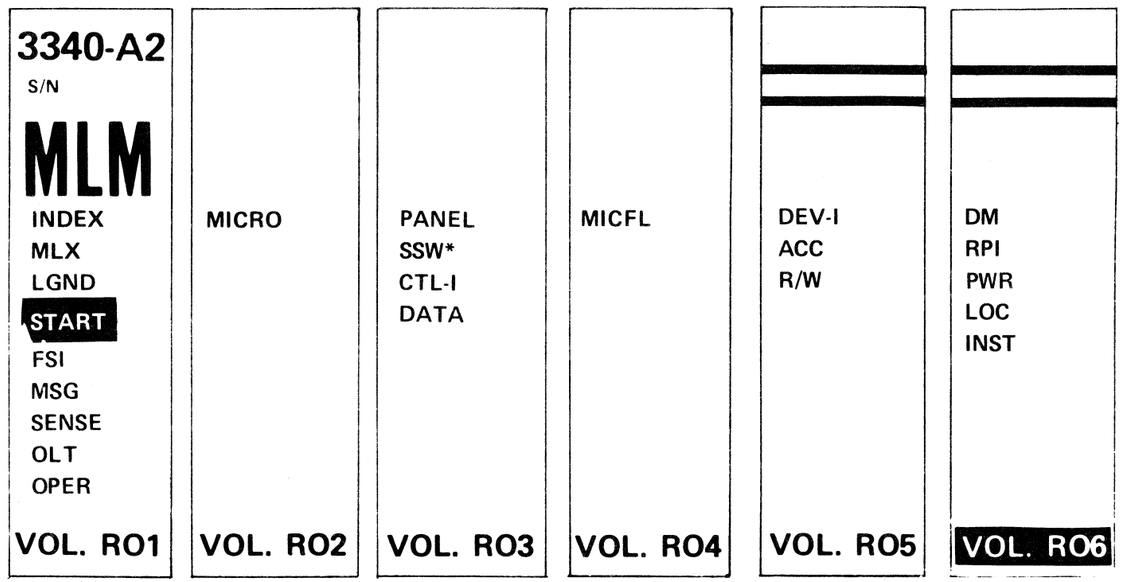
IBM Maintenance Library

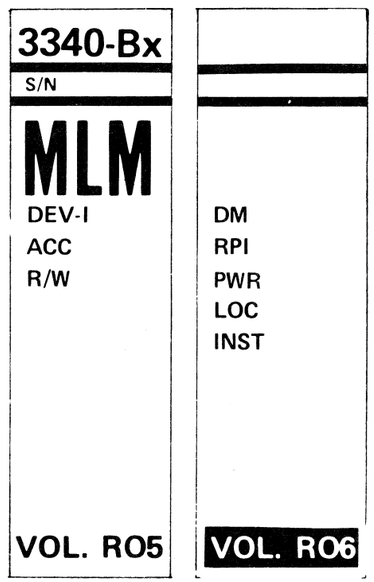
CONTROL MODULE



Volumes R01, 2, 3, and 4 accompany only Control Modules (A2).

* *This section is only with Control Modules that have the string switch feature installed.*

SATELLITE MODULE



Volumes RO5 and RO6 accompany every Control Module (A2) and every Satellite Module (B1 or B2). (One set per serial numbered frame.) To ensure proper documentation level, use the volume that goes with the module you are working on.

3340 Disk Storage

DG0999 Seq. 1 of 2	2747732 Part No. ( )	440203 2 Nov 73	440218 5 Aug 74	440224 15 Dec 75				

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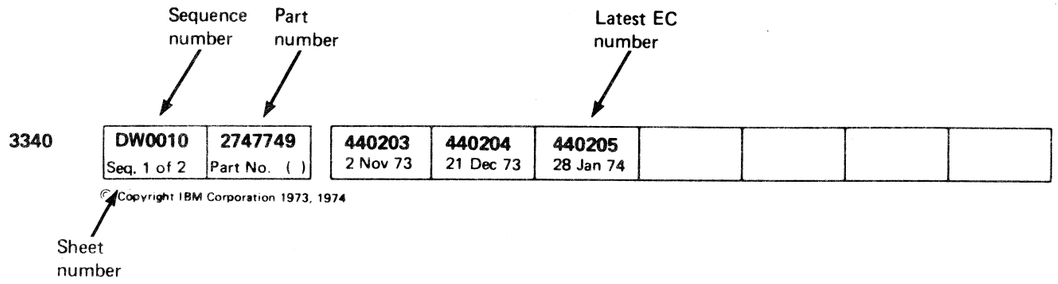
PREFACE

MAINTENANCE LIBRARY ORDERING PROCEDURE (IBM Internal)

Individual pages of the 3340 Maintenance Library 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.

Example:



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3340	DG0999 Seq. 2 of 2	2747732 Part No. ( )	440203 2 Nov 73	440218 5 Aug 74	440224 15 Dec 75				

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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

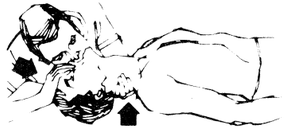
General Considerations

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.

DM CONTENTS (Maps and Theory)

Data Module Maps – – – – – – – – – – – – DM 100–353

Provides maintenance procedures for analyzing problems related to Data Module load/unload operations.

For a description of the Data Module with reference to DM size, head positioning, data surface, track layout, and track format, see OPER 10–25.

Load Checkout – – – – – – – – – – – – DM 400

Describes the mechanical position of unloading components during a load operation at significant machine timings.

Unload Checkout – – – – – – – – – – – – DM 510

Describes the mechanical position of loading components during an unload operation at significant machine timings.

Mechanical Features of 3340 – – – – – DM 610

Describes the mechanics of 3340 with primary features, mechanical interface, and mechanics of loading/unloading.

Air Flow – – – – – – – – – – – – – DM 630

Mechanical – Electrical Timing – – – – DM 640

Gives the load/unload timing for mechanical and electrical components related to cam shaft rotation.

Data Module States – – – – – – – – DM 650

Describes load, unload, and access operations related to Data Module states.

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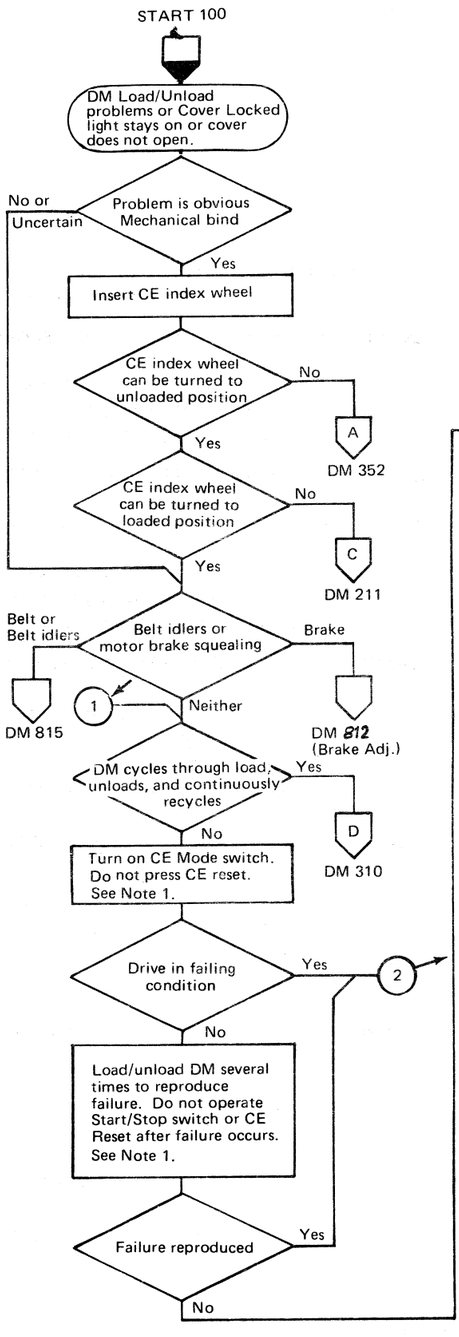
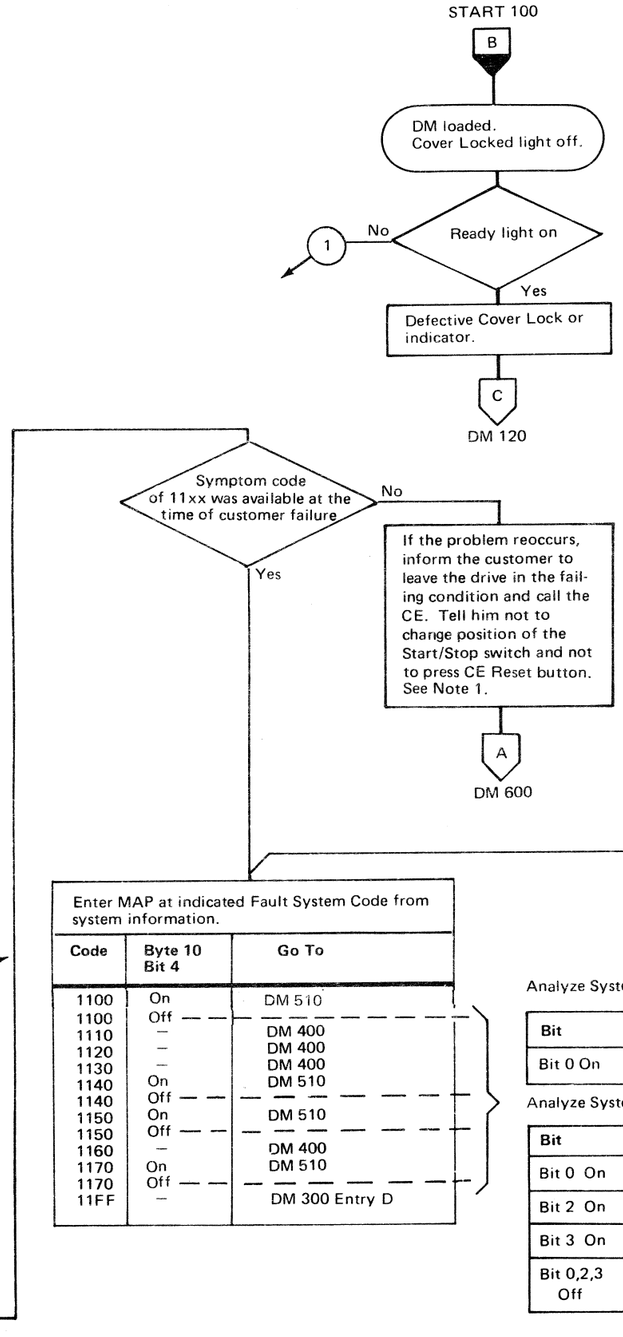
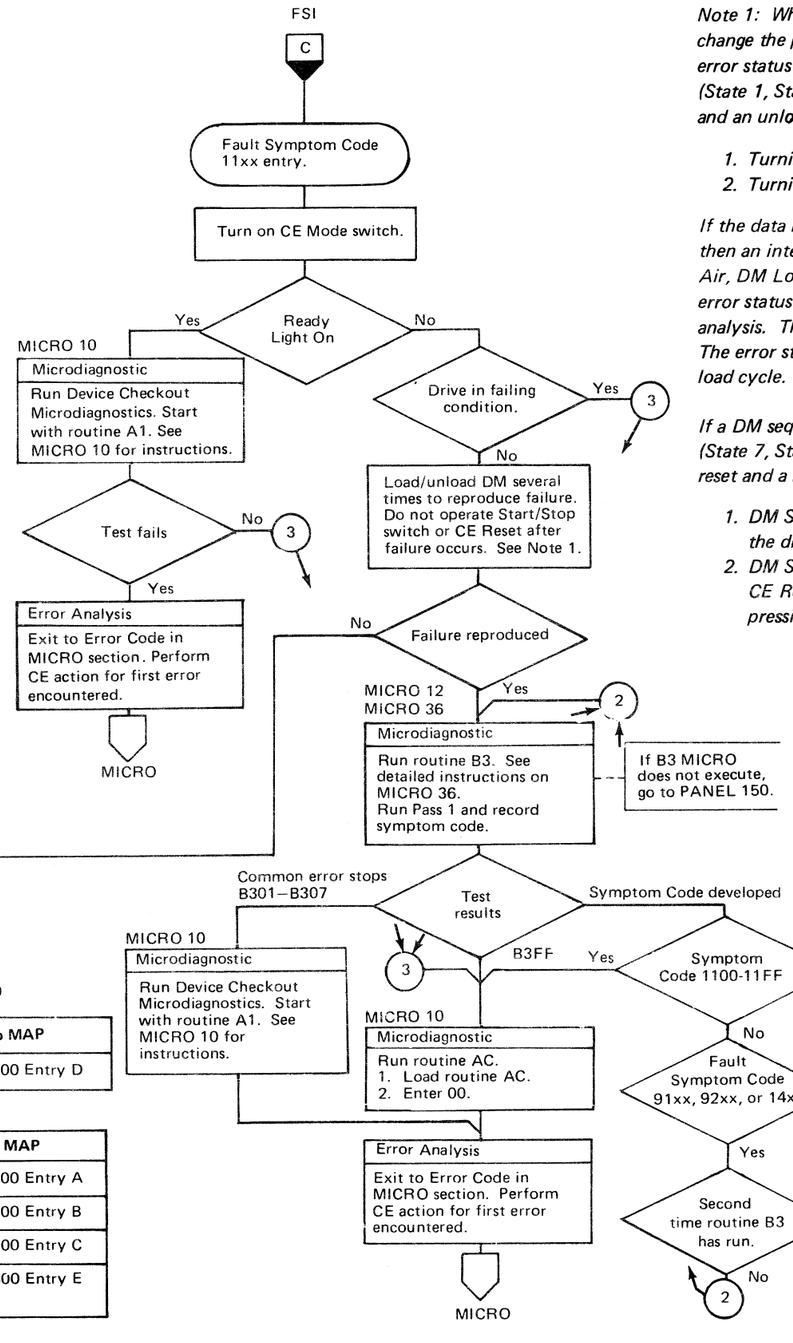
DM LOAD/UNLOAD – START







Note 1: When a failure occurs, do not press CE Reset or change the position of the Start/Stop switch because the error status may be changed. During the load cycle (State 1, State 2, State 3) DM Sequence Error is reset and an unload is initiated by:

1. *Turning Start/Stop switch to Stop.*
2. *Turning on CE Mode switch, then pressing CE Reset.*

If the data module loads successfully to Ready State 6 and then an interlock error occurs (loss of Belt, Mtr Speed Air, DM Loaded Switch, or DM Size Parity Check) the error status is latched and available in the sense status for analysis. The data module drops Ready, then unloads. The error status remains latched until State 1 of the next load cycle.

If a DM sequence error occurs during the unload cycle (State 7, State 5, State 4 or State 0), the DM sequence is reset and a retry to unload occurs as follows:

1. *DM Sequence error in State 7, 5, or 4 is reset if the drive is placed in CE Mode and CE Reset is pressed.*
2. *DM Sequence error in State 0 is reset by pressing CE Reset or by placing the drive in CE Mode and pressing CE Reset.*

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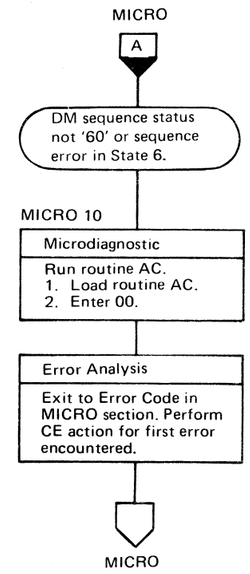
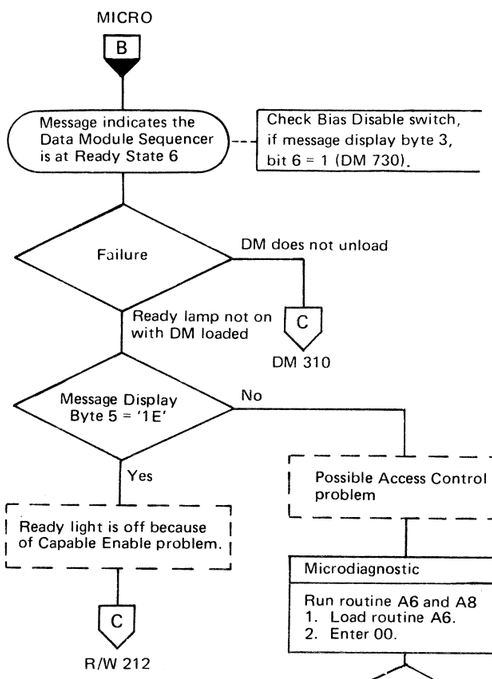
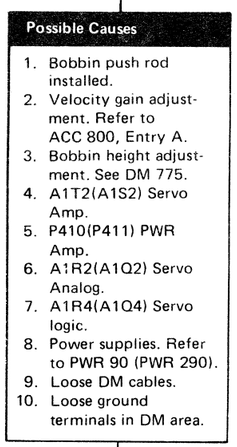
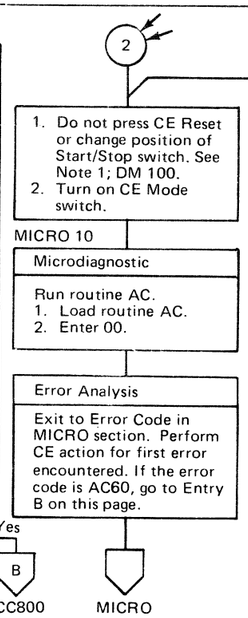
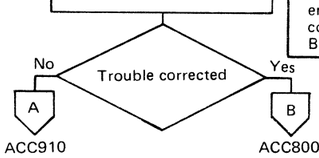
DM LOAD/UNLOAD – START

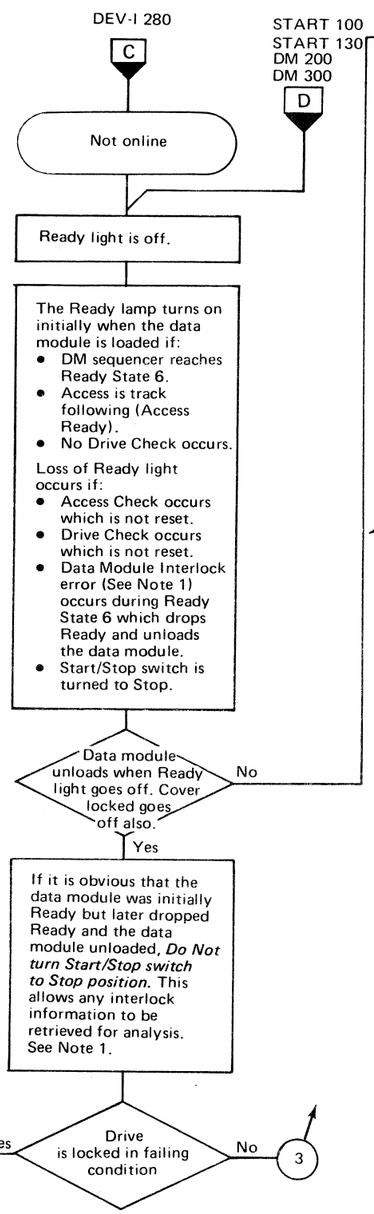


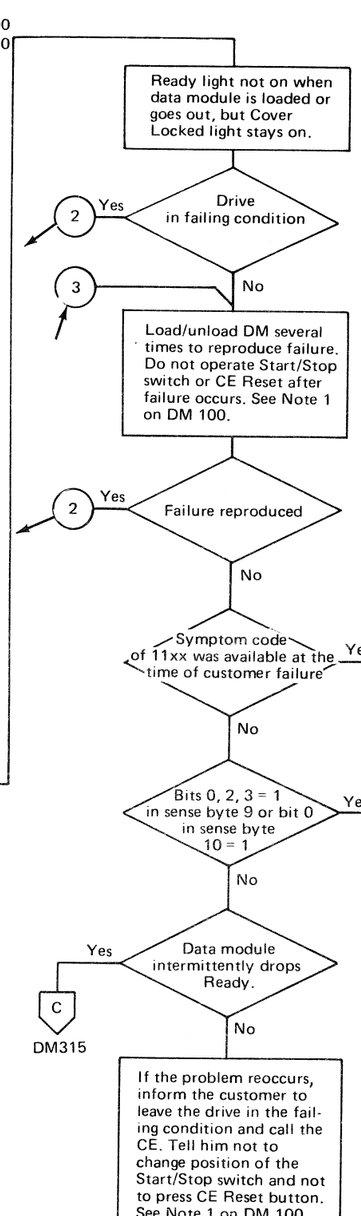






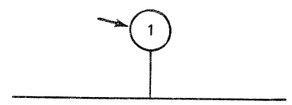






Enter MAP at indicated Fault System Code from system sense information.

Code	Byte 10 Bit 4	Go To
1100	On	DM510
1100	Off	DM 400
1110	–	DM 400
1120	–	DM 400
1130	–	DM 400
1140	On	DM 510
1140	Off	DM 510
1150	On	DM 510
1150	Off	DM 400
1160	–	DM 400
1170	On	DM 510
1170	Off	DM 300 Entry D
11FF	–	



Analyze System Sense Byte 10

Bit	Go to MAP
Bit 0 On	DM 300 Entry D

Analyze System Sense Byte 9

Bit	Go to MAP
Bit 0 On	DM 300 Entry A
Bit 2 On	DM 300 Entry B
Bit 3 On	DM 300 Entry C
Bit 0,2,3 Off	DM 300 Entry E

Note 1: An Interlock Error is caused by:
1. *Loss of Air Belt*
2. *Loss of Mtr Speed Air*
3. *Loss of DM Loaded switch*
4. *DM size check*

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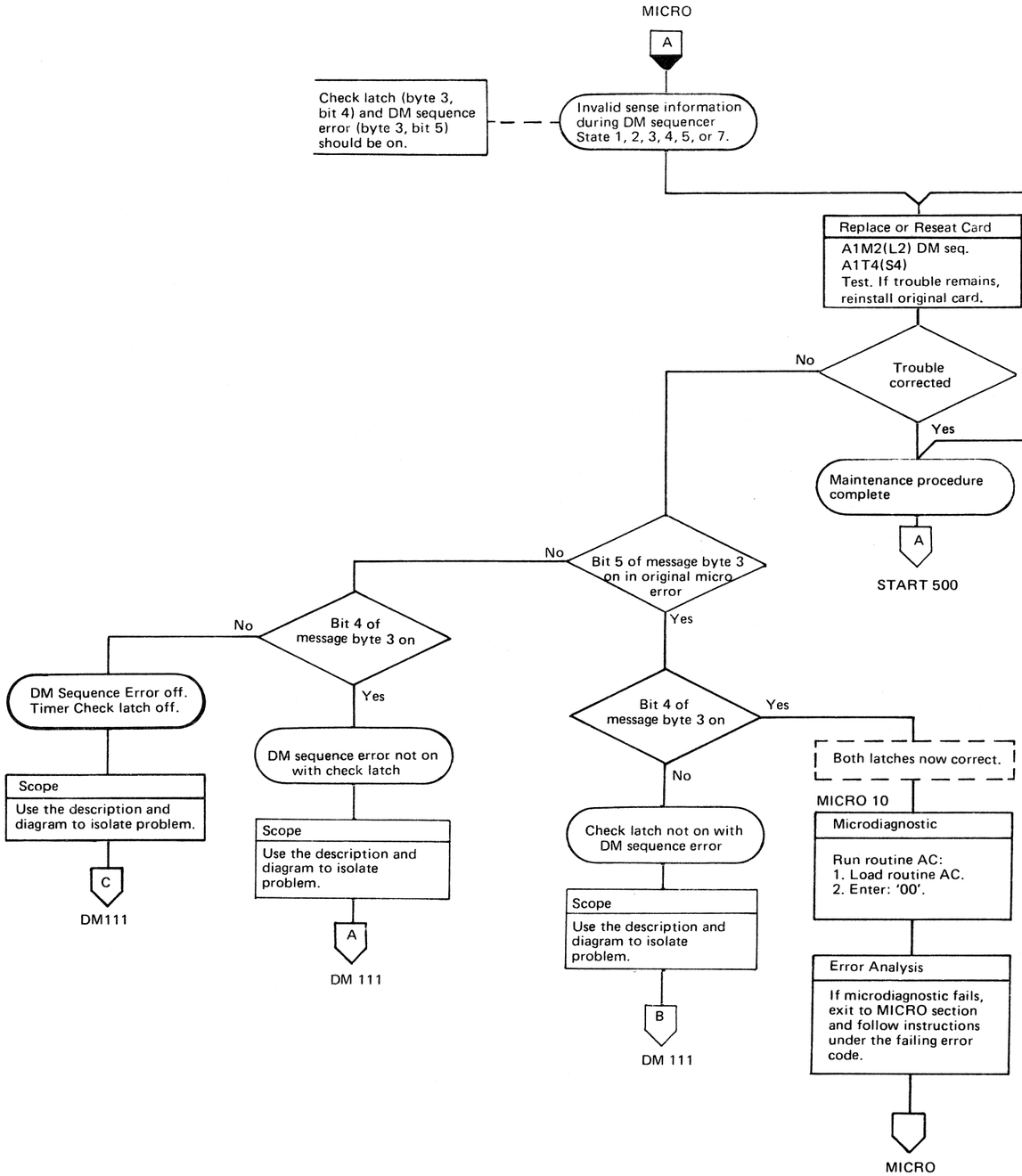
INVALID DM SEQUENCE ERROR STATUS



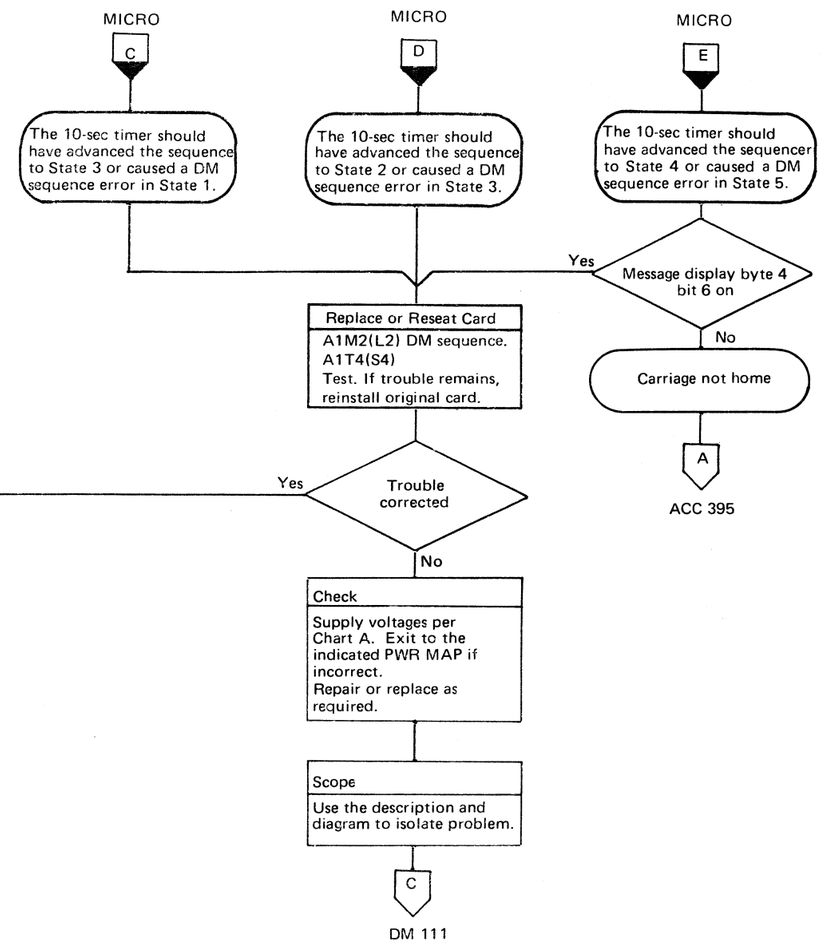


CHART A

Voltage	Pins	Tolerance	Maximum AC Ripple	Map Exit	
				Control Module	Satellite Module
+12 V	A1M2D05(L2D05)	+12.0 to +14.4	0.10 V p-p	PWR 45-A	PWR 245-A
−24 V	A1M2D03(L2D03)	−24.0 to −28.8	0.08 V p-p	PWR 50-A	PWR 250-A
+ 6 V	A1M2B11(L2B11)	+5.76 to +6.24	0.04 V p-p	PWR 60-A	PWR 260-A
−12 V	A1M2D06(L2D06)	−12.0 to −14.4	0.08 V p-p	PWR 40-A	PWR 240-A
−4 V	A1M2B06(L2B06)	−3.84 to −4.16	0.04 V p-p	PWR 55-A	PWR 255-A

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INVALID DM SEQUENCE ERROR STATUS

DM 110
DM 310
A

DM Sequence Error not indicated with Check Latch Indication.

Check

DM Status Bit 5 (Stop Recycle) should be on with DM Status Bit 4 (Check Latch).

A DM 113
B DM 113

DM 110

Check Latch Indication not on with DM Sequence Error.

Check

DM Status Bit 4 (Check Latch) should be on with DM Status Bit 5 (Sequence Error).

B DM 113
A DM 113

DM 110
DM 130
C

10-second delay timer not functioning

Check

Cycle data module through Load/Unload operations and scope delay timer.
Theory:
State 1 DM 215
State 3 DM 221
State 5 DM 335

D DM 111

Microdiagnostic

Set up Scope Loop with Return B4.
1. Enter 10,83,00,8F,43,00, 00,00,00,00,00,00,00, 00,00,00.

Scope

Trigger A1M2G12 (L2G12) –Sense Status 2.

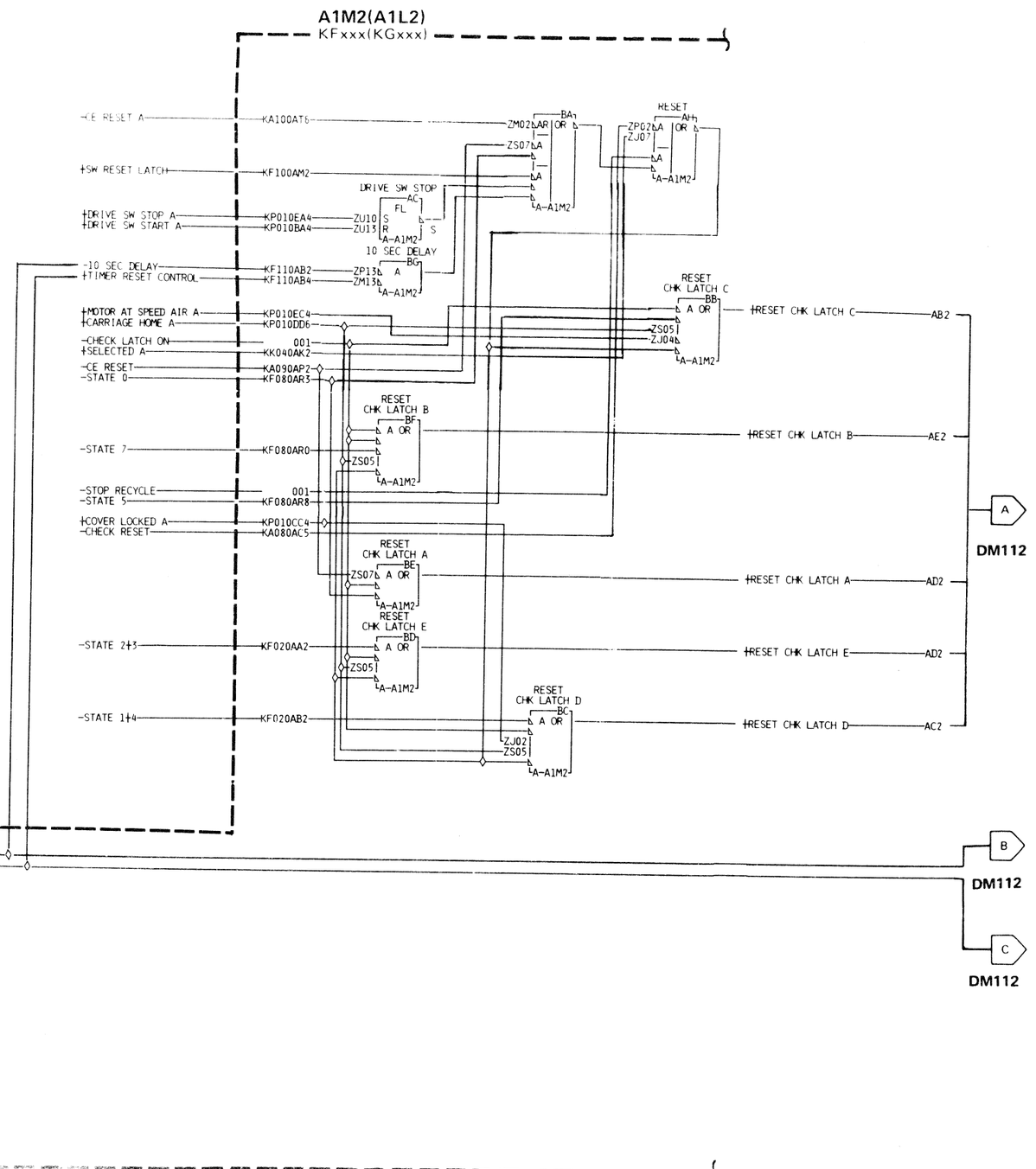
C DM 113

Trace Logic function to source of failure. See DEV-I 132 for complete interface.

Trouble Corrected

No → A → DM 600

Yes → A → START 500



DH0094	2747628
Seq. 1 of 2	Part No. (P)

440202	440203	440205	440214	440228		
7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	29 Oct 76		

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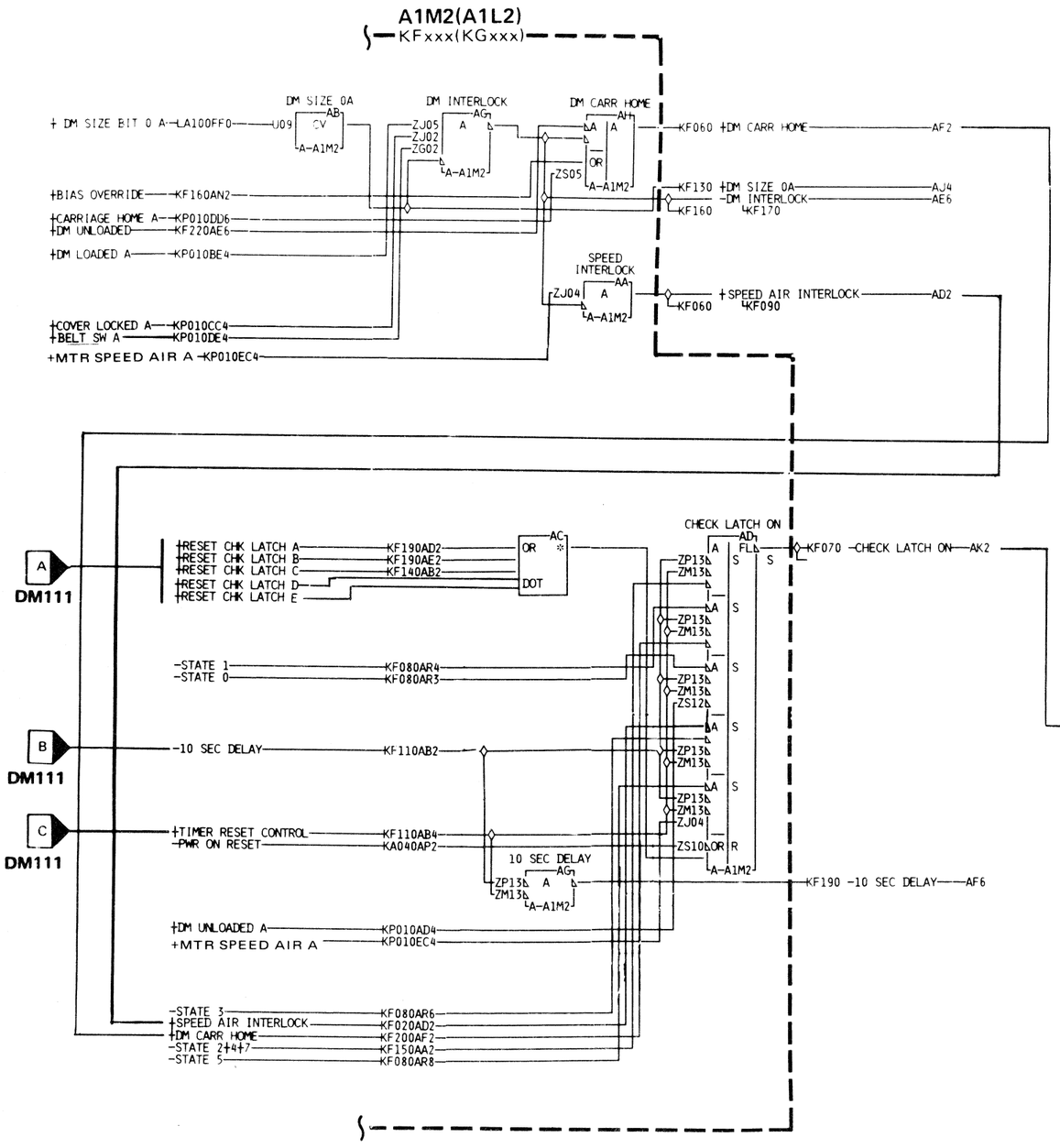
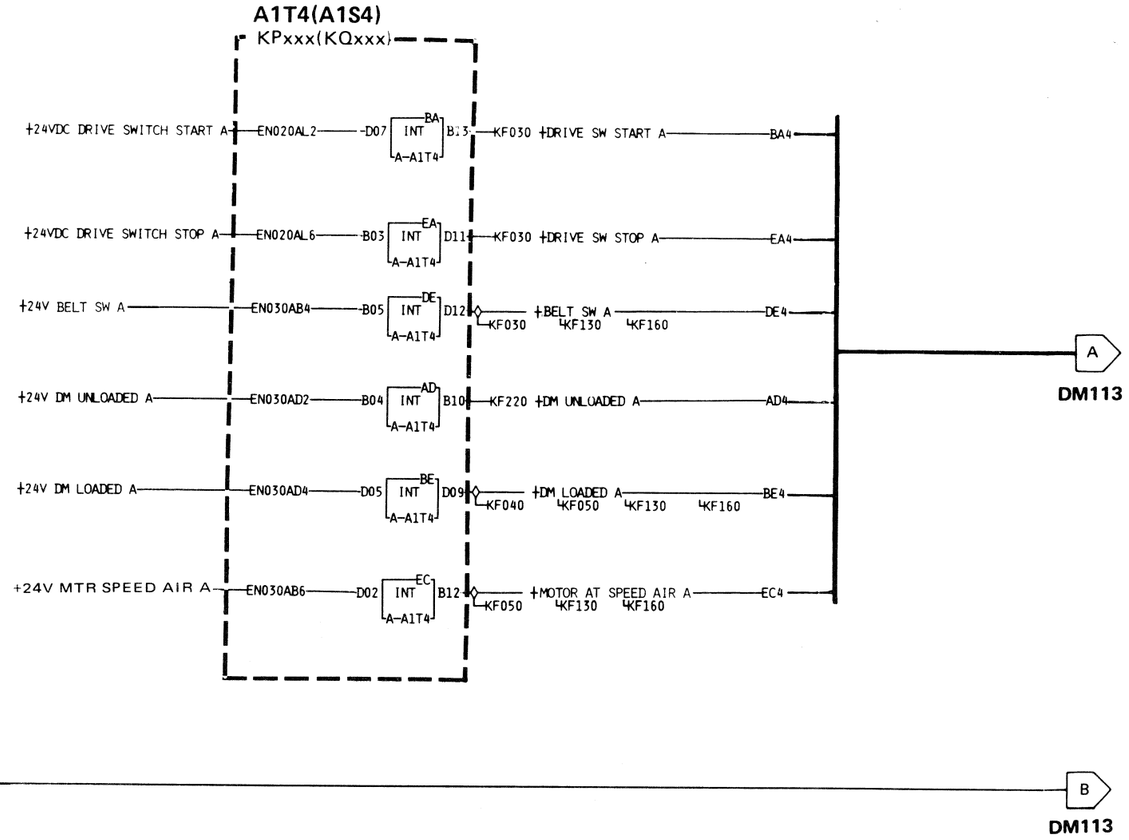
INVALID DM SEQUENCE ERROR STATUS (Continued)





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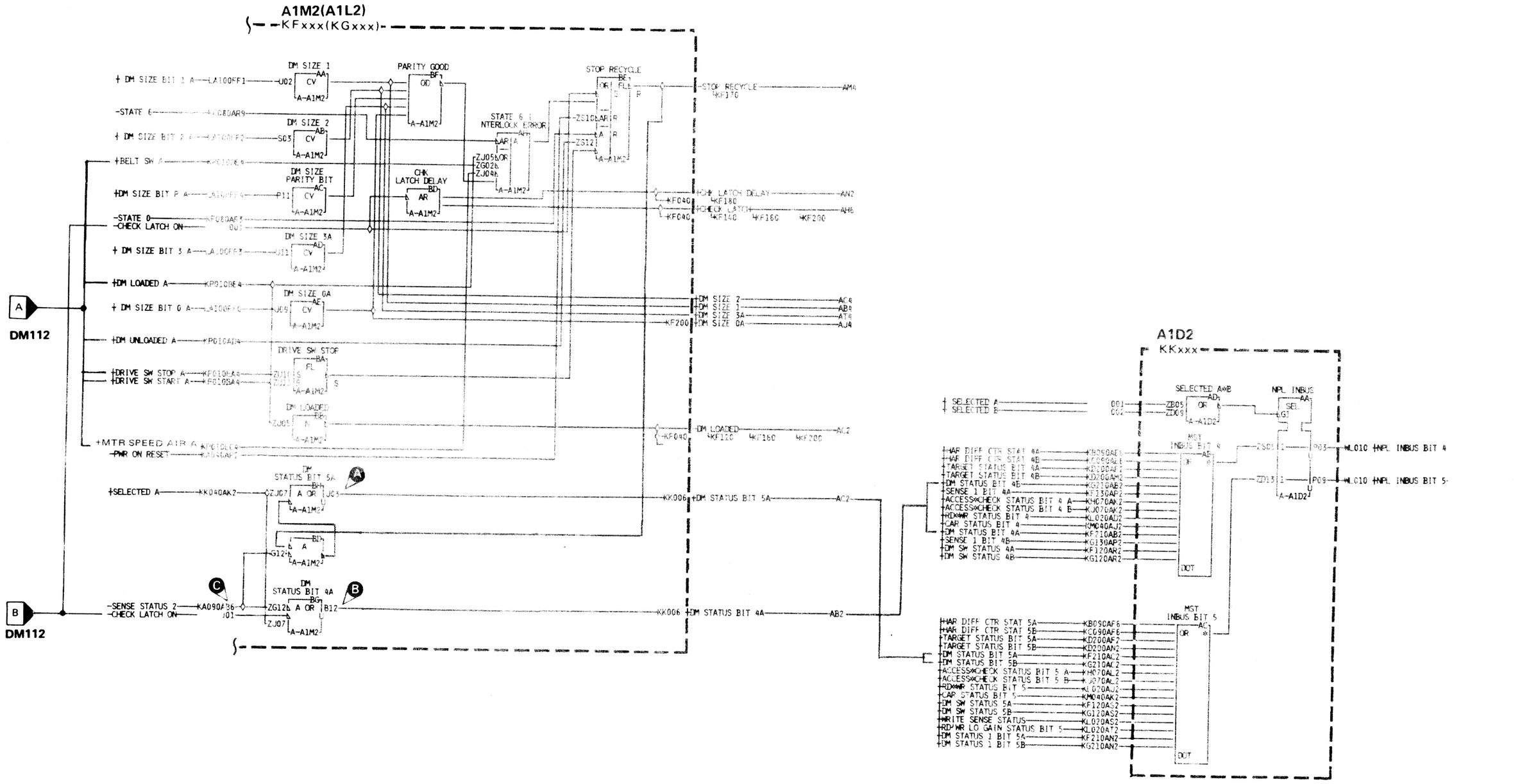
INVALID DM SEQUENCE ERROR STATUS (Continued)



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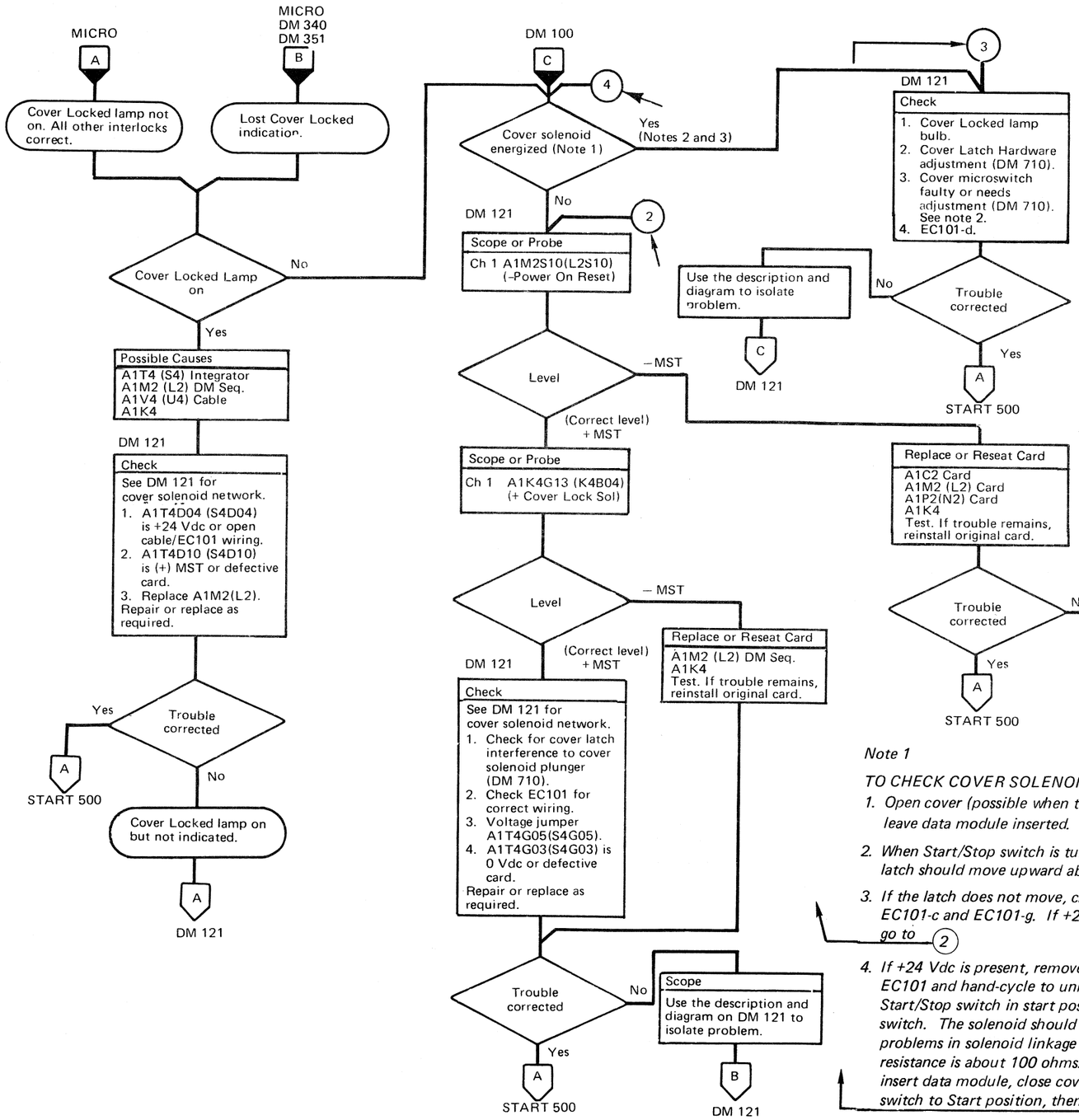
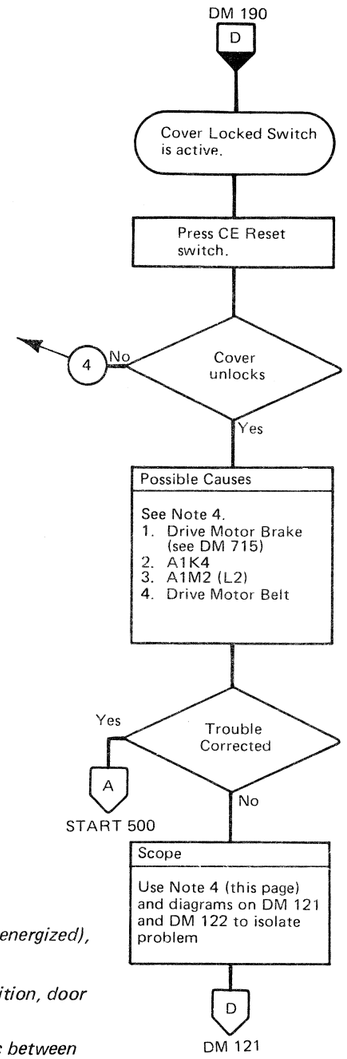
COVER LOCKED CONTROL



Note 1

TO CHECK COVER SOLENOID:

1. *Open cover (possible when the solenoid is de-energized), leave data module inserted.*
2. *When Start/Stop switch is turned to Start position, door latch should move upward about ¼".*
3. *If the latch does not move, check for +24 Vdc between EC101-c and EC101-g. If +24 Vdc is not present, go to* (2)
4. *If +24 Vdc is present, remove shroud and cover over EC101 and hand-cycle to unloaded position. With Start/Stop switch in start position, press DM Present switch. The solenoid should energize. Check for problems in solenoid linkage or latch spring. Solenoid resistance is about 100 ohms. If solenoid does energize, insert data module, close cover, turn drive Start/Stop switch to Start position, then go to* (3)



Note 2

When analyzing a problem with the cover open, place the CE cover switch in the CE position to activate the data module load motor controls.

Note 3

TO RETRIEVE THE DATA MODULE:

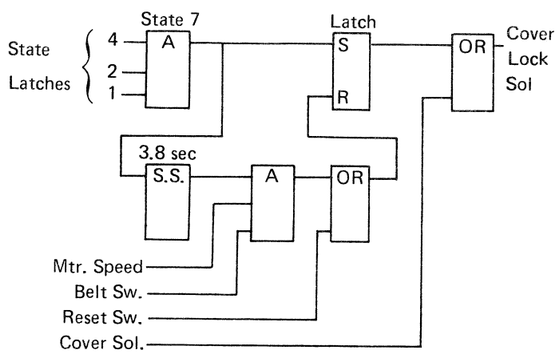
If the cover solenoid is energized and entry was from DM 340 or DM 351:

1. *Turn off the +24 V power switch.*
2. *Open cover and turn on the +24 V power switch.*
3. *Pull up the CE cover switch to complete the unload cycle.*

If cover solenoid is not energized, use the CE Index wheel to unload the data module.

Note 4

The cover lock latch is set to prevent removal of a turning Data Module if a brake or belt failure occurs. When the DM sequencer enters State 7 the Cover Lock latch is set and a 3.8 second single shot started. Under normal operation three conditions are required to reset the cover locked latch: the 3.8 second timer active; the belt switch active; and the Motor Speed switch going inactive before the 3.8 second single shot times out. If any of these conditions are not met the cover remains locked until either Power-On-Reset or the CE Reset switch is pressed. See the simplified diagram below. For detailed diagrams, see DM 121 or DM 122.



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COVER LOCKED CONTROL

DM 120 A

Cover locked not detected but cover locked lamp is on

Microdiagnostic

Setup to run B4:
1. Load routine B4
2. Enter: 10, 83, 00, 8F, 23, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00.

Scope

Sweep: 2 µs/div
Trigger:
SLOPE (+)
A1M2J07 (L2J07)
(+ Selected)
CHI A1M2B10 (L2B10)
(– Sense Status 3)

K DM 122
L DM 122

Check

1. Check interface for missing +DM switch status 2. See DEV-I 132 for complete interface.
2. Scope back to switch for missing cover locked indication.

N DM 122

Trouble corrected — No → A → DM 600

Yes → A → START 500

DM 120 DM 190 B

Cover solenoid does not energize

1. Open drive cover.
2. Index at unloaded pos.
3. Insert data module.
4. Turn Start/Stop switch on. (See NOTE 1.)

Check

Following for indicated MST levels:
1. (Not) + Bias Disable Sw A
2. (Not) – Pwr On Reset
3. + Drive Sw Start A
4. +DM Present A
5. + DM Unloaded A
6. (Not) + DM Loaded A
7. + Carriage Home A
8. (Not) + Belt Sw A
9. (Not) + Motor At Speed Air A
10. +Cover Lock Sol A

Trace Logic to source of problem.

D DM 122
M DM 122
B DM 122
C DM 122
E DM 122
F DM 122
J DM 122
G DM 122
H DM 122
P DM 122

DM 120 C

Cover solenoid energized but not indicated

Activate CE cover switch (See Note 2)

Check

Cover locked switch and logic associated with it. Repair or replace as required.

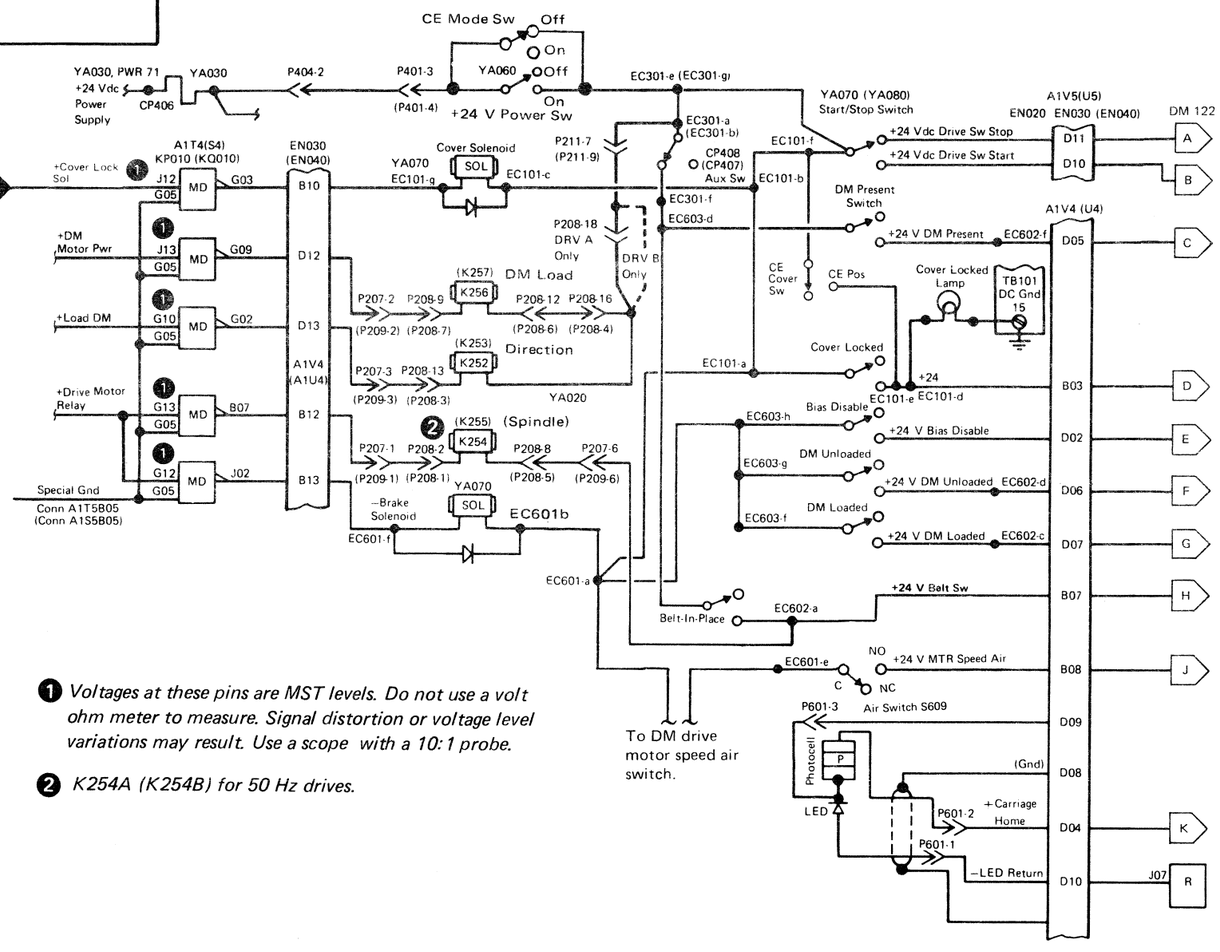
DM 120 D

Cover solenoid energized after Unload cycle. Can be reset using CE Reset.

Check

Cover solenoid associated logic. See Note 4, DM 120

DM 122 E



Note 1: To check cover solenoid, open cover, leave DM inserted. When Start/Stop switch is set to Start, position door latch should move upward about 1/4 inch. See DM 710 for mechanical diagram and adjustment procedure.

Note 2: To open cover, turn off +24 Vdc switch. Open cover and turn +24 Vdc switch on.

1 *Voltages at these pins are MST levels. Do not use a volt ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*

2 *K254A (K254B) for 50 Hz drives.*

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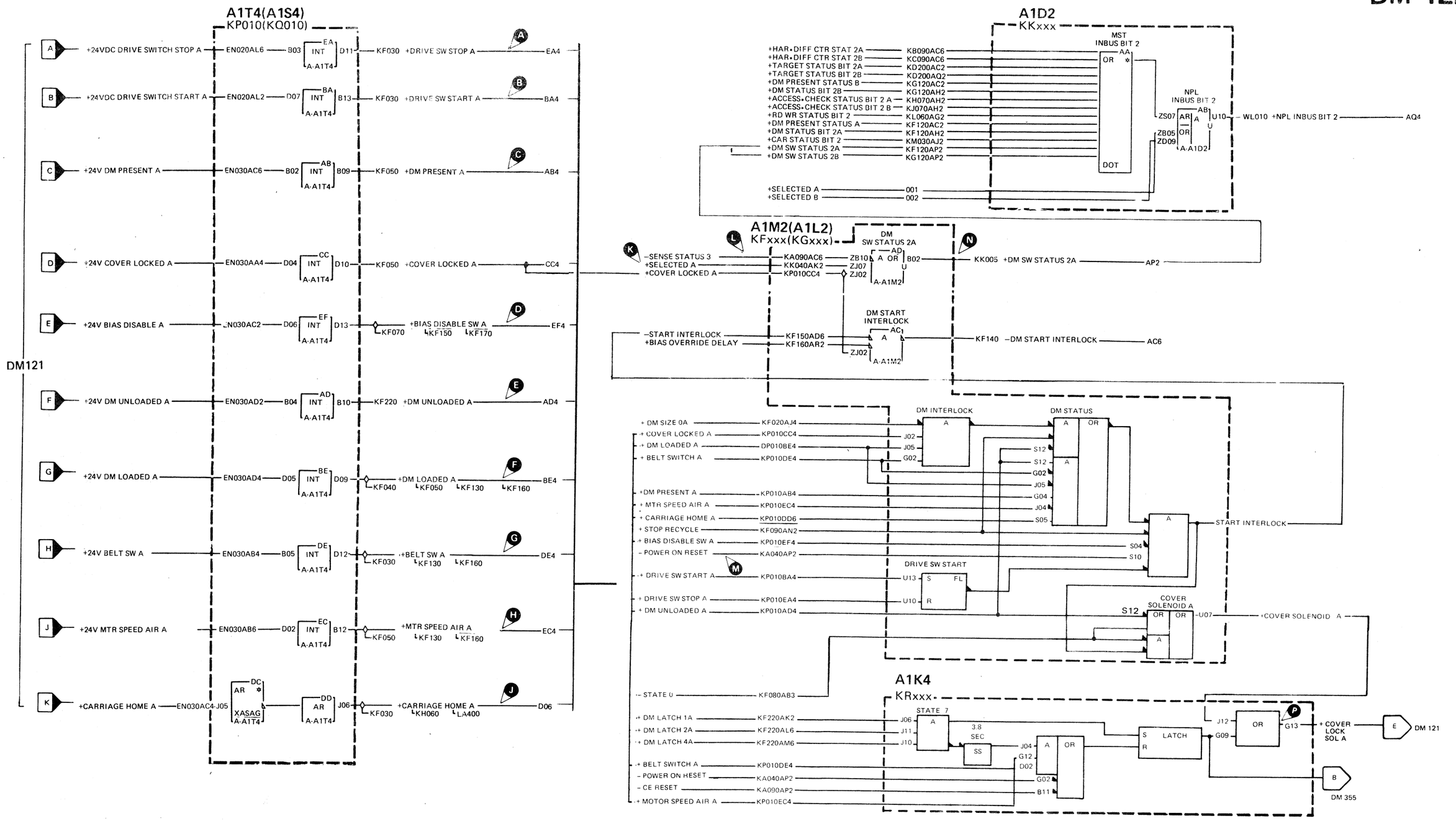
COVER LOCKED CONTROL (Continued)



DH0102	2747214	440200	440202	440203	440205	440214	440228	440241
Seq. 1 of 2	Part No. (P)	25 Jun 73	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	29 Oct 76	30 Oct 78

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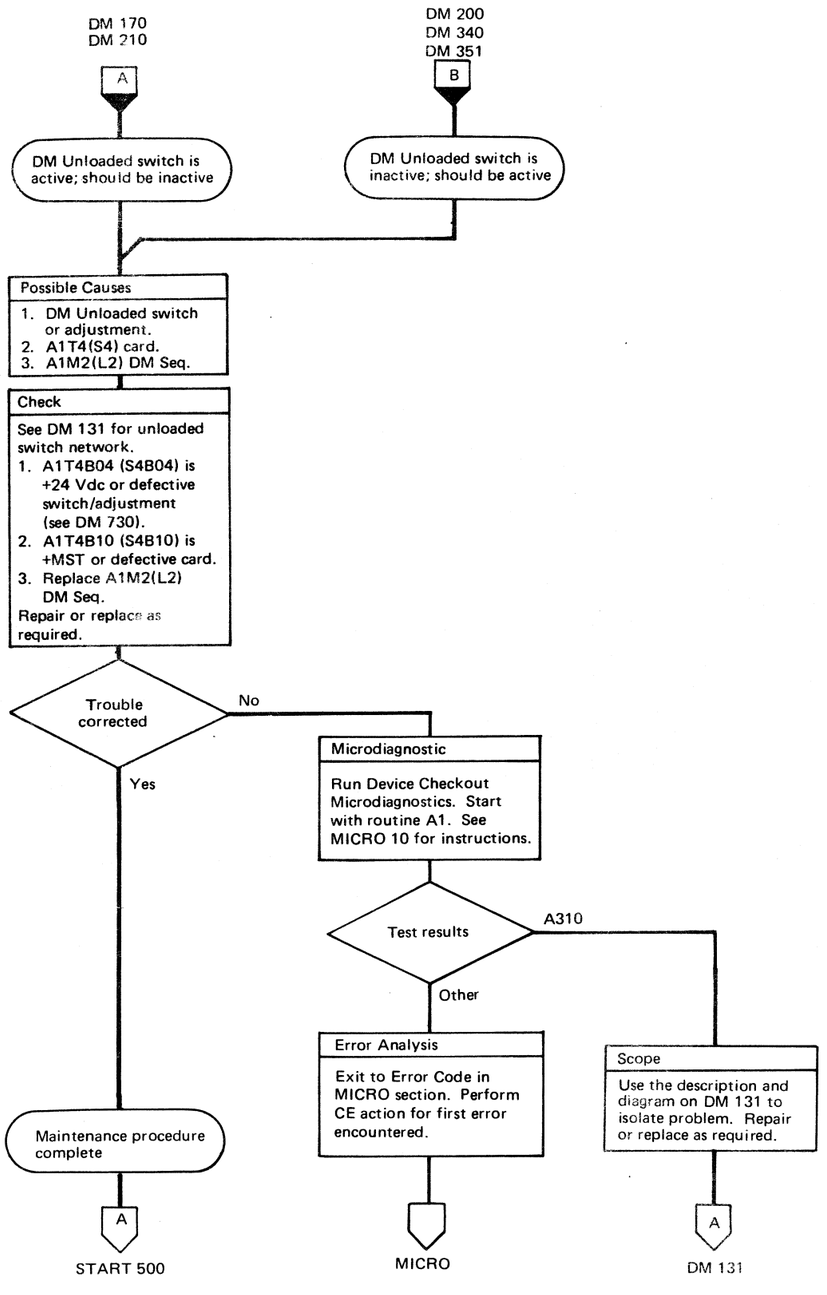
DM UNLOADED SWITCH CONTROLS



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DM 130
A

MICRO 37

Microdiagnostics

Run Routine B4.

1. Load routine B4
2. Enter 10,83,00,8F,23, 00,00,00,00,00,00, 00,00,00,00

KK 020

Scope

Sweep 2 μs/div

Trigger
Slope (+)
A1D2B05 (D2D09) (+Selected) B

CH1 A1M2B10 (L2B10) (-Sense Status 3) A
volts/div 0.1
probe X10

CH2 A1D2 S02 (+NPL inbus bit 3) C
volts/div 0.2
probe X10

Check

If DM is unloaded, there should be a +NPL pulse at A1D2S02.

If DM is loaded, A1D2S02 should be –NPL.

No — Trouble Corrected — Yes

No: A → DM 600

Yes: A → START 500

A1M2
KF120

-SENSE STATUS 3 — KA090AC6 — ZB10 A OR B04 — KK005 +DM SW STATUS 3A — AQ2
+SELECTED A — KK040AK2 — ZJ07 U
+DM UNLOADED A — KP010AD4 — ZS12 A-A1M2

A1D2
KK005

+HAR*DIFF CTR STAT 3A — KB090AD6
+HAR*DIFF CTR STAT 3B — KC090AD6
+TARGET STATUS BIT 3A — KD200AD2
+TARGET STATUS BIT 3B — KD200AL2
+BELT STATUS B — KG120AB2
+DM STATUS BIT 3B — KG210AA2
+ACCESS*CHECK STATUS BIT 3 A — KH070AJ2
+ACCESS*CHECK STATUS BIT 3 B — KJ070AJ2
+CAR STATUS BIT 3 — KM030AK2
+BELT STATUS A — KF120AB2
+DM STATUS BIT 3A — KF210AA2
+RD*WR STATUS BIT 3 — KL020AE2
+DM SW STATUS 3A — KF120AQ2
+DM SW STATUS 3B — KG120AQ2
+CAR STAT BIT 3 — KM030AS2

MST INBUS BIT 3 L — AA — OR * — DOT

+SELECTED A — 001
+SELECTED B — 002

NPL INBUS BIT 3 C — AB — AR A U — ZS08 — S02 — WL010 +NPL INBUS BIT 3 — AR4

ZB05 OR ZD09 A-A1D2 — B

A1T4
KP010

+24V DM UNLOADED A — EN030AD2 — B04 INT AD B10 — KF220 +DM UNLOADED A
A-A1T4

YA030, PWR 71
+24 Vdc Power Supply — CP406 — YA030 — P401-2 — P401-3 — (P401-4)

CE Mode Sw: Off / On
YA060: Off / On
+24 V Power Sw

EC301-a (EC301-g)

EC101-F — EC101-b — EC101-a — EC601-a — EC603-h — EC603-g — DM Unloaded — +24 V DM Unloaded — EC602-d — D06 — A1V4(U4)

YA070 (YA080) Start/Stop Switch

A1V5(U5) EN020 EN030 (EN040)
+24 Vdc Drive Sw Stop — D11
+24 Vdc Drive Sw Start — D10

3340	DH0104 Seq. 1 of 2	2747215 Part No. (0)	440200 25 Jun 73	440202 7 Sept 73	440203 2 Nov 73	440205 28 Jan 74	440214 17 Jun 74	440228 29 Oct 76

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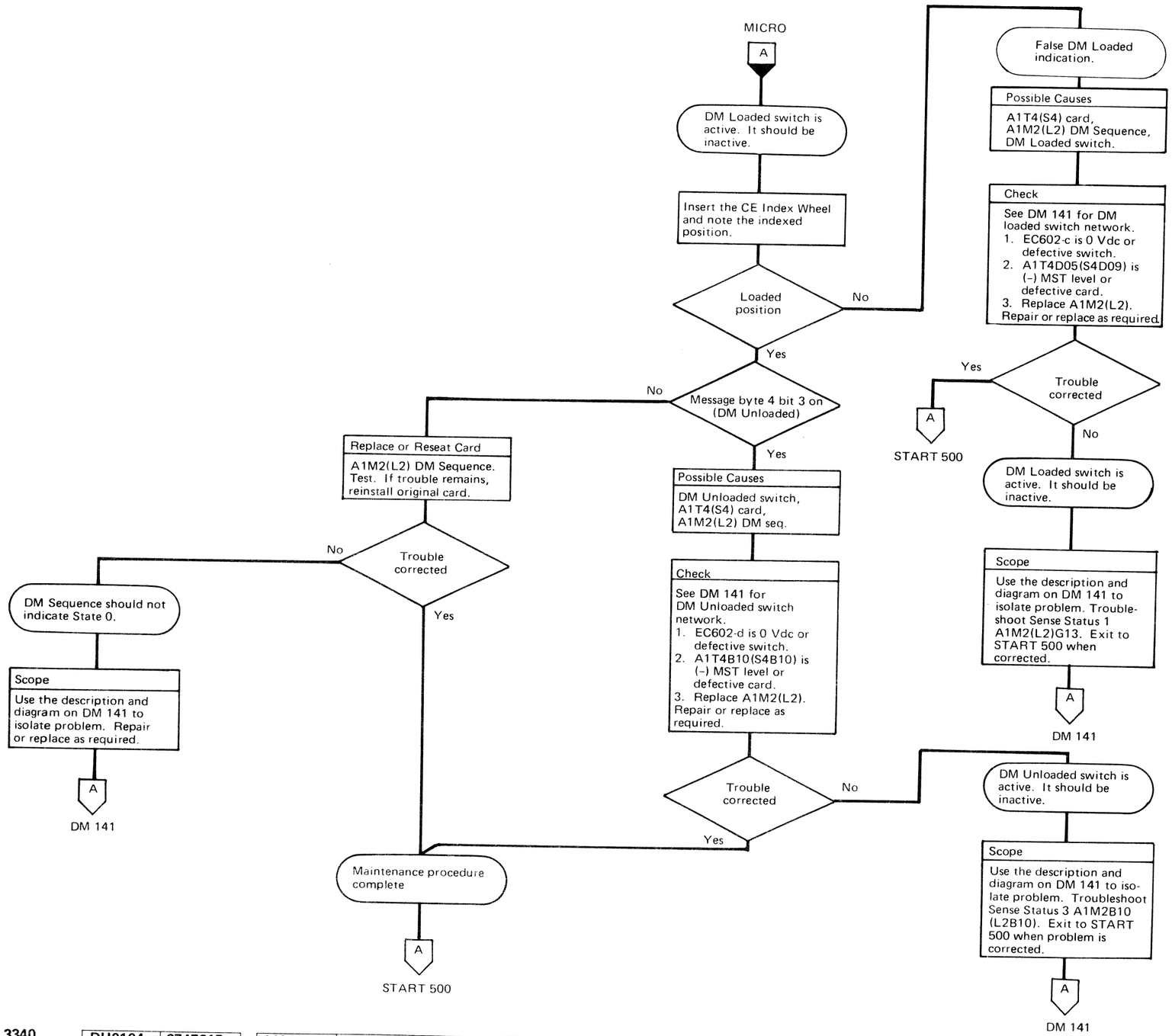
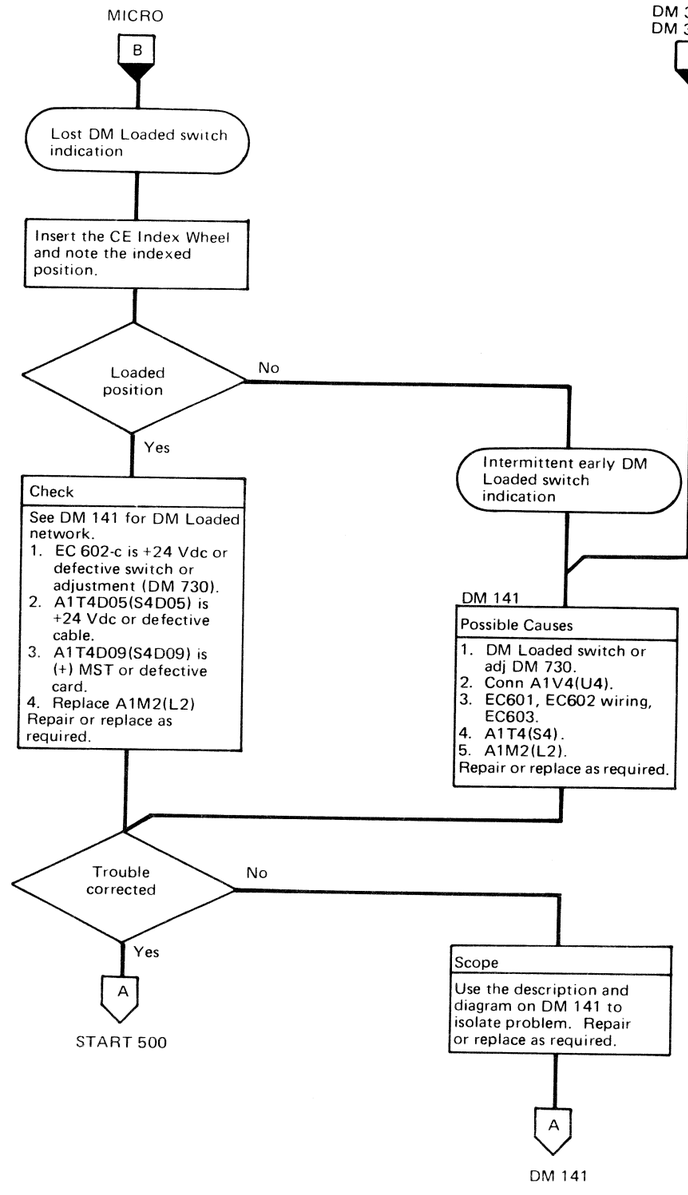
DM LOADED SWITCH CONTROLS





DH0104	2747215	440200	440202	440203	440205	440214	440228	
Seq. 2 of 2	Part No. (0)	25 Jun 73	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	29 Oct 76	

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DM LOADED SWITCH

DM 140
DM 300
DM 311

A

MICRO 37

Microdiagnostics

Run Routine B4

1. Load Routine B4
2. Enter 10,83,00,8F,23, 00,00,00,00,00,00,00, 00,00,00,00,00

KK 020

Scope

Sweep 2 μs/div

Trigger

Slope(+)
A1D2B05 (D2D09) (+Selected) — B

CH1 A1M2B10 (L2B10) (–Sense Status 3) — A
volts/div 0.1
Probe X10

CH2 A1D2P03 (+NPL Inbus Bit 4) — C
volts/div 0.2
Probe X10

Check

If DM is loaded, a +NPL pulse should be at A1D2P03. — C

If DM is unloaded, A1D2P03 should be a minus NPL level.

Trouble Corrected

Yes → A → START 500

No → A → DM 600

+24 V DM Loaded

EC602-c → D07 → A1V4 (U4) → +24V DM LOADED A → EN030AD4 → D05 INT BE D09 A-A1T4 → +DM LOADED A

A1T4 (A1S4)
KP010 (KQ010)

EC603-f

EC603-g

EC603-h

EC601-a

EC101-a

EC101-b

EC101-f

Start/Stop Switch
D11 +24 Vdc Drive Sw Stop
D10 +24 Vdc Drive Sw Start
A1V5(U5)

YA070 (YA080)

EN020 EN030 (EN040)

EC301-e (EC301-g)

Off On — On
Off — +24 V Power Sw — YA060
CE Mode Sw

P401-3 (P401-4)

YA030, PWR 71
+24 Vdc Power Supply
CP406 — YA030

P404-2

A1M2 (A1L2)
KFxxx (KGxxx)

+DM LOADED A → KP010BE4 → ZJ05 DM LOADED AA1 N A-A1M2 → -DM LOADED

-SENSE STATUS 3 → KA090AC6
+SELECTED A → KK040AK2
ZB10 A OR AB U B12 → KK006 +DM SW STATUS 4A

A DM SW STATUS 4A

A1D2
KKxxx

+HAR DIFF CTR STAT 4A → KB090AE6
+HAR DIFF CTR STAT 4B → KC090AE6
+TARGET STATUS BIT 4A → KD200AE2
+TARGET STATUS BIT 4B → KD200AM2
+DM STATUS BIT 4B → KG210AB2
+SENSE 1 BIT 4A → KF130AP2
+ACCESS*CHECK STATUS BIT 4 A → KH070AK2
+ACCESS*CHECK STATUS BIT 4 B → KJ070AK2
+RD*WR STATUS BIT 4 → KL020AD2
+CAR STATUS BIT 4 → KM040AJ2
+DM STATUS BIT 4A → KF210AB2
+SENSE 1 BIT 4B → KG130AP2
+DM SW STATUS 4A → KF120AR2
+DM SW STATUS 4B → KG120AR2

INBUS BIT 4 AA OR * DOT

+SELECTED A → 001
+SELECTED B → 002

NPL INBUS BIT 4 C
ZS05 AR A AB U P03 → +L010 +NPL INBUS BIT 4 → AS4
B ZB05 OR ZD09 A-A1D2

DH0106	2747216
Seq. 1 of 2	Part No. (0)

See EC History	440227	440228				
	14 Sept 76	29 Oct 76				

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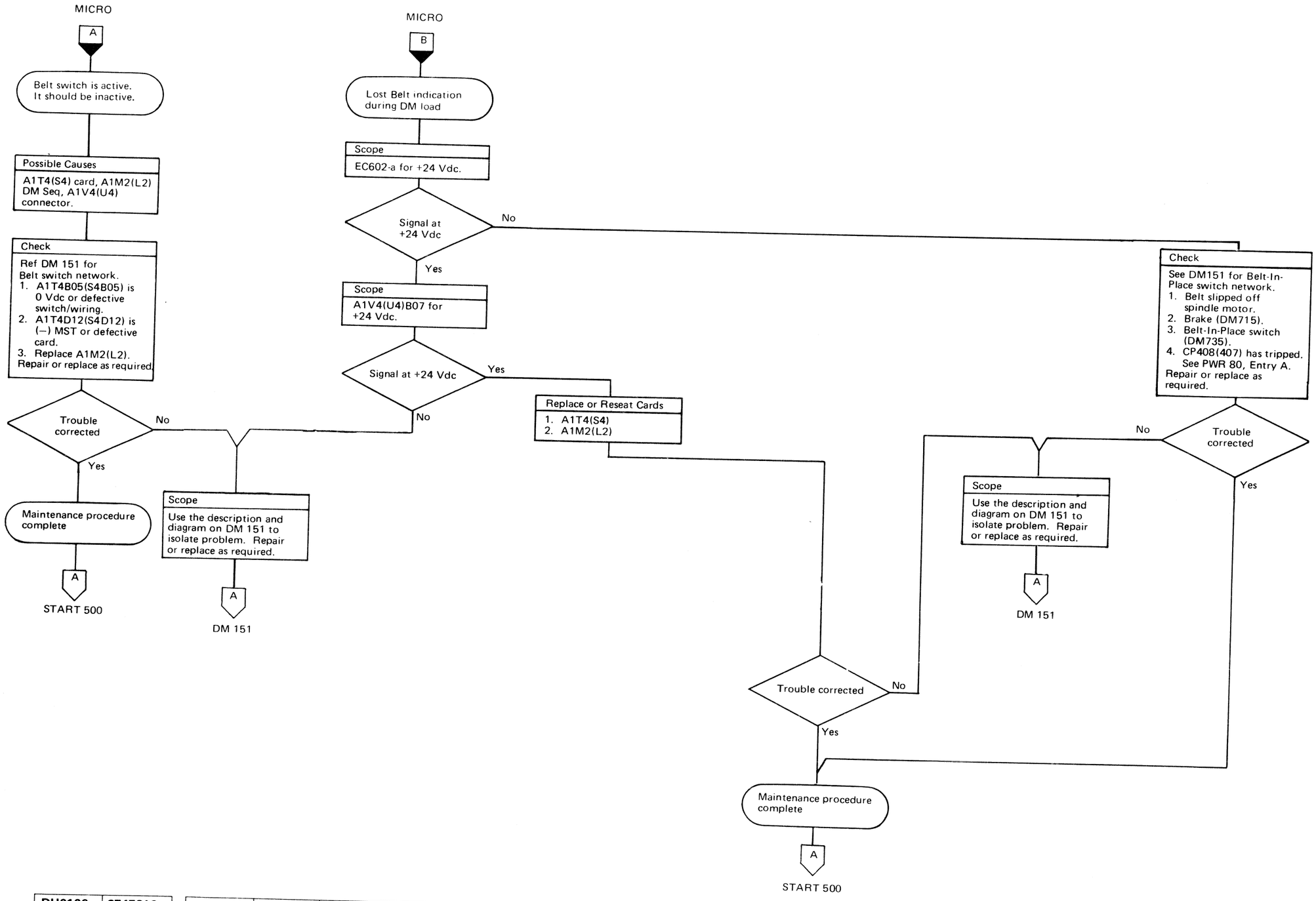
BELT SWITCH CONTROLS



DH0106 Seq. 2 of 2	2747216 Part No. (0)

See EC History	440227 14 Sept 76	440228 29 Oct 76				

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DM 150
DM 300

A

MICRO 37

Microdiagnostics

Run Routine B4

1. Load Routine B4
2. Enter 10,83,00,8F,23, 00,00,00,00,00,00, 00,00,00,00,00,00

KK020

Scope

Sweep 2 μs/div
Trigger
Slope (+)
A1D2B05 (D2D09)
(+Selected)

CH1 A1M2B10 (L2B10)
(-Sense Status 3)
Volts/Div 0.1
Probe X10

C

A

Check

A +NPL pulse should be at A1D2P09 if DM is fully loaded or if the index wheel is past 300° during a load cycle.

A1D2P09 is –NPL if DM is unloaded or less than 300° during the load/unload cycle.

B

Trouble Corrected

Yes

No

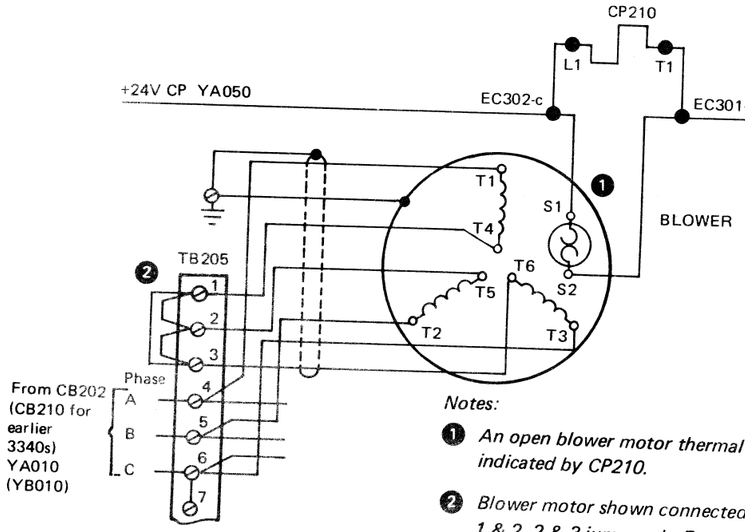
A

START 500

A

DM600

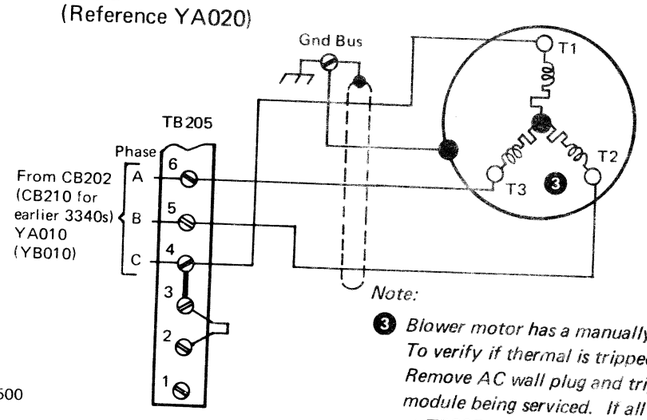
50 HZ
(Reference YA020)



Notes:

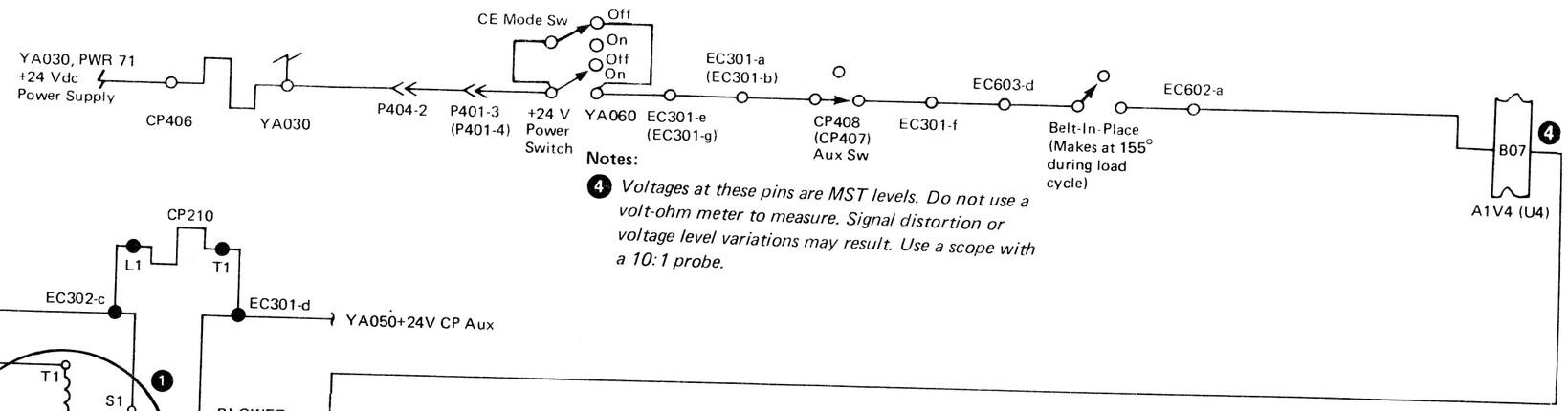
1. *An open blower motor thermal is indicated by CP210.*
2. *Blower motor shown connected Y-phase 1 & 2, 2 & 3 jumpered. For delta phase jumper terminals 2 & 6, 1 & 5, 3 & 4.*

60 Hz
(Reference YA020)



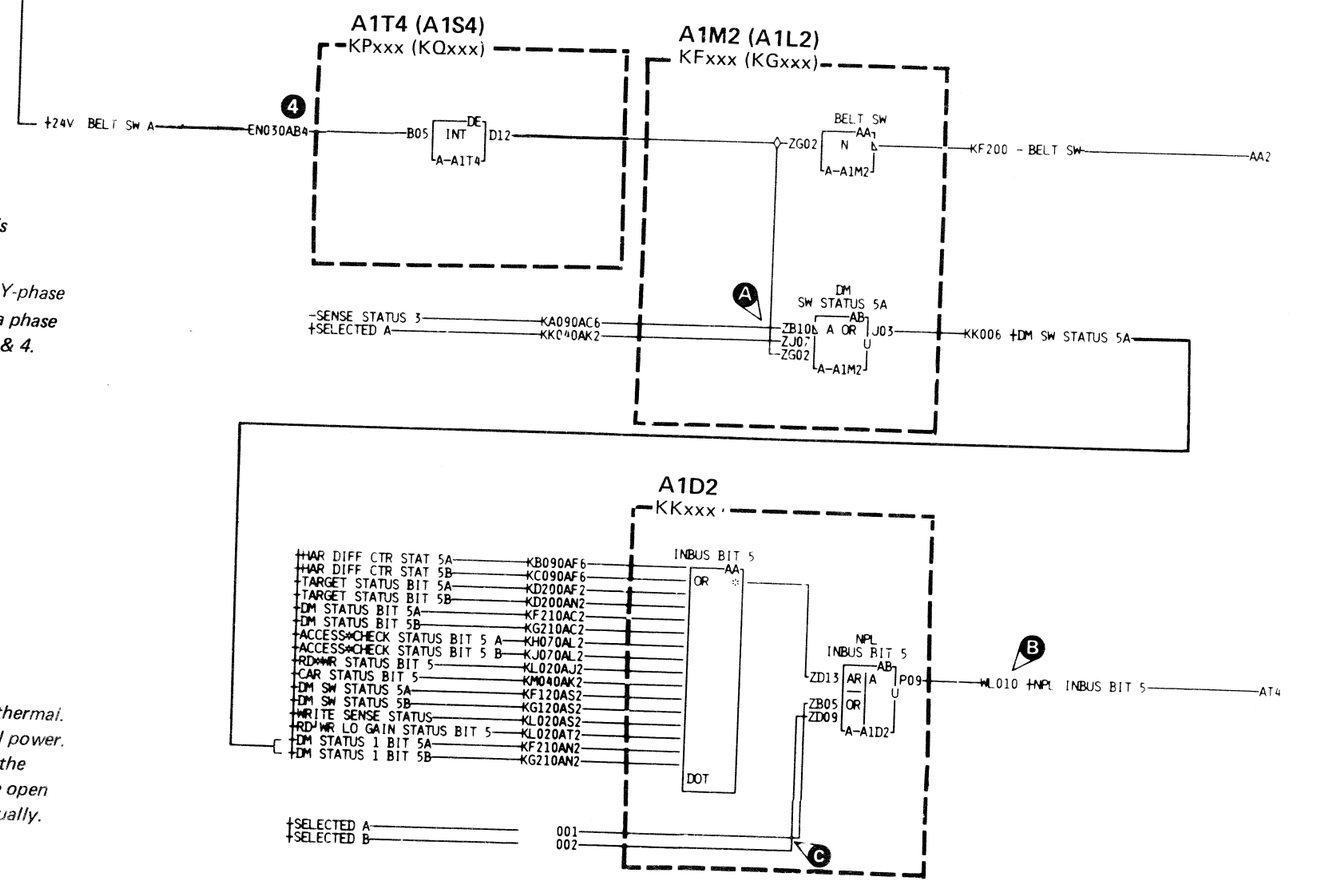
Note:

3. *Blower motor has a manually resettable thermal. To verify if thermal is tripped, remove all power. Remove AC wall plug and trip CB202 in the module being serviced. If all 3 phases are open at TB205, thermal is tripped. Reset manually.*



Notes:

4. *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*



DH0107	2747630
Seq. 1 of 2	Part No. (0)

440202	440203	440205	440214	440219	440227	440228
7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	26 Sept 74	14 Sept 76	29 Oct 76

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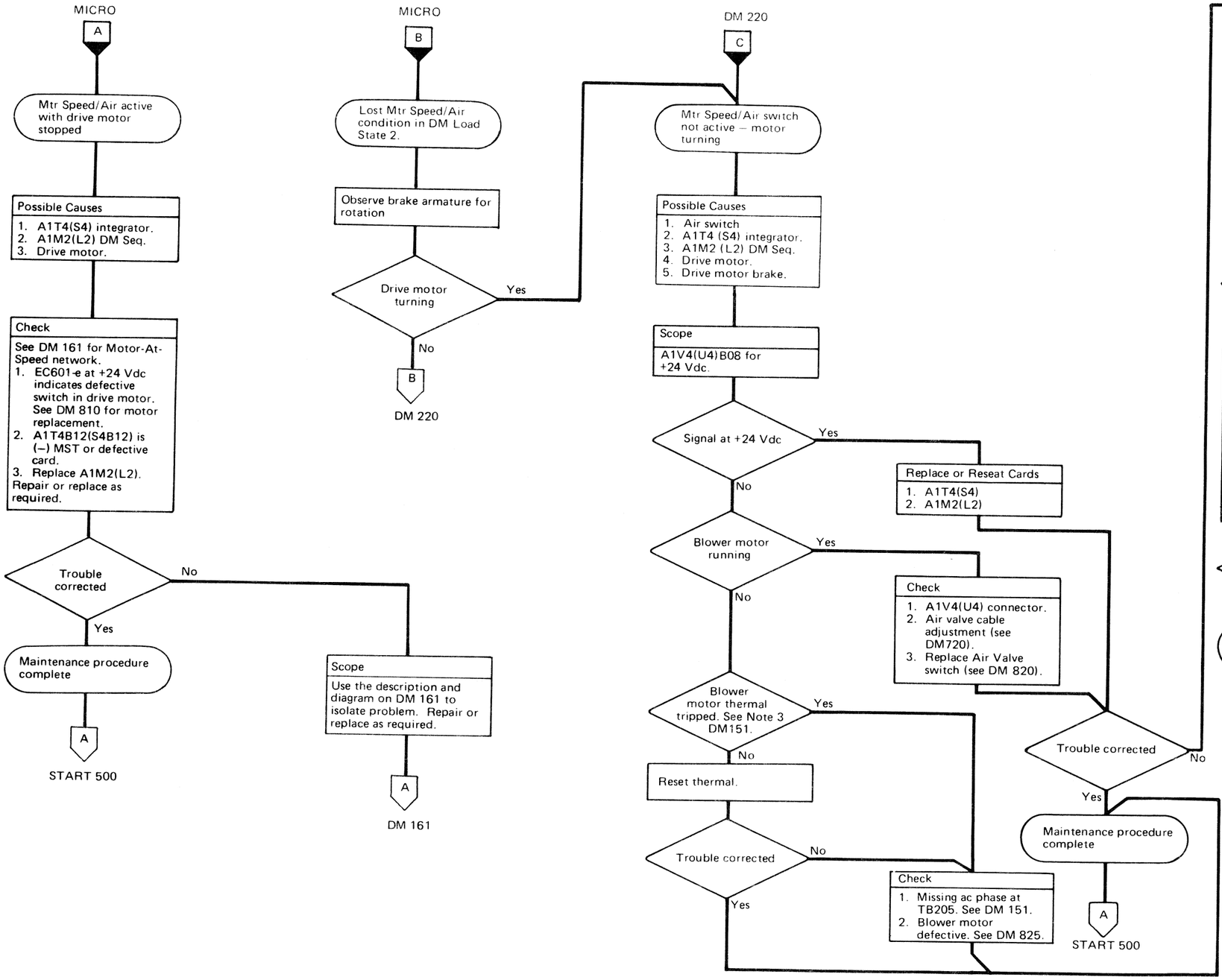
MTR SPEED/AIR SWITCH CONTROLS



DH0107 Seq. 2 of 2	2747630 Part No. (0)

440202 7 Sept 73	440203 2 Nov 73	440205 28 Jan 74	440214 17 Jun 74	440219 26 Sept 74	440227 14 Sept 76	440228 29 Oct 76

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MOTOR-AT-SPEED SWITCH CONTROLS

DM 160
DM 300

A

MICRO 37

Microdiagnostics

Run Routine B4.
1. Load Routine B4.
2. Enter 10,83,00,8F,23, 00,00,00,00,00,00,00, 00,00,00,00,00

KK006

Scope

Sweep 2 µs/div

Trigger
Slope (+)
A1D2B05 (D2D09)
(+Selected) — E

CH1 A1M2B10 (L2B10)
(–Sense Status 3)
volts/div 0.1
probe X10 — D

CH2 A1D2J06
(+NPL inbus bit 7)
volts/div 0.2
probe X10 — F

Check

1. A +NPL pulse at A1D2J06 indicates motor is at speed. — F
2. If motor is stopped or not at speed, A1D2J06 should be –NPL
3. +24 V at EC601-a — A
4. P201 (P203) line voltage correct — C
5. **K254A (K254B) points** clean and making good contact — B

Trouble Corrected — No → A → DM 600

Yes → A → START 500

CE Mode Sw: Off / On
YA060: Off / On
+24 V Power Sw
YA030, PWR 71
+24 Vdc Power Supply
CP406
YA030
P401-2
P401-3
(P401-4)
EC301-e (EC301-g)
YA070 (YA080) Start/Stop Switch
+24 Vdc Drive Sw Stop
+24 Vdc Drive Sw Start
A1V5(U5) EN020 EN030 (EN040)
D11
D10
EC301-a (EC301-b)
EC101-f
EC101-a
EC601-a
EC101-b
CP408 (CP407) Aux Sw
EC301-f
EC603 d
Belt-In-Place
EC602-a
+Drive Motor Relay
KF020 (KG020)
G13
G05
MD
E07
A1T4(S4) KP010 (KQ010)
A1V4 (A1U4)
B12
P207-1
(P209-1)
P208-2
(P208-1)
K254A
(K254B)
P208-8 (P208-5)
CP217 (CP218)
P207-6 (P209-6)
Special Gnd
Conn A1T5B05 (Conn A1S5B05)

(P203) P201
(TB202) TB201
EC601-e
+24 V MTR Speed Air
B08
A1V4 (U4)
Air Switch S609
EC601–G
EC601–H
T1
T2
T3
T4
T5
T6
DRIVE MOTOR

(K254B–1) K254A–1
(9)6
(8)9
NOTE 2
NOTE 3
NOTE 5
NOTE 6
(RC210) RC204
(RC211) RC205
TB205
Phase A B C
From CB202 (CB210 for earlier 3340s) YA010 (YB010)
(K254B–2) K254A–2
(5)7
(6)4
NOTE 4
NEUT
NEUT

Notes:

1. *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*
2. *Motors are shown connected Y- phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*
3. *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218, respectively.*
4. *Connection shown for Y-phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*
5. *Unused positions not shown.*
6. *Numbers in parentheses are for dual contactors used on early machines.*

+MTR SPEED AIR A
+24 V MTR SPEED AIR A — EN030AB6

A1T4 (A1S4)
KP010 (KQ010)
DO2 — EC INT B12 — A–A1T4
+MTR SPEED AIR A — KP010EC4

A1M2 (A1L2)
KFxxx (KGxxx)
ZJ04 — MOTOR AT SPEED AA N AB — A–A1M2
–MTR SPEED AIR — AD2

A1D2
KKxxx

+INTERFACE SENSE BIT 7 — KA110AP2
+HAR DIFF CTR STAT 7A — KB090AH6
+HAR DIFF CTR STAT 7B — KC090AH6
+TARGET STATUS BIT 7A — KD200AH2
+TARGET STATUS BIT 7B — KD200AP2
+DM STATUS BIT 7A — KF210AE2
+DM STATUS BIT 7B — KG210AE2
+ACCESS STATUS BIT 7 A — KH070AN2
+CHECK STATUS BIT 7 A — KH070AR2
+ACCESS STATUS BIT 7 B — KJ070AN2
+CHECK STATUS BIT 7 B — KJ070AR2
+RD+WR STATUS BIT 7 — KL020AL2
+CAR STATUS BIT 7 — KM050AK2
+DM SW STATUS 7A — KF120AU2
+DM SW STATUS 7B — KG120AU2
INBUS BIT 7 — AA OR * — DOT
NPL INBUS BIT 7 — ZS13 AR A AB OR U — ZB05 ZD09 — A–A1D2
J06 — +NL020 +NPL INBUS BIT 7 — AV4
+SELECTED A
+SELECTED B
001
002

DM SW STATUS 7A
–SENSE STATUS 3 — KA090AC6
+SELECTED A — KK040AK2
ZB10 A OR P12 — KK006 +DM SW STATUS 7A
ZJ07
ZJ04
A–A1M2

DH0108 Seq. 1 of 2	2747812 Part No. (7)	440205 28 Jan 74	440214 17 Jun 74	440220 17 Oct 74	440223 14 Mar 75	440228 29 Oct 76		

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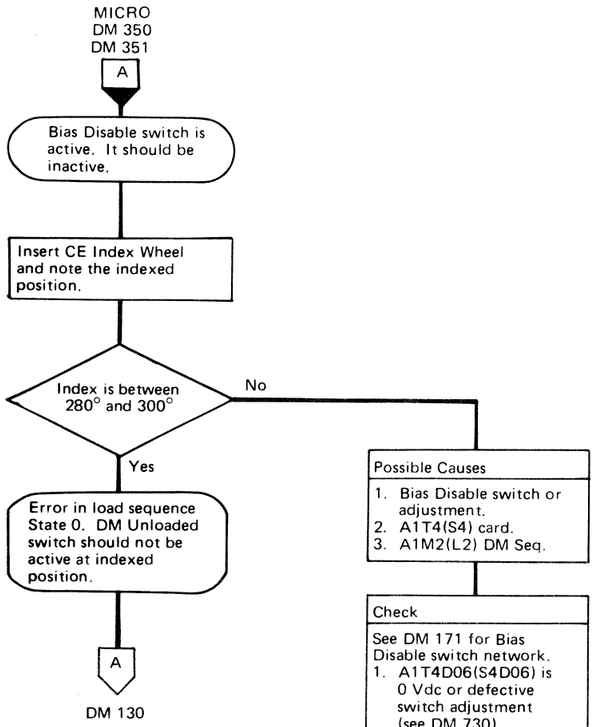
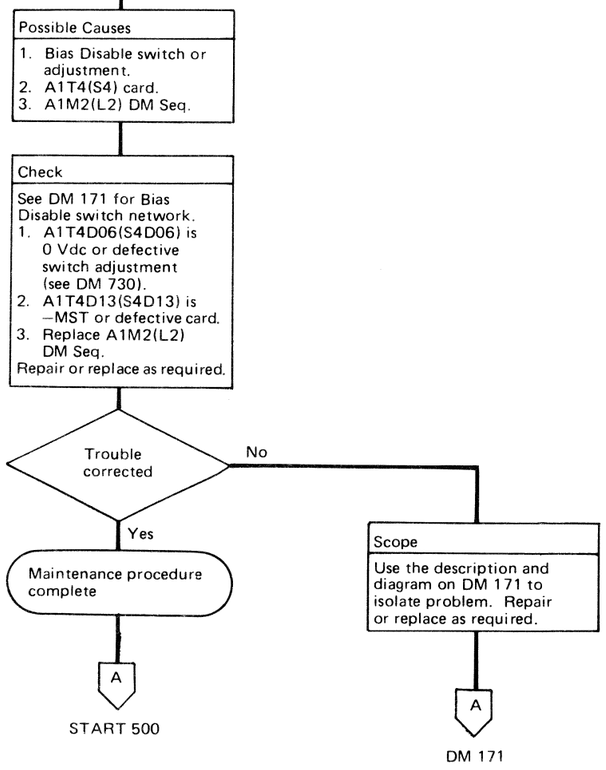
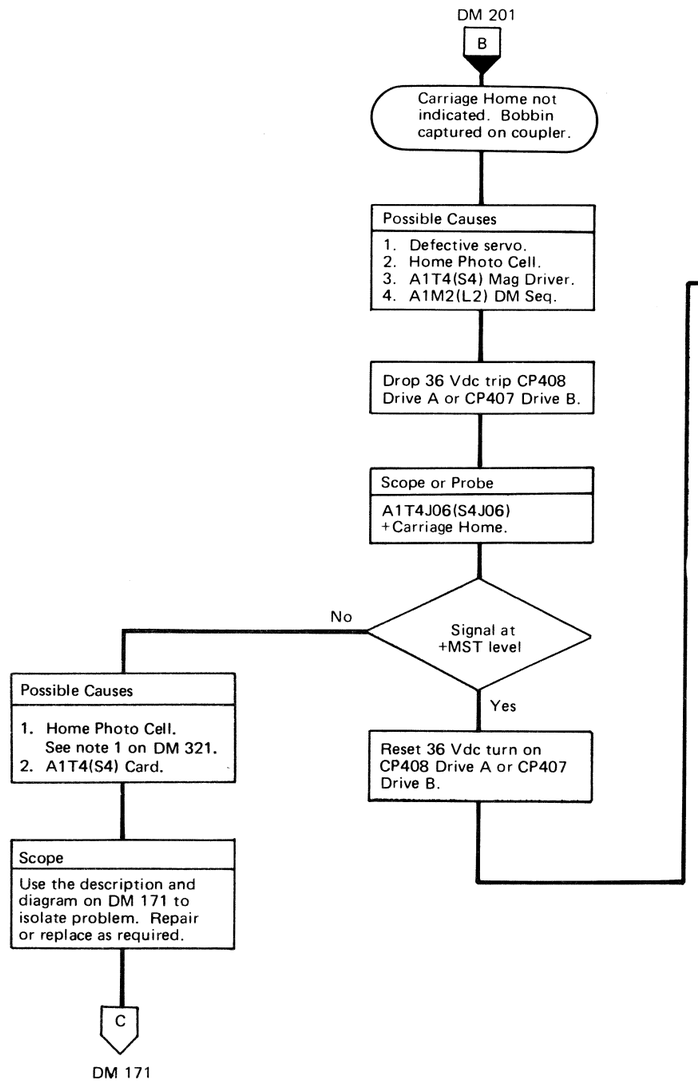
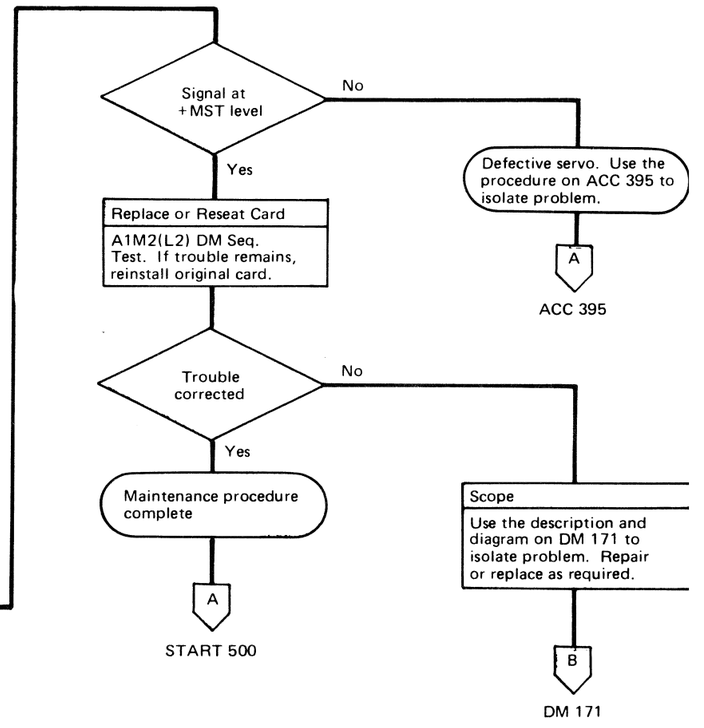
BIAS DISABLE SWITCH CONTROLS









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BIAS DISABLE SWITCH CONTROLS

DM 170 A

MICRO 34

Microdiagnostic

Run routine B4.
1. Load routine B4.
2. Enter: 10, 83, 00, 8F, 13, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00.

KK 006

Scope

Sweep: 2 µs/div
Trigger:
Slope (+)
A1D2B05 (D2D09)
(+Selected) D
Ch1 A1M02G12 (L2G12) C
(-Sense status 2)
volts/div 0.1
probe X10
Ch 2 A1D2M03 E
(+NPL in bus bit 6)
volts/div 0.2
probe X10

Check

A1D2M03 should be -NPL unless the Index wheel is between 280° and 300°. Trace +DM status bit 6 back to determine the problem. Bias disable switch should be on only between approximately 280° and 300°. F

Trouble corrected — No → A → DM 600

Yes → Maintenance procedure complete. → A → START 500

DM 170 B

Microdiagnostic

Run routine B4.
1. Load routine B4.
2. Enter: 10, 83, 00, 8F, 23, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00.

KK006

Scope

Sweep: 2 µs/div.
Trigger:
Slope (+)
A1D2B05(D2D09) D
(+Selected)
Ch 1 A1M2B10(L2B10) A
(-Sense status 3)
volts/div 0.1
Probe X10
Ch 2 A1D2M03 E
(+NPL in bus bit 6)
volts/div 0.2
Probe X10

Check

If A1T4J06 (S4J06) is + MST A1D2M03 should have a +NPL pulse on it. B

DM 170 C

Check

1. -4 V at P601-3
2. Diode 1
3. A1V4(U4) connector
4. P601-1 (-LED return)

A1V4 (U4)
P601-3
Photocell P
LED
(Gnd)
P601-2
P601-1
1 +Carriage Home
-LED Return
D09
D08
D04
D10
D02
EC603-h
Bias Disable
+24 V Bias Disable
EC601-a
EC101-a
EC101-b
EC101-f
YA030 PWR 71 +24 Vdc Power Supply
CP406
YA030
P404-2
P401-3
(P401-4)
YA060
Off
On
+24 V Power Sw
Off
On
CE Mode Sw
EC301-a (EC301-q)
+24 Vdc Drive Sw Stop
+24 Vdc Drive Sw Start
D11
D10
YA070 (YA080)
Start/Stop Switch

A1T4 (A1S4)
KF 010 (KQ010)
C06 Serv 4 V A1T4 KV010
J05 XASAG A-A1T4
DC AR
DD AR J06 A-A1T4
J07 R
D06 INT D13
EF A-A1T4
A1V5 (U5)
EN020 EN030 (EN040)

+DM MOTOR 1+2 — KF040AA4

B — KF030 +CARRIAGE HOME A — KH060 LA400 — 2

3 — C

A1M2 (A1L2)
KFxxx (KGxxx)

+STATE 2+4+7 — 001
-DM STATUS CHECK — KF200AC6
-DM INTERLOCK — KF200AE6
ZS10 OR FL S S A R A-A1M2

CARRIAGE GO HOME A
AE A GG03 — KH010 -CARRIAGE GO HOME A-
A-A1M2

CARRIAGE BIAS CONTROL
AG OR OR
+STATE 3 — KF070AD2
+STATE 7 — KF070AG2
+STATE 5 — KF070AL2
-PWR ON RESET — KA040AP2
+DM REZERO A — KF040AF2 — ZJ12
-STATE 2 — KF080AR5
-STATE 1+4 — KF020AB2
+CARRIAGE HOME A — KP010DD6 — ZS05
+BIAS DISABLE SW A — KP010EF4 — ZS04
-STATE 0 — KF080AR3
-STOP RECYCLE — KF090AM4
ZS04 A-A1M2
+DM MOTOR LATCH — KF100AF2

A1D2
KK006
MST L INBUS BIT 6 AA OR *
NPL INBUS BIT 6 AB AR A U
ZJ02 AR A M03 — WL020 +NPL INBUS BIT 6-
ZB05 OR ZD09 A-A1D2
D
DOT
1
+INTERFACE SENSE BIT 6 — KA110AL2
+HAR DIFF CTR STAT 6A — KB090AG6
+HAR DIFF CTR STAT 6B — KC090AG6
+TARGET STATUS BIT 6A — KD200AG2
+TARGET STATUS BIT 6B — KD200AR2
+DM STATUS BIT 6A — KF210AD2
+DM STATUS BIT 6B — KG210AD2
+ACCESS*CHECK STATUS BIT 6 A — KH070AM2
+ACCESS*CHECK STATUS BIT 6 B — KJ070AM2
+RD*WR STATUS BIT 6 — KL020AK2
+CAR STATUS BIT 6 — KM050AJ2
+DM SW STATUS 6A — KF120AT2
+DM SW STATUS 6B — KG120AT2
+SELECTED A — 001
+SELECTED B — 002

PWR RESET
AB
ZS10 N A-A1M2
+PWR RESET — KF080 KF090 KF100 KF130 KF180 KF220 — AE2

A
DM SW STATUS 6A
AC
-SENSE STATUS 3 — KA090AC6
+SELECTED A — KK040AK2
ZB10 A OR DD9
ZJ07
ZS05 A-A1M2
KK006 +DM SW STATUS 6A — AT2

CARRIAGE HOME
AA
ZS05 N A-A1M2
-CARRIAGE HOME — KF040 KF060 KF140 — AD2

DM MOTOR PWR A
AD
ZS05 AR A OR M09 A-A1M2
KP010 +DM MOTOR PWR A — AK2

SENSE L 2OR1 BIT 6
AB
-SENSE STATUS 2 — KA090AB6
+BIAS DISABLE SW A — KP010EF4
ZG12 OR ZS04
-SENSE STATUS 1 — KA090AA6
-DM SIZE 2 BIT — 001
ZG13 A-A1M2

DM STATUS BIT 6A
AC
+SELECTED A — KK040AK2
ZJ07 A OR D09 A-A1M2
F
KK006 +DM STATUS BIT 6A — AD2 — 1

SELECTED
AA
ZJ07 N A-A1M2
-SELECTED — KF090 KF120 — AC2

Note:

1 *Photo Cell output:*
Home position = more positive than –2.45 Vdc.
Not Home position = more negative than –2.75 Vdc.

DH0109	2747631	440202	440203	440205	440214			
Seq. 1 of 2	Part No. ( )	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74			

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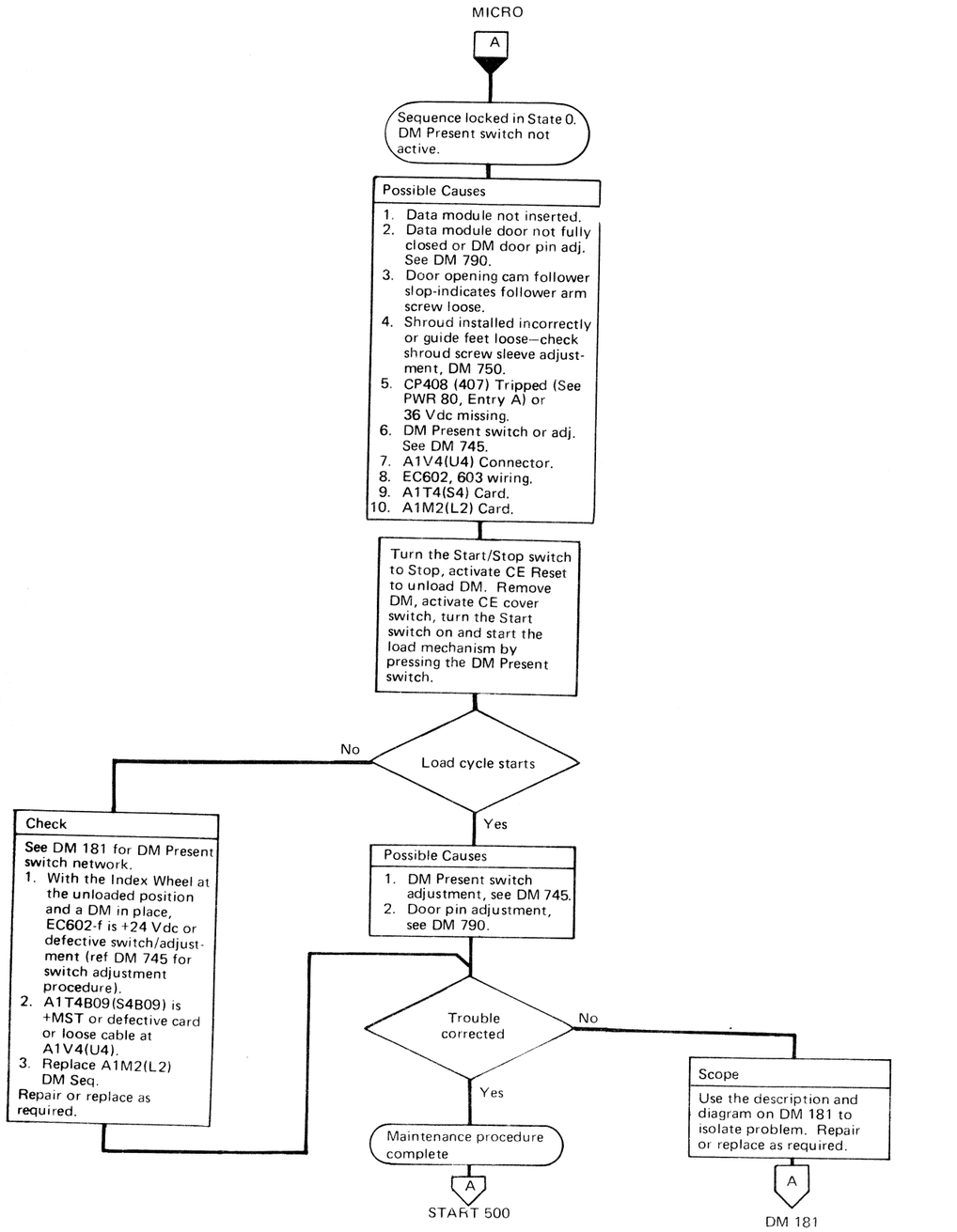
DM PRESENT SWITCH CONTROLS



DH0109	2747631	440202	440203	440205	440214			
Seq. 2 of 2	Part No. ( )	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74			

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DM 180
A

MICRO 37

Microdiagnostics

Run Routine 84

1. Load routine 84
2. Enter 10, 83, 00, 8F, 23, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00

KK005

Scope

Sweep 2 μs/div
Trigger
Slope (+)
A1D2B05 (D2D09)
(+ Selected)
CH1 A1M2B10 (L2B10)
(–Sense Status 3)
Volts/Div 0.1
Probe X10
CH2 A1D2U12
(+NPL inbus Bit 1)
Volts/Div 0.2
Probe X10

B
A
C

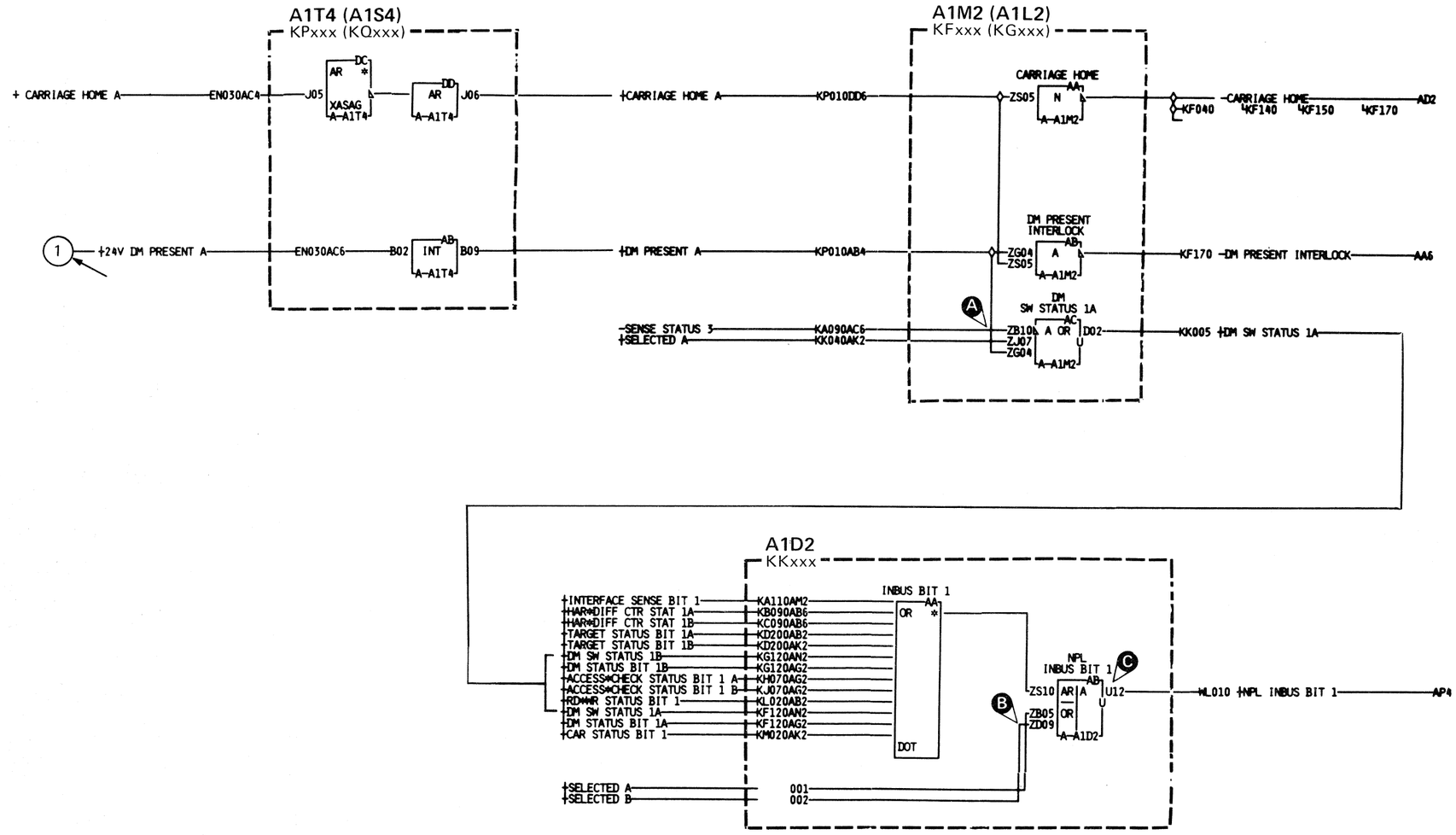
Check

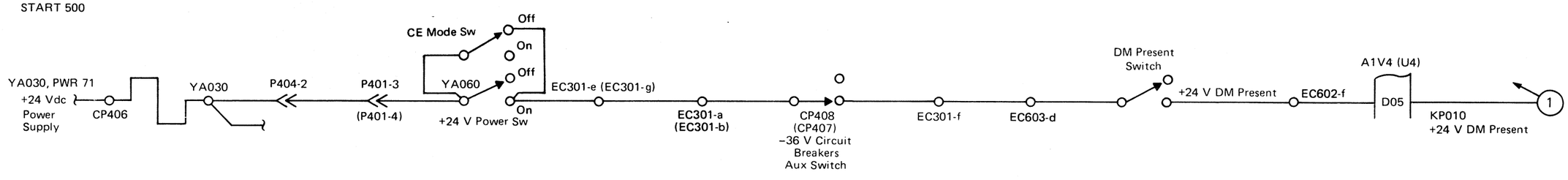
A1D2U12 should have a +NPL pulse.
Trace circuit to find problem.

Trouble Corrected
No
Yes

A
START 500

A
DM 600





3340	DH0110 Seq. 1 of 2	2747218 Part No. (0)	440200 25 Jun 73	440202 7 Sept 73	440203 2 Nov 73	440205 28 Jan 74	440214 17 Jun 74	440241 30 Oct 78	

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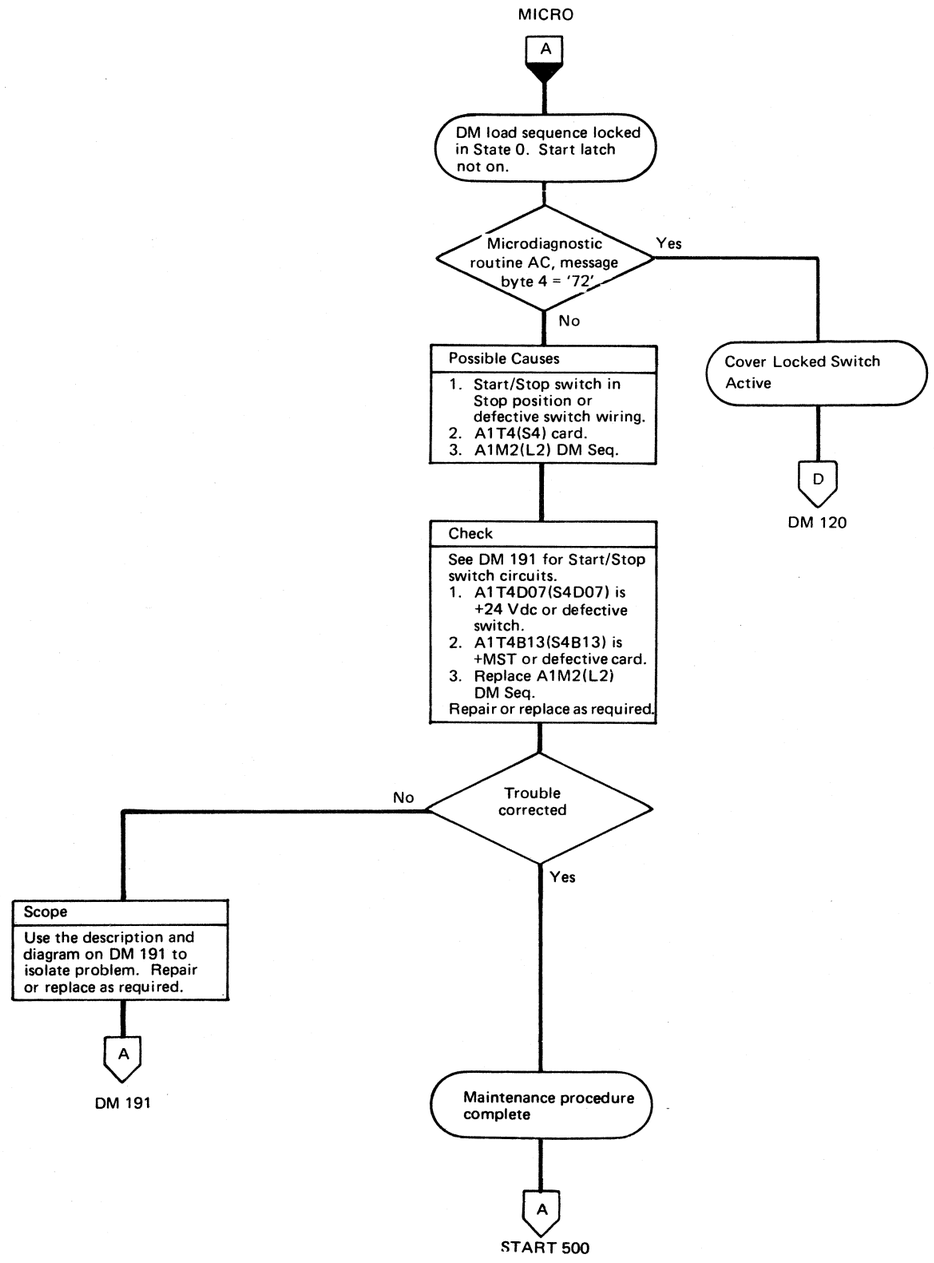
DM START/STOP SWITCH CONTROLS



DH0110	2747218	440200	440202	440203	440205	440214	440241	
Seq. 2 of 2	Part No. ( )	25 Jun 73	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	30 Oct 78	

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DM START/STOP SWITCH CONTROLS

DM 190

A

MICRO 37

Microdiagnostics

Run Routine B4

1. Load Routine B4
2. Enter 10,83,00,8F,23, 00,00,00,00,00,00,00, 00,00,00,00,00

KK005

Scope

Sweep 2 μs/div

Trigger
Slope (+)
A1D2B05 (D2D09)
(+Selected) C

CH1 A1M2B10 (L2B10)
(–Sense Status 3)
volts/div 0.1
probe X10 B

CH2 A1D2M09
(+NPL inbus bit 0)
volts/div 0.2
probe X10 D

Check

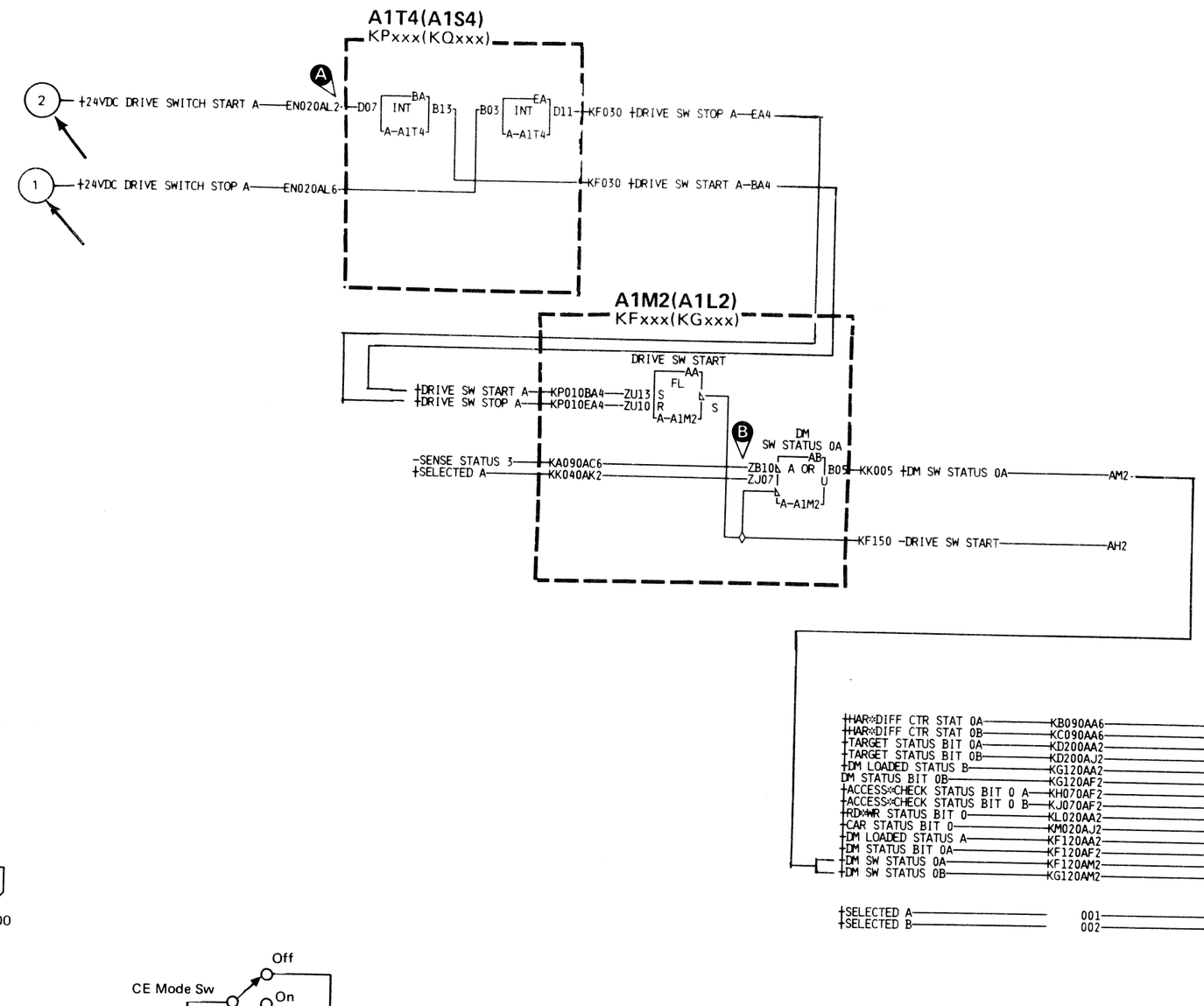
If A1T4D07 is +24 Vdc, A1D2M09 should have a +NPL pulse. A D

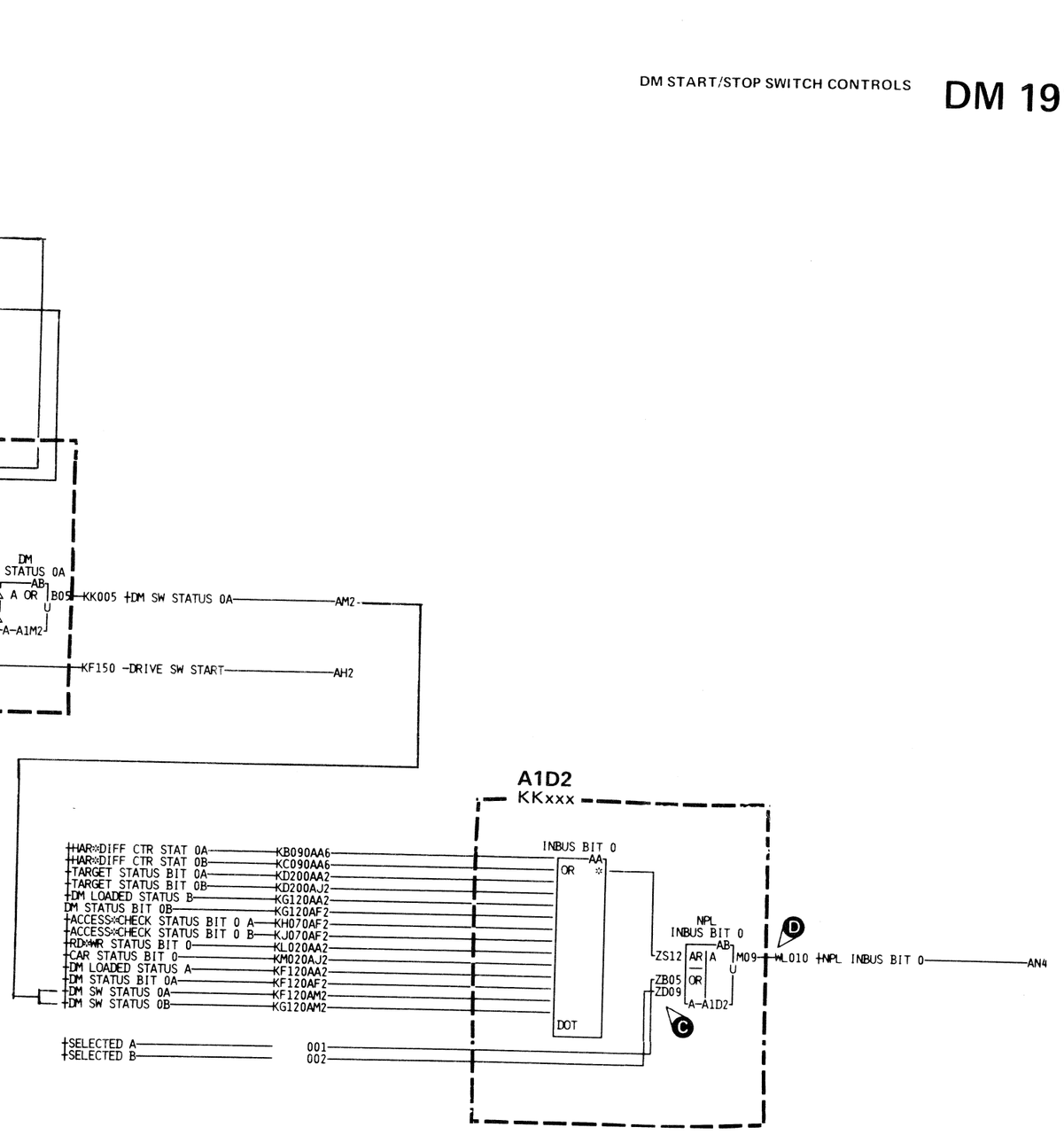
Trace circuit and isolate problem.

