buss		Jumper R20
48	6	100036-206	Screw, Pan Hd.		4-40 X 3/8 lg.
49		[illegible]	[illegible]		[illegible]
50	6	100063-013	Washer, Nylon Shoulder		
51	6	100147-001	Insulator, Mica		Use with item 12 & 13
52	A/R	120100-001	Grease, Thermal Joint		
53					
54	1	202341-036	Marker, Connector-J		J36
55	1	-037	Marker, " "		J37
56	1	-038	Marker, " "		J38
57	1	-039	Marker, " "		J39
58					
59	0	301154-001	Schematic		
60	0	301196-001	Printed Master		

FORM 209 (R 3/77)

USED WITH 301920 COMMUTATOR BD.

CODE D120

REV. B

ASSEMBLY PART NUMBER 301153-102

WANGCO (PERKIN ELMER DATA SYSTEMS)

MATERIAL LIST

ASSEMBLY PART NUMBER 301153-102 REV. B

TITLE ASSY, PWB BRUSHLESS SPINDLE MOTOR, DR. PWR. SW. 100/200 TPI MODEL F & T DATE 6/9/77 SHEET 1 OF 2

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
1	1	301152-001	Board, Processed		REV C
2					
3	1	301178-001	Plate, Heatsink		
4					
5					
6	1	123037-001	I.C.	74LS42	U1
7	3	101139-001	I.C.	75451	U2,3,4
8	1	123040-001	I.C.	74LS157	U5
9	1	123036-001	I.C.	74LS74	U6
10					
11					
12	3	151004-001	Transistor		Q1,2,3
13	3	151003-001	Transistor		Q5,7,9
14	3	101053-001	Transistor	2N2907A	Q4,6,8
15	1	101052-001	Transistor	2N2222A	Q10
16					
17					
18	6	100127-001	Diode, Rectifier	1N4003	CR1,2,3,4,5,6
19					
20	1	101058-005	Diode, Zener, 4.7V	1N5230B	VR1
21					
22	6	101086-334	Capacitor, Ceramic	.33uf	C12,13,14,15,16,17
23	3	101042-103	Capacitor, Ceramic	.01uf	C8,10,11
24	6	101004-103	Capacitor, Poly	.01uf	C1,2,3,4,5,6
25	1	101003-685	Capacitor, Tant., 35V	6.8uf	C7
26	1	101002-156	Capacitor, " 20V	15uf	C9
27					
28	3	101156-331	Resistor, 5%, ¼W	330	R1,3,5
29					
30	5	101156-102	Resistor, 5%, ¼W	1K	R8,12,16,19,23
31	6	-202	Resistor, " "	2K	R7,9,11,13,15,17

FORM 209 (R 3/77)

CC

CODE D120

REV. B

ASSEMBLY PART NUMBER 301153-102

WANGCO (PERKIN ELMER DATA SYSTEMS)

MATERIAL LIST

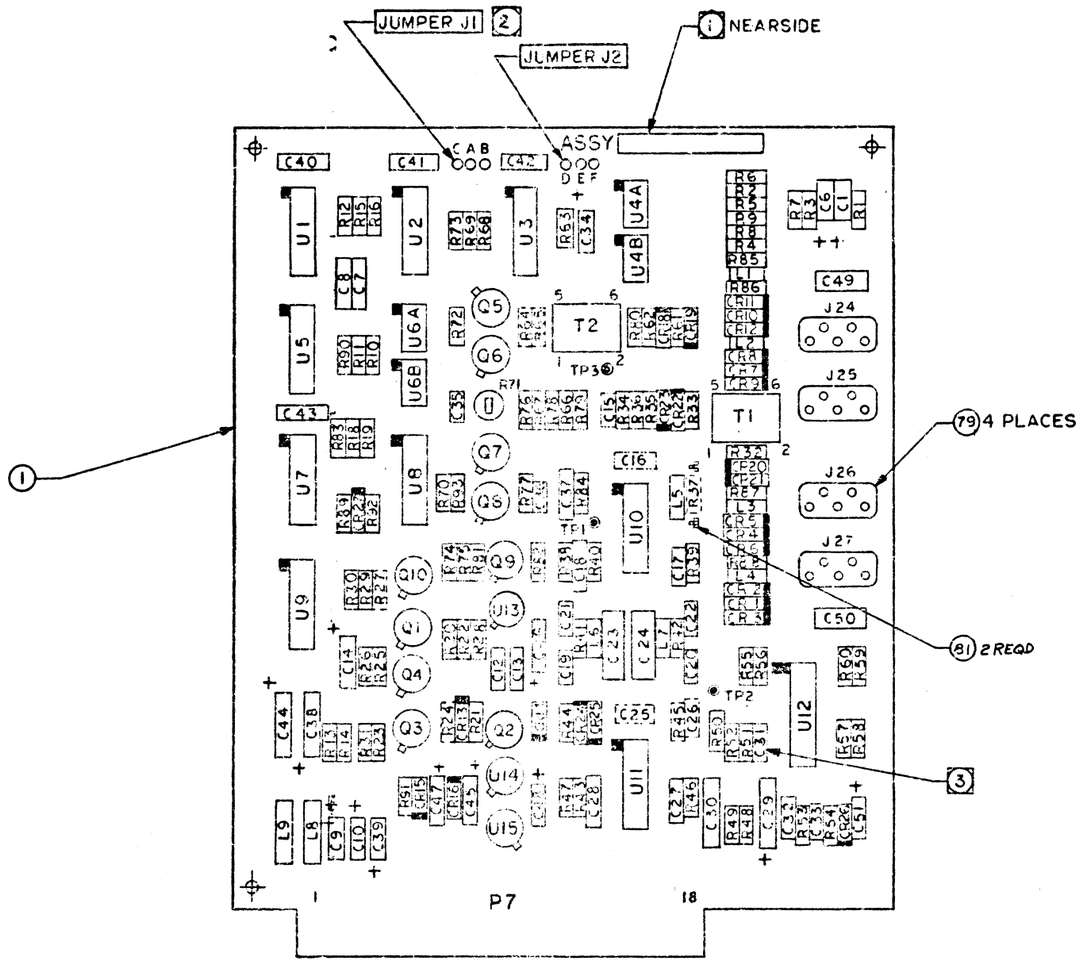
ASSEMBLY PART NUMBER 301153-102 REV. B

TITLE ASSY, PWB BRUSHLESS SPINDLE MOTOR, DR. PWR SW. 100/200 TPI MODEL F & T DATE 6/9/77 SHEET 2 OF 2

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
32	1	101156-302	Resistor, 5%, ¼W	3K	R21
33	1	-512	Resistor, " "	5.1K	R22
34	6	-511	Resistor, " "	510	R2,4,6,10,14,18
35					
36	1	100247-015	Connector	3 Pin	J37
37	1	-007	Connector	5 Pin	J38
38	2	120905-001	Connector	10 Pin	J36,39
39					
40					
41	2	100429-001	Rivet, Al., Univ. Head		.095 dia. X .156 lg.
42	2	101135-001	Terminal		
43					
44	6	147800-001	Standoff - Swage Type		.250 dia. X .187 lg.
45	1	-002	Standoff " "		.250 dia. X .250 lg.
46					
47	A/R	100051-024	Wire, Buss		Jumper R20
48	6	100036-206	Screw, Pan Hd.		4-40 X 3/8 lg.
49					
50	6	100063-013	Washer, Nylon Shoulder		
51	6	100147-001	Insulator, Mica		Use with item 12 & 13
52	A/R	120100-001	Grease, Thermal Joint		
53	A/R	100303-004	Cement		
54	1	202341-036	Marker, Connector-J		J36
55	1	-037	Marker, " "		J37
56	1	-038	Marker, " "		J38
57	1	-039	Marker, " "		J39
58					
59	0	301154-001	Schematic		
60	0	301151-001	Printed Master		
61					
62	1	301405-001	Rework Instructions		

FORM 209 (R 3/77)

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT RELEASE			
B	CR/O 5810			
C	CR/O 6026			
D	CR/O 6182			
D1	MFG RELEASE NO CHANGE			
E	CR/O 6488			
F	CR/O 6710			
G	CR/O 6977			
H	CR/O 7433			
H1	CR/O 7537			
J	CR/O 8042			



'EMATIC SEE DWG 301158.

'ENTS SHOWN IN PHANTOM ARE VARIABLE.
'ULATED M/L FOR VALUES.

'ER LOCATIONS SEE TABULATED M/L.

APPROPRIATE DASH NUMBER, S/N AND LATEST ON LETTER .12 HIGH WHITE CHARACTERS PER O SPEC 100037.

...LESS OTHERWISE SPECIFIED

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PART NO. 301157 – XXX SEE TABULATED M/L

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± —— ANGULAR .XXX± —— °
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES ✓
4. ALL DIMS IN INCHES.

DRAWN 9/4/75
CHECK
APPR.
MATERIAL
FINISH
MODEL No. 200 TPI F & T
NEXT ASSY 300000 -00001

Wangco Incorporated

ASSY, PWB – DATA ELECTRONICS

SCALE 2:1 SIZE D 301157 J

WEIGHT SHEET 1 OF 1

B-55

BASIC

D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-000 REV. J

TITLE ASSY. PWB. DATA ELECTRONICS 100/200TPI F & T DATE 5/21/75 SHEET 1 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Board, Processed.	301156-001	1	E		
2						
3						
4	IC 74S74	123023-001	1			U2.
5	IC 7426	101011-001	3			U1,8,9.
6	IC 311	101022-001	1			U6A.
7	IC 75452	101031-001	2			U4A,4B.
8	IC 592	101032-001	2			U10,11.
9	IC 75451	101139-001	1			U6B.
10	IC 7414	123001-001	3			U3,5,7.
11	IC 10116	125000-001	1			U12.
12	IC 78M06HC	125005-006	1			U14.
13	IC 78M08HC -008		1			U13.
14	IC 79M06AHC	125007-006	1			U15.
15	Transistor. 2N2222A	101052-001	3			Q1,4,10.
16	Transistor, 2N2907A	101053-001	7			Q2,3,5,6,7,8,9,.
17						
18						
19						
20						
21						
22						
23						
24	Diode. 1N5317	101034-001	21			CR1,2,3,4,5,6,7,8,9,10,11,
						CR12,18,19,20,21,22,23,
						CR24,25,26.
25	Diode 3.9V 1N5228	101058-003	1			CR27
26	Diode 1N4003	100127-001	4			CR13,14,15,16.
27						
28	Inductor, 5% 1.5uh	122500-003	1			L5.
29	Inductor, " 27uh	101074-270	6			L1,2,3,4,6,7,
30	Inductor, " 220uh	122500-001	2			L8,9.

D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-000 REV. J

TITLE ASSY. PWB. DATA ELECTRONICS, 100/200TPI F & T DATE 5/21/75 SHEET 2 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
31						
32	Capacitor, Mica. 56pf	100243-560	3			C35,36,37.
33	Capacitor, Mica. 62pf	-620	4			C19.20,21,22, .
34						
35						
36						
37	Capacitor, Ceramic. .01uf	101042-103	15			C7,8, 12,13,17,18,27,28,
						C33,40,41,42,43,49,50.
38	Capacitor, Poly. .022uf	101004-223	4			C23,24,29,30.
39	Capacitor, Tantl. 20V 2.2uf	101002-225	11			C1,6,9,10,32,34,45,46,47,
						C48,51.
40	Capacitor, Tantl. 20V. 15uf	101002-156	3			C38,39,44.
41	Capacitor, " 6V. 56uf	101001-566	1			C14.
42						
43						
44						
45	Resistor, Var. 100	101148-101	1			R71.
46						
47						
48	Resistor, 5%, ½W. 10	101156-100	10			R18,35,36,38,39,46,47,61,
						R62,63
49	Resistor, 5%, ½W. 15	101156-150	1			
50						
51	Resistor, " " 33	-330	2			R66,67.
52	Resistor, " " 47	-470	3			R19,51,52
53	Resistor, " " 56	-560	2			R1,29.
54	Resistor, " " 75	-750	1			R79.
55	Resistor, " " 100	-101	2			R33,78.
56	Resistor, " " 200	-201	3			R72,73,93
57	Resistor, " " 330	-331	1			R70
58	Resistor, " " 360	-361	2			R68,69.
59	Resistor, " " 470	-471	4			R41,42,43,44.

D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-000 REV. J

TITLE ASSY. PWB. DATA ELECTRONICS. 100/200TPI F & T. DATE 5/21/75 SHEET 3 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
60	Resistor,5%, ½W. 510	101156-511	2			R48,49.
61	Resistor, " " 1K	-102	7			R13,14,80,85,86,87,88.
62	Resistor, " " 1.2K	-122	1			R53.
63	Resistor, " " 1.5K	-152	7			R32,55,56,57,58,59,60.
64	Resistor, " " 1.8K	-182	1			R54.
65	Resistor, " " 2K	-202	12			R12,15,16, ,27,30,31,40,50
						R74,76,83,89.
66	Resistor,5%, ¼W. 2.4K	101156-242	1			R20
67	Resistor, " " 3K	-302	1			R34.
68	Resistor, " " 5.1K	-512	8			R21, 26, 75, 77, 81, 82, 90,
						R91.
69	Resistor,5%, ¼W. 10K	-103	5			R2,3,4,5,25.
70	Resistor, " " 20K	-203	1			R84.
71	Resistor, " " 43K	-433	1			R10.
72	Resistor, " " 68K	-683	1			R11.
73	Resistor, " " 100K	-104	4			R6,7,8,9.
74	Resistor, " " 27.K	-273	1			R92.
75						
76						
77	Transformer.	101060-001	1			T1.
78	Transformer.	-002	1			T2.
79	Connector, 5 Pin.	101133-001	4			J24,25,26,27.
80	Pin, Wire Wrap.	100360-001	9			Test Point & Jumper Points.
81	Pin	100337-002	2			To Be Used With Item 94
82						
83						
	Schematic.	301158-001	0	J		
	Printed Master.	301155-001	0			
	Procedure, Test.	900088-001	0			
	Rework Instructions	302230-001	0			

2400 RPM HEAD SELECT: INV. DISC SELECT: INV. CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157--001 REV. K

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 200TPI F&T DATE 4-15-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		402450-003
90						
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,⅛W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor, 5%,⅛W 330	101156-331	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
97						
98						
99						
100	Jumper, Insulated	300648-001	A/R			Jumper J1 B to C
						J2 E to F

2400 RPM HEAD SELECT: INV. DISC SELECT: INV. CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-002 REV. K

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 200TPI F&T DATE 4-15-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		
90						
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,⅛W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor, 5%,⅛W 330	101156-331	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
97						
98						
99						
100	Jumper, Insulated	300648-001	A/R			Jumper J1 A to B
						J2 E to F

2400 RPM HEAD SELECT: STD. DISC SELECT: INV. CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-003 REV. K

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 200TPI F&T DATE 4-15-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		
90						
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,⅛W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor, 5%,⅛W 330	101156-331	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
97						
98						
99						
100	Jumper, Insulated	300648-001	A/R			Jumper J1 B to C
						J2 D to E

2400 RPM HEAD SELECT: STD. DISC SELECT: STD. CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-004 REV. K

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 200TPI F&T DATE 4-15-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		
90						
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,⅛W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor, 5%,⅛W 330	101156-331	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
97						
98						
99						
100	Jumper, Insulated	300648-001	A/R			Jumper J1 A to B
						J2 D to E

1500RPM HEAD SELECT: INV. DISC SELECT: INV. CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-005 REV. E

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 200TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		
90						
91	Capacitor, Mica 100pf	100243-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,⅛W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor, 5%,⅛W 180	101156-181	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
97						
98						
99						
100	Jumper, Insulated	300648-001	2			Jumper J1 B to C
						J2 E to F

1500RPM
HEAD SELECT: STD.
DISC SELECT: INV.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-006 REV. E

ASSY. PWB.
TITLE DATA ELECTRONICS MODEL 200TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
91	Capacitor, Mica 100pf	100243-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%, ¼W 180	101156-181	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 A to B J2 E to F

1500 RPM
HEAD SELECT: INV.
DISC SELECT: STD.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-007 REV. F

ASSY. PWB
TITLE DATA ELECTRONICS MODEL 200TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
91	Capacitor, Mica 100pf	100243-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%,¼W 180	101156-181	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 B to C J2 D to E

1500RPM
HEAD SELECT: STD.
DISC SELECT: STD.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-008 REV. E

ASSY. PWB.
TITLE DATA ELECTRONICS MODEL 200TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
91	Capacitor, Mica 100pf	100243-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%, ¼W 180	101156-181	1			R45
96	Resistor, " " 3.0K	-302	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 A to B J2 D to E

2400RPM
HEAD SELECT: INV.
DISC SELECT: INV.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-101 REV. F

ASSY. PWB.
TITLE DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%,¼W 330	101156-331	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 B to C J2 E to F

2400RPM
HEAD SELECT: STD.
DISC SELECT: INV.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-102 REV. F

ASSY. PWB.
TITLE DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%,¼W 330	101156-331	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 B to C J2 D to E

2400RPM
DISC SELECT: STD.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-103 REV. F

ASSY. PWB.
TITLE DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%,¼W 330	101156-331	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 B to C J2 D to E

2400RPM
HEAD SELECT: STD.
DISC SELECT: STD.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-104 REV. F

ASSY. PWB.
TITLE DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
91	Capacitor, Mica 62pf	100243-620	1			C26
92	Capacitor, " 100pf	-101	1			C25
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%, ¼W 330	101156-331	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 A to B J2 D to E

1500RPM
HEAD SELECT: INV.
DISC SELECT: INV.
CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-105 REV. F

ASSY. PWB.
TITLE DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
90	Capacitor, Mica 15pf	100243-150	1			C15
91	Capacitor, " 100pf	-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50^)
95	Resistor, 5%,¼W 180	101156-181	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 B to C J2 E to F

1500 RPM

HEAD SELECT: STD.
DISC SELECT: INV.

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-106 REV. F

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	ENGR. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
90	Capacitor, Mica 15pf	100243-150	1			C15
91	Capacitor, " 100pf	-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor,5%,¼W 180	101156-181	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 A to B J2 E to F

1500RPM

HEAD SELECT: INV.
DISC SELECT: STD.

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301157-107 REV. F

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	ENGR. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
90	Capacitor, Mica 15pf	100243-150	1			C15
91	Capacitor, " 100pf	-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor, 5%, ¼W 180	101156-181	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 B to C J2 D to E

1500RPM

HEAD SELECT: STD.
DISC SELECT: STD.

CODE D120

WANGCO INCORPORATED

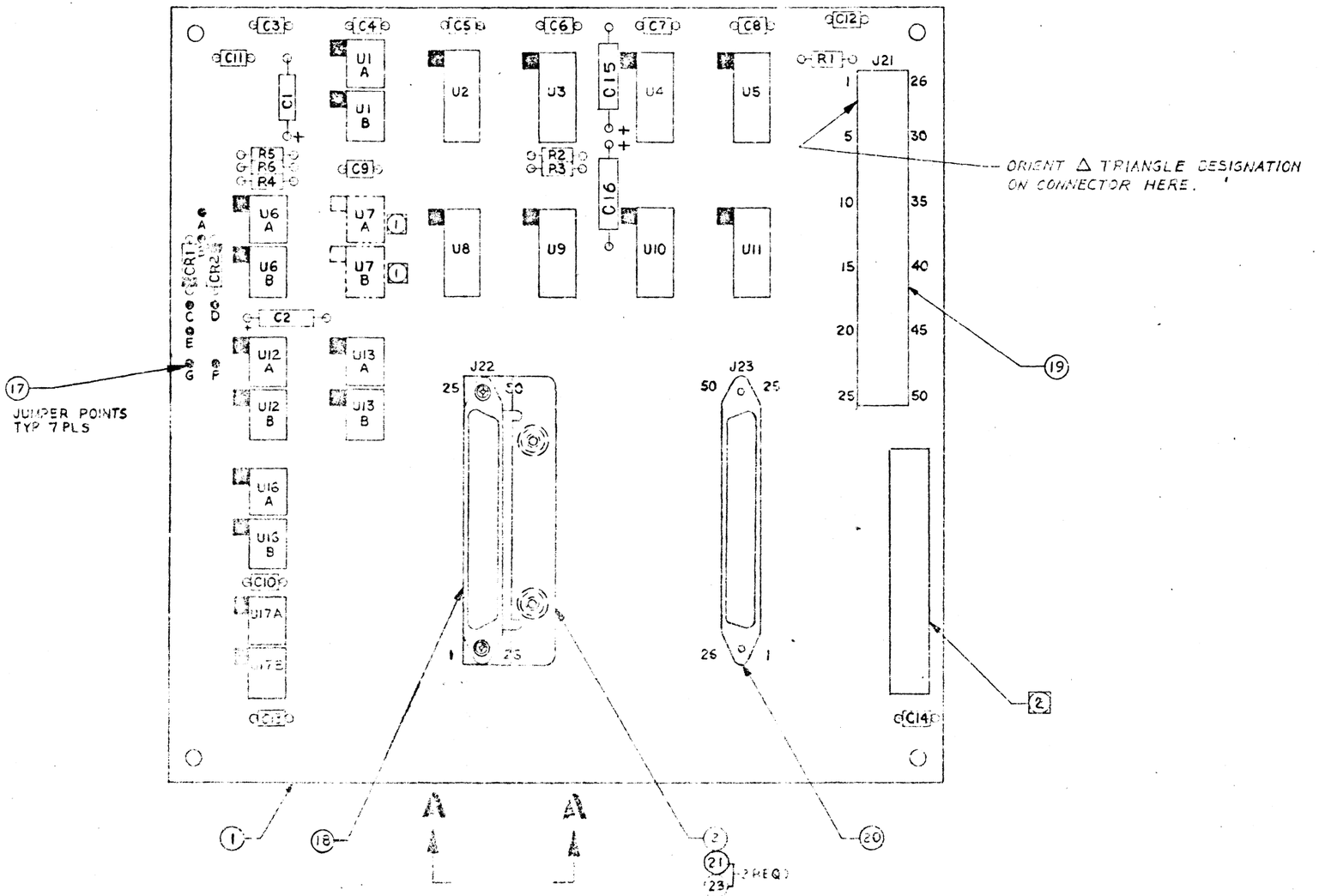
MATERIAL LIST

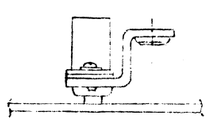
PART NUMBER 301157-108 REV. F

TITLE ASSY. PWB. DATA ELECTRONICS MODEL 100TPI F&T DATE 4-13-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	ENGR. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301157-000		J		NEXT ASSEMBLY/USED ON
90	Capacitor, Mica 15pf	100243-150	1			C15
91	Capacitor, " 100pf	-101	1			C25
92	Capacitor, " 180pf	-181	1			C26
93						
94	Resistor, 5%,¼W	302075-001	1			R37 test select(1.00 to 50Ω)
95	Resistor, 5%,¼W 180	101156-181	1			R45
96	Resistor, " " 2.4K	-242	2			R64,R65
100	Wire, Jumper	300648-001	A/R			Jumper J1 A to B J2 D to E

REV				
A	MFG REL			
B	CR/O 7026			
C	CR/O 7784			





VIEW

3. FOR SCHEMATIC REF DWG SEE 301180.
2. MARK PART NUMBER APPROPRIATE DASH NUMBER ASSY, S/N AND LATEST REVISION LETTER, .12 HIGH WHITE CHARACTERS PER WANGCO SPEC 100037
1. COMPONENT SHOWN IN PHANTOM LINES ARE VARIABLE SEE M/L.

