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CUSTOMER ENGINEERING DIVISION

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12141/40 F75
12066-XX/65-01 F75
12066/C5 K75

FIELD LEVEL MAINTENANCE GUIDE

PRELIMINARY

DIABLO SERIES 40 DISK DRIVES

WANG

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SECTION 1
INTRODUCTION

1.1 SCOPE

This is a Field Level Maintenance Guide for the Diablo Series 40 Disk Drives. The intent of this FLMG is to provide the Customer Engineers with a concise reference for the installation, maintenance, and repair of Diablo Series 40 Disk Drives. The material in this FLMG has been drawn from the following publications: ISNs 31/36; SNLs 76.2/86.1; Service Bulletin 43.1; and portions of the Diablo Maintenance Manual. The Customer Engineer should use this FLMG as an aid, while consulting the Diablo Maintenance Manual, the Technical Procedures Manual, and the Field Price Catalog for additional information.

On the back page of this FLMG is a field input form for the Customer Engineer to provide comments, additions or changes to this text. Since this is a preliminary publication, your input will aid in finalizing the text.

1.2 GENERAL

The Diablo Series 40 Disk Drives that are presently being used in the Wang product line are:

The Model 43 - This drive has a total capacity of 5 megabytes on 1 fixed and 1 removable platter. It has a lateral track density of 100 tracks per inch and revolves at 1500 RPM. Used on 630/730/2230 Systems.

The Model 44 - This drive has a total capacity of 10 megabytes on 1 fixed and 1 removable platter. It has a lateral track density of 200 tracks per inch and revolves at 2400 RPM. Used on 2260/2260-2 Systems.

The Model 44B - This drive has a total capacity of 10 megabytes on 1 fixed and 1 removable platter. It has a lateral track density of 200 tracks per inch and revolves at 2400 RPM. Used on 2260B/2260-2 Systems.

The Model 43 and Model 44 drives are very similar in physical structure and PCB compliment. The Model 44B, while being functionally the same, is structurally different and has a completely different PCB compliment. The following is a list of the major differences between the Model 44 and Model 44B. See the specification tables 1-1 and 1-2 for a complete comparison.

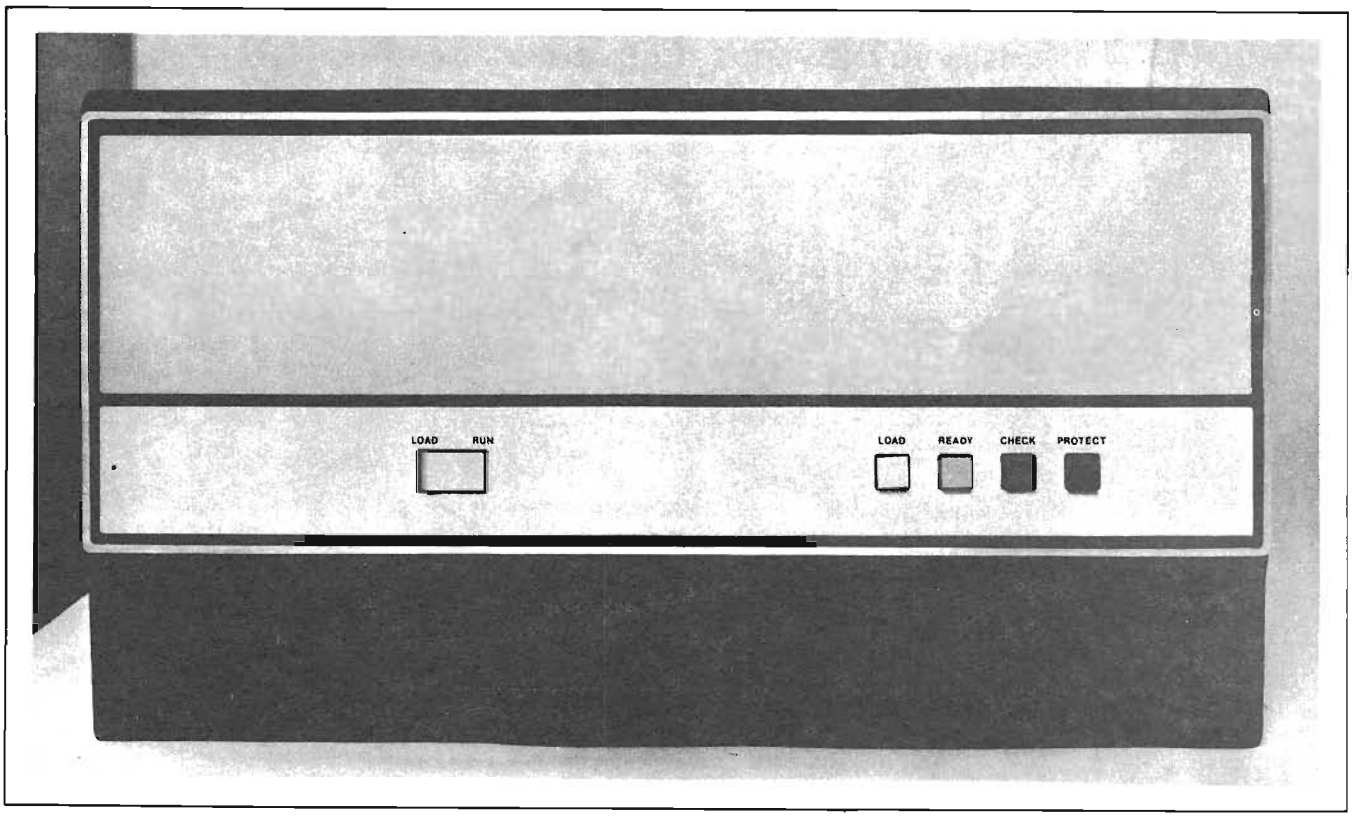


FIGURE 1-1 SERIES 40 FRONT PANEL

TABLE 1-1

PARAMETER	MODEL 43	MODEL 44	MODEL 44B
Storage Medium:			
Type	Type 5440 cartridge and a fixed disk.	Type 5440 cartridge and a fixed disk.	Type 5440 cartridge and a fixed disk.
Diameter	14 inches	14 inches	14 inches (35.56 cm)
Lateral Track Density	100 tracks per inch	200 tracks per inch	200 tpi (25.4 mm)
Recording Format: (double frequency)			
Tracks	816 (200 plus 4 spares on each surface of each disk).	1632 (400 plus 8 spares on each surface of each disk).	1632 (400 plus 8 spares on each surface of each disk).
Cylinders	204 (four tracks per cylinder, two per disk).	408 (four tracks per cylinder, two per disk).	408 (four tracks per cylinder, two per disk).
Capacity, Bits:*			
per drive	50,000,000	100,000,000	100,000,000
per disk	25,000,000	50,000,000	50,000,000
per inch (innermost track)	2200	2200	2200
per cylinder	250,000	250,000	250,000
per track	62,500	62,500	62,500
Access Time:			
Track-to-track	10 ms	8 ms	8 ms
Average	38 ms	38 ms	38 ms
Full Stroke	70 ms	70 ms	70 ms
Disk Rotation*	1500 rpm $\pm$ 0.2%	2400 rpm $\pm$ 0.2%	2400 rpm $\pm$ 0.2%
Average Latency	25 ms	12.5 ms	12.5 ms

TABLE 1-2

PARAMETER	MODEL 43	MODEL 44	MODEL 44B
Bit Transfer Rate	2500 kHz	2500 kHz	2500 kHz
Power Requirement	+24 Vdc ±5%, 6A -24 Vdc ±5%, 5A +5 Vdc ±2%, 4A	+24 Vdc ±5%, 6A -24 Vdc ±5%, 5A +5 Vdc ±2%, 4A	100, 120, 220, 240 volts are @50 or 60 Hz.
Heat Dissipation	900 btu/hr	900 btu/hr	900 btu/hr
Environment (operating):			
Temperature	50°F to 104°F (10 to 40)°C	60°F to 90°F	50°F to 104°F
Temperature change rate	1°F per hour	1°F per hour	18°F (10°C) per hour
Relative humidity (non-condensing)	20% to 80%	20% to 80%	20% to 80%
Maximum altitude	6000 ft.	6000 ft.	10,000 ft. (3048 m)
Environment (storage):			
Temperature	-40°F/C to 150°F (65°C)	-40°F/C to 150°F (65°C)	-40°F/C to 140°F (60°C)
Relative humidity (non-condensing)	5% to 95%	5% to 95%	5% to 90%
Physical:			
Width	17-1/2 inches	17-1/2 inches	17-1/4 inches
Height	10-5/16 inches	10-5/16 inches	10-5/16 inches
Weight (with cartridge)	136 lbs.	136 lbs.	179 lbs.

Differences between the Model 44 and Model 44B.

Operational Differences:

1. The Model 44B will not operate if the removable disk is not in place (upper index detection is required).
2. The power lamp is off unless the disk is write protected; then, the lamp is on until the lamp switch is depressed.

Physical Differences:

1. The Model 44B has an internal power supply.
2. Input voltage selection (100, 120, 220, 240 VAC) is accomplished by changing the position of a printed circuit board in the rear of the unit (beside the AC power cord).
3. The R/W heads are ramp loaded (as opposed to being solenoid loaded on the Model 43 & 44).
4. The drive electronics has been redesigned, reducing the number of PCB's to 8 (these PCB's are described in section 3).
5. The shipping clamp in the 44B is located on top of the head carriage. It butts against the bowl, holding the heads in the home position.
6. The 44B uses a smaller air filter due to the incorporating of an internal power supply.

Maintenance Differences

In order to allow index only packs (C.E. alignment cartridges) to be used, SW1 at location B70 of the Logic PCB must be set on. This means that to perform index or head alignment, this switch must be on.

TABLE 1-3

DISK DRIVE SUMMARY

WANG MODEL #	CAPACITY (BYTES)	DIABLO MODEL #
2230-1	1,288,800	43
2230-2	2,457,600	43
2230-3	5,013,504	43
2260B ¼	2,457,600	44B
2260B ½	5,013,504	44B
2260B	10,027,008	44B
2260	10,027,008	44
2260 ¼	2,457,600	44
2260 ½	5,013,504	44
2260-2	20,054,016	44 or 44B (2)
630-1	1,228,800	43
630-2	2,457,600	43
630-3	4,915,200	43
730-1	1,228,800	43
730-2	2,457,600	43
730-3	4,915,200	43

1.3 2200 SYSTEM DISK PLATTER COMPATABILITY

The disk platter compatibility Table 1-4 reflects the disk cartridge interchangeability between the various disk drives offered by Wang Labs. Notice that all 2260/2260Bs are capable of reading all 2230 platters (using a special disk address explained after the chart) and that there is complete compatability between 2260 and 2260B platters.

TABLE 1-4

2200 SYSTEM

DISK PLATTER COMPATABILITY TABLE

A PLATTER CREATED ON A:	CAN BE READ BY A:									
	2230-1	2230-2	2230-3	2260	2260½	2260¼	2260B	2260B½	2260B¼	2260-2
2230-1	✓	✓	✓	✓**	✓**	✓**	✓**	✓**	✓**	
2230-2	✓*	✓	✓	✓**	✓**	✓**	✓**	✓**	✓**	
2230-3	✓*	✓*	✓	✓**	✓**	✓** *	✓**	✓**	✓** *	
2260				✓	✓*	✓*	✓	✓*	✓*	✓
2260½				✓	✓	✓*	✓	✓	✓*	✓
2260¼				✓	✓	✓	✓	✓	✓	✓
2260B				✓	✓*	✓*	✓	✓*	✓*	✓
2260B½				✓	✓	✓*	✓	✓	✓*	✓
2260B¼				✓	✓	✓	✓	✓	✓	✓
2260-2				✓	✓*	✓*	✓	✓*	✓*	✓

*The platter can be read up to the maximum address available on this capacity drive.

**In order to access a Model 2230 disk cartridge in a Model 2260 or 2260B series Disk Drive, a special disk device address of 350 must be used. The special address causes this series to initiate a routine which simulates the Model 2230 track spacing and platter format for reading on the Removable Platter. The user is then able to read information from the cartridge in Model 2230 format with standard disk statements, while the cartridge is loaded in a Model 2260/2260B series drive. For example, the statement LIST DC R/350 generates a listing of the Catalog Index from a Model 2230 cartridge loaded in a Model 2260/2260B drive. Similarly, the special address can be assigned to a file number, and referenced indirectly in statements which do not permit the use of a device address. For example, the statements

```
SELECT #3 350
DATALOAD DC OPEN R #3, "TEST"
```

could be used to reopen the file TEST on a Model 2230 cartridge in a Model 2260/2260B Disk Drive.

If the Model 2260/2260B is the second, or subsequent, disk drive in a system, the special address must be calculated by adding a HEX(40) to the disk device address. For example, if the address of the Model 2260/2260B is 320, the special address is 360; if the normal address is 330, the special address is 370, etc. Note that the special address should not be used to access the Fixed Platter of the Model 2260/2260B, nor should it be used to access a Removable Platter formatted in the Model 2260/2260B itself.

NOTE:

The 2260-2 does not have this capability because the addition of a HEX(40) to the disk device address is used to address the slave drive.

1.4 OPERATING INSTRUCTIONS

1.4.1 *OPERATING PRECAUTIONS*

Disk Drive Operation

To obtain the best performance and reliability from the Series 40, and to prevent equipment damage, the following precautions should be observed:

1. Do not connect or disconnect power or I/O cables while power is turned on.
2. Either a disk cartridge or the dust cover should be in place in the bowl at all times, to prevent airborne contamination.
3. The drive should be left in the RUN mode whenever possible so that clean filtered air will be supplied to the interior of the machine.
4. A sustained audible "tinging" or "scratching" sound may be caused by head-to-disk contact. If it persists, discontinue machine operation and investigate the cause.
5. Do not force or attempt to override any interlock. Interlocks are safety devices, included to prevent injury, equipment damage, and loss of data.

Cartridge Handling and Storage

The following precautions should be observed when handling or storing disk cartridges:

1. Cartridges are magnetically recorded records. They MUST be kept away from strong magnetic fields, such as large rotating electrical machines, high current buss bars or cables, welding equipment, etc.
2. The cartridge dust cover should be in good condition, and kept on the cartridge while it is out of the disk drive. This ensures a positive dust seal, and immobilizes the disk inside.

3. Cartridges may be stored either on edge or flat. When stored flat, avoid stacking more than five (5) high. Cartridges should never be stored in direct sunlight, or in dusty or dirty areas.
4. Any Disk Cartridge that has been dropped should be inspected by the disk cartridge manufacturer before attempting to use it.
5. Refer to the cartridge manufacturer's instructions for maintenance and cleaning procedures.

1.4.2 *CONTROLS AND INDICATORS*

Standard Series 40 Disk Drives have one front-panel control and four front-panel indicators:

43/44	44B
LOAD/RUN switch	Same
LOAD indicator	Same
READY indicator	Same
CHECK indicator	Same
POWER indicator	Protect Indicator

PROTECT Switchlight (44B)

A red indicator light with momentary-contact pushbutton which is lit when (a) operating power is present and (b) writing is inhibited in accord with the settings of the write protect option switches on the Data Transfer PCB. If it is desired to write on a disk normally protected by the setting of the write protect option switches, the operator may momentarily press the pushbutton. This action overrides the settings of the write protect option switches and turns off the red indicator light to indicate "not protected". The drive is returned to the write protect mode by the LOAD/RUN switch or by a pulse on the Write Protect line.

For installations where it is desired that interruptions of AC power not result in write protect, the write protect option switches on the Data Transfer PCB can be set to the "off" position.

The controls and indicators are shown in Figure 1-1, and depict a drive with the Write Protect option installed. Below is a summary of controls and indicators.

CONTROL/INDICATOR	FUNCTION
LOAD/RUN Switch 43/44/44B NOTE: Does not control power to the drive.	A two position rocker switch that provides a means for starting and stopping the disk drive. Cartridges may be removed and inserted when the switch is in the LOAD position and the LOAD light is on. With a cartridge inserted, switching to the RUN position starts the disk drive and brings the disk up to its normal operating speed in about 60 seconds. When the switch is moved to the LOAD position, the disk decelerates to a stop in about 15 seconds, after which the LOAD light turns on.
LOAD 43/44/44B	A white indicator light which shows that cartridges can be loaded or unloaded. The light is on only when the LOAD/RUN switch is in the LOAD position, the disk is not rotating, the brushes are retracted, the heads are retracted and power is on.
READY 43/44/44B	A yellow indicator light which shows that the drive has completed its start-up sequence. The light comes on when the disk is rotating at its correct speed, heads are in position and no other conditions are present which would prevent a seek, read, or write operation. The light is extinguished when the LOAD/RUN switch is set in the LOAD position.
CHECK 43/44/44B	An orange indicator light which shows, that due to some abnormal condition, the Series 40 may be incapable of writing. When the abnormal condition no longer exists, the Series 40 is reset by moving the LOAD/RUN switch to LOAD position and then back to RUN.

POWER 43/44	A red indicator light that is on when operating power is present.

1.4.3 *INTERLOCKS*

The disk drive cartridge clamps are locked shut while equipment power is off, or while the spindle is rotating. The operator should never attempt to force the cartridge clamp open, or to defeat any interlock. This practice could lead to equipment damage. The cartridge clamps cannot be operated while the heads or disk cleaning brushes are positioned over the disk surface, or when equipment power is off. The spindle motor will not rotate if the cartridge dust cover is not installed, or if the cartridge clamps are open.

1.4.4 *TYPICAL OPERATING PROCEDURE*

The following is a typical procedure for operation of a standard Series 40 Disk Drive. If the cartridge cannot be installed or removed because of the interlock, do not use force.

1. Observe Load lamp. The cartridge retainers connot be opened if the light is off. (If light is off, check power to drive. Power must be on.)

2. Open the cartridge retaining clamps located at the side of the spindle bowl.

3. To load a cartridge, press the tab on the cartridge handle to the left. Then raise the cartridge handle. This action will separate the dust cover from the disk cartridge (see Figure 1-2).

4. Place the disk cartridge over the spindle hub. Insure that the cartridge opening for head entry is located at the rear of the spindle bowl. When the cartridge is correctly located, it will not rotate. Lower the cartridge handle to lock the cartridge to the spindle.

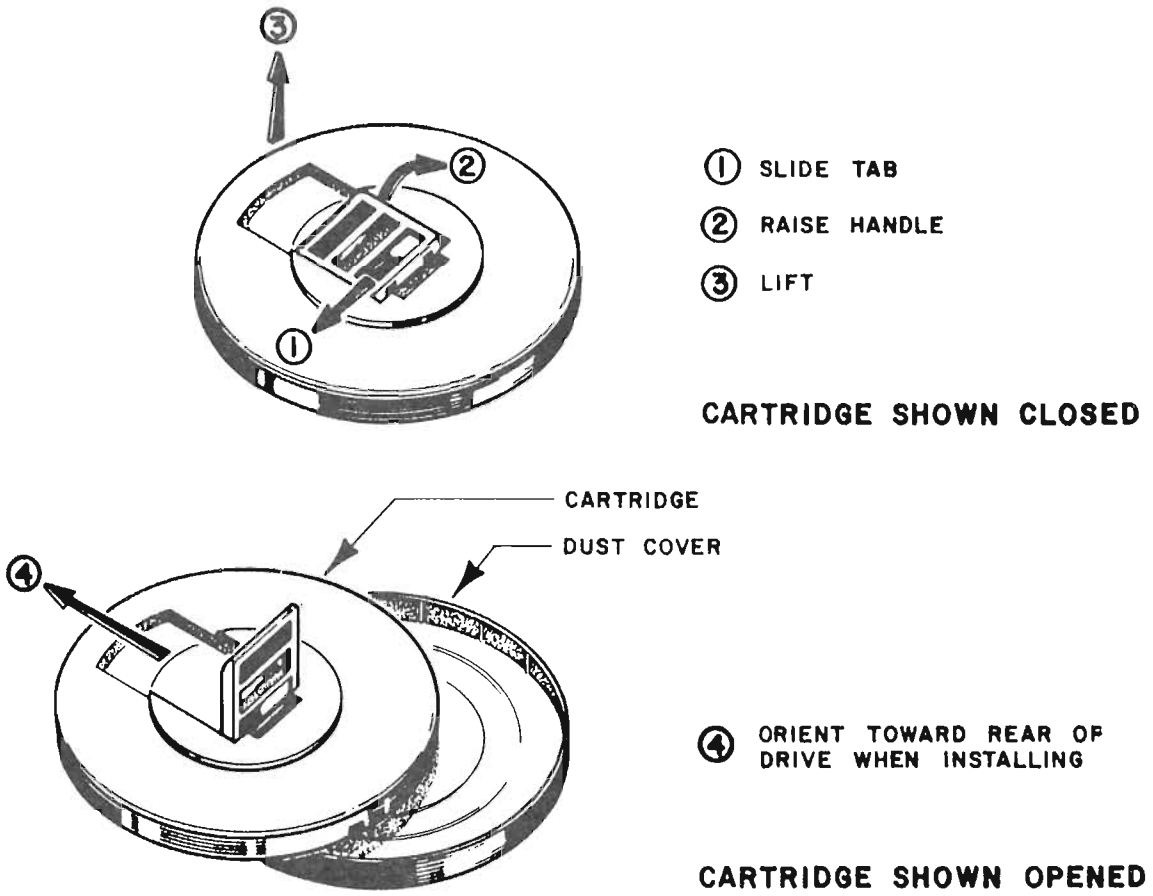


FIGURE 1-2 OPENING THE TYPE 5440 DISK CARTRIDGE

5. Place the dust cover, open end down, on top of the disk cartridge.

6. Close the cartridge retaining clamps.

7. Set the LOAD/RUN switch to the RUN position.

8. Observe the front panel LOAD light go out. The disk is now rotating and the start-up cycle is taking place.

9. Allow the equipment about 60 seconds to complete its start-up cycle. At the completion of the start-up cycle, the READY light will come on.

10. The machine may be selected to perform Seek, Read or Write operations with the READY light on.

11. If the READY light does not come on, or if the orange CHECK light does come on, there is a problem.

12. If it is desired to remove the cartridge when disk operation is complete, set the LOAD/RUN switch to LOAD. Wait for the LOAD light to come on (this takes about 15 seconds).

13. To remove the cartridge, open the cartridge retaining clamps, remove the dust cover, press the tab on the cartridge handle to the left, and raise the cartridge handle. This allows the disk cartridge to be lifted out of the disk drive.

14. Invert the dust cover, lower the cartridge into it, and fold the handle down all the way to engage the cover magnets and release the tab. The cartridge is now ready for storage.

15. Install another cartridge and dust cover and place the drive in the RUN mode or completely deenergize the system.

NOTE:

If no cartridge is to be installed at this time, cover the spindle bowl area with a plastic sheet or other lint-free cover.

SECTION 2
INSTALLATION PROCEDURES

2.1 UNPACKING (43/44)

The Series 40 is packed for shipment as shown in Figure 2-1. Remove the machine from the inner packing container, and remove the plastic dust cover. Packing materials should be retained for possible future use. Referring to Figure 2-1, remove the four 7/16" x 4" bolts, washers, and stand-off pillars securing the unit to the plywood base. These are accessible from underneath.

NOTE:
DO NOT turn the disk drive upside down!

Unpacking Procedure (44B)

The unpacking procedure for the disk drive is readily apparent by referring to the shipping container assembly drawing shown in Figure 2-2. When unpacking the disk drive, the packing materials should be retained for possible later use. Before initial operation of the disk drive, the head positioner shipping clamp, shown in Figure 2-3, must be removed.

2.2 PREPARING THE SERIES 40 FOR USE

The following four steps may be performed in any order to prepare the disk drive for installation and use.

Check Drawer Interlock Switch Actuator

Referring to Figure 2-4, lift the left hand drawer latch, as shown, and observe the position of the drawer interlock switch actuator arm. The solid line illustration shows the correct position for this arm. If the arm is out of position and wedged beside the striker plate as shown, move it to its correct position.

Remove the Shipping Clamp (43/44)

A shipping clamp is installed prior to shipment, to prevent movement of the head assemblies. This clamp must be removed prior to con-

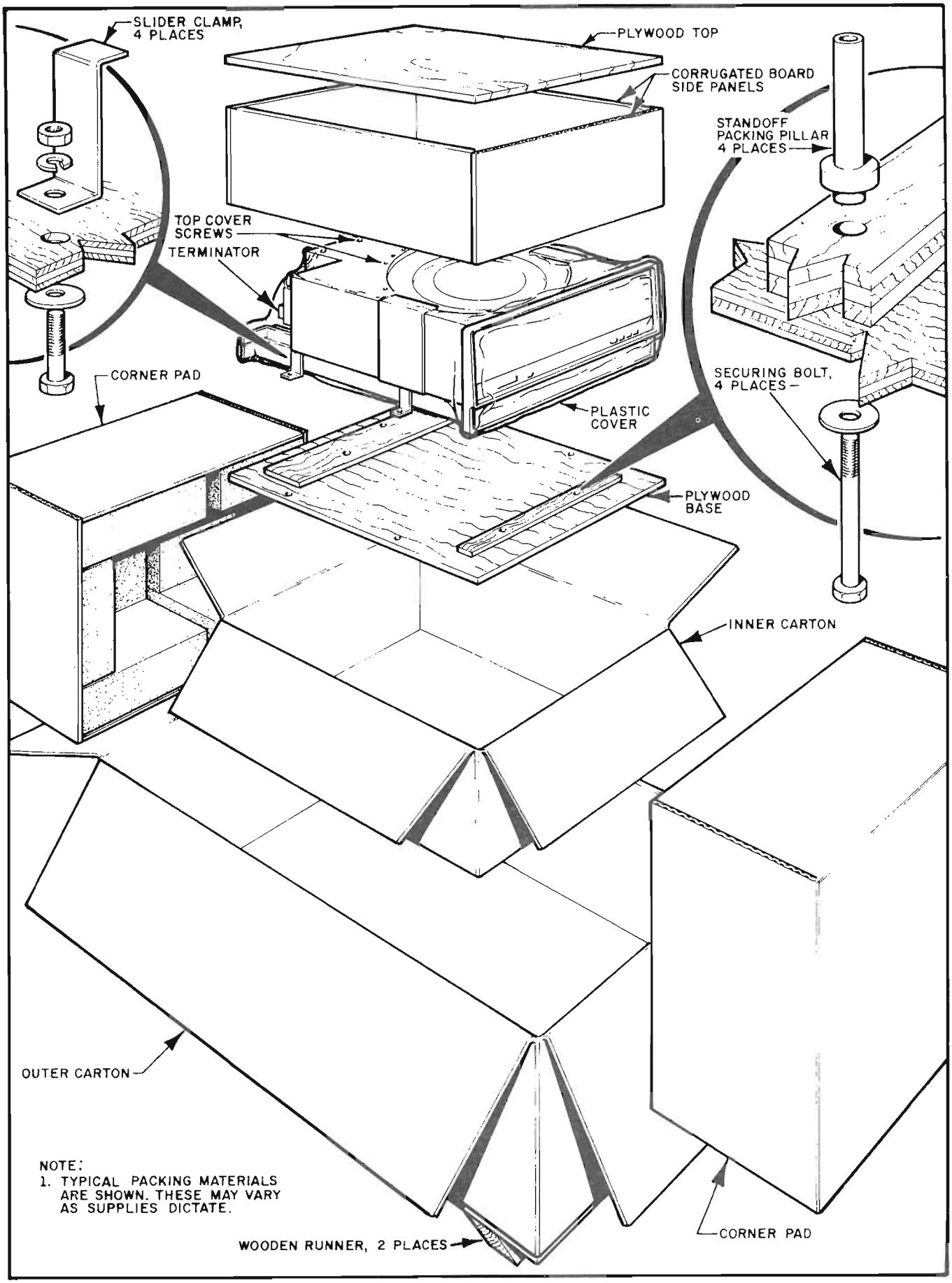


FIGURE 2-1 SERIES 40 PACKING FOR SHIPMENT

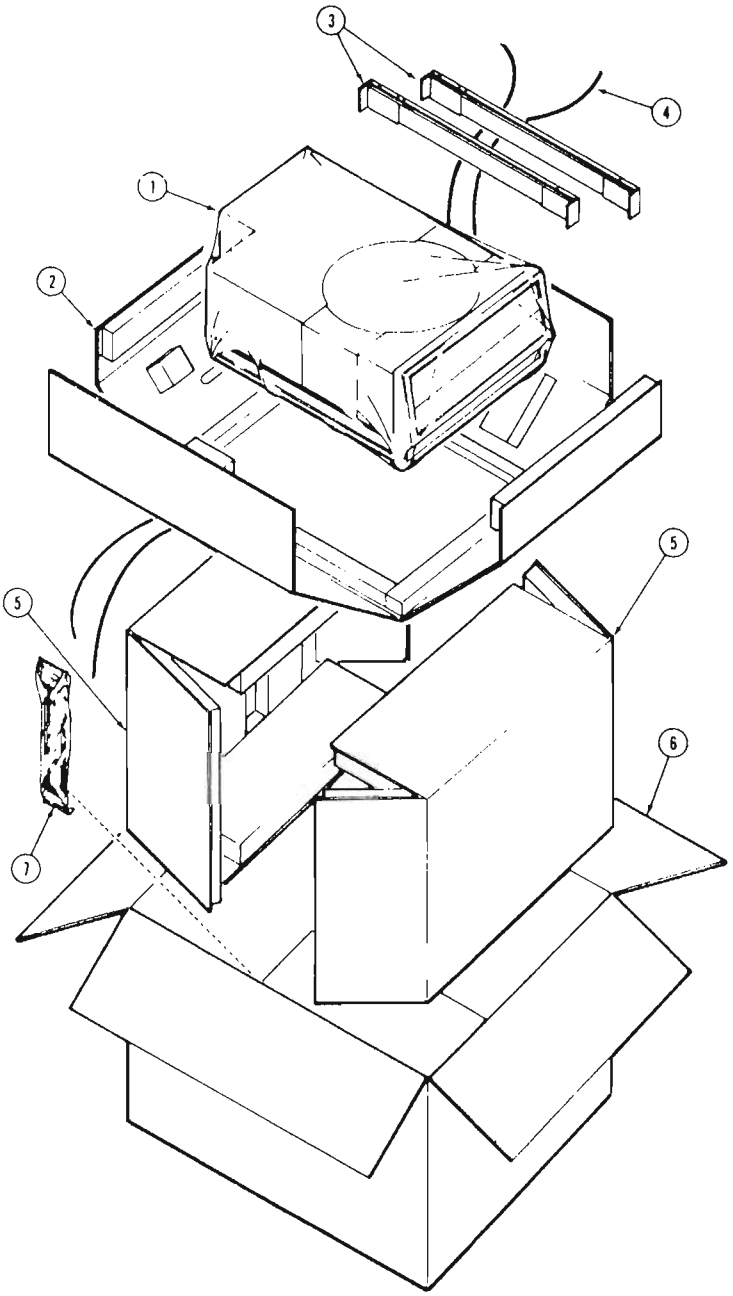


FIGURE 2-2 SHIPPING CONTAINER ASSEMBLY

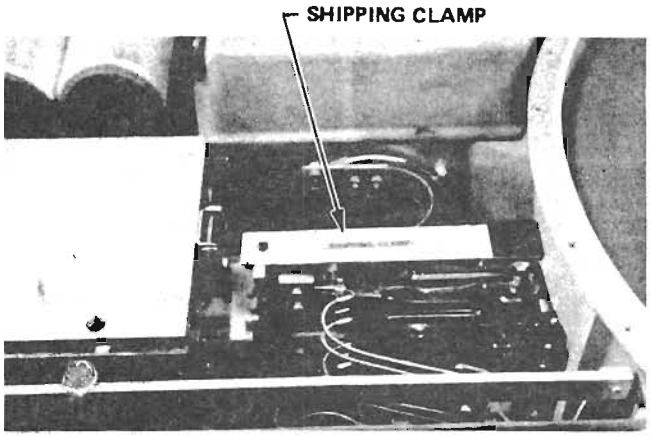


FIGURE 2-3 HEAD POSITIONER SHIPPING CLAMP

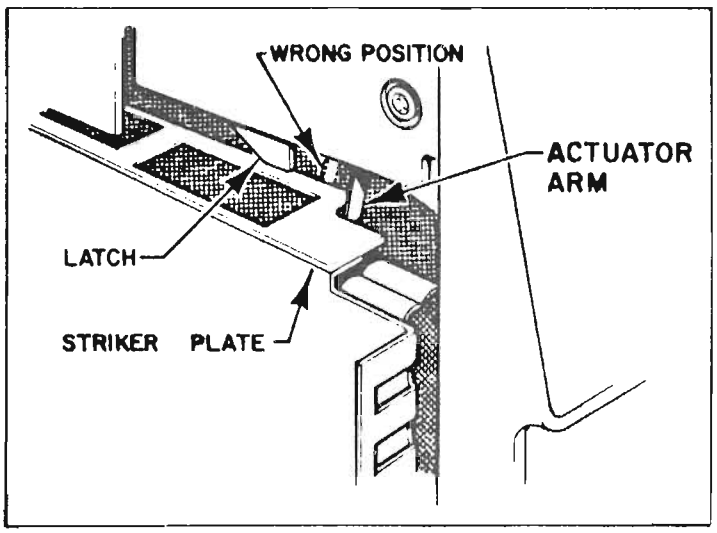


FIGURE 2-4 DRAWER INTERLOCK SWITCH POSITION

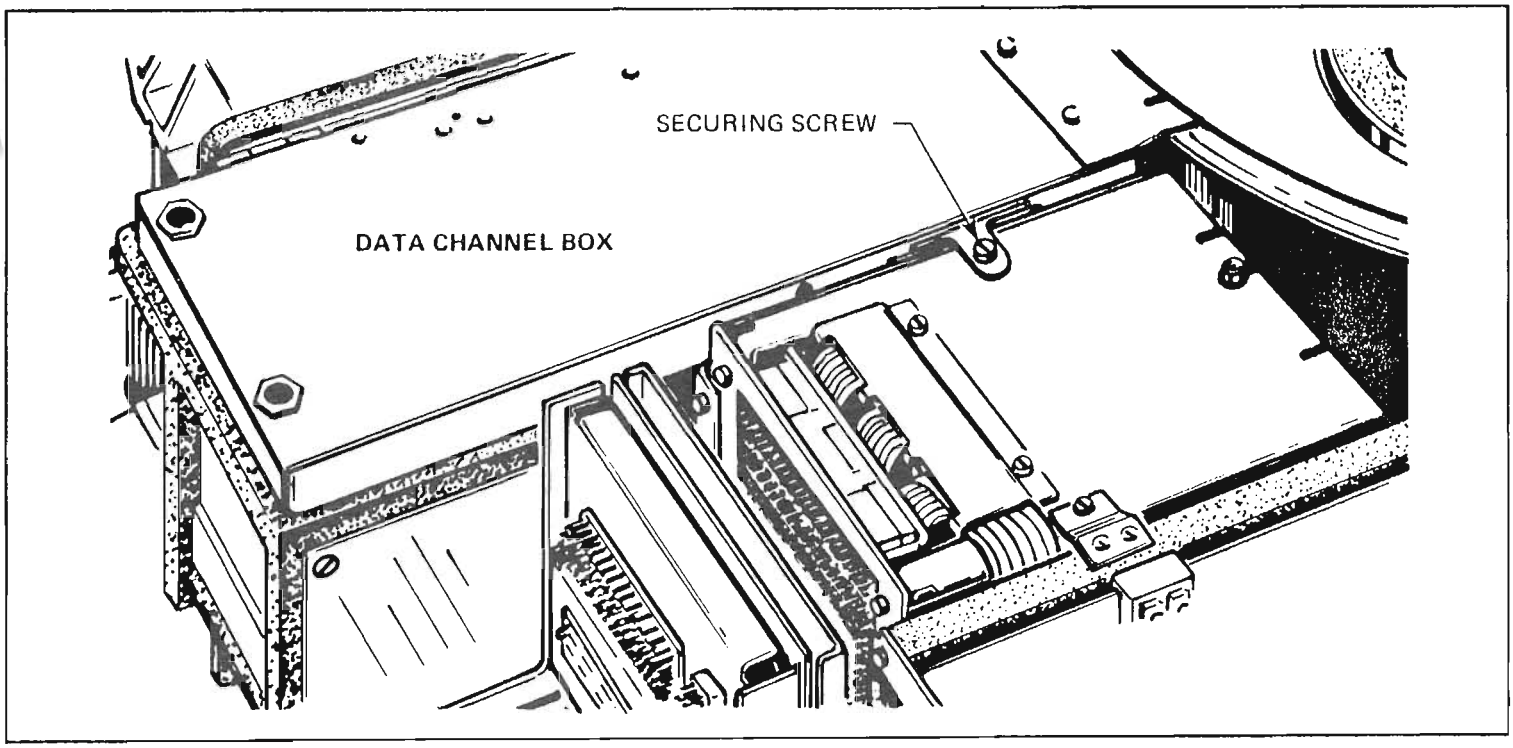


FIGURE 2-5 DATA CHANNEL BOX

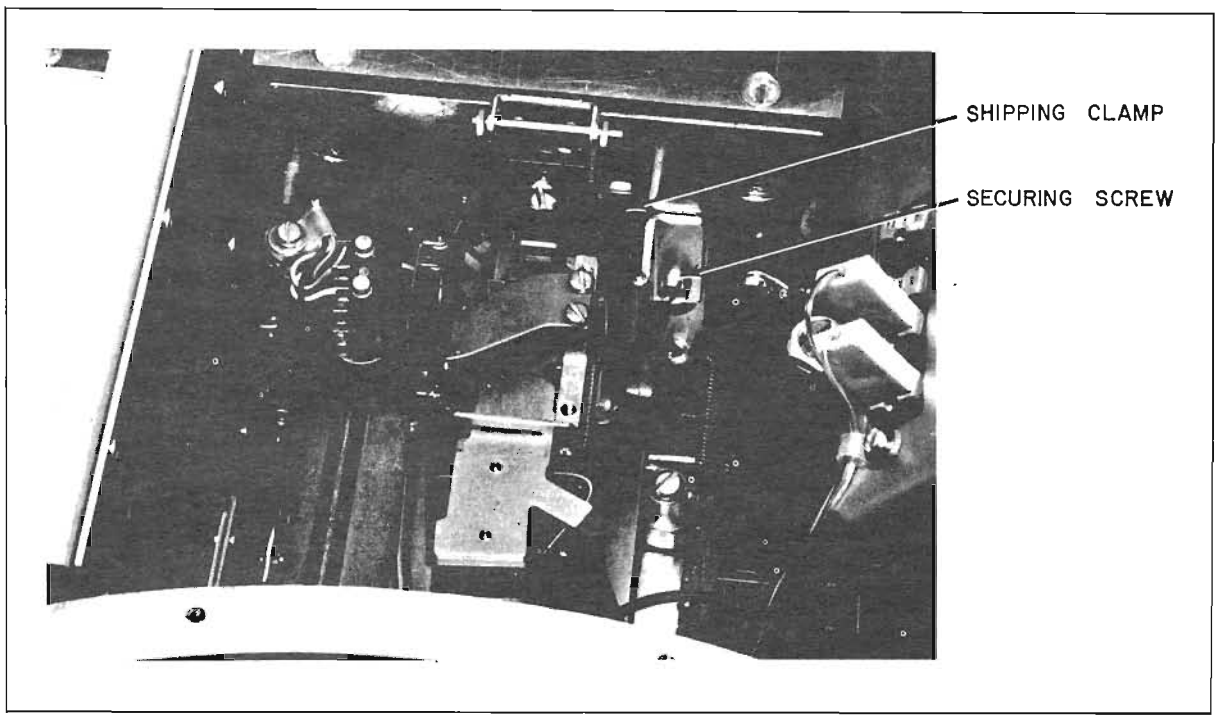


FIGURE 2-6 SHIPPING CLAMP

necting the disk drive to its using system. Remove the four screws holding the top rear cover, and remove the cover. Next, loosen the securing screw for the data channel box shown in Figure 2-5, and tip this box up to the right to expose the read/write head area.