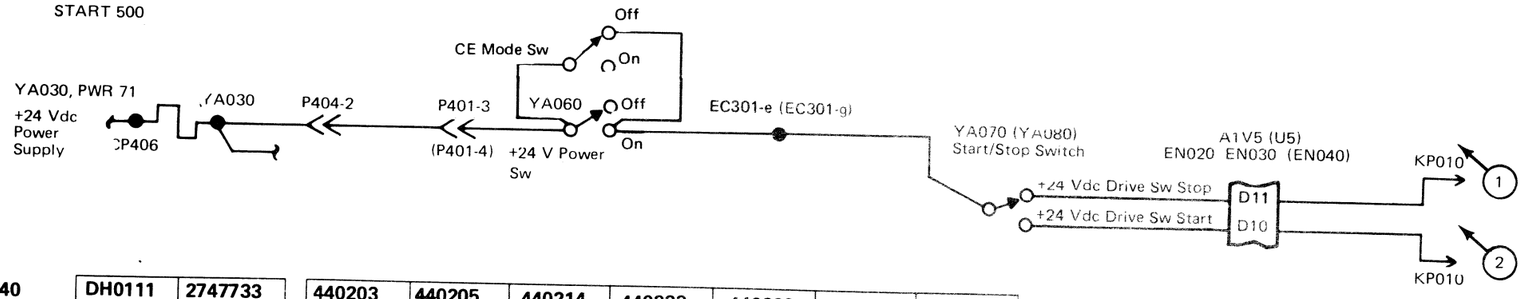
Trouble Corrected

No → A → DM 600

Yes → A → START 500







DH0111	2747733	440203	440205	440214	440223	440228		
Seq. 1 of 2	Part No. (0)	2 Nov 73	28 Jan 74	17 Jun 74	14 Mar 75	29 Oct 76		

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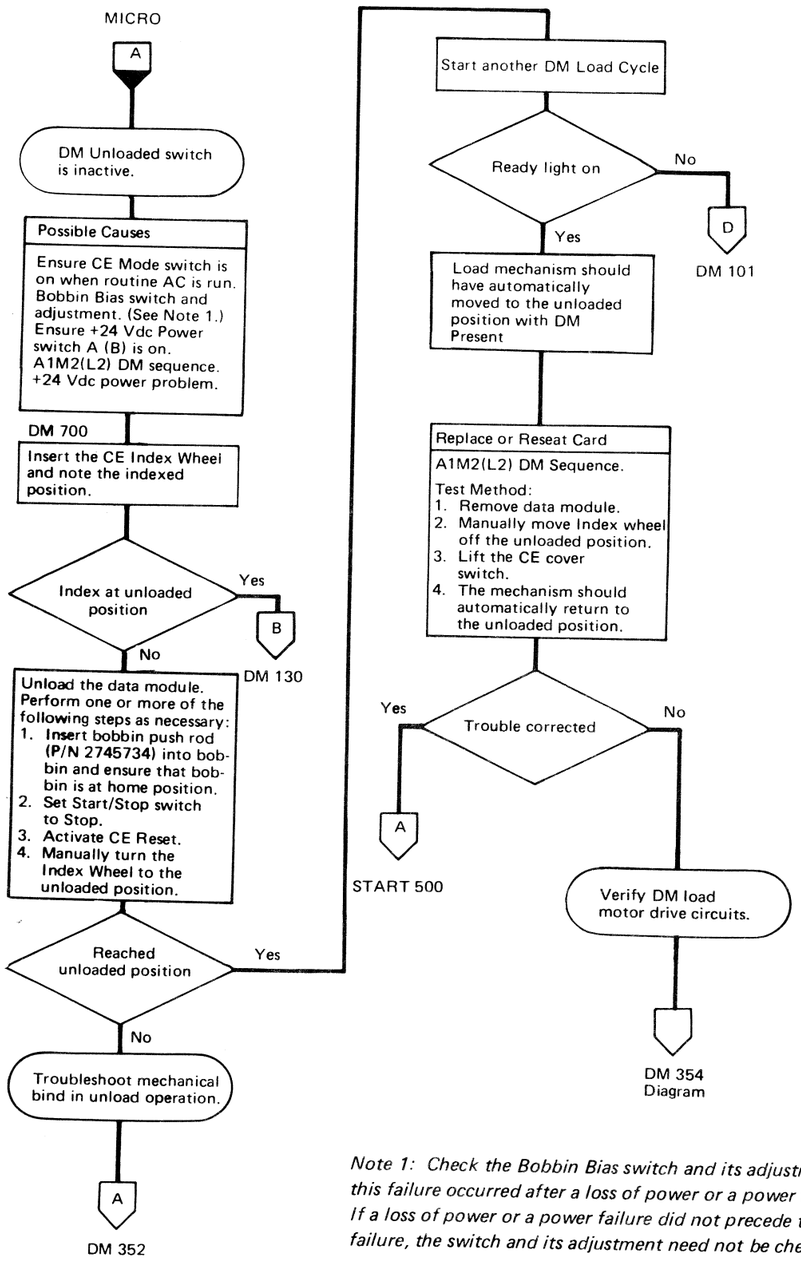
DM SEQUENCE ERROR IN STATE 0 – INITIAL CONDITIONS

For data module load theory, refer to DM 650, DM 655, and DM 206.



Note 1: Check the Bobbin Bias switch and its adjustment if this failure occurred after a loss of power or a power failure. If a loss of power or a power failure did not precede this failure, the switch and its adjustment need not be checked.

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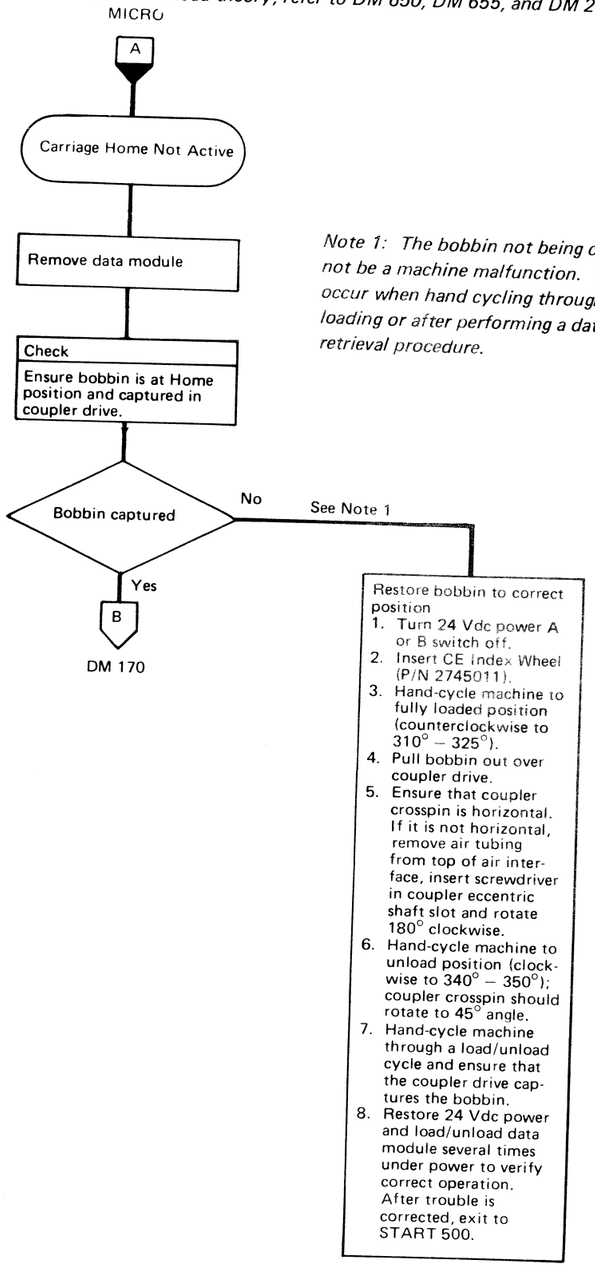
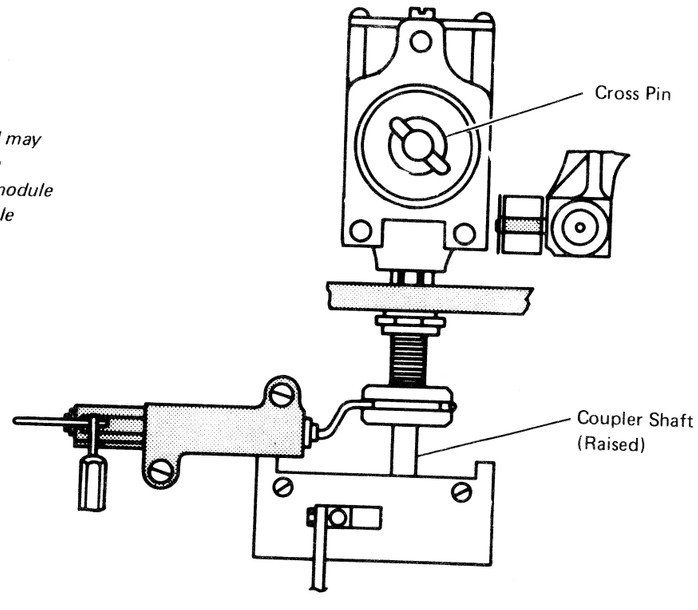
DM SEQUENCE ERROR IN STATE 0 – INITIAL CONDITIONS

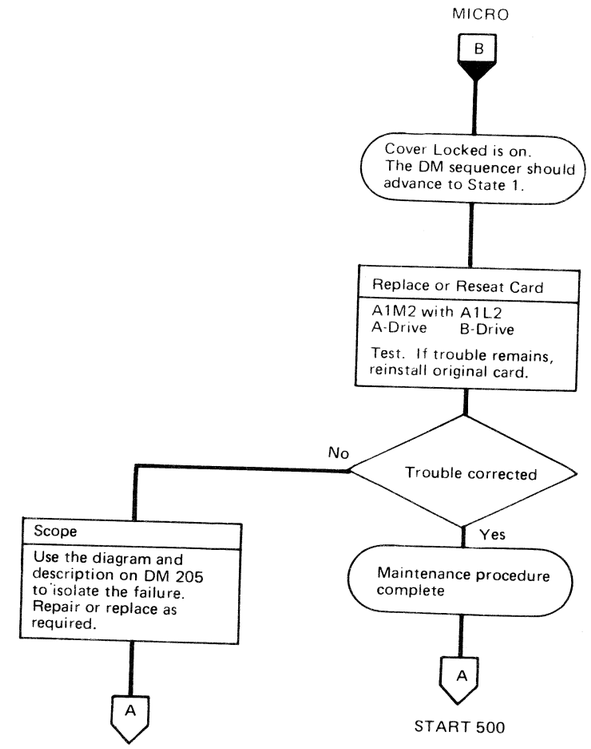
For data module load theory, refer to DM 650, DM 655, and DM 206.



Note 1: The bobbin not being captured may not be a machine malfunction. This can occur when hand cycling through data module loading or after performing a data module retrieval procedure.

Coupling Assembly at 260°





DH0112	2747219
Seq. 1 of 2	Part No. (P)

440200	440202	440203	440205	440214	440228	
25 Jun 73	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	29 Oct 76	

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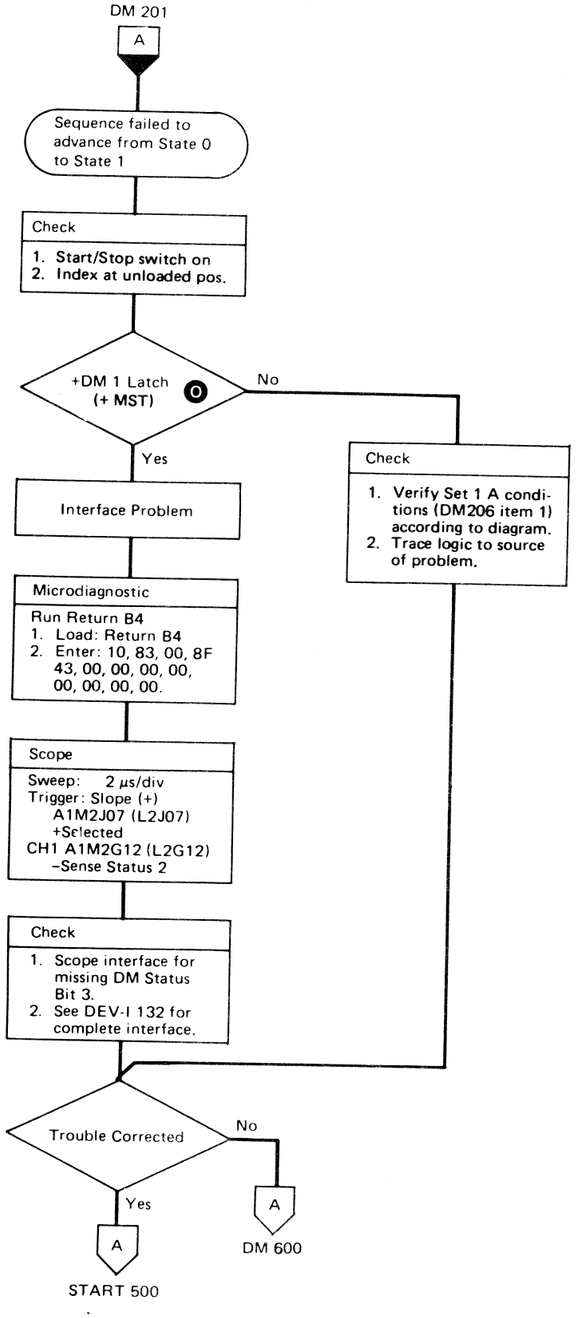
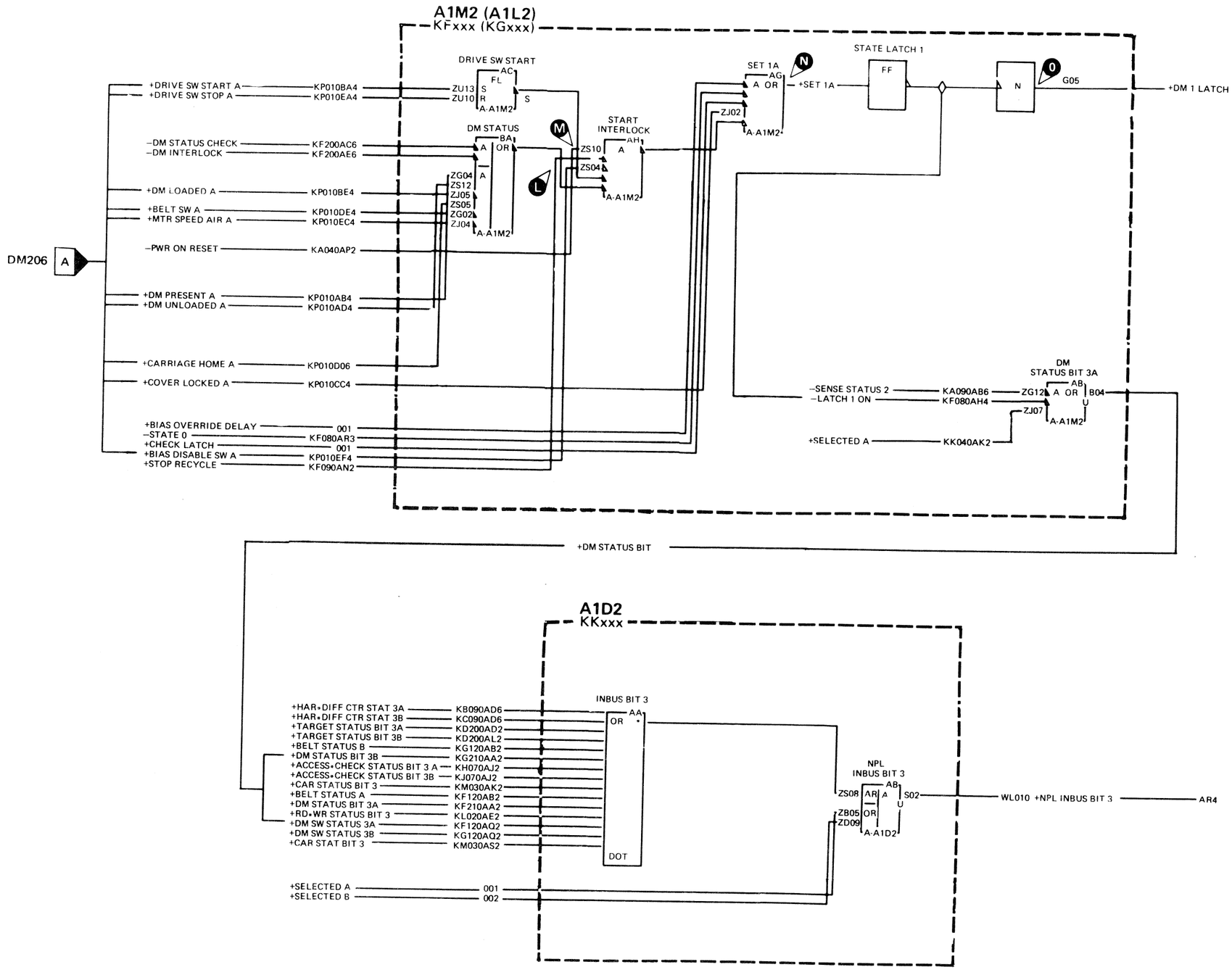
DM SEQUENCE LOCKED IN STATE 0





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DM SEQUENCE LOCKED IN STATE 0 (Continued)

(Mechanical Timing Chart DM 640)

ADVANCE FROM STATE 0 TO STATE 1

In State 0, the following occurs:

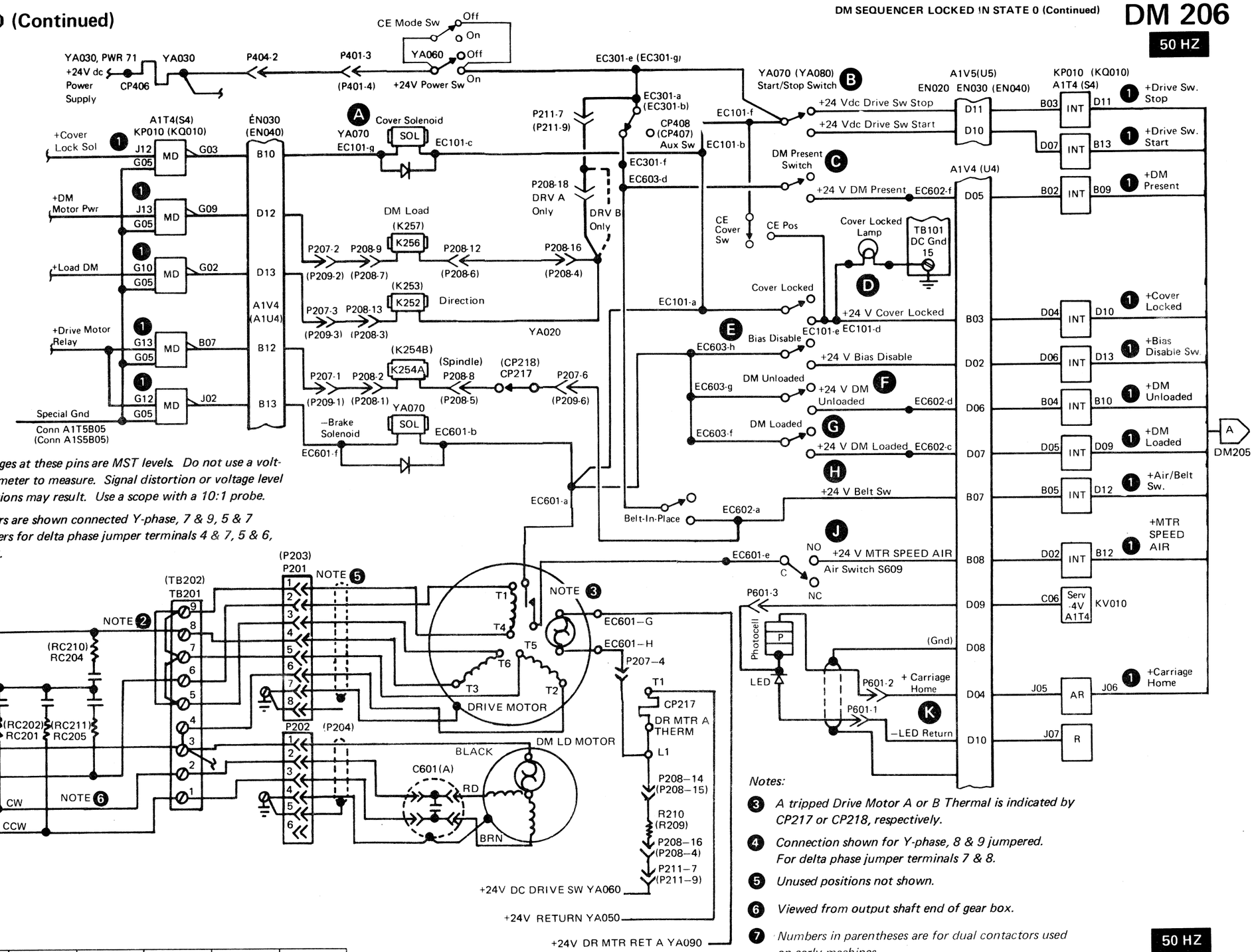
DM Sequence Reset to State 0 by Power On Reset (M) (DM 205) or completion of DM Unload.
With DM inserted and cover closed, loading begins when Start/Stop switch is placed in START position.

1. Set 1A Conditions (N) (DM 205) are:

- Start/Stop switch in START position (B)
- DM Present closed (C).
- DM Unloaded closed (F).
- Belt open (H).
- DM Loaded open (G).
- Carriage at Home (K). (See Note 1 DM 321).
- MTR Speed Air open (J).
- Bias Disable open (E).
- Stop Recycle off (L) (DM 205).
- Not Power On Reset (M) (DM 205).

2. Step to State 1:

- Cover locks by energizing solenoid (A).
- Sets 1A latch (N) (DM 205).
- Cover Locked switch transfers and lights the Cover Locked lamp (D).
- State decoder advances to State 1.



Notes:

1. *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*
2. *Motors are shown connected Y-phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*
3. *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218, respectively.*
4. *Connection shown for Y-phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*
5. *Unused positions not shown.*
6. *Viewed from output shaft end of gear box.*
7. *Numbers in parentheses are for dual contactors used on early machines.*

DH0113	2747813	440205	440214	440220	440223	440228	440241	
Seq. 1 of 2	Part No. (7)	28 Jan 74	17 Jun 74	17 Oct 74	14 Mar 75	29 Oct 76	30 Oct 78	

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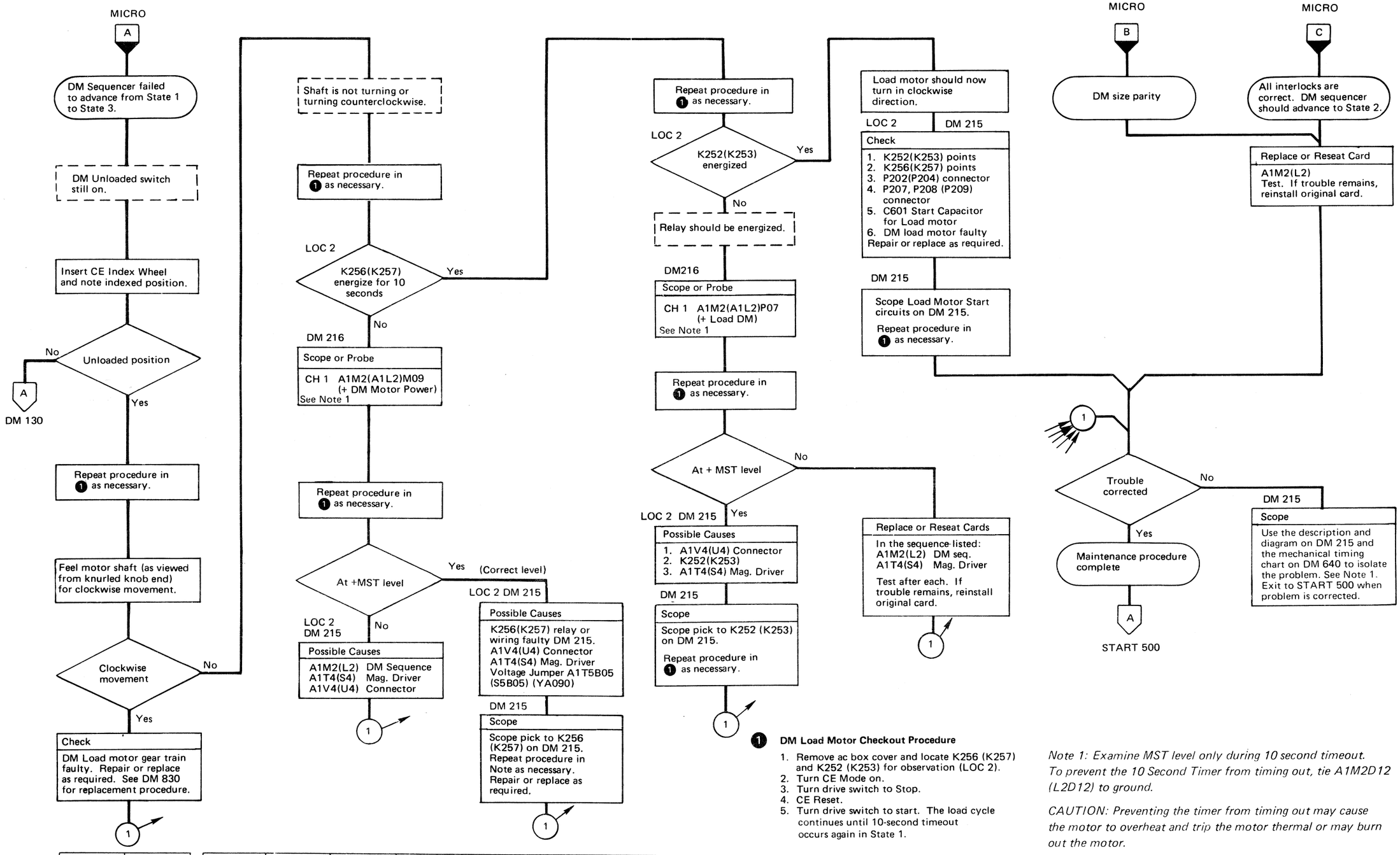
DM SEQUENCE ERROR IN STATE 1

For data module load theory, refer to DM 620, DM 650, DM 655, and DM 215.



1 DM Load Motor Checkout Procedure

1. Remove ac box cover and locate K256 (K257) and K252 (K253) for observation (LOC 2).
2. Turn CE Mode on.
3. Turn drive switch to Stop.
4. CE Reset.
5. Turn drive switch to start. The load cycle continues until 10-second timeout occurs again in State 1.

Note 1: Examine MST level only during 10 second timeout. To prevent the 10 Second Timer from timing out, tie A1M2D12 (L2D12) to ground.

CAUTION: Preventing the timer from timing out may cause the motor to overheat and trip the motor thermal or may burn out the motor.

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DM SEQUENCE ERROR IN STATE 1

For data module load theory, refer to DM 620, DM 650, DM 655, and DM 215.

MICRO

A

Both DM Loaded and DM Unloaded switches are open.

Insert CE Index Wheel on machine. It should be at the loaded position (315°).

Index at loaded position (315°)

Yes

DM Loaded switch is open.

Possible Causes

1. DM Loaded SW.
2. A1T4(S4) Int.
3. A1M2(L2) DM Seq.

LOC 2
DM 215
DM 217

Note

Check

See (H) on DM 215 for DM Loaded Sw Network

1. EC 602-c is +24 Vdc or defective switch or EC wiring.
2. A1T4D05 (S4D05) is +24 Vdc or open cable.
3. A1T4D09 (S4D09) is +MST or defective card.
4. Replace A1M2(L2)

Trouble corrected

Yes

Remove CE Index Wheel

Maintenance procedure complete

A

START 500

No

DM 215

Scope

Use the description and diagram on DM 215 to isolate the problem. Troubleshoot back on A1T4(S4) D08 (–DM Loaded). Exit to START 500 when problem is corrected.

No

DM 100

C

Mechanical bind is indicated.

DM load motor may coast backward after timeout occurs. Note position of Index Wheel and then turn wheel in load direction (counterclockwise)*until it stops. Check Index.

Index is between 0° and 80°

Yes

No

Index is between 80° and 200°

Yes

A

DM 212

No

Index is between 200° and 310°

Yes

B

DM 213

No

Index is between 310° and 325°.

C

DM 213

DM 410

DM unloaded switch is open; indicates that the load cycle started.

During this portion of the load cycle, the load cart starts forward, the load bail moves toward the load beam to capture the data module and the door cart moves to open the data module door. See timing chart DM 640 and theory DM 620.

Remove data module (see Note). Remove shroud (see DM 705).

Index wheel can be turned to 50°

No

Yes

Distance between bail and load beam screw (see DM 785) should be at least 3/16" (4,7). Check with index at 50° while pushing bail towards VCM.

Above conditions correct

Yes

No

Bail clamping too tight on DM load pin

Check load beam adjustment, DM 785, and then form bail for clearance of 1/4" (6,4) to 5/16" (8,2) between bail and load beam screw. If unable to perform adjustment or obtain clearance, replace Load Cart assembly (see DM 850).

Index wheel can be turned to 80°

No

Yes

Load cycle only stops with data module in drive.

DM 400

Check

1. Data module guide feet screws loose.
2. Shroud installed incorrectly or needs adjustment of shroud screw sleeves, DM 750.
3. Try another data module – if it works correctly, check original data module for a bind in door hardware.

Trouble corrected

No

Yes

Maintenance procedure complete

A

START 500

DM 410

Check

1. Check for binds, loose or missing screws, or missing C-clips in path of main cam or cam followers; or loose cam follower bearings. See DM 855 for removal.
2. Binding load cart or toggle – check that slide rails and pins are in their correct position. C-clips are installed, and set screws are tight. See DM 855 for removal.
3. Door opening assembly – check for binds in door link pivot, or binding door cart rollers, or missing door cart pin.
4. Bind in load motor assembly. Remove to check.

Repair or replace as required.

Remove CE Index Wheel

Trouble corrected

No

Yes

A

START 500

A

DM 400

MICRO

B

Belt switch not active, DM Loaded switch active

Insert CE Index Wheel on machine. It should be at the loaded position (315°).

Index at loaded position (315°)

No

Yes

Belt not on

Remove DM (see Note). Remove shroud (see DM 705).

LOC 2
DM 215

LOC 6

Possible Causes

1. Spindle motor belt off. Check motor plate mounting rollers.
2. Belt-in-Place Switch (DM 735).
3. Motor plate tension spring loose.
4. Belt tension spring.
5. A1V4(U4) Connector.
6. Blower Motor or Thermal Tripped (Note 2, DM 215) or ac wiring.
7. EC 602 or EC 603 wiring.
8. A1T4(S4) A1M2(L2).

Reload data module to failing condition.

DM 215

Scope

Scope back from A1T4(S4) D12 (Belt) on DM 215 to isolate problem.

Maintenance procedure completed

A

START 500

Loaded Switch making early.

Remove DM (see Note). Remove shroud (see DM 705).

Check

DM Loaded switch adjustment on DM 730. Repair or replace as required. Switch may be bouncing.

Trouble corrected

Yes

No

DM 215

Scope

Use the description and diagram on DM 215 to isolate the problem. Exit to START 500 when problem is corrected.

Note: Turn Start/Stop switch off. If not unloaded, use CE Reset. If it still does not unload, use knurled knob on DM load motor or CE hand Index Wheel to unload data module. Refer to DM 500 if unable to remove data module. Remove shroud (DM 705) to check mechanical items. See LOC 6 for component locations.

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DM SEQUENCE ERROR IN STATE 1

For data module load theory, refer to DM 620, DM 650, DM 655, and DM 215.

In this part of the cycle the load cart moves the data module forward to engage the data module cone with the alignment ball. The air interface is sealed and the data module connector mated. The belt idlers are retracted and the drive motor is pulled toward the VCM. See timing chart DM 640 and load theory DM 620.

DM 211

A

Load cycle stops between 80° – 200° (See Load Check-out Procedure, DM 410.)

Index is between 80° – 90°? Yes

Index is between 90° – 110°? Yes

Index is between 110° – 130°? Yes

Index is between 130° – 200°

A

DM 213

DM cone should engage with alignment bail

CAUTION

Turn +24 V power switch off and open top cover.

Check

1. Check to ensure data module is not stalling load motor because of Read Only interlock Plug inserted incorrectly.
2. If interference on Read Only switch assembly, check adjustment DM 740.
3. Check for tilted DM connector.

Open top cover and observe area around Read Only interlock plug

Check

1. Motor belt is in place.
2. Idler wheels are free.
3. Idler wheel retainer spring is in place.
4. Motor plate is free of binds.

Repair or replace as required.

Trouble corrected? Yes → 1

No

Remove data module, DM shroud, and lower trim panel. (See note.)

Trouble corrected? Yes → 1

No → 2

CAUTION

Turn 24 Vdc Power switch off.

Determine if DM door is open as viewed with the front top cover open.

DM door opened? Yes

No

Turn CE index toward 0° – remove data module

DM 400

Check

1. Inspect door opening holes in data module for excessive wear or breakage.
2. See load cart travel adjustment DM 780.
3. Door pins too far from VCM. See DM 790.
4. Shroud too high or needs adjustment of shroud screw (DM 750).
5. Check door cart operation, door link assembly. Check for missing pins or defective door cart rollers or binds, door pin adjustment (DM 400).
6. DM present switch assembly too high – See adjustment DM 745.

Repair or replace as required.

Remove data module using CE Index wheel (see Note).

Check

Shroud installed incorrectly or needs adjustment of shroud screw sleeves DM 750.
Repair or replace as required.

Trouble corrected? No

Yes

DM 213

B

Remove data module, DM shroud and lower trim panel. (See Note)

2

LOC 6
DM 400

Check

1. Check for binds, loose or missing screws, or missing C-clips in path of main cam or cam followers; or loose cam follower bearings. See DM 855 for removal.
2. Binding load cart or toggle. Check that slide rails and pins are in their correct position, C-clips are installed and set screws are tight. **See DM 860 for removal.**
3. Load motor binds.
4. Data module guide feet are binding. Check that screws are tight.
5. Shroud screw sleeve adjustment DM 750.

1

Remove CE index wheel

Trouble corrected? Yes

No

DM 400

Maintenance procedure complete

A

START 500

Note: Turn +24 Vdc power switch on. Turn Start/Stop switch off. If not unloaded, use knurled knob on DM load motor or CE hand Index Wheel to unload data module. See DM 500 if unable to remove data module. Remove shroud (see DM 705).

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See EC History	440224 15 Dec 75	440227 14 Sept 76	440228 29 Oct 76			

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DM SEQUENCE ERROR IN STATE 1

For data module load theory, refer to DM 620, DM 650, DM 655, and DM 215.

DM 211
DM 230

C

Index is between 310° and 325°

Remove data module (see Note).
Remove shroud and lower trim panels; see DM 705.

DM 212

A

Index between 130° – 200° or hand cycled to 310° – 325° from 130° – 200°

Remove data module
1. Turn off 24 Vdc power switch A or B.
2. Hand-cycle machine with index wheel to unloaded position (clockwise past 0° to 300° – 310°) and remove data module.
3. Remove shroud and lower trim panels; see DM 705

DM 400

Check
1. Belt idlers binding.
2. Motor plate binding on support rollers or pivot.

Repair or replace as required.

DM 420

Check

Hand-cycle machine through the load cycle using Index wheel. Ensure that the coupler eccentric shaft rotates 180°, that the coupler crosspin shaft rotates 45°, and that the crosspin is horizontal at the end of the load cycle. See Figure 1. Repair or replace as required.

Crosspin horizontal — Yes → DM 400 Check (1. Hand-cycle machine through several load and unload cycles. Look for binding in load bail mechanicsm and DM Load motor gear train. 2. Carriage latch actuator broken or needs adjustment; see DM 755. 3. Load bail and load beam adjustment; see DM 785. 4. Bobbin height adjustment, see DM 770. Refer to DM 400 for detailed checkout procedure. Repair or replace as required.)

No

Coupler eccentric shaft rotates 180° — Yes → Crosspin shaft in coupler is broken or damaged. Cause could be bobbin bias reversal problem. Replace bobbin (DM 845) and return here.

No

Mechanical bind

B

DM 212

Trouble corrected — Yes → 1

No

Possible Causes
1. DM Load motor
2. A1M2, Drive A
   A1L2, Drive B
   (Timer pulse less than 9.5 seconds)

Refer to the description and theory on the DM 610 pages to help analyze the problem.

1

With power off, use following procedure to bring data module to Ready.
1. Hand-cycle main cam to unloaded position.
2. Insert data module and hand-cycle to loaded and coupled position.
3. Restore power to drive. Turn on +24 Vdc power switch. Turn Start/Stop switch to Start position.

Drives complete load cycle to Ready State 6.

MICRO 10

Microdiagnostic

Run Device Checkout Microdiagnostics. Start with routine A1. See MICRO 10 for instructions.

Failure — No → 1

Yes

Error Analysis

Exit to Error Code in MICRO section. Perform CE action for first error encountered.

MICRO

1

Maintenance procedure complete

A

START 500

DM 211

B

Index between 200° – 310°

During this part of the cycle, the load cart and toggle link finish their travel, the coupler rack starts forward and turns the coupler drive shaft 180°. This positions the coupler crosspin to the horizontal position and couples the bobbin to the carriage. The drive shaft is then pulled down to free the bobbin. The motor plate continues to advance to its final position. See DM 410-420.

Remove:
1. Data module (see Note).
2. Shroud and lower trim panel, DM 705.

Bind between 210° and 225°

Yes → Rack movement is probably prevented by the coupler drive being down and interlocked.

No (225° – 310°) → DM 400 DM 430

Check
1. Drive motor plate; C-clip missing from pivot; pivot binding; support rollers binding.
2. DM Load motor may have stalled while coupling bobbin to carriage. Check: DM Load motor or gear train.
3. Load beam adjustment; see DM 785.
4. Bobbin height adjustment; see DM 770.
5. Clip out of position on bottom carriage unlatch adjustment link; see DM 755.
6. Bind in main cam shaft assembly; see DM 855 for removal.
7. A1M2, Drive A; A1L2, Drive B (Timer pulse less than 9.5 seconds).

Repair or replace as required.

Use the description on DM 215 and refer to the mechanical timing chart on DM 640 to isolate the problem.

1

DM 775

Check
1. Coupler crank assembly or linkage loose or uncoupled.
2. Bind in air valves or air valve cables.
3. Crank assembly adjustment, DM 775.
4. Bind in rack and pinion for removal. See DM 840.

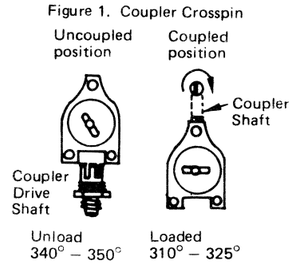
Replace or repair as required.

Trouble corrected — Yes → 1

No

Note: Turn the Start/Stop switch to Stop. If the data module is not unloaded, unload by: CE Reset knurled knob on DM Load motor index wheel. Remove shroud (DM 705) to check mechanical items. See DM 500 if unable to remove data module. See LOC 6 for component locations.

Figure 1. Coupler Crosspin



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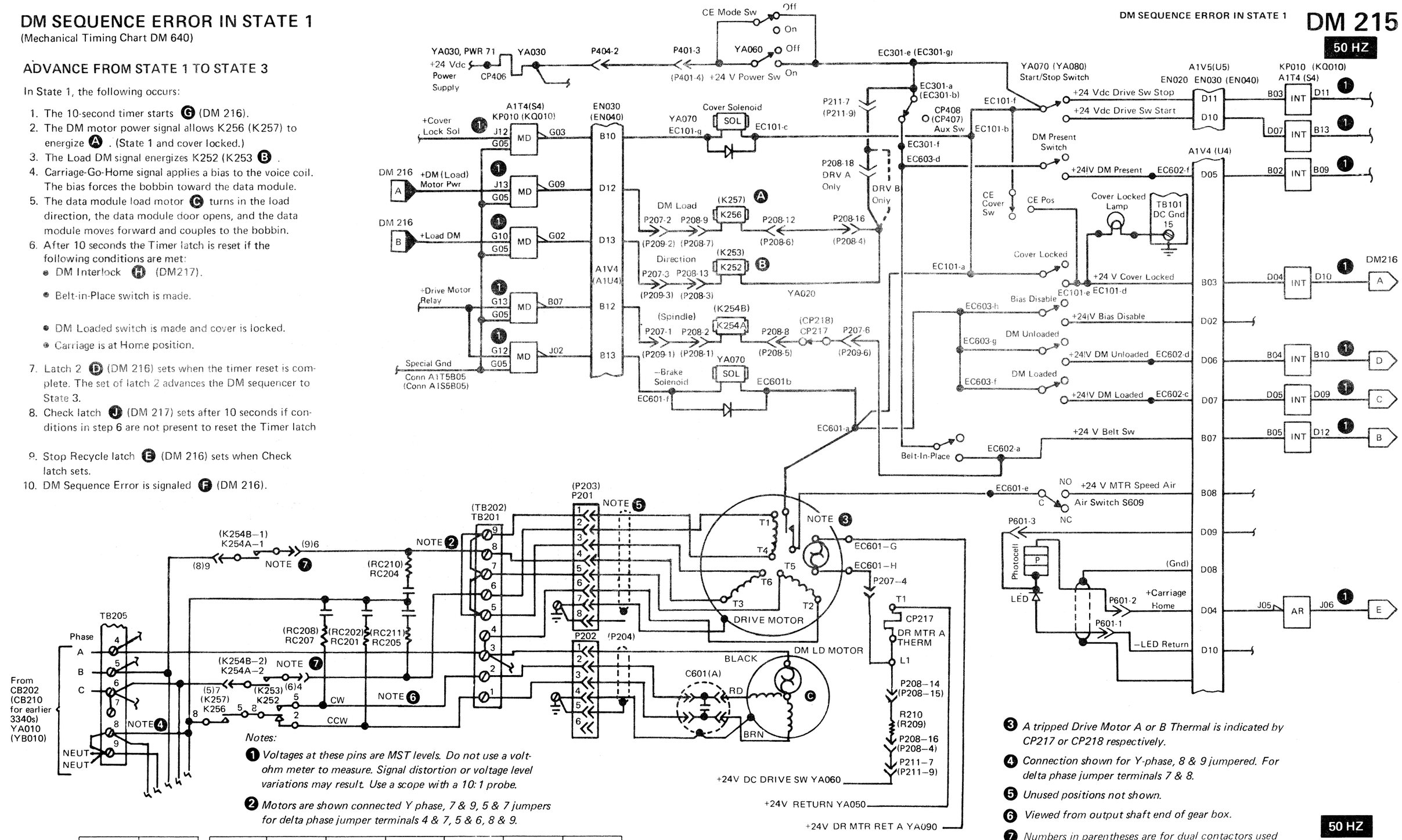
DM SEQUENCE ERROR IN STATE 1

(Mechanical Timing Chart DM 640)

ADVANCE FROM STATE 1 TO STATE 3

In State 1, the following occurs:

1. The 10-second timer starts (G) (DM 216).
2. The DM motor power signal allows K256 (K257) to energize (A). (State 1 and cover locked.)
3. The Load DM signal energizes K252 (K253 (B).
4. Carriage-Go-Home signal applies a bias to the voice coil. The bias forces the bobbin toward the data module.
5. The data module load motor (C) turns in the load direction, the data module door opens, and the data module moves forward and couples to the bobbin.
6. After 10 seconds the Timer latch is reset if the following conditions are met:
   - DM Interlock (H) (DM217).
   - Belt-in-Place switch is made.
   - DM Loaded switch is made and cover is locked.
   - Carriage is at Home position.
7. Latch 2 (D) (DM 216) sets when the timer reset is complete. The set of latch 2 advances the DM sequencer to State 3.
8. Check latch (J) (DM 217) sets after 10 seconds if conditions in step 6 are not present to reset the Timer latch
9. Stop Recycle latch (E) (DM 216) sets when Check latch sets.
10. DM Sequence Error is signaled (F) (DM 216).



Notes:

1. *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*
2. *Motors are shown connected Y phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*
3. *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218 respectively.*
4. *Connection shown for Y-phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*
5. *Unused positions not shown.*
6. *Viewed from output shaft end of gear box.*
7. *Numbers in parentheses are for dual contactors used on early machines.*

DH0131	2747814	440205	440211	440220	440227	440228	440241	
Seq. 1 of 2	Part No. (7)	28 Jan 74	22 Apr 74	17 Oct 74	14 Sept 76	29 Oct 76	**30 Oct 78**	

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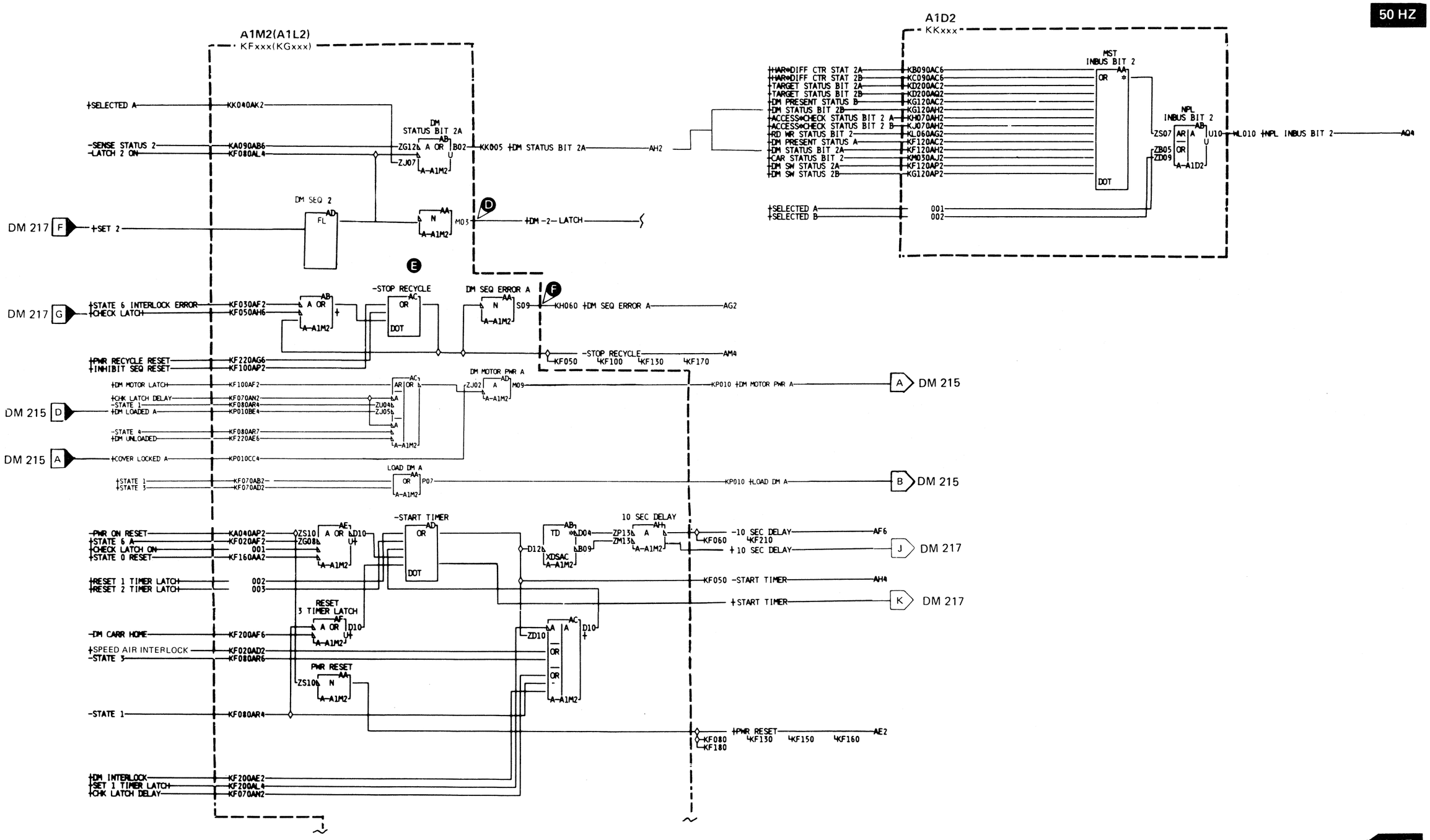
DM SEQUENCE ERROR IN STATE 1
50 HZ
DM 215

DM SEQUENCE ERROR IN STATE 1 (Continued)



DH0131 Seq. 2 of 2	2747814 Part No. (7)

440205 28 Jan 74	440211 22 Apr 74	440220 17 Oct 74	440227 14 Sept 76	440228 29 Oct 76	440241 30 Oct 78	

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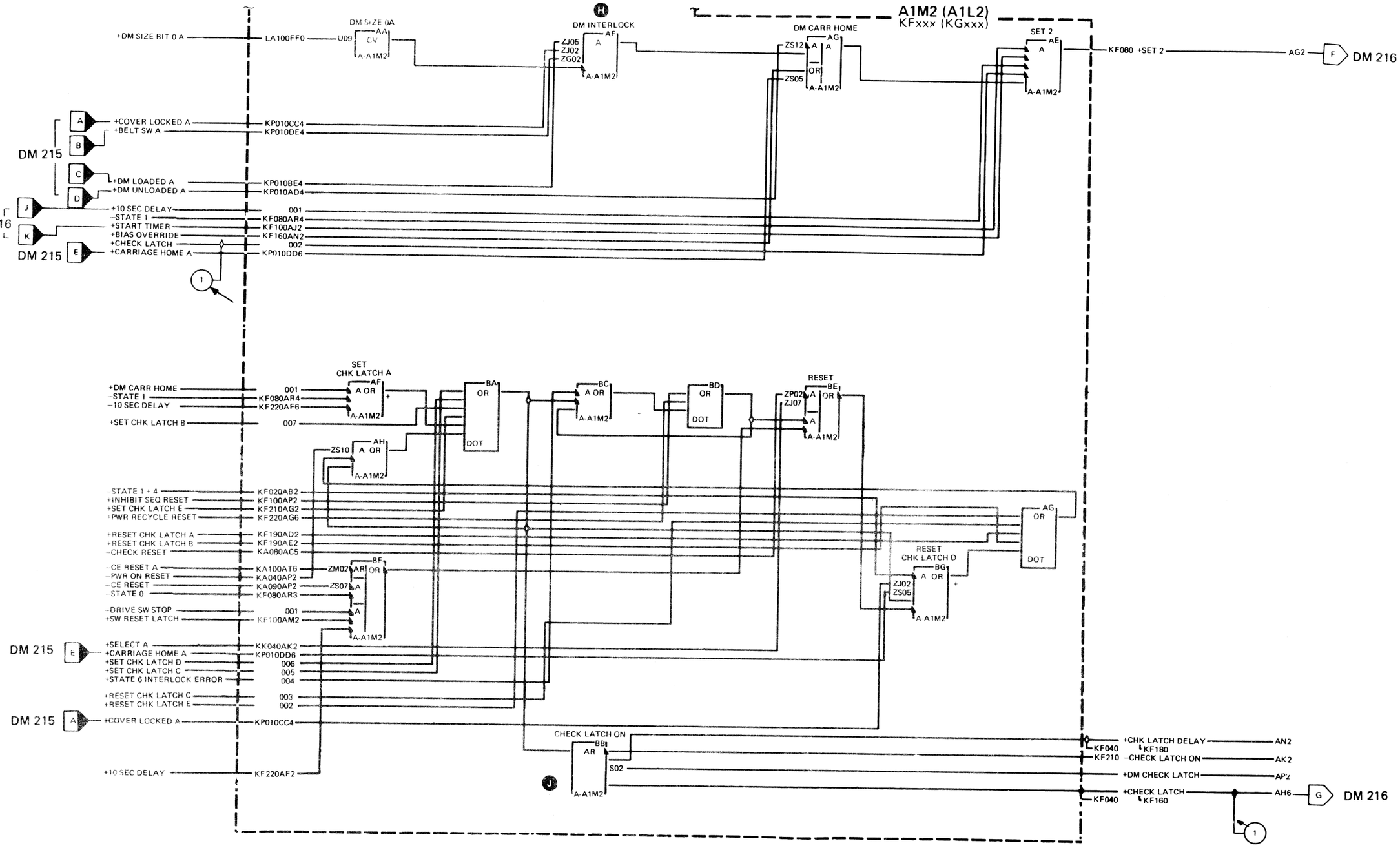
DM SEQUENCE ERROR IN STATE 1 (Continued)

DM 217



DH0132	2747633
Seq. 1 of 2	Part No. (P)

440202	440203	440205	440214	440227	440228
7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	14 Sept 76	29 Oct 76

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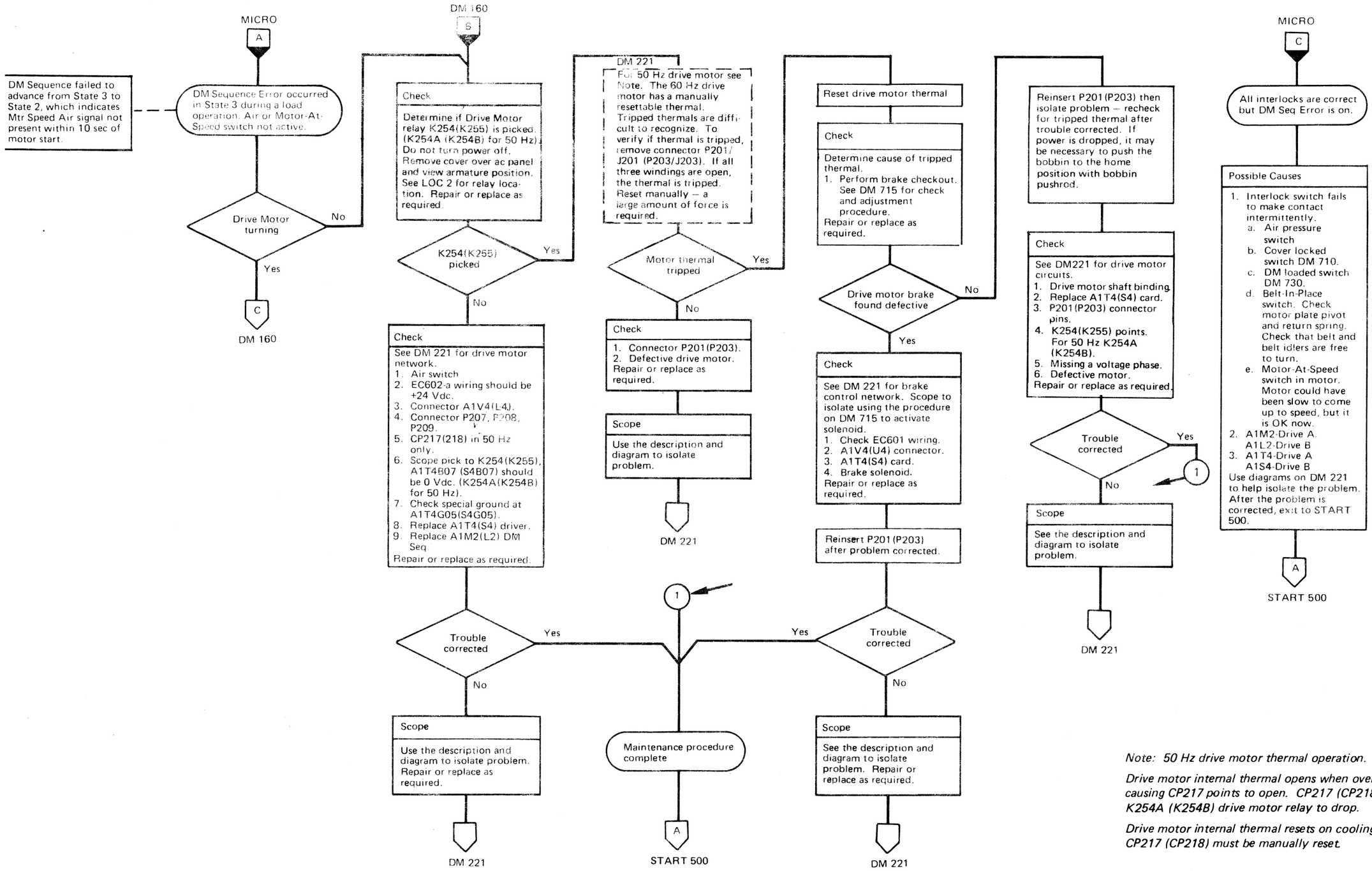
DM LOAD – SEQUENCE ERROR IN STATE 3

For data module load theory, refer to DM 656, DM 652, and DM 221.



Note: 50 Hz drive motor thermal operation.

Drive motor internal thermal opens when overheated, causing CP217 points to open. CP217 (CP218) causes K254A (K254B) drive motor relay to drop.

Drive motor internal thermal resets on cooling. CP217 (CP218) must be manually reset.

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DM SEQUENCE ERROR IN STATE 3

(Mechanical Timing Chart DM 640)

ADVANCE FROM STATE 3 TO STATE 2

In State 3 the following occurs:

1. The 10-second timer (E) is started (DM 222).
2. The brake solenoid (B) is energized, releasing the brake. (Drive Motor Relay Signal)
3. Relay K254A (K254B) (A) is energized (Drive Motor Relay signal).
4. The spindle motor starts (C)
5. MTR Speed Air switch (D) makes as motor approaches full speed.
6. At the end of 10 seconds, the Timer latch (E) is reset. (Speed Air Interlock) (DM 222).
7. Latch 1 (I) resets advancing sequencer to State 2 (DM 223).
8. Check latch (F) sets at the end of the 10-sec delay if motor-at-speed switch is not made (DM 222).
9. Stop Recycle latch (H) sets when the Check latch sets (DM 222).
10. DM Sequence Error (G) is signaled (DM 222).

Notes:

(1) *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*

(2) *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218, respectively.*

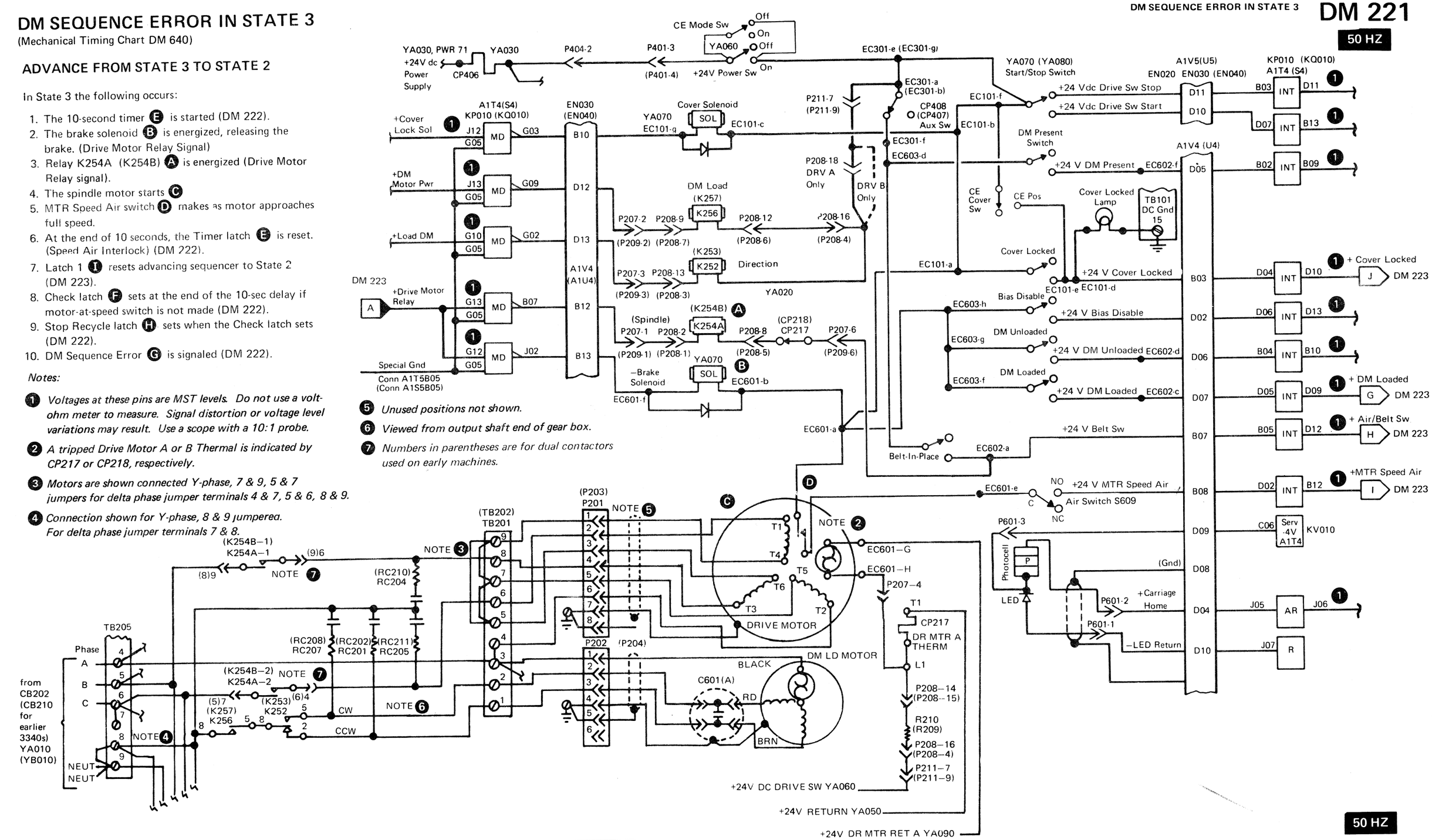
(3) *Motors are shown connected Y-phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*

(4) *Connection shown for Y-phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*

(5) *Unused positions not shown.*

(6) *Viewed from output shaft end of gear box.*

(7) *Numbers in parentheses are for dual contactors used on early machines.*



DH0135 Seq. 1 of 2	2747815 Part No. (7)	440205 28 Jan 74	440214 17 Jun 74	440220 17 Oct 74	440227 14 Sept 76	440228 29 Oct 76	440241 30 Oct 78	

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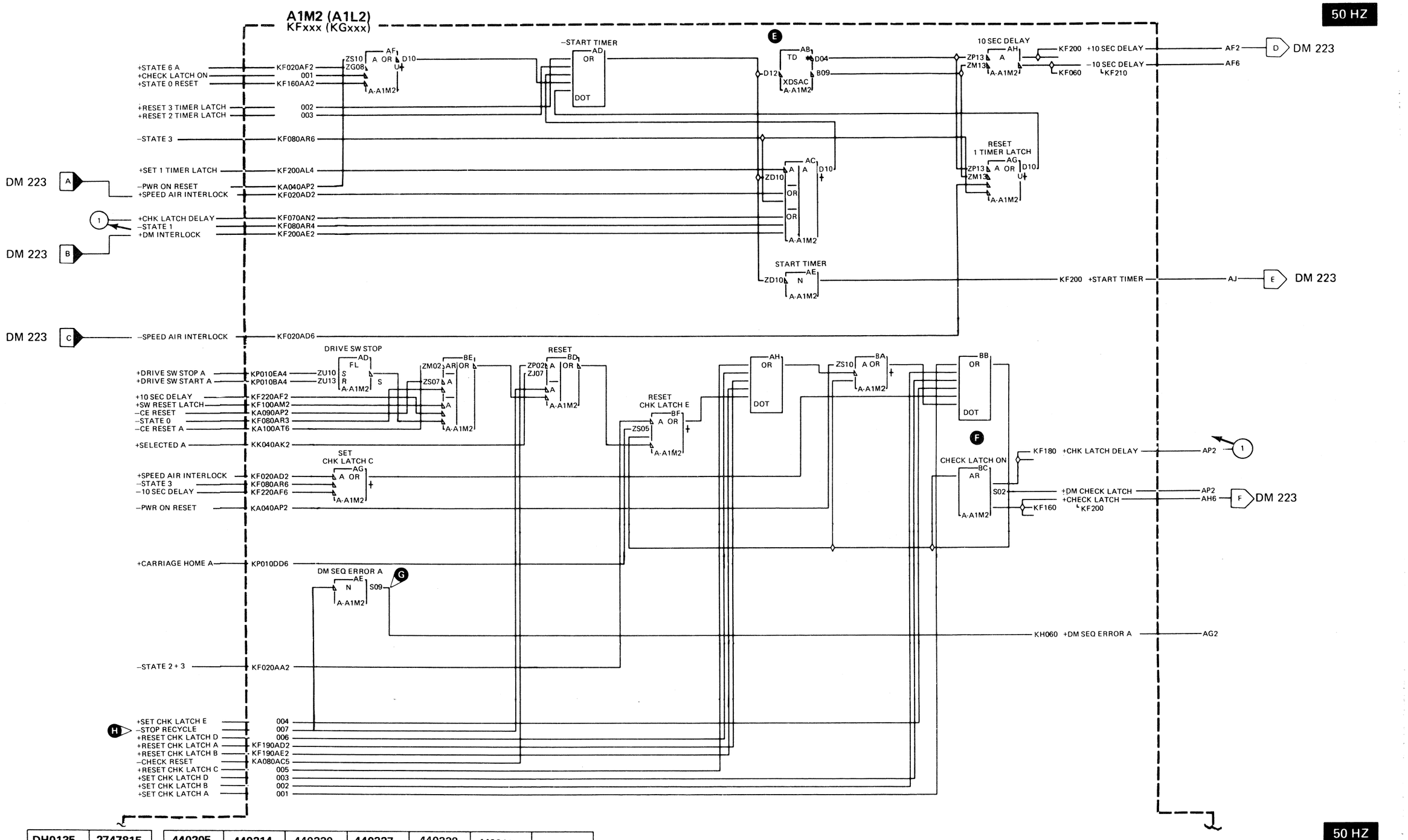
DM SEQUENCE ERROR IN STATE 3 (Continued)



DH0135 Seq. 2 of 2	2747815 Part No. (7)	440205 28 Jan 74	440214 17 Jun 74	440220 17 Oct 74	440227 14 Sept 76	440228 29 Oct 76	440241 30 Oct 78	

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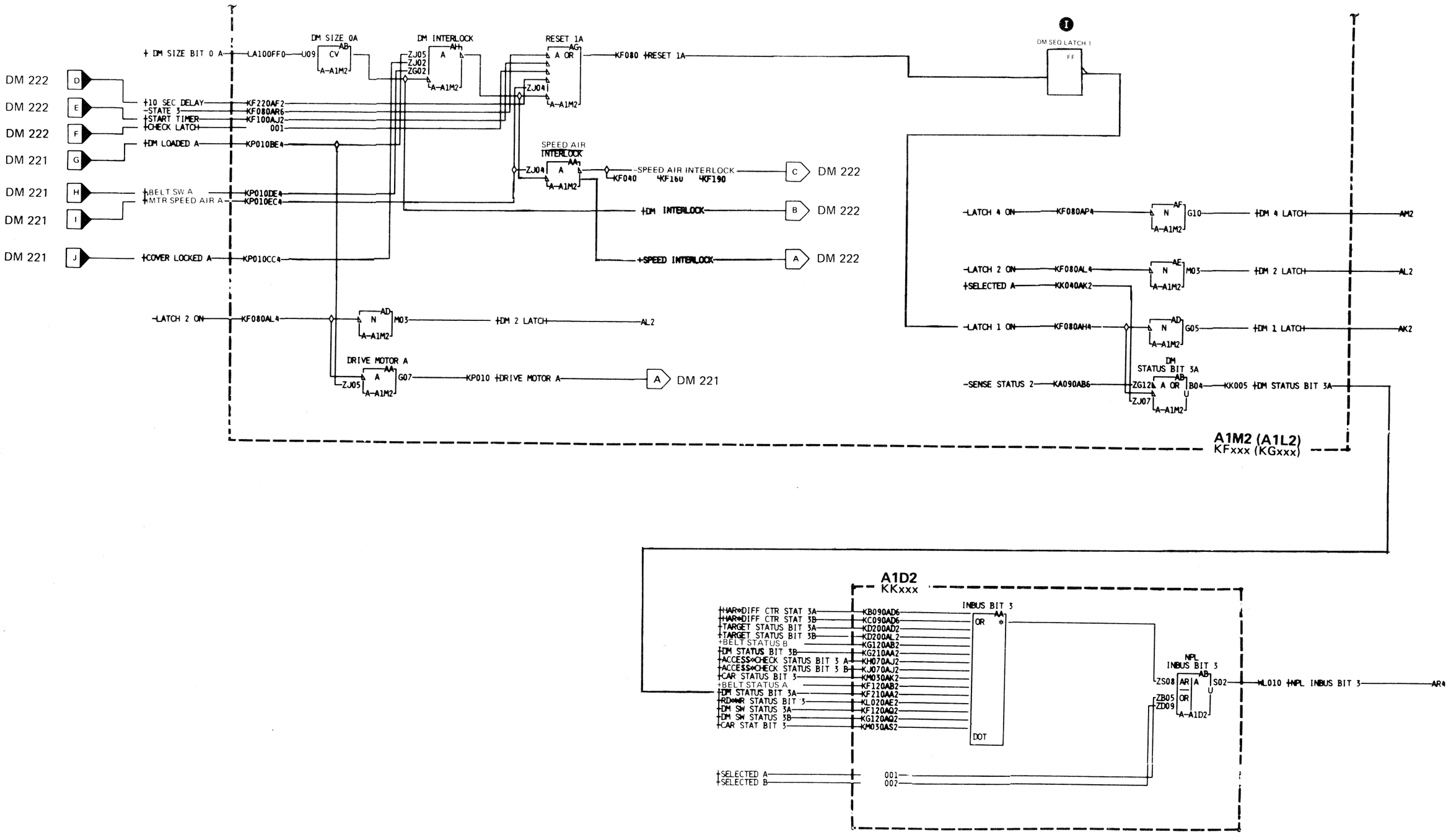
DM 223



DH0141	2747224
Seq. 1 of 2	Part No. (P)

440200	440202	440203	440205	440214	440223	440228
25 Jun 73	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	14 Mar 75	29 Oct 76

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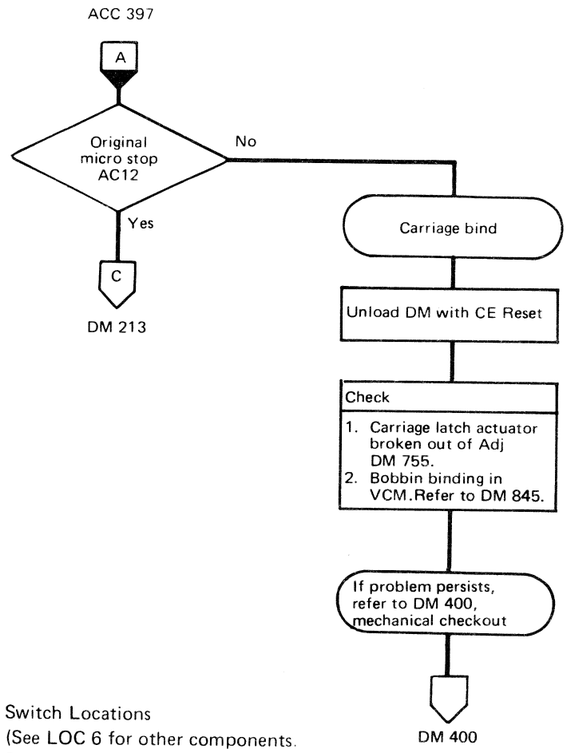
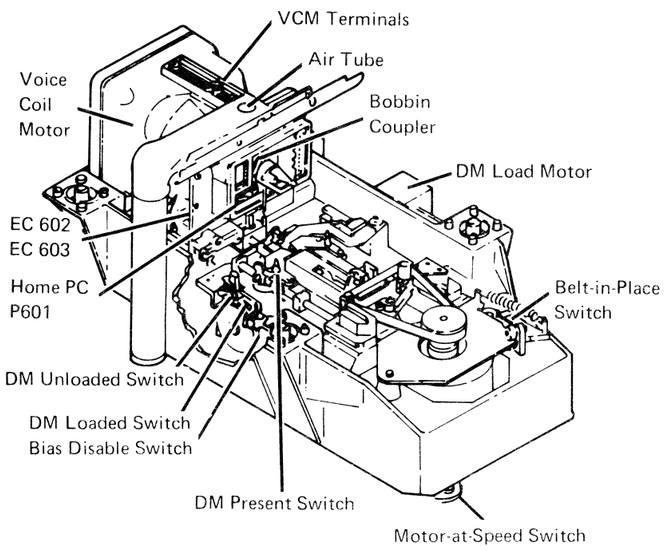
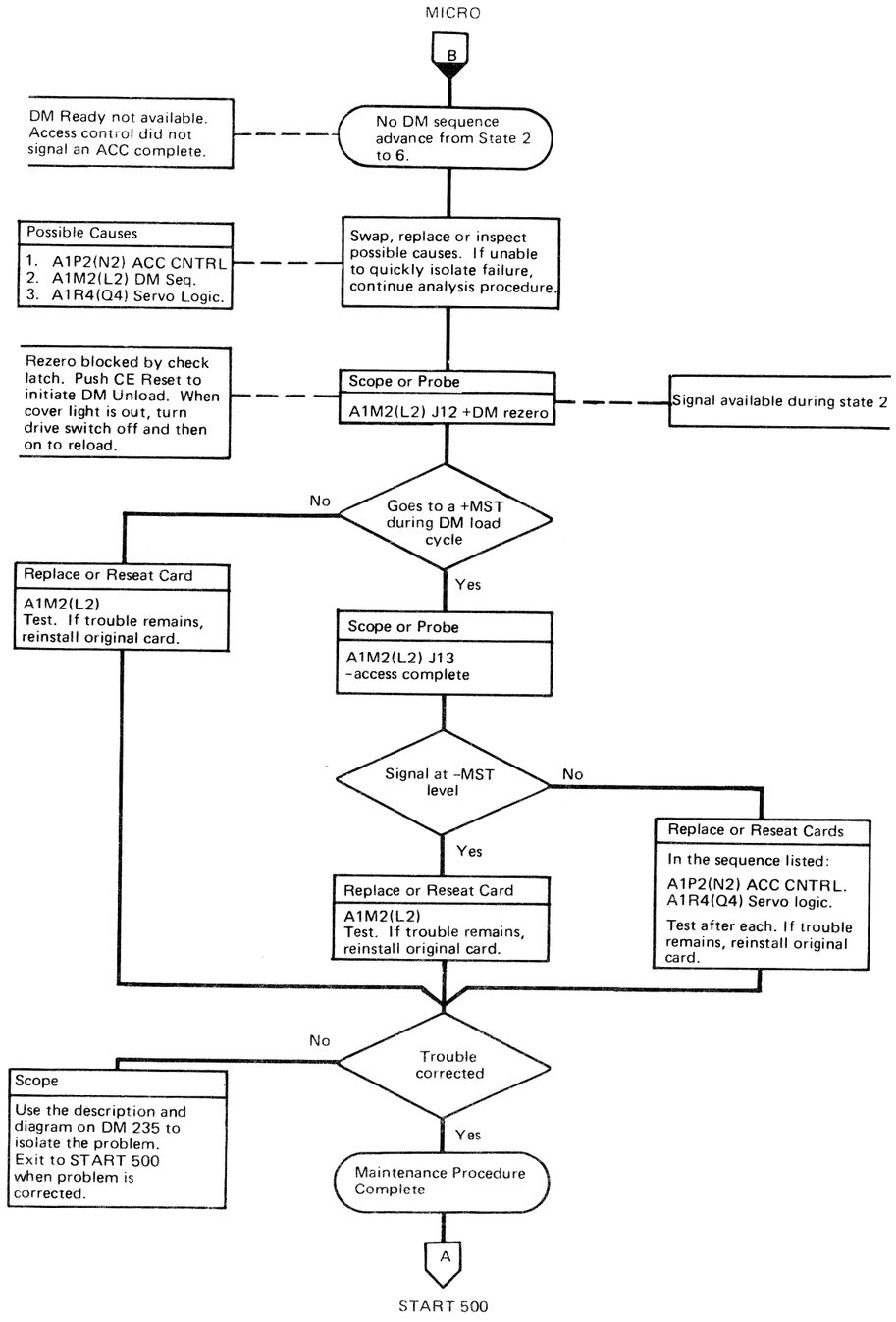
DM SEQUENCE ERROR IN STATE 2

For sequence theory, refer to DM 652, DM 656, and DM 235



Switch Locations
(See LOC 6 for other components.
Shroud removal on DM 705).





DH0141	2747224	440200	440202	440203	440205	440214	440223	440228
Seq. 2 of 2	Part No. (P)	25 Jun 73	7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	14 Mar 75	29 Oct 76

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DM SEQUENCE ERROR IN STATE 2

(Mechanical Timing Chart DM 640)

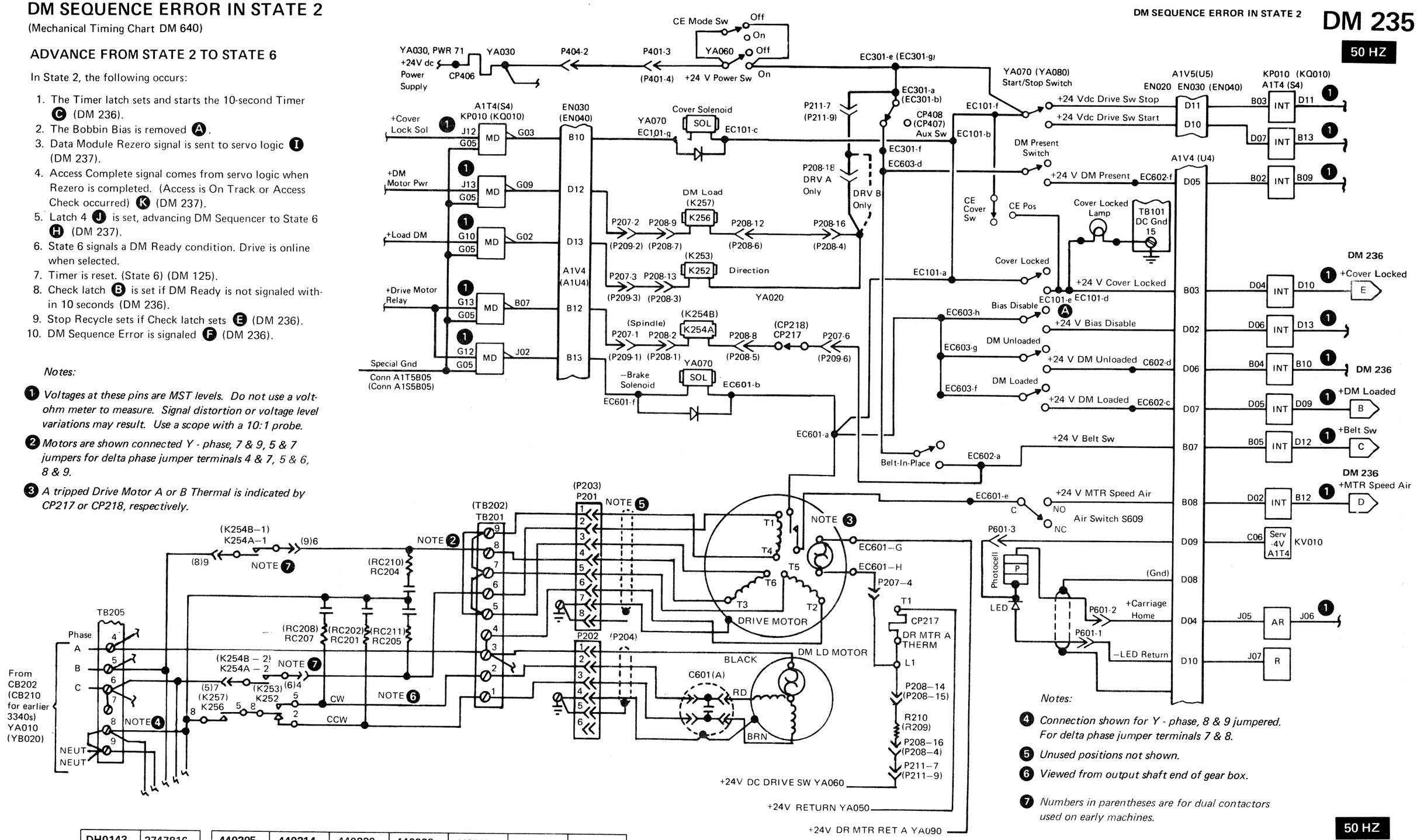
ADVANCE FROM STATE 2 TO STATE 6

In State 2, the following occurs:

1. The Timer latch sets and starts the 10-second Timer (C) (DM 236).
2. The Bobbin Bias is removed (A).
3. Data Module Rezero signal is sent to servo logic (I) (DM 237).
4. Access Complete signal comes from servo logic when Rezero is completed. (Access is On Track or Access Check occurred) (K) (DM 237).
5. Latch 4 (J) is set, advancing DM Sequencer to State 6 (H) (DM 237).
6. State 6 signals a DM Ready condition. Drive is online when selected.
7. Timer is reset. (State 6) (DM 125).
8. Check latch (B) is set if DM Ready is not signaled within 10 seconds (DM 236).
9. Stop Recycle sets if Check latch sets (E) (DM 236).
10. DM Sequence Error is signaled (F) (DM 236).

Notes:

1. *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*
2. *Motors are shown connected Y - phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*
3. *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218, respectively.*



Notes:

4. *Connection shown for Y - phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*
5. *Unused positions not shown.*
6. *Viewed from output shaft end of gear box.*
7. *Numbers in parentheses are for dual contactors used on early machines.*

DH0143	2747816	440205	440214	440220	440228	440241		
Seq. 1 of 2	Part No. (7)	28 Jan 74	17 Jun 74	17 Oct 74	29 Oct 76	**30 Oct 78**		

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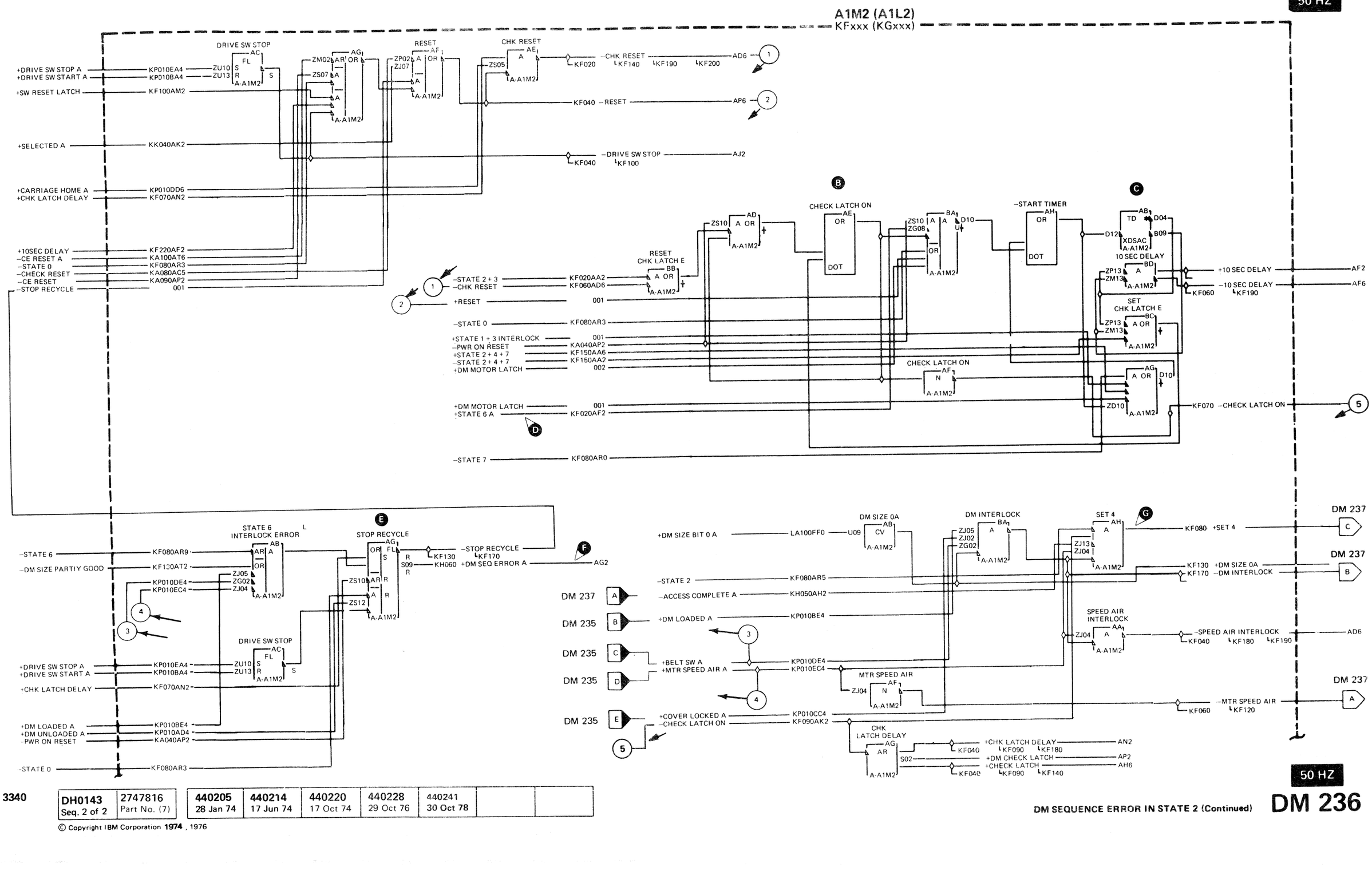
DM SEQUENCE ERROR IN STATE 2 (Continued)



DH0143 Seq. 2 of 2	2747816 Part No. (7)	440205 28 Jan 74	440214 17 Jun 74	440220 17 Oct 74	440228 29 Oct 76	440241 30 Oct 78	

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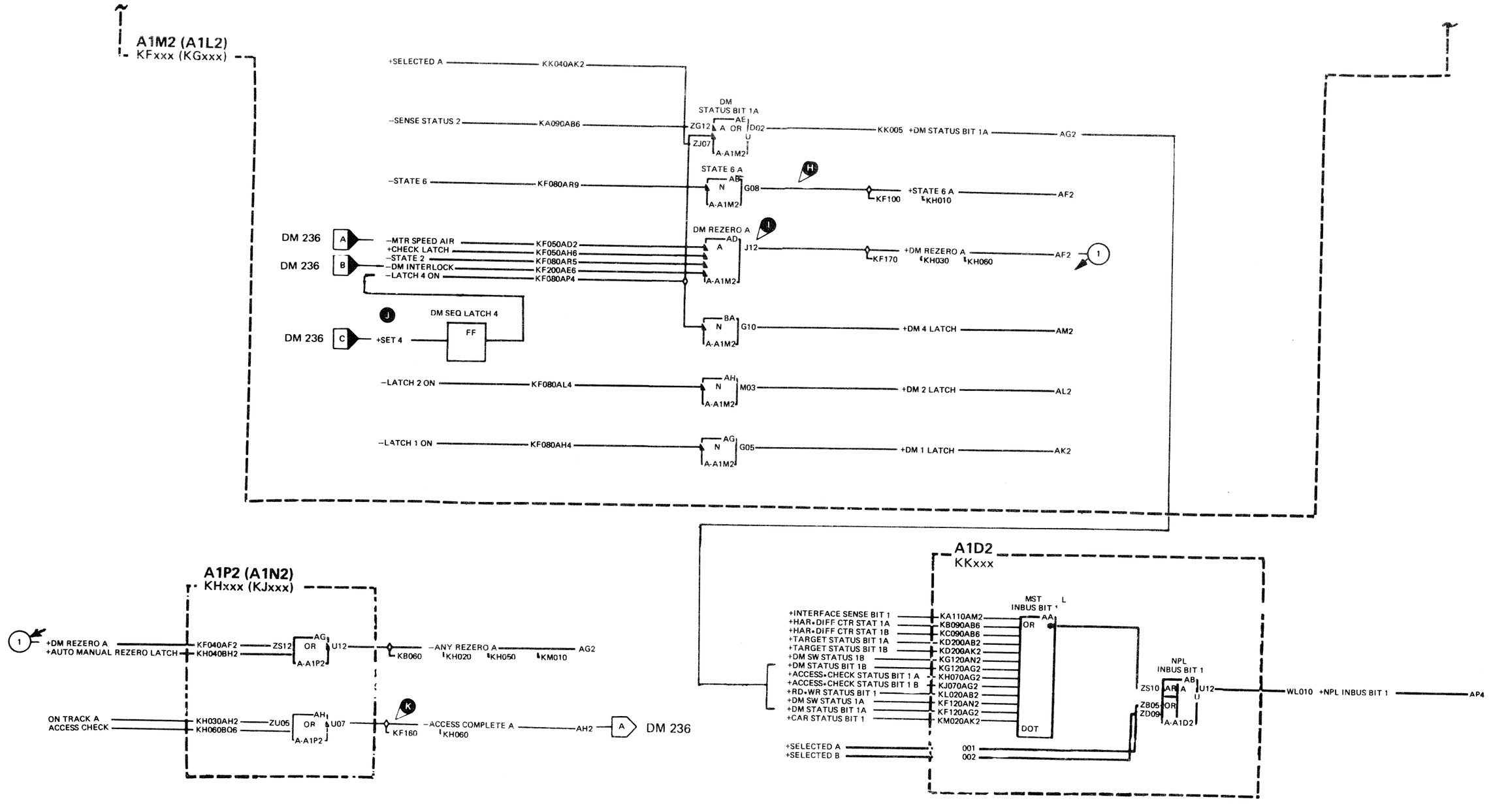
DM SEQUENCE ERROR IN STATE 2 (Continued)



DH0150 Seq. 1 of 2	2747225 Part No. (Q)

See EC History	440227 14 Sep 76	440228 29 Oct 76				

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DM SEQUENCE ERROR – LOST READY STATE 6

For sequence theory, refer to DM 656.

DM went from Ready State 6 to State 0 (Unloaded) without operator intervention. Stop Recycle Latch on. Check Latch is off.

MICRO DM 100 A

DM Loaded switch went inactive in Ready State 6

Lost DM Loaded

Reload data module.
1. Turn Start/Stop switch to Stop.
2. Activate CE Reset.
3. Turn Start/Stop switch to Start.

Ready light turns on — No → D DM 101

Yes

Intermittent loss of DM Loaded

Check DM Loaded switch adjustment according to the procedure on DM 730. Return to this point if adjustment not required. Repair or replace as required.

Possible Causes

See DM 141 for DM Loaded switch network.
1. Intermittent DM Loaded switch (DM 730).
2. EC601, EC602, EC603, EC101, EC301 wiring.
3. A1V4(U4) conn.
4. A1T4(S4) card.
5. A1M2(L2) DM seq.

Troubleshoot with the aid of the description and diagram on DM 141.

A

DM 141

MICRO DM 100 B

Air switch or Motor-At-Speed switch went inactive in Ready State 6.

Lost MTR Speed Air

Reload data module.
1. Turn Start/Stop switch to Stop.
2. Activate CE Reset
3. Turn Start/Stop switch to Start

Ready light turns on — No → D DM 101

Yes

Intermittent loss of Motor-At-Speed.

DM 161

Possible Causes

Check the following for loose connection:
1. Defective Air switch (DM 820).
2. Drive motor thermal tripped. Reset thermal. See Note 2 on DM 161.
3. A1V4(U4) conn.
4. P201 (203) conn.
5. A1T5B05(S5B05) conn.
6. EC 601 wiring.
7. K254 (K255)–60 Hz. K254A (K254B)–50 Hz
8. A1T4(S4) card.
9. A1M2(L2) DM Seq.
10. Drive motor brake.
11. Drive Motor (DM 810).

See DM 715 for check procedure.

Drive Motor-At-Speed switch. See DM 810 for replacement procedure.

Troubleshoot with the aid of the description and diagram on DM 161

A

DM 161

MICRO DM 100 C

Belt signal went inactive in Ready State 6.

Lost Belt

Reload data module.
1. Turn Start/Stop switch to Stop.
2. CE reset.
3. Turn Start/Stop switch to Start.

Ready light turns on — No → D DM 101

Yes

Intermittent loss of Belt.

DM 151

Possible Causes

1. Defective belt in Place switch (DM 735).
2. A1V4(U4) conn.
3. EC602, 601, 301 wiring.
4. A1T4(S4) card.
5. A1M2(L2) DM Seq.

Troubleshoot with the aid of the description and diagram on DM 151.

A

DM 151

MICRO DM 100 D

DM Size Check occurred in Ready State 6.

DM Size Error

DM 301

Possible Causes

Data module interface connector (DM 805)
Data Module connector (DM 870)
A1V2(U2) Connector
A1M2(L2) Card

Trouble corrected — Yes → MICRO DM 100 E

No

CAUTION
Turn off +24 Vdc Power switch

Hand cycle Data Module to fully loaded and coupled position.

MICRO 10

Microdiagnostic

Run routine AC. Loop and bypass errors. See detailed instructions on MICRO 10.

DM 301

Scope

Sweep 20μs/div
Trigger
Slope (–)
A1M2G13(L2G13)
(– Sense Status 1)
Use the description and diagram on DM 301 to isolate the problem.
Troubleshoot DM Size bits
(35 Mb DM=Bit 1 on.)
(70 Mb DM=Bit 2 on.)
Sys/3 only:
(12 Mb DM = Bits 0, 1, 2, 3 off, Bit P on.)
Turn +24V Power switch back on and exit to START 500 when problem is corrected.

MICRO DM 100 E

No Interlock failures are latched on in the Switch Status Byte

Some sense information may have been reset after the first error. Secure new sense data. With drive in CE mode, turn Start/Stop switch to STOP and activate CE reset to unload Data Module. Then initiate a new load cycle.

First time here — Yes → D DM 101

No

Replace
A1M2(L2)

Maintenance procedure complete

A

START 500

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DM SEQUENCE ERROR IN STATE 6 – LOST READY

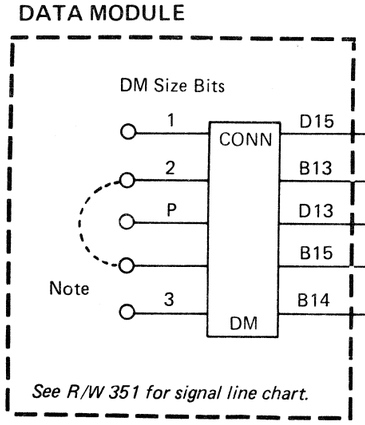
DATA MODULE SIZE

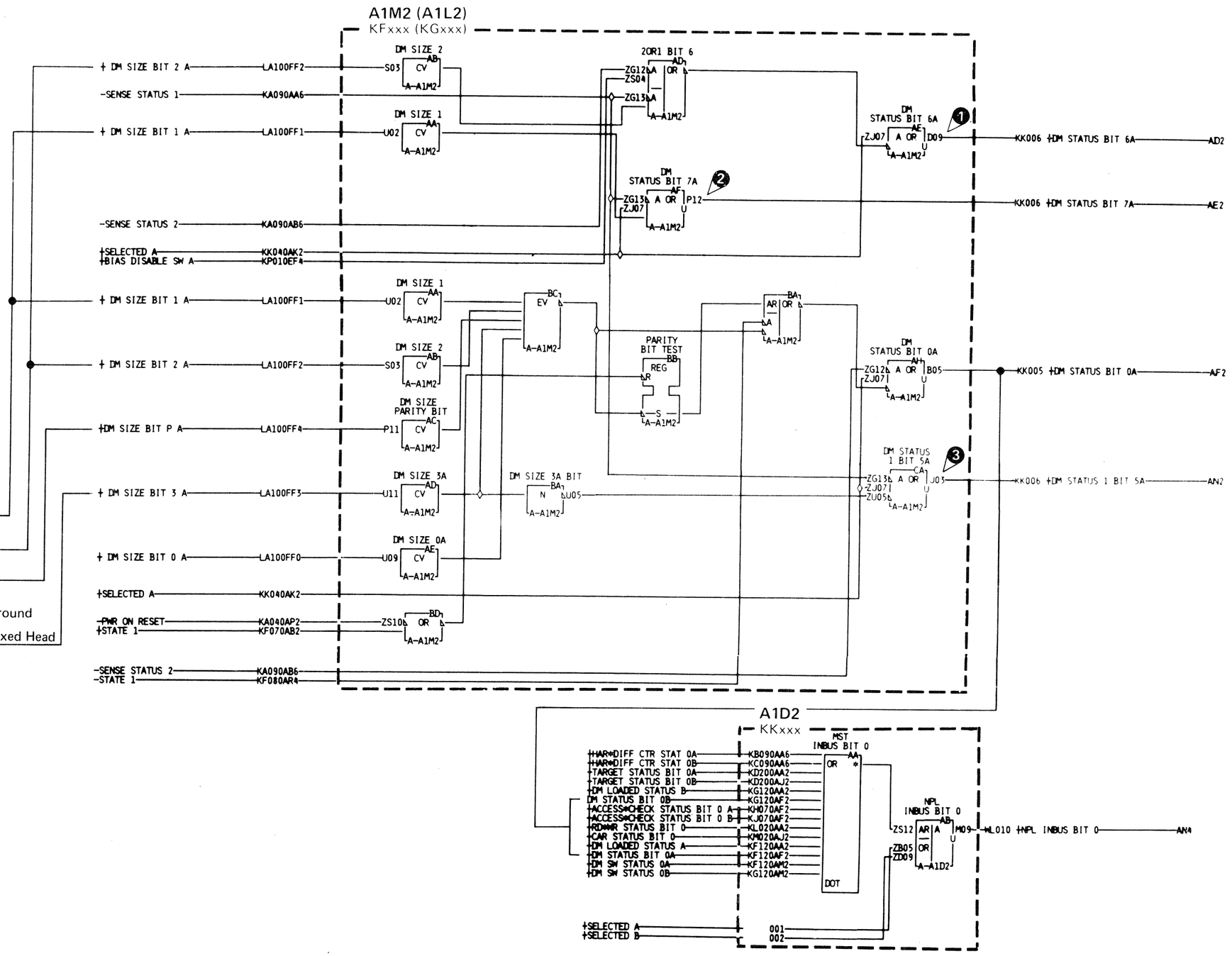
The DM size is determined by the jumpers inside the data module A1V2D08 (A-drive) and A1U2D08 (B-drive). Cables on the servo board provide the ground for the DM jumpers.

Data size bits 1, 2, and 3 are sent to the drive through several connectors and are present at the DM card A1M2 (A-drive) and A1L2 (B-drive).

DM size is sensed by the control tag Sense Status 1.

DM Size		35 MB	70 MB	70F MB	12 (S/3) MB
DM Size Bits	3	0	0	1	0
	2	0	1	1	0
	1	1	0	0	0
	P	0	0	1	1
DM Status Bits	5	0	0	1	0
	6	0	1	1	0
	7	1	0	0	0





Note: Jumper shown connected for 70 megabytes.

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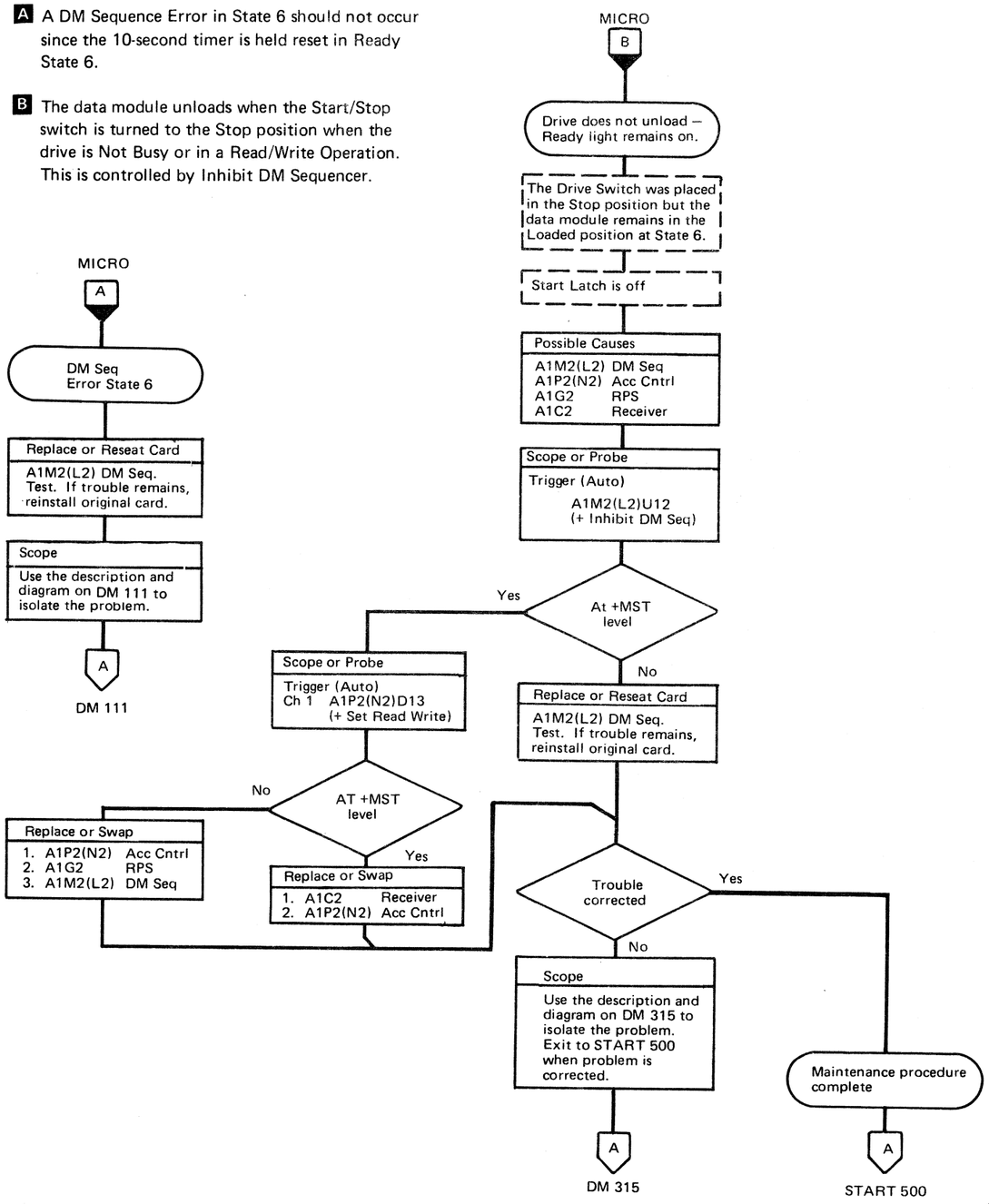
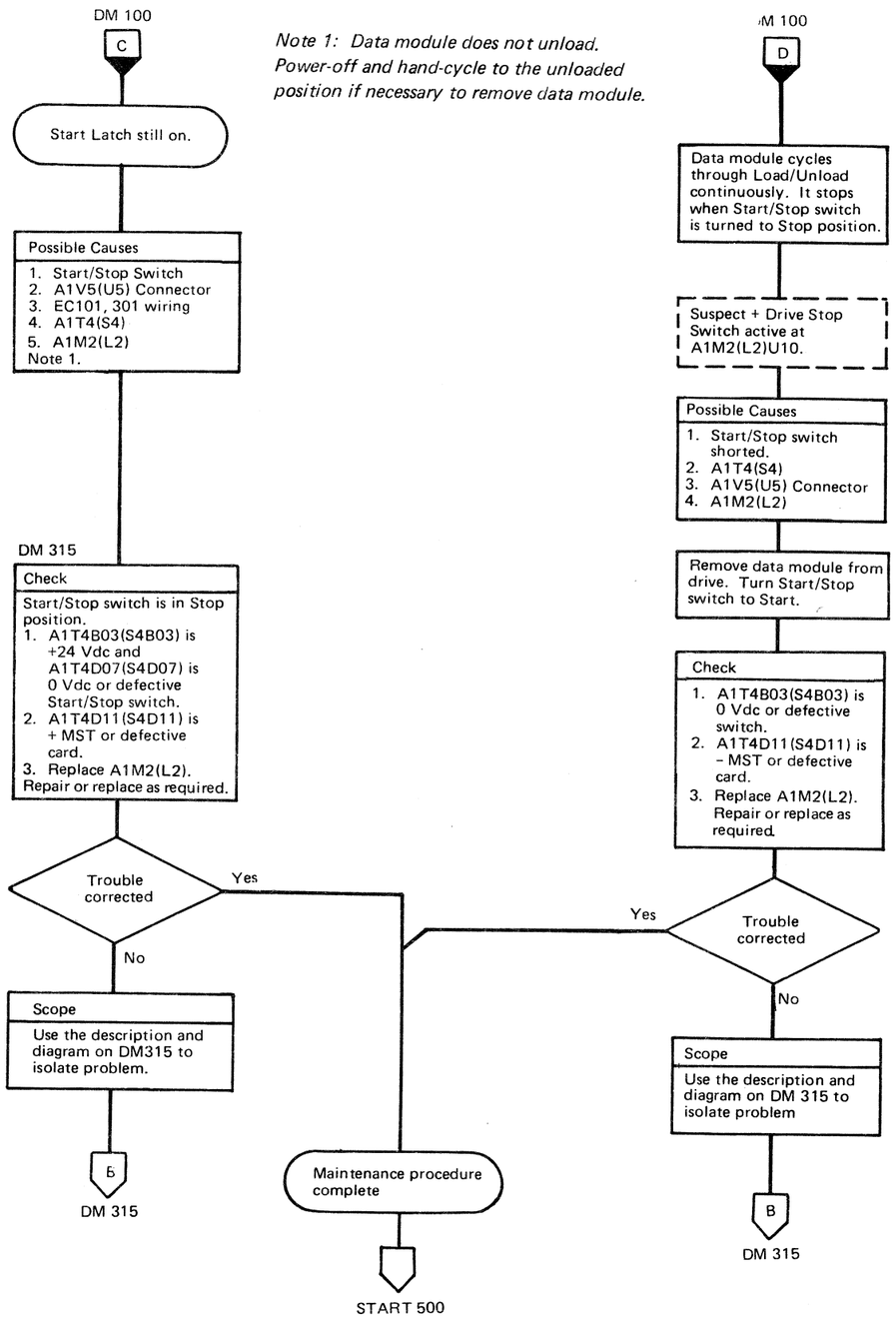
DM SEQUENCE ERROR IN STATE 6 – DRIVE WILL NOT UNLOAD AT STATE 6

A A DM Sequence Error in State 6 should not occur since the 10-second timer is held reset in Ready State 6.

B The data module unloads when the Start/Stop switch is turned to the Stop position when the drive is Not Busy or in a Read/Write Operation. This is controlled by Inhibit DM Sequencer.





Note 1: Data module does not unload. Power-off and hand-cycle to the unloaded position if necessary to remove data module.

DH0152	2747226
Seq. 2 of 2	Part No. (P)

See EC History	440224 15 Dec 75	440227 14 Sep 76	440241 30 Oct 78			

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DM SEQUENCE ERROR IN STATE 6

DM SEQUENCE ERROR IN STATE 6

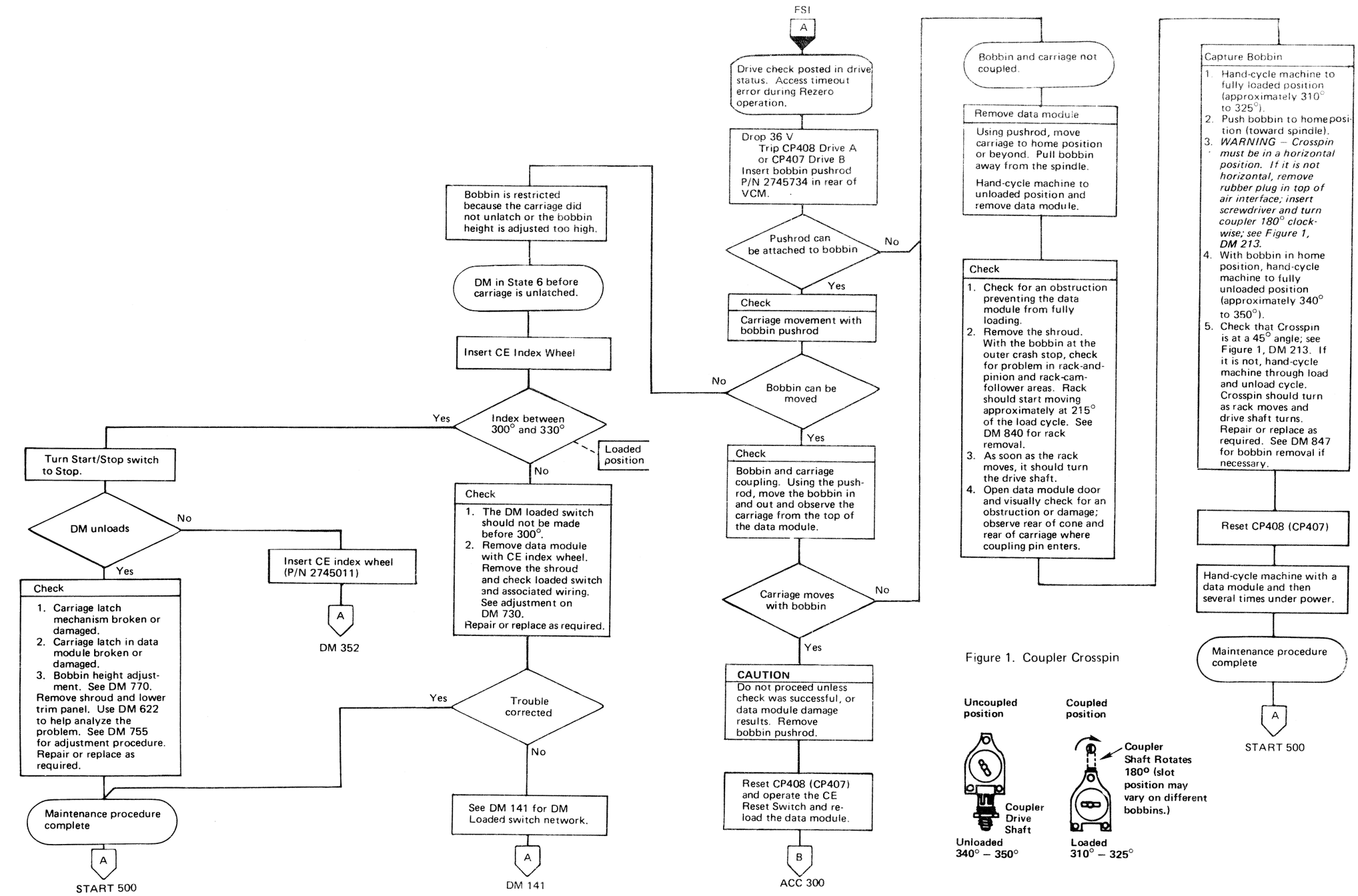

Figure 1. Coupler Crosspin

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DM SEQUENCE ERROR IN STATE 6

DM 310 A

Drive does not unload. Ready light remains on.

Check
1. Turn Start/Stop switch to Stop. — A
2. Set 1B activates to turn Latch 1 on. — B DM 316
3. DM Seq. advances from State 6 to State 7 (Latch 1, 2 and 4 on) — D DM 316
4. State 6 going off turns off Ready light. — E DM 316

Trouble Corrected — Yes → A START 500; No → A DM 600

DM 310 B

Defective DM Load/ Unload Controls

Check
1. Verify both sides of Start/Stop switch. — A
2. Verify Interlock Check Conditions. — C DM 316

DM 10* C

Dropping Ready light intermittently.

Data module unloads when failure occurs. — No → Console message indicates Seek Check Symptom Code 1506 or 1508. → FSI 100

Yes → Check all items for Belt failure. See Belt switch network at right.

DM 315

Possible Causes
1. Defective Belt-in-Place switch – DM 735.
2. A1V4(U4) conn.
3. EC602, 603, or 301 wiring.
4. A1T4(S4) card.
5. A1M2(L2) DM Seq.

Trouble corrected — No → Check all items for MTR Speed Air failure. See Motor-at-Speed network at right.

DM161

Possible Causes
1. Defective Air Switch (DM 820).
2. Drive motor thermal tripped. Reset thermal. See Note 2 on DM 151.
3. A1V4(U4) conn.
4. P201(203) conn.
5. A1T5B05(S5B05) conn.
6. EC601 wiring.
7. K254(K255) – 60 Hz K254A(K254B) – 50 Hz
8. A1T4(S4) card.
9. A1M2(L2) DM Seq.
10. Drive motor brake.
11. Drive motor – DM 810.

See DM 715 for check procedure.

Trouble corrected — No → Check all items for DM Loaded switch failure. See DM Loaded switch network at right.

Possible Causes
1. Intermittent DM Loaded switch – DM 730.
2. EC601, 602, 603, 101, or 301 wiring.
3. A1V4(U4) conn.
4. A1T4(S4) card.
5. A1M2(L2) DM Seq.

Trouble corrected — No → Check all items for DM Size checks.

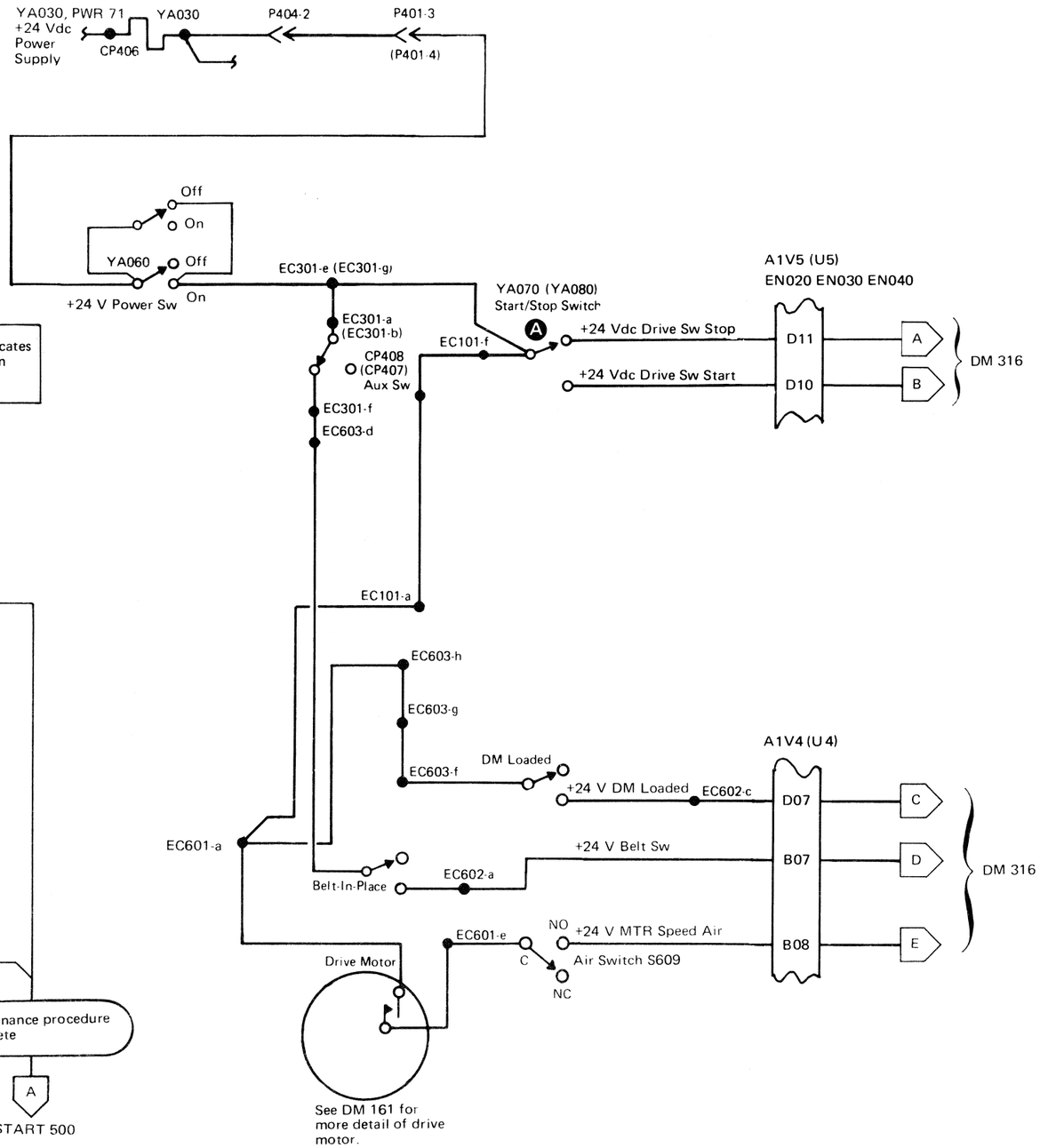
DM 301

Possible Causes
1. DM interface conn. – DM 805.
2. DM conn – DM 870.
3. AV2(U2) conn.
4. A1M2(L2) DM Seq.

Trouble corrected — No → See Note 1 on DM 316. → A DM 600

Yes → Maintenance procedure complete → A START 500

Trouble corrected — Yes → A DM 600



DH0160 Seq. 2 of 2	2747227 Part No. (0)

See EC History	440223 14 Mar 75	440227 14 Sep 76	440228 29 Oct 76			

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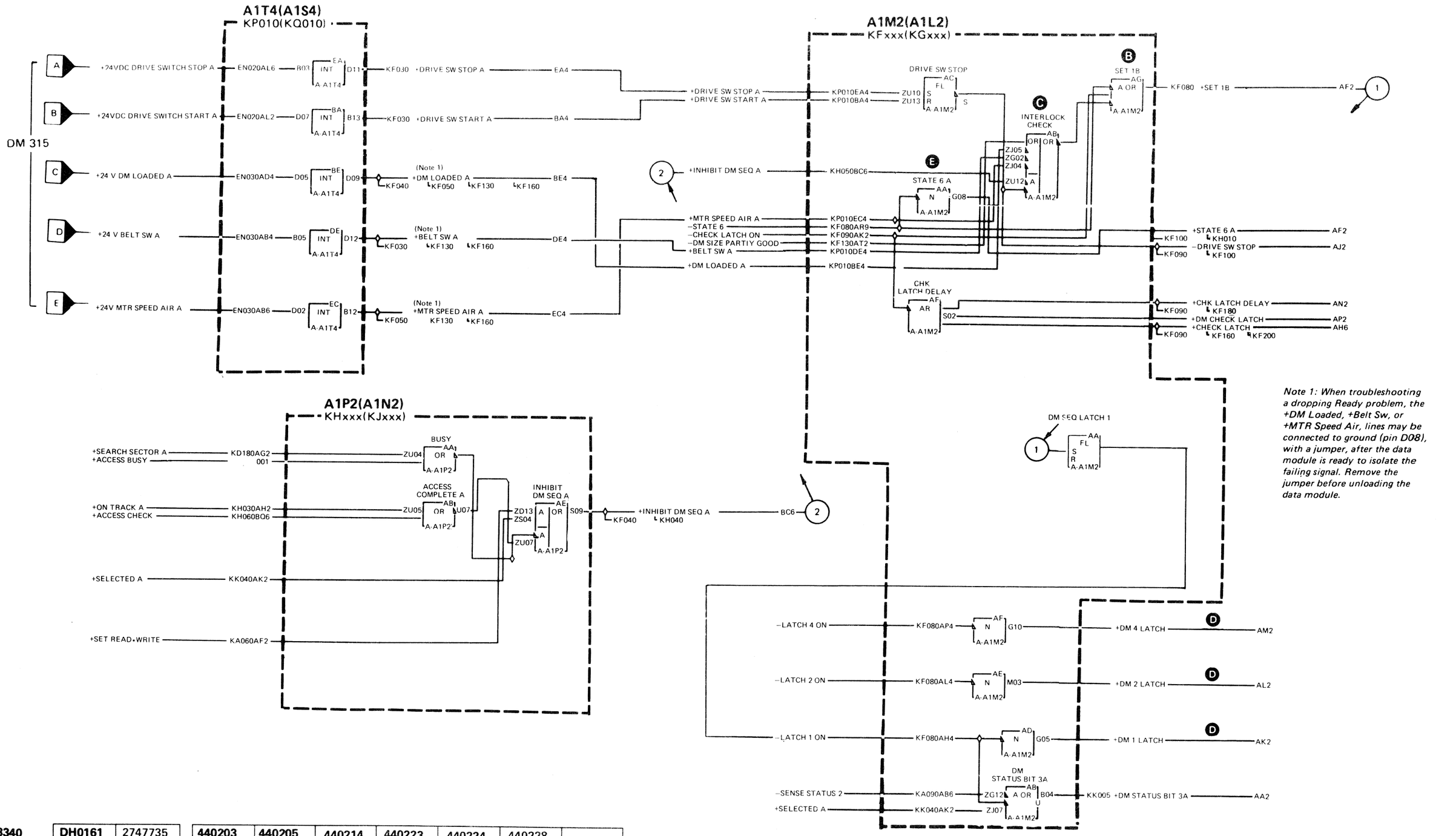
DM SEQUENCE ERROR IN STATE 6 (Continued)



Note 1: When troubleshooting a dropping Ready problem, the +DM Loaded, +Belt Sw, or +MTR Speed Air, lines may be connected to ground (pin D08), with a jumper, after the data module is ready to isolate the failing signal. Remove the jumper before unloading the data module.

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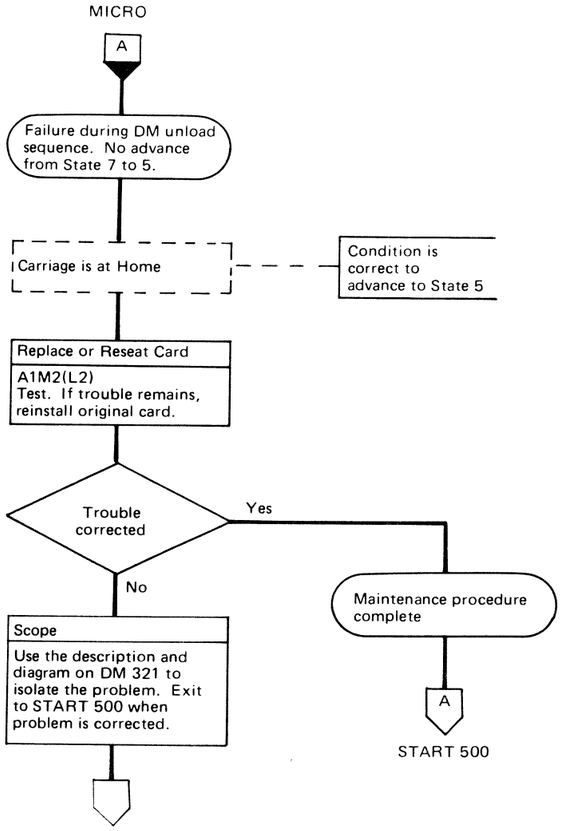
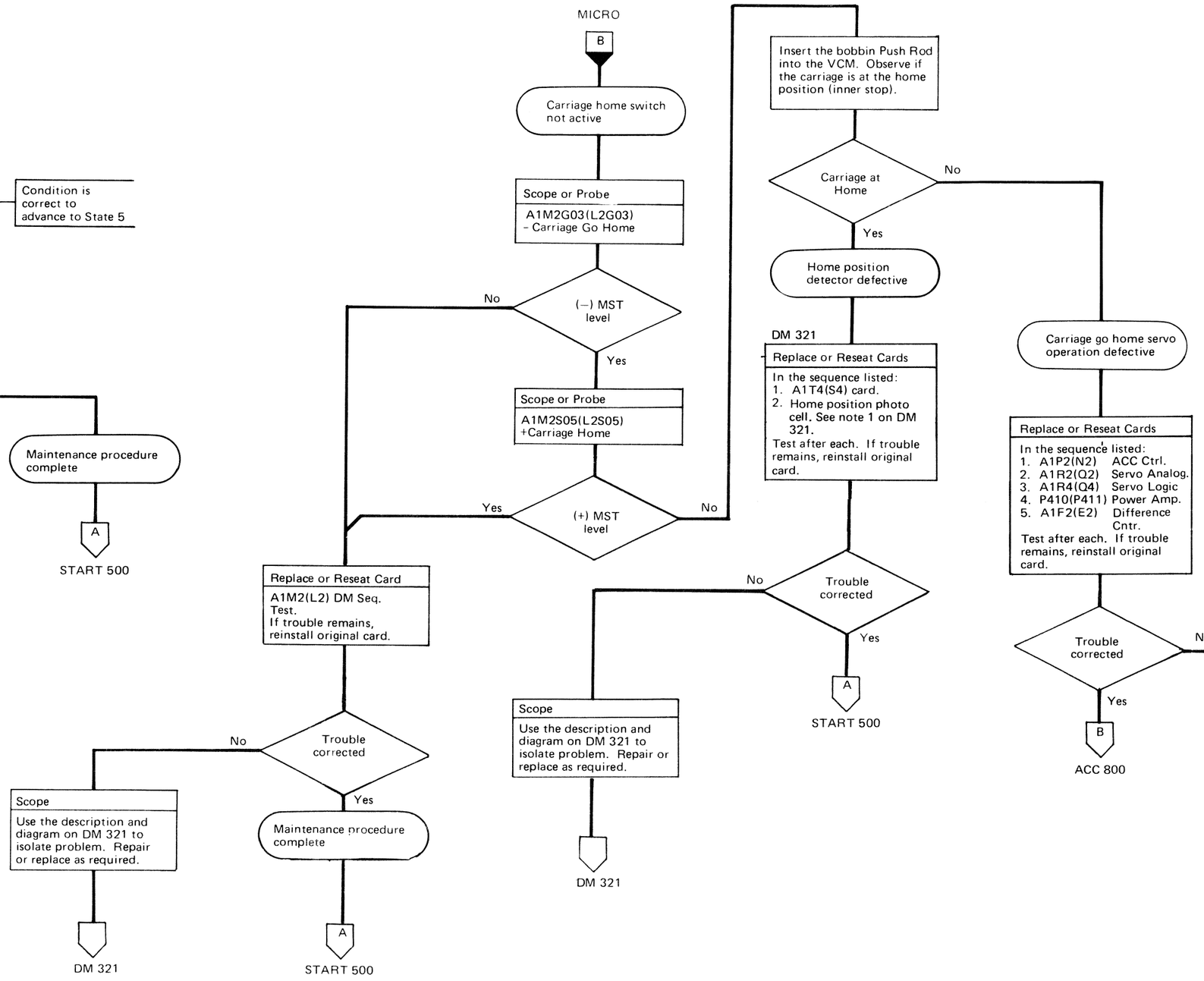
DM SEQUENCE ERROR IN STATE 7

For theory, refer to DM 321, DM 657, and DM 652.





DH0161 Seq. 2 of 2	2747735 Part No. (P)

440203 2 Nov 73	440205 28 Jan 74	440214 17 Jun 74	440223 14 Mar 75	440224 15 Dec 75	440228 29 Oct 76	

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DM SEQUENCE ERROR IN STATE 7

(Mechanical Timing Chart DM 640)

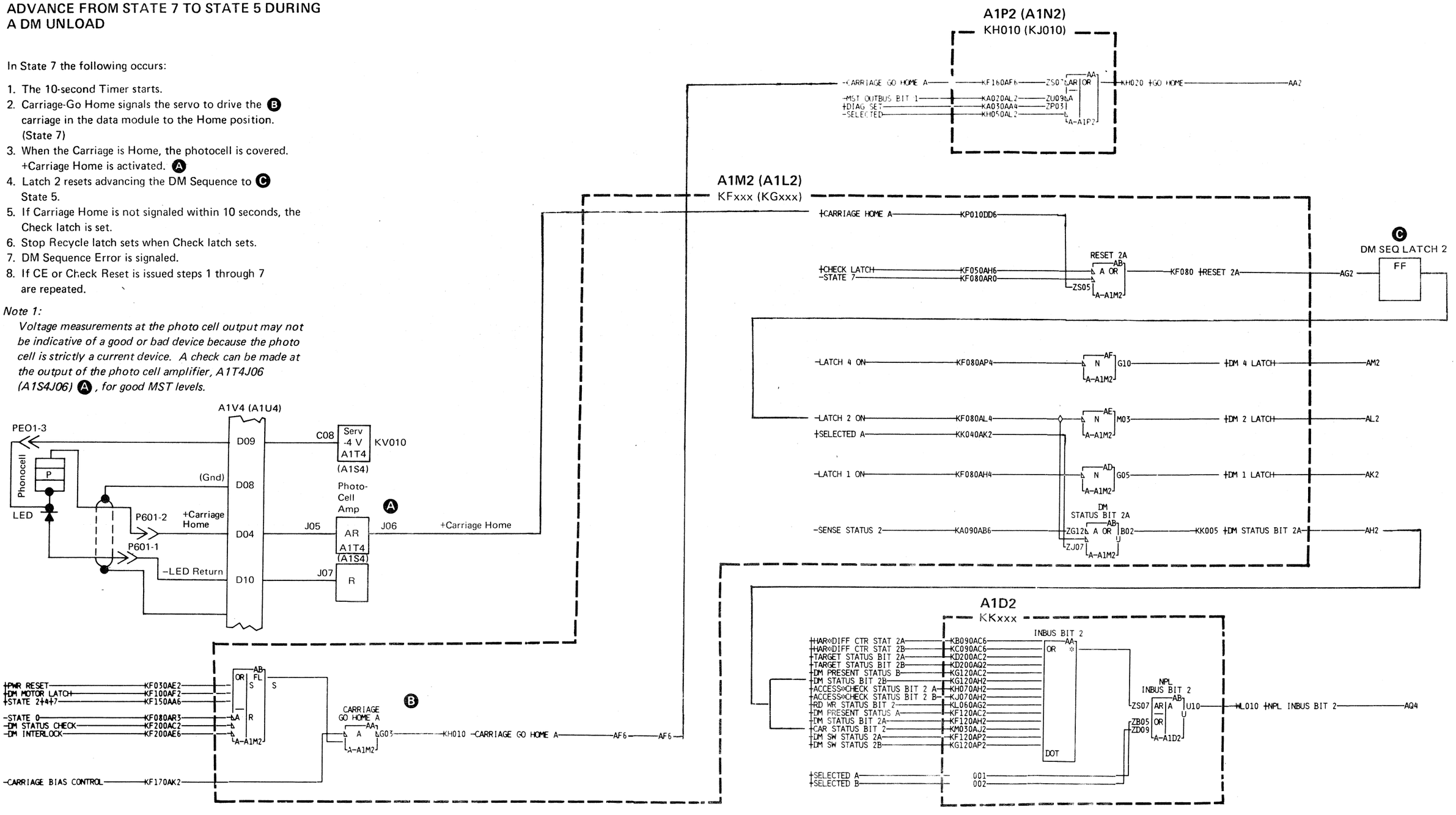
ADVANCE FROM STATE 7 TO STATE 5 DURING A DM UNLOAD

In State 7 the following occurs:

1. The 10-second Timer starts.
2. Carriage-Go Home signals the servo to drive the Ⓑ carriage in the data module to the Home position. (State 7)
3. When the Carriage is Home, the photocell is covered. +Carriage Home is activated. Ⓐ
4. Latch 2 resets advancing the DM Sequence to Ⓒ State 5.
5. If Carriage Home is not signaled within 10 seconds, the Check latch is set.
6. Stop Recycle latch sets when Check latch sets.
7. DM Sequence Error is signaled.
8. If CE or Check Reset is issued steps 1 through 7 are repeated.

