83308400

CONTROL DATA
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CONTROL DATA®
STORAGE MODULE DRIVE
BJ7XX

INSTALLATION AND CHECKOUT
PREVENTIVE MAINTENANCE
CORRECTIVE MAINTENANCE
DIAGRAMS
WIRE LISTS

Volume 1 of 2

HARDWARE MAINTENANCE MANUAL

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Volume 1 of 2

HARDWARE MAINTENANCE MANUAL

REVISION RECORD

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PREFACE

This manual has been prepared for customer engineers and other technical personnel direcly involved with maintaining the Storage Module Drives (SMD) shown in the configuration chart.

Maintenance information is provided by five sections in this manual. Section numbers and a brief description of their contents are listed below:

Section 1 - Installation and Checkout
Provides information on preparing the drive for initial use: Uncrating, installation, initial checkout and start up.

Section 2 - Preventive Maintenance
Provides detailed procedures for routine maintenance of the drive.

Section 3 - Corrective Maintenance
Provides general maintenance information, drive tests and adjustments, trouble analysis aids, and repair and replacement procedures.

Section 4 - Diagrams
Provides logic diagrams and assembly schematics.

Section 5 - Wire Lists
Provides documentation on wiring for logic and mechanical assemblies.

Manuals applicable to the Storage Module Drive are as follows:

Publication No.	Title
83308400	Maintenance
83308500	Reference
83308600	Parts Data

A guide for the Disk Drive Operator, Publication number 83323770, is also available. The guide may be ordered through Literature Distribution Services at the following address:

Control Data Corporation
Literature Distribution Services
308 North Dale St.
St. Paul, MN 55103

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EQUIP. IDENT. NUMBER	FINAL ASSY P/N	POWER		CABINET FEATURES							ELEC FEATURES					
		HZ	VOLT	ACST	NON ACST	IX	2X	DESK	RACK	CAB-INET	DAISY CHAIN	HYST. BRAKE	NRZ/ MFM	PLO	VAR. SECT.
BJ7A1-A	76420002	60	120		X					X		X	X	X	
BJ7A2-A	76420003	60	120		X					X	X	X	X	X	X
BJ7A2-B	76420009	50	220		X					X	X	X	X	X	X
BJ7A2-C	76420011	60	100		X					X	X		X	X	
BJ7A2-D	76420010	50	100		X					X	X	X	X	X	X
BJ7A2-E	76420015	60	120		X				X		X	X	X	X	X
BJ7A2-F	76420016	50	120		X				X	X	X	X	X	X	X
BJ7A2-G	76420037	60	120	X			X				X	X	X	X	X
BJ7A2-H	76420038	50	220	X			X				X	X	X	X	X
BJ7A2-J	76420046	60	120		X			X			X	X	X	X	X
BJ7A2-K	76420048	50	220		X					X	X	X	X	X	X
BJ7A2-L	76420049	60	100		X				X		X	X	X	X	X
BJ7A2-M	76420050	50	100		X				X		X	X	X	X	X
BJ7A2-N	76420052	60	120		X					X	X	X	X	X	X
BJ7A2-P	76420051	50	220		X					X	X	X	X	X	X
BJ7A2-R	76420066	60	120		X				X		X	X	X	X	X
BJ7A2-S	76420053	50	220		X					X	X	X	X	X	X
BJ7A2-T	76420056	60	120		X					X	X	X	X	X	X
BJ7A2-U	76420057	50	220		X					X	X	X	X	X	X
BJ7A2-V	76420070	50	220	X		X				X	X	X	X	X	X
BJ7A2-T	76420056	60	120		X					X	X	X	X	X	X
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BJ7A2-W	76420058	50	220		X			X			X	X	X	X	X
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BJ7A3-B	76420008	50	220		X				X		X	X	X	X	X
BJ7A3-C	76420062	60	120	X			X				X	X	X	X	
BJ7A3-E	76420065	60	120	X			X				X	X	X	X	
BJ7A3-F	76420074	60	120		X					X	X	X	X	X	X
BJ7A3-G	76420075	50	220		X					X	X	X	X	X	X
BJ7A3-H	76420080	60	120	X			X				X	X	X	X	X
BJ7A3-K	76420082	60	120	X			X							X	
BJ7A4-A	76420005	60	120		X				X				X	X	
BJ7A5-A	76420006	60	120		X					X		X	X	X	
BJ7A5-B	76420007	50	220		X					X	X	X	X	X	
BJ7A6-A	76420012	60	120		X					X	X	X	X	X	
BJ7A7-A	76420013	60	120		X					X	X	X	X	X	X
BJ7A7-B	76420014	50	220		X					X	X	X	X	X	X
BJ7A7-C	76420031	60	120		X					X	X	X	X	X	X
BJ7A7-D	76420032	50	220		X					X	X	X	X	X	X
BJ7A7-E	76420076	60	120	X						X	X	X	X	X	X
BJ7A7-F	76420077	50	220	X						X	X	X	X	X	X
BJ7B2-A	76420029	60	120	X		X					X	X	X	X	X
BJ7B2-B	76420030	50	220	X		X					X	X	X	X	X
BJ7B2-C	76420033	60	120	X		X					X	X	X	X	X

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STORAGE MODULE DRIVE CONFIGURATION

EQUIP. IDENT. NUMBER	FINAL ASSY P/N	POWER		CABINET FEATURES							ELEC FEATURES				
		HZ	VOLT	ACST	NON ACST	IX	2X	DESK	RACK	CAB-INET	DAISY CHAIN	HYST. BRAKE	NRZ/ MFM	PLO	VAR. SECT.
BJ7B2-D	76420034	50	220	X		X					X	X	X	X	X
BJ7B2-G	76420039	60	120	X		X					X	X	X	X	X
BJ7B2-H	76420040	50	220	X		X					X	X	X	X	X
BJ7B2-J	76420054	60	120	X		X					X	X	X	X	X
BJ7B2-K	76420055	50	220	X		X					X	X	X	X	X
BJ7B2-L	76420063	60	120	X		X					X	X	X	X	X
BJ7B2-M	76420074	50	220	X		X				X				X	
BJ7B2-N	76420064	60	120	X		X					X	X	X	X	X
BJ7B2-P	76420071	50	100	X		X				X	X	X	X	X	X
BJ7B2-R	76420078	50	220	X		X					X	X	X	X	X
BJ7B2-S	76420079	60	120	X		X					X	X	X	X	X
BJ7B2-U	76420081	60	120	X		X				X				X	
BJ7B4-A	76420041	60	120	X		X					X	X	X	X	X
BJ7B4-C	76420043	60	120	X			X				X	X	X	X	X
BJ7B4-E	76420044	60	120	X		X					X	X	X	X	X
BJ7B4-G	76420045	60	120	X			X				X	X	X	X	X
BJ7B5-A	76420069	60	120	X			X		X		X	X	X	X	X

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SECTION 1

INSTALLATION AND CHECKOUT

INTRODUCTION

This section contains information concerning the initial installation and checkout of both the acoustic and non-acoustic drives.

ACOUSTIC DRIVE

The drive comes from the factory in one of two configurations (figure 1-1):

- Cabinet with drive on top (1X Option).
- Drawer mount drive to be mounted in an available cabinet (2X Option).

The basic configuration is a cabinet with a drive mounted on top. This basic configuration is expanded by adding a drawer mounted unit to the lower part of the cabinet.

NON-ACOUSTIC DRIVE

The drive comes from the factory in one of two configurations (figure 1-2).

- Drive for desk top (or CDC cabinet) use.
- Drive with hardware for rack mount.

UNCRATING

1. Raise case assembly (refer to Maintenance Preliminary Conditions, section 3A).
2. On acoustic cabinet models, remove right side panel (refer to Maintenance Preliminary Conditions, section 3A).
3. Remove screw securing deck holddown bracket to deck assembly (figure 1-3). Loosen screw securing bracket to base assembly. Slide bracket away from deck and rotate 90 degrees toward front of drive. Tighten screw securing bracket to base. Replace screw that secured bracket to deck and tighten.

CAUTION

Cables might shift during shipping. When raising the deck for the first time, ensure that cables and harnesses do not get caught on the deck.

4. Raise deck to maintenance position (refer to Maintenance Preliminary Conditions, section 3A).
5. Inspect base assembly, deck assembly and power supply for damage.
6. Remove logic plugs packaged in a plastic bag near deck holddown bracket.
7. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.
8. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.
9. Inspect top of deck assembly for damage.
10. Raise logic chassis to maintenance position (refer to Maintenance Preliminary Conditions, section 3A).
11. Inspect logic chassis connectors and wiring for loose or broken wires. Make sure all connectors and logic cards are firmly seated, and check for loose hardware.
12. Lower logic chassis to normal operating position.
13. Remove carriage locking pin from shipping hole and put in storage hole (figure 1-3).
14. Lower case assembly.
15. On cabinet model, replace right side panel.
16. Manually lift drive and remove skid from underneath.
17. Check Pack Access cover for tight seal per adjustment procedure of Pack Access Cover.

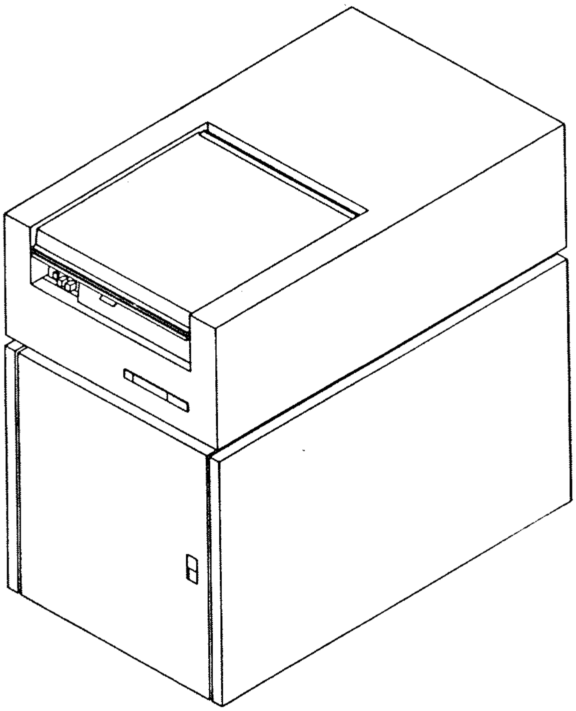
INSTALLATION REQUIREMENTS

GENERAL

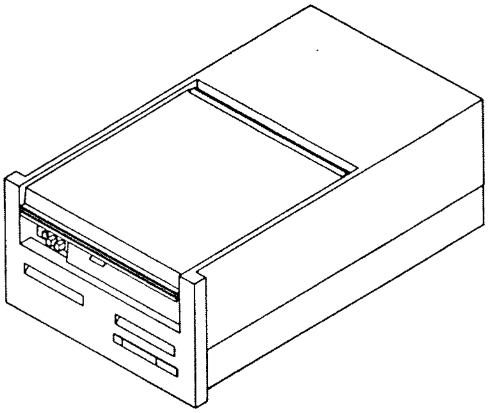
Installation involves determining a suitable location and then leveling and aligning the unit once it is located.

NOTE

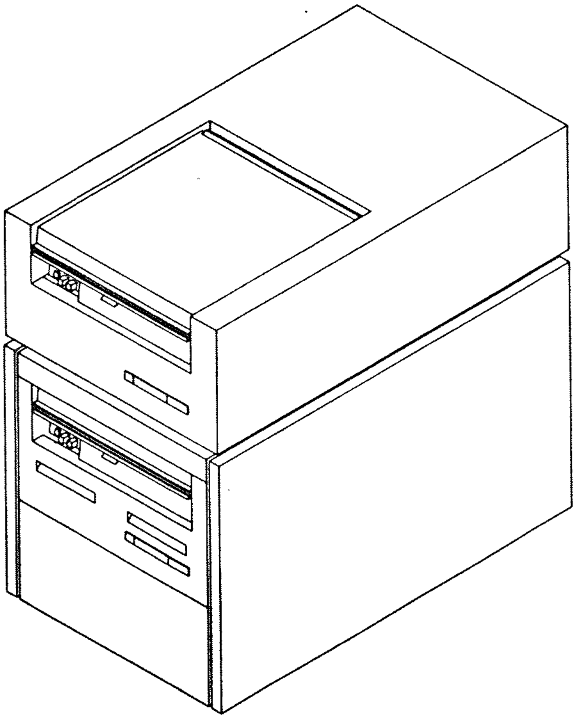
Make sure temperature gradients are not exceeded during installation. Refer to the general description section in the hardware reference manual.



CABINET WITH TOP MOUNTED DRIVE



DRAWER MOUNT DRIVE



CABINET WITH BOTH TOP MOUNT AND DRAWER MOUNTED DRIVES

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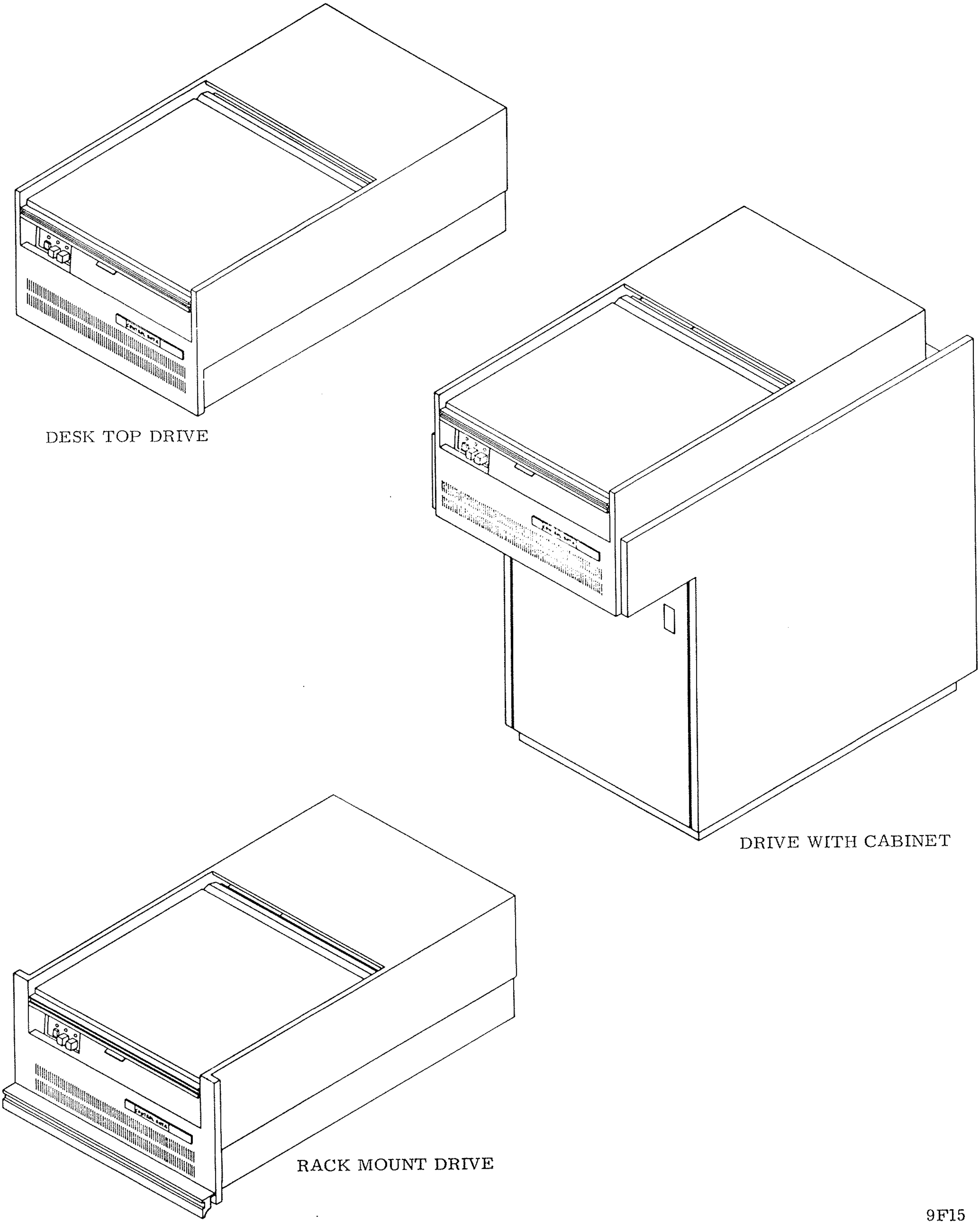
Figure 1-1. Acoustic Drive Physical Configurations



DESK TOP DRIVE

DRIVE WITH CABINET

RACK MOUNT DRIVE

Figure 1-2. Non-Acoustic Drive Physical Configurations

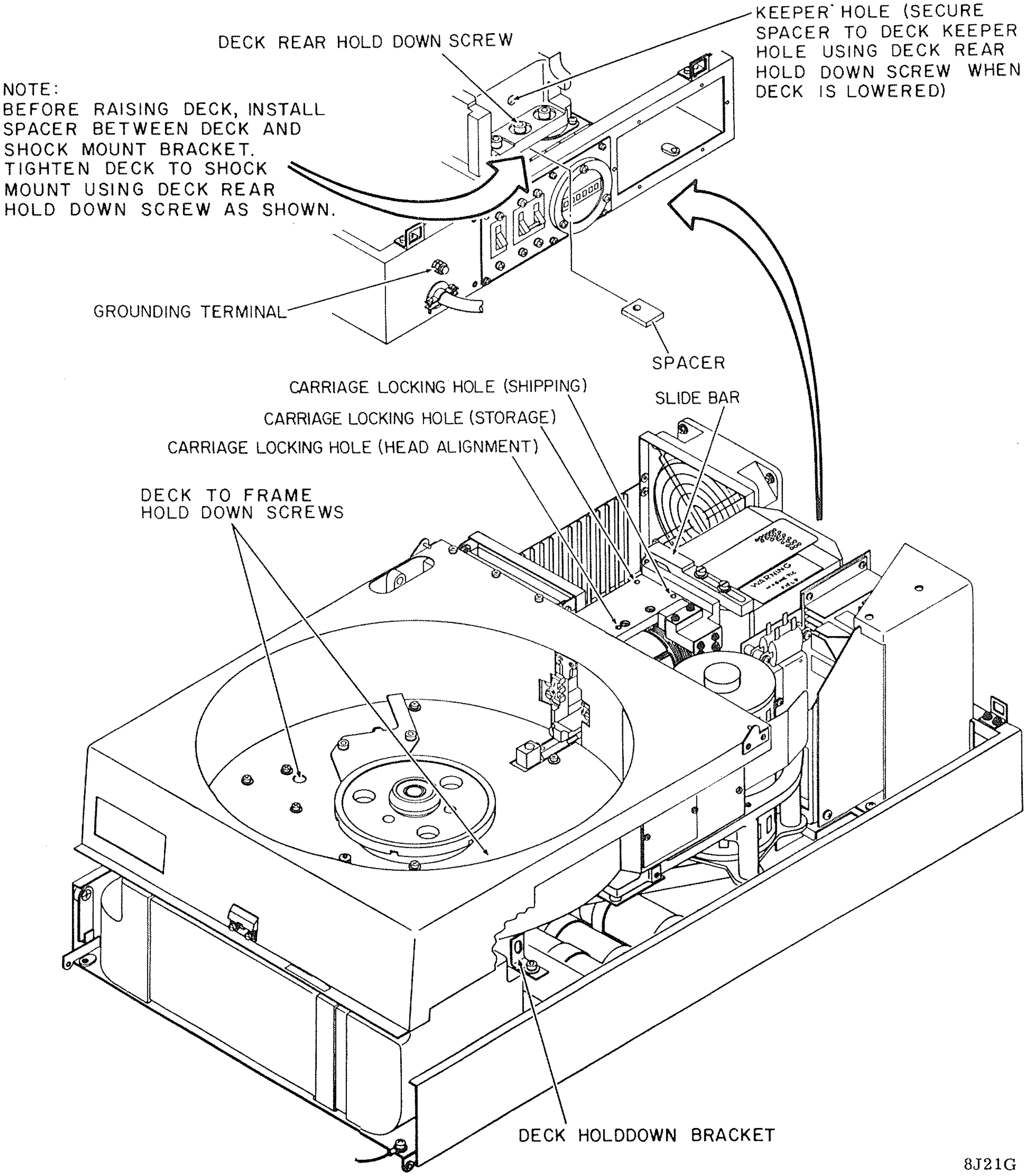


Figure 1-3. Drive Shipping Hardware

LOCATION

When the drive is installed, there must be enough clearance around the unit to permit access to it for maintenance. Figures 1-4, 1-5, and 1-7 give the size and space requirements of the drive.

LEVELING AND ALIGNING

1. Roll cabinet to designated location. Position it so that I/O panel is over floor cutout.
2. Remove leveling pads from inside of drive and install locknut on each leveling pad.
3. Install leveling pads into frame.
4. Turn down leveling pads until casters are completely off the floor.
5. Place spirit level on main deck so ends of level point to front and rear of deck. (Unit should be level with other units.)
6. Adjust leveling pads until surface is horizontal within three angular degrees.
7. Place spirit level on main deck so ends of level point toward sides.
8. Adjust leveling pads until surface is horizontal within three angular degrees.
9. Repeat procedure until main deck is horizontal within three angular degrees regardless of spirit level orientation.
10. Tighten locknuts on leveling pads.

POWER WIRING

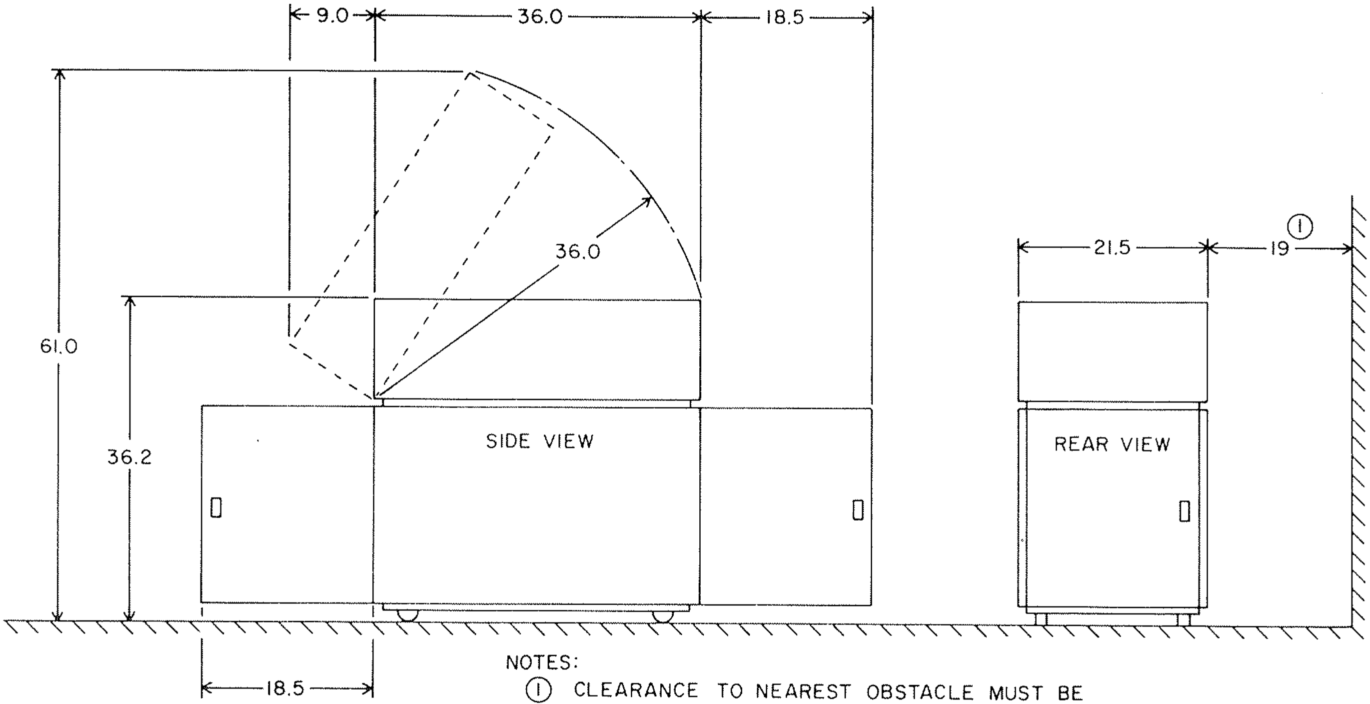
Drive power requirements are listed in table 1-1. Drive line current versus startup time is shown in figure 1-6.

POWER SYSTEM GROUNDING

The site ac power system must have provisions for correct equipment safety grounding. All of the following conditions must be met.

1. The branch circuit supplying ac power to the drive must have safety ground provisions. Therefore, this current must include an insulated grounding conductor that is identical to the grounded and ungrounded branch circuit

Text continued page 1-7



NOTES:
① CLEARANCE TO NEAREST OBSTACLE MUST BE MINIMUM OF 19 IN. FOR MAINTENANCE PURPOSES.
2. DIMENSIONS ARE GIVEN IN INCHES.

Figure 1-4. Acoustic Cabinet without Drawer Mount Space Requirements

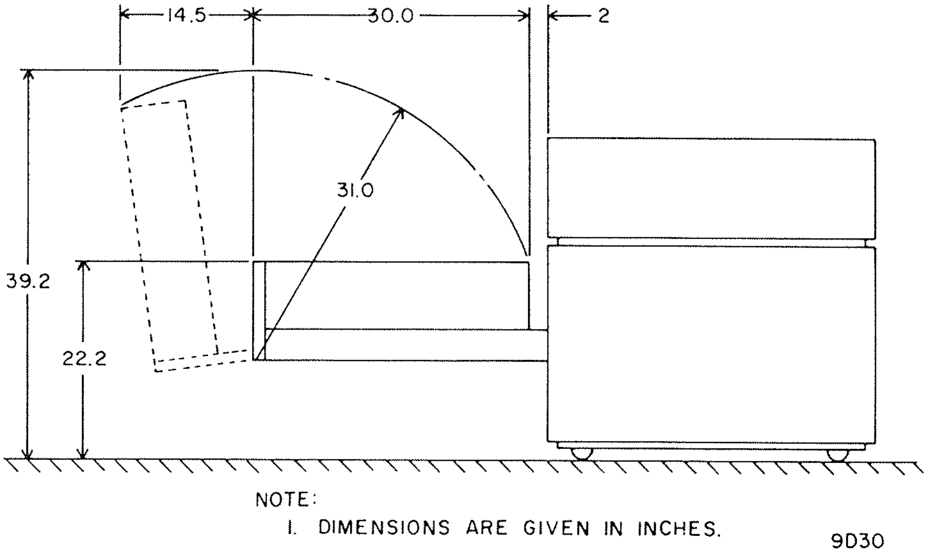


Figure 1-5. Acoustic Cabinet with Drawer Mount Space Requirements

TABLE 1-1. POWER REQUIREMENTS

Specifications	Value			
AC Power Input Options	Voltage	Frequency	Phase	
	100 (±10) Vac	60 (+.6 -1.2) Hz	1	
	100 (±10) Vac	50 (+.5, -1) Hz	1	
	120 (+8, -18) Vac	60 (+.6, -1) Hz	1	
	220 (+15, -25) Vac	50 (+.5, -1) Hz	1	
	240 (+17, -27)Vac	50 (+.5, -1) Hz	1	
Power Used With Disks and Carriage in motion	Power Input	Max Line Current	Power Consumption	Power Factor
	100V 60 Hz	6.2 A	0.55 KW	.80
	100V 50 Hz	7.0 A	0.69 KW	.77
	120V 60 Hz	6.6 A	0.47 KW	.70
	220V 50 Hz	4.9 A	0.70 KW	.60
	240V 50 Hz	5.1 A	0.75 KW	.57

Table continued on next page

Specifications	Value			
	Power Input	Max Line Current	Power Consumption	Power Factor
Power Used With Disks and Carriage at Rest	100V 60 Hz	1.3 A	0.13 KW	0.9
	100V 50 Hz	1.5 A	0.17 KW	0.9
	120V 60 Hz	1.4 A	0.14 KW	0.9
	220V 50 Hz	1.4 A	0.30 KW	0.9
	240V 50 Hz	1.5 A	0.35 KW	0.9
Start Up Current	Refer to figure 1-6.			

conductors. The insulated grounding conductor shall show either a green color or green with a yellow strip.

2. The grounding conductor specified in step 1 is to be grounded at the service equipment.

3. All power receptacles (including convenience outlets for oscilloscopes and other test equipment) must be at a common ground potential to prevent shock hazards if two equipments are touched simultaneously. Therefore, all attachment-plug receptacles in the vicinity of the drive are to be the grounding type; furthermore, the grounding conductors serving these receptacles are to be connected to the same grounding conductor that serves the drive.

SYSTEM GROUNDING

The controller and its attached drives must be connected to earth ground. The permissible grounding schemes, listed in preferred order, are:

1. Controller and drives connected to qualified site floor ground. A qualified ground would be a floor grid where the horizontal and vertical members of the grid are mechanically secure and have ground straps or their equivalent joining them to assure a constant ground potential. In turn, the grid must be connected to earth ground. An alternate qualified floor ground is a grounding grid or grounding bus system provided under the false floor.

2. Controller and drives connected to otherwise qualified floor grid, except that floor grid is isolated from earth ground. In this case, controller is then connected to earth ground to ground the system.

3. No site floor grid available: controller and drives connected to each other in a daisy chain configuration. Controller connected to earth ground.

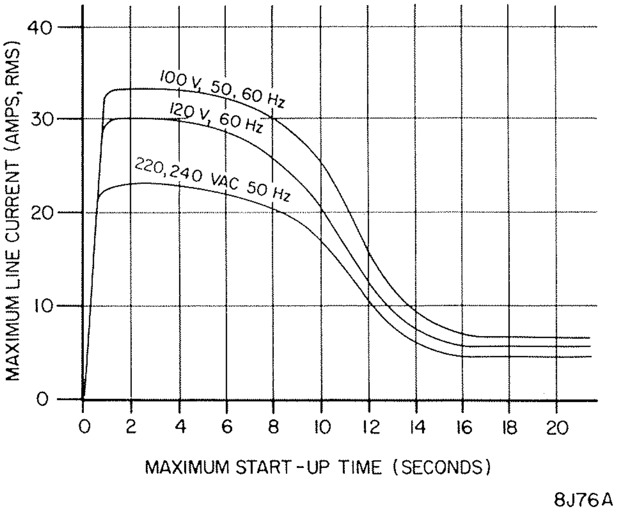


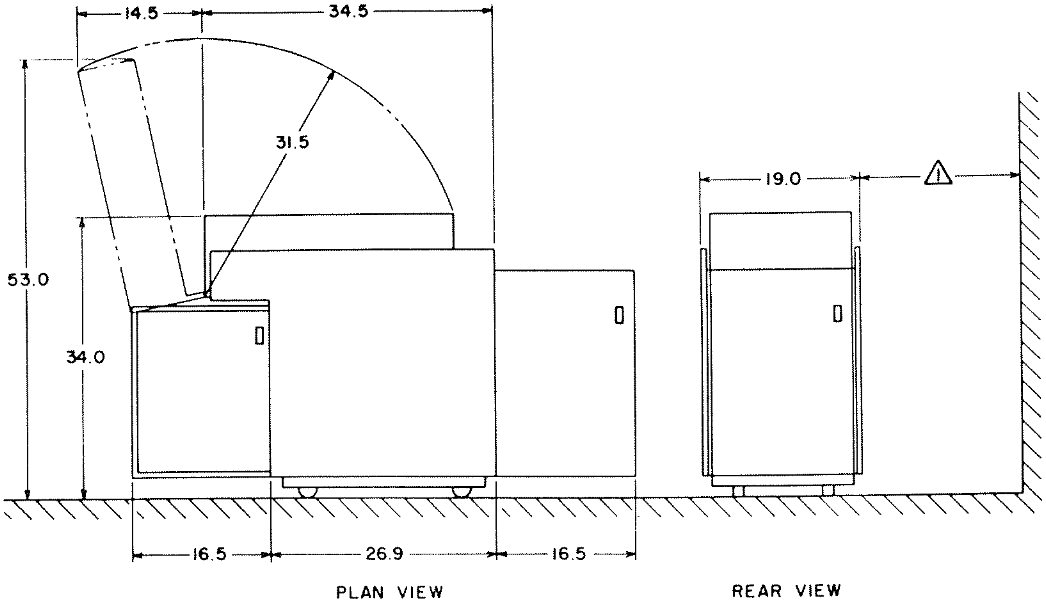
Figure 1-6. Line Current vs Start Up Time

Earth ground at the site may be available at the main power distribution panel (if it is connected to building ground), at the steel plate in contact with the masonry below the panel (if the panel is not connected to earth ground), or to an earth ground bus. Connect one end of a prepared ground strap to the available ground.

Connect remainder of grounds as follows:

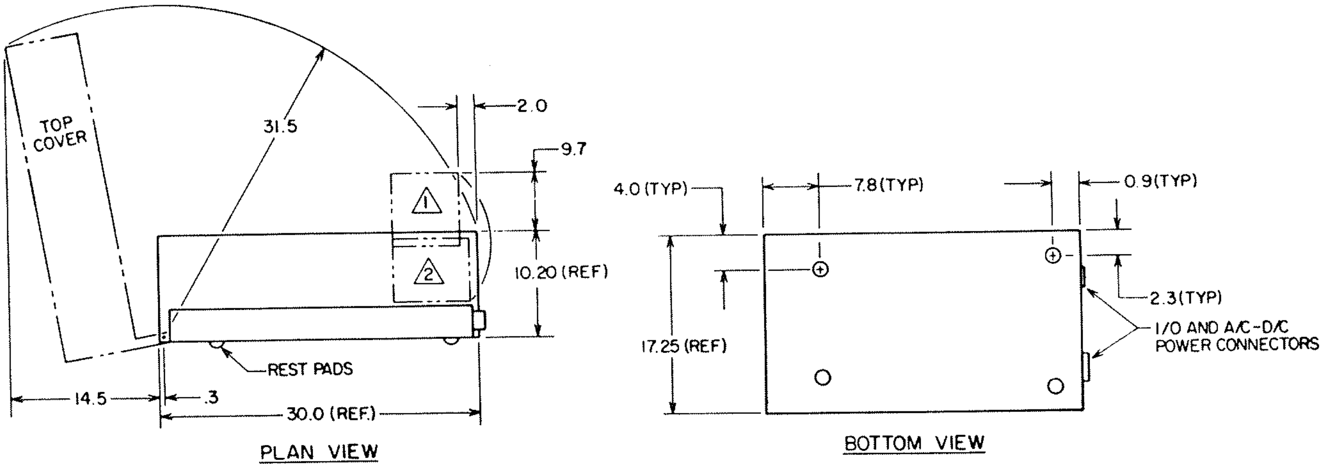
1. Grounding terminal is mounted at the rear of unit, above the AC power cord.

2. Attach two ground straps to this screw. One strap will go to each of the two closest drives. Tighten screws.



NOTE: △1 IF NEXT OBSTACLE (WALL OR OTHER EQUIPMENT) IS GREATER THAN 34 INCHES HIGH, THEN A MINIMUM SERVICE AREA OF 19 INCHES IS REQUIRED FOR MAINTENANCE, MEASURED FROM THE REAR TO THE RIGHT SIDE OF THE UNIT.

CABINET MOUNT DETAIL



△1 LOGIC CHASSIS OPEN POSITION
△2 LOGIC CHASSIS CLOSED POSITION

9F19

Figure 1-7. Desk and Cabinet (non-acoustic) Mount Space Requirements

3. Repeat step 2 for remaining drives. Drive closest to controller is to be connected to controller ground.

4. Connect controller to earth ground.

Floor Grid Available

If a floor grid is available (schemes 1 or 2), each drive is to be individually connected to the floor grid. Ground each drive as follows:

1. Grounding terminal is mounted at the rear of unit, above the AC power cord. Route braided strap with free end into floor cutout.

2. Drill 11/32-inch hole in grid.

3. Secure strap lug to grid using screw (pn 17901524) and lockwasher (pn 10126403). Lockwasher goes under terminal lug.

Floor Grid Not Available

If a floor grid is not available, all of the drives must be connected to the controller in a daisy chain grounding configuration. In turn, the controller must be connected to earth ground.

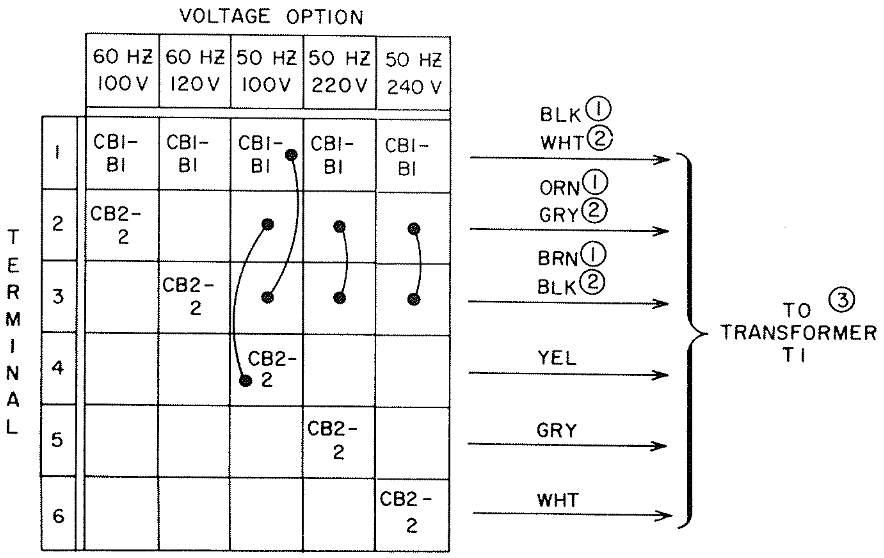
The ground connections are via flat braided shielding (pn 93267009). Cut this shielding to the lengths required to go from drive to drive, drive to controller, and controller to earth ground. Crimp and solder a terminal lug (pn 40125601) to the end of each strap.

AC POWER CONNECTIONS

Each drive receives its ac power via a 12-foot cable. This cable originates from line filter FL1 located in the rear of the drive below the power supply.

The 220/240 vac, 50 Hz unit does not have an ac power connector, install connector to power cable as follows: green (or green with yellow stripe) to ac equipment ground, brown to phase one, and blue to neutral. The green wire is the safety ground. It is not to be used as neutral as it is a non-current carrying ground.

Input power is available at AITB1. This terminal board is located under the deck and ahead of the transformer, it is accessable by raising the deck. The drive is adapted to the desired input voltage option by rewiring AITB1 according to figure 1-8.



NOTES:
① WIRE COLOR FOR 50 HZ UNITS.
② WIRE COLOR FOR 60 HZ UNITS.
③ REFER TO SECTION 5—BASE ASSY W/L.
4 ●—● INDICATES JUMPER WIRE.

9D31B

Figure 1-8. AITB1 Input Wiring

SIGNAL CABLING

Each drive connects to the controller via two cables. These are designated the A cable and the B cable. Refer to figure 1-8.1 (A cable requirements) and 1.8.2 (B cable requirements).

The B cable always connects directly to the controller. However, if more than one drive is involved in the system, the A cable may be either star or daisy chain connected. Figure 1-9 shows both configurations.

When connected in a star configuration, each drive A cable connects directly to the controller and the extra A cable connector (used for daisy chaining) is terminated.

When connected in a daisy chain, the drives are connected as shown in figure 1-9 . In this case, only the A cable of the first drive in the chain connects directly to the controller, and the others connect via the daisy chain. The last drive in the chain is left with an extra A cable connector and this is terminated.

Figure 1-10 shows a possible method of routing the cables within the cabinet. This figure shows the cabinet with a drawer mounted drive installed and the two drives connected in a daisy chain configuration. If the drives were connected in a star configuration the extra A cable connectors (J4) would be terminated.

For a list of cable and accessory part numbers, refer to table 1-2.

+ UNIT SELECT TAG	25
- UNIT SELECT TAG	22
+ UNIT SELECT BIT 0	44
- UNIT SELECT BIT 0	1
+ UNIT SELECT BIT 1	5
- UNIT SELECT BIT 1	2
+ UNIT SELECT BIT 2	7
- UNIT SELECT BIT 2	3
+ UNIT SELECT BIT 3	12
- UNIT SELECT BIT 3	8
+ TAG 1	49
- TAG 1	46
+ TAG 2	51
- TAG 2	48
+ TAG 3	55
- TAG 3	52
+ BIT 0	26
- BIT 0	23
+ BIT 1	27
- BIT 1	24
+ BIT 2	31
- BIT 2	28
+ BIT 3	32
- BIT 3	29
+ BIT 4	33
- BIT 4	30
+ BIT 5	37
- BIT 5	34
+ BIT 6	38
- BIT 6	35
+ BIT 7	39
- BIT 7	36
+ BIT 8	43
- BIT 8	40
+ BIT 9	44
- BIT 9	41
+ OPEN CABLE DETECTOR	20
- OPEN CABLE DETECTOR	16
+ INDEX △1	13
- INDEX △1	10
+ SECTOR △1	77
- SECTOR △1	74
+ FAULT	14
- FAULT	11
+ SEEK ERROR	78
- SEEK ERROR	75
+ ON CYLINDER	18
- ON CYLINDER	15
+ UNIT READY	21
- UNIT READY	17
+ ADDRESS MARK	45
- ADDRESS MARK	42
+ WRITE PROTECT	56
- WRITE PROTECT	53
- POWER SEQUENCE HOLD	73
- SEQUENCE PICK IN	76

MATES
WITH
DRIVE

NOTES:

△1 MAY BE ON B CABLE, DEPENDING ON OPTION.

9F26

Figure 1-8.1, A Cable Requirements

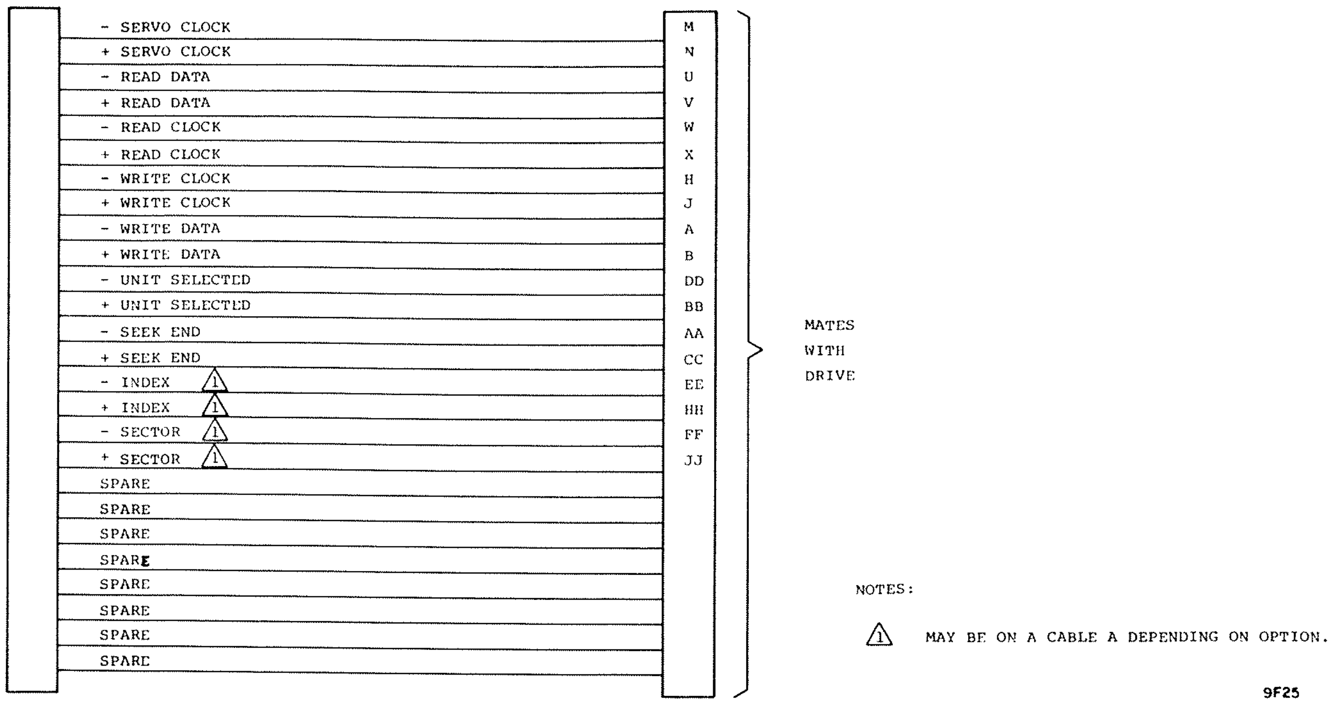


Figure 1-8.2. B Cable Requirements

TABLE 1-2. ACCESSORIES

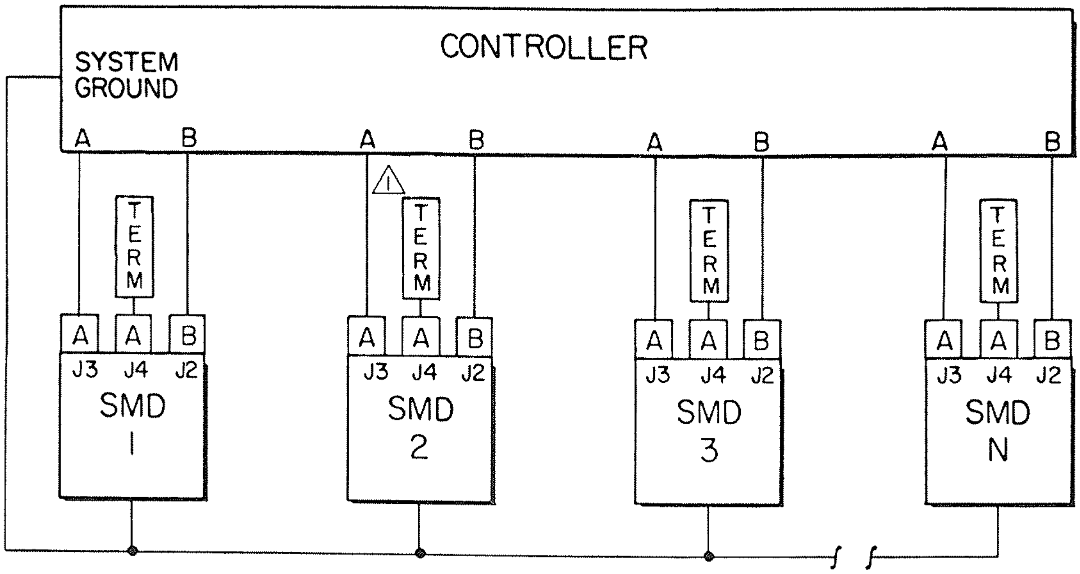
Cable and Accessories List

Cable Length	A Cable * (Shielded)	A Cable (Unshielded)	B Cable * (Shielded)	B Cable (Unshielded)
1.53 m (5 ft)	77569702	77439102	47201700	75141300
3.05 m (10 ft)	77569703	77439103	47201701	75241301
4.58 m (15 ft)	77569704	77439104	47201702	75241302
6.10 m (20 ft)	77569705	77439105	47201703	75241303
7.63 m (25 ft)	77569706	77439106	47201713	75241313
9.16 m (30 ft)	77569707	77439107	47201704	75241304
12.2 m (40 ft)	77569708	77439108	47201714	75241314
15.3 m (50 ft)	77569709	77439109	47201705	75241305

I/O Plug Terminator - Part Number 40067209

A Cable Straight-In Kit - Part Number 95050700**

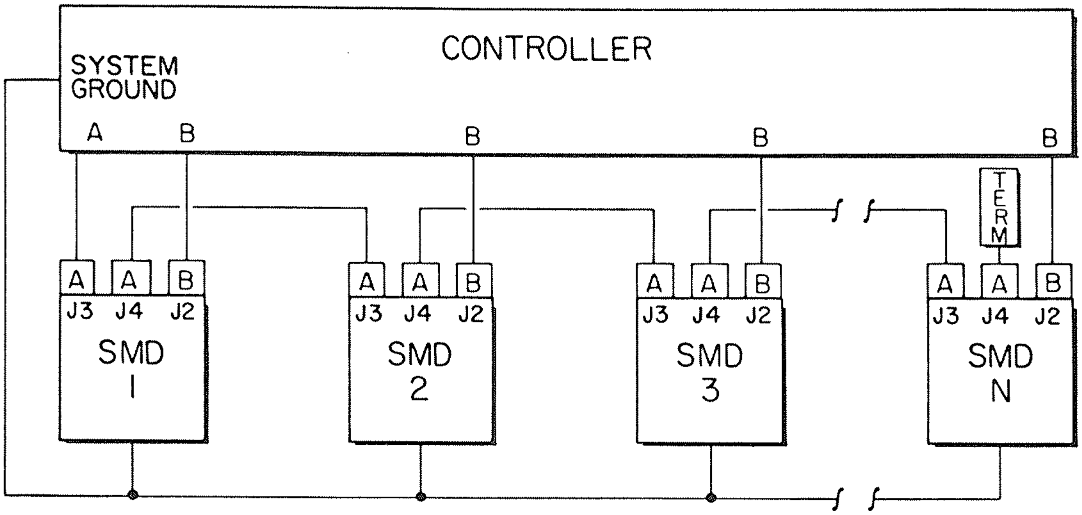
Notes:
* Shielded A and B cables are used in high noise enviroments.
** Kit used to modify 90° connector (standard on factory units) to 180° connector.



STAR-CABLED SYSTEM

MAXIMUM INDIVIDUAL A AND B CABLE LENGTHS = 100 FT.

⚠ TERMINATORS NOT REQUIRED ON OLDER UNITS WHICH HAVE TERMINATORS ON RECEIVER CARDS.



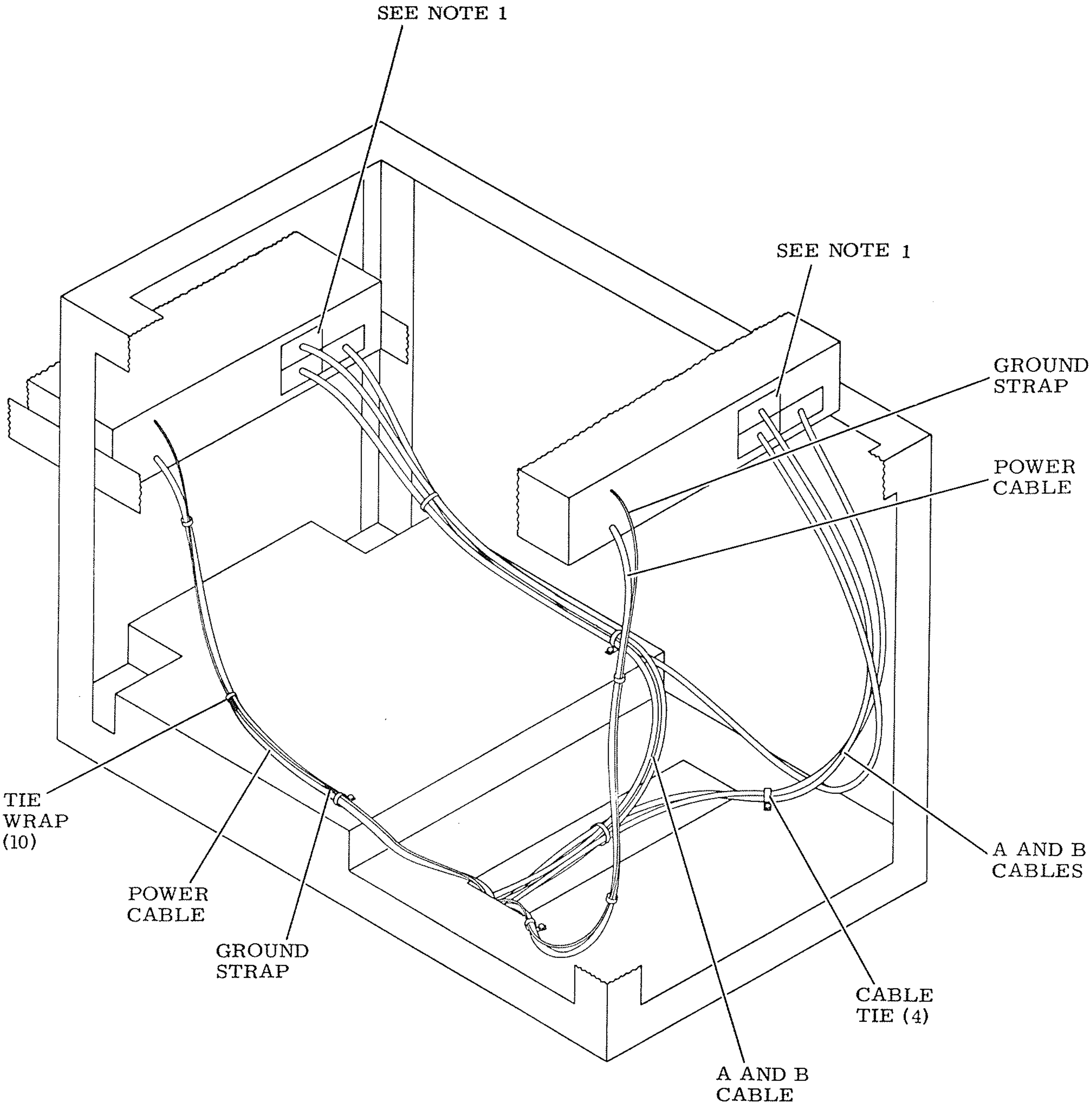
DAISY CHAIN-CABLED SYSTEM

MAXIMUM CUMULATIVE A CABLE LENGTH = 100 FT.*
MAXIMUM INDIVIDUAL B CABLE LENGTH = 100 FT.

*EXCLUDES INTERNAL DRIVE CABLE.

9F16

Figure 1-9. System Cabling



NOTES:

1. REPLACED BY TERMINATOR IF IT IS LAST DRIVE IN DAISY CHAIN OR STAR CONNECTED.

9D33D

Figure 1-10. Basic Cable Routing with Drawer Mount

SECTOR PLUG INSTALLATION
(S/C 08 and Blw)

The number of sector pulses generated by the drive for each revolution of the disk pack depends on the configuration of its sector plug. This plug is installed on the logic backpanel at card location A03 and its terminals have a one to one correspondence with the backpanel pins. This means that terminal 1A on the plug connects to pin 1A on the backpanel and so on.

The plug furnishes preset inputs to the drives sector counter and table 1-3 shows the binary value of each sector plug terminal. The drive comes from the factory with its sector plug prewired for 64 sectors. If a different number of sectors is desired, it is necessary to rewire the plug.

Prior to rewiring the plug, the correct preset value for the counter must be determined. This is done using the following formula (refer to Publication Number 83317300 for more information).

4096 - Length of Sector = Preset Value

Where: length of sector

13440 (total dibits per revolution)
Number of Desired Sectors

Depending on the number of sectors desired, the sector length may or may not come out evenly (without a remainder). How this is taken into account when using the formula is explained in the following examples.

EXAMPLE 1:

a. 64 sectors are desired so sector length is: 13440/64 which equals 210. This means there will be 64 sectors each with 210 dibits in length.

b. Substituting into the preset value formula: 4096 - 210 = 3886.

c. Referring to table 1-3, the plug is wired as follows:

2B(2^{11})	Should	8B(2^7)	Should
2A(2^{10})	be a	8A(2^6)	be a
3B(2^9)	logical	9A(2^4)	logical
3A(2^8)	one and	15B(2^0)	zero and
9B(2^5)	connect	210	connect
13A(2^3)	to		to
14B(2^2)	terminal		terminal
14A(2^1)	5A (+5V)		1A (GND)
3886			

EXAMPLE 2:

a. 71 sectors are desired so sector length is: 13440/71 which equals 189 with a remainder of 21. This means there will be 71 sectors each 189 dibits in length and one sector (the last before index) 21 dibits in length.

b. Substituting into the preset value formula (note that the remainder of 21 is not used): 4096 - 189 = 3907.

c. In this case the sector plug should be wired to preset the counter to 3907. The correct wiring is determined using table 1-3 (refer to example 1).

The procedure for wiring the sector plug is as follows (refer to figure 1-11 and table 1-3):

1. Remove the existing jumper wires from the plug.
2. Compute the desired sector length and preset value then determine the proper wiring by referring to table 1-3.

NOTE

In steps 3 and 4, use 24 AWG wire of the correct length with a contact crimped to each end. Refer to figure 1-11 for details.

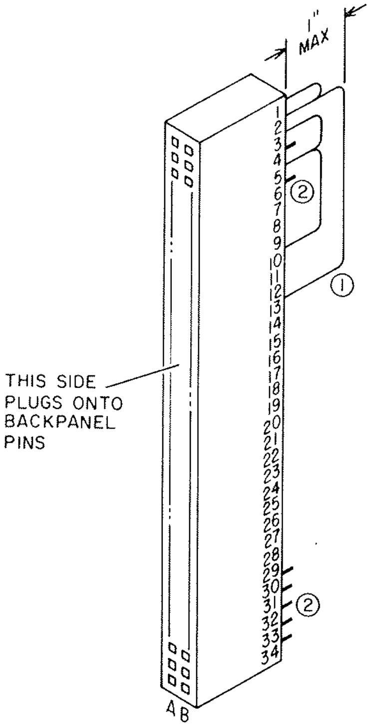
3. Daisy chain together all the terminals that are to be a logical one and connect the daisy chain to terminal 5A (+5V).

TABLE 1-3. SECTOR PLUG WIRING

Plug Terminal	2B	2A	3B	3A	8B	8A	9B	9A	13A	14B	14A	15B
Binary Value	2^{11}	2^{10}	2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
Decimal Value	2048	1024	512	256	128	64	32	16	8	4	2	1
NOTE: Those terminals to be set to a logical one should be connected to terminal 5A (+5V). Those terminals to be set to a logical zero should be connected to plug terminal 1A (gnd).												

4. Daisy chain together all the terminals that are to be a logical zero and connect the daisy chain to terminal 1A (ground).

5. Insert a wire and contact pin into all unused terminals in rows 1 through 6 and rows 30 through 34 (refer to figure 1-11).



NOTES:

① JUMPER WIRE IS 24 AWG (CDC PN 24548305) AND HAS A CONTACT (CDC PN 94245607) CRIMPED ONTO EACH END.

② INSERT WIRE AND CONTACT (CRIMPED TOGETHER) INTO UNUSED TERMINALS IN ROWS 1-6 AND 30-34.

3. TERMINAL 5A CONNECTS TO +5V ON BACKPANEL AND TERMINAL 1A CONNECTS TO GND ON BACKPANEL.

9D35

Figure 1-11. Sector Plug Installation

SETTING SECTOR SELECT SWITCHES (S/C 08 and Above)

The number of sectors per revolution generated by the drive logic must be matched to that required by the controller. Therefore, sector select switches are provided in the drive logic to allow selection of different sector counts. These switches are located on logic card A03 and appear as shown in figure 1-11.1.

Refer to the subsystem reference manual to determine the number of sectors required by the controller; and then locate that number in table 1-4. Across from the number of sectors listed in the table is a row of Cs and Os. C represents the Closed or On position of the sector switch. O represents the Open or Off position of the sector switch. Set the switches to the positions designated in the table while referring to figure 1-11.1 for an illustration of the switch positions.

The switch settings listed in table 1-4 have been determined from a formula. Use of this formula is demonstrated below to provide the userwith an additional tool for determining sector switch settings.

Each sector will contain a certain number of dibits (received from the servo tracks). The number of dibits in each sector is the result of the number of sectors required by the controller. Thus:

$$\text{Total Dibits per Sector} = \frac{13\ 440}{\text{Number of Sectors}} - 1$$

NOTE

Ignore any remainder in the calculation. However, the existence of a remainder adds a "short" sector before index.

Each sector switch represents a binary and decimal value of dibits (as counted in the logic). The values related to each switch are as follows:

Switch No.	Binary Value	Decimal Value
0	2^0	1
1	2^1	2
2	2^2	4
3	2^3	8
4	2^4	16
5	2^5	32
6	2^6	64
7	2^7	128
8	2^8	256
9	2^9	512
10	2^{10}	1024
11	2^{11}	2048

Here is an example of determining the switch settings for selecting 63 sectors:

$$\text{Total Dibits per Sector} = \frac{13\ 440}{63} - 1 = 212$$

NOTE

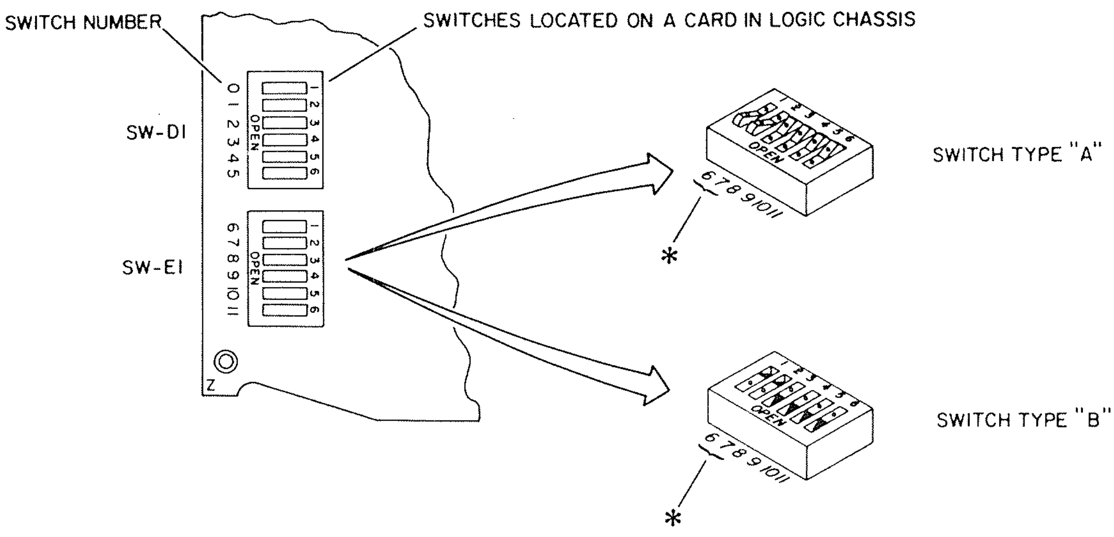
Remainder is ignored.

Determine which switches to place in the Closed or On position as follows:

Total Dibits per sector	212
Dibits selected by switch 7	128
(Difference)	84
Dibits selected by switch 6	64
(Difference)	20
Dibits selected by switch 4	16
(Difference)	4
Dibits selected by switch 2	4
(Difference)	0

Thus, placing switches 2, 4, 6, and 7 in the Closed or On position selects 63 sectors of 212 dibits per sector. Since a remainder existed in the calculation formula, an additional "short" sector of 21 Sector Clock Pulses (806 kHz) will be present just before index.

ROCKER-TYPE SWITCHES

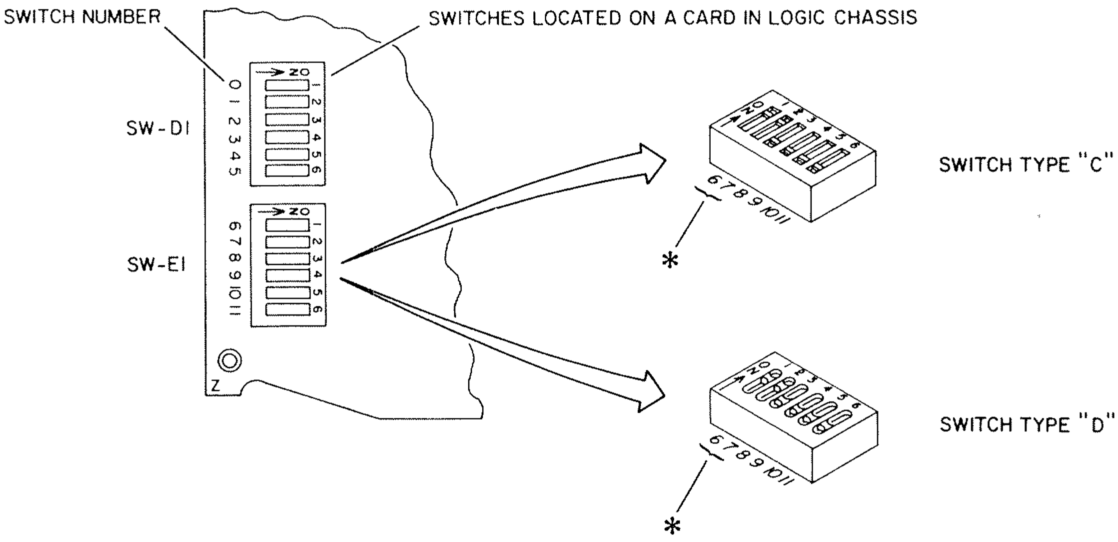


ROCKER-TYPE SWITCHES:

TO ACTUATE A SWITCH TO ITS CLOSED POSITION,
PRESS ON END OF SWITCH FARTHEST FROM "OPEN" LETTERING.

* SWITCHES 6 AND 7 SHOWN IN CLOSED POSITION.

SLIDE-TYPE SWITCHES



SLIDE-TYPE SWITCHES:

TO ACTUATE A SWITCH TO ITS ON POSITION,
SLIDE SWITCH IN DIRECTION OF ARROW SHOWN ON SWITCH.

* SWITCHES 6 AND 7 SHOWN IN ON POSITION.

9H10A

Figure 1-11.1. Sector Select Switches

TABLE 1-4. SECTOR SELECT SWITCH SETTINGS

Number of Sectors	Switch Number												Number of Sectors	Switch Number											
	0	1	2	3	4	5	6	7	8	9	10	11		0	1	2	3	4	5	6	7	8	9	10	11
4	C	C	C	C	C	O	O	O	C	O	C	C	36	O	O	C	O	C	C	C	O	C	O	O	O
5	C	C	C	C	C	C	C	O	O	C	O	C	37	O	C	O	C	O	C	C	O	C	O	O	O
6	C	C	C	C	C	C	O	C	O	O	O	C	38	O	O	O	O	O	C	C	O	C	O	O	O
7	C	C	C	C	C	C	C	O	C	C	C	O	39	C	C	C	O	C	O	C	O	C	O	O	O
8	C	C	C	C	O	O	O	C	O	C	C	O	40	C	C	C	C	O	O	C	O	C	O	O	O
9	O	O	C	O	C	O	C	C	C	O	C	O	41	O	C	C	O	O	O	C	O	C	O	O	O
10	C	C	C	C	C	C	O	O	C	O	C	O	42	C	C	C	C	C	C	O	O	C	O	O	O
11	O	O	C	O	O	O	C	C	O	O	C	O	43	C	C	C	O	C	C	O	O	C	O	O	O
12	C	C	C	C	C	O	C	O	O	O	C	O	44	O	O	O	O	C	C	O	O	C	O	O	O
13	O	O	O	C	O	O	O	O	O	O	C	O	45	C	O	O	C	O	C	O	O	C	O	O	O
14	C	C	C	C	C	C	O	C	C	C	O	O	46	C	C	O	O	O	C	O	O	C	O	O	O
15	C	C	C	C	C	C	C	O	C	C	O	O	47	O	O	C	C	C	O	O	O	C	O	O	O
16	C	C	C	O	O	O	C	O	C	C	O	O	48	C	C	C	O	C	O	O	O	C	O	O	O
17	C	O	C	O	C	O	O	O	C	C	O	O	49	C	O	O	O	C	O	O	O	C	O	O	O
18	C	O	O	C	O	C	C	C	O	C	O	O	50	C	C	O	C	O	O	O	O	C	O	O	O
19	O	C	O	O	O	O	C	C	O	C	O	O	51	O	C	C	O	O	O	O	O	C	O	O	O
20	C	C	C	C	C	O	O	C	O	C	O	O	52	C	O	O	O	O	O	O	O	C	O	O	O
21	C	C	C	C	C	C	C	O	O	C	O	O	53	O	O	C	C	C	C	C	C	O	O	O	O
22	C	O	O	O	O	C	C	O	O	C	O	O	54	C	C	C	O	C	C	C	C	O	O	O	O
23	C	C	C	O	O	O	C	O	O	C	O	O	55	C	C	O	O	C	C	C	C	O	O	O	O
24	C	C	C	C	O	C	O	O	O	C	O	O	56	C	C	C	C	O	C	C	C	O	O	O	O
25	O	O	O	C	C	O	O	O	O	C	O	O	57	O	C	O	C	O	C	C	C	O	O	O	O
26	C	C	O	O	O	O	O	O	O	C	O	O	58	O	C	C	O	O	C	C	C	O	O	O	O
27	O	O	O	O	C	C	C	C	C	O	O	O	59	O	C	O	O	O	C	C	C	O	O	O	O
28	C	C	C	C	C	O	C	C	C	O	O	O	60	C	C	C	C	C	O	C	C	O	O	O	O
29	O	C	C	C	O	O	C	C	C	O	O	O	61	C	C	O	C	C	O	C	C	O	O	O	O
30	C	C	C	C	C	C	O	C	C	O	O	O	62	C	C	C	O	C	O	C	C	O	O	O	O
31	O	O	O	O	C	C	O	C	C	O	O	O	63	O	O	C	O	C	O	C	C	O	O	O	O
32	C	C	O	O	O	C	O	C	C	O	O	O	64	C	O	O	O	C	O	C	C	O	O	O	O
33	O	C	C	O	C	O	O	C	C	O	O	O	65	C	O	C	C	O	O	C	C	O	O	O	O
34	O	C	O	C	O	O	O	C	C	O	O	O	66	O	C	O	C	O	O	C	C	O	O	O	O
35	C	C	C	C	C	C	C	O	C	O	O	O	67	C	C	C	O	O	O	C	C	O	O	O	O

Note: C = Closed or On position; O = Open or Off position.

Table continued on next page

TABLE 1-4. SECTOR SELECT SWITCH SETTINGS (Contd)

Number of Sectors	Switch Number												Number of Sectors	Switch Number											
	0	1	2	3	4	5	6	7	8	9	10	11		0	1	2	3	4	5	6	7	8	9	10	11
68	O	O	C	O	O	O	C	C	O	O	O	O	99	O	C	C	O	O	O	O	C	O	O	O	O
69	C	O	O	O	O	O	C	C	O	O	O	O	100	C	O	C	O	O	O	O	C	O	O	O	O
70	C	C	C	C	C	C	O	C	O	O	O	O	101	O	O	C	O	O	O	O	C	O	O	O	O
71	O	O	C	C	C	C	O	C	O	O	O	O	102	O	C	O	O	O	O	O	C	O	O	O	O
72	C	O	O	C	C	C	O	C	O	O	O	O	103	C	O	O	O	O	O	O	C	O	O	O	O
73	C	C	C	O	C	C	O	C	O	O	O	O	104	O	O	O	O	O	O	O	C	O	O	O	O
74	O	O	C	O	C	C	O	C	O	O	O	O	105	C	C	C	C	C	C	C	O	O	O	O	O
75	O	C	O	O	C	C	O	C	O	O	O	O	106	C	O	C	C	C	C	C	O	O	O	O	O
76	C	C	C	C	O	C	O	C	O	O	O	O	107	O	O	C	C	C	C	C	O	O	O	O	O
77	C	O	C	C	O	C	O	C	O	O	O	O	108	C	C	O	C	C	C	C	O	O	O	O	O
78	C	C	O	C	O	C	O	C	O	O	O	O	109	O	C	O	C	C	C	C	O	O	O	O	O
79	C	O	O	C	O	C	O	C	O	O	O	O	110	C	O	O	C	C	C	C	O	O	O	O	O
80	C	C	C	O	O	C	O	C	O	O	O	O	111	O	O	O	C	C	C	C	O	O	O	O	O
81	O	O	C	O	O	C	O	C	O	O	O	O	112	C	C	C	O	C	C	C	O	O	O	O	O
82	O	C	O	O	O	C	O	C	O	O	O	O	113	C	O	C	O	C	C	C	O	O	O	O	O
83	O	O	O	O	O	C	O	C	O	O	O	O	114	O	O	C	O	C	C	C	O	O	O	O	O
84	C	C	C	C	C	O	O	C	O	O	O	O	115	C	C	O	O	C	C	C	O	O	O	O	O
85	C	O	C	C	C	O	O	C	O	O	O	O	116	O	C	O	O	C	C	C	O	O	O	O	O
86	C	C	O	C	C	O	O	C	O	O	O	O	117	C	O	O	O	C	C	C	O	O	O	O	O
87	C	O	O	C	C	O	O	C	O	O	O	O	118	O	O	O	O	C	C	C	O	O	O	O	O
88	C	C	C	O	C	O	O	C	O	O	O	O	119	C	C	C	C	O	C	C	O	O	O	O	O
89	O	C	C	O	C	O	O	C	O	O	O	O	120	C	C	C	C	O	C	C	O	O	O	O	O
90	O	O	C	O	C	O	O	C	O	O	O	O	121	O	C	C	C	O	C	C	O	O	O	O	O
91	O	C	O	O	C	O	O	C	O	O	O	O	122	C	O	C	C	O	C	C	O	O	O	O	O
92	C	O	O	O	C	O	O	C	O	O	O	O	123	O	O	C	C	O	C	C	O	O	O	O	O
93	C	C	C	C	O	O	O	C	O	O	O	O	124	C	C	O	C	O	C	C	O	O	O	O	O
94	C	O	C	C	O	O	O	C	O	O	O	O	125	O	C	O	C	O	C	C	O	O	O	O	O
95	O	O	C	C	O	O	O	C	O	O	O	O	126	C	O	O	C	O	C	C	O	O	O	O	O
96	C	C	O	C	O	O	O	C	O	O	O	O	127	O	O	O	C	O	C	C	O	O	O	O	O
97	C	O	O	C	O	O	O	C	O	O	O	O	128	O	O	O	C	O	C	C	O	O	O	O	O
98	O	O	O	C	O	O	O	C	O	O	O	O													

Note: C = Closed or On position; O = Open or Off position.

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DRAWER MOUNT INSTALLATION

Perform the following procedure to install the drawer mounted drive into an acoustic cabinet. It is assumed that all power, ground and signal cables have been removed from the top mounted drive. Figure 1-12 shows the cabinet as it appears before the installation and indicated the parts that have to be removed before the drawer mount drive can be installed.

1. Remove and discard front door and its associated hardware from drive cabinet as follows (refer to figure 1-12).
   a. Remove ground strap.
   b. Lift out release pin from lower hinge and remove door.
   c. Remove both upper and lower hinges from drive cabinet.
   d. Remove front door latch.
2. Remove and discard rear door as follows:
   a. Disconnect ground strap from door.
   b. Disconnect fan cable from door.
   c. Lift out release pin from lower hinge and remove door.
3. Remove left and right side panels as follows:
   a. Remove ground strap.
   b. Loosen two quarter turn fasteners and lift side panel off.

      NOTE

      A convenient support for ballast installation is made by laying two, 2-inch by 4-inch boards on floor (2-inch edge against floor) and covering them with a piece of 1/2-inch plywood.
4. Position ballast beneath frame and attach ballast to underside of cabinet floor using four flat washers, lock washers, and screws. See figure 1-14.
5. Refer to figure 1-14 and install upper and lower front panels. Connect ground strap to lower front panel.
6. Loosely install catches using two flat washers, lock washers and screws for each. Position keeper latches so that distance from cut out to bottom of keeper latch is less than distance from cut out to top of keeper latch.
7. Perform Slide Assembly Installation procedure.
8. Install case assembly on drive.
9. Slide drive to its closed position and tighten hardware securing keeper latches. This ensures that keeper latches are properly aligned to case.
10. Install the I/O cables (refer to discussion on signal cabling).
11. Connect the power wiring and ground the drive (refer to discussion on power wiring).
12. Install new rear door as follows:
    a. Place door on hinges and install release pin.
    b. Install ground strap disconnected from old door in step 2 (refer to figure 1-15).
    c. Connect fan cable disconnected from old door in step 2 (refer to figure 1-15).
13. Replace side panels by reversing the procedure of step 3.
14. Proceed to initial checkout and startup of the drive (refer to discussion on initial checkout and startup).

RACK MOUNT OPTION INSTALLATION

GENERAL

The rack mount option enables the standard SMD base assembly (with special case assembly) to be mounted in a 19-inch standard EIA rack. The depth of this type of rack shall be 36 inches minimum. The features of this type of mounting are:

- Slides have built-in stop (at 22 inches) in the pack access position.
- Slides have built-in locks (at 32 inches) in the maintenance position.

ASSEMBLY INSTRUCTIONS

1. Perform Slide Assembly Installation procedure.
2. Loosely install right and left keeper latches using two screws each. Orient keeper latches so that short leg of each keeper latch protrudes in the lowest position (protruding leg then forms bottom of L-shaped keeper latch).

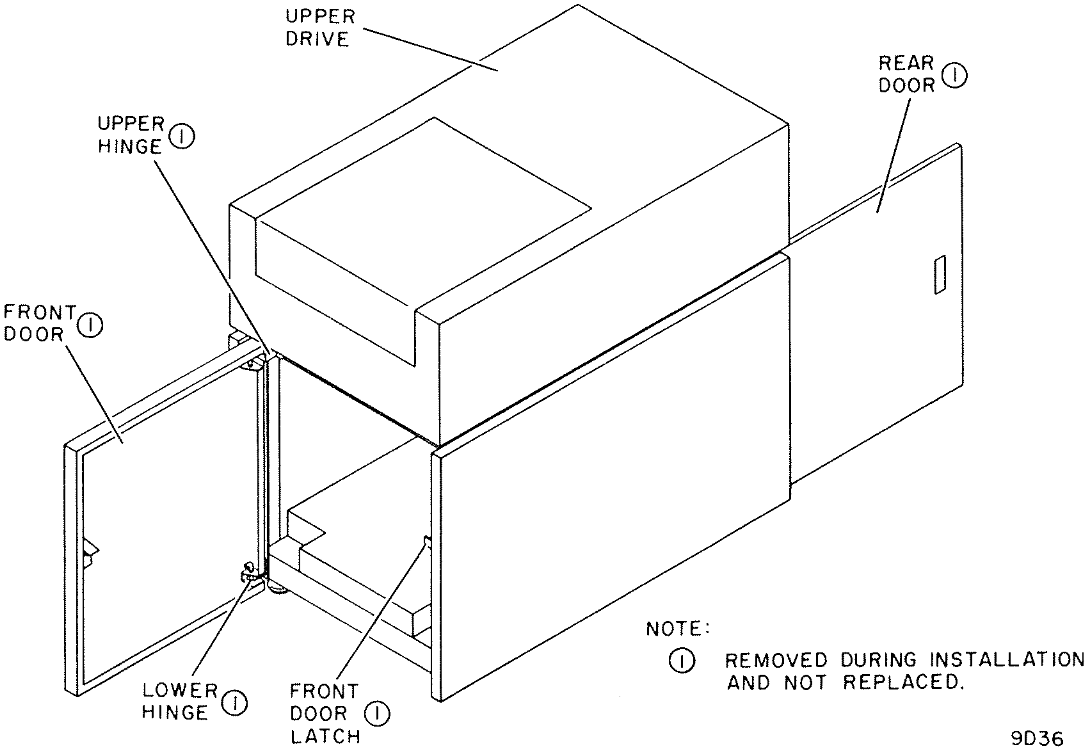


Figure 1-12. Cabinet Before Drawer Mount Installation

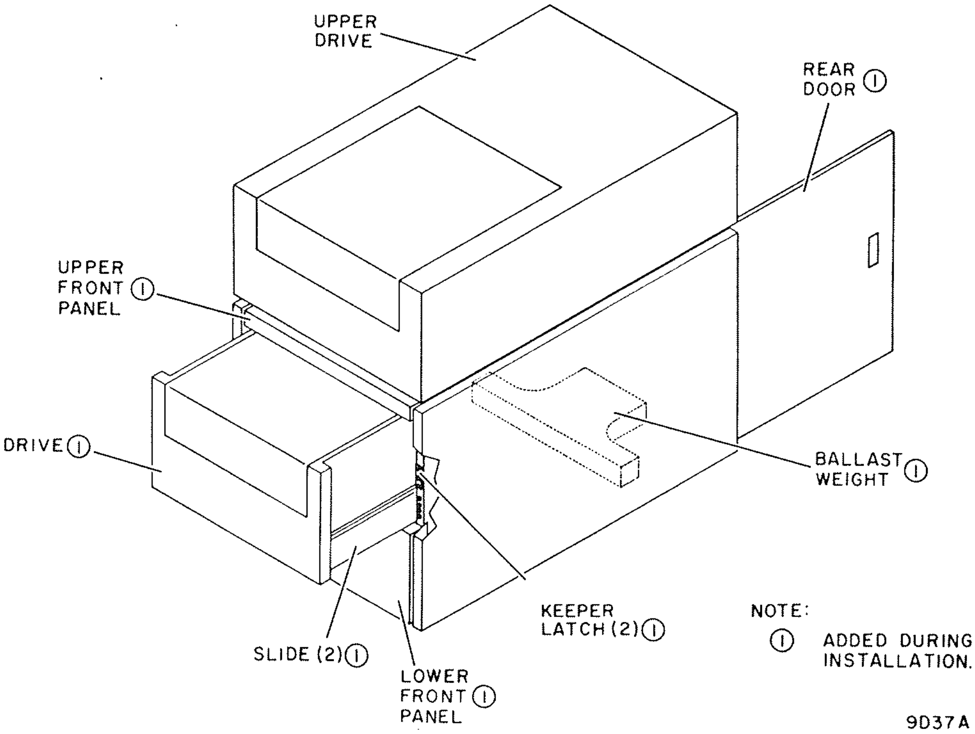


Figure 1-13. Cabinet After Drawer Mount Installation

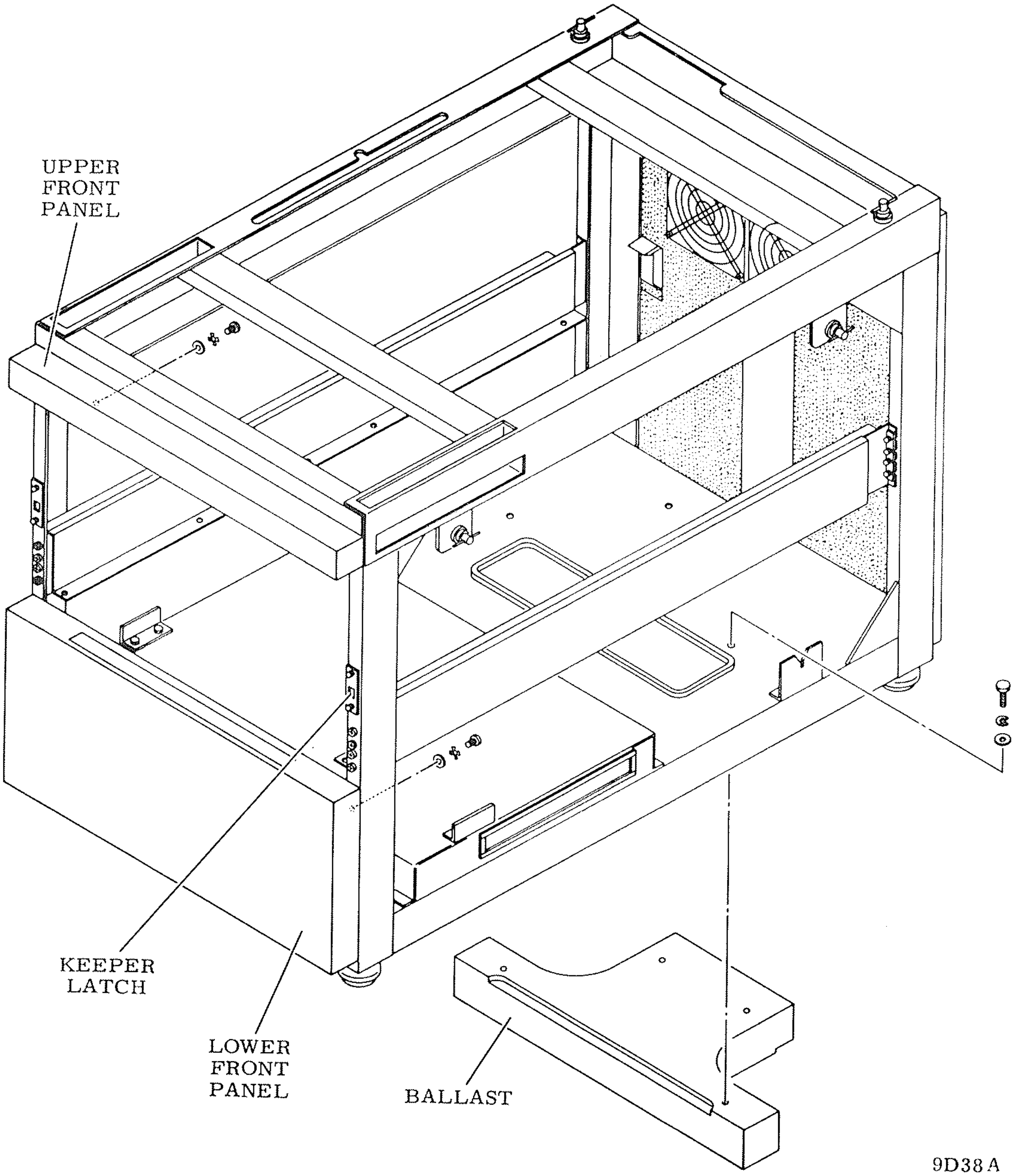


Figure 1-14. Ballast and Front Panel Installation

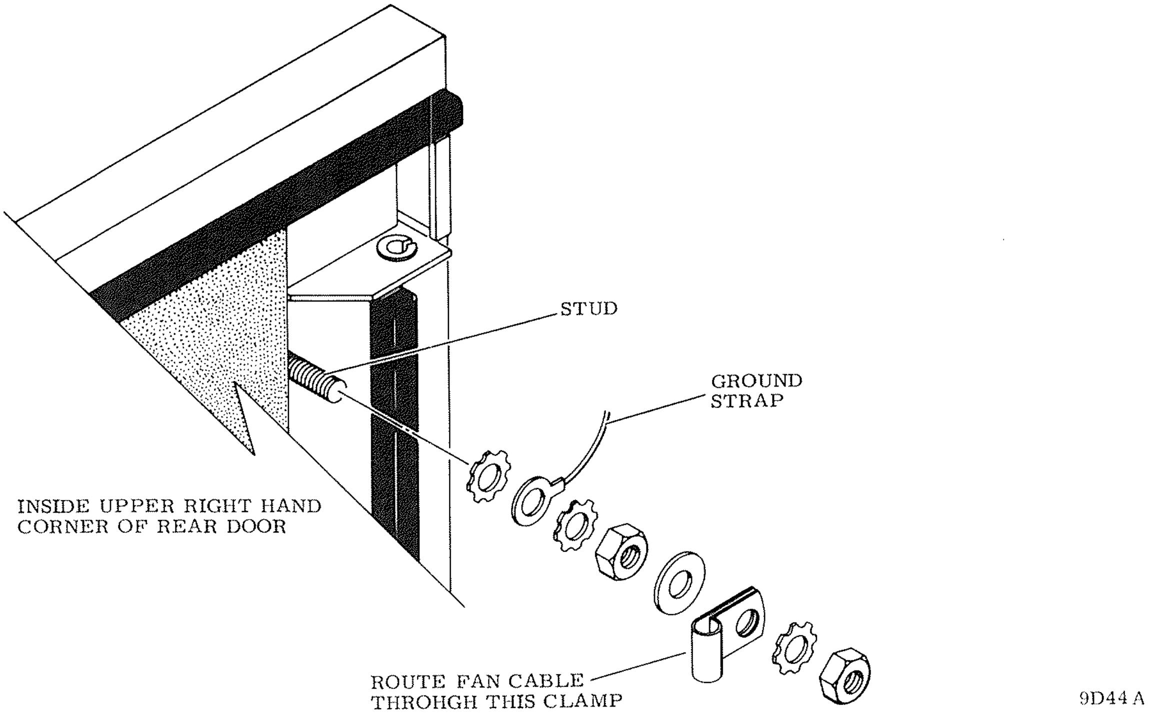


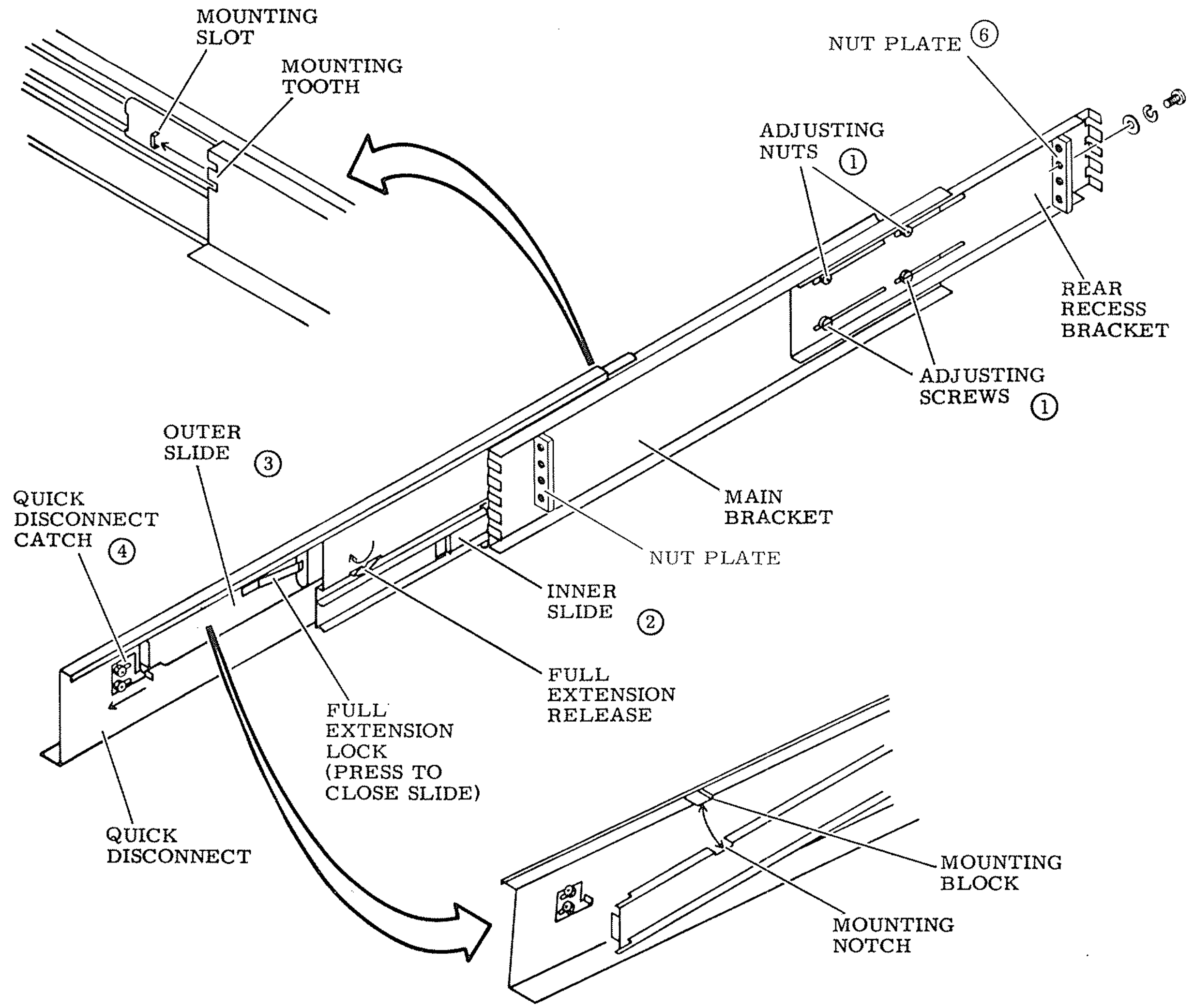
Figure 1-15. Rear Door Ground/Fan Cable Installation

3. Install case assembly on drive.
4. Slide drive to its closed position and tighten hardware securing keeper latches. This ensures that keeper latches are properly aligned to case.

SLIDE ASSEMBLIES INSTALLATION

Install slide assemblies as follows:

1. Loosen adjusting screws and nuts securing rear recess bracket to main bracket so that slide assembly can be adjusted. Refer to figure 1-16.
2. Push brackets into fully closed position.
3. Loosely attach nut plates to frame using four screws and lock washers each.
4. Extend main and rear recess brackets of slide assembly and place slotted ends of brackets between nut plates and frame. Slide assemblies must be positioned with quick disconnect flanges at bottom and facing each other.
5. Ensure that slide assemblies are aligned and parallel, then tighten mounting hardware securing each end of slide assemblies to frame.
6. Extend slide assemblies to full extension as follows (refer to figure 1-16). Pull out inner slide until it stops, then depress full extension release and extend outer slide until it locks in fully extended position.
7. Loosen two nuts securing each quick disconnect keeper latch and then slide keeper latch forward. See direction arrow in figure 1-16.
8. Lift quick disconnect enough to disengage mounting block (on disconnect) from mounting notch (on slide), then pull quick disconnect forward until mounting tooth slips out of mounting slot.
9. If drive has mounting pads on the bottom, remove them.



NOTES:

① ALLOW REAR RECESS BRACKET ADJUSTMENT.

② LOCKS IN EXTENDED POSITION WHEN OUTER SLIDE IS FULLY EXTENDED.

③ EXTENDED BY PRESSING FULL EXTENSION RELEASE. FULL EXTENSION LOCK SNAPS OUT WHEN THIS SLIDE IS FULLY EXTENDED.

④ LOOSENING NUTS ALLOWS CATCH TO MOVE IN DIRECTION OF ARROW THUS ALLOWING QUICK DISCONNECT TO BE REMOVED.

5 ASSEMBLY SHOWN IS FOR RIGHT SIDE OF DRIVE.

⑥ NUT PLATES, WHICH ARE FURNISHED WITH SLIDE, ARE SUPPLIED WITH EITHER HOLES CENTERED IN THE NUT PLATE OR HOLES OFFSET FROM THE CENTER OF THE NUT PLATE. ON NUT PLATES WITH OFFSET HOLES, INSTALL NUT PLATES SO HOLES ARE CLOSED TO THE BRACKETS.

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Figure 1-16. Slide Assembly

NOTE

For ease of assembly and to prevent damage to case assembly, remove case before installing drive on slide assemblies.

10. Using four countersunk flat-head screws and countersunk washers on each side, attach quick disconnects to drive's base.

CAUTION

Before mounting drive ensure that all slide assembly mounting hardware is secure. Use two people to lift drive on to slides. When installing drawer-mounted drive, use care not to exert undue downward pressure or frame may tip forward.

11. Carefully lift drive over full extended slide assemblies. Engage mounting teeth of quick disconnects with mounting slots of outer slides. Seat mounting blocks of quick disconnects into mounting notches of outer slides.

12. Slide quick disconnect keeper latches toward rear until they are under outer slides. Tighten nuts to secure keeper latches. This locks the drive to the slide assemblies.

13. Press in (to release) full extension locks and then push drive all the way in and out several times to ensure that it moves freely. If binding occurs, check slide assemblies for proper alignment.

INITIAL CHECKOUT AND STARTUP

This procedure assumes that all preceding procedures have been completed. Before performing this procedure become familiar with safety precautions and maintenance preliminary conditions specified in section 3 of this manual. Proceed as follows:

1. Raise pack access cover and inspect head/arms for physical damage and foreign material. Ensure head/arms are properly seated and properly positioned on cam towers.

2. Remove spindle cover. Inspect for any foreign material around pack locator and flange of spindle.

3. Using a vacuum cleaner; remove dust, dirt, and other foreign material from interior of shroud and cabinet.

4. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

5. Raise case assembly (refer to Maintenance Preliminary Conditions, section 3). The case assembly is hinged at the front of the drive and opens from the rear.

6. Raise logic chassis to maintenance position (refer to Maintenance Preliminary Conditions, section 3). Verify all logic cards are firmly seated in their connectors.

CAUTION

Do not remove any power resistor connections.

NOTE

On units S/N 900 and below, pull voice coil leads directly off without any up or down movement. Up and down movement may misorient voice coil leads.

7. Remove black voice coil wire.

8. Ensure all power resistor connections are firmly seated.

9. Connect drive to an external power source.

10. Set AC POWER circuit breaker to ON. Blower shall start.

11. Set POWER SUPPLY circuit breaker to ON. Logic fan shall start. Observe START indicator (located on control panel): If indicator is on, press START switch to extinguish light.

CAUTION

Ensure carriage is in full retract position to avoid contact between data pack cover and head/arm assemblies.

12. Install data pack (refer to Maintenance Preliminary Conditions, section 3).

13. Press START switch and observe the following:

    a. START indicator lights.

    b. Drive motor starts.

    Allow drive to operate in this condition for five minutes.

14. Press START switch to stop drive motor. Set POWER SUPPLY circuit breaker to OFF.

15. Replace black voice coil wire. Set POWER SUPPLY circuit breaker to ON.

16. Press START switch and observe the following:

    a. START indicator lights.

    b. Drive motor starts.

    c. Heads load and READY indicator lights.

17. Perform head/arm alignment check (refer to Drive Tests and Adjustments, section 3B) using site CE disk pack.

NOTE

Drive was tested and adjusted at the factory for proper operation and needs no other preliminary adjustment or inspection.

18. Install system I/O cables and terminator.

19. Perform required controller/system checks.

20. Drive initial checkout and startup is now complete.

SECTION 2

PREVENTIVE MAINTENANCE

INTRODUCTION

Performance of the drive is dependent on the proper and timely execution of a preventive maintenance routine. Such a routine is provided by the Preventive Maintenance Index (table 2-1).

The index consists of six levels based on a calendar period or hours of operation (whichever comes first). The elapsed time meter keeps a cumulative record of hours of operation. Perform preventive maintenance in accordance with the indication of this meter. The Procedure column (table 2-1) lists the title of the paragraph containing the required instructions.

The following levels of scheduled preventive maintenance are required:

Level 1 - Weekly or 150 hours (no preventive maintenance scheduled)

Level 2 - Bimonthly or 1000 hours (no preventive maintenance scheduled)

Level 3 - Quarterly or 1,500 hours (no preventive maintenance scheduled)

Level 4 - Semiannually or 3,000 hours

Level 5 - Annually or 6,000 hours (no preventive maintenance scheduled)

Level 6 - Biennially or 9,000 hours

MAINTENANCE MATERIALS

The material used in the procedures of this section are listed below:

Material	Source
Filter coat	CDC* 12210958
Lubricant Paste	CDC 95016101
Media Cleaning Solution	CDC 82365800
Tape, Adhesive	Commercially available

*CDC® is a registered trademark of Control Data Corporation

TABLE 2-1. PREVENTIVE MAINTENANCE INDEX

Level	Est. Time (Minutes)	Procedure
2	20	Head Dusting **
4	2	Inspect actuator assembly
4	5	Clean Primary filter*
4	2	Check power supply outputs
4	1	Clean shroud and spindle
4	2	Clean and lubricate lockshaft
4	5	Clean carriage rails and bearings
6	20	Replace absolute filter*

*Intervals are maximum times. Preventive maintenance may be required more frequently depending on dust contamination level of operating area.

** The head dusting level 2 interval is recommended for the average site. However, the interval may be shorter or longer, or the procedure eliminated depending upon site conditions.

LEVEL 2 MAINTENANCE PROCEDURES

HEAD DUSTING

NOTE

Head dusting is a dry process. Do not use any type of cleaning solution.

1. Turn off drive motor.
2. Before removing the disk pack, use a lint-free cloth moistened with head and media cleaning solution to wipe off the top of the drive and around and behind the pack access cover.
3. Remove disk pack.
4. Set Power Supply and AC Power circuit breakers to Off.
5. Place index finger on the bottom surface of head arm assembly, as shown in figure 2-1. Avoid touching rear surface of head pad. Push up and pull the head arm assemblies toward the spindle to the point just before the head arms slide off the head cam. If the head arm assemblies are extended beyond this point, follow the directions in step 10 to move them to the retracted position; then repeat this step.

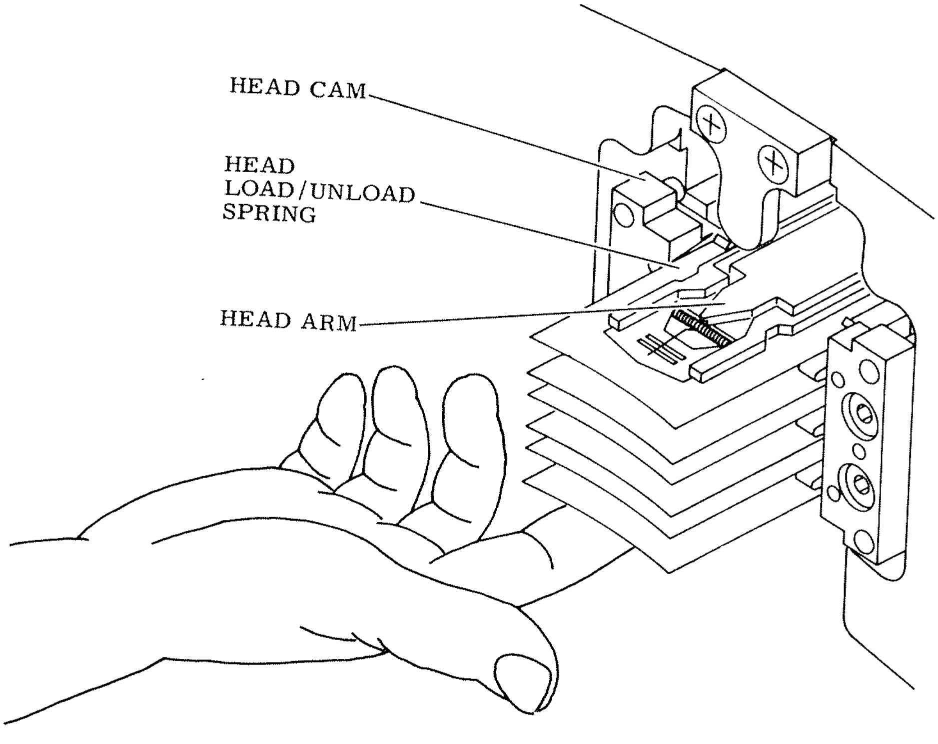

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Figure 2-1. Positioning Head Arm Assemblies

6. Use the following procedure to blow off the loose oxide dust particles from the flying surface, spoiler holes, and leading edge of each head. (See figure 2-2.)

WARNING

Aim nozzle of can of dust remover away from face to prevent personal injury in case hose snaps off nozzle.

NOTE

Keep can of dust remover in an upright position to prevent liquid propellant from spraying on the heads.

a. Connect plastic hose to nozzle of super dry dust remover can. (See figure 2-3.)

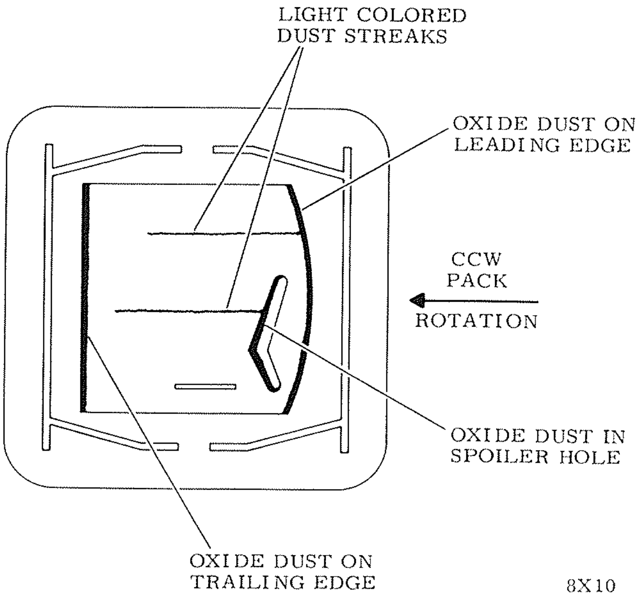


Figure 2-2. Typical Formation of Oxide Particles on Head Pad

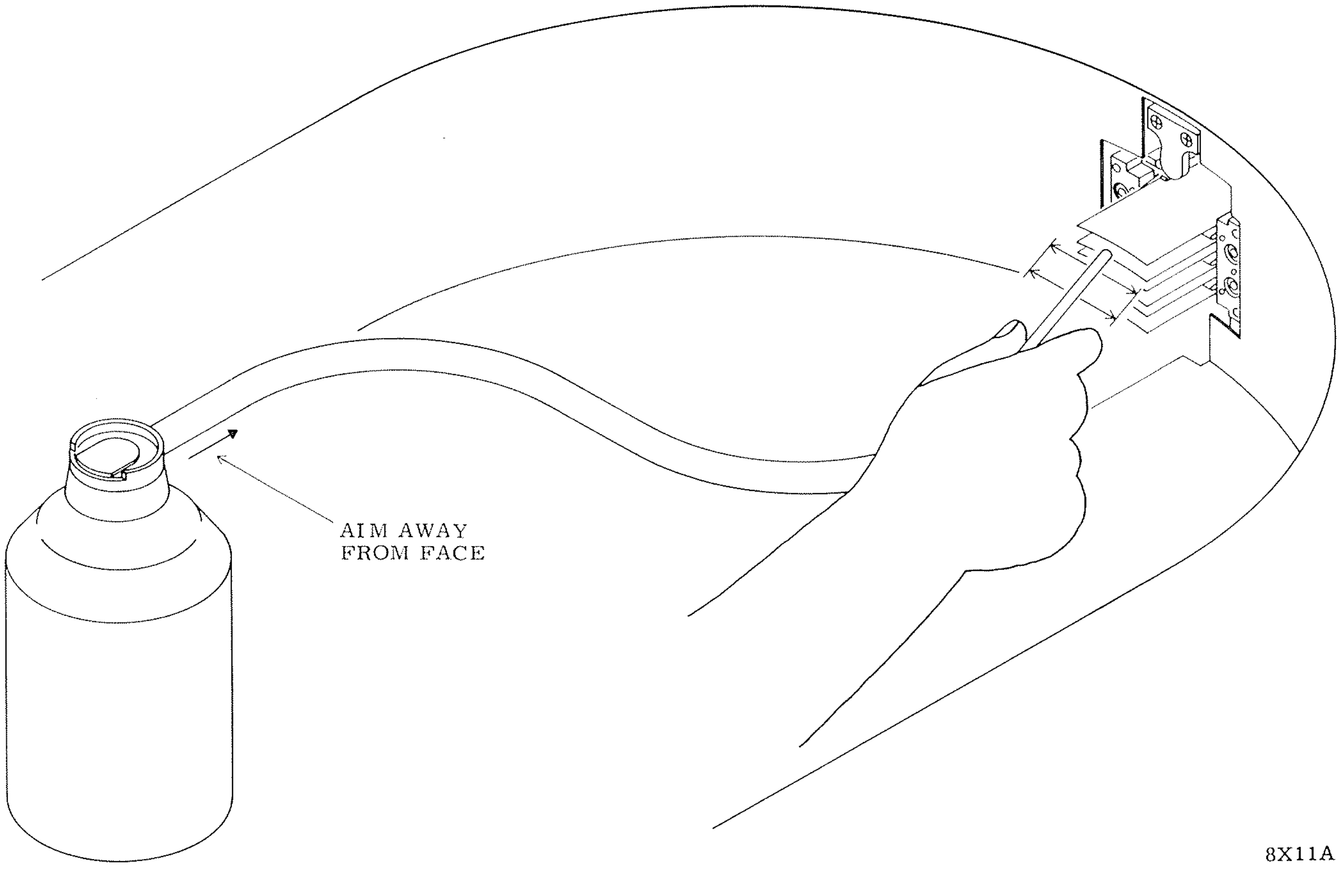


Figure 2-3. Using Super Dry Dust Remover

b. Set the can of dust remover on a flat surface inside the shroud.

NOTE

Always start with the top head and proceed to the next lower head, doing the bottom head last.

c. Hold end of plastic hose one-fourth inch from head to be cleaned. Aim it upward for downward-facing heads or downward for upward-facing heads.

d. While spraying, move hose back and forth six to eight times.

7. Buff the flying surface of each head as follows. (See figure 2-4.)

   a. Hold an eight-inch strip of lint-free gauze between the thumb and forefinger of both hands. Hold gauze tightly, not slack.

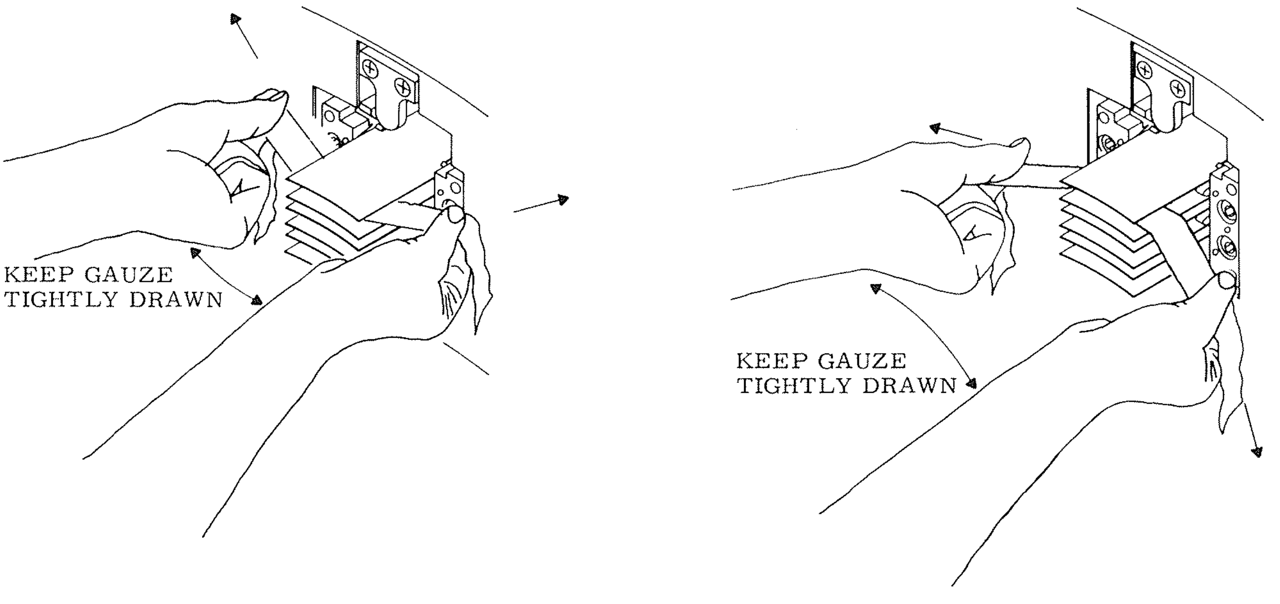
   b. Place the gauze over a head and move the gauze back and forth eight to ten times on each head while applying light pressure.

   c. Buff each head using the same piece of gauze.

   d. Repeat a through c using a new piece of gauze each time until there is no longer any evidence of oxide on the gauze.

   If, after buffing heads three times, the gauze still shows evidence of oxide, the heads will have to be removed from the drive and cleaned as described in the head cleaning procedure in this manual.

8. Blow off heads again using the super dry dust remover, as in step 6. Be sure all lint and dust are removed.



DOWN FACING HEADS

UP FACING HEADS

Figure 2-4. Wiping Head Pads

9. Inspect heads with a high intensity light to see if any loose oxide dust particles remain. Use a two-inch minimum square mirror to view heads facing downward.

   If after inspection, any head still shows evidence of oxide on flying surface, remove the head and clean or replace it as described in this manual.

10. When finished dusting heads, place the index finger on surface of the carriage indicated by the arrow in figure 2-5. Push the head arm assemblies back to the retracted position. Avoid touching the head load/unload springs.

11. Set Power Supply and AC Power circuit breakers to On.

12. With the air blower on, wipe the inside of the shroud using a lint-free cloth moistened with head and media cleaning solution.

NOTE

> If available, use scratch pack in steps 13 and 14. Replace scratch pack with customer pack after allowing drive to run on scratch pack for one minute.