NOTES: UNLESS OTHERWISE SPECIFIED

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC AND MAY NOT, IN WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC

PART NO 301179-XXX SEE TABULATED M/L ASSY

ASSEMBLY P.W.B
I.O. CONNECTOR

301179 C

WANGCO INCORPORATED

MATERIAL LIST

CODE D120

PART NUMBER	REV.
301179-000	C

TITLE ASSY. I/O CONNECTOR PWB. MODEL Disc. DATE 3/20/75 SHEET 1 OF 2

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
1	Board, Processed.	300073-001	1	D		
2	Retainer, Connector. Bottom.	300589-001	1			
3						
4	I.C. 8T380	100347-001	8			U2.3.4.5.8.9.10.11.
5	I.C. 75452	101031-001	12			U1A.1B.6A.6B.12A.12B.13A.
						13B.U16A.16B.17A.17B.
6						
7						
8	Diode. 1N4003	100127-001	2			CR1.2.
9						
10	Capacitor. 100V. .01uf	101042-103	8			C3.4.5.6.7.8.9.10.
11	Capacitor. .1uf	100364-104	4			C11.12.13.14.
12	Capacitor. 20V. 15uf	101002-156	2			C1.2.
13	Capacitor. 6V. 56uf	101001-566	2			C15,C16.
14	Resistor. 5%,¼W. 75	101156-750	1			R1.
15	Resistor. " " 1K	" -102	4			R2.3.4.5.
16						
17	Pin, Wire Wrap	100360-001	7			A,B,C,D,E,F,G
18	Connector, Male. 50 pin.	101036-001	1			J22.
19	Connector, " 50 pin.	101040-001	1			J21.
20	Connector, Female. 50 pin.	101037-001	1			J23.
21	Screw, Pan Head.	100036-103	2			2-56 x 3/16"
22						
23	Washer, Flat.	100047-100	2			No. 2.
24						
25	Test Procedure.	900000-001	0			
26	Wire, Solid.	100248-924	A/R			Jumper J2. From C to D.
27						Jumper J3. " E to F.
28						Jumper J4. " E to G.
29						
30	Schematic.	301180-001	0	A		
31	Artwork, Master.	300074-001	0			

TERMINATION VOLTAGE: INTERNAL. ATTENTION LINES; D-40/PERTEC NEGATIVE

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301179-001	B

TITLE ASSY. I/O CONNECTOR PWB. MODEL Disc. DATE 3/20/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:	301179-000		C		NONE
	Use Process Board.	300073-001	REF			
	Cut etch between U13B-6					
	to J21-7.					
	Add wire from J21-7 to					
	U3-9.10.					
	Add wire from U3-14 to U3-6.					
	Add wire from U13B-1 to U3-7.					
	Add wire from U13B-6 to U3-2.					
6	I.C. 75451	101139	2			U7A.7B. Add.
26	Wire, Solid.	100248-924	A/R			Add. Jumper J1 from A to B.

RDY. GATED WITH WRITE CHECK.
TERMINATION VOLTAGE: INTERNAL. ATTENTION LINES: POSITIVE.

CODE D120

WANGCO INCORPORATED

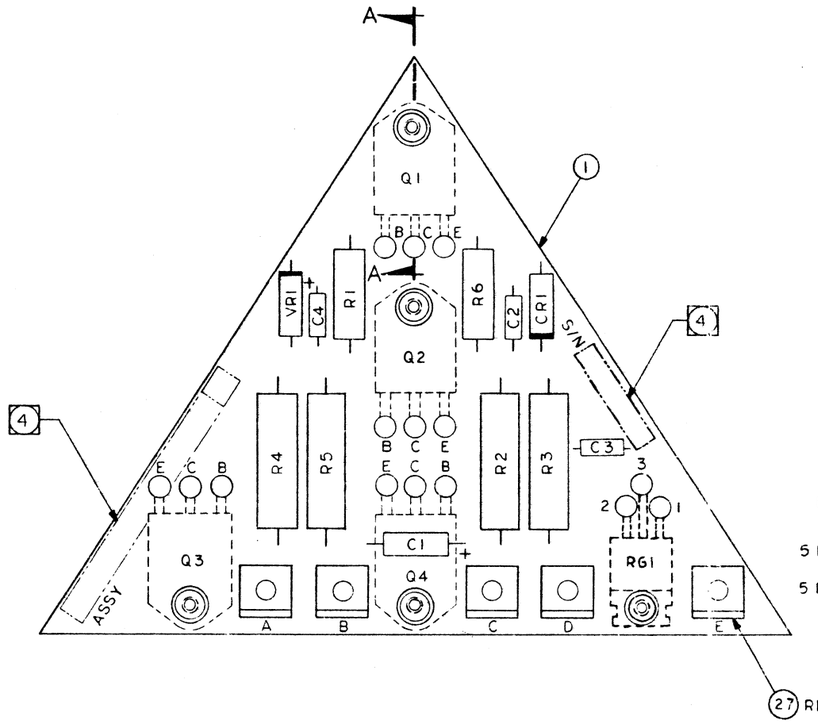
MATERIAL LIST

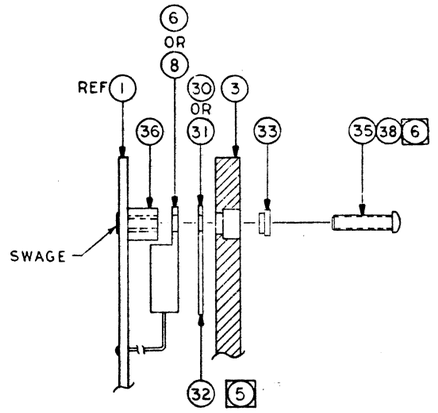
PART NUMBER	REV.
301179-002	B

TITLE ASSY. I/O CONNECTOR PWB. MODEL Disc. DATE 7/17/75 SHEET 1 OF 1

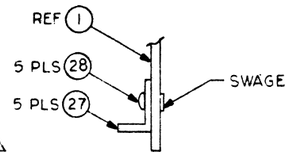
ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:-	301179-000		C		NEXT ASSEMBLY/USED ON 301524-014, 401524-009, 301500-003
	Use Process Board	300073-001	Ref.			
	Cut etch between U13B-6 to J21-7.					
	Add wire from J21-7 to U3-9.10.					
	Add wire from U3-14 to U3-6.					
	Add wire from U13B-1 to U3-7.					
	Add wire from U13B-6 to U3-2.					
6	I.C. 75452	101031-001	2			U7A,7B. Add.
26	Wire, Solid.	100248-924	A/R			Jumper J1 A to B. Add.

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	PILOT RELEASE			
A	MFG RELEASE			
B	C.R./O 5717			
C	CR/O 5923			
D	CR/O 6142			

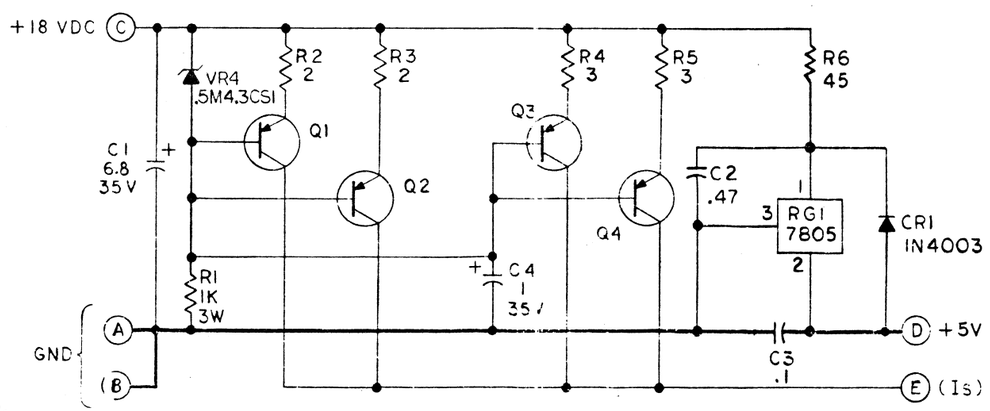




SECTION A-A
SCALE: NONE
TYP 5 PLS



LAST USED	DELETED
Q4	
RG1	
VR1	
CR1	
C4	
R6	



PART NO 301198-XXX SEE M/L

(6) INSERT AND TIGHTEN SCREW, ITEM 40, APPLYING 6 INCH LBS. OF TORQUE.

(5) APPLY THERMAL JOINT GREASE ON BOTH SIDES OF MICA WASHER.

(4) MARK LATEST REV. LEVELS, APPROPRIATE DASH NO., AND SERIAL NO. WERE SHOWN. .12 HIGH CHARACTERS COLOR: BLACK PER WANGCO SPEC 100037.

~~(3) FOR VR1 R6 C4 CR1 VALUES SEE M/L UNIT VERSIONS.~~

2. ALL CAPACITOR VALUES IN MICROFARADS.
1. ALL RESISTOR VALUES IN OHMS. 1%.5W.

NOTES: UNLESS OTHERWISE SPECIFIED,

NOTES UNLESS SPECIFIED		
1. TOLERANCES XX± ANGULAR .XXX± ±	DRAWN	
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK	
3. MACH. SURFACES	APPR.	
4. ALL DIMS IN INCHES.	MATERIAL	
	FINISH	
	MODEL No. F&T 10/20/30 TPI	
	NEXT ASSY	

Wangco Incorporated

ASSEMBLY, PWB,
SPINDLE DRIVE REGULATOR

SCALE	SIZE	
2:1	D	301198 CHARTED

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET

B-65

CODE
D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301198-002	B2

TITLE ASSY. PWB. SPINDLE DRIVE REGULATOR. MODEL F & T 100/200TPI DATE 9/23/75 SHEET 1 OF 2

REV B2

PART NUMBER 301198-002

DATE

APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
1	Board, Processed.	301197-001	1	C		
2						
3	Plate, Transistor Mtg.	300614-001	1			
4						
5						
6	Transistor.	151004-001	4			Q1,2,3,4.
7						
8	Regulator, Voltage,5V 7805	125006-005	1			RG1.
9						
10						
11	Diode. 1N4003	100127-001	1			CR1.
12	Diode, Zener 4.3V,1%.5M4.3CSI	107040-009	1			VR1.
13						
14	Capacitor, Tant. 35V. 1uf	101003-105	1			C4.
15	Capacitor, Tant. 35V. 6.8uf	-685	1			C1.
16	Capacitor, Ceramic. .47uf	101086-474	1			C2.
17	Capacitor, " .1uf	-104	1			C3.
18	Resistor, 1%, 5W. 2	142000-004	2			R2,3
19	Resistor, " " 45	-019	1			R6.
20	Resistor, 5%, 3W. 1K	100068-102	1			R1.
21	Resistor, 1%, 5W. 3	142000-006	2			R4,5
22						
23						
24						
25						
26						
27	Terminal.	101135-001	5			
28	Rivet, Al, Univ. Hd.	100429-001	5			.095 dia. x .156 lg.
29						
30	Insulator, Mica.	100147-001	4			Use with item 6.
31	Insulator, "	100146-001	1			Use with item 8.
32	Thermal Joint Grease.	120100-001	A/R			Use with item 6 & 8.

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301198-002	B2

TITLE ASSY. PWB. SPINDLE DRIVE REGULATOR. MODEL F & T 100/200TPI DATE 9/23/75 SHEET 2 OF 2

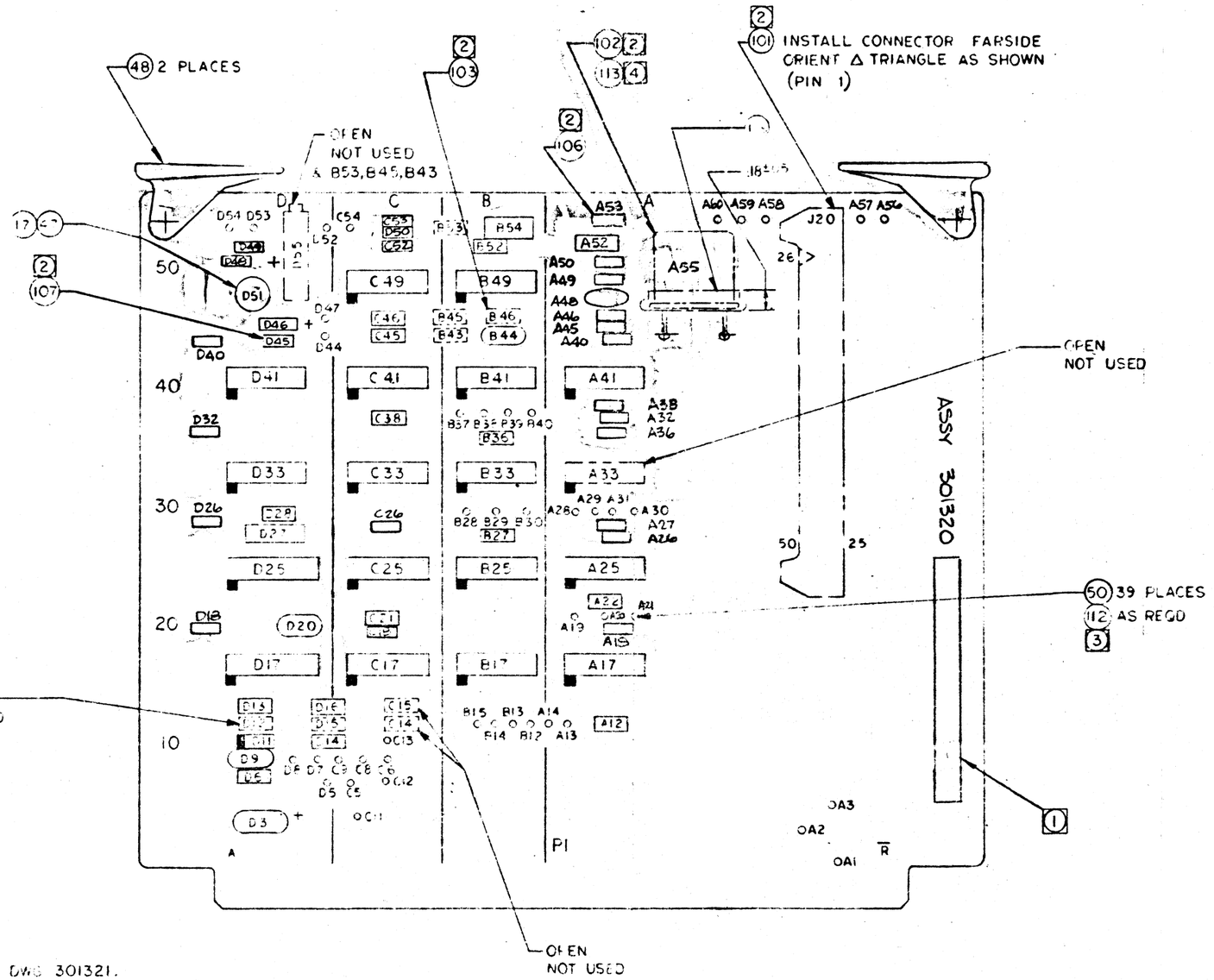
PART NUMBER 301198-002 REV. B2

APPROVED DATE

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
33	Washer, Nylon Shoulder.	100063-013	5			
34						
35	Screw, Pan Hd.	100036-206	5			4-40 X 3/8 lg.
36	Standoff, Swage.	147800-001	5			.250 dia x 3/16 lg.
37						
38	Cement.	100303-004	A/R			
39						
40	Printed Master.	301196	Ref			
41	Schematic.	301198-100	Ref	D		
42	Assy, Pwb., Spindle Drive	301198-100	42			
43	Rework Instructions	301406	1			

FORM 209 (R.12/74)

REV	DESCRIPTION	CHK.	DATE	APPROVED
A	MFG RELEASE			
B	C2/O 2384			
C	C4/O 6445			
D	[illegible]			
X1	ECO			
D1	C2/O 8020			
E	C2/O [illegible]			
E1	C2/O [illegible]			



5 FOR SCHEMATIC REFERENCE SEE DWG 301321.

3 SOLDER HOLD DOWN WIRE, ITEM 113, TO CASE OF CRYSTAL, ITEM 102, AND TO PLATED HOLE AS INDICATED.

4 FOR JUMPER LOCATIONS SEE M/L.

2 COMPONENTS SHOWN IN PHANTOM ARE VARIABLE. SEE M/L FOR REQUIREMENTS.

1 MARK APPROPRIATE DASH NUMBER, S/N AND LATEST REVISION LETTER .12 HIGH CHARACTERS COLOR WHITE, PER WANGCO SPEC 100037.

NOTES: UNLESS OTHERWISE SPECIFIED

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC AND MAY NOT BE WHOLLY OR IN PART BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC

NOTES UNLESS SPECIFIED		
1. TOLERANCES XX ± ANGULAR .XXX ±	DRAWN	[illegible] 12/18/75
2. BREAK ALL SHARP EDGES APPROX .010	CHECK	
3. MACH. SURFACES ✓	APPR.	
4. ALL DIMS IN INCHES.	MATERIAL	—
5. DIMENSIONS APPLY AFTER FINISH AND HEAT TREAT	FINISH	—
	MODEL No. SF & ST — F & T	
	HEAT ANY	

WANGCO INCORPORATED

ASSEMBLY, P.W.B — DATA INTERFACE VFO II

SCALE	SIZE	DWG NO.	REV
2:1	D	301320	D

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 1 OF 1

B-69

BASIC — CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-000 — REV. E

TITLE ASSEMBLY, PWB. DATA INTERFACE, VFO II — MODEL SF&ST, F&T — DATE 9/4/75 — SHEET 1 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Board, Processed.	301319-001	1			
2						
3						
4	I.C. 9602	100234-001	1			D25.
5	I.C. 74S00	123028-001	1			A41.
6	I.C. 4024	100344-001	1			B49.
7	I.C. 4044	100345-001	1			C49.
8	I.C. 8T20B	101024-001	1			D17.
9	I.C. 74S74	123023-001	1			D41.
10	I.C. 74LS00	123029-001	1			D33.
11	I.C. 74S04	123046-001	1			B17.
12	I.C. 74LS08	123032-001	2			B41,C25.
13	I.C. 74LS11	123034-001	1			A25.
14	I.C. 74LS32	123035-001	2			B25,C33.
15	I.C. 74LS74	123036-001	3			B33,C17,C41.
16	I.C. 74S08	123050-001	1			A17
17	I.C. 7805	125005-005	1			D51.
18						
19						
20	Diode, Zener 1N5231B	101058-006	1			D11.
21						
22						
23	Capacitor, Mica. 33pf	100243-330	2			A48,D20.
24	Capacitor, Mica. 47pf	-470	1			B44.
25	Capacitor, Mica. 510pf	-511	1			B54.
26						
27						
28	Capacitor, Poly. .0027uf	100165-272	1			D27.
29	Capacitor, Poly. .0047uf	-472	1			A52.
30	Capacitor, Poly. .01uf	101042-103	12			A18,A26,A32,A40,C18,C26,D9,
						D18,D26,D32,D40,D50.
32	Capacitor, 20v. 2.2uf	101002-225	2			D46,D48.
33	Capacitor, 6v. 56uf	101001-566	1			D3.