Figure 2-6 shows the location of the shipping clamp and its mounting screw. Remove both of these, and store for possible future use. Position the data channel box and tighten its securing screw, then replace and screw down the top cover.

(44B)

To remove the shipping clamp from a 44B drive, again remove the four screws holding the top rear cover and remove the cover.

Figure 2-3 shows the location of the shipping clamp and its mounting screw. Remove both of these and store for future use and replace the cover.

Installing Select Line Jumpers (43/44)

Diablo 43 and 44 Disk Drives are shipped with the select line jumper installed in the No. 1 position. If it is desired to change the jumper, first remove the terminator if installed. Next, remove the I/O Box cover (behind the terminator) by removing the two screws and washers, and by gently prying the cover off. The Select Line Jumper may now be seen as shown in Figure 2-7. It may be pulled out and replaced easily. The jumper must be installed with one of its pins in the center socket, and the other in the socket corresponding to the number assigned to the drive.

Diablo Model 44B Unit Select

Unit selection on the Model 44B is accomplished by switches 3 & 4 in a switch bank located at M75 of the Address Logic PCB (12064 or 12101). Figure 2-8 shows the switch settings that identify the disk drive as unit number 1, 2, 3, or 4.

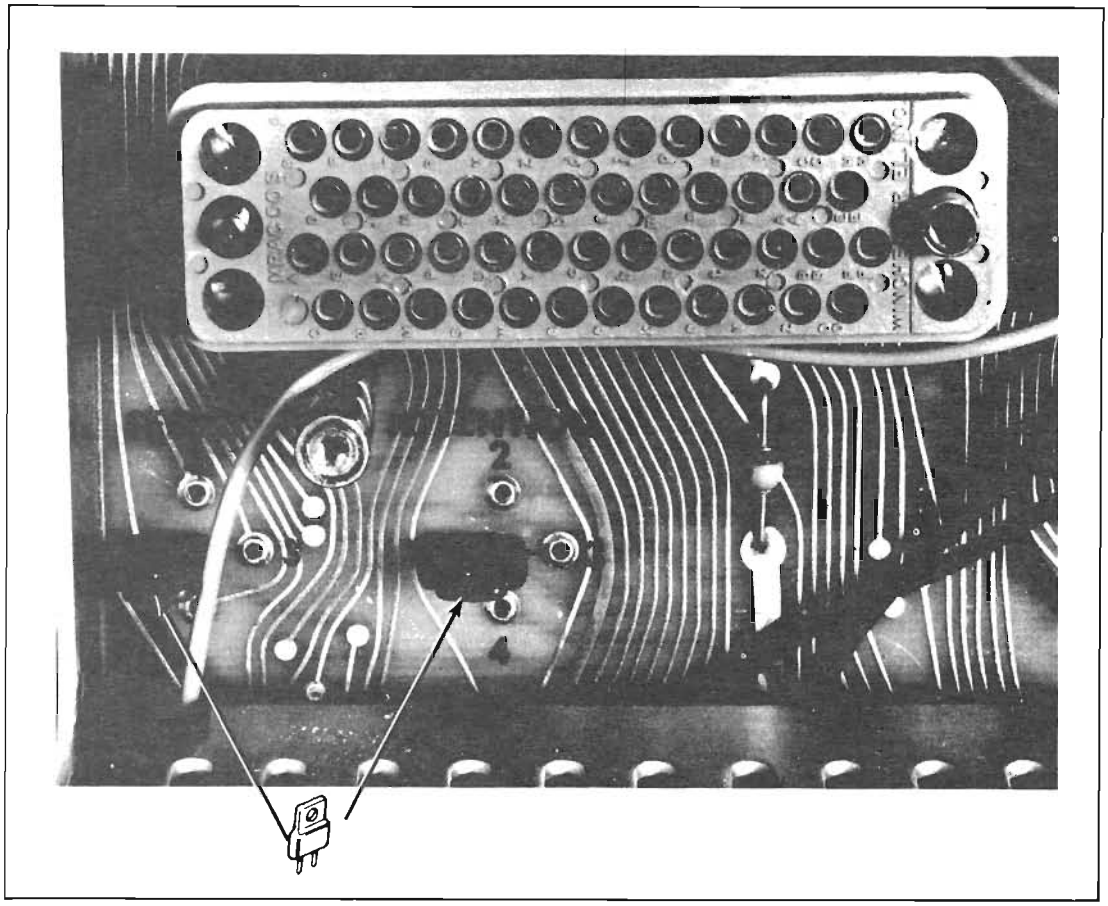


FIGURE 2-7 SELECT LINE AND ATTENTION LINE JUMPERS

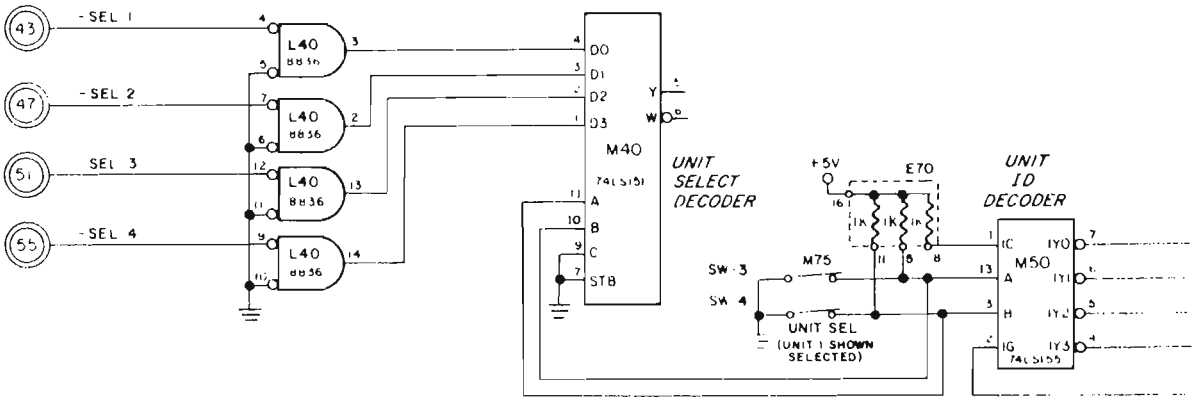


FIGURE 2-8 ADDRESS LOGIC PCB

SW3	SW4	
ON	ON	- FILE 1
ON	OFF	- FILE 2
OFF	ON	- FILE 3
OFF	OFF	- FILE 4

SW3	SW4	
ON	ON	- FILE 1
ON	OFF	- FILE 2
OFF	ON	- FILE 3
OFF	OFF	- FILE 4

NOTE:

The attention lines are not used in Wang systems; therefore, its jumper position is irrelevant.

When the jumper has been properly installed, or the switches properly set, replace the cover and reconnect the terminator or I/O cable connector as required.

Leveling Procedure

Refer to Figure 2-9. Upon initial installation, whenever a shock mount is replaced, or when a series of head positioning errors occur, the leveling should be checked. Uneven stresses on the disk(s) due to an unlevel condition can cause positioning errors, and may lead to premature bearing failure if left uncorrected.

2.3 TEMPERATURE STABILIZATION

The alignment cartridge shall be temperature stabilized to the disk drive operating temperature prior to attempting alignment.

CAUTION:

Only after the disk drive has been temperature stabilized can the alignment cartridge stabilization be accomplished.

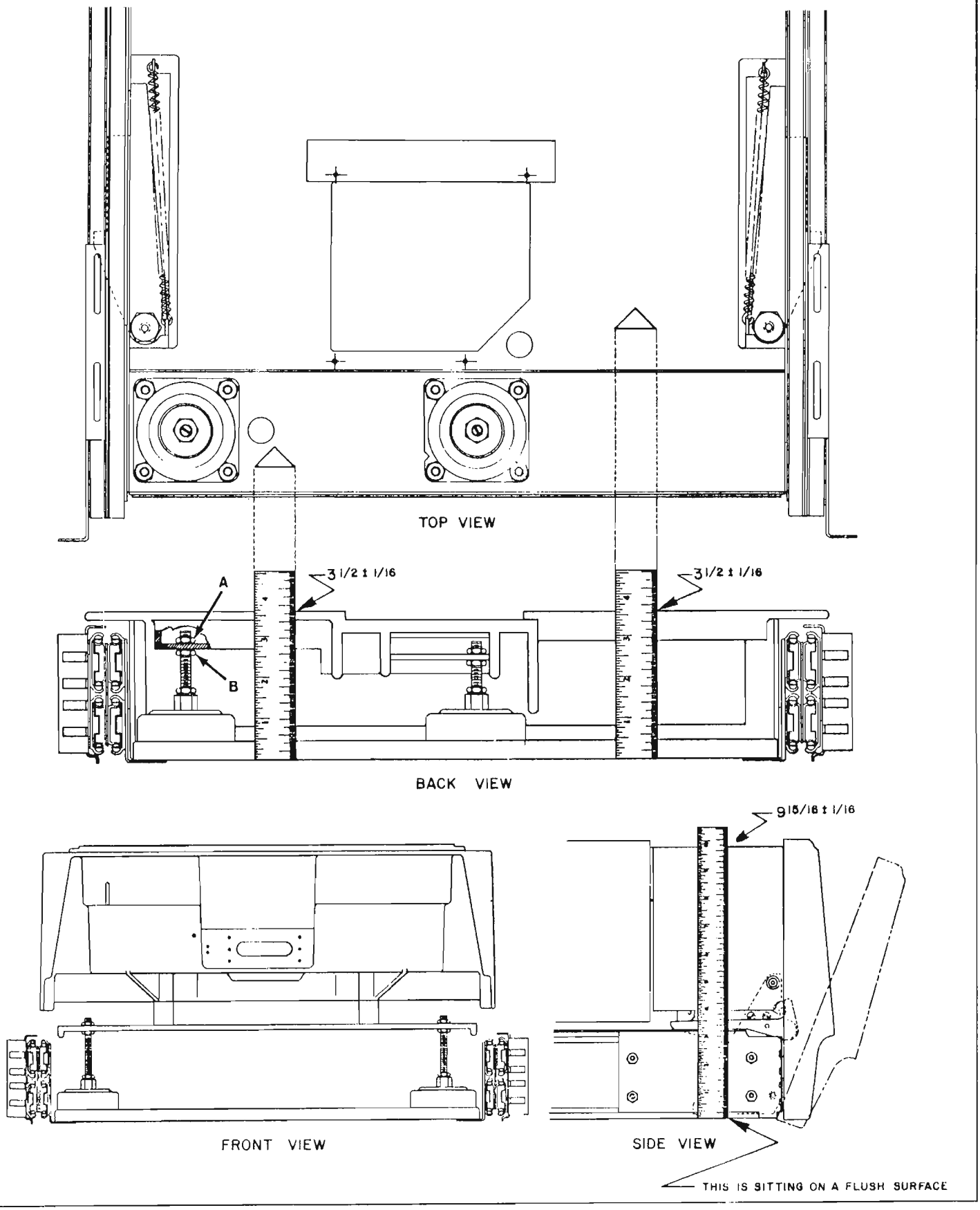


FIGURE 2-9 SHOCK MOUNT ADJUSTMENT

Drive Temperature Stabilization

The Series 40 Disk Drives are temperature stabilized after *two hours* of head-loaded operation from a cold start-up in the recommended machine operating environment.

Alignment Cartridge Temperature Stabilization

The time required for temperature stabilization of the alignment cartridge is dependent upon the cartridge storage environment.

Storage in the Drive Operating Environment

If the cartridge storage temperature is essentially the same as the recommended machine operating environment, the cartridge shall be allowed to run in the drive with heads loaded for *15 minutes* prior to attempting the alignment procedure.

Storage in other than the Drive Operating Environment

If the cartridge storage temperature is essentially different from the recommended drive operating environment, the cartridge shall be allowed to run in the drive with heads loaded for *30 minutes*. After this initial period, the cartridge shall be removed, reinstalled, and the drive operated with heads loaded for an *additional 15 minutes* prior to attempting the alignment procedure.

This Diagnostic section is part of ISN #31. An updated diagnostic is currently being documented and will be included in the final version of this publication.

2.4 2230/2260 DIAGNOSTICS

2.4.1 *2230/2260 DISK HARDWARE DIAGNOSTICS*

This diagnostic is very similar to the 2230 Disk Hardware Diagnostic. It can be used on both the 2230 and the 2260 models.

INSTRUCTIONS

1) CLEAR, EXECUTE.

2) LOAD, EXECUTE.

3) RUN, EXECUTE.

4) The CRT displays the following:
ENTER 1, 2, 3, or 4.

1 - - - - - - - - - - 2230-1 Disk Drive
2 - - - - - - - - - - 2230-2 Disk Drive
3 - - - - - - - - - - 2230-3 Disk Drive
4 - - - - - - - - - - 2260 Disk Drive

5) ENTER Y or N for the first test. This test in long, and may be skipped and returned to later.

This diagnostic checks the following:

a) WRITES and READS on every sector.
b) DATASAVE DA/DATALOAD DA using 1 to 10 variables.
c) DATASAVE DA/DATALOAD DA using Alphanumeric variables.
d) DATASAVE DA/DATALOAD DA using Alphanumeric arrays.
e) DATASAVE BA/DATALOAD BA using Numeric and Alpha.
f) Numeric Sector Addressing.
g) READ after a WRITE.

Hardware diagnostics yield the following results:

TEST A: FIXED DISK / ERRORS = X Y.Z%

REMOVABLE DISK / ERRORS = X Y.Z%

Where: X = Quantity of errors
Y.Z = Percentage; indicates number of sectors failed vs. total number of sectors on the disk under test.

TEST B:

FIXED DISK:

Testing DATASAVE DA, DATALOAD DA, using from 1 to 10 variables.

Loop # ( ) Complete (1 - 5 loop count)

REMOVABLE DISK:

Testing DATASAVE DA, DATALOAD DA, using from 1 to 10 variables.

Loop # ( ) Complete (1 - 5 loop count)

TEST C:

FIXED DISK:

Alpha-numeric variables

Loop # ( ) Complete (1 - 5 loop count)

REMOVABLE DISK:

Alpha-numeric variables

Loop # ( ) Complete (1 - 5 loop count)

TEST D:

FIXED DISK:

Alpha and Numeric Arrays

Loop # ( ) Complete (1 - 5 loop counter)

REMOVABLE DISK:

Alpha and Numeric Arrays

Loop # ( ) Complete (1 - 5 loop counter)

TEST E:

FIXED DISK:

Testing DATASAVE BA, DATALOAD BA, using numeric and alphanumeric sector addressing.

Loop # ( ) Complete (1 - 5 loop counter)

REMOVABLE DISK:

Testing DATASAVE BA, DATALOAD BA, using numeric and alphanumeric sector addressing.

Loop # ( ) Complete (1 - 5 loop counter)

TEST F:

FIXED DISK:

Read after Write at random locations.

LOCATION ##### TOTAL SECTORS ###

(0 - 19,583) (1 - 260) count

REMOVABLE DISK:

Read after Write at random locations.

LOCATION ##### TOTAL SECTORS ###

(0 - 19,583) (1 - 260) counter

When TEST F completes, the cassette automatically rewinds and reloads the first block, to allow continued testing.

NOTE:

A failure in tests B through E produces "STOP ERROR" on CRT, and processing halts.

A failure in test F produces ERROR 85 on CRT.

2.4.2 *2230/2260 MICRO-CODE DIAGNOSTICS*

This diagnostic is exactly the same as the 2230 MICROCODE Diagnostic except that it has been expanded for the 2260 addresses.

INSTRUCTIONS

1) CLEAR, EXECUTE.

2) LOAD, EXECUTE.

3) RUN, EXECUTE.

4) ENTER 1, 2, 3, or 4 for the following:

1 - - - - - - - - - - 2230-1 Disk Drive

2 - - - - - - - - - - 2230-2 Disk Drive

3 - - - - - - - - - - - 2230-3 Disk Drive

4 - - - - - - - - - - - 2260 Disk Drive

This diagnostic checks the following instructions:

DATALOAD/DATASAVE DC OPEN	MOVE END
DATALOAD/DATASAVE DC	CATALOG INDEX
DATALOAD/DATASAVE DA	SCRATCH DISK
DATALOAD/DATASAVE BA	COPY
DSKIP, DBACKSPACE	MOVE
VERIFY	DATASAVE DC CLOSE
LIMITS	SCRATCH

A test passed prints "OK" on the CRT; a test failure results in "ERROR" on the CRT.

SECTION 3

PCB DESCRIPTION

3.1 MODEL 43/44

3.1.1 *LOCATION OF ELECTRONIC ASSEMBLIES (43/44)*

Electronic circuit boards are contained in five areas in the 43/44 as follows:

1. Input/Output (I/O) Card Cage - this card cage accommodates six pluggable PCBs. Two circuit boards (RDR1 and RDR2) contain line drivers and line receivers, and are installed in all disk drives. A third slot (I/O 5) holds the Data/Clock Separator (D/CS) PCB. The I/O 3 slot holds the sector counter PCB.

   The I/O Card Cage also contains the I/O motherboard, into which the PCBs listed above are inserted. The I/O Card Cage is attached to the rear of the left-hand slide assembly of the 43/44.

2. Main Electronics Card Cage - this card contains the following pluggable PCBs:

   M01 - Spindle Drive (SD)
   M02 - Oscillator (OR)
   M04 - Temperature Compensation (TC) (200 tpi drives only)
   M05 - Sequence Logic (SL)
   M06 - Sensor (SR)
   M07 - Servo (SO)
   M08 - Address Logic 2 (AL2)
   M09 - Address Logic 1 (AL1)

3. Read/Write (R/W) PCB - this circuit board is mounted in a sealed Data Channel Box above the head-positioner linear motor.

4. Heat Sink Assembly - this assembly consists of the Heat Sink (HS) PCB, the power transistor heat sink, and the Servo Inhibit (SI) PCB. The Heat Sink Assembly is mounted on the left side of the Main Electronics Card Cage.

5. Panel Distributor PCB - this board is mounted on the rear of the front panel.

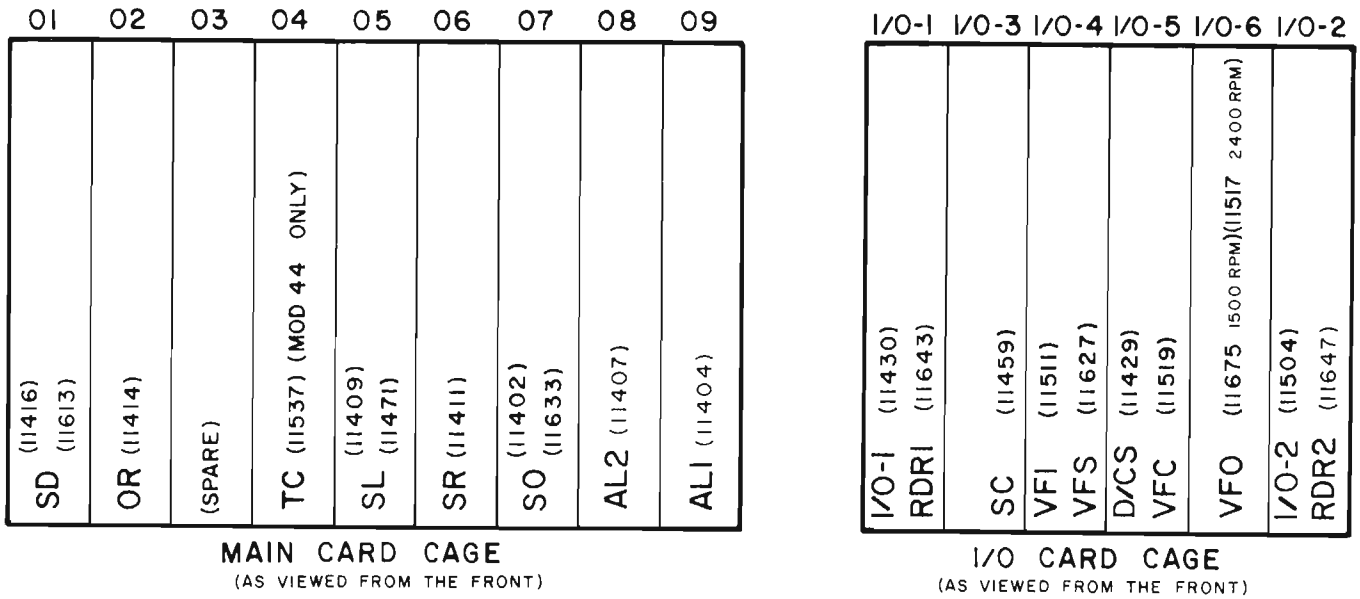


FIGURE 3-1 PCB LOCATIONS

Card Cage PCBs (43/44)

To remove card-cage PCBs, lower the card cage to the maintenance position. Location of the PCBs is shown in Figure 3-1, and each PCB is clearly marked in the upper front corner of the board. Figures 3-2 and 3-3 shows the method of board removal.

I/O PCBs (43/44)

After removal of the slotted plate at the bottom rear of the I/O box, the pluggable I/O PCBs are removed simply by sliding them out of their slots.

Heat Sink Assembly (43/44)

To remove the Heat Sink Assembly it is necessary to disconnect all cable harnesses and individual wires which connect the Heat Sink Assembly with other parts of the disk drive. This involves removing a harness clamping bar, unplugging two connectors, and disconnecting screw-type terminals. The clamping bar, connectors, and terminals are all located on the heat sink PCB. Disconnected wires should be tagged to insure accurate reconnection. After electrical disconnection, remove the screw holding the Heat Sink Assembly to the top of the card cage and the two screws hinging the bottom of the Heat Sink Assembly. Installation is performed in reverse order.

Heat Sink PCB and Components

Most electronic components in the Heat Sink Assembly are directly accessible after removal of the top cover. Additionally, access to the ten power transistors, two power resistors, and the servo release switch is accomplished by removing the screw holding the Heat Sink Assembly to the card cage.

Access to the rear of the heat sink PCB is accomplished as follows:

1. Remove the screw holding the Heat Sink Assembly to the top of the card cage.

2. Remove the screws which mount the ten power transistors to the heat sink.

3. Detach the two power resistors and the servo release switch on the front of the heat sink.

4. Remove the seven screws which hold the PCB to the heat sink. The PCB will now swing partially clear of the heat sink. If complete removal of the PCB is required, follow the preceding steps and then disconnect the Heat Sink Assembly from the remainder of the disk drive.

R/W Amplifier PCB (43/44)

1. Remove the top cover of the data channel box. This is accomplished by removing two hex nuts from the rear corners of the cover, two screws from the front corners.

2. Remove the stand-off collars which support the rear corners of the cover.

3. Disconnect the PCB electrically. This is accomplished by unplugging the two connectors, removing the four screw terminal connections, and disconnecting the four head cables.

4. Remove the mounting screw at J82 on the PCB. The PCB can now be lifted out.

Installation is accomplished by following the preceding steps in reverse order.

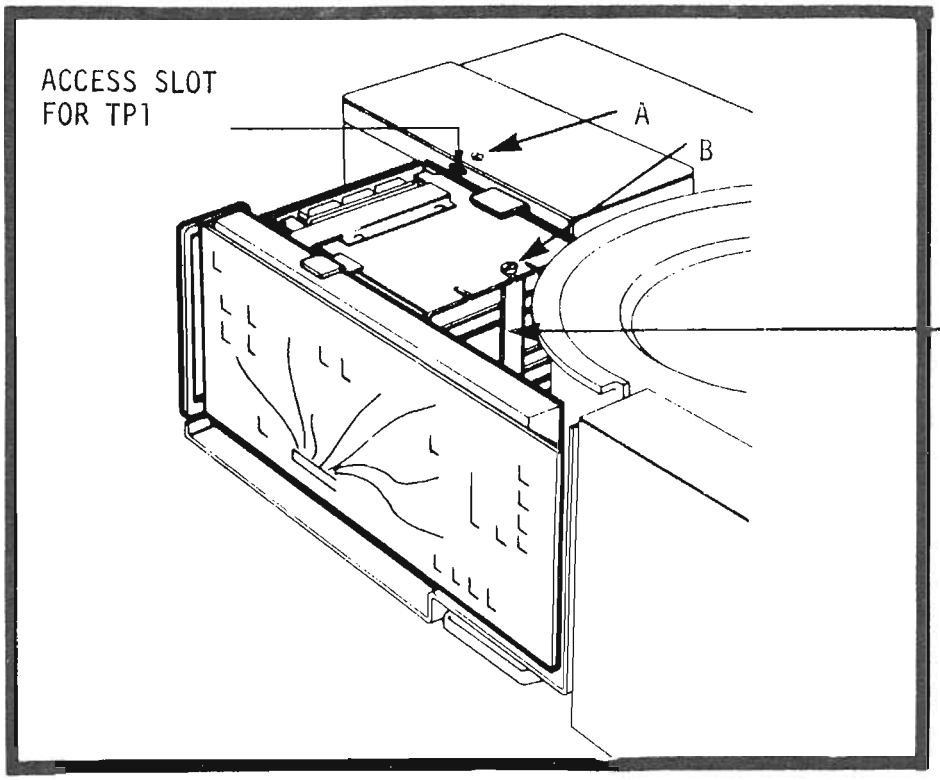


FIGURE 3-2a

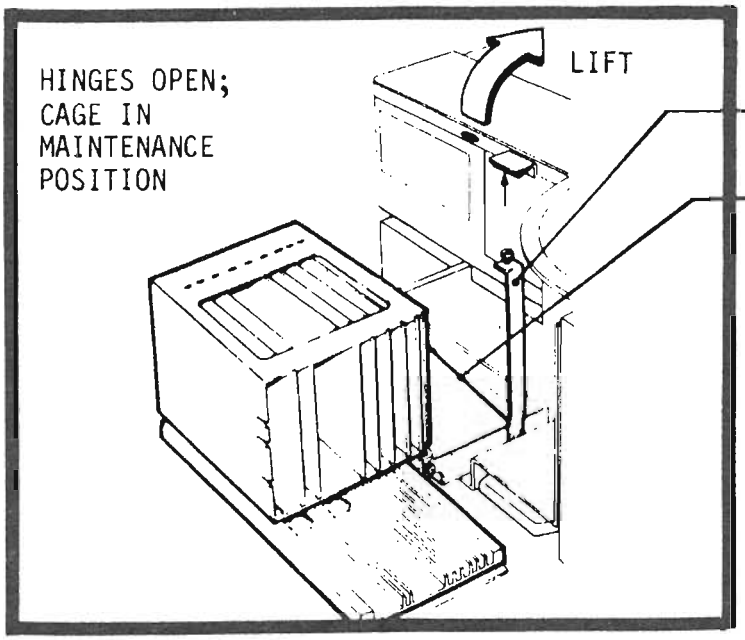


FIGURE 3-2b

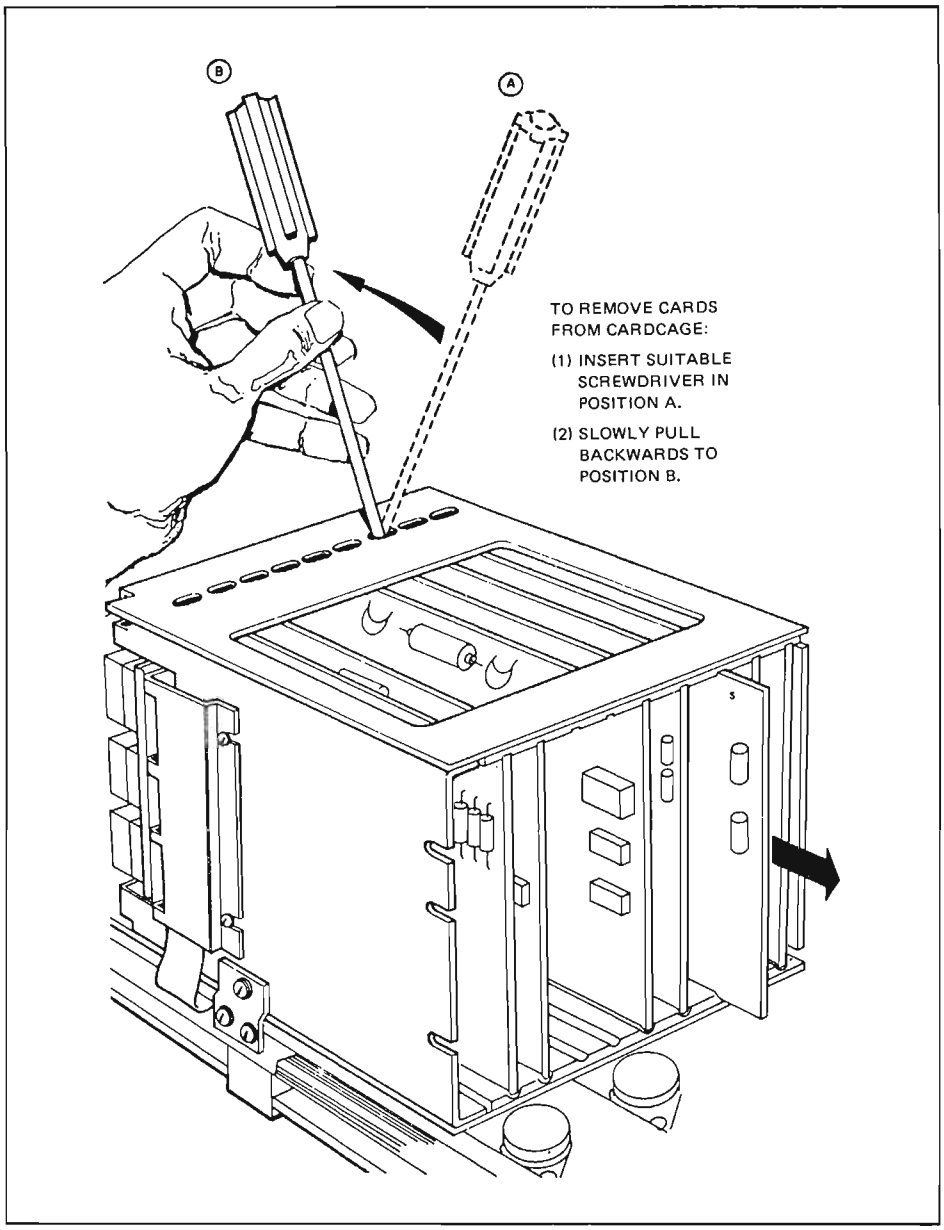


FIGURE 3-3 REMOVAL OF PLUGGABLE PCBs

3.1.2 *DIABLO PC BOARD LABELING*

To avoid confusion between the PC board compliments for the Diablo Model 43 (Wang 2230) and the Diablo Model 44 (Wang 2260), the Customer Engineering Division will label certain 2230-only and 2260-only Diablo PC boards with a Brady label "3" for Diablo Model 43 or a "4" for Diablo Model 44. This label will be attached to the wiring side. Diablo boards that can be used interchangeably between 2230's and 2260's will not be labeled. If a Diablo Model 43 (2230) PC board is field updated for Model 44 use, it must be labeled accordingly. The following Diablo boards require either a Brady "3" or "4" lable as described above.

2230 (Model 43) Boards Requiring a "3" Label:

Designation	Diablo #
AL-1-CB	11404-00
AL-2-CB	11407-00
SO-CB	11633-00
OR-CB	11414-00
RW-CB	11486-02
IO2-CB	11433
RDR2-CB	11637-00
D/CS-CB	11429-00
	11637-00

2260 (Model 44) Boards Requiring a "4" Label:

Designation	Diablo #
AL-1-CB	11404-20
AL-2-CB	11407-20
SO-CB	11633-20
SL-CB	11471-01
OR-CB	11414-01
RW-CB	11486-20
IO2-CB	11504
RDR2-CB	11647-00
D/CS-CB	11429-01
	11637-01

DIABLO 43/44 DISK DRIVE PC BOARDS

Diablo Model 43 (Wang 2230)			Diablo Model 44 (Wang 2260)		
PCB	Diablo #	WLI #	Diablo #	WLI #	Changes:
AL-1-CB	11404-00	726-0451	11404-20	726-0471	Added 10Ω resistor at location D3.
AL-2-CB	11407-00	726-0452	11407-20	726-0472	Moved 10Ω jumper resistors at J-55 and J-57 to J-54 and J-56.
SO-CB	11633-00	726-0466	11633-20	726-0473	a) Added a .47 µf, 50V capacitor at location E-37. b) Added a 1.21 Meg, 1/4 watt, 1% resistor at location E-38.
SR-CB	11411-01	726-0454	11411-01	726-0454	No changes; directly compatible.
SL-CB	11471-00	726-0462	11471-01	726-0474	A 11471-00 from a 2230 may be used in a 2260 without modification; but a 11471-01 may not be used in a 1500 RPM 2230.
SL-CB	11471-02	726-0491	11471-03	726-0492	Remove 10Ω resistor at location F49.
OR-CB	11414-00	726-0455	11414-01	726-0475	Added a 10Ω jumper resistor* at location H-22.
				IMPORTANT:	The spindle speed variant resistors* at locations J50 thru J-57 must be in the same configuration as the board being replaced. *10Ω, 1/4W, 5% Diablo #10021-10.
OR-CB	11873-00	726-0493	11873-01	726-0497	Remove 10Ω resistor at location E46.

Diablo Model 43 (Wang 2230)			Diablo Model 44 (Wang 2260)		
PCB	Diablo #	WLI #	Diablo #	WLI #	Changes:
SD-CB	11613-01	726-0464	11613-01	726-0464	No changes; directly compatible.
MB	11635	726-0484	11635		No changes; directly compatible.
HS-CB	11631-01	726-0465	11631-01	726-0465	No changes; directly compatible.
HS-CB	11890	726-0483	11890	726-0483	No changes; directly compatible. NOTE: Requires revision "H" SD-CB.
RW-CB	11486-02	726-0463	11486-20	726-0476	11486-20 (new board) is not compatible with 11486-02.
PD-CB	11499-00	726-0388	11499-00		No changes; directly compatible.
AW-CB	11435-20	726-0477	11435-20		No changes; directly compatible.
IO1-CB or RDR1-CB	11431-01 11643-01	726-0460 726-0468	11431-01 or 11643-01		No changes; directly compatible.
IO2-CB or RDR2-CB	11433 11645-00	726-0478 726-0469	11504 11647-00	726-0479 726-0470	11504 (new board) is not compatible with 11433. 11647-00 (new board is not compatible with 11645-00.
D/CS-CB	11429-00 11637-00	726-0459 726-0467	11429-01 11637-01	726-0480 726-0481	11429-01 and 11637-01 are not compatible with 11429-00 or 11637-00.
SC-CB	11459	726-0461	11459		No changes; directly compatible.
IO-MB	11400-01 11521	726-0485	11400-01 11521		No changes; directly compatible.
TC-CB	Not used in Diablo Mod. 43)		11537		Not interchangeable between 2260's; requires unique calibration for temperature compensation.