13. Place disk pack in drive and close pack access cover. Allow the air flow to purge the system for one minute.

14. Start up drive and observe that drive functions properly.

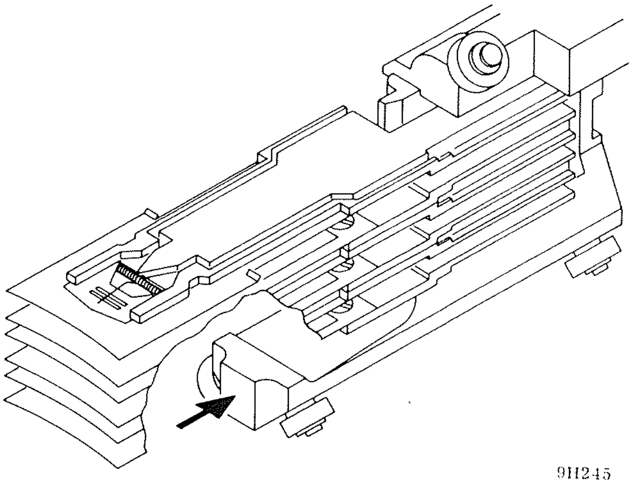


Figure 2-5. Returning Head Arm Assemblies to Retracted Position

15. Return drive to computer operator.

The following materials are required for head dusting (see the list of Maintenance Tools and Materials for the applicable CDC part numbers):

Description

1. Super Dry Dust Remover
2. Hose Assembly
3. High Intensity Light
4. Lint-free Tube Gauze
5. Two Inch Minimum Square Front Surface Mirror

The following material is used only for moistening the lint-free cloth to wipe off the top of the pack access cover and inside the shroud:

Description

6. Head and Media Cleaning Solution
7. Lint-free cloth

LEVEL 4 MAINTENANCE PROCEDURES

INSPECT ACTUATOR ASSEMBLY

1. Open pack access cover.
2. Open cabinet top.
3. Inspect entire actuator for presence of dust and other foreign materials. Pay particular attention to the following areas:
   a. Circular cutouts in face of magnet assembly (receives voice coil).
   b. Rail surfaces (particularly horizontal surfaces) of carriage track on which carriage and bearing assembly travels.
4. Use lint-free gauze dampened with media cleaning solution (not soaked) to remove deposits or attracted particles. Refer to Clean Carriage Rails and Bearings procedure.

CLEAN PRIMARY FILTER (ACOUSTIC CABINET)

1. Remove air filter (figure 2-6) by lifting upward so that bottom edge clears retaining trough. Pull filter towards you and out of trough.
2. Agitate filter in mild detergent solution. Rinse in reverse direction with a low pressure nozzle.
3. Shake excess water from filter and allow filter to dry before proceeding.
4. Spray filter thoroughly with Filter Coat and install in unit.

CLEAN PRIMARY FILTER (NON-ACOUSTIC CABINET)

1. Raise case assembly.
2. Remove hardware securing filter holddown flange and filter to case assembly (figure 2-7). Remove filter holddown flange.
3. Remove air filter from top cover by lifting upward so that bottom edge clears retaining trough. Pull bottom of filter towards you and out of top trough.
4. Agitate filter in mild detergent solution. Rinse in reverse direction with a low pressure nozzle.
5. Shake excess water from filter and allow filter to dry before proceeding.
6. Spray filter thoroughly with Filter Coat and install in unit.
7. Install holddown flange and install washers and nuts removed in step 2.

CHECK POWER SUPPLY OUTPUTS

Adjustment - S/C 23 & Blw

1. Open cabinet top cover.
2. Start spindle motor and allow read/write heads to load.
3. Command a 32-track repeat seek (32 tracks forward and 32 tracks reverse continuously) starting at track 0.
4. Using an AC/DC volt/ohmmeter, measure the output voltages on the 5 volt regulator boards.
   a. The +5 volt regulator output must be within +5.10 ((±0.05) volts. If not, adjust potentiometer shaft on edge of regulator board.
   b. The -5 volt regulator output must be within -5.10 (±0.05) volts. If not, adjust potentiometer shaft on edge of regulator board.

Adjustment - S/C 24 & Abv

1. Raise logic chassis to maintenance position.
2. Connect digital volt/ohmmeter between GND and +5 V fastons on logic chassis backpanel.
3. Command drive to do repeat seeks between cylinders 0 and 32.
4. Plus 5-volt output should be +5.10 ±0.05 volts. If not, adjust +5 V potentiometer on card A1A1 until output is within specification.
5. Move volt/ohmmeter leads to -5 V faston.
6. Minus 5-volt output should be -5.10 ±0.05 volts. If not, adjust -5 V potentiometer on card A1A1 until output is within specification.
7. If any adjustment was necessary in preceeding steps, recheck both outputs.

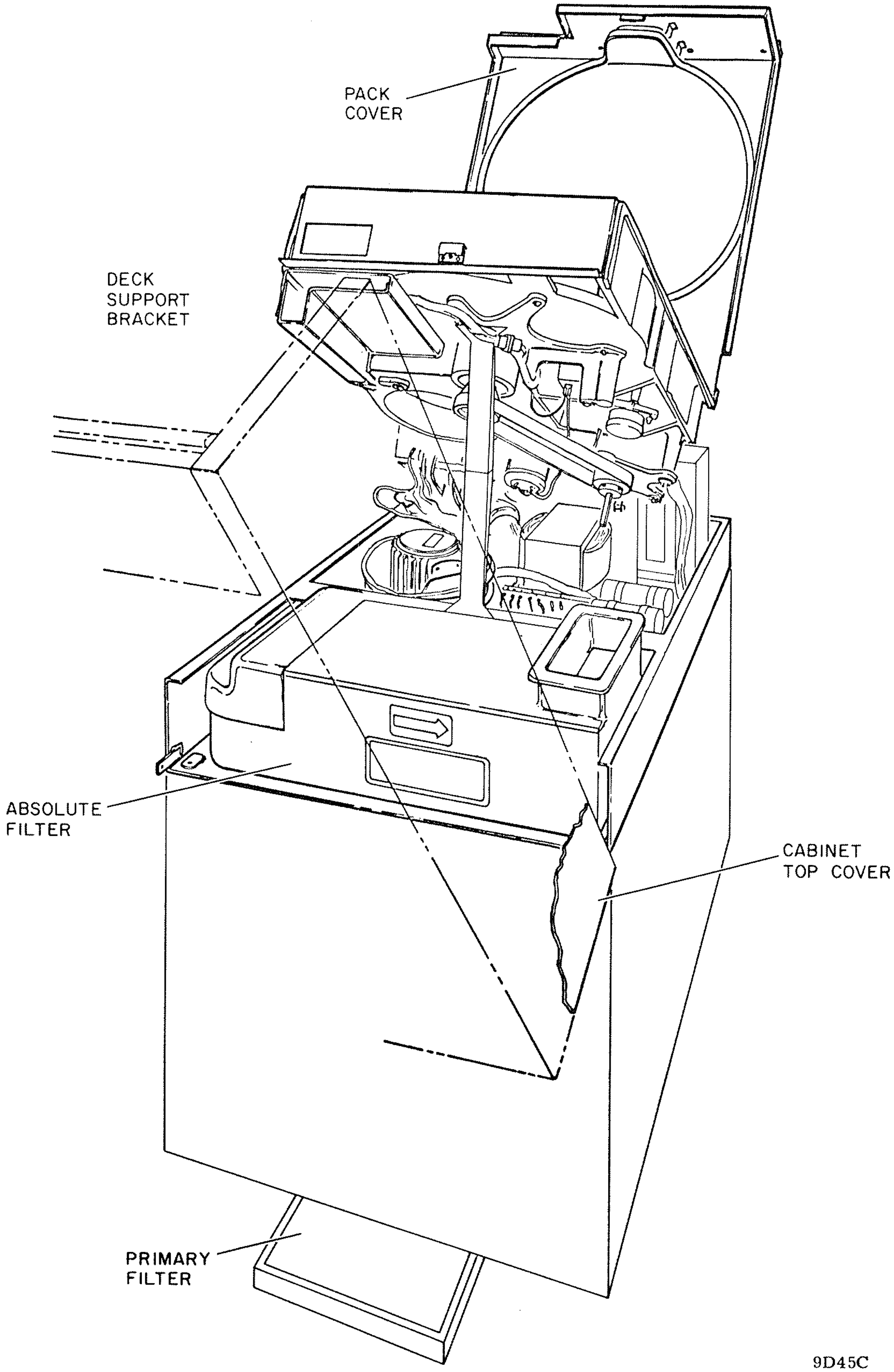


Figure 2-6. Air Filter Locations

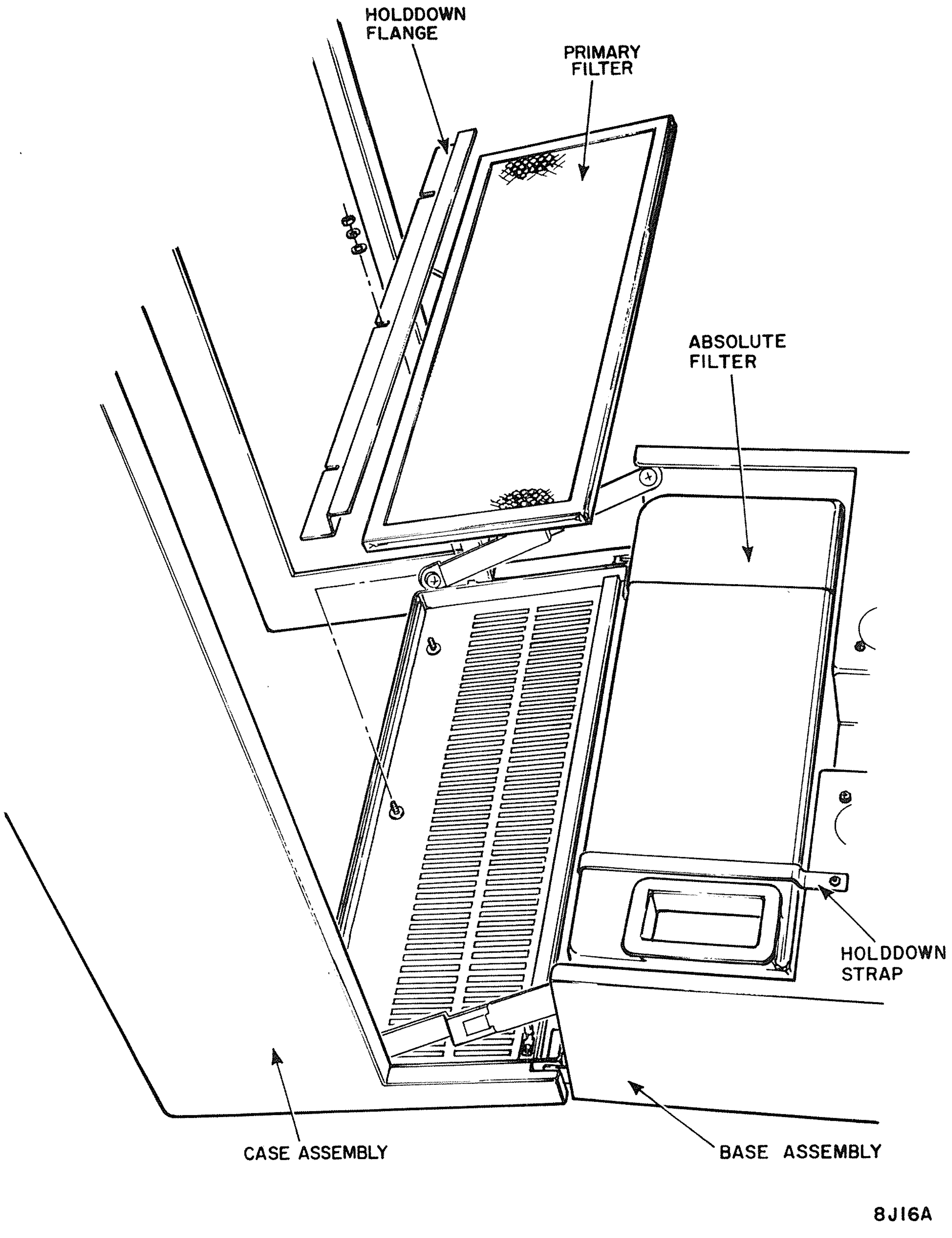


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Figure 2-7. Cabinet Filters

8. When both power supply outputs are within specification, restore drive to normal operation.

CLEAN SHROUD AND SPINDLE

1. Stop spindle motor.
2. Open pack access cover.

CAUTION

Keep disk pack at least three inches away from any part of the magnet assembly.

3. Remove disk pack.

CAUTION

Bearing damage can occur if alcohol runs into spindle.

4. Clean shroud with a lint-free gauze that is slightly dampened with media cleaning solution. Wipe shroud to remove all dirt and smudges. Thoroughly wipe spindle surface.
5. After cleaning shroud, use a wad of adhesive-type tape and pick up any particles that were not picked up with gauze. Make certain that all particles are removed from interior of shroud.

CLEAN AND LUBRICATE LOCKSHAFT

1. Stop spindle motor.
2. Open pack access cover.
3. Remove disk pack.
4. Use lint-free gauze and a brush or sharp instrument to clean lockshaft threads on top of spindle.
5. Apply a thin coat of lubricant paste to threads.

CLEAN CARRIAGE RAILS AND BEARINGS

1. Turn off UNIT POWER circuit breaker.
2. Remove cabinet top cover.
3. Open pack access cover.
4. Remove disk pack.
5. Clean rails and bearing surfaces (figure 2-7.1) with lint-free gauze that is slightly dampened with media cleaning solution. It is necessary to manually move carriage to gain access to all surfaces. Do not move carriage so far heads load.

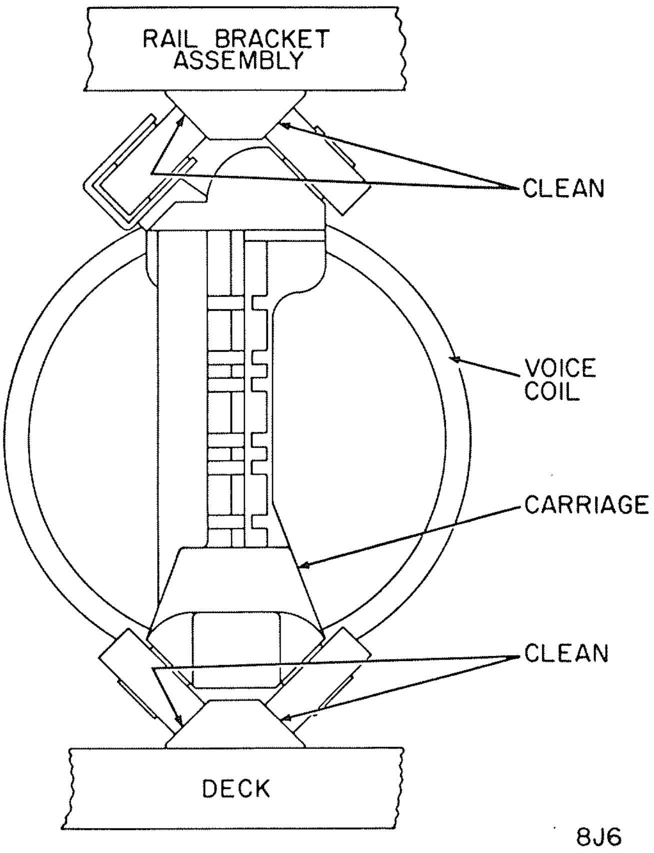


Figure 2-7.1. Carriage Rails and Bearings

6. Wipe rails and bearing surfaces with dry gauze.
7. Check for cleanliness by manually moving carriage. If any slight resistance to free rolling is encountered, repeat steps 4 and 5.

LEVEL 6 MAINTENANCE PROCEDURES

REPLACE ABSOLUTE FILTER

An adequate supply of clean air to the pack area is essential to proper operation of the drive. The absolute filter traps all dirt particles too small to be stopped by the primary filter. Eventually the filter becomes too clogged to yield a sufficient airflow, and it must be replaced. Its useful life depends on the drives operating environment.

The user has two options: (1) replace the absolute filter at fixed intervals dependent on site environment or (2) obtain a pressure gauge (see table 3-1) and replace the absolute filter when it fails the testing procedure given below.

With the first option, replacement of the absolute filter is required once every two years when the drive is operated in a computer room environment. If the drive is operated in something other than a computer room environment, absolute filter replacement is required more often. In a non-computer room environment, it is suggested that the absolute filter be replaced every year or whenever there is doubt about the ability of the filter to pass air into the shroud area.

With the second option, maintenance personnel can periodically check the airflow through the absolute filter to determine the proper time for filter replacement. Regardless of a planned testing schedule, testing should be performed whenever there is doubt about the ability of the filter to pass air into the shroud area.

The following describes testing and replacement of the absolute filter.

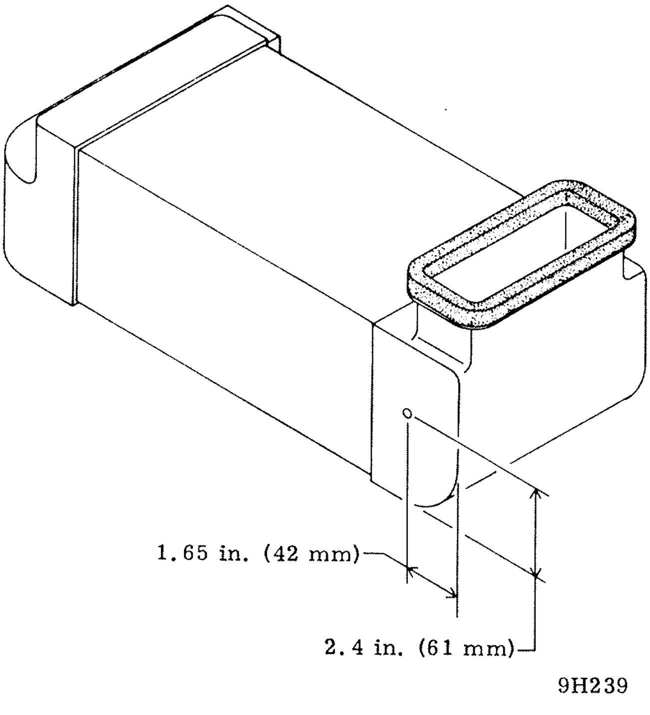


Figure 2-8. Drilling of Absolute Filter

Testing Absolute Filter

1. Remove power from the drive.
2. Gain access to absolute filter and determine whether filter has a hole and plastic plug for test purposes. If not,
   a. Remove filter from drive.
   b. Drill a 0.25 inch (6.35 mm) hole in the location shown in Figure 2-8.
   c. Thoroughly clean shavings from filter before reinstalling it in drive.
3. Remove plastic plug and insert tubing attached to the differential pressure gauge (refer to list of Maintenance Tools and Materials).
4. Apply power to drive and load heads.
5. If pressure is 0.5 inch-water or less, filter should be replaced. If pressure is above 0.5 inch-water, filter need not be replaced at this time.
6. Remove tubing and insert plug. (Spare plastic plugs are included in the gauge test kit.) The plastic plug must be inserted at all times except when making pressure measurements.
7. Return drive to normal operation.

Replacing Absolute Filter

1. Remove power from drive and raise deck to maintenance position.
2. Remove screw and lockwasher securing filter retaining bracket (see Figure 6-15 in Section 6).
3. Remove bracket by pivoting it toward front of drive and disengaging flange on bracket from slot in base pan.
4. Remove absolute filter by pulling it toward front of drive. If may be necessary to jiggle filter to disengage it from blower motor outlet.
5. Wipe base pan clean in area under absolute filter and around blower motor outlet.
6. Install new filter by sliding it in from front of drive and engaging it in blower motor outlet.
7. Install filter retaining bracket and secure with screw and lockwasher.
8. Return deck to normal operating position.

SECTION 3

CORRECTIVE MAINTENANCE

CORRECTIVE MAINTENANCE

3

INTRODUCTION

This section contains instructions for drive corrective maintenance. This information is provided in the form of general maintenance information, drive tests and adjustments, trouble analysis aids, and repair and replacement procedures.

SECTION 3A

GENERAL MAINTENANCE INFORMATION

GENERAL

Maintenance information is provided to aid in the repair of functionally deficient drives. Tests are performed to isolate causes of drive failures such as:

- Inability to perform required adjustments.
- The occurrence of accessing failures.
- The occurrence of read recovery or writing malfunctions.

In general, before performing any drive adjustments or maintenance procedures, install a scratch pack or its equivalent on the drive and switch the drive to an "off-Line" mode of operation to prevent system interference.

NOTE

> The paragraphs following safety precautions describe, in general terms, the methods used for gaining access to the various servicing areas of the drive. Once these procedures have been described, they will not be repeated in subsequent maintenance instructions. Therefore, maintenance personnel are urged to read through the general procedures at least once to become familiar with these standard procedures.

SAFETY PRECAUTIONS

Observe the following safety precautions at all times. Failure to do so may cause equipment damage and/or injury.

- Use care while working with power system. Line ac voltages are present at AITB1.
- Keep hands away from actuator during seek operations and when reconnecting leads to voice coil (under certain conditions, emergency retract voltage may be present, causing sudden reverse motion and head unloading).
- When performing head alignment utilize the carriage locking pin to prevent personal injury.
- Use caution while working near heads. If heads are touched, fingerprints can damage them. Clean heads immediately if they are touched.
- Keep pack access cover closed unless it must be open for maintenance. This prevents entrance of dust into pack area.
- Keep all watches, disk packs, meters, and other test equipment at least two feet away from voice coil magnet when case assembly is raised.
- Use scratch pack for maintenance procedures, do not use data pack; otherwise customer data may be destroyed.
- Do not use CE alignment disk pack unless specifically directed to do so. These packs contain prerecorded alignment data that can be destroyed if test procedure requires drive to write. This alignment data cannot be generated in the field.
- Install deck rear holddown screw and spacer before raising deck assembly and installing support bracket. Remove screw and spacer and install in keeper hole (in back of deck) after deck assembly is back in operating position.
- Do not remove any logic card without first turning POWER SUPPLY circuit breaker off.
- If power to spindle motor is lost while heads are loaded and voice coil leadwire is disconnected, immediately manually retract carriage. Otherwise heads will crash when disk speed is insufficient to permit heads to fly.
- If drive fails to power down when START switch is pressed, disconnect black voice coil lead wire and manually retract carriage before troubleshooting malfunction.

MAINTENANCE TOOLS AND MATERIALS

The tools, test equipment and materials recommended for drive maintenance are listed in table 3-1.

TABLE 3-1. MAINTENANCE TOOLS AND MATERIALS

Description	Part Number
Card Extender	CDC 54109701
Carriage Alignment Arm	CDC 75018400
CE Disk Pack 877-51 (400 TPI)	CDC 70438700
Chip Extender - Chip Clipping	CDC 12212196
Cloth, Lint Free	CDC 94211400
Computer Card	5084
Crocus Cloth	Commercially available
Deck Support Bracket (S/C 16 & Below)	CDC 87073000
Dust Remover, Super Dry	CDC 95047800
Field Test Unit (TB216A)	CDC 82338800
Field Test Unit (TB301A) with Head Alignment	CDC 75255000
Field Test Unit (TB301B) without Head Alignment	CDC 75255001
Field Test Unit (TB304A) with Head Alignment	CDC 77449300
Field Test Unit (TB304B) with Head Alignment	CDC 77449301
Field Test Unit (TB304C) without Head Alignment	CDC 77449302
Gauze, Lint Free	CDC 12209713
Grease, Dielectric, Silicone	CDC 95533600
Head Alignment Tool	CDC 75018803
Head Alignment Kit	CDC 77440503
High Intensity Light*	CDC 12212038
Hose Assembly	CDC 82346500
Loctite, Grade C	Loctite Corp.
Loctite Primer, Grade N	Loctite Corp.
Media Cleaning Solution	CDC 82365800
Mirror	Commercially available
Nutdriver, Hollow Stem	Exelite #6
Oscilloscope, Dual Trace	Tektronix 454 or equivalent
Oscilloscope Hood	Tektronix 016-0083-00
Pin Straightener	CDC 87369400
Potentiometer Adjustment Tool	CDC 12212278
Pressure Gauge Kit, Differential (Optional)	CDC 73040102
Push-Pull Gauge	CDC 12210836
Removal Tool, 20-30 AWG	CDC 92020500
Scope Probe Tip (Hatchet Type)	CDC 12212885
Speed Sensor Adjustment Tool	CDC 87052600
Top Cover Support Rod, S/C 07 w/o 37686 & Below only	CDC 87062300
Torque Screwdriver	CDC 12218425
Torque Screwdriver Bit	CDC 87016701
Volt/Ohmmeter (Digital)	Ballentine 345 or equivalent
Wire Wrap Bit, 30 AWG	CDC 12218402
Wire Wrap Gun, Electric	CDC 12259111
Wire Wrap Sleeve	CDC 12218403

* Works only with 120 V, 60 Hz. For other voltages and frequencies, use commercially available 100 or 150 watt outdoor floodlight with suitable receptacle and extension cord. Note: Light must have hard safety glass bulb and all items must be rated for use with applicable source power.

MAINTENANCE PRELIMINARY CONDITIONS

INTERLOCKS

Opening the pack cover or raising deck breaks the control interlock (figure 3-1). The heads unload, the spindle motor shuts down, and the READY indicator extinguishes. Refer to Publication No. 83308500, Theory of Operation section for Control Interlock function.

DISK PACK INSTALLATION AND REMOVAL

Installation

Make certain the disk pack to be installed has been properly maintained.

1. Raise pack access cover.
2. Turn disk pack cover handle counterclockwise to remove bottom cover. Set bottom cover aside.

CAUTION

Non-fully retracted heads indicate a problem in the drive's servo, and may result in damage to the pack or heads during pack installation or removal. If heads are not fully retracted, contact maintenance personnel. DO NOT push on heads.

3. Place disk pack squarely on spindle and turn disk pack cover handle clockwise until spindle brake plate engages.
4. Continue turning (clockwise) until handle is tight.
5. Remove disk pack cover (by lifting straight up) and store with bottom cover.
6. Close pack access cover.

Removal

1. Press drive START switch to stop drive motor.
2. Raise pack access cover.

CAUTION

Non-fully retracted heads indicate a problem in the drive's servo, and may result in damage to the pack or heads during pack installation or removal. If heads are not fully retracted, contact maintenance personnel. DO NOT push on heads.

3. Place disk pack cover squarely onto disk pack and turn disk pack cover handle counterclockwise until spindle brake plate engages.
4. Continue turning handle (counterclockwise) until a clicking sound is heard.
5. Lift disk pack and cover straight up and remove.
6. Put bottom cover into place and turn disk pack cover handle clockwise until bottom cover is secure.
7. Close pack access cover.

CASE ASSEMBLY RAISING AND LOWERING

Although there are several types of case assemblies, for the purpose of raising and lowering procedures, there are only two types:

1. Acoustic top case
2. Normal case

The acoustic top case can have one of two methods of latching:

a. two 1/4 - turn fasteners

b. a slide-bolt latch

The normal case is latched with two push-release catches. These catches may or may not be secured with socket head screws.

ACOUSTIC TOP CASE RAISING

1. Open rear door and look inside drive to determine how case is secured.
2. Release top case as follows:
   a. If case is secured by 1/4 - turn fasteners, use a screwdriver to release the two 1/4 - turn fasteners. Then lift up on rear of case.
   b. If case is secured by a slide-bolt latch, use a six mm hex wrench to actuate the latch while lifting upward on rear of case.

NOTE

In some drives, the latch operated by a 5/32 inch hex wrench instead.

3. Continue to lift case upward until support rod reaches its end of travel.
4. Then lower case until support rod bottoms securely in stop groove of support rod slide.

ACOUSTIC TOP CASE LOWERING

1. Push case assembly forward until it reaches its end of travel.
2. Lift up on support rod.
3. Lower case while continuing to lift up on support rod just long enough for it to clear stop groove in guide; then continue to lower case to its closed position.
4. Secure case as required by:
   a. using a screwdriver to turn the two 1/4 - turn fasteners to their locked position, or
   b. confirming that the slide-bolt is fully extended below the latch catch.

NORMAL CASE RAISING

1. Look at the rear of case assembly to determine how case is secured. If the latches are secured by socket head screws, loosen them.

CAUTION

Lift up case only about one inch during the next step.

2. Release case as follows:
   a. Depress the release catches and lift up case slightly, or
   b. Depress the socket head screws and lift up case slightly.
3. After case has been released and raised about an inch, swing hinged rear panel of case outward to clear the logic chassis fan.
4. Pivot case upward and toward the front until it rests on case support arms. (In older units, a top cover support rod must be installed.)

NORMAL CASE LOWERING

CAUTION

To avoid damage to latches and logic chassis fan, carefully follow instructions pertaining to the case rear panel as the case is lowered.

1. Pivot case toward rear and downward, and, as it is being lowered, swing hinged rear panel outward so it clears logic chassis fan. Do not completely close case.
2. When case is about one inch from touching frame, swing hinged rear panel inward until it reaches its end of travel.
3. While holding in hinged rear panel, lower case assembly to its fully closed position.
4. Ensure that the latches catch. If socket head screws are used, tighten them.

DECK MAINTENANCE POSITION

To perform some of the corrective maintenance procedures, it is necessary to raise the deck to a maintenance position. Refer to figure 3-2.

Raise Deck

1. Press drive START switch to drop drive motor.

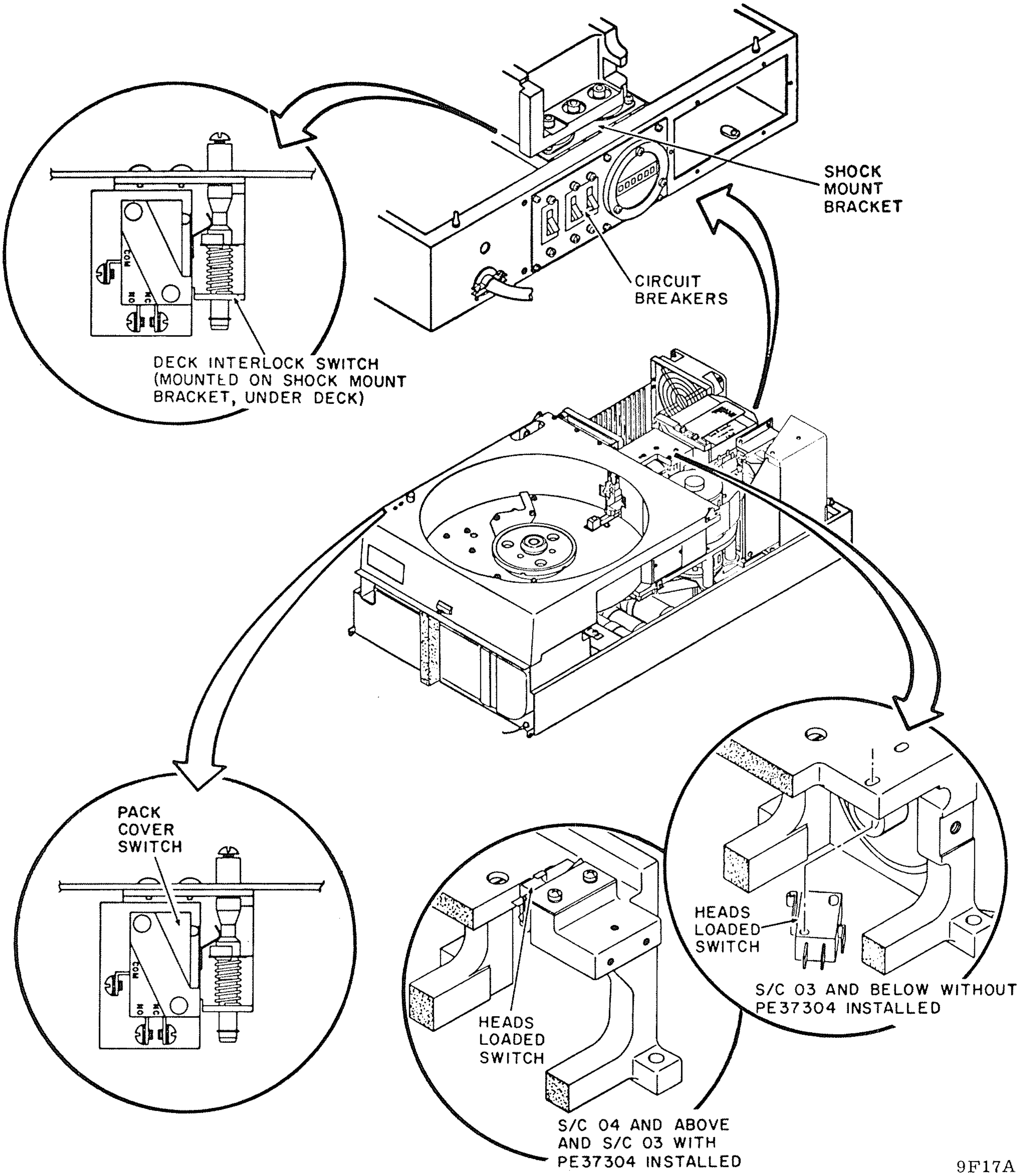


Figure 3-1. Control Interlocks

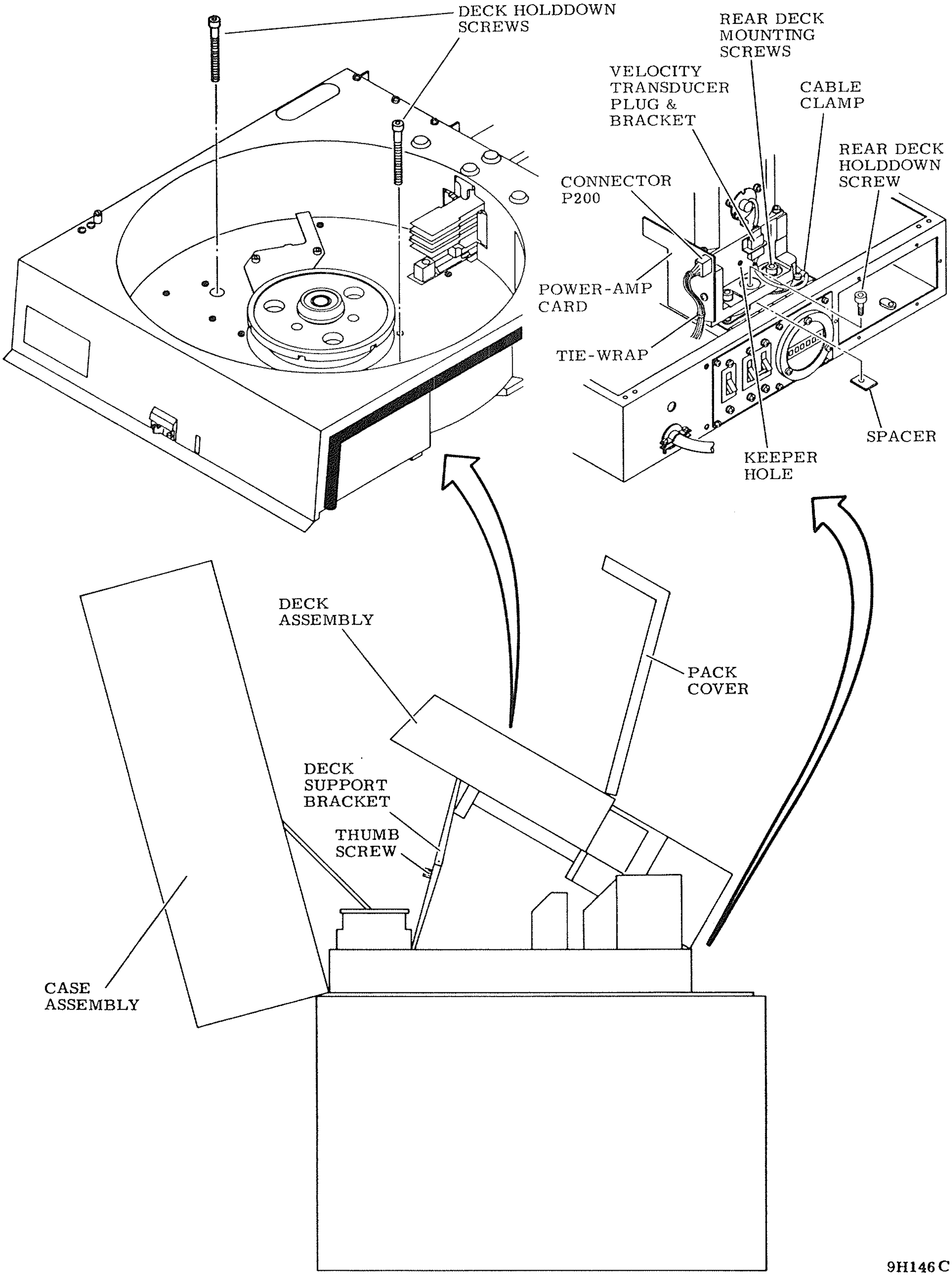


Figure 3-2. Drive Maintenance Position
(S/C 17 and ABV)

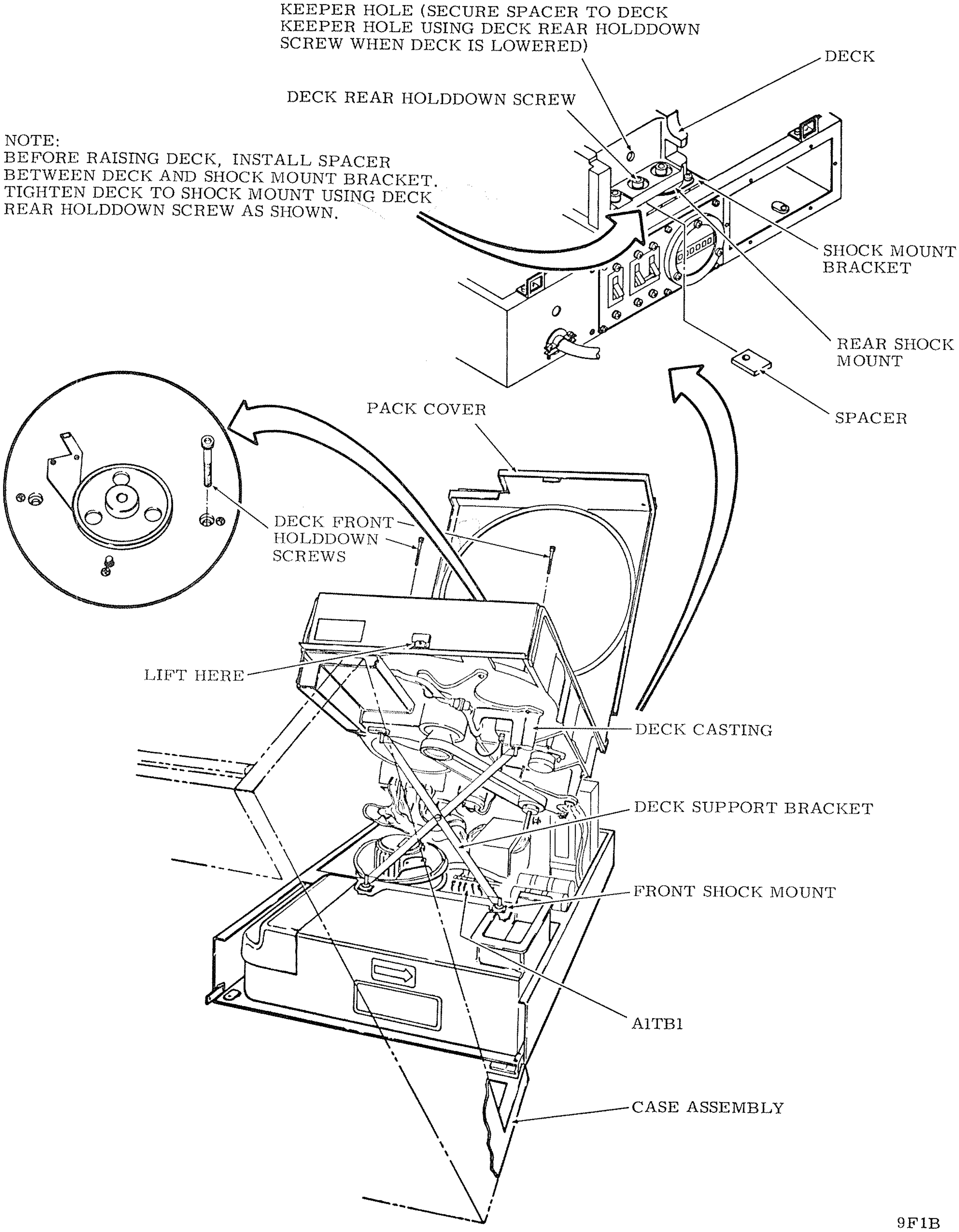


Figure 3-2.1. Drive Maintenance Position
(S/C 16 and BLW)

2. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

3. Disconnect input power cable from external power source.

4. Remove disk pack (refer to Disk Pack Installation and Removal paragraph). Leave pack access cover open.

5. Remove two deck front holddown screws.

6. Raise the case assembly (refer to Case Assembly Raising and Lowering paragraph).

CAUTION

> Do not raise deck without installing spacer between deck and shock mount bracket. Damage to rear shock mounts could occur.

7. Remove deck rear holddown screw and spacer from keeper hole and install spacer between deck and shock mount bracket.

8. Secure deck to shock mount bracket using deck rear holddown screw.

9. Perform step 9a for S/C 16 and below units, perform step 9b for S/C 17 through 19 and 9c for S/C 20 and above units.

   a. Lift deck and install deck support bracket into front shock mounts. Lower deck onto deck support bracket. Deck support bracket fits into deck casting where deck front holddown screws were removed.

   b. Lift up deck from front of drive until deck support bracket is completely extended. Carefully lower deck until support bracket slides into locking position (hinge in center of bracket should point slightly towards rear of drive).

   c. Lift deck from front of drive until deck support bracket is completely extended. Carefully lower deck until support bracket slides into position (hinge in center of bracket should point slightly towards rear of drive). Remove thumb screw from storage hole and secure in the locking hole located on the face of the deck support bracket. The thumb screw must be in the locking hole when deck is in raised position.

Lower Deck

1. Perform step 1a for S/C 16 and below units, perform step 1b for S/C 17 through 19 and 1c for S/C 20 and above units.

   a. Lift deck and remove deck support bracket.

   b. Lift deck until deck support bracket disengages from locked position and push front of bracket slightly, then lower.

   c. Remove thumb screw from locking hole and secure in storage hole. Lift deck until the deck support bracket disengages from locked position and push back of the bracket slightly forward, then lower deck slowly.

2. Lower deck to normal operating position.

3. Secure deck to front shock mounts using two deck front holddown screws.

4. Remove deck rear holddown screw and spacer. Store in keeper hole.

5. Lower case assembly (refer to Case Assembly Raising and Lowering paragraph).

6. Connect input power cable to external power source.

7. Set AC POWER and POWER SUPPLY circuit breakers to ON.

8. Install disk pack (refer to Disk Pack Installation and Removal paragraph).

9. Press drive START switch to load heads.

LOGIC CHASSIS MAINTENANCE POSITION

The logic chassis is hinged on a bracket attached to the deck. The logic chassis is secured to the deck by a turnlock fastener. To raise the logic chassis to the maintenance position, proceed as follows:

1. Raise case assembly.

2. Loosen turnlock fastener securing logic chassis to deck.

3. Swing logic chassis to a vertical position.

4. Move slide bar (located on top of magnet assembly) toward logic chassis until it stops.

5. Lower logic chassis onto slide bar.

NOTE

> Steps 6 and 7 are only necessary if card accessibility is required.

6. Loosen two outboard screws securing logic chassis cover to logic chassis. Do not remove.

7. Swing cover away from top screws (closest to fan) and lift off of bottom screws.

CAUTION

When reinstalling the logic chassis cover, do not tighten the plastic tipped socker head screws used as guides for the cover - tightening these screws will destroy the plastic locking principle.

8. To lower logic chassis to operating position, reverse steps 1 through 7.

SIDE PANEL REMOVAL AND INSTALLATION (CABINET MODEL)

The side panels are secured to the frame by two screws located toward the top of the panel. Also, a quick disconnect ground strap is attached to the panel in the lower corner. The panel tilts out from the top and lifts off the bottom positioning brackets.

OFF-LINE OPERATION

Certain procedures require execution of operational commands (seek, read, etc.). These commands may be derived by means of the FIELD TEST EXERCISER (refer to Publication No. 70612800 for tester operating procedures).

USE OF TEST SOFTWARE

The drive is prepared for test software whenever the drive motor is up to speed, the heads are loaded and the READY indicator on the control panel is lighted. Refer to manuals or other documentation applicable to the specific system or subsystem for information concerning the test software routines.

MANUAL HEAD POSITIONING

Power On Manual Head Positioning

Manual head positioning (with power on and disk pack up to speed) is not recommended unless required by maintenance procedure or loss of servo control makes it necessary.

1. Observe the following safety precautions during manual carriage operation.

   - Make certain that heads will unload or are unloaded before turning power off.
   - If power to drive motor is lost while heads are loaded and voice coil leadwire is disconnected, immediately retract carriage. Otherwise, heads crash when disk speed is insufficient to enable heads to fly.
   - When positioning heads, do not use excessive downward force on voice coil.
   - Before reconnecting black voice coil leadwire, make sure fingers and tools are clear of coil and actuator.
   - Do not use CE disk pack unless specifically directed to do so. Use only the type of pack called for in the maintenance procedure.

2. Install disk pack (refer to Disk Pack Installation and Removal paragraph).

CAUTION

If loss of servo control necessitates manual loading and unloading of heads, observe the following:

Do not load heads unless disk pack is up to speed.

When manually loading or unloading heads, simulate normal load (unload) speed of servo under electrical control.

Disconnect black voice coil leadwire before attempting to load heads.

3. Press drive START switch to allow normal power-up first seek.

4. Raise case assembly (refer to Case Assembly Raise and Lower paragraph).

5. Disconnect black voice coil leadwire (refer to figure 3-3).

6. Remove magnet cover to gain access to voice coil (refer to figure 3-3).

7. Position carriage as required by maintenance procedure by applying a lateral (parallel to voice coil movement) pressure to voice coil.

WARNING

Keep hands away from actuator.

8. Replace black voice coil leadwire:

   a. Touch black leadwire to terminal and ensure carriage locks on cylinder. If erratic voice coil movement is noticed, remove leadwire immediately and troubleshoot malfunction.

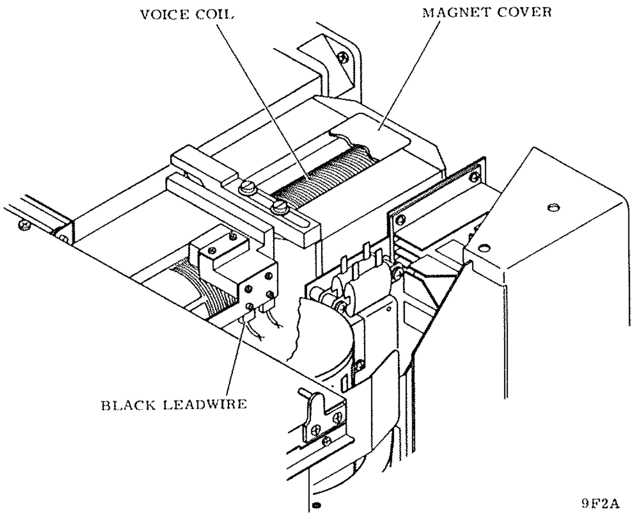


Figure 3-3. Magnet Cover and Voice Coil

   b. After carriage locks on cylinder, firmly seat black voice coil leadwire.

9. Replace magnet cover.

10. Lower case assembly (refer to Case Assembly Raising and Lowering paragraph).

Power Off Manual Head Positioning

CAUTION

Do not position heads manually with power off and a disk pack installed.

1. Press drive START switch to stop drive motor.

2. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

3. Remove disk pack (refer to Disk Pack Installation and Removal paragraph).

4. Raise case assembly (refer to Case Assembly Raising and Lowering paragraph).

5. Remove magnet cover to gain access to voice coil (refer to figure 3-3).

CAUTION

Do not use excessive downward pressure on voice coil.

6. Position carriage as required by maintenance procedure by applying a lateral (parallel to coil movement) pressure to voice coil.

7. Return carriage to full retract position.

8. Replace magnet cover.

9. Install disk pack (refer to Disk Pack Installation and Removal paragraph).

10. Set AC POWER and POWER SUPPLY circuit breakers to ON.

11. Press drive START switch to load heads.

PREPARING DRIVE FOR OFF-LINE OPERATION

The drive may be set offline (with respect to the system) as necessary to accomplish maintenance procedures.

While it is not necessary to remove power from the drive in order to set it offline, it is necessary to remove power in order to connect a FTU. Whenever the drive is taken offline, inform the operator beforehand. The following procedure describes setting the drive offline. Setting the drive online is the opposite condition.

1. Press drive START switch to stop motor.

2. Set AC POWER and POWER SUPPLY circuit breakers to off.

3. Raise case assembly to gain access to logic chassis.

4. Place logic chassis in maintenance position.

5. Loosen four screws securing logic chassis cover and remove cover.

6. Set Local/Remote switch (on EXPN board behind operator panel) to LOCAL (sc 10 and above).

NOTE

The FTU can be connected to the I/O bypass connectors (sc 10 and above), or it can be connected to the standard I/O connectors. If the FTU is to be connected to the standard I/O connectors, do not perform step 7. If it is to be connected to the I/O by-pass, do not perform step 8.

7. Connect the FTU to the I/O by-pass as follows:

   a. Set Maintenance Unit Disable switch to DISABLE (card location A05).

   b. Connect the FTU I/O by-pass cable to the drive I/O by-pass connector.

   c. Perform required maintenance on drive.

NOTE

If the drive string is in a daisy chain configuration (see figure 1-9) the entire drive string must be lowered down before removing the system I/O cables.

8. Connect the FTU to the standard I/O connectors as follows:

   a. Disconnect the system I/O cables from the drive under test.

   b. If drive is in a daisy chain string, patch I/O cables around drive under test if system operation is required.

   c. Connect the FTU A cable to J3.

   d. Connect the FTU-B cable to J4.

   e. Perform required maintenance on drive.

PREPARING DRIVE FOR ON-LINE OPERATION

1. Press drive START switch to stop drive motor.

2. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

3. Disconnect terminator from J4.

4. Replace logic chassis cover.

5. Connect cables (from system) to J2, J3, and J4.

6. Set AC POWER and POWER SUPPLY circuit breakers to ON.

7. Return logic chassis to normal operation position.

8. Lower case assembly.

9. Press drive START switch to start the drive motor and load heads.

SECTION 3B

DRIVE TESTS AND ADJUSTMENTS

GENERAL

This section provides information on all the electrical test and adjustments which can be performed in the field. The adjustments contained here are limited to those which can be performed at the drive level. These tests should only be performed as required elsewhere in this manual, or when there is suspicion that the drive is not functioning properly. A drive that passes all the requirements in this section may be considered operationally acceptable. If any of the adjustments, contained in this section, cannot be completed satisfactorily, terminate the procedure and refer to the Trouble Analysis section.

Mechanical adjustments are contained in the Repair and Replacement section. Other tests normally associated with analyzing a malfunction, are contained in the Trouble Analysis section. A person performing these tests and adjustments should already be familiar with the information contained in the General Maintenance Information section. Refer to that section for information on safety precautions and maintenance tools and materials.

These procedures assume that an FTU is connected to the drive (or that suitable software is available), that a scratch pack is installed (or CE pack where noted), and that the drive is powered on. All the following tests are written, providing first a check procedure, and then the adjustment. If the drive meets the criteria of the check, there is no need of the adjustment.

The following procedures are contained in this section, in the order specified:

- Plus and Minus 5 Volt Adjustment
- Head Arm Alignment
- Velocity Gain Adjustment

PLUS AND MINUS 5-VOLT REGULATORS

This procedure checks the output of the plus and minus 5-volt power supplies while the drive is doing repeat seeks. Power supply outputs are checked at the logic chassis backpanel. Therefore, the supplies are being checked in a manner to account for both line loss and loading.

This procedure assumes that the FTU is connected to the drive, a scratch pack is installed and power is applied.

ADJUSTMENT - S/C 23 & BLW

1. Raise logic chassis to maintenance position.
2. Connect digital volt/ohmmeter between GND and +5 V fastons on logic chassis backpanel.
3. Command drive to do repeat seeks between cylinders 0 and 32.
4. Plus 5-volt output should be +5.10 ±0.05 volts. If not, adjust +5 V potentiometer (see figure 3-4) until output is within specification.
5. Move volt/ohmmeter leads to -5 V faston.
6. Minus 5-volt output should be -5.10 ±0.05 volts. If not, adjust -5 V potentiometer (see figure 3-4) until output is within specification.
7. If any adjustment was necessary in preceeding steps, recheck both outputs.
8. When both power supply outputs are within specification, restore drive to normal operation.

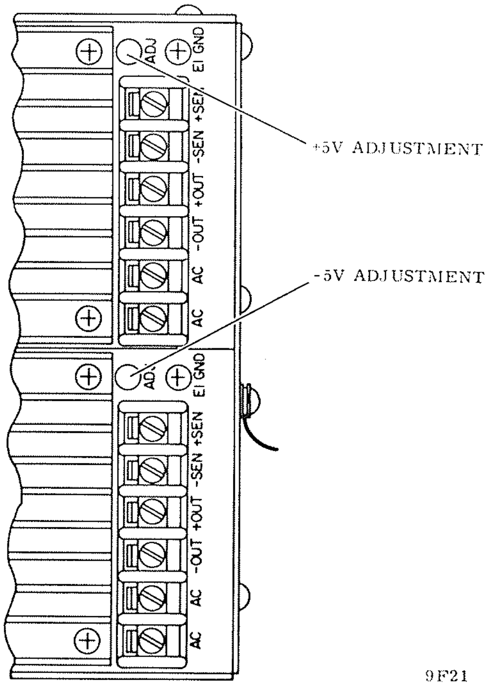


Figure 3-4. Power Supply Adjustment S/C 23 & Blw

ADJUSTMENT S/C 24 & ABV

1. Raise logic chassis to maintenance position.
2. Connect digital volt/ohmmeter between GND and +5 V fastons on logic chassis backpanel.
3. Command drive to do repeat seeks between between cylinders 0 and 32.
4. Plus 5-volt output should be +5.10 ±0.05 volts. If not, adjust +5 V potentiometer on card A1A1 (see figure 3-4.1) until output is within specification.
5. Move volt/ohmmeter leads to -5 V faston.
6. Minus 5-volt output should be -5.10 ±0.05 volts. If not, adjust -5 V potentiometer on card A1A1 (see figure 3-4.1) until output is within specification.
7. If any adjustment was necessary in preceeding steps, recheck both outputs.
8. When both power supply outputs are within specification, restore drive to normal operation.

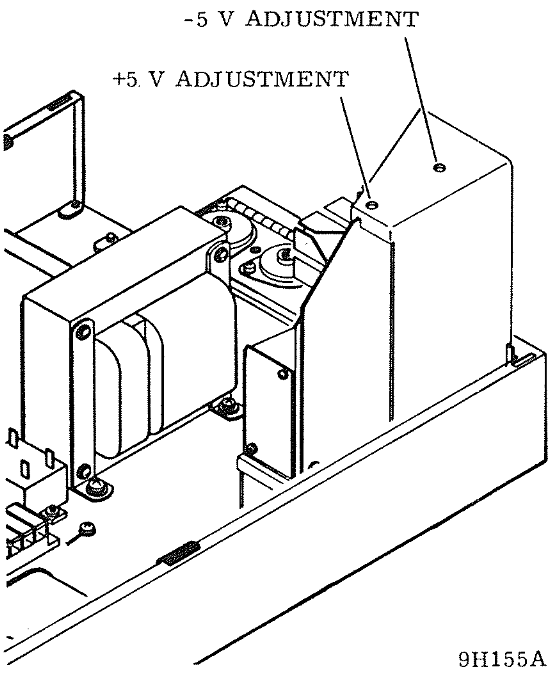


Figure 3-4.1. Power Supply Adjustment S/C 24 & Abv.

HEAD ALIGNMENT

GENERAL

Alignment of the heads is checked under the following conditions:

1. During initial installation of the drive.

2. After replacing one or more head arm assemblies.

3. When misalignment of one or more heads is suspected. (For example, inability to read a pack written on another drive.)

If it is determined that a head is misaligned, the head arm is adjusted to bring the alignment of the head within specifications. Figure 3-5 is a flowchart summarizing the basic functions of the head alignment check and adjustment procedure.

Head alignment is performed by using a Field Test Unit (FTU) or by using the controller, microprogram diagnostics, head alignment card and meter. This procedure applies only to the method using an FTU. Refer to the FTU maintenance manual for switch settings and functions called for in this procedure.

When performing head alignment, give special consideration to the following:

Thermal Stabilization - In order to ensure accuracy during head alignment, it is important that the drive, CE pack, and FTU be at their normal operating temperature. This requires that all three be connected and allowed to operate (pack turning and heads loaded to cylinder zero) for a minimum of 60 minutes. If head alignment is being performed on more than one drive, and provided that the pack was taken immediately from a previous drive, and provided that the drive under test has been operating with heads loaded for a minimum of 60 minutes preceding tests; then the CE pack only requires a 15-minute stabilization time.

Alignment Tool - Use only the head alignment tool specified in the maintenance tools and materials table. Use of a different tool may cause damage to head arm or carriage. Always inspect the adjustment end of tool prior to use. Tool must be free of nicks and scratches and must have a polished surface where it enters the carriage alignment hole. If any aluminum deposits are present, polish tool surface with crocus cloth. Any other polishing medium will damage the tool. Do not use a defective tool; repair or replace tool if damage exists. When using tool, position it so that pin in end of tool engages alignment slot in head arm. The tool should slip easily through the alignment hole in the carriage and into the alignment slot in the head arm. If anything more than a small amount of force is required to adjust the head, the tool is probably binding in the hole of the carriage. Ensure that alignment tool is kept perpendicular to hole in carriage at all times.

Carriage Locking - During the alignment procedure (when the heads are over the alignment track) the carriage locking pin and ring assembly must be installed in the ALIGN TRACK LOCK hole in the rail bracket assembly. This locks the carriage in one head alignment position. Failure to install the pin and ring assembly would allow the carriage to retract if any emergency retract signal were generated. Since your hands are in the actuator during the head alignment procedure, the retract could be dangerous.

CAUTION

Should an emergency retract condition be generated when the locking pin is in the ALIGN TRACK LOCK hole, the following results may occur:

- Blown fuses,
- Tripped dc circuit breaker
- Blown power amplifier transistors, and
- Unretracted heads on a stationary CE pack.

Carefully observe the instructions regarding the installation and removal of the carriage locking pin and ring assembly.

INITIAL SETUP

1. Install CE disk pack and perform thermal stabilization.

2. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

3. Raise case assembly to maintenance position.

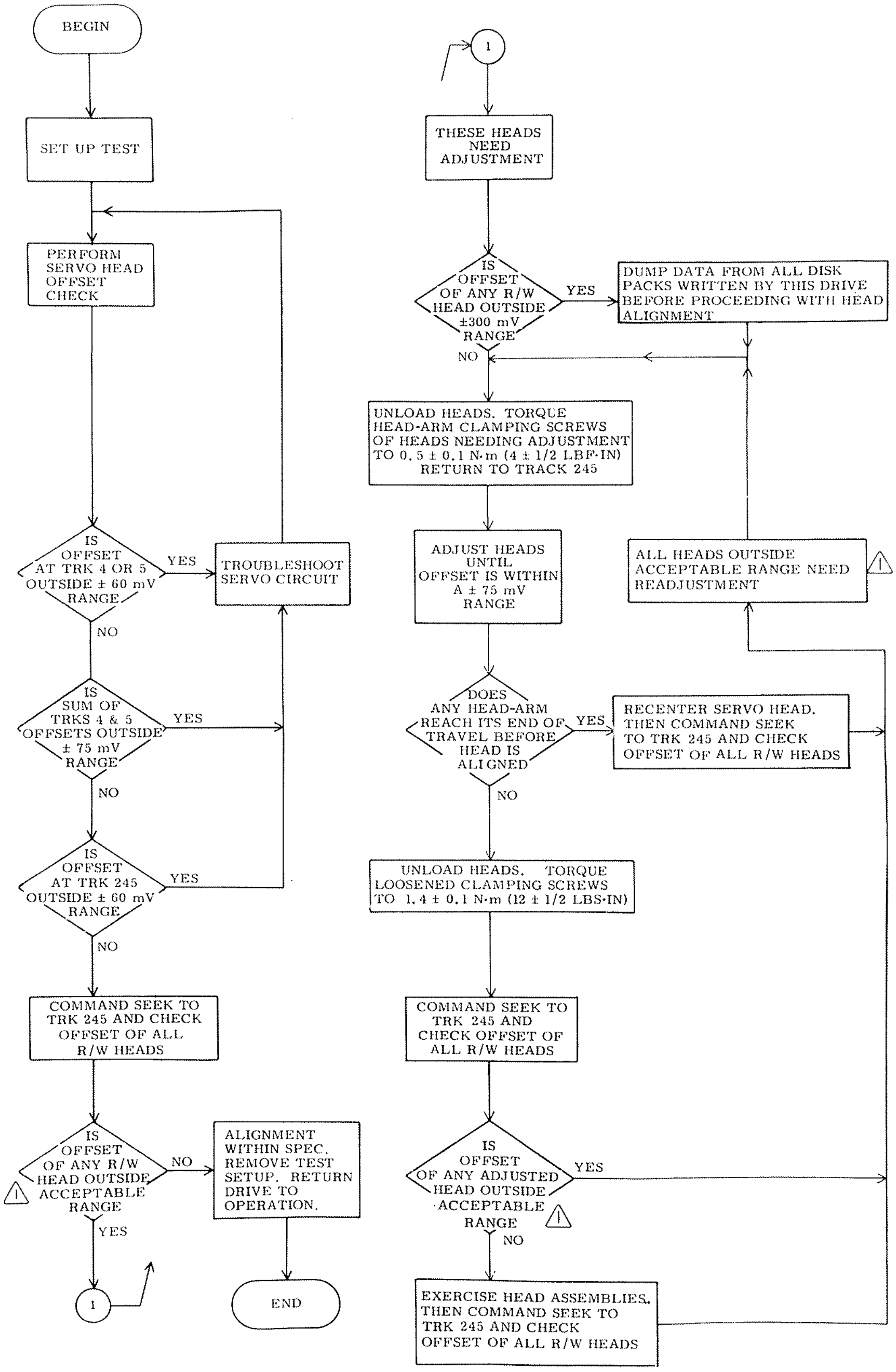
4. Install head alignment card into location A08.

5. Raise logic chassis.

6. Connect FTU to drive. Refer to FTU maintenance manual for installation instructions.

7. Install terminator on I/O connector. If unit is a dual channel drive, install terminator on I/O connector of channel being used by FTU.

8. Connect meter cables between head alignment card and FTU-null meter. (Refer to figure 3-6).



⚠ ACCEPTABLE RANGE DEPENDS ON CE PACK USED:
- IF PACK IS SAME ONE USED FOR LAST ALIGNMENT, RANGE IS 0 ± 150 mv.
- IF PACK IS NOT SAME ONE USED FOR LAST ALIGNMENT, RANGE IS 0 ± 225 mv.

Figure 3-5. Basic Head Alignment Check and Adjustment Procedure

9. Connect oscilloscope to test point Z (ground) and test point Y (dibits) on head alignment card.

10. Install head alignment cable between A08 pins 8-11 A and B and A3A02 J104 of head select/read amplifier card.

11. Set AC POWER and POWER SUPPLY circuit breakers to ON.

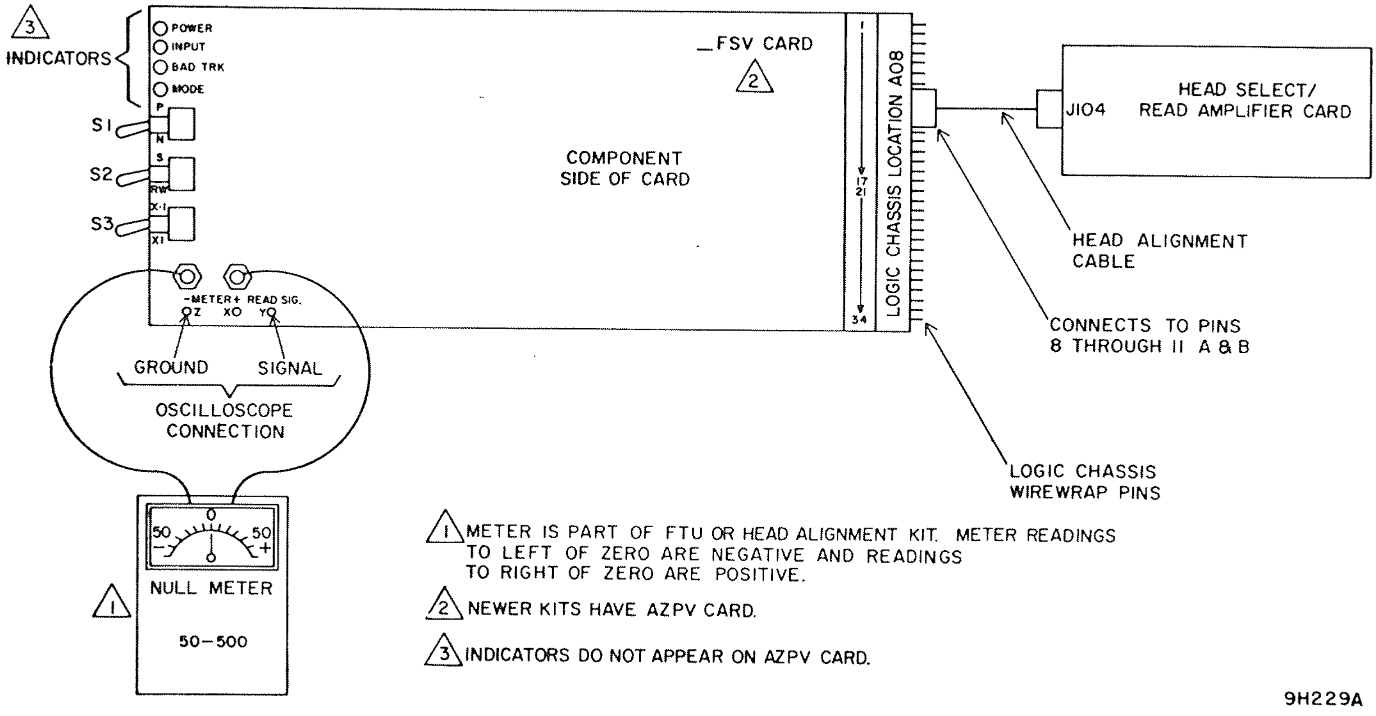
12. Press START switch to start drive motor and load heads.

CAUTION

The CE disk pack has odd-even dibits on tracks 000 through 330 only. Do not attempt to access beyond cylinder 330.

SERVO HEAD OFFSET CHECK

1. Set head alignment card S/RW switch to S and X.1/X1 switch to X.1.
2. Command continuous seeks between cylinders 240 and 245 for a minimum of 30 seconds.
3. Command direct seek to cylinder 004.
4. Observe dibit pattern on oscilloscope. It should be similar to that shown on figure 3-6.1.



1 METER IS PART OF FTU OR HEAD ALIGNMENT KIT. METER READINGS TO LEFT OF ZERO ARE NEGATIVE AND READINGS TO RIGHT OF ZERO ARE POSITIVE.

2 NEWER KITS HAVE AZPV CARD.

3 INDICATORS DO NOT APPEAR ON AZPV CARD.

Figure 3-6. Head Alignment Setup

OSCILLOSCOPE SETTINGS

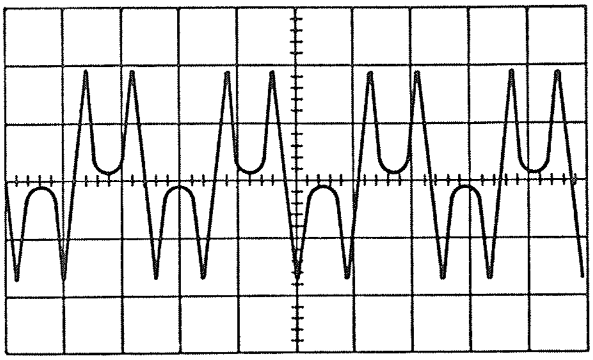
LOGIC GND TO SCOPE GND

VOLTS / DIV
CH 1 - 2V
CH 2 - NOT USED

TIME / DIV
A - 2 μSEC
B - NOT USED

TRIGGERING
A - INTERNAL POSITIVE
B - NOT USED

PROBE CONNECTIONS (USE X10 PROBE)
CH 1 TO DIBITS TEST POINT Y ON HD ALIGN CARD
CH 2 - NOT USED



8J140C

Figure 3-6.1. Head Alignment Waveform

5. Toggle P/N switch to both P and N positions and record null meter readings. If both P and N readings are less than 50 mV, the X.1/X1 switch can be set to X1 position for more accurate readings.

6. Calculate head offset by using the following formula:

   (P) - (N) = OFFSET

   Where P is meter reading with P/N switch in P position and N is meter reading with switch in N position. Meter readings to right of zero are positive and meter readings to left of zero are negative.

EXAMPLE 1: P = +20 N = +15
(P) - (N) = (+20) - (+15) = +5

EXAMPLE 2: P = +20 N = -15
(P) - (N) = (+20) - (-15) = +35

EXAMPLE 3: P = -20 N = +15
(P) - (N) = (-20) - (+15) = -35

7. Record offset calculated in step 6.

8. Evaluate servo head offset as follows:

   - If offset ranges between +60 mV and -60 mV, it is acceptable so proceed with head alignment.

   - If offset is outside ±60 mV range, it is unacceptable. In this case, trouble shoot servo system before proceeding with head alignment.

9. Command direct seek to cylinder 005 and repeat steps 4 through 8.

10. Add offset readings from cylinders 004 and 005. This sum should range between +75 mV and -75 mV. If it does not, troubleshoot servo system.

EXAMPLE 1: P_4 = -25 N_4 = -15
(P) - (N) = (-25) - (-15)= -10 mV

P_5 = +10 N_5 = -10
(P) - (N) = (+10) - (-10)= +20 mV

-(-10) + (+20) = +10 mV

Sum is within ± 75 mV range and is therefore acceptable.

EXAMPLE 2: P_4 = +30 N_4 = -10
(P) - (N) = (+30) - (-10)= +40 mV

P_5 = +15 N_5 = -30
(P) - (N) = (+15) - (-30)= +45 mV
(+40) + (+45) = +85 mV

Sum is outside ±75 range and is therefore unacceptable. Servo system troubleshooting is required.

11. Command direct seek to cylinder 245, install carriage locking pin (refer to figure 3-6.2) and repeat steps 4 through 8.

READ/WRITE HEADS CHECK AND ADJUSTMENT

1. Set R/RW switch to RW. Observe that dibit pattern is similar to that shown on figure 3-6.1.

2. Calculate offset of all read/write heads by using same method given in steps 5 and 6 of Servo Head Check.
3. Remove carriage locking pin.

CAUTION

If any offset exceeds a 0 ±300 mV range, those heads are excessively misaligned. Therefore, to avoid possible loss of data, transfer data from packs written with those heads to other storage before proceeding with alignment.

4. Evaluate read/write head offset as follows:
   - a. When using same CE pack as used for last alignment, offsets must range between +150 mV and -150 mV. If all offsets are within this range, alignment is satisfactory so proceed to step 16.
   - b. When using a different CE pack than the one used for last alignment, offsets must range between +225 mV and -225 mV. If all offsets are within this range, alignment is satisfactory so proceed to step 16.
   - c. If any offsets are outside acceptable range, as defined in steps a or b (whichever applies), these heads are misaligned. Proceed to step 5.
5. Press START switch to stop drive motor and unload heads.
6. Remove connector support bracket (see figure 3-20).
7. Loosen head-arm mounting screws securing heads requiring alignment and torque these screws to 4±1/2 lbf. in (0.5 +0.1 N·m).
8. Press START switch to start drive motor and load heads.
9. Command direct seek to cylinder 245.

CAUTION

Use extreme care to avoid short circuit contact with write driver board when installing or removing head alignment tool and torque wrench.

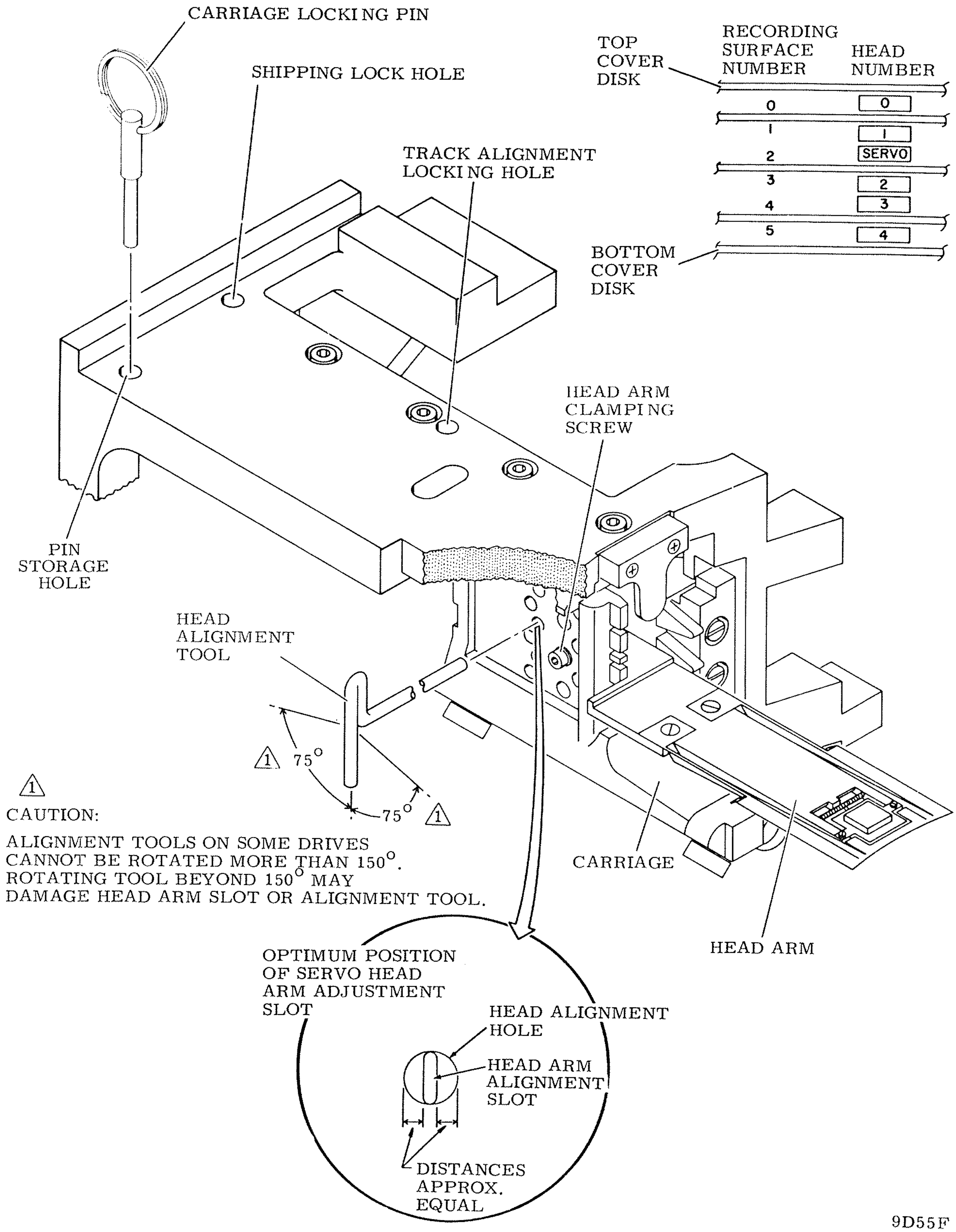
10. Align heads as follows:
    - a. Install jumper between AOU-11A (seek-error) and ground. This jumper prevents force exerted during alignment from moving the heads off the alignment cylinder to an adjacent cylinder. Be sure to remove jumper before commanding drive to perform another seek.
    - b. Select head to be aligned.

WARNING

To prevent personal injury in case of an emergency retract, install carriage locking pin in head alignment hole prior to positioning head alignment tool. Be sure to remove pin before next seek is performed.

    - c. Install head alignment tool so that tool pin engages head-arm alignment slot (refer to figure 3-6.2).
    - d. Observe oscilloscope and adjust head to obtain balanced dibit pattern. Pattern is balanced when point A amplitude equals point B and point C equals point D (see figure 3-6).
    - e. Observe null meter and adjust head until offset ranges between +75 mV and -75 mV. Calculate offset as described in steps 5 and 6 of Servo Head Check. Occasionally, a head cannot be aligned because its adjustment slot is at its end of travel. If this occurs, check position of servo head-arm adjustment slot and if necessary, recenter it. However, it should be noted that any slight adjustment of the servo head required realignment of all read/write heads. Torque servo head to 12 ±1/2 (lbf. in (1.4 ± 0.1 N·m).
    - f. Repeat steps a through e for all heads to be aligned.
11. Remove carriage locking pin and also remove jumper from A2B09-11A.
12. Press START switch to stop drive motor and unload heads.
13. Torque head-arm clamp screws of each head adjusted to 12 ±1/2 lbf. in (1.4 ± 0.1 N·m). While torqueing screws, use only straight arm allen wrench and keep it as perfectly aligned as possible with screws. If care is not taken during this operation, head may be pushed out of alignment.
14. Check each head adjusted to see if torqueing screws affected alignment. If any heads are outside ±150 mV range, readjust them as directed in steps 7 through 13.

15. Perform the following to ensure that heads will remain aligned under normal operating conditions.
    a. Command continuous seeks between cylinders 240 and 245 for a minimum of 30 seconds.
    b. Unload and load heads at least twice.
    c. Command direct seek to cylinder 245.
    d. Check alignment of each head adjusted. If any heads are outside acceptable tange (as defined in step 4).
16. Press START switch to stop drive motor.
17. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
18. Disconnect test setup and remove alignment card and terminator (if installed).
19. Replace connector support bracket (see figure 3-20).
20. Lower logic chassis to normal operating position.
21. Lower case assembly.
22. Remove CE pack.
23. Restore drive to on-line operation.



1 CAUTION:

ALIGNMENT TOOLS ON SOME DRIVES CANNOT BE ROTATED MORE THAN 150°. ROTATING TOOL BEYOND 150° MAY DAMAGE HEAD ARM SLOT OR ALIGNMENT TOOL.

Figure 3-6.2. Head Arm Alignment

VELOCITY GAIN ADJUSTMENT

This procedure provides information on the checking and, if necessary, adjusting of the servo system velocity signal. If the adjustment cannot be completed satisfactorily, the procedure must be terminated. If this happens, refer to the Trouble Analysis section. The following procedure assumes that the FTU is connected, and that a scratch pack is installed on the drive.

1. With the drive case closed, command random seeks for 10 minutes minimum in order to thermally stabilize drive.
2. Stop random seeks and set up oscilloscope per figure 3-6.1. Oscilloscope ground references must be as shown.
3. Command 822 (hex 336) cylinder continuous seeks and adjust oscilloscope trigger level to obtain waveform shown in figure 3-6.1.
4. Measure full length seek time. Time between On Cylinder pulses should be 52 ±2 milliseconds.
5. If full length seek time is not as specified, perform velocity gain adjustment. On card A12, adjust velocity gain potentiometer E2R6 (see figure 3-7) until time between leading edges of On Cylinder pulses is 52 ±2 milliseconds.
6. Return drive to normal operation.

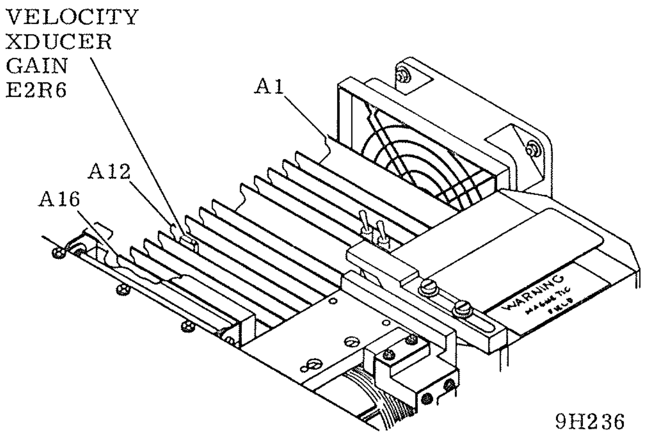


Figure 3-7. Velocity Gain Adjustment Locations

OSCILLOSCOPE SETUP

	VOLTS / DIV	TEST POINT	SIGNAL NAME
CH I - (USE X PROBE)	0.2V	A04 03A	+ON CYLINDER
CH 2 - (USE X PROBE)	NOT USED		

	SLOPE / SOURCE	TEST POINT	SIGNAL NAME
TRIGGER A- (USE X 10 PROBE)	+/EXT	A04 07A	-FORWARD SEEK
TRIGGER B- (USE X PROBE)	NOT USED		

TIME / DIV: 10 ms MODE TRIGGER: CH 1

ADDITIONAL SETTINGS: NONE

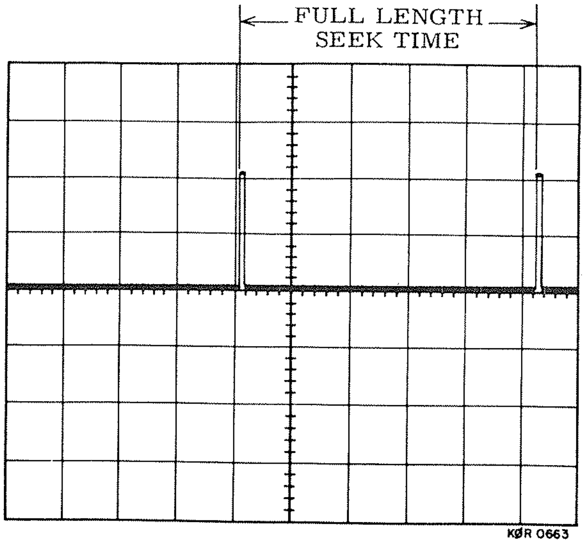


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Figure 3-6.3. Velocity Gain Waveform

SECTION 3C

TROUBLE ANALYSIS AIDS

GENERAL

Various types of malfunction can occur during the course of drive operation. No attempt has been made to correlate the many possible malfunctions to their most likely cause. However, as a troubleshooting aid on the broad subject of accessing errors, these four categories are definable:

- Seek errors
- Address errors
- On cylinder errors
- Seek monitor checks

Prior to beginning detailed tests or adjustments, perform the procedures in Drive Tests and Adjustments. If these tests and adjustments do not correct the malfunction or reveal a correctable problem, proceed with the Power System Checks.

POWER SYSTEM CHECKS

OUTPUT VOLTAGES CHECK

Perform the following check with the drive performing continous 128-track seeks. The +5V and -5V adjustment procedures are located in the Drive Tests and Adjustments paragraphs of this section. All measurements should be made by connecting a digital volt/ohmmeter at the logic chassis connection or at the capacitor in the case of -42V. The following voltages shall be present:

1. Ground to +20 (+20±2 vdc).
2. Ground to +5 (+5.1±0.05 vdc).
3. Ground to +42 (+42±2 vdc).
4. Ground to -20 (-20±2 vdc).
5. Ground to -42 (-42±2 vdc).
6. Ground to -5 (-5.1±0.05 vdc).

EMERGENCY RETRACT TEST

1. Raise case assembly.
2. Press drive START switch to start drive motor and load heads.
3. Apply a ground to A13-14B and observe that heads unload.
4. Sync an oscilloscope negative on A13-14B and observe the output at the JLQV card, location A12, TPF. The output at TPF should peak at 2.0 (±0.5) volts during the retract.
5. Prepare drive for on line operation.

SERVO SYSTEM ADJUSTMENTS AND CHECKS

GENERAL

The following procedures check the logic associated with the servo. These procedures are applicable only if adjustments could not be made or if troubleshooting a malfunctioning drive.

All servo system checks are written as independent procedures. If more than one check is being made, drive preparation steps may be omitted for subsequent checks.

VELOCITY GAIN CHECK

This procedure adjusts output of velocity transducer circuit thereby controlling seek time. Proceed as follows:

1. Perform steps 1 through 6 of Fine Position Amplitude Check.
2. Connect oscilloscope channel 1 to wirewrap pin A04-03A (On Cylinder).
3. Set oscilloscope time per division control to 10 ms per cm.
4. Command continuous seeks between cylinders 000 and 822.
5. Observe waveforms and note that time between On Cylinder pulses is 52 ±2 ms. If timing is incorrect, perform Velocity Gain Adjustment procedure (Section 2B).
6. Prepare drive for on line operation.

FINE POSITION AMPLITUDE CHECK

1. Prepare drive for use with test software or field test exerciser.
2. Trigger oscilloscope negative external on wire wrap pin A04-07A (Not Forward Seek).

3. Connect oscilloscope channel 1 to test point F on card A11 (Fine Position Analog).

4. Set oscilloscope volts per division control to 2 volts per cm and time per division control to 1 ms per cm.

5. Command continuous seeks between cylinders 000 and 001.

6. Amplitude of waveform (refer to figure 3-8) should be between 8.6 and 12.6 volts peak to peak. If voltage exceeds tolerance, replace card at A11. If tolerance is still not met, replace card at A10.

7. Prepare drive for on line operation.

ON CYLINDER DELAY CHECK

1. Prepare drive for use with test software or field test exerciser.

2. Trigger oscilloscope positive external at wirewrap pin A04-15A (On Cylinder Sense).

3. Connect oscilloscope channel 1 to wirewrap pin A04-03A (On Cylinder).

4. Command continuous seeks between cylinders 000 and 001.

5. Observe that On Cylinder pulse occurs between 1.40 and 2.10 ms from start of the trace. If not, replace card A04.

6. Prepare drive for on line operation.

COARSE VELOCITY INTEGRATOR CHECK

This procedure checks operation of Desired Velocity Function Generator. Function Generator smooths steps in coarse position error signal which are present during last 256 cylinders of a seek.

1. Prepare drive for use with test software or field test exerciser.

NOTE

> Insert spare wirewrap pin (or equivalent) into back of connector attached to backpanel so oscilloscope probe can be attached.

2. Trigger oscilloscope positive external at wirewrap pin A09-26B (T≤7).

3. Connect oscilloscope channel 1 to test point D on card A12.

4. Command continuous seeks between cylinders 000 and 256.

5. Adjust oscilloscope controls to display two sloped curves (refer to figure 3-9).

6. The amplitude of the last discontinuity (figure 3-9) should be from .03 to .05 volts (ignore spike). If it does not

OSCILLOSCOPE SETTINGS

LOGIC GND TO SCOPE GND

VOLTS / DIV
  CH I - 2V/CM
  CH 2 - NOT USED

TIME / DIV
  A - IMS/CM
  B - NOT USED

TRIGGERING
  A - EXT NEG, A04-07A
  B - NOT USED

PROBE CONNECTIONS
  CH I TO A11-TPF
  CH 2 NOT USED

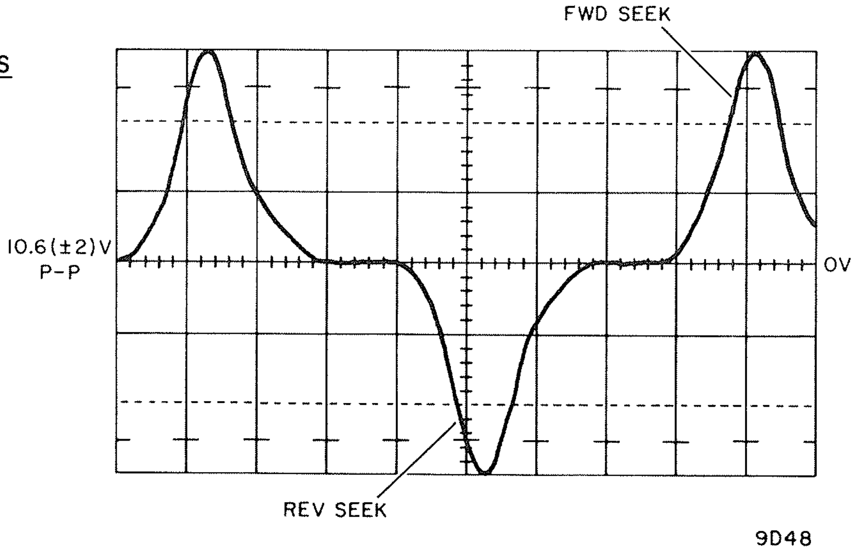


Figure 3-8. Fine Position Amplitude Waveform

meet these specifications perform Digital to Analog Converter and Velocity Transducer Gain Uniformity Checks.

7. Prepare drive for on line operation.

DIGITAL TO ANALOG CONVERTER CHECK

The position converter output should be clamped at negative saturation until tracks to go is less than 256 (T<256). During remainder of seek position converter output is under control of digital to analog converter.

1. Prepare drive for use with test software or with field test exerciser.

2. Trigger oscilloscope negative external at wirewrap pin A04-08A (Not Rev Seek).

3. Connect oscilloscope channel 1 to test point C on Card A12 (D/A Converter).

4. Command continuous seeks between cylinders 000 and 260.

5. Observe waveforms and evaluate them as follows (oscilloscope settings and waveforms are shown on figure 3-10):

   a. Ensure that top waveform on figure 3-10 has an amplitude of -10.5 volts maximum.

   b. Ensure that steps on the bottom waveform (except for the last two) have height between 20 and 60 mV. Last two steps should each have height of 40 mV.

6. If requirements of step 5 are not met, replace cards in A12 or A13.

7. Prepare drive for on line operation.

VELOCITY TRANSDUCER GAIN UNIFORMITY CHECK

1. Prepare drive for use with test software or field test exerciser.

2. Trigger oscilloscope positive external at wirewrap pin A09-26B (T≤7).

3. Connect oscilloscope channel 1 to test point B on card A12 (velocity integrator output).

4. Command continuous seeks between cylinders 000 and 007.

5. Decalibrate horizontal sweep and adjust triggering control to observe both positive and negative ramps (figure 3-11). Ramps represent integrated velocity sawtooth during last seven cylinders of seek. Positive ramps are forward seek, negative ramps are reverse seek.

OSCILLOSCOPE SETTINGS

LOGIC GND TO SCOPE GND

VOLTS / DIV
   CH I - .2V/CM
   CH 2 - NOT USED

TIME / DIV
   A - .5 MS/CM
   B - NOT USED

TRIGGERING
   A - EXT POS, A09-26B
   B - NOT USED

PROBE CONNECTIONS
   CH I TO AI2-TPD
   CH 2 NOT USED

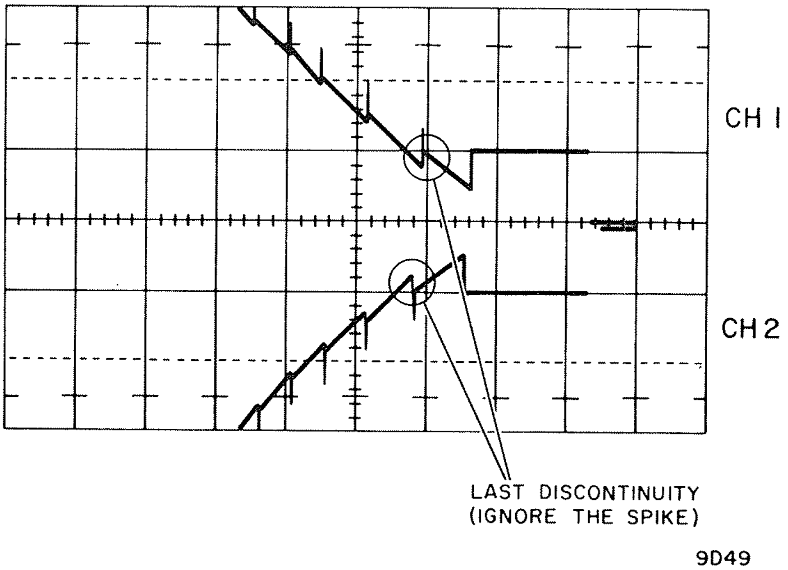


Figure 3-9. Coarse Velocity Integrator Waveform

OSCILLOSCOPE SETTINGS

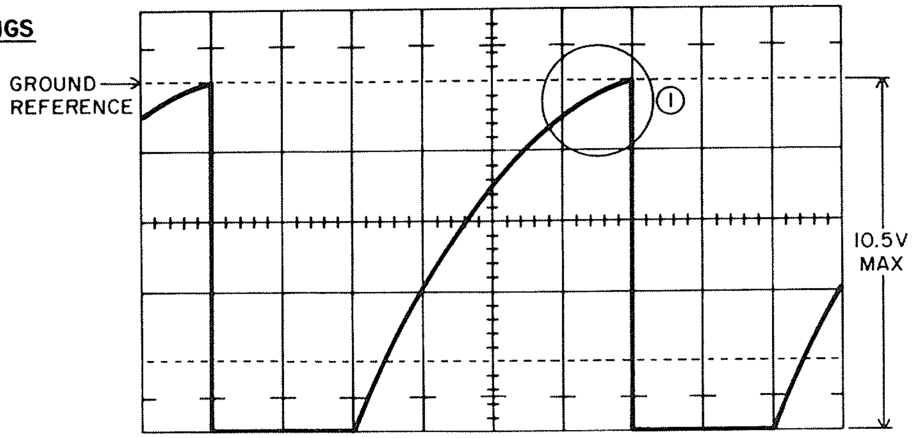
LOGIC GND TO SCOPE GND

VOLTS / DIV
- CH 1 - 2 V
- CH 2 - NOT USED

TIME / DIV
- A - 5 MS
- B - NOT USED

TRIGGERING
- A - EXT NEG, A04-08A
- B - NOT USED

PROBE CONNECTIONS
- CH 1 TO A12-TPC
- CH 2 NOT USED



OSCILLOSCOPE SETTINGS

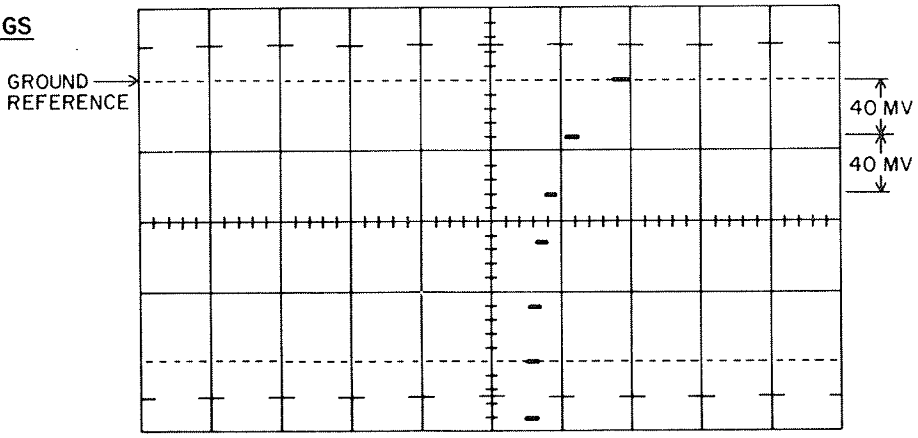
LOGIC GND TO SCOPE GND

VOLTS / DIV
- CH 1 - 0.05 V
- CH 2 - NOT USED

TIME / DIV
- A - 5 MS
- B - NOT USED

TRIGGERING
- A - EXT NEG, A04-08A
- B - NOT USED

PROBE CONNECTIONS
- CH 1 TO A12-TPC
- CH 2 NOT USED



NOTE
① LOWER WAVEFORM IS EXPANDED VIEW OF THIS SECTION.

9D50

Figure 3-10. Digital to Analog Converter Output Waveform

6. Check voltages of second to last positive and negative ramps (figure 3-11). Amplitude of each ramp should be 2.4 to 3.0 volts and difference in amplitudes between two ramps should be less than 0.4 volts. If these requirements are not met, either card A12 or velocity transducer is defective.

7. Prepare drive for on line operation.

FINE ENABLE SWITCHING LEVEL CHECK

This procedure verifies that Fine Enable switches in at proper level. This signal, along with T≤1, set Fine FF.

1. Prepare drive for use with test software or field test exerciser.

2. Trigger oscilloscope negative external at wirewrap pin A04-07A (Not Forward Seek).

3. Connect oscilloscope channel 2 to test point B on card A12 (velocity integrator output).

4. Connect oscilloscope channel 1 to wirewrap pin A04-16B (FINE).

5. Set oscilloscope trigger mode to chop.

6. Command continuous seeks between cylinders 000 and 001.

7. Check that Fine signal switches to a logical 1 when positive or negative velocity signal is between 1.3 and 1.5 volts (figure 3-12). If these requirements are not met replace card in A11.

8. Prepare drive for on line operation.

TRACK SERVO AMPLITUDE CHECK

This test checks the amplitude of track servo signal output of servo preamp.

1. Prepare drive for use with test software or field test exerciser.

2. Trigger oscilloscope internal positive.

NOTE

Insert spare wirewrap pin (or equivalent) into back of connector attached to backpanel so oscilloscope can be attached.

3. Connect oscilloscope channel 1 to wirewrap pin A10-25B (dibit signals from servo preamp).

4. Connect oscilloscope channel 2 to wirewrap pin A10-23B (dibit signals from servo preamp).

5. Set oscilloscope trigger mode to add and invert either channel 1 or 2.

6. Command seek to cylinder 000 and observe amplitude of waveform (figure 3-13).

7. Command seek to cylinder 822 and observe amplitude of waveform (figure 3-13).

8. Check that waveforms observed in steps 6 and 7 are between 0.3 and 1.5 volts

OSCILLOSCOPE SETTINGS

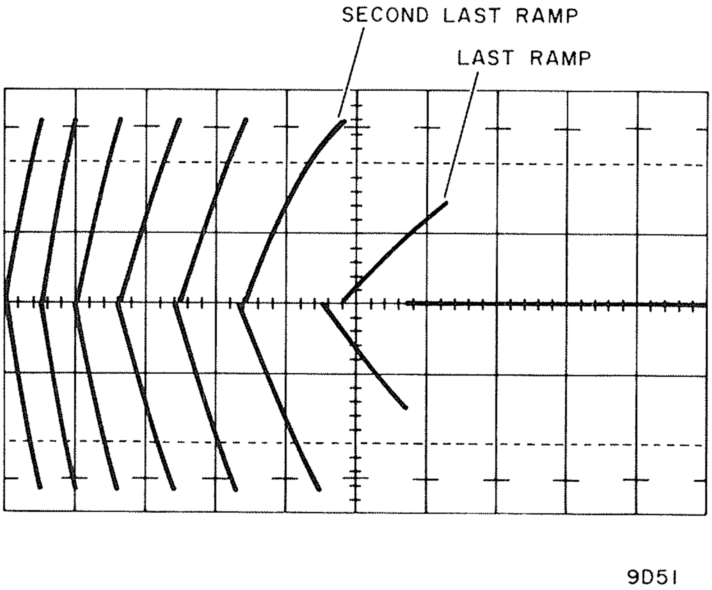
LOGIC GND TO SCOPE GND

VOLTS / DIV
  CH I - IV/CM
  CH 2 - NOT USED

TIME / DIV
  A - .5 MS/CM
  B - NOT USED

TRIGGERING
  A - EXT POS, A09-26B
  B - NOT USED

PROBE CONNECTIONS
  CH I TO A12-TPB
  CH 2 NOT USED



Integrated Velocity Waveform

OSCILLOSCOPE SETTINGS

LOGIC GND TO SCOPE GND

VOLTS / DIV
  CH 1 - 5V/CM
  CH 2 - 1V/CM

TIME / DIV
  A - 1MS/CM
  B - 1MS/CM

TRIGGERING
  A - EXT NEG, A04-07A
  B - NA

PROBE CONNECTIONS
  CH 1 TO A04-16B
  CH 2 TO A12-TPB

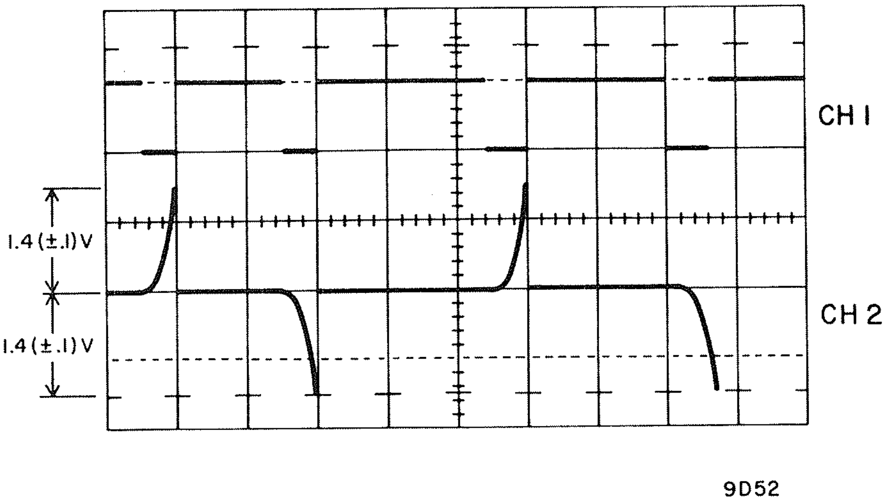


Figure 3-12. Fine Enable Switching Waveform

OSCILLOSCOPE SETTINGS

LOGIC GND TO SCOPE GND

VOLTS / DIV
  CH 1 - 2V
  CH 2 - NOT USED

TIME / DIV
  A - 2 μSEC
  B - NOT USED

TRIGGERING
  A - INTERNAL POSTIVE
  B - NOT USED

PROBE CONNECTIONS (USE X10 PROBE)
  CH 1 TO FTU DIBITS JACK
  CH 2 - NOT USED

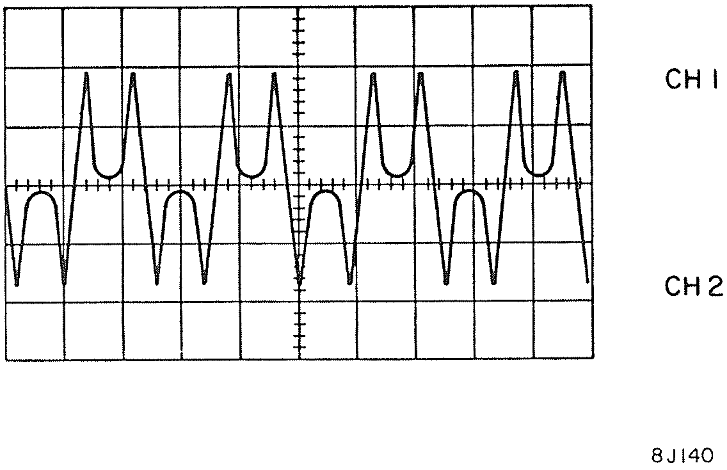


Figure 3-13. Track Servo Amplitude Waveform

peak to peak (note that waveform in step 6 has largest amplitude).

9. If one side of servo head is shorted to ground, a waveform similar to that shown in figure 3-14 will be displayed. The servo will continue to funtion, but intermittent seek errors occur.

10. If track servo amplitude is not as specified in figure 3-13, replace servo head or servo preamp.

11. Prepare drive for on line operation.

CYLINDER PULSE SWITCHING LEVEL CHECK

NOTE

> If requirements of steps 1 through 7 are met it is not necessary to perform remainder of this procedure.

1. Prepare drive for use with test software or field test exerciser.

2. Trigger oscilloscope positive internal.

3. Connect oscilloscope channel 1 to wire-wrap pin A04-22A (Cylinder Pulses).

OSCILLOSCOPE SETTINGS

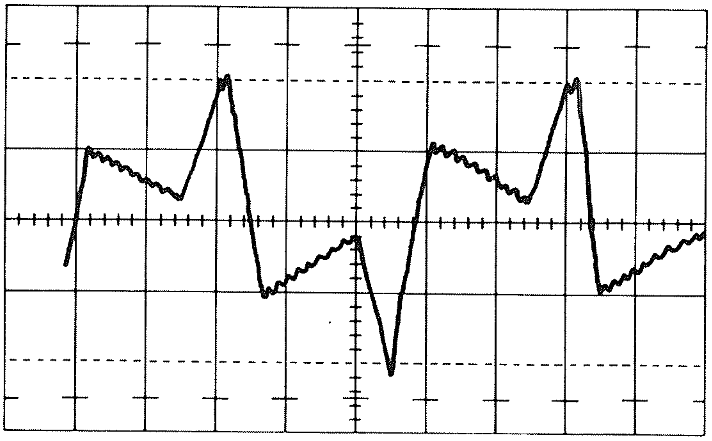
LOGIC GND TO SCOPE GND

VOLTS / DIV
  CH 1 - .1V/CM
  CH 2 - .1V/CM

TIME / DIV
  A - .5μS/CM
  B - NOT USED

TRIGGERING
  A - INT NEG
  B - NOT USED

PROBE CONNECTIONS
  CH 1 TO A10-25B
  CH 2 TO A10-23B



9D54

Figure 3-14. Shorted Servo Head Waveform

4. Command continuous seeks between cylinders 000 and 004.

5. Check for series of positive-going 10 (±2.5) μsec cylinder pulses.

6. Trigger oscilloscope external positive at A04-03A (On Cylinder).

7. Check that last cylinder pulse (generated from leading edge of On Cylinder) is present and has pulses width of approximately 0.2 μsec.

8. Trigger oscilloscope negative external at wirewrap pin A04-28B (Cylinder Detect A).

9. Connect oscilloscope channel 1 to wirewrap pin A10-09B (Track Servo Signal).

10. Command continuous seeks between cylinders 000 and 004.

11. Set oscilloscope time per division to 50 μsec per cm and volts per division to 0.2V per cm.

12. Check that Track Servo signal is between -0.3 and -0.5 volts at beginning of sweep.

13. Trigger oscilloscope positive external at A04-28B (Cylinder Detect A) and check that track servo signal is between -0.1 and +0.1 at beginning of the sweep.

14. Trigger oscilloscope negative external at wirewrap pin A04-27B (Cylinder Detect B). Check that Track Servo signal is between +0.3 and +0.5 volts at beginning of sweep.

15. Trigger positive external and check that Track Servo signal is between -0.1 and +0.1 at beginning of sweep.

16. If levels are not met replace card A10.

17. Prepare drive for on line operation.

END OF TRAVEL CHECK

1. Prepare drive for use with test software or field test exerciser.

2. Disconnect voice coil from power amp by removing wires from K2 pin 8.

3. Remove plastic shield from top of magnet assembly to gain access to voice coil.

4. Command a return to zero seek.

5. Trigger oscilloscope negative internal.

NOTE

Insert spare wirewrap pin (or equivalent) into back of connector attached to backpanel so oscilloscope probe can be attached.

6. Connect oscilloscope channel 1 to wirewrap pin A03-16A (Not Forward EOT Enable).

7. Set oscilloscope time per division control to 5 ms per cm and volts per division control to 2 volts per cm.

8. Slowly move positioner toward cylinder 822. After passing cylinder 822, signal goes low and will remain low as long as positioner is moving.

9. Trigger oscilloscope positive internal.

10. Connect oscilloscope channel 1 to wirewrap pin A03-10B (Reverse EOT Pulse).

11. Change oscilloscope time per division to 20 µsec per cm.

NOTE

Do not unload heads manually.

12. Slowly move carriage toward cylinder 000. After passing cylinder 000, Reverse EOT Pulses should appear (approximately 40 µsec in duration).

13. Unload heads manually (refer to procedure for manually positioning carriage).

14. Press START switch to stop drive motor.

15. Replace plastic shield removed in step 3.

16. Set POWER SUPPLY circuit breaker to off.

17. Connect wires removed in step 2.

18. Prepare drive for on line operation.

ON CYLINDER SWITCHING LEVEL CHECK

This procedure verifies that On Cylinder is enabled when Fine Position signal approaches null with Fine FF set.

1. Prepare drive for use with test software or field test exerciser.

2. Trigger oscilloscope positive external at wirewrap pin A04-15A (On Cylinder Sense).

3. Connect oscilloscope channel 1 to test point F on Card A11 (Fine Position Analog).

4. Command continuous seeks between cylinders 000 and 003.

5. Two erratic horizontal waveforms are displayed. Check that both positive and negative waveforms are between 0.88 and 1.08 volts peak at beginning of trace.

6. Command return to zero seek.

7. Disconnect voice coil from power amp by removing wires from K2 pin 8.

8. Remove plastic shield from top of magnet assembly to provide access to voice coil.

9. Change oscilloscope trigger to negative internal.

10. Manually move carriage back and forth. Check that both positive and negative waveforms are between 1.45 and 1.77 volts peak at the beginning of trace.

11. If requirements of steps 5 or 10 are not met, replace card A09.

CAUTION

Refer to discussion on manually positioning carriage before manually unloading heads.

12. Manually unload heads.

13. Press START switch to stop drive motor.

14. Set POWER SUPPLY circuit breaker to off.

15. Replace plastic shield removed in step 8.

16. Connect wires removed in step 7.

17. Prepare drive for on line operation.

LOSS OF SERVO CONTROL CHECKS

If problems exist in servo system such that satisfactory results cannot be obtained through use of test software or field test exerciser, check out system by performing following procedures (figure 3-5).

1. Prepare drive as follows:
    a. Press START switch to stop drive motor.
    b. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
    c. Raise case assembly.
    d. Raise logic chassis to maintenance position.

e. Loosen four screws securing logic chassis cover and remove cover.

f. Remove logic control of voice coil by disconnecting black lead wire at voice coil.

g. Remove plastic shield from top of magnet assembly to provide access to voice coil.

CAUTION

Make sure positioner is fully retracted (refer to procedure for manually positioning carriage).

2. Check that output of summing amplifier is at 0 volts before drive motor is energized by performing the following procedure.

   a. Set oscilloscope trigger control to auto (free running).

   b. Set oscilloscope volts per division control to 5 volts per cm.

   c. Connect oscilloscope channel 1 to test point E on card A12.

   d. Set AC POWER and POWER SUPPLY circuit breakers to ON.

   e. Observe that voltage observed is 0 volts.

3. Check that output of summing amplifier goes to -10 volts when drive motor gets up to speed by performing the following procedure.

   a. Set oscilloscope controls as in step 2.

   b. Press START switch to start drive motor and observe that voltage drops to -10 volts when drive motor gets up to speed.

CAUTION

To avoid head crash, make certain drive motor is up to speed.

4. Manually load heads (refer to discussion on manually positioning carriage).

5. Check velocity transducer and velocity amplifier. If signals observed are as specified in the following, transducer and amplifier are functioning properly.

   a. Connect oscilloscope channel 1 to test point F on card A12 (output of velocity transducer circuit).

   b. Set oscilloscope trigger control to auto (free running).

   c. Set oscilloscope volts per division control to .5V per cm, set time per division control to 10 ms per cm.

   d. Manually move positioner toward cylinder 822 (forward direction). Signal should go negative and amplitude should increase as the speed of positioner increases.

   e. Manually move positioner toward cylinder 000 (reverse direction). Signal should go positive and amplitude should increase as speed of positioner increases.

6. Check Fine Position signal. If signals observed are as specified in following, it indicates that track servo, the A10 card and servo head are functioning properly.

   a. Connect oscilloscope channel 1 to test point F on card A11 (Fine Position Analog).

   b. Set oscilloscope trigger control to auto (free running).

   c. Set oscilloscope volts per division control to 2V per cm and time per division control to 10 ms per cm.

   d. Observe 10.6 (±2) volts peak to peak signal when moving positioner in either forward or reverse direction. When positioner is on cylinder, signal should stay at 0 volts.

7. Check summing amplifier output. If signals observed are as specified in the following, it indicates that proper signal is being gated to summing amplifier, fine mode is enabled, and velocity amplifier and fine position signals are properly summed together.

   a. Connect oscilloscope channel 1 to test point E (summing amplifier output) on card A12.

   b. Set oscilloscope trigger control to auto (free running).

   c. Set oscilloscope volts per division control to 5V per cm and time per division control to 20 ms per cm.

   d. Signal observed should be that of step 6 superimposed on signal of step 5.

   e. Signal should also clamp at approximately +10 volts.