D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-000 — REV. E

TITLE ASSEMBLY. PWB. DATA, INTERFACE, VFO II — MODEL SF & ST,F&T — DATE 9/4/75 — SHEET 2 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
34	Resistor, 5%, ¼W. 10	101156-100	2			D14,D16.
35	Resistor, " " 75	-750	3			A12,A22,A27.
36	Resistor, " " 220	-221	2			A36,A45.
37	Resistor, " " 240	-241	1			D6.
38	Resistor, " " 200	-201	1			D49.
39	Resistor, " " 560	-561	1			A38.
40	Resistor, " " 1K	-102	9			A50,B27,B36,C21,C38,C45,
						C46,C52,C53.
42	Resistor, 5%, ¼W. 1.2K	101156-122	1			B52.
43	Resistor, " " 1.8K	-182	1			A46.
44	Resistor, " " 10K	-103	2			D13,D28.
45	Resistor " " 510	-511	1			A49
46						
47	Pad Transistor	100223-001	1			Used with Item 17
48	Extractor, Card.	107901-001	2			
49						
50	Pin Connector .025SQ	100369-001	44			A1,2,3,13,14,19,20,21,28,
						A29,30,31,56,57,58,59,60,
						B12,13,14,15,28,29,30,37,
						B38,39,40,C5,6,8,9,11,12,
						C13,54,D5,7,8,44,47,52,53,
						D54
56	Schematic	301321-001	0			
57	Printed Master	301318-001	0			
58	Test Procedure	900104-001	0			
59	Test Specification	900105-001	0			
60	Specification	301431-001	0			

1500RPM. WRITE - DF READ - PULSE 'D' WANGCO POSITIONER 1562 KHz — CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-101 — REV. F

TITLE ASSY. PWB. DATA INTERFACE, VFO. — MODEL 100 & 200 TPI — DATE 9/5/75 — SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		
101	Connector	101040-002	1			J20.
102	Crystal	101059-002	1			A55.
103	Capacitor. 20pf	100243-200	1			B46.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
106	Capacitor. .0027uf	101004-272	1			A53.
107	Resistor, 1%, ¼W. 6.34K	100155-366	1			D45.
112	Wire, Solid Insulated.	300648-001	A/R			Jumper A20 to A21.
						Jumper B39 to B40.
						Jumper B28 to B29.
						Jumper A28 to A30.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

1500RPM. WRITE - DF READ - NRZI ' C ' WANGCO POSITIONER 1562 KHz — CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-102 — REV. F

TITLE ASSY. PWB. DATA INTERFACE, VFO. — MODEL 100 & 200 TPI — DATE 9/5/75 — SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		
101	Connector.	101040-002	1			J20.
102	Crystal	101059-002	1			A55.
103	Capacitor. 20pf	100243-200	1			B46.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
106	Capacitor. .0027uf	101004-272	1			A53.
107	Resistor, 1%, ¼W. 6.34K	100155-366	1			D45.
112	Wire, Solid Insulated.	300648-001	A/R			Jumper A20 to A21.
						Jumper B38 to B40.
						Jumper B29 to B30.
						Jumper A28 to A30.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

1500RPM. WRITE - NRZI 62 KHz. Read - NRZI 'C' WANGCO POSITIONER — CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-104 — REV. F

TITLE ASSY. PWB. DATA INTERFACE, VFO — MODEL 100 & 200 TPI — DATE 9/5/75 — SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		
101	Connector	101040-002	1			J20.
102	Crystal.	101059-002	1			A55.
103	Capacitor. 20pf	100243-200	1			B46.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
106	Capacitor. .0027uf	101004-272	1			A53.
107	Resistor, 1%, ¼W. 6.34K	100155-366	1			D45.
112	Wire, Solid Insulated.	300648-001	A/R			Jumper A19 to A20.
						Jumper A28 to A29.
						Jumper B38 to B40.
						Jumper B29 to B30.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

1500RPM. WRITE - NRZI 1588.5 KHz. READ - NRZI 'C' WANGCO POSITIONER — CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-105 — REV. F

TITLE ASSY. PWB. DATA INTERFACE, VFO — MODEL 100 & 200 TPI — DATE 9/5/75 — SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		
101	Connector	101040-002	1			J20.
102	Crystal.	101059-004	1			A55.
103	Capacitor 20pf	100243-200	1			B46.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
106	Capacitor. .0027uf	101004-272	1			A53.
107	Resistor, 1%, ¼W 6.34K	100155-366	1			D45.
112	Wire, Solid Insulated.	300648-001	A/R			Jumper A19 to A20.
						Jumper A28 to A29.
						Jumper B38 to B40.
						Jumper B29 to B30.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

1500RPM WRITE - DF READ - UNDISCRIMINATED WANGCO POSITIONER — CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-106 — REV. E

TITLE ASSY. PWB. DATA INTERFACE, VFO. — MODEL 100 & 200 TPI — DATE 1-15-76 — SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		
101	Connector	101040-002	1			J20.
102	Crystal	101059-002	1			A55.
103	Capacitor 20pf	100243-200	1			B46.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
106	Capacitor .0027uf	101004-272	1			A53.
107	Resistor, 1%,¼W 6.34K	100155-366	1			D45.
112	Jumper, Insulated	300648-001	8			Jumper A20 to A21.
						Jumper B37 to B40.
						Jumper B28 to B29.
						Jumper A28 to A30.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
113	Wire, Solid	100051-024	A/R			Use with Item 102, A55.
						Jumper A 1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

2400RPM. WRITE - NRZI READ - NRZI 'C' WANGCO POSITIONER — CODE D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER 301320-107 — REV. F

TITLE ASSY. PWB. DATA INTERFECE, VFO. — MODEL 100 & 200 TPI — DATE 9/5/75 — SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		
101	Connector.	101040-002	1			J20.
102	Crystal.	101059-003	1			A55.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
107	Resistor, 1%, ¼W. 4.12K	100155-348	1			D45.
112	Wire, Solid Insulated.	300648-001	A/R			Jumper A19 to A20.
						Jumper A28 to A29.
						Jumper B38 to B40.
						Jumper B29 to B30.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
13	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

2400 RPM. WRITE - DF. READ - NRZI 'C' WANGCO POSITIONER CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301320-109 REV. F

TITLE ASSY. PWB. DATA INTERFACE, VFO. MODEL 100 & 200 TPI DATE 9/5/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		NEXT ASSEMBLY/USED ON
101	Connector	101040-002	1			J20.
102	Crystal.	101059-003	1			A55.
107	Resistor, 1%, ¼W. 4.12K	100155-348	1			D45.
112	Wire, Solid Insulated.	300648-001	A/R			Jumper A20 to A21.
						Jumper B38 to B40.
105	Tubing, Thermofit	100185-009	A/R			Jumper B29 to B30.
	Use with Item 102					Jumper A28 to A30.
						Jumper D7 to D8,
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

2400RPM.. WRITE - DF. READ - PULSE 'D' WANGCO POSITIONER CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301320-110 REV. F

TITLE ASSY. PWB. DATA INTERFACE,VFO MODEL 100 & 200 TPI DATE 9/5/75 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		NEXT ASSEMBLY/USED ON
101	Connector	101040-002	1			J20.
102	Crystal.	101059-003	1			A55.
107	Resistor, 1%, ¼W. 4.12K	100155-348	1			D45.
112	Wire, Solid Insulated.	300648-001	A/R			Jumper A20 to A21.
						Jumper B39 to B40.
						Jumper B28 to B29.
						Jumper A28 to A30.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

WRITE - DF 2400RPM READ - UNDISCRIMINATED WANGCO POSITIONER CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301320-113 REV. E

TITLE ASSY. PWB. DATA INTERFACE, VFO MODEL 100 & 200 TPI DATE 1-15-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING:-	301320-000		E		NEXT ASSEMBLY/USED ON
101	Connector	101040-002	1			J20.
102	Crystal	101059-003	1			A55.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
107	Resistor, 1%, ¼W 4.12K	100155-348	1			D45.
112	Jumper, Insulated	300648-001	8			Jumper A21 to A20.
						Jumper A28 to A30.
						Jumper B37 to B40.
						Jumper B29 to B28.
						Jumper D7 to D8.
						Jumper D44 to D47.
						Jumper B13 to B15.
						Jumper A14 to B12.
113	Wire, Solid	100051-024	A/R			Use with Item 102, A55.
						Jumper A1 to A2
						C11 to C12
	Rework instructions	301777-001	0			

2400 RPM WRITE - DF READ - PULSE 'D' WANGCO POSITIONER CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER 301320-116 REV. E

TITLE ASSY. PWB. DATA INTERFACE,VFO II MODEL F&T DATE 6-2-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD/DELETE THE FOLLOWING:	301320-000		E		NEXT ASSEMBLY/USED ON
28	Capacitor, Poly .0027uf	100165-272	1			D27 Delete
28	Capacitor, Poly .0056uf	101004-562	1			D27 Add.
101	Connector	101040-002	1			J20 Add.
102	Crystal	101059-003	1			A55 Add.
107	Resistor, 1%,¼W 4.12K	100155-348	1			D45 Add.
112	Jumper, Insulated	300648-001	10			Jumper A20 to A21 Add.
						Jumper B39 to B40 Add.
						Jumper B28 to B29 Add.
						Jumper A28 to A30 Add.
						Jumper D7 to D8 Add.
						Jumper D44 to D47 Add.
						Jumper B13 to B15 Add.
						Jumper A14 to B12 Add.
						Jumper A1 to A2 Add.
						Jumper C11 to C12 Add.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
	Rework instructions	301777-001	0			

1500 RPM WRITE - DF READ - PULSE 'D' 1440 KHz WANGCO POSITIONER CODE D120

WANGCO INCORPORATED

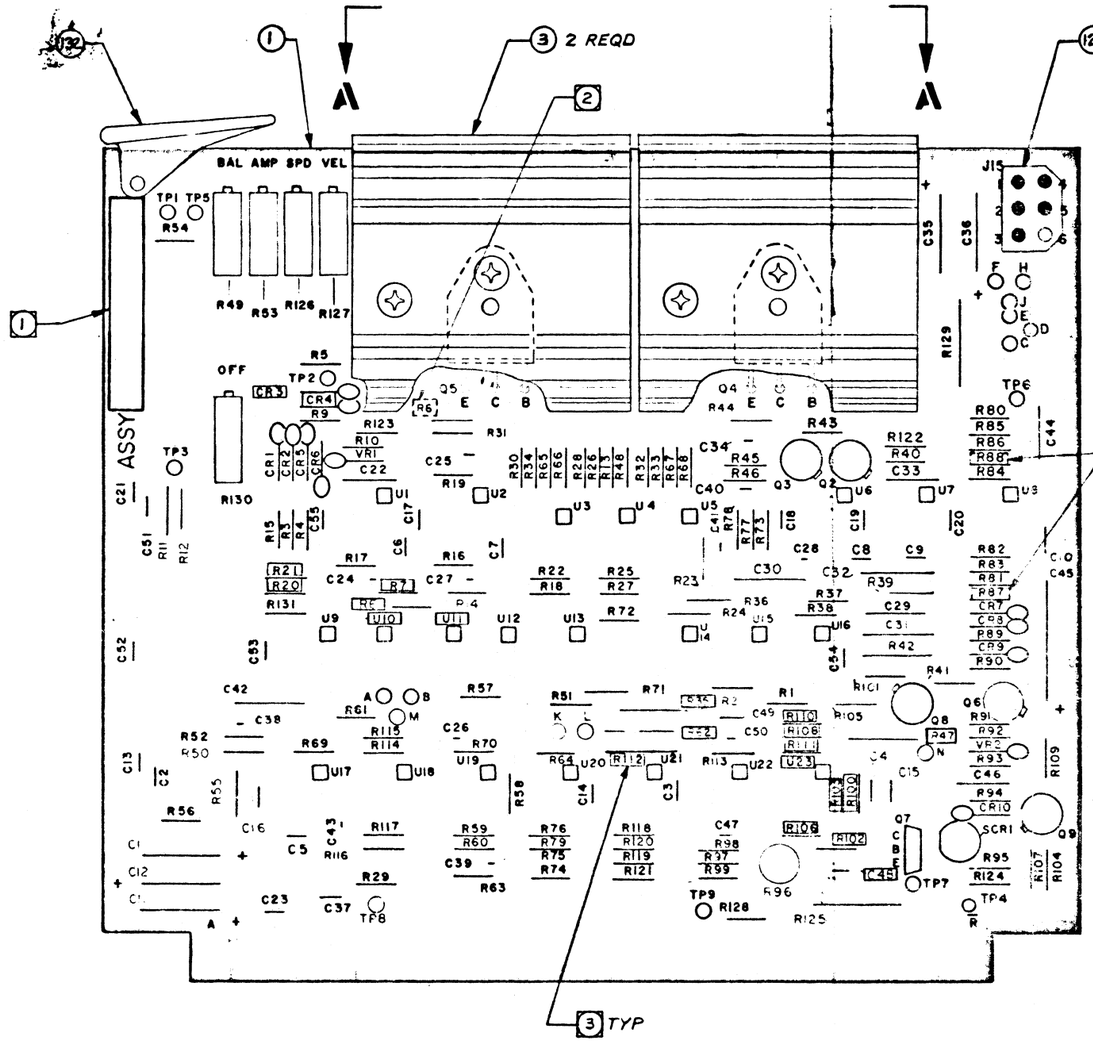
MATERIAL LIST

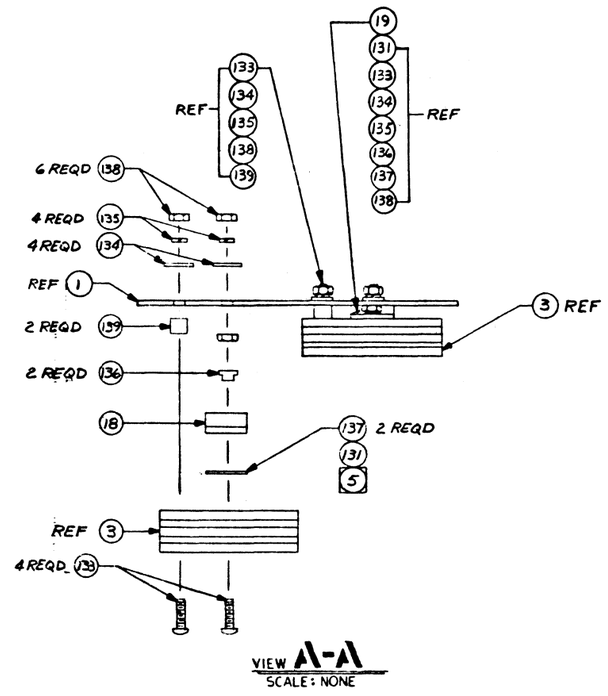
PART NUMBER 301320-117 REV. D

TITLE ASSY. PWB. DATA INTERFACE, VFO MODEL 100 & 200TPI DATE 7-12-76 SHEET 1 OF 1

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
	USE MATERIAL LIST AND ADD THE FOLLOWING: -	301320-000		E		NEXT ASSEMBLY/USED ON
101	Connector	101040-002	1			J20.
102	Crystal	101059-008	1			A55.
103	Capacitor 20pf	100243-200	1			B46.
105	Tubing, Thermofit	100185-009	A/R			Use with Item 102
106	Capacitor .0027uf	101004-272	1			A53.
107	Resistor, 1%,¼W 6.34K	100155-366	1			D45.
112	Wire, Solid Insulated	300648-001	A/R			Jumper A20 to A21
						" B39 to B40
						" B28 to B29
						" A28 to A30
						" D7 to D8
						" D44 to D47
						" B13 to B15
						" A14 to B12
						A1 to A2
						C11 to C12
113	Wire, Solid	100051-024	A/R			Hold Down Wire for Item 102
	Rework instructions	301777-001	0			

REVISIONS				3C1584
REV.	DESCRIPTION	CHK.	DATE	APPROVED
F1	CR/O 7856	[illegible]	[illegible]	J Hunt
F2	CR/O 8078	[illegible]	[illegible]	D Paul
F3	CR/O 8252	[illegible]	[illegible]	J Hunt
G	CR/O [illegible]	[illegible]	[illegible]	J Hunt





5 APPLY THERMAL GREASE (ITEM 131) TO BOTH SIDES OF MICA WASHER (ITEM 137).

4. FOR SCHEMATIC REF DWG SEE 301585.

3 COMPONENTS OUTLINED WITH SOLID LINES ARE VARIABLE COMPONENTS.

2 RESISTORS R8, R87 & R88 ARE NOT USED.

1 MARK APPROPRIATE DASH NUMBER, S/N AND LATEST REVISION LETTER .12 HIGH WHITE CHARACTERS PER WANGCO SPEC 100037.

NOTES UNLESS OTHERWISE SPECIFIED

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC AND MAY NOT, IN WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC

PART NUMBER 301584 - XXX ASSY, SEE TABULATED M/L

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX ± ANGULAR .XXX ±	DRAWN	Jim Oldfield	4/6/77
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH SURFACES ✓	APPR.	J Hunt	5/7/77
4. ALL DIMS IN INCHES	MATERIAL		
5. DIMENSIONS APPLY AFTER FINISH AND HEAT TREAT	FINISH		
	MODEL No. 100 TPI F & T		
	NEXT ASSY		

WANGCO
PERKIN ELMER DATA SYSTEMS

ASSY, PWB - SERVO AMPLIFIER III

SCALE	SIZE		CODE
2:1 & NOTED	D	301584	G
DO NOT SCALE THIS DRAWING	WEIGHT	SHEET 6 OF 6	

CODE ID 120 QTY REQ'D 1

B-73

D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
301584-001	G

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 100TPI F&T — DATE 2-20-76 — SHEET 1 OF 6

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Board Processed	301583-001	1	E		
2						
3	Heat Sink	300135-002	2			
4						
5						
6	IC LM308	125009-001	1			U17
7	IC 311	101022-001	3			U18,20,21
8	IC 1458	101026-001	5			U2,6,8,19,22
9	IC 1458	101026-002	2			U1,7
10	IC 5020	101029-003	4			U3,4,5,9
11	IC 7426	101011-001	1			U14
12	IC 75452	101031-001	4			U12,13,15,16
13						
14						
15	Transistor MPS-U51	100083-001	1			Q7
16	Transistor 2N2222A	101052-001	3			Q2,6,8
17	Transistor 2N2907A	101053-001	2			Q3,9
18	Transistor EP2179	151003-001	1			Q5
19	Transistor EP2180	151004-001	1			Q4
20						
21						
22	Diode 1N5317	101034-001	8			CR1,2,5,6,7,8,9,10
23						
24	Diode, Zener 1N5235	101058-010	1			VR2
25	Diode, Zener 10V ± 2%	107041-003	1			VR1
26						
27	SCR 2N5060	161000-001	1			SCR1
28						
29						
30						
31	Capacitor, Mica 10pf	100243-100	1			C43
32						

D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
301584-001	G

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 100TPI F&T — DATE 2-20-76 — SHEET 2 OF 6

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
34	Capacitor, Mica 20pf	100243-200	1			C38
35	Capacitor, Mica 62pf	100243-620	1			C50
36	Capacitor, Mica 100pf	-101	8			C24,25,26,27,28,34,39,41
37						
38	Capacitor, Mica 330pf	-331	2			C37,49
39						
40	Capacitor, Poly, .0047uf	101004-472	1			C33
41	Capacitor, Poly, .001uf	101005-102	3			C22,44,46
42	Capacitor, Ceramic, .01uf	101042-103	24			C2,3,4,5,6,7,8,9,10,13,14, 15,16,17,18,19,20,21,23,51, 52,53,54,55
43						
44	Capacitor, 1% .01uf	102701-103	5			C29,30,31,32,42
45						
46						
47	Capacitor, Ceramic .1uf	101086-104	1			C47
48	Capacitor, Ceramic .33uf	101086-334	1			C40
49						
50	Capacitor, Tant. 6.8uf	101003-685	2			C35,36
51	Capacitor, Tant. 15uf	101002-156	3			C1,11,12
52	Capacitor, Tant. 180uf	102761-187	1			C45
53						
54						
55						
56						
57						
58						
59						
60						
61						
62						

D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
301584-001	G

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 100TPI F&T — DATE 2-20-76 — SHEET 3 OF 6

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
64	Resistor, Var. 5K	100163-502	1			R126
65	Resistor, Var. 10K	100163-103	4			R49,53,127,130
66	Resistor, Var. 10K	138000-103	1			R96
67						
68	Resistor, 5%, 3W 0.1	101084-001	1			R129
69	Resistor, 5%, 3W 100	101084-005	1			R125
70						
71	Resistor, 5%, ¼W 10	101156-100	3			R55,56,109
72	Resistor, " " 51	-510	1			R101
73	Resistor, " " 100	-101	2			R46,92
74						
75	Resistor, 5%, ¼W 1K	101156-102	10			R3,43,44,45,82,83,84,86,99, 104
76	Resistor, 5%, ¼W 2.2K	101156-222	1			R17
77	Resistor, 5%, ¼W 1.5K	101156-152	11			R12,29,63,69,74,79,114,117, 121,123,128
78	Resistor, 5%,¼W 1.8K	101156-182	2			R94,124
79	Resistor, " " 2K	-202	1			R80
80	Resistor, " " 3K	-302	2			R15,95
81	Resistor, " " 4.7K	-472	2			R11,89
82	Resistor, " " 5.1K	-512	2			R54,59
83	Resistor, " " 6.2K	-622	2			R75,115
84	Resistor, " " 7.5K	-752	14			R1,2,13,23,24,33,48,51,57, 65,66,67,71,72
85	Resistor, 5%,¼W 10K	101156-103	2			R91,107
86	Resistor, " " 12K	-123	1			R10
87	Resistor, " " 20K	-203	2			R76,116
88	Resistor, " " 22K	-223	1			R9
89	Resistor, " " 36K	-363	2			R81,85
90	Resistor, " " 75K	-753	1			R73
91	Resistor, " " 91K	-913	1			R68
92	Resistor, " " 100K	-104	3			R90,93,105

D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
301584-001	G

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 100TPI F&T — DATE 2-20-76 — SHEET 4 OF 6

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
94	Resistor, 5%, ¼W 300K	101156-304	2			R5,32
95	Resistor, " " 510K	-514	2			R52,97
96	Resistor, " " 1M	-105	3			R50,113,131
97	Resistor, " " 10Meg	-106	1			R98
98						
99						
100	Resistor, 1%, ¼W 1.0K	100155-289	1			R40
101	Resistor, " " 2.0K	-318	4			R18,22,26,28
102						
103	Resistor, " " 3.92K	-346	1			R119
104	Resistor, " " 4.99K	-356	2			R25,27
105	Resistor, " " 5.49K	-360K	1			R4
106	Resistor, " " 9.09K	-381	1			R38
107	Resistor, " " 10K	-385	4			R30,34,36,120
108	Resistor, " " 12.1K	-393	1			R118
109	Resistor, " " 14K	-399	1			R122
110	Resistor, " " 16.9K	-407	1			R78
111	Resistor, " " 18.2K	-410	2			R37,39
112	Resistor, " " 100K	-481	3			R61,64,41
113						
114	Resistor, " " 261K	-521	1			R77
115	Resistor, " " 280K	-524	1			R42
116						
117	Resistor, 0.1%, 1/8W 4.99K	142006-356	5			R14,16,19,31,70
118	Resistor, " " 10K	-385	2			R58,60
119						
120						
121						
122						
123						
124						
125						

D120

WANGCO INCORPORATED — MATERIAL LIST

PART NUMBER	REV.
301584-001	G

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 100TPI F&T — DATE 2-20-76 — SHEET 5 OF 6

ITEM NO.	DESCRIPTION	PART NO.	REQD	NEW REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
127	Connector, 6 Pin	100247-013	1			J15
128						
129	Pin, Wire Wrap	100360-001	15			TP1,2,3,4,5,6,7,8,9 Jumper Pts A,B,K,L,M,N
130						
131	Grease, Thermal Joint	120100-001	A/R			
132	Extractor, Card	107901-001	1			
133	Screw, Pan Head	100036-208	4			4-40 x 1/2"
134	Washer, Flat	100047-200	4			No. 4
135	Washer, Spring Lock	100042-200	4			No. 4
136	Washer, Nylon, Shoulder	100063-014	2			
137	Insulator, Mica	100147-001	2			Use with Q4 & Q5
138	Nut, Hex	100043-200	6			4-40
139	Spacer	100093-026	2			
140	Wire, Jumper 22GA	100051-022	A/R			Jumper C to D J to H
141						
	Printed Master	301582-001	0	D		
	Schematic	301585-001	0	D		
	Test Specification	900153-001	0			
	Test Procedure	900154-001	0			

