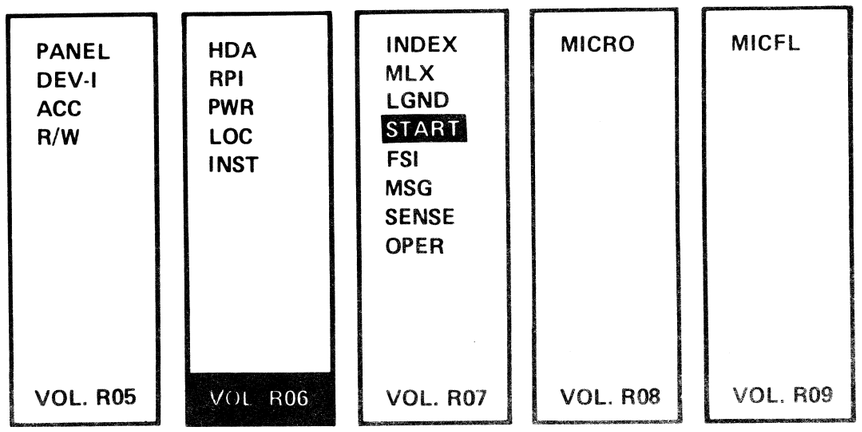
IBM **Maintenance Library**



Every Satellite Module on the 3340 subsystem (including the 3344) has its own Volumes R05 and R06.

The 3344 MLM also includes Volumes R07, R08, and R09. See the START section in Volume R07 for details.

3344 Disk Storage Maintenance Information

3344

JA0000 Seq. 1 of 2	2359021 Part No.

441235 28 May 76				

PREFACE

MAINTENANCE LIBRARY MANUAL ORDERING PROCEDURE (IBM Internal)

Individual pages of the 3344 Maintenance Library Manual can be ordered from the San Jose plant by using the Wiring Diagram/Logic Page Request (Order No. 120-1679). In the columns headed "Logic Page" enter the page identifier information: sequence number, sheet number, part number, and EC number. Groups of pages can be ordered by including a description (section, volume, etc.) and the machine serial number.

This manual was prepared by the IBM General Products Division, Technical Publishing, Department G26, San Jose, California 95193.

3344

JA0000 Seq. 2 of 2	2358021 Part No.	441235 28 May 76				

SAFETY

CE SAFETY PRACTICES

All Customer Engineers are expected to take every safety precaution possible and observe the following safety practices while maintaining IBM equipment.

1. You should not work alone under hazardous conditions or around equipment with dangerous voltage. Always advise your manager if you MUST work alone.
2. Remove all power, ac and dc, when removing or assembling major components, working in immediate areas of power supplies, performing mechanical inspection of power supplies, or installing changes in machine circuitry.
3. After turning off wall box power switch, lock it in the Off position or tag it with a "Do Not Operate" tag, Form 229-1266. Pull power supply cord whenever possible.
4. When it is absolutely necessary to work on equipment having exposed operating mechanical parts or exposed live electrical circuitry anywhere in the machine, observe the following precautions:
   a. Another person familiar with power off controls must be in immediate vicinity.
   b. Do not wear rings, wrist watches, chains, bracelets, or metal cuff links.
   c. Use only insulated pliers and screwdrivers.
   d. Keep one hand in pocket.
   e. When using test instruments, be certain that controls are set correctly and that insulated probes of proper capacity are used.
   f. Avoid contacting ground potential (metal floor strips, machine frames, etc.). Use suitable rubber mats, purchased locally if necessary.
5. Wear safety glasses when:
   a. Using a hammer to drive pins, riveting, staking, etc.
   b. Power or hand drilling, reaming, grinding, etc.
   c. Using spring hooks, attaching springs.
   d. Soldering, wire cutting, removing steel bands.
   e. Cleaning parts with solvents, sprays, cleaners, chemicals, etc.
   f. Performing any other work that may be hazardous to your eyes. REMEMBER – THEY ARE YOUR EYES.
6. Follow special safety instructions when performing specialized tasks, such as handling cathode ray tubes and extremely high voltages. These instructions are outlined in CEMs and the safety portion of the maintenance manuals.
7. Do not use solvents, chemicals, greases, or oils that have not been approved by IBM.
8. Avoid using tools or test equipment that have not been approved by IBM.
9. Replace worn or broken tools and test equipment.
10. Lift by standing or pushing up with stronger leg muscles – this takes strain off back muscles. Do not lift any equipment or parts weighing over 60 pounds.
11. After maintenance, restore all safety devices, such as guards, shields, signs, and grounding wires.
12. Each Customer Engineer is responsible to be certain that no action on his part renders products unsafe or exposes customer personnel to hazards.
13. Place removed machine covers in a safe out-of-the-way place where no one can trip over them.
14. Ensure that all machine covers are in place before returning machine to customer.
15. Always place CE tool kit away from walk areas where no one can trip over it; for example, under desk or table.
16. Avoid touching moving mechanical parts when lubricating, checking for play, etc.
17. When using stroboscope, do not touch ANYTHING – it may be moving.
18. Avoid wearing loose clothing that may be caught in machinery. Shirt sleeves must be left buttoned or rolled above the elbow.
19. Ties must be tucked in shirt or have a tie clasp (preferably nonconductive) approximately 3 inches from end. Tie chains are not recommended.
20. Before starting equipment, make certain fellow CEs and customer personnel are not in a hazardous position.
21. Maintain good housekeeping in area of machine while performing and after completing maintenance.

Knowing safety rules is not enough.
An unsafe act will inevitably lead to an accident.
Use good judgment - eliminate unsafe acts.

ARTIFICIAL RESPIRATION

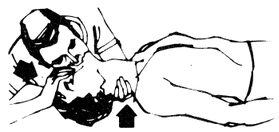
General Considerations

1. Start Immediately – Seconds Count
   Do not move victim unless absolutely necessary to remove from danger. Do not wait or look for help or stop to loosen clothing, warm the victim, or apply stimulants.
2. Check Mouth for Obstructions
   Remove foreign objects.
3. After victim is breathing by himself or when help is available:
   a. Loosen clothing.
   b. Place victim on his side.
   c. Keep victim warm.
4. Remain in Position
   After victim revives, be ready to resume respiration if necessary.
5. Call a Doctor
   Have someone summon medical aid.
6. Don't Give Up
   Continue without interruption until victim is breathing without help or is certainly dead.

Rescue Breathing for Adults

1. Place victim on back; lift neck and tilt head way back. (Quickly remove any noticeable food or objects from mouth.)

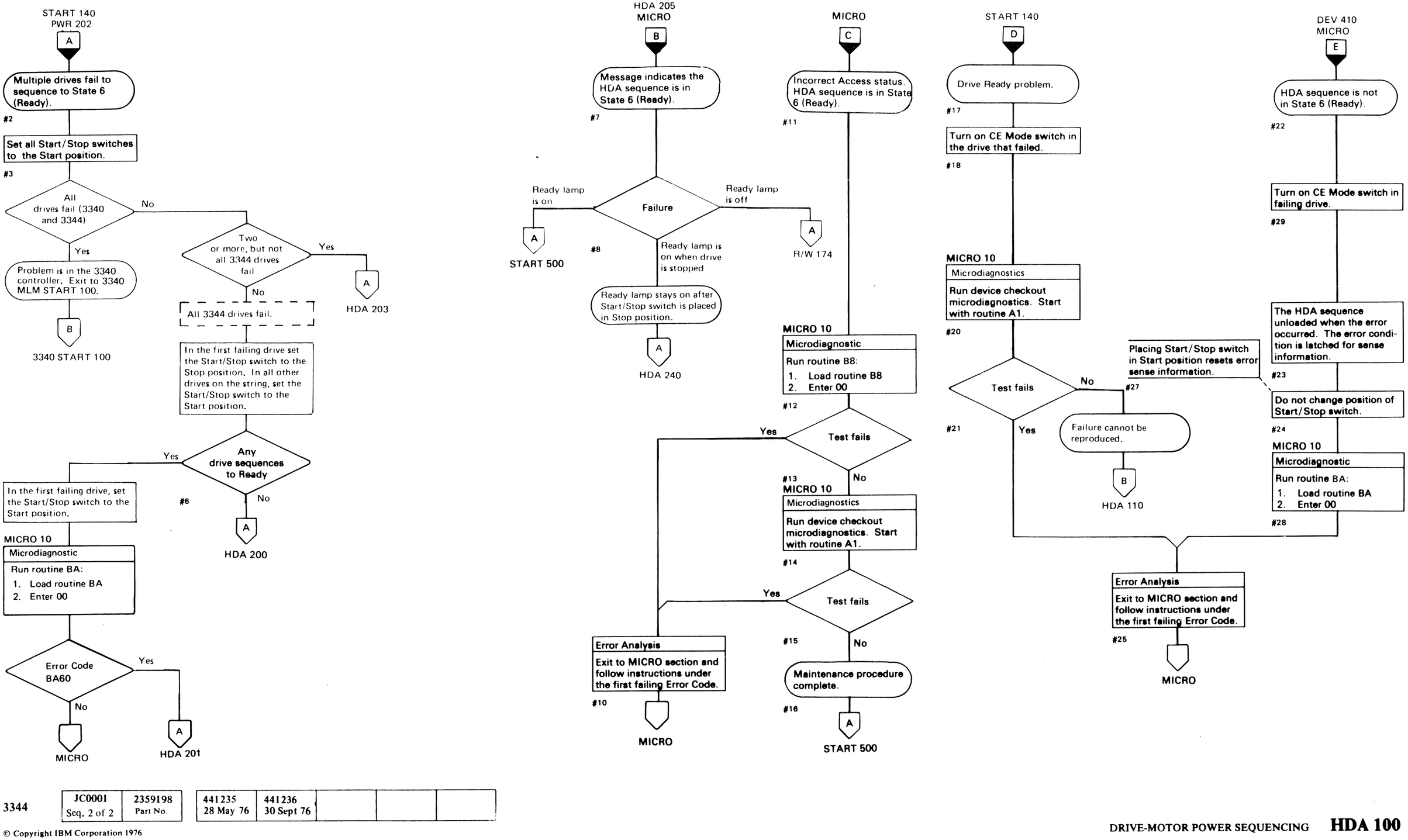
2. Pinch nose closed; make airtight seal around victim's mouth with your mouth; and forcefully breathe into victim until chest rises (expands).



3. Continue breathing for the victim 12 times per minute WITHOUT STOPPING.
4. If chest does not rise (expand), roll victim onto side and pound firmly between shoulder blades to remove blocking material. Also, try lifting jaw higher with your fingers. Resume rescue breathing.

HDA CONTENTS

DRIVE-MOTOR POWER SEQUENCING



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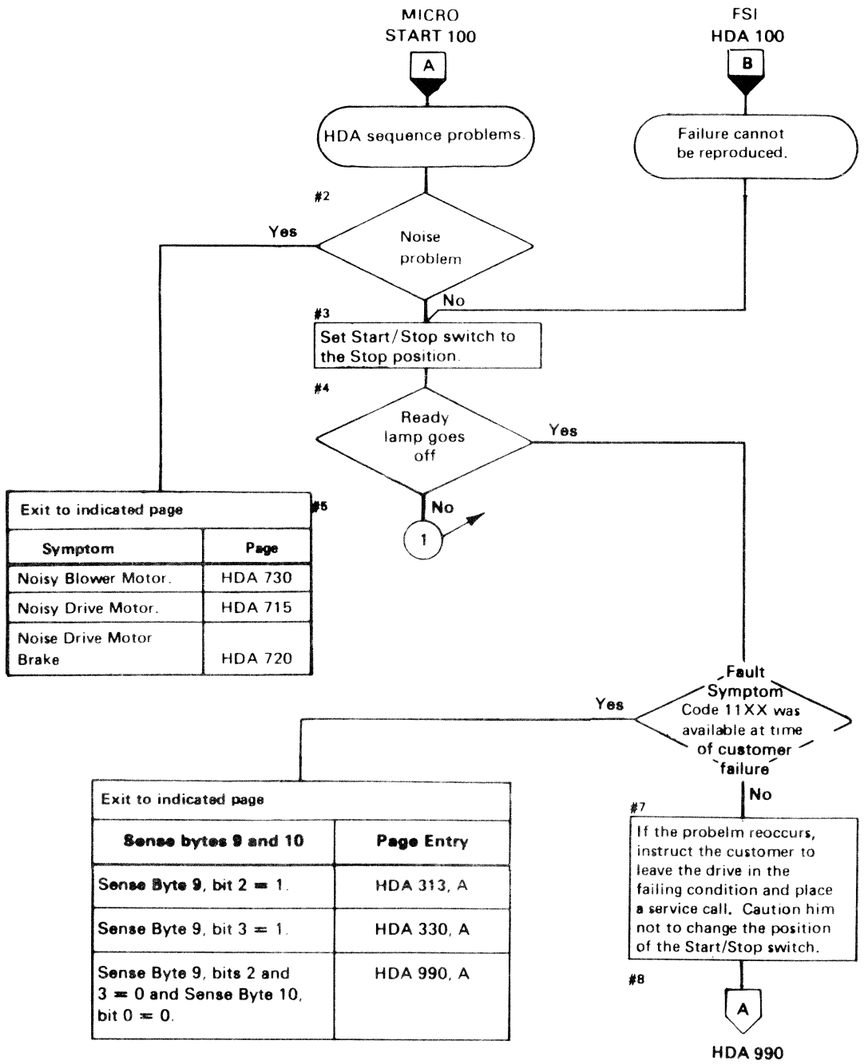
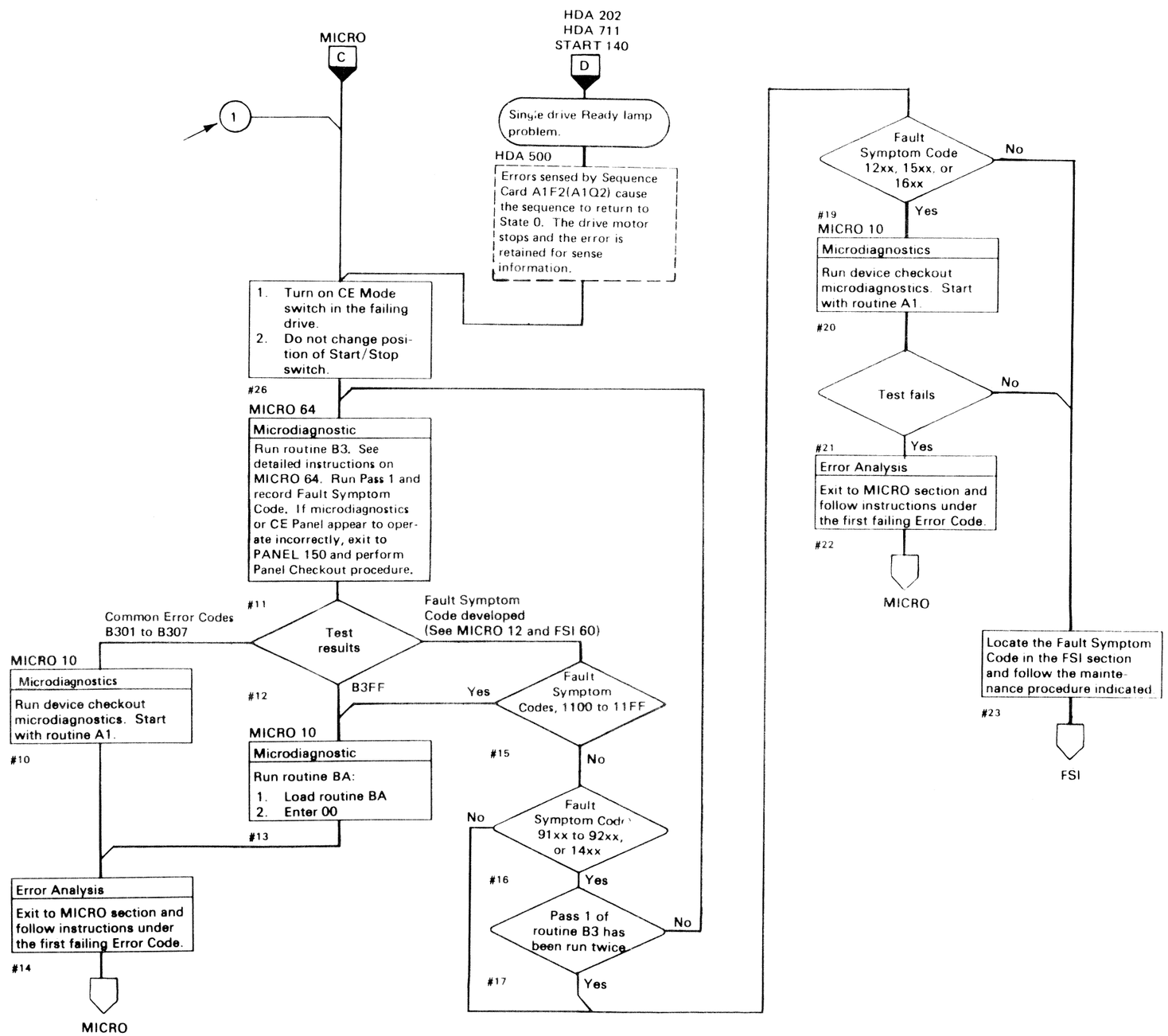
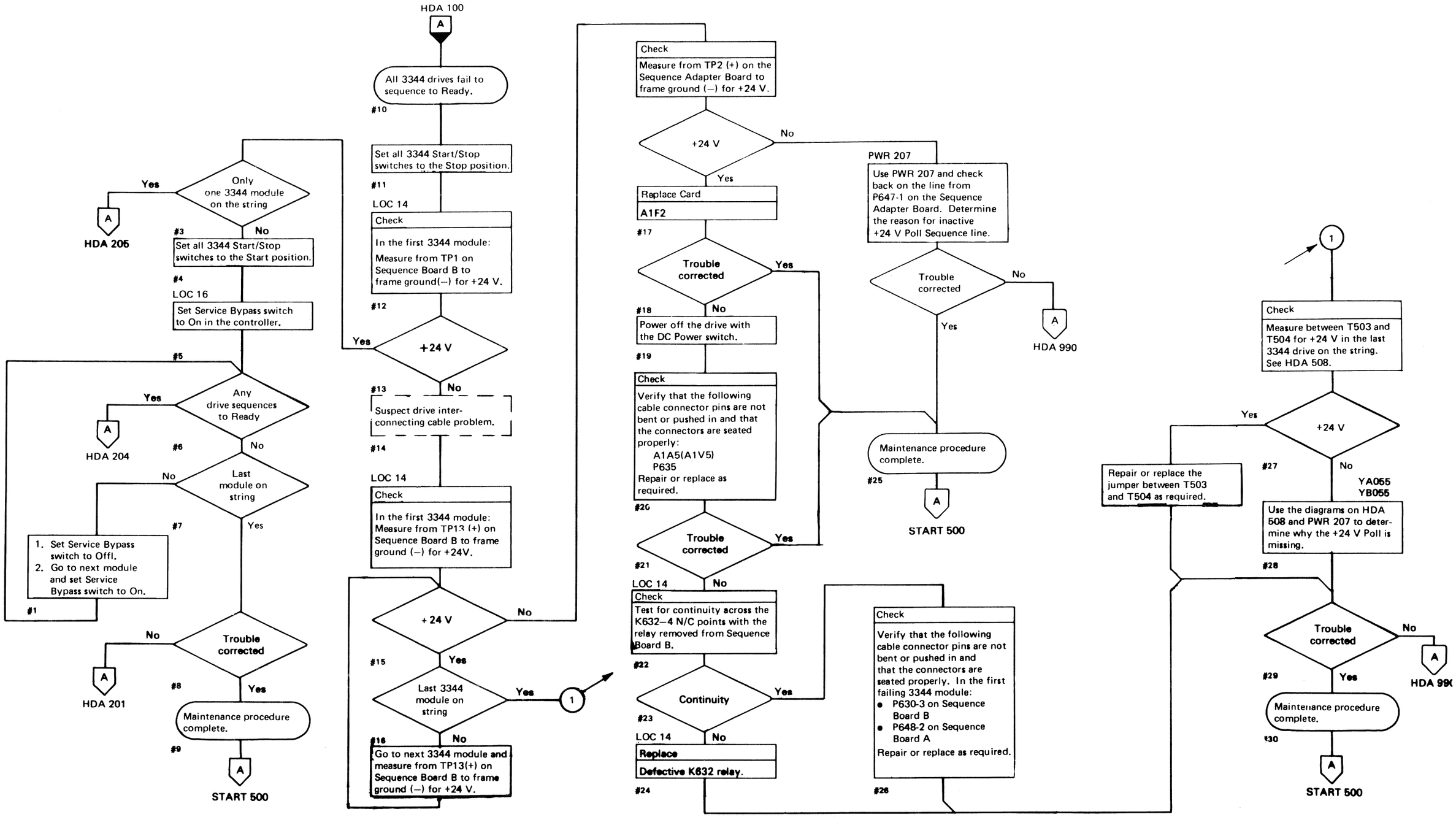




JC0110 Seq. 1 of 2	2359199 Part No.

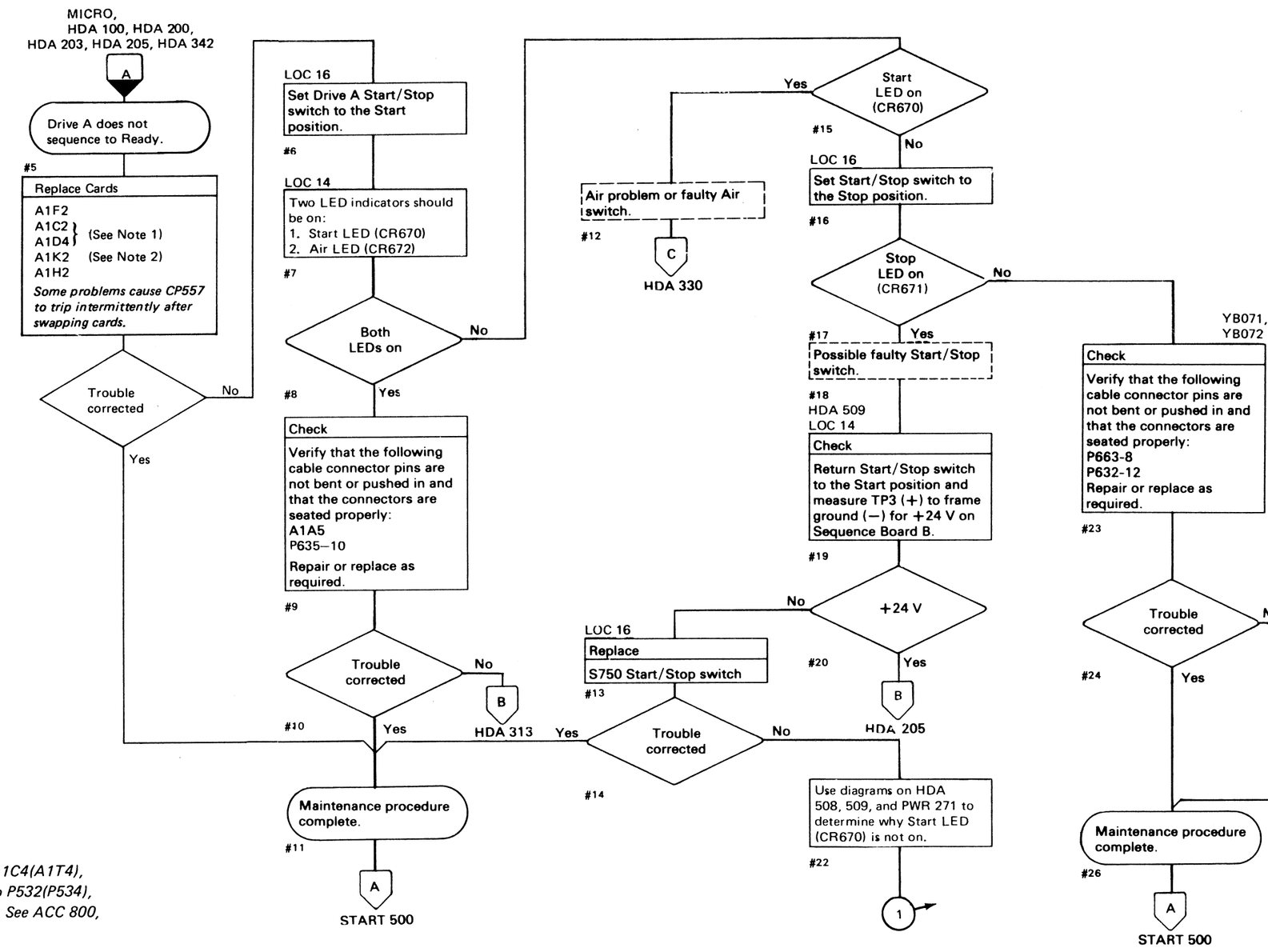
441235 28 May 76	441236 30 Sept 76	441237 1 Mar 77		

SEQUENCE LOCKED IN STATE 0



3344	JC0110 Seq. 2 of 2	2359199 Part No.	441235 28 May 76	441236 30 Sept 76	441237 1 Mar 77		

SEQUENCE LOCKED IN STATE 0



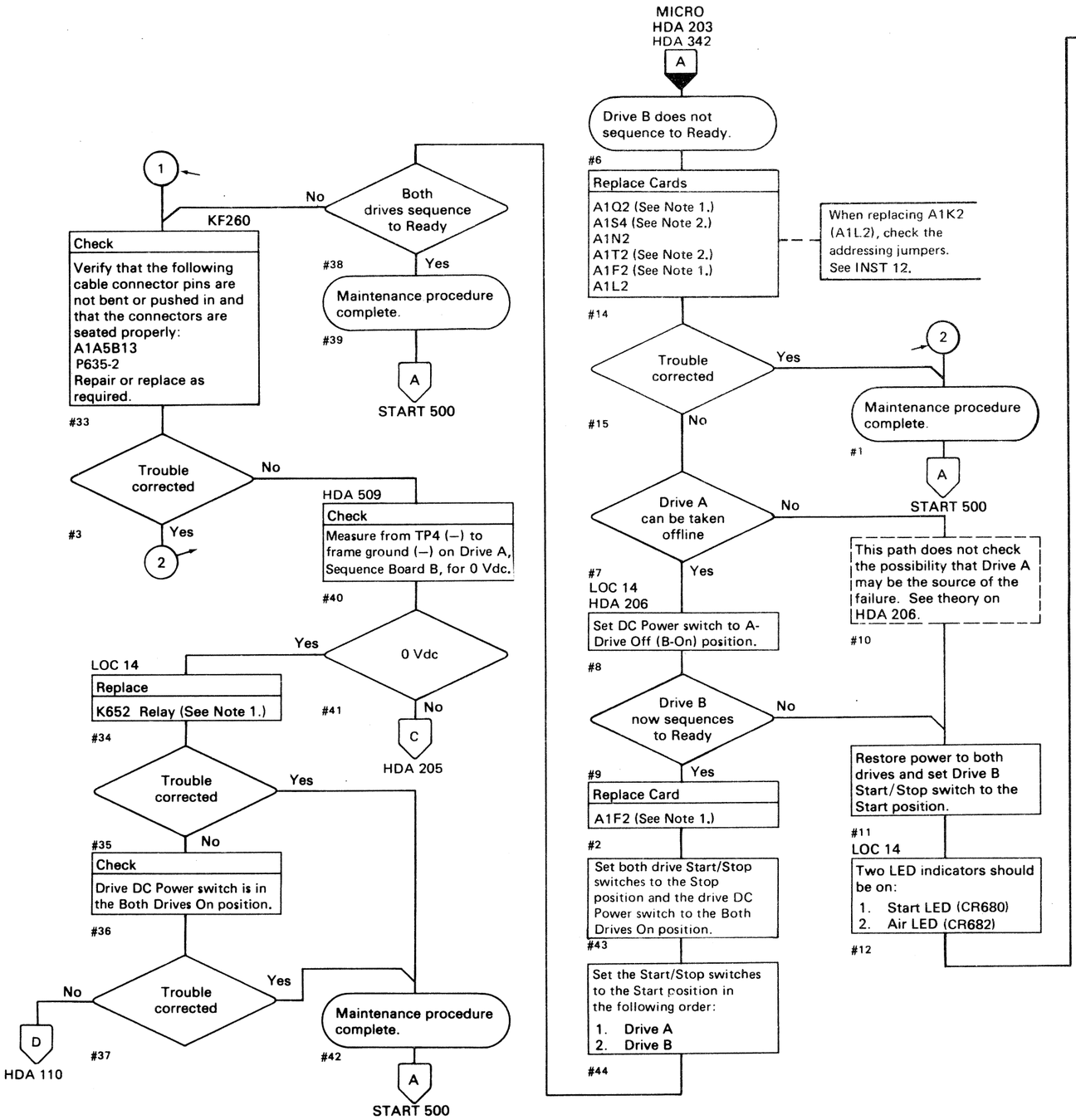
Note 1: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

Note 2: *When replacing A1K2(A1L2), check the addressing jumpers. See INST 12.*

JC0201 Seq. 1 of 2	2359200 Part No.

441235 28 May 76	441236 30 Sept 76	441241 29 Aug 80		

SEQUENCE LOCKED IN STATE 0



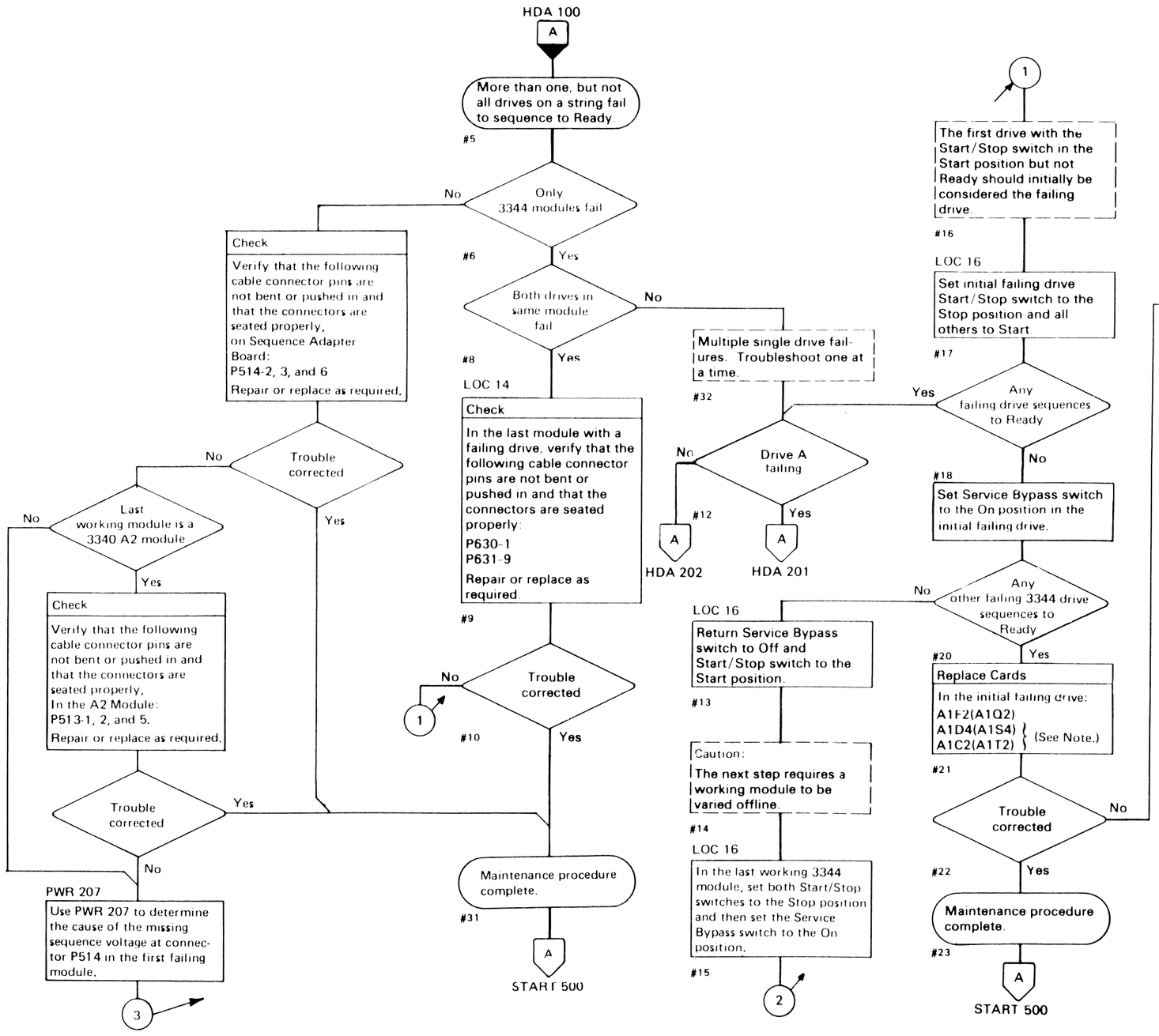
Note 1: *A1F2(A1Q2) can be damaged by a shorted diode across the relay coil of K651(K661) or K652(K662). Before swapping relays with K651(K661) or K652(K662), check for a shorted diode on both the relays removed from, and installed into these positions. The resistance should be approximately 3 ohms in one direction and 50 ohms with the meter leads reversed.*

Note 2: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

JC0201 Seq. 2 of 2	2359200 Part No.

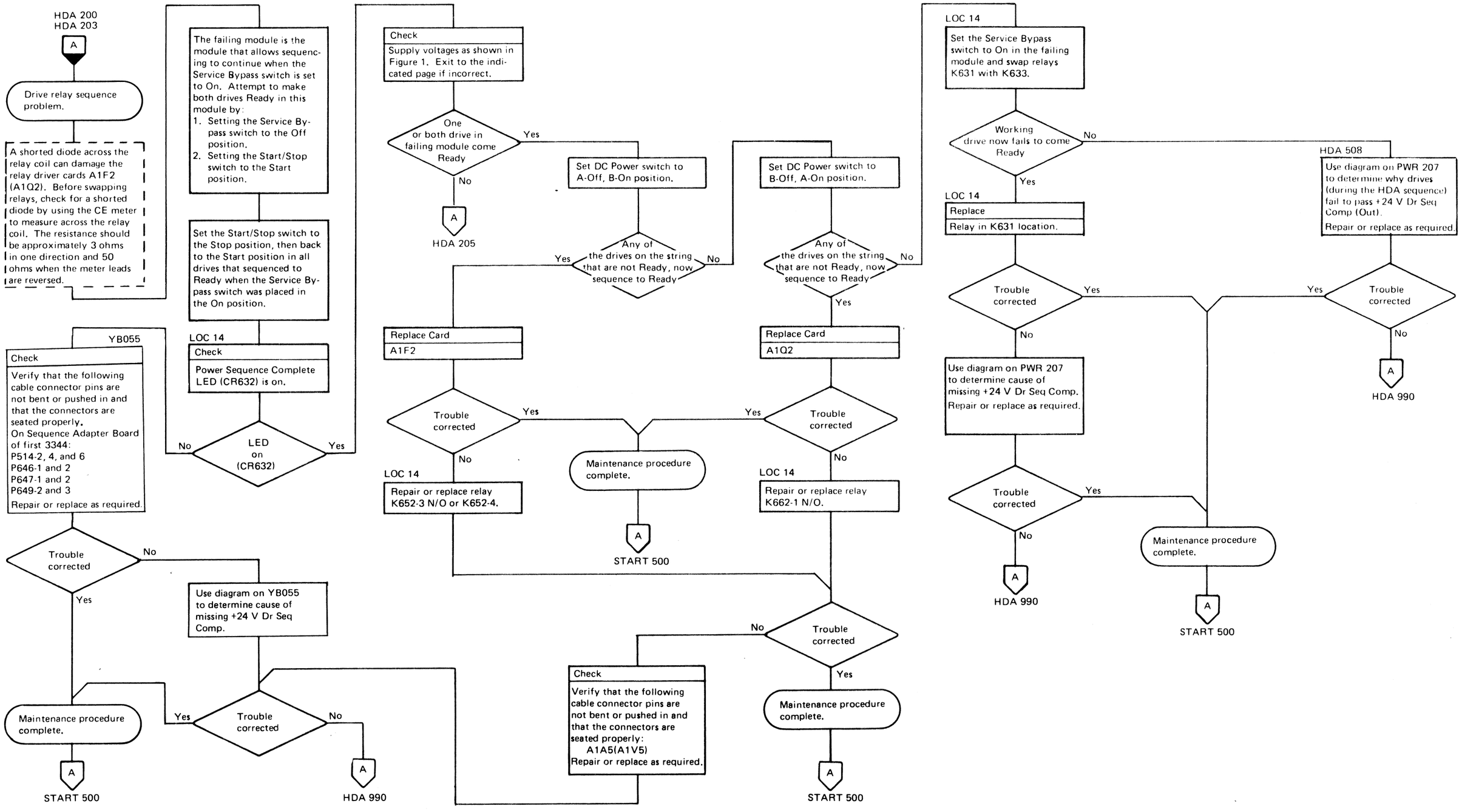
441235 28 May 76	441236 30 Sept 76	441241 29 Aug 80		

SEQUENCE LOCKED IN STATE 0



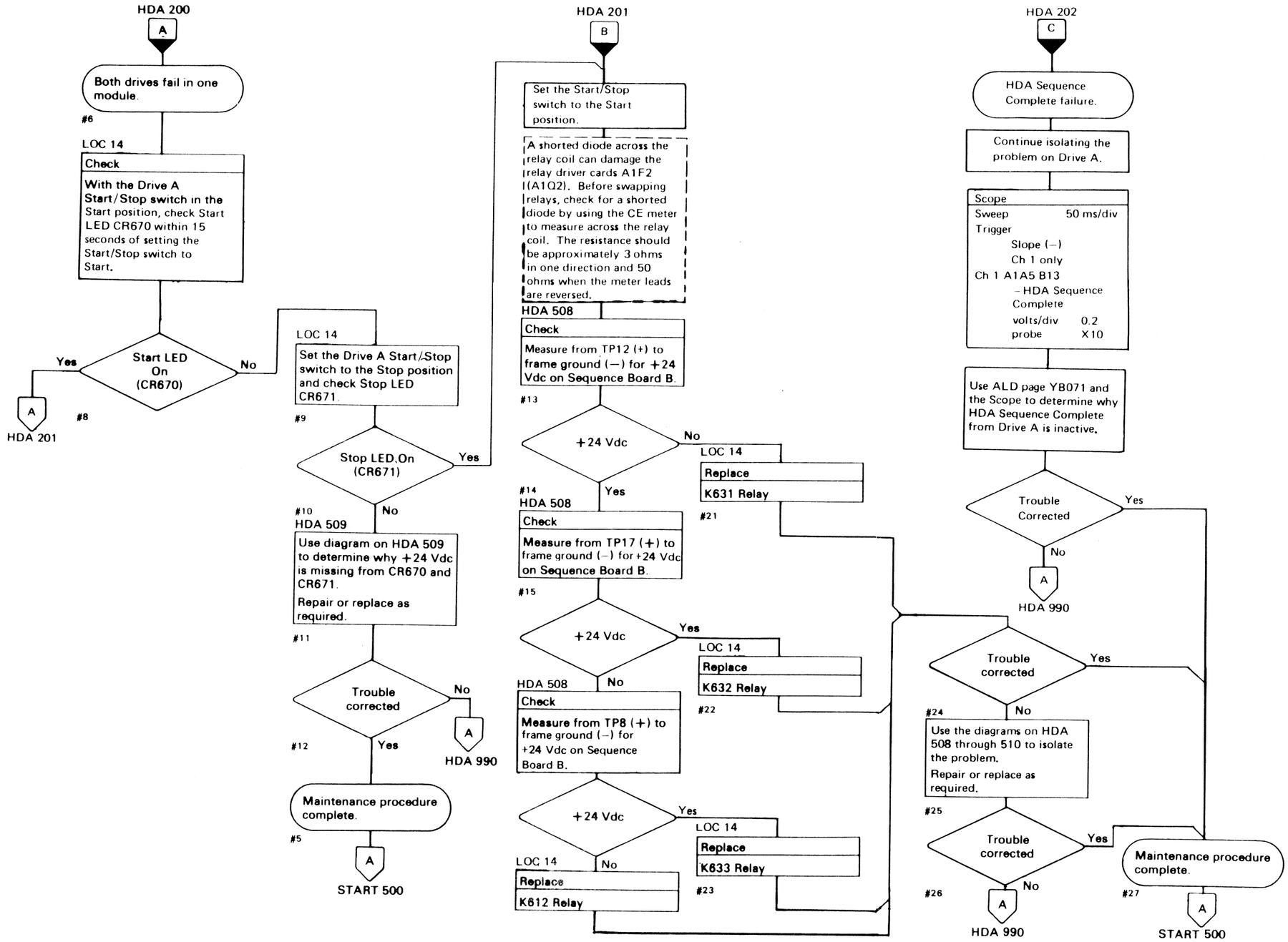
Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

SEQUENCE LOCKED IN STATE 0



3344	JC0203 Seq. 2 of 2	2359201 Part No.	441235 28 May 76	441236 30 Sept 76		

SEQUENCE LOCKED IN STATE 0



3344	JC0205 Seq. 1 of 2	2359202 Part No.	441235 28 May 76	441236 30 Sept 76	441237 1 Mar 77	

SEQUENCE LOCKED IN STATE 0

To advance from State 0 to State 1, the following lines must be in the indicated condition:

- 24 V Start Sw On is active.*
- State 0 is active.
- Inhibit HDA Recycle is inactive.
- HDA Sequence Ck Lth is inactive.
- Power On Reset is inactive.

*Relay K632 must be picked in order to activate the +24 V Start Sw On line in Drive A. The +24 V Start Sw On line in Drive B is activated by both K632 and K652 being picked. If the Drive DC Power switch is in the Drive A Off (Drive B On) position, the +24 V Start Sw On line in Drive B is activated by K632 only.

See HDA 508 through 510 for additional theory.

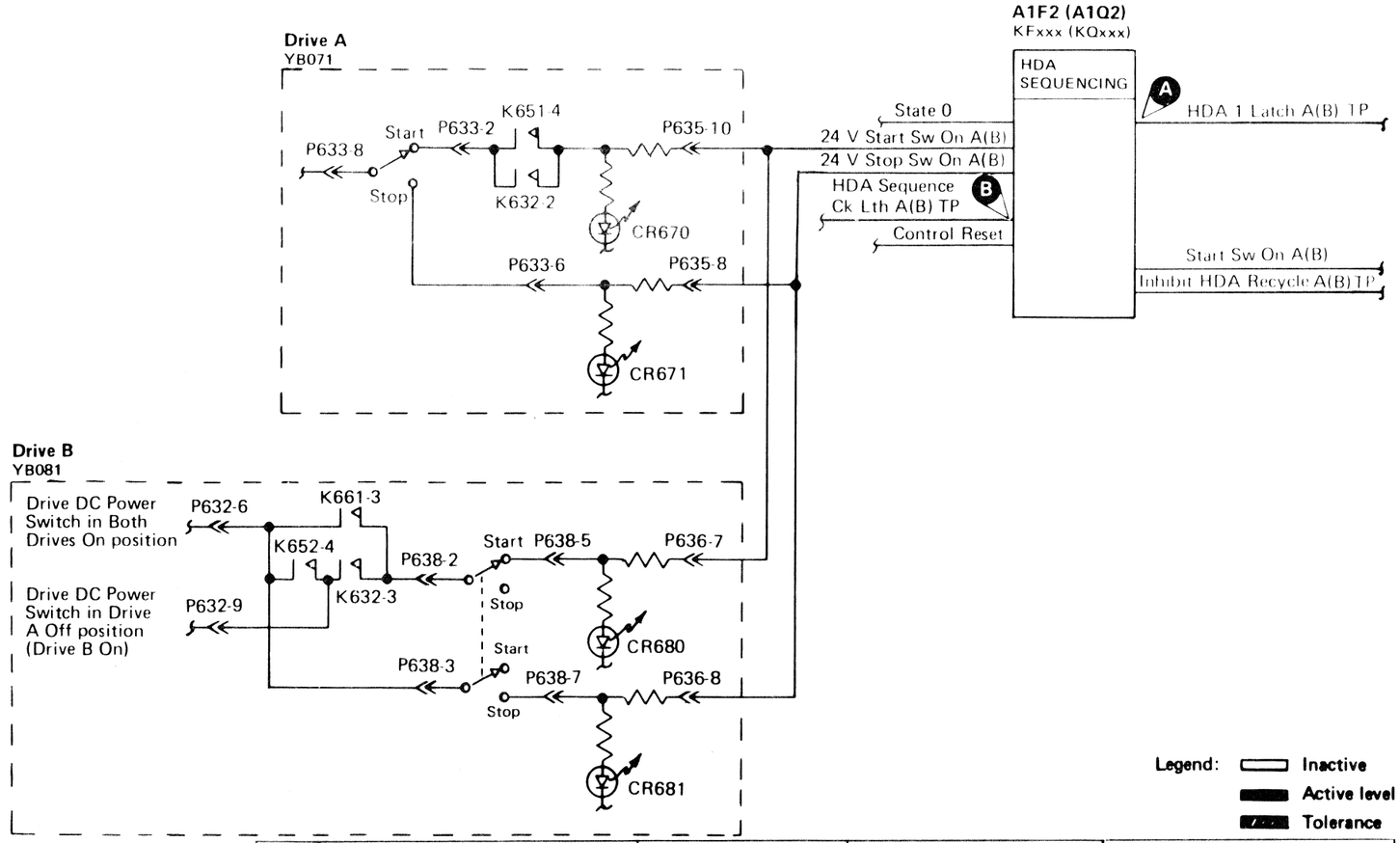
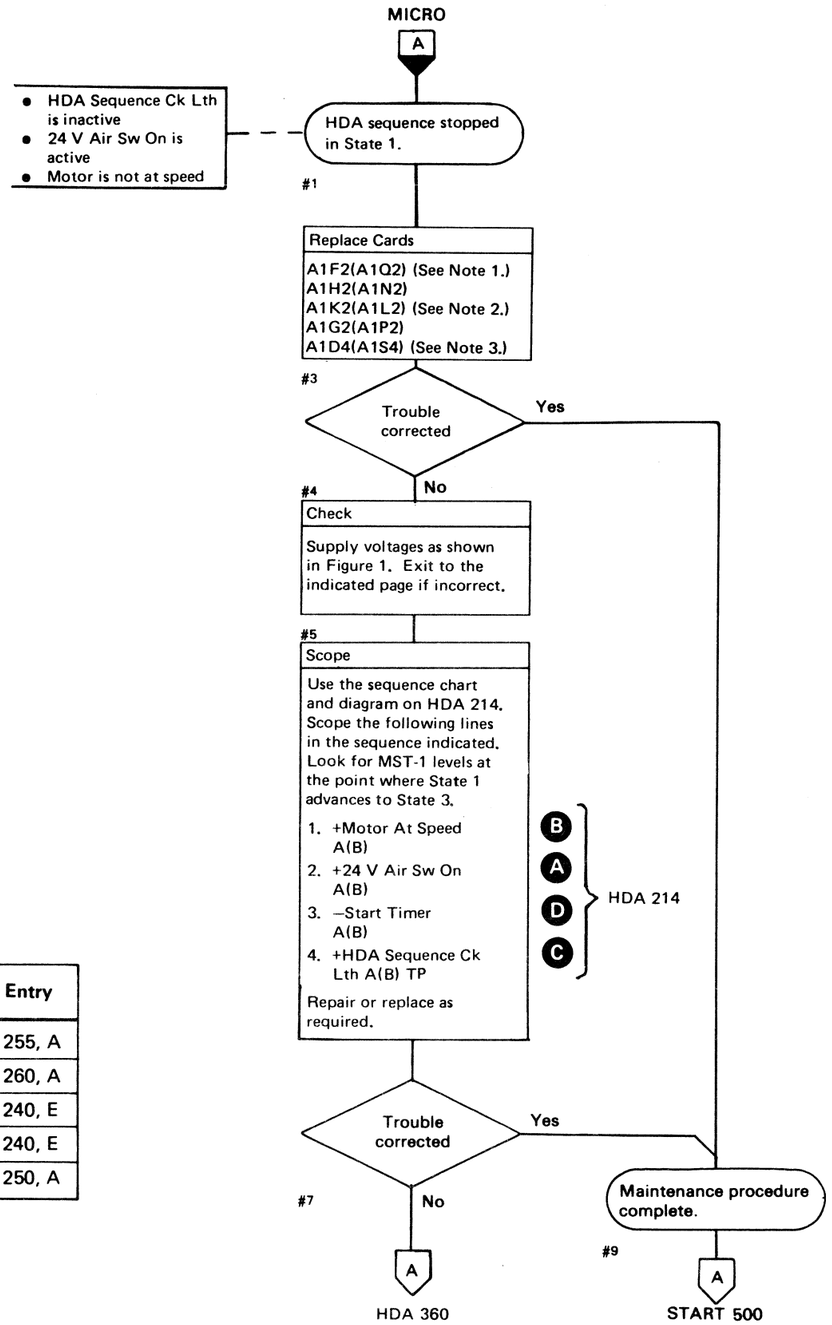


Chart Line No.	Line Name	ALD	Test Point		States 0 → 1
1	+24 V Start Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) U12		
2	+Start Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) U11		
3	+Inhibit HDA Recycle A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) G05		Inactive
4	+HDA Sequence Ck Lth A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B12	B	Inactive
5	+HDA 1 Latch A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B07	A	
6	K632–2 N/O (K632-3 N/O)	YA071 (YA081) YB071 (YB081)			
7	Power On Reset	KF140 (KQ140)	A1F2 (A1Q2) P02		Inactive

SEQUENCE LOCKED IN STATE 1



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Note 2: *When replacing A1K2(A1L2), check the addressing jumpers. See INST 12.*

Note 3: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

Figure 1. Drive Voltage Chart

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
–4 V	A1C2 (A1T2) B06	–3.84 to –4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
–12 V	A1C2 (A1T2) D06	–12.0 to –14.4 V	0.23 V p-p	PWR 240, E
–24 V	A1C2 (A1T2) D03	–24.0 to –28.8 V	0.10 V p-p	PWR 250, A

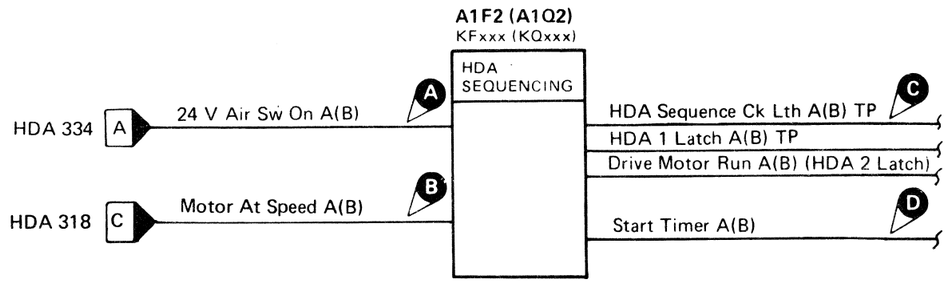
* Use a digital voltmeter to check voltages.
** Use a scope to measure the ripple. See PWR 290 for the procedure.

SEQUENCE LOCKED IN STATE 1

To advance from State 1 to State 3, the following lines must be in the indicated condition:

- 24 V Air Sw On is active.
- Motor is not at speed.

See HDA 500 through 510 for additional theory.



Legend: Inactive
Active level
Tolerance

Chart Line No.	Line Name	ALD	Test Point		States 1	States 3
1	+HDA 1 Latch A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B07			
2	+Drive Motor Run A(B) (HDA 2 Latch)	KF200 (KQ200)	A1F2 (A1Q2) D09			
3	+24 V Air Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) S10	A		
4	+Motor At Speed A(B)	KF130 (KQ130)	A1F2 (A1Q2) U03	B		Inactive
5	−Start Timer A(B)	KF170 (KQ170)	A1F2 (A1Q2) G09	D		Inactive
6	+HDA Sequence Ck Lth A(B) TP	KF160 (KQ160)	A1F2 (A1Q2) B12	C		Inactive

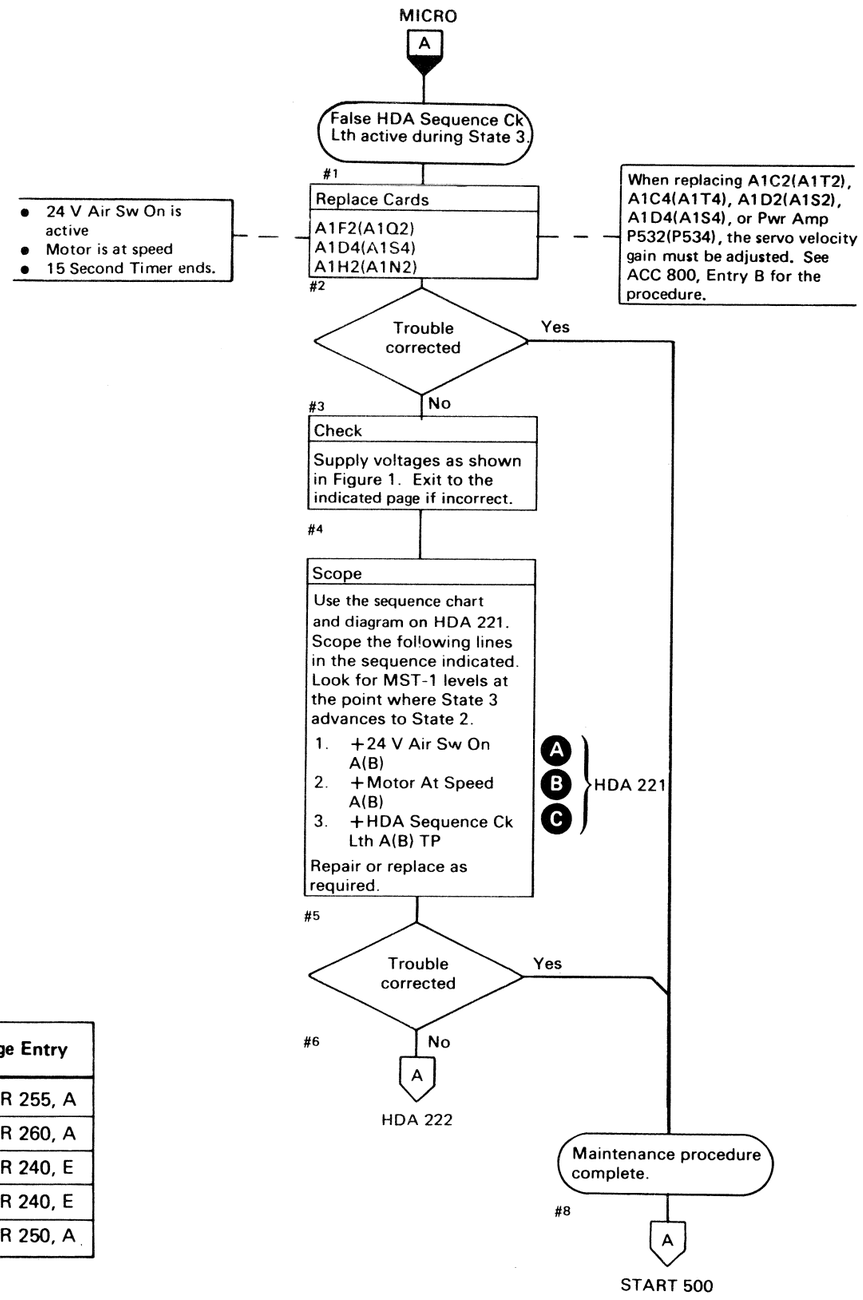
SEQUENCE ERROR OCCURRED IN STATE 3

To advance from State 3 to State 2, the following conditions must exist:

- Drive Motor Run is active.
- 15-Second Timer ends.
- HDA Sequence Ck Lth is inactive.

AT the end of 15 seconds, if Motor at Speed is active, the HDA 1 Latch turns off, advancing the HDA sequence from State 3 to State 2.

See HDA 500 through 510 for additional theory.



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Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
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+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
−12 V	A1C2 (A1T2) D06	−12.0 to −14.4 V	0.23 V p-p	PWR 240, E
−24 V	A1C2 (A1T2) D03	−24.0 to −28.8 V	0.10 V p-p	PWR 250, A

* Use a digital voltmeter to check voltages.
** Use a scope to measure the ripple. See PWR 290 for the procedure.

SEQUENCE ERROR OCCURRED IN STATE 3

To advance from State 3 to State 2, the following conditions must exist:

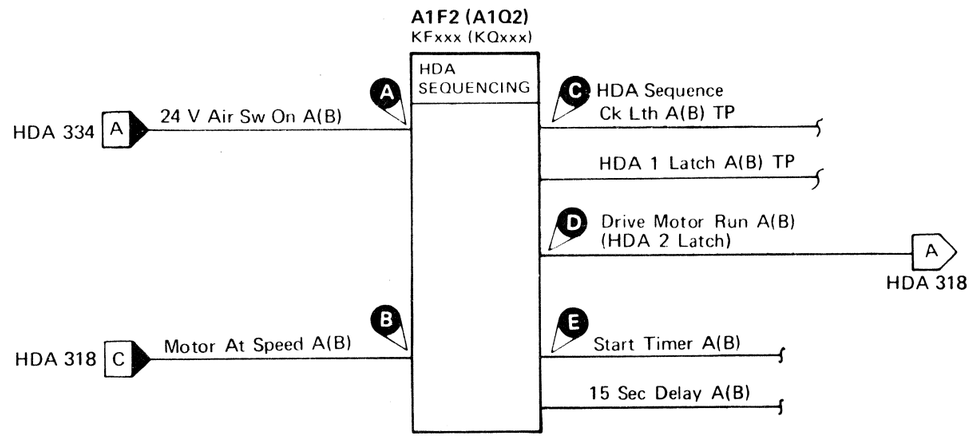
- Motor At Speed is active.
- 15-Second Timer ends.
- 24 V Air Sw On is active.
- HDA Sequence Ck Lth is inactive.

At the end of 15 seconds, if Motor At Speed is active, the HDA 1 Latch turns off, advancing the HDA sequence from State 3 to State 2.

See HDA 500 through 510 for additional theory.

JC0220 Seq. 2 of 2	2359204 Part No.

441235 28 May 76	441236 30 Sept 76	441241 29 Aug 80		



Legend: Inactive; Active level; Tolerance

Chart Line No.	Line Name	ALD	Test Point		States: 3 (15 Sec)	States: 2
1	+HDA 1 Latch A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B07		4, 12	
2	+Drive Motor Run A(B) (HDA 2 Latch)	KF200 (KQ200)	A1F2 (A1Q2) D09	D		
3	−Start Timer A(B)	KF170 (KQ170)	A1F2 (A1Q2) G09	E	1,2	
4	−15 Second Delay A(B)	KF170 (KQ170)	A1F2 (A1Q2) G11		3	
5	+HDA Sequence Ck Lth A(B) TP	KF160 (KQ160)	A1F2 (A1Q2) B12	C	Inactive	
6	+Motor At Speed A(B)	KF130 (KQ130)	A1F2 (A1Q2) U03	B	////////	
7	+24 V Air Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) S10	A		

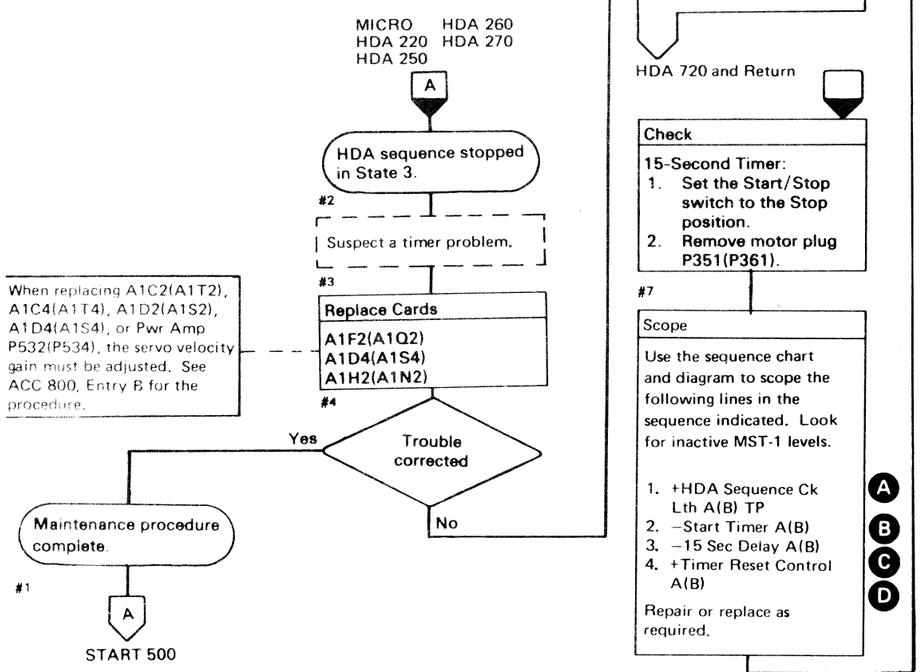
SEQUENCE ERROR OCCURRED IN STATE 3

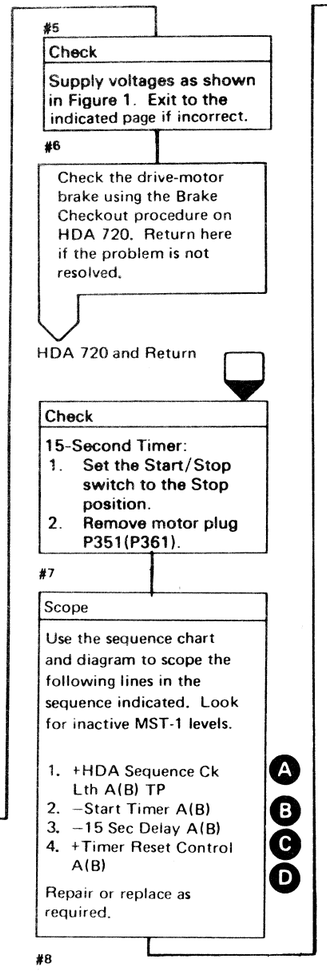
To advance from State 3 to State 2, the following conditions must exist:

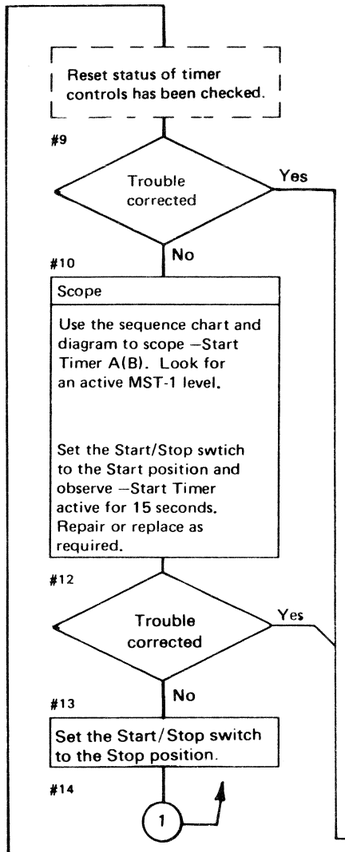
- Motor At Speed is active.
- 15-Second Timer ends.
- 24 V Air Sw On is active.

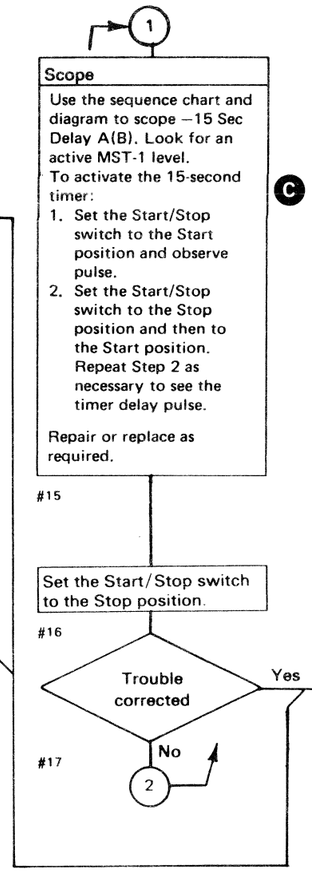
The 15-Second Timer is used to indicate excessive time in arriving at Motor At Speed in State 3. From State 5, to State 4 and State 4 to State 0, the timer is used to indicate excessive time in changing States.

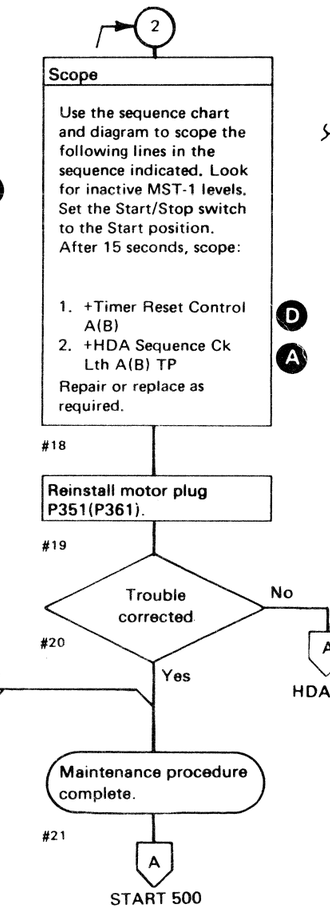
See HDA 500 through 510 for additional theory.

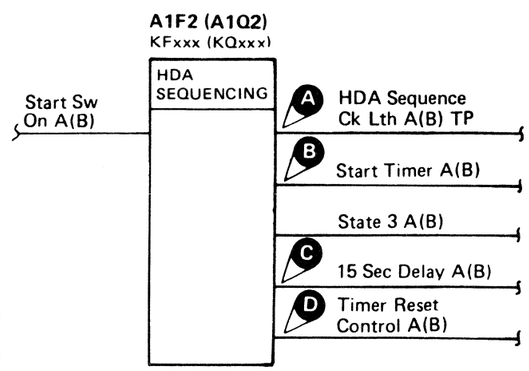












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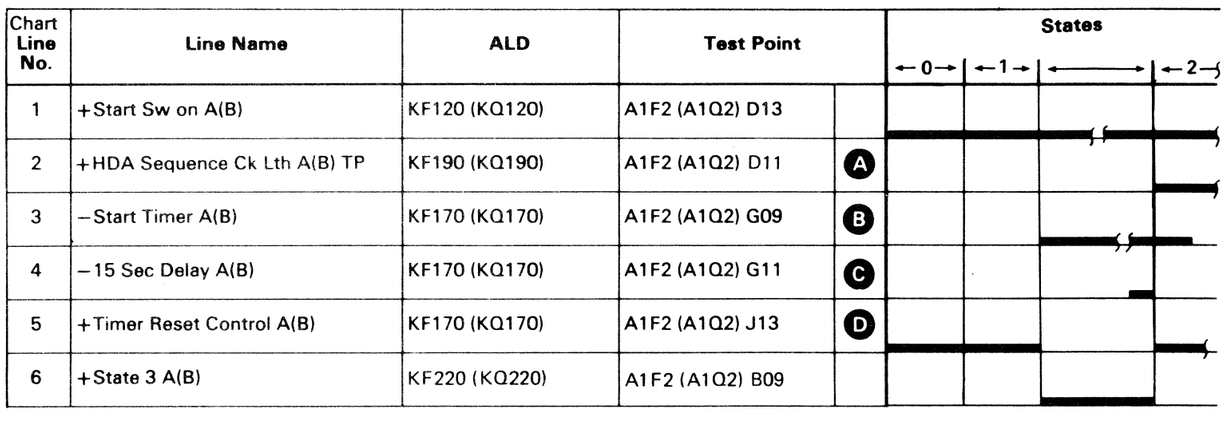
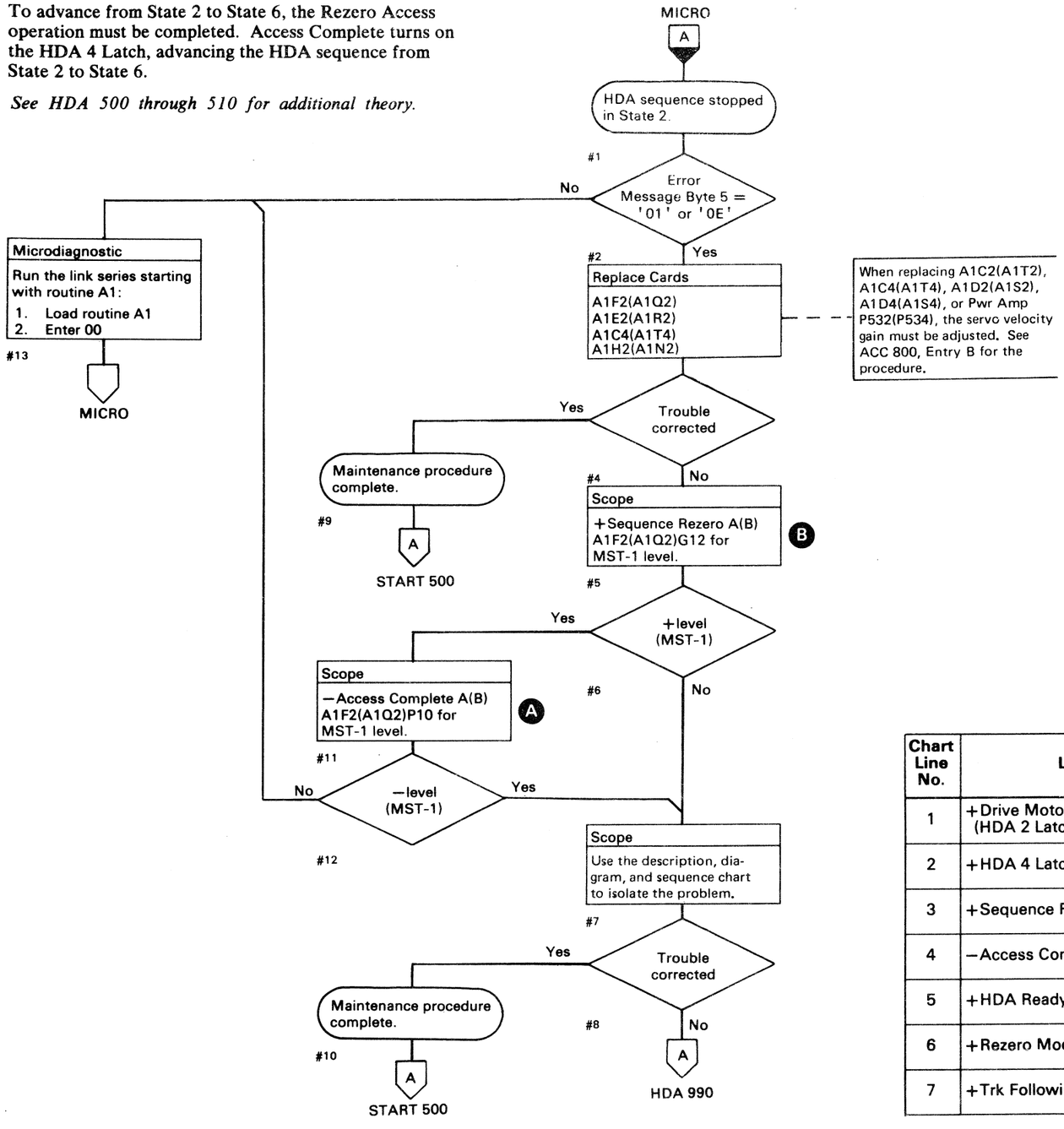


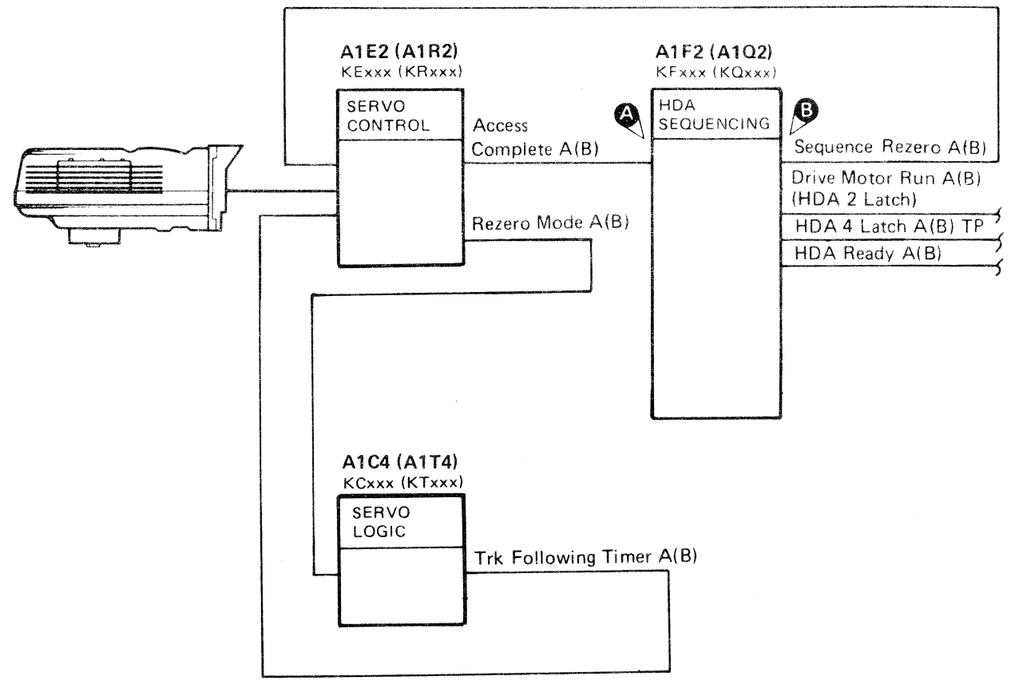
Chart Line No.	Line Name	ALD	Test Point		
1	+Start Sw on A(B)	KF120 (KQ120)	A1F2 (A1Q2) D13		
2	+HDA Sequence Ck Lth A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) D11	A	
3	−Start Timer A(B)	KF170 (KQ170)	A1F2 (A1Q2) G09	B	
4	−15 Sec Delay A(B)	KF170 (KQ170)	A1F2 (A1Q2) G11	C	
5	+Timer Reset Control A(B)	KF170 (KQ170)	A1F2 (A1Q2) J13	D	
6	+State 3 A(B)	KF220 (KQ220)	A1F2 (A1Q2) B09		

SEQUENCE ERROR OCCURRED IN STATE 2

To advance from State 2 to State 6, the Rezero Access operation must be completed. Access Complete turns on the HDA 4 Latch, advancing the HDA sequence from State 2 to State 6.

See HDA 500 through 510 for additional theory.





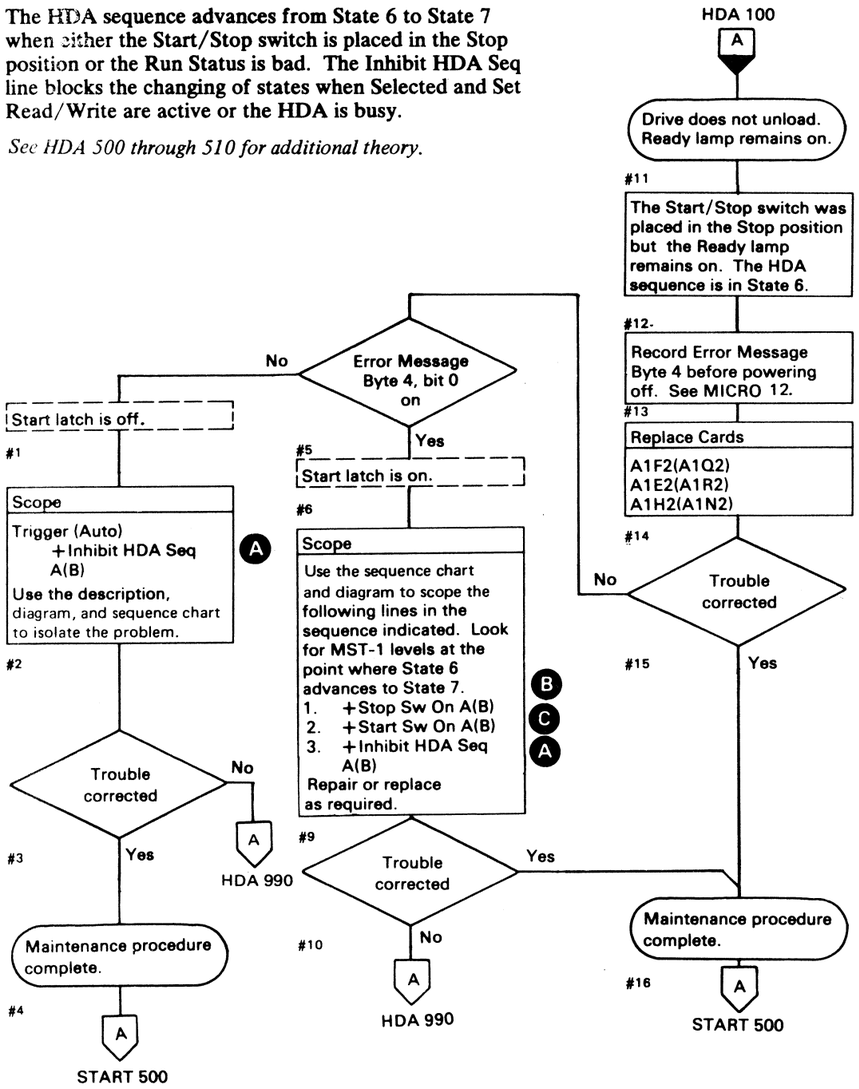
Legend: Inactive, Active level, Tolerance

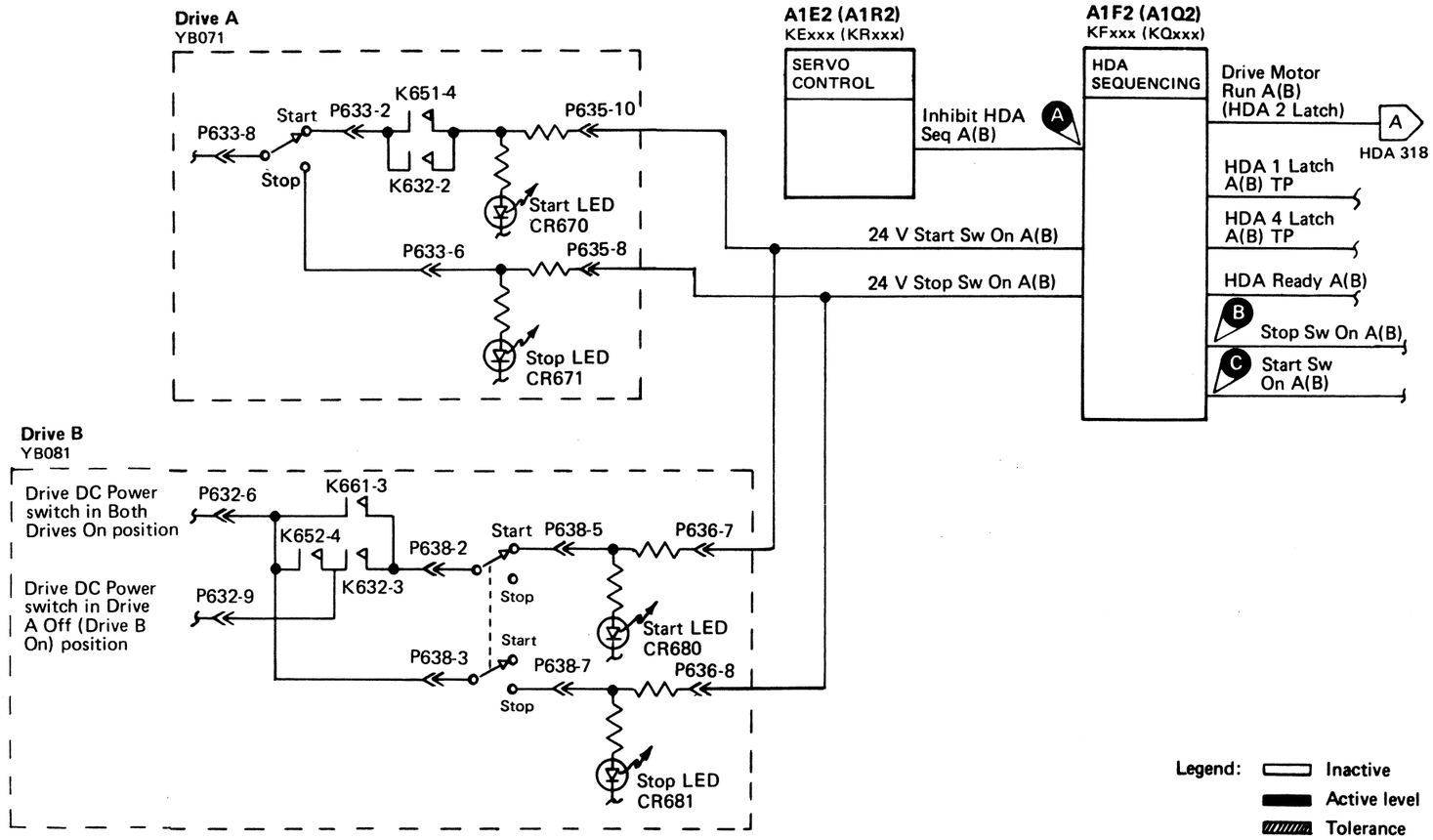
Chart Line No.	Line Name	ALD	Test Point		States 2	States 6
1	+Drive Motor Run A(B) (HDA 2 Latch)	KF200 (KQ200)	A1F2 (A1Q2) D09			
2	+HDA 4 Latch A(B) TP	KF210 (KQ210)	A1F2 (A1Q2) D11			4
3	+Sequence Rezero A(B)	KF150 (KQ150)	A1F2 (A1Q2) G12	B	1	
4	−Access Complete A(B)	KF150 (KQ150)	A1F2 (A1Q2) P10	A		
5	+HDA Ready A(B)	KE150 (KR150)	A1E2 (A1R2) J13			1,2
6	+Rezero Mode A(B)	KE150 (KR150)	A1E2 (A1R2) D13			
7	+Trk Following Timer A(B)	KE110 (KR110)	A1E2 (A1R2) M04			

SEQUENCE ERROR OCCURRED IN STATE 6

The HDA sequence advances from State 6 to State 7 when either the Start/Stop switch is placed in the Stop position or the Run Status is bad. The Inhibit HDA Seq line blocks the changing of states when Selected and Set Read/Write are active or the HDA is busy.