8. Check power amplifier output. If signals observed are as specified in following, power amplifier is functioning properly.

    a. Connect oscilloscope channel 1 to black lead wire which was disconnected from voice coil.

    b. Set oscilloscope trigger control to auto (free running).

    c. Set oscilloscope volts per division control to 20V per cm and time per division control to 10 ms per cm.

    d. Move positioner in forward, then reverse direction and observe signal switching from +40 to -40 volts.

CAUTION

Refer to discussion on manually positioning carriage before manually unloading heads.

9. Manually unload heads.

10. Press START switch to stop drive motor.

11. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

12. Reconnect black lead wire to voice coil and replace plastic shield removed in step 1g.

13. Replace cover on logic chassis and tighten four screws.

14. Lower logic chassis from maintenance position. Lower case assembly.

15. Prepare drive for on line operation.

FINE POSITION OFFSET CHECK

1. Prepare drive for use with test software or field test exerciser.

2. Command direct seek to cylinder 400.

3. Set oscilloscope triggering to automatic. Set vertical sensitivity of each channel to 50 mV per cm.

4. Connect oscilloscope channels 1 and 2 to A11-TPF (Fine Position Analog).

5. Switch oscilloscope to Add mode and adjust the ground reference level to the horizontal centerline.

6. Set channel 1 input coupling to DC and set channel 2 input coupling to AC.

7. The dc value of the position signal should be -100 to +100 mV.

8. If the requirement of step 7 is out of tolerance, connect both channel 1 and 2 probes to A12-TPE (summing amp output) and reposition heads to a track where the dc value of the signal is -10 to +10 mV.

9. Repeat steps 3 through 7. If the dc offset is now within the range of -30 to +30 mV, the cause of the excessive dc offset at cylinder 200 is mechanical. Check the head cables, coil flex leads, velocity transducer and carriage for exerting excessive force. If the dc offset is greater than -30 to +30 mV, the excessive offset voltage is caused by an electrical problem possibly located in one of the logic cards at locations A09, A10, A11, A12 or a bad ground from the velocity transducer.

10. Prepare drive for on line operation.

READ/WRITE SYSTEM CHECK

Field-level tests of the read/write system require that signals with fast rise times be accurately measured. Make sure that the scope probe ground adapter is connected to ground (TP-A or TP-Z) of the card being tested.

HEAD AMPLITUDE TEST

The procedure verifies that the read signal has sufficient amplitude to be reliably processed by the read logic. Since amplitude decreases as the recording frequency increases, the minimum amplitude in MFM recording is obtained when an all "0's" or all "1's" pattern is being read. The minimum amplitude is tested first. Minimum recording frequency, therefore, the greatest amplitude, is obtained by a pattern of alternate "1010..." pattern. This amplitude is also tested.

Since read data is tested by the same heads that write the data pattern, head alignment is not verified by this test. If this test fails on only one head, replace that head. If it fails on all heads, replace read amplifier card (on deck) and repeat test.

Perform this test on all heads as follows:

1. Seek to cylinder 821.

2. Connect oscilloscope vertical inputs to J104 pins 3 and 5. Measure signal differentially by placing scope in Add mode and inverting channel B.

3. Sync positive on A03-TPC (Index).

4. Write data pattern of all "1's".

NOTE

The Field Test Exerciser (FTE) writes by syncing on negative-going edge of Index, then delaying 600 µsec and writing either low frequency (101010...) or high frequency (0000... or 1111...) until the leading edge of the next Index.

5. Measure and record peak to peak amplitude of read signal. It shall be at least 130 mv peak to peak.

6. Seek to cylinder 000.

7. Write data pattern of 101010...

8. Measure and record peak to peak amplitude of read signal. It shall not exceed 1100 mv peak to peak.

MISCELLANEOUS LOGIC CHECKOUT

START/STOP TIME

This procedure verifies correct operation of the spindle drive motor and hysteresis brake. Use a stopwatch or wristwatch with sweep second hand.

1. Connect oscilloscope to back panel pin A05-17B (Up to Speed).

2. Press START switch and start timer. Up to Speed should be "1" in 10 (±5) seconds.

3. Press START switch. Pack should come to complete stop in less than 25 seconds.

SPEED SENSING

This procedure verifies correct operation of the speed detection function. Proceed as follows with a pack installed.

1. Load heads.

2. Connect oscilloscope to back panel pin J202-1 (Speed Transducer Output). Sync negative internal. Calibrate scope trace to ground.

3. Observe waveform on oscilloscope. Signal should reach at least -1.0vdc on negative swing and +1.0 to +4.5 vdc on positive swing. If not, check sensor gap as directed in Speed Sensor Adjustment procedure in section 3D.

POWER UP CLEAR

This procedure verifies that the internal Master Clear is operational during startup conditions. A pack need not be installed.

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

2. Connect oscilloscope channel 1 to +5 vdc. Place channel 2 scope probe on Power Up Blanking signal at A05-25B.

3. Set AC POWER and POWER SUPPLY circuit breakers to ON while observing oscilloscope.

   a. Channel 1 (±5v) should reach +4.5v within 100 ms.

   b. Channel 2 pulse width ("0") should be 600 (±100) ms.

SECTION 3D

REPAIR AND REPLACEMENT PROCEDURES

GENERAL

Procedures in the following paragraphs outline in detail the adjustment, replacement, and checkout of the field-replaceable parts or assemblies of a drive. Not all procedures contain all three categories of information. For example, some replaceable items do not require a checkout procedure after replacement; others may not require an adjustment.

Before performing any of these procedures, read the entire procedure and become familiar with safety precautions and preliminary conditions specified at the beginning of this Corrective Maintenance section.

The drive tests and adjustments should be performed prior to replacing any parts. This ensures that apparent malfunctions are not caused simply by misadjustments. Also, these procedures should be performed whenever logic cards or other electrical components are repaired or replaced.

BLOWER MOTOR REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Remove ac power plug.
2. Raise case assembly.
3. Remove disk pack.
4. Raise deck assembly to maintenance position.
5. Identify blower motor leadwires and disconnect wires (figure 3-15).
6. Remove left side panel (left side as viewed from front).
7. Remove five screws and washers securing blower assembly to base assembly (screws are under base assembly) and remove defective blower.
8. Install replacement blower assembly in base assembly. Orient blower motor leadwires per figure 3-15.
9. Secure blower assembly to base assembly using five screws and washers. Tighten screws.
10. Connect blower motor leadwires per figure 3-15.
11. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.
12. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.
13. Set AC POWER and POWER SUPPLY circuit breakers to ON.

BRAKE PLATE REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Remove two screws and nylon bushings securing brake plate to deck assembly (figure 3-31).
4. Remove nylon bushings from faulty brake plate and install them on replacement brake plate.
5. Install brake plate and spring and secure to deck with two screws.
6. Restore drive to on-line operation.

CAM TOWER REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise case assembly.
4. Manually load heads per Power Off Manual Head Positioning procedure.

CAUTION

Use care not to touch heads or bump head arm assemblies during the following procedure.

5. Remove both cam towers.
6. On newer units, where the rail bracket assembly has four cam tower alignment pins, replace new cam towers in the reverse order of removal. Tighten mounting screws to a torque of 12 ±2 pounds-force-inch, and return unit to normal operation.

on older units, where the rail bracket assembly does not have cam tower alignment pins, proceed to step 7 and replace both cam towers simultaneously.

7. Remove stop block.

8. Position both replacement cam towers on cam tool so that cam towers are pressed onto the alignment pins of cam tool.

9. With cam towers held by cam tool, firmly press cam towers against rail bracket assembly so that pilot pin of each cam tower enters related pilot hole in rail bracket.

10. Insert cam tower mounting screws into threads of rail bracket assembly such that they pass through holes in cam tool and secure cam towers to rail bracket assembly. Tighten screws a torque of 12 ±2 pounds-force-inch.

11. Remove tool from cam towers.

12. Replace stop block.

13. Manually unload heads per Power Off Head Positioning procedure.

14. Lower case assembly.

15. Set AC POWER and POWER SUPPLY circuit breakers to ON.

CARRIAGE AND COIL ASSEMBLY

Because of the precision alignment of the carriage bearings and the special tool: and training required to accomplish the alignment, the carriage and coil assembly cannot be replaced in the field. If either the carriage or coil is damaged or misaligned, call the factory maintenance representative for service.

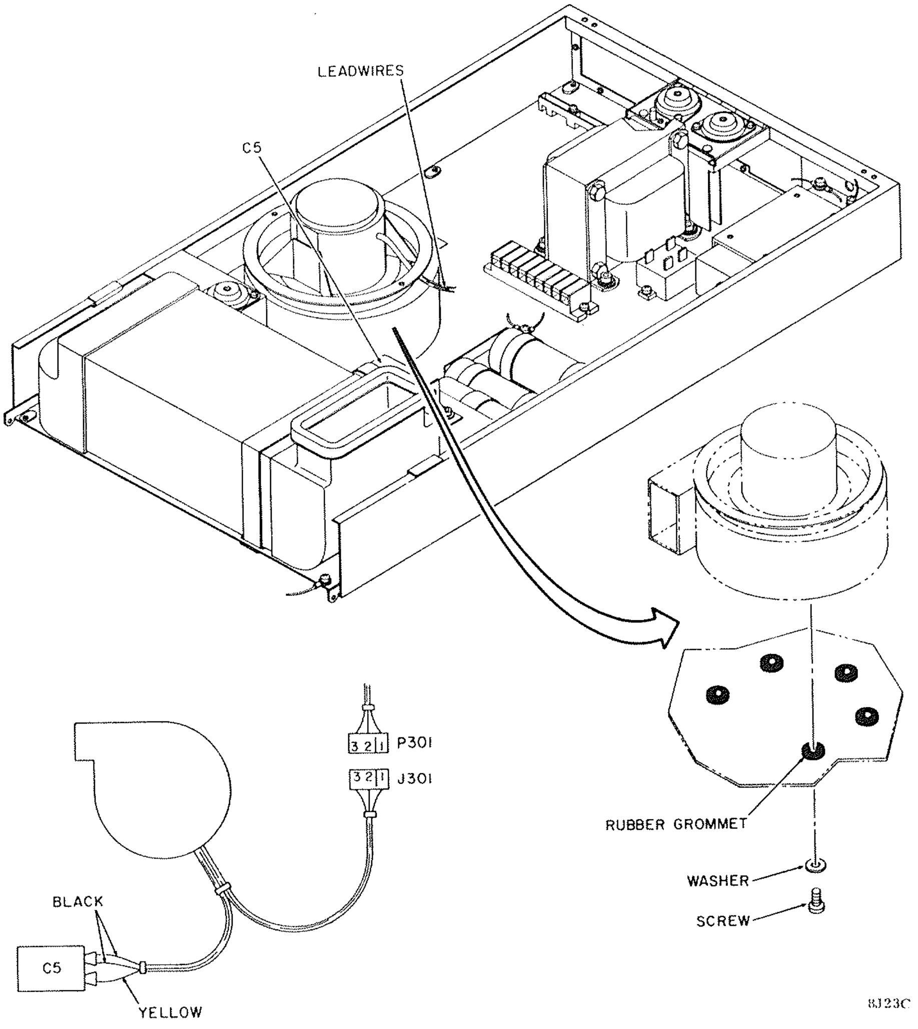


Figure 3-15. Blower Motor Replacement

CIRCUIT BREAKER REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Disconnect input power cable from external power source.
2. Remove disk pack.
3. Raise case assembly.
4. Remove six screws and spring lock washers securing circuit breaker mounting plate to base.
5. Remove screws and spring lock washers securing circuit breaker to mounting plate.
6. Identify wires to be removed from circuit breaker. Remove nylon covers and nuts securing wires to circuit breakers.
7. Remove defective circuit breaker.
8. Install replacement circuit breaker in mounting plate in reverse order of removal.
9. Install circuit breaker mounting plate on base being careful not to pinch electrical wires.
10. Lower case assembly.
11. Connect input power cable to external power source.
12. Set AC POWER and POWER SUPPLY circuit breakers to ON.
13. Perform Initial Checkout and Startup procedure.

Deck Interlock Switch (A1S4)

The deck interlock switch is illustrated in figure 3-3 of Volume 2.

Adjustment

Adjustment of the deck interlock switch is not a critical adjustment. Should it be necessary to adjust the deck interlock switch, use the adjusting screw in the end of the plunger to increase or decrease the travel of the plunger.

Removal-Replacement

1. Remove power from the unit.
2. Remove the case assembly (top cover), raise the deck, and install a deck support bracket. (Refer to figure 3-2.)

NOTE

> A six-inch long hex driver is recommended for easier removal of the front and rear deck mounting screws.

3. Remove the two front deck hold down screws located in the shroud area.
4. Remove the two wires from the deck interlock switch, located directly behind the transformer.
5. Remove the deck support bracket and return the deck to its original condition.
6. Unplug the velocity transducer and remove its mounting bracket, located at the rear of the magnet. This is necessary to allow removal of the two rear deck mounting screws.
7. Remove the velocity transducer cable clamp and lay the cable aside.
8. Remove the two rear deck mounting screws. The rear deck hold down screw and spacer should be in the keeper hole. All screws are located directly above the running time meter.
9. Unplug connector P200 from power amp card and remove the tie wrap closest to this connector to allow more harness movement.

WARNING

> Use care when reaching under the raised deck to avoid any accidents.

10. Raise the rear of the deck about four inches. Lift the hinged, shock-mount bracket containing the interlock switch away from the magnet until it stops. Slowly lower the rear deck assembly until it rests on the mounting bracket.
11. Remove the two mounting screws from the underside of the interlock switch, and remove the switch.

Repair

No repair of the deck interlock switch is possible.

HYSTERESIS BRAKE REPLACEMENT (S/C 08 W/O 37669 & BELOW)

The following procedure describes removal and reassembly of hysteresis supplied with units manufactured at S/C 08 W/O 37669 and below. If a new replacement is being installed, use the removal instructions from this procedure and the reassembly instructions described in Hysteresis Brake Replacement S/C 08 W/ 37669 and above.

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise case assembly.
4. Raise deck assembly to maintenance position.
5. Disconnect hysteresis braker leadwires. Remove cable ties as required, noting their locations.
6. Loosen two setscrews securing brake armature to drive motor shaft.
7. Remove two screws and washers securing brake assembly to drive motor mounting plate (figure 3-16). Remove brake assembly.
8. Apply one drop of Loctite to threads of screws used to mount brake assembly.
9. Position replacement brake assembly over drive motor shaft. Secure brake assembly to motor mounting plate with two screws and washers. Tighten screws.
10. As viewed from drive motor end, position left most setscrew of brake over flat on motor shaft (refer to figure 3-16). Tighten both setscrews to a torque of 16(+2) pounds-force-inch.
11. Connect hysteresis brake leadwires.
12. Replace cable ties removed in step 5.
13. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.
14. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

HYSTERESIS BRAKE REPLACEMENT (S/C 08 W/ 37669 & ABOVE)

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise case assembly.
4. Raise deck assembly to maintenance position.
5. Disconnect hysteresis brake leadwires.
6. Remove cable ties as required, noting their locations.
7. Refer to figure 3-16 and loosen hex head socket screw in brake collar that clamps brake armature to motor shaft.
8. Loosen nut securing brake assembly to brake mounting bracket.
9. Remove brake assembly, including collar.
10. If a new brake is being installed, remove brake mounting bracket from it.

CAUTION

In order to prevent damage to drive motor shaft, brake replacement must be performed in the order specified.

11. Loosen screw that attaches brake mounting bracket to motor mounting plate; or if a new bracket is being installed, loosely install brake mounting bracket on motor mounting plate.
12. Install brake shaft collar on brake (ridge of collar to be facing away from drive motor) and then install brake on drive motor shaft.
13. Slide brake on motor shaft so that stud on brake contacts end of slot in mounting bracket. Tighten nut securing brake to brake mounting bracket.

NOTE

To minimize motor and brake vibration, ensure that the socket head screw in the brake shaft collar is positioned opposite the set screw in the pulley shaft collar.

14. Support brake to maintain centering on motor shaft while tightening screw securing brake mounting bracket to motor mounting plate.
15. While holding motor pulley to prevent shaft from turning, rotate hysteresis brake armature several turns to eliminate any misalignment between drive motor shaft and brake armature.

16. With brake shaft collar resting on brake, tighten hex head socket screw in collar as follows:

    - On older units (use a 7/64-inch hex wrench) tighten screw to a torque of 20 ± pounds-force-inch.
    - Newer units (use a 9/64-inch hex wrench) tighten screw to a torque of 25 ± pounds-force-inch.

    NOTE

    Replacement brakes are supplied with extension cabling (required on older units). If extension cable is not required, discard it.

17. Connect brake leadwires.

18. Replace cable ties removed in step 6, being certain that all wires are secured so they will not be rubbed by drive belt.

19. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

20. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

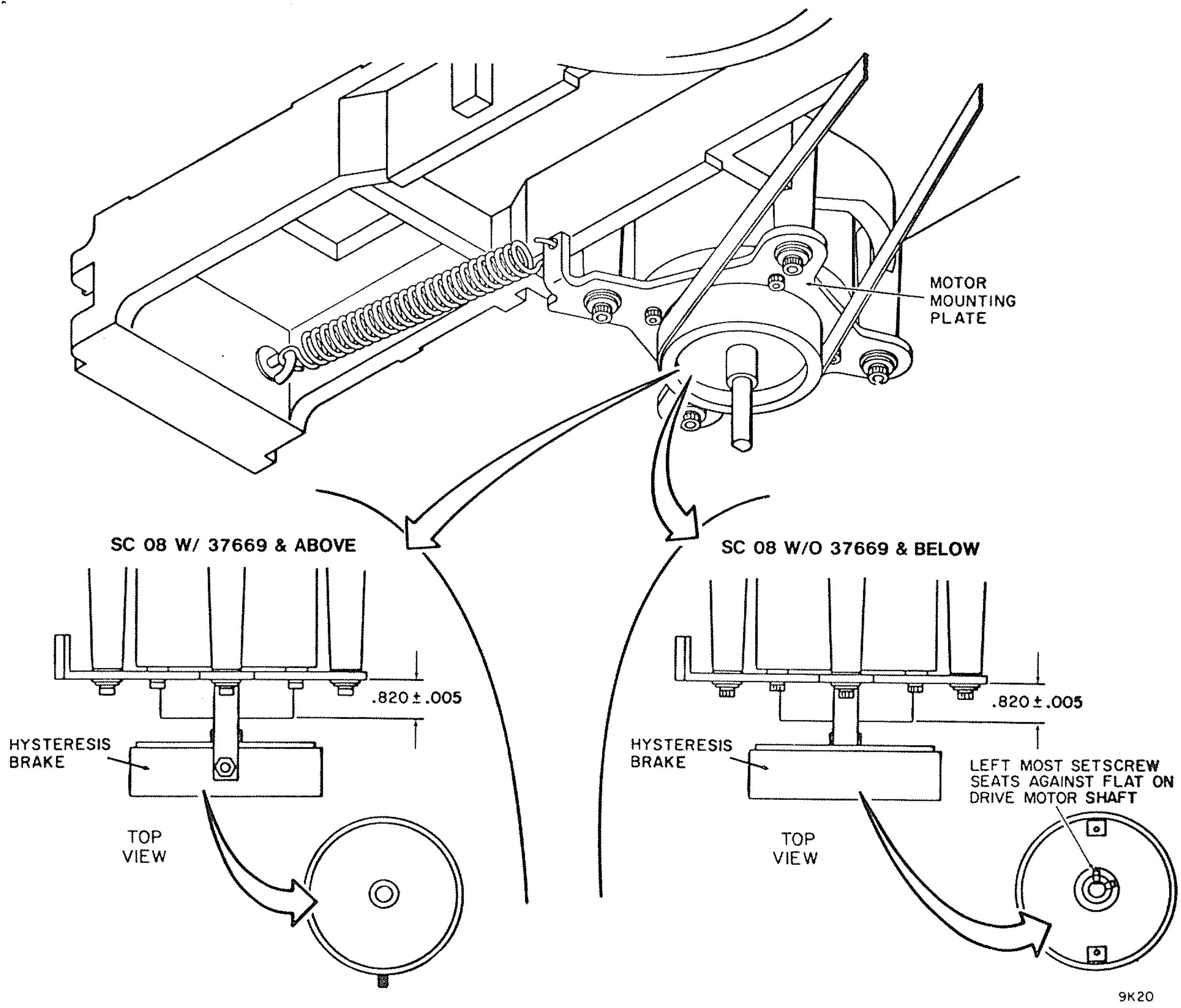


Figure 3-16. Hysteresis Brake Replacement

DRIVE BELT

ADJUSTMENT

1. Raise case assembly.
2. Measure distance between end of spring hook and locking nut as shown in figure 3-17. If dimension is correct, restore drive to normal operation condition. If adjustment is required, proceed to next step.
3. Adjust idler spring tension by turning nut that secures spring hook at back of deck assembly. Clockwise rotation of nut increases spring length, counterclockwise rotation of nut decreases spring length.
4. Close cabinet top cover.

REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise deck to maintenance position.
4. On units with hysteresis brake, remove brake assembly as described in applicable Hysteresis Brake Replacement procedure.

CAUTION

To avoid damage to motor shaft, roll belt off drive motor pulley.

5. Remove drive belt from drive motor pulley by grasping and moving motor mounting plate (against idler spring force) towards spindle assembly. Remove belt from drive.
6. Install replacement belt on spindle pulley.
7. Grasp and move motor mounting plate (against idler spring force) towards spindle assembly.
8. Slip drive belt around drive motor pulley. Release motor mounting plate.
9. Manually rotate drive motor pulley several revolutions to make certain that the drive belt is properly tracking on drive motor and spindle pulley. Perform Drive Belt Adjustment procedure.
10. On units with hysteresis brake, replace brake assembly as described in applicable Hysteresis Brake Replacement procedure.
11. Lower deck from maintenance position and secure to base assembly.
12. Perform Drive Belt Adjustment procedure.
13. Restore drive to on-line operation.

DRIVE MOTOR REPLACEMENT

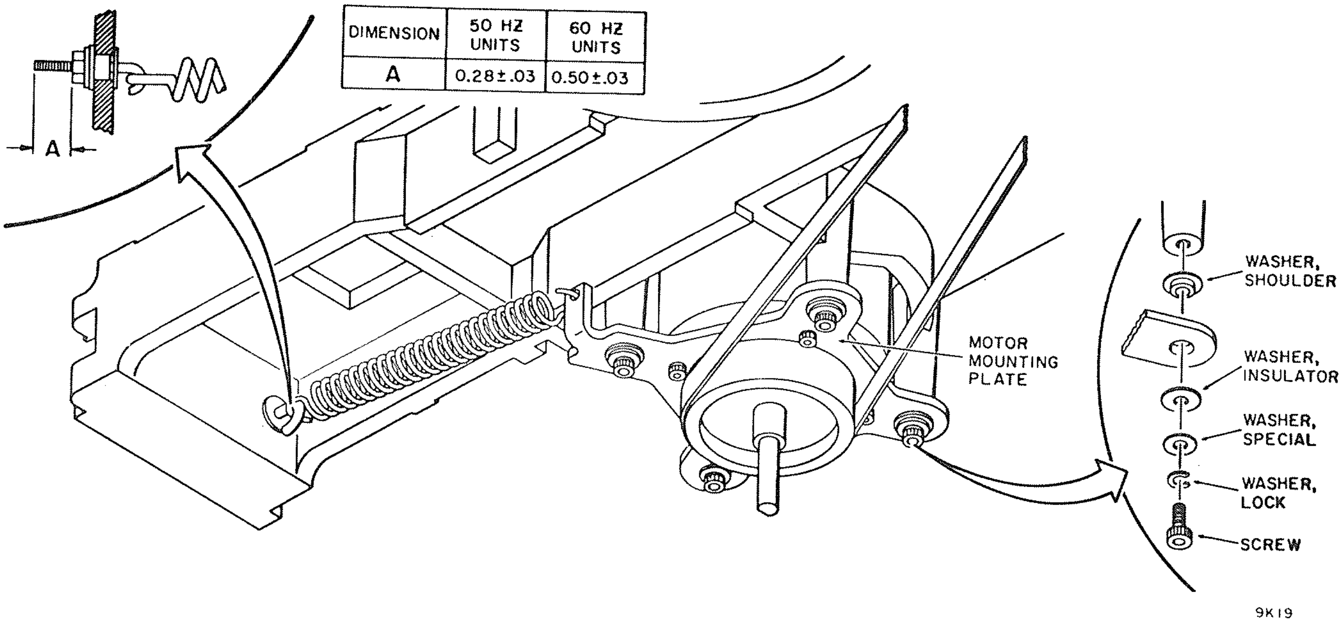
The following procedure may be used for motor replacement on all SMD units. Some SMD units have a circular section removed from the pack shroud which permits use of an alternate method (refer to Drive Motor Replacement, Alternate Method).

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise deck to maintenance position.
4. Disconnect drive motor leadwires.
5. On units with hysteresis brake, remove brake assembly as described in applicable Hysteresis Brake Replacement procedure.
6. Relax idler spring tension by turning adjustment nut on rear of deck until about two threads are visible on screw.
7. Roll drive belt off spindle pulley.
8. Disconnect idler spring from motor mounting plate.
9. Remove four screws, washers, and bushings securing motor mounting plate to deck casting (figure 3-17). Remove motor and motor mounting plate through bottom of deck.
10. Position drive motor and mounting plate beneath deck (figure 3-17) and secure to deck using four screws, washers, and nylon bushings. Torque screws to 10 (±2) inch-pounds.
11. Connect idler spring to motor mounting plate.
12. Position flat side of drive belt around spindle pulley. Hold belt taut around pulley while performing next step so belt does not slip off pulley.
13. While maintaining hand tension on belt, roll belt onto motor pulley while manually rotating spindle pack hub in a counterclockwise direction.
14. Rotate spindle pulley several revolutions to seat belt on pulley.
15. On units with hysteresis brake, replace brake assembly as described in Hysteresis Brake Replacement procedure.
16. Connect drive motor leadwires.
17. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.
18. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.
19. Set AC POWER and POWER SUPPLY circuit breakers to ON.
20. Perform Drive Belt Adjustment procedure.

DRIVE MOTOR REPLACEMENT (ALTERNATE METHOD)

The following procedure may be used as a substitute for the preceding drive motor replacement procedure on all SMD units which have a circular section removed from the pack shroud directly above the motor.

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise deck to maintenance position.
4. Disconnect motor leadwires. For those units which include a quick disconnect connector on the motor leadwires, the remaining leadwire harness may remain installed and the motor leads disconnected at the connector.
5. Remove drive belt from motor pulley by rolling belt off motor pulley in a clockwise direction as viewed from under the deck. Remove belt from drive. (The belt adjustment screw does not need to be loosened unless easier removal and reinstallation of the belt is desired.)
6. On units with hysteresis brake, remove brake assembly as described in applicable Hysteresis Brake Replacement procedure.
7. Loosen motor pulley lock collar screw. Remove pulley and lock collar from motor shaft. If pulley seems to be seized on motor pulley, place two flat head type screwdrivers 180 degrees apart between pulley and motor plate and push pulley off motor with downward pressure on screwdrivers.



DIMENSION	50 HZ UNITS	60 HZ UNITS
A	0.28±.03	0.50±.03

Figure 3-17. Drive Motor Assembly

8. Remove three remaining screws and hardware securing motor to motor pivot plate and retain for later use.

9. Remove motor through top of deck assembly.

10. Remove motor pulley, lock collar and motor pivot plate from replacement motor. Discard pivot plate. Disconnect and discard surplus leadwire harness on replacement motor if original one was left in drive (refer to step 4).

11. Insert motor (shaft end first) into access hole in deck assembly until it seats on pivot bracket.

12. Secure motor to motor pivot plate with three screws and hardware retained in step 8. Secure motor ground cable to motor plate (at hole located nearest tension spring) using internal tooth star washer.

13. Connect motor leadwires (if leadwire harness was retained in drive, install connector together).

14. Install replacement pulley and lock collar on motor shaft to dimension shown in figure 3-17. End of lock collar shall not extend beyond end of pulley after installation. Torque lock collar screw to 65 ±5 inch pounds.

15. Reinstall hysteresis brake assembly onto motor shaft using procedure from appropriate Hysteresis Brake Replacement procedure.

16. Reinstall drive belt directly over brake and onto spindle pulley. While holding belt on spindle pulley, roll belt onto motor pulley in a direction counterclockwise when viewed from above deck. Rotating spindle after belt is started, facilitates belt installation. Rotate spindle four to five revolutions to insure that belt is centered and tracking properly.

17. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

18. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

19. Set AC POWER and POWER SUPPLY circuit breakers to ON.

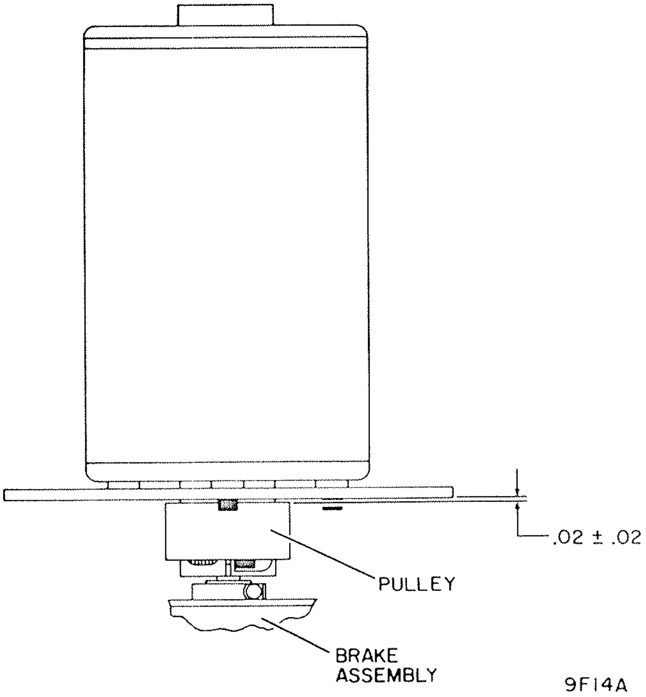


Figure 3-18. Pulley Installation

HEAD ARM ASSEMBLIES

The various parts involved in the removal and replacement of the head arms are identified in figures 3-19 and 3-20. Repair of the head arm assemblies is limited to inspection and cleaning, refer to the Repair paragraph for details and limits.

ADJUSTMENT

Adjustment of the head arm assemblies is covered in section 3B, Test and Adjustment.

REMOVAL-REPLACEMENT

The following procedure covers removal and replacement of either the servo head or the read/write heads. Remove heads from the carriage only to perform head inspection and cleaning, or as directed by other procedures in this manual. When removing the servo head also remove read/write head number two. This allows room for the head cable and connectors to pass between the adjacent head arms with a lessened chance of doing damage.

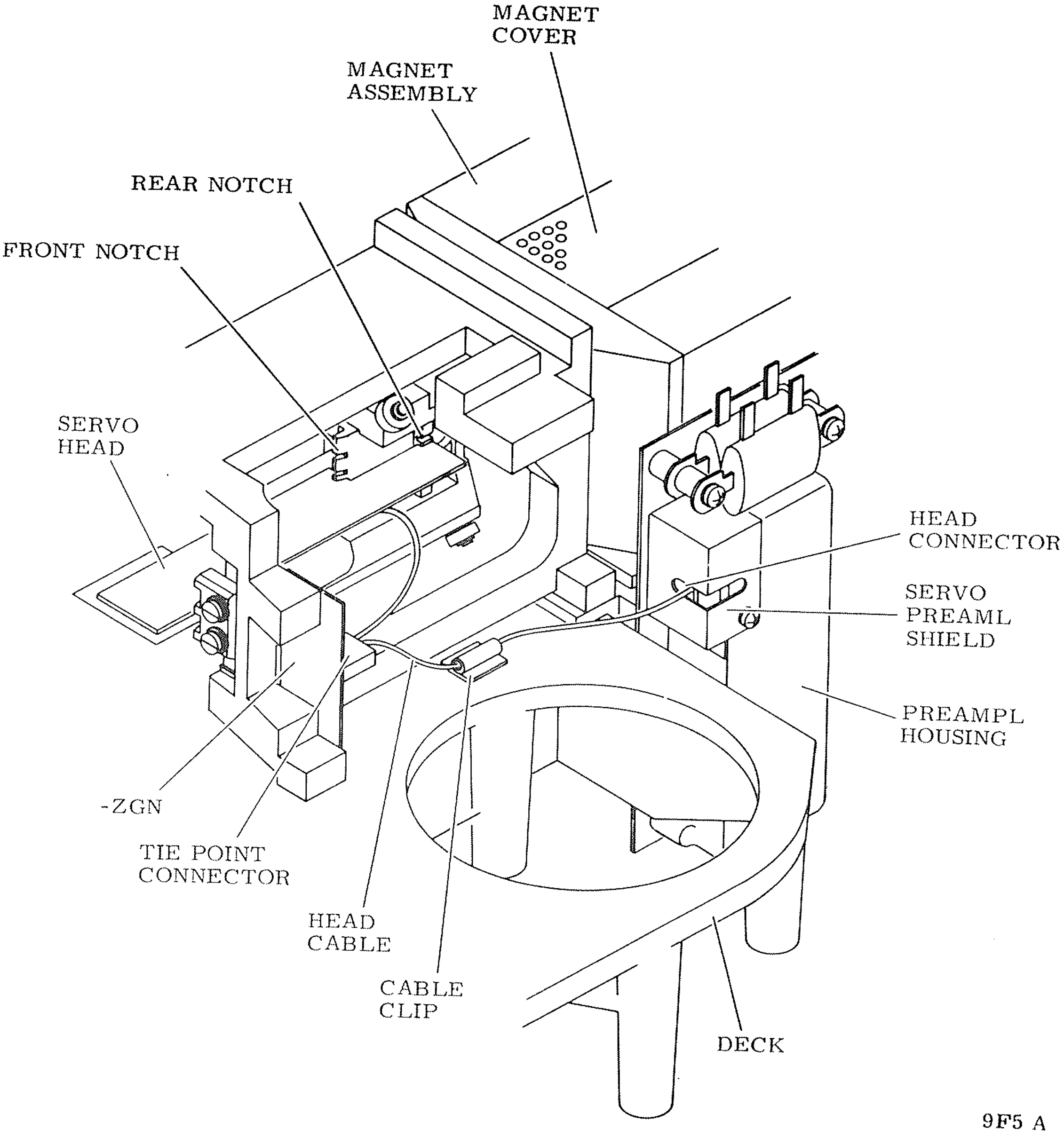


Figure 3-19. Head Replacement - Right Side View

1. Remove connector support bracket or servo pre-amplifier shield and disconnect head arm connector for subject head (for servo head, also remove head cable from cable clip and disconnect tie point connector).
2. Remove head mounting screw and associated hardware.
3. Manually extend heads far enough to be able to grasp front of head arm from inside pack area.

CAUTION

Head pads and gimbal springs are extremely delicate and easily damaged. Grasp head arms carefully and only by edges of head arm. If head pad is touched, perform head cleaning procedure.

4. Grasp entire stack of heads such that they are all held in alignment to one another. Carefully extend heads all the way into pack area.

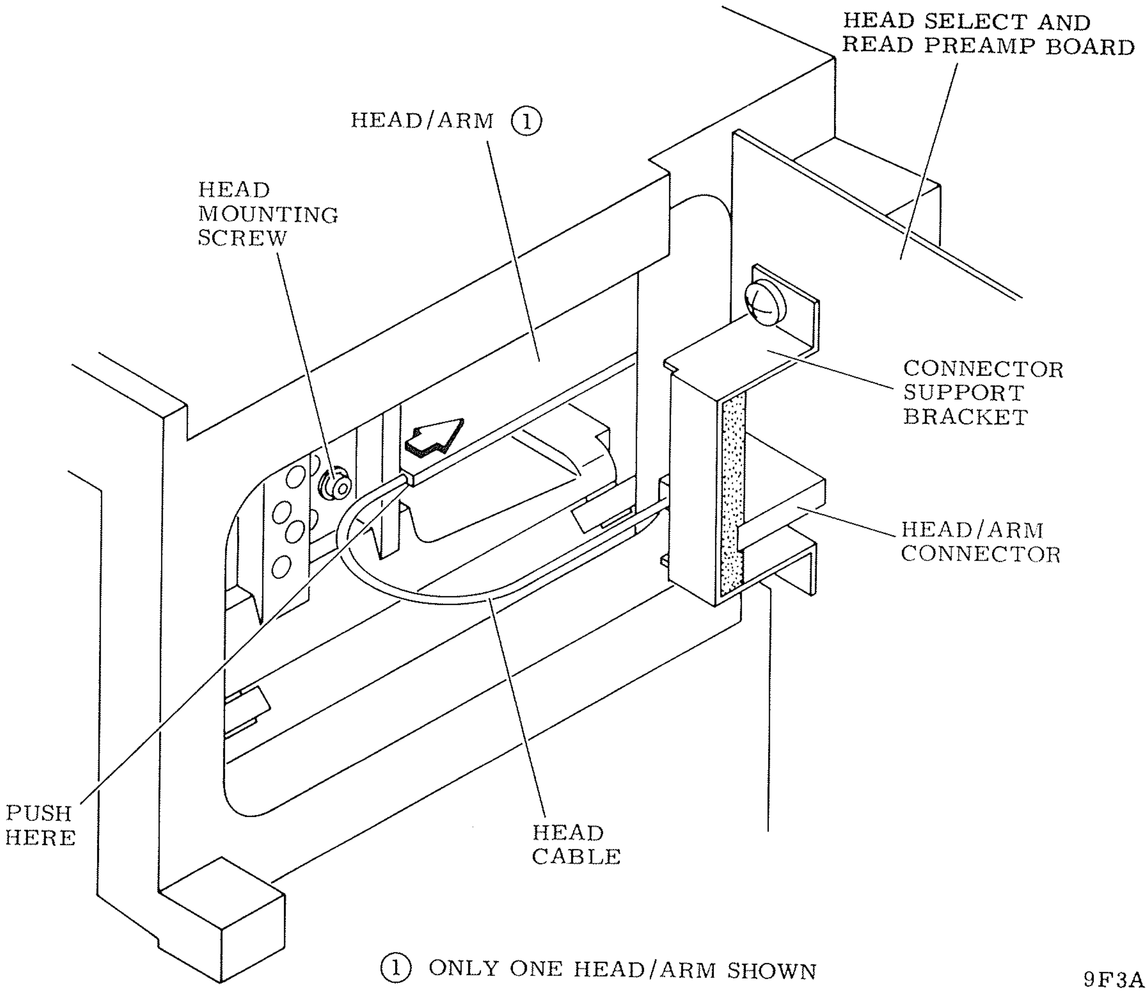


Figure 3-20. Head Replacement - Left Side View

5. Carefully grasp subject head arm at front and also push gently on rear of head arm as shown in figure 3-20. Guide head arm and connector(s) through adjacent head arms and into pack area.
6. Perform required maintenance procedure.
7. Install head arm assembly by fully extending heads into pack area, and guiding head arm connector between adjacent head arms. Use care not to damage adjacent heads.
8. Seat head arm in both front and rear notches on carriage.
9. Grasp entire stack of heads such that they are all held in alignment to one another. Carefully retract heads. Do not push on front of head arm assemblies while retracting heads.
10. Carefully position head arm as required in order to insert head mounting screw. Support head arm from opposite side when inserting head mounting screw or forward pressure of wrench may dislodge head arm.
11. Ensure that head arm assembly is aligned in relation to remainder of heads where they protrude into pack area.
12. Tighten screw, securing head arm assembly to carriage, until torque is 12 ±1/2 pounds-force-inch.
13. Carefully reconnect head arm connector and replace related hardware removed in step 1.
14. Perform Head Arm Adjustment procedure.

REPAIR

General

The drive has a positive pressure filtration system that eliminates the need for periodic inspection and cleaning of heads. The heads should be inspected for the following reasons only:

1. A problem is traced to a specific head or heads; for example, excessive data errors.
2. Head to disk contact is suspected. This may be indicated by an audible ping, scratching noise, or a burning odor when the heads are over the disk area.
3. Concentric scratches are observed on the disk surfaces.
4. Contamination of pack is suspected (possibly due to improper storage of the pack).
5. The pack has been physically damaged (possibly due to dropping or bumping).

CAUTION

Do not attempt to operate the media on another drive until full assurance is made that no damage or contamination has occurred to the media.

Do not attempt to operate the drive with another media until full assurance is made that no damage or contamination has occurred to the drive heads or to the shroud area.

Head Inspection

CAUTION

Do not smoke when inspecting or cleaning heads. Use extreme care not to damage the head.

Do not touch the head pad or gimbal spring with fingers or tools.

If head must be laid down, do not allow the head pad or gimbal spring to touch anything.

Remove suspected head as described in the read write or servo head arm replacement procedure. Refer to figure 3-21, observe the head arm assembly, and perform the suggested remedy as follows:

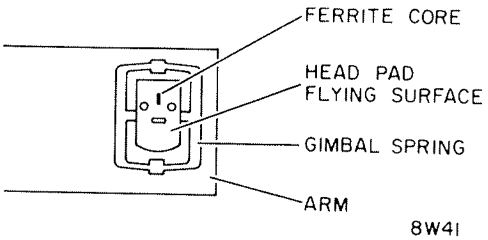


Figure 3-21. Typical Head Arm Components

1. If reddish-brown oxide deposits exist on the head, replace or clean the head arm assembly.
2. If head appears scratched, replace or clean the head arm assembly.
3. If head appears damaged, replace the head arm assembly.
4. If the gimbal spring (it holds the head pad to the arm) is bent or damaged, replace the head arm assembly.

Head Cleaning

CAUTION

Head cleaning is a delicate procedure which is not recommended. It should not be undertaken unless it is absolutely necessary and then it should be performed by properly trained personnel only.

Refer to figure 3-22 if head cleaning is required and perform the following procedure. Use care not to damage any part of the head arm assembly.

CAUTION

In the following step, hold the can of dust remover upright (vertical). If the can is not held upright, liquid propellant will be sprayed on the head.

1. Use super dry dust remover (see list of Maintenance Tools and Materials) to blow off all loose particles from the head pad (flying surface), from the edge of the head pad, and from the holes in the head pad. Hold the nossle one-fourth to one-half inch (6 to 12 mm) from the head pad. Spray with a back and forth motion across the head pad, making certain to hold the can only in a vertical position.

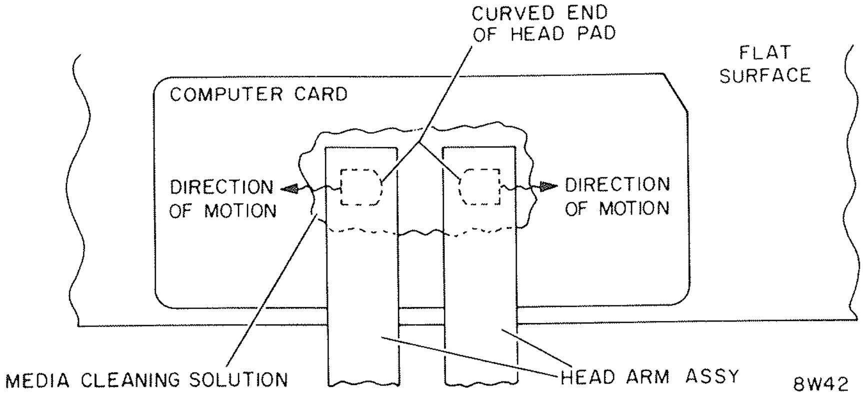


Figure 3-22. Head Cleaning Motion

2. Clean a smooth, flat working surface, for example, a glass or formica table top.

3. Place a new, unpunched, clean computer card with the back side up (printing down) on the clean flat working surface as shown in figure 3-22.

CAUTION

Care should be taken to avoid excess cleaning solution. Excess solution on the head cable may remove the plasticizer and make the cable stiff. A stiff cable reduces the flexibility of the head pad and could cause broken wires.

4. Moisten a small area in the center of the card with media cleaning solution. (Refer to the list of Maintenance Tools and Materials.)

CAUTION

Inspect the media cleaning solution for contamination, rust, dirt, etc. Do not use contaminated solution.

5. Very carefully place the head pad flying surface on moistened area and move head pad from moistened area to dry area in a zig-zag motion as shown in figure 3-22. Move head in a direction away from curved end of head pad. If it is moved in the opposite direction the sharp edge of the curved end will cut into the computer card and prevent movement and proper cleaning.

6. Blow off the head again using the super dry dust remover as in step 1.

NOTE

Discoloration of media cleaning solution and computer card indicate that oxide particles are being removed from head pad flying surface.

7. Repeat steps 3, 4, 5, and 6 using a clean computer card and clean media cleaning solution each time until no discoloration on card is present.

8. After discoloration has ceased, inspect head to determine that oxide deposits were removed. If deposits remain but show signs of being removed, repeat cleaning procedure until deposits are removed.

9. If oxide deposits cannot be removed, replace head arm assembly.

10. If oxide deposits were removed and head passes inspection according to the Head Arm Replacement Criteria, reinstall head.

11. Follow read/write or servo head arm replacement procedure to install cleaned head or a replacement head as required.

Head Arm Replacement Criteria

A head arm assembly requires replacement if any of the following conditions exist:

1. Consistent oxide buildup on the same head, indicating repeated head to disk contact.

2. Appreciable oxide buildup which cannot be removed.

3. Scratches on the head flying surface.

4. Imbedded particles in the head pad flying surface.

5. Bent or damaged gimbal spring.

6. Any apparent physical damage to head arm assembly.

Disk Pack Handling (CE and Data Packs)

The positive pressure filtration system of the drive eliminates the need for periodic inspection and cleaning of the disk pack (media). However, should improper operating conditions of the pack be indicated by any of the following symptoms, immediately remove the pack from the drive.

1. A sudden increase in error rates related to one or more heads is observed.
2. An unusual noise such as pinging or scratching is heard.
3. A burning odor is smelled.
4. Contamination of the pack from dust, smoke, oil or the like is suspected.

If any doubt about the pack's functional condition exists, return it to the vendor, enclosing a description of the known or suspected malfunction.

CAUTION

Do not attempt to operate the media on another drive until full assurance is made that no damage or contamination has occurred to the media.

Do not attempt to operate the drive with another media until full assurance is made that no damage or contamination has occurred to the drive heads or to the shroud area.

Disk Pack Inspection and Cleaning

In some cases, the user may attempt to inspect and clean the disk pack rather than return it to the vendor. This task must be performed by properly trained personnel only, using the following procedure.

NOTE

Inspection and cleaning of disk packs in the field can cause additional problems for the following reasons:

- Exposure of the pack to non-cleanroom conditions during inspection and cleaning may additionally contaminate the pack.
- Disk surfaces may be scratched by using contaminated or improper cleaning equipment.
- The pack may be damaged while the covers are removed.
- Deposits of cleaning solution residue may be left on disk surface if improperly cleaned or if commercial grade solutions are used.

CAUTION

Disk pack cleaning should never be attempted with the pack mounted on the drive, since this setup can introduce contamination into the drive itself.

1. Mount the pack on a commercially available pack inspection fixture.
2. Dampen, but do not soak, a lint-free swab-paddle with media cleaning solution (refer to the list of Maintenance Tools and Materials), or with a solution of 91% reagent grade isopropyl alcohol and 9% deionized water by volume.
3. Using a sweeping motion, insert the damp swab-paddle between the disks and manually rotate the pack while applying the swab-paddle lightly to the disk surface to be cleaned.
4. After the swab-paddle has been applied for one full cleaning rotation, withdraw it with a sweeping motion while maintaining contact with the disk surface (do not lift the swab-paddle from the surface).
5. If oxide or contaminants are observed on the swab-paddle, repeat steps 2, 3, and 4, using a clean swab-paddle for each pass, until no oxide or contaminants are observed on the swab-paddle.
6. Repeat steps 3 and 4 using a dry swab-paddle to remove all cleaning solution residue.
7. Repeat steps 2 through 6 for each surface.

HEADS LOADED SWITCH

ADJUSTMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Rais case assembly.
4. Remove magnet cover (figure 3-23) by prying cover open with a screwdriver.
5. Identify heads loaded switch leadwires. Disconnect leadwires at switch terminals.
6. Connect a multimeter (set to RX1) across switch terminals.
7. With carriage retracted, multimeter should indicate infinity.

CAUTION

Do not move carriage forward far enough to allow heads to load against themselves.

8. Slowly move carriage towards spindle while observing multimeter. Multimeter must indicate zero ohms when carriage has traveled 0.07 (±0.04) inch from full retract stop. (Distance is measured from rear edge of coil to magnet.) If adjustment is needed, proceed to next step. If no adjustment is needed, proceed to step 10.

NOTE

Make certain that carriage is fully retracted while performing next step.

9. Loosen screws securing heads loaded switch to mounting bracket. Adjust switch position until it actuates after 0.07 (±0.04) inch travel from full retract stop.
10. Disconnect multimeter leadwires from switch terminals.
11. Connect heads loaded switch leadwires to switch terminals.
12. Install magnet cover.
13. Lower case assembly.
14. Install disk pack.
15. Set AC POWER and POWER SUPPLY circuit breakers to ON.

REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise case assembly.
4. Remove magnet cover (figure 3-23) by prying cover open with a screwdriver.
5. Identify heads loaded switch leadwires. Disconnect leadwires at switch terminals.
6. Remove two screws and washers securing heads loaded switch to mounting bracket.
7. Position replacement switch on mounting bracket (pretravel adjustment bracket must be under switch actuator arm). Loosely secure switch to bracket using two screws and washers.
8. Perform Heads Loaded Switch Adjustment procedure starting at step 9.

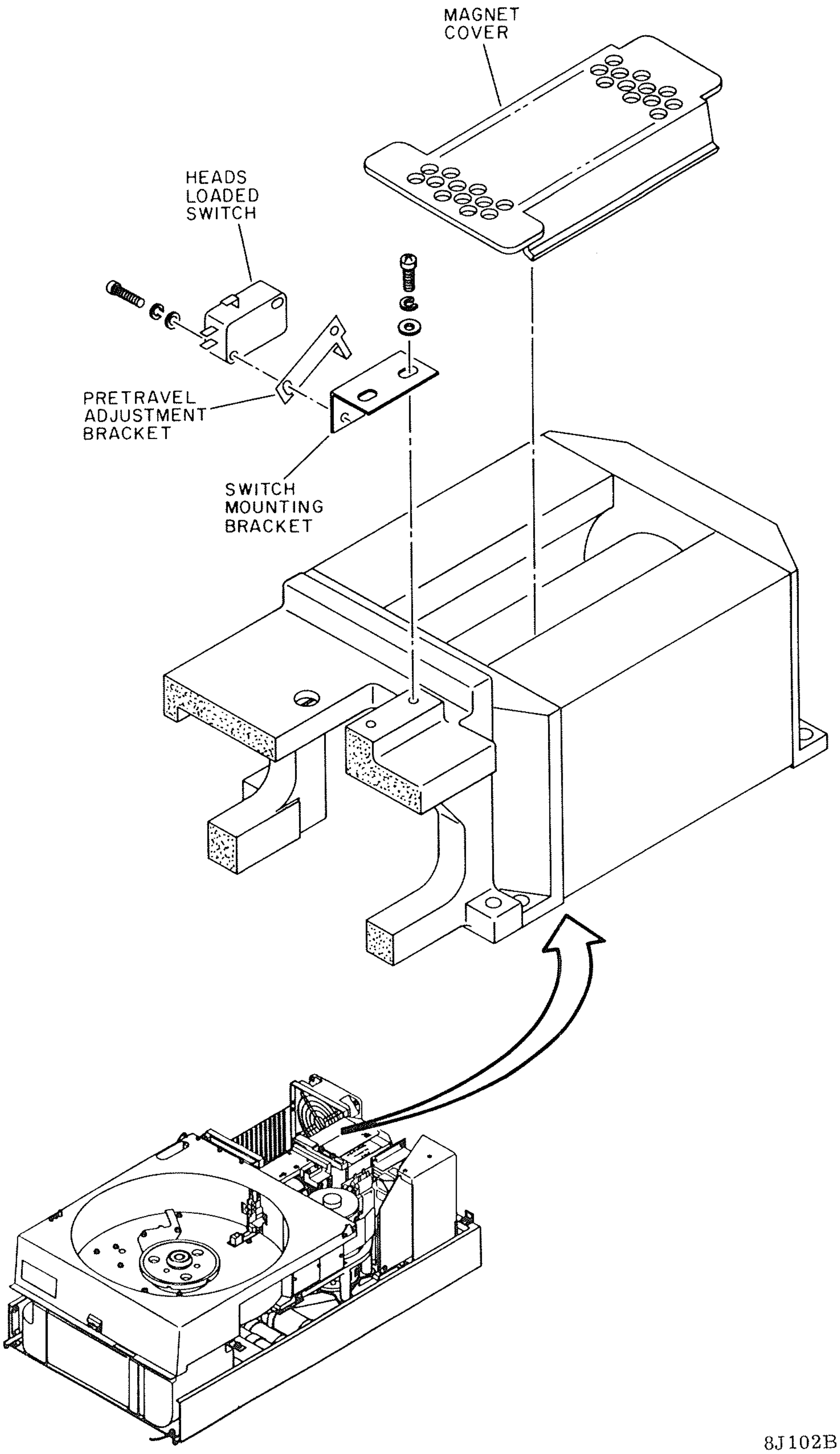


Figure 3-23. Heads Loaded Switch

POWER AMPLIFIER ASSEMBLY REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Disconnect input power cable from external power source.
2. Remove disk pack.
3. Raise case assembly.
4. Raise logic chassis to maintenance position.
5. Raise deck to maintenance position.
6. Disconnect servo preamp connector (figure 3-24).
7. Remove screw and washer securing servo connector bracket to servo preamp housing (figure 3-25). Slide servo connector bracket carefully back along servo head cable.

NOTE

Observe connector orientation on pins.

8. Disconnect servo head connector from servo preamp.
9. Remove two screws and washers securing power resistors R3 and R4 to power amp mounting plate (figure 3-24).

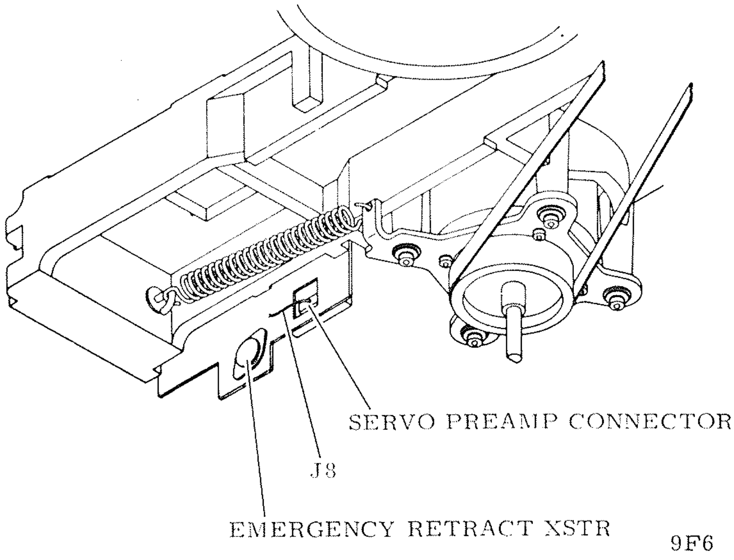


Figure 3-24. Servo Preamp Connector

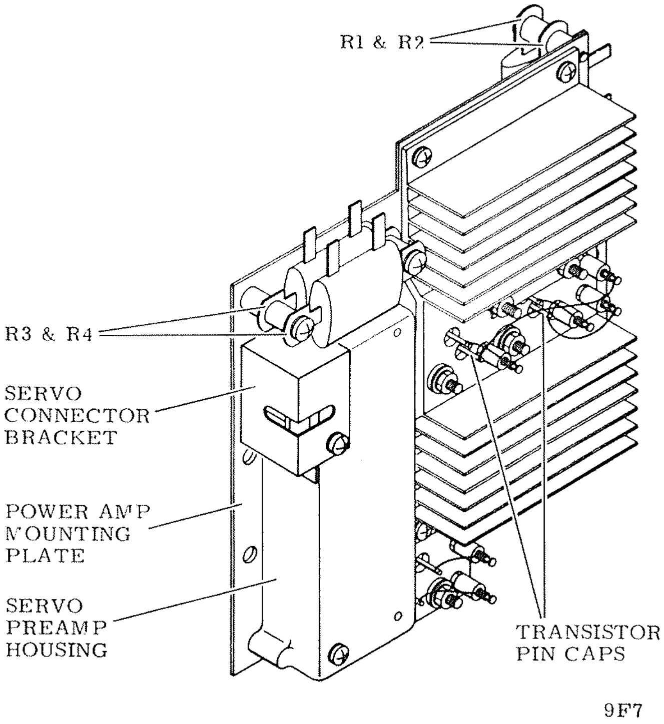


Figure 3-25. Servo Preamp Housing

10. Remove two screws and washers securing power resistors R1 and R2 to power amp mounting plate (figure 3-25).
11. Remove four screws and washers securing power amp mounting plate to deck.
12. Rotate power amp assembly up and out towards rear of unit (figure 3-26). On older units without ECO 37281 installed, requires power supply module removal to gain access to power amp assembly.

NOTE

Observe lead arrangement and assure leads can be replaced on appropriate connections.

13. Remove transistor pin caps from defective transistor (figure 3-25). The

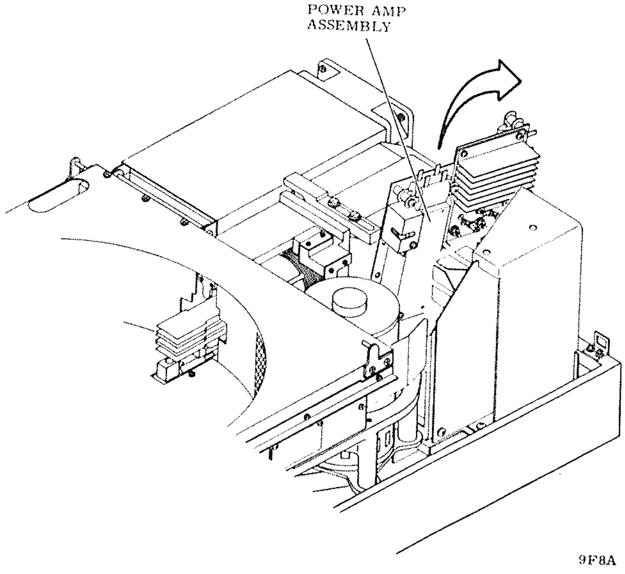


Figure 3-26. Power Amplifier Assembly

caps are somewhat delicate and care should be taken not to deform them.

14. Replace defective transistor as described in figure 3-26.

15. Replace transistor pin caps (figure 3-25).

16. Reposition power amp assembly.

17. Secure power amp mounting plate to deck.

18. Secure power resistor R1 and R2 to power amp mounting plate (figure 3-25).

19. Secure power resistor R3 and R4 to power amp mounting plate (figure 3-25).

20. Connect servo head connector to servo preamp.

21. Replace servo connector bracket and secure to servo preamp housing (figure 3-25).

22. Connect servo preamp connector (figure 3-24).

23. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

24. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

25. Lower logic chassis to normal operating position.

26. Lower case assembly.

27. Connect input power cable to external power source.

28. Set AC POWER and POWER SUPPLY circuit breakers to ON.

29. Install disk pack.

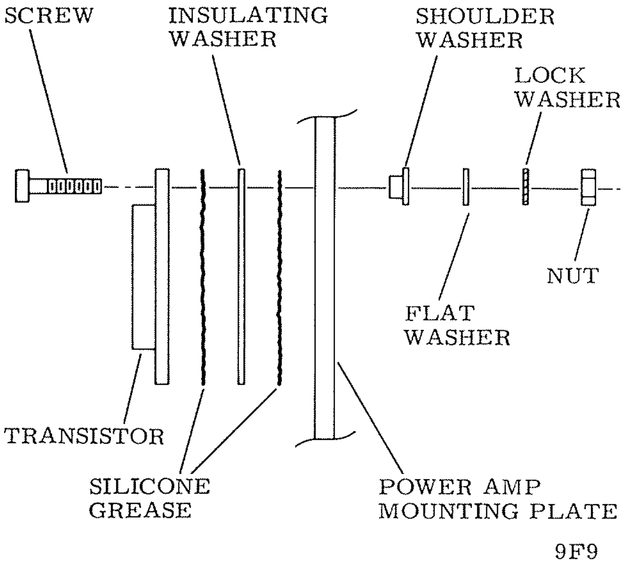


Figure 3-27. Transistor Assembly

POWER SUPPLY REPLACEMENT

The type of power supply found in the machine depends upon when the machine was built. Units built prior to series code 24 have a power supply module assembly. This module consists of two regulator assemblies and a printed circuit board assembly (PC board). The module can be repaired by replacing any of the subassemblies, or it can be replaced as an assembly.

Beginning at series code 24, the module was replaced with a single, two-sided component assembly (__XKV). Because component assemblies are generally not considered field repairable, the following procedure only covers removal and replacement of the assembly. However, the parts data manual/ section does break this assembly down to its component parts. If repair is attempted, be careful not to damage foil paths or other components.

Since removing the power supply requires the removal of harnesses, components, and jumper wires, be sure to observe the arrangement of all leads to ensure that they can be replaced properly.

POWER SUPPLY MODULE REPAIR AND REPLACEMENT S/C 23 and Below

Refer to figure 3-28, sheets 1 and 2, and perform the following steps:

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Disconnect input power cable from external power source.
2. Remove disk pack.
3. Raise case assembly.
4. Remove four screws securing power supply to base. These screws are located under the base.
5. Remove black and red wires (quick disconnect) from ±5 V regulators at ±SEN connections on terminal strip.
6. Cut cable tie securing ±5 V sense harness to power supply chassis.
7. Remove ground strap between power supply chassis and rear shock mount on deck.
8. Remove upper two nuts, lockwashers and flatwashers securing PC board assembly to power supply chassis.
9. Remove right and left fuse shields.
10. Raise deck to maintenance position.
11. Remove lower two nuts, lockwashers and flatwashers securing PC board assembly to power supply chassis.
12. Lift up on power supply and remove PC board by swinging toward front of drive around drive motor.
13. Remove four standoffs from PC board mounting studs.
14. Gain access to power supply by lifting power supply clear of base.
15. Remove wiring from terminal strip of defective regulator.
16. Remove six screws securing regulator assembly to power supply chassis (shown as "A" in figure 3-28 for the +5 V regulator). Pull regulator away from chassis.
17. Remove quick-disconnect jumper wire from -OUT terminal of +5 V regulator, or from +OUT terminal of -5 V regulator, depending upon which regulator is to be replaced.
18. Remove defective regulator assembly.
19. Remove 0.33 μF capacitor assembly from quick disconnect terminals on back of regulator and install in replacement regulator.
20. Slide regulator into power supply chassis.
21. Secure regulator to chassis using six screws.
22. Connect wiring harness to terminal strip.
23. Replace quick disconnect jumper wire removed in step 17.
24. Replace PC board assembly (refer to steps 8 thru 13).
25. Position power supply and secure to deck using four screws removed in step 4.

NOTE

Route wiring harness between power supply and side of base.

26. Connect black and red sense wires removed in step 5.
27. Secure sensing harness to power supply chassis with cable tie straps.

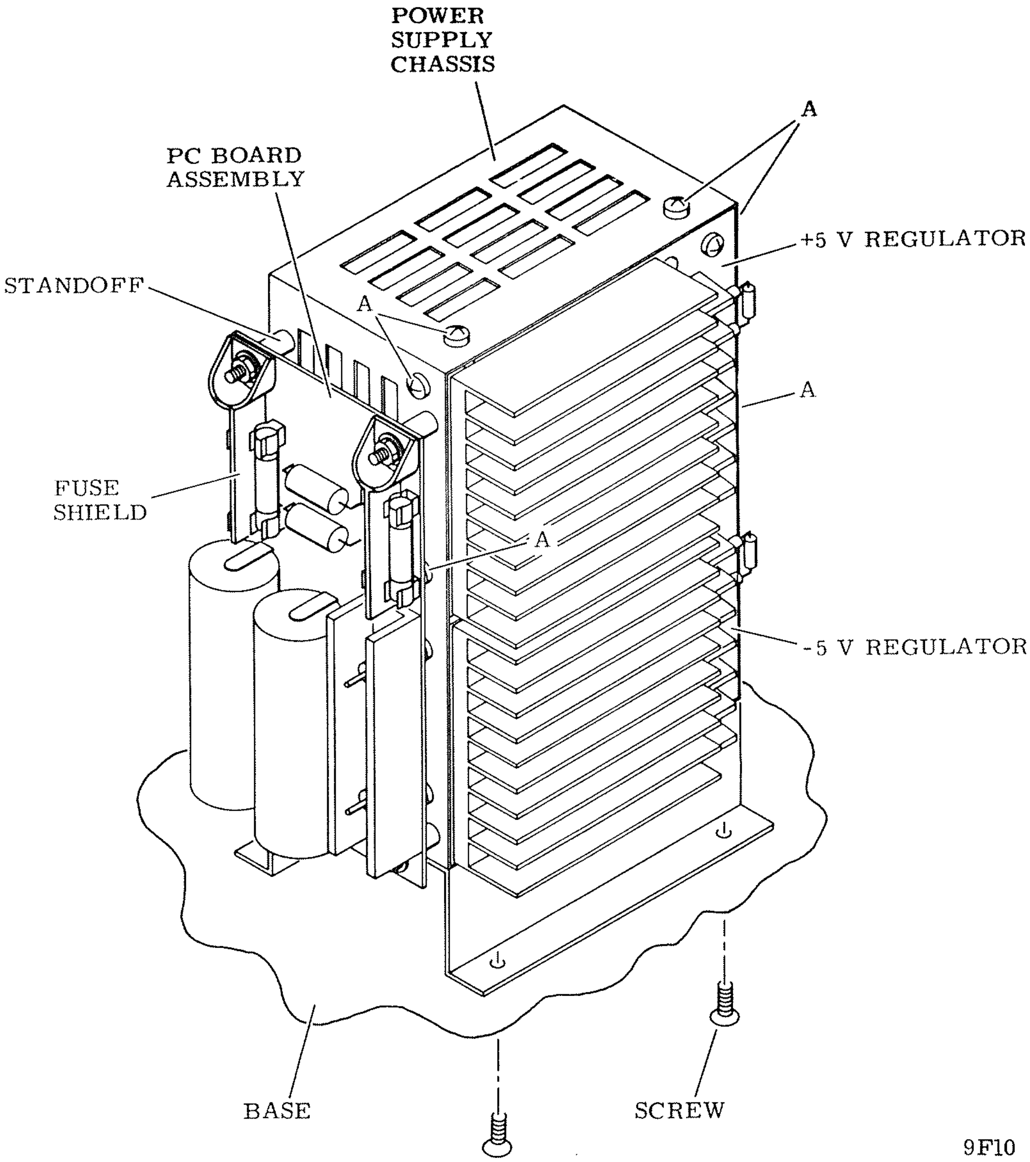
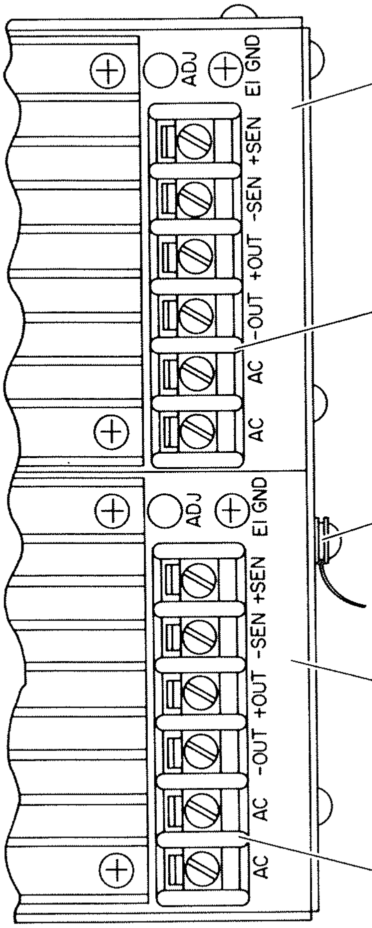


Figure 3-28. Power Supply Module Repair and Replacement
S/C 23 and Below (Sheet 1 of 2)



	A1 (+5 V)		A2 (-5 V)	
TERM	RING TONGUE	QUICK DISCONNECT	RING TONGUE	QUICK DISCONNECT
+SEN	RESISTOR	RED (+5 SENSE)	RESISTOR	RED (-5 SENSE)
-SEN	RESISTOR	BLACK (+5 SENSE)	RESISTOR	BLACK (-5 SENSE)
+OUT	RED	NONE	GND STRAP BLACK	BLK JUMPER
-OUT	BLACK BLACK	BLK JUMPER	BLUE	NONE
AC	BLACK	NONE	PURPLE	NONE
AC	WHITE	NONE	YELLOW	NONE

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Figure 3-28. Power Supply Module Repair and Replacement
S/C 23 and Below (Sheet 2)

28. Reconnect ground strap to power supply chassis.

29. Lower case assembly.

30. Connect input power cable to external power source.

31. Set AC POWER and POWER SUPPLY circuit breakers to ON.

32. Perform Output Voltages Check. (See Trouble Analysis Aids section)

33. Install disk pack and return drive to online condition.

POWER SUPPLY REPLACEMENT - S/C 24 and Above

Refer to figure 3-29 and perform the following steps:

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Disconnect input power cable from external power source.
3. Remove disk pack.
4. Raise case assembly.
5. Remove hardware securing power supply cover. Lift cover up and away from power supply.
6. Disconnect connectors A1J1 and A1J2.
7. Remove hardware securing ground strap to rear of power supply bracket.

NOTE

> For cabinet mounted units, open rear door before proceeding to next step.

8. Remove screws (found on under side of base) that hold power supply to base.
9. Lift power supply up and away from base.
10. Remove screws and associated hardware securing _XKV component assembly.
11. Attach new _XKV componeent assembly to power supply bracket.
12. Secure bracket to base.
13. Reconnect connectors A1J1 and A1J2.
14. Replace ground strap.
15. Replace power supply cover.

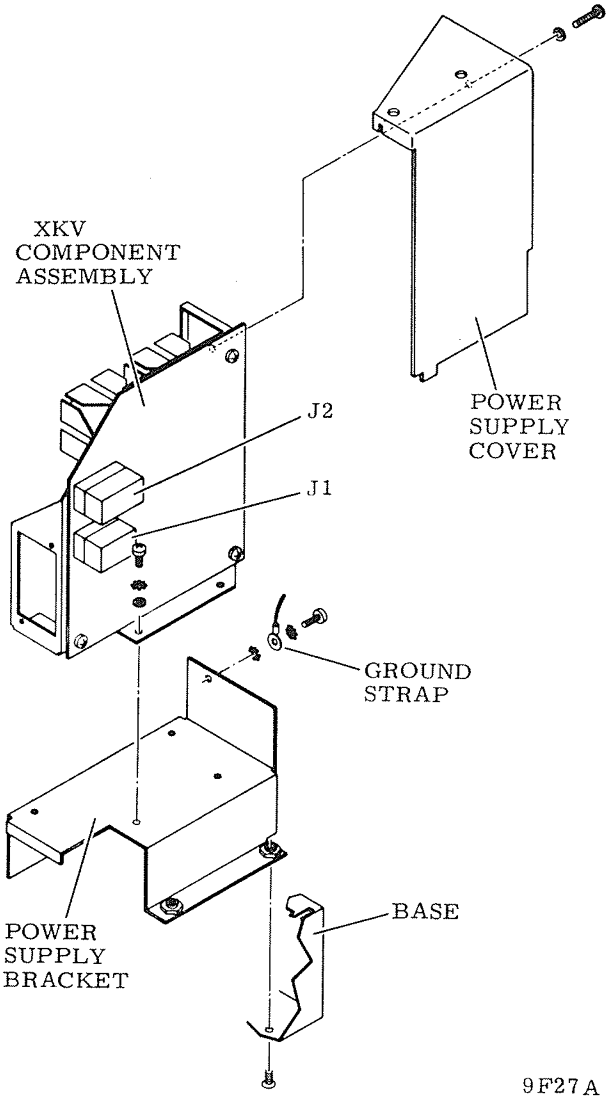


Figure 3-29. Power Supply Replacement S/C 24 and Above

16. Lower case assembly.
17. Connect input power cable to external power source.
18. Set AC POWER and POWER SUPPLY circuit breakers to ON.
19. Perform Output Voltage Checks. (See Trouble Analysis Aids section.)
20. Install disk pack and return drive to online condition.

RAIL BRACKET ASSEMBLY

Because of the precision alignment, and the special tools and training required to accomplish the alignment, it is not possible to perform adjustment or replacement of the rails or the rail bracket assembly in the field. Under no circumstances should the screws securing the rails or the rail bracket to the deck be loosened. If either the rails or the rail bracket assembly are damaged or misaligned, contact the factory maintenance representative for service.

RELAY REPLACEMENT (K2)

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Disconnect input power cable from external power source.
2. Remove disk pack.
3. Raise case assembly.
4. Raise deck assembly to maintenance position.
5. Identify and label relay leadwires. Disconnect leadwires.
6. Remove four screws and washers securing A9 assembly to deck.
7. Remove two screws and washers securing relay to A9 assembly. Remove relay.
8. Install new relay and assemble in reverse order of removal.
9. Inspect routing of wire harness to make sure it does not interfere with raising and lowering of logic chassis or rub on drive belt.
10. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.
11. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.
12. Connect input power cable to external power source.
13. Set AC POWER and POWER SUPPLY circuit breakers to ON.
14. Remove magnet shield to expose voice coil.

CAUTION

Do not move carriage forward far enough to allow heads to load against themselves.

WARNING

Emergency retract will engage and drive carriage toward rear of unit.

15. Move coil by applying a lateral (parallel to coil movement) pressure to coil just far enough to disengage heads loaded switch. Emergency retract should engage and drive carriage toward rear of unit.
16. Replace magnet shield.
17. Lower case assembly.

SERVO PREAMP BOARD REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Disconnect input power cable from external power source.
2. Remove disk pack.
3. Raise case assembly.
4. Raise logic chassis to maintenance position.
5. Raise deck to maintenance position.
6. Disconnect servo preamp connector from servo preamp board (figure 3-24).

NOTE

It is necessary to raise the deck several times during the procedure. Do not remove deck rear holddown screw and spacer from rear shock mount bracket at this time.

7. Lower deck to normal operating position.

8. Remove two screws and washers securing power resistors to power amp mounting plate (figure 3-30).

9. Lift power resistors up and toward drive motor to allow removal of servo preamp housing.

10. Remove upper securing screw and washer (figure 3-30). Carefully slide servo connector bracket back along servo head cable.

11. Disconnect servo head connector from servo preamp board.

12. Remove servo preamp housing from power amp mounting plate as follows:

    a. Insert screwdriver as shown in figure 3-30.

    NOTE

    Deck will not be raised enough to install support bracket.

    b. Raise deck with left hand until lower securing screw is accessible.

    c. Loosen lower securing screw until housing is free. It is not necessary to remove the screw at this time.

    d. Remove screwdriver and lower deck.

    e. Lift housing up and out.

    f. Remove lower securing screw from housing.

13. Replace defective servo preamp board (figure 3-30). Servo preamp board is secured to housing by two screws.

14. Secure servo preamp housing to power amp mounting plate as follows:

    a. Insert lower securing screw and washer into housing (figure 3-30).

    b. Position housing against mounting plate.

    c. Using upper securing screw, loosely secure housing to mounting plate.

    d. Insert screwdriver as shown in figure 3-30.

    NOTE

    Deck will not be raised enough to install support bracket.

    e. Raise deck with left hand to gain access to lower securing screw and tighten screw to secure housing to mounting plate.

    f. Remove screwdriver and lower deck.

    g. Remove upper securing screw.

15. Connect servo head connector to servo preamp board. Note pin keying. Be careful not to bend pins.

16. Reposition servo connector bracket and secure to servo preamp housing using upper securing screw and washer (figure 3-30).

17. Replace power resistors (refer to steps 8 and 9) using two screws and washers.

18. Raise deck to maintenance position (install support bracket). Connect servo preamp connector to servo preamp board (figure 3-24). Note pin keying. Be careful not to bend pins.

19. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

20. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

21. Lower logic chassis to normal operating position.

22. Lower case assembly.

23. Connect input power cable to external power source.

24. Set AC POWER and POWER SUPPLY circuit breakers to ON.

25. Install disk pack.

SPEED SENSOR

ADJUSTMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

2. Remove disk pack.

3. Using speed sensor adjustment tool, check adjustment of speed sensor (figure 3-31). If adjustment is required, continue to next step. If no adjustment is required, procedure is completed.

4. Raise deck to maintenance position.

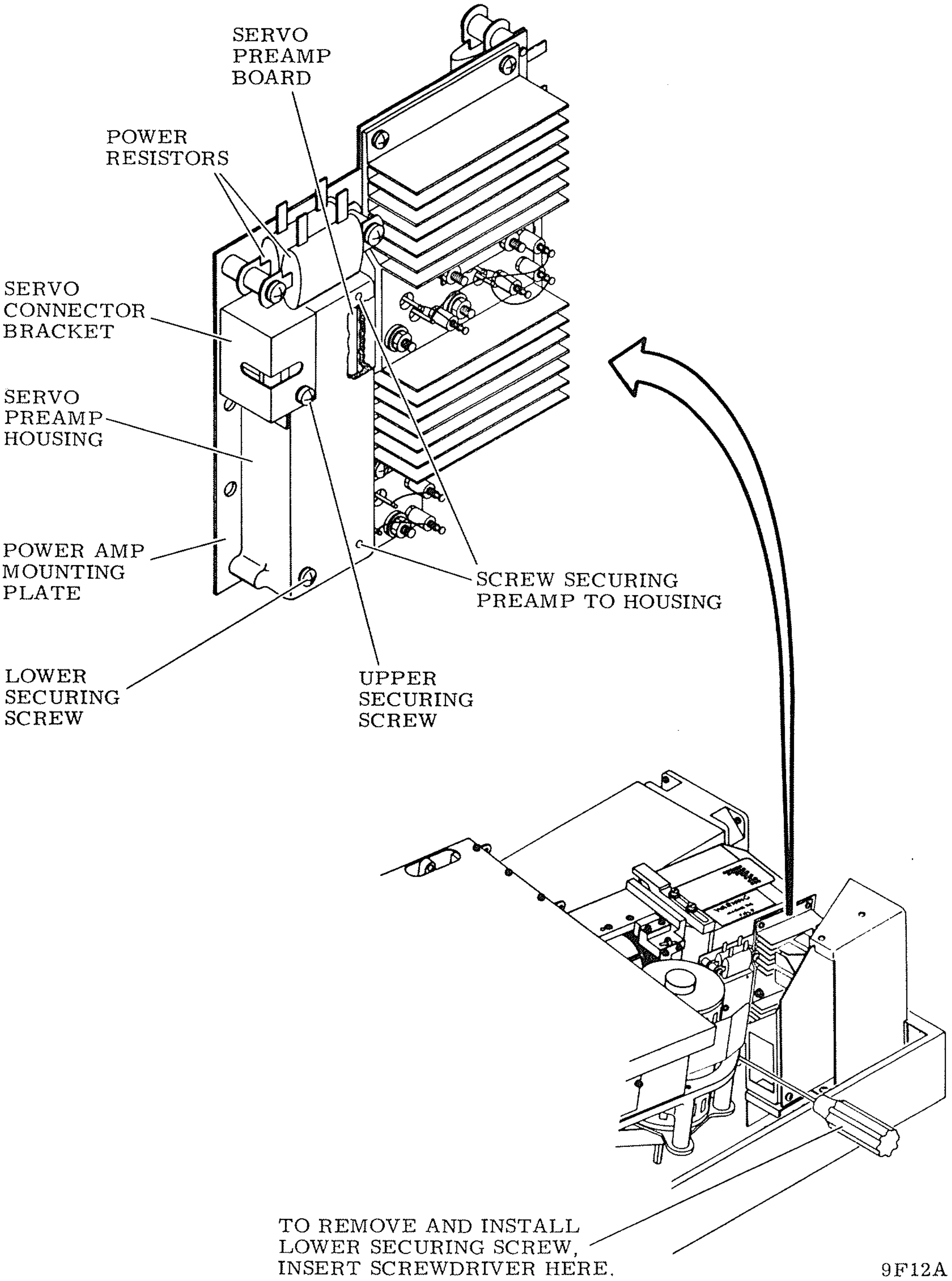


Figure 3-30. Servo Preamp Board Replacement

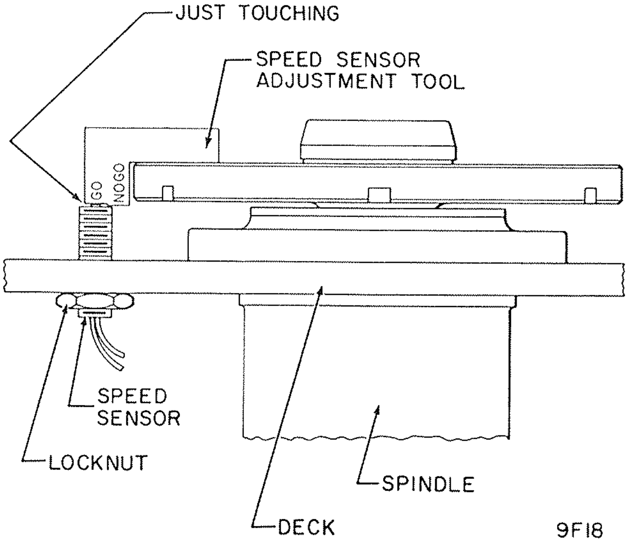


Figure 3-31. Speed Sensor Adjustment

5. Loosen locknut on speed sensor.

6. Rotate speed sensor until it is in adjustment. Torque speed sensor locknut to 5 (±1) inch-pounds. Recheck adjustment with adjustment tool.

7. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

8. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

9. Perform Speed Sensing Check.

REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

2. Remove disk pack.

3. Raise case assembly.

4. Raise deck assembly to maintenance position.

5. Disconnect speed sensor connector J202.

6. Loosen locknut on speed sensor (figure 3-31).

7. Remove faulty speed sensor by turning sensor counterclockwise.

8. Install replacement speed sensor until tip of speed sensor and adjustment tool are as shown in figure 3-30.

9. Tighten locknut on speed sensor.

10. Recheck speed sensor adjustment. Repeat adjustment if necessary.

11. Connect speed sensor leadwires.

12. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

13. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

14. Perform Speed Sensing Check.

SPINDLE ASSEMBLY

SPINDLE REPLACEMENT

CAUTION

When spindle assembly is removed from drive or shipping container, do not allow it to rest on pulley end of assembly. When it must be set down, lay it on its side or on spindle face plate. Improper handling of spindle may cause damage to spindle bearings which could result in premature failure of spindle or even damage to disks and heads.

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

2. Remove disk pack.

3. Raise case assembly.

4. Raise deck assembly to maintenance position.

5. Disconnect ground strap from ground spring.

6. Turn nut on belt spring tension screw (figure 3-17) until about two threads remain through nut.

7. Remove belt from spindle pulley by rolling belt off pulley in a counterclockwise direction.

8. Remove three button head screws securing spindle assembly to deck (figure 3-32). These screws are located under the spindle top surface and accessible through the three holes in top of the spindle.

NOTE

Notch in deck allows clearance for ground spring.

9. Carefully lift spindle assembly from deck to avoid damaging ground spring.

10. Remove two screws, lockwashers and flat washers securing ground spring mounting block to spindle assembly (figure 3-34).

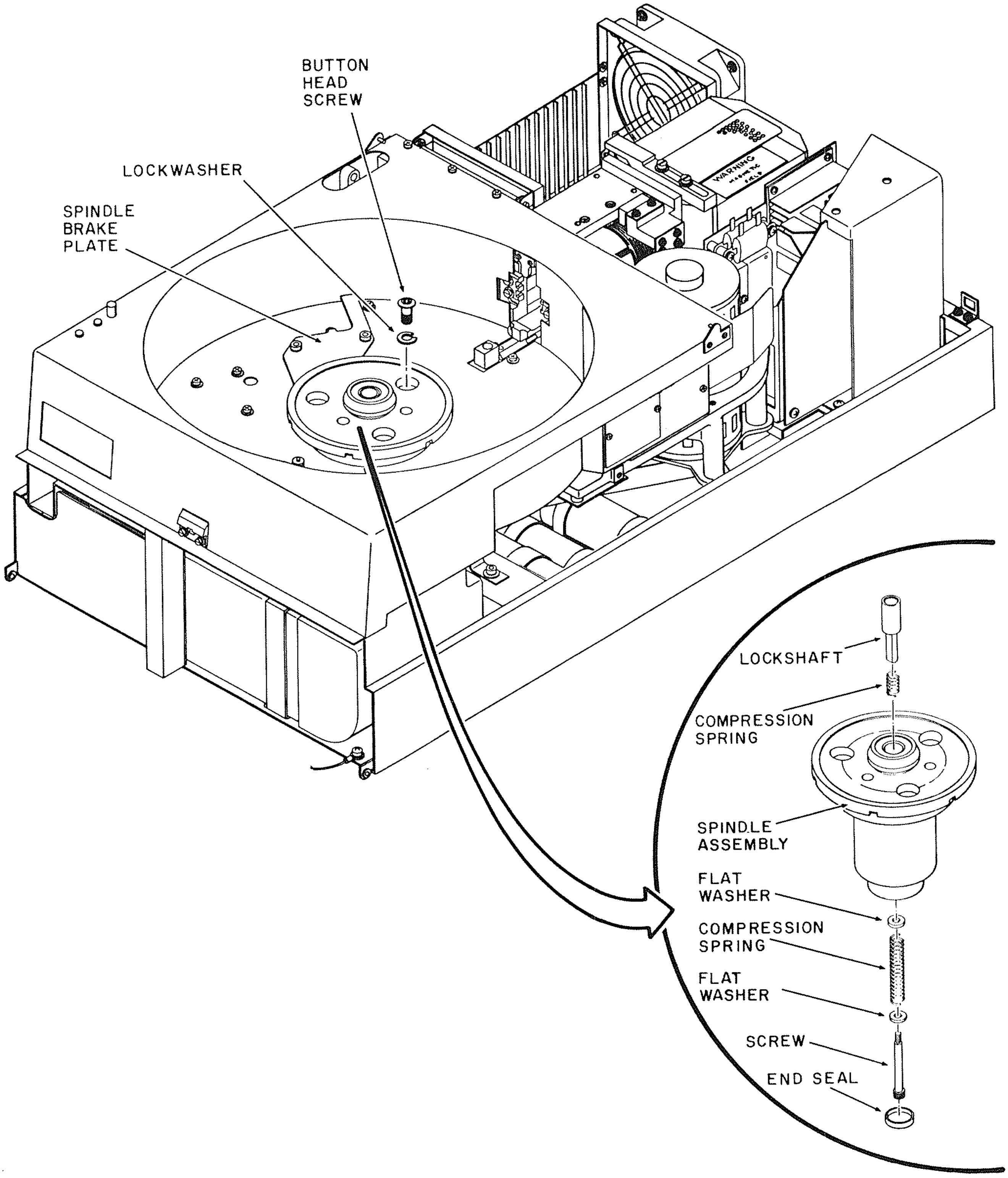


Figure 3-32. Spindle Replacement

11. Install ground spring mounting block on replacement spindle assembly using two screws, lockwashers and flat washers. Tighten screws.

12. Carefully lower replacement spindle assembly through deck opening in shroud. Orient spindle assembly so that ground spring mounting block faces drive motor.

13. Secure spindle assembly to deck using three socket head screws. Do not tighten screws.

14. Perform Spindle/Carriage Alignment procedure and then return to next step of this procedure.

15. Connect ground strap to ground spring terminal.

16. Perform Ground Spring Adjustment procedure.

17. Install and adjust drive belt (refer to Drive Belt Replacement and Adjustment procedures).

18. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

19. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

20. Perform Head/Arm Alignment procedure.

LOCKSHAFT REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.

2. Remove disk pack.

3. Raise case assembly.

4. Raise deck assembly to maintenance position.

5. Remove screw securing ground spring to mounting bracket (screw closest to ground spring contact). Loosen other screw in ground spring and rotate spring away from lockshaft end seal.

6. Remove lockshaft end seal by inserting a screwdriver tip between end seal and bottom of pulley and prying down until end seal falls off spindle shaft (two screwdrivers on opposite ends facilitate seal removal).

7. Insert a 1/8 inch Allen wrench into lockshaft screw inside spindle shaft. Hold spindle pack mounting plate stationary with one hand and with the other hand loosen lockshaft screw.

8. Remove lockshaft screw, flat washers and compression spring from spindle (while removing parts, take note of how parts are assembled).

9. Remove lockshaft and compression spring from top of lockshaft.

10. Position compression spring on replacement lockshaft and install into top of spindle until lockshaft is seated inside spindle shaft.

11. Assemble lockwasher screw, one flat washer, spring, and other flat washer as shown in figure 3-31.

NOTE

Using Loctite Primer in next step reduces the setting time for Loctite from 24 to 12 hours.

12. Apply a very minute amount of Loctite, Grade C to the first three threads of the lockshaft screw (make sure that no Loctite contacts screw, washers, or the spring).

13. Guide lockshaft screw into bottom of spindle shaft and thread screw into lockshaft.

14. Torque lockshaft screw to 40 (±5) inch-pounds.

15. Position lockshaft end seal onto spindle shaft. Lightly tap seal onto shaft using a plastic faced hammer. Make sure that end seal is completely flush with bottom of pulley.

16. Rotate ground spring onto end seal and secure screw to mounting block using one screw. Tighten both screws securing spring to mounting block.

17. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.

18. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.

19. Clean spindle and shroud per procedure listed in Preventive Maintenance section.

20. Allow Loctite to cure for 24 hours (12 hours if primer was used) before starting spindle motor.

SPINDLE/CARRIAGE ALIGNMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise case assembly.
4. Raise logic chassis to maintenance position.
5. Remove number 3 (second from bottom) head/arm assembly (refer to Head/Arm Alignment procedure).
6. Refer to figure 3-33 and install carriage alignment tool in head number 3 slot on carriage. Secure tool to carriage with two screws and washers, Torque each screw to 4 inch-pounds.
7. Extend carriage until alignment tool is aligned as shown in figure 3-33.
8. Check that distance between alignment tool and spindle is as specified in figure 3-33. If adjustment is required, go to step 9. If requirement is met, go to step 15.
9. Retract carriage.
10. Rotate spindle until three holes in top of spindle are aligned with the three screws securing spindle to deck assembly.
11. Remove the screws and washers securing spindle to deck. Install screws (without washers) snug tight.
12. Extend carriage until alignment tool is positioned as shown in figure 3-33.
13. Gently tap spindle using a plastic hammer until dimension between alignment tool and spindle is as specified in figure 3-33.
14. Tighten one screw at a time and check dimension after tightening each screw. After tightening the last screw, remove the first screw tightened in step 11 and install one washer on screw and install screw. Tighten screw. Perform this procedure for the second screw and then the third. Recheck dimensional requirement after tightening each screw.
15. Remove alignment tool and install number 3 head/arm assembly.
16. Perform Head/Arm Alignment check and adjustment for head 3.

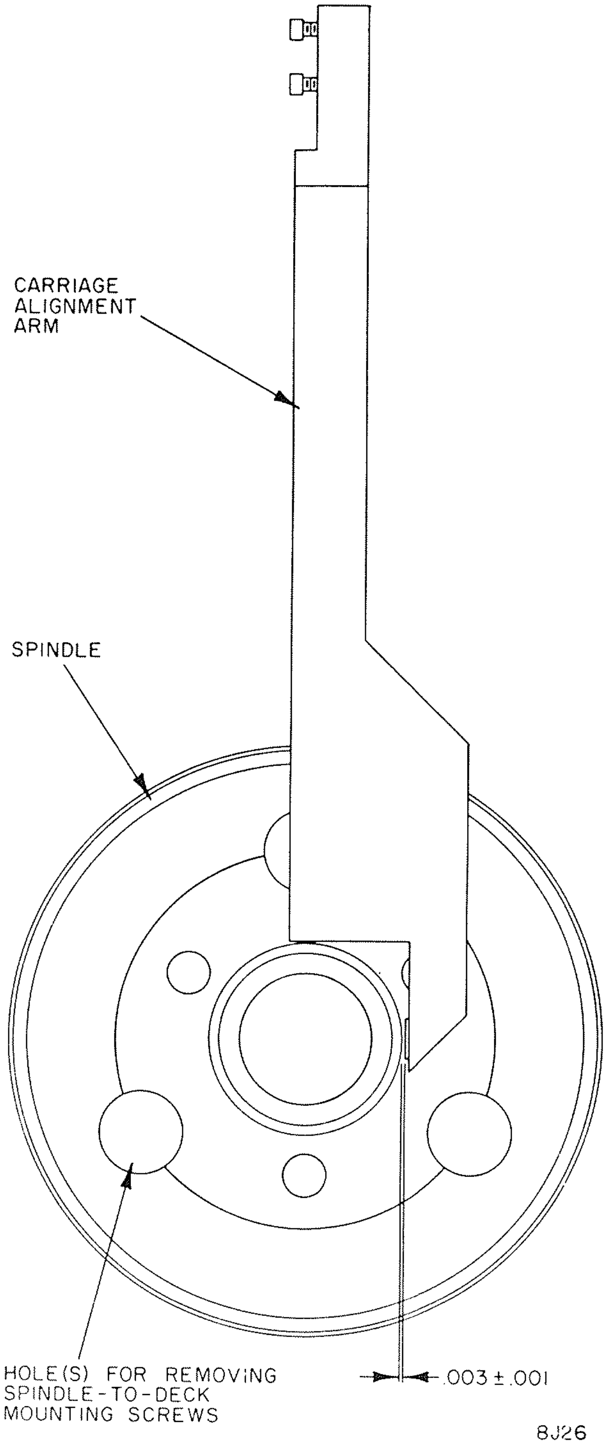


Figure 3-33. Spindle/Carriage Alignment

STATIC GROUND SPRING

ADJUSTMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise case assembly.
4. Raise deck assembly to maintenance position.
5. Connect a push-pull gauge to outer end of ground spring (figure 3-34).
6. Force (applied perpendicular to spring length) required to pull ground spring contact free of spindle lockshaft end seal should be within 90 (±25) grams.
7. If not within requirements of step 6, loosen two screws securing ground spring spring block to side of spindle assembly (figure 3-34). Reposition block. (Slide block towards deck to increase spring tension. Slide block away from deck to decrease spring tension.) Tighten screws and recheck requirements of step 6. Repeat adjustments until requirement is met.
8. Remove ground spring leadwire at ground spring mounting block terminal.
9. Connect multimeter (set to RX1) across ground spring leadwire and ground spring terminal. Meter should indicate zero ohms. If not, go to step 10. If OK go to step 11.
10. Clean lockshaft end seal with gauze slightly dampened with media clean-

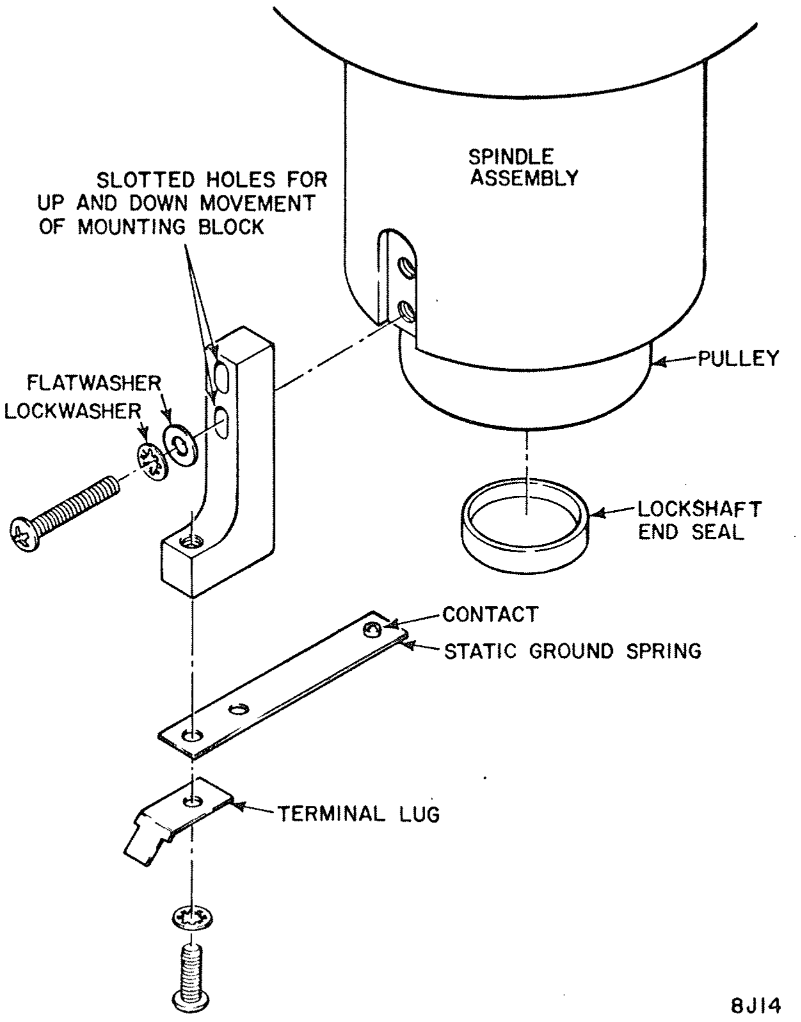


Figure 3-34. Static Ground Spring

ing solution. Repeat step 9, if requirement is not met replace ground spring. If OK go to step 11.

11. Disconnect multimeter leadwires.
12. Connect ground spring leadwire to ground spring terminal lug.
13. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.
14. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.
15. Lower case assembly.
16. Set AC POWER and POWER SUPPLY circuit breakers to ON.

REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF.
2. Remove disk pack.
3. Raise case assembly.
4. Raise deck assembly to maintenance position.
5. Disconnect ground spring leadwire from ground spring terminal lug.
6. Remove two screws, lockwashers, one flat washer and one terminal lug securing ground spring to mounting block.
7. Position replacement ground spring on mounting block as shown in figure 3-34.
8. Secure ground spring to mounting block, using two screws, lockwashers, one flat washer and one terminal lug (assemble hardware as shown in figure 3-34). Tighten screw.
9. Perform steps 5 through 16 of Static Ground Spring Adjustment procedure.

TIME METER REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Disconnect input power cable from external power source.
2. Remove disk pack.
3. Raise case assembly.
4. Remove six screws and spring lock washers securing time meter mounting plate to base.
5. Remove screws and spring lock washers securing time meter to mounting plate.
6. Identify wires to be removed from time meter. Remove nylon covers and nuts securing wires to time meter.
7. Remove defective time meter.
8. Install replacement time meter in mounting plate in reverse order of removal.
9. Install time meter mounting plate on base being careful not to pinch electrical wires.
10. Lower case assembly.
11. Connect input power cable to external power source.
12. Set AC POWER and POWER SUPPLY circuit breakers to ON.
13. Perform initial Checkout and Startup procedure.

TRIAC REPLACEMENT

1. Set AC POWER and POWER SUPPLY circuit breakers to OFF. Disconnect input power cable from external power source.
2. Remove disk pack.
3. Raise case assembly.
4. Raise deck assembly to maintenance position.
5. Locate bad triac.
6. Identify and label triac leadwires. Disconnect leadwires.
7. Remove two screws and washers securing triac. Remove triac.
8. Install new triac in reverse order of removal.
9. Lower deck from maintenance position. Remove deck rear holddown screw and spacer. Install screw and spacer in keeper hole on back of deck.
10. Secure deck assembly to base assembly using two screws through bottom of shroud. Tighten screws.
11. Connect input power cable to external power source.
12. Lower case assembly.
13. Set AC POWER and POWER SUPPLY circuit breakers to ON.

VELOCITY TRANSDUCER

The velocity transducer assembly consists of a transducer coil (complete with housing and connector), a transducer core, and an extension rod. Whenever it is necessary to change any part of the transducer assembly, all parts of the assembly must be changed.

NOTE

When ordering the velocity transducer assembly, also be certain to order the extension rod.

The following procedure first covers replacement of the transducer coil, aligning it to the old transducer core. It then covers replacement of the core.

Refer to figure 3-35 and:

1. Remove attaching hardware securing transducer coil to rear of magnet assembly. Unplug connector P22.
2. Carefully remove transducer coil, sliding it straight out rear of magnet assembly.
3. Slowly and carefully slide replacement transducer coil into rear of magnet assembly.
4. Align one of the three slots on back of transducer coil with mounting hole in magnet. Manually extend heads and slide carriage back and forth. Be aware of any drag or of any rubbing sound. Rotate coil and move carriage again for each of remaining two slots on back of transducer coil.
5. Select mounting slot that produced minimum drag and minimum rubbing. Orient this slot to mounting hole and install and tighten attaching hardware.
6. Reconnect connector P22. Extend heads and move carriage back and forth to verify alignment of transducer coil.
7. Reach in from logic chassis side of drive and disconnect extension rod from rear of carriage assembly using a 1/8-inch open end wrench.
8. Push extension rod and transducer core through coil and out rear of magnet assembly.
9. Apply light coat of Loctite grade C to threads of new extension rod and screw rod into end of replacement transducer core. Wipe off excessive Loctite.

NOTE

Do not apply Loctite to remaining end of extension rod until completing next step.

10. Slowly and carefully slide replacement transducer core and extension rod through coil from rear.

CAUTION

Use extreme care not to allow Loctite to get on carriage rails or bearings.

11. Very carefully apply a light coat of Loctite grade C to threads on end of extension rod. Thread extension rod into rear of carriage and lightly tighten. Wipe away excessive Loctite.
12. Manually extend heads and move carriage back and forth to verify that carriage moves freely and there is no excessive drag.

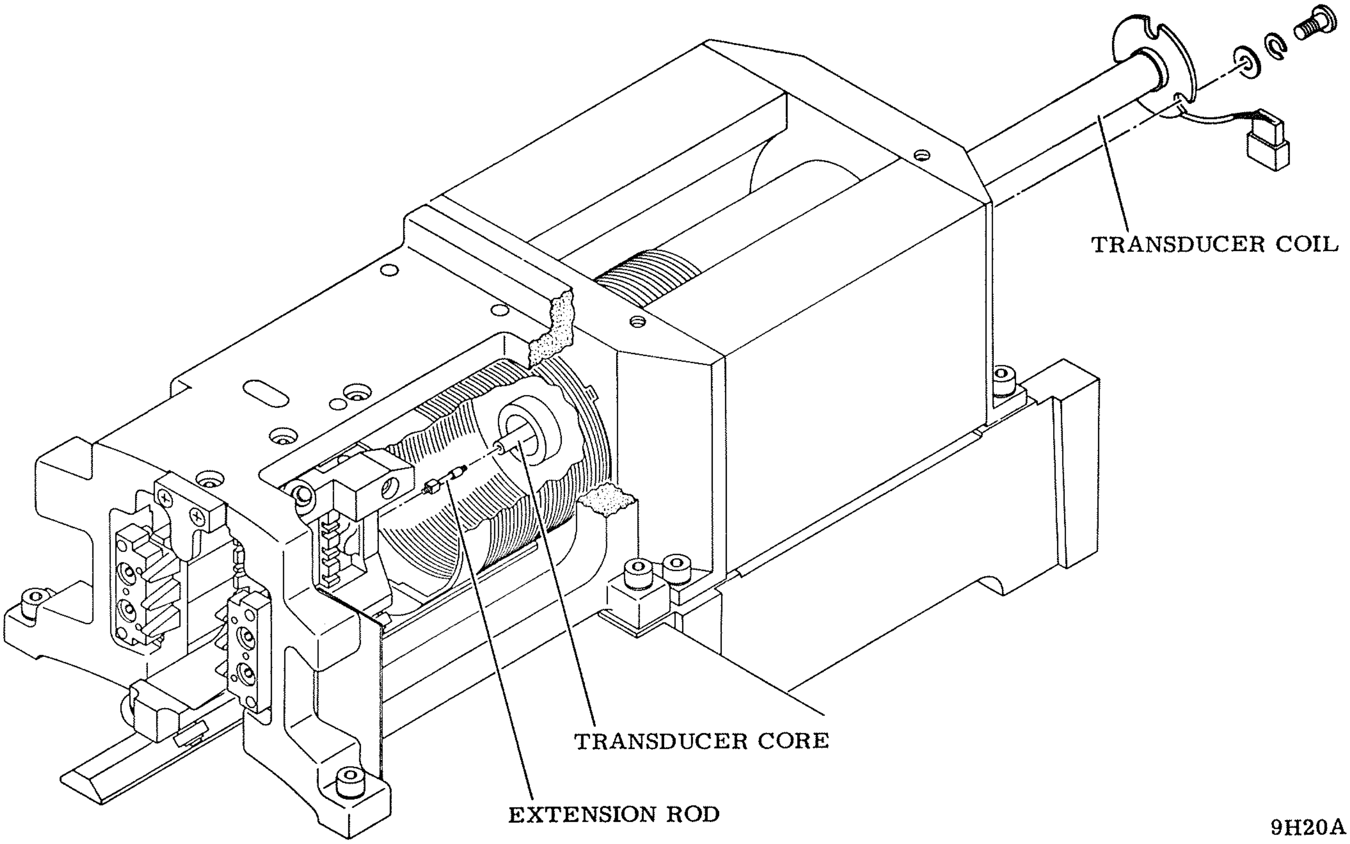


Figure 3-35. Velocity Transducer Replacement

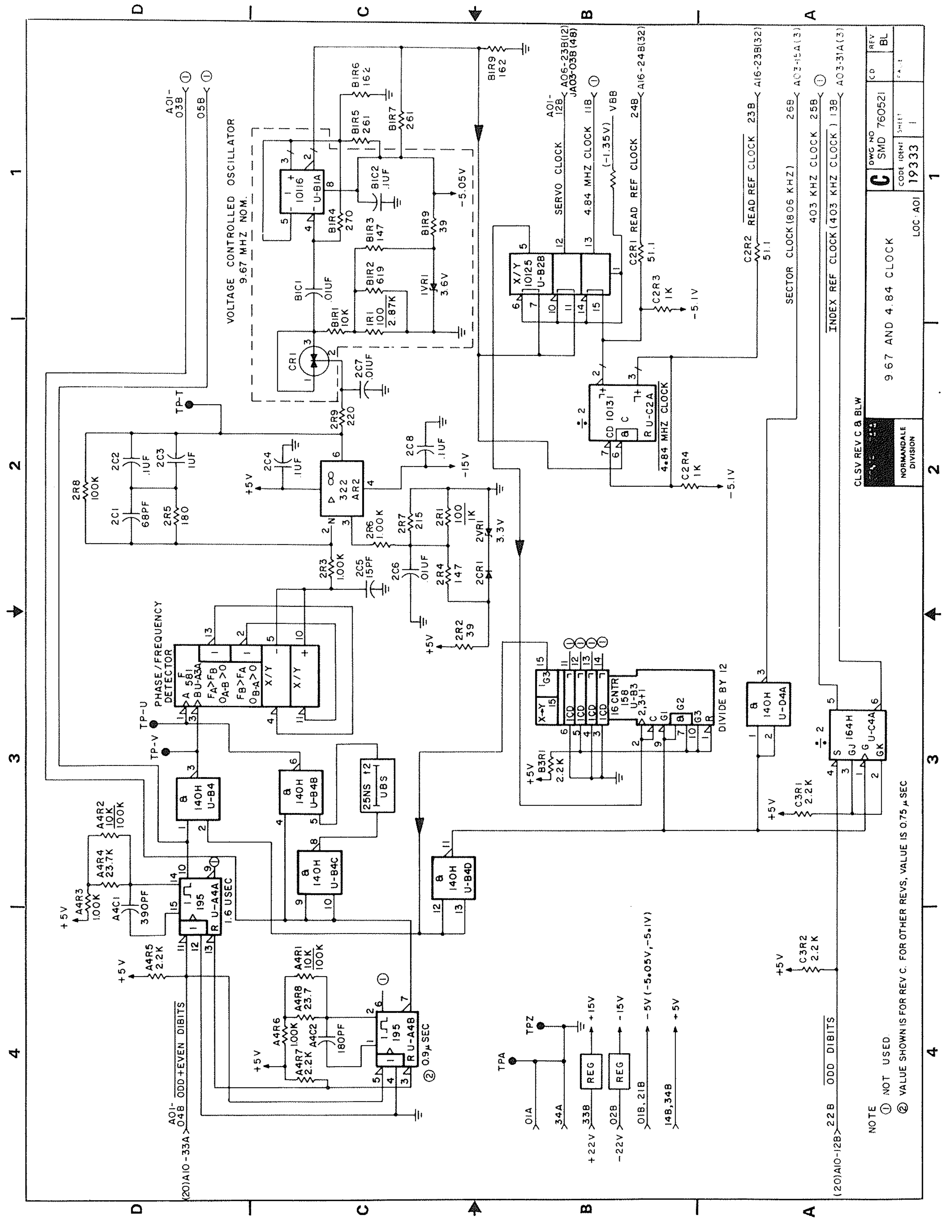
SECTION 4

DIAGRAMS

INTRODUCTION

This section contains diagrams that logically describe the drive in terms of the functions which the unit performs. Schematic diagrams for the logic cards are located in the Logic Cards Manual (refer to Preface). Descriptive material for discrete component circuits is located in the same manual.

Flow charts, simplified circuits, and timing diagrams that describe unit functions are located in the Theory of Operation section (refer to Publication Number 83308500).