3.2 MODEL 44B

3.2.1 *LOCATION OF ELECTRONIC ASSEMBLIES (44B)*

Electronic Circuit boards are contained in two areas in the 44B as follows:

1. Electronic Card Cage - this accommodates six pluggable PCB's and a motherboard assembly. The PCB's contained in this card cage perform all logical, control and data transfer functions.

2. Power Supply Assembly - this accommodates one PCB on which is contained the voltage rectification and regulation circuitry necessary to operate the drive.

PCB Compliment - The 44B is made up of 8 major Assemblies:

J1 I/O PCB Assembly #12025.
J2 Power Driver PCB Assembly #19032 (WL #726-0443).
*J3 Servo PCB Assembly #12068 (WL #726-0442). Will be replaced by a 12099 Servo PCB WLI #726-0432.
*J4 Address Logic PCB Assembly #12064 (WL #726-0441). Will be replaced by a 12101 Address Logic PCB WLI #726-0431.
J5 Logic PCB Assembly #12066 (WL #726-0440).
J6 Data Transfer PCB Assembly #12046 (WL #726-0439). Will be replaced by a 12095 Data Transfer PCB WLI #726-0430.
Power Supply Assembly #19033 (WL #726-0438).
Motherboard Assembly #12023.

*The Address Logic & Servo PCB's must be replaced as a pair.

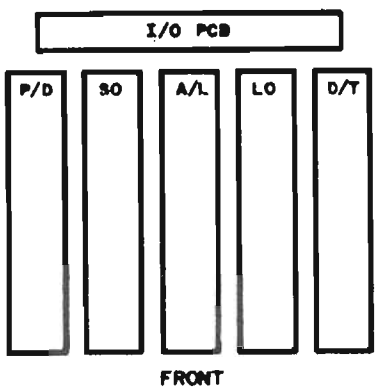


FIGURE 3-4
CARD CAGE PCB LOCATIONS

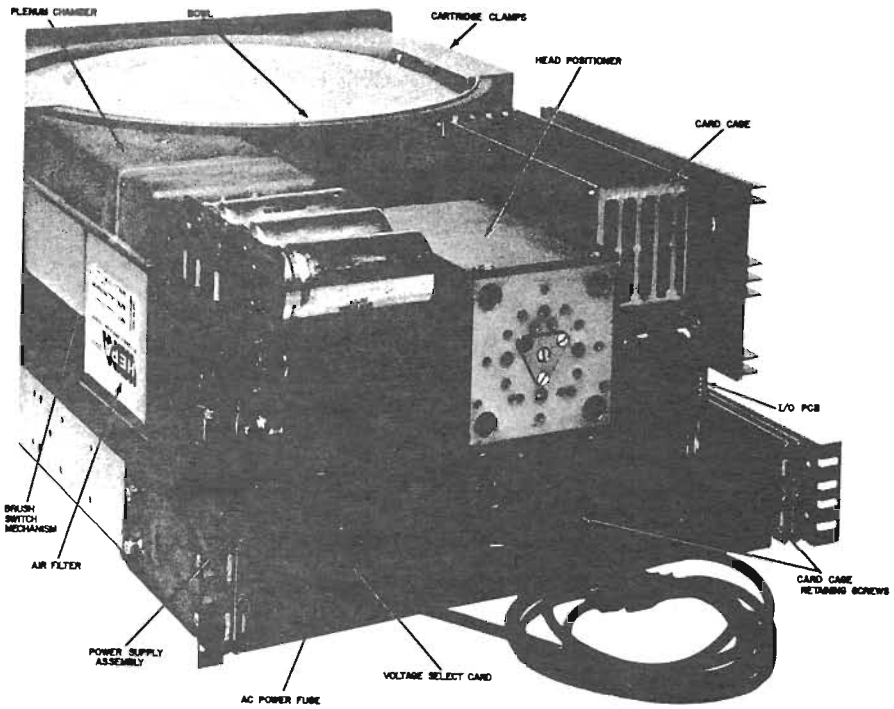


FIGURE 3-5 LOCATION OF ASSEMBLIES

3.2.2 *DIABLO OPTION SELECTION SWITCHES*

Diablo 44B options are switch selectable; the option-select switches are contained on three circuit boards:

DATA TRANSFER - DIABLO #12046 (Replaced by 12095)
ADDRESS LOGIC - DIABLO #12064 (Replaced by 12101)
LOGIC - DIABLO #12066

For Diablo Model 44B Disk Drives to function properly with Wang interface logic, option-select switches must be set to the following configurations:

	SW1	SW2	SW3	SW4
DATA TRANSFER	ON	ON	ON	OFF
ADDRESS LOGIC	OFF	OFF	ON	ON
LOGIC	*OFF	OFF	X	X

X = Not Used.
*This switch must be on when using an alignment cartridge.

Designation/WLI #:

I/O PCB
12025 REV A

DATA TRANSFER PCB
12046 XDG
WLI #726-0439

At location L35 there is a bank of switches that control the following:

SW1 - Write/Erase Option - ON
SW2 - Write Protect Upper - OFF
SW3 - Write Protect Lower - OFF
SW4 - Unseparated Data - OFF

NOTE: The switches function is followed by the position it should be in for Wang operation.

This PCB is going to be replaced by a multilayer PCB in the future, its Diablo number is 12095 (WLI #726-0430).

LOGIC PCB
12066 XDS
WLI #726-0440

At location B70 there is a bank of switches that control the following:

SW1 - Index Only Upper Disk - OFF
SW2 - 1500 RPM - OFF
SW3 - Not Used - X
*SW4 - Top Disk Select - ON

The switches function is followed by the position it should be in for Wang operation.

SW1 must be on for operation with an alignment cartridge.

On artwork 12065 upper index is available on TPF75, on artwork 12065-01 upper index is available on TPE76. *Also on artwork 12065-02 SW4 is used to switch the Top Disk Select line, on artwork prior to that SW4 was not used.

Because of differences in TRK Ø sensors when a logic PCB is changed, the TRK Ø adjustment should be checked.

Designation/WLI #:

ADDRESS LOGIC PCB
12064 XDD
WLI #726-0441

At location M75 there is a bank of switches that control the following:

SW1 - 200/100 TPI - OFF
SW2 - Negative Attention - OFF

SW3	SW4	FILE SELECT
ON	ON	FILE 1
ON	OFF	FILE 2
OFF	ON	FILE 3
OFF	OFF	FILE 4

The switches function is followed by the position it should be in for Wang operation.

This PCB is undergoing redesign to improve head positioning characteristics. The new PCB is Diablo #12101 (WLI #726-0431). If this board is to replace a 12064, the servo board must also be changed from a 12068 to a 12099.

SERVO PCB
12068 XDD
WLI #726-0442

This PCB is undergoing redesign to improve head positioning characteristics. The new PCB is Diablo #12099 (WLI #726-0432). If this board is to replace a 12068, the Address Logic must also be changed from a 12064 to a 12101.

-5V required for 7013 amplifier operation can be tapped from a 1K resistor at M31 of this board.

If the artwork is 12098, then on the 12099 Servo PCB, -5V can be tapped from pin 7 or 9 of H26.

POWER DRIVER PCB
12062-01 XDG
WLI #726-0443

This is the latest revision of the Power Driver PCB with circuit changes to decrease spindle driver switching noise and improve actuator seek time. It is directly compatible with the old 12062 Power Driver.

*The artwork revision level of Diablo 44B PCB's can be found etched on the wire side of the PCB's.

Example: The artwork revision of the 12066 Logic PCB is 12065-01.

3.2.3 *DIABLO PCB REVISION LEVELS*

Since the inception of the Diablo Model 44B into the Wang product line, there have been several hardware changes to the drive. These changes correct various drive problems and improve drive performance. The following is a list of changes, by PCB, that have been made to date.

Modifications to the Logic PCB assembly to:

1. Correct an artwork error.
2. Improve track zero circuit operation.
3. Prevent crosstalk between index and sector pulses.
4. Improve the stability of the speed OK F/F.

To correct an artwork error on the 12066 Logic PCB, install a jumper from M20 pin 9 to M20 pin 2. This change makes the revision level of this PCB XDH.

The following changes to Diablo circuitry are required to resolve the Track Ø problems encountered on Diablo Model 44B disk drives.

To update the "over tracks" detect circuit located on the LOGIC circuit board (Diablo #12066) the following additions and changes must be installed (see Figure 3-6 for circuitry added).

This change brings the LOGIC PC revision level to L.

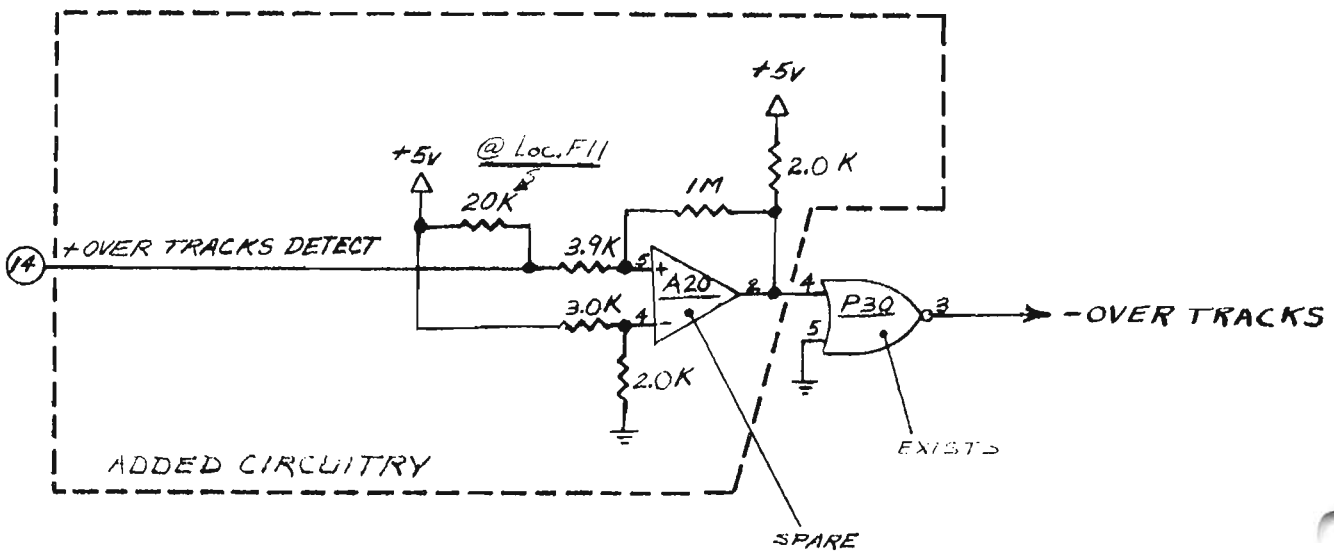


FIGURE 3-6 CIRCUITRY ADDED TO LOGIC BOARD

a. Change F10 and F11 to 20K resistors (WL #330-4023) if they are not that value.

b. Cut the etch running between F11 (20K resistor) and P30-4.

c. Connect pin 14 through a 3.9K (WL #330-3040) resistor to A20 pin 5.

d. Connect A20 pin 5 to A20 pin 2 through a 1M resistor (WL #330-6010).

e. Connect A20 pin 4 to +5V through a 3K resistor (WL #333-0068).

f. Connect A20 pin 4 to logic ground through a 2K resistor (WL #333-0007).

g. Connect A20 pin 2 to +5V through a 2K resistor (WL #333-0007).

h. Connect A20 pin 2 to P30 pin 4.

To prevent crosstalk of Index and Sector pulses, incorporate the following:

Change resistors A10 & B20 from 47KΩ to 20KΩ (provided by Diablo in kit).

To improve the stability of speed OKFF D60, replace diode at B59 with a 10Ω resistor (provided by Diablo in kit).

These modifications change the LOGIC PC (Diablo #12066; WL #726-0440) to a revision R.

An artwork revision brought the 12066 to revision XDS. This board can be differentiated from the old style by the artwork revision level which is etched on the wire side of the PCB. The old style is artwork revision 12065, the new style is artwork revision 12065-01. Also, a group of seven test points near the top center have signal assignments that differ from those on the old artwork. They are as follows:

E74 Upper Index/Sector marks

E75 Lower Index marks

E76 Upper Index marks only when using alignment cartridge and switch 1 at location B70 is on

E77 Upper Transducer Output

F74 Lower Transducer Output

F75 Over Tracks Detect signal at P30-2

F76 Phase 2 of Spindle Drive

Diablo has since issued a new 12066 with revised artwork. This PCB can be identified by its artwork revision which is 12065-02, it also has an additional test point at location P74. This test point is the output of P30-3 $\overline{\text{OVER}}$ $\overline{\text{TRACKS}}$.

With artwork 12065-02, Switch 4 in the switch bank at location B70, is used to switch the top disk select line for test purposes; therefore, during normal drive operation the switch must be in the on position.

Modifications to the #12046-XX Data Transfer PCB Assembly to prevent a False Write Check.

In some instances the #12046-XX Data Transfer PCB Assembly will intermittently go into a false AC fault condition indicating Write Gate with no Write Data. Units that exhibit this problem should make the following change to decrease Write Check sensitivity.

a) Change the capacitor location L24 from .001 µF to .0022 µF 50V (WLI #300-1929).

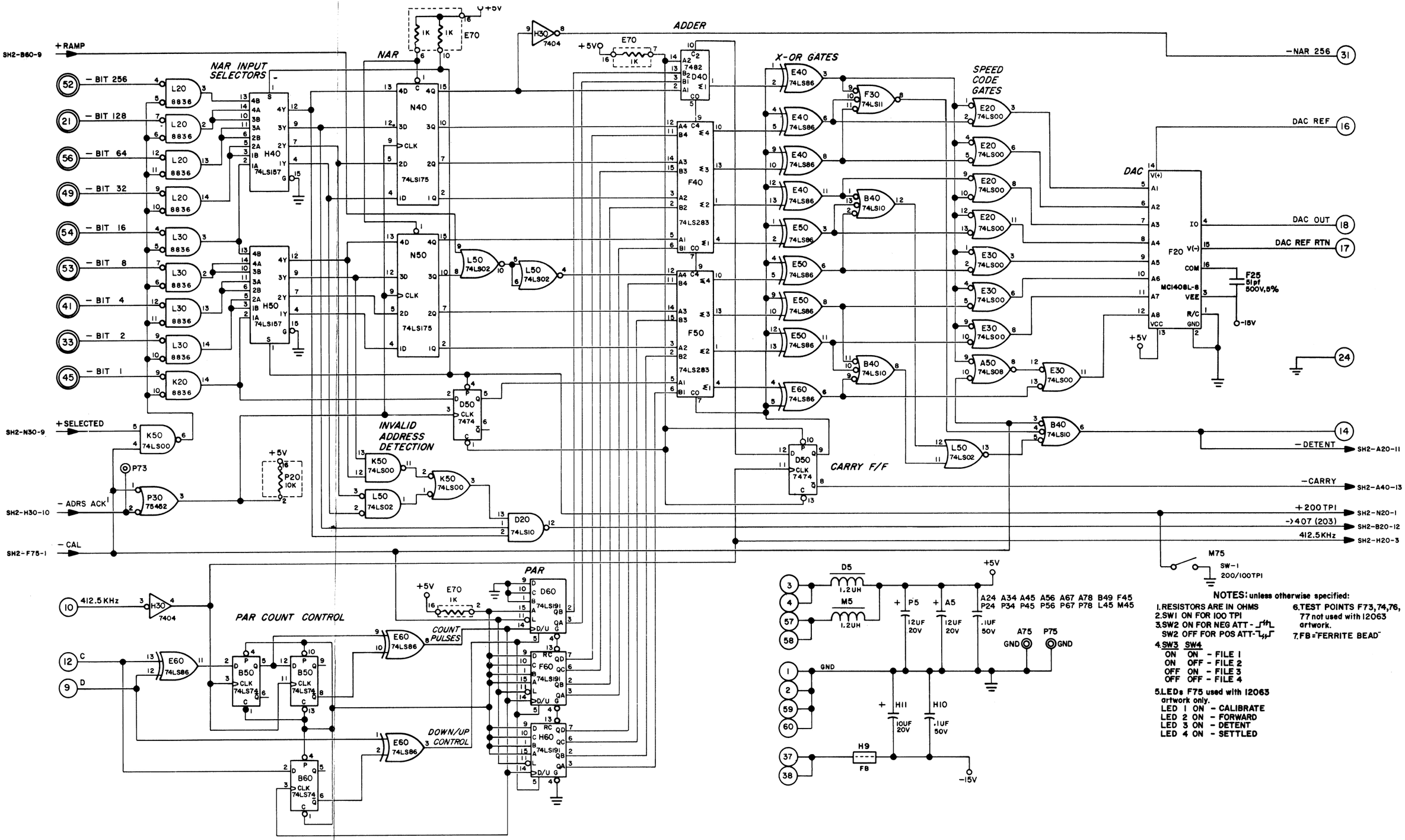
This changes the revision level of the board to 'XDF'.

3.3 CIRCUIT DIAGRAMS

The list below indexes the circuit diagrams which follow. The assembly numbers correspond to the assembly number silk-screened onto each PCB assembly. The artwork numbers correspond to the artwork number etched on the PCB.

A revision history follows each diagram.

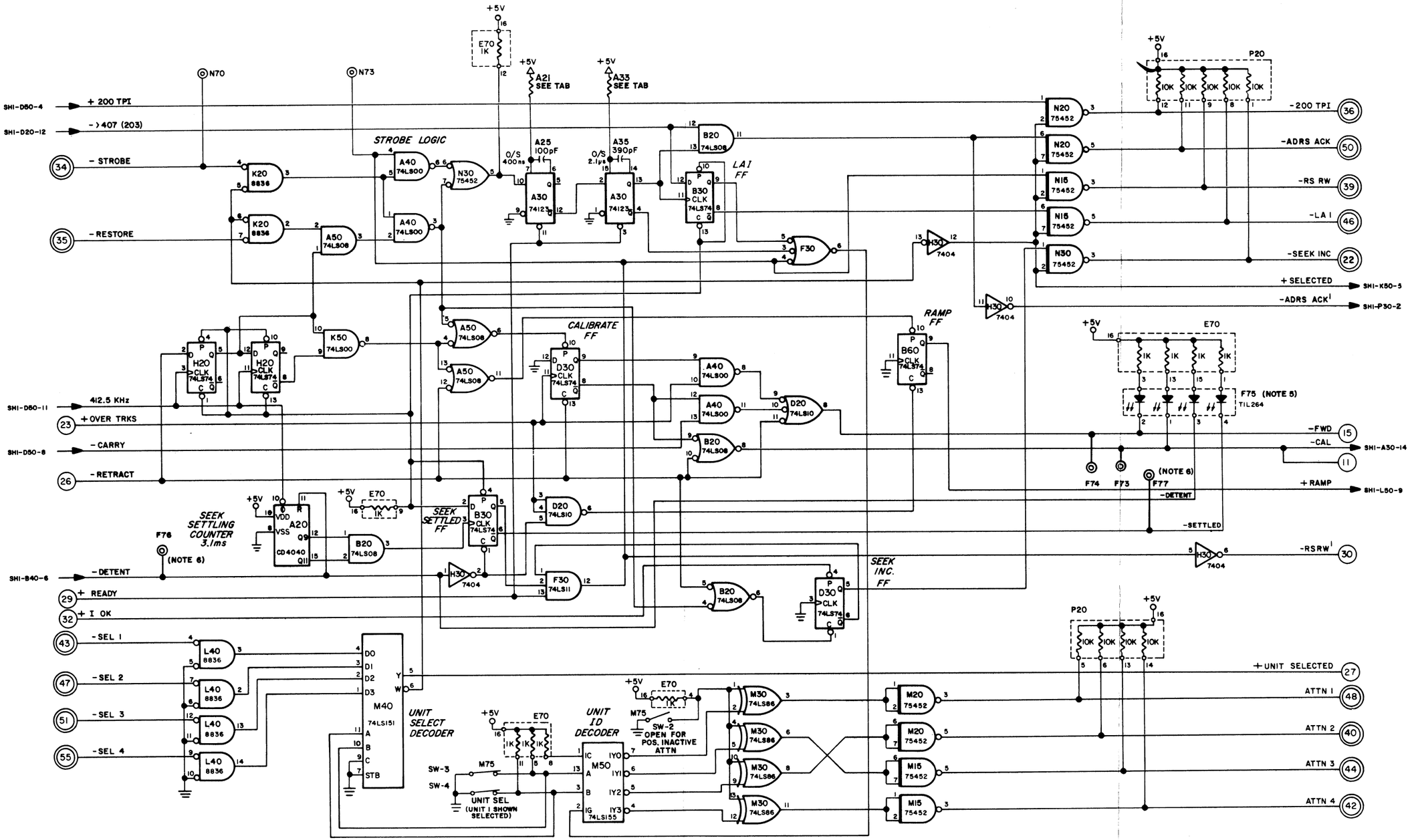
Title	Assembly No.	Artwork No.
Sheet 1 - Address Logic PCB Schematic Sheet 2 -	12101	12063/12100
Sheet 1 - Address Logic PCB Schematic Sheet 2 -	12101-XX	12100-01
Sheet 1 - Logic PCB Schematic Sheet 2 -	12066	12065
Sheet 1 - Logic PCB Schematic Sheet 2 -	12066	12065-01
Sheet 1 - Logic PCB Schematic Sheet 2 -	10266-XX	10265-01/12065-02
Sheet 1 - Power Driver PCB Schematic	12062	
Sheet 1 - Power Driver PCB Schematic	12062-01	



NOTES: unless otherwise specified:

1. RESISTORS ARE IN OHMS
2. SW1 ON FOR 100 TPI
3. SW2 ON FOR NEG ATT - ⎍⎍L
   SW2 OFF FOR POS ATT - ⎍⎍
4. SW3 SW4
   ON ON - FILE 1
   ON OFF - FILE 2
   OFF ON - FILE 3
   OFF OFF - FILE 4
5. LEDs F75 used with 12063 artwork only.
   LED 1 ON - CALIBRATE
   LED 2 ON - FORWARD
   LED 3 ON - DETENT
   LED 4 ON - SETTLED
6. TEST POINTS F73,74,76, 77 not used with 12063 artwork.
7. FB = "FERRITE BEAD"

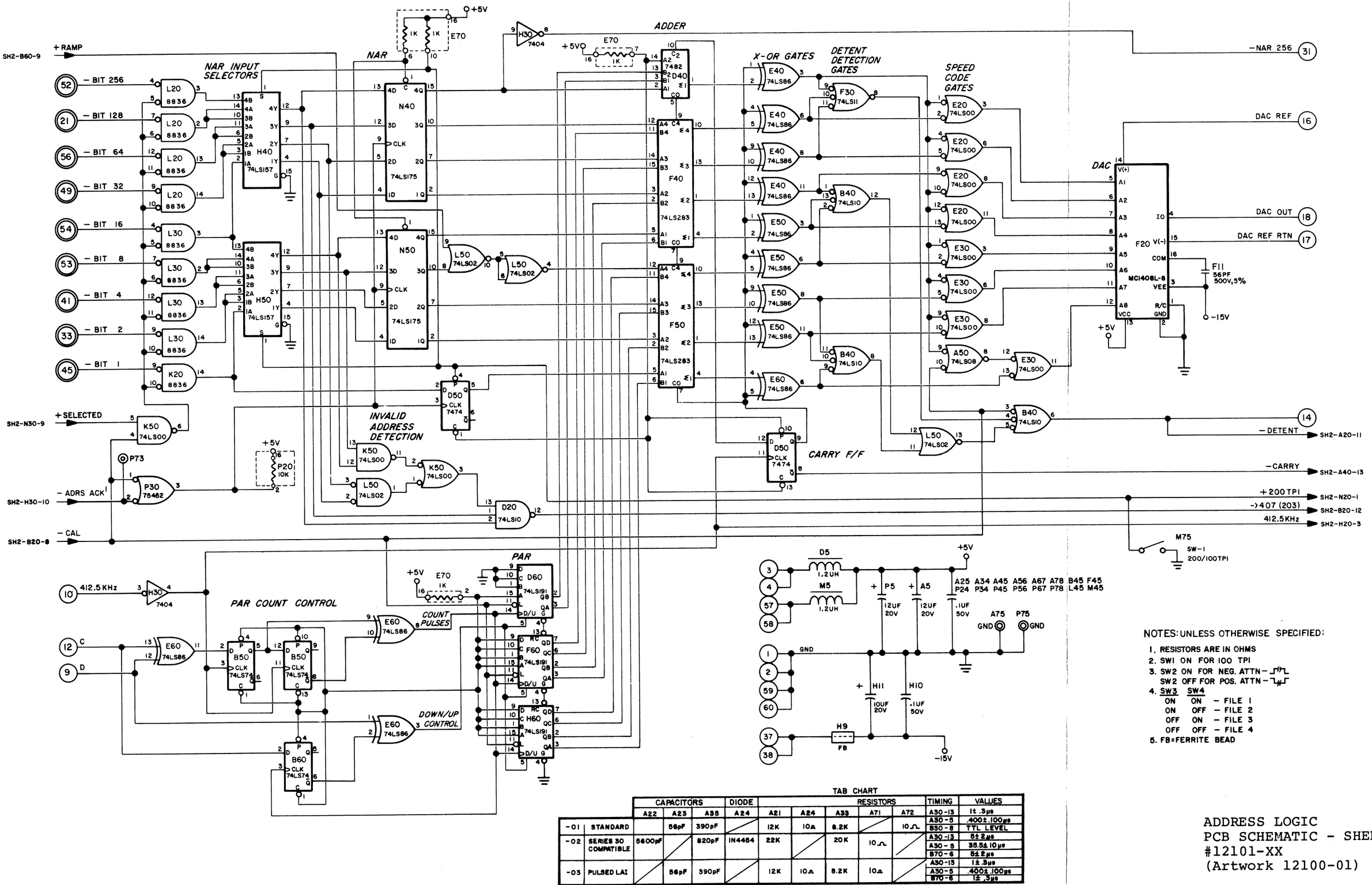
ADDRESS LOGIC
PCB SCHEMATIC - SHEET 1
#12101
(Artwork 12100 or Modified 12063)



ADDRESS LOGIC
PCB SCHEMATIC - SHEET 2
#12101
(Artwork 12100 or Modified 12063)

REVISION HISTORY - ADDRESS LOGIC PCB No. 12101
(PCB Artwork No. 12100, or 12063 modified for 12101 PCB Assembly)

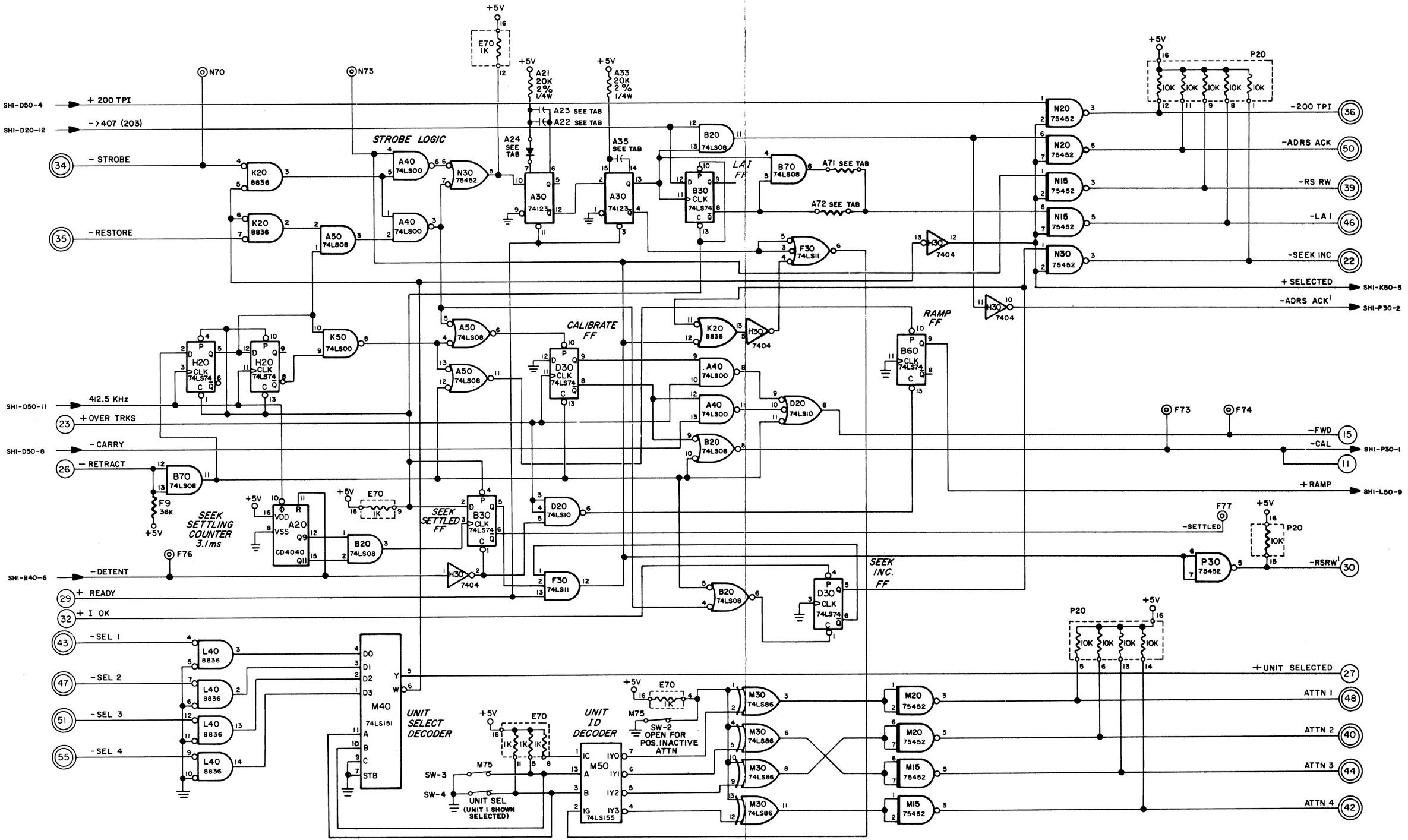
Rev.	XECO	Artwork 12063 (modified)
XD-B	099	Speed code bit 1 goes to DAC F20 instead of becoming DIF 1.
		Artwork 12100
XD-A	082	Releases schematic and assembly for new artwork.
XD-C	107	Document change.
XD-D	126	Bill-of-material change.



TAB CHART

		CAPACITORS			DIODE	RESISTORS					TIMING	VALUES
		A22	A23	A35	A24	A21	A24	A33	A71	A72	A30-13	1± .3µs
											A30-5	.400±.100µs
-01	STANDARD		56pF	390pF		12K	10Ω	8.2K		10Ω	B30-8	TTL LEVEL
-02	SERIES 30 COMPATIBLE	5600pF		820pF	IN4454	22K		20K	10Ω		A30-13	5±2µs
											A30-5	35.5±10µs
											B70-6	5±2µs
-03	PULSED LAI		56pF	390pF		12K	10Ω	8.2K	10Ω		A30-13	1± .3µs
											A30-5	.400±.100µs
											B70-6	1± .3µs

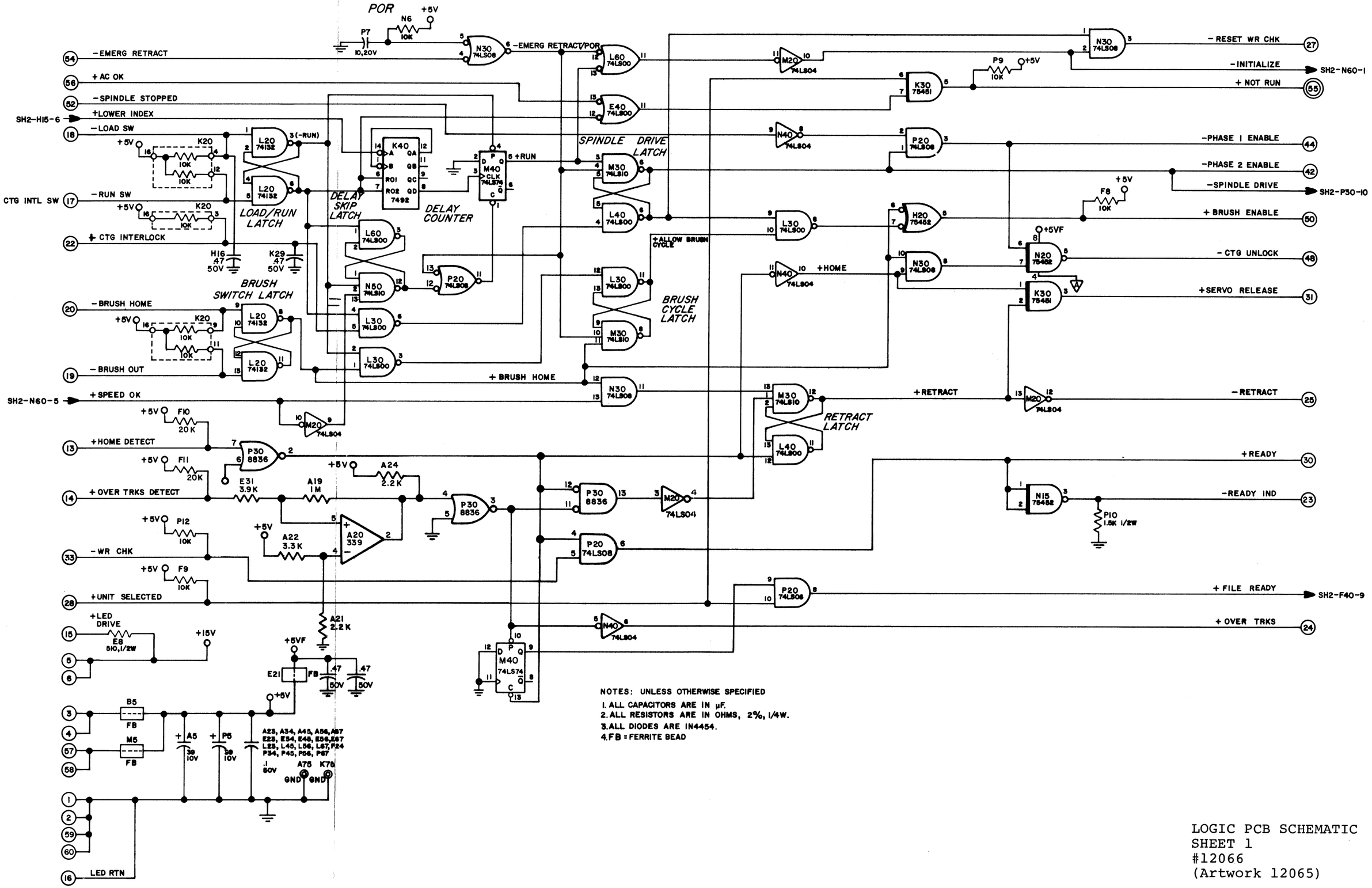
ADDRESS LOGIC
PCB SCHEMATIC - SHEET 1
#12101-XX
(Artwork 12100-01)



ADDRESS LOGIC
PCB SCHEMATIC - SHEET 2
#12101-XX
(Artwork 12100-01)

REVISION HISTORY - ADDRESS LOGIC PCB No. 12101-XX
(PCB Artwork No. 12100-01)

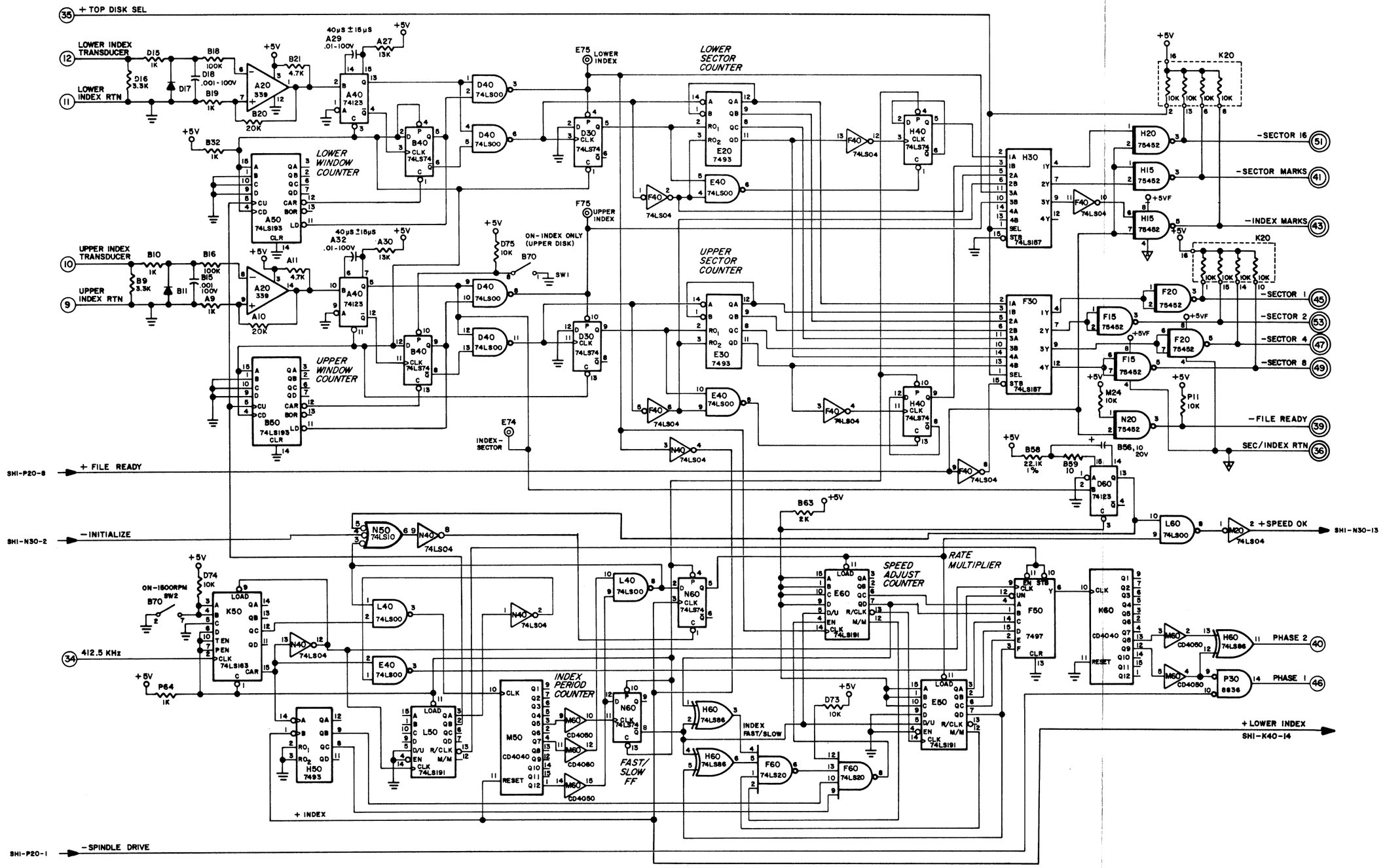
Rev.	XECO	
XD-E	100	1) Releases schematic and assembly for artwork 12100-01 covering PCB assemblies 12101-01, -02. 2) Gate B70-11 added in -RETRACT line.
XD-F	141	A22 listing in Tab Chart corrected.
Rev.	**ECO**	
A	2097	ECO release of schematic and assembly for 12101-01, -02, -03.
B	2219	Inputs to Attention gate F30-6 altered for interface compatibility with Model 44A. Gate K20-13 and inverter H30-6 added.



NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL CAPACITORS ARE IN μF.
2. ALL RESISTORS ARE IN OHMS, 2%, 1/4W.
3. ALL DIODES ARE IN4454.
4. FB = FERRITE BEAD

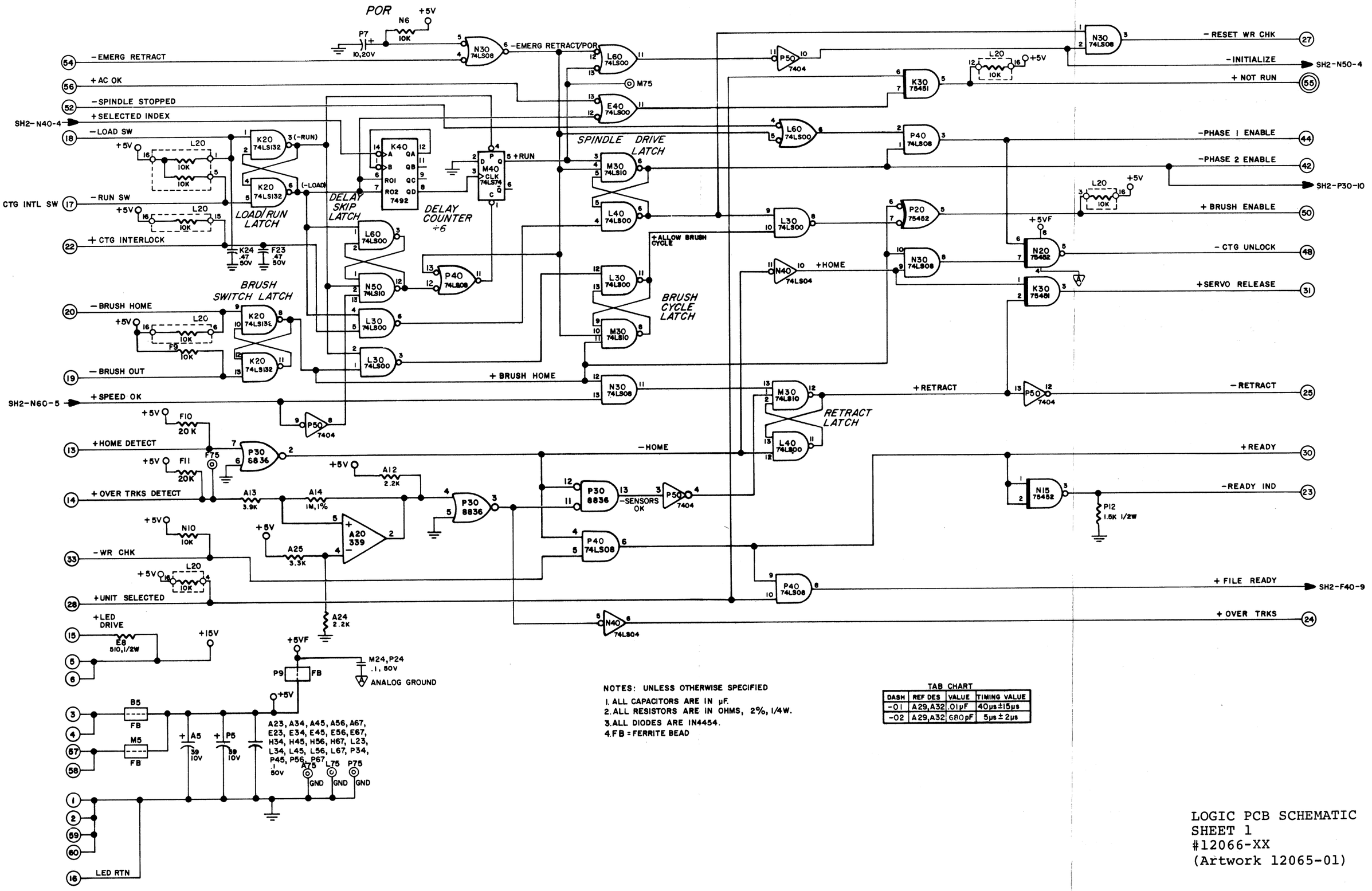
LOGIC PCB SCHEMATIC
SHEET 1
#12066
(Artwork 12065)



LOGIC PCB SCHEMATIC
SHEET 2
#12066
(Artwork 12065)

REVISION HISTORY - LOGIC PCB No. 12066
(PCB Artwork No. 12065)

Rev.	XECO	
XD-E	073	Schematic and assembly of earliest version shipped.
XD-F	083	Gate N50-6 and inverter N40-8 added to Speed OK F/F clear input to prevent heads loading at low RPM after emergency retract.
XD-H	103	Add jumper to replace missing trace. No functional effect.
XD-L	113	1) Comparator A20-2 added to OVER TRKS DETECT circuit. 2) Delay Counter K40 clock changed from SELECTED INDEX to LOWER INDEX.
XD-M	124	Schematic correction to OVER TRKS comparator A20-2 circuit.
XD-R	149	1) Updates index transducer amps to match Rev. level A of 12066-XX using 12065-02 artwork. 2) Diode replaced by resistor at position B59 in D60 O/S circuit.



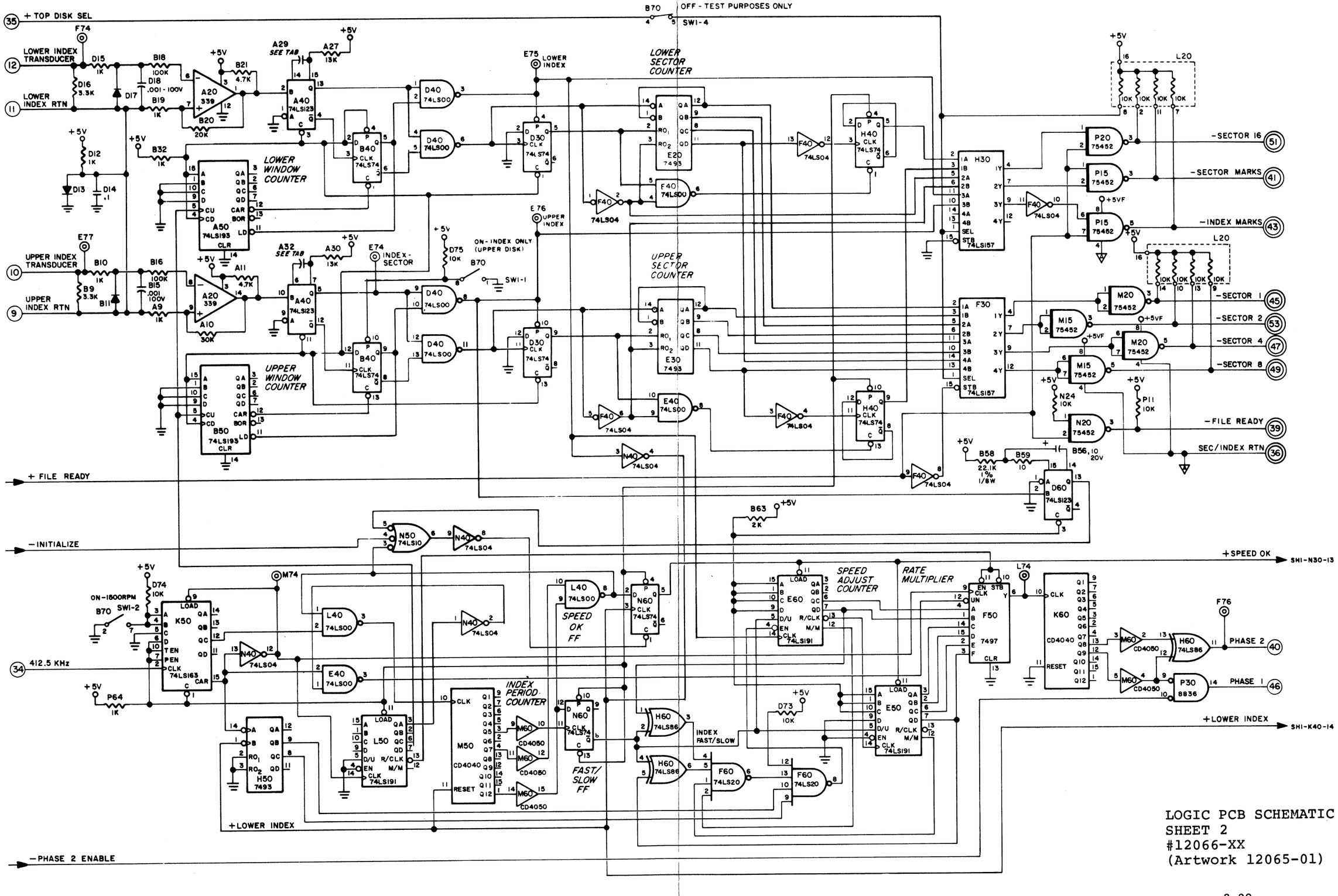
NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL CAPACITORS ARE IN μF.
2. ALL RESISTORS ARE IN OHMS, 2%, 1/4W.
3. ALL DIODES ARE IN4454.
4. FB = FERRITE BEAD

TAB CHART

DASH	REF DES	VALUE	TIMING VALUE
-01	A29,A32	.01μF	40μs±15μs
-02	A29,A32	680pF	5μs±2μs

LOGIC PCB SCHEMATIC
SHEET 1
#12066-XX
(Artwork 12065-01)

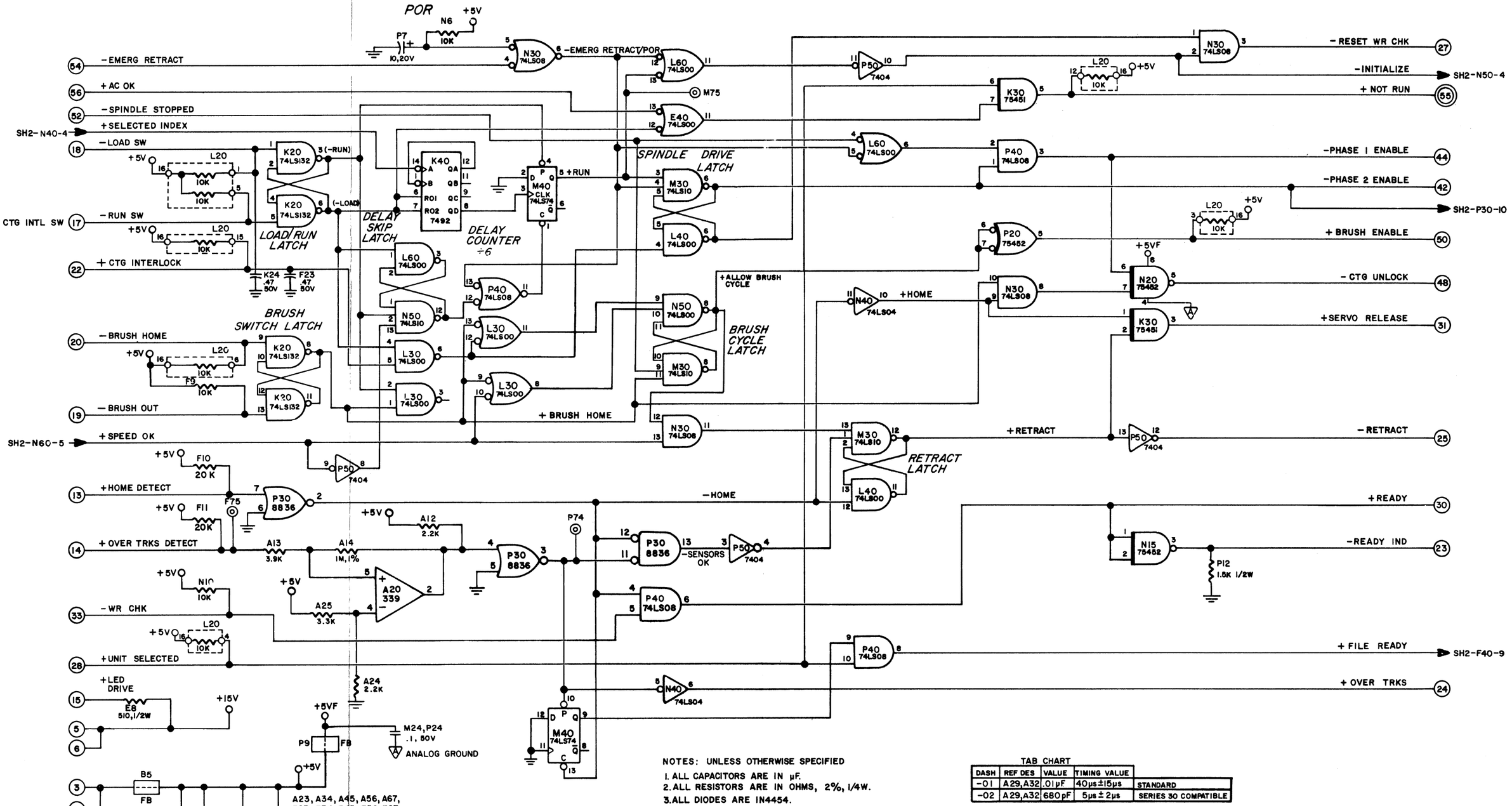


LOGIC PCB SCHEMATIC
SHEET 2
#12066-XX
(Artwork 12065-01)

REVISION HISTORY - LOGIC PCB No. 12066
(PCB Artwork No. 12065-01)

For later revision levels using #12065-01 artwork, see Figures 7-5B and 7-6B.

Rev.	XECO	
XD-G	086	Release of schematic and assembly for artwork 12065-01.
XD-J	104	1) Delay Counter K40 clock changed from SELECTED INDEX to LOWER INDEX. 2) TP F75 changed from HOME DETECT to OVER TRKS DETECT.
XD-K	108	Comparator A20-2 added to OVER TRKS DETECT circuit.
XD-N	125	Schematic correction to OVER TRKS Comparator A20-2 circuit.
XD-S	150	1) Resistors A10/B20 in index transducer amps changed from 47K to 20K. 2) In D60-13 O/S circuit, diode B59 replaced by resistor.



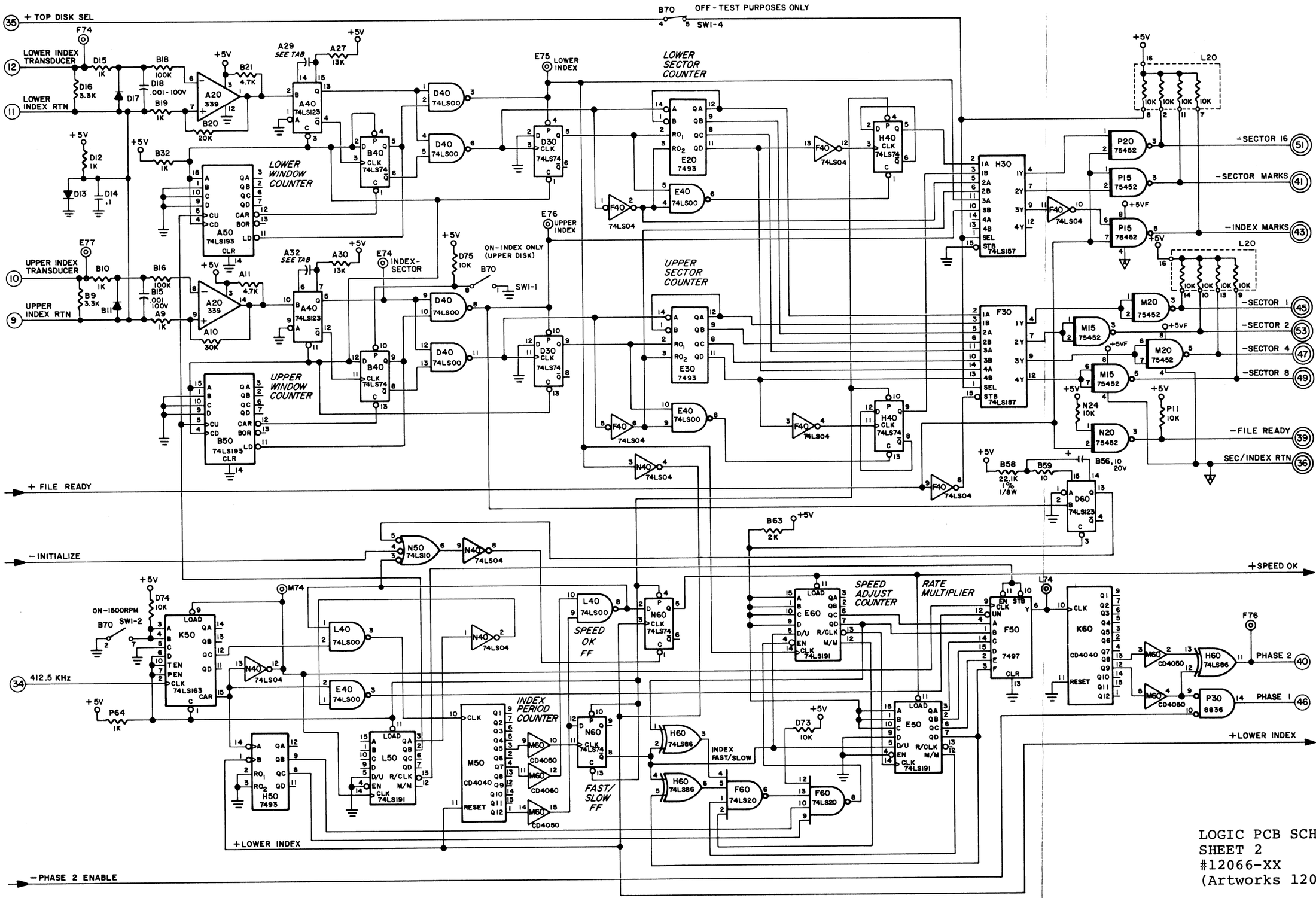
NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL CAPACITORS ARE IN µF.
2. ALL RESISTORS ARE IN OHMS, 2%, 1/4W.
3. ALL DIODES ARE IN4454.
4. FB = FERRITE BEAD

TAB CHART

DASH	REF DES	VALUE	TIMING VALUE	
-01	A29,A32	.01µF	40µs±15µs	STANDARD
-02	A29,A32	680pF	5µs ± 2µs	SERIES 30 COMPATIBLE

LOGIC PCB SCHEMATIC
SHEET 1
#12066-XX
(Artworks 12065-01/-02)



LOGIC PCB SCHEMATIC
SHEET 2
#12066-XX
(Artworks 12065-01/-02)

REVISION HISTORY - LOGIC PCB No. 12066-XX

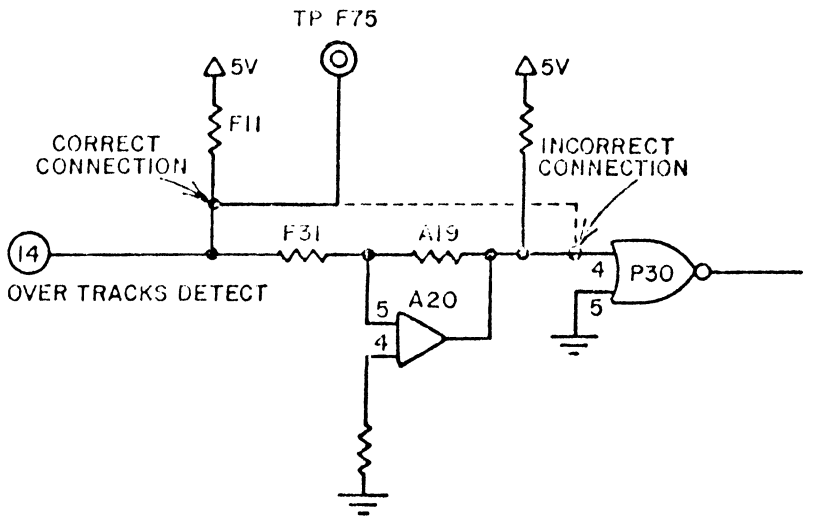
For earlier Rev. levels using 12065-01 artwork, see Figures 7-5A and 7-6A.

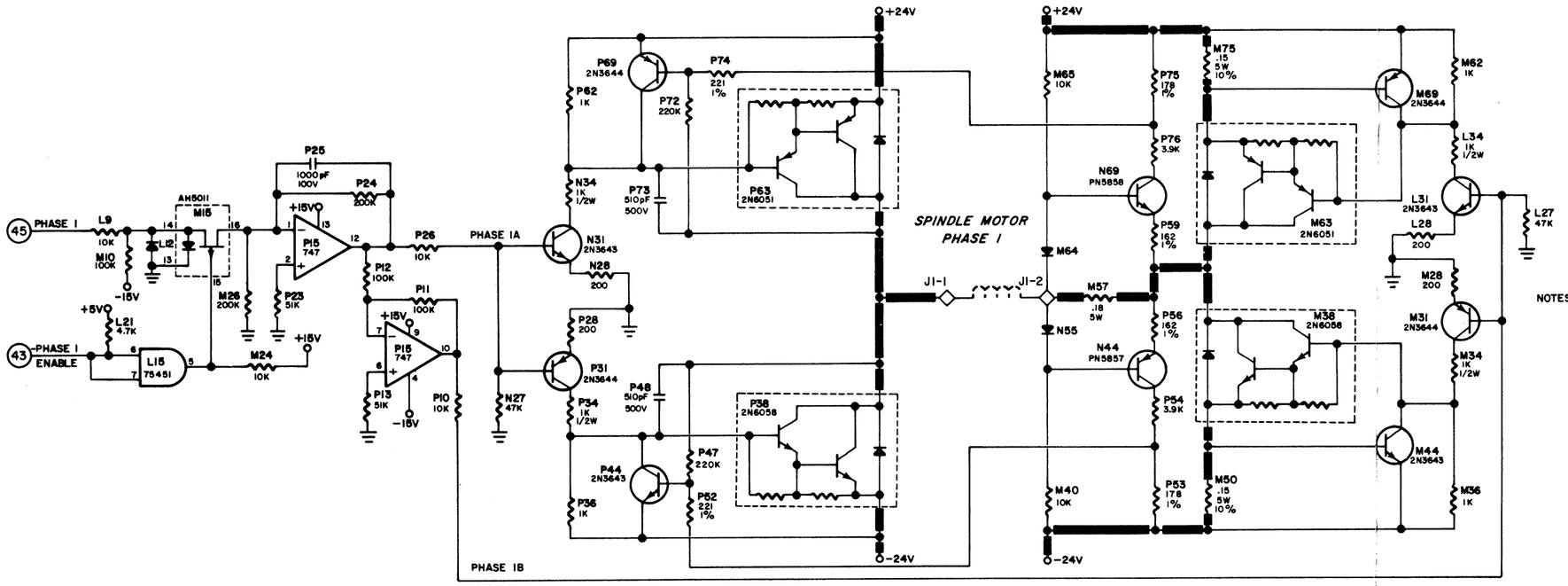
Rev.	XECO	Artwork 12065-01
XD-V	176	1) Resistor A10 in Upper Index Transducer amp changed from 20K to 30K. 2) Brush Enable circuit changed.

Rev.	ECO	Artwork 12065-02
C	2220	Earliest version shipped.

Logic PCB Assemblies using artwork #12065-01 have Test Point F75 incorrectly wired to component P30, Pin-4. This TP should be connected to the OVER TRACKS DETECT signal at resistor F11 (see Figure).

To correct this wiring error, the junper from TP F75 to P30-4 should be removed from P30-4 and moved to resistor F11. This change does not affect operation of the drive since the TP in only used while performing Track Zero Adjustment.

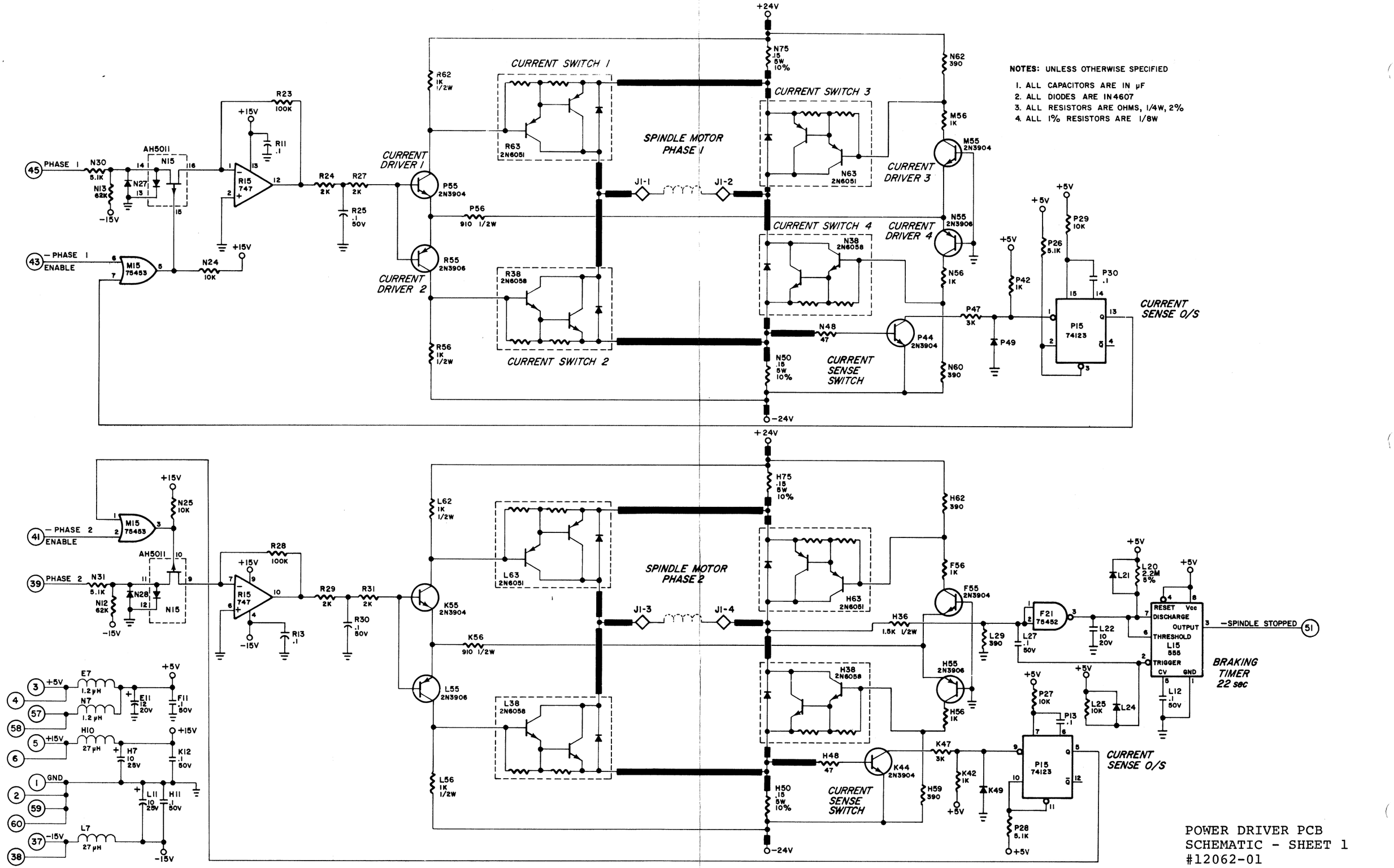




NOTES: UNLESS OTHERWISE SPECIFIED

1. ALL CAPACITORS ARE IN μF.
2. ALL DIODES ARE IN4607.
3. ALL RESISTORS ARE IN OHM'S, 1/4W, 2%.
4. ALL 1% RESISTORS ARE 1/8W.

POWER DRIVER PCB
SCHEMATIC - SHEET
#12062



POWER DRIVER PCB
SCHEMATIC - SHEET 1
#12062-01

REVISION HISTORY - POWER DRIVER PCB No. 12062-00

Rev.	XECO	
XD-D	055	Earliest version shipped.
XD-E	060	For spindle circuit noise reduction, diodes changed to resistors at locations N28, P28, L28, M28, J28, K28, F28, H28.
XD-F	074	Resistors D10/D20 in I OK amp change from 2.7M to 2M.
XD-G	123	Bill-of-Material change.
XD-H	185	Resistor K20 changed from 1.5M to 2.2M for longer braking period.

25 SERVO DRIVE
27 SERVO DRIVE SIGNAL RET
29 + SERVO RELEASE
F72 SERVO RELEASE SWITCH
+15V
B10
B11 .1 50V
B9 42.2K 1%
B6 4.02K 1%
B7 10K
A6 747
B15 10.2K 1%
B16
M12 10K
AH5011 N15
A14 1K
A15 10K
A6 747
B14
B12 .1 50V
-15V
A16 2.7M 1%
A17 100K
A18 .0047 100V
D23 1K
D24 .01 200V
B20 5.1K
+24V
B62 1K
A26 680 1/2W
A21 2N3904
B63 2N6051
A68 200pF 500V
B60 300 1/2W
B55 300pF 500V
B57 680 1/2W
D57 200pF 500V
B21 2N3906
B19 .033 100V
E62 680 1/2W
E63 2N6058
E60 1K
-24V
21 -24V UNFUSED
22
A30
D26
+24V
B38 470
B39 2N3906
B35 5.1K
B40 2.4K 1/2W
J3-1
B34 IN6.2V
B36 2.4K 1/2W
B48 2N3904
E38 2N6058
EMERGENCY RETRACT DRIVER
D48 10 20V
B50 1K
D52 2.4K 1/2W
D50 IN4454
M
HEAD POSITIONER MOTOR POLARITY: + FOR FORWARD
K_T = 1.6 LBS/AMPS
I_{MAX} = 6.25A
J3-2
B43 .2 1% 10W
VOLTAGE CHECK
+5V
H26 5.1K
H18 LM319
H30 3K 2%
H29 1K 2%
H28 1K 2%
H16 1.5K 1%
H31 3.74K 1%
H15 1.65K 1%
+15V
+5V
-15V
D22 100K
D20 2.0M
D12 LM319
D21 100K
D9 100K
D8 .47 50V
D10 2.0M
D7 1K
OVERCURRENT DETECTOR
K30 IN6.2V
K16 10K
K31 680 1/2W
K19 .01 200V
K18 .47 50V
K20 555
CV GND OUTPUT THRESHOLD TRIGGER DISCHARGE RESET Vcc
K27 10K
K26 1.1M 1%
M25 78M24C
N8 6.8 35V
+24V REG 54
+I OK 31
L28 .1, 50V
F21 75452
-EMERGENCY RETRACT 53
7 +24V
8
9
10
11
12
13 -24V
14
15
16
17
18
-24V
47 -CARTRIDGE UNLOCK
E19 43K
F19 18K
F15 10 35V
E20 2K
E29 MJE2090
CARTRIDGE UNLOCK DRIVER
F18 A14F
E18 1.5K 1/2W
LOAD INDICATOR 33
35
CARTRIDGE UNLOCK SOLENOID

POWER DRIVER PCB
SCHEMATIC - SHEET 2
#12062-01

REVISION HISTORY - POWER DRIVER PCB No. 12062-01

Rev.	XECO	
XD-A	084	XECO release of schematic and assembly.
XD-B	136	Document correction.
XD-C	186	1) Resistors P47 and K47 changed from 4.7K to 3K at inputs to Current Sense One-Shots. 2) Resistor L20 changed from 1.5M to 2.2M for longer braking period.

Rev.	ECO	
A	2096	ECO release of schematic and assembly.
B	2177	PCB artwork correction.
C	2223	Resistor L20 changed from 1.5M to 2.2M for longer braking period.

3.4 WANG MICROPROCESSOR

The disk controller consists of a discreet microprocessor programmed to control disk operations and communicate with the various Wang systems.

Electronics Description - WANG PORTION

The following PC boards are located in the controller chassis:

6295/6295-1	I/O TERMINATOR
6296	MICROPROCESSOR
6297-1	MICROPROCESSOR
6298	RAM/ROM
6299/6398	DISK CONTROL
6349	MOTHERBOARD

Figure 3-7 illustrates physical layout.