See HDA 500 through 510 for additional theory.





Legend: Inactive, Active level, Tolerance

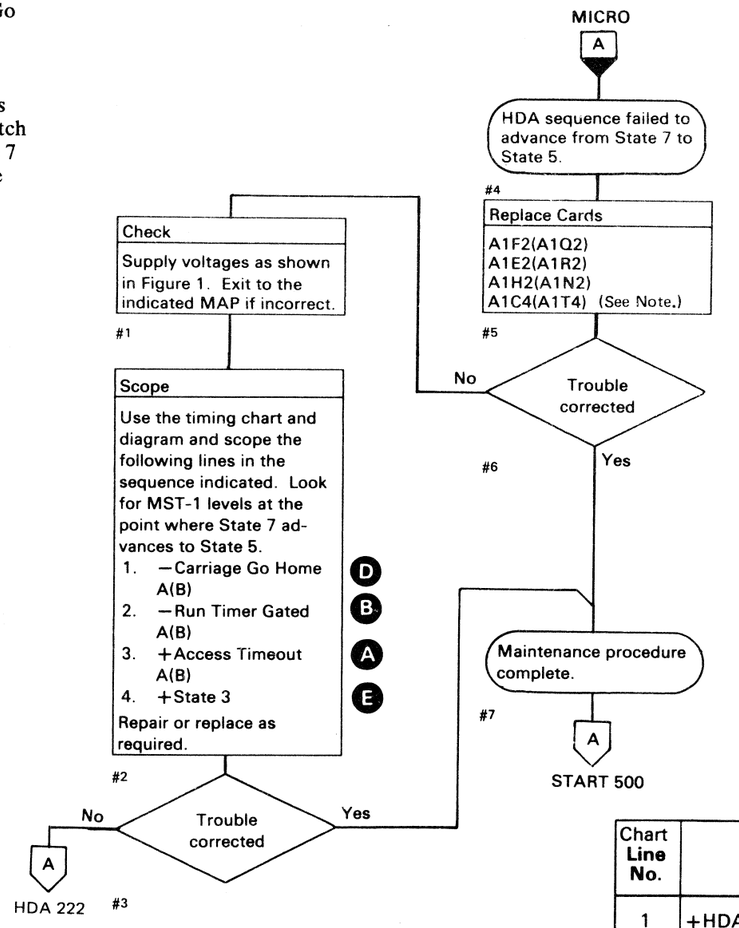
Chart Line No.	Line Name	ALD	Test Point		States 6	States 7
1	+HDA 1 Latch A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B07			6.8
2	+Drive Motor Run A(B) (HDA 2 Latch)	KF200 (KQ200)	A1F2 (A1Q2) D09			
3	+HDA 4 Latch A(B) TP	KF210 (KQ210)	A1F2 (A1Q2) D11			
4	+HDA Ready A(B)	KF220 (KQ220)	A1F2 (A1Q2) B10		1	
5	+Stop Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) S09	B		
6	+Inhibit HDA Seq A(B)	KF130 (KQ130)	A1F2 (A1Q2) B13	A	Inactive	
7	+24 V Stop Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) U10			
8	+Start Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) U11	C	5	
9	+24 V Start Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) U12		7	

SEQUENCE ERROR OCCURRED IN STATE 7

The HDA checks the Run Status and sends Carriage Go Home to the servo. If Run Status is bad, the Inhibit HDA Recycle latch is set, signaling an HDA Sequence error to the system. Run Timer Gated is activated by Carriage Go Home. Within 220 ms, Access Timeout is activated, generating Go Home Complete. HDA 2 Latch is turned off, advancing the HDA sequence from State 7 to State 5. Carriage Go Home is reset in State 3 of the next HDA load sequence.

See HDA 500 through 510 for additional theory.

Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*



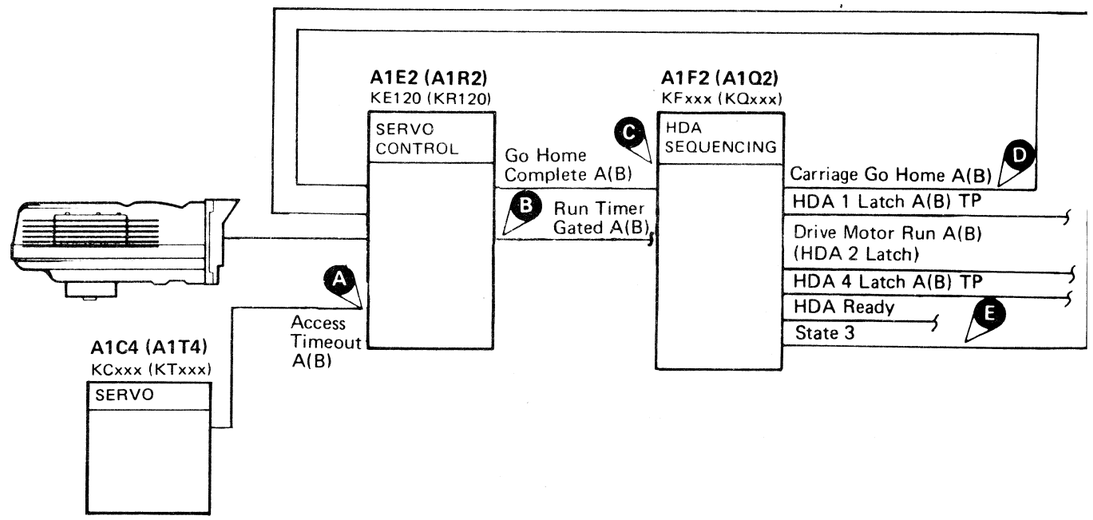


Figure 1. Drive Voltage Chart

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
−4 V	A1C2 (A1T2) B06	−3.84 to −4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
−12 V	A1C2 (A1T2) D06	−12.0 to −14.4 V	0.23 V p-p	PWR 240, E
−24 V	A1C2 (A1T2) D03	−24.0 to −28.8 V	0.10 V p-p	PWR 250, A

* Use a digital voltmeter to check voltages.
** Use a scope to measure the ripple. See PWR 290 for the procedure.

Legend: Inactive; Active level; Tolerance

Chart Line No.	Line Name	ALD	Test Point		States
1	+HDA 1 Latch A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B07		
2	+Drive Motor Run A(B) (HDA 2 Latch)	KF200 (KQ200)	A1F2 (A1Q2) D09		5
3	+HDA 4 Latch A(B) TP	KF210 (KQ210)	A1F2 (A1Q2) D11		
4	−Carriage Go Home A(B)	KF150 (KQ150)	A1F2 (A1Q2) M02	D	
5	−Go Home Complete A(B)	KF200 (KQ200)	A1F2 (A1Q2) G02	C	8
6	+State 3	KF220 (KQ220)	A1F2 (A1Q2) B09	E	Inactive
7	−Run Timer Gated A(B)	KE120 (KR120)	A1E2 (A1R2) P04	B	1,2,3
8	+Access Timeout A(B)	KE120 (KR120)	A1E2 (A1R2) M10	A	7

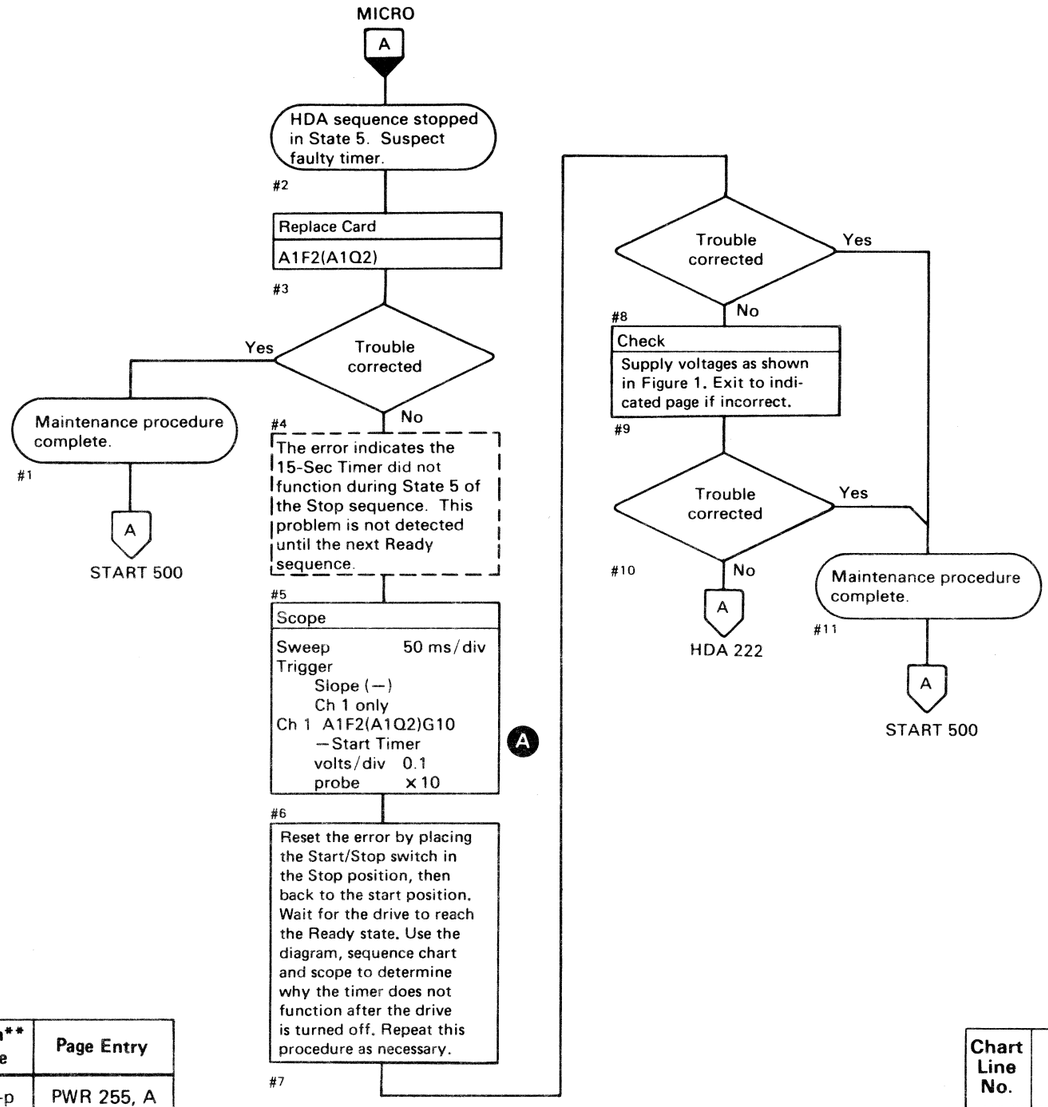
HDA SEQUENCE ERROR OCCURRED IN STATE 5

The following actions occur as the HDA sequence enters State 5:

- 15-Second Timer starts.
- Drive Motor Run is inactive.
- The brake de-energizes.

At completion of the 15-second timeout, the HDA 1 latch is turned off, advancing the HDA sequence from State 5 to State 4.

See HDA 500 through 510 for additional theory.



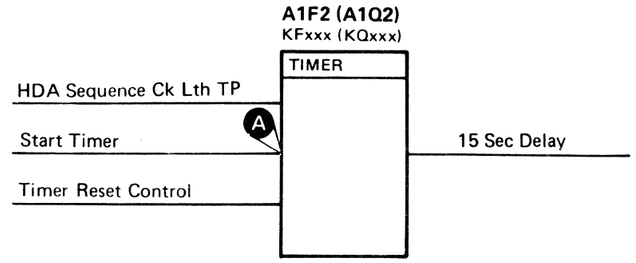


Figure 1. Drive Voltage Chart

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
−4 V	A1C2 (A1T2) B06	−3.84 to −4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
−12 V	A1C2 (A1T2) D06	−12.0 to −14.4 V	0.23 V p-p	PWR 240, E
−24 V	A1C2 (A1T2) D03	−24.0 to −28.8 V	0.10 V p-p	PWR 250, A

* Use a digital voltmeter to check voltages.
** Use a scope to measure the ripple. See PWR 290 for the procedure.

Chart Line No.	Line Name	ALD	Test Point	
1	—Start Timer	KF170 (KQ170)	A1F2 (A1Q2) G09	A
2	+HDA Sequence Ck Lth TP	KF170 (KQ170)	A1F2 (A1Q2) B12	
3	—15 Sec Delay	KF170 (KQ170)	A1F2 (A1Q2) G11	
4	+Timer Reset Control	KF170 (KQ170)	A1F2 (A1Q2) J13	

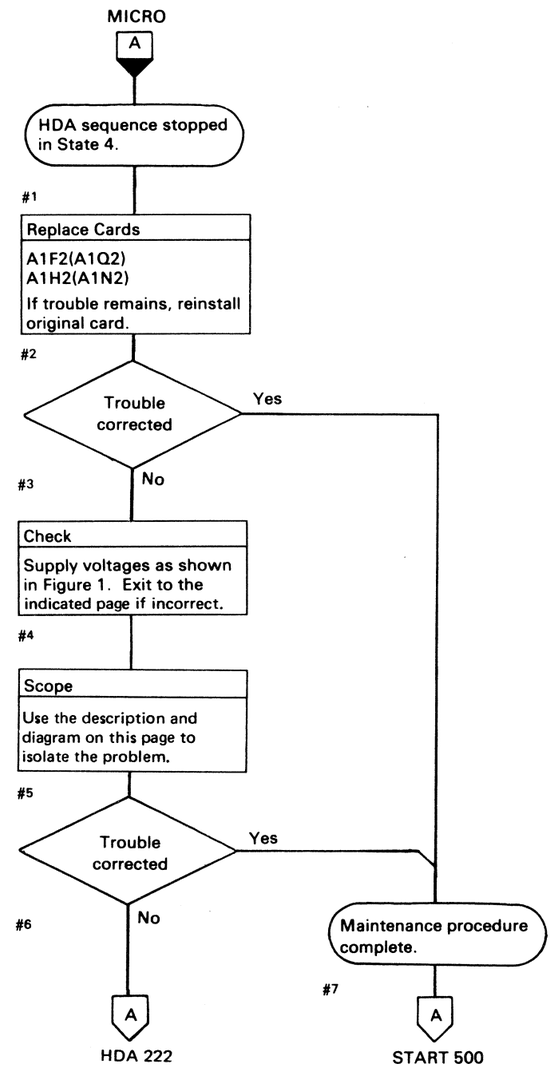
SEQUENCE ERROR OCCURRED IN STATE 4

To advance from State 4 to State 0, the following lines must be in the indicated condition:

- HDA 4 Latch is active.
- 15–Second Timer is active.

The 15-Second Timer was started in State 5. The End 15-Sec Delay line resets the HDA 4 Latch, advancing the HDA sequence from State 4 to State 0.

See HDA 500 through 510 for additional theory.



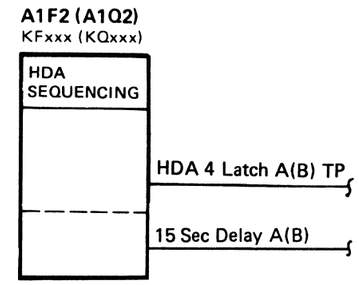


Figure 1. Drive Voltage Chart

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
–4 V	A1C2 (A1T2) B06	–3.84 to –4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
–12 V	A1C2 (A1T2) D06	–12.0 to –14.4 V	0.23 V p-p	PWR 240, E
–24 V	A1C2 (A1T2) D03	–24.0 to –28.8 V	0.10 V p-p	PWR 250, A

* Use a digital voltmeter to check voltages.
** Use a scope to measure the ripple. See PWR 290 for the procedure.

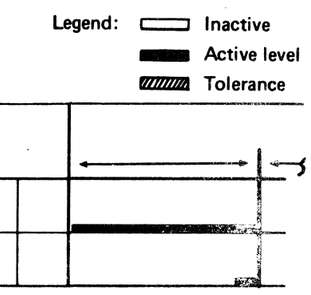
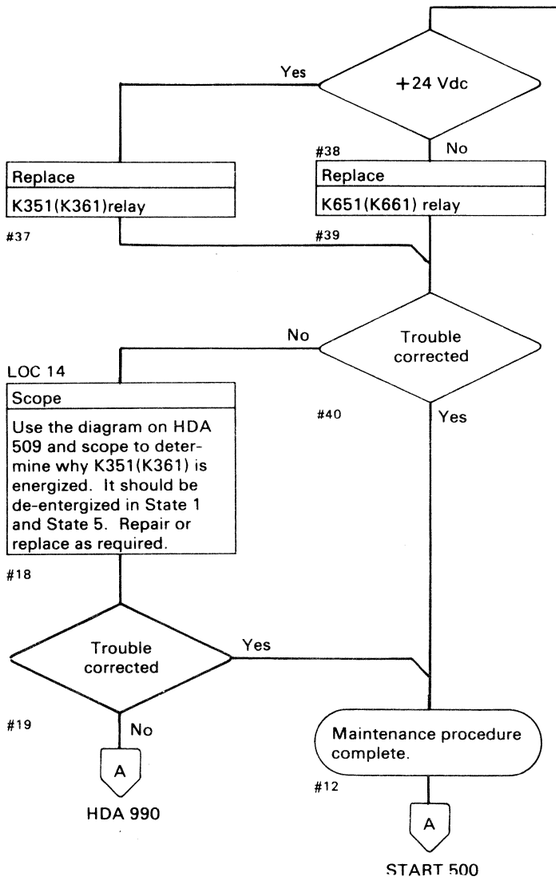


Chart Line No.	Line Name	ALD	Test Point	
1	+HDA 4 Latch A(B) TP	KF210 (KQ210)	A1F2 (A1Q2) D11	
2	–15 Sec Delay A(B)	KF180 (KQ180)	A1F2 (A1Q2) M04	

MOTOR AT SPEED ERROR



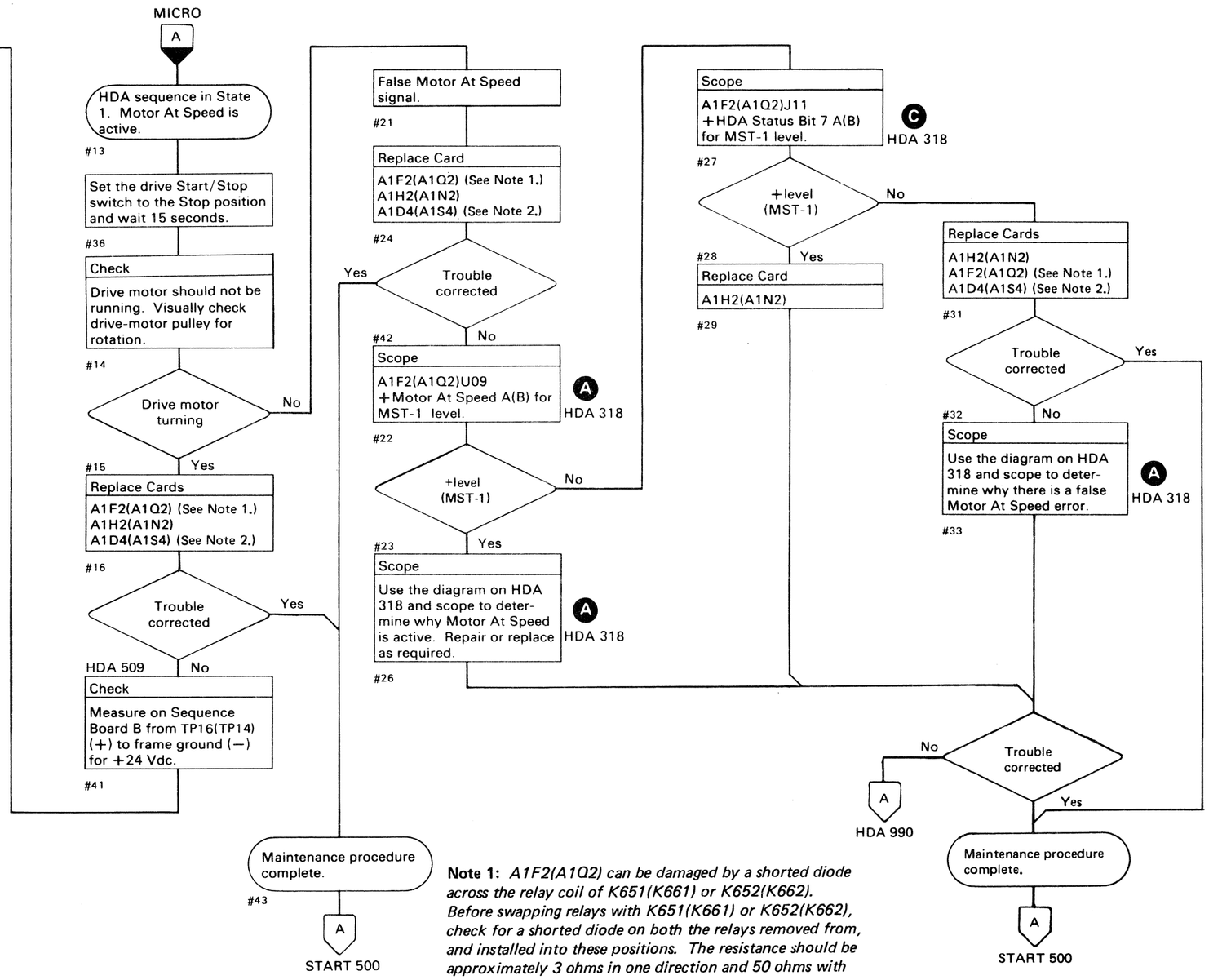


Figure 1. Drive Voltage Chart

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
−4 V	A1C2 (A1T2) B06	−3.84 to −4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
−12 V	A1C2 (A1T2) D06	−12.0 to −14.4 V	0.23 V p-p	PWR 240, E
−24 V	A1C2 (A1T2) D03	−24.0 to −28.8 V	0.10 V p-p	PWR 250, A

* Use a digital voltmeter to check voltages.
** Use a scope to measure the ripple. See PWR 290 for the procedure.

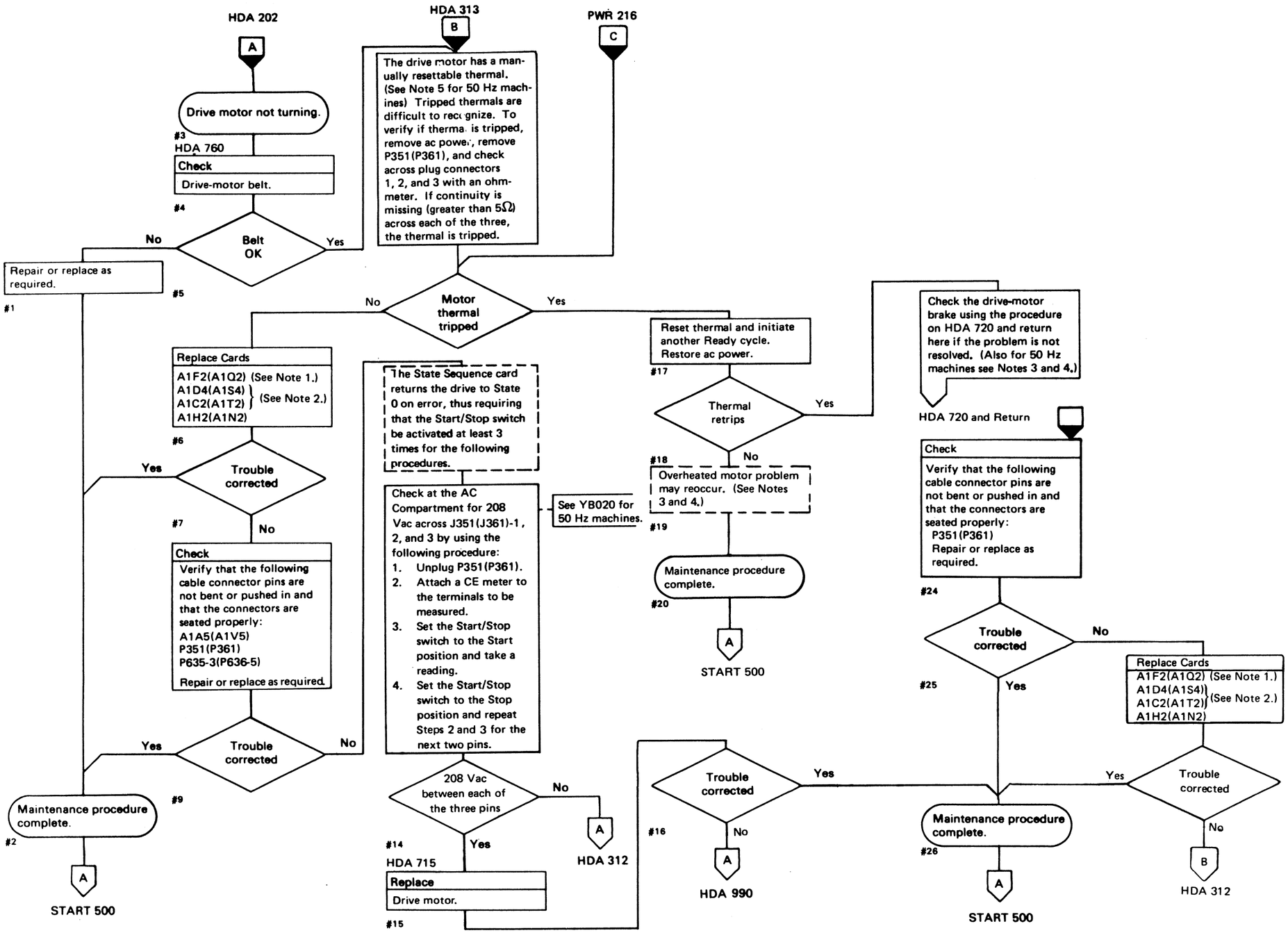
Note 1: *A1F2(A1Q2) can be damaged by a shorted diode across the relay coil of K651(K661) or K652(K662). Before swapping relays with K651(K661) or K652(K662), check for a shorted diode on both the relays removed from, and installed into these positions. The resistance should be approximately 3 ohms in one direction and 50 ohms with the meter leads reversed.*

Note 2: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

JC0270 Seq. 2 of 2	2359208 Part No.

441235 28 May 76	441236 30 Sept 76	441241 29 Aug 80		

MOTOR AT SPEED ERROR



Notes:

1. *A shorted diode across the relay coil can damage the relay driver cards A1F2(A1Q2). Before replacing cards, check for a shorted diode on relays K652(K662) and K651(K661) by using the CE meter to measure across the relay coil. The resistance should be approximately 3 ohms in one direction and 50 ohms when the meter leads are reversed.*

2. *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

3. *On 50 Hz machines wired for 380/440 Wye, a shorted drive motor filter capacitor can cause the motor thermal to trip. The capacitor is C351 or C352 for Drive A and C364 or C365 for Drive B.*

   To check for a failing capacitor, use one of the following procedures:

   a. *Place the Start/Stop switch on the failing drive to the Stop position, then reset the motor thermal. A shorted capacitor will cause the thermal to trip again.*

   b. *Remove ac power from the drive by manually tripping CB230. Remove the cover from the AC Compartment and be sure to observe the safety precautions (Dangerous Voltages). Locate TB351/TB361. Disconnect one end of the capacitor between screws 4 and 8 or 2 and 7 and check for continuity. Replace the capacitor if defective.*

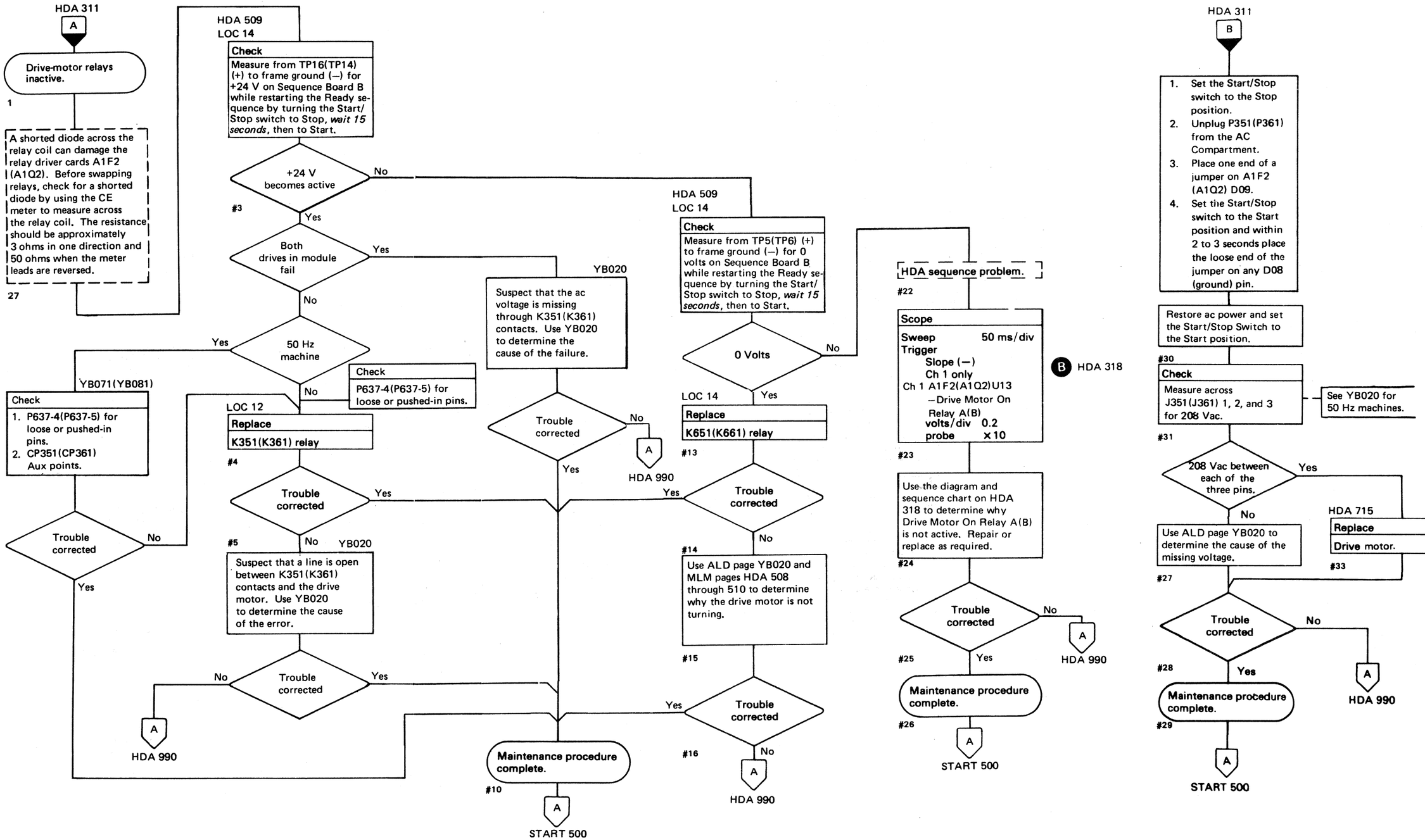
4. *On 50 Hz machines if a replacement drive motor or capacitor is not available for immediate installation, turn off the main line ac power (CB230). Reset the failing motor thermal and unplug the drive motor cable. Turn on the ac power and place the non-failing drive online.*

   AC power to both drives must be off during motor replacement unless the thermal switch for the failing drive is bypassed.

5. *On 50 Hz machines, disregard the continuity check. The thermal causes a circuit protector, external to the motor, to open. See YB020 for the thermal and YB049 for the circuit protector. Auxiliary points for the circuit protector are shown on YB055.*

JC0311 Seq. 1 of 2	2359209 Part No.	441235 28 May 76	441237 1 Mar 77	441238 3 Oct 77	441241 29 Aug 80	

MOTOR AT SPEED ERROR HDA 312



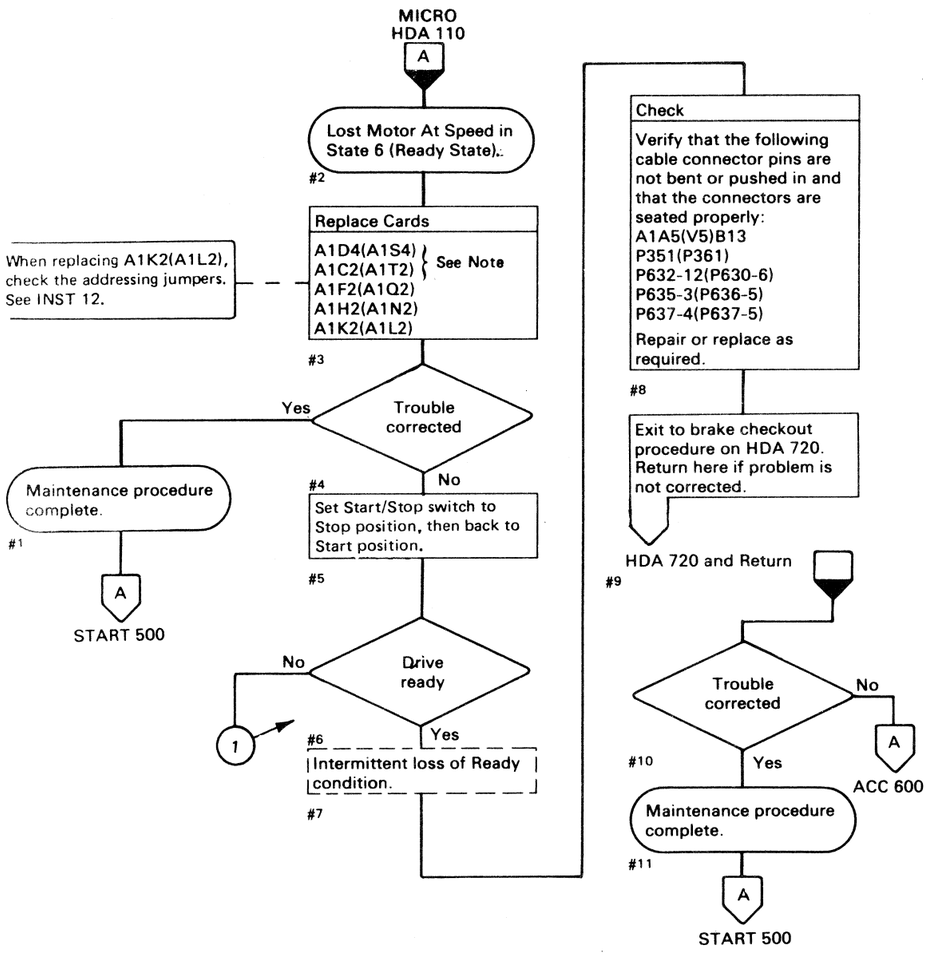
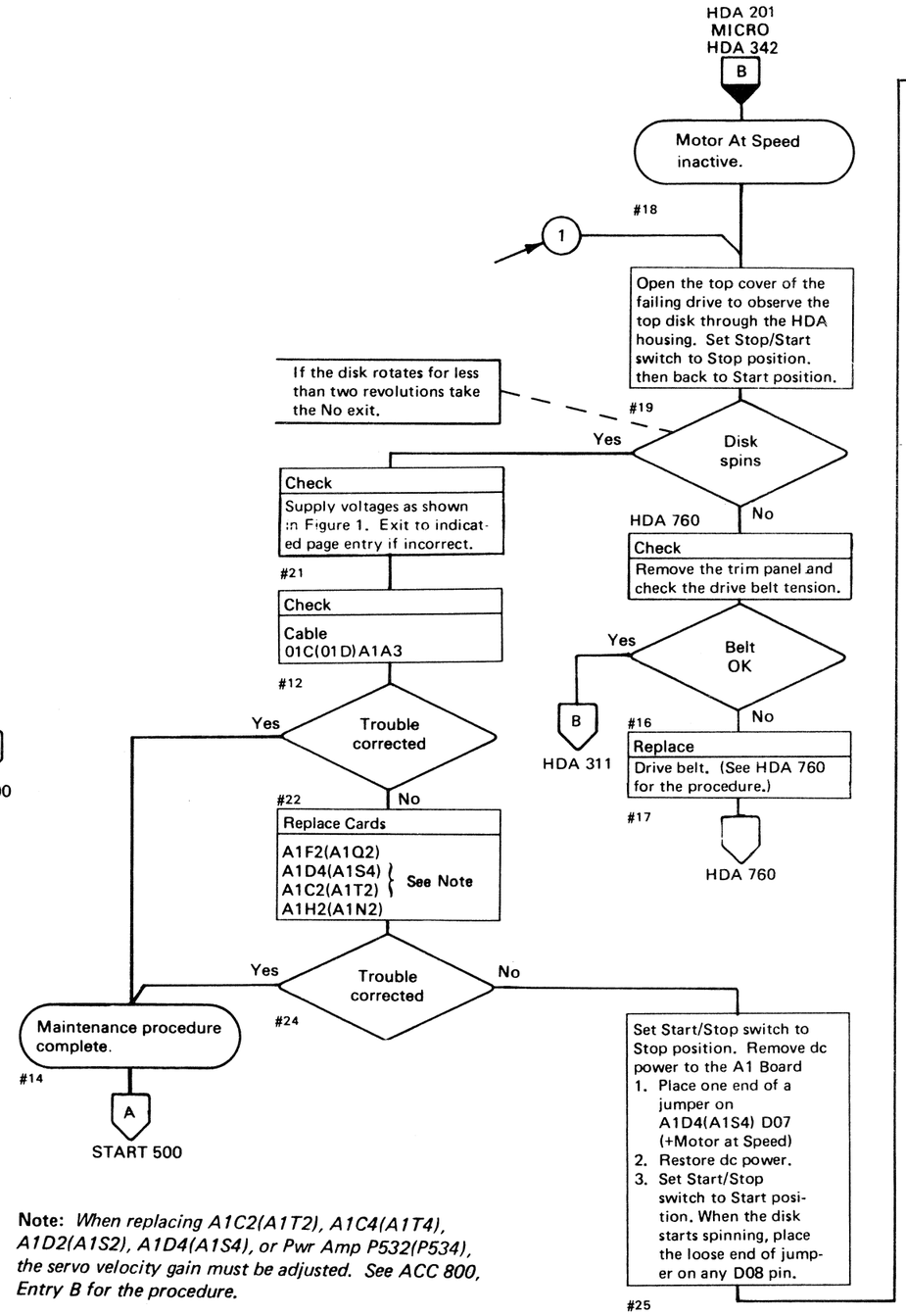


Figure 1. Drive Voltage Chart

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
−4 V	A1C2 (A1T2) B06	−3.84 to −4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
−12 V	A1C2 (A1T2) D06	−12.0 to −14.4 V	0.23 V p-p	PWR 240, E
−24 V	A1C2 (A1T2) D03	−24.0 to −28.8 V	0.10 V p-p	PWR 250, A

* Use a digital voltmeter to check voltages.

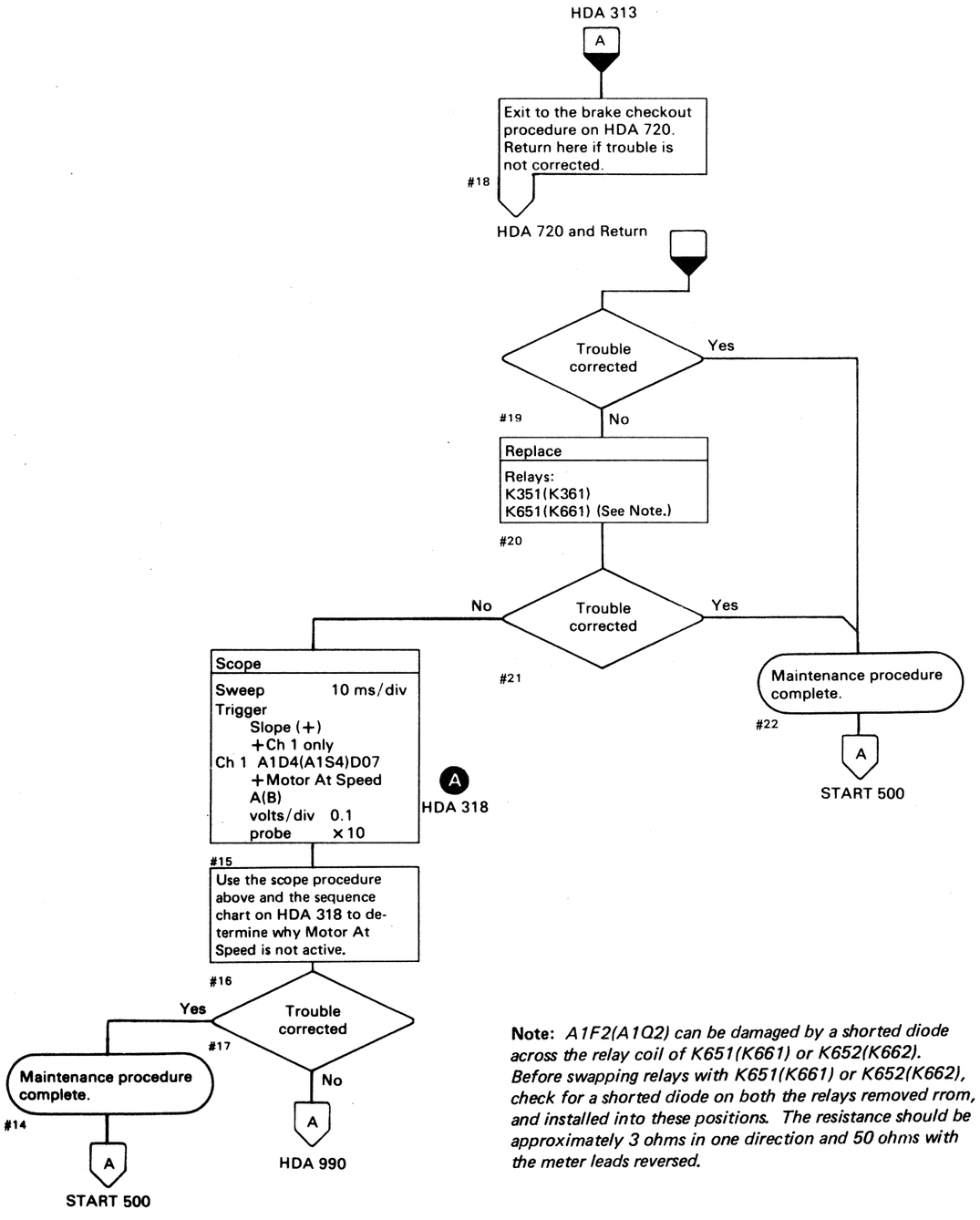
** Use a scope to measure the ripple. See PWR 290 for the procedure.



Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

JC0313 Seq. 1 of 2	2359210 Part No.	441235 28 May 76	441236 30 Sept 76	441241 29 Aug 80		

MOTOR AT SPEED



Note: *A1F2(A1Q2) can be damaged by a shorted diode across the relay coil of K651(K661) or K652(K662). Before swapping relays with K651(K661) or K652(K662), check for a shorted diode on both the relays removed rrom, and installed into these positions. The resistance should be approximately 3 ohms in one direction and 50 ohms with the meter leads reversed.*

JC0313 Seq. 2 of 2	2359210 Part No.

441235 28 May 76	441236 30 Sept 76	441241 29 Aug 80		

MOTOR AT SPEED ERROR

VCO pulses are applied to a counter to detect Motor At Speed. The counter is reset by sync pulses on the Servo Clock line. As the speed of the motor increases, the rate of VCO pulses increases. When the motor reaches 80% of speed (2371 rpm), the counter completes its count before being reset by the sync pulse on the Servo Clock line and the Motor At Speed line is activated.

The AGC Open line remains active until the motor reaches 2786 rpm to inhibit variation on the Motor At Speed line.

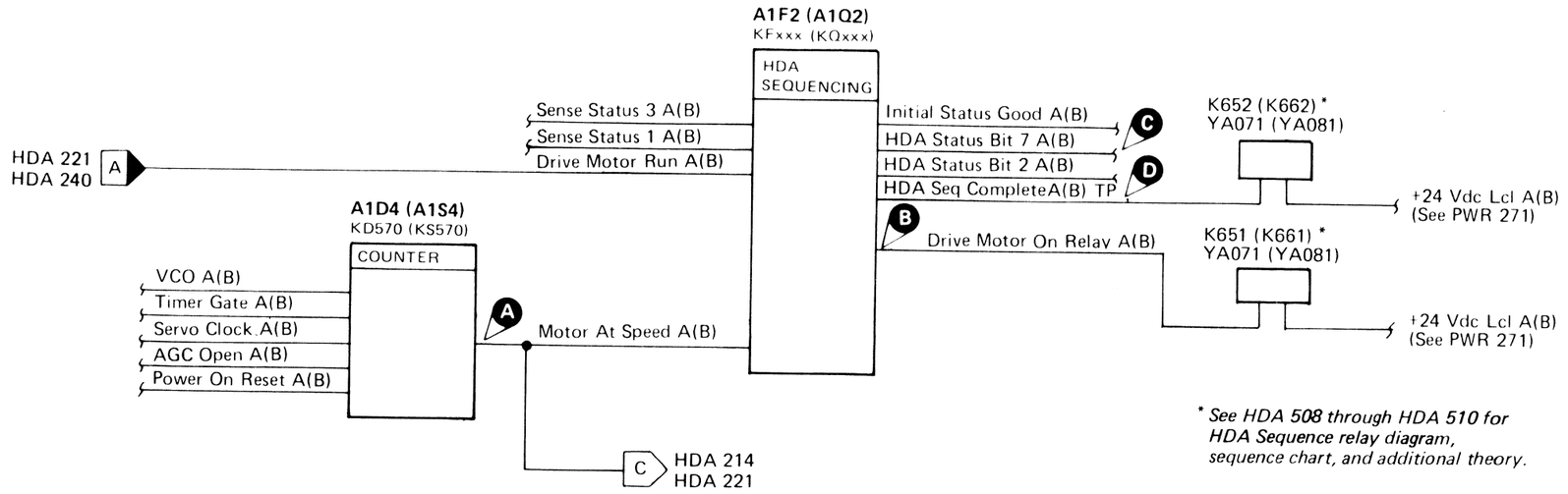
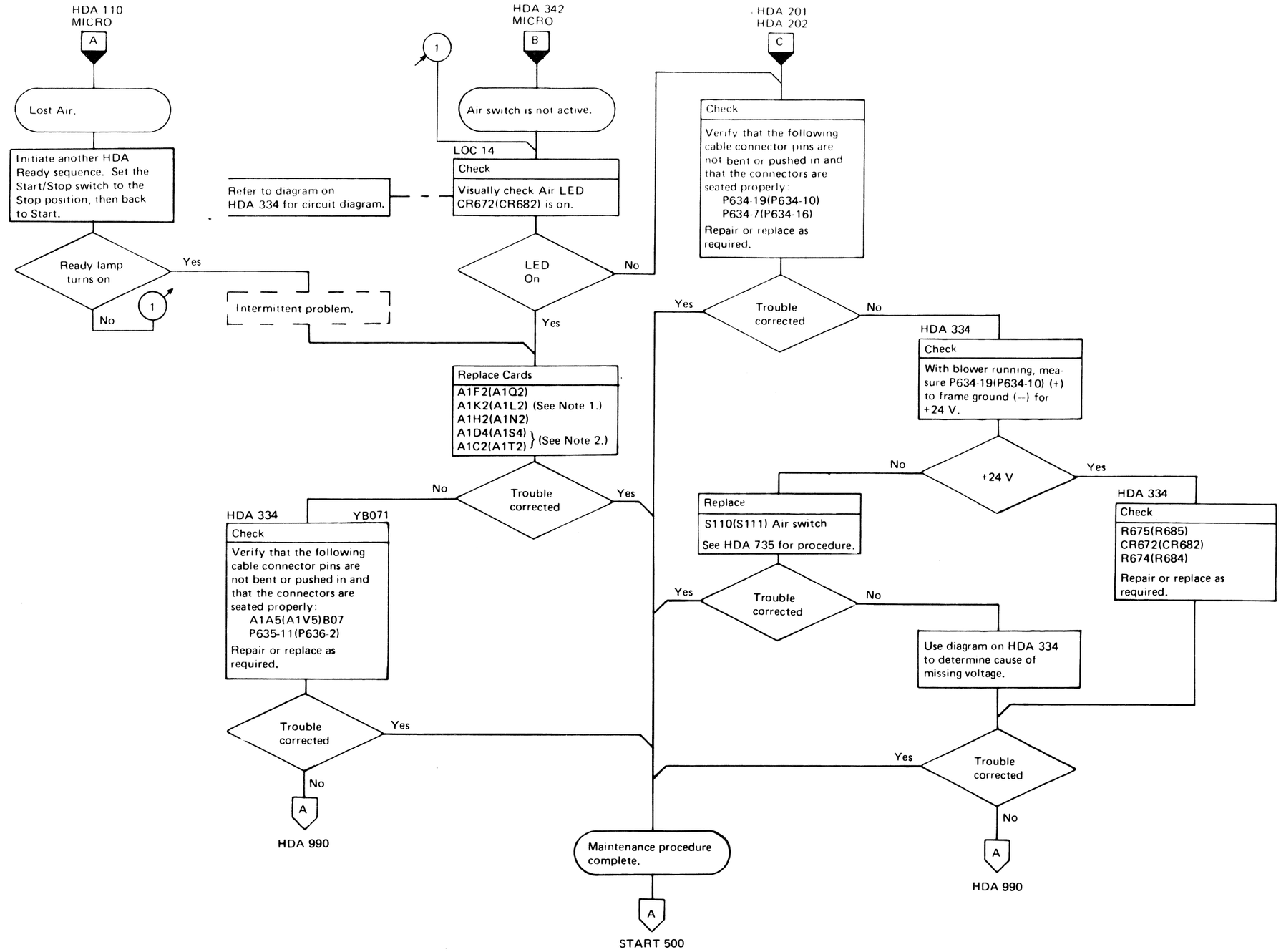


Chart Line No.	Line Name	ALD	Test Point		
1	+VCO A(B)	KD570 (KS570)	A1D4 (A1S4) D13		
2	+AGC Open A(B)	KD570 (KS570)	A1D4 (A1S4) B11		
3	+Timer Gate A(B)	KD570 (KS570)	A1D4 (A1S4) J13		
4	+Servo Clock A(B)	KD570 (KS570)	A1D4 (A1S4) G10		
5	−Drive Motor On Relay A(B)	KF260 (KQ260)	A1F2 (A1Q2) U13	B	
6	+Motor At Speed A(B)	KD570 (KS570)	A1D4 (A1S4) D07	A	
7	+HDA Status Bit 7 A(B)	KF240 (KQ240)	A1F2 (A1Q2) J11	C	Inactive
8	−Sense Status 3 (A)B	KF130 (KQ130)	A1F2 (A1Q2) B04		Inactive
9	+HDA Status Bit 2 A(B)	KF230 (KQ230)	A1F2 (A1Q2) B02		Inactive
10	−Sense Status 1 A(B)	KF130 (KQ130)	A1F2 (A1Q2) D04		Inactive
11	−HDA Seq Complete A(B) TP	KF260 (KQ260)	A1F2 (A1Q2) S02	D	6

AIR SWITCH FAILURE



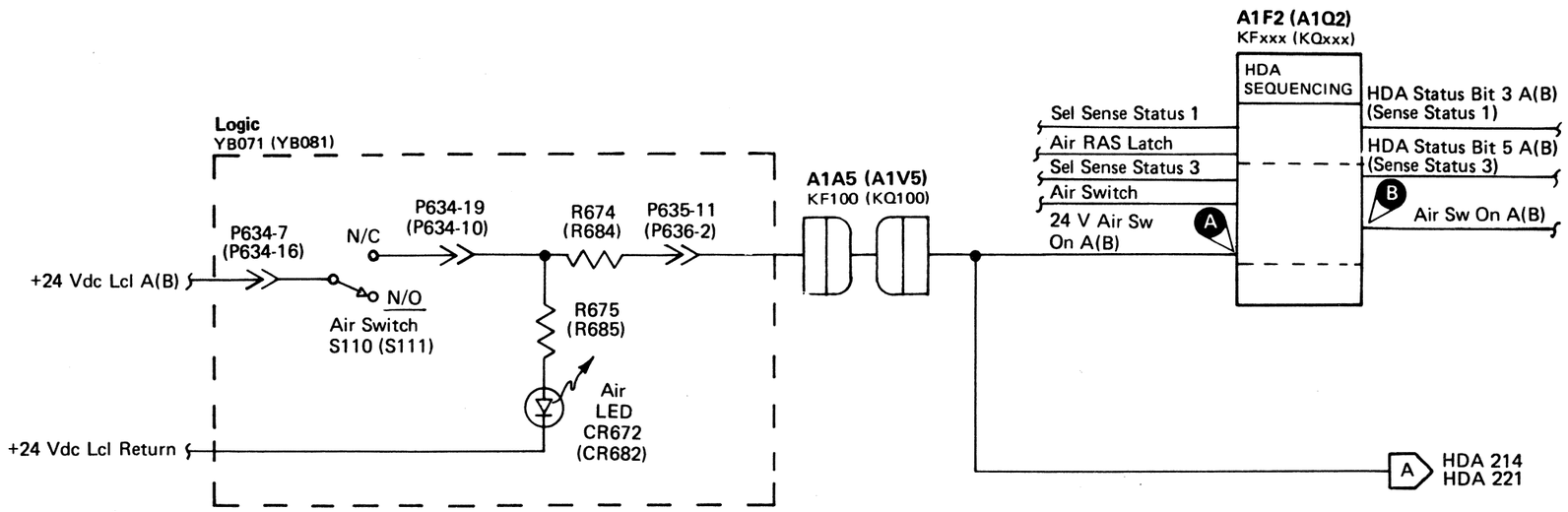
Note 1: *When replacing A1K2(A1L2), check the addressing jumpers. See INST 12.*

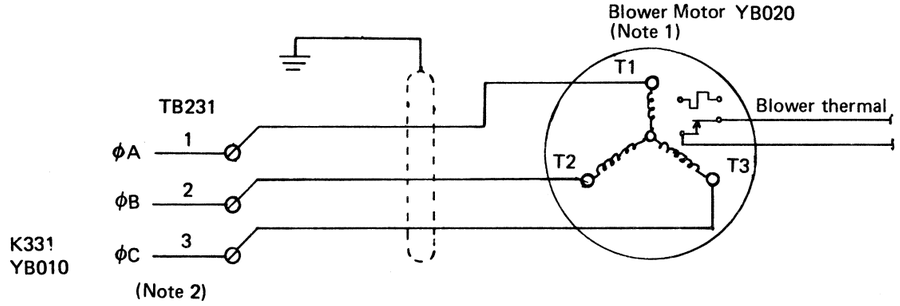
Note 2: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

JC0315 Seq. 2 of 2	2359211 Part No.

441235 28 May 76	441236 30 Sept 76			

AIR SWITCH FAILURE **HDA 334**





YA020

Note 1: *All components are located in the primary enclosure except motors.*

Note 2: *Motors are capable of operating with 200, 208, or 230 Vac.*

Chart Line No.	Line Name	ALD	Test Point	
1	+24 V Air Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) S10	A
2	+Air Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) S11	B

JC0334 Seq. 1 of 2	2359212 Part No.

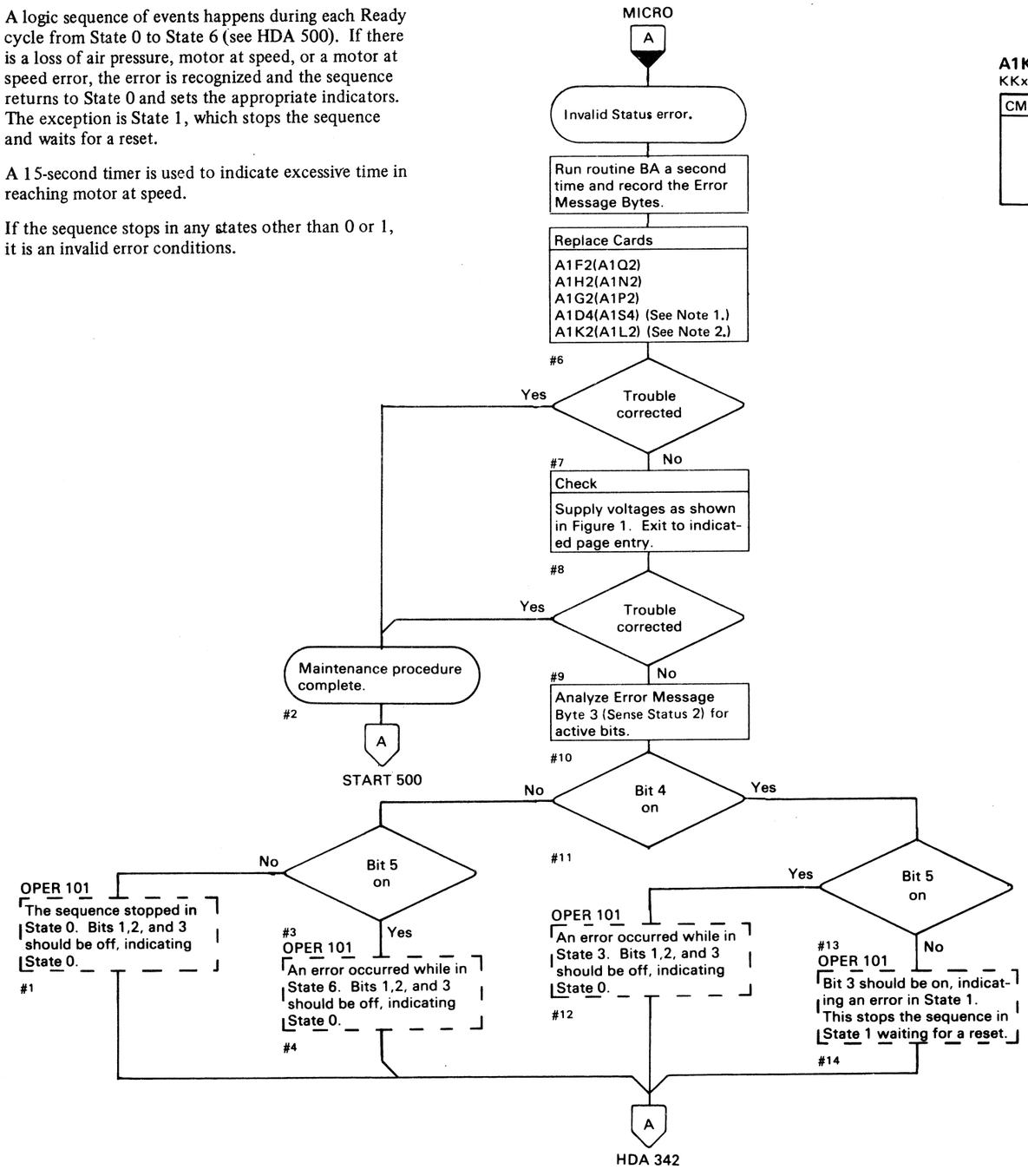
441235 28 May 76	441241 29 Aug 80			

INVALID STATUS ERROR

A logic sequence of events happens during each Ready cycle from State 0 to State 6 (see HDA 500). If there is a loss of air pressure, motor at speed, or a motor at speed error, the error is recognized and the sequence returns to State 0 and sets the appropriate indicators. The exception is State 1, which stops the sequence and waits for a reset.

A 15-second timer is used to indicate excessive time in reaching motor at speed.

If the sequence stops in any states other than 0 or 1, it is an invalid error conditions.



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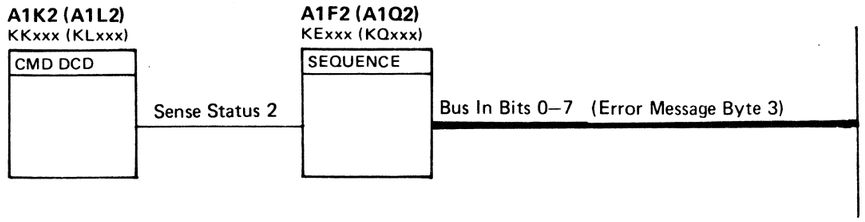


Error Message Byte 3 (Sense Status 2)	
Bus In Bit	**Definition**
0	—
1	HDA 4 Latch
2	HDA 2 Latch
3	HDA 1 Latch
4	HDA Sequence Check
5	Inhibit HDA Recycle
6	—
7	Odd Physical Track

Figure 1. Drive Voltage Check

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
–4 V	A1C2 (A1T2) B06	–3.84 to –4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
–12 V	A1C2 (A1T2) D06	–12.0 to –14.4 V	0.23 V p-p	PWR 240, E
–24 V	A1C2 (A1T2) D03	–24.0 to –28.8 V	0.10 V p-p	PWR 250, A

001 06C

* Use a digital voltmeter to check voltages.

** Use a scope to measure the ripple. See PWR 290 for the procedure.

Note 1: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

Note 2: *When replacing A1K2(A1L2), check the addressing jumpers. See INST 12.*

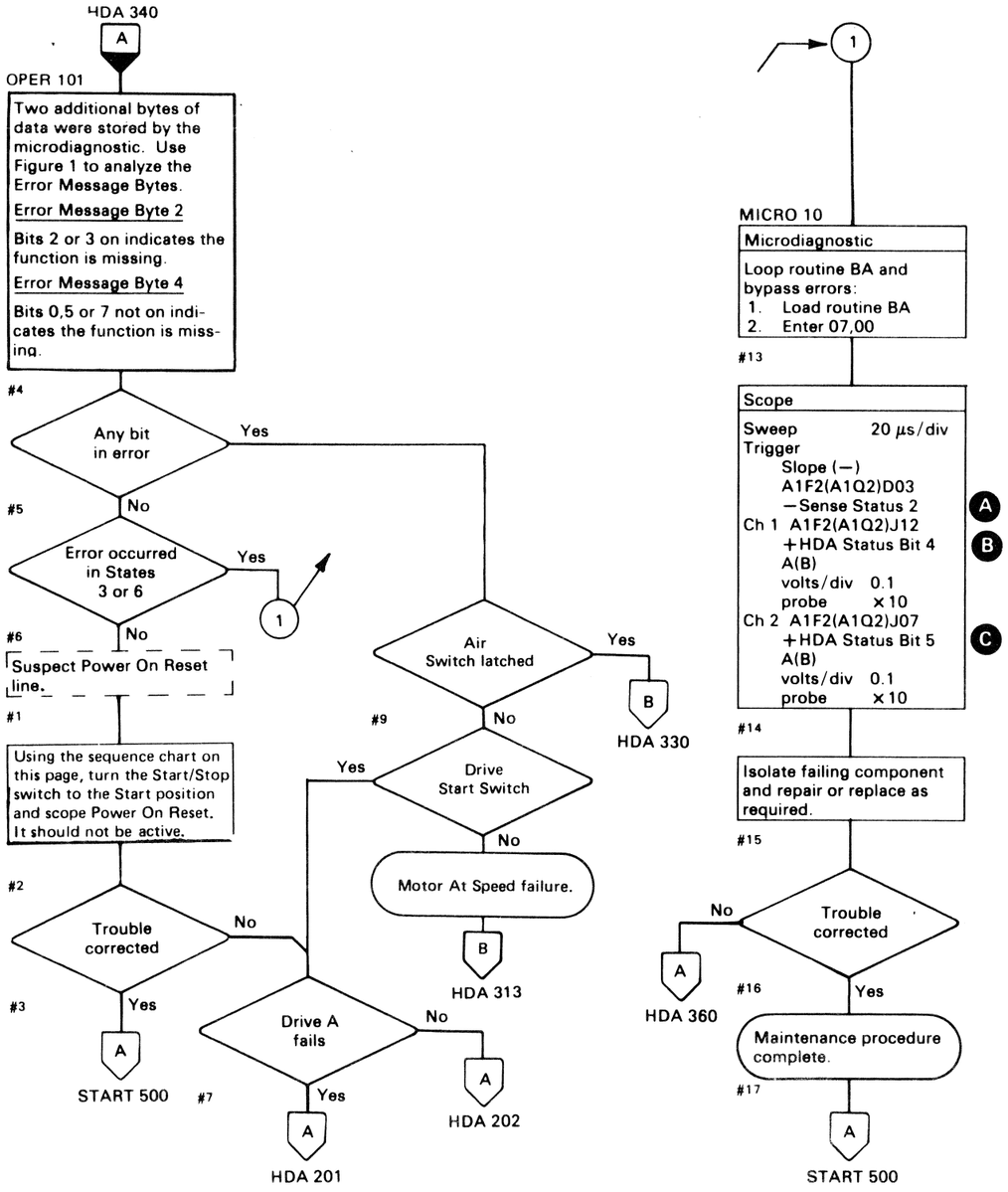
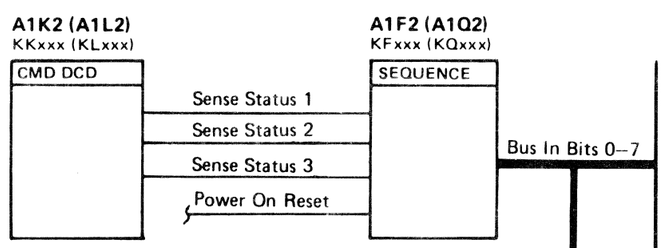


Figure 1. Microdiagnostic Error Message Bytes 2 and 4.



Bus In Bits	Error Message Byte 2 (Sense Status 1)	Error Message Byte 4 (Sense Status 3)
0		Drive Start Switch
1		
2	Motor At Speed Latched	
3	Air Switch Latched	
4		
5		Air Switch
6		
7		Motor At Speed Switch

Error Message Byte 3 (Sense Status 2)	
Bus In Bit	**Definition**
0	–
1	HDA 4 Latch
2	HDA 2 Latch
3	HDA 1 Latch
4	HDA Sequence Check
5	Inhibit HDA Recycle
6	–
7	Odd Physical Track

Legend: Inactive; Active level; Tolerance

Chart Line No.	Line Name	ALD	Test Point		
1	−Sense Status 2	KF130 (KQ130)	A1F2 (A1Q2) D03	A	
2	+Inhibit HDA Recycle A(B) TP	KF140 (KQ140)	A1F2 (A1Q2) G05		Inactive
3	+HDA Sequence Ck Lth A(B) TP	KF160 (KQ160)	A1F2 (A1Q2) B12		Inactive
4	+HDA Status Bit 4 A(B)	KF240 (KQ240)	A1F2 (A1Q2) J12	B	
5	+HDA Status Bit 5 A(B)	KF240 (KQ240)	A1F2 (A1Q2) J07	C	
6	−Power On Reset	KF140 (KQ140)	A1F2 (A1Q2) G08		Inactive

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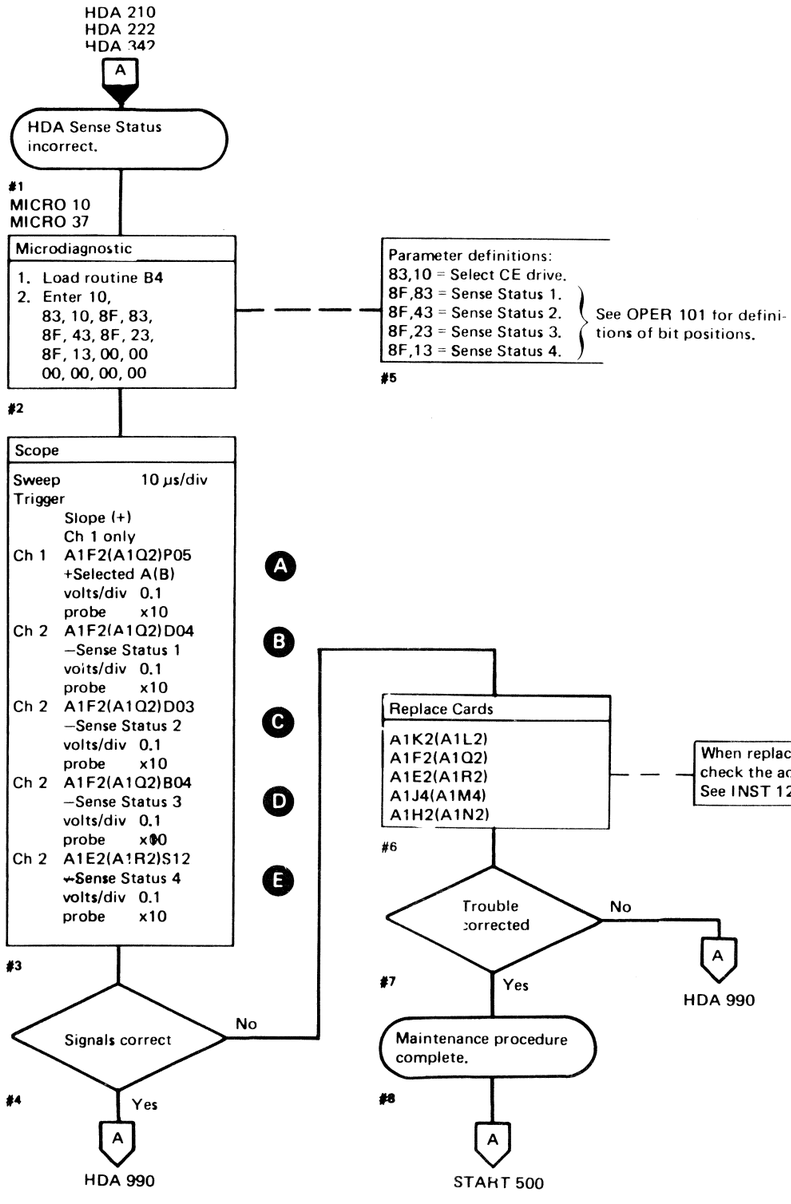
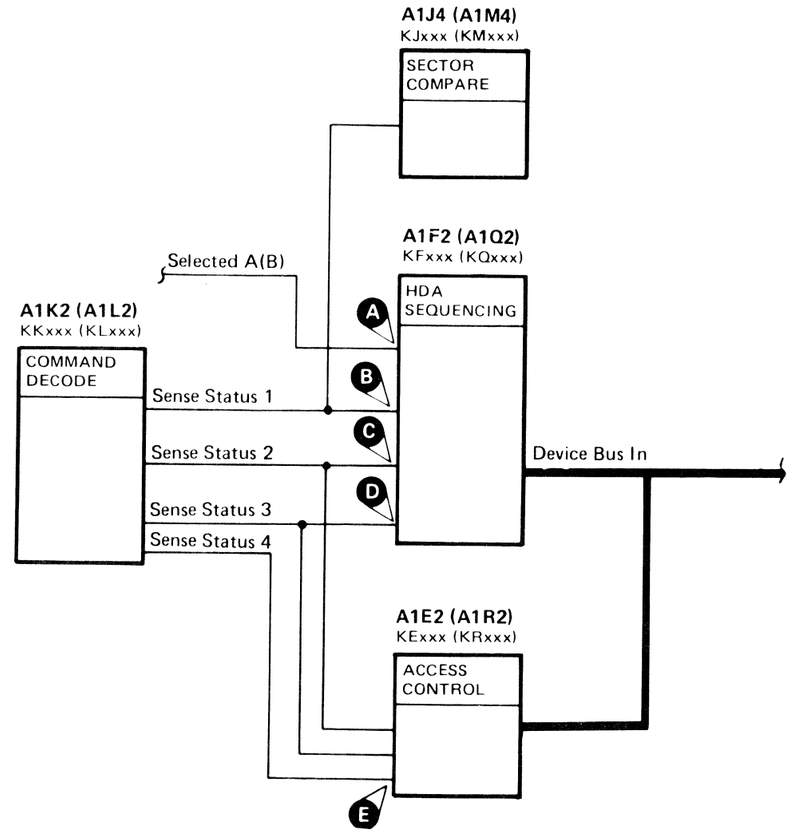
HDA SENSE STATUS CHECKOUT





Legend: Inactive · Active level · Tolerance

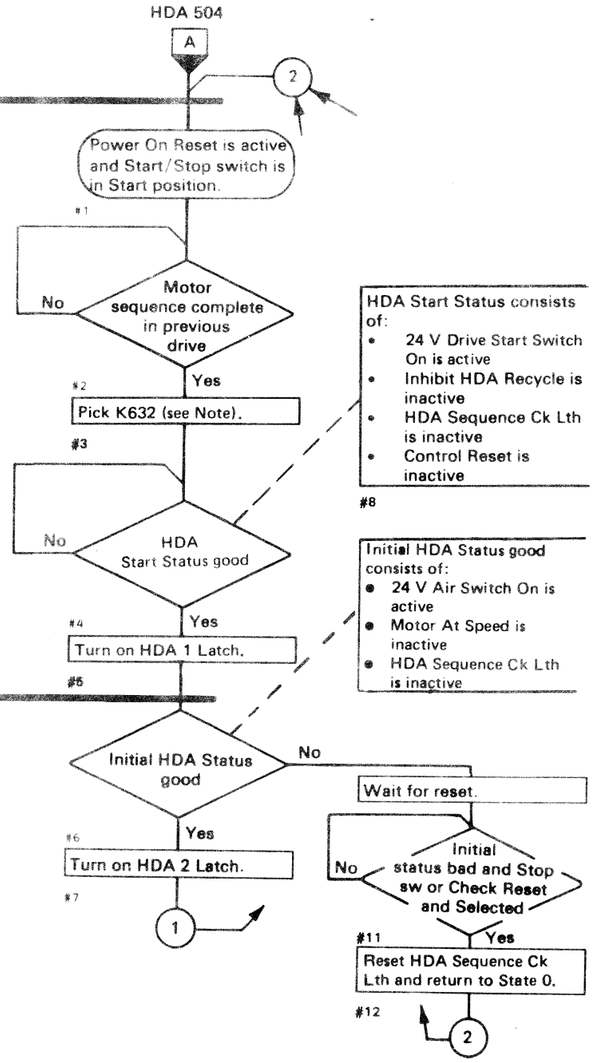
Chart Line No.	Line Name	ALD	Test Point		
1	+Selected A(B)	KF130 (KQ130)	A1F2 (A1Q2) P05	A	
2	–Sense Status 1	KF130 (KQ130)	A1F2 (A1Q2) D04	B	
3	–Sense Status 2	KF130 (KQ130)	A1F2 (A1Q2) D03	C	
4	–Sense Status 3	KF130 (KQ130)	A1F2 (A1Q2) B04	D	
5	–Sense Status 4	KE160 (KR160)	A1E2 (A1R2) S12	E	

HDA READY SEQUENCE THEORY

The objectives of the HDA Ready sequence are to:

- Start and bring the drive motor up to speed.
- Allow only one drive motor at a time to start and come up to speed (see description on HDA 100).
- Rezero Access.

The output of the HDA State Sequence latches (HDA 1 latch, HDA 2 latch, and HDA 4 latch) is fed to the State Decoder. The binary value of these latches is decoded as States 0 to 7. The Ready sequence steps from State 0 through State 1, State 3, State 2, to State 6 (Ready).