B-74

TRACK OFFSET & TEMPERATURE COMPENSATION — CODE D120

WANGCO PERKIN ELMER DATA SYSTEMS — MATERIAL LIST

ASSEMBLY PART NUMBER	REV.
301584-002	E

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 200TPI F&T — DATE 2-20-76 — SHEET 1 OF 5

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
1	1	301583-001	Board Processed		REV C
2					
3	2	300135-002	Heat Sink		
4					
5					
6	1	125009-001	I.C.	LM308	U17
7	3	101022-001	I.C.	311	U18,20,21
8	6	101026-001	I.C.	1458	U2,6,8,19,22,23
9	2	101026-002	I.C.	1458	U1,7
10	5	101029-003	I.C.	5020	U3,4,5,9,10
11	1	101011-001	I.C.	7426	U14
12	5	101031-001	I.C.	75452	U11,12,13,15,16
13					
14					
15	1	100083-001	Transistor	MPS-U51	Q7
16	3	101052-001	Transistor	2N2222A	Q2,6,8
17	2	101053-001	Transistor	2N2907A	Q3,9
18	1	151003-001	Transistor	EP2179	Q5
19	1	151004-001	Transistor	EP2180	Q4
20					
21					
22	8	101034-001	Diode	1N5317	CR1,2,5,6,7,8,9,10
23					
24	1	101058-010	Diode, Zener	1N5235	VR2
25	1	107041-003	Diode, Zener 10V ± 2%		VR1
26					
27	1	161000-001	SCR	2N5060	SCR1
28					
29					
30					
31	1	100243-100	Capacitor, Mica	10pf	C43
32					
33					

T120

WANGCO PERKIN ELMER DATA SYSTEMS — MATERIAL LIST

ASSEMBLY PART NUMBER	REV.
301584-002	E

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 200TPI F&T — DATE 2/20/76 — SHEET 2 OF 5

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
34	1	100243-200	Capacitor, Mica	20pf	C38
35	1	100243-620	Capacitor, Mica	62pf	C50
36	8	-101	Capacitor, Mica	100pf	C24,25,26,27,28,34,39,41
37					
38	2	100243-331	Capacitor, Mica	330pf	C37,49
39					
40	1	101004-472	Capacitor, Poly	.0047uf	C33
41	3	101005-102	Capacitor, Poly	.001uf	C22,44,46
42	24	101042-103	Capacitor, Ceramic	.01uf	C2,3,4,5,6,7,8,9,10,13,14,15, 16,17,18,19,20,21,23,51,52,53, 54,55
43					
44	5	102701-103	Capacitor, 1%	.01uf	C29,30,31,32,42
45					
46					
47	1	101086-104	Capacitor, Ceramic	.1uf	C47
48	1	101086-334	Capacitor, "	.33uf	C40
49	1	-473	Capacitor, "	.047uf	C48
50	2	101003-685	Capacitor, Tant	6.8uf	C35,36
51	3	101002-156	Capacitor, Tant	15uf	C1,11,12
52	1	102761-187	Capacitor, Tant	180uf	C45
53					
54					
55					
56					
57					
58					
59					
60					
61					
62					
63					

D120

WANGCO PERKIN ELMER DATA SYSTEMS — MATERIAL LIST

ASSEMBLY PART NUMBER	REV.
301584-002	E

TITLE ASSY. PWB SERVO AMPLIFIER - III — MODEL 200TPI F&T — DATE 2/20/76 — SHEET 3 OF 5

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
64	1	100163-502	Resistor, Var.	5K	R126
65	4	-103	Resistor, "	10K	R49,53,127,130
66	1	138000-103	Resistor, "	10K	R96
67					
68	1	101084-001	Resistor, 5%, 3W	0.1	R129
69	1	101084-005	Resistor, 5%, 3W	100	R125
70					
71	3	101156-100	Resistor, 5%, ¼W	10	R55,56,109
72	1	-510	Resistor, " "	51	R101
73	2	-101	Resistor, " "	100	R46,92
74					
75	10	101156-102	Resistor, 5%, ¼W	1K	R3,43,44,45,82,83,84,86,99, R104
76	1	101156-222	Resistor, 5%, ¼W	2.2K	R17
77	11	-152	Resistor, " "	1.5K	R12,29,63,69,74,79,114,117, R121,123,128
78	2	101156-182	Resistor, 5%, ¼W	1.8K	R94,124
79	1	-202	Resistor, " "	2K	R80
80	2	-302	Resistor, " "	3K	R15,95
81	2	-472	Resistor, " "	4.7K	R11,89
82	4	-512	Resistor, " "	5.1K	R54,59,103,110
83	2	-622	Resistor, " "	6.2K	R75,115
84	16	-752	Resistor, " "	7.5K	R1,2,6,7,13,23,24,33,48,51,57, R65,66,67,71,72
85	2	101156-103	Resistor, 5%, ¼W	10K	R91,107
86	1	-123	Resistor, " "	12K	R10
87	2	-203	Resistor, " "	20K	R76,116
88	1	-223	Resistor, " "	22K	R9
89	2	-363	Resistor, " "	36K	R81,85
90	1	-753	Resistor, " "	75K	R73
91	1	-913	Resistor, " "	91K	R68
92	3	101156-104	Resistor, 5%, ¼W	100K	R90,93,105
93					

CODE
D120

WANGCO
PERKIN ELMER DATA SYSTEMS

MATERIAL LIST

ASSEMBLY PART NUMBER	REV.
301584-002	E

REV.

ASSEMBLY PART NUMBER 301584-002

TITLE ASSY. PWB SERVO AMPLIFIER - III MODEL 200TPI F&T DATE 2/20/76 SHEET 4 OF 5

ITEM	REQD	PART NO.	DESCRIPTION		REMARKS
94	2	101156-304	Resistor, 5%, ¼W	300K	R5,32
95	2	-514	Resistor, " "	510K	R52,97
96	5	-105	Resistor, " "	1M	R20,21,50,113,131
97	1	-106	Resistor, " "	10Meg	R98
98					
99					
100	1	100155-289	Resistor, 1%, ¼W	1.0K	R40
101	4	-318	Resistor, " "	2.0K	R18,22,26,28
102					
103	1	100155-346	Resistor, 1%, ¼W	3.92K	R119
104	2	-356	Resistor, " "	4.99K	R25,27
105	1	-360	Resistor, " "	5.49K	R4
106	1	-381	Resistor, " "	9.09K	R38
107	7	-385	Resistor, " "	10K	R30,34,36,100,102,106,120
108	1	-393	Resistor, " "	12.1K	R118
109	1	-399	Resistor, " "	14K	R122
110	1	-407	Resistor, " "	16.9K	R78
111	2	-410	Resistor, " "	18.2K	R37,39
112	3	-481	Resistor, " "	100K	R41,61,64
113					
114	1	100155-521	Resistor, 1%, ¼W	261K	R77
115	1	-524	Resistor, " "	280K	R42
116					
117	5	142006-356	Resistor, 0.1%, 1/8W	4.99K	R14,16,19,31,70
118	2	-385	Resistor, " "	10K	R58,60
119					
120	4	100172-571	Resistor, 1%, ½W	866K	R35,47,62,112
121					
122	1	100155-411	Resistor, 1%, ¼W	18.7K	R108
123	1	-452	Resistor, " "	49.9K	R111
124					
125					
126					

CODE
D120

ASSEMBLY PART NUMBER	REV.
301584-002	E

WANGCO
PERKIN ELMER DATA SYSTEMS

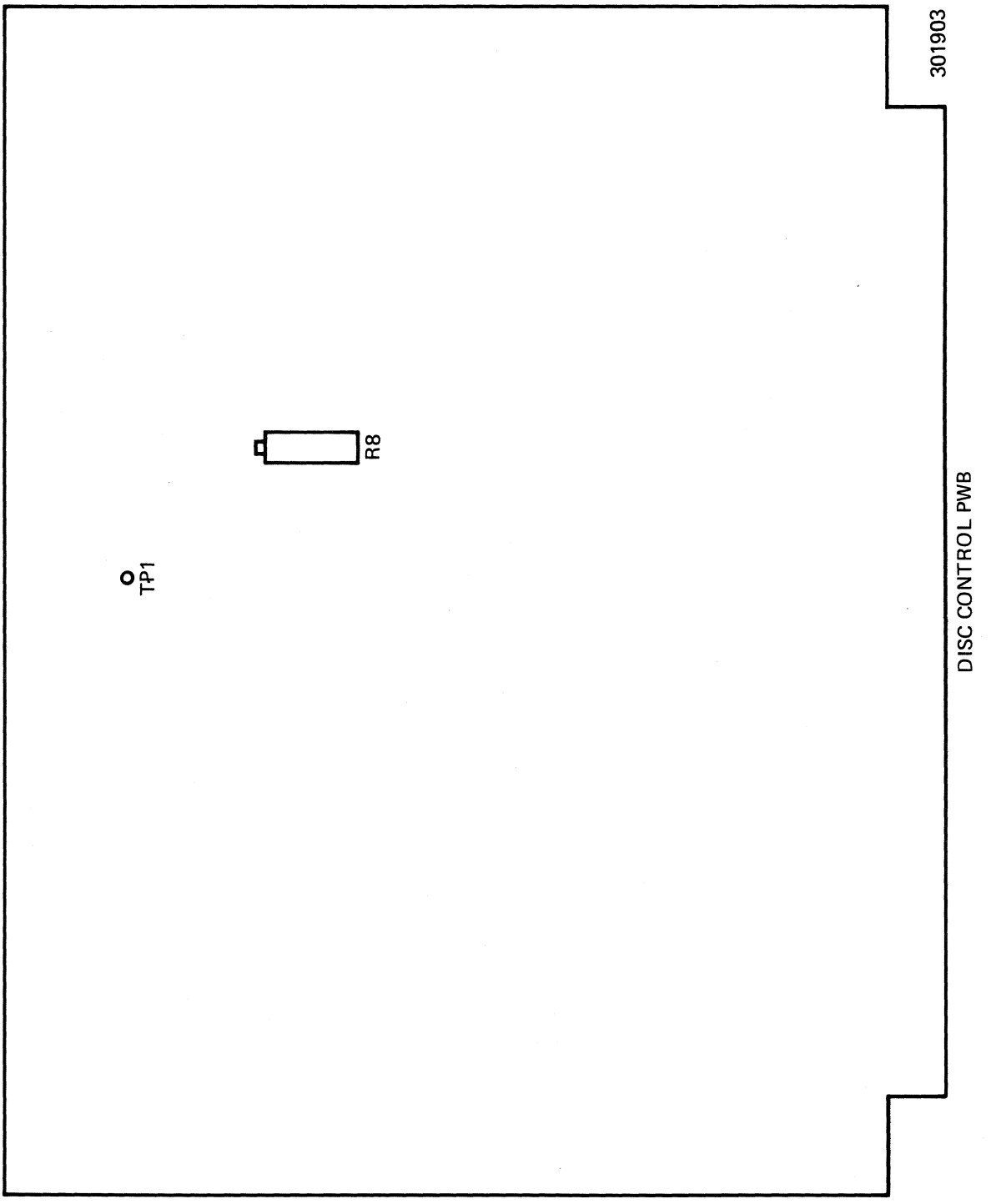
MATERIAL LIST

REV. E

ASSEMBLY PART NUMBER 301584-002

TITLE ASSY. PWB SERVO AMPLIFIER - III MODEL 200TPI F&T DATE 2/20/76 SHEET 5 OF 5

ITEM	REQD	PART NO.	DESCRIPTION	REMARKS
127	1	100247-013	Connector, 6 Pin	J15
128				
129	15	100360-001	Pin, Wire Wrap	TP1,2,3,4,5,6,7,8,9,
				Jumper Pts A,B,K,L,M,N
130				
131	A/R	120100-001	Grease, Thermal Joint	
132	1	107901-001	Extractor, Card	
133	4	100036-208	Screw, Pan Hd	4-40 X ½"
134	4	100047-200	Washer, Flat	No. 4
135	4	100042-200	Washer, Spring Lock	No. 4
136	2	100063-014	Washer, Nylon Shoulder	
137	2	100147-001	Insulator, Mica	Use with Q4 & Q5
138	6	100043-200	Nut, Hex	4-40
139	2	100093-026	Spacer	
140	A/R	100051-022	Wire, Jumper 22GA	Jumper C to D
				J to H
141	3	300648-001	Jumper, Insulated	Jumper A to B
				K to L
				M to N
	0	301582-001	Printed Master	
	0	301585-001	Schematic	
	0	900153-001	Test Specification	
	0	900154-001	Test Procedure	


301903
DISC CONTROL PWB
R8
TP1

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301903-000	D

TITLE ASSY, PWB. DISC CONTROL - 2 MODEL F&T DATE 10-27-76 SHEET 1 OF 3

REV. D | PART NUMBER 301903-000 | DATE 01-05-77 | APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
1	Board, Processed	301902-001	1	C		
2						
3	IC 9602	100234-001	5			U4,11,17,33,34
4	IC 7404	100330-001	1			U25
5	IC 7400	100328-001	1			U22,
6	IC 7402	100329-001	2			U16,30
7	IC 7408	100332-001	4			U5,15,31,32
8	IC 7410	100333-001	1			U13
9	IC 7474	100339-001	6			U18,19,20,23, 26,28,
10	IC 7486	100341-001	1			U27
11	IC 74S02	123066-001	1			U8
12	IC 7411	101009-001	2			U9,14
13	IC 7432	101012-001	2			U7,21
14	IC 74193	101020-001	3			U1,2,3
15	IC 311	101022-001	2			U29A,29B
16	IC 555V	101023-001	1			U10
17	IC 75451	101139-001	1			U35
18	IC 74S00	123028-001	1			U6
19						
20	Transistor 2N2222A	101052-001	2			Q1,2
21						
22						
23	Diode 1N5317	101034-001	4			CR2,4,5,6
24	" , Zener 1N5230B	101058-005	2			VR1,2
25	" " 1N5251B	-016	1			VR3
26	" " 5.1V 1N5231B	101058-006	1			VR4
27						
28	Capacitor, Mica 33pf	100243-330	1			C5
29	" " 180pf	-181	1			C3
30	Capacitor, Mica 270pf	100243-271	2			C10,12
31	" " 620pf	-621	2			C4,41
32	" Ceramic .01uf	101042-103	17			C2,C22 thru 35,43,44

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301903-000	D

TITLE ASSY. PWB. DISC CONTROL - 2 MODEL F&T DATE 10-27-76 SHEET 2 OF 3

REV. D | PART NUMBER 301903-000 | DATE | APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	MIN. REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
33	Capacitor .015uf	101004-153	2			C7,14
34						
35	Capacitor .068uf	101004-683	3			C11,13,20
36	" ,Tant. 20V 2.2uf	101002-225	3			C16,17,19
37	" " 6V 6.8uf	101001-685	2			C45,47
38	" " 20V 15uf	101002-156	1			C1
39	" " 6V 56uf	101001-566	3			C18,21,48
40						
41	Crystal 3.2MHz	101059-001	1			XCL1
42						
43						
44	Resistor, Variable 20K	101006-203	1			R8
45	" " 1 Meg	101148-105	1			R31
46						
47	Resistor, 5%,¼W 75	101156-750	1			R39
48	" " " 220	-221	2			R6,44
49	" " " 510	-511	3			R5,17,55
50	" " " 560	-561	1			R43
51	" " " 820	-821	1			R21
52	" " " 1K	-102	9			R22,23,24,26,28,35,45,46,54
53	" " " 1.5K	-152	4			R3,4,14,15
54	" " " 1.8K	-182	1			R30
55	" " " 2K	-202	5			R13,25,32,51,53
56	" " " 5.1K	-512	3			R7,18,34
57	" " " 5.6K	-562	1			R48
58	" " " 6.8K	-682	2			R9,11
59	" " " 10K	-103	3			R40,50,52
60	" " " 20K	-203	1			R47
61						
62	Resistor, 5%,¼W 39K	-393	4			R10,12,16,27
63	" " " 30K	-303	1			R49
64	" " " 150K	101156-154	1			R20

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301903-000	D

TITLE ASSY. PWB. DISC CONTROL - 2 MODEL F&T DATE 10-27-76 SHEET 3 OF 3

REV. D | PART NUMBER 301903-000 | DATE | APPROVED

ITEM NO.	DESCRIPTION	PART NO.	REQD	MFR REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
65						
66	Tubing, Thermofit	100185-009	A/R			Use with item 41
67	Wire, Buss	100051-024	A/R			Hold Down Wire for XCL1
68	Extractor, Card	100354-001	2			
69	Pin, Wire Wrap	100360-001	29			TP1,TP2 & Jumper Points
70	Jumper, Insulated	300648-001	4			Jumper J1 from M to P
						J5 from T to R
						AA to AB
						AC to AD
	Schematic	301904-001	0	D		
	Artwork, Master	301901-001	0			
	Specification		0			
	Rework Instructions	302361-001	0			

2400RPM. SECTOR CONFIGURATION. TYPE "D" INTERFACE. FRONT LOAD.
40usec INDEX/SECTOR PULSE WIDTH. USE WITH DIFFERENTIATOR PWB. (P/N 300921)

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301903-113	D

TITLE ASSY. DISC CONTROL - 2 PWB LOAD CYCLE DELAY MODEL F DATE 1-11-77 SHEET 1 OF 1

REV. D | PART NUMBER 301903-113 | DATE 1-11-77 | APPROVED M.B.

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
	USE MATERIAL LIST AND ADD THE FOLLOWING:	301903-000		D		
75	IC 74192	101019-001	1			U12
76						
77	Capacitor .015uf	101004-153	1			C9
78	Capacitor, 5% .015uf	102793-153	1			C39
79	Capacitor, 5% .015uf	-153	1			C40
80						
81						
82						
83	Resistor, 5%,¼W 2K	101156-202	1			R2
84	Resistor, " " 110K	-114	1			R29
85	Resistor, " " 110K	-114	1			R36
86	Resistor, " " 39K	-393	1			R36
87	Resistor, " "	302075-006	1			R56 Test Select
88						
89						
90	Wire, Jumper	300648-001	5			
						Jumper J2 G to H
						J3 J to L
						J6 A to B
						J7 D to E
						J8 W to V

REV. A

PART NUMBER 301903-101

PILOT RELEASE
THIS DRAWING TO BE USED FOR THE PROCUREMENT OF PIECES ONLY
PROJECT ENG
DATE

NEXT ASSY.

WANGCO
A UNIT OF PERKIN-ELMER DATA SYSTEMS

This drawing contains proprietary information of WANGCO and may not, in whole or in part, be duplicated or disclosed or used for manufacture of any part disclosed herein without the prior written permission of WANGCO

MATERIAL LIST

CODE IDENT.	CODE
52465	D120

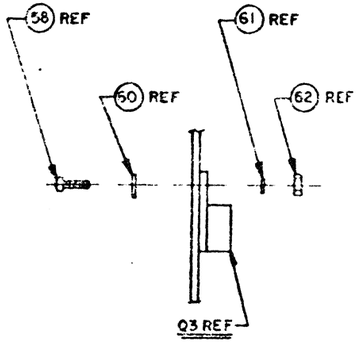
PART NUMBER	REV.
301903-101	A

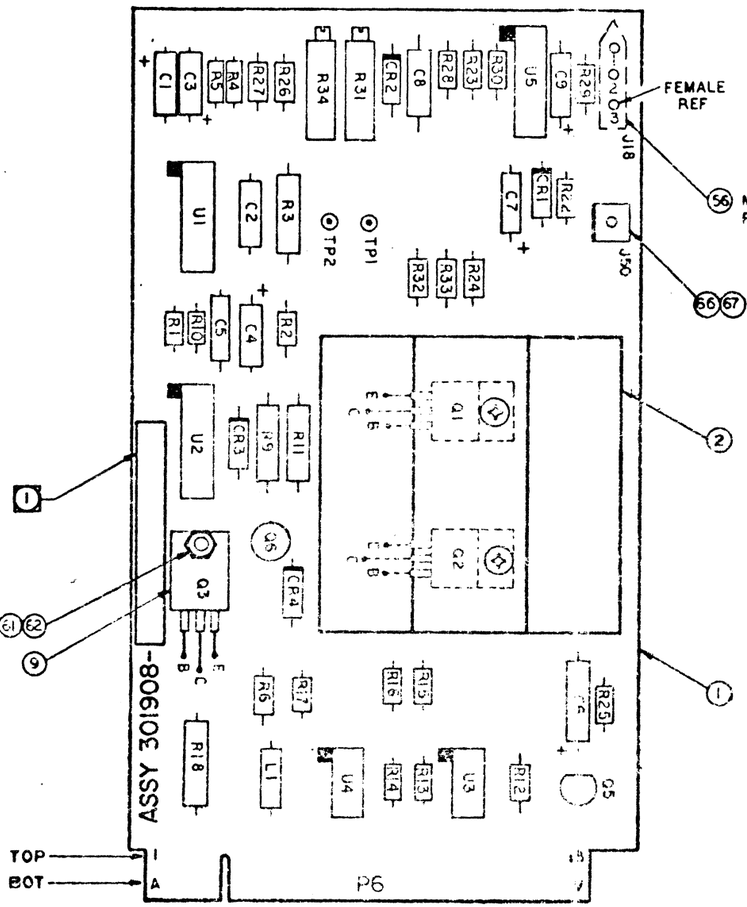
ASSY, DISC CONTROL - 2 PWB
LOAD CYCLE DELAY
5usec INDEX/SECTOR PULSE WIDTH, 1500RPM,
FRONT LOAD, USE W/PWB P/N 300921

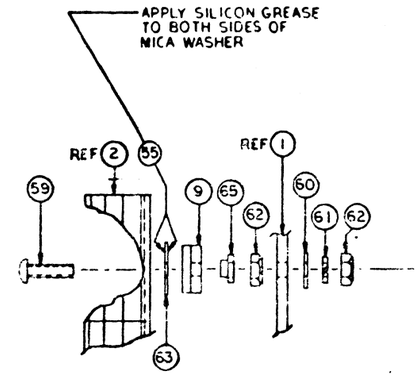
TITLE _____ MODEL _____ DATE 12/7/77 SHEET 1 OF 1

ITEM	REQD	PART NO.	DESCRIPTION	REMARKS
1	1	301903-000	Assy, Disc Control, Pwb., Basic	REV C
75	1	101020-001	I.C. 74193	U12
76				
77	1	101004-153	Capacitor, .015uf	C9
78	2	100165-222	Capacitor, .0022uf	C39,40
79				
80				
81				
82				
83	1	101156-202	Resistor, 5%, ¼W 2K	R2
84				
85				
86	1	101156-393	Resistor, 5%, ¼W 39K	R38
87				
88				
89				
90	A/R	300648-001	Wire, Jumper	Jumper J2 G to H
				J3 J to L
				J6 A to B
				J7 D to E
				J8 W to V

REVISIONS				301908
REV.	DESCRIPTION	CHK.	DATE	APPROVED
X2	EXP REL		3-8-7	
A	[illegible]			
B	CRIO 1403			
X1	EXP REL, AUTO-INSERTION			
B1	CRIO 8121			







VIEW A-A
EXPLODED
TYP 2 PLS

THIS DRAWING TO BE USED FOR THE PROCUREMENT OF ____ PIECES ONLY
PROJECT ENG _____ DATE _____
EWO _____

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC. AND MAY NOT, IN WHOLE OR IN PART, BE DUPLICATED OR DISCLOSED OR USED FOR MANUFACTURE OF ANY PART ENCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGCO INC.