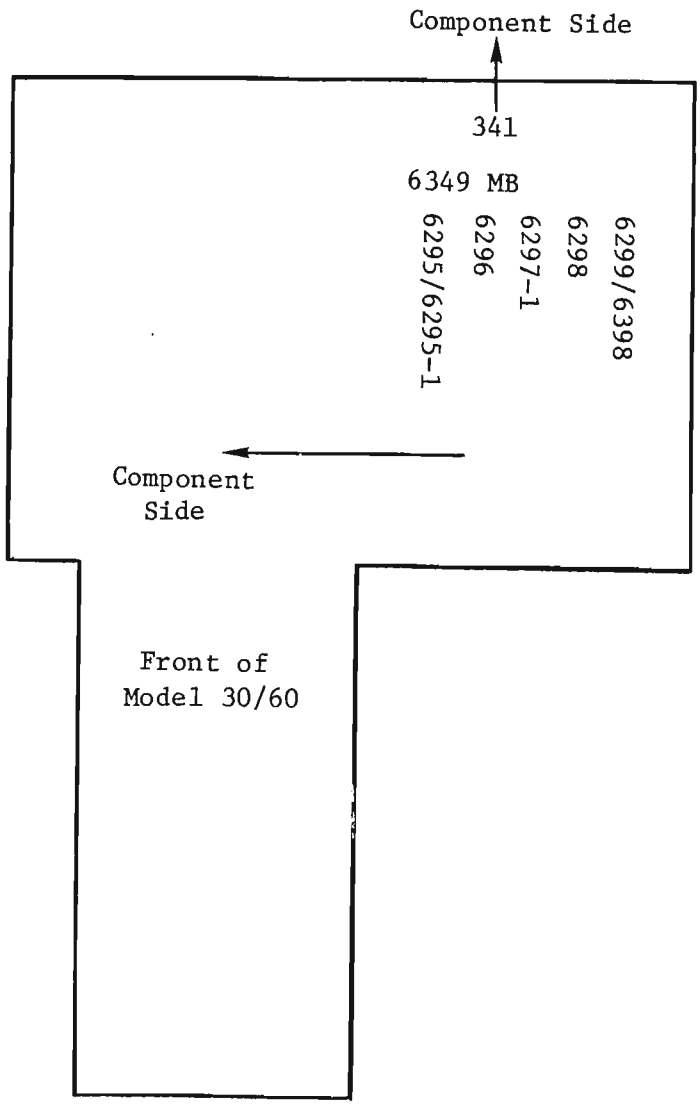


FIGURE 3-7
CONTROLLER CHASSIS

3.5 STORAGE CAPACITY CONVERSION PROCEDURES

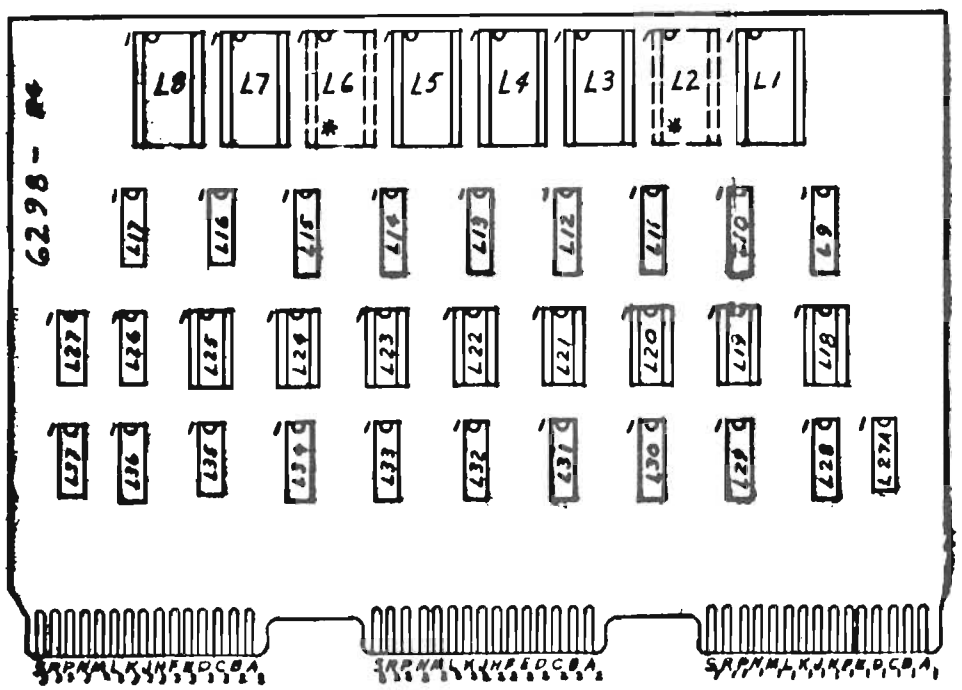
Storage capacity conversion from a 2260/2260B ¼ to a 2260/2260B ½ or to a 2260/2260B is accomplished by changing the PROM loading on the 6298 PCB. These changes are designated in the PROM loading variation table below. All other hardware in both the Wang processor and the Diablo section remains the same.

PROM LOADING VARIATION TABLE

I.C.	2260 or 2260B	2260½ or 2260B½	2260½ or 2260B¼
L3	378-0356	378-0356	378-0356
L7	378-0357	*378-0527	*378-0526
L4	378-0358	378-0358	378-0358
L8	378-0359	378-0359	378-0359
L1	378-0360	378-0360	378-0360
L5	378-0361	378-0361	378-0361

*Only PROMs that differ from 2260B loading.

Component Layout



*L6, L2 are not loaded

FIGURE 3-8

SOFTWARE LOADING VARIATION CHART

VARIATION	-10	-11	-12	-13	-14	-15	-16	-17	-18
SEE P.C. BD. LAYOUT	630-1	630-2	630-3	730-1	730-2	730-3	2230-1	2230-2	640-1
L3	378-0163	378-0163	378-0163	378-0163	378-0163	378-0163	378-0196R1	378-0196R1	378-0196R1
L7	378-0185	378-0189	378-0193	378-0164	378-0168	378-0172	378-0197R1	378-0203R1	378-0209R1
L4	378-0165R1	378-0165R1	378-0165R1	378-0165R1	378-0165R1	378-0165R1	378-0198R1	378-0198R1	378-0198R1
L8	378-0166	378-0166	378-0166	378-0166	378-0166	378-0166	378-0199R1	378-0199R1	378-0199R1
L1	-	-	-	-	-	-	378-0200R1	378-0200R1	378-0200R1
L5	-	-	-	-	-	-	378-0201R1	378-0201R1	378-0201R1
L2	-	-	-	-	-	-	-	-	-
L6	-	-	-	-	-	-	-	-	-

VARIATION	-19	-20	-21	-22	-23	-24	-25	-26
SEE P.C. BD. LAYOUT	640-1	640-2	740-1	740-2	2240-1	2240-2	2242	2243
L3	378-0227R1	378-0231R1	378-0214	378-0214	378-0235R5	378-2039R5	378-0279R3	378-0283R6
L7	378-0228R1	378-0232R1	378-0215	378-0215	378-0236R5	378-0240R5	378-0280R3	378-0284R6
L4	378-0229R3	378-0229R3	378-0216	378-0216	378-0237R3	378-0287R3	378-0287R3	378-0285R4
L8	378-0230R3	378-0230R2	378-0217R1	378-0217R1	378-0230R3	378-0238R3	378-0238R3	378-0286R5
L1	-	-	378-0218R2	378-0224R2	-	-	-	-
L5	-	-	378-0219R2	378-0225R2	-	-	-	-
L2	-	-	-	-	-	-	-	-
L6	-	-	-	-	-	-	-	-

TABLE 2

WANG MICROPROCESSOR PC BOARDS

2230 Microprocessor	2260/2260B/2260B½/2260B¼ Microprocessor	2260-2 Microprocessor
6295 PC (WLI#210-6295)	6295 PC (WLI#210-6295) No changes; directly compatible.	6295-1 PC (WLI#210-6295-1) To use a 6295 in a 2260-2, ECN 5656 must be incorporated.
6296 PC (WLI#210-6296)	6296 PC (WLI#210-6296) No changes; directly compatible.	6296 PC (WLI #210-6296) No changes; directly compatible.
6297-1 PC (WLI #210-6297-1)	6297-3 PC (WLI#210-6297-3) A 6297-1 must be changed as follows for use in a 2260. Cut etches from L14-11 and from L2-3. Add a jumper wire from L24-2 to L2-2. Add another jumper wire from L1-13 to L2-3.	6297-3 PC (WLI#210-6297-3) No changes; directly comtible.
6298 PC (WLI#210-6298)	6298 PC (WLI#210-6298) PROMs for a 2260 must be loaded. See loading diagram on page	6298 PC (WLI#210-6298) 2260 PROMs.
6299 PC (WLI#210-6299) or 6398 PC (WLI#210-6398) 6.25 MHz XTAL	6299-1 PC (WLI#210-6299-1) or 6398-1 PC (WLI#210-6398-1) To use either a 6299 or a 6398 in a 2260, change the 6.25 MHz XTAL to a 10 MHz XTAL.	6299-1 PC (WLI#210-6299-1) or 6398-1 PC (WLI#210-6398-1) NOTE: ECNs 5692 and must be implemented for proper operation.
341 PC (WLI#210-0341)	341 PC (WLI#210-0341) No changes; directly compatible.	341 PC (WLI#210-0341) No changes; directly compatible.
6349 PC (WLI#210-6349) Motherboard	6349 PC (WLI#210-6349) Add a jumper wire from 6299 socket pin 9_2 to I/O connector pin $^2 9$.	6349-1 PC (WLI#210-6349-1) Add a wire from the upper contact of the Drive 1/Drive 2 select switch to pin A_2 of the 6295 connector. Add ^{2}a wire from the lower contact of the Drive 1/Drive 2 select switch to pin 9_3 of the 6295 connector. Remove the wire from pin P_2 of the 6299/6398 connector, ^{2}and connect it to pin K_3 of the 6295 connector. (Ref: ^{3} SB 72, Sec. 2.2, pg. 5, 6, 7.)

DISK PROM LIST

WLI #	MODEL	WLI #	MODEL
378-0163	730-1 Disk	378-0197R1	2230-1 Disk
378-0164	730-1 Disk	378-0198R1	2230-1 Disk
378-0165R1	730-1 Disk	378-0199R1	2230-1 Disk
378-0166	730-1 Disk	378-0200R1	2230-1 Disk
378-0167	730-2 Disk (Use 378-0163)	378-0201R1	2230-1 Disk
378-0168	730-2 Disk	378-0202R1	2230-2 Disk (Use 378-0196R1)
378-0169R1	730-2 Disk (Use 378-0165R1)	378-0203R1	2230-2 Disk
378-0170	730-2 Disk (Use 378-0166)	378-0204R1	2230-2 Disk (Use 378-0198R1)
378-0171	730-3 Disk (Use 378-0165)	378-0205R1	2230-2 Disk (Use 378-0199R1)
378-0172	730-3 Disk	378-0206R1	2230-2 Disk (Use 378-0200R1)
378-0173R1	730-3 Disk (Use 378-165R1)	378-0207R1	2230-2 Disk (Use 378-0201R1)
378-0174	730-3 Disk (Use 378-0166)	378-0208R1	2230-3 Disk (Use 378-0196R1)
378-0184	630-1 Disk (Use 378-0163)	378-0209R1	2230-3 Disk
378-0185	630-1 Disk	378-0210R1	2230-3 Disk (Use 378-0198R1)
378-0186R1	630-1 Disk (Use 378-0165R1)	378-0211R1	2230-3 Disk (Use 378-0199R1)
378-0187	630-1 Disk (Use 378-0166)	378-0212R1	2230-3 Disk (Use 378-0200R1)
378-0188	630-2 Disk (Use 378-0163)	378-0213R1	2230-3 Disk (Use 378-0201R1)
378-0189	630-2 Disk	378-0356	2260 Disk/60B Disk/60-2 Disk
378-0190R1	630-2 Disk (Use 378-0165R1)	378-0357	2260 Disk/60B Disk/60-2 Disk
378-0191	630-2 Disk (Use 378-0166)	378-0358	2260 Disk/60B Disk/60-2 Disk
378-0192	630-3 Disk (Use 378-0165)	378-0359	2260 Disk/60B Disk/60-2 Disk
378-0193	630-3 Disk	378-0360	2260 Disk/60B Disk/60-2 Disk
378-0194R1	630-3 Disk (Use 378-0165R1)	378-0361	2260 Disk/60B Disk/60-2 Disk
378-0195	630-3 Disk (Use 378-0166)	378-0526	2260B ¼ Disk
378-0196R1	2230-1 Disk	378-0527	2260B ½ Disk

3.6 SYSTEM CABLES

The interface cables used between the Diablo disk drive and the WANG microprocessor have been modified to adapt to the particular type of disk used (44 or 44B), and the system configuration (single disk or daisy chain). The PCB used on the cables has been changed to accommodate the addition of terminating resistors. The jumper is still provided on the various PCBs to select the additional address bit required for 2260 operation. The jumper must be in for all 2260 applications.

The transition to these new cables creates a problem since the 7013 exerciser requires a terminator to operate properly. This means that each office must have a terminator available for disk service calls. Due to a shortage of Diablo terminators, the Home Office cannot supply enough terminators. To relieve this situation, it is suggested that the interface cable in older units be replaced with the new interface cable to acquire the terminator(s) from customer units.

WANG MODEL #	DIABLO DRIVE USED	DISK INTERFACE CABLE USED
2260 (all variations)	44	220-0108-2A
2260B (all variations)	44B	220-0108-2
2260-2 (MASTER)	44/44B	220-0150
2260-2 (SLAVE)	44/44B	220-0151
630/730/2230	43	220-0108-2A*

*The jumper that provides the additional address bit for 2260 operation should be removed.

NOTE:

These cables are not used on the 928 System. The disk interface cables made for the 928 System are:

1. 220-0108-3A for use with a Model 44 disk drive.
2. 220-0108-3 for use with a Model 44B disk drive.

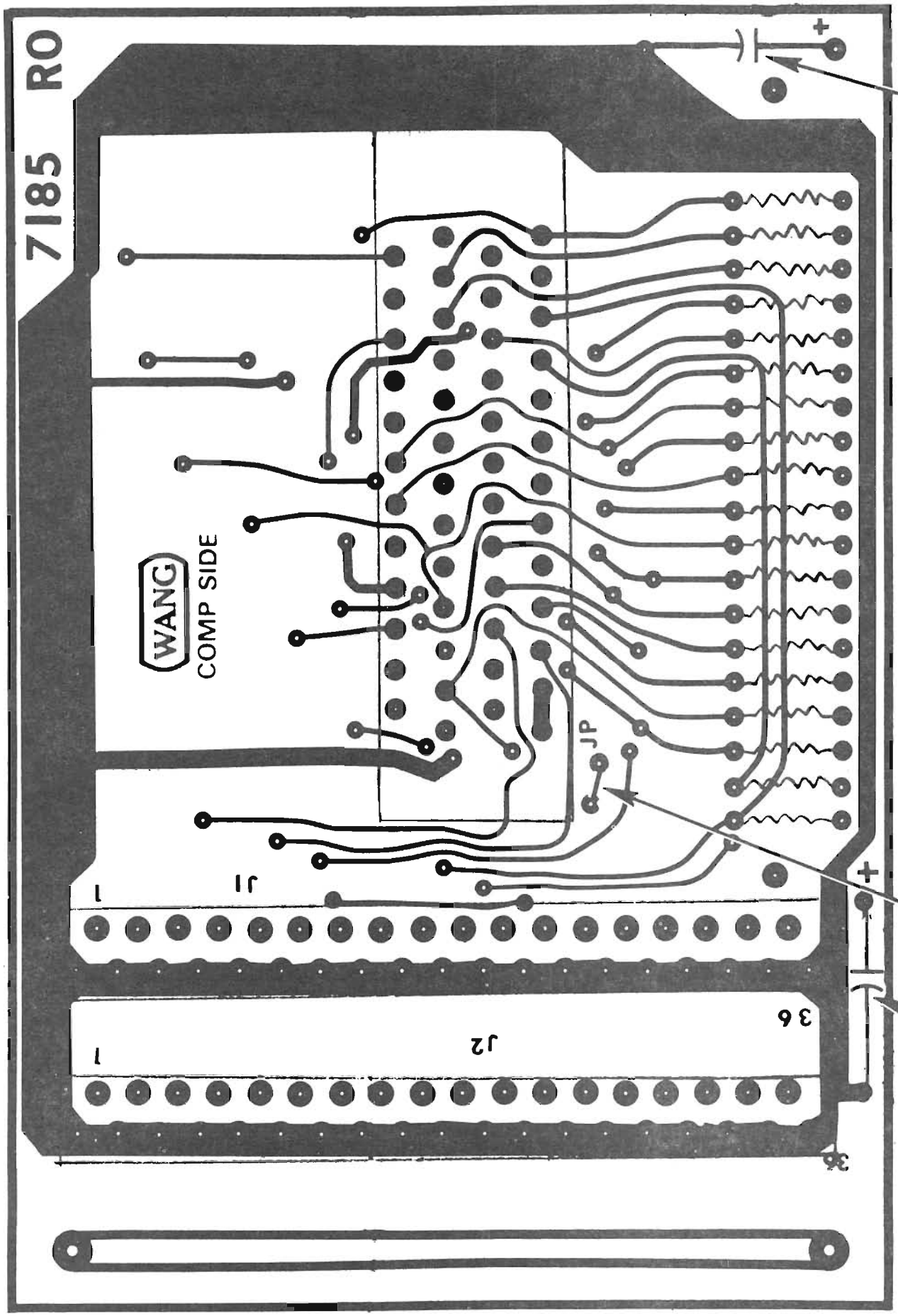
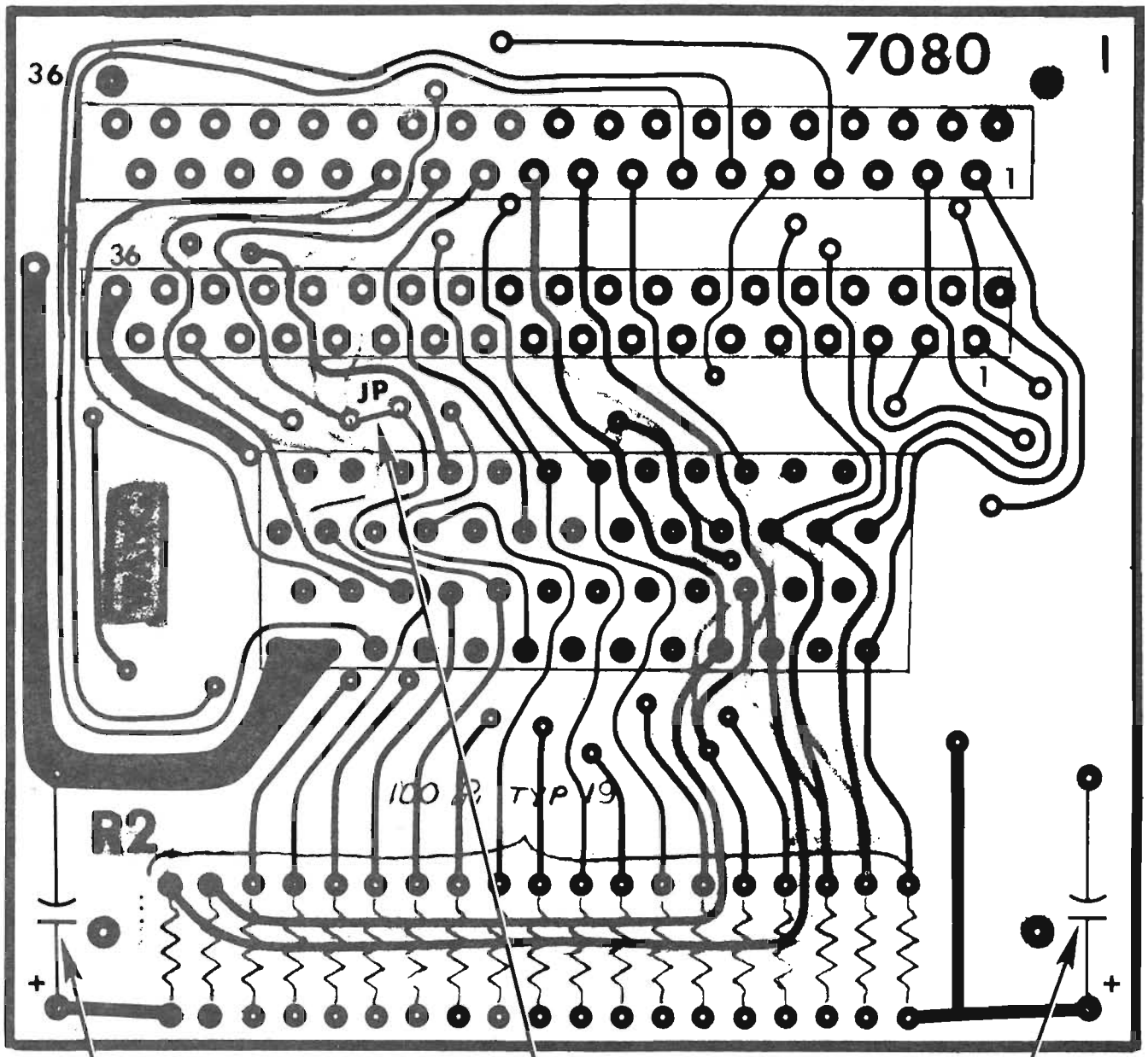

7185 RO
WANG
COMP SIDE
JP
J1
1
J2
1
36
15 UF, 20V
JUMPER IN FOR MODEL 2260
15 UF, 20V

FIGURE 3-9



IN 2260/2260B/2260B½/2260B¼
OUT 630/730/2230

FIGURE 3-10

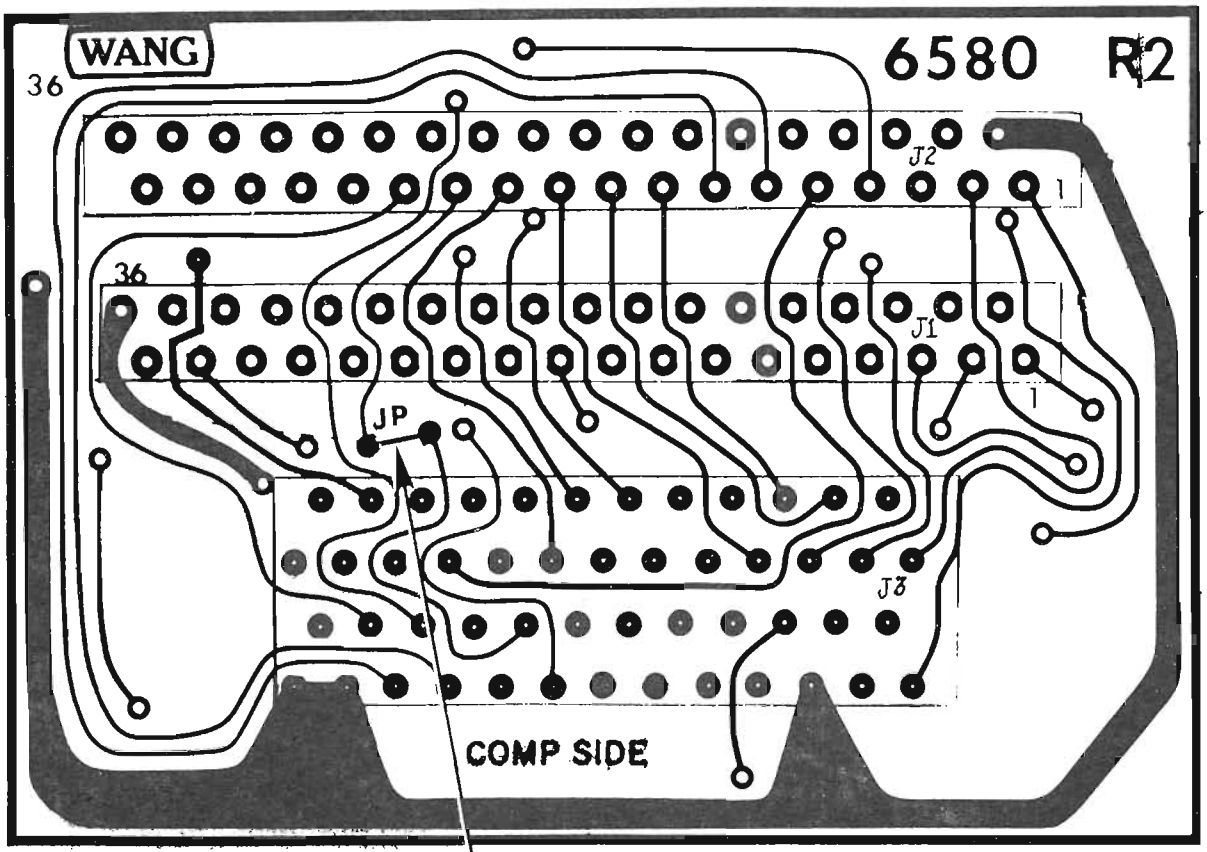


FIGURE 3-11

JUMPER IN FOR MODEL 2230

PCBs Used On Cable Assemblies

CABLE #	PCB USED
220-0108-2A	7080 (includes termination resistors)
220-0108-2	7185 (includes termination resistors)
220-0150	6580
220-0151	6580 on the master end
	7080 on the slave end (includes termination resistors)

I/O Cable Requirements

CABLE #	WHERE USED
220-0066	2230/2240/2242
220-0066-1	630/730/640/740
220-0066-3	2243/2270/WCS/2260

I/O Cable Conversion

To convert a 220-0066-1 to a 220-0066 perform the following wire change:

Cable End	Remove the wire from	Connect the wire to
Amphenol	Pin 33	Pin 11
Fingerboard	Pin 13	Pin 10

To convert a 220-0066 to a 220-0066-3 perform the following wire change:

Connect a spare wire to pin 9 of the fingerboard and pin 12 of the Amphenol connector.

3.7 OPERATION OF 7013 EXERCISER

Diablo Disk Exerciser

The Diablo Disk Exerciser, the 7013 board, is a testing device that allows the user to operate the Model 44B Diablo Disk Drives independent of a CPU. The 7013 can be used for disk drive testing and is useful for performing disk drive alignment.

The 7013 tester has two banks of switches, four indicators, three cables and two test points. Their labels and functions are:

1) TA - Track Address. When ON, the disk receives the track address from the track address switches. When OFF, the track address is generated randomly or sequentially by circuitry on the 7013 as selected by RND.

2) DISP - Disable. When ON, the track address is disabled. The head will remain positioned wherever it is when the DISP switch is turned ON.

3) RST - Restore. When ON, the head is repeatedly positioned to TRACK 0. RST overrides the TA and RND switches.

4) HUP - Head Upper/Lower. ON selects the upper head, OFF selects the lower head.

5) DUP - Disk Upper/Lower. ON selects the upper (removable) disk, OFF selects the lower (fixed) disk.

6) RND - Random Track Generator. When ON, a random track address is generated. When OFF, a sequential track address is generated. In both cases, the TA switch must be OFF. RND is overridden when RST is on (see item c).

7) TK1 through TK256. These are the track address switches. Setting a track address swith ON causes the head to move to the appropriate track, but only when the TA switch is ON.

NOTE:

Switch 8 of Switch Bank 1 is easily mistaken for Track Address Bit 4; however, Switch 7 of Switch Bank 1 controls this Track Address Bit and Switch 8 is not used.

There are four indicators in the upper left corner of the PCB, next to switch bank 2. They idenfity the present operating status of the disk drive. Each illuminates if the drive is in any of the four states represented.

8) LAI - Logical Address Interlock. If ON, an illegal address has been selected. (>203 for 43, >407 for 44/44B.)

9) SI - Seek Incomplete. If ON, indicates the head did not move to the track address requested.

10) FR - File Ready. When ON, indicates the drive is ready for use.

11) RSRW - Ready to Seek, Read or Write. When ON, indicates the drive is ready to do another seek, read, or write operation.

There are 3 cables attached to the 7013 exerciser. Because of the difference in head cable connectors between the 43/44 and the 44B, a second head cable connector was required; therefore, the cable connections are as follows:

12) Cable 1A plugs into either the upper or lower head cable of the removable disk of a 43/44 drive.
Cable 1B plugs into either the upper or lower head cable of the removable disk of a 44B drive.

13) Cable 2 connects to the emitter of J22 on the R/W PCB in the Model 43 and 44 drives, but on the Model 44B the cable connects to the junction of resistor M31 and transistor M33 on the servo board. This provides the 7013 PCB amplifier with negative 5 volts.

There are two test points on the exerciser.

14) TP1 - the amplifier output of the 7013.

15) TP2 - $\pm$ zero volts.

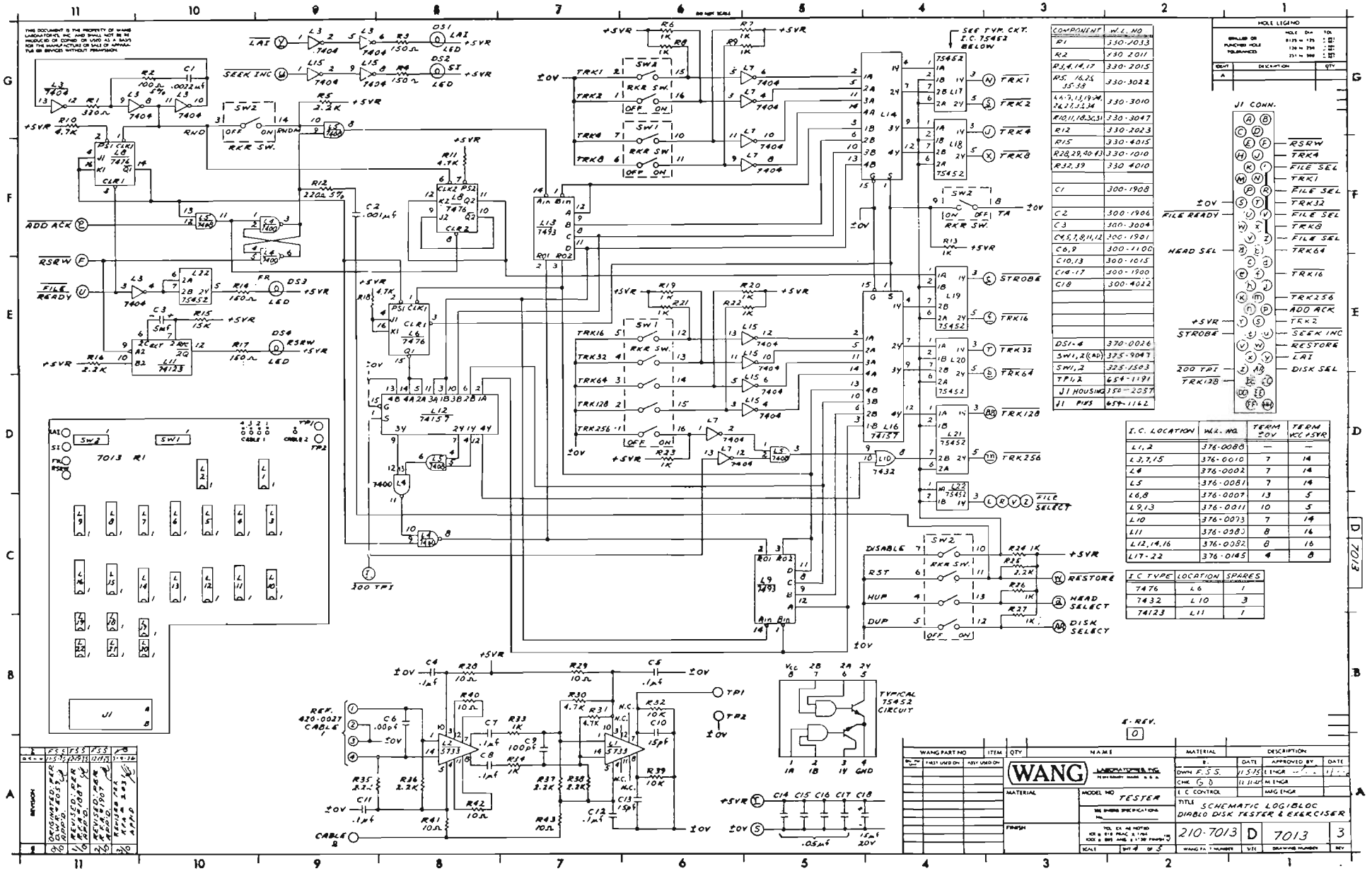
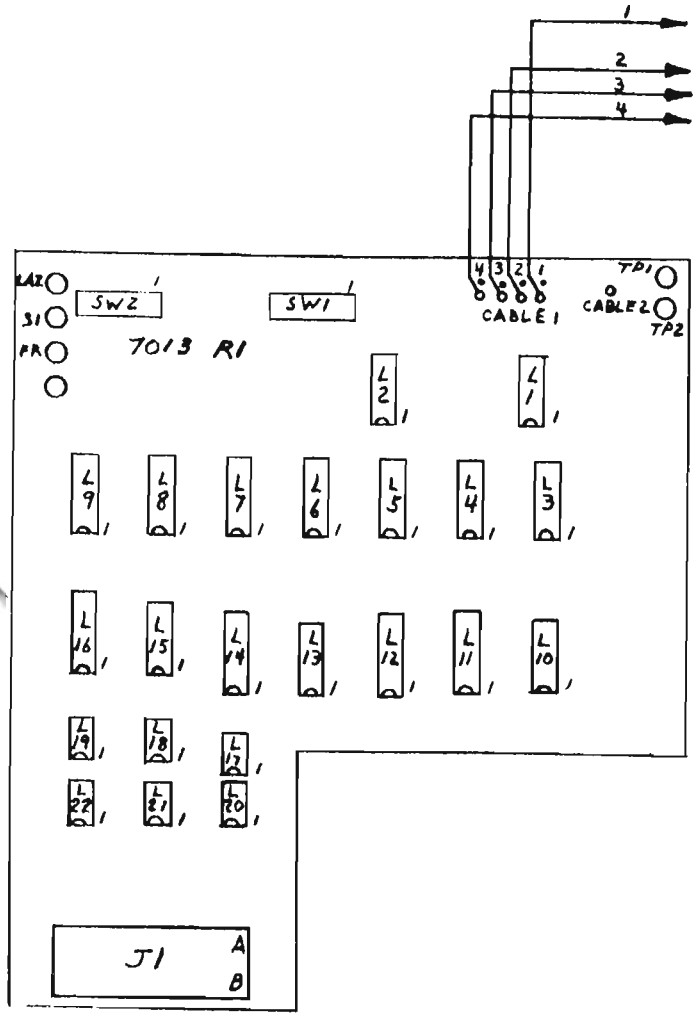
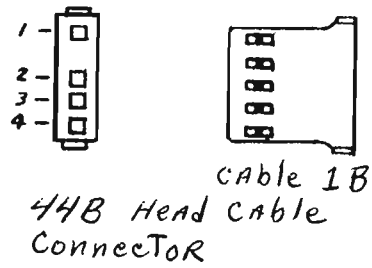


FIGURE 3-12 EXERCISER


1
2
3
4
SW2
SW1
7013 R1
CABLE 1
CABLE 2
TP1
TP2
J1
A
B


1
2
3
4
CABLE 1B
44B Head Cable
Connector

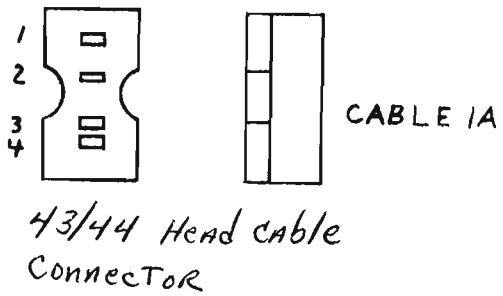

1
2
3
4
CABLE 1A
43/44 Head Cable
Connector

FIGURE 3-13

SECTION 4
MAINTENANCE

4.1 GENERAL TROUBLESHOOTING TECHNIQUES

The recommended first step in troubleshooting is to identify in which of the following categories the malfunction falls:

1. Series 40 problem
2. Non-Series 40 problem
3. Interchangeability problem

If all indications are normal except for the presence of non-intermittent data errors, the problem is probably one of disk pack interchangeability. The alignment of the Read/Write heads may be off. In this case, verify machine alignment by performing the adjustments described in the maintenance section of this maintenance guide.

If the problem is not one of disk interchangeability, it should then be determined if the Series 40 is malfunctioning or if the problem is actually originating externally to the disk drive. Check the cartridge seating, verify that all cable connections (including the terminator) are properly made, and that correct signals are being presented to the Series 40 interface. If malfunctioning persists, turn off the DC power supply, disconnect the I/O cable, and turn on and verify DC power. A CHECK light in the LOAD mode indicates low voltage in the R/W electronics (43/44 only).

Load a cartridge onto the disk drive, and attempt to place the drive in the RUN mode. If the spindle does not start, the problem is with the disk drive.

If the spindle starts, either the READY or CHECK light should come on within one minute, and the corresponding output at the interface connector should be true if the unit is selected.

The CHECK light ON indicates low voltage or trouble in the "write" circuitry. The READY light on indicates that the cartridge is properly seated, the spindle speed is correct, and heads are loaded.

If neither light comes on within one minute, power or other internal difficulty is indicated.

4.2 VOLTAGE CHECKS

4.2.1 *CONTROLLER VOLTAGE CHECKS*

There are two voltages that must be checked in the controller, +5 volts and -9.0 volts. The former may be checked on pin 14 of a 14 pin IC, and the latter on pin 24 of a PROM. The 341 regulator board has two adjustable pots for the voltages. The left pot controls -9.0 volts and the right pot controls +5 volts. Note that when one pot is adjusted, it affects the other adjustment. Never adjust one without checking the other.

4.2.2 *44B VOLTAGE CHECK POINTS*

The power supply assembly produces the following DC voltages required by the disk drive circuitry.

+24 VDC, -24 VDC, -24 VDC Unfused
+15 VDC, -15 VDC
+5 VDC

NOTE:
-24 VDC Unfused output is used to drive the emergency head retract circuit.

All the above voltages can be checked at TB2 of the Regulator PCB.

+24 VDC (TB2-11)
24V Return (TB2-9 & 10)
-24 VDC (TB2-8)
-24 VDC Unfused (TB2-12)
5V Common (TB2-6)
+5VDC (TB2-7)
15V Common (TB2-1)
+15VDC (TB2-2)
-15VDC (TB2-3)

The +5 VDC output is adjustable by means of the 500Ω potentiometer at location D31.