STATE 0

To advance from State 0 to State 1, the following lines must be in the indicated condition:

- +24 Vdc Dr Mtr A(B) Start is active (turns on Start latch)
- HDA Sequence Ck Lth is inactive
- Inhibit HDA Recycle is inactive
- Power On Reset is inactive
- State 0 is active

Note: *Relay K632 must be picked to activate +24 V Start Sw On in Drive A. The +24 V Start Sw On in Drive B is activated by both K632 and K652 being picked (see HDA 206).*

STATE 1

To advance from State 1 to State 3, the following lines must be in the indicated condition:

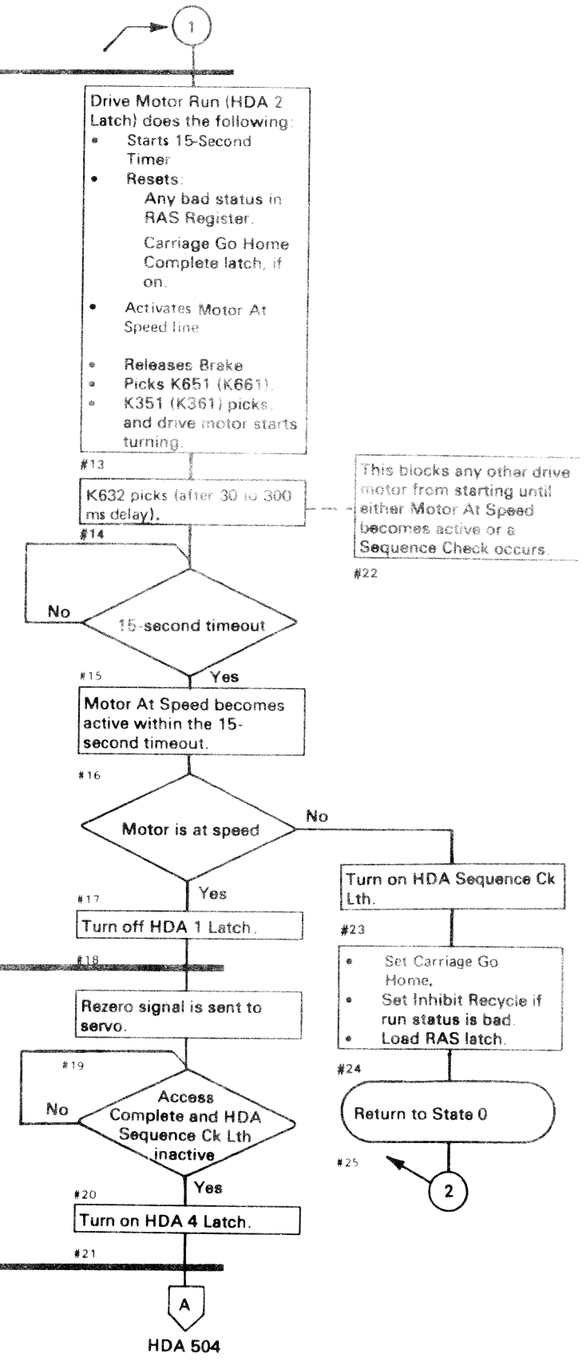
- 24 V Air Switch On is active
- HDA Sequence Ck Lth is inactive

STATE 3

To advance from State 3 to State 2, the following conditions must exist:

- Drive Motor Run is active
- State 3 is active
- 15-Second Timer ends.
- HDA Sequence Ck Lth is inactive

At completion of the 15-second timeout, the HDA sequence checks the Motor At Speed line. If the motor is at speed, the HDA 1 latch is turned off, advancing the sequence from State 3 to State 2. If the motor is not at speed, the HDA Sequence Ck Lth and Inhibit HDA Recycle latch are turned on and the sequence returns to State 0. An active HDA Sequence Ck Lth activates Sequence Complete, allowing the next drive in the string (with its Start/Stop switch in the Start position) to sequence to Ready.



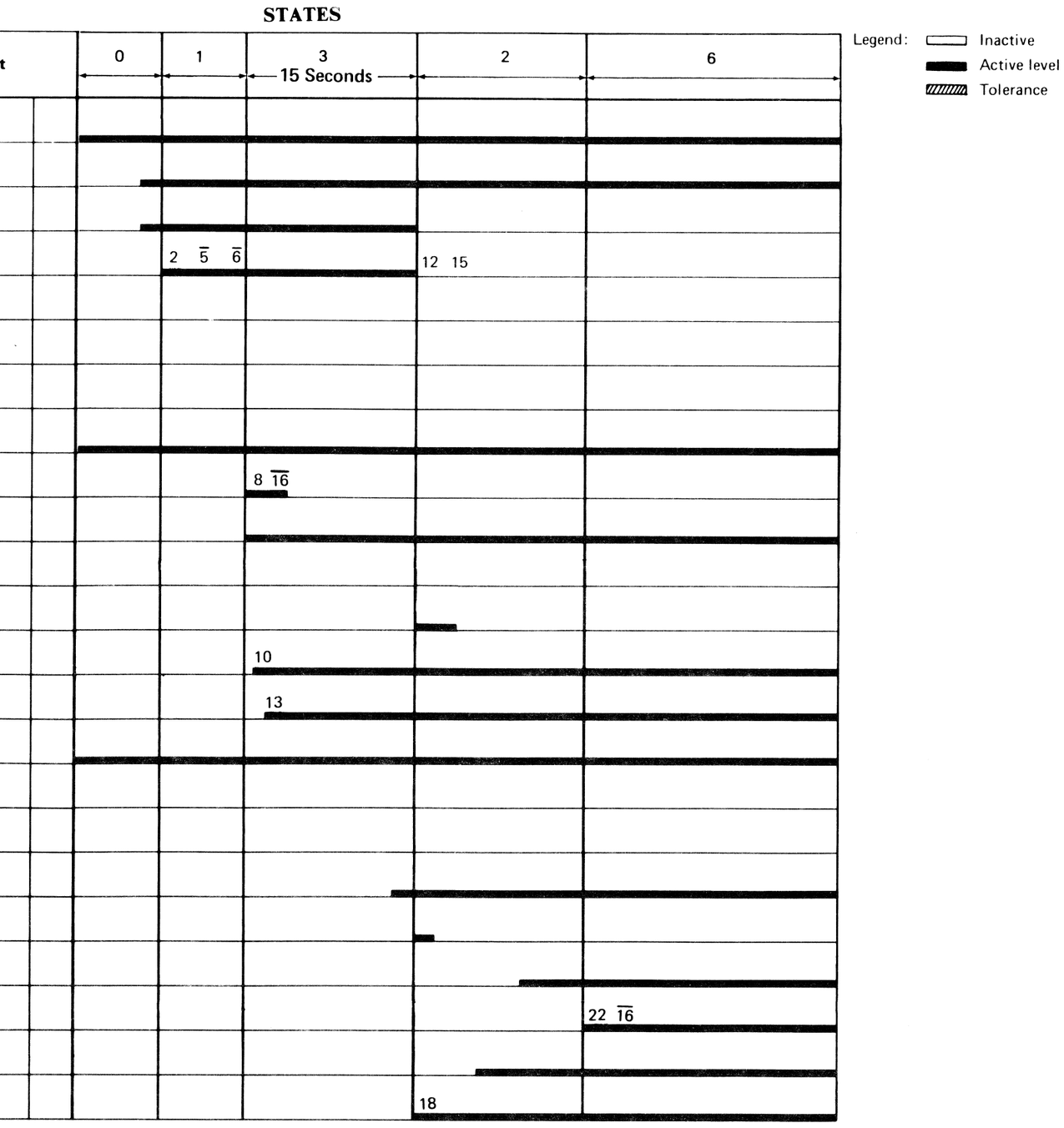
STATE 2

To advance from State 2 to State 6, the Rezero Access operation must be completed. Access Complete turns on the HDA 4 latch advancing the HDA sequence from State 2 to State 6 (Ready).

STATE 6 (Ready)

HDA READY SEQUENCE CHART

	Chart Line No.	Line Name	ALD	Test Point
States 0–1	1	+Air Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) S11
	2	+24 V Start Sw On A(B)	YA071 (YA081)	A1A5 (A1V5) D10
	3	K632 Start Drvs	YA055	
	4	+HDA 1 Latch A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B07
	5	+Control Reset	KF190 (KQ190)	
	6	+Inhibit HDA Recycle A(B) TP	KF140 (KQ140)	A1F2 (A1Q2) G05
States 1–3	7	–Initial Status Good	KF130 (KQ130)	
	8	–Start Timer A(B)	KF180 (KQ180)	A1F2 (A1Q2) M05
	9	HDA 2 Latch +Drive Motor Run A(B)	KF200 (KQ200)	A1F2 (A1Q2) D09
States 3–2	10	–15 Sec Delay A(B)	KF180 (KQ180)	A1F2 (A1Q2) M04
	11	K651(K661) Drive Motor Run	YA071 (YA081)	
	12	K351(K361) Drive Motor	YA071 (YA081)	
	13	–Run Status Good	KF190 (KQ190)	
	14	+HDA Sequence Ck Lth A(B) TP	KF160 (KQ160)	A1F2 (A1Q2) B12
States 2–6	15	+Motor At Speed	KF130 (KQ130)	A1F2 (A1Q2) U03
	16	+Sequence Rezero A(B)	KF150 (KQ150)	A1F2 (A1Q2) G12
	17	+HDA Ready A(B)	KE150 (KR150)	A1E2 (A1R2) J13
	18	+HDA 4 Latch A(B) TP	KF210 (KQ210)	A1F2 (A1Q2) D11
	19	–Access Complete A(B)	KF150 (KQ150)	A1F2 (A1Q2) P10
	20	K652 (K662) Drv Mtr Seq Comp	YA071 (YA081)	



HDA STOP SEQUENCE THEORY

The objectives of the HDA Stop sequence are to have the:

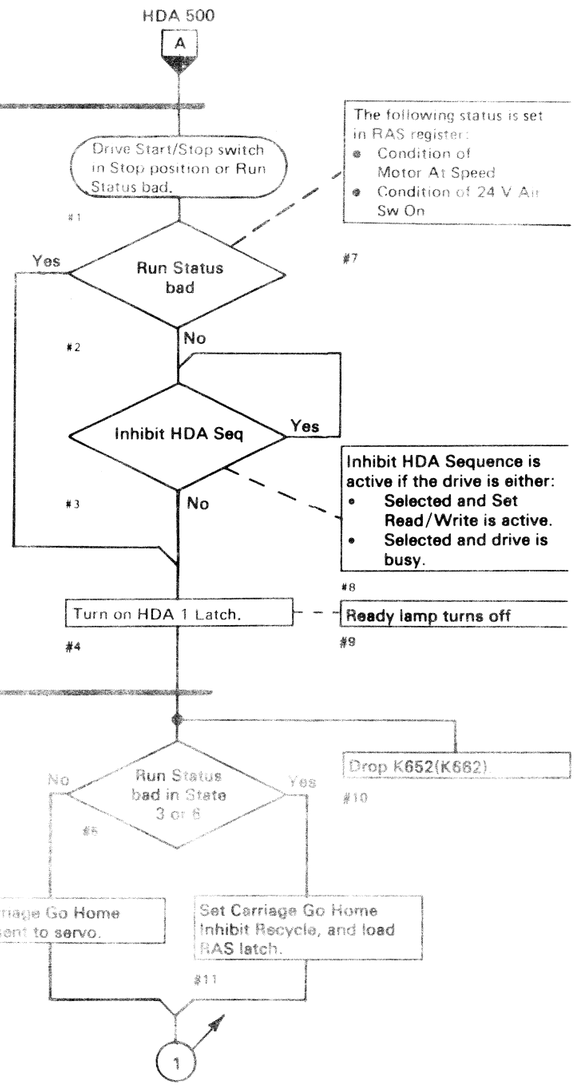
- Ready lamp turned off
- Carriage moved to Home position
- Motor stopped
- HDA sequence advanced to State 0

The output of the HDA State Sequence latches (HDA 1 latch, HDA 2 latch, and HDA 4 latch) is fed to the State Decoder. The binary value of these latches is decoded as States 0 to 7.

The Stop sequence steps from State 6 (Ready) through State 7, State 5, State 4, to State 0.

STATE 6

The HDA sequence advances from State 6 to State 7 when either the Start/Stop switch is placed in the Stop position or the Run Status is bad. The Inhibit HDA Seq line blocks the changing of states when Selected and Set Read/Write are active, or the HDA is busy.



STATE 7

The HDA checks the Run Status and sends Carriage Go Home to the servo. If Run Status is bad, the Inhibit HDA Recycle latch is set, signaling an HDA sequence error to the system. Run Timer Gated is activated by Carriage Go Home. Within 220 ms, Access Timeout is activated generating Go Home Complete. HDA Sequence 2 Latch is turned off, advancing the HDA sequence from State 7 to State 5. Carriage Go Home is reset in State 3 of the next HDA load sequence.

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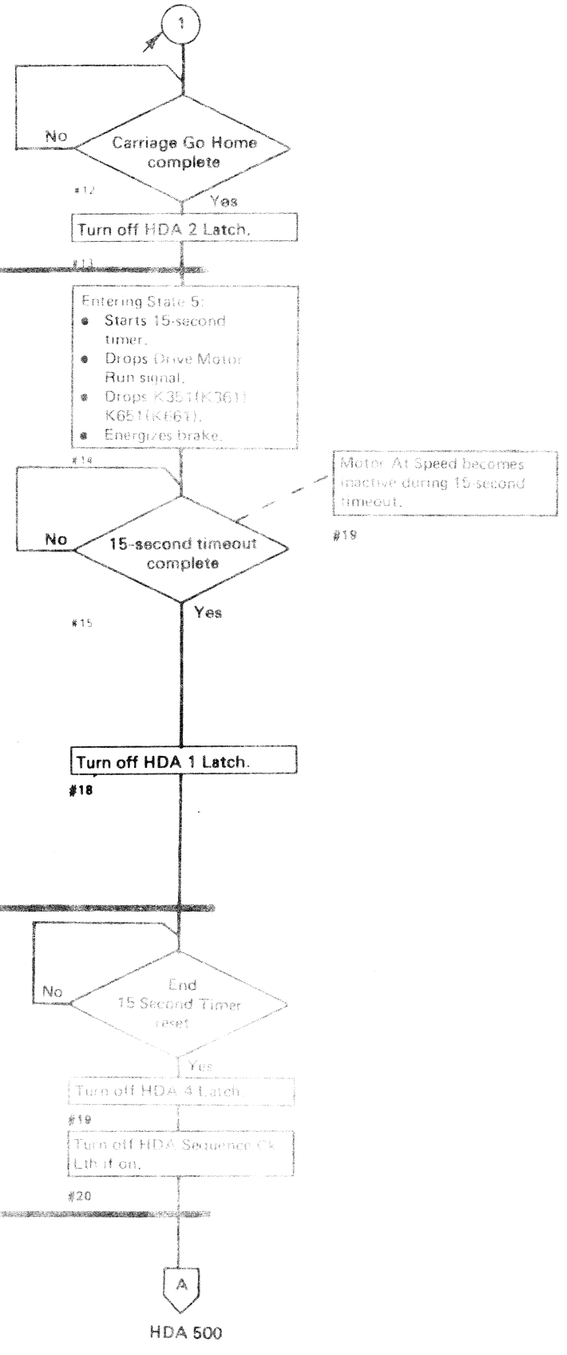


STATE 5

The following actions occur as the HDA sequence enters State 5:

- The 15-Second Timer starts.
- The Drive Motor Run line becomes inactive.
- The brake solenoid de-engerizes.

At completion of the 15-second timeout, the HDA sequence is set to State 4.

STATE 4

To advance from State 4 to State 0, the following lines must be in the indicated condition:

- End 15 Second Timer inactive.

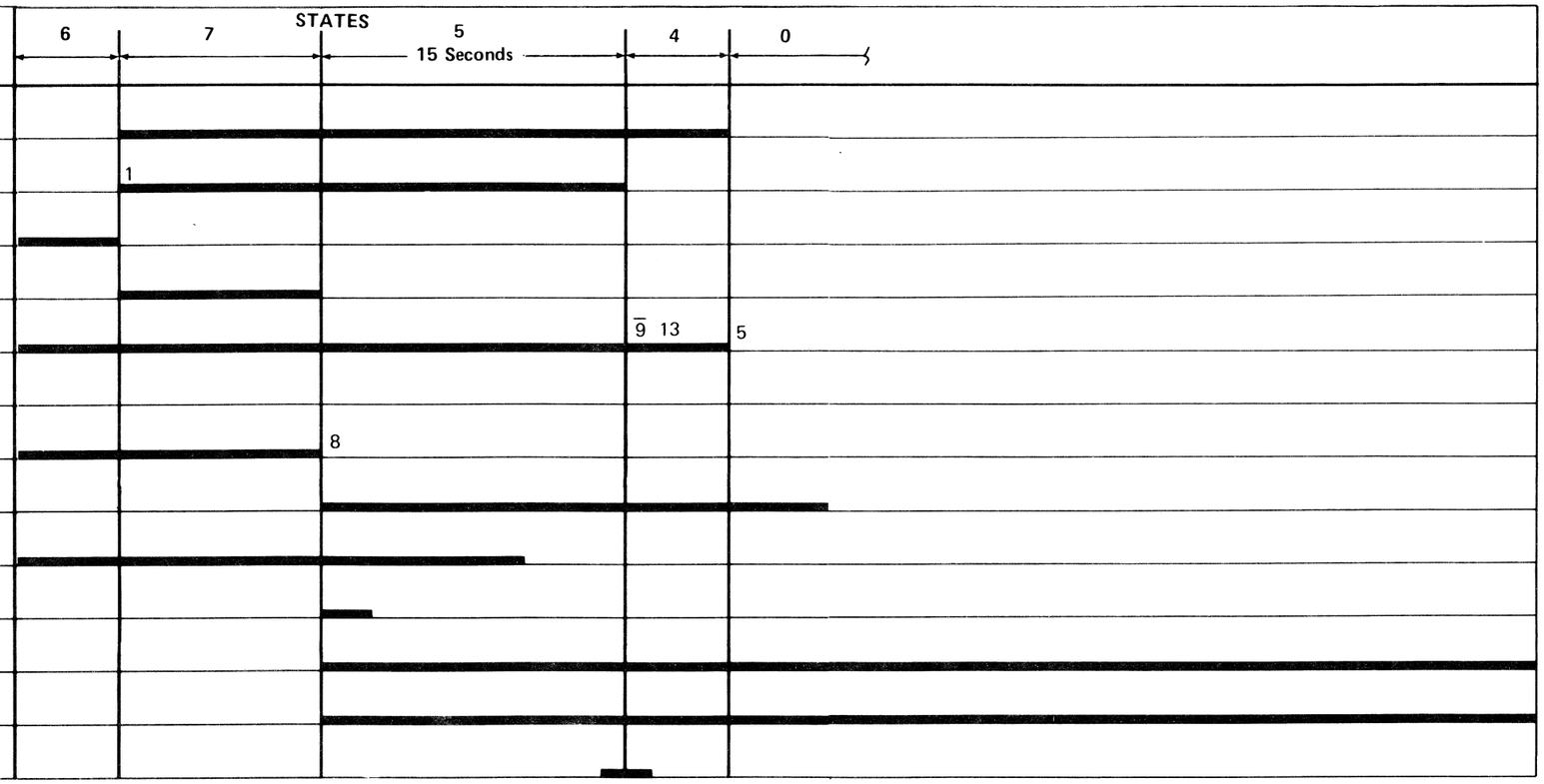
The 15-Second Timer was started in State 5. The End 15 Sec Delay becoming inactive and the State 4 lines reset the HDA 4 latch, advancing the HDA sequence from State 4 to State 0.

STATE 0

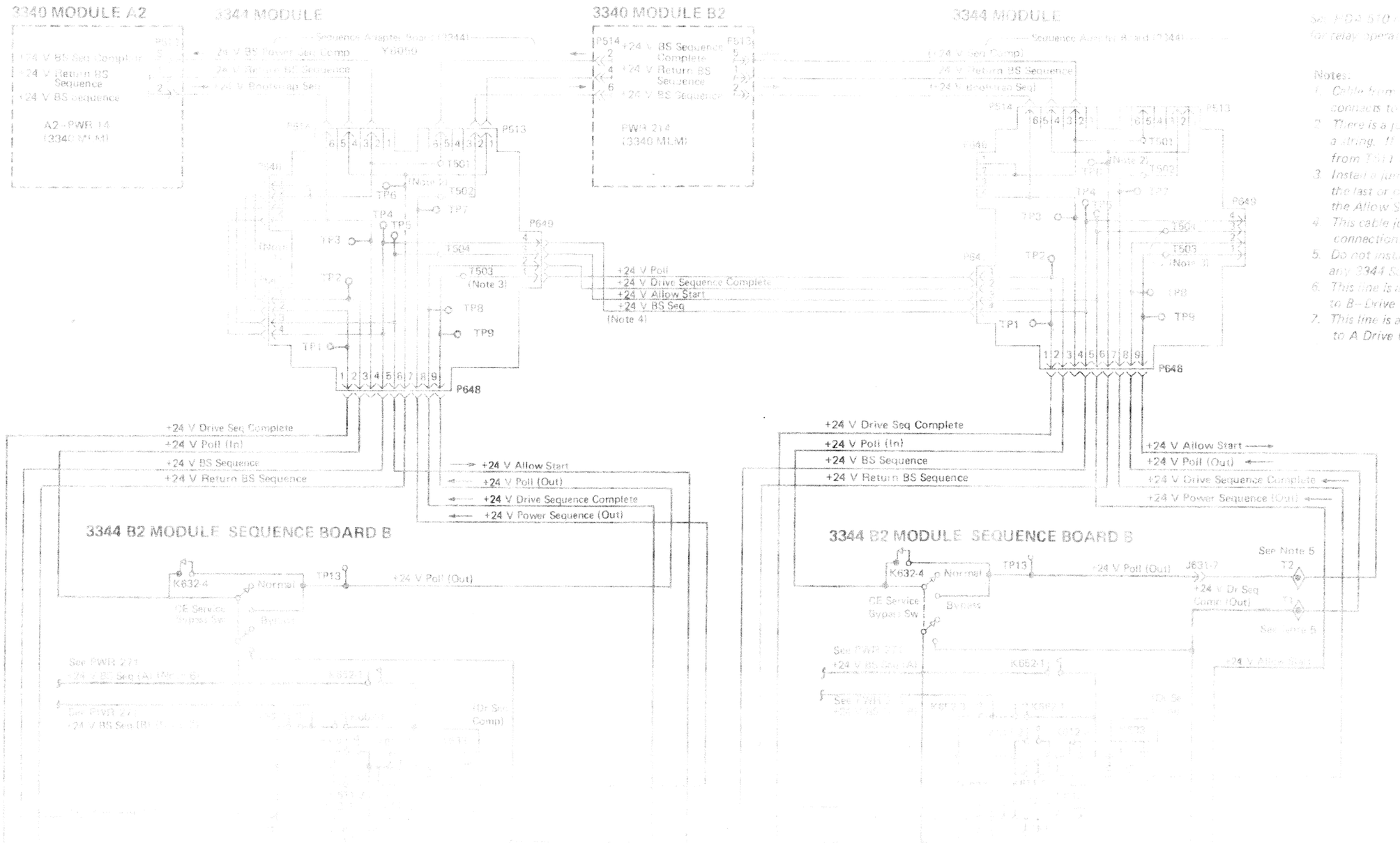
HDA STOP SEQUENCE CHART

Legend: Inactive
Active level
Tolerance

Chart Line No.	Line Name	ALD	Test Point
1	+24 V Stop Sw On A(B)	KF100 (KQ100)	A1F2 (A1Q2) U10
2	+HDA 1 Latch A(B) TP	KF190 (KQ190)	A1F2 (A1Q2) B07
3	+HDA Ready A(B)	KE150 (KR150)	A1E2 (A1R2) J13
4	−Carriage Go Home A(B)	KF150 (KQ150)	A1F2 (A1Q2) M02
5	+HDA 4 Latch A(B) TP	KF210 (KQ210)	A1F2 (A1Q2) D11
6			
7	+HDA 2 Latch A(B) TP	KF200 (KQ200)	A1F2 (A1Q2) D09
8	−Go Home Complete A(B)	KE120 (KR120)	A1E2 (A1R2) J11
9	+Motor At Speed	KF130(KQ130)	A1F2(A1Q2)U03
10	−Start Timer A(B)	KF180 (KQ180)	A1F2 (A1Q2) M05
11	K651(K661) Drive Motor Run	YA071 (YA081)	TP5 (TP10)
12	K351(K361) Drive Motor	YA071 (YA081)	TP16 (TP14)
13	−15 Sec Delay A(B)	KF180 (KQ180)	A1F2 (A1Q2) M04



HDA RELAY SEQUENCE DIAGRAM



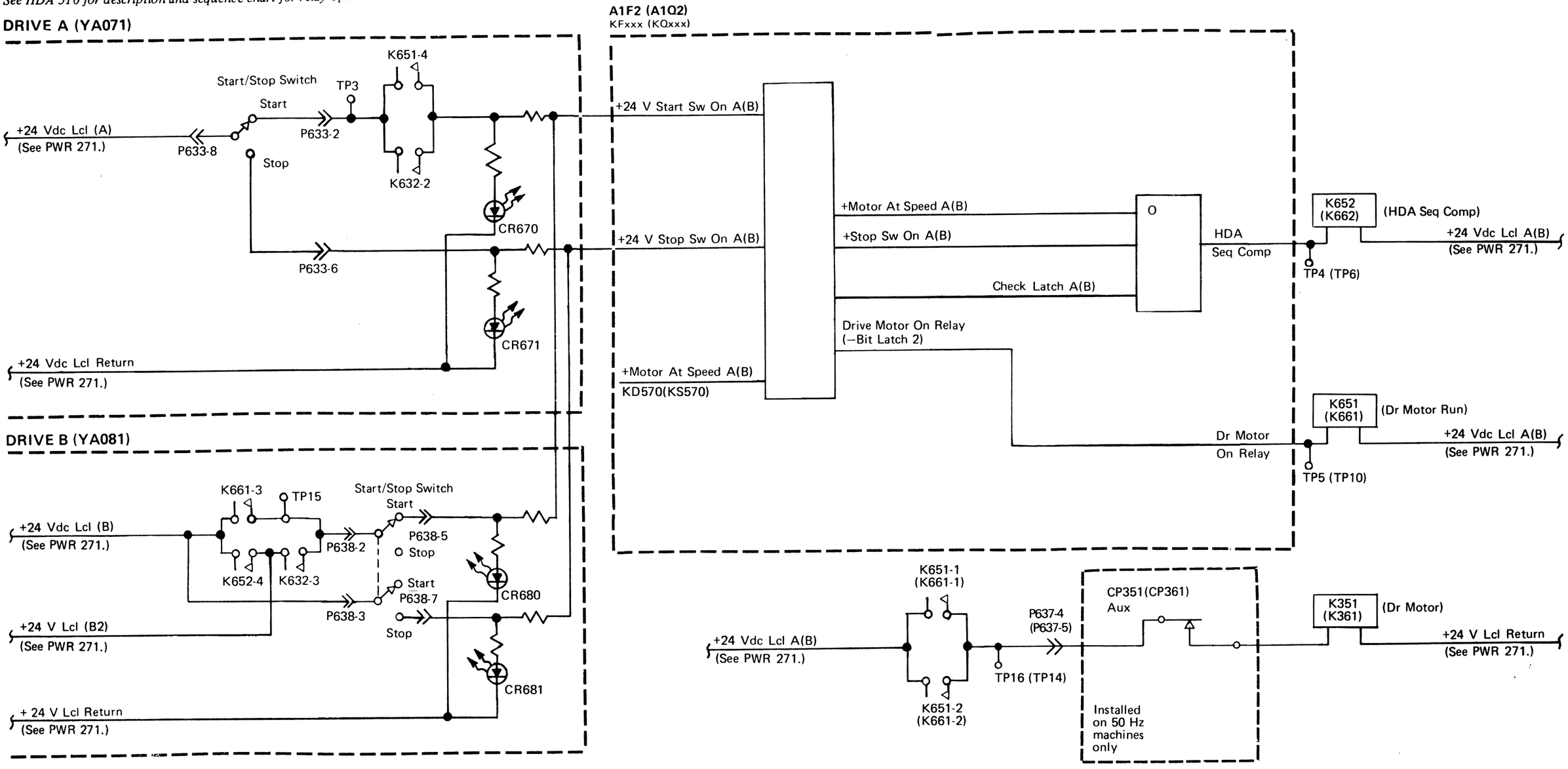
See HDA 510 for interposer and sequence cards for relay operation.

Notes:

1. *Cable from P649 to P647 is used only in first 3344 that connects to a 3340 string.*
2. *There is a jumper from T501 to T502 in the last 3344 of a string. If the last module is a 3340, there is a jumper from T511 to T512 (PWR 214-3340 MLM).*
3. *Install a jumper from T504 to T503 in the 3344 that is the last or only 3344 of a string. This jumper energizes the Allow Start relay, K631, in each 3344.*
4. *This cable just passes through a 3340 with no electrical connection.*
5. *Do not install jumper from T2 on B—T1 to T2 on any 3344 Sequence Board B (PWR 208).*
6. *This line is active only when the DE Power switch is set to B—Drive Off (A—On).*
7. *This line is active only when the DE Power switch is set to A Drive Off (B—On).*

HDA RELAY SEQUENCE DIAGRAM

See HDA 510 for description and sequence chart for relay operation.



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HDA RELAY SEQUENCE THEORY AND SEQUENCE CHART

See HDA 508 and 509 for Relay diagram and sequence chart. HDA 500 through 506 contain the overall HDA ready sequence and stop sequence theory.

Initial HDA Relay Sequence

Relay K603 (String Power Sequence Complete) picks when dc power is on in all modules of the string (Service Bypass switch off and Power Check LED off in all modules).

K603-2 point passes the +24 V Poll (through each module) to the last module where a jumper between T503 and T504 makes +24 V Allow Start line active. The Allow Start line picks K631 (Allow Start) in each module on the string. K603-2 also activates the line Drive Seq Comp.

Drive Seq Comp picks K632 (Start Drives) in the first drive on the string. K632 picking in any module drops the +24 V Poll line which drops K631 (Allow Start) in all modules. This is to keep all the following drives from sequencing until K633 (Dr Seq Comp) picks in the sequencing module.

Drive A Sequencing (HDA 509)

K632-2 N/O activates +24 V Start Sw On A to the A1F2 card (Lights Start LED CR670). The HDA advances from State 0 through State 3 (see HDA 500 through 502 for theory). K651 (Dr Motor Run) is picked when the HDA sequence enters State 3. K351 (Dr Motor A) is picked through K651 N/O points. Motor At Speed line is activated when the drive motor reaches 80% of speed and picks K652 (HDA Seq Comp).

Note: *K652 (HDA Seq Comp) can also be picked by the Start/Stop switch being in the Stop position (Stop LED CR671 being On) or by the HDA Sequence Ck Lth being active. This prevents Drive A from keeping the rest of the drives on the string from sequencing to Ready when either the Start/Stop switch is in the Stop position or an error occurs while the HDA is sequencing.*

Drive B Sequencing (HDA 509)

K632-3 N/O and K652-4 N/O activates +24 V Start Sw On B (with the Start/Stop switch in the Start position) to the A1Q2 card. The HDA sequence advances from State 0 through State 3 (see HDA 500 through 502 for theory). K661 (Dr Motor Run) is picked when the HDA sequence enters State 3. K361 (Dr Motor B) is picked through K661 N/O points. Motor At Speed line is activated when the drive motor reaches 80% of speed and picks K662 (HDA Seq Comp).

Note: *K662 (HDA Seq Comp) can also be picked by the Start/Stop switch being in the Stop position (Stop LED CR681 being On) or by the HDA Sequence Ck Lth being active. This prevents Drive B from keeping the rest of the drives on the string from sequencing to Ready when either the Start/Stop switch is in the Stop position or an error occurs while the HDA is sequencing.*

Next Module Sequencing (HDA 508)

In order to pass the sequence to the next module on the string, K633 (Dr Seq Comp) is picked through K652-3 (HDA Seq Comp A) and K662-1 (HDA Seq Comp B) points. K633 picking drops K632 (in the module that has just completed its sequence) which reactivates the +24 V Poll line. The +24 V Poll line repicks K631 in all modules. K633-4 N/O Drive Seq Comp (In) to the next module on the string. This relay sequence is repeated in each module on the string.

Note: *K633 (Dr Seq Comp) is held after a module has completed to prevent K632 from repicking. K633 is picked immediately through K612-3 N/O (+6 V Sense) points if dc power is not available to the A1 logic Board.*

Legend: Inactive / Active level / Tolerance

Relay Sequence Chart (HDA Sequence)

Chart Line No.	Line Name	ALD	Test Point	←-15 TO 30 Sec Logic Delay→
1	+24 Start Sw On A	YA071	A1A5 D10	
2	+24 Start Sw On B	YA081	A1V5 D10	
3	K633 Dr Seq Comp	YA055	TP8	7, 10
4	K631 Allow Start	YA055	TP1	5
5	K632 Start Drives	YA055	TP17	3, 4
6	K651 Dr Mtr Run (A)	YA071	TP5	
7	K652 HDA Seq Comp (A)	YA071	TP4	$\overline{1}$
8	K351 Dr Mtr (A)	YA071	TP16	8
9	K661 Dr Mtr Run (B)	YA081	TP10	
10	K662 HDA Seq Comp (B)	YA081	TP13	$\overline{2}$
11	K361 Dr Mtr (B)	YA081	TP14	9

MECHANICAL REMOVALS AND ADJUSTMENT CONTENTS

LOWER FRONT COVERS

Open the lower front covers 9 by inserting a screwdriver below the latch 10 and lifting the latch.

TOP FRONT COVER

1. Open the lower front covers 9 using the procedure above.
2. Open the top front cover 1 by inserting a screwdriver below the top cover latch handle 3, pushing the interposer hand release 4 toward the back of the machine, and then lifting the top cover handle.

TRIM PANEL

1. Open the top front cover 1 using the procedure above.
2. Remove the two screws from the trim panel 2 and remove the panel.

   Note: *It may be necessary to remove the lower front cover before removing the trim panel.*

LOWER REAR COVERS

Open the lower rear covers 7 by inserting a screwdriver below the latch 8 and lifting the latch.

TOP REAR COVER

1. Open the lower rear covers 7.
2. Loosen the top rear cover screw 6 and lift the top rear cover 5.

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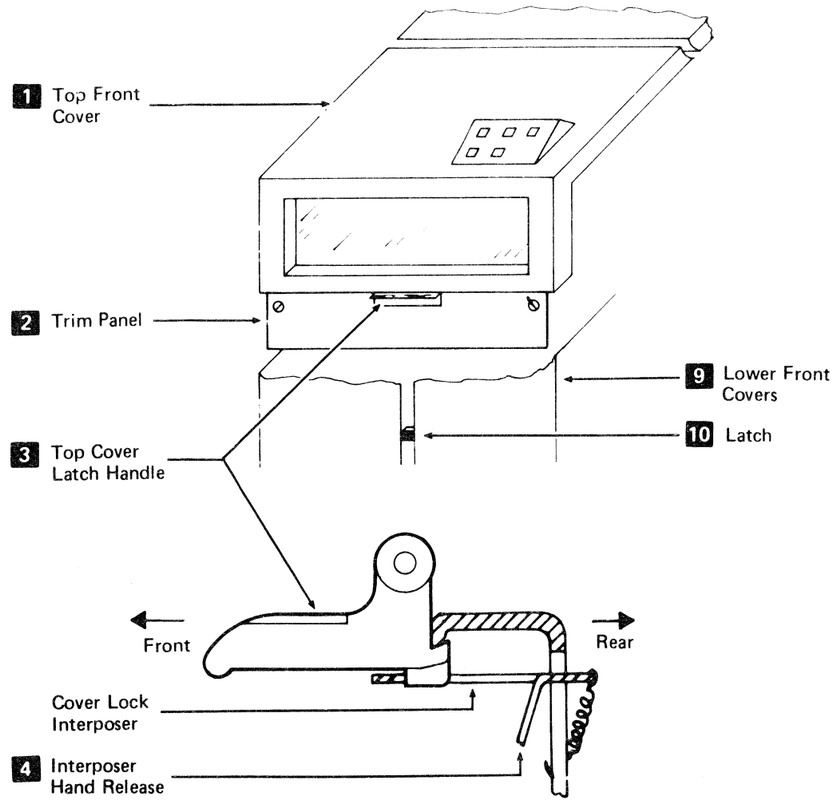
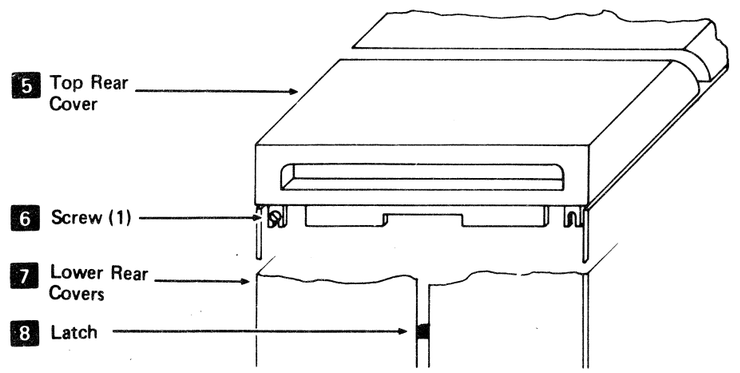




VOICE COIL CHECK, REMOVAL, AND REPLACEMENT

CHECKS

Purpose

This procedure describes the basic checks to determine if the voice coil should be replaced and the details for removal and replacement when it is necessary.

A broken or damaged coil or flexure wire can cause the following failure symptoms. These symptoms are described in the 1500 and 1600 Fault Symptom Codes.

- Ready drops
- Ready does not come up
- Overshoot Checks occur
- Servo Off-Track errors occur

Before proceeding with a voice coil removal and replacement, the following areas should be carefully checked:

- Verify that the HDA carriage is not binding (see HDA 712).
- Verify that the servo gain is properly adjusted (see ACC 800, Entry B).
- Verify that the drive motor and brake are not vibrating excessively (see HDA 715 and 720).
- Verify that the coil and flexure wires have an ohm reading of 4.0 to 4.6 ohms. Check this by raising the top of the rear cover (see HDA 705), unplugging the power amplifier cable to VCM terminals A and B **7**, and measuring with an ohmmeter. If the continuity (ohm reading) is within the range, replug the power amplifier cable and go to HDA 990. If the coil continuity is not within the range, remove and replace the voice coil using the procedure below.
- Verify that VCM terminals A and B are tight.

Bill of Material and Supplies

The voice coil replacement package may be ordered from Mechanicsburg using B/M 2345225. It contains:

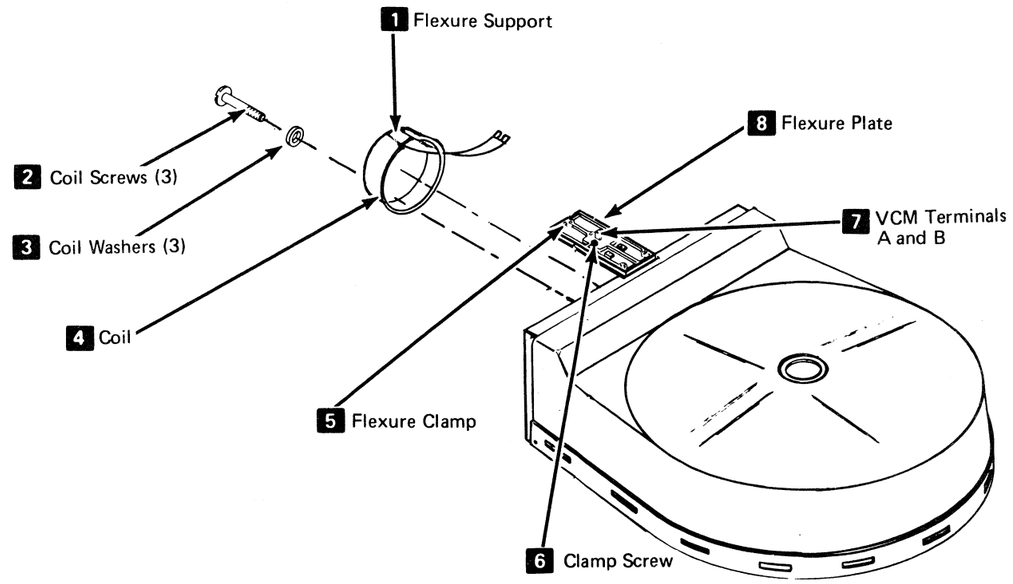
A new voice coil
Three stainless steel screws (4-40)
Three aluminum washers
Locquic Primer†
Loctite A Sealant†
Torque screwdriver
A bit (for the screwdriver)
Lint-free tissues

REMOVAL

1. Perform Steps 1 through 15 of the HDA Removal procedure on HDA 710 to remove the HDA. The HDA should be placed on a flat unobstructed surface. Be sure that the carriage is pushed back and latched as instructed in Step 11 of the removal procedure and observe the contamination instructions.
2. Tip and support the HDA about 2 or 3 inches (25.4 to 50.8 mm) with the coil end up. This keeps the carriage back into the HDA. Hold the carriage into the HDA when working on the coil. Maintain a clean atmosphere to prevent contaminating the open end of the HDA.
3. Cover the exposed center hole and the space between the carrier struts with lint-free tissues.
4. Loosen the clamp screw **6** that holds the end of the flexure wire to the flexure plate **8**. Slip the flexure wire out of the clamp.
5. Loosen the three screws **2** holding the coil to the carrier. The screws were originally installed with Loctite A Sealant, so they may be a little difficult to turn. Use the screwdriver bit which properly fits the heads of the screws. Remove and discard the screws and the three washers **3**. Remove the coil **4** by carefully slipping it off the strut without twisting or turning it. Do not allow the carrier to move back and forth.

REPLACEMENT

1. Clean off the Loctite particles that came out with the screws. Clean the outside diameter surface of the strut that will receive the new coil. Install the new coil. The fit may be loose or slightly tight. In either case, carefully install the coil squarely and smoothly. Do not allow the coil to bind. Locate the coil so that the slot in the flexure support **1** straddles the top strut. The coil must be bottomed on the three strut shoulders. When handling and installing the coil, do not kink or sharply bend the flexure, especially at the support end. Allow the flexure to flex and bend naturally between the coil and flexure plate. Guide the end of the flexure into the flexure clamp **5** until it bottoms, then tighten the clamp screw **6**. Check the continuity at VCM terminals A and B **7** for 4.0 to 4.6 ohms.
2. Completely coat the new screw threads with Locquic Primer. Lay the screws on a lint-free tissue with the heads down and allow them to dry for at least three minutes.
3. Hold one of the screws horizontally and apply one drop of Loctite A Sealant on the threads. Blot the screw immediately with a lint-free tissue to remove excess sealant. Fit the screw with a washer and insert it into one of the threaded holes in the strut. Tighten to 38 ± 3 inch ounce (27.36 ± 2.16 mm kgf) with the torque screwdriver. Do not undertighten or overtighten the screws. The sealant starts hardening immediately and is completely hard in 10 minutes.
4. Repeat Steps 2 and 3 with the other two screws. Check that all the screws are properly seated and that the washers are snug against the coil.
5. Check the coil continuity for 4.0 to 4.6 ohms at VCM terminals A and B.
6. Remove the lint-free tissues from around the strut and make sure that everything is clean around the open end of the HDA.
7. Install the HDA (see HDA 710).
8. Perform the HDA Checkout procedure (see HDA 711, Steps 1, 2, 5, and 6), then go to START 500.



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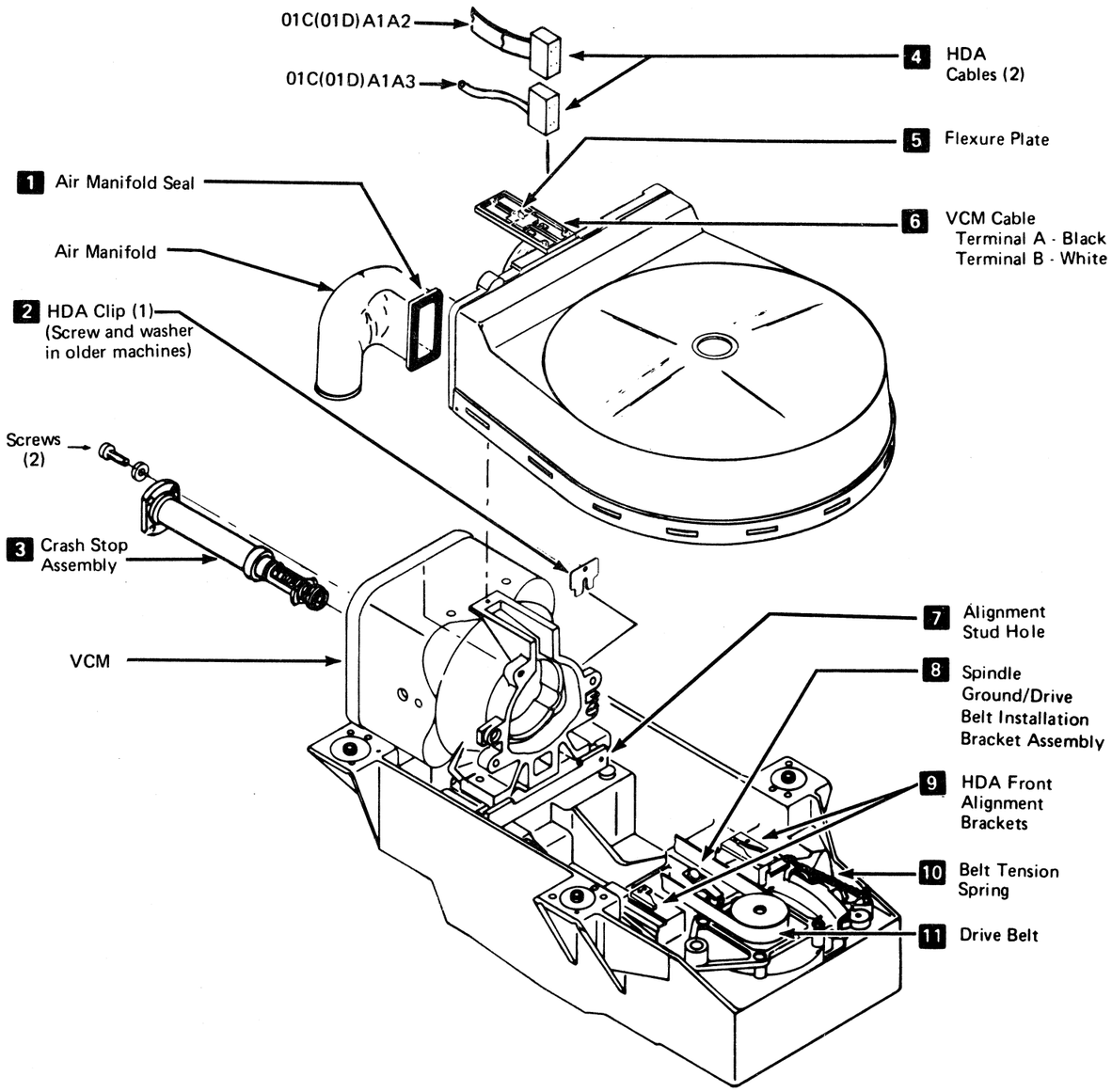
HDA REMOVAL AND REPLACEMENT PROCEDURE



HDA REMOVAL AND REPLACEMENT

See HDA 709 for keyed references.

REMOVAL

Caution: Before removing an HDA for replacement, be sure that the customer data, if possible, is either copied or destroyed by the customer.

HDA Part Numbers

Model B2 – P/N 2758811
Model B2F – P/N 2758813

} If ordering a new HDA for a machine that uses a screw instead of a clip 2, a clip must also be ordered.

Screw 2 10-32 x 0.375 inch long with lockwasher – P/N 234329: Washer 2 – P/N 23141 (See Step 9 of Removal procedure.)

HDA Clip 2 – P/N 2758497

To prevent contamination to the HDA while it is temporarily removed from the machine, obtain a plastic bag or other suitable container to cover it while it is removed from the machine.

1. Set the CE Mode switch to position A (Drive A) or B (Drive B).
2. Set the DC Power switch to OFF to remove the dc power from the drive being serviced (see LOC 14).

   Note: *The blower operates during this procedure.*
3. Open the top front cover and remove the trim panel (see HDA 705 for procedure).
4. Remove the belt tension spring 10 from the machine.
5. Open the top rear cover (see HDA 705 for procedure).
6. Remove the crash stop assembly 3 from the VCM:
   a. Insert the bobbin pushrod through the back of the VCM and thread it into the carrier.
   b. Loosen the two crash stop assembly screws. (On older style crash stop assemblies, the screws must be removed.)
   c. Turn the crash stop assembly clockwise 90 degrees to uncouple from the carriage.
   d. Use the bobbin pushrod to push the carriage in as far as possible.
   e. Unscrew the bobbin pushrod and remove.
   f. Pull the crash stop assembly from the rear of the VCM.
7. Disconnect the two HDA cables 4 from the rear of the HDA.
8. Disconnect the VCM cable 6 by slipping the wires from Terminal A and Terminal B.
9. Remove the one HDA clip 2 (this may be a screw and washer in older machines).
10. Raise the top rear cover enough to give clearance to the flexure plate 5. Slide the HDA toward the front of the machine approximately 1/2 inch (1.27 cm).

    Note: *The HDA may seal itself against the VCM and the two may be difficult to separate.*
11. Insert the bobbin pushrod through the back of the VCM and push the carriage in as far as possible. This engages the carriage latch mechanism and prevents the carriage mechanism from moving while the HDA is out of the machine. Remove the bobbin pushrod from the HDA.
12. Slide the HDA forward and lift from the machine.
13. Put the HDA on a flat unobstructed surface and place it in the plastic bag or other suitable container obtained earlier.

    Note: *If the HDA is shipped back to the plant, pack the HDA in the shipping container received with the replacement HDA. Include all documentation (EREP, API, PSA, PSB, PSC, Customer Symptoms) associated with this replacement.*
14. Check the air manifold seal 1 for surface damage.
15. Check the VCM alignment (see VCM replacement procedure, Step 1 on HDA 725).

REPLACEMENT

See HDA 709 for keyed references.

1. Raise the top rear cover enough to give clearance to the flexure plate.

   Note: *Be sure the smooth side of the belt is against the HDA pulley. Place the belt on the belt installation bracket assembly 8, so that the HDA pulley sets inside the belt loop. Loop the other end of the belt around the drive motor pulley (be sure that the motor remains toward the front of the machine while replacing the HDA).*
2. Set the HDA in the machine and align the rear alignment stud with the alignment hole 7 and the HDA feel with the front alignment brackets 9.
3. Slide the HDA into place and install the HDA clip 2. Check the seating of the Air Manifold Seal 1.
4. Ensure that the blower is operating. Allow the blower to purge the HDA for a minimum of 15 seconds before proceeding.
5. Re-install the crash stop assembly 3.
   a. Turn the crash stop assembly 90 degrees from its coupled position and slowly insert it into the back of the VCM.
   b. When the back of the crash stop assembly is flush with the VCM, rotate the crash stop assembly 90 degrees counterclockwise to couple it with the carriage. If the crash stop assembly cannot be rotated, insert the bobbin pushrod through the back of the VCM and thread it into the carrier. Pull the carriage toward the back of the machine just enough to allow the crash stop assembly to be rotated 90 degrees.
   c. Tighten the crash stop assembly screws.
6. Install the belt tension spring and check that the drive belt is in place.
7. Reconnect the HDA and VCM cables.

   Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.
8. Bring HDA to Ready condition.
9. Install back panel jumper between: C4D09 (T4D09) and ground to put servo in zero mode.
10. Check for carriage binding by inserting the bobbin pushrod into the back of the VCM and threading it into the coupler. Move the carriage between the outer and inner stops with the pushrod. If resistance or binding is felt (over 100 grams), use the procedure on HDA 712 to correct the problem. Return here and continue once the trouble is corrected.
11. Remove the bobbin pushrod and jumper.
12. Press Attention button to bring HDA to Ready.
13. Install trim panel, restore power and exit to the HDA Checkout procedure on HDA 711.

HDA CHECKOUT PROCEDURE

BASIC CHECKOUT (ALL HDAs)

1. Start the drive and verify that the Ready lamp comes on. If the Ready lamp does not come on, recheck the installation of the HDA. Verify that the drive belt is installed correctly with the smooth side of the belt against the pulley, the HDA cables are plugged into the correct connectors, the DC Power switch is in the Both Drives On position, and the CE Service Bypass switch is in the Off position.

   If still unable to bring the drive to a Ready condition after rechecking the installation, exit to HDA 110, Entry D, then return here when the problem is corrected.

2. Allow the HDA to stabilize by running for 2 minutes before continuing with the checkout procedure.

3. Adjust the servo gain using the procedure on ACC 800, Entry B. Return here and continue when the procedure is complete.

4. Run the linked series of microdiagnostic routines A1 through AE. Start with routine A1. If errors occur, exit to the MICRO section and follow the instructions under the first failing Error Code. *If the storage control control is a System/3 DSA, it may be necessary to initialize the CE track by using routine 10 of Section C12 before running microdiagnostics. Refer to the System/3 Diagnostic Users Guide for loading procedure.*

5. Run microdiagnostic routines B1, B2, and AB. If errors occur, exit to the MICRO section and follow the instructions under the first failing Error Code.

6. If attached to a 3880: perform a diagnostic reset ('30' option) from the CE panel. If attached to a 3830-2 or ISC: load the Fault Symptom Code Generator by replacing the functional microprogram disk and entering '30'.

7. If a new HDA has been installed, continue below. If the original HDA is being reinstalled, exit to START 500.

8. Run OLT T3344PSC in default mode to build the SD (skip displacement) directory. If the SD directory already exists (PSC message) it is not necessary to rewrite it. See OLT Users Guide (D99-3340A) for procedure.

9. Run OLT T3340PSA (for running instructions see 3340 OLT section). *If the storage control is a System/3 DSA, use program C1B. If the OLT does not run error free,* the HDA must be initialized by the customer using one of the following initialization utilities:

   IBC DASDI
   IEH DASDR
   $INIT (System/3 DSA only)

   If the HDA cannot be initialized, run EREP and exit to START 100 with the error data.

10. The HDA Checkout procedure is complete. Exit to START 500.

HDA CARRIAGE BINDING CHECKOUT PROCEDURE

CARRIAGE CHECKOUT FOR BINDING:

1. Ensure that the blower is running before continuing. If the blower is not running, use YB020 to isolate the trouble before returning here and continuing.
2. Bring HDA to Ready condition then install a jumper C4D09 (T4D09) to ground to put servo in zero mode.
3. Insert the bobbin pushrod into the back of the VCM and thread into the carriage.
4. Manually move the carriage from the outer stop to the inner stop.
5. Binding is present if any roughness is felt or if the force required to move the bobbin pushrod is greater than 100 grams.
6. If the binding condition is present, continue with the HDA Carriage Binding Procedure below.

Note: *Remove bobbin pushrod and jumper when procedure is complete.*

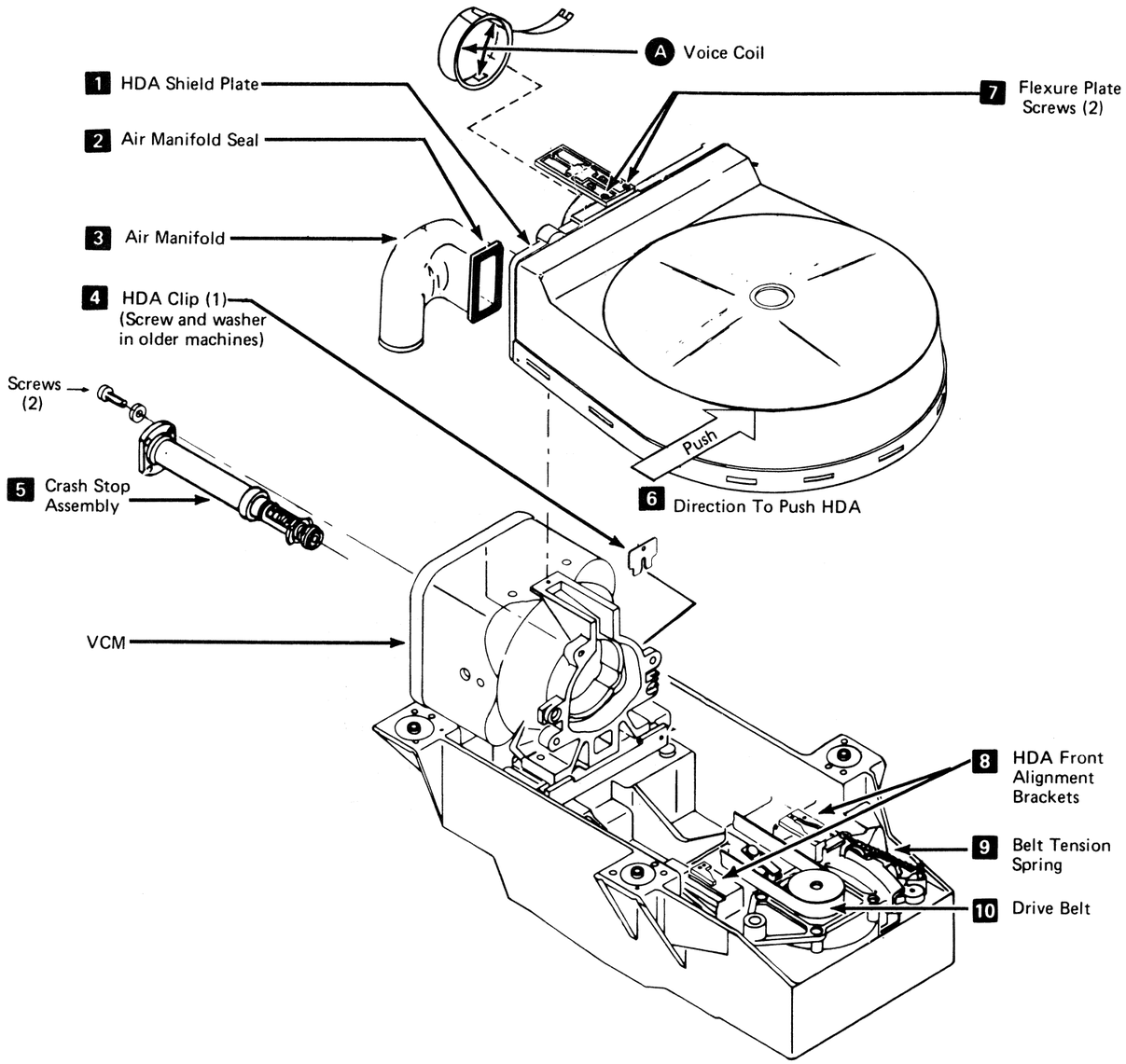
HDA CARRIAGE BINDING PROCEDURE

The following procedure can be used to determine the cause of the carriage binding condition:

1. Check that the air manifold 3 is nearly parallel to the HDA shield plate 1 with only the air manifold seal 2 touching the HDA. Loosen the air manifold mounting screws and reposition the air manifold as necessary.
2. Check that the HDA feet are in the front alignment brackets 8. If the feet are in the alignment brackets, push the HDA to the right 6 to check for proper registration of the feet in the alignment brackets. Recheck the HDA for binding.
3. Remove the crash stop assembly (see Step 8 of the HDA Removal Procedure on HDA 710) and recheck for binding. If the binding condition disappears, re-install the crash stop assembly and recheck for binding. If binding occurs with the crash stop assembly installed but disappears with the assembly removed, replace the crash stop assembly.

   Note: *It may be possible to eliminate the binding condition by rotating the crash stop assembly on its axis by 180 degrees. If the binding condition disappears, this should be considered only as a temporary repair until a new crash stop assembly is available.*
4. Loosen the two screws 7 holding the flexure plate to the HDA and recheck the carriage for binding. If the binding condition still exists, tighten the flexure plate screws and continue with the next step below. If the binding condition disappears when the flexure plate is loose, reposition the flexure plate and tighten the screws. Recheck for binding.
5. Power down the HDA, remove the belt tension spring 9 and remove the HDA clip 4 to allow the HDA to find its natural position. Replace the HDA Clip, replace the belt tension spring, and recheck the carriage for binding.
6. Remove the HDA (see HDA 710 for procedure). Check the voice coil motor (VCM) alignment (see HDA 725 for procedure).

   Note: *Do not replace HDA until Step 7.*
7. Check for voice coil binding using the following procedure:
   a. Use a soft tip marker, such as a felt-tip or fiber-tip pen (do not use a graphite pencil), to mark the inner surface of the voice coil bobbin A between each of the voice coil supports.
   b. Re-install the HDA and check for binding using procedure on this page. If binding condition is still present, remove the HDA and check the marks on the voice coil bobbin A for smearing or rubbing. If smearing or rubbing is present replace the voice coil. See HDA 708 for procedure.
8. If binding condition still exists, replace the HDA.



HDA CABLE SWAP PROCEDURE

PURPOSE

The HDA Cable Swap procedure describes the swapping of HDA cables between two HDAs in the same module. After the cables are swapped, HDA-A uses the HDA-B logic and HDA-B uses the HDA-A logic. The operator panels and addresses are not interchanged; therefore, the Drive A Start/Stop switch still controls spindle A drive motor.

PROCEDURE

1. Vary both drives offline.
2. Set both Start/Stop switches to Stop.
3. Set Service Bypass switch to On.
4. Swap voice coil cables as follows:

   Note: *Remove voice coil slide-on connectors before removing ground screw.*

   a. Remove voice coil slide-on connectors from the flexure plate of both drives.

   b. Remove the screw and ground lead from both drives.

   c. Place Drive B ground lead on the voice coil of Drive A and secure with a screw. Repeat the step for Drive B.

   d. Place Drive B voice coil leads on the Drive A voice coil and Drive A leads on Drive B voice coil. The connectors must be installed in the location as shown in Figure 2.

5. Interchange the cables (see Figure 1) at the HDAs:

   a. 01C-A1A2 with 01D-A1A2.

   b. 01C-A1A3 with 01D-A1A3.

6. Set the Service Bypass switch to Off.
7. Set Drive B Start/Stop switch to the Start position and within three seconds, set Drive A Start/Stop to the Start position. If the switches are not turned on in this sequence, the drives do not come Ready.

   Note: *If Ready is dropped on either drive for any reason, place both Start/Stop switches in the Stop position, then repeat Step 7 above to restore the drives to the Ready condition.*

8. Adjust Servo Gain. See ACC 800, Entry B.
9. Run the following microdiagnostics in default mode:

   a. Linked series Routines A1 through AE.

   b. Routine B1.

   c. Routine B2.

   Note: *All microdiagnostic failures must be corrected before running OLTs to avoid erroneously writing over customer data.*

10. If there are no microdiagnostic failures, the following OLT may be run:

    a. T3340 PSA (see OLT 20).

    b. T3340 PSB (see OLT 24).

    c. For System/3 DSA, run Section C12 or C1B. See System/3 Diagnostic Users Guide for loading procedures.

11. Restore all cables to the original configuration, re-adjust the Servo Gain (see ACC 800, Entry B), then return to MAP.

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Figure 1. Voice Coil Motors (Rear View)

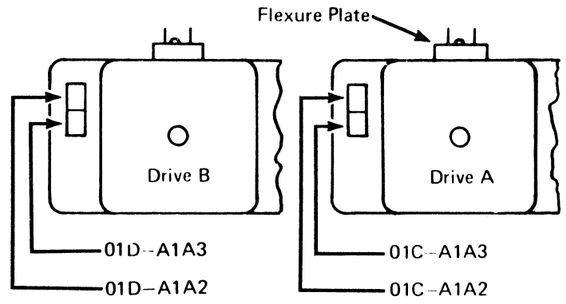
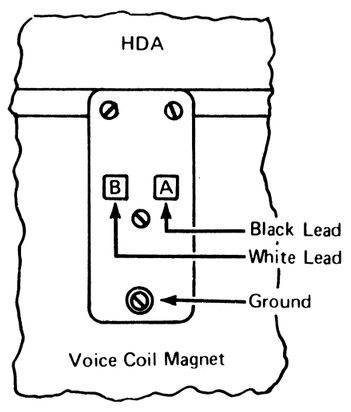


Figure 2. Flexure Plate (Top View)



DRIVE MOTOR REMOVAL AND REPLACEMENT

REMOVAL

1. Remove the HDA using the procedure on HDA 710.
2. Unplug the motor power plug 11 from the AC Compartment.
3. Label and disconnect the wires going to EC601 7 using one of the following procedures:
   a. For 60 Hz machines, label and disconnect the two cable leads going to EC601.
   b. For 50 Hz machines, the removal of a drive motor requires both drives to be off or the drive thermal circuit protector (CP351/CP361) auxiliary points (YA/YB/YC055) to be jumpered. The thermal bypass jumper must be installed before disconnecting the four cable leads at EC601 and must remain installed during motor removal and replacement
4. Remove the retainer clip from the motor pivot pin 6.
5. Remove the two mounting screws 9 from the motor support assembly and slide the assembly out of the way.
6. Lift the motor out of the frame.

REPLACEMENT

1. Check the DC Power Switch (see LOC 14) to ensure that dc power is removed from the drive and check that the Start/Stop switch is in the Stop position.
2. If installing a new drive motor, remove the motor pulley 4 and brake 12 from the old motor and install it on the new motor. If the pulley is bonded, the motor and pulley must be replaced as an assembly.
   a. Remove the brake 12.
   b. Remove the retaining bolt 1, keyed washer 2, washers 8, and motor pulley 4, if not bonded.
   c. Install the motor pulley 4 on the new motor, ensuring that the keyed washer 2 is engaged in the drum motor keyway 5 and the pulley keyway 3. The retaining bolt 1 must be tightened to the following torque value:
      100 ± 5 inch pounds (115.2 ± 5.8 cm kgf).
   d. See HDA 720 for brake replacement.
3. Replace the drive motor in the reverse order of the removal procedure. Do not re-install the HDA. Continue with Step 4 below after the drive motor is installed.

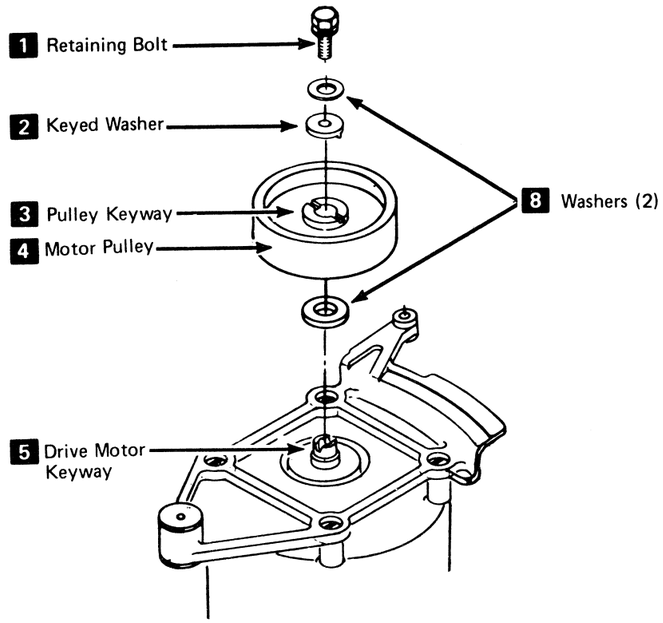
   Note: *(For 50 Hz only) If the drive motor thermal auxiliary points were bypassed during the removal and replacement, remove the bypass jumper before proceeding.*
4. Check the direction of the drive motor rotation if a new motor is being installed. If re-installing the old drive motor, go to Step 5.
   a. Restore dc power.

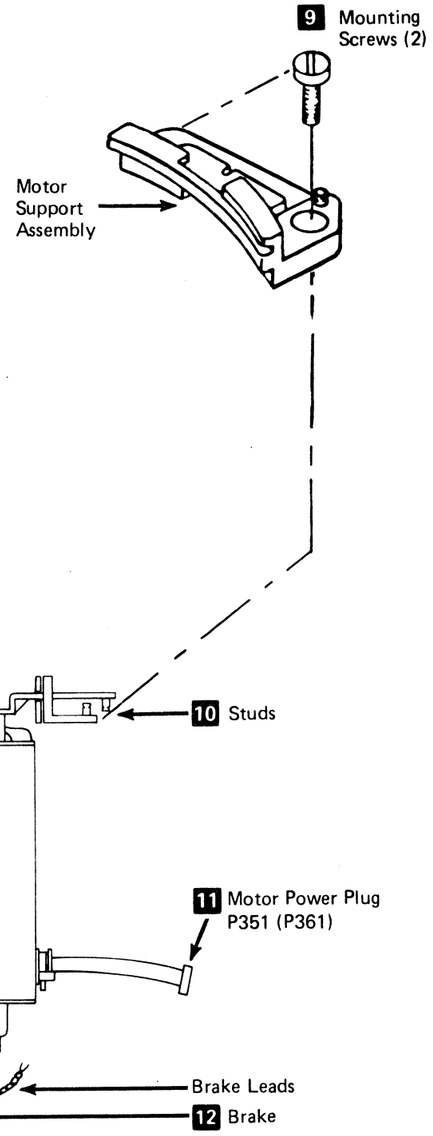
   Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.

   DANGER
   Keep hands and objects clear of the motor. The motor will pivot toward the front of the machine when the Start/Stop switch is placed in the Start position.

   b. Hold the flapper valve door open in order to close the Air switch. See HDA 760 for the location.
   c. Set the Start/Stop switch to the Start position.
   d. Observe the drive-motor pulley for direction rotation. The pulley should rotate counterclockwise when viewed from the top of the 3344.
   e. If the drive motor rotation is clockwise, reverse the motor wires in the drive motor connector P351(P361) 11 as follows:
      For 60 Hz – Positions 1 and 2
      For 50 Hz Wye (380/440 Vac) – Positions 1 and 2
      For 50 Hz Delta (200/220/235 Vac) – Positions 1 and 2, and Positions 4 and 5.
      Logic for the drive motor is shown on ALD page YB020.
   f. Remove dc power from the drive.
5. Replace the HDA using the procedure on HDA 710.
6. Restore power to the drive, set te CE Mode switch to Off (center position), and exit to START 500.

   Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.





DRIVE MOTOR BRAKE REMOVAL, REPLACEMENT, AND CHECKOUT

REMOVAL

Caution: The brake assembly spring tension adjusting collar is preset at time of manufacture. Excessive wear or damage to the HDA results if this adjustment is altered in the field.

1. Set the CE Mode switch to position A (Drive A) or B (Drive B).
2. Set the DC Power switch (see LOC 14) to Off for the drive being serviced.
3. Open the front covers (see HDA 705 for the procedure).
4. Disconnect the drive-motor power plug **5** from the AC Compartment.
5. Remove the two brake leads from EC601b and EC601f **2** .
6. Remove the four brake mounting screws **6** .
7. Slide the brake down and off the motor shaft.

REPLACEMENT

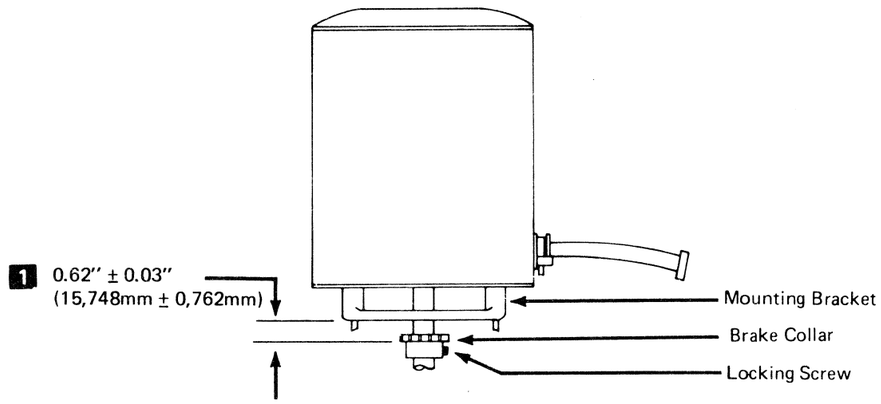
1. Check the brake collar adjustment **1** , between the lower surface of the mounting bracket and the lower surface of the brake collar.
2. Adjust the collar, if required, by loosening the locking screw and repositioning the collar on the drive-motor shaft. Retighten the locking screw.
3. Center the brake disk **7** in the brake assembly **4** .
4. Slide the brake assembly over the brake collar. If necessary, rotate the brake assembly to match the slotted disk with the splines on the brake collar. Push the brake assembly up until its upper surface is mated with the mounting bracket on the drive motor.
5. Replace the four brake mounting screws **6** .
6. Replace the two brake leads in EC601b and EC601f **2** .
7. Ensure that the Start/Stop switch is in the Stop position.
8. Turn the DC Power switch to the Both Drives On position.

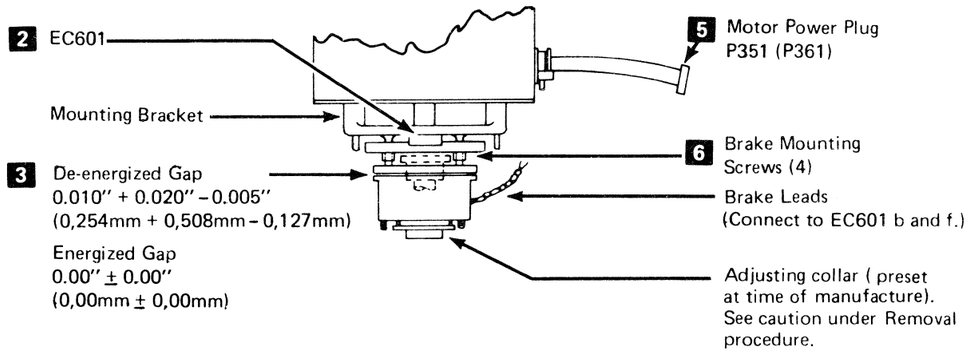
   Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is Ready after power is restored.
9. Continue with Checkout procedure.

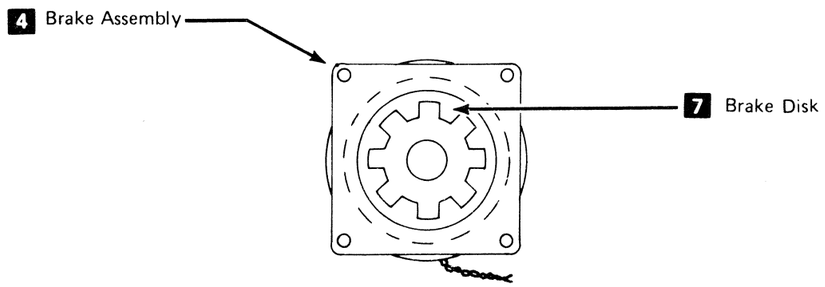
CHECKOUT

1. Remove the motor power plug, P351(P361) **5** .
2. Set the Start/Stop switch to the Start position; this energizes the brake.

   Note: *The brake remains energized for 15 seconds. To re-energize the brake, set the Start/Stop switch to the Stop position, then back to the Start position.*
3. Check that there is no air gap at **3** . If there is no air gap, go to the next step. If there is an air gap, check for +24 Vdc between EC601f (−) and EC601b (+) **2** . If the voltage is +24 Vdc, the brake is defective; replace it. If the voltage is not +24 Vdc, troubleshoot the brake circuit. See YB071(YB081).
4. Set the Start/Stop switch to the Stop position; this de-energizes the brake.
5. Check the air gap at **3** for 0.010" +0.020" −0.005" (0,254mm +0,508mm −0,127mm) clearance. If the air gap is not within tolerance, the brake is defective and should be replaced. The air gap is not adjustable.
6. Replace the motor plug.
7. Make the drive Ready.
8. Set the Start/Stop switch to the Stop position.
9. Check that the brake stops the HDA within 8 to 14 seconds.
10. Set the CE Mode switch to Off and exit to START 500.







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VOICE COIL MOTOR REMOVAL AND REPLACEMENT

REMOVAL

1. Remove the HDA using the procedure on HDA 710.
2. Remove the VCM cable ground wire screw and ground wire **4** .
3. Remove the three Voice Coil Motor (VCM) mounting screws **1** .

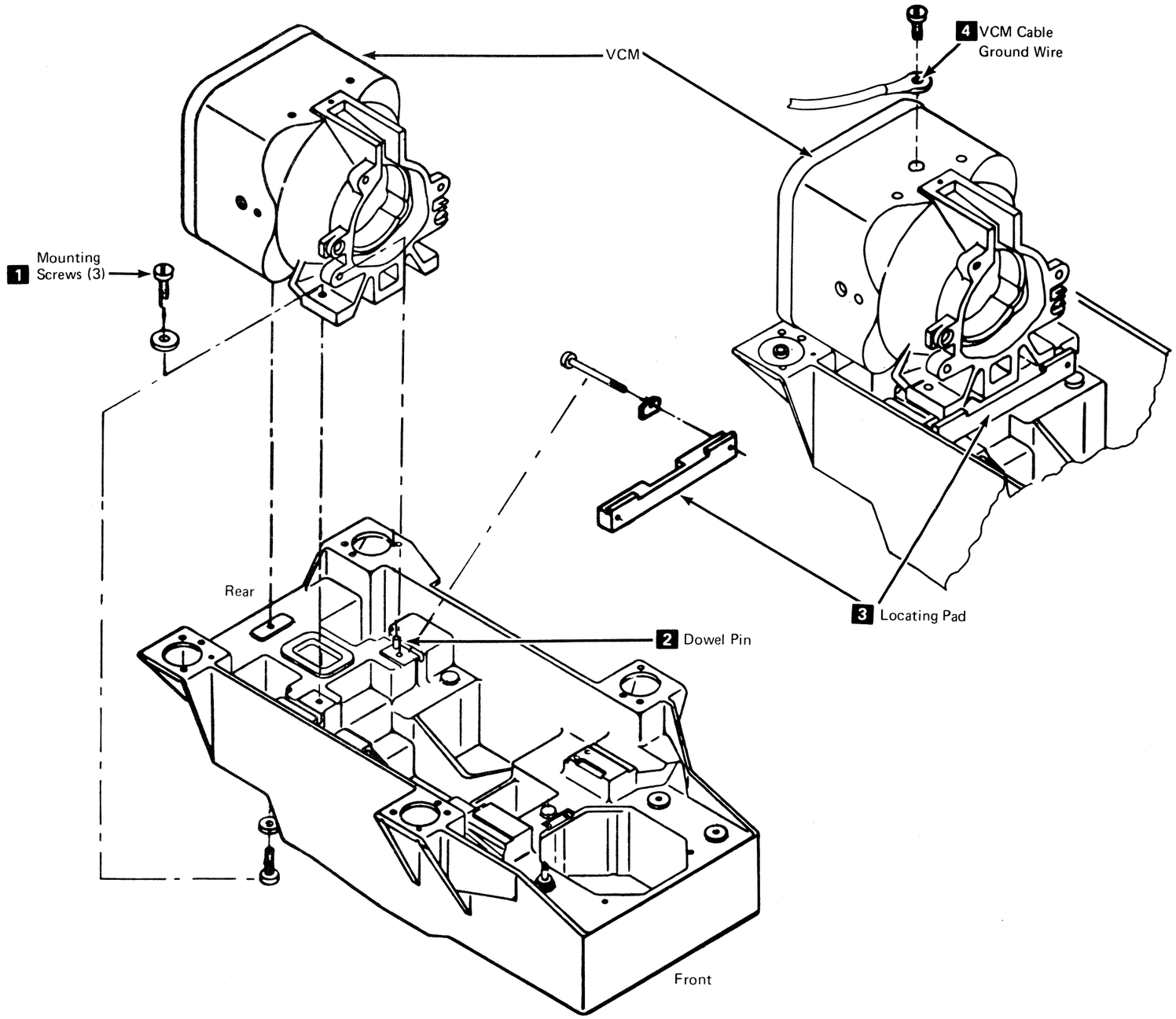
   DANGER

   The VCM exceeds 75 pounds.
4. Remove the VCM from the drive.
5. Leave dc power off until the new VCM is installed.