PART NUMBER 301908-001

NOTES UNLESS SPECIFIED			
1. TOLERANCES .XX ± ANGULAR .XXX ± ±	DRAWN	ZUCKERMAN	Nov 7[illegible]
2. BREAK ALL SHARP EDGES APPROX. 010	CHECK	[illegible]	
3. MACH. SURFACES √	APPR.	[illegible]	
4. ALL DIMS IN INCHES	MATERIAL		
5. DIMENSIONS APPLY AFTER FINISH AND HEAT TREAT	FINISH		
	MODEL NO.	F&T 100/200 TPI	
	NEXT ASSY	MULTIPLE USAGE	

WANGCO INCORPORATED

ASSEMBLY
POWER REGULATOR PWB

SCALE	SIZE		
2:1	D	301908	B1
PROPRIETARY	LENGTH	SHEET 4 OF 4	

B-81

[1] MARK APPROPRIATE DASH NO. AND LATEST REV LETTER .12 HIGH WHITE CHARACTERS PER WANGCO SPEC 100037.

NOTES: UNLESS OTHERWISE SPECIFIED.

CODE D120

REV. B1 | PART NUMBER 301908-001 | DATE | APPROVED

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301908-001	B1

TITLE ASSY. POWER REGULATOR PWB MODEL F&T 100,200TP DATE 11-8-76 SHEET 1 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
						MULTIPLE USAGE
1	Board, Processed	301907-001	1	B		
2	Heatsink	300135-001	1			
3						
4						
5	Integrated Circuit 723	100108-001	2			U1,2
6	" " 75452	101031-001	2			U3,4
7	" " 74LS123	123039-001	1			U5
8						
9	Transistor, PNP TI.P42A	101048-001	3			Q1,2,3
10	" NPN 2N2222A	101052-001	1			Q5
11	" PNP 2N2907A	101053-001	1			Q6
12						
13						
14	Diode, Zener 5230B	101058-005	1			CR1
15	" " 1N5234	101058-009	1			CR3
16	Diode, Zener 5231B	101058-006	1			CR2
17	Diode, Switching 1N5317	101034-001	1			CR4
18						
19	Capacitor, Mica 100pf	100243-101	1			C5
20	" Poly .1uf	101004-104	1			C8
21	" " .001uf	101005-102	1			C2
22						
23	Capacitor, Tant. 35V 56uf	101001-566	1			C9
24	" " 6.8uf	101003-685	3			C1,4,7
25	" " 15uf	101002-156	2			C3,6
26						
27						
28	Resistor, 5%,3W 330	100068-331	1			R9
29	" 3% " 10	101084-003	1			R18
30	" " " .5	-002	2			R3,11
31						
32	Resistor, 5%,¼W 62	101156-620	2			R12,14

FORM 209 (R.12/74)

CODE D120

REV. B1 | PART NUMBER 301908-001 | DATE | APPROVED

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301908-001	B1

TITLE ASSY., POWER REGULATOR PWB MODEL F&T 100,200 TP DATE 11-8-76 SHEET 2 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
33	Resistor, 5%,¼W 100	101156-101	1			R2
34	" " " 430	-431	2			R26,27
35	" " " 750	-751	1			R17
36	" " " 3K	-302	4			R6,10,15,16
37	" " " 3.6K	-362	1			R1
38	" " " 1.5K	-152	1			R13
39	" " " 5.1K	-512	1			R22
40	" " " 12K	-123	1			R23
41						
42	Resistor, 5%,¼W 1K	101156-102	3			R25,28,30
43	" " " 20K	-203	1			R29
44	" " " 30K	-303	1			R24
45						
46	Resistor, 1%,¼W 1.21K	100155-297	1			R32
47	" " " 2.05K	-319	1			R4
48	" " " 3.01K	-335	1			R5
49	" " " 3.4K	-340	1			R33
50						
51	Potentiometer, 3/4W 1K	100163-102	2			R31,34
52						
53	Inductor 220uh	122500-001	1			L1
54						
55	Silicon Grease	120100-001	A/R			Apply both sides of 62
56	Connector 3 Pin	100247-010	1			J18
57						
58	Screw, Pan Head	100036-206	1			4-40 x 3/8"
59	" " "	-208	2			4-40 x 1/2"
60	Washer, Flat	100047-200	3			No. 4
61	" Spring Lock	100042-200	3			No. 4
62	Nut, Hex.	100043-200	5			4-40
63	Insulator, Mica	100146-001	2			Use with Q1 and Q2
64						
65	Washer, Nylon Shoulder	100063-014	2			Use with Q1 and Q2

FORM 209 (R.12/74)

CODE D120

REV. B1

PART NUMBER 301908-001

APPROVED

DATE

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301908-001	B1

TITLE ASSY. POWER REGULATOR PWB MODEL F&T 100,200TP DATE 11-8-76 SHEET 3 OF 4

ITEM NO.	DESCRIPTION	PART NO.	REQD	REV.	ACT. REV.	REMARKS / NEXT ASSEMBLY/USED ON
66	Rivet, Brass	100429-001	1			J50
67	Terminal	101135-001	1			J50
68	Pin, Wire Wrap	100360-001	2			TP1, TP2
69						
70	Schematic	301909-001	0	A		
71	Printed Master	301906-001	0	B		
72	Spec, PWB Assy. Pwr. Reg.	300997-001	0			
73	Test Procedure					

FORM 209 (R.12/74)

REVISIONS				301920 C
REV.	DESCRIPTION	CHK	DATE	APPROVED
XI	EXP RELEASE			
A	PILOT RELEASE			
B	CR/O 7738 MFG REL			
C	CR/O 7847			

P36

+5V 9 — RED — (9)

GND 8 — GRN — (8)

C2 .01

C1 15 20V

D7 47K

D10 3K

D6 .01

D5 5.1K

D8 LM 311

D1

D9 1.8K

D4 6.2K

(4) BRN

P36 10 KEY POLARIZATION

P36 4 CELL 1

A3 47K

B2 3K

A2 .01

A4 5.1K

D2

A5 LM 311

(5) RED

5 CELL 2

A6 1.8K

B1 6.2K

C5 47K

C7 3K

C3 .01

C8 5.1K

D3

B8 LM 311

(6) YEL

6 CELL 3

(6) LED POWER 1 — ORN — (1)

2N2222A B3

B5 590 1/2W 1%

B6 IN5237

B7 39

C4 1.8K

C6 6.2K

5. DO NOT VAPOR DEGREASE ASSY. CLEAN WITH ISOPROPYL ALCOHOL ONLY.

(4) SEE MFG ENGRG WIRE LIST FOR WIRE LENGTHS.

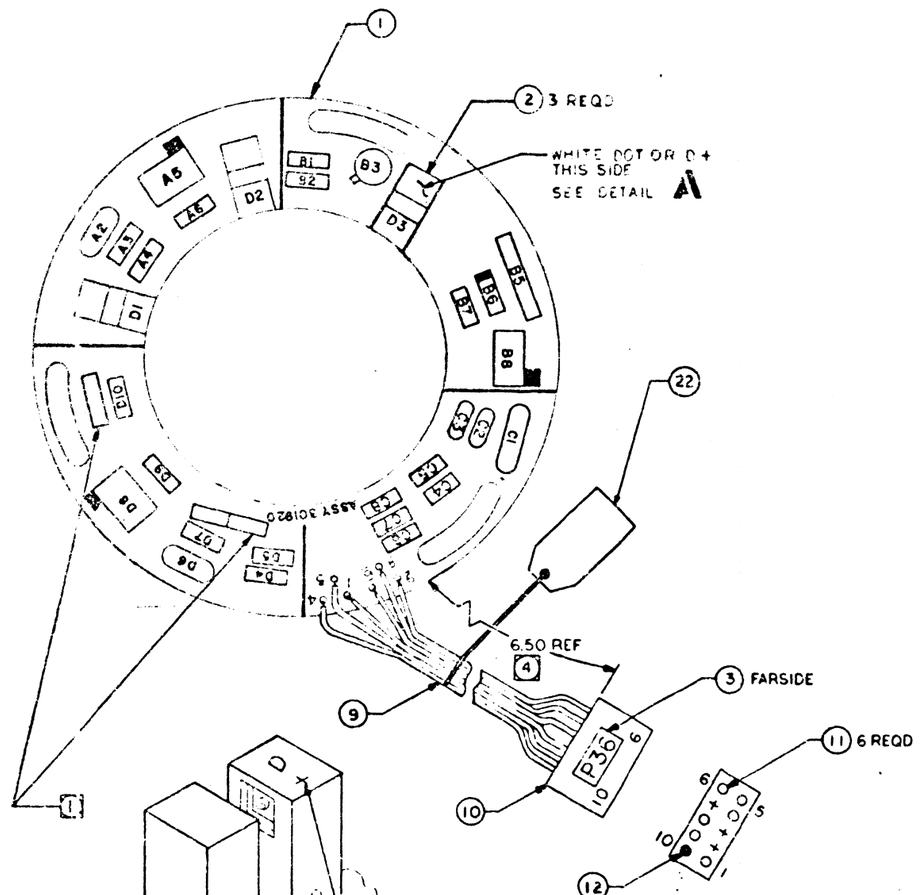
3 ALL CAPACITOR VALUES IN MICROFARADS.

ALL RESISTOR VALUES IN OHMS, 5%, 1/4W.

(1) MARK APPROPRIATE DASH NO. OR NOS. & LATEST REVISION LETTER WHERE SHOWN (IN DOUBLE BLOCK) & DATE IN SINGLE BLOCK. USE .12 HIGH CHARACTERS COLOR WHITE, PER WANGO SPEC 100037.

NOTES: UNLESS OTHERWISE SPECIFIED

(5) 560Ω RESISTOR ON SWITCH BOARD MUST BE REPLACED WITH JUMPER WIRE.



DETAIL A
3 PLACES

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGO INC AND MAY NOT BE DUPLICATED, DISCLOSED OR USED FOR MANUFACTURE OF ANY PART DISCLOSED HEREIN WITHOUT THE PRIOR WRITTEN PERMISSION OF WANGO INC

PART NO. 301920-001 ASSY

NOTES UNLESS SPECIFIED	DRAWN	Cassidy	12 3 76
1. TOLERANCES .XX ± — ANGULAR ± — .XXX ± —	CHECK		12 3 76
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.		
3. MACH. SURFACES — √	MATERIAL	—	
4. ALL DIMS IN INCHES.	FINISH	—	
	MODEL NO.	SPEC ST	SCALE 2:1
	SIZE	D	301920 C1
	NEXT ASSY	301992	SHEET 2 OF 2

Wangco Incorporated

ASSEMBLY, PWB: COMMUTATOR BOARD

B-85

CODE D120

WANGCO INCORPORATED

MATERIAL LIST

PART NUMBER	REV.
301920-001	C

REV. C

PART NUMBER 301920-001

DATE

APPROVED

TITLE ASSY., COMMUTATOR PWB. MODEL F&T SF & ST DATE 12-9-76 SHEET 1 OF 2

ITEM NO.	DESCRIPTION	PART NO.	REQD	MFG. REV.	ACT. REV.	REMARKS
						NEXT ASSEMBLY/USED ON
						301690, 301217
1	Board, Processed	301919-001	1	C		
2	Switch, Optical Modified	301272-001	3			D1,D2,D3
3	Marker, Conn. - P	202340-036	1			P36
4	I.C. LM311	101022-001	3			A5,B8,D8
5	Transistor 2N2222A	101052-001	1			B3
6	Diode 1N5237	101058-012	1			B6
7	Capacitor, Disc, 100V .01	102662-001	4			A2, C2,C3, D6
8	Capacitor, Tant. 20V 15 uf	101002-156	1			C1
9	Cable, Flat 6 Cond.	100403-001	A/R			
10	Connector, Hsg.	105016-001	1			P36
11	Pin, Female	106004-001	6			
12	key, Polarization	101171-001	1			
13						
14	Resistor, 5%,¼W 1.8K	101156-182	3			A6,C4, D9
15	Resistor, " " 3K	-302	3			B2,C7,D10
16	Resistor, " " 5.1K	-512	3			A4,C8,D5
17	Resistor, " " 6.2K	-622	3			B1,C6,D4
18	Resistor, " " 47K	-473	3			A3,C5,D7
19	Resistor, 1%,½W 590	100172-267	1			B5
20	Resistor, 5%,¼W 390	101156-391	1			B7
21						
22	Tag, Field Notice	302080-001	1			
23						
24	Printed Master	301918	Ref.	C		
25	Schematic	301920	Ref.			(Appears on Assy.)
26						
27	Specification	301921	Ref.			
28						
29						
30						

CC

APPENDIX C

SCHEMATICS

APPENDIX C
100/200 TPI DISC DRIVE
SCHEMATIC INDEX

Title	Drawing	Page
I/O Connector PWB	300076	C-3
Power Supply	300346	C-6
Servo Logic PWB (200 TPI)	300498	C-7
Electronic Interconnect PWB	300803	C-9
Servo Logic PWB (100 TPI)	301026	C-10
Control Interface PWB	301027	C-12
Spindle Motor Power Switch PWB	301154	C-13
Data Electronics PWB (100 TPI)	301158	C-14
I/O Connector PWB	301180	C-16
Data Interface PWB (VFO)	301321	C-19
Interconnect Diagram	301386	C-20
Servo Amplifier PWB	301585	C-21
Disc Control - 2	301904	C-22
Power Regulator	301909	C-23
Connector Board		B-85
Differential Board		B-37

REVISIONS				
REV.	DESCRIPTION	CHK	DATE	APPROVED
A	AIEG/CEESEE CR/O 3845			
B	SEE CR/O 5013			
C	CR/O 6003			

FROM DATA INTERFACE BOARD

J21

WRT PROT	6	U13A 75452 pins 6,7 → 5
DATA OUT	27	U16A 75452 pins 1,2 → 3
DATA CLK	26	U12B 75452 pins 1,2 → 3
WRT CHK	8	U13B 75452 pins 1,2 → 3
SAC 1	17	U16B 75452 pins 6,7 → 5
SAC 2	18	U17A 75452 pins 6,7 → 5
SAC 4	19	U17B 75452 pins 6,7 → 5
SAC8/FIDX	20	U17B 75452 pins 1,2 → 3
SAC16/FSTR	21	U17A 75452 pins 1,2 → 3
STR/SAC 32	16	U16A 75452 pins 6,7 → 5
IDX	15	U12B 75452 pins 6,7 → 5
PSEUDO SECTOR 2000	25	U16B 75452 pins 1,2 → 3
SEEK INCOMP	33	U12A 75452 pins 1,2 → 3
ILL AD	11	U12A 75452 pins 6,7 → 5
ADD ACK	10	U13A 75452 pins 1,2 → 3
RDY	7	U13B 75452 pins 6,7 → 5
ENDR		

J22 → J23

J22	J23
11	11
14	14
13	13
15	15
5	5
9	9
6	6
3	3
1	1
26	26
2	2
4	4
10	10
8	8
7	7
12	12
21	21
22	22
23	23
24	24
GROUND (121, 122, 123, 124)	GROUND

TO INTERFACE

TO DAISY CHAIN

[3] RESISTOR NETWORK
[2] SEE M/L FOR VARIABLE COMPONENTS.
1. ALL RESISTORS IN OHMS 5%, 1/4W.

NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES.

DRAWN
CHECK
MATERIAL
FINISH
MODEL No. DISC
NEXT ASSY 300075

Wang Computer Products

SCHEMATIC
I/O CONNECTOR

SIZE D | 300076 | C

SCALE —

WEIGHT

SHEET 1 OF 3

REVISIONS				300076 C
REV.	DESCRIPTION	CHK.	DATE	APPROVED
—	SEE SHT #		11/13	

J21

ATTENTION 14

SEL 1 43

SEL 2 44

SEEK COMP 9

+5V

R2 1K

R3 1K

C15 56μF 6V

C16 56μF 6V

U3 380

U2 380

U7A 75452

U7B 75452

U6B 75452

J22

J23 (2)

ATTENTION

SEEK COMPLETE

JUMPER POINTS

CR1 IN4003

CR2 IN4003

TER BIAS

C1 15 20V

C2 15 20V

U14 (2) (3)

TERMINATOR

U8 380

U1A 75452

U1B 75452

U6A 75452

U6B 75452

R4 1K

R5 1K

R6 OPEN

EN DR

(NOT USED)

EN RECV

J22

UNIT SELECT

TERMINATING VOLTAGE

J23 (2)

UNIT SELECT

TERMINATING VOLTAGE

LAST USED	DELETED
U17B	
C14	
R6	

J21

+5 VOLTS

GROUND

C3 .01 C4 .01 C5 .01 C6 .01 C7 .01 C8 .01 C9 .01 C10 .01

C11 .1 C12 .1 C13 .1 C14 .1

+5V

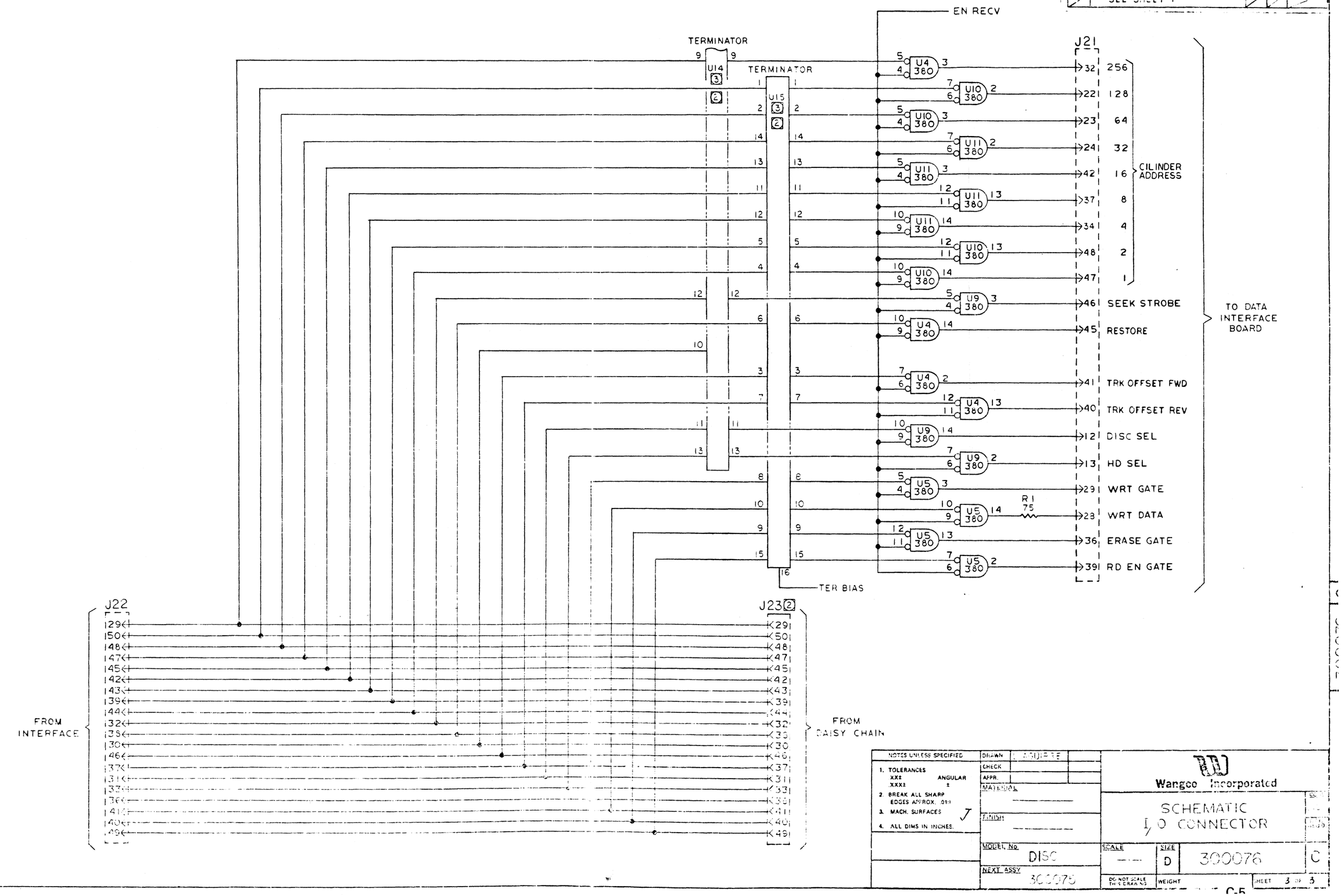
NOTES UNLESS SPECIFIED	DRAWN	12-13-78
1. TOLERANCES XX± ANGULAR XXX± ±	CHECK	
2. BREAK ALL SHARP EDGES APPROX .010	APPR	
3. MACH. SURFACES ✓	MATERIAL	
4. ALL DIMS IN INCHES	FINISH	

Wang Computer Products

SCHEMATIC
I/O CONNECTOR

MODEL NO.	SCALE	SIZE		
DISC	—	D	300076	C
NEXT ASSY 300075	DO NOT SCALE THIS DRAWING	WEIGHT	SHEET 2 OF 3	

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
	SEE SHEET 1			



NOTES UNLESS SPECIFIED	DRAWN	J. ANDUEZE	Wangco Incorporated	
1. TOLERANCES XX± ANGULAR .XXX± ±	CHECK		SCHEMATIC I/O CONNECTOR	
2. BREAK ALL SHARP EDGES APPROX. .011	APPR.			
3. MACH. SURFACES	MATERIAL			
4. ALL DIMS IN INCHES.	FINISH			
	MODEL No.	DISC	SCALE —— SIZE D	300076 C
	NEXT ASSY	300075	DO NOT SCALE THIS DRAWING	WEIGHT SHEET 3 OF 3

C-5

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
	SEE SHT 4			

P18
+18 VDC 1
+18 VDC 2
HARD PICK 3

J10
TO SPINDLE DRIVE MODULE 300612 REF { HARD PICK 6, +18 VDC 5
−18 VDC 3
GROUND 2
TO AC POWER SWITCH REF. { 4, 1 BLACK

F4 (11)

FL1 P/N 101151
L
GND GREEN
RFI
N WHITE
E1

AC INPUT →

P28 J28
11, 12 GRAY WHT 130V
8 VIO WHT 110V
7
6 BLUE 110V
6
5 GRN 10V
5
YEL WHT 130V
4
ORN WHT 110V
3
3
2 RED 110V
2
1 BRN 10V
11 13

T1
ORANGE 9
YELLOW 10
VIOLET 11
GRAY 12
WHT 13
P/N 300150

(11) 300324-XXX REF.