4.2.3 *43/44 VOLTAGE ADJUSTMENT AND OUTPUT CONNECTIONS*

To facilitate use and handling, the DC power cable assembly furnished with the Model 429 has been made very thin and flexible. As a result, the voltage drop in the cable under nominal load is larger than would normally be encountered in similar applications. In the case of the 24-volt outputs, the drop is still a negligible percentage of the output voltage; however, in the case of the 5 volt output, the drop is 0.3 volts. The power supply is factory adjusted so that the voltage present at the output connector is 5 volts under nominal load. If the cable assembly furnished with the Model 429 is shortened or if a different cable is used. the 5 volt output may have to be adjusted. This is accomplished by means of a 500Ω potentiometer at B62 on the regulator PC assembly. Access to this control is by loosening the two screws holding the DC output end of the power supply cover, and lifting the cover. An adjustment range of approximately 4.8V to 6.4V is available at the terminal posts on the PCB. The adjustment should be made under conditions simulating the expected nominal load.

The cable assembly furnished with the Model 429 provides separate ground conductors for the 24 volt and 5 volt outputs. If a different cable is used, care must be exercised to maintain these separate ground systems. Failure to maintain this separation may cause large ground currents which can damage a disk drive connected to the power supply. The DC power cable is removed by unscrewing the terminal post clamps and the cable clamp. Connector pin assignments are as shown in Figure 4-1.

NOTE:

DC ground should not be tied to chassis ground.

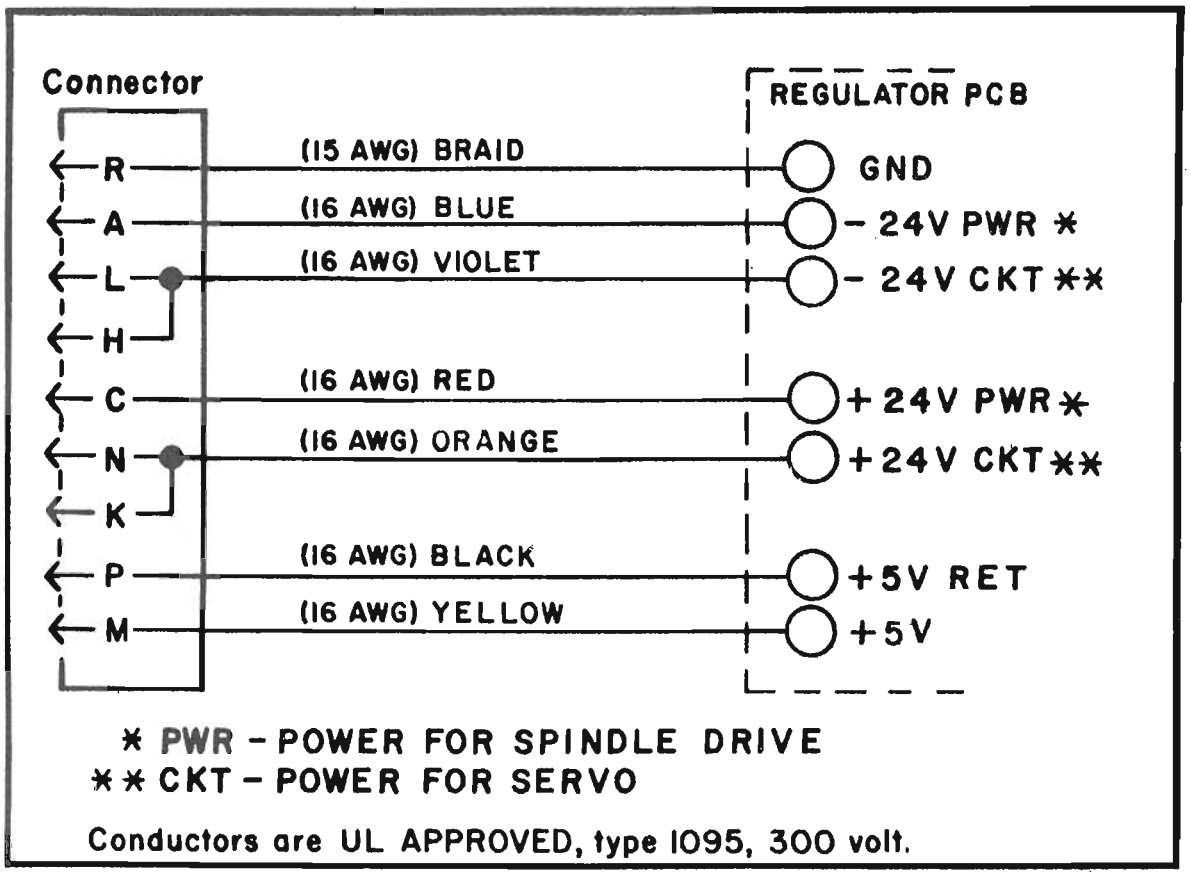


FIGURE 4-1
CONNECTOR PIN ASSIGNMENTS

4.3 MOST COMMON ADJUSTMENTS (44B)

4.3.1 *TRACK 0 ADJUSTMENT PROCEDURE (TRIBIT)*

Track zero adjustment requires the use of an alignment cartridge, 44B extender board, 7013 exerciser, and oscilloscope.

CAUTION:

To ensure that the R/W heads do not retract too quickly when using the Diablo Disk Exerciser, set the exerciser address switches to zero before switching from the RUN mode to the LOAD mode. If this is not done, the heads will retract at high speed and hit the rear stop. This can cause misalignment of the R/W heads.

Do not lean on the drive when performing the adjustment since TRK Ø adjustment will change if the weight distribution is not equal.

Do not perform the adjustment in incandescent or natural light so as not to affect the output of the phototransistor. (Flourescent lighting will not affect the phototransistor.)

1. Adjust the upper disk R/W heads for .050" gap (see Figure 4-2 for metric equivalent).

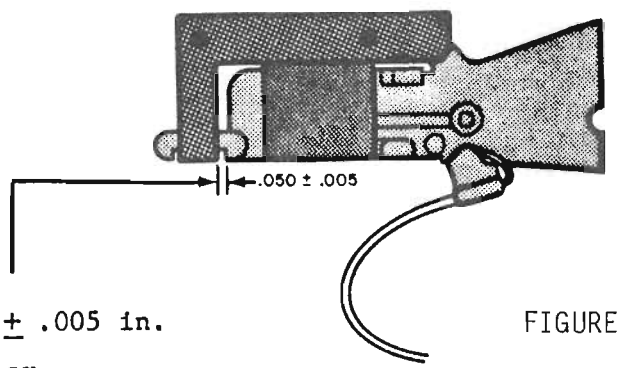
   When using a TRIBIT CE cartridge, the following must be performed to adapt to a 44B.

2. A cable adapting the 44B head cable connector to the 7013 exerciser connector is necessary to perform this adjustment. Since a limited quantity of these adapters exists at the Area offices, the following interconnection method must be used if an adapter cable is not available.

3. Pins 1 and 4 of the R/W coil must be connected to pins 1 and 4 of the amplifier input cable connector.

   In order for the R/W head to function, its center tap must be grounded; therefore, pin 3 of the 44B connector must be connected to pin 2 or 3 of the exerciser connector (see Figure 4-3). To ensure that the Erase heads are off, pin 2 of the 44B connector must be connected to pin 2 or 3 of the exerciser connector.

Last, the exerciser board requires -5V to operate the amplifier. Negative five volts is found at location M31 on the servo boards with artwork revision 12067, and at locations H26, pins 7 and 9, on servo boards with artwork revision 12098. See Figures 4-4A and 4-4B.



GAP: .050 ± .005 in.
or
.127 ± .013 cm.

FIGURE 4-2 R/W HEADS

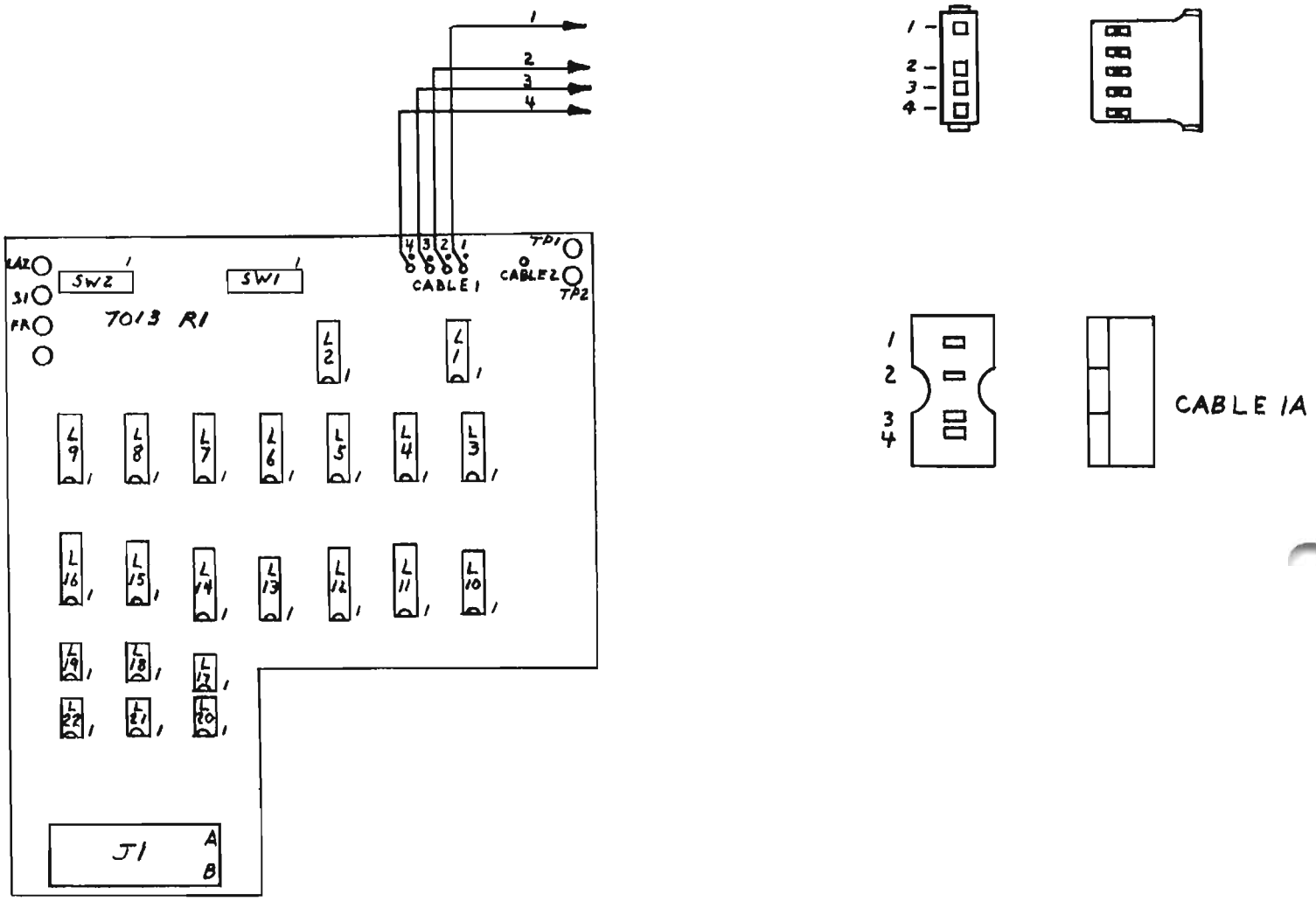


FIGURE 4-3 7013 EXERCISER BOARD

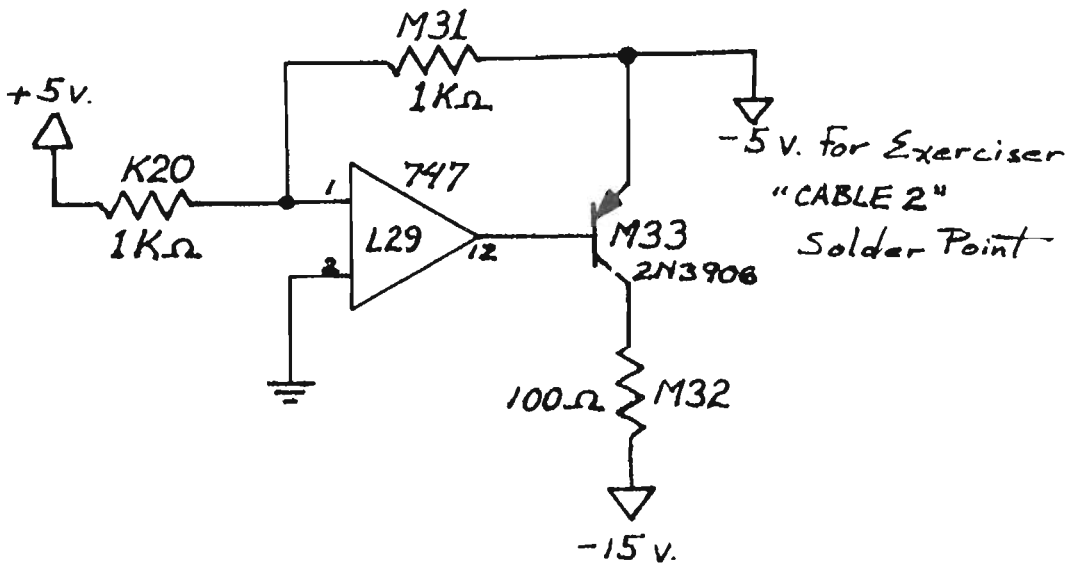


FIGURE 4-4A SERVO REGULATOR (-5 VOLTS)
for servo boards with 12067 artwork*

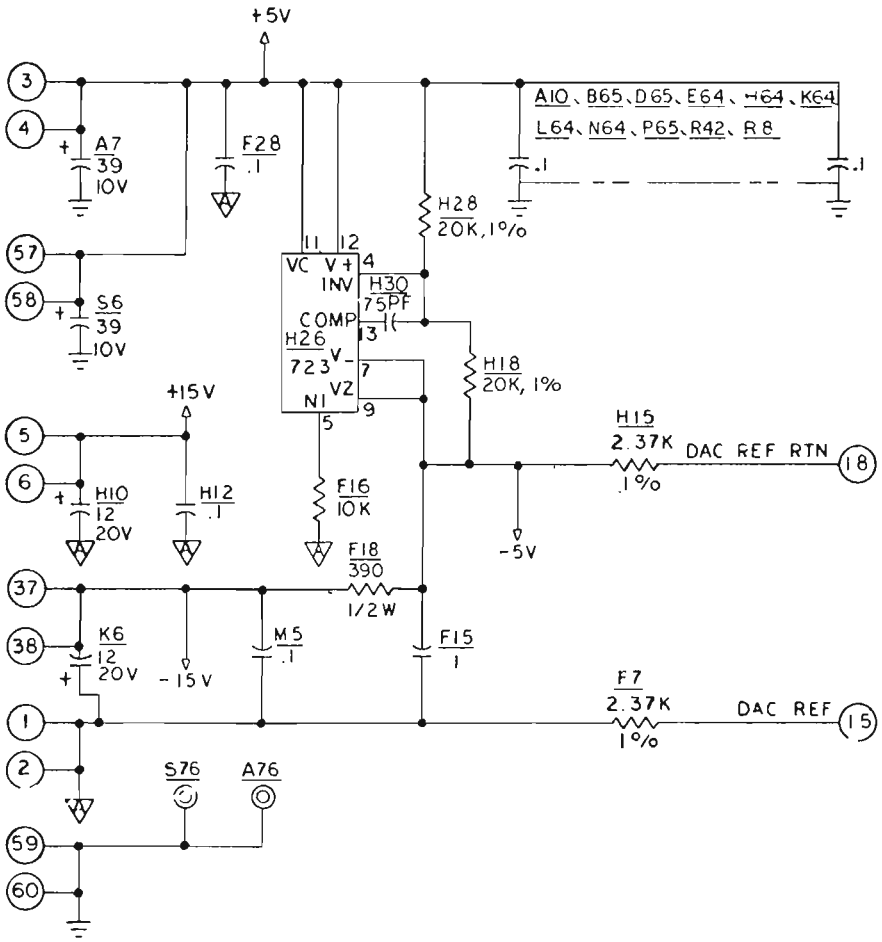


FIGURE 4-4B -5V REGULATOR ON THE SERVO BOARD
for boards with 12098 artwork*

* The artwork revision is etched on the wire side of Diablo 44B PCB's

4. Set scope as follows:

   Main Time Base
   Mode - Normal
   Coupling - DC
   Source - External
   Time Base - 2 ms/cm
   Vertical Amplifiers
   Display Mode - Channel 1
   Trigger Source - Upper Index
   Vertical Deflection - 50 mv/cm using a 10X probe
   Coupling (Channel 1) - AC
   Coupling (Channel 2) - DC

5. Install alignment cartridge and set LOAD/RUN switch to RUN. Allow drive to stabilize for 30 minutes.

6. Connect Channel 1 scope probe to TP-1 on the 7013 exerciser circuit board.

7. Trigger scope externally on the negative edge of Upper Index TPF75 on Logic PCB's with 12065 Artwork; TPE76 on Logic PCB's with 12065-01 or higher Artwork.

   NOTE:
   Switch 1 at location B70 must be on.

8. Set exerciser to perform a single seek to track 1Ø. See switch settings below. (If the Index Burst Pattern is seen at track 1Ø, go to track Ø fine adjustment.)

   TRK 8 ON TA ON
   TRK 2 ON ALL OTHERS OFF

9. If the Index Burst Pattern is not found at track 1Ø, with the exerciser, seek to tracks around 1Ø until the Index Burst Pattern is obtained (Ref: Figure 4-5).

10. Loosen track zero assembly screws (Figure 4-6) slightly (approx. 1/4 turn).

11. Loosen the eccentric lock screw.

12. Note track address on exerciser switches where the burst pattern is obtained; then adjust track zero eccentric accordingly (Ref: Figure 4-6):

    Track Address less than 1Ø - turn eccentric clockwise
    Track Address more than 1Ø - turn eccentric counterclockwise

13. Perform a RESTORE then seek to track 1Ø again.

14. Repeat track searching and eccentric adjustment until scope display shows the index burst pattern at track 1Ø. Note that a restore and a seek to track 10 is required after each eccentric adjustment of the Track Ø Eccentric. When the burst pattern is obtained at track 1Ø, do a Restore, then re-seek track 1Ø to verify that the correct pattern is repeatedly accessible at track 1Ø.

Track Ø Fine Adjustment

The remaining steps comprise a fine adjustment procedure which ensures that track Ø detenting occurs at the proper position on the Position Sawtooth Ramp. The position at which track Ø is detected is selected to compensate for mechanical overshoot and temperature variations.

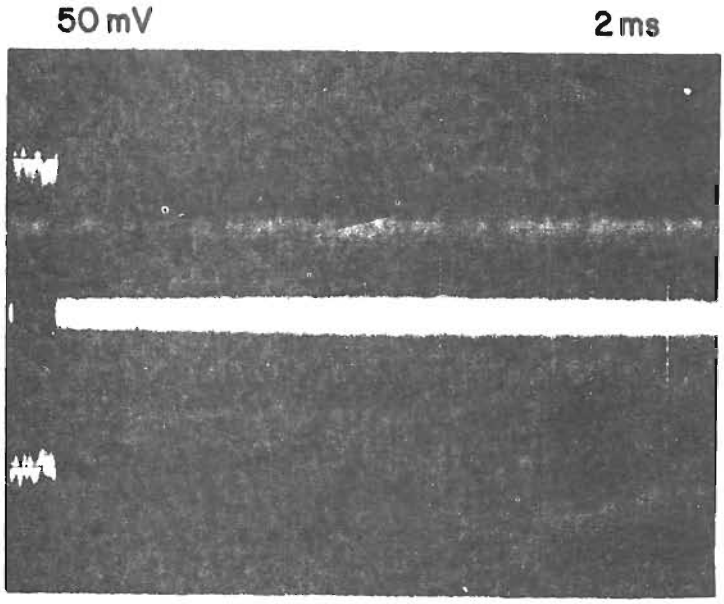


FIGURE 4-5 TRACK 10 DATA BURST

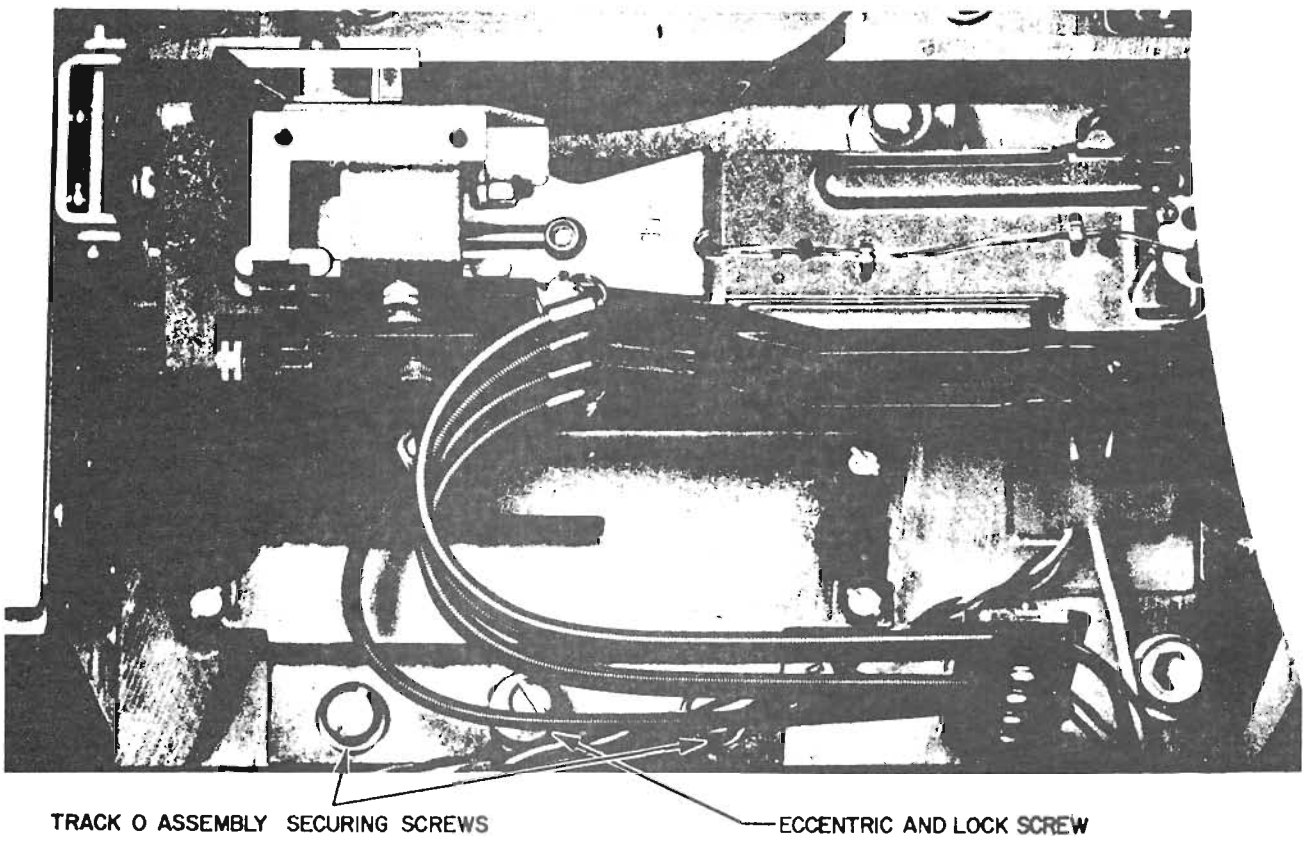


FIGURE 4-6 TRACK 0 SENSOR ADJUSTMENT

1. Connect Channel 1 scope probe to P30-3 (TP P74 for Logic PCB's with artwork revision 12065-02) of the Logic PCB 12066 (over tracks output), and connect the channel 2 probe to the Servo PCB, TP H72. With the oscilloscope in the *chopped* mode, change trigger to negative internal channel 1, with HF REJECT selected.

2. Establish a reference (ground) for servo T.P. H72 and adjust scope channel 2 vertical sensitivity for 2 volts/cm.

3. Initiate a continuous RESTORE operation by turning the RST switch on the 7013 exerciser ON.

4. Adjust the position of the Track Ø sensor until P30-3 (TP P74 for 12065-01 artwork) switches high at point "A" in the *Position Sawtooth* waveshape, Figure 4-7. Point "A" occurs at the vertical midpoint between points "B" (Reference point) and "C" (negative peak of *Position Sawtooth* waveshape). This may be seen more easily by superimposing the two waveshapes via re-adjustment of vertical position controls. When the adjustment is correct, pulse "D" will not exceed 1.5 ms in duration.

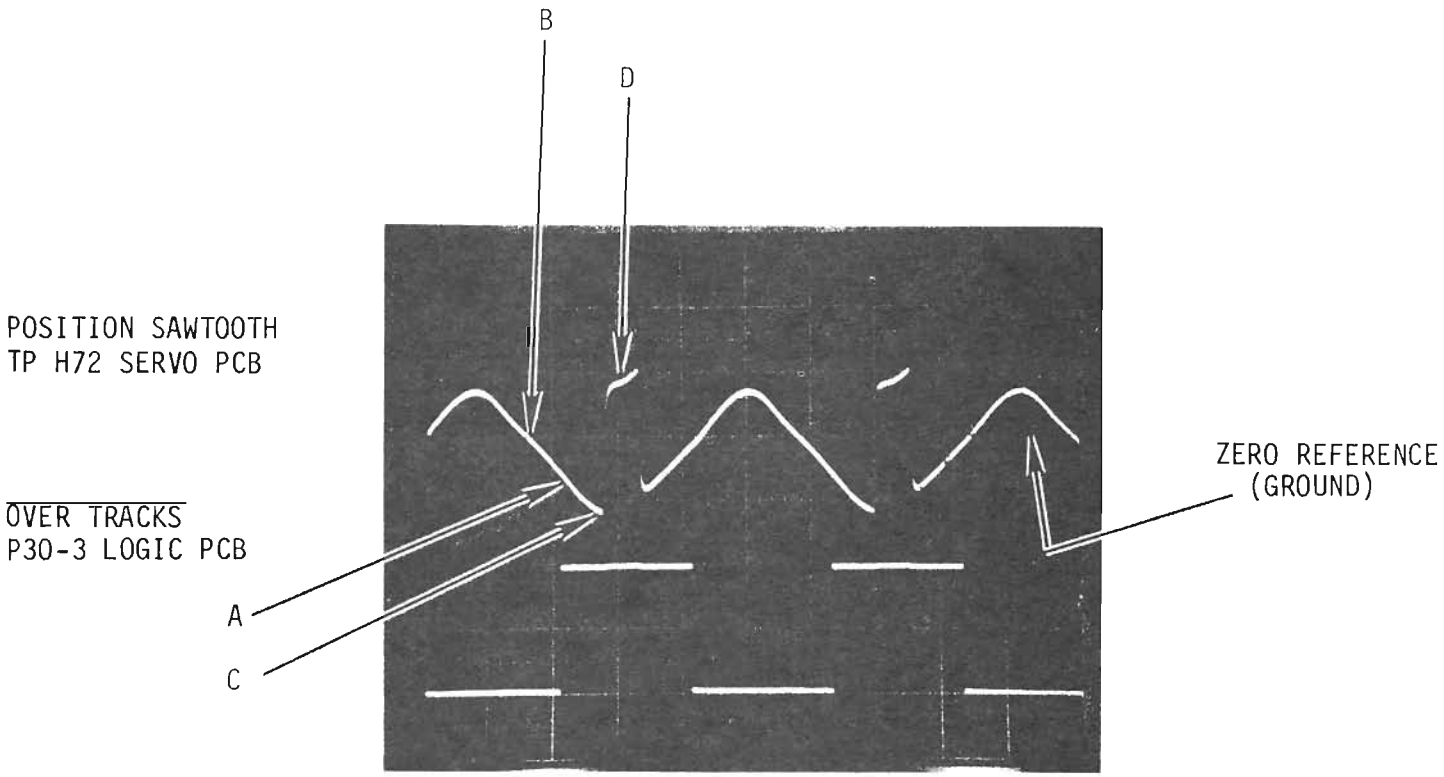


FIGURE 4-7 TRACK 0 SENSOR FINE ADJUSTMENT WAVESHAPES

5. Secure Track Ø sensor bracket, reverify waveshape obtained in step 4, then recheck burst pattern on track 1Ø as explained in steps 4 thru 14.

6. Following track zero adjustment, check R/W head alignment.

4.3.2 *HEAD ALIGNMENT (TRIBIT)*

Head Alignment (Tribit). Set the exerciser switches as follows:

TRK 128....ON
TRK 16.....ON
TRK 2......ON
TA.........ON
All Others......OFF

Connect cable 2 of the 7013 Exerciser to 1K resistor, M31 on the Servo Board (12068 and 12099 PCB's with 12067 artwork, location H26 pins 7 & 9 on 12099 PCB's with 12098 artwork, see Figures 4-4A and 4-4B).

Locate the four Head Plugs on the D/T PCB (#12046). These plugs are oriented from the top down: upper head/upper disk; lower head/upper disk. The lower two plugs are for the lower disk heads.

Remove the removable disk upper head cable from the Data Transfer Board to align the upper head, or the removable disk lower head cable to align the lower head*. Connect the head cable to cable described in Figure 4-3.

*The upper head should be aligned first.

Connect channel 2 of the oscilloscope to TP1 on the 7013. Set the scope to INVERT. Trigger the oscilloscope on TP1, SLOPE & LEVEL NEGATIVE.

NOTE:

If the scope being used does not have the INVERT capability, signals shown in Figures 4-8 & 4-9 will be inverted.

Install the alignment cartridge, set the LOAD/RUN switch to RUN.

Allow the drive and alignment cartridge to temperature stabilize, according to the temperature stabilization criteria outlined earlier. After temperature stabilization a pattern similar to Figure 4-8 or 4-9 should be seen. Set a ground reference line on the oscilloscope and adjust the Vertical Sensitivity and Variable controls for a vertical deflection of six divisions from the ground reference to the highest peak. If the difference of the two peaks is more than 1/2 of a division, adjust the head as described below.

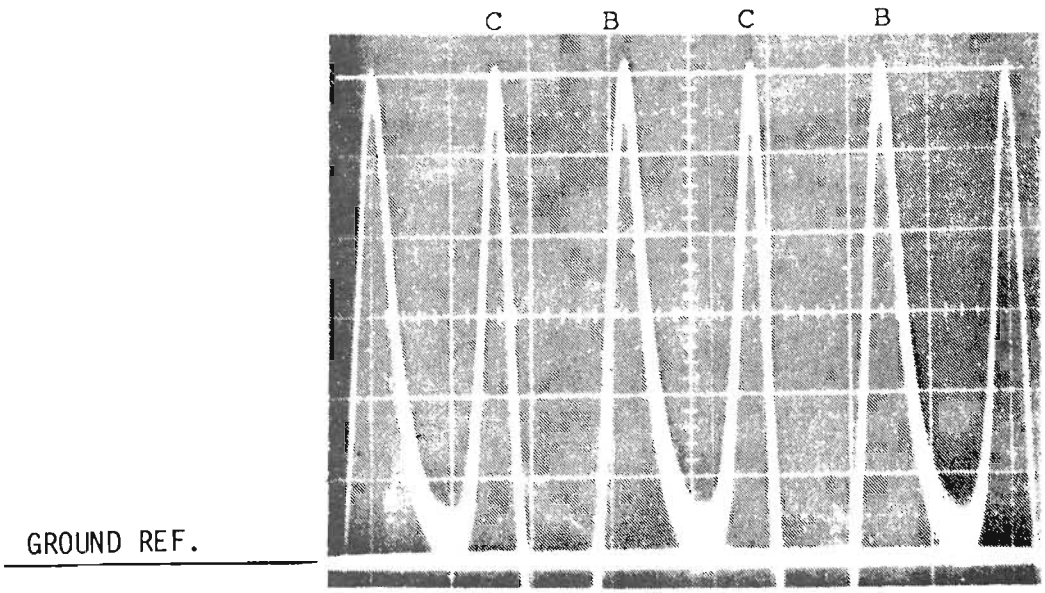


FIGURE 4-8 HEADS ALIGNED

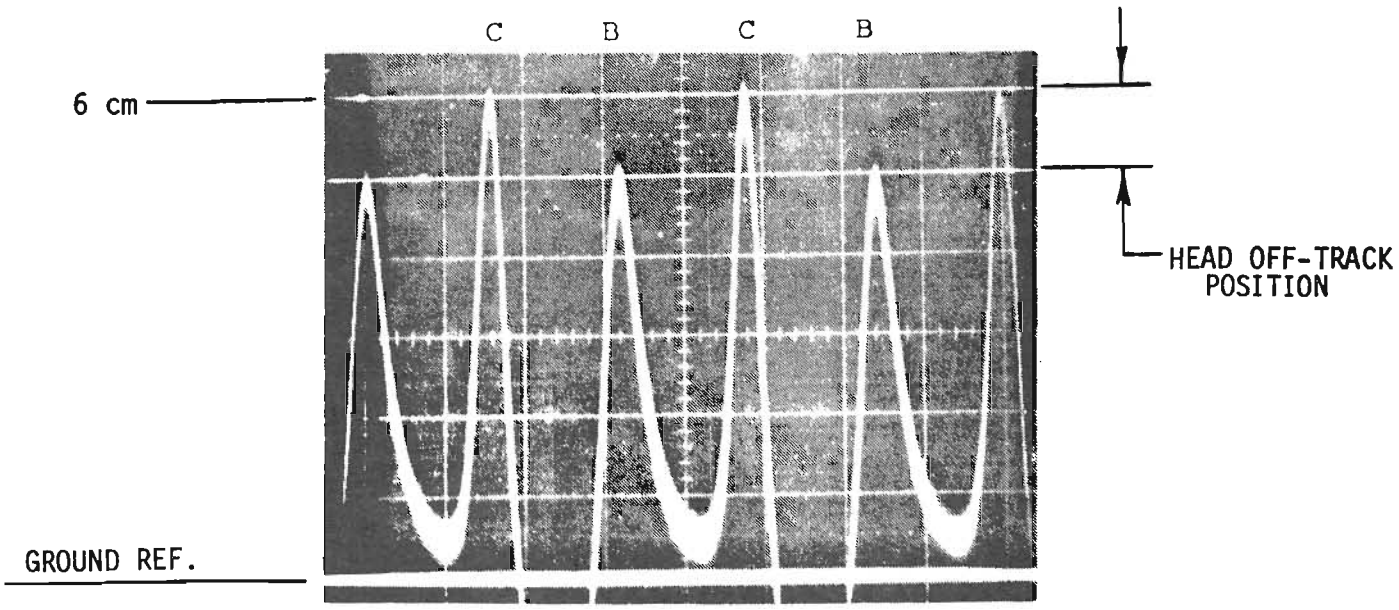


FIGURE 4-9 MEASURING HEAD OFF-TRACK DISTANCE

CAUTION:

Thoroughly clean all cartridge/spindle mating surfaces using head cleaning pads. Be certain the cartridge is write protected. If write protect option is not installed, disable write function at controller or CPU.

1. Move the card cage to the head-cleaning position as described earlier.

2. Position the heads to track 146 (200 tpi).

NOTE:

Head positioning cannot be done manually. Slew the heads into position using the exerciser.

3. If the head(s) requires alignment, proceed as follows: (Note: If both heads require alignment, the upper head must be adjusted first.)

Removable Disk Upper Head Only

a. If not already done, connect cable 1B of the exerciser to the upper head cable.

b. Slightly loosen the two screws holding both head assembly clamps.

c. Position a screwdriver at the point indicated in Figure 4-10, and manually move the head assembly in or out to obtain the correct alignment waveform.

NOTE:

While adjusting the head, readjust the oscilloscope variable control to maintain a deflection of 6 divisions. It is imperative that a 6 division deflection be maintained to measure the head deviation properly. The head is aligned when the two peaks are of equal amplitude.

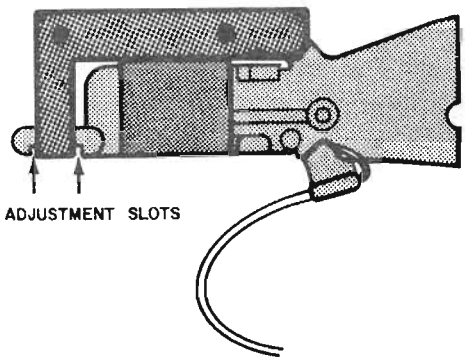


FIGURE 4-10 HEAD ADJUSTMENT

d. Torque the upper head assembly clamp screw to 125 inch ounces.

e. Recheck head alignment to insure that torquing the clamp screw did not change the heads position.

f. Check alignment of lower head and adjust as necessary.

g. Torque the lower head assembly clamp screw to 125 inch ounces.

NOTE:

As the clamp screw is tightened, the head may move slightly. If necessary, readjust the head position, allowing for any head movement caused by tightening the screw.

Removable Disk Lower Head Only

a. Disconnect cable 1B from the upper head cable and connect to lower head cable.

b. Slightly loosen the screw holding the lower head assembly clamp.

c. Position a screwdriver at the point indicated in Figure 4-10, and manually move the head assembly in or out to obtain the correct alignment waveform.

d. Torque the head assembly clamp screw to 125 inch ounces.

e. Recheck head alignment to insure that torquing the clamp screw did not change the heads position.

f. Switch the unit from RUN to LOAD to retract the heads, and then return to the RUN mode of operation. (Set TRK Address Switches to 0 before switching to LOAD.)

g. Reposition the R/W heads back to the alignment track (146), and recheck the alignment of the heads. Repeat the adjustment procedure as necessary.

