3420/3
3420/38
3420/380
3420/3803
3420/3803
3420/3803

IBM 3420/3803
Magnetic Tape Subsystem **Reference Guide**

IBM

PREFACE

This reference guide and associated video presentation were created by FE Service Planning and Support to assist you in maintaining the 3420/3803 Magnetic Tape Subsystem. Two approaches were taken:

1. New information is included as a result of IR data indicating the areas where more in-depth knowledge is needed.

2. Current information, which is frequently used, has been condensed from the MLM/ Pathfinder and included here.

The guide is divided into four major sections. Each of these sections contains information which logically fits into that section. Take the time to glance through the guide and get an idea of what is included.

Pay particular attention to the "NTF Service Checks" portion of each area. It is intended to give you a list of actions to be performed which may help eliminate many call-back situations. When you write a no trouble found IR (major unit 960) try to use unit/cause codes which best describe the reported failure symptom so that FE SP/S may have a better understanding of areas of the machines with intermittent problems.

THIRD EDITION (January 1980)
This is a major revision of, but does not make S229-6019-1 obsolete.

Address any comments concerning the contents of this publication to: IBM Field Engineering Service Planning, Department 96C, Building 005, Tucson, Arizona 85744.

© Copyright International Business Machines Corporation 1978, 1980

CONTENTS

GENERAL

3420 Subsystem Characteristics 1
3803 Model 3 and 3803 Model 1 Differences 3
Recording Philosophy 5
Understanding EREP1 9
Procedure for Scoping 3420 Tape Unit Sense Bits on Logic Board 17
3420/3803 Status/Sense Bytes 19
3803-2/3420-3 Through 8 Tape Drive Sense Analysis 20
3803/3420 Online Tests 27
What is Where in the MLM? 31
Common Abends 35
Tools and Test Equipment 39

MEDIA

IRD PEP Specialist 45
Magnetic Tape 47
Common Media Related Problems 51

3420

Read/Write Service Techniques 53
Read/Write Failure Analysis 61
Read/Write Head Service Hints 63
3420 Read/Write NTF Checklist 65
Tape Developing Procedure 67
Developed Tape Samples 69
3420 RD/WR Data Flow 71
3420 Tape Motion Service Techniques 73
3420 Tape Motion NTF Checklist 77
3420 Tape Motion 79
3420 Power Service Techniques 83
3420 Power NTF Checklist 85
3420 Power - DC Voltages 87
3420/6250 Conversion Tips 91
3420 PM Schedule 95
3420 Sales Feature Codes 99
3420 (All Models) Status Identifier 101
3420 ECA Checklist 103
Models 3, 5, 7 - A1 Board 117
Models 4, 6, 8 - A1 Board 119
Card Jumpers - Models 3, 5, 7 121
Card Jumpers - Models 4, 6, 8 125
Common 3420 Part Numbers 129
Flat Belt Pneumatic Supply 131

CONTENTS *(continued)*

3803

3803 Model 1 Data Flow 139
3803 Model 2 Data Flow 141
3803 Microprocessor Instruction Format 143
3803 Microprocessor Tips 145
Current ALU Patches 149
Current 3420/3803 Related Software Zaps 153
3803 Channel Interface 155
3803 DC Voltages 163
3803 Mod 1 to 2 - 6250 Conversion Tips 165
3803 Conversion Tips from Data Bank 169
3803 Preventive Maintenance Schedule 173
3803 Sales Feature Codes 175
3803-1 Feature Identifier 177
3803-1 Feature Installation Times 179
3803-2 Feature Installation Times 183
3803 ECA Checklist 185

Bibliography 197
Index 199
Reader's Comment Form . . . . . —

GENERAL

3420 SUBSYSTEM CHARACTERISTICS

	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Tape Speed (Read or Write)						
(ips)	75	75	125	125	200	200
(cm/sec)	190,5	190,5	317,5	317,5	508	508
6250 Read Access Time, nominal*(ms)		2.3		1.6		1.1
1600 Read Access Time, nominal*(ms)	4.0	4.0	2.9	2.6	2.0	1.65
6250 Write Access Time, nominal*(ms)		2.1		1.5		0.95
1600 Write Access Time, nominal*(ms)	4.0	3.0	2.9	2.0	2.0	1.28
Forward Start Time, nominal**(ms)	1.8	1.4	1.4	1.1	1.3	.08
Data Rates (Kb/sec;Kd/sec):						
6250 bpi		470/940		780/1560		1250/2500
1600 bpi PE	120/240	120/240	200/400	200/400	320/640	320/640
800 bpi NRZI (9-Track)	60/120		100/200		160/320	
800 bpi NRZI (7-Track)	60		100		160	
556 bpi NRZI (7-Track)	41.7		69.5		111.2	
200 bpi NRZI (7-Track)	15.0		25.0		40.0	
Passing Times per Byte (usec):						
6250 bpi		2.133		1.28		0.80
1600 bpi PE	8.3	8.3	5.0	5.0	3.1	3.1
800 bpi NRZI	16.7		10.0		6.2	
556 bpi NRZI	24.0		14.4		9.0	
200 bpi NRZI	66.7		40.0		25.0	
Passing Times, IBG (ms):						
6250 bpi		4.0		2.4		1.5
9-Track (PE and NRZI)	8.0	8.0	4.8	4.8	3.0	3.0
7-Track (NRZI)	10.0		6.0		3.75	
Rewind Time (2400-foot reel)	60	60	60	60	45	45
Rewind/Unload Time:						
(2400-foot reel) (sec)	66	66	66	66	51	51
Load Operation, approximate time (in sec) to 'tape unit ready' (after reel/cartridge is mounted and LOAD/REWIND is pressed)	10	10	10	10	7	7

*Read access time is the interval from initiation of a Forward Read command given to the tape control when tape is not at load point, until the first data byte is read when tape is brought up to speed from stopped status.