NOTE
① NOT USED.
② VALUE SHOWN IS FOR REV C. FOR OTHER REVS, VALUE IS 0.75 μSEC

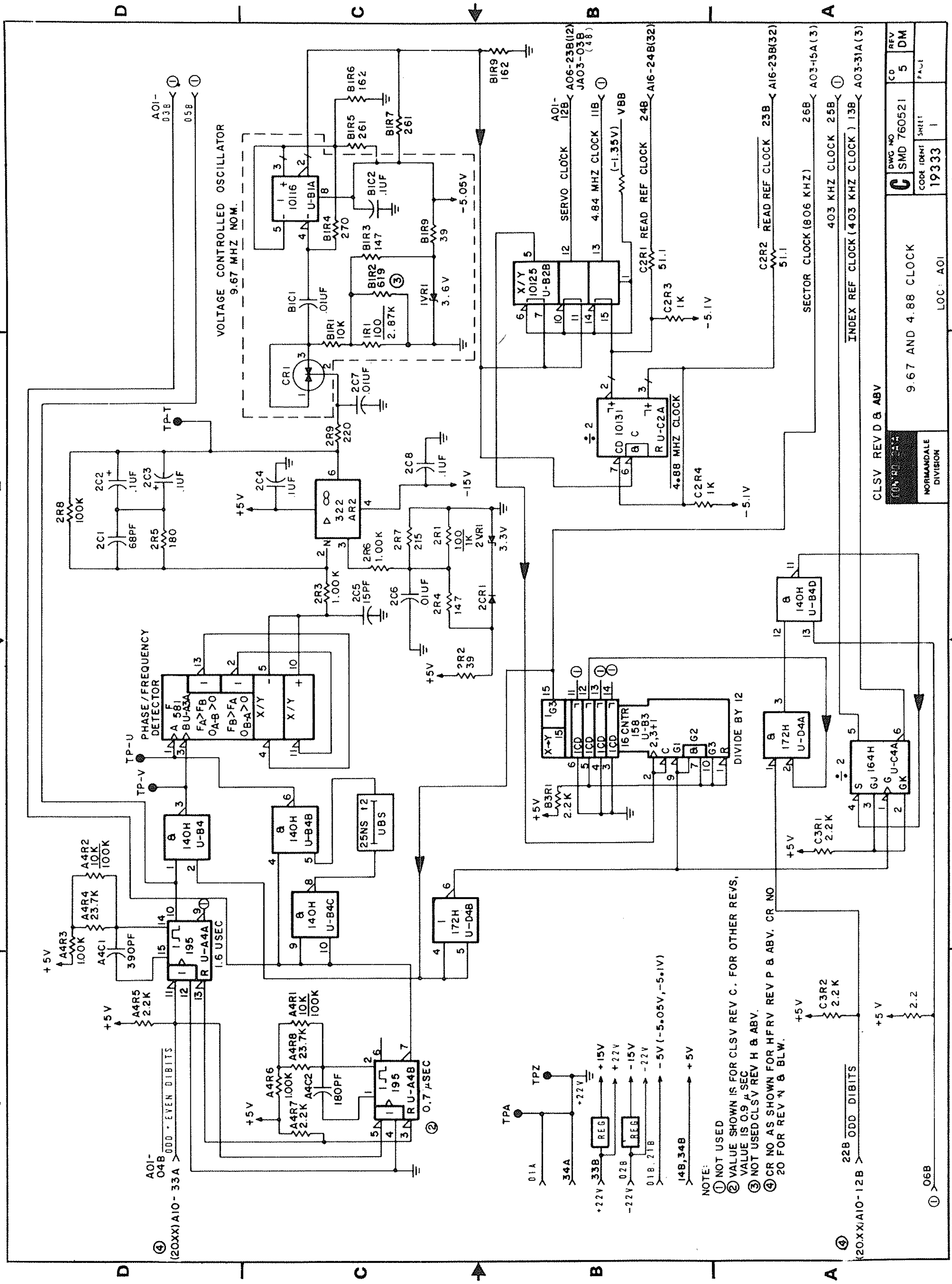
CLSV REV C & BLW

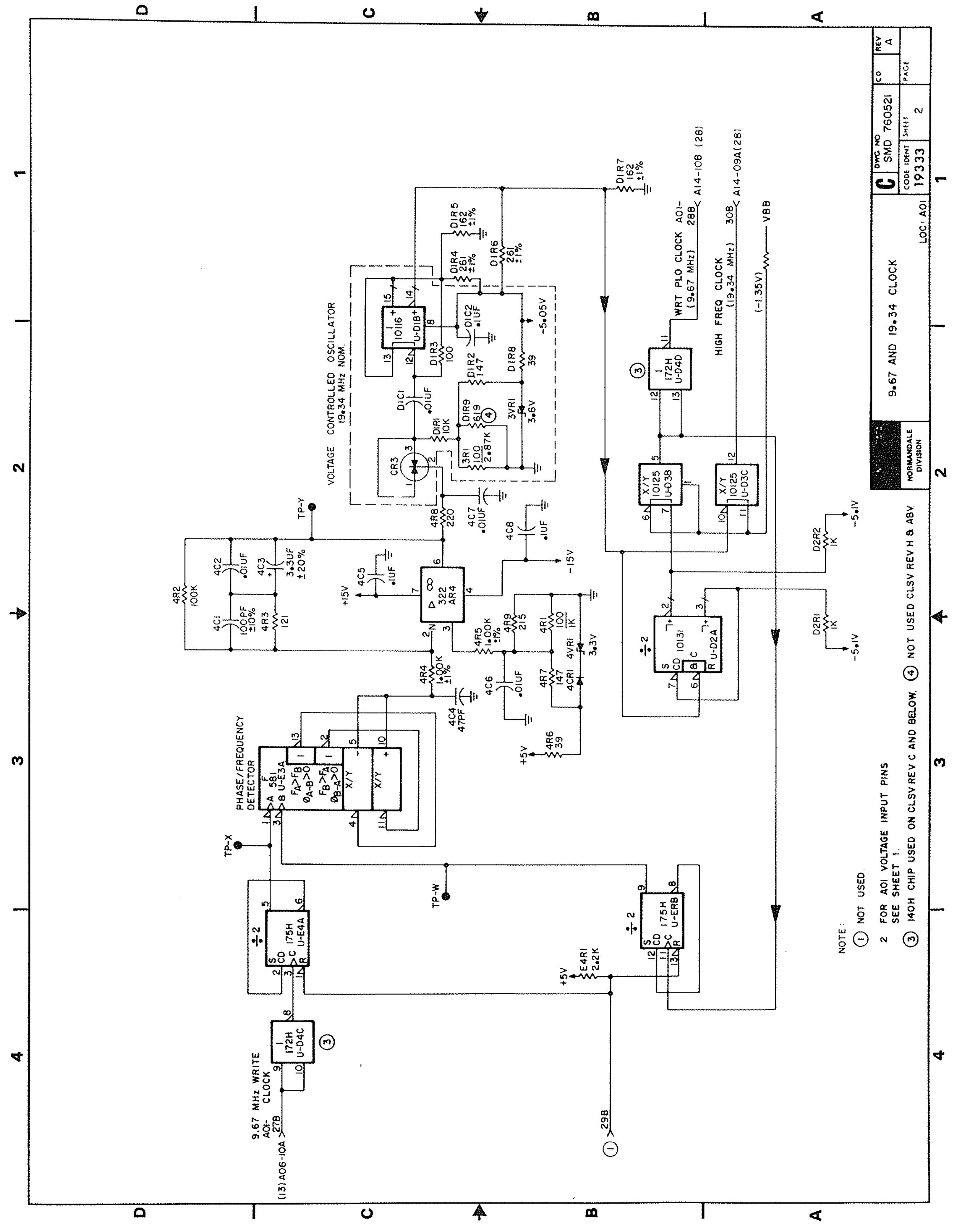
NORMANDALE DIVISION

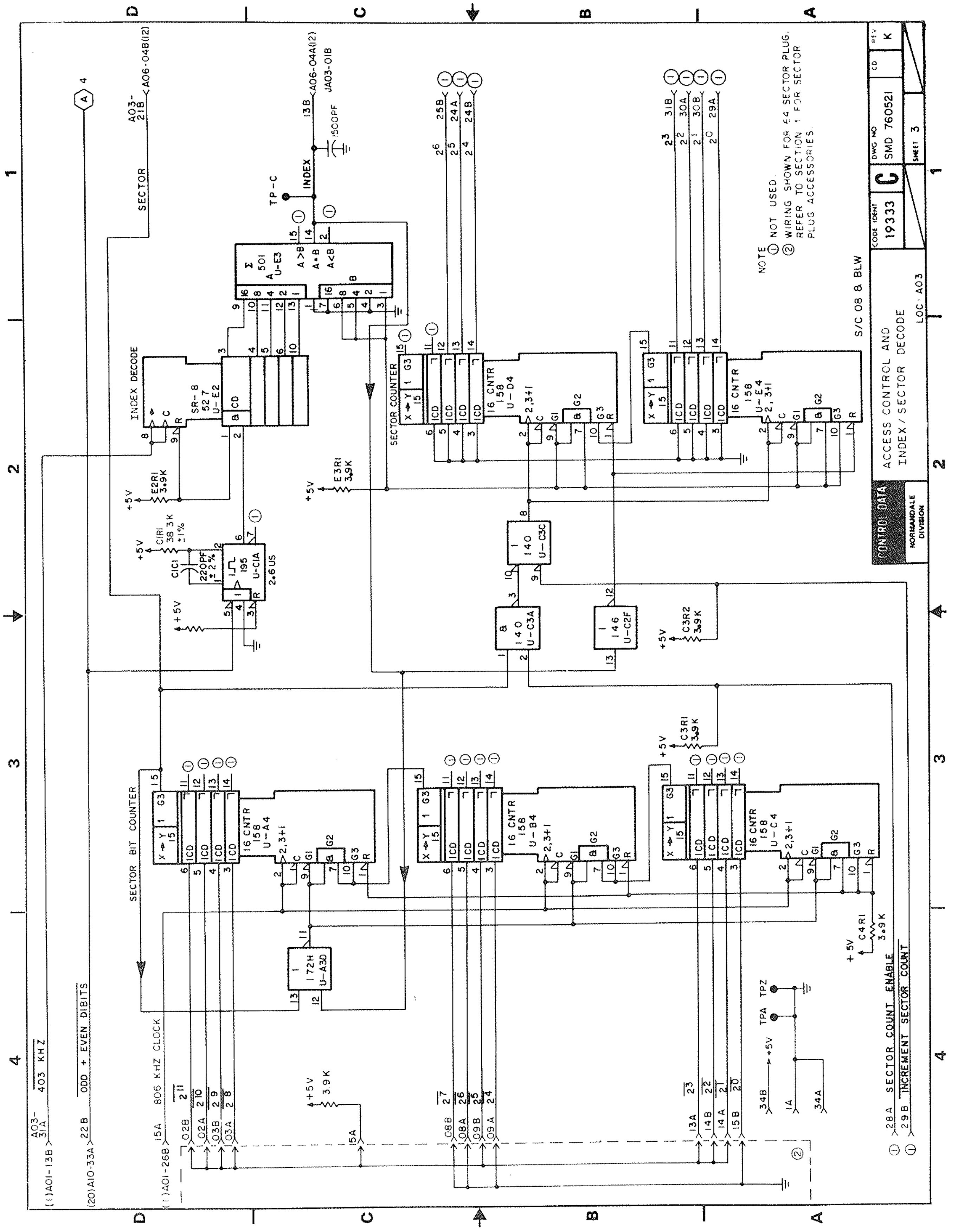
9 67 AND 4.84 CLOCK

LOC: A01

C
DWG NO SMD 760521
CODE IDENT 19333
SHEET 1
REV BL


VOLTAGE CONTROLLED OSCILLATOR
9.67 MHZ NOM.
10116 U-B1A
B1C2 .1UF
B1R4 270
B1R3 147
B1R2 619 ③
B1R1 10K
1R1 100 2.87K
1VR1 3.6V
B1R9 39
-5.05V
B1R5 261
B1R6 162
B1R7 261
B1R9 162
B1C1 .01UF
CR1
2C7 .01UF
2R9 220
TP-T
2C2 .1UF
2C3 .1UF
2R8 100K
2C1 68PF
2R5 180
2C4 .1UF
+5V
322 AR2
2C8 .1UF
-15V
2R6 1.00K
2R7 215
2R1 100 1K
2VR1 3.3V
2R3 1.00K
2C5 15PF
2C6 .01UF
2R4 147
2CR1
2R2 39
+5V
PHASE/FREQUENCY DETECTOR
581 BU-A3A
FA>FB OA-B>0
FB>FA OB-A>0
X/Y
TP-U
TP-V
140H U-B4
140H U-B4B
25NS UBS
140H U-B4C
172H U-D4B
A4R2 10K 100K
A4R4 23.7K
A4R3 1.00K
A4C1 390PF
+5V
195 U-A4A 1.6 USEC
A4R5 2.2K
A4R1 10K 100K
A4R8 23.7K
A4R6 1.00K
A4C2 180PF
A4R7 2.2K
195 U-A4B 0.7 μSEC ②
A01-04B ODD · EVEN DIBITS
④ (20XX)A10-33A
A01-03B ①
05B ①
A01-12B
SERVO CLOCK
A06-23B(12) JA03-03B (48)
4.84 MHZ CLOCK 11B ①
(-1.35V) VBB
READ REF CLOCK 24B A16-24B(32)
X/Y 10125 U-B2B
C2R1 51.1
C2R3 1K
-5.1V
C2R2 51.1
READ REF CLOCK 23B A16-23B(32)
SECTOR CLOCK (806 KHZ) 26B A03-15A(3)
403 KHZ CLOCK 25B ①
INDEX REF CLOCK (403 KHZ CLOCK) 13B A03-31A(3)
÷ 2
10131 U-C2A
4.88 MHZ CLOCK
C2R4 1K
-5.1V
140H U-B4D
16 CNTR 158 U-B3 2,3+1
DIVIDE BY 12
B3R1 2.2K
+5V
172H U-D4A
÷ 2
GJ 164H U-C4A
C3R1 2.2K
+5V
C3R2 2.2K
+5V
2.2
TPZ
TPA
+22V
REG
+15V +22V -15V -22V -5V (-5.05V,-5.1V) +5V
01A 34A 33B 02B 01B,21B 14B,34B
22B ODD DIBITS
④ (20XX)A10-12B
① 06B
NOTE:
① NOT USED
② VALUE SHOWN IS FOR CLSV REV C. FOR OTHER REVS, VALUE IS 0.9 μSEC
③ NOT USED CLSV REV H & ABV.
④ CR NO AS SHOWN FOR HFRV REV P & ABV. CR NO 20 FOR REV N & BLW.
CLSV REV D & ABV
9.67 AND 4.88 CLOCK
LOC: A01
CONTROL DATA
NORMANDALE DIVISION
C
DWG NO SMD 760521
CD 5
REV DM
CODE IDENT 19333
SHEET 1
A B C D 1 2 3 4

9.67 AND 19.34 CLOCK
NORMANDALE DIVISION
LOC: A01
C
DWG NO SMD 760521
CD
REV A
CODE IDENT 19333
SHEET 2
PAGE
VOLTAGE CONTROLLED OSCILLATOR
19.34 MHz NOM.
PHASE/FREQUENCY DETECTOR
581 U-E3A
F
FA>FB
ØA-B>0
FB>FA
ØB-A>0
X/Y
10116 U-D1B
CR3
D1C1 .01UF
D1R1 10K
D1R2 147
D1R3 100
D1R4 261 ±1%
D1R5 162 ±1%
D1R6 261 ±1%
D1R7 162 ±1%
D1R8 39
D1R9 619 ④
3R1 100 2.87K
3VR1 3.6V
D1C2 .1UF
-5.05V
4R8 220
4C7 .01UF
4C8 .1UF
TP-Y
TP-X
TP-W
4R2 100K
4C2 .01UF
4C3 3.3UF ±20%
4C1 100PF ±10%
4R3 121
4C5 .1UF
+15V
-15V
322 AR4
4R4 1.00K ±1%
4C4 47PF
4R5 1.00K ±1%
4R9 215
4R1 100 1K
4C6 .01UF
4R7 147
4CR1
4VR1 3.3V
4R6 39
+5V
÷ 2
175H U-E4A
172H U-D4C ③
9.67 MHz WRITE CLOCK
A01-27B
(13) A06-10A
175H U-ERB
E4R1 2.2K
① 29B
10131 U-D2A
D2R1 1K
D2R2 1K
-5.1V
X/Y 10125 U-D3B
X/Y 10125 U-D3C
172H U-D4D ③
WRT PLO CLOCK (9.67 MHz)
A01-28B
A14-10B (28)
HIGH FREQ CLOCK (19.34 MHz)
30B
A14-09A(28)
(-1.35V)
VBB
NOTE:
① NOT USED.
2 FOR A01 VOLTAGE INPUT PINS SEE SHEET 1.
③ 140H CHIP USED ON CLSV REV C AND BELOW.
④ NOT USED CLSV REV H & ABV.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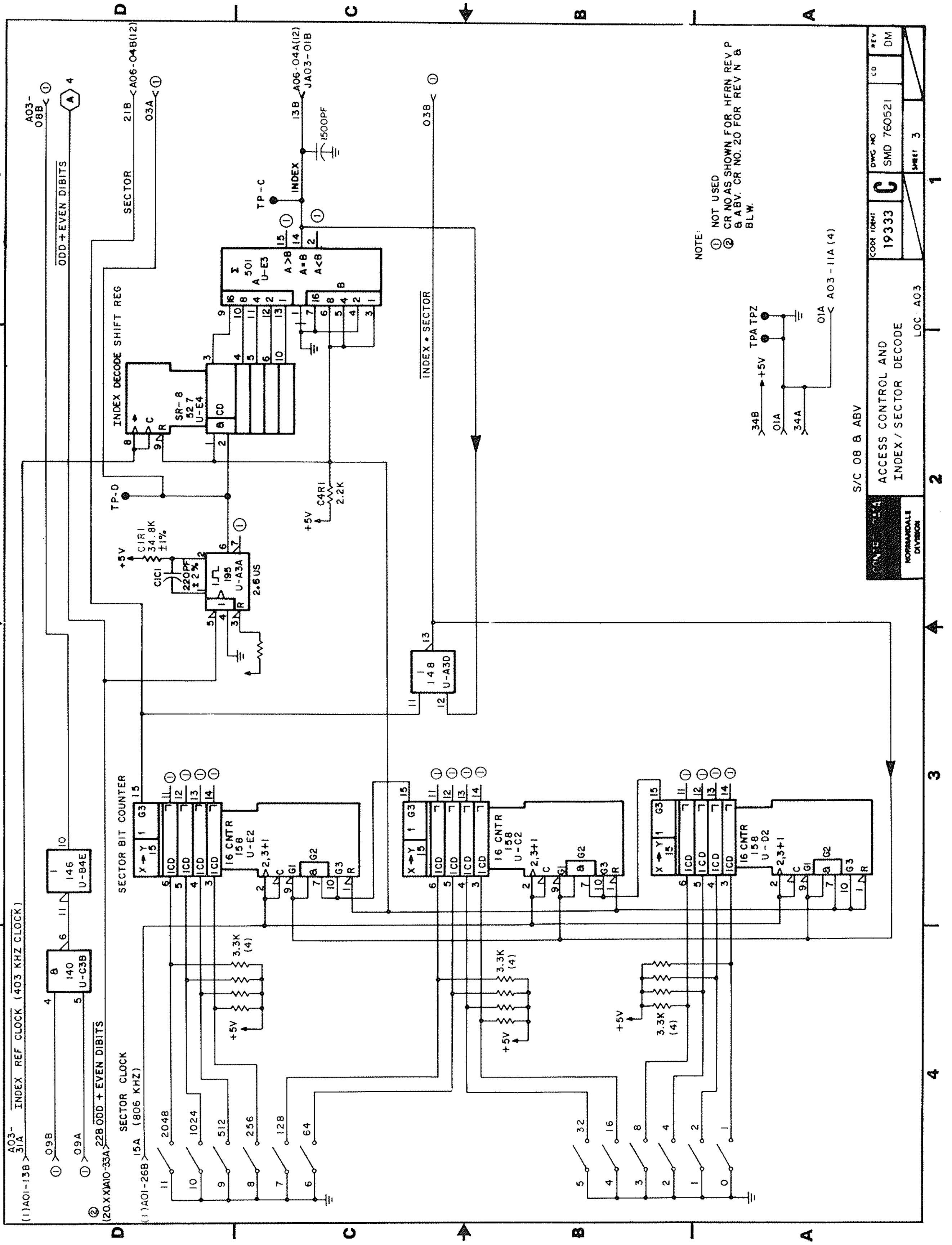
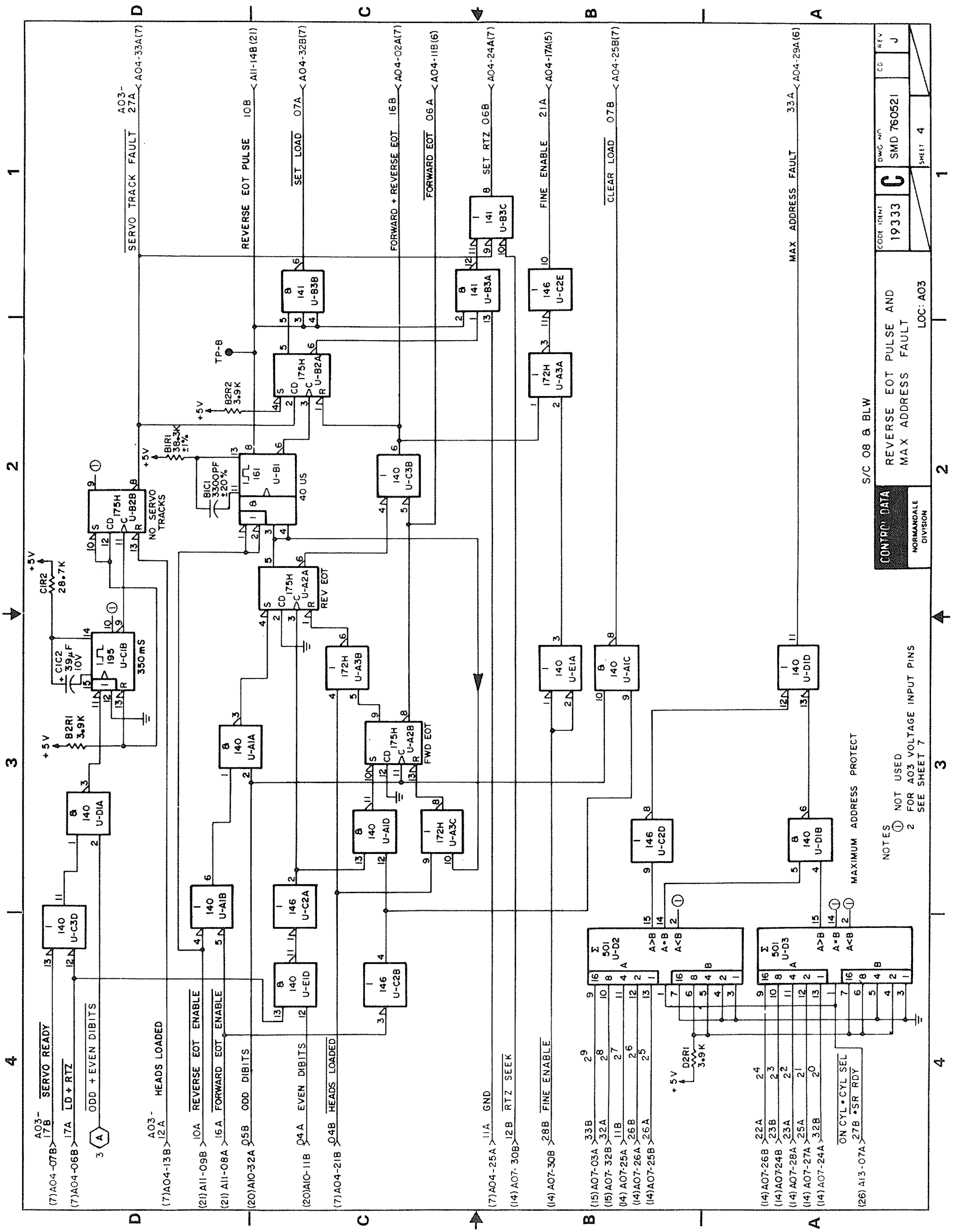
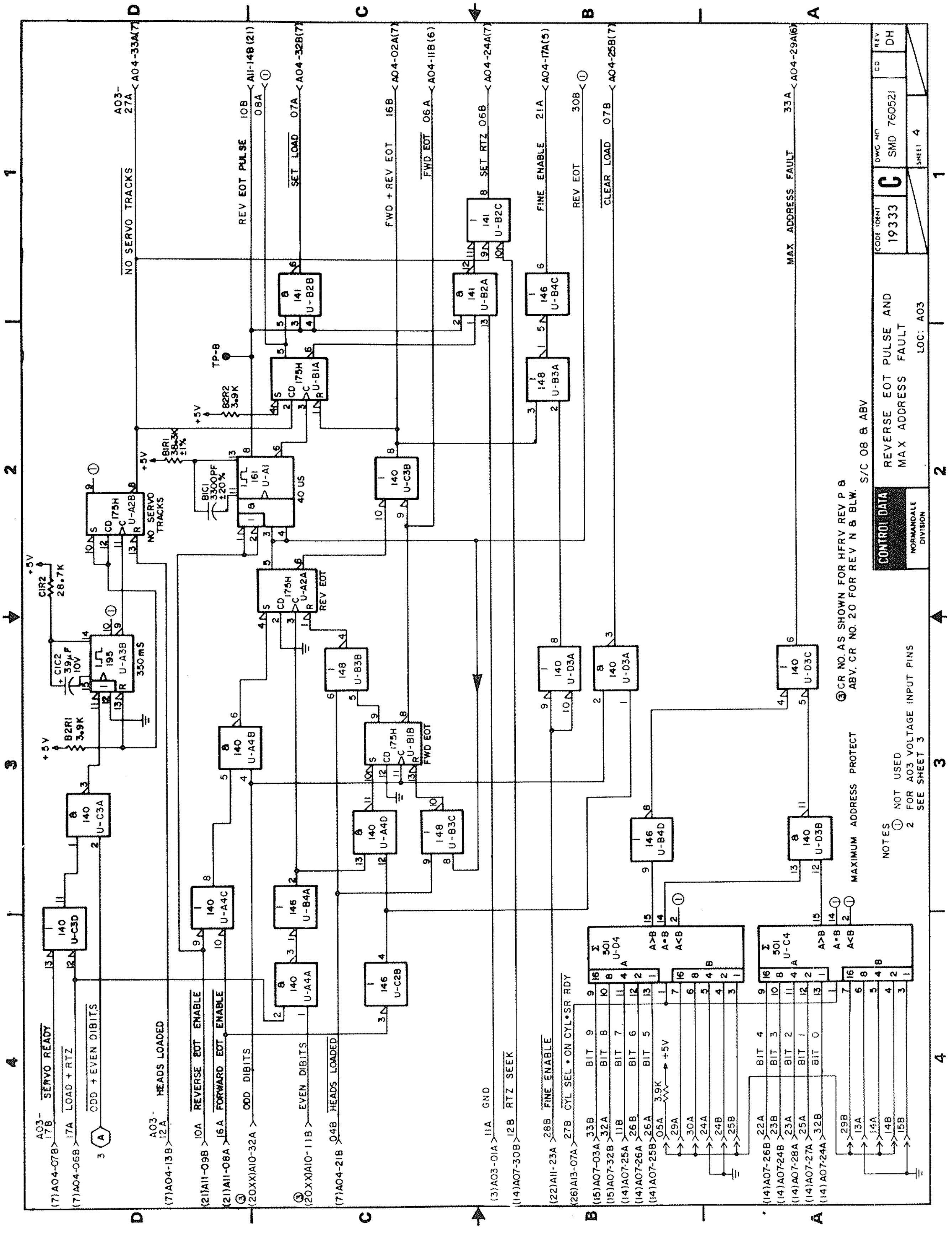
NORMANDALE DIVISION
ACCESS CONTROL AND
INDEX/SECTOR DECODE
LOC: A03
CODE IDENT 19333
C
DWG NO SMD 76052I
SHEET 3
REV K
NOTE
① NOT USED
② WIRING SHOWN FOR 64 SECTOR PLUG. REFER TO SECTION 1 FOR SECTOR PLUG ACCESSORIES
S/C 08 & BLW
SECTOR
INDEX
TP-C
1500PF
A06-04B(12)
A06-04A(12)
JA03-01B
A03-21B
13B
INDEX DECODE
SR-8 527 U-E2
Σ 501 U-E3
A>B
A=B
A<B
SECTOR COUNTER
16 CNTR 158 U-D4
16 CNTR 158 U-E4
16 CNTR 158 U-A4
16 CNTR 158 U-B4
16 CNTR 158 U-C4
SECTOR BIT COUNTER
195 U-C1A 2.6US
140 U-C3C
140 U-C3A
146 U-C2F
172H U-A3D
E2R1 3.9K
E3R1 3.9K
C1R1 38.3K ±1%
C1C1 220PF ±2%
C3R2 3.9K
C3R1 3.9K
C4R1 3.9K
+5V
2⁶ 25B
2⁵ 24A
2⁴ 24B
2³ 31B
2² 30A
2¹ 30B
2⁰ 29A
(1)A01-13B
A03-31A
403 KHZ
(20)A10-33A
22B
ODD + EVEN DIBITS
(1)A01-26B
15A
806 KHZ CLOCK
2̅1̅1̅ 02B
2̅1̅0̅ 02A
2̅9̅ 03B
2̅8̅ 03A
2̅7̅ 08B
2̅6̅ 08A
2̅5̅ 09B
2̅4̅ 09A
2̅3̅ 13A
2̅2̅ 14B
2̅1̅ 14A
2̅0̅ 15B
34B
1A
34A
TPA
TPZ
28A SECTOR COUNT ENABLE
29B INCREMENT SECTOR COUNT


ACCESS CONTROL AND
INDEX/SECTOR DECODE
LOC A03
S/C 08 & ABV
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 3
REV DM
NORMANDALE DIVISION
NOTE:
① NOT USED
② CR NO AS SHOWN FOR HFRN REV P & ABV. CR NO. 20 FOR REV N & BLW.
INDEX DECODE SHIFT REG
SR-8 527 U-E4
Σ 501 U-E3
A>B
A=B
A<B
INDEX
TP-C
TP-D
1500PF
A06-04A(12) JA03-01B
13B
SECTOR
21B
A06-04B(12)
03A
A03-08B
ODD + EVEN DIBITS
03B
INDEX • SECTOR
195 U-A3A
2.6 US
C1R1 34.8K ±1%
C1C1 220PF ±2%
C4R1 2.2K
+5V
148 U-A3D
146 U-B4E
140 U-C3B
SECTOR BIT COUNTER
16 CNTR 158 U-E2
16 CNTR 158 U-C2
16 CNTR 158 U-D2
3.3K (4)
INDEX REF CLOCK (403 KHZ CLOCK)
SECTOR CLOCK (806 KHZ)
22B ODD + EVEN DIBITS
(1)A01-13B
A03-31A
09B
09A
(20.XX)A10-33A
(1)A01-26B
15A
2048
1024
512
256
128
64
32
16
8
4
2
1
TPA TPZ
34B
01A
34A
A03-11A(4)


REVERSE EOT PULSE AND MAX ADDRESS FAULT
S/C 08 & BLW
LOC: A03
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 4
REV J
NOTES
① NOT USED
2 FOR A03 VOLTAGE INPUT PINS SEE SHEET 7
MAXIMUM ADDRESS PROTECT
(7) A04-07B A03-17B SERVO READY
(7) A04-06B 17A LD + RTZ
3 A ODD + EVEN DIBITS
(7) A04-13B A03-12A HEADS LOADED
(21) A11-09B 10A REVERSE EOT ENABLE
(21) A11-08A 16A FORWARD EOT ENABLE
(20) A10-32A 05B ODD DIBITS
(20) A10-11B 04A EVEN DIBITS
(7) A04-21B 04B HEADS LOADED
(7) A04-25A 11A GND
(14) A07-30B 12B RTZ SEEK
(14) A07-30B 28B FINE ENABLE
(15) A07-03A 33B 2^9
(15) A07-32B 32A 2^8
(14) A07-25A 11B 2^7
(14) A07-26A 26B 2^6
(14) A07-25B 26A 2^5
(14) A07-26B 22A 2^4
(14) A07-24B 23B 2^3
(14) A07-28A 23A 2^2
(14) A07-27A 25A 2^1
(14) A07-24A 32B 2^0
(26) A13-07A 27B ON CYL • CYL SEL • SR RDY
SERVO TRACK FAULT A03-27A A04-33A(7)
REVERSE EOT PULSE 10B A11-14B(21)
SET LOAD 07A A04-32B(7)
FORWARD + REVERSE EOT 16B A04-02A(7)
FORWARD EOT 06A A04-11B(6)
SET RTZ 06B A04-24A(7)
FINE ENABLE 21A A04-17A(5)
CLEAR LOAD 07B A04-25B(7)
MAX ADDRESS FAULT 33A A04-29A(6)
U-C3D U-D1A U-C1B 195 350mS C1C2 39µF 10V C1R2 28.7K B2R1 3.9K
U-B2B 175H NO SERVO TRACKS
U-B1 161 40 US B1C1 3300PF ±20% B1R1 38.3K ±1% B2R2 3.9K TP-8
U-B2A 175H U-B3B 141 U-B3A 141 U-B3C 141
U-A2A 175H REV EOT U-A2B 175H FWD EOT
U-A1A U-A1B U-A1C U-A1D U-A3A 172H U-A3B 172H U-A3C 172H
U-C2A 146 U-C2B 146 U-C2D 146 U-C2E 146 U-C3B 140
U-E1A U-E1D U-D1B U-D1D
U-D2 Σ 501 A>B A=B A<B
U-D3 Σ 501 A>B A=B A<B
D2R1 3.9K +5V



③ CR NO. AS SHOWN FOR HFRV REV P & ABV. CR NO. 20 FOR REV N & BLW.

S/C 08 & ABV

MAXIMUM ADDRESS PROTECT

NOTES
① NOT USED
2 FOR A03 VOLTAGE INPUT PINS SEE SHEET 3

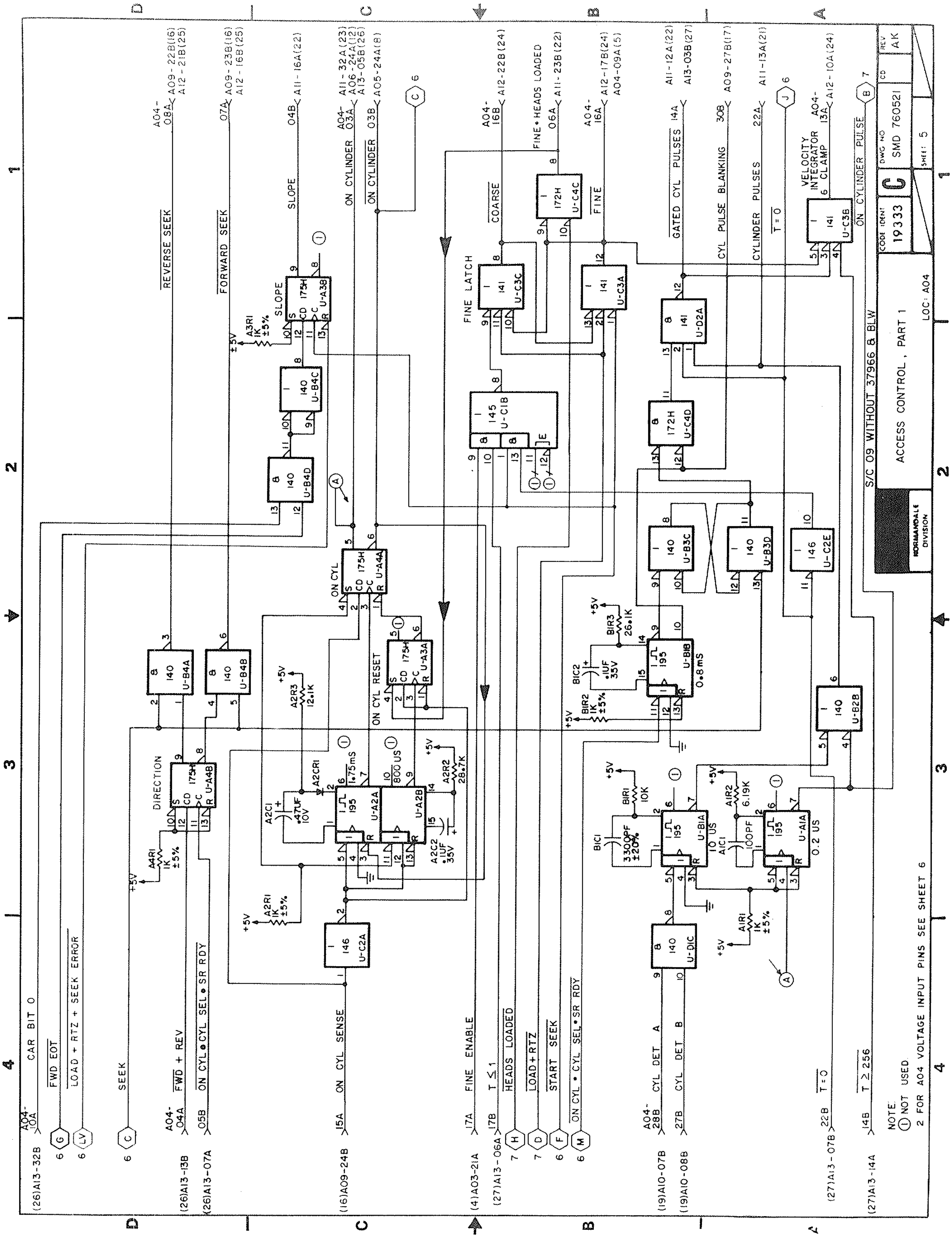
CONTROL DATA
NORMANDALE DIVISION

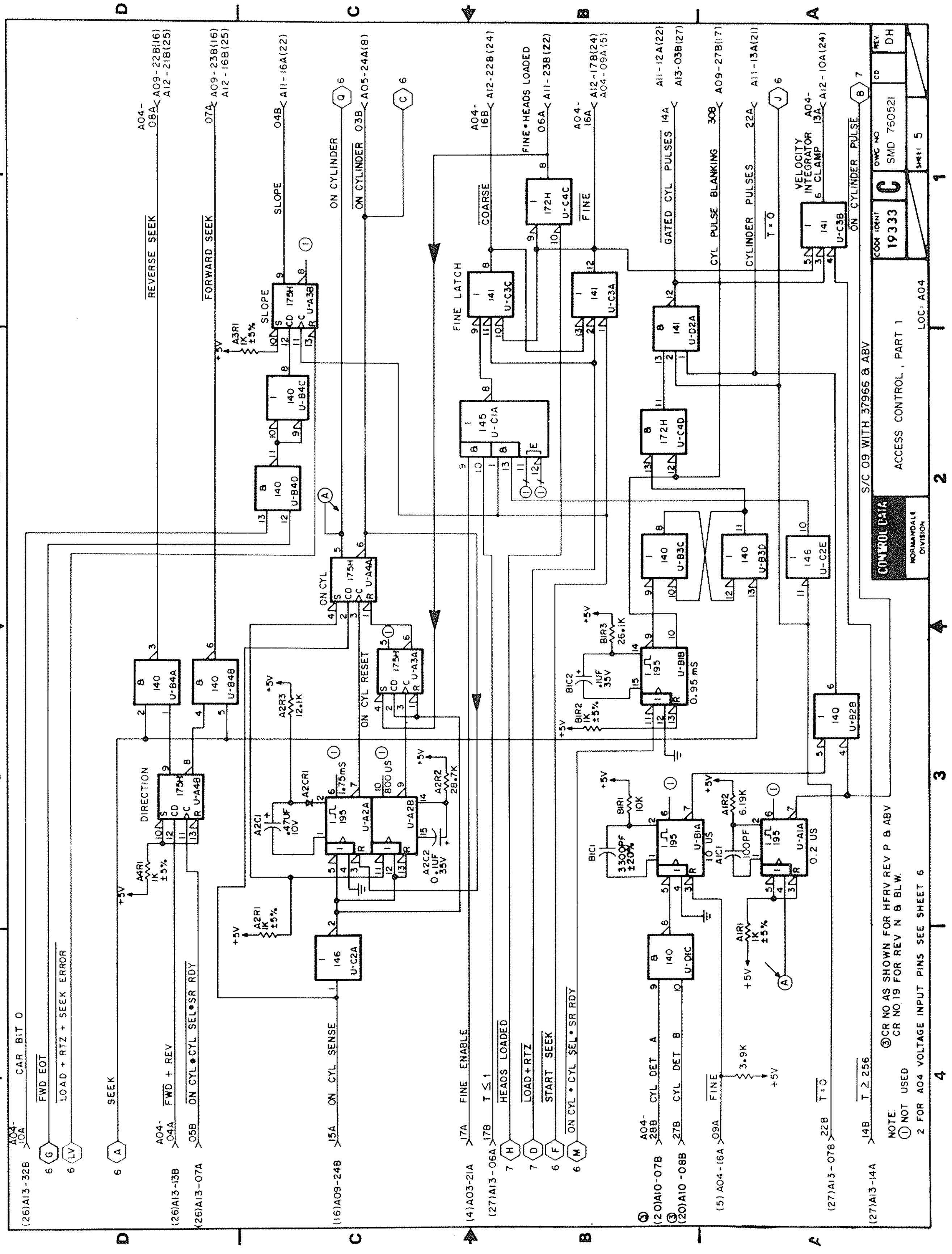
REVERSE EOT PULSE AND MAX ADDRESS FAULT

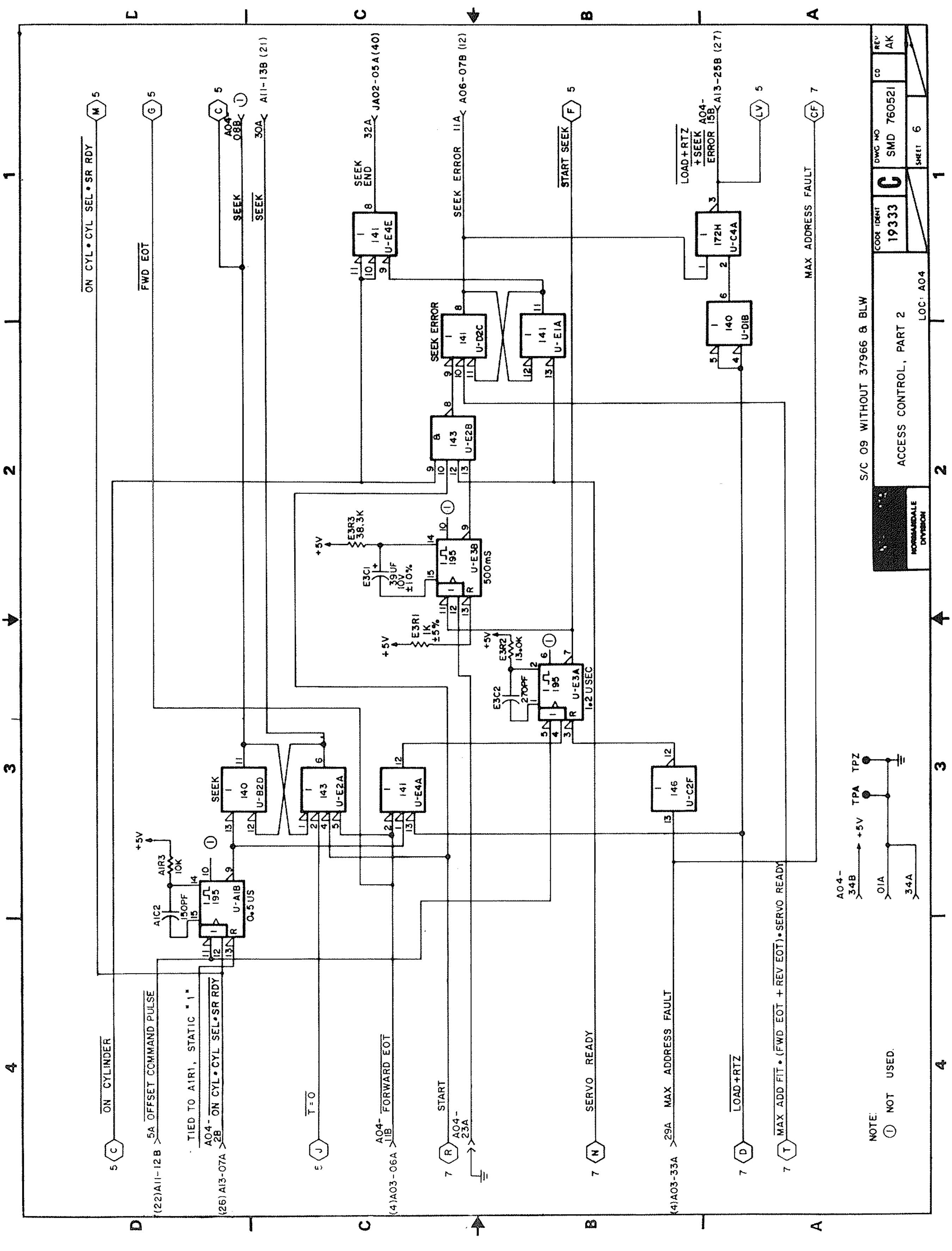
LOC: A03

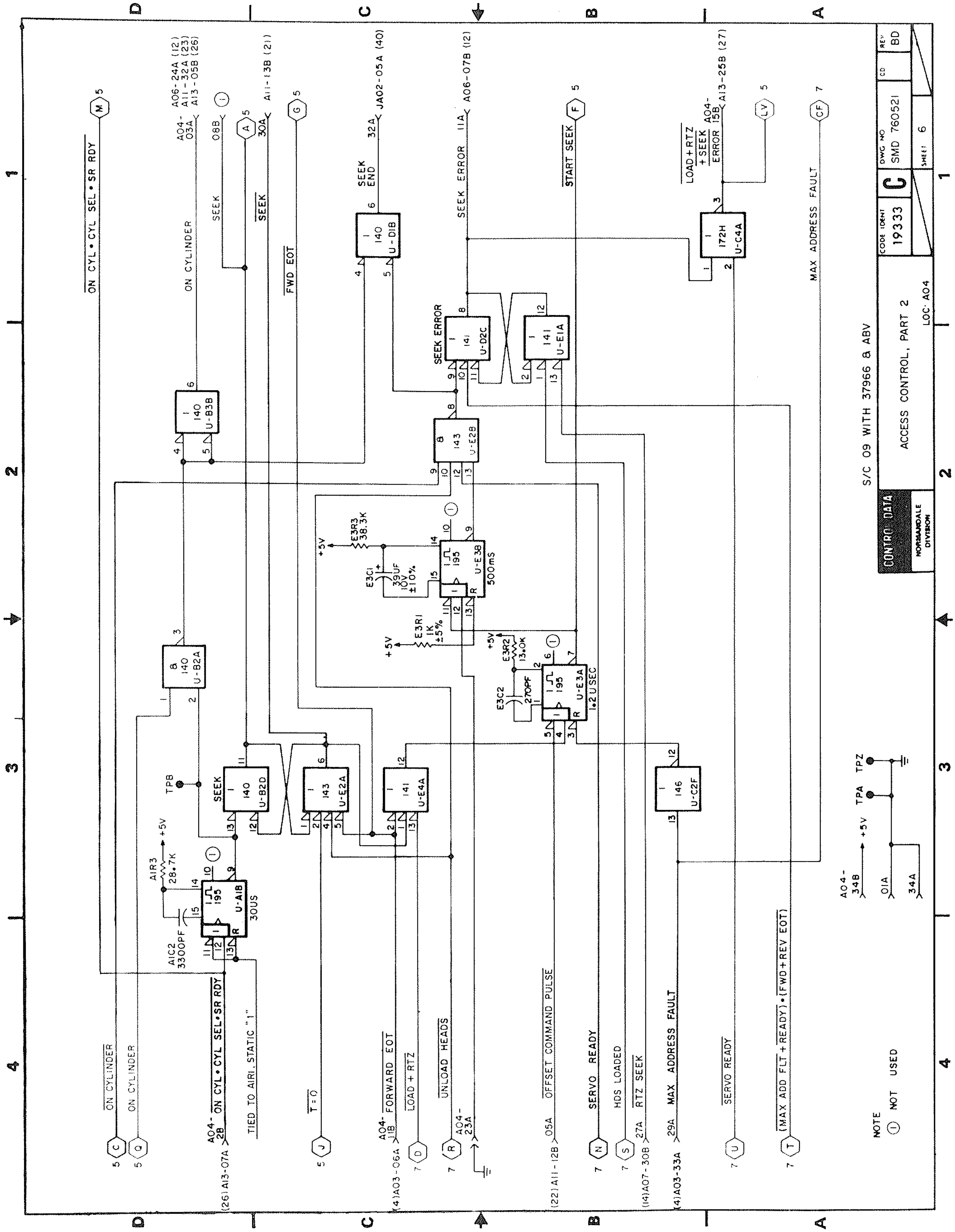
CODE IDENT 19333 | C | DWG NO SMD 760521 | CD | REV DH

SHEET 4

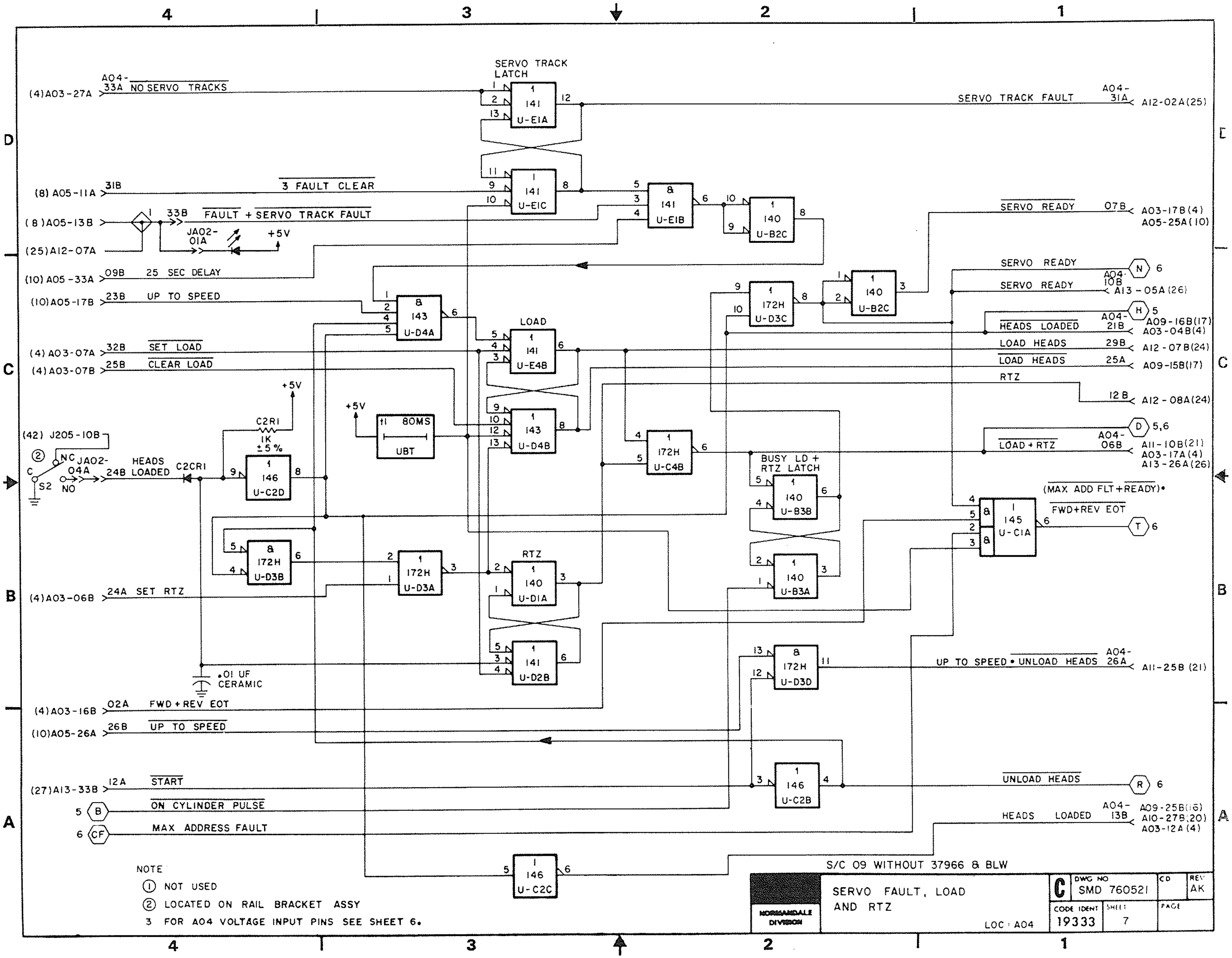

ACCESS CONTROL, PART 1
S/C 09 WITHOUT 37966 & BLW
LOC: A04
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 5
REV AK
NORMANDALE DIVISION
NOTE:
① NOT USED.
2 FOR A04 VOLTAGE INPUT PINS SEE SHEET 6
CAR BIT 0
FWD EOT
LOAD + RTZ + SEEK ERROR
SEEK
FWD + REV
ON CYL • CYL SEL • SR RDY
ON CYL SENSE
FINE ENABLE
T ≤ 1
HEADS LOADED
LOAD + RTZ
START SEEK
ON CYL • CYL SEL • SR RDY
CYL DET A
CYL DET B
T = 0
T ≥ 256
REVERSE SEEK
FORWARD SEEK
SLOPE
ON CYLINDER
ON CYLINDER
FINE LATCH
COARSE
FINE • HEADS LOADED
FINE
GATED CYL PULSES
CYL PULSE BLANKING
CYLINDER PULSES
T = 0
VELOCITY INTEGRATOR CLAMP
ON CYLINDER PULSE
DIRECTION
ON CYL
ON CYL RESET
U-A4B
U-A3B
U-A4A
U-A3A
U-B4A
U-B4B
U-B4C
U-B4D
U-A2A
U-A2B
U-C2A
U-C1B
U-C3C
U-C4C
U-C3A
U-D2A
U-C4D
U-B3C
U-B3D
U-C2E
U-B1B
U-B2B
U-B1A
U-A1A
U-D1C
U-C3B
1.75mS
800 US
0.8mS
10 US
0.2 US
A2C1 .47UF 10V
A2C2 .1UF 35V
B1C2 .1UF 35V
B1C1 3300PF ±20%
A1C1 100PF
A2R1 1K ±5%
A2R2 28.7K
A2R3 12.1K
A3R1 1K ±5%
A4R1 1K ±5%
B1R1 10K
B1R2 1K ±5%
B1R3 26.1K
A1R1 1K ±5%
A1R2 6.19K
+5V
(26)A13-32B
(26)A13-13B
(26)A13-07A
(16)A09-24B
(4)A03-21A
(27)A13-06A
(19)A10-07B
(19)A10-08B
(27)A13-07B
(27)A13-14A
A09-22B(16)
A12-21B(25)
A09-23B(16)
A12-16B(25)
A11-16A(22)
A11-32A(23)
A06-24A(12)
A13-05B(25)
A05-24A(8)
A12-22B(24)
A11-23B(22)
A12-17B(24)
A04-09A(5)
A11-12A(22)
A13-03B(27)
A09-27B(17)
A11-13A(21)
A12-10A(24)
A04-10A
A04-04A
05B
15A
17A
17B
A04-28B
27B
22B
14B
A04-08A
07A
04B
A04-03A
03B
A04-16B
06A
A04-16A
14A
30B
22A
A04-13A
G
LV
C
H
D
F
M
J
B
A
1
2
3
4
D
C
B
A


CONTROL DATA
NORMANDALE DIVISION
S/C 09 WITH 37966 & ABV
ACCESS CONTROL, PART 1
LOC: A04
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 5
REV DH
REVERSE SEEK
FORWARD SEEK
SLOPE
ON CYLINDER
ON CYLINDER
COARSE
FINE • HEADS LOADED
FINE
FINE LATCH
GATED CYL PULSES
CYL PULSE BLANKING
CYLINDER PULSES
T = 0
VELOCITY INTEGRATOR CLAMP
ON CYLINDER PULSE
DIRECTION
ON CYL
ON CYL RESET
CAR BIT 0
FWD EOT
LOAD + RTZ + SEEK ERROR
SEEK
FWD + REV
ON CYL • CYL SEL • SR RDY
ON CYL SENSE
FINE ENABLE
T ≤ 1
HEADS LOADED
LOAD + RTZ
START SEEK
ON CYL • CYL SEL • SR RDY
CYL DET A
CYL DET B
FINE
T = 0
T ≥ 256
U-A3B
U-B4C
U-B4D
U-A4A
U-A3A
U-B4A
U-B4B
U-A4B
U-A2A
U-A2B
U-C2A
U-C1A
U-C3C
U-C4C
U-C3A
U-D2A
U-C4D
U-B3C
U-B3D
U-C2E
U-C3B
U-B1B
U-B2B
U-B1A
U-A1A
U-D1C
1.75mS
800 US
0.95 mS
10 US
0.2 US
A2C1 .47UF 10V
A2CR1
A2R2 28.7K
A2C2 0.1UF 35V
A2R3 12.1K
A2R1 1K ±5%
A3R1 1K ±5%
A4R1 1K ±5%
B1R3 26.1K
B1C2 .1UF 35V
B1R2 1K ±5%
B1R1 10K
B1C1 3300PF ±20%
A1R2 6.19K
A1C1 100PF
A1R1 1K ±5%
3.9K
+5V
(26)A13-32B
(26)A13-13B
(26)A13-07A
(16)A09-24B
(4)A03-21A
(27)A13-06A
③(20)A10-07B
③(20)A10-08B
(5)A04-16A
(27)A13-07B
(27)A13-14A
A09-22B(16)
A12-21B(25)
A09-23B(16)
A12-16B(25)
A11-16A(22)
A05-24A(8)
A12-22B(24)
A11-23B(22)
A12-17B(24)
A04-09A(5)
A11-12A(22)
A13-03B(27)
A09-27B(17)
A11-13A(21)
A12-10A(24)
③ CR NO AS SHOWN FOR HFRV REV P & ABV
CR NO.19 FOR REV N & BLW.
NOTE:
① NOT USED
2 FOR A04 VOLTAGE INPUT PINS SEE SHEET 6


ON CYL • CYL SEL • SR RDY
M 5
FWD EOT
G 5
C 5
A04-08B
SEEK
SEEK
30A
A11-13B (21)
SEEK END
32A
JA02-05A (40)
SEEK ERROR
11A
A06-07B (12)
START SEEK
F 5
LOAD + RTZ + SEEK ERROR
A04-15B
A13-25B (27)
LV 5
MAX ADDRESS FAULT
CF 7
141 U-E4E
SEEK ERROR
141 U-D2C
141 U-E1A
172H U-C4A
140 U-D1B
143 U-E2B
E3R3 38.3K
+5V
E3C1 39UF 10V ±10%
195 U-E3B 500mS
E3R1 1K ±5%
+5V
E3R2 13.0K
E3C2 270PF
195 U-E3A 1.2 USEC
SEEK
140 U-B2D
143 U-E2A
141 U-E4A
146 U-C2F
A1R3 10K
+5V
A1C2 150PF
195 U-A1B 0.5 US
TPA TPZ
A04-34B
+5V
01A
34A
ON CYLINDER
C 5
5A OFFSET COMMAND PULSE
(22)A11-12B
TIED TO A1R1, STATIC "1"
A04-2B ON CYL • CYL SEL • SR RDY
(26)A13-07A
T = 0
J 5
A04-11B FORWARD EOT
(4)A03-06A
START
A04-23A
R 7
SERVO READY
N 7
29A MAX ADDRESS FAULT
(4)A03-33A
LOAD + RTZ
D 7
MAX ADD FLT • (FWD EOT + REV EOT) • SERVO READY
T 7
NOTE:
① NOT USED.
S/C 09 WITHOUT 37966 & BLW
ACCESS CONTROL, PART 2
LOC: A04
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 6
CD
REV AK
NORMANDALE DIVISION
1 2 3 4
A B C D



CONTROL DATA
NORMANDALE DIVISION
S/C 09 WITH 37966 & ABV
ACCESS CONTROL, PART 2
LOC A04
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 6
REV BD
ON CYL • CYL SEL • SR RDY
ON CYLINDER
SEEK
SEEK
FWD EOT
SEEK END
SEEK ERROR
START SEEK
LOAD + RTZ + SEEK ERROR
MAX ADDRESS FAULT
A04-03A
A06-24A (12)
A11-32A (23)
A13-05B (26)
08B
30A
A11-13B (21)
32A
JA02-05A (40)
11A
A06-07B (12)
A04-15B
A13-25B (27)
U-D1B
U-B3B
U-D2C
U-E1A
U-E2B
U-C4A
172H
U-E3B
500mS
E3R3 38.3K
E3C1 39UF 10V ±10%
E3R1 1K ±5%
E3R2 13.0K
E3C2 270PF
U-E3A
1.2USEC
U-B2A
U-B2D
U-E2A
U-E4A
U-C2F
146
U-A1B
30US
A1R3 28.7K
A1C2 3300PF
TPB
TPA
TPZ
+5V
A04-34B
01A
34A
ON CYLINDER
ON CYLINDER
A04-2B
ON CYL • CYL SEL • SR RDY
TIED TO A1R1, STATIC "1"
(26) A13-07A
T = 0
A04-11B
FORWARD EOT
LOAD + RTZ
(4) A03-06A
UNLOAD HEADS
A04-23A
05A
OFFSET COMMAND PULSE
(22) A11-12B
SERVO READY
HDS LOADED
27A
RTZ SEEK
(14) A07-30B
29A
MAX ADDRESS FAULT
(4) A03-33A
SERVO READY
(MAX ADD FLT + READY) • (FWD + REV EOT)
NOTE
① NOT USED



NOTE

① NOT USED

② LOCATED ON RAIL BRACKET ASSY

3 FOR A04 VOLTAGE INPUT PINS SEE SHEET 6.

SERVO FAULT, LOAD AND RTZ

LOC: A04

C DWG NO SMD 760521

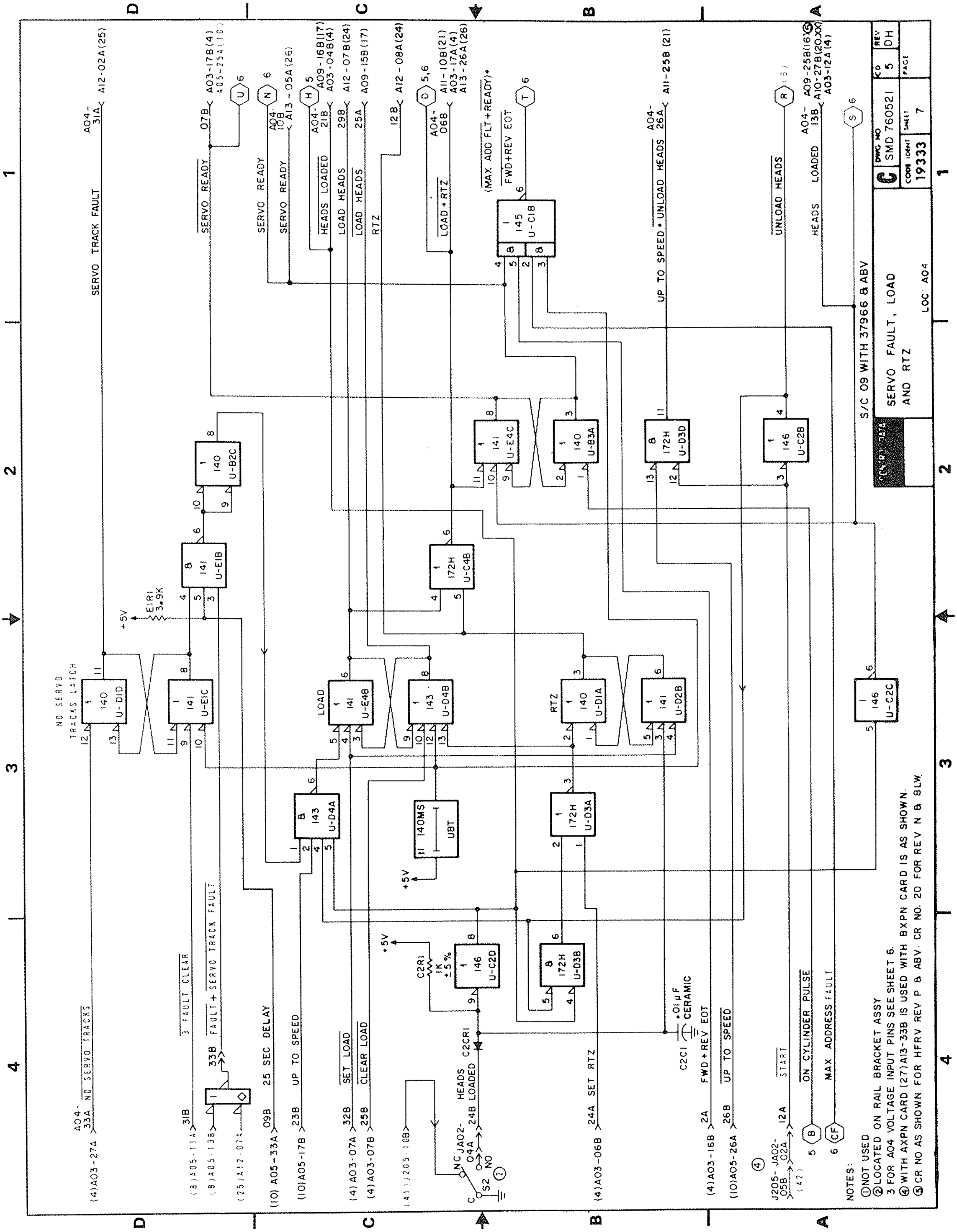
CD

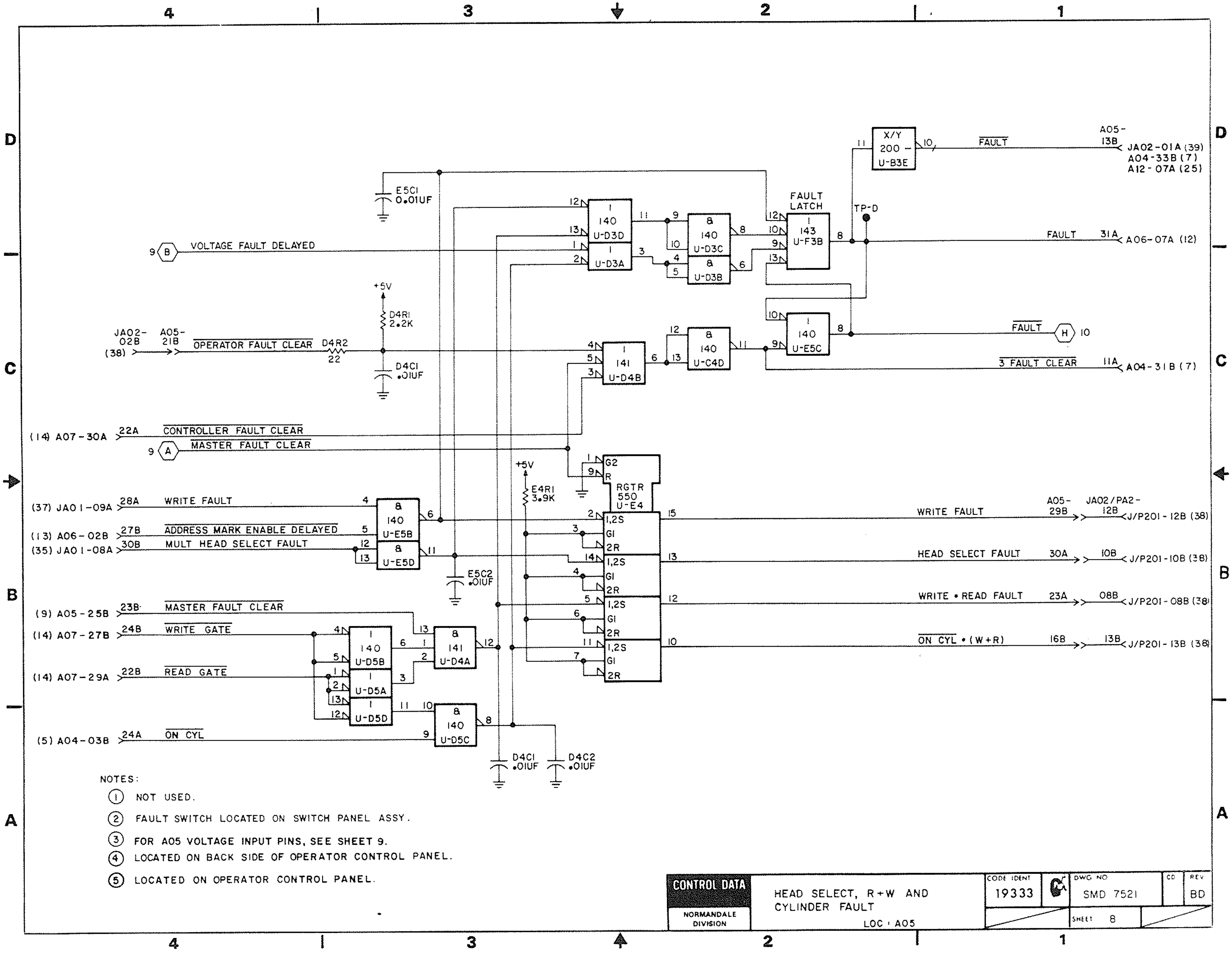
REV AK

CODE IDENT 19333

SHEET 7

PAGE


SERVO FAULT, LOAD AND RTZ
LOC: A04
S/C 09 WITH 37966 & ABV
DWG NO SMD 760521
CD 5
REV DH
CODE IDENT 19333
SHEET 7
PAGE
SERVO TRACK FAULT
SERVO READY
SERVO READY
SERVO READY
HEADS LOADED
LOAD HEADS
LOAD HEADS
RTZ
LOAD + RTZ
(MAX ADD FLT + READY) •
FWD + REV EOT
UP TO SPEED • UNLOAD HEADS
UNLOAD HEADS
HEADS LOADED
NO SERVO TRACKS LATCH
LOAD
RTZ
140MS
UBT
+5V
E1R1 3.9K
C2R1 1K ±5%
C2C1 .01µF CERAMIC
S2
NO SERVO TRACKS
3 FAULT CLEAR
FAULT + SERVO TRACK FAULT
25 SEC DELAY
UP TO SPEED
SET LOAD
CLEAR LOAD
HEADS LOADED C2CR1
SET RTZ
FWD + REV EOT
UP TO SPEED
START
ON CYLINDER PULSE
MAX ADDRESS FAULT
A12-02A(25)
A03-17B(4)
A05-23A(10)
A13-05A(26)
A09-16B(17)
A03-04B(4)
A12-07B(24)
A09-15B(17)
A12-08A(24)
A11-10B(21)
A03-17A(4)
A13-26A(26)
A11-25B(21)
A09-25B(16)
A10-27B(20,XX)
A03-12A(4)
(4)A03-27A
(8)A05-11A
(8)A05-13B
(25)A12-07A
(10)A05-33A
(10)A05-17B
(4)A03-07A
(4)A03-07B
(41)J205-10B
(4)A03-06B
(4)A03-16B
(10)A05-26A
J205-05B
JA02-02A
JA02-04A
U-D1D
U-E1C
U-E1B
U-B2C
U-D4A
U-E4B
U-D4B
U-C2D
U-D3B
U-C4B
U-E4C
U-B3A
U-D1A
U-D2B
U-D3A
U-C1B
U-D3D
U-C2B
U-C2C
NOTES:
① NOT USED
② LOCATED ON RAIL BRACKET ASSY
3 FOR A04 VOLTAGE INPUT PINS SEE SHEET 6.
④ WITH AXPN CARD (27)A13-33B IS USED WITH BXPN CARD IS AS SHOWN.
⑤ CR NO AS SHOWN FOR HFRV REV P & ABV. CR NO. 20 FOR REV N & BLW.

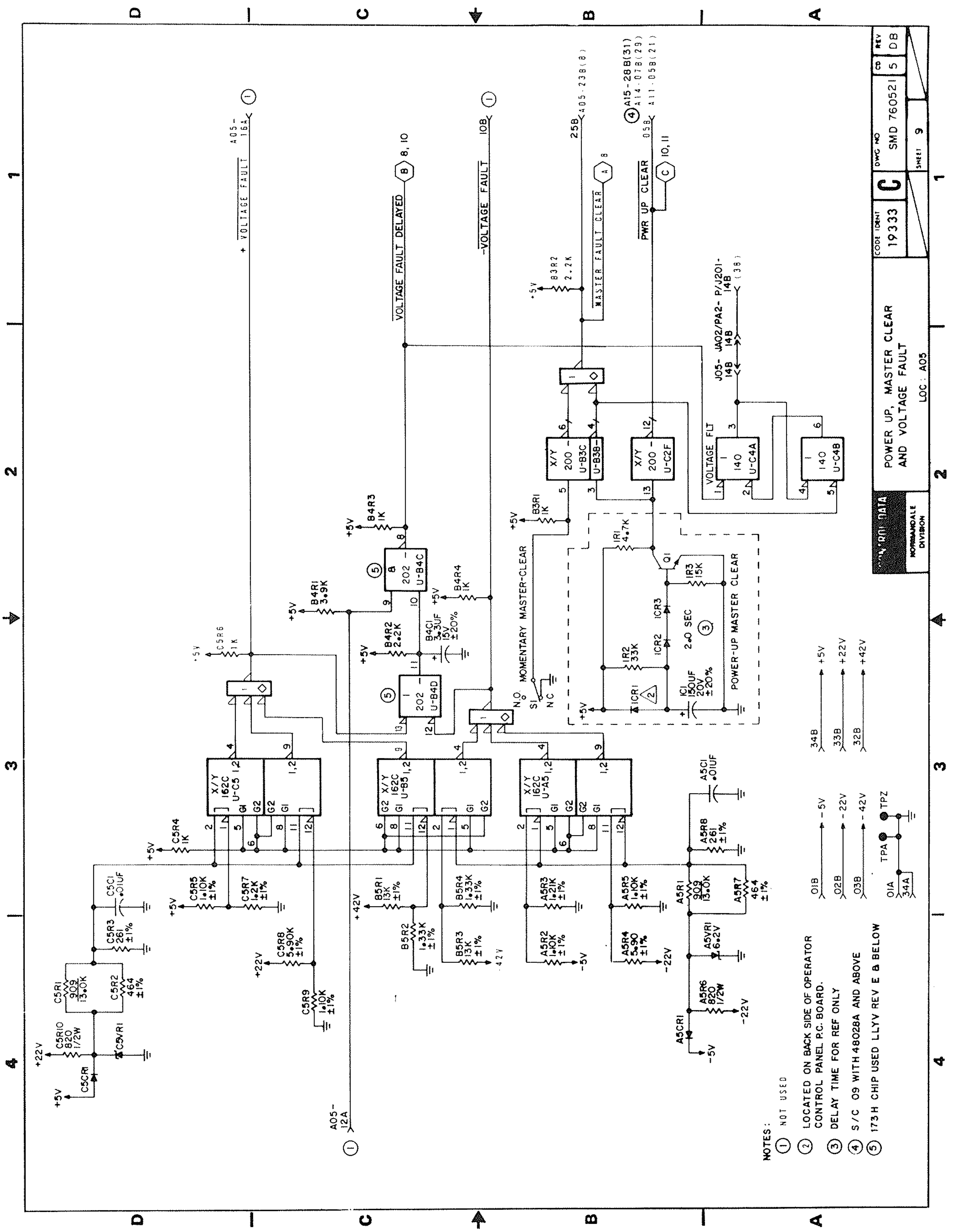


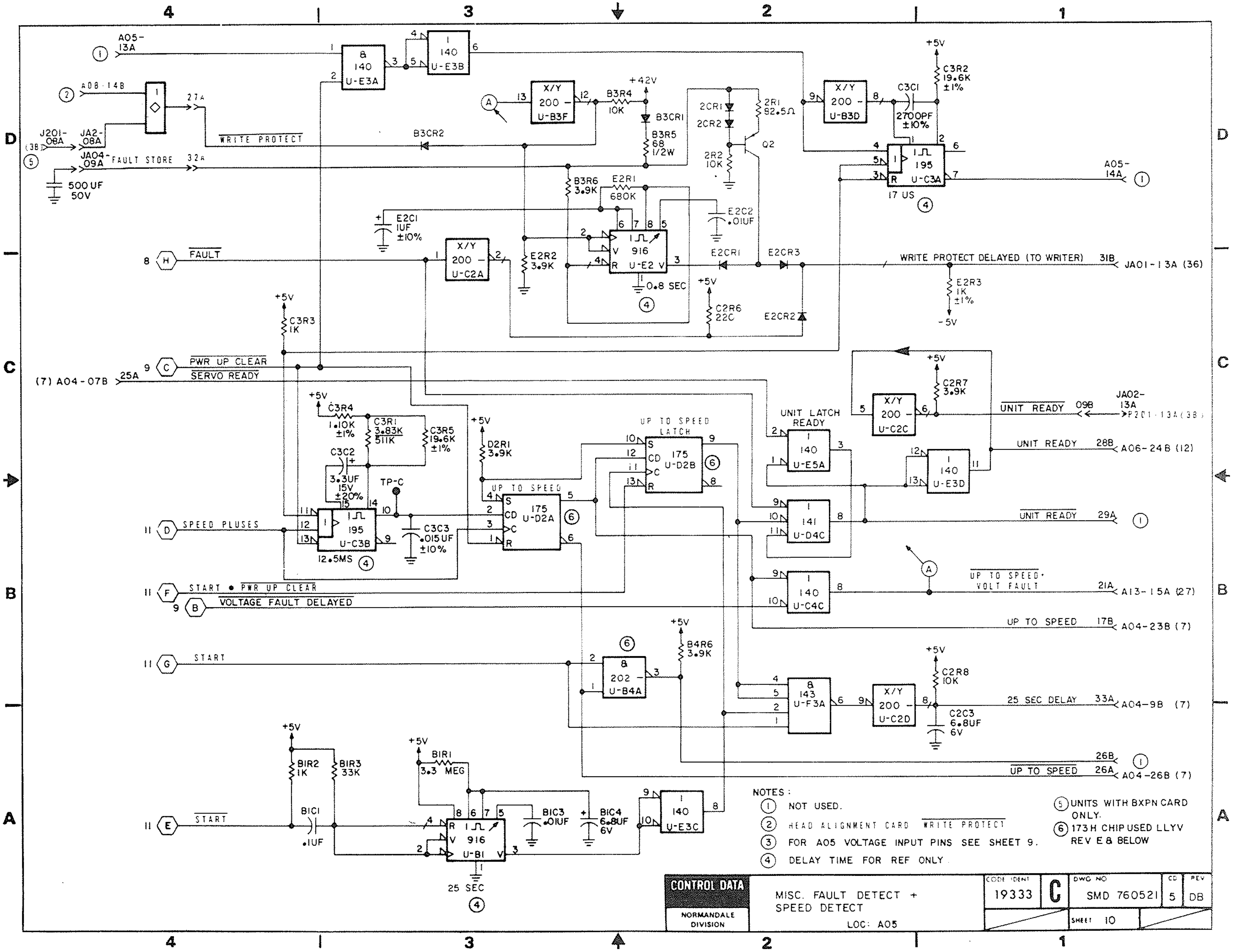
NOTES:
① NOT USED.
② FAULT SWITCH LOCATED ON SWITCH PANEL ASSY.
③ FOR A05 VOLTAGE INPUT PINS, SEE SHEET 9.
④ LOCATED ON BACK SIDE OF OPERATOR CONTROL PANEL.
⑤ LOCATED ON OPERATOR CONTROL PANEL.

CONTROL DATA
NORMANDALE DIVISION

HEAD SELECT, R+W AND
CYLINDER FAULT
LOC : A05

CODE IDENT	DWG NO	CD	REV
19333	SMD 7521		BD
	SHEET 8		


POWER UP, MASTER CLEAR AND VOLTAGE FAULT
LOC: A05
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
C
DWG NO SMD 760521
CD 5
REV DB
SHEET 9
+ VOLTAGE FAULT
VOLTAGE FAULT DELAYED
-VOLTAGE FAULT
MASTER FAULT CLEAR
PWR UP CLEAR
VOLTAGE FLT
MOMENTARY MASTER-CLEAR
POWER-UP MASTER CLEAR
2.0 SEC
A05-16A
A05-12A
10B
25B
A05-23B(8)
05B
A15-28B(31)
A14-07B(29)
A11-05B(21)
J05- JA02/PA2- P/J201-
14B 14B 14B (3B)
B 8, 10
A 8
C 10, 11
X/Y 162C U-C5
X/Y 162C U-B5
X/Y 162C U-A5
X/Y 200 U-B3C U-B3B
X/Y 200 U-C2F
I 140 U-C4A
I 140 U-C4B
8 202 U-B4C
I 202 U-B4D
B4R3 1K
B4R1 3.9K
B4R2 2.2K
B4R4 1K
B4C1 3.3UF 15V ±20%
B3R1 1K
B3R2 2.2K
C5R6 1K
C5R4 1K
C5R5 1.10K ±1%
C5R7 1.2K ±1%
C5C1 .01UF
C5R3 261 ±1%
C5R1 909 13.0K
C5R2 464 ±1%
C5R10 820 1/2W
C5VR1
C5CR1
C5R8 5.90K ±1%
C5R9 1.10K ±1%
B5R1 13K ±1%
B5R2 1.33K ±1%
B5R3 13K ±1%
B5R4 1.33K ±1%
A5R3 1.21K ±1%
A5R2 1.10K ±1%
A5R5 1.10K ±1%
A5R4 5.90 ±1%
A5R1 909 13.0K
A5R7 464 ±1%
A5R8 261 ±1%
A5C1 .01UF
A5VR1 6.2V
A5R6 820 1/2W
A5CR1
1R1 4.7K
1R2 33K
1R3 15K
1C1 150UF 20V ±20%
1CR1
1CR2
1CR3
Q1
S1 N.O. N.C.
+5V
+22V
+42V
-5V
-22V
-42V
01B 02B 03B
34B 33B 32B
01A 34A
TPA TPZ
NOTES:
① NOT USED
② LOCATED ON BACK SIDE OF OPERATOR CONTROL PANEL P.C. BOARD.
③ DELAY TIME FOR REF ONLY
④ S/C 09 WITH 48028A AND ABOVE
⑤ 173H CHIP USED LLYV REV E & BELOW
A B C D
1 2 3 4

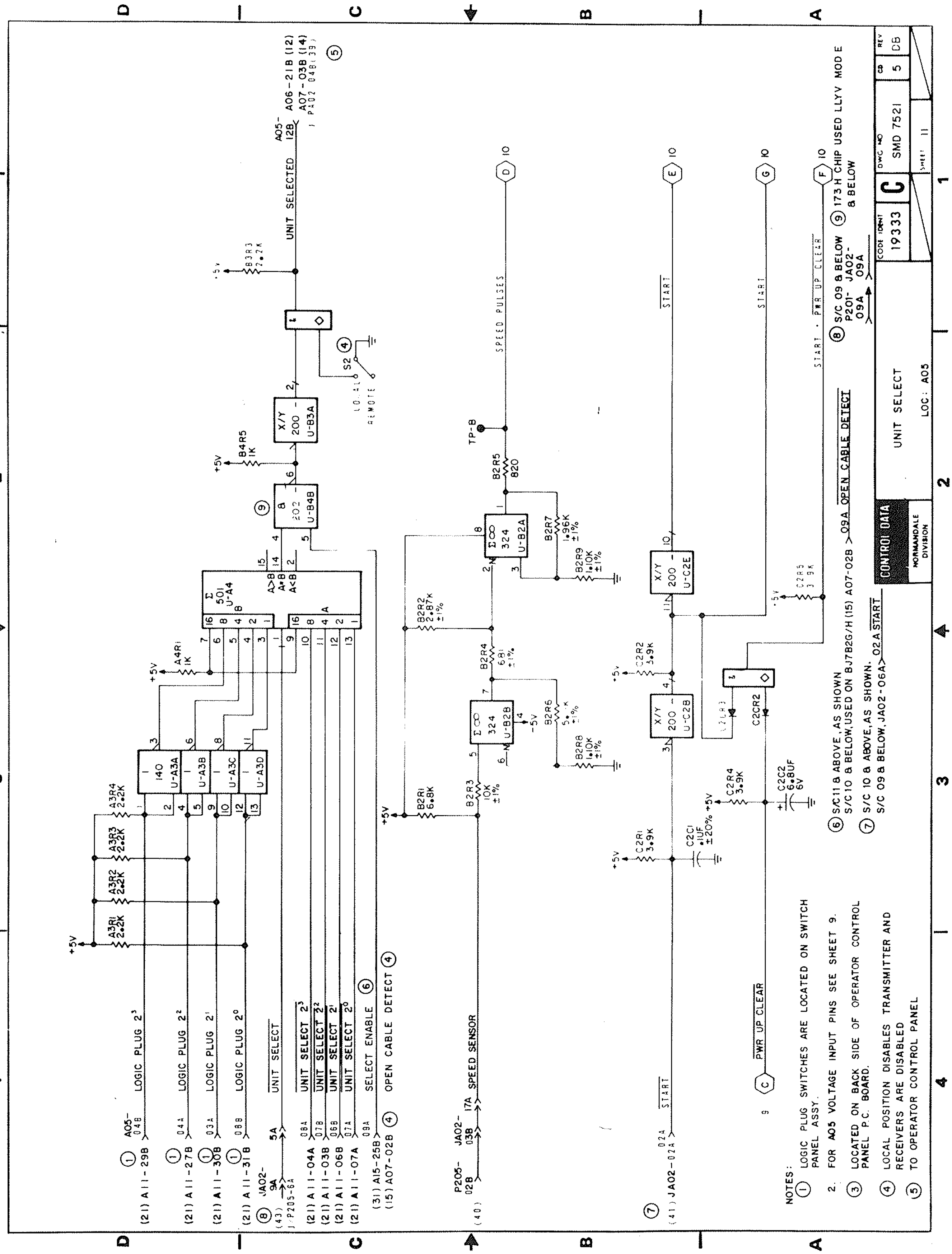


NOTES:
① NOT USED.
② HEAD ALIGNMENT CARD WRITE PROTECT
③ FOR A05 VOLTAGE INPUT PINS SEE SHEET 9.
④ DELAY TIME FOR REF ONLY
⑤ UNITS WITH BXPN CARD ONLY.
⑥ 173H CHIP USED LLYV REV E & BELOW

CONTROL DATA
NORMANDALE DIVISION

MISC. FAULT DETECT + SPEED DETECT
LOC: A05

CODE IDENT		DWG NO	CD	REV
19333	C	SMD 760521	5	DB
		SHEET 10		



NOTES:

① LOGIC PLUG SWITCHES ARE LOCATED ON SWITCH PANEL ASSY.

2. FOR A05 VOLTAGE INPUT PINS SEE SHEET 9.

③ LOCATED ON BACK SIDE OF OPERATOR CONTROL PANEL P.C. BOARD.

④ LOCAL POSITION DISABLES TRANSMITTER AND RECEIVERS ARE DISABLED

⑤ TO OPERATOR CONTROL PANEL

⑥ S/C 11 & ABOVE, AS SHOWN
S/C 10 & BELOW, USED ON BJ7B2G/H (15) A07-02B >— 09A OPEN CABLE DETECT

⑦ S/C 10 & ABOVE, AS SHOWN.
S/C 09 & BELOW, JA02-06A >— 02A START

⑧ S/C 09 & BELOW
P201- JA02-
09A → 09A

⑨ 173 H CHIP USED LLYV MODE
& BELOW

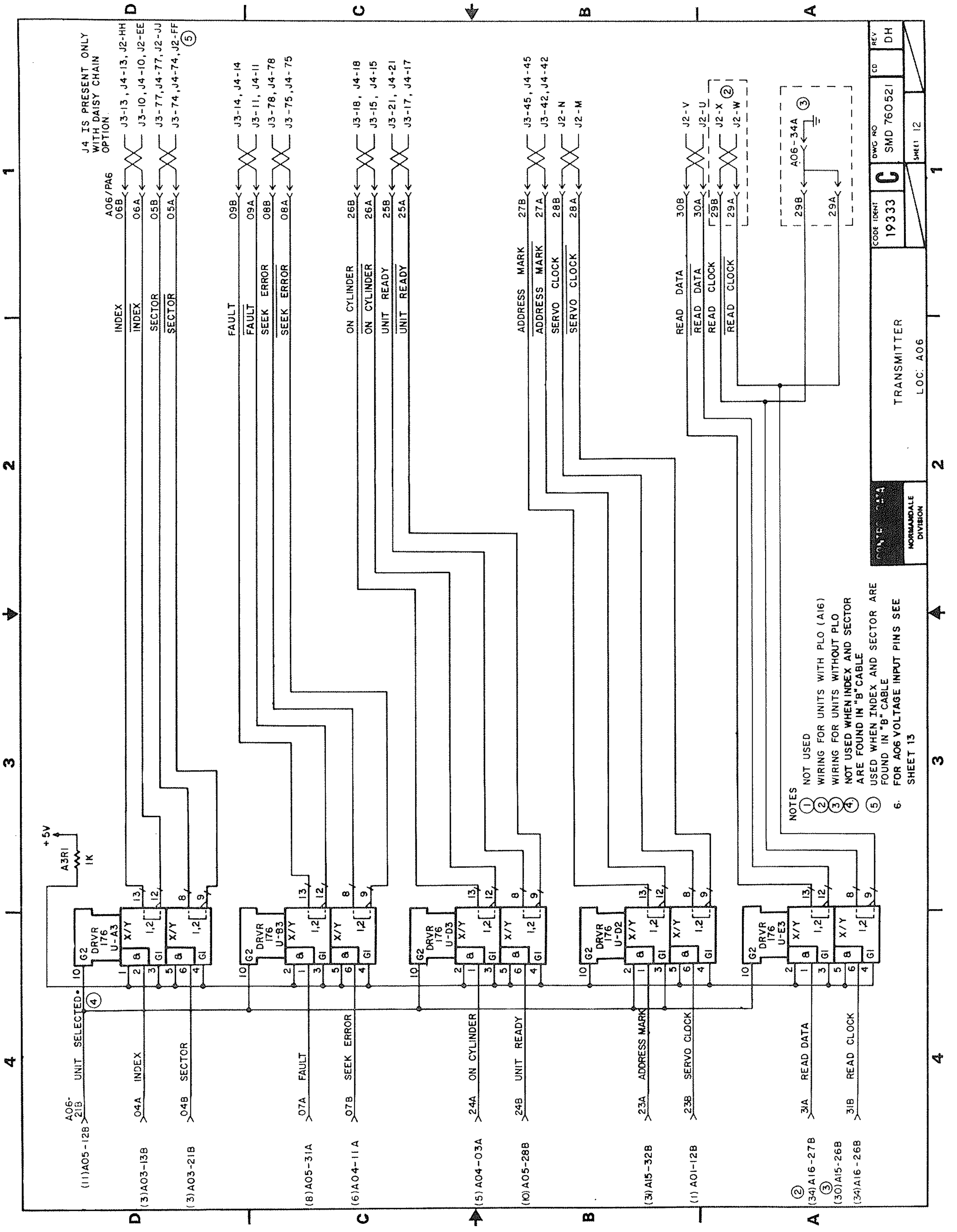
CONTROL DATA
NORMANDALE DIVISION

UNIT SELECT

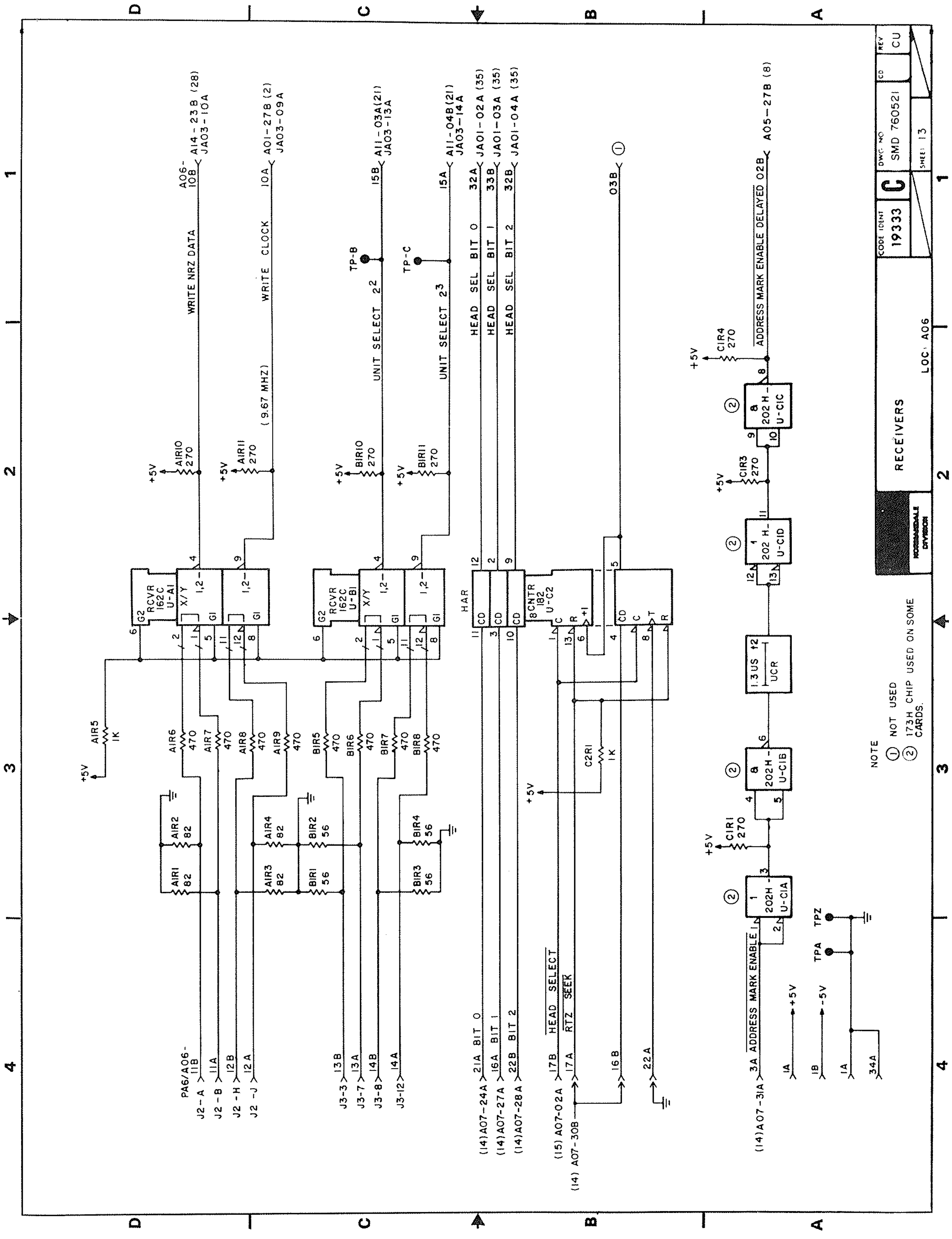
LOC: A05

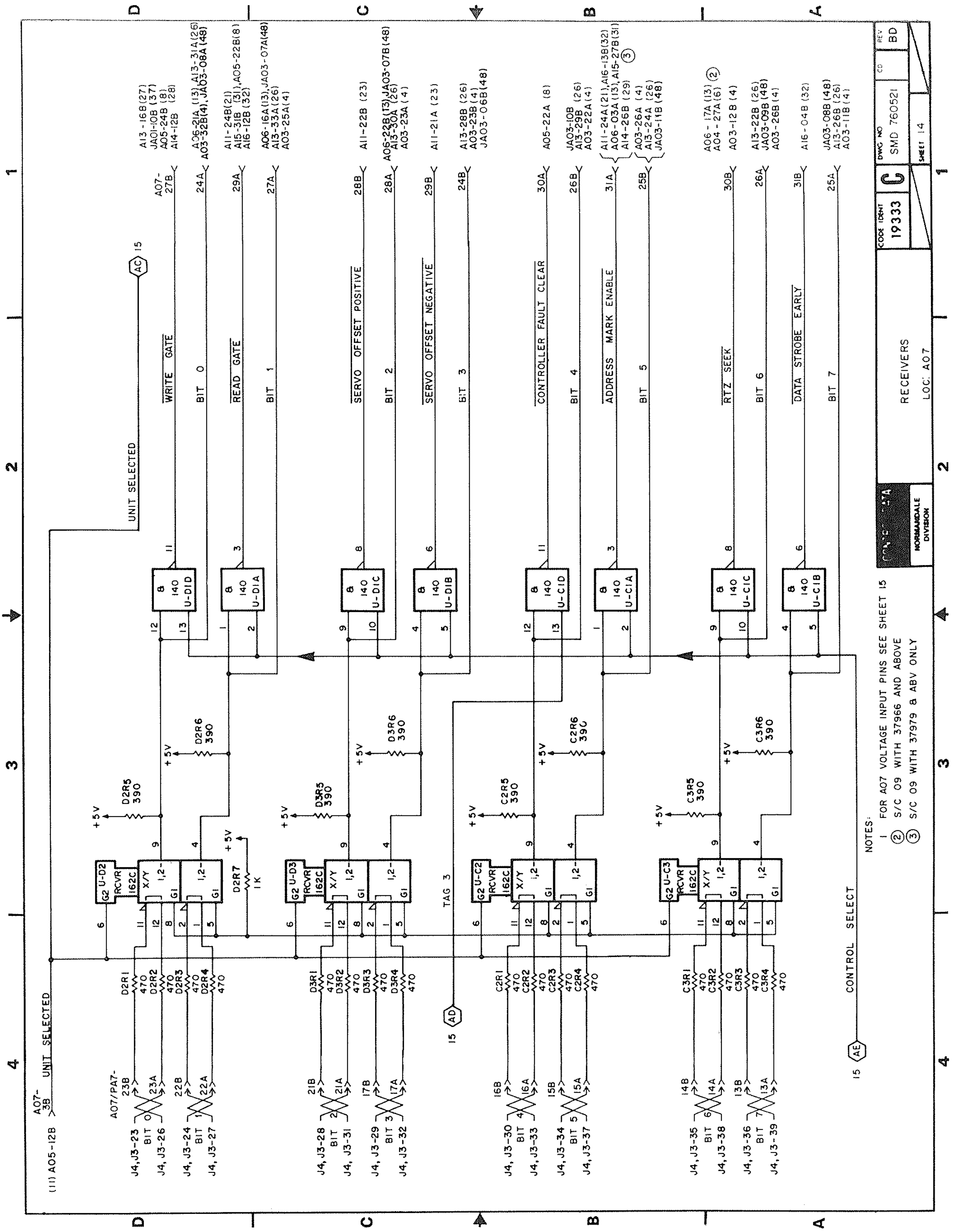
CODE IDENT		DWG NO	CB	REV
19333	C	SMD 7521	5	DB

SHEET 11



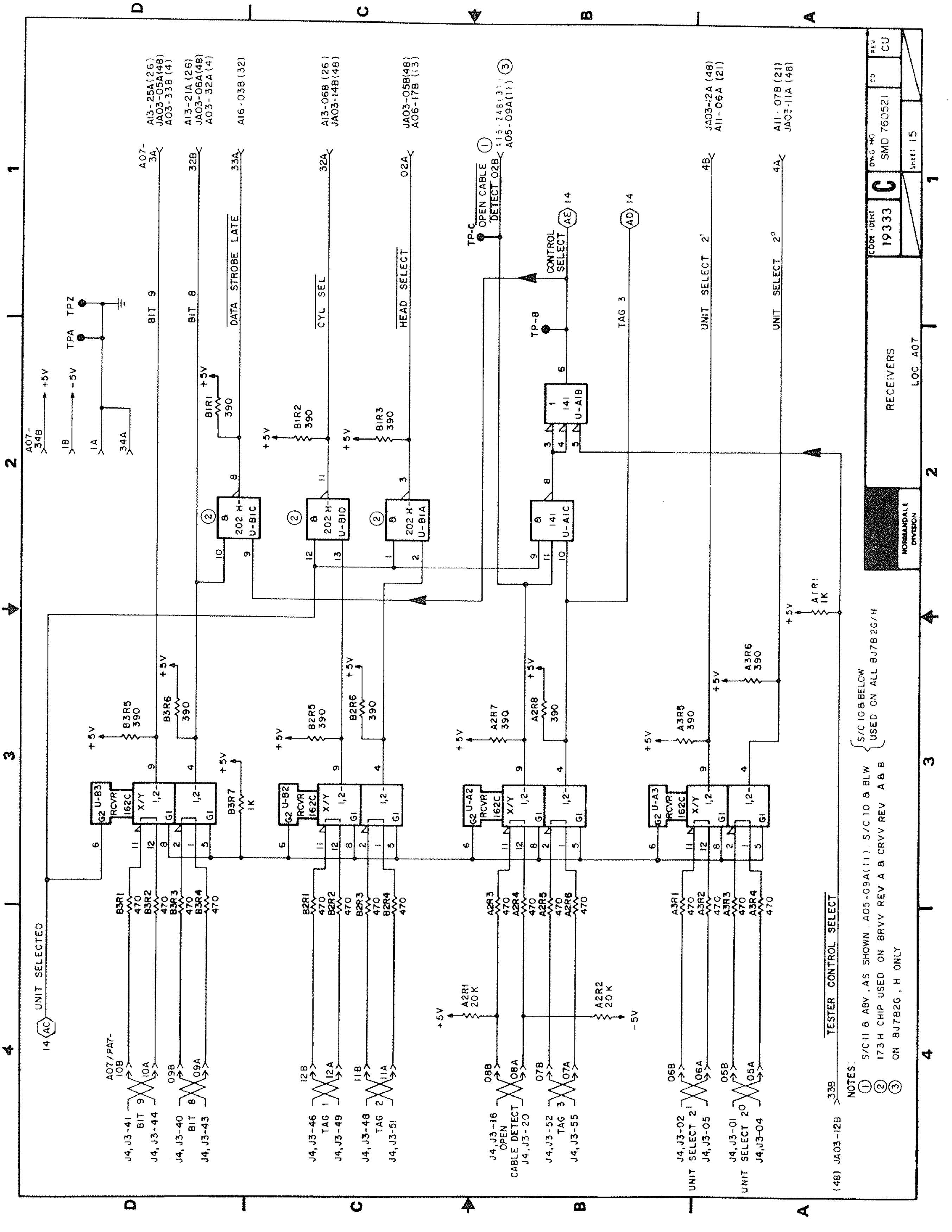
NOTES
① NOT USED
② WIRING FOR UNITS WITH PLO (A16)
③ WIRING FOR UNITS WITHOUT PLO
④ NOT USED WHEN INDEX AND SECTOR ARE FOUND IN "B" CABLE
⑤ USED WHEN INDEX AND SECTOR ARE FOUND IN "B" CABLE
6. FOR A06 VOLTAGE INPUT PINS SEE SHEET 13

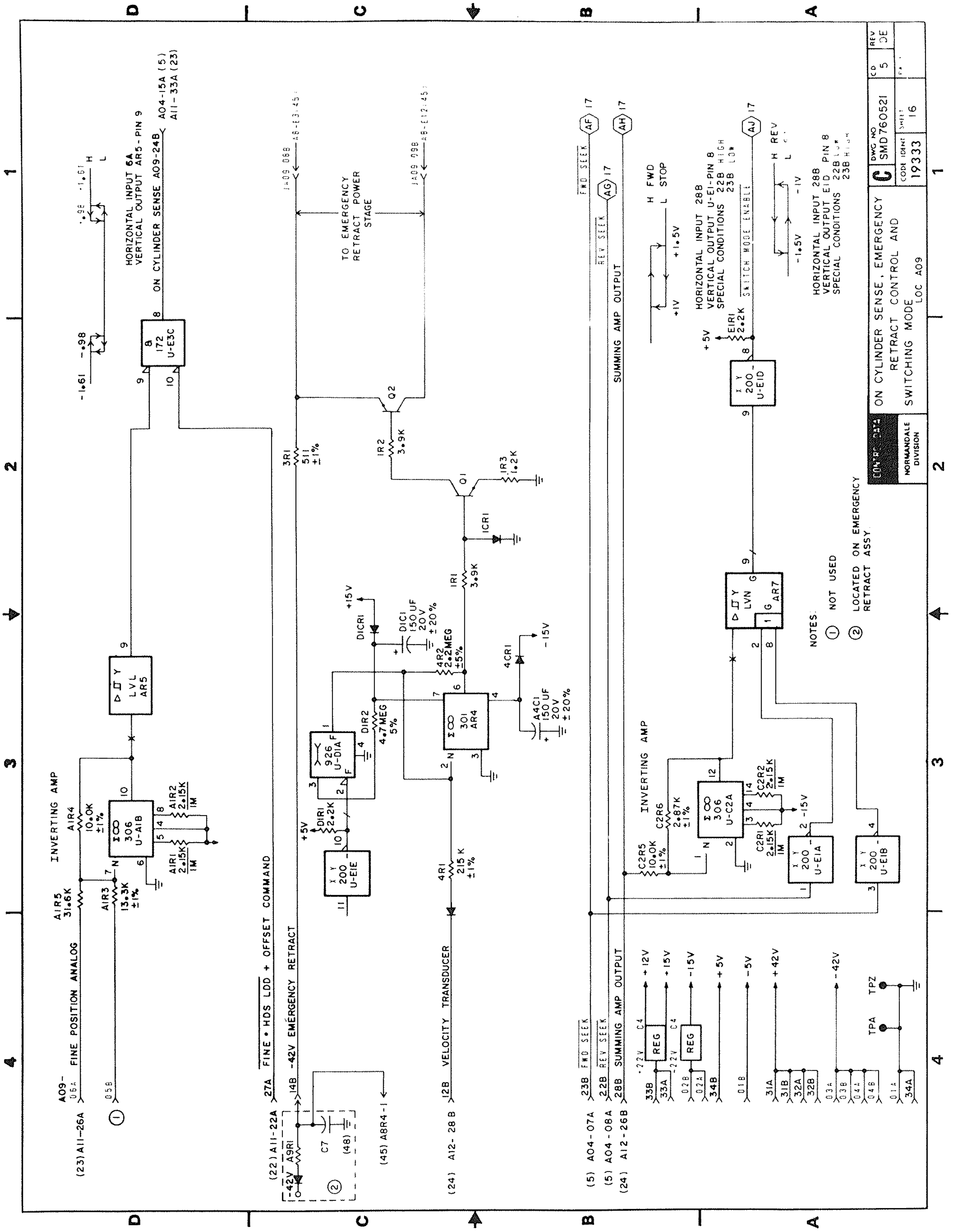

RECEIVERS
LOC: A06
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 13
REV CU
NOTE
① NOT USED
② 173H CHIP USED ON SOME CARDS.
WRITE NRZ DATA
A06-10B
A14-23B (28)
JA03-10A
WRITE CLOCK
(9.67 MHZ)
10A
A01-27B (2)
JA03-09A
UNIT SELECT 2²
15B
A11-03A(21)
JA03-13A
TP-B
UNIT SELECT 2³
15A
A11-04B(21)
JA03-14A
TP-C
HEAD SEL BIT 0
32A
JA01-02A (35)
HEAD SEL BIT 1
33B
JA01-03A (35)
HEAD SEL BIT 2
32B
JA01-04A (35)
03B ①
ADDRESS MARK ENABLE DELAYED 02B
A05-27B (8)
+5V
AIR10 270
AIR11 270
BIR10 270
BIR11 270
C1R4 270
C1R3 270
C1R1 270
RCVR 162C U-A1
RCVR 162C U-B1
G2
X/Y
1,2
G1
HAR
CD
CNTR 182 U-C2
C
R
T
+1
202 H U-C1C
202 H U-C1D
202 H U-C1B
202H U-C1A
1.3 US UCR
AIR5 1K
AIR6 470
AIR7 470
AIR8 470
AIR9 470
BIR5 470
BIR6 470
BIR7 470
BIR8 470
C2R1 1K
AIR1 82
AIR2 82
AIR3 82
AIR4 82
BIR1 56
BIR2 56
BIR3 56
BIR4 56
PA6/A06-11B
J2-A
J2-B
J2-H
J2-J
11A
12B
12A
J3-3
J3-7
J3-8
J3-12
13B
13A
14B
14A
21A BIT 0
16A BIT 1
22B BIT 2
HEAD SELECT
RTZ SEEK
17B
17A
16B
22A
(14) A07-24A
(14) A07-27A
(14) A07-28A
(15) A07-02A
(14) A07-30B
ADDRESS MARK ENABLE
3A
(14) A07-31A
1A
1B
34A
+5V
-5V
TPA
TPZ
D
C
B
A
1
2
3
4

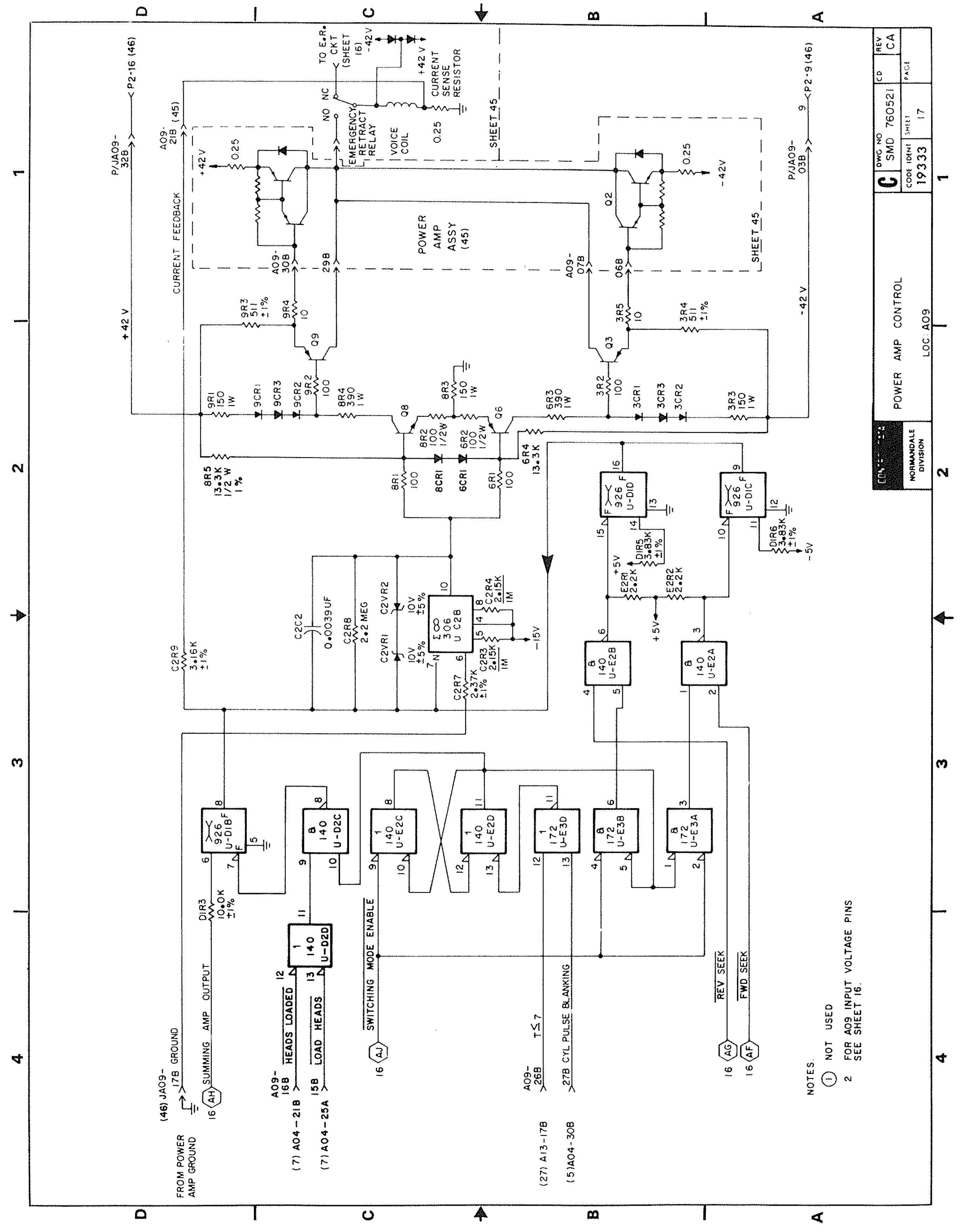


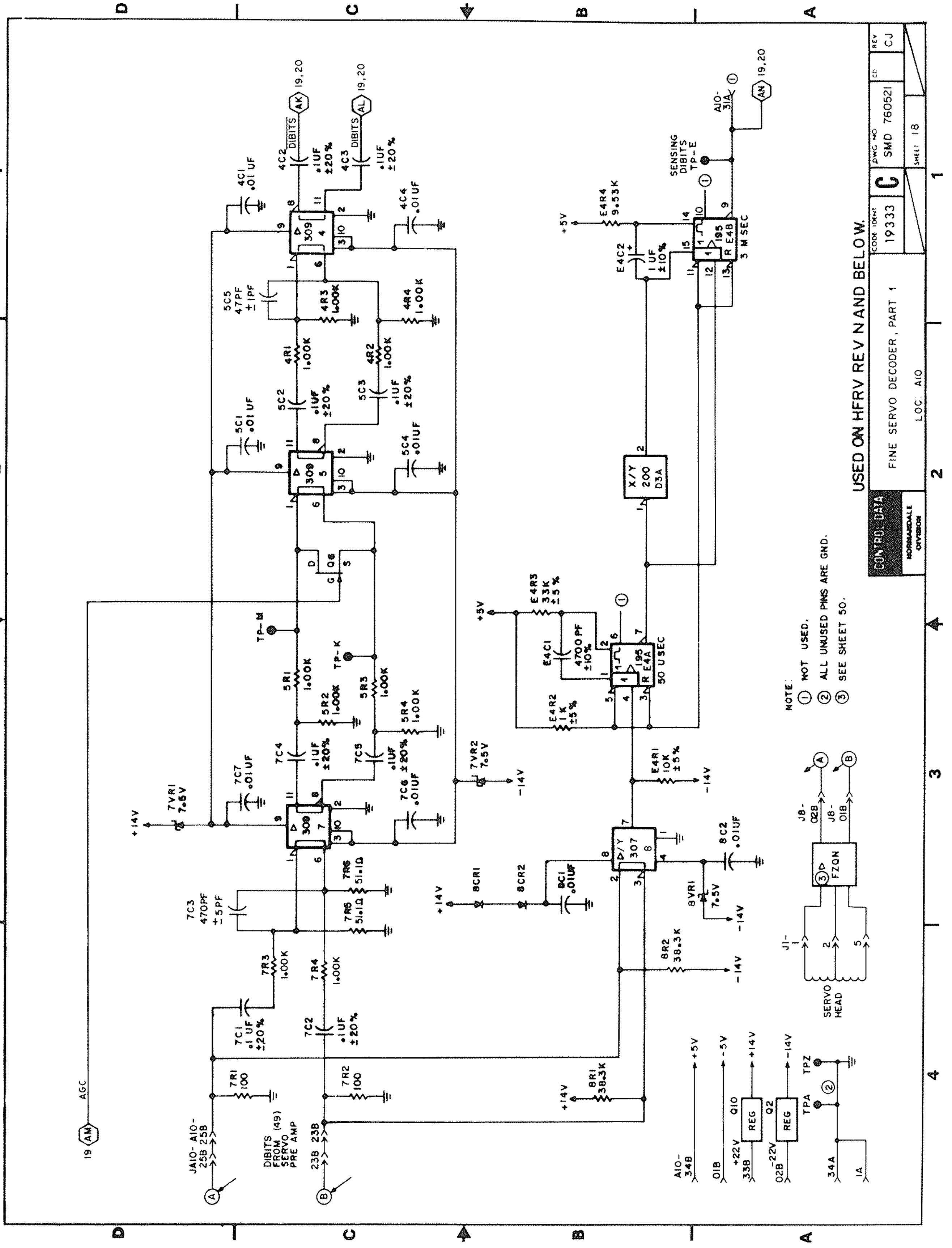
NOTES:
1 FOR A07 VOLTAGE INPUT PINS SEE SHEET 15
② S/C 09 WITH 37966 AND ABOVE
③ S/C 09 WITH 37979 & ABV ONLY

RECEIVERS
LOC: A07


RECEIVERS
LOC A07
NORMANDALE DIVISION
CODE IDENT 19333
C
DWG NO SMD 76052I
REV CU
SHEET 15
UNIT SELECTED
BIT 9
BIT 8
DATA STROBE LATE
CYL SEL
HEAD SELECT
OPEN CABLE DETECT 02B
CONTROL SELECT
TAG 3
UNIT SELECT 2¹
UNIT SELECT 2⁰
TP-C
TP-B
TPA
TPZ
+5V
-5V
U-B3 RCVR 162C
U-B2 RCVR 162C
U-A2 RCVR 162C
U-A3 RCVR 162C
202 H- U-B1C
202 H- U-B1D
202 H- U-B1A
141 U-A1C
141 U-A1B
B3R5 390
B3R6 390
B3R7 1K
B2R5 390
B2R6 390
A2R7 390
A2R8 390
A3R5 390
A3R6 390
A1R1 1K
B1R1 390
B1R2 390
B1R3 390
A2R1 20 K
A2R2 20 K
J4, J3-41 BIT 9 J4, J3-44
J4, J3-40 BIT 8 J4, J3-43
J4, J3-46 TAG 1 J4, J3-49
J4, J3-48 TAG 2 J4, J3-51
J4, J3-16 OPEN CABLE DETECT J4, J3-20
J4, J3-52 TAG 3 J4, J3-55
J4, J3-02 UNIT SELECT 2¹ J4, J3-05
J4, J3-01 UNIT SELECT 2⁰ J4, J3-04
(48) JA03-12B 33B
TESTER CONTROL SELECT
A13-25A(26) JA03-05A(48) A03-33B(4)
A13-21A(26) JA03-06A(48) A03-32A(4)
A16-03B(32)
A13-06B(26) JA03-14B(48)
JA03-05B(48) A06-17B(13)
A16-24B(31) A05-09A(11) ③
JA03-12A(48) A11-06A(21)
A11-07B(21) JA03-11A(48)
NOTES:
① S/C 11 & ABV, AS SHOWN. A05-09A(11), S/C 10 & BLW
② 173H CHIP USED ON BRVV REV A & CRVV REV A & B
③ ON BJ7B2G, H ONLY
S/C 10 & BELOW USED ON ALL BJ7B2G/H


ON CYLINDER SENSE, EMERGENCY RETRACT CONTROL AND SWITCHING MODE
LOC A09
CONTROL DATA
NORMANDALE DIVISION
DWG NO SMD76052I
CODE IDENT 19333
SHEET 16
C
CD 5
REV DE
FINE POSITION ANALOG
VELOCITY TRANSDUCER
-42V EMERGENCY RETRACT
FINE • HDS LDD + OFFSET COMMAND
INVERTING AMP
306 U-A1B
LVL AR5
172 U-E3C
ON CYLINDER SENSE A09-24B
A04-15A (5)
A11-33A (23)
HORIZONTAL INPUT 6A
VERTICAL OUTPUT AR5-PIN 9
TO EMERGENCY RETRACT POWER STAGE
Q1
Q2
301 AR4
926 U-D1A
200 U-E1E
LVN AR7
306 U-C2A
200 U-E1A
200 U-E1B
200 U-E1D
FWD SEEK
REV SEEK
SUMMING AMP OUTPUT
SWITCH MODE ENABLE
H FWD
L STOP
H REV
L
HORIZONTAL INPUT 28B
VERTICAL OUTPUT U-E1-PIN 8
SPECIAL CONDITIONS 22B HIGH 23B LOW
HORIZONTAL INPUT 28B
VERTICAL OUTPUT E1D PIN 8
SPECIAL CONDITIONS 22B LOW 23B HIGH
NOTES:
① NOT USED
② LOCATED ON EMERGENCY RETRACT ASSY.
(23) A11-26A
(22) A11-22A
(45) A8R4-1
(24) A12-28B
(5) A04-07A
(5) A04-08A
(24) A12-26B
+12V
+15V
-15V
+5V
-5V
+42V
-42V
REG
TPA
TPZ


POWER AMP CONTROL
LOC: A09
CONTROL DATA
NORMANDALE DIVISION
C
CD
DWG NO SMD 760521
REV CA
CODE IDENT 19333
SHEET 17
PAGE
POWER AMP ASSY (45)
CURRENT FEEDBACK
SHEET 45
EMERGENCY RETRACT RELAY
NO NC
TO E.R. CKT (SHEET 16)
VOICE COIL
CURRENT SENSE RESISTOR
0.25
+42 V
-42 V
P/JA09-32B
A09-21B (45)
P2-16 (46)
P/JA09-03B
P2-9 (46)
A09-30B
29B
A09-07B
06B
Q2
Q3
Q6
Q8
Q9
9R1 150 1W
9R2 100
9R3 511 ±1%
9R4 10
9CR1
9CR2
9CR3
8R1 100
8R2 100 1/2W
8R3 150 1W
8R4 390 1W
8R5 13.3K 1/2 W 1%
8CR1
6CR1
6R1 100
6R2 100 1/2W
6R3 390 1W
6R4 13.3K
3R2 100
3R3 150 1W
3R4 511 ±1%
3R5 10
3CR1
3CR2
3CR3
C2C2 0.0039UF
C2R8 2.2 MEG
C2VR1 10V ±5%
C2VR2 10V ±5%
306 U C2B
C2R3 2.15K 1M
C2R4 2.15K 1M
C2R7 2.37K ±1%
C2R9 3.16K ±1%
-15V
+5V
-5V
926 U-D1D
926 U-D1C
926 U-D1BF
D1R3 10.0K ±1%
D1R5 3.83K ±1%
D1R6 3.83K ±1%
E2R1 2.2K
E2R2 2.2K
140 U-E2B
140 U-E2A
140 U-D2C
140 U-E2C
140 U-E2D
172 U-E3D
172 U-E3B
172 U-E3A
140 U-D2D
(46) JA09-17B GROUND
FROM POWER AMP GROUND
SUMMING AMP OUTPUT
AH
A09-16B HEADS LOADED
15B LOAD HEADS
(7) A04-21B
(7) A04-25A
SWITCHING MODE ENABLE
AJ
A09-26B T≤7
27B CYL PULSE BLANKING
(27) A13-17B
(5) A04-30B
REV SEEK
FWD SEEK
AG
AF
NOTES:
① NOT USED
2 FOR A09 INPUT VOLTAGE PINS SEE SHEET 16.