REPLACEMENT

1. Place the VCM on the baseplate and slide the VCM:
   a. Forward against the locating pad **3** .
   b. To the side against the dowel pin **2** .
2. Replace and tighten the VCM mounting screws.
3. Visually recheck the VCM for registration using Replacement Steps 1a and 1b.
4. Re-install the VCM cable ground wire **4** .
5. Replace the HDA using the procedure on HDA 710.
6. Restore all power, set the CE Mode switch to Off (center position), and exit to START 500.

   Caution: When restoring power, do not turn the Drive DC Power switch past the Both On position. If the other drive in the module is online, verify that it is still Ready after power is restored.



BLOWER MOTOR REMOVAL AND REPLACEMENT

REMOVAL

1. Open the front and back covers. See HDA 705 for the procedure.
2. Set the Service Bypass switch to On and then trip CB230 to remove power from the 3344 blower.
3. Remove the prefilter housing from the front of machine:
   a. Loosen the inner clamp **2** between the prefilter housing and the blower.
   b. Remove the two filter retainer springs **7** , slide the filter to the right using the top and bottom hand notches **6** , and remove the filter.
   c. Remove the three mounting screws **8** .
   d. Separate the prefilter housing from the blower and remove from the machine.
4. Roll the flexible coupler **1** back onto the blower housing.
5. Fold the upper left and right corners of the logic gate seal **3** back onto the logic gate air/pivot housing separating the logic gate air/pivot assembly from the blower assembly.
6. Remove the blower motor with the blowers attached:
   a. Remove the AC Compartment cover and disconnect the blower motor wires from TB211. Disconnect the ground wire. See LOC 2 or 12.
   b. Loosen the blower motor cable clamp in the AC Compartment and remove the cable.
   c. Separate the quick disconnects for the two blower motor thermal wires and free the wires from any tie straps.
   d. Remove the two blower motor mounting screws **5** and slide the blower assembly from the machine.
7. Examine all flexible fittings **1** , **2** , and **3** for signs of deterioration.

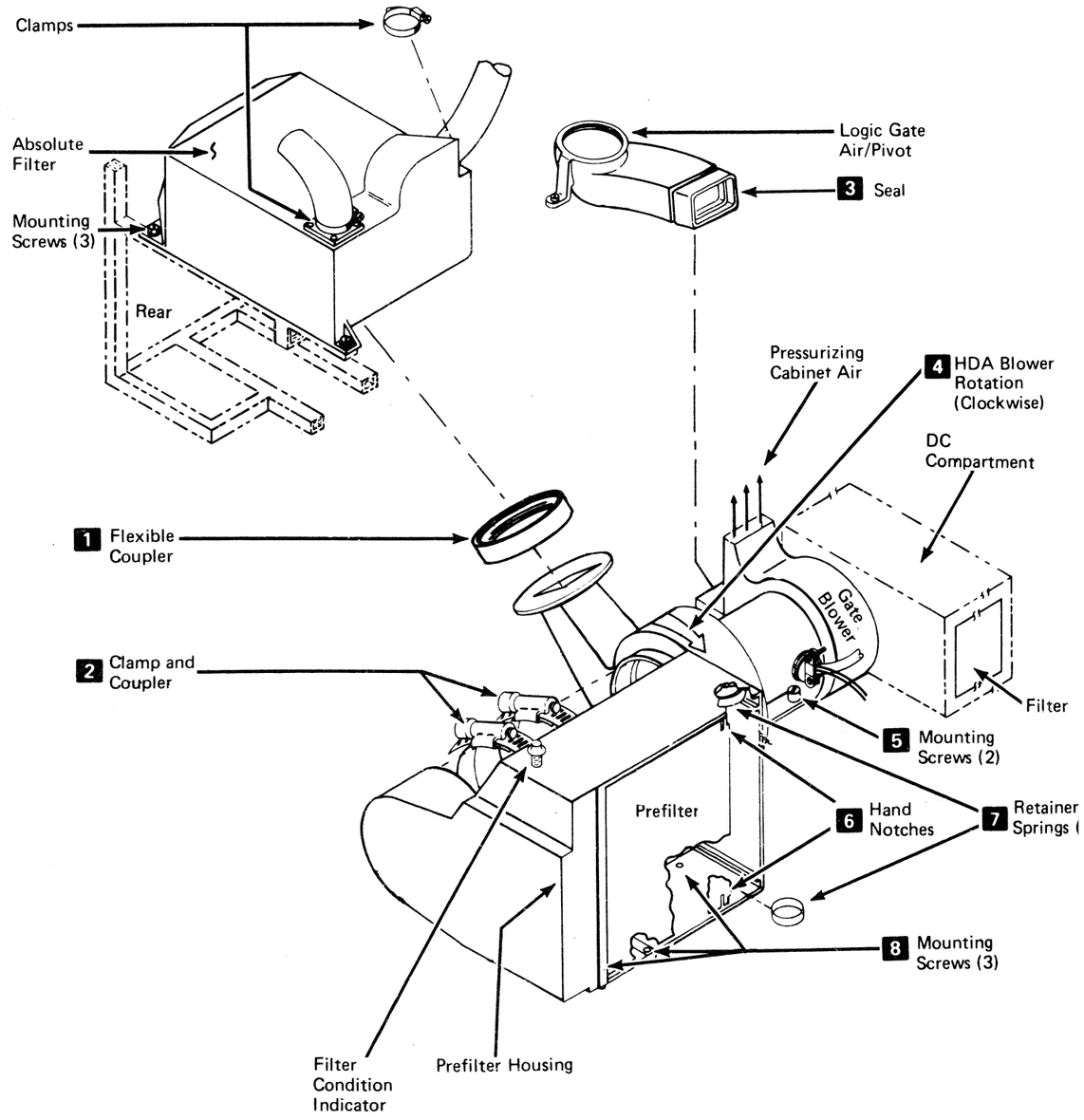
REPLACEMENT

1. If installing a new blower assembly, remove all flexible fittings (flexible coupler **1** , clamp and coupler **2** , and seal **3**) from the old unit and install on the new unit.
2. Replace in the reverse order of removal.

   DANGER
   Before beginning step 3, be sure hand and other objects are clear of the blower assembly.

3. Check the blower motor rotation after the blower is reinstalled and before reinstalling the prefilter housing by restoring power and checking the Air LED CR672 (CR682) and by visually checking direction of rotation **7** . If the rotation of the blower is correct, the LED will be on.
4. If rotation is incorrect, remove power and reverse any two motor wires (1 and 2, 2 and 3, or 1 and 3) at TB211. Check blower rotation again.
5. Restore power, close covers, and exit to START 500.

   Caution: When restoring power, do not turn the Drive DC Power switch past the Both On position. If the other drive in the module is online, verify that it is still Ready after power is restored.



AIR SWITCH REMOVAL AND REPLACEMENT

REMOVAL

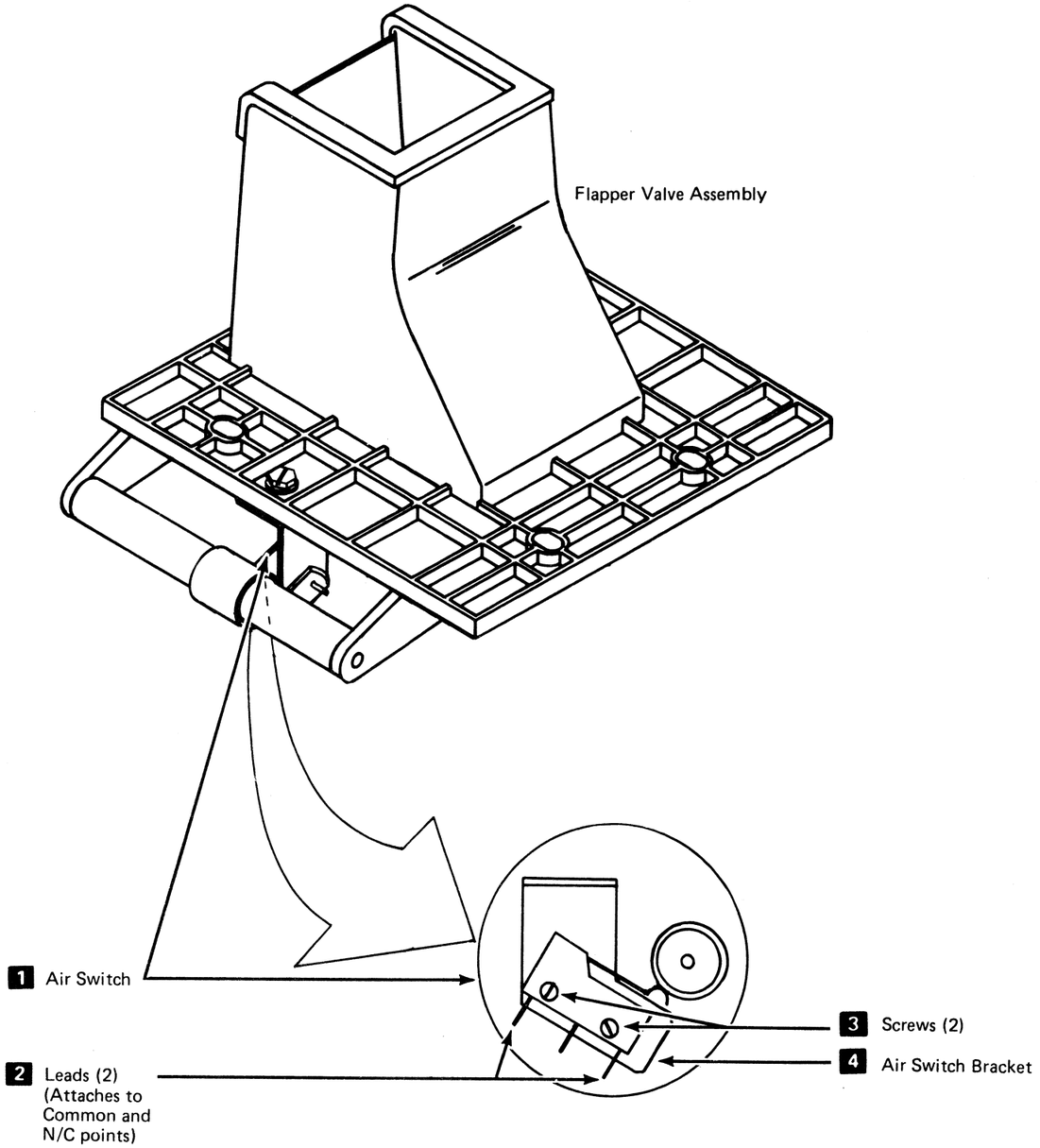
An Air Switch, one for each drive, is located on the flapper valve assembly which is mounted under the rear of the baseplate. See diagram on HDA 760.

1. Open the rear covers (see HDA 705 for procedure).
2. Set the CE Mode switch to position A (Drive A) or B (Drive B).
3. Set the DC Power switch (see LOC 14) to the Off position for the drive being serviced.
4. Remove the two leads **2** from the Air switch N/C and common contacts.
5. Remove the two mounting screws **3** and the Air switch **1** .

REPLACEMENT AND ADJUSTMENT

1. Replace the Air switch in the reverse order of removal.
2. Adjust the switch in its bracket **4** so the N/C points just make contact when the door is 0.125" ± 0.063" (3,175 mm ± 1,60 mm) from the closed position.
3. Restore power, set the CE Mode switch to Off (center position), and exit to START 500.

Caution: When restoring power, do not turn the Drive DC Power switch past the Both On position. If the other drive in the module is online, verify that it is still Ready after power is restored.



PREFILTER CHECK AND REPLACEMENT

PREFILTER CHECK

Tools

1. Differential pressure gauge P/N 2200120
2. Hose and adapter assembly (one required) P/N 2200635

Purpose

The prefilter check indicates whether or not filter replacement is required. Replace the prefilter if the air pressure drop across the filter exceeds 0.90 inches of water. The normal pressure drop across a new filter is approximately 0.50 inches of water. A vacuum is created between the outside atmosphere and the air input to the blower as the filter becomes clogged.

Test

1. Open left front cover and remove the cap from the nipple 1 on the prefilter housing.
2. Hold the gauge with its face vertical and with the zero dial position at the top. With the gauge still vertical, turn the Zero Set screw 5 until the needle indicates 0.50 inches of water on the pressure side of the scale (the left 0.5 on the gauge) 4 . The gauge is now calibrated and must be held in a vertical position while the reading is taken.
3. Connect a tube 3 between the gauge fitting 8 and the nipple 1 . With the blower running and the gauge held in a vertical position, the needle should indicate between 0.5 inches of pressure 4 and 0.4 inches vacuum 7 for an unclogged air filter.

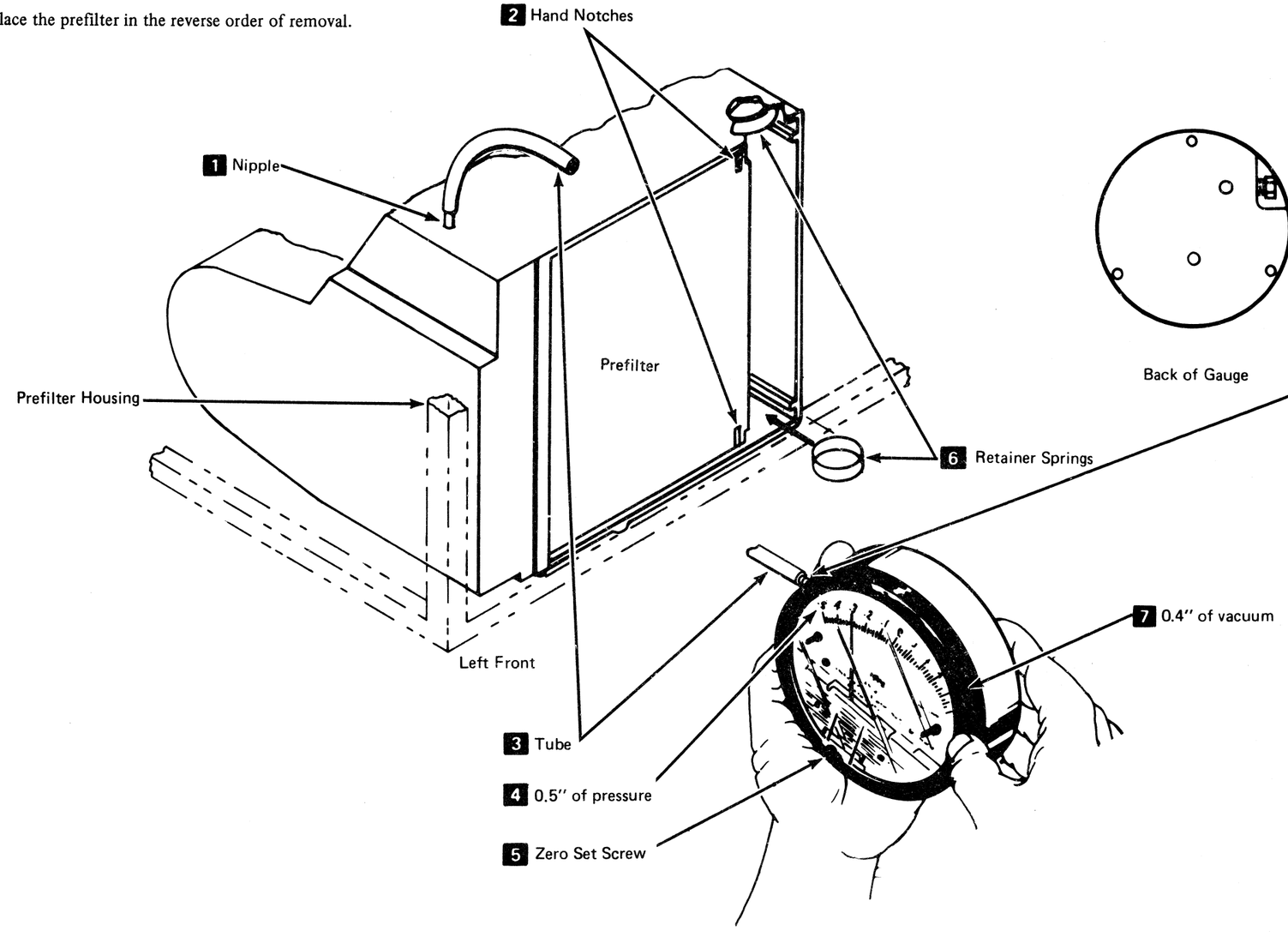
REMOVAL

Caution: Turn AC power off prior to removal of filter. Make sure customer is not using any associated machines that may be affected by turning AC power off.

1. Open the front covers (see procedure on HDA 705).
2. Remove the two retainer springs 6 by sliding them forward and out of their slots.
3. Use the top and bottom hand notches 2 to slide the prefilter to the right.
4. Remove the prefilter from the front of the prefilter housing.

REPLACEMENT

Replace the prefilter in the reverse order of removal.



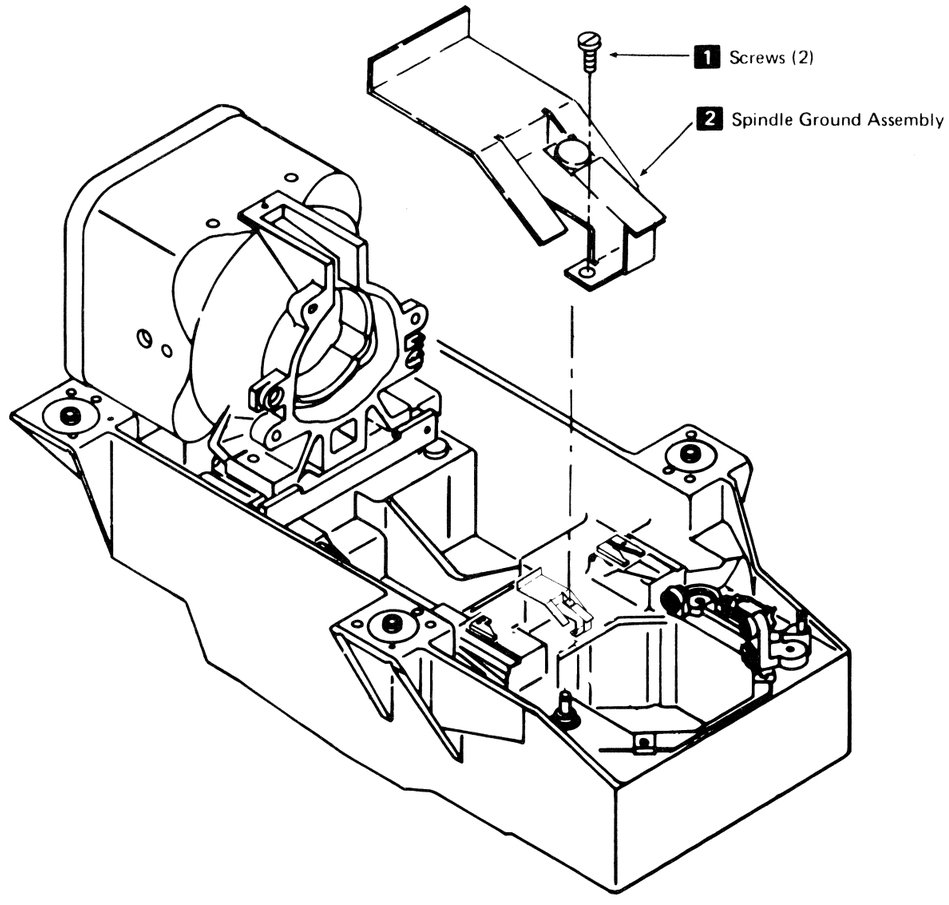
SPINDLE GROUND REMOVAL AND REPLACEMENT

REMOVAL

1. Remove the HDA (see HDA 710 for procedure)
2. Remove the two spindle ground screws **1** and spindle ground assembly **2**

REPLACEMENT

1. Replace in the reverse order of removal.
2. Exit to START 500.



HDA BELT REMOVAL AND REPLACEMENT

HDA BELT REPLACEMENT

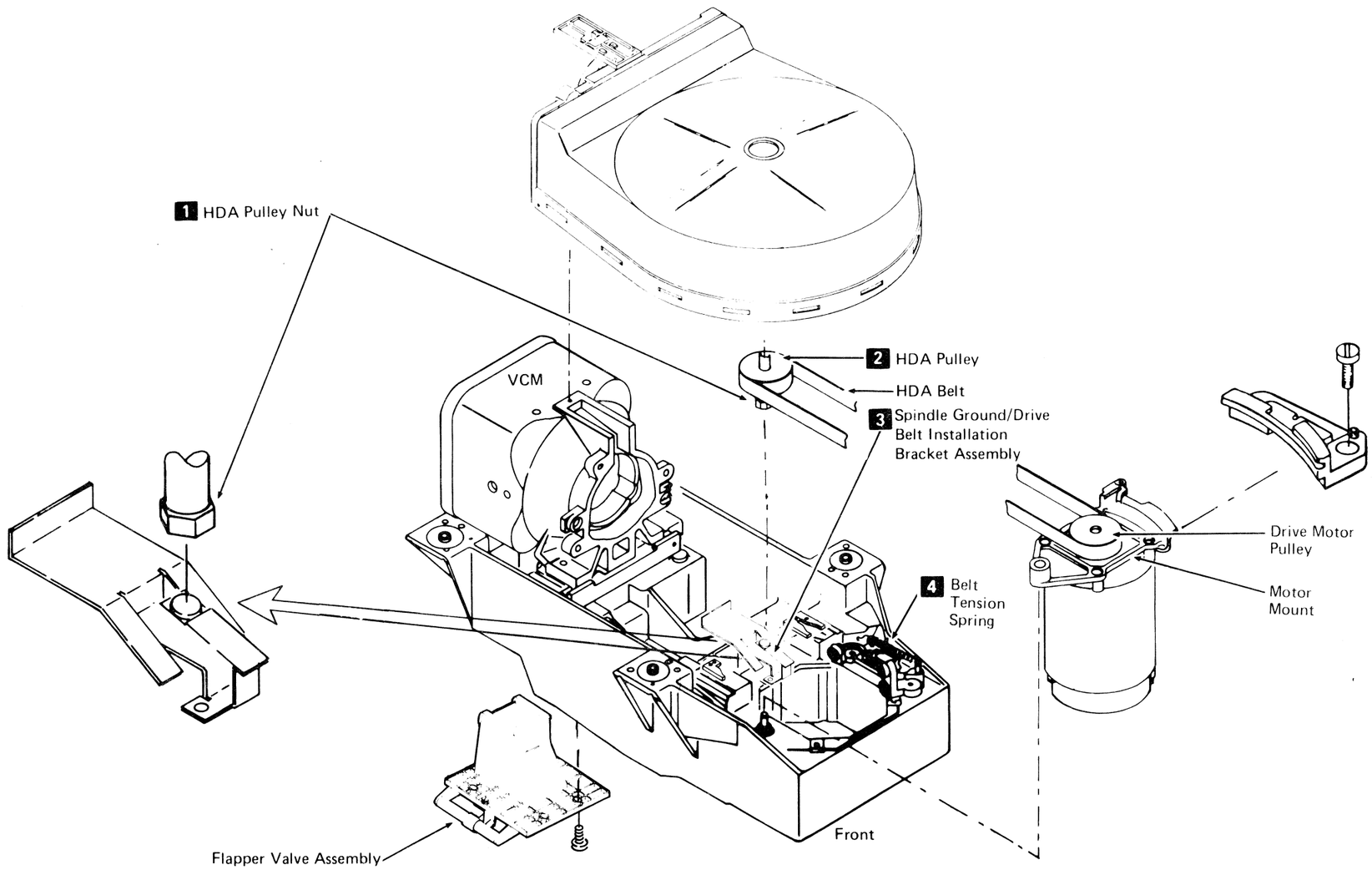
1. Set the CE Mode switch to position A (Drive A) or B (Drive B).
2. Set the DC Power switch to the Off position for the drive being serviced (see LOC 14).
3. Open the top front cover and remove the trim panel (See HDA 705 for procedure).

   Note: *Removal of the top cover latch bracket helps in replacing of the belt. See HDA 770 for the procedure.*

4. Disconnect the belt tension spring **4** from the stationary front stud, and push the motor toward the rear of the machine.
5. Cut the HDA belt to prevent damage to the HDA spindle ground and remove.
6. Slide the new HDA belt between the HDA pulley nut **1** and the spindle ground assembly **3**. Use a long blade screwdriver to help slide the belt into place, being careful not to damage the spindle ground.
7. Slide the belt up and around the HDA pulley **2** with the smooth side of the belt against the pulley.
8. Slide the belt over the motor pulley and pull the motor forward to prevent the belt from slipping off the HDA pulley.
9. Install the belt tension spring.
10. Be sure the belt is on both the HDA and drive motor pulleys.
11. Re-install the top front cover latch bracket (see HDA 770 for adjustment) and the trim panel (see HDA 705).
12. Close the top front cover, restore power, and set the CE Mode switch to Off (center position).

    Caution: When resotring power, do not turn the Drive DC Power switch past the Both On position. If the other drive in the module is online, verify that it si still Ready after power is restored.

13. Exit to START 500.



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FRONT TOP COVER LATCH REMOVAL AND REPLACEMENT

REMOVAL

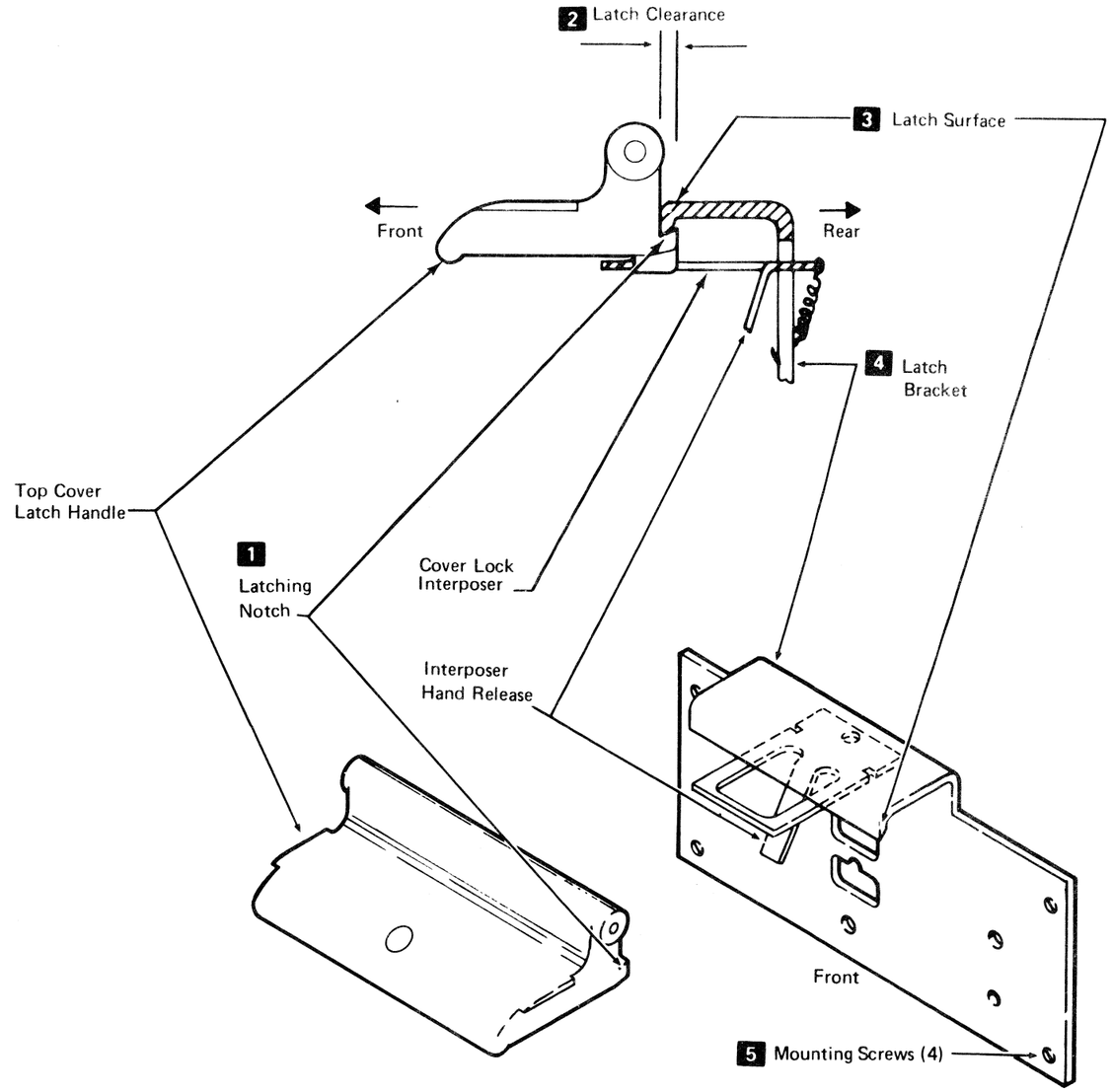
1. Open the top front cover and remove the trim panel. (See HDA 705 for the procedure.)
2. Remove the four screws 5 from the latch bracket 4 and remove the bracket from the drive.

REPLACEMENT

Replace the front top cover latch in the reverse order of removal and adjust using the adjustment procedure below.

CHECK AND ADJUSTMENT

1. Open the top cover and remove the trim panel (see HDA 705 for the procedure).
2. Check that:
   a. The latch surface 3 seats in the latching notch 1 .
   b. The latching notch and the latch surface are parallel.
   c. The cover is held within 0.030 ± 0.020 inches (0,762 ± 0,508mm) of the top of the frame.
3. Adjust the top cover latch by:
   a. Loosening the four cover hinge screws and positioning the cover to obtain a small latch clearance 2 . Retighten the four hinge screws.
   b. Loosening the four mounting screws 5 and positioning the latch bracket 4 , as described in Step 2. Retighten the four mounting screws.
4. Reinstall the trim panel and close the top front cover.
5. Exit to START 500.



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TROUBLE NOT FOUND

A

This page contains aids for problem resolution where insufficient error information is available to follow the maintenance analysis procedure. It may also be used as an aid in analyzing intermittent errors. See the EREP section of the *System/3 Diagnostic Users Guide* if attached to a System/3.

CHECK DEVICE ADDRESS

Check EREP printouts to determine if more than one device is failing.

CHECK MICRODIAGNOSTIC DISK

If the microdiagnostics failed, verify that the disk is the proper EC level for the device that failed.

EC INSTALLATION

If an engineering change has been recently installed, check the EC installation instructions and determine where the change was made. Inspect the back panel for tight wire wraps.

CIRCUIT BREAKERS

Verify that all Circuit Breakers (CBs) and Circuit Protectors (CPs) are set.

RELAYS (LOC 14)

Caution: Do not swap any relay that has a shorted coil into any other position, as damage can occur to the relay driver cards A1F2(A1Q2).

Check for loose relays and replace or swap as required.

- Drive A — K351,K651,K652
- Drive B — K361,K661,K662
- Common to Both Drives — K331,K611,K612, K631,K632,K633

CONNECTORS

Check that the following connectors are seated:

- AC Compartment (Dr Mtr) — P351,P361
- DC Regulator Board (DC Sequence) — P633,P634,P635, P636,P638
- Sequence Adapter Boards A and B (Module Sequence) — P634,P633,P635, P630,P631,P632, P637

Check that the edge connector wires are tight on the following:

- DC Compartment
- Bottom of the drive motor EC601 (LOC 12)

TERMINAL BOARDS

Check for loose wires on TB531 (LOC 14). (Drive dc distribution.)

JUMPERS (LOC 14)

- Verify that jumpers are installed from T503 to T504 on the Sequence Adapter Board B in the last module on the string only (LOC 14).
- Check that −24 V special voltage jumper is installed on A1B1(A1U1)C11.

DRIVE MOTOR

Verify that the drive motor thermal is not tripped (see HDA 715 for location of thermal).

Check:

- Drive motor brake adjustment (HDA 720).
- Belt tension spring (HDA 760).

Check the direction of drive motor rotation. Open the top front cover and observe that the HDA disk rotates counterclockwise.

BLOWER MOTOR

Verify that the blower motor thermal (CP311) is not tripped (LOC 12).

Check the direction of blower motor rotation (see HDA 730).

Check for loose connections on TB211 (LOC 12).

HDA

Carriage Binding, HDA 712.

Cable Swapping, HDA 713.

Voice Coil Replacement, HDA 708.

Replacement, HDA 710.

VOLTAGE CHECKS

Drive Voltage Chart

Voltage*	Test Point	Tolerance	Maximum** AC Ripple	Page Entry
−4 V	A1C2 (A1T2) B06	−3.84 to −4.50 V	0.10 V p-p	PWR 255, A
+6 V	A1F2 (A1Q2) B11	+5.76 to +6.24 V	0.08 V p-p	PWR 260, A
+12 V	A1C2 (A1T2) D05	+12.0 to +14.4 V	0.23 V p-p	PWR 240, E
−12 V	A1C2 (A1T2) D06	−12.0 to −14.4 V	0.23 V p-p	PWR 240, E
−24 V	A1C2 (A1T2) D03	−24.0 to −28.8 V	0.10 V p-p	PWR 250, A

00106C

* Use a digital voltmeter to check voltages.
** Use a scope to measure the ripple. See PWR 290 for the procedure.

Verify that the DC Power switch is in the Both Drives On position (LOC 14).

Verify correct ac voltages to drive motor.

Check for loose wires on main Ground Bus W1 (hinge end of A1 Gate) (LOC 12).

WIRING

Check Ready lamp wiring.

Check continuity and connections on the following:

- Drive DC Power switch (LOC 14)
- Start/Stop switch
- Attention switch
- R/W or Read switch
- Ready lamp
- Service Bypass switch
- CE Mode switch

(Start/Stop switch through CE Mode switch: LOC 16)

- Air switch (HDA 735)

CARD SOCKETS/PINS

Check for tight wire wraps on A1F2(A1Q2) card socket.

SUMMARY OF CARDS

Reseat or Replace:

A1F2(A1Q2)	HDA Sequence Controls, Integrator, and Magnet Drive
A1E2(A1R2)	Access Control
A1K2(A1L2)*	Command Decode and Power On Reset
A1C4(A1T4)**	Servo Logic
A1H2(A1N2)	R/W Safety
A1G2(A1P2)	HAR*CAR*Diff/Control
A1D4(A1S4)**	Index Decode
A1C2(A1T2)**	Servo Amp

REFERENCES

HDA Ready Sequence Theory – HDA 500 through 510.

HDA Cable Swap Procedure – HDA 713.

Functional description of logic cards – OPER 15 through 31.

* *When replacing A1K2(A1L2), check the addressing jumpers. See INST 12.*

** *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the sevro velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

RPI CONTENTS

REFERENCE TO OTHER SECTIONS

3344

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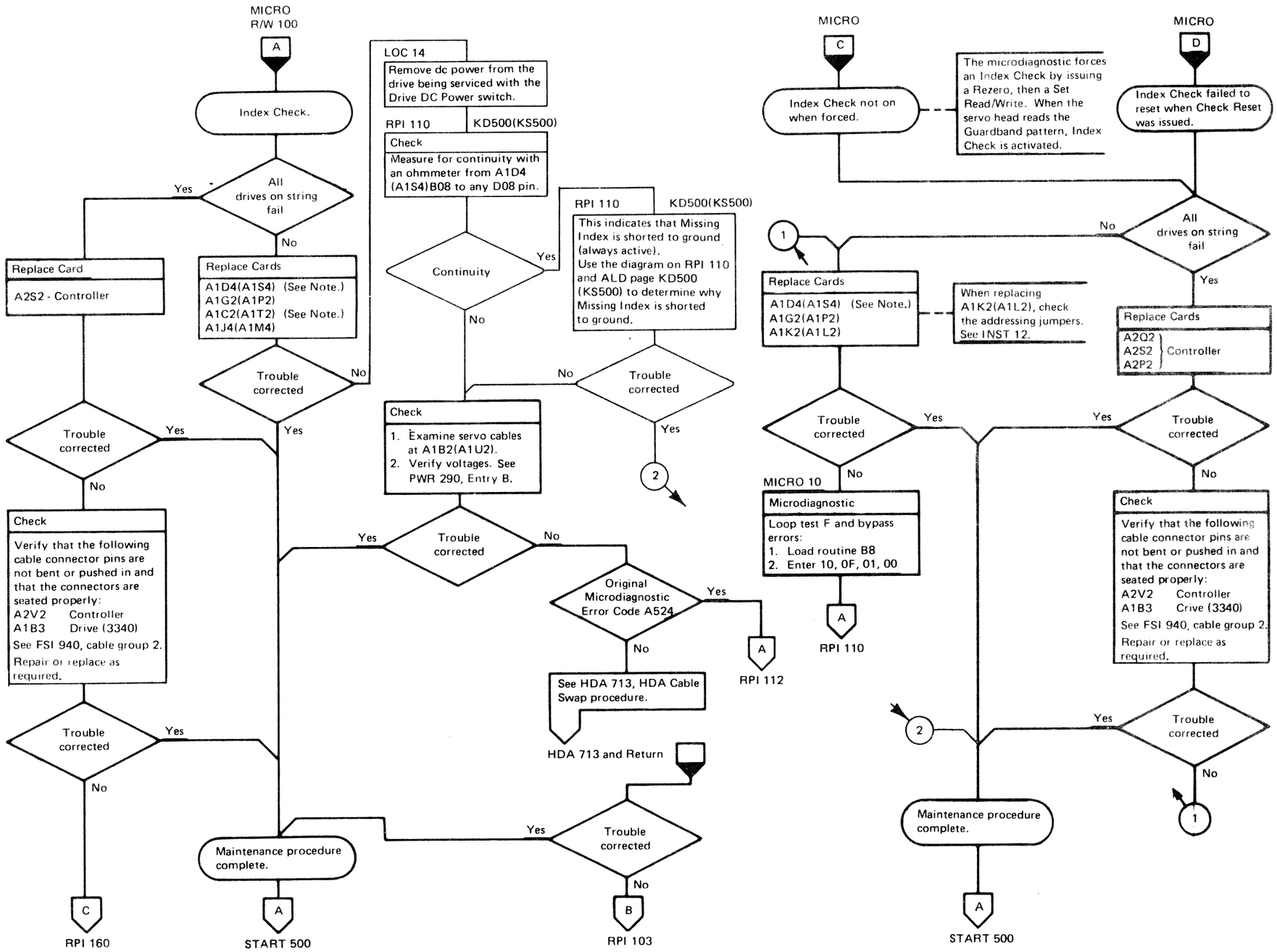
INDEX CHECK

Index Check (Index Mark without Valid Index) is caused by an invalid Index pattern detected while Set Read/Write is active. A valid Index pattern is '1011' (valid Index 2), or '1101' (Valid Index 1).

See OPER 126 for detailed description of Index Detection.

Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*



INDEX CHECK/ACTIVE TRACK

RPI 100

A

Active Track failure.

MICRO 68

Microdiagnostic

1. Load routine B4
2. Enter parameters: 10, 83, 10, 8B, 00, 8F, 07, 42, 64, 00, 00, 00, 00, 00, 00, 00, 00.

Parameter definition:
8B, 00 = Set HAR 00

Scope

Sweep	2 ms/div
Trigger	
Slope (–)	
Ch 1 only	
Ch 1	A1D4(A1S4)B13
	–Valid Index 1
	volts/div 0.1
	probe X10
Ch 2	A1G2(A1P2)J10
	+Active Track TP
	volts/div 0.1
	probe X10

Active Track should appear as in Figure 1. If the signals are incorrect, see RPI 155 to isolate the problem.

MICRO 68

Microdiagnostic

1. Load routine B4
2. Enter parameters: 10, 83, 10, 8B, 01, 8F, 07, 42, 64, 00, 00, 00, 00, 00, 00, 00, 00.

Parameter definition:
8B, 01 = Set HAR 01

Scope

Sweep	2 ms/div
Trigger	
Slope (+)	
Ch 1 only	
Ch 1	A1D4(A1S4)J05
	+Valid Index 2
	volts/div 0.1
	probe X10
Ch 2	A1G2(A1P2)J10
	+Active Track TP
	volts/div 0.1
	probe X10

Active track should appear as in Figure 2. If the signals are incorrect, see RPI 155 to isolate the problem.

Maintenance procedure complete.

A

START 500

Figure 1. Active Track (Valid Index 1)

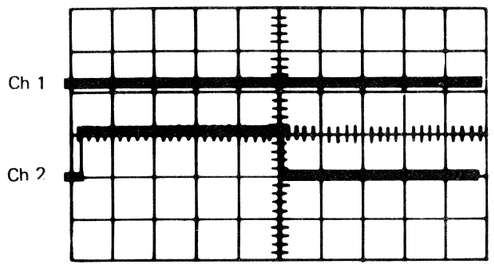
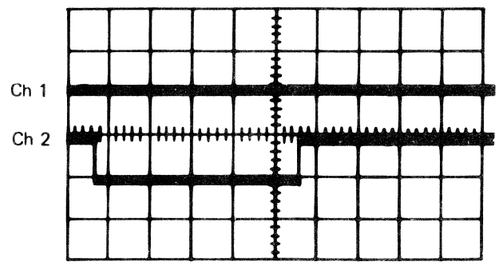


Figure 2. Active Track (Valid Index 2)



RPI 100

B

Index Check failures. Index Check was found to be active.

Let test stop on error.

Scope

Main sweep	5 ms/div
Delayed sweep	2 µs/div
Trigger	
Slope (–)	
Ch 1 only	
Ch 1	A1D4(A1S4)B13
	–Valid Index 1
	volts/div 0.1
	probe X10
Ch 2	A1D4(A1S4)D10
	+Index Bit
	volts/div 0.1
	probe X10

The signals should appear as in Figure 3a. If the signals are incorrect, use delayed sweep (Figure 3b) and look at index bits just prior to second Index. See RPI 130 to isolate the problem.

Scope

Main sweep	5 ms/div
Delayed sweep	2 µs/div
Trigger	
Slope (+)	
Ch 1 only	
Ch 1	A1D4(A1S4)J05
	+Valid Index 2
	volts/div 0.1
	probe X10
Ch 2	A1D4(A1S4)D10
	+Index Bit
	volts/div 0.1
	probe X10

The signals should appear as in Figure 4a. If the signals are incorrect, use delayed sweep (Figure 4b) and look at index bits just prior to second Index. If signals are correct, loop failing test, and scope back from A1G2(A1P2)S03 +HAR•CAR•Diff Status 3 which is Index Check when Sense Read Write command is given. See RPI 130 to isolate the problem.

Maintenance procedure complete.

A

START 500

Figure 3a. 1011 (Valid Index 1 Pattern)

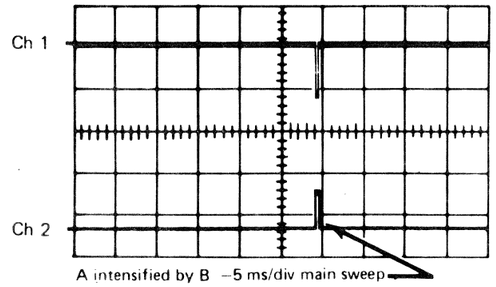


Figure 3b. Delayed Sweep

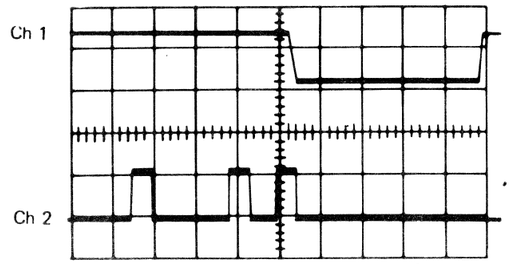


Figure 4a. 1101 (Valid Index 2 Pattern)

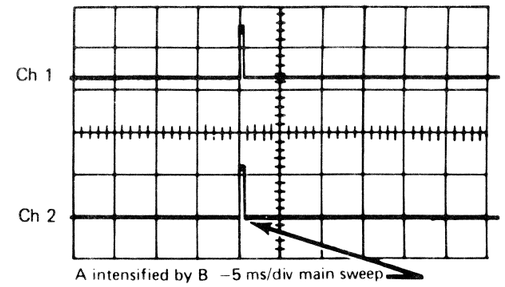
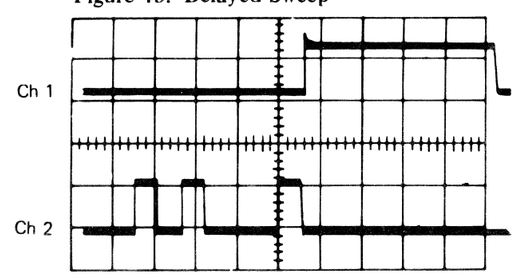


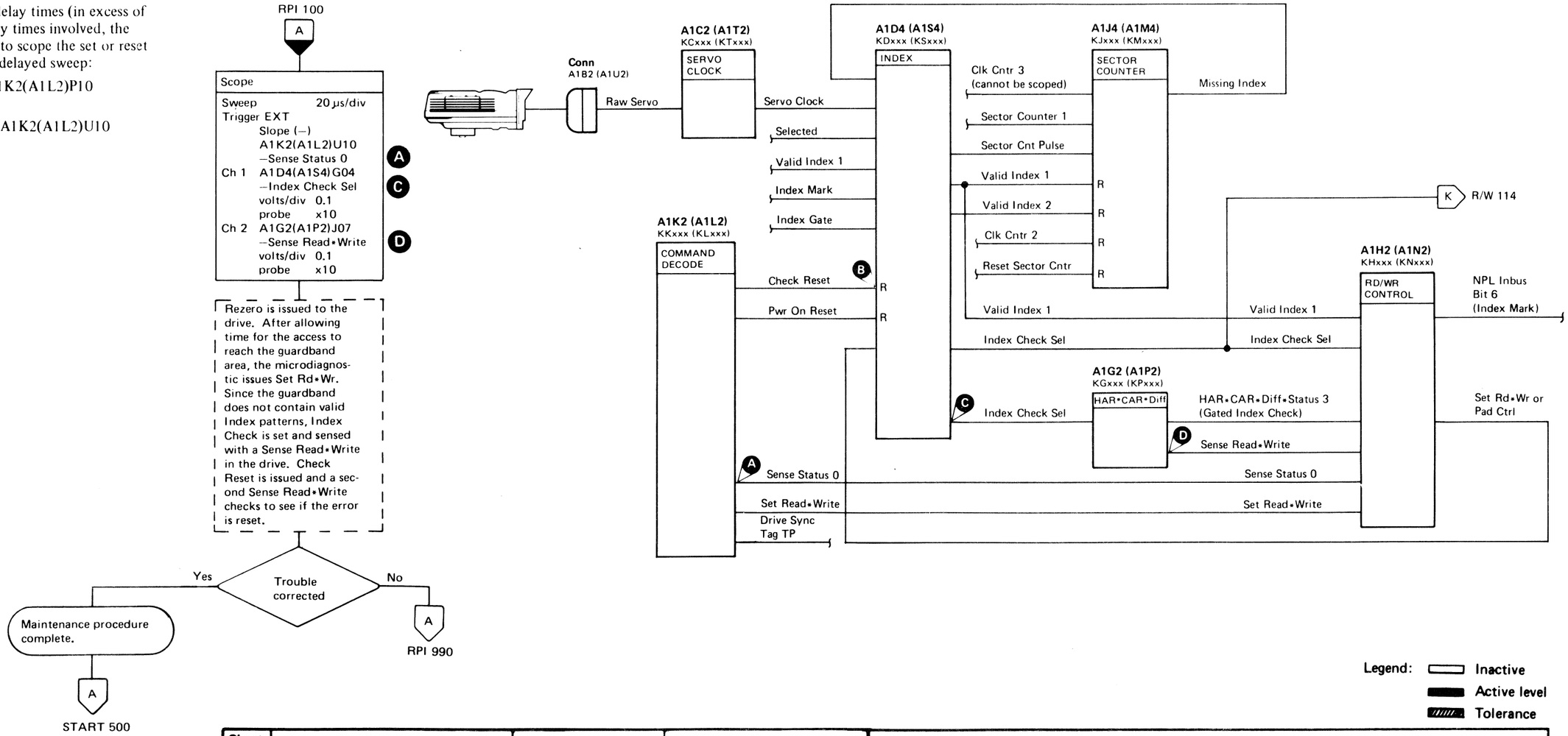
Figure 4b. Delayed Sweep



INDEX CHECK

Routine B8, test F contains long delay times (in excess of 400 ms). Because of the long delay times involved, the following sync points can be used to scope the set or reset of Index Check Sel without using delayed sweep:

- Setting of the error, sync on A1K2(A1L2)P10 (–Drive Sync Tag).
- Resetting of the error, sync on A1K2(A1L2)U10 (–Sense Status 0).



Legend: Inactive; Active level; Tolerance

Chart Line No.	Line Name	ALD	Test Point	
1	–Sense Status 0	KK170 (KL170)	A1K2 (A1L2) U10	A
2	–Index Check Sel	KD500 (KS500)	A1D4 (A1S4) G04	C
3	–Sense Read*Write	KG190 (KP190)	A1G2 (A1P2) J07	D
4	–Check Reset	KD510 (KS510)	A1D4 (A1S4) B12	B
5	+Valid Index 2	KD520 (KS520)	A1D4 (A1S4) J05	

INDEX CHECK

Missing Index or an Invalid Index Mark during a Set Read*Write operation activates the Index Check Select latch. Index Check Select latch activates Read/Write Check. Sense Read*Write and Selected gate the Read/Write Check to the interface as NPL Inbus Bit 3. Reading and writing are inhibited until the Index Check Select latch is reset by either Power On Reset or Check Reset.

Missing Index

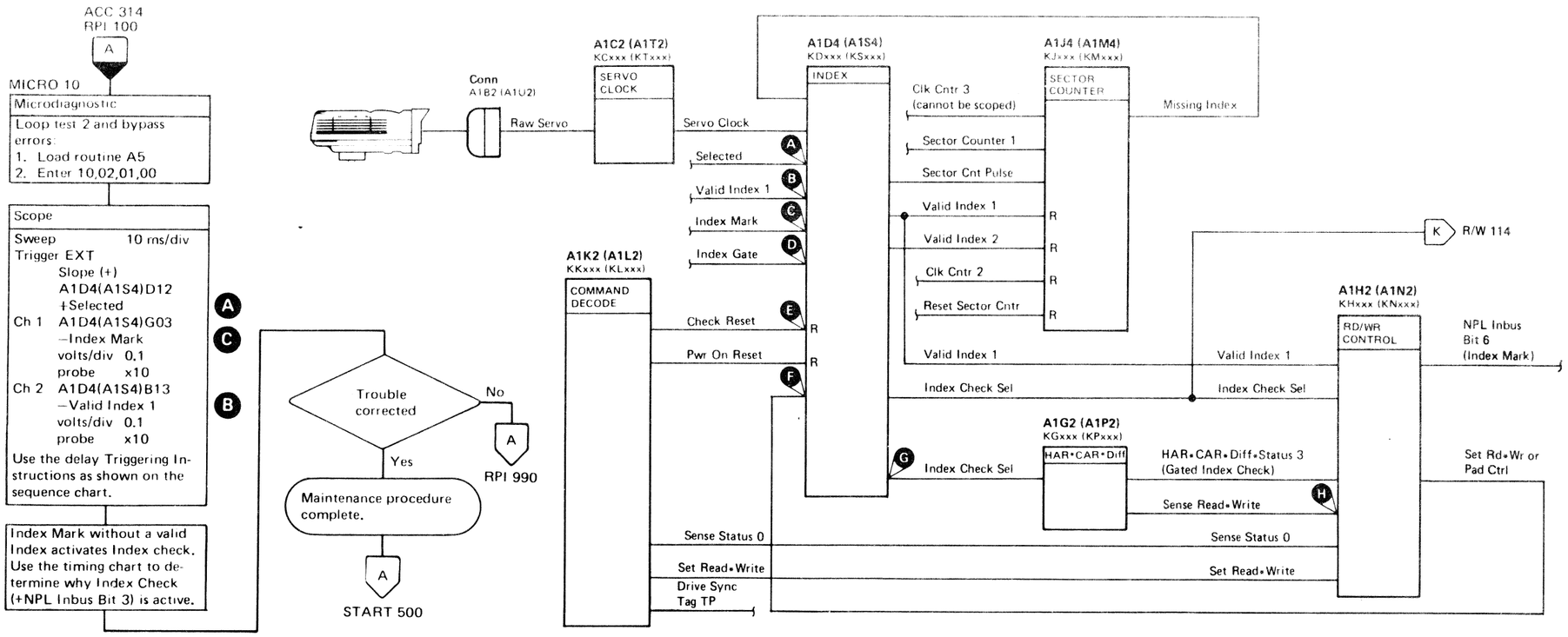
Missing Index is activated, after Sector 127, by the following conditions:

- Clock Counter 3 active.
- Valid Index 1 or 2 inactive.

Invalid Index Mark

Invalid Index Mark consists of the following conditions:

- Index Mark active.
- Valid Index 1 or 2 inactive.



Triggering Instructions

B Sweep Mode – B Starts After Delay Time	**A and B Time/Div** – 10 ms/div	**Slope** – (+)
Delay Time-Delay Sweep – 2 ms/div	**Delay-Time Multiplier** – 6.5	**Source** – Int Ch 1

Legend: Inactive; Active level; Tolerance

Figure 1. Expanded Sequence Chart

Change Delay Time-Delay Sweep to 1 μs/div.

Use Ch 2 to scope each of the lines.

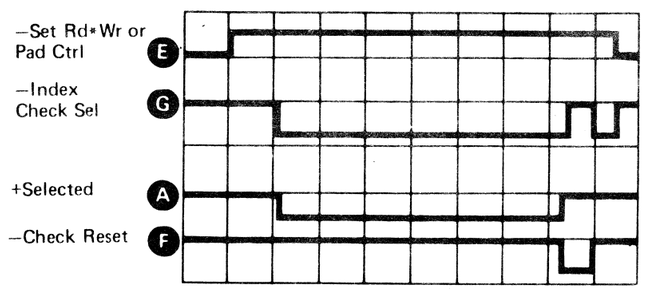
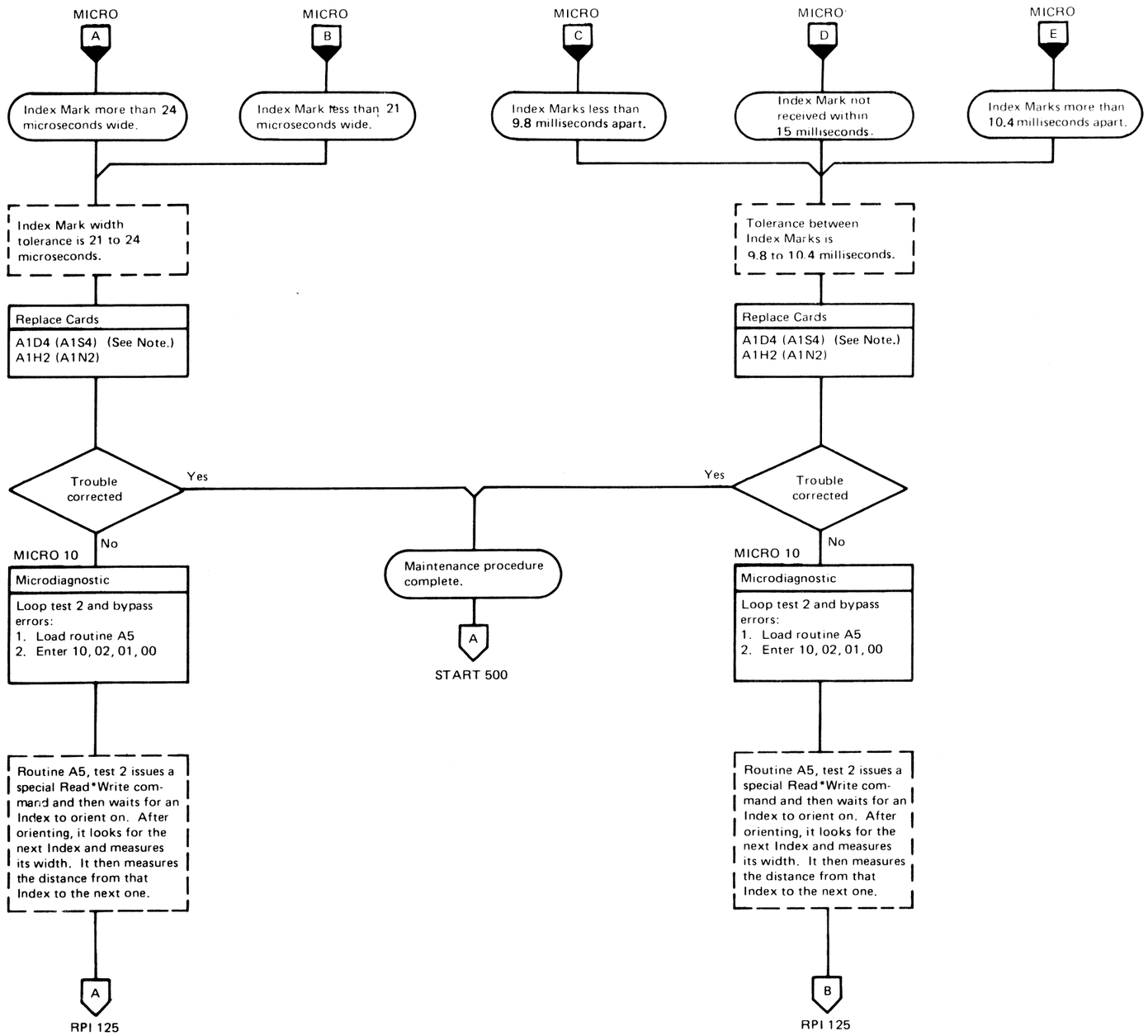
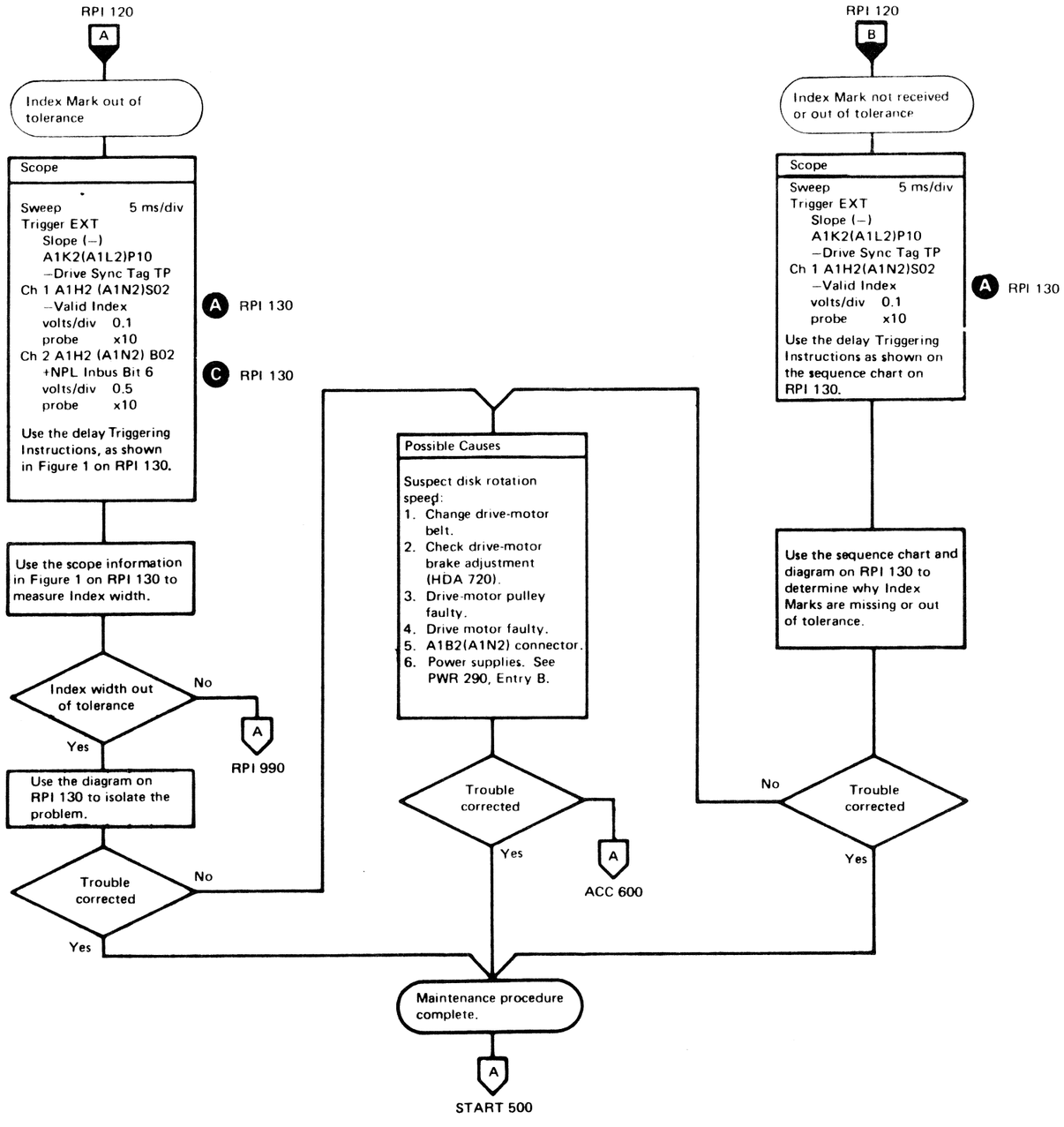


Chart Line No.	Line Name	ALD	Test Point		Chart
1	–Set Rd*Wr or Pad Ctrl	KD500 (KS500)	A1D4 (A1S4) G02	F	See Figure 1.
2	–Index Mark	KD500 (KS500)	A1D4 (A1S4) G03	C	
3	–Valid Index 1	KD520 (KS520)	A1D4 (A1S4) B13	B	
4	+Index Gate	KD500 (KS500)	A1D4 (A1S4) B07	D	
5	–Index Check Sel	KD500 (KS500)	A1D4 (A1S4) G04	G	1, 2, 4,
6	–Sense Read*Write	KG190 (KP190)	A1G2 (A1P2) J07	H	
7	–Check Reset	KD510 (KS510)	A1D4 (A1S4) B12	E	
8	+Selected	KD510 (KS510)	A1D4 (A1S4) D12	A	
9	+Valid Index 2	KD520 (KS520)	A1D4 (A1S4) J05		

INDEX CHECK

Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*





INDEX CHECK

Routine A5, test 2 issued a special Read*Write command and then waits for an Index to orient on. After orienting, it waits for the next Index and measures the width of it. It then measures the distance from that Index to the next one.

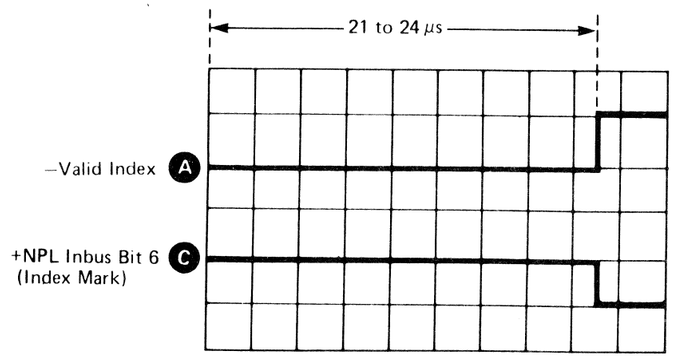
Figure 1. Expanded Sequence Chart

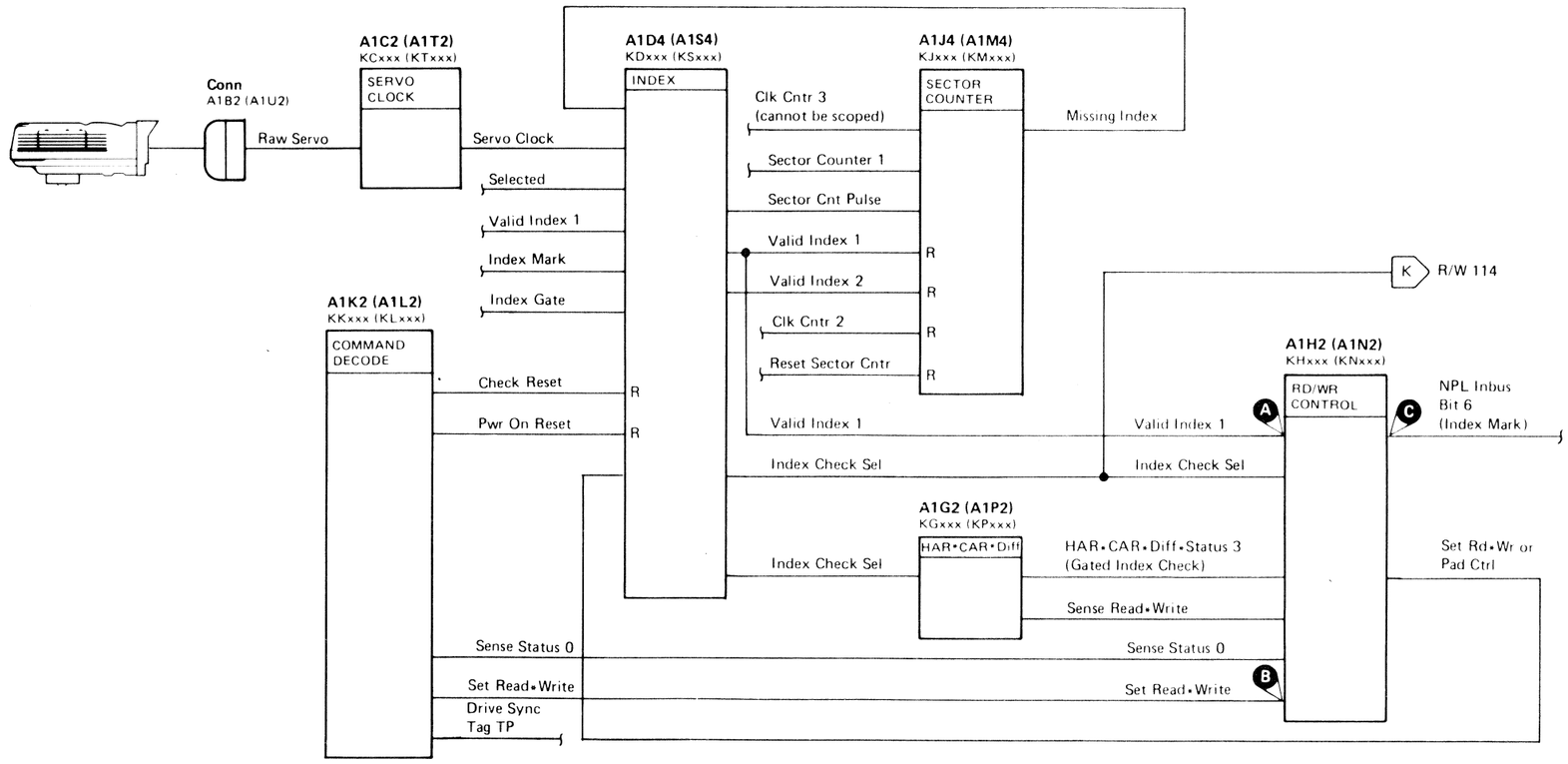
Triggering Instructions

B Sweep Mode – B Triggerable after Delay Time
Delay Time-Delay Sweep – 5 μs/div

A and B Time/Div – 5 ms/div
Delay-Time Multiplier – 1.5

Slope – (–)
Source – Int Ch 1





Triggering Instructions

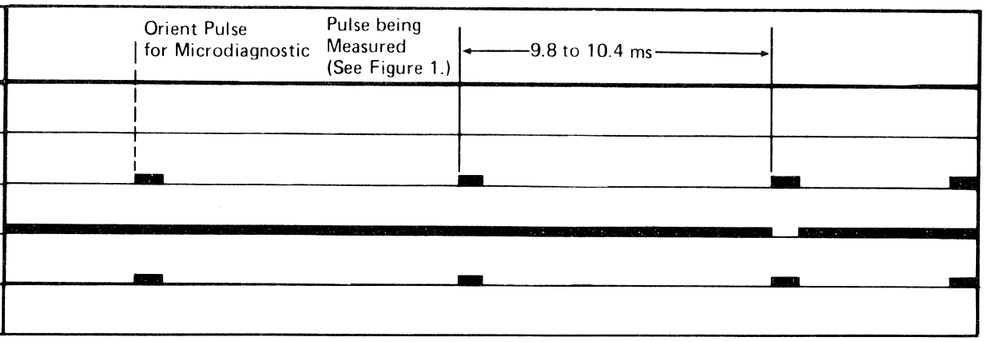
B Sweep Mode – B Triggerable After Delay Time
Delay Time-Delay Sweep – 2 ms/div

A and B Time/Div – 5 ms/div
Delay-Time Multiplier – 0.0

Slope – (–)
Source – Int Ch 1

Legend: Inactive, Active level, Tolerance

Chart Line No.	Line Name	ALD	Test Point		
1	–Drive Sync Tag TP	KK170 (KL170)	A1K2 (A1L2) P10		
2	–Valid Index 1	KH140 (KN140)	A1H2 (A1N2) S02	A	
3	+Set Read•Write	KH140 (KN140)	A1H2 (A1N2) S13	B	
4	+NPL Inbus Bit 6 (Index Mark)	KH200 (KN200)	A1H2 (A1N2) B02	C	
5	+ Valid Index 2	KD520 (KS520)	A1D4 (A1S4) J05		



INDEX CHECK/ACTIVE TRACK

INDEX CHECK

Index Check indicates that an invalid Index pattern is detected while Set Read/Write is active. Valid Index patterns are:

Valid Index 1 Bit Pattern = 1101

Valid Index 2 Bit Pattern = 1011

See OPER 126 for Index Detection theory.

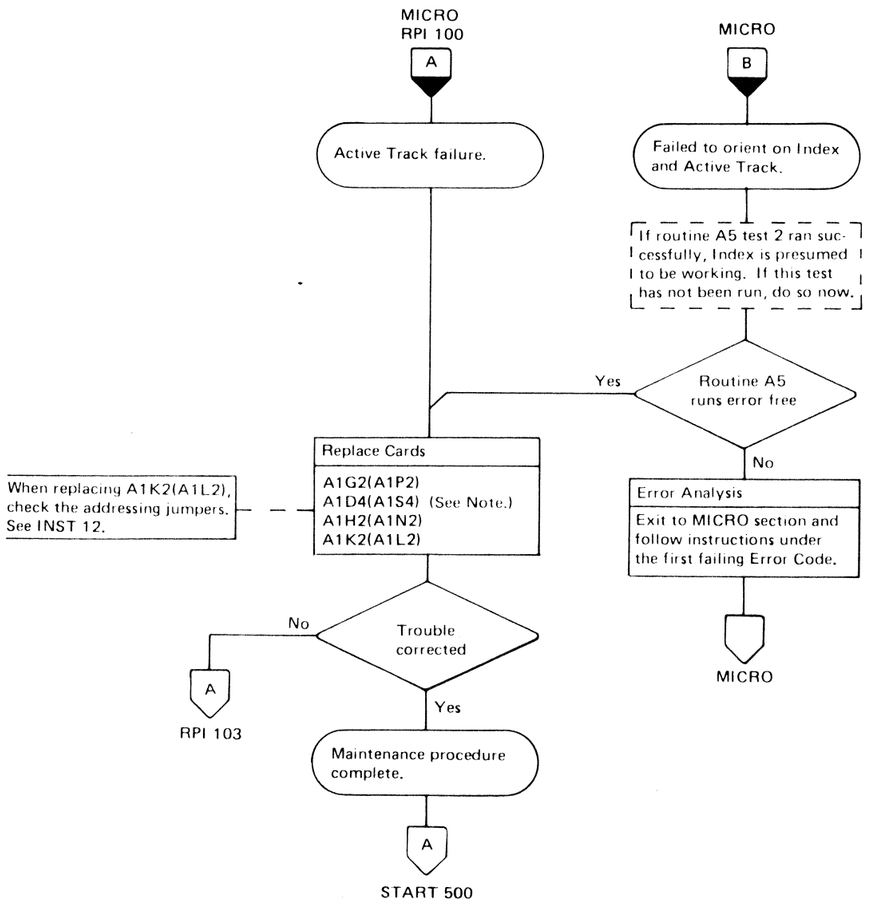
ACTIVE TRACK

Active Track (present for 10 ms) indicates the logical track the heads are currently positioned over. When Head Address Bit 7 is off, Active Track is present during the even half track. When Head Address Bit 7 is on, Active Track is present during the odd half track. Active Track is indicated by Read/Write Status Bit 7.

Due to interface skew, Index Marks at the beginning and end of Active Track may be present for as much as 50 ns before the change in the Active Track signal.

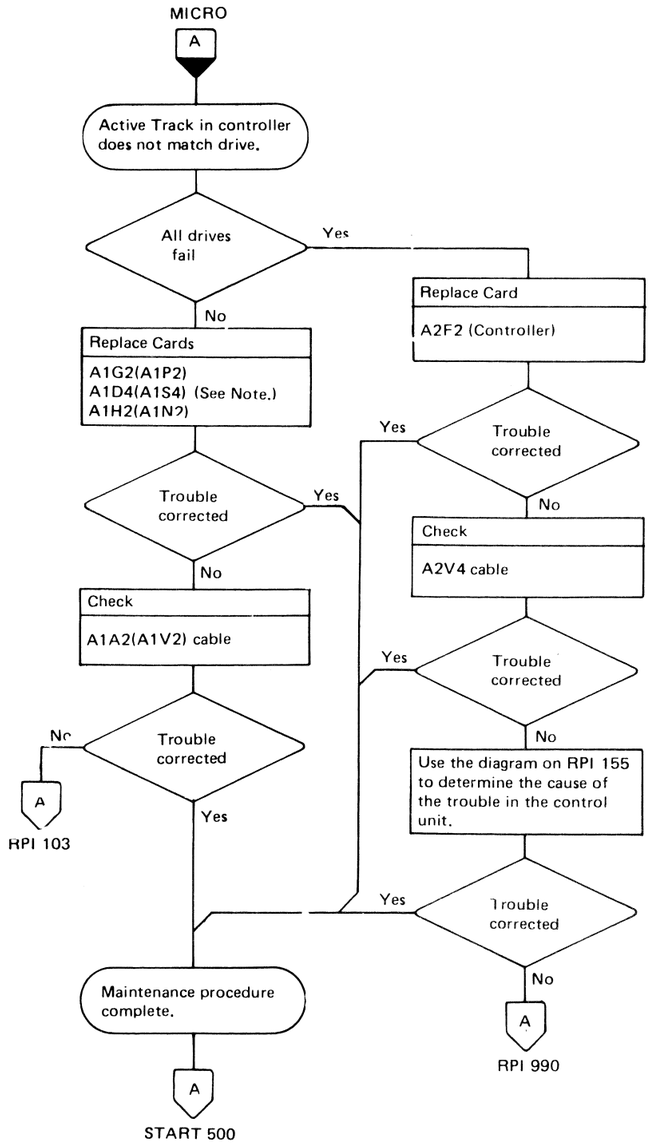
INDEX

Index occurs each 9.8 to 10.4 ms and is 21 to 24 μs wide. When Set Read/Write is active, Index is indicated by Rd Wr Status Bit 6.