DB1
C5 + 83K UF 25V
C6 + 83K UF 25V
R11 330 5W
R12 330 5W
F1 (7)
F2 (7)

J16
4 −18VDC UNFUSED
1 −18VDC
2 +18VDC
3 POWER SUPPLY GROUND

P9
5 +18 VDC
4, 7 RETURN
2 −18 VDC
3 NOT USED
6 NOT USED
9 NOT USED (CONNECTOR ORIENTATION ONLY)
8 +5 VDC
1 AC POWER LOSS

F3 5A

DB2
+ C7 27000UF 20V −

+5 REGULATOR ASSY P/N 300200
R3 100
Q1 TI.42A
Q2 2N3771
R5 33
R4 62
R7 R8 .15 .15 5W 5W
VR1 IN4736A 6.8V 5% 1W
SCR1 RCA 40654
C1 + 15
R1 1.5K 1cw
R10 1K
R2 5100
U1 723
C2 .001 200 VDC
R6 470
C3 + 56 6V
C4 + 15
R9 1K

(11) TABULATION CHART

DASH NO.		VOLTAGE	P28 PIN NO. DESIGNATIONS			F4
300324	-100	100 VAC	11 / 12	2 / 3	6 / 7	3A SB
	-110	110 VAC	11 / 12	1 / 3	5 / 7	3A SB
	-120	120 VAC	11 / 12	2 / 4	6 / 8	3A SB
	-130	130 VAC	11 / 12	1 / 4	5 / 8	3A SB
	-200	200 VAC	— / 11 / 12	3 / 2 / 7	6 / — / —	2A SB
	-220	220 VAC	— / 11 / 12	3 / 1 / 7	5 / — / —	2A SB
	-230	230 VAC	— / 11 / 12	3 / 2 / 8	5 / — / —	2A SB
	-240	240 VAC	— / 11 / 12	4 / 2 / 8	6 / — / —	2A SB
	-250	250 VAC	— / 11 / 12	4 / 1 / 8	6 / — / —	2A SB
300324	-260	260 VAC	— / 11 / 12	4 / 2 / 8	6 / — / —	2A SB

REFERENCE DESIGNATIONS	
HIGHEST USED	DELETED
C7	
DB2	
FL1	
F4	
F3 5A	
J16	
P9	
R11	

(11) SEE TABULATION FOR VOLTAGE PLUG CONFIGURATION, AND LINE FUSE TYPE.
10. ALL CAPACITORS IN MICRO-FARADS, 20V, 10%.
9. ALL RESISTORS IN OHMS, 5%, 1/4W;.
UNLESS OTHERWISE SPECIFIED:

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NOTES UNLESS SPECIFIED	DRAWN	
1. TOLERANCES XX± ANGULAR, XXX± ±	CHECK	
2. BREAK ALL SHARP EDGES APPROX. .010	APPR	
3. MACH. SURFACES √	MATERIAL	
4. ALL DIMS IN INCHES.	FINISH	
	MODEL No.	
	NEXT ASSY	

Wangco Incorporated

SCHEMATIC, POWER SUPPLY

SCALE	SIZE	300346	CODE
	D	SHEET 1	

DO NOT SCALE THIS DRAWING — AS BUILT — SHEET 6 OF 6

REVISIONS				300498 F
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	MFG REL SEE CR/O 3625			
B	SEE CR/O 3841		3/14	
C	SEE CR/O 4083		3/14	
D	CR/O 5078		8/	
E	CR/O 6004		3/27/72	
F	CR/O 7054		12/6/72	

UNLOAD FF (–)
LOAD (–)
SHT 2

P4
LD HD (–) H
RTZ (+) F
BEGINNING OF TRAVEL PULSE (–) E
SK (+) 33
DET ODD (–) R
DET EVEN (–) S

U13 7402
U20 7400
U30 7408
U6 7402
U3 7402
U1 7400
U33 7400
U21 75452
U22 75452

UNLOAD F/F (U29 7474)
LOAD F/F (U29 7474)
BOT 1 (U19 7474)
BOT 2 (U31 7474)
DETENT F/F (U31 7474)

C3 270 PF
+5V R14 5.1K
U2 9602 400 nSEC
SK DLY ONE/SHOT

+5V PULL UP
ZERO (+)
ILL ADD (+)
DLY DT (–)

+5V R15 1K

P4
27 LOAD UNLOAD (+)
17 LOAD/UNLOAD (–)
V COARSE SERVO ENABLE (–)
P̄ SERVO DET EN (–)
N̄ DET EN (+)
31 AD 256 (+)
M̄ DLY SK (–)
T ODD (+)

CAR 1
DLY SK (–)
DT EN FF (+)
DT P (+)
UNLOAD (–)
CL CAR (+)
256
256
128
128
64
64
32
32
16
16
8
8
4
4
2
2
1
1
SHT 2

+13V
–13V
+5V
C22 1.5UF
GROUND
GND
GND

ADD 256 34
128 D
64 C
32 B
16 A
8 Z
4 Y
2 X
ADD 1 W

AD256 F/F (U23 7474)
AD128 F/F (U27 7474)
AD64 F/F (U26 7474)
AD32 F/F (U26 7474)
AD16 F/F (U27 7474)
AD8 F/F (U24 7474)
AD4 F/F (U24 7474)
AD2 F/F (U25 7474)
AD1 F/F (U25 7474)

+5V R24 1K
+5V R25 1K

NAR REGISTER

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NOTES UNLESS SPECIFIED
1. TOLERANCES .XX± ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES.

DRAWN M. Wang 6/7/73
CHECK
APPR.
MATERIAL
FINISH
MODEL No. 200 TPI F&T
NEXT ASSY 300497
DO NOT SCALE THIS DRAWING

Wangco Incorporated

SCHEMATIC SERVO LOGIC-2

CODE D108
QTY. REQ'D.
SCALE —
SIZE D
300498 F
WEIGHT
SHEET 1 OF 2

CC

300498 F

REVISIONS				300498 F
REV.	DESCRIPTION	CHK.	DATE	APPROVED
—	SEE SHT 1 OF 2			

SHT 1 256 256 128 128 64 64 32 32 16 16 8 8 4 4 2 2 1 1

+5V +5V +5V +5V +5V +5V

R18 7.5K R19 7.5K R20 7.5K R21 7.5K R22 7.5K R23 7.5K

R1 49.9K 1% R2 100K 1% R3 200K 1% R4 402K 1% R5 820K 5% R6 1.6 MEG 5%

U34 5020 U36 5020 U35 5020 U35 5020 U36 5020 U34 5020

TEMP COMP

P4 N TCV

ZERO(+) ILL ADD(+) SHT 1

C6 .01 R9 63.4K 1%

U38 5558 R26 JUMPER

P4 P TC DAC

$\overline{K}$ ILL ADD (+)

ILL ADD DECODER

U28 7411 U37 7432 U37 7432 U37 7432 U28 7411 U28 7411

+5V R16 1K

CAR-3 U4 74193 CAR-2 U8 74193 CAR-1 U15 74193

SHT 1 CL CAR (+) DLY DT (-)

C4 .0047 R11 20K C5 .0047 R12 20K

DT EN FF(+) DTP (+) UNLOAD (-) U32 9602 28LS

CAR DLY DETENT DLY

U33 7400 COUNT UP ENABLE U33 7400 COUNT DOWN ENABLE

SHT 1 +5V PULL UP CAR 1

COMP-1 U17 9324 COMP-2 U18 9324

CAR 256 NAR>CAR

SUB-3 U5 7483 SUB-2 U9 7483 SUB-1 U16 7483

CAR 128 CAR 64 CAR 32 CAR 16 CAR 8 CAR 4 CAR 2 CAR 1

U10 7486 U10 7486 U10 7486 U11 7486 U10 7486 U11 7486 U11 7486 U11 7486

ONE'S COMPLIMENT

U21 75452 R10 150 R13 2K C32 .1

K DIF 256/128(+)

C35 33PF R7 2.32K 1% C7 .01 R8 4.64K 1%

D/A CONVERTER U7 1406 C29 .01 C36 .01 C2 .01 C34 .01

U38 5558 +13V -13V

M DDAC

$\overline{L}$ FWD(-)

U23 7474 FWD F/F R U33 7400

SHT 1 LOAD (-) DLY SK (-) UNLOAD FF(-) +13V GND -13V

C34 .01 C2 .01 C36 .01

SHT 1 +5V GND +5V

C20 C21 .01 C23 .01 C24 .01 C25 .01 C26 C27 .01 C28 C30 .01 C31 C29 .01 C19 .01

C9 C10 .01 C11 .01 C12 .01 C13 .01 C14 C15 .01 C16 C17 .01 C1 .01 C8 .01 C18

3. ALL CAPACITOR VALUES IN MICROFARADS.
2. ALL RESISTOR VALUES IN OHMS, 5%, 1/4W.
[1] OPTIONAL CAPACITOR LOCATION TO BE USED FOR ADDITIONAL FILTERING WHERE REQUIRED
NOTES UNLESS OTHERWISE SPECIFIED

5. FOR ASSY REF SEE 300497
[4] FOR JUMPER VARIATIONS SEE M/L.

LAST USED	DELETED
U38	U12, U14
C36	C33
R26	R17, R24, R25

THIS DRAWING CONTAINS PROPRIETARY INFORMATION OF WANGCO INC. AND MAY NOT BE REPRODUCED IN PART, BE DUPLICATED OR DISCLOSED FOR USE FOR MANUFACTURE OF ANY PART DISCLOSED UNLESS WITH THE PRIOR WRITTEN PERMISSION OF WANGCO INC.

NOTES UNLESS SPECIFIED	DRAWN	M. Miyasato	7/26/73
1. TOLERANCES .XX± ANGULAR .XXX± ±	CHECK		
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.		
3. MACH. SURFACES	MATERIAL		
4. ALL DIMS IN INCHES.	FINISH		
	MODEL No.		
	NEXT ASSY		

Wangco Incorporated

SCHEMATIC SERVO LOGIC-2

CODE DIO8 QTY. REQ'D.

SCALE —— SIZE D 300498 F

DO NOT SCALE THIS DRAWING WEIGHT SHEET 2 OF 2

300498 F

REVISIONS				300803
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	MFG REL' SEE CR/O 3850			
B	SEE CR/O 4336			
C	SEE CR/O 4798			
D	SEE CR/O 5184			
E	CR/O 6186			
1				

J1 DIB

J4 SLB

J5 SVA

J15 [2]
- 6 SERVO MOTOR RELAY COIL
- 3 POWER SUPPLY GROUND
- 1 -18V FUSED SWITCHED
- 2 +18V FUSED
- 4 SERVO AMPLIFIER OUTPUT
- 5 MOTOR RETURN

J30
- 1 TACH RTN (RED)
- 2 SHIELD
- 3 TACH (BLACK)

} LINEAR VELOCITY TACHOMETER

+13V, +5V, −13V, GROUND

J14
- 6 LIGHT SOURCE
- 4 +13V
- 2 POSITION CHANNEL
- 1 POSITION COMMON
- 5 BEGINNING OF TRAVEL
- 3 AGC

} OPTICAL POSITION TRANSDUCER

J31
- 2 TEMP.
- 3 +5V

} TEMP. SENSOR

J8 UNIT SELECT SWITCH
- 6 SEL 1
- 9 SEL 2

J7 DEB

J2 C1B

J3 DCR

J6 PRB

J8
- 3 R DISC WRT PROT SW
- 2 F DISC WRT PROT SW

J18 [2] HARD PICK

J11 BRUSH MOTOR ON (−)

J29

J12
- 3 +5V
- SECTOR IN (REM)
- SECTOR RTN (REM)
- 5 −13V

J13
- SECTOR IN (FIXED)
- SECTOR RTN (FIXED)

J9
- AC IN
- +18V
- GND
- −18V
- +5V

CR1 IN5624, CR2 IN5624, CR3 IN5624, CR4 IN5624

C1 .1, C2 .1, C3 .1, C4 .1, C5 .1

[2] J15 & J18 IS SHOWN FOR CLARITY ONLY. IT IS NOT PART OF THE ELECTRONICS INTERCONNECT BOARD.

1. SIGNAL NAMES SHOWN AT SIGNAL SOURCE ONLY.

NOTES: UNLESS OTHERWISE SPECIFIED

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NOTES UNLESS SPECIFIED
1. TOLERANCES .XXX ANGULAR .XXXX ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES

DRAWN, CHECK, APPR., MATERIAL, FINISH

MODEL No. DISC SERIES 200

NEXT ASSY 300586

Wangco Incorporated

SCHEMATIC ELECTRONICS INTERCONNECT BD

CODE D108

SIZE D | 300803 | REV G

SCALE — | WEIGHT | SHEET 1 OF 1

WAS PART OF ASSY 300586

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
—	SEE SHT 2 OF 2	—	—	—

301026

P4

LD HD (-) H

RTZ (+) F

BEGINNING TRAVEL PULSE E

SK (+) 33

D ODD (-) R

DT EVE (-) S

+13V 3 C

-13V 2 B

+5V 4 D

GROUND 1 A 36 R

ADD 128 64 32 16 8 4 2 1 — D C B A Z Y X W

+5V R1 5.1K

U31 7402

UNLOAD F/F — U26 7474

LOAD F/F — U26 7474

BOT-1 — U14 7474

BOT-2 — U25 7474

DETENT F/F — U25 7474

C2 180 PF

R2 (3)

SK DLY ONE/SHOT — U1 9602

+5VPU

ZERO (+)

ILL ADD (+)

DLY DT (-)

FWD FF (-)

FWD FF (+)

SHT 2

U7 7400

U5 7402

U13 7408

U8 7400

U19 7402

U5 7403

U30 7432

U5 7402

+5V R15 5.1K

C25 82PF

U1 9602 200 n SEC

+5V R13 1K

AD128 F/F — U23 7474

AD64 F/F — U24 7474

AD32 F/F — U24 7474

AD16 F/F — U23 7474

AD8 F/F — U27 7474

AD4 F/F — U27 7474

AD2 F/F — U28 7474

AD1 F/F — U28 7474

U9 75452

U9 75452

+13V

-13V

+5V

C1 15UF

GND

+5V R14 1K

+5V R4 1K

+5V R3 1K

NAP REGISTER

UNLOAD F F (-)

LOAD (-)

SHT 2

U8 7400

U31 7402

U13 7408

U5 7402

U19 7402

+5V R5 1K

P4

27 LOAD / UNLOAD (+)

17 LOAD / UNLOAD (-)

V COARSE SERVO EN (-)

P S DT EN (-)

N DT EN (+)

31 ADD 128 (+)

M DLY SK (-)

T ODD (+)

DLY SK (-)

DT EN FF (+)

DT P (+)

UNLOAD (-)

CL CNTR (+)

128 128 64 64 32 32 16 16 8 8 4 4 2 2 1 1

SHT 2

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NOTES UNLESS SPECIFIED			
1. TOLERANCES XX± ANGULAR XXX± ±	DRAWN	L AGUIRRE	3-14-74
2. BREAK ALL SHARP EDGES APPROX. .010	CHECK		
3. MACH. SURFACES ✓	APPR.		
4. ALL DIMS IN INCHES.	MATERIAL		
	FINISH		
	MODEL No.	PRT 100 TPI	
	NEXT ASSY	301025	

Wangco Incorporated

SCHEMATIC
SERVO LOGIC-3
100 TPI

SCALE — SIZE D 301026 G

DO NOT SCALE THIS DRAWING — WEIGHT — SHEET 1 OF 2

C-10

REVISIONS				301025
REV.	DESCRIPTION	CHK	DATE	APPROVED
X1	EXPERIMENTAL REL.		3/5	
A	PILOT REL		1/5	
B	CR/O 6009			
C	CR/O 6345			
C	MFG RELEASE NO CHANGE			
D	CR/O 6872			
E	CR/O 6957			
F	CR/07256			
G	CR/O 7646			

ILLEGAL ADDRESS DECODER

U29 7411 · U30 7432 · U29 7411 · U30 7432 · U30 7432 · U29 7411

128 128 64 64 32 32 16 16 8 8 4 4 2 2 1 1 — SHT 1

ZERO(+)
ILL ADD(+)
} SHT 1

+5V PU
CL CNTR(+)
DLY DT(−)
} SHT 1

+5V

R8 1K

COMP 1 U17 9324 · COMP 2 U18 9324 · NAR> CAR

CAR-2 U15 74193 · CAR-1 U21 74193

CTR 128 · CTR 64 · CTR 32 · CTR 16 · CTR 8 · CTR 4 · CTR 2 · CTR 1

SUB-2 U16 7483 · SUB-1 U22 7483

U11 7486 · U11 7486 · U10 7486 · U11 7486 · U10 7486 · U10 7486 · U10 7486

U6A 75452 · R10 150 · C8 1UF 35V · +5V · R12 2K

P4
P TO DAC
K ILL ADD(+)
K DIF 128(+)/64(+)

+5V · R6 20K · C3 .0047 · +5V · R7 20K · C4 .0047

DT EN FF(+)
DTP(+)
UNLOAD(−)
} SHT 1

U20 9602 (30 U SEC) · CARDLY · U20 9602 (30 U SEC) · DLY DT

U32 7400 · U32 7400

C5 33PF · +5V · R9 2.32K 1% · C9 .01 · R11 4.64K 1%

D/A CONVERTER U4 1406

U6B 1458 · +13V · C10 .01 · C11 .01 · −13V

C6 .01 · −13V · C7 .01

M DDAC

LOAD(−)
DLY SK(−)
UNLOAD FF(−)
} SHT 1

U7 7400 · U32 7400

FWD F/F U2 7474

L FWD(−)

FWD FF(+)
FWD FF(−)
} SHT 1

+5V
GND
+5V
} SHT 1

C12 C14 C16 C18 C20 C22 C24 .01
C13 C15 C17 C19 C21 C23 .01
+5V
GND
+5V

3 FOR VARIABLE COMPONENTS AND JUMPER CONFIGURATION SEE M/L.
2. ALL CAPACITOR VALUES IN MICROFARADS.
1. ALL RESISTOR VALUES IN OHMS. 5%, 1/4 W.
NOTES: UNLES OTHERWISE SPECIFIED

LAST USED	DELETED
U32	
C25	
R15	

NOTES UNLESS SPECIFIED
1. TOLERANCES XX± ANGULAR .XXX± ±
2. BREAK ALL SHARP EDGES APPROX. .01
3. MACH. SURFACES
4. ALL DIMS IN INCHES.

DRAWN L. AGUIRRE 3-74 · CHECK · APPR. · MATERIAL · FINISH

MODEL No. F-T 100 TPI
NEXT ASSY 301025

Wangco Incorporated

SCHEMATIC
SERVO LOGIC-3
100 TPI

CODE D 108 · QTY. HEAD

SCALE — · SIZE D · 301026 · G

DO NOT SCALE THIS DRAWING · WEIGHT · SHEET 2 OF 2

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REVISIONS				301027
REV.	DESCRIPTION	CHK.	DATE	APPROVED
A	MFG REL SEE CR/O 3421	TB	2/3/75	LB
B	SEE CR/O 3660	TB	7/4/75	LB
C	SEE CR/O 38-	TB	8/3/75	LB
D	CR/O 5509	TB	12/4/75	LB
E	SEE CR/O 6006	TB	12/19/75	J. Smith
F	CR/O 8019 (AUTO INSERTION)	ISC	11/1/76	J. Howard

TABLE

	SIGNAL	JUMPER
J1	UNCONDITIONL RESTORE	A-C
J1	RESTORE WITH SEEK STROBE	A-B
J3	SEEK INCOMPLETE ONLY	G-J
J3	SEEK INCOMPLETE AND ILL ADD	G-H
J4	RESETING SEEK COMP. BY SEEK INCOMPLETE AND ILL ADD	HH-JJ
J4	RESETING SEEK COMP BY SEEK INCOMPLETE ONLY	HH-GG
J4	SEEK COMP DISREGARD SEEK-INCOMPLETE AND ILL ADD	HH-FF
J5	SEEK COMP RESET @ EVERY SEEK	M-K
J5	SEEK COMP RES IF ADDRESS CHGS	M-L
J6	SEEK COMP (STANDARD)	MM-KK
J6	INVERTING SEEK COMP	MM-LL
J7	DISC SELECT (STD)	SS-PP
J7	DISC SELECT (INV)	SS-RR
J8	MULTIPLEX IDX	EE-DD
J8	REMOVE DISC IDX	EE-CC
J9	MULTIPLEX SAC 8	BB-Y
J9	FIXED DISC INDEX ONLY	BB-Z
J10	MULTIPLEX SAC 16	AA-X
J10	FIXED DISK STR ONLY	AA-W
J11	MULTIPLEX STR	U-T
J11	MULTIPLEX SAC 32	U-S
J11	REMOVE STR ONLY	U-V
J12	ILL ADD PULSE	P-R
J12	ILL ADD LEVEL	N-R
J13	UNLOAD STANDARD	UU-VV
J2	D-40 ATTENTION	WW-ZZ
J2	D-30 ATTENTION	WW-YY
J2	C-200/300 ATTENTION	WW-XX
J2	CD-22 ATTENTION	WW-AAA
J14	D40 NEG. ATTN/DAISY CHAIN	KK-ZZ
J15		LL-WW
J16		L-MM

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3 FOR JUMPER LOCATIONS AND VARIABLE COMPONENTS SEE TABLE AND M/L.
2. ALL CAPACITORS IN MICROFARADS.
1. ALL RESISTORS IN OHMS ±5% 1/4 W. UNLESS OTHERWISE SPECIFIED.