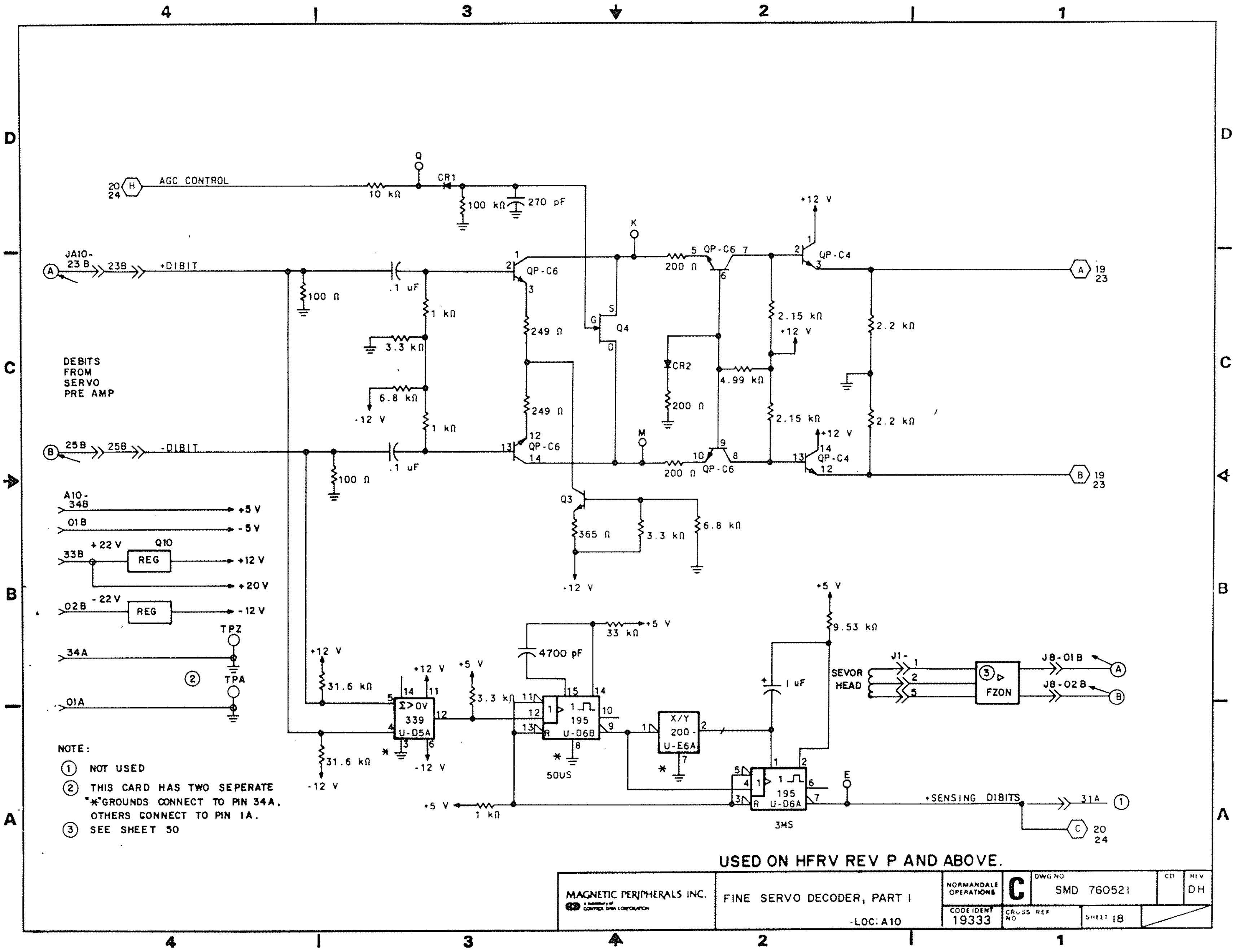
NOTE:
① NOT USED.
② ALL UNUSED PINS ARE GND.
③ SEE SHEET 50.

USED ON HFRV REV N AND BELOW.

CONTROL DATA
NORMANDALE DIVISION

FINE SERVO DECODER, PART 1
LOC. A10

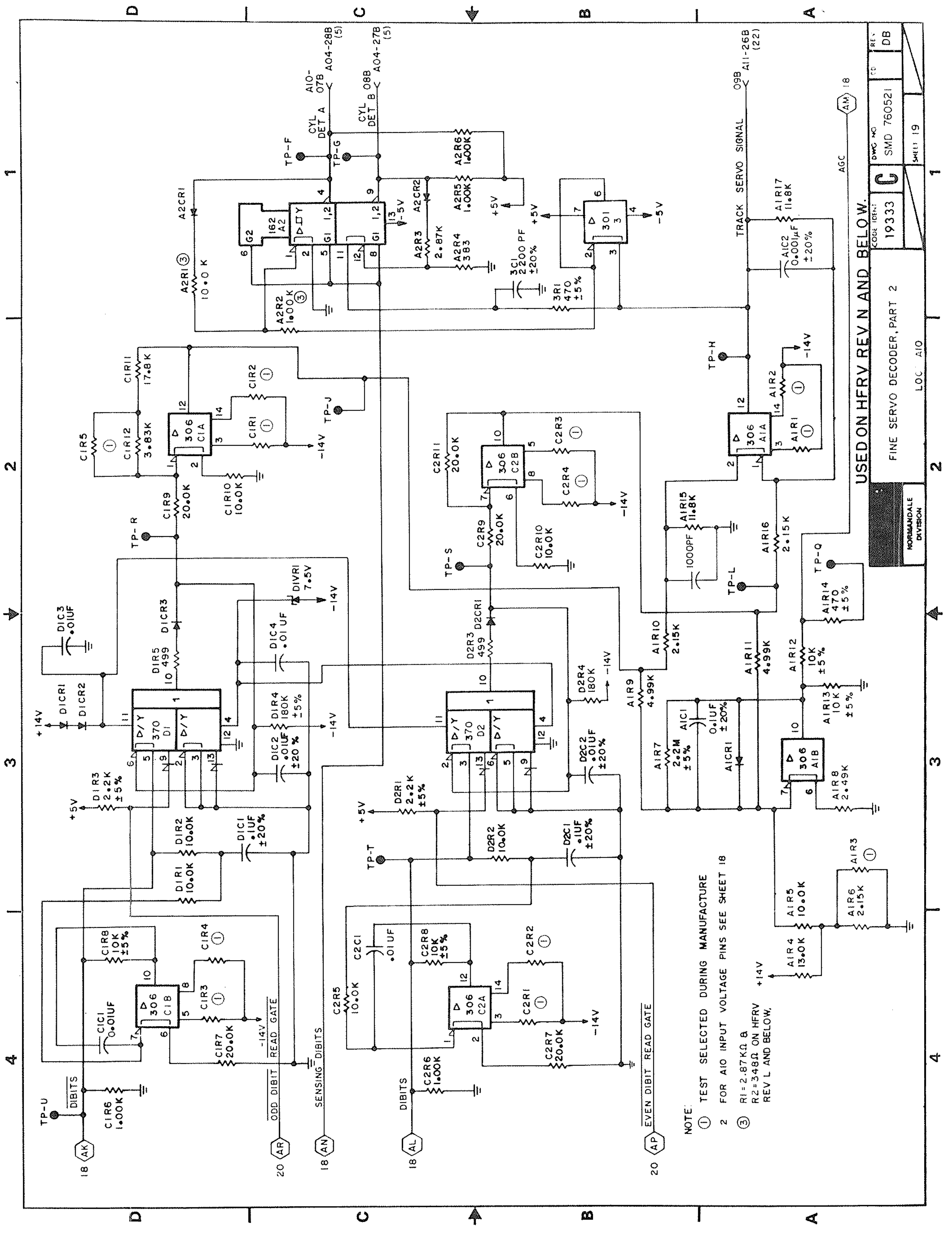
CODE IDENT 19333
C
DWG NO SMD 76052I
SHEET 18
REV CJ



NOTE:
① NOT USED
② THIS CARD HAS TWO SEPERATE "*"GROUNDS CONNECT TO PIN 34A, OTHERS CONNECT TO PIN 1A.
③ SEE SHEET 50

USED ON HFRV REV P AND ABOVE.

MAGNETIC PERIPHERALS INC.	FINE SERVO DECODER, PART I -LOC: A10	NORMANDALE OPERATIONS C	DWG NO SMD 760521	CD	REV DH
		CODE IDENT 19333	CROSS REF NO	SHEET 18	



NOTE:

① TEST SELECTED DURING MANUFACTURE

2 FOR A10 INPUT VOLTAGE PINS SEE SHEET 18

③ R1=2.87KΩ & R2=348Ω ON HFRV REV L AND BELOW.

USED ON HFRV REV N AND BELOW.

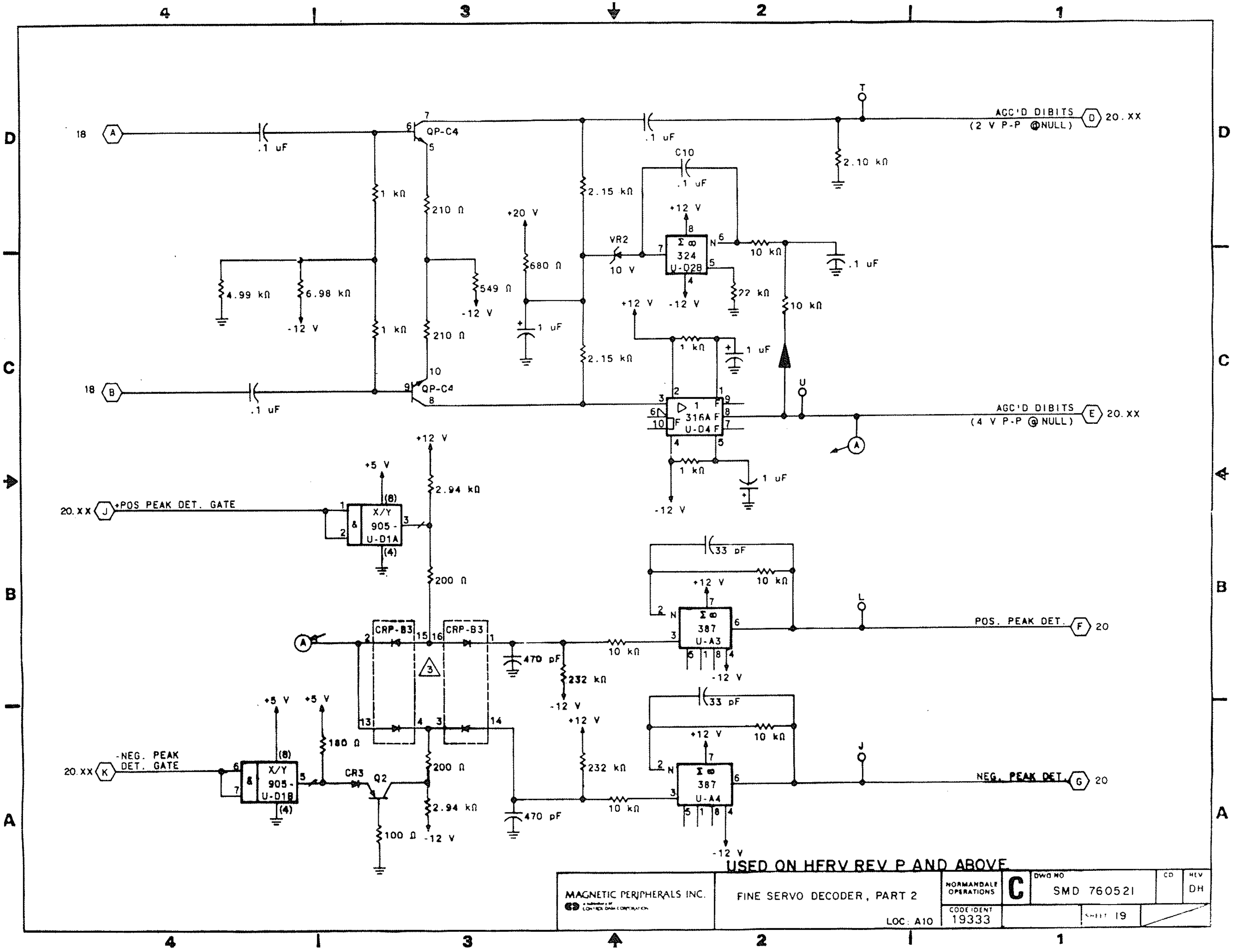
FINE SERVO DECODER, PART 2

LOC A10

NORMANDALE DIVISION

CODE IDENT	SIZE	DWG NO	REV
19333	C	SMD 76052I	DB

SHEET 19



USED ON HFRV REV P AND ABOVE

MAGNETIC PERIPHERALS INC.

FINE SERVO DECODER, PART 2

LOC: A10

NORMANDALE OPERATIONS

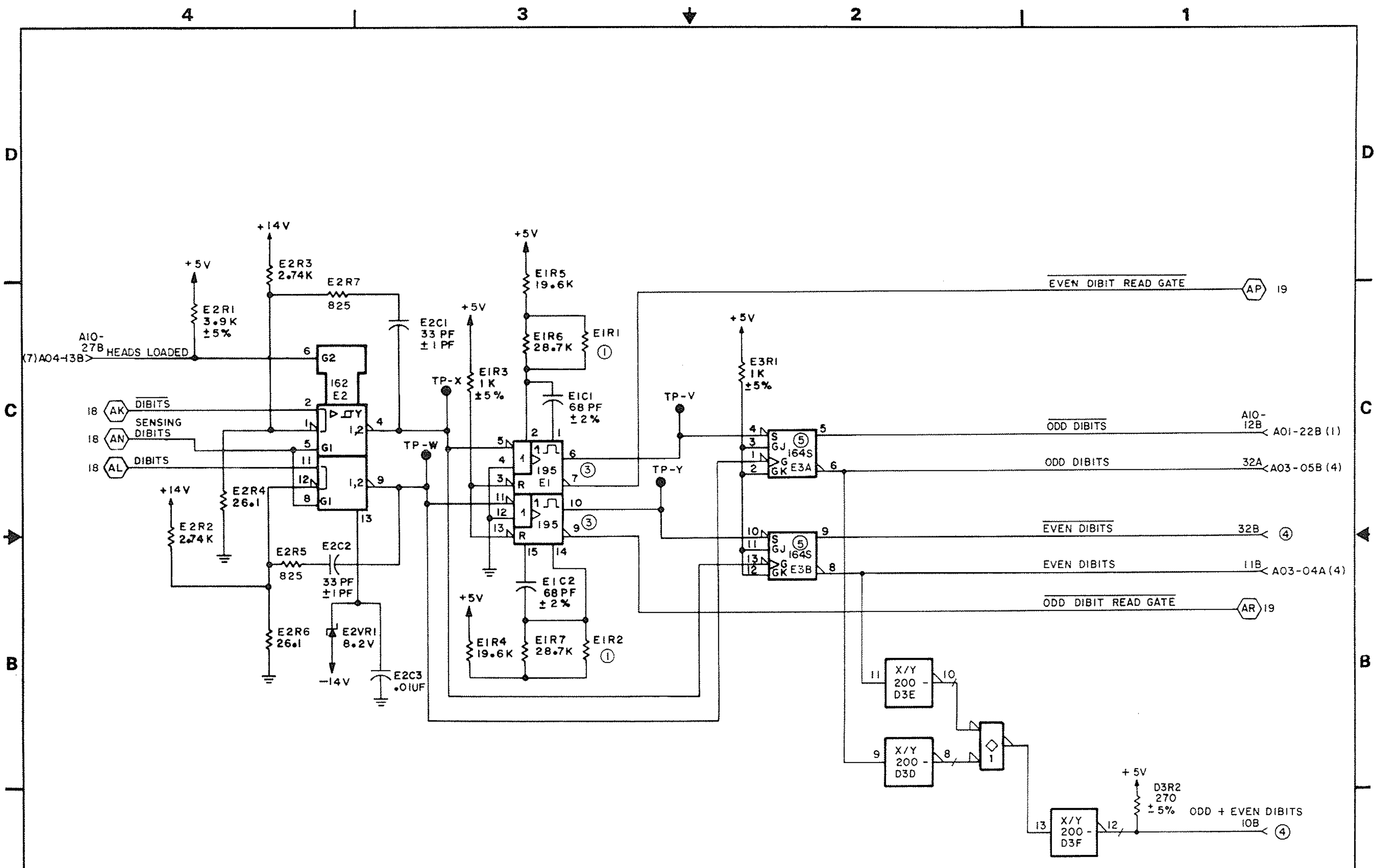
C

DWG NO SMD 760521

REV DH

CODE IDENT 19333

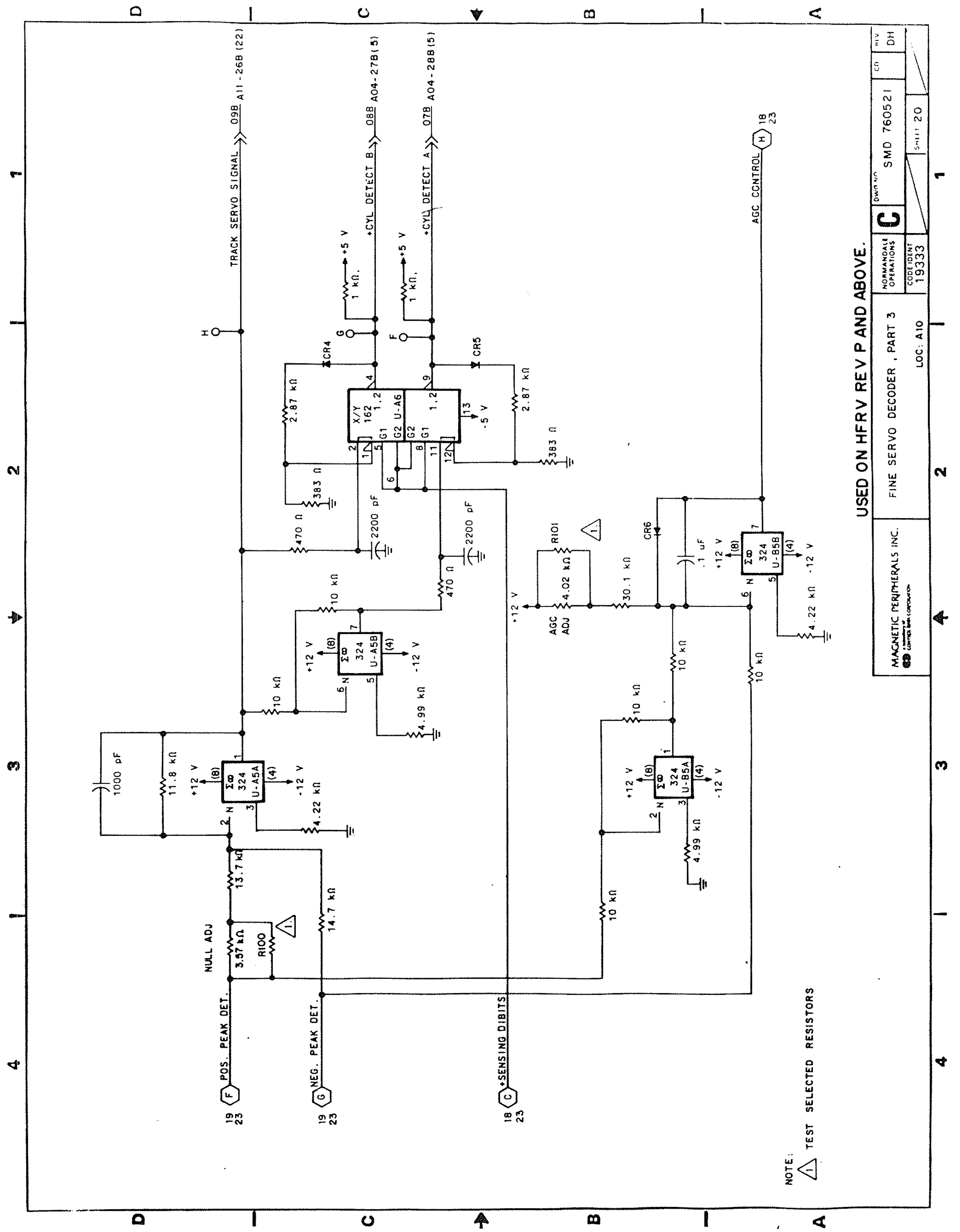
SHEET 19

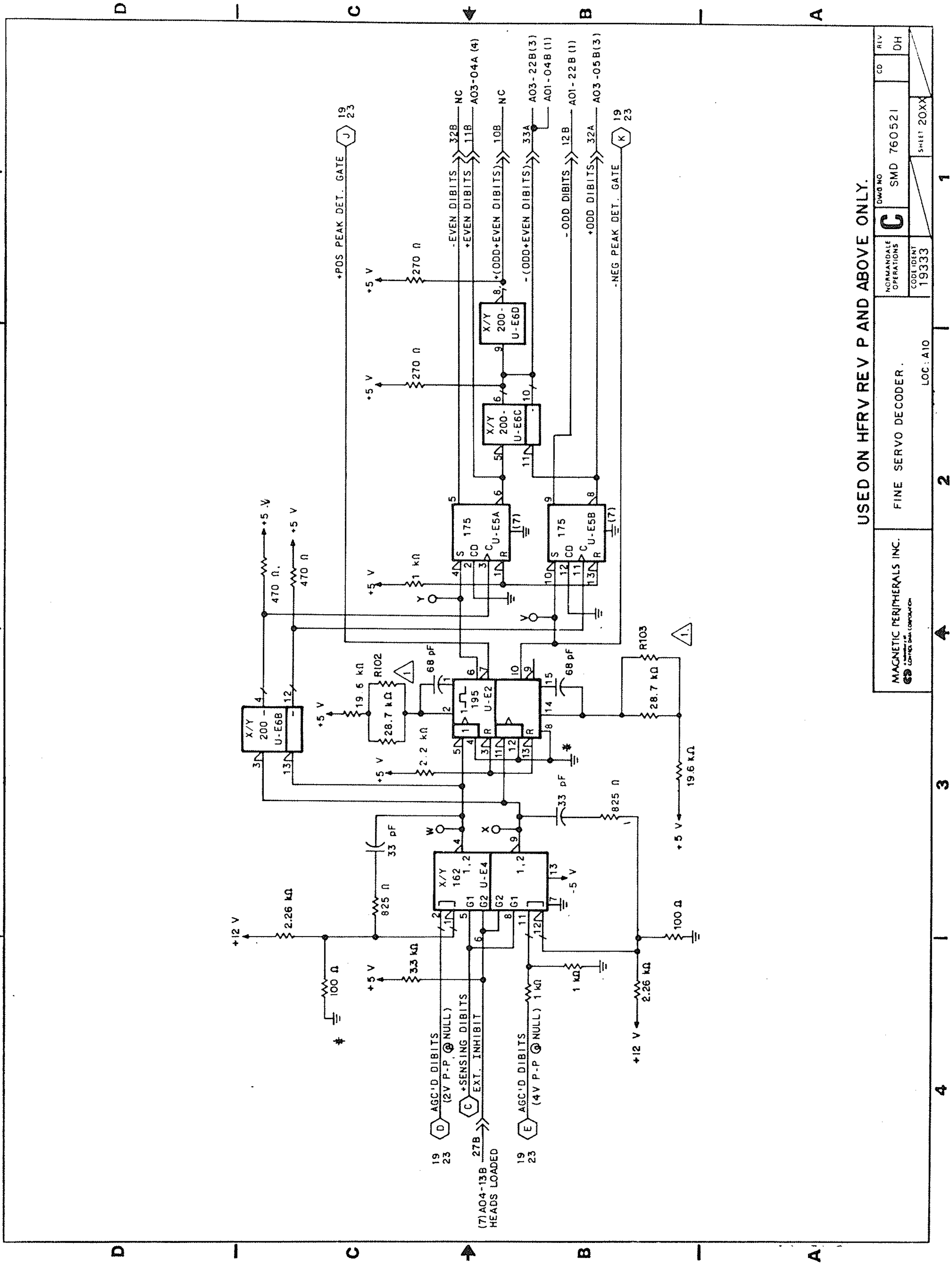


NOTE
① TEST SELECTED DURING MANUFACTURE.
2 FOR A10 INPUT VOLTAGE PINS SEE SHEET 18
③ 890 ± 20NS
④ NOT USED
⑤ 164H CHIP USED MOD J AND BELOW.

USED ON HFRV REV N AND BELOW.

CONTROL DATA
NORMANDALE DIVISION
FINE SERVO DECODER, PART 3
LOC: A10
CODE IDENT 19333
C
DWG NO SMD 760521
CD
REV CY
SHEET 20


USED ON HFRV REV P AND ABOVE.
FINE SERVO DECODER , PART 3
LOC: A10
MAGNETIC PERIPHERALS INC.
NORMANDALE OPERATIONS
CODE IDENT 19333
C
SMD 760521
SHEET 20
DH
TRACK SERVO SIGNAL
09B A11-26B (22)
+CYL DETECT B
08B A04-27B(5)
+CYL DETECT A
07B A04-28B(5)
AGC CONTROL
H 18 23
+5 V
1 kΩ.
CR4
CR5
2.87 kΩ
383 Ω
X/Y 162 U-A6
-5 V
2200 pF
470 Ω
10 kΩ
324 U-A5B
+12 V
-12 V
4.99 kΩ
R101
4.02 kΩ
AGC ADJ
30.1 kΩ
CR6
.1 uF
324 U-B5B
4.22 kΩ
1000 pF
11.8 kΩ
324 U-A5A
13.7 kΩ
14.7 kΩ
NULL ADJ
3.57 kΩ
R100
324 U-B5A
POS. PEAK DET.
F 19 23
NEG. PEAK DET.
G 19 23
+SENSING DIBITS
C 18 23
NOTE: 1 TEST SELECTED RESISTORS



USED ON HFRV REV P AND ABOVE ONLY.

FINE SERVO DECODER.

LOC: A10

MAGNETIC PERIPHERALS INC.

NORMANDALE OPERATIONS

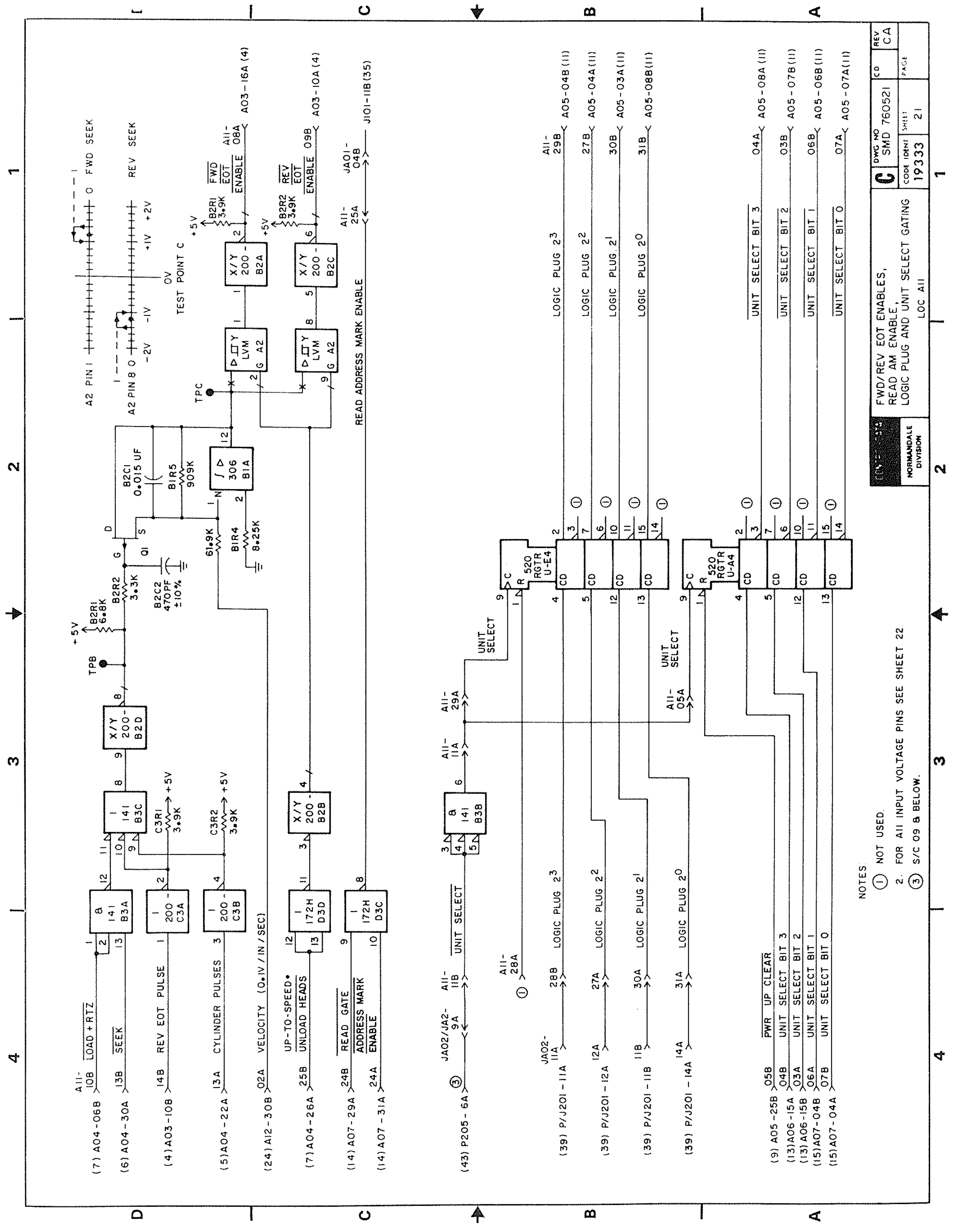
CODE IDENT 19333

SIZE C

DWG NO SMD 760521

SHEET 20XX

CD REV DH

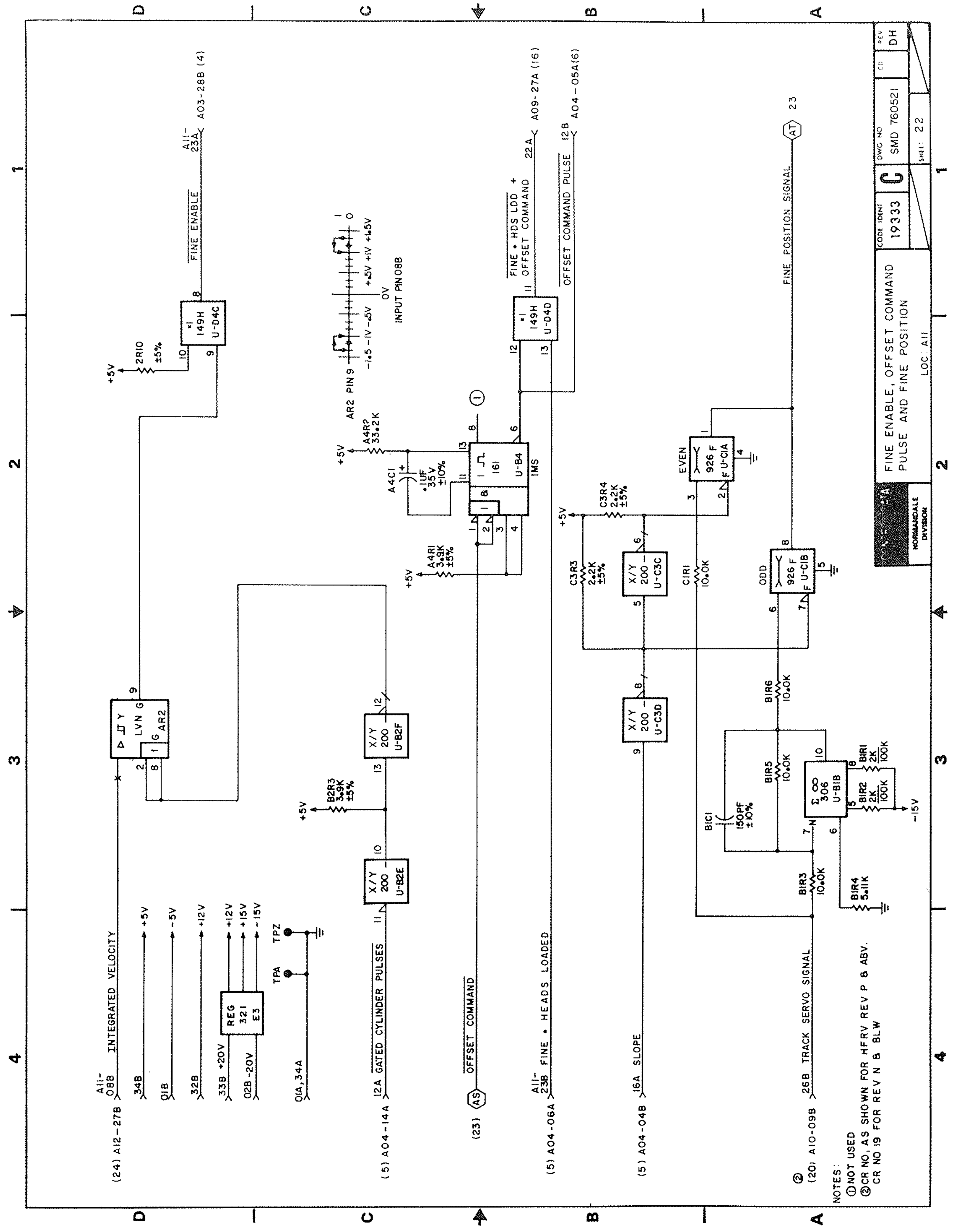


NOTES
① NOT USED.
2. FOR A11 INPUT VOLTAGE PINS SEE SHEET 22.
③ S/C 09 & BELOW.

NORMANDALE DIVISION

FWD/REV EOT ENABLES,
READ AM ENABLE,
LOGIC PLUG AND UNIT SELECT GATING
LOC A11

C DWG NO SMD 760521
CODE IDENT 19333
SHEET 21
REV CA



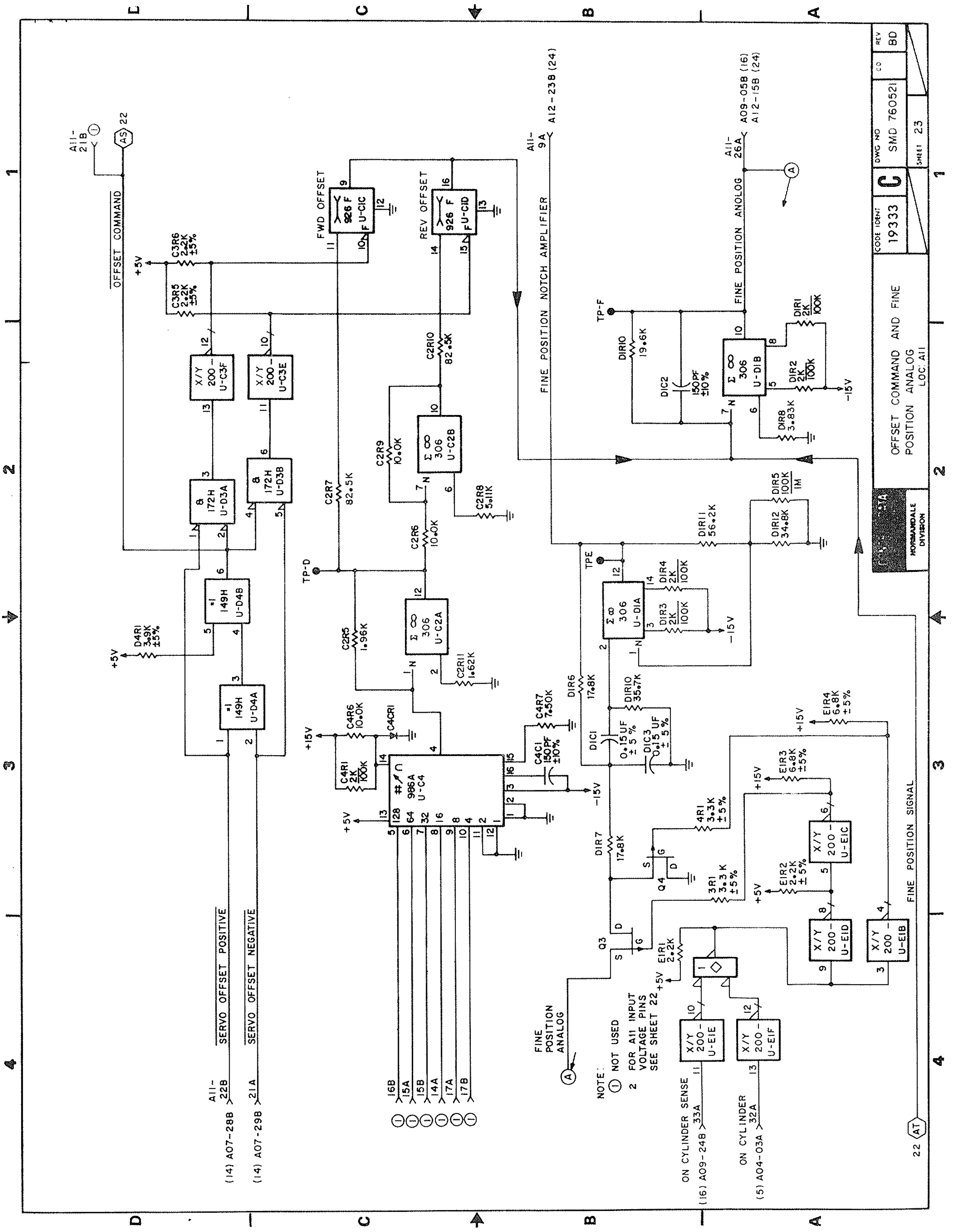
FINE ENABLE, OFFSET COMMAND PULSE AND FINE POSITION

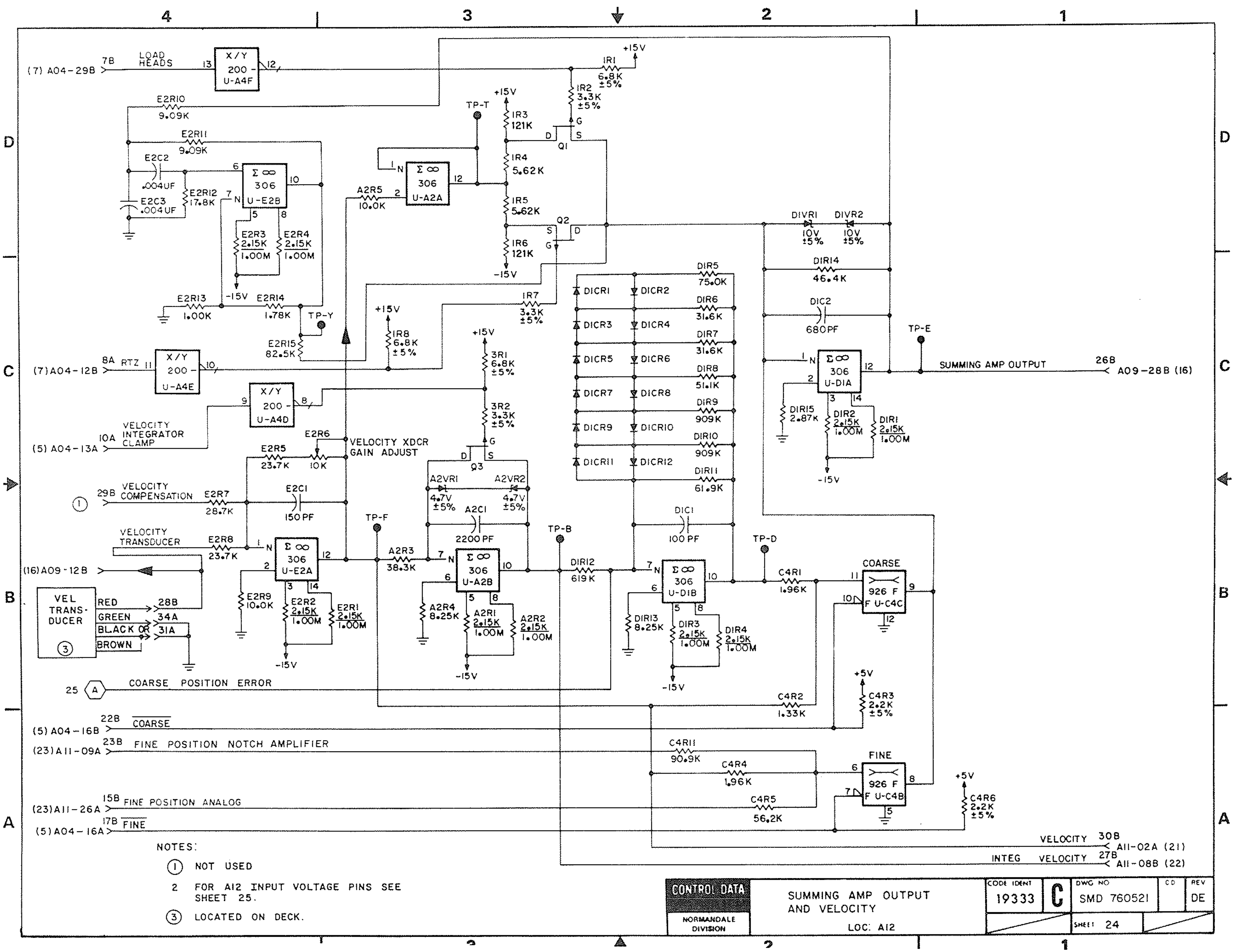
LOC: A11

CONTROL DATA NORMANDALE DIVISION

CODE IDENT 19333 C DWG NO SMD 760521 SHEET 22 REV DH

NOTES:
① NOT USED
② CR NO, AS SHOWN FOR HFRV REV P & ABV. CR NO 19 FOR REV N & BLW


OFFSET COMMAND AND FINE POSITION ANALOG LOC: A11
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 23
REV BD
NORMANDALE DIVISION
OFFSET COMMAND
A11-21B ①
AS 22
SERVO OFFSET POSITIVE
SERVO OFFSET NEGATIVE
(14) A07-28B A11-22B
(14) A07-29B 21A
FWD OFFSET
REV OFFSET
926 F U-C1C
926 F U-C1D
FINE POSITION NOTCH AMPLIFIER
A11-9A A12-23B (24)
FINE POSITION ANOLOG
A11-26A A09-05B (16) A12-15B (24)
FINE POSITION SIGNAL
FINE POSITION ANALOG
22 AT
TP-D
TP-E
TP-F
X/Y 200- U-C3F
X/Y 200- U-C3E
172H U-D3A
172H U-D3B
149H U-D4B
149H U-D4A
306 U-C2B
306 U-C2A
306 U-D1A
306 U-D1B
986A U-C4
X/Y 200- U-E1C
X/Y 200- U-E1D
X/Y 200- U-E1B
X/Y 200- U-E1E
X/Y 200- U-E1F
C3R6 2.2K ±5%
C3R5 2.2K ±5%
D4R1 3.9K ±5%
C2R10 82.5K
C2R9 10.0K
C2R7 82.5K
C2R8 5.11K
C2R6 10.0K
C2R5 1.96K
C2R11 1.62K
C4R6 10.0K
C4CR1
C4R1 2K 100K
C4R7 7.50K
C4C1 150PF ±10%
D1R10 19.6K
D1C2 150PF ±10%
D1R1 2K 100K
D1R2 2K 100K
D1R8 3.83K
D1R11 56.2K
D1R5 100K 1M
D1R12 34.8K
D1R4 2K 100K
D1R3 2K 100K
D1R6 17.8K
D1R10 35.7K
D1C1 0.15 UF ± 5%
D1C3 0.15 UF ± 5%
D1R7 17.8K
4R1 3.3K ±5%
3R1 3.3 K ±5%
E1R1 2.2K
E1R2 2.2K ± 5%
E1R3 6.8K ± 5%
E1R4 6.8K ± 5%
Q3
Q4
+5V
+15V
-15V
16B 15A 15B 14A 17A 17B
ON CYLINDER SENSE (16) A09-24B 33A
ON CYLINDER (5) A04-03A 32A
NOTE:
① NOT USED
2 FOR A11 INPUT VOLTAGE PINS SEE SHEET 22
A B C D 1 2 3 4



NOTES:

① NOT USED

2 FOR A12 INPUT VOLTAGE PINS SEE SHEET 25.

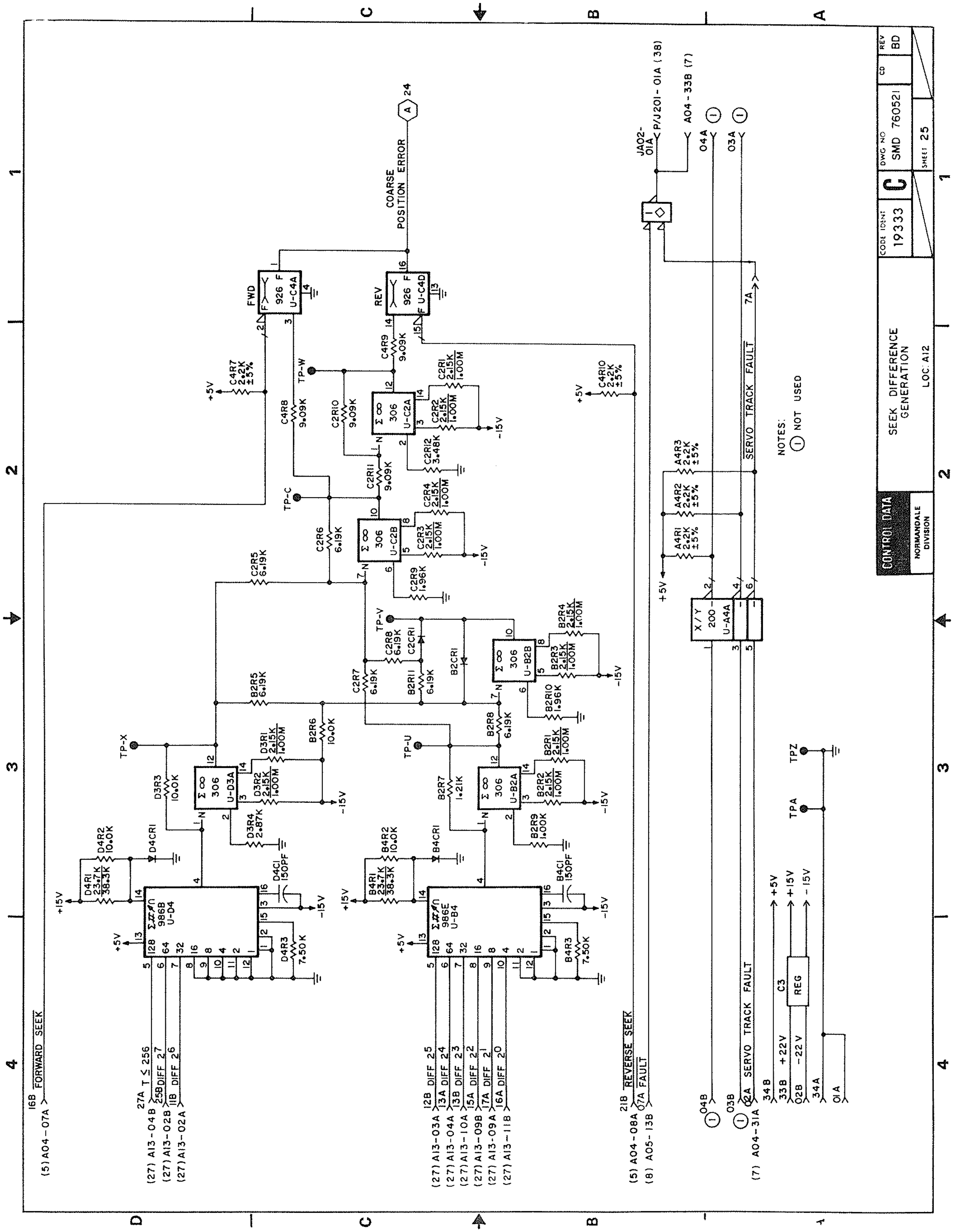
③ LOCATED ON DECK.

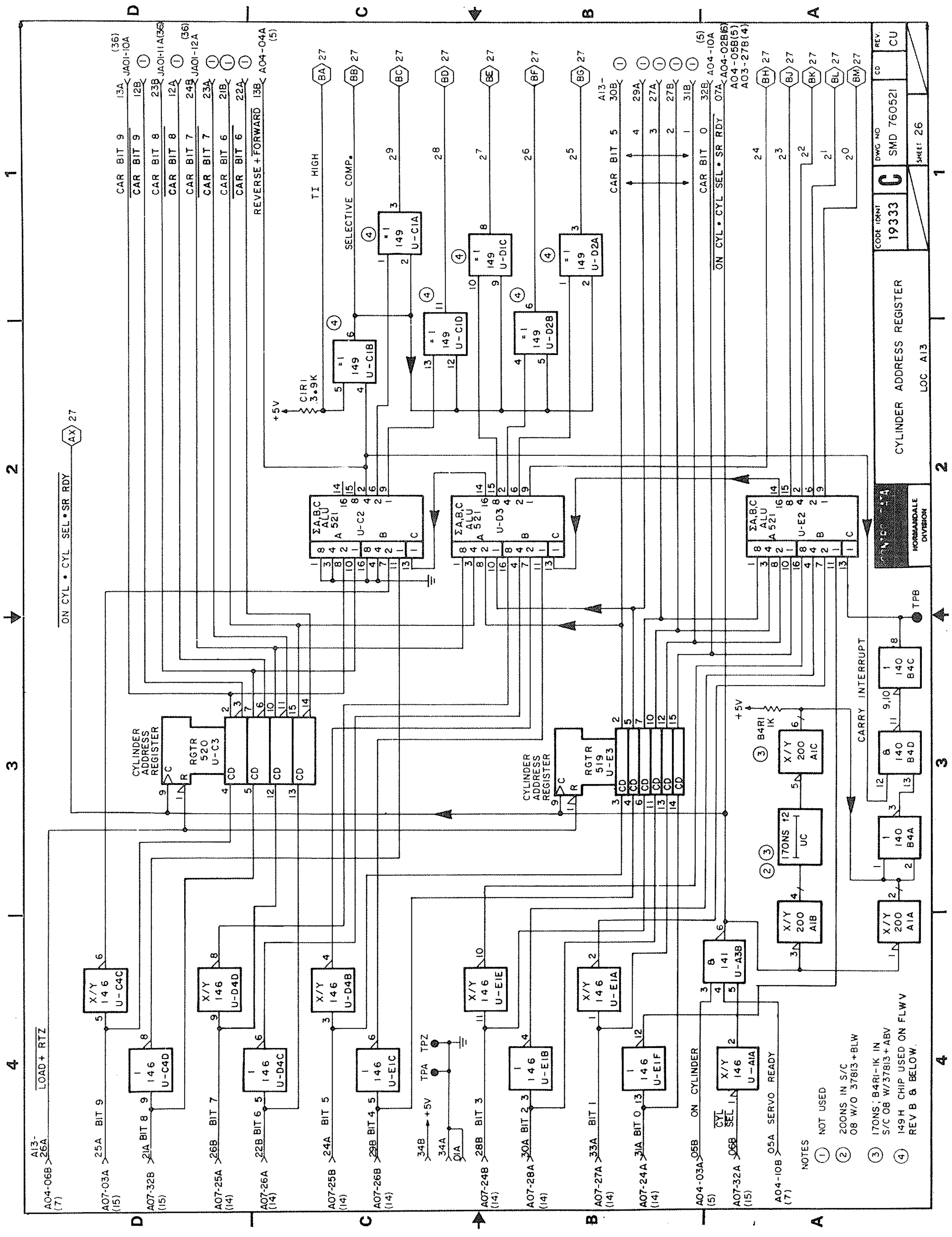
CONTROL DATA
NORMANDALE DIVISION

SUMMING AMP OUTPUT AND VELOCITY

LOC: A12

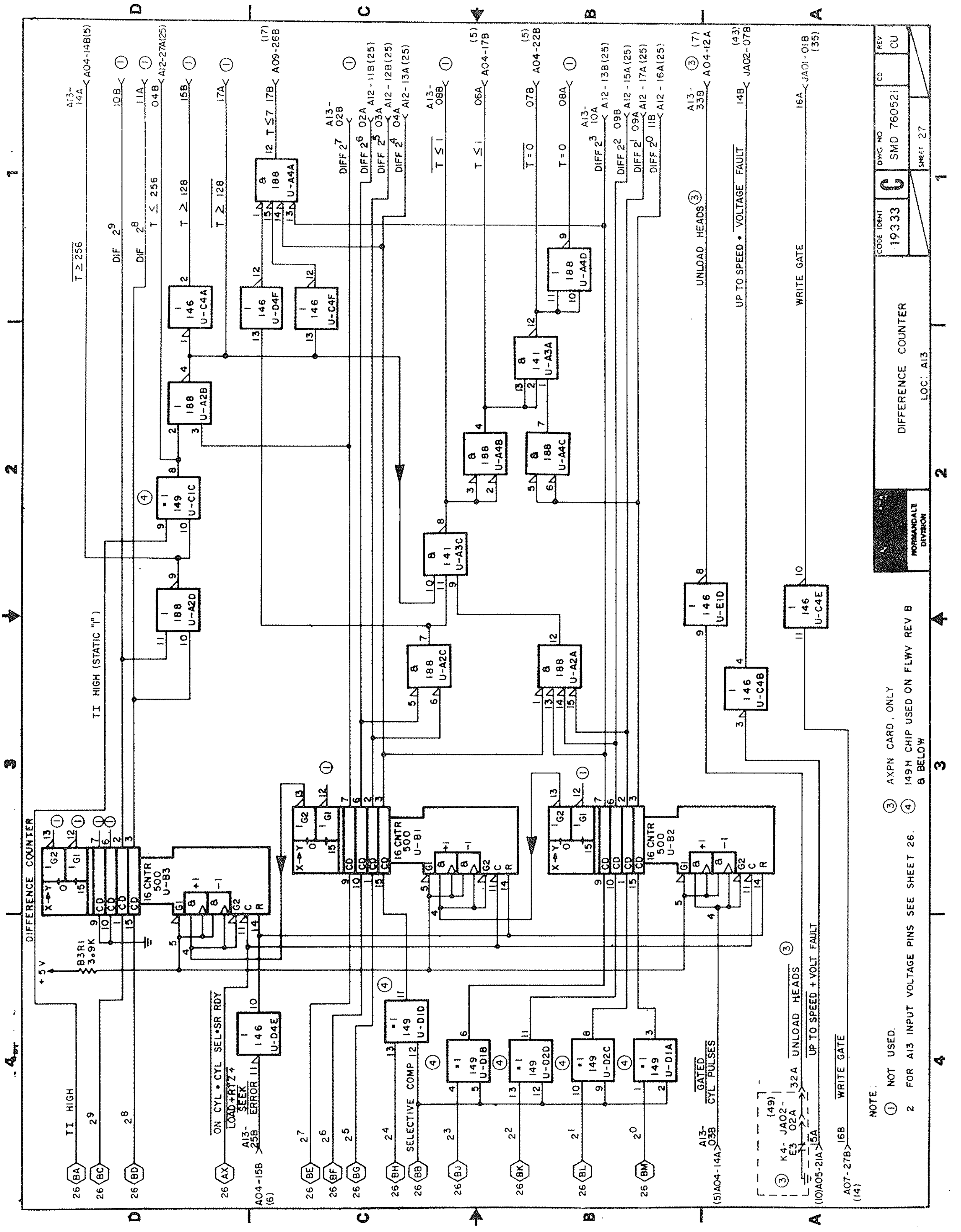
CODE IDENT		DWG NO	CD	REV
19333	C	SMD 760521		DE
		SHEET 24		

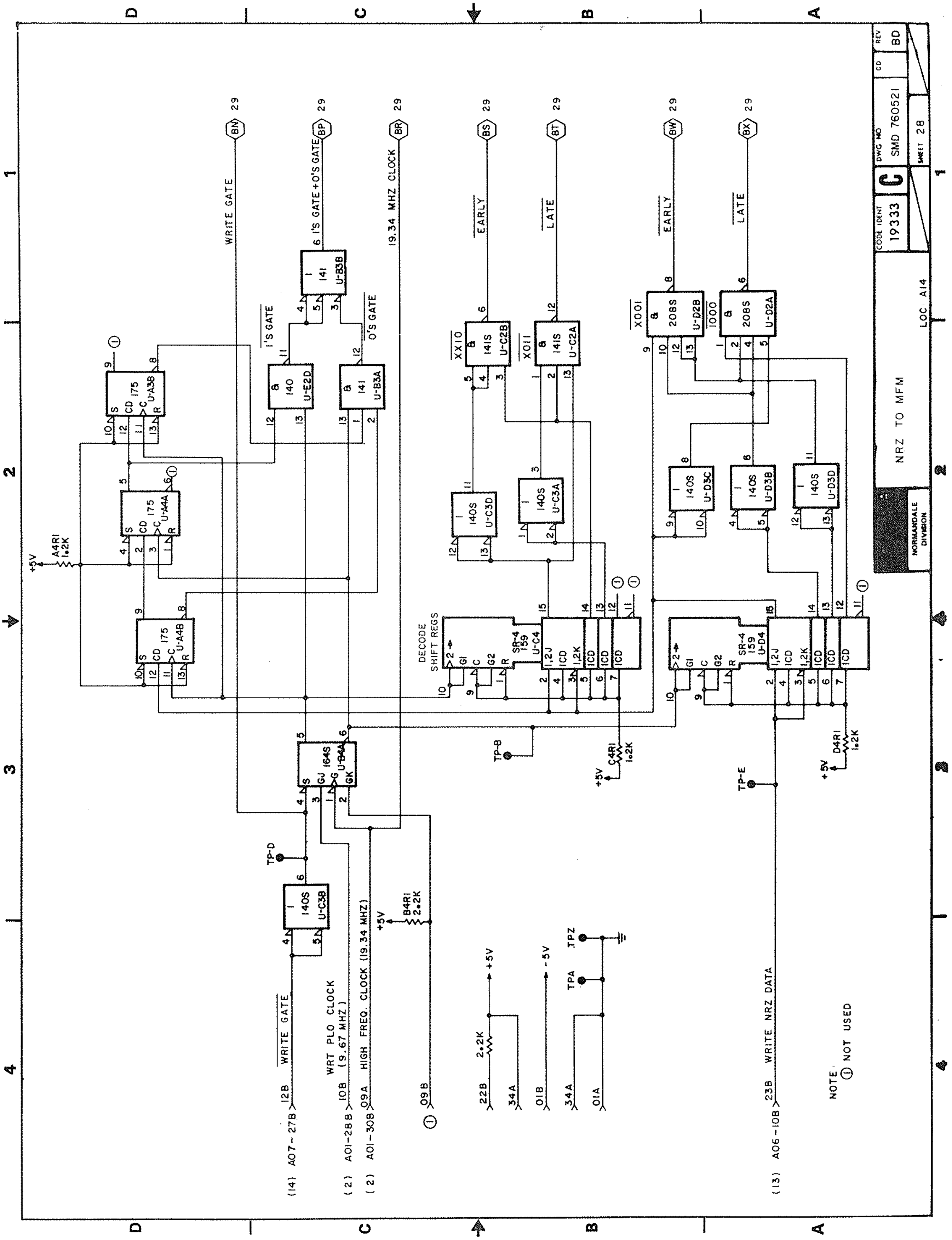

SEEK DIFFERENCE GENERATION
LOC: A12
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 25
REV BD
NOTES:
① NOT USED
COARSE POSITION ERROR
A 24
FWD 926 U-C4A
REV 926 U-C4D
Σ ∞ 306 U-C2A
Σ ∞ 306 U-C2B
Σ ∞ 306 U-B2B
Σ ∞ 306 U-D3A
Σ ∞ 306 U-B2A
ΣΠ∫∩ 986B U-D4
ΣΠ∫∩ 986E U-B4
X/Y 200 U-A4A
TP-W
TP-C
TP-V
TP-X
TP-U
TPA
TPZ
C4R7 2.2K ±5%
C4R8 9.09K
C4R9 9.09K
C4R10 2.2K ±5%
C2R1 2.15K 1.00M
C2R2 2.15K 1.00M
C2R3 2.15K 1.00M
C2R4 2.15K 1.00M
C2R5 6.19K
C2R6 6.19K
C2R7 6.19K
C2R8 6.19K
C2R9 1.96K
C2R10 9.09K
C2R11 9.09K
C2R12 3.48K
C2CR1
B2CR1
B2R1 2.15K 1.00M
B2R2 2.15K 1.00M
B2R3 2.15K 1.00M
B2R4 2.15K 1.00M
B2R5 6.19K
B2R6 10.0K
B2R7 1.21K
B2R8 6.19K
B2R9 1.00K
B2R10 1.96K
B2R11 6.19K
D3R1 2.15K 1.00M
D3R2 2.15K 1.00M
D3R3 10.0K
D3R4 2.87K
D4R1 23.7K 38.3K
D4R2 10.0K
D4R3 7.50K
D4CR1
D4C1 150PF
B4R1 23.7K 38.3K
B4R2 10.0K
B4R3 7.50K
B4CR1
B4C1 150PF
A4R1 2.2K ±5%
A4R2 2.2K ±5%
A4R3 2.2K ±5%
+5V
+15V
-15V
C3 REG
+22V
-22V
JA02-01A
P/J201-01A (38)
A04-33B (7)
04A ①
03A ①
7A SERVO TRACK FAULT
16B FORWARD SEEK
(5) A04-07A
27A T ≤ 256
25B DIFF 27
11B DIFF 26
(27) A13-04B
(27) A13-02B
(27) A13-02A
12B DIFF 25
3A DIFF 24
13B DIFF 23
5A DIFF 22
17A DIFF 21
16A DIFF 20
(27) A13-03A
(27) A13-04A
(27) A13-10A
(27) A13-09B
(27) A13-09A
(27) A13-11B
21B REVERSE SEEK
07A FAULT
(5) A04-08A
(8) A05-13B
① 04B
① 03B
02A SERVO TRACK FAULT
(7) A04-31A
34B
33B
02B
34A
01A
1
2
3
4
A
B
C
D

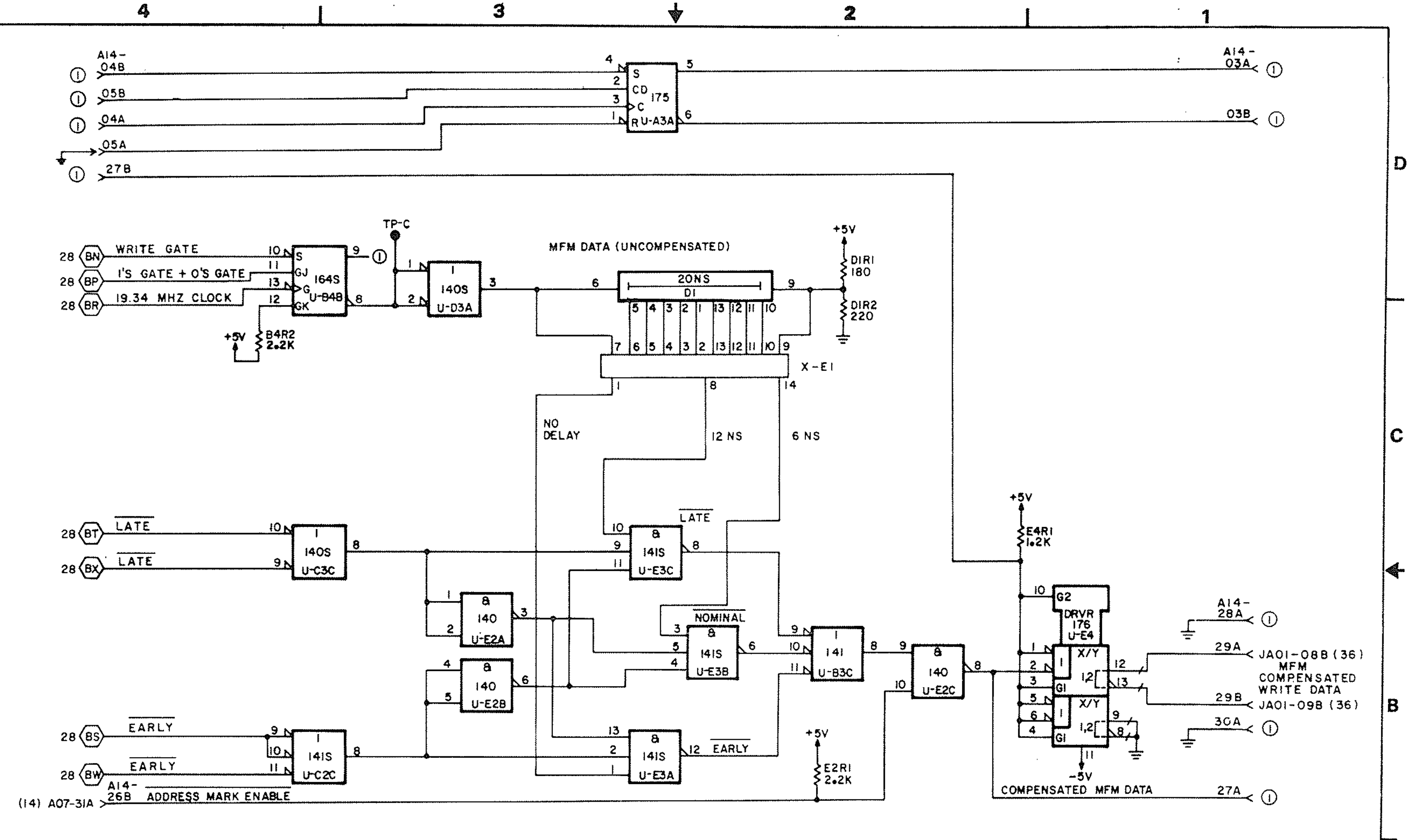


NOTES

1. ① NOT USED
2. ② 200NS IN S/C 08 W/O 37813+BLW
3. ③ 170NS; B4R1-1K IN S/C 08 W/37813+ABV
4. ④ 149H CHIP USED ON FLWV REV B & BELOW.


DIFFERENCE COUNTER
LOC: A13
NORMANDALE DIVISION
CODE IDENT 19333
C
DWG NO SMD 76052I
SHEET 27
REV CU
NOTE:
① NOT USED.
2 FOR A13 INPUT VOLTAGE PINS SEE SHEET 26.
③ AXPN CARD, ONLY
④ 149H CHIP USED ON FLWY REV B & BELOW
16 CNTR 500 U-B3
16 CNTR 500 U-B1
16 CNTR 500 U-B2
188 U-A2D
149 U-C1C
188 U-A2B
146 U-C4A
146 U-D4F
146 U-C4F
188 U-A4A
188 U-A2C
141 U-A3C
188 U-A4B
188 U-A4C
141 U-A3A
188 U-A4D
188 U-A2A
146 U-E1D
146 U-C4B
146 U-C4E
146 U-D4E
149 U-D1D
149 U-D1B
149 U-D2D
149 U-D2C
149 U-D1A
TI HIGH (STATIC "1")
T ≥ 256
DIF 2^9
DIF 2^8
T ≤ 256
T ≥ 128
T ≤ 7
DIFF 2^7
DIFF 2^6
DIFF 2^5
DIFF 2^4
T ≤ 1
T = 0
DIFF 2^3
DIFF 2^2
DIFF 2^1
DIFF 2^0
UNLOAD HEADS ③
UP TO SPEED • VOLTAGE FAULT
WRITE GATE
TI HIGH
ON CYL • CYL SEL•SR RDY
LOAD+RTZ+SEEK ERROR
SELECTIVE COMP
GATED CYL PULSES
UNLOAD HEADS
UP TO SPEED + VOLT FAULT
+5V
B3R1 3.9K
A04-14B(5)
A12-27A(25)
A09-26B
A12-11B(25)
A12-12B(25)
A12-13A(25)
A04-17B
A04-22B
A12-13B(25)
A12-15A(25)
A12-17A(25)
A12-16A(25)
A04-12A
JA02-07B
JA01-01B
A04-15B
A04-14A
A05-21A
K4-E3 JA02-02A
A07-27B
26 BA
26 BC
26 BD
26 AX
26 BE
26 BF
26 BG
26 BH
26 BB
26 BJ
26 BK
26 BL
26 BM


NRZ TO MFM
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 28
REV BD
LOC A14
NORMANDALE DIVISION
WRITE GATE
I'S GATE + O'S GATE
19.34 MHZ CLOCK
EARLY
LATE
I'S GATE
O'S GATE
XX10
X011
X001
1000
DECODE SHIFT REGS
SR-4 159 U-C4
SR-4 159 U-D4
175 U-A3B
175 U-A4A
175 U-A4B
140 U-E2D
141 U-B3A
141 U-B3B
141S U-C2B
141S U-C2A
208S U-D2B
208S U-D2A
140S U-C3D
140S U-C3A
140S U-D3C
140S U-D3B
140S U-D3D
164S U-B4A
140S U-C3B
A4R1 1.2K
C4R1 1.2K
D4R1 1.2K
B4R1 2.2K
2.2K
+5V
-5V
TP-B
TP-D
TP-E
TPA
TPZ
BN 29
BP 29
BR 29
BS 29
BT 29
BW 29
BX 29
(14) A07-27B 12B WRITE GATE
(2) A01-28B 10B WRT PLO CLOCK (9.67 MHZ)
(2) A01-30B 09A HIGH FREQ. CLOCK (19.34 MHZ)
① 09B
22B
34A
01B
34A
01A
(13) A06-10B 23B WRITE NRZ DATA
NOTE: ① NOT USED



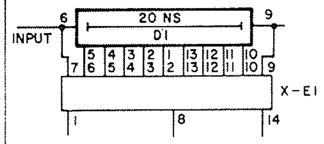
NOTE:

① NOT USED

② DELAY LINES ARE CONNECTED TO JUMPER BLOCK AS SHOWN IN DIAGRAM AT THE RIGHT. ACTUAL DELAYS ARE SELECTED DURING MANUFACTURING. THIS DIAGRAM SHOWS TYPICAL CONNECTIONS. DELAY TIME FOR EACH DELAY LINE PIN RELATIVE TO PIN 6 INPUT IS SHOWN IN CHART TO THE RIGHT.

3 FOR A14 INPUT VOLTAGE PINS SEE SHEET 28

PIN	20NS DELAY
5	2 NS
4	4 NS
3	6 NS
2	8 NS
1	10 NS
13	12 NS
12	14 NS
11	16 NS
10	18 NS
9	20 NS

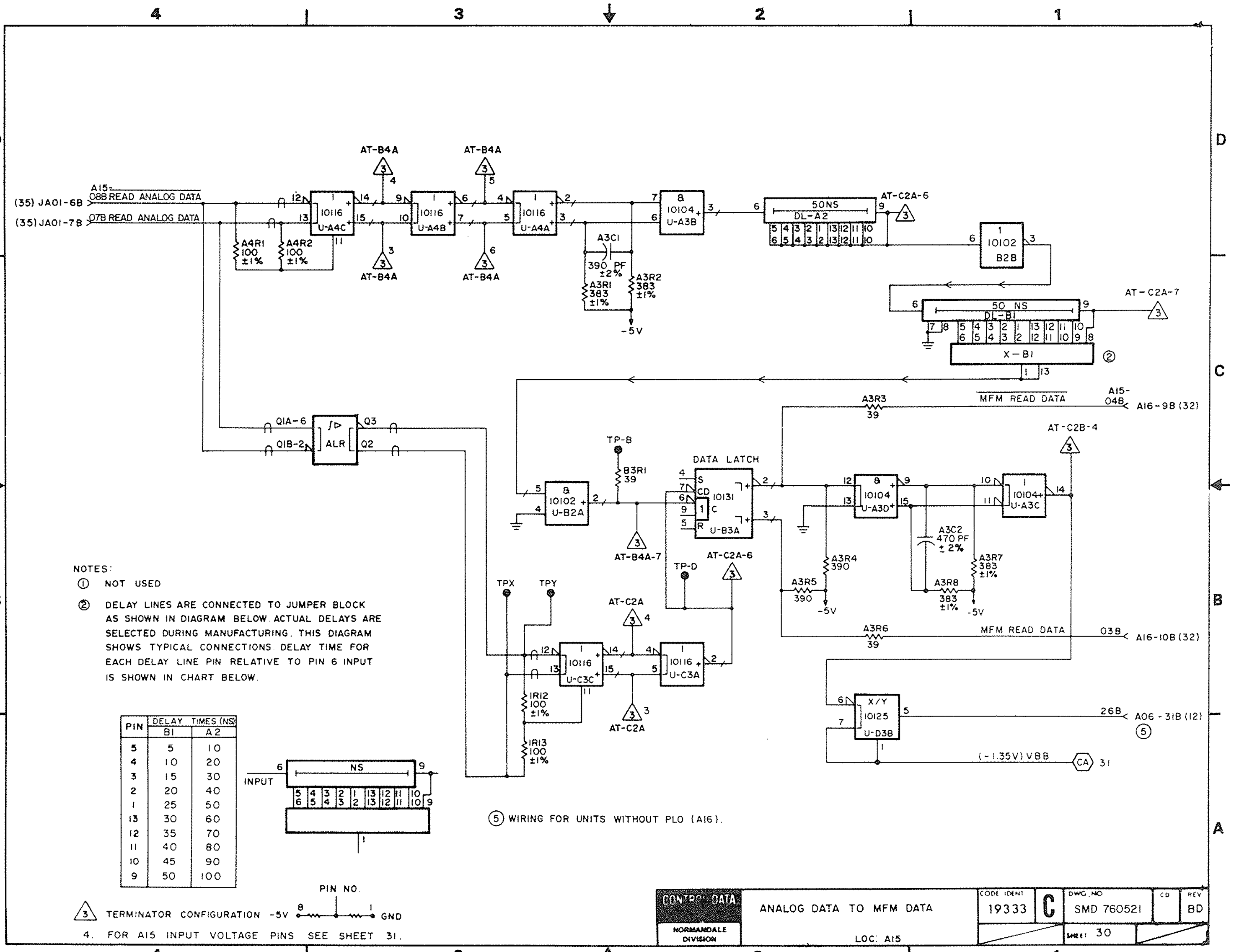


CONTROL DATA
NORMANDALE DIVISION

NRZ TO MFM

LOC: A14

CODE IDENT		DWG NO	CD	REV
19333	C	SMD 760521	5	BD
		SHEET 29		



NOTES:

① NOT USED

② DELAY LINES ARE CONNECTED TO JUMPER BLOCK AS SHOWN IN DIAGRAM BELOW. ACTUAL DELAYS ARE SELECTED DURING MANUFACTURING. THIS DIAGRAM SHOWS TYPICAL CONNECTIONS. DELAY TIME FOR EACH DELAY LINE PIN RELATIVE TO PIN 6 INPUT IS SHOWN IN CHART BELOW.

PIN	DELAY TIMES (NS)	
	B1	A2
5	5	10
4	10	20
3	15	30
2	20	40
1	25	50
13	30	60
12	35	70
11	40	80
10	45	90
9	50	100

⑤ WIRING FOR UNITS WITHOUT PLO (A16).

3 TERMINATOR CONFIGURATION -5V 8 — 1 GND

4. FOR A15 INPUT VOLTAGE PINS SEE SHEET 31.

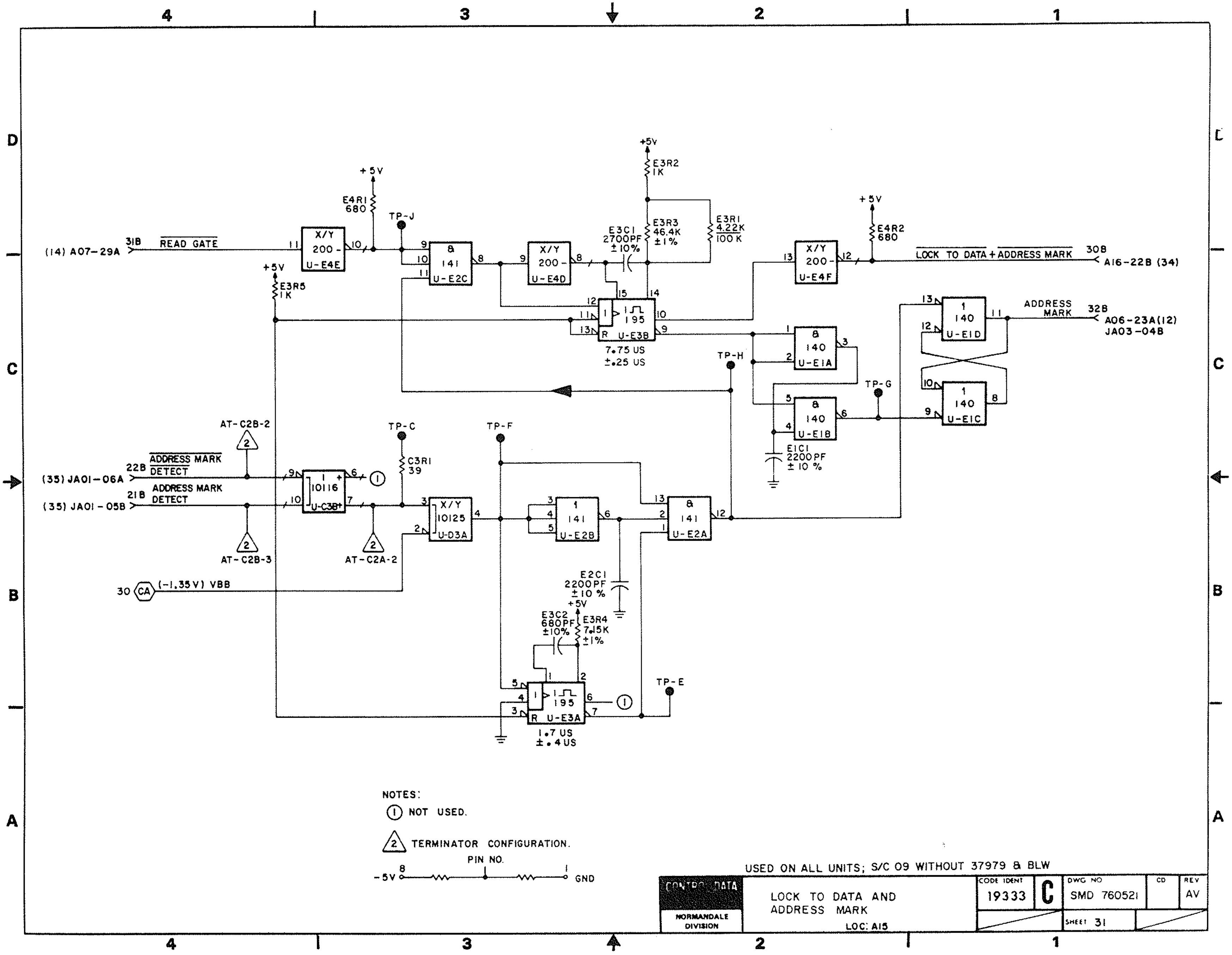
CONTROL DATA
NORMANDALE DIVISION

ANALOG DATA TO MFM DATA

LOC: A15

CODE IDENT 19333 C DWG. NO. SMD 760521 CD REV BD

SHEET 30



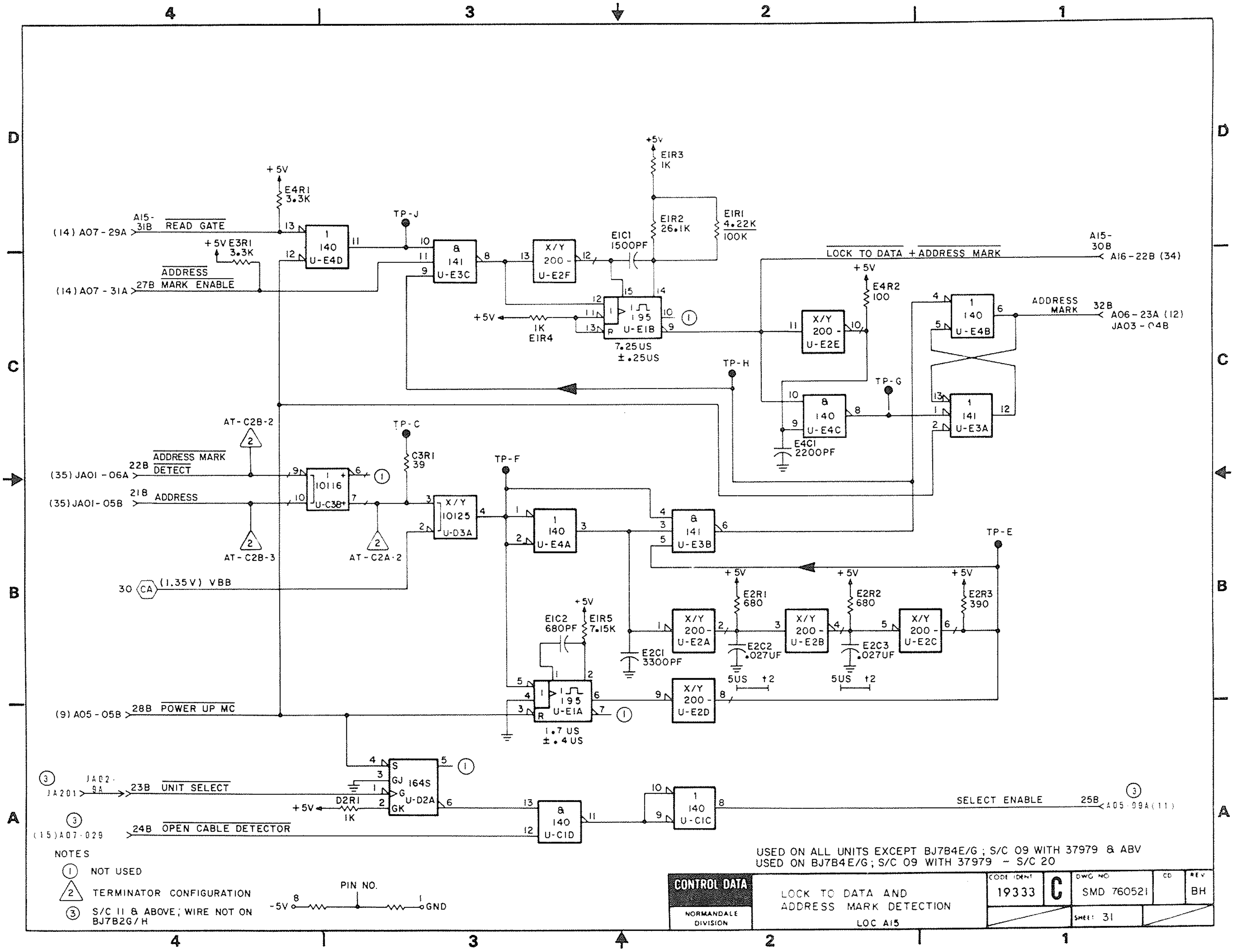
NOTES:

① NOT USED.

⚠ 2 TERMINATOR CONFIGURATION.

USED ON ALL UNITS; S/C 09 WITHOUT 37979 & BLW

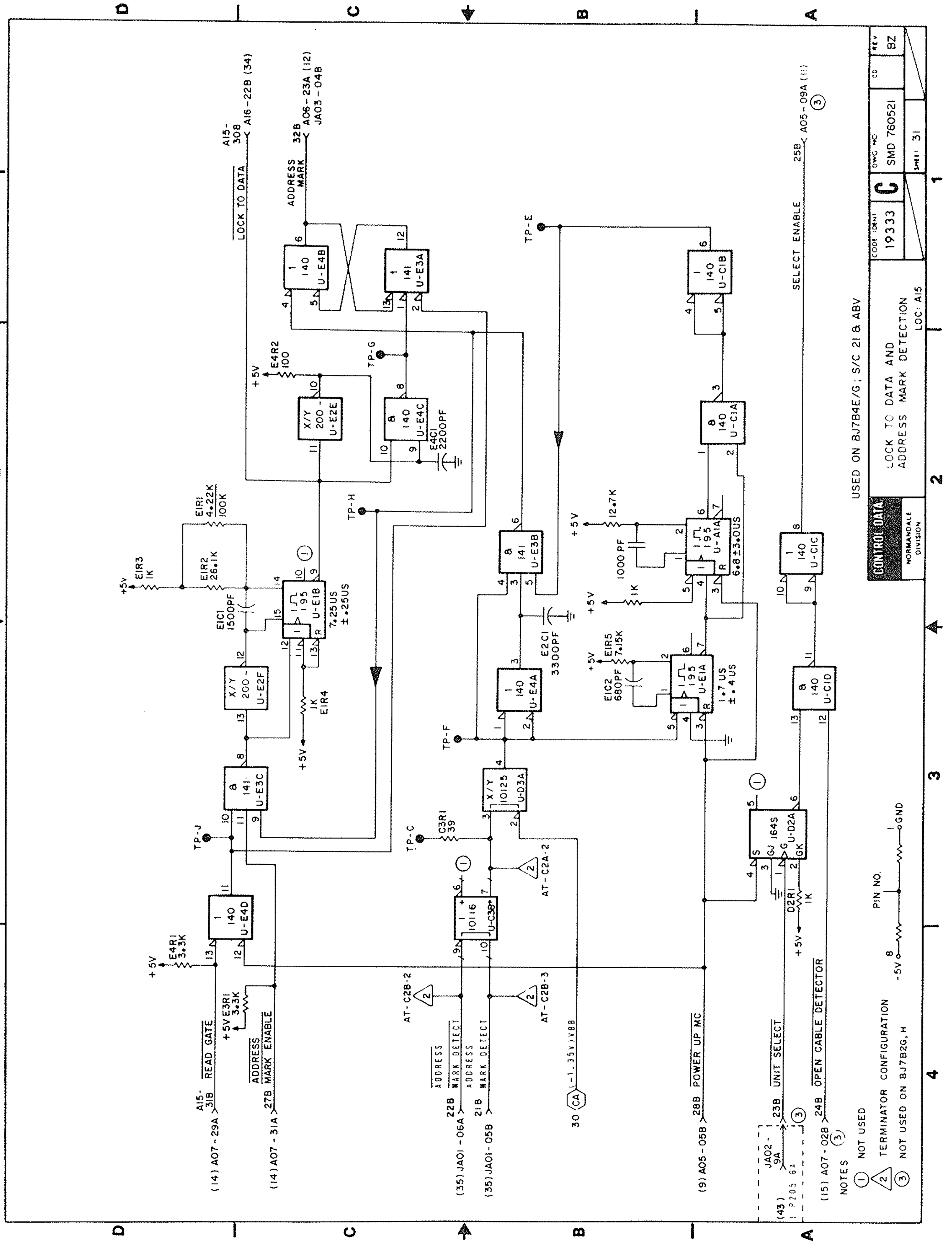
CONTROL DATA NORMANDALE DIVISION	LOCK TO DATA AND ADDRESS MARK LOC: A15	CODE IDENT 19333	C	DWG NO SMD 760521 SHEET 31	CD	REV AV

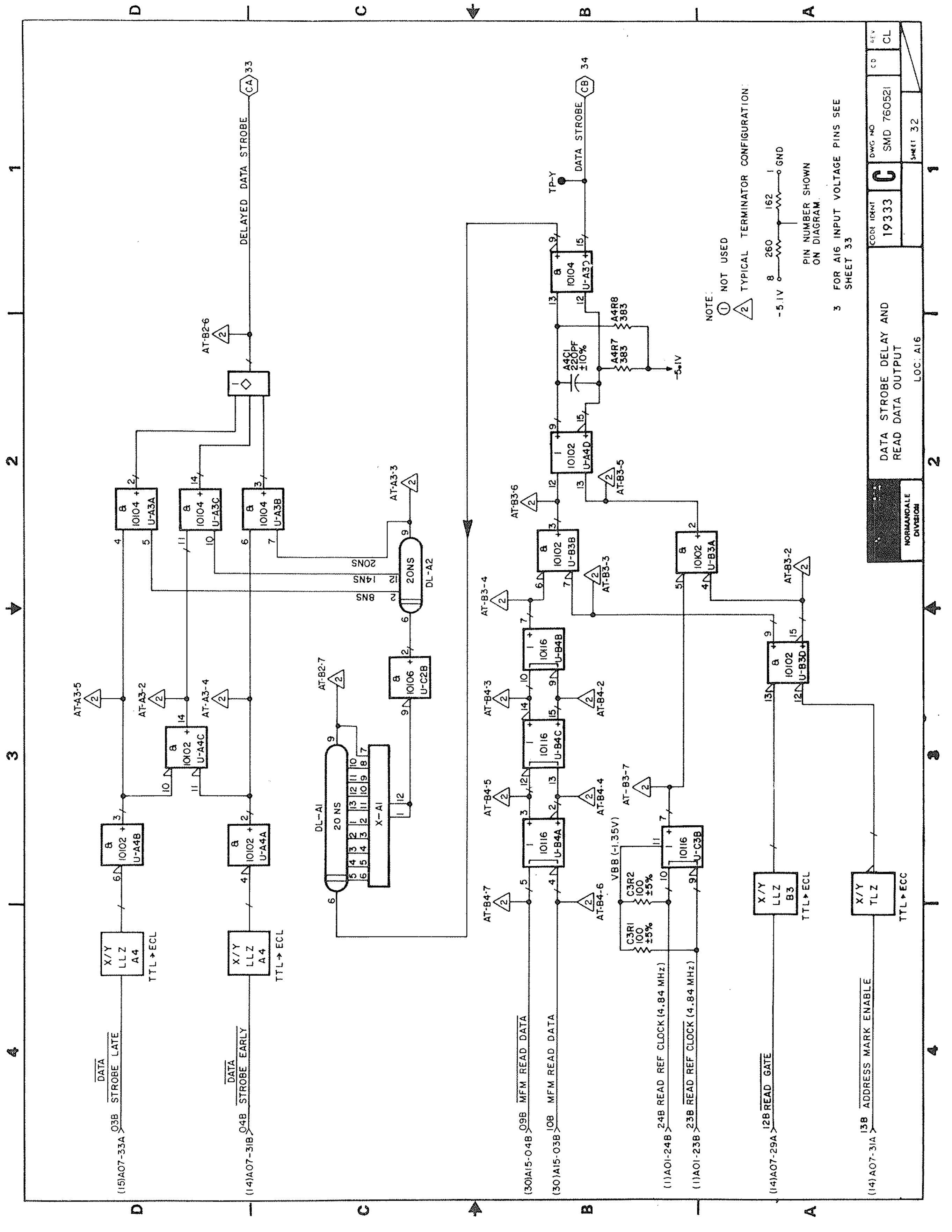


NOTES
① NOT USED
2 TERMINATOR CONFIGURATION
③ S/C 11 & ABOVE; WIRE NOT ON BJ7B2G/H

USED ON ALL UNITS EXCEPT BJ7B4E/G ; S/C 09 WITH 37979 & ABV
USED ON BJ7B4E/G ; S/C 09 WITH 37979 - S/C 20

CONTROL DATA NORMANDALE DIVISION	LOCK TO DATA AND ADDRESS MARK DETECTION LOC A15	CODE IDENT 19333	C	DWG NO SMD 760521	CD	REV BH
				SHEET 31		


USED ON BJ7B4E/G; S/C 21 & ABV
CONTROL DATA
NORMANDALE DIVISION
LOCK TO DATA AND ADDRESS MARK DETECTION
LOC: A15
CODE IDENT 19333
C
DWG NO SMD 76052I
SHEET 31
REV BZ
LOCK TO DATA
A15-30B
A16-22B (34)
ADDRESS MARK
32B
A06-23A (12)
JA03-04B
SELECT ENABLE
25B
A05-09A (11)
TP-E
TP-G
TP-H
TP-J
TP-C
TP-F
U-E4B
U-E3A
U-C1B
U-E2E
U-E4C
U-C1A
E4R2 100
E4C1 2200PF
E1R1 4.22K 100K
E1R3 1K
E1R2 26.1K
E1C1 1500PF
U-E1B
7.25US ±.25US
1K E1R4
U-E2F
U-E3B
U-E4A
E2C1 3300PF
12.7K
1000 PF
U-A1A
6.8±3.0US
U-C1C
E1R5 7.15K
E1C2 680PF
U-E1A
1.7 US ±.4US
U-C1D
U-E3C
U-D3A
10125
C3R1 39
U-C3B
10116
AT-C2A-2
AT-C2B-2
AT-C2B-3
U-E4D
E4R1 3.3K
+5V E3R1 3.3K
U-D2A
GJ 164S
D2R1 1K
PIN NO.
GND
-5V
READ GATE
A15-31B
(14) A07-29A
ADDRESS MARK ENABLE
27B
(14) A07-31A
ADDRESS MARK DETECT
22B
(35) JA01-06A
ADDRESS MARK DETECT
21B
(35) JA01-05B
30 CA -1.35V VBB
POWER UP MC
28B
(9) A05-05B
UNIT SELECT
23B
JA02-9A
(43) P205 6A
OPEN CABLE DETECTOR
24B
(15) A07-02B
NOTES
1 NOT USED
2 TERMINATOR CONFIGURATION
3 NOT USED ON BJ7B2G,H



NOTE:

① NOT USED

② TYPICAL TERMINATOR CONFIGURATION:

-5.1V 8 260 162 1 GND

PIN NUMBER SHOWN ON DIAGRAM.

3 FOR A16 INPUT VOLTAGE PINS SEE SHEET 33

NORMANDALE DIVISION

DATA STROBE DELAY AND READ DATA OUTPUT

LOC: A16

CODE IDENT 19333

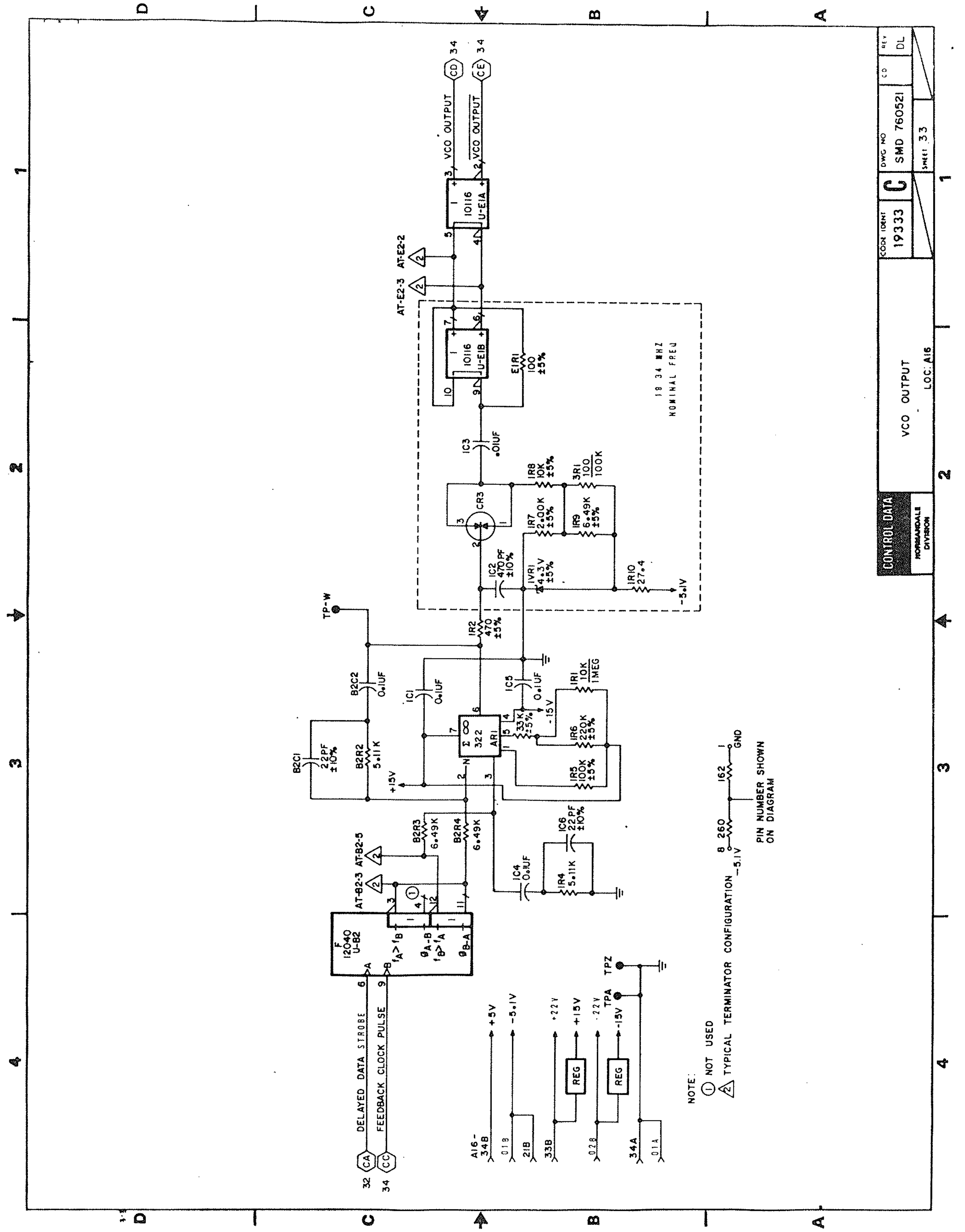
C

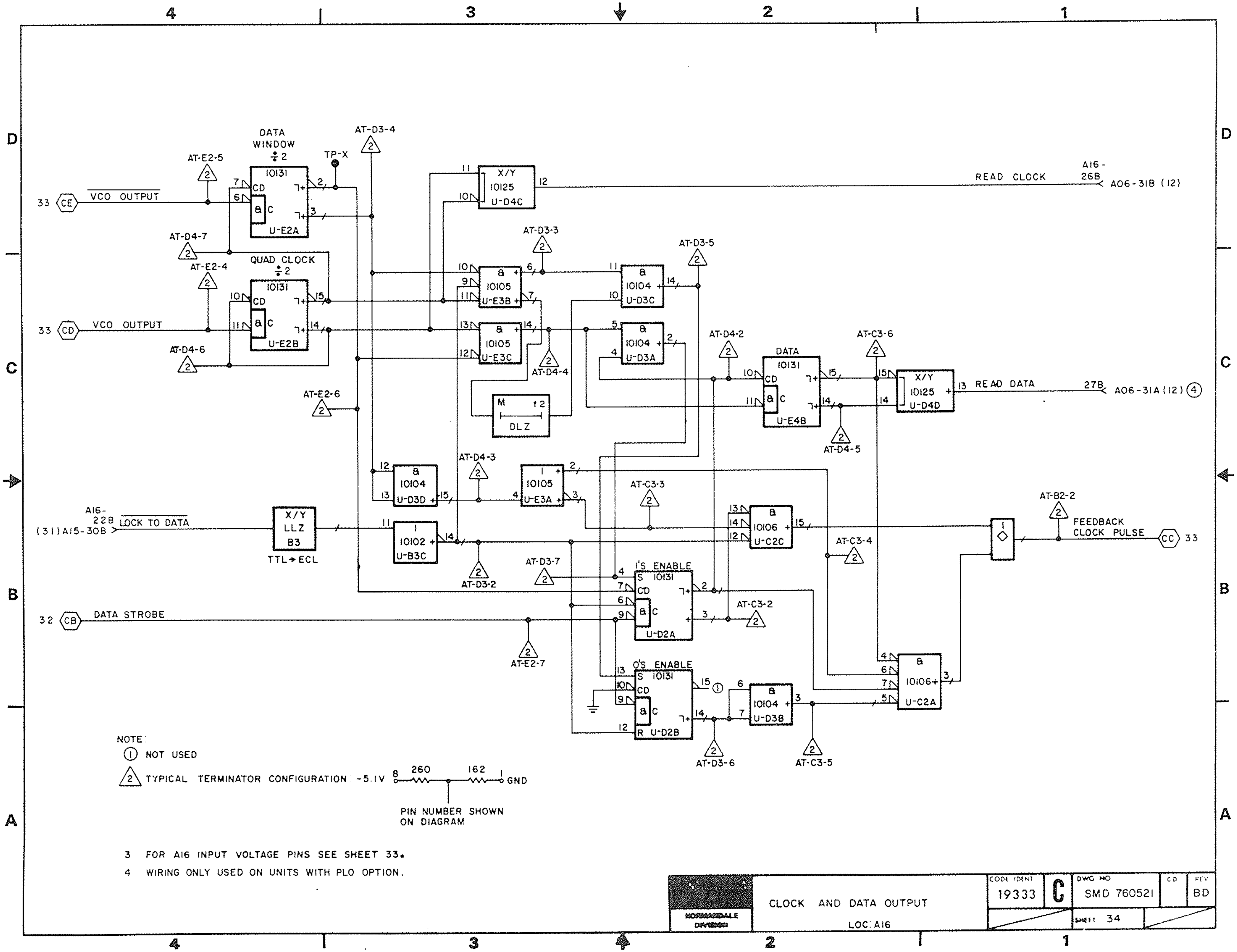
DWG NO SMD 760521

CO

REV CL

SHEET 32


VCO OUTPUT
LOC: A16
CONTROL DATA
NORMANDALE DIVISION
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 33
REV DL
VCO OUTPUT CD 34
VCO OUTPUT CE 34
10116 U-E1A
10116 U-E1B
AT-E2-2
AT-E2-3
E1R1 100 ±5%
1C3 .01UF
1R8 10K ±5%
3R1 100 100K
CR3
1R7 2.00K ±5%
1R9 6.49K ±5%
1C2 470PF ±10%
1VR1 4.3V ±5%
1R10 27.4
-5.1V
18.34 MHZ NOMINAL FREQ
TP-W
1R2 470 ±5%
B2C2 0.1UF
1C1 0.1UF
1C5 0.1UF
1R1 10K 1MEG
322 AR1
33K ±5%
-15V
1R6 220K ±5%
1R5 100K ±5%
B2C1 22PF ±10%
B2R2 5.11K
+15V
B2R3 6.49K
B2R4 6.49K
1C6 22PF ±10%
1C4 0.1UF
1R4 5.11K
AT-B2-3
AT-B2-5
F 12040 U-B2
fA > fB
ØA-B
fB > fA
ØB-A
DELAYED DATA STROBE CA 32
FEEDBACK CLOCK PULSE CC 34
A16-34B
+5V
01B
-5.1V
21B
33B
+22V
+15V
REG
02B
-22V
-15V
TPA
TPZ
34A
01A
NOTE:
① NOT USED
△2 TYPICAL TERMINATOR CONFIGURATION
-5.1V 8 260 162 1 GND
PIN NUMBER SHOWN ON DIAGRAM



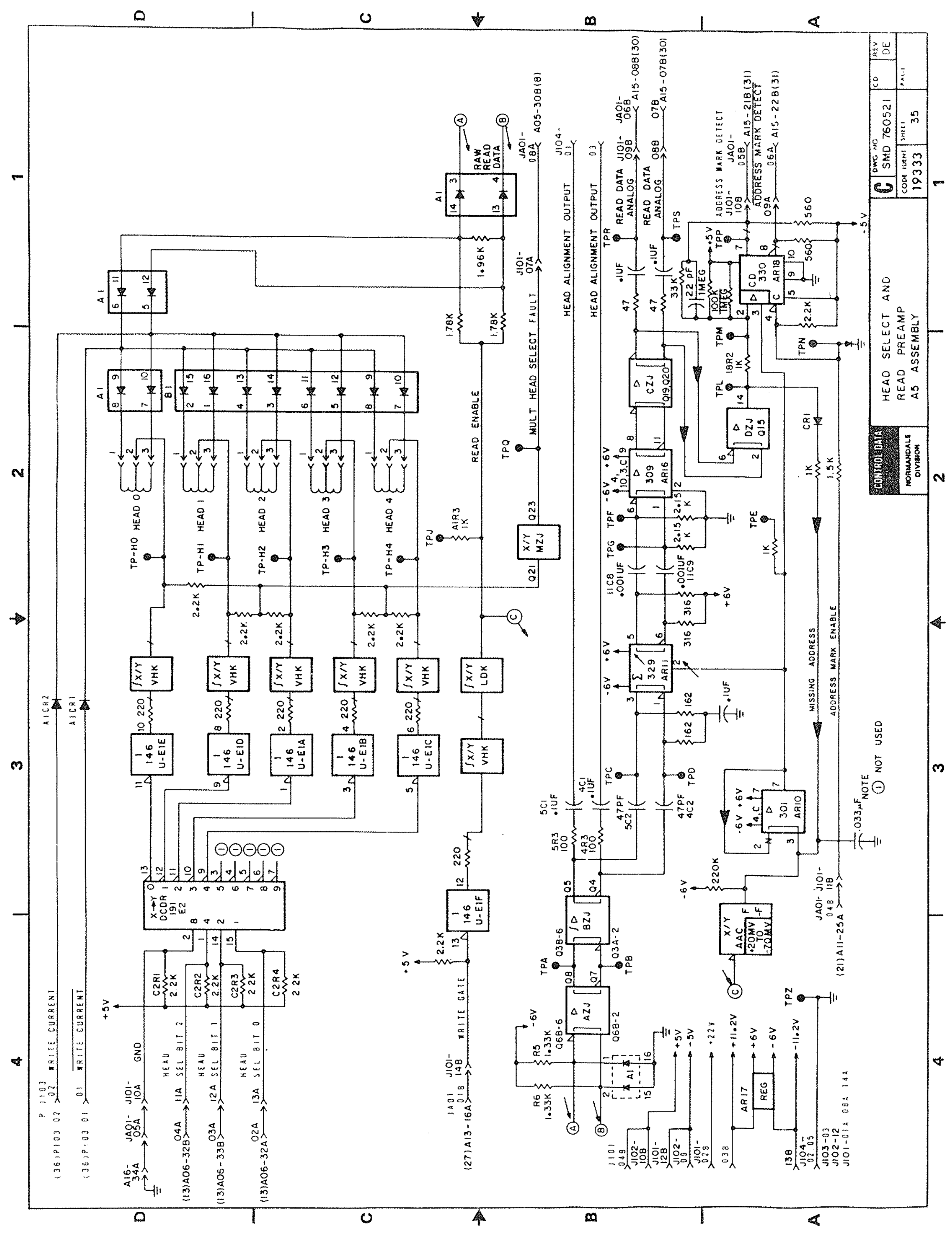
NOTE:
① NOT USED
② TYPICAL TERMINATOR CONFIGURATION: -5.1V 8 260 162 1 GND
PIN NUMBER SHOWN ON DIAGRAM

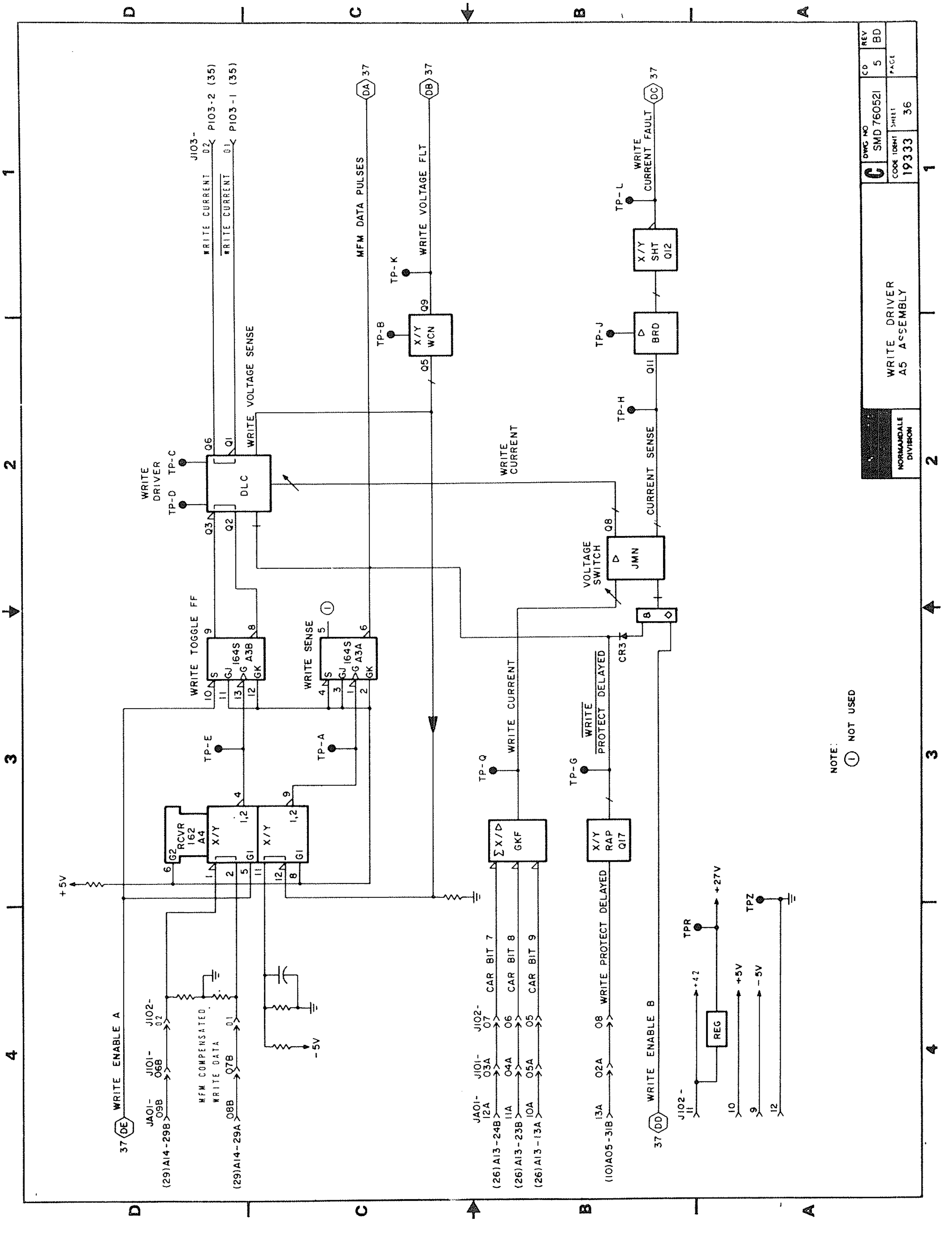
3 FOR A16 INPUT VOLTAGE PINS SEE SHEET 33.
4 WIRING ONLY USED ON UNITS WITH PLO OPTION.