Note 1:

Voltage measurements at the photo cell output may not be indicative of a good or bad device because the photo cell is strictly a current device. A check can be made at the output of the photo cell amplifier, A1T4J06 (A1S4J06) Ⓐ, for good MST levels.



DH0162	2747635	440202	440203	440205	440223	440241		
Seq. 1 of 1	Part No. (P)	7 Sept 73	2 Nov 73	28 Jan 74	14 Mar 75	30 Oct 78		

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DM UNLOAD – SEQUENCE ERROR IN STATE 5

For theory, refer to DM 335, DM 657, and DM 652.

MICRO A

Lost carriage home indication during unload sequence State 5.

Scope or Probe
A1M2G03(L2G03) - Carriage Go Home

(–) MST level
No
Yes

Lost carriage go home servo function

Scope
Use the description and diagram on ACC 420 to isolate problem. Repair or replace as required.

A
ACC 420

Replace or Reseat Card
A1M2(L2) DM Seq. Test. If trouble remains, reinstall original card.

Trouble corrected
Yes
No

Scope
Use the description and diagram on DM 335 to isolate problem. Repair or replace as required.

DM 335

MICRO B

DM Unload sequence failed to advance from State 5 to State 4.

MTR Speed Air active when the 10 Second Timer timed out.

Observe brake armature

Drive Motor stopped
No
Yes

1

LOC 12
Determine if K254(K255) picked. Do not power-off. Remove cover over ac panel. View relay armature position.

K254(K255) de-energized
No
Yes

Possible Causes
K254(K255) contacter points stuck. Troubleshoot with the aid of the diagram on DM 335.

Replace or Reseat Cards
In the sequence listed:
1. A1M2(L2) DM Seq. Card
2. A1T4(S4) Card

Test after each. If trouble remains, reinstall original card.

Trouble corrected
Yes
No

Scope
Use the description and diagram on DM 335 to isolate problem.

DM 335

MICRO C

1

MTR Speed Air not active. This is current condition.

Possible Causes
1. Brake could be faulty, which may take longer than 10 sec to slow down motor. Check adjustment on DM 715.
2. A1M2 (L2) DM Seq..
3. A1T4(S4) card.
4. Spindle motor defective. See DM 810

Trouble corrected
Yes
No

Possible defective drive motor brake. Brake should cause loss of motor at speed (30% speed reduction) within 10 sec.

Verify brake operation according to the procedure on DM 715. Return to this point if trouble persists.

Trouble corrected
Yes
No

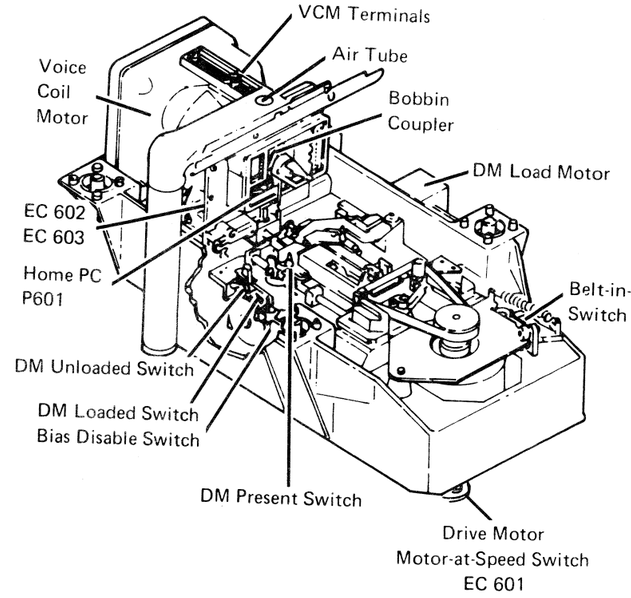
Scope
Use the description and diagram on DM 335 to isolate problem. Repair or replace as required.

DM 335

Maintenance procedure complete

A
START 500

Switch Locations
(See LOC 6 for other components.
Shroud removal on DM 705).



DH0170 Seq. 1 of 2	2747817 Part No. (7)

440205 28 Jan 74	440214 17 Jun 74	440220 17 Oct 74	440223 14 Mar 75	440228 29 Oct 76		

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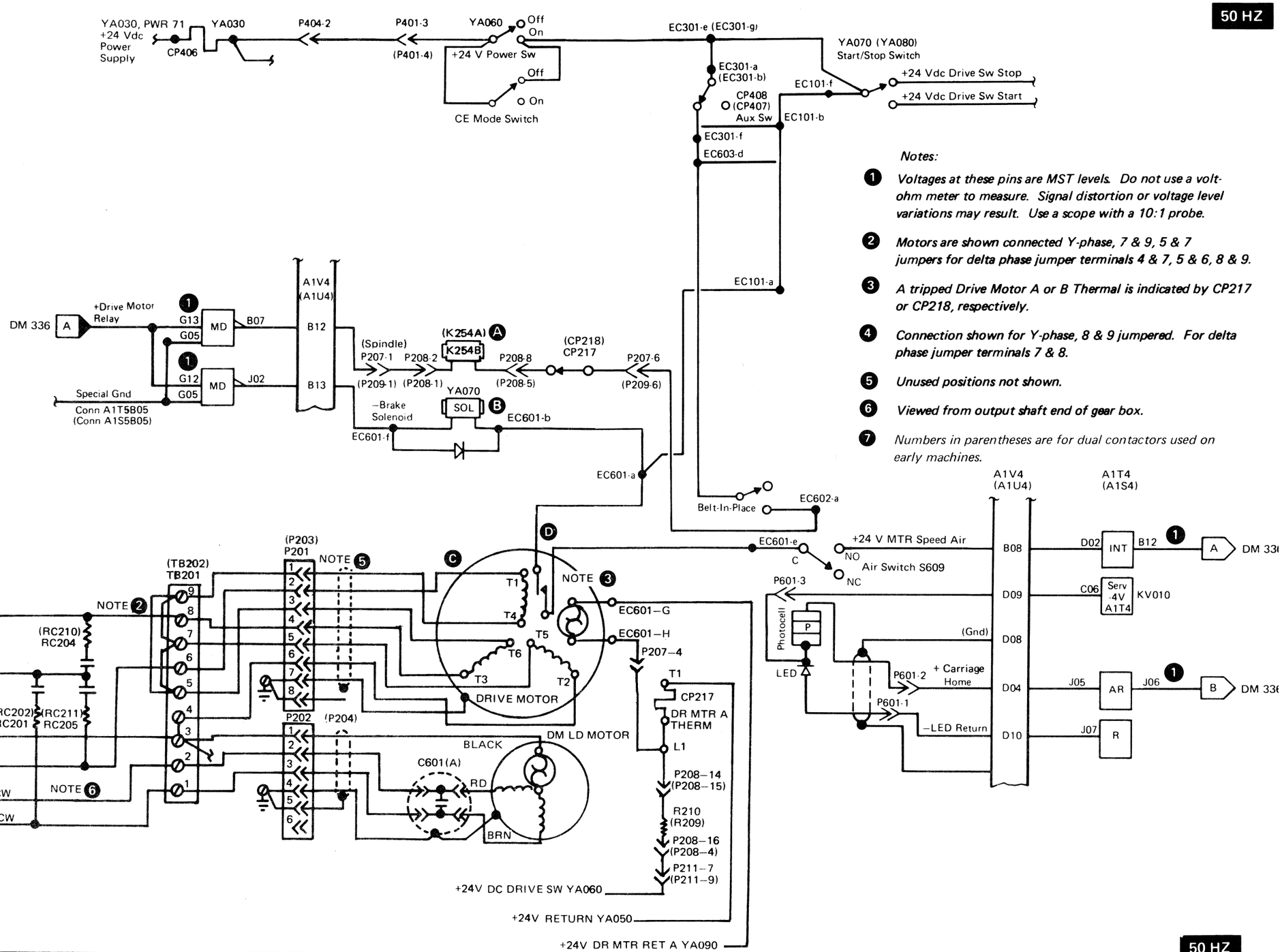
DM SEQUENCE ERROR IN STATE 5

(Mechanical Timing Chart DM 640)

Advance from State 5 to State 4 During Unload

In State 5 the following occurs:

1. K254 (K255) Ⓐ is de-energized (Latch 2 is off).
2. Brake is de-energized. (+Drive Motor de-activated, Latch 2 is off in State 5) Ⓑ.
3. Drive motor Ⓒ slows down, Motor-at-Speed switch opens Ⓓ.
4. The Timer latch resets when the 10 Second Timer times out. It was started in State 7 Ⓕ (DM 336).
5. Latch 1 is reset, advancing sequencer to State 4 Ⓔ (DM 336).
6. Check latch sets in State 5 if motor is still at speed when the 10-second Timer times out and carriage is Home.
7. Stop Recycle latch sets.
8. DM Sequence Error is signaled.



Notes:

1. *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*
2. *Motors are shown connected Y-phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*
3. *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218, respectively.*
4. *Connection shown for Y-phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*
5. *Unused positions not shown.*
6. *Viewed from output shaft end of gear box.*
7. *Numbers in parentheses are for dual contactors used on early machines.*

DH0170	2747817	440205	440214	440220	440223	440228		
Seq. 2 of 2	Part No. (7)	28 Jan 74	17 Jun 74	17 Oct 74	14 Mar 75	29 Oct 76		

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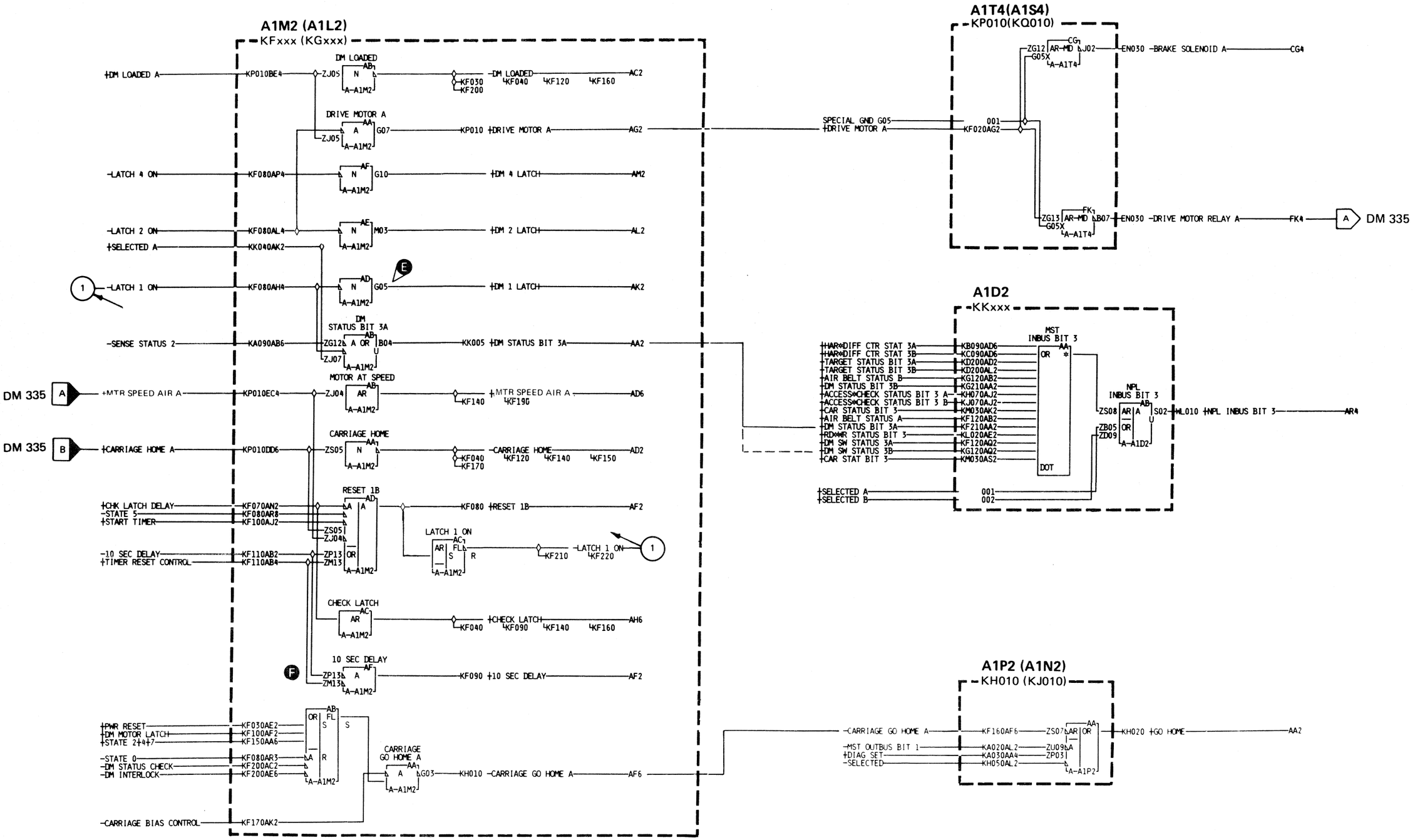
DM SEQUENCE ERROR IN STATE 5 (Con't)



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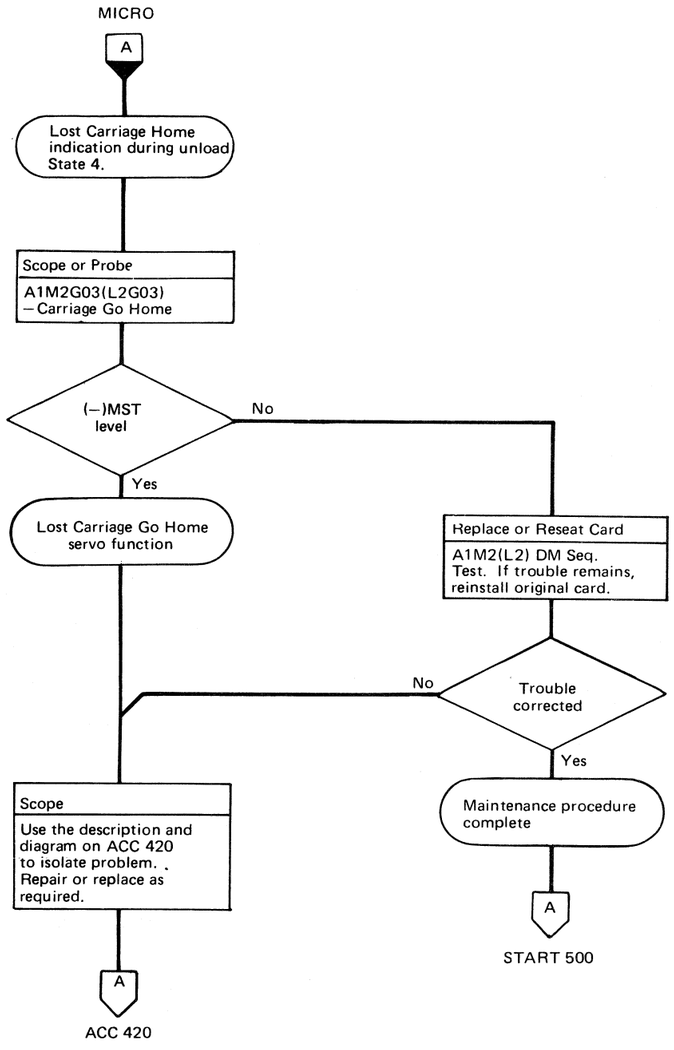
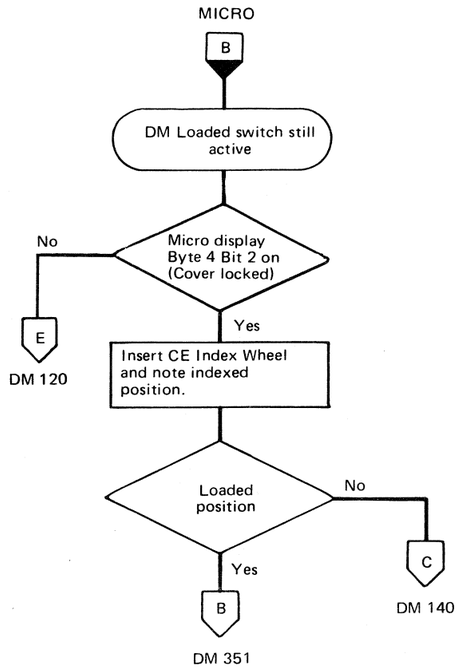
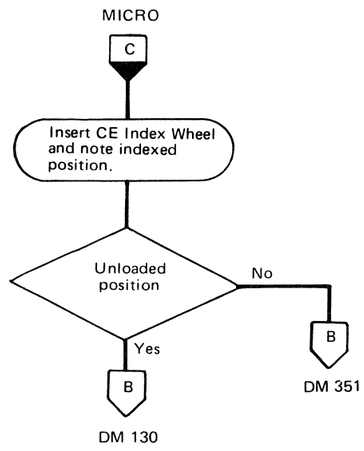
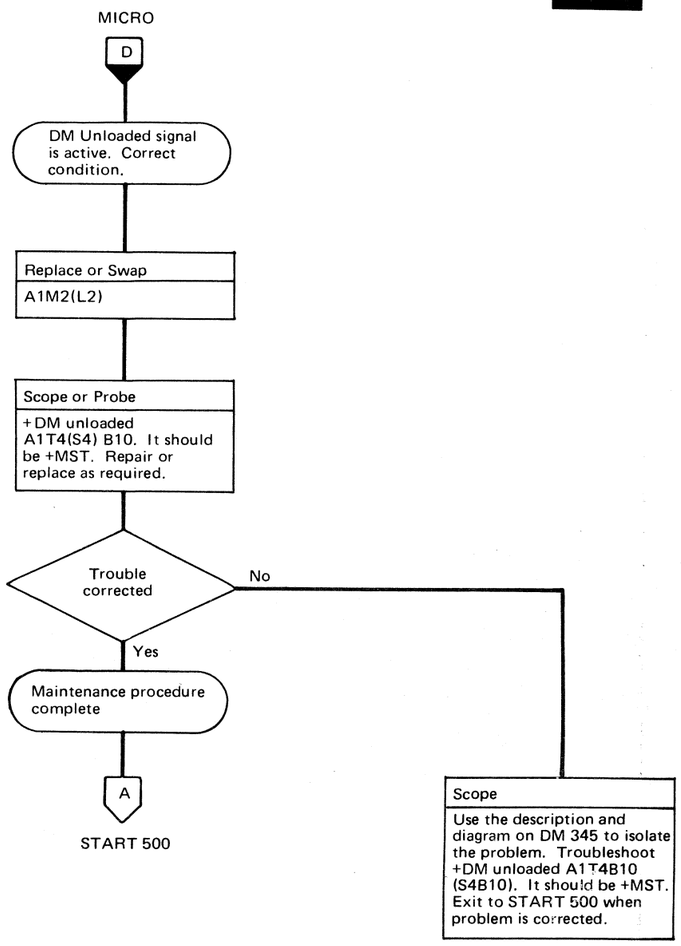
DM UNLOAD – SEQUENCE ERROR IN STATE 4

For theory, refer to DM 345, DM 657, and DM 652.

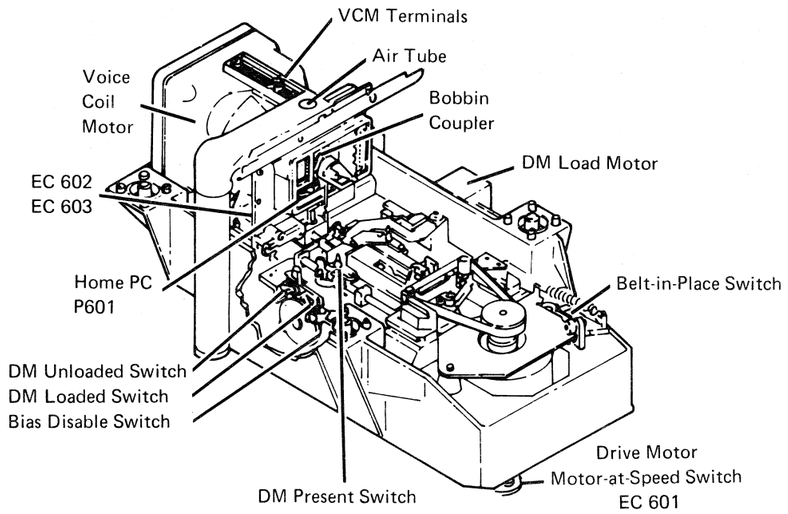








Switch Locations
(See LOC 6 for other components.
Shroud removal on DM 705).



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DM SEQUENCE ERROR IN STATE 4

(Mechanical Timing Chart DM 640)
(DM Unload Theory DM 650)

Advance from State 4 to State 0 During Unload Sequence

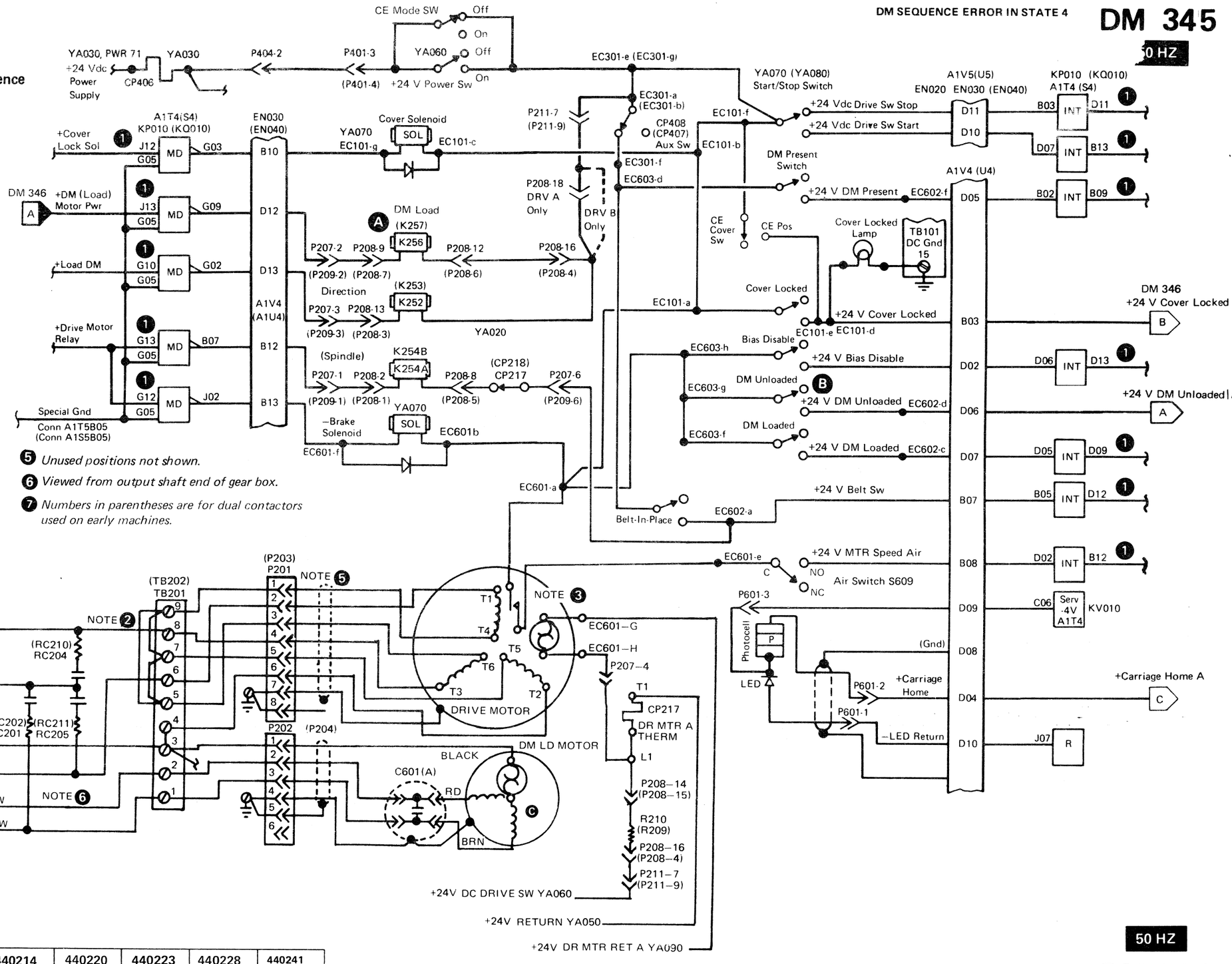
The following occur in State 4:

1. The 10-second Timer is started.
2. DM Motor Power is signaled. (State 4, not Check latch, not DM Unloaded, and cover locked.)
3. Relay K256 (K257) energizes. (A)
4. DM load motor unloads data module. (C) The bobbin is first uncoupled, then the data module is retracted. (Bobbin Bias is applied by Carriage Go Home.)
5. DM Unloaded switch makes. (B)
6. Latch 4 is reset (D) DM 346, advancing sequencer to State 0, and Timer latch is reset. Cover solenoid is deenergized.
7. If DM Unloaded switch does not make within 10 seconds, the Check latch is set.
8. Stop Recycle latch is set.
9. DM Sequence Error is signaled.

See DM 510 for unload mechanism checkout procedure.

Notes:

1. *Voltages at these pins are MST levels. Do not use a volt-ohmmeter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*
2. *Motors are shown connected Y-phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*
3. *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218 respectively.*
4. *Connection shown for Y-phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*
5. *Unused positions not shown.*
6. *Viewed from output shaft end of gear box.*
7. *Numbers in parentheses are for dual contactors used on early machines.*



DH0173	2747818
Seq. 2 of 2	Part No. (7)

440205	440211	440214	440220	440223	440228	440241
28 Jan 74	22 Apr 74	17 Jun 74	17 Oct 74	14 Mar 75	29 Oct 76	30 Oct 78

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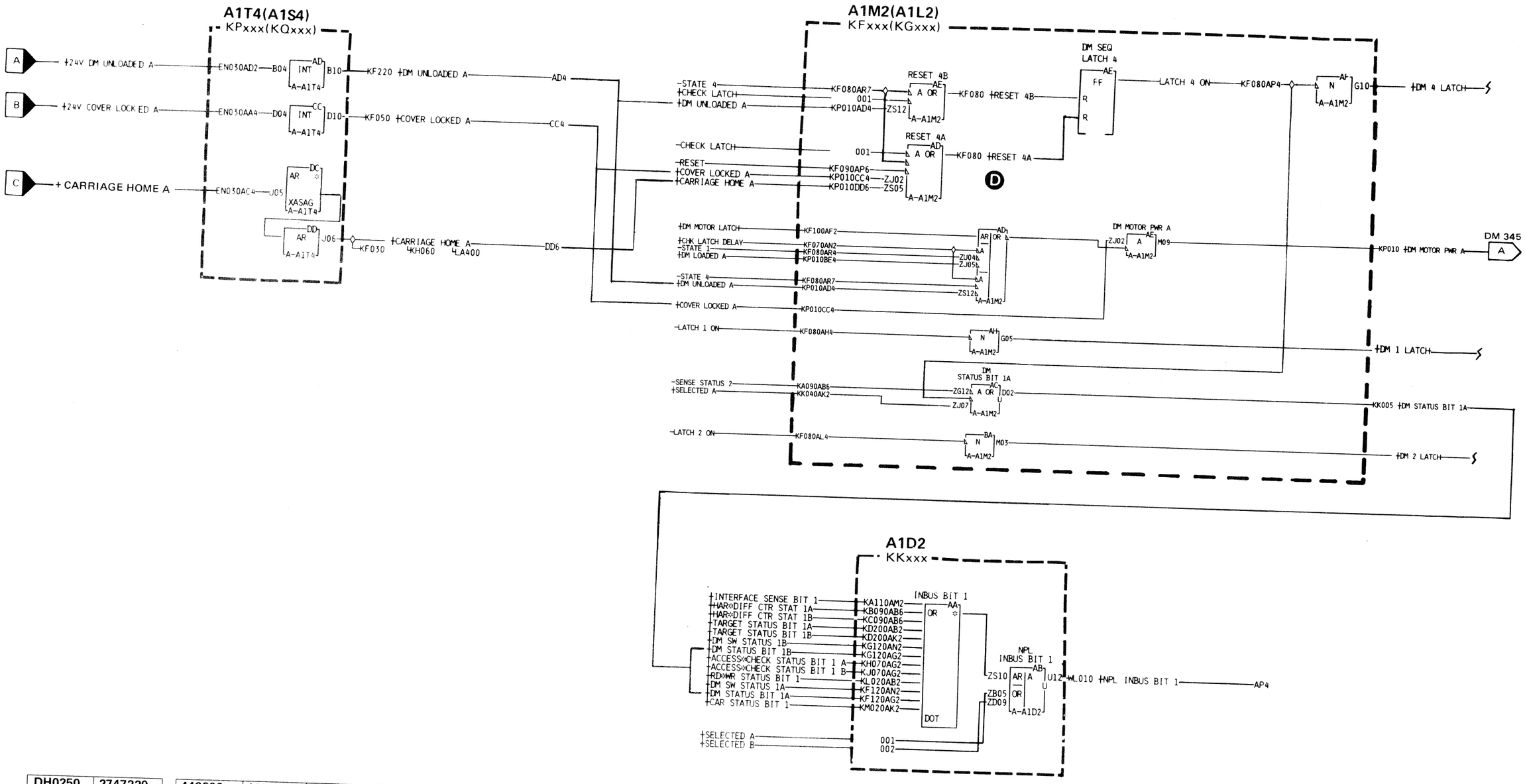
DM SEQUENCE ERROR IN STATE 4



3340

DH0250	2747229
Seq. 1 of 2	Part No. ( )

440200	440202	440203	440205	440211	440214	
25 Jun 73	7 Sept 73	2 Nov 73	28 Jan 74	22 Apr 74	17 Jun 74	

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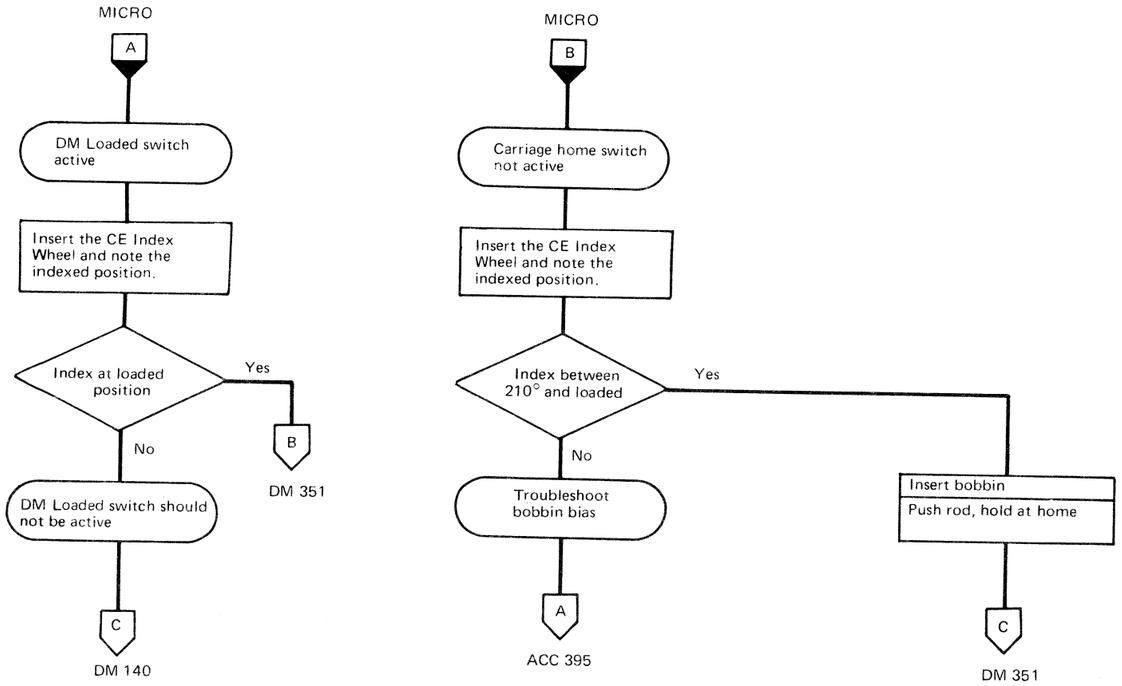
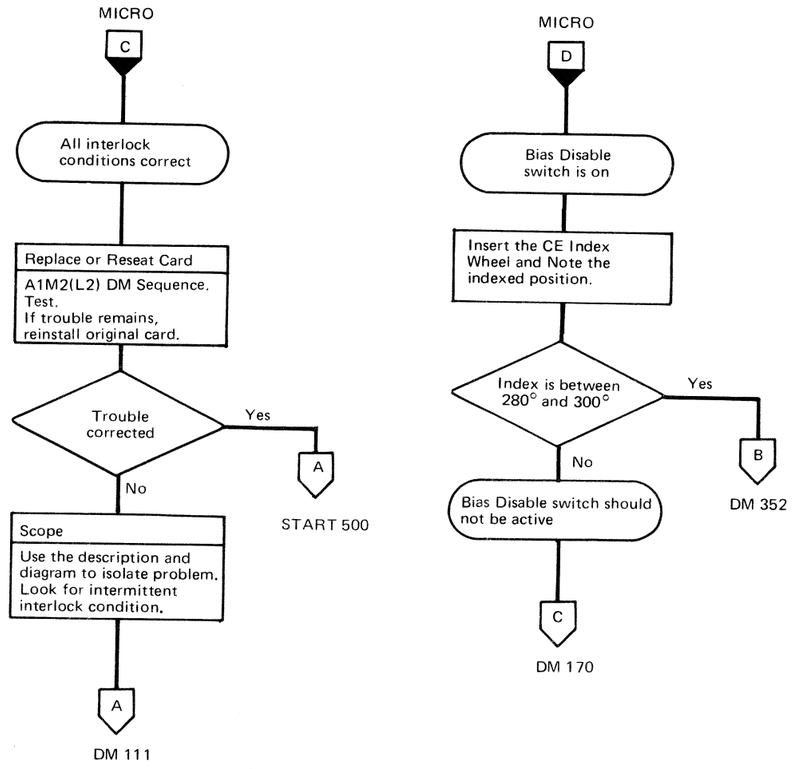
DM UNLOAD – SEQUENCE ERROR IN STATE 0

For data module unload theory, refer to DM 354.





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DM SEQUENCE ERROR IN STATE 0

For theory, refer to DM 354

MICRO

A

DM Unloaded switch and Loaded switch both not active.

Cover locked interlocks DM load motor.

Cover Locked lamp on

The data module should have been in the fully retracted position and the cover unlocked.

Insert CE index hand wheel

Index at unloaded position

No

Yes

A

DM 130

DM 340
DM 350

B

DM sequence error in Unload operation.

Micro display Byte 4 Bit 2 on

No

B

DM 120

Yes

DM 350

C

CAUTION
CE Reset may be pressed more than once. However, an intermittent problem may disappear as a result of multiple retries.

Press CE Reset button and determine ANY or ALL of the following conditions by gently feeling the knurled knob on the end of the DM load/unload motor shaft. Check the items below during the 10-15 seconds of timeout.

1. Motor does not turn. (CCW/CW)
2. Motor does turn. (CCW/CW)
3. Motor turns, but quickly stalls. (CCW/CW)
4. Motor turns in the reverse direction after stalling and timing out in step 3 above.
5. Motor turns CCW, but DM does not unload.

Data module unloads

No

Yes

2

Motor stalls

Yes Items 3,4

Item 5

No (it spins)

A

DM 352

Remove data module – Insert CE Index Wheel. Hold carriage in home position with bobbin pushrod if necessary and hand-crank data module out.

The data module load motor is not driving the main camshaft. Check that the motor gear is seated in the main cam gear. Repair or replace (see DM 830) as required. After the problem is corrected, go to START 500.

Motor turns

Item 1

No

Item 2

Yes

First direction CW

Yes

No

Direction CCW

1

Yes

A

ACC 395

Suspect bobbin bias problem

DM 730
LOC 6

Open cover – remove data module. Hand-cycle machine 295° until Bias Disable switch transfers.

DM 171

Scope or Probe

Ch 1 TP 2
A1T4(S4)D13
(+ Bias Disable)

At + MST level

Yes

No

A

DM 170

2

Replace or Reseat Card

A1M2(L2)
Test. If trouble remains, reinstall original card.

Trouble corrected

Yes

A

START 500

No

LOC 2
LOC 6
DM 345

Possible Causes

1. A1V4(U4) connector
2. P207, P208 (P209) connector.
3. A1T4(S4).
4. K256 (K257) (Scope pick to K256 (K257) DM 355).
5. Voltage jumper, A1T5B05 (S5B05), see YA 090.

(correct level)

Yes

At + MST level

No

Replace or Reseat Cards

In the sequence listed:

1. A1M2(L2)
2. A1T4(S4)

Test after each. If trouble remains, reinstall original card.

Do not turn power off. Remove ac box cover.

Push CE reset – DM sequencer attempts to drive the load motor for 10 seconds.

LOC 2

K256(K257) picked for 10 seconds (view armature position)

Yes

DM 345

No

Scope or Probe

Ch 1
A1T4(S4)J13
(+ DM Motor Power)

Push CE Reset

1

Push CE Reset

LOC 2

Check

If K252(K253) is picked, the motor attempts to turn in wrong direction (clockwise movement as viewed from knurled knob end of shaft).

LOC 2

K252(K253) picked (view armature position)

No

(correct condition)

Yes

Replace or Reseat Cards

In the sequence listed:

1. A1M2(L2)
2. A1T4(S4)

Test after each. If trouble remains, reinstall original card.

Scope load motor start circuit. CCW winding should be active.

DM 354

LOC 2
LOC 6

Possible Causes

1. K252-1(K253-1).
2. K256-1(K257-1).
3. P201(P203) connector.
4. DM Load motor.
5. P207, P208 (P209 connector.

Yes

Trouble corrected

No

Maintenance procedure complete

A

START 500

DM 354

Scope

Use the description and diagram on DM 354 to isolate the problem. Exit to START 500 when problem is corrected.

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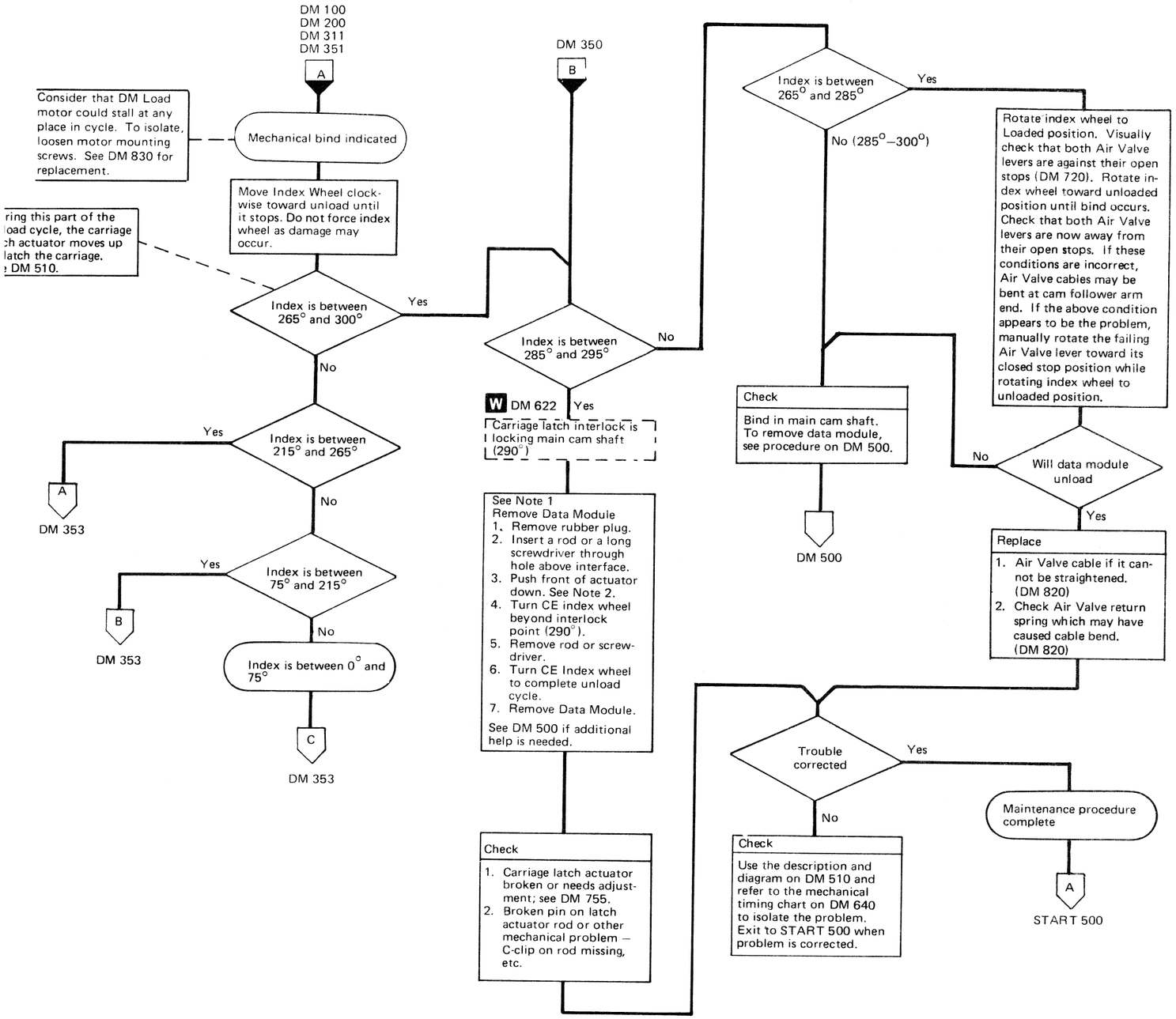
M SEQUENCE ERROR IN STATE 0

r theory, refer to DM 354.



Note 1: Insert the bobbin push rod and ensure that bobbin is at the home position. If the Index wheel can now be turned to the unloaded position, remove the data module or troubleshoot as a load problem.

Note 2: If this procedure does not allow the index wheel to turn past the interlock, turn the index to the loaded position. Manually uncouple the bobbin using a screwdriver through the hole in the air interface. Turn bobbin shaft 180° and pull bobbin back into the VCM with the bobbin push rod. Remove the VCM; see DM 845 steps 3 and 5 through 10 (this takes about 5 minutes). The carriage interlock can now be overcome by pushing up on the interlock arm from under the shield plate. See DM 622 for a drawing of the interlock. Turn the index wheel to the unloaded position.

DH0254	2747230
Seq. 2 of 2	Part No. ( )

See	440218	440223				
EC History	5 Aug 74	14 Mar 75				

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DM SEQUENCE ERROR IN STATE 0

For State theory, refer to DM 650, DM 655, and DM 206.

During this portion of the cycle the bobbin is uncoupled. The drive shaft is raised and the plastic fingers capture the bobbin. The rack starts back, causing the coupler shaft to rotate 180°. This turns the cross-pin to a 45° angle. The carriage is now free to move away from the bobbin. See DM 520.

DM 352 A

Index is between 215° and 265°

DM 520

Check

Coupling drive rotation adjustment; see DM 765.
1. Turn CE index wheel to 290°. See Note 2.
2. Remove rubber plug from top of air interface.
3. Insert screwdriver in hole, turn bobbin coupling counter-clockwise.
4. Use bobbin pushrod to pull bobbin away from carriage. Unload DM by hand cycle.

Repair or replace as required.

Data module unloads

Yes

After checking the coupling drive rotation adjustment, ensure that the bobbin is captured when finished. See Bobbin Captured Procedure on DM 201.

1

Trouble corrected

Yes

Maintenance procedure complete

A

START 500

No

DM 510
DM 640

Use description beginning on DM 510 and mechanical timing chart on DM 640 to isolate problem

DM 510

No (See Note 2)

DM 510

The problem is:
1. Bind in rack-and-pinion.
2. Bind in main cam.

To determine problems, the data module must be removed. Exit to DM 500.

A

DM 500

During this portion of the unload cycle, the data module is retracted toward the unloaded position as the load cart moves backward. See DM 520.

DM 352 B

Index is between 75° and 215°

Index is between 75° and 130° See DM 501, Note 2.

Yes

No (130°–215°)

DM 520

Check

See if bobbin is still coupled to carriage.
If bobbin is coupled:
1. Turn Index wheel to 300°. See Note 2
2. Remove rubber plug from air interface.
3. Insert bobbin pushrod and push bobbin in.
4. Insert a screwdriver and turn coupler counterclockwise 180°.
5. Pull bobbin away from carriage.

Repair or replace as required.

Bobbin still coupled

No

Yes

The bobbin coupling arm is broken or jammed in carriage.

A

DM 847

Check

Unload data module with Index wheel and remove shroud, DM 705. Hand-cycle machine and check for problem in rack-and-pinion and rack-cam-follower area. (Rack should start moving at approximately 215° of the load cycle.) See DM 840 for rack removal. Repair or replace as required.

Capture Bobbin
1. Hand-cycle machine to fully loaded position (approximately 310° to 320°).
2. Push bobbin to home position.
3. *WARNING: Crosspin must be in a horizontal position. If it is not horizontal, insert screwdriver in air interface hole and turn coupler 180° clockwise.*
4. With bobbin in home position, hand-cycle machine to fully unloaded position, approximately 340° to 350°.
5. Check that crosspin is at a 45° angle.

DM 510
DM 520

Check Mechanics

1. Hand-cycle machine with a data module.
2. Cycle several times under power.

When satisfied that problem is corrected, exit to START 500.

Check

1. Remove trim plate from frame in front of shroud.
2. Hand-cycle machine to 215°.
3. Observe position of idlers (see Figure 1).
4. Hand-cycle machine towards 0°. Idlers should start to move at approximately 200°. If they do not move, push them out with a screwdriver while continuing the hand-unload.

Data module unloads

No

Yes

DM 705

Check

Remove shroud and check for problem in idler arm gears or return spring. (See Figure 1.)

Cam shaft or cam follower jammed; load cart bind.

A

DM 500

During this part of the cycle, the door linkage assembly closes the door in the data module and the load cart releases the data module.

DM 352 C

Index is between 0° and 75°

Open cover and remove data module. Close data module door.

Check

1. Bind in door linkage mechanism (DM 860).
2. Load cart bind; see DM 860 for removal. Check for loose shafts, pins, or foreign objects in this area.
3. Main cam shaft bind (DM 855).

1

Note 1: When loaded, both idler arms must be heald away from belt or a screeching noise results.

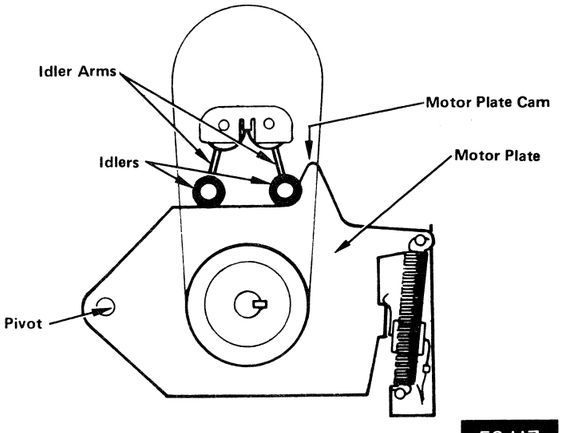
During an unload cycle the idler return spring must move the idler arms out to the side as the data module retracts or the shroud jamps against the idlers at approximately 120°.

Note 2: If the CE index wheel cannot be turned to 300°, remove the crank link (from the rear of machine). Pull crank upward allowing the drive shaft to clear the bobbin. Turn the CE index wheel to position indicated.

Figure 1

Position of Idlers with Data Module Fully Loaded

Refer to the checkout procedure on DM 430. See Note 1.



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DM 354

50 HZ

DM SEQUENCE ERROR IN STATE 0

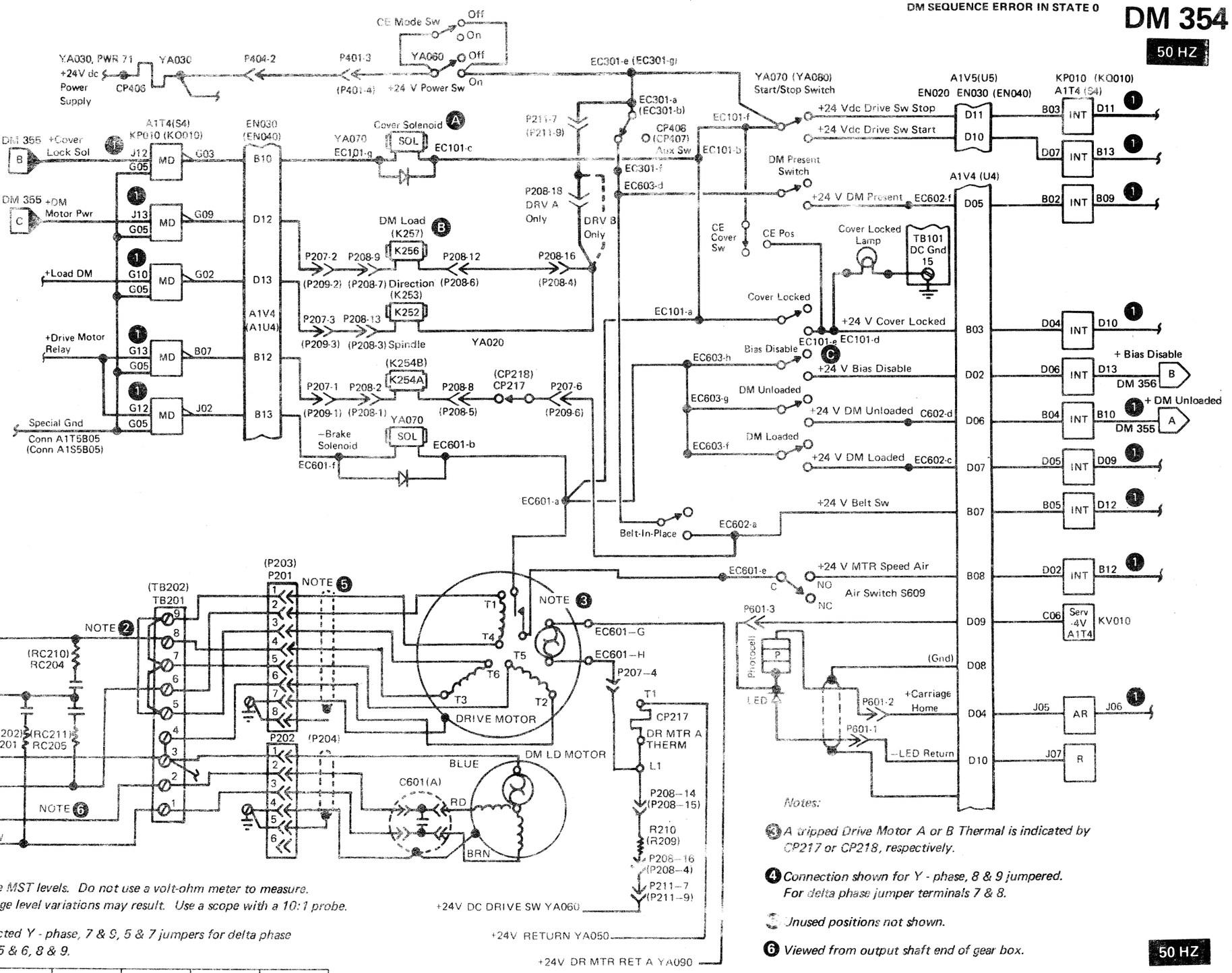
(Mechanical Timing Chart DM 640)

Advance from State 4 with Check Latch on or from State 1 with Check Latch on to State 0.

1. CE or Check Reset resets latch 1 and latch 4 which puts the decoder in state 0 (D). (DM 355)
2. The DM motor latch (E) sets. (DM 355)
3. The 10-second timer starts (C). (DM Motor Latch is on.) (DM 356)
4. Relay K256 (K257) (D) picks to turn the Data Module load motor in unload direction. (DM motor power is on.)
5. DM sequence error occurs when the check latch (E) (DM 356) sets if the DM unloaded switch does not make within 10 seconds. (The 10 sec timer latch reset.) The Stop Recycle Latch sets (DM 356).
6. The cover solenoid (F) deenergizes when the DM unloaded switch makes.

The Data Module motor drives the mechanism to uncouple the bobbin, then retracts the data module back to the unload position.

Bobbin Bias is applied during Unload except during the time the Bias Disable switch (G) is made to allow carriage to latch.



Notes:

1. *Voltages at these pins are MST levels. Do not use a volt-ohm meter to measure. Signal distortion or voltage level variations may result. Use a scope with a 10:1 probe.*
2. *Motors are shown connected Y - phase, 7 & 9, 5 & 7 jumpers for delta phase jumper terminals 4 & 7, 5 & 6, 8 & 9.*
3. *A tripped Drive Motor A or B Thermal is indicated by CP217 or CP218, respectively.*
4. *Connection shown for Y - phase, 8 & 9 jumpered. For delta phase jumper terminals 7 & 8.*
5. *Unused positions not shown.*
6. *Viewed from output shaft end of gear box.*

DH0258	2747890
Seq. 2 of 2	Part No. (7)

440214	440223	440228	440241			
17 Jun 74	14 Mar 75	29 Oct 76	30 Oct 78			

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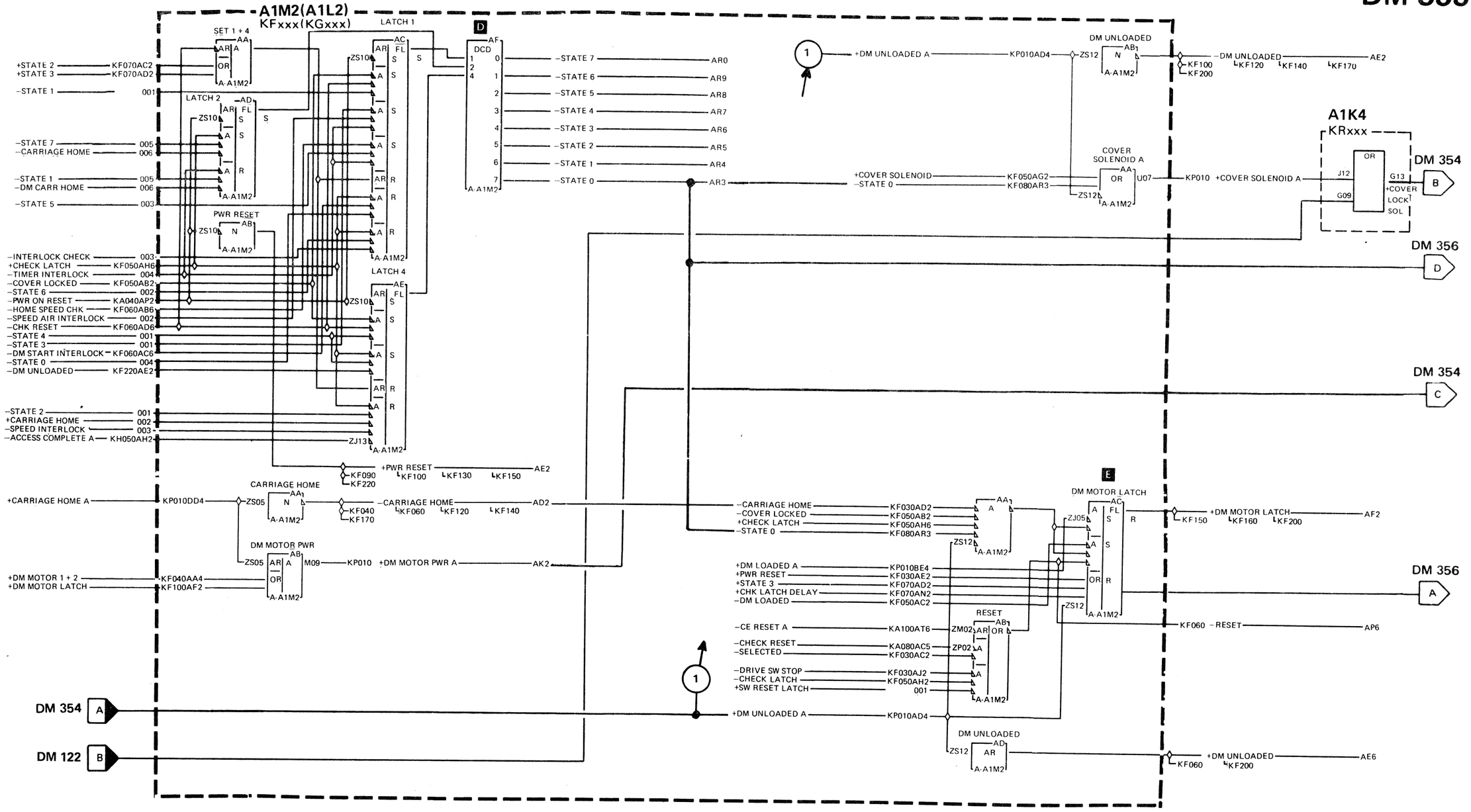
DM SEQUENCE ERROR – STATE 0

DM 355



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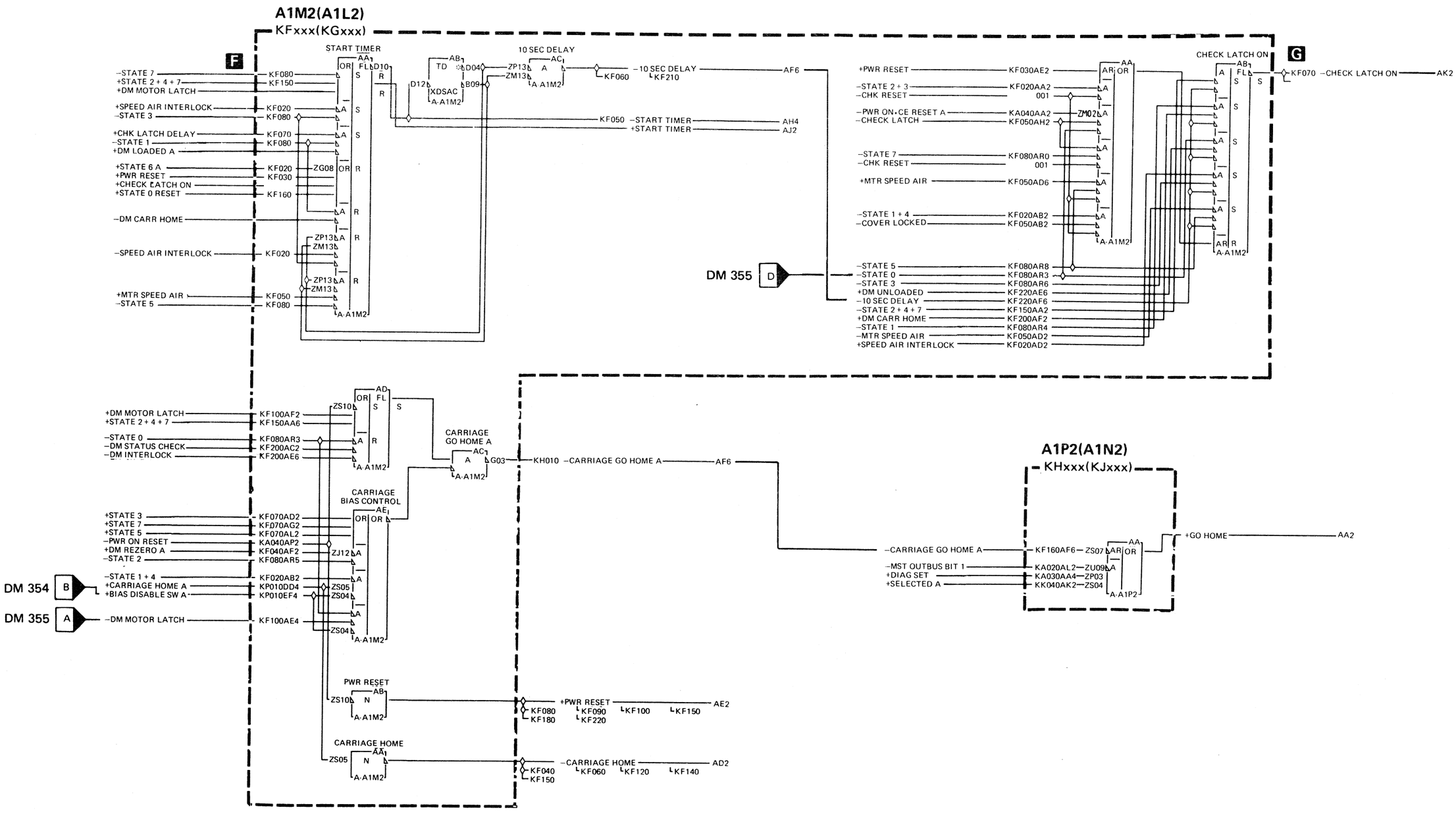

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LOAD CHECKOUT

STATIC CHECK

Purpose

The following procedure is a manual method for verifying proper operation of the data module load mechanism. Any difference from the described operation is a possible source of DM load failure.

If parts replacement or adjustment is required, refer to DM 690 for the location of the appropriate removal or adjustment procedure.

Preparation

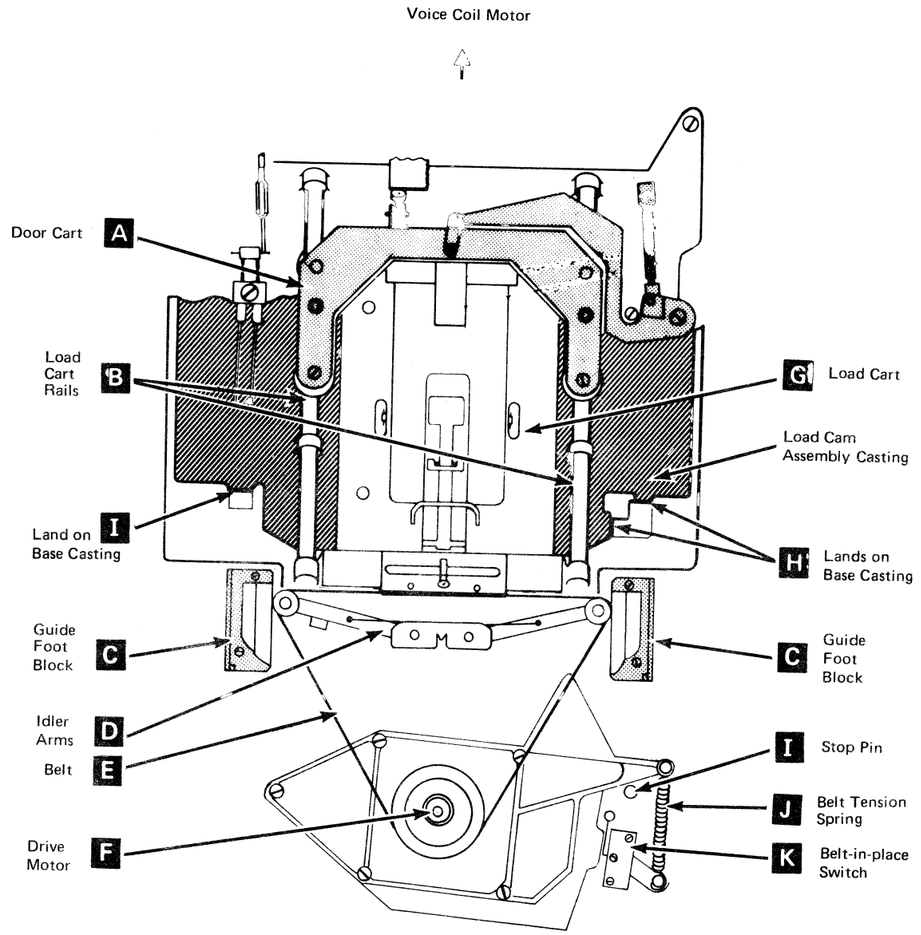
1. Remove the DM from the drive. See DM500 for the removal procedure if the DM is stuck in the drive.
2. Set the drive to CE Mode.
3. Turn off the +24 V switch for the respective drive. This removes voltage from the drive DM load area.
4. Remove the shroud and lower appearance panel (DM705).
5. Insert the CE Index Wheel; (DM700).
6. Return the mechanism to the unloaded position (355°). If unable to do so, go to the Unload Checkout Procedure on DM510.

Procedure

Verify that the following items are correct.

- The door cart **A** is positioned toward the VCM. Normal linkage tolerance allows about 3/16 inch movement of the door cart. If linkage slop is excessive, suspect loose or worn cam follower bearings.
- The load cart **G** is positioned toward the front of the machine. Normal linkage tolerance permits only about 1/16 inch movement of the load cart. If excessive movement is noted, suspect the following:
  - Loose or worn cam follower bearings and associated linkage (DM621 **D**).
  - Loose, scored, or damaged load cart rails **B**
- Load cam casting is registered on lands on the base casting **H**. If re-registration is required, the following adjustments must be checked and corrected (if required) in this sequence:
  - Load Beam (DM785)
  - Door Pin (DM790)
  - Bobbin height (DM770)
  - Crank assembly (DM775)
  - Coupling driver rotation (DM765)
- Guide feet blocks **C** are tight and not chipped or broken.
- Drive motor **F** is retracted to the stop pin **I** by the belt tension spring **J**.
- Belt-in-place micro switch **K** is not operated at this time. See DM735 for switch adjustment.
- Belt **E** is in position as shown (smoothside toward the pully surface), and the belt idler arms **D** are holding the belt in the expanded position. The idler arm gears are meshed. Check for damaged gear teeth (DM430).

(Continued on DM401).



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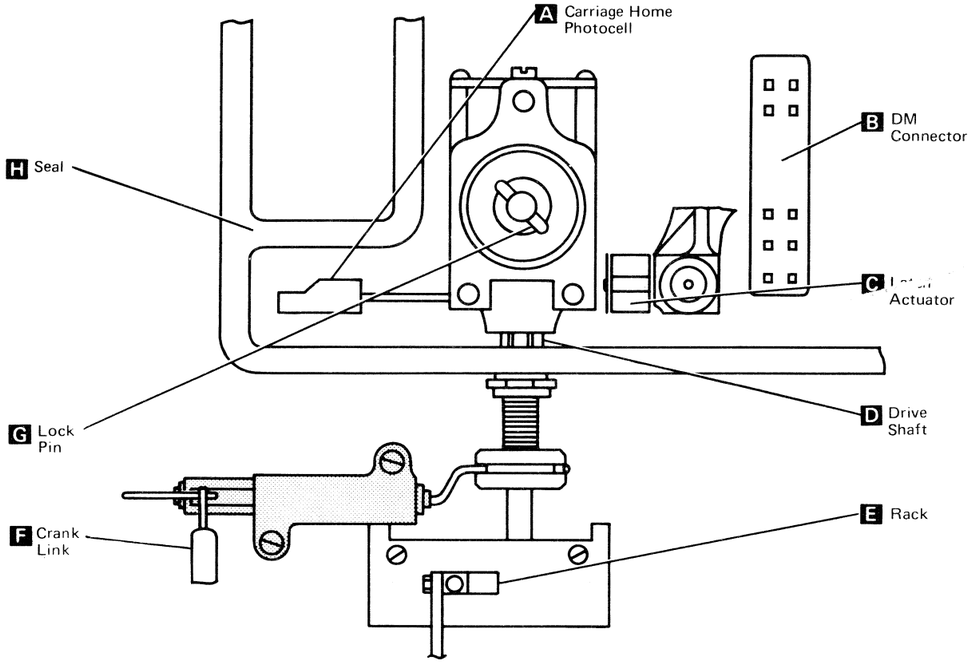
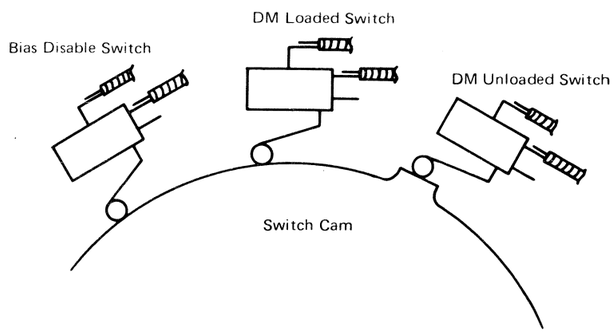
LOAD CHECKOUT (Con't)

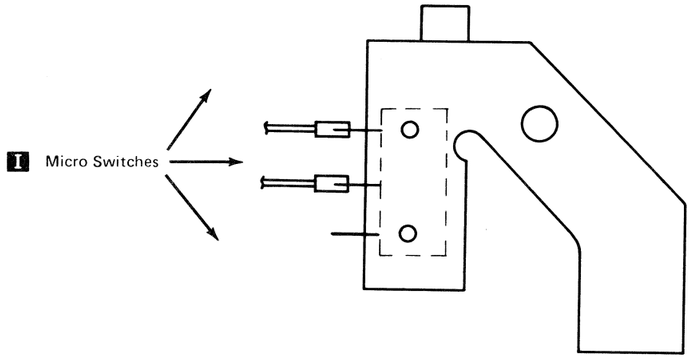
- The coupler drive shaft and nylon support fingers are engaged in the bobbin **D**. See DM 622 for coupling mechanism details.
- The coupling lock pin **G** is 45° from the horizontal. If pin position is incorrect, perform the Bobbin Capture procedure on DM 201. If pin is still incorrect, bobbin coupling is probably damaged. See replacement procedure on DM 847.
- The coupler drive shaft rack **E** is pulled toward the front of the machine. Check that there is no looseness between the rack and the adjustment link.
- The carriage latch actuator **C** is in the lowered (non-operated) position, but can be manually raised against spring tension. See DM755.
- The DM connector **B** pins are not damaged and the cable is firmly plugged into the rear of the connector.
- The crank linkage **F** is intact.
- The carriage home photo cell **A** is tight on the shield plate and the cable connector is in place.
- The plastic air interface is secure, that it is not cracked or broken, and the rubber seal **H** is intact.
- The wires on the microswitch **I** terminals are not loose.
- The load area has no loose, missing or worn parts.

(Continued on DM410)

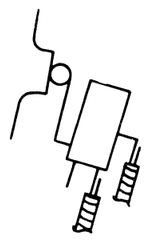




DM Present Switch



Belt-in-Place Switch



DH0262	2747232	440200	440202	440203	440205	440223	440224	440227
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LOAD CHECKOUT (Con't)

DYNAMIC CHECK

With the data module removed, use the knurled knob on the load motor or CE Index Wheel (DM700) to turn the drive through a load cycle.

Note: There is a large gear ratio between the load motor and the camshaft. The load motor should turn easily. Even if the camshaft is locked for any reason, the load motor turns easily until it becomes wound up; it will roll back the opposite way when released.

Follow the timing sequence below as the load cycle progresses. Timings are approximate.

INDEX DESCRIPTION

355° Unloaded position.

0° The load cart **A** begins to move toward the Voice Coil Motor (VCM). The linkage that moves the load cart (which carries the DM to the loaded position) is shown on DM 621. A schematic diagram of the linkage is illustrated on the right **G**.

10° The bail **C** begins to close. Bail operation depends on load cart motion and a stationary cam (DM 621).

20° The bail **C** is now closed to within 5/16 inch of the load beam screw **D**. If the data module were present, DM capture stud would be captured between the load beam screw and the bail. Check load beam adjustment (DM 785).

The door cart **B** begins to move away from the VCM. The DM door would be opening if a DM were mounted. The door cart should roll easily. The rollers should not be chipped, broken, or binding. Jams between 20 degrees and 90 degrees usually are associated with DM door opening problems. A sticky DM door, a door failing to unlatch, or a binding cart are possible causes of trouble.

90° The door cart is fully operated. See mechanism at 90° illustration at right. Check door pin adjustment (DM 790).

The load cart **A** begins more rapid movement toward the VCM. The door cart and load cart move together. Load cart movement continues to 210°.

The data module, if it were mounted, would be moved toward the VCM. The shroud moved toward the VCM. Any mechanical interference with the movement of the DM or the shroud could be a source of trouble.

110° The alignment ball **F** would enter the cone on the DM. (Severe misalignment could cause the ball and DM cone to crash together stalling the load motor).

125° The ball would be in the alignment cone if a DM were mounted; alignment would be positive from this point on.

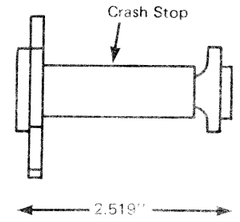
The self-aligning DM electrical connector would begin mating at this time. Foreign material or cracked or broken mounting could cause failure to seat properly or failure to couple.

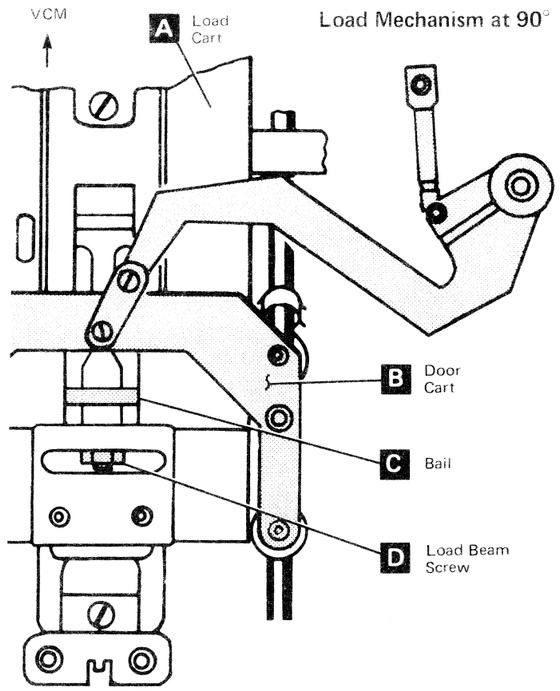
150° The DM carriage latch pin would enter the carriage latch actuator **E**. Severe maladjustment of the carriage latch actuator height could cause jamming of the load mechanism or premature unlatching of the carriage. (Adjustment of carriage latch actuator can be found on DM755.)

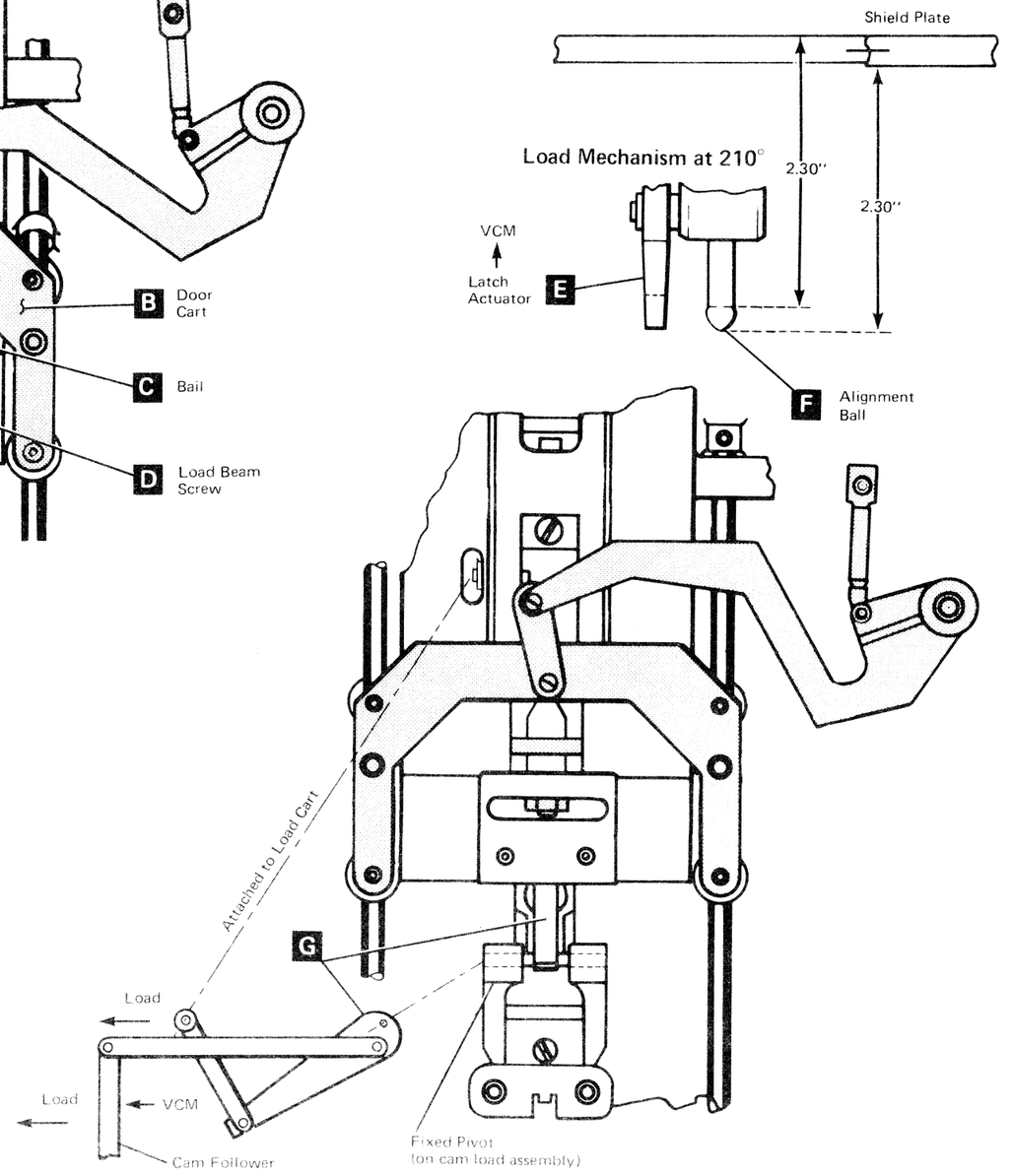
170° At this time, the air interface would seal to the DM.

210° The load cart movement is now completed. The load cart toggle link **G** is almost straight. If the data module, were present, it would be held firmly against the alignment ball.

(Continued on DM420).







DH0262	2747232	440200	440202	440203	440205	440223	440224	440227
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LOAD CHECKOUT (Continued)

220° The coupler shaft rack **F** begins to move toward the VCM to rotate the coupler shaft. See DM 622 for details of this mechanism.

Note: The mechanism gets noticeably more difficult to turn at this point due to the coupler mechanism in the bobbin.

230° The coupler cross pin **D** on the bobbin turns to horizontal at about 230°. The coupler shaft **E** continues to rotate (total rotation of 180°). The coupler cross pin would lock the DM carriage to the bobbin against the three alignment pads **C**. Check bobbin height adjustment (DM 770).

260° The coupler shaft **E** now begins to lower under control of the crank linkage **A**, **G**. It lowers until the spool **J** is near the surface of the guide block **K**. Adjustment of crank linkage is shown on DM 775. Check correct assembly of spool (DM 840).

275° The nylon guide **B** around the coupler shaft **E** begins to lower along with the coupler shaft. As the nylon guide **H** lowers, it frees the bobbin to move.

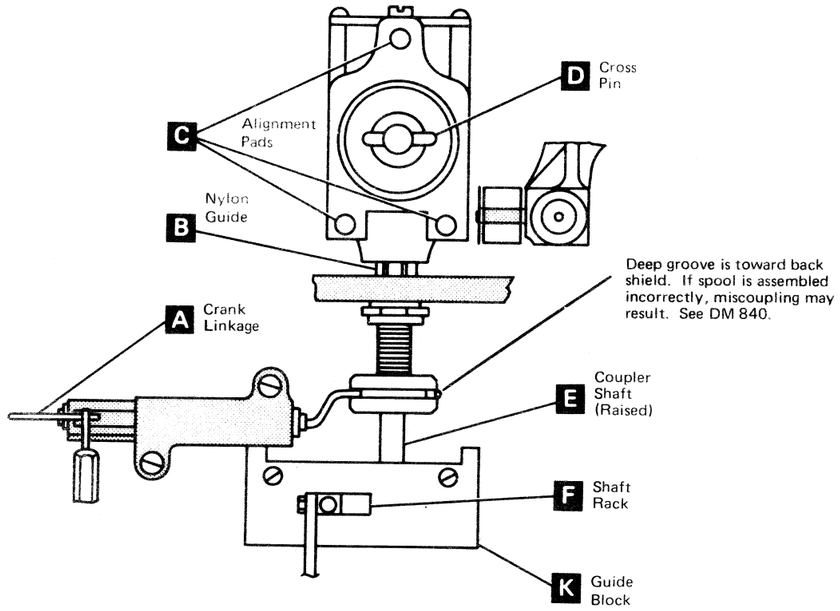
290° The coupler shaft **L** is at the bottom of its travel.

The carriage latch actuator **I** outer end begins to raise. This would unlatch the DM carriage if DM were present, so that the carriage and bobbin (coupled together) would be free to move under control of the servo circuits.

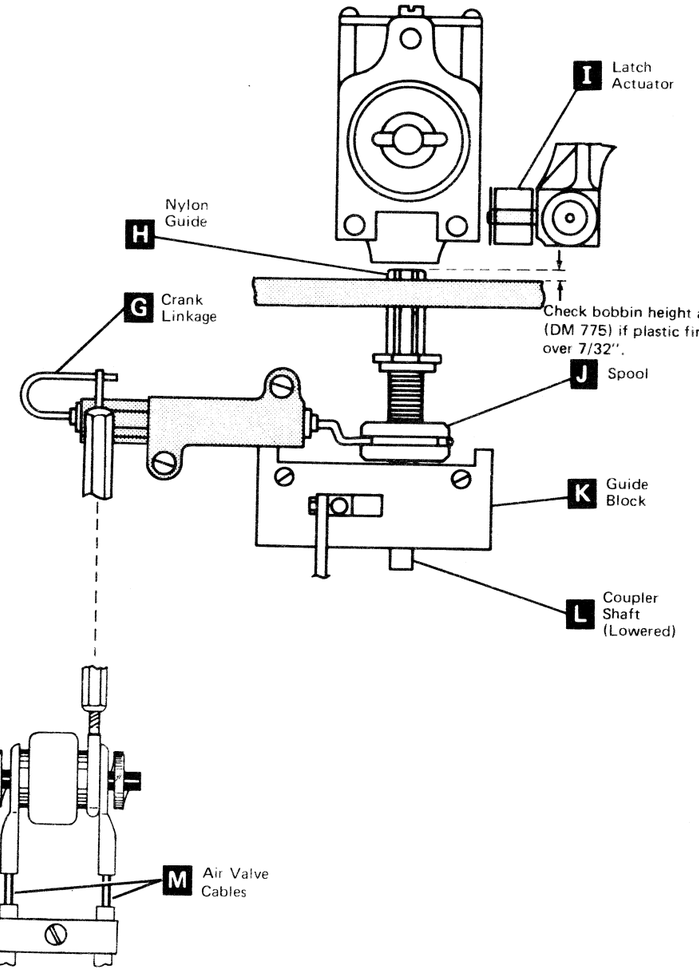
305° Carriage latch actuator completes upward travel. Check adjustment on DM 755.

315° Fully loaded position. The air valve cables **M** are fully extended and the air valves fully operated. (See DM720 to check air valve operation).
(Continue with DM 430.)

Coupling Assembly at 260°



Coupling Assembly at 315°



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LOAD CHECKOUT (Continued)

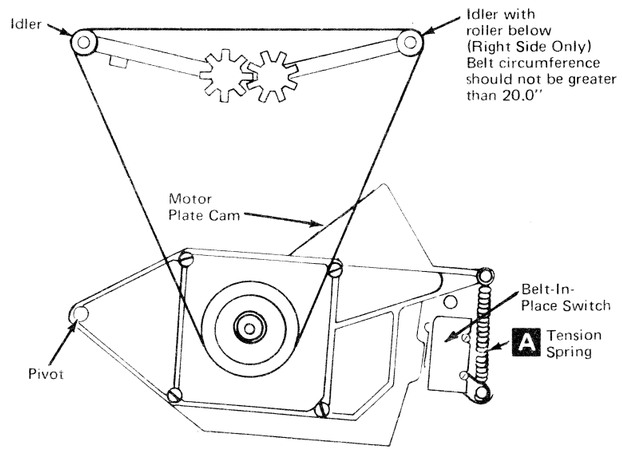
DATA MODULE DRIVE MOTOR AND BELT CHECKOUT

Check the operation of the belt, motor mount, motor break, idlers, and the belt-in-place switch by pressing on belt where the DM pully would press.

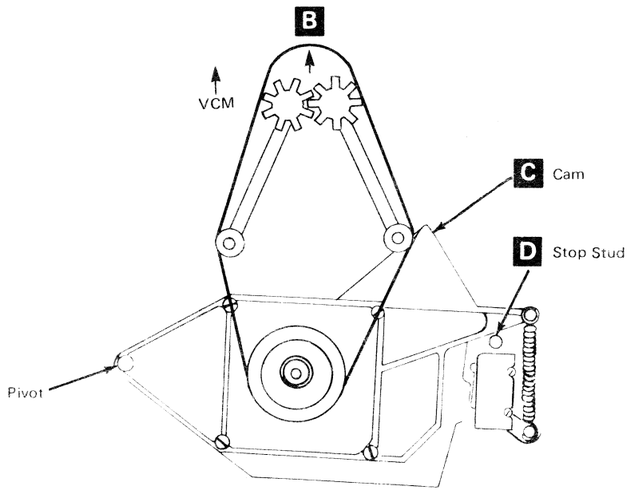
Procedure

1. Turn off +24 V switch and remove shroud (DM705).
2. Turn camshaft to fully loaded position (315°). Remove tension spring **A** .
3. Push belt at point **B** toward VCM while observing the idlers moving toward each other. The idlers should turn freely or binds can occur during loading.
4. Push belt further toward the VCM. Check that the motor plate rotates counterclockwise to move away from the stop stud **C** and would stretch the tension spring if it were connected. At this time, the roller on the bottom of the right idler arm contacts the motor plate cam **C** which takes over positioning of belt idlers. The idlers are not designed for high speed and must not contact the belt while the motor is turning.
5. Apply additional pressure on belt toward VCM. Belt-in-place switch will operate **E** (Adj. DM735). Release belt gradually while replacing tension spring. Motor plate and idler should return to initial positions.
6. Check for brake action with motor brake on (de-energized). (Brake adjustment is shown on DM715).
7. Check proper position of idlers, belt, and motor plate. (Smooth side of belt should be toward pulley.)
8. If trouble is not found, exit to DM 600, Entry A.
9. Return drive to unloaded position and complete Common Exit Procedure shown on DM 705.

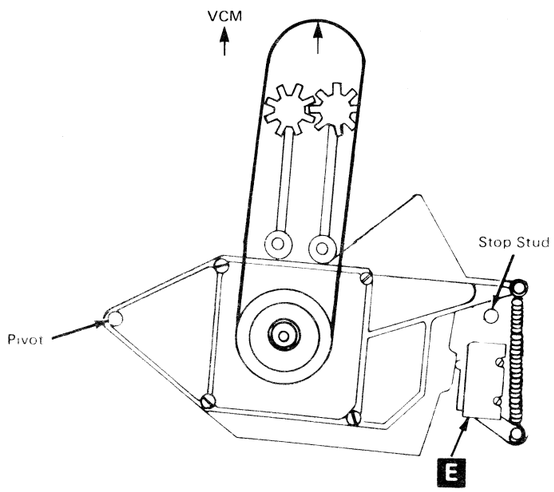
Idlers Full Width (Unloaded)



Idlers Moved In



Belt-In-Place Switch Made



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STUCK DM RETRIEVAL PROCEDURE

DM 352
DM 353

A

CAUTION: Do not use this procedure unless referenced to this page from some other MLM page. Always begin action from START 100. Failure to analyze cause of malfunction may cause excessive work or damage may result if previous procedures are not followed.

If the data module fails to unload and turn off cover locked lamp after the Start/Stop switch is turned off, perform the following sequence of steps until the DM is removed from the drive.
1. Set Start/Stop switch to Stop.
2. Set respective drive to CE mode and activate CE reset.
3. Insert bobbin push rod (P/N 2745734) into the VCM, push the carriage to the home position (inner stop).

Use depth marks on push rod to determine

Carriage moves to home — Yes

No

Turn off 36 volt power CP 408 (CP 407).

Carriage goes home — Yes

No

Bobbin may be jammed in VCM or against drive shaft.

A. Rotate the camshaft to the fully loaded position (315°).
B. Remove the rubber plug or air tubing A from the top of the air interface, insert a screwdriver through the hole and rotate the bobbin coupling shaft 180° counterclockwise. Push the bobbin in to move carriage home.
C. Using the bobbin push rod, pull the bobbin away from the spindle.

Activate CE reset.

Yes — Data module unloads.

No

1. Turn off 24 volt switch for respective drive.
2. Insert CE Index wheel (DM 700). Note indexed position.
3. Hand-cycle the data module to the unloaded position (355°).

Consider that DM load motor could stall at any place in cycle. To isolate, loosen motor mounting screws. See DM 830 for replacement.

Yes — Data module unloads.

No

1

Yes — Index between 355° (unloaded) and 90°.

No

1. Turn on 36 volt power if you turned it off.
2. Remove DM. DM can be lifted free of load mechanism between 355° (unloaded) and 90°.

DM 510

Bobbin can be uncoupled — Yes

No

If the bobbin cannot be uncoupled from the carriage, go to DM 847 and perform bobbin removal.

DM 847

Hand-cycle DM to the unloaded position.

Data module unloads. — No — 1

Yes

Suspect problems in bobbin or bobbin height adjustment (See DM 845 for Bobbin removal).

Exit to DM 510 to determine the cause of the hang-up at the noted index position.

DM 510

Index between 90° and 130°. — No

Yes

A

DM 501

Check
1. Remove the trim plate from frame in front of the shroud.
2. Hand-cycle machine to 215°.
3. Observe position of idlers (see figure 1).
4. Hand-cycle machine toward 0°. Idlers should start to move at approximately 200°. If they do not move, push them out with a screwdriver while continuing the hand unload.

Yes — Data module unloads

No

Index locked at 130° in unloaded direction and cannot be turned past 240° in loaded direction. — Yes

Cam shaft or cam follower jammed: load cart bind.

C

DM 501

B

DM 501

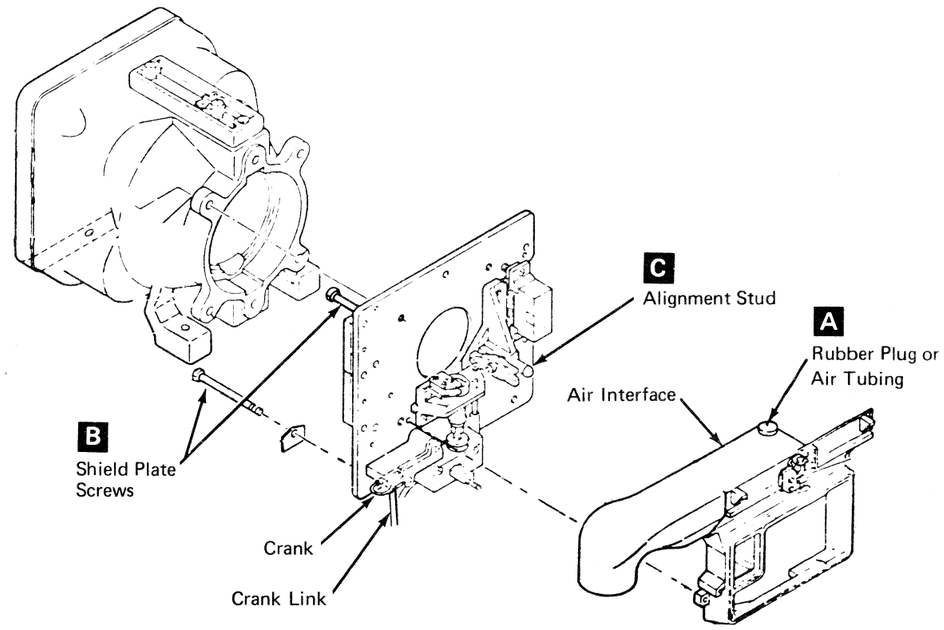
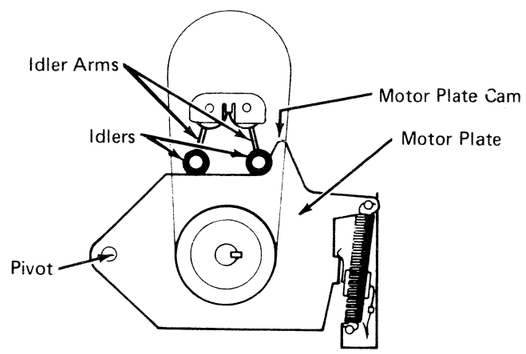


Figure 1

Position of idlers with data module fully loaded. Refer to the checkout procedure on DM 430.



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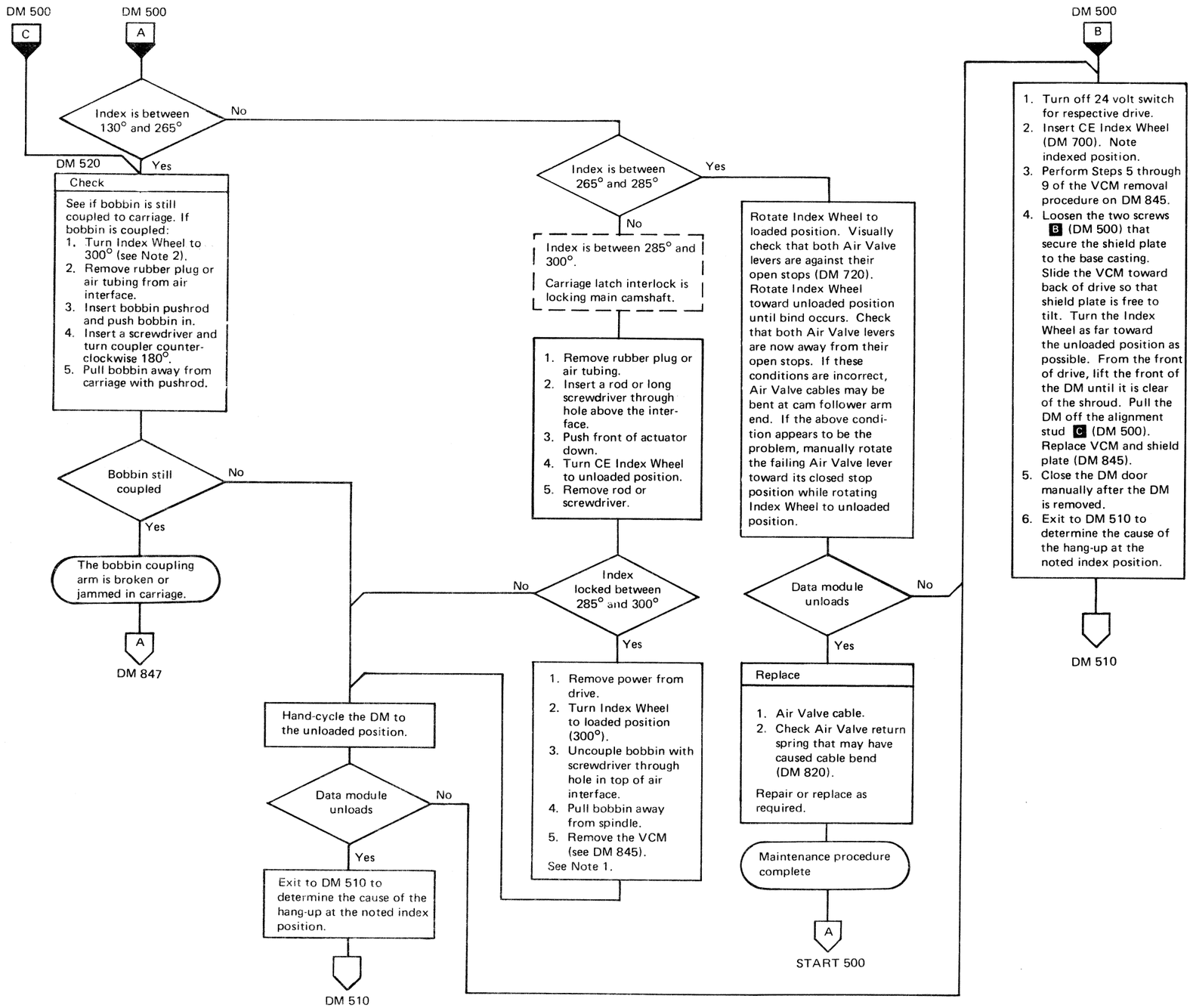
STUCK DM RETRIEVAL PROCEDURE

Note 1: With the VCM removed, problems can be determined by looking through the large hole in the VCM plate directly under the adjustment link. Push upward on interlock arm with finger under bottom of the shield directly under adjustment link. Turn the Index Wheel to the unloaded position. Resecure the shield plate to the VCM so that the shield plate aligns with the locating studs on the front of the VCM (see DM 835 for replacement procedure.

Note 2: The bobbin stud and drive shaft slot relationship may slip 90° if the drive shaft starts to turn because of incorrect rotation adjustment (see DM 353). The camshaft will stall between 130° and 215° because the bobbin shaft did not rotate 180°. The bobbin is still coupled. When the bobbin is pulled with the data module, the bobbin hits the inside front of the VCM

If the bobbin hits the VCM, the Index wheel cannot be rotated back to 300°. Pull the crank link toward the outside of the machine with pliers. Push the link off the crank with a screwdriver. The drive shaft now drops down. If necessary, pull the end of the crank upward, which forces the drive shaft further down until it clears the bobbin shaft and the Index Wheel can be turned to 300°.



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UNLOAD CHECKOUT

Purpose:

The following procedure is a manual method for verifying the data module unload mechanism. The mechanics used for unload operation are the reverse of the load mechanics; however for this procedure it is assumed that a failure exists on the drive which prevents normal unloading. Examine the drive according to the following sequence and look for any difference in the described operation as a possible source of failure.

If parts replacement or adjustment is required, refer to DM 690 for the location of the appropriate removal or adjustment procedure.

Prerequisites

For DM unload failures that occur before the unload motor is started, run micro routine AC (with drive in failing condition) to analyze failure status. If the micro error code is AC4X or AC9X proceed; otherwise refer to map entry for respective error code.

Preparation

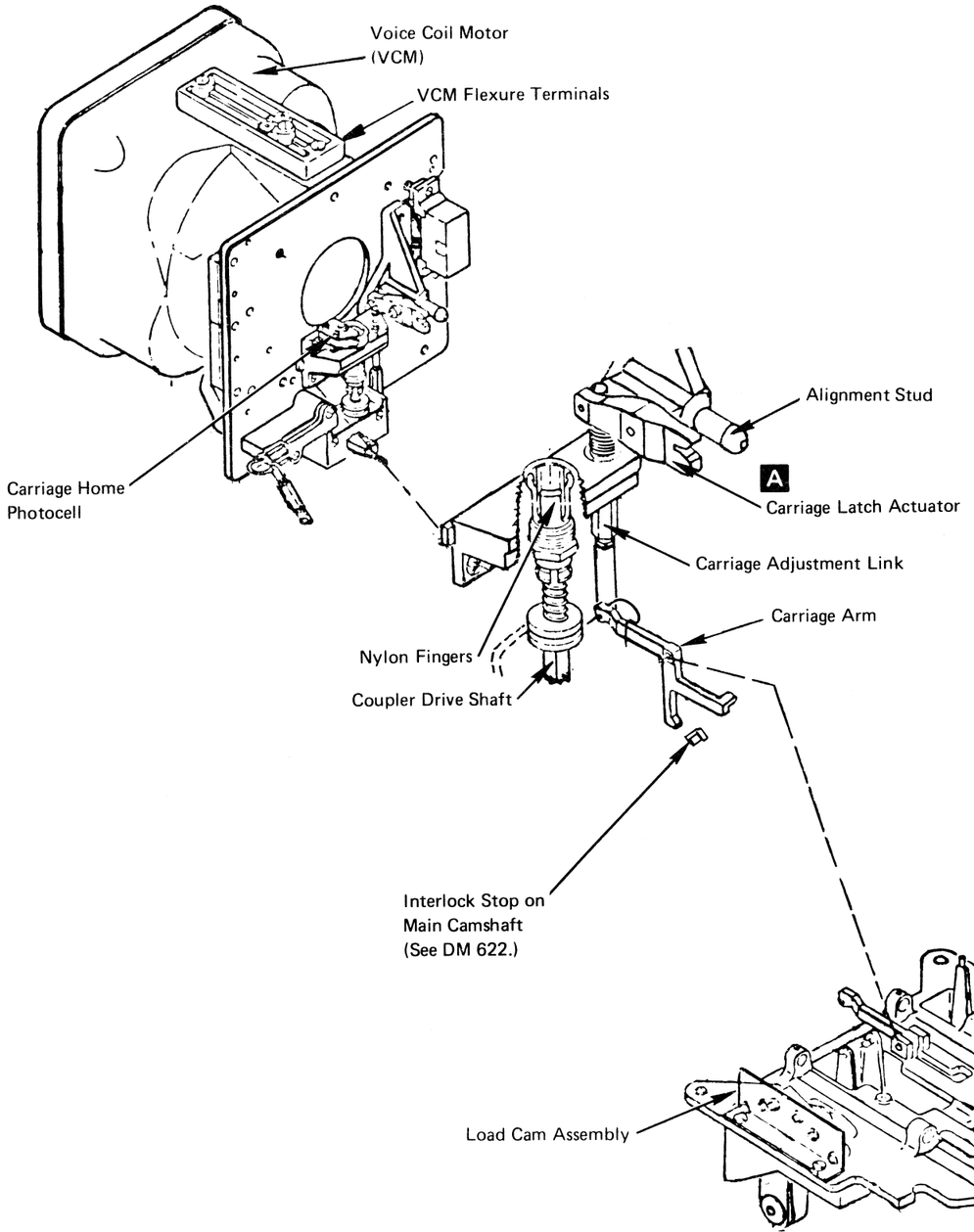
1. **Remove DM from drive. Refer to DM 352 Entry A if a mechanical bind occurs during an unload.**
2. **Ensure that shield plate is secured to the base plate and VCM is mounted.**
3. Set the drive to CE Mode and turn off **the +24 V** switch for the respective drive. This removes voltage from the DM load area on which work is to be performed.
4. **Remove the shroud and lower appearance** panel (DM 705).
5. **Insert the CE Index Wheel (DM 700).**
6. Return the mechanism to the loaded position (315°), note the Index of the mechanical bind point, and advance to that section of the following procedure.
7. Ensure that the bobbin is at the home position over the coupling shaft.

Procedure

Use the CE Index Wheel or the knurled knob on the load motor to turn the drive through the unload cycle. Follow the timing sequence below as the cycle progresses. Timings are approximate.

INDEX	DESCRIPTION
310° to 325°	Loaded position – **DM Loaded switch** closed.
304°	Carriage starts to latch. A bind prior to **this point is probably in either the** • DM load motor. See DM830 for the procedures to remove and verify. • Main Cam assembly. See DM855 for removal procedures.
293° to 304°	Carriage latch actuator **A** moves down to latch the carriage. Look for broken or missing parts in the latch mechanism **linkage. Problems in this area result in the main camshaft interlocking between 285° and 295°.**

(Continued on DM520)



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UNLOAD CHECKOUT

300° to 260° Air valves close. If binding occurs here, a bent air valve cable at the cam follower end may be the problem. See DM 720 for adjustment and DM 820 for removal procedures.

Coupler drive shaft **B** raises to engage with bobbin. Without the data module installed, the bobbin must be at home position or pulled clear of shaft. Disconnect coupler crank **D** to isolate binds. See DM 775 for adjustment and DM 840 for removal procedures.

265° to 215° Bobbin and carriage uncouple. The coupler drive shaft rack **C** starts to move backward (away from VCM) and the drive shaft **B** rotates 180°. The bobbin coupler shaft also rotates 180°, which rotates the coupling pin **A** clockwise 45° (from horizontal to diagonal.) If a failure has occurred during this phase, check the following:

- Drive shaft may have already been rotated 180° in uncoupled direction so that it cannot turn bobbin coupling any further in uncoupled direction. Turn CE Index Wheel to loaded position (315°) and perform Bobbin Capture Procedure on DM 201, except rotate the coupling *clockwise* 180°. Continue manual unload.
- Mechanical bind in rack assembly or cam assembly. Inspect visible parts for damage or foreign material. Isolate bind source by disconnecting rack assembly from cam follower (see DM 840, step 10).

200° Load cart **E** starts to pull the data module to the unloaded position with the coupler cross pin at 45°. Check that cross pin is not damaged and is at 45°. There should be no free rotation of pin. Problems in this area may be caused by a damaged bobbin coupling. See DM 847.

If the bobbin had to be manually uncoupled to remove the DM, a failure to uncouple (265° to 215°) prevents the DM from unloading.

180° Data module is moved off the alignment ball and off the alignment pads to come to rest on the shroud for support.

155° Drive motor belt tension is released, the belt idlers are not touching cam surface on the motor plate, and idlers support the belt.

If a failure occurs between 200° and 75°, check the following:

- Damaged belt idlers. See DM 815 for replacement procedure.
- Mechanical bind in load cart or cam assembly. Inspect visible parts for damage or foreign material. See DM 855 for removal instructions.

The data module, if it were mounted, would be moved toward the VCM. The shroud moved toward the VCM. Any mechanical interferences with the movement of the DM or the shroud could be a source of trouble.

90° The door cart begins to move toward the VCM. The DM door would be closing if a DM were mounted. The door cart should roll easily. The rollers should not be chipped, broken, or binding. Jams between 20 degrees and 90 degrees usually are associated with DM door closing problems. A sticky DM door or a binding cart are possible causes of trouble.

20° The door cart is fully operated.

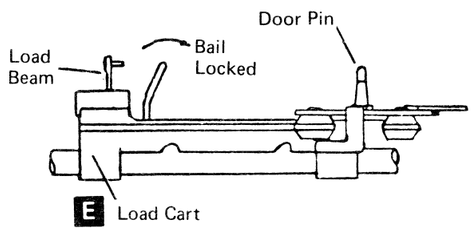
The bail begins to open. If the data module were present the capture stud would be released from between the load beam screw and the bail.

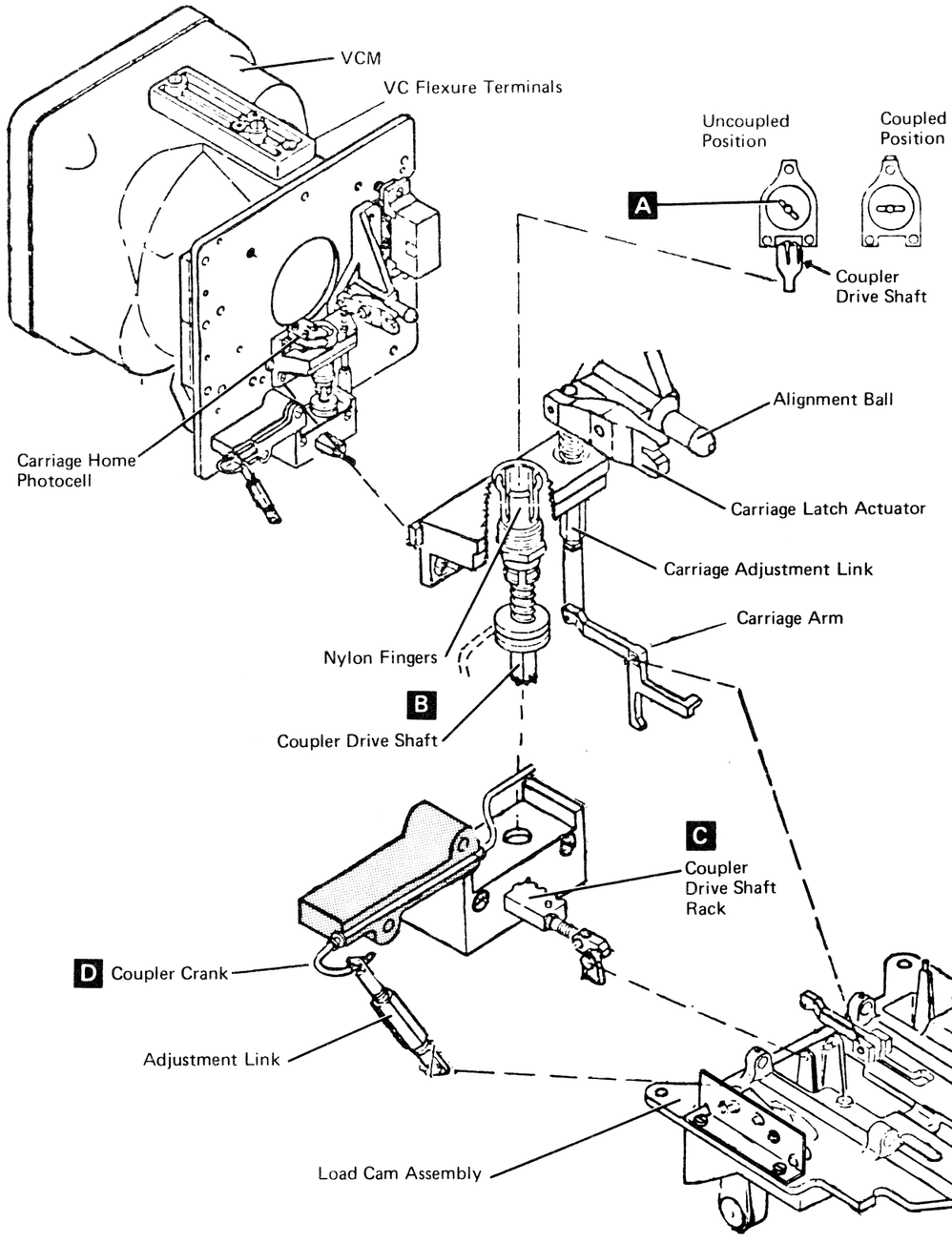
10° The bail is fully opened. Bail operation depends on load cart motion and a stationary cam.

355° Unloaded position.

If trouble is not found, exit to DM 600, Entry A.

VCM





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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

The following procedure is to be followed by CEs in the field to determine the ability of a questionable IBM 3348 Data Module to meet IBM standards.

DATA MODULE STATIC CHECKOUT PROCEDURE

The steps of this section may be done on a bench or desk where a detailed inspection is possible.

CAUTION: Perform inspection in as clean an environment as possible.

1. DATA MODULE COVER

Visually inspect the exterior of the data module for damage. Damage is considered minor if it is confined to areas of the covers that do not expose the heads, disks, or carriage to contamination. Check that the Read Only interlock is not broken. If it is broken, see DM 742 for the replacement procedure. Check that the internal rubber seal between the top and bottom covers of the data module is in place.

2. DOOR CLOSED

Check that the data module door is completely closed and cannot be opened without releasing the door latches. At least one latch must detent into place. If both of the latches fail to detent and hold the door closed, the data module door should be replaced (see DM 880 for procedure). If the door is slightly open but manually can be closed and latched properly, check the door pin closing adjustments on all 3340 drives where the module may have been used last.

3. LOOSE PIECES

Check for loose pieces in the data module by gently shaking it from side to side. DO NOT shake vertically as this may cause a loose piece to damage the servo surface. Turn the data module to a vertical position (door on top) and visually inspect for loose pieces inside the cover at the lowest point (front). If loose pieces are present, the data module must be replaced (see DM 570).

4. DATA MODULE CONNECTOR

Open the data module door and inspect the data module connector and connector pins for damage. Keep the disks horizontal as much as possible to minimize contamination. If the connector or connector pins are damaged, see DM 870 for connector replacement procedure.

5. AIR NOZZLE

Place data module right side up on a flat surface and check that the air nozzle (C) is securely positioned (see Figure 1). If it is loose, snap it into place. If the nozzle has made contact with the disks enough to generate particles, the data module should be replaced (see DM 570).

6. HEADS AND ARMS

Carefully inspect the head and arm positions. The arms should be closely centered between the disks, and all heads should be lying flat on the disks. If the arms and heads appear to be in their proper positions, verify that the carriage is latched in the home position by observing the latch lever (D) position (see Figure 1). If the heads and arms are not properly positioned, the data module must be replaced (see DM 570).

7. WAY STOP

Check the plastic carriage way stop (F) on the outer end of the carriage way (see Figure 1). Ensure that the horizontal tab on the top is not cracked, bent, or broken. If it is damaged, head and/or disk damage may have occurred. The data module should be replaced (see DM 570).

8. CARRIAGE BINDS

Unlatch the carriage latch lever (J) by lifting the lever with a finger and moving the carriage *slowly* from stop to stop (see Figure 1). It should move smoothly and freely. If binding or roughness is present, pay particular attention to Steps 9 through 14.

9. STOP PIN

Check the stop pin (E) on the underside of the carriage above the cylindrical way (see Figure 1). The pin should not touch the way and should extend far enough to contact the way stop when the carriage is moved through its full stroke. If the stop pin touches the cylindrical way, the way may be damaged and access errors may result. If the pin touches the cylindrical way or is bent or broken, the data module must be replaced (see DM 570).

10. ANTI-TILT BRACKET

Check the pin on the right side of the carriage under the anti-tilt bracket (G) (see Figure 1). The pin should not touch the anti-tilt bracket at any point in the carriage travel. A minimum clearance of 0.001" (0,025 mm) should exist between the pin and the anti-tilt bracket in the latched position. If the pin binds against the anti-tilt bracket, carriage latching problems or access errors may result and the data module should be replaced (see DM 570).

11. LATCH PINS

Check the carriage latch lever (D) (see Figure 1). Ensure that the latch pins (B) do not contact the carriage latch rail or the side of the carriage. Access errors may result if a pin touches the rail or carriage and the data module should be replaced (see DM 570).

12. LATCH LEVER SPRING

Check that the carriage latch lever return spring, just forward of the latch lever mounting block, is not interfering with the carriage movement. If the coil spring under the latch lever is not positioned vertically or the mounting block is not securely fastened, the data module should be replaced (see DM 570).

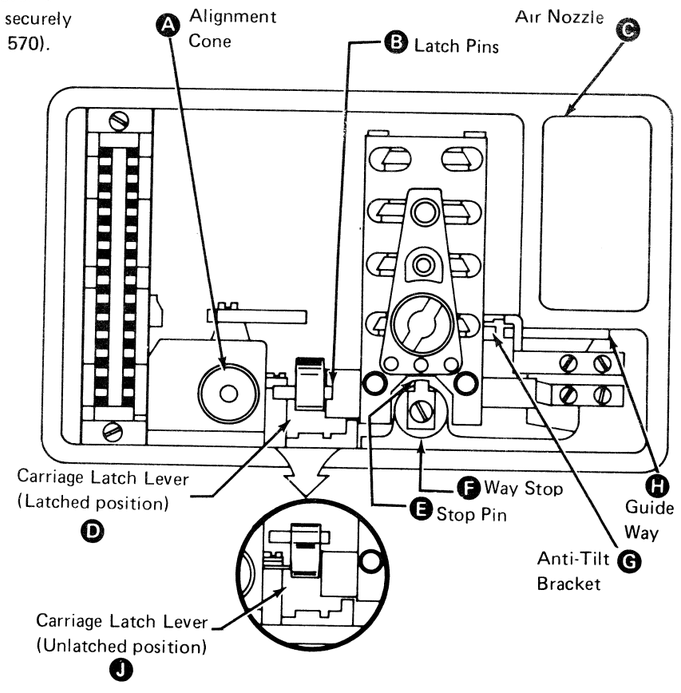
13. CARRIAGE BEARINGS

If the conditions described previously do not identify any binding or roughness of carriage movement, the roughness may be due to carriage bearing damage or contamination. Visually inspect the carriage bearings for wear tracks or foreign particles on the outside diameter of the bearings. A continuous line of discoloration showing bearing wear may be present but does not necessarily indicate that the wear is excessive. However if the line of discoloration is not continuous or is in isolated spots it indicates uneven wear and may be the cause of the binding or roughness. If it is determined that this is the cause of the binding or roughness, the data module should be replaced (see DM 570).

14. CYLINDRICAL WAY

Check for foreign particles on the cylindrical way that may cause roughness or binding in the carriage. The marks on the way are usually in line with and under the carriage bearings.

Figure 1. 3348 Data Module (Door Open)



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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

15. CARRIAGE LATCH

Return the carriage to the inner stop (toward spindle) and allow the carriage latch to engage in the home position. Check that the cam surface of the latch moves the carriage about 1/4" (6,350 mm) towards the outer diameter and that the latch is engaged and holds the carriage fixed in the home position. If the latch is not engaged in the home position, check the latch lever for spring tension and binding using the following procedure:

Measure the force required to lift the carriage lever. It should be approximately 3 to 4 pounds (1,361 kg to 1,814 kg) with no binding and correct spring tension.

If the force required to move the lever is much less than 3 to 4 pounds, the return spring is defective or broken.

If the force required to move the lever is much greater than 3 to 4 pounds, the carriage latch is binding.

If the carriage latch lever spring tension is incorrect or binding, the data module should be replaced (see DM 570).

16. GUIDE WAY

Check the spring-loaded guide way (H) located to the right of the carriage (see Figure 1, DM 535) to ensure that it is in a horizontal position. If it is at an angle, move it to the horizontal position and recheck the data module for overall performance.

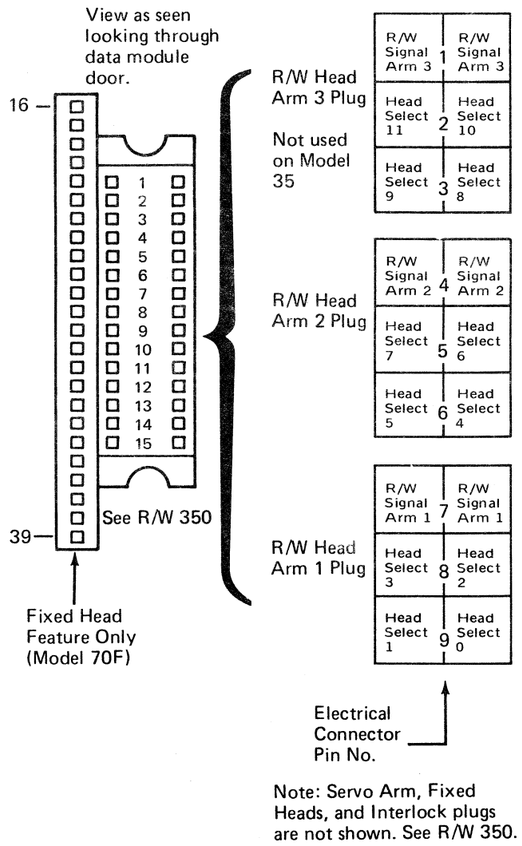
17. STATIC GROUND CHECK

With an ohmmeter, check the resistance between the carriage and the ground strap mounting screws. The meter should read a short circuit. Any resistance greater than 0.5 ohm may indicate a break in the ground strap assembly. Also check for data module static grounding by checking between the inside of the data module alignment cone (A) (see Figure 1, DM 535) and the data module base plate near the spindle. Note that this check must be made to the extreme inner depth of the cone, beyond the alignment nylon insert. This resistance should be zero ohms; if it is not, the data module should be replaced (see DM 570).

18. CONNECTOR PIN GROUND

With the carriage latched home, check the resistance from all pins in the connector to the data module ground strap (see Figure 1). Use an ohmmeter set to the x1000 scale. All pins should have an infinite resistance except for pins B12, D10, D11, and D12. Use an ohmmeter set to the x1 scale for the reading on pin D10. This pin should read zero ohms. Pins B12, D11, and D12 may show a resistance to ground other than zero or infinite resistance. If there is a problem in the connector, repair or replace it (see DM 870 for replacement procedure). If the problem is not in the connector, the data module should be replaced (see DM 570).

Figure 1. Data Module Connector Plug Chart



Note: Servo Arm, Fixed Heads, and Interlock plugs are not shown. See R/W 350.

19. SPINDLE BEARINGS

Turn the data module upside down or on one edge. Check the spindle bearing by rotating the disks clockwise as viewed from the bottom or pulley side, and listening for a clicking sound and feeling for any bearing roughness. If either condition is present the data module must be replaced (see DM 570).

20. DISK RUNOUT

Rotate the disks clockwise as viewed from the pulley side of the data module. Observe the oxide coated disks for axial (up and down) and radial (side to side) runout (see Figure 2). If noticeable runout exists, the data module must be replaced (see DM 570).

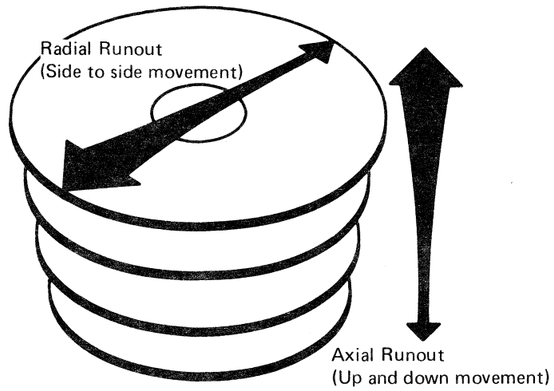


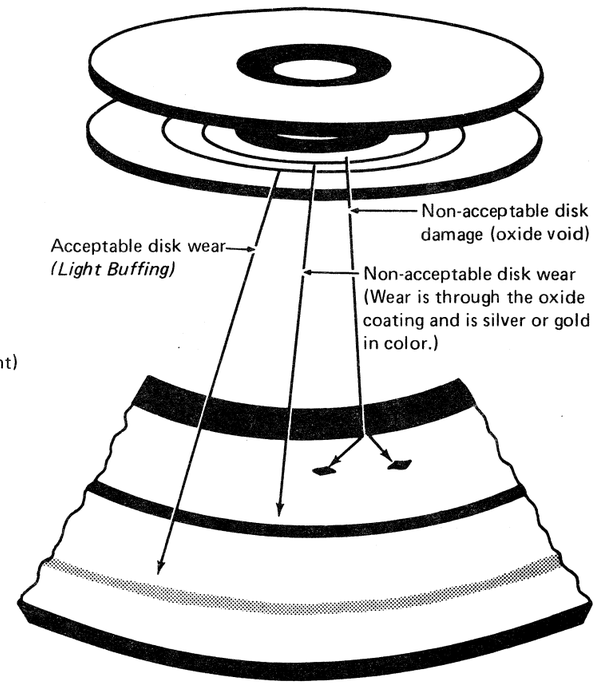
Figure 2. Disk Runout

21. SURFACE DAMAGE

Continue slowly turning the disk clockwise as viewed from the pulley side. Listen closely as the heads slide over the disk surface. A hissing sound is normal. A ping or click is abnormal and indicates a rough spot on a disk surface. Move the carriage slowly from the inner to the outer crash stop positions as the disks continue to turn slowly. Also check the entire data module for damaged disk surfaces with the aid of a high intensity lamp. Damage and acceptable and non-acceptable wear is shown in Figure 3. Any surface damage is unacceptable and the the data module should be replaced (see DM 570).

CAUTION: Do not attempt to clean the disk surface.

Figure 3. Disk Surface Damage



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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

DATA MODULE LOADING CHECKOUT PROCEDURE

1. VISUAL CHECK

Visually inspect the registration alignment cone Ⓒ and the carriage bobbin latch plate Ⓓ for damage (see Figure 1). Replace the data module if either are damaged (see DM 570).

Close the data module door and make sure that at least one latch detents into place.

2. DRIVE CHECK

Ensure that the drive load cycle has been checked using the procedure on DM 410, DM 420, and DM 430.

3. DM LOAD CYCLE CHECKOUT

The following steps describe failure conditions of a data module load cycle that could be caused by a defective data module.

4. DATA MODULE DOOR OPEN

Check if the data module door fails to open, or only opens partially. This causes the data module not to load, and the cam shaft stalls at 20 to 90 degrees rotation.

If the data module door fails to open completely, the most probable cause is that the door pins did not go into the holes in the door or slipped out and failed to unlatch the door latches. The following may cause these conditions:

a. Broken door or latches (visually inspect). If broken see Door Replacement procedure on DM 880.

b. Binding door or more than 10 lbs. (4,536 kg) of force required to open the door. Unlatch and open the door slowly. Attach a spring scale (P/N 460870) to the center of the door with tape and check that the door opens smoothly, with not more than 10 pounds (4,536 kg) of force and without binds.

CAUTION: If the spring scale is off center, the door may bind giving a false indication.

5. ALIGNMENT CONE

The following steps provide a check for drive registration ball to data module alignment cone interference. Misalignment between the alignment ball and the cone could cause a load failure.

a. Check the adjustment of the shroud locating studs on the drive using the procedure on DM 750 and DM 751.

b. If both front shock mounts inside the data module collapsed, it would allow the cone to drop, relative to the data module covers. Check that the distance from the center line of the cone to the lower edge of the opening into the data module is 0.55" ± 0.06" (13,980 mm ± 1,524 mm) (see Ⓐ in Figure 1). If this measurement varies more than 0.06" (1,524 mm) the data module should be replaced (see DM 570).

c. Check for foreign material in the data module cone. Ⓒ Contaminants here could prevent the completion of the load cycle. Clean as required using isopropyl alcohol P/N 2155966.

CAUTION: Do not allow any alcohol to come in contact with the disk surfaces.

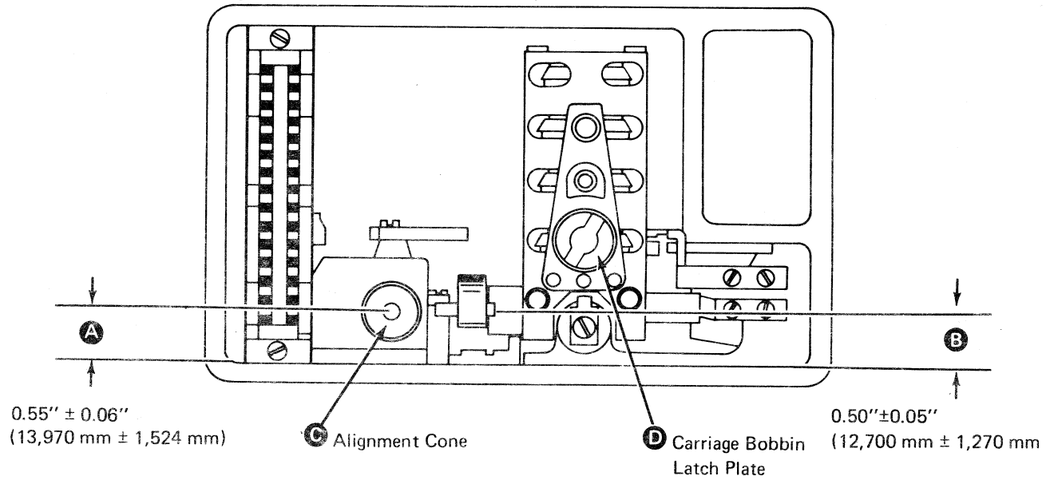
6. DATA MODULE CONNECTOR INTERFERENCE

Foreign material or a cracked or broken connector or connector mounting could cause a failure of the connector to seat, but usually does not prevent the completion of the load cycle. The drive connector is spring loaded, and has enough travel to allow the load cycle to be complete. If the connector is causing the problem, repair or replace it (see DM 870 for connector replacement procedure).

7. CARRIAGE LATCH ACTUATOR MISALIGNMENT

Open the door and ensure that the carriage is latched in the home position. Check the distance from the center line of the carriage latch operating pin to the edge of the opening into the data module. This distance should be 0.50" ± 0.05" (12,700 mm ± 1,270 mm) (see Ⓑ in Figure 1). If this distance is less than 0.45" (11,430 mm), check carefully for carriage mis-alignment. The data module should be replaced if the carriage has been twisted or tipped, because disk surface damage may have occurred (see DM 570).

Figure 1. 3348 Data Module (Door Open)



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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

8. FAILURE TO COUPLE

The following steps provide a check for a failure to couple the data module to the carriage bobbin of the 3340 drive.

There are at least three conditions in the data module that could cause a failure to couple:

a. One is caused by the carriage not being latched in the home position. If the carriage is moved toward the spindle and held there, it could cause a failure to couple.

   Normally, the carriage cannot remain closer to the spindle than the latched home position. There is a ramp on the latch plate to force the carriage away from the spindle to the latched position. However, if the carriage latch lever spring is broken, or if the lever is binding, the carriage would not be forced to the latched home position. Check the carriage latch lever as described in Step 15 of the Data Module Static Checkout procedure on DM 540.

b. The second condition occurs if the carriage is latched in the home position, but the 3 alignment pads on the back of the carriage are too close to the spindle (dimension from spindle centerline to alignment pad surface is too small). Before checking for this condition, check the bobbin position in the drive using DM 765 and DM 770. To check the position of the alignment pads, hand load the data module using the index wheel with the drive top cover open. Look through the data module cover (a flashlight will help) at the three alignment pads on the carriage and the three on the bobbin. The alignment pads on the carriage should touch the alignment pads on the bobbin before the coupling shaft on the bobbin starts to turn (approximately 210 degrees on the index wheel). If the pads do not touch before the coupling shaft starts turning, difficulties in completing the coupling may occur; such as a binding stop at 230 degrees. The most likely reason for this in the data module is the positioning of the carriage latch lever pivot block. If for any reason the block is not positioned correctly, the data module must be replaced (see DM 570).

c. If the data module inspection does not reveal any defects, the data module may be loaded manually to check for binding by inserting the index wheel and rotating it counterclockwise to 315 degrees (loaded). If a bind is detected, see DM 211, Entry C.

9. CARRIAGE NOT UNLATCHING

In an IBM 3348 Data Module, the only known cause for the carriage failing to unlatch on a data module load cycle, is a binding latch lever, as described in Step 15 of the Data Module Static Checkout procedure on DM 540.

10. DATA MODULE GROUND INTEGRITY

Secure a test lead wire, approximately 3 feet long, to one of the 8 screws on the bottom of the data module, ensuring that the lead makes contact to the base plate of the data module by checking the resistance through the lead to the base plate. It must be zero ohms. Load the data module in a 3340 drive. Check the resistance from the open end of the test lead to the machine frame. This resistance should be zero ohms. If the resistance is other than zero, see DM 540, Step 17, DM 545, step 5c, and perform the following spindle ground check and/or adjustment.

Spindle Ground Check:

a. With 24 Vdc off, hand load a data module.

b. Disconnect the spindle ground wire from the base plate.

c. Connect the CE meter (RXI scale) between the ground wire and the frame ground. It should read approximately 2 to 10 ohms. If a poor ground is found, proceed with the adjustment.

d. Insert the bobbin pushrod (P/N 2745734) into the VCM, hold the carriage at the home position (inner stop), and use the index wheel to unload the data module.

e. Restore 24 Vdc.

Spindle Ground Adjustment:

a. Form the spindle ground strap so that 20-25 grams of force is required to lift the strap from where it rests against the bottom of the shroud.

b. The ground strap should be centered (left to right) in the hole of the pulley and as far toward the VCM as possible.

c. The ground strap should not contact the edge of the hole in the pulley.

d. Recheck the resistance of the spindle ground.