Note: *When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

ACTIVE TRACK



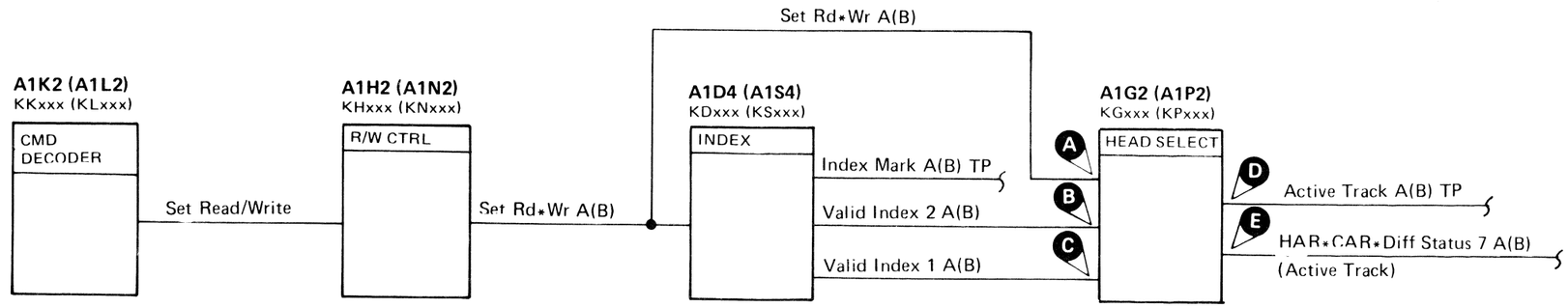


Chart Line No.	Line Name	ALD	Test Point	
1	−Set Rd*Wr A(B)	A1D4 (A1S4) G02	KD500 (KS500)	A
2	+Valid Index 2 A(B)	A1D4 (A1S4) J05	KD520 (KS520)	B
3	−Valid Index 1 A(B)	A1D4 (A1S4) B13	KD520 (KS520)	C
4	+Active Track A(B) TP	A1G2 (A1P2) J10	KG170 (KP170)	D
5	+HAR*CAR*Diff Status 7 A(B) (Active Track)	A1G2 (A1P2) J03	KG180 (KP180)	E

Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

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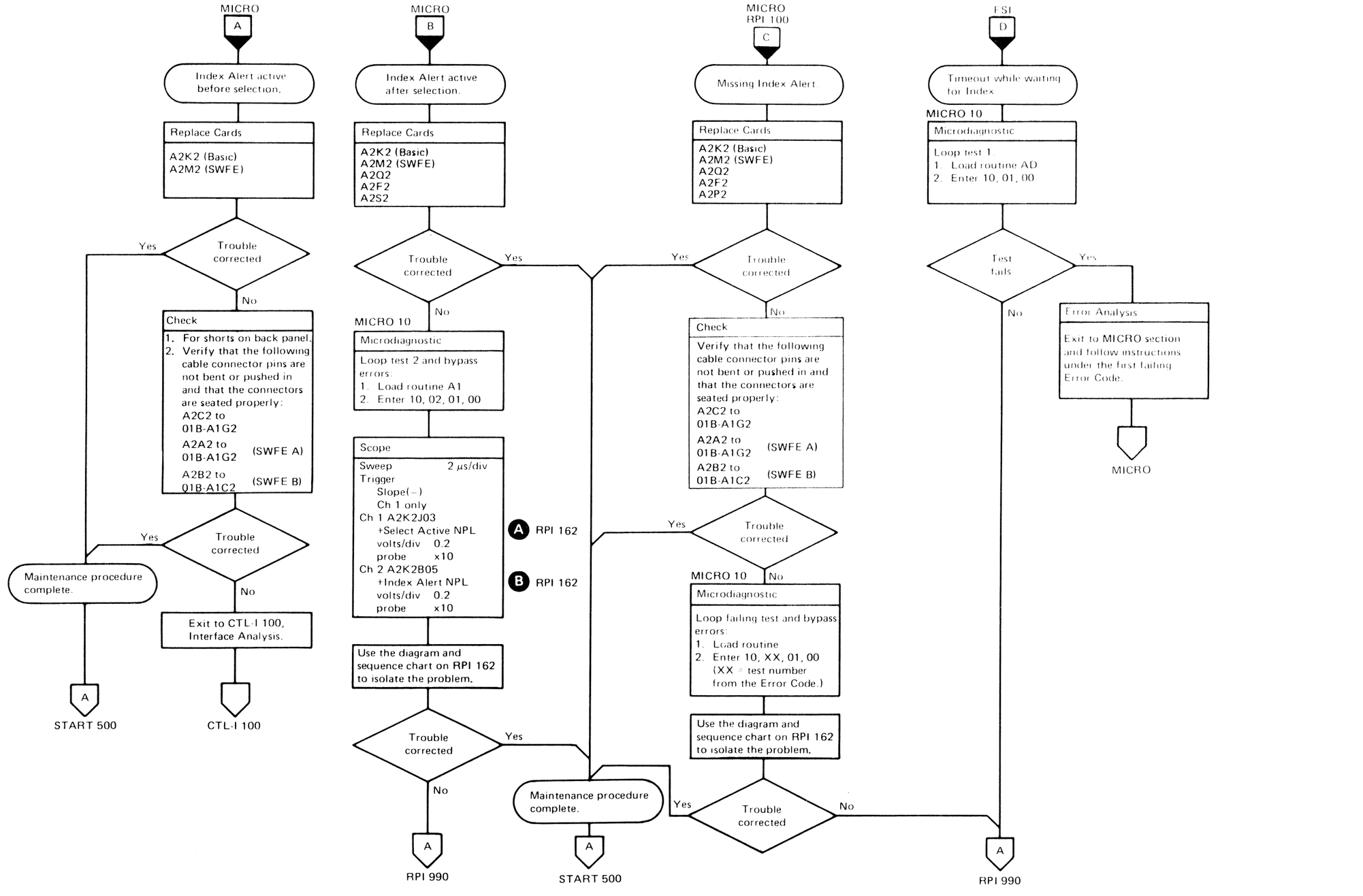
INDEX ALERT ERROR

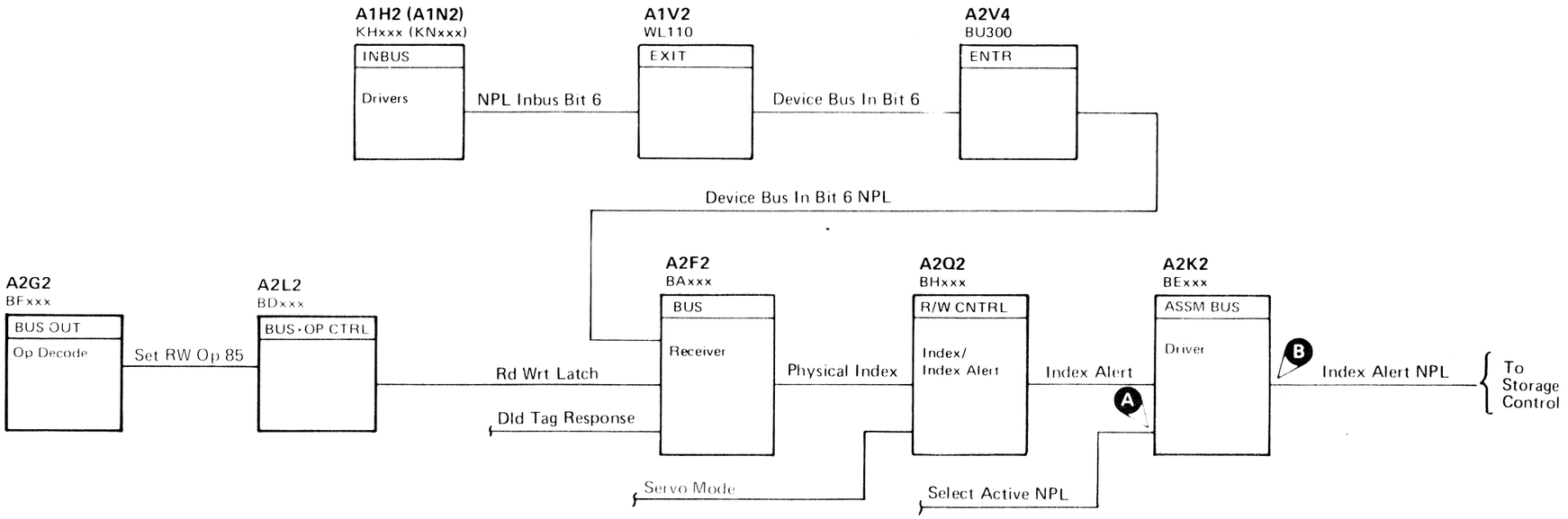
INDEX ALERT ERROR



JE0160 Seq. 1 of 2	2359235 Part No.

441235 28 May 76	441236 30 Sept 76			

INDEX ALERT ERROR



Legend: Inactive, Active level, Tolerance

Chart Line No.	Line Name	ALD	Test Point		Select Controller	Reset Controller	
1	+Tag Bus	BF100	A2G2 xxx *		Tag '03'	Tag '09'	
2	+Bus Out	BF130	A2G2 xxx**		Ctrlr Addr	Bus '80'	
3	+Select Hold	BF100	A2G2 B12				
4	+Tag Gate NPL	BF130	A2G2 J11				
5	+Bus In	BA150	A2F2 xxx***		Ctrlr Adr (3-of-6)		
6	+Tag Valid NPL	BE160	A2K2 G05				
7	+Normal End NPL	BE160	A2K2 D11				
8	+Select Active NPL	BE160	A2K2 J03	A			
9	+Check End NPL	BE160	A2K2 D05		Inactive		
10	+Sync In NPL	BE160	A2K2 D04		Inactive		
11	+Index Alert NPL	BE160	A2K2 B05	B	Inactive		

Error Code A126 if Index Alert is active.

*xxx = Tag Bus bits 0, 4,5,6,7, and P.

**xxx = Bus Out bits 0–7 and P.

***xxx = Bus In Bits 0–7 and P.

INDEX ALERT ERROR

Scope Setup

Sweep 2 ms/div

Trigger
- Slope (+)
- A2L2D13
- +CE Alert Execute Ind

Ch 1/Ch 2 Use timing diagram.

Action:

Use the diagram and sequence chart on this page to isolate the problem. The sequence chart shows routine AD test 1.

Microdiagnostic

Loop test 1 and bypass errors:

1. Load routine AD.
2. Enter 10,01,01,00

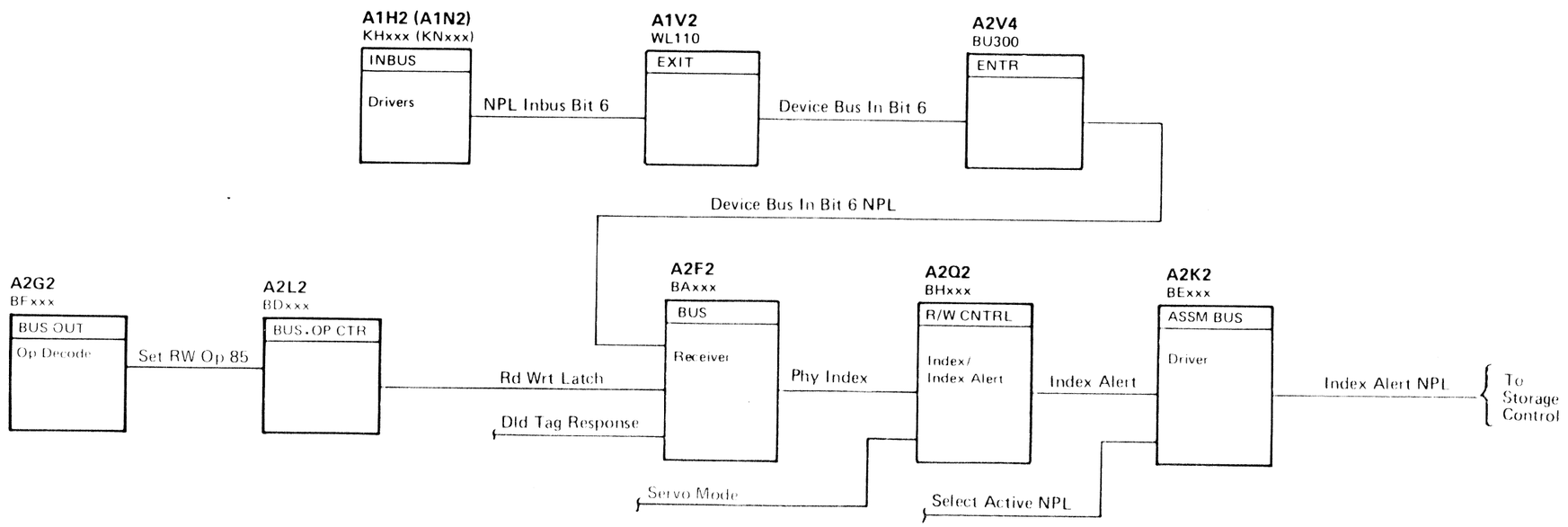
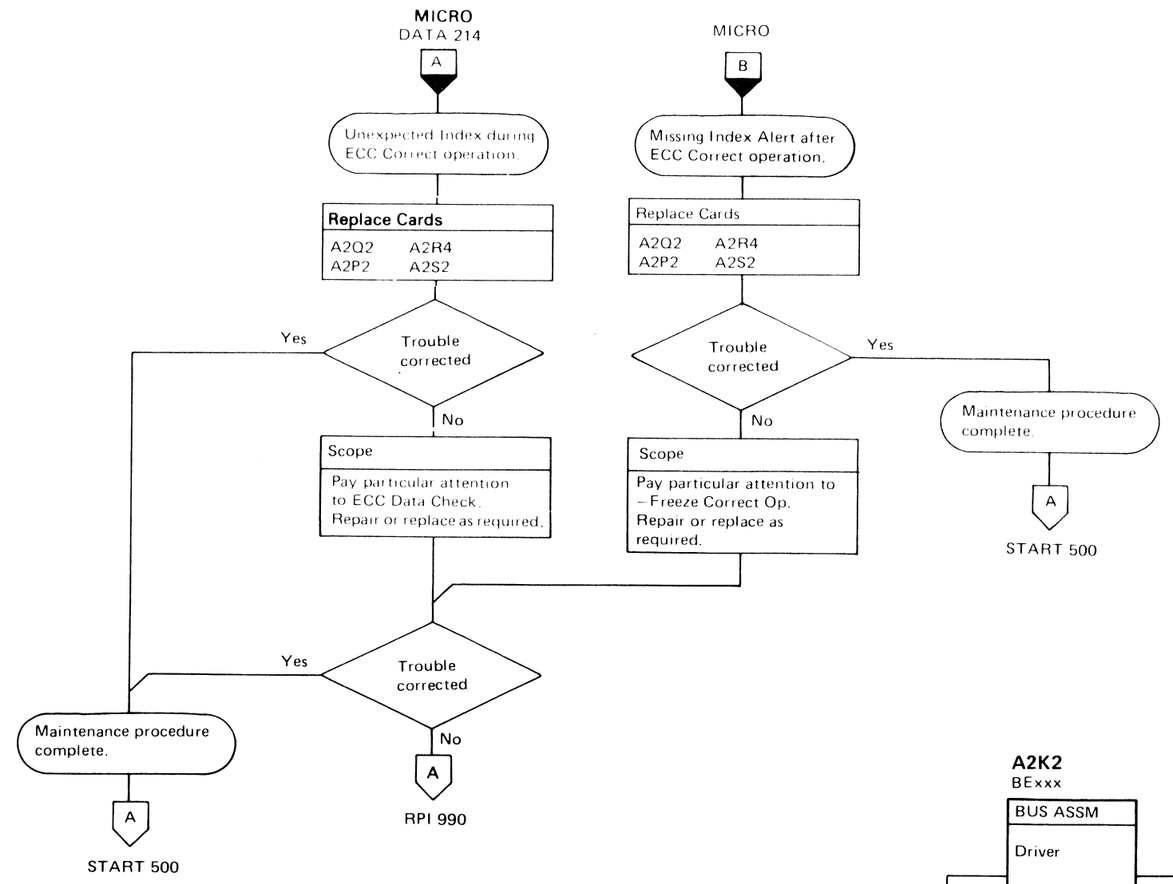
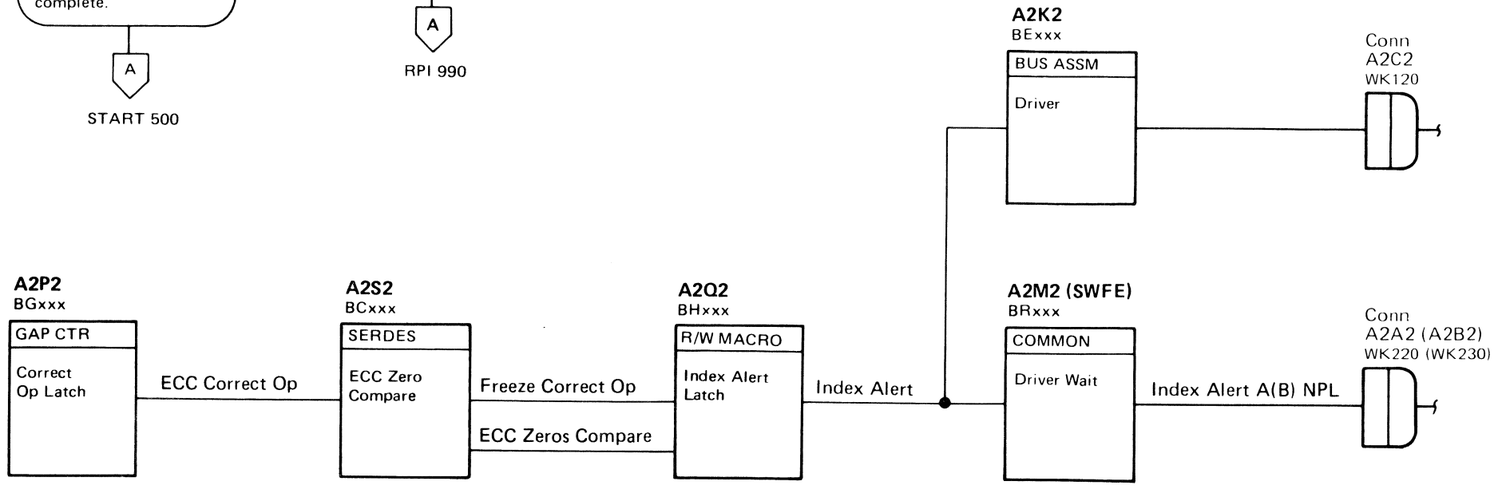


Chart Line No.	Line Name	ALD	Test Point		
1	–Set RW Op 85	BF110	A2G2 D03		
2	–Rd Wrt Latch	BA140	A2F2 S04		
3	–Index Alert	BE160 BR150 (SWFE)	A2K2 D06 A2M2 U10 (SWFE)		
4	+Index Alert NPL	BE160 BR170 (SWFE)	A2K2 B05 A2M2 S12 (SWFE)		
5	–Phy Index	BH170	A2Q2 S07		
6	+Servo Mode	BH170	A2Q2 S11		
7	–Bit Ring 3	BH170	A2Q2 M10		Pulses at Bit Ring Rate
8	–CT 57	BH170	A2Q2 G07		1 CT 57 pulse approximately every 140 μs while Set RW Op 85 is active

INDEX ALERT DURING CORRECT OPERATION

After an ECC Data Check and during an ECC Correct operation, the controller ceases to transfer Index pulses from the device to storage control. Instead, when a correctable ECC pattern is found, as indicated by Freeze Correct Op, the controller generates an Index Alert signal to the storage control indicating that a pattern has been found. The ECC Shift Register then stops shifting and waits for the storage control to sense the pattern byte.





TRANSMIT TARGET ERROR

SET TARGET – '8D'

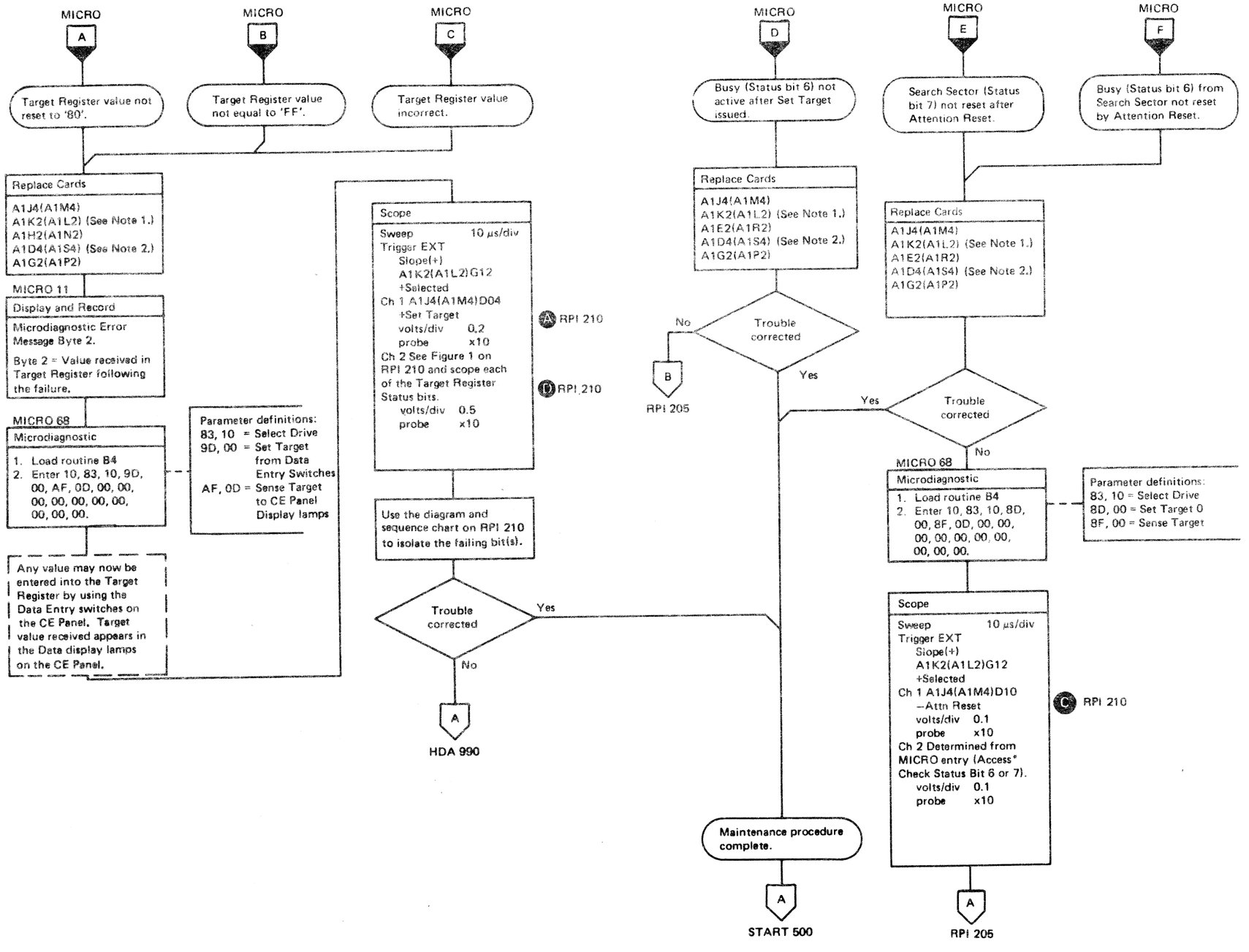
Tag '8D' transfers the value on Bus Out to the Target Register of the selected drive for Rotational Position Sensing (RPS). The drive immediately begins a Search Sector operation to compare the Target Register with the Sector Counter until they compare equal.

TRANSFER SECTOR COUNT

Rotational Position Sensing (RPS) senses the angular position of a record on the disk and uses it to reduce rotational delay on subsequent operations.

The drives contain a counter that counts the 128 sectors between Index Marks. When a G1 (Home Address) or a G3 (Count field) operation begins, the Transfer Sector Count line is activated in the controller and sent to the drive over Device Outbus bit 0. The drive uses bit 0 as a control to transfer the value in the Sector Counter into the Target Register. After the Read or Write operation is completed, the Target Register may be sensed and used for subsequent operations.

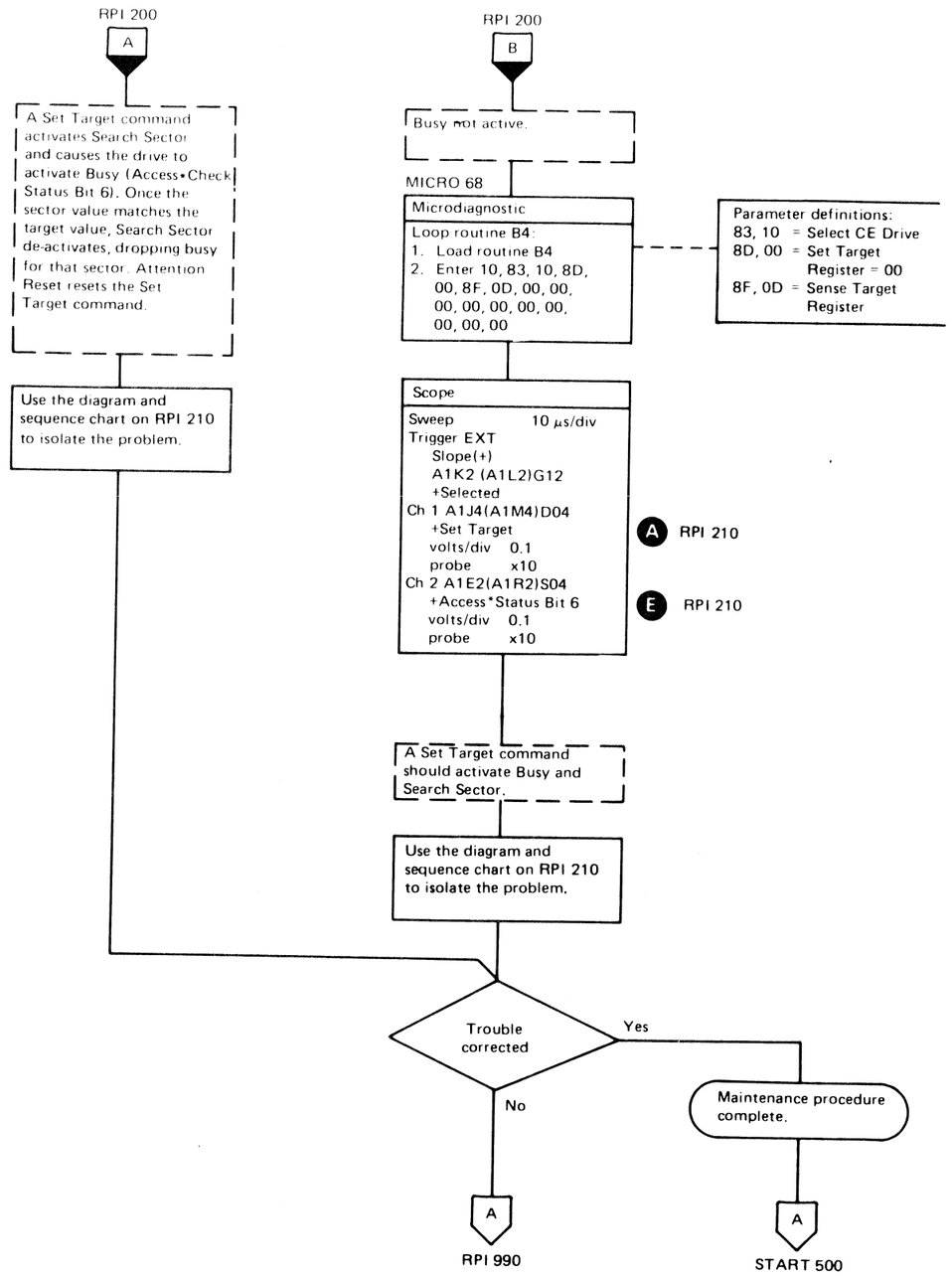
See OPER 203 through 205 for a more complete explanation of Rotational Position Sensing.



Note 1: *When replacing A1K2 (A1L2), check the addressing jumpers. See INST 12.*

Note 2: *When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

TRANSMIT TARGET ERROR



TRANSMIT TARGET ERROR

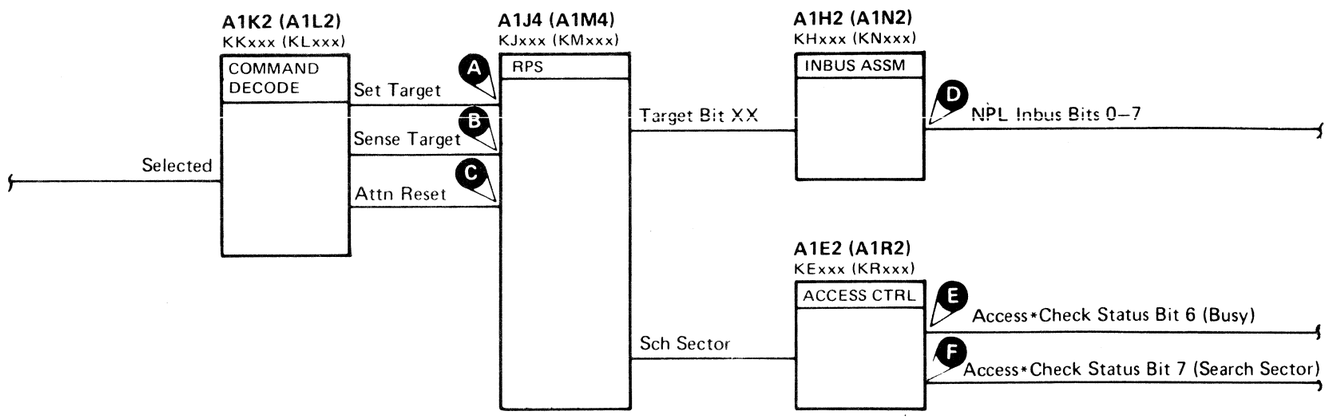


Figure 1. Target Register Status Bits

Bits	ALD	Test Point
0	KH 200 (KN200)	A1H2 (A1N2) B05
1		A1H2 (A1N2) D05
2		A1H2 (A1N2) B09
3		A1H2 (A1N2) D10
4		A1H2 (A1N2) D07
5		A1H2 (A1N2) D02
6		A1H2 (A1N2) B02
7		A1H2 (A1N2) D06

Legend: Inactive, Active level, Tolerance

Chart Line No.	Line Name	ALD	Test Point		Check for active Target Register bits during Sense Target time.
1	+Selected	KK140 (KL140)	A1K2 (A1L2) G12		
2	+Set Target	KJ530 (KM530)	A1J4 (A1M4) D04	A	
3	–Sense Target	KJ520 (KM520)	A1J4 (A1M4) B09	B	
4	+Access*Check Status Bit 6	KE160 (KR160)	A1E2 (A1R2) S04	E	
5	+Access*Check Status Bit 7	KE160 (KR160)	A1E2 (A1R2) M13	F	
6	–Attn Reset	KJ530 (KM530)	A1J4 (A1M4) D10	C	
7	+NPL Inbus Bits 0–7	KH200 (KN200)	See Figure 1.	D	

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TRANSMIT TARGET ERROR

Target Status Bit 0 is always active when Sense Target command is issued.

The Set Target command sets the Target Register to the value of Bus Out. Power On Reset resets the register to '80'.

The Sense Target command puts the Target Register value on Bus In.

Transmit Target Register error indicates that the value received on Bus In when Sense Target command is issued does not equal the value set into the Target Register by the microprogram.

Device Busy is present (except during Sector Compare time) as long as the Search Sector latch is active. The latch is set by a Set Target command and reset by Attention Reset or Power On Reset.

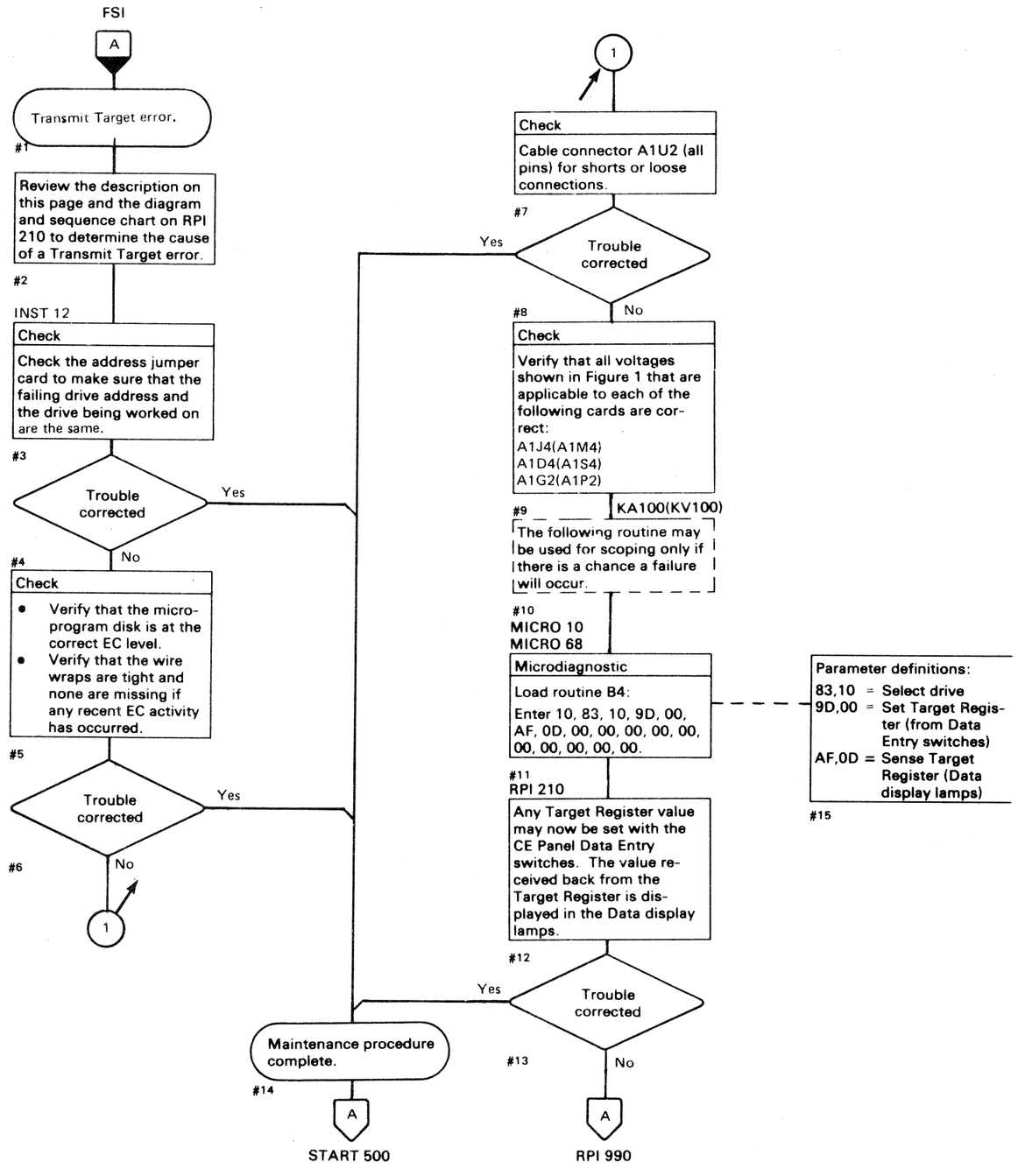

Figure 1. Voltage Check

Voltage	Test Point
-4 V +6 V +12 V -12 V -24 V	Use the ALD pages KA100 (KV100) to determine applicable voltages and their test points. See PWR 290 for acceptable tolerances.

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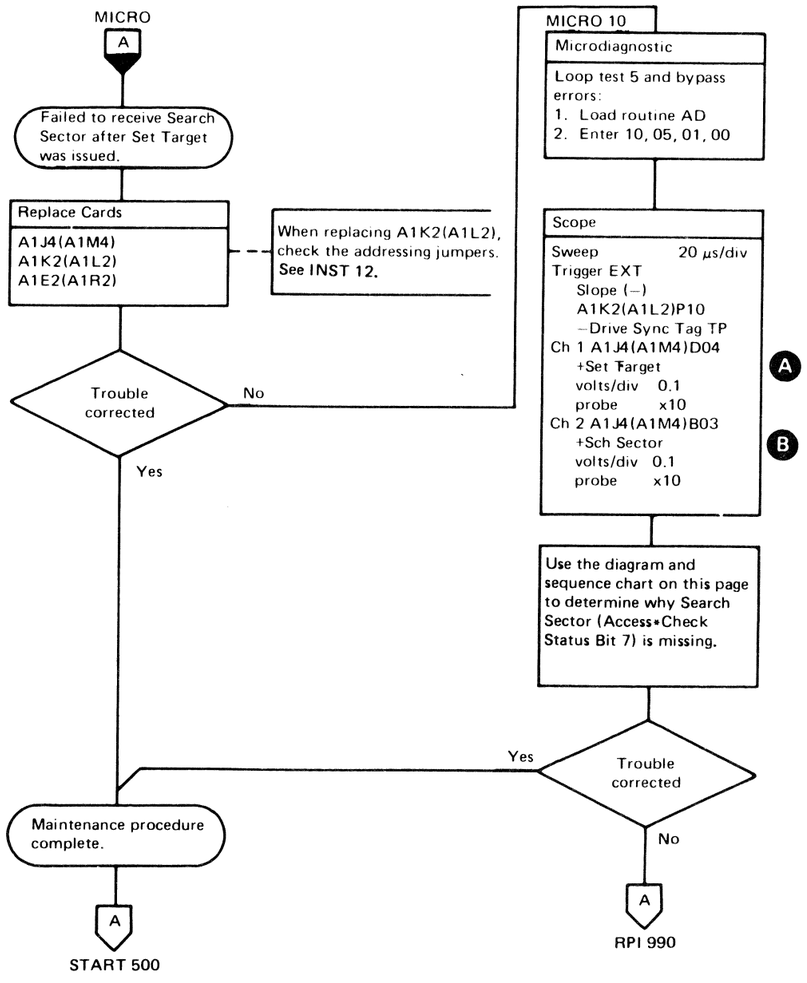
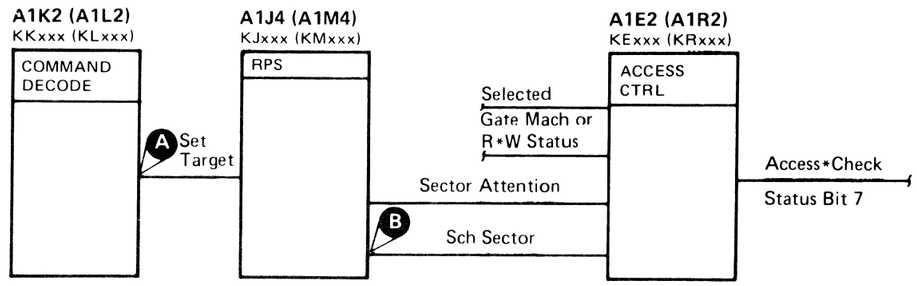
SEARCH SECTOR FAILURE

The Set Target command sets the value of Bus Out into the Target Register and starts a Search Sector operation. When the Sector Counter is equal to the value in the Target Register, a 153 to 163 microsecond Sector Compare pulse is generated. The Sector Compare pulse occurs at each revolution until an Attention Reset is issued.





Legend: Inactive, Active level, Tolerance

Chart Line No.	Line Name	ALD	Test Point		
1	+Set Target	KJ530 (KM530)	A1J4 (A1M4) D04	A	
2	+Sch Sector	KJ510 (KM510)	A1J4 (A1M4) B03	B	

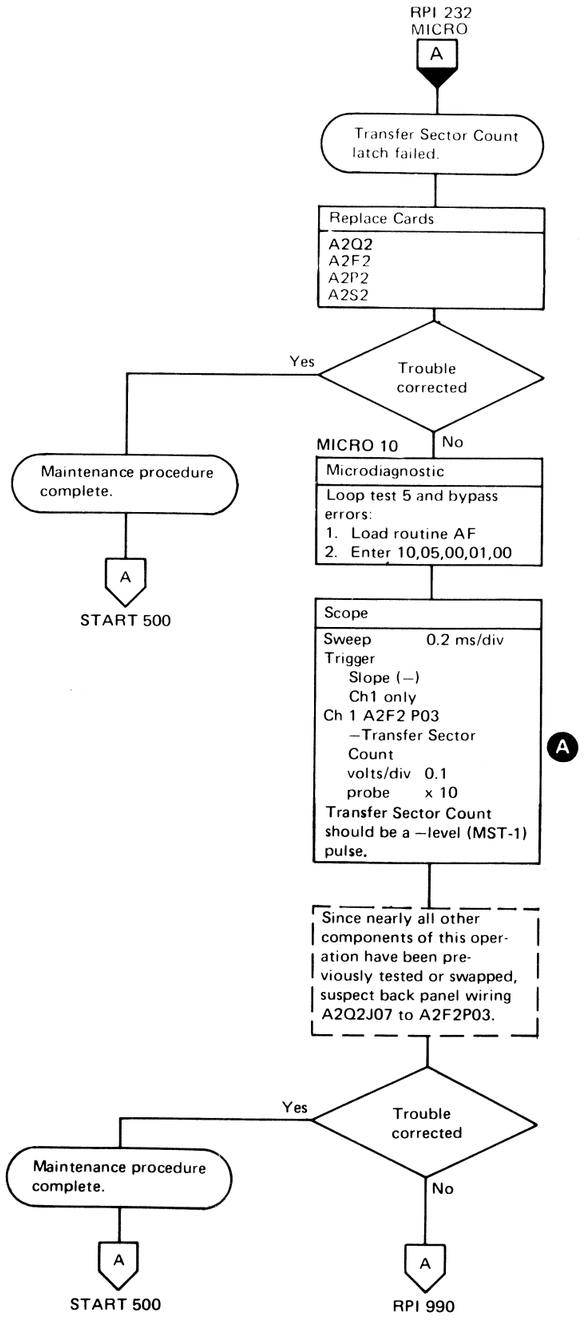
TRANSFER SECTOR COUNT LATCH FAILURE

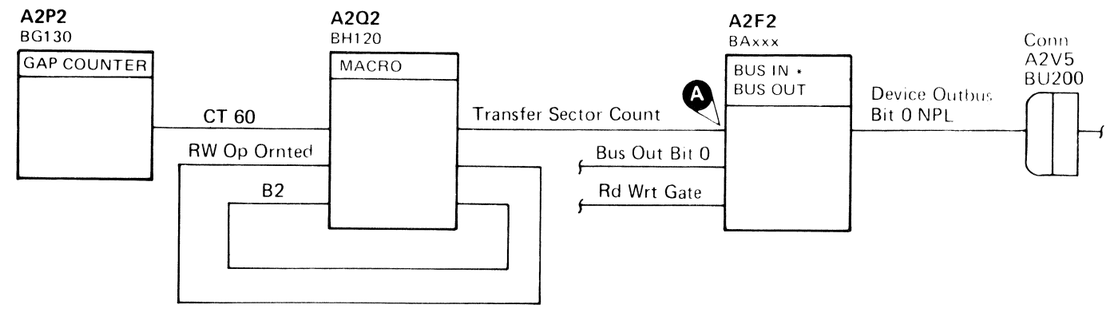
TRANSFER SECTOR COUNT

Rotational Position Sensing (RPS) senses the angular position of a record on the disk and uses it to reduce rotational delay on subsequent operations.

The drives contain a counter that counts the 128 sectors between Index Marks. When a G1 (Home Address) or a G3 (Count field) operation begins, the Transfer Sector Count line is activated in the controller and sent to the drive over Device Outbus bit 0. The drive uses bit 0 as a control to transfer the value in the Sector Counter into the Target Register. After the Read or Write operation is completed, the Target Register may be sensed and used for subsequent operations.

See OPER 203 through 205 for a more complete explanation of Rotational Position Sensing.



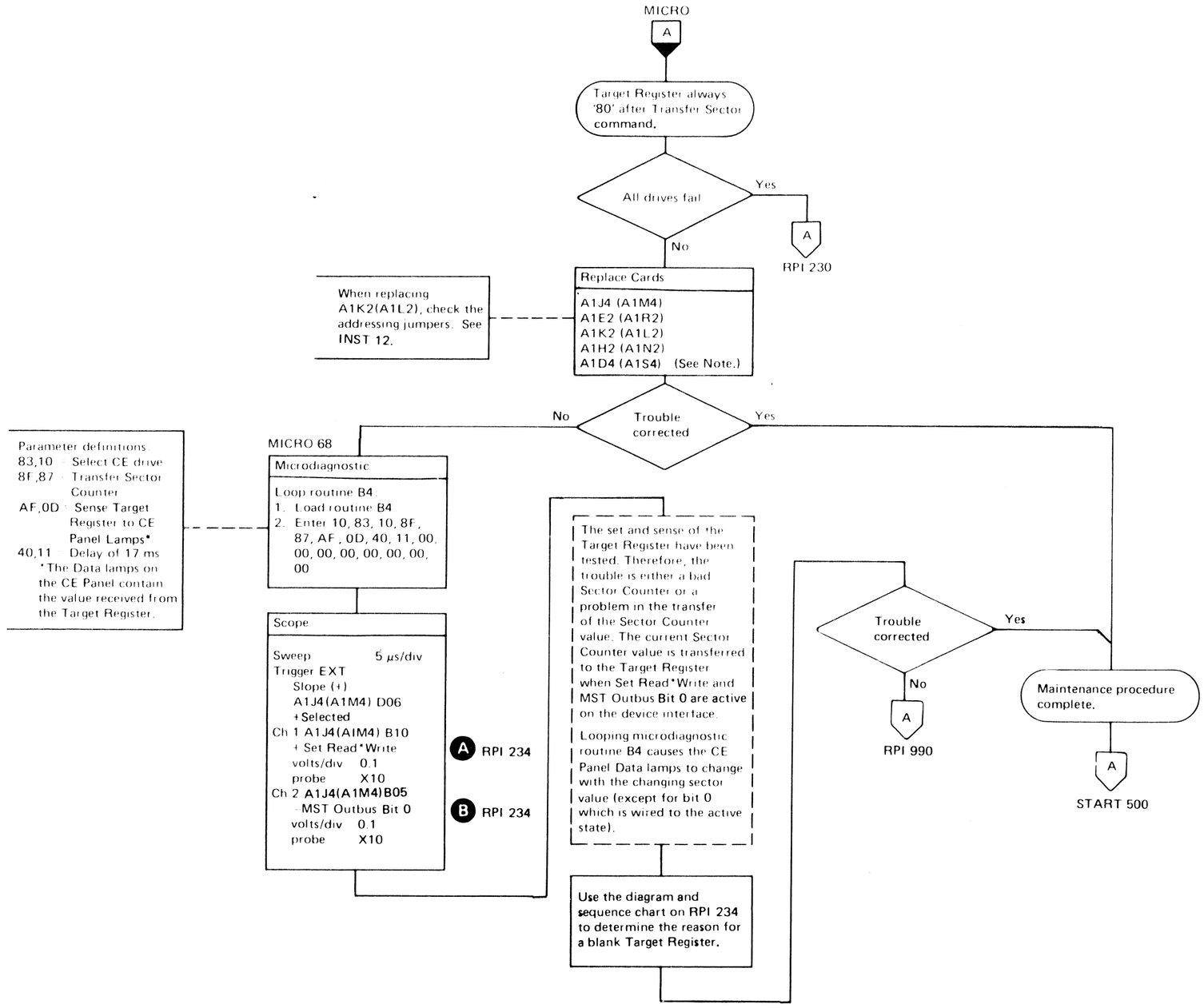


Legend:
- Inactive
- Active level
- Tolerance

Chart Line No.	Line Name	ALD	Test Point		
1	+CT 60	BH120	A2Q2 G04		
2	–Transfer Sector Count	BA140	A2F2 P03	A	
3	–Bus Out Bit 0	BA140	A2F2 M02		
4	–Rd Wrt Gate	BA140	A2F2 M13		

TRANSFER SECTOR COUNT LATCH FAILURE

See OPER 203 through 205 for a more complete explanation of Rotational Position Sensing.



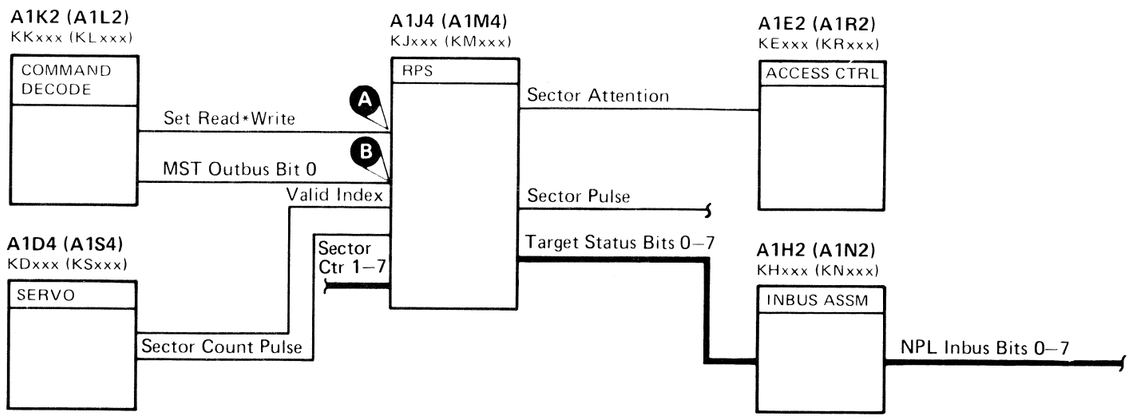
Note: *When replacing A1C2 (A1T2), A1C4 (A1T4), A1D2 (A1S2), A1D4 (A1S4), or Pwr Amp P532 (P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

TRANSFER SECTOR COUNT LATCH FAILURE

The Sector Counter counts from 0 (at Index) to 127. The Sector Counter runs continuously while the drive is track following. Sector Count pulses are developed from the servo clock. The Sector Clock Counter (see OPER 204) accepts 39 sector count pulses before advancing the Sector Counter one count. After the Sector Counter reaches 127, the Valid Index 1 pulse resets the Sector Counter for the next revolution.

The Target Register performs two functions:

1. It holds the starting sector location of the record to be read or written. The register is loaded at the beginning of all Read, Write, and Search CCWs by a Set Sector command. The sector number is retrieved from main storage.
2. It temporarily stores the beginning sector count transferred from the Sector Counter after a Write operation.



Legend: Inactive
Active level
Tolerance

Chart Line No.	Line Name	ALD	Test Point		
1	+Selected	KJ520 (KM520)	A1J4 (A1M4) D06		
2	+Set Read*Write	KJ510 (KM510)	A1J4 (A1M4) B10	A	
3	–MST Outbus Bit 0	KJ510 (KM510)	A1J4 (A1M4) B05	B	
4	+Sector Pulse	KJ520 (KM520)	A1J4 (A1M4) B11		
5	–Sector Count Pulse	KJ520 (KM520)	A1J4 (A1M4) D05		
6	–Valid Index 1	KJ520 (KM520)	A1J4 (A1M4) D09		

Check for the presence of pulses moving across the scope face by changing the sweep time to 0.5 ms/div.
(Index is checked in an earlier routine.)

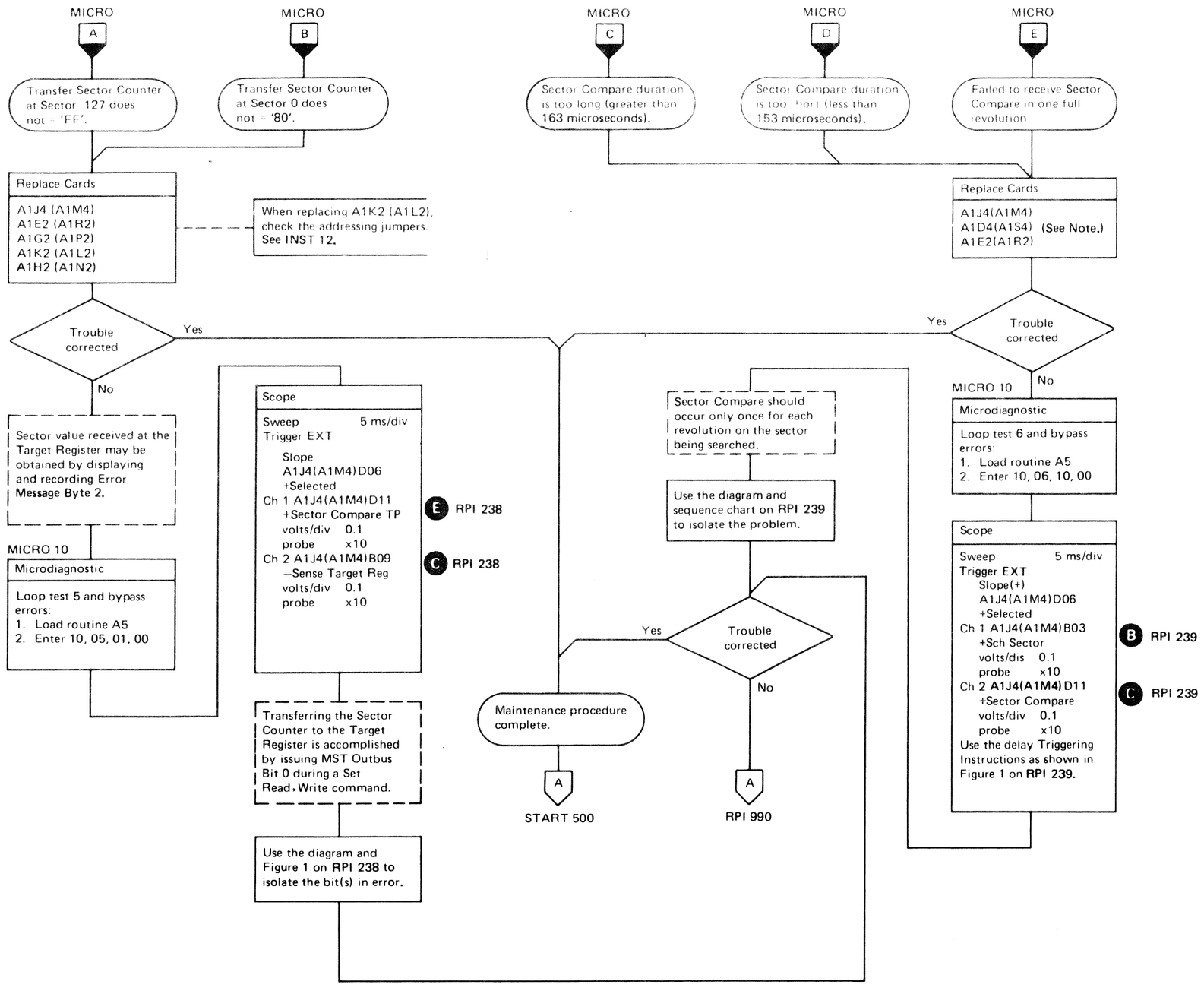
TRANSFER SECTOR COUNT LATCH FAILURE

Rotational Position Sensing (RPS) senses the angular position of a record on the disk and uses it to reduce rotational delay on subsequent operations.

The drives contain a counter that counts the 128 sectors between Index Marks. When a G1 (Home Address) or a G3 (Count field) operation begins, the Transfer Sector Count line is activated in the controller and sent to the drive over Device Outbus bit 0. The drive uses bit 0 as a control to transfer the value in the Sector Counter into the Target Register. After the Read or Write operation is completed, the Target Register may be sensed and used for subsequent operations.

See OPER 203 through 205 for a more complete explanation of Rotational Position Sensing.

Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*



TRANSFER SECTOR COUNT LATCH FAILURE

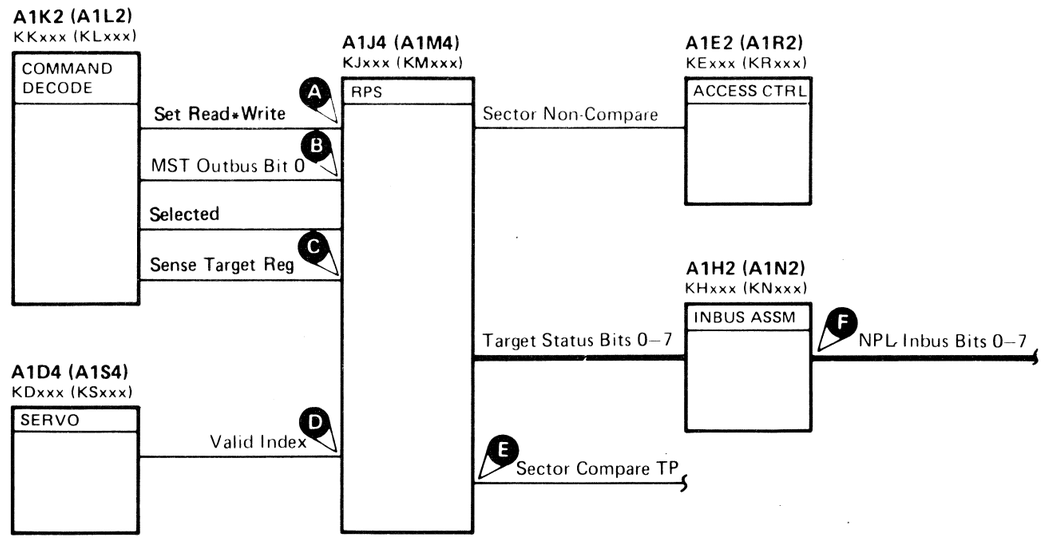


Figure 1. Target Register Status Bits

Bits	ALD	Test Point
0	KH 200 (KN200)	A1H2 (A1N2) B05
1		A1H2 (A1N2) D05
2		A1H2 (A1N2) B09
3		A1H2 (A1N2) D10
4		A1H2 (A1N2) D07
5		A1H2 (A1N2) D02
6		A1H2 (A1N2) B02
7		A1H2 (A1N2) D06

Legend: Inactive; Active level; Tolerance

Chart Line No.	Line Name	ALD	Test Point		Transfer Sector 127 / Transfer Sector 0
1	+Selected	KJ520 (KM520)	A1J4 (A1M4) D06		
2	+Sector Compare TP	KJ510 (KM510)	A1J4 (A1M4) D11	E	
3	+Set Read*Write	KJ510 (KM510)	A1J4 (A1M4) B10	A	
4	–MST Outbus Bit 0	KJ510 (KM510)	A1J4 (A1M4) B05	B	
5	–Sense Target Reg	KJ520 (KM520)	A1J4 (A1M4) B09	C	
6	–Valid Index	KJ520 (KM520)	A1J4 (A1M4) D09	D	
7	+NPL Inbus Bits 0–7	KH200 (KN200)	See Figure 1.	F	

TRANSFER SECTOR COUNT LATCH FAILURE

Rotational Position Sensing (RPS) senses the angular position of a record on the disk and uses it to reduce rotational delay on subsequent operations.

The drives contain a counter that counts the 128 sectors between Index Marks. When a G1 (Home Address) or a G3 (Count field) operation begins, the Transfer Sector Count line is activated in the controller and sent to the drive over Device Outbus bit 0. The drive uses bit 0 as a control to transfer the value in the Sector Counter into the Target Register. After the Read or Write operation is complete, the Target Register may be sensed and used for subsequent operations.

See OPER 203 through 205 for a more complete explanation of Rotational Position Sensing.

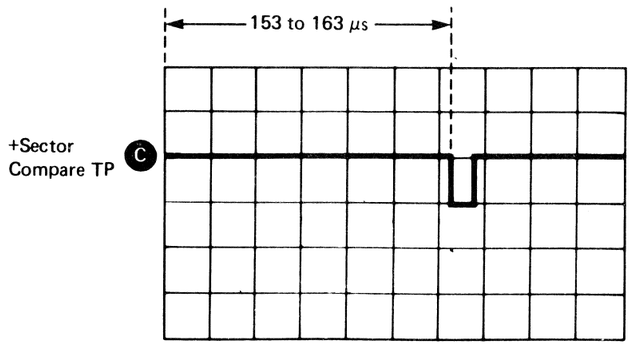
Figure 1. Expanded Sequence Chart

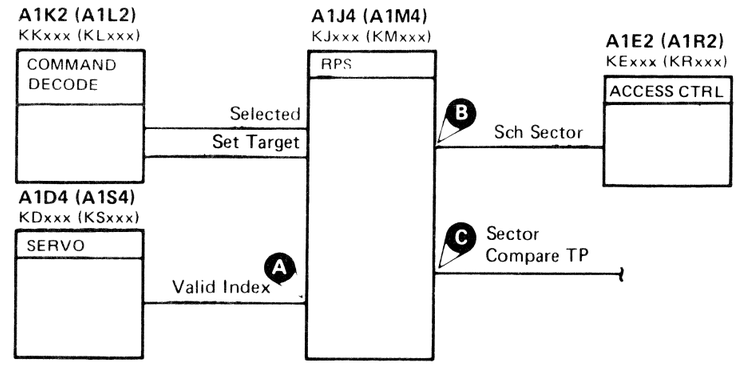
Triggering Instructions

B Sweep Mode – B Triggerable After Delay Time
Delay Time-Delay Sweep – 20 μs/div

A and B Time/Div – 5 ms/div
Delay-Time Multiplier – 4.0

Slope – (+)
Source – Int Ch 1





Legend: Inactive, Active level, Tolerance

Chart Line No.	Line Name	ALD	Test Point		See Figure 1.
1	+Selected	KJ520 (KM520)	A1J4 (A1M4) D06		
2	–Valid Index	KJ520 (KM520)	A1J4 (A1M4) D09	A	
3	+Sch Sector	KJ510 (KM510)	A1J4 (A1M4) B03	B	
4	+Sector Compare TP	KJ510 (KM510)	A1J4 (A1M4) D11	C	

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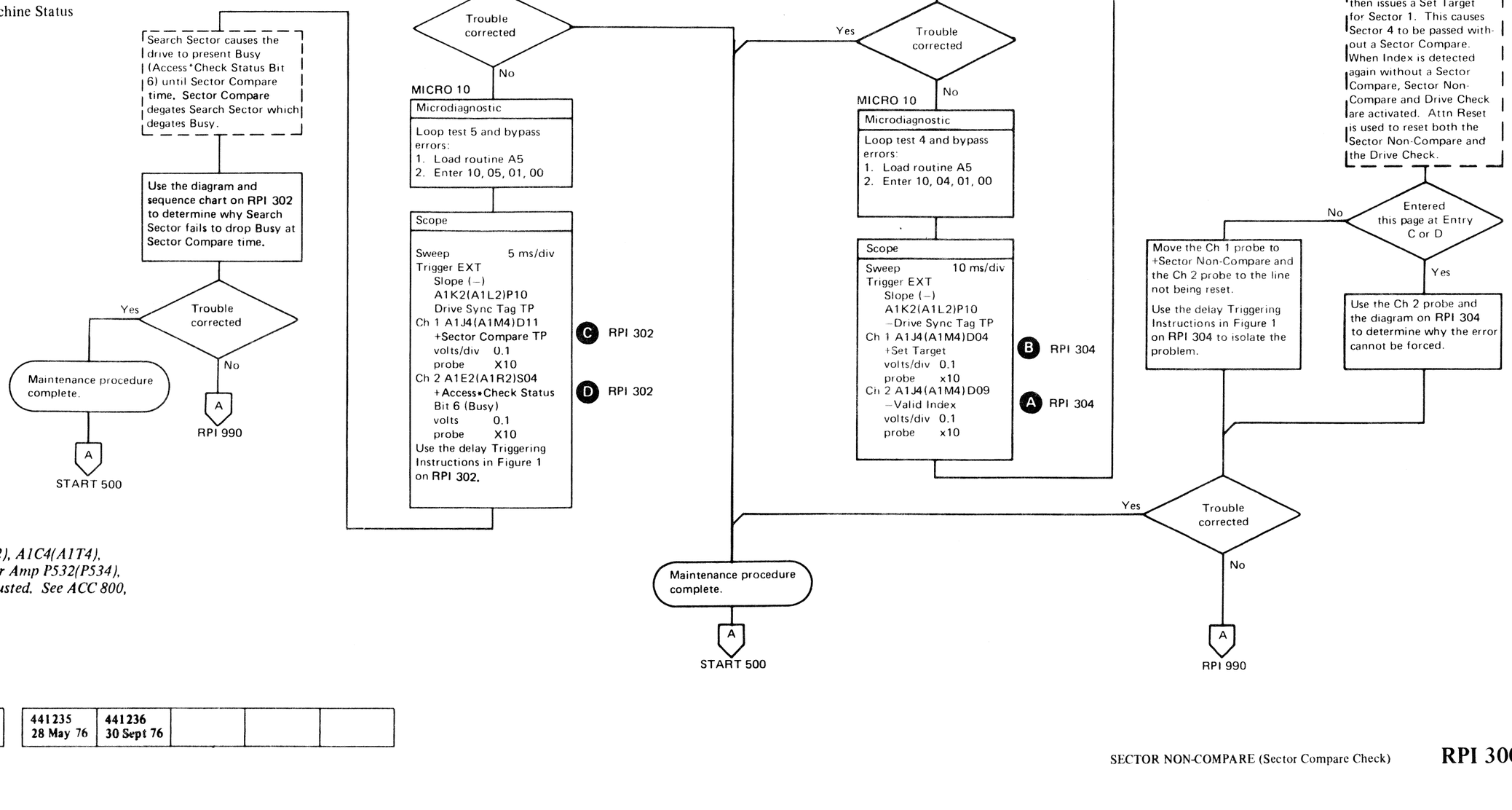
SECTOR NON-COMPARE (Sector Compare Check)

The Sector Non-Compare occurs as follows:

1. Set Target sets the Target Register and starts Search Sector.
2. Sector Compare Check latch 1 is set at the first Valid Index (Index Mark). See ALD page KJ510(KM510).
3. Sector Compare Check latch 2 is set at the fall of Index Mark.
4. Sector Compare Check latch 1 turns off if no Sector Compare occurs before the next Valid Index.
5. Sector Compare Check latch 1 off and Sector Compare Check latch 2 on causes Sector Non-Compare.
6. Attention is set and remains on until Attention Reset or Check Reset is issued. Sector Compare Check is also indicated in Sense Status 1, bit 1.
7. Drive Check is turned on in Machine Status



Note: *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

SECTOR NON-COMPARE (Sector Compare Check)

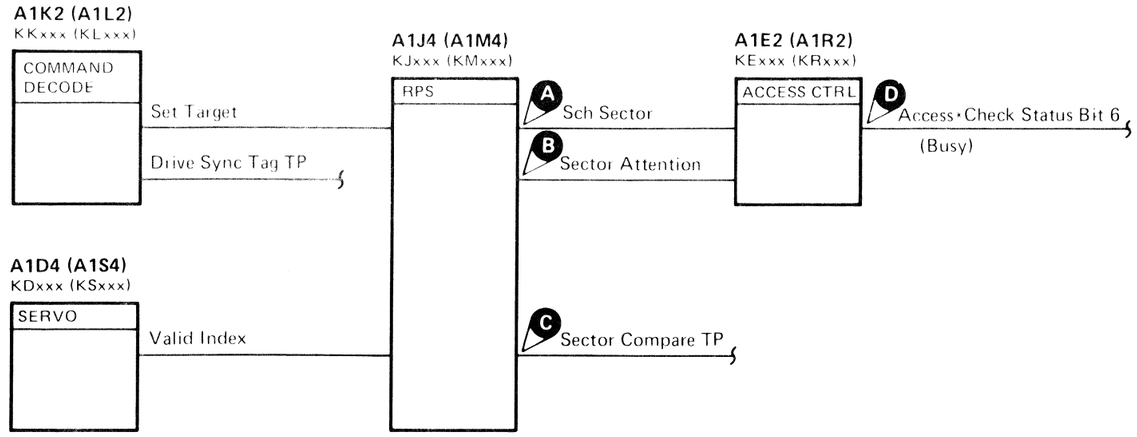


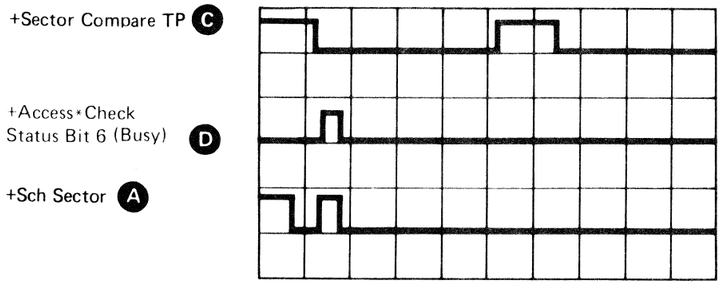
Figure 1. Expanded Sequence Chart

Triggering Instructions

B Sweep Mode – B triggerable after delay time
Delay Time-Delay Sweep – 0.1 ms/div

A and B Time/Div – 5 ms/div
Delay-Time Multiplier – 0.0

Slope – (+)
Source – Int Ch 1



Legend: Inactive, Active level, Tolerance

Chart Line No.	Line Name	ALD	Test Point		See Figure 1.
1	–Drive Sync Tag TP	KK170 (KL170)	A1K2 (A1L2) P10		
2	+Sector Compare TP	KJ510 (KM510)	A1J4 (A1M4) D11	C	
3	+Access*Check Status Bit 6 (Busy)	KE160 (KR160)	A1E2 (A1R2) S04	D	
4	+Sch Sector	KE170 (KR170)	A1E2 (A1R2) G13	A	
5	+Sector Attention	KJ510 (KM510)	A1J4 (A1M4) D03	B	

SECTOR NON-COMPARE (Sector Compare Check)

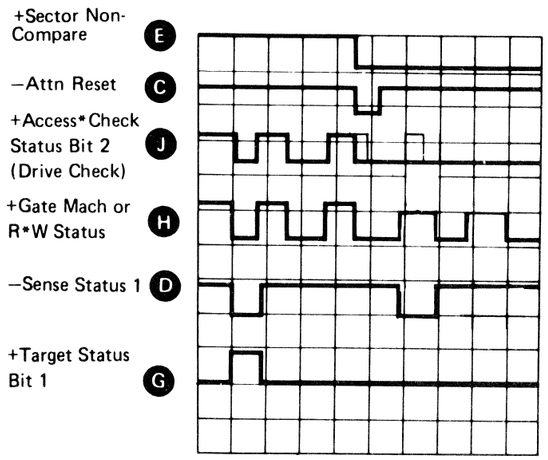
Figure 1. Expanded Sequence Chart

Triggering Instructions

B Sweep Mode – B Starts After Delay Time
Delay Time-Delay Sweep – 20 μs/div

A and B Time/Div – 10 ms/div
Delay-Time Multiplier – 3.0

Slope – (+)
Source – Int Ch 1



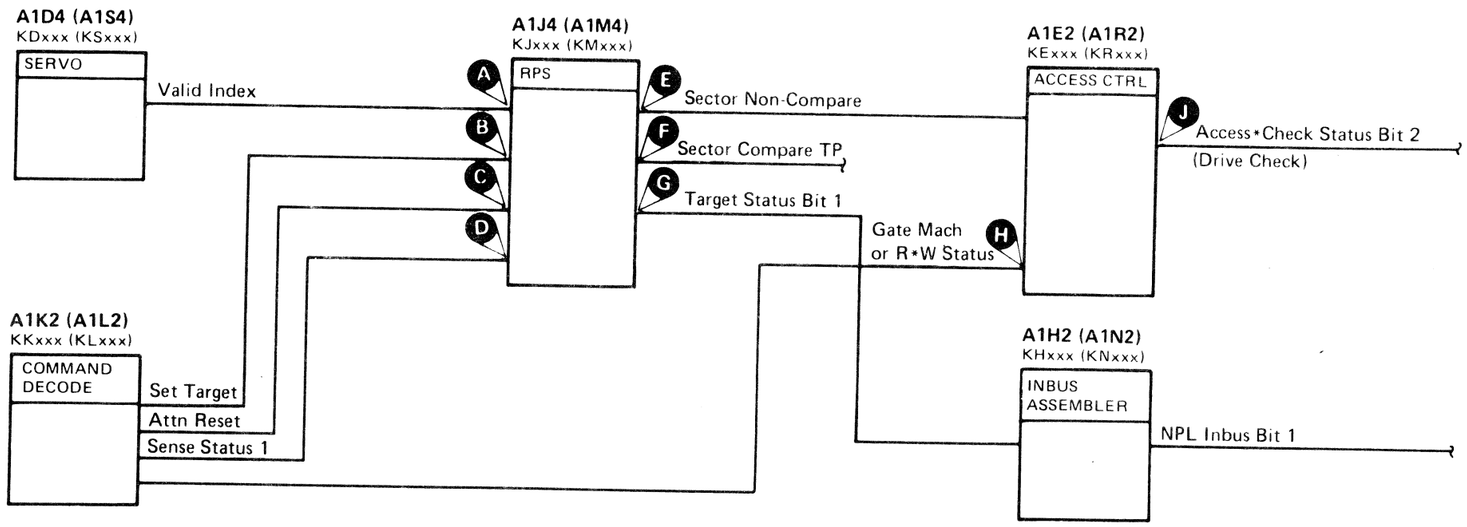
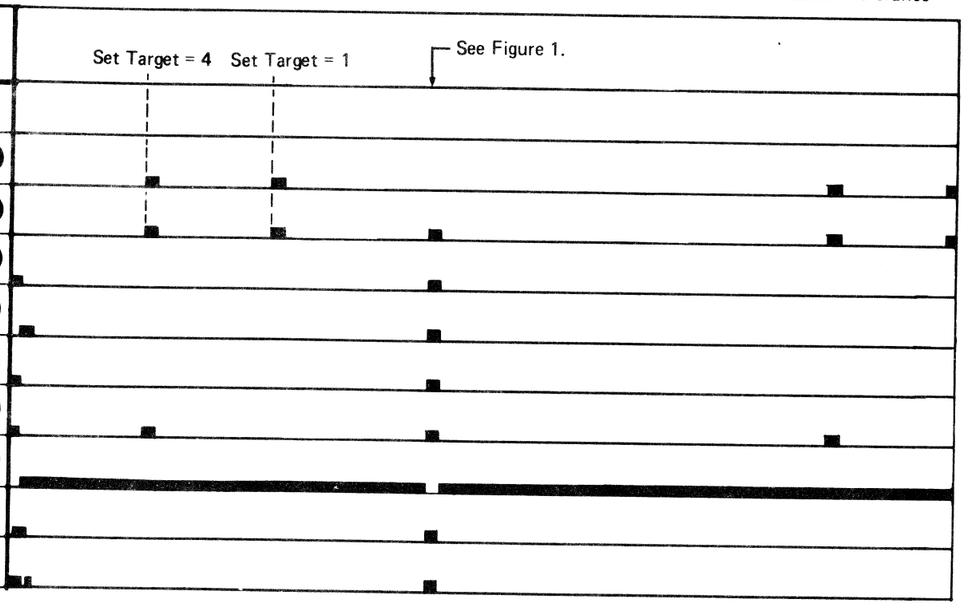


Chart Line No.	Line Name	ALD	Test Point	
1	–Drive Sync Tag TP	KK170 (KL170)	A1K2 (A1L2) P10	
2	+Set Target	KJ530 (KM530)	A1J4 (A1M4) D04	B
3	–Valid Index	KJ520 (KM520)	A1J4 (A1M4) D09	A
4	+Sector Non-Compare	KJ510 (KM510)	A1J4 (A1M4) D02	E
5	–Attn Reset	KJ530 (KM530)	A1J4 (A1M4) D10	C
6	+Access*Check Status Bit 2 (Drive Check)	KE160 (KR160)	A1E2 (A1R2) S10	J
7	+Sector Compare TP	KJ510 (KM510)	A1J4 (A1M4) D11	F
8	+Gate Mach or R*W Status	KE160 (KR160)	A1E2 (A1R2) U12	H
9	+Target Status Bit 1	KJ510 (KM510)	A1J4 (A1M4) J09	G
10	–Sense Status 1	KJ510 (KM510)	A1J4 (A1M4) G13	D



SECTOR NON-COMPARE (Sector Compare Check)

The Set Target command sets the value of Bus Out into the Target Register and starts a Search Sector operation. When the Sector Counter is equal to the value in the Target Register, a 124 to 136 microsecond Sector Compare pulse is generated. The Sector Compare pulse occurs at each revolution until an Attention Reset is issued.

Device Bus In bit 7 is active (except at Sector Compare time) while a Search Sector is in progress.

Device Bus In bit 6 is active except at Sector Compare time to indicate that the drive is busy.

Sector Non-Compare occurs if a Sector Compare is not found within two Index Marks. Sector Non-Compare activates Drive Check. The Sector Non-Compare occurs as follows:

1. Set Target sets the Target Register and starts Search Sector.
2. Sector Compare Check latch 1 is set at the first Valid Index (Index Mark). See ALD page KJ510(KM510).
3. Sector Compare Check latch 2 is set at the fall of Index Mark.
4. Sector Compare Check latch 1 turns off if no Sector Compare occurs before the next Valid Index.
5. Sector Compare Check latch 1 off and Sector Compare Check latch 2 on gives the condition for Sector Non-Compare.
6. Attention is set and remains on until Attention Reset or Check Reset is issued. Sector Compare Check is also indicated in Sense Status 1 bit 1.
7. Drive Check is turned on in Machine Status.

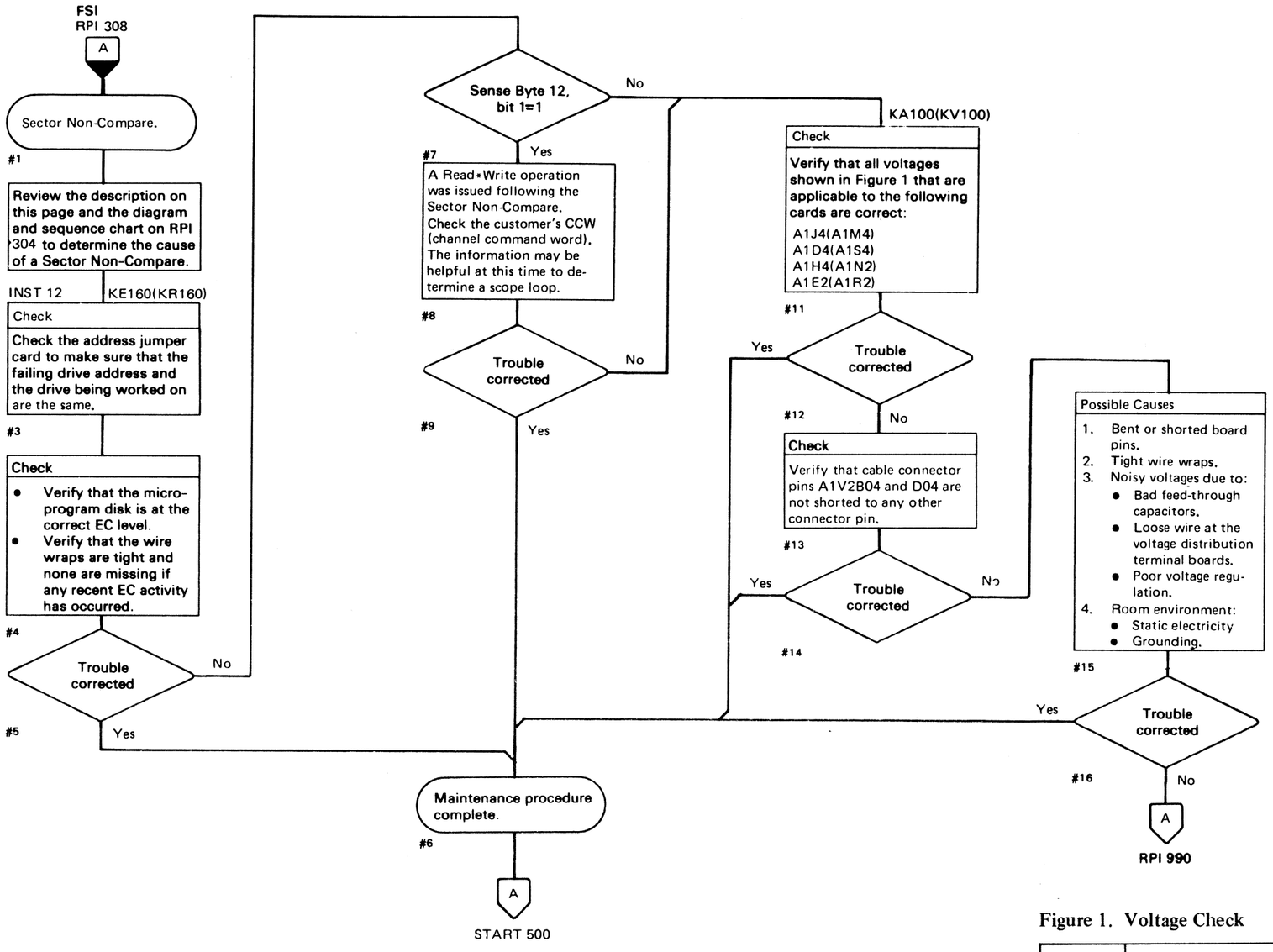


Figure 1. Voltage Check

Voltage	Test Point
-4 V +6 V +12 V -12 V -24 V	Use the ALD pages KA100 (KV100) to determine applicable voltages and their test points. See PWR 290 for acceptable tolerances.