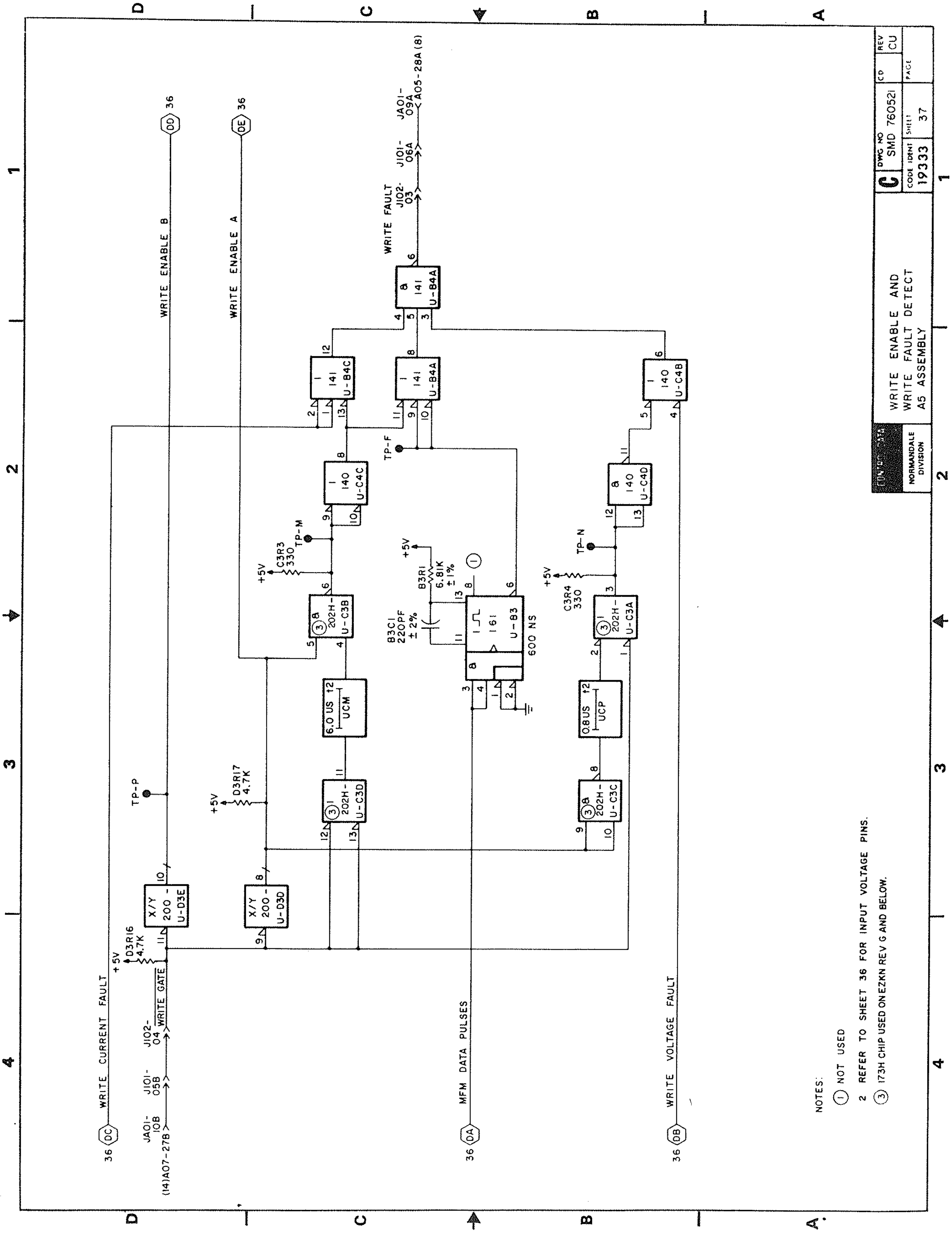
NORMANDALE DIVISION

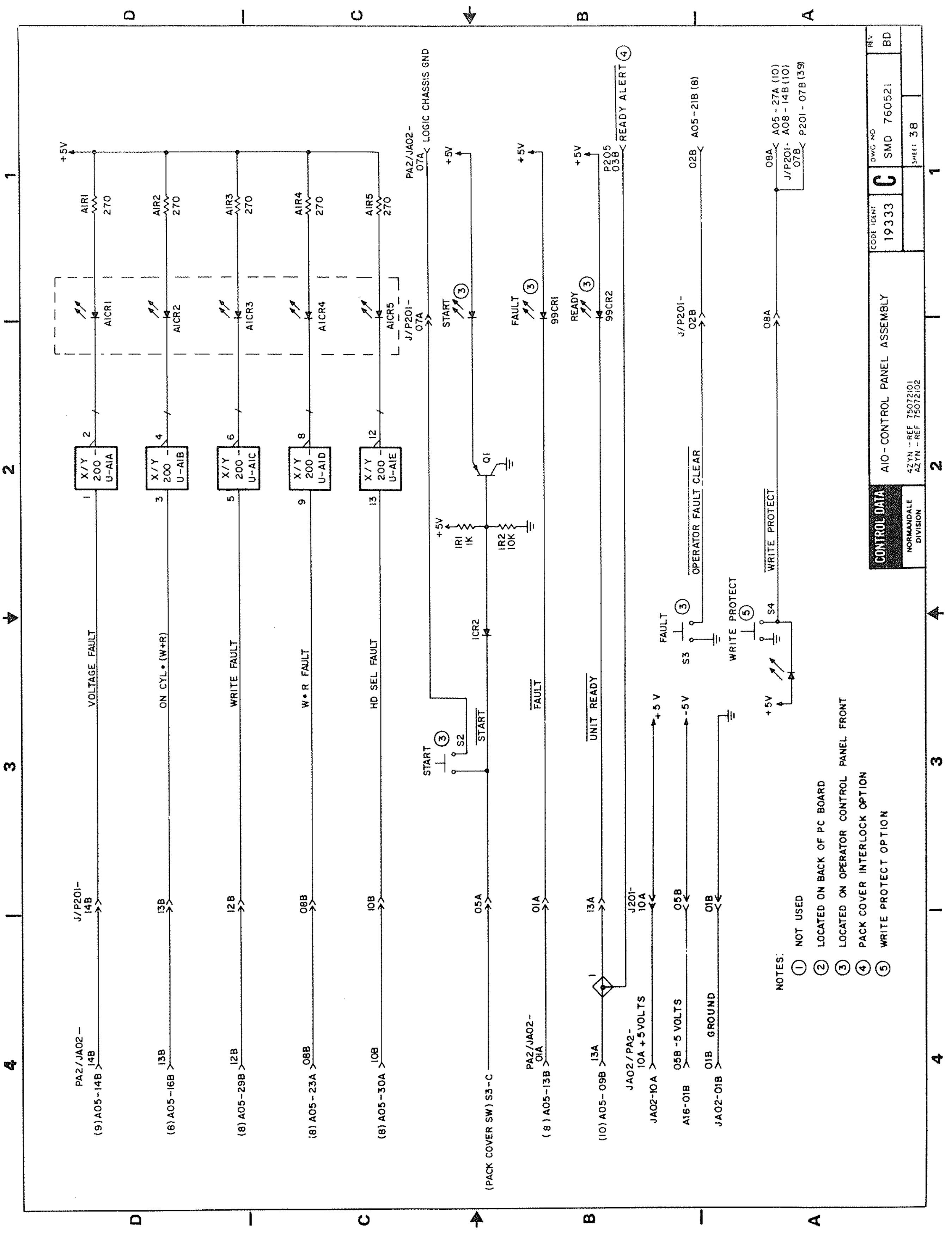
CLOCK AND DATA OUTPUT
LOC: A16

CODE IDENT		DWG NO	CD	REV
19333	C	SMD 760521		BD
		SHEET 34		


HEAD SELECT AND READ PREAMP A5 ASSEMBLY
CONTROL DATA
NORMANDALE DIVISION
C
DWG NO SMD 760521
CODE IDENT 19333
SHEET 35
REV DE
TP-H0 HEAD 0
TP-H1 HEAD 1
TP-H2 HEAD 2
TP-H3 HEAD 3
TP-H4 HEAD 4
X→Y DCDR 191 E2
146 U-E1E
146 U-E1D
146 U-E1A
146 U-E1B
146 U-E1C
146 U-E1F
∫X/Y VHK
∫X/Y LDK
X/Y MZJ
READ ENABLE
MULT HEAD SELECT FAULT
HEAD ALIGNMENT OUTPUT
READ DATA ANALOG
RAW READ DATA
ADDRESS MARK DETECT
MISSING ADDRESS
ADDRESS MARK ENABLE
WRITE GATE
WRITE CURRENT
HEAD SEL BIT 2
HEAD SEL BIT 1
HEAD SEL BIT 0
GND
A1CR1
A1CR2
AZJ
BZJ
329 AR11
309 AR16
CZJ Q19,Q20
DZJ Q15
CD 330 AR18
301 AR10
X/Y AAC +20MV TO -70MV
AR17
REG
NOTE ① NOT USED
+5V
-5V
-6V
+6V
+22V
+11.2V
-11.2V
TPA
TPB
TPC
TPD
TPE
TPF
TPG
TPJ
TPL
TPM
TPN
TPP
TPQ
TPR
TPS
TPZ
CR1
A05-30B(8)
A15-08B(30)
A15-07B(30)
A15-21B(31)
A15-22B(31)
(27)A13-16A
(21)A11-25A
(13)A06-32B
(13)A06-33B
(13)A06-32A
A16-34A

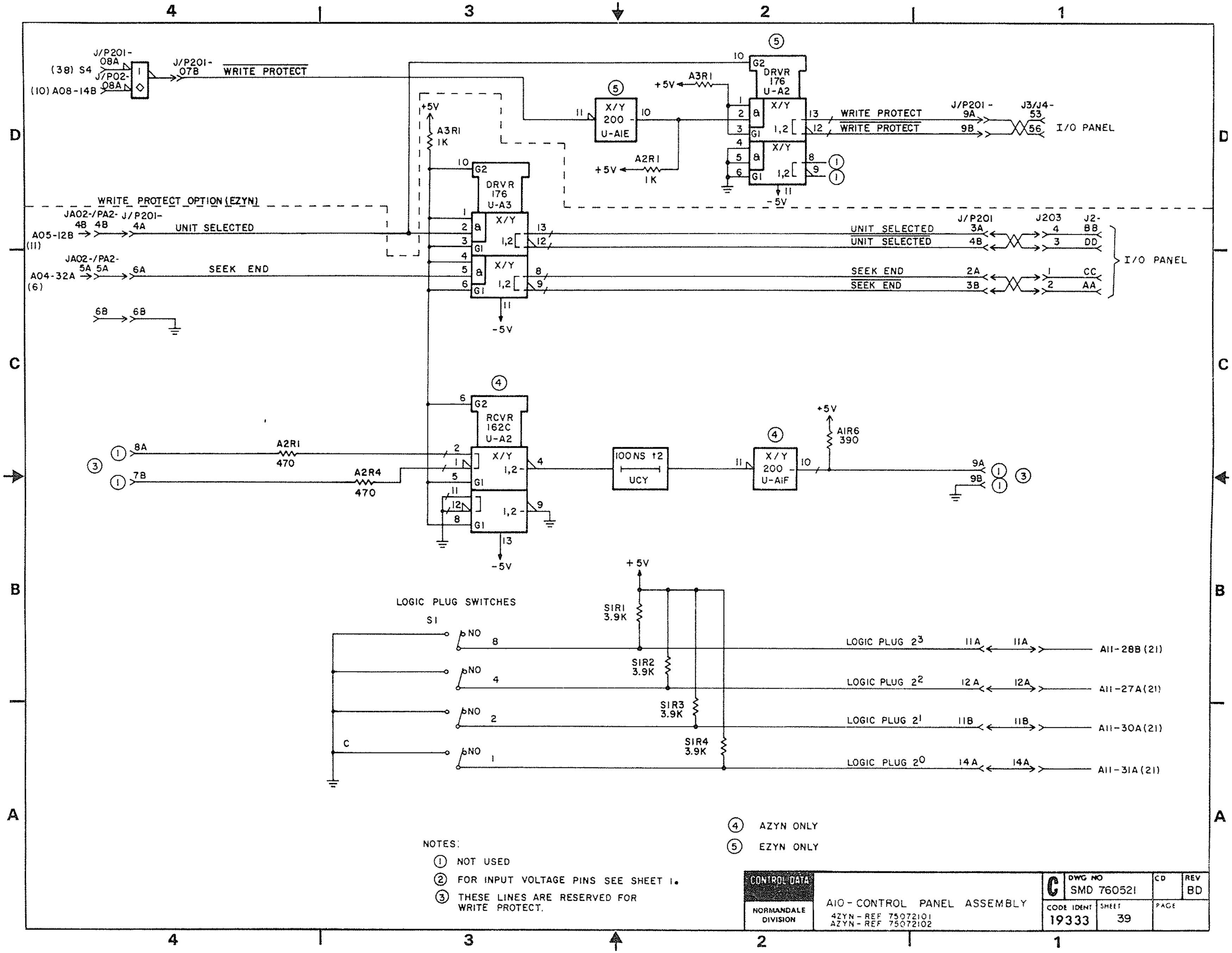

WRITE DRIVER
A5 ASSEMBLY
NORMANDALE DIVISION
C
CODE IDENT 19333
DWG NO SMD 760521
CD 5
REV BD
SHEET 36
WRITE CURRENT
WRITE CURRENT
J103-
02
01
P103-2 (35)
P103-1 (35)
MFM DATA PULSES
DA 37
WRITE VOLTAGE FLT
DB 37
WRITE CURRENT FAULT
DC 37
TP-L
X/Y SHT Q12
TP-K
Q9
X/Y WCN
Q5
TP-B
BRD
TP-J
Q11
TP-H
WRITE VOLTAGE SENSE
Q6
Q1
WRITE DRIVER
TP-C
TP-D
DLC
Q3
Q2
WRITE CURRENT
CURRENT SENSE
Q8
VOLTAGE SWITCH
JMN
CR3
WRITE TOGGLE FF
164S A3B
S GJ G GK
9 8 10 11 13 12
WRITE SENSE
164S A3A
5 6 4 3 1 2
①
TP-E
TP-A
RCVR 162 A4
X/Y
X/Y
G2 G1 G1
1,2
4
9
6 1 2 5 11 12 8
+5V
-5V
WRITE ENABLE A
37 DE
JA01-09B
J101-06B
J102-02
(29)A14-29B
MFM COMPENSATED WRITE DATA
08B
07B
01
(29)A14-29A
TP-Q
WRITE CURRENT
Σ X/D GKF
CAR BIT 7
CAR BIT 8
CAR BIT 9
JA01-12A 11A 10A
J101-03A 04A 05A
J102-07 06 05
(26)A13-24B
(26)A13-23B
(26)A13-13A
TP-G
WRITE PROTECT DELAYED
X/Y RAP Q17
WRITE PROTECT DELAYED
13A 02A 08
(10)A05-31B
WRITE ENABLE B
37 DD
J102-11
10 9 12
+42
REG
TPR
+27V
+5V
-5V
TPZ
NOTE:
① NOT USED
A B C D
1 2 3 4


WRITE ENABLE B
DD 36
WRITE ENABLE A
DE 36
WRITE FAULT
J102-03
J101-06A
JA01-09A
A05-28A (8)
& 141 U-B4A
1 141 U-B4C
1 141 U-B4A
1 140 U-C4B
TP-F
1 140 U-C4C
& 140 U-C4D
TP-M
C3R3 330
+5V
③ & 202H- U-C3B
B3R1 6.81K ±1%
B3C1 220PF ± 2%
1 161 U-B3
600 NS
①
TP-N
C3R4 330
③ 1 202H- U-C3A
6.0 US ↑2 UCM
0.8 US ↑2 UCP
③ 1 202H- U-C3D
③ & 202H- U-C3C
D3R17 4.7K
TP-P
X/Y 200- U-D3E
X/Y 200- U-D3D
D3R16 4.7K
WRITE CURRENT FAULT
36 DC
JA01-10B
(14)A07-27B
J101-05B
J102-04
WRITE GATE
MFM DATA PULSES
36 DA
WRITE VOLTAGE FAULT
36 DB
NOTES:
① NOT USED
2 REFER TO SHEET 36 FOR INPUT VOLTAGE PINS.
③ 173H CHIP USED ON EZKN REV G AND BELOW.
CONTROL DATA
NORMANDALE DIVISION
WRITE ENABLE AND WRITE FAULT DETECT A5 ASSEMBLY
C
CODE IDENT 19333
DWG NO SMD 76052I
SHEET 37
CD
PAGE
REV CU
D C B A
1 2 3 4

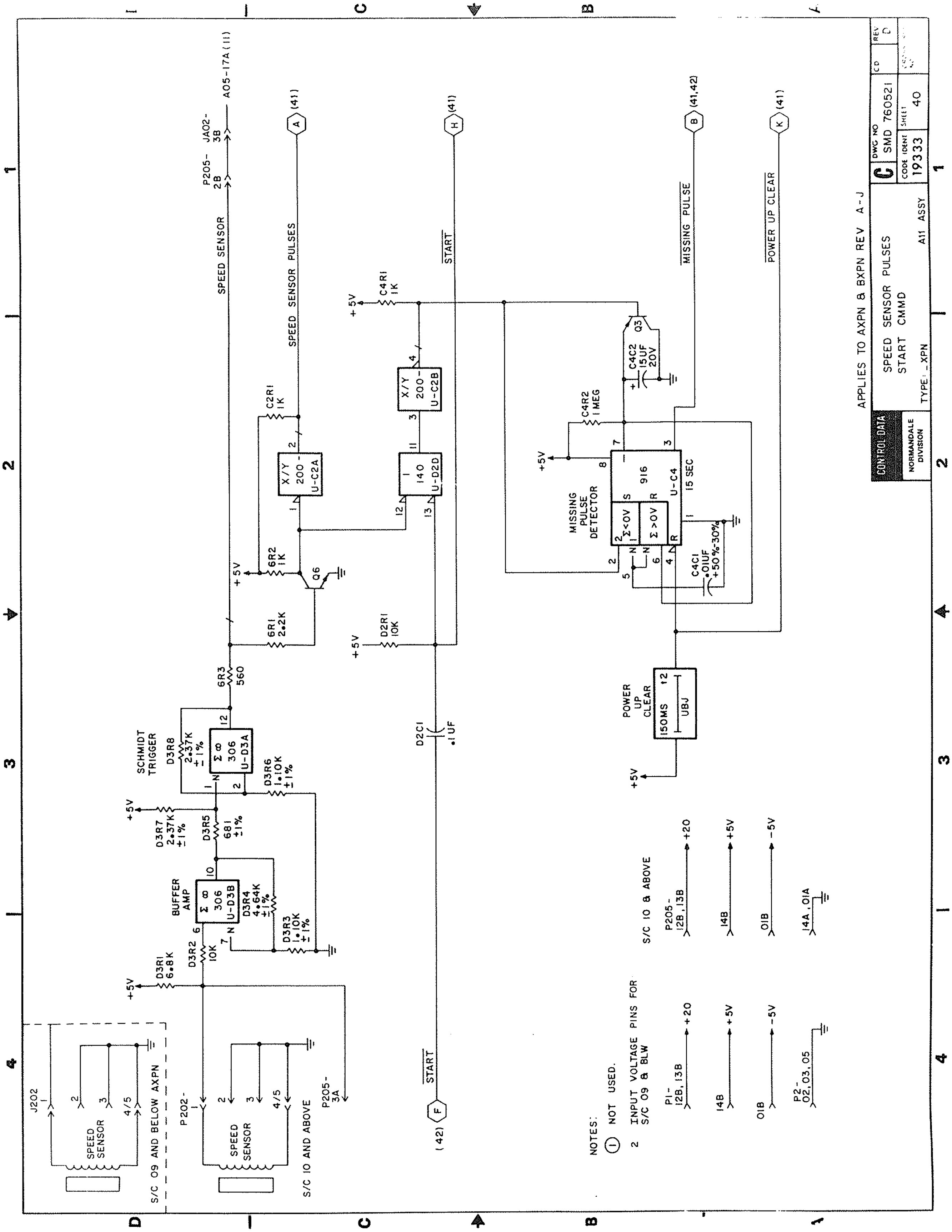


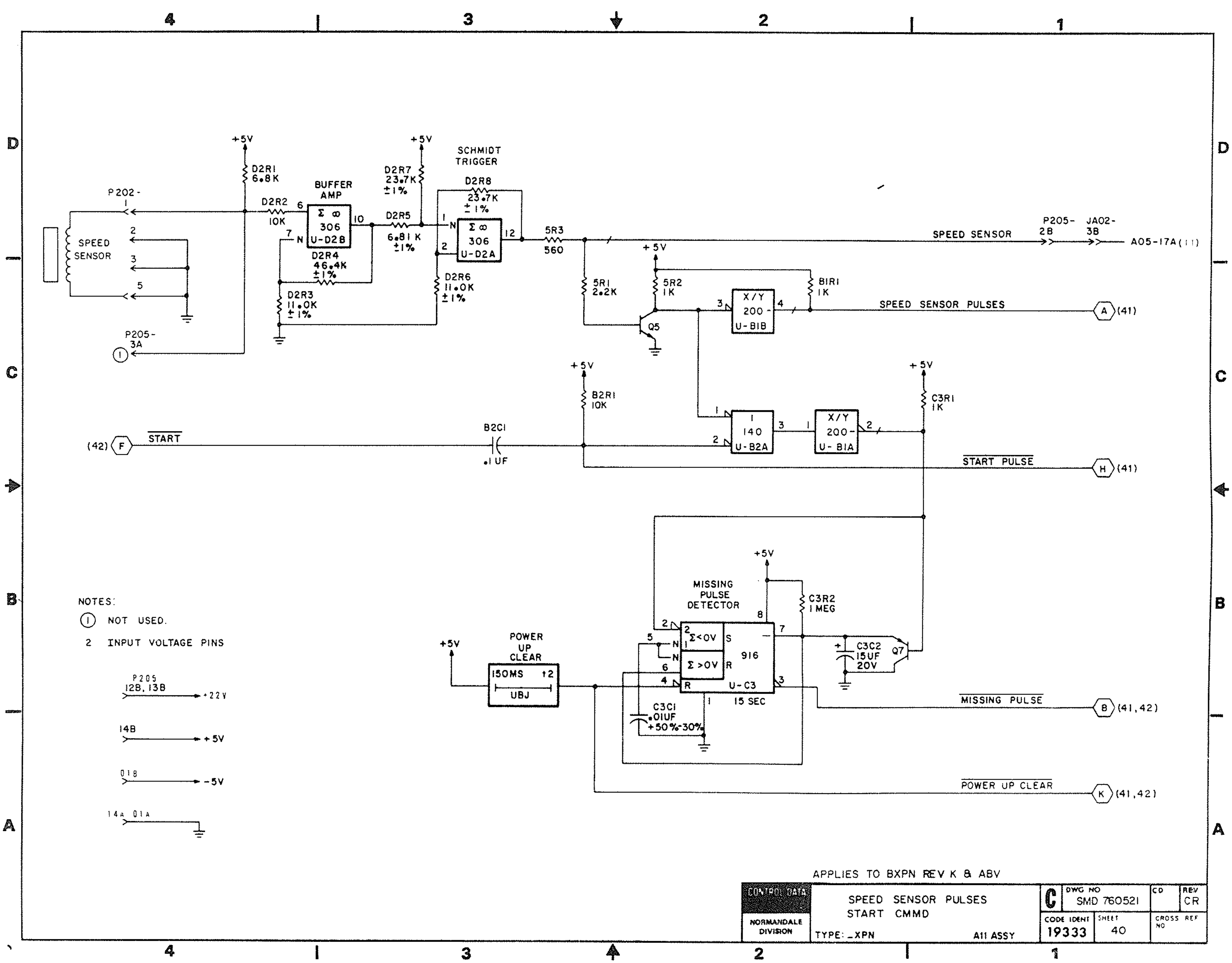
NOTES:
① NOT USED
② LOCATED ON BACK OF PC BOARD
③ LOCATED ON OPERATOR CONTROL PANEL FRONT
④ PACK COVER INTERLOCK OPTION
⑤ WRITE PROTECT OPTION

CONTROL DATA
NORMANDALE DIVISION
AIO-CONTROL PANEL ASSEMBLY
4ZYN - REF 75072101
AZYN - REF 75072102
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 38
REV BD



4
3
2
1
D
C
B
A
(38) S4
(10) A08-14B
J/P201-08A
J/P02-08A
J/P201-07B
WRITE PROTECT
⑤
X/Y 200 U-A1E
11
10
A2R1 1K
+5V
A3R1
DRVR 176 U-A2
G2
G1
X/Y
1,2
13
12
WRITE PROTECT
J/P201-9A
9B
J3/J4-53
56
I/O PANEL
-5V
+5V
A3R1 1K
DRVR 176 U-A3
WRITE PROTECT OPTION (EZYN)
JA02-/PA2-4B 4B
J/P201-4A
A05-12B (11)
UNIT SELECTED
JA02-/PA2-5A 5A
6A
A04-32A (6)
SEEK END
6B
6B
J/P201 3A
4B
2A
3B
J203 4
3
1
2
J2-BB
DD
CC
AA
I/O PANEL
④
RCVR 162C U-A2
A2R1 470
A2R4 470
8A
7B
③
①
100NS ↑2
UCY
X/Y 200 U-A1F
+5V
A1R6 390
9A
9B
LOGIC PLUG SWITCHES
S1
NO
8
4
2
1
C
+5V
S1R1 3.9K
S1R2 3.9K
S1R3 3.9K
S1R4 3.9K
LOGIC PLUG 2^3
LOGIC PLUG 2^2
LOGIC PLUG 2^1
LOGIC PLUG 2^0
11A
12A
11B
14A
A11-28B (21)
A11-27A (21)
A11-30A (21)
A11-31A (21)
NOTES:
① NOT USED
② FOR INPUT VOLTAGE PINS SEE SHEET 1.
③ THESE LINES ARE RESERVED FOR WRITE PROTECT.
④ AZYN ONLY
⑤ EZYN ONLY
CONTROL DATA
NORMANDALE DIVISION
A10-CONTROL PANEL ASSEMBLY
4ZYN-REF 75072101
AZYN-REF 75072102
C
DWG NO SMD 760521
CD
REV BD
CODE IDENT 19333
SHEET 39
PAGE


APPLIES TO AXPN & BXPN REV A-J
CONTROL DATA
NORMANDALE DIVISION
SPEED SENSOR PULSES
START CMMD
TYPE: _XPN
A11 ASSY
C
DWG NO SMD 760521
CODE IDENT 19333
SHEET 40
REV D
SPEED SENSOR
P205- 2B
JA02- 3B
A05-17A (11)
SPEED SENSOR PULSES
A (41)
START
H (41)
MISSING PULSE
B (41,42)
POWER UP CLEAR
K (41)
+5V
C4R1 1K
X/Y 200- U-C2B
C2R1 1K
X/Y 200- U-C2A
1 140 U-D2D
Q3
C4C2 15UF 20V
C4R2 1 MEG
916 U-C4
15 SEC
MISSING PULSE DETECTOR
Σ<0V
Σ>0V
S
R
C4C1 .01UF +50%-30%
6R2 1K
Q6
6R1 2.2K
D2R1 10K
6R3 560
POWER UP CLEAR
150MS
UBJ
D2C1 .1UF
SCHMIDT TRIGGER
D3R8 2.37K ±1%
Σ ∞ 306 U-D3A
D3R6 1.10K ±1%
D3R7 2.37K ±1%
D3R5 681 ±1%
BUFFER AMP
Σ ∞ 306 U-D3B
D3R4 4.64K ±1%
D3R3 1.10K ±1%
D3R2 10K
D3R1 6.8K
S/C 10 & ABOVE
P205- 12B,13B
+20
14B
01B
-5V
14A, 01A
J202
SPEED SENSOR
S/C 09 AND BELOW AXPN
P202-
S/C 10 AND ABOVE
P205- 3A
START
F (42)
NOTES:
① NOT USED.
2 INPUT VOLTAGE PINS FOR S/C 09 & BLW
P1- 12B, 13B
P2- 02, 03, 05
D
C
B
A
1
2
3
4



NOTES:

① NOT USED.

2 INPUT VOLTAGE PINS

APPLIES TO BXPN REV K & ABV

CONTROL DATA

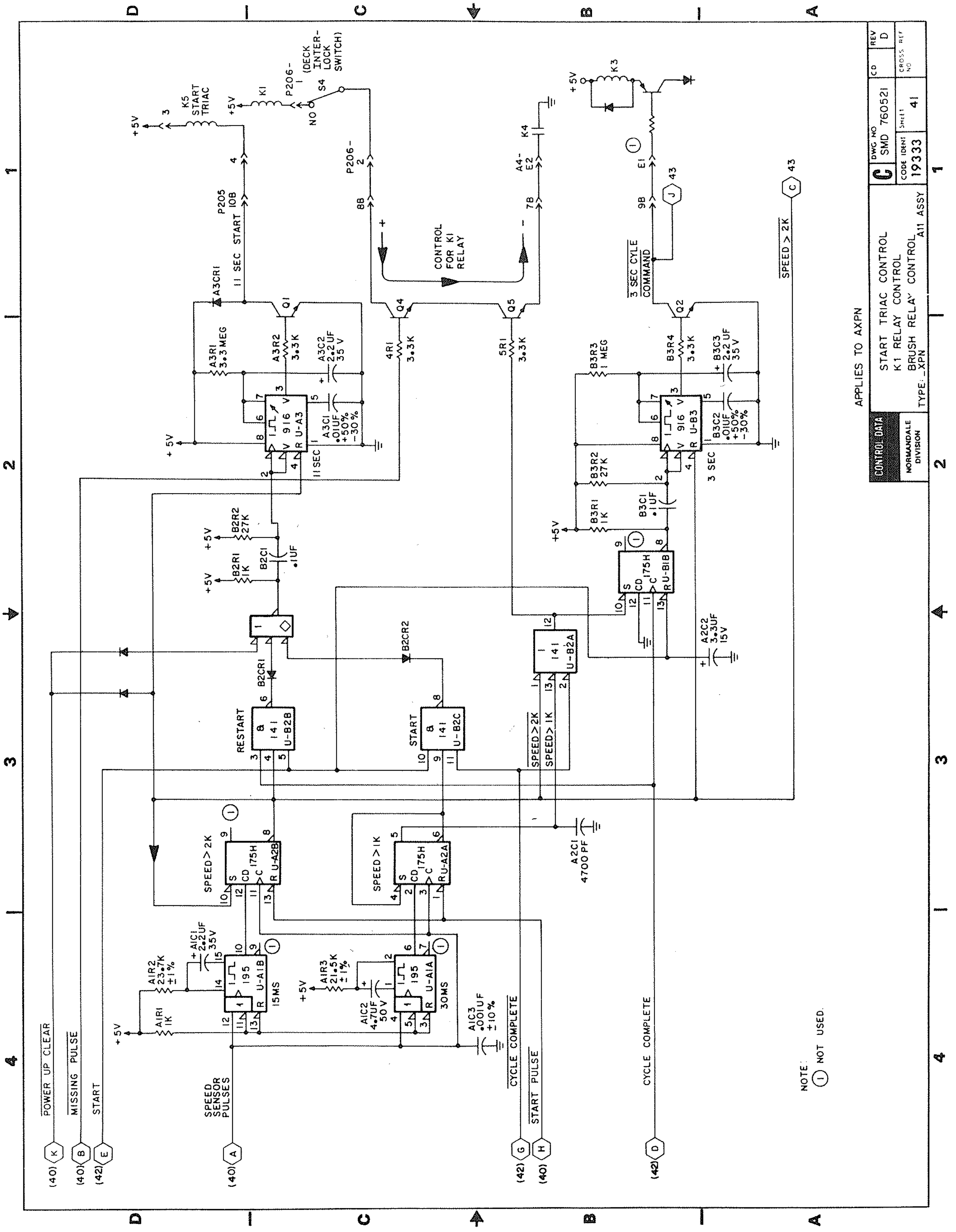
NORMANDALE DIVISION

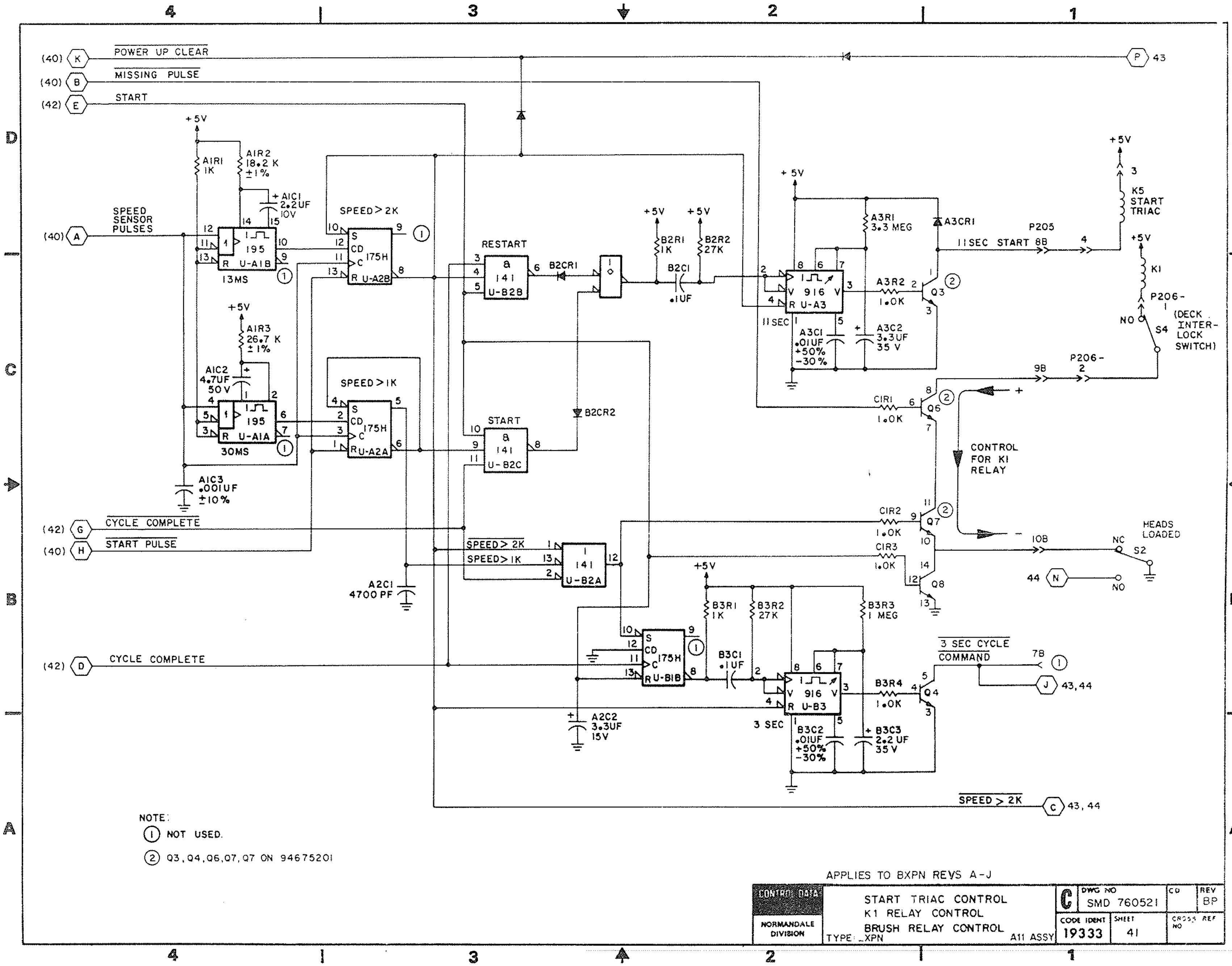
SPEED SENSOR PULSES
START CMMD

TYPE: _XPN A11 ASSY

C DWG NO SMD 760521 CD REV CR

CODE IDENT 19333 SHEET 40 CROSS REF NO


APPLIES TO AXPN
CONTROL DATA
NORMANDALE DIVISION
START TRIAC CONTROL
K1 RELAY CONTROL
BRUSH RELAY CONTROL
TYPE: XPN
A11 ASSY
C
DWG NO SMD 760521
CD
REV D
CODE IDENT 19333
SHEET 41
CROSS REF NO
NOTE: ① NOT USED.
POWER UP CLEAR
MISSING PULSE
START
SPEED SENSOR PULSES
CYCLE COMPLETE
START PULSE
CYCLE COMPLETE
SPEED > 2K
3 SEC CYCLE COMMAND
11 SEC START
CONTROL FOR K1 RELAY
K5 START TRIAC
K1
P206-1 (DECK INTERLOCK SWITCH)
S4
NO
P205 10B
P206-2
8B
A4-E2
K4
7B
9B
E1
K3
+5V
U-A3 916
U-B3 916
U-A1B 195 15MS
U-A1A 195 30MS
U-A2B 175H
U-A2A 175H
U-B1B 175H
U-B2B 141 RESTART
U-B2C 141 START
U-B2A 141
A3R1 3.3 MEG
A3R2 3.3K
A3C2 2.2UF 35V
A3C1 .01UF +50% -30%
A3CR1
Q1
Q2
Q4
Q5
4R1 3.3K
5R1 3.3K
B3R3 1 MEG
B3R4 3.3K
B3C3 2.2UF 35V
B3C2 .01UF +50% -30%
B3R2 27K
B3R1 1K
B3C1 .1UF
B2R2 27K
B2R1 1K
B2C1 .1UF
B2CR1
B2CR2
A2C2 3.3UF 15V
A2C1 4700 PF
A1R1 1K
A1R2 23.7K ±1%
A1C1 2.2UF 35V
A1R3 21.5K ±1%
A1C2 4.7UF 50V
A1C3 .001UF ±10%
SPEED > 2K
SPEED > 1K
11 SEC
3 SEC
(40) K
(40) B
(42) E
(40) A
(42) G
(40) H
(42) D
J 43
C 43
D C B A
1 2 3 4



NOTE:

① NOT USED.

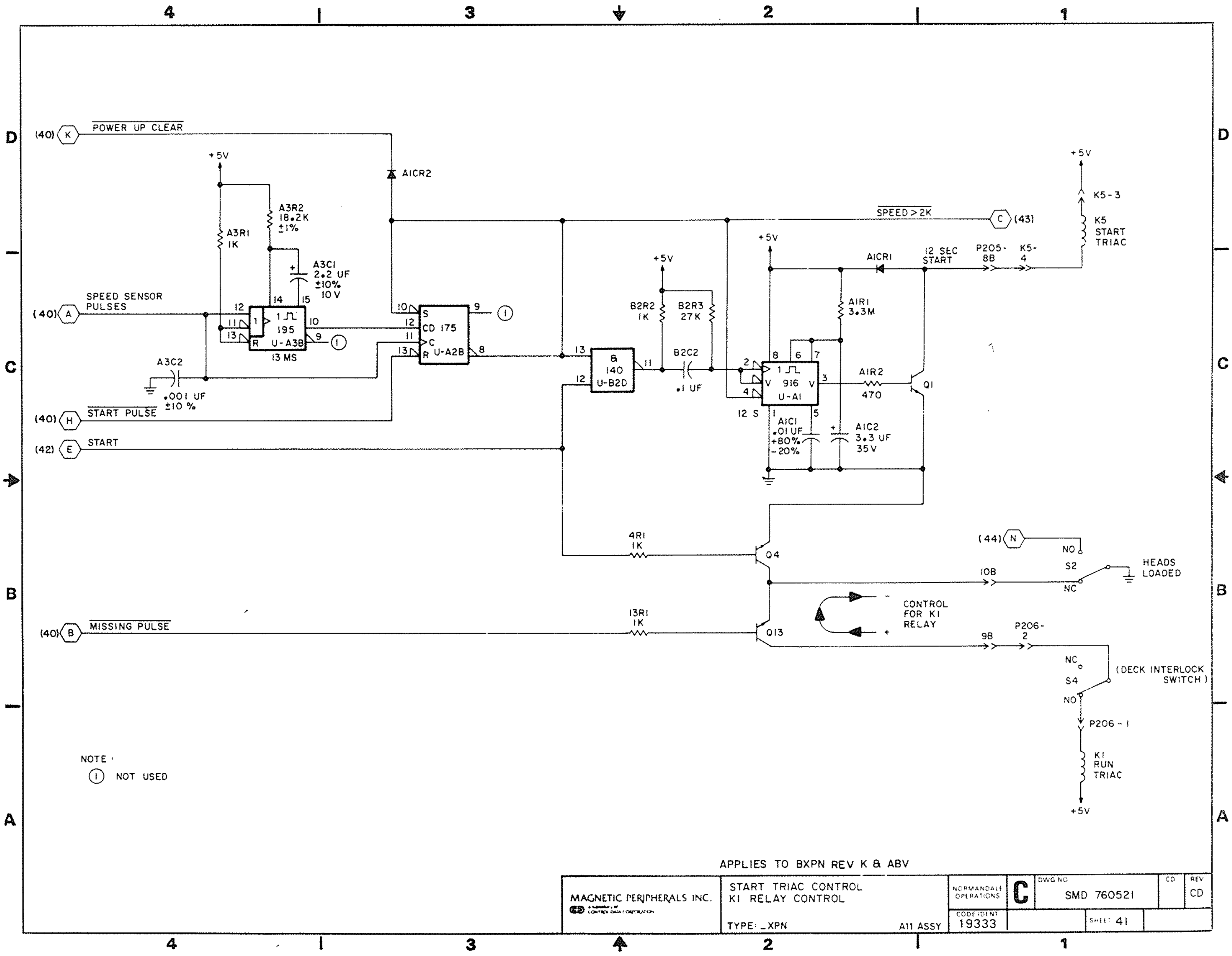
② Q3, Q4, Q6, Q7, Q7 ON 94675201

APPLIES TO BXPN REVS A-J

CONTROL DATA
NORMANDALE DIVISION

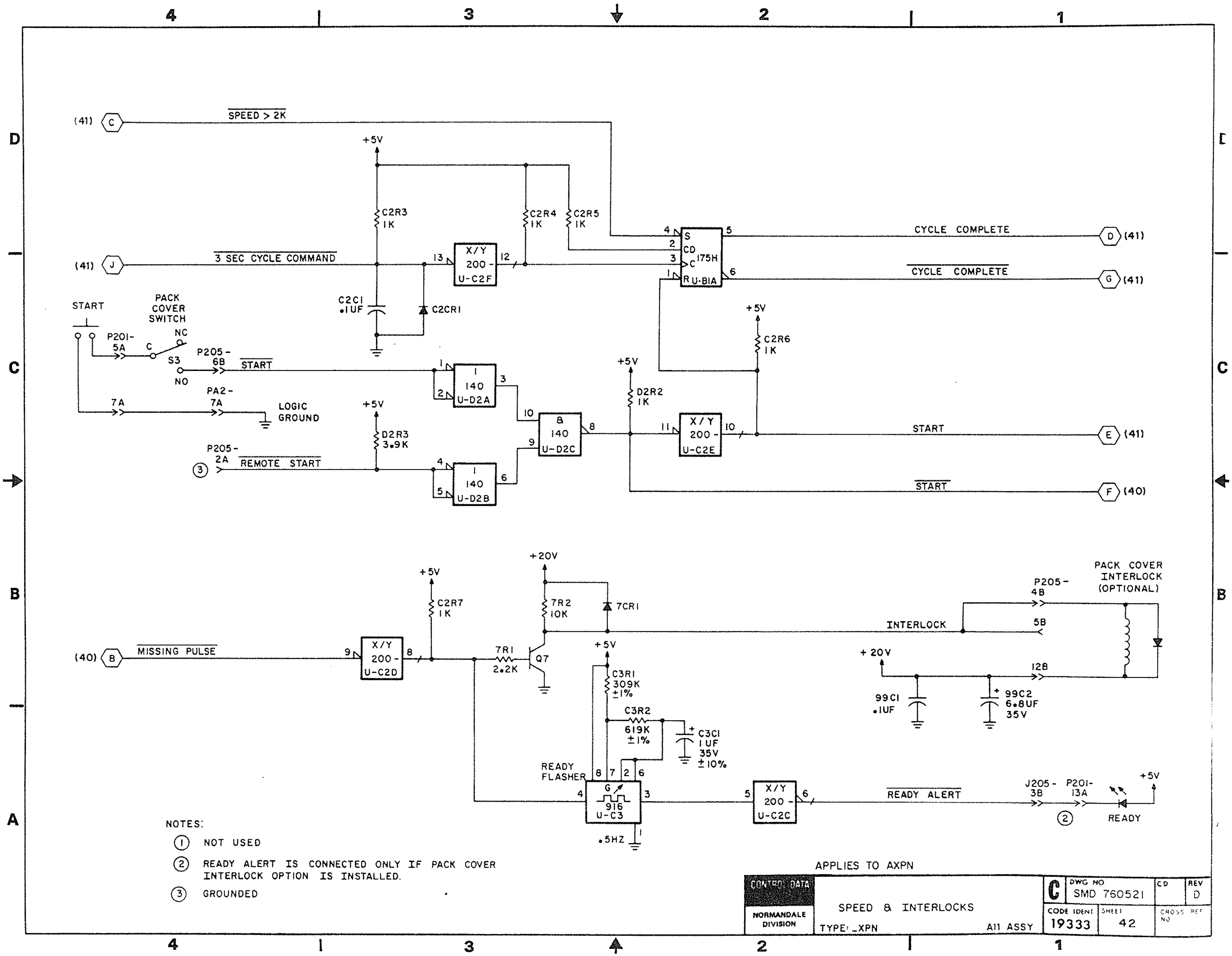
START TRIAC CONTROL
K1 RELAY CONTROL
BRUSH RELAY CONTROL
TYPE XPN
A11 ASSY

C DWG NO SMD 760521
CD
REV BP
CODE IDENT 19333
SHEET 41
CROSS REF NO



APPLIES TO BXPN REV K & ABV

MAGNETIC PERIPHERALS INC. a subsidiary of CONTROL DATA CORPORATION	START TRIAC CONTROL K1 RELAY CONTROL TYPE: _XPN A11 ASSY	NORMANDALE OPERATIONS CODE IDENT 19333	C	DWG NO SMD 760521 SHEET 41	CO REV CD



NOTES:

① NOT USED

② READY ALERT IS CONNECTED ONLY IF PACK COVER INTERLOCK OPTION IS INSTALLED.

③ GROUNDED

APPLIES TO AXPN

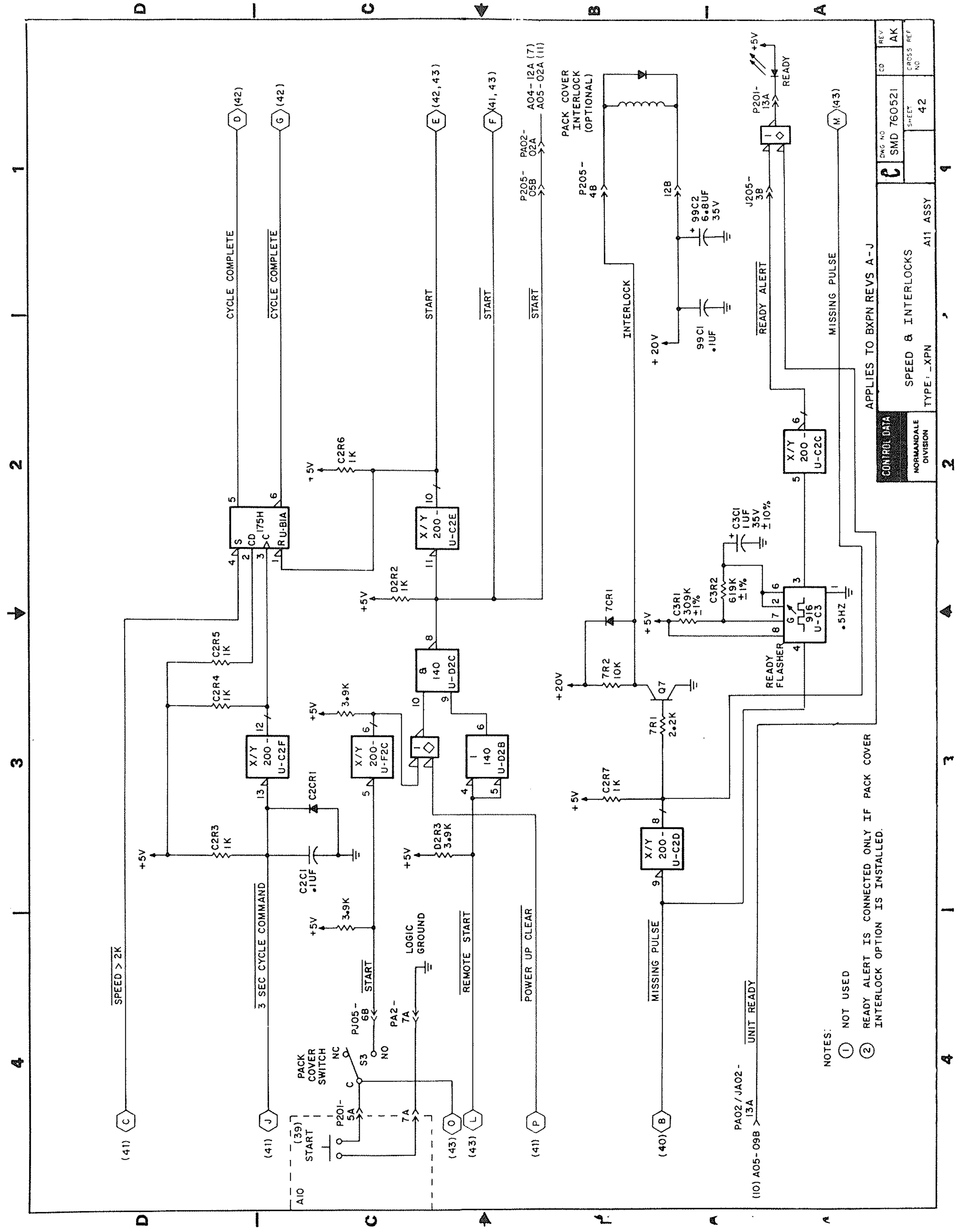
CONTROL DATA
NORMANDALE DIVISION

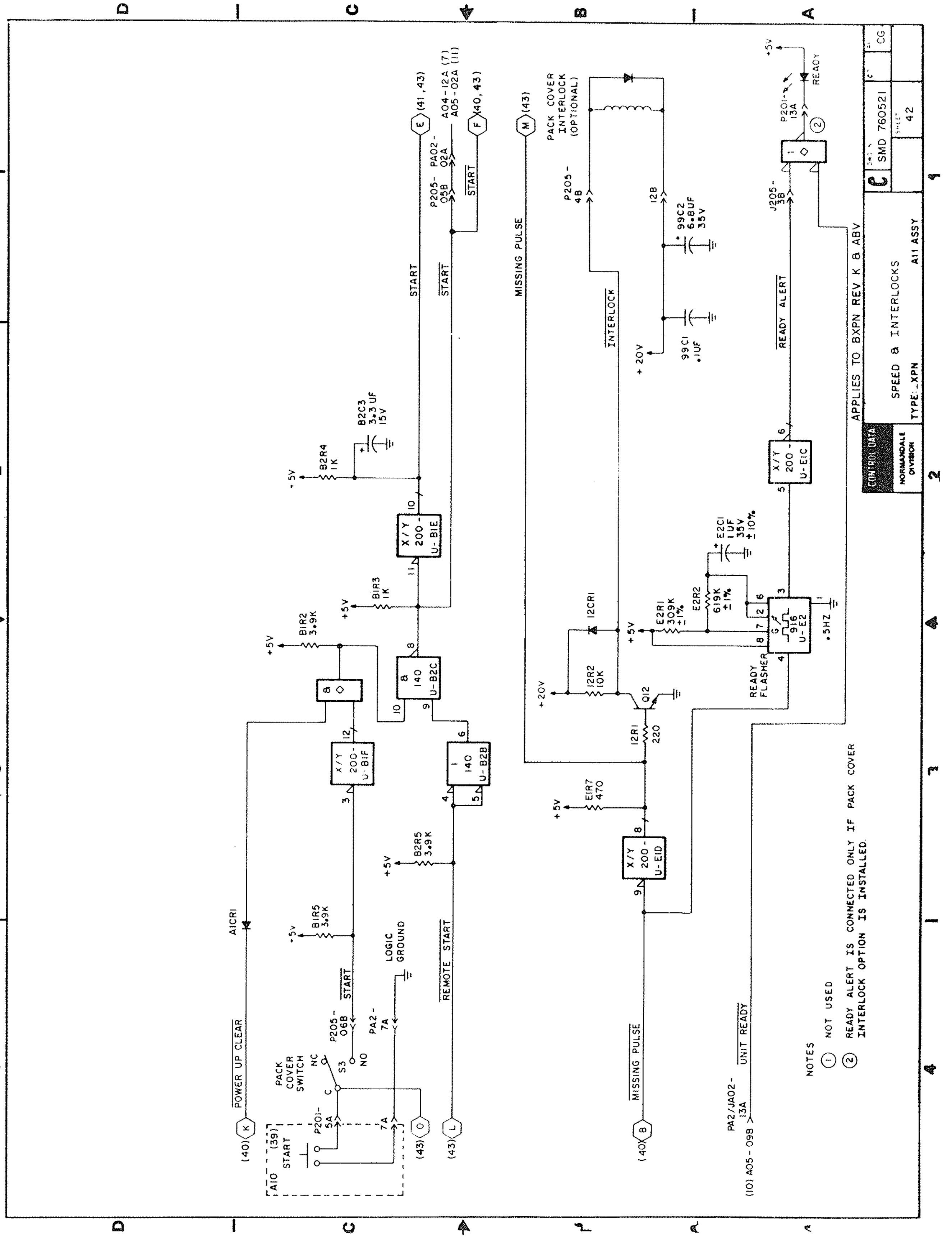
SPEED & INTERLOCKS

TYPE: _XPN A11 ASSY

DWG NO SMD 760521 CD REV D

CODE IDENT 19333 SHEET 42 CROSS REF NO


APPLIES TO BXPN REVS A-J
SPEED & INTERLOCKS
TYPE: _XPN
A11 ASSY
CONTROL DATA
NORMANDALE DIVISION
DWG NO SMD 760521
SHEET 42
CD
REV AK
CROSS REF NO
NOTES:
① NOT USED
② READY ALERT IS CONNECTED ONLY IF PACK COVER INTERLOCK OPTION IS INSTALLED.
CYCLE COMPLETE
CYCLE COMPLETE
(42)
(42)
START
START
START
(42,43)
(41,43)
P205-05B
PA02-02A
A04-12A (7)
A05-02A (11)
PACK COVER INTERLOCK (OPTIONAL)
P205-4B
12B
INTERLOCK
+20V
99C2 6.8UF 35V
99C1 .1UF
READY ALERT
J205-3B
P201-13A
READY
+5V
MISSING PULSE
(43)
SPEED > 2K
(41)
3 SEC CYCLE COMMAND
(41)
175H U-B1A
S CD C R
C2R5 1K
C2R4 1K
C2R3 1K
X/Y 200-U-C2F
C2CR1
C2C1 .1UF
+5V
C2R6 1K
X/Y 200-U-C2E
D2R2 1K
& 140 U-D2C
X/Y 200-U-F2C
3.9K
3.9K
1 140 U-D2B
D2R3 3.9K
LOGIC GROUND
START
PJ05-6B
PA2-7A
PACK COVER SWITCH
S3
NC NO C
P201-5A
7A
(39) START
A10
(43)
(43)
REMOTE START
POWER UP CLEAR
(41)
+20V
7R2 10K
7CR1
Q7
7R1 2.2K
C2R7 1K
X/Y 200-U-C2D
MISSING PULSE
(40)
C3R1 309K ±1%
C3R2 619K ±1%
C3C1 1UF 35V ±10%
916 U-C3
.5HZ
READY FLASHER
X/Y 200-U-C2C
UNIT READY
PA02/JA02-13A
(10) A05-09B
D C B A
1 2 3 4



APPLIES TO BXPN REV K & ABV

CONTROL DATA NORMANDALE DIVISION

SPEED & INTERLOCKS

TYPE: XPN

A11 ASSY

C SMD 760521

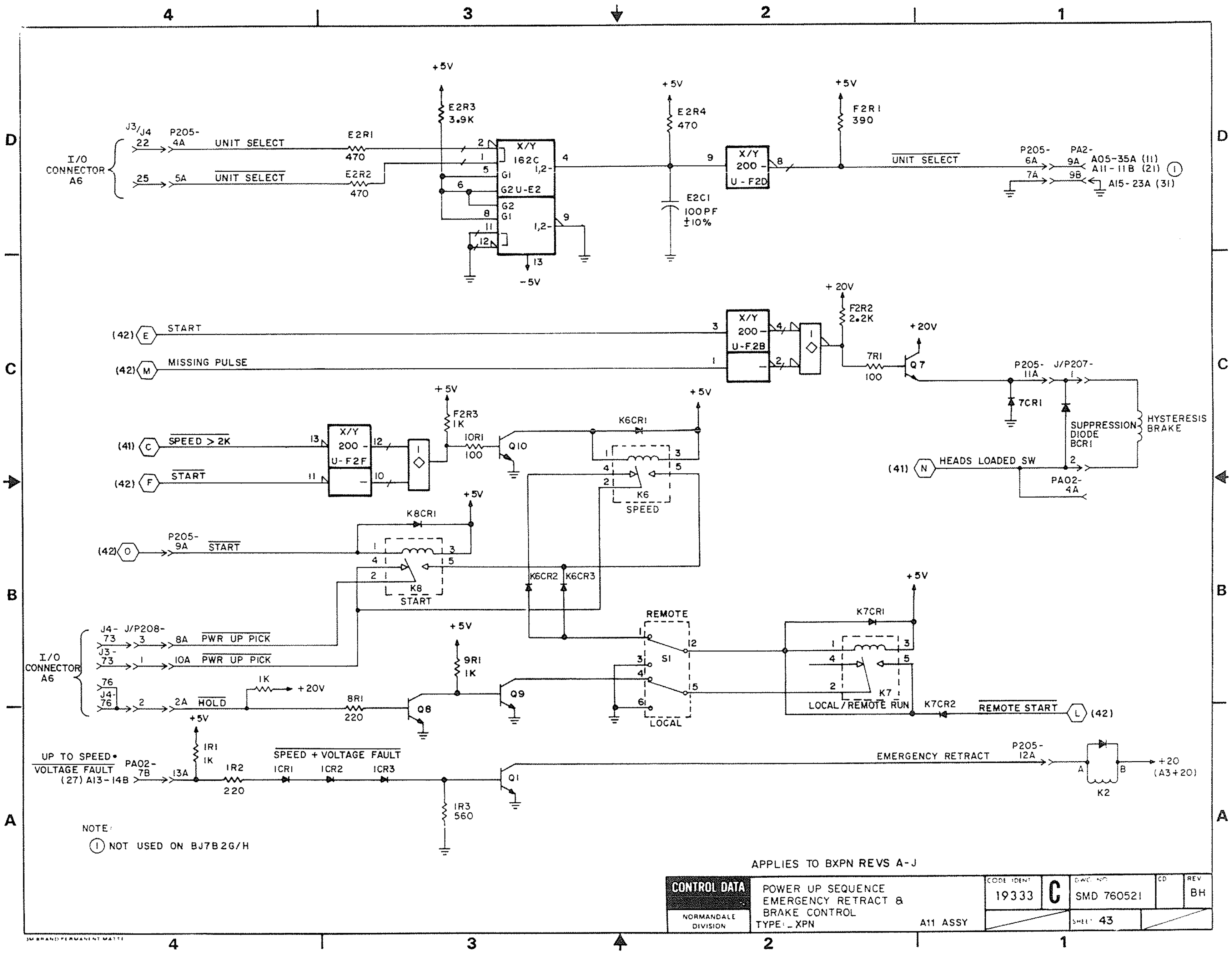
SHEET 42

CG

NOTES

① NOT USED

② READY ALERT IS CONNECTED ONLY IF PACK COVER INTERLOCK OPTION IS INSTALLED.

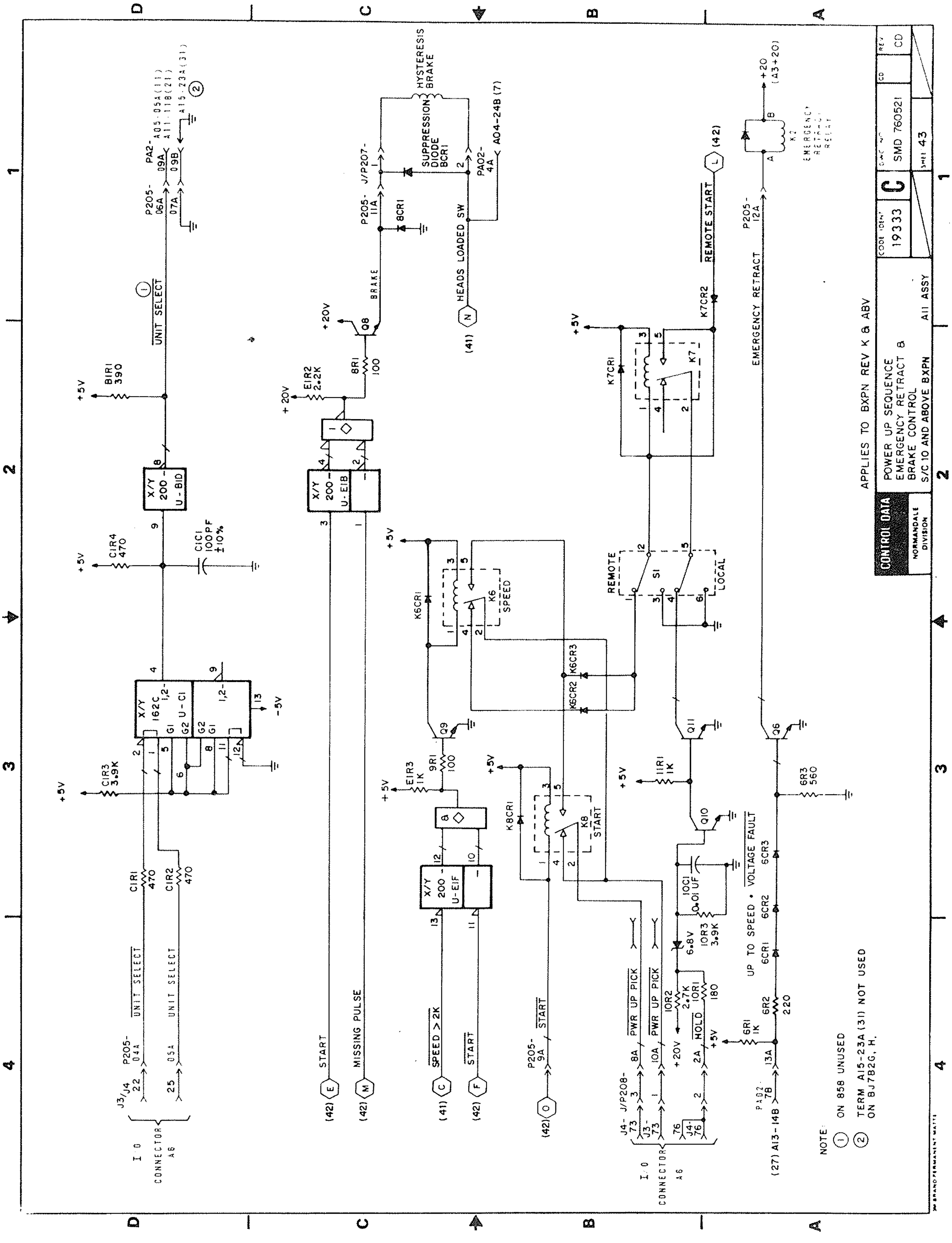


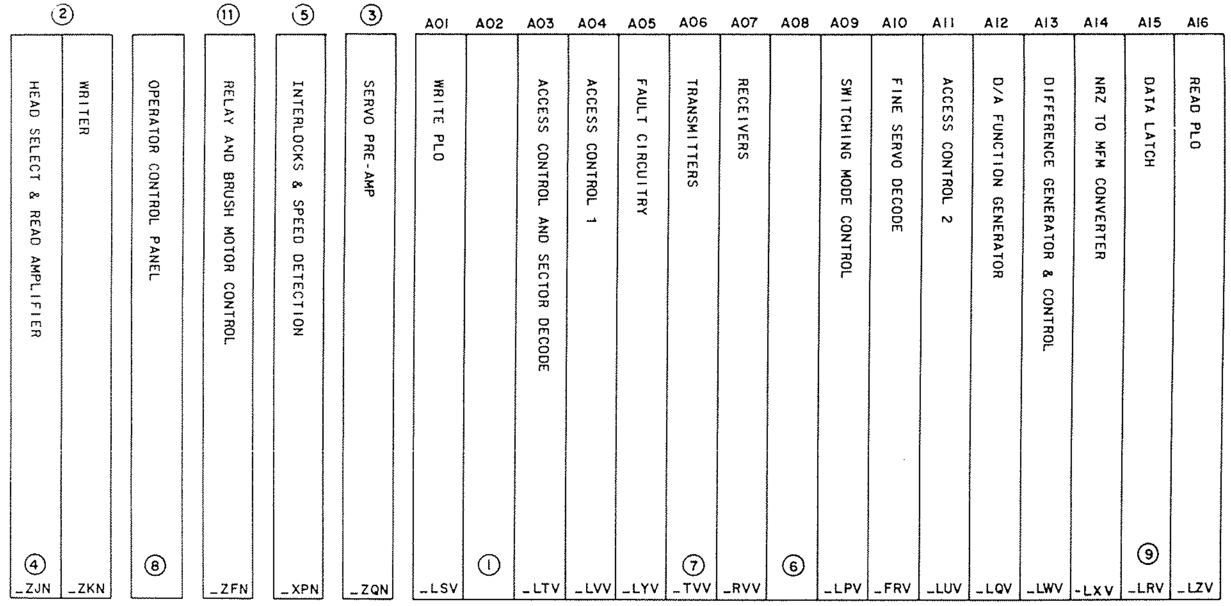
NOTE:

① NOT USED ON BJ7B2G/H

APPLIES TO BXPN REVS A-J

CONTROL DATA NORMANDALE DIVISION	POWER UP SEQUENCE EMERGENCY RETRACT & BRAKE CONTROL TYPE: XPN A11 ASSY	CODE IDENT 19333	C	DWG NO SMD 760521 SHEET 43	CD	REV BH

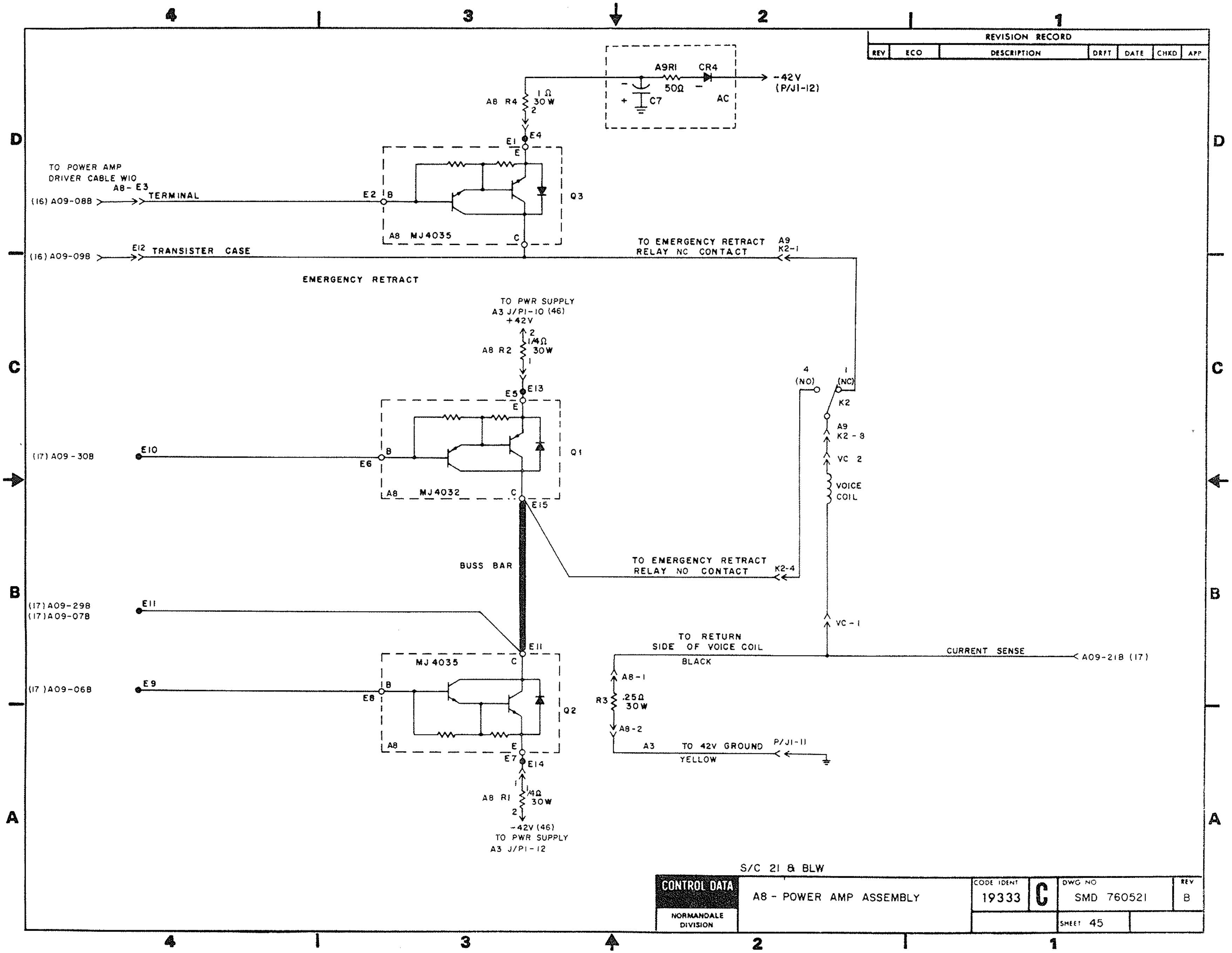

APPLIES TO BXPN REV K & ABV
CONTROL DATA
NORMANDALE DIVISION
POWER UP SEQUENCE
EMERGENCY RETRACT &
BRAKE CONTROL
S/C 10 AND ABOVE BXPN
A11 ASSY
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 43
REV CD
NOTE:
① ON 858 UNUSED
② TERM A15-23A (31) NOT USED ON BJ7B2G, H.
UNIT SELECT
UNIT SELECT
I O CONNECTOR A6
J3/J4 22
25
P205-04A
05A
C1R1 470
C1R2 470
C1R3 3.9K
+5V
X/Y 162C U-C1
C1R4 470
C1C1 100PF ±10%
X/Y 200 U-B1D
B1R1 390
P205-06A
07A
PA2-09A
09B
A05-05A(11)
A11-11B(21)
A15-23A(31)
HYSTERESIS BRAKE
SUPPRESSION DIODE BCR1
J/P207-1
2
PA02-4A
A04-24B (7)
8CR1
P205-11A
BRAKE
Q8
+20V
8R1 100
E1R2 2.2K
X/Y 200 U-E1B
START
MISSING PULSE
SPEED > 2K
START
(42) E
(42) M
(41) C
(42) F
(41) N
HEADS LOADED SW
K6CR1
K6 SPEED
K6CR2
K6CR3
Q9
9R1 100
E1R3 1K
X/Y 200 U-E1F
K8CR1
K8 START
P205-9A
START
(42) O
J4- J/P208-73 3
J3-73 1
J4-76 2
8A PWR UP PICK
10A PWR UP PICK
2A HOLD
+20V
+5V
10R2 2.7K
10R1 180
6.8V
10C1 .01 UF
10R3 3.9K
Q10
Q11
11R1 1K
UP TO SPEED • VOLTAGE FAULT
6CR1
6CR2
6CR3
6R1 1K
6R2 220
6R3 560
Q6
PA02-7B
13A
(27) A13-14B
REMOTE
S1
LOCAL
K7CR1
K7
K7CR2
REMOTE START
(42) L
EMERGENCY RETRACT
P205-12A
K2 EMERGENCY RETRACT RELAY
+20 (A3+20)
D C B A
1 2 3 4



NOTES:

① NOT USED
② A 5 ASSEMBLY LOCATED BEHIND LOGIC CHASSIS AND UNDER SHROUD.
③ LOCATED ON POWER AMP ASSEMBLY NEXT TO MAGNET.
④ MZJN INSTALLED IN UNITS WITH VARIABLE SECTOR, AND FIXED SECTOR.
⑤ LOCATED UNDER DESK ASSEMBLY A11.
⑥ NOT USED; SOME PINS RESERVED FOR HEAD ALIGHMENT CARD
⑦ GTVV USED WHEN SECTOR AND INDEX ARE FOUND IN B CABLE.
⑧ EZYN USED WITH WRITE PROTECT OPTION.
⑨ KLRV USED ON BJ7B43/G
10. FOR SPECIFIC CARD TYPES, REFER TO THE SPARE PARTS LIST IN THE PARTS DATA MANUAL.
11. A4 ASSEMBLY LOCATED UNDER DECK ASSEMBLY, S/C 09 AND BELOW.

MAGNETIC PERIPHERALS INC. a subsidiary of CONTROL DATA CORPORATION	CHASSIS MAP	NORMANDALE OPERATIONS	C	DWG NO SMD 760521	CD	REV BZ
		CODE IDENT 19333		SHEET 44		



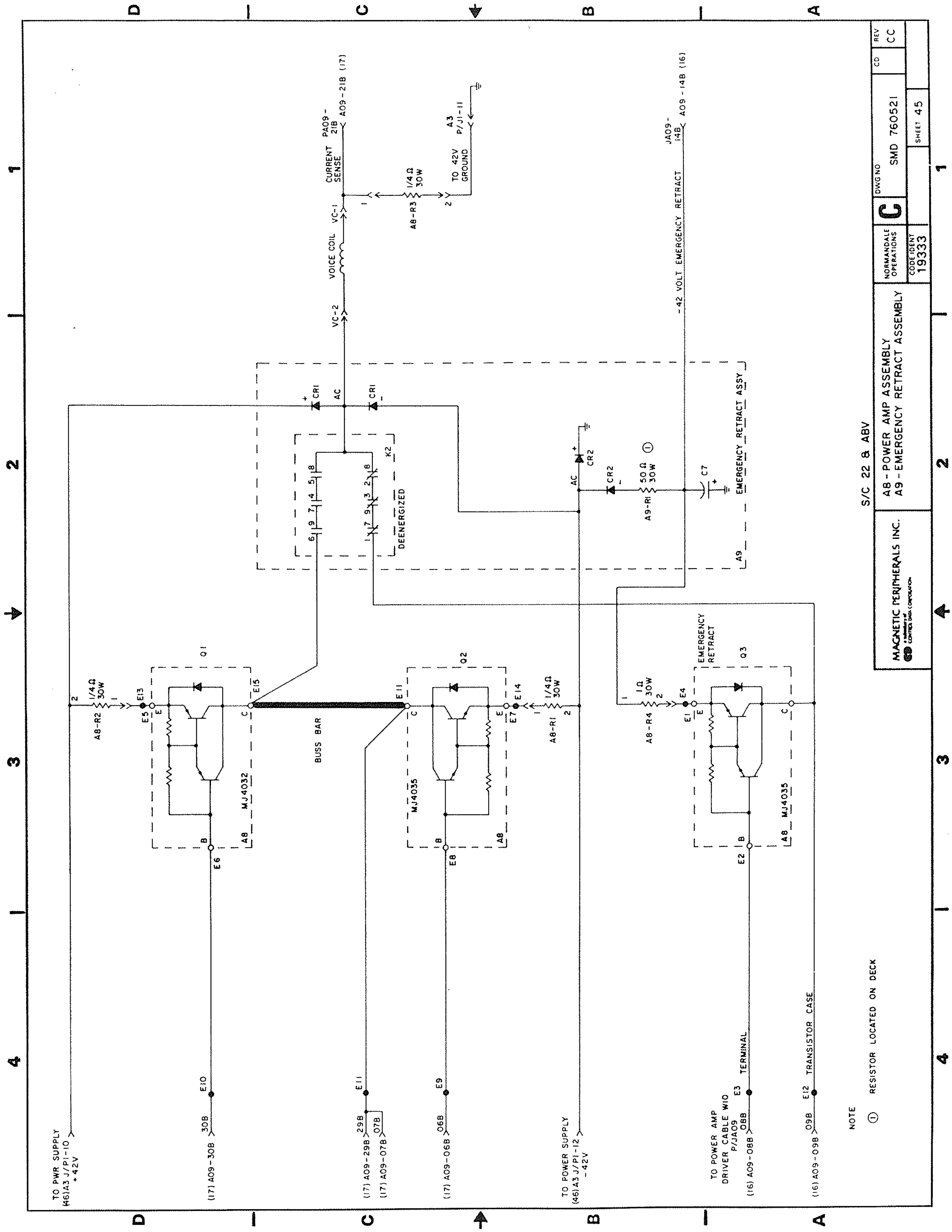
REVISION RECORD						
REV	ECO	DESCRIPTION	DRFT	DATE	CHKD	APP

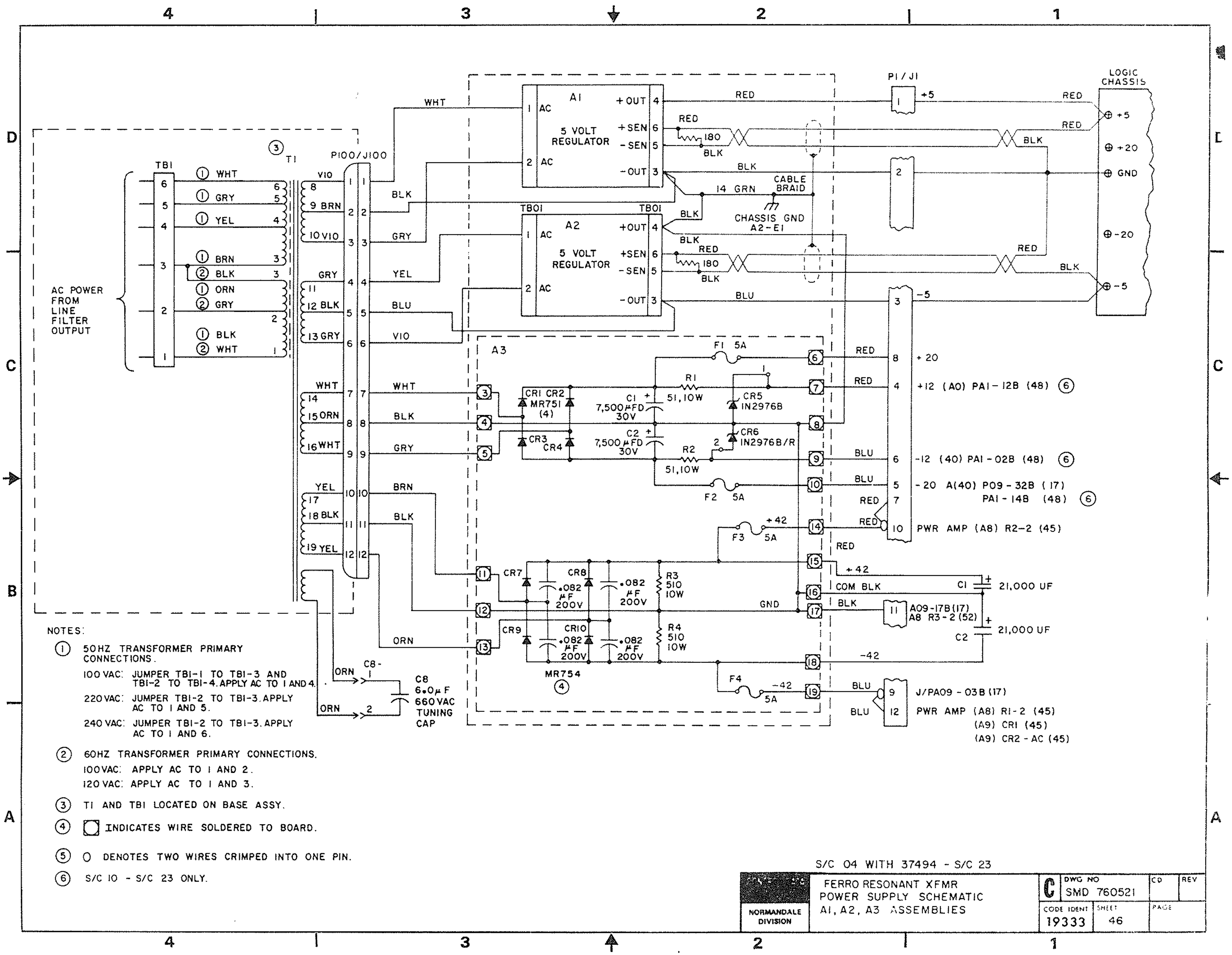
S/C 21 & BLW

CONTROL DATA
NORMANDALE DIVISION

A8 - POWER AMP ASSEMBLY

CODE IDENT 19333
C
DWG NO SMD 760521
REV B
SHEET 45


S/C 22 & ABV
A8 - POWER AMP ASSEMBLY
A9 - EMERGENCY RETRACT ASSEMBLY
MAGNETIC PERIPHERALS INC.
a subsidiary of Control Data Corporation
NORMANDALE OPERATIONS
CODE IDENT 19333
DWG NO C SMD 760521
SHEET 45
CD
REV CC
NOTE
① RESISTOR LOCATED ON DECK
TO PWR SUPPLY (46) A3 J/P1-10 +42V
(17) A09-30B
30B
E10
(17) A09-29B
(17) A09-07B
29B
07B
E11
(17) A09-06B
06B
E9
TO POWER SUPPLY (46) A3 J/P1-12 -42V
TO POWER AMP DRIVER CABLE W10 P/JA09
(16) A09-08B
08B
E3
TERMINAL
(16) A09-09B
09B
E12
TRANSISTOR CASE
A8-R2
1/4Ω 30W
E13
E5
E
Q1
MJ4032
A8
B
E6
C
E15
BUSS BAR
E11
Q2
MJ4035
E8
E14
E7
A8-R1
1/4Ω 30W
EMERGENCY RETRACT
Q3
MJ4035
A8-R4
1Ω 30W
E4
E1
E2
K2
DEENERGIZED
CR1
AC
CR2
A9-R1
50Ω 30W ①
C7
EMERGENCY RETRACT ASSY
A9
VOICE COIL
VC-2
VC-1
CURRENT SENSE
PA09-21B
A09-21B (17)
A8-R3
1/4Ω 30W
TO 42V GROUND
A3 P/J1-11
-42 VOLT EMERGENCY RETRACT
JA09-14B
A09-14B (16)
D
C
B
A
1
2
3
4



NOTES:

1. ① 50HZ TRANSFORMER PRIMARY CONNECTIONS.
   100 VAC: JUMPER TB1-1 TO TB1-3 AND TB1-2 TO TB1-4. APPLY AC TO 1 AND 4.
   220 VAC: JUMPER TB1-2 TO TB1-3. APPLY AC TO 1 AND 5.
   240 VAC: JUMPER TB1-2 TO TB1-3. APPLY AC TO 1 AND 6.

② 60HZ TRANSFORMER PRIMARY CONNECTIONS.
100 VAC: APPLY AC TO 1 AND 2.
120 VAC: APPLY AC TO 1 AND 3.

③ T1 AND TB1 LOCATED ON BASE ASSY.

④ ☐ INDICATES WIRE SOLDERED TO BOARD.

⑤ ○ DENOTES TWO WIRES CRIMPED INTO ONE PIN.

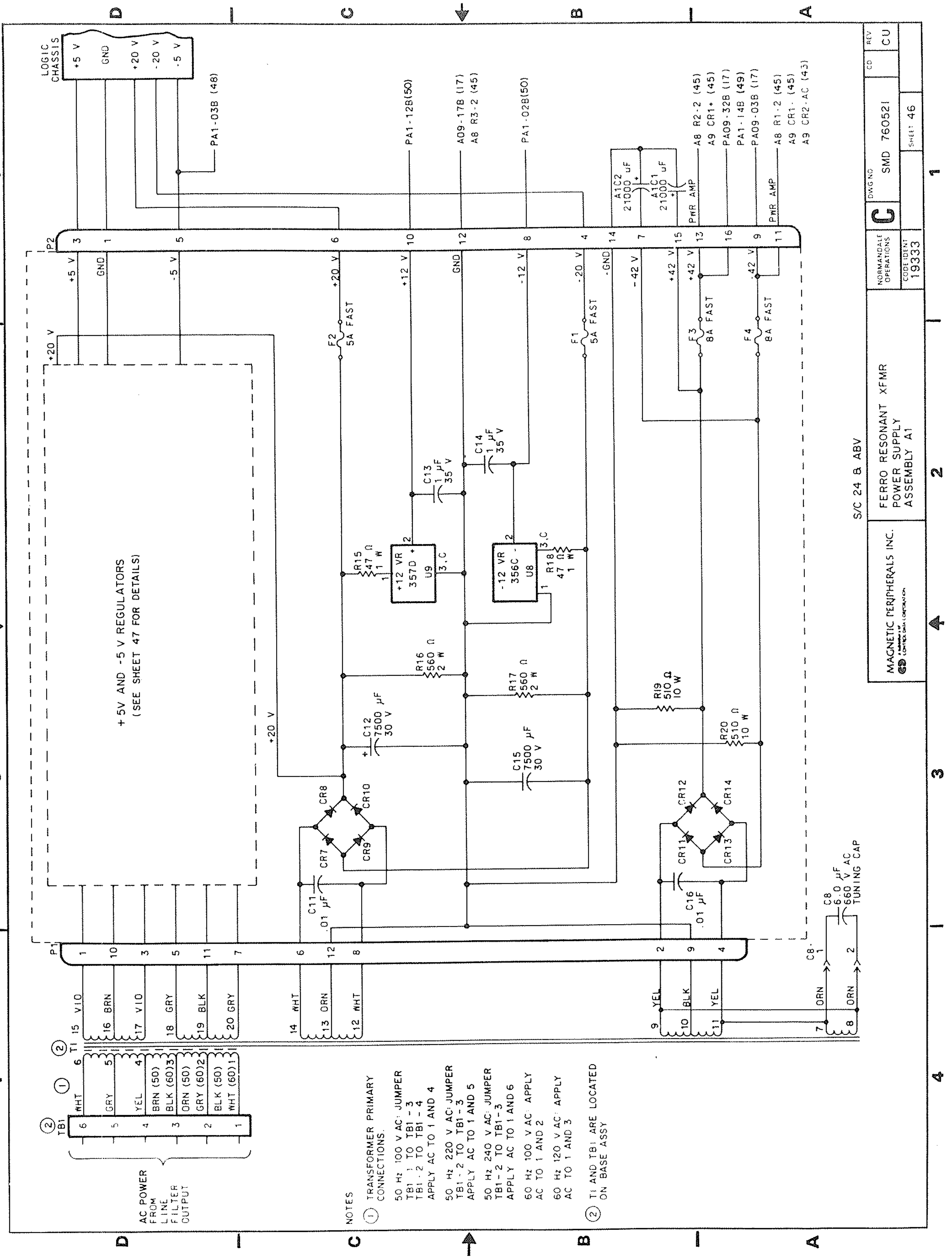
⑥ S/C 10 - S/C 23 ONLY.

S/C 04 WITH 37494 - S/C 23

NORMANDALE DIVISION

FERRO RESONANT XFMR
POWER SUPPLY SCHEMATIC
A1, A2, A3 ASSEMBLIES

C	DWG NO	CO	REV
	SMD 760521		
CODE IDENT 19333	SHEET 46	PAGE	



NOTES

① TRANSFORMER PRIMARY CONNECTIONS.

50 Hz 100 V AC: JUMPER
TB1-1 TO TB1-3
TB1-2 TO TB1-4
APPLY AC TO 1 AND 4

50 Hz 220 V AC: JUMPER
TB1-2 TO TB1-3
APPLY AC TO 1 AND 5

50 Hz 240 V AC: JUMPER
TB1-2 TO TB1-3
APPLY AC TO 1 AND 6

60 Hz 100 V AC: APPLY
AC TO 1 AND 2

60 Hz 120 V AC: APPLY
AC TO 1 AND 3

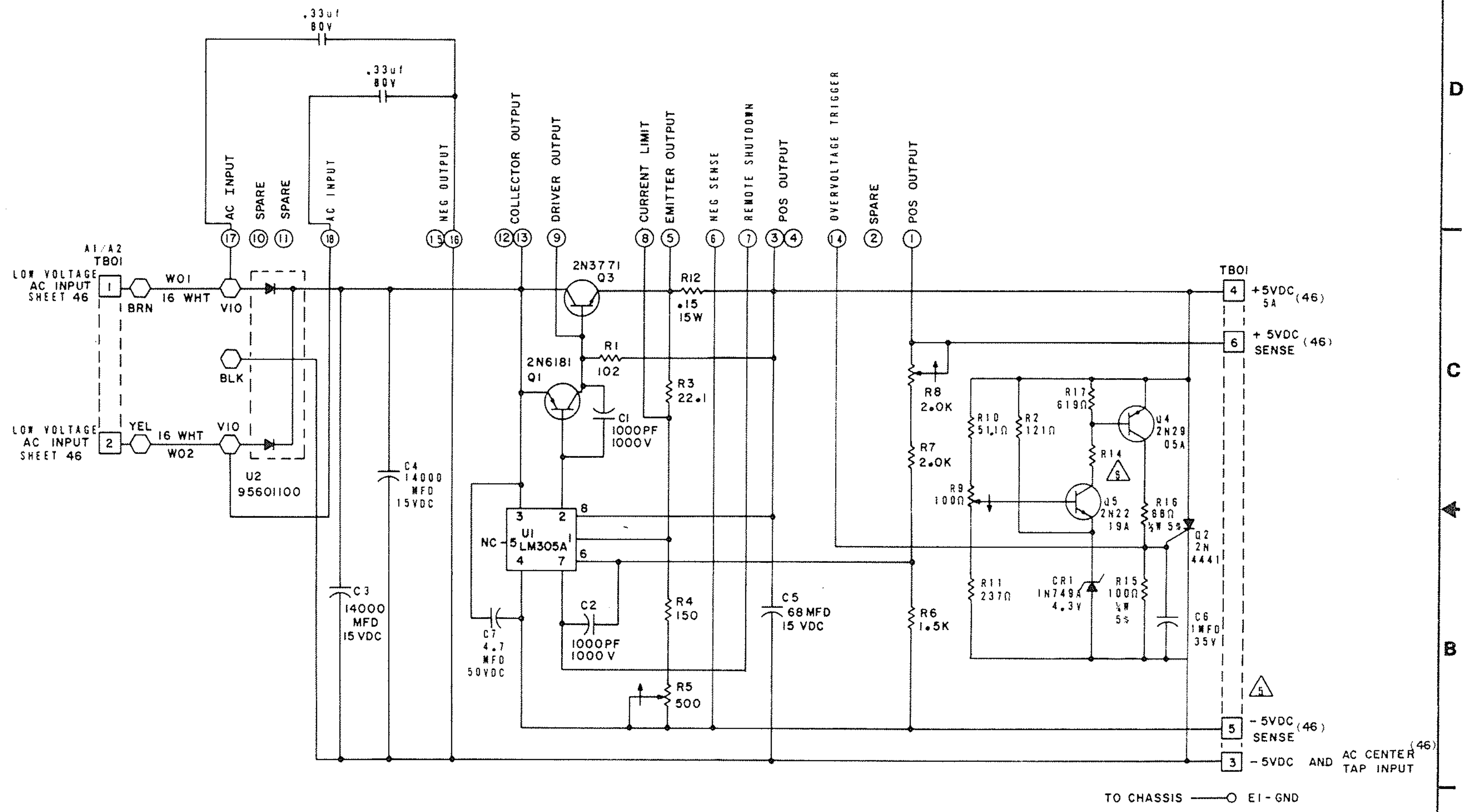
② T1 AND TB1 ARE LOCATED ON BASE ASSY

S/C 24 & ABV

MAGNETIC PERIPHERALS INC.
A subsidiary of CONTROL DATA CORPORATION

FERRO RESONANT XFMR
POWER SUPPLY
ASSEMBLY A1

NORMANDALE OPERATIONS
CODE IDENT 19333
C
DWG NO SMD 760521
SHEET 46
REV CU



NOTES:

1 UNLESS OTHERWISE SPECIFIED ALL RESISTORS ARE ¼W 1%.

2 INPUT-OUTPUT TERMINATIONS ARE AS FOLLOWS:
○ INDICATES CARD EDGE CONNECTIONS.
⬡ INDICATES CARD QUICK-CONNECTS.
□ INDICATES SUPPLY INPUT-OUTPUT TERMINAL STRIP CONNECTIONS.

INDICATES INCREASE IN ADJUSTMENT CLOCKWISE DIRECTION.

4. THIS UNIT REQUIRES 3 WIRE LOW VOLTAGE AC INPUT OF APPROXIMATELY 8.5-10.5 VAC INPUT TRANSFORMER CENTER TAP CONNECTS TO NEG OUTPUT TERMINAL AND REMAINING TWO WIRES CONNECT TO TERMINALS MARKED AC. DC OUPUT CONNECTIONS MUST BE MADE AT DC OUTPUT TERMINALS

5 SENSING CONNECTIONS MUST BE MADE BEFORE OPERATING UNIT CONNECT + SENSE TO + OUTPUT & - SENSE TO - OUTPUT

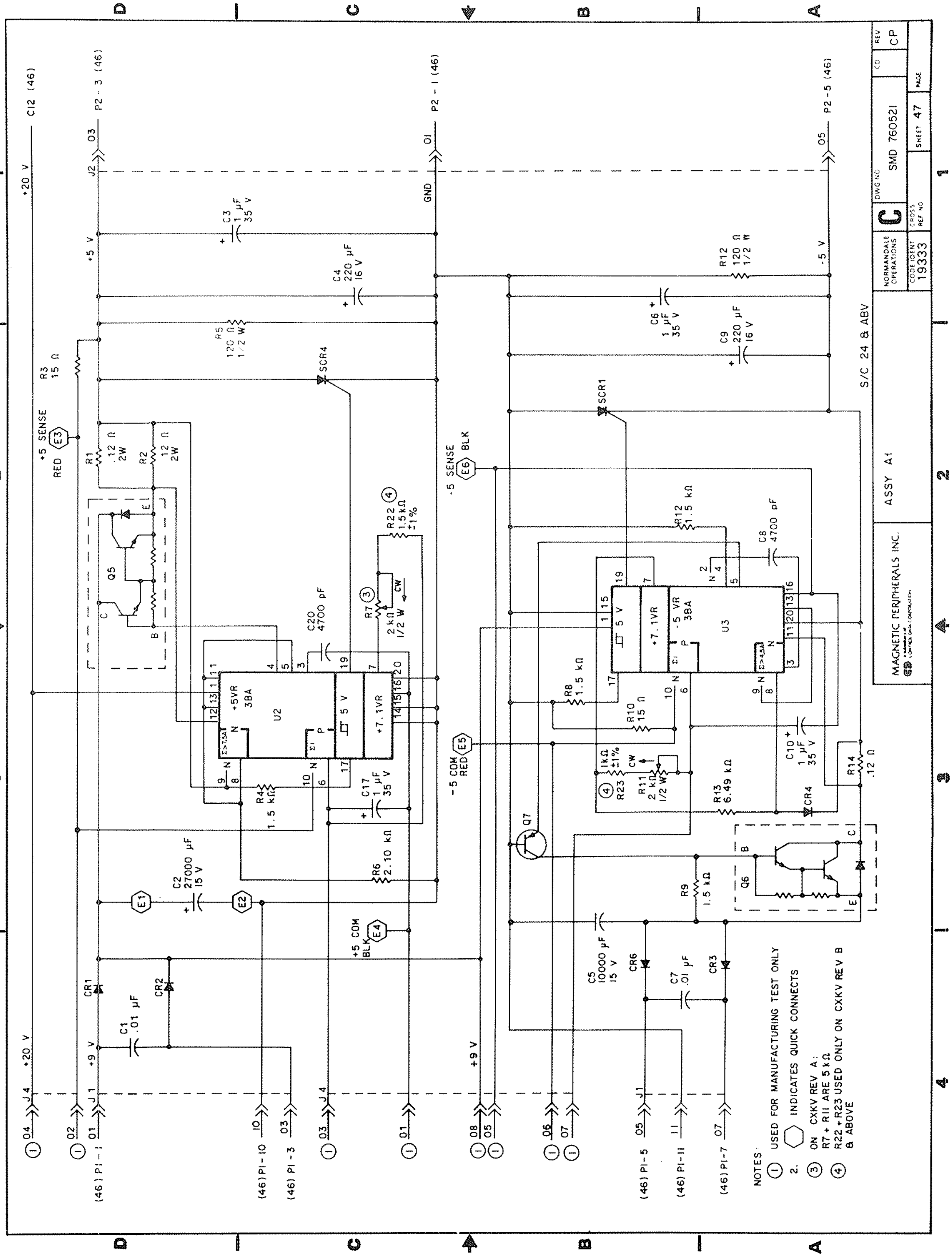
6 R14 IS REPLACED BY JUMPER ON THIS ASS'Y

S/C 04 WITH 37494 - S/C 23

NORMANDALE DIVISION

A1 / A2 WIRING DIAGRAM

C	DWG NO SMD 760521	CD	REV BD
CODE IDENT 19333	SHEET 47	PAGE	

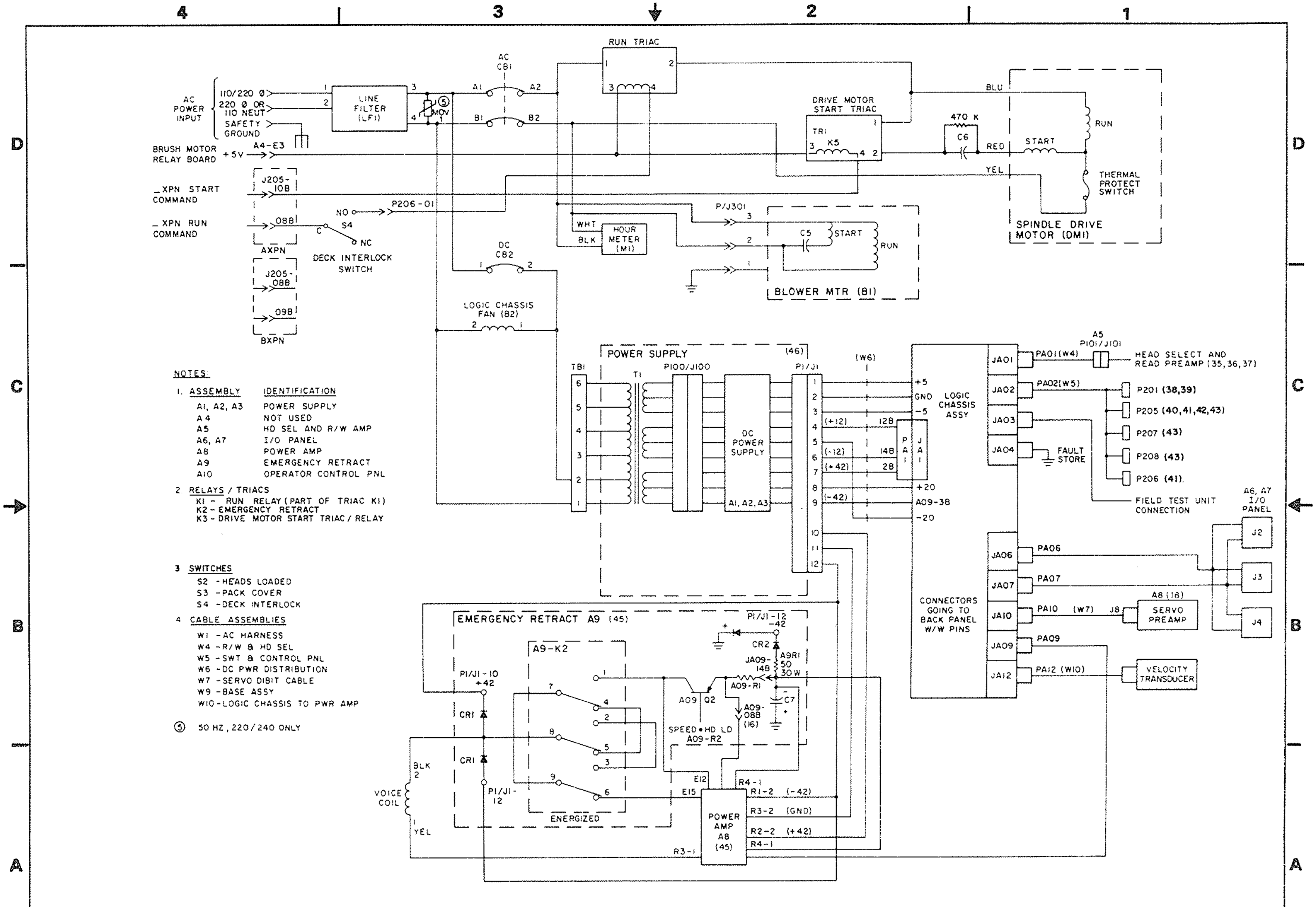


NOTES:
① USED FOR MANUFACTURING TEST ONLY
2. ⬡ INDICATES QUICK CONNECTS
③ ON CXKV REV A: R7 + R11 ARE 5 kΩ
④ R22 + R23 USED ONLY ON CXKV REV B & ABOVE

S/C 24 & ABV

ASSY A1

MAGNETIC PERIPHERALS INC.
NORMANDALE OPERATIONS
CODE IDENT 19333
C
DWG NO SMD 760521
CD
REV CP
CROSS REF NO
SHEET 47
PAGE



NOTES:

1. ASSEMBLY — IDENTIFICATION

A1, A2, A3	POWER SUPPLY
A4	NOT USED
A5	HD SEL AND R/W AMP
A6, A7	I/O PANEL
A8	POWER AMP
A9	EMERGENCY RETRACT
A10	OPERATOR CONTROL PNL

2. RELAYS / TRIACS
   - K1 - RUN RELAY (PART OF TRIAC K1)
   - K2 - EMERGENCY RETRACT
   - K3 - DRIVE MOTOR START TRIAC / RELAY

3 SWITCHES
   - S2 -HEADS LOADED
   - S3 -PACK COVER
   - S4 -DECK INTERLOCK

4 CABLE ASSEMBLIES
   - W1 -AC HARNESS
   - W4 -R/W & HD SEL
   - W5 -SWT & CONTROL PNL
   - W6 -DC PWR DISTRIBUTION
   - W7 -SERVO DIBIT CABLE
   - W9 -BASE ASSY
   - W10-LOGIC CHASSIS TO PWR AMP

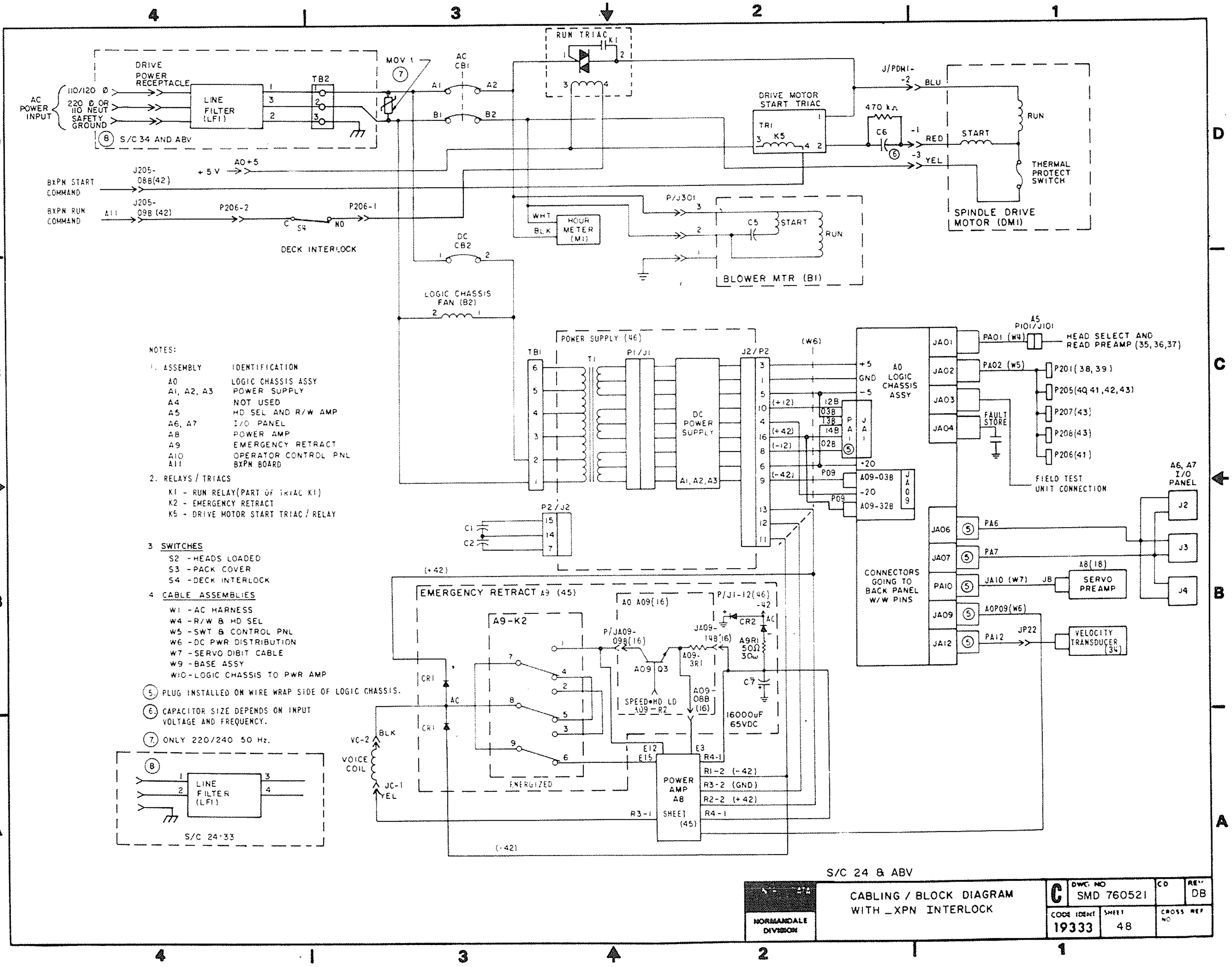
⑤ 50 HZ, 220/240 ONLY

S/C 10 - S/C 23

NORMANDALE DIVISION

CABLING / BLOCK DIAGRAM
WITH _XPN INTERLOCK

C DWG NO SMD 760521
CD
REV BR
CODE IDENT 19333
SHEET 48
CROSS REF NO



NOTES:

1. ASSEMBLY IDENTIFICATION

A0	LOGIC CHASSIS ASSY
A1, A2, A3	POWER SUPPLY
A4	NOT USED
A5	HD SEL AND R/W AMP
A6, A7	I/O PANEL
A8	POWER AMP
A9	EMERGENCY RETRACT
A10	OPERATOR CONTROL PNL
A11	BXPN BOARD

2. RELAYS / TRIACS
   - K1 - RUN RELAY(PART OF TRIAC K1)
   - K2 - EMERGENCY RETRACT
   - K5 - DRIVE MOTOR START TRIAC / RELAY

3. SWITCHES
   - S2 - HEADS LOADED
   - S3 - PACK COVER
   - S4 - DECK INTERLOCK

4. CABLE ASSEMBLIES
   - W1 - AC HARNESS
   - W4 - R/W & HD SEL
   - W5 - SWT & CONTROL PNL
   - W6 - DC PWR DISTRIBUTION
   - W7 - SERVO DIBIT CABLE
   - W9 - BASE ASSY
   - W10 - LOGIC CHASSIS TO PWR AMP

⑤ PLUG INSTALLED ON WIRE WRAP SIDE OF LOGIC CHASSIS.