Fixed Disk Upper and Lower Heads

NOTE:

This adjustment should only be performed in an initial installation or after the fixed disk or the lower heads have been replaced.

Since disk interchangeability is not affected by the lower heads, the adjustment consists of merely moving the card cage to the head-cleaning position, inserting a 0.050" $\pm$ .005" shim between the head mounting plate and the carriage roller plate, tightening the set screw to 128 inch ounces, and removing the shim. This adjustment is shown in Figure 4-11.

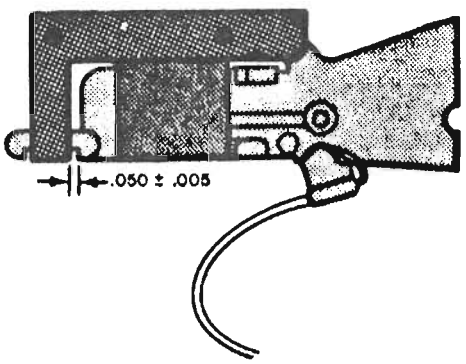


FIGURE 4-11 HEAD ADJUSTMENT - LOWER SET

4.3.3 *INDEX TRANSDUCER ALIGNMENTS*

Upper Index Transducer Adjustment (TRIBIT)

NOTE:

A disk hub and sector ring, retrieved from a defective disk cartridge and used here in a manner similar to the procedure outlined for the lower transducer, will appreciably shorten the time needed to achieve this adjustment.

Install an alignment cartridge. Place the drive in the RUN mode, and observe the signal at pin 10 on the Logic PCB (#12066) (TP E77 on Logic PCB's with 12065-01 or higher artwork). The amplitude of the positive peaks of the index transducer output should be 400 mV $\pm$ 100 mV for narrow sector slots (.020" slots), or 1000 mV $\pm$ 200 mV for wide sector slots (.080" slots). If the signal falls outside the appropriate range, proceed as follows:

1. Place the drive in the LOAD mode and, when able, remove the alignment cartridge.

2. Verify the transducer lamination-to-sector ring clearance of .008" $\pm$ .003" by laying a straight-edge across the spindle hub and checking the gap between its lower edge and the top of the lamination with a plastic feeler gauge. If the clearance is out of tolerance, loosen the hold-down screws (screws A in Figure 4-12), and add or remove shims (Diablo P/N 16358) as required. Retighten the screws just enough to secure the transducer and still allow slight lateral movement.

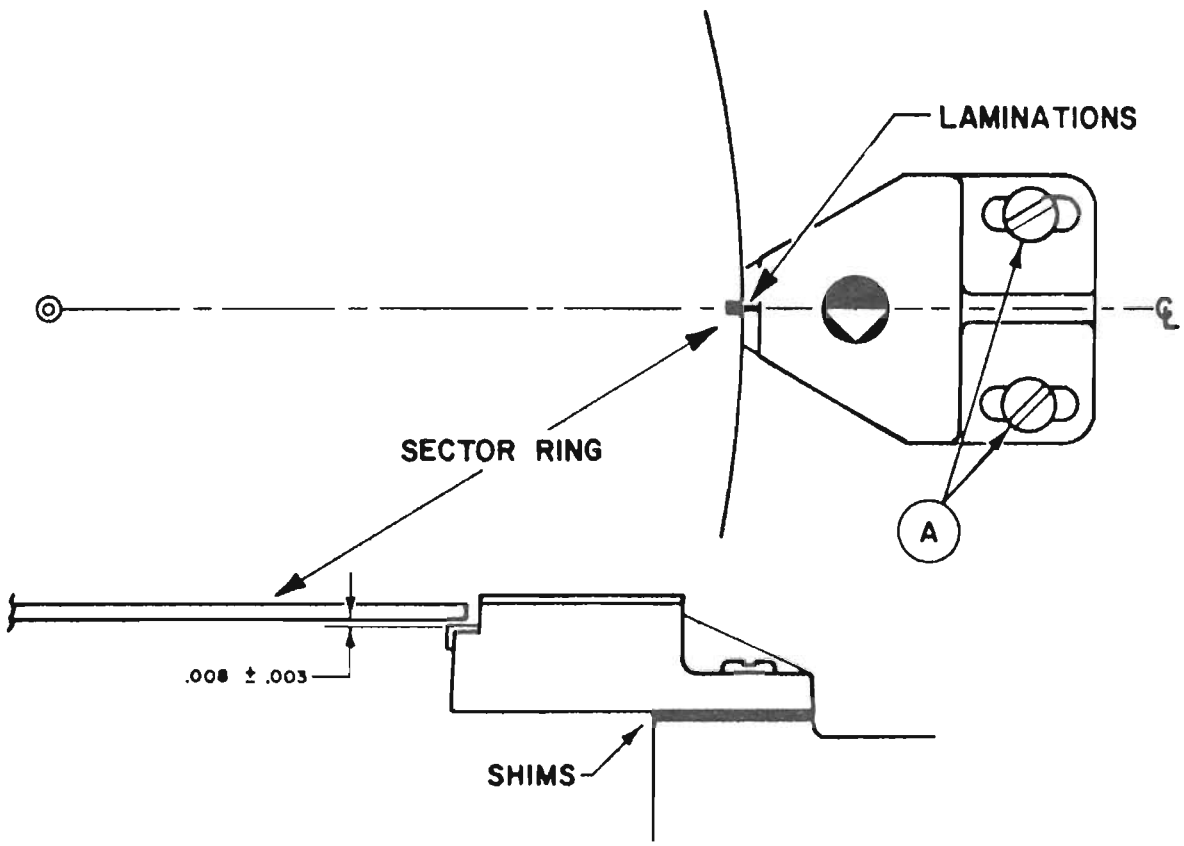


FIGURE 4-12 INDEX TRANSDUCER ADJUSTMENT

3. Align the transducer/lamination center line with the spindle hub center, and move the transducer in or out radially until the tip of the lamination clears the outside of the spindle hub flange by approximately 3/64". Tighten the hold-down screws a little.

4. Reinstall the alignment cartridge, switch from LOAD to RUN mode and, when able, recheck the signal level of the index transducer output. If the signal is in tolerance, the cartridge may be removed and the hold-down screws tightened firmly. If the signal is not in tolerance, repeat step 3 - moving the transducer radially a small amount either in or out each time until optimum signal level is achieved.

5. Front-panel components are accessible for removal or replacement by loosening the two hexagon socket screws which hold the front panel in position. Access to these screws is through two holes, one on each side of the bowl, as shown in Figure 4-13. To permit the front panel to swing freely, two lower screws, one on each side may require loosening. These screws are located between the front panel and the lower section of the slide inner member. The front panel now swings down partially, giving access to components mounted on the rear of the front panel. Some components mounted on the pan or baseplate are also accessible by lowering the front panel.

6. Locate the index transducer baseplate, which is screwed to the outside front of the bowl assembly at the centerline. This plate, shown in Figure 4-14, has four hex-head fastening screws ("A") and a slotted-head adjustment screw ("B").

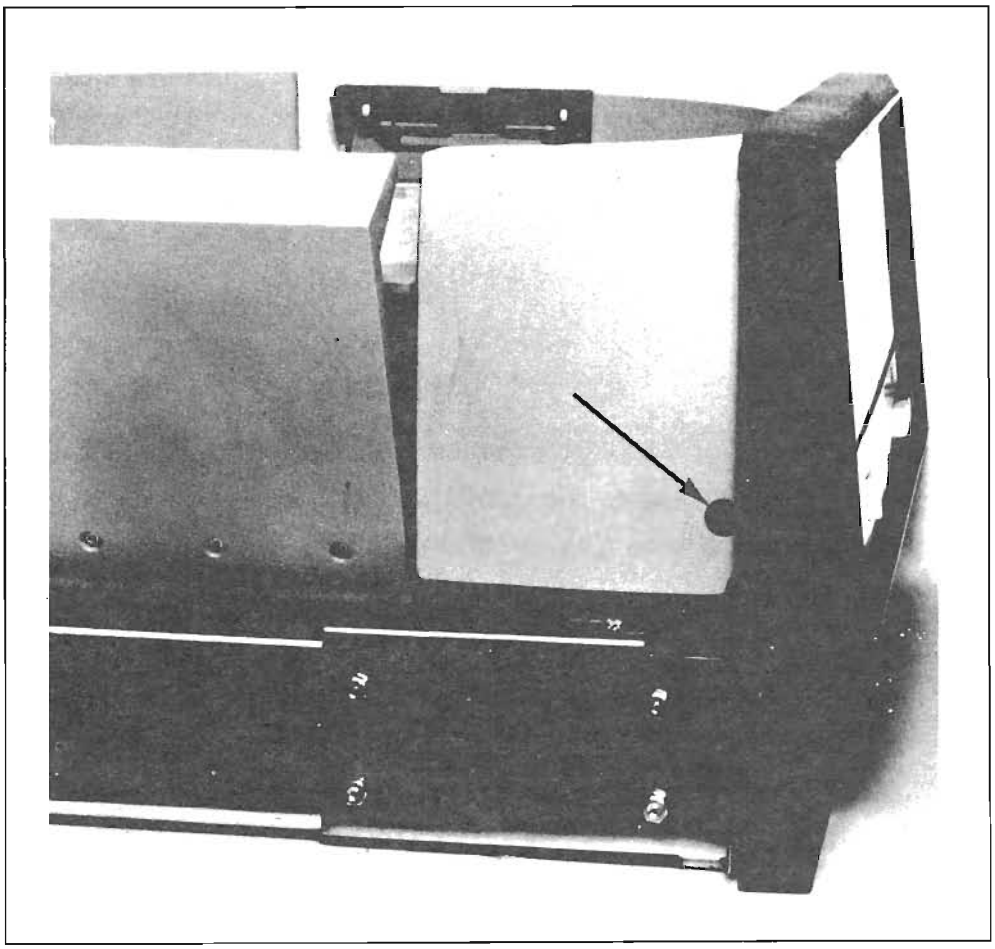


FIGURE 4-13 FRONT PANEL HOLDING SCREW ACCESS

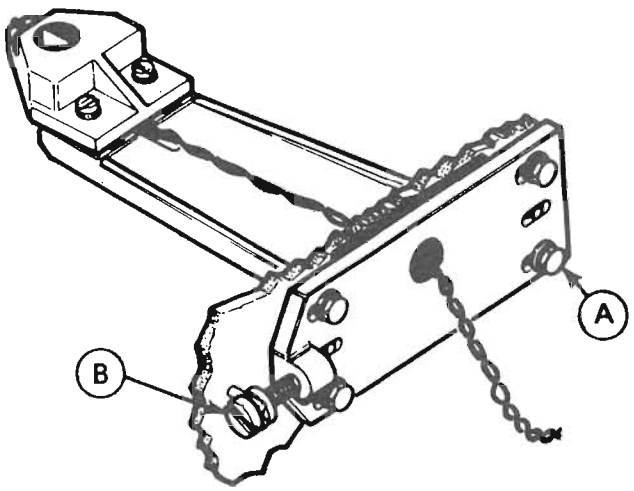


FIGURE 4-14 UPPER INDEX TRANSDUCER ADJUSTMENT

Index Transducer Alignment. Set the exerciser switches as follows:

TRK 8....ON
TRK 2....ON
TA.....ON
All Others....OFF

Connect cable 2 of the 7013 Exerciser to 1K resistor M31 on the early Servo board (12068) or the 12099 with 12067 artwork. On 12099 PCB's with 12098 artwork -5V is available at location H26 pins 7 & 9, see Figures 4-4A and 4-4B.

Locate the four Head Plugs on the D/T PCB (#12046). These plugs are oriented from the top down: upper head/upper disk; lower head/upper disk, etc. The lower two plugs are for the lower disk heads.

Remove upper disk/lower head cable from the Data Transfer board and connect it to cable described in Figure 4-3.

Connect channel 1 of the oscilloscope to TP1 on the 7013 Exerciser. Trigger EXT. NEGATIVE on TP F75 of Logic PCB's with 12065 Artwork; TP E76 of Logic PCB's with 12065-01 Artwork. Perform the index transducer alignment as described below:

1. Install the alignment cartridge, place the drive in the RUN mode. (Allow time for temperature stabilization.)

2. Using the exerciser, seek to track 10 (200 tpi).

3. Slightly loosen the four fastening screws just enough to permit side movement of the transducer baseplate.

4. Using the adjustment screw ("B" Figure 4-14), position the index transducer so that the leading edge of the read gate occurs 19 usec $\pm$ 3 usec after the leading edge of the index mark. Do not tighten the fastening screws yet. See "A" in Figure 4-15.

5. Alternately selecting each of the upper heads, adjust the index transducer so that the read gate is symmetrical around the 19 usec point. Total pulse separation between the heads shall not exceed 6.25 usec. If this tolerance is exceeded, the heads must be checked for proper seating. See "B" in Figure 4-15.

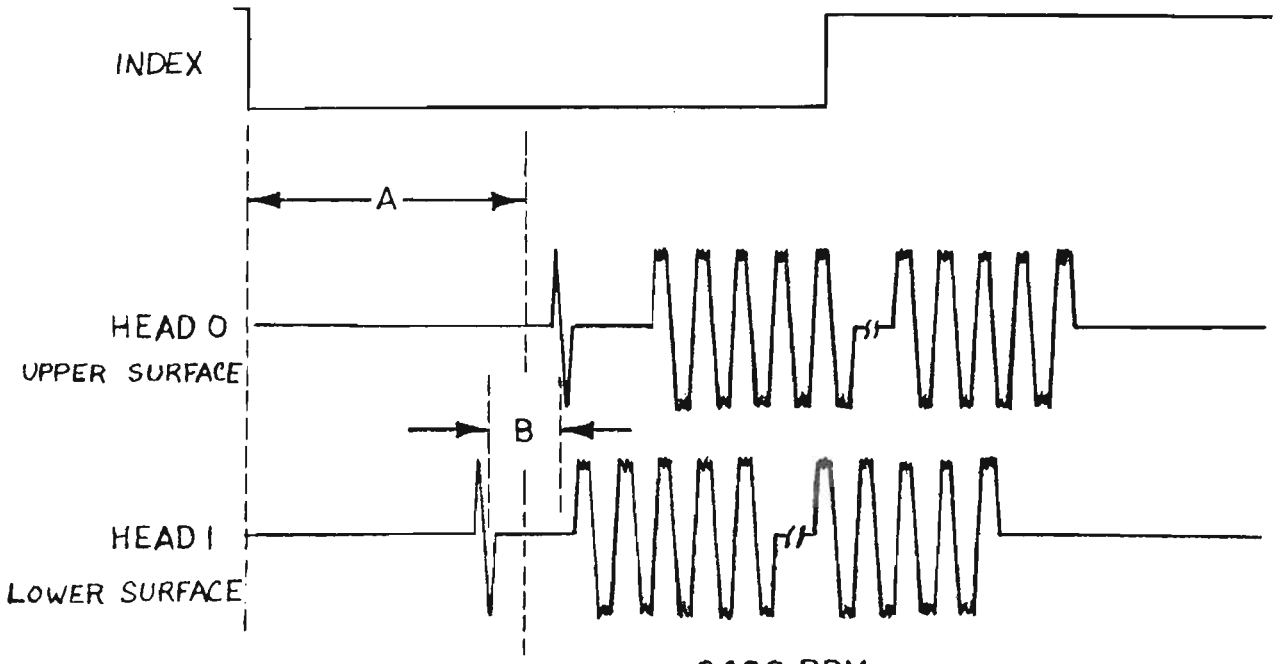


FIGURE 4-15 INDEX TRANSDUCER ALIGNMENT TIMING REQUIREMENTS

6. Tighten the four fastening screws, observing that tightening the screws does not result in misalignment.

7. Return the front panel to the operating position.

4.3.4 *HEAD POSITIONER AZIMUTH ADJUSTMENT*

NOTE:

Presently the TRIBIT alignment cartridges that we have do not have azimuth information recorded at track 402. As we receive cartridges that contain this information, they will be rotated so that cartridges presently in the field can be updated.

Check Procedure:

1. Trigger scope externally on negative going edge of index at TP F75 for Logic PCB's with 12065 Artwork; TP E76 for Logic PCB's with 12065-01 Artwork.

2. Measure the Index-to-Data burst time for one of the upper disk heads at track 10 and then at track 402. Note the time difference in the Index-to-Data burst time, between track 10 and track 402 (see Figure 4-16). The time difference "A" must not exceed 6 µsec. If the time difference is greater than 6 µsec perform the following adjustment.

Adjustment Procedure:

1. Break the holding torque of Allen screw holding rear of positioner base plate.

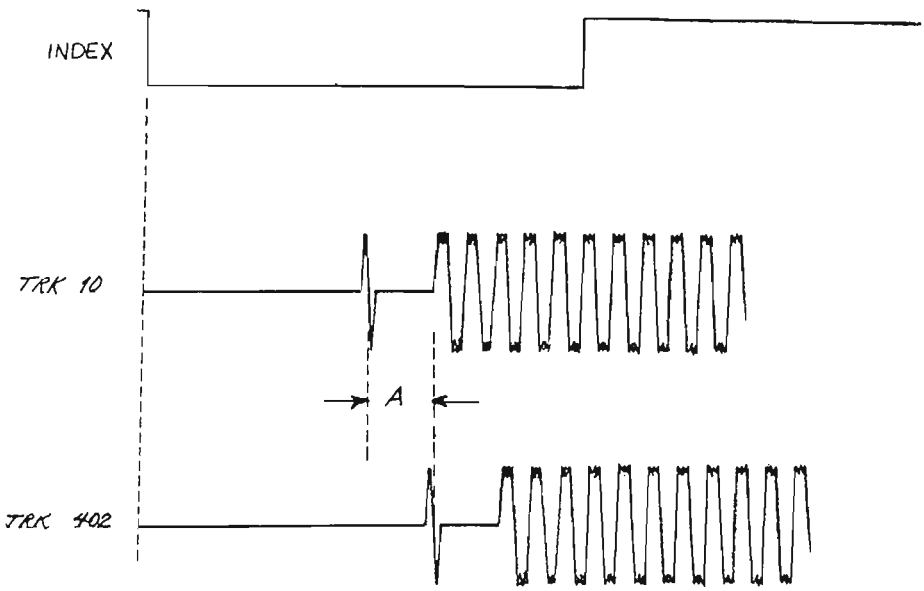


FIGURE 4-16 POINT "A" CANNOT EXCEED 6 USEC

2. Loosen two Allen screws holding front end of positioner base plate.

3. Loosen temperature compensation arm screw.

4. Use large screwdriver to shift positioner to left or right while standing at the side of the disk drive.

5. Verify index-to-data burst on both upper disk heads is within 6 usec at track 10 and track 402.

6. Secure the three head positioner screws and repeat index-to-data burst verification.

7. Check track-zero adjustment according to section 3.3.1 and adjust if necessary.

4.4 MOST COMMON ADJUSTMENTS (43 & 44)

4.4.1 *TRACK ZERO (FINE ADJUST)*

Diablo Model 43 & 44 drives have a fine track zero adjustment which can be done as follows:

NOTE:

All switches on the 7013 should be set to the off position.

For the fine track zero adjustment a disk pack, exerciser (7013 board) and oscilloscope are required.

1. Disconnect the I/O cable from the rear of the Diablo Drive. Install the 7013 exerciser and the terminator block (see Figure 4-17).

2. Install the disk pack and place the disk drive in the RUN mode.

3. Locate the track zero adjustment screw. This is an Allen screw located just below the bail plate as shown in Figure 4-18.

4. After the drive is ready, set the restore switch on the 7013 exerciser PCB to the on position. This will cause the drive to perform continuous restores.

5. Observe the waveform at TP13 (Servo PCB), while using TP14 (position term) on the servo PCB as a trigger point.

6. Adjust with a 9/64 inch "L shaped" Allen wrench until the waveform is obtained as shown in Figure 4-19.

4.4.2 *R/W HEAD ALIGNMENT*

Diablo 43/44 Read/Write head alignment is performed as follows:

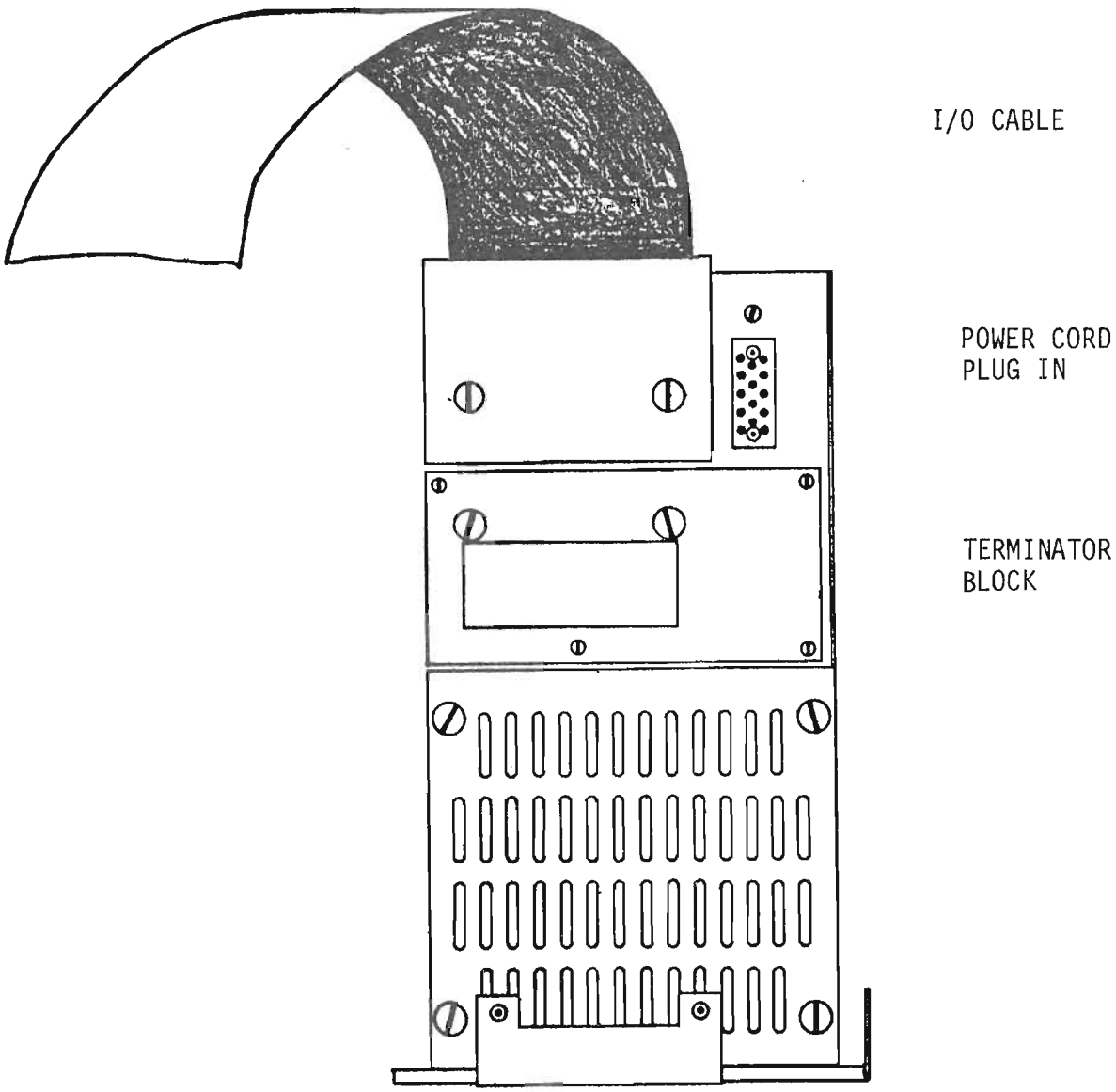


FIGURE 4-17 I/O CONNECTIONS

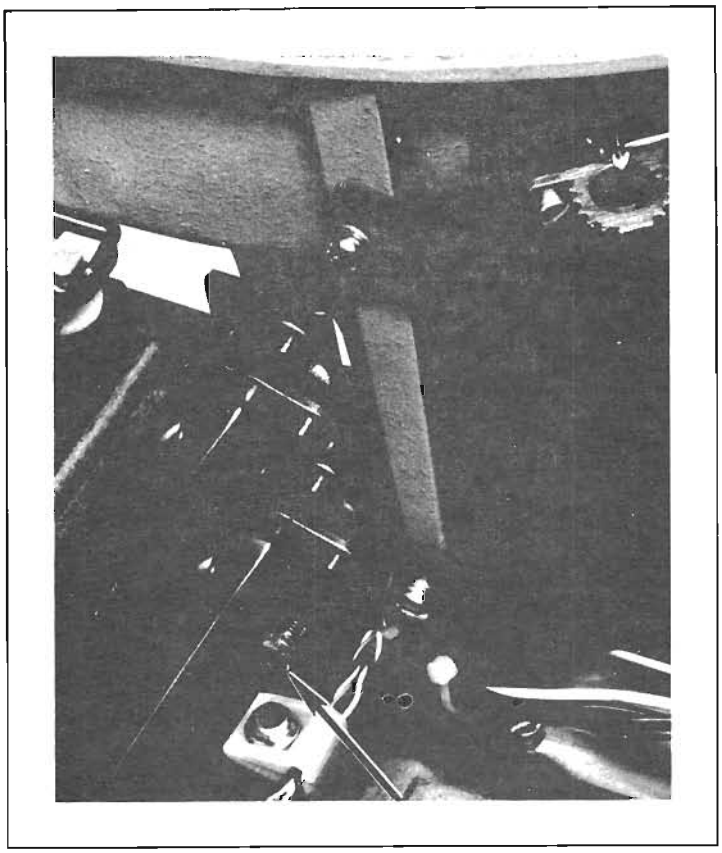


FIGURE 4-18 TRACK ZERO ADJUSTMENT SCREW

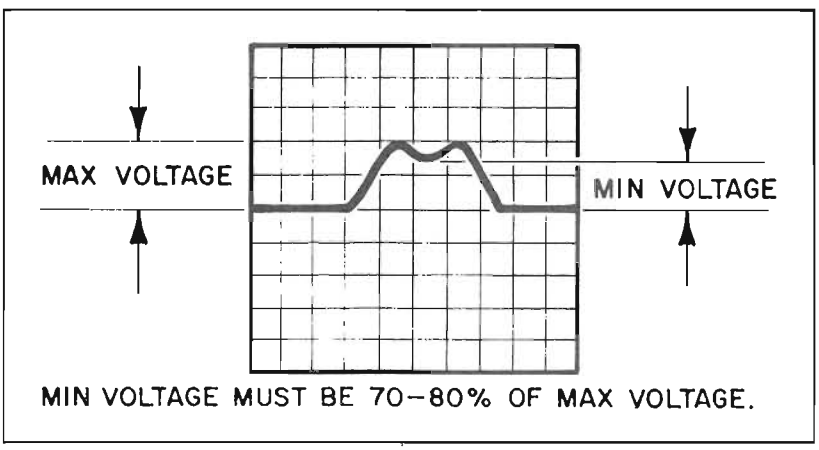


FIGURE 4-19 TRACK ZERO WAVEFORM

For a R/W head alignment, the following tools are essential:

1. CE Pack (Tribit Pattern).
2. R/W Head Adjustment Tool.
3. 3/32" Allen wrench.
4. 7013 Exerciser board.

Upper Head Alignment

Disconnect the I/O cable from the rear of the Diablo drive and install the 7013 exerciser. Install the terminator block (see Figure 4-17).

Connect cable 2 of the 7013 exerciser to the emitter of J-22 on the read/write board. (See diagram below.)

Locate the four head plugs of the R/W PCB. These plugs are connected from the rear forward: upper head/removable disk; lower head/removable disk; upper head/lower disk; lower head/lower disk.

Disconnect the removable disks' upper head cable from the R/W board to align the upper head, or the removable disks' lower head cable to align the lower head*. Connect the head cable to the cable described in the operation of the exerciser board.

*If both heads require alignment, the lower head should be aligned first.

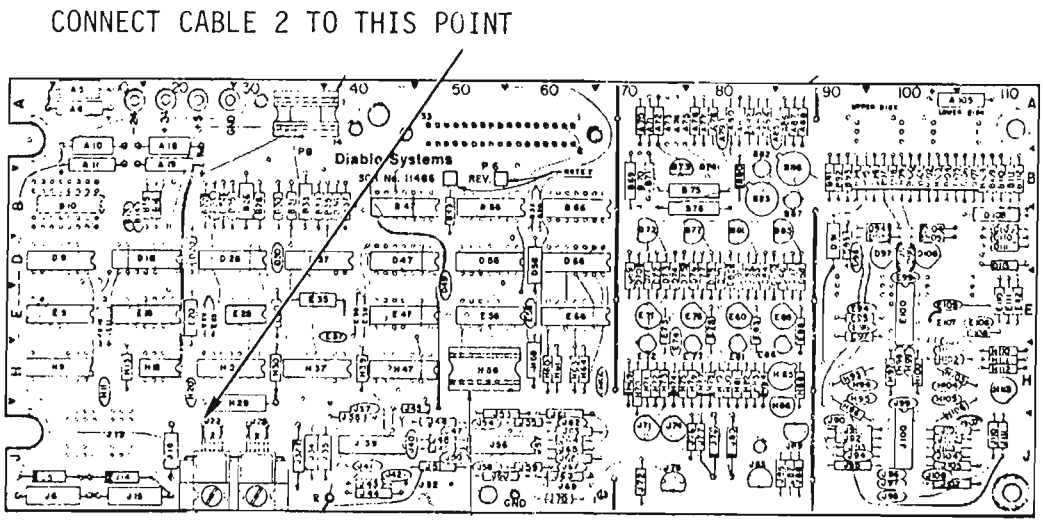


FIGURE 4-20 READ/WRITE AMPLIFIER BOARD

Connect channel 2 of the oscilloscope to TP1 on 7013. Set the scope to invert. Trigger the oscilloscope on TP1, with the slope and the level to negative.

NOTE:

If the scope being used does not have the invert capability, signals shown in Figures 4-21a and 4-21b will be inverted.

Install the alignment cartridge, and set the LOAD/RUN switch to RUN.

Allow the drive and alignment cartridge to temperature stabilize, according to the temperature stabilization criteria outlined earlier. After temperature stabilization a pattern similar to Figure 4-21a or 4-21b should be seen. Set a ground reference line on the oscilloscope and adjust the Vertical Sensitivity and Variable controls for a vertical deflection of six divisions from the ground reference to the highest peak. If the difference of the two peaks is more than 1/2 of a division, adjust the head as described below.

1. Position the heads to track 73 for Model 43 or track 146 for Model 44 by setting the exerciser track address switch as follows:

43		44	
TRK 64	ON	TRK 128	ON
TRK 8	ON	TRK 16	ON
TRK 1	ON	TRK 2	ON
TA	ON	TA	ON
All others off		All others off	

NOTE;

Head positioning cannot be done manually. Slew the heads into position using the exerciser.

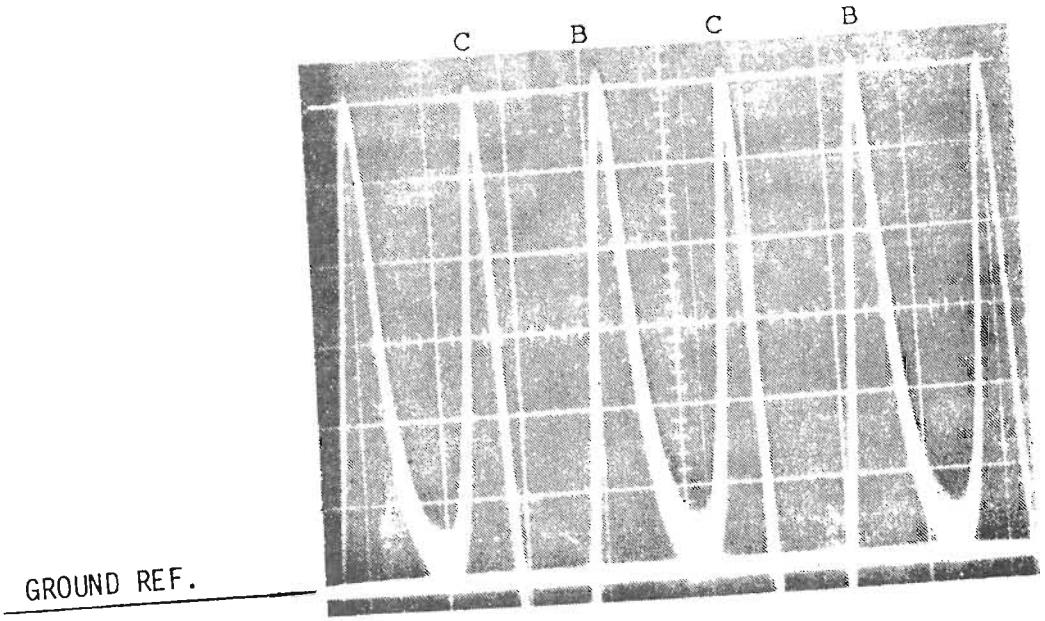


FIGURE 4-21a

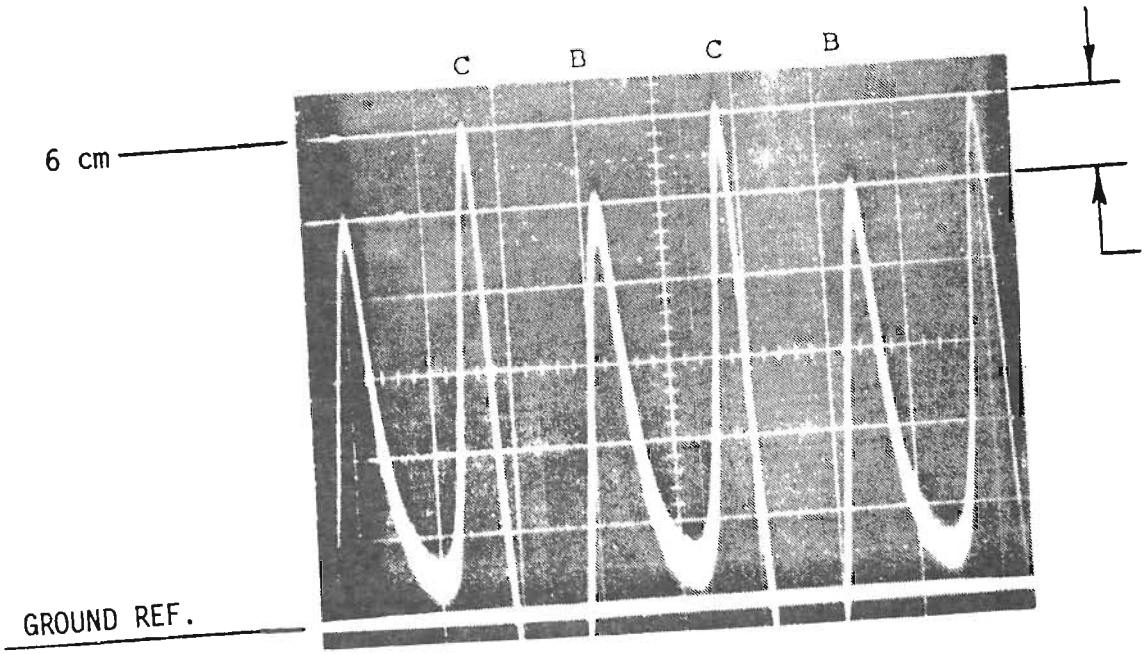


FIGURE 4-21b

2. If head alignment is required, proceed as follows:

Removable Disk Lower Head Only:

a) Install the R/W head adjustment tool as shown in Figure 4-22. Refer to Figure 4-23 during the remainder of the R/W head alignment.

b) Slightly loosen screw A of the selected head.

c) Engage the large end of pin B in the large hole in head mounting plate (see view A of Figure 4-23).

d) To move the head out (away from the spindle) turn screw D counterclockwise.

e) To move the head in (toward the spindle) turn screw D clock-

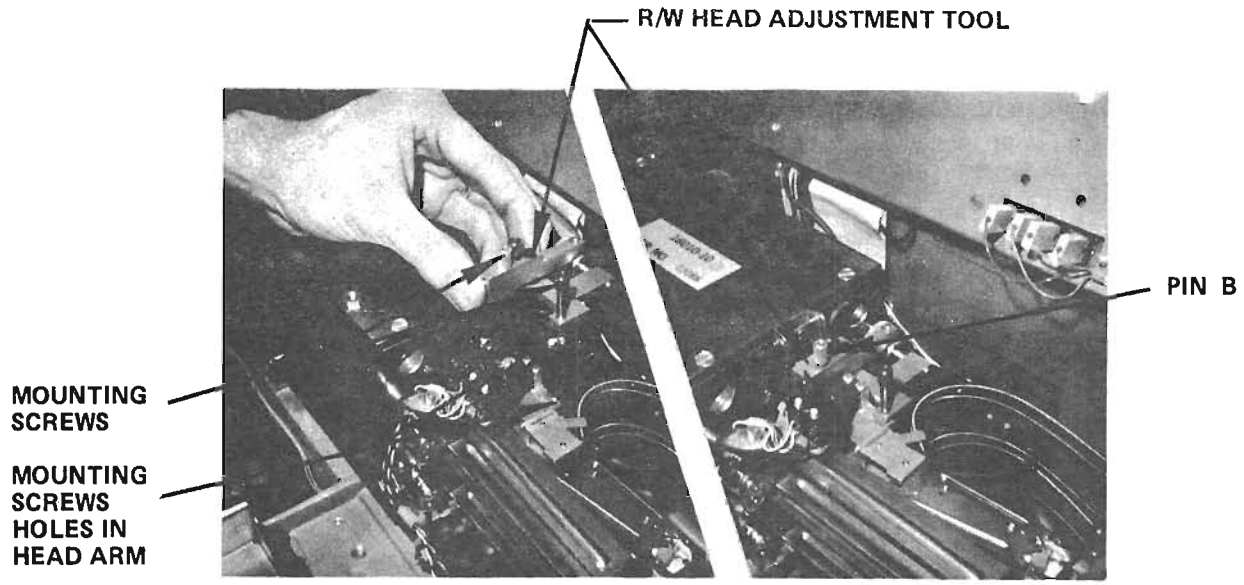


FIGURE 4-22 INSTALL R/W HEAD ADJUSTMENT TOOL

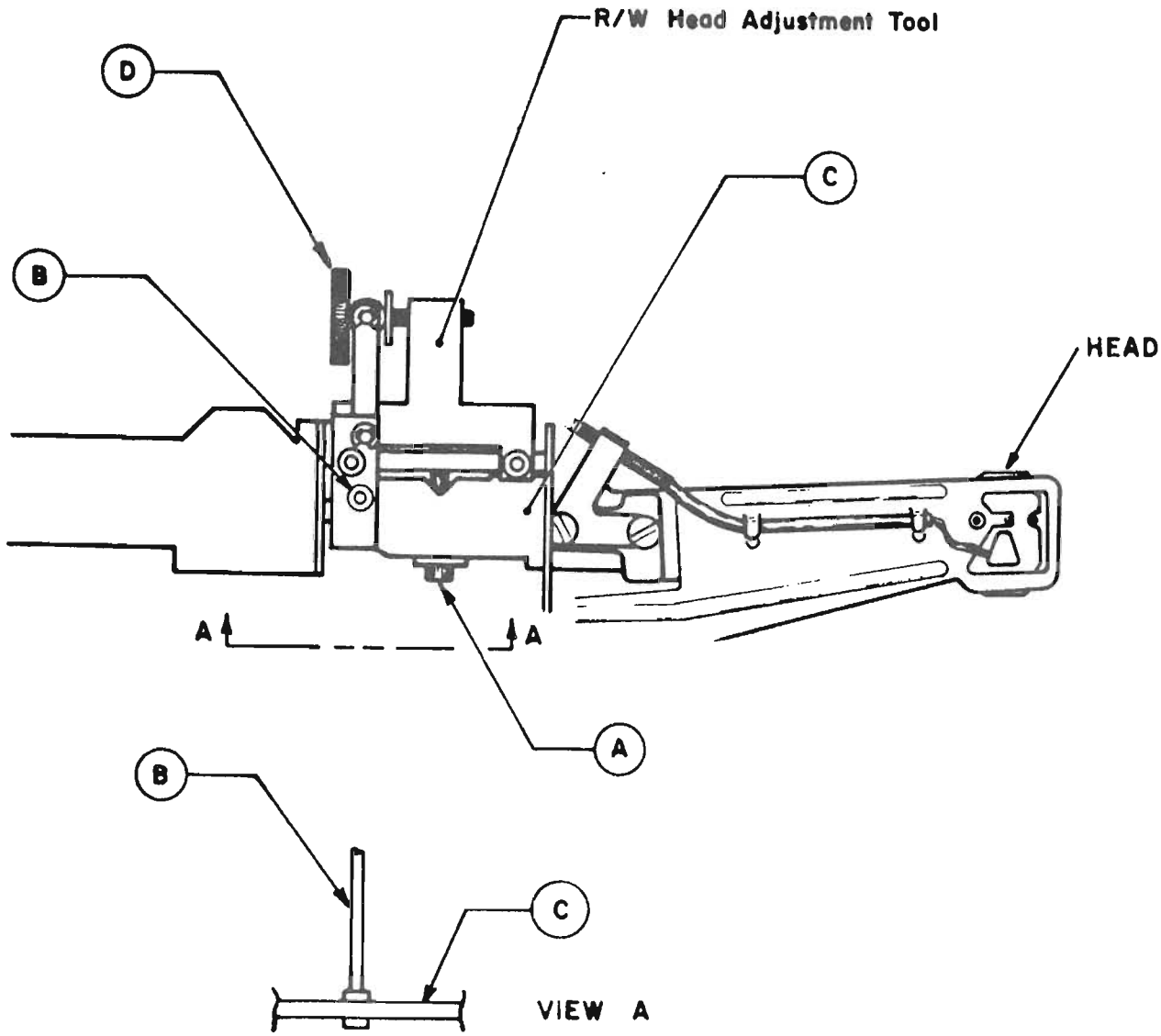


FIGURE 4-23 R/W HEAD ADJUSTMENT

f) Move the head assembly in or out to obtain the correct alignment waveform.

g) Torque the screw A to 95 inch ounces. Switch the unit from RUN to LOAD to retract the heads, then return to the RUN mode of operation.

h) Reposition the R/W head to the required track (73 or 146) making sure the alignment was not lost while tightening screw A.