If the resistance cannot be reduced to under ten ohms, the data module is subject to intermittent data check errors and should be replaced (see DM 570).

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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

DATA MODULE OPERATIONAL CHECKOUT PROCEDURE

For the following checks, the data module must be loaded in a 3340 drive that is known to be operating properly.

1. LOADS, THEN UNLOADS - DM SIZE CHECK

If the data module will load, but unloads before coming Ready, open the data module door and check for continuity of connector pins from pin B15 to the pins in the following table:

DM Size	B15 Jumpered to Pin
12	D13 (CE Tool, System/3 only)
35	D15
70	B13
70F	B13, B14, D13

If continuity does not exist, the DM size jumpers are open or are incorrectly connected. If continuity does exist between the pins, install a jumper between A1B4J07 (A drive) or A1Q4J07 (B drive) to ground, and reload the data module. Run microdiagnostic routine B3 and routine AC and identify the cause of the DM Size Check error, using the MLM.

2. LOADS, BUT NOT READY

If the data module completes the load cycle (disk spinning) but the drive does not come Ready, use a scope to check the following:

a. Servo Signal Normal

Use the bobbin pushrod to hold the carriage on track. Tape the rod to the back of the VCM to hold the heads in the data area of the disk. Scope the servo tri-bit pattern at pin A1T2J04 (A drive) or A1S2J04 (B drive) and compare with Figure 1. If the tri-bit signal matches the signal shown in Figure 1, go to Step e. If the signal does not look like Figure 1, move the pushrod slightly in either direction to balance the position component of the signal in order to make the signal look like Figure 1. If this can be done, go to Step e. If this cannot be done, go to Step b.

Note: If the tri-bit signal is inverted from that shown, the disk may be rotating in the wrong direction (clockwise, as viewed from the top of the data module).

b. Servo Signal Abnormal

If tri-bit signal is missing, or does not compare to Figure 1, scope servo input signal using X1 probes on A1V2D13 and A1V2D09 (A drive) or A1U2D13 and A1U2D09 (B drive), and compare with Figure 2. Sync scope internal, AC, and Channel 1 only. The signals on pins D13 and D09 must be 180 degrees out of phase with respect to each other. If proper signals are present on both input scoping points, but the tri-bit signals did not compare properly to Figure 1 in Step a, the data module resistor may be open or is not functioning properly. With a digital voltmeter, check for −20.0 volts ± 0.4 volts to the data module resistor at A1V2B10 (A1U2D10), and −16 volts to −18 volts on A1V2D13 (A1U2D13), when the data module is loaded. If the data module resistor is suspected, check the resistance at the DM connector, pins B10 to B11. This resistance should be between 12.1 K ohms and 15.8 K ohms. If the resistance is not within this range, or varies, the data module must be replaced (see DM 570).

c. One Servo Signal Missing

If only one signal is present: the dc level of the signal is at zero volts; the signals are in phase; the servo pre-amplifier in the data module is not working properly or a connection is not made. Recheck the data module connector pins and the connection of the head leads to the back of the data module connector. If the pins are not at fault, the data module should be replaced (see DM 570).

d. Both Servo Signals Missing

If neither signal is present, the servo head may be open, the voltage to the servo pre-amplifier is not available, or a connection is not made. Check the data module connector plug pin D11 in the 3340 drive for −8.3 Vdc (see ACC 631). If the −8.3 Vdc is available to the data module and the connector pins are good but the servo signal is missing, try reseating the connections between the head leads and the back of the data module connector. If the servo signal is still missing, the data module must be replaced (see DM 570).

e. Servo Amplitude

Observe the servo tri-bit signal amplitude from the servo pre-amplifier in differential mode (set the scope Mode Trigger to Add and invert Channel 2) at the pins noted in Step b. The signal should be similar to Figure 1. The minimum amplitude, peak-to-peak, should be 32 millivolts. The maximum amplitude, peak-to-peak, should not exceed 250 millivolts. If any identified servo signal is beyond these limits, the data module should be replaced (see DM 570).

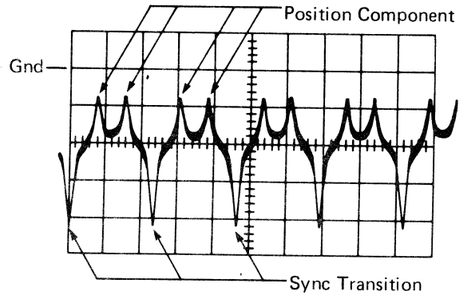

Figure 1. Servo Tri-Bit Signal
(Carriage On Track)
Sweep 1 μs/div.
Trigger
Slope (−)
Ch 1 only
Ch 1 A1T2(A1S2)J04
0.2 volts/div X10 probe

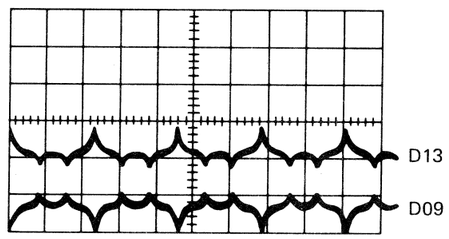

Figure 2. Servo Pre-Amp Signal
(Carriage On Track)
Sweep 1 μs/div.
Trigger
Slope (−)
Sync Int AC Ch 1 only
Ch 1 A1V2(A1U2)D13
Servo Preamp 1
Ch 2 A1V2(A1U2)D09
Servo Preamp 2
0.1 volts/div. X1 probe

f. Servo - Modulation

Use the same scope points and scope setup as in Step e and change the scope time base to 5 milliseconds per division. Look for a 20.2 millisecond train of pulses. This equals one disk revolution. The minimum signal level for any modulation of the signal envelope should not be less than 60 percent of the maximum signal amplitude on any track or 65 percent if the change in modulation occurs in 10 microseconds or less (see Figure 3). If any servo track is modulated beyond these limits, the data module should be replaced (see DM 570).

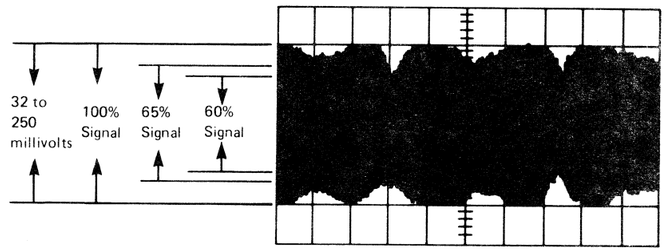

Figure 3. Signal Envelope Distortion
Carriage, Any Track
Sweep Variable, to 5 ms/div.
Trigger/Mode Ext/Add
Slope (−)
Sync − Index Mark A(B)
A1F2(E2)D07
For Servo modulation:
Ch. 1 A1V2(A1U2)D13, Servo Preamp 1
Ch. 2 A1V2(A1U2)D09, Servo Preamp 2

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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

g. "B" Guardband Rezero Pattern

Move the access to the outer crash stop (OD). Use the scope points referenced in Step b. The signal should be the Guardband B signal, as shown in Figure 1.

h. "A" Guardband Rezero Pattern

If the signal appears as in Figure 2 instead of that shown in Figure 1, the servo track guardbands are improperly recorded and the data module must be replaced (see DM 570); or the crash stop in the drive is not properly positioned. If this condition should occur, check other data modules on the same drive for this condition, and check the suspected data module on other drives for the same condition.

i. "A" Guardband, Index, On Track

Move the access forward slightly [6 tracks = 0.02" (0,508 mm)] with the bobbin pushrod and observe the "A" Guardband signal. Notice that the sharp transitions of the signal must change to the leading edge of the waveform, as shown in Figure 2.

Note that all the time the access is in the guardband area, a continuous train of pulses can be observed from + Index Bit at A1T2J12 (A1S2J12).

Continue to move the access forward. The pattern should change to that shown in Figure 3 with the amplitude of the positive peaks indicating the track position component.

j. Servo Clock

Scope the + Servo Clock signal at A1T2J11 (A1S2J11). This train of pulses is developed from the servo sync transitions. The servo clock pulses should occur every 2.4 microseconds and should be 0.2 microseconds in width, as long as the disk is turning, and are independent of the access position from the ID (inner diameter) to the OD (outer diameter). See ACC 631, reference 5.

3. LOADED AND READY

The following steps provide a checkout procedure of the data module with the data module loaded and the drive Ready.

a. With a data module and drive in a Ready state, press the Attention pushbutton to rezero the drive. Insert a bobbin pushrod and feel for vibration. If vibration is detected, the spindle bearings may be damaged or the servo disk may have shifted. If this is the case, the data module must be replaced (see DM 570).

b. If no vibration is detected, scope the + Position signal on pin A1T2D10 (A drive) or A1S2D10 (B drive). Look for 20 msec ± 2 msec sine wave oscillations. See Figure 4. If oscillations are greater than 500 millivolts peak-to-peak, the servo disk has shifted radially, and the data module must be replaced (see DM 570).

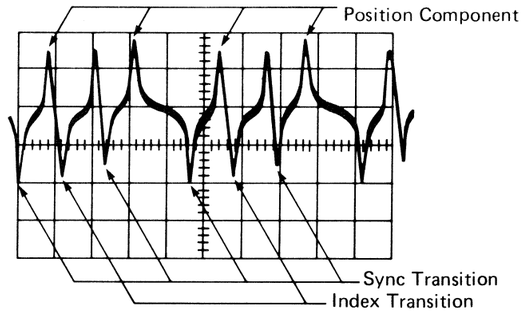

Figure 1. B Guardband Signal (Outer Crash Stop)

(Carriage at Outer Stop)
Sweep 1 μs/div.
Trigger/Mode Norm/Add
Slope (–)
Ch 1 A1T2B04 (S2B04)
0.05 volts/div, X1 probe
Ch 2 A1T2D04 (S2D04)
0.05 volts/div, X1 probe
Invert

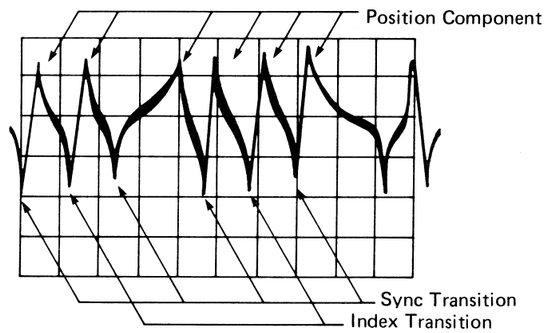

Figure 2. A Guardband Signal

Sweep 1 μs/div.
Trigger/Mode Norm/Add
Slope (–)
Ch 1 A1T2B04 (S2B04)
0.05 volts/div, X1 probe
Ch 2 A1T2D04 (S2D04)
0.05 volts/div, X1 probe
Invert

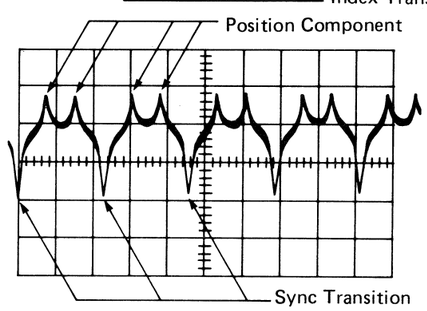

Figure 3. Servo Signal (On track position)

(Carriage at Track 0)
Scope setup same as for Figure 1.
Sweep 1 μs/div.
Trigger/Mode Norm/Add
Slope (–)
Ch 2 A1T2D04 (S2D04) - Servo Preamp 1
0.05 volts/div, X1 probe
Ch 1 A1T2B04 (S2B04) - Servo Preamp 2
0.05 volts/div, X1 probe
Invert

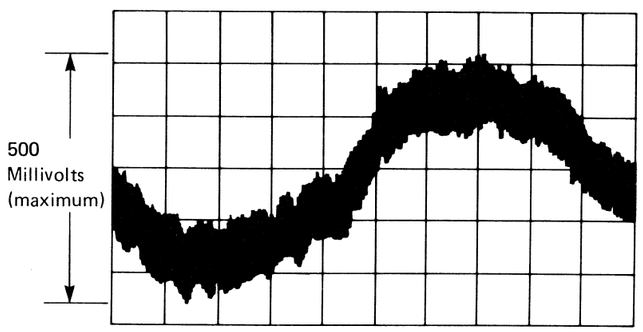

Figure 4. Oscillation of Position Signa

(Carriage at Track 0)
Sweep 2 ms/div.
Trigger
Slope (–)
Sync. Int. AC Ch. 1 only
Ch. 1 A1T2(S2)D10
+ Position
100 mv/div.

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IBM 3348 DATA MODULE CHECKOUT PROCEDURE

PROGRAM CHECK OF DATA MODULE

1. DATA MODULE SCAN AND DIAGNOSTICS

Run the data module under control of the OLTs T3340PSA and T3340PSB (on System/3, run routine C1B), and run microdiagnostic routines B1 and B2.

2. DIAGNOSTICS RUN OK

If programs run without errors and all preceding checks are satisfactory, the data module is presumed good, and should be returned to the customer.

3. ERROR ISOLATION

If errors occur, determine if the failures are common to one logical track, one physical track, one physical head, arm, etc.

a. Scope Servo Track

If all tracks on one physical cylinder have Data Checks on PLO checks, the Servo Track may be defective. Carefully perform step 2 of the Data Module Operational Checkout procedure (see DM 555) on the physical cylinder in question.

b. Scope Read Signal

If one or more physical heads are defective (2 logical heads, example 0 and 1) on multiple tracks, run microdiagnostic routine B1 and scope read signal amplitude, differentially, (Mode Trigger to Add and invert Channel 2), on pins A1J2G02 and A1J2J02. The minimum amplitude, peak-to-peak, must not be less than 40 millivolts. The maximum read data signal, peak-to-peak, should not exceed 225 millivolts. If any identified data track is beyond these limits and track flagging will not allow satisfactory service, the data module should be replaced (see DM 570).

4. SIGNAL ENVELOPE MODULATION

Observe Read Data signal amplitude as in Step 3b for a train of pulses of at least 20.2 milliseconds. The minimum signal level for any modulation of the signal envelope, exclusively of differences due to single or double frequency of various data patterns, should not be less than 60 percent of the maximum signal amplitude, on any track. No change of signal amplitude, with a minimum level of 65% of maximum signal amplitude, should occur in fewer than 10 microseconds. See Figure 1.

5. MECHANICAL MISALIGNMENT, OFF TRACK

The odd and even data track amplitudes (10.1 milliseconds each) of a read head signal should compare equal in amplitude, exclusive of differences due to various patterns. Run microdiagnostic routine B1 on the failing track. Scope the HA, R0, and R1 records. Look for a difference in Read Signal amplitude from the customer-written R1 record. If a difference in amplitude is observed, and that difference in amplitude is noted at the point approximately ten microseconds before the Address Mark in the R1 data field, it is possible that the head (or heads) has moved off track. Inspect the carriage assembly by using Steps 6 through 15 of the Data Module Static Checkout procedure on DM 535. Replace the data module if any mechanical misalignment is found (see DM 570).

6. SIGNAL TO NOISE

Observe any electrical noise or pulse distortion of the read data signal in Step 3b and Step 4. Noise should not exceed 10 percent of the read data signal maximum amplitude.

7. INDUCED NOISE

If nonrepeatable data checks have occurred on one head, observe the Read Data signal as in Step 4. Insert the carriage bobbin pushrod and watch for noise spikes while tapping the shaft of the pushrod with a non-conductive tool (pencil, etc.). Replace the data module if noise spikes can be induced (see DM 570).

DATA MODULE UNLOADING CHECKOUT PROCEDURE

1. UNLOAD DATA MODULE

Unload the data module using the procedure on DM 510 and DM 520.

2. UNLOAD INTERLOCK (290 degrees)

Cam shaft interlock conditions occur when the carriage is not latched in the home position and a data module unload operation starts. The cam shaft will stop at 290 degrees (mechanical interlock). Ensure that the carriage is pushed to the home position (toward the spindle) with the bobbin pushrod. The two conditions in the data module that could cause the drive to interlock are:

a. A broken carriage latch lever return spring, as described in Step 15, Data Module Static Checkout procedure on DM 540.

b. A binding carriage latch lever, described in Step 15 of the Data Module Static Checkout procedure on DM 540.

3. DOOR CLOSE STALL

Cam shaft stalling between 10 degrees and 20 degrees on the unload cycle, indicates a data module door closure problem.

To isolate any problem to either the data module or to the drive, use Steps 4 and 5 of the Data Module Loading Checkout procedure on DM 545. The door closing force should not exceed 10 pounds (4,536 kg).

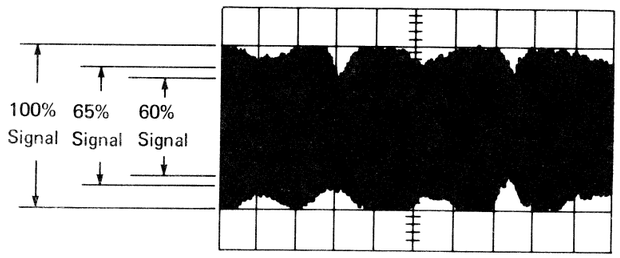

Figure 1. Signal Envelope Distortion

Carriage, Any Track
Sweep Variable, to 5 ms/div.
Trigger Mode Ext/Add
Slope (–)
Sync – Index Mark A(B)
A1F2(E2)D07

For Read Data Modulation:
Ch.1 A1J2G02, Read Data 1
Ch.1 A1J2J02, Read Data 2

Vertical variable, adjust to 4 divisions for full 100% signal.

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See EC History	440223 14 Mar 76	440227 14 Sept 76		

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A2+C'2

IBM 3348 DATA MODULE CHECKOUT PROCEDURE

DEFECTIVE DATA MODULES

The following procedures are to be followed when it is determined that an IBM 3348 Data Module is defective and must be replaced.

1. NEW DATA MODULES

If the IBM 3348 Data Module being inspected is new or under 90-day warranty, any defect on one or more tracks or heads, or any mechanical defect as defined in the IBM 3348 Data Module Checkout procedures, classifies the data module as defective by IBM standards. It should be replaced under existing procedures through the local I.R.D. representative.

CAUTION: Ensure that the carriage is latched in the home position before shipping a data module.

2. USED DATA MODULES

If the data module is not new or under 90-day warranty, consider having the customer flag defective tracks, and assigning alternate tracks, to return the data module to service. If the defect will not permit satisfactory service when an alternate track has been used, the data module should be replaced, through the local I.R.D. representative, using existing procedures for used defective data modules.

3. DATA RETRIEVAL

If data retrieval of customer data on a defective IBM 3348 Data Module is required, make every effort to do so locally before the module is replaced. The local Program Support Representative should use the appropriate customer utility program (System/3, use $COPY; DOS, use ATLAS; VS, use IEHDASDR; or use stand alone utility IBCDASDI). If data retrieval is still required, contact your local I.R.D. representative. He will make necessary arrangements for transportation and replacement procedures. When a defective data module is being returned to the plant, be certain that all known defects and data retrieval requirements are clearly defined in the request to the plant. Data retrieval is available at the plant on a "best-can-do" basis, with no guarantee implied. Response time for data retrieval at the plant is usually ten days or less after receipt of the data module in San Jose.

3340

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NO TROUBLE FOUND

DM Common Entry

A

Failure not found by MAPs or duplicated by MICROs

Possible Causes

1. Power supply specifications; refer to Chart A.
2. Data module; swap if available.
3. Verify all circuit protectors are on.
4. +24 V switch good.
5. Verify correct voltage to drive motor and DM load motor, and direction of rotation.
6. Verify brake is properly adjusted; DM715.
7. Verify drive motor is running within specification DM160, Entry C.
8. Verify C601 good, start capacitor for DM load motor.
9. Relays are seated properly, relay contacts are in good working condition and make good contact; K252 (K253), K254 (K255)–60 Hz, K254A (K254B)–50 Hz, and K256 (K257).
10. Verify connector A1T5B05 (A1S5B05) is on A1T4G05 (S4G05).
11. Check for frayed wires in base plate area.
12. Inspect plugs for secure installation; P207, P208, P209, P401, P404 P201 (P203), and P202 (P204).
13. Inspect voltage TBs for loose connections or frayed wires; TB101, TB201 (TB202), and TB205.
14. Inspect edge connectors for secure installation or frayed wires; EC101 EC301, EC601, EC602, A1V4 (A1U4), A1V5 (A1U5), A1V2 (A1U2), and EC603.
15. Verify cover solenoid is adjusted and working properly; DM710.
16. Verify shroud properly installed; DM705.
17. Inspect DM load area for loose hardware or foreign matter.
18. Verify mechanical adjustment is within specifications in any area related to defect.
19. Verify switches are adjusted properly.
20. Ensure bobbin is captured in coupler drive; DM705.
21. Verify home photocell is good and connector P601 secure; DM170, Entry B.
22. Check PWR on reset line (+MST at A1C2U07 and A1C2U05) ref KA040.
23. Reseat, swap, or replace the following Cards
    - A1M2 (A1L2) Cart Sequence
    - A1T4 (A1S4) Mag DRV
    - A1C2 Controls
    - A1P2 (A1N2) Access CTRL/Atten
24. Verify Start/Stop switch is working properly.

Trouble Corrected

No

Yes

A

START 500

Refer to Load/Unload Theory (DM 610) or to Load Checkout (DM400) or to Unload Checkout (DM510)

CHART A – POWER SUPPLY VOLTAGES

Measuring Point		Voltage Range	Maximum Ripple	MAP Exit CTRL Module	MAP Exit Sat Module
+24 V Pwr Sw. Ctr. Term		+21.6 V to +26.4 V	.375 V p/p	PWR 70-A	PWR 270-A
A1L2D03	−24 Vdc	−24.0 V to −28.8 V	.08 V p/p	PWR 50-A	PWR 250-A
A1R2D05	+12 Vdc	+12.0 V to +14.4 V	.08 V p/p	PWR 45-A	PWR 245-A
A1M2D06	−12 Vdc	−12.0 V to −14.4 V	.08 V p/p	PWR 40-A	PWR 240-A
A1P2B06	−4 Vdc	− 3.72 V to − 4.4 V	.04 V p/p	PWR 55-A	PWR 255-A
A1J2B11	+6 Vdc	+ 5.76 V to + 6.24 V	.04 V p/p	PWR 60-A	PWR 260-A
TB101-3 Logic Gate	−36 Vdc	−36.0 V to −43.2 V	.12 V p/p	PWR 80-A	PWR 280-A

Ensure V ref is on the following cards

A1M2 B08 (L2 B08) – 1.28 Vdc (nom.)
A1T4 B08 (S4 B08) – 1.28 Vdc (nom.)
A1C2 B08 – 1.28 Vdc (nom.)

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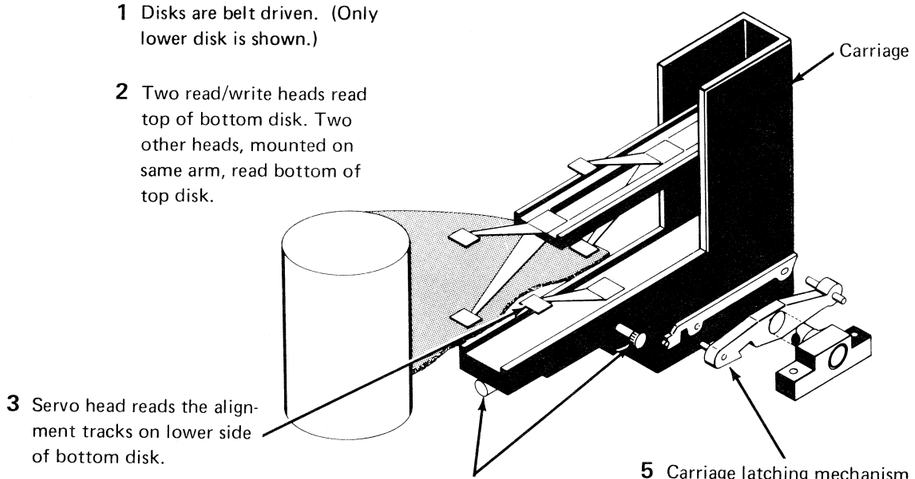
MECHANICAL FEATURES OF 3340

The following pages describe the functions of the data module and 3340.

DATA MODULE

- Two or more disks with read/write and servo heads are mounted on an internal carriage.
- Carriage is latched in home position (toward spindle) when DM (data module) is unloaded.
- DM guided to load position by alignment ball and alignment pads.
- The data module cover is not removable in the field.



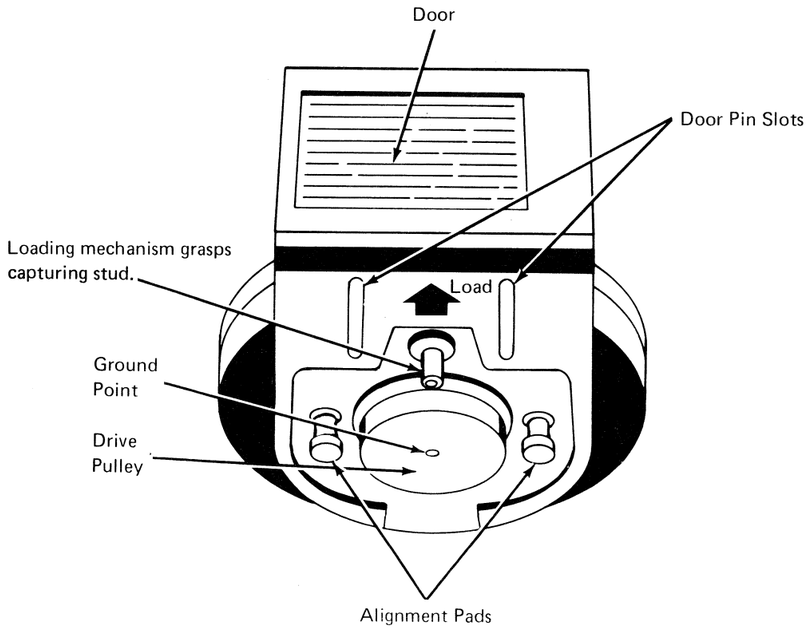
1 Disks are belt driven. (Only lower disk is shown.)

2 Two read/write heads read top of bottom disk. Two other heads, mounted on same arm, read bottom of top disk.

3 Servo head reads the alignment tracks on lower side of bottom disk.

4 Carriage rides on cylindrical way. Outrigger on each side of carriage prevents carriage from twisting on cylindrical way.

5 Carriage latching mechanism holds carriage in Home position while DM is remove from machine.



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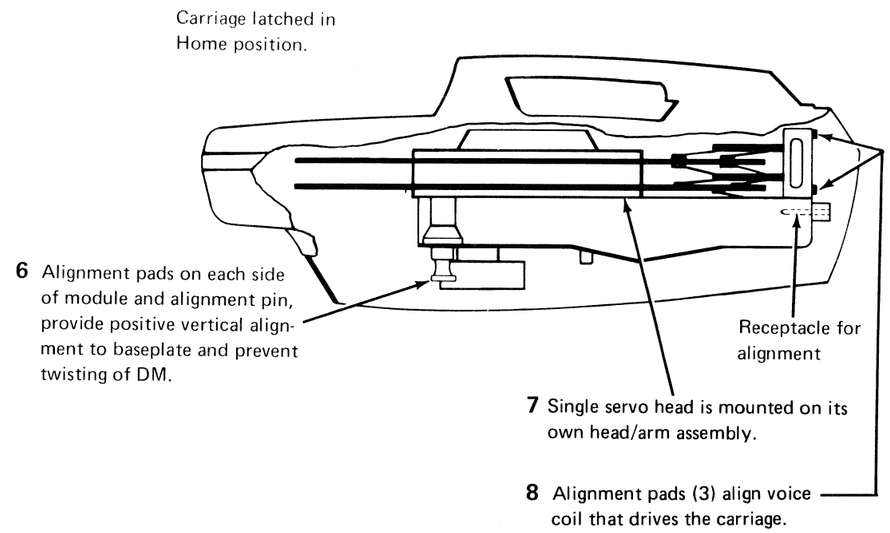
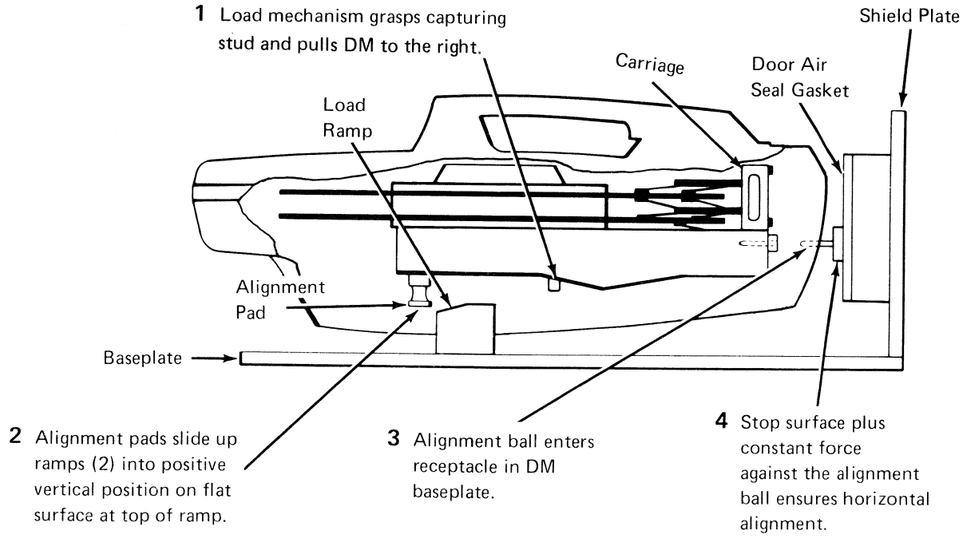
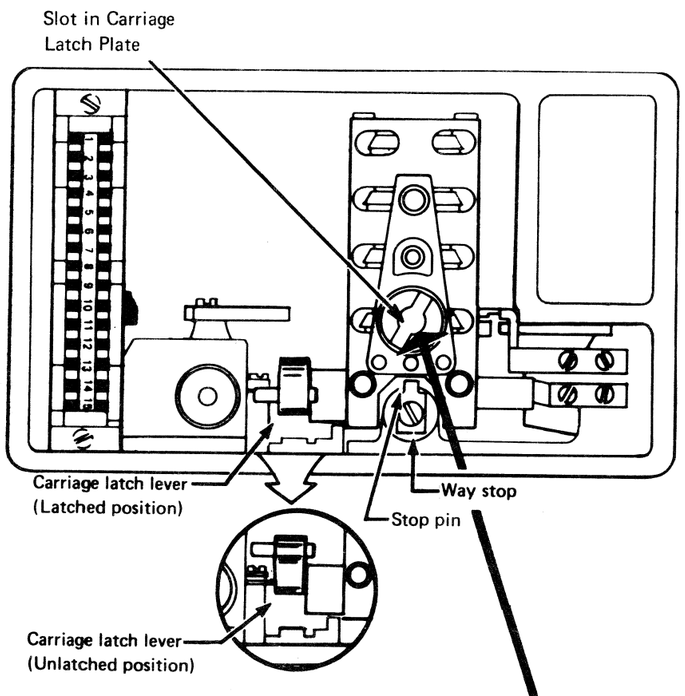


DATA MODULE ALIGNMENT ON BASEPLATE

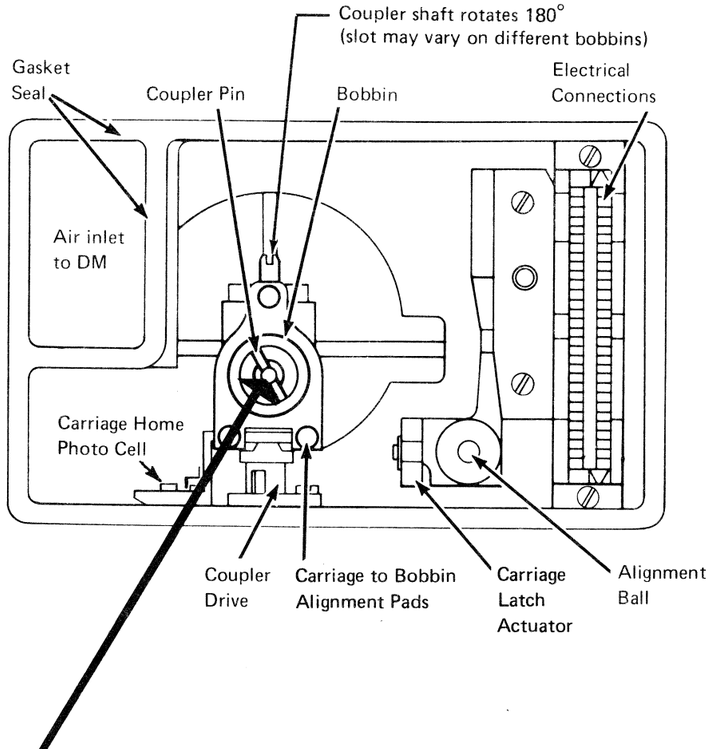
Precise alignment of the data module to the baseplate must occur during the Loading operation (see DM 611). Three reference points, two alignment pads and an alignment ball, ensure exact positioning.



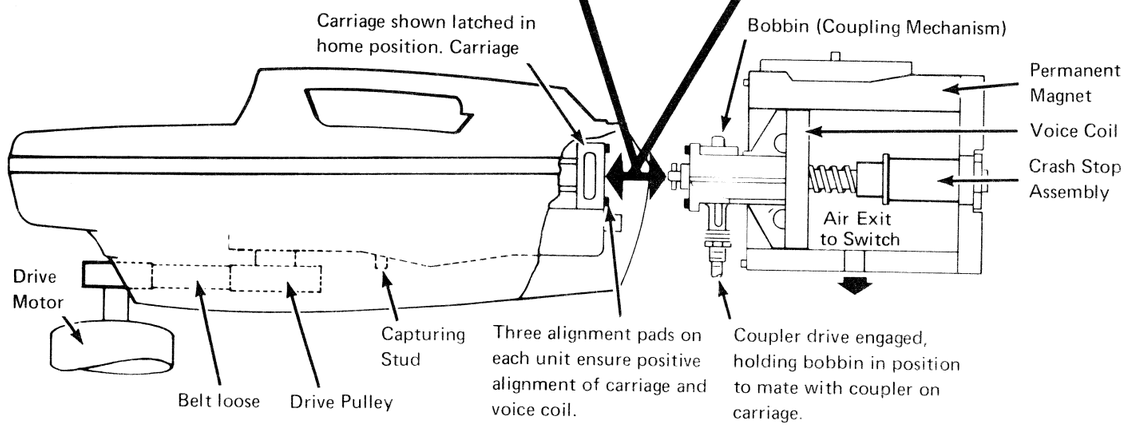
Data Module Through Open Door



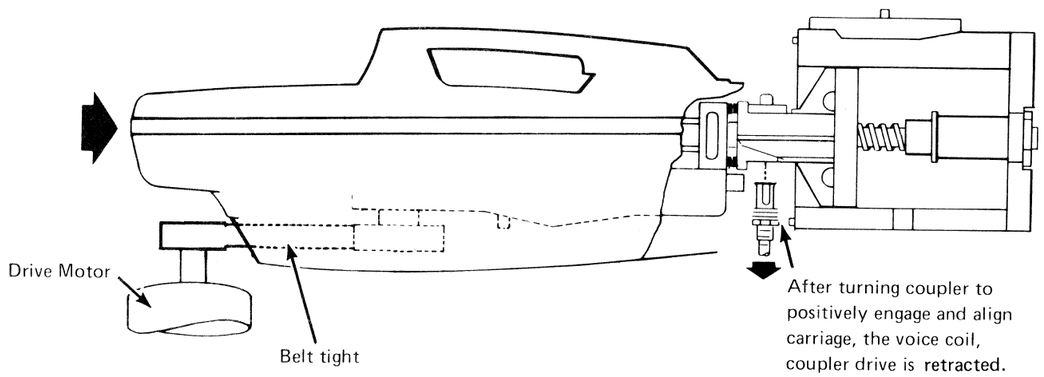
View toward the Voice Coil from the Data Module



Data Module Unloaded Position



Data Module Loaded Position



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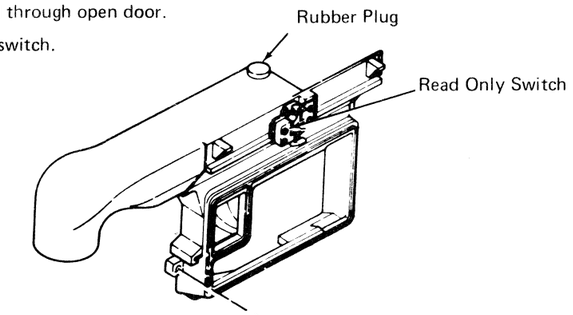
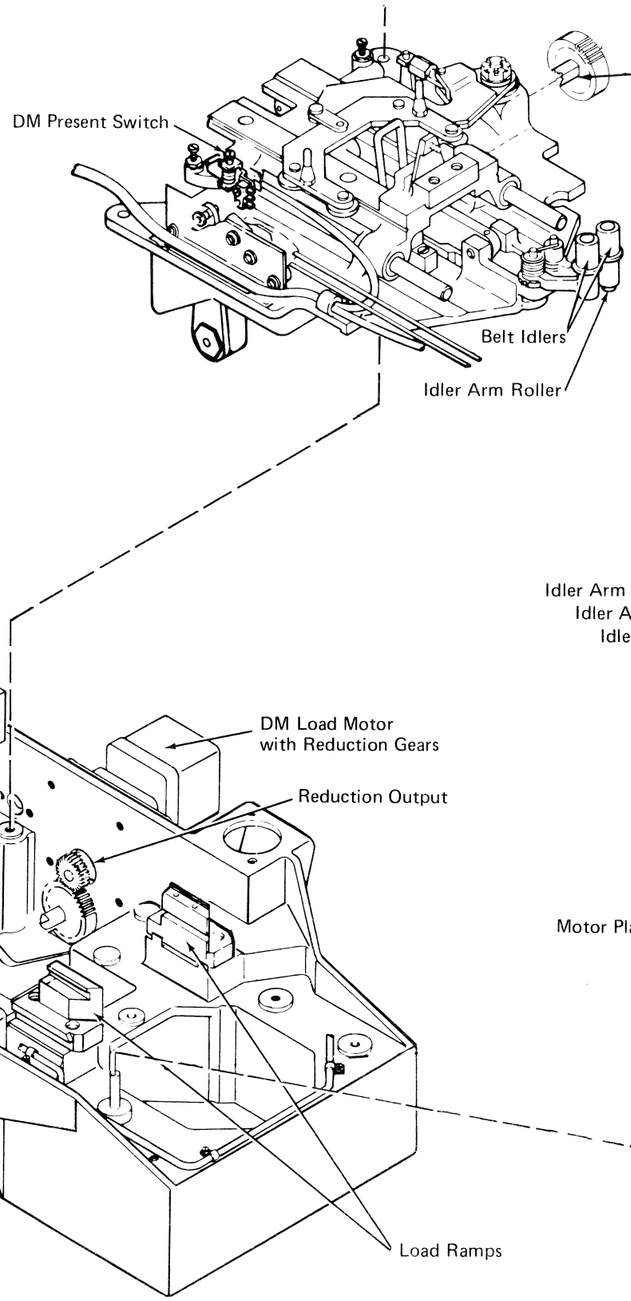
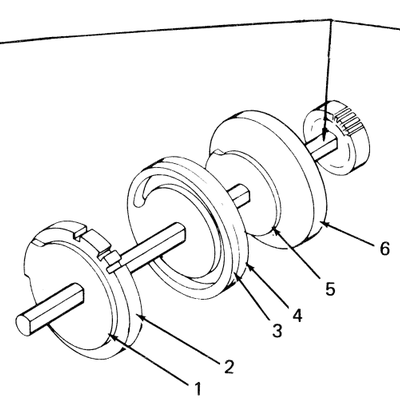
MECHANICS OF LOADING

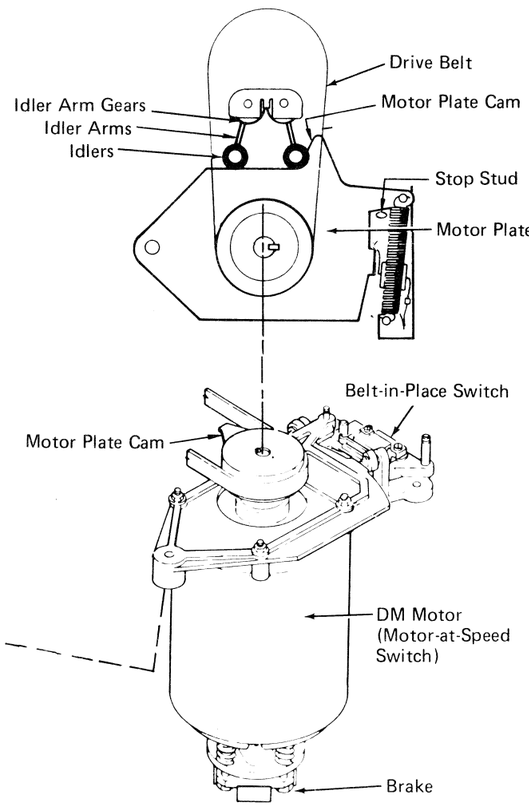
AIR INTERFACE

- Divides cooling air between DM disks and VCM.
- Gasket seals with DM through open door.
- Supports Read Only switch.









LOAD ASSEMBLY

- Camshaft is driven approximately 360 degrees forward by the DM load motor to load, and the same amount in reverse to unload. With power off, the DM can be loaded and unloaded with the CE Index wheel or the knob on the load motor.
- Cam-operated switches control the load motor and the bias on the voice coil.
- Cams time the load and unload functions. The cams from left to right are:
  1. Switch cam
  2. Retract and air valves cam, with indexing groves
  3. Coupler drive shaft rack cam
  4. DM load cam
  5. Interlock latch cam
  6. Door cart cam
- Load cart pinches the DM capture stud as the DM moves into alignment with the VCM.
- Door cart, mounted to the load cart with rollers, opens the door to permit DM carriage and bobbin coupling.
- Drive belt idlers are mounted on the load assembly. Meshing gears of the idler arms are spring-loaded to open and hold drive belt when the DM is not loaded.

DISK DRIVE MOTOR AND BRAKE

- Energize the brake to release the motor.
- Internal Motor-at-Speed points close at 70% of full speed.
- Belt-in-Place switch monitors motor position, and therefore, presence of belt.
- Motor plate cam, operating against an idler arm roller, holds idlers away from the drive belt while the DM is loaded.

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MECHANICS OF LOADING

This page and the facing page show the load cam assembly and associated components required to load the DM. The electromechanical timing chart shown on DM 640 contains the mechanical timings shown on this page and should be used in conjunction for a better understanding of the entire function.

LOAD CART ACTION

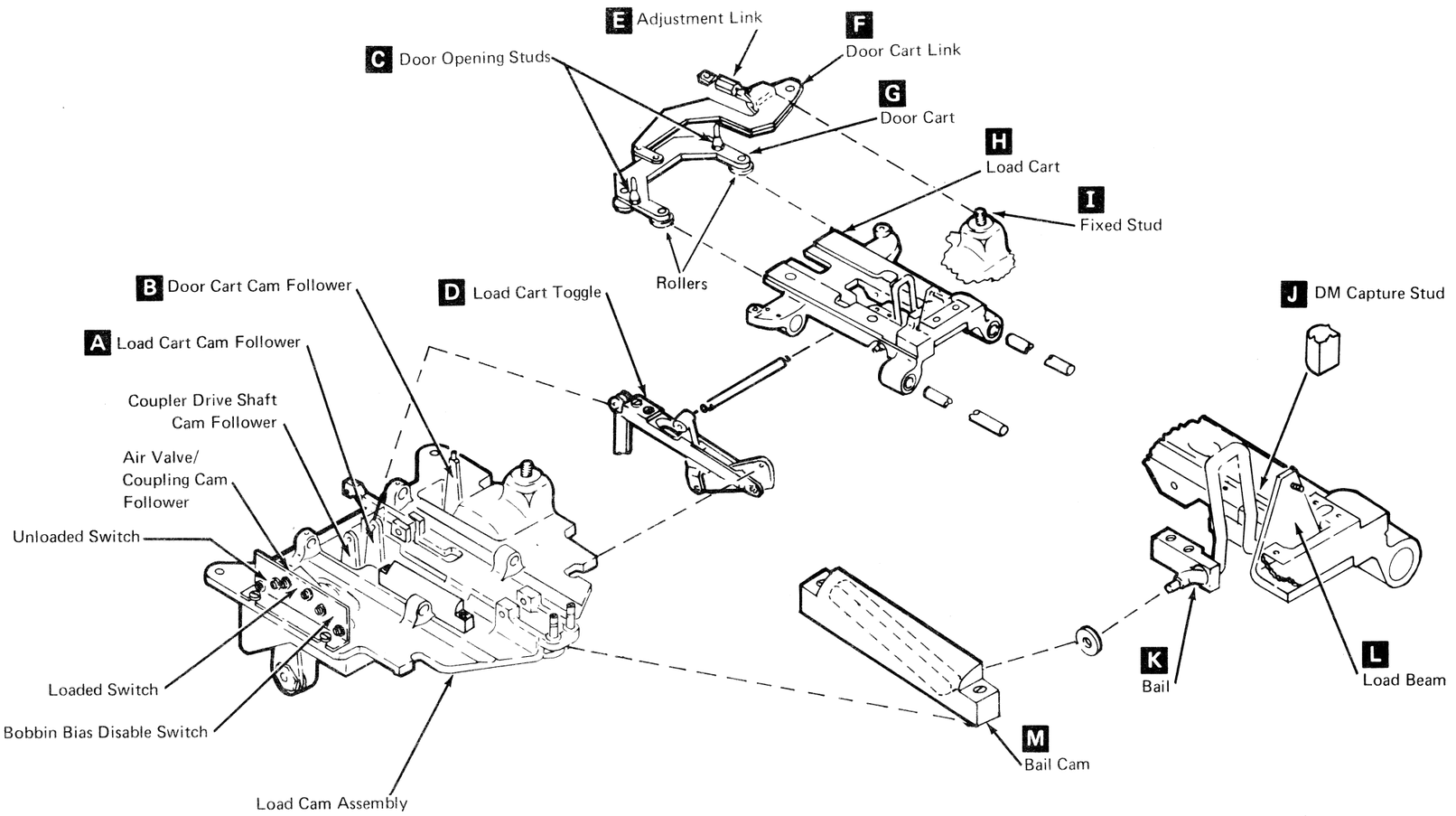
With the DM inserted in the shroud and the cover closed, place the Start/Stop switch in the Start position; this causes the DM load motor to turn the load camshaft. The load cart cam follower **A** lengthens the toggle **D** to move the load cart **H** toward the VCM. Note the movement of the various parts on the cam chart (at the bottom of this page). The load beam **L** contacts the DM capture stud **J** to move the DM toward the VCM (toward the rear). As the cart moves to the rear, the bail **K** rides up the bail cam **M** to pinch the capture stud with the load beam and locks the bail.

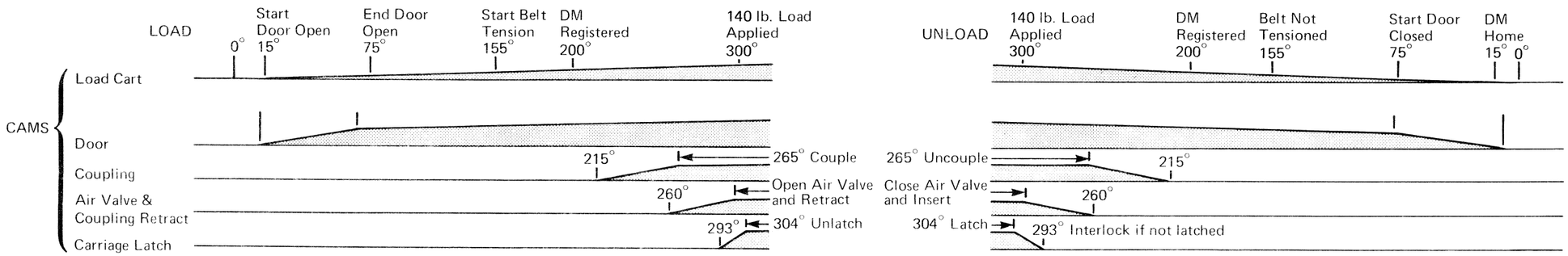
DOOR CART ACTION

Movement of the door cart **G** begins shortly after the load cart but it moves faster to ensure that the door is open before the alignment ball enters the DM. Observe the timing relationship of the load cam to the door cart cam. The door cart, which rides on the load cart with rollers, supports two door studs **C**. Internal door latches on the underside of the data module are released by the door opening studs before the door can be opened. The door cart cam follower **B** operates the adjustment link **E** to move cart link **F** which pivots on a fixed stud **I** (part of the load cam casting).

DISK SPINDLE AND BELT ENGAGEMENT

After the door is fully open, the load cart continues to move the data module, the belt tension increases to close the belt idlers and allow roller on the right idler arm to ride on the cam surface of the motor plate. The disk spindle can now be driven by the motor.





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MECHANICS OF LOADING

COUPLING

When the DM is registered (200°), the cone in the data module is resting against the alignment ball. Also, the bobbin coupler cross pin **O** is in the slot in the rear of the carriage extending through the latch plate by the cross pin pilot shaft and is ready for coupling. Coupling is accomplished by rotating the coupler cross pin to a horizontal position. Bobbin bias holds the bobbin toward the carriage while loading and unloading; the bias is removed while latching or unlatching the carriage. The coupler shaft and coupler drive shaft **X** fit together like socket wrench tools; thus, the coupler drive shaft can be lowered from the bobbin path. Once coupled, the bobbin is supported entirely by the DM carriage.

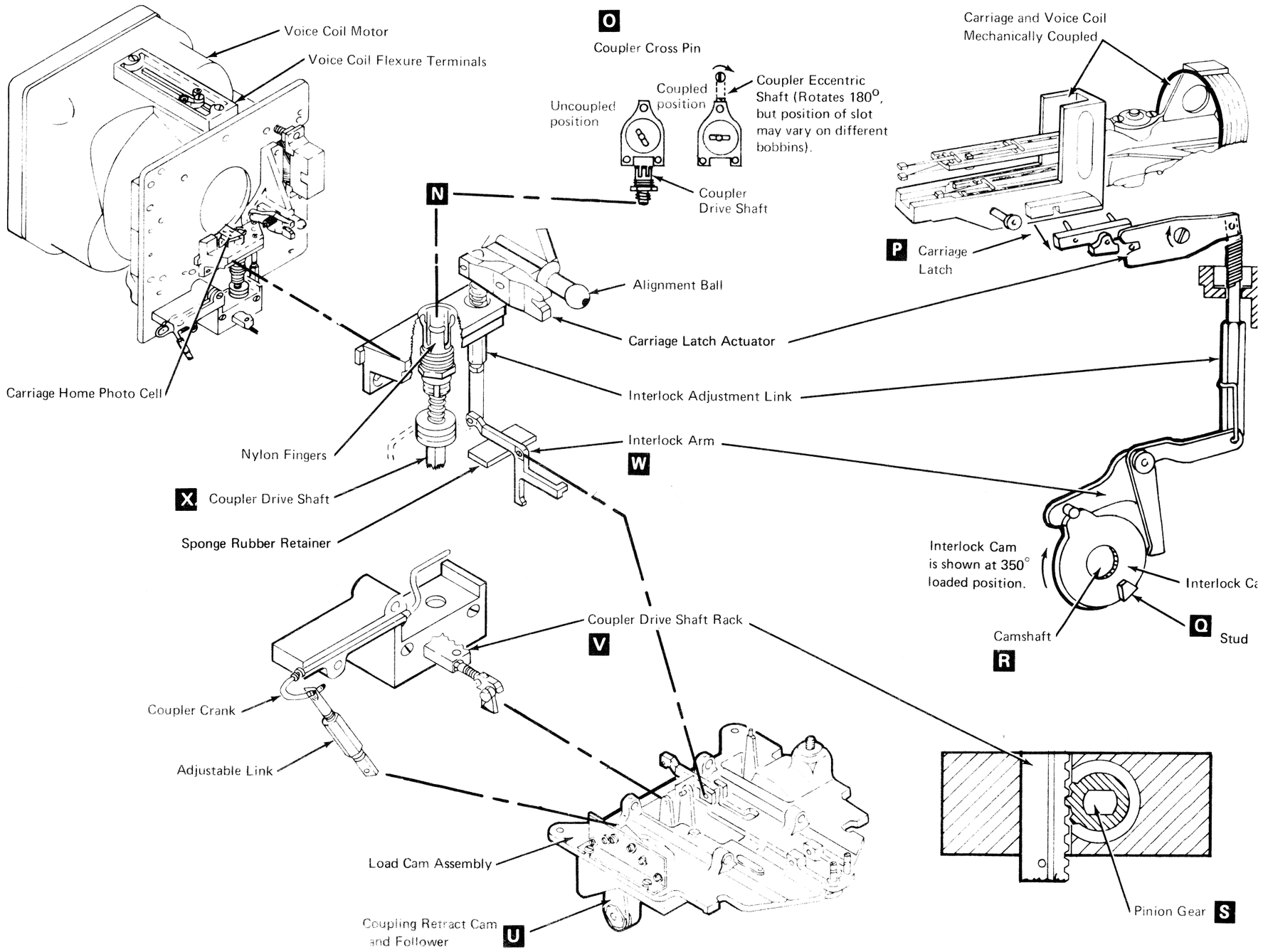
The coupler drive shaft is in the up position (engaged with the bobbin coupler shaft) when the DM is unloaded and thus ready to load. The coupler drive shaft is raised and lowered by the coupler crank **Y**, adjustable link, air/coupling retract cam and follower **U**. Note that the coupler drive shaft starts to retract at 260° and is completely retracted while the DM is loaded. Air valves, shown on DM 630, are operated by the air/coupling retract cam.

The rotation is accomplished by the interaction of the coupling cam, the cam follower, and the coupler drive shaft rack **V**.

The carriage latch **P**, which locks the carriage in position while the DM is unloaded, is released late in the load cycle by the carriage latch cam. The latch, with its associated components, prevents unloading if the carriage cannot be relatched. The interlock arm **W** has a cam following section that catches the stud **C** to stop the unload cycle, if the carriage is not latched. The carriage must be at the home position (toward the spindle) to be latched.

Once loaded, the servo system takes control to position the carriage to track zero.

To unload, follow the unload timing chart shown on DM 640.



DH0296	2747641
Seq. 1 of 2	Part No. (P)

440202	440203	440205	440214	440219	440223	440227
7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	26 Sept 74	14 Mar 75	14 Sep 76

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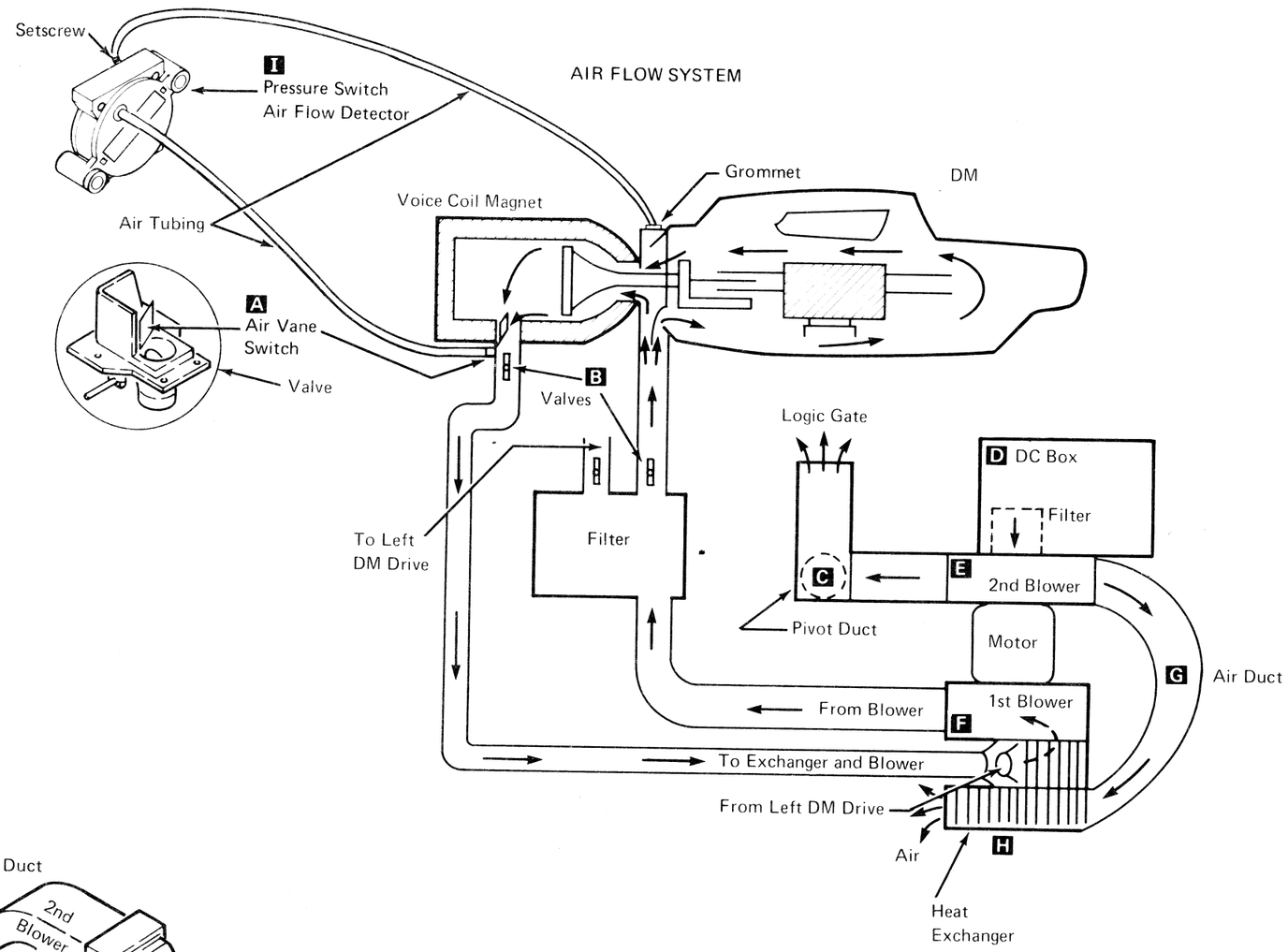
AIR FLOW

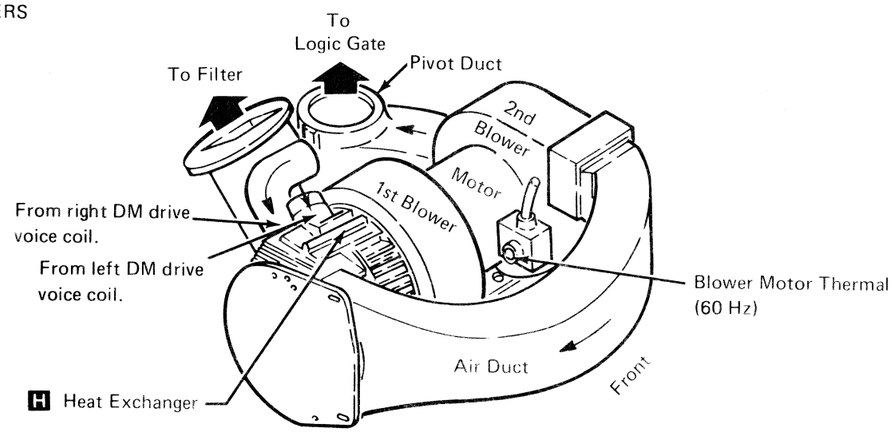
- The voice coil and data module are cooled by air recirculated through the first blower **F** and heat exchanger **H** .
- Fins of the exchanger are cooled by air from the second blower **E** as it passes through to the atmosphere.
- Air flow is stopped by two valves when the DM is unloaded. The valves **B** are below the voice coil and on the filter output.
- Air in the closed system is pumped through the circuit when the valves are open (DM loaded).
- Air flow is monitored by a switch **A** below the voice coil, or on later machines, by a switch **I** located on the frame. See LOC 6 or or LOC 16. See Note 1.
- A second blower cools the logic gate, the DC box, and the recirculated air heat exchanger.

1. Air is drawn through the filter in the bottom of the DC box **D** into the second blower **E** .
2. The blower provides air to the logic gate through the lower pivot duct **C** , and through the air duct **G** to the heat exchanger **H** .

Note 1: The pressure switch air flow detector **I** *is used in later machines instead of the air vane switch* **A** *. A pressure switch monitors the differential pressure across the VCM. If the blower or either entry or exit air air valves fail, the differential pressure across the VCM becomes zero and the switch opens. A 6-32 setscrew is inserted in the tubing and acts as an air restrictor to limit the pressure surges caused by an actuating voice coil.*



BLOWERS



DH0296	2747641
Seq. 2 of 2	Part No. (P)

440202	440203	440205	440214	440219	440223	440227
7 Sept 73	2 Nov 73	28 Jan 74	17 Jun 74	26 Sept 74	14 Mar 75	14 Sept 76

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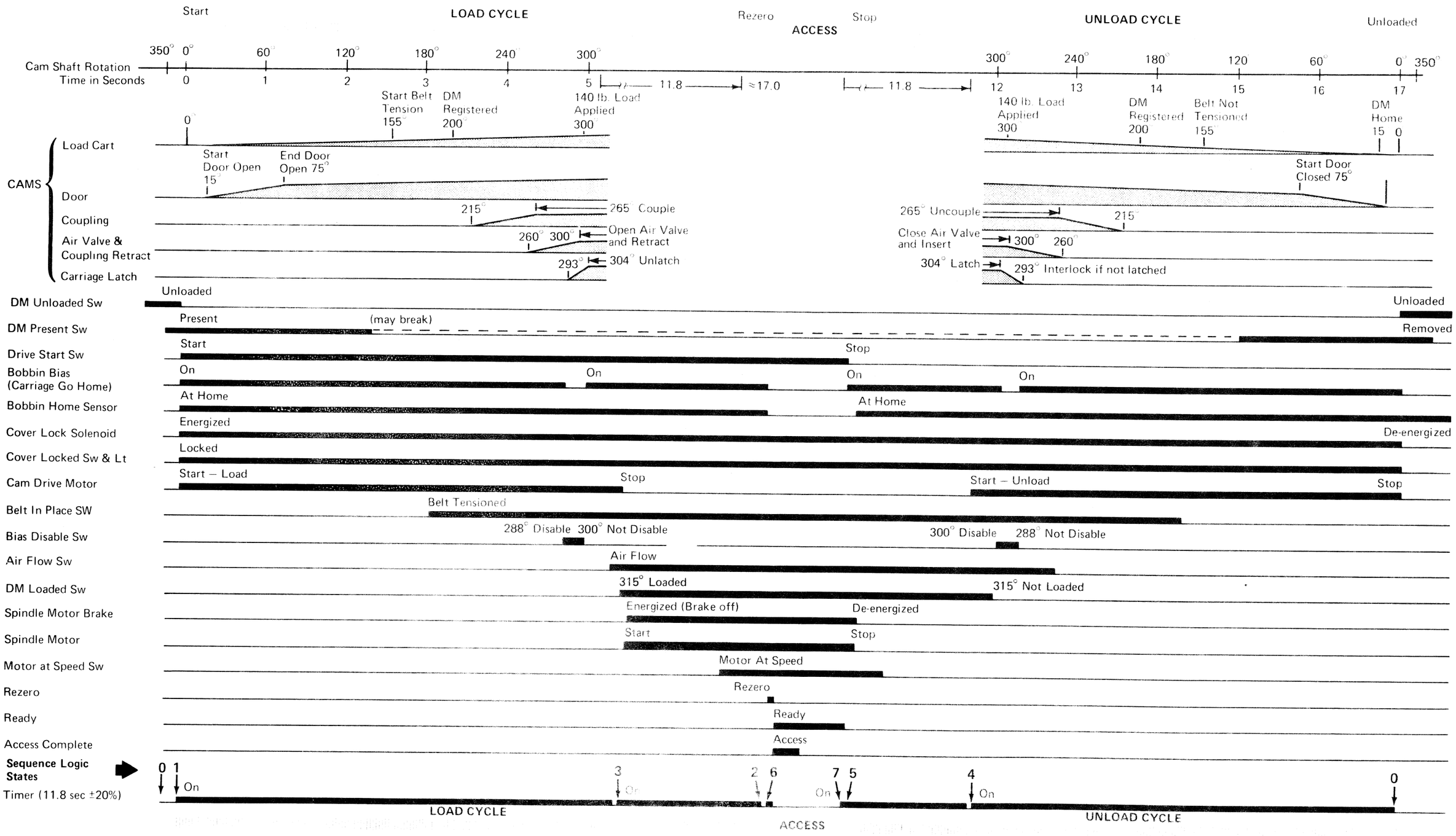

DH0298 Seq. 1 of 2	2747737 Part No. (P)

440203 2 Nov 73	440205 28 Jan 74	440223 14 Mar 75	440224 15 Dec 75	440228 29 Oct 76		

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DATA MODULE STATES

LOAD – ACCESS – UNLOAD

See timing diagram on DM 640

The process of loading the data module (DM), accessing data, and unloading the data module is controlled by circuitry that operates in eight states. The states are:

State 0 Wait
State 1 Load the data module and unlock the carriage.
State 3 Get the drive motor up to speed.
State 2 Move the carriage from the Home position to track 0 (Rezero operation).
State 6 Access data (Read and Write).
State 7 Move the carriage Home.
State 5 Turn the drive motor off.
State 4 Unload the data module; latch the carriage.

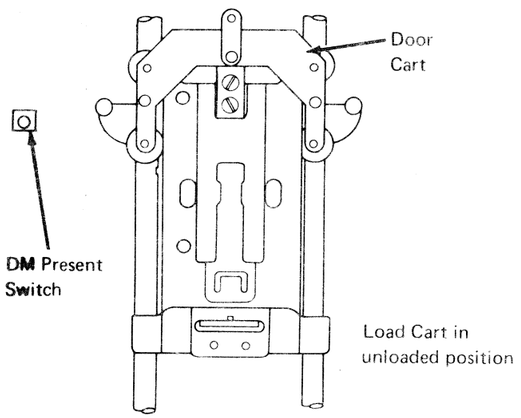
The process begins and ends in State 0. A power-on-reset causes entry to State 0. In any state, certain prerequisites must be met before the circuitry can advance to the next state. In State 4, a signal from the DM unloaded switch causes the return to State 0 (unloaded condition). Any error encountered while advancing through the states is posted in the sense bytes.

STATE 0

See DM 205 for circuit diagrams

Wait (Unloaded Condition)

The operator places the data module in the machine (DM Present switch makes), closes the cover, and turns the Start/Stop switch to Start, which energizes the cover solenoid. The cover solenoid allows the cover to lock after it is closed.



The prerequisites for entering State 1 from State 0 are:

- Door closed (Door Locked switch made).
- Data module installed (DM Present switch).
- Drive switch to Start.
- DM Unloaded switch made.
- Carriage at the Home position.

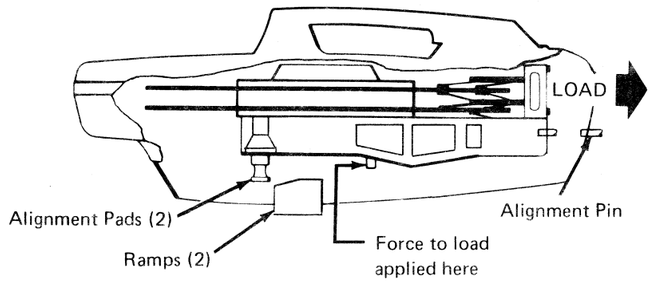
STATE 1

See DM 215 for circuit diagrams and DM 621 for mechanical operation.

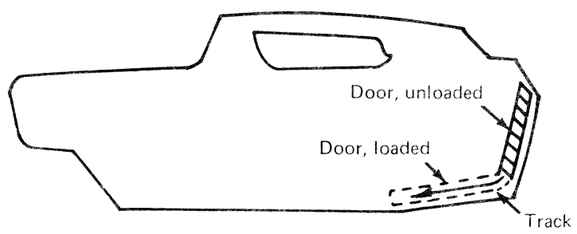
Load the Data Module

The following functions occur during State 1:

1. **The data module is moved into alignment on the baseplate.** A cam drive motor rotates the camshaft a single revolution clockwise (from the motor end). Cam-driven linkages cause the module to move to precise alignment on the baseplate.

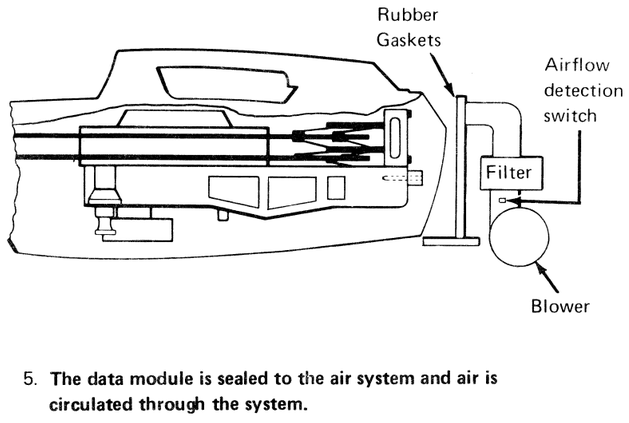


2. **The data module door is opened.**
As the DM begins to move into the loaded position, the door (like a rolltop desk) is pulled down by cam-driven linkages.

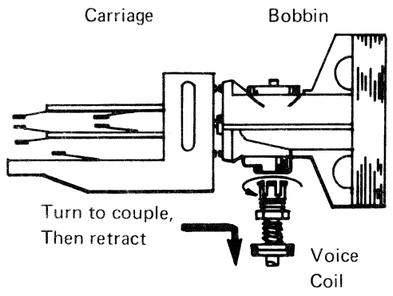


3. **Drive motor belt is engaged.**
As the data module drive pulley moves toward the voice coil, the belt is engaged with the drive pulley. Belt tension is provided by a spring. A Belt-in-Place switch is made while the belt is under tension.

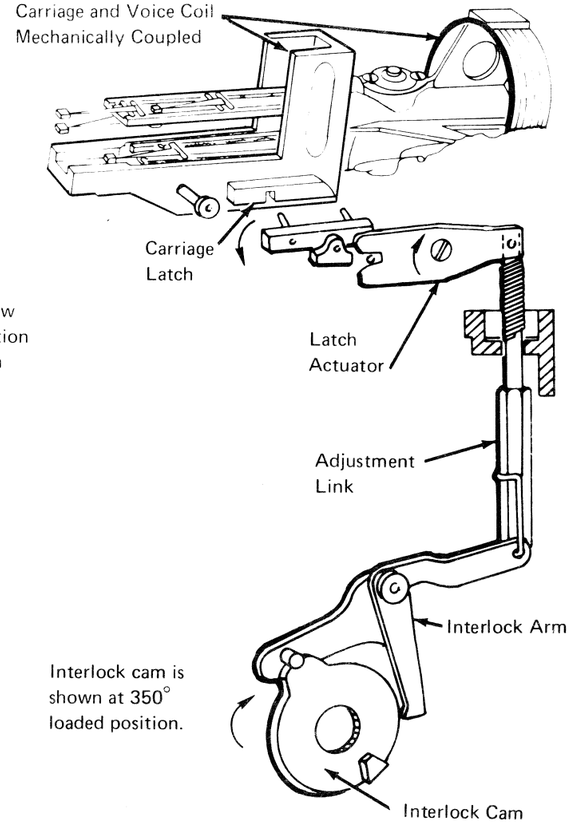
4. **The electrical contacts of the DM connector go together when the data module is fully loaded.**



5. **The data module is sealed to the air system and air is circulated through the system.**



6. **The voice coil is coupled to the carriage in the data module.**



7. **The carriage is unlatched as the camshaft completes the revolution.**

8. **The Data Module Loaded switch signals that the data module is mechanically loaded.**

The prerequisites for entering State 3 from State 1 are:

- DM Loaded (switch).
- Belt-in-Place (switch).
- Carriage Home.
- Door Locked (switch).

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DATA MODULE STATES (Continued)

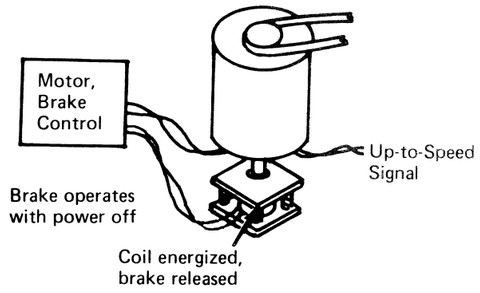
STATE 3

See DM 221 for circuit diagrams.

Release Brake, Start Motor, Sense Motor Up To Speed.

The following functions occur during State 3:

1. Parallel circuits start the motor and energize the brake coil, which releases the brake.



2. When the motor is up to speed, the centrifugal switch transfers to signal that the motor is at speed.

The prerequisites for entering State 2 from State 3 are:

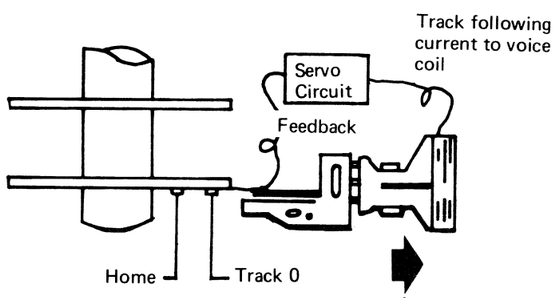
- Motor up to speed.
- DM loaded.
- Belt in place.
- Door locked.
- Airflow detected.

STATE 2

See DM 235 for circuit diagrams.

Move Carriage to Track 0.

During State 2 a rezero operation is executed and the servo circuits move the carriage to track 0. (See OPER 129 for a description of the Rezero operation.)



The prerequisites for entering State 6 from State 2 are:

- Access Complete.
- Carriage unlatched.
- Motor up to speed.
- DM loaded.
- Belt in place.
- Cover locked.
- Airflow detected.

STATE 6

Access to Data (Online condition)

The following functions occur during State 6:

1. Signal DM Ready to control unit.

2. Access data (Online condition).

When in State 6, any of the following may cause circuitry to step to State 7:

- Motor not at speed or loss of air.
- Loss of Belt in Place.
- Loss of DM Loaded switch.
- DM Size Parity indicator.
- Start/Stop switch in Stop position and drive Not Busy or in Read/Write operation.

STATE 7

See DM 321 for circuit diagrams.

Move Carriage to Home

Carriage moves from track x to home position.

The prerequisite for entering State 5 from State 7 is:

- Carriage home photocell covered.

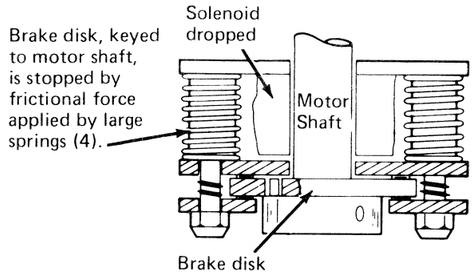
STATE 5

See DM 335 for circuit diagrams.

Turn Drive Motor Off

The following functions occur during State 5:

Circuits to motor and brake coil are dropped. Spring action in the brake assembly causes the motor to stop quickly.



The prerequisite for entering State 4 from State 5 is:

- Motor not at speed.

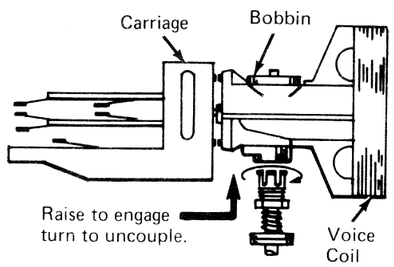
STATE 4

See DM 345 for circuit diagrams.

Unload Data Module

1. Cam drive motor rotates the camshaft a single revolution counterclockwise (from the motor end). Cam-driven linkages latch the carriage at home position.

2. Extend coupling mechanism; uncouple carriage from bobbin.



DH0301 Seq. 1 of 2	2747234 Part No. (P)

440200 25 Jun 73	440202 7 Sept 73	440203 2 Nov 73	440205 28 Jan 74	440214 17 Jun 74	440223 14 Mar 75	440228 29 Oct 76

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3. Move data module toward unloaded position. Cam-driven linkages move the module toward the unloaded position.

4. Air seal breaks.

5. Contact connection opens.

6. Belt disengages from module pulley.

7. DM door closes.

8. Signal DM Unloads (switch).

9. Cover unlocks.

The prerequisite for entering State 0 from State 4 is:

- DM Unloaded.

STATE 0

Return to Wait State (Unloaded Condition)

DM STATE SEQUENCE (LOAD)

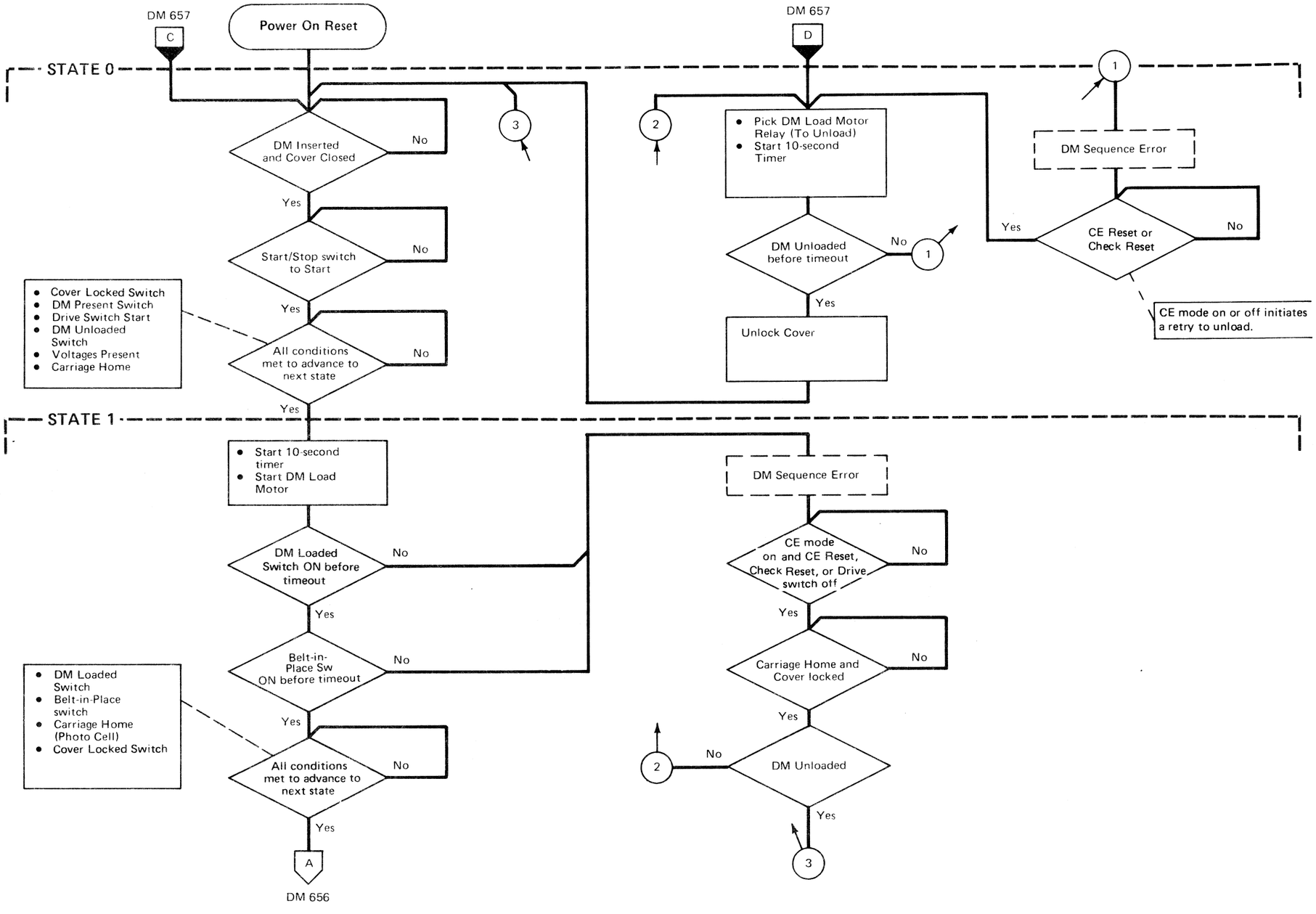
Power on.

The data module is placed in the drive.

The drive door is closed.

The drive Start/Stop switch is turned to Start.

During state 1, the actual loading of the data module takes place. When all the indicators of the load completion are sensed, the sequencer moves to state 3.



DH0301 Seq. 2 of 2	2747234 Part No. (P)

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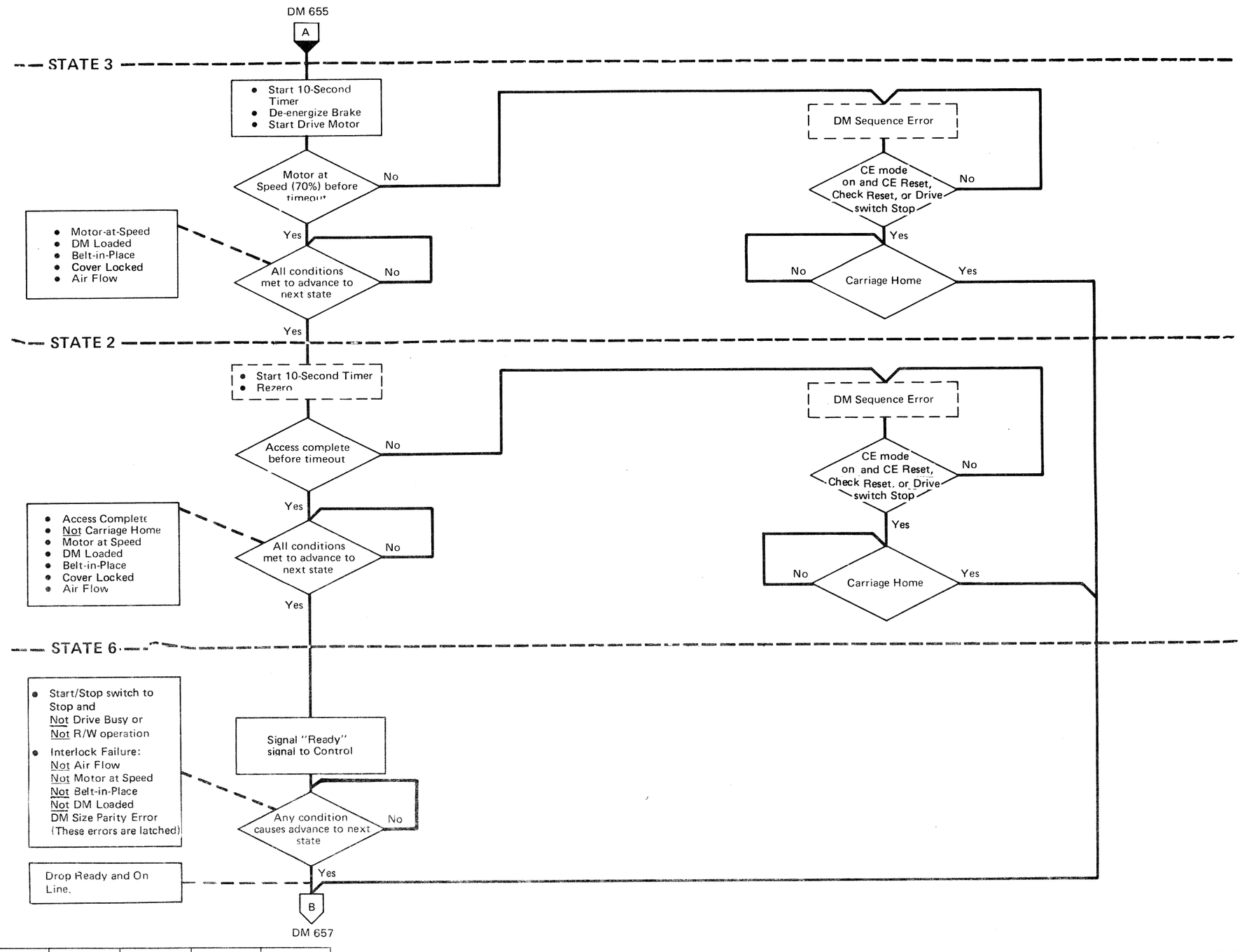
DM STATE SEQUENCE (LOAD)

The drive motor begins to turn. When it is up to speed to allow the heads to load, the sequencer goes to state 2.

Rezero operation begins; the heads are loaded and track following begins.

The load cycle is complete. The sequencer remains in this state for data retrieval (Seek. Rezero. Read and Write operations).

An interlock error causes the Ready light to go off and Reset Online as the data module leaves state 6. The sequence completes the unload cycle. The interlock failure is latched for sense status and is not reset until state 1 of the next load cycle.



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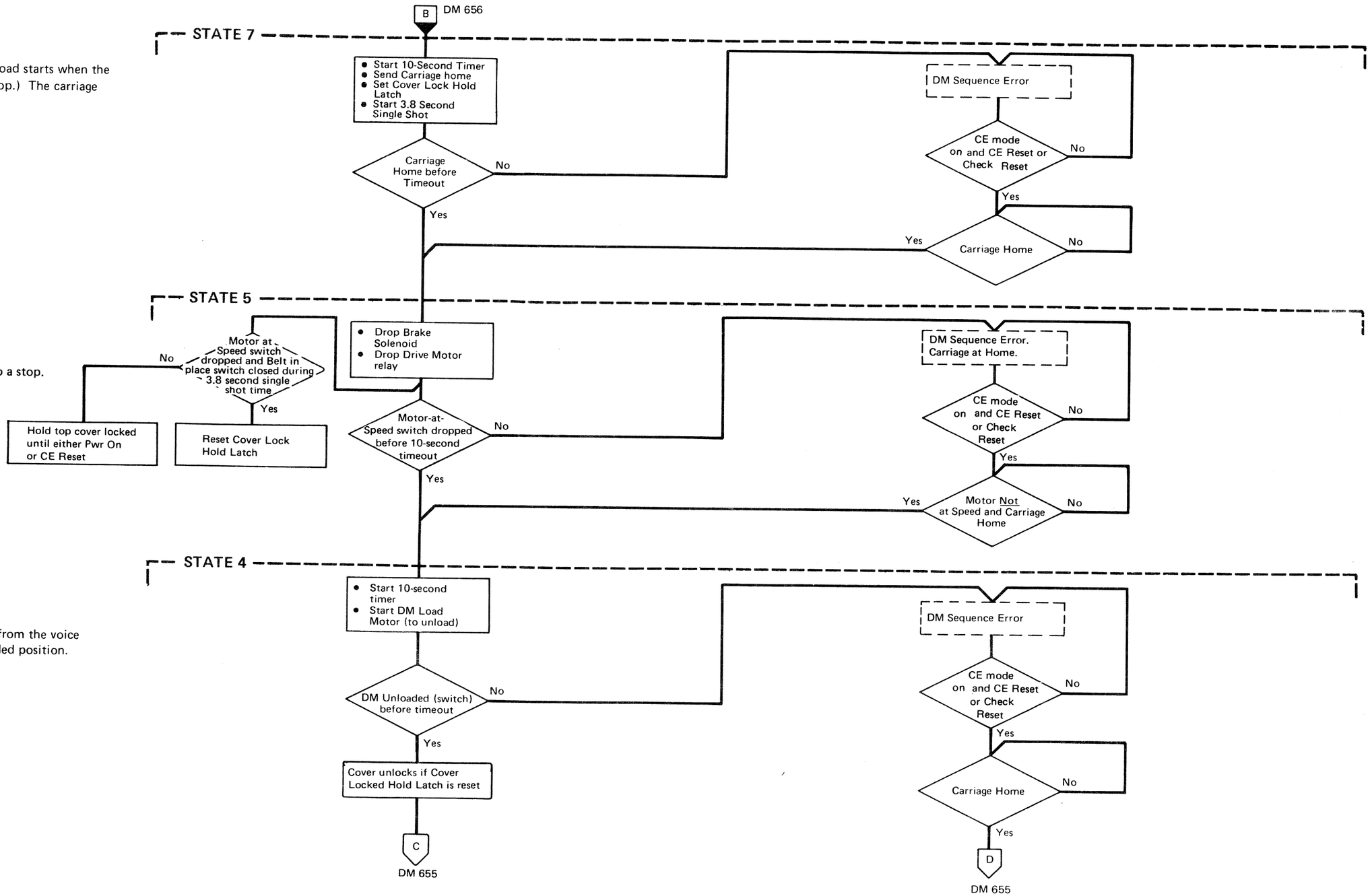
DM STATE SEQUENCE (UNLOAD)

Start of the unload cycle. (Normal unload starts when the drive Start/Stop switch is turned to Stop.) The carriage goes Home (inner crash stop).

The drive motor turns off and comes to a stop.

The data module physically uncouples from the voice coil motor and moves out to the unloaded position.



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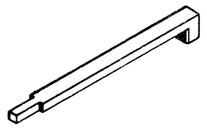
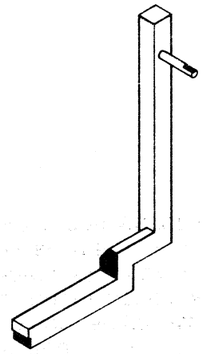
ADJUSTMENT TOOL KIT (P/N 2745995)

The tool kit contains the following items (part number)

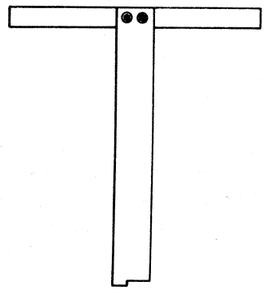
Pointer (P/N 2343546)



Feet and Switch Gauge (P/N 2745987)

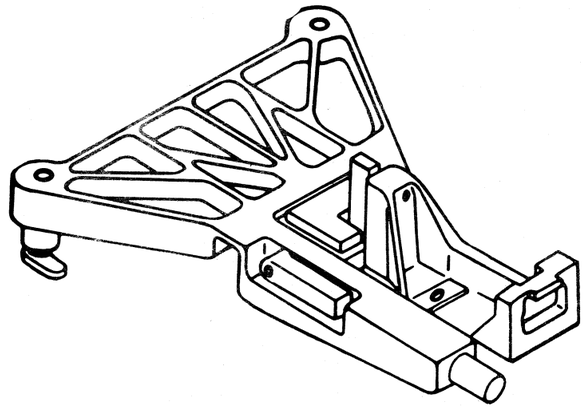


Door Pin Gauge (P/N 2745978)

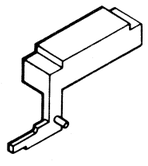


Pin (P/N 2745996)

Adjustment Tool (P/N 2745994)

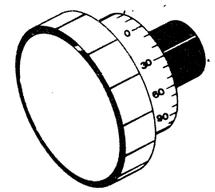


Actuator Gauge (P/N 2745986)

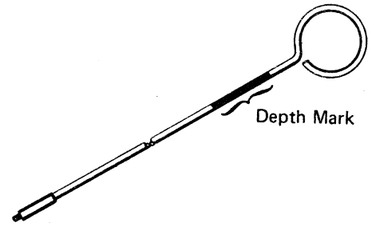


OTHER TOOLS

Index Wheel (P/N 2745011)

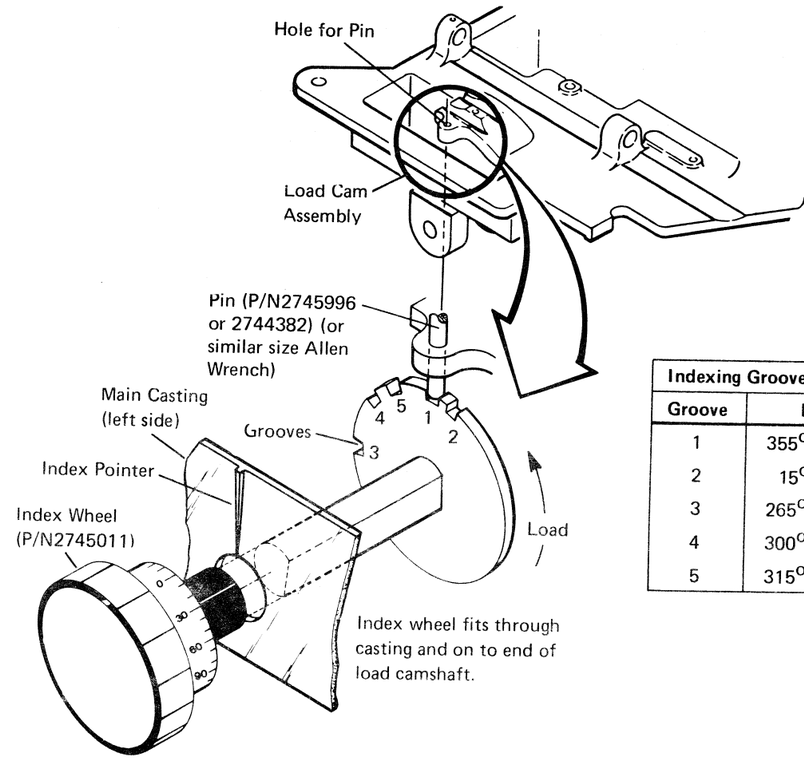


Bobbin Push Rod (P/N 2745734)



APPLICATIONS

(Index Wheel and Pin)



Indexing Grooves for Camshaft	
Groove	**Position**
1	355° Unloaded
2	15° Not used
3	265° Coupling
4	300° Bobbin Bias
5	315° Loaded

DH0312 Seq. 2 of 2	2747235 Part No. (P)

See EC History	440228 29 Oct 76	440241 30 Oct 78				

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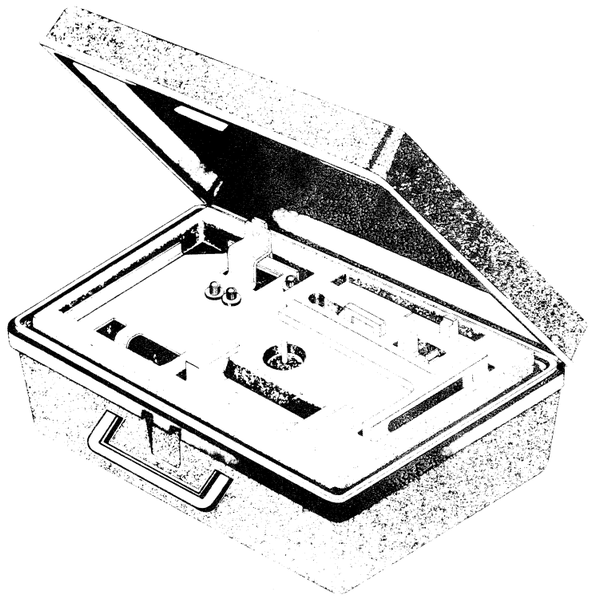
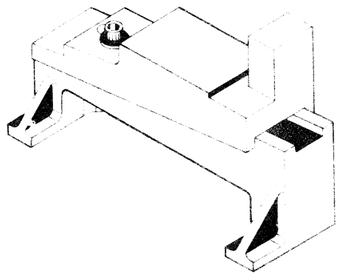
3340 TOOLS (Continued)

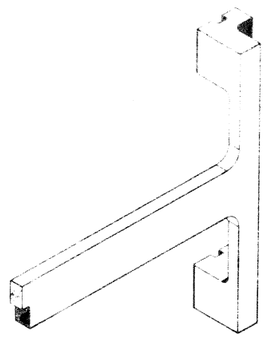
Adjustment Tool Kit (P/N 2744390)
The tool kit contains the following items (Part Number):



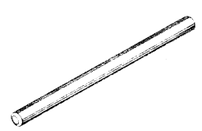
Slide Tool Assembly
(P/N 2744380)



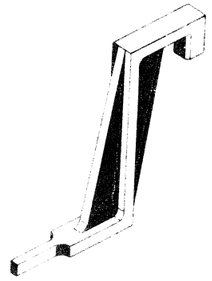
Door Pin Tool (P/N 2744381)



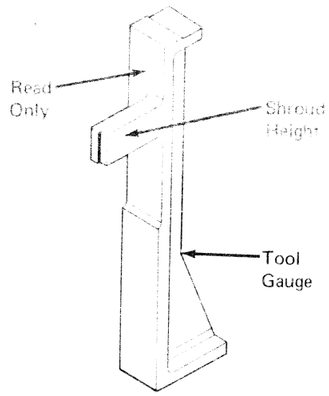
Pin (P/N 2744382)



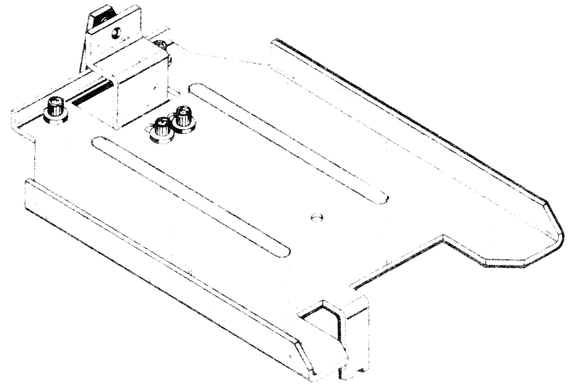
Pointer Coupling Rotation Tool (P/N 2744383)



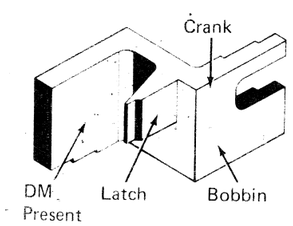
Tool Gauge (P/N 2744384)



Load Beam Tool (P/N 2744661)



Gauge (P/N 2744385)



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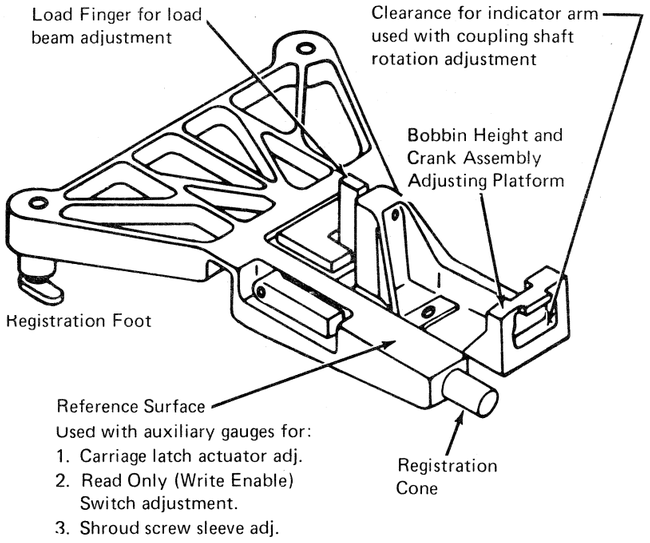
INSTALLING ADJUSTMENT TOOL

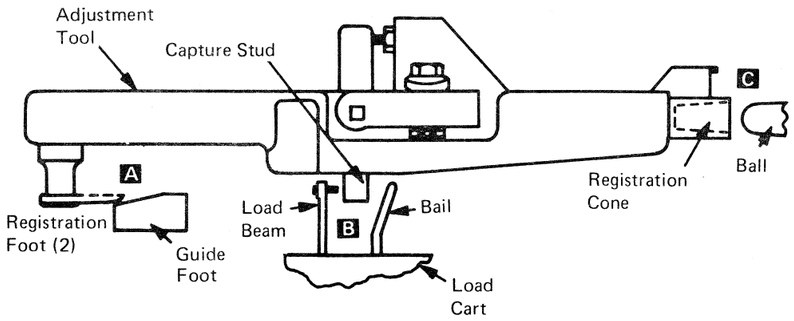
The adjustment tool (P/N 2745994) can be installed by either of two methods: Method 2 allows the tool to be removed during the adjustment of a part while Method 1 holds capture stud between load beam and bail.

CAUTION: Never install tool under power.



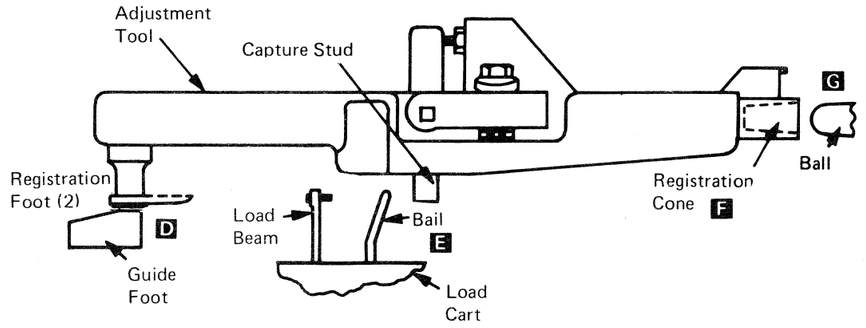
METHOD 1:

1. Remove the shroud (DM 705).
2. Turn the camshaft (with the CE Index Wheel or the knurled knob on the DM load motor) to the unloaded position (355°).
3. Place the adjustment tool so the registration feet rest on the guide feet **A** and the capture stud is between the load beam and the bail, **B** .
4. Turn the camshaft toward the loaded position (315°). Guide the tool by hand while loading until the ball is partially inside the registration cone **C** .
5. Continue turning the camshaft to the position indicated by the adjustment to be performed or the loaded position (315°).
6. Support tool when unloading.



METHOD 2:

1. Remove the shroud (DM 705).
2. Turn the camshaft (with the CE Index Wheel or the knurled knob on the DM load motor) to unloaded position (355°).
3. Put the registration feet of the tool at the entry to the registration guide feet **D** .
4. Raise the registration cone end of tool **F** so the capture stud goes over the bail **E** .
5. Slide the tool toward the VCM while lowering the registration cone to slide over the ball **G** .



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HROUD REMOVAL, COUPLING, AND OMMON EXIT PROCEDURE

HROUD REMOVAL

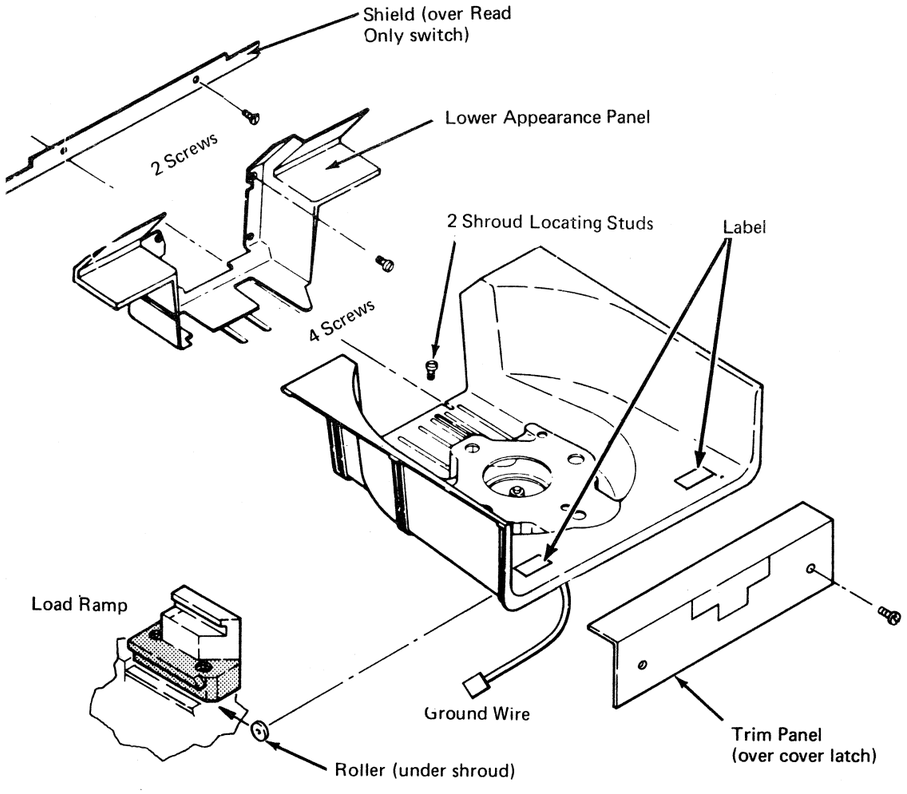
ote: Remove the shroud to check and/or replace items the data module load mechanical area.

Open top front cover.

Turn off 24 Volts switch in service drive and place in CE mode.

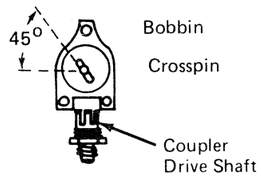
From rear of machine, insert CE Index Wheel (DM 700) and turn camshaft to 30° or use knurled knob on DM load motor (approximately 40 CW turns from unloaded position) to turn camshaft far enough so slots in shroud clear locating studs.

Pull shroud toward front of machine and lift front of shroud clear of load ramps. Remove ground wire from left side of base and lift shroud clear of machine.



COUPLING

The diagrams below describe the conditions that should exist when the bobbin is in the coupled and uncoupled positions.

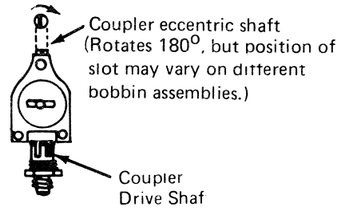


A Bobbin Uncoupled Position

1. Bobbin shaft is held captured by the Coupler Drive Shaft.
2. Crosspin is at 45°.
3. Camshaft is in unloaded position (215° to 355°).

Note: If Bobbin is not captured, or if Crosspin is not at 45°:

1. Turn Camshaft to loaded position (315°).
2. Verify conditions shown at **B** *.*
3. Hold Bobbin in forward position over the Coupler Drive Shaft, and turn the Camshaft to the unloaded position (355°).



B Bobbin Coupled Position

1. Coupler Drive Shaft is lowered away from Bobbin.
2. Crosspin is horizontal.
3. Camshaft is not in unloaded position (265° to 315°).

Note: If Crosspin is not horizontal:

1. Remove Rubber Plug in top of Air Interface.
2. Turn Slotted Shaft at the top of the Bobbin Casting 180° counter-clockwise until Crosspin is horizontal.

COMMON EXIT PROCEDURE

1. Ensure tools and gauges are removed.
2. Replace all panels and covers.
3. Shroud installation
   A. Insert CE Index Wheel (DM 700) and turn camshaft to 30° or use knurled knob on DM load motor (approximately 40 CW turns from unloaded position) to turn camshaft far enough so slots in shroud clear locating studs.
   B. Check that belt is still in position on motor pulley.
   C. Slide shroud into shroud locating studs. Connect the spindle ground wire to the slip on terminal on left side of base casting. Push shroud down and pull it toward front of machine until shroud roller pins fit into lower track of load ramp.
      Recheck step B.
   D. If the shroud is being replaced by a new shroud, check that the label is installed.

Note: On some machines a second language label may be installed on the right side of the shroud.

4. If you have finished servicing machine, check the following:
   A. Camshaft is in the unloaded position (355).
   B. Bobbin is captured correctly **A** .
5. Remove CE Index Wheel.
6. Turn on 24 Volts switch and be sure all power is on.
7. Exit to START 500 Entry A.

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TOP COVER LATCH

PURPOSE

These adjustments ensure that:

1. When the door is closed, the door handle notch is parallel to the striker surface.
2. When the solenoid is energized, the interposer locks the door handle.
3. The Cover Locked switch operates correctly.

SPECIAL TOOLS REQUIRED

None

CHECK 1

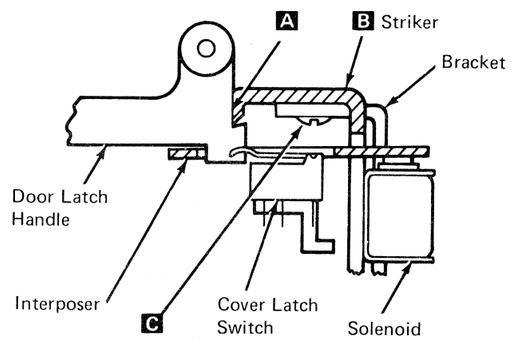
1. Place service drive in CE Mode.
   Turn off 24 Volts switch.
2. Remove trim panel over door latch (DM 705).
3. Check that lip of the striker seats into the notch of the latch handle **A** with the door closed.
4. With door closed, the distance from the lower surface of the top cover to the angle iron frame should be 0.040 – 0.080 inch on left and right sides.
5. If adjustment is:
   Correct – proceed to Check 2.
   Incorrect – proceed to Adjustment 1.

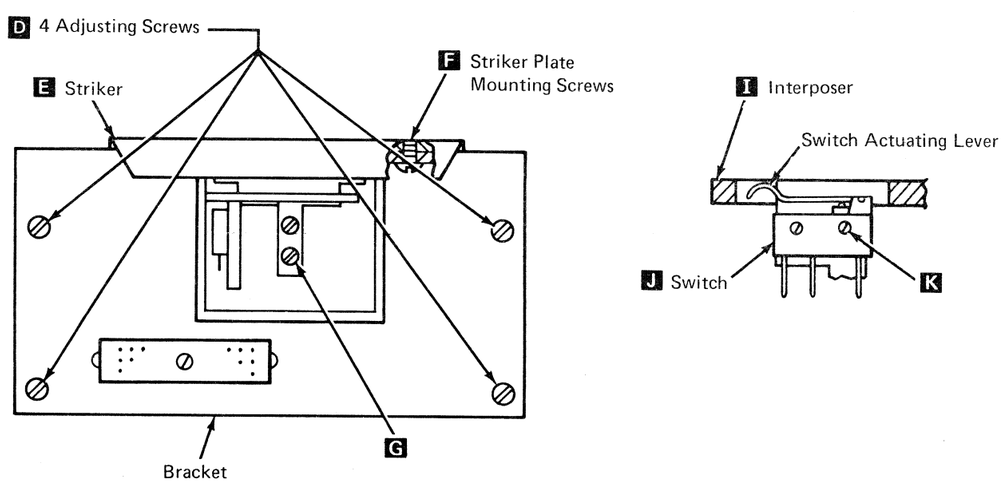
ADJUSTMENT 1

1. Ensure cover is in correct alignment; that is, even with front of frame when closed. Tighten four top cover mounting screws (under hinge on right and left).
2. Loosen four screws on latch assembly **D** and position bracket vertically so top surface of the striker is level with frame of machine.
3. Close door and push bracket down until lower surface of top cover is 0.040 – 0.080 inch from frame assembly. Tighten screws.
4. Proceed to Check 2.

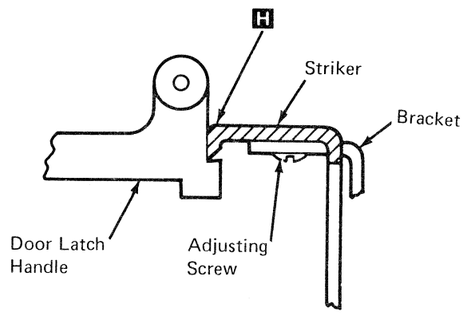
CHECK 2

1. With door closed, check that the vertical surface of the striker lip is flush with the latch handle along the entire length of the striker lip. **H**
2. If adjustment is:
   Correct – proceed to Check 3.
   Incorrect – proceed to Adjustment 2.





Striker in correct position, flush with latch handle.



ADJUSTMENT 2

1. With door closed, loosen 2 adjusting screws (shown at both **C** and **F**) and position the striker (shown at both **B** and **E**) so the vertical surface of the lip is flush with the latch handle along the entire length of the striker lip.
2. Go back and redo Check 1.

CHECK 3

1. Remove shroud (DM 705).
2. With door open, push armature down at solenoid end. Interposer end of armature should have 9/64 ± 1/64" (3,6 ± 0,4 mm) clearance. Armature should not bind when released. When door is closed, the latch handle should not touch end of interposer (indicates solenoid assembly is too low).
3. If adjustment is:
   Correct – proceed to Check 4.
   Incorrect – proceed to Adjustment 3.

ADJUSTMENT 3

1. Loosen 2 solenoid screws **G** .
2. Hold armature down against solenoid and push solenoid up until there is 9/64" (3,6 mm) clearance from armature to the striker.
3. Tighten 2 screws and check that armature does not bind. Readjust solenoid position if bind occurs.
4. Proceed to Check 4.

CHECK 4

1. When the switch actuating lever is flush with the top surface of the interposer **I** , the switch lever is 0.030 – 0.050 inch past make point of the switch. Use CE meter R x 1 scale to check continuity.
2. If adjustment is:
   Correct – proceed to Common Exit Procedure (DM 705).
   Incorrect – proceed to Adjustment 4.

ADJUSTMENT 4

1. Loosen 2 switch screws **K** and adjust switch **J** to meet condition in above check.
2. Proceed to Common Exit Procedure (DM 705).

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DRIVE MOTOR BRAKE

If the new style brake assembly is installed, refer to the Replacement and Brake Check procedures on DM 812 for checks and adjustments. The new style brake can be identified by the polished steel finned housing that encloses the brake coil.

PURPOSE

This adjustment ensures brake disengagement when energized and braking when deenergized. If brake appears to be defective, refer to the replacement procedure on DM 810.

Note: *A noise is normal when brake slows motor to a stop.*

SPECIAL TOOLS REQUIRED

None

CHECK 1 – GAP CLEARANCE

1. Place service drive in CE mode. Remove Motor Plug.

   A-Drive P201 (LOC2)
   B-Drive P203 (LOC 2)

2. Energize brake with jumper to ground while power is on.

   A-Drive A1V4B13 to D08
   B-Drive A1U4B13 to D08

3. Observe 0.005" to 0.015" (0,127 to 0,381 mm) between armature and disk at each adjustment screw **A** to ensure that the brake disk **E** is parallel to the brake surface.
4. Check that brake disk **E** moves up and down freely on the collar.
5. If adjustment is:

   Correct – remove jumper and proceed to Check 2–Collar.
   Incorrect – proceed to Adjustment 1.

ADJUSTMENT 1 – GAP CLEARANCE

1. With brake still energized (Item 2 of check), tighten or loosen self-locking **C** nuts to obtain 0.005" to 0.015" (0,127 to 0,381 mm) clearance between disk and armature **A**. If brake is not energized, adjustment will not change. If voltage between EC601f (–) and EC601b(+) is +24 Vdc, the solenoid is defective. See DM 810 for replacement. If voltage is not +24 Vdc, troubleshoot brake circuit (DM 335).
2. Remove jumper and proceed to Check 2–Collar.

CHECK 2 – COLLAR

1. Remove collar cover under brake.
2. Check that lower edge of collar is 23/64" (9,1 mm) below brake surface.

   A-Drive – Measure distance **B** with 6" scale.
   B-Drive – Mark distance **B** on tab card and measure marked distance with 6" scale.

3. If adjustment is:

   Correct – Proceed to Check 3 – Stop time.
   Incorrect – Proceed to Adjustment 2–Collar.

ADJUSTMENT 2 – COLLAR

1. Loosen two set screws **D**.
2. Slide collar up or down to obtain 23/64" (9,1 mm) between bottom of collar and brake surface **B**. See Note.
3. Tighten both screws and proceed to Check 3 – Stop time.

CHECK 3 – STOP TIME

To check the effectiveness of the brake, perform the following scoping procedure:

Scope set up

Sweep	.5 sec/div
Vertical	.2 volts/div
Trigger	External, slope +
X10 probes	

Probe points on A1 board

	Drive A	Drive B
Ext sync (stop sw)	T4D11	S2D11
Ch 1 (Mtr speed sw)	T4B12	S4B12

1. Make drive ready
2. Turn Start/Stop switch to Stop (scope should trigger)
3. Observe time when Motor At Speed signal falls. It should not exceed 3.6 seconds. If it exceeds 3.6 seconds replace the brake.

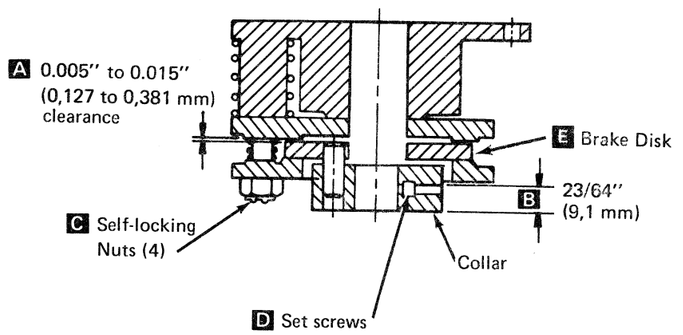
Note: *Check 1 – Gap Clearance and Check 2 – Collar should be performed before replacing the brake. Recheck stop time if any adjustment was required.*

PAGE EXIT PROCEDURE

1. Replace cover over brake collar.
2. Replace motor plug

   A-Drive P201
   B-Drive P203

3. If motor thermal was tripped because of brake failure, reset thermal under motor.
4. Return to Common Exit Procedure on DM 705.



Note: *If the collar is rusted to the shaft and can not be moved, use gear puller (P/N 450365) to remove the entire brake assembly, as a unit, from the shaft.*

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AIR VALVE

PURPOSE

When correctly adjusted, the air supply butterfly valves are open when the data module is loaded and closed when the data module is unloaded.

SPECIAL TOOLS REQUIRED

None

CHECK 1

1. Place service drive in CE Mode.
   Remove shroud and lower appearance panel; see DM 705.
2. Turn camshaft to fully loaded position (315°).
3. Check that both air valve levers are against their open stops **A**.
4. If adjustment is:
   Correct – proceed to Check 2.
   Incorrect – proceed to Adjustment.

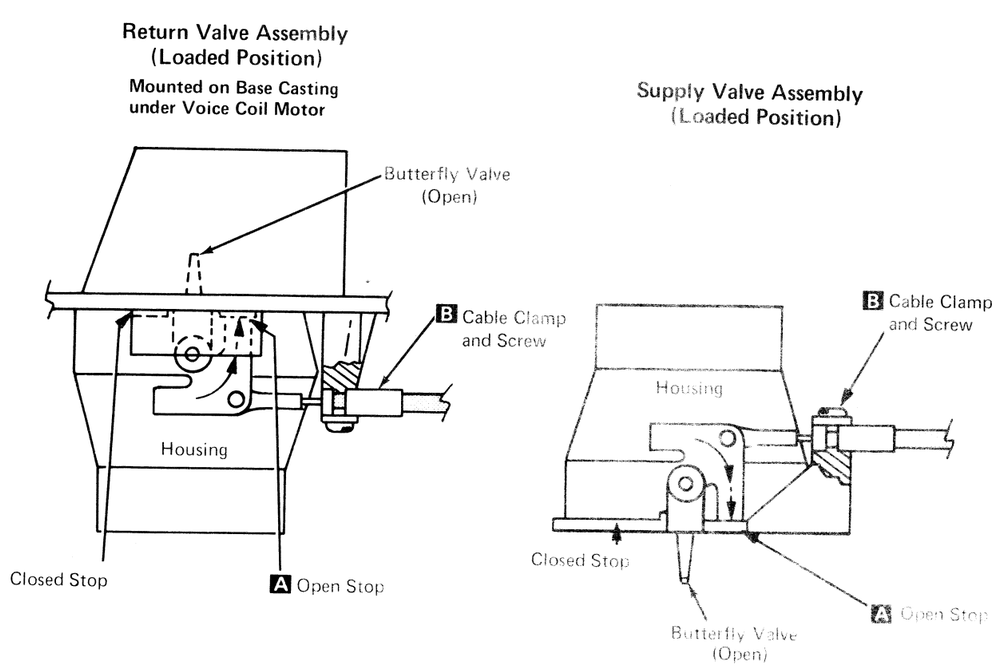
ADJUSTMENT

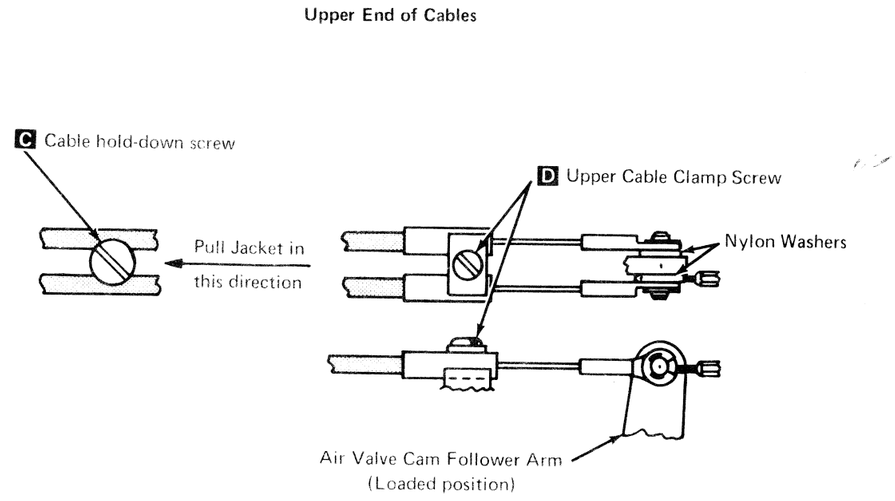
Index is still at fully loaded position (315°).

1. Check that cable jackets at the valve end are correctly seated and clamp screws **B** are tight.
2. On upper end of cable jacket loosen clamping screw **D** and hold-down screw **C**. Pull cable jackets as far as they go. Ensure that both the supply and return butterfly valve levers are against their open stops.
3. Tighten upper cable clamp **D**.
4. Pull the slack from the cable jackets and tighten hold-down screw **C**.
5. Proceed to Check 2.

CHECK 2

1. Manually rotate the camshaft through a full load/unload cycle checking that each cable moves through the full stroke. If binding occurs, check the cable stroke and be sure that the jackets are pulled far enough from the air valve follower assemply. Check for defective Air Valve return springs or bent cable at cam follower end. See DM 820 if replacement is required. See step 2 of adjustment.
2. Replace the shroud and lower trim panel (DM 705).
3. Proceed to Common Exit Procedure (DM 705).





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CAM DRIVE MOTOR

PURPOSE

This adjustment ensures positive drive and correct mesh of motor drive gear with load camshaft gear.

SPECIAL TOOLS REQUIRED

None.

CHECK

1. Put service drive in CE Mode and turn off 24 Volts switch.
2. Insert Index Wheel and turn camshaft to unloaded position (355°).

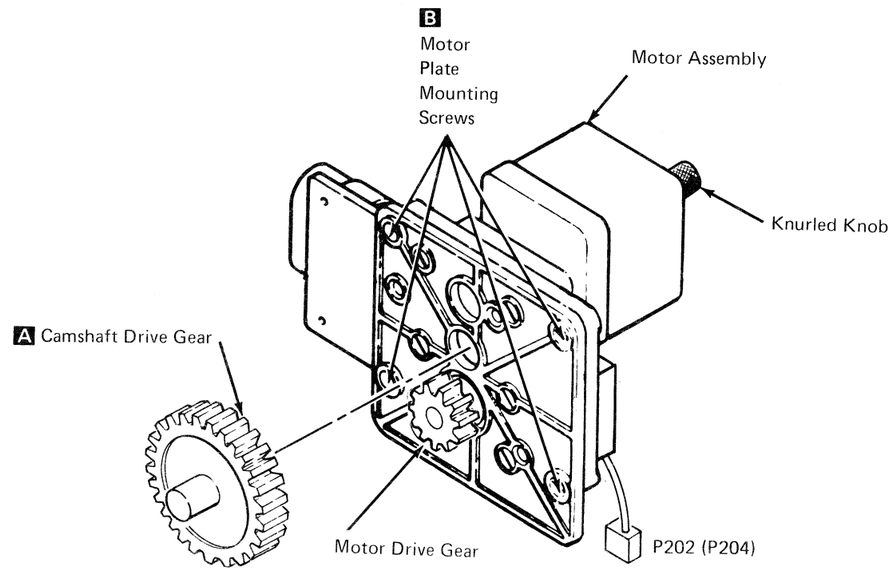
   If camshaft cannot be turned, remove drive motor. Follow procedure on DM 830 except leave shroud in place. Then turn to unloaded position (355°).
4. Remove data module.
5. Hand cycle through load and unload cycles with knurled knob on drive motor or CE Index Wheel (DM 700).
6. Check for even movement of cam assembly without jerks or resistance and for completion of cycles. If operation is

   Correct – return to Common Exit Procedure on DM 705.

   Incorrect – proceed to Adjustment.

ADJUSTMENT

1. Loosen all four mounting screws. **B**
2. Move motor drive gear assembly down for complete mesh with camshaft drive gear. **A**
3. Tighten Mounting Screws. **B**
4. If camshaft drive is not satisfactory, the roll pin may be broken or missing, or reduction gears may be stripped. Repair or replace (DM 830).
5. Go to Common Exit Procedure (DM 705).



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CAM SWITCHES (Load, Unload, and Bobbin Bias Disable)

PURPOSE

This adjustment ensures that cam switches make and break at the desired time.

SPECIAL TOOLS REQUIRED

Pin (DM 700 or 701) or similar size allen wrench.

CHECK

1. Put service drive in CE Mode and turn off 24 Volts switch.
2. Remove shroud (DM 705).
3. Turn camshaft with CE Index Wheel (DM 700). and check appropriate switch.

Unload	Groove 1 (355°)
Bobbin Bias Disable	Groove 4 (300°)
Loaded	Groove 5 (315°)

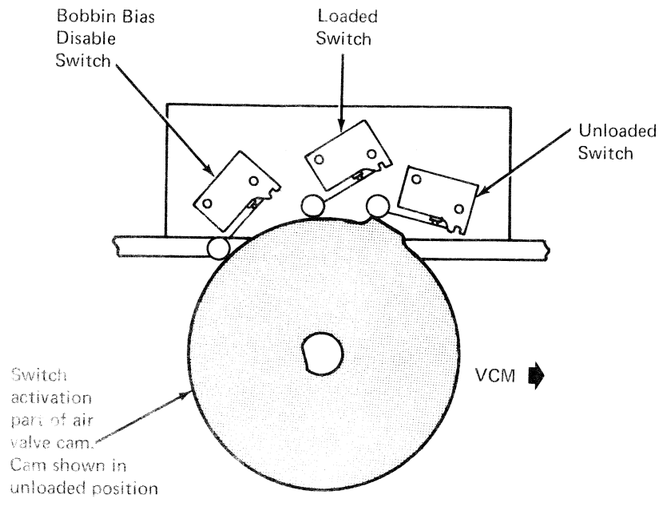
4. Insert pin or similar size allen wrench through casting into desired groove. The switch should make and break within travel allowed by pin in groove. Use meter on R x 1 scale to monitor switch make and break.
5. If switch operation is:
   Correct – complete Page Exit Procedure.
   Incorrect – proceed with Adjustment.

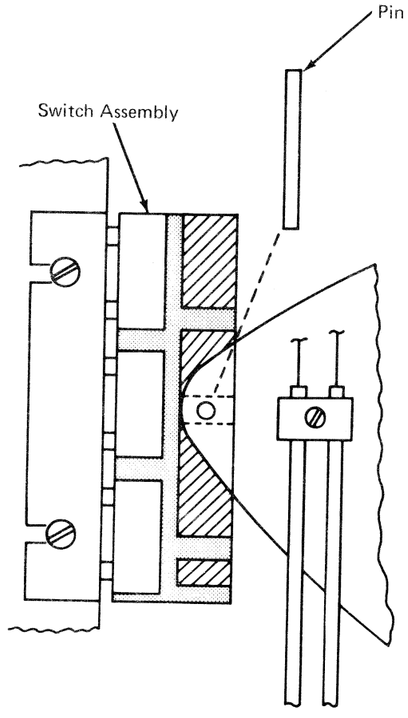
ADJUSTMENT

1. Remove lower appearance panel (DM 705).
2. Switch bracket should be as far left as possible with mounting screws tight.
   If bracket moved, check all three switches.
3. Loosen switch mounting screw and position to meet check conditions.
4. Tighten screws and complete Page Exit Procedure.

PAGE EXIT PROCEDURE

1. Return to Common Exit Procedure (DM 705).





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BELT-IN-PLACE SWITCH

PURPOSE

This adjustment ensures that switch makes and breaks as motor plate changes position during loading and unloading.

SPECIAL TOOLS REQUIRED

None

CHECK

1. Put service drive in CE Mode and turn off 24 Volts switch.
2. Remove shroud (DM 705).
3. Remove belt tension spring. **A**
4. With meter on R x 1 scale, check that switch makes when on cam surface and opens when off cam surface.
5. If switch operation is:

   Correct – complete Page Exit Procedure.

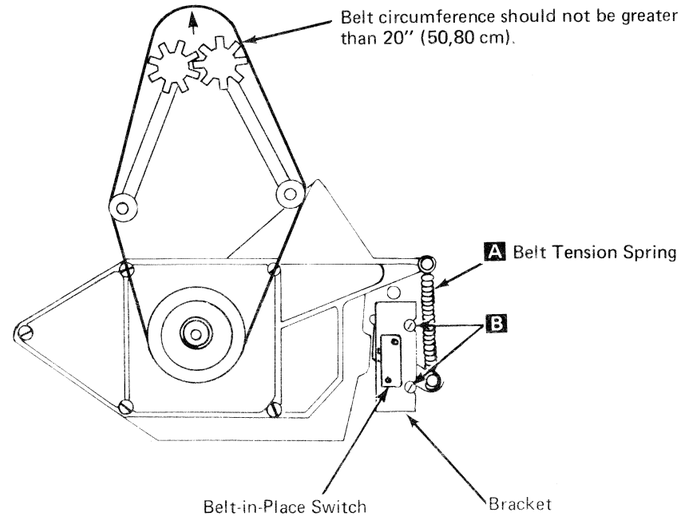
   Incorrect – proceed with Adjustment.

ADJUSTMENT

1. Loosen screws on switch mounting bracket. **B**
2. Shift bracket to meet check requirements. Switch arm should travel 0.010" after completing circuit (over-travel).
3. Tighten bracket and complete Page Exit Procedure.

PAGE EXIT PROCEDURE

1. Replace belt tension spring and belt.
2. Return to Common Exit Procedure (DM 705).



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READ ONLY SWITCH ENABLE OR DISABLE INSET

If using tool kit on DM 701, use procedure on DM 741.

PURPOSE

This adjustment ensures that the Read Only switch is transferred by a DM with the inset rotated to raise the switch plunger to enable writing, but does not raise the plunger when rotated to disable position.

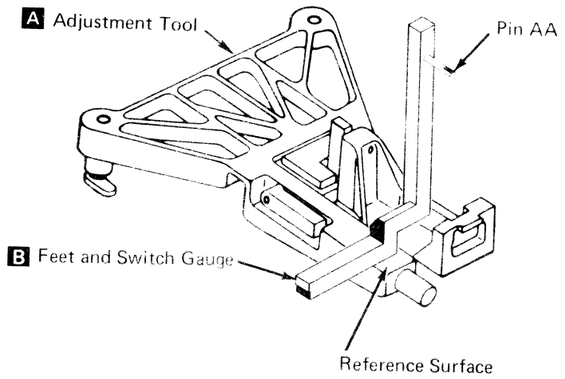
SPECIAL TOOLS REQUIRED - *See DM 700*

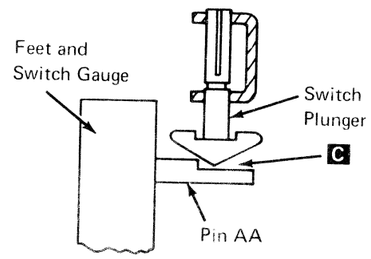
Adjustment Tool Kit (DM 700)

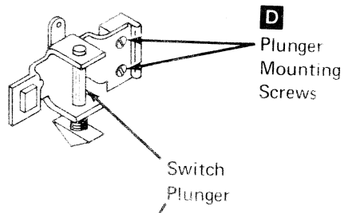
Note: If adjustment tool kit is not available, use the alternate method at right. Any adjustments made without adjustment tool kit must be checked with the tool when available.