⑥ CAPACITOR SIZE DEPENDS ON INPUT VOLTAGE AND FREQUENCY.

⑦ ONLY 220/240 50 Hz.

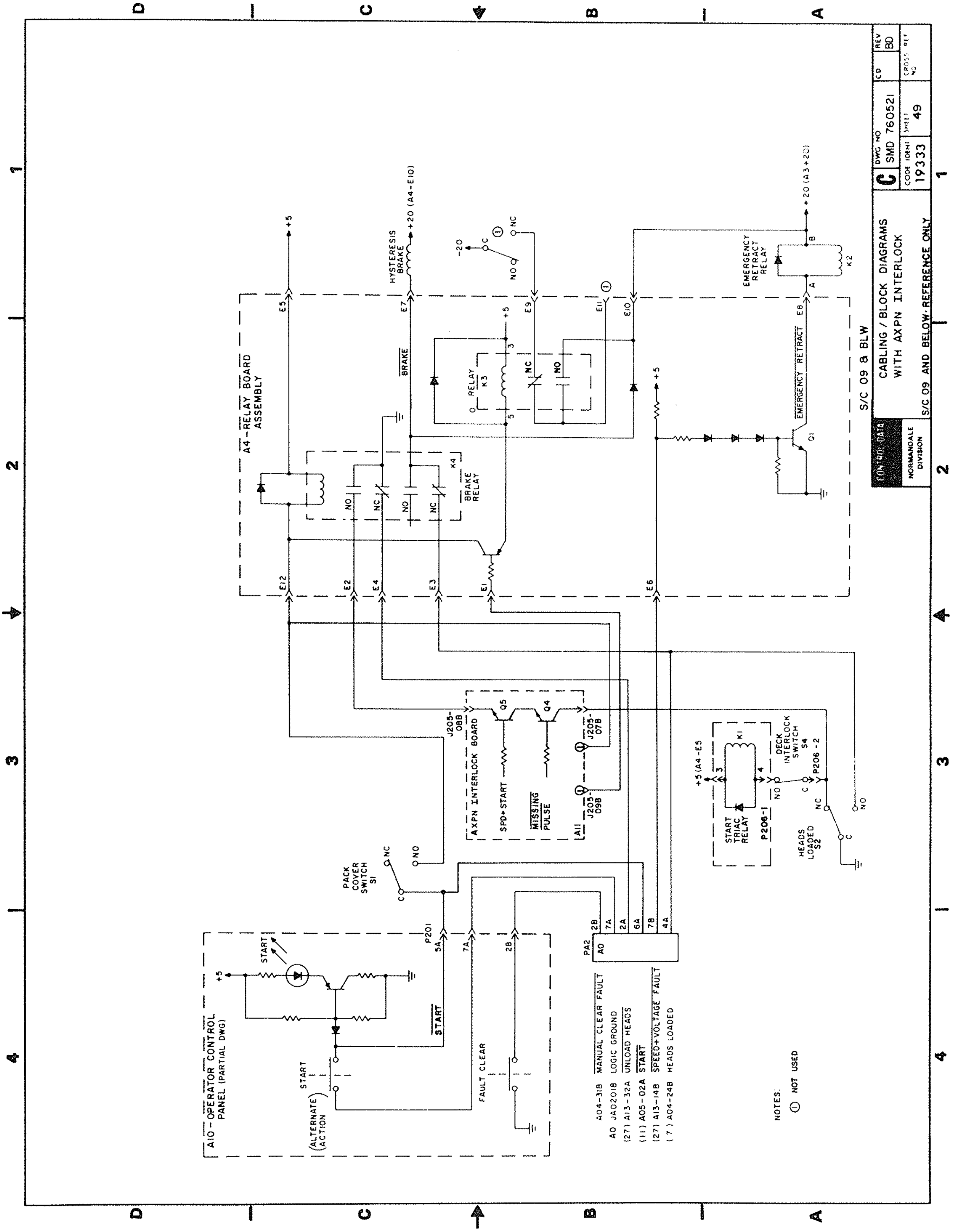
S/C 24 & ABV

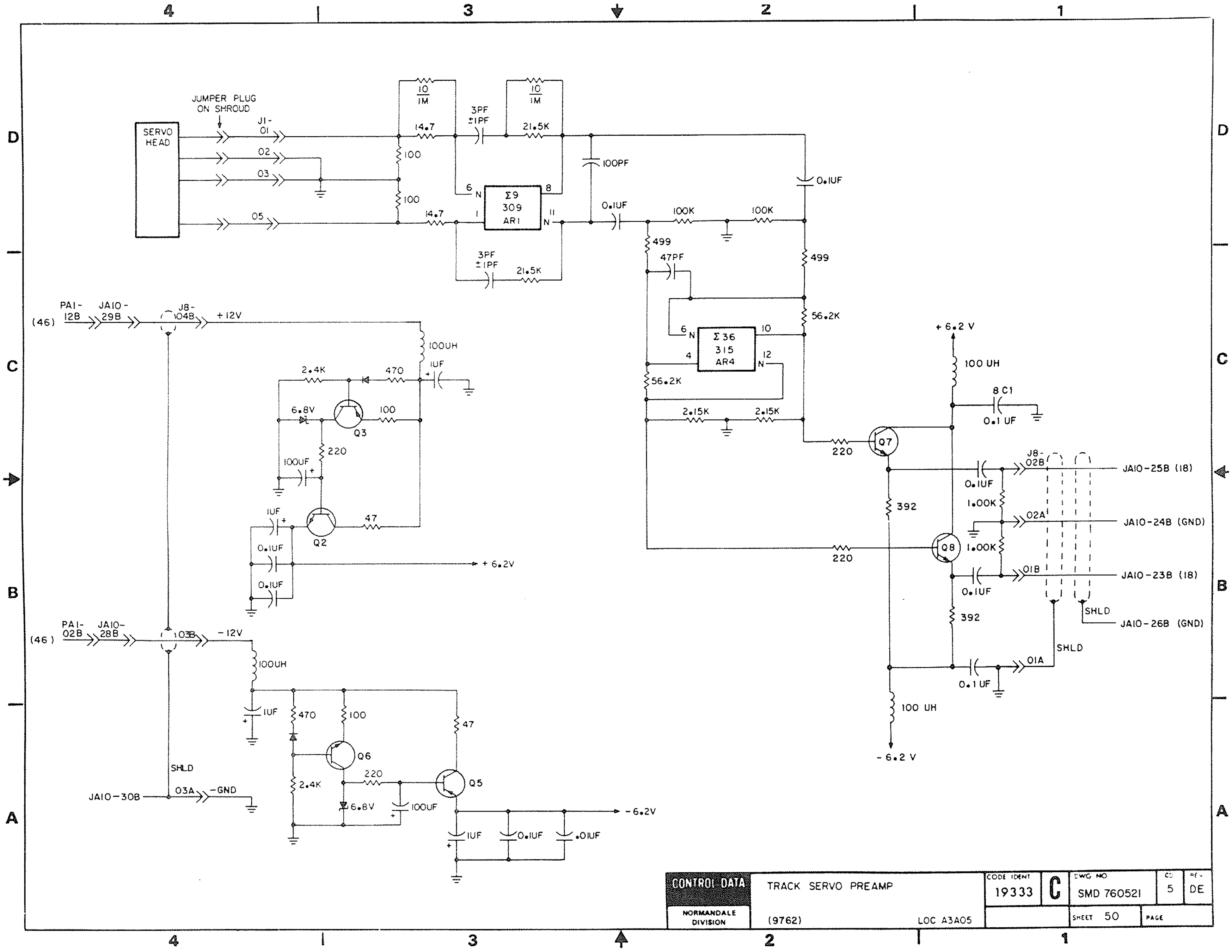
NORMANDALE DIVISION

CABLING / BLOCK DIAGRAM
WITH _XPN INTERLOCK

C DWG NO SMD 760521 CD REV DB

CODE IDENT 19333 SHEET 48 CROSS REF NO


CONTROL DATA
NORMANDALE DIVISION
CABLING / BLOCK DIAGRAMS WITH AXPN INTERLOCK
S/C 09 AND BELOW-REFERENCE ONLY
DWG NO SMD 760521
CODE IDENT 19333
SHEET 49
REV BD
S/C 09 & BLW
A4-RELAY BOARD ASSEMBLY
BRAKE
EMERGENCY RETRACT
RELAY K3
BRAKE RELAY K4
HYSTERESIS BRAKE
+20 (A4-E10)
+20 (A3+20)
EMERGENCY RETRACT RELAY K2
Q1
E1 E2 E3 E4 E5 E6 E7 E8 E9 E10 E11 E12
NO NC
-20
+5
AXPN INTERLOCK BOARD
SPD+START
MISSING PULSE
Q5 Q4
J205-08B
J205-07B
J205-09B
A11
START TRIAC RELAY K1
+5 (A4-E5)
P206-1
P206-2
DECK INTERLOCK SWITCH S4
HEADS LOADED S2
PACK COVER SWITCH S1
P201
5A 7A 2B
PA2
A0
2B 7A 2A 6A 7B 4A
A10-OPERATOR CONTROL PANEL (PARTIAL DWG)
START
(ALTERNATE ACTION)
FAULT CLEAR
A04-31B MANUAL CLEAR FAULT
A0 JA02018 LOGIC GROUND
(27) A13-32A UNLOAD HEADS
(11) A05-02A START
(27) A13-14B SPEED+VOLTAGE FAULT
(7) A04-24B HEADS LOADED
NOTES:
① NOT USED
A B C D
1 2 3 4



CONTROL DATA
NORMANDALE DIVISION

TRACK SERVO PREAMP

(9762) LOC A3A05

CODE IDENT 19333

C

DWG NO SMD 760521

CD 5

REV DE

SHEET 50

PAGE

SECTION 5

WIRE LISTS

DESCRIPTION OF WIRE LISTS

The two types of wire lists are:

1. The logic and R/W wire wrap wiring.
2. The single wire and cable types that are the non-logic wiring.

LOGIC WIRE LISTS

The following is an example of the logic wire list with an identification and an explanation of the columns. The logic wire list is a double ended type listing. That is, each wire is listed twice, first by the lowest card and pin number it is wired to, then by the highest card and pin number (refer to - 16 in the listing shown below).

General

Back panels are machine wired according to the following paragraphs. The wiring operation prepares the unit for a number of operational options. A wire is installed for each entry in the list even if the unit does not contain the logic card types or complement to make full use of these options.

Logic Signal Name

The signal name is an identification of a wire or wires appearing on the logic diagrams. A "+" before the signal name indicates a logical "1". A "-" indicates logical "0". Signal names listed on the wire list such as "-CLEAR LOAD" would appear on the logic diagram as "CLEAR LOAD". +PULL UP indicates that the listed wire is always a logical "1" because it is tied to +5 volts.

Term A/Term B

These columns locate the logic chassis wire wrap pins which the identified wire joins together.

Logic chassis row A

Card connector position 01 (positions identified horizontally 01 through 16)

Pin identifier (10 pins from the left side of the chassis and in the bottom column)

A 01 10A

If the column is preceded by the letter J, the origin is from one of the connectors in the area where the

Logic Signal Name (Wire ID)

Term A/Term B

Wire Wrap (Z Level)

TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	1 OF 13	SMD 7439	A

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+PULL UP	A0303B	A0302A		1	
2	+EVEN DIBITS	A0304A	A1011B		1	
3	-HEADS LOADED	A0304B	A0421B		1	
4	+PULL UP	A0305A	A0302B		1	
5	+ODD DIBITS	A0305B	A1032A		1	
6	-FORWARD EOT	A0306A	A0411B		1	
7	+SET RTZ	A0306B	A0424A		1	
8	-SET LOAD	A0307A	A0432B		1	
9	-CLEAR LOAD	A0307B	A0425B		1	
10	- 16	A0308A	A0309A		1	
11	- 64 GND	A0308A	A0308B		2	

card is installed. The locator (same as first four digits in this column) is etched alongside each connector.

Z (Level)

The Z level denotes the vertical separation which an installed wire has relative to the surface of the wire pin board. This vertical separation is maintained at both ends of the installed wire when it is wrapped on the pins. Two vertical separation distances are possible. A numeral 1 in this column indicates the smallest separation. A 2 in the column indicates the largest separation.

NON-LOGIC WIRE LISTS

The following is an example of a non-logic wire list with an explanation of the columns:

Identifier - Sequence of the wires in the wire list

Wire Size - Size of conductor (AWG)

Color Code - Color code information is the same as that for resistor color coding

Wire Length - Length of conductor in inches

Origin - Origin point of conductor

Destination - Destination point of conductor

Remarks - Useful comments or notes

Color Code

Solid colored wires are identified by a one digit number in this column. Multi-colored wires are identified by a number having two or three digits. Each digit of the number identifies one of the colors. The code numbers are identified as follows:

0 - Black
1 - Brown
2 - Red
3 - Orange
4 - Yellow
5 - Green
6 - Blue
7 - Violet
8 - Gray
9 - White
S - Shield

In multi-digit color codes, the first digit denotes base color and the remaining digits denote tracer colors.

TITLE		SHEET NO.	DOCUMENT NO.	REV.
W9 CABLE ASSY, BASE ASSEMBLY WIRING	WL	1 of 1	SMD	J

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	24	4	30	S4	C	A4	E2		
2	20	-	-	T1	1	TB1	1		
3	20	0	8	M1		CB2	A2		
4	20	9	8	M1		CB1	B2		
5									

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP Ref 76038043		36, 400 TPI	1 OF 17	AW

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	-MINUS 5V	A0101B	A0121B		1	
2	-MINUS 20V	A0102B	A0502B		2	
3	-0DD+EVN DIBIT	A0104B	A0322B		2	
4	-SERVO CLOCK	A0112B	A0623B		2	
5	-INDEX REF CLOCK	A0113B	A0331A		1	
6	+PLUS 5V	A0114B	A0134B		1	
7	-MINUS 5V	A0121B	A0101B		1	
8	-ODD DIBIT	A0122B	A1012B		1	
9	-REF CLOCK	A0123B	A1623B		1	
10	+REF CLOCK	A0124B	A1624B		1	
11	+SECTOR CLOCK	A0126B	A0315A		1	
12	+WRITE CLOCK	A0127B	A0610A		1	
13	-WRITE CLOCK	A0128B	A1410B		1	
14	+HI FREQ CLOCK	A0130B	A1409A		1	
15	+PLUS 20V	A0133B	A0533B		2	
16	+PLUS 5V	A0134B	A0114B		1	
17	-GND -128 GND	A0301A A0301A	A0311A A0308B		1 1	
18	+PULL UP	A0302A	A0303B		1	
19	+PULL UP	A0302A	A0302B		2	
20	+PULL UP	A0302B	A0302A		2	
21	+PULL UP	A0302B	A0305A		1	WIRING INSTALLED ON UNITS WITHOUT SECTOR PLUG INSTALLED. WIRING SHOWN FOR 64 SECTORS.
22	+PULL UP	A0303A	A0303B		2	
23	+PULL UP	A0303A	A0309B		1	
24	+PULL UP	A0303B	A0303A		2	
25	+PULL UP	A0303B	A0302A		1	
26	+EVEN DIBITS	A0304A	A1011B		1	
27	-HEADS LOADED	A0304B	A0421B		1	
28	HIGH MAX CYL +PULL UP	A0305A A0305A	A0314A A0302A		1 1	
29	+ODD DIBITS	A0305B	A1032A		1	
30	-FORWARD EOT	A0306A	A0411B		1	
31	+SET RTZ	A0306B	A0424A		1	
32	-SET LOAD	A0307A	A0432B		1	
33	-CLEAR LOAD	A0307B	A0425B		1	
34						

K0R-0542

TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36,400 TPI	2	N

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
-16 GND	A0308A	A0309A		1	WIRING INSTALLED ON UNITS WITHOUT SECTOR PLUG INSTALLED. WIRING SHOWN FOR 64 SECTORS.
-64 GND	A0308A	A0308B		2	
-64 GND	A0308B	A0308A		2	
-128 GND	A0308B	A0301A		1	
-16 GND	A0309A	A0308A		1	
-1 GND	A0309A	A0315B		2	
GND MAX CYL	A0309A	A0313A		1	
+PULL UP	A0309B	A0303A		1	
+PULL UP	A0309B	A0314B		2	
-REV EOT ENABLE	A0310A	A1109B		1	
+REV EOT PULSE	A0310B	A1114B		1	
-GND	A0311A	A0301A		1	
+BUS BIT 7	A0311B	A1326B		1	
+HEADS LOADED	A0312A	A0413B		1	
+HEADS LOADED	A0312A	A0925B		2	
-RTZ 5	A0312B	A0427A		2	S/C 09 W/ 37966 & ABV
-RTZ SEEK	A0312B	A0730B		1	
GND MAX CYL	A0313A	A0315B		2	
+PULL UP	A0313A	A0314B		1	
GND MAX CYL	A0313A	A0309A		1	
+PULL UP	A0313A	A0314A		2	
+INDEX	A0313B	A0604A		1	
+INDEX	A0313B	JA0301B		2	
HIGH MAX CYL	A0314A	A0305A		1	
+PULL UP	A0314A	A0313A		2	
HIGH MAX CYL	A0314A	A0314B		2	
+PULL UP	A0314B	A0309B		2	
HIGH MAX CYL	A0314B	A0314A		2	
+PULL UP	A0314B	A0313A		1	
HIGH MAX CYL	A0314B	A0325B		1	
+SECTOR CLOCK	A0315A	A0126B		1	
-1 GND	A0315B	A0309A		2	WIRING FOR 64 SECTOR-SEE NOTE ON SHEET 1 OF W/W.
GND MAX CYL	A0315B	A0313A		2	
GND MAX CYL	A0315B	A0324B		1	
-FWD EOT ENABLE	A0316A	A1108A		1	
+FWD+REV EOT	A0316B	A0402A		1	
-LD+RTZ	A0317A	A0406B		1	
-SERVO READY	A0317B	A0407B		1	
+FINE ENABLE	A0321A	A0417A		1	
+SECTOR	A0321B	A0604B		1	
+BUS BIT 4	A0322A	A1329B		1	
-ODD+EVEN DIBIT	A0322B	A1033A		1	
-ODD+EVEN DIBIT	A0322B	A0104B		2	

TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36,400 TPI	3	N

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
+BUS BIT 2	A0323A	A1330A		1	
+BUS BIT 3	A0323B	A1328B		1	
GND MAX CYL	A0324A	A0324B		2	
GND MAX CYL	A0324A	A0334A		1	
GND MAX CYL	A0324B	A0324A		2	
GND MAX CYL	A0324B	A0315B		1	
+BUS BIT 1	A0325A	A0616A		2	
HIGH MAX CYL	A0325B	A0314B		1	
HIGH MAX CYL	A0325B	A0329B		2	
+BUS BIT 5	A0326A	A0725B		2	
+BUS BIT 6	A0326B	A1322B		1	
-SERVO TRKFLT	A0327A	A0433A		2	
-ON CYL•CYL SEL	A0327B	A0405B		1	
-ON CYL•CYL SEL	A0327B	A1307A		1	
-FINE ENABLE	A0328B	A1123A		1	
HIGH MAX CYL	A0329A	A0329B		1	
HIGH MAX CYL	A0329A	A0330A		2	
HIGH MAX CYL	A0329B	A0329A		1	
HIGH MAX CYL	A0329B	A0325B		2	
HIGH MAX CYL	A0330A	A0329A		2	
-INDEX REF CLOCK	A0331A	A0113B		1	
+BUS BIT 8	A0332A	A1321A		1	
+BUS BIT 0	A0332A	JA0308A		1	
+MAX ADD FAULT	A0333A	A0429A		1	
+BUS BIT 9	A0333B	A1325A		1	
GND MAX CYL	A0334A	A0324A		1	
+FWD+REV EOT	A0402A	A0316B		1	
-ONCYL CYLSEL	A0402A	A0405B		2	
-ONCYL CYLSEL	A0402B	A1307A		1	
+ON CYLINDER	A0403A	A0624A		1	
-ON CYLINDER	A0403B	A0524A		2	
-NOT FWD/REV	A0404A	A1313B		1	
+SLOPE	A0404B	A1116A		1	
-OFFSET CMMD PULSE	A0405A	A1112B		1	
-ONCYL•CYLSEL	A0405B	A0327B		1	
-ONCYL•CYLSEL	A0405B	A0402B		2	
+FINE•HEADS LOADED	A0406A	A1123B		1	
-LD+RTZ	A0406B	A0317A		1	
-LD+RTZ	A0406B	A1110B		2	
-SEEK FWD	A0407A	A1216B		1	
-SEEK RWD	A0407A	A0923B		2	
-SERVO READY	A0407B	A0525A		2	
-SERVO READY	A0407B	A0317B		1	
-SEEK REV	A0408A	A0922B		2	
-SEEK REV	A0408A	A1221B		1	
+COARSE	A0409A	A0416A		2	S/C 09 W/ 37966 & ABV
+25 SEC DELAY	A0409B	A0533A		2	
+ CAR BIT 0	A0410A	A0332B		2	

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP		36,400 TPI	4	Z

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+SERVO READY -SET RTZ	A0410B A0411A	A1305A A0607B		1 2	
2	-FORWARD EOT	A0411B	A0306A		1	
3	+UNLOAD HEADS +UNLOAD HEADS	A0412A A0412A	A0502A A1333B		2 1	S/C 10 & ABV S/C 09 & BLW
4A	+UNLOAD HEADS +RTN TO ZERO	A0412A A0412B	JA0202A A1208A		1 1	S/C 10 & ABV
4B	+RTN TO ZERO	A0412B	A0405A		1	
5	+VELOCITY CLAMP	A0413A	A1210A		1	
6	+HEADS LOADED	A0413B	A0312A		1	
7	+HEADS LOADED	A0413B	A1027B		2	
8	-GTD CYL PULSE	A0414A	A1112A		1	
9	-T GTR THAN 256	A0414B	A1314A		1	
10	+ONCYL SENSE	A0415A	A0924B		1	
11	-LD+RTZ+SEEK ERROR	A0415B	A1325B		1	
12	+COARSE +COARSE	A0416A A0416A	A0409A A1217B		2 1	S/C 09 W/37966 & ABV
13	+FINE	A0416B	A1222B		1	
14	+FINE ENABLE	A0417A	A0321A		1	
15	+T LESS THAN 1	A0417B	A1306A		1	
16A 16B	+HEADS LOADED +HEADS LOADED	A0421B A0421B	A0916B A0304B		2 1	
17	+CYLINDER PULSE	A0422A	A1113A		1	
18	-T EQUALS ZERO	A0422B	A1307B		1	
19	+OFFSET CMMD PULSE	A0423A	A0434A		1	
20	+UP TO SPEED	A0423B	A0517B		1	
21	+SET RTZ	A0424A	A0306B		1	
22	+HDS LDED 20V	A0424B	JA0204A		1	
23	-LOAD HEADS	A0425A	A0915B		1	
24	-CLEAR LOAD	A0425B	A0307B		1	
25	+SPD+UNLD HDS	A0426A	A1125B		1	
26	-UP TO SPD	A0426B	A0526A		1	
27	+RTZ 5 +CYL DET B	A0427A A0427B	A0312B A1008B		2 1	S/C 09 W/37966 & ABV
28	+CYL DET A	A0428B	A1007B		1	
29	+MAX ADD FAULT	A0429A	A0333A		1	
30	+LOAD HEADS	A0429B	A1207B		1	
31	-SEEK FF	A0430A	A1113B		1	
32	+CYL PULSE BLK	A0430B	A0927B		1	
33	+SERVO FAULT	A0431A	A1202A		1	
34	-3FAULT CLEAR	A0431B	A0511A		2	

K0R-0542

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36,400 TPI	5	Z

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1A	+SEEK END	A0432A	JA0205A		1	
1B	-SET LOAD	A0432B	A0307A		1	
2	-SERVO TRKFLT	A0433A	A0327A		2	
3	-FAULT	A0433B	JA02-01A		1	
4A	-FAULT	A0433B	A0513B		2	
4B	-GROUND	A0434A	A0405A		1	
5	-GROUND	A0501A	A0506A		2	
	-START	A0502A	JA0206A		1	S/C 09 & BLW
	+UNLOAD HEADS	A0502A	A0412A		2	S/C 10 & ABV
6	-MINUS 20V	A0502B	A0802B		1	
7	-MINUS 20V	A0502B	A0102B		2	
8	+LOGIC PLG 1	A0503A	A1130B		1	
9	-MINUS 36V	A0503B	A0903B		1	
10	+LOGIC PLG 2	A0504A	A1127B		1	
11	+LOGIC PLG 3	A0504B	A1129B		1	
12	-UNIT SELECT STROBE	A0505A	A1111B		2	S/C 10 & BLW *
	-UNIT SELECT STROBE	A0505A	A1111B		1	S/C 11 & ABV
13	-PWRUP CLEAR	A0505B	A1105B		1	
	-GROUND	A0506A	A0501A		2	
14	+MAG PICK UP	A0506A	JA0203A		1	
15	-UNIT SEL BIT 1	A0506B	A1106B		1	
16	-UNIT SEL BIT 0	A0507A	A1107A		1	
17	-UNIT SEL BIT 2	A0507B	A1103B		1	
18	-UNIT SEL BIT 3	A0508A	A1104A		1	
19	+LOGIC PLG 0	A0508B	A1131B		1	
20	-OPN CABLE DET	A0509A	A0702B		1	S/C 10 & BLW *
21	+SEL ENABLE	A0509A	A1525B		1	S/C 11 & ABV
	-UNIT RDY	A0509B	JA0213A		1	
22	-3 FALT CLEAR	A0511A	A0431B		2	
	+UNIT SELECT	A0512B	JA0204B		2	
23	+UNIT SELECT	A0512B	A0621B		1	
24						
25	-FAULT	A0513B	A1207A		1	
26	-FAULT	A0513B	A0433B		2	
27	+VOLTAGE FAULT	A0514B	JA0214B		1	
28	+ON CYL•(W+R)	A0516B	JA0213B		1	
29	-MAG PICKUP	A0517A	JA203B		1	
30	+UP TO SPEED	A0517B	A0423B		1	
31	+SPDF+VOLT FLT	A0521A	A1315A		1	
32	-MAN FLT CLR	A0521B	JA0202B		1	
33	-FAULT CLEAR	A0522A	A0730A		1	
34	-READ GATE	A0522B	A0513A		1	

NOTE:

* WIRE USED ON ALL BJ7B2 G/H, ONLY.

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TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36, 400 TPI	6	N

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	-READ GATE	A0522B	A1124B		1	
2	+W+R FAULT	A0523A	JA0208B		1	
3	-FAULT CLEAR	A0523B	A0525B		1	
4	-ON CYLINDER	A0524A	A0403B		2	
5	-ON CYLINDER	A0524A	JA0302B		1	
6	-WRITE GATE	A0524B	A0727B		2	
7A	-WRITE GATE	A0524B	JA0110B		1	
7B	-SERVO READY	A0525A	A0407B		2	
8	-FAULT CLEAR	A0525B	A0523B		1	
9	-UP TO SPEED	A0526A	A0426B		1	
10						
11	+WR PROTECT	A0527A	A0814B		1	
12	-ADDMK DELAYED	A0527B	A0602B		1	
13	+WRITE FAULT	A0528A	JA0109A		1	
14	+UNIT READY	A0528B	A0624B		1	
15	+WRITE FAULT	A0529B	JA0212B		1	
16	+HEAD SELECT FAULT	A0530A	JA0210B		1	
17	+HD SEL FLT	A0530B	JA0108A		1	
18	+FAULT	A0531A	A0607A		1	
19	+WRTR INHIBIT	A0531B	JA0113A		1	
20	+PWR UP WR PROTECT	A0532A	JA0409A		1	
21A	+PLUS 36V	A0532B	JA0114B		1	
21B	+PLUS 36V	A0532B	A0932B		2	
22A	+25 SEC DELAY	A0533A	A0409B		2	
22B	+PLUS 20V	A0533B	A0833B		1	
23	+PLUS 20V	A0533B	A0833B		2	
	-MINUS 5V	A0601B	A0602A		1	
24	-MINUS 5V	A0602A	A0601B		1	
25	-ADDMK DELAYED	A0602B	A0527B		1	
26	-ADDRESSMARK	A0603A	A0731A		1	
27	+INDEX	A0604A	A0313B		1	
28	+SECTOR	A0604B	A0321B		1	
29	+FAULT	A0607A	A0531A		1	
30	+SEEK ERROR	A0607B	A0411A		2	
31	+WRITE CLOCK	A0610A	JA0309A		2	
32	+WRITE CLOCK	A0610A	A0127B		1	
33	+WRITE DATA	A0610B	A1423B		1	
34	+UNIT SEL BIT 3	A0615A	JA0314A		2	

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TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36,400 TPI	7	A

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+UNIT SEL BIT 3	A0615A	A1104B		1	
2	+UNIT SEL BIT 2	A0615B	JA0313A		2	
3	+UNIT SEL BIT 2	A0615B	A1103A		1	
4A	+BUS BIT 1	A0616A	A0727A		1	
4B	+BUS BIT 1	A0616A	A0325B		2	
5	-HD SEL STROBE	A0616B	A0617A		2	
6	-HD SEL STROBE	A0617A	A0616B		2	
7	-HED SEL TAG 3	A0617B	A0702A		1	
8	+BUS BIT 0	A0621A	A0724A		2	
9	+UNIT SELECT	A0621B	A0703B		2	
10	+UNIT SELECT	A0621B	A0512B		1	
11	-GROUND	A0622A	A0634A		1	
12A	+BUS BIT 2	A0622B	A0728B		1	
12B	+BUS BIT 2	A0622B	JA0307B		2	
13	-ADDRESS MARK	A0623A	A1532B		1	
14	-SERVO CLOCK	A0623B	A0112B		2	
15	-SERVO CLOCK	A0623B	JA0303B		1	
16	+ON CYLINDER	A0624A	A1305B		2	
17	+ON CYLINDER	A0624A	A0403A		1	
18	+UNIT READY	A0624B	A0528B		1	
19	-GROUND	A0629A	A0629B		2	UNITS WITHOUT
20	-GROUND	A0629B	A0634B		1	PLO
21	+READ DATA	A0631A	A1627B		1	UNITS WITH PLO
22	+READ DATA	A0631A	A1526B		1	UNITS WITHOUT PLO
23	+READ CLOCK	A0631B	A1626B		1	
24	+HEAD BIT 0	A0632A	JA0102A		1	
25	+HEAD BIT 2	A0632B	JA0104A		1	
26	+HEAD BIT 1	A0633B	JA0103A		1	
27	-GROUND	A0634A	A0622A		1	
28	-GROUND	A0634B	A0629B		2	UNITS WITHOUT PLO
29	-HD SEL TAG 3	A0702A	JA0305B		2	
30	-HD SEL TAG 3	A0702A	A0617B		1	
31	-OPN CABLE DET	A0702B	A0509A		1	S/C 10 & BLW *
	-OPN CABLE DET	A0702B	A1524B		1	S/C 11 & ABV
32	+BUS BIT 9	A0703A	A1314A		2	
33	+BUS BIT 9					NOTE: * WIRE USED ON ALL BJ7B2 G/H ONLY.
34	+UNIT SELECT	A0703B	A0621B		2	

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TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36, 400 TPI	8	A

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+UNIT SEL BIT 0	A0704A	A1107B		1	
2	+UNIT SEL BIT 0	A0704A	JA0311A		2	
3	+UNIT SEL BIT 1	A0704B	JA0312A		2	
4	+UNIT SEL BIT 1	A0704B	A1106A		1	
5	+BUS BIT 0	A0724A	A0621A		2	
6	+BUS BIT 0	A0724A	A1331A		1	
7	+BUS BIT 3	A0724B	A1328B		2	
8	+BUS BIT 3	A0724B	JA0306B		1	
9	+BUS BIT 7	A0725A	JA0308B		1	
10	+BUS BIT 7	A0725A	A1326B		2	
11	+BUS BIT 5	A0725B	A0326A		2	
12	+BUS BIT 5	A0725B	A1324A		1	
13	+BUS BIT 6	A0726A	A1322B		2	
14	+BUS BIT 6	A0726A	JA0309B		1	
15	+BUS BIT 4	A0726B	JA0310B		1	
16	+BUS BIT 4	A0726B	A1329B		2	
17	+BUS BIT 1	A0727A	A0616A		1	
18	+BUS BIT 1	A0727A	A1333A		2	
19	-WRITE GATE	A0727B	A0524B		2	
20	-WRITE GATE	A0727B	A1412B		1	
21	+BUS BIT 2	A0728A	A0622B		1	
22	+BUS BIT 2	A0728A	A1330A		2	
23	-SERVO OFFSET FWD	A0728B	A1122B		1	
24A	-READ GATE	A0729A	A1531B		1	
24B	-READ GATE	A0729A	A0513B		2	
25	-READ GATE	A0729A	A1612B		1	
26	-SERVO OFFSET REV	A0729B	A1121A		1	
27	-FAULT CLEAR	A0730A	A0522A		1	
28	-RTZ SEEK	A0730B	A0312B		1	
29	-AM ENABLE	A0731A	A1124A		2	
30	-ADDRESS MARK	A0731A	A0603A		1	
31	-DATA STROBE EARLY	A0731B	A1604B		1	
32	-CYL SEL TAG 1	A0732A	A1306B		1	
33	+BUS BIT 8	A0732B	A1321A		2	
34	+BUS BIT 8	A0732B	JA0306A		1	

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TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36,400 TPI	9	AW

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
1	-DATA STROBE LATE	A0733A	A1603B		1	
	-CONT SEL TAG 3	A0733B	JA0312B		1	
2	-MINUS 20 VOLTS	A0802B	A0502B		1	
	+SERVO DIBITS	A0813B	A1023B		1	
3	+WR PROTECT	A0814B	A0527A		1	
	-WRITE PROT	A0814B	JA0208A		2	S/C 10 & Abv.
4	-SERVO DIBITS	A0815B	A1025B			
	-MINUS-20V	A0802B	A0502B		1	
5	+PLUS-20V	A0833B	A0533B		1	
	-GROUND	A0901A	A0917B		1	
6	-MINUS-20V	A0902A	A0902B		1	ELPV-Rev. C
	-MINUS-20V	A0902B	A0902A		1	ELPV-Rev. C
7	-MINUS-36V	A0903A	A0904A		1	ELPV-Rev. C
	-MINUS-36V	A0903A	A0903B		2	ELPV-Rev. C
8	-MINUS-36V	A0903B	A0503B		1	
	-MINUS-36V	A0903B	A0903B		2	ELPV-Rev. C
9	+FIN POS ANALOG	A0906A	A1126A		1	
	-MINUS-36V	A0904A	A0903A		1	ELPV-Rev. C
10	-MINUS-36V	A0904A	A0904B		2	ELPV-Rev. C
	-MINUS-36V	A0904B	A0904A		2	ELPV-Rev. C
11	+PWR JUMPER	A0907B	A0929B		1	
	+VEL XDUCER	A0912B	A1228B		1	
12	-LOAD HEADS	A0915B	A0425A		1	
	+HEADS LOADED	A0916B	A0421B		2	
13	-GROUND	A0917B	A0901A		1	
	-SEEK REV	A0922B	A0408A		1	
14	-SEEK FWD	A0923B	A0407A		2	
	+ON CYL SENSE	A0924B	A0415A		1	
15	+ON CYL SENSE	A0924B	A1133A		2	
	+TLESS THAN 7	A0926B	A1317B		1	
16	+NOT FINE + OFFSET	A0927A	A1122A		1	
	+CYLPULSE BLK	A0927B	A0430B		1	
17	+SUM AMP OUT	A0928B	A1226B		1	
	+PWR JUMPER	A0929B	A0907B		2	
18	+PLUS+36V	A0931A	A0931B		1	ELPV-Rev. C
	+PLUS+36V	A0931A	A0932A		2	ELPV-Rev. C
19	+PLUS+36V	A0931B	A0931A		1	ELPV-Rev. C
	+PLUS+36V	A0932A	A0932B		1	ELPV-Rev. C
20	+PLUS+36V	A0932A	A0931A		2	ELPV-Rev. C
	+PLUS+36V	A0932B	A0932A		1	ELPV-Rev. C
21	+PLUS+36V	A0932B	A0532B		2	
22	+PLUS+20V	A0933A	A0933B		1	ELPV-Rev. C
23	+PLUS+20V	A0933B	A0933A		1	ELPV-Rev. C
24	+CYL DET A	A1007B	A0428B		1	
25	+CYL DET B	A1008B	A0427B		1	
26	+TK SERVO SIG	A1009B	A1126B		1	
27	+EVEN DIBITS	A1011B	A0304A		1	
28	-ODD DIBIT	A1012B	A0122B		1	
29	+SERVO DIBITS	A1023B	JA1023B			
30	-SERVO DIBITS	A1025B	JA1025B			
31	+HEADS LOADED	A1027B	A0413B		1	
32	-MINUS 12 VOLTS	A1028B	JA0102B		1	
33	+PLUS 12 VOLTS	A1029B	JA0112B		1	
34	+ODD DIBITS	A1032A	A0305B		1	

TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36,400 TPI	10	N

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	-ODD+EVEN DIBIT	A1033A	A0322B		1	
2	+VELOCITY	A1102A	A1230B		1	
3	-MINUS 20 VOLTS	A1102B	A1502B		1	
4	+UNIT SELECT BIT 2	A1103A	A0615B		1	
5	-UNIT SELECT BIT 2	A1103B	A0507B		1	
6	-UNIT SELECT BIT 3	A1104A	A0508A		1	
7	+UNIT SELECT BIT 3	A1104B	A0615A		1	
8	+UNIT SELECT STROBE -PWRUP CLEAR	A1105A A1105B	A1111A A1407B		2 2	S/C 09 W/48028A & ABV
9	-PWRUP CLEAR +UNIT SELECT BIT 1	A1105B A1106A	A0505B A0704B		1 1	
10	-UNIT SELECT BIT 1	A1106B	A0506B		1	
11	-UNIT SELECT BIT 0	A1107A	A0507A		1	
12	+UNIT SELECT BIT 0	A1107B	A0704B		1	
13	-FWD EOT ENABLE	A1108A	A0316A		1	
14	+INTEGRATED VEL	A1108B	A1227B		1	
15	+FINE POS	A1109A	A1223B		1	
16	-REV EOT PULSE	A1109B	A0310A		1	
17	-LOAD +RTZ	A1110B	A0406B		2	
18	-LOAD + RTZ	A1110B	A1326A		1	
19	+UNIT SELECT STROBE	A1111A	A1105A		2	
20	+UNIT SELECT STROBE	A1111A	A1129A		1	
21	-UNIT SELECT STROBE	A1111B	JA0209A		1	S/C 10 & BLW *
22	-UNIT SELECT STROBE -UNIT SELECT STROBE	A1111B A1111B	A0505A A0505A		2 1	S/C 10 & BLW * S/C 11 & ABV
23	-UNIT SELECT STROBE -GATED CYL PULSES	A1111B A1112A	A1523B A0414A		2 1	S/C 11 & ABV
24	-GATED CYL PULSES	A1112A	A1303B		2	
25	+OFFSET CMMD PULSE	A1112B	A0405A		1	
26	+CYLINDER PULSES	A1113A	A0422A		1	
27	-SEEK FF	A1113B	A0430A		1	
28	+REV EOT PULSE	A1114B	A0310B			
29	+SLOPE	A1116A	A0404B		1	
30	-SERVO OFFSET REV	A1121A	A0729B		1	
31	+NOT FINE + OFFSET	A1122A	A0927A		1	
32	-SERVO OFFSET FWD	A1122B	A0728B		1	NOTE: * WIRES USED ON ALL BJ7B2 G/H ONLY.
33	-FINE ENABLE	A1123A	A0328B		1	
34	+FINE HDS LOADED	A1123B	A0406A		1	

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TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36, 400 TPI	11	A

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1A	-AM ENABLE	A1124A	A0731A		2	
1B	-AM ENABLE	A1124A	A1426B		1	
2A	-READ GATE	A1124B	A1612B		2	
2B	-READ GATE	A1124B	A0522B		1	
3	+READ AM ENABLE	A1125A	JA0104B		1	
4	+SPEED + UNLOAD HDS	A1125B	A0426A		1	
5	+FINE POS ANALOG	A1126A	A0906A		1	
6	+FINE POS ANALOG	A1126A	A1215B		2	
7	+TRACK SERVO SIGNAL	A1126B	A1009B		1	
8	+LOGIC PLUG 2	A1127A	JA0212A		1	
9	+LOGIC PLUG 2	A1127B	A0504A		1	
10	+LOGIC PLUG 3	A1128B	JA0211A		1	
11	+UNIT SELECT STROBE	A1129A	A1111A		1	
12	+LOGIC PLUG 3	A1129B	A0504B		1	
13	+LOGIC PLUG 1	A1130A	JA0211B		1	
14	+LOGIC PLUG 1	A1130B	A0503A		1	
15	+LOGIC PLUG 0	A1131A	JA0214A		1	
16A	+LOGIC PLUG 0	A1131B	A0508B		1	
16B	+ON CYL SENSE	A1133A	A0924B		2	
17	+PLUS 20 VOLTS	A1133B	A1533B		1	
18	+SERVO FAULT	A1202A	A0431A		1	
19	-FAULT	A1207A	A0513B		1	
20	+LOAD HEADS	A1207B	A0429B		1	
21	+RETURN TO ZERO	A1208A	A0412B		1	
22	+VELOCITY LAMP	A1210A	A0413A		1	
23	+DIFF BIT 6	A1211B	A1302A		1	
24						
25	+DIFF BIT 5	A1212B	A1303A		1	
26	+DIFF BIT 4	A1213A	A1304A		1	
27	+DIFF BIT 3	A1213B	A1310A		1	
28	+DIFF BIT 2	A1215A	A1309B		1	
29	+FINE POS ANALOG	A1215B	A1126A		2	
30	+DIFF BIT 0	A1216A	A1311B		1	
31	-SEEK FWD	A1216B	A0407A		1	
32	+DIFF BIT 1	A1217A	A1309A		1	
33	+COARSE	A1217B	A0416A		1	
34	-SEEK REV	A1221B	A0408A		1	

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TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36, 400 TPI	12	A

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+FINE	A1222B	A0416B		1	
2A	+FINE POS	A1223B	A1109A		1	
2B	+DIF BIT 7	A1225B	A1302B		1	
3	+SUM AMP OUT	A1226B	A0928B		1	
4A	+ T-GRTHN 256	A1227A	A1304B		2	
4B	+INTEGRTD VEL	A1227B	A1108B		1	
5	+VEL XDUCER	A1228B	A0912B		1	
6	+VELOCITY	A1230B	A1102A		1	
7	-GROUND	A1231A	A1234A		1	
8	-GROUND	A1301A	JA0304A		1	
9A	+DIF BIT 6	A1302A	A1211B		1	
9B	+DIF BIT 7	A1302B	A1225B		1	
10	+DIF BIT 5	A1303A	A1212B		1	
11	-GTD CYL PULSE	A1303B	A1112A		2	
12	+DIF BIT 4	A1304A	A1213A		1	
13	+SERVO READY	A1305A	A0410B		2	
14A	+ON CYLINDER	A1305B	A1132A		1	
14B	+ON CYLINDER	A1305B	A0624A		2	
15	+T LESS THAN 1	A1306A	A0417B		1	
16	-CYL SEL TAG 1	A1306B	A0732A		1	
17	-CYL SEL TAG 1	A1306B	JA0314B		2	
18	-ON CYL·CYLSEL	A1307A	A0327B		2	
19	-ON CYL·CYLSEL	A1307A	A0402B		1	
20	-T EQUALS SERVO	A1307B	A0422B		1	
21	+DIF BIT 1	A1309A	A1217A		1	
22	+DIF BIT 2	A1309B	A1215A		1	
23	+DIF BIT 3	A1310A	A1213B		1	
24	+DIF BIT 0	A1311B	A1216A		1	
25	+CAR BIT 9	A1313A	JA0110A		1	
26	+REV + NOT FWD	A1313B	A0404A		1	
27	+BUS BIT 9	A1314A	A0333B		1	
28	-SPDF+VOLTFLT	A1314B	JA0207B		1	
29	+SPDF+VOLTFLT	A1315A	A0521A		1	
30	+T GTR THAN 128	A1315B	A1212A		1	
31A	+WRITE GATE	A1316A	JA0101B		1	
31B	-WRITE GATE	A1316B	A1412B		2	
32	-T GTR THAN 128	A1317A	A0414B		1	
33	+T LESS THAN 7	A1317B	A0926B		1	
34	+BUS BIT 8	A1321A	A0732B		2	

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TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP		36, 400 TPI	13	Z

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+BUS BIT 8	A1321A	A0332A		1	
2						
3	+BUS BIT 6	A1322B	A0326B		1	
4	+BUS BIT 6	A1322B	A0726A		2	
5	+CAR BIT 8	A1323B	JA0111A		2	
6	+BUS BIT 5	A1324A	JA0311B		2	
7	+BUS BIT 5	A1324A	A0725B		1	
8	+CAR BIT 7	A1324B	JA0112A		2	
9A	+BUS BIT 9	A1325A	A0703A		2	
9B	-LD+RTZ+SEEK ERROR	A1325B	A0415B		1	
10	-LD+RTZ	A1326A	A1110B		1	
11	+BUS BIT 7	A1326B	A0725A		2	
12	+BUS BIT 7	A1326B	A0311B		1	
13	+BUS BIT 3	A1328B	A0724B		2	
14	+BUS BIT 3	A1328B	A0323B		1	
15	+BUS BIT 4	A1329B	A0726B		2	
16	+BUS BIT 4	A1329B	A0322A		1	
17	+BUS BIT 2	A1330A	A0728A		2	
18	+BUS BIT 2	A1330A	A0323A		1	
19	+BUS BIT 0	A1331A	A0724A		1	
20	+BUS BIT 0	A1331A	JA0308A		2	
21	-UNLOAD HEADS	A1332A	JA0202A		1	S/C 09 & BLW,ONLY
22	+CAR BIT 0	A1332B	A0410A		1	
23	+BUS BIT 1	A1333A	JA0307A		1	
24	+BUS BIT 1	A1333A	A0727A		2	
25	+UNLOAD HEADS	A1333B	A0412A		1	S/C 09 & BLW,ONLY
26	-GROUND	A1401A	JA0303A		1	
27	-GROUND	A1401A	A1405A		2	
28	-GROUND -PWRUP CLEAR	A1405A A1407B	A1401A A1528B		2 1	 S/C 09 W/37979 &ABV
29	-PWRUP CLEAR +HI FREQ CLOCK	A1407B A1409A	A1105B A0130B		2 1	S/C 09 W/48028A
30	-WRITE CLOCK	A1410B	A0128B		1	
31A	-WRITE GATE	A1412B	A0727B		1	
31B	-WRITE GATE	A1412B	A1316B		2	
32	+WRITE DATA	A1423B	JA0310A		2	
33	+WRITE DATA	A1423B	A0610B		1	
34	-ADDRESS MARK	A1426B	A1316B		1	

K0R-0542

TITLE		DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP	WL	36,400 TPI	14	A

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
1	-ADDRESS MARK	A1426B	A1613B		2	
2	-WRITE DATA	A1429A	JA0108B		1	
3	+WRITE DATA	A1429B	JA0109B		1	
4	-GROUND	A1501A	JA0302A		1	
5	-MINUS 20V	A1502B	A1602B		2	
6	-MINUS 20V	A1502B	A1102B		1	
7	-MFM DATA	A1503B	A1610B		1	
8	+MFM DATA	A1504B	A1609B		1	
9	-ANALOG DATA	A1507B	JA0107B		1	
	+ANALOG DATA	A1508B	JA0106B		1	
10	+ADD MK DET	A1521B	JA0105B		1	
	-ADD MK DET	A1522B	JA0106A		1	
11	-UNIT SELECT STROBE	A1523B	A1111B		2	S/C 11 & ABV *
	-UNIT SELECT STROBE	A1523B	JA0209A		1	S/C 11 & ABV *
12	-OPN CABLE DET	A1524B	A0702B		1	S/C 11 & ABV *
	+SEL ENABLE	A1525B	A0509A		1	S/C 11 & ABV *
13	-AM ENABLE	A1527B	A1613B		1	S/C 09 W/ 37979 & ABV
	-PWRUP CLEAR	A1528B	A1407B		1	S/C 09 W/ 37979 & ABV
14	-LK TO DATA AMK	A1530B	A1622B		1	
15	-LOCK TO DATA	A1531B	A0514A		1	
16 16	-ADDRESS MARK	A1532B	JA0304B		2	
17	-ADDRESS MARK	A1532B	A0623A		1	
18	+PLUS 20V	A1533B	A1133B		1	
19	+PLUS 20V	A1533B	A1633B		2	
20	-GROUND	A1601A	JA0301A		1	
21	-GROUND	A1601A	JA0401A		2	
22	-5 VOLTS	A1601B	JA0205B		1	
	-MINUS 20 VOLTS	A1602B	A1502B		2	
23	-DATA STROBE LATE	A1603B	A0733A		1	
24	-DATA STROBE EARLY	A1604B	A0731B		1	
25	+MFM DATA	A1609B	A1504B		1	
26	-MFM DATA	A1610B	A1503B		1	
	-READ GATE	A1612B	A0729A		1	
27	-READ GATE	A1612B	A1124B		2	
28	-ADDRESS MARK	A1613B	A1426B		2	
	-AM ENABLE	A1613B	A1527B		1	S/C 09 W/ 37979 & ABV
29	-LK TO DATA AMK	A1622B	A1530B		1	
30	-REF CLOCK	A1623B	A0123B		1	
31	+REF CLOCK	A1624B	A0124B		1	
32	+READ CLOCK	A1626B	A0631B		1	
33	+READ DATA	A1627B	A0631A		1	
34	-GROUND	A1633A	JA0313B		1	

NOTE:

* WIRES DELETED FROM BJ7B2G/H.

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP		36,400 TPI	15	Z

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+PLUS 20V	A1633B	A1533B		2	
2	-GROUND	A1634A	JA0105A		1	
3	-READ GATE	JA0101B	A0522B		2	
4	+HEAD BIT 0	JA0102A	A0632A		1	
5	-MINUS 11 VOLTS	JA0102B	A1028B		1	
6A	+HEAD BIT 1	JA0103A	A0633B		1	
6B	-5 VOLTS	JA0103B	JA0205B		2	
7	+HEAD BIT 2	JA0104A	A0632B		1	
8	+READ AM ENABLE	JA0104B	A1125A		2	
9	-ON CYLINDER	JA0105A	A0403B		1	
10	+ADD MK DET	JA0105B	A1521B		1	
11	ADD MK DET	JA0106A	A1522B		1	
12	+ANALOG DATA	JA0106B	A1508B		1	
13	-ANALOG DATA	JA0107B	A1507B		1	
14	+HD SEL FLT	JA0108A	A0530B		1	
15	+WRITE DATA	JA0108B	A1429A		1	
16	+WRITE FAULT	JA0109A	A0528A		1	
17	-WRITE DATA	JA0109B	A1429B		1	
18	+CAR BIT 8	JA0110A	A1323B		2	
19	-WRITE GATE	JA0110B	A0524B		1	
20	+CAR BIT 7	JA0111A	A1324B		2	
21	+PLUS 5V	JA0111B	JA0210A		1	
22	+CAR BIT 6	JA0112A	A1321B		2	
23	+PLUS IIV	JA0112B	A1029B		1	
24	+WRTR INHIBIT	JA0113A	A0531B		1	
25	+PLUS 36V	JA0114B	A0532B		1	
26	-FAULT	JA0201A	A0433B		1	
27	-GROUND	JA0201B	JA0207A		1	
28	-GROUND	JA0201B	JA0209B		2	
29	-UNLOAD HEADS	JA0202A	A1332A		1	S/C 09 & BLW
30	+UNLOAD HEADS -MAN FLT. CLER	JA0202A JA0202B	A0412A A0521B		1 1	S/C 10 & ABV
31	+MAG PICK UP	JA0203A	A0506A		1	
32	-MAG PICK UP	JA0203B	A0517A		1	
33A	+HDS LDED 20V	JA0204A	A0424B		1	
33B	+UNIT SELECT	JA0204B	A0512B		2	
34A	+SEEK END	JA0205A	A0432A		1	
34B	-5 VOLTS	JA0205B	A1601B		1	
34C	-5 VOLTS	JA0205B	JA0103B		2	

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TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
LOGIC CHASSIS WIRE WRAP		36,400 TPI	16	AW

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	-START	JA0206A	A0502A		1	S/C 09 & BLW
2	-GROUND	JA0206B	JA0209B		1	
3	-GROUND	JA0207A	JA0201B		1	
4	-SPD FLT+VOLT FLT	JA0207B	A1314B		1	
5	+W+R FAULT	JA0208B	A0523A		1	
	-WRITE PROT	JA0208A	A0814B		2	S/C 10 & ABV
6	-UNIT SELECT STROBE	JA0209A	A1111B		1	S/C 10 & BLW
7A	-GROUND	JA0209B	JA0201B		2	
7B	-GROUND	JA0209B	JA0206B		1	
	-UNIT SELECT STROBE	JA0209A	A1523B		1	S/C 11 & ABV
8	+PLUS 5V	JA0210A	JA0111B		1	
9	+HEAD SELECT FAULT	JA0210B	A0530A		1	
10	+LOGIC PLUG 3	JA0211A	A1128B		1	
11	+LOGIC PLUG 1	JA0211B	A1130A		1	
12	+LOGIC PLUG 2	JA0212A	A1127A		1	
13	+WRITE FAULT	JA0212B	A0529B		1	
14	-UNIT READY	JA0213A	A0509B		1	
15	+ON CYL•(W+R)	JA0213B	A0516B		1	
16	+LOGIC PLG 0	JA0214B	A1131A		1	
17	+VOLTAGE FAULT	JA0214B	A0514B		1	
18	-GROUND	JA0301A	A1601A		1	
19	+INDEX	JA0301B	A0313B		2	
20	-GROUND	JA0302A	A1501A		1	
21	-ON CYLINDER	JA0302B	A0524A		1	
22	-GROUND	JA0303A	A1401A		1	
23	-SERVO CLOCK	JA0303B	A0623B		1	
24	-GROUND	JA0304A	A1301A		1	
25	-ADDRESS MARK	JA0304B	A1532B		2	
26	+BUS BIT 9	JA0305A	A0703A		1	
27	-HD SEL TAG 3	JA0305B	A0702A		2	
28	+BUS BIT 8	JA0306A	A0732B		1	
29	+BUS BIT 3	JA0306B	A0724B		1	
30	+BUS BIT 1	JA0307A	A1333A		1	
31	+BUS BIT 2	JA0307B	A0622B		2	
32	+BUS BIT 0	JA0308A	A1331A		2	
33	+BUS BIT 0	JA0308A	A0332B		1	
34	+BUS BIT 7	JA0308B	A0725A		1	

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TITLE LOGIC CHASSIS WIRE WRAP	WL	DOCUMENT NO. 36,400 TPI	SHEET NO. 17	REV. A

LINE NO.	SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	
1	+WRITE CLOCK	JA0309A	A0610A		2	
2	+BUS BIT 6	JA0309B	A0726A		1	
3	+WRITE DATA	JA0310A	A1423B		2	
4	+BUS BIT 4	JA0310B	A0726B		1	
5	+UNIT SEL BIT 0	JA0311A	A0704A		2	
6	+BUS BIT 5	JA0311B	A1324A		2	
7	+UNIT SEL BIT 1	JA0312A	A0704B		2	
8	-CTLSEL TAG 3	JA0312B	A0733B		1	
9	+UNIT SEL BIT 2	JA0313A	A0615B		2	
10	-GROUND	JA0313B	A1633A		1	
11	+UNIT SEL BIT 3	JA0314A	A0615A		2	
12	-CYL SEL TAG 1	JA0314B	A1306B		2	
13	-GROUND	JA0401A	A1601A		2	
14	+PWR UP WR PROTECT	JA0409A	A0532A		1	
15						
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TITLE		SHEET NO.	DOCUMENT NO.	REV.
W4 CABLE ASSY, R/W AND HEAD SELECT	WL	1 of 1	SMD 7437	G

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	24		11.5	LGC CONNECTOR TO		HEAD SEL PC BOARD			
1A		5		PA1 (JA01)	1B	P101 (J101)	14B		$\overline{\text{READ GATE}}$ A0729A (14)
1B		0		PA1	1A	P101	14A		GND
1C		4		PA1	2B	P101	13B		-12 VOLTS, A1025B
1D		0		PA1	2A	P101	13A		HEAD SEL BIT 0 A0632A (13)
1E		3		PA1	3B	P101	12B		-5 VOLTS
1F		0		PA1	3A	P101	12A		HEAD SEL BIT 1 A0633B (13)
1G		2		PA1	4B	P101	11B		AM ENABLE A1316A (27)
1H		0		PA1	4A	P101	11A		HEAD SEL BIT 2 A0632B (13)
1J		1		PA1	5B	P101	10B		AM DETECT A1521B (31)
1K		0		PA1	5A	P101	10A		$\overline{\text{ON CYL}}$ A0405B
1L		0		PA1	6A	P101	9A		AM DETECT A15022B (31)
1M		0		PA1	8A	P101	7A		MULT HD SEL FLT A0530B (8)
1N		0		PA1	9A	P101	6A		WRITE FLT A0528A (8)
1P		5		PA1	10B	P101	5B		$\overline{\text{WRITE}}$ A0727B (14)
1R		0		PA1	10A	P101	5A		CAR BIT 8, A1323B (26)
1S		4		PA1	11B	P101	4B		+5 VOLTS
1T		0		PA1	11A	P101	4A		CAR BIT 7, A1324B (26)
1U		3		PA1	12B	P101	3B		+12 VOLTS
1V		0		PA1	12A	P101	3A		CAR BIT 6, A1321B (26)
1W		2		PA1	13B	P101	2B		+20 VOLTS
1X		0		PA1	13A	P101	2A		WR PROTECT DELAY A0531B (10)
1Y		1		PA1	14B	P101	1B		+36 VOLTS, A0532B
1Z		0		PA1	14A	P101	1A		GROUND
2	24		11.5						READ ANALOG DATA
2A		6		PA1	6B	P101	9B		A1508B (30)
2B		9		PA1	7B	P101	8B		A1507B (30)
2C		SHLD		COND IDENT 3		COND IDENT			
3	20	0		PA1	7A	COND IDENT 2C			
4	20	0		COND IDENT 2C		P101	8A		
5	24		11.6						MFM DATA
5A		6		PA1	8B	P101	7B		A1429B (29)
5B		9		PA1	9B	P101	6B		A1429A (29)
5C		SHLD		COND IDENT 2C		COND IDENT			
6	20	0		COND IDENT 2C		COND IDENT 5C			
7	20	0		COND IDENT 5C		COND IDENT 4			

TITLE		SHEET NO.	DOCUMENT NO.	REV.
S/C 09 & BLW REF: 77479200 W5 CABLE ASSY, SWITCH AND CONTROL PANEL	WL	1 of 2	SMD 7197	N

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	26		36						
1A		0		PA2	1A	P201	1A		FAULT A0513B (10)
2B		9		PA2	1B	P201	1B		GROUND A0201B
3	24	4	36	PA2	2A	A4	E4		
4	24	4	36	PA2	2B	P201	2B		FLT CLR A0521B (8), A0431B (7)
5									
5A									
5B									
6	24	4	36	PA2	4A	A4	E3		HDS LDD A0424B (7)
7	↑	↑	18	A4	E3	S2	NO		HDS LDD A0424B (7)
8			6	P201	5A	S3	C		PACK COVER SWT
9			36	P201	5A	PA2	6A		START
10			36	PA2	7A	P201	7A		LOGIC CHASSIS GND
11			22	PA2	7B	A4	E6		$\overline{\text{SPD+VOLT}}$ FLT A1314B (27)
12									
13			24	A4	E2	S4	NC		HDS LDD SWT
14			36	PA2	10A	P201	10A		+5 VOLTS, A0210A
15			36	PA2	11A	P201	11A		LAP BIT 3 A0504B (7)
16			36	PA2	11B	P201	11B		LAP BIT 1 A0503A (7)
17			36	PA2	12A	P201	12A		LAP BIT 2 A0504A (7)
18			36	PA2	13A	P201	13A		READY, A0509B (10)
19	↓	↓	36	PA2	14A	P201	14A		LAP BIT 0 A0508B (7)
20	24	4	29	S3	NO	A4	E12		PACK COVER SWT
21	20	0	18	S2	C	A4	GND		HEADS LDD SWT
22	20	2		A3	+5	A4	E5		+5 VOLTS
23	20	2		A3	+20	K2	B		+20 VOLTS
24	20	2		K2	B	A4	E10		+20 VOLTS
25	20	2		A4	E5	K1	3		+5 VOLTS
26	20	0		A3	GND	A4	GND		
27									
28	20	6		A3	-20	S1	C		-20 VOLTS
29	24	4		K2	A	A4	E8		RETRACT RELAY
30	24	4	36	PA2	12B	P201	12B		WRITE FAULT
31	24	4	36	PA2	10B	P201	10B		HEAD SELECT FAULT
32	24	4	36	PA2	8B	P201	8B		W+R FAULT
33	24	4	36	PA2	13B	P201	13B		$\overline{\text{ON CYL}}$ • (W+R)
34	24	4	36	PA2	14B	P201	14B		VOLT FAULT
35	24	4	36	PA2	5B	P201	5B		
36	26	4	36						
36A		9		PA2	5A	P201	6A		$\overline{\text{SEEK END}}$

TITLE		SHEET NO.	DOCUMENT NO.	REV.
W5 CABLE ASSY, SWITCH AND CONTROL PANEL	WL	2 of 2	SMD 7197	A

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION		REMARKS
				LOCATION	PIN NO.	LOCATION	PIN NO.	
36B		0		PA2	6B	P201	6B	
37	26		36					
37A		9		PA2	4B	P201	4A	$\overline{\text{UNIT SELECTED}}$
37B		0		PA2	6B	P201	6B	
38	26		36					
38A		9		PA2	9A	P201	9A	$\overline{\text{UNIT SELECT STROBE}}$
38B		0		PA2	9B	P201	9B	
39	26		44					
39A		9		J203	1	P201	2A	SEEK END
39B		0		J203	2	P201	3B	$\overline{\text{SEEK END}}$
40	26		44					
40A		9		J203	3	P201	4B	UNIT SELECTED
40B		0		J203	4	P201	3A	$\overline{\text{UNIT SELECTED}}$
41	26		44					
41A		9		P204	1	P201	7B	UNIT SEL STROBE
41B		0		P204	2	P201	8A	
42	26		44					
42A		9		P204	3	P201	7B	
42B		0		P204	4	P201	8A	
43	24	4	14	P201	5B	P205	1B	
44	↑	4	14	P201	13A	▲	3A	
45		4	30	A4	E1		9B	
46		4	30	A4	E2		7B	
47		2	30	A4	E5		14B	
48		2	30	A4	E10		12B	
49		4	30	A4	E12		6B	
50		2	30	K5	3		14B	
51	↓	4	30	K5	4		10B	
52	24		40	PA2	1B			
52A		0		PA2	3A		1A	
52B		2	3	PA2	3B		2B	
53	24	0	26	P205	2A	▼	14A	
54	24	0		A4	GND	P205	14A	
55	24	4		P206	1	K1	4	
56	24	4		P206	2	P205	8B	

TITLE	S/C 10 & ABOVE REF: 40139901 W-5 HARNESS WIRE LIST	WL	DOCUMENT NO. 4399	SHEET NO. 1 of 2	REV. B

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
1A	PA2-1A	P201-1A	9		
1B	PA2-1B	P201-1B	0		
2	PA2-2A	P205-5B	4		
3	PA2-2B	P201-2B	4		
4A	PA2-3A	P205-1A	9		
4B	PA2-3B	P205-2B	0		
5	PA2-4A	S2-NO	4		
6A	PA2-4B	P201-4A	9		
6B	PA2-6B	P201-6B	0		
7A	PA2-5A	P201-6A	9		
7B	PA2-6B	P201-6B	0		
8	PA2-5B	P201-5B	4		
9	PA2-4A	P207-2	4		
10	PA2-7A	P201-7A	4		
11	PA2-7B	P205-13A	4		
12	PA2-8A	P201-8A	4		
13	PA2-8B	P201-8B	4		
14A	PA2-9A	P205-6A	9		
14B	PA2-9B	P205-7A	0		
15	PA2-10A	P201-10A	4		
16	PA2-10B	P201-10B	4		
17	PA2-11A	P201-11A	4		
18	PA2-11B	P201-11B	4		
19	PA2-12A	P201-12A	4		
20	PA2-12B	P201-12B	4		
21	PA2-13A	P201-13A	4		
22	PA2-13B	P201-13B	4		
23	PA2-14A	P201-14A	4		
24	PA2-14B	P201-14B	4		
25	P201-5B	P205-1B	4		
26	P201-8A	P201-7B	4		
27	A3-+5	K1-3	2		
28	K1-3	K5-3	2		
29	K5-3	P205-14B	2		

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
S/C 10 & ABOVE REF: 40139901 W-5 HARNESS WIRE LIST		4399	2 of 2	B

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
30	A3-+20	K2-B	2		
31	K2-B	P205-12B	2		
32	A3-GND	P205-14A	0		
33	K2-A	P205-12A	4		
34	S2-NC	P205-10B	4		
35	K5-4	P205-8B	4		
36	S3-NO	P205-6B	4		
37	S3-C	P205-9A	4		
38	S3-C	P201-5A	4		
39	A3-GND	S2-C	0		
40	K1-4	P206-1	4		
41	P206-2	P205-9B	4		
42	P208-2	P205-2A	4		
43					
44	P208-1	P205-10A	4		
44	P208-3	P205-8A	4		
45A	P201-9A	J3-53	9		
45B	P201-9B	J3-56	0		
45C	J3-53	J4-53	9		
45D	J3-56	J4-56	0		
46A	J2-CC	P201-2A	9		
46B	J2-AA	P201-3B	0		
47A	J2-BB	P201-4B	9		
47B	J2-DD	P201-3A	0		
48A	P205-5A	J3-25	9		
48B	P205-4A	J3-22	0		
48C	J3-25	J4-25	9		
48D	J3-22	J4-22	0		
49	P205-11A	P207-1	4		
50	P201-13A	P205-3B	4		
51	P201-5A	P2A-6A	4		

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
(REF: 77396300) W6 CABLE ASSY, DC POWER DISTRIBUTION	WL	1 of 1	SMD 7583	F

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
	J1 1	A0 +5	Red		+5 volts
	J1 2	A0 GND	Blk		GND
	J1 3	A0 -5	Blu		-5 volts
	J1 4	PA1 12B	Red		+12 volts
	J1 5	A3 -20	Blu		-20 volts (A09-33B)
	J1 6	DCPA1 2B	Blu		-12 volts
	J1 7	DCPA1 14B	Red		+36 volts
	J1 8	A0 +20	Red		+20 volts (A09-2B)
	J1 9	A0 -36	Blu		-36 volts (A09-3B),ELPV,REV. B
	J1 9	A0 -42	Blu		-42 volts (A09-3B),ELPV,REV. C
	J1 10	A8 R2-2	Red		+36 volts, ELPV, REV. B
	J1 10	A8 R2-2	Red		+42 volts, ELPV, REV. C
	J1 11	A8 R3-2	Blk		±36 GND, ELPV, REV. B
	J1 11	A8 R3-2	Blk		±42 GND, ELPV, REV. C
	J1 12	A8 R1-2	Blu		-36 volts, ELPV, REV. B
	J1 12	A8 R1-2	Blu		-42 volts, ELPV, REV. C
	A9(CR1 +)	A8 R2-2	Red		+36 volts
	A09 17B	A8 R3-2	Blk		±36 volt ground
	A9(CR1 -)	A8 R1-2	Blu		-36 volts
	A9(CR1 -)	A9 (CR2 AC)	Blu		
	A0 -5	DCPA1 3B	Blu		-5 volts
	A0 +20	DCPA1 13B	Red		+20 volts
	J1 7	A0 32B	Red		+42 volts(A09-32B), ELPV, REV. C
	A09 32B	A09 32A	Red		+42 volts, ELPV, REV. C
	A09 32B	A09 31A	Red		+42 volts, ELPV, REV. C
	A09 31B	A09 31B	Red		+42 volts, ELPV, REV. C
	A09 3B	A09 3A	Blu		-42 volts, ELPV, REV. C
	A09 3A	A09 4A	Blu		-42 volts, ELPV, REV. C
	A09 4A	A09 4B	Blu		-42 volts, ELPV, REV. C

TITLE		SHEET NO.	DOCUMENT NO.	REV.
W7 CABLE ASSY, SERVO DIBIT CABLE, J8	WL	1 OF 1	SMD 7446	E

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1		WHT	26	JA10	25B	J8	2B	-D1 BITS	NOTE: JA10 CONNECTS TO
2		BLK	26	JA10	24B	J8	2A	GRD	LOGIC CHASSIS PINS A10 AND
3		RED	26	JA10	23B	J8	1B	+D1-BITS	J8 CONNECTS TO THE SERVO
4		SHIELD	26	JA10	26B	J8	1A	SHIELD	PREAMP CIRCUIT BOARD.
5		WHT	26	JA10	28B	J8	3B	-12 V	
6		RED	26	JA10	29B	J8	4B	+12 V	
7		BLK	26	JA10	30B	J8	3A	GRD	
8		SHIELD	26	JA10	30A	J8	4A	SHIELD	
									Ref 75244600

TITLE		SHEET NO.	DOCUMENT NO.	REV.
W9 CABLE ASSY, BASE ASSEMBLY WIRING FOR UNITS WITH FERRO-RESONANT TRANSFORMER	WL	1 OF 1	REF 77387400	A

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	24	4	30	S4	C	A4	E2		
2	20	9-60Hz 0-50Hz	–	T1	1	TB1	1		
3	20	0	8	M1		CB2	A2		HOUR METER
4	20	9	8	M1		CB1	B2		HOUR METER
5	20	3	–	T1		TUNING CAP	1		
6	20	3	–	T1		TUNING CAP	2		
7									
8	16	BLK	3.25	CB1	A1	CB2	1		
9	20	8-60Hz 3-50Hz	–	T1	2	TB1	2		
10	20	0-60Hz 1-50Hz	–	T1	3	TB1	3		
11	20	4	–	T1	4	TB1	4		
12	20	8	–	T1	5	TB1	5		
13	20	9	–	T1	6	TB1	6		
14	16	RED		POWER SUPPLY		C1	+		S/C 23 & Blw only
15	16	BLU		POWER SUPPLY		C2	-		S/C 23 & Blw only
16	16	BLK		POWER SUPPLY		C1	-		S/C 23 & Blw only
17	22	RED		BM1		NOT USED			BRUSH MTR
18	22	WHT		BM1		A4	MTG SCREW		BRUSH MTR
19	22	BLK		DM1 BRAKE		A4	E10		OPTIONAL
20	22	BLK		DM1 BRAKE		A4	E7		OPTIONAL
21									
21	24	YEL	4.0	SW1	NC	A4	E9		
22	16	RED	10.0	K5	2	C6	2		
23	16	BLU	12.0	DM1	AC	K5	1		
24	16	YEL	12.0	DM1	AC	P302	1		
25	16	RED	7.0	DM1	AC	C6	1		
26	16	BLK	2	TB1	2	TB1	3		FOR 220/240, 50 HZ
27	16	BLK	3	A9K2	5	A9K2	4		
28	16	BLK	3	A9K2	7	A9K2	9		
29	16	BLK	3	A9K2	2	A9K2	3		
30	16	BLK	16	VOICE COIL	2	A9K2	8		
31	24	YEL	6	A9CR1	AC	A9K2	8		
32	24	YEL	12	S4	NO	J206	1		
33	20	YEL	12	S4	C	J206	2		
34	16	BLK	2	TB1	1	TB1	3		FOR 100 VAC, 50 HZ
35	16	BLK	4	TB1	2	TB1	4		FOR 100 VAC, 50 HZ
36	16	YEL BLK	2	LINE FILTER	ϕ	TB1	5		FOR 220 VAC
37	16	YEL BLK	4	LINE FILTER	ϕ	TB1	6		FOR 240 VAC
38	16	YEL BLK	–	LINE FILTER	ϕ	TB1	4		FOR 100 VAC, 50 HZ
39	16	YEL BLK	–	LINE FILTER	ϕ	TB1	3		FOR 120 VAC, 60 HZ
40	16	YEL	–	LF	NEUT	TB1	1		NEUTRAL
41	16	YEL BLK	–	LF	ϕ	TB1	2		FOR 100 VAC, 60 HZ
42	24	YEL	13	K6	1	P205	5B		
43	24	YEL	13	K6	2	P205	13B		

TITLE		SHEET NO.	DOCUMENT NO.	REV.
W10 CABLE ASSY, LOGIC CHASSIS TO POWER AMP	WL	1 of 1	SMD 7151	F

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	24	YELO	46.0	JA09	09B	A8	E12		
2	24	YELO	39.0	JA09	29B	A8	E15		
3	24	YELO	46.0	JA09	08B	A8	E3		
4	24	YELO	39.0	JA09	30B	A8	E10		
5	24	YELO	39.0	JA09	06B	A8	E9		
6	24	YELO	35.0	JA09	14B	A9	C7-		
7	24	BLUE	35.0	JA09	21B	A8	R3-1		CRIMP TOGETHER
8	16	YELO	3.0	VC	1	A8	R3-1		" "
9	20	BLK	26	JA09	17B	A8	R3-2		
									Ref. 76415100

TITLE		SHEET NO.	DOCUMENT NO.	REV.
POWER AMP DRIVER TO EMERGENCY RETRACT ASSY	WL	1 of 1	SMD 7163	D

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	16	RED	8.0	A8	R2-1	A8	E13		
2	16	WHT	10.0	A8	R4-2	A8	E4		
3	16	YEL	14.0	A9	C7	A8	R4-1		
4	16	BLU	9.0	A8	R1-1	A8	E14		
5	16	YEL	16.0	A8	E11	A9	K2-6		
6									
7									
8									
9	16	WHT	19.0	A8	E12	A9	K2-1		
									Ref 76416300

TITLE		SHEET NO.	DOCUMENT NO.	REV
W1 CABLE ASSY. AC HARNESS	WL	1of 1	REF 77387300	A

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	14	4		CB1	A1	LF	3		
2	14	4		CB1	B1	LF	4		
3	16	5/4		GND		LF	GND		
4	14	4		CB1	A2	K1	1		
5	14	4		CB1	B2	K5	1		
6	16	5/4		GND		K5 BASE	GND		
7	16	4		CB1	A2	P301	3		
8	16	4		CB1	B2	P301	2		BLOWER MOTOR
9	16	5/4		GND		P301	1		
10	16	4		CB2	2	TB1	SEE NOTE		
11	16	4		CB1	B1	TB1	1		
12	16	5/4		GND		CKT BKR CB1 BASE			
13	14	4		K1	2	J302	1		
14	16	5/4		GND		TB1 BASE	GND		

NOTE:

SEE MAINTENANCE INSTALLATION SECTION ON AC POWER CONNECTIONS FOR WIRING.

Ref 75258200

TITLE	WL	DOCUMENT NO.	SHEET NO.	REV.
I/O CABLE WIRE LIST (REF: 83228100)		8281	1 of 5	A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
1A	J3-1	PA7-5B	0		
1B	J3-4	PA7-5A	1		
2A	J4-1	PA7-5B	0		
2B	J4-4	PA7-5A	1		
3A	J3-2	PA7-6B	0		
3B	J3-5	PA7-6A	2		
4A	J4-2	PA7-6B	0		
4B	J4-5	PA7-6A	2		
5A	J3-3	PA6-13B	3		
5B	J3-7	PA6-13A	0		
6A	J4-3	PA6-13B	3		
6B	J4-7	PA6-13A	0		
7A	J3-8	PA6-14B	4		
7B	J3-12	PA6-14A	0		
8A	J4-8	PA6-14B	4		
8B	J4-12	PA6-14A	0		
9A	J3-10	PA6-6A	0		WITH BTVV CARD
9B	J3-13	PA6-6B	5		WITH BTVV CARD
9A	J3-10		0		WITH GTVV CARD
9B	J3-13		5		WITH GTVV CARD
10A	J4-10	PA6-6A	0		WITH BTVV CARD
10B	J4-13	PA6-6B	5		WITH BTVV CARD
10A	J4-10		0		WITH GTVV CARD
10B	J4-13		5		WITH GTVV CARD
11A	J3-11	PA6-9A	0		
11B	J3-14	PA6-9B	6		
12A	J4-11	PA6-9A	0		
12B	J4-14	PA6-9B	6		
13A	J3-15	PA6-26A	0		
13B	J3-18	PA6-26B	7		
14A	J4-15	PA6-26A	0		
14B	J4-18	PA6-26B	7		
15A	J3-16	PA7-8B	0		
15B	J3-20	PA7-8A	8		

TITLE I/O CABLE WIRE LIST (REF: 83228100)	WL	DOCUMENT NO. 8281	SHEET NO. 2 of 5	REV. A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
16A	J4-16	PA7-8B	0		
16B	J4-20	PA7-8A	8		
17A	J3-17	PA6-25A	0		
17B	J3-21	PA6-25B	9		
18A	J4-17	PA6-25A	0		
18B	J4-21	PA6-25B	9		
19A	J3-22	J204-2	0		S/C 09 & BLW
19B	J3-25	J204-1	1		S/C 09 & BLW
20A	J4-22	J204-4	0		S/C 09 & BLW
20B	J4-25	J204-3	1		S/C 09 & BLW
21A	J3-23	PA7-23B	0		
21B	J3-26	PA7-23A	2		
22A	J4-23	PA7-23B	0		
22B	J4-26	PA7-23A	2		
23A	J3-24	PA7-22B	0		
23B	J3-27	PA7-22A	3		
24A	J4-24	PA7-22B	0		
24B	J4-27	PA7-22A	3		
25A	J3-28	PA7-21B	0		
25B	J3-31	PA7-21A	4		
26A	J4-28	PA7-21B	0		
26B	J4-31	PA7-21A	4		
27A	J3-29	PA7-17B	0		
27B	J3-32	PA7-17A	5		
28A	J4-29	PA7-17B	0		
28B	J4-32	PA7-17A	5		
29A	J3-30	PA7-16B	0		
29B	J3-33	PA7-16A	6		
30A	J4-30	PA7-16B	0		
30B	J4-33	PA7-16A	6		
31A	J3-34	PA7-15B	0		
31B	J3-37	PA7-15A	7		
32A	J4-34	PA7-15B	0		
32B	J4-37	PA7-15A	7		

TITLE I/O CABLE WIRE LIST (REF: 83228100)	WL	DOCUMENT NO. 8182	SHEET NO. 3 of 5	REV. A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
33A	J3-35	PA7-14B	0		
33B	J3-38	PA7-14B	8		
34A	J4-35	PA7-14B	0		
34B	J4-38	PA7-14A	8		
35A	J3-36	PA7-13B	0		
35B	J3-39	PA7-13A	9		
36A	J4-36	PA7-13B	0		
36B	J4-39	PA7-13A	9		
37A	J3-40	PA7-9B	0		
37B	J3-43	PA7-9A	1		
38A	J4-40	PA7-9B	0		
38B	J4-43	PA7-9A	1		
39A	J3-41	PA7-10B	0		
39B	J3-44	PA7-10A	2		
40A	J4-41	PA7-10B	0		
40B	J4-44	PA7-10A	2		
41A	J3-42	PA5-27A	0		
41B	J3-45	PA6-27B	3		
42A	J4-42	PA6-27A	0		
42B	J4-45	PA6-27B	3		
43A	J3-46	PA7-12B	0		
43B	J3-49	PA7-12A	4		
44A	J4-46	PA7-12B	0		
44B	J4-49	PA7-12A	4		
45A	J3-48	PA7-11B	0		
45B	J3-51	PA7-11A	5		
46A	J4-48	PA7-11B	0		
46B	J4-51	PA7-11A	5		
47A	J3-52	PA7-7B	0		
47B	J3-55	PA7-7A	6		
48A	J4-52	PA7-7B	0		
48B	J4-55	PA7-7A	6		
49A	JA3-74	PA6-5A	0		WITH BTVV CARD
49B	JA3-77	PA6-5B	7		WITH BTVV CARD

TITLE I/O CABLE WIRE LIST (REF: 83228100)	WL	DOCUMENT NO. 8182	SHEET NO. 4 of 5	REV. A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
49A	J3-74		0		WITH GTVV CARD
49B	J3-77		7		WITH GTVV CARD
50A	JA4-74	PA6-5A	0		WITH BTVV CARD
50B	JA4-77	PA6-5B	7		WITH BTVV CARD
50A	J4-74		0		WITH GTVV CARD
50B	J4-77		7		WITH GTVV CARD
51A	J3-75	PA6-8A	0		
51B	J3-78	PA6-8B	8		
52A	J4-75	PA6-8A	0		
52B	J4-78	PA6-8B	8		
53A	J2-EE		0		INDEX WITH BTVV CARD
53B	J2-HH		9		INDEX WITH BTVV CARD
53A	J2-EE	PA6-6A	0		INDEX WITH GTVV CARD
53B	J2-HH	PA6-6B	9		INDEX WITH GTVV CARD
54A	J2-FF		0		SECTOR WITH BTVV CARD
54B	J2-JJ		9		SECTOR WITH BTVV CARD
54A	J2-FF	PA6-5A	0		SECTOR WITH GTVV CARD
54B	J2-JJ	PA6-5B	9		SECTOR WITH GTVV CARD
55A	J2-AA	P203-2	0		S/C 09 & BLW
55B	J2-CC	P203-1	1		S/C 09 & BLW
56A	J2-BB	P203-4	0		S/C 09 & BLW
56B	J2-DD	P203-3	1		S/C 09 & BLW
57A			0		
57B			2		
58A			0		
58B			2		
59A	J3-80	PA7-34A	0		
59B			3		
60A	J4-80	PA7-34A	0		
60B			3		
61A	J2-A	PA6-11B			
61B	J2-B	PA6-11A			
61C					
62A	J2-M	PA6-28A			

TITLE I/O CABLE WIRE LIST (REF: 83228100)	WL	DOCUMENT NO. 8182	SHEET NO. 5 of 5	REV. A

SIGNAL NAME OR NUMBER IDENTIFICATION	ORIGIN	DESTINATION	WIRE COLOR	Z LEVEL	NOTES
62B	J2-N	PA6-28B			
62C					
63A	J2-U	PA6-30A			
63B	J2-V	PA6-30B			
63C					
64A	J2-W	PA6-29A			
64B	J2-X	PA6-29B			
64C					
65A	J2-J	PA6-12A			
65B	J2-H	PA6-12B			
65C					
66	COND.IDENT. 63C	COND.IDENT. 64C	0		
67	COND.IDENT. 64C	COND.IDENT. 62C	0		
68	COND.IDENT. 62C	COND.IDENT. 65C	0		
69	COND.IDENT. 65C	COND.IDENT. 61C	0		
70	COND.IDENT. 61C	J2 CORNER GUIDE PIN	0		
71	J2 CORNER GUIDE PIN	J2-D	0		
72	J2-D	J2-E	0		
73	J2-E	J2-K	0		
74	J2-K	J2-T	0		
75	J2-T	J2-Y	0		
76	J2-MM	PA6-2A	6		
77	J208-1	J3-73	0		
78	J208-2	J3-76	0		
79	J208-2	J4-76	0		
80	J208-3	J4-73	0		
81	J2 CORNER GUIDE PIN				BASE GROUND

TITLE		SHEET NO.	DOCUMENT NO.	REV.
FAN CABLE ASSEMBLY	WL	1 OF 1	SMD 7362	A

IDENTIFIER	WIRE SIZE	COLOR CODE	WIRE LENGTH	ORIGIN		DESTINATION			REMARKS
				LOCATION	PIN NO	LOCATION	PIN NO		
1	20	0	40	CB2	2	B2	1		
2	20	9	38.5	CB1	B1	B2	2		
3	18	CLEAR	35	CB1	GND	LOWER GRILL B2			
									REF. 76036200

APPENDIX A

DECISION LOGIC TABLES (DLTs)

for SMDs with Series Code 24 (SC 24) and above

CONTENTS

FIGURES

TABLES

APPENDIX A
DECISION LOGIC TABLES (DLTs)

INTRODUCTION

Decision logic tables help the maintenance technician to organize his thinking when problems occur in the drive. For a given fault condition (or set of conditions), actions are recommended to locate and correct the fault. The actions are arranged so that the corrective measures that are easiest to perform (checking a fuse or changing a card in the logic chassis, for example) are listed before the more difficult tasks such as replacing the head/arm assembly or drive motor.

A section called Useful Troubleshooting Aids precedes the DLT section and is separated from it by a divider page. This section contains two general-interest maintenance procedures, as well as tables and figures that should prove useful throughout the troubleshooting effort, particularly to personnel not familiar with the SMD.

The DLT section consists of ten tables, described briefly below.

- DLT 1 shows how to correct problems that occur while attempting to "power up" the drive.
- DLT 2 isolates dc power distribution problems either to the power supply loads or to the power supply module, and tells how to cure those that occur within the power supply module itself.
- DLT 3 shows how to locate power faults in the dc loads, defining cures for those encountered in the unfused loads (±5 V, ±12 V).
- DLT 4 shows how to locate and correct faults in the ±20 V loads.
- DLT 5 shows how to locate and correct faults in the ±42 V loads.
- DLTs 6 through 9 are to be used with the FTU (TB304) to correct various seek and read/write errors.
- DLT 10 shows what to do when a drive does not "power down" properly.

The procedures referred to in the DLTs form the last section in this appendix.

USING THE DLT

The DLT is divided into four quadrants. The upper-left quadrant, CONDITIONS, contains the various test conditions that can be answered "yes" or "no". The CONDITIONS quadrant is prefaced by any ASSUMPTIONS (that is, preconditions) that must be observed if the test results are to be valid. Sometimes, prerequisite actions other than the ASSUMPTIONS must be taken before the test for a given condition is made. Such steps are included in the CONDITIONS quadrant. The yes (Y) or no (N) answers to each condition are shown in numbered columns in the top-right Situations quadrant.

To use the DLT, first determine whether the result of a condition tested is Y or N. If two or more conditions exist simultaneously, look for a situations column that combines the appropriate Y-N answers for those conditions. A dash (-) in the top-right Situations quadrant means that the related Condition is not a factor in determining what actions are to be taken for that situation.

Next, determine what action should be taken for a given test result (i.e., situation) by following down the selected column to the row marked "1" in the lower-right Sequence quadrant. (If there is only one recommended action for a given situation, an "X" appears instead of the "1".) The recommended action is then located by moving across to the lower-left ACTIONS quadrant. A dash in a column of the Sequence quadrant indicates that the related Action isn't applicable.

After taking the first recommended action, repeat the test that gave rise to the situation. If the test results haven't changed (same situation), try recommended action 2, and so on, being sure to repeat the test after each such action.

Column 1 is generally reserved for an "everything OK" situation. If a DLT requires more than one sheet, this "no problem" column is repeated on each sheet. Similarly, the last ACTION on each sheet is a recommendation to "call field support". Don't brood over your inadequacy if you reach this last entry; not every situation can be covered in a DLT!

USEFUL TROUBLESHOOTING AIDS

USING A VOM TO CHECK A CAPACITOR

1. Remove power from the equipment.
2. Discharge capacitor by momentarily shorting the leads with a jumper wire. (Use screwdriver for large capacitors.)
3. Isolate the capacitor by disconnecting one lead from the circuit.
4. Set VOM to X1000 (ohms) scale.
5. Connect the VOM across the capacitor leads. The condition of the capacitor is interpreted as follows:

Meter reading	Interpretation
Needle goes rapidly to full scale (0Ω), then regresses to infinity (∞). (See NOTE.)	Capacitor OK
Needle goes rapidly to full scale and remains there.	Capacitor shorted
Needle deflects slightly or not at all.	Capacitor open

NOTE

Speed with which needle returns to infinity (∞) is a function of capacity rating. Return swing is rapid for small capacitors, becoming slower as capacity increases. To a lesser degree, return swing is also dependent upon which meter scale is used.

IN-CIRCUIT DIODE CHECKING WITH A VOM

A diode that is suspect can be given a preliminary check without disconnecting it from the circuit. Merely check the diode twice, reversing the meter leads between the two readings. Of course, power should be off, and for your own peace of mind any capacitors in the circuit should be discharged.

Keep in mind that the forward drop across a good diode is in the range 5 - 15Ω; the reverse drop is on the order of 1 MΩ. Parallel resistances in the circuit will, of course, significantly reduce the higher of these two readings, but if one is low and the other high, chances are the diode is OK. If both are low, the diode is probably shorted; if both are high, it's probably open.

This check can also be used for a bridge rectifier. You'll probably want to check at least two diodes in the bridge, because back-circuits may give different readings across different diodes.

TABLE A-1. DC VOLTAGES USED BY LOGIC-CHASSIS CARDS

Loc.	+5 V	-5 V	+12 V	+20 V	-20 V	+42 V	-42 V
A01	✓	✓		✓	✓		
A03	✓						
A04	✓						
A05	✓	✓		✓	✓	*	*
A06	✓	✓					
A07	✓	✓					
A09	✓	✓		✓	✓	*	*
A10	✓	✓		✓	✓		
A11	✓	✓	✓	✓	✓		
A12	✓			✓	✓		
A13	✓						
A14	✓	✓					
A15	✓	✓					
A16	✓	✓		✓	✓		

✓ = Used
* = Brought in via back-panel connector

TABLE A-2. VOLTAGES USED BY ELECTRONIC ASSEMBLIES

Ass'y	Name	+5 V	-5 V	+12 V	-12 V	+20 V	+42 V	-42 V
A4	Motor Relay Brd (with AXPN only)	✓						
A5	Hd Select, R/W Amp	✓	✓	✓	✓	✓	✓	
A8	Power Amp						✓	✓
A8	Servo Preamp			✓	✓			
A9	Emergency Retract						✓	✓
A10	Operator Panel	✓	✓					
A11	-XPN Board	✓	✓			✓		

✓ = Used

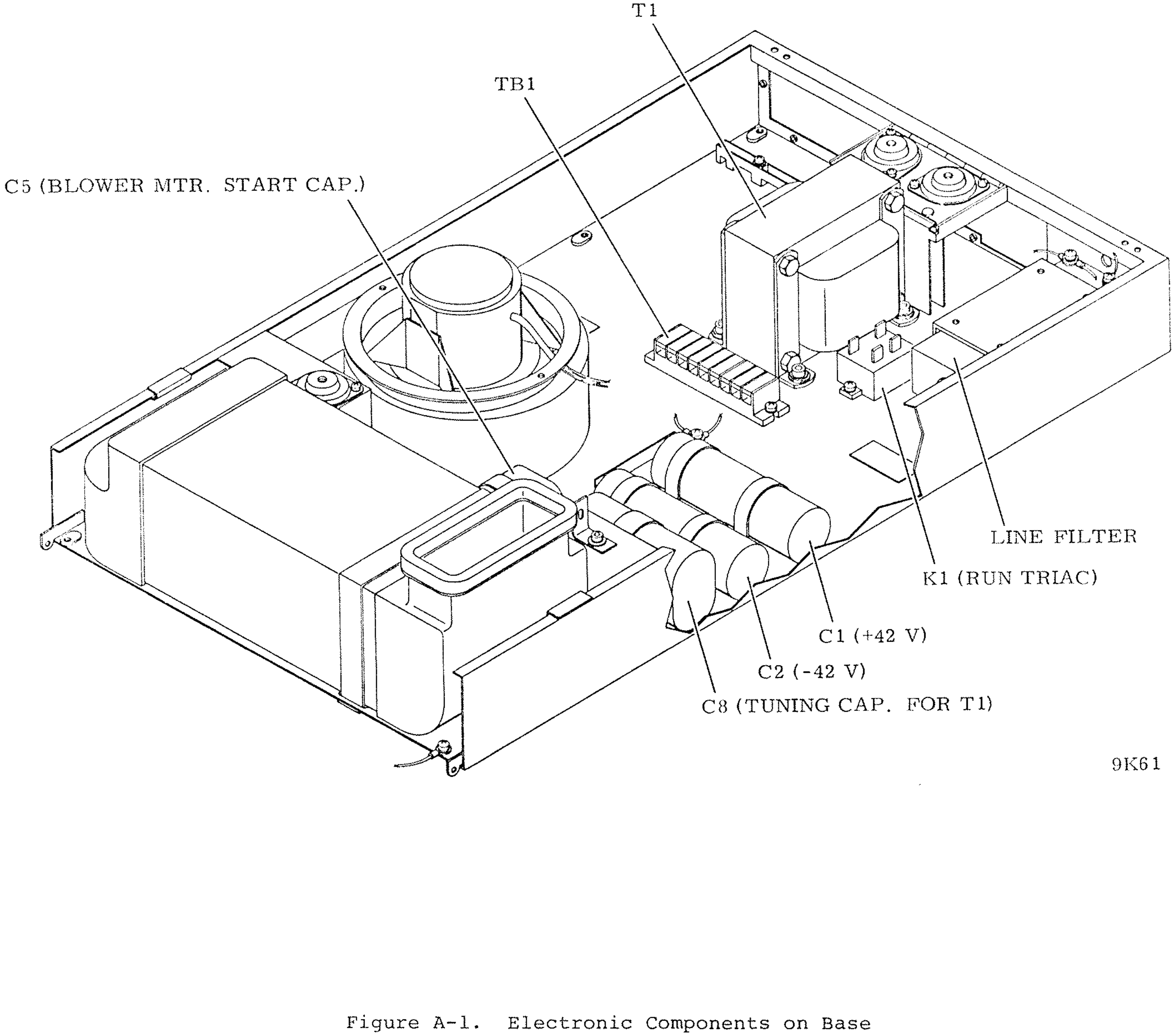

Figure A-1. Electronic Components on Base

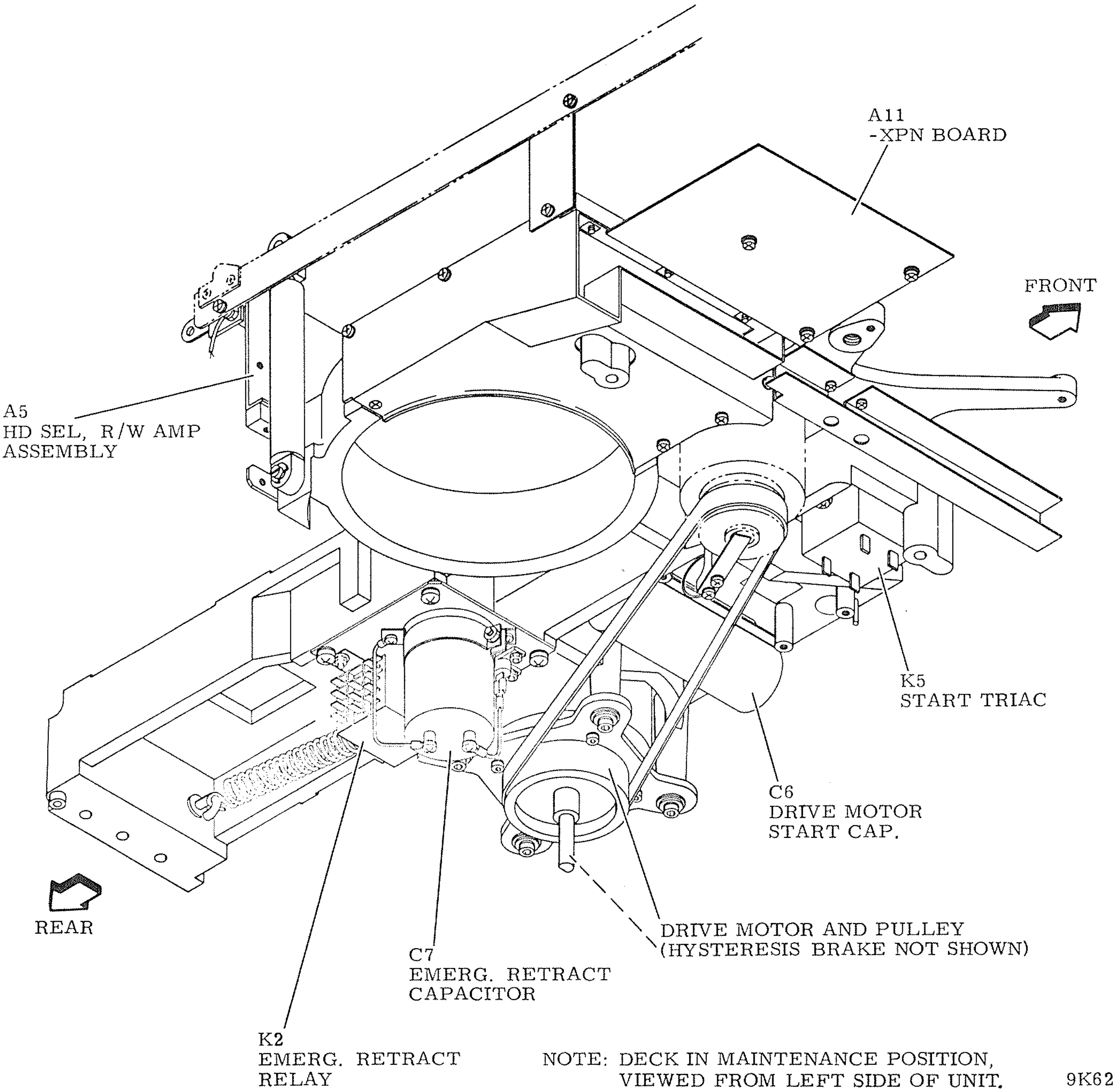

Figure A-2. Electronic Components on Deck

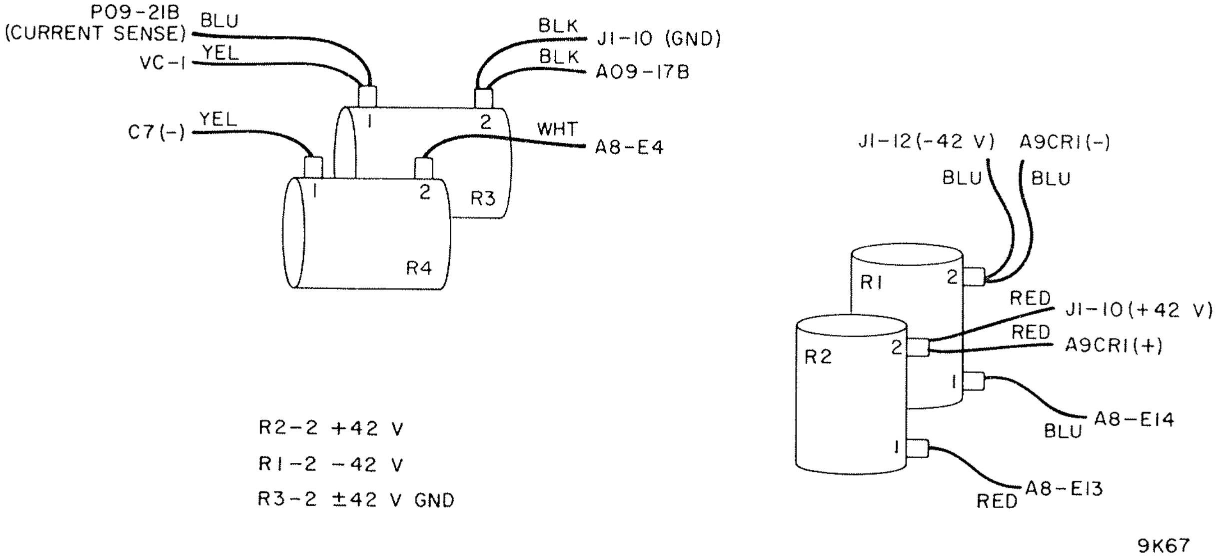

Figure A-3. 30-W Resistor Locations for Assembly A8

APPENDIX A

DECISION LOGIC TABLES (DLTs)

DLT 1 POWER UP (sheet 1 of 2)

Warning: Tuning capacitor C8 is charged to 440 volts. Treat it with respect!

Enters from: Assumptions

Procedures: B

References: Logic Diagrams

Exits to: DLT 2 or sheet 2 of this DLT

Assumption:
1. Drive connected to ac power
2. Disk pack installed
3. Attempt to power up and start drive from SMD panel (LOCAL mode).

CONDITIONS	1	2	3	4	5	6	7	8
1. Turn on AC POWER breaker (CB1). Does CB1 trip?	N	Y	N	-	-	-	-	
2. Does blower start when CB1 is actuated?	Y	-	N	-	-	-	-	
3. Turn on POWER SUPPLY breaker (CB2). Does CB2 trip?	N	-	-	Y	-	-	-	
4. Does logic fan start when CB2 is actuated?	Y	-	-	-	N	-	-	
5. Does CB1 or drive motor thermal brkr trip when CB2 is actuated?	N	-	-	-	-	Y	-	
6. Is smell of burning insulation detected soon after turning on CB2?	N	-	-	-	-	-	Y	

ACTIONS								
1. Continue with Condition 7 on sheet 2.	X	-	-	-	-	-	-	
2. Suspect blower. Separate P/J301; if trouble persist, blower is OK.	-	1	-	-	-	-	-	
3. Suspect short/gnd in blower cable or connector.	-	2	-	-	-	-	-	
4. Suspect time meter. Disconnect; if trouble persists, meter is OK.	-	3	-	-	-	-	-	
5. Suspect CB1.	-	4	2	-	-	-	-	
6. If pwr plug customer-provided, check phase and gnd connections.	-	-	1	-	-	-	-	
7. Check for ac at line filter.	-	-	3	-	-	-	-	
8. Chk for open blower, cable, or blower motor capacitor.	-	-	4	-	-	-	-	
9. Suspect shorted C8. See WARNING, above.	-	-	-	1	-	-	-	
10. Suspect shorted logic fan or cable.	-	-	-	2	-	-	-	
11. Problem may be the -XKV (p.s.) brd. Do steps 1-5 in Procedure B.	-	-	-	3	-	-	-	
12. Suspect short in T1 or T1 wiring. Go to step 6 in Procedure B.	-	-	-	4	-	-	-	
13. Suspect open logic fan or cable.	-	-	-	-	1	-	-	
14. Chk CB2 for ac input. If ac present, replace CB2.	-	-	-	-	2	-	-	
15. Cause: Run triac energized before START switch has been pressed. Suspect Run logic (-XPN board).	-	-	-	-	-	1	-	
16. Chk Run triac for shorted LOAD contacts (terminals 1,2).	-	-	-	-	-	2	-	
17. You have lost +5 V power. IMMEDIATELY TURN OFF CB2 TO PREVENT BURNING UP THE VOICE COIL. To check for loss of voltage, go to DLT 2.	-	-	-	-	-	-	X	
18. Call Field Support.	-	5	5	5	3	3	-	

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DLT 1 POWER UP (sheet 2 of 2)

Warning: None

Enters from: Sheet 1

Procedures: C

References: Logic Diagrams, DLT 6

Exits to: DLT 2, DLT 7

Assumption:
1. Drive connected to ac power
2. Disk pack installed
3. Attempt to power up and start drive from SMD panel (LOCAL mode).

CONDITIONS	**1**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
7. Press START sw. Does either CB1 or drive mtr thermal brkr trip?	N	Y	N	N	N	N	N	N
8. Does START light come on when START switch is pressed?	Y	-	N	N	Y	Y	Y	Y
9. Does drive motor start when START switch is pressed?	Y	-	Y	N	N	Y	Y	Y
10. Does drive motor come up to speed?	Y	-	-	-	-	N	Y	Y
11. Do heads load? (READY light comes on.)	Y	-	-	-	-	-	N	Y
12. Does drive mtr cut out after up-to-speed timeout expires?	N	-	-	-	-	Y	-	N
13. Does CB2 trip after drive has been operating normally?	N	-	-	-	-	-	-	Y
ACTIONS								
19. Power-up and First Seek completed properly. Go to DLT 7.	X	-	-	-	-	-	-	-
20. Suspect shorted Start triac.	-	1	-	-	-	-	-	-
21. Suspect shorted drive motor start capacitor.	-	2	-	-	5	-	-	-
22. Suspect open Start winding in drive motor.	-	3	-	-	8	-	-	-
23. START indicator burned out. Replace ind/sw.	-	-	1	-	-	-	-	-
24. Check all interlocks.	-	-	-	1	-	-	-	-
25. Go to DLT 2 to check for presence of +5 volts.	-	-	-	2	-	-	-	-
26. Chk that Local/Remote sw (BXPN brd only) is set to LOCAL.	-	-	-	-	1	-	-	-
27. Chk drive mtr thermal brkr. If tripped, find out why.	-	-	-	-	2	-	-	-
28. Suspect Run logic. Start with -XPN board.	-	-	-	-	3	-	-	-
29. Suspect Run triac.	-	-	-	-	4	1	-	-
30. Chk hysteresis brake for mechanical binding.	-	-	-	-	6	2	-	-
31. Suspect brake logic continuously energized (-XPN board).	-	-	-	-	7	3	-	-
32. Suspect speed sensor, or attendant logic on -XPN board.	-	-	-	-	-	4	-	-
33. Suspect open Run winding in drive motor.	-	-	-	-	9	-	-	-
34. Refer to DLT 6--First Seek.	-	-	-	-	-	-	X	-
35. Suspect overloaded (overheated) pwr supply. Chk per Procedure C.	-	-	-	-	-	-	-	1
36. Call Field Support.	-	4	2	3	10	5	-	2

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DLT 2 DC VOLTAGE CHECK

Warning: Tuning capacitor C8 is charged to 440 volts. Treat it with respect!

Enters from: DLT 1 or when a dc voltage is suspect.

Procedures: A

References: Logic Diagrams

Exits to: DLTs 3,4,5; or DLT 1 if this table was entered from Actions 17 or 25 of that DLT.

Assumption: Lack of one or more dc voltages is noticed or suspected. Initial voltage measurements are made with all dc loads connected, using Procedure A.

CONDITIONS	1	2	3	4	5	6	7	8	9	10	11	12
1. Are ±5 voltages OK with load?	Y	N	N	N	N							
2. With ±5 V loads disconnected (P/J2 separated), is there +5 V at J2-03 and -5 V at J2-05? (Use J2-01 as ground.) ①	-	-	Y	N	N	-	-	-	-	-	-	-
3. Are ±12, ±20, ±42 voltages significantly low?	N	-	-	-	Y	-	-	-	-	-	-	-
4. Are ±20 voltages OK?	Y	-	-	-	-	N	N	-	-	-	-	-
5. 20 V fuse(s) blown? ②	N	-	-	-	-	N	Y	-	-	-	-	-
6. Are ±12 voltages OK with load?	Y	-	-	-	-	-	-	N	-	-	-	-
7. With ±12 V loads disconnected, is there +12 V at J2-10 and -12 V at J2-08? (Use J2-01 as ground.) ① ③	-	-	-	-	-	-	-	-	N	Y	-	-
8. Are ±42 voltages OK?	Y	-	-	-	-	-	-	-	-	-	N	N
9. 42 V fuse(s) blown? ②	N	-	-	-	-	-	-	-	-	-	N	Y
ACTIONS												
1. DC voltages are OK.	X	-	-	-	-	-	-	-	-	-	-	-
2. Separate P/J2 (on -XKV brd) and try Condition 2.	-	X	-	-	-	-	-	-	-	-	-	-
3. Trouble is in the ±5 V loads. Go to DLT 3.	-	-	X	-	-	-	-	-	-	-	-	-
4. Replace -XKV brd or, optionally, the entire p.s. assembly.	-	-	-	1	-	1	-	-	1	-	1	-
5. Suspect open tuning capacitor (see WARNING, above).	-	-	-	-	1	-	-	-	-	-	-	-
6. Trouble is in the ±20 V loads. Go to DLT 4.	-	-	-	-	-	-	X	-	-	-	-	-
7. Separate P/J2 and try Condition 7.	-	-	-	-	-	-	-	X	-	-	-	-
8. Trouble is in the ±12 V loads. Go to DLT 3.	-	-	-	-	-	-	-	-	-	X	-	-
9. Trouble is in the ±42 V loads. Go to DLT 5.	-	-	-	-	-	-	-	-	-	-	-	X
10. Call Field Support.	-	-	-	2	2	2	-	-	2	-	2	-

① Reconnect P/J2 to reestablish loads before going to next Condition.

② Check with VOM. Fuse is bad if supply voltage does not appear on each side of fuse (use board foil as gnd).

③ If no voltage, check 39Ω resistors R15 and R18 (figure A-4). Open resistor indicates drastic overload. Be sure to check out the loads (DLT 5) after replacing the supply.

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DLT 3 LOCATING FAULTS IN THE ±5 V, ±12 V LOADS (sheet 1 of 2)

Warning: Discharge C8 each time you turn off CB2 to separate or mate connectors

Enters from: DLT 2

Procedures: D

References: Figures A-1,A-2,A-3; tables A-1,A-2; Procedure A for dc voltages

Exits to: DLT 1, if required to complete Power Up diagnostic

Assumption: DLT 2 has pointed to a load fault in either the ±5 V or the ±12 V networks. Precede each of the listed Conditions by turning off CB2.