Removable Disk Upper Head Only:

a) Disconnect cable 1 from the upper head cable and connect to lower head cable.

b) Slightly loosen the screw A for upper head assembly clamp.

c) Engage the large end of pin B in the large hole in the selected head mounting plate C (see view A of Figure 4-23).

d) To move the head in or out by turning screw B clockwise or counterclockwise until you obtain the correct alignment waveform.

e) Tighten screw A of selected head to 95 inch ounces.

f) Reposition selected head back to required track (73 or 146) to make sure you did not lose the alignment while tightening screw A.

4.4.3 *UPPER INDEX TRANSDUCER ADJUSTMENT (TRIBIT)*

NOTE:

A disk hub and sector ring, retrieved from a defective disk cartridge and used here in a manner similar to the procedure outlined for the lower transducer, will appreciably reduce the time necessary to accomplish this adjustment.

Install an alignment cartridge. Place the drive in the RUN mode, and observe the signal at pin V on the Sensor PCB (TP1 on R/W board). The amplitude of the positive peaks of the index transducer output should be 400 mV $\pm$ 100 mV for narrow sector slots (.020" slots), or 1000 mV $\pm$ 200 mV for wide sector slots (.080" slots). If the signal falls outside the appropriate range, proceed as follows:

1. Place the drive in the LOAD mode and, when motion stops, remove the alignment cartridge.

2. Verify the transducer lamination-to-sector ring clearance of .008" $\pm$ .003" by laying a straight-edge across the spindle hub and checking the gap between its lower edge and the top of the lamination with a plastic feeler gauge. If the clearance is out of tolerance, loosen the hold-down screws (screws A in Figure 4-12), and add or remove shims (Diablo P/N 16358) as required. Retighten the screws just enough to secure the transducer and still allow slight lateral movement.

3. Align the transducer/lamination center line with the spindle hub center, and move the transducer in or out radially until the tip of the lamination clears the outside of the spindle hub flange by approximately 3/64". Tighten the hold-down screws a little.

4. Reinstall the alignment cartridge, switch from LOAD to RUN mode and, when able, recheck the signal level of the index transducer output. If the signal is in tolerance, the cartridge may be removed and the hold-down screws tightened firmly. If the signal is not in tolerance, repeat step 3 - moving the transducer radially a small amount either in or out each time until optimum signal level is achieved.

5. Front-panel components are accessible for removal or replacement by removing the two Allen screws which hold the front panel in position. Access to these screws is through two holes, one on each side of the bowl, as shown in Figure 4-13. To permit the front panel to swing freely, two lower screws, one on each side may require loosening. These screws are located between the front panel and the lower section of the slide inner member. The front panel now swings down partially, giving access to components mounted on the rear of the front panel. Some components mounted on the pan or baseplate are also accessible by lowering the front panel.

6. Locate the index transducer baseplate, which is screwed to the outside front of the bowl assembly at the centerline. This plate, shown in Figure 4-24, has four hex-head fastening screws ("A") and a slotted-head adjustment screw ("B").

Index Transducer Alignment. Set the exerciser switches as follows:

43		44	
TRK 4	ON	TRK 8	ON
TRK 1	ON	TRK 2	ON
TA	ON	TA	ON
All Others	OFF	All Others	OFF

Connect cable 2 of the 7013 Exerciser to the emitter of J-22 on the R/W board. (See diagram on page 4-27.)

Locate the four Head Plugs on the R/W PCB. These plugs are oriented from the rear forward: upper head/removable disk; lower head/removable disk, etc. The remaining two plugs are for the fixed disk heads.

Remove upper disk/lower head cable from the R/W board and connect it to cable described in Figure 4-3.

Connect channel 1 of the oscilloscope to TP1 on the 7013 Exerciser. Trigger EXT. NEGATIVE on pin 11 of the SR board. Perform the index transducer alignment as described below:

1. Install the alignment cartridge, place the drive in the RUN mode. (Allow time for temperature stabilization.)

2. Using the exerciser, seek track 5 (100 TPI) or track 10 (200 TPI).

3. Slightly loosen the four fastening screws just enough to permit side movement of the transducer baseplate.

4. Using the adjustment screw ("B" Figure 4-24), position the index transducer so that the leading edge of the read gate occurs at 30 µsec $\pm$ 5 µsec after the leading edge of the index mark (19 µs $\pm$ 3 µs for 200 TPI). Do not tighten the fastening screws yet. See "A" in Figure 4-25.

5. Alternately selecting each of the upper heads, adjust the index transducer so that the read gate is symmetrical around the 30 usec (19 usec for 200 TPI) point. Total pulse separation (relationship) between the heads shall not exceed 10 usec for 43 (6.25 usec for 44). If this tolerance is exceeded, the heads must be checked for proper seating. See specification "B" in Figure 4-25.

6. Tighten the four fastening screws, observing that tightening the screws does not result in misalignment.

7. Return the front panel to the operating position.

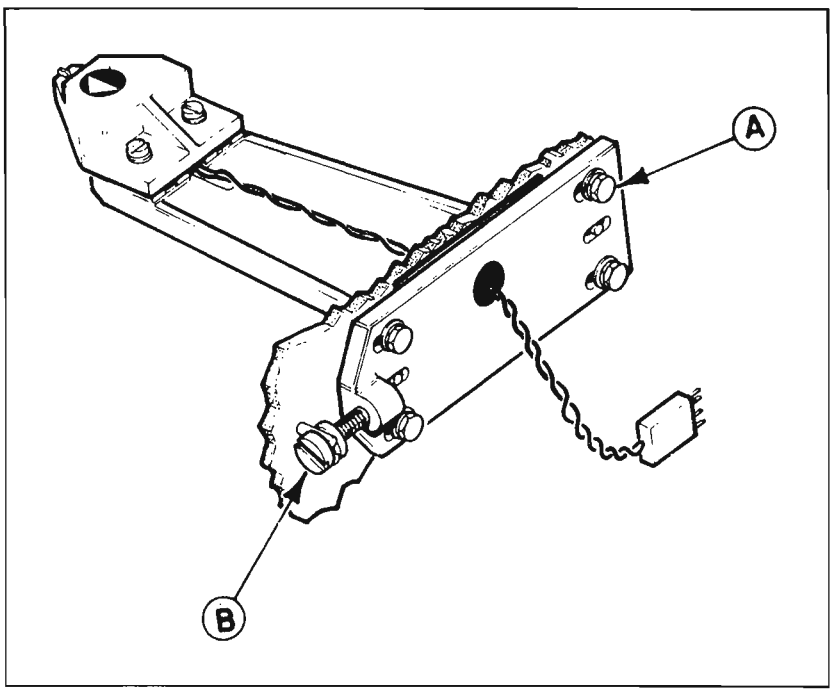


FIGURE 4-24
INDEX TRANSDUCER ADJUSTMENT

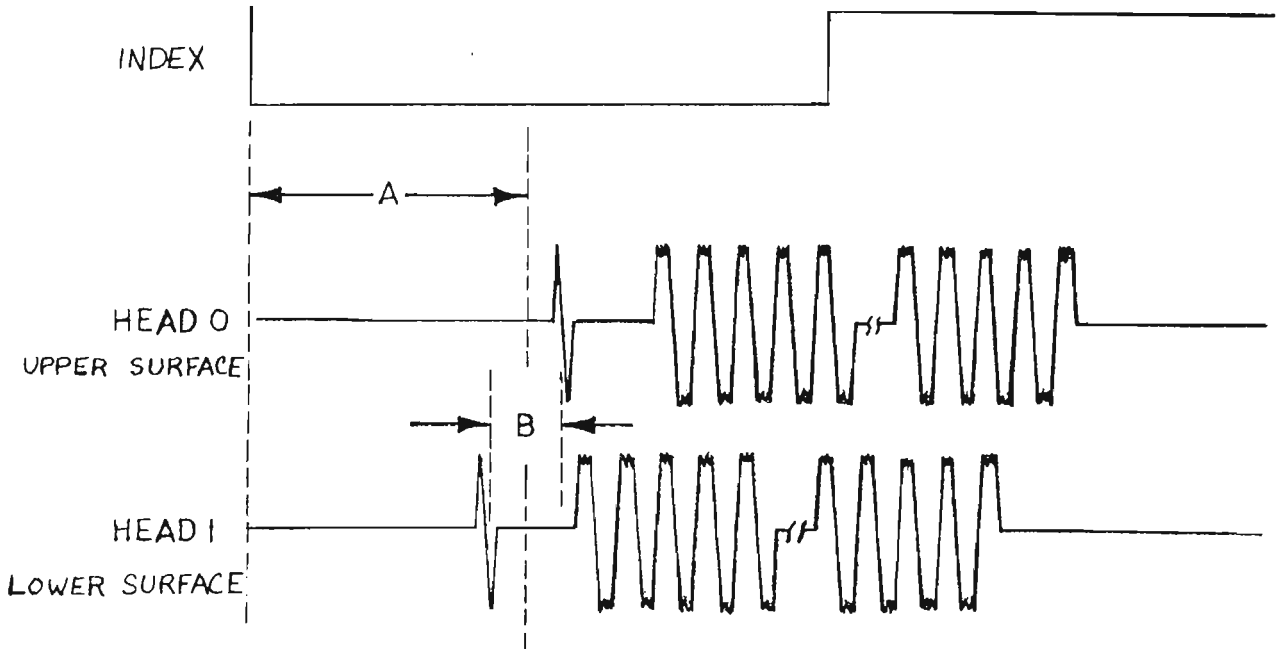


FIGURE 4-25 INDEX TRANSDUCER ALIGNMENT TIMING REQUIREMENTS

2400 RPM
A = 19 µs
B = 6.2 µs max.

4.4.4 *HEAD LOAD SOLENOID ADJUSTMENTS*

When experiencing problems with head load operation, all of the following should be checked and adjustment(s) made as required. If a problem persists after all adjustments have been carefully checked, a new Head Load Solenoid Assembly, Part #726-0349 (Diablo #16322-03) should be installed.

Solenoid Throw Adjustment Procedure

Insufficient throw can cause the rollers on the R/W Head Assembly to drag on the head load bails. The best solenoid performance is obtained when the throw is adjusted to the specification shown in Figure 4-26.

The Head Load Solenoid is removed as follows:

1. On the underside of the disk drive, remove the head load solenoid access cover plate at the rear of the baseplate.

2. Disconnect the two solenoid leads from the terminal block next to the solenoid.

3. Remove the two "C-clips" from the Head Load Linkage (B) and the Dashpot Linkage (C), as shown in Figure 4-26.

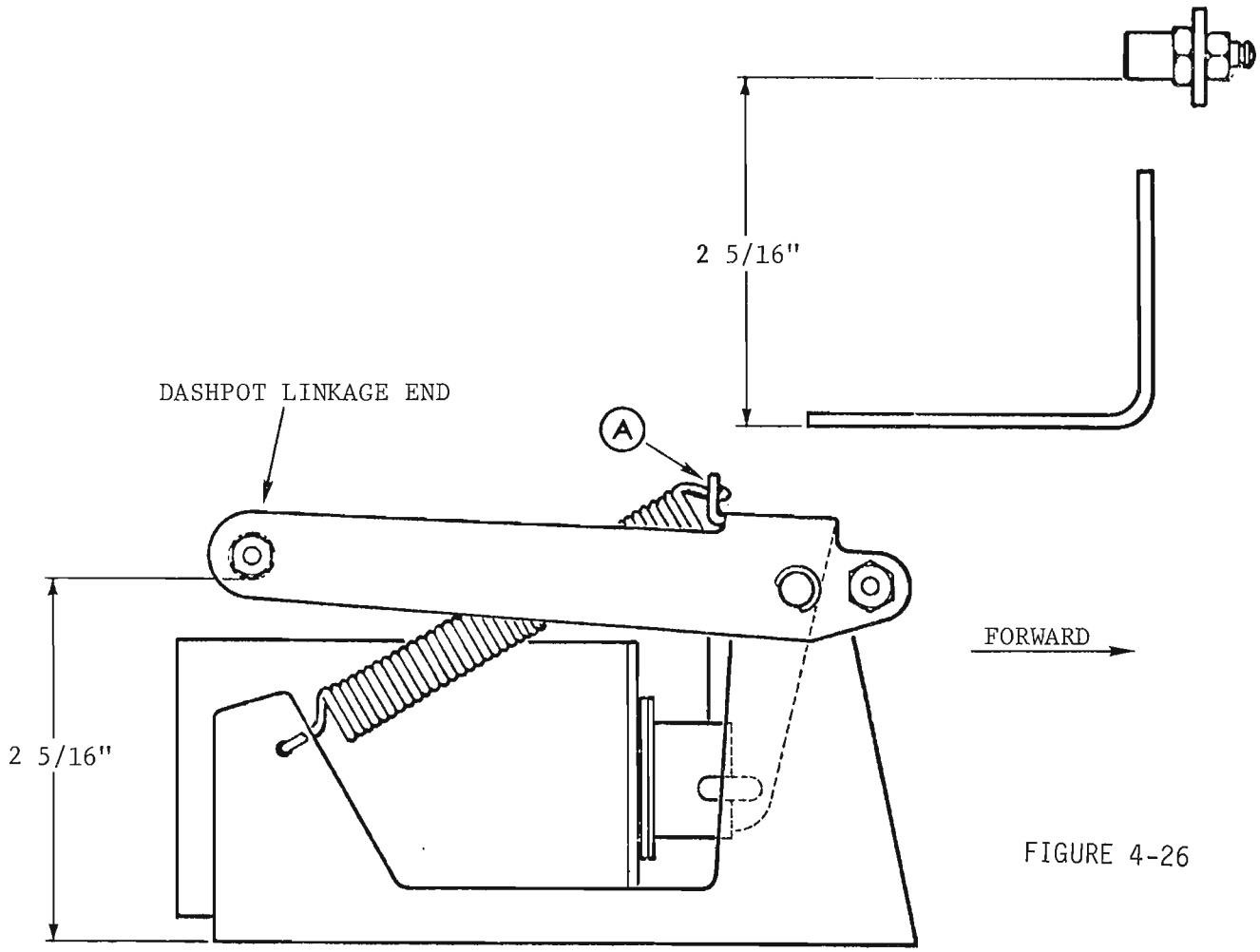


FIGURE 4-26

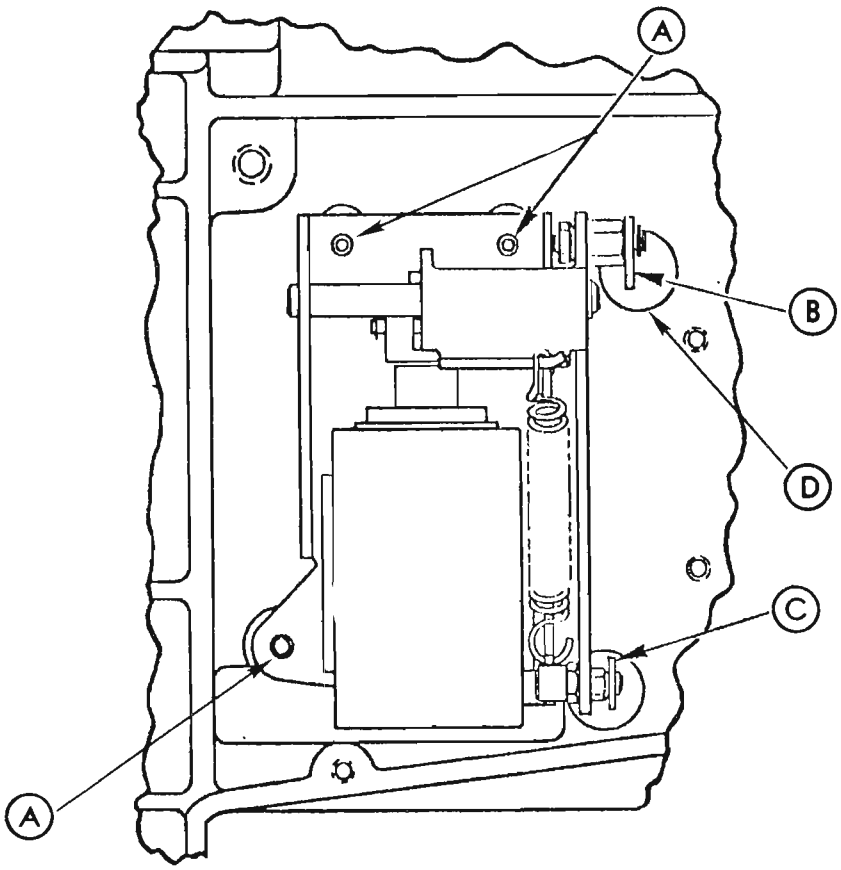


FIGURE 4-27

4. Remove the three mounting screws (A), shown in Figure 4-27, which fasten the solenoid to the baseplate. Remove the solenoid.

CAUTION:

Do not pull the Dashpot Linkage Arm "C" out any further than necessary to prevent the disengagement of the piston from the Dashpot Housing.

To meet the specifications as shown in Figure 4-26, remove the spring from the "A" end, and loosen the four (4) screws shown in Figure 4-28.

Push the solenoid forward to the end of the bottom screw slots.

Raise the Dashpot Linkage end until 2 5/16" is obtained. (The solenoid should be moving to the rear as the Dashpot end is raised.)

When the proper distance is obatined, tighten the four (4) bottom screws in the solenoid assembly.

Verify that the plunger has bottomed when the adjustment is correct.

Replace the spring.

Installation of the Head Load Solenoid is accomplished by following procedure 4.4.4 steps 1-4 in reverse.

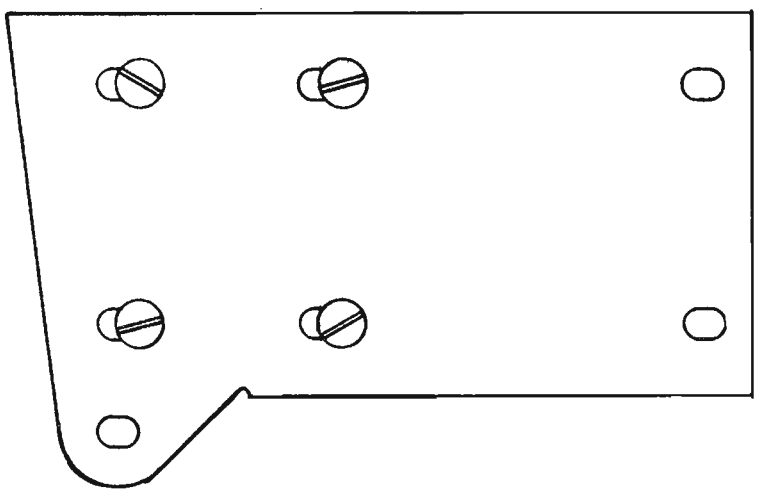


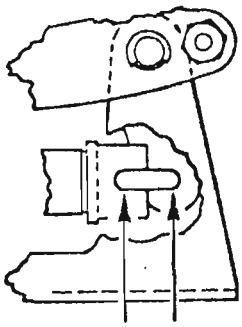
FIGURE 4-28

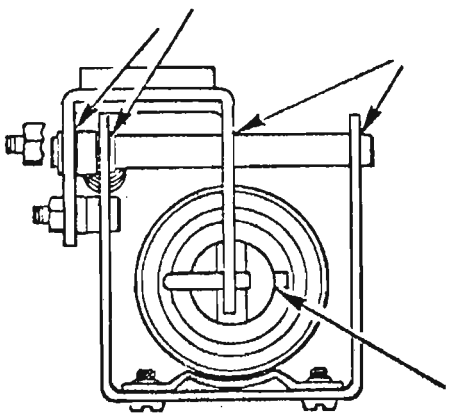
Solenoid Mechanical Alignment

Mechanical misalignment of the solenoid assembly can cause binding in the linkage resulting in marginal operation. To relieve linkage binding perform the following. See Figure 4-29.

1. Loosen three mounting screws (A).

2. Adjust the solenoid assembly as required to obtain free movement of links (B) and (C).





Caution

1) Do not oil the solenoid plunger.

2) Do not load and unload heads more than once every 30 seconds to avoid solenoid damage.

FIGURE 4-29

3. Verify that linkage (B) does not contact the bottom plate of the head positioner assembly, item (D).

4. As an additional margin against binding of the solenoid linkage, apply one drop of IBM oil to the linkage pivot points as shown in Figure 4-29.

Head Load Bail Arm

The R/W heads may slap the disk when unloading due to misadjustment of the bail arms. Slapping occurs if the heads are too close to the disk surface when in the unload condition.

Arm Adjustment

NOTE:

Step 1 and 2 adjustments, if required, must be done in proper order.

Heads are numbered from top to bottom.

1. Refer to Figure 4-30. With disk rotation stopped, check for .062" ± .010" clearance between head H-00 and the recording disk. Adjust by turning eccentric (A), keeping the "Throw" of the eccentric generally to the right side of the drive. Tighten screw (B).

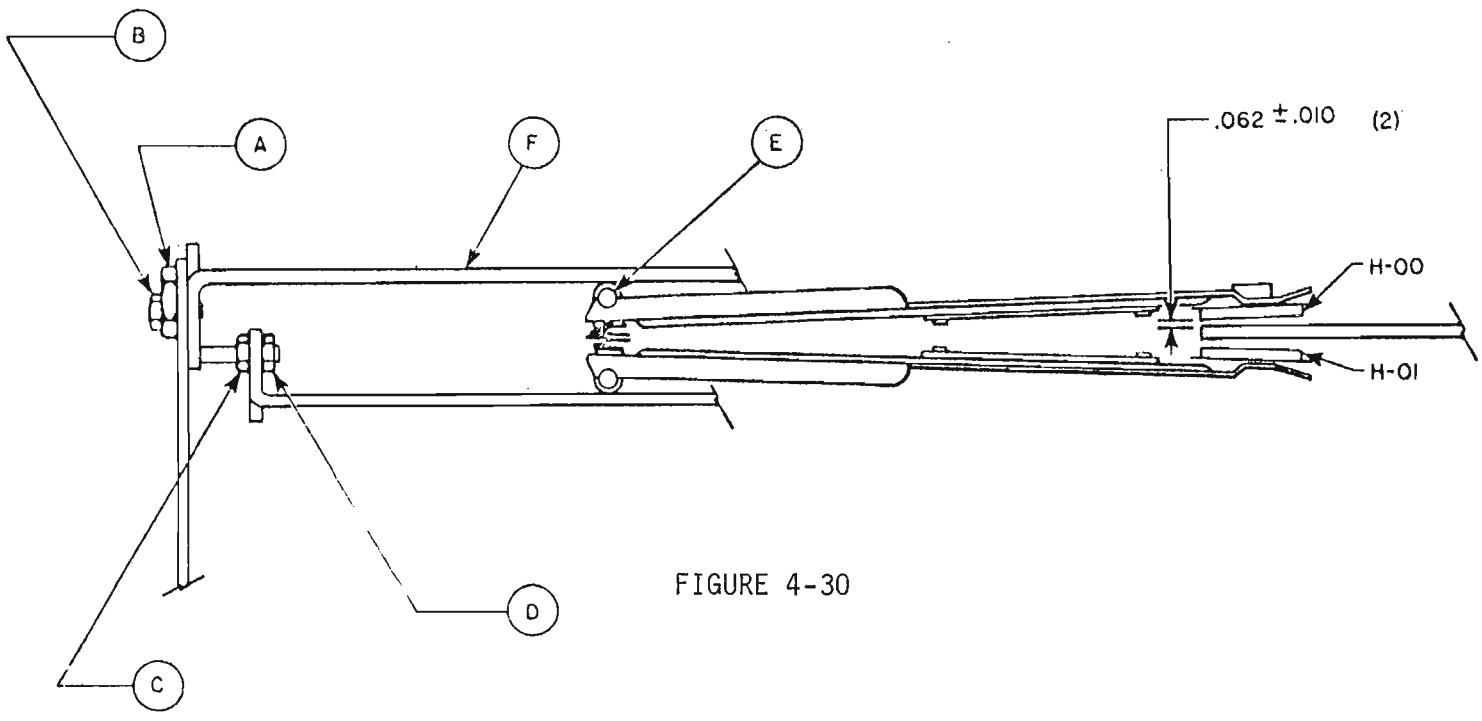


FIGURE 4-30

2. Check for .062" ± .010" clearance between head H-01 and the recording disk. Adjust by turning eccentric (C), keeping the "Throw" of the eccentric generally towards the bottom of the drive. Tighten nut (D).

3. Repeat step (1) for head H-02 (top head of fixed disk). Step (2) for head H-03 (bottom head of fixed disk).

4. Load the R/W heads, check to see that clearance exists between the four (E) rollers and the four (F) loading bails. The minimum clearance should be .002".

Head Load Dashpot Timing

Adjustment of the Dashpot requires a disk pack with information written on track zero, and an oscilloscope.

1. Install a disk pack with data recorded on Track "0" and place the disk drive in the "RUN" mode.

2. Sync on the negative-going leading edge of the head load pick signal at pin P7-12 of the heatsink, and observe the signal at TP-1 on the R/W PCB assembly.

3. Trigger the head load one-shot by grounding pin 3 of the (SL) PCB assembly. Observe the trace on the oscilloscope. A data burst will appear when the heads are fully loaded. See Figure 4-31.

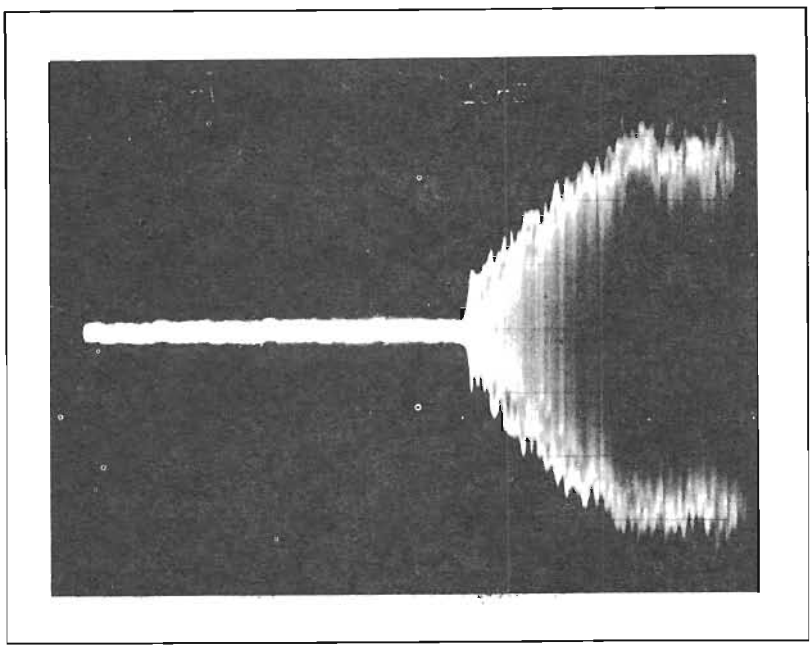


FIGURE 4-31
DATA BURST

CAUTION:

DO NOT LOAD and UNLOAD HEADS more than once every 30 seconds to avoid solenoid damage.

4. Repeat step 3 and turn Dashpot adjusting screw until the first pulse appears between 50 and 100 milliseconds after the start of the sweep.

Head Load Interlock Adjustment

Head Load Interlock Adjustment requires an oscilloscope. See Figure 4-33.

1. Remove the (SD) and (SO) PCB assemblies, location M01 and M07.

2. Connect the oscilloscope to TP-4 (SR) PCB assembly. Scope Settings: 2V/DIV, Auto Trigger.

3. Turn drive power on.

4. Move the carriage from front to rear until the signal appearing on the scope goes low.

5. Loosen locknut (D) and adjust for .015" $\pm$ .010". Raise slide manually, using a screwdriver at point (E).

6. With (A) down, adjust for .005" $\pm$ .002" clearance between slide (A) and (B), by moving (E). Tighten screw (C).

7. Turn power off, remove scope probe from TP-4 of (SR) PCB, install (SD) PCB in location M01, (SO) PCB in location M07.

8. With power off, check dimensions in steps 5 and 6.

NOTE:

Do not attempt to manually load the heads with the carriage in the retracted position since damage may result to slide (A), causing the assembly to bind.

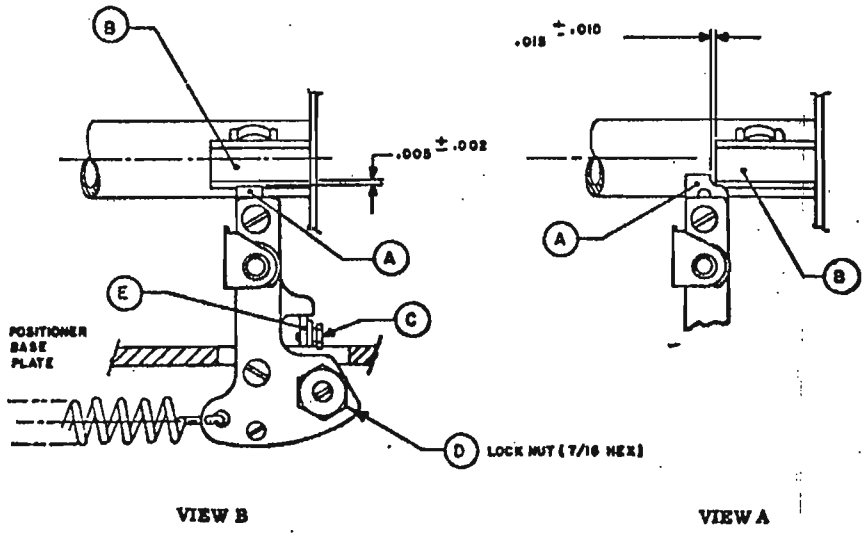


FIGURE 4-32

Revision Levels

Check for proper revision level on the heatsink (16712-XX) and (SL) PCB (11471-XX).

Pick signal and hold current changes have been made to the head load solenoid circuits. Hold current is decreased by about 25% to reduce power dissipation in the solenoid. When the solenoid temperature increases, its internal resistance increases; therefore the time duration of the head load pick signal has been increased from 700 msec to 1400 msec to overcome the added resistance.

The following is a description of the component changes:

1. Head Load Pick Signal - Sequence Logic PCB (SL) location M05. These changes appear on (SL) PCB assemblies revision "D" and higher.

   (SL) PCB #11471-00 and 11471-01
   Remove the 39 uF capacitor at location A12 and replace with an 82 uF, 6V capacitor.

(SL) PCB #11471-02 and 11471-03
Remove the 620K resistor at location D48 and replace wtih a 1.2M, 1/4 W, 5% resistor.

2. Hold Current Change - Heatsink assembly, #16712-XX.
This change appears on heatsink assemblies, revision "P" and higher.

Remove the 20 OHM 10W power resistor (located electrically between terminals R3 and R4) from the finned side of the heatsink. Replace with a 30 OHM 10W power resistor.

WANG F.L.M.G. FIELD INPUT FORM; 40 SERIES DISK DRIVES

Since this is a preliminary F.L.M.G., which will be finalized soon, your input will serve to provide a more comprehensive publication; therefore, if the need for additional information or changes in the existing text is required, fill out this form and return it to your Area Office. Be certain that the information submitted is not only accurate, but complete and up to date. Include schematics, drawings, photos, or descriptions as they apply. Make references to paragraph numbers and figures and indicate whether the information is new or if it pertains to existing text. Include as many additional sheets and documents as necessary, and list sources of information (ISN/NL/SB/Vendor, etc.).

Area Office should review this material and assign it for inclusion in the F.L.M.G. Return the form to the Home Office.

ORIGINATOR: _____ DATE: _____

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