CHECK (With Tool)

1. Put service drive in CE Mode and turn off 24 Volts switch.
2. Remove shield over Read Only switch (DM 705).
3. Raise the plunger manually and ensure that plunger does not bind and that switch transfers 0.015" (0,38 mm) past the make point. Loosen the mounting screws **G** and adjust the switch position if adjustment is required. Use CE meter to check for correct switch operation.
4. Load adjustment tool **A** by method 2 (DM 702) (without turning camshaft).
5. Position feet and switch gauge **B** (DM 700) on adjustment tool reference surface as shown.
6. The upper pin surface must not clear the switch plunger (no-go); the lower pin surface must clear the plunger (go). **C**
7. If clearances are:
   Correct – complete Page Exit Procedure.
   Incorrect – proceed with Adjustment.

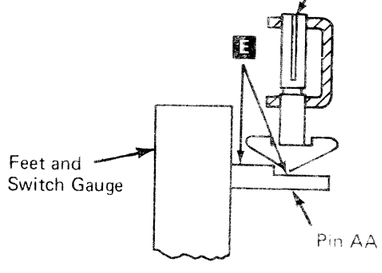






ADJUSTMENT (With Tool)

1. Loosen plunger mounting screws. **D**
2. Shift switch bracket up or down until the plunger clears the lower portion at pin AA, but touches the upper portion of pin AA. **E**
3. Tighten mounting screws and complete Page Exit Procedure.



PAGE EXIT PROCEDURE (With Tool)

1. Remount shield over Read Only switch if removed.
2. Return to Common Exit Procedure (DM 705).

ALTERNATE METHOD (Without Tool)

The alternate is used when the adjustment tool is not available. Consider this as a temporary measure which must be checked as soon as possible with an adjustment tool.

CHECK (Without Tool)

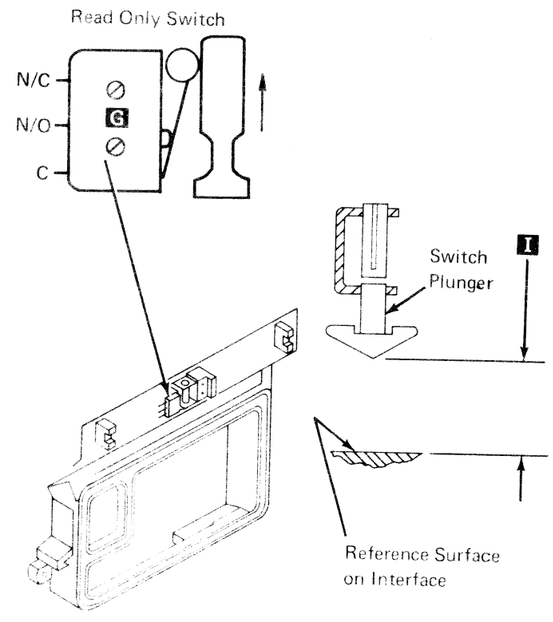
1. Put service drive in CE Mode and activate CE Cover (Bypass) switch.
2. Load data module both with and without the inset in read position.
3. Observe Read Only switch function and approximate adjustment as operated by the data module.
4. The switch operation is:
   Correct – complete Page Exit Procedure.
   Incorrect – continue with Adjustment.

ADJUSTMENT (Without Tool)

1. Remove upper trim panel and loosen plunger mounting screws. **D**
2. Raise the plunger manually and ensure that plunger does not bind and that switch transfers a maximum of 0.015" (0,38 mm) past the make point. Loosen the mounting screws **G** and adjust the switch position if adjustment is required. Use CE meter to check for correct switch operation.
3. Position free-end of plunger 5-1/32" ± 1/32" (127,78 ± 0,61 mm) above reference surface on interface. **F**
4. Tighten screws and load and unload data module. Check that Read Only lamp is lit with inset in Read position and not lit when in the Write position. Complete the Page Exit Procedure.

PAGE EXIT PROCEDURE (Without Tool)

1. Remove data module.
2. Make arrangements to check adjustments at the earliest opportunity with the Adjustment Tools.
3. Return to Common Exit Procedure (DM 705).



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READ ONLY SWITCH ENABLE OR DISABLE INSET

PURPOSE

This adjustment ensures that the Read Only switch is transferred by a DM with the insert rotated to raise the switch plunger to enable writing, but does not raise the plunger when rotated to the disable position.

SPECIAL TOOLS REQUIRED — *See DM 701*

Tool gauge (P/N 2744384)
Slide tool assembly (P/N 2744380)
CE index wheel (P/N 2745011)

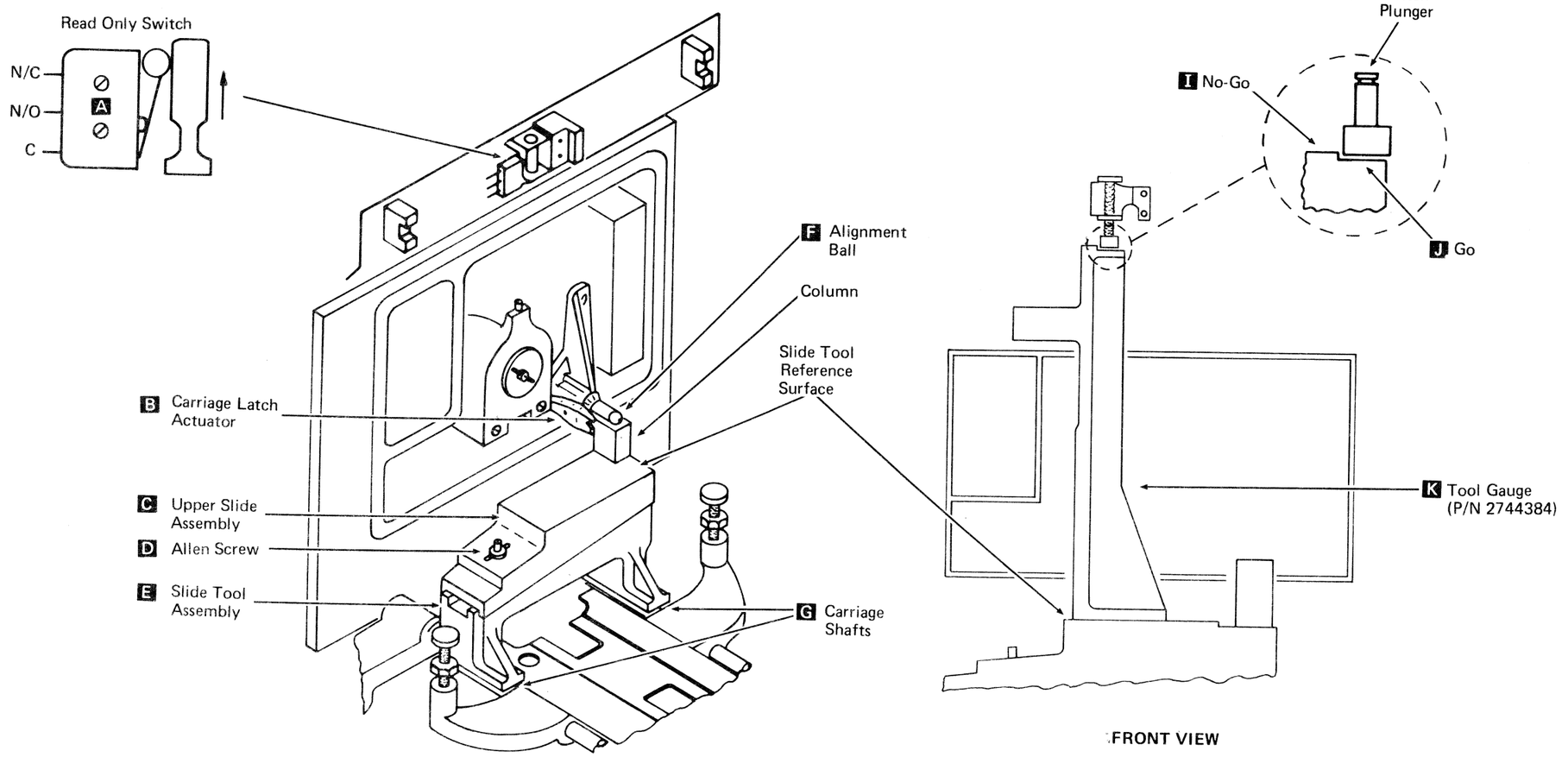
CHECK

1. Place service drive in CE mode and turn off 24 Volts switch.
2. Remove shield over Read Only switch (DM 705).
3. Raise the plunger manually. Be sure that the plunger does not bind and that the switch transfers 0.015" (0.38 mm) past the make point. Loosen mounting screws **A** and adjust the switch position as required.
4. Remove shroud (see DM 705).
5. Remove lower trim panel (see DM 705).
6. Using CE index wheel, rotate camshaft to 90°.
7. Loosen Allen screw **D** on slide tool assembly **E**.
8. Set slide tool on carriage shafts **G**, making sure that the column on the tool is between the carriage latch actuator **B** and the alignment ball **F**.
9. Using CE index wheel, rotate camshaft toward 95° until load cart holds slide tool securely.
10. Push upper slide assembly **C** gently against alignment ball **F**.
11. Manually tighten Allen screw **D** to hold upper slide assembly securely.
12. Set tool gauge **K** (P/N 2744384) on slide tool assembly surface.
13. The upper surface of the tool gauge must not clear the switch plunger (No-Go condition) **I**. The lower surface of the tool gauge must clear the switch plunger (Go condition) **J**.
14. If adjustment is:
    Correct — complete Page Exit Procedure (with Tool) on DM 740.
    Incorrect — proceed to Adjustment.

ADJUSTMENT

Perform Check procedure before doing adjustment.

1. Loosen plunger mounting screws **H**.
2. Shift switch bracket up or down until the plunger clears the lower surface of tool gauge but touches the upper surface of the tool gauge **K**.
3. Tighten mounting screws and complete Page Exit Procedure (with Tool) on DM 740.



FRONT VIEW

DH0390 Seq. 2 of 2	2747798 Part No. (P)

440205 28 Jan 74	440214 17 Jun 74	440218 5 Aug 74	440219 26 Sept 74	440223 14 Mar 75	440224 15 Dec 75	440227 14 Sept 76

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READ ONLY ACTUATOR REPLACEMENT

PURPOSE

This procedure is used to replace Read Only Actuators that may become broken during field use.

Compare C in Figure 1 and F in Figure 2 to determine if Style A or Style B Data Module handle is installed, then select correct replacement procedure below.

SPECIAL TOOLS REQUIRED

No special tools are required.

CAUTION
Use a blunt tool to prevent damage to data module for Style A Read Only Actuator replacement.

READ ONLY ACTUATOR REPLACEMENT (Style A, Figure 1)

1. Remove broken actuator A from handle. (Be certain that no small pieces are left in the data module actuator recess.)
2. Remove screw B located in actuator recess.
3. Place a blunt tool between the cover and the handle above the door opening, and twist (as shown) to raise the front edge of the handle from the cover a distance of about 1/8th of an inch.
4. Insert replacement actuator in opening with small ears down (inside the actuator recess) and ramp facing door. With blunt tool turned to provide the 1/8th inch opening, place large ear in notch on one side and, with a twisting action of the actuator, snap second ear in place in the notch on the opposite side. Actuator should rotate freely and snap into the Read Only position or Write Enable position.
5. Place actuator in the open position and replace screw in actuator recess.
6. Check Read Only switch clearance (DM 741). A misadjusted switch may be the cause of Read Only Actuator breakage.

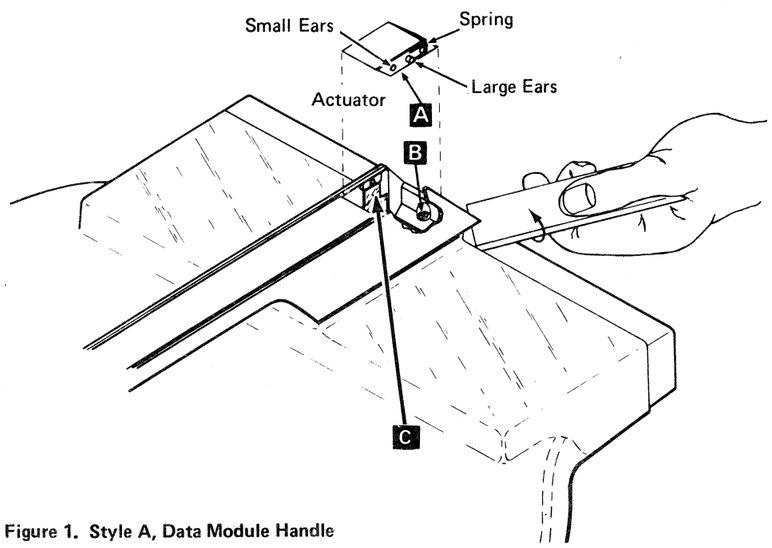

Figure 1. Style A, Data Module Handle

READ ONLY ACTUATOR REPLACEMENT (Style B, Figure 2)

1. Remove broken actuator D from handle. (Be certain that no small pieces are left in the data module actuator recess.)
2. Holding replacement actuator D in vertical position (as shown) insert large ear E into notch F. With a clockwise twisting action of the actuator, snap second ear into place in the notch on the opposite side. Actuator should rotate freely and snap into read only or write enable position.
3. Check Read Only switch clearance (DM 741). A misadjusted switch may be the cause of Read Only Actuator breakage.

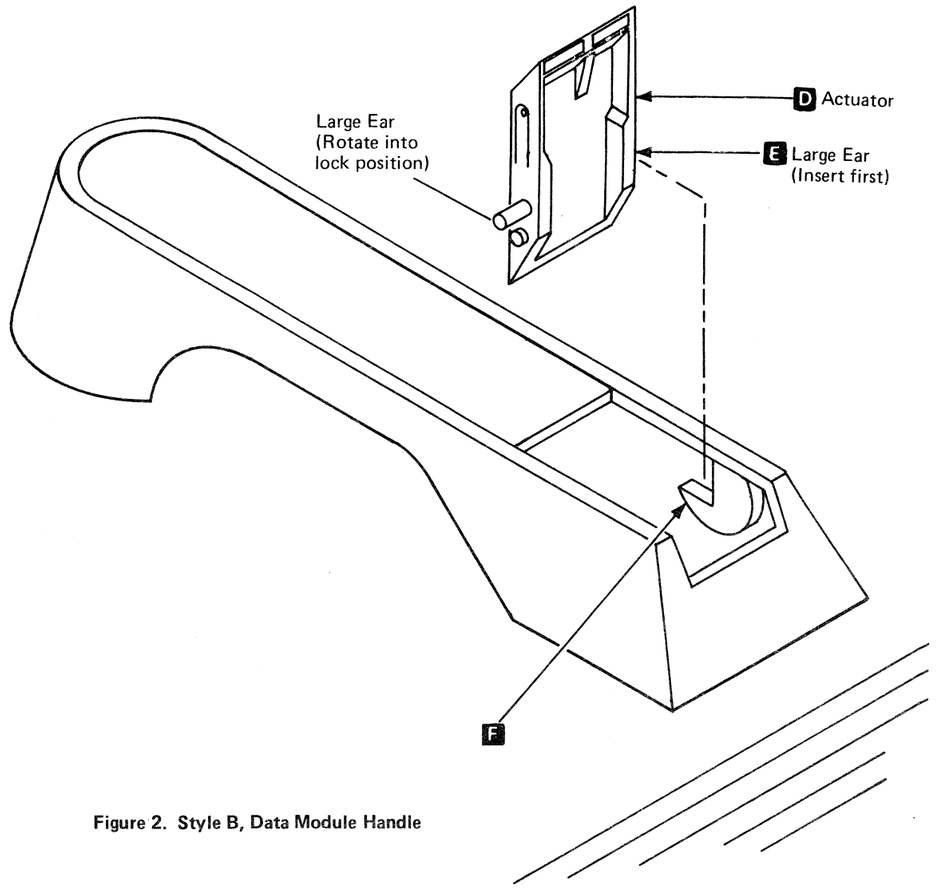

Figure 2. Style B, Data Module Handle

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DATA MODULE PRESENT SWITCH

PURPOSE

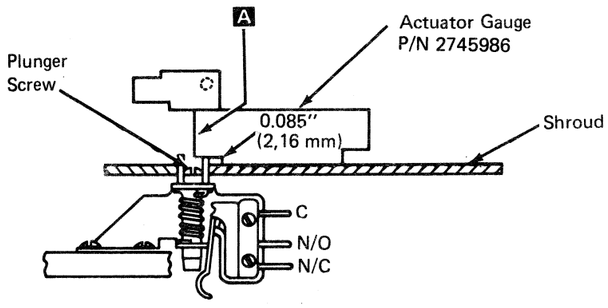
This adjustment ensures the switch makes when data module is present but is open when data module is removed.

CAUTION: The adjustment is dependent on proper height of shroud screw sleeves. Make certain shroud screw sleeves are properly adjusted. Turn now to DM 750 and check sleeve positions.

SPECIAL TOOLS REQUIRED

Actuator gauge (P/N 2745986 – DM 700) or
Gauge (P/N 2744385 – DM 701)

If gauge is not available, use alternate method at right. Any adjustment made without gauge must be checked with the tool when available.



CHECK (With Tool)

1. The sleeve height on DM 750 was checked and is correct.
2. Put the service drive in CE Mode and turn off the 24 Volts switch.
3. Remove shroud (DM 705) and connect CE meter between the common and normally open positions of the switch using Rx1 scale. The switch mounting screws must be tight.
4. If using the actuator gauge (P/N 2745986), go to Step 5. If using the gauge (P/N 2744385), go to step 6.
5. Replace shroud and position actuator gauge as shown (0.085") **A** . This should close the switch but the opposite end of the gauge (0.115"/2,92mm) should not close the switch **B** . Go to Step 7.
6. Replace shroud and position gauge as shown in **C** The upper step in the gauge should not close the switch **D** , but the lower step should close the switch **E**
7. If adjustment is:
   Correct – remove meter leads, and return to Common Exit Procedure; on DM 705.
   Incorrect – proceed with Adjustment (with tool).

ADJUSTMENT (With Tool)

1. Turn plunger screw to adjust switch. Turn screw clockwise (CW) to cause switch to make earlier.
2. Switch should just open when sleeve is 0.125" ± 0.040" (3.18 ± 1.02 mm) above shroud **F** .
3. Remove meter leads.
4. Return to Common Exit Procedure on DM 705.

ALTERNATE METHOD (Without Tool)

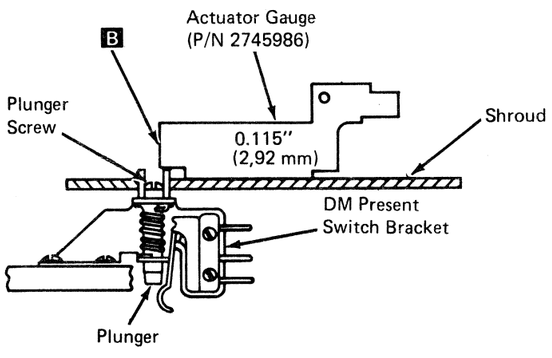
The alternate method is used when actuator gauge (see DM 700) is not available. The alternate method is temporary and should be checked with the actuator gauge at the earliest opportunity.

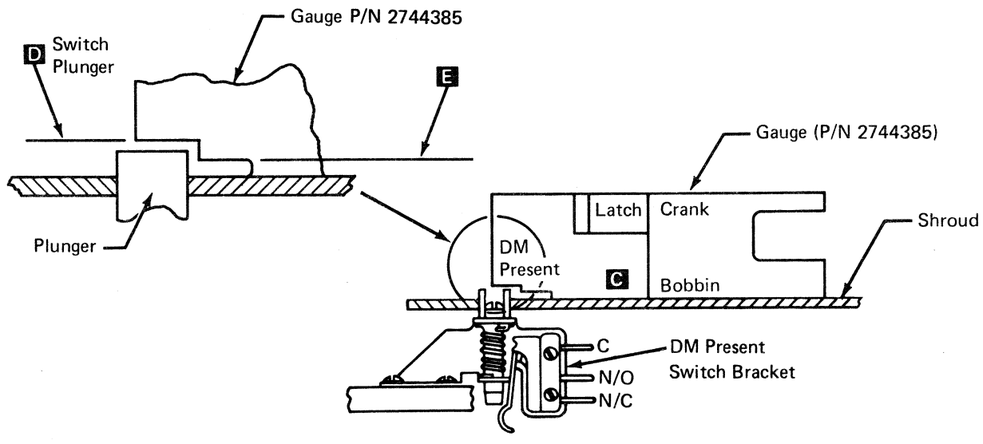
CHECK (Without Tools)

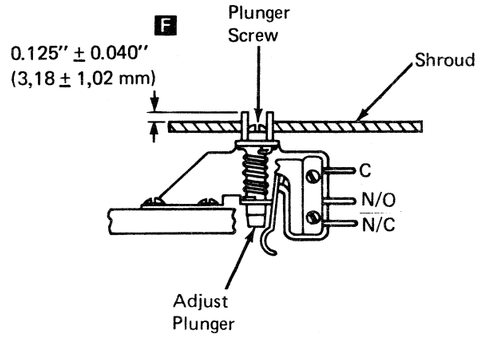
1. The sleeve height on DM 750 was checked and is correct.
2. Put service drive in CE Mode and turn off the 24 Volts switch.
3. Remove shroud (DM 705) and connect CE meter between the common and normally open positions of the switch using Rx1 scale. The switch mounting screws must be tight.
4. Replace shroud and observe that the switch just opens when the top of the sleeve is 0.125" ± 0.040" (3,18 ± 1,02 mm) above the shroud. **F**
5. If adjustment is:
   Correct – remove meter leads, and return to Common Exit Procedure on DM 705.
   Incorrect – proceed to Adjustment (Without Tool).

ADJUSTMENT (Without Tools)

1. Turn plunger screw to adjust switch. Turn screw clockwise (CW) to cause switch to make earlier.
2. Switch should just open when sleeve is 0.125" ± 0.040" (3,18 ± 1,02 mm) above shroud. **F**
3. Remove meter leads.
4. Return to Common Exit Procedure on DM 705.







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SHROUD SCREW SLEEVES

If using tool kit on DM 701, use procedure on DM 751.

PURPOSE

The adjustment ensures proper loading alignment of data module cone with alignment ball.

SPECIAL TOOLS REQUIRED – *See DM 700*

Feet and Switch Gauge (P/N 2745987)
Adjustment Tool (P/N 2745994)

If these tools are not available, use alternate method at right. Adjustments made without the tools must be checked with the tools at the earliest opportunity.

CHECK (With Tools)

1. Put service drive in CE Mode and turn off 24 Volts switch.
2. Remove shroud and both shroud retaining screws (DM 705).
3. Load adjustment tool **A** by Method 2 – (DM 702, capture stud free of bail). Place feet and switch gauge **B** on reference surface with leg above right sleeve.
4. Observe that sleeve clears shorter portion of leg but not the longer section. **C**
5. Check the left sleeve with the gauge reversed.
6. If sleeves adjustment is:
   Correct – complete Page Exit Procedure.
   Incorrect – proceed to Adjustment.

ADJUSTMENT (With Tools)

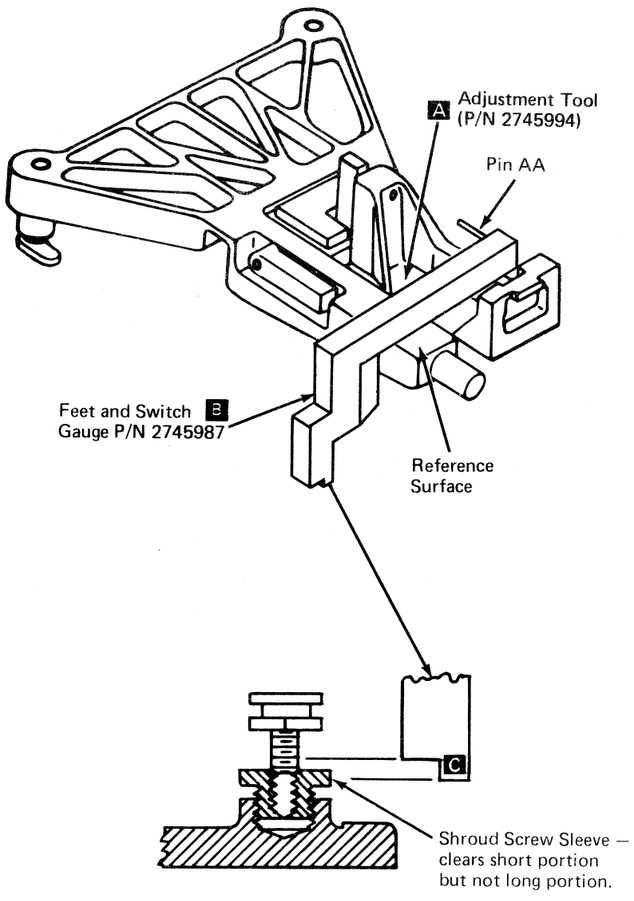
1. Place gauge in position shown **B** .
2. Apply Loctite Type A* (P/N 216348) to external sleeve-threads and Loctite Type E* (P/N 605960) to internal threads of sleeve.

   CAUTION
   Wear safety glasses when working with Loctite.

3. Turn sleeve in load cart casting until sleeve clears upper surface, but does not clear lower surface of step in gauge leg.
4. Do not overtighten shroud screw at installation because this could change the adjustment.
5. Complete Page Exit Procedure.

PAGE EXIT PROCEDURE (With Tools)

1. If shroud screw sleeves were not adjusted, go to Common Exit Procedure (DM 705).
2. If page entry was made for DM Present switch adjustment, return to DM 745.
3. If sleeves were adjusted, the DM Present switch adjustment must be checked (DM 745).



*Trademark of American Sealants Company.

ALTERNATE METHOD (Without Tools)

The alternate method is used when the adjustment tool is not available. This method is considered temporary and must be checked with a tool at the earliest opportunity.

CHECK (Without Tools)

1. Put service drive in CE Mode, turn off 24 Volts switch; and remove shroud (DM 705).
   Turn machine to the loaded position (315°).
2. Fold tab card around 6" scale and tape folded end. **F**
3. Pull card upward to take up any slack.
4. With scale resting on surface of shroud screw sleeve **H** , mark card at point even with the center of the alignment ball. **D**
5. Remove scale and measure distance between alignment ball and lower lip of shroud support screw.
6. Distance should be 2-7/32 ± 1/64" (56, 36 ± 0, 38 mm). **E**
7. The lower lip of each shroud support screw must be within 1/64" (0,38 mm) of the distance **G** from load cart casting.
8. If distances are:
   Correct – complete Page Exit Procedure.
   Incorrect – proceed to Adjustment.

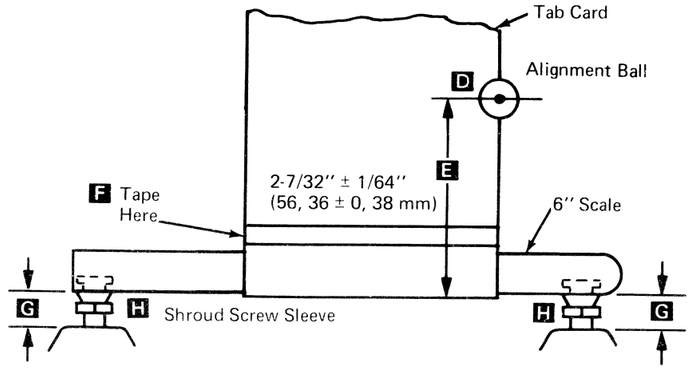
ADJUSTMENT (Without Tools)

1. Use the measuring procedure outlined in check. Adjust height of shroud screws by turning sleeve.
2. When correct apply Loctite Type A* (P/N 216348) and then complete Page Exit Procedure.

   CAUTION
   Wear safety glasses when working with Loctite.

PAGE EXIT PROCEDURE (Without Tools)

1. If shroud screw sleeves were not adjusted, go to Common Exit Procedure (DM 705).
2. If page entry was made for DM Present switch adjustment, return to DM 745.
3. If sleeves were adjusted, the DM Present switch adjustment must be checked (DM 745).



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SHROUD SCREW SLEEVES

PURPOSE

This adjustment ensures proper loading alignment of the data module cone with the alignment ball.

SPECIAL TOOLS REQUIRED *–See DM 701*

Tool gauge (P/N 2744384)
Slide tool assembly (P/N 2744380)
CE index wheel (P/N 2745011)

CHECK

1. Place service drive in CE mode and turn off 24 Volts switch.
2. Remove shroud (see DM 705).
3. Remove lower appearance panel (see DM 705).
4. Using CE index wheel, rotate camshaft to 90°.
5. Loosen Allen screw **B** on slide tool assembly **D**.
6. Set slide tool assembly on load cart shafts **F**. Be sure that column on tool is between the carriage latch actuator **A** and the alignment ball **E**.
7. Using CE index wheel, rotate camshaft toward 95° until load cart holds slide tool securely.
8. Push upper slide **C** gently against alignment ball **E**.
9. Manually tighten Allen screw **B** to hold upper slide assembly securely.
10. Hold tool gauge **I** (P/N 2744384) lightly on slide tool assembly surface.
11. Upper surface of gauge **G** should go over shroud pin without lifting the tool from the slide tool surface. The lower surface of the gauge **H** (No-Go) should not. Check the shroud pins **J** on both sides.
12. If adjustment is:
    Correct – complete Page Exit Procedures on DM 705.
    Incorrect – proceed to Adjustment.

ADJUSTMENT

1. Apply Loctite Type A* (P/N 216348) to external sleeve threads and Locitite Type E* (P/N 605960) to shroud pin threads as required.

   DANGER
   Wear safety glasses when working with Loctite.
2. Make sure sleeve pin is tight in sleeve.
3. Hold tool gauge (P/N 2744384) securely on slide tool assembly.
4. Turn sleeve in load cart casting until sleeve clears upper surface **G** (Go), but does not clear lower surface **H** (No-Go).
5. Do not overtighten shroud screw at installation because this could change the adjustment.
6. Complete Page Exit Procedure (with Tools) on DM 750.

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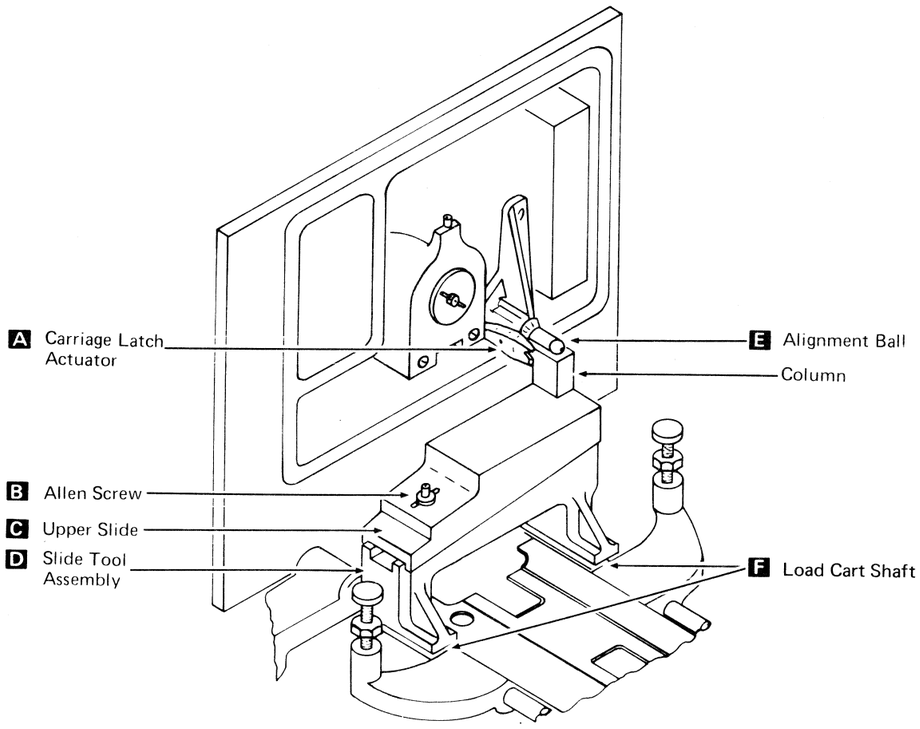

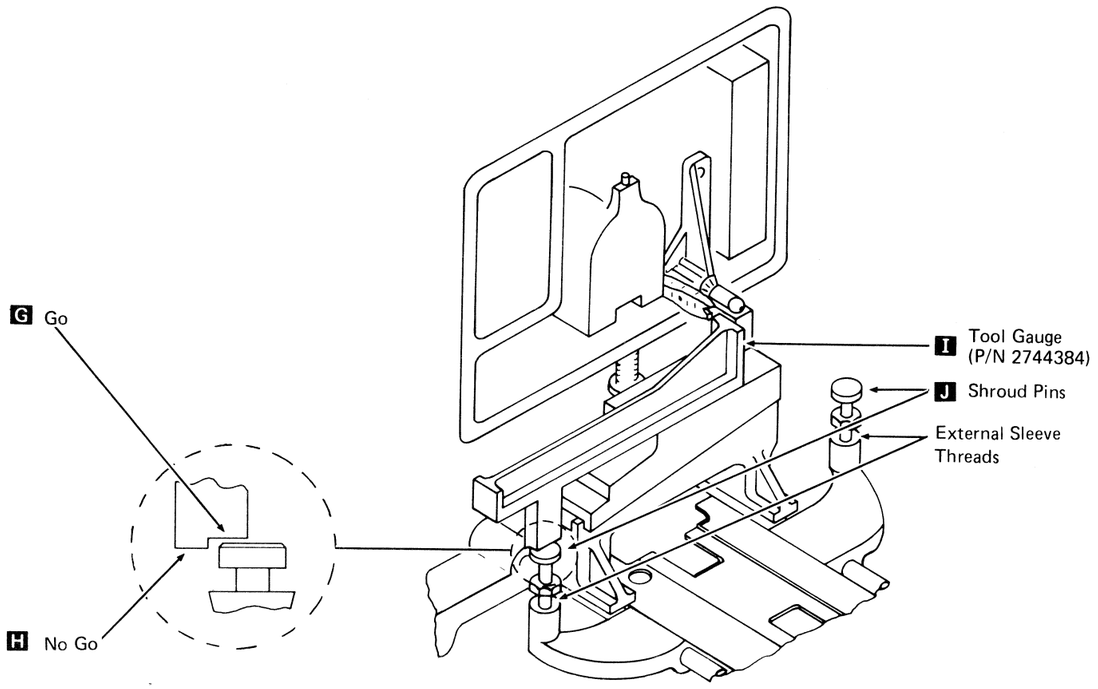

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CARRIAGE LATCH ACTUATOR (With Tool)

If using tool kit on DM 701, use procedure on DM 756.

PURPOSE

This adjustment ensures that the carriage unlatches during a load cycle and latches during unload. The main camshaft interlocks at 295-285° during unload if carriage does not latch. Refer to the Unload Checkout Procedure on DM 510 and the Load Checkout Procedure on DM 410.

SPECIAL TOOLS REQUIRED — *See DM 700*

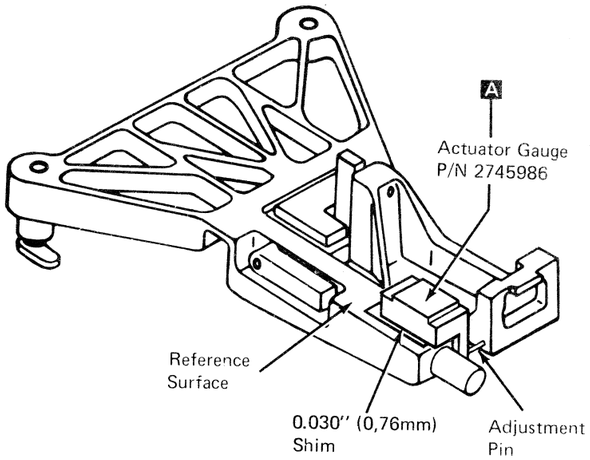
Adjustment tool (P/N2745994) and actuator gauge (P/N2745986) are required for this procedure (DM 700). Use alternate procedure on page DM 760 if these tools are not available. Proceed to Check 1 if tools are available.

CHECK 1 — LOWER LIMIT (With Tool)

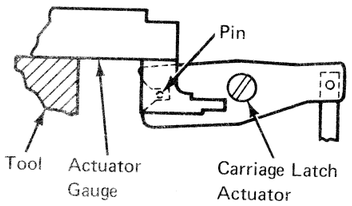
1. Put service drive in CE mode, turn off 24 Volts switch, and remove shroud (DM 705). Be sure that latch actuator is not binding.
2. Leave camshaft at the unload position (355°). Hand load the tool and hold it toward the VCM. See method 2 on DM 702.
3. Place the actuator gauge on the reference surface of the tool (without shim) **A** . Slide the gauge toward latch actuator. If pin slides into actuator slot without touching upper inside surface of actuator, the lower adjustment limit is satisfied **C** .
4. If adjustment is:

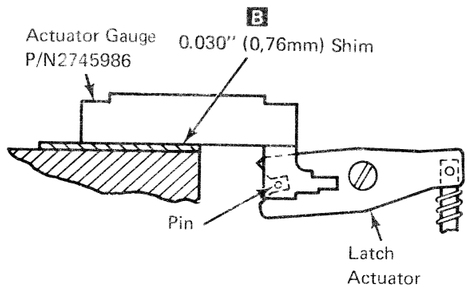
   Correct — proceed to Check 2.

   Incorrect — proceed to Adjustment.



C Pin in slot — No contact with either inside slot surface.





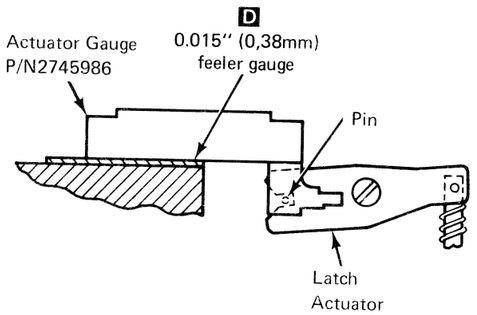
CHECK 2 — UPPER LIMIT (With Tool)

1. Shim the actuator gauge with a .030" (0,76 mm) thickness gauge
   shim toward actuator. The upper inside surface of the actuator slot must not be higher than the upper surface of the pin **B** .

   If the pin passes completely into the actuator slot without contacting the upper inside slot surface, the actuator height exceeds the upper adjustment limit, and the actuator position must be lowered.
2. If adjustment is:

   Correct — proceed to Common Exit Procedure (DM 705).

   Incorrect — proceed to Adjustment.

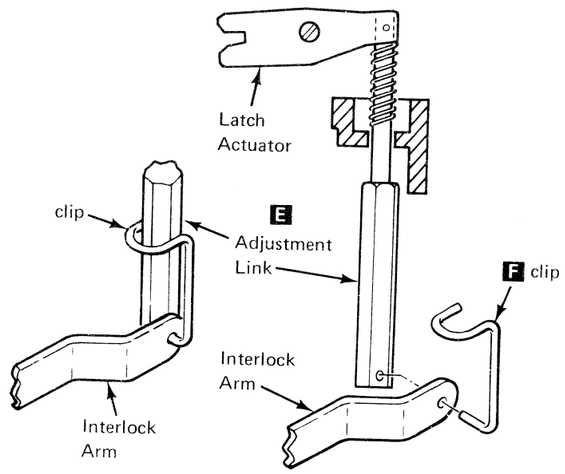


ADJUSTMENT (With Tool)

CAUTION: Before adjusting the carriage latch actuator out of specification.

Field adjustment is rarely necessary.

1. Remove lower appearance panel (DM 705).
2. Place the actuator gauge, with a .015" thickness gauge under it, on the reference surface of the tool. Slide gauge and shim toward the actuator slot; pin should just touch upper surface of slot. **D**
3. Determine whether to lengthen or shorten adjustment link. **E** If the pin hits the upper surface of the latch actuator slot, turn the adjustment link counterclockwise.
4. Remove clip with aid of small screwdriver which holds interlock arm to link **F** .
5. Turn link 1/2 turn; reconnect clip.
6. Repeat steps 2, 3, 4, and 5 until adjustment is correct.
7. Repeat Check 2.



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CARRIAGE LATCH ACTUATOR

PURPOSE

This adjustment ensures that the carriage unlatches during a load cycle and latches during unload. The main camshaft interlocks at 295–285° during unload if carriage does not latch, refer to the Unload Checkout Procedure on DM 510 and the Load Checkout Procedure on DM 410.

SPECIAL TOOLS REQUIRED – *See DM 701*

Slide tool assembly (P/N 2744380).
Gauge (P/N 2744385).

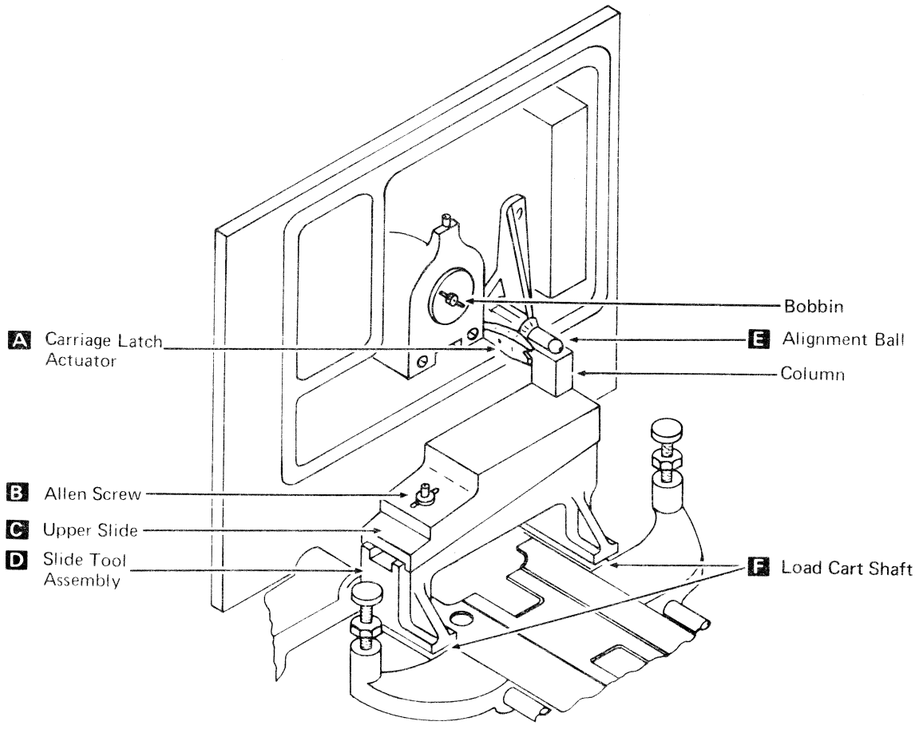
CHECK

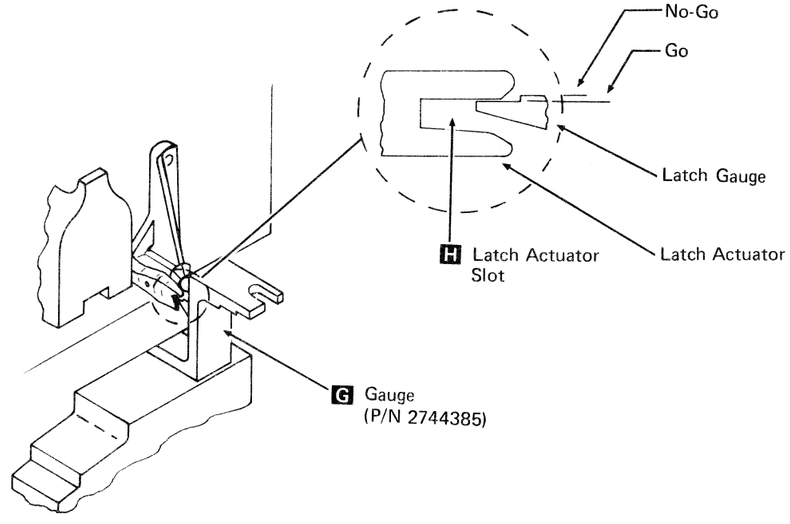
1. Place service drive in CE mode, turn off 24 Volts switch, and remove shroud (DM 705).
2. Be sure that latch actuator **A** is not binding.
3. Remove lower trim panel (see DM 705).
4. Insert CE index wheel and rotate load camshaft to loaded position at 315° (see DM 700).
5. Lift and slide bobbin back into VCM.
6. Using CE index wheel, rotate camshaft to 90°.
7. Loosen Allen screw **B** on slide tool assembly **D**.
8. Set slide tool assembly on load cart shafts **F**, making sure that column on tool is between carriage latch actuator **A** and alignment ball **E**.
9. Using CE index wheel, rotate camshaft toward 95° until load cart holds slide tool assembly securely.
10. Push upper slide **C** gently against alignment ball **E**.
11. Manually tighten Allen screw **B** to hold upper slide securely.
12. Set gauge **G** (P/N 2744385) on slide tool assembly surface.
13. Slide gauge into slot of latch actuator **H**. The Go surface of gauge should not touch the upper surface of the latch actuator slot. The No-Go surface should touch.
14. If adjustment is:
    Correct – proceed to Common Exit Procedure on DM 705.
    Incorrect – proceed to Adjustment.

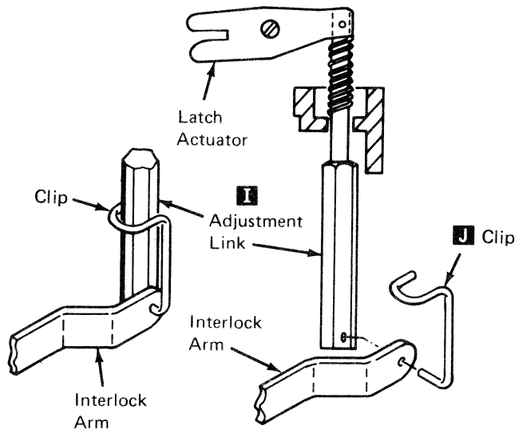
ADJUSTMENT

CAUTION
Before adjusting the carriage latch actuator height, be certain that the height is out of specification. Field adjustment is rarely necessary.

1. Determine whether to lengthen or shorten adjustment link **I**. If Go surface of gauge touches upper surface of slot, turn the adjustment link counterclockwise.
2. Remove clip **J** which holds interlock arm to link with aid of small screwdriver.
3. Turn link 1/2 turn; reconnect clip.
4. Repeat step 10 of the Check procedure and steps 1, 2, and 3 of this procedure until adjustment is correct.







DH0405	2747939	440219	440223					
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CARRIAGE LATCH ACTUATOR (Without Tools)

PURPOSE

This adjustment ensures that the carriage unlatches during a load cycle and latches during unload. Refer to the Load Checkout Procedure on DM 410 and the Unload Checkout Procedure on DM 510.

SPECIAL TOOLS REQUIRED

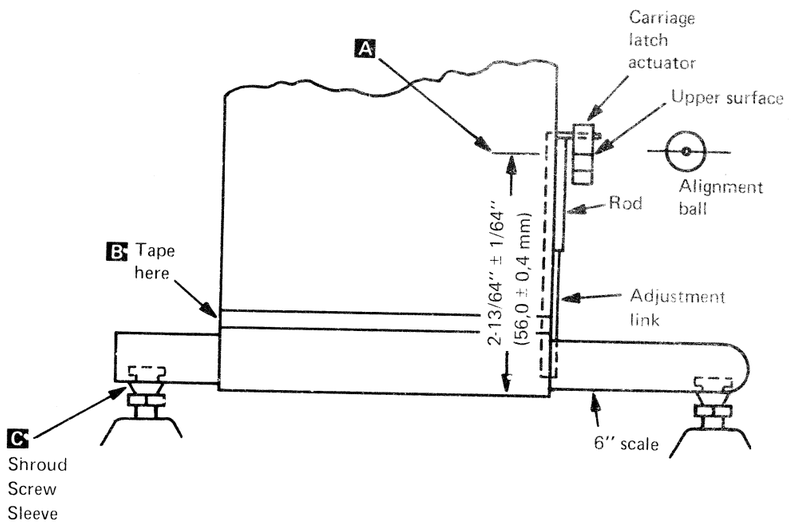
None. If tools are available, use procedure on DM 755.

CHECK (Without Tools)

1. Place service drive in CE mode.

   Ensure shroud screw sleeve adjustment is correct (DM 750).
2. Remove shroud (DM 705).
3. Hand-cycle machine to 180°.
4. Fold tab card around 6" scale and tape folded end **B**. Pull card upward to take up any slack.
5. With scale resting on surface of shroud screw sleeve **C** **E**, mark card at the point where the inside surface of the carriage latch actuator sets **A** **D**.
6. Measure the distance from the mark to the bottom of the card. This distance is 2-13/64" ± 1/64" (56,0 ± 0,4 mm) if latch actuator is in adjustment.
7. If adjustment is:

   Correct -- return to Common Exit Procedure on DM 705.
   Incorrect – proceed to Adjustment (Without Tools).



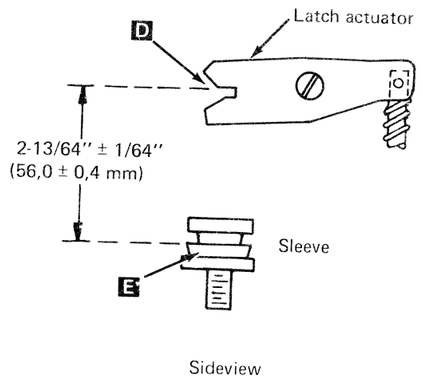
ADJUSTMENT (Without Tools)

CAUTION: This adjustment is not as accurate as using adjustment tools (see DM 700), so use extreme care. Recheck adjustment as soon as tool kit is available.

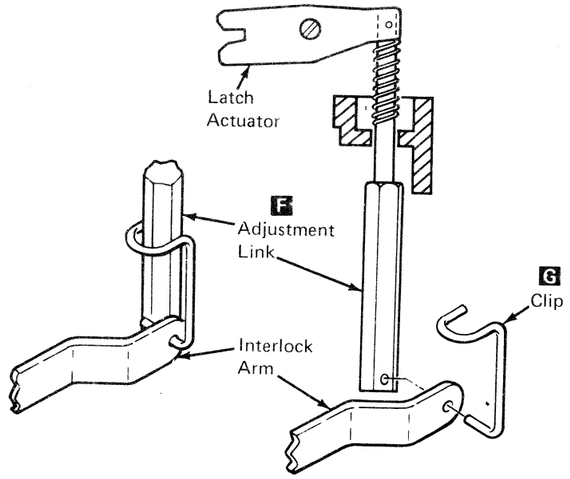
NOTE:

1. *If the latch actuator is adjusted too high, the carriage may fail to latch and cause a mechanical interlock during unload cycle.*
2. *If the latch actuator is adjusted too low the carriage may fail to unlatch at end of load cycle and carriage may drag on latch.*

1. On tab card used for check, mark a line 2-1/4" (51,4 mm) from bottom of card. Hold scale and card as in step 5 of check.
2. Determine whether adjustment link needs to be shortened or lengthened.
3. Remove lower trim panel (DM 705). Remove clip **G** with small screwdriver, turn adjustment link 1/2 turn **F**, reinstall clip.
4. Repeat steps 2 and 3 until the mark on the card lines up with the inner upper surface of the carriage latch actuator.
5. Return to Common Exit Procedure (DM 705).



Sideview



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COUPLING DRIVER ROTATION

If using tool kit on DM 701, use procedure on DM 766.

PURPOSE

This adjustment ensures that when the drive shaft moves upward, during unload, the square slot in the top of the drive shaft mates with the coupling shaft under the bobbin and the bobbin is captured. Refer to the Load Checkout Procedure on DM 410 and the Unload Checkout Procedure on DM 510.

SPECIAL TOOLS REQUIRED — *See DM 700*

Adjustment tool (P/N 2745994), pointer (P/N 2343546), and CE Index Wheel (P/N 2745011) are required for this procedure. If these tools *are not* available, proceed to Check (Without Tools) on this page. If the tools are available, proceed to Check (With Tools).

CHECK (With Tools)

1. Put service drive in CE Mode and remove shroud (DM 705).
2. Insert CE Index Wheel (DM 700), install the adjustment tool on the drive (method 1 on DM 701) and turn the camshaft to the loaded position (315°).

   Note: If unable to turn camshaft to fully loaded position (315°), remove bobbin from coupler drive shaft by sliding crank to left and removing adjustment link **C**, *then turn camshaft to loaded position (315°).*

   Lift the bobbin from the shaft assembly and move it clear of shaft (toward rear of VCM).

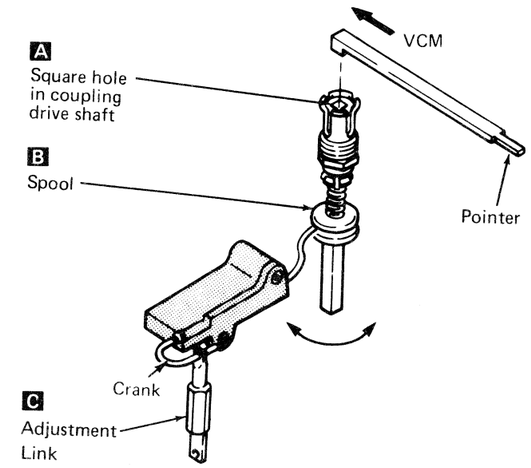
   Turn the camshaft to the coupling position (265°). See DM 700. Insert pin (P/N 2747996) in groove 3.

   Install the pointer into square hole in drive shaft **A**.
3. Move the pointer in the clockwise direction to the limit of the rotational freedom (slop = 1/2" nominal, measured at the end of pointer). **E**

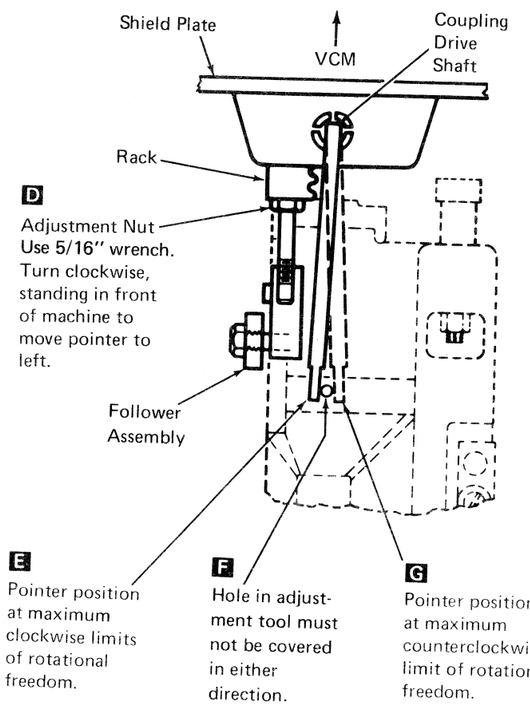
   Repeat the procedure in the counterclockwise direction **G**.
4. If the hole **F** in the adjustment tool is covered when the pointer is in position **E** or **G**, the adjustment is incorrect.
5. If adjustment is:
   Correct — remove pointer, turn camshaft to the unloaded position (355°) and remove tool from drive. Then proceed to Common Exit Procedure (DM 705).
   Incorrect — proceed to Adjustment.

ADJUSTMENT (With Tools)

1. Remove lower appearance panel (DM 705).
2. Remove pointer and turn camshaft to 60°, then turn the adjustment nut **D** 1/8 turn. Turn camshaft back to 265°. Insert pointer and recheck adjustments per steps 2, 3, and 4 of the Check procedure above. Repeat check and adjustment until adjustment is correct.
3. Remove pointer. Turn the camshaft to the unloaded position (355°) and remove tool from drive.
4. If crank adjustment link was removed in step 2 of Check, reinstall link.
5. Proceed to Common Exit Procedure (DM 705).



TOP VIEW



CHECK (Without Tools)

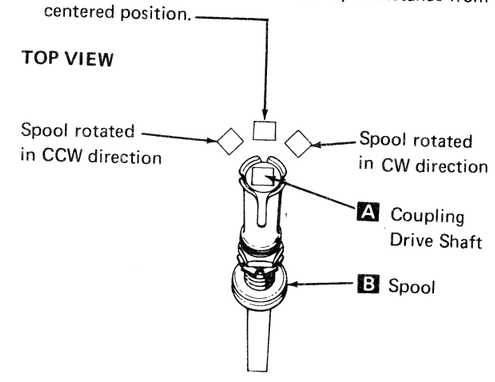
CAUTION
This method is not as accurate as using the adjustment tool gauge. Recheck this adjustment with the adjustment tool as soon as possible.

1. Put service drive in CE Mode and remove shroud (DM 705).
2. Insert CE Index Wheel (DM 700) and turn camshaft to loaded position (315°).

   Note: If unable to turn camshaft to fully loaded position (315°), remove bobbin from coupler drive shaft by sliding crank to left and removing adjustment link **C**, *then turn camshaft to loaded position (315°).*

   Lift bobbin from shaft assembly and move it clear of shaft (toward rear of VCM).
3. Turn camshaft to coupling position (265°). Insert allen wrench in groove 3 (DM 700).
4. Observe the square hole in the drive shaft **A**. Turn spool **B** in both directions (CW, CCW) and determine if square hole appears to move an equal distance from centered position.

TOP VIEW



5. If adjustment appears to be:
   Correct — proceed to Common Exit Procedure (DM 705).
   Incorrect — proceed to Adjustment (Without Tools).

ADJUSTMENT (Without Tools)

1. Remove lower trim panel (DM 705).
2. Turn adjustment nut **D** until the condition in step 4 of the Check procedure is met. (Turn index to 60° for access to nut, then turn index back to 265° after nut is adjusted.)
3. If crank adjusting link was removed in step 2 of check, reinstall link.
4. Proceed to Common Exit Procedure (DM 705).

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COUPLING DRIVER ROTATION

PURPOSE

This adjustment ensures that when the drive shaft moves upward, during unload, the square slot in the top of the drive shaft mates with the coupling shaft under the bobbin and the bobbin is captured. Refer to the Load Checkout Procedure on DM 410 and the Unload Checkout Procedure on DM 510.

SPECIAL TOOLS REQUIRED – *See DM 701*

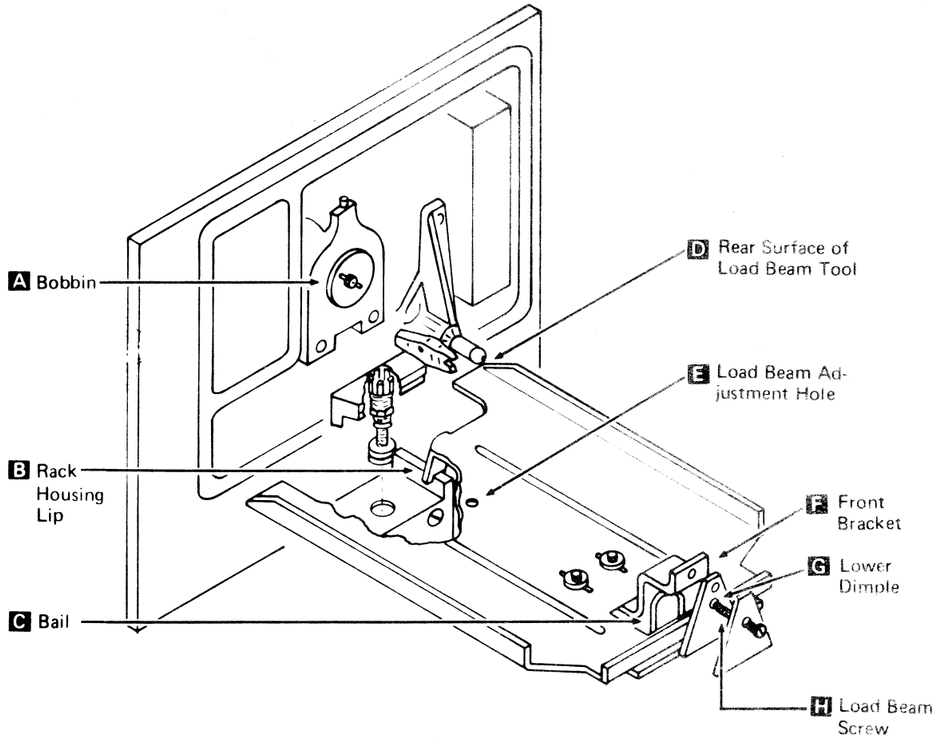
Load beam tool (P/N 2744661)
Pin (P/N 2744382)
Pointer coupling rotation tool (P/N 2744383)
CE index wheel (P/N 2745011)

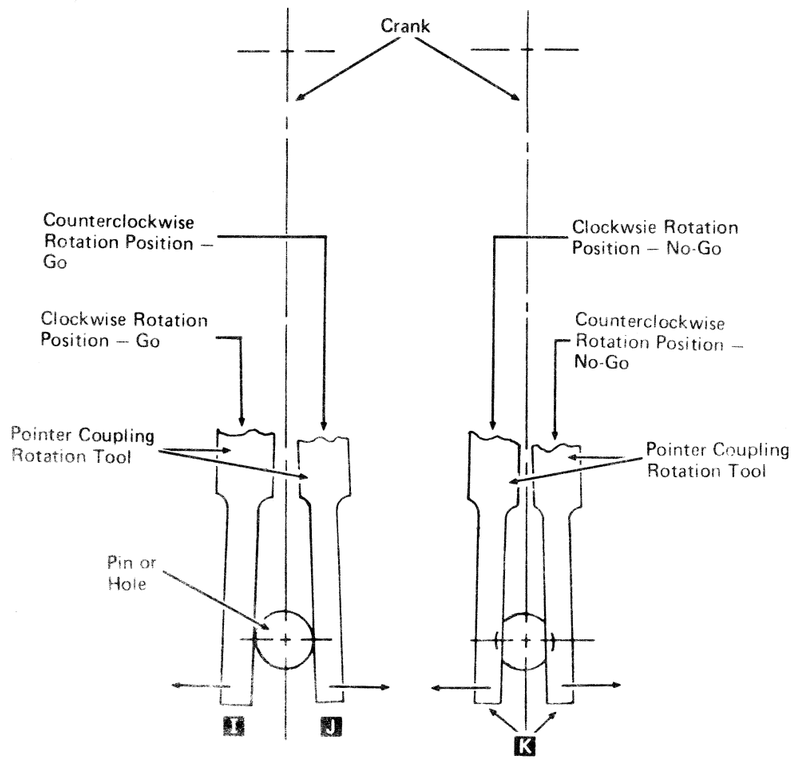
CHECK

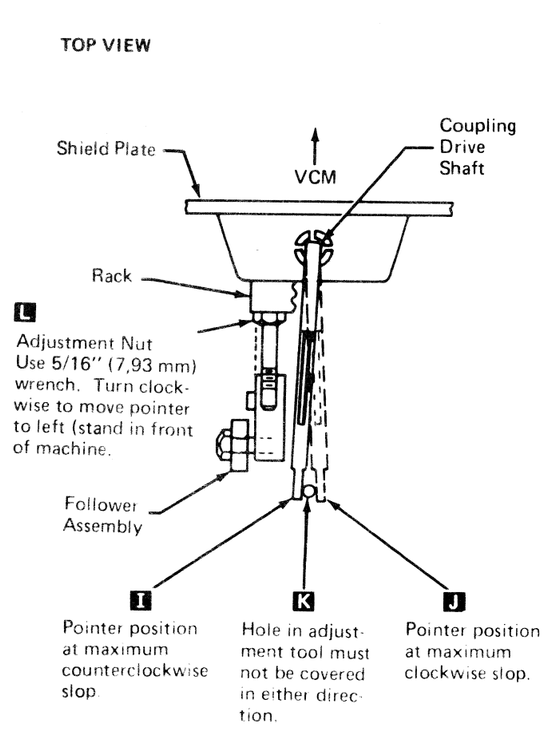
1. Place service drive in CE Mode.
2. Remove shroud (See DM 705).
3. Remove lower appearance panel (See DM 705).
4. Insert CE index wheel and rotate camshaft to loaded position at 315°.
5. Lift and slide bobbin **A** back into VCM.
6. Using CE index wheel, rotate camshaft to 150°.
7. Install load beam tool as follows:
   a. Push down on front of tool so bail **C** is between front bracket **F** and load beam screw **H**.
   b. Insert load beam screw in lower dimple **G** of front bracket.
   c. Hold tool level, and position notch in rear tab of load beam tool over rack housing lip **B**.
8. Slowly rotate CE index wheel until rear surfaces of load beam tool **D** are flush against VCM shield plate. Continue rotating index wheel to 265°. Insert pin (P/N 2744382) in groove 3 of camshaft at 265° (see DM 700).
9. Insert coupling rotation tool into the coupling drive shaft. It maybe necessary to compress rubber air seal with tool to fit tool into drive shaft.
10. Visually check Go/No-Go conditions on the load beam tool as follows:
    a. Move pointer end of coupling rotation tool clockwise to maximum stop **I** (limit of the rotational freedom). Nominal slop measures 1/2" (12,7 mm) at end of pointer.
    b. Repeat Step 10a in counterclockwise direction **J**.
    c. If the hole in the load beam tool is covered when the pointer is either in position indicated in Steps 10a or 10b **K**, the adjustment is incorrect.
11. If adjustment is:
    Correct – remove pin and pointer, pull bobbin over drive shaft and turn camshaft to 150°. Remove tool from drive then turn camshaft to unloaded position (355°). Proceed to Common Exit Procedure on DM 705.
    Incorrect – proceed to Adjustment.

ADJUSTMENT

1. Rotate camshaft to 150° then remove coupling rotation and load beam tools from machine.
2. With the camshaft at 60°, turn the adjustment nut **L** 1/8 turn.
3. Install load beam and coupling rotation tools, as described in Steps 6–9 of Check procedure.
4. Recheck adjustment. If adjustment is still incorrect, repeat Steps 1 thru 3 until adjustment is correct, then proceed to Common Exit Procedure on DM 705.







DH0415	2747941	440219	440223	440224				
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BOBBIN HEIGHT (VERTICAL ALIGNMENT OF CARRIAGE)

If using tool kit on DM 701, use procedure on DM 771.

This adjustment ensures that the bobbin crosspin mates with the latch plate slot in the carriage as the data module is loaded.

This adjustment raises or lowers the plastic fingers and thereby determines the bobbin vertical position when the data module is unloaded.

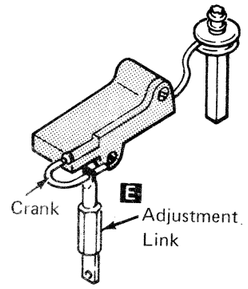
SPECIAL TOOLS REQUIRED -- *See DM 700*

Adjustment tool (P/N 2745994)
Actuator gauge (P/N 2745986)
CE Index wheel (P/N 2745011)

CHECK

1. Place service drive in CE Mode.
2. Remove shroud (DM 705).
3. Insert the CE Index Wheel. Hand-cycle machine to loaded position (CCW to 315°). Push bobbin off coupler drive shaft and back into VCM. Cycle machine to unloaded position (CW to 355°).

   Note: If unable to crank machine to fully loaded position, remove bobbin from coupler drive shaft by sliding crank to left and removing adjustment link **E** *. Turn the camshaft to loaded position (315°). Lift bobbin off nylon fingers and push back into VCM. Turn the camshaft to unloaded position (355°).*
4. With bobbin clear of shaft, insert adjustment tool **A** (using method 2 described on DM 702) without rotating camshaft. Put actuator gauge on adjusting platform with 0.040" (1,02 mm) thickness gauge in place **B**
5. Height of nylon fingers must be between Go and No-Go steps **C** . If fingers are damaged, replace shaft assembly (DM 840).
6. If adjustment is:
   Correct – return to Common Exit Procedure (DM 705).
   Incorrect – proceed to Adjustment.



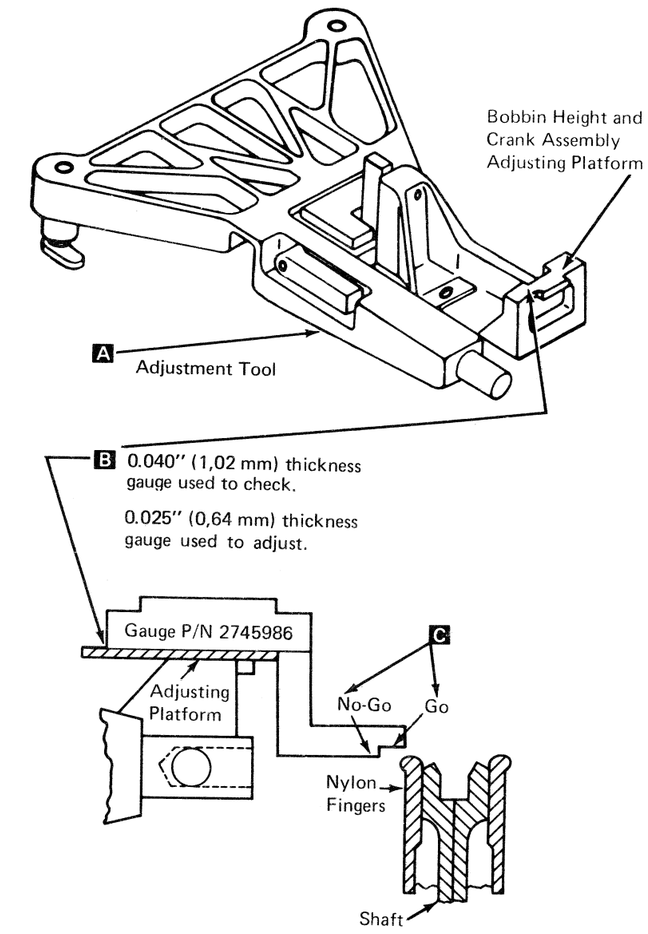
3. Use a 5/8" (15,9 mm) wrench to turn bobbin height adjustment nut **D** until the nylon fingers are in contact with the Go surface of the gauge **C** .

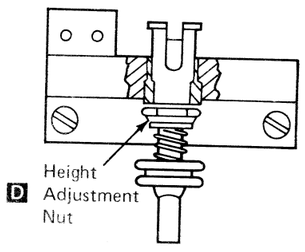
   Note: It may be necessary to remove the adjustment tool to turn the nut. If nut does not maintain adjustment, coat shaft threads with Loctite Type E (P/N 605960).*
4. If crank adjusting link was removed as described in step 3 note of Check, reinstall link.
5. Return to Common Exit Procedure (DM 705).

ADJUSTMENT

1. Remove lower appearance panel (DM 705).
2. Put actuator gauge on adjusting platform with 0.025" (0,64mm) thickness gauge in place **B**

* Trademark of American Sealants Company.





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440205 28 Jan 74	440214 17 Jun 74	440219 26 Sept 74	440223 14 Mar 75			

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BOBBIN HEIGHT (Vertical Alignment of Carriage)

PURPOSE

This adjustment ensures that the bobbin crosspin mates vertically with the latch plate slot in the carriage as the data module is loading.

This adjustment raises or lowers the plastic fingers and thereby determines the vertical bobbin position when the data module is loading.

SPECIAL TOOLS REQUIRED – *See DM 701*

Slide tool assembly (P/N 2744380)
Gauge (P/N 2744385)
CE index wheel (P/N 2745011)

CHECK

1. Place drive in CE mode.
2. Remove shroud (see DM 705).
3. Remove lower appearance panel (see DM 705).
4. Insert CE index wheel and rotate load camshaft to loaded position at 315° (see DM 700).
5. Lift and slide bobbin back into VCM.
6. Using CE index wheel, rotate camshaft to 90°.
7. Loosen Allen screw **B** on slide tool assembly **D**.
8. Set slide tool assembly on load cart shafts **F**. Be sure that the column on tool is between carriage latch actuator **A** and alignment ball **E**.
9. Using CE index wheel, rotate camshaft toward 95° until load cart holds slide tool assembly securely.
10. Push upper slide **C** to the right gently against alignment ball **E**.
11. Manually tighten Allen screw **B** to hold upper slide securely.
12. Set gauge **G** (P/N 2744385) on slide tool assembly surface.
13. Slide bobbin side of gauge over plastic fingers. The upper surface of gauge **I** (Go) should slide over the bobbin, but the lower surface **H** should not (No-Go).
14. If adjustment is:
    Correct – proceed to Common Exit Procedure on DM 705.
    Incorrect – proceed to Adjustment.

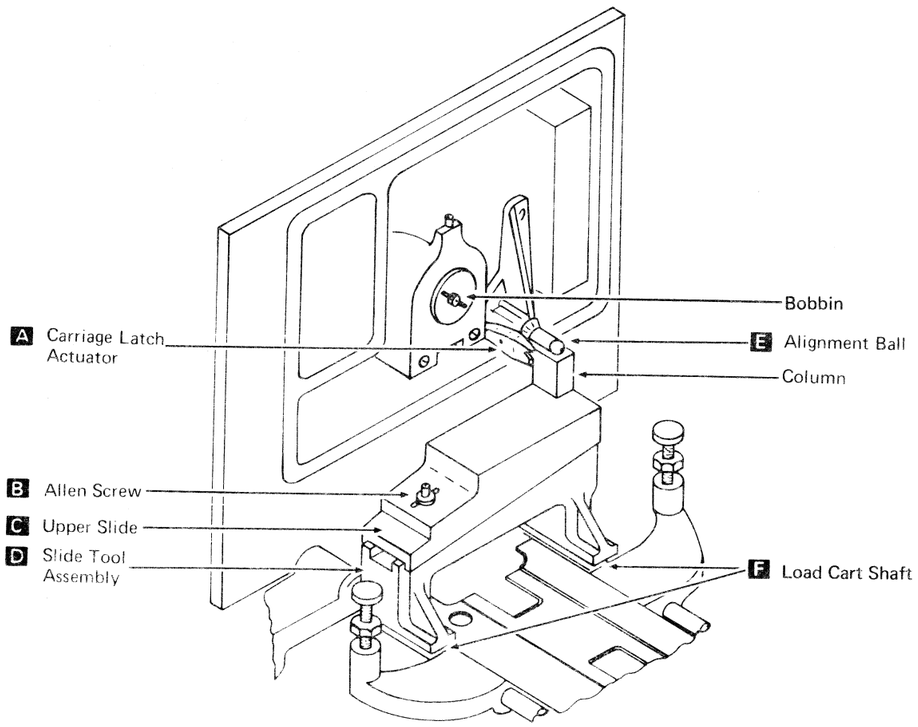
ADJUSTMENT

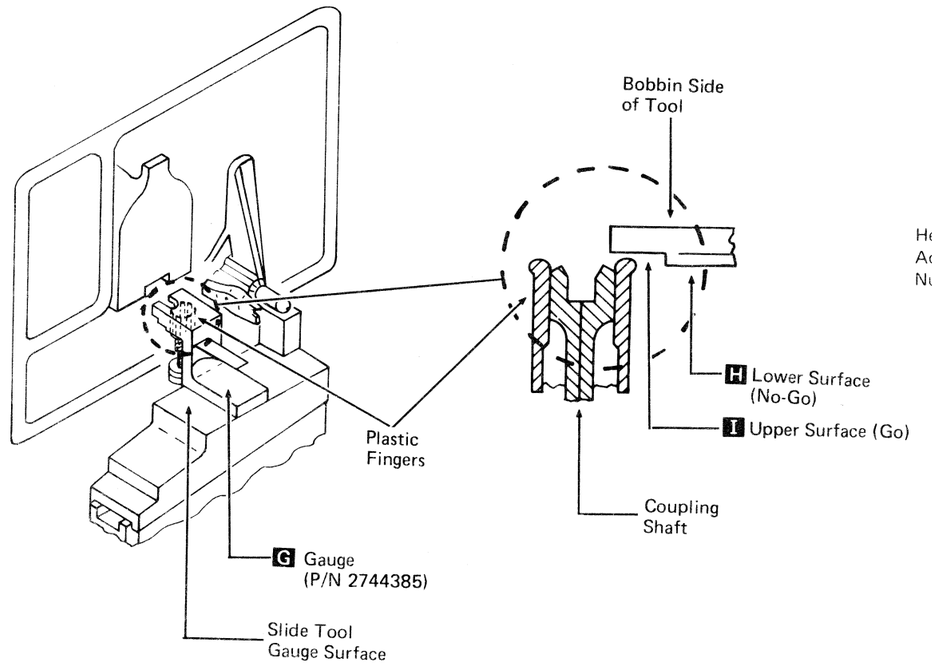
1. Use a 5/8" (15, 9 mm) wrench to turn bobbin height adjustment nut **J** until the nylon fingers clear the upper surface of the gauge **I** (Go), and hit the lower surface **H** (No-Go).

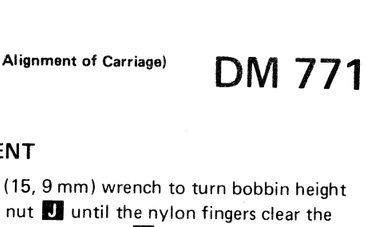
   Note: It may be necessary to remove the adjustment tool to turn the nut. If nut is loose or does not maintain adjustment, coat shaft threads with Loctite Type E (P/N 605960).*

   DANGER
   Wear safety glasses when working with Loctite.
2. Recheck bobbin height.
3. Return to Common Exit Procedure on DM 705.

* *Trademark of American Sealants Company*







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CRANK ASSEMBLY

If using tool kit on DM 701, use procedure on DM 776.

PURPOSE

This adjustment ensures that the crank:

1. Raises the drive shaft during uncoupling high enough to mate with the coupling shaft under the bobbin, but
2. Does not raise the drive shaft so high that the bobbin is tilted when it is captured by the drive shaft. Refer to the Load Checkout Procedure on DM 410 and the Unload Checkout Procedure on DM 510.

SPECIAL TOOLS REQUIRED — *See DM 700*

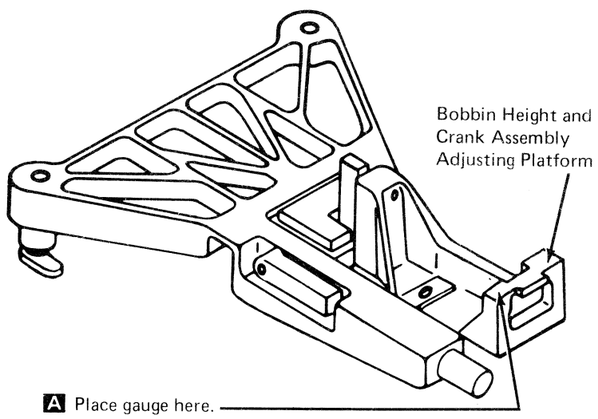
Adjustment tool (PN 2745994), actuator gauge (PN 2745986), and CE Index Wheel (PN 2745011).

CHECK

1. Place service drive in CE Mode. Remove shroud (DM705).
2. Insert CE Index Wheel (DM 700).
3. Turn machine to loaded position (315°) and push bobbin into VCM clear of drive shaft.

   Note: *If unable to crank machine to fully loaded position (315°), remove bobbin from coupler drive shaft by sliding crank to the left and removing adjustment link* **E**. *Turn the camshaft to loaded position (315°). Push bobbin off nylon fingers and back into VCM.*
4. Turn machine to unloaded position (355°). Reinstall adjusting link if it was removed in step 3 above.
5. With bobbin clear of the coupler drive shaft, insert adjustment tool (method 2 on DM 702) without rotating camshaft. Put actuator gauge on the adjusting platform to check the shaft height **A**. If necessary, rotate nylon fingers so end of gauge goes between fingers **C**. Check height of shaft with Go/No Go steps of the gauge. The top of the shaft should be between the Go and No-Go steps **B**.
6. If adjustment is:

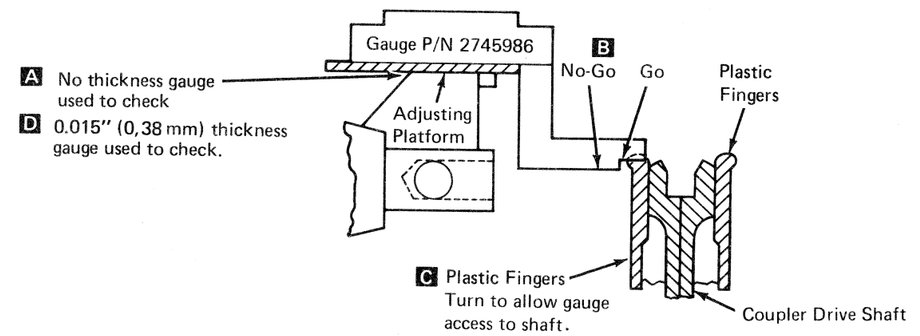
   Correct — return to Common Exit Procedure (DM 705).
   Incorrect — proceed to Adjustment.

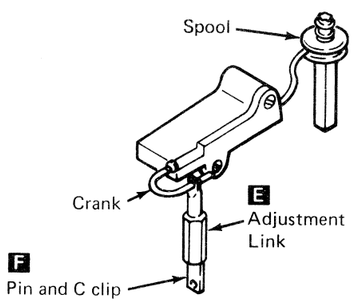


ADJUSTMENT

1. Remove lower appearance panel (DM 705).
2. Remove the C-clip pin **F** and slide the link off the crank.
3. Put a 0.015" (0,38 mm) thickness gauge between actuator gauge and adjusting platform **D**. Rotate adjustment link until shaft just contacts No-Go surface of gauge when the link is attached to the pin; adjust to the nearest half-turn of the link. **E**

   Note: *Shorten link to raise coupler drive shaft, lengthen link to lower shaft.*
4. Replace C-clip **F**. Turn the camshaft to the unloaded position and then back to the loaded position.
5. Return to Common Exit Procedure (DM705).





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CRANK ASSEMBLY

PURPOSE

This adjustment ensures that the crank:

1. Raises the drive shaft high enough during uncoupling to mate with the coupling shaft under the bobbin, but
2. Does not raise the drive shaft so high that the bobbin is tilted when it is captured by the drive shaft. Refer to the Load Checkout Procedure on DM 410 and the Unload Checkout Procedure on DM 510.

SPECIAL TOOLS REQUIRED — *See DM 701*

Slide tool assembly (P/N 2744380)
Gauge (P/N 2744385)
CE index wheel (P/N 2745011)

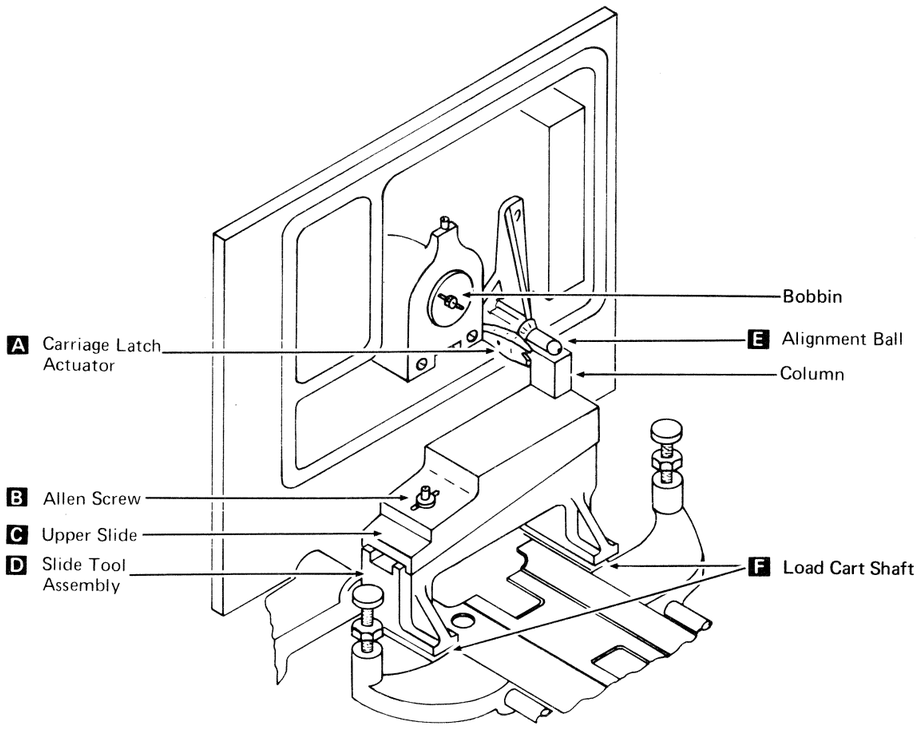
CHECK

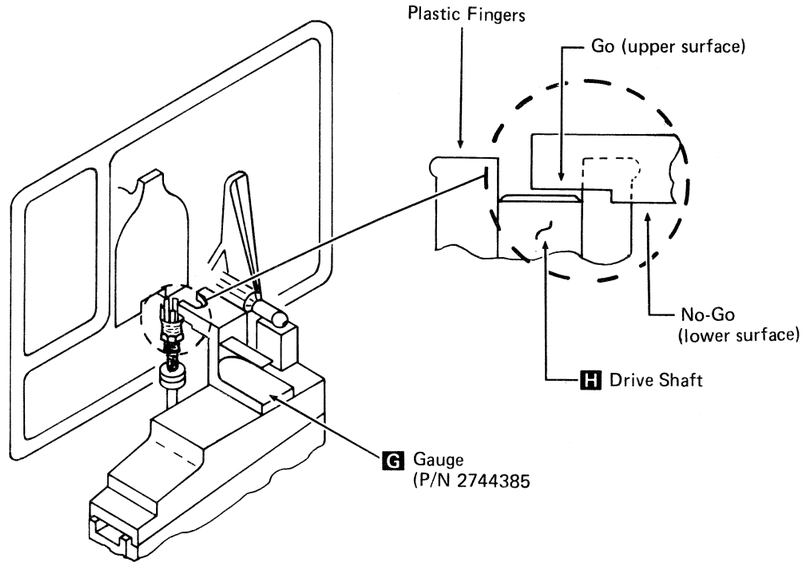
1. Place service drive in CE mode.
2. Remove shroud (see DM 705).
3. Remove lower appearance panel (see DM 705).
4. Insert CE index wheel and rotate load camshaft 315° to loaded position (see DM 700).
5. Lift and slide bobbin back into VCM.
6. Using CE index wheel, rotate camshaft to 90°.
7. Loosen Allen screw **B** on slide tool assembly **D**.
8. Set slide tool assembly on load cart shafts **F**. Be sure that the column on tool is between carriage latch actuator **A** and alignment ball **E**.
9. Using CE index wheel, rotate camshaft toward 95° until load cart holds slide tool securely.
10. Push upper slide **C** to the right gently against alignment ball **E**.
11. Manually tighten Allen screw **B** to hold upper slide securely.
12. Set gauge **G** (P/N 2744385) on slide tool assembly surface.
13. Rotate plastic finger assembly by hand, as required, for easier access to check drive shaft height.
14. Slide gauge between plastic fingers over drive shaft **H**. The Go surface (upper surface) of the gauge should slide over the top of the drive shaft; the No-Go surface (lower surface) should not.
15. If adjustment is:
    Correct — proceed to Common Exit Procedure on DM 705.
    Incorrect — proceed to Adjustment.

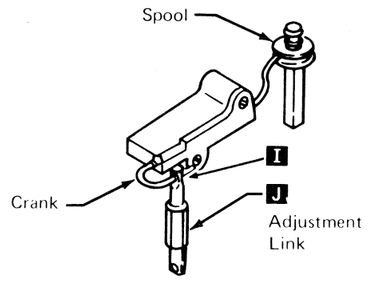
ADJUSTMENT

1. Slide the link **I** off the crank.
2. Place a 0.015" (0,38 mm) thickness gauge between the gauge and slide tool assembly. Rotate adjustment link **J** until shaft just contacts the No-Go surface of gauge when the link is attached to the pin. Adjust to the nearest half-turn of the link.

   Note: Shorten link to raise coupler drive shaft; lenghten link to lower shaft.
3. Turn camshaft to loaded position, then back to unloaded position.
4. Recheck crank height as per steps 10, 11, and 12 of Check procedure, and re-adjust if necessary.
5. Go to Common Exit Procedure on DM 705.







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LOAD CART TRAVEL

PURPOSE

This adjustment allows the position of the toggle link to be varied. *The toggle link is not adjustable in later machines.* When adjusted correctly, the toggle link does not over-travel past the horizontal position when in the loaded position (315°).

In the unloaded position (355°) it still allows the bail to lock open. See the load checkout procedure on DM 410 and the unload checkout procedure on DM 520.

SPECIAL TOOLS REQUIRED

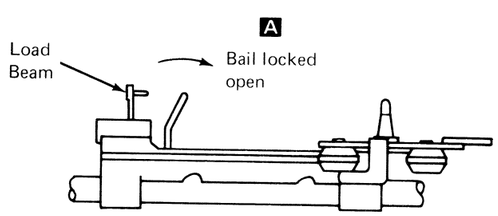
None

CHECK 1

1. Put service drive in CE Mode.
2. Remove shroud (DM 705).
3. Insert CE Index Wheel (DM 700).
4. While turning the camshaft toward the loaded position (315°), observe the load cart motion. The cart should move toward the VCM until it comes to a stop at the fully loaded position. (315°)
5. If the cart moves forward, stops, and then visibly reverses direction and moves away from the VCM while the camshaft is turned into the fully loaded position (315°), the load cart adjustment link is too long.
6. If adjustment is:
   Correct – proceed to Check 2.
   Incorrect – proceed to Adjustment 1.

CHECK 2

1. Observe the bail while turning the camshaft to the unloaded position (355°). If the camshaft turns to the fully unloaded position without locking the bail open **A**, the adjustment link is too short.
2. If adjustment is:
   Correct – proceed to Common Exit Procedure on DM 705.
   Incorrect – proceed to Adjustment 2.



ADJUSTMENT 1 (Link Too Long)

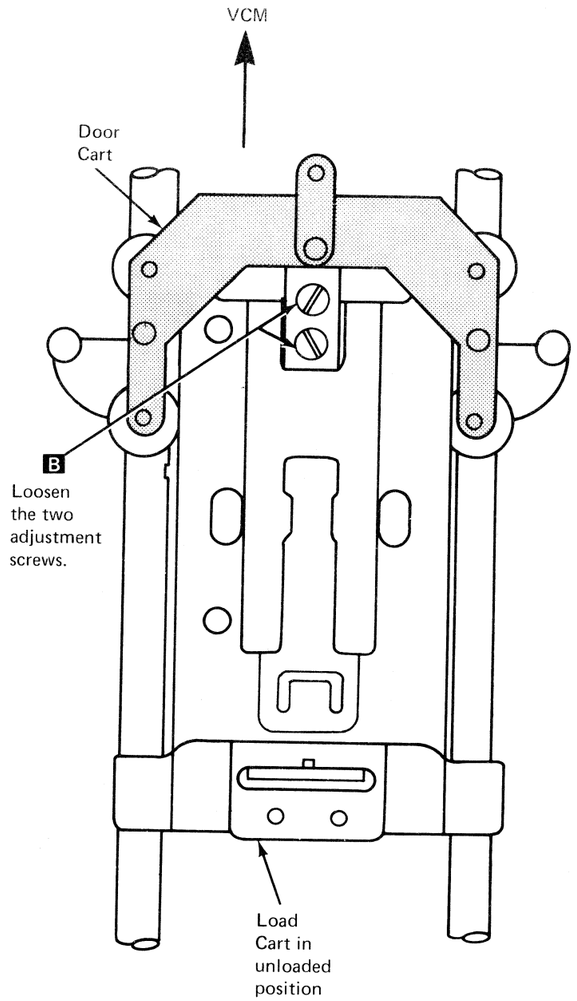
CAUTION: If load cart adjustment is changed, load beam adjustment may change. Adjustment tool (DM 700) is required for load beam adjustment.

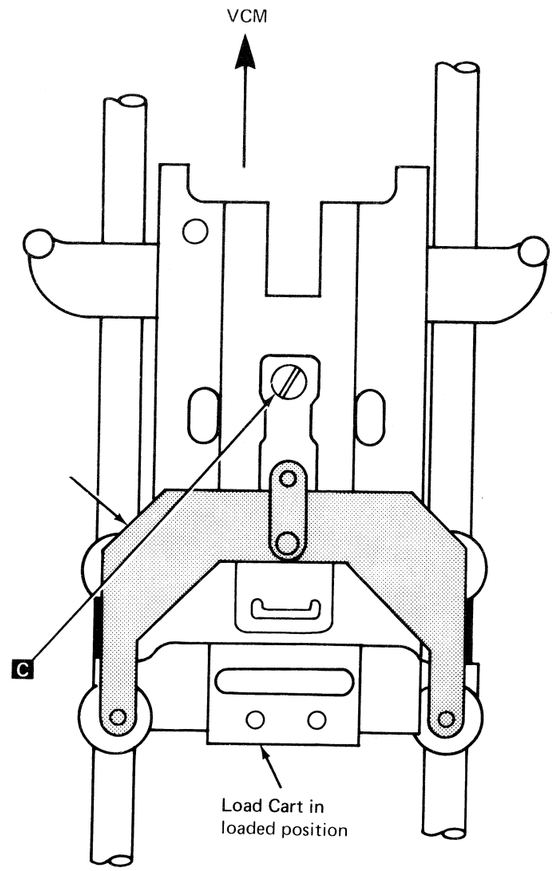
1. Turn the camshaft to the unloaded position (355°).
2. Loosen the two adjustment screws **B**.
3. Turn the camshaft to the loaded (315°) position. Push the load cart as far toward the VCM as it will go. Tighten the exposed adjustment screw **C**.
4. Turn the camshaft until the second adjustment screw is exposed. Tighten screw.
5. Perform load cart travel checks 1 and 2 again to ensure adjustment is correct.
6. Load beam adjustment may change if load cart travel adjustment is altered.
7. Proceed to load beam adjustment on DM 785.

ADJUSTMENT 2 (Link Too Short)

CAUTION: If load cart travel is changed, load beam adjustment may change; adjustment tool (see DM 700) is needed to check load beam.

1. While camshaft is in the unloaded position (355°), loosen the two adjustment screws **B**.
2. With camshaft in the fully unloaded position (355°), push the load cart away from the VCM until the bail is fully locked open **A**.
3. Tighten the two adjustment screws firmly.
4. Perform load cart travel checks again.
5. Load beam adjustment may change if load cart travel adjustment is changed.
6. Proceed to load beam adjustment on DM 785.





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LOAD BEAM

If using tool kit on DM 701, use procedure on DM 786.

PURPOSE

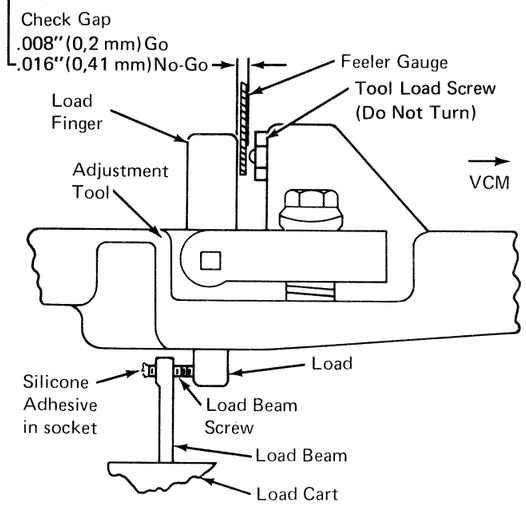
The load beam screw is adjusted to approximately 140 lbs (64, 9 kg) which ensures secure alignment pin capture when the data module is loaded.

SPECIAL TOOLS REQUIRED — *See DM 700*

Adjustment tool (P/N 2745994)

CHECK

1. Place service drive in CE mode.
2. Remove shroud (DM 705).
3. Insert CE Index Wheel (DM 700). Install load adjustment tool by method 1 (DM 702). Turn the camshaft to loaded position (315°), and insert pin in groove 5 (DM 700).
4. Check that the clearance between the load finger on the adjustment tool and the preset allen screw is .008" (0,2 mm) .016" (0,41 mm).
   See note.
5. If adjustment is:
   Correct — proceed to Common Exit Procedure on DM 705.
   Incorrect — proceed to Adjustment.



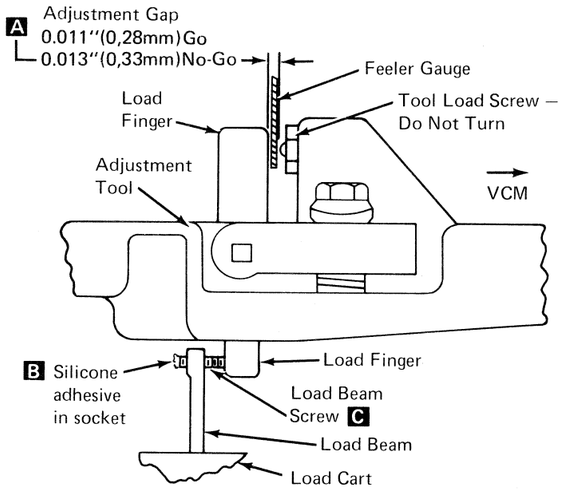
NOTE: The difference between Check Gap and Adjustment Gap is due to possible variations between adjustment tools in the field.

ADJUSTMENT

1. Remove silicone adhesive in socket **B** of load beam screw.
2. Remove load beam screw **C** and clean.
3. Apply Loctite E* (P/N 605960) (P/N 4003058 WTC) to load beam adjustment screw threads. **C**

   CAUTION
   Wear safety glasses when working with Loctite.
4. Turn load beam screw until a gap which is Go on 0.011" (0,28 mm) and No-Go on 0.013" (0,33 mm) is attained. **A** See note.

   Clearance increases with clockwise rotation.
   Remove tool to turn setscrew.
5. If load cart travel has:
   Changed: go to Door Pin (DM 790).
   Not changed: go to Common Exit Procedure (DM 705).



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LOAD BEAM

PURPOSE

The load beam screw is adjusted to approximately 140 lb (64,9 kg), which ensures secure alignment pin capture when the data module is loading.

SPECIAL TOOLS REQUIRED – *See DM 701*

Load beam tool (P/N 2744661)

CHECK

1. Place service drive in CE mode.
2. Remove shroud (see DM 705).
3. Remove lower appearance panel (see DM 705).
4. Check load beam tool calibration. The gap **F** should measure 0.160" (4,06 mm) with the tool unloaded. Use 20 IBM, or equivalent, cards to measure the gap. Loosen mounting screws **A** and adjust gap if necessary.
5. Insert CE index wheel (see DM 700) and rotate camshaft to 150°.
6. Install load beam tool as follows:
   a. Push down on front of tool so bail **B** is between front bracket **D** and load beam screw **C**.
   b. Insert load beam screw in lower dimple **E** of front of tool.
   c. Hold tool level, and position notch in rear tab of load beam tool over rack housing lip.
7. Slowly rotate the CE index wheel until the camshaft is fully loaded at 315°. The load beam screw must set into the load beam tool lower dimple **E**. Check that the clearance between the two upper dimples of the load beam tool is 0.030" ± 0.010" (0,762 ± 0,254 mm)
8. If adjustment is:
   Correct – Turn camshaft to 150°, remove load beam tool and proceed to Common Exit Procedure on DM 705.
   Incorrect – proceed to Adjustment.

ADJUSTMENT

1. Remove silicone adhesive in socket of load beam screw.
2. Remove load beam screw and clean.
3. Apply Loctite E* (P/N 605960) (P/N 4003058 WTC) to load beam adjustment screw threads.

   DANGER
   Wear safety glasses when working with Loctite.
4. Replace load beam screw and adjust until clearance between dimples is 0.030" ± 0.005" (0,762 ± 0,127 mm) **F**. Clearance increases with counter-clockwise rotation, and decreases with clockwise rotation.
5. Check load cart travel (see DM 780). If travel has:
   Changed – go to Door Pin (see DM 790).
   Not changed – go to Common Exit Procedure on DM 705.

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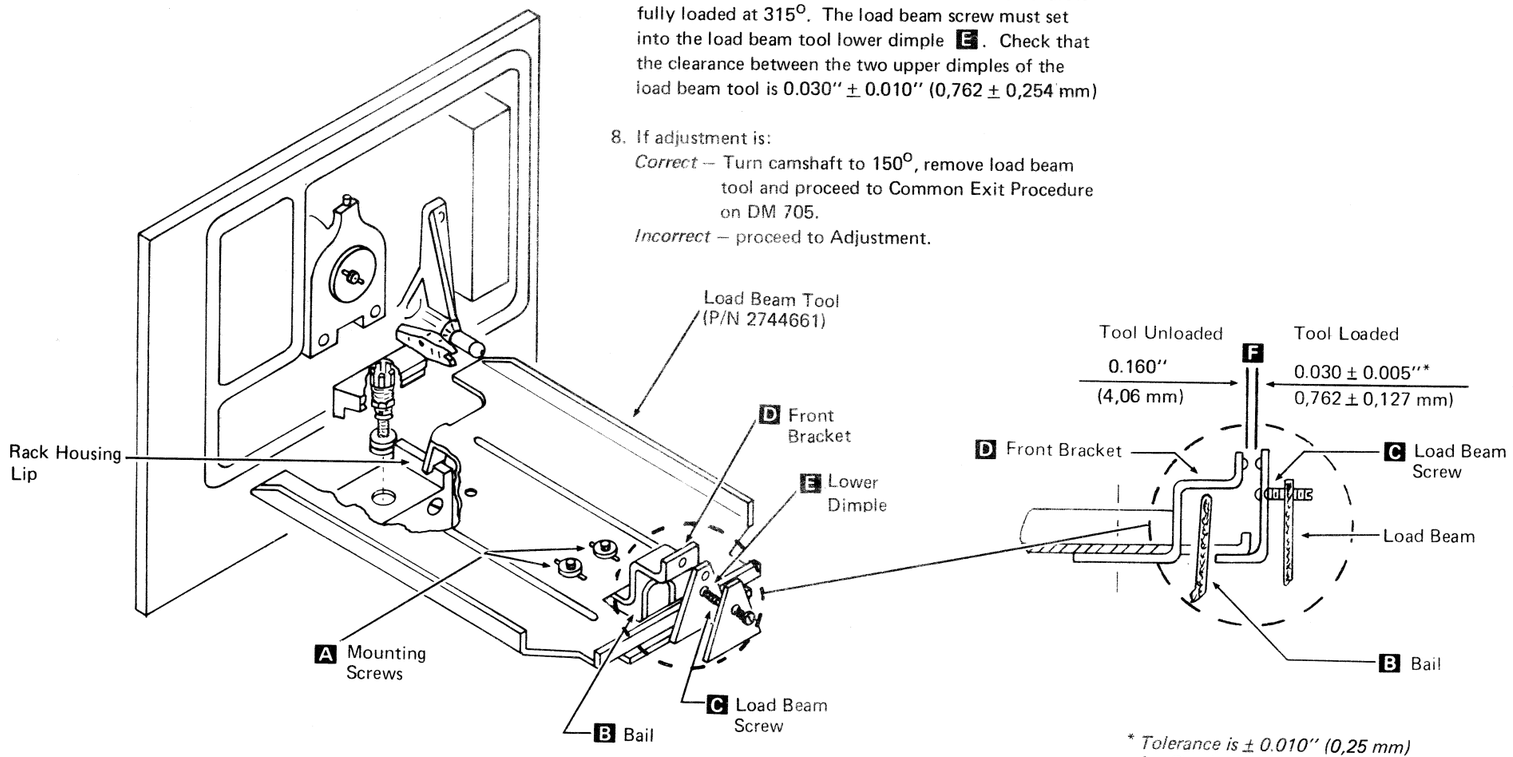

* *Tolerance is ± 0.010" (0,25 mm) for Check procedure.*

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DOOR PIN

PURPOSE

This adjustment ensures that the data module door fully opens and fully closes. It also ensures that the data module door pin holes align properly on the door pins when the DM is inserted in the machine. Refer to the Load Checkout Procedure on DM 410 and the Unload Checkout Procedure on DM 510.

SPECIAL TOOLS REQUIRED — *See DM 700 and 701*

Door pin gauge or Door pin tool pin

If door pin gauge is not available, use the alternate method at right. Any adjustments made without the door pin gauge must be checked with the gauge when it is available.

CHECK (With Gauge)

1. Place service drive in CE Mode.
2. Remove shroud (DM 705).
3. Insert CE Index Wheel (DM 700). Turn camshaft to unloaded position (355°) and insert pin in groove 1 (DM 700).
4. Lay door pin gauge over door pins and bail as shown **A** .
5. Pull door cart away from VCM by applying pressure at point ❶ until all backlash in the linkage is removed; then release pressure on linkage.
6. Push load cart toward VCM by applying pressure at point ❷ until all backlash in the linkage is removed; then release the cart. Nominal rotational freedom (slop) of the door cart is 3/8" (0,37 mm). If there is more than 3/8" (0,37 mm) slop, check for wear in the door cart pivot, linkage points and cam follower assembly before proceeding with the check.

Do not touch door pin tool or load cart at this point or check will be invalid unless steps 5 and 6 are repeated.

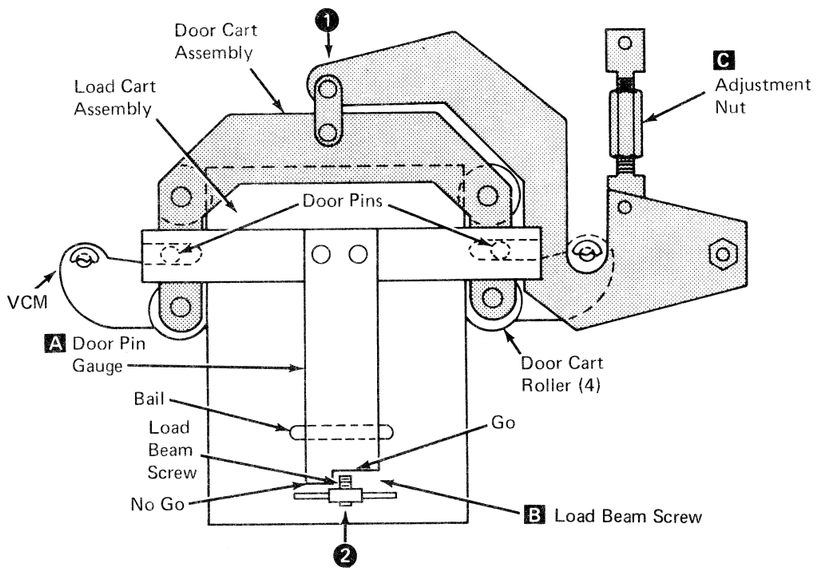
7. View the area of the door pin gauge where the Go/No-Go notch faces the load beam screw **B** .
8. If the end of the load beam screw is between the Go and No-Go steps, the door pin adjustment is within tolerance.
9. If adjustment is:
   Correct — complete Page Exit Procedure.
   Incorrect — proceed with Adjustment.

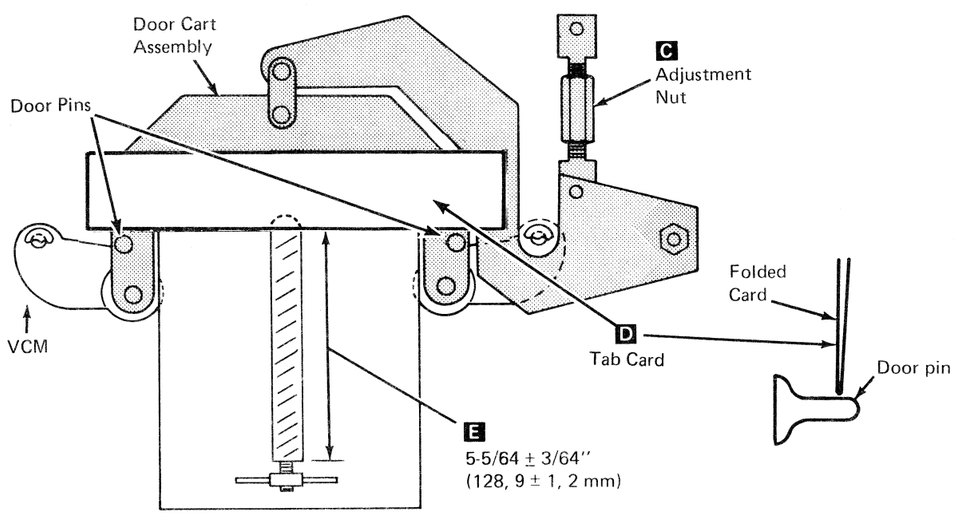
ADJUSTMENT (With Gauge)

1. Determine the direction the adjustment nut **C** needs to be turned.
2. Turn nut and recheck adjustment — perform steps 4, 5, 6, 7, and 8 of Check Procedure.
3. Repeat step 2 until adjustment is correct.
4. Complete Page Exit Procedure.

PAGE EXIT PROCEDURE

1. Remove all tools.
2. Return to Common Exit Procedure (DM 705).





ALTERNATE METHOD (Without Gauge)

The alternate method is used when the door pin gauge is not available. This is a temporary measure which must be checked as soon as possible with a door pin gauge.

CHECK (Without Gauge)

1. Put service drive in CE Mode.
2. Remove shroud (DM 705).
3. At unloaded position (355°), push door cart away from VCM by applying pressure at point ❶ until all back-lash in the linkage is removed; then release pressure on linkage.
4. Push load cart toward the VCM by applying pressure at point ❷ until all backlash in the linkage is removed; then release cart.
5. Do not allow door cart to move. If it moves, repeat steps 3 and 4.
6. Fold tab card **D** and hold against backside of door pins.
7. Check that distance from edge of tab card (back of door pins) to load beam screw is 5-5/64" ± 3/64" (128, 9 ± 1, 2 mm) **E** .
8. If adjustment is:
   Correct — Complete Page Exit Procedure.
   Incorrect — proceed with adjustment.

ADJUSTMENT

1. Turn adjustment nut **C** until back of door pins are 5-5/64" ± 3/64" (128, 9 ± 1,2 mm) from load beam screw.
2. Recheck steps 3, 4, 5, 6, and 7 in alternate check.
3. Complete Page Exit Procedure.

PAGE EXIT PROCEDURE

1. Remove all tools.
2. Return to Common Exit Procedure (DM 705).

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DOOR PIN DM 790

COVER LATCH ASSEMBLY, SOLENOID, COVER LOCKED SWITCH REPLACEMENT

FRONT COVER LATCH ASSEMBLY

Function

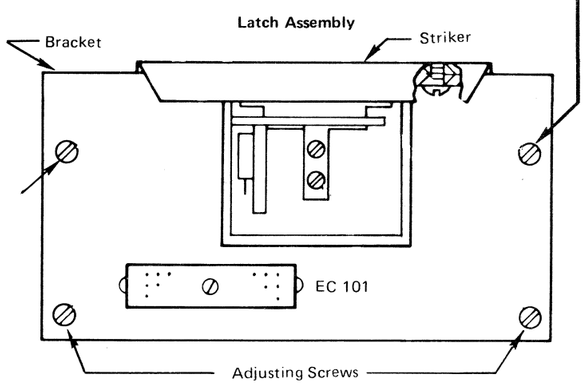
The latch assembly ensures that the handle notch is parallel to the striker surface so that when the solenoid is energized, the interposer locks the door handle.

Removal

1 Set CE Mode switch to CE and turn off (down) 24 volt switch.
2 Remove shroud and trim panel, as shown on DM 705.
3 At EC101, remove the five connector wires going to the latch solenoid assembly. Observe and remember the positions of the wires.
4 Remove four screws holding the latch assembly bracket to the frame.
5 Lift the assembly up and out of the machine.

Replacement

1 Position the new latch assembly (into the machine and down) so the screw holes are lined up with the bracket.
2 Insert the four screws through the bracket and tighten them.
3 Replace the five wires from the solenoid into the EC101 connector positions noted during removal, see YA070.
4 Restore power (turn 24 volt switch up).
5 Turn to DM 710 and complete the adjustment; reassemble as shown.
6 Return to common exit procedure, DM 705.



FRONT COVER LATCH SOLENOID

Function

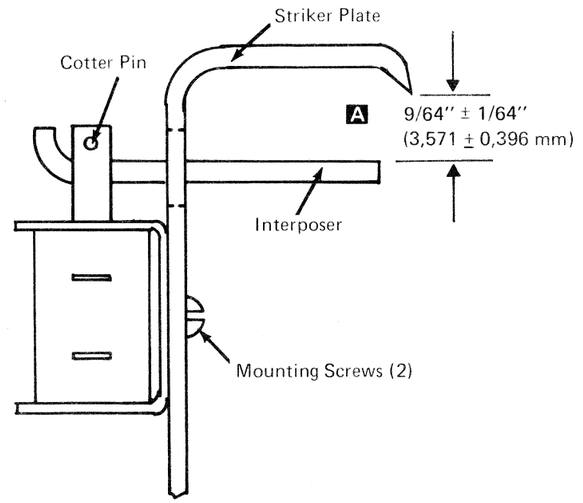
The latch solenoid is used to keep the door locked once loading has begun.

Removal

1 Set CE Mode switch to CE and turn off (down) 24 volt switch.
2 Remove shroud and trim panel, as shown on DM 705.
3 At EC101 remove the two solenoid connector wires. Observe and remember the positions of the wires in the connector.
4 Remove the cotter pin from the solenoid plunger.
5 Remove the two mounting screws from the solenoid.
6 Slide the solenoid clear of the interposer; lift it up and out of the machine.

Replacement

1 Position the new solenoid on the striker plate with the interposer in the armature slot.
2 Loosely fasten the solenoid to the striker plate using the two screws previously removed.
3 Insert the cotter pin in the armature so the interposer tongue is secured. Bend one side of the pin to secure it in place.
4 Insert the two solenoid wires into EC101 in the connector positions noted on removal. See YA070 for wiring diagram. (Polarity is not significant.)
5 Adjust the solenoid position so that when the armature is seated (down) the interposer is from 9/64" ± 1/64" (3,571 ± 0,396 mm) from the striker. **A** Make sure that the interposer is free from binds and tighten the screws.
6 If other adjustments are required, go to DM 710.
7 Return to common exit procedure DM 705.



COVER LOCKED SWITCH

Function

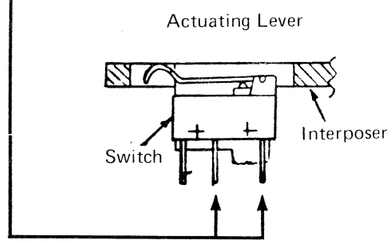
The cover locked switch is activated after the solenoid has latched the front cover. Its signal allows the next step in the loading sequence to start.

Removal

1 Set CE Mode switch to CE and turn off (down) 24 volt switch.
2 Remove trim panel (DM 705).
3 Remove the two push-on wire clips from the switch lugs. Note that there are three lugs on the switch, but only two are used.
4 Remove the two mounting screws that fasten the switcl to the interposer.

Replacement

1 Position the switch against the interposer and insert the mounting screws. Tighten loosely so the switch positio can be adjusted.
2 Attach the CE meter leads to the switch lugs and set th meter on the R x 1 scale.
3 Check that when the switch actuating lever is flush witl the top surface (use a straightedge) of the interposer, th switch actuating lever has traveled between 0.030 and 0.050 inch (0,76 and 1,27 mm) past the make point.
4 When the adjustment is complete, tighten the switch mounting screws.
5 Disconnect meter leads.
6 Reconnect the two push-on connectors to the switch lu closest to the switch lever end.
7 Return to common exit procedure, DM 705.



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INTERFACE CABLE AND CONNECTOR REPLACEMENT

READ/WRITE AND SERVO INTERFACE CABLE

Function

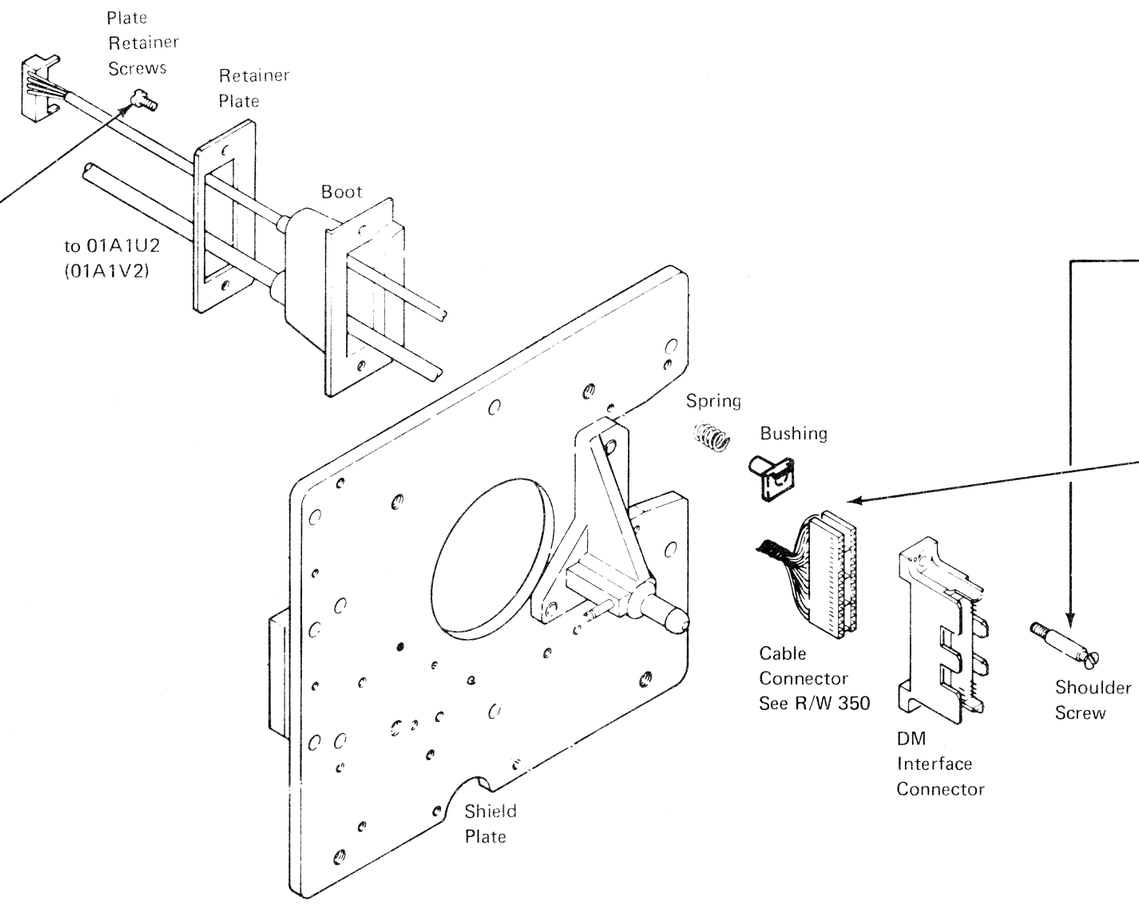
The interface cable is used to supply the servo preamp voltages, the servo signals, the DM size bits, and the Read/Write Head Select lines.

Removal

1. Remove power from the drive:
   Set CE Mode switch to CE.
   Press PWR OFF on A-Box, front panel and trip CP210 on B-Box at rear of ac box.
2. Remove the two retainer plate screws.
3. Remove the screw that fastens the cable ground to the shield plate.
4. Unplug the cable connector from the back of the DM interface connector. (The interface connector can be replaced when worn without having to rewire the cable.)
5. Remove the connector from the read/write matrix card. Remove servo cable (A-drive, 01A1U2; B-drive, 01A1V2) and the cable from the raceway.
6. Pull the connector, cable, and boot through the retainer plate.

Replacement

1. Thread the new interface cable through the retainer plate, connector first, until the insulating boot is seated in the plate.
2. Align the cable in the raceway and attach the connector to the read/write card. Install the servo cable (A-drive, 01A1U2; B-drive, 01A1V2).
3. Insert the interface portion of the connector in the DM interface connector; see R/W 350.
4. Attach the cable ground lug to the shield plate with the screw previously removed.
5. Fasten the retainer plate to the shield plate using the two screws previously removed.
6. Check that all fasteners are tight and the cable is correctly routed in the raceway.
7. Restore power to the drive.
8. Exit to START 500.



DM INTERFACE CONNECTOR

Function

The DM interface connector carries the signals between the drive and the DM. It can become worn with use and is replaced without involving the cable wiring.

Removal

1. Remove power from the drive:
   Set CE Mode switch to CE.
   Press PWR OFF on A-Box, front panel and trip CP210 on B-Box at rear of ac box.
2. Remove the interface connectors shoulder screws, bushings, and springs.
3. Pull the DM interface connector free from the cable assembly.

Replacement

1. Line up the new interface connector and press it into the cable connector.
2. Fasten the interface connector to the shield plate using the springs, bushings, and shoulder screws previously removed.
3. Restore power to the drive.
4. Exit to START 500.

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DRIVE MOTOR; PULLEY AND PLATE; AND BRAKE REPLACEMENT

If the new style brake assembly is installed, refer to DM 812. The new style brake can be identified by the polished steel finned housing that encloses the brake coil.

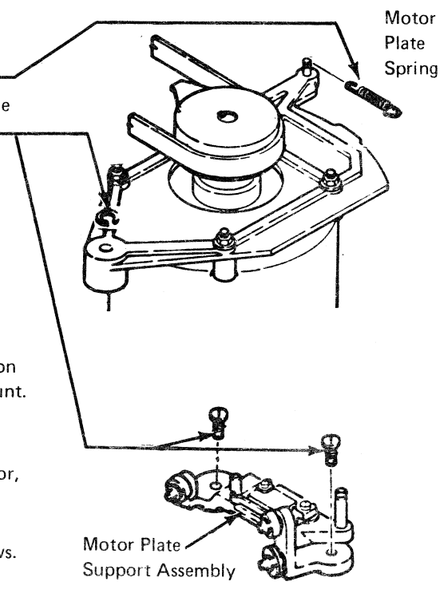
SPINDLE DRIVE MOTOR ASSEMBLY

Function

The drive motor assembly provides the power to rotate the DM spindle. Power is transferred by a belt. The assembly includes the pulley, motor, mounting plate, and brake mechanism. Refer to DM 430 for manual check procedure.

Removal

1 Set CE Mode switch to CE and turn off (down) the 24 volt switch.
2 Disconnect the motor cable (P201/203) (LOC 4).
3 Remove the shroud and appearance panel (DM 705).
4 Remove the motor belt (DM 815).
5 Disconnect the motor plate spring.
6 Remove the E-clip from the motor plate pivot and the two screws from the motor plate support.
7 Retract the three cable wires from EC601 under the motor. Observe and remember their locations.
8 Release and remove the motor cable clamp from the ac box.
9 Using both hands lift the drive motor from the pivot and remove from the machine.



Replacement

1 Using both hands, lift the motor assembly and position it so the pivot enters the pivot hole in the motor mount.
2 Route the motor cable to the ac box and tighten the cable clamp.
3 Insert the five cable wires into EC601 under the motor, being careful to plug them into the correct locations (DM 161).
4 Fasten the motor plate to the support with two screws.
5 Install the E-clip over the pivot post.
6 Reinstall the motor plate spring.

Performance Check

1 Insert the P201/203 motor cable (LOC 4).
2 Turn on (up) the 24 volt switch.
3 Install a jumper to energize the brake and drive motor: on A-drive, A1T4G13 to any D08 pin; on B-drive, A1S4G13 to any D08 pin.
4 Verify that the motor pulley turns CCW when the Belt-in-Place switch is actuated.
If the direction is CW, interchange any two of the three-phase ac wires at the P201/203 cable connector; see YA020 or YB020 for the wiring diagram.
5 Turn off the 24 volt switch.
6 Change the wires in motor plug P201/203.
7 Replace the motor belt (DM 815).
8 Proceed to Common Exit Procedure on DM 705.

SPINDLE DRIVE MOTOR PULLEY AND PLATE

Function

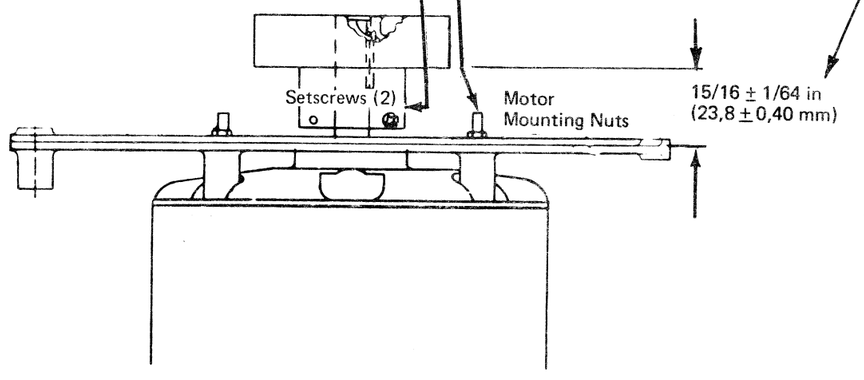
The motor pulley transfers power to the DM spindle pulley via a belt. The motor mounting plate attaches the motor and pivots on the drive casting stud.

Removal

1 Set CE Mode switch to CE and turn off (down) the 24 volt switch.
2 Remove shroud, as shown on DM 705.
3 Remove motor belt (DM 815).
4 With a 4-40 six-fluted bristol head wrench, loosen the two screws holding the pulley to the shaft.
5 Lift off the pulley. Retain the shaft key for reuse.
6 Remove and retain the two pulley setscrews for reuse.
7 If the motor plate requires replacement, remove the four nuts from the motor mounting bolts, replace the mounting plate, and reuse the nuts to tighten the plate in place.

Replacement

1 Insert the setscrews loosely in the pulley.
2 Push the pulley onto the shaft with the key in place.
3 Adjust the pulley height so the bottom of the pulley is 15/16 ± 1/64 in (23,8 ± 0,40 mm) above the surface of the mounting plate.
4 Tighten the setscrews with a 4-40 wrench.
5 Replace the belt (DM 815).
6 Proceed to Common Exit Procedure on DM 705.



SPINDLE DRIVE BRAKE ASSEMBLY

Function

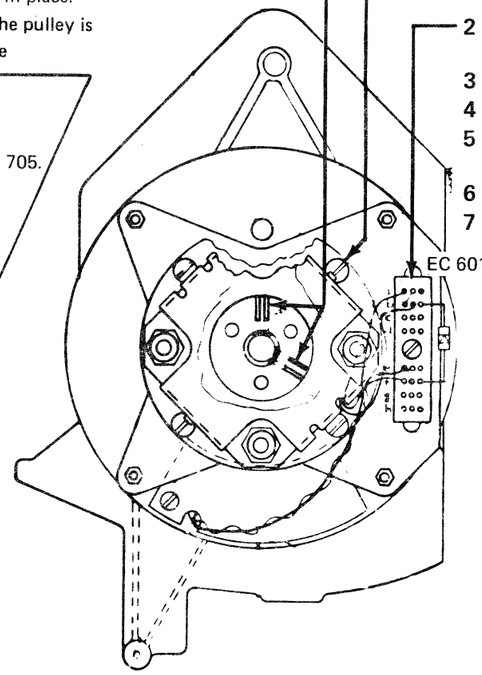
The brake is used to stop the spindle motor during the unload cycle. It consists of a brake disk clamped between brake shoes which are activated by a solenoid.

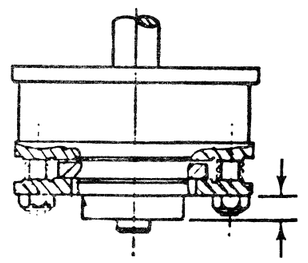
Removal

1 Set CE Mode switch to CE and turn off (down) the 24 volt switch.
2 Remove the shroud (DM 705).
3 If the B-drive brake assembly is to be replaced, the spindle drive motor must be removed; see this page. The A-drive brake can be replaced without removing the motor.
4 Remove and retain the brake assembly cover; it will be reused.
5 Loosen the two setscrews and remove the drive collar.
6 Remove the two brake wires from EC601. Observe and remember their positions in the connector.
7 Remove the four screws holding the brake to the brake mounting plate; then remove the brake assembly.

Replacement

1 Position the brake assembly on the bottom of the motor; then insert and tighten the four mounting screws.
2 Insert the three wires into EC601 in the correct position (DM 206).
3 Install the drive collar on the shaft as shown.
4 Replace the brake assembly cover.
5 If a B-drive, replace the motor assembly, as shown on this page.
6 Check drive collar and brake adjustments (DM 715).
7 Proceed to Common Exit Procedure on DM 705.





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DRIVE MOTOR BRAKE REMOVAL, REPLACEMENT, AND CHECK

Function

The brake is used to stop the spindle motor during the unload cycle. It consists of a brake disk clamped between brake shoes under spring pressure when the brake coil is de-energized.

Note: A noise is normal when brake slows motor to a stop.

Removal

1. Set the CE Mode switch to CE and turn off (down) the 24 volt switch.
2. Remove the shroud (DM 705).
3. If the B-drive brake assembly is to be replaced, the spindle drive motor must be removed (see DM 810). The A-drive brake can be replaced without removing the motor.
4. Remove the motor plug **F** P201(P203).
5. Remove the brake wires from EC601 **B** . Observe and remember their positions in the connector.
6. ~~Remove the four brake mounting screws and spacers **G** .~~
7. Slide the brake off the motor shaft.

Replacement

1. Check the collar position **A** . The lower surface of the collar should be 29/32" + 1/32" (23,012mm + 0,787mm) below the mounting plate.
2. If adjustment is required, loosen the locking screw **E** , re-position, and re-tighten the locking screw.
3. Center the brake disk in the brake assembly **D** .
4. Carefully push the brake assembly into position over the lower surface of the collar. ~~Insert the four spacers between the brake and the mounting bracket and~~ Install the four mtg. screws. It may be necessary to rotate the brake assembly **D** to engage the disk slots with the collar.
5. Replace the two brake leads in EC601 **B** .
6. If this is a B-drive, replace the motor (see DM 810).
7. Turn on the +24 volt switch.
8. Replace the motor plug, P201(P203) or proceed to brake check (DM 715).

Brake Check

1. Remove the motor plug, P201(P203 **F** .
2. Turn Start/Stop switch to Start; this energizes the brake.
3. Check that there is no air gap at **C** . 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 (+). If the voltage is +24 Vdc, the brake is defective; replace it. If the voltage is not +24 Vdc, troubleshoot the brake circuit (DM 335).
4. Turn the Start/Stop switch to Stop; this de-energizes the brake.
5. Check the air gap at **C** 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 and go to Brake Stop Time Check.

Brake Stop Time Check

To check the effectiveness of the brake perform the following scoping procedure:

Scope set up

Sweep	.5 sec/div
Vertical	.2 volts/div
Trigger	External, slope+
X10 Probes	

Probe points on A1 board

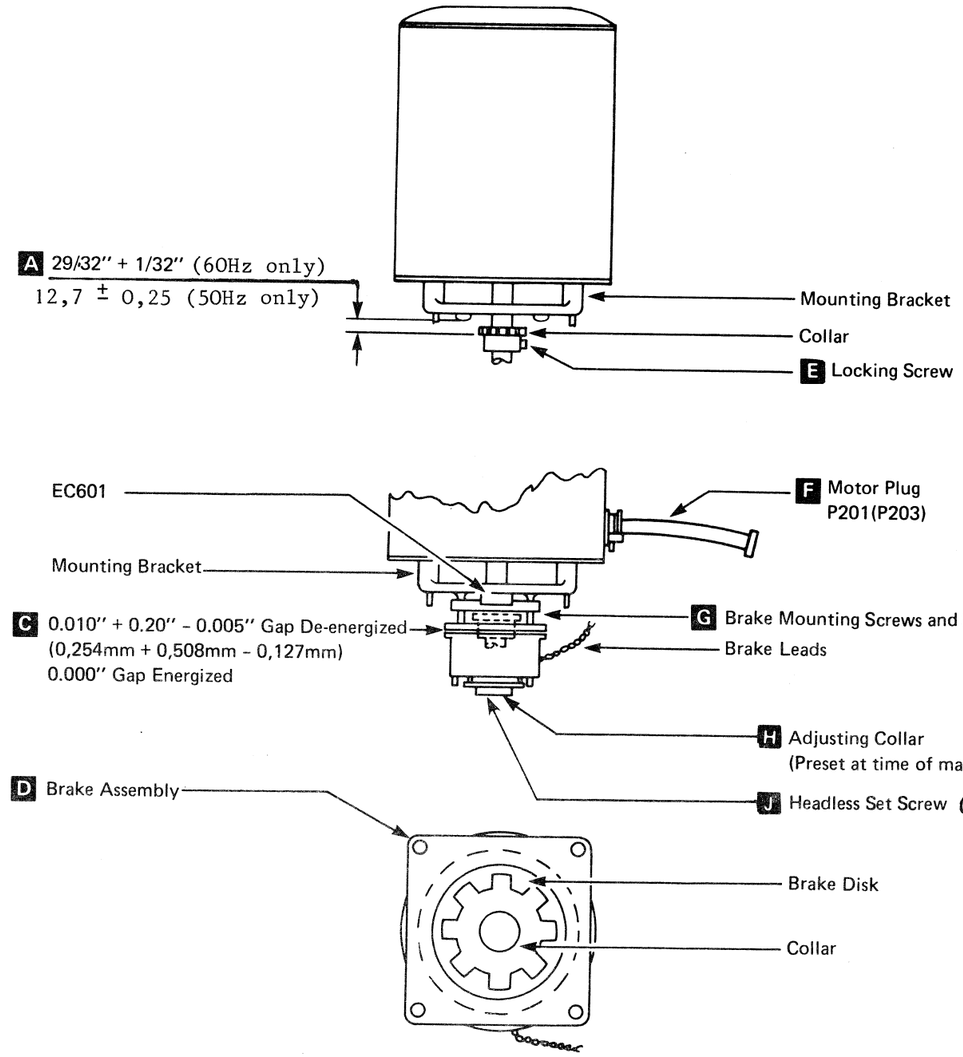
	Drive A	Drive B
Ext sync (stop sw)	T4D11	S4D11
Ch 1 (Mtr speed sw)	T4B12	S4B12

Braking force is determined by scoping the fall of the motor at speed signal.