CONDITIONS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. Limit ±5 V load to logic chassis only:								
a) Remove ±20 V and ±42 V fuses (4).								
b) Remove PA1 from w/w side of logic chassis.								
c) Remove PA10 from w/w side of logic chassis.								
d) Remove P101 from connector on assembly A5.								
e) Remove P201 from connector on operator panel (ass'y A10).								
f) Remove P205 from connector on -XPN brd (ass'y A11).								
g) Reconnect P/J2 to establish power supply loads.								
h) Turn on CB2. Are ±5 voltages OK? ①	Y	N	-	-	-	-	-	-
2. Restore ±12 V to logic chassis:								
a) Reconnect PA1 to w/w side of logic chassis.								
b) Turn on CB2. Are ±12 voltages OK? ①	-	-	Y	N	-	-	-	-
3. Add control panel (ass'y A10) to +5 V load:								
a) Reconnect P/J201 on operator panel.								
b) Turn on CB2. Are ±5 voltages OK? ①	-	-	-	-	Y	N	-	-
4. Add -XPN brd (ass'y A11) to ±5 V load:								
a) Reconnect P/J205 on -XPN board.								
b) Turn on CB2. Are ±5 voltages OK? ①	-	-	-	-	-	-	Y	N

ACTIONS								
1. Go to Condition 2.	X	-	-	-	-	-	-	-
2. Go to Procedure D to pinpoint ±5 V fault in logic chassis.	-	X	-	-	-	-	-	-
3. Go to Condition 3.	-	-	X	-	-	-	-	-
4. Turn off CB2, remove card A11, and try again. If trouble persists, examine w/w from PA1 to location A11 for +12 V short to gnd. If trouble disappears when A11 is removed, replace card A11.	-	-	-	1	-	-	-	-
5. Go to Condition 4.	-	-	-	-	X	-	-	-
6. Replace operator panel.	-	-	-	-	-	1	-	-
7. Go to Condition 5 on sheet 2.	-	-	-	-	-	-	X	-
8. Replace -XPN board.	-	-	-	-	-	-	-	1
9. Call Field Support.	-	-	-	2	-	2	-	2

① As given in Procedure A.

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DLT 3 LOCATING FAULTS IN THE ±5 V, ±12 V LOADS (sheet 2 of 2)

Warning: Discharge C8 each time you turn off CB2 to separate or mate connectors

Enters from: DLT 2

Procedures: D

References: Figures A-1,A-2,A-3; tables A-1, A-2; Procedure A for dc voltages

Exits to: DLT 1, if required to complete Power Up diagnostic

Assumption: DLT 2 has pointed to a load fault in either the ±5 V or the ±12 V networks. Precede each of the listed Conditions by turning off CB2.

CONDITIONS	9	10	11	12				
5. Add servo preamp assembly to ±12 V load:								
a) Reconnect PA10 to w/w side of logic chassis backpanel.								
b) Turn on CB2. Are ±12 voltages OK? ①	Y	N	-	-				
6. Add assembly A5 to ±5 V, ±12 V loads:								
a) Reconnect P/J101 on assembly A5.								
b) Turn on CB2. Are any voltages below spec? ①	-	-	Y	N				
ACTIONS								
10. Go to Condition 6.	X	-	-	-				
11. Replace the servo preamp assembly.	-	1	-	-				
12. Replace assembly A5.	-	-	1	-				
13. The ±5 V and ±12 V loads are OK. Return to DLT 1, if required, to complete the Power Up diagnostic.	-	-	-	x				
14. Call Field Support.	-	2	2	-				
① As given in Procedure A.								

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DLT 4 LOCATING FAULTS IN THE ±20 V LOADS

Warning: Discharge C8 each time you turn off CB2 to separate or mate connectors

Enters from: DLT 2

Procedures: None

References: Logic Diagrams; tables A-1, A-2

Exits to: DLT 1, if required to complete Power Up diagnostic.

Assumption: F1 or F2 blows when ±20 V loads connected. Be sure that F1 and F2 are good, then precede each Condition listed below by turning off CB2.

CONDITIONS	1	2	3	4	5	6	7	8	9	10	11	12
1. Restrict ±20 V distribution to the logic chassis:												
a) Remove P101 from assembly A5.												
b) Remove P205 from -XPN brd (assembly A11).												
c) Turn on CB2. Does either F1 or F2 blow?	Y	N	-	-	-	-	-	-	-	-		
2. Add assembly A5 to +20 V load:												
a) Reconnect P/J101.												
b) Turn on CB2. Does F1 (+20 V) blow?	-	-	Y	N	-	-	-	-	-	-		
3. Add -XPN board (assembly A11) to +20 V load:												
a) Reconnect P/J205 to -XPN board.												
b) Turn on CB2. Does F1 (+20 V) blow?	-	-	-	-	Y	N	-	-	-	-		
4. Check out ±20 V wiring on logic chassis:												
a) Remove cards A01, A05, A09, A10, A11, A12, A16. (All use ±20 V.)												
b) Turn on CB2 and check F1 and F2. Did either fuse blow?	-	-	-	-	-	-	Y	N	-	-		
5. Check individual ±20 V cards:												
a) Select a ±20 V card and insert it in the proper card slot.												
b) Turn on CB2. Did either F1 or F2 blow?	-	-	-	-	-	-	-	-	Y	N		
ACTIONS												
1. Problem is in the logic chassis. Go to Condition 4.	Y	-	-	-	-	-	-	-	-	-		
2. Go to Condition 2.	-	X	-	-	-	-	-	-	-	-		
3. Chk P101 cable for shorts/gnds. If OK, replace assembly A5.	-	-	1	-	-	-	-	-	-	-		
4. Go to Condition 3.	-	-	-	X	-	-	-	-	-	-		
5. Chk P205 cable for shorts/gnds. If OK, replace -XPN board.	-	-	-	-	1	-	-	-	-	-		
6. Check logic chassis backpanel wiring: +20 V is on pin 33B, -20 V is on pin 02B. If problem cannot be located, special-order a new logic chassis.	-	-	-	-	-	-	X	-	-	-		
7. Go to (or repeat) Condition 5. When all cards OK, go to Action 9.	-	-	-	-	-	-	-	X	-	X		
8. Replace the defective card and try Condition 5 again.	-	-	-	-	-	-	-	-	1	-		
9. The ±20 V loads now check out to be OK. Return to DLT 1, if required, to complete the Power Up diagnostic.	-	-	-	-	-	X	-	-	-	-		
10. Call Field Support.	-	-	2	-	2	-	-	-	2	-		

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DLT 5 LOCATING FAULTS IN THE ±42 V LOADS (sheet 1 of 2)

Caution: Ensure that any leads you disconnect are clear of grounds or electrical elements.

Enters from: DLT 2

Procedures: None

References: Logic Diagrams; tables A-1,A-2; figure A-3

Exits to: DLT 1, if required, to complete Power Up diagnostic

Assumption: F3 and/or F4 blow when ±42 V load is connected. This DLT involves alternately disconnecting ass'ys A8,A9,A5 and A0 (locations A05 and A09 only) until fault is found. Be sure F3 and F4 are good, then precede each Condition below by turning off CB2.

CONDITIONS	1	2	3	4	5	6		
1. Is F3 (+42 V) the only fuse blown?	Y	N	-	-	-	-		
2. Disconnect ±42 V from assembly A8: (refer to figure A-3).								
a) Remove the two red wires (+42 V) from R2-2.								
b) Remove the two blue wires (-42 V) from R1-2.								
c) Remove the two black wires (gnd) from R3-2.								
d) Turn on CB2. Did either F3 or F4 blow?	-	-	Y	N	-	-		
3. Disconnect ±42 V from emergency retract assembly A9:								
a) Discharge tuning capacitor C8. (WARNING: 440 volts!)								
b) Remove red wire from + terminal of dual-diode package CR1.								
c) Remove two blue wires from - terminal of CR1.								
d) Remove single blue wire from AC terminal of dual-diode CR2.								
e) Turn on CB2. Did either F3 or F4 blow?	-	-	-	-	Y	N		

ACTIONS	1	2	3	4	5	6		
1. Turn off CB2, then remove Fault Store capacitor (500 µF) from JA04. Replace F3 and turn on CB2. If fuse holds, replace capacitor. If fuse blows, reinstall capacitor and take next recommended Action.	1	-	-	-	-	-		
2. Go to Condition 2.	2	X	-	-	-	-		
3. Ass'y A8 is OK. Restore wires removed in Condition 1, then go to Condition 3.	-	-	X	-	-	-		
4. Replace assembly A8 and try Condition 2 again.	-	-	-	1	-	-		
5. Ass'y A9 is OK. Restore wires removed in Condition 3, then go to Condition 4 on sheet 2.	-	-	-	-	X	-		
6. Replace assembly A9 and try Condition 3 again.	-	-	-	-	-	1		
7. Call Field Support.	3	-	-	2	-	2		

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DLT 5 LOCATING FAULTS IN THE ±42 V LOADS (sheet 2 of 2)

Caution: Ensure that any leads you disconnect are clear of grounds or electrical elements.

Enters from: DLT 2

Procedures: None

References: Logic Diagrams; tables A-1,A-2; figure A-3

Exits to: DLT 1, if required, to complete Power Up diagnostic

Assumption: F3 and/or F4 blow when ±42 V load is connected. This DLT involves alternately disconnecting ass'ys A8,A9,A5 and A0 (locations A05 and A09 only) until fault is found. Be sure F3 and F4 are good, then precede each Condition below by turning off CB2.

CONDITIONS	7	8	9	10	11	12	13	14
4. Check out head sel/R-W assembly A5:								
a) Disconnect P101 from assembly A5.								
b) Turn on CB2. Did F3 blow? (A5 does not use -42 V.)	Y	N	-	-	-	-	-	-
5. Check out ±42 V wiring on logic chassis backpanel:								
a) Remove cards at locations A05 and A09 of logic chassis.								
b) Turn on CB2. Did F3 or F4 blow?	-	-	Y	N	-	-	-	-
6. Install card A05 and turn on CB2. Did F3 or F4 blow?	-	-	-	-	Y	N	-	-
7. Install card A09 and turn on CB2. Did F3 or F4 blow?	-	-	-	-	-	-	Y	N
ACTIONS								
8. Assembly A5 is OK. Reconnect P/J101 and go to Condition 5.	X	-	-	-	-	-	-	-
9. Replace Piggy-back-ZKN board (Writer) in assembly A5 and try Condition 4 again.	-	1	-	-	-	-	-	-
10. Check backpanel wiring between locations A09 and A05. +42 V is on pin 33B, -42 V on pin 03B. Voltages come in on W5 harness attaching to A09 w/w pins via PA09.	-	-	1	-	-	-	-	-
11. Go to Condition 6.	-	-	-	X	-	-	-	-
12. Replace card A05 and try Condition 6 again.	-	-	-	-	1	-	-	-
13. Go to Condition 7.	-	-	-	-	-	X	-	-
14. Replace card A09 and try Condition 7 again.	-	-	-	-	-	-	1	-
15. The ±42 V distribution check out OK. Go to DLT 1, if required, to complete Power Up diagnostic.	-	-	-	-	-	-	-	X
16. Call Field Support.	-	2	2	-	2	-	2	-

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DLT 6 FIRST SEEK (sheet 1 of 2)

Warning: None

Enters from: DLTs 1 through 5

Procedures: See sheet 2

References: Logic Diagrams

Exits to: DLT 7 or sheet 2 of this DLT

Assumption: START light is on, drive is up to speed.

CONDITIONS	1	2	3	4	5	6	7	8
1. READY light comes on, signifying successful First Seek?	Y	N	N	N	N	N		
2. First Seek attempted?	-	N	N	N	N	N		
3. Check that Heads Loaded switch is transferring:								
a) Press START sw to stop disk. Do not turn off breakers.								
b) Manually push voice coil forward to move heads off unloading ramp. Does voice coil attempt to retract?	-	-	N	Y	Y	Y		
4. Check forward drive to voice coil:								
a) Disconnect wire from term. 2 of v.c. (one closest to magnet assy).								
b) Attach + lead of VOM to disconnected wire, com. lead to logic gnd.								
c) Press START.								
d) Wait for 15-20 second up-to-speed timeout to expire and then chk VOM. Does VOM read approx +40 V?	-	-	-	-	N	Y		

ACTIONS	1	2	3	4	5	6	7	8
1. No problem. Go to DLT 7.	X	-	-	-	-	-		
2. Go to Condition 3.	-	X	-	-	-	-		
3. Suspect leads to (or contacts in) Em. Retract Relay.	-	-	1	-	-	-		
4. Suspect open voice coil.	-	-	2	-	-	-		
5. Replace Heads Loaded switch.	-	-	3	-	-	-		
6. Replace power amp.	-	-	4	-	6	-		
7. Hds Loaded sw OK. Go to Condition 4 to chk fwd drive on v.c.	-	-	-	X	-	-		
8. Suspect card A09 (pwr amp control).	-	-	-	-	1	-		
9. Suspect cards A11, A03 (direction control).	-	-	-	-	2	-		
10. Suspect card A12 (summing amp).	-	-	-	-	3	-		
11. Suspect card A13 (diff cntr, CAR).	-	-	-	-	4	-		
12. Suspect card A05 (speed control) and -XPN board.	-	-	-	-	5	-		
13. Voice coil should attempt First Seek when up-to-speed timeout expires. Go to Condition 5 on sheet 2.	-	-	-	-	-	X		
14. Call Field Support.	-	-	5	-	7	-		

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DLT 6 FIRST SEEK (sheet 2 of 2)

Warning: None

Enters from: Sheet 1

Procedures: Trk Servo Amplitude Check (section 3C); Hd-Arm Repl.(3D), Hd Alignment(3B)

References: Logic Diagrams

Exits to: DLT 7

Assumption: START light is on, drive is up to speed.

CONDITIONS	7	8	9	10	11	12	13
1. READY light signifies successful First Seek? (From sheet 1.)	N	N	N	N	N	N	N
2. First Seek attempted? (From sheet 1.)	Y	Y	Y	Y	Y	Y	Y
5. Drive attempts First Seek, then unloads?	Y	Y	Y	Y	-	-	-
6. Servo preamp input to card A10 OK?	-	N	Y	Y	-	-	-
7. Track Servo signal present at A10-09B (output pin)?	-	-	N	Y	-	-	-
8. Drive seeks to forward mechanical stop, FAULT light comes on (+42 fuse blows), but heads don't unload--unit cannot power down?	-	-	-	-	Y	-	-
9. Drive seeks to fwd mech stop, waits for FAULT light (+42 fuse blows), then retracts?	-	-	-	-	-	Y	-
10. Drive loads heads, hesitates, then creeps to fwd EOT?	-	-	-	-	-	-	Y
ACTIONS							
15. Not sensing dibits. Chk servo preamp input to A10 (Trk Servo Ampl Chk), then go to Condition 6.	X	-	-	-	-	-	-
16. Chk for continuity/gnds in servo preamp cable (input to A10).	-	1	-	-	-	-	-
17. Replace servo preamp.	-	2	-	-	-	-	-
18. Replace and align servo head (see Procedures, above).	-	3	-	-	-	-	-
19. Suspect card A10.	-	-	1	-	-	-	-
20. Suspect propagation of Track Servo signal through cards A11, A09, A12, A04.	-	-	-	1	-	-	-
21. Replace power amp.	-	-	-	-	3	2	-
22. Suspect velocity transducer and attendant logic on card A12 (cards A04, A11 also involved, but checked in Action 23).	-	-	-	-	2	-	-
23. Suspect Fine Enable logic on cards A11, A04.	-	-	-	-	1	-	1
24. Suspect cards A12, A10, A09.	-	-	-	-	-	1	2
25. Call Field Support.	-	4	2	2	4	3	3

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DLT 7 RTZ/CONTINUOUS SEEKS

Warning: None

Enters from: DLT 6

Procedures: None

References: Logic Diagrams

Exits to: DLT 8

Assumption:
1. FTU connected to drive via A and B I/O cables
2. Remote/Local switch on drive (if present) set to REMOTE
3. LAP installed and drive selected from FTU.

CONDITIONS	1	2	3	4	5	6	7	8
1. Actuate RTZ switch on FTU. RTZ successful?	Y	N	-	-	-			
2. Set up and perform continuous seeks:								
a) Set FTU Access Mode switch to CONT.								
b) Set all FTU Cyl Address switches "off" (down).								
c) Actuate START switch.								
d) Sequentially select/deselect Cyl Adrs switches (1,2,4,8...256, 512) to step actuator between track 0 and the track indicated by the active Cyl Address switch.								
Continuous seeks successful?	Y	-	N	-	-			
3. Select track (cyl) 822:								
• Set Cyl Adrs switches to 366_{16} (1466_{8}).								
Seek to track 822 successful?	Y	-	-	N	-			
4. Select track 823 (to force seek error):								
• Set Cyl Adrs switches to 367_{16} (1467_{8}).								
Seek error when attempting to go to "track 823"?	Y	-	-	-	N			

ACTIONS	1	2	3	4	5	6	7	8
1. Seeks executed properly—proceed to DLT 8.	X	-	-	-	-			
2. Replace A03 card (Access Control and Sector Decode).	-	1	1	1	1			
3. Replace A04 card (Access Control 1).	-	2	-	-	-			
4. Replace A11 card (Access Control 2).	-	3	-	-	-			
5. Replace A12 card (D/A Function Generator).	-	4	3	3	3			
6. Replace A07 card (Receivers).	-	5	4	4	4			
7. Replace A13 card (Difference Counter and Control).	-	-	2	2	2			
8. Call Field Support.	-	6	5	5	5			

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DLT 8 WRITE/WRITE FORMAT (sheet 1 of 2)

Warning: None

Enters from: DLT 7

Procedures: None

References: Logic diagrams

Exits to: Sheet 2

Assumption: FTU connected to drive and FTU switches set per "Preliminary Set-up" in Operation section of TB304 manual. In addition, FTU Wrt-Rd Select switch set for either WRT or WRT FORMAT operation.

CONDITIONS	1	2	3	4	5	6	7	8
1. FAULT indication is given when drive is connected to controller but not when connected to FTU?	N	Y	-	-				
2. FAULT light on FTU panel comes on?	N	N	Y	Y				
3. FAULT light on SMD panel comes on?	N	N	N	Y				

ACTIONS	1	2	3	4	5	6	7	8
1. No problem--proceed to DLT 9.	X							
2. Check that Write Protect switches are OFF.		X						
3. Check that +5 V is available at operator panel. If available, replace -ZYN card (operator panel, ass'y A10).			X					
4. Go to Condition 4 on sheet 2.				X				

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DLT 8 WRITE/WRITE FORMAT (sheet 2 of 2)

Warning: None

Enters from: Sheet 1

Procedures: None

References: Logic diagrams

Exits to: DLT 9

Assumption: FTU connected to drive and FTU switches set per "Preliminary Set-up" in Operation section of TB304 manual. In addition, FTU Wrt-Rd Select switch set for either WRT or WRT FORMAT operation.

	CONDITIONS	5	6	7	8	9	10	11	12	13	14
2,3.	FAULT indications on both FTU and SMD panels? (From sheet 1.)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4.	Is fault limited to certain groups of contiguous addresses?	Y	N	-	-	-	-	-	-	-	-
5.	Does fault appear only for WRT FORMAT operations?	-	-	Y	N	-	-	-	-	-	-
6.	Set FTU Addr/Sect MK switch to SECT MK and try again.										
	Does FAULT light still come on?	-	-	-	-	N	Y	-	-	-	-
7.	Check LEDs on operator panel:										
	a) WRT FLT on?	-	-	-	-	-	-	Y	-	-	-
	b) HD SEL FLT on?	-	-	-	-	-	-	-	Y	-	-
	c) WR · RD FLT on?	-	-	-	-	-	-	-	-	Y	-
	d) $\overline{\text{ON CYL}}$ · (W + R) on?	-	-	-	-	-	-	-	-	-	Y

	ACTIONS	5	6	7	8	9	10	11	12	13	14
5.	Replace A13 card (CAR bits 7,8,9).	1	-	-	-	-	-	-	-	-	-
6.	Go to Condition 5.	-	X	-	-	-	-	-	-	-	-
7.	Go to Condition 6.	-	-	X	-	-	-	-	-	-	-
8.	Go to Condition 7.	-	-	-	X	-	-	-	-	-	-
9.	Suspect cards A11, A14, A07 (Address Mark Enable).	-	-	-	-	1	-	-	-	-	-
10.	Restore sw to ADDR MK position, repeat test and go to										
	Condition 7.	-	-	-	-	-	X	-	-	-	-
11.	Chk that FTU's Servo Offset sw is "off" (center position).	-	-	-	-	-	-	1	1	1	1
12.	Replace A01 card (Write PLO).	-	-	-	-	-	-	2	-	-	-
13.	Replace A14 card (NRZ → MFM).	-	-	-	-	-	-	3	-	-	-
14.	Replace A07 card (Rcurs).	-	-	-	-	-	-	4	2	2	-
15.	Replace A05 card (Write Protect).	-	-	-	-	-	-	5	-	3	2
16.	Replace A04 card (On Cyl).	-	-	-	-	-	-	-	-	-	3
17.	Replace Write Driver card on assembly A5.	2	-	-	-	2	-	6	-	4	4
18.	Replace Read Amp card on assembly A5.	-	-	-	-	-	-	-	3	-	-
19.	Call Field Support.	3	-	-	-	3	-	7	4	5	5

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DLT 9 READ

Warning: None

Enters from: DLT 8

Procedures: Head Alignment

References: Logic Diagrams

Exits to: DLT 10

Assumption: FTU connected to drive and set per "Preliminary Set-up" in Operation section of TB304 manual. In addition, FTU Wrt-Rd Select switch set to RD position.

CONDITIONS	1	2	3	4	5	6	7	8
1. Was address read peoperly? ①	Y	Y	Y	N	N			
2. Was data read properly? ①	Y	N	N	-	-			
3. Are errors head-related?	-	N	Y	N	Y			
ACTIONS								
1. No problem--proceed to DLT 10.	X	-	-	-	-			
2. Check that DATA switches on FTU are set to read the pattern previously written on disk.	-	1	-	-	-			
3. Replace A16 card (Read PLO).	-	2	-	2	-			
4. Replace A15 card (Data Latch).	-	3	-	3	-			
5. Replace A14 card (MFM → NRZ).	-	4	-	4	-			
6. Replace All card (Offset).	-	5	-	5	-			
7. Replace A07 card (Rcurs).	-	6	-	6	-			
8. Replace A06 card (Xmtrs).	-	7	1	7	1			
9. Check head alignment per maintenance procedure.	-	8	2	8	2			
10. Replace Hd Sel/Rd Preamp card on assembly A5.	-	9	-	9	-			
11. Replace faulty head(s).	-	-	3	-	3			
12. Reformat disk using WRT FORMAT procedure in FTU manual.	-	-	-	1	-			
13. Call Field Support.	-	10	4	10	4			

① A NO answer here implies that the procedures given in the FTU manual's Trouble Analysis DLT have already been executed in an attempt to recover the address/data, but to no avail.

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DLT 10 POWER DOWN

Warning: None

Enters from: DLT 9

Procedures: None

References: Logic diagrams

Exits to: None (diagnostics completed)

Assumption: Remote operation--Attempt to power-down the drive from the FTU
Local operation--Press START switch to extinguish START light and power-down the drive.

CONDITIONS	1	2	3	4	5	6	7	8
1. START light on SMD goes out? (LOCAL mode only.)	Y	Y	Y	Y	N			
2. Heads unload?	Y	Y	Y	N	-			
3. Drive motor brakes to a stop.	Y	N	N	-	-			
4. Drive motor coasts to a stop.	N	N	Y	-	-			

ACTIONS								
1. None req'd--diagnostics completed satisfactorily.	X	-	-	-	-			
2. Chk deck interlock switch (or wiring) for grounds.	-	1	-	-	-			
3. Chk that Heads Loaded switch has transferred (PA02-4A should be at ground).	-	2	-	-	-			
4. Replace BXPN brd (ass'y A11) or relay brd (ass'y A4) as applicable.	-	3	2	-	-			
5. Chk hysteresis brake and intervening connectors (see logic diagrams); if OK, go to next recommended Action.	-	-	1	-	-			
6. Replace A03 card (RTZ Latch).	-	-	-	1	-			
7. Replace A12 card (Summing Amp).	-	-	-	2	-			
8. Replace A09 card (Power Amp Control).	-	-	-	3	-			
9. Suspect base of Q1 on operator panel (-ZYN card) grounded. Check associated components on -ZYN card.	-	-	-	-	1			
10. Call Field Support.	-	4	3	4	2			

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PROCEDURES

PROCEDURE A: CHECKING DC VOLTAGES

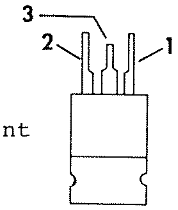
This procedure defines dc-voltage checkpoints on the drive for both load and no-load conditions. It is used in conjunction with DLT2 or whenever a dc voltage is suspect.

The voltage readings in table A-3 may be obtained by using either a standard (needle-type) or digital volt-ohmmeter. Table A-4 gives the usual symptoms for a malfunctioning power supply. Because spare parts for the components in the various supplies are not usually provided, a power supply is not normally repaired in the field, but simply replaced by substituting either a new power supply board or an entire power supply assembly.

TABLE A-3. CHECKING DC VOLTAGES

Voltage to be Checked	Volt-Ohmmeter Connections				Voltage Readings
	Normal Load (A1P/J2 Mated)		No Load (A1P/J2 Separated)		
	+ Probe	- Probe	+ Probe	- Probe	
+5	+5 Faston	Either of the GND Fastons on logic chassis or the ground-plane foil of the -XKV brd (see figure A-4).	J2-03	J2-01 or J2-02 or J2-12 or J2-14	+5.1 (±0.05)
-5	-5 Faston		J2-05		-5.1 (±0.05)
+12	U9-2 ①②		J2-10		+12 (±2)
-12	U8-2 ①②		J2-08		-12 (±2)
+20	+20 Faston		J2-06		+20 (±2)
-20	-20 Faston		J2-04		-20 (±2)
+42	A1F3		J2-13		+42 (±2)
-42	A1F4		J2-09		-42 (±2)

① U8, U9 Pin Arrangement



② If ± 12 voltages remain in the range 7-9 V (±) or fluctuate between ±12 V and 0 V, suspect a fault in the dc loads. Verify with no-load readings. Heavy overloads such as a dead short will cause the regulator's thermal protect feature to drop the output voltage to zero.

TABLE A-4. FAILURE SYMPTOMS IN POWER SUPPLIES

Symptom	Probable Cause
1. Noticeable ripple at output (checked with oscilloscope)	Open diode or open filter capacitor
2. Less than specified output (ac input ok)	Shorted diode or shorted filter capacitor
3. Output decreases significantly when load is connected.	Open bleeder resistor

PROCEDURE:

1. Turn off POWER SUPPLY breaker (CB2)
2. Raise logic chassis to maintenance position to give access to voltage Fastons.
3. Be sure that P/J2 is mated to provide loads for the supplies to be checked.
4. Turn on CB2
5. Using the VOM probe connections from the NORMAL LOAD columns of table A-3, check each supply voltage.
6. If any voltage is outside the tolerance given in table A-3, or is nonexistent, proceed to check the no-load voltages by separating P/J2 and using the probe connections specified in the NO LOAD columns of the table. (Turn off CB2 before separating P/J2)
7. If the ±5 V readings are outside the tolerances of table A-3, adjust those voltages as described under the Plus and Minus 5 Volt Regulators procedure in section 3B.
8. If further maintenance is not to be performed at this time:
   a. turn off CB2
   b. reconnect P/J2
   c. return the logic chassis to its normal position and secure the 1/4-turn fastener.
   d. turn on CB2 to restore normal drive functions.

PROCEDURE B: CHECKING AC INPUTS TO POWER SUPPLIES

This procedure verifies that a given secondary winding of ferroresonant transformer T1 has sufficient voltage to drive its associated power supply. The procedure should be performed whenever T1 is suspected as the cause for a lower-than-normal dc voltage, as measured using Procedure A. Steps 6 through 16 should also be performed whenever either the power supply assembly or the -XKV power supply board has been replaced, to assure that the previously malfunctioning supply did not damage the transformer.

NOTE

> The ±5, ±20, and ±42 V supplies constitute the load for T1 and its tuning capacitor, A1C8. Without a load, T1 would oscillate and produce meaningless voltage readings. For this reason, do not separate P/J1 in an attempt to measure the ac input voltages directly at the pin-sockets of P1.

The first five steps in the procedure, along with the resistance readings in table A-5, assure that the -XKV board itself is not shorted. This ensures that the subsequent ac input readings will be a valid indication of the transformer's performance. Table A-6 shows the oscilloscope connections for monitoring the ac input to each supply. Figure A-4 gives the location of those monitoring points on the -XKV board. Figure A-5 shows the square-wave input (secondary-winding output) and the nominal ac voltages, the latter given more precisely in table A-6.

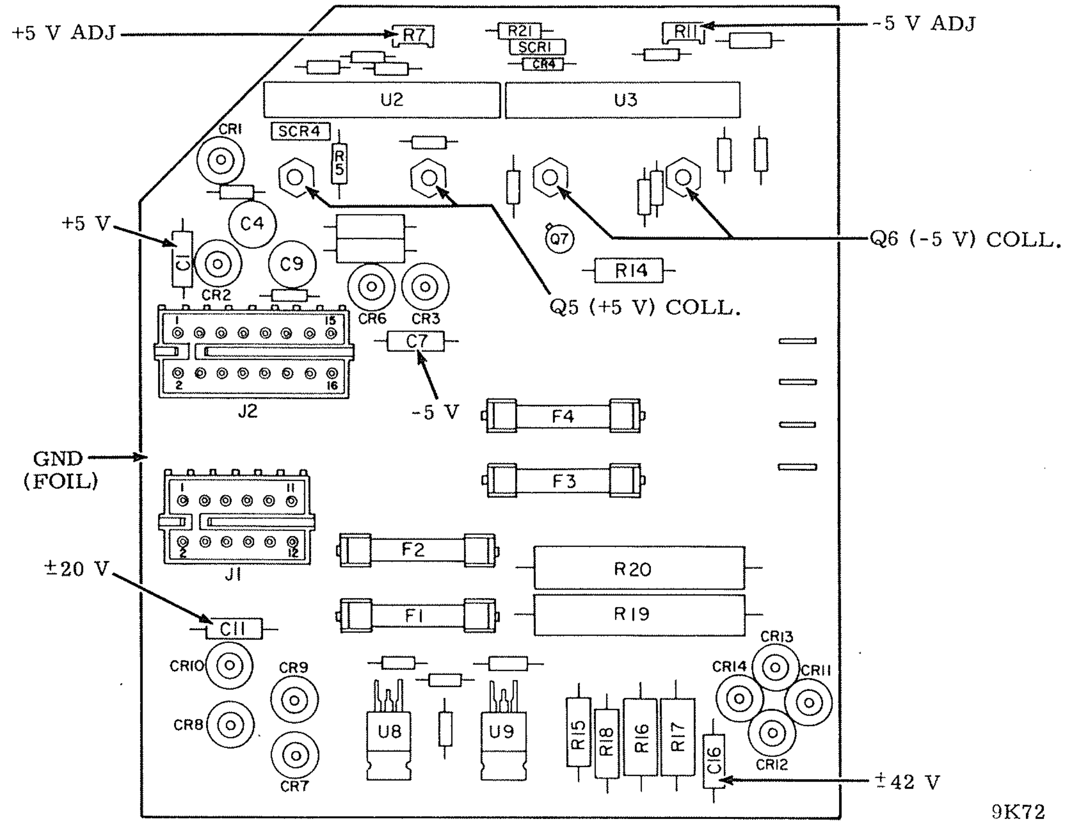


Figure A-4. AC-Input Probe Points on -XKV Board

OSCILLOSCOPE SETTINGS

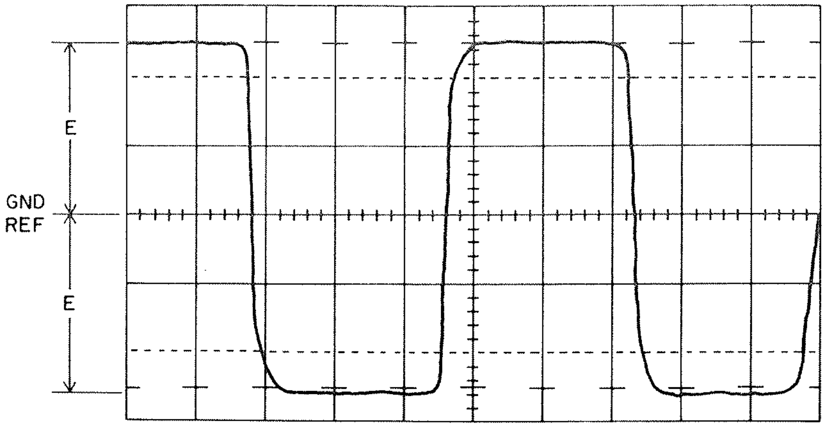
SCOPE GND TO LOGIC GND

VOLTS/DIV
CH 1 - ①
CH 2 - NA

TIME/DIV
A - VARY FOR CONVENIENT TRACE
B - NA

TRIGGERING
A (USE X1 PROBE) - LINE
B (USE X PROBE) - NA

PROBE CONNECTIONS
CH 1 (USE X1 PROBE) - ②
CH 2 (USE X PROBE) - NA



① ±5 V: E = 11 V
±20 V: E = 22 V
±42 V: E = 44 V

② SEE TABLE

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Figure A-5. T1 Inputs to Power Supply (-XKV Board

PROCEDURE:

Steps 1 through 5 ensure that there are no shorts in the power supplies on the -XKV board that might give the erroneous impression that T1 was at fault rather than the board itself.

1. Turn off CB2 (Power Supply breaker)
2. Remove the plastic cover protecting the -XKV board.
3. Isolate the -XKV board by separating connectors P/J1 (to T1) and P/J2 (to dc loads).
4. Referring to table A-5, check the input resistance of each supply. Allow time for the input capacitor to charge before determining the final reading.

TABLE A-5. CHECKING FOR SHORTED -XKV BOARD

Power Supply	VOM Connections to J1	Resistance (VOM Scale: Rx100)
+5 V	1,3	Inf.
-5 V	5,7	Inf.
±20 V	6,8	4300Ω
±42 V	2,4	4300Ω

5. If any of the four readings are significantly lower than those given in table A-5, the -XKV board should be replaced.

Steps 6 through 16 check the ac input to the -XKV board.

6. Reconnect P/J1
7. Plug in the test scope and set the trigger control to LINE. Turn on the scope and when the horizontal trace becomes visible, center it on the graticule.
8. Connect the scope's ground probe to the ground-plane foil of the -XKV board (refer to figure A-4).
9. Turn on CB2.
10. Connect the scope's + probe (i.e., CH1 or CH2, depending upon scope set-up) to either lead of the input filter capacitor listed in table A-6 for the voltage to be checked. (Refer to figure A-4 for capacitor locations.)
11. Adjust scope's TIME/DIV control to secure a stable square-wave trace (ref: figure A-5).

TABLE A-6. CHECKING AC INPUTS TO -XKV BOARD

Supply to be Checked for AC Input	Scope Connections (Refer to Figure A-1)		AC Input Voltages (Check each Side of Input Capacitor)
	+ Probe (AC Input)	- Probe (Ground)	
+5 V	C1	Ground-plane foil of -XKV board (see fig. A-1)	11 V ±1 V
-5 V	C7		11 V ±1 V
±20 V	C11		22 V ±1 V
±42 V	C16		44 V ±2 V

12. Adjust scope's VOLTS/DIV control to allow easy mental reckoning of the voltage represented by the trace, as shown against the graticule lines.

13. Record the voltage (or make a mental note, if you trust your visual memory) from the ground reference line on the graticule to the top and bottom plateaus of the trace, as indicated by "E" in figure A-5 (two readings).

14. Repeat step 13 with the + probe connected to the other lead of the input capacitor.

15. If both steps 13 and 14 show a symmetrical waveshape about the ground reference line (that is, all four voltage readings are the same), and are within the tolerance specified in table A-6, the T1 winding for that particular supply is ok.

NOTE

If you suspect a disparity between the sets of readings taken in steps 10 and 11, check the probe points again with a VOM, which will make any difference more distinguishable. Keep in mind that the VOM readings will be less because they are effective, not peak, voltages.

16. If the voltage readings are not the same, or if they are the same but not within the tolerances given in table A-6, the problem has to be a shorted winding in T1. You may be able to confirm this by sniffing the transformer for evidence of burned insulation, although this is not a definite test. Proceed to step 17.

WARNING

Tuning capacitor A1C8 is charged to 440 volts. Be sure to discharge it before starting step 17.

17. Replace transformer T1, using the procedure given in section 2D.

18. Check the newly installed transformer by repeating steps 6 through 14.

PROCEDURE C: TROUBLESHOOTING HEAT-GENERATED PROBLEMS

CAUTION

> If the heads perform an unscheduled retract and the START and FAULT lights are both off, immediately turn off the POWER SUPPLY breaker; you have dropped +5 V and run the risk of burning up the voice coil. Only after you've shut off dc power should you check to see if the power-down resulted from a failure on the ac line. (Hint: is the blower still on?)

If you commit the above CAUTION to memory and act instinctively upon it, you may one day save yourself a lot of trouble; failure of the +5 V supply is a common cause for abnormal shut-downs.

Heat-related problems are easy to diagnose: they occur only when the drive gets hot, and they disappear when the drive has had a chance to cool off. If you suspect a problem is heat-related, let the drive cool down, then note the failure (or more accurately, the absence of the failure) when the drive is started up again. Often the trouble-shooting period can be shortened by applying artificial heat to the suspected area (a hair dryer is useful here). Once you've diagnosed the problem, correct it as you would any other malfunction.

Heat problems are of two types -- those originating in the power supplies and those developing in the various loads. Should a load fault take out a 20 V or 42 V fuse, the course is clear: simply refer to the applicable "load" DLT. If the load does not pop a fuse but merely brings up a FAULT light (on the back of the operator panel), the table below should offer a starting point for correcting the problem. (If the +5 V supply goes, of course, the fault lights won't work.)

FAULT	PROBLEM RELATED TO
Voltage (except +5 V)	A05
On Cyl•(W+R)	A05, A02, A04
Write	A05, A02, A13, A14, A5 assy (Write Driver board)
W•R	A05, A02, A07
Hd Sel	A05, A06, A5 assy (Hd Sel/Rd Amp board)

Losing ±5 V can be bothersome because those supplies maintain a uniform output voltage right up to their current limit, and then drop to 0 V when that limit is exceeded. Should this happen, check to see if the supply itself is the culprit by disconnecting the 5 V load. If the voltage returns to 5 V, the fault lies in the load, not the supply.

PROCEDURE D: PIN-POINTING VOLTAGE FAULTS IN THE LOGIC CHASSIS

This procedure locates ±5 V, ±20 V, and ±42 V faults on cards in the logic chassis or in the logic chassis backpanel wiring. (There is no ±12 V load in logic chassis assembly A2.)

The test procedure may be conducted in either of two ways. The first method is to check the ±5 V, ±20 V, and ±42 V loads individually by entering Procedure D from the applicable DLT:

±5 V -- Condition 1 of DLT 3

±20 V -- Condition 1 of DLT 4

±42 V -- Condition 3 of DLT 6

The second method is to check all three loads at the same time. The test for load faults in each voltage is made by adding cards to the logic chassis one at a time, so it is more efficient to check all three loads on a given card at one time. (Of course, some cards will not require all three checks.)

The second method is the one described below, and requires that the tests for Conditions 1 and 2 of DLT 6 have been satisfactorily completed before entering the procedure.

NOTE

> It should be pointed out that, as shown in table A-1, only +5 V is used on every card. If there is no +5 V fault in the logic chassis, only the cards using the faulted voltage(s) need to be removed.

1. Be certain that Conditions 1 and 2 of DLT 6 have been tested with satisfactory results before proceeding to step 2. (Condition 1 checks the servo capacitors, Condition 2 the power amplifier.)
2. Turn off the POWER SUPPLY (PS) breaker.
3. Separate PA80 and PA81 from their jacks on the logic chassis.
4. Ensure that all other connectors are properly mated.
5. Remove all cards from the logic chassis. (See NOTE, above, for possible exception to this "all cards" rule.)
6. Turn on the PS breaker.
7. Load faults caused by wiring errors in (or damage to) the logic chassis backpanel will show up as a blown fuse. Check the integrity of each fuse as described in DLT 2. If a fuse blows, carefully raise the logic chassis to the maintenance position and check backpanel for grounds caused by bent pins or dangling wires. After clearing the fault, restore the logic chassis to its normal position.
8. Turn off the PS breaker. You are now ready to start putting the cards back in the logic chassis one at a time, checking for faults after each one has been inserted.
9. Before inserting a card, examine both sides for evidence of arcing across the foil. Often the carbon residue around an arc area can be removed with an alcohol swab and the card won't give any more trouble.
10. Insert the selected card properly.
11. Turn on the PS breaker.
12. Using table A-1 to determine which voltages are present on the card, check the integrity of the applicable fuses.
13. If step 12 shows a blown fuse, turn off the PS breaker, replace the card just installed with a fresh one from the spare parts bin and try the test again.
14. If step 12 shows that the fuses are OK, turn off the PS breaker and, selecting another card, repeat steps 9 through 14.
15. When all cards have been checked good, return to the applicable "load fault" DLT to continue the dc-load checkout on the additional assemblies.

APPENDIX B

DECISION LOGIC TABLES (DLTs)

for SMDs with Series Code 23 (SC 23) and below

CONTENTS

FIGURES

TABLES

APPENDIX B
DECISION LOGIC TABLES (DLTs)

INTRODUCTION

Decision logic tables help the maintenance technician to organize his thinking when problems occur in the drive. For a given fault condition (or set of conditions), actions are recommended to locate and correct the fault. The actions are arranged so that the corrective measures that are easiest to perform (checking a fuse or changing a card in the logic chassis, for example) are listed before the more difficult tasks such as replacing the head/arm assembly or drive motor.

A section called Useful Troubleshooting Aids precedes the DLT section and is separated from it by a divider page. This section contains two general-interest maintenance procedures, as well as tables and figures that should prove useful throughout the troubleshooting effort, particularly to personnel not familiar with the SMD.

The DLT section consists of ten tables, described briefly below.

- DLT 1 shows how to correct problems that occur while attempting to "power up" the drive.
- DLT 2 isolates dc power distribution problems either to the power supply loads or to the power supply module, and tells how to cure those that occur within the power supply module itself.
- DLT 3 shows how to locate power faults in the dc loads, defining cures for those encountered in the unfused loads (±5 V, ±12 V).
- DLT 4 shows how to locate and correct faults in the ±20 V loads.
- DLT 5 shows how to locate and correct faults in the ±42 V loads.
- DLTs 6 through 9 are to be used with the FTU (TB304) to correct various seek and read/write errors.
- DLT 10 shows what to do when a drive does not "power down" properly.

The procedures referred to in the DLTs form the last section in this appendix.

USING THE DLT

The DLT is divided into four quadrants. The upper-left quadrant, CONDITIONS, contains the various test conditions that can be answered "yes" or "no". The CONDITIONS quadrant is prefaced by any ASSUMPTIONS (that is, preconditions) that must be observed if the test results are to be valid. Sometimes, prerequisite actions other than the ASSUMPTIONS must be taken before the test for a given condition is made. Such steps are included in the CONDITIONS quadrant. The yes (Y) or no (N) answers to each condition are shown in numbered columns in the top-right Situations quadrant.

To use the DLT, first determine whether the result of a condition tested is Y or N. If two or more conditions exist simultaneously, look for a situations column that combines the appropriate Y-N answers for those conditions. A dash (-) in the top-right Situations quadrant means that the related Condition is not a factor in determining what actions are to be taken for that situation.

Next, determine what action should be taken for a given test result (i.e., situation) by following down the selected column to the row marked "1" in the lower-right Sequence quadrant. (If there is only one recommended action for a given situation, an "X" appears instead of the "1".) The recommended action is then located by moving across to the lower-left ACTIONS quadrant. A dash in a column of the Sequence quadrant indicates that the related Action isn't applicable.

After taking the first recommended action, repeat the test that gave rise to the situation. If the test results haven't changed (same situation), try recommended action 2, and so on, being sure to repeat the test after each such action.

Column 1 is generally reserved for an "everything OK" situation. If a DLT requires more than one sheet, this "no problem" column is repeated on each sheet. Similarly, the last ACTION on each sheet is a recommendation to "call field support". Don't brood over your inadequacy if you reach this last entry; not every situation can be covered in a DLT!

USEFUL TROUBLESHOOTING AIDS

USING A VOM TO CHECK A CAPACITOR

1. Remove power from the equipment.
2. Discharge capacitor by momentarily shorting the leads with a jumper wire. (Use screwdriver for large capacitors.)
3. Isolate the capacitor by disconnecting one lead from the circuit.
4. Set VOM to X1000 (ohms) scale.
5. Connect the VOM across the capacitor leads. The condition of the capacitor is interpreted as follows:

Meter reading	Interpretation
Needle goes rapidly to full scale (0Ω), then regresses to infinity (∞). (See NOTE.)	Capacitor OK
Needle goes rapidly to full scale and remains there.	Capacitor shorted
Needle deflects slightly or not at all.	Capacitor open

NOTE

Speed with which needle returns to infinity (∞) is a function of capacity rating. Return swing is rapid for small capacitors, becoming slower as capacity increases. To a lesser degree, return swing is also dependent upon which meter scale is used.

IN-CIRCUIT DIODE CHECKING WITH A VOM

A diode that is suspect can be given a preliminary check without disconnecting it from the circuit. Merely check the diode twice, reversing the meter leads between the two readings. Of course, power should be off, and for your own peace of mind any capacitors in the circuit should be discharged.

Keep in mind that the forward drop across a good diode is in the range 5 - 15Ω; the reverse drop is on the order of 1 MΩ. Parallel resistances in the circuit will, of course, significantly reduce the higher of these two readings, but if one is low and the other high, chances are the diode is OK. If both are low, the diode is probably shorted; if both are high, it's probably open.

This check can also be used for a bridge rectifier. You'll probably want to check at least two diodes in the bridge, because back-circuits may give different readings across different diodes.

TABLE B-1. DC VOLTAGES USED BY LOGIC-CHASSIS CARDS

Loc.	+5 V	-5 V	+12 V	+20 V	-20 V	+42 V	-42 V
A01	✓	✓		✓	✓		
A03	✓						
A04	✓						
A05	✓	✓		✓	✓	*	*
A06	✓	✓					
A07	✓	✓					
A09	✓	✓		✓	✓	*	*
A10	✓	✓		✓	✓		
A11	✓	✓	✓	✓	✓		
A12	✓			✓	✓		
A13	✓						
A14	✓	✓					
A15	✓	✓					
A16	✓	✓		✓	✓		

✓ = Used
* = Brought in via back-panel connector

TABLE B-2. VOLTAGES USED BY ELECTRONIC ASSEMBLIES

Ass'y	Name	+5 V	-5 V	+12 V	-12 V	+20 V	+42 V	-42 V
A4	Motor Relay Brd (with AXPN only)	✓						
A5	Hd Select, R/W Amp	✓	✓	✓	✓	✓	✓	
A8	Power Amp						✓	✓
A8	Servo Preamp			✓	✓			
A9	Emergency Retract						✓	✓
A10	Operator Panel	✓	✓					
A11	_XPN Board	✓	✓			✓		

✓ = Used

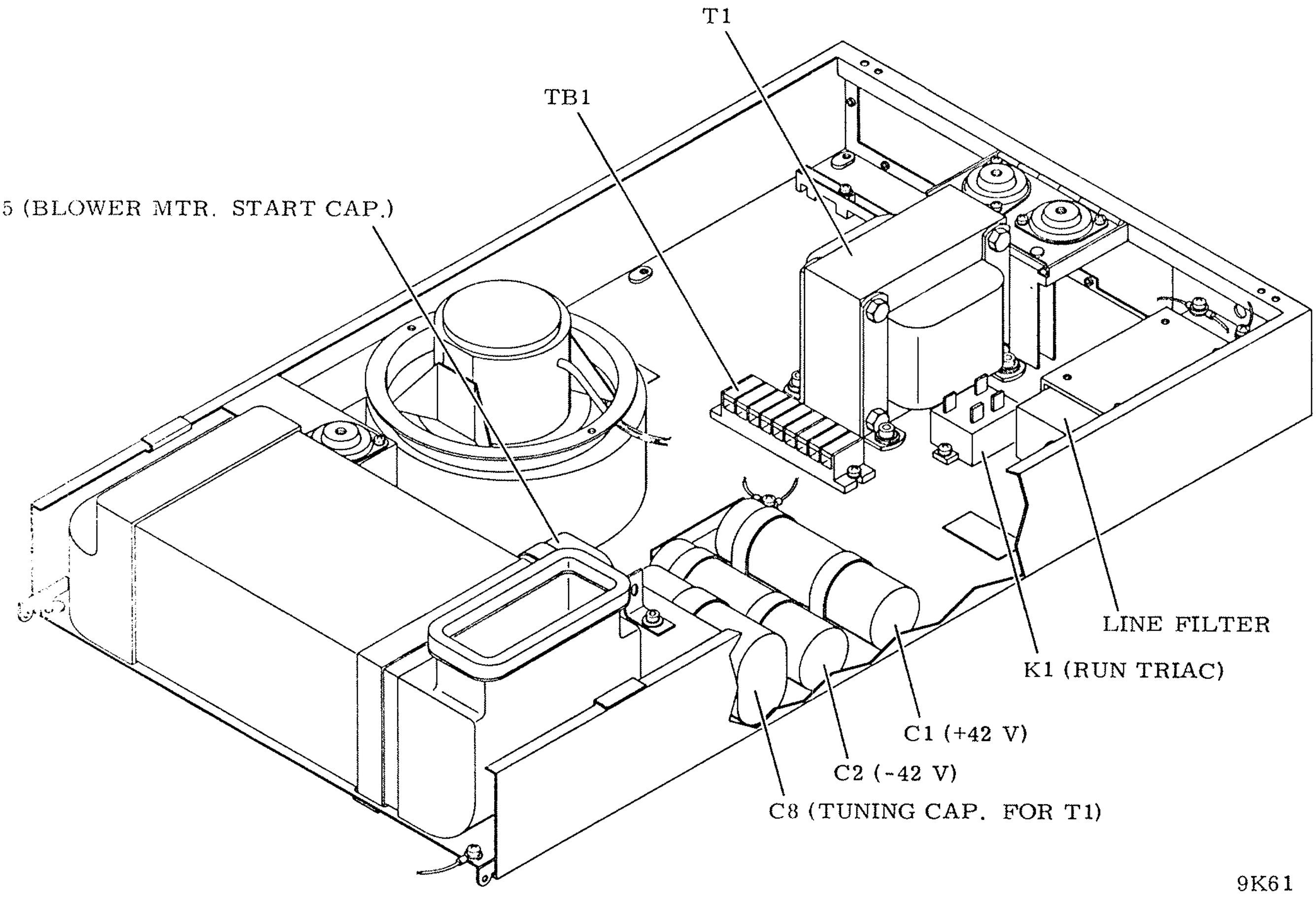


Figure B-1. Electrical Components on Base

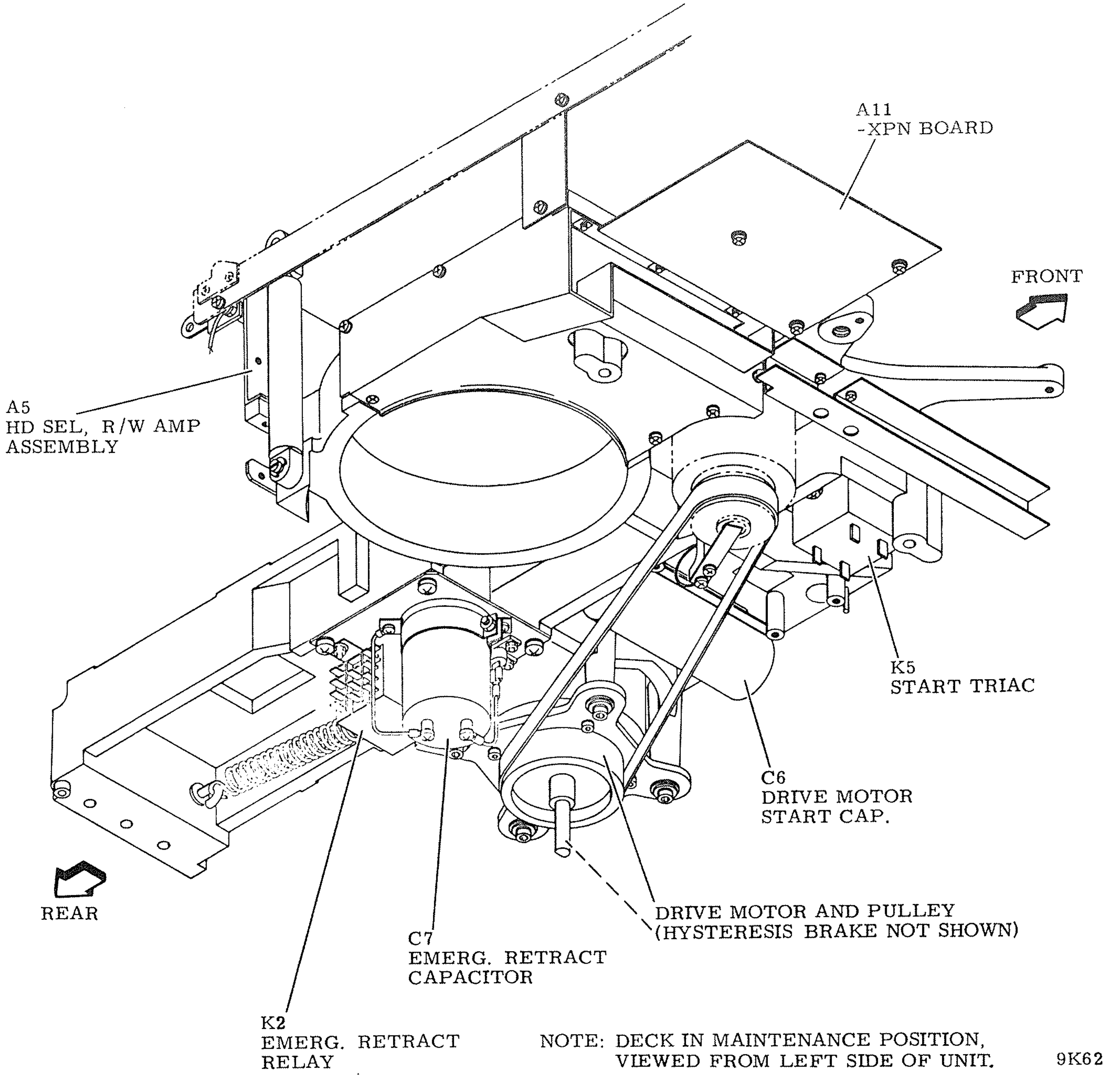


Figure B-2. Electrical Components on Deck

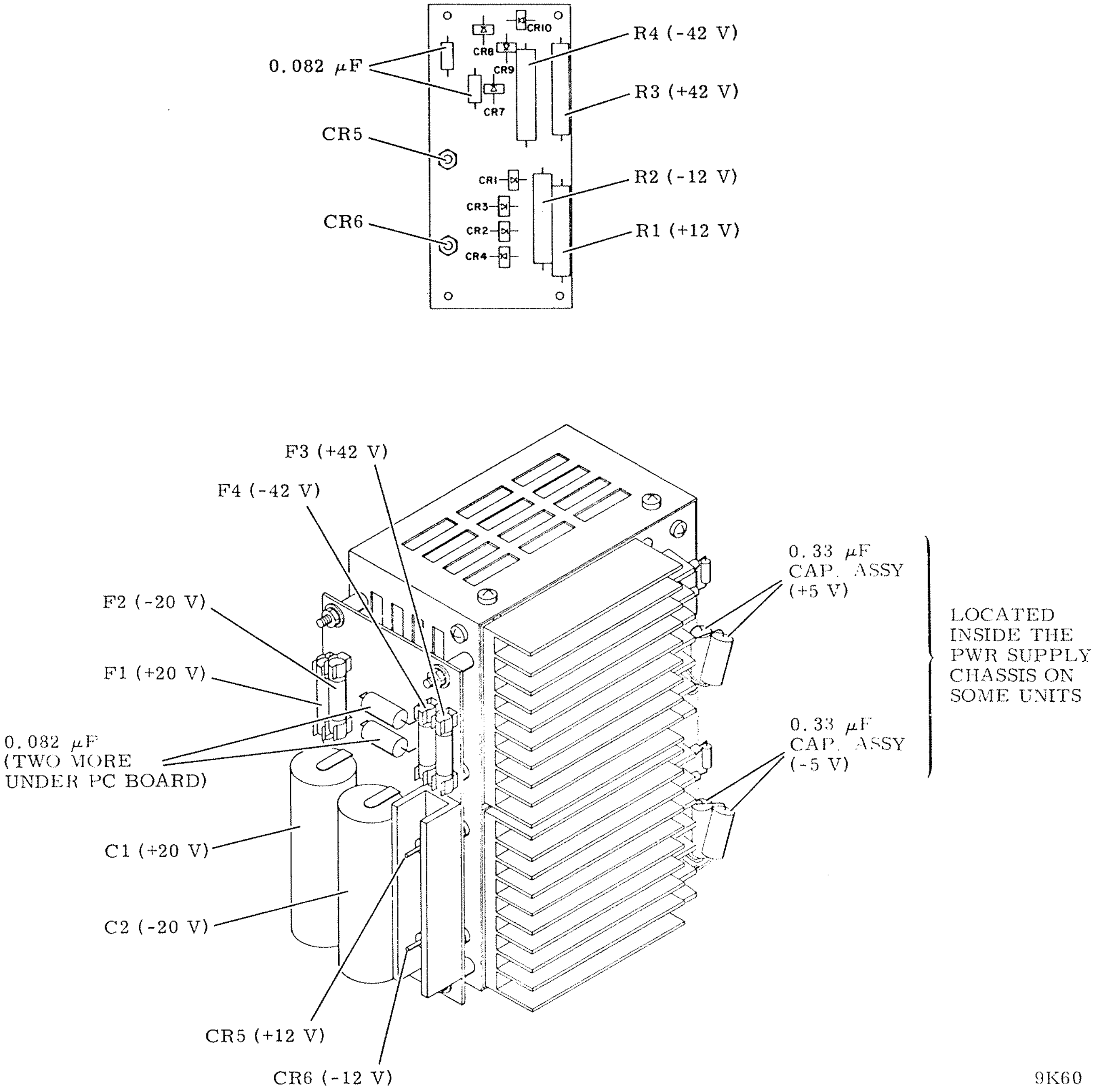


Figure B-3. External Components on Power Supply Module

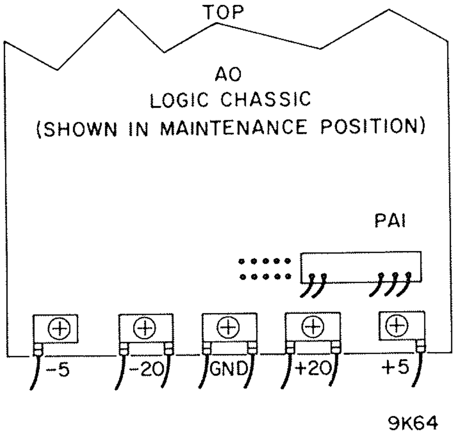
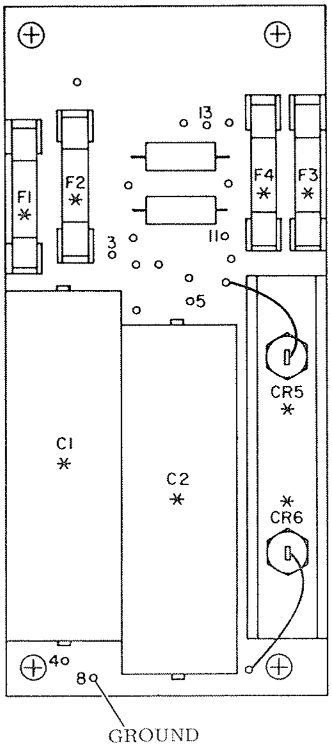


Figure B-4. DC Connections to Logic Chassis



POINTS	MEASURE (±10%)
3, 5	20 VAC TO POINT 8
11, 13	40 VAC TO POINT 8
F1	+20 V TO POINT 8
F2	-20 V TO POINT 8
F3	+42 V TO POINT 8
F4	-42 V TO POINT 8
CAP OF CR5	+12 V TO POINT 8
CAP OF CR6	-12 V TO POINT 8

NOTE: ASTERISKED COMPONENTS ARE RECOMMENDED SPARE PARTS, AS ARE THE EIGHT DIODES ON BACK OF PC BOARD.

9K65

Figure B-5. Voltage Checkpoints on Assembly A3

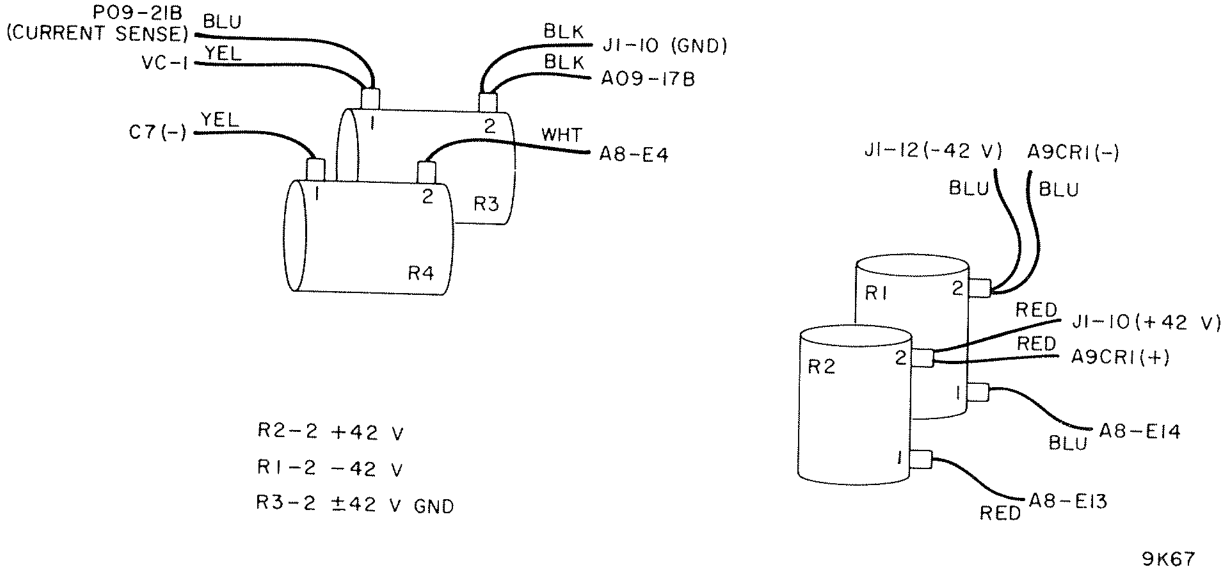


Figure B-6. 30 W Resistor Locations for Assembly A8

APPENDIX B

DECISION LOGIC TABLES (DLTs)

DLT 1 POWER UP (sheet 1 of 2)

Warning: Tuning capacitor C8 is charged to 440 volts. Treat it with respect!

Enters from: Assumptions

Procedures: A, B

References: Figures A-1 through A-3

Exits to: DLTs 2,4,5; or sheet 2 of this DLT

Assumption:
1. AC power connected
2. Disk pack installed on drive
3. Attempt to power-up and start drive from SMD panel.

CONDITIONS	1	2	3	4	5	6	7	8	9	10	11	12
1. Blower starts when AC POWER breaker is actuated?	Y	N	N	-	-	-	-	-	-	-	-	
2. AC POWER breaker trips when actuated?	N	N	Y	-	-	-	-	-	-	-	-	
3. POWER SUPPLY (PS) breaker trips when actuated?	N	-	-	Y	N	N	N	N	N	N	N	
4. Logic fan starts when PS breaker is actuated?	Y	-	-	-	N	Y	Y	Y	Y	Y	Y	
5. ±5 V OK? (Use Procedure A to check all dc voltages.)	Y	-	-	-	-	N	N	-	-	-	-	
6. No ±5 V; ±12, ±20, ±42 voltages significantly low?	N	-	-	-	-	-	Y	-	-	-	-	
7. ±12, ±20 voltages OK?	Y	-	-	-	-	-	-	N	-	Y	-	
8. ±42 V OK?	Y	-	-	-	-	-	-	-	N	-	Y	
9. 20 V fuse(s) blown? (Either or both.)	N	-	-	-	-	-	-	-	-	Y	-	
10. 42 V fuse(s) blown? (Either or both.)	N	-	-	-	-	-	-	-	-	-	Y	

ACTIONS												
1. Continue with Condition 11 on sheet 2.	X	-	-	-	-	-	-	-	-	-	-	
2. If pwr plug customer-provided, chk phase and gnd connections.	-	1	1	-	-	-	-	-	-	-	-	
3. Pull blower connector. If trouble persists, blower is OK.	-	-	2	-	-	-	-	-	-	-	-	
4. Disconnect hour meter. If trouble persists, meter is OK.	-	-	3	-	-	-	-	-	-	-	-	
5. Check/replace AC POWER breaker.	-	2	4	-	-	-	-	-	-	-	-	
6. Check for ac at line filter; replace line filter if required.	-	3	-	-	-	-	-	-	-	-	-	
7. Check for open blower, blower capacitor, or blower cable.	-	4	-	-	-	-	-	-	-	-	-	
8. Suspect shorted logic fan or cable.	-	-	-	1	-	-	-	-	-	-	-	
9. Suspect shorted tuning capacitor. See WARNING, above.	-	-	-	2	-	-	-	-	-	-	-	
10. Check PS brkr for short/gnd to frame.	-	-	-	3	-	-	-	-	-	-	-	
11. Suspect short in dc network. Troubleshoot per DLT 2.	-	-	-	4	-	-	-	-	-	-	-	
12. Suspect open circuit in logic fan or cabling.	-	-	-	-	1	-	-	-	-	-	-	
13. Chk PS brkr for ac input. If input present replace brkr.	-	-	-	-	2	-	-	-	-	-	-	
14. Troubleshoot per Procedure B.	-	-	-	-	-	1	-	1	1	-	-	
15. Suspect open tuning capacitor. See WARNING, above.	-	-	-	-	-	-	1	-	-	-	-	
16. Fault is in ±20 V load. Go to DLT 4.	-	-	-	-	-	-	-	-	-	X	-	
17. Fault is in ±42 V load. Go to DLT 5.	-	-	-	-	-	-	-	-	-	-	X	
18. Call Field Support.	-	5	5	5	3	2	2	2	2	-	-	

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DLT 1 POWER UP (sheet 2 of 2)

Warning: None

Enters from: Sheet 1

Procedures: A, C

References: Figures A-1 through A-3; DLT 6; Logic Diagrams

Exits to: DLT 7

Assumption:
1. AC power connected
2. Disk pack installed on drive
3. Attempt to power-up and start drive from SMD panel.

CONDITIONS	1	12	13	14	15	16	17	18	19			
11. AC POWER or drive thermal brkr trips when PS brkr is actuated?	N	Y	N	N	N	N	N	N	N			
12. AC POWER or drive thermal brkr trips when START sw is pressed?	N	-	Y	N	N	N	N	N	N			
13. START light comes on when START switch is pressed?	Y	-	-	N	N	Y	Y	Y	Y			
14. Drive motor starts when START switch is pressed?	Y	-	-	Y	N	N	Y	Y	Y			
15. Drive motor comes up to speed?	Y	-	-	-	-	-	N	Y	Y			
16. Heads load? (READY light comes on.)	Y	-	-	-	-	-	-	N	Y			
17. Drive motor cuts out after 15-second timeout expires?	N	-	-	-	-	-	Y	-	-			
18. PS brkr trips after drive has been operating for a time?	N	-	-	-	-	-	-	-	Y			
ACTIONS												
19. Power Up and First Seek completed properly. Go to DLT 7.	X	-	-	-	-	-	-	-	-			
20. Suspect Run triac.	-	1	-	-	-	6	-	-	-			
21. Suspect Run logic. Chk logic diagrams, beginning with -XPN brd.	-	2	-	-	-	-	1	-	-			
22. Suspect Start triac.	-	-	1	-	-	-	-	-	-			
23. Suspect drive motor start capacitor (C6).	-	-	2	-	-	5	-	-	-			
24. Suspect open Start winding in drive motor.	-	-	3	-	-	9	-	-	-			
25. Suspect START switch/indicator.	-	-	-	1	-	-	-	-	-			
26. Chk for presence of +5 V per Procedure A.	-	-	-	-	1	-	-	-	-			
27. Chk for +20 V to motor relay brd (if Assembly A4 is present in drive).	-	-	-	-	-	4	-	-	-			
28. Local/Remote sw (BXPN board only) not in LOCAL.	-	-	-	-	-	1	-	-	-			
29. Check all interlocks.	-	-	-	-	2	2	-	-	-			
30. Chk drive mtr thermal brkr. If tripped, determine cause.	-	-	-	-	-	3	-	-	-			
31. Chk hysteresis brake for mechanical binding.	-	-	-	-	-	7	2	-	-			
32. If brake energized, chk logic (motor relay brd or -XPN brd).	-	-	-	-	-	8	3	-	-			
33. Suspect speed sensor or attendant logic, starting with -XPN brd.	-	-	-	-	-	-	4	-	-			
34. Suspect open Run winding in drive motor.	-	-	-	-	-	10	-	-	-			
35. Refer to DLT 6, First Seek.	-	-	-	-	-	-	-	X	-			
36. Suspect overloaded (overheated?) power supply. Troubleshoot per Procedure C.	-	-	-	-	-	-	-	-	1			
37. Call Field Support.	-	3	4	2	3	11	5	-	2			

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DLT 2 ISOLATING PROBLEMS IN THE DC NETWORK (sheet 1 of 2)

Warning: None

Enters from: DLT 1

Procedures: B

References: Figures A-1,A-2,A-3,A-5

Exits to: DLT 3

Assumption: POWER SUPPLY (PS) breaker trips immediately upon being actuated. Breaker, C8, logic fan are all OK.

	CONDITIONS	1	2	3	4	5	6	7	8
1.	Isolate p.s. module from dc loads: Separate P/J1 (be sure not to isolate module from T1 by separating P/J100)--both connectors are in same harness. Turn on PS brkr. Does PS brkr trip?	N	Y	-	-	-	-		
2.	Isolate +5 V supply: Remove ring-tongue leads from AC terminals of ass'y A1. Turn on PS brkr. Does PS brkr trip?	-	-	N	Y	-	-		
3.	Isolate -5 V supply: Remove ring-tongue leads from AC terminals of ass'y A2. Turn on PS brkr. Does PS brkr trip?	-	-	-	-	N	Y		

	ACTIONS	1	2	3	4	5	6	7	8
1.	Problem is in a power supply load. To isolate, go to DLT 3.	X	-	-	-	-	-		
2.	Problem is in the power supply module. Go to Condition 2.	-	X	-	-	-	-		
3.	Check ac input to supply as given in Procedure B.	-	-	1	-	1	-		
4.	Replace ass'y A1 (+5 V supply) or take next recommended Action.	-	-	2	-	-	-		
5.	+5 V supply is OK. Reconnect A1 leads and go to Condition 3.	-	-	-	X	-	-		
6.	Replace ass'y A2 (-5 V supply) or take next recommended Action.	-	-	-	-	2	-		
7.	-5 V supply is OK. Reconnect A2 leads. Then replace assembly A3 or take next recommended Action.	-	-	-	-	-	1		
8.	In lieu of assembly replacement, replace entire p.s. module or, if applicable, go to next recommended Action.	-	-	3	-	3	2		
9.	If assembly A3 is suspected, the specific supply may be pinpointed by the procedure given on sheet 2. The procedure requires unsoldering leads on the A3 board so as to individually test the two supplies. Such action generally voids the warranty on the A3 assembly, and should be attempted only as a "last resort" fix.	-	-	-	-	-	3		
10.	Call Field Support.	-	-	4	-	4	4		

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DLT 2 ISOLATING PROBLEMS IN THE DC NETWORK (sheet 2 of 2)

Warning: None

Enters from: Sheet 1

Procedures: Using a VOM to Check a Capacitor; In-Circuit Diode Checking With a VOM;A

References: Figure A-5

Exits to:

Assumption: Assembly A3 has been determined as the cause of the power supply module failure. The procedure below is being attempted in an effort to repair, rather than replace, assembly A3.

CONDITIONS	1	2	3	4	5	6	7	8
1. Isolate ±20 V supply:								
a) Turn off PS breaker.								
b) Carefully unsolder leads to solder points 3 and 5 on PC assembly A3. (Refer to figure A-5 for solder points.)								
c) Turn on PS breaker. Does PS breaker trip?	N	Y						

ACTIONS	1	2	3	4	5	6	7	8
1. Fault has to be in the ±42 V supply. Proceed as follows:	1	-						
a) Turn off PS breaker.								
b) Carefully resolder leads to solder points 3 and 5.								
c) Carefully unsolder leads to solder points 11 and 13.								
d) With p.s. schematic as a reference (Sheet 48 in diagrams section), check for faulty diodes/capacitors using the two procedures in the "Useful Troubleshooting Aids" section of this appendix.								
2. Replace the defective component(s).	2	2						
3. Fault is in the ±20 V supply. With p.s. schematic as a reference, check for faulty diodes/capacitors as directed in Action 1d.	-	1						
4. Turn on PS brkr and chk for proper dc voltages per Procedure A.	3	3						
5. Reconnect P/J1 (for full load) and repeat voltage measurements to verify the fix.	4	4						

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DLT 3 LOCATING FAULTS IN THE DC LOADS (sheet 1 of 2)

Warning: Discharge C8 each time you turn off the POWER SUPPLY (PS) breaker

Enters from: DLT 2

Procedures: D

References: Figures A-1,A-2,A-3; Tables A-1,A-2

Exits to: DLT 4, DLT 5

Assumption: With P/J1 separated to isolate the dc loads from the power supply module, the PS breaker holds when actuated, indicating a fault in one or more of the power supply loads.

CONDITIONS	1	2	3	4	5	6	7	8	9	10	11	12
1. Examine ±20 V fuses (F1,F2) on A3. Is either fuse blown?	N	Y	-	-	-	-	-	-	-	-	-	
2. Examine ±42 V fuses (F3,F4) on A3. Is either fuse blown?	N	-	Y	-	-	-	-	-	-	-	-	
3. Restrict dc load to ±5 V on logic chassis:												
a) Remove ±20 V and ±42 V fuses (4).												
b) Remove P101 from assembly A5 (ref: figure A-3).												
c) Remove PA10 from logic backpanel (to isolate servo preamp).												
d) Remove P201 from operator panel, ass'y A10.												
e) Remove P205 from -XPN brd, ass'y A11 (ref: figure A-3).												
f) Remove PA1 from backpanel (±12 V, et al).												
g) Reconnect P/J1, then turn on PS brkr. Does PS brkr trip?	-	-	-	N	Y	-	-	-	-	-	-	
4. Restore ±12 V to logic chassis: Turn off PS brkr, reconnect PA1 to backpanel, turn on PS brkr. Does PS brkr trip?	-	-	-	-	-	N	Y	-	-	-	-	
5. Restore +5 V to operator panel: Turn off PS brkr, reconnect P/J201, turn on PS brkr. Does PS brkr trip?	-	-	-	-	-	-	-	N	Y	-	-	
6. Restore ±5 V to assembly A5:												
a) Turn off PS brkr.												
b) Remove PA1 from backpanel (to keep ±12 V from A5).												
c) Reconnect P/J101 and turn on PS brkr. Does PS brkr trip?	-	-	-	-	-	-	-	-	-	N	Y	
ACTIONS												
1. Go to Condition 3.	X	-	-	-	-	-	-	-	-	-	-	
2. Go to DLT 4 to locate ±20 V load fault.	-	X	-	-	-	-	-	-	-	-	-	
3. Go to DLT 5 to locate ±42 V load fault.	-	-	X	-	-	-	-	-	-	-	-	
4. ±5 V to logic chassis is OK. Go to Condition 4.	-	-	-	X	-	-	-	-	-	-	-	
5. Go to Procedure D to locate ±5 V fault in logic chassis.	-	-	-	-	1	-	-	-	-	-	-	
6. ±12 V to logic chassis is OK. Go to Condition 5.	-	-	-	-	-	X	-	-	-	-	-	
7. Chk PA1 cable for shorts/grounds. If cable is OK, go to Procedure D to locate ±12 V fault in logic chassis.	-	-	-	-	-	-	1	-	-	-	-	
8. Operator panel OK. Go to Condition 6.	-	-	-	-	-	-	-	X	-	-	-	
9. Chk P/J201 cable for shorts/grounds. If OK, replace ass'y A10.	-	-	-	-	-	-	-	-	1	-	-	
10. ±5 V to A5 is OK. Go to Condition 7 on sheet 2.	-	-	-	-	-	-	-	-	-	X	-	
11. Chk P/J101 cable for shorts/grounds. If OK, replace ass'y A5.	-	-	-	-	-	-	-	-	-	-	1	
12. Call Field Support.	-	-	-	-	2	-	2	-	2	-	2	

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DLT 3 LOCATING FAULTS IN THE DC LOADS (sheet 2 of 2)

Warning: Discharge C8 each time you turn off the PS breaker

Enters from: Sheet 1

Procedures: None

References: Figures A-1,A-2,A-3; tables A-1,A-2

Exits to: None

Assumption: The dc fault has been localized to one of the following unfused loads:
±5 V in assy All ±12 V in assy A5
±12 V in assy All

	CONDITIONS	12	13	14	15	16	17		
7.	Restore ±12 V to A5: Turn off PS brkr, reconnect PA1 to backpanel, turn on PS brkr. Does PS brkr trip?	N	Y	-	-	-	-		
8.	Restore ±5 V to ass'y All: Turn off PS brkr, reconnect P/J205, turn on PS brkr. Does PS brkr trip?	-	-	N	Y	-	-		
9.	Restore ±12 V to servo preamp: Turn off PS brkr, reconnect PA10 to backpanel, turn on PS brkr. Does PS brkr trip?	-	-	-	-	N	Y		
	ACTIONS								
13.	±12 V to A5 is OK. Go to Condition 8.	X	-	-	-	-	-		
14.	Recheck cables for PA1 and P101. If still OK, ±12 V is bad on assembly A5. Replace A5.	-	1	-	-	-	-		
15.	±5 V to -XPN brd is OK. Go to Condition 9.	-	-	X	-	-	-		
16.	Check P205 cable for shorts/grounds. If OK, replace -XPN board.	-	-	-	1	-	-		
17.	±5 V and ±12 V distribution is OK.	-	-	-	-	X	-		
18.	Check PAID cable for shorts/grounds. If OK, replace servo preamp.	-	-	-	-	-	1		
19.	Call Field Support.	-	2	-	2	-	2		

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DLT 4 LOCATING FAULTS IN THE ±20 V LOADS

Warning: Discharge C8 each time you turn off CB2 to separate or mate connectors

Enters from: DLT 2

Procedures: None

References: Logic Diagrams; tables

Exits to: DLT 1, if required to complete Power Up diagnostic.

Assumption: F1 or F2 blows when ±20 V loads connected. Be sure that F1 and F2 are good, then precede each Condition listed below by turning off CB2.

CONDITIONS	1	2	3	4	5	6	7	8	9	10	11	12
1. Restrict ±20 V distribution to the logic chassis:												
a) Remove P101 from assembly A5.												
b) Remove P205 from -XPN brd (assembly A11).												
c) Turn on CB2. Does either F1 or F2 blow?	Y	N	-	-	-	-	-	-	-	-		
2. Add assembly A5 to +20 V load:												
a) Reconnect P/J101.												
b) Turn on CB2. Does F1 (+20 V) blow?	-	-	Y	N	-	-	-	-	-	-		
3. Add -XPN board (assembly A11) to +20 V load:												
a) Reconnect P/J205 to -XPN board.												
b) Turn on CB2. Does F1 (+20 V) blow?	-	-	-	-	Y	N	-	-	-	-		
4. Check out ±20 V wiring on logic chassis:												
a) Remove cards A01,A05,A09,A10,A11,A12,A16. (All use ±20 V.)												
b) Turn on CB2 and check F1 and F2. Did either fuse blow?	-	-	-	-	-	-	Y	N	-	-		
5. Check individual ±20 V cards:												
a) Select a ±20 V card and insert it in the proper card slot.												
b) Turn on CB2. Did either F1 or F2 blow?	-	-	-	-	-	-	-	-	Y	N		
ACTIONS												
1. Problem is in the logic chassis. Go to Condition 4.	X	-	-	-	-	-	-	-	-	-		
2. Go to Condition 2.	-	X	-	-	-	-	-	-	-	-		
3. Chk P101 cable for shorts/gnds. If OK, replace assembly A5.	-	-	1	-	-	-	-	-	-	-		
4. Go to Condition 3.	-	-	-	X	-	-	-	-	-	-		
5. Chk P205 cable for shorts/gnds. If OK, replace -XPN board.	-	-	-	-	1	-	-	-	-	-		
6. Check logic chassis backpanel wiring: +20 V is on pin 33B, -20 V is on pin 02B. If problem cannot be located, special-order a new logic chassis.	-	-	-	-	-	-	X	-	-	-		
7. Go to (or repeat) Condition 5. When all cards OK, go to Action 9.	-	-	-	-	-	-	-	X	-	X		
8. Replace the defective card and try Condition 5 again.	-	-	-	-	-	-	-	-	1	-		
9. The ±20 V loads now check out to be OK. Return to DLT 1, if required, to complete the Power Up diagnostic.	-	-	-	-	-	X	-	-	-	-		
10. Call Field Support.	-	-	2	-	2	-	-	-	2	-		

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DLT 5 LOCATING FAULTS IN THE ±42 V LOADS (sheet 1 of 2)

Warning: Ensure that any leads you disconnect are clear of grounds or electrical elements.

Enters from: DLT 2

Procedures: None

References: Logic Diagrams; tables B-1,B-2; figure B-6

Exits to: DLT 1, if required, to complete Power Up diagnostic

Assumption: F3 and/or F4 blow when ±42 V load is connected. This DLT involves alternately disconnecting ass'ys A8,A9,A5 and A0 (locations A05 and A09 only) until fault is found. Be sure F3 and F4 are good, then precede each Condition below by turning off CB2.

CONDITIONS	1	2	3	4	5	6	7	8
1. Is F3 (+42 V) the only fuse blown?	Y	N	-	-	-	-		
2. Disconnect ±42 V from assembly A8: (refer to figure B-6).								
a) Remove the two red wires (+42 V) from R2-2.								
b) Remove the two blue wires (-42 V) from R1-2.								
c) Remove the two black wires (gnd) from R3-2.								
d) Turn on CB2. Did either F3 or F4 blow?	-	-	Y	N	-	-		
3. Disconnect ±42 V from emergency retract assembly A9:								
a) Discharge tuning capacitor C8. (WARNING: 440 volts!)								
b) Remove red wire from + terminal of dual-diode package CR1.								
c) Remove two blue wires from - terminal of CR1.								
d) Remove single blue wire from AC terminal of dual-diode CR2.								
e) Turn on CB2. Did either F3 or F4 blow?	-	-	-	-	Y	N		

ACTIONS								
1. Turn off CB2, then remove Fault Store capacitor (500 μF) from JA04. Replace F3 and turn on CB2. If fuse holds, replace capacitor. If fuse blows, reinstall capacitor and take next recommended Action.	1	-	-	-	-	-		
2. Go to Condition 2.	2	X	-	-	-	-		
3. Ass'y A8 is OK. Restore wires removed in Condition 1, then go to Condition 3.	-	-	X	-	-	-		
4. Replace assembly A8 and try Condition 2 again.	-	-	-	1	-	-		
5. Ass'y A9 is OK. Restore wires removed in Condition 3, then go to Condition 4 on sheet 2.	-	-	-	-	X	-		
6. Replace assembly A9 and try Condition 3 again.	-	-	-	-	-	1		
7. Call Field Support.	3	-	-	2	-	2		

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DLT 5 LOCATING FAULTS IN THE ±42 V LOADS (sheet 2 of 2)

Warning: Ensure that any leads you disconnect are clear of grounds or electrical elements.

Enters from: DLT 2

Procedures: None

References: Logic Diagrams; tables B-1,B-2; figure B-6

Exits to: DLT 1, if required, to complete Power Up diagnostic

Assumption: F3 and/or F4 blow when ±42 V load is connected. This DLT involves alternately disconnecting ass'ys A8,A9,A5 and A0 (locations A05 and A09 only) until fault is found. Be sure F3 and F4 are good, then precede each Condition below by turning off CB2.

CONDITIONS	7	8	9	10	11	12	13	14
4. Check out head sel/R-W assembly A5:								
a) Disconnect P101 from assembly A5.								
b) Turn on CB2. Did F3 blow? (A5 does not use -42 V.)	Y	N	-	-	-	-	-	-
5. Check out ±42 V wiring on logic chassis backpanel:								
a) Remove cards at locations A05 and A09 of logic chassis.								
b) Turn on CB2. Did F3 or F4 blow?	-	-	Y	N	-	-	-	-
6. Install card A05 and turn on CB2. Did F3 or F4 blow?	-	-	-	-	Y	N	-	-
7. Install card A09 and turn on CB2. Did F3 or F4 blow?	-	-	-	-	-	-	Y	N
ACTIONS								
8. Assembly A5 is OK. Reconnect P/J101 and go to Condition 5.	X	-	-	-	-	-	-	-
9. Replace piggy-back -ZKN board (Writer) in assembly A5 and try Condition 4 again.	-	1	-	-	-	-	-	-
10. Check backpanel wiring between locations A09 and A05. +42 V is on pin 33B, -42 V on pin 03B. Voltages come in on W5 harness attaching to A09 w/w pins via PA09.	-	-	1	-	-	-	-	-
11. Go to Condition 6.	-	-	-	X	-	-	-	-
12. Replace card A05 and try Condition 6 again.	-	-	-	-	1	-	-	-
13. Go to Condition 7.	-	-	-	-	-	X	-	-
14. Replace card A09 and try Condition 7 again.	-	-	-	-	-	-	1	-
15. The ±42 V distribution checks out OK. Go to DLT 1, if required, to complete Power Up diagnostic.	-	-	-	-	-	-	-	X
16. Call Field Support.	-	2	2	-	2	-	2	-

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DLT 6 FIRST SEEK (sheet 1 of 2)

Warning: None

Enters from: DLTs 1 through 5

Procedures: See sheet 2

References: Logic Diagrams

Exits to: DLT 7 or sheet 2 of this DLT

Assumption:
START light is on, drive is up to speed.

CONDITIONS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1. READY light comes on, signifying successful First Seek?	Y	N	N	N	N	N		
2. First Seek attempted?	-	N	N	N	N	N		
3. Check that Heads Loaded switch is transferring:								
a) Press START sw to stop disk. Do not turn off breakers.								
b) Manually push voice coil forward to move heads off unloading ramp. Does voice coil attempt to retract?	-	-	N	Y	Y	Y		
4. Check forward drive to voice coil:								
a) Disconnect wire from term. 2 of v.c. (one closest to magnet assy).								
b) Attach + lead of VOM to disconnected wire, com. lead to logic gnd.								
c) Press START.								
d) Wait for 15-20 second up-to-speed timeout to expire and then chk VOM. Does VOM read approx +40 V?	-	-	-	-	N	Y		
ACTIONS								
1. No problem. Go to DLT 7.	X	-	-	-	-	-		
2. Go to Condition 3.	-	X	-	-	-	-		
3. Suspect leads to (or contacts in) Em. Retract Relay.	-	-	1	-	-	-		
4. Suspect open voice coil.	-	-	2	-	-	-		
5. Replace Heads Loaded switch.	-	-	3	-	-	-		
6. Replace power amp.	-	-	4	-	6	-		
7. Hds Loaded sw OK. Go to Condition 4 to chk fwd drive on v.c.	-	-	-	X	-	-		
8. Suspect card A09 (pwr amp control).	-	-	-	-	1	-		
9. Suspect cards A11, A03 (direction control).	-	-	-	-	2	-		
10. Suspect card A12 (summing amp).	-	-	-	-	3	-		
11. Suspect card A13 (diff cntr, CAR).	-	-	-	-	4	-		
12. Suspect card A05 (speed control) and -XPN board.	-	-	-	-	5	-		
13. Voice coil should attempt First Seek when up-to-speed timeout expires. Go to Condition 5 on sheet 2.	-	-	-	-	-	X		
14. Call Field Support.	-	-	5	-	7	-		

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DLT 6 FIRST SEEK (sheet 2 of 2)

Warning: None

Enters from: Sheet 1

Procedures: Trk Servo Amplitude Check (section 3C); Hd-Arm Repl.(3D), Hd Alignment(3B)

References: Logic Diagrams

Exits to: DLT 7

Assumption: START light is on, drive is up to speed.

	CONDITIONS	7	8	9	10	11	12	13
1.	READY light signifies successful First Seek? (From sheet 1.)	N	N	N	N	N	N	N
2.	First Seek attempted? (From sheet 1.)	Y	Y	Y	Y	Y	Y	Y
5.	Drive attempts First Seek, then unloads?	Y	Y	Y	Y	-	-	-
6.	Servo preamp input to card A10 OK?	-	N	Y	Y	-	-	-
7.	Track Servo signal present at A10-09B (output pin)?	-	-	N	Y	-	-	-
8.	Drive seeks to forward mechanical stop, FAULT light comes on (+42 fuse blows), but heads don't unload--unit cannot power down?	-	-	-	-	Y	-	-
9.	Drive seeks to fwd mech stop, waits for FAULT light (+42 fuse blows), then retracts?	-	-	-	-	-	Y	-
10.	Drive loads heads, hesitates, then creeps to fwd EOT?	-	-	-	-	-	-	Y
	ACTIONS							
15.	Not sensing dibits. Chk servo preamp input to A10 (Trk Servo Ampl Chk), then go to Condition 6.	X	-	-	-	-	-	-
16.	Chk for continuity/gnds in servo preamp cable (input to A10).	-	1	-	-	-	-	-
17.	Replace servo preamp.	-	2	-	-	-	-	-
18.	Replace and align servo head (see Procedures, above).	-	3	-	-	-	-	-
19.	Suspect card A10.	-	-	1	-	-	-	-
20.	Suspect propagation of Track Servo signal through cards A11, A09, A12, A04.	-	-	-	1	-	-	-
21.	Replace power amp.	-	-	-	-	3	2	-
22.	Suspect velocity transducer and attendant logic on card A12 (cards A04, A11 also involved, but checked in Action 23).	-	-	-	-	2	-	-
23.	Suspect Fine Enable logic on cards A11, A04.	-	-	-	-	1	-	1
24.	Suspect cards A12, A10, A09.	-	-	-	-	-	1	2
25.	Call Field Support.	-	4	2	2	4	3	3

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DLT 7 RTZ/CONTINUOUS SEEKS

Warning: None

Enters from: DLT 6

Procedures: None

References: Logic Diagrams

Exits to: DLT 8

Assumption:
1. FTU connected to drive via A and B I/O cables
2. Remote/Local switch on drive (if present) set to REMOTE
3. LAP installed and drive selected from FTU.

CONDITIONS	1	2	3	4	5	6	7	8
1. Actuate RTZ switch on FTU. RTZ successful?	Y	N	-	-	-			
2. Set up and perform continuous seeks:								
a) Set FTU Access Mode switch to CONT.								
b) Set all FTU Cyl Address switches "off" (down).								
c) Actuate START switch.								
d) Sequentially select/deselect Cyl Adrs switches (1,2,4,8...256,								
512) to step actuator between track 0 and the track indicated								
by the active Cyl Address switch.								
Continuous seeks successful?	Y	-	N	-	-			
3. Select track (cyl) 822:								
● Set Cyl Adrs switches to 366_{16} (1466_8).								
Seek to track 822 successful?	Y	-	-	N	-			
4. Select track 823 (to force seek error):								
● Set Cyl Adrs switches to 367_{16} (1467_8).								
Seek error when attempting to go to "track 823"?	Y	-	-	-	N			

ACTIONS								
1. Seeks executed properly—proceed to DLT 8.	X	-	-	-	-			
2. Replace A03 card (Access Control and Sector Decode).	-	1	1	1	1			
3. Replace A04 card (Access Control 1).	-	2	-	-	-			
4. Replace A11 card (Access Control 2).	-	3	-	-	-			
5. Replace A12 card (D/A Function Generator).	-	4	3	3	3			
6. Replace A07 card (Receivers).	-	5	4	4	4			
7. Replace A13 card (Difference Counter and Control).	-	-	2	2	2			
8. Call Field Support.	-	6	5	5	5			

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DLT 8 WRITE/WRITE FORMAT (sheet 1 of 2)

Warning: None

Enters from: DLT 7

Procedures: None

References: Logic diagrams

Exits to: Sheet 2

Assumption: FTU connected to drive and FTU switches set per "Preliminary Set-up" in Operation section of TB304 manual. In addition, FTU Wrt-Rd Select switch set for either WRT or WRT FORMAT operation.

CONDITIONS	1	2	3	4	5	6	7	8
1. FAULT indication is given when drive is connected to controller but not when connected to FTU?	N	Y	-	-				
2. FAULT light on FTU panel comes on?	N	N	Y	Y				
3. FAULT light on SMD panel comes on?	N	N	N	Y				
ACTIONS								
1. No problem--proceed to DLT 9.	X							
2. Check that Write Protect switches are OFF.		X						
3. Check that +5 V is available at operator panel. If available, replace -ZYN card (operator panel, ass'y A10).			X					
4. Go to Condition 4 on sheet 2.				X				

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DLT 8 WRITE/WRITE FORMAT (sheet 2 of 2)

Warning: None

Enters from: Sheet 1

Procedures: None

References: Logic diagrams

Exits to: DLT 9

Assumption: FTU connected to drive and FTU switches set per "Preliminary Set-up" in Operation section of TB304 manual. In addition, FTU Wrt-Rd Select switch set for either WRT or WRT FORMAT operation.

CONDITIONS	5	6	7	8	9	10	11	12	13	14		
2,3. FAULT indications on both FTU and SMD panels? (From sheet 1.)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
4. Is fault limited to certain groups of contiguous addresses?	Y	N	-	-	-	-	-	-	-	-		
5. Does fault appear only for WRT FORMAT operations?	-	-	Y	N	-	-	-	-	-	-		
6. Set FTU Addr/Sect MK switch to SECT MK and try again.												
Does FAULT light still come on?	-	-	-	-	N	Y	-	-	-	-		
7. Check LEDs on operator panel:												
a) WRT FLT on?	-	-	-	-	-	-	Y	-	-	-		
b) HD SEL FLT on?	-	-	-	-	-	-	-	Y	-	-		
c) WR · RD FLT on?	-	-	-	-	-	-	-	-	Y	-		
d) $\overline{\text{ON CYL}}$ · (W + R) on?	-	-	-	-	-	-	-	-	-	Y		
ACTIONS												
5. Replace A13 card (CAR bits 7,8,9).	1	-	-	-	-	-	-	-	-	-		
6. Go to Condition 5.	-	X	-	-	-	-	-	-	-	-		
7. Go to Condition 6.	-	-	X	-	-	-	-	-	-	-		
8. Go to Condition 7.	-	-	-	X	-	-	-	-	-	-		
9. Suspect cards A11, A14, A07 (Address Mark Enable).	-	-	-	-	1	-	-	-	-	-		
10. Restore sw to ADDR MK position, repeat test and go to												
Condition 7.	-	-	-	-	-	X	-	-	-	-		
11. Chk that FTU's Servo Offset sw is "off" (center position).	-	-	-	-	-	-	1	1	1	1		
12. Replace A01 card (Write PLO).	-	-	-	-	-	-	2	-	-	-		
13. Replace A14 card (NRZ → MFM).	-	-	-	-	-	-	3	-	-	-		
14. Replace A07 card (Rcurs).	-	-	-	-	-	-	4	2	2	-		
15. Replace A05 card (Write Protect).	-	-	-	-	-	-	5	-	3	2		
16. Replace A04 card (On Cyl).	-	-	-	-	-	-	-	-	-	3		
17. Replace Write Driver card on assembly A5.	2	-	-	-	2	-	6	-	4	4		
18. Replace Read Amp card on assembly A5.	-	-	-	-	-	-	-	3	-	-		
19. Call Field Support.	3	-	-	-	3	-	7	4	5	5		

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DLT 9 READ

Warning: None

Enters from: DLT 8

Procedures: Head Alignment

References: Logic Diagrams

Exits to: DLT 10

Assumption: FTU connected to drive and set per "Preliminary Set-up" in Operation section of TB304 manual. In addition, FTU Wrt-Rd Select switch set to RD position.

	CONDITIONS	1	2	3	4	5	6	7	8
1.	Was address read peoperly? ①	Y	Y	Y	N	N			
2.	Was data read properly? ①	Y	N	N	-	-			
3.	Are errors head-related?	-	N	Y	N	Y			

	ACTIONS	1	2	3	4	5	6	7	8
1.	No problem--proceed to DLT 10.	X	-	-	-	-			
2.	Check that DATA switches on FTU are set to read the pattern previously written on disk.	-	1	-	-	-			
3.	Replace A16 card (Read PLO).	-	2	-	2	-			
4.	Replace A15 card (Data Latch).	-	3	-	3	-			
5.	Replace A14 card (MFM → NRZ).	-	4	-	4	-			
6.	Replace A11 card (Offset).	-	5	-	5	-			
7.	Replace A07 card (Rcurs).	-	6	-	6	-			
8.	Replace A06 card (Xmtrs).	-	7	1	7	1			
9.	Check head alignment per maintenance procedure.	-	8	2	8	2			
10.	Replace Hd Sel/Rd Preamp card on assembly A5.	-	9	-	9	-			
11.	Replace faulty head(s).	-	-	3	-	3			
12.	Reformat disk using WRT FORMAT procedure in FTU manual.	-	-	-	1	-			
13.	Call Field Support.	-	10	4	10	4			

① A NO answer here implies that the procedures given in the FTU manual's Trouble Analysis DLT have already been executed in an attempt to recover the address/data, but to no avail.

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DLT 10 POWER DOWN

Warning: None

Enters from: DLT 9

Procedures: None

References: Logic diagrams

Exits to: None (diagnostics completed)

Assumption: Remote operation--Attempt to power-down the drive from the FTU
Local operation--Press START switch to extinguish START light and power-down the drive.

	CONDITIONS	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1.	START light on SMD goes out? (LOCAL mode only.)	Y	Y	Y	Y	N			
2.	Heads unload?	Y	Y	Y	N	-			
3.	Drive motor brakes to a stop.	Y	N	N	-	-			
4.	Drive motor coasts to a stop.	N	N	Y	-	-			

	ACTIONS								
1.	None req'd--diagnostics completed satisfactorily.	X	-	-	-	-			
2.	Chk deck interlock switch (or wiring) for grounds.	-	1	-	-	-			
3.	Chk that Heads Loaded switch has transferred (PA02-4A should be at ground).	-	2	-	-	-			
4.	Replace BXPN brd (ass'y A11) or relay brd (ass'y A4) as applicable.	-	3	2	-	-			
5.	Chk hysteresis brake and intervening connectors (see logic diagrams); if OK, go to next recommended Action.	-	-	1	-	-			
6.	Replace A03 card (RTZ Latch).	-	-	-	1	-			
7.	Replace A12 card (Summing Amp).	-	-	-	2	-			
8.	Replace A09 card (Power Amp Control).	-	-	-	3	-			
9.	Suspect base of Q1 on operator panel (-ZYN card) grounded. Check associated components on -ZYN card.	-	-	-	-	1			
10.	Call Field Support.	-	4	3	4	2			

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PROCEDURES

PROCEDURE A: CHECKING DC VOLTAGES

Procedure A is a supplement to the Power System Checks procedure given in section 3C of this manual. In addition to defining voltage checkpoints for a normal-load situation, procedure A also defines checkpoints on the power supply module only. These are useful in the event that the dc loads have been disconnected (by separating P/J1) for checking, repairing, or replacing a power supply.

NOTE

> Output voltage from the +5 V and -5 V regulated supplies will fall to 0 V when the load is removed. As implied in table B-3, no-load readings on these two supplies will prove fruitless.

Bear in mind that the ±5 and ±12 voltages, the latter being derived from the basic ±20 V supply, are not fused. Overloads or shorts in these networks (or the supplies themselves) may trip the POWER SUPPLY breaker, killing all dc voltages.

Voltage readings in table B-3 may be obtained by using either a standard (needle-type) or digital volt-ohmmeter.

The usual symptoms for a malfunctioning power supply are given in table B-4.

TABLE B-3. CHECKING DC VOLTAGES

Voltage to be Checked	Volt-Ohmmeter Connections								Voltage Readings
	Normal Load (P/J1 Mated)				No Load (P/J1 Separated)				
	+ Probe		- Probe		+ Probe		- Probe		
	Ass'y	Point	Ass'y	Point	Ass'y	Point	Ass'y	Point	
+5	A0	+5	A0	GND	Cannot be checked				+5.0 V (±0.05 V)
-5	A0	GND	A0	-5	Cannot be checked				+5.0 V (±0.05 V)
+12	A3	CR5	A0	GND	A3	CR5	A3	8	+12.0 V (±0.3 V)
-12	A0	GND	A3	CR6	A3	8	A3	CR6	+12.0 V (±0.3 V)
+20	A0	+20	A0	GND	A3	F1	A3	8	+20.0 V (±1.0 V)
-20	A0	GND	A0	-20	A3	8	A3	F2	+20.0 V (±1.0 V)
+42	A8	R2-2	A8	R3-2	A3	F3	A3	8	+42.0 V (±2.0 V)
-42	A8	R3-2	A8	R1-2	A3	8	A3	F4	+42.0 V (±2.0 V)

PROCEDURE:

1. Turn off POWER SUPPLY breaker (CB2).
2. Raise logic chassis (assembly A0) to maintenance position to give access to voltage Fastons.
3. Be sure that P/J1 is mated to provide loads for the supplies to be checked.
4. Turn on CB2.
5. Using the VOM probe connections from the NORMAL LOAD columns of table B-3, check each supply voltage.
6. If any voltage is outside the tolerance given in table B-3, or is non-existent, proceed to check the no-load voltages by separating P/J1 and using the probe connections shown in the NO LOAD columns of the table. (Turn off CB2 before separating P/J1.)
7. If the ±5 V readings are outside the tolerances given in table B-3, adjust those voltages as described under the Plus and Minus 5 Volt Regulators procedure in section 3B.
8. If further maintenance is not to be performed at this time:

   a. turn off CB2

   b. reconnect P/J1

   c. return logic chassis to its normal position

   d. turn on CB2 to restore normal drive functions.

TABLE B-4. FAILURE SYMPTOMS IN POWER SUPPLY

Symptom	Probable Cause	Remedy
1. Noticeable ripple at output (checked with oscilloscope)	Open diode or open filter capacitor	If in A1 or A2, replace errant regulator. If in ±20 V or ±42 V supply, troubleshoot using procedures from Useful Troubleshooting Aids section and repair the supply, or replace assembly A3.
2. Less than specified output (ac input OK)	Shorted diode or shorted filter capacitor	
3. Output decreases significantly when load is connected	Open bleeder register	Bleeders are not spare-parts item; replace the affected assembly.

PROCEDURE B: CHECKING AC INPUTS TO POWER SUPPLIES

This procedure verifies that a given secondary winding of ferroresonant transformer T1 has the requisite voltage to drive its associated power supply. The procedure should be performed whenever a power supply voltage failure is encountered, in order to ascertain whether the supply or the transformer is at fault. The procedure should also be performed after a supply has been repaired or replaced, and before the ac input leads to that supply have been reconnected, to ensure that the previously malfunctioning supply did not damage the transformer.

SPECIAL NOTE

> The ±5 V, ±20 V, and ±42 V power supplies constitute the load for transformer T1 and its tuning capacitor, C8. When using procedure B to check the ac input to these supplies, do not disconnect more than one set of ac input leads at a time. To do so may cause T1 to go into oscillation, producing meaningless readings. Under no circumstances should you attempt these ac readings by separating P/J100 and checking the transformer side of that connector.

Table B-5 shows the oscilloscope connections for monitoring the ac input to the supplies (output from T1); figure B-7 shows the square-wave input and specified voltages, the latter also given in the table.

1. Turn off the POWER SUPPLY breaker.
2. Assure that the T1 leads to be monitored for ac level are disconnected from their power supply input points. (Remove the ring-tongue leads from the AC terminals of assembly A1 or A2, as required, or unsolder the leads to the ±20 V or ±42 V supplies on PC-board assembly A3 as shown in figure B-5.)
3. Plug in the test scope and set the trigger control to LINE. Turn on the scope and when the horizontal trace becomes visible, center it on the graticule.
4. If the ac input to the -5V supply is to be checked, connect the scope's ground probe to the -OUT terminal of assembly

TABLE B-5. CHECKING AC INPUTS TO POWER SUPPLIES

Supply To Be Checked For AC Input	Scope Connections				AC Input Voltage (±5%)
	+ Probe		GND Probe		
	Ass'y	Point	Ass'y	Point	
+5	A1	AC (either)	A1	-OUT	11 V
-5	A2	AC (either)	A2	-OUT	11 V
±20	A3	3 or 5	A1	-OUT	22 V
±42	A3	11 or 13	A1	-OUT	44 V

OSCILLOSCOPE SETTINGS

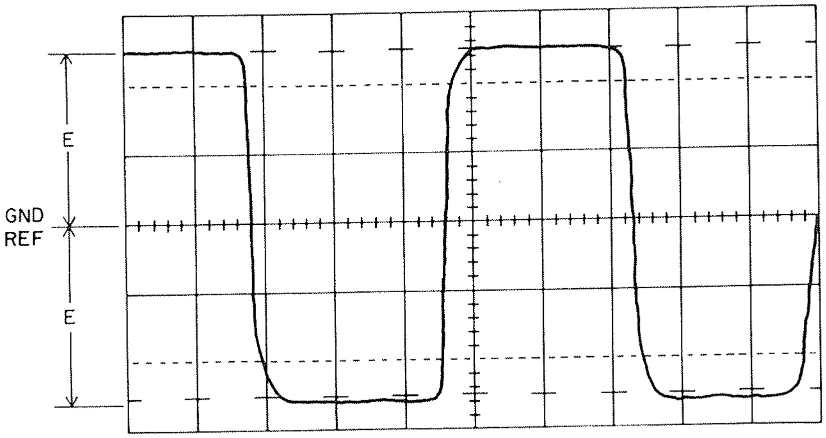
SCOPE GND TO LOGIC GND ①

VOLTS/DIV
CH 1 - ②
CH 2 - NA

TIME/DIV
A - VARY FOR CONVENIENT TRACE
B - NA

TRIGGERING
A (USE X1 PROBE) - LINE
B (USE X PROBE) - NA

PROBE CONNECTIONS
CH 1 (USE X1 PROBE) - ③
CH 2 (USE X PROBE) - NA



① SCOPE GROUND ON -OUT TERMINAL OF A2 FOR -5 V, ON -OUT TERMINAL OF A1 FOR OTHERS.

② ±5 V: E=11 V
±20 V: E=22 V
±42 V: E=44 V

③ USE AC TERMINALS FOR ± 5 V SUPPLIES; SEE FIGURE A-5 FOR OTHERS.

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Figure B-7. T1 Input to Power Supplies

A2. For all other supplies, connect the ground probe to -OUT of the +5 V regulator (assembly A1).

5. Turn on the POWER SUPPLY breaker.

6. Connect the scope's + probe (i.e., CH1 or CH2, depending upon scope set-up) to either of the ac input leads from T1.

7. Adjust scope TIME/DIV control to secure a stable square-wave trace (ref: figure B-7).

8. Adjust scope VOLTS/DIV control to allow easiest mental reckoning of the voltage represented by the trace, as shown against the graticule lines.

9. Record the voltage (or make a mental note, if you trust your visual memory) from the ground reference line on the graticule to the top and bottom of the trace (two readings) as indicated by "E" in figure B-7.

10. Repeat step 9 with the + probe connected to the other ac input lead from T1.

11. If both steps 9 and 10 show a symmetrical waveshape about the ground reference line (that is, all four voltage readings are the same), and are within the 5% input voltage margin specified in table B-5, T1 is OK. Replace the errant power supply as indicated by the first applicable Action in DLT 2, then go to procedure A as specified by Action 14 in DLT 2.

12. If the readings are not the same, or if they are the same but not up to the 5% margin of table B-5, the problem has to be a shorted winding in T1. (You may be able to confirm the conclusion by sniffing the transformer for evidence of burned insulation, although this is not a definitive test.)

WARNING

Tuning capacitor C8 is charged with 440 volts. Treat it with respect!

13. Replace T1: Turn off POWER SUPPLY breaker, remove scope leads, discharge C8 and remove leads from T1, separate P/J100, disconnect T1 leads (two) from TB1. Install the new transformer by reversing the procedure.

14. Check the new transformer by repeating steps 5 through 11.

NOTE

Replacing T1 does not mean you're home free. A bad power supply could have caused the transformer failure. Therefore, continue with procedure A.

PROCEDURE C: TROUBLESHOOTING HEAT-GENERATED PROBLEMS

CAUTION

If the heads perform an unscheduled retract and the START and FAULT lights are both off, immediately turn off the POWER SUPPLY breaker; you have dropped +5 V and run the risk of burning up the voice coil. Only after you've shut off dc power should you check to see if the power-down resulted from a failure on the ac line. (Hint: is the blower still on?)

If you commit the above CAUTION to memory and act instinctively upon it, you may one day save yourself a lot of trouble; failure of the +5 V supply is a common cause for abnormal shut-downs.

Heat-related problems are easy to diagnose: they occur only when the drive gets hot, and they disappear when the drive has had a chance to cool off. If you suspect a problem is heat-related, let the drive cool down, then note the failure (or more accurately, the absence of the failure) when the drive is started up again. Often the troubleshooting period can be shortened by applying artificial heat to the suspected area (a hair dryer is useful here). Once you've diagnosed the problem, correct it as you would any other malfunction.

Heat problems are of two types -- those originating in the power supplies and those developing in the various loads. Should a load fault take out a 20 V or 42 V fuse, the course is clear: simply refer to the applicable "load" DLT. If the load does not pop a fuse but merely brings up a FAULT light (on the back of the operator panel), the table below should offer a starting point for correcting the problem. (If the +5 V supply goes, of course, the fault light won't work.)

FAULT	PROBLEM RELATED TO
Voltage (except +5 V)	A05
On Cyl·(W+R)	A04, A05, A07
Write	A05, A07, A13, A14, A5 assy (Write Driver board)
W·R	A05, A07
Hd Sel	A05, A06 A5 assy (Hd Sel/Rd Amp board)

Losing ±5 V can be bothersome because those supplies, being unfused, can't tell you whether the source of the problem is in the supply or the load. Moreover, they maintain a uniform output voltage right up to their current limit, and then drop to 0V when that limit is exceeded. Should this happen, check to see if the supply itself is the culprit by disconnecting the 5 V load. If the voltage returns to 5 V, the fault lies in the load, not the supply. (Refer to DLT 3 for locating specific faults in the dc load.)

PROCEDURE D: PIN-POINTING VOLTAGE FAULTS IN LOGIC CARDS

This procedure has been written for checking out the ±5 V and +12 V loads in the logic chassis (see DLT 3), but is just as applicable to the -12 V, ±20 V, and ±42 V circuits on any PC board, be it in the logic chassis or one of the other assemblies.

1. Turn off the POWER SUPPLY breaker.
2. Raise logic chassis to upright (maintenance) position if this has not already been done.
3. Remove all cards from the logic chassis. (Slots A02 and A08 are empty.)

You are now ready to start putting the cards back in, checking for load faults after each has been reinstalled. You'll probably find it easiest to install the top card (A01) first.

4. Before inserting the card, examine both sides for evidence of arcing across the foil. (Since you've come to this procedure because there is a ±5 V fault, visual examination can't but help in detecting the miscreant board.) Often the carbon residue around an arc area can be removed with an alcohol swab and the card won't give any more trouble.
5. Insert the card properly (especially important for the first one!) and turn on the POWER SUPPLY breaker to check the integrity of the load.
6. If the breaker trips, replace the card just installed with a fresh one from the spare parts bin and try the test again.
7. If the breaker holds (card is OK), turn it off, and selecting the next card, repeat steps 4 through 7.
8. When all cards have been checked (and replaced as required), return to Condition 5 in DLT 3 to complete the dc-load checkout.

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