FALSE DRIVE CHECK

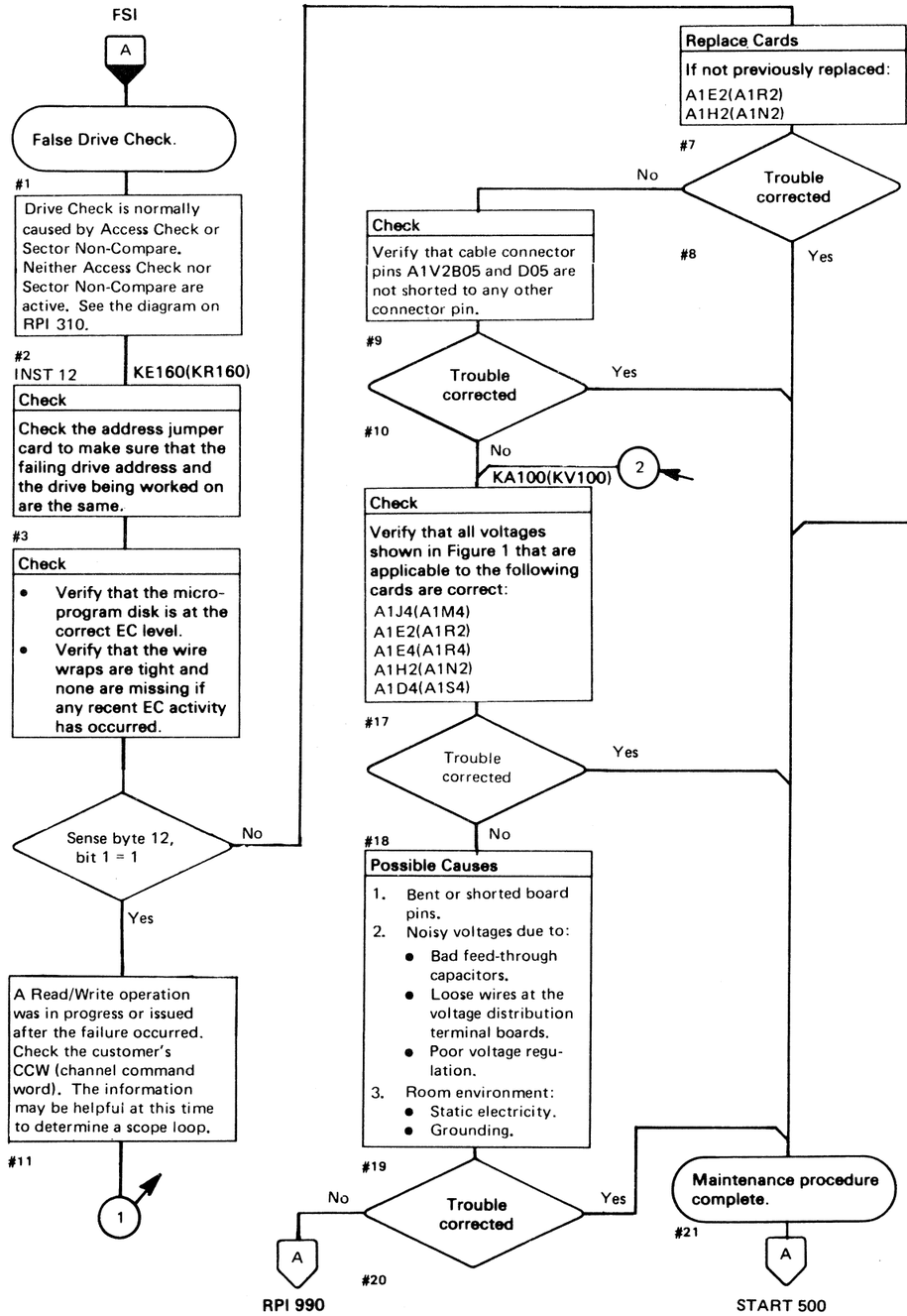


Figure 1. Voltage Check

Voltage	Test Point
-4 V +6 V +12 V -12 V -24 V	Use the ALD pages KA100 (KV100) to determine applicable voltages and their test points. See PWR 290 for acceptable tolerances.

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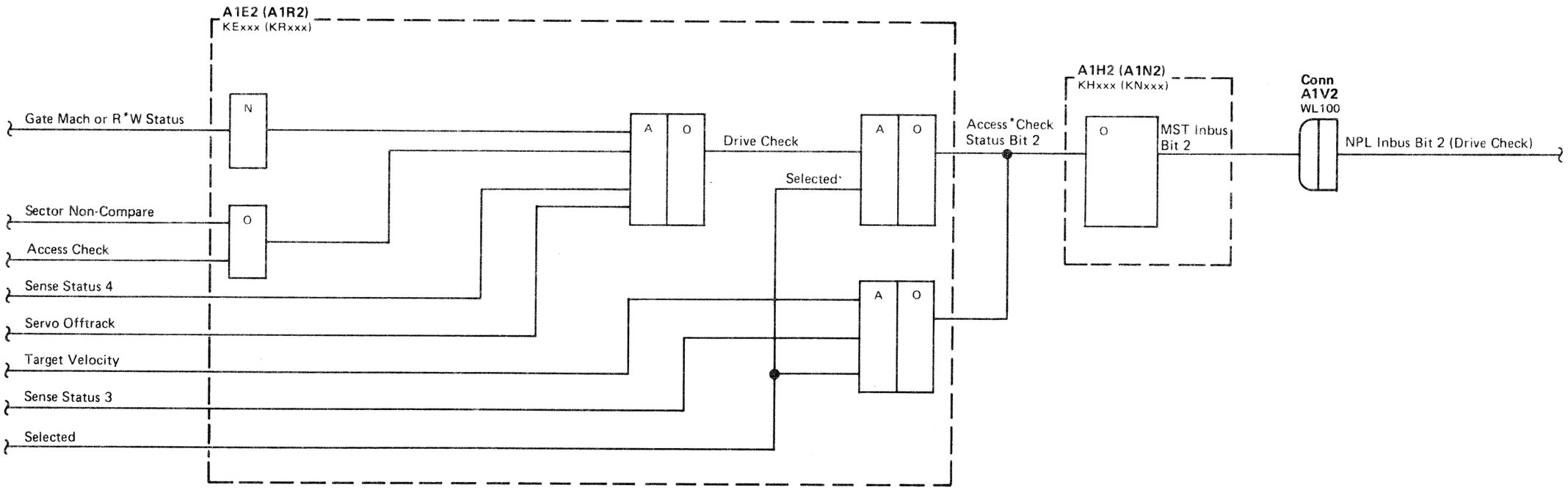
FALSE DRIVE CHECK

Use this diagram for reference only.



TROUBLE NOT FOUND

A

This page contains aids for problem resolution where insufficient error information is available to follow the maintenance analysis procedure. It may also be used as an aid in analyzing intermittent errors. See the ERAP section of the *System/3 Diagnostic Users Guide* if attached to a System/3.

CHECK DEVICE ADDRESS

Check EREP printouts to determine if more than one device is failing.

CHECK MICRODIAGNOSTIC DISK

If the microdiagnostic failed, verify that the microdiagnostic disk used is the proper EC level for the device that failed.

EC INSTALLATION

If an engineering change has been recently installed, check the EC installation instructions and determine where the change was made.

Inspect the back panel for tight wire wraps.

DRIVE MOTOR

Drive motor speed is incorrect. Check the following:

- Drive motor belt (see HDA 760).
- Drive motor pulley loose or faulty (see HDA 760).
- Drive motor brake (see HDA 720).
- Drive motor faulty (see HDA 715 for replacement procedure).

CABLE

Check for a loose or defective cable at:

A1B2 (A1U2)
A1Y3 (A1Y4)
01C (01D) A1A2
01C (01D) A1A3
A1A2
A1A3
A1V2
A1V3

VOLTAGE CHECKS

Power supply voltage is incorrect (see PWR 290, Entry B).

HDA

Use the HDA Cable Swap Procedure (HDA 713) to isolate the problems to the HDA. See HDA 710 for HDA replacement procedure.

SUMMARY OF CARDS

Reseat or replace:

A1D4 (A1S4)*
A1G2 (A1P2)
A1C2 (A1T2)*
A1H2 (A1N2)
A1K2 (A1L2)**
A1J4 (A1M4)

* *When replacing A1C2(A1T2), A1C4(A1T4), A1D2(A1S2), A1D4(A1S4), or Pwr Amp P532(P534), the servo velocity gain must be adjusted. See ACC 800, Entry B for the procedure.*

** *When replacing A1K2(A1L2), check the addressing jumpers. See INST 12.*

REFERENCES

Index theory on OPER 126.

B

CHECK DEVICE ADDRESS

Check EREP printouts to determine if more than one device is failing.

CHECK MICRODIAGNOSTIC DISK

If the microdiagnostic failed, verify that the microdiagnostic disk used is the proper level for the device that failed.

EC INSTALLATION

If an engineering change has been recently installed, check the EC installation instructions and determine where the change was made.

Inspect the back panel for tight wire wraps.

VOLTAGE CHECKS

Check the voltages (see PWR 290, Entry B).

SUMMARY OF CARDS

A1J4 (A1M4)
A1K2 (A1L2)*
A1E2 (A1R2)
A1H2 (A1N2)

* *When replacing A1K2(A1L2), check the addressing jumpers. See INST 12.*

REFERENCES

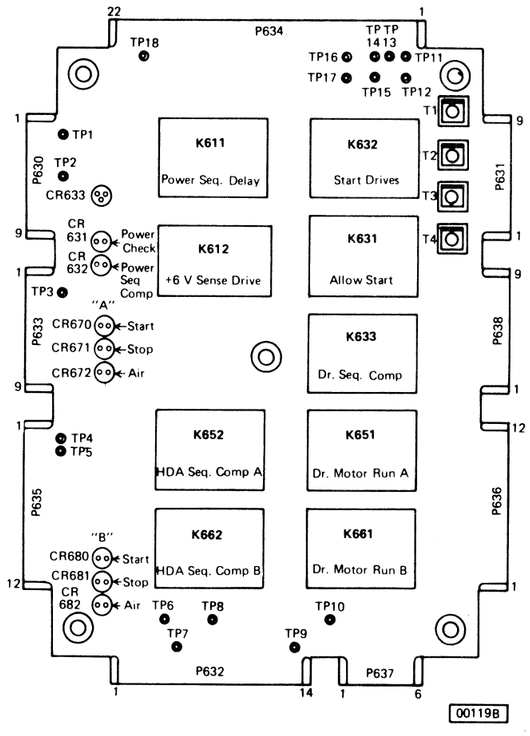
Transmit Target theory on OPER 205 and 206.

PWR CONTENTS

POWER ON FAILURE ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

Board B (3344)



START 140
PWR 12 (3340)

A

String or module does not power on. Both AC and DC lamps are on in the Control Module.

#2

Observe the Power Sequence Complete (LEDs in all 3344 modules. (Sequence Board B)

#3

All Power Seq Complete LEDs on

No

Yes

#4

Proper power sequence of operation:

For 3340 B2 module:

Both AC and DC lamps are on (See Sequence Board A2 on PWR 204 of the 3344 MLM)

For 3344 B2 module:

Power Sequence Complete LED on and Power Check LED off (See Sequence Board B on PWR 208).

To bypass a 3344 module, turn the Service Bypass switch On.

#1

All Power Check LEDs off

Yes

No

A

HDA 100

The failing module is the module closest to the A2 Module that has its Power Check LED On.

A

PWR 216

START 140

B

3344 Power Sequence failure. K611 failed to pick in the first 3344 module. (Pwr Seq Complete LED off)

#5

Power Check LED on

No

Yes

#6

Use PWR 207, PWR 208, and YB055 to isolate the problem.

Possible causes are:

1. P514(3340)
2. P630, P646, P647, or P648 (3344)
3. K611 points
4. K611 coil or its associated time delay pick circuit.
5. Defective Power Sequence Complete LED.

#7

After the problem is corrected exit to PWR 290 for Fix Verification and Checkout procedure.

#8

A

PWR 290

B

PWR 216

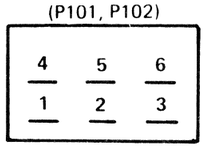
POWER SEQUENCING CIRCUITS

DANGER
LETHAL VOLTAGES are present in the power servicing area.
SAFETY cannot be overemphasized.
Consider ALL CIRCUITS LIVE until measured otherwise.
CAPACITORS are potentially explosive devices.
WEAR SAFETY GLASSES.
After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

POWER-ON SEQUENCE (See PWR 11–3340 MLM)

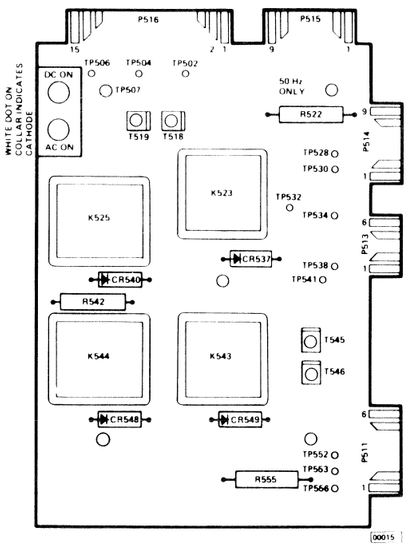
1. K251, Phase Rotation
2. K525, EPO
3. Power On Button
4. K544, Sequence Pick
5. K260, Main AC Contactor (AC On)
6. DC Power Supplies and Blower
7. K543, +6 Volt Sense (DC On)
8. +24V Sequence to Satellite Mods.
9. Satellite Modules Power Up
10. K523, Sequence Complete

EPO CONNECTOR (P101, P102)

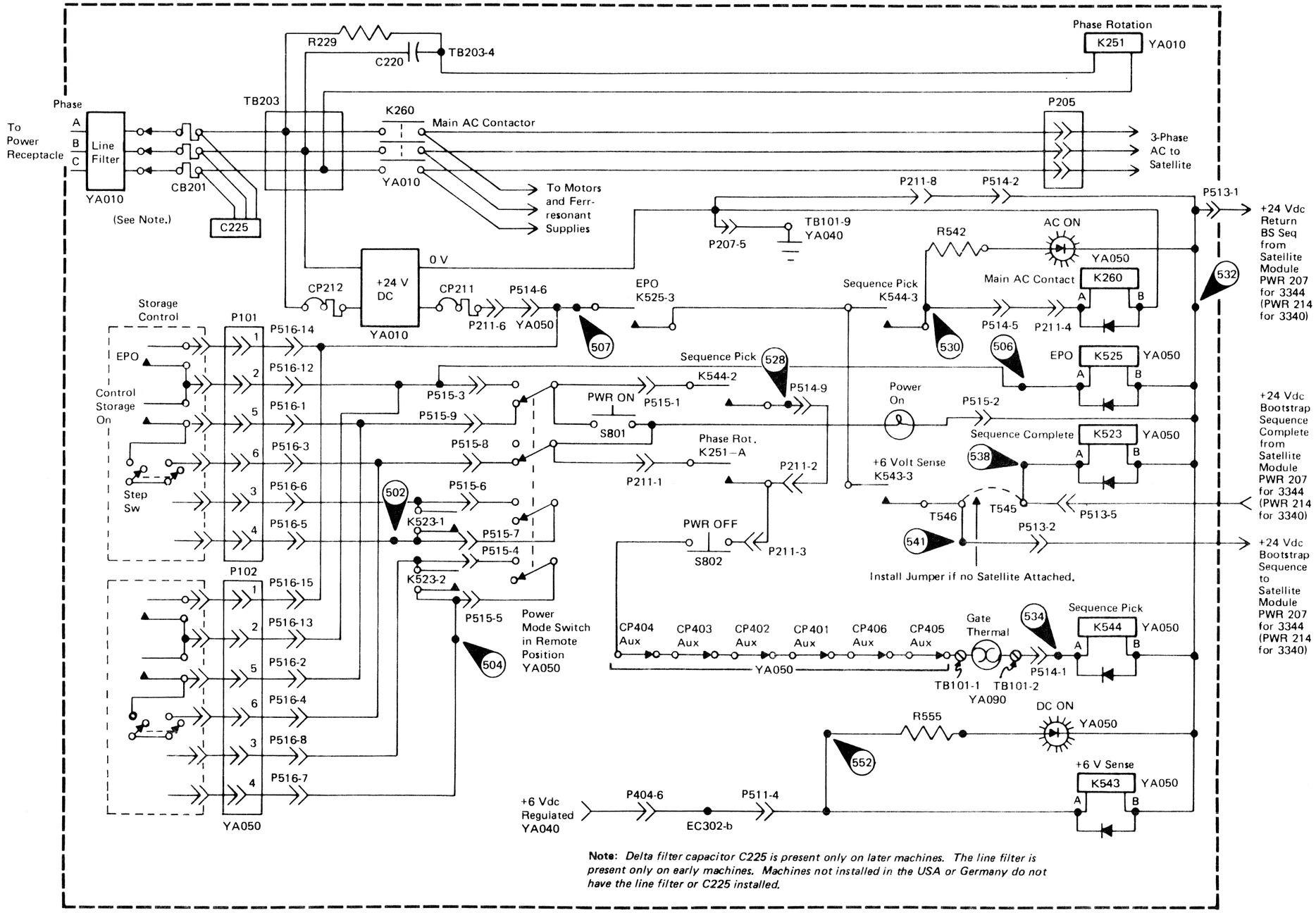


(plugging view)

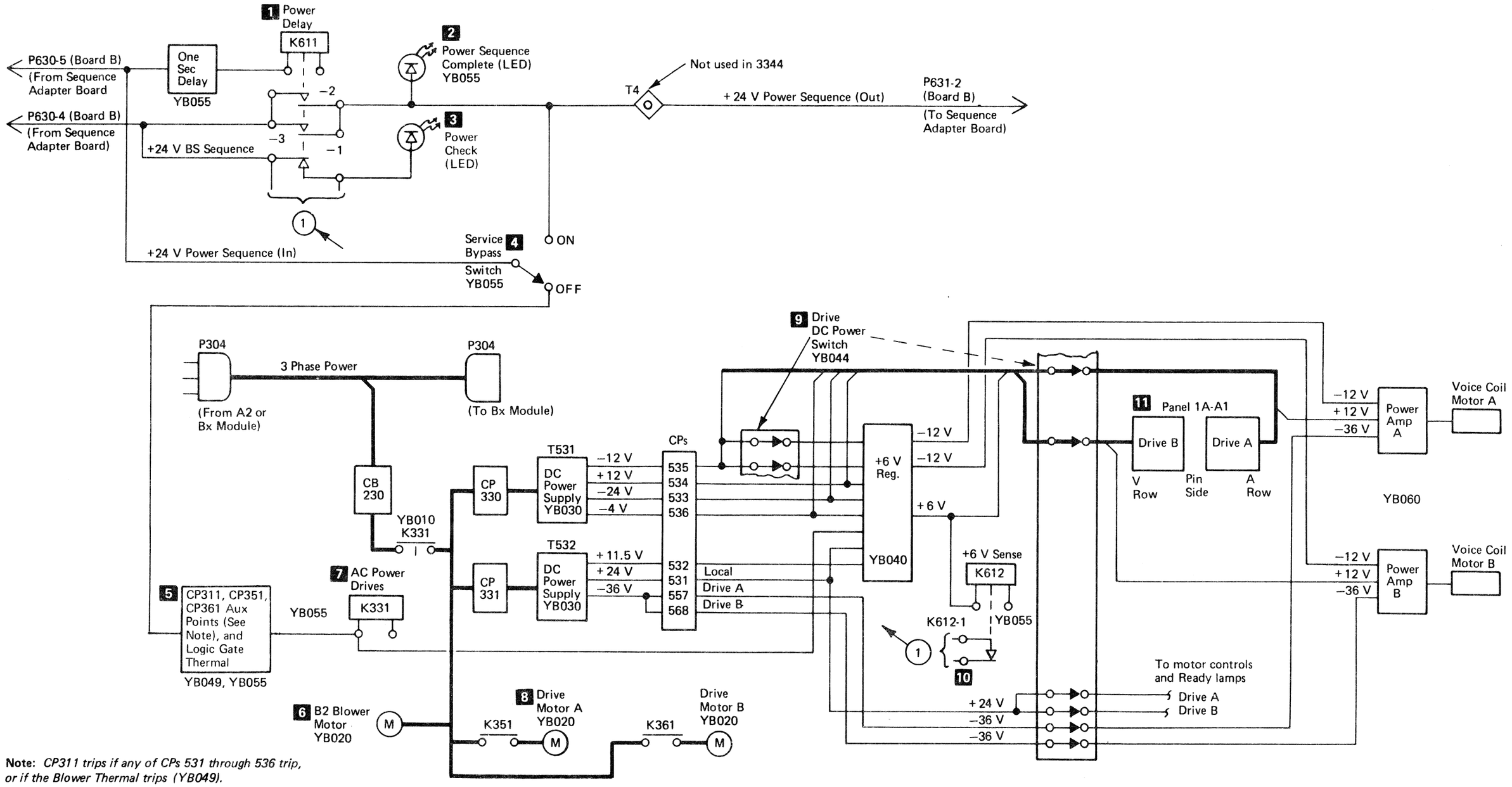
SEQUENCE BOARD, A2 (3340)



LOCATED IN 3340 A2 MODULE



Note: *Delta filter capacitor C225 is present only on later machines. The line filter is present only on early machines. Machines not installed in the USA or Germany do not have the line filter or C225 installed.*



Note: *CP311 trips if any of CPs 531 through 536 trip, or if the Blower Thermal trips (YB049).*

SEQUENCING 3344s WITH 3340s

The 3344 Disk Storage module or modules connect to a 3340 Disk Storage Subsystem (string). A 3340 A2 Module provides data control and power control to one, two, or three 3344s. The 3340s and 3344s can be mixed in any combination and in any sequence in the string, if the 3340 A2 is the first module of the string.

A logic diagram of the power sequence description is located on PWR 207 and 208.

The TBs for Delta-Wye conversion are shown on PWR 292 except for TB530, which is described on PWR 290.

AC AND DC POWER ON

References are to the Drive Power diagram on PWR 205.

3340 A2 Controller

The control module controls power sequencing and supplies three-phase power to all modules. Power sequencing is initiated by the storage control or by the Power On switch when the Power Mode switch is in the Local position (PWR 14 3340 MLM). Two lines, +24 V Bootstrap Sequence and +24 V Bootstrap Sequence Complete (PWR 14) and a +24 V Return line connect to the next 3340 B2 or 3344 B2 Module. The +24 V Bootstrap Sequence line is active when the DC On lamp is activated. The DC On lamp indicates that three-phase power is available to all modules of the string. The +24 V Bootstrap Sequence line brings up power in the next 3340 or 3344 module. With power on, the +24 V Sequence Complete line in the control module is activated by a jumper in the last module of the string. +24 V BS Sequence Complete picks the Sequence Complete relay (K523) in the A2 Module (PWR 14 — 3344 MLM). K523 releases the storage control so that it can advance to the next string.

3344 DC Supplies and Blower

The drive power sequencing diagrams on PWR 207 and 208 show the connections between 3340s and 3344s. The two 3340s and two 3344s can be connected in any combination as long as the A2 is the first module. The Sequence Adapter Board in the first 3344, which contains no relay logic, adapts control lines between the 3340s and 3344s. The +24 V Bootstrap Sequence signal passes through the cable between P646 and P647 (in the first 3344 only) to all 3344 Sequence Adapter Boards. The +24 V Power Sequence line is also supplied from the +24 V Bootstrap line. Power Sequence (In) picks the AC Power Drive contactor (K331) through the Off position of the Service Bypass switch and picks the Power Sequence Delay relay (K611) through a one-second time delay. (K611 **1** and K331 **7** are also shown on PWR 205.) After one second, the K611 points connect the +24 V BS Sequence line to the +24 V Power Sequence (Out) line which is returned to the Sequence Adapter Board to activate T502 and P513-2. Install a jumper between T501 and T502 (Power Seq Comp — 3344) if this is the last module. Sequence Complete in the 3344 becomes BS Sequence Complete in the 3340 A2 Module where it picks the Sequence Complete relay (K523).

If this is not the last module of the string, the line at P513-2 becomes +24 V BS Sequence to initiate power on in the 3340 B2 Module and the last 3344. After K611 in the last module is picked, the jumper between T501 and T502 on the Sequence Adapter Board returns Sequence Complete to the control module to pick K523 and finish the power-on sequence for blowers and DC voltages.

3344 Drive Power

When the AC Power Drives relay (K331) **7** is picked, three-phase power goes to the blower motor, to the transformers in the DC Power supplies, and to the relays in the spindle drive motor circuits. K331 and the Power Delay relay (K611) **1** are picked in parallel, but the B side of K611 coil goes to —24 Vdc through a 1-second delay circuit. The pick signal (+24 V Power Sequence) is supplied from the 3340 A2 or the previous Bx Module through the Sequence Adapter Board (PWR 207). K331 is not picked if the Service Bypass switch **4** is in the On position or one of the series of Aux CP points **5** is open. CP351 or CP361 (YB049) trips as a result of an overheated spindle drive motor.

The signal path to start the power-on sequence in the next module is through the On position of the Service Bypass switch or through the points of K611. With either path, Power Sequence Complete (LED) **2** is on and the signal goes back to the Sequence Adapter Board. From the Adapter Board, the signal is returned to the A2 Module as Sequence Complete (see Note 2 — PWR 207), or to the next module (3344 or 3340).

With K331 picked, the blower motor **6** starts, power supplies activate, and three-phase power becomes available to the Drive Motor relays (K351 and K361) **8**. The A1 Board **11** has power when the +6 V Sense relay (K612) **10** is picked. Points of K612 open to turn off Power Check (LED) **3** . As a service aid, power can be removed from one drive at a time by positioning the Drive DC Power switch **9** to the Drive A or Drive B Off position.

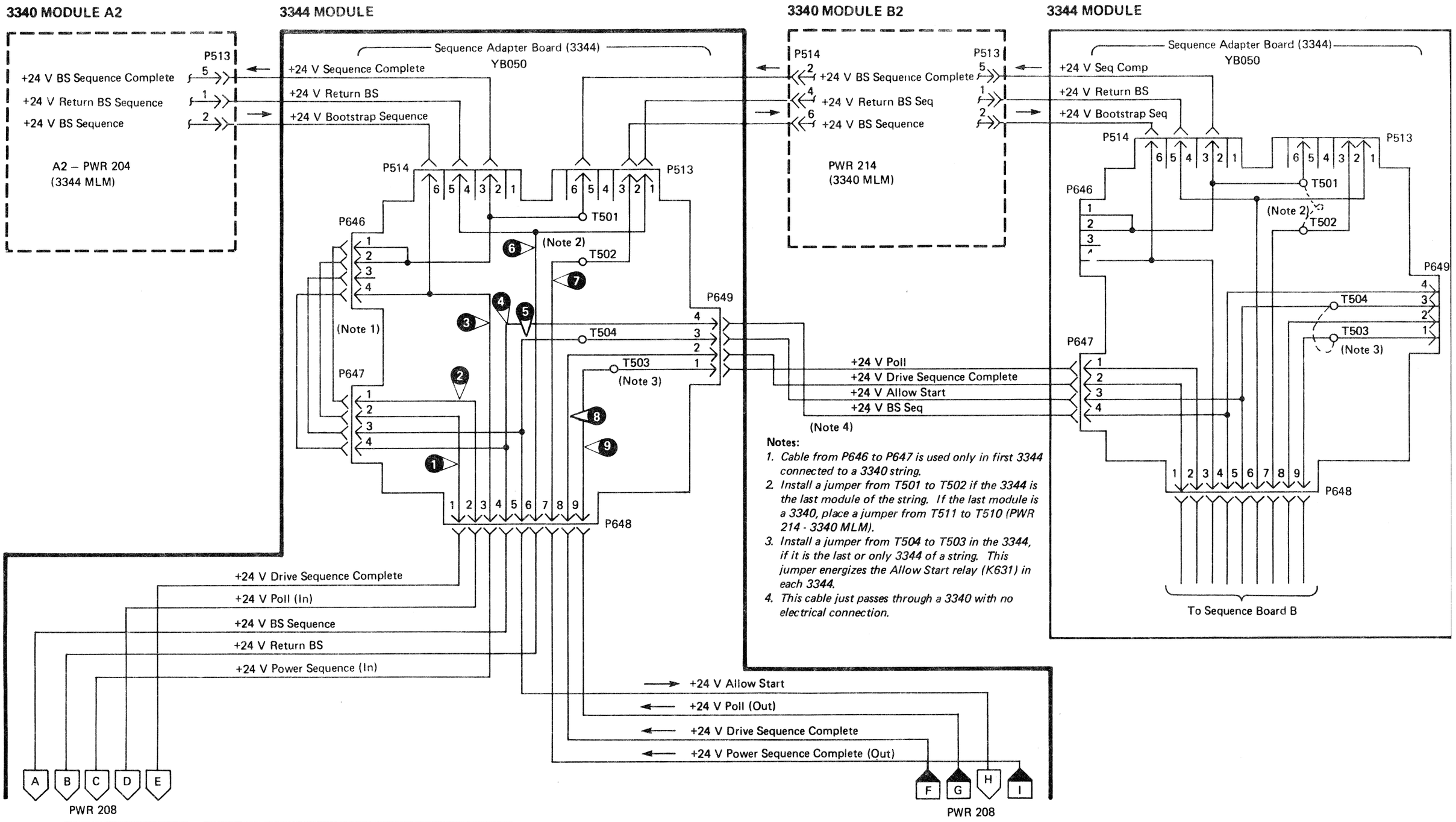
With both drives ready, the condition of the LED indicators on Sequence Board B are as follows:
Power Check - Off,
Power Sequence Complete - On,
Start (A) - On,
Stop (A) - Off,
Air (A) - On,
Start (B) - On,
Stop (B) - Off, and
Air (B) - On.

START 3344 SPINDLE DRIVE MOTORS

The 3340 spindle drive motors start immediately after dc supply voltages are available if the Start/Stop switches are in the Start position. Spindle motors in 3344s are sequenced on to hold down the peak load if the Start/Stop switches are in the Start position. The +24 V Allow Start, +24 V Drive Sequence Complete, and +24 V Poll lines determine the starting order.

The +24 V Sequence Complete (BS Sequence Complete in 3340) provides +24 V Drive Sequence Complete (In) and +24 V Poll (In) to the Sequence Adapter Board of the first 3344 of the string. These lines are active when the cable from P646 to P647 is in place on the Sequence Adapter Board in the first 3344. The jumper cable is used only in the first 3344.

Assuming both spindle drive motor switches are in the Start position, Drive Motor A starts first. The +24 V Drive Sequence Complete (In) picks the Start Drives relay (K632-YB055) through Allow Start relay (K631). K631 was picked by the jumper between T504 and T503 in the end module which took +24 V Poll and returned it on the +24 V Allow Start line. Points of K351 **8** (PWR 205) and K361 supply three-phase power to the spindle drive motors. CP351 or CP361 (YB049) trips as a result of an overheated spindle drive motor.



Notes:

1. *Cable from P646 to P647 is used only in first 3344 connected to a 3340 string.*
2. *Install a jumper from T501 to T502 if the 3344 is the last module of the string. If the last module is a 3340, place a jumper from T511 to T510 (PWR 214 - 3340 MLM).*
3. *Install a jumper from T504 to T503 in the 3344, if it is the last or only 3344 of a string. This jumper energizes the Allow Start relay (K631) in each 3344.*
4. *This cable just passes through a 3340 with no electrical connection.*

3344	JG0206 Seq. 2 of 2	2359254 Part No.	441235 28 May 76	441236 30 Sept 76	441237 1 Mar 77	441238 3 Oct 77	

DRIVE POWER SEQUENCING

PWR 207 A B C D E

PWR 207 F G H I

SEQUENCE BOARD B (3344)

CE Mode B A Off

Service Bypass On Off

00127A

Drive Seq Complete

K633-4

11

+24 V Drive Sequence Complete

P631-1

P630-1 P634-8 3 2 Off On 1 P634-2

+24 V Poll P630-3 K632-4

T2 13 +24 V Poll P631-7

(Note)

P634-5 6 5 Off 4 On YB055 P634-3

Service Bypass (S1030)

K631 Allow Start

1

P630-9 (Not Used in 3344)

T1 (Note) Logic Gate Thermal YB090

Blower Thermal CP311 Aux

P631-9

CP361 CP351 K331 AC Power Drives

P634-20 18 TB101-1 TB101-2

TB431-5 9 P637-6 Aux YB049 YB055

P632-13 +24 V Sense BS

Service Bypass (S1030) P634-15 9 Off 8 On 7 YB055 P634-14 P632-3

T4 (Note) +24 V Power Sequence (Out)

P631-2

+24 V Power Sequence (In) P630-5

+24 V Power Sequence (In)

K611-1 K612-1

TB306-2 R311 150Ω L1 YB049 T1 TB306-3

P637-3

Blower and DC CPs CP311

P534-6

2

R632 1.3KΩ

Power Check (LED) YB055

Blower Thermal YB020 TB306-4 P534-9

CPs 531-536 Aux Points

TB431-6

K611 YB055

P631-8 (Not Used in 3344)

+24 V BS Sequence Return

R630 39K

CR633

Power Sequence Complete (LED) YB055

R631 2.2K

C630 1 K μF

R633 1.3KΩ

K611-2

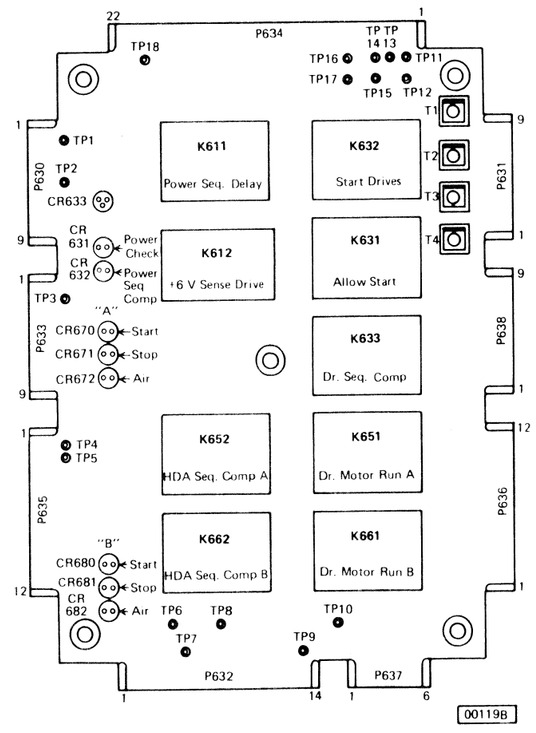
K611-3

+24 V BS Sequence Return P630-6

+24 V BS Sequence P630-4

+24 V BS Sequence P631-5 (Not Used in 3344)

SEQUENCE BOARD B



Note: *Do not install a jumper from T3 to T4 or T1 to T2 on any 3344 Sequence Board B.*

DRIVE POWER SEQUENCING ANALYSIS

PWR 202
START 140

A

Drives power-on sequence failure in a B2 Module.

#4

CB230 tripped

Yes → B → PWR 220

No

#5

Blower motor running in the failing B2

Yes → CP330 or CP331 tripped (See Note)

No → A → PWR 217

Yes → C PWR 220

No

CP351 or CP361 tripped

Yes → B → HDA 311

No

CP311 tripped (Blower Motor Thermal)

Yes

No

CP531 – 536 tripped

Yes

#2
PWR 208

No YB049

Check

Check the following possible causes for CP311 tripping at random:

1. Poor connection to the aux points of CP531 to 536 or blower thermal.
2. Defective aux points of CP531 to 536.
3. Defective blower thermal.
4. Defective CP311.
5. Missing phase to blower.

#3

(1) #14

Exit to indicated page

CP	Function	Page Entry
531	+24 V Local	PWR 270, A
532	+6 V Bulk	PWR 260, C
533	−24 V Supply	PWR 250, B
534	+12 V Supply	PWR 240, D
535	−12 V Supply	PWR 240, C
536	−4 V Supply	PWR 255, B

Tripped CPs are seldom the fault of the CP.

Press gate thermal switch pushbutton.

#8

Machine powers on

No

Yes

#9

Check

DC Compartment air filter. Clean or replace as required.

#10

Check

With power on, the blower should be forcing air out the top of the logic gate.

#11

Blower running

No

Yes

#12

Check the following possible causes for the Gate Thermal tripping:

1. Environmental heat problem.
2. Defective thermal.
3. Blower running backwards due to incorrect power phasing.

#13

(1)

Use logic YB020 to isolate and correct the problem. Possible causes are:

1. Wiring from K331 N/O points 3, 6, and 9 to TB211 open.
2. Open blower motor winding.

If blower replacement is necessary, see HDA 730 for procedure.

#16

Turn Service Bypass switch to Off and attempt to power on. If B2 Module fails to power on, return to START 100 for a new fault indication.

#15

(1)

An overall description of the power-on sequence is located on PWR 206 through PWR 208.

For AC Compartment locations, see PWR 221 or LOC 12.

No

Service Bypass switch off

#19

Yes

+24 Vdc at TP9 on Sequence Board B

No

#20

Yes

The top center black button protrudes when not picked. If in doubt, note change in button position with power on and off.

#29

K331 picked

Yes

No

#23

K331 should be picked. Use PWR 208 and YB055 to isolate the problem. Possible causes are:

1. P637
2. K331 coil or +24 V return.

#25

(1)

Use PWR 221, YB055, and YB010 to determine why no machine power. Possible causes are:

1. K331 contacts.
2. P304 (No ac power to this module).

#24

(1)

Yes

+24 Vdc at TP18 on Sequence Board B

#21

No

Use PWR 208 and YB055 to determine why +24 V is missing at TP9. Possible causes are:

1. P632
2. CP311 (Blower thermal) aux points defective
3. Logic gate thermal contacts (see Note).
4. TB101, TB431, TB306 or associated wiring.

#18

(1)

Use PWR 208 and YB055 to isolate the problem. Possible causes are:

1. P634, P630, or P631 in previous module.
2. Service Bypass switch fails to make contact in the Off position.

#22

(1)

Note: *CPs 330 and 331 have white pushbuttons that protrude about 1/8 inch when reset and about 1/4 inch when tripped.*

PWR 202
B

Power Sequence Complete and Power Check both off in B2 Module.

Use PWR 207, PWR 208, and YB055 to isolate this power sequence problem. Possible causes are:

1. P513 in previous module.
2. P514, P646, P647, P648, P630, and P631 in this module.
3. Sequence Adapter Board distribution.
4. No +24 V sequence voltage from previous module.

(1)

After problem is corrected, exit to PWR 290 for Fix Verification and Checkout Procedure.

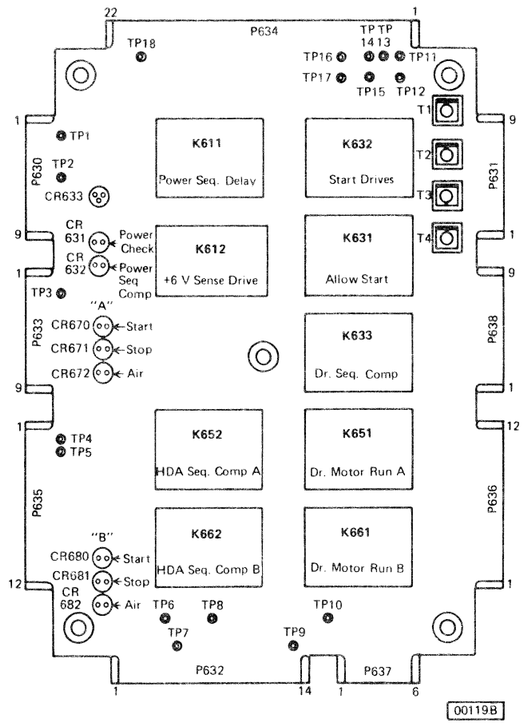
#28

A

PWR 290

SEQUENCE PANEL

Board B



DRIVE POWER SEQUENCING ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

An overall description of the power-on sequence is located on PWR 206 through PWR 208.

PWR 260
PWR 216

A

Check for missing voltages. #9

Any voltage measuring less than 70% of its rated potential is considered missing. #8

+6 Vdc at TP7 on Sequence Board B — Yes / No #10

Relay K612 should be picked. Use PWR 261 and YB055 to isolate the problem.
Possible causes are:
1. K612 coil. K612 has a 6 Vdc coil. Do not interchange.
2. +6 Vdc return circuit
#3

Rotate DC CP Panel for access to the rear of the CPs. #30

W1 (the DC Common Ground) is located on the logic gate. W1 is grounded by a lead from the steel frame to W1-12. #29

+11.5 Vdc from CP532 load side to W1 — Yes / No

Remove DC Compartment cover. #11

+24 Vdc sense from P530-1 to W1 — No / Yes #4

Use PWR 261 YB040, and YB055 to isolate the problem.
Possible causes are:
1. TB431 and TB531
2. P530
#1

−4 Vdc from CP536 load terminal to W1 (Gnd) — Yes / No #27

B → PWR 260

A → PWR 220

+12 Vdc from P530-3 to W1 — No / Yes #5

B → PWR 240

+24 Vdc Local from P530-2 to W1 — No / Yes #6

B → PWR 272

−4 Vdc from P530-4 to W1 — No / Yes

B → PWR 255

+6 Vdc from P530-10 to W1 — No / Yes #14

Use PWR 261 to determine why +6 Vdc is missing.
Possible causes are:
1. P530 contact or associated wiring.
2. +6 V Regulator board. (Replace the board.)
3. TB531
#26

Use PWR 261 and YB040 to determine why +6 Vdc is missing at TP7. Possible cause is:
1. P530, P534 or P632.
#15

Re-install jumper (T501 to T502) in last module of string. #28

After problem is corrected, exit to PWR 290, Fix Verification and Checkout Procedure. #22

A → PWR 290

PWR 30 (3340)

B

Short in satellite module or cabling causes CP211 to trip in control module.

Use PWR 204 and PWR 207 to isolate the short to the failing module.
Reconnect P513 in 3340 A2 Module.
Progressively eliminate each satellite module by starting at the first module in the string and move jumpers T510-T511 (3340-B2) or T501-T502 (3344) from the last to the first module. If more than one 3344 is installed on the string move jumper from T503-T504 in the last 3344 module to the next 3344 module. Disconnect P513 (3340) or P631 (3344) in the module that now contains the jumper.
Reset CP211 in control module and attempt to power on.
#18

CP211 tripped — No / Yes #19

There is a short in the module or in the cable from P513 or P514 in the previous module. Turn Service Bypass switch on if failing module is a 3344 or trip CP210 for a 3340 to bypass circuits in this module. Reset CP211 in control module and attempt to power on.
#31

Failing module 3344 — Yes / No

Use PWR 31 and PWR 214 in 3340 MLM to isolate the problem. Disconnect connectors, relays and/or leads in the +24 Vdc distribution to locate short.

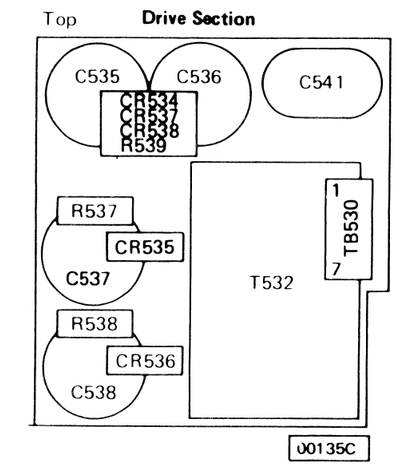
PWR (3340)

CP211 tripped — Yes / No

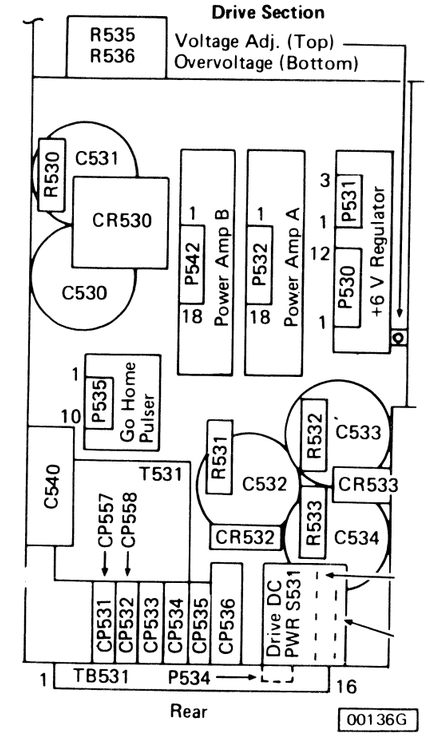
Use PWR 207 and 208 and YB055 to isolate the short.
Possible causes are:
1. P631, P646, P647, P648, P649, and P514 in the failing module.
2. P513 in the previous module.
3. K611 or associated time delay wiring.
4. Power Check (LED) circuit including K611 and K612 N/C points.
5. Off position of Service Bypass switch.
6. K631 or associated pick wiring.
7. Sequence Adapter Board defective.
#25

Use PWR 207 and 208 and YB055 to isolate the short.
Possible causes are:
1. K331 Contactor.
2. Ground at Gate Thermal or auxiliary contacts.
3. P634, P632, or P637
#21

DC COMPARTMENT, Front Half



DC COMPARTMENT, Rear Half



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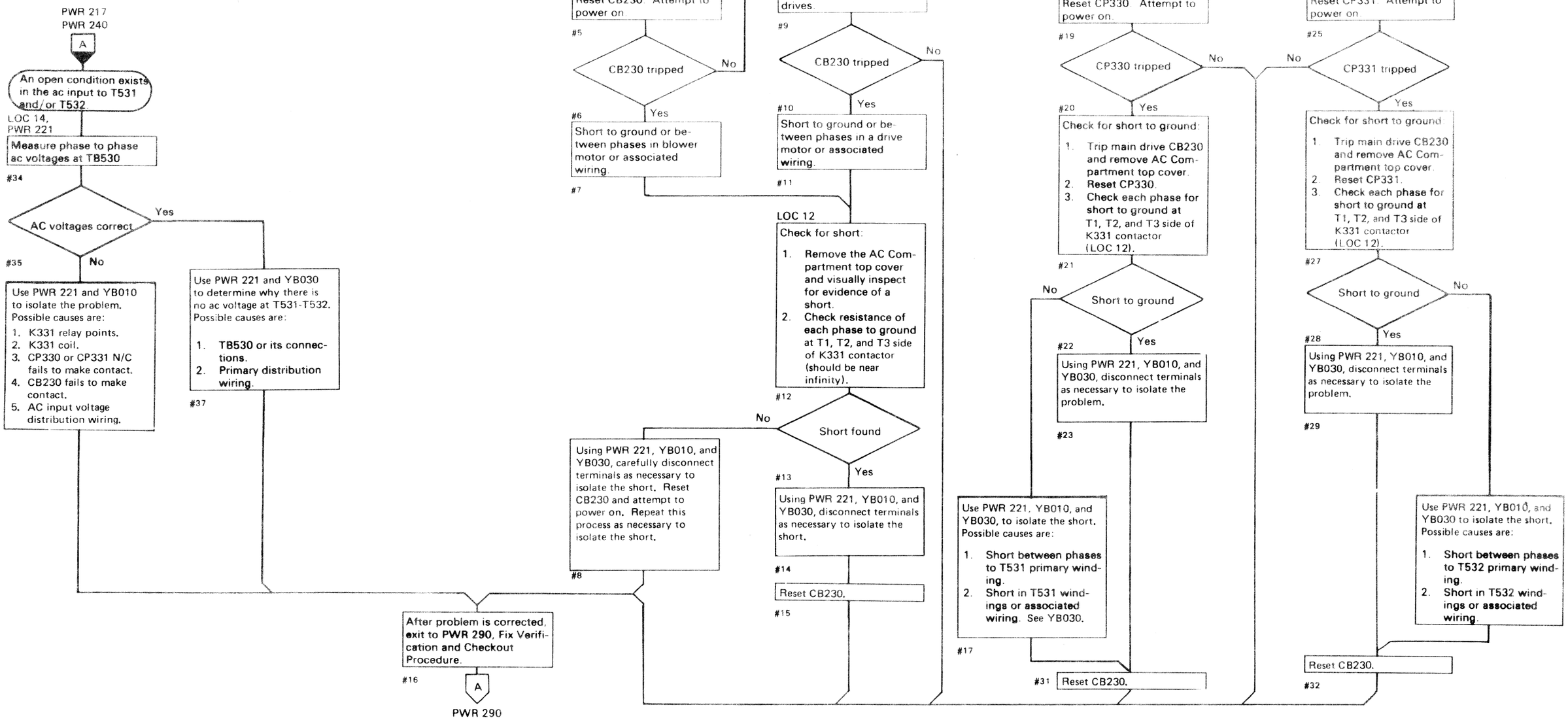
AC CIRCUIT FAILURE ANALYSIS

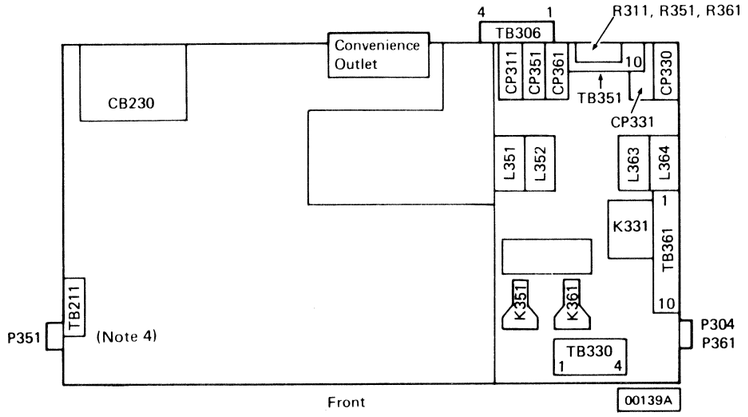
DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.



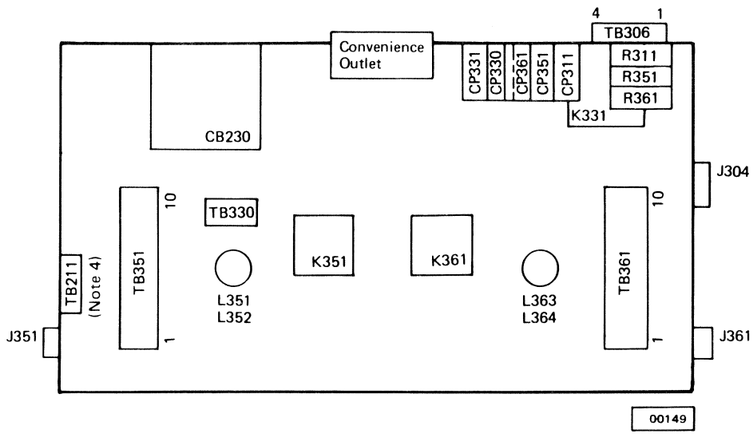
AC CIRCUIT DIAGRAM

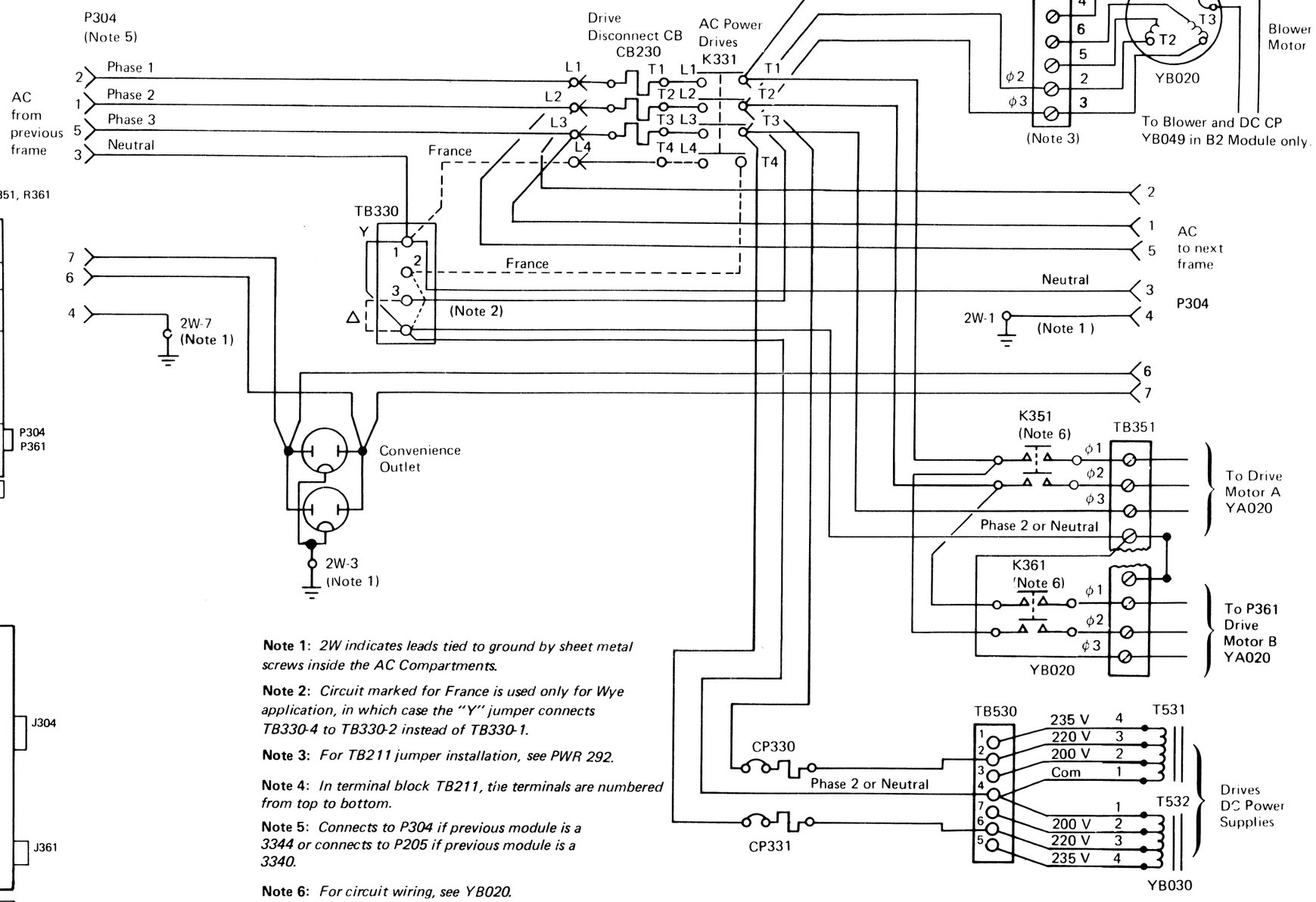
DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

AC COMPARTMENT, Top View (earlier machines)



AC COMPARTMENT, Top View (later machines)





Note 1: *2W indicates leads tied to ground by sheet metal screws inside the AC Compartments.*

Note 2: *Circuit marked for France is used only for Wye application, in which case the "Y" jumper connects TB330-4 to TB330-2 instead of TB330-1.*

Note 3: *For TB211 jumper installation, see PWR 292.*

Note 4: *In terminal block TB211, the terminals are numbered from top to bottom.*

Note 5: *Connects to P304 if previous module is a 3344 or connects to P205 if previous module is a 3340.*

Note 6: *For circuit wiring, see YB020.*

–12 VOLT AND +12 VOLT FAILURI ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise.
CAPACITORS are potentially explosive devices
WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

Drive	Voltage	Test Point	Range	AC Ripple
A	–12 Vdc	A1C2D06	–12.0 to –14.4 V	0.10 V p/p
A	+ 12 Vdc	A1C2D05	+ 12.0 to + 14.4 V	0.10 V p/p
B	–12 Vdc	A1T2D06	–12.0 to –14.4 V	0.10 V p/p
B	+ 12 Vdc	A1T2D05	+ 12.0 to + 14.4 V	0.10 V p/p

ACC 600 PWR 280
ACC 630 PWR 290
A
–12 Vdc or +12 Vdc missing or out of spec.
Measure voltage and ripple from test points to ground (W1) if not measured on a previous page.
Voltage and ripple measured
OK
Voltage distribution problem. Use YB090 to isolate the problem.
After problem is corrected, exit to PWR 290 for Fix Verification and Checkout Procedure.
A
PWR 290
Out of Spec
Voltage too high
No
AC ripple excessive
No
Voltage too low.
Use PWR 241 to isolate the problem.
Possible causes are:
1. Low line voltage or wrong T531 primary taps used. (See PWR 290, Entry C.)
Note: *Before changing taps, check voltage at TB101-3 for –24.0 to –28.8 V.*
2. High resistance connection at terminal block or connector on 12 Vdc line or 12 Vdc return line. See Service Note 4, PWR 241.
3. Check voltage across C534 (–12 V) or C533 (+12 V) to isolate the problem to the supply or voltage distribution network. See Service Note 1, PWR 241.
Yes
Use PWR 241 to isolate the problem.
Possible causes are:
1. C534 (–12 V) or C533 (+12 V) open. See Service Note 1, PWR 241.
2. CR533 or its connections open. See Service Note 3, PWR 241.
Yes
Use PWR 241 and YB030 to isolate the problem.
Possible causes are:
1. AC line voltage.
2. T531 primary taps. See PWR 290, Entry C.
3. Open in +12 V return line causes a higher than normal voltage. See Service Note 4, PWR 241.
Any Voltage Missing
Use PWR 241 to isolate the missing –12 Vdc problem.
Possible causes are:
1. CR533 or diode connection open. See Service Note 2, PWR 241.
2. Poor connection to C534 or the associated wiring. See Service Note 1, PWR 241.
3. CP535 is defective.
4. Drive DC Power switch common.
W1, the DC Common Ground is located on the logic gate. W1 is grounded by a lead from the steel frame to W1–12.
Any voltage measuring less than 70% of its rated potential is considered missing.
–12 Vdc missing
Yes
PWR 241
Measure the voltage from TB101-8 (–12 V Drive A) and TB101-4 (–12 V Drive B) to W1 (Ground).
Both Missing
–12 Vdc measured
Both OK
One Missing
Use PWR 241 to isolate the problem.
Possible causes are:
1. Drive DC Power switch fails to make contact.
2. TB531 or associated wiring. (Check the return line.)
Yes
CB330 tripped
C
PWR 220
No
CP535 tripped
Yes
1
No
Voltage distribution problem. Use YB090 to isolate the problem.
ACC 600 PWR 217
B
Missing +12 Vdc.
–24 Vdc from CP533 load terminal to W1 (Gnd)
No
A
PWR 220
Yes
No
PWR 241
Measure the voltage from TB101-9 (+12 V Drive A) and TB101-5 (+12 V Drive B) to W1 (Ground).
Both Missing
+12 Vdc measured
Both OK
One Missing
Use PWR 241 to isolate the problem.
Possible causes are:
1. Drive DC Power switch fails to make contact.
2. TB531 or associated wiring. (Check the return line.)
Yes
CP330 tripped
C
PWR 220
No
Yes
CP534 tripped
2
No
Use PWR 241 to isolate the missing +12 Vdc problem.
Possible causes are:
1. CR533 or diode connection open. See Service Note 3, PWR 241.
2. Poor connection to C533 or the associated wiring. See Service Note 1, PWR 241.
3. CP534 is defective.
4. Drive DC Power switch common.
ACC 630 ACC 600
E
Missing +12 Vdc or –12 Vdc.
Use PWR 241 to isolate the problem.
Possible causes are:
1. P530, P531, P532, and P542 connectors.
2. CP534 or CP535.
3. Drive DC Power switch.
4. Open circuit in the voltage distribution or the return line.
PWR 201 PWR 216
C
1
CP535 tripped.
Reset CP535 and then CP311. Attempt to power on.
CP535 tripped
No
Yes
Check
Use a CE meter to check –12 Vdc load resistance. See Service Note 2, PWR 241.
There is a short or overload in the –12 Vdc supply or its distribution. Use the diagram on PWR 241 to isolate the problem.
PWR 201 PWR 216
D
2
CP534 tripped.
Reset CP534 and then CP311. Attempt to power on.
CP534 tripped
No
Yes
Short or overload on +12 V power supply. Use PWR 241 and a CE meter to check +12 Vdc load resistance. See Service Note 2, PWR 241.
After problem is corrected, exit to PWR 290 for Fix Verification and Checkout Procedure.
A
PWR 290

–12 VOLT AND +12 VOLT DIAGRAM

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider
ALL CIRCUITS LIVE until measured otherwise.
CAPACITORS are potentially explosive devices.
WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

See ZA100 for relay and contactor point location.

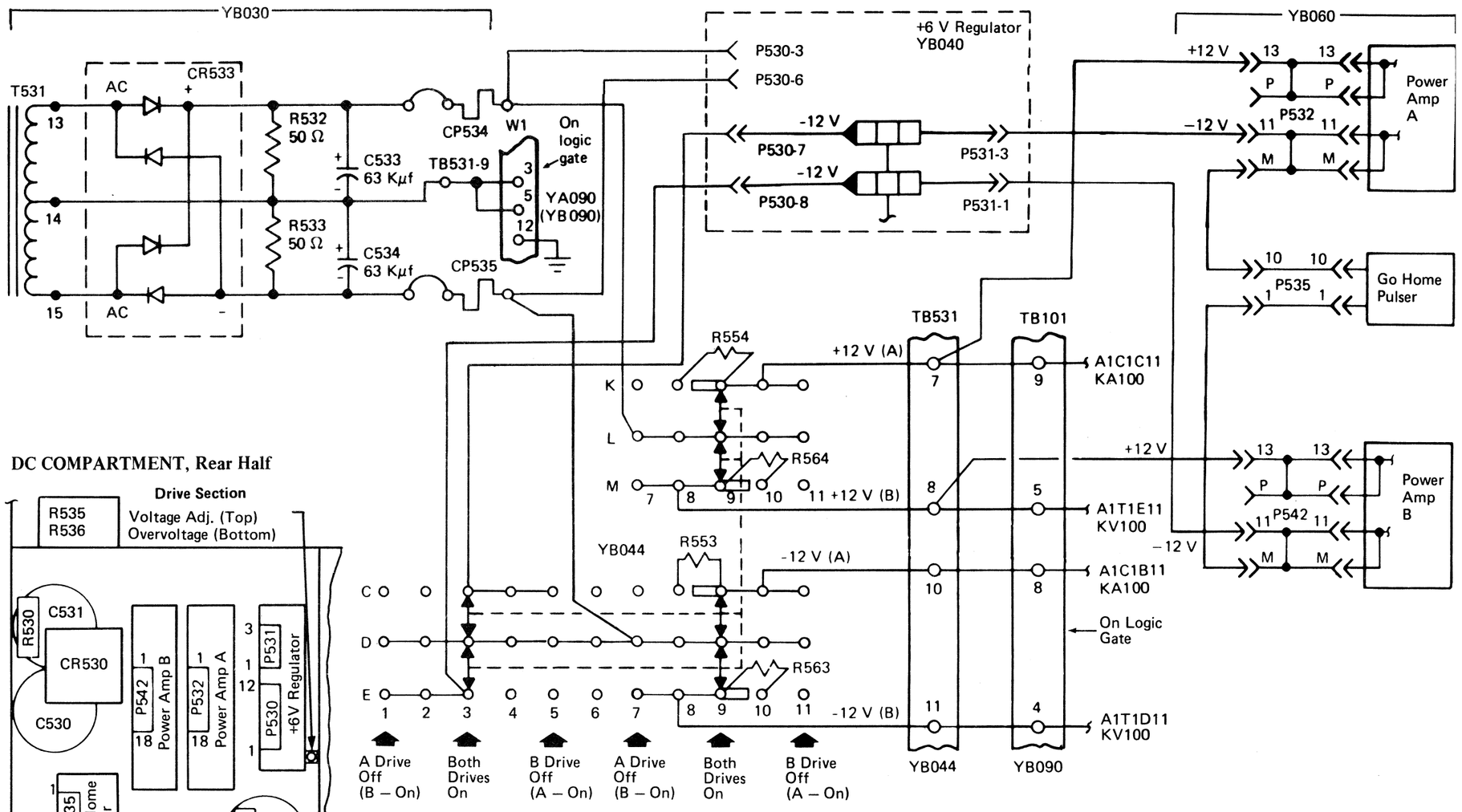
SERVICE NOTES

1. *Capacitor Check with CE Meter*
   a. *With power off, discharge the capacitor by shorting the terminals together.*
   b. *Open the circuit to one capacitor terminal.*
   c. *Set the meter range to R x 10.*
   d. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
   e. *Reverse the leads and repeat the check. Because of the charge built up by the first check, the needle should deflect beyond zero, then go back toward infinity. For large capacitors, set range to R x 1 to speed up the process.*
2. *Load Resistance Check with CE Meter*

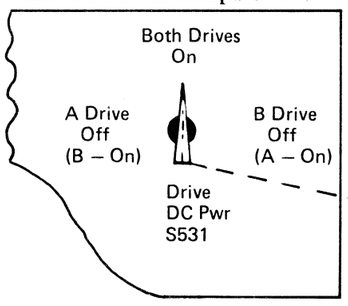
   Note: *Meter slowly rises to value.*

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
–12 V	Rx1	Common (+ Ω)	Load side of CP535	CP535 Tripped	>60 ohm
				CP535 Reset	>20 ohm
+12 V	Rx1	Pos (+ Ω)	Load side of CP534	CP534 Tripped	>30 ohm
				CP534 Reset	>20 ohm

3. *Rectifier Check with CE Meter*
   a. *Disconnect the leads to CR533 assembly.*
   b. *With the meter set to R x 1, connect the common lead to one ac terminal and the other lead alternately to the + and – terminal, measure the resistance which should be from 5 to 15 ohms.*
   c. *Set the meter to R x 1 and measure the resistance between the two ac terminals. The resistance should be near infinity.*
4. *An open 12 Vdc return line to the T531 12 V secondary center tap causes the –12 Vdc to drop below and the +12 Vdc to rise above specifications.*
5. *The power amp –12 volts is controlled by a transistor switch on the +6 volt regulator board. A drop in the +24 Vdc sequence supply immediately cuts off the –12 volts to the power amps.*



Rear DC Power Compartment



The Drive DC Power switch has 15 wafers (A through Q) with 12 or fewer terminals per wafer. The three detent positions for contact wipers are:
1. A Drive Off – terminals 1 and 7.
2. Both Drives On – terminals 3 and 9.
3. B Drive Off – terminals 5 and 11.

Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.

3344

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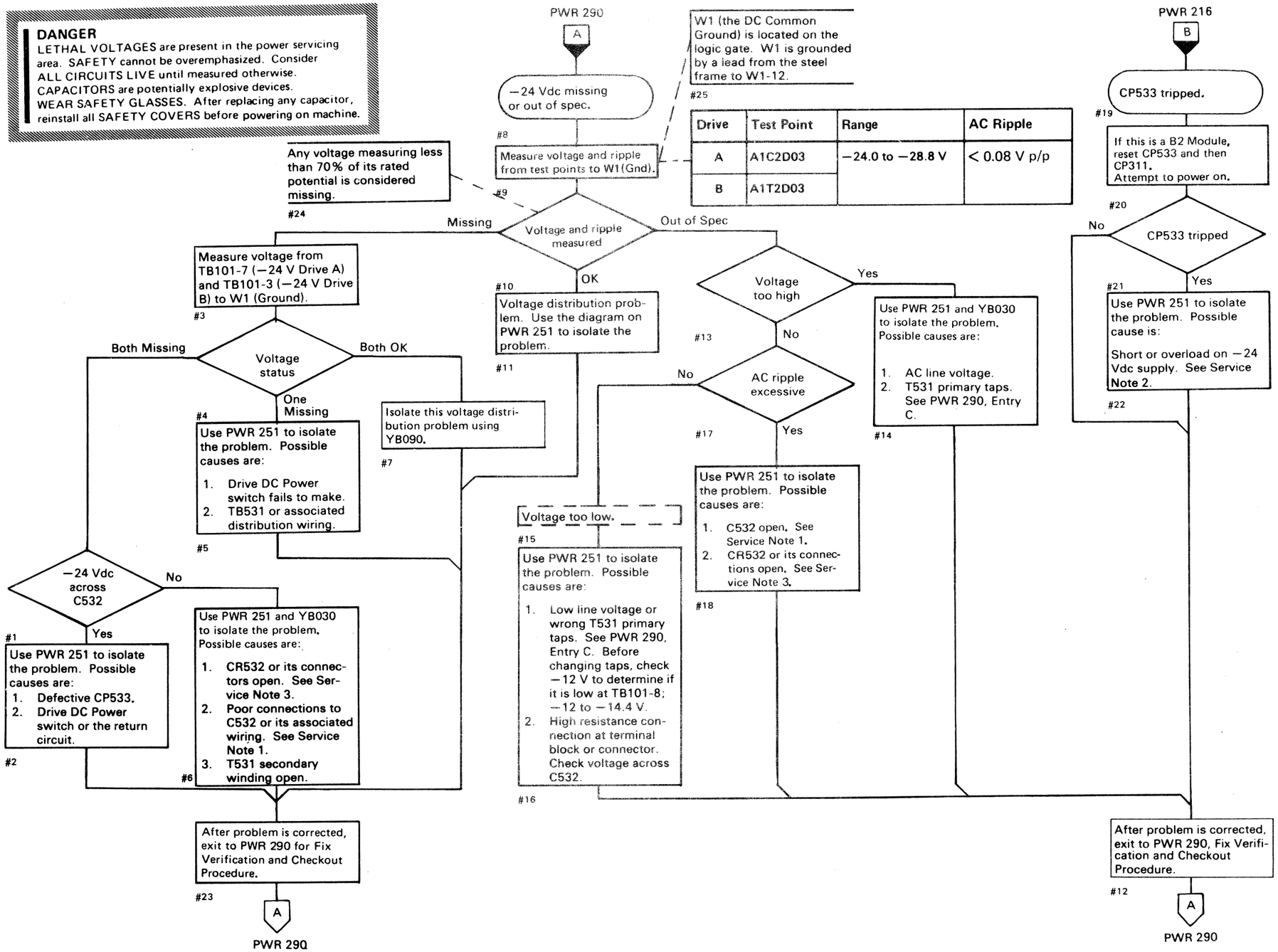
−24 VOLT FAILURE ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.



SERVICE NOTES

1. *Capacitor Check with CE Meter*
   a. *With power off, discharge the capacitor by shorting the terminals together.*
   b. *Open the circuit to one capacitor terminal.*
   c. *Set the meter range to R x 10.*
   d. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
   e. *Reverse the leads and repeat the check. Because of the charge built up by the first check, the needle should deflect beyond zero, then go back toward infinity. For large capacitors, set range to R x 1 to speed up the process.*
2. *Load Resistance Check with CE Meter*

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
		With Drive DC Power switch set to both on			
−24 V	Rx10	Common (+ Ω)	CP533 Load Term.	CP533 Tripped	> 750 ohm
				CP533 Reset	> 75 ohm
		With Drive DC Power switch set to one off.			
−24 V	Rx10	Common (+ Ω)	CP533 Load Term.	CP533 Tripped	> 1500 ohm
				CP533 Reset	> 75 ohm

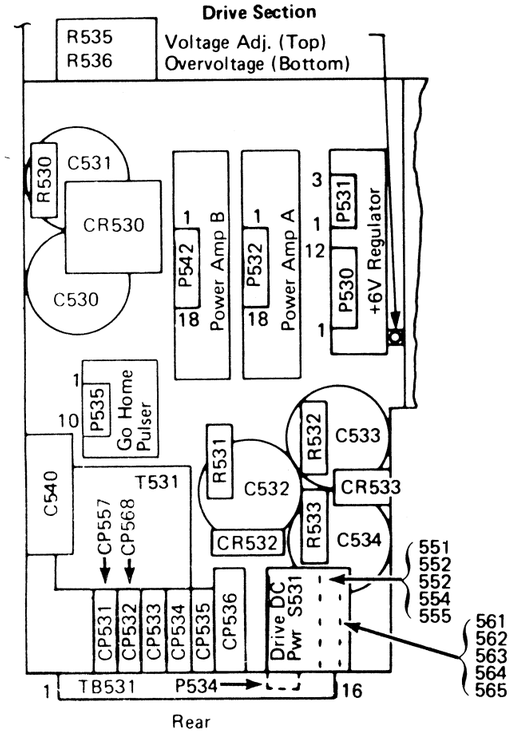
3. *Rectifier Check with CE Meter*
   a. *Disconnect the leads to CR532 assembly.*
   b. *With the meter set to R x 1, measure the forward resistance which should be from 5 to 15 ohms.*
   c. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

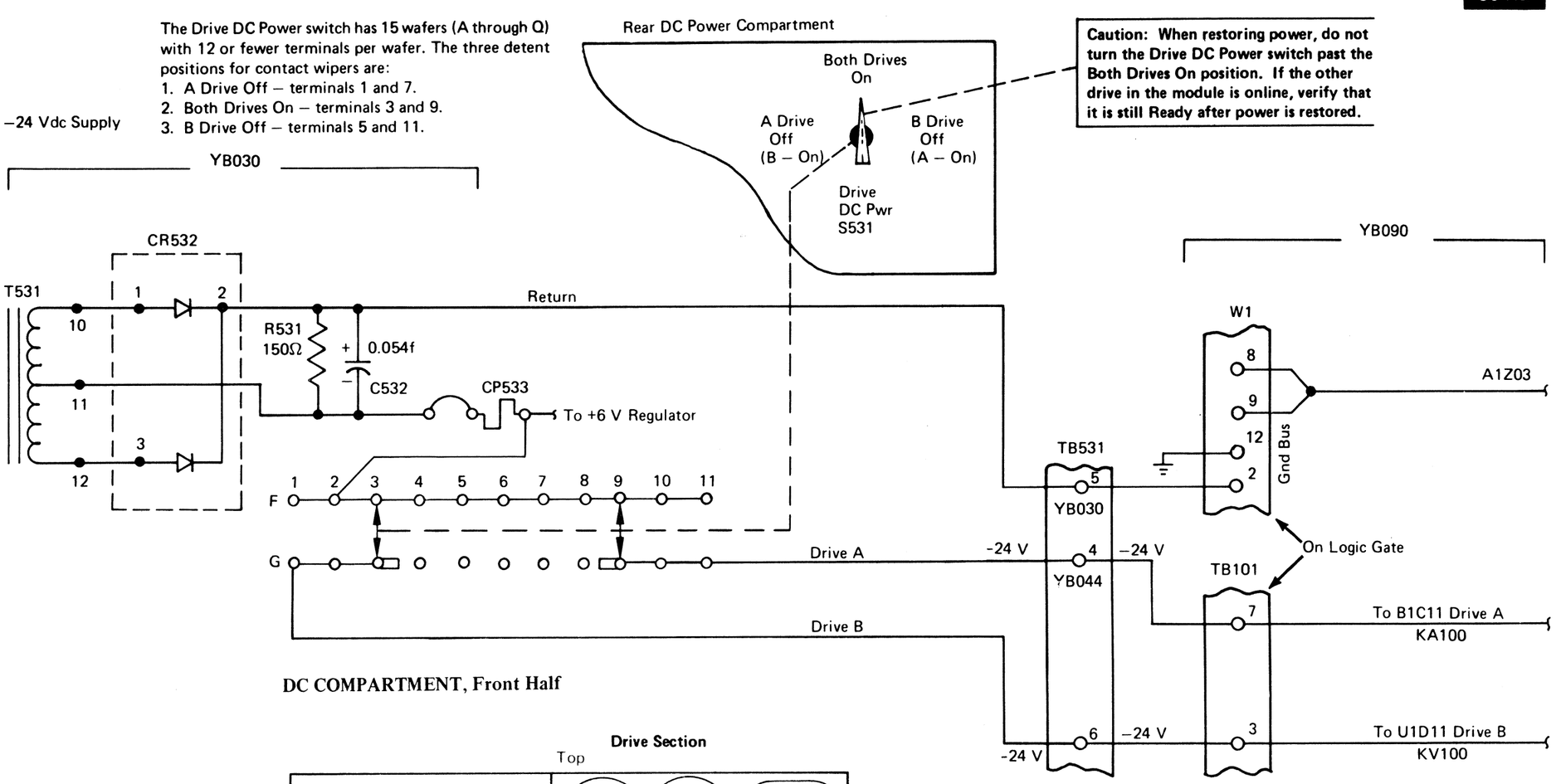
–24 VOLT SUPPLY DIAGRAM

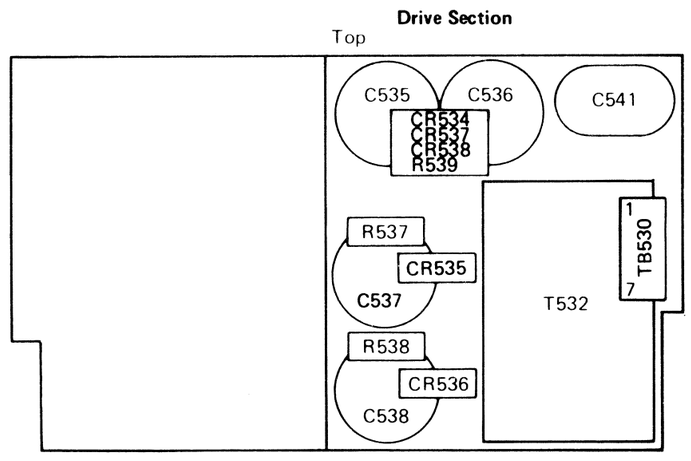
DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

The Drive DC Power switch has 15 wafers (A through Q) with 12 or fewer terminals per wafer. The three detent positions for contact wipers are:
1. A Drive Off – terminals 1 and 7.
2. Both Drives On – terminals 3 and 9.
3. B Drive Off – terminals 5 and 11.

Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.