1. Make drive ready.
2. Turn Start/Stop switch to Stop (scope should trigger).
3. Observe time when Motor At Speed signal falls. It should be 2.0 sec. minimum to 3.6 sec. maximum. Adjust brake if fall time is not in tolerance.

Brake Adjustment

1. ~~Loosen set screw **J** . It may be necessary to free epoxy from the screw in order to insert the fluted socket wrench.~~
2. To increase braking force, turn adjusting collar **H** cw one detent position at a time until fall time is 3.6 sec. or less.
3. To decrease braking force, turn adjusting collar **H** ccw one detent position at a time, repeating steps 1 thru 3, until fall time is 2.0 sec. or more.
4. ~~Tighten set screw **J** .~~
5. If the above adjustment cannot be achieved, replace the brake.
6. Return to common exit procedure on DM 705.



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MOTOR BELT, IDLER ARM, AND AIR INTERFACE REPLACEMENT

SPINDLE MOTOR BELT

Function

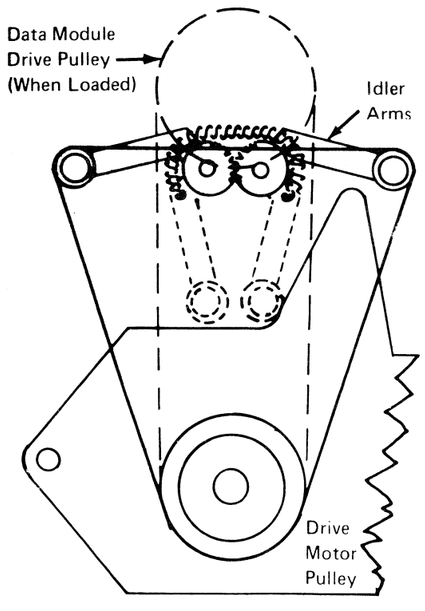
The spindle motor belt transfers rotary power from the drive motor to the DM spindle. During the DM loading process the belt is held in position by two spring-loaded idler arms. After the DM is loaded, the motor plate spring holds the belt tension against the DM spindle. Refer to DM 430 for manual checkout procedure.

Removal

1 Set CE Mode switch to CE and turn off (down) the 24 volt switch.
2 Remove the shroud (DM 705).
3 Compress the idler pulleys together and remove the belt.

Replacement

1 Compress the idler pulleys together and install the belt over the motor drive pulley and the released idler pulleys. The smooth side of the belt must be inside, against the motor pulley. Belt circumference should not be greater than 20.0".
2 Proceed to Common Exit Procedure (DM 705).



BELT IDLER ARMS

Function

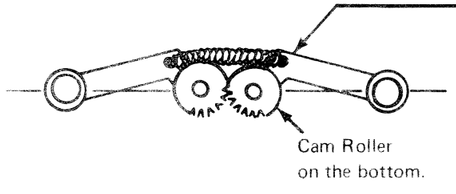
The belt idler arms are spring loaded to position the belt correctly around the DM spindle pulley when the DM is inserted.

Removal

1 Set CE Mode switch to CE and turn off (down) 24 volt switch.
2 Remove the shroud (DM 705).
3 Remove the spindle motor belt, using the procedure on this page.
4 Remove the idler pulley return spring.
5 Remove the two nuts that hold the bracket; then remove the bracket.
6 Lift the two idler pulleys from the pivot pins.

Replacement

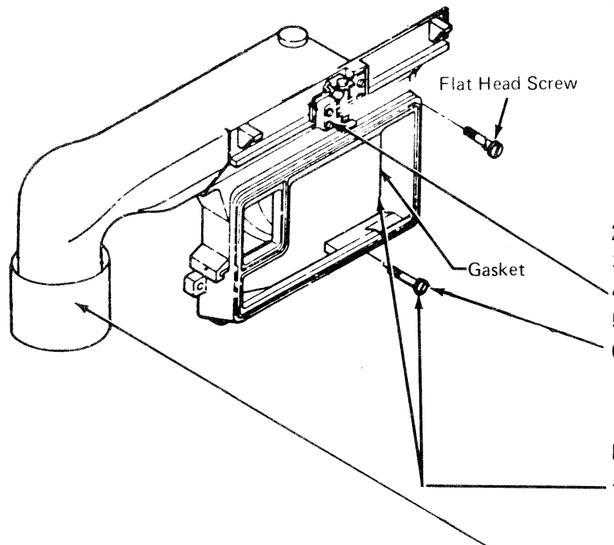
1 Apply SBB No. 3 grease (P/N 2744599) to pins and place the idler arms over the pivot pins so their gears mesh with the arms 180° apart and the bottom cam-roller on the right.
2 Position the bracket over the two pins and install the nuts that hold the bracket in place.
3 Install the return spring between the idler arms with the arms pointing away from the motor pulley. The mechanism may have to be partially loaded to provide installation room.
4 Install the belt, smooth side against the motor pulley, as shown on this page. Visually check the belt for wear. Belt circumference should not be greater than 20.0".
5 Proceed to Common Exit Procedure (DM 705).



AIR INTERFACE

Function

The air interface divides the cooling air between the DM disks and the VCM. The interface gasket forms a seal with the DM when the door opens as the DM is loaded. The Read Only switch is mounted on the interface shell.



Removal

1 Remove the power from the drive:
Set CE Mode switch to CE.
Press PWR OFF (on A-Box, front panel;
on B-Box, CP 210 at rear of ac box).
2 Remove the shroud (DM 705).
3 Remove both the upper and lower trim panels (DM 705).
4 Remove the wires from the Read Only switch.
5 Disconnect the air system coupling.
6 Remove the four mounting screws and lift the interface from the machine. Note that these screw heads may not be the same. Be sure to replace them in the same holes.

Replacement

1 Position the interface and install the four mounting screws
Note: Ensure that gasket is between air interface and VCM shield plate.
2 Reconnect the airflow system coupling.
3 Attach the Read Only switch wires, (R/W 213).
4 Install the upper and lower trim panels and the shroud, as shown on DM 705, common exit procedure.
5 Verify that the Read Only switch adjustment is correct (DM 740).
6 Make sure that the home position cell cable is in the interface slot.
7 Restore power.
8 Exit to START 500.

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AIR VALVE ASSEMBLY, AIR VANE SWITCH, AIR VALVE CABLE REPLACEMENT

AIR VALVE/AIR VANE SWITCH ASSEMBLY

Function

The air valves control the flow of filtered air into the DM. The two butterfly valves are controlled by dual cables actuated by a cam follower which is part of the loading sequences. One valve controls the air input flow; the other, the output.

MACHINES WITH AIR VANE SWITCH

The air vane rotates and operates a switch when air is flowing. The switch is found only in the air return lines under the VCMs.

PRESSURE SWITCH AIR FLOW DETECTOR

Later machines have a pressure switch that monitors the differential pressure across the VCM. If the blower or either entry or exit air vanes fail, the differential pressure across the VCM becomes zero and the switch opens. A 6-32 setscrew is inserted in the tubing and acts as an air restricter to limit the pressure surges caused by an actuating voice coil.

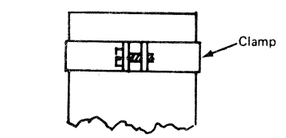
AIR PRESSURE CHECK

Measure the differential air pressure across the air switch by placing a slack tube manometer (P/N 453500) between the air tube from the VCM assembly and the air tube from the Air Valve assembly. There should be a minimum 1.5" (38,1mm) water pressure differential across the air switch when both drives of a dual drive machine (one drive of B1 Model) are Ready. If there is less than 1.5" (38,1mm) differential water pressure look for air system problems such as defective blower, clogged absolute filter (DM 830), defective Air Valve Asm., and loose couplings.

Note: 2314 pressure gauge (P/N 2200394) may be used in place of manometer for more accurate reading. However, 2314 gauge must be readjusted to be used here, as it has only 1" full scale deflection.

Removal

1 Remove power from the drive: Set Power Mode switch to Local. Press PWR OFF (on A-Box, front panel; on B-Box, CP 210 at rear of ac box).
2 On the bottom of the assembly, release the air tube clamp and slip the air tube from the collar. (Some machines may not use an air tube clamp.)
3 If the assembly is in a return line (under the VCM), remove the two wires **A** or air tube **C** from the air vane switch. The air supply valve assemblies (mounted on the filter) have no electrical connection.

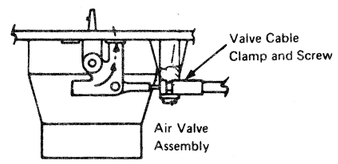


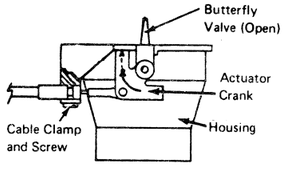
The air valves mounted on the absolute filter have an O-ring seal; be sure to keep these for reuse. (See DM 830.)
4 Loosen the air valve cable clamp screw.
5 Remove and retain the C-clip that holds the cable to the actuating crank. (Do not lose the C-clip.)
6 Remove the four mounting bolts; then lift the assembly from the machine.

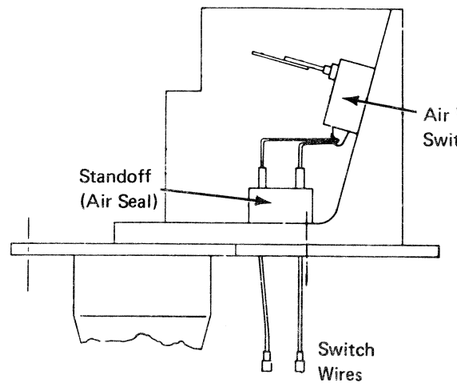
Replacement

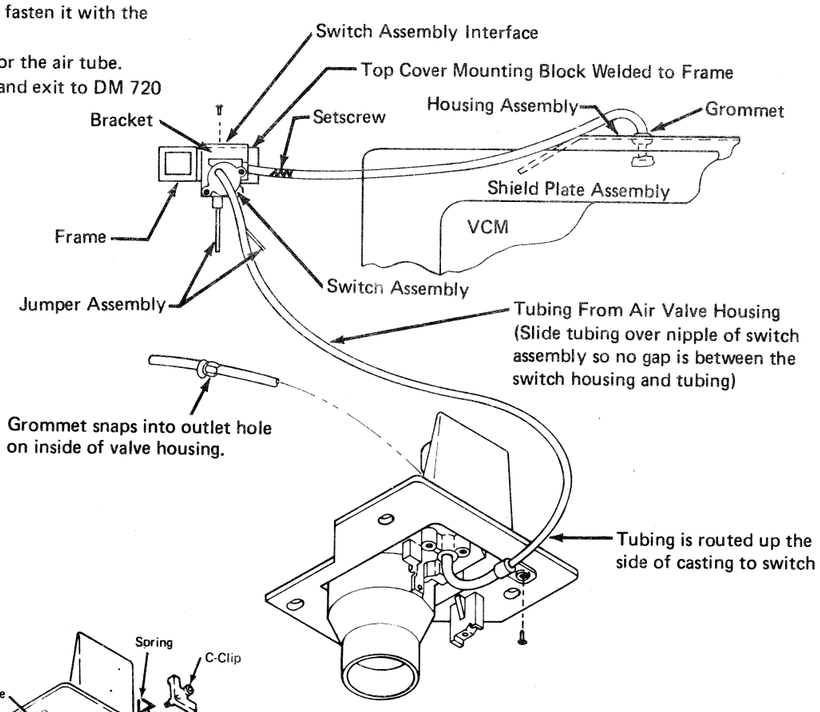
Note: The supply and return assemblies are not interchangeable. If a new unit is to be installed, make sure the correct part is used.

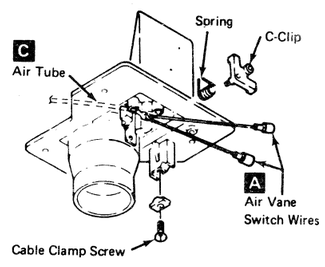
1 Position the assembly in place and insert the mounting bolts.
2 Insert the cable end on the crank and fasten it with the C-clip.
3 Reconnect the air vane switch wires, or the air tube.
4 Install the cable clamp screw loosely and exit to DM 720 for the valve adjustment procedure.
5 Restore power











AIR VALVE CABLE

Function

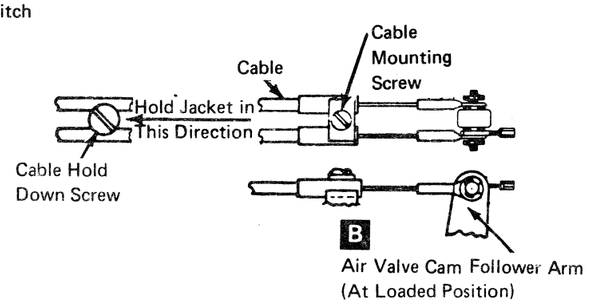
The air valve cable transmits the motion of the cam follower to the two air valves for each drive. The cable terminations are mounted on each side of the cam follower. The cable consists of a flexible twisted wire bundle in the center of reinforced covering — the wire moving in response to force and the covering clamped to remain stationary. The air valve is spring-loaded to remain in the closed position.

Removal

1 Remove power from the drive: Set Power Mode switch to Local. Press PWR OFF (on A-Box, front panel; on B-Box, CP 210 at rear of ac box).
2 On the air valve assembly loosen the cable clamp and remove the C-clip from the actuator crank.
3 Remove the shroud and lower trim panel, as shown on DM 705.
4 Remove the C-clip from the pin at the cam follower. **B**
5 Loosen the cable mounting screw and pull the cable from the baseplate.

Replacement

1 Slide the new cable under the cable clamp. Do not tighten the screw.
2 Slide the cable end over the pin in the cam follower **B** and replace the C-clip.
3 Tighten the cable clamp.
4 Adjust the cable as shown on DM 720.
5 On the air valve assembly install the cable end on the actuator crank and replace the C-clip.
6 Proceed to Common Exit Procedure (DM 705).



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BLOWER-MOTOR REPLACEMENT

BLOWER-MOTOR ASSEMBLY

Function

The blower-motor assembly is composed of two distinct systems, one closed and one open. The motor drives two blowers. The open system blower **A** circulates cooling air to the logic gate (bottom outlet) and through the heat exchanger (top outlet and duct) where it dissipates heat collected by the closed system. The closed system blower **B** circulates air through the absolute filter and then through the air valves to the data modules and voice coil motor. From here it is returned through the air tubes to the heat exchanger for cooling and then back to the blower.

Removal

1 If the blower in the controller module (models A-2 or C-2) is to be replaced, power down the sub-system and disconnect the AC power cable from the wall receptacle.
If the blower in a satellite module (model B-1 or B-2) is to be replaced, power down the sub-system and turn off CB 210 (Main Line Disconnect) in the satellite module having the blower replaced. The power may then be returned to the remainder of the string.

2 Remove covers from the machine to provide access to the blower assembly.

3 Disconnect the blower motor cable (three terminals for 60 Hz but six terminals for 50 Hz) from TB205 inside the ac box (see LOC 2) and the ground lug from the ground bus in the box.

4 Loosen the cable clamp at the end of the ac box and withdraw the cable.

5 If the module is an A-2, remove the line filter (three screws). Later machines have C225 instead of a line filter, C225 need not be removed.
On 50-Hz machines, disconnect the thermal cable at EC301, EC302 (LOC 4).

6 From the rear, disconnect the two air coupling hoses from the heat exchanger and the boot connecting the blower to the absolute filter.

7 Remove two screws from the heat exchanger cover (flat side) and remove the air duct by pulling it free together with the coupling boot, from the end blower. The air duct and screws will be reused.

8 Remove wires from dc ground bus (in front of blower assembly).

9 Remove the three top nuts and washers from the shock mount studs, two near the motor and one in the heat exchanger cover. Disconnect the bottom blower boot.

10 From the front of the machine, tilt the motor/blower back and unscrew the front shock mount from the frame.

11 Lift the assembly up and over both front and rear shock mount studs.

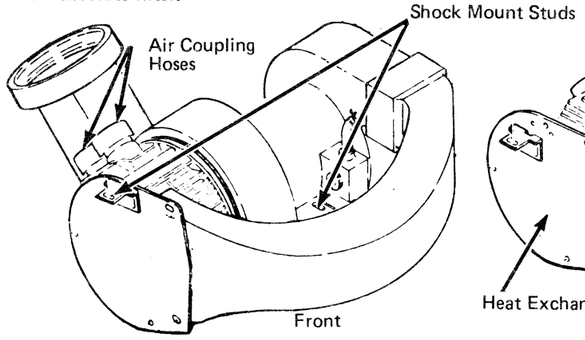
12 Remove the front shock mount from the heat exchanger cover.

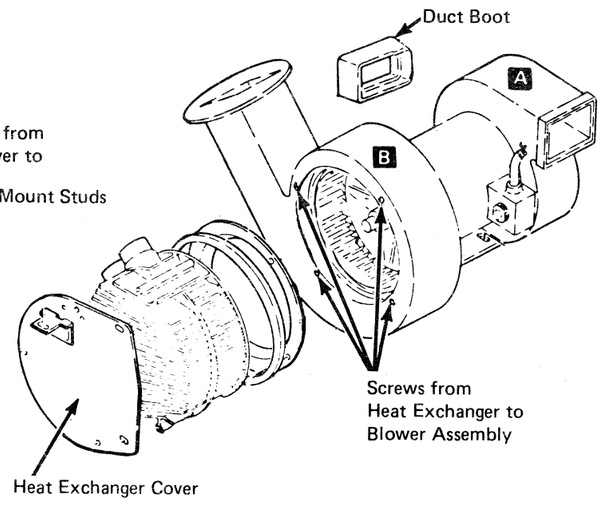
Note: *In an A-2 or C-2 module, removal of the blower assembly can be further simplified by removing the four screws holding the heat exchanger to the blower assembly, and removing the heat exchanger separately from the blower assembly.*

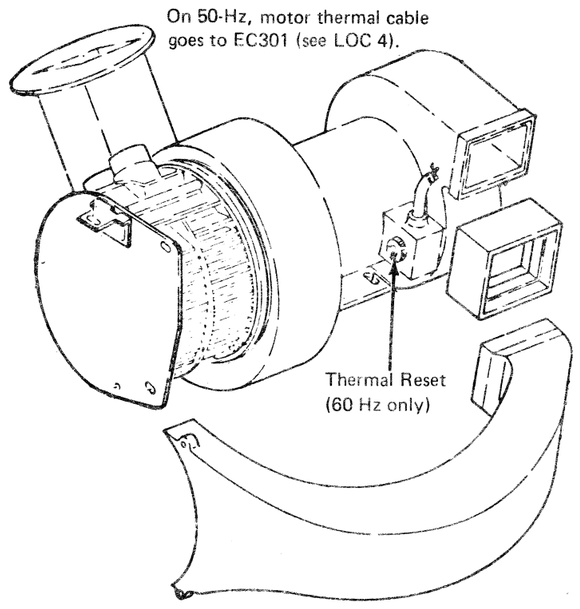
In B-1 and B-2 machines, separation of the heat exchanger and the blower assembly is not possible, without unbolting the adjacent machine frames and disconnecting interconnecting power and signal cables. This need not be done, as the heat exchanger and blower assembly can be removed as a complete unit, by carefully positioning the unit to enable removal.

13 Remove the blower-motor assembly through the front of the machine.

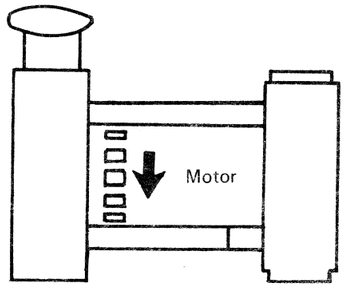
14 For B-1 or B-2 machines, remove the four screws holding the heat exchanger to the blower assembly, and separate the heat exchanger from the blower.







Air Duct



Blower viewed from front

Replacement

Note: *The sequence of the following steps reflects replacement in a model A-2 or C-2 machine. For a model B-1 or B-2 machine, do step 2 prior to step 1.*

1 Position the blower-motor assembly in the machine to the left and replace the heat exchanger to the right.

2 Fasten the heat exchanger to the blower-motor assembly through the gasket with the four screws that were previously removed. Be sure to replace the shockmount bracket under the top left screw.

3 Position the assembly so the rear shockmount and right end shockmount bolts are seated through their mounting flanges.

4 Tilt the assembly back so the front shockmount hole is accessible and replace the shockmount in its hole in the frame. Be sure that it is completely seated; then drop the assembly with the shockmount stud protruding through the front mounting flange.

5 Replace and tighten the three washers and nuts on the shockmount studs. Replace wires onto dc ground bus.

6 Position the air duct boot over the end blower tube, align the other end over the edge of the heat exchanger under the cover, and replace the two screws that hold it in place.

7 From the rear, reconnect the two air coupling hoses to the heat exchanger and reconnect the boot between the blower and the absolute filter.

8 Replace the line filter if previously removed. On 50 Hz machines, reconnect the thermal cable at EC301, EC302; see LOC 4, YA020, or YB020.

9 Route the motor cable to the ac box through the cable clamp and reconnect the cable (three terminals for 60 Hz but six terminals for 50 Hz) to TB205 (YA020, YB020) inside the ac box; see LOC 2. Tighten cable clamp and dress motor cable as a protective cover over T205.

10 Reconnect the ground lug to the ground bus in the bottom of the ac box.

11 Do Performance Check.

12 Replace the machine covers.

13 Exit to START 500.

Performance Check

a. On A-2 machines, restore the ac power to the module and press the PWR ON switch.
If the machine is a B-1 or B-2 module and has been unbolted, reconnect the interface and power cables and replace the frame bolts.

b. Restore power.

c. Ensure that the motor is rotating in the proper direction by examining the cooling slots in the motor as power is applied.

d. If the motor is rotating incorreclty, cut the power and change the wiring at TB205 (see YA020 or YB020). Restore power and recheck Step c.

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CAM DRIVE MOTOR, ABSOLUTE FILTER REPLACEMENT

CAM DRIVE MOTOR

Function

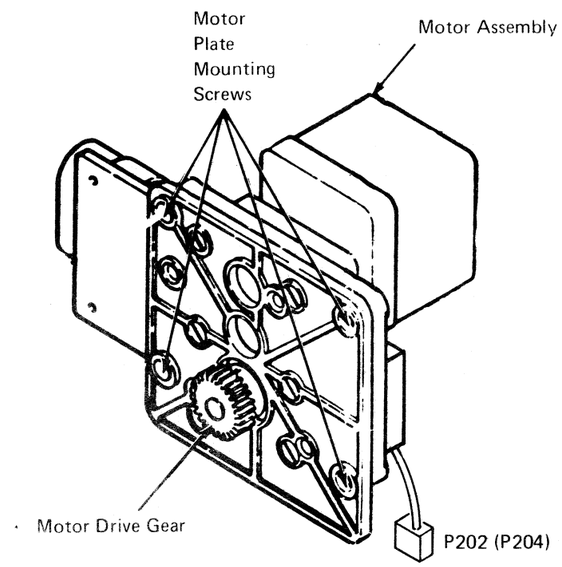
The cam drive motor provides power for the DM loading sequence. The motor drive gear is driven in either direction through a reducing gear box.

Removal

1 Set CE Mode switch to CE and turn off (down) the **24 volt** switch.
2 Remove the shroud (DM 705).
3 Remove the motor cable at P202 (P204).
4 Remove the cable clamp on the ac box.
5 Remove the four motor plate mounting screws. Lift the motor free from the base casting.

Replacement

1 Apply Molykote G* (P/N 357830) to the drive gear.
2 Adjust the cam drive gear teeth, as shown on DM 725.
3 Tighten the four mounting screws.
4 Reinstall the cable clamp on the ac box.
5 Reattach the motor cable to P202 (P204).
6 Return to Common Exit Procedure (DM 705).



ABSOLUTE FILTER

Function

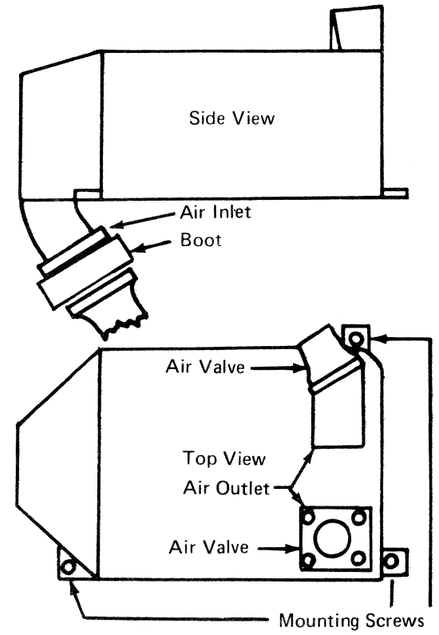
The absolute filter removes small particles and other debris from the closed air circulation system used to cool the VCM and maintain an air cushion between the Read/Write heads and the disk surfaces.

Check

Measure the air pressure differential across the absolute filter with a Slack Tube Manometer (P/N 453500) by making slit in the boot and Air Valve hose, just large enough to insert the manometer air tubes. Differential air pressure across the absolute filter should normally be 1.0" (25,4mm) of water pressure. The filter is dirty or clogged when this pressure is 1.6" (40,64mm) of water. After check is made, remove tubes and make sure that the slits close up and no air is leaking through them. If air leaks through the slits the boot and/or tubing must be replaced.

Removal

1 Remove power from the drive:
Set CE Mode switch to CE.
Press PWR OFF (on A-Box, front panel; on B-Box, CP 210 at rear of ac box).
2 Remove covers to allow access to the filter.
3 Remove the two mounting screws on each of the valve assemblies (only one on the B-1 model). Be sure to save the O-rings for reuse.
4 Remove the three mounting screws that hold the filter to the chassis.
5 Remove the boot on the underside of the filter. The air tube under the VCM can be removed to gain additional clearance.
6 Remove filter:
On an A-2 module – slide the filter out through the side of the machine.
On a B-1 or B-2 module – remove the spindle drive motor on the A-drive (see DM 810), then pull the filter out through the front.



Replacement

1 Replace the filter. See Removal Step 6 for differences between the A and B drives.
2 Replace the boot on the underside of the filter. If the air tube under the VCM was removed, replace it.
3 Install the three mounting screws that hold the filter to the chassis.
4 Position the valve assemblies in place, install O-rings and fasten them with two mounting screws (each).
5 Ensure that all air tubes, couplings, and boots are in place.
6 Replace all covers.
7 Restore power.
8 Exit to START 500.

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SHIELD ASSEMBLY REPLACEMENT

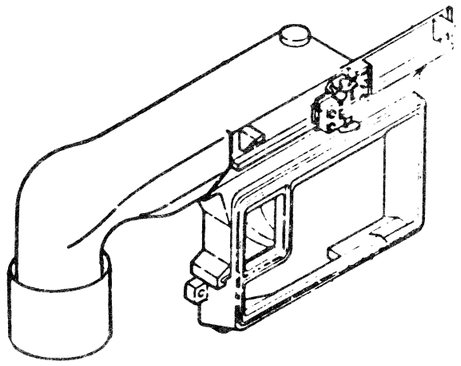
SHIELD ASSEMBLY

Function

The shield assembly contains the home photo cell; the frame; the shaft; the crank; and rack and pinion assemblies; and the alignment ball. These assemblies are used in the DM loading sequence with mechanical actions being driven by the cam drive motor.

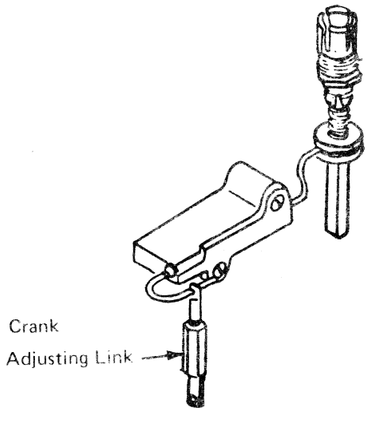
Removal

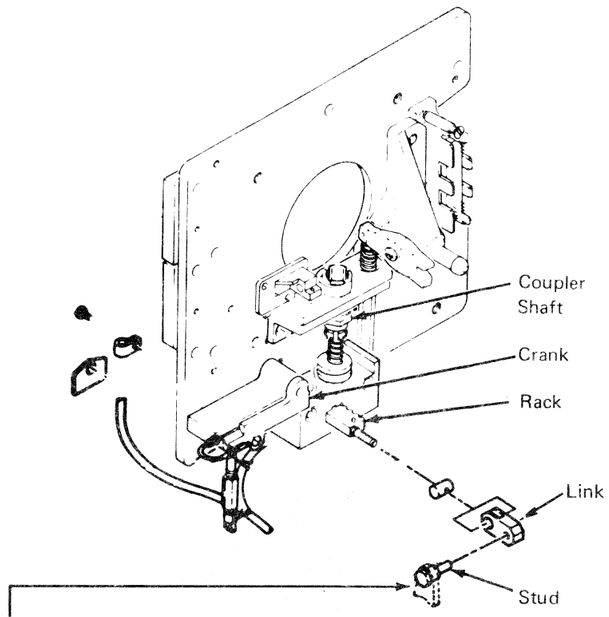
1 Remove the Air Interface, see DM 815.



2 With the CE Index wheel (see DM 700), rotate the camshaft to the loaded (315°) position, lift the bobbin from the shaft assembly, and move it clear of the shaft toward the rear of the VCM.

3 Rotate the camshaft to the unloaded (355°) position; remove the clip and pin from the cam follower end of the crank adjusting link. Remove the crank adjusting link from the crank to prevent it falling off.

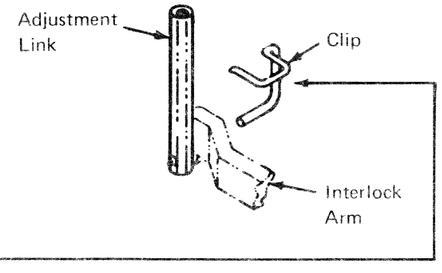




4 Turn the Index wheel to the 40° position, then use a 3/8 inch wrench to remove the stud connecting the cam follower to the rack. The stud access can be improved by loosening the Allen screw and sliding the cart rail toward the front of the machine. It may be necessary to turn the rack adjusting screw to separate the link from the rack.

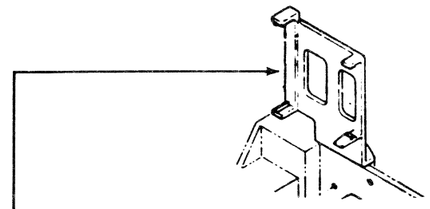
5 Press down the crank until the coupler shaft clears the interlock plate; then push the rack toward the shield plate as far as possible.

Note: Some machines do not have an interlock plate.



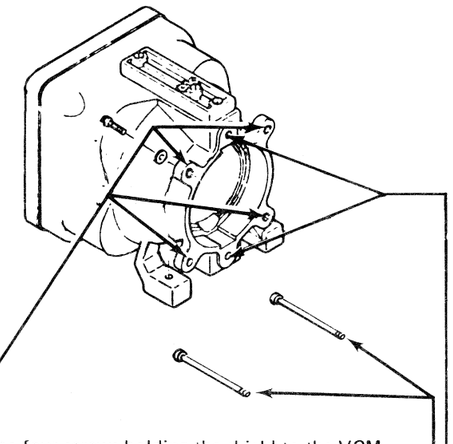
6 With a small screwdriver, pry the end of the adjustment link clip away from the adjustment link and remove and retain the clip.

7 Remove the Read/Write Interface cable and connector from the shield, as shown on DM 805, steps 1–4 only.



8 Remove the card and card bracket from the base casting.

9 Remove and retain the home photocell connector, the EC blocks, and the cable clamp from the shield. These parts will be reused.



10 Remove the four screws holding the shield to the VCM and the two bolts that fasten the shield to the base casting.

11 Carefully separate the shield from the VCM, using care not to damage the alignment pins, and remove the shield plate.

Replacement

1 Position the shield assembly lining up the VCM alignment pin (top and bottom) with the matching holes in the shield.

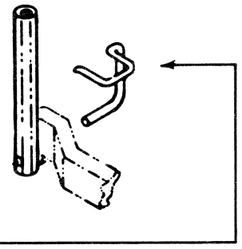
2 Install the four screws that hold the shield plate to the VCM.

3 Replace and tighten the two bolts holding the shield to the baseplate casting.

4 Reinstall the cable clamp, the EC blocks, and the home photocell connector. These parts were removed from the old shield plate.

5 Replace the card bracket on the side of the baseplate casting and install the read/write card.

6 Replace the Read/Write Interface cable and connector, as shown on DM 805.



7 Install the adjustment link clip through the interlock arm and through the adjustment link. Fasten the clip onto the adjustment link. Apply some SBB No. 3 grease to the joint surfaces and the pin.

8 Lift up the crank and position the cart so the coupler shaft can be raised through the opening in the interlock plate (if present).

9 Turn the Index to 40° and insert the cam follower stud through the link to the rack. Tighten the stud with a 3/8 inch wrench. Apply SBB No. 3 to the linkage.

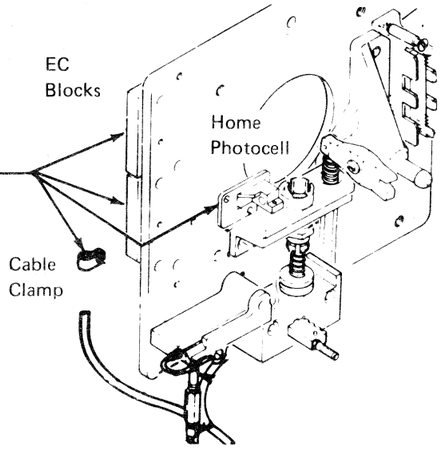
10 If the load cart rail was previously disconnected, reposition it and tighten the set screw.

11 Rotate the index to the unload (355°) position and replace the crank adjusting link on the crank.

12 Replace the Air Interface (DM 815).

13 Make the following checks, adjusting if necessary:
Load Beam (DM 785)
Carriage Latch Actuator (DM 755)
Coupling Driver rotation (DM 765)
Bobbin height (DM 770)
Crank Assembly (DM 775)
Read Only switch (DM 740)

14 Return to Common Exit Procedure (DM 705).



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INTERFACE COUPLING, CRANK, PHOTO CELL REPLACEMENT

INTERFACE COUPLING COMPONENTS

- Shaft Assembly
- Frame Assembly
- Rack and Pinion Assembly

When any of the above assemblies must be removed, they all must be removed.

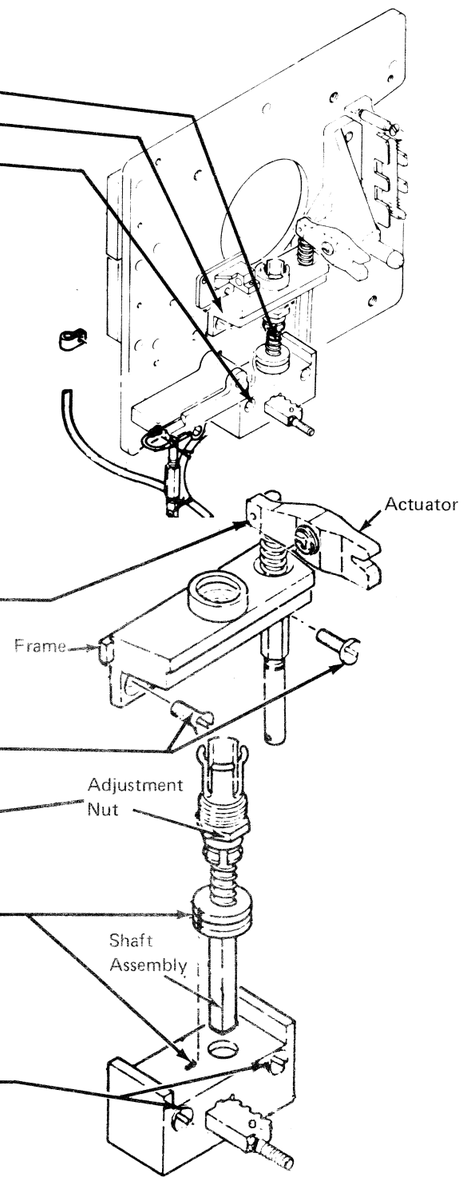
Function

These three assemblies are all involved in the DM load/unload sequence and are mounted on the shield assembly.

Removal

1 Set CE Mode switch to CE and turn off (down) the 24 volt switch.

2 Perform steps 1–6, Shield Assembly Removal on DM 835.



3 Remove the carriage latch actuator C-clip and washer; remove the actuator (DM 865).

4 Remove the frame assembly (two screws).

5 To aid in reassembly, push the rack inward to its limit and mark the drive shaft spool and rack and pinion assembly.

6 Remove the two screws holding the rack and pinion assembly to the shield.

7 Remove the three assemblies from the shield. The shaft assembly can be removed by unscrewing the adjustment nut.

DH0490	2747808	440205	440214	440223				
Seq. 1 of 2	Part No. ( )	28 Jan 74	17 Jun 74	14 Mar 75				

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Replacement

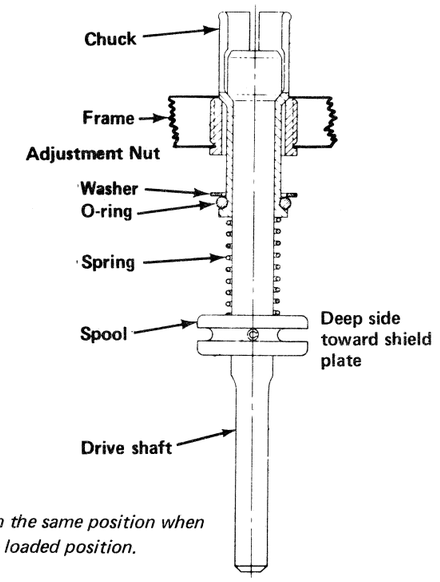
1 Install the adjustment nut on the shaft assembly.

2 Insert the shaft assembly into the frame assembly.

3 Reposition the assemblies on the shield.

4 At the loaded position, ensure that with the rack pushed all the way into the assembly, the shaft is inserted so that the deep groove faces the shield plate. Fasten the rack and pinion assembly to the shield plate (two screws).

As the screws are tightened, ensure that the end of the crank goes into the slot in the rear of the spool on the drive shaft.



This assembly is in the same position when the index is at the loaded position.

5 Apply SBB No. 3 (P/N 2744599) to the spool slot and shaft end.

6 Check that the mark on the shaft assembly coincides with the mark on the rack and pinion assembly made during dissassembly. If a new shaft assembly is used, insert the shaft so the deep groove faces the shield plate when the rack is pushed toward the shield plate to its limit.

7 Reattach the frame assembly (two screws).

8 Replace the actuator on the actuator rod and reinstall the C-clip and washer (DM 865).

9 Perform Steps 7–13 (DM 835). Be sure to do the checks and adjustments, except for the Load Beam and Read Only switch, as shown in DM 835, Step 13.

CRANK ASSEMBLY

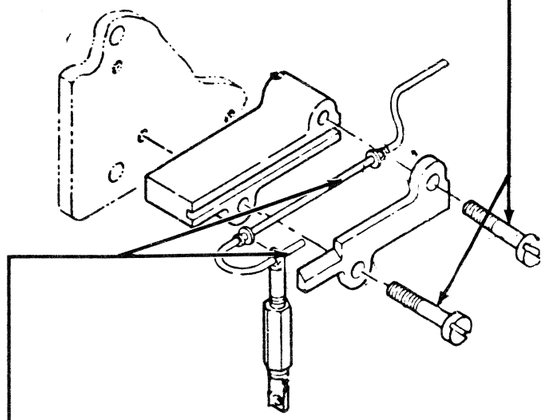
Removal

1 Set CE Mode switch to CE and turn off (down) the 24 volt switch.

2 Remove the shroud and lower trim panel (DM 705).

3 Remove the two screws holding the cover to the crank assembly.

4 Remove the adjustment link from the crank; then remove the crank.



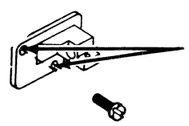
Replacement

1 Put the crank end through the adjustment link and position it in the assembly groove.

2 Apply SBB No. 3 grease in the groove of the assembly; replace the crank cover, and fasten the assembly to the shield plate with two screws. Ensure that the crank link is placed in the slot of the drive shaft spool.

3 Check the crank adjustment (DM 775).

CARRIAGE HOME PHOTOCELL ASSEMBLY



Removal

1 Remove the photocell assembly (two screws).

2 Remove the connector from the circuit board; then remove the assembly.

Replacement

1 Plug the cable onto the new photocell assembly and replace it in the machine using two screws. No adjustment is necessary.

2 Exit to START 500.

VOICE COIL MOTOR, BOBBIN REPLACEMENT

VOICE COIL MOTOR (VCM)

CAUTION
A strong magnetic field exists in the vicinity of the VCM.

Function

The voice coil motor (VCM) positions the bobbin which is coupled to the read/write heads in the DM. It responds to addressing information and moves the read/write heads to the desired track.

Removal

1 Remove the power from the drive:
Set Power Mode switch to CE.
Press PWR OFF on A-Box, front panel;
on B-Box, trip CP 210 at rear of ac box.

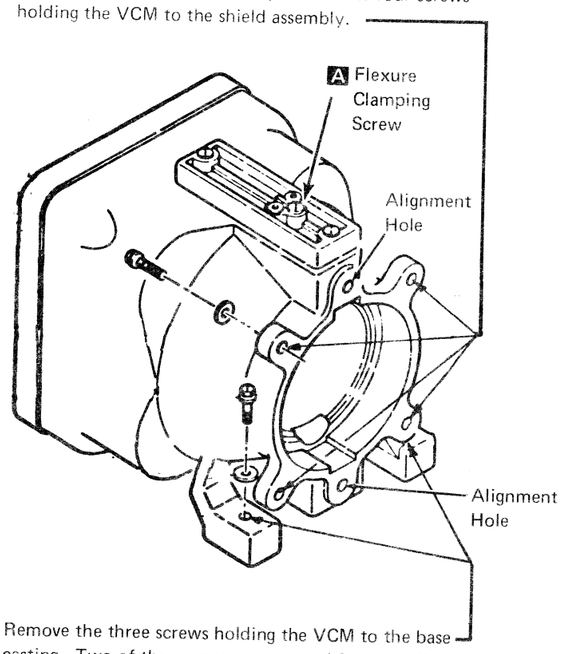
2 Remove the shroud (DM 705).

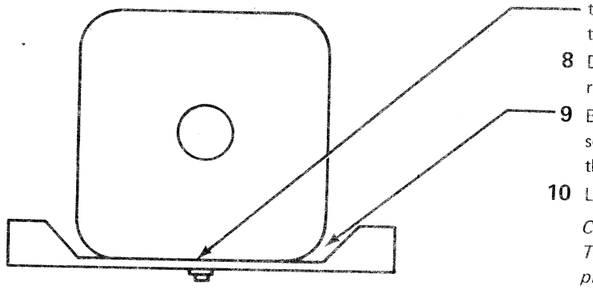
3 Using the CE Index wheel (P/N 2745011, DM 700), attempt to rotate the camshaft to the loaded (315°) position (DM 700).

4 Lift the bobbin from the shaft assembly and slide it into the VCM, so it is clear of the shaft. This step is done only when the data module is removed.

5 Remove the read/write card support bracket from the base casting. Disconnect the cables and move the bracket and card out of the way.

6 From the back of the machine, remove the four screws holding the VCM to the shield assembly.





7 Remove the three screws holding the VCM to the base casting. Two of the screws are removed from the flanges next to the shield assembly. The third screw is below the outside surface of the VCM positioned head-down through the cable trough and baseplate.

8 Disconnect the coil leads from the top of the VCM and remove the cable clamp.

9 Break the VCM free from the shield plate using a large screwdriver under the outside end close to where the third screw was removed.

10 Lift the VCM from the baseplate.

CAUTION
The VCM weighs 29.4 kg (65 lb) and can be handled by placing one hand inside the bore and the other under the rear plate. Be sure to remove your watch to avoid magnetic contamination.

Replacement

1 Using one hand inside the bore and the other under the rear plate, position the VCM on the base casting. Align the two pins with their holes in the shield plate and push the VCM close enough so the screws can be started.

2 Replace the four screws holding the VCM to the shield plate and tighten them.

3 Replace and tighten the three screws that hold the VCM to the base casting, two adjacent to the shield plate and one under the outside end of the VCM.

4 Replace the VCM electrical leads, blue/white on the left side and red/black on the right, as viewed from the rear of the machine. Tighten the cable clamps.

5 Replace the read/write card support bracket and fasten it to the base casting; then plug the connectors correctly to the card.

6 Withdraw the bobbin assembly far enough to be captured by the shaft (DM 705).
The bobbin crosspin must be in a horizontal position before manually unloading the drive. If pin rotation is required, turn the eccentric shaft on top of the bobbin with a screwdriver until it is horizontal.

7 With the CE index wheel, manually unload the drive to the unloaded position (355°).

8 Restore power to the drive.

9 Replace the shroud and exit to Common Exit Procedure on DM 705.

BOBBIN ASSEMBLY

Function

The bobbin assembly is the interface between the VCM and the carriage in the DM. A coupling device latches the bobbin to the carriage during the loading sequence.

Removal

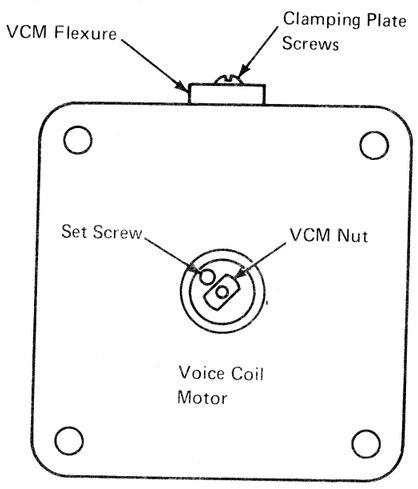
1 Remove the VCM, as shown on this page.

2 Loosen the set screw in the VCM nut.

3 Loosen the flexure clamping screw A and remove the two clamping plate screws.

4 Remove the plate from the VCM.

5 With a 9/16 inch wrench, remove the VCM nut and slide the bobbin assembly out the bore of the VCM.



Replacement

1 Insert the bobbin into the bore of the VCM, routing the flexure leads through the opening at the top of the VCM.

2 With a medium amount of force, tighten the nut on the bobbin shaft; then insert and tighten the set screw.

3 Insert the flexure into the clamping plate aligning the flexure edge with the registration marks on the bottom of the plate. Tighten the clamping screw.

4 Fasten the flexure clamping plate to the VCM with two screws.

5 Replace the VCM, using the procedure on this page.

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BOBBIN REMOVAL FROM CARRIAGE AFTER UNCOUPLING FAILURE

DM 353

A

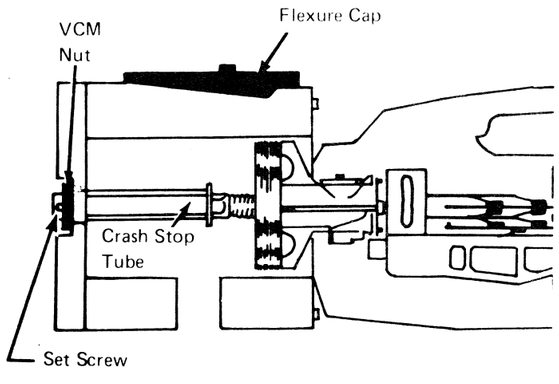
DM cannot be removed because of a failure to uncouple from the bobbin.

The internal pilot shaft pin may be bent or broken. This failure is identified by:

1. Drive stalls in the unload cycle (130° – 215°).
2. Bobbin still attached to carriage although cam-operated uncoupling is complete.
3. There will be some looseness between the bobbin and the carriage because the latching load has been relieved, but the cross pin has not rotated to match the slot in the latch plate. Verify the cross pin looseness with the bobbin push rod.
4. If plastic cam in pilot shaft is broken, there may not be any cross pin looseness.

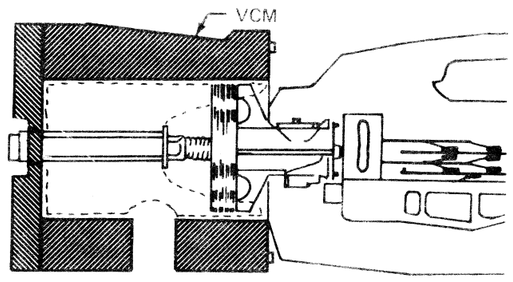
Bobbin Removal (uncoupling failure only)

1. Remove power from the drive:
   Set Power Mode switch to CE.
   Press PWR OFF (on A-Box, front panel;
   on B-Box, CB 210 at rear of ac box).
2. Install the CE index wheel (see DM 700) and rotate the camshaft to the fully loaded (315°) position. If CE index wheel cannot be turned to unloaded position, remove the crank link from the rear of the machine. Pull link upward to free bobbin from drive shaft. Turn CE index wheel to loaded position.
3. Remove the flexure cap (top of VCM); loosen setscrew in nut and remove the nut at the rear of the VCM, while holding the crash stop tube.

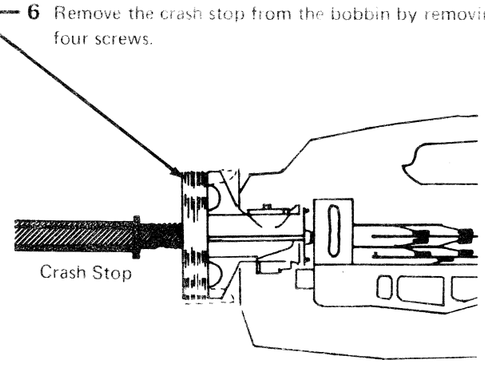


4. Remove the seven 1/4" screws holding the VCM to the shield plate and base casting (DM 845) VCM removal, steps 6 and 7.
5. Remove VCM from around the bobbin by sliding VCM directly backwards (take care not to damage the bobbin) and lift it off the base casting (DM 845) VCM removal, steps 9 – 10.

   CAUTION
   Avoid applying external force or a twisting motion to the bobbin to prevent damage to the heads and disks.



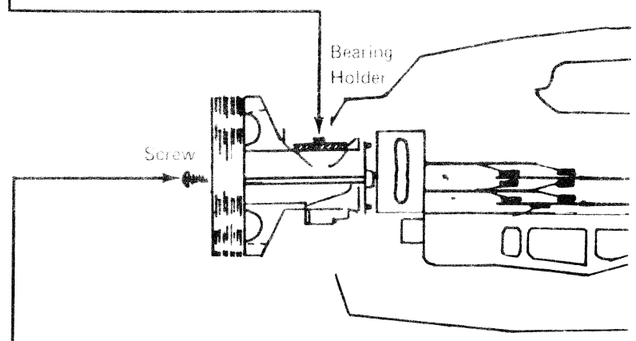
6. Remove the crash stop from the bobbin by removing four screws.



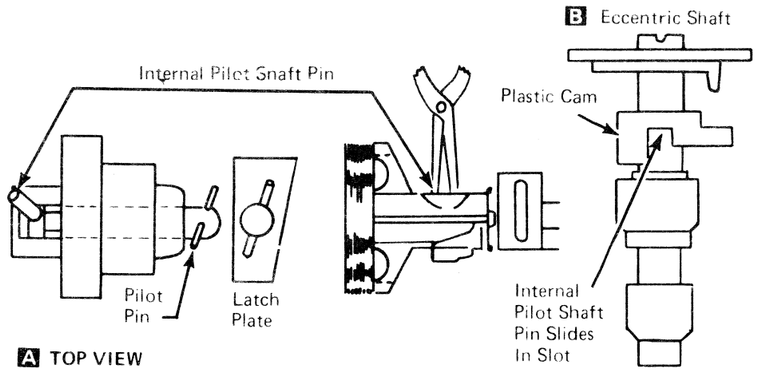
7. Move the bobbin/carriage assembly to the rear as far as possible; then turn the CE index wheel to 280°.

8. While supporting the bobbin from the bottom with your hand, remove the two screws that fasten the bearing holder to the bobbin. Remove the eccentric shaft **B** assembly through the bobbin top.

   CAUTION
   Avoid applying external force or a twisting motion to the bobbin to prevent damage to the heads and disks.



9. Install a 4-40 x 3/4" screw from the rear crash stop bore into the tapped hole in the bobbin bulkhead.
10. Turn the screw until it contacts the pilot assembly sleeve and relieves the coupling latch force.
11. With a needlenose pliers, turn the coupling pilot shaft **A** 45° and remove the bobbin from the carriage. The pilot pin now lines up with the slot in the latch plate.



12. Manually push the carriage back to home position and latch it. Unload the Data Module.
13. Replace the bobbin assembly (DM 845). A Field B/M is available with the eccentric shaft and Pilot assembly to rebuild the bobbin assembly.

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LOAD ASSEMBLY REPLACEMENT

LOAD ASSEMBLY

Function

This assembly includes the cam drive, load cart, door cart, and door link assemblies. Its function is to perform the mechanical actions required to load and unload the DM.

Removal

1 Remove power from the drive:
Set CE Mode switch to CE.
Press PWR OFF on A-Box, front panel and trip CP210 on B-Box, at rear of ac box).

2 Remove shroud and lower appearance panel (DM 705).

3 Remove the cam drive motor (DM 830).

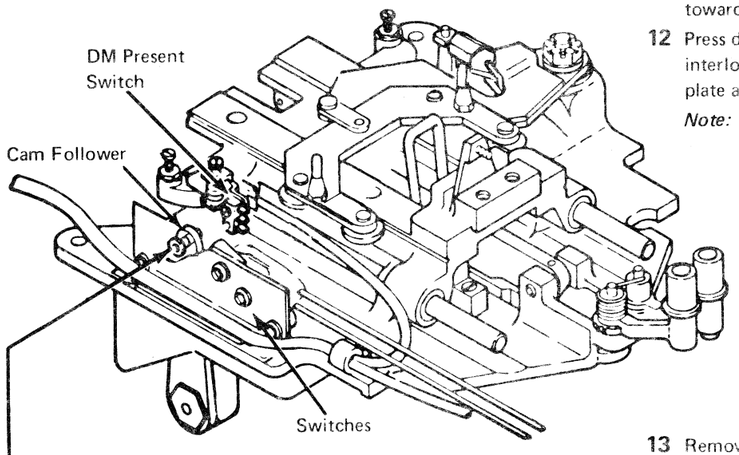
4 Remove the spindle drive belt (DM 815).

5 Install the CE index wheel on the cam shaft and turn it to the loaded (315°) position (DM 700).

6 Lift the bobbin from the shaft assembly and move it back into the VCM so it is clear of the shaft assembly.

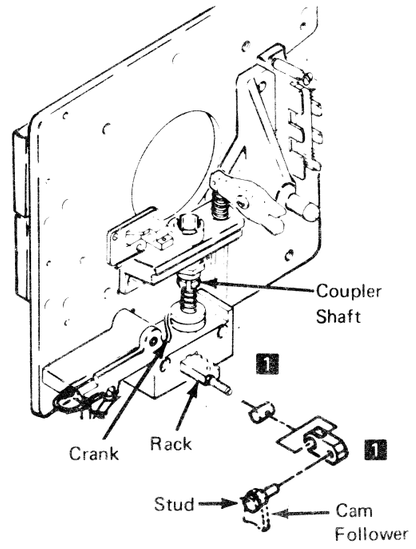
7 Disconnect and remove three switches; DM Loaded, DM Unloaded, and Bias Disable. These are not reused; the replacement assembly contains these switches already attached and adjusted. The cable clamps are also removed.

8 Disconnect the wires from the DM Present switch.



9 Remove the air valve cable hold-down screw located near the cam follower (DM 820).

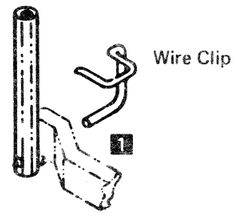
10 Remove the E-clip and pin from the air valve cable ends; then remove the cam follower crank linkage — do not lose the nylon washers (DM 820).



11 Turn the Index wheel to the 40° position; then use a 3/8 inch wrench to remove the stud connecting the cam follower to the rack. The stud access can be improved by loosening the Allen screw and sliding the cart rail toward the front of the machine.

12 Press down the crank until the coupler shaft clears the interlock plate; then push the rack toward the shield plate as far as possible.

Note: Some machines do not have an interlock plate.



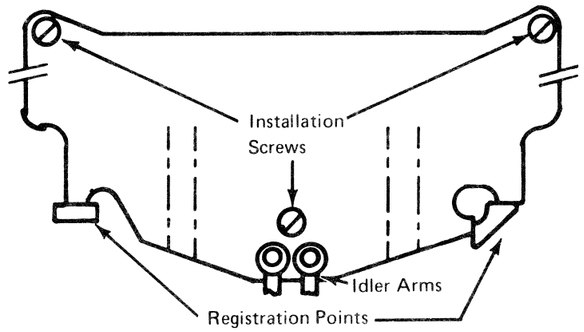
13 Remove the wire clip holding the interlock arm to the latch actuator adjustment link. A small screwdriver can aid in unlatching the wire clip.

14 Turn the index wheel to 120° and remove the three screws holding the load assembly to the base casting; then remove the index wheel.

15 From the front of the drive, remove the load assembly.

Replacement

1 From the front of the drive, place the load assembly on the base casting so the three registration points are in alignment. Install the Index wheel and turn it to 120° then install the three screws that hold the load assembly to the base casting.

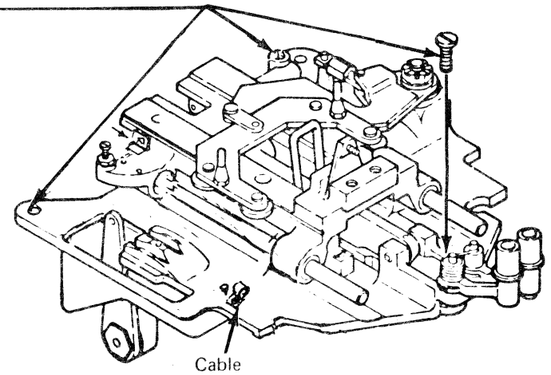


2 Replace the wire clip through the interlock arm and adjustment link after applying a small amount of SBB No. 3 grease (P/N 2744599) 1. The wire clip is held in place by lifting the hook around the adjustment link. A small screwdriver may be required to position the hook.

3 Turn the Index to 40° and insert the cam follower stud through the link to the rack. Tighten the stud with a 3/8 inch wrench. Apply SBB No. 3 grease to the linkage 1.

4 Reinstall the cam follower crank link (DM 840).

5 Replace the E-clips and pin into the air valve cable.



6 Replace the air valve cable hold-down screw near the cam follower (DM 720).

7 Reconnect the wires to the DM Present, DM Loaded, DM Unloaded, and Bias Disable switches.

8 Turn the Index wheel to the Loaded (315°) position and pull the bobbin forward from the VCM so it aligns with the shaft assembly.

9 Replace the spindle drive belt (DM 815).

10 Replace the cam drive motor (DM 830).

11 Make the following checks. All items may require adjustment except those marked with a bullet. However, all should be checked:

Load Beam (DM 785).
- DM Loaded, DM Unloaded, Bias Disable switches (DM 730). Door Pin (DM 790).
- Shroud Screw sleeves (DM 750).

Air Valve cables (DM 720).
Crank Assembly (DM775).
Coupling Driver rotation (DM 765).
Carriage Latch Actuator (DM 755).
- Load Cart travel adjustable on earlier drive (DM 780).

12 Proceed to Common Exit Procedure on DM 705.

1 Lubricate with SSB No. 3 grease, P/N2744599

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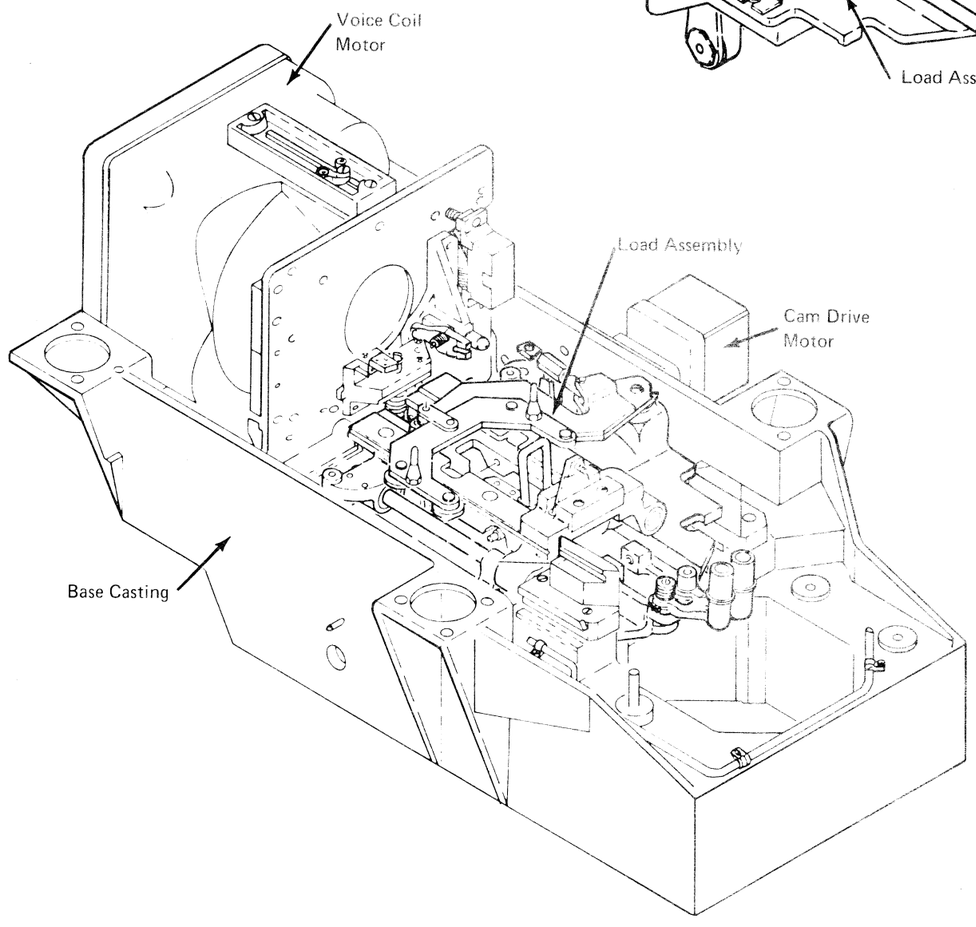
CAM DRIVE REPLACEMENT

CAM DRIVE ASSEMBLY

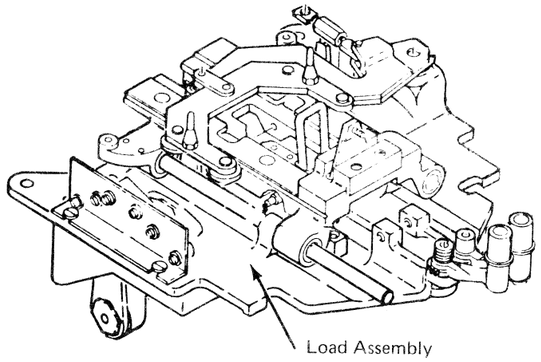
Function

This assembly includes the main camshaft, the toggle link, and the cam base assembly. It serves as a mounting base for the cams and cam followers that perform the mechanical operation sequencing during the load or unload process.

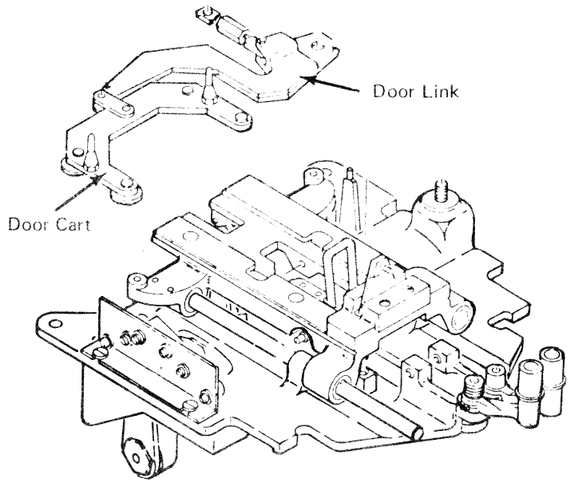


Removal

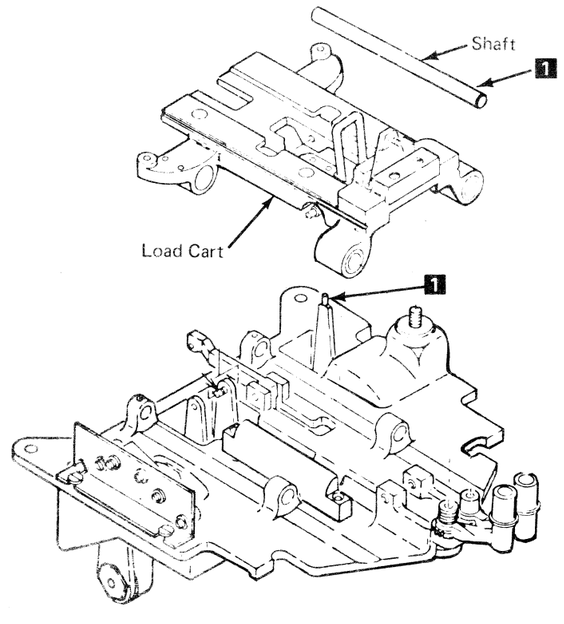
1 Remove the load assembly (see DM 850) and place it on a convenient working surface.



2 Remove the door cart and door link (DM 860).

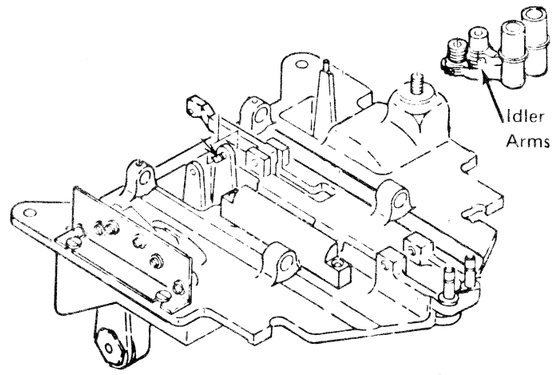


3 Remove the load cart assembly (DM 860).

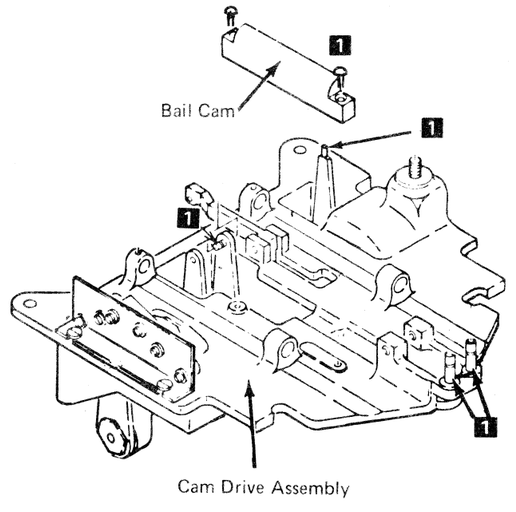


1 Lubricate with SBB No. 3 grease, P/N 2744599.

4 Remove the idler arm assemblies (DM 815)



5 Remove the bail cam (two screws).



Replacement

1 After applying a small quantity of SBB No. 3 grease 1 to the cam cavity, replace the bail cam (two screws).
2 Replace the Idler Arm assemblies (DM 815).
3 Replace the Load Cart assembly (DM 860).
4 Replace the Door Cart and Door Link (DM 860).
5 Replace the Load assembly in the drive (DM 850).
6 Exit to START 500.

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LOAD CART, DOOR CART AND LINK ASSEMBLIES REPLACEMENT

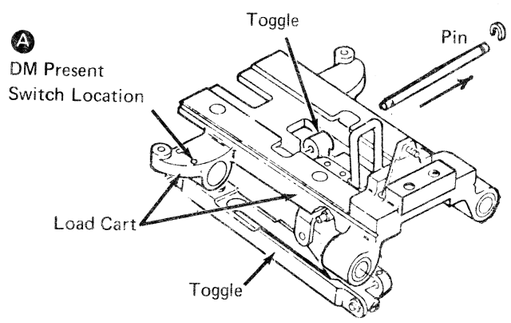
LOAD CART ASSEMBLY

Function

The load cart moves the data module during the loading and unloading processes. A bail locks to the DM stud to ensure DM alignment with the drive interface. Caution should be observed as the load bail exerts over 100 pounds of pressure.

Removal

1 Remove shroud and lower trim appearance (DM 705).
2 Remove spindle drive motor (DM 810).
3 Separate the toggle linkage from the load cart by removing the 2 C-clips and the pin. Slide the pin out of the right side of the load cart.

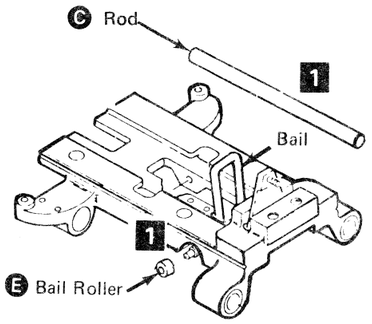


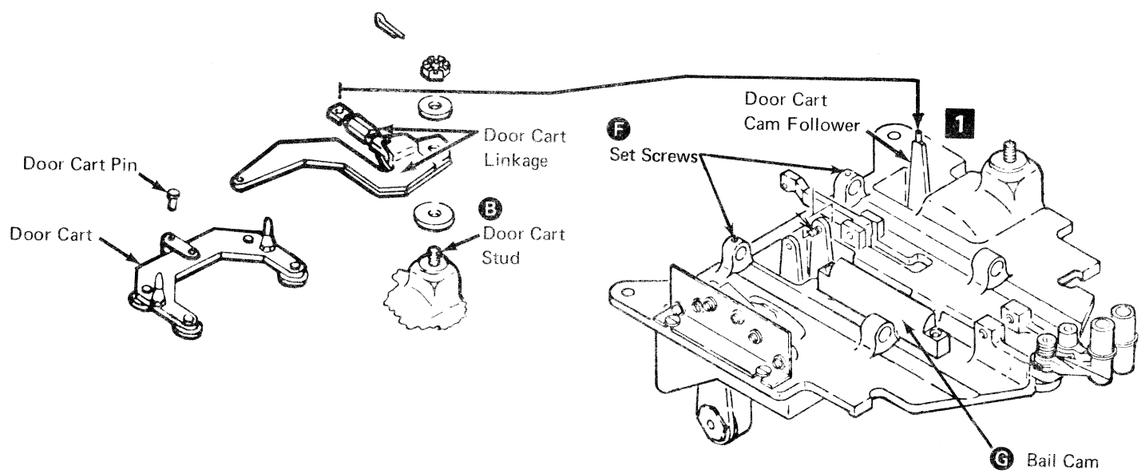
4 Remove the cotter pin, nut, and washer from the door cart stud bolt Ⓑ.

5 If the entire assembly is being replaced, remove the DM Present switch (two screws) Ⓐ.

6 Loosen the two set screws Ⓕ and slide the rods Ⓒ toward the front of the drive.

7 Remove the load cart and its attached door linkage by lifting them up and to the right. In disengaging the bail Ⓓ from the bail cam, be sure to recover the roller Ⓔ that rides in the cam — it will be reused.





Replacement

1 Reposition the load cart in line with the shaft housings.
2 Insert the roller over the bail follower shaft after applying a small quantity of SBB No. 3 grease 1 in the follower and on the shaft. Slide the bail follower into the cam slot. Be sure that the door link is on the actuating cam follower as the load cart is positioned.
3 Slide the two shafts, coated with SBB No. 3 grease 1 through the bushings in the door cart and the load assembly. Tighten the two set screws.
4 Reinstall the DM Present switch (two screws).
5 Apply a small amount of SBB No. 3 grease 1 to the door link stud and replace the washer, castellated nut, and cotter pin. Do not overtighten the nut.
6 Replace the toggle link pin, coated with SBB No. 3, 1 sliding the pin in from the right and engaging the toggle. Reinstall the C-clips on the ends of the pin.
7 Reinstall the spindle drive motor (DM 810).
8 Replace the lower appearance panel (DM 705).
9 Readjust the following:
Load Beam (DM 758);
DM Present switch (DM 745);
Shroud height screws (DM 750);
Load Cart travel (DM 785 — early drives only).
10 Proceed to Common Exit Procedure, DM 705.

DOOR CART AND DOOR LINK

Removal

1 Remove Load Cart using the procedure on this page.
2 Separate the door cart from the door link by removing the E-clip and pin. Either the door cart or door link can now be removed.

Replacement

1 Replace the pin and refasten the E-clip holding the two pieces together.
2 Reposition the door link (apply SBB No. 3 grease 1 to both surfaces) over the cam follower arms on the right end.
3 Replace the load cart with the door link over the cam; then check the adjustments shown in Replacement Step 9 on this page.
4 Proceed to Common Exit Procedure, DM 705.

1 Lubricate with SBB No. 3 grease, P/N 2744599

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LATCH ACTUATOR, ROD ASSEMBLY

CARRIAGE LATCH ACTUATOR ROD ASSEMBLY

Function

The carriage latch in the DM prevents the carriage from moving except when loaded into the drive. The final act in the loading process consists of releasing the carriage after it has been linked to the VCM. This carriage release is activated by the carriage latch under control of the interlock cam. Refer to the load checkout procedure on DM 420 and the unload checkout procedure on DM 510.

Removal

1 Set CE Mode switch to CE and turn off 24 volt switch.
2 Remove the shroud and lower appearance panel (DM 705).
3 Install the CE Index wheel (DM 700) and turn the camshaft to the loaded (315°) position. Lift the bobbin from the shaft and move it clear of the shaft toward the rear of the VCM.
4 With a small screwdriver, remove the hook portion of the clip connecting the adjustment link to the interlock arm. Remove and retain the clip; it will be reused.
5 Unscrew the hexagonal adjustment link from the threaded rod.
6 Remove the carriage latch actuator using the procedure on this page.
7 Lift the rod out of the frame (mounted on the shield plate). Retain the spring and washer for reuse (these may not come out with the rod).

Replacement

1 Install the rod with the spring and washer in the frame assembly.
2 Screw the hexagonal adjustment link about ten turns onto the rod.
3 Install the carriage latch actuator using the procedure on this page.
4 Turn the camshaft to the loaded (315°) position; then pull the bobbin from the VCM onto the shaft assembly. The bobbin crosspin must be horizontal before unloading the drive (DM 705).
5 Turn the camshaft to the unloaded (355°) position.
6 Reinstall the trim panel and shroud (DM 705).
7 Check the Carriage Latch adjustment (DM 755).
8 Proceed to the Common Exit Procedure on DM 705.

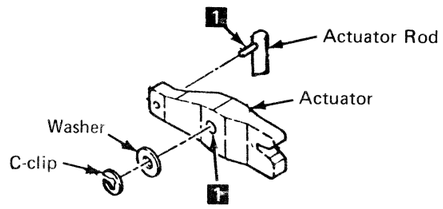
CARRIAGE LATCH ACTUATOR

Removal

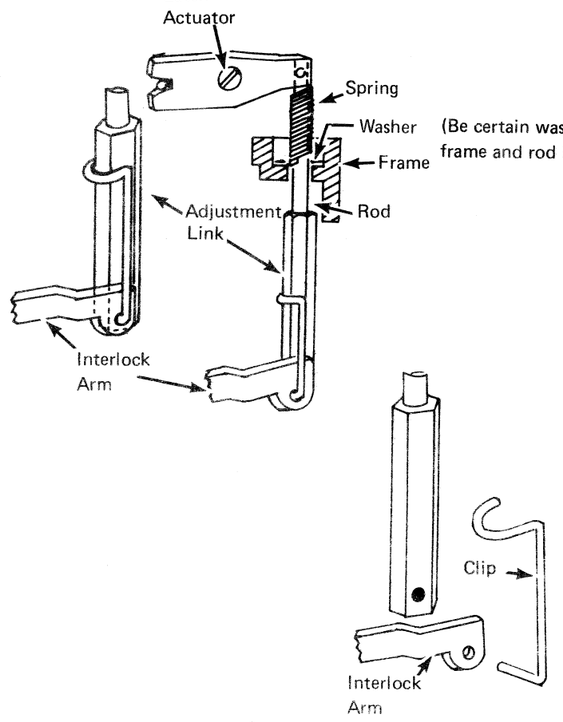
1 With the CE Index wheel, rotate the camshaft to the loaded (315°) position; then lift the bobbin from the shaft assembly and move it clear of the shaft toward the rear of the VCM.
2 Remove and retain the C-clip and washer from the pivot pin; these will be reused.
3 Remove the latch actuator.

Replacement

1 Replace the latch actuator on the pivot pin and with the actuator rod pin in the rear hole. Apply a small amount of SBB No. 3 grease [1] to both pins.
2 Replace the washer and C-clip on the pivot pin.
3 Check the carriage latch actuator adjustment (DM 755).
4 Proceed to Common Exit Procedure, DM 705.



[1] Lubricate with SBB No. 3 grease, P/N 2744599



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DATA MODULE CONNECTOR REPLACEMENT

R/W 340
A

NOTE: The DM must remain clean for satisfactory operation. When servicing the DM, be careful to keep contaminants to a minimum:

1. *Do not smoke while the DM door is open.*
2. *Do not open the DM in a dusty environment.*
3. *Do not breathe into the DM. (The condensation of moisture can damage the disk surface and heads.)*
4. *Do not leave the door open.*

Function

The connector transfers signals to and from the DM. If it is worn or otherwise damaged, it is designed to be replaced without permanent wiring replacement.

Removal

1 The door is opened by releasing two catches in the bottom of the DM. Use an Allen wrench or some other blunt object on the catches and slide the door down into the bottom. Do not use a pencil or other brittle objects, as contamination can result.

Once the door catches are released, the opening can be kept at a minimum by keeping the door up but not latched, except when actual access is required.

2 Loosen the two captive cap screws in the interface connector.

3 Hold the connector in your hand and remove only the head lead plugs **A**.

4 Transfer the model-size jumper (lower six pins) from the old connector **B** to its replacement.

5 Jumper connections vary for the 35 Mb and the 70 Mb models as shown, see R/W 350.

Replacement

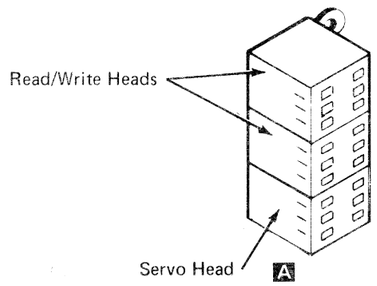
1 Replug the head beginning just above the model-size pins (lower six) and working up.

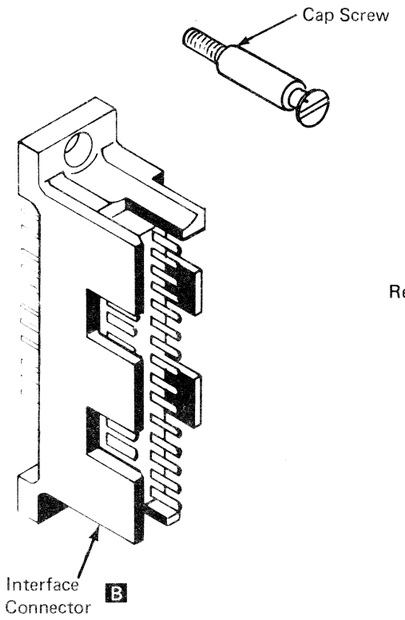
2 Remount the connector.

3 Check the connector continuity; see R/W 340.

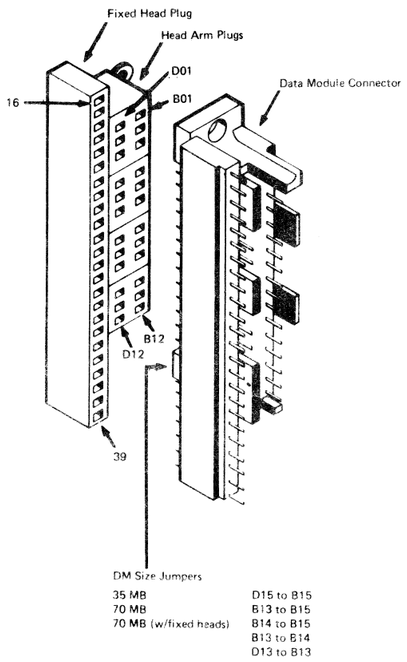
4 Close the door and run the diagnostic Routines B1 and OLTS T3340-PSA and T3340-PSB.

35 Mb CONNECTOR

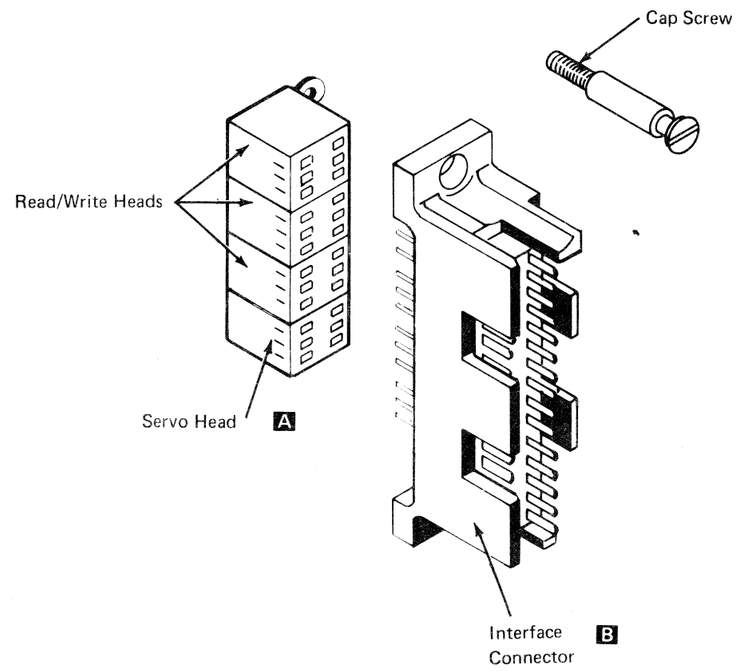




70 Mb FIXED HEAD CONNECTOR



70 Mb CONNECTOR



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DATA MODULE DOOR REPLACEMENT

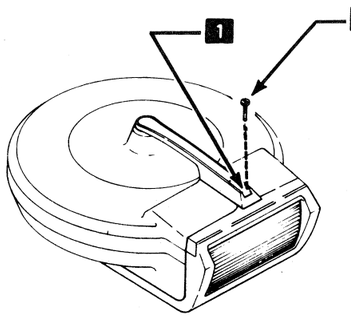
CAUTION: Alert the customer personnel that any data residing on the Data Module to be repaired, that they desire to save, must be dumped to another storage medium, prior to beginning the repair procedure.

REPLACEMENT PROCEDURE

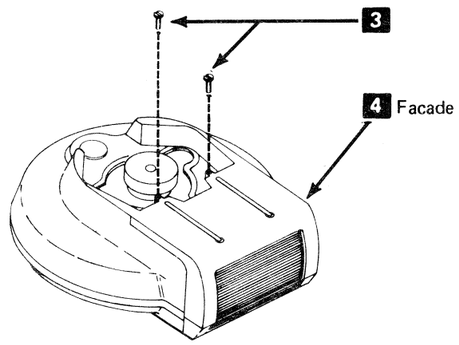
This procedure is for IBM 3348 Data Module Door assembly PN 2746060.

CAUTION: The repair must be performed in a clean work area, free from exposure to dust, smoke, or other airborne contaminates. Use care to avoid introducing chips, dust, or other particles from the door assembly, into the Data Module. Do not touch the disk surfaces with bare fingertips or allow the inside of the Data Module to be exposed any longer than required to accomplish door replacement.

1. Rotate the "READ ONLY" lever **1**, to expose the screw **2** fastened into the facade of the Data Module and remove the screw.



2. Turn the Data Module over and remove two (2) flat head screws **3** from the bottom side of the facade.



3. Remove the facade **4** from the Data Module.

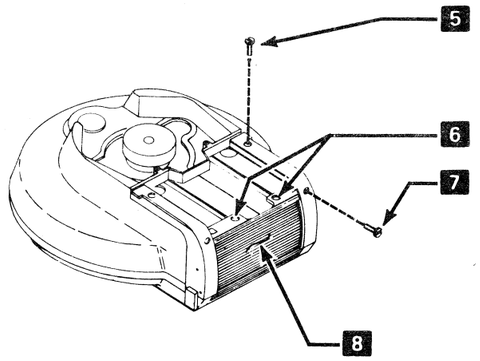
4. Turn the Data Module upside down.

5. Remove the indicated screw **5** at the open end of the door track.

6. Release both door latches **6**, and slide the door to the open position.

7. Remove the indicated screw **7** exposed at the track corner.

8. Carefully move track to the side and remove the door.



9. Insert the new door assembly P/N 2746060 **8**.

   CAUTION: When re-installing the screws in the following steps, use care not to overtighten.

10. Insert screw **7** at the track corner. Do not tighten.

11. Slide the door toward the closed position, and insert screw **5** at the open end of the door track. Ensure that the door assembly does not bind while traveling from the open to the closed position.

12. Tighten screws **5** and **7**. Recheck the door for binds.

13. Close the door, and ensure that the door latches **6** snap into place to hold the door closed.

14. Replace the Data Module facade **4** by reversing steps 1 through 3. Tighten screws **2** and **3**.

15. Go to MLM page DM 535, and follow the IBM 3348 Data Module Checkout procedure, to verify that the Data Module is functioning properly, before returning the Data Module to the customer.

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RPI CONTENTS

Index MAPs – – – – – – – – – – – – **RPI 100–123**

Provide maintenance procedures for Index detection problems.

Index Detection Theory – – – – – – – **OPER 126**

High-level theory of "even" and "odd" index detection.

RPS MAPs (Feature) – – – – – – – – **RPI 500–605**

Provide maintenance procedures for problems relating to Rotational Position Sensing circuits.

Rotational Position Sensing Description – – – – – – – – – – **OPER 250, 251**

High-level theory of operation for the RPS feature.

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INDEX CHECK/ACTIVE TRACK

INDEX CHECK

Index check indicates that an invalid Index pattern is detected while Set Read/Write is active.

Refer to RPI 102 for a description of Index decoding.
See OPER 126 for Index Detection theory.

ACTIVE TRACK

Active Track (present for 10 m s) 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.

Valid Index Even Bit Pattern = 1011

Valid Index Odd Bit Pattern = 1101

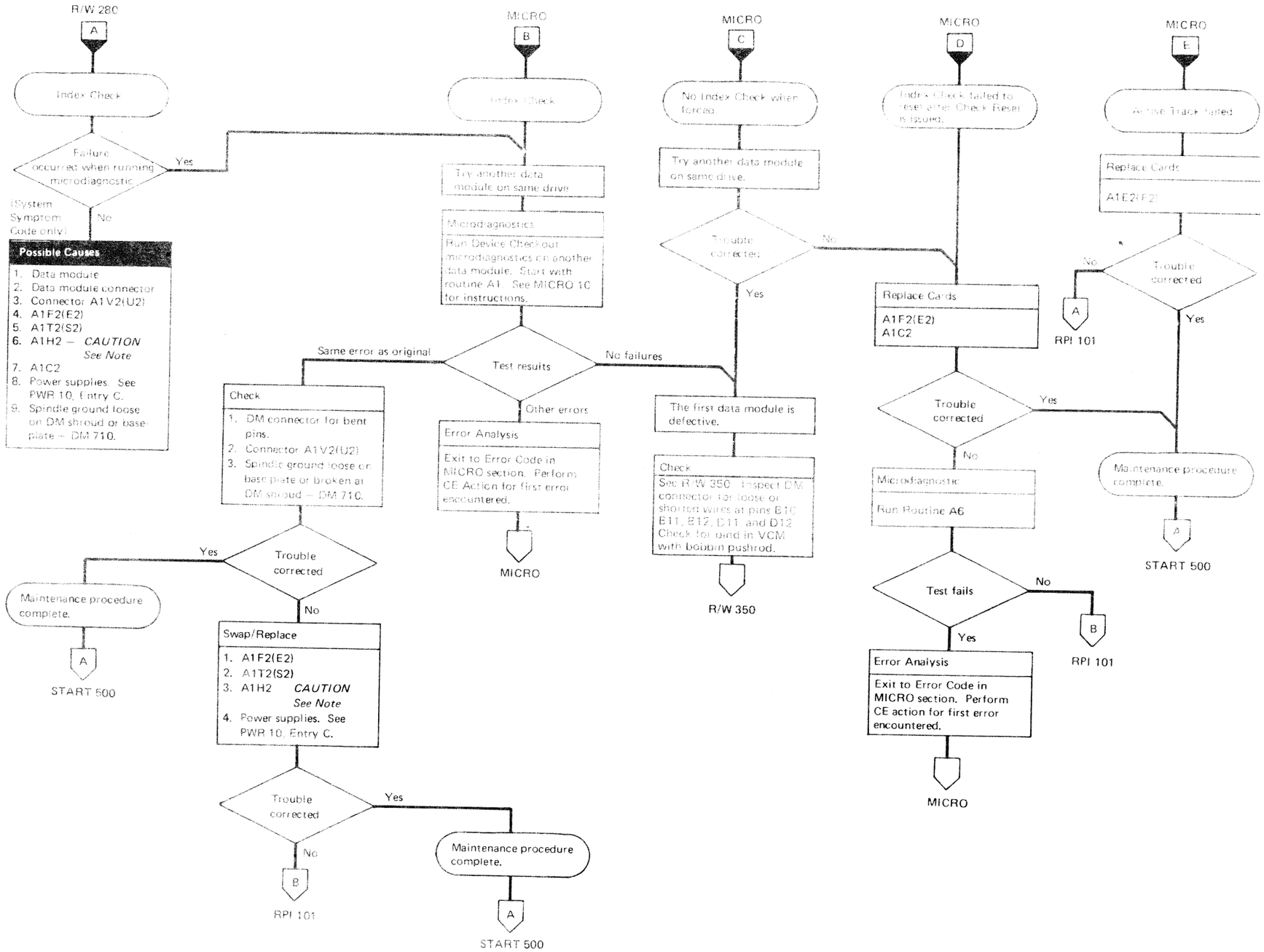
Refer to RPI 102 for a description of Index decoding.

INDEX

Index occurs each 9.8 – 10.4 ms and is 8 – 10 μs wide. When Set Read/Write is active, Index is indicated by RD/WR Status Bit 6.

CAUTION

Note: R/W and PLO signals are terminated by resistors on the A1J2 and A1H2 cards through jumpers on the A1 board of the last module in the string. Removal of the A1J2 or A1H2 cards in the last module causes R/W failures in other modules. As a precaution to prevent data checks, the customer should be prevented from using any of the drives in the string while these cards are removed or replaced in any module even though power is turned off in that module.



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INDEX CHECK/ACTIVE TRACK

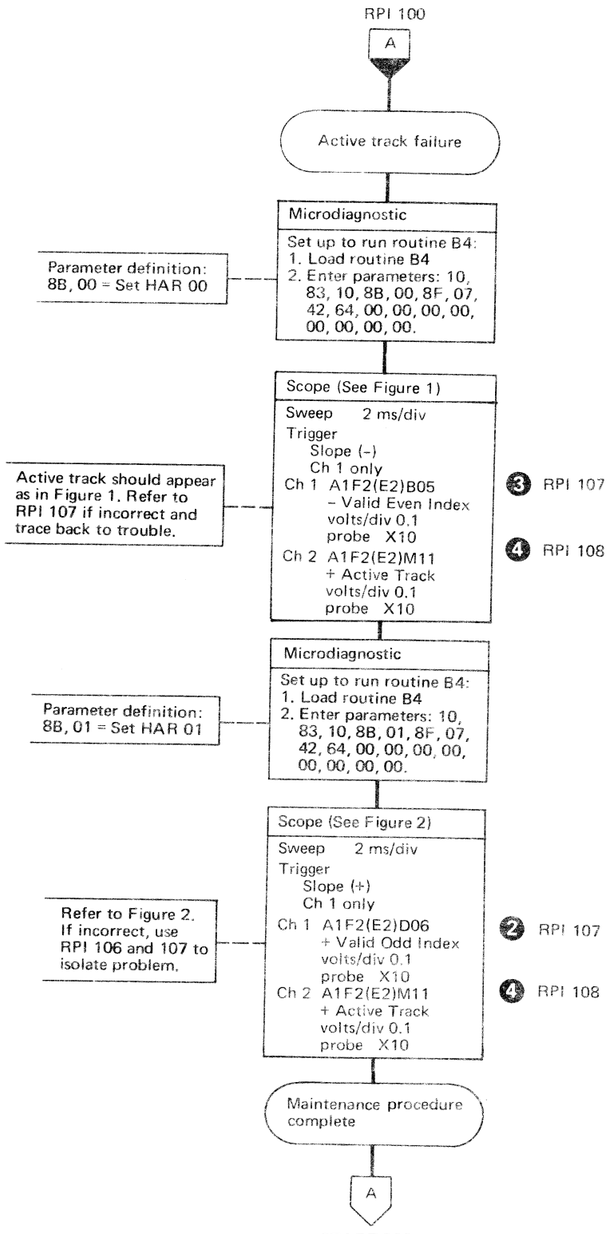


Figure 1.

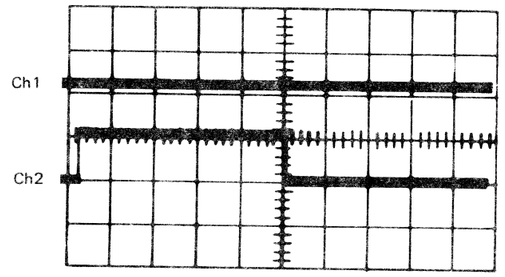
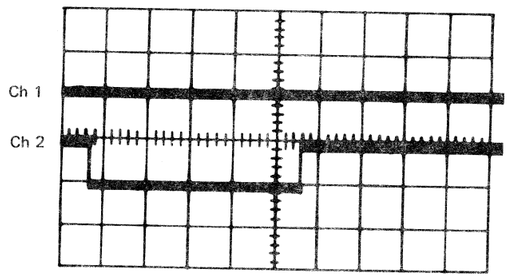


Figure 2.



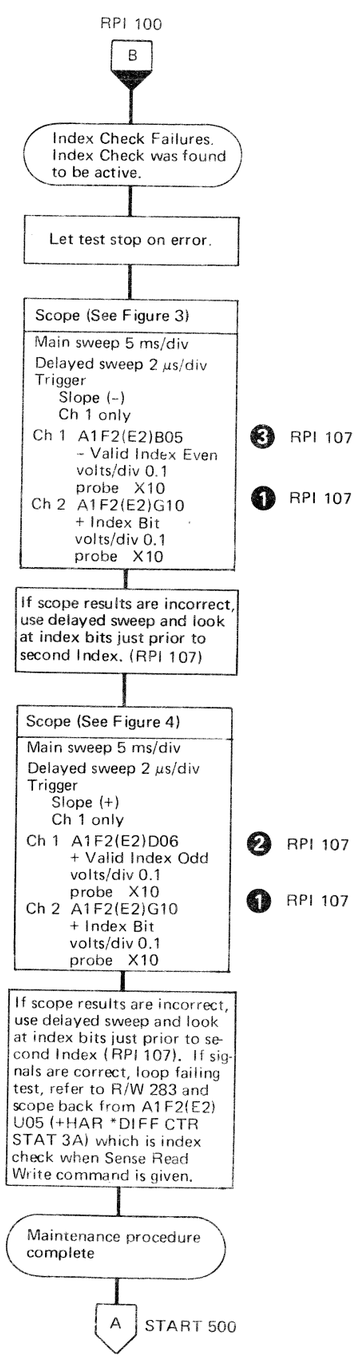


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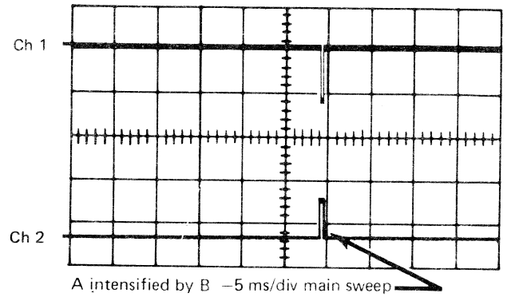
Figure 3. 1011 (Even Index pattern)



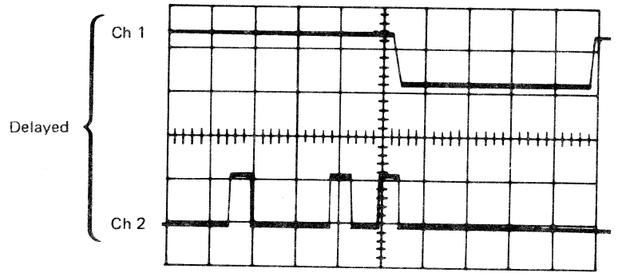
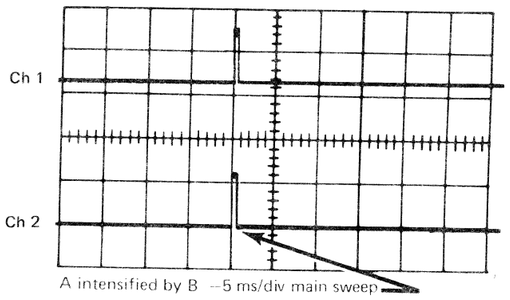
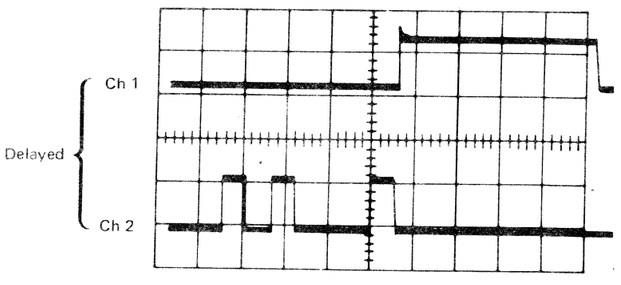


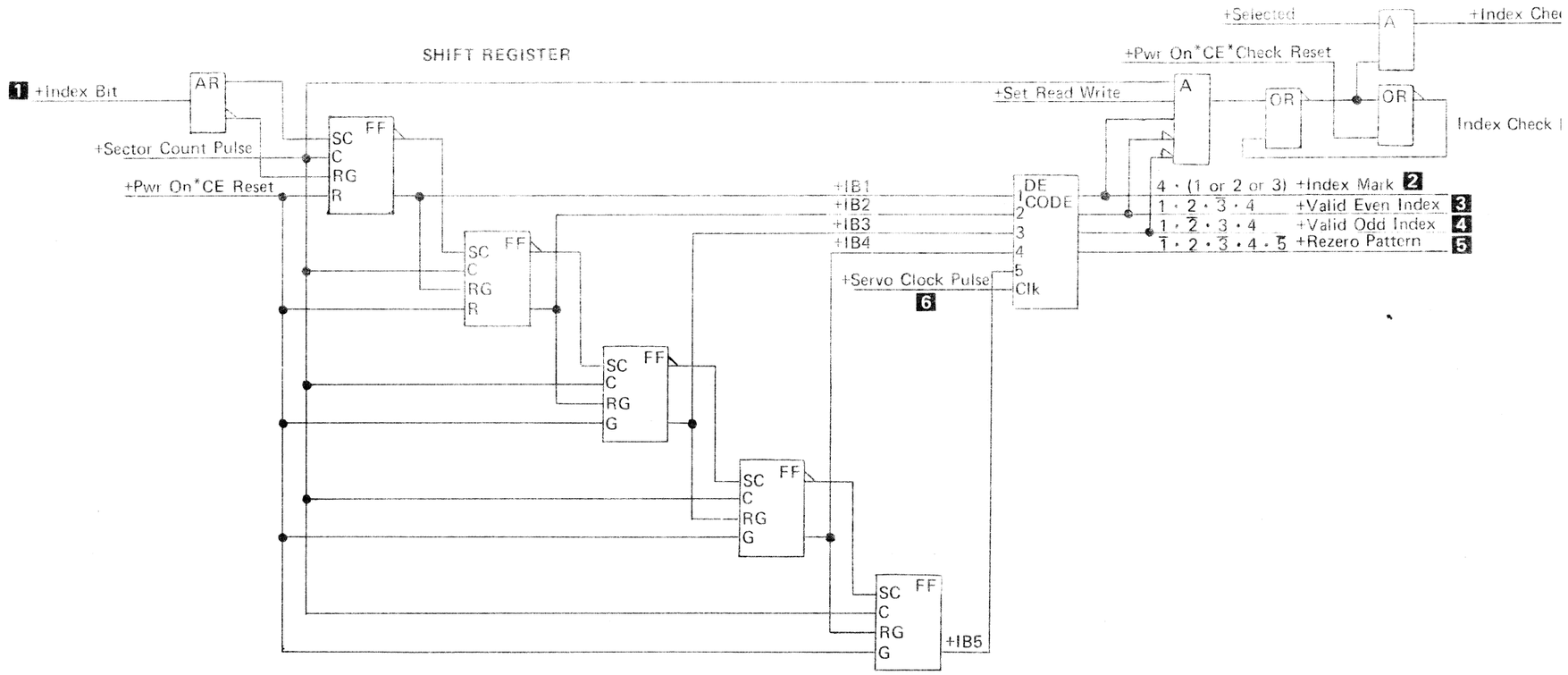
Figure 4.



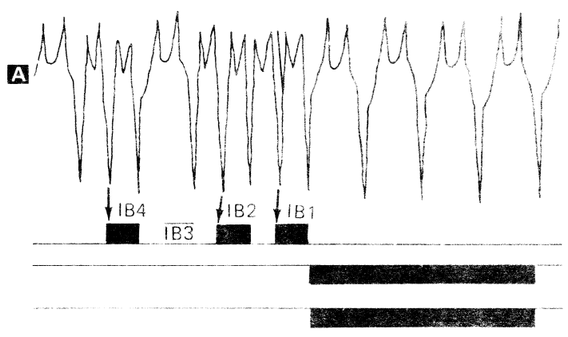


INDEX CHECK/ACTIVE TRACK

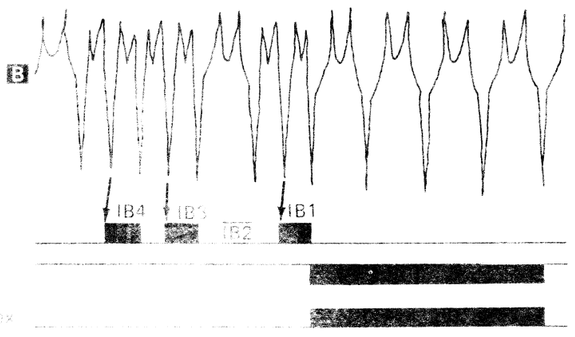
- Index check is triggered if invalid pattern of Index pulses were detected.
- Index is generated by writing a special servo pattern of Even Index **A** or Odd Index **B** with additional sync bits.
- There are two Indexes per disk rotation, each 180° apart.
- The Servo Amp separates the extra sync bits and generates the line Index bits **1**.
- The Index bits are shifted into a shift register. When the proper decode is achieved, the corresponding output is set.
- The output remains active until all bits are shifted out of the positions IB1, IB2, IB3, and IB4. The next Servo Clock **6** pulse resets the Decode latch.
- Index Mark **2** is set whenever IB4 and IB1, IB2, or IB3 are active. This occurs for both Index and a Rezero Pattern.
- Valid Even Index **3** is set with a decode of IBs 1, 2, 4, but not 3.
- Valid Odd Index **4** is set with a decode of IBs 1, 3, 4, but not 2.
- Rezero pattern uses an additional Index bit for decode **5** IBs 2 and 4, but not IBs 1, 3, and 5.
- Pattern **C** is written in the outer guard band of the disk. It appears as a continuous Index written for the entire disk rotation.
- For a more detailed diagram of Index decoding, see RPI 107 and OPER 126 for theory.



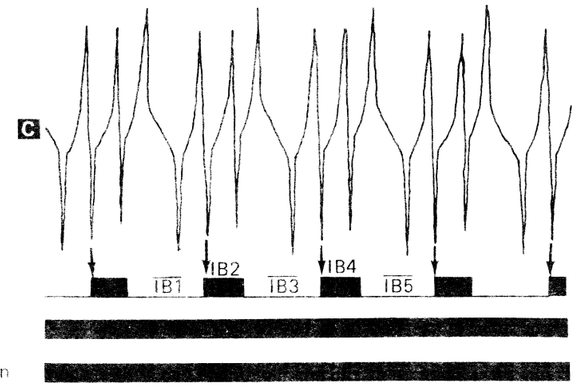
EVEN INDEX



ODD INDEX



REZERO PATTERN



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INDEX CHECK/ACTIVE TRACK

MICRO A

Index pulse width greater than 10 microseconds

MICRO B

Index pulse width less than 8 microseconds

Index width tolerance is between 8 and 10 microseconds

MICRO C

Time between two Index Marks is less than 9.8 milliseconds

Correct time between Index Marks is 9.8–10.4 milliseconds

MICRO D

Index Mark not received within 10.4 ms or time between Index Marks greater than 10.4 ms.

Install other data module

Microdiagnostics
Rerun routine A5.

Test results

No Failures

Check drive motor brake. Note 2.

The first data module is defective

Check
See R/W 350.
Inspect DM Connector for loose or shorted wires at pins:
B10, B11, B12, D11, D12

DM 531

Other Errors

Error Analysis
Exit to Error Code in MICRO section. Perform CE Action for first error encountered.

MICRO

Same as original error

Replace Cards
A1T2(S2)
A1F2(E2)
A1H2 –*CAUTION See Note 1.*
A1C2
A1V2(U2) Connector

Trouble corrected

Yes

No

Swap, replace or inspect possible causes. If unable to quickly isolate failure, continue analysis procedure.

Possible Causes
Suspect disk rotation speed:
1. Drive motor belt
2. Motor brake. See Note 2.
3. One phase missing to drive motor (DM 206)
4. Drive motor
5. A1V2(U2) Connector
6. A1T2(S2) Card
7. Power Supplies PWR10 Entry C
8. Spindle Ground Loose

Trouble corrected

Yes

No

Error stop

A521
A522

A520
A523

Maintenance procedure complete

A

START 500

A

RPI 104

B

RPI 104

CAUTION

Note 1: R/W and PLO signals are terminated by resistors on the A1J2 and A1H2 cards through jumpers on the A1 board of the last module in the string. Removal of the A1J2 or A1H2 cards in the last module causes R/W failures in other modules. As a precaution to prevent data checks, the customer should be prevented from using any of the drives in the string while these cards are removed or replaced in any module, even though power is turned off in that module.

If a 3344 is attached, refer to 3344 MLM, INST 8, for terminator location.

Note 2: See DM 715 to check brake operation. If solenoid is not energized, scope to isolate (DM 221).

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INDEX CHECK/ACTIVE TRACK

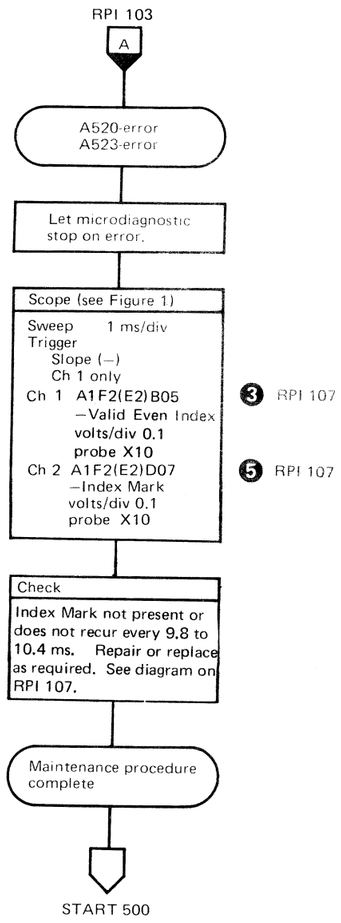
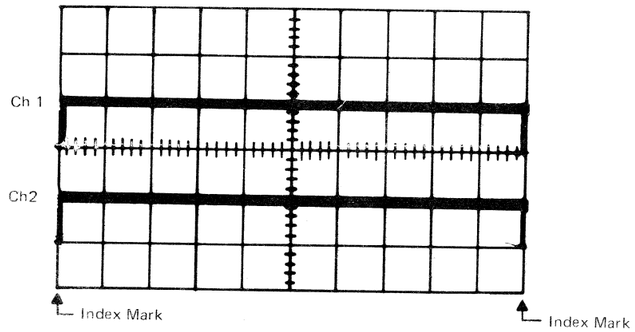


Figure 1



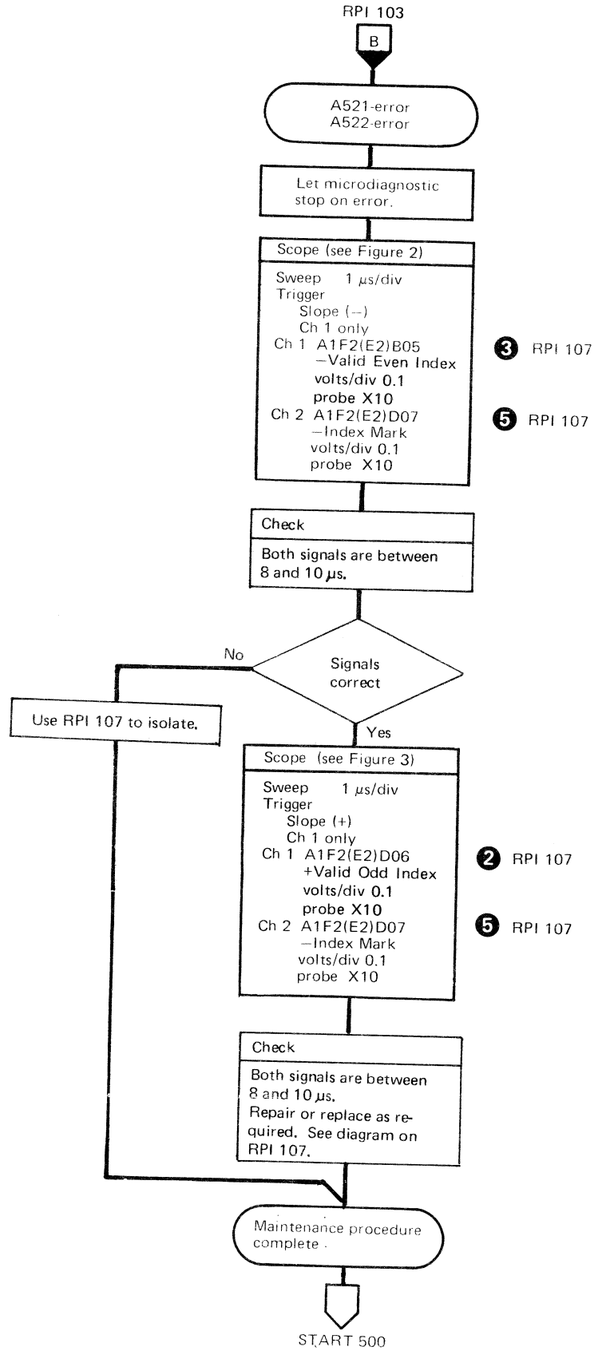


Figure 2

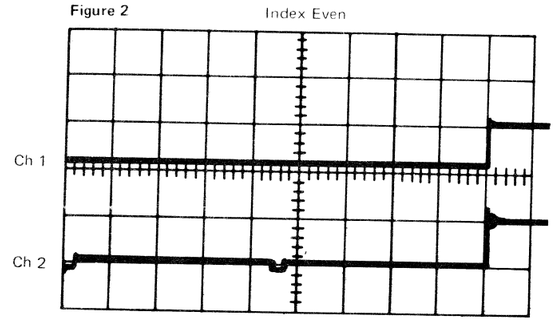
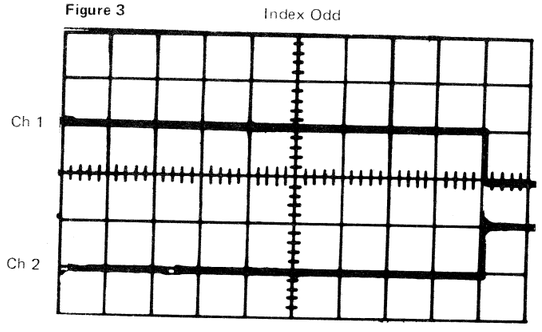


Figure 3



DK0106 Seq. 1 of 2	2747242 Part No. ( )	440200 25 Jun 73	440202 7 Sept 73	440203 2 Nov 73	440205 28 Jan 74	440207 15 Feb 74	440218 5 Aug 74	

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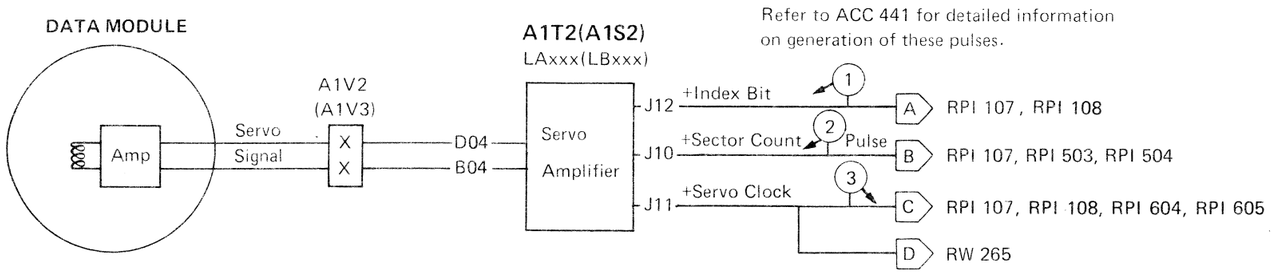
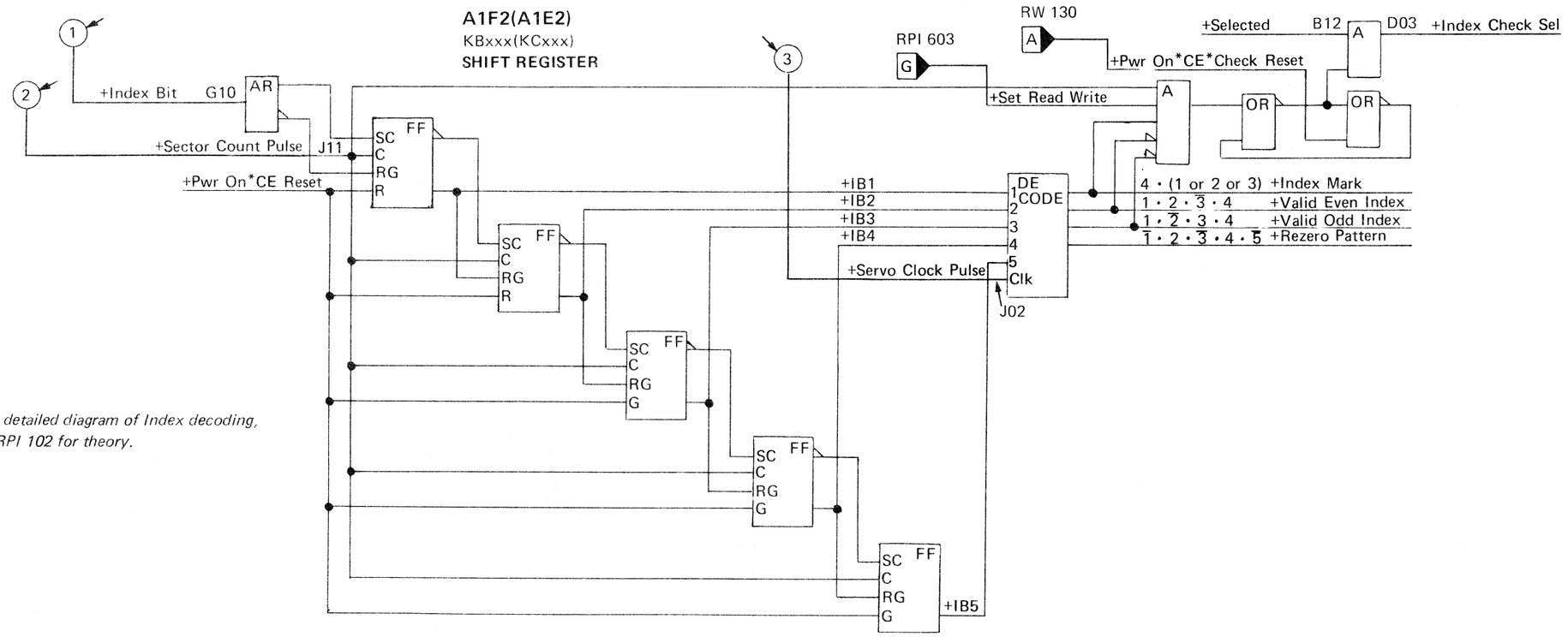
INDEX ALERT DURING CORRECT OPERATION





Note: For a more detailed diagram of Index decoding, see RPI 107 and RPI 102 for theory.

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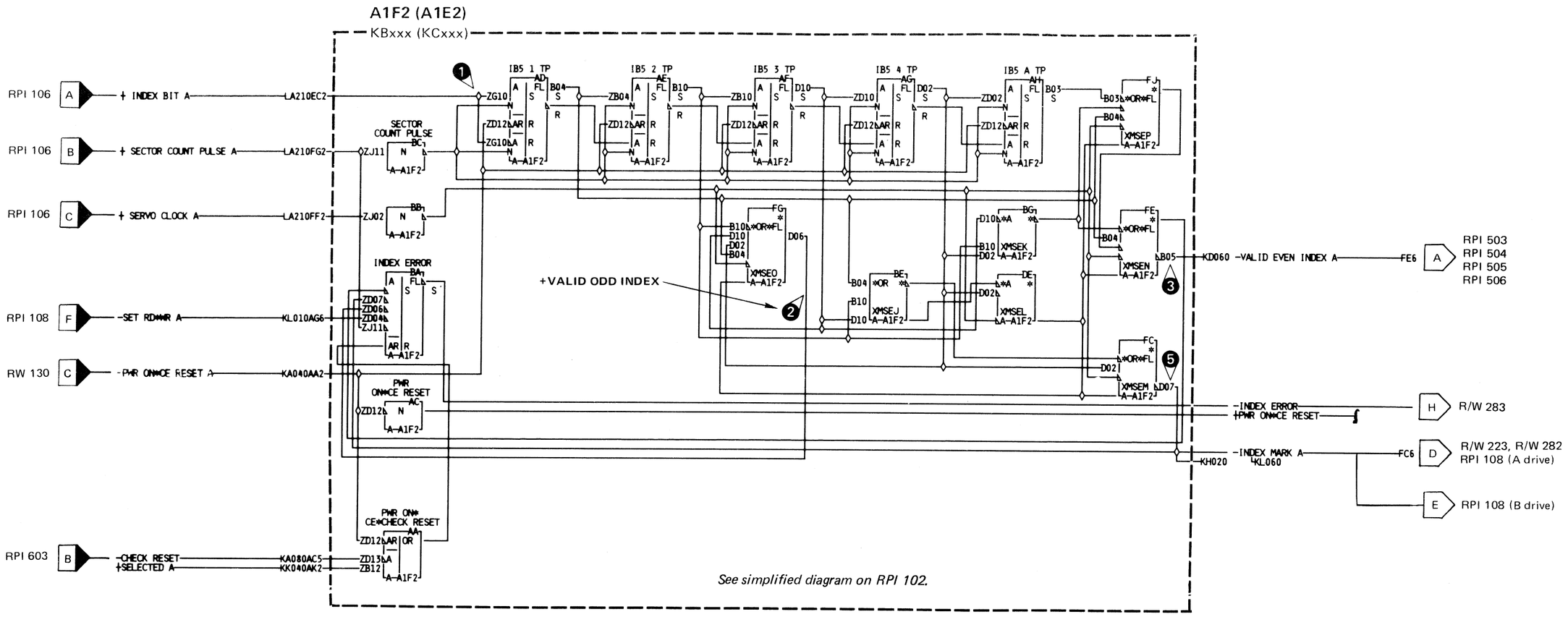
INDEX/ACTIVE TRACK FAILURES



DK0108	2747642	440202	440203	440207	440218			
Seq. 1 of 2	Part No. ( )	7 Sept 73	2 Nov 73	15 Feb 74	5 Aug 74			

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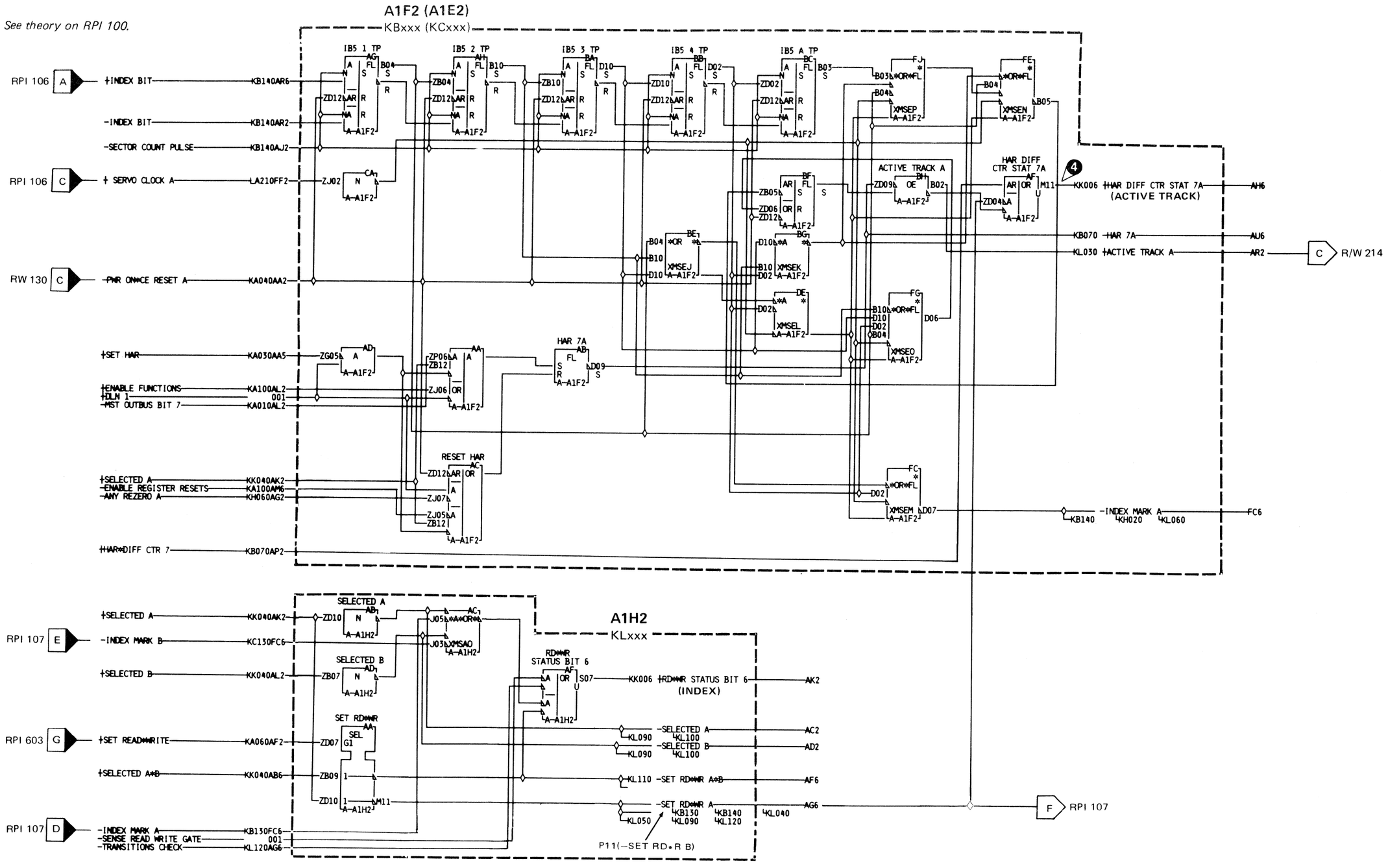
INDEX/ACTIVE TRACK FAILURES

See theory on RPI 100.



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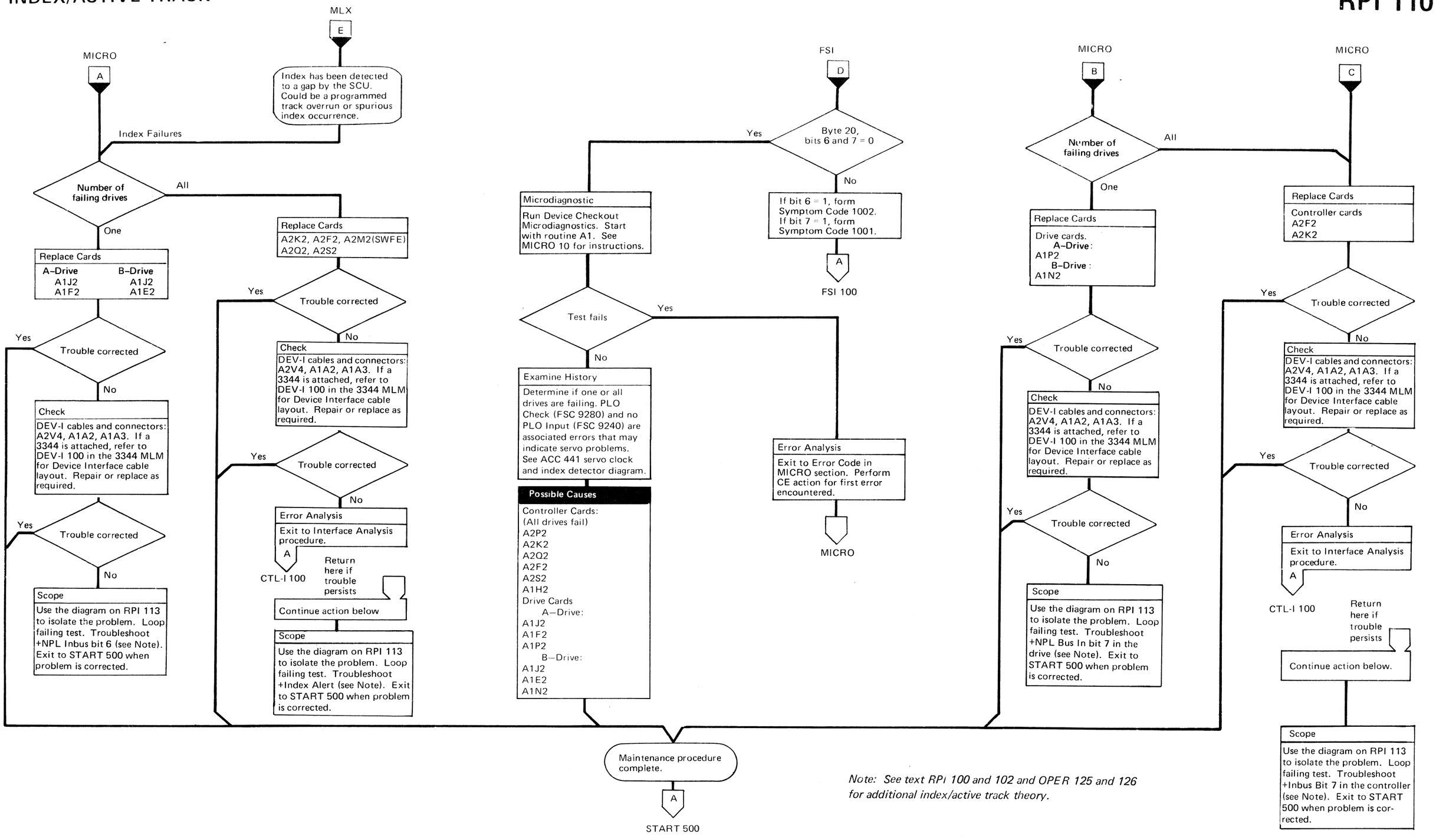
INDEX/ACTIVE TRACK



Note: See text RPI 100 and 102 and OPER 125 and 126 for additional index/active track theory.