LAST USED	DELETED
U26	
C20	
R10	
TP4	

NOTES UNLESS SPECIFIED
1. TOLERANCES XXX ANGULAR, XXXX ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES

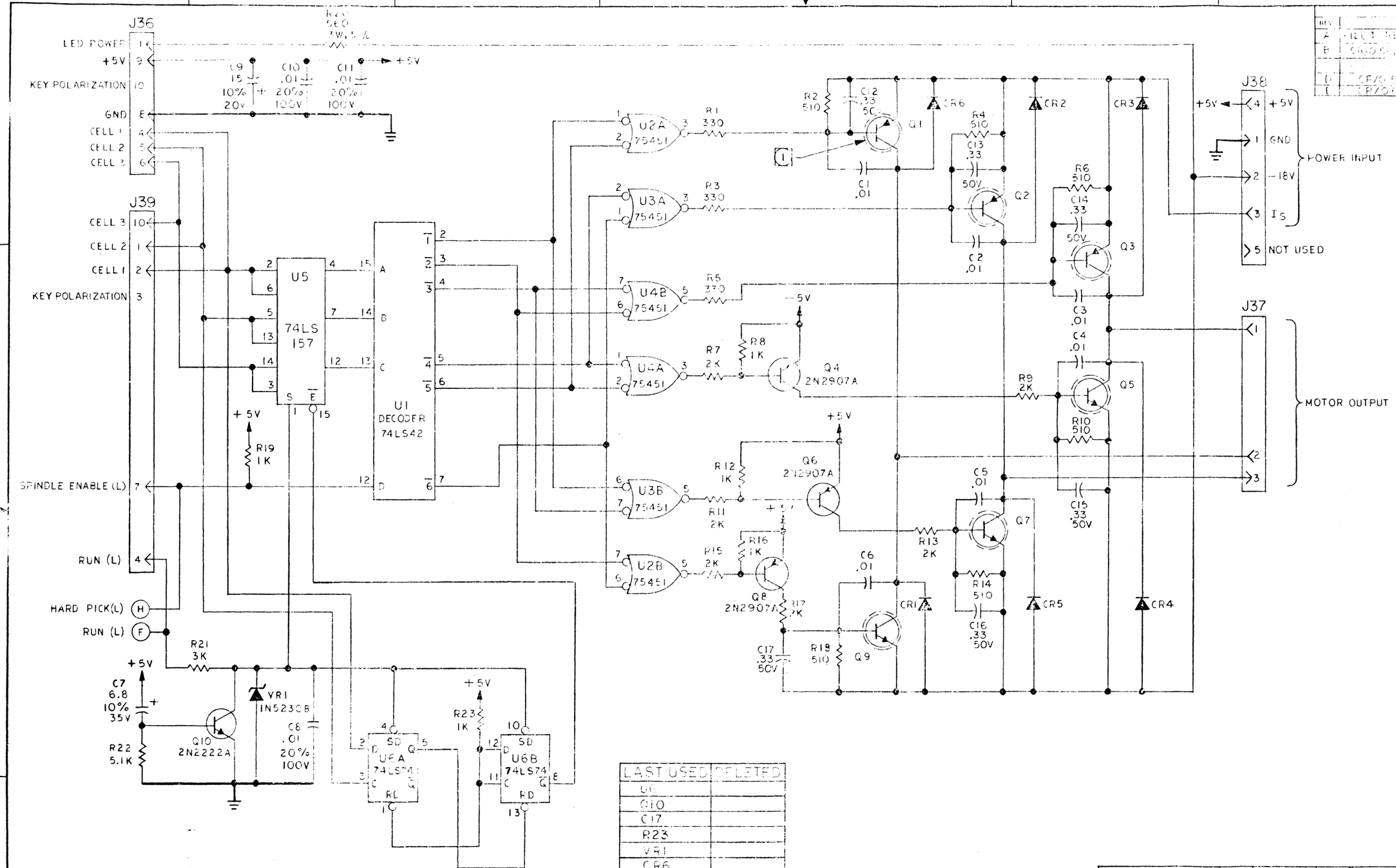
DRAWN L. AGUIRRE 8-1-74
CHECK
APPR.
MATERIAL
FINISH
MODEL NO DISK
NEXT ASSY 301030

Wangco Incorporated

SCHEMATIC
CONTROL INTERFACE
200 TPI

SIZE D | 301027 | F
SCALE
WEIGHT
SHEET 1 OF 1

DO NOT SCALE THIS DRAWING



LAST USED	DELETED
U6	
Q10	
C17	
R23	
VR1	
CR6	

4. ALL DIODES TO BE IN4003.
3. ALL CAPACITOR VALUES IN MICROFARADS, 10%, 80V.
2. ALL RESISTOR VALUES IN OHMS, 5%, 1/4 W.
[1] TRANSISTORS ENCIRCLED BY DASHED LINES ARE HEATSINKED.

NOTES: UNLESS OTHERWISE SPECIFIED

REV	DESCRIPTION	DATE	APPD
A	PILOT RELEASE		
B	CR6 ADDED		
D	CE/0.5622		
E	PR75141		

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NOTES UNLESS SPECIFIED	DRAWN	CHECK	APPR.	MATERIAL	FINISH
1. TOLERANCES .XX± —— ANGULAR ± —— .XXX± —— 2. BREAK ALL SHARP EDGES APPROX. .010 3. MACH. SURFACES —— √ 4. ALL DIMS IN INCHES					

Wangco Incorporated

SCHEMATIC, PWB — BRUSHLESS DC SPINDLE MOTOR DR PWR SWITCH

CODE IDENT NO. 10515 | DWG NO. 301154 | REV E | SIZE D | SCALE —— | SHEET 1 OF 1 | DO NOT SCALE THIS DRAWING | WEIGHT

MODEL NO. F & T 100/200 TPI

NEXT ASSY 301153

C-13

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
F	CR10 6650 (REPLACES 7435)			
G	CR10 7457			
H	CR10 7435			
J	CR10 8042			

J27 F BOTTOM: CR1, CR2, CR3
J26 F TOP: CR4, CR5, CR6
J25 R BOTTOM: CR7, CR8, CR9
J24 R TOP: CR10, CR11, CR12

READ TRANSFORMER → CR21
CR20 → SHT 2
ERASE DRIVER → R80

+13V (F) → R1 56, C1 22 20V

P7
HD SEL N
DISK SEL 15
F DISK WRT PROT SW F
R DISK WRT PROT SW H
SP DET P
DC LOSS R
AC LOSS 9

U3 14 (4), U4A 75452, U4B 75452, U1 26, U5 14

R2 10K, R3 10K, R4 10K, R5 10K
R6 100K, R7 100K, R8 100K, R9 100K
L1 27UH, L2 27UH, L3 27UH, L4 27UH
R85 1K, R86 1K, R87 1K, R88 1K

MULTIPLE HEADS SELECTED
+13V, +5V
R10 43K, R11 68K, C7 .01, C8 .01, R12 2K
U5A 311
-13V

+5V → R15 2K
R13 1K, R14 1K, C9 2.2 20V, C10 2.2 20V

R16 2K, R18 10, CR27 3.9V, Q1 2N2222A, R20 2.4K, R21 5.1K, R90 5.1K, R91 5.1K, R92 27K, R93 200, Q10 2N2222A, R19 47
U8 75451
U1 26

Q2 2N2907A, U13 78M08HC, C12 .01, R22 OPEN, C13 .01, R28 OPEN, +8R
R23 15, R24 OPEN, Q3 2N2907A, 10K R25, Q4 2N2222A, R26 5.1K, R27 2K
U7 14

U9 26
R29 56, C14 56 6V
FAULT GATE
WRT CHK X → P7-M
SHT 2
U8-3
U7-3

R30 2K, R31 2K, R89 2K

+13V, +5V, GND, -13V
L8 220UH, C38 15 20V
+13V FILTERED (F)
CR13 IN4003, CR14 IN4003
U14 78M06HC, C45 2.2 20V, C46 2.2 20V
+6R
C39 15 20V, C40 .01, C41 .01, C42 .01, C43 .01
TP3 GND, C44 15 20V
L9 220UH
-13V FILTERED (F)
CR15 IN4003, CR16 IN4003
U13 79M06AHC, C47 2.2 20V, C48 2.2 20V
C49 .01, C50 .01

5. ALL I.C'S ARE 74 SERIES.
I.C'S VCC & GND:
7414, 7426, 7474 - PIN 14 TO +5V, PIN 7 TO GND.
75451, 75452 - PIN 8 TO +5V PIN 4 TO GND.
[4] FOR VARIABLE COMPONENTS & JUMPER LOCATIONS. SEE M/L
3. ALL DIODES TO BE IN5317.
2. ALL CAPACITORS IN MICROFARADS
1. ALL RESISTORS IN OHMS 1/4W, 5%
NOTES: UNLESS OTHERWISE SPECIFIED

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NOTES UNLESS SPECIFIED
1. TOLERANCES XX ± ANGULAR .XXX ±
2. BREAK ALL SHARP EDGES APPROX .010
3. MACH. SURFACES ✓
4. ALL DIMS IN INCHES
5. DIMENSIONS APPLY AFTER FINISH AND HEAT TREAT

DRAWN, CHECK, APPR., MATERIAL, FINISH

WANGCO INCORPORATED

SCHEMATIC
DATA ELECTRONICS
S43

MODEL No. 200 TPI FET
N-XT ASSY 301157
SCALE ---
SIZE D
301158
J
DO NOT SCALE THIS DRAWING
WEIGHT
SHEET 1 OF 2

REVISIONS				
REV.	DESCRIPTION	CHK.	DATE	APPROVED
	SEE SHEET 1			

READ TRANSFORMER

WRITE TRANSFORMER

WRITE DRIVERS

WRITE CURRENT ADJ

ERASE DRIVER

INNER TRACKS CURRENT SHUNT

READ ENABLE

R/W HEADS SIGNAL TP2

P7

U	READ DATA 1	
17	READ DATA 2	
M	WRITE CHK X	
L	WRITE PROTECT	

AD 255/128	12	
WRITE DATA X	J	
ERASE	T	
WRITE	16	

SHT 1 · CR10 · U9-E · U1-3 SHT 1 · U9-2 SHT 1

LAST USED	DELETED
U15	
Q10	
CR27	C17
L9	
C51	C2,3,4,5
R93	R17
T2	

NOTES: UNLESS OTHERWISE SPECIFIED

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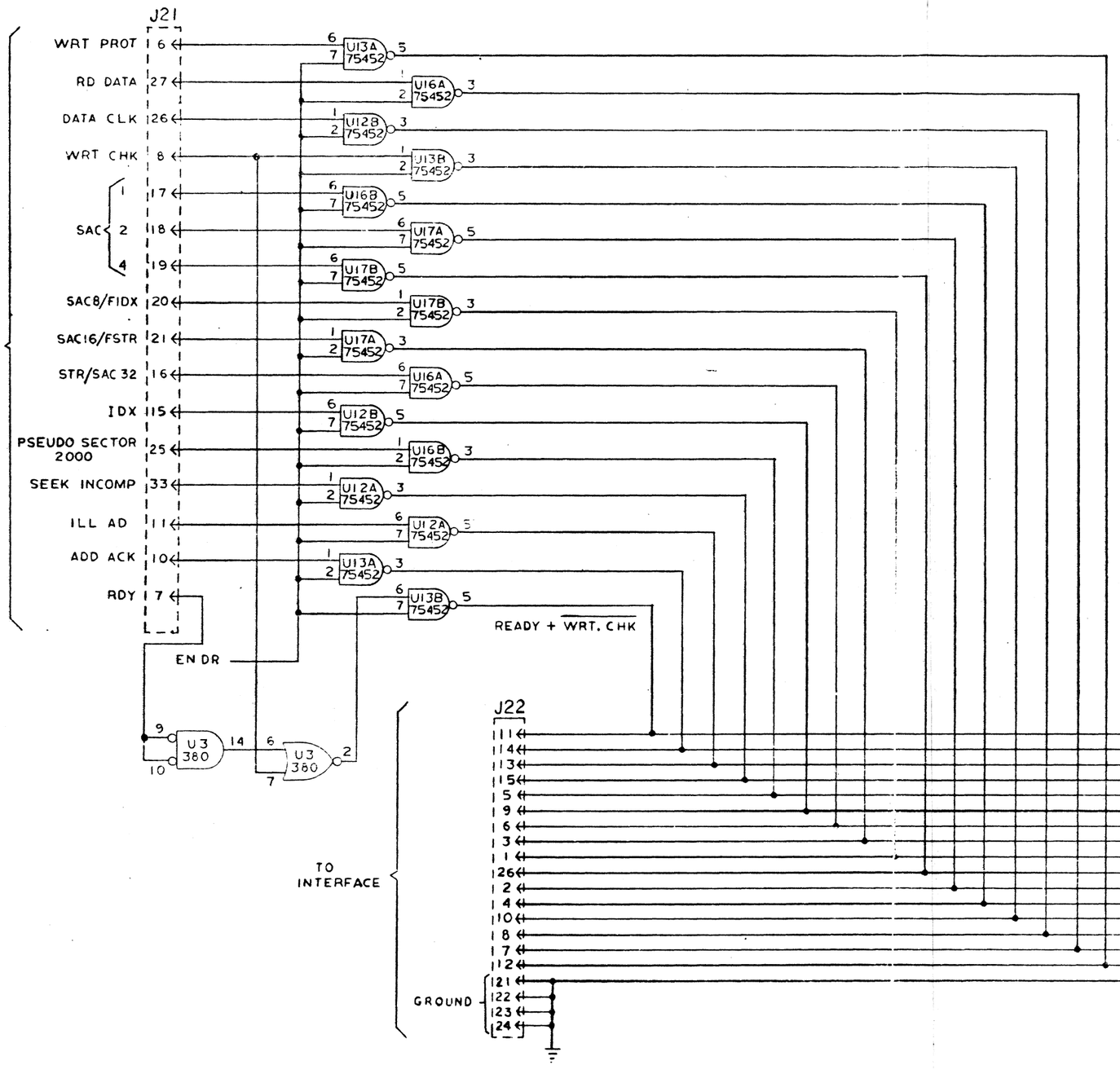
WANGCO INCORPORATED

SCHEMATIC
DATA ELECTRONICS
S43

SCALE: | SIZE: D | 30158 | REV: J

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 2 OF 2

REV		
A	MFG. REL	



[3] RESISTOR NETWORK
[2] SEE M/L FOR VARIABLE COMPONENTS
1. ALL RESISTORS IN OHMS 5%, 1/4W
NOTES UNLESS OTHERWISE SPECIFIED

Wang Computer Products

SCHEMATIC
I/O CONNECTOR

D50
301179

SIZE D 301180 A

SHT 1 OF 3

C-16

SEE SHT 1

J21

ATTENTION 14

SEL 1 43

SEL 2 44

SEEK COMP 9

+5V R2 1K

+5V R3 1K

C15 56μf 6V

C16 56μf 6V

U3 380

U2 380

U7A [2]

U7B [2]

U6B 75452

J22

J23 [2]

ATTENTION

SEEK COMPLETE

+5V C1 15 20V

JUMPER POINTS

CR1 IN4003

CR2 IN4003

C2 15 20V

TER BIAS

U14 [2] [3]

U8 380

1A 75452

1B 75452

+5V R4 1K.

+5V R5 1K

U6B 75452

EN DR

+5V R6 OPEN

U6A 75452

(NOT USED)

EN RECV

J22

UNIT SELECT 0 34 / 1 35 / 2 27 / 3 28

TERMINATING VOLTAGE 25

J23 [2]