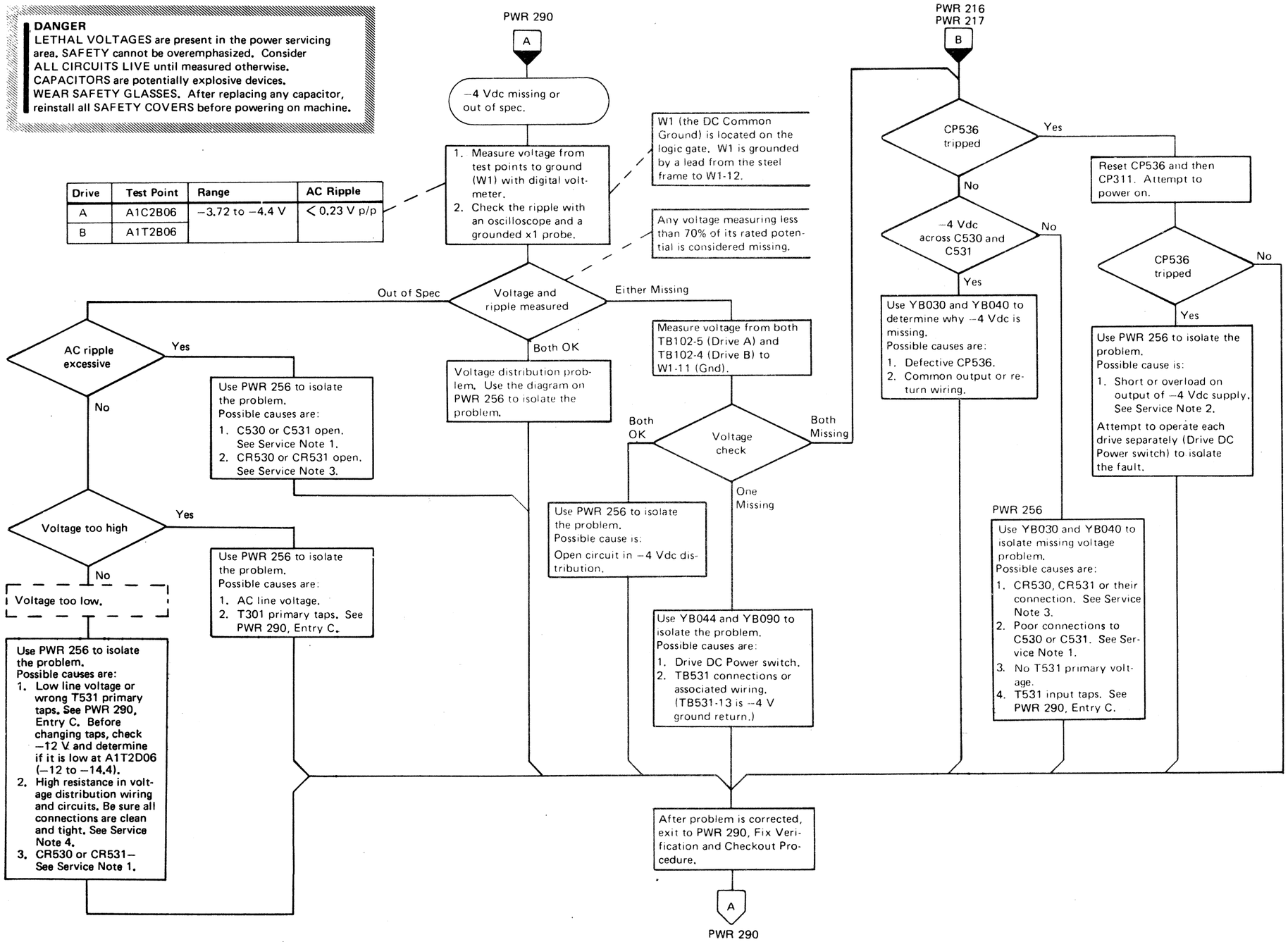






–4 VOLT FAILURE ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.



Drive	Test Point	Range	AC Ripple
A	A1C2B06	–3.72 to –4.4 V	< 0.23 V p/p
B	A1T2B06		

SERVICE NOTES

1. *Capacitor Check with CE Meter*
   a. *With power off, discharge the capacitor by shorting the terminals together.*
   b. *Open the circuit to one capacitor terminal.*
   c. *Set the meter range to R x 10.*
   d. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
   e. *Reverse the leads and repeat the check. Because of the charge built up by the first check, the needle should deflect beyond zero, then go back toward infinity. For large capacitors, set range to R x 1 to speed up the process.*
2. *Load Resistance Check with CE Meter*

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
–4 V	Rx1	Common (+Ω)	CP536 Load side	CP536 Tripped	> 15 ohm
				CP536 Reset	> 10 ohm

3. *Rectifier Check with CE Meter*
   a. *Remove heat-sink assembly from top of C530 and C531. The rectifier leads are soldered on. Use the heat-sink as the diode terminal.*
   b. *With the meter set to R x 1, measure the forward resistance which should be from 5 to 15 ohms.*
   c. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*
4. *The voltage across C530 and C531 should normally measure about 0.3 to 0.6 volts higher than the voltage measured at TB 102-5/6 or TB 102-3/4. Other typical voltages measurements are: (Refer to PWR 256)*
   - *A to B 0.06 volts (Drives A & B)*
   - *B to C 0.07 volts (Drives A & B)*
   - *C to D 0.15 volts (Drive A)*
   - *C to E 0.15 volts (Drive B)*
   - *D to F 0.11 volts (Drive A)*
   - *E to G 0.11 volts (Drive B)*
   - *F to A1C2B06 0.02 volts (Drive A)*
   - *G to A1T2B06 0.02 volts (Drive B)*
   - *H to J 0.06 volts (Drives A & B)*
   - *J to K 0.12 volts (Drives A & B)*
   - *K to A1C2D08 0.02 volts (Drive A)*
   - *K to A1T2D08 0.02 volts (Drive B)*

If voltage drops exceed these typical examples and voltage as measured at card is still below specification, recheck connections and/or replace parts as required.

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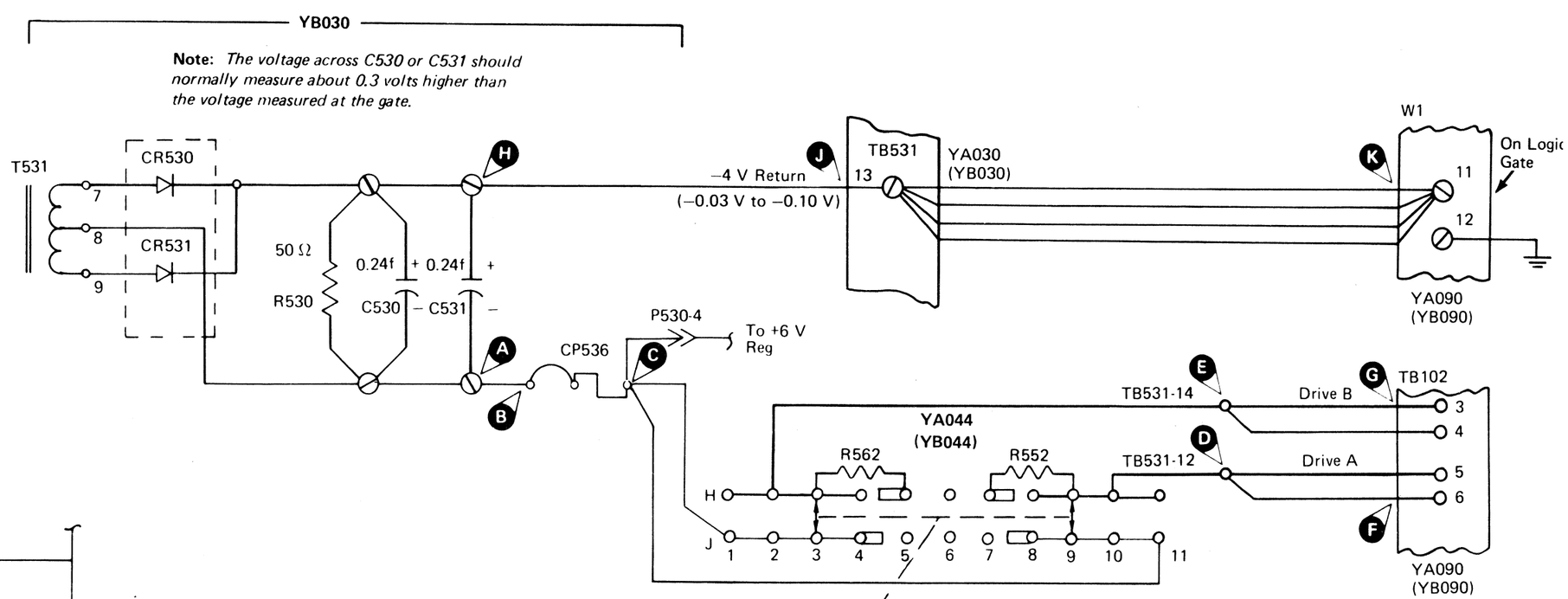
441235 28 May 76	441236 30 Sept 76	441237 1 Mar 77	441241 29 Aug 80	

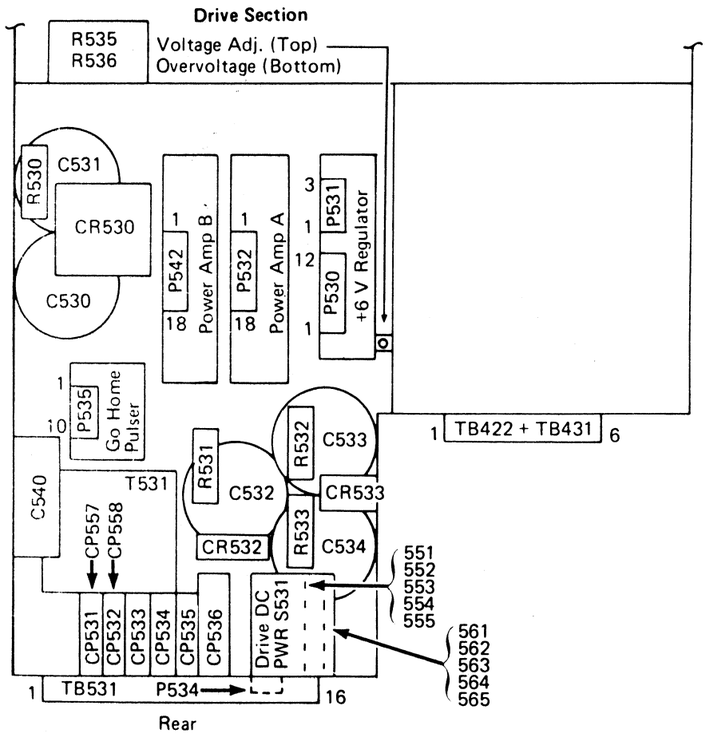
–4 VOLT SUPPLY DIAGRAM

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider
ALL CIRCUITS LIVE until measured otherwise.
CAPACITORS are potentially explosive devices.
WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering-up machine.

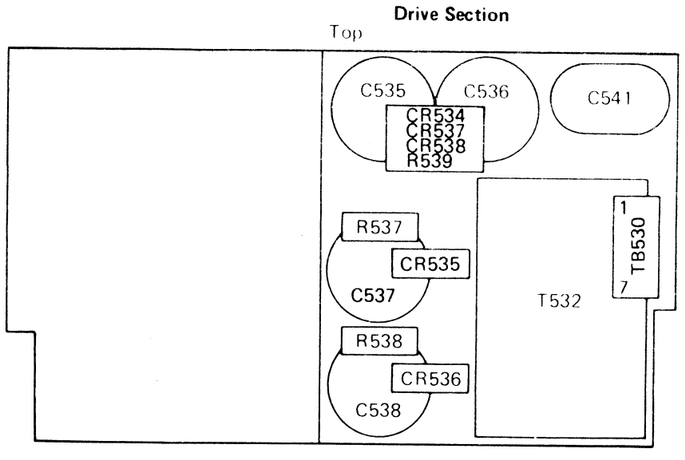
–4 Vdc Supply



DC COMPARTMENT, Rear Half

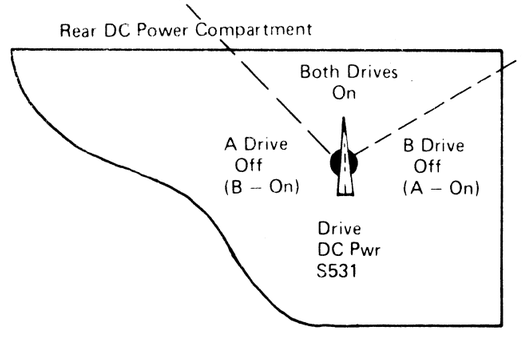


DC COMPARTMENT, Front Half



The Drive DC Power switch has 15 wafers (A through Q) with 12 or fewer terminals per wafer. The three detent positions for contact wipers are:
1. A Drive Off – terminals 1 and 7.
2. Both Drives On – terminals 3 and 9.
3. B Drive Off – terminals 5 and 11.

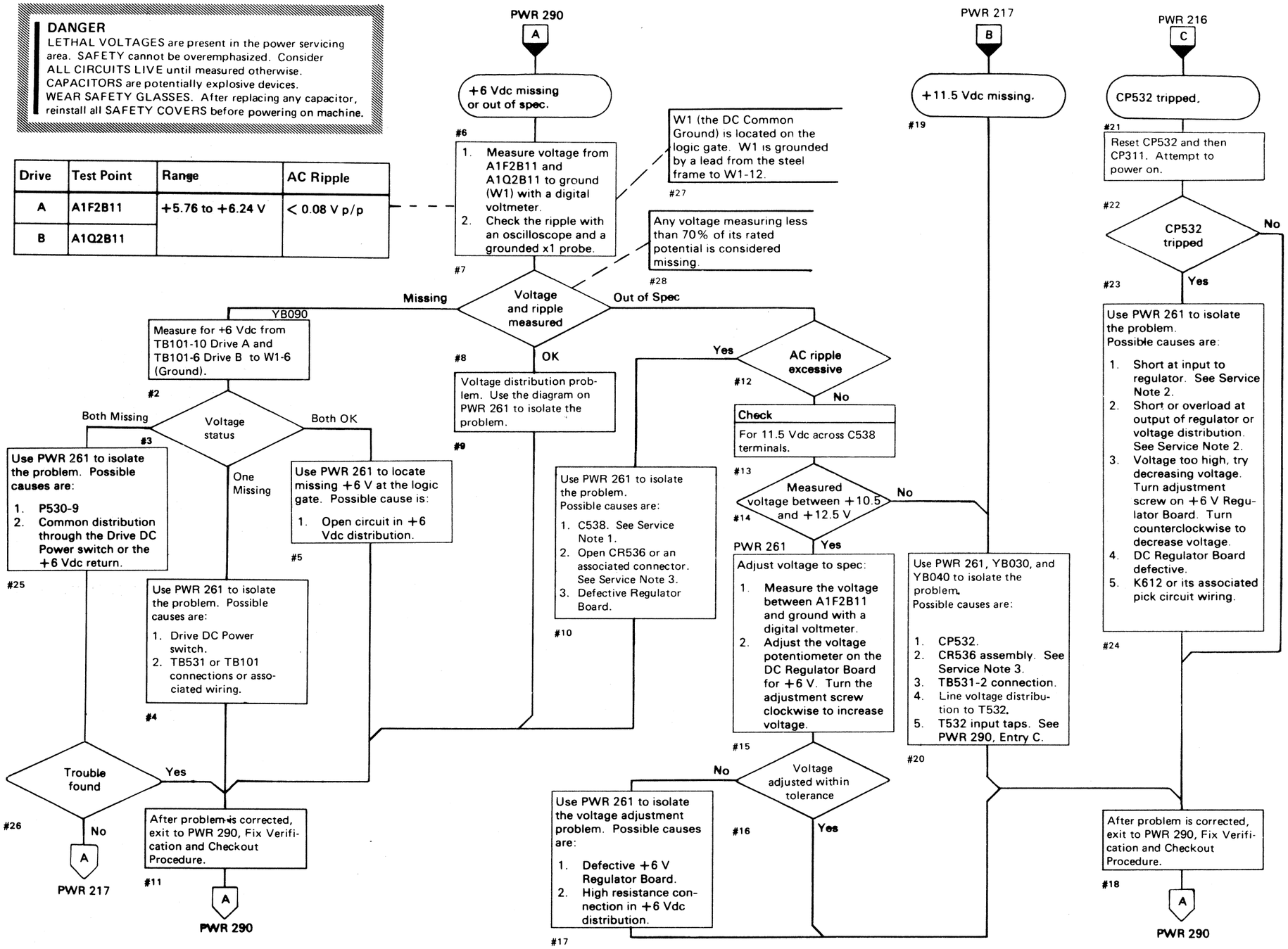
Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.



+6 VOLT FAILURE ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider
ALL CIRCUITS LIVE until measured otherwise.
CAPACITORS are potentially explosive devices.
WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

Drive	Test Point	Range	AC Ripple
A	A1F2B11	+5.76 to +6.24 V	< 0.08 V p/p
B	A1Q2B11		



SERVICE NOTES

1. *Capacitor Check with CE Meter*
   a. *With power off discharge the capacitor by shorting the terminals together.*
   b. *Open the circuit to one capacitor terminal.*
   c. *Set the meter range to R x 10.*
   d. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
   e. *Reverse the leads and repeat the check. Because of the charge built up by the first check, the needle should deflect beyond zero, then go back toward infinity. For large capacitors, set range to R x 1 to speed up the process.*
2. *Load Resistance Check with CE Meter*

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
+6 V	Rx10	Common (+Ω)	CP532 Load side (−Ω)	CP532 Tripped	> 400 ohm
				CP532 Reset	> 30 ohm
		With Drive DC Power switch set to both on.			
		W1	TP7 Seq Bd B	CP532 Reset	> 15 ohm
		With Drive DC Power switch to one off.			
		W1	TP7 Seq Bd B	CP532 Reset	> 20 ohm

3. *Rectifier Check with CE Meter*
   a. *Disconnect the leads to CR536 assembly.*
   b. *With the meter set to R x 1, measure the forward resistance which should be from 5 to 15 ohms.*
   c. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

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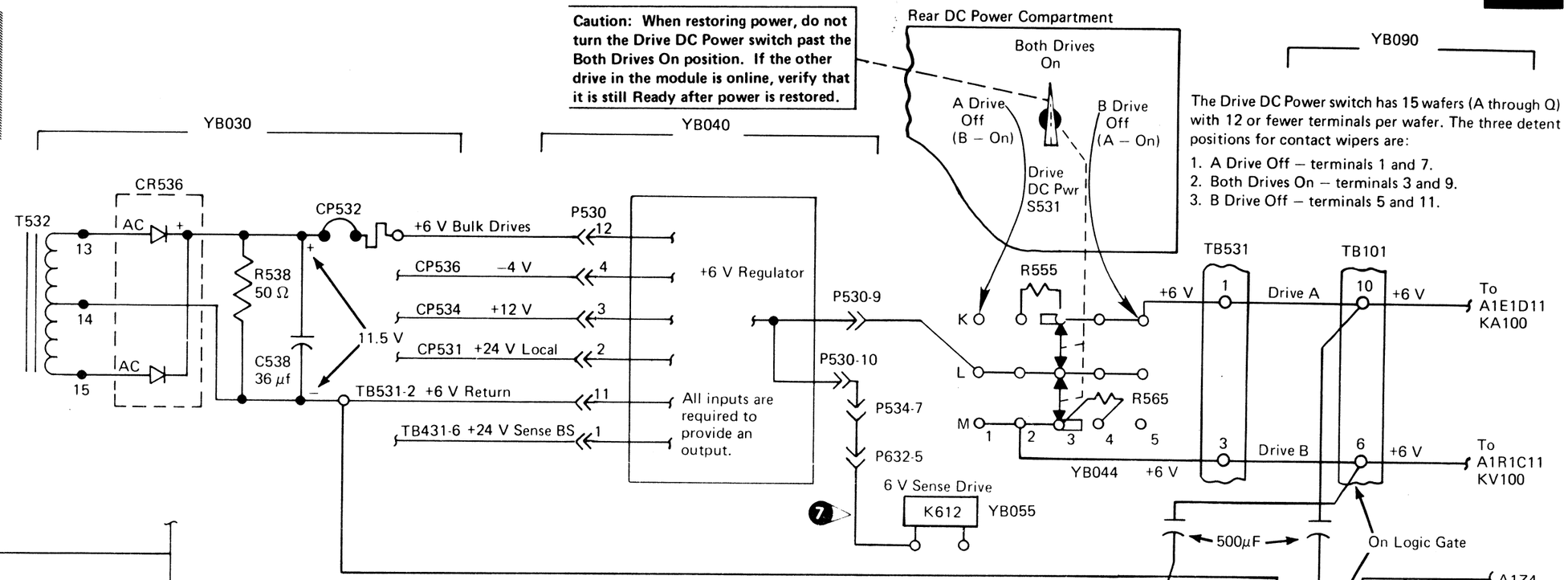
+6 VOLT REGULATOR DIAGRAM

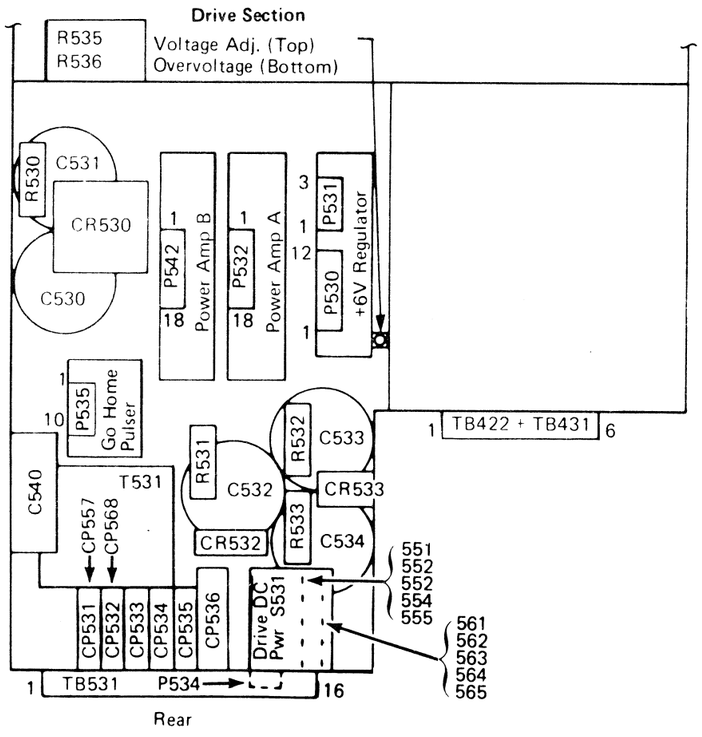
DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

See ZA100 for relay and contactor point location.

Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.

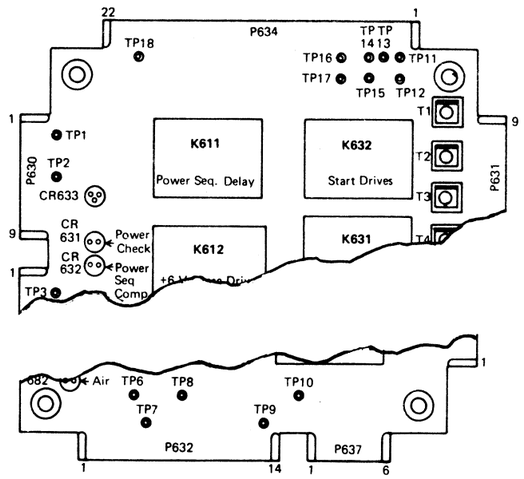


DC COMPARTMENT, Rear Half

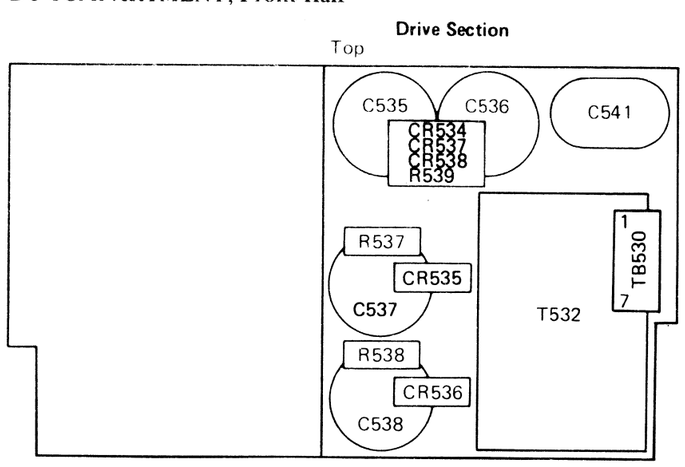


SEQUENCE PANEL

Board B



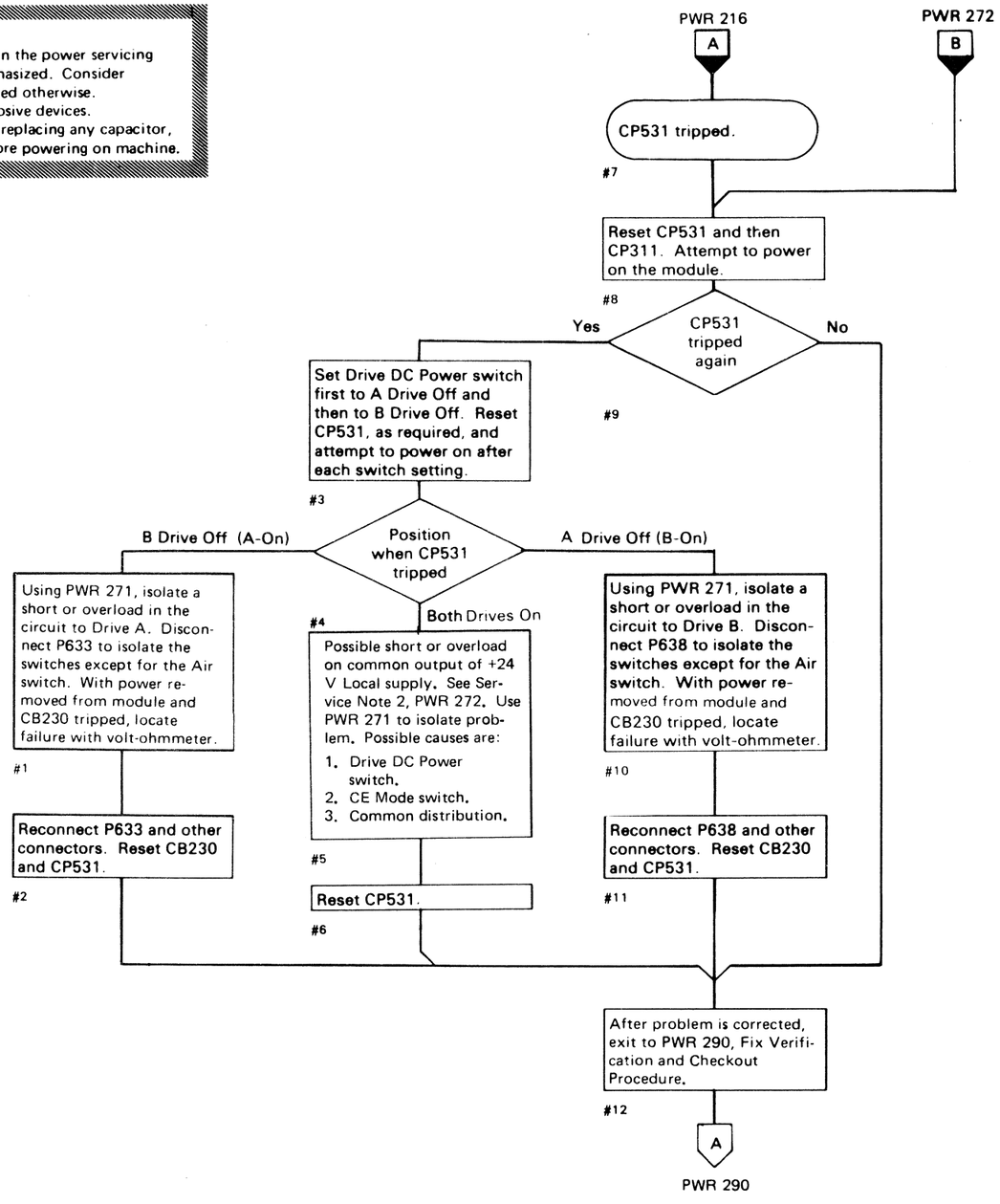
DC COMPARTMENT, Front Half



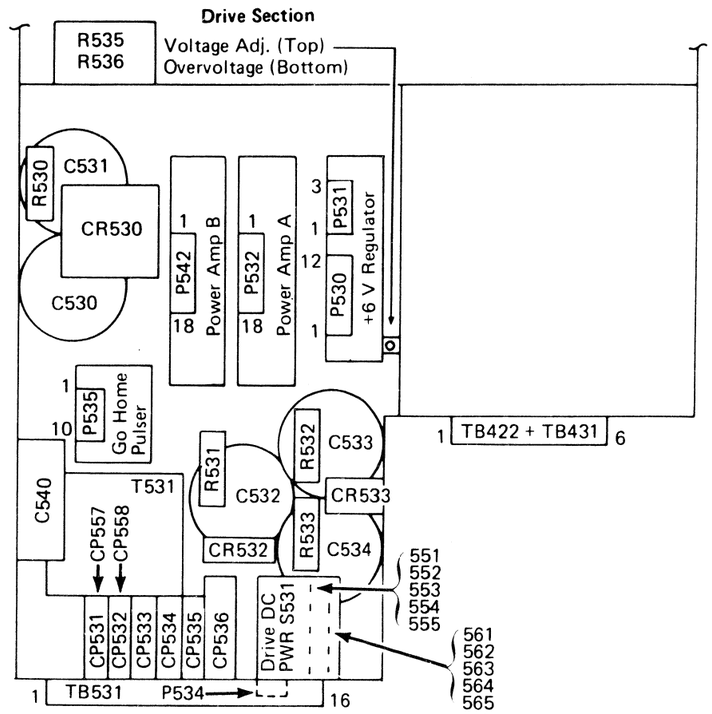
3344	JG0261 Seq. 1 of 2	2359268 Part No.	441235 28 May 76	441236 30 Sept 76	441237 1 Mar 77	441241 29 Aug 80	

+24 VOLT (Local) FAILURE ANALYSIS

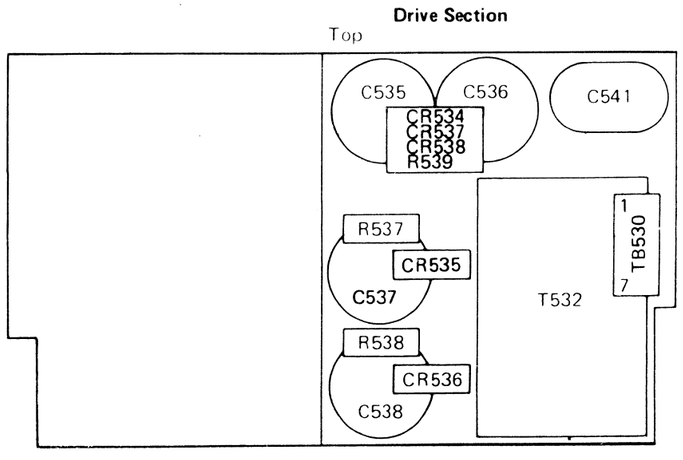
DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.



DC COMPARTMENT, Rear Half



DC COMPARTMENT, Front Half

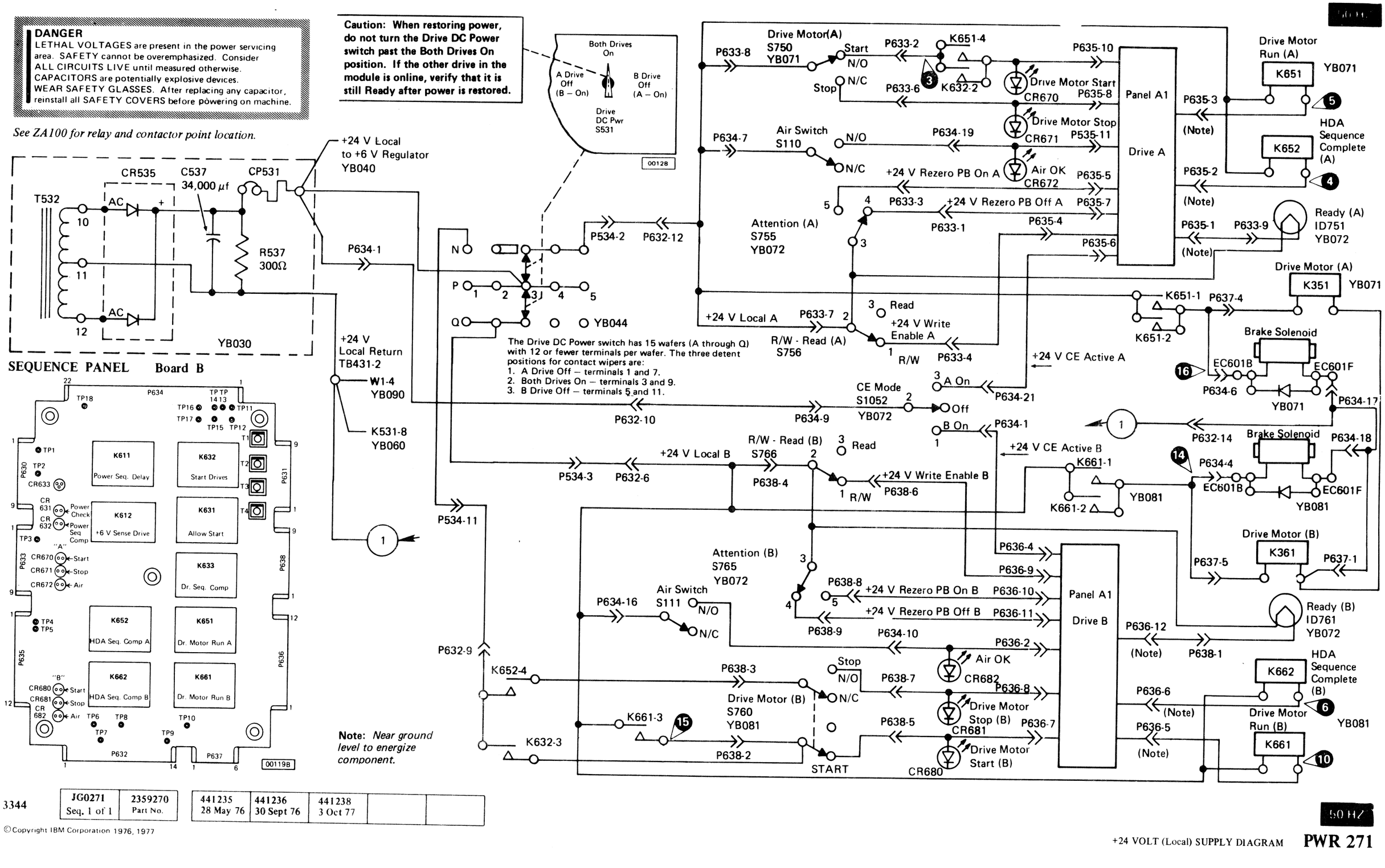


+24 VOLT (Local) SUPPLY DIAGRAM

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.

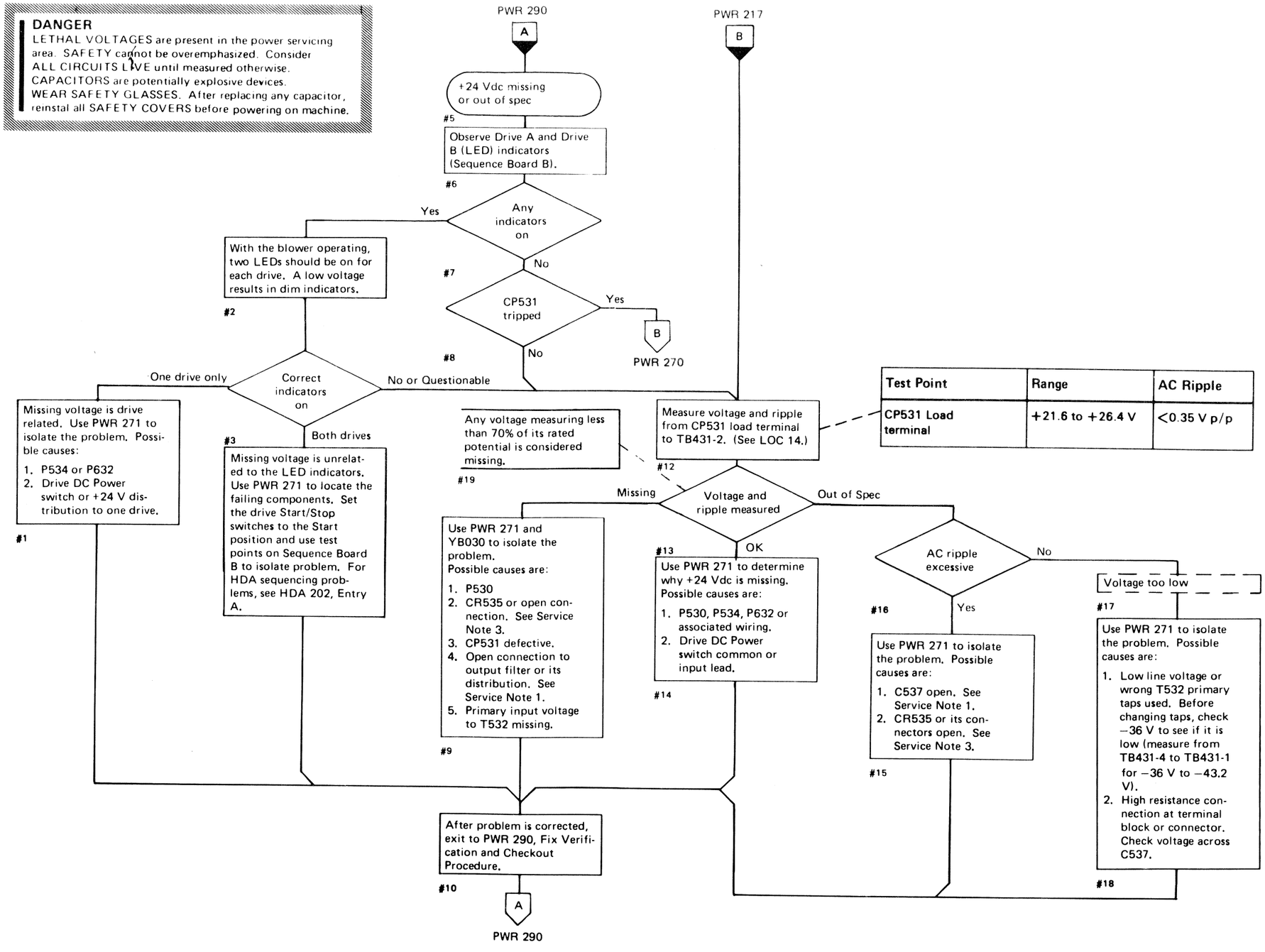
See ZA100 for relay and contactor point location.



3344	JG0271 Seq. 1 of 1	2359270 Part No.	441235 28 May 76	441236 30 Sept 76	441238 3 Oct 77	

+24 VOLT (Local) FAILURE ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstal all SAFETY COVERS before powering on machine.



SERVICE NOTES

1. *Capacitor Check with CE Meter*
   a. *With power off, discharge the capacitor by shorting the terminals together.*
   b. *Open the circuit to one capacitor terminal.*
   c. *Set the meter range to R x 10.*
   d. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
   e. *Reverse the leads and repeat the check. Because of the charge built up by the first check, the needle should deflect beyond zero, then go back toward infinity. For large capacitors, set range to R x 1 to speed up the process.*
2. *Load Resistance Check with CE Meter.*
   Drive DC Power switch in the Both Drives position.

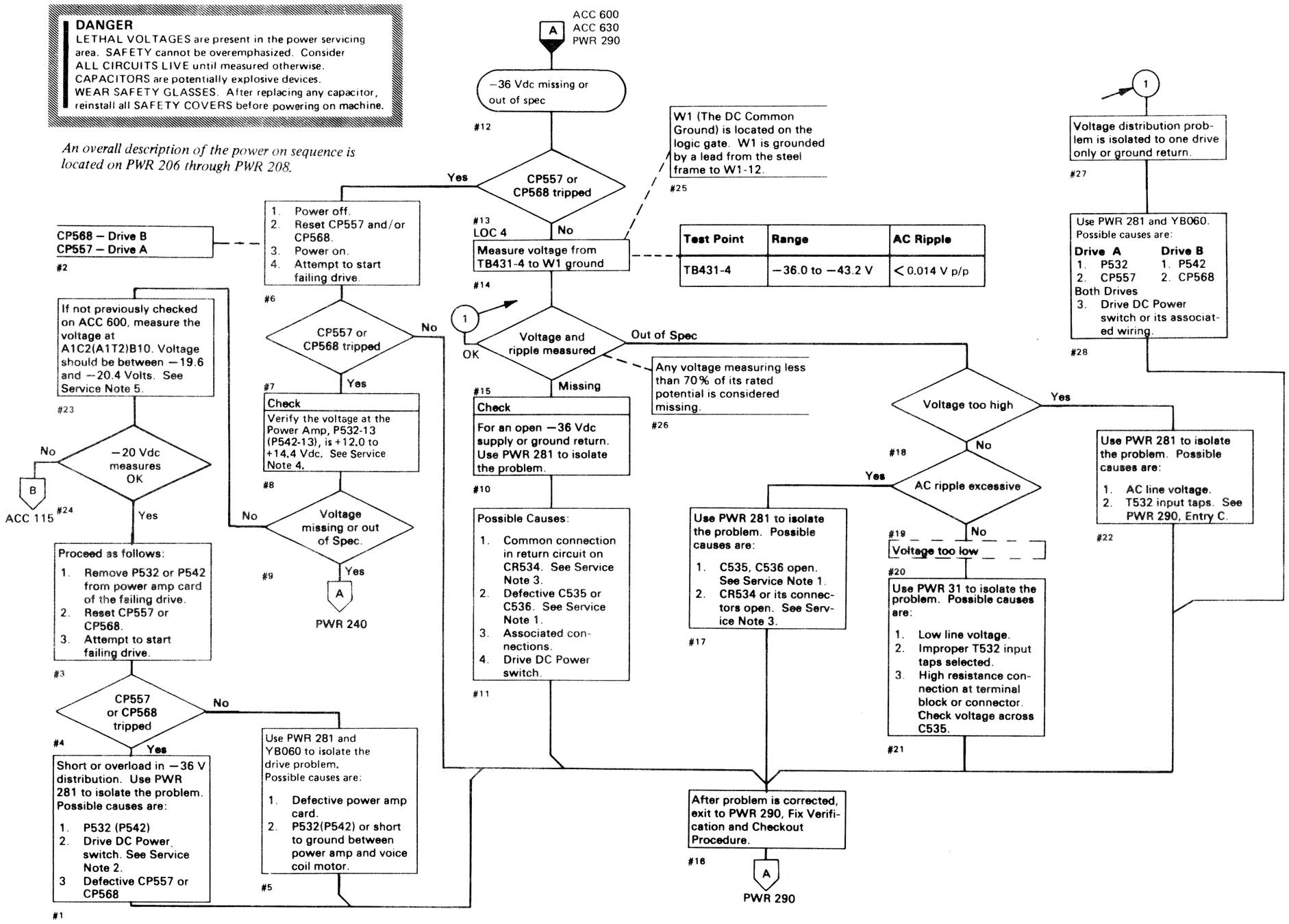
Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
+24 V	Rx1	Common (+ Ω)	Load side of CP531	CP531 Tripped	> 100 ohm
				CP531 Reset	> 15 ohm

3. *Rectifier Check with CE Meter*
   a. *Disconnect the leads to CR535.*
   b. *With the meter set to R x 1, measure the forward resistance of each diode which should be from 5 to 15 ohms.*
   c. *Set the meter to R x 100 and reverse the meter leads. The resistance should be near infinity.*

–36 VOLT FAILURE ANALYSIS

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.

An overall description of the power on sequence is located on PWR 206 through PWR 208.



SERVICE NOTES

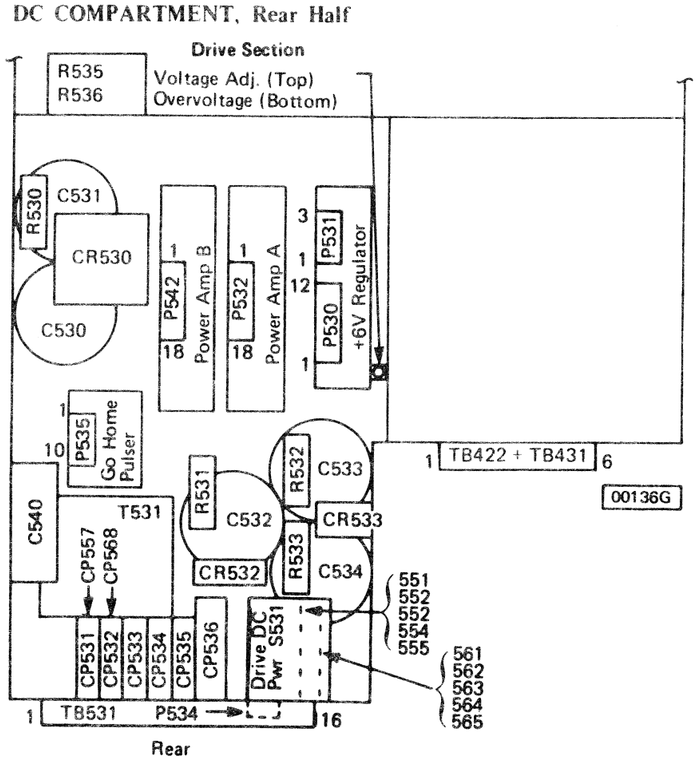
1. *Capacitor Check with CE Meter*
   a. *With power off, discharge the capacitor by shorting the terminals together.*
   b. *Open the circuit to one capacitor terminal.*
   c. *Set the meter range to R x 10.*
   d. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
   e. *Reverse the leads and repeat the check. Because of the charge built up by the first check, the needle should deflect beyond zero, then go back toward infinity. For large capacitors, set range to R x 1 to speed up the process.*
2. *Load Resistance Check with CE Meter*

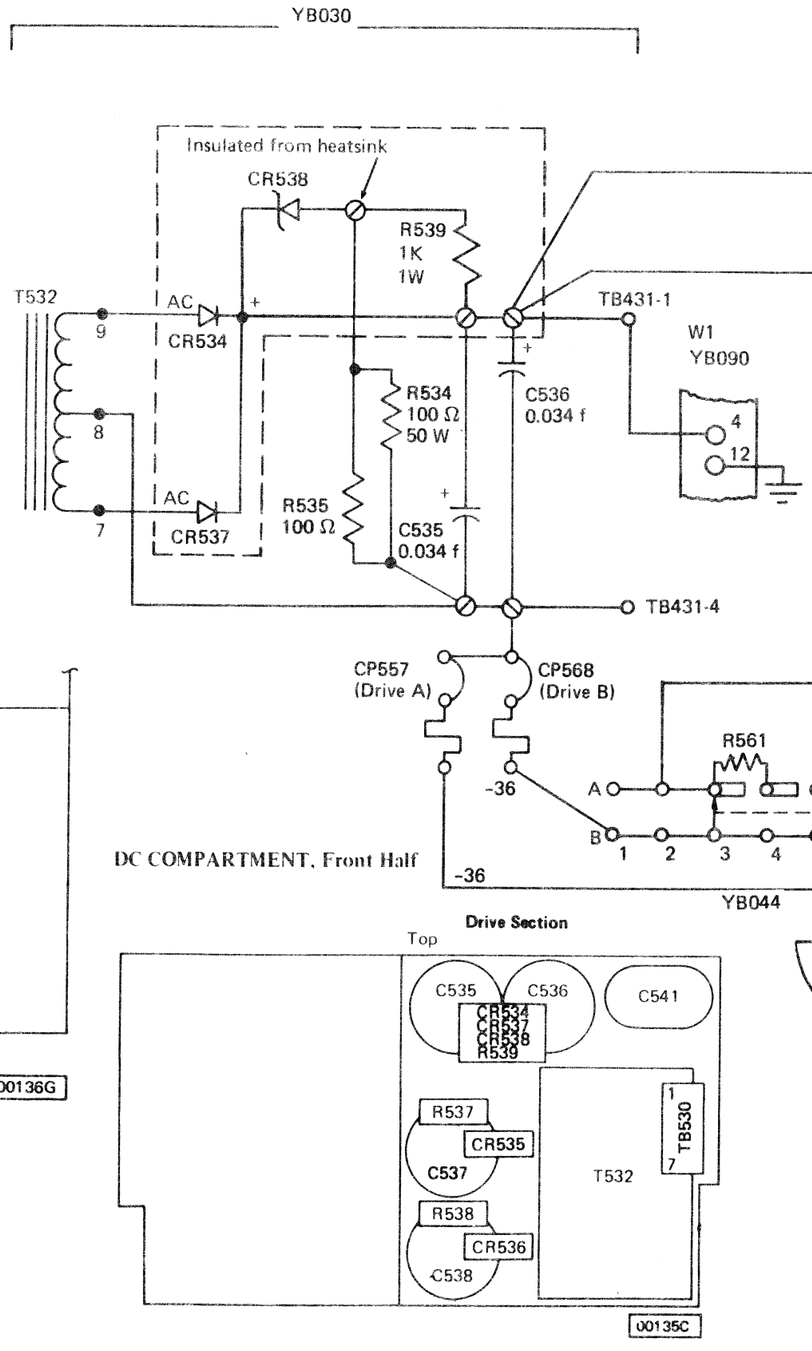
Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
–36 V	Rx10 Rx1	Common (+ Ω)	CP557/CP568 Load Side	CP557/CP568 Tripped CP557/CP568 Reset	> 750 Ω > 30 Ω

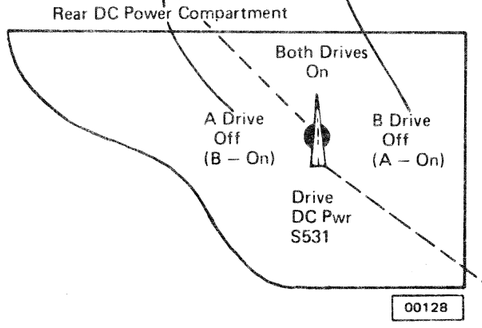
3. *Rectifier Check with CE Meter*
   a. *Disconnect the leads to the CR534 assembly.*
   b. *With the meter set to R x 1, measure the forward resistance which should be from 5 to 15 ohms.*
   c. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*
4. *+12 Vdc missing at the power amplifier(s) causes an overload on the –36 Vdc supply which may cause CP557 and/or CP568 to trip. Measure voltages at P532-13 and P542-13 shown on PWR 281.*
5. If –20 V is missing at A1C2(A1T2)B10, an overload is placed on the –36 Vdc supply which may trip CP557 and/or CP568.

–36 VOLT SUPPLY DIAGRAM

DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering on machine.







The Drive DC Power switch has 15 wafers (A through Q) with 12 or fewer terminals per wafer. The three detent positions for contact wipers are:

1. A Drive Off – terminals 1 and 7.
2. Both Drives On – terminals 3 and 9.
3. B Drive Off – terminals 5 and 11.

Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.

FIX VERIFICATION AND VOLTAGE CHECKS

PWR A

FIX VERIFICATION AND CHECKOUT PROCEDURE

Complete the following checklist to ensure that the machine problem has been corrected. If a check cannot be completed, go to the referenced MLM page for aid in making a fix.

Note 1: *It is not always necessary to check each step. Use your own good judgement in skipping all unneeded steps.*

1. Set Power Mode switch to Local, then power off the string. If string did not power off, go to PWR 10, Entry B (controller) of the 3340 MLM.
2. Restore the string to normal operating conditions. (Remove all diagnostic jumpers and replace wiring, connectors, or parts that were removed.)
3. Power on the string, then set the Power Mode switch to the Remote position.
4. Verify that both the ac and dc power lamps and the blowers all turn on in each 3340 module. Verify that the Power Sequence Complete indicators and blowers all turn on in each 3344 module. If not, go to PWR 10, Entry A (controller) of the 3340 MLM.
5. Turn on Drive A and B Start switches on the problem module(s). Verify that the drive status indicators (LED) and both Ready lamps turn on. If Ready did not come on, go to START 100, Entry A.
6. Run a power supply voltage check as shown in the Voltage Check Chart (this page).
7. Examine the DC Compartment air filter and clean or replace if necessary (LOC 12–3344).
8. Replace all covers.
9. Run the Single Drive Checkout (START 110–3344).
10. Go to START 500, Entry A (3344 MLM).

PWR B

VOLTAGE CHECKS

Note 2: *The following checks should be made with the drives stopped or Ready but with no Seek or Read/Write operations in progress.*

DC Voltage Checks

With a digital voltmeter, measure each dc voltage in the order listed in the Voltage Check Chart. Only one voltage can be directly adjusted, that is, +6 V to the drives logic board (A1). If adjustments are necessary, the rear DC Compartment top cover must be removed. Be certain that only the voltage adjustment potentiometer on the regulator card is adjusted. (See PWR 261.) The overvoltage potentiometer is adjusted at the plant and should not be changed. Turn the voltage adjustment potentiometer clockwise to increase the voltage.

All power supplies, except the one mentioned above, have no output voltage adjustment. The only adjustment possible is to change the transformer primary input taps. The T531 primary taps determine the ac input for the –12 V, +12 V, –4.0 V, and –24 V supplies. The T532 primary taps determine the ac input for the –36 V, +11.5 V, and +24 V Local supplies. If any of these supplies are not within specification, check the main 3-phase ac power and ensure that the machine is wired for the correct input voltage, as shown in the Transformer Primary Input Tap Wiring Chart on this page.

If the voltage checks are not completed successfully, exit to the appropriate page indicated in the Voltage Check Chart.

If the voltage checks are completed successfully, but this page is entered because of a known dc voltage problem, the problem must be in the voltage distribution. Use the appropriate diagram listed in the chart to isolate the problem.

AC Ripple Checks

If the peak-to-peak ac ripple exceeds the maximum listed in the chart, it is likely that a power supply part has failed.

To measure the ac ripple, use the ac input on a scope having a 0.01 volt per centimeter range and a X1 probe placed on the test points shown in the chart. Place the probe ground on any convenient ground point.

If the ac component is greater than the maximum listed, exit to the appropriate page referenced in the chart to correct the problem.

W1 (the DC Common Ground) is located on the logic gate. W1 is grounded by a lead from the steel frame to W1-12.

PWR C

TRANSFORMER PRIMARY INPUT TAP WIRING CHART

Voltage		B2 Module TB530 YB030 (Notes 4 and 5)
Wye	Delta	
–	200 V	Phase 1 to TB530-3 Phase 3 to TB530-7
380 V	220 V	Phase 1 to TB530-2 Phase 3 to TB530-6
408 V	235 V	Phase 1 to TB530-1 Phase 3 to TB530-5

Note 3: *Before changing primary taps, check another dc output voltage that uses the same primary winding.*

Note 4: *Phase 2 to TB530-4 is common to both transformers.*

Note 5: *Other TBs affected by Delta-Wye Conversions are shown on PWR 292.*

VOLTAGE CHECK CHART

DC Supply	Test Point	Tolerance (Volts)	Adjustment	Logic Page	Maximum AC Ripple	Diagram	Page Entry
+24 V Local	T1 of CP531 to W1 (Gnd)	+21.6 to +26.4	None*	YB030	0.35 V p/p	PWR 271	PWR 272, A
-24 V	A1C2D03 (Dr A)/ A1T2D03 (Dr B) to A1K2D08	-24.0 to -28.8	None*	YB090	0.08 V p/p	PWR 251	PWR 250, A
+12 V	A1C2D05 (Dr A)/ A1T2D05 (Dr B) to A1K2D08	+12.0 to +14.4	None*	YB090	0.10 V p/p	PWR 241	PWR 240, A
-12 V	A1C2D06 (Dr A)/ A1T2D06 (Dr B) to A1K2D08	-12.0 to -14.4	None*	YB090	0.10 V p/p	PWR 241	PWR 240, A
-4 V	A1C2B06 (Dr A)/ A1T2B06 (Dr B) to A1K2D08	-3.84 to -4.50	None*	YB090	0.23 V p/p	PWR 256	PWR 255, A
+6 V Reg	A1F2B11 (Dr A)/ A1Q2B11 (Dr B) to A1F2D08/ A1Q2D08	+5.76 to +6.24 (Adjust to 6.0)	Turn screw clockwise to increase voltage	YB090	0.08 V p/p	PWR 261	PWR 260, A
-36 V	TB431-4 to W1 (gnd)	-36.0 to -43.2	None*	YB030	0.14 V p/p	PWR 281	PWR 280, A

*Check transformer primary taps and change to match available voltage.

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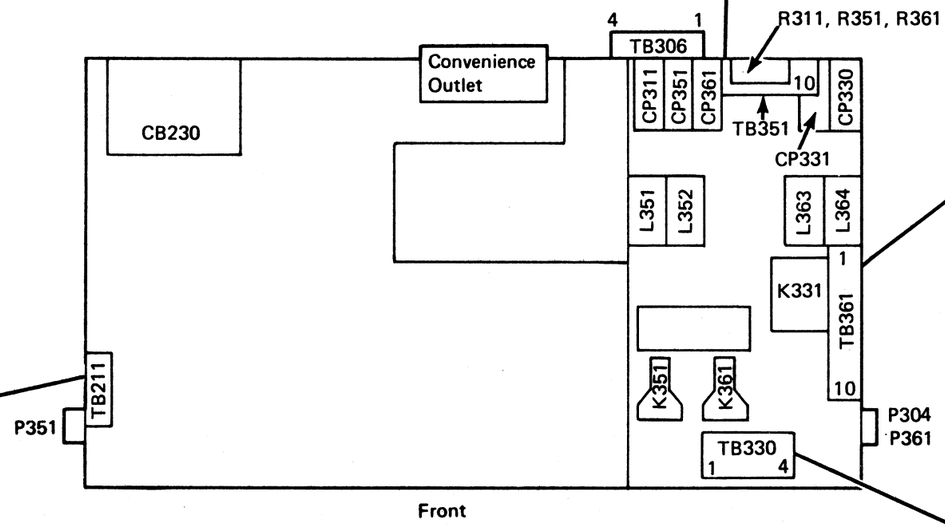
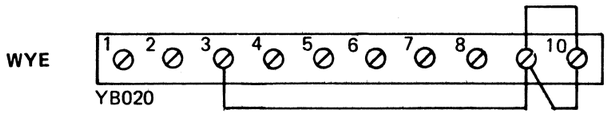
DELTA-WYE CONVERSION

Details of power to TB530, three-phase power to TB531 and T532, are described at Entry C on PWR 290.

AC COMPARTMENT, Top View (earlier machines)

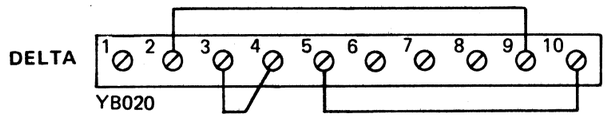


TB351–Drive Motor A
TB361–Drive Motor B

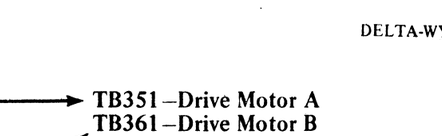


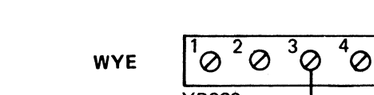
TB351–Left
TB361–Back

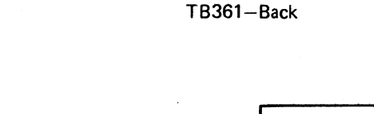
TB351–Right
TB361–Front



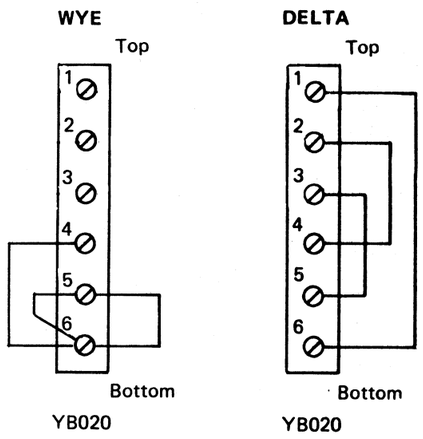
TB330–Drive Motors and Drive Ferro Transformers



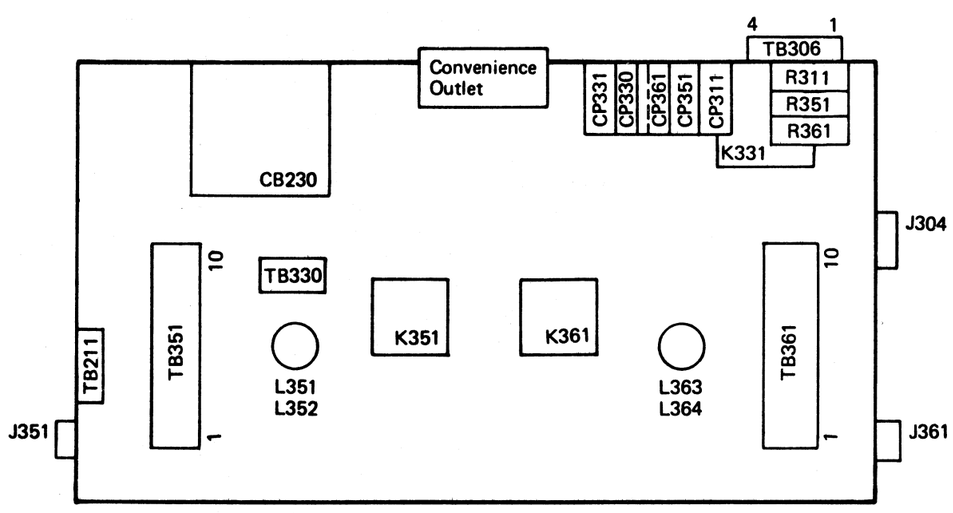




TB211–Blower Motor



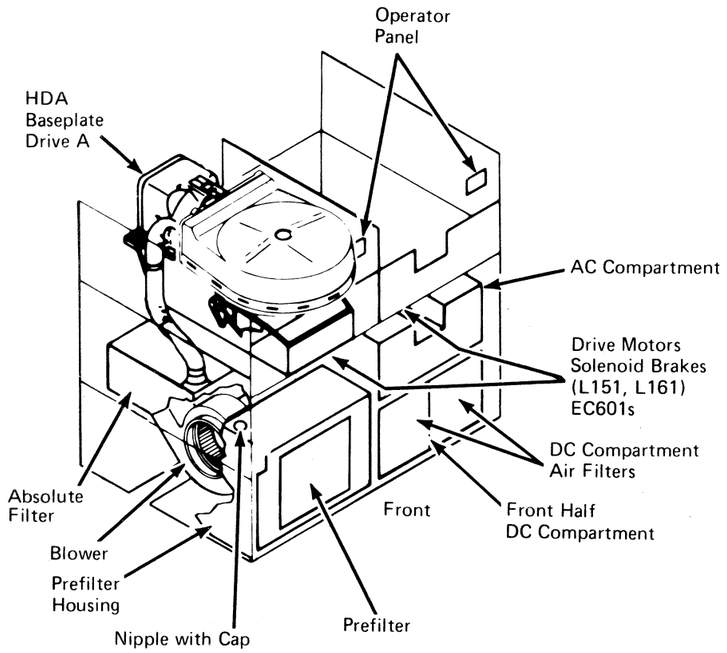
AC COMPARTMENT, Top View (later machines)



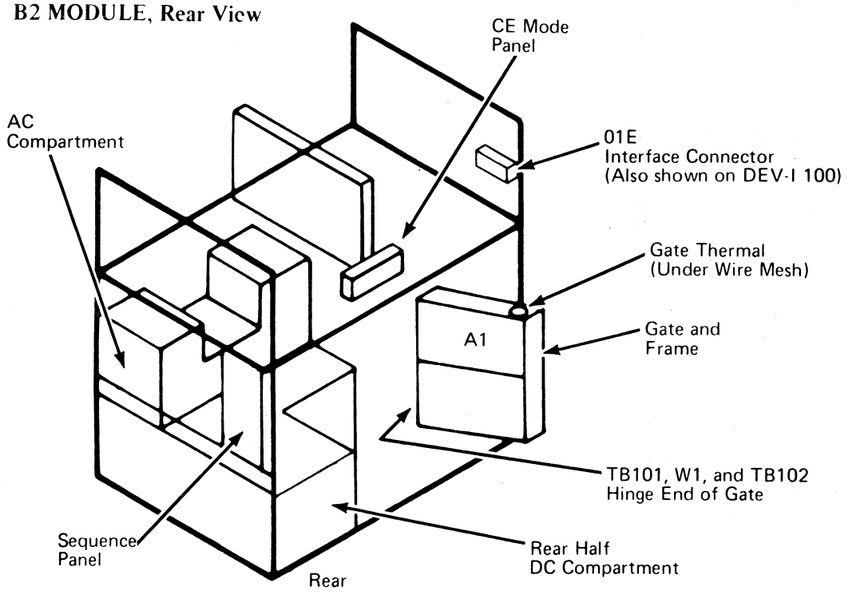
LOCATION INDEX

SATELLITE MODULE LOCATIONS

B2 MODULE, Front View

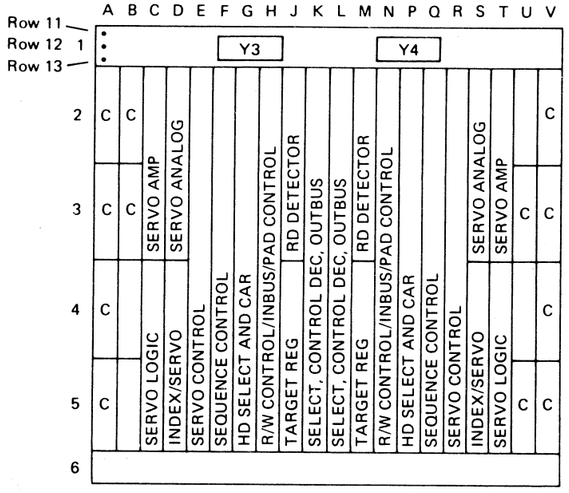


B2 MODULE, Rear View



GATE A AND FRAME

Drive Board, Card Side 01A-A1

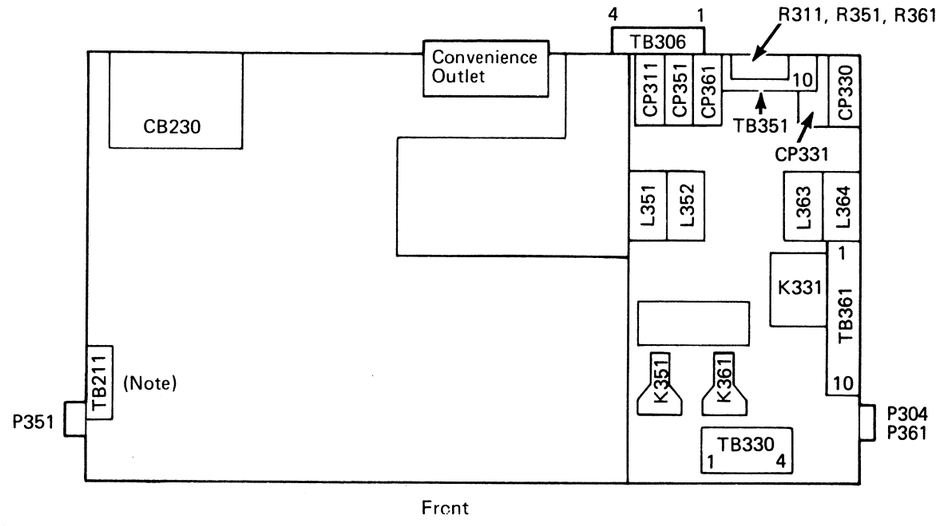


BOARD A1 TOP ROW CONNECTOR PIN ALIGNMENT

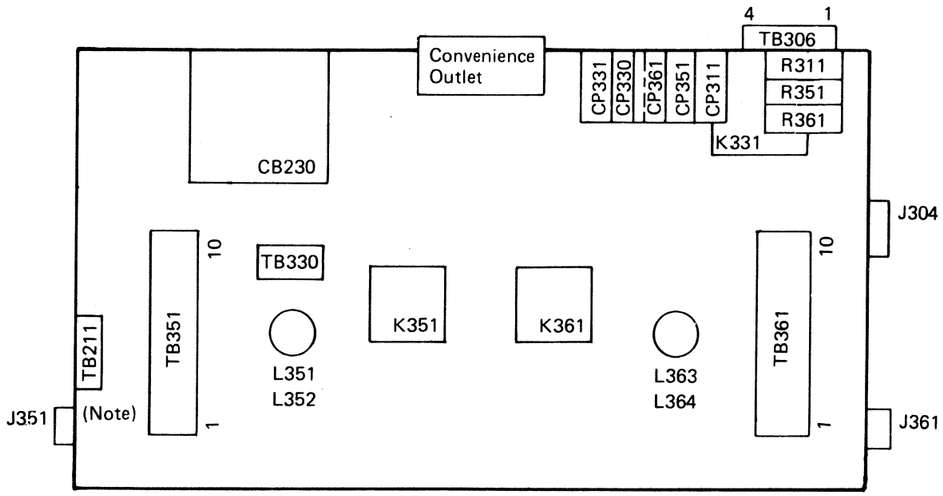
Y3	B02	=	A1H1 A13
	D02	=	A1H1 A11
	B13	=	A1K1 B13
	D13	=	A1K1 B11
Y4	B02	=	A1L1 D13
	D02	=	A1L1 D11
	B13	=	A1N1 E13
	D13	=	A1N1 E11

Refer to logic AA100

AC COMPARTMENT, Top View (Earlier Machines)



AC COMPARTMENT, Top View (Later Machines)



Note: *In terminal block TB211, the terminals are numbered from top to bottom.*

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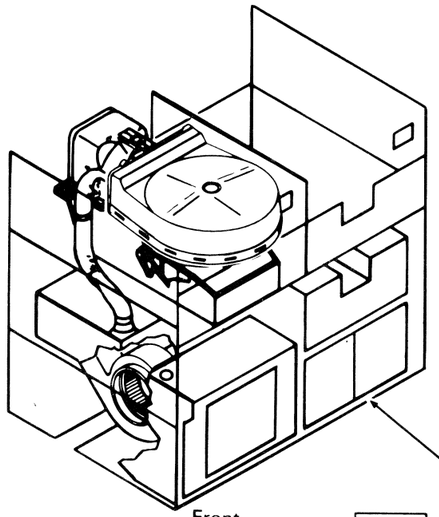
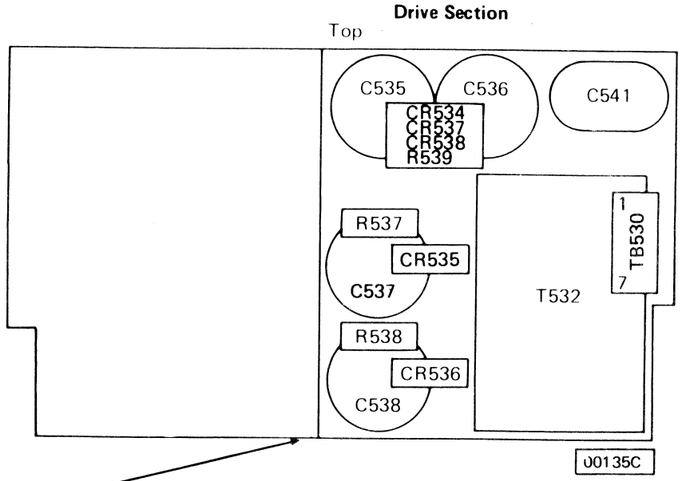
SATELLITE MODULE LOCATIONS

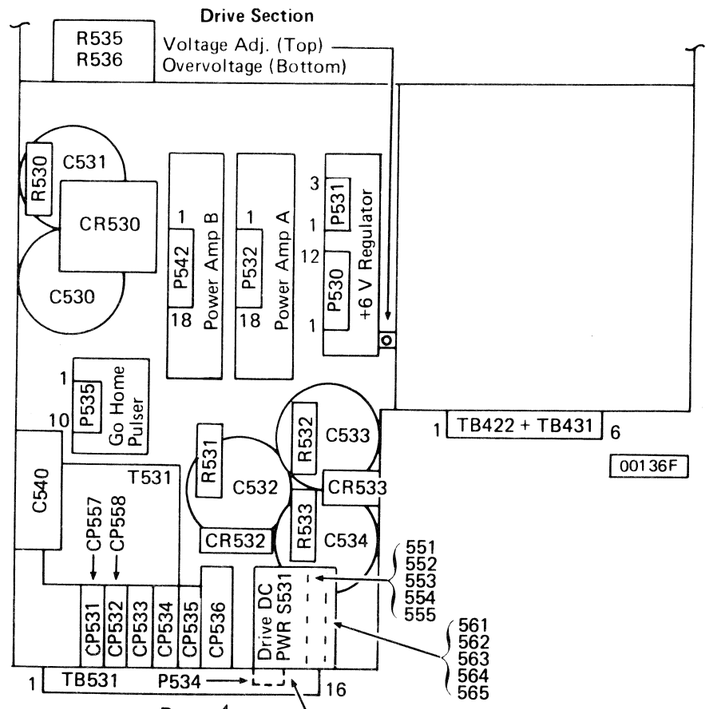
B2 MODULE, Front View



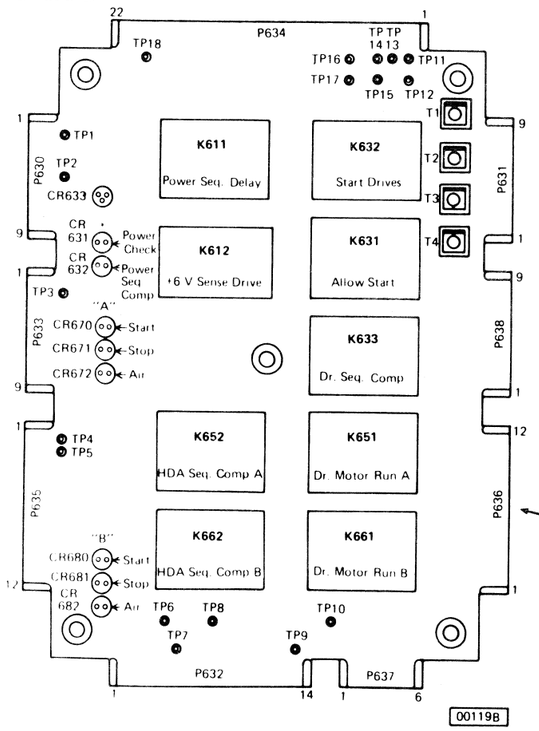
DC COMPARTMENT, Front Half



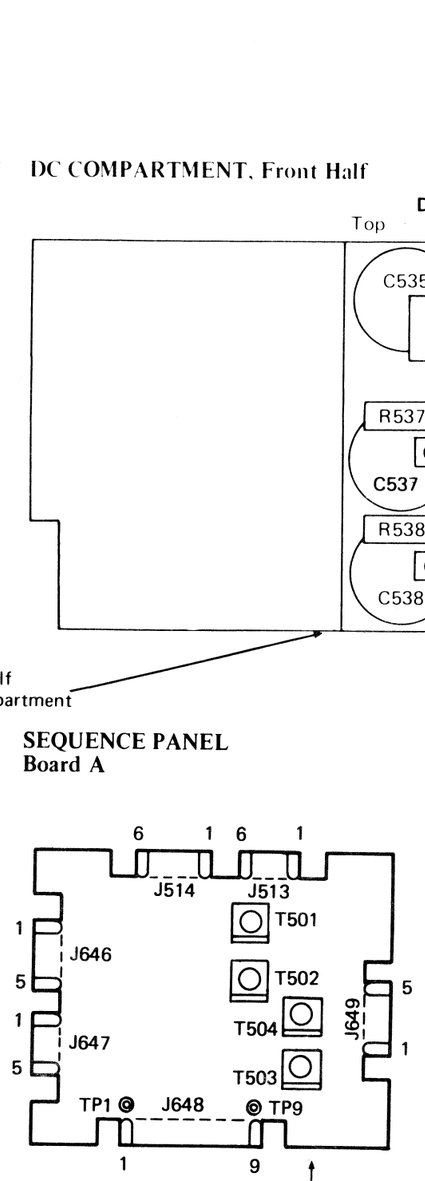
DC COMPARTMENT, Rear Half



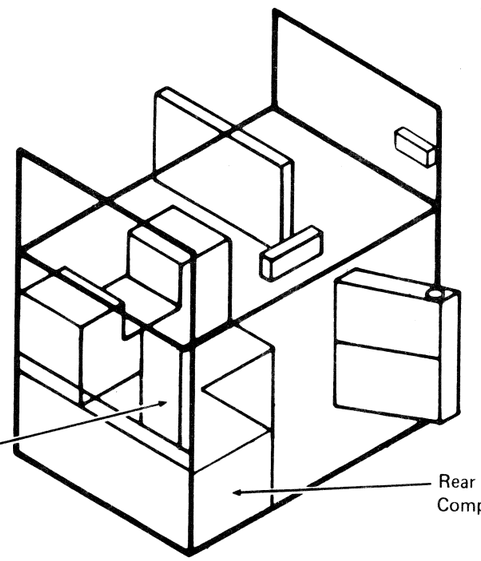
SEQUENCE PANEL
Board B



SEQUENCE PANEL
Board A

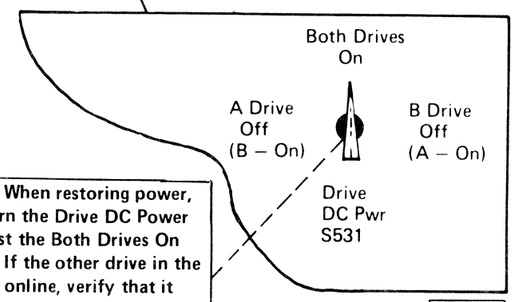


B2 MODULE, Rear View



Sequence Panel

Rear Half DC Compartment



Caution: When restoring power, do not turn the Drive DC Power switch past the Both Drives On position. If the other drive in the module is online, verify that it is still Ready after power is restored.