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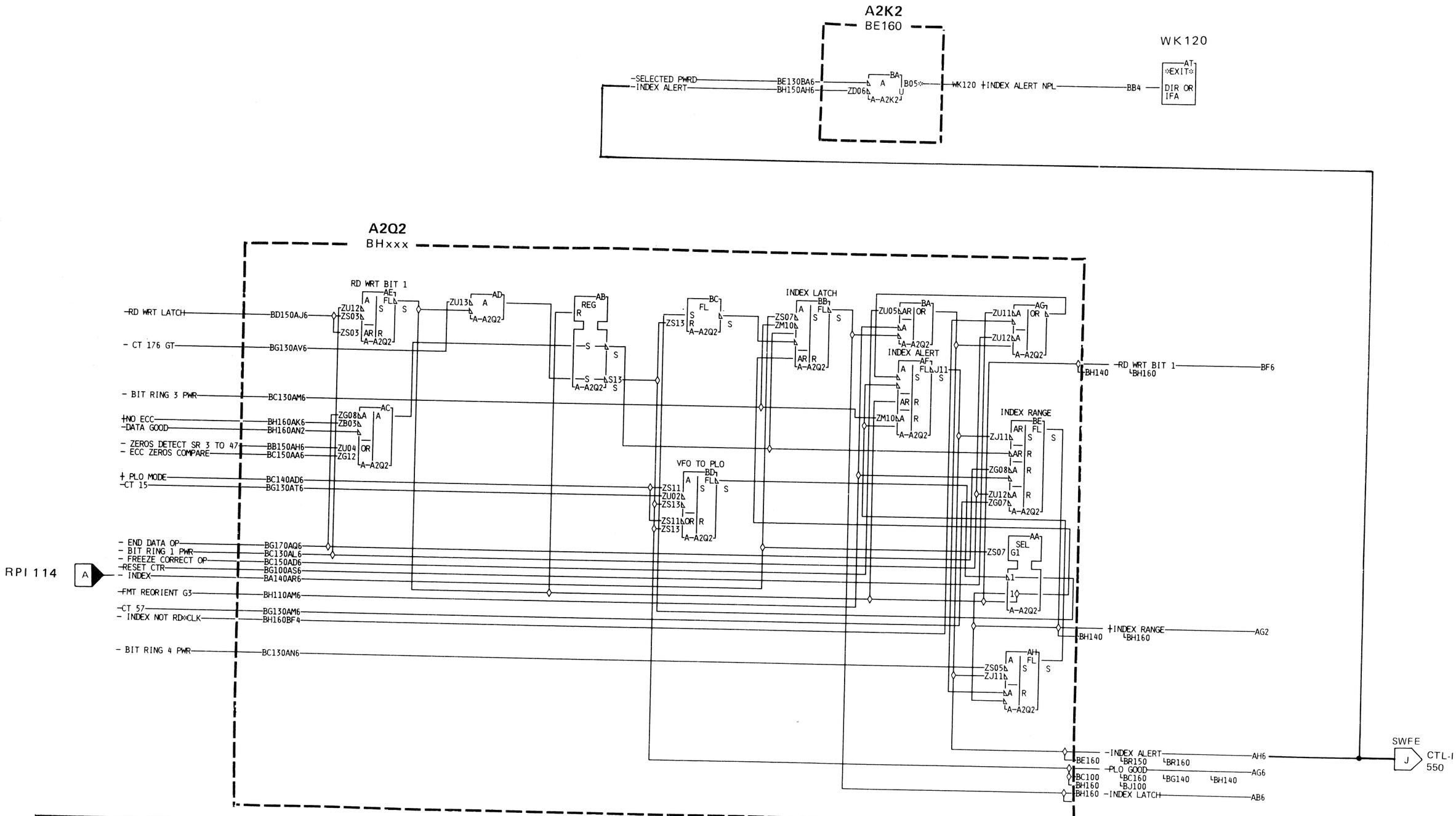
INDEX ALERT AND ACTIVE TRACK **RPI 113**



3340	DK0110 Seq. 2 of 2	2747243 Part No. (0)	See EC History	440223 14 Mar 75	440227 14 Sept 76				

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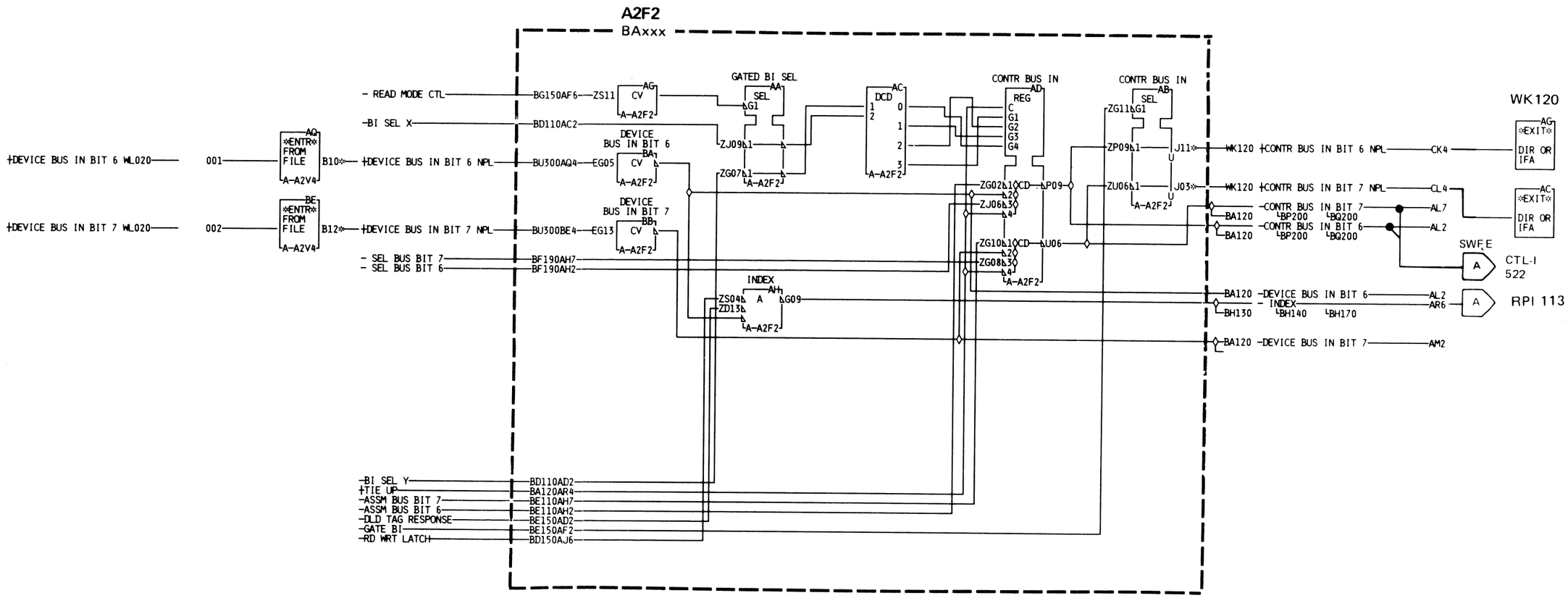
INDEX ALERT AND ACTIVE TRACK



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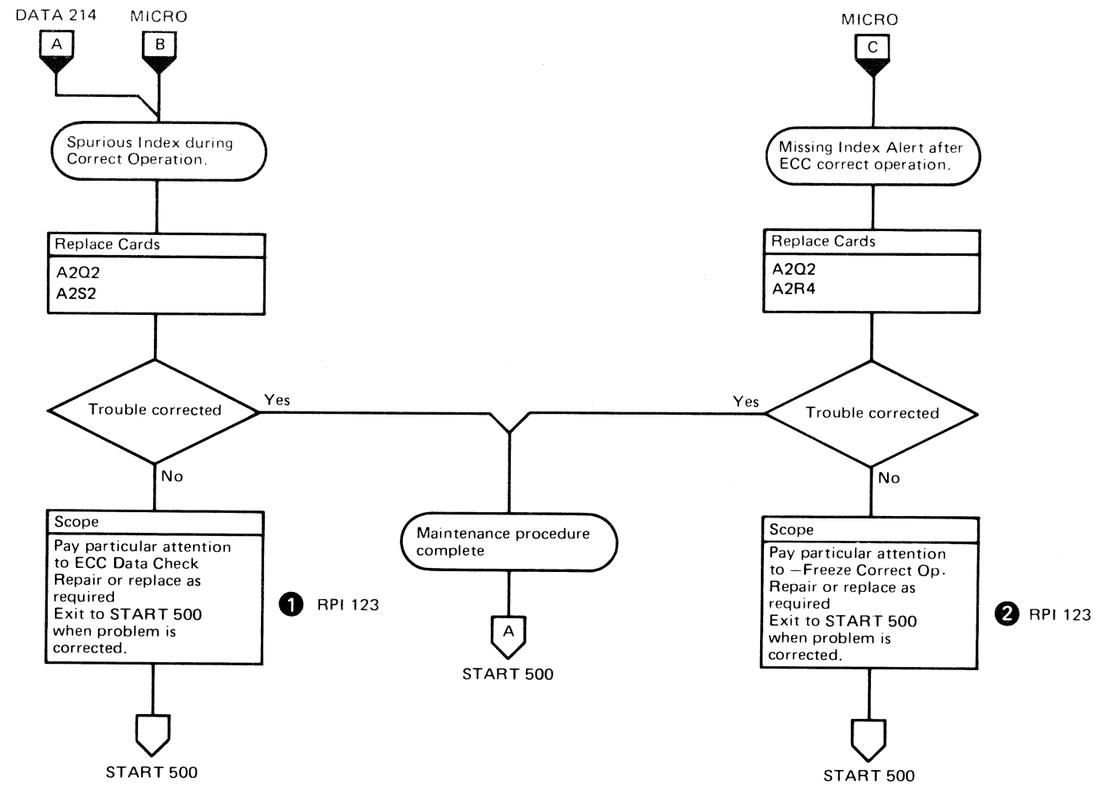
INDEX ALERT DURING CORRECT OPERATION

After an ECC Data Check and during a 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 that a pattern has been found. The ECC Shift Register then stops shifting and waits for the storage control to sense the pattern byte.



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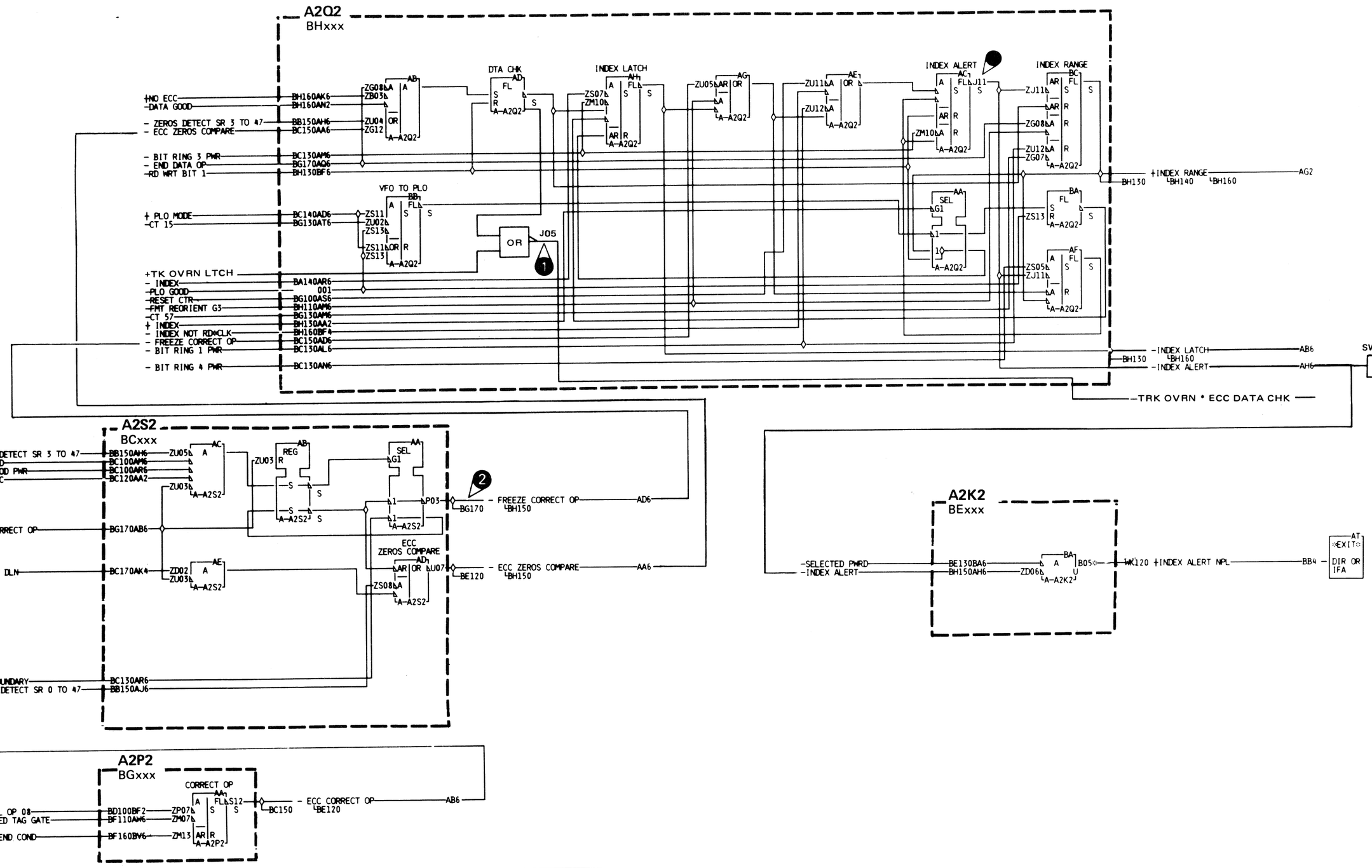
INDEX ALERT DURING CORRECT OPERATION



DK0120	2747244
Seq. 1 of 2	Part No.( )

See EC History	440223 14 Mar 75	440224 15 Dec 75				

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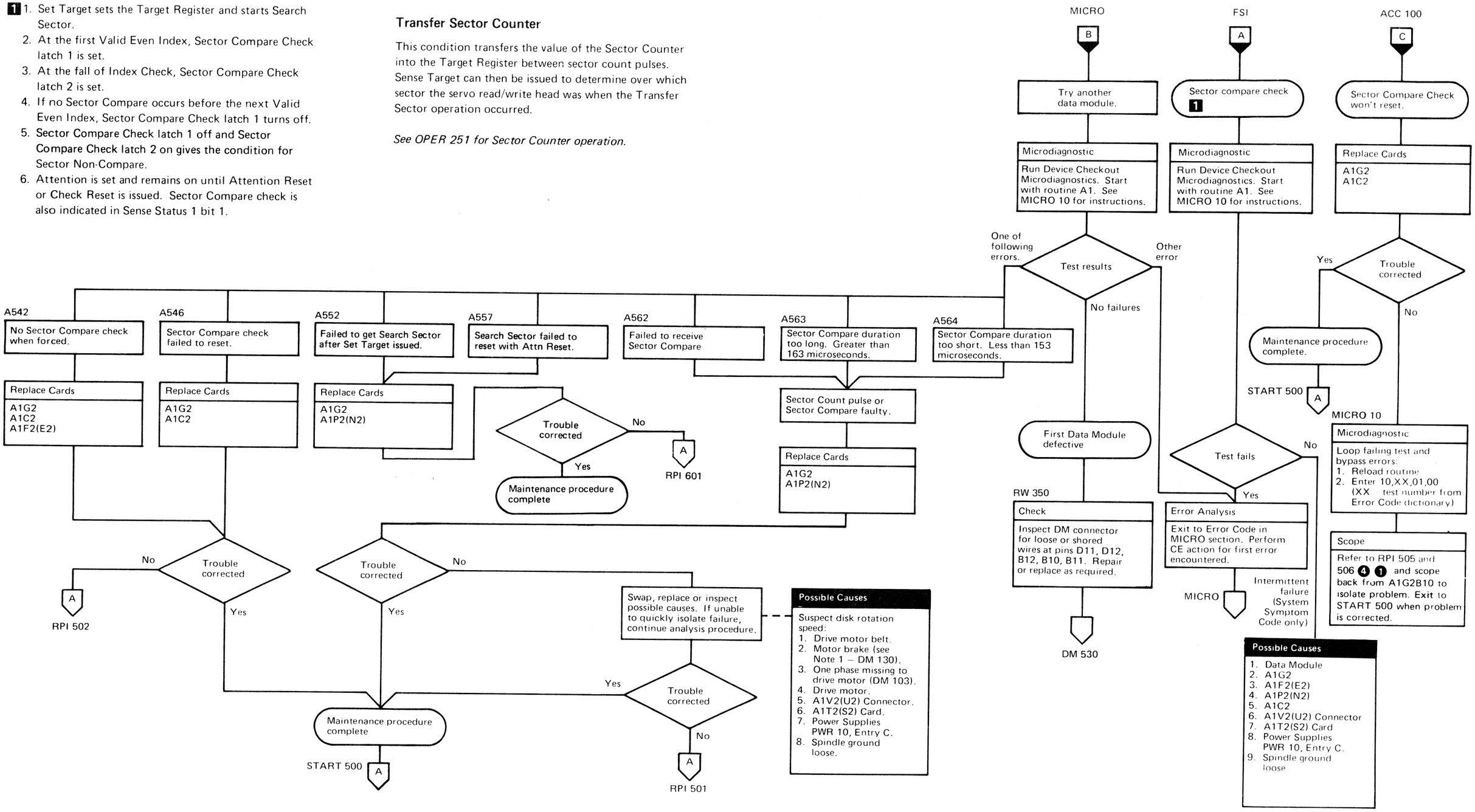
A Sector Non-Compare Occurs as Follows:

1. Set Target sets the Target Register and starts Search Sector.
2. At the first Valid Even Index, Sector Compare Check latch 1 is set.
3. At the fall of Index Check, Sector Compare Check latch 2 is set.
4. If no Sector Compare occurs before the next Valid Even Index, Sector Compare Check latch 1 turns off.
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.

Transfer Sector Counter

This condition transfers the value of the Sector Counter into the Target Register between sector count pulses. Sense Target can then be issued to determine over which sector the servo read/write head was when the Transfer Sector operation occurred.

See OPER 251 for Sector Counter operation.



DK0120 Seq. 2 of 2	2747244 Part No. ( )	See EC History	440223 14 Mar 75	440224 15 Dec 75				

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RPI 500

A

A562, A563, A564 Error codes

Error code

A562

A563
A564

Diagnostic

Setup to run routine B4:
1. Load routine B4.
2. Enter parameters: 10 83, 10, 8D, xx, 42, 64, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00.

Parameter functions:
xx = failing sector
See display byte 2.

Diagnostic

Setup to run routine B4:
1. Load routine B4.
2. Enter parameters: 10 83, 10, 8D, 00, 42, 64, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00.

Parameter function:
8D, 00 = Set Target to 00.

Scope (Figure 1)

Sweep 20 μs/div
Trigger
Slope(−)
Ch 1 only
Ch 1 A1G2S09(U13)
−Valid Even Index
volts/div 0.1
probe X10
Ch 2 A1G2M03(M02)
+Sector Compare
volts/div 0.1
probe X10
Ch 2 A1P2(N2)B04
+Check Status Bit 6
volts/div 0.1
probe X10
Use RPI 505 and 506 to isolate failure.

Error A562 sweep length varies between 20 us/div and 2 ms/div as sector value increases.

6 RPI 505 (RPI 506)

2 RPI 505 (RPI 506)

8 RPI 505

1

No

Trouble corrected

Yes

Scope

Scope back on.
RPI 505(506) to failure.
Repair or replace as required.

Maintenance Procedure Complete

A

START 500

1

A562

Error code

A563
A564

Diagnostic

Reenter routine B4.
1. Reload routine B4.
2. Enter parameters: 10 83, 10, 8D, 7E, 42, 64, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00.

Parameter function:
8D, 7E = Set Target to 127 (Decimal).

Scope (Figure 2)

Sweep 2 ms/div
Trigger
Slope(−)
Ch 1 only
Ch 1 A1G2S09(U13)
−Valid Even Index
volts/div 0.1
probe X10
Ch 2 A1G2M03(M02)
+Sector Compare
volts/div 0.1
probe X10
Use RPI 505 and 506 to isolate failure.

Move Trace 2 to center of screen, then X10 mag on.

6 RPI 505 (RPI 506)

2 RPI 505 (RPI 506)

Figure 1

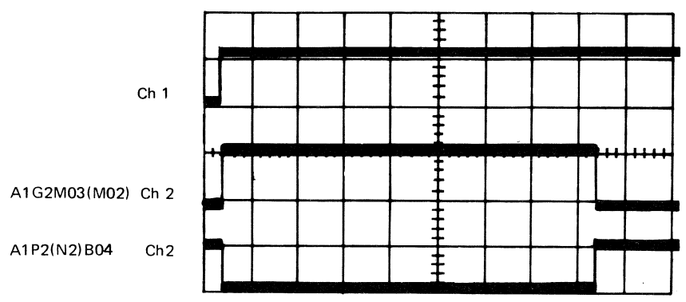
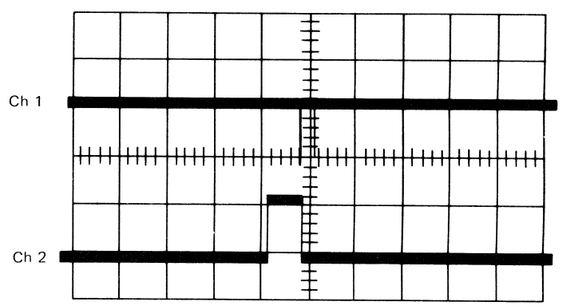


Figure 2



DK0500 Seq. 1 of 2	2747245 Part No. ( )

See EC History	440218 5 Aug 75	440223 14 Mar 75				

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RPI 500

A

A542 or A546 error

Microdiagnostic

Loop routine A5, test 4
1. Load routine A5.
2. Enter parameter: 10, 04, 01, 00.

Scope (Figure 1)

Sweep 5 ms/div
Trigger
Slope(+)
A1G2U09(U07)
+ Selected A(B)
Ch 1 A1G2U11
+Set Target
volts/div 0.1
probe X10
Ch 2 **A1G2P04(S13)**
+Sector Non-Compare
volts/div 0.1
probe X10
Ch 2 A1G2S09(U13)
–Valid Even Index
volts/div 0.1
probe X10

❸ RPI 505(506)

❼ RPI 505(506)

❻ RPI 505(506)

Check

Sector Non-Compare is active. Use RPI 505 and 506 to isolate failure.

Sector Compare Check is forced on by aligning on Even Index and setting the Target Register to 4. After sector 1 is passed, the Target Register is set to 1. Sector Compare Check occurs at the next Even Index.(A542 error if Sector Compare Check does not come on.)

Scope (Figure 2)

Sweep 20 μs/div
Trigger
Slope(–)
Ch 1 only
Ch 1 A1G2G09
–Sense Status 1
volts/div 0.1
probe X10
Ch 2 A1G2M05
–Check Reset
volts/div 0.1
probe X10
Ch 2 **A1G2B10**
+Target Status Bit 1
volts/div 0.1
probe X10

❺ RPI 505(506)

❶ RPI 505(506)
(Probe first)

❹ RPI 505(506)
(Probe second)

Check

Target status bit does not come on after check reset. Use RPI 505 and 506 to isolate failure.

Maintenance procedure complete

A

START 500

Note: If an error is detected while looping a test, the microprogram terminates the test and starts it over again from the beginning. Any part of the signal appearing after the error is detected and before the test is restarted is not valid.

Figure 1. Set Sector Non-Compare

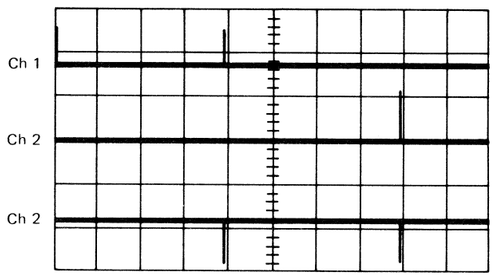
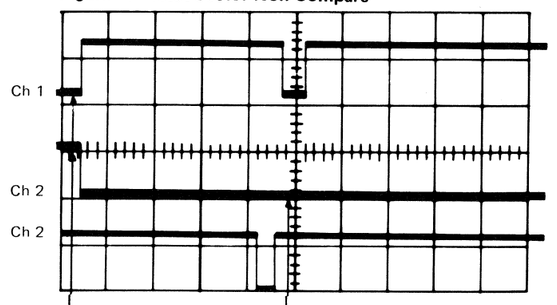


Figure 2. Reset Sector Non-Compare



DK0500 Seq. 2 of 2	2747245 Part No. ( )

See EC History	440218 5 Aug 75	440223 14 Mar 75				

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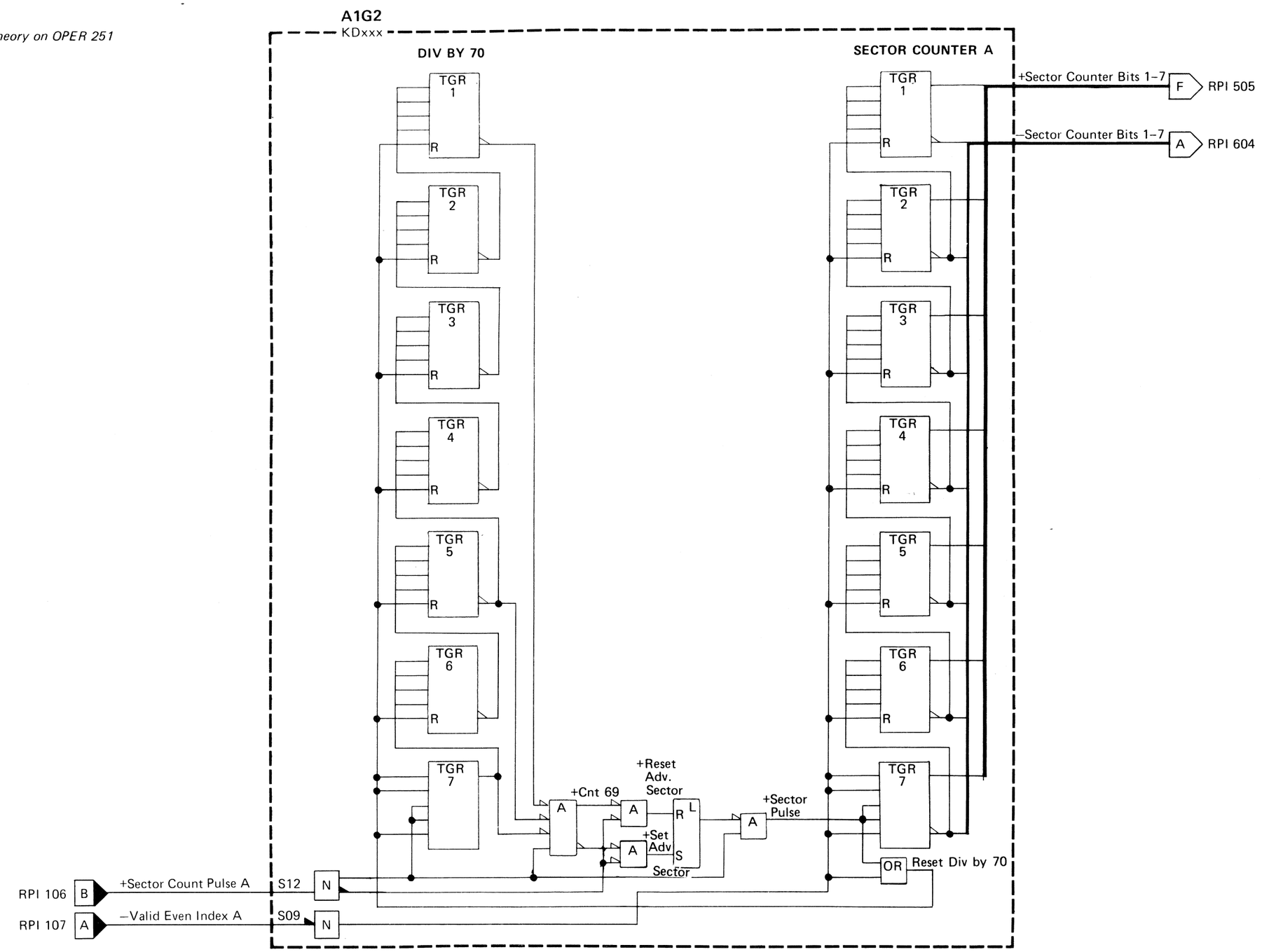
SECTOR NON-COMPARE (DRIVE A)

See theory on OPER 251



DK0503 Seq. 1 of 2	**2747530** Part No. ( )	**440200** 25 Jun 73	**440202** 7 Sept 73	**440203** 2 Nov 73	**440204** 21 Dec 73	**440207** 15 Feb 74		

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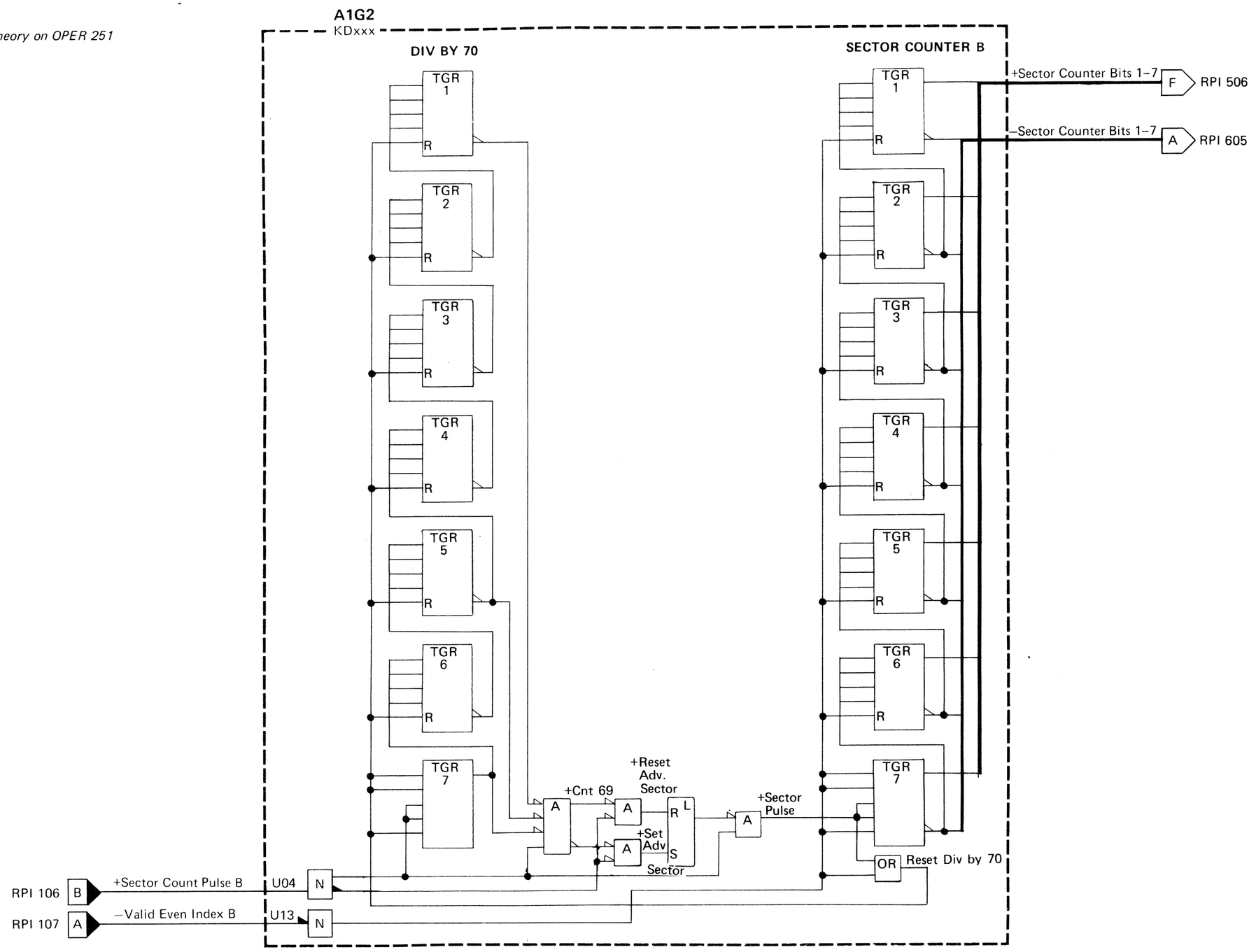
SECTOR NON-COMPARE (DRIVE B)

See theory on OPER 251



DK0503 Seq. 2 of 2	**2747530** Part No. ( )	**440200** 25 Jun 73	**440202** 7 Sept 73	**440203** 2 Nov 73	**440204** 21 Dec 73	**440207** 15 Feb 74		

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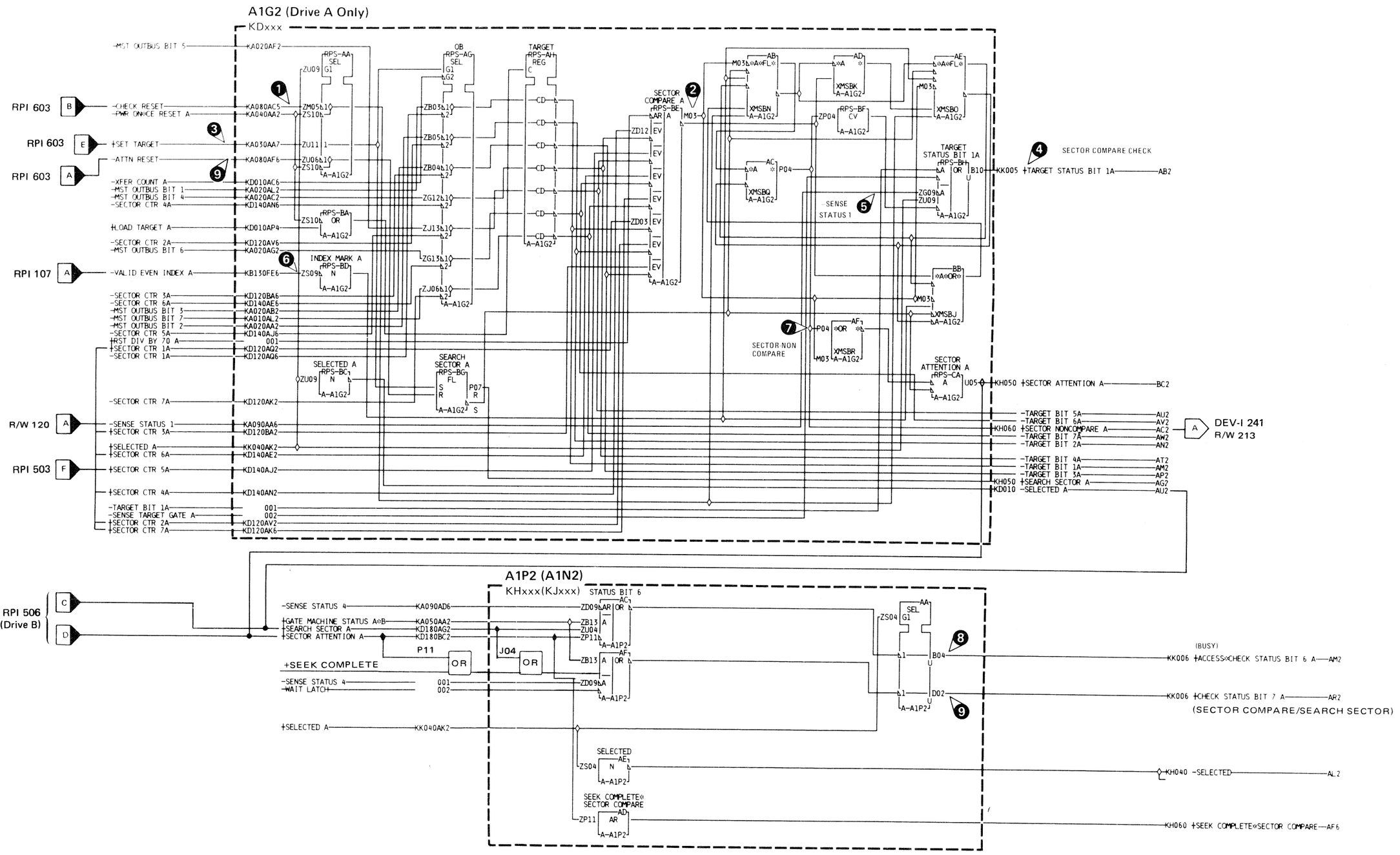

DK0505	2747654	440202	440203	440204	440207	440210		
Seq. 1 of 2	Part No. ( )	7 Sept 72	2 Nov 73	21 Dec 73	15 Feb 74	15 Apr 74		

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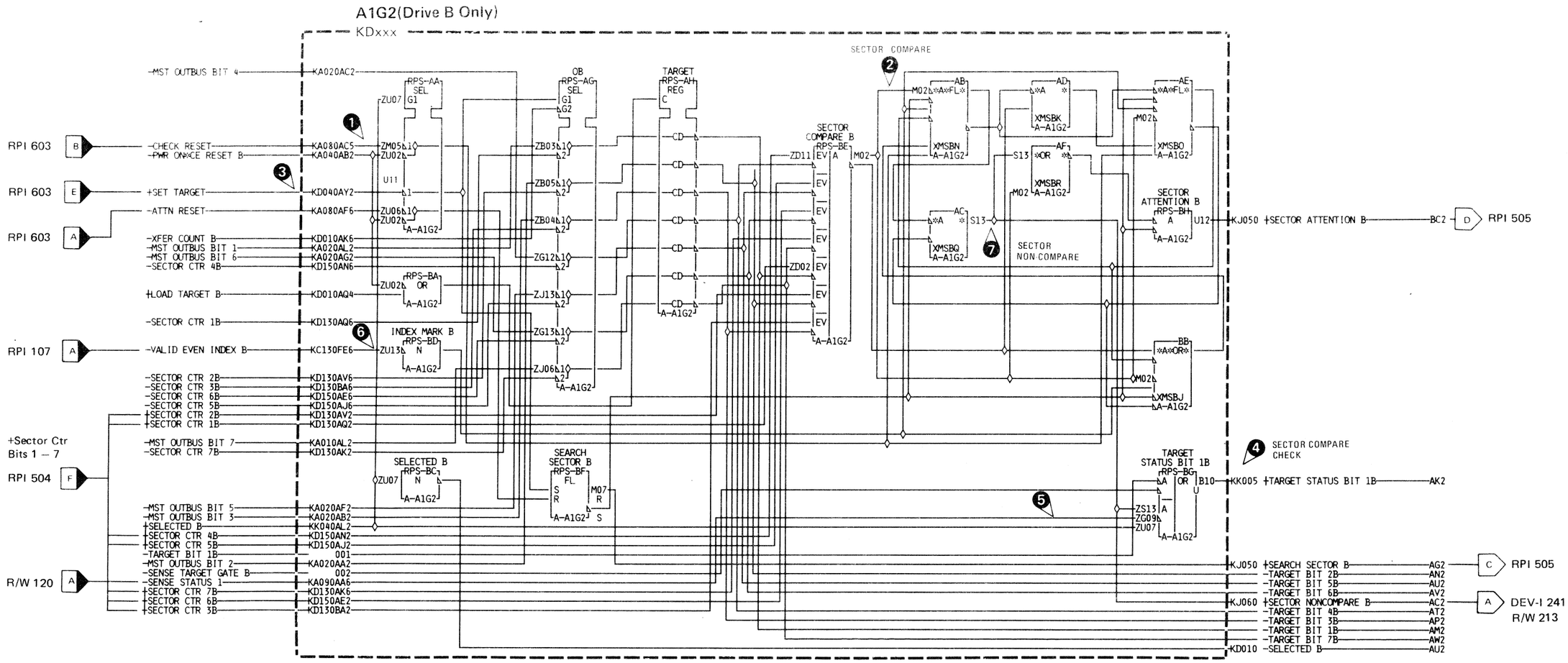

DK0505 Seq. 2 of 2	2747654 Part No. ( )	440202 7 Sept 73	440203 2 Nov 73	440204 21 Dec 73	440207 15 Feb 74	440210 15 Apr 74		

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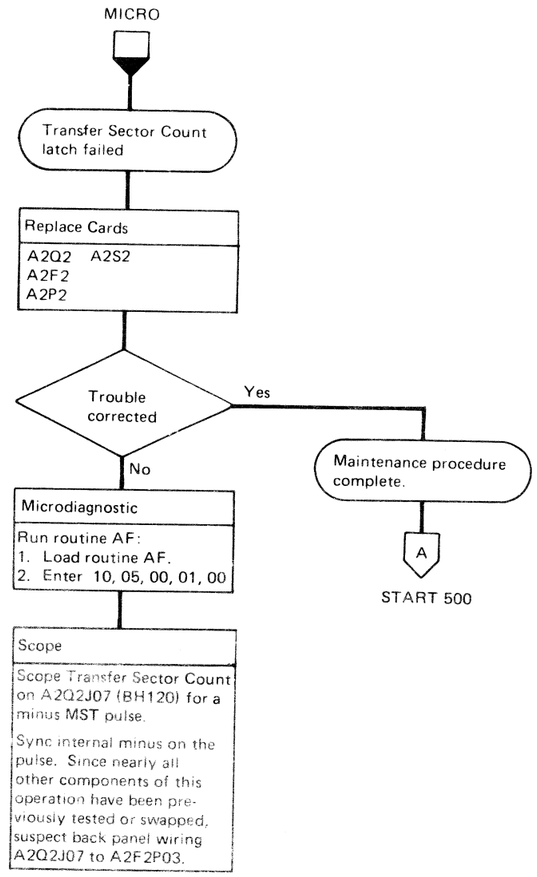
TRANSFER SECTOR COUNT LATCH FAILURE

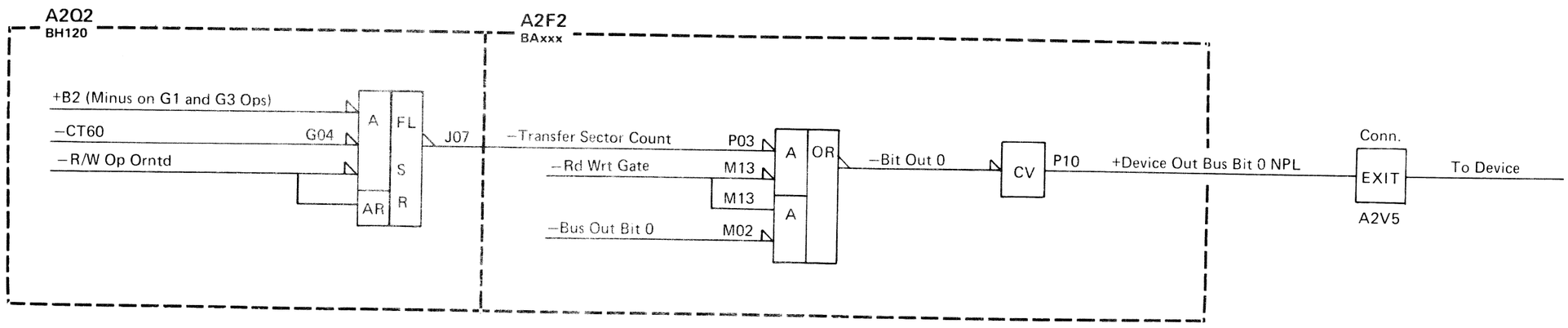
TRANSFER SECTOR COUNT

When the Rotational Position Sensing (RPS) feature is installed, the angular position of a record on the disk can be sensed and used to reduce rotational delay on subsequent operations.

Drives equipped with RPS contain a counter which counts the 128 sectors between even index marks. When a G1 (home address) or a G3 (count field) operation is begun, the Transfer Sector Count line is activated in the controller and sent to the drive over Device Bus Out 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 250–251 for a more complete explanation of Rotational Position Sensing.





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TRANSMIT TARGET ERROR

If the Rotational Position Sensing (RPS) feature is installed, card A1G2 is installed.

When the Sense Target command is issued, Bus In bit 0 on indicates the feature is present.

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

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

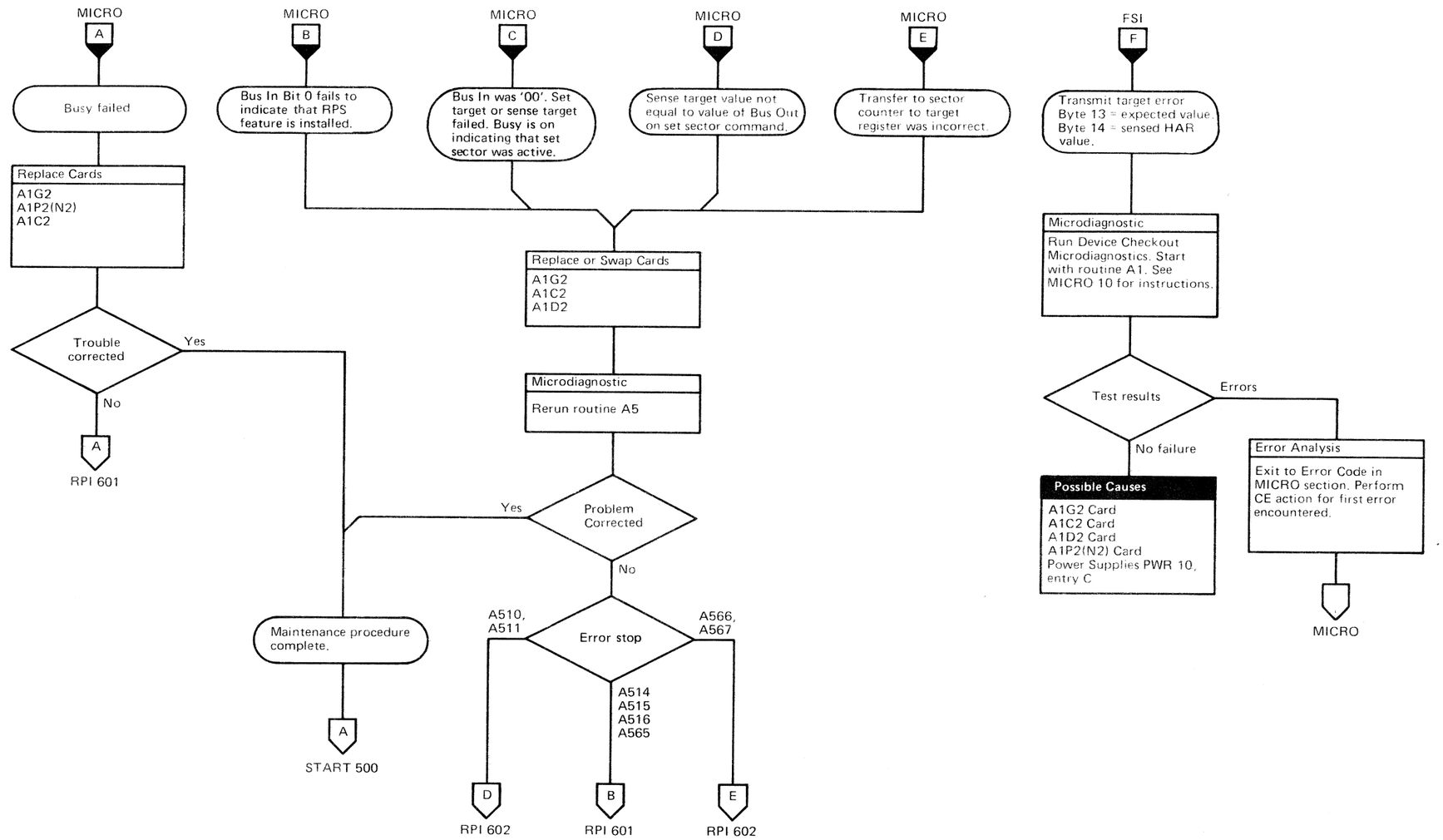
TRANSFER SECTOR COUNTER

The value of the Sector Counter (see Sector Compare theory OPER 251) can be set into the Target Register with a Set Read/Write command and Outbus bit 0 active. (Transfer Sector Counter.)

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

Device Busy is present as long as the Search Sector latch is on. The latch is set by a Set Target command. The latch is reset by an Attention Reset command or Power On or CE Reset.

See OPER 250 for RPS theory.



DK0600 Seq. 1 of 2	2747246 Part No. ( )

See EC History	440218 5 Aug 75	440223 14 Mar 75				

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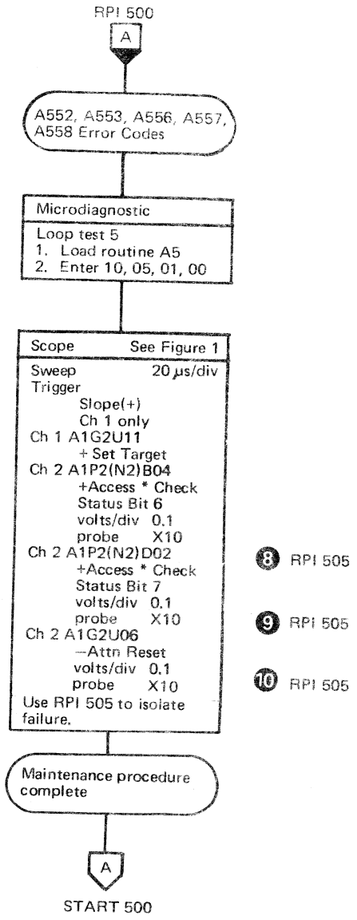
TRANSMIT TARGET ERROR



8 RPI 505

9 RPI 505

10 RPI 505

Valid Even Index

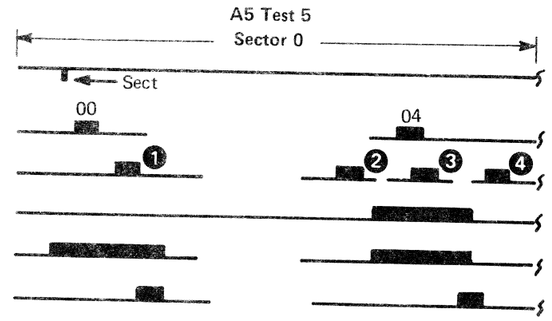
Set Target

Read Drive Status

Access Check Status Bit 6 (Busy)

Access Check Status Bit 7 (Search Sector)

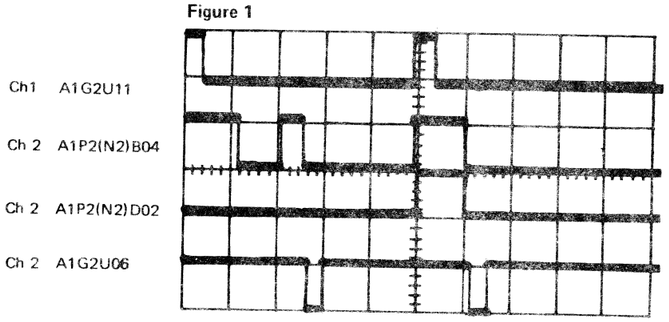
Attention Reset

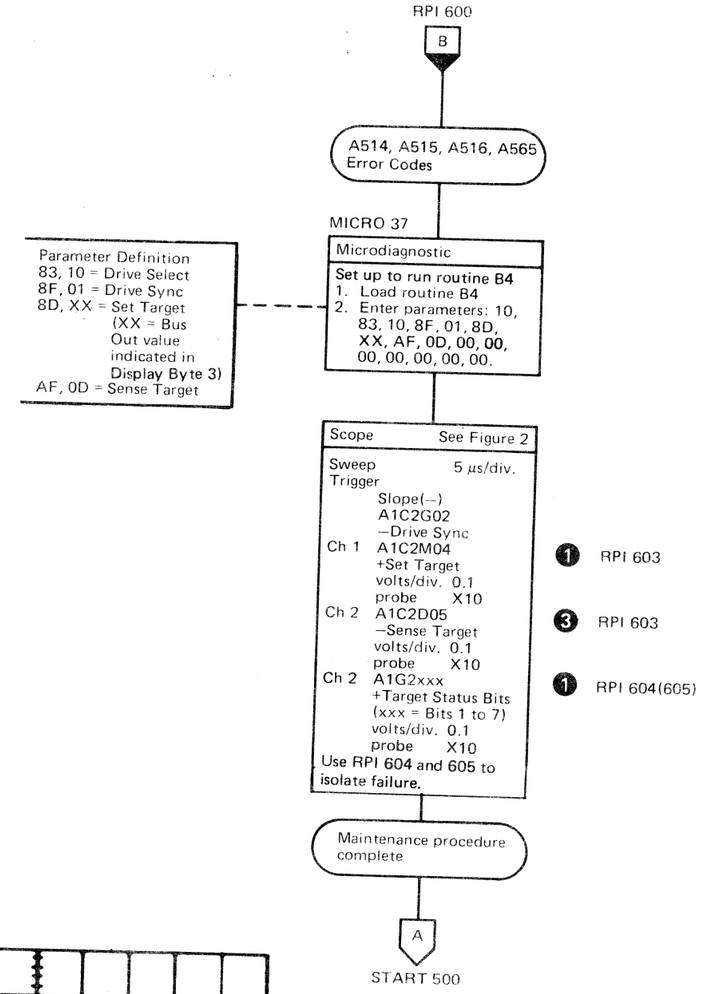


1 A552 If Sector Search is not active
1 A553 If Busy Active during Sector Compare Time
2 A557 If Search Sector still active
3 A556 If Busy not active
4 A558 If Busy still active

Note: If an error is detected while looping a test, the microprogram terminates the test and starts it over again from the beginning. Any part of the signal appearing after the error is detected and before the test is re-started is not valid.

Figure 1



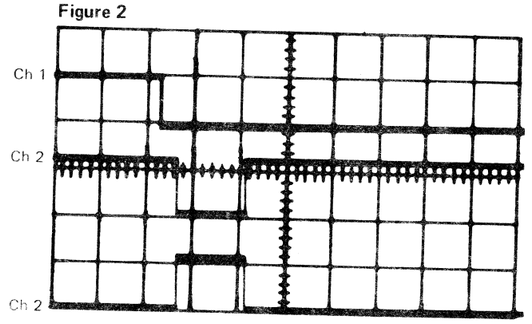


1 RPI 603

3 RPI 603

1 RPI 604(605)

Figure 2



DK0600 Seq. 2 of 2	2747246 Part No. ( )	See EC History	440218 5 Aug 75	440223 14 Mar 75				

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TRANSMIT TARGET ERROR

RPI 600 C

Busy (Bus In Bit 6) is active during a Search Sector Operation until a Sector Compare occurs. During Sector Compare time busy is degated.

Busy Failed.
Error Code A553.

MICRO 37

Microdiagnostic

Parameter Definition:
83, 10 = Drive Select
8D, 00 = Set Target Register

Setup to run routine B4
1. **Load routine B4**
2. Enter parameters: 10, 83, **10, 8D, 00, 00, 00,** 00, 00, 00, 00, 00, 00, 00, 00, 00.

RPI 603 — See Note

Busy should be inactive during Sector Compare time.

Scope (See Figure 1)

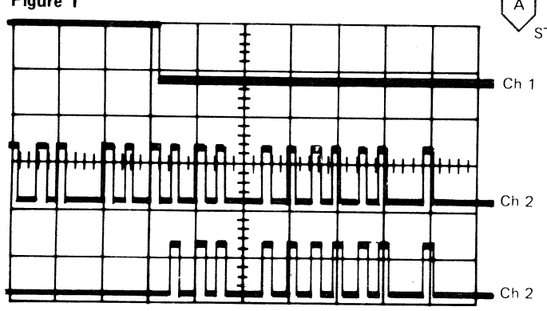
Sweep 50 μs/div.
Trigger
Slope (–)
A1G2S09(U13)
–Valid Even Index
Ch 1 A1G2M03(M02)
+Sector Compare
(For Sector 0)
volts/div. 0.1
probe X10
Ch 2 A1C2M04
+Set Target
volts/div. 0.1
probe X10
Ch 2 A1P2(N2)B04
+Access Check
Status Bit 6 (Busy)
volts/div. 0.1
probe X10
Use RPI 505 and 506 to isolate failure.

6 RPI 505(506)
2 RPI 505(506)
3 RPI 505
8 RPI 505

Maintenance procedure complete

A START 500

Figure 1



RPI 600 D

Target Status Bit 0 is always on if RPS Feature is present when Sense Target Register is issued.

Error Codes
A510, A511

MICRO 37

Microdiagnostic

Parameter Definitions:
83, 10 = Select Drive
8F, 0D = Sense Target

Setup to run routine B4
1. Load routine B4
2. Enter parameters: 10, 83, 10, 8F, 0D, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00, 00.

RPI 603 — See Note

Scope (See Figure 2)

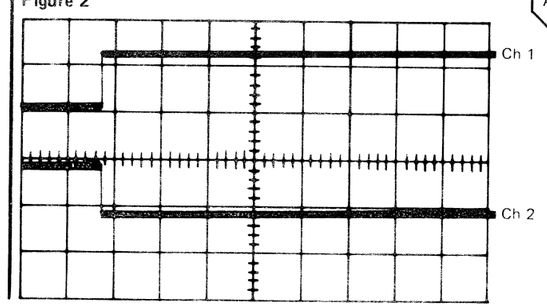
Sweep 5 μs/div.
Trigger
Slope (–)
Ch 1 only
Ch 1 A1C2D05
–Sense Target Register
volts/div. 0.1
probe X10
Ch 2 A1G2B07
+Target Status Bit 0
volts/div. 0.1
probe X10
Use RPI 603, 604, and 605 to isolate failure.

3 RPI 603
2 RPI 604(605)

Maintenance procedure complete

A START 500

Figure 2



RPI 600 E

A566 Stop Target Register is not equal to FF when Transfer Sector Counter occurs at sector 127.

A567 Stop indicates Target Register was not equal to 80 when Transfer Sector Counter occurs at sector 00.

Error Codes
A566, A567

MICRO 10

Microdiagnostic

Setup to run A5
1. Load routine A5
2. Enter parameters: 10, 06, 01, 00

See Note

Scope (See Figure 3)

Sweep 20 μs/div.
Trigger
Slope(+)
Ch 1 only
Ch 1 A1G2M13
+Set Read/Write
volts/div. 0.1
probe X10
Ch 2 A1G2J09(J10)
+Servo Clock A(B)
volts/div. 0.1
probe X10
Ch 2 A1G2P02
–MST Outbus Bit 0
volts/div. 0.1
probe X10
Use RPI 604 and 605 to isolate failure.

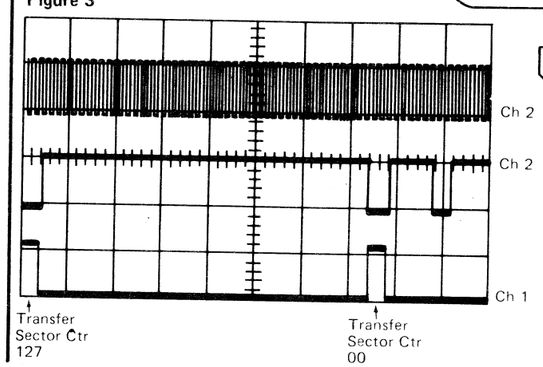
3 RPI 604(605)
4 RPI 604(605)
5 RPI 604(605)

Note: When scoping, be aware that once an error is detected, further testing is suspended and the error message is generated. Therefore, the signals beyond the point of the error are not valid.

Maintenance procedure complete

A START 500

Figure 3



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See EC History	440218 5 Aug 75	440223 14 Mar 75				

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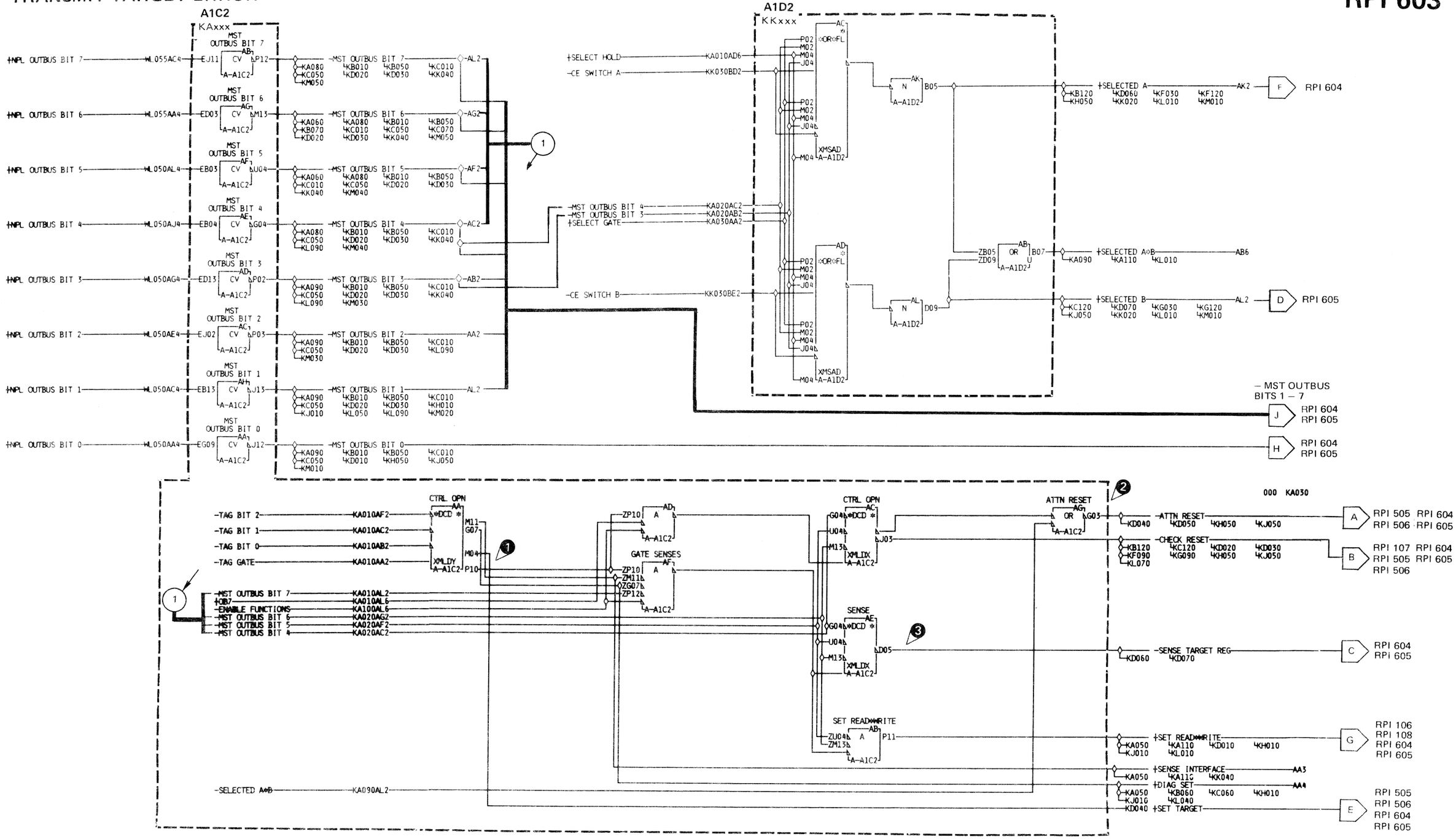
TRANSMIT TARGET ERROR



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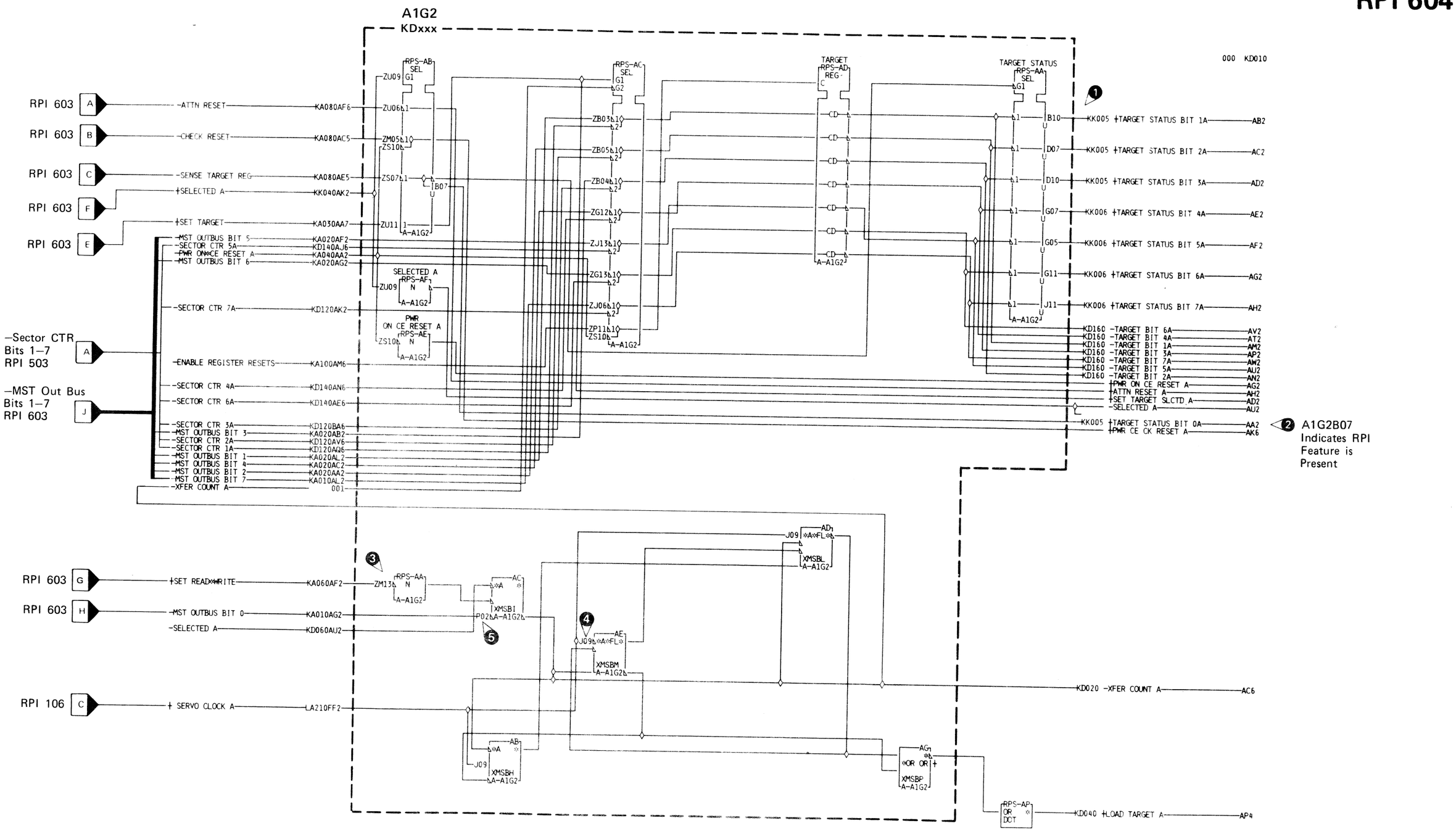
TRANSMIT TARGET ERROR (DRIVE A)



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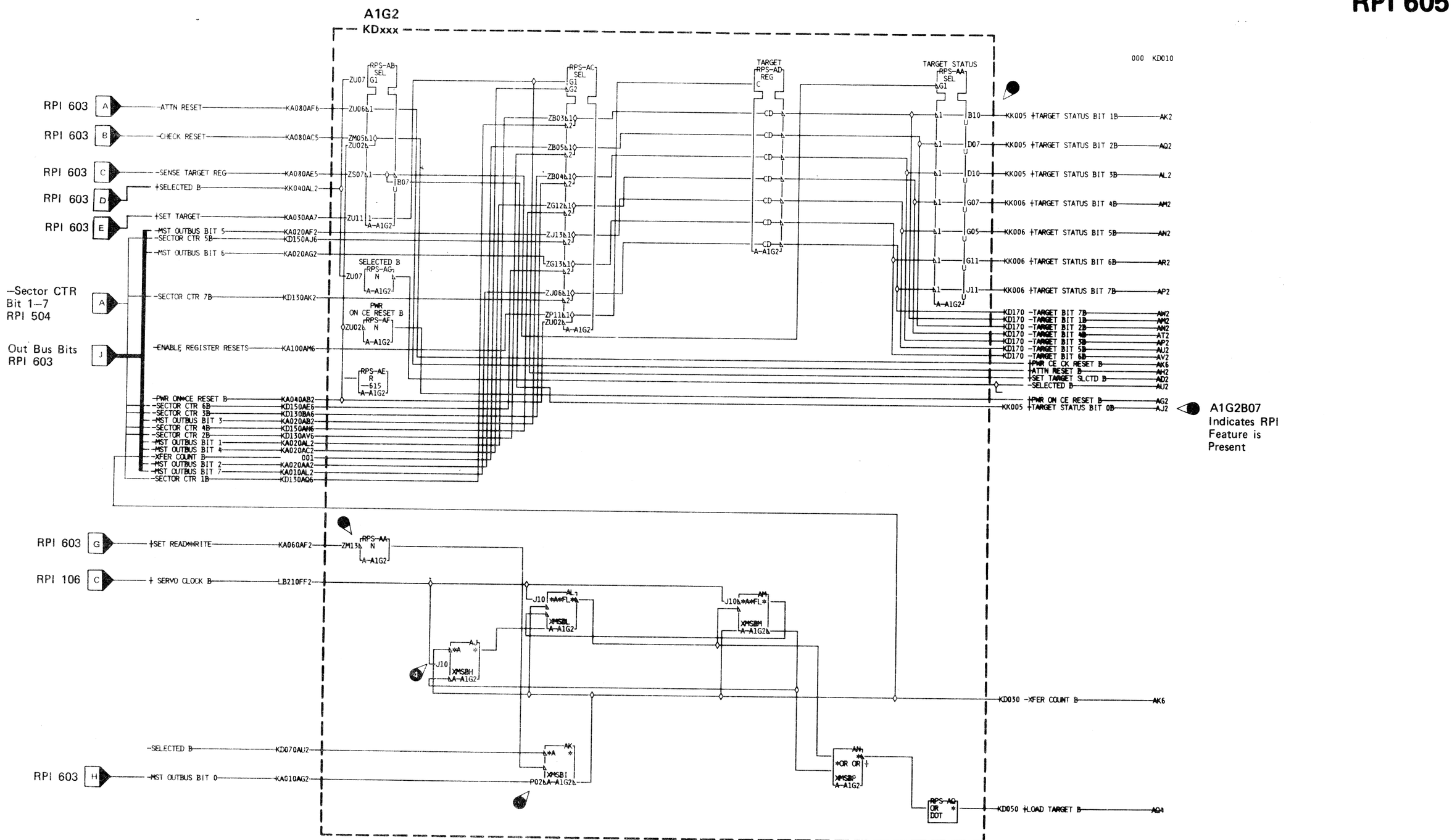
TRANSMIT TARGET ERROR (DRIVE B)



3340

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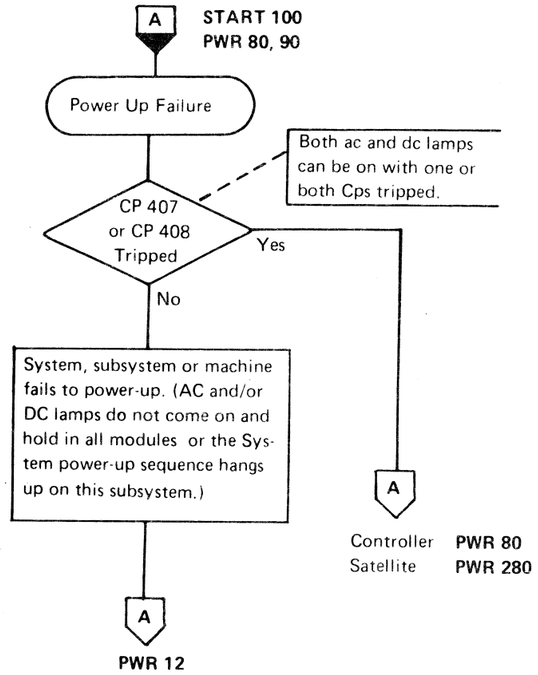
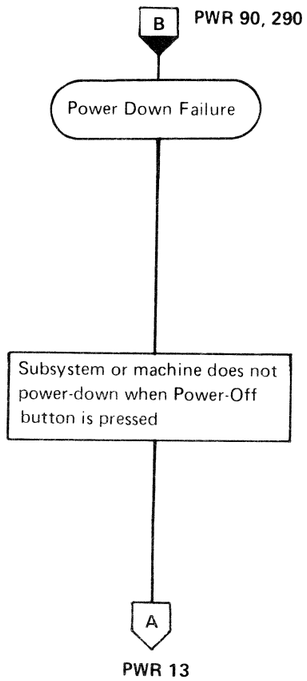
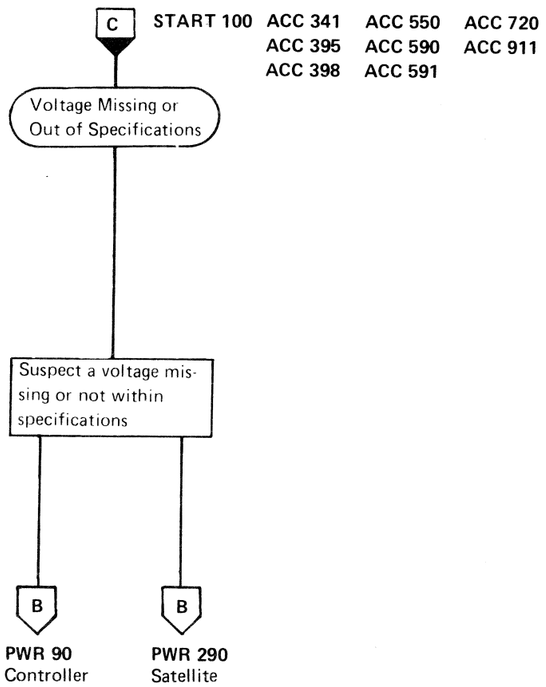
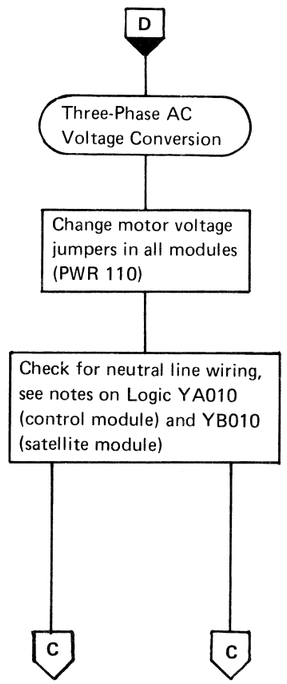
POWER SUPPLY FAILURE ANALYSIS









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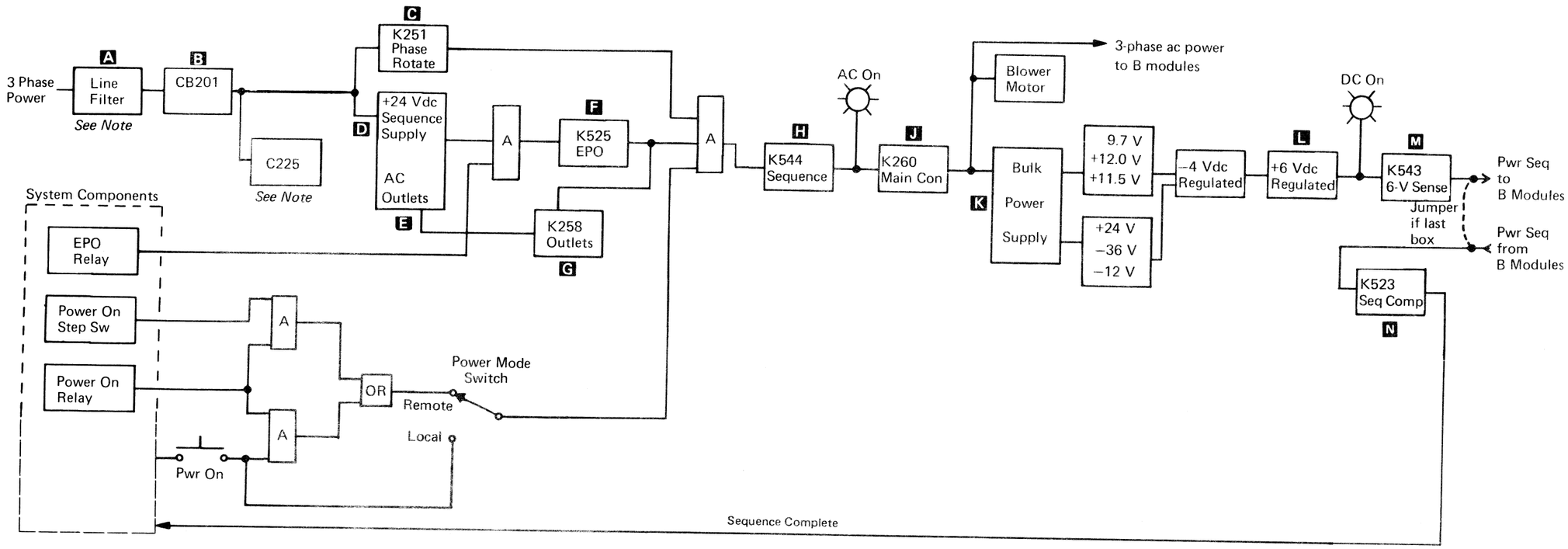

Power for the 3340 Disk Storage Subsystem

Power for the entire 3340 disk storage subsystem is routed through the A2 (control) module. This ac power (three-phase, 50 Hz) is controlled by the sequencing circuits in the A2 module.

In early machines, the three wires are connected to a line filter **A** to suppress interference. In later machines, a filter capacitor (C225) is connected to the output of CB201. A capacitor lead is connected to each of the three phases. The fourth wire in the cable is tied directly to frame ground. From the line filter, the ac power cables go to a triple 32 amp circuit breaker (CB201) **B**.

A special phase-detecting relay **C** (K251) now senses that the Mains ac power phasing sequence spins the disk drive motors in the correct direction. If the wiring is incorrect, the K251 relay prevents the ac power from proceeding any further.

AC power from one of the three phases goes through a circuit protector to the sequence supply **D** where a transformer provides two outputs. Phase A (through CP212) and neutral, supply ac power to the primary of transformer T201. The sequence secondary output is rectified and filtered and sent out as +24 Vdc with a return circuit.

Phase B **E** (through CP213) and neutral (through CP216) supply ac power through K258 **G** relay points to the CE convenience outlets.

Power for the CE outlets is provided only by the control module and carried to the satellite modules by the ac power cables.

In the Control module, the +24 Vdc sequence voltage is first sent to the EPO (emergency power off) relay **F** in the controlling system. With the EPO switch closed, the +24 Vdc is returned to the control module where it picks the EPO relay (K525). This closes the CE outlet relay (K258) **G** and supplies ac power to the CE outlets. The +24 Vdc also goes through the sequence pick relay **H** (K544) which was picked when the controlling system EPO signal was returned to the control module.

When the sequence pick relay closed, +24 Vdc was applied to the main contactor relay **J** (K260) and to the AC On indicator (light emitting diode). The +24 Vdc is routed through the picked phase rotation relay (K251) points; then in a series circuit, it travels through the circuit protectors of the dc power supplies in the control module. The Mains power now goes to the bulk power supplies **K** that provide operating power for the drive.

The last power voltage required for proper module operation is the +6 Vdc regulated supply **L**. This is detected by a special 6 volt sense relay (K543) **M**. The +6 Vdc regulated voltage is also applied to the DC On LED. When the K543 relay is picked, the +24 Vdc sequence voltage is sent to the next (satellite) module where power is brought up in a similar way.

After the +24 Vdc sequence voltage has traveled through all the satellite modules and each has been powered-up, the signal is returned to the control module where it picks the sequence complete relay (K523) **N**. This signals the controlling system that the 3340 storage subsystem has powered-up and the controlling system stepping switch can advance to the next subsystem. This description applies to the 3340 subsystem during normal operation.

The Power Mode switch in each module is set to Remote. When this switch is set to Local, the module sequencing is removed from the chain of operations and power control is in the hands of the CE.

A description of satellite module operations can be found on PWR 201.

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.

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POWER UP 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 up machine.

PWR 10 A

System, subsystem or machine does not power up.

1. System powers-up 3340s with Power Mode sw not set to Prompt.
2. System power up sequence bypasses 3340s when Power Mode switch is set to Local.
3. If system power-up sequence hangs while attempting to power-up 3340s, set Power Mode switch to Local. This will release the System.

On Power Seq. Board

Both AC and DC lamps on in control module

Yes

No

With 3340 Pwr On button released

3344 Modules in string

Yes

A

PWR 202 3344 MLM

No

All Satellite Modules have both lamps on

Yes

No

Other strings attached to this Storage Control Unit hang up waiting for Power Complete from this string. Set the Power Mode switch to Local.

On Power Seq. Board

Satellite Module Power Failure.

A

PWR 210 Satellite MLM

System Powers Up

Yes

No

Defect in system controlled subsystem power-up circuitry.

Possible Causes
1. EPO cable
2. P516, P515
3. P101
4. Power Mode switch.

Refer to system logic and check system source voltage at TP502.
See PWR 14 to help isolate the problem.

1

2

Possible Causes
AC Power On lamp or associated cable and connectors. Use PWR 14 to help isolate the problem.

1

K523 Picked (Power Complete)

Yes

No

Possible Cause
K523 N/O failed to make.
See PWR 14 to help isolate the problem.

1

+24V at TP538 on Power Sequence Board

Yes

No

Possible Cause
K523 coil open.
See PWR 14 to help isolate the problem.

1

Possible Causes
K523 pick circuit open. Check for jumper between T510 and T511 in last machine in string. Jumper is between T545 and T546 in control module if no satellites are attached.
If K523 won't pick, move jumper to another machine to isolate problem to a machine, cable or connector.
See PWR 14 to help isolate the problem.

1

2 AC

Lamps off

AC and DC

Set Power Mode sw to Local. Press Power On.

DC

Blower Motor on

No

Yes

Yes

B

PWR 20

Yes

CB 202 tripped (Was CB 210)

No

Possible Causes
1. K260 (Main ac contactor)
2. P211
3. P514

See PWR 14 to help isolate the problem.

1

CP214 or CP215 tripped

Yes

No

Overload in Bulk Supply

C

PWR 20

Missing DC Voltage

A

PWR 16

1

After problem is corrected exit to PWR 90 and Shutdown Procedure

A

PWR 90

Subsystem powers up and holds

No

Yes

Possible Causes
1. EPO cable or connectors
2. Power Mode switch
3. System Power On relay

See PWR 14 to help isolate the problem.

1

CB or CP tripped see Table

Yes

No

Depress Gate Thermal button and attempt to power up, see PWR 13 Figure.

Machine Powers Up

Yes

No

B

PWR 13

K525 picked (EPO)

Yes

No

K544 picked (Sequence Pick)

Yes

No

Possible Causes
1. K544-3 N/O failed to mk
2. K525-2 N/O failed to mk

See PWR 14 to help isolate the problem.

1

Warning: Line voltage is present on K251 coil.

K251 picked (Phase Rotation)

No

Yes

Possible Causes
1. Main AC lines
2. K251 circuitry

See PWR 14 to help isolate the problem.

1

K544 pick or hold circuit. If K544 won't pick with Power On, hold in Power On button during voltage checks.
See PWR 14 to help isolate the problem.

1

Sequence supply (+24V) or Main AC missing

C

PWR 30

+24 Vdc at TP507

No

Yes

+24 Vdc at TP506

Yes

Possible Cause
1. K525 coil
See PWR 14 to help isolate the problem.

1

Possible Causes
System EPO points
See PWR 14 to help isolate the problem.

1

Exit to page indicated by CB or CP that was tripped

CP or CB	Function	Exit to	Entry
CB 201	Main ac Breaker	PWR 20	A
CP 210	Blower Thermal	PWR 13	C
CP 211	+24Vdc Sequence Supply	PWR 30	A
CP 212	+24Vdc Sequence Supply	PWR 30	B
CP 401	-12Vdc Supply	PWR 40	B
CP 402	+12Vdc Supply	PWR 45	B
CP 403	-24Vdc Supply	PWR 50	B
CP 404	- 4Vdc Supply	PWR 55	B
CP 405	+ 6Vdc Supply	PWR 60	B
CP 406	+24Vdc Local Supply	PWR 70	B

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POWER PROBLEM 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-up machine.

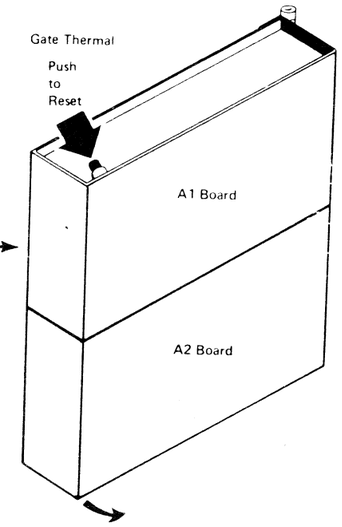
PWR 10
A
Subsystem Power Down Failure
Turn Power Mode switch to Local. Press Power Off.
Subsystem Powers Down
No
Yes
K544 Drops
Yes
No
PWR 14
Check
K544 for sticking armature or defective pick circuit. See PWR 31 to help isolate the problem.
PWR 14
K260 Main ac contactor did not drop. Check for shorted K544-3 point.
See PWR 14 to help isolate the problem.
PWR 14
System Power-On relay points not opening in system or defective wiring.
See PWR 14 to help isolate the problem.
After problem is corrected, exit to Fix Verification and Checkout Procedure.
A
PWR 90

PWR 12
C
When blower motor overheats, the blower thermal opens, causing CP210 to trip. Blower thermal resets automatically when cool.
CP210 tripped
Possible Causes
1. Blower motor.
2. Blower motor thermal.
3. CP210.
4. Blower running backwards due to incorrect power phasing.

The blower motor thermal is self-resetting.

If blower motor replacement is necessary, see DM 825 and YA020.

PWR 12
B
Gate Thermal Trips
Reset Gate Thermal
Check
DC compartment air filter. Clean or replace as necessary.
Check
With power ON the blower should be running and air exhausting from the top of the Logic gate
Blower Running
No
Yes
If blower does not run, use YA020 to help isolate the problem.
If blower replacement is necessary, see DM 825.
YA020
Possible Causes
1. Environmental heat problem
2. Defective thermal
3. Blower running backwards due to incorrect power phasing.
After problem is corrected, exit to START 500.
A
START 500



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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-up machine.

POWER-ON SEQUENCE (See PWR 11)

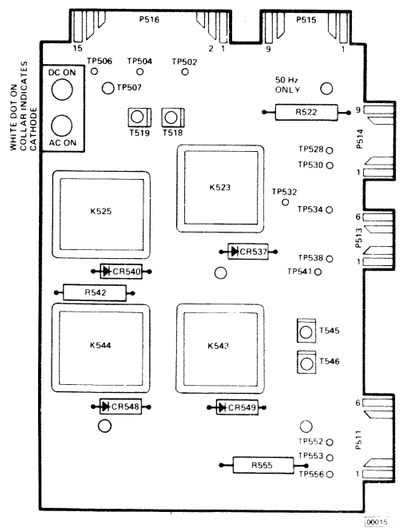
1. K251, Phase Rotation
2. K525, EPO
3. Power On Button
4. K544, Sequence Pick
5. K260, Main AC Contactor (AC On)
6. DC Power Supplies and Blower
7. K543, +6 Volt Sense (DC On)
8. +24 V Sequence to Satellite Mods.
9. Satellite Modules Power Up
10. K523, Sequence Complete

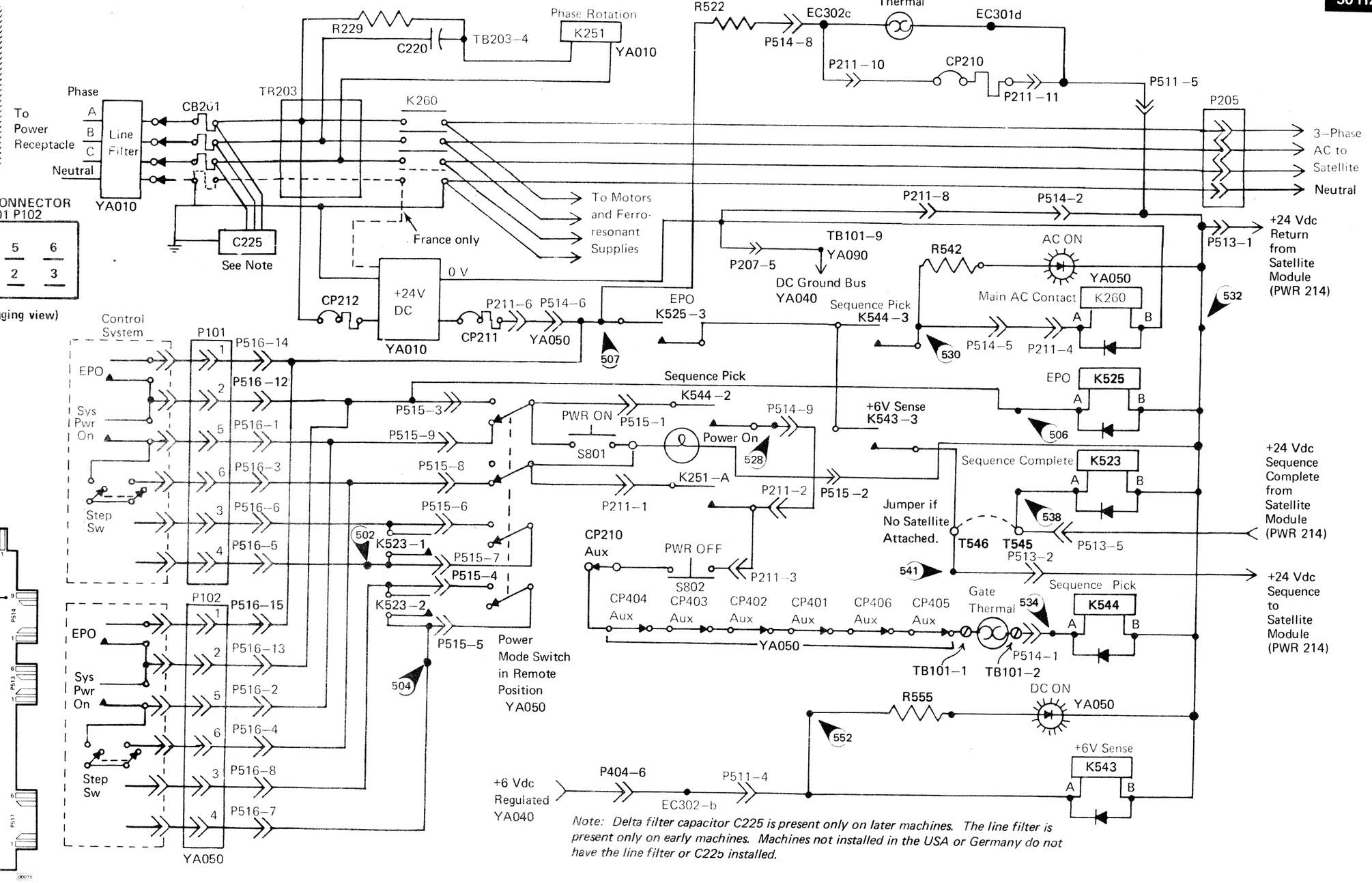
EPO CONNECTOR P101 P102

4	5	6
1	2	3

(plugging view)

SEQUENCE BOARD, A2





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.

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MISSING VOLTAGE ANALYSIS

PWR 12 (A)

Missing dc Voltage

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

-4 Vdc at TP406 on dc Reg. board

Yes

+6 Vdc at TP 404 on dc Power Board — See PWR 17

Yes

PWR 17
Possible Causes
1. K543 pick circuit K543 has a 6 V coil. **DO NOT SWAP**
2. DC Power On lamp

Use PWR 61 to help isolate the problem.

(1)

No

YA040
Check on DC Reg. Board
+11.5 Vdc at TP403
+24 Vdc at TP408

Voltage Missing

Yes

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

No

PWR 17
Possible Causes
1. Defective +6 V regulator card.
2. Q409 open (replace DC Regulator board).

Use PWR 61 to help isolate the problem.

Missing Voltage Is

+24

+24 Vdc Sequence voltage is missing on DC Regulator board.

Possible Causes
1. P514-4 & P404-10 conn.
2. EC 302-d

Use PWR 31 to help isolate the problem.

+11.5

Check at rear of dc comp.
+24 Vdc at EC302-a

+24 V Missing

Yes

Suspect no AC to T302 (Phase B missing)

PWR 17
Possible Causes
1. P210
2. CP214 (AC compartment)
3. T302

Use logic YA010 & YA030 to help isolate the problem.

No

+11.5 Vdc is missing on DC Reg. board.

Possible Causes
1. Open in +11.5 Vdc line:
   a. CP405
   b. PC301
   c. P404–9
   d. P301, P303
2. Open in +11.5 Vdc return line:
   a. P404–14 or 15
   b. P301–3
   c. P303–1
   d. TB101–9

Use PWR 61 to help isolate the trouble.

No

PWR 17
Possible Causes
1. Detective -4 V regulator card.
2. Q401 defective (replace DC Regulator board).

Use the diagram on PWR 56 to help isolate the problem.

Yes

Voltage OK

No

Possible Causes
1. P406
2. TB101

Use the diagram on PWR 56 to help isolate the problem.

PWR 17
Check on DC Reg. board
1. Measure from TP406 (–) to TP401 (+) for 9.7 V.
2. TP402 (+12 V) to ground.

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

No

Voltage Missing

Yes

Check
TP407 to ground, 0v to -.2 V.

Missing Voltage Is

9.7

PWR 17 YA 030
Possible Causes
1. P404 or P405 connector.
2. CP404

Use PWR 56 to help isolate the problem.

(1)

Yes

+11.5 Vdc at TP403 on dc Power Board

Suspect no AC to T301

YA030
Possible Causes
1. TB311
2. P210 connectors
3. CP215 defective
4. T301 defective

Use logic YA010 and YA030 to help isolate the problem.

9.7 and +12

+12

PWR 17 YA030
Possible Causes
1. P301, P302, & P404-11 connectors.
2. CP402

Use PWR 41 and PWR 56 to help isolate the problem.

(1)

No

Suspect no AC to transformers T301 and T302.

Possible Causes
1. P210 connector
2. TB311

Use logic YA010 and YA030 to help isolate the problem.

(1)

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

(A) PWR 90

3340

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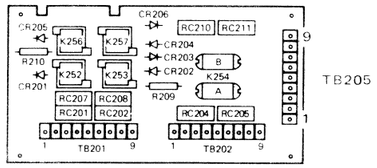
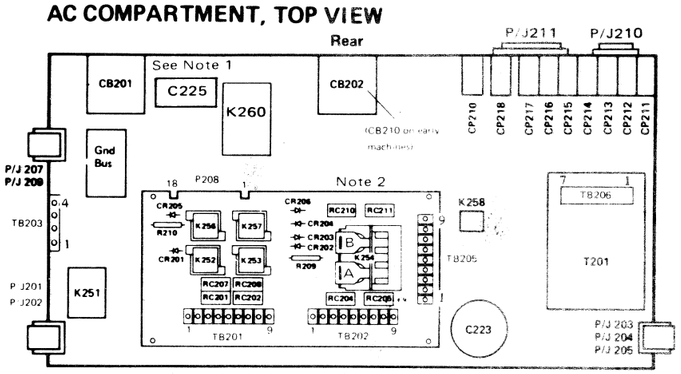
DC VOLTAGE TEST POINTS

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.



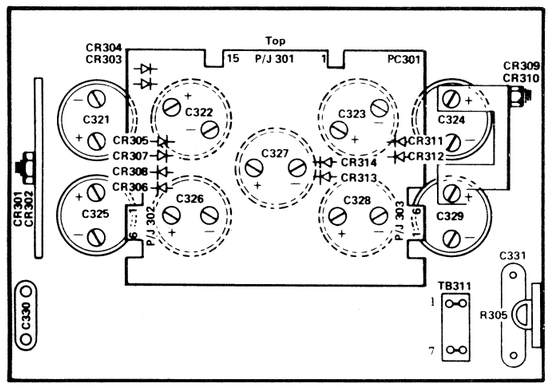
Note 2: The above version of K254 relay is used on later machines.

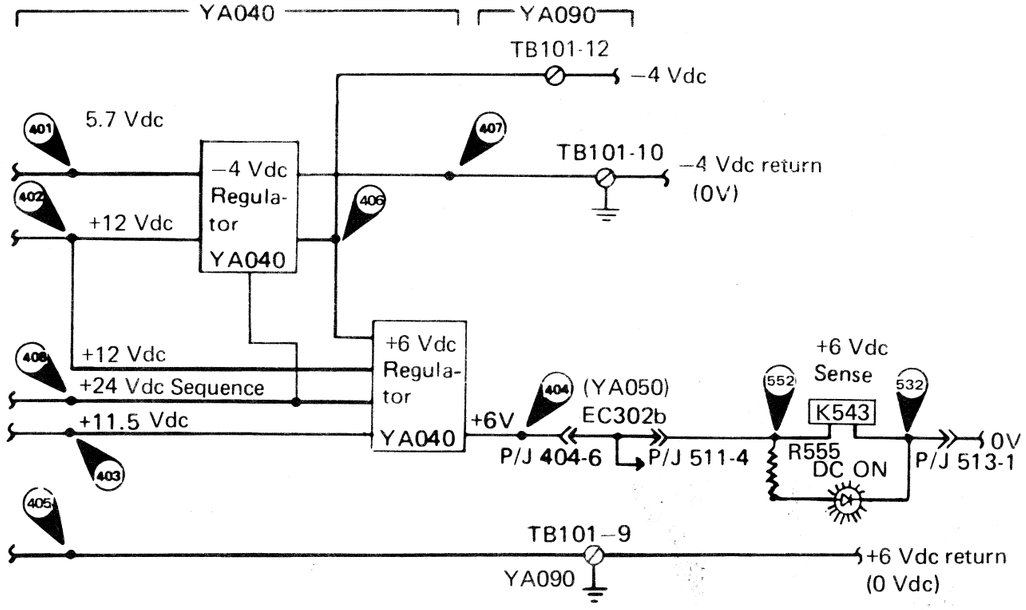
AC COMPARTMENT, TOP VIEW



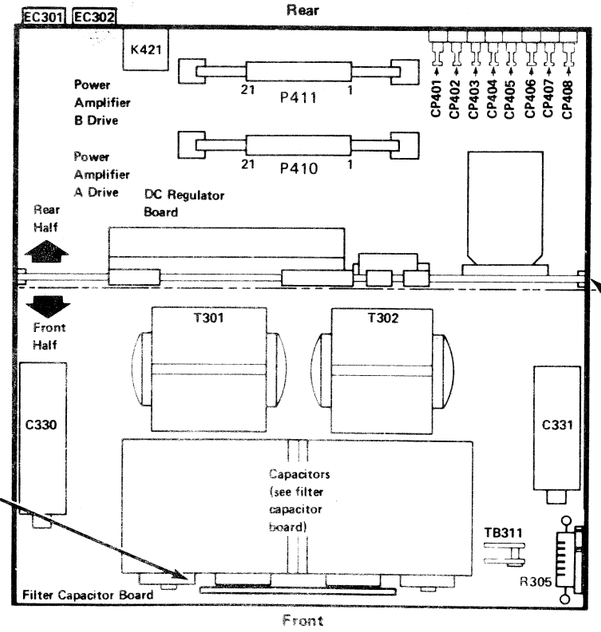
Note 1: C225 is not present on early machines with line filters. Machines not installed in the USA or Germany do not have the line filter or C225 installed.

DC POWER SUPPLY, RECTIFIERS, AND FILTERS

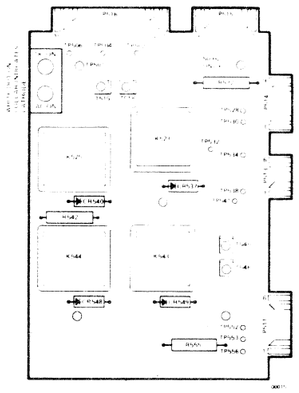


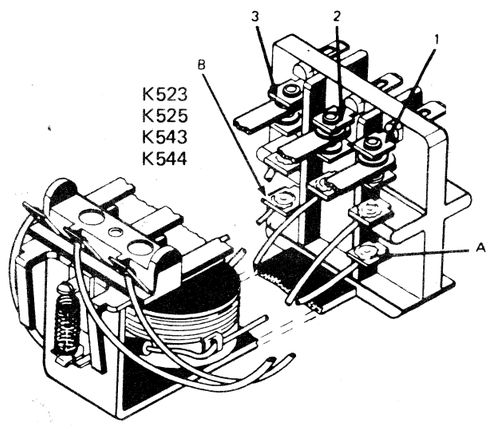


DC COMPARTMENT, TOP VIEW

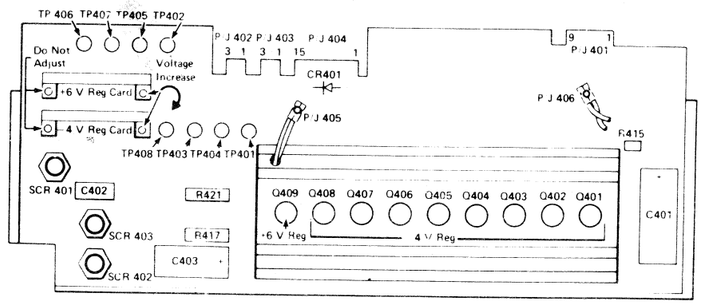


SEQUENCE BOARD, A2





DC REGULATOR BOARD



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CB 201, 202*, CP 214, 215 TRIPS

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.

PWR 12
A

CB 201 Tripped

PWR 21
Reset CB 201. Attempt power-up

CB 201 Tripped — No → 1

Yes

Isolate Module
1. With CB201 tripped, disconnect P205.
2. Reset CB201 and attempt power up.

CB201 Tripped — No

With CB201 tripped, reconnect P205.

Short in satellite module or in cabling between modules

3344 Module in subsystem string — Yes → A → PWR 220 3344 MLM

No → A → PWR 220

Yes

There is a short on the main 3 phase power line in this module

PWR 21 YA010
Check
1. Disconnect AC power plug.
2. Remove AC compartment top cover and visually inspect area for evidence of a short.
3. Check each phase for shorts to ground at left side of K260 contactor. If no shorts to ground are found, short must be between phases. Use PWR 21 and logic YA010 to isolate the short.

Reconnect P205

1

1

After problem is correct, exit to Fix Verification and Checkout Procedure.

A

PWR 90

Note 1. Rectifier Check with CE Meter

CAUTION: Turn off machine power.

1. *Refer to PWR 17 for rectifier locations.*
2. *Disconnect P301, 302, and 303 from PC301.*
3. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
4. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

PWR 12
B

CB202* Tripped

1. Reset CB202.*
2. Turn drive switch to stop.
3. Attempt power-up.

CB202* Tripped — No

Yes

There is a short to ground or between phases in blower motor or associated wiring

Attempt to load a data module on both drives.

CB202* Tripped — No → 1

Yes

There is a short to ground or between phases in a drive motor, DM load motor, or associated wiring.

YA010
YA020

PWR 21
Check
1. Disconnect AC power plug and reset CB202*
2. Remove the AC compartment top cover and visually inspect for evidence of a short.
3. Check resistance of each phase to ground at right side of K260 contactor (should be near infinity).

Short — No → Using PWR 21 and logic YA010 and YA020, carefully disconnect plugs and terminals as necessary to isolate the short. Reconnect AC power plug and attempt power up. Repeat this process as necessary to isolate the short. → 1

Yes → Using PWR 21 and logic YA010 and YA020, disconnect plugs and terminals as necessary to isolate the short. → 1

*CB210 on early machines.

PWR 12
C

CP214 Tripped

Reset CP214. Attempt power-up.

CP214 Tripped — No → 1

Yes

Check
1. Disconnect AC power plug and remove AC compartment top cover.
2. Reset CP214.
3. Check each phase for short to ground at right hand side of K260 contactor.

Short — Yes → Using PWR 21 and logic YA010 and YA030, disconnect plugs and terminals as necessary to isolate the trouble. → 1

No YA010 YA020

PWR 21
Possible Causes
1. Short between phases to T302 primary winding.
2. Shorted rectifier in T302 secondary circuits (CR309 through CR314) Note 1.
3. Short on PC301 or in associated wiring.
4. Short in T302 windings or C331.

Use PWR 21 and logic YA010 and YA030 to isolate the trouble. → 1

CP215 Tripped

Reset CP215. Attempt power-up.

CP215 Tripped — No → 1

Yes

Check
1. Disconnect AC power plug and remove AC compartment top cover.
2. Reset CP215.
3. Check each phase for short to ground at right hand side of K260 contactor.

Short — Yes → 1

No YA010 YA020

PWR 21
Possible Causes
1. Short between phases to T301 primary winding.
2. Short rectifier in T301 secondary circuits (CR301 through CR308) Note 1.
3. Short on PC301 or in associated wiring.
4. Short in T301 windings or C330.

Use PWR 21 and logic YA010 and YA030 to isolate the trouble. → 1

DQ0016	2747769	See	440223	440224				
Seq. 2 of 2	Part No. ( )	EC History	14 Mar 75	15 Dec 75				

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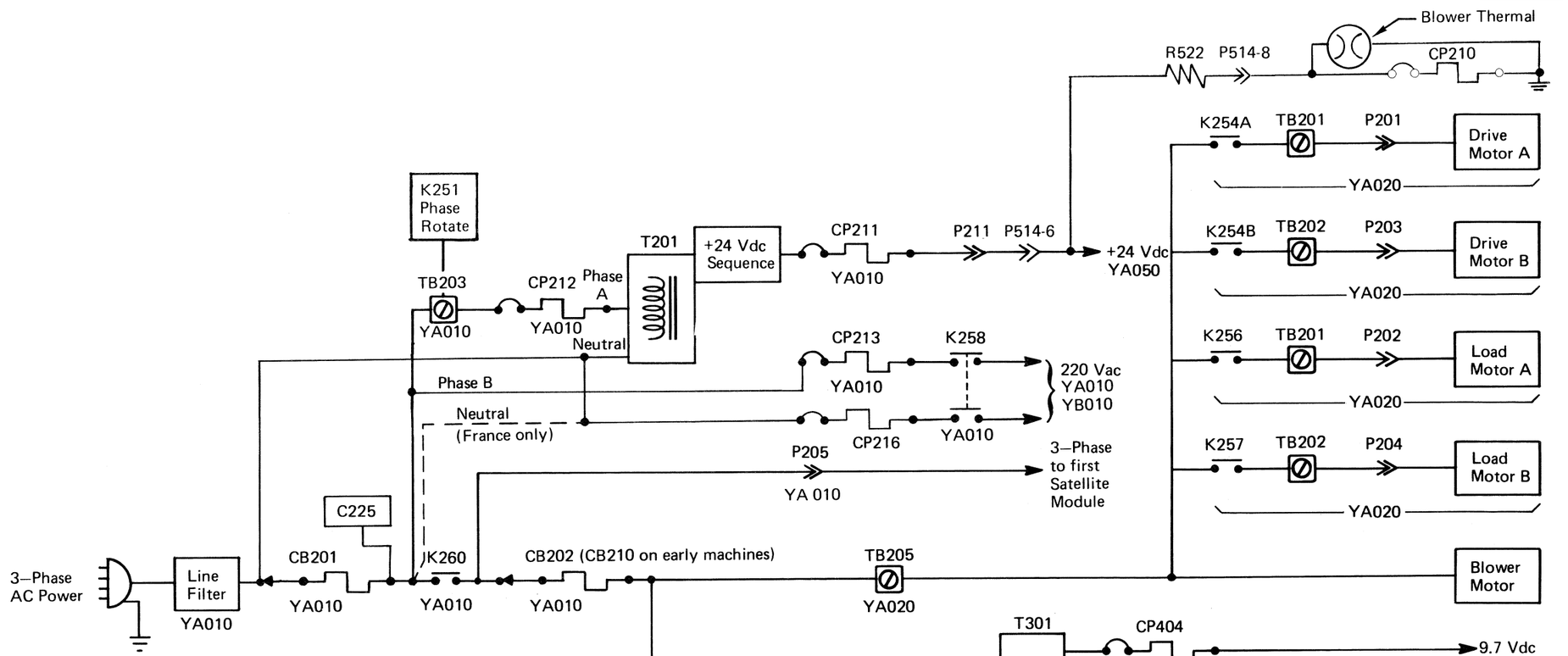
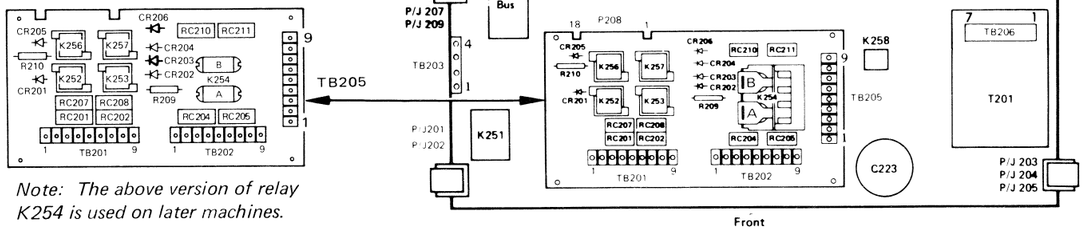
CIRCUIT BREAKER DIAGRAM

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.



Note: The above simplified drawing represents three-phase ac power. Delta filter capacitor C225 is only present on later machines. The line filter is only present on early machines. Machines not installed in the USA or Germany do not have the line filter or C225 installed.

AC COMPARTMENT, TOP VIEW



Note: The above version of relay K254 is used on later machines.

DQ0020	2747770
Seq 1 of 2	Part No. (4)

See EC History	440224 15 Dec 75	440227 14 Sept 76				

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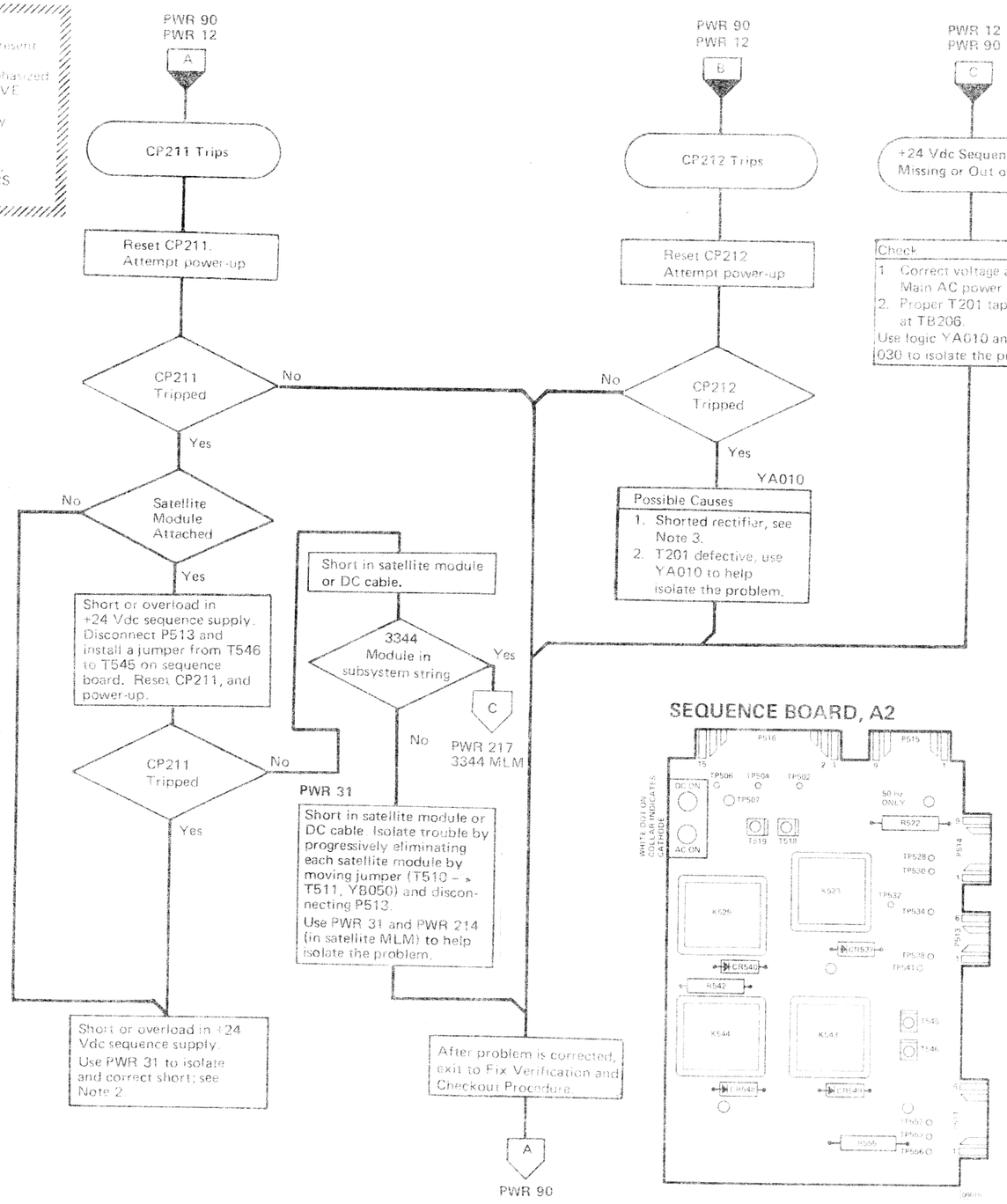
+ 24 VOLT SEQUENCE SUPPLY (CP211, CP212)

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.



Test Point	Range	Ripple
TP507	+19.2 to +30.7 V	< 0.6 V p/p

SERVICE NOTES

Note 1. Capacitor Check with CE Meter
CAUTION: Turn off machine power.

DANGER
Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set the meter range to R x 10.*
3. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
4. *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 the range to R x 1 and speed up the process.*

Note 2. Load Resistance Check
CAUTION: Turn off machine power.
With CB201 open, measure the resistance between the following test points and ground. Use a CE meter on the R x 1 scale with the Pos (–Ω) lead grounded.

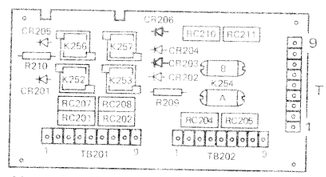
Test Point	*Condition*	*Resistance*
507		*>100 ohms*
538		*>100 ohms*
534		*>100 ohms*
530	*P514 connected*	*>5 ohms*
530	*P514 unplugged*	*>500 ohms*

Note 3. Rectifier Check with CE Meter
CAUTION: Turn off machine power.

1. *Disconnect P302.*
2. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
3. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

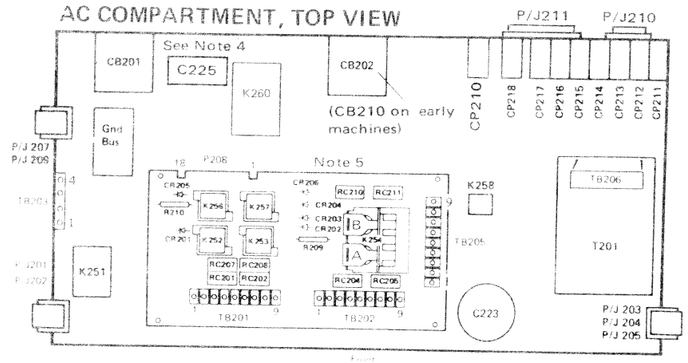
Note 4. *C225 is only present on later machines. Machines not installed in the USA or Germany do not have C225 installed.*

SEQUENCE BOARD, A2



Note 5: The above version of relay K254 is used on later machines.

AC COMPARTMENT, TOP VIEW



DQ0020	2747770	See EC History	440224	440227				
Seq. 2 of 2	Part No. (4)		15 Dec 75	14 Sept 76				

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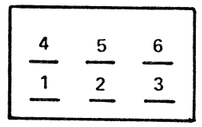
+24 VOLT SEQUENCE SUPPLY CIRCUITS

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-up machine.

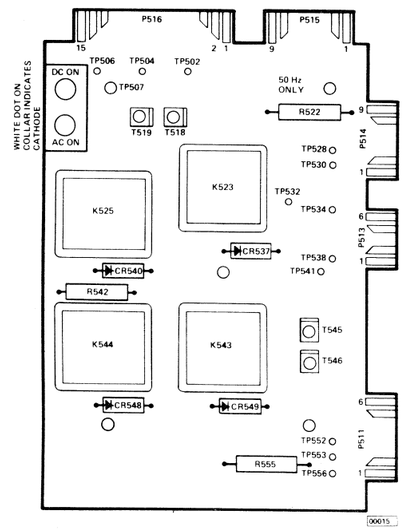
EPO CONNECTOR P101, P102

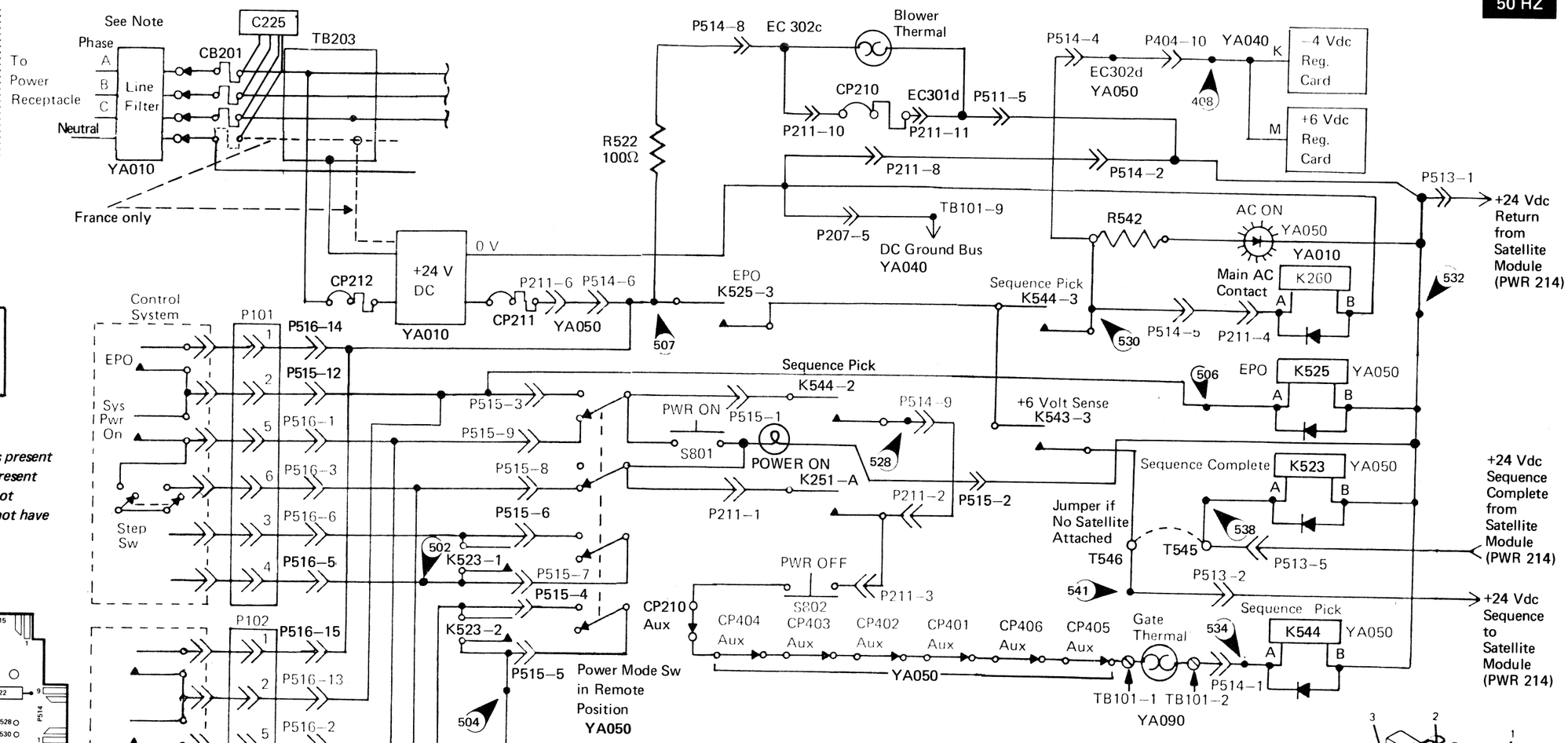


(plugging view)

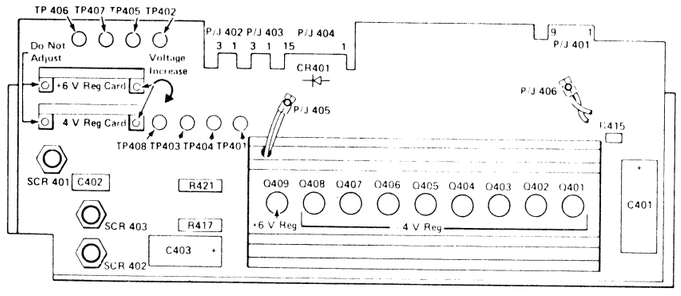
Note: Delta filter capacitor (C225) is present on later machines. The line filter is present only on earlier machines. Machines not installed in the USA or Germany do not have the line filter or C225 installed.

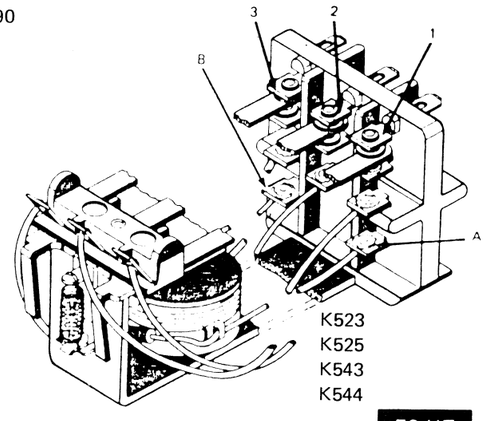
SEQUENCE BOARD, A2





DC REGULATOR BOARD





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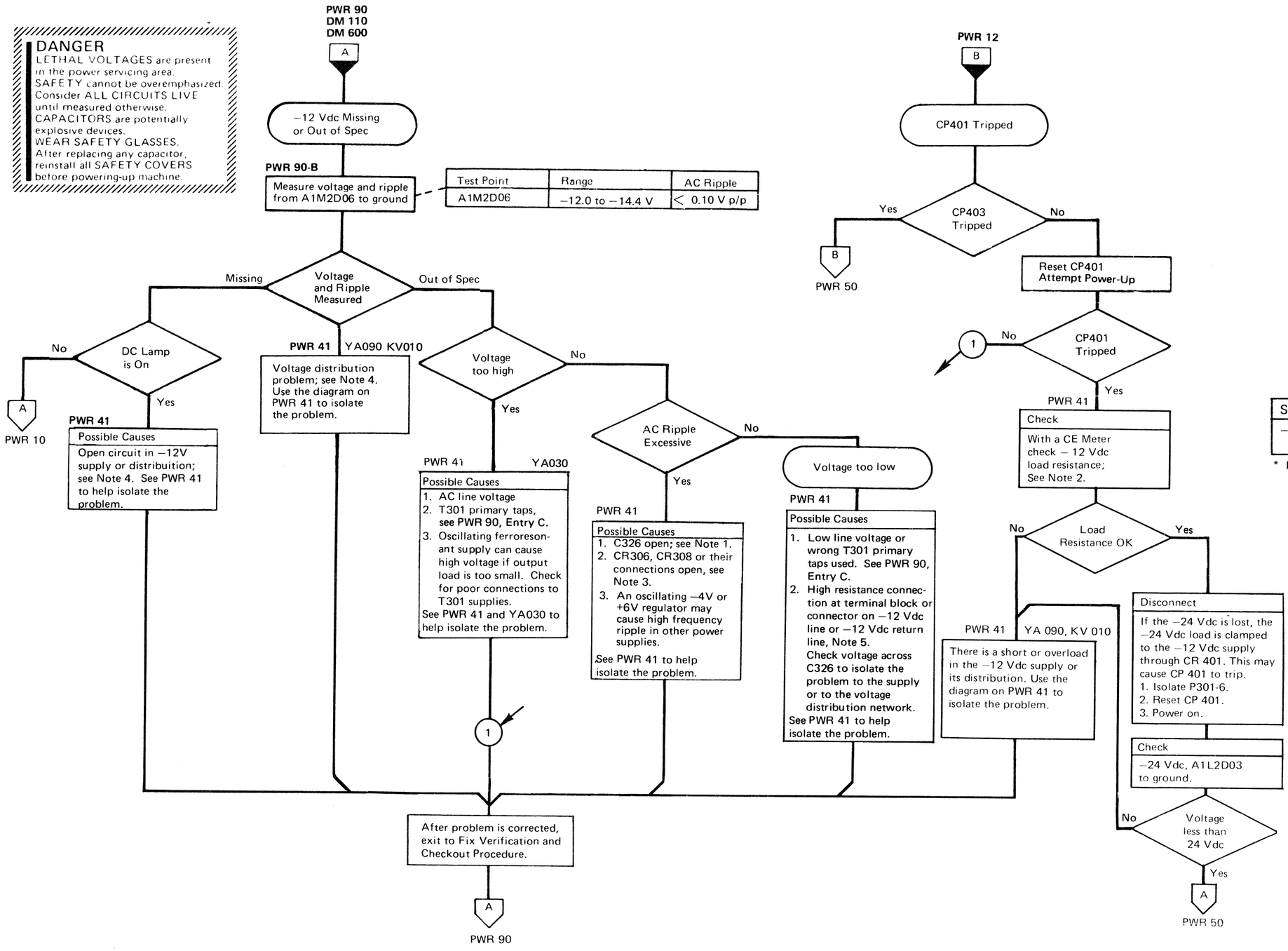
–12 VOLT SUPPLY (CP401)



SERVICE NOTES

Note 1. Capacitor Check with CE Meter

CAUTION: Turn off machine power.

DANGER

Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set the meter range to R x 10.*
3. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
4. *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 the range to R x 1 to speed up the process.*

Note 2. Load Resistance Check with CE Meter

CAUTION: Turn off machine power.

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
–12 V	Rx1	Common (+ Ω)	TB101–6*	CP401 Tripped	> 80 ohm
				CP401 Reset	> 25 ohm

* Located on the logic gate.

Note 3. Rectifier Check with CE Meter

CAUTION: Turn off machine power.

1. *Disconnect P302.*
2. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
3. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

Note 4.

The power amp –12 volts is controlled by a transistor switch on the –4 volt regulator card. A drop in the +24 Vdc sequence supply immediately cuts off the –12 volts to the power amps.

Note 5.

An open -12 Vdc return line to the T301 12 V secondary center tap causes the -12 V to drop below spec and the +12 V to increase above spec.

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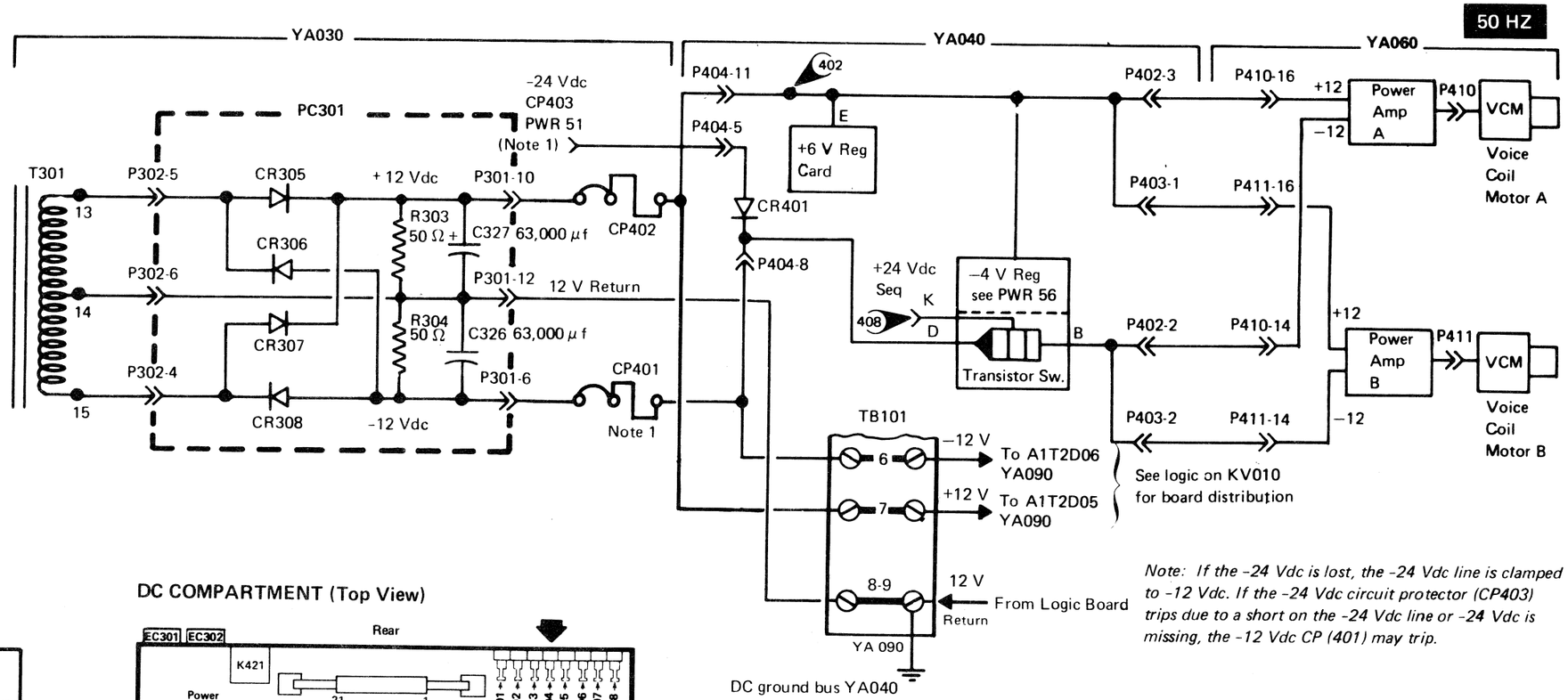
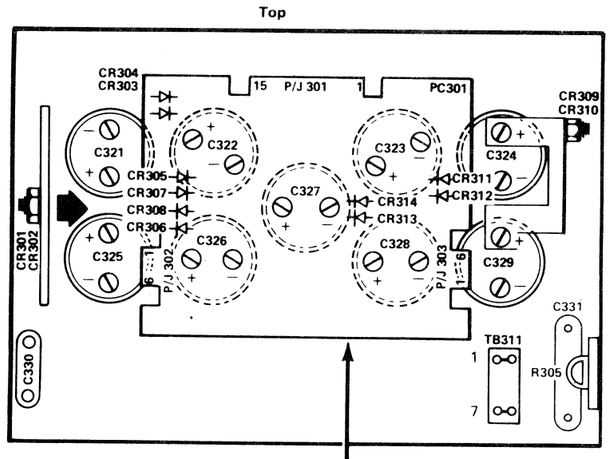
-12 VOLT AND +12 VOLT CIRCUITS

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 up machine.

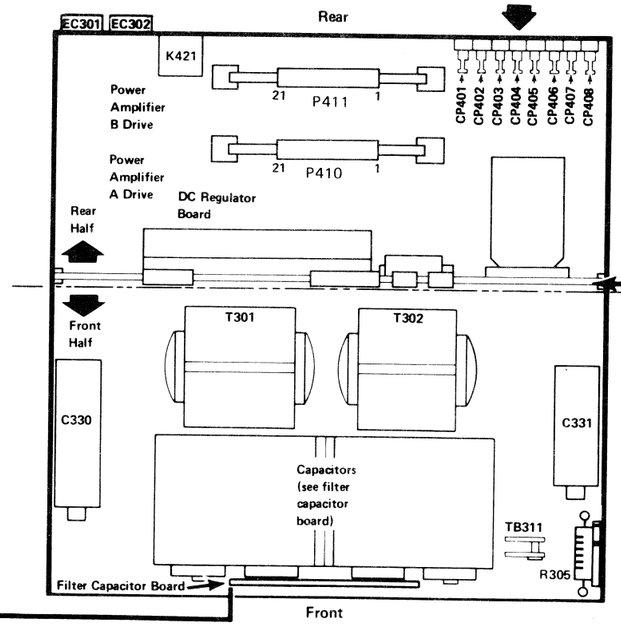


Note: If the -24 Vdc is lost, the -24 Vdc line is clamped to -12 Vdc. If the -24 Vdc circuit protector (CP403) trips due to a short on the -24 Vdc line or -24 Vdc is missing, the -12 Vdc CP (401) may trip.