UNIT SELECT

TERMINATING VOLTAGE

LAST USED	DELETED
U17B	
C14	
R6	

J21

+5 VOLTS 5 30 31

GROUND 1 2 3 4

C3 .01 C4 .01 C5 .01 C6 .01 C7 .01 C8 .01 C9 .01 C10 .01

C11 .1 C12 .1 C13 .1 C14 .1

+5V

rh

NOTES UNLESS OTHERWISE SPECIFIED

1. TOLERANCES
XXX ANGULAR
XXX
2. BREAK ALL SHARP EDGES APPROX .010
3. MAGNETIC SENSITIVE
4. ALL DIMS IN INCHES

Western Digital Corporation

SCHEMATIC
I/O CONNECTOR

DISC 301179

301180 A

C-17 2 OF 3

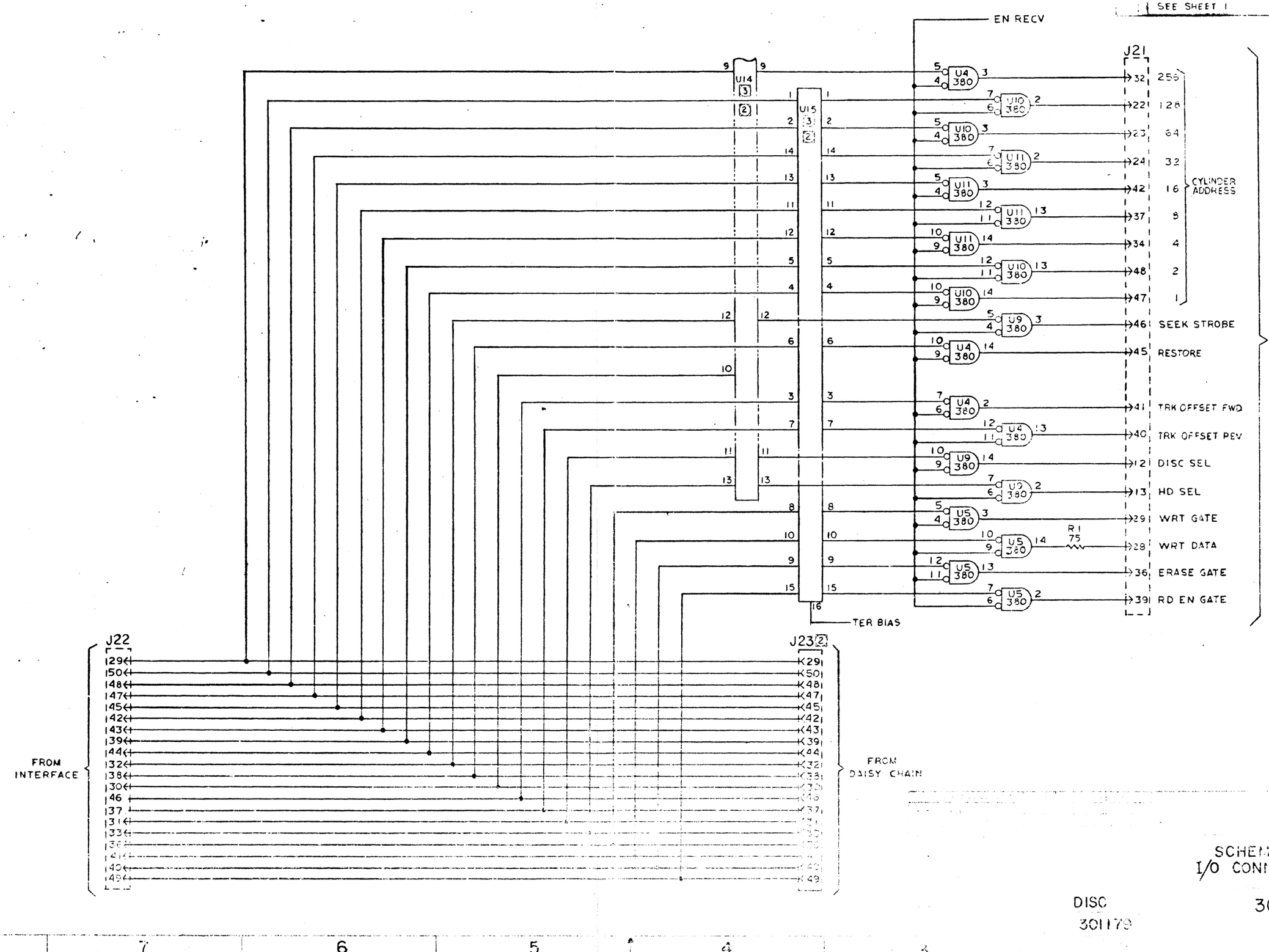
FAST FILE COPY

NUMBER EIH135

SHT 2 OF 3

301180 SCHEMATIC- I/O Connector

SEE SHEET 1



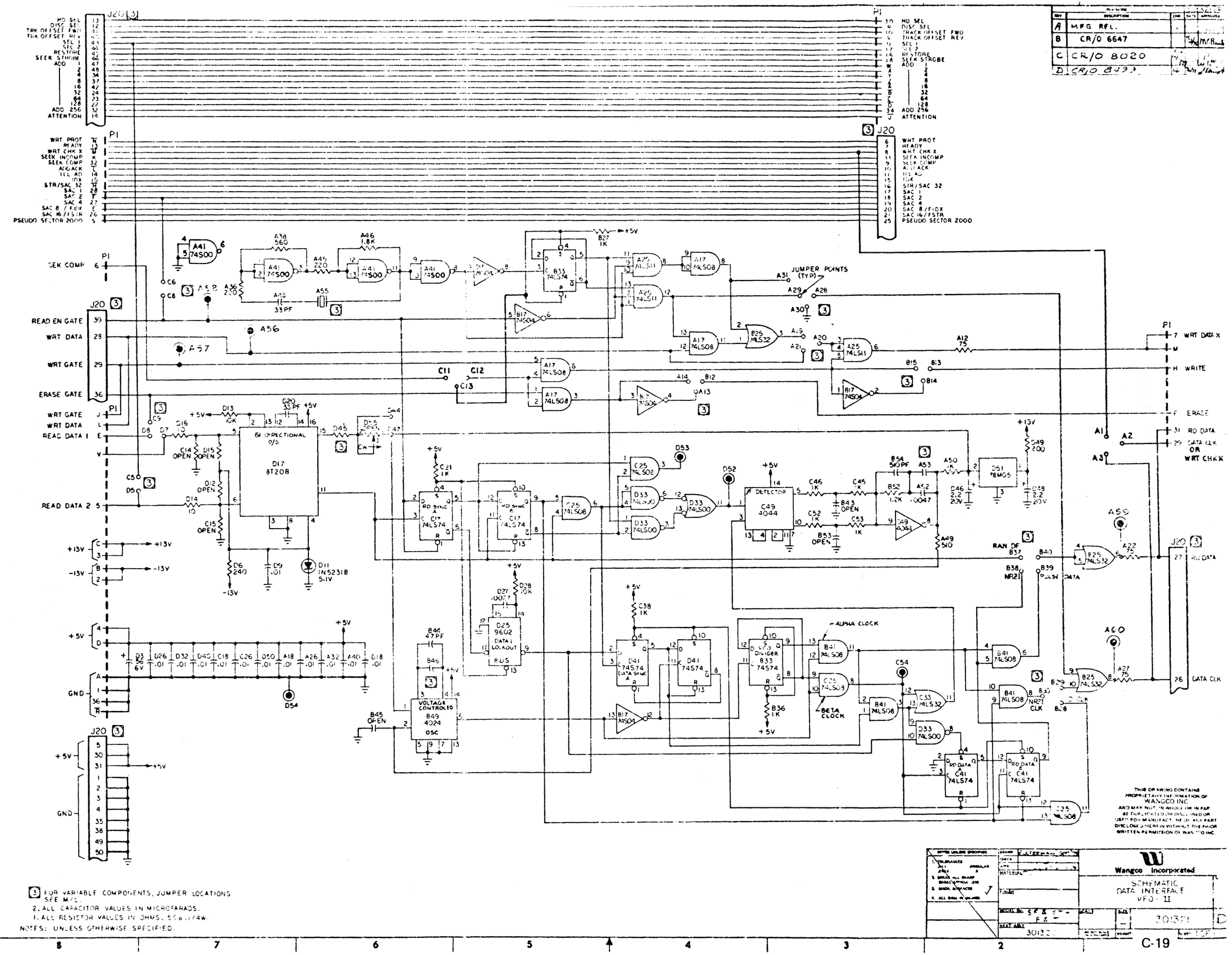
SCHEMATIC
I/O CONNECTOR

DISC
301179

301180

3 of 3

REV	DESCRIPTION	CHK	DATE	APPROVED
A	MFG REL.			
B	CR/O 6647			
C	CR/O 8020			
D	CR/O 8393			



(3) FOR VARIABLE COMPONENTS, JUMPER LOCATIONS SEE M/L.
2. ALL CAPACITOR VALUES IN MICROFARADS.
1. ALL RESISTOR VALUES IN OHMS, 5% 1/4W.
NOTES: UNLESS OTHERWISE SPECIFIED.

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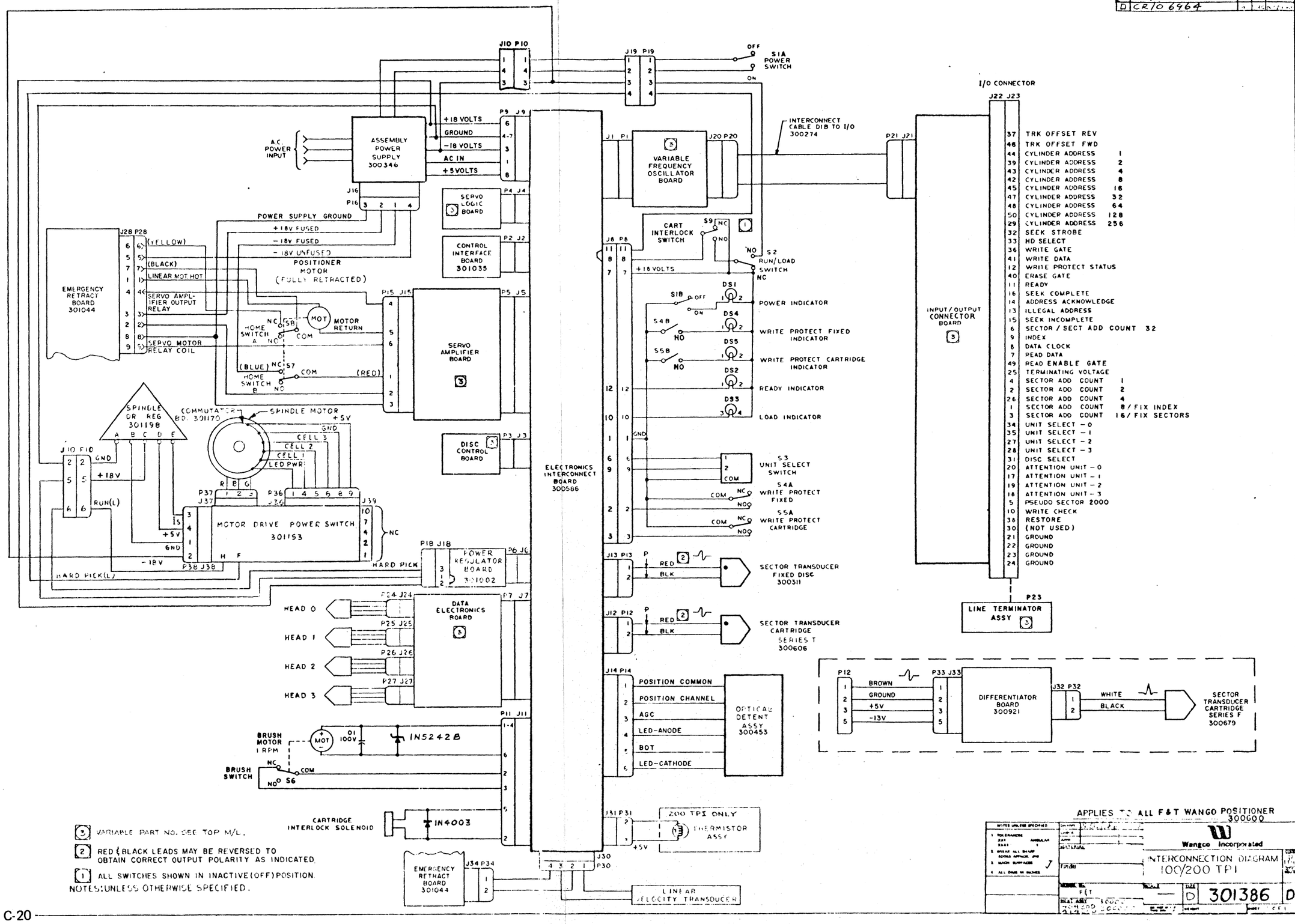
Wangco Incorporated

SCHEMATIC DATA INTERFACE VFO - II

30139

REV	DESCRIPTION	CHK	DATE	APPROVED
A	MFG REL			
B	CR/O 6818			
C	CR/O 6882			
D	CR/O 6964			

301386



[3] VARIABLE PART NO. SEE TOP M/L.

[2] RED & BLACK LEADS MAY BE REVERSED TO OBTAIN CORRECT OUTPUT POLARITY AS INDICATED.

[1] ALL SWITCHES SHOWN IN INACTIVE (OFF) POSITION.

NOTES: UNLESS OTHERWISE SPECIFIED.

APPLIES TO ALL F&T WANGO POSITIONER 300600

Wangco Incorporated

INTERCONNECTION DIAGRAM 100/200 TPI

SIZE D 301386 D

SCALE NONE SHEET 1 OF 1

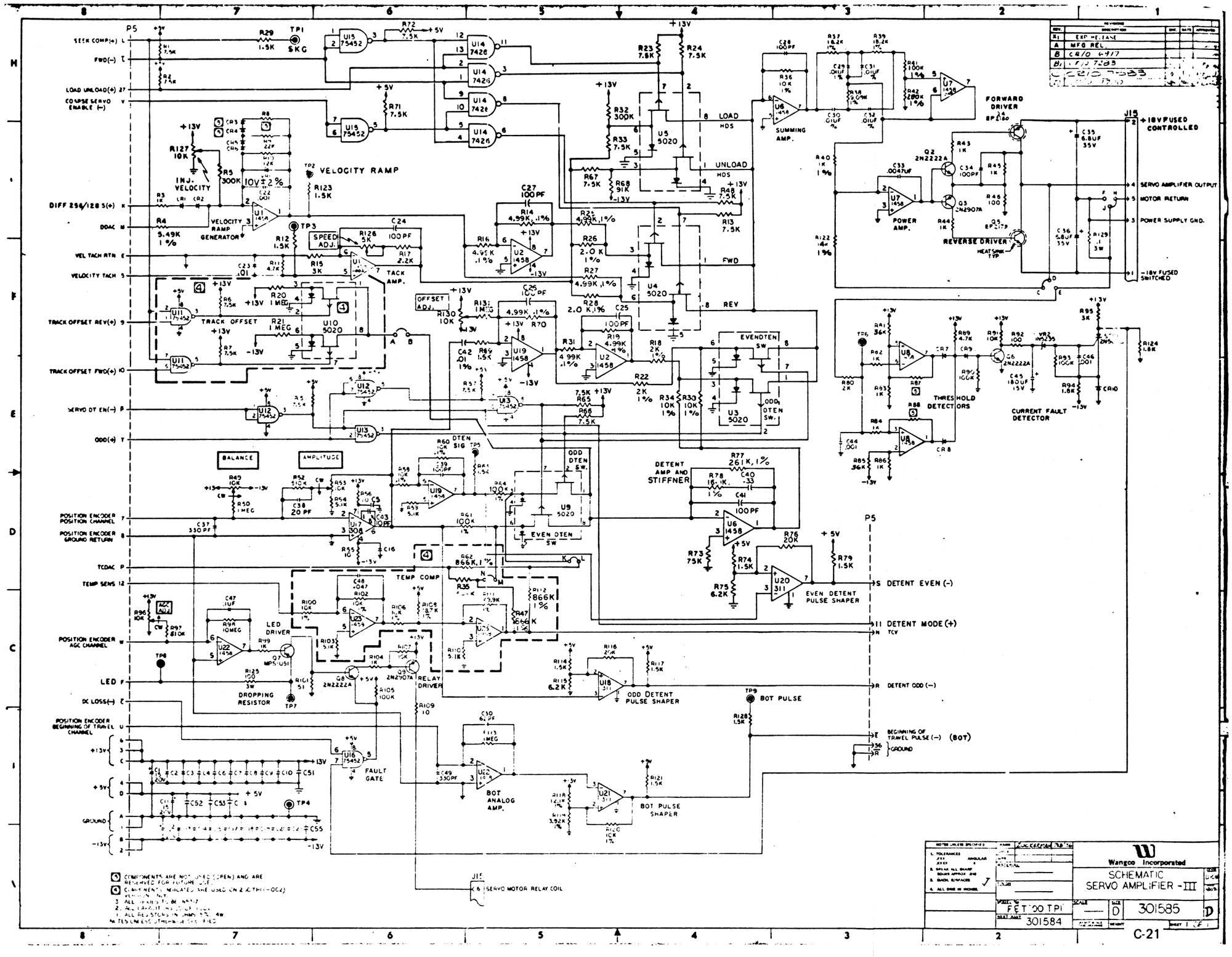
F&T

MATL ASST 300600 301002 300586

MANUFACTURING FEATURES

1 OF 1

301386 INTERCONN. DIA, 200TPI


P5
SEEK COMP(+) L
FWD(-) T
LOAD UNLOAD(+) 27
COURSE SERVO ENABLE (-) V
DIFF 256/128 S(+) K
DOAC M
VEL TACH RTN E
VELOCITY TACH S
TRACK OFFSET REV(+) 9
TRACK OFFSET FWD(+) 10
SERVO DT EN(-) B
ODD(+) T
POSITION ENCODER POSITION CHANNEL 7
POSITION ENCODER GROUND RETURN 8
TCDAC P
TEMP SENS 12
POSITION ENCODER AGC CHANNEL W
LED F
DC LOSS(-) Z
POSITION ENCODER BEGINNING OF TRAVEL CHANNEL U
+13V
+5V
GROUND
-13V
INJ. VELOCITY
VELOCITY RAMP GENERATOR
VELOCITY RAMP
SPEED ADJ.
TACK AMP.
TRACK OFFSET
OFFSET ADJ.
BALANCE
AMPLITUDE
DTEN SIG
ODD DTEN SW.
EVEN DTEN SW
EVENDTEN SW
TEMP COMP
LED DRIVER
DROPPING RESISTOR
RELAY DRIVER
FAULT GATE
BOT ANALOG AMP.
BOT PULSE SHAPER
ODD DETENT PULSE SHAPER
EVEN DETENT PULSE SHAPER
DETENT AMP AND STIFFNER
SUMMING AMP.
POWER AMP.
FORWARD DRIVER
REVERSE DRIVER
THRESHOLD DETECTORS
CURRENT FAULT DETECTOR
LOAD
UNLOAD
FWD
REV
+18V FUSED CONTROLLED
SERVO AMPLIFIER OUTPUT
MOTOR RETURN
POWER SUPPLY GND.
-18V FUSED SWITCHED
DETENT EVEN (-)
DETENT MODE (+)
DETENT ODD (-)
BOT PULSE
BEGINNING OF TRAVEL PULSE (-) (BOT)
GROUND
SERVO MOTOR RELAY COIL
10V ± 2%
TCV
EXP. RELEASE
MFG REL.
C-21
Wangco Incorporated
SCHEMATIC
SERVO AMPLIFIER - III
FET 100 TPI
301584
301585
D
C-21

REVISIONS			
REV.	DESCRIPTION	ENG.	DATE
X1	EXP. REL		3-7-77
A	PILOT REL		3-7-77
B	CR/O 7854		3-7-77
C	CR/O 8256		3-7-77
D	CR/O 8388 MFG. REL		3-7-77

SPEED CONTROL OSC

DIVIDER 1 | DIVIDER 2 | DIVIDER 3

RPM CTR 1 | RPM CTR 2 | RPM CTR 3

P3

SECTOR IN (REM) M
SECTOR RTN (REM) L
NOT USED 21
SECTOR IN (FIXED) P
SECTOR RTN (FIXED) N
AC LOSS K
-18V SW 35
NOT USED 36
RUN/STOP RUN (-) B
BRUSH MOTOR ON (-) A
RTN ZERO N
-13V 2 B
+13V 3 C
+5V 4 D
GROUND 1 A R 36

IDX TO DATA TIMER
REM IDX P.W.
REM IDX WINDOW
FIXED IDX P.W.
FIXED IDX WINDOW
INDEX ALIGNMENT
D.C. LOSS DRIVER
RETRACT F/F
B.M. F/F
RUN TO LOAD TIMER
SOLENOID F/F
±13 VOLT LOSS DETECTOR
OFF SPEED F/F
CNT 2048 F/F
INC SPEED 1
SPM ON F/F
RDY DLY 1
RDY DLY 2

P3

S PSEUDO SECTOR 2000
Z SP DETEC
M SPM ON
V RIDX
29 R STR
H LD HD (-)
U RDY 1
30 F IDX
31 F STR
P BM ON (+)
F RTZ (+)
D SOL
C DC LOSS (-)

TABLE

COMP / JUMPER	DESIGNATION	LOCATION / COMP VALUE
R29	2400 RPM	110K
R36		110K
R29	1500 RPM	OPEN
R36		OPEN
J2	IDX ONLY	H-F
J3		J-K
J2	IDX / STR	H-G
J3		J-L
C39	IDX / STR PLS (500NS)	OPEN
C40		OPEN
C39	IDX / STR PLS (5µS)	.0022 UF
C40		.0022 UF
J1	SINGLE DISC ONLY	U-V
J1	DUAL DISC	W-V

LAST USED	DELETED
U35	
CR6	CR3
VR4	
C48	C36 C6
R56	R33
TP2	
Q2	

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4 JUMPERS ARE PERMANENTLY WIRED AS SHOWN.
3 SEE TABLE 4 M/L FOR COMP OR JUMPER LOCATIONS.
2. ALL CAPACTORS IN MICROFARADS.
1. ALL RESISTORS IN OHMS ±5% ¼W

NOTES UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED
1. TOLERANCES .XXX ANGULAR .XXX ±
2. BREAK ALL SHARP EDGES APPROX. .010
3. MACH. SURFACES
4. ALL DIMS IN INCHES

DRAWN
CHECK
APPR. JM 3-7-77
MATERIAL
FINISH
MODEL No. F/T
NEXT ASSY 301903

Wangco Incorporated

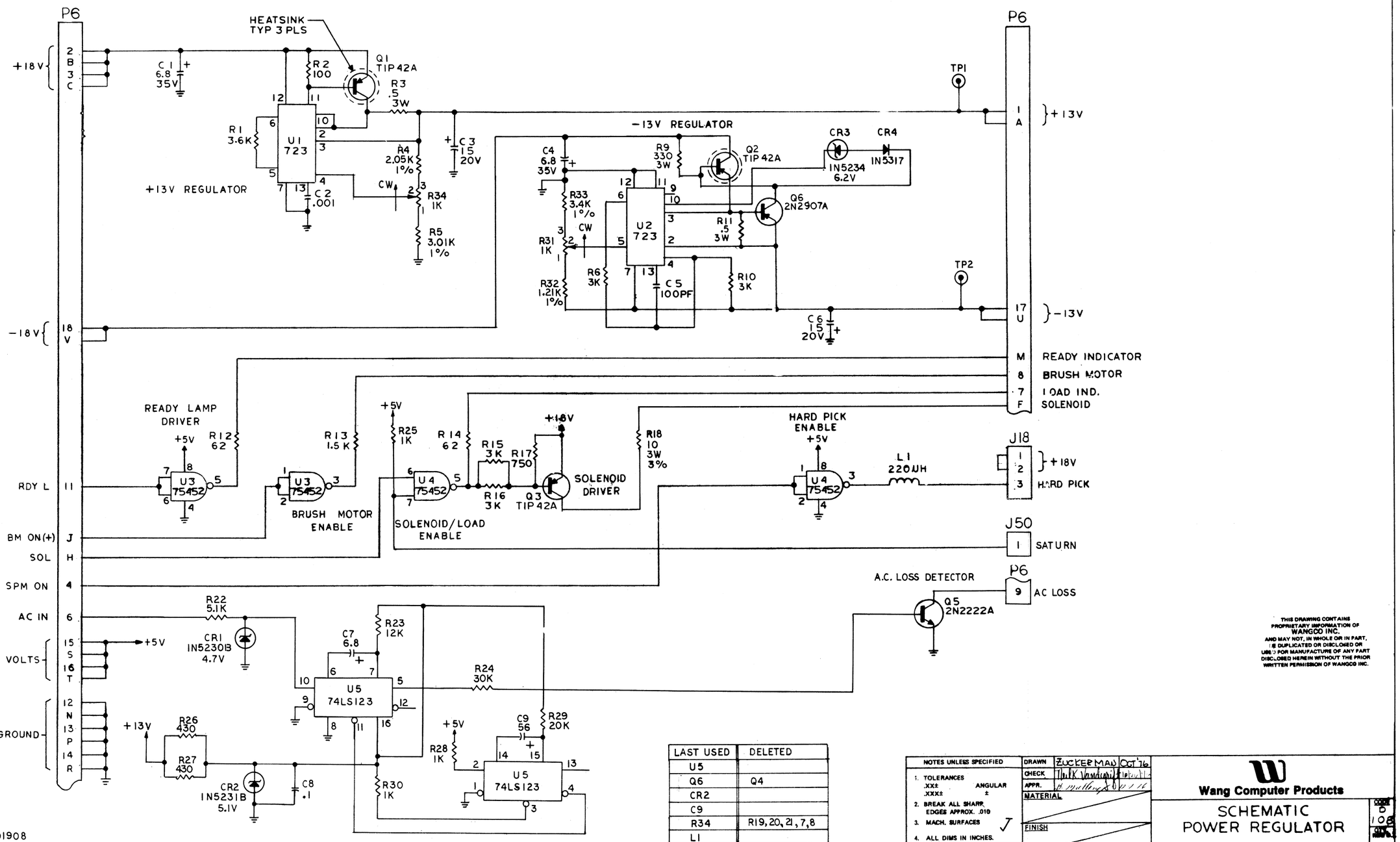
SCHEMATIC DISC CONTROL-2,

SIZE D | 301904 | D

SCALE | WEIGHT | SHEET 1 OF 1

301904

REVISIONS			301909	
REV.	DESCRIPTION	CHK.	DATE	APPROVED
X2	EXP REL		8-7-2	[illegible]
1	[illegible]	[illegible]	[illegible]	[illegible]



LAST USED	DELETED
U5	
Q6	Q4
CR2	
C9	
R34	R19, 20, 21, 7, 8
L1	

4. FOR ASSY DWG SEE 301908
3. FOR ARTWORK SEE 301906
2. ALL CAPACITORS IN MICROFARDS.
1. ALL RESISTORS IN OHMS ±5% 1/4W.
NOTES: UNLESS OTHERWISE SPECIFIED

NOTES UNLESS SPECIFIED	DRAWN	ZUCKERMAN OCT'76
1. TOLERANCES .XX± ANGULAR .XXX±	CHECK	[illegible]
2. BREAK ALL SHARP EDGES APPROX. .010	APPR.	[illegible]
3. MACH. SURFACES	MATERIAL	
4. ALL DIMS IN INCHES.	FINISH	
	MODEL No. F&T 100/200TPI	
	NEXT ASSY 301908	

Wang Computer Products

SCHEMATIC
POWER REGULATOR

CODE ID NO. D 108

SCALE	SIZE	DWG NO.	REV
—	D	301909	A

DO NOT SCALE THIS DRAWING | WEIGHT | SHEET 1 OF 1

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