00111B

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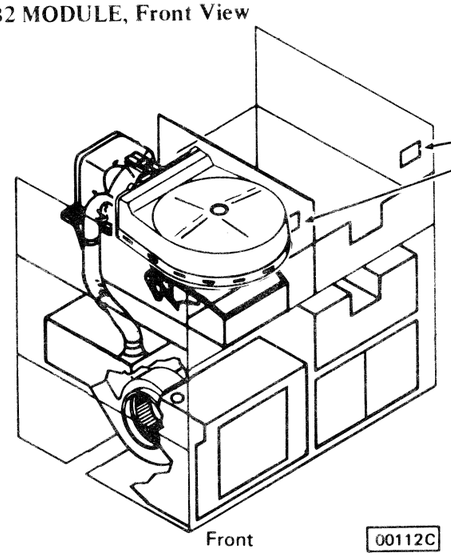
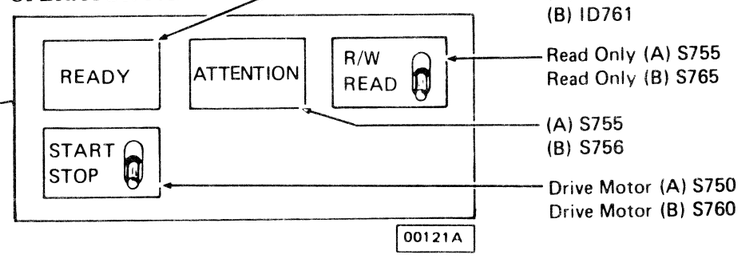
SATELLITE MODULE LOCATIONS

B2 MODULE, Front View

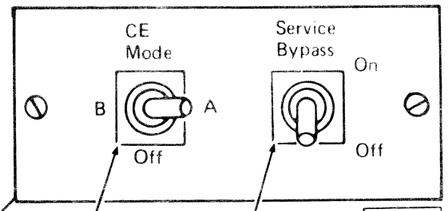


OPERATOR PANEL

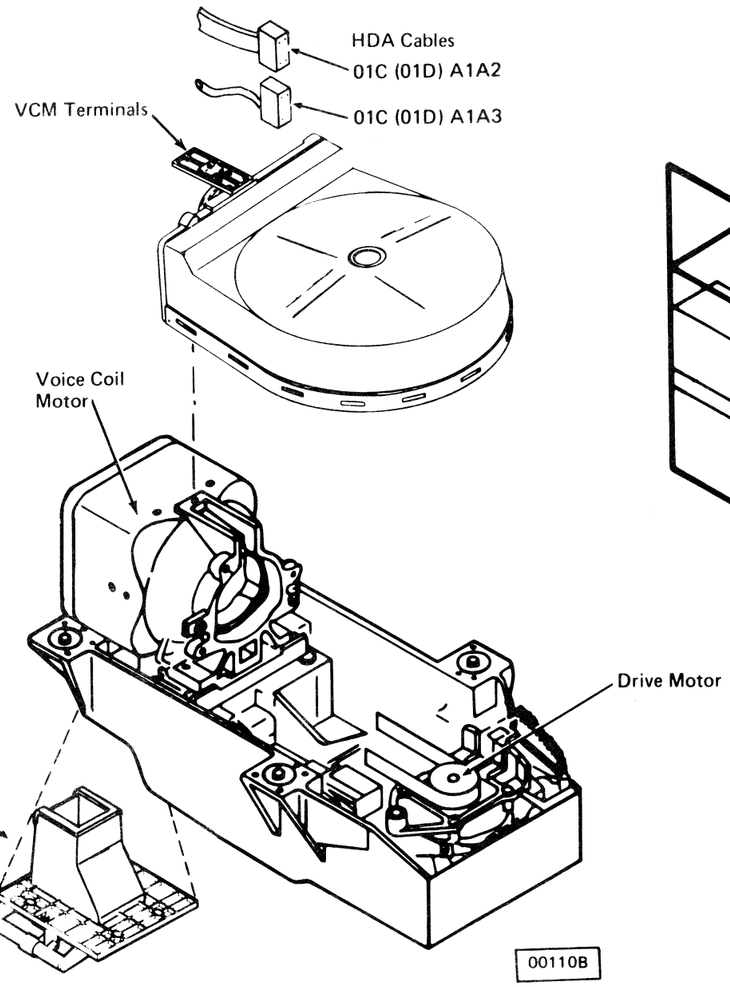


(A) ID751
(B) ID761
Read Only (A) S755
Read Only (B) S765
(A) S755
(B) S756
Drive Motor (A) S750
Drive Motor (B) S760

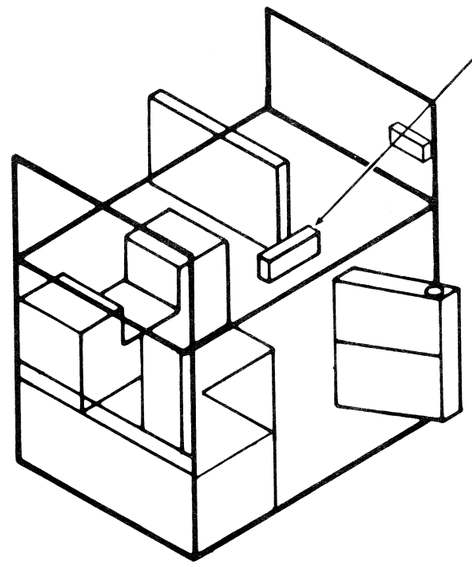
CE MODE AND SERVICE BYPASS



HDA AND BASE PLATE



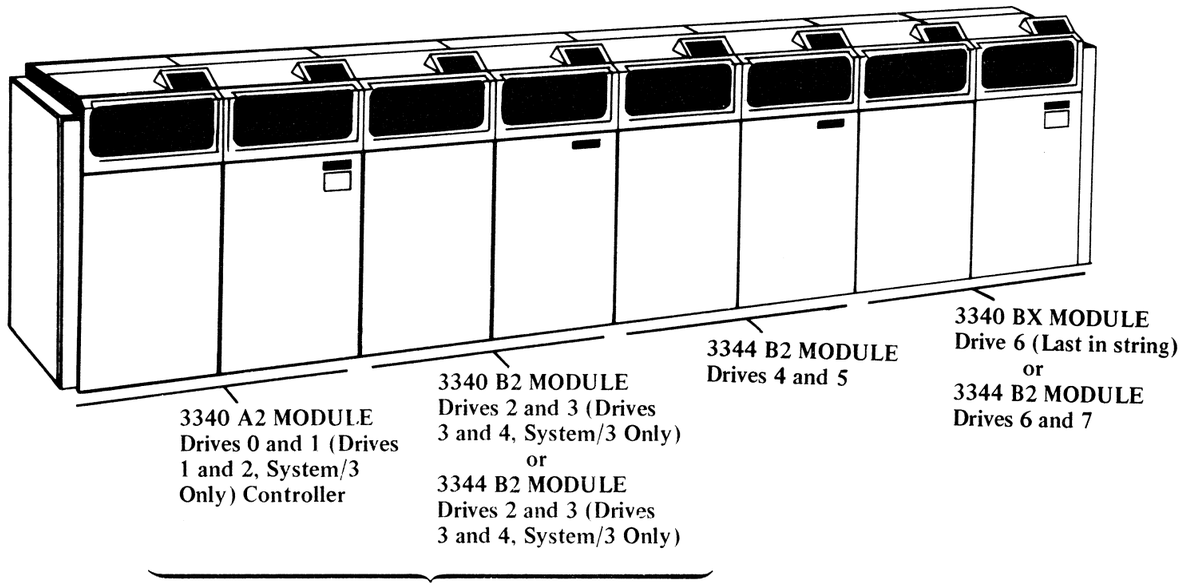
B2 MODULE, Rear View



INSTALLATION PROCEDURES

These installation procedures are used to install the 3340 and 3344 (all models).

3340/3344 DISK STORAGE



3344

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INSTALLATION PROCEDURES

A INTRODUCTION

1. Follow each step in sequence: A, B, C, etc.
2. When installing an A2 Module, one or more B1/B2 Modules, and one or more 3344 B2 Modules, perform all steps.
3. When adding a B1/B2 Module to an existing string, perform all steps except J and M.

B INSTALLATION CHECK

Check with the IBM Branch Office or area Physical Planning Representative to ensure that installation planning requirements are met (service receptacle voltage, phase rotation, grounding and cable lengths). When attaching 3340s to existing systems (3830-2, 370/115, 370/125, etc.), check that the correct attachment features are installed. The attachment feature should be ordered on an MES by the responsible sales office before installation of the 3340 or 3344.

To successfully complete drive installation, at least one 3348 data module must be available.

C UNPACK UNITS

1. Use Packing/Unpacking instructions taped to cover. Remove packing. Check for damage.

   Caution: Check that all tape is removed from bobbin and data module alignment pin area.

2. Inventory parts in shipping group. Use the BM listing:

   BM 2745311 (A2 50/60 hz) or
   BM 2745312 (B1/B2 60 hz) or
   BM 2745313 (B1/B2 50 hz) or
   BM 2758191 (3344 only)

Special Tools and Test Equipment

Required for installation:

	Part Number
Digitec Voltmeter	453585
Scope 453 or 454	453047 or 453550
Handwheel (A2 Shipping Group)	2745011
Bobbin Pushrod (Shipping Group for 3344)	2758393
3344 Shipping Tachrod (2 required)	2758392
May be required:	(B O Tool)
3340 Adjustment Tool Kit	See DM 700 and DM 701 (3340 MLM)

Special Adapters

If installing string 2 to ISC, 3830-2, or 3880, and the 3340 A2 Module is followed by a 3344 B2 Module, the spindle numbering in string 2 is changed to that shown by installing an adapter (P/N 5864492, order from Mechanicsburg*) and a different retainer (P/N 811802, order from Mechanicsburg*) in the A2 Module. (See INST 14.)

* For U.S. orders only. For WTC orders, order from each country's stock.

INSTALLATION PROCEDURES

D LOCATE UNITS

___1 Remove all covers, except top.

___2 Position A2 Module.

___3 On a multiple module installation, remove the end cover and mounting hardware from the A2 Module, and re-install it on the last B1/B2 or 3344 Module. See the diagram on INST 1.

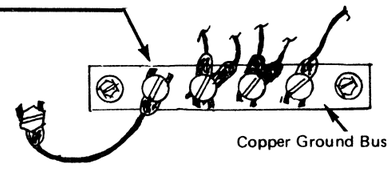
___4 On multiple module installations, position other modules as shown on INST 1. Keep modules approximately 6 inches apart. Do not adjust level jacks now. A B1 Module should be the last in the string.

Note: *(End Cover Hardware change)*
The end covers of machines with serial numbers 20221–20450 may be difficult to install on machines of later manufacture. Dispose of the old cover (P/N 2744810 at EC 442818 level) and order a new cover (P/N 2744810). The new cover has a striker latch (higher EC level) in place of the up-and-down latch bar.

E BASEPLATE AND DC SUPPLIES GROUND CHECK

___1 In the 3340, remove this jumper at the copper ground bus end for each A2, B1, or B2 Module.

In the 3344, at the W1 Block, remove the jumper from the screw 12 end for each 3344 being installed. W1 is located on the logic gate.



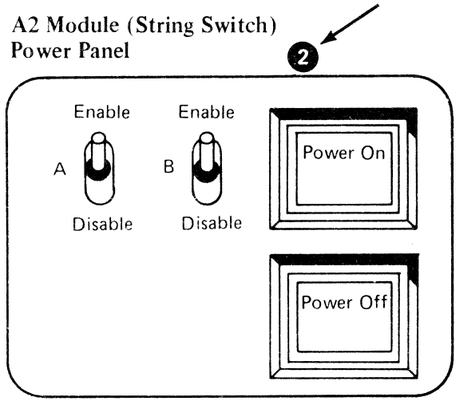
___2 If installing an A2 Module, pull the ribbon connectors from the following locations to remove ground connections at the tailgate:

- On a basic machine without the string switch feature:

  A2C2, A2C3, A2C4, A2C5

- With the string switch feature:

  A2A2, A2A3, A2A4, A2A5
  A2B2, A2B3, A2B4, A2B5



___3 Check that the resistance between each baseplate and frame ground is at least 1 megohm.

Baseplates are connected through the servo and R/W matrix card cables and by leads to the dc common terminal block on the logic gate.

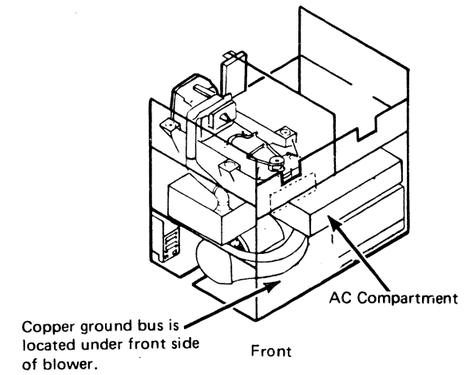
If resistance is less than 1 megohm, a grounding condition exists. Correct this problem first. Possible causes are:

- Spindle drive belt slipped down during shipment, indicated by approximately 30K ohms to frame ground.
- Loose mounting clamps in the DC Compartment (LOC 14) allowing components to shift and provide a short to frame ground.

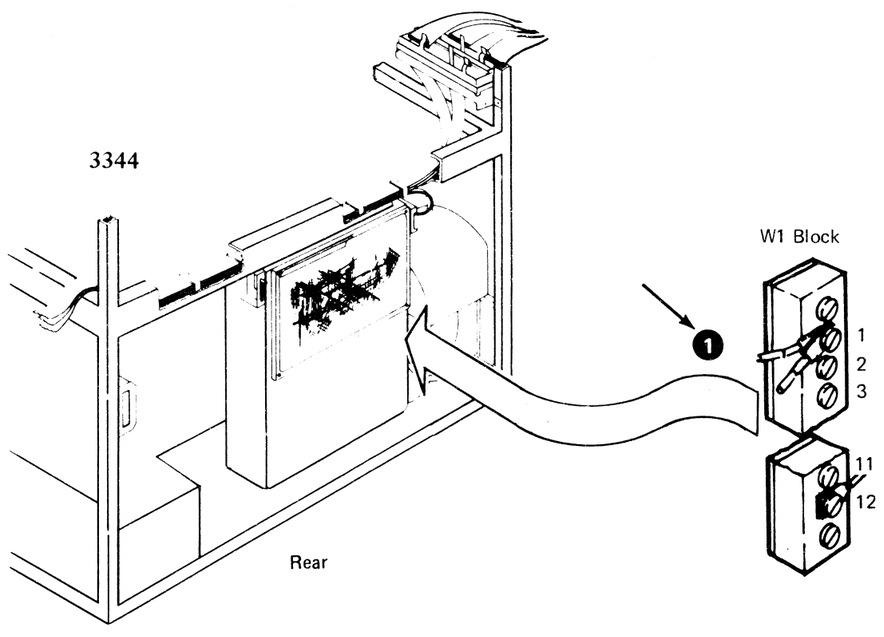
For additional information, see the power section of the logics and the PWR pages in the MLM.

___4 Reconnect each jumper at the ground bus and re-install the ribbon cables.

3340 A2, B1, or B2



3344



F CABLING MODULES – SEQUENCE CABLE AND TERMINATORS

For System/3 installation, go to INST 9.

Caution: Do not connect the A2 Module to ac wall receptacle now.

__ 1 Connect dc sequence cables between modules. Cable is pre-installed in B1/B2 Modules. Route cable through trough.

Cable connector ends are designated (numbered) Pxxx A Pxxx connector end connects to Pxxx on a Sequence Board in a 3340 and to Jxxx (Sequence Adapter Board) in a 3344.

Using Figure 1, connect the desired combinations of 3340s and 3344s. Cable (A) connects from a 3340 (P513) or 3344 (J513) to the adjacent 3340 (P514) or 3344 (J514). Cable (B) connects control lines (unique to the 3344) between 3344 Modules only, but may pass *through* a 3340. In the first 3344, cable (B) (J646 to J647) adapts the 3340 control lines to a 3344. Each 3344 is shipped with this cable (P/N 2757779) plugged to J646 and J647; leave it connected in the first 3344 of the string. In the second or third 3344 of the string, disconnect the cable at the J646 plug end and connect the plug to J649 (Sequence Adapter Board) in the first or second 3344. If cable is too short to reach J646, reorder the cable under the same part number. The new cable should be at E/C 451173, which is 24 inches longer. With this cabling arrangement, the sequence starts with the first 3344 and continues to the second, then on to the third.

If only one 3344 is in a string, no (B) cable changes are required. The (B) cable, plugged to the Sequence Adapter Board at J646 and J647, remains connected as it came from the plant.

__ 2 If a 3340 B1/B2 is the last module in the string, install a jumper (P/N 2744877 in the A2 Shipping Group) from T510 to T511 (C) and in the last 3344, install a jumper between T503 and T504 (D). Both are shown in Figure 1 and on their respective Sequence Boards. One jumper (P/N 2744877) is supplied on the 3340 A2 Sequence Board and the second jumper is supplied on the 3344 Sequence Adapter Board. Only two jumpers are required for a 3340/3344 string.

If a 3344 is the last module of the string, install jumper T501 to T502 (C) and T503 to T504 (D) as shown in Figure 1 and in the Sequence Adapter Board diagram. One jumper (P/N 2744877) is supplied on the 3340 A2 Sequence Board and the second jumper is supplied on the 3344 Sequence Adapter Board. Only two jumpers are required for a 3340/3344 string.

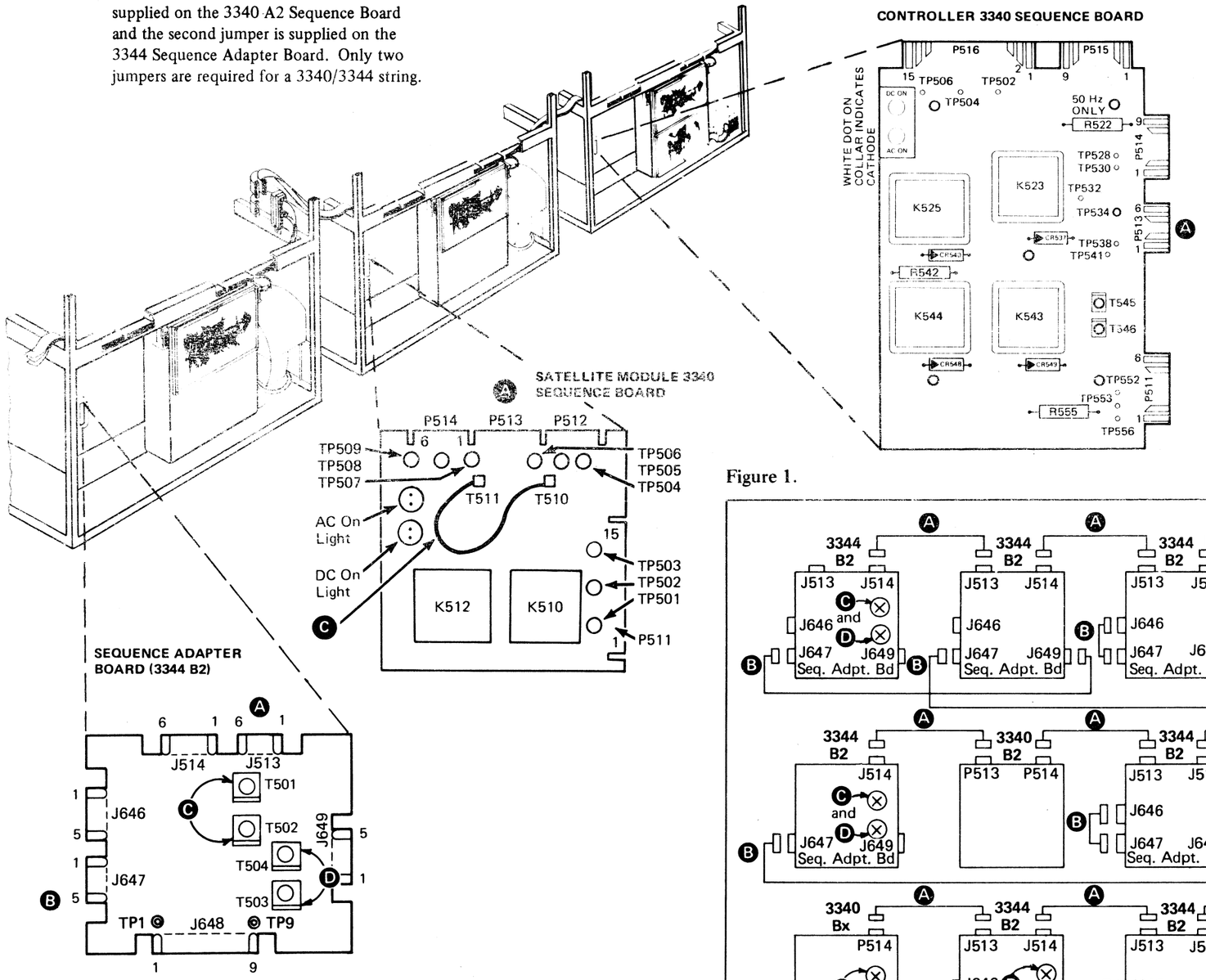
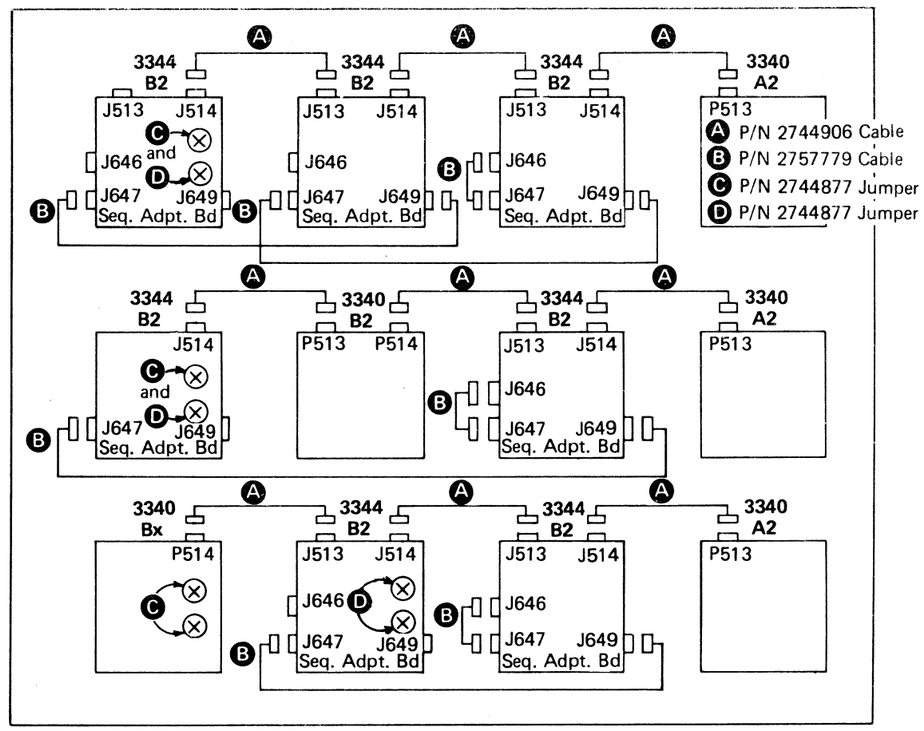


Figure 1.



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F CABLING MODULES (Continued)

__ 3 PLO Termination: If a 3340 is the last module, terminate the PLO on the last module by jumper connection (P/N 815925 in A2 Shipping Group). Plug jumper on pin side of board:

A1H2 D03 to A1H2 B03
and
A1H2 D04 to A1H2 B04

Refer, if needed, to the 3340 ALD page KL080.

If a 3344 is the last module, termination is accomplished by inserting a card as described in item G 3.

__ 4 R/W Data Termination: If a 3340 is the last module, terminate R/W data line on last module by jumper connection (P/N 815925 in A2 Shipping Group). Plug jumper on pin side of board:

A1J2 D12 to A1J2 B12
and
A1J2 D13 to A1J2 B13

Refer, if needed, to the 3340 ALD page KN010.

If a 3344 is the last module, termination is accomplished by inserting a card as described in item G 3.

__ 5 Remove any R/W Data, or PLO termination jumpers from any other than the last module.

G CABLING INTERFRAME CONNECTORS

There are two styles of device interfaces presently in the field:

Present Production – A new style interface that uses pre-installed cables and an interframe connector.

Existing in the field – Old style interface with cables routed through a trough.

Convert old style interface to new style interface. Order FBM 2344383 for an A2 Module, FBM 2344383 plus FBM 2344418 for a B2 Module, and FBM 2344418 for a B1 Module. One or two FBMs is required for each machine with old style interface.

FBM 2344383 supplies 3 outgoing cables. FBM 2344418 supplies interframe connector and 3 incoming cables. After FBM installation, perform Steps 1, 2, and 3.

__ 1 Plug the ribbon cables in the appropriate slot in the interframe connector, as shown in Figure 1.

__ 2 Insert the two-wide terminator (P/N 5863806) in the two-wide card guide (P/N 811804). These items are supplied in the A2 Shipping Group.

__ 3 Install the two-wide terminator card in the last module 01A board as follows:

3340 TERMINATION: If a 3340 is the last module, install the 2-wide terminator card in A1A3 of the A1 logic board instead of cables. (See DEV-I305 of the 3340 MIM.)

Unplug the cable at A1B2(VFO/PLO). Tie the three cables back (two from A1A3 and one from A1B2) outside the gate using cable tie P/N 1159519 (in the A2 Shipping Group).

Note: *If this cable (A1B2) is left installed, error stops will occur.*

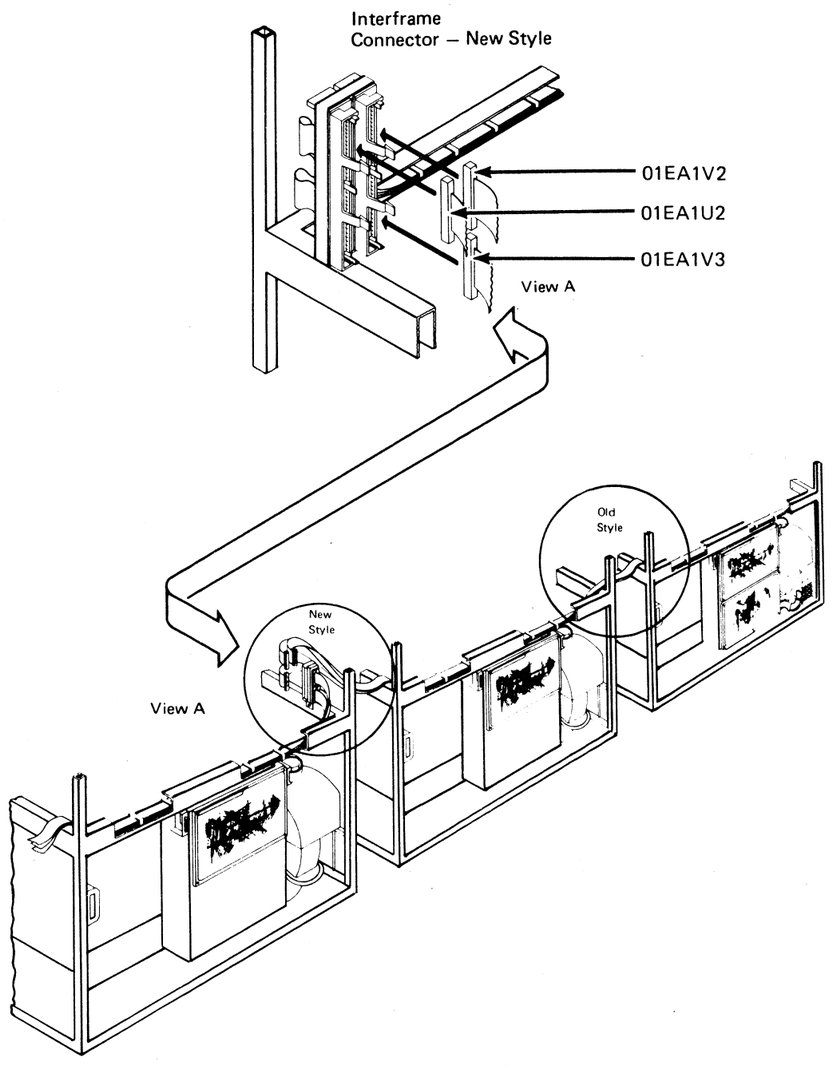
3344 TERMINATION: If a 3344 is the last module, install the 2-wide terminator card in A1A2 of the A1 logic board instead of cables. (See DEV-I100 of the 3344 MIM.)

Insert the 1-wide terminator (P/N 8250634) in the 1-wide card guide (P/N 811802). These items are supplied in the 3344 B2 Shipping Group. Plug it into 01A-A1B3 instead of the cable. Tie the three cables back (two from A1A2 and one from A1B3) outside the gate using cable tie P/N 1159519 (in the 3344 B2 Shipping Group).

If a B2 Module is being added to the string, move the terminators to the new last module, and replug the cables as marked on the cable-ends. Follow the procedure above for plugging the terminator cards.

Note: *Orientation of connector may vary from that shown.*

Figure 1.



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441235 28 May 76	441236 30 Sept 76	441237 1 Mar 77	441240 30 May 80	441241 29 Aug 80

INSTALLATION PROCEDURES

For System/3 only.

F G CABLING MODULES SEQUENCE CABLE CABLING INTERFRAME CONNECTORS TERMINATION

Caution: Do not connect the A2 Module to ac wall receptacle now.

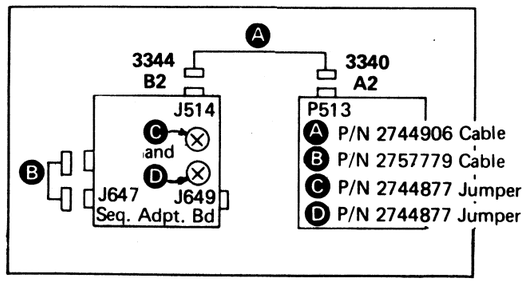
___1 Connect dc sequence cables between modules. Cable is pre-installed in B2 Modules. Route cable through trough.

Cable connector ends are designated (numbered) Pxxx. A Pxxx connector end connects to Pxxx on a Sequence Board in a 3340 and to Jxxx (Sequence Adapter Board) in a 3344.

Using Figure 1, connect cable (A) from a 3340 (P513) to the adjacent 3340 (P514) or 3344 (J514). No (B) cable changes are required. The (B) cable, plugged to the Sequence Adapter Board at J646 and J647, remains connected as it came from the plant.

___2 If a 3344 is the last module of the string, install jumper T501 to T502 (C) and T503 to T504 (D) as shown in Figure 1 and in the Sequence Adapter Board diagram.

Figure 1.



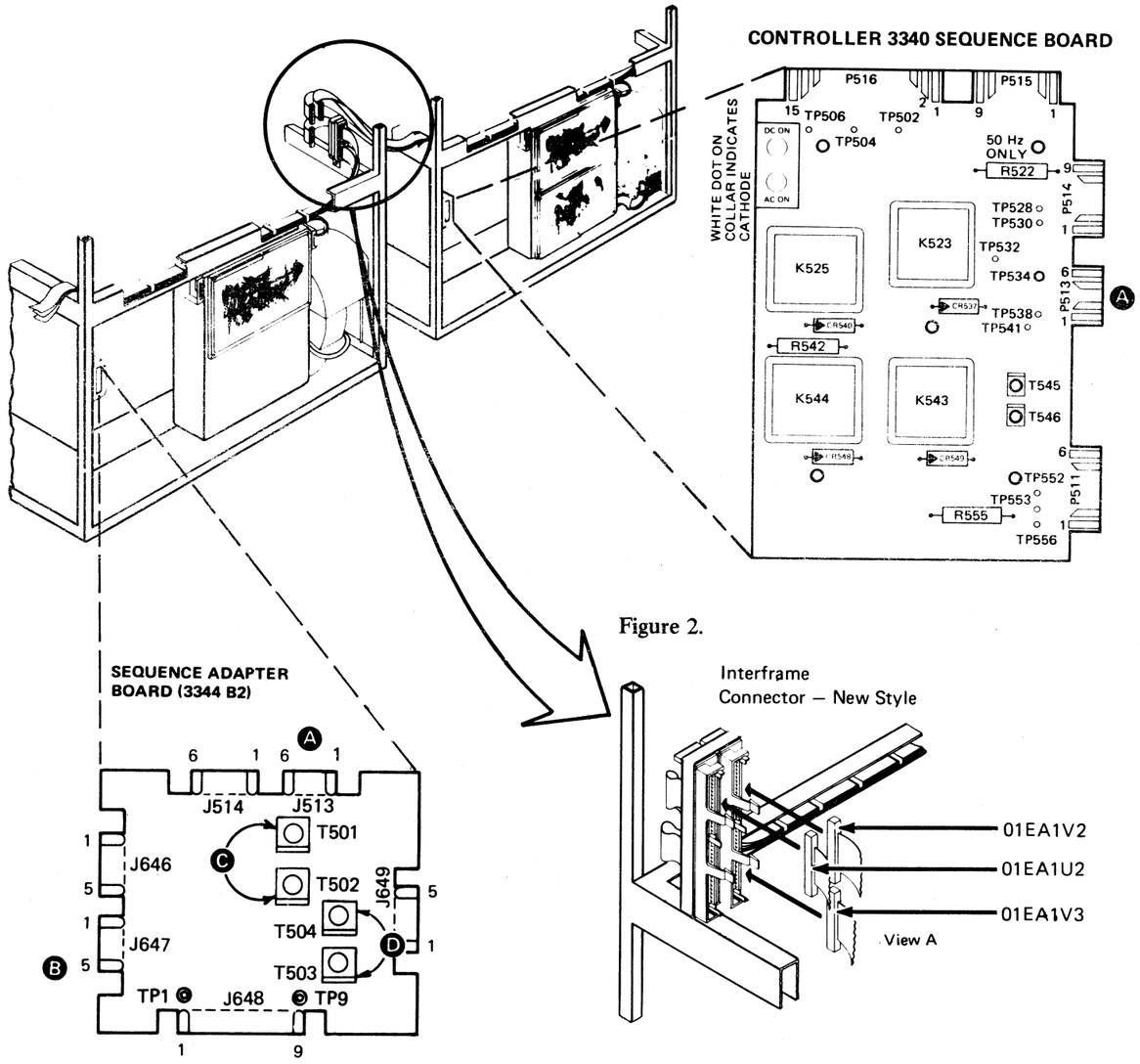


Figure 2.

Note: *Orientation of connector may vary from that shown.*

___3 Plug the ribbon cables in the appropriate slot in the interframe connector, as shown in Figure 2.

___4 If a 3344 is the last module, install the 2-wide terminator card in the A1A2 instead of cables. Insert the two-wide terminator (P/N 5863806) in the two-wide card guide (P/N 811804). These items are supplied in the A2 Shipping Group.

Insert the 1-wide terminator (P/N 8250634) in the 1-wide card guide (P/N 811802). These items are supplied in the 3344 B2 Shipping Group. Plug it into A1B3 instead of the cable. Tie the three cables back (two from A1A2 and one from A1B3) outside the gate using cable tie P/N 1159519 (in the 3344 B2 Shipping Group).

If a B2 Module is being added to the string, move the terminators to the new last module, and replug the cables as marked on the cable-ends. Follow the procedure above for plugging the terminator cards.

___5 Remove any R/W Data, or PLO termination jumpers from any other than the last module. Remove sequence jumpers from all but the last module.

Note: If the last module on the string is a 3344, remove any R/N and PLO jumpers from the last module.

H AC POWER CABLES, LEVEL AND BOLT FRAMES

DANGER
If attaching to a previously installed A2 or B1/B2 Module, the AC power must be removed by turning off the main line disconnect (CB201) in the A2 Module.

___1 Move all units together.

Connect ac power cable from B2 to the connector on A2 or next B2 AC Compartment (P205 for 3340 and P304 for 3344).

___2 Verify with a CE meter that a direct short exists between the AC Compartments of the modules. (Check the green and yellow ground wire from AC Compartment to AC Compartment for 0.1 or less ohms.) If the reading is not within this range, investigate and correct the condition.

___3 Adjust leveling jacks for appearance and ease of inserting frame tie bolts.

Caution: **Before tightening bolts, check that no cables are caught between frame members.**

___4 Bolt frames together using:
3 bolts (P/N 59652 B2 Shipping Group)
3 washers (P/N 6935 B2 Shipping Group)
3 nuts (P/N 39600 B2 Shipping Group)

___5 In the 3344s only, remove the bobbin shipping rod from the rear of the voice coil motor. See Figure 1.

Note: *Store the bobbin shipping rod in the clips located at the rear on the VCM.*

Caution: **The bobbin shipping rod must be re-installed whenever the machine is moved, even for short distances.**

If at a later time the bobbin must be retrieved at the inner diameter (ID), thread the bobbin pushrod (P/N 2758393) into the shipping rod. Undo the wingnut and washer and insert the combined tools. After the bobbin is returned to the outer diameter (OD), slip the washer and wingnut back over the stud on the shipping rod and hand-tighten. Prevent the rod from turning by applying an open-end wrench to the stud at the end of the shipping rod. Flats are provided for this purpose.

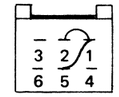
Caution: **Do not overtighten the rod or wingnut. Fingertight is tight enough.**

___6 Also only in the 3344s, insert the bobbin pushrod into each VCM and move the bobbin in and out several times. Check for a binding condition. If a bind occurs, go to HDA 710 for further analysis.

J CABLING CONTROL MODULE (A2) TO CONTROL INTERFACE

___1 Connect EPO cable (P/N 5351178) from control module tailgate to system EPO. The EPO cable pigtail (ground) does not need to be connected at the 3340 end. It should be taped back against the cable body. Connect J101 to the first system and J102 to the second system.

Note: *If it is inconvenient at this time to connect the EPO cable, use the shorting plug assembly (P/N 2282264, A2 Shipping Group), but the EPO cable should be connected as soon as possible.*



EPO Plug
(Wiring Side)

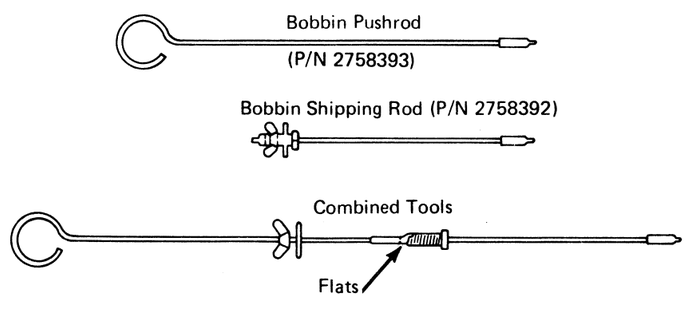
___2 Connect interface cables (P/N 5466456) from control module tailgate to the control interface. Plug the light grey cable connector into the black tailgate connector and the black cable connector into the light grey tailgate connector. To determine the color of the new style tailgate connectors, look at the center portion of the connector where it is not plated.

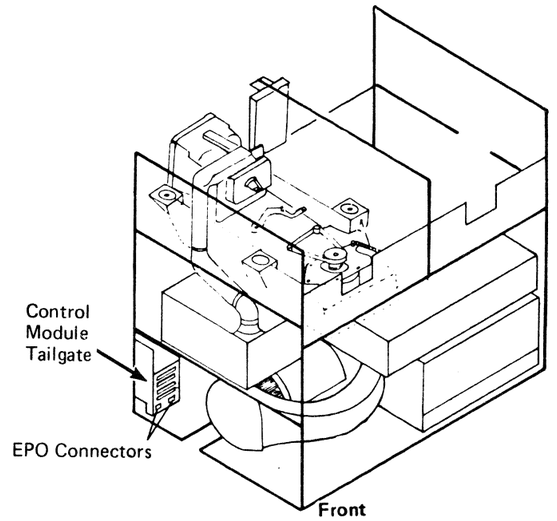
Note: *The plating on the tailgate connectors provides a ground path from the cable shield through the tailgate to the 3340 frame.*

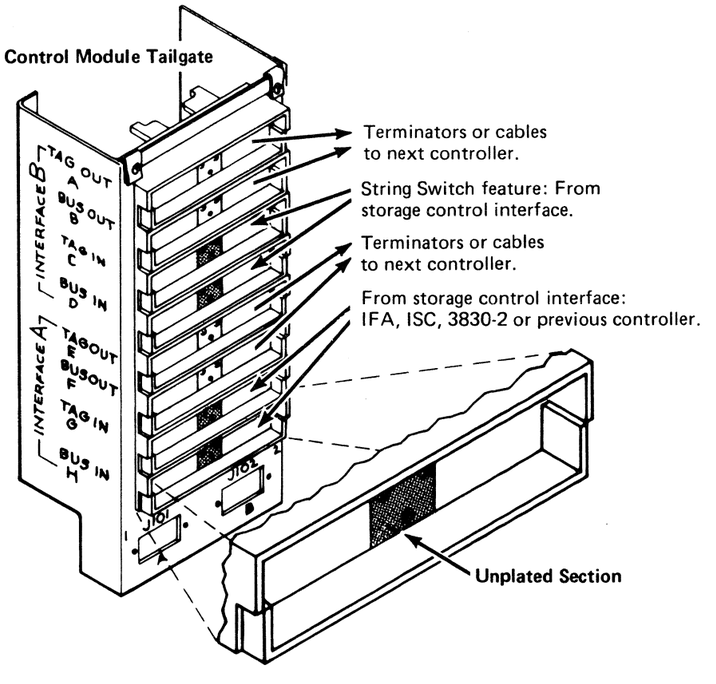
___3 Plug two Bus terminators (P/N 2282675) into the Bus Out and Tag Out positions in the control module tailgate. These terminators are shipped with the host system.

___4 If installing multiple controllers, connect interface cables in Bus Out and Tag Out positions. Terminate at the last controller by plugging two Bus terminators (P/N 2282675) into the Bus Out and Tag Out positions.

Figure 1.







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K ADDRESSING

Check that Storage Control addresses are correct for this configuration.
If a 3340 and 3344 are being installed on a System/3, go to INST 17.

__ 1 Install the customer's assigned address labels (P/N 5412746 in A2 Shipping Group) in the recesses on the Operator Panel (see example on this page) for both 3340s or 3344s. The addresses must be included within the "All Possible Channel Addresses for 3830, ISC, or 3880 Operation" chart on this page and INST 14, similar charts for the 115/125 DDA or 135 IFA Operation on INST 16 or the chart for 4331 Operation on INST 17A. The groups and their beginning addresses are as follows:

Group ❶ – X00
Group ❷ – X40
Group ❸ – X80
Group ❹ – XC0

All strings addressed by the same 3830, ISC, or 3880 must have addresses within the same group. For example, if String 0 uses address X80 for Spindle 0 in Group 3, the other strings must have the following addresses:

String 1, Spindle 0 X88
String 2, Spindle 0 X90
String 3, Spindle 0 X98

__ 2 In the 3340s, establish logical drive addresses for each module by plugging jumpers (P/N 815925 in B1/B2 Shipping Group) on the A1 Board of each drive. (See Figure 1.)

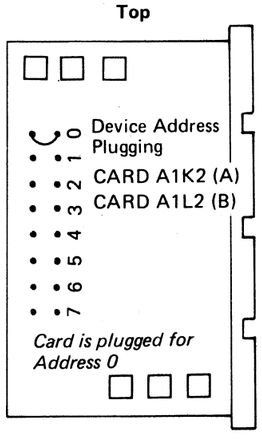
Figure 1. Drive Address (3340)

Drive Module	Logical Address		Jumper on Board A1, Card Location A1D2
	Drv A	Drv B	
1 (Ctrl Mod)	0	1	None
2 (Sat Mod)	2	3	M10 to P10
3 (Sat Mod)	4	5	M11 to P11
4 (Sat Mod)	6	7	M12 to P12

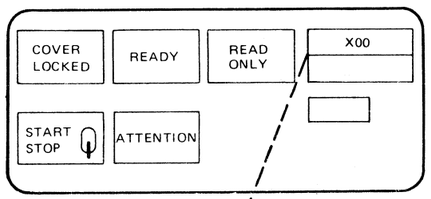
Note: *A 3340 B1 Module contains only one drive (Drive A). Drive B address is disabled at the plant. For reference, see ALD pages KK030 and KK040.*

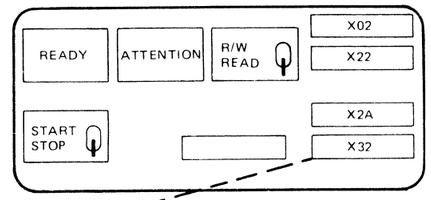
__ 3 In the 3344s, establish each drive address by connecting jumper points on card A1K2(A1L2) with jumper (P/N 816645) as shown in Figure 2. A jumper is shipped on each card. Plug the drive addresses in sequence; no two can be plugged alike. If this is String 2 on a 3830, ISC or 3880, and a 3344 follows 3340, see Note 3 on INST 14 for additional considerations.

Figure 2. Drive Address Card



ALL POSSIBLE CHANNEL ADDRESSES FOR 3830, ISC, OR 3880 OPERATION





CTL-I

3830-2 or ISC or 3880

(See Notes 1 and 2 on INST 14)

Spindle 0

Spindle 2

String 0

Group	Row	3340 A2		3344 B2		3344 B2		3344 B2	
		Spindle 0	Spindle 1	Spindle 2	Spindle 3	Spindle 4	Spindle 5	Spindle 6	Spindle 7
❶	A	X00	X01	X02 22 2A 32	X03 23 2B 33	X04 24 2C 34	X05 25 2D 35	X06 26 2E 36	X07 27 2F 37
❷	B	X40	X41	X42 62 6A 72	X43 63 6B 73	X44 64 6C 74	X45 65 6D 75	X46 66 6E 76	X47 67 6F 77
❸	C	X80	X81	X82 A2 AA B2	X83 A3 AB B3	X84 A4 AC B4	X85 A5 AD B5	X86 A6 AE B6	X87 A7 AF B7
❹	D	XC0	XC1	XC2 E2 EA F2	XC3 E3 EB F3	XC4 E4 EC F4	XC5 E5 ED F5	XC6 E6 EE F6	XC7 E7 EF F7

Only the first addresses (in blocks) have to be plugged; all others are for reference only.

String 1

Group	Row	3340 A2		3340 B2		3340 B2		3340 B2	
		Spindle 0	Spindle 1	Spindle 2	Spindle 3	Spindle 4	Spindle 5	Spindle 6	Spindle 7
❶	E	X08	X09	X0A	X0B	X0C	X0D	X0E	X0F
❷	F	48	49	4A	4B	4C	4D	4E	4F
❸	G	88	89	8A	8B	8C	8D	8E	8F
❹	H	C8	C9	CA	CB	CC	CD	CE	CF

INST 14

See EC History	441239 15 Jun 79	441240 30 May 80	441241 29 Aug 80	

K ADDRESSING (Continued)

For 3344s on 3830-2, ISC, or 3880, use this page and INST 12.

For 3344s on 135 IFA and 115 or 125 DDA, use INST 16.

For 3344s on 4331s, use INST 17A.

— **4** Select the desired controller address (string address) and install jumpers in A2G2 (see Figure 3). String addresses are shown on INST 12, 14, and 16. For reference, see ALD page BF120.

Figure 3. Controller Addressing (A2G2)

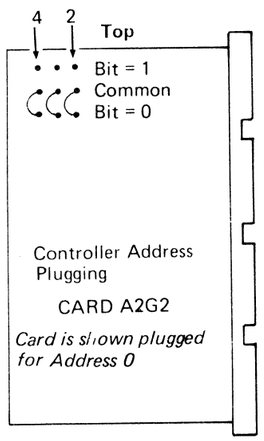
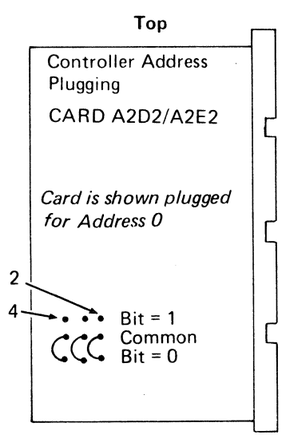
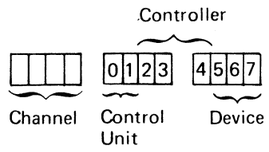


Figure 4. Controller Addressing (A2D2/A2E2)



— **5** For String Switch Feature: Plug cards at A2D2 (Interface A) and at A2E2 (Interface B). These cards have to be plugged with the identical address as the card in A2G2. See Figure 4.

Figure 5. Controller and Drive Addresses



Controller	Plug	Addresses	Addresses Group	Addresses Row
0	4 3 2	X00 – X07	1	A
		X40 – X47	2	B
		X80 – X87	3	C
		XC0 – XC7	4	D
1	4 3 2	X08 – X0F	1	E
		X48 – X4F	2	F
		X88 – X8F	3	G
		XC8 – XCF	4	H
2 (See Note 3)	4 3 2	X10 – X17	1	J
		X50 – X57	2	K
		X90 – X97	3	L
		XD0 – XD7	4	M
3	4 3 2	X18 – X1B	1	N
		X58 – X5B	2	P
		X98 – X9B	3	Q
		XD8 – XDB	4	R

Note 1: *A 3340 B2 Module can be substituted for a 3344 B2 Module, as shown in the chart. If the substitution is made, use the address specified in the blocks under each spindle heading. Example: String 0, spindle 2 and 3, would have address X02 and X03 for a 3340 B2 Module when substituted for a 3344 B2 Module.*

Note 2: *3344 B2 Module can only be installed in Strings 0 and 2, as indicated in the charts.*

INST 12

String 2

(See Notes 2 and 3)

Group	Row	3340 A2 Spindle 2	3340 A2 Spindle 3	3344 B2 Spindle 0	3344 B2 Spindle 1	3344 B2 Spindle 4	3344 B2 Spindle 5	3340 B2 Spindle 6	3340 B2 Spindle 7
1	J	X12	X13	X10 20 28 30	X11 21 29 31	X14 1C 38 3C	X15 1D 39 3D	X16 1E 3A 3E	X17 1F 3B 3F
2	K	X52	X53	X50 60 68 70	X51 61 69 71	X54 5C 78 7C	X55 5D 79 7D	X56 5E 7A 7E	X57 5F 7B 7F
3	L	X92	X93	X90 A0 A8 B0	X91 A1 A9 B1	X94 9C B8 BC	X95 9D B9 BD	X96 9E BA BE	X97 9F BB BF
4	M	XD2	XD3	XD0 E0 E8 F0	XD1 E1 E9 F1	XD4 DC F8 FC	XD5 DD F9 FD	XD6 DE FA FE	XD7 DF FB FF

Only the first addresses (in blocks) have to be plugged; all others are for reference only.

String 3

Group	Row	3340 A2 Spindle 0	3340 A2 Spindle 1	3340 B2 Spindle 2	3340 B2 Spindle 3
1	N	X18	X19	X1A	X1B
2	P	58	59	5A	5B
3	Q	98	99	9A	9B
4	R	D8	D9	DA	DB

Terminator

Note 3: *In string 2, if the 3340 A2 Module is followed by a 3340 B2 Module, the spindle numbering is 0 and 1 for the A2 Module and 2 and 3 for the B2 Module.*

If the 3340 A2 Module is followed by a 3344 B2 Module, the spindle numbering in string 2 is changed to that shown by installing an adapter (P/N 5864492, order from Mechanicsburg) and a different retainer (P/N 811802, order from Mechanicsburg*) in the A2 Module.*

a. Unplug the ribbon cable at A2V4.

b. Insert the ribbon cable into the adapter.

c. Remove the cable retainer (P/N 811411) that is on the cable and replace it with a different retainer (P/N 811802, order from Mechanicsburg).*

d. Re-insert the assembly into A2V4.

e. Plug address cards A1K2 and A1L2 for spindles 0 and 1 in the first 3344 B2 Module.

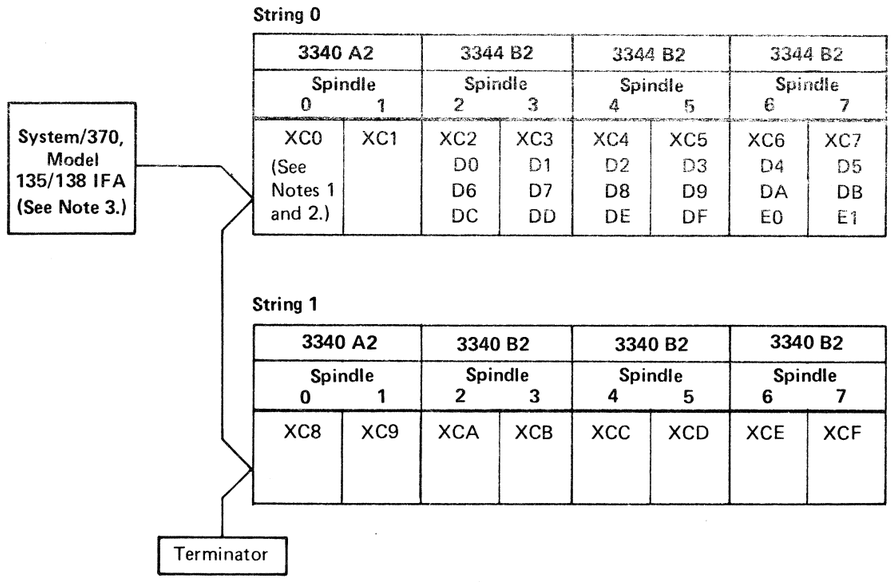
f. Addressing jumpers are required in the 3340 A2 Module from A1D2M10 to A1D2P10.

**For U.S. orders only. For WTC orders, order from each country's stock.*

K ADDRESSING (Continued)

ADDRESSING FOR SYSTEM/370, MODEL 135/138 IFA

Base Address: XC0-E1

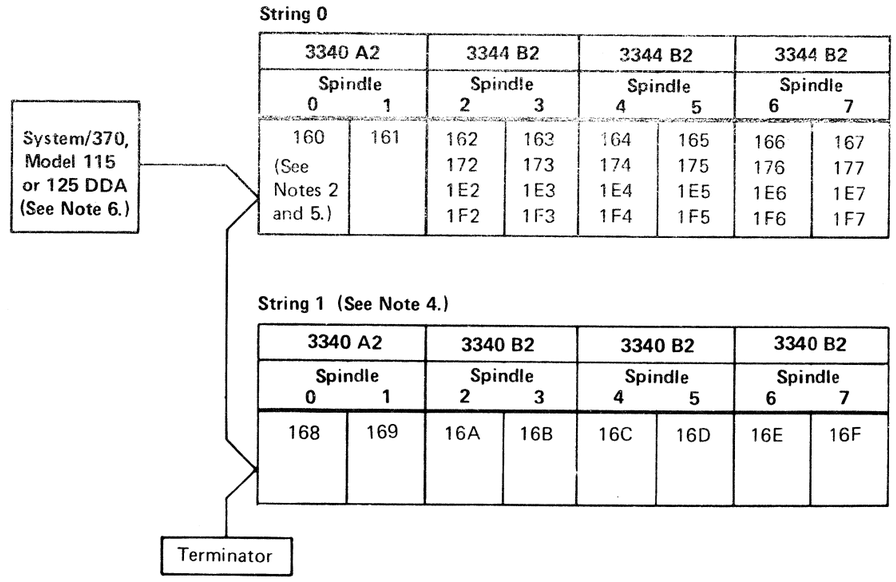


Note 1: *A 3344 HDA stores information equal to four 3340 Data Modules. The first area of spindle 2 in a 3344 is address XC2. Address XC2 also allows access to the other three areas, logical address XD0, XD6, and XDC on the same physical spindle as XC2. Any other combinations of addresses for XC2 are not possible. If a 3340 B2 Module is substituted for a 3344 B2 Module in the chart, use the address on the top of String 0 (XC2 through XC7).*

Note 2: *3344s are installed only in String 0.*

Note 3: *The maximum number of spindles is 16, but 34 addresses are available.*

ADDRESSING FOR SYSTEM/370, MODEL 115 OR 125 DDA



Note 4: *String 1 cannot be installed on a Model 115 DDA.*

Note 5: *If a 3340 B2 Module is substituted for a 3344 B2 Module in the chart, use the address on the top line of String 0 (162 through 167).*

Note 6: *Maximum number of spindles for a:*
Model 115 is 8 but 26 addresses are available.
Model 125 is 16 but 34 addresses are available.

JL0016 Seq. 2 of 2	2359288 Part No.

See EC History	441240 30 May 80	441241 29 Aug 80		

INSTALLATION PROCEDURES

K Addressing (Continued)

For System/3 only.

___1 The 3340 spindles are wired as Spindles 0 and 1 at the plant. Plug the 3344 for Spindles 2 and 3 on A1K2 and A1L2 cards (Figure 1).

___2 Connect jumpers on controller card A2G2 (Figure 2) to address 000 for bits 2, 3, and 4 in the 3340 A2 Module.

___3 Install the customer's assigned address labels (P/N 5412746 in A2 Shipping Group) in the recesses on the Operator Panel (see example on this page) for both 3340s or 3344s.

Figure 1. Drive Address Card

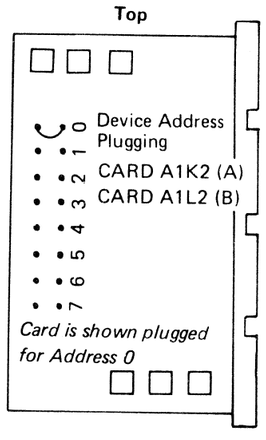
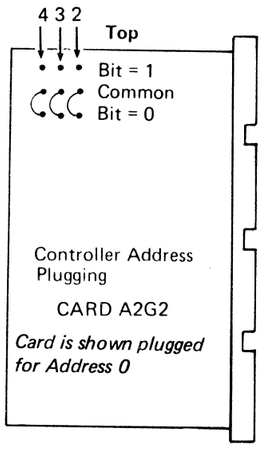
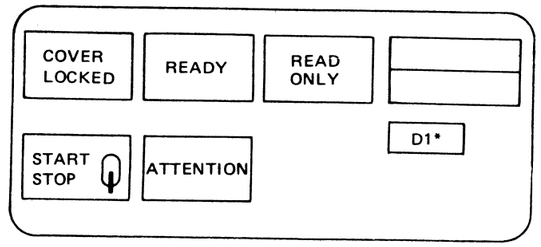


Figure 2. Controller Addressing (A2G2)

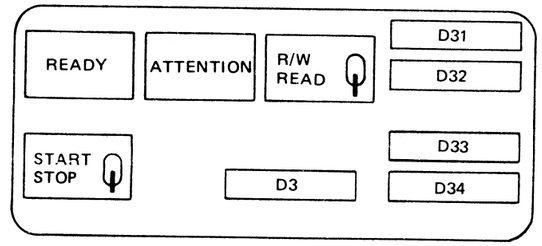


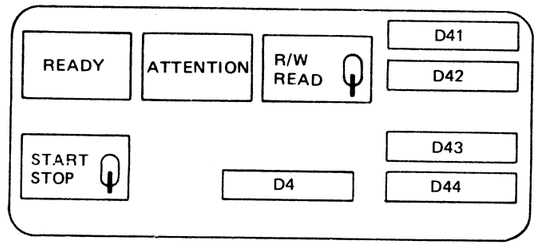
3340 Operator Panel



*D2 address label on second 3340 A2 drive.

3344 Operator Panel





System/3

3340 A2		3344 B2	
Spindle 0	Spindle 1	Spindle 2	Spindle 3
D1	D2	D31 D32 D33 D34	D41 D42 D43 D44

K ADDRESSING (Continued)

SYSTEM ADDRESSING CHART FOR 4331 OPERATION

System 4331 DASD Adapter*

*Also know as FTA.

String 0 (See Figure 1)

3340 A2		3344 B2		3344 B2		3344 B2	
Spindle 0	1	Spindle 2	3	Spindle 4	5	Spindle 6	7
X00	X01	X02	X03	X04	X05	X06	X07
See Note 1		X2A X4A X6A	X2B X4B X6B	X2C X4C X6C	X2D X4D X6D	X2E X4E X6E	X2F X4F X6F

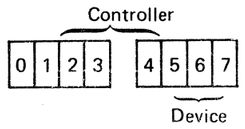
String 1 (See Figure 1)

3340 A2		3344 B2		3344 B2		3344 B2	
Spindle 0	1	Spindle 2	3	Spindle 4	5	Spindle 6	7
X10	X11	X12	X13	X14	X15	X16	X17
See Note 1		X3A X5A X7A	X3B X5B X7B	X3C X5C X7C	X3D X5D X7D	X3E X5E X7E	X3F X5F X7F

Terminator

Note 1: *A 3344 HDA stores information equal to four 3340 Data Modules. Each 3344 has four logical addresses as shown in the addressing chart. If a 3340 B2 Module is substituted for a 3344 B2 Module, use the addresses shown above the dashed lines. Up to three 3340 B2 or 3344 B2 Modules can be installed in a string in any sequence.*

Figure 1. Controller and Drive Addresses



Controller (String)	Card Jumpers	CNTL/DEVICE Addresses	System Addresses
0	4 3 2	X00-X07	200-207 or 500-507
1	4 3 2	X08-X0F	210-217 or 510-517

Install jumpers for controller addresses on card A2G2 for desired address as shown above. If string switch is installed, cards A2D2 (A2E2) must also have jumpers installed. See steps K4 and K5 on INST 14.

INSTALLATION PROCEDURES

L MECHANICAL CHECKS

For 3344, omit items 1, 2, and 3.

__ 1 Check (in the baseplate area) that the drive belt is properly installed and that the drive motor is in place.

__ 2 Operate the DM load mechanism manually through a complete load and unload cycle. Use the handwheel (P/N 2745011, 3340 A2 Shipping Group). See DM 705 (3340 MLM) for shroud removal.

Caution: Do not operate load mechanism under power without a data module. Damage to the coupler and bobbin mechanism can result.

__ 3 Remove handwheel and install shroud. See DM 705 (3340 MLM) for shroud installation.

Note: *Do not leave the ground wire off the shroud. It can cause intermittent Read/Write problems.*

__ 4 Check for loose cards and cable connectors in each gate. If cards were removed, be certain to reseat them properly. Check the matrix cards and cables also.

__ 5 Repeat for each drive.

M CONTROLLER POWER CHECK (60Hz)

For 50 Hz machines, go to step M, on INST 19.

Set the Power Mode switch to the Local position during installation.

__ 1 **Turn off control module (A2) mainline CB201.**

__ 2 **Position all drive Start/Stop switches to Stop.**

__ 3 **In all satellite modules, turn off main circuit breaker**

(3340 = CB210)
(3344 = CB230)

__ 4 **Verify with a CE meter that a direct short exists between the large pin (GND) of the power plug and the control module frame ground (0.1 ohm or less). Investigate and correct this condition first if this is not the case.**

__ 5 **Turn on wall receptacle CB and check ac at receptacle.**

DANGER
Lethal voltage

Compare receptacle voltage to the voltage specified on the voltage label located in the lower front lefthand side of the DC Compartment.

Note 1: *If voltage conversion is required, see table below and/or YA030 for needed jumper changes to TB311 (front half DC Compartment). See table below and/or YA010 for jumper changes at TB206 (AC Compartment, 3340).*

Note 2: *For Japan (60Hz only) install a jumper at the convenience outlet at TB206 if required. (See YA010.)*

Voltage	Ferro Transformer TB 530	Bootstrap Transformer TB 206
200	3 – 4 – 7	1–2
208	2 – 4 – 6	1–3
230	1 – 4 – 5	1–4
Logic Page	YB030 (3344ALD)	YA010 (3340ALD)

If voltage conversion is made, record the changes on the voltage label.

__ 6 Turn off wall receptacle CB and install power cable; turn on wall receptacle CB, turn on CB201 and press the controller Power-On switch. If power comes on, go to Step 7.

If power does not come on, phase rotation may be incorrect (relay 251). Have customer maintenance personnel check the phase rotation at the wall receptacle. Contact the Branch Office Installation Planning Representative if assistance is needed.

If changing rotation at the wall receptacle is not possible, disconnect power cable from ac outlet. Correct the phasing by reversing input leads on the controller mainline CB201.

Repeat the beginning of Step 6. If phasing is correct and power does not sequence on (ac and dc lights on), go to START 100, PWR 10, etc. (Check CBs and CPs.)

__ 7 Check the voltages as shown in Figure 1 and adjust the required voltage. Use Digitec 251 † voltmeter (P/N 453585). Setting must be precisely at 6 V for the 6 V supply and -4 V for the 4 V supply at installation time. Adjustments must be made with the DM loaded and ready. If adjustment is required, see PWR 90, Entry B (3340 MLM) for procedure.

Figure 1.

DANGER
Power off drive before removing or replacing DC Compartment cover. (Remove cover for adjustment only.)

Supply	Range	Test Point
+24 Vdc Local	+21.6 V to +26.4 V	EC603F*
+24 Vdc Bootstrap	+19.2 V to +30.7 V	TB101-1**
−24 Vdc	−24.0 V to −28.8 V	A1L2D03
+12 Vdc	+12.0 V to +14.4 V	A1R2D05
−12 Vdc	−12.0 V to −14.4 V	A1M2D06
− 4 Vdc	− 3.84 V to − 4.16 V	A1P2B06
+ 6 Vdc	+ 5.76 V to + 6.24 V	A1J2B11
−36 Vdc	−36.0 V to −43.2 V	TB101-3**

* On VCM front mounting plate
** On side of logic gate

Note: *Voltages are measured with reference to the board ground.*

† Trademark of United Systems Corporation.

M CONTROLLER POWER CHECK (50 Hz) – WORLD TRADE MACHINES

Set the Power Mode switch on the CE Panel to the Local position during installation.

___1 Turn off control module (A2) mainline CB201.

___2 Position all drive Start/Stop switches to Stop.

___3 In all satellite modules, turn off the main circuit breaker

(3340 = CB210)
(3344 = CB320)

___4 Verify with a CE meter that a direct short exists between the green and yellow lead of the line cord and the control module frame ground (0.1 ohm or less). Investigate and correct this condition first if this is not the case.

___5 Check the machine voltage label (A2 and B1/B2 Modules). Turn on wall receptacle CB and check ac at receptacle.

DANGER
Lethal voltage

___6 If ac power at receptacle agrees with voltage label, go to Step 7.

If ac power at receptacle is different from voltage label, determine type and level of voltages at ac outlet.

For the 3340s use PWR 10, Entry D (3340 MLM) to correct wiring in both the control (A2) and satellite modules.

For the 3344s, see N on INST 20.

3 Phase Table

Delta Voltage	Wye Voltage
200 ± 10% } Line-Line	380 ± 10% to Neutral = 220 V
220 ± 10% } Line-Line	
235 ± 10% } Line-Line	408 ± 10% to Neutral = 235 V

___7 Turn off wall-receptacle CB and install power cable; see YB010 (50 Hz) for hookup. Turn on wall receptacle CB. Turn on CB201 and press the controller Power-On switch. If power comes on, go to Step 8.

If power does not come on, phase rotation may be incorrect (relay 251). Use YA010 to check that the 3-phase wires are properly connected. Have the customer maintenance personnel check the phase rotation at the wall receptacle. Contact the Branch Office Installation Planning Representative if assistance is needed.

If changing rotation at the wall receptacle is not possible, disconnect the power cable from the ac outlet. Correct the phasing by reversing any two input leads on the controller mainline CB201.

Repeat the beginning of Step 7. If phasing is correct and power does not sequence on, go to INST 22 and check the symptom list.

___8 Check the voltages shown in Figure 1. Use Digitec 251 † voltmeter (P/N 453585). Setting must be precisely at 6 V for the 6 V supply and -4 V for the 4 V supply at installation time. Adjustments must be made with the DM loaded and ready. If adjustment is required, see PWR 90, Entry B (3340 MLM), for procedure.

Figure 1.

DANGER
Power off drive before removing or replacing DC Compartment cover. (Remove cover for adjustment only.)

Supply	Range	Test Point
+24 Vdc Local	+21.6 V to +26.4 V	EC603F*
+24 Vdc Bootstrap	+19.2 V to +30.7 V	TB101-1**
−24 Vdc	−24.0 V to −28.8 V	A1L2D03
+12 Vdc	+12.0 V to +14.4 V	A1R2D05
−12 Vdc	−12.0 V to −14.4 V	A1M2D06
− 4 Vdc	− 3.84 V to − 4.16 V	A1P2B06
+ 6 Vdc	+ 5.76 V to + 6.24 V	A1J2B11
−36 Vdc	−36.0 V to −43.2 V	TB101-3**

* On VCM front mounting plate
** On side of logic gate

Note: *Voltages are measured with reference to the board ground.*

† Trademark of United Systems Corporation.

INSTALLATION PROCEDURES INST 19

N SATELLITE MODULE POWER CHECK

___1 Check that the voltage specified on each module voltage label (on the front of the ac power compartment for 3340 and on the frame above the ac power box for 3344) coincides with that specified on the A2 Module. If a 3340 voltage conversion is required, see YB030 for jumper changes on TB311 (front half of the DC Compartment). If a 3344 conversion is required, see YB030 for transformer tap wiring changes (TB530). For 50 Hz only, see PWR 292 for Delta/Wye wiring changes.

DANGER
Disconnect ac power cable (P/N 2744901) to do conversion.

___2 Turn on CB210 (3340) or CB230 (3344). Check the module voltages shown in Figure 1. Use the Digitec 251 † voltmeter (P/N 453585). The +6.0 Vdc should be set at nominal at installation time. Adjustments must be made with the DM loaded and ready. (For 3344, the HDA must be ready.) If adjustments are required, see PWR 290 in the respective 3340 or 3344 manual.

___3 Repeat for each 3340 or 3344 Module.

O POWER ON SEQUENCE AND EPO CHECK

___1 Turn module power on. Place the drive Start/Stop switch in the Start position.

a. Check that the disk rotates counter clockwise as viewed from the top. If the disk rotation is wrong, use PWR 221 and ALDs to locate device phase rotation problem.

b. The drive Ready lamp must come on within 30 seconds. If the lamp does not come on, go to INST 22.

For 3344s only, insert the bobbin pushrod into each VCM and move the bobbin in and out several times. Check for a binding condition. If a bind occurs, go to HDA 710 for further analysis.

___2 Press the Attention pushbutton and verify the rezero function. The Ready lamp should go off momentarily and then come back on.

___3 Repeat the above steps for each drive.

___4 Bring all drives to the Ready state.

___5 Power off the subsystem at the storage control (check that control module Power Mode switch is in the Remote position).

___6 Power on at the storage control and observe the following:

a. Control module power and satellite module power come on.

b. All drives start through the cycle within seconds from each other and should go to the Ready state.

___7 If any problems occur, go to INST 22.

___8 Install all covers. Adjust hinges and cover latches for alignment, appearance, and ease of operation. The conductive rubber seals must be slightly compressed against the frame when the covers are latched to provide a path for electrostatic discharge.

Figure 1. Voltage Chart

DC Supply	Test Point (See Notes) 3340	Test Point (See Notes) 3344	Tolerance (Volts)
+24 V Local	EC603F 1	CP531 Load Terminal to W1 3	+21.6 to +26.4
−24 V	A1L2D03	A1C2D03 (Dr A) A1T2D03 (Dr B) 4	−24.0 to −28.8
+12 V	A1R2D05	A1C2D05 (Dr A) 4 A1T2D05 (Dr B)	+12.0 to +14.4
−12 V	A1M2D06	A1C2D06 (Dr A) 4 A1T2D06 (Dr B)	−12.0 to −14.4
−4 V	A1P2B06	A1C2B06 (Dr A) 4 A1T2B06 (Dr B)	−3.84 to −4.50
+6 V Reg	A1J2B11	A1F2B11 (Dr A) 5 A1Q2B11 (Dr B)	+5.76 to +6.24 (Adjust to 6.0)
−36 V	TB101-3 2	TB431-4 to W1 3	−36.0 to 43.2

In 3340s, measure voltage with reference to board ground.
1 *On VCM front mounting plate.*
2 *On side of logic gate.*

In 3344s, measure voltage with respect to:
3 *W1 – ground bus on logic gate (see INST 4).*
4 *A1K2D08*
5 *A1F2D08 (Drive A)/A1Q2D08 (Drive B)*

DANGER
Power off drive before removing or replacing DC Compartment cover. Remove cover for adjustment only.

† Trademark of United Systems Corporation.

INSTALLATION PROCEDURES

P FACILITY CHECKOUT

__1 Make all drives Ready.

__2 Install VCM decals (P/N 2758616 and P/N 2758618 of the 3344 B2 Shipping Group) on the back of the 3340 A2 VCMs.

__3 Check all drives with the microdiagnostics. Run routine A0 once, then run the linked series. The checklist below references run procedures. If an error is encountered, see INST 22 first and then follow the normal troubleshooting procedures beginning with START 100 if the trouble is not corrected.

__4 With fixed heads, test the heads by running routine B1 with the appropriate parameters for a 3340. None are needed for a 3344.

Q SYSTEM TEST

For System/3, omit Steps 1 and 3.

__1 Configure OLTEP, OLTSEP, and ASCAP to include the 3340s and 3344s.

__2 Check that all CE Mode switches are in the Off (online) position. Push all Attention pushbuttons to rezero the data modules/HDAs.

__3 Run all online tests from the CPU. Misleading errors can occur if two controllers on the same channel have the same address. Refer to INST 12, Step 3 for proper plugging.

Run PSA on each volume to verify all HAs (Home Addresses) and R0s (Record Zeros).

__4 Ensure that the EPO cable is installed. Do not leave the shorting plug installed.

R RECORDS

__1 Assist customer with his checkout of the facility.

__2 Complete all installation records and report that the installation is completed to the Branch Office dispatcher *(Machine serial tag is located on the lower frame member, left front).*

__3 Leave these installation procedures in the Maintenance Library Manual for future reference.

__4 Update the Account Management Plan book to include this installation.

__5 For string switch feature, install decal (P/N 2745548, A2 Shipping Group) on the frame member below the CE Panel. Complete decal to indicate cabling.

3340 MICRODIAGNOSTIC DISK

Checklist for 3340 Microdiagnostics:									
Drive	A	B	C	D	E	F	G	H	Remarks
A0-A1-A2		/	/	/	/	/	/	/	Run once
A7 in adjust mode (Note)									Enter 'A7100100' (See ACC 801)
A2-AE									Description (starts on MICRO 20)
A6-A8									See MICRO 24
B1									See MICRO 34
B2									See MICRO 35
									See MICRO 28

3344 MICRODIAGNOSTIC DISK

Checklist for 3344 Microdiagnostics:									
Drive		B	C	D	E	F	G	H	Remarks
A2		/	/	/	/	/	/	/	Run once
A7 (Note)									See ACC 800
A2-AE									Description (starts on MICRO 20)
B1									See MICRO 56
B2									See MICRO 60
AB									See MICRO 28

Note: *Due to component aging, it is considered normal for a servo to need some adjusting during installation. If the servo adjustment is within ¾ of a turn (either direction), it does not require adjustment.*

S INSTALLATION PROBLEMS

Use the Symptom Checklist to assist in isolating installation type problems. Do not spend a great deal of time. If a pass through the problem list does not result in a fix, go to START 100 and follow the established maintenance procedure in the MLM.

The following is a list of general hints. Use it when problems are encountered during installation that do not have obvious symptoms.

1. Check interframe connector cables and terminators. See INST 8 and DEV-I 100.
2. Check controller and drive addressing. See INST 12.
3. Check cables between controller (3340 A2) and storage control. Verify cables are not reversed. See INST 8.
4. Check all voltages. Procedures are on PWR 90 in the 3340 MLM and PWR 290 in the 3344 MLM. For 50 Hz, motor conversions are on PWR 110 (3340).
5. Verify that the correct Functional Microprogram disk is loaded in storage control, ISC, or IFA.
6. If the string switch feature is installed, verify that both A and B Enable/Disable switches are in the Enable position.
7. Make sure that the 3344 spindle drive start sequence cable (Cable B in Chart 1 on INST 6) is correctly connected in each 3344 Module. Cable B in the first 3344 connects between P646 and P647 on the same board (Sequence Adapter Board). If a second 3344 is installed, Cable B connects from J647 in the second 3344 to J649 in the first 3344. If a third 3344 is installed, Cable B connects from J647 in the third 3344 to J649 in the second 3344.
8. Return to established maintenance procedures in the MLM. Go to START 100.

SYMPTOM CHECKLIST FOR INSTALLATION PROBLEMS

Failure	Symptom	Recommended Action	Reference
Power Sequence	Power *does not* sequence completely through all modules.	1. Make sure that the power sequence cables that connect between modules at P513 and P514 are plugged in correctly. In the end module only, check that a jumper is installed: On a 3340 Module – between T510 and T511. On a 3344 Module – between T501 and T502. 2. Make sure that the ac power cable is plugged in and seated properly. On a 3340 Module – P205 On a 3344 Module – P304 *Problems can be caused by a pin that is pushed back into the connector (the motor turns slowly and CBs and CPs trip).*	INST 6 PWR 207 INST 10, H 1 YA010 (3340) YB010 (3344) PWR 221
	Power *does* sequence completely through all modules, but the drive motors will not start.	Use Chart 1 on INST 6 to check that cable B (P/N 275781) is plugged in and seated properly in all machines. 3344 drive motors are sequenced independently through this cable. Cable B is terminated by a jumper between T503 and T504 in the last 3344 Module (even if it is not the last module on the string).	INST 6
Ready Lamp Not On	Drive never comes Ready. Drive motor starts, then stops.	Check that both ends of the HDA cable (at the HDA, and at the A1 logic board) are seated properly. (Possible loss of Motor At Speed signal.)	
	Drive motor runs ok, but the drive never comes Ready.	1. Check the Servo Gain adjustment on ACC 800, Entry A. 2. Make sure that no address jumper is installed on the 3344 from A1D2M10 to A1D2P10. 3. Check for other servo problems and possible missing voltages. Go to START 100. 4. Check that disk rotates Counter Clockwise as viewed from the top.	INST 12, K 2 PWR-221
Microdiagnostic	Microdiagnostics do not load. Execute Request LED is on continuously.	Check for one or more of the following faulty conditions: 1. Control interface cables swapped, loose, or not connected. 2. Wrong terminator used (check P/N). 3. Switching Unit (for example, IBM 2914) not set up correctly (ask operator). 4. Wrong microdiagnostic disk being used.	INST 8 ZA090
	Microdiagnostic Error Codes A158 A211 A220	Check for device interface cables plugged into the wrong interframe connector.	INST 8, G DEV-I 100
Fault Symptom Code	Fault Symptom Code 9120	Check the addresses wired on cards A1K2 (Drive A) and A1L2 (Drive B). The addresses must not be the same on both cards (or any two cards in the string).	INST 12, K 2