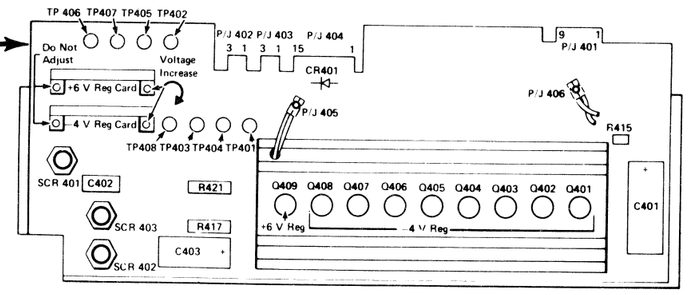
RECTIFIERS AND FILTERS (Front View)



DC COMPARTMENT (Top View)



DC REGULATOR BOARD (Rear View)



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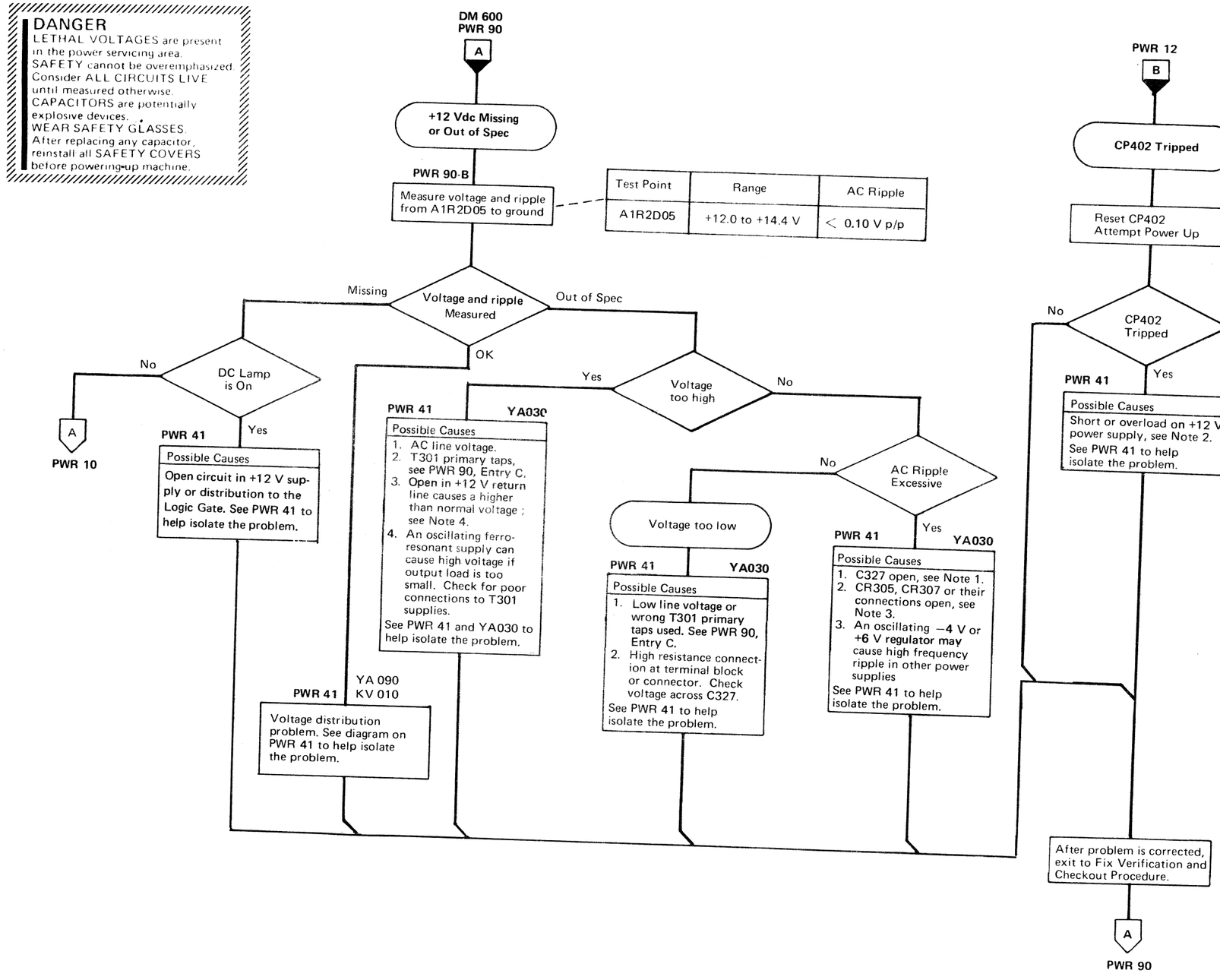
+12 VOLT SUPPLY (CP402)

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.



SERVICE NOTES

Note 1. Capacitor Check with CE Meter

CAUTION: Turn off machine power.

DANGER
Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set the meter range to R x 10.*
3. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns towards infinity.*
4. *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 the range to R x 1 to speed up the process.*

Note 2. Load Resistance Check with CE Meter.

CAUTION: Turn off machine power.

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
+12 V	Rx1	Pos (−Ω)	TB101−7*	CP402 Tripped	> 80 ohm
				CP402 Reset	> 20 ohm

*Located on the Logic Gate.

Note 3. Rectifier Check with CE Meter

CAUTION: Turn off machine power.

1. *Disconnect P302.*
2. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
3. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

Note 4.

An open 12 Vdc return line (in series with P302−6) to the T301 12 V secondary center tap causes the −12 Vdc to drop below and the +12 Vdc to rise above specifications.

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–24 VOLT SUPPLY (CP403)

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.

DM 110
DM 600
PWR 90

A

–24 Vdc Missing or Out of Spec

PWR 90-B

Measure voltage and ripple from A1L2D03 to ground

Test Point	Range	AC Ripple
A1L2D03	–24.0 to –28.8 V	<0.08 V p/p

Less than –14 Vdc; see Note 4.

Voltage and ripple measured

Missing

Out of Spec

OK

DC Lamp On

Yes

No

A

PWR 10

See PWR 51

24 V across TB101 –4 and TB101 –8

Yes

No

PWR 51

Possible Causes
1. Bad connector on board or open land pattern on MST board.
2. Return line open or not grounded.

See PWR 51 to help isolate the problem.

24 V across C322

Yes

No

PWR 51

Possible Causes

P301–14 or 15 open; CP403 open.

See PWR 51 to help isolate the problem.

55 Vac across P302–1 and P302–2

Yes

No

PWR 51

Possible Causes

P302–1,2,3 open; PC301 has open land pattern.

See PWR 51 to help isolate the problem.

PWR 51

Possible Causes

T301 transformer secondary open.

See PWR 51 to help isolate the problem.

PWR 51

YA090, KV010

Voltage distribution problem. Use the diagram on PWR 51 to help isolate the problem.

Voltage too high

Yes

No

PWR 51

YA030

Possible Causes
1. AC line voltage.
2. T301 primary taps, see PWR 90, Entry C.
3. Oscillating ferroresonant supply can cause high voltage if output load is too small. Check for poor connections to T301 supplies.

See PWR 51 and YA030 to help isolate the problem.

AC Ripple Excessive

No

Yes

Voltage too low

PWR 51

YA030

Possible Causes
1. See Note 4.
2. Low line voltage or wrong T301 primary taps, see PWR 90, Entry C. Before changing taps check –12 V to determine if it is low at A1M2D06; –12 to –14.4 V.
3. High resistance connection at terminal block or connector. Check voltage across C322.

See PWR 51 to help isolate the problem.

PWR 51

Possible Causes
1. C322 open, see Note 1.
2. CR303. CR304 or their connections open, see Note 3.
3. An oscillating –4 V or +6 V regulator may cause high frequency ripple in other supplies.

See PWR 51 to help isolate the problem.

PWR 12

B

CP403 Tripped

Reset CP403. Attempt Power Up

CP403 Tripped

Yes

No

PWR 51

Possible Causes

Short or overload on –24 Vdc supply, see Note 2.

See PWR 51 to help isolate the problem.

After problem is corrected exit to Fix Verification and Checkout Procedure.

A

PWR 90

SERVICE NOTES

Note 1. Capacitor Check with CE Meter
CAUTION: Turn off machine power.

DANGER
Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set the meter range to R x 10.*
3. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns towards infinity.*
4. *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 towards infinity. For large capacitors, set the range to R x 1 to speed up the process.*

Note 2. Load Resistance Check with CE Meter
CAUTION: Turn off machine power.

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
–24 V	Rx10	Com (+ Ω)	TB101–4*	CP403 Tripped	> 200 ohm
	Rx1			CP403 Reset	> 75 ohm

*Located on the Logic Gate.

Note 3. Rectifier Check with CE Meter
CAUTION: Turn off machine power.

1. *Disconnect P302.*
2. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
3. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

Note 4.

If the –24 Vdc supply voltage is lost, the –24 Vdc line is clamped to –12 Vdc by a diode (CR401) on the DC Regulator board.

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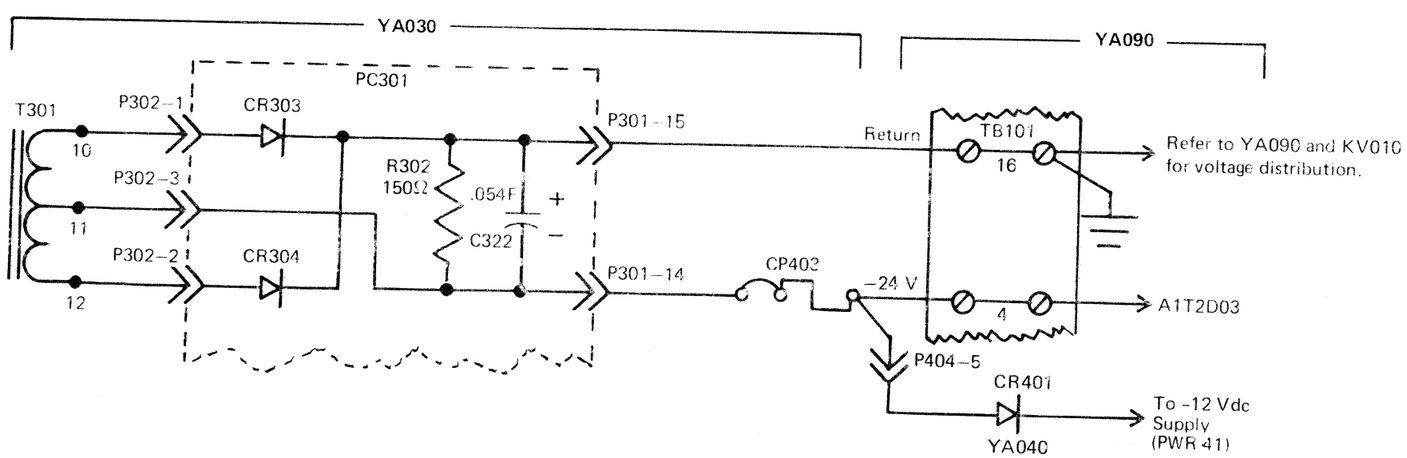
–24 VOLT SUPPLY CIRCUIT

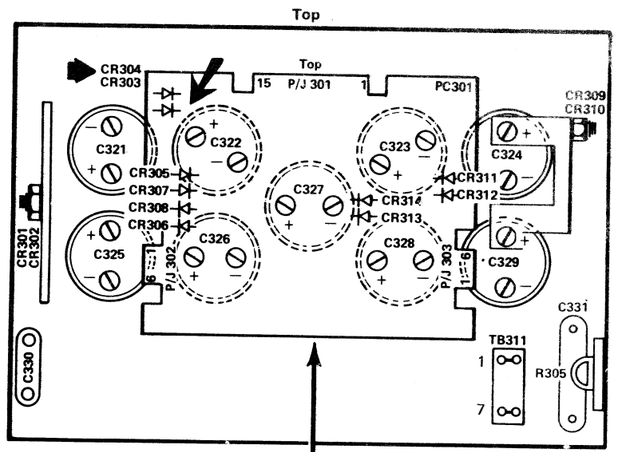
DANGER
LETHAL VOLTAGES are present in the power servicing area. SAFETY cannot be overemphasized. Consider ALL CIRCUITS LIVE until measured otherwise. CAPACITORS are potentially explosive devices. WEAR SAFETY GLASSES. After replacing any capacitor, reinstall all SAFETY COVERS before powering-up machine.

–24 Vdc SUPPLY (CP403)

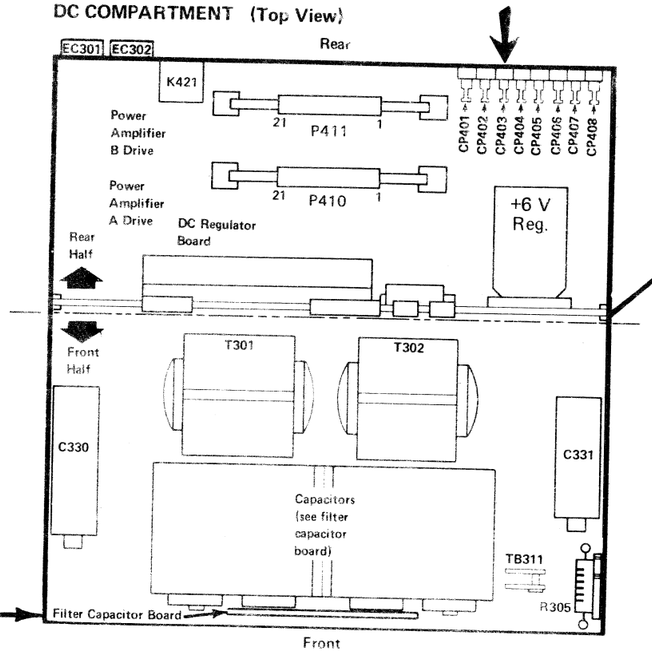


Note: *CR401 is used to clamp –24 Vdc to –12 Vdc supply.*

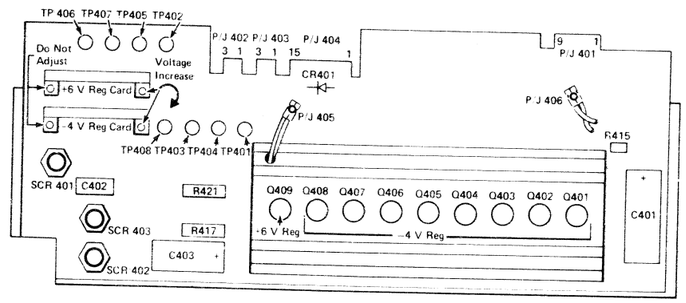
RECTIFIERS AND FILTERS (Front View)



DC COMPARTMENT (Top View)



DC REGULATOR BOARD (Rear View)



DQ0051	2747774	440206	440205	440209	440214	440223		
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–4 VOLT SUPPLY (CP404)

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.

DM 600
PWR 90
A

–4 Vdc Missing or Out of Spec

PWR 90-B

1. Measure voltage from A1P2B06 to ground with digital voltmeter.
2. Check the ripple with an oscilloscope and a grounded x1 probe.

Test Point	Range	AC Ripple
A1P2B06	–3.84 to –4.16 V	<0.04 V p/p

Voltage and Ripple Measured

Missing

DC Lamp is On

No → A → **PWR 10**

Yes

PWR 56

Possible Causes

Open circuit in –4 Vdc supply or distribution

See PWR 56 to help isolate the problem.

OK

YA090
KV010
BV100

PWR 56

Voltage distribution problem. Use diagram on PWR 56 to help isolate the problem.

Out of Spec

AC Ripple Excessive

No

Check

Voltage between TP406 (–) and TP401 (+), 8.7 to 10.7 V

Voltage Normal

Yes

PWR 56

Adjust

With a digital voltmeter measure the voltage between A1P2B06 and D08. Adjust the –4 V regulator card for –4 V (–3.84 to –4.16 V). Turn voltage adjustment screw clockwise to increase voltage.

Voltage adjusted within tolerance

No

PWR 56

Possible Causes

1. Defective –4 V regulator card.
2. Defective transistor on DC regulator board (replace the board).
3. High resistance connection in –4 Vdc distribution.

See PWR 56 to help isolate the problem.

Yes

Voltage Normal

No

Possible Causes

1. T301 input taps – does voltage match PWR 90, Entry C?
2. Poor connection to C321, C324, or CP404 – check voltage.

See YA030 and YA040 to help isolate the problem.

Yes

PWR 56

Possible Causes

1. C321, C325, C401, or C403 open; see Note 1.
2. CR301 or CR302 open; see Note 3.
3. Defective regulator card or transistor on –4 V heat sink.
4. An oscillating –4 V or +6 V regulator may cause high frequency ripple in this supply and other supplies.
5. Oscillating ferroresonant supply; see Note 5.

See PWR 56 to help isolate the problem.

PWR 12
B

CP404 Tripped

Reset CP404. Attempt power-up

CP404 Tripped

No

Yes

Possible Causes

1. Short or overload at output, see Note 2.
2. Voltage too high, try decreasing voltage pot on –4 V regulator card about 2 turns CCW.
3. DC regulator board defective; shorted transistor; or shorted SCR402/SCR403, see Note 4.

See PWR 56 to help isolate the problem.

After problem is corrected exit to Fix Verification and Checkout Procedure.

A
PWR 90

SERVICE NOTES

Note 1. Capacitor Check with CE Meter.

CAUTION: Turn off machine power.

DANGER
Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set meter range to R x 10.*
3. *Touch meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
4. *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 the range to R x 1 to speed up the process.*

Note 2. Load Resistance Check with CE Meter.

CAUTION: Turn off machine power.

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
–4 V	Rx1	Com (+ Ω)	TB101-12*	CP404 Tripped	> 5 ohm
				CP404 Reset	> 5 ohm

*Located on Logic gate.

Note 3. Rectifier Check with CE Meter.

CAUTION: Turn off machine power.

1. *Disconnect CR301 and CR302 from heat sink.*
2. *With the meter set to R x 1, measure the forward resistance – should be from 15 to 30 ohm.*
3. *Set the meter to R x 1000 and reverse the meter leads which should be near infinity.*

Note 4.

SCRs 402 and 403 short out CP404 if excess voltage is detected at the output of the -4 V regulator. These SCRs could fire if the regulator card is defective or the –4 V line to pin Q is open.

Note 5.

An insufficient load at the output of this supply can cause the ferroresonant transformer (T301) to go into oscillation. This causes excessive ripple at the output and high voltage at the T301 unregulated supply outputs.

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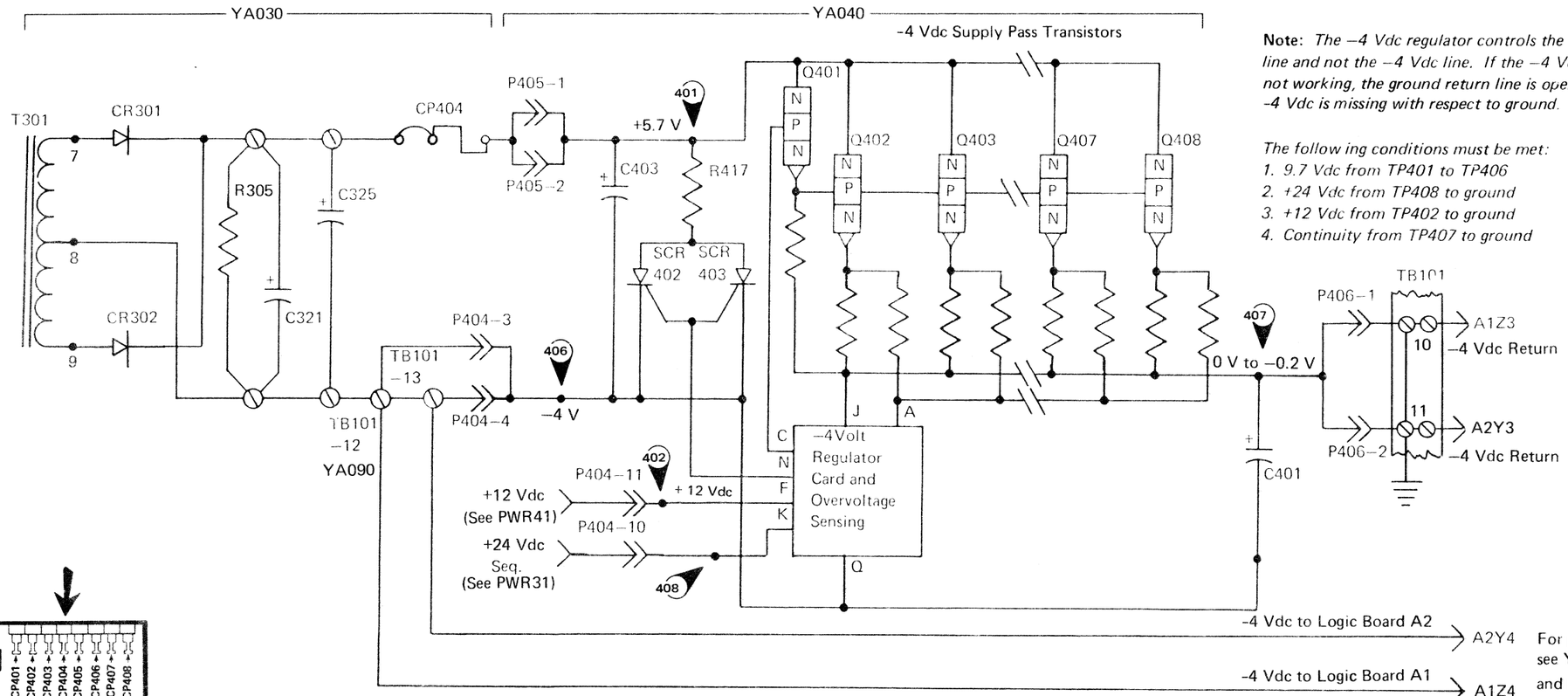
–4 VOLT SUPPLY CIRCUIT

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.

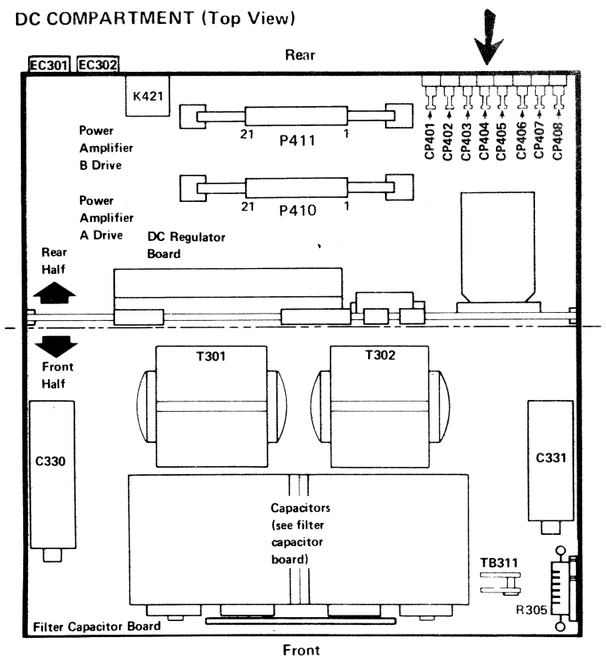


Note: *The –4 Vdc regulator controls the –4 Vdc return line and not the –4 Vdc line. If the –4 Vdc regulator is not working, the ground return line is open and the -4 Vdc is missing with respect to ground.*

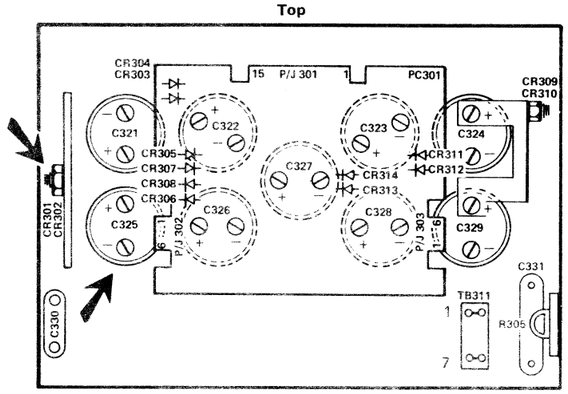
The follow ing conditions must be met:
1. *9.7 Vdc from TP401 to TP406*
2. *+24 Vdc from TP408 to ground*
3. *+12 Vdc from TP402 to ground*
4. *Continuity from TP407 to ground*

For power distribution see YA090, KV010, and BV100.

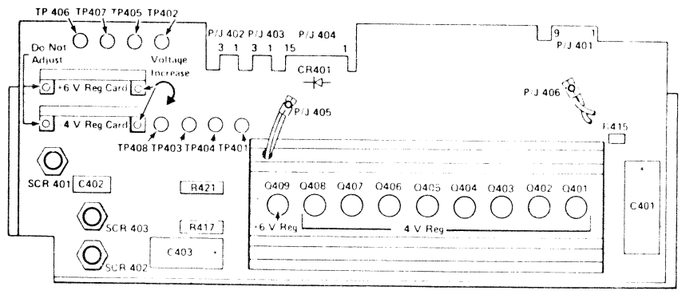
DC COMPARTMENT (Top View)



RECTIFIERS AND FILTERS (Front View)



DC REGULATOR BOARD (Rear View)



DQ0056	2747775	440206	440205	440209	440214	440223		
Seq.1 of 2	Part No. ( )	4 Jan 74	28 Jan 74	25 Mar 74	17 Jun 74	14 Mar 75		

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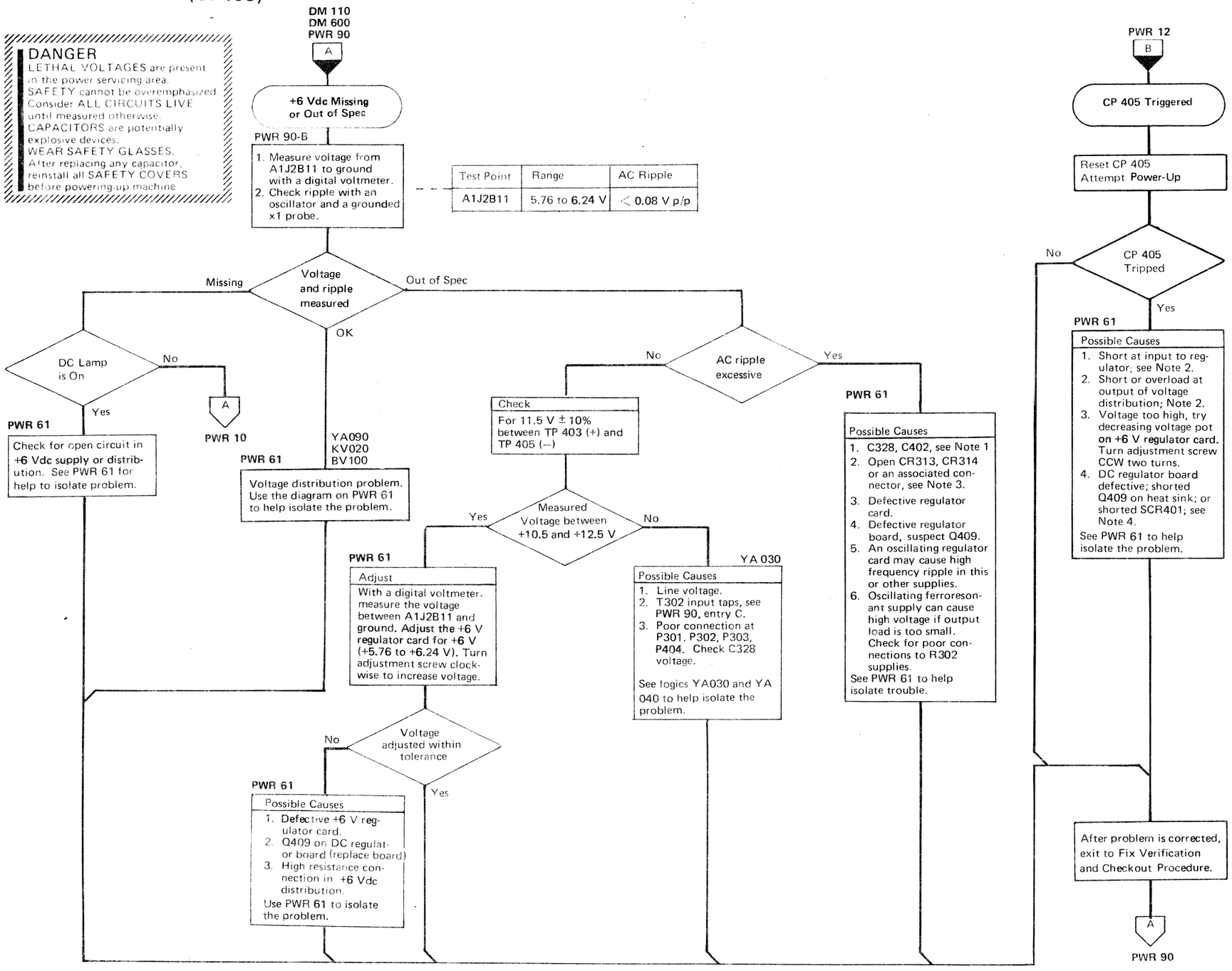
+6 VOLT SUPPLY (CP405)

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.



SERVICE NOTES

Note 1. Capacitor Check with CE Meter

CAUTION: Turn off machine power.

DANGER
Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set the meter range to R x 10.*
3. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
4. *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 the range to R x 1 to speed up the process.*

Note 2. Load Resistance Check with CE Meter.

CAUTION: Turn off machine power.

Supply	Scale	Com (+ Ω)	Pos (- Ω)	Condition	Resistance
+6 V	Rx1	Ground	TB101-5*	CP405 Tripped	> 10 ohm
				CP405 Reset	> 10 ohm
		TP 403	TP 405		> 15 ohm

*Located on Logic Gate.

Note 3. Rectifier Check with CE Meter

CAUTION: Turn off machine power.

1. *Disconnect P303.*
2. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
3. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

Note 4:

SCR401 is used to short the output of CP405 to ground if overvoltage is detected at the output of the regulator.

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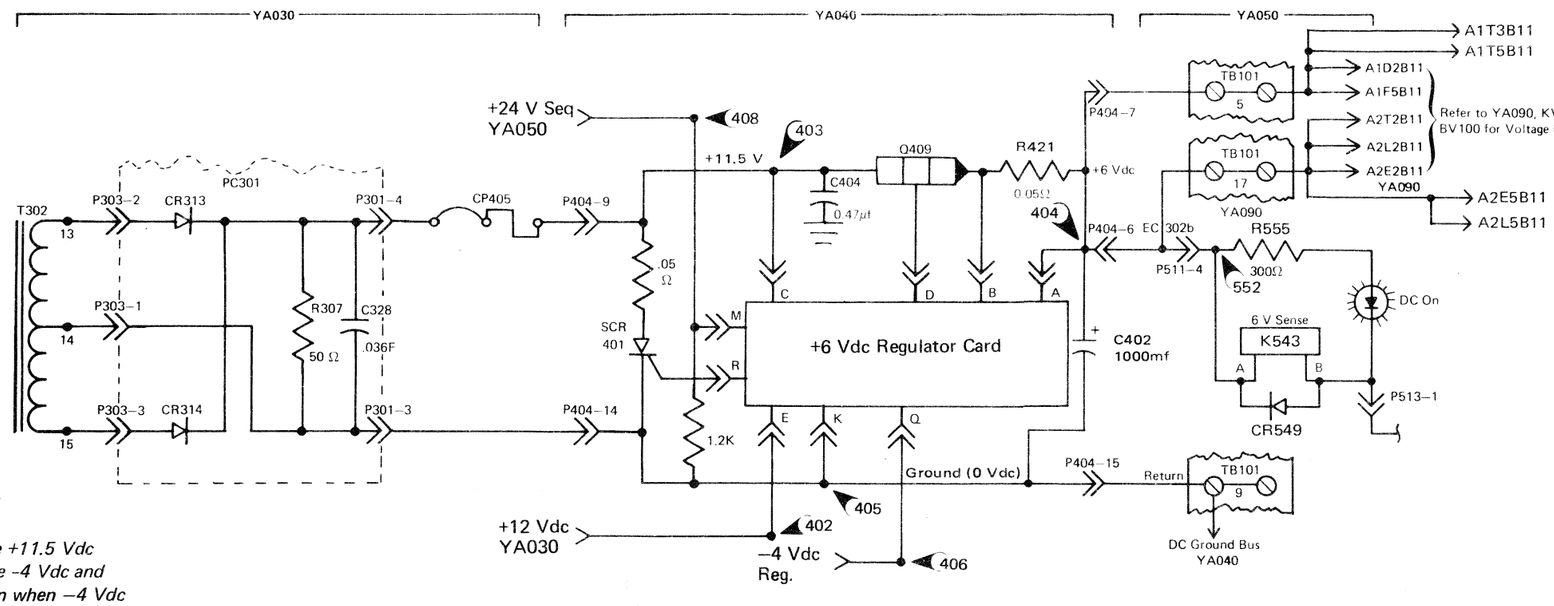
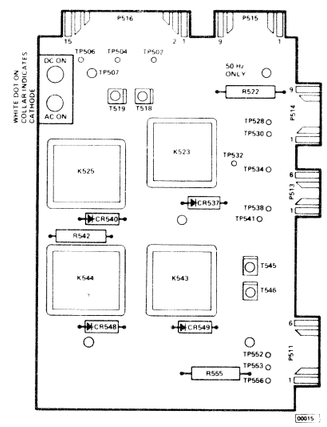
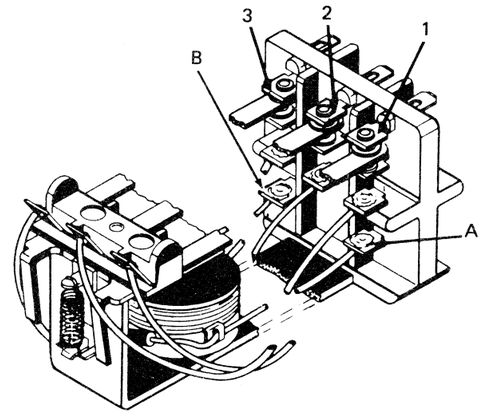
+6 VOLT REGULATOR CIRCUIT

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.

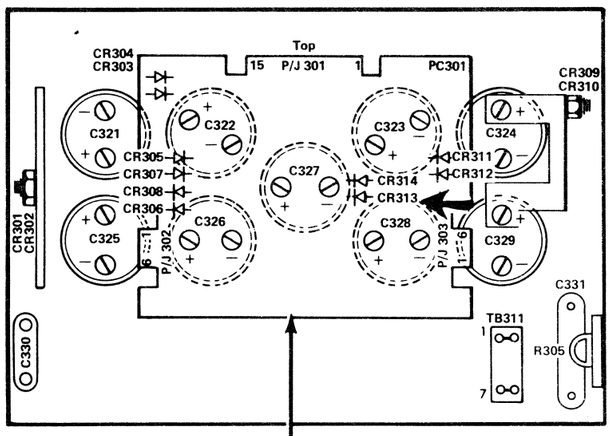
Note: The +6 Vdc regulator regulates the +11.5 Vdc supply. The regulator is controlled by the -4 Vdc and +24 Vdc sequencing supplies. It turns on when −4 Vdc reaches -3.8 Vdc and the +24 Vdc sequencing voltage reaches +18.0 V. Plus 12 Vdc is also required as a bias voltage for the regulator circuits.



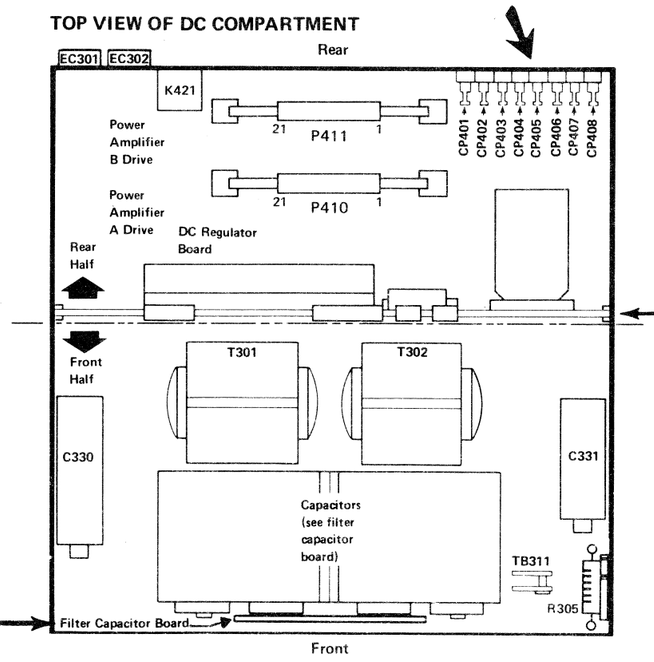




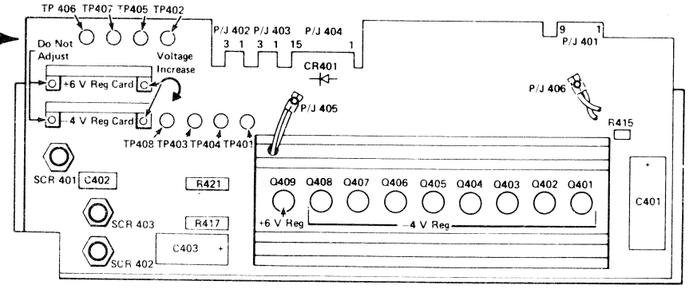
DC POWER SUPPLY, RECTIFIERS AND FILTERS (Front View)



TOP VIEW OF DC COMPARTMENT



DC REGULATOR BOARD



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+24 VOLT LOCAL SUPPLY (CP406)

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.

DM 111
PWR 90

A

+24Vdc Missing or Out of Spec

PWR 90-B

Measure voltage and ripple at +24 Vdc Pwr Sw A or B center terminal on power mode panel, see LOC 6.

Test Point	Range	AC Ripple
Power on A sw, center term	+21.6 to 26.4V	< 0.35V p/p

Voltage and Ripple Measured

Missing

No

DC Lamp Is On

A
PWR 10

Yes

PWR 71

Check for open circuit in +24Vdc supply or distribution.
See PWR 71 for help to isolate the problem.

OK

PWR 71

Voltage Distribution problem. Use diagram on PWR 71 to help isolate the problem.

Out of Spec

Yes

Voltage Too High

PWR 71 **YA030**

Possible Causes
1. AC line voltage.
2. **T302 input taps, see PWR 90, Entry C.**
3. Oscillating ferroresonant supply can cause high voltage if output load is too small. Check for poor connections to T302 supplies.

See PWR 71 to help isolate the problem.

No

AC Ripple excessive

Yes

PWR 71

Possible Causes
1. C323 open, see Note 1.
2. CR311, CR312 or their connectors open, see **Note 3.**
3. An oscillating −4V or +6V regulator may cause high frequency ripple in other supplies.

See PWR 71 to help isolate the problem.

Voltage too low

PWR 71

Possible Causes
1. Low line voltage or wrong T302 primary used.
   Before changing taps check −36V to see if it is low (TB101-3; logic gate; −36.0 to −43.2V).
2. High resistance connection at terminal block or connector. Check voltage across C322.

See PWR 71 to help isolate the problem.

PWR 12

B

CP406 Tripped

Reset CP 406. Attempt power up

No

CP 406 Tripped

Yes

PWR 71

Possible Causes

Short or overload on the output of the +24 Vdc supply. See Note 2. Use PWR 71 and the +24 Vdc power switches on the power mode panel to help isolate the problem. CE Sw must be on to turn +24 Vdc Off. See LOC pages to locate components.

After problem is corrected exit to Fix Verification and Checkout Procedure.

A
PWR 90

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SERVICE NOTES

Note 1. Capacitor Check with CE Meter

CAUTION: Turn off machine power.

DANGER
Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set the meter range to R x 10.*
3. *Touch the meter leads to the two capacitor terminals and observe that the needle nearly goes to zero, then returns toward infinity.*
4. *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 the range to R x 1 to speed up the process.*

Note 2. Load Resistance Check with CE Meter.

CAUTION: Turn off machine power.

Both +24 Vdc power switches must be on.

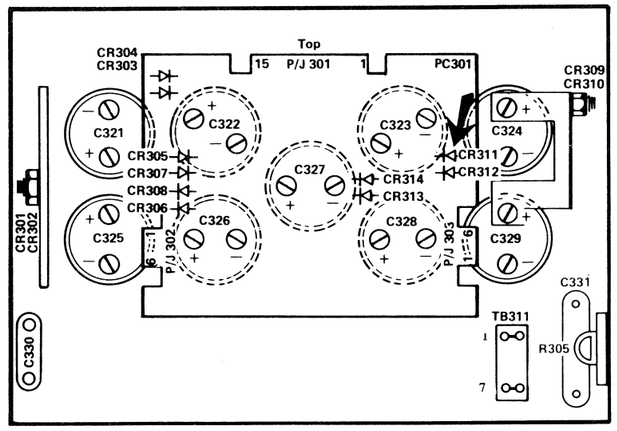
Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
+24V	Rx1	Com (+ Ω)	Pwr Sw A,center terminal	CP406 Tripped	> 50 ohm
				CP406 Reset	> 15 ohm

Note 3. Rectifier Check with CE Meter

CAUTION: Turn off machine power.

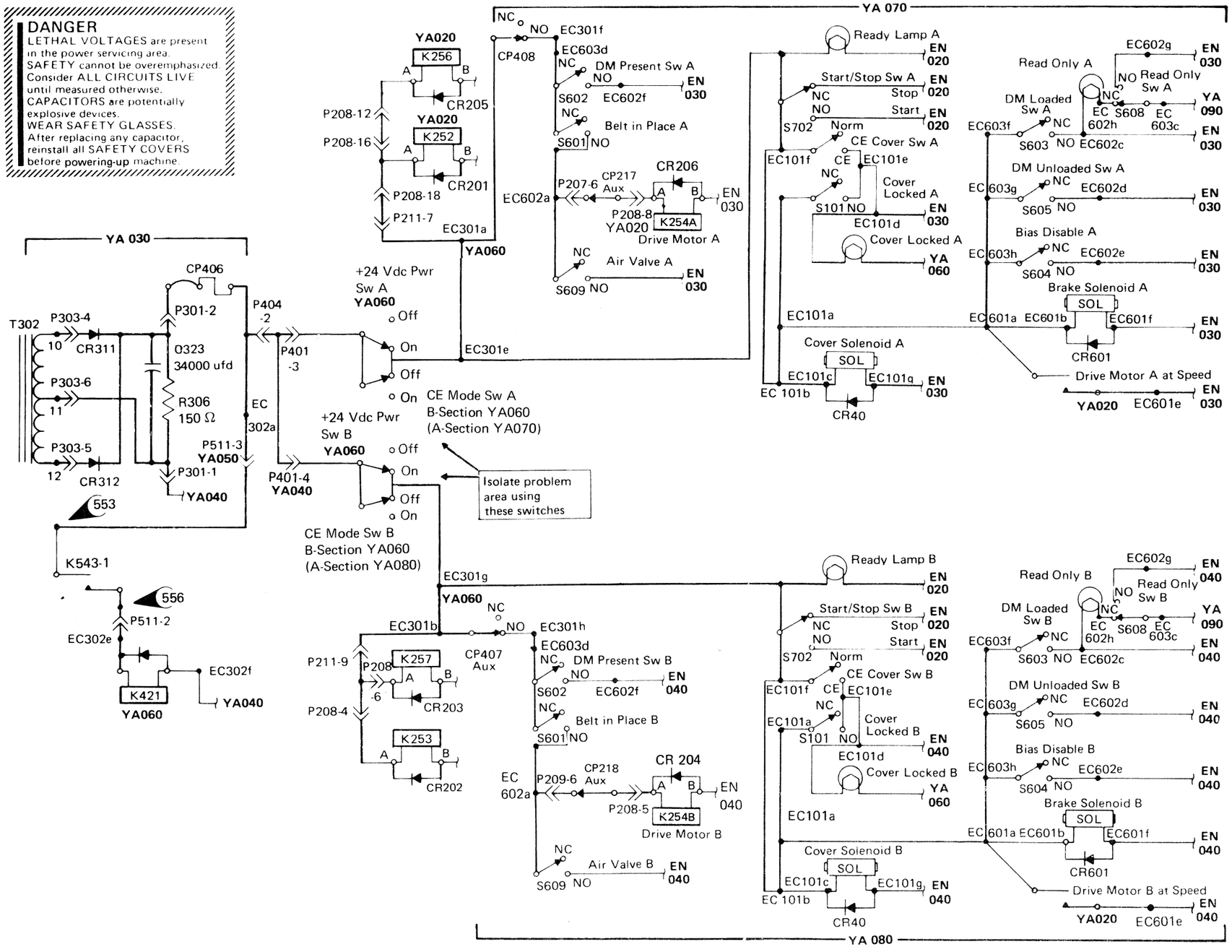
1. *Disconnect P303.*
2. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
3. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

DC POWER SUPPLY, RECTIFIERS AND FILTERS, (Front View)

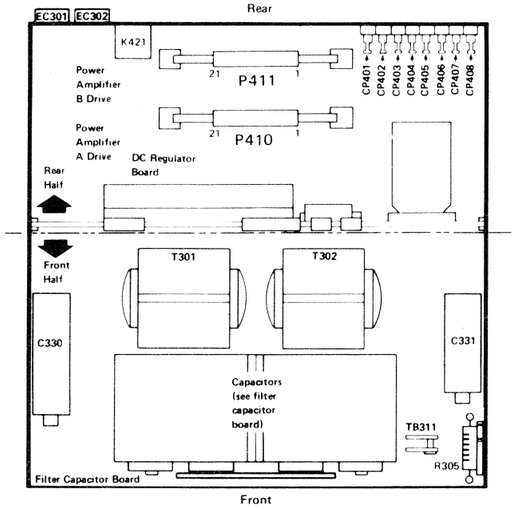


+24 VOLT LOCAL SUPPLY CIRCUIT

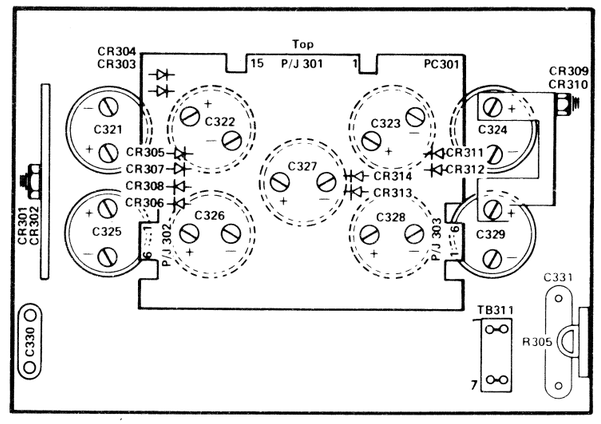
DANGER
LETHAL VOLTAGES are present in the power servicing area.
SAFETY cannot be overemphasized.
Consider ALL CIRCUITS LIVE until measured otherwise.
CAPACITORS are potentially explosive devices.
WEAR SAFETY GLASSES.
After replacing any capacitor, reinstall all SAFETY COVERS before powering-up machine.



DC COMPARTMENT (Top View)



DC RECTIFIERS AND FILTERS (Front View)



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–36 VOLT SUPPLY (CP407, CP408)

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.

DM 150
DM 600
ACC 320
PWR 10
PWR 90

A

–36 Vdc missing or Out of Spec

CP407 or CP408 tripped

Yes

CP407 – Drive B
CP408 – Drive A

1. Power down
2. Reset CP407 & CP408
3. Power-up
4. Attempt to load DM on failing drive.

CP407 or CP408 tripped

No

Yes

PWR 81

Possible Causes

1. Short or overload on –36 Vdc supply. See Note 2.
2. +12 Vdc missing to the power amplifiers. See Note 4.
3. Power amplifiers; swap P410 and P411 or power amplifiers.

Use PWR 81 to help isolate the problem.

No

A

PWR 10

DC lamp on

Yes

Measure voltage from TB101-3 to ground.

Test Point	Range	AC Ripple
TB101-3	–36.0 to –43.2 V	<0.14 V p/p

Voltage and ripple measured

Missing

Out of spec

Check

For an open in –36 Vdc supply or ground return. See PWR 81 to isolate the problem.

OK

To determine, measure voltage across coil (+24 V) and that voltage on each side of K421 points to ground (–36 V), see PWR 81.

K421 picked

No

Yes

Check

Check for open circuit in –36 V supply or distribution. See PWR 81 to help isolate problem.

PWR 81

Possible Causes

1. K543 coil open.
2. K543-3 N/O failed to make.

Use PWR 81 to help isolate trouble.

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

A

PWR 90

Voltage too high

No

Yes

PWR 81 YA030

Possible Causes

1. AC line voltage
2. T302 input taps, see PWR 90, Entry C.
3. Oscillating ferroresonant supply can cause high voltage if output load is too small. Check for poor connections to T302 supplies.

See PWR 81 to help isolate problem.

AC ripple excessive

Yes

No

Voltage too low

PWR 81

Possible Causes

1. Low line voltage. Are proper T302 taps selected.
2. High resistance connection at terminal block or connector. Check voltage across C324

See PWR 81 to help isolate the problem.

PWR 81

Possible Causes

1. C324, C329 open, see Note 1.
2. CR309, CR320 or their connectors open, see Note 3.
3. Oscillating –4 V or +6 V regulator can cause high frequency ripple in other supplies.

See PWR 81 to help isolate the problem.

SERVICE NOTES

Note 1. Capacitor Check with CE Meter
CAUTION: Turn off machine power.

DANGER
Short the capacitor terminals, using the metal blade of a screwdriver with an insulated handle, to be sure the capacitor is fully discharged.

1. *Open the circuit to one capacitor terminal.*
2. *Set the meter range to R x 10.*
3. *Touch the meter leads to the two capacitor terminals and check that the needle nearly goes to zero and then returns toward infinity.*
4. *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 the range to R x 1 to speed up the process.*

Note 2. Load Resistance Check with CE Meter.
CAUTION: Turn off machine power.

Supply	Scale	Gnd Lead	Test Point	Condition	Resistance
+36V	Rx1	Com (+ Ω)	TB101-3*	CP408 Tripped	infinity
				CP408 Reset	>20 ohm
	Rx 100		P411- 7	——	>500 ohm
			P410- 7	——	>500 ohm

*Located on Logic gate.

Note 3. Rectifier Check with CE Meter.
CAUTION: Turn off machine power.

1. *Disconnect transformer leads from rectifiers.*
2. *With the meter set to R x 1, measure the forward resistance which should be from 15 to 30 ohms.*
3. *Set the meter to R x 1000 and reverse the meter leads. The resistance should be near infinity.*

Note 4:
+12 Vdc missing at the power amplifier(s) causes an overload on the 36 Vdc supply which may cause CP407 and/or CP408 to trip.

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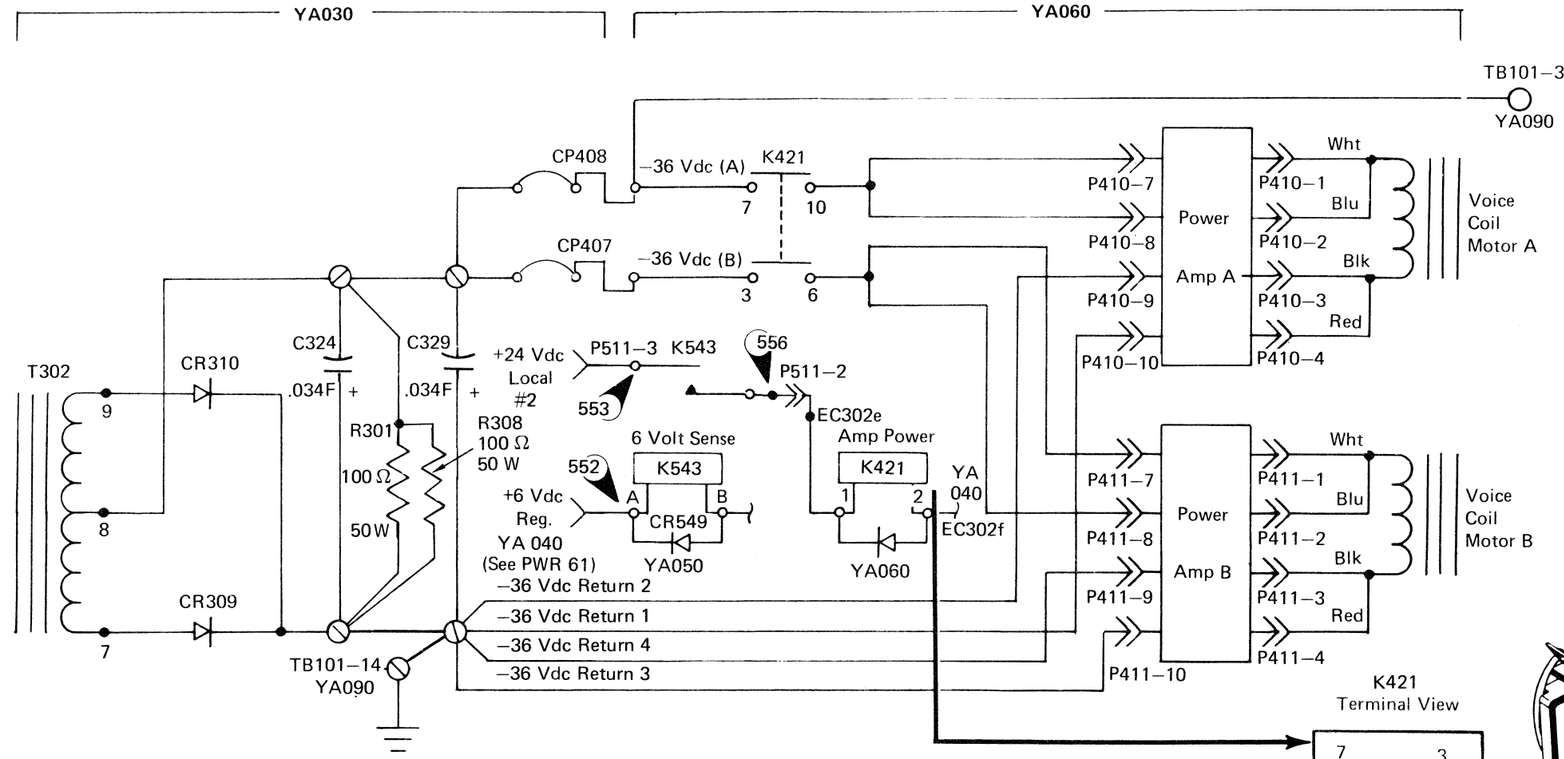
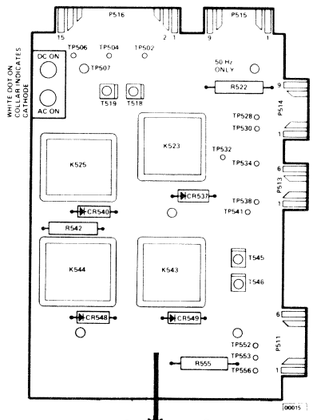
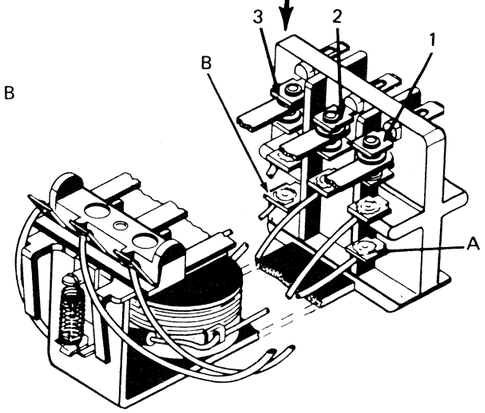
–36 VOLT SUPPLY CIRCUIT

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.

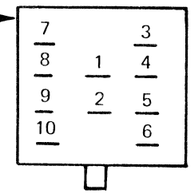


SEQUENCE BOARD



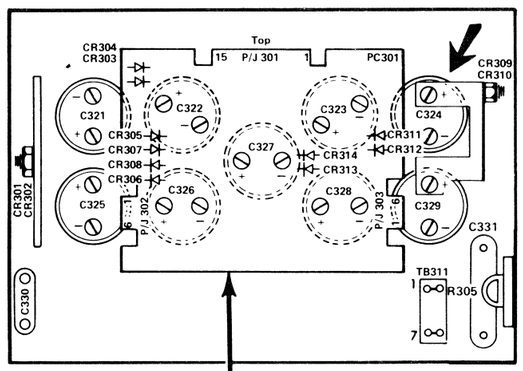


K421
Terminal View

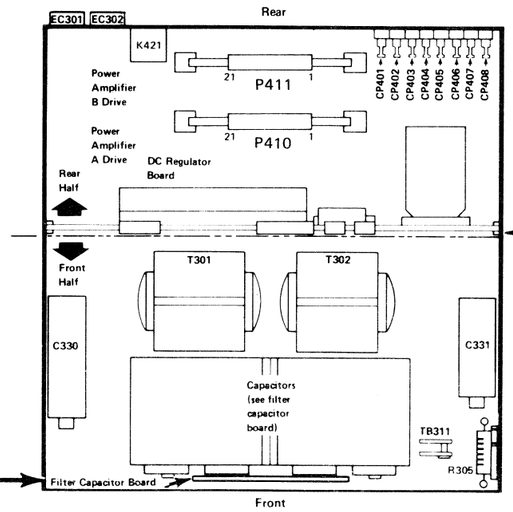


Note: K543 (6 Vdc Sense) has a 6 Vdc coil. Do not swap with other relays.

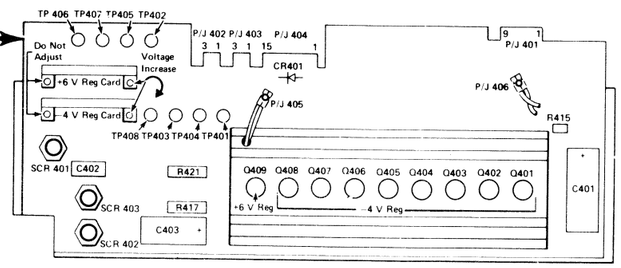
DC POWER SUPPLY, RECTIFIERS AND FILTERS, (Front View)



TOP VIEW OF DC COMPARTMENT



DC REGULATOR BOARD



DQ0081	2747778	440206	440208	440223				
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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: It is not always necessary to check each step. Use your judgement for skipping all unneeded steps.

1. Set Power Mode switch to Local; then power-down the subsystem. If subsystem did not power-down, go to PWR 10, Entry B.
2. Restore the subsystem to normal operating conditions. (Remove all diagnostic jumpers and replace wiring, connectors, or parts that were removed.)
3. Power-up subsystem, then set Power Mode switch to normal.
4. Verify that both AC and DC power lamps and the blowers all turn on in each module. If not, go to PWR 10, Entry A.
5. Run a power supply voltage check as shown in the Voltage Check Chart (this page).
6. Examine the DC supply compartment air filter and clean or replace if necessary (LOC 12).
7. Replace all covers.
8. Load the DMs and verify that the DM Ready lamp(s) turn on in the problem drive(s). If DM Ready did not come on, go to START 100, Entry B.
10. Go to START 500, Entry A.

PWR B

VOLTAGE CHECKS

Note: The following checks should be made with the data modules loaded and Ready, but with no Seek or Read/Write operations in progress. If voltage checks are made with the data module unloaded, the voltage drops when a data module is loaded.

DC Voltage Checks

With a digital voltmeter, measure each dc voltage in the order that it is listed in the Voltage Check Chart. Only two voltages can be directly adjusted, –4 V and +6 V. 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 91). The overvoltage potentiometer on each card is adjusted at the factory and should not be changed. Turn the voltage adjustment potentiometer clockwise to increase the voltage.

All power supplies, except the two mentioned above, have no output voltage adjustment. The only adjustment possible is to change the transformer primary input taps. The T301 primary taps determine the ac input for the –12 V, +12 V, –9.7 V, and –24 V supplies. The T302 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 Wiring Chart on this page. If all voltages from either T301 or T302 are high or low, check the line voltage taps at TB311 or appropriate ferroresonant capacitor C330/C331. See YA030.

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

If this page was entered because of a known dc voltage problem, and the voltage checks are okay, 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 map referenced in the chart to correct the problem.

PWR C

TRANSFORMER PRIMARY INPUT TAP WIRING CHART

	Voltage	TB206 (YA010)	TB311 (YA030
Delta	200 V	Lead #1 to TB206–2	Lead #1 to TB311–3 Lead #2 to TB311–7
Delta	220 V	Lead #1 to TB206–3	Lead #1 to TB311–2 Lead #2 to TB311–6
Delta	235 V	Lead #1 to TB206–4	Lead #1 to TB311–1 Lead #2 to TB311–5
Wye	380 V	Lead #1 to TB206–3	Lead #1 to TB311–2 Lead #2 to TB311–6
Wye	408 V	Lead #1 to TB206–4	Lead #1 to TB311–1 Lead #2 to TB311–5

VOLTAGE CHECK CHART

DC Supply	Test Point	Tolerance (Volts)	Adjustment	Logic Page	Maximum AC Ripple	Diagram	MAP–Entry
+24 V Seq	TP507 (DC Seq. Bd.)	+19.2 to +30.7	None*	YA060	0.6 V p/p	PWR 31	PWR 30–A/B/C
+24 V Local	+24 V Switch A Center Term	+21.6 to +26.40	None*	YA060	0.350 V p/p	PWR 71	PWR 70–A
–24 V	A1L2D03	–24.0 to –28.8	None*	KV010 YA090	0.08 V p/p	PWR 51	PWR 50–A
+12 V	A1R2D05	+12.0 to +14.4	None*	KV010 YA090	0.10 V p/p	PWR 41	PWR 45–A
–12 V	A1M2D06	–12.0 to –14.4	None*	KV010 YA090	0.10 V p/p	PWR 41	PWR 40–A
–4 V Reg	A1 Board P2B06	–3.84 to –4.16 Adjust to –4.0	**	KV010 YA090	0.04 V p/p	PWR 56	PWR 55–A
–4 V Reg	A2 Board K2B06	–3.84 to –4.16	**	YA090 BV100	0.04 V p/p	PWR 56	PWR 55–A
+6 V Reg	A1 Board J2B11	+5.76 to +6.24 Adjust to +6.0	**	KV020 YA090	0.08 V p/p	PWR 61	PWR 60–A
+6 V Reg	A2 Board K2B11	+5.76 to 6.24	**	YA090 BV100	0.08 V p/p	PWR 61	PWR 60–A
–36 V	TB101-3 (Logic Gate)	–36.0 to –43.2	None*	YA090	0.14 V p/p	PWR 81	PWR 80–A
–20 V	A1T2B10	–19.6 to –20.4	None*		0.07 V p/p		ACC 720–A
–20 V	A1S2B10	–19.6 to –20.4	None*		0.07 V p/p		ACC 720–A

* Check transformer primary input taps, change to match available voltage, see chart above.

** –4 V and +6 V should be adjusted to –4.0 V and +6.0 V using the test point on the A1 board. Do not use test. point on A2 board to adjust voltages. To increase the voltage, turn the adjustment screw clockwise (CW).

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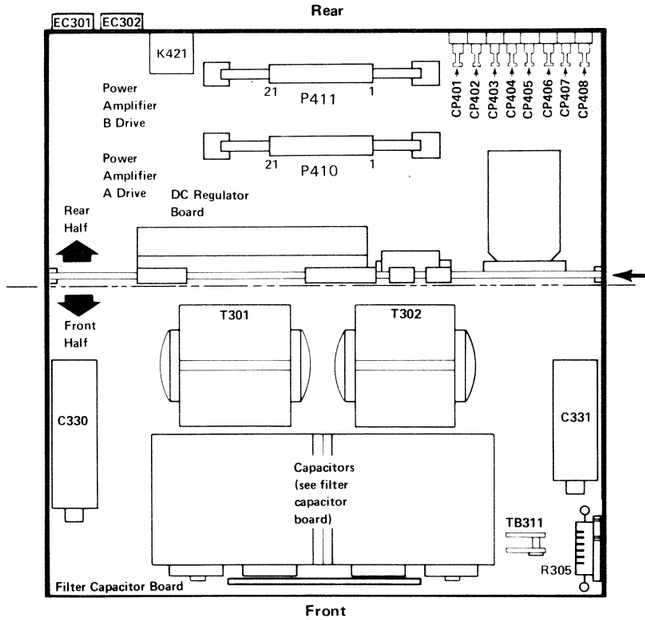
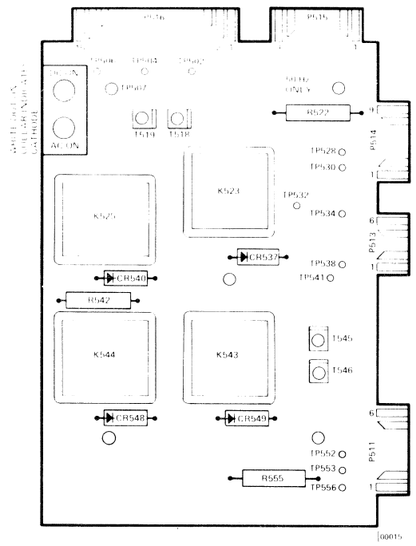
TEST POINT LOCATIONS

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.

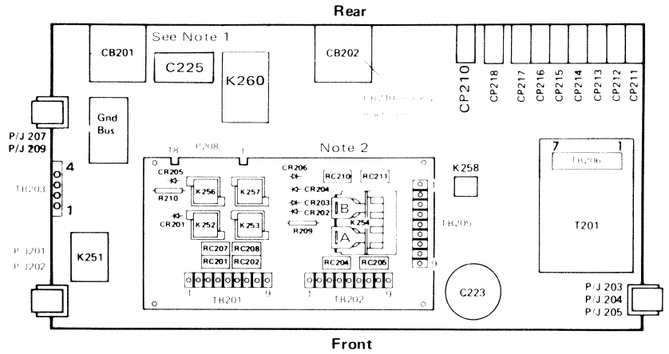
TOP VIEW OF DC COMPARTMENT



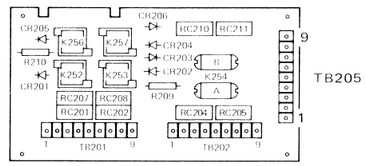
SEQUENCE BOARD, A2



AC COMPARTMENT, TOP VIEW

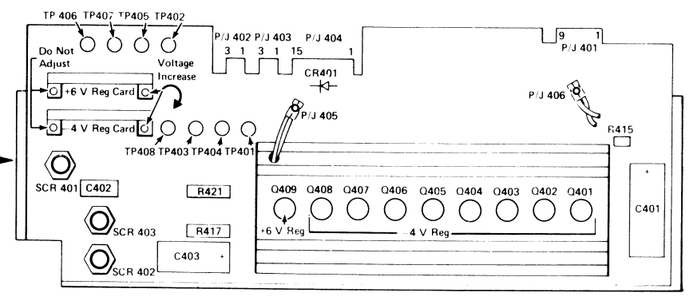


Note 1: C225 is not present on the early machines with line filters. Machines not installed in the USA or Germany do not have C225 installed.



Note 2: The above version of relay K254 is used on later machines.

DC REGULATOR BOARD



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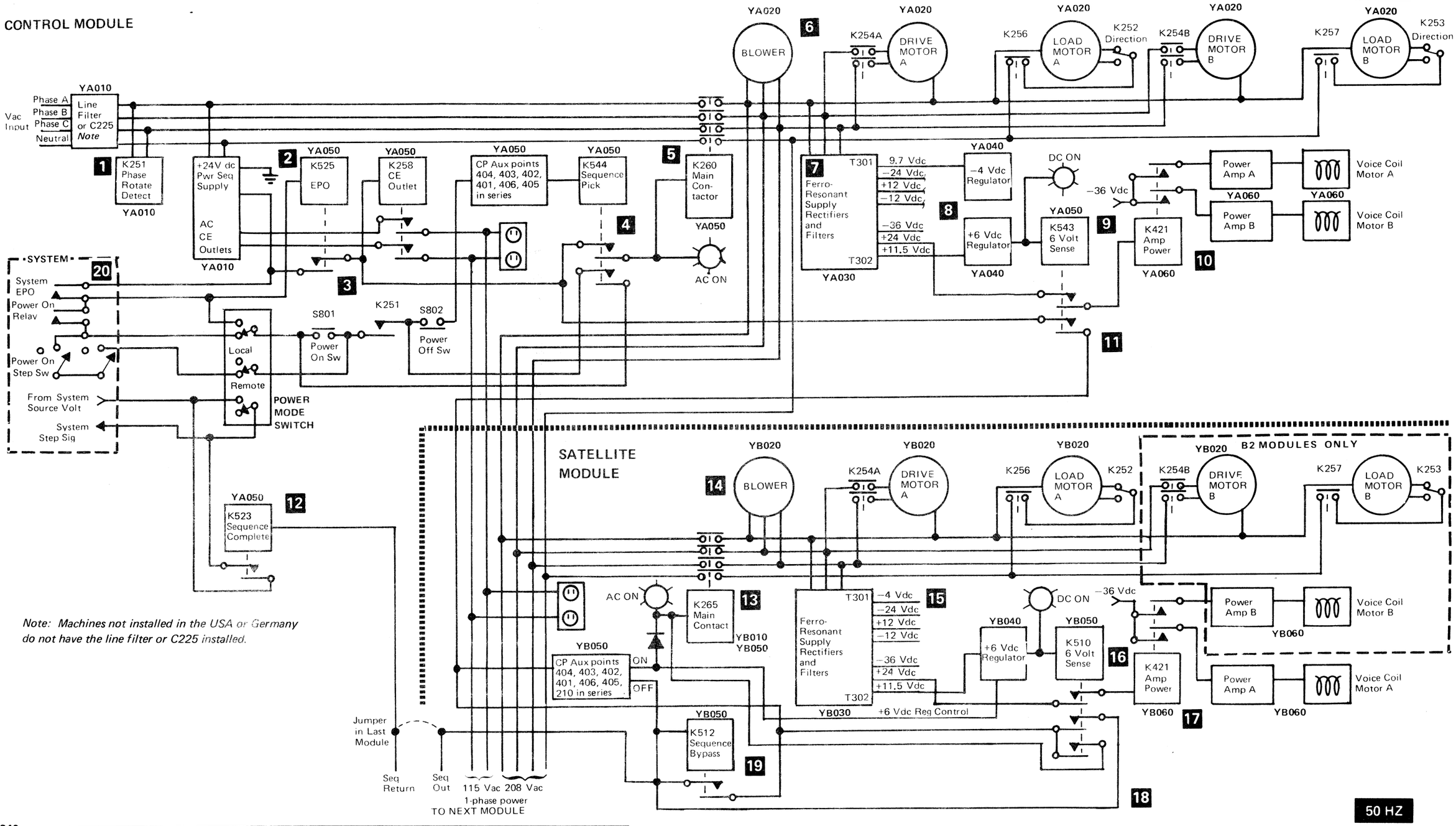
POWER SEQUENCE

CONTROL MODULE



Note: Machines not installed in the USA or Germany do not have the line filter or C225 installed.

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POWER SEQUENCE

POWER-UP SEQUENCE

CONTROL MODULE

1 Three-phase ac power is supplied from the power receptacle and turns on the +24 Vdc sequence supply and the AC CE outlet supply. K251 (Phase Rotation Detection) picks if the phase rotation is correct.

2 System EPO relay picks K525 (EPO) in control module.

3 K525 (EPO) picks K258 (CE outlet) relay.

4 System power-on relay and system power-on step switch pick K544 (sequence pick) if CPs are reset and the gate thermal and blower thermal (CP210) are not open.

5 K544 points pick K260 (main ac contactor) and turns on AC On indicator (light emitting diode) on the control module (Sequence Board)

6 Blower motor comes on.

7 Ferroresonant transformers (T301, T302), rectifiers, and filters produce dc power: 9.7 Vdc, −24 Vdc, +12 Vdc, −12 Vdc, −36 Vdc, +24 Vdc (Local), +11.5 Vdc.

8 The 9.7 Vdc and +12 Vdc along with +24 Vdc from the sequence supply turn on the −4 Vdc regulator. The −4 Vdc along with +11.5 Vdc and +12 Vdc turn on the +6 Vdc regulator.

9 DC On indicator (LED) in control module (Sequence Board) comes on and K543 (6 Volt Sense) picks with +6 Vdc.

10 K543 (6 volt sense) points pick K421 (lamp power) and forwards −36 Vdc to power amps.

11 K543 (6 volt sense) points also send +24 Vdc sequencing voltage to first satellite module.

12 K523 (sequence complete) relay picks sending 3340 subsystem ready signal to system.

SATELLITE MODULE

13 K265 (main contactor) picks and Satellite AC On indicator (LED) turns on if the CPs are reset.

14 Blower motor comes on.

15 Ferroresonant transformers (T301, T302), rectifiers, and filters produce dc power: −4 Vdc, −24 Vdc, +12 Vdc, −12 Vdc, −36 Vdc, +24 Vdc (Local), +11.5 Vdc. Sequence supply +24 Vdc and −4 Vdc along with +11.5 Vdc and +12 Vdc turn on the +6 Vdc Regulator.

16 K510 (6 volt sense) picks when +6 V regulated supply comes up.
DC On indicator (LED) in satellite module turns on.

17 K510 (6 volts sense) points pick K421 (amp power) and forward −36 Vdc to power amps.

18 K510 (6 volt sense) picks K512 (EPO) and sends + 24 Vdc Sequencing power to next satellite module or, if this is the last module in the string, sends signal back to pick K523 (Sequence Complete) in control module.

19 If any satellite CPs are tripped, their aux contacts pick K512 (sequence bypass) and send the sequence voltage to the next module or back to the control module. This bypass allows the rest of the subsystem to power-up and hold.

POWER DOWN SEQUENCE

System Power-Down or Control Module Power Off Button Pressed

1. K544 drops when power-off button in control module is pressed or system power-off relay drops. **4**
2. K523 (sequence complete) drops. **12**
3. K260 (main contactor) opens. **5**
   AC power to all modules is removed.
   DC power goes to zero in all modules (+24 Vdc sequence supply in control module stays on).
   AC and DC power indicators turn off.
   All relays drop except for control: K525 (EPO); K258 (CE Outlet); and K251 (Phase Rotation Detection)

Control Module CP or Gate Thermal Opens

If any of the CPs (404, 403, 402, 401, 406, or 405) trip or the Gate Thermal or Blower Thermal opens, a power down occurs as shown above.

CP Drops in Satellite Module

1. K265 (main contactor) opens and removes 3-phase ac power. **13**
2. K512 (sequence bypass) remains picked and continues to send +24 Vdc sequence voltage to the next module. **19**
3. DC power drops when K265 opens. Both ac and dc LEDs turn off. **15**

System EPO (Emergency Power Off)

1. System EPO opens. **20**
2. K525 (EPO) drops. **2**
3. K544 (sequence pick) drops. **4**
   K258 (CE outlet) drops.
4. K260 (main contactor) drops. **5**

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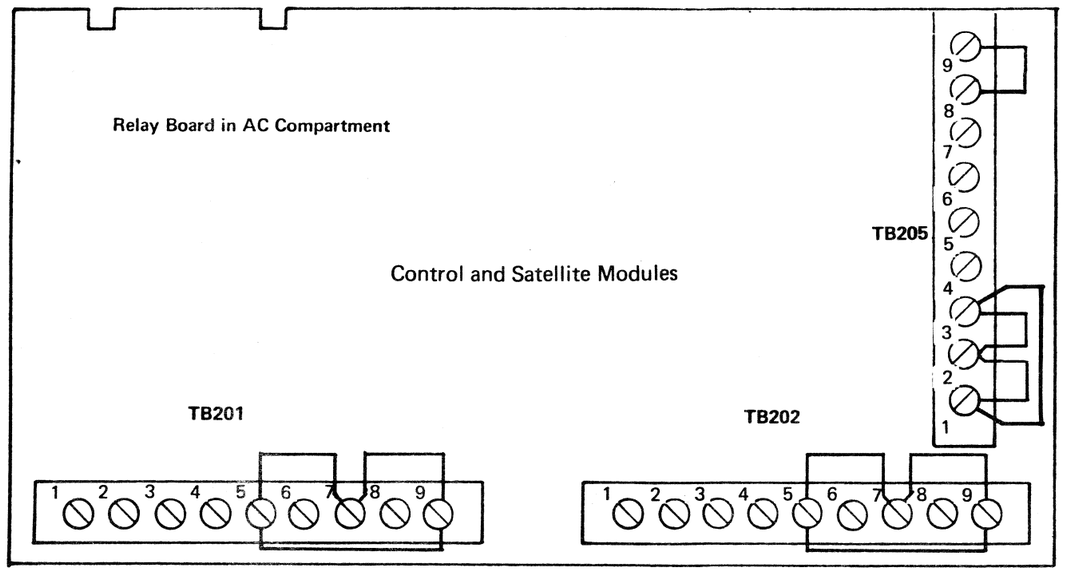
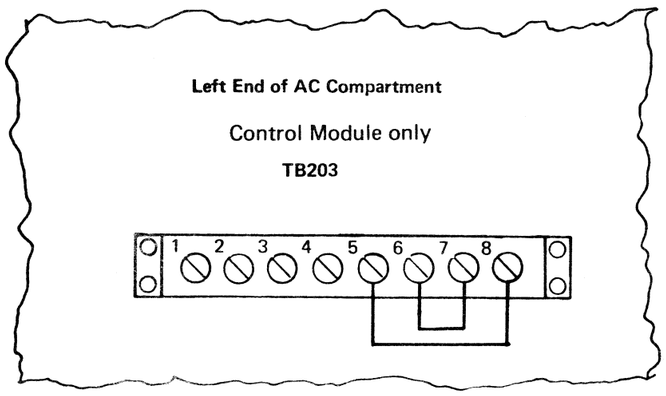
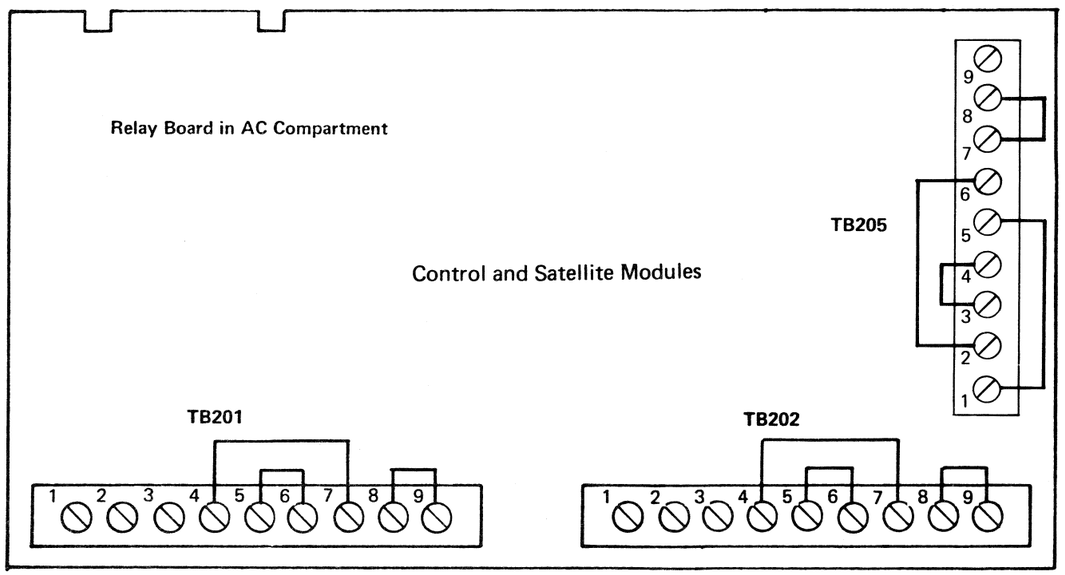
MOTOR VOLTAGE CONVERSION

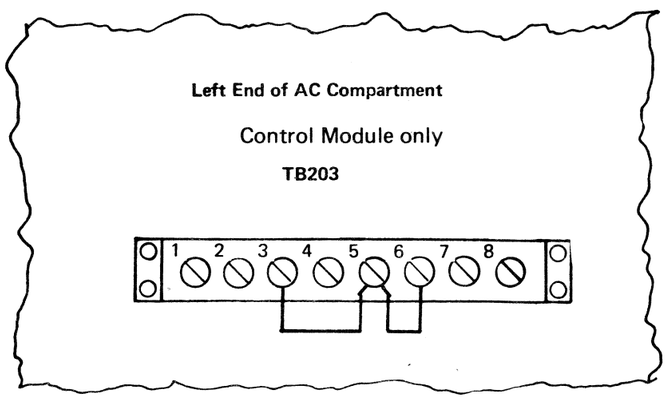
"Y-Phase" Wiring Jumpers





"△-Phase" Wiring Jumpers





DQ0101	2747780	440206	440208					
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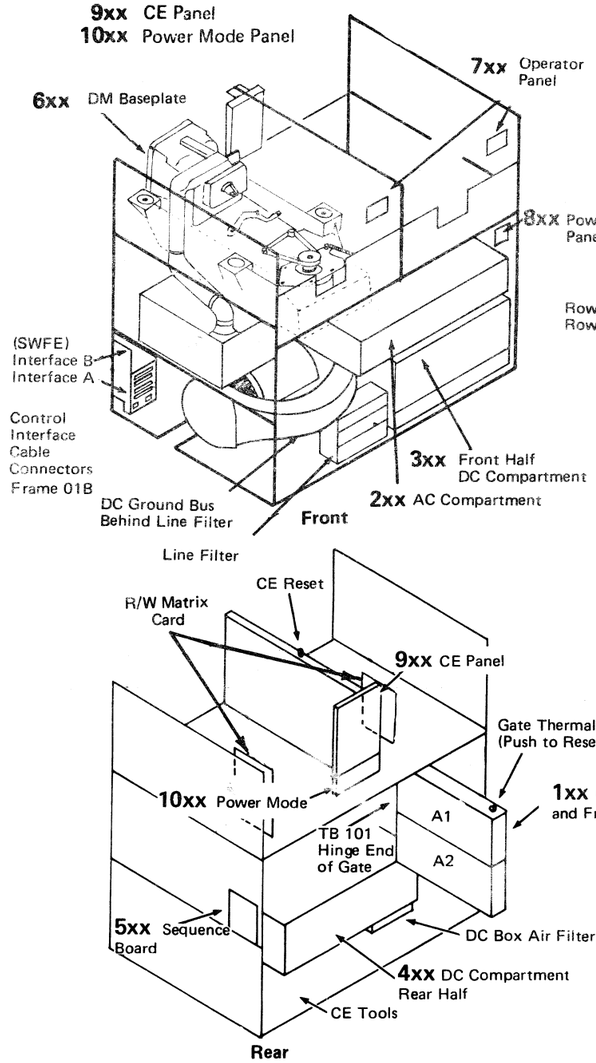
CONTROL MODULE LOCATIONS

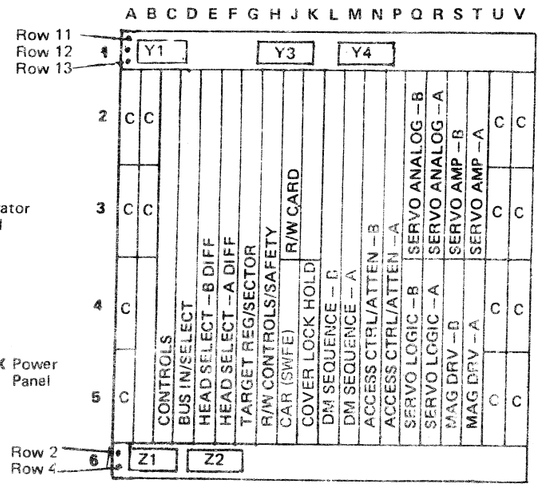
Numbered designations of components (C201, R205, K252, etc.) are coded according to the area of the machine they occupy, as follows:

- **1xx** Gate A and Frame
- **2xx** AC Compartment
- **3xx** Front Half DC Compartment
- **4xx** Rear Half DC Compartment
- **5xx** Sequence Board
- **6xx** DM Baseplate
- **7xx** Operator Panel
- **8xx** Power Panel
- **9xx** CE Panel
- **10xx** Power Mode Panel



1xx GATE A and FRAME

DRIVE BOARD, CARD SIDE 01A-A1

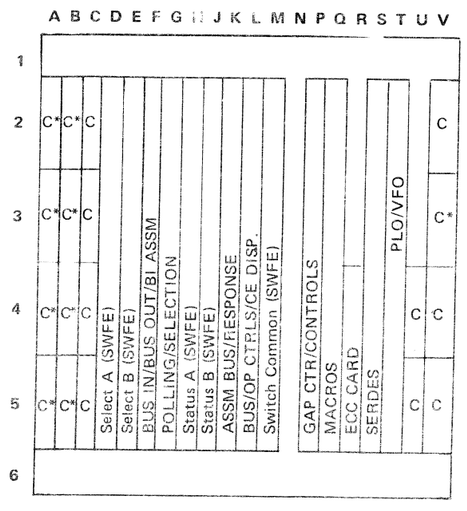


Board A1 Top and Bottom Row Connector Pin Alignment:

Y1	B02 = A1A1 D13 D02 = A1A1 D11 B13 = A1C1 E13 D13 = A1C1 E11	Z1	B02 = A1A6 D04 D02 = A1A6 D02 B13 = A1C6 E04 D13 = A1C6 E02
Y3	B02 = A1H1 A13 D02 = A1H1 A11 B13 = A1K1 B13 D13 = A1K1 B11	Z2	B02 = A1D6 E04 D02 = A1D6 E02 B13 = A1G6 A04 D13 = A1G6 A02
Y4	B02 = A1L1 D13 D02 = A1L1 D11 B13 = A1N1 E13 D13 = A1N1 E11		

Refer to Logic ENxxx

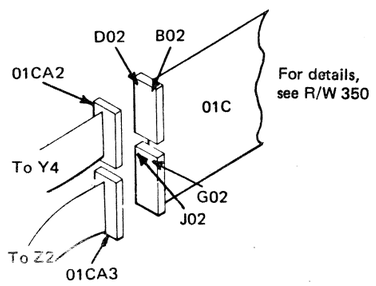
CONTROLLER BOARD, CARD SIDE 01A-A2



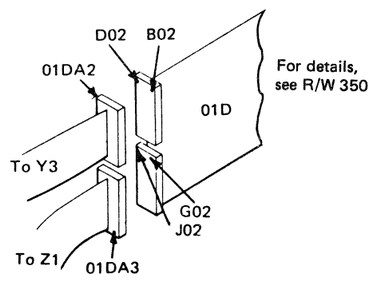
C indicates connector installed for basic machine.

C* indicates connector installed for String Switch feature (SWFE).

R/W MATRIX CARD, A Drive

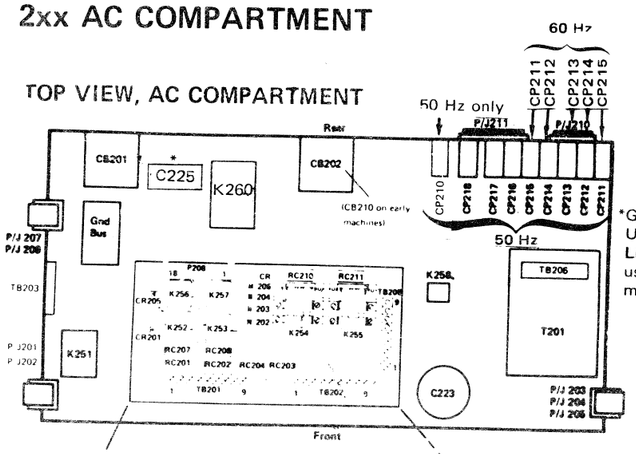


R/W MATRIX CARD, B Drive



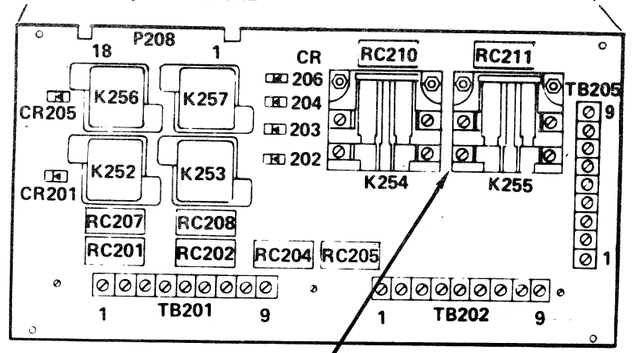
2xx AC COMPARTMENT

TOP VIEW, AC COMPARTMENT



*Germany, U.S. only. Line filter used in early machines.

TOP VIEW, AC BOARD



On 50 Hz systems, K254 and K255 are a single subassembly and are designated as K254A (A-drive) and K254B (B-drive) on early machines. On later machines, relays (P/N2426370) are used.

Note: The CAR card at A1J4 is present only when the String Switch feature (SWFE) is installed.

DT0002 Seq. 1 of 2	2747298 Part No. (I)	See EC History	440227 14 Sep 76	440241 30 Oct 78				

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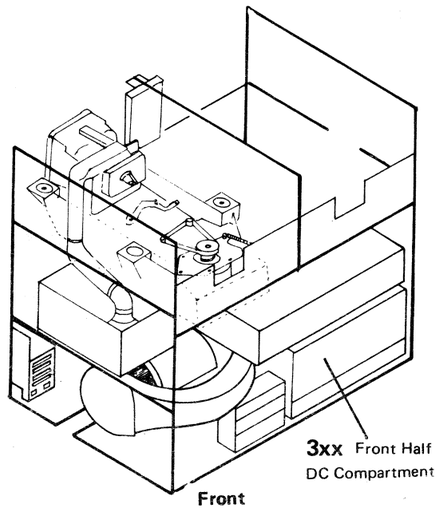
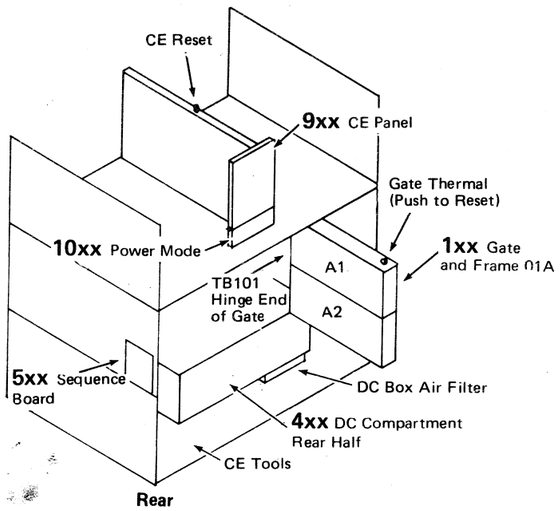
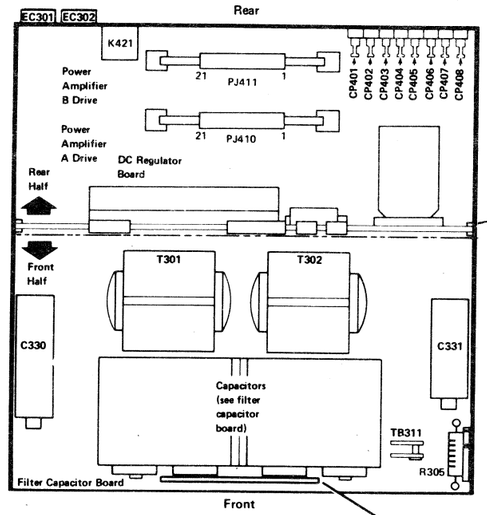
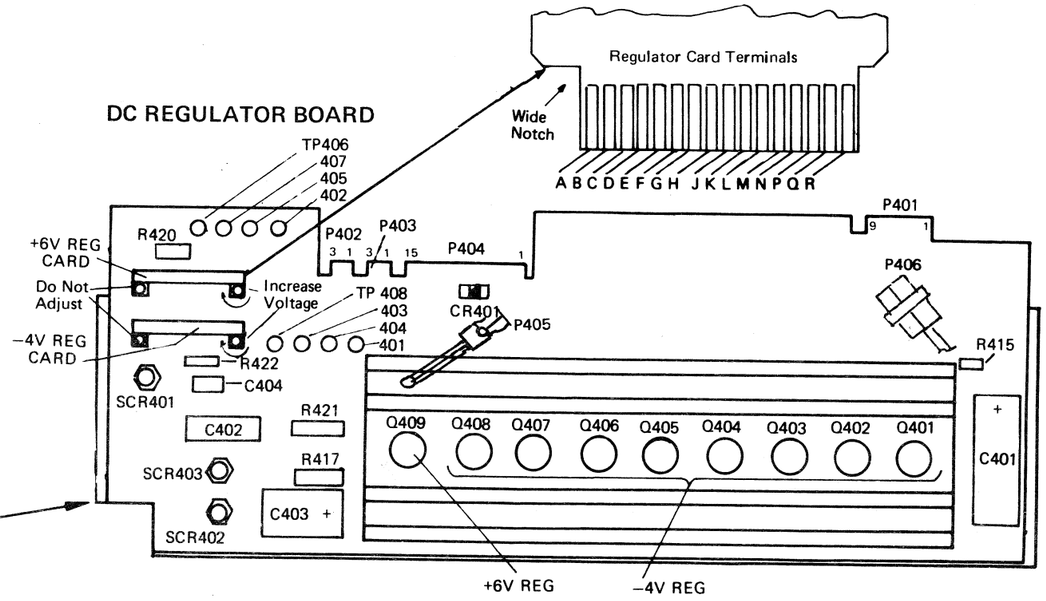




TOP VIEW, DC COMPARTMENT

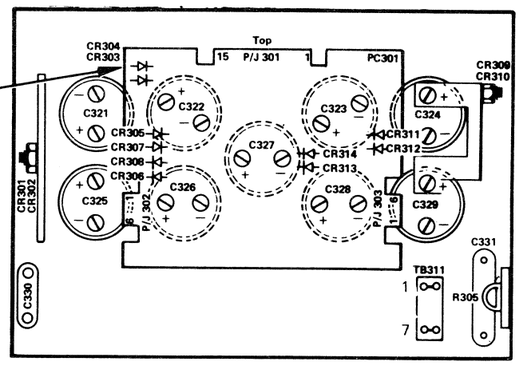


4xx REAR HALF DC COMPARTMENT



3xx FRONT HALF DC COMPARTMENT

DC RECTIFIERS AND FILTERS (Front View)



Filter Capacitor Board

DT0002 Seq. 2 of 2	2747298 Part No. (I)

See EC History	440227 14 Sep 76	440241 30 Oct 78				

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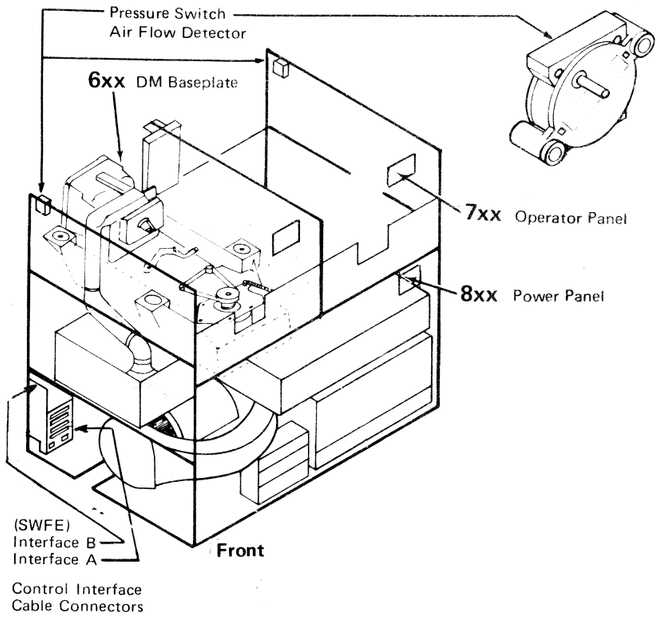
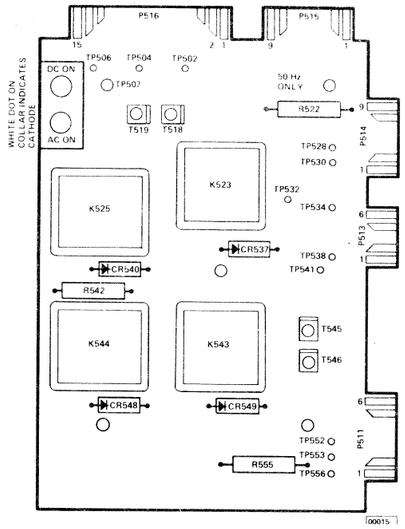
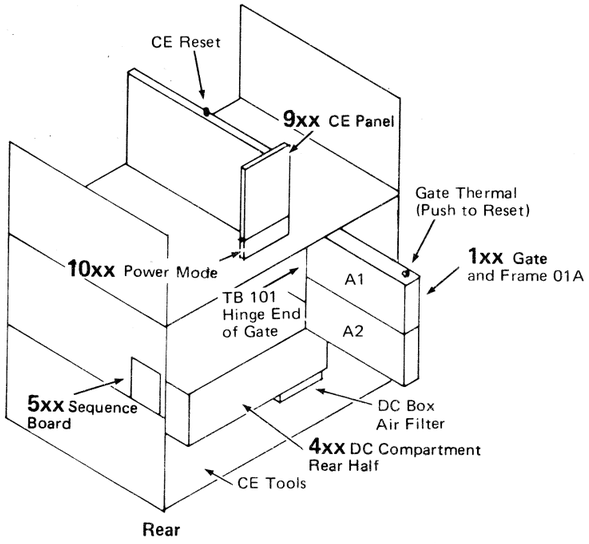
CONTROL MODULE LOCATIONS

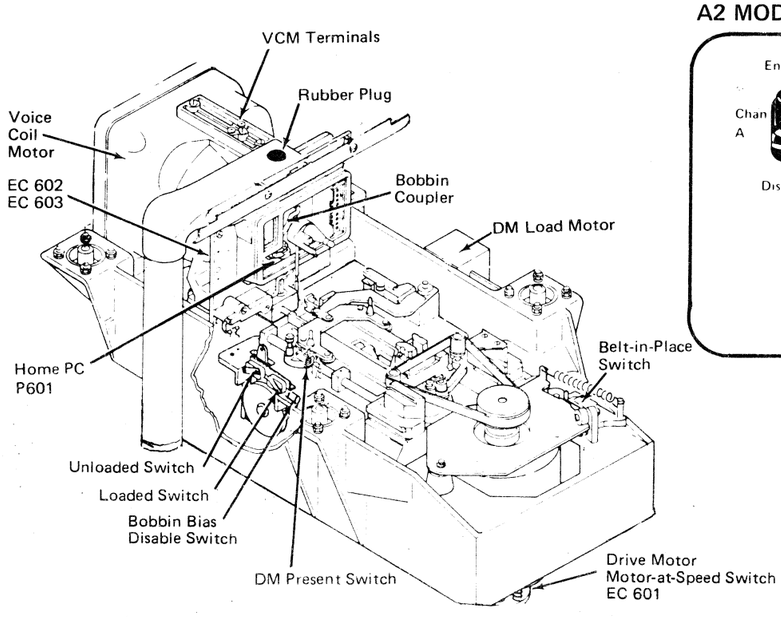


5xx SEQUENCE BOARD

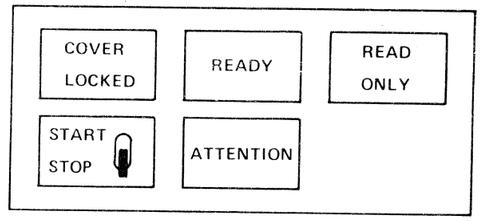




6xx DM BASEPLATE

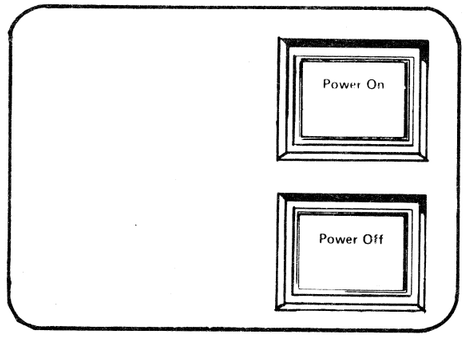


7xx OPERATOR PANEL

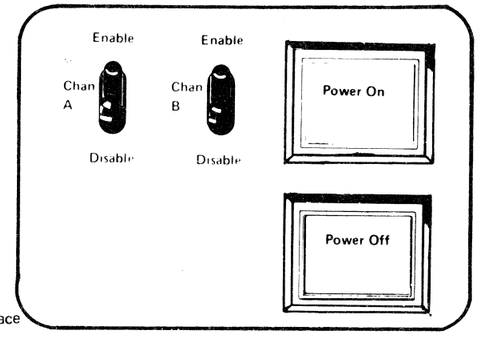


8xx POWER PANEL

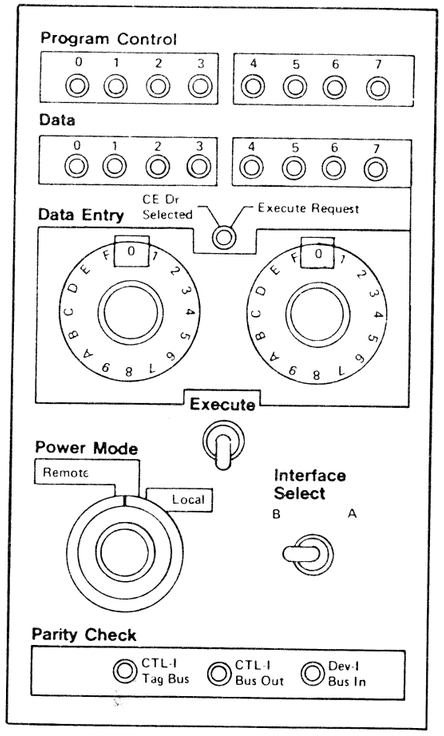
A2 MODULE (STANDARD)



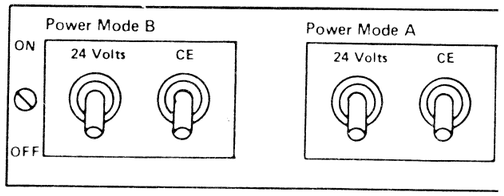
A2 MODULE (STRING SWITCH)



9xx CE PANEL



10xx POWER MODE PANEL



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INSTALLATION PROCEDURES

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Unpack Units	C	INST 2
Locate Units	D	INST 2
Cabling		
Cabling Modules—Sequence Cable and Termination	F	INST 4
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Cabling Controller Module To Control Interface	J	INST 6
Cabling Modules, Device Interface	G	INST 5
Mechanical Checks		
Baseplate Ground Check	E	INST 2
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Addressing		
Addressing	L	INST 8
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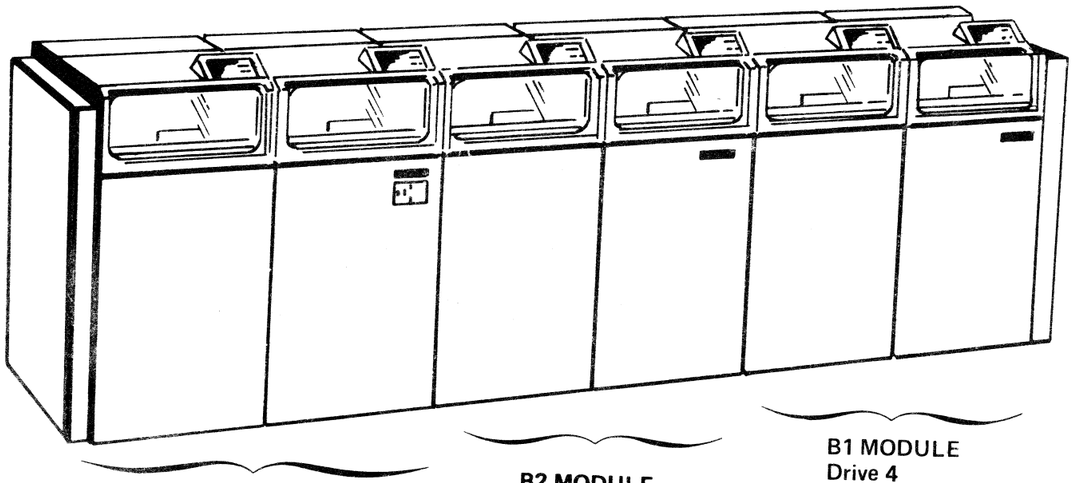
Controller Power Check (60HZ)	M	INST 10
Controller Power Check (50HZ)	M	INST 10
Drive Power Check		
Satellite Module Power Check	N	INST 12
3340 Facility		
Facility Checkout	P	INST 12
System Test	Q	INST 12
Records	R	INST 12
Cabling Controller Module to Control Interface	J	INST 6
Power On Sequence and EPO Check	O	INST 12

3340 DISK STORAGE



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INSTALLATION PROCEDURES

A INTRODUCTION

__ 1 When installing a 3340 subsystem that includes a 3344 or when installing a 3344 on 3340 subsystem, use the INST section of the 3344 MLM (available – May, 1976).

__ 2 Follow each step in sequence.

__ 3 When installing an A2 module, omit the following steps:

- D Items 3 and 4
- F Item 1
- H Both items
- N All items

__ 4 When installing an A2 module and one or more B1/B2 modules, do all steps.

__ 5 When adding a B1/B2 module to an existing subsystem, perform all steps except Controller Power Check M.

Special Tools and Test Equipment

Required for installation:

	Part Number
Digitec Voltmeter	453585
453 or 454 Scope	453047 or 453550
Handwheel (A2 Shipping Group)	2745011
Bobbin Pushrod (A2 Shipping Group)	2745734
May be required:	(B O Tool)
3340 Adjustment Tool Kit	See DM 700 and DM 701

B PRE-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.

To successfully complete drive(s) 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)

__ 3 Remove deflector pan (P/N 2745439) taped to the top of the AC compartment.

D LOCATE UNITS

If installing an A2 module only, omit items 3 and 4.

__ 1 Remove all covers, except top.

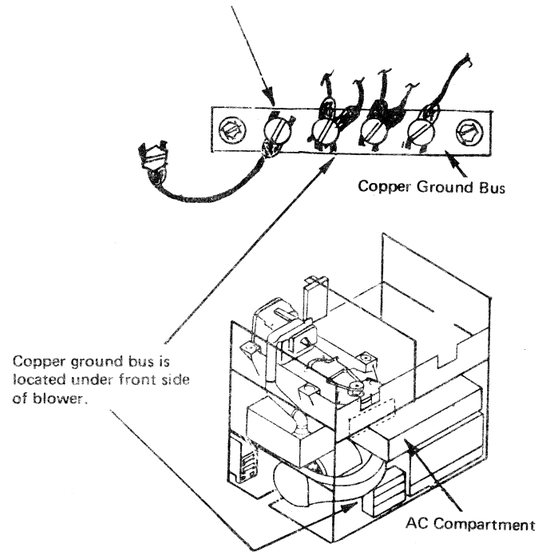
__ 2 Position A2 module.

__ 3 On a multiple module installation, remove the end cover and mounting hardware from the A2 module, and reinstall the last B1/B2 module. See diagram on INST 1. *Note: (End Cover Hardware change) The end covers of machines with serial numbers 20221 – 20450 may be difficult to install to machines of later manufacture. Dispose of the old cover (P/N 2744810 at EC 442818 level) and order a new cover (P/N 2744810. It has a striker latch (higher EC level) in place of the up-and-down latch bar.*

__ 4 On multiple module installations, position other modules as shown on INST 1. Keep modules approximately 6 inches apart. Do not adjust leveling jacks now. B1 Module should be last in the string.

E BASEPLATE GROUND CHECK

__ 1 Remove this jumper at the copper ground bus end for each 3340 A2, B1, and B2 that is being installed.



__ 2 If installing an A2 box, 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 (copper ground bus) on the frame.

__ 4 If resistance is less than 1 megohm, a grounding condition exists. Correct this problem first. For additional information, see Power Section of Logics and PWR pages in MLM.

__ 5 Reconnect the jumper at the ground bus and reinstall the ribbon cables.

Note:
If a ground check is required between the host system and the 3340, the interface cables should be disconnected.

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INSTALLATION PROCEDURES

F CABLING MODULES
SEQUENCE CABLE AND TERMINATION

If installing an A2 module only, omit Item 1.

CAUTION: Do not connect the A2 module to AC wall receptacle now.

— **1** Connect dc sequence cable (P/N 2744906) between modules. Cable is pre-installed in B1/B2 modules. Route cable through trough and plug into P513. (B)

— **2** If A2 is last module in string, install jumper (P/N 2744877, in A2 ship group) from T545 to T546 (Power Sequence Board) (C).

If B1/B2 is last module in string, install jumper (P/N 2744877, in A2 ship group) from T510 to T511 (Power Sequence Board) (A).

— **3** Terminate PLO on last module by jumper connection (P/N 815925 in A2 shipping group). Plug jumper on pin side of board.

PLO Terminations:

A1H2 D03 to A1H2 B03
and
A1H2 D04 to A1H2 B04

If reference is needed, see ALD page KL080.

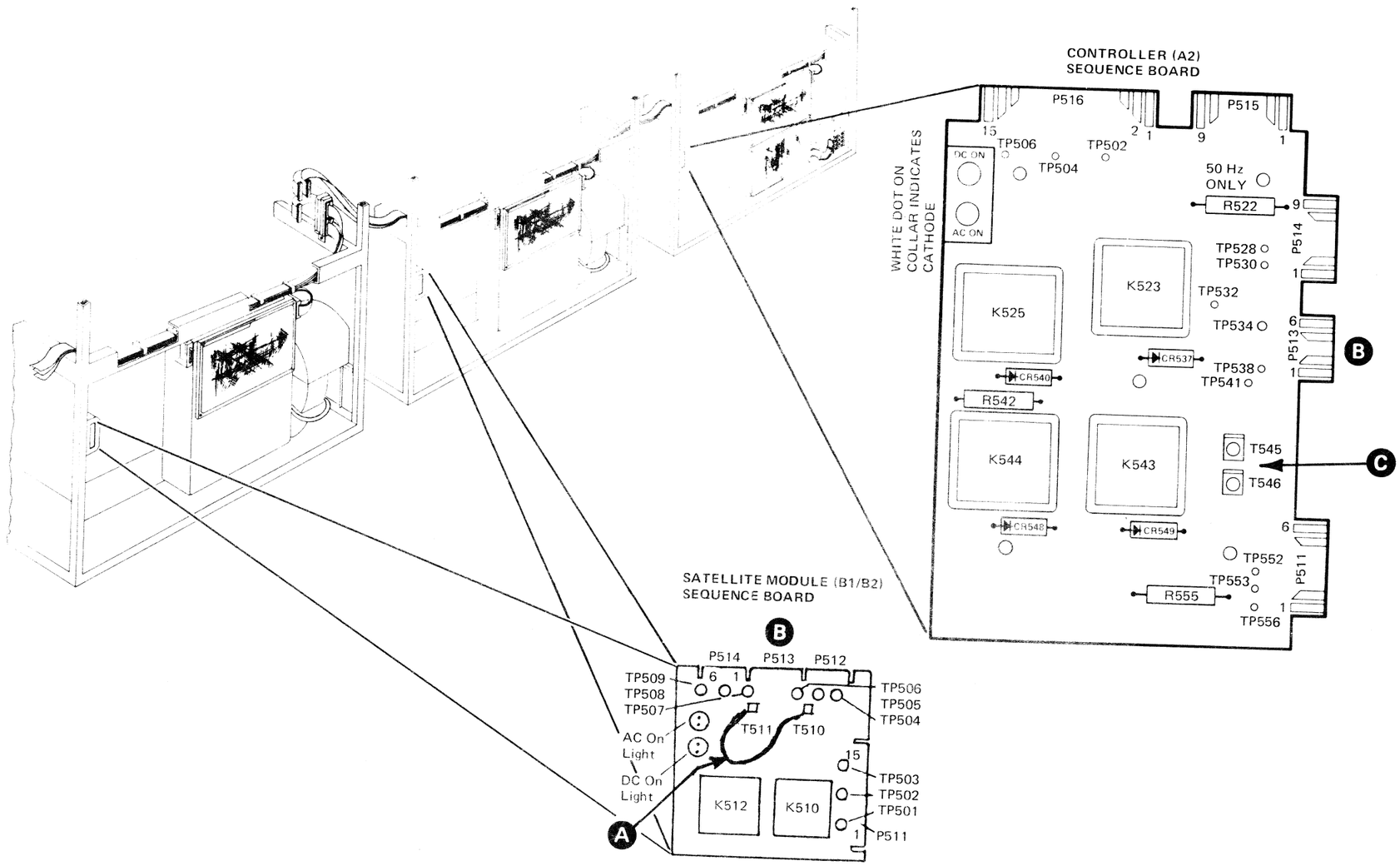
— **4** Terminate R/W Data line on last module by jumper connection (P/N 815925 in A2 shipping group). Plug jumper on pin side of board.

R/W Data Terminations:

A1J2 D12 to A1J2 B12
and
A1J2 D13 to A1J2 B13

If reference is needed, see ALD page KN010.

— **5** Remove any R/W Data or PLO termination jumpers from any other than last module.



DW0010 Seq 1 of 2	2747749 Part No. (0)	See E/C History	440218 5 Aug 74	440219 26 Sept 74	440223 14 Mar 75	440224 15 Dec 75	440226 27 Feb 76	440227 14 Sept 76

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G CABLING MODULES DEVICE INTERFACE

If installing an A2 module only, omit Items 1, 2, and 3, do step 4.

Use the table below to identify your situation. Cabling between 2 Modules (A2, B2, B1) can be done by one of the following methods:

- Present Production: New style interface using pre-installed cables and an interframe connector.
- Existing in the field: Old style interface. Cables routed through trough.
- Combinations: A mix of old style and new style interface occurs when present production machines are added to existing strings or from field transfers. Convert the entire string to the new style interface. The new style interface is not compatable with the old style interface.

If you are Installing			
a	To a	Interface Style	Cable Routing
New A2/B2	New B1/B2	NEW STYLE INTERFACE All hardware preinstalled during manufacturing.	Do steps 1 and 4.
New A2/B2	Existing B1/B2	OLD STYLE INTERFACE Use hardware from B1/B2. Leave new cable installed in A2/B2. Fold the connectors out of the way	Do steps 2, 3, and 4
Existing A2/B2	Existing B1/B2	OLD STYLE INTERFACE Use hardware from B1/B2 Route cables carefully through trough.	Do steps 2, 3, and 4 If interface combinations occur in the string, convert to the new style interface
Existing A2/B2	New B1/B2	Convert old style interface to NEW STYLE INTERFACE. Order FMB 2344383 and FBM 2344418. One of each FBM 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, do steps 1 and 4.

— **1** Plug the ribbon cables in the appropriate slot in the interframe connector as shown in Figure 1.

— **2** Install two flat cables (P/N 2744929) between modules as shown at (B). These flat cables are pre-installed in the B1/B2 modules and must be routed in cable trough to follow existing cables. Check finished cable routing for any restrictions or pinching.

— **3** Install VFO/PLO cables (P/N 2744928) between modules (also pre-installed). Route in cable trough and connect as shown at (A).

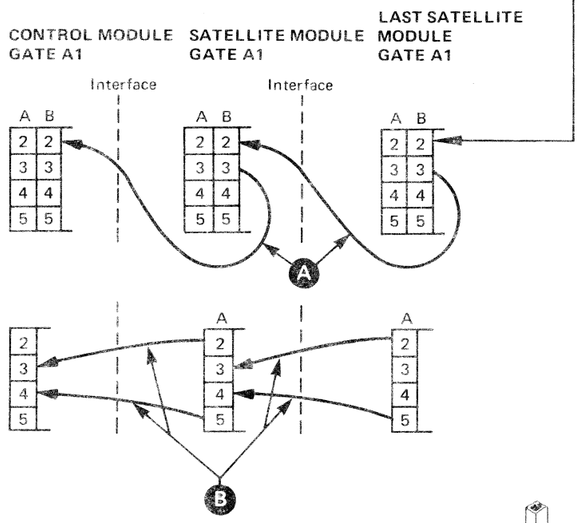
} Old Style

— **4** Install terminator card in the last module. (P/N 5863806, in A2 ship group).

In the last module of the string, unplug cables in A1A3 and A1A4 and insert terminator card in A1A3. Unplug cable in A1B2 and tie all three cables back using cable tie P/N 1159519 (in A2 ship group).

If adding a B1 or B2 to an existing string, remove terminator card from A1A3 in former last module and replug cables in A1A3, A1A4, and A1B2.

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



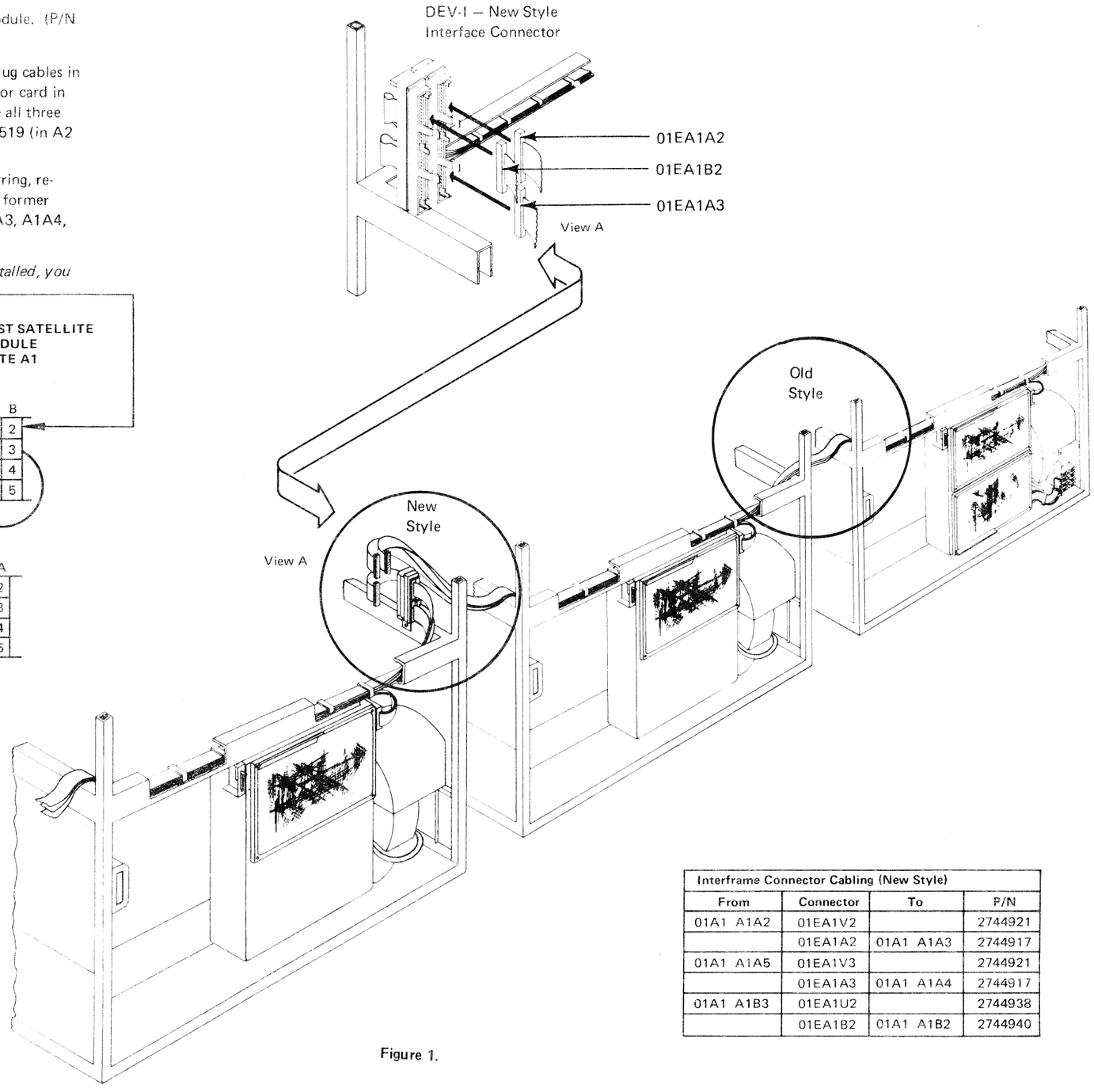


Figure 1.

Interframe Connector Cabling (New Style)			
From	Connector	To	P/N
01A1 A1A2	01EA1V2		2744921
	01EA1A2	01A1 A1A3	2744917
01A1 A1A5	01EA1V3		2744921
	01EA1A3	01A1 A1A4	2744917
01A1 A1B3	01EA1U2		2744938
	01EA1B2	01A1 A1B2	2744940

DW0010	2747749	See	440218	440219	440223	440224	440226	440227
Seq. 2 of 2	Part No. (0)	E/C History	5 Aug 74	26 Sept 74	14 Mar 75	15 Dec 75	27 Feb 76	14 Sept 76

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INSTALLATION PROCEDURES

H AC POWER CABLES, LEVEL AND BOLT FRAMES

__ 1 Move all units together.

Connect AC power cable from B1/B2 to the connector on A2 or next B1/B2 AC compartment (P205).

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

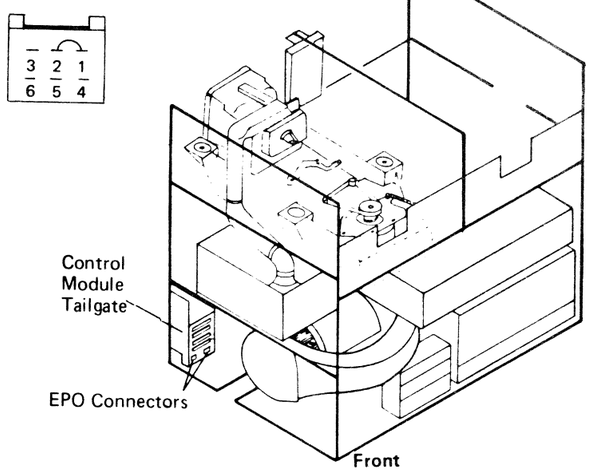
CAUTION: Before tightening bolts, check that no cables are caught between frame members.

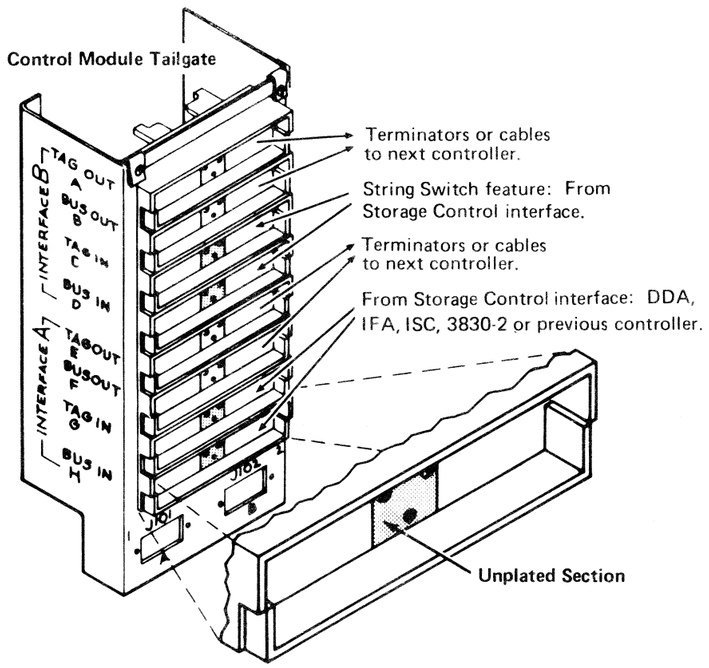
__ 2 Bolt frames together using:

3 bolts (P/N 59652 – B1/B2 Shipping group)
3 washers (P/N 6935 – B1/B2 Shipping group)
3 nuts (P/N 3960 – B1/B2 Shipping group)

__ 3 Install deflector pan (P/N 2745439) as follows:

a. Open front covers.
b. Slide deflector under machine, aligning it with the DC compartment air filter opening.
c. Hook the two front deflector tabs over the frame member, making sure the door latch is between the tabs.
d. Open back covers.
e. Hook the rear deflector tabs over the frame member.
f. Check that the deflector is secure on the frame members and close covers.





J CABLING CONTROLLER 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 system 1 and J102 to system 2.

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. Replug the jumper wire according to this figure:

__ 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 last controller by plugging two Bus terminators (P/N 2282675) into the Bus Out and Tag Out position.

K MECHANICAL CHECKS

__ 1 Check (in the baseplate area) that the drive belt is properly installed and that the drive motor is in place. Ensure that shipping blocks are removed from behind drive motor.

__ 2 Operate the DM load mechanism manually through a complete load and unload cycle. Use the handwheel (P/N 2745011, A2 shipping group). See DM 705 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 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.

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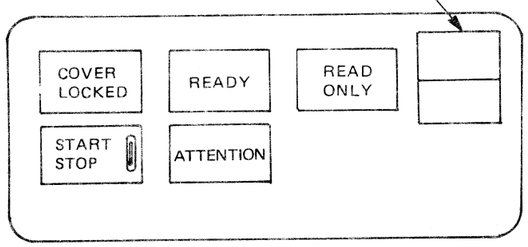
INSTALLATION PROCEDURES

L ADDRESSING

1 Install customer-assigned physical address labels (P/N 5412746 in A2 shipping group) in the recess on the Operator Panel.



2 Establish logical drive addresses for each module by jumper (P/N 815925 in B1/B2 shipping group) on board A1 of each drive.

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

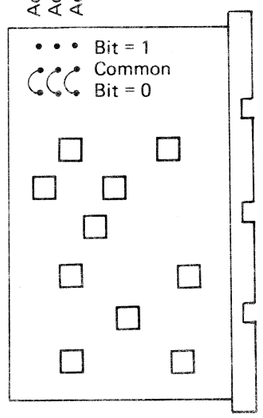
Note: A 3340 B1 contains only one drive (Drive A). Drive B address is disabled at the plant. For reference, see ALD pages KK030 and KK040.

3 Select the desired controller address from the appropriate chart and install jumpers in A2G2. For reference, see ALD page BF120.

Card A2G2

Top

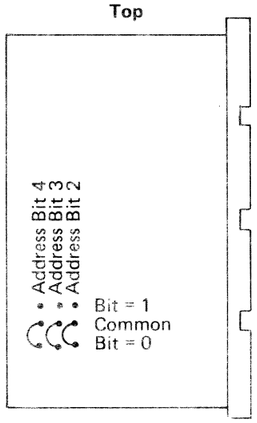
Note: Card is shown plugged for address 0.



4 **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.

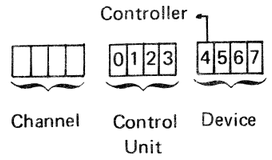
Card A2D2, A2E2

Top



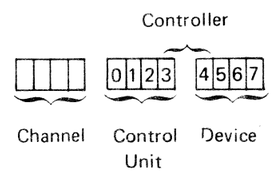
Controller Address Plugging			
System	**Controller Address**	**System Address**	**Remarks**
System/3	Plug for 0	160–163	Loc A2G2
System/7	Plug for 0	160–167	Loc A2G2
115	Plug for 0	160–163	Loc A2G2
125	1 String = 0 2 String = 1	160–167 168–16F	Loc A2G2
135 IFA	1 String = 0 2 String = 1	1C0–1C7 1C8–1CF	Loc A2G2
135 Mix	3333 must be 0 3340 must be 1	150–157 158–15F	Loc A2G2
3830-2	See other charts		
ISC	See other charts		
String Switch	Can be 0, 2, or 3	System dependent	

Controller Addressing Without 32 Drive Expansion Feature



Controller	Plug	Addresses
0	4 3 2	XX0 – XX7
1	4 3 2	XX8 – XXF

Controller Addressing With 32 Drive Expansion Feature



Controller	Plug	Addresses
0	4 3 2	X00 – X07 X20 – X27 X40 – X47 X60 – X67 X80 – X87 XA0 – XA7 XC0 – XC7 XE0 – XE7
1	4 3 2	X08 – X0F X28 – X2F X48 – X4F X68 – X6F X88 – X8F XA8 – XAF XC8 – XCF XE8 – XEF
2	4 3 2	X10 – X17 X30 – X37 X50 – X57 X70 – X77 X90 – X97 XB0 – XB7 XD0 – XD7 XF0 – XF7
3	4 3 2	X18 – X1F X38 – X3F X58 – X5F X78 – X7F X98 – X9F XB8 – XBF XD8 – XDF XF8 – XFF

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INSTALLATION PROCEDURES

M CONTROLLER POWER CHECK (60 Hz)

For 50 Hz, go to step M, World Trade

Place Power Mode switch on CE panel in Local mode during installation.

__ 1 Turn off controller module (A2) mainline CB 201.

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

__ 3 In all Satellite Modules (B1/B2), turn off mainline circuit breaker (CB 210).

__ 4 Verify with a CE meter that a direct short exists between the large pin (GND) of the power plug and the controller 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 left-hand side of the dc compartment.

Note 1: If voltage conversion is required, see table below and/or YA 030 for needed jumper changes to TB 311 (front half dc compartment). See table below and/or YA 010 for jumper changes at TB 206 (ac compartment).

Note 2: For Japan (60 Hz only), jumper convenience outlet at TB206, if required. (See YA 010.)

Voltage	Ferro Transformer TB 311	Bootstrap Transformer TB 206
200 208 230	3 – 4 – 7 2 – 4 – 6 1 – 4 – 5	1 – 2 1 – 3 1 – 4
Logic Page	YA030	YA010

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 CB 201 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 CB 201.

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 shown below. Use Digitec 251† voltmeter (P/N 453585). Set the +6.0 V to +6.0 V and −4.0 V to −4.0 Vdc at nominal at installation time. Adjustments must be made with the DM loaded and ready. If adjustment is required, see PWR 90, Entry B, for procedure.

DANGER
Power-down 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	TB 101-1**
−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	TB 101-3**

* 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

Place Power Mode switch on CE panel in Local mode during installation.

__ 1 Turn off controller module (A2) mainline CB 201.

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

__ 3 In all Satellite Modules (B1/B2), turn off the mainline circuit breaker (CB 210 in early machines, CB 202 in later machines).

__ 4 Verify with a CE meter that a direct short exists between the green and yellow lead of the line cord and the controller module frame ground (0.1 ohm or less). Investigate and correct this condition first if this is not the case.

__ 5 Check the machine power rating plate (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 power rating plate, go to item 7.

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

DELTA (△) 3 PHASE

Voltage
200 ± 10% 220 ± 10% 235 ± 10% } Line–Line

WYE (Y) 3 PHASE

Voltage
380 ± 10% to Neutral = 220 V 408 ± 10% to Neutral = 235 V

Use PWR 10, Entry D, to correct wiring in both the controller (A2) and satellite modules (B1/B2).

__ 7 Turn off wall receptacle CB and install power cable, see YH010 (50 Hz) for hookup. Turn on wall receptacle CB. Turn on CB 201 and press the controller power-on switch. If power comes on, go to item 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.

Repeat the beginning of item 7. 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.

__ 8 Check the module voltages shown below. Use Digitec 251† voltmeter (P/N 453585). Set the +6.0 V to +6.0 and −4.0 V to −4.0 Vdc at nominal at installation time. Adjustments must be made with the DM loaded and ready. If adjustment is required, see PWR 90, Entry B, for procedure.

DANGER
Power-down 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.

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N SATELLITE MODULE POWER CHECK

__ 1 Check that the voltage specified on each module voltage label (on front of ac power compartment) coincides with that specified on the A2 module. If voltage conversion is required, see YB 030 for jumper changes on TB 311 (front half dc compartment).

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

__ 2 Turn on CB 210 (CB 202 in later machines). Check the module voltages shown below. Use the Digitec 251† voltmeter (P/N 453585). The +6.0 Vdc should be set at +6.0 Vdc at installation. Adjustment must be made with DM loaded and ready. If adjustment is required see PWR 290, Entry B, for procedure.

DANGER
Power-down 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	−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	− 3.72 V to − 4.4 V	A1P2B06
+ 6 Vdc	+ 5.76 V to + 6.24 V	A1J2B11
−36 Vdc	−36.0 V to −43.2 V	TB 101-3**

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

† Trademark of United Systems Corporation.

__ 3 Repeat for each module.

O POWER ON SEQUENCE AND EPO CHECK

__ 1 Turn module power on. Install a data module in the drive to be tested. Place the drive On/Off switch in the ON position. The Drive Ready lamp must come on within 30 seconds. If the lamp does not come on, go to START 100 and perform the required action.

__ 2 Press the Attention button 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 Load a data module on all drives and bring all drives to Ready status.

__ 5 Power-down at CPU (check that controller power is on Remote).

__ 6 Power-up at CPU and observe the following:

a. Controller power and satellite power comes on.
b. All drives start through the load cycle within milliseconds from each other and should go to Ready status within a few seconds.

__ 7 If any problems occur, go to START 100.

__ 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

P FACILITY CHECKOUT

__ 1 Load a data module on each drive.
An IBM data module is to be used when running routine A7. See reference notes for routine A7 on MICRO 24.

__ 2 Use the microdiagnostic facility checkout procedure on START 110 to check all drives. Recommended procedure is to run routine A0 once, and then the linked routines A1–AE, followed by A7, A6–A8, B1, and B2.

Check List for Microdiagnostics									
Drive	A	B	C	D	E	F	G	H	Remarks
A0-A1-A2									Run once
A7 in adjust mode									Enter 'A7,10,01,00' (See ACC 801)
A2-AE									Description (starts on MICRO 20)
A6-A8									See MICRO 24
B1									See MICRO 34
B2									See MICRO 35

__ 3 With String Switch feature, run routine B6 also. See MICFL 1407 for instructions.

__ 4 With Fixed Head feature, test fixed heads by running routine B1 with the appropriate parameters. See MICRO 34 for instructions.

Q SYSTEM TEST

__ 1 Configure OLTEP and OLTSEP (DCP and Systems Test if a System/3) to include the 3340 facility.

__ 2 Check that all CE mode switches are in the Online position. Push all Attention buttons to rezero the data modules.

__ 3 Run ASCAP and all online tests from the CPU. Misleading errors can occur if two controllers on the same channel have the same address. Refer to INST 8, Item 3 for proper plugging.

__ 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 installation complete to dispatcher in Branch Office.

Note: 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.

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