*Write access time is the interval from the issuance of a Move command given to the tape unit when tape is not at load point, until the first data byte is written on tape when tape is brought up to speed from stopped status.

**Start time is the interval from the issuance of a Move command to the tape unit, until tape attains 90% of specified velocity.

3803 MODEL 3 AND 3803 MODEL 1 DIFFERENCES

The Model 3 was designed to attach to 370/115s and 125s. It is basically a Model 1 with three major differences. These differences are required because the 115 and 125 don't use a standard 370 channel.

- ALU1 is modified to interface with the channel on the 115 and 125 and translate the activity to 370 channel sequences which the rest of the 3803 understands.

- Hardware logic called AUTO DATA TRANSFER is provided to handle the data transfer. It includes the byte counter.

- A 32-BYTE DATA BUFFER is provided for reading and writing. This large a buffer is required in the event that data crosses a page boundary. When this happens, time is required for ALU1 to set the address of the new page back into the data address control in the 115 or 125.

The 3803 Model 3 tape subsystem connects to the Magnetic Tape Adaptor (MTA) interface of system 3115 or system 3125. The term MTA interface refers to a set of lines over which control and data signals are exchanged between the control unit and the MTA portion of the system.

The basic 3803-3 Control Unit consists of a MTA interface attachment section, a data buffer section, a microprogram section, a read section, a write section, a tape unit interface and a CE section.

I/O commands received from CPU through MTA are executed with microprograms resident in two independent read-only storage (ROS) units within the 3803-3 Control Unit. One ROS controls the MTA interface lines while the other ROS controls the tape unit interface.

The 3803-3 Control Unit operates in burst mode for all data transfers and executes commands received across the interface, performing one command on a single tape unit at a time.

When a 3803 Model 3 is taken offline, all functions from the control to the tape unit become the same as a Model 1 3803.

RECORDING PHILOSOPHY

Types of Codes:

NRZI Non-Return to Zero Indicating
PE Phase Encoding
GCR Group Coded Recording

The progression of IBM digital recording from NRZI to PE to GRC is the result of IBM's effort to provide the customer with the lowest cost and highest reliability tape storage devices.

NRZI coding utilizes a chnage in flux to indicate a one and no change to represent a zero. NRZI tapes can be written in densities of 200, 556 bpi in 7-track format, and 800 bpi in 9-trace format. (See example A.)

PE coding utilizes a change of magnetic flux in the positive direction to indicate a one and a change in the negative direction to indicate a zero. PE tapes are written in 1600 bpi 9-track density only. (See example B.)

GCR coding utilizes a combination of NRZI and PE to achieve the highest density available on IBM drives. Density for GCR is effectively 6250 bpi. (See Example C.)

Group Coded Recording - 6250 bpi

Group Coded Recording (GCR) offers many advantages over previously used recording methods. This recording offers higher reliability even with existing tape libraries. Greatly expanded error correction capability has been engineered into GCR. Higher data rates and lower access times give higher throughput and reduced channel time, resulting in higher system performance. Data is compacted on tape, reducing rewind times, shortening the length of tape required for a data set, reducing the number of reels, reducing mounts and dismounts, and improving overall tape handling. Other advantages exist, but here we wish to discuss only the recording technique.

The data is still recorded in blocks, or groups of characters. A block of data may be a single character or byte, or a number of bytes as determined by the programming system used. The significant improvements in the GCR mode are:

1. The information data is recorded at an effective density of 6250 bytes per inch.
2. The separation between blocks (IBG) is 0.3 inch, and,
3. That simultaneous errors in any two of the nine tracks are corrected automatically.

A GCR block consists of a preamble, data and a postamble. The preamble and postamble are each 80 bytes long and serve to synchronize the read detection circuits in a manner similar to previous 1600 bpi subsystems. The data portion of the block consists of the following:

RECORDING PHILOSOPHY *(continued)*

1. For every seven bytes of channel data, an ECC character (error correcting code) is generated and these eight bytes, called a data group, are encoded into ten bytes, called a storage group, which are then written on the tape. There will be as many of these ten byte storage groups as there are multiples of seven channel data bytes in the record block. The last group of the record block may contain up to 158 storage groups.

2. The remainder or last group of the channel data bytes (zero to six bytes) is encoded with whatever "pad" bytes are necessary, an auxiliary check character, and the ECC character generated from these into a ten-byte residual group. This residual data group is created for every block recorded, even though no residual bytes are found in the record and will always be ten bytes long. The auxiliary check character verifies read and write operations.

3. End of data is signaled by a unique subgroup of five bytes immediately preceding the residual group.

4. Following the residual group, a ten-byte CRC (Cyclic Redundancy Check) group is encoded. This group, with the auxiliary check character, ensures the integrity of the read and write operation including verifying any error corrections which may have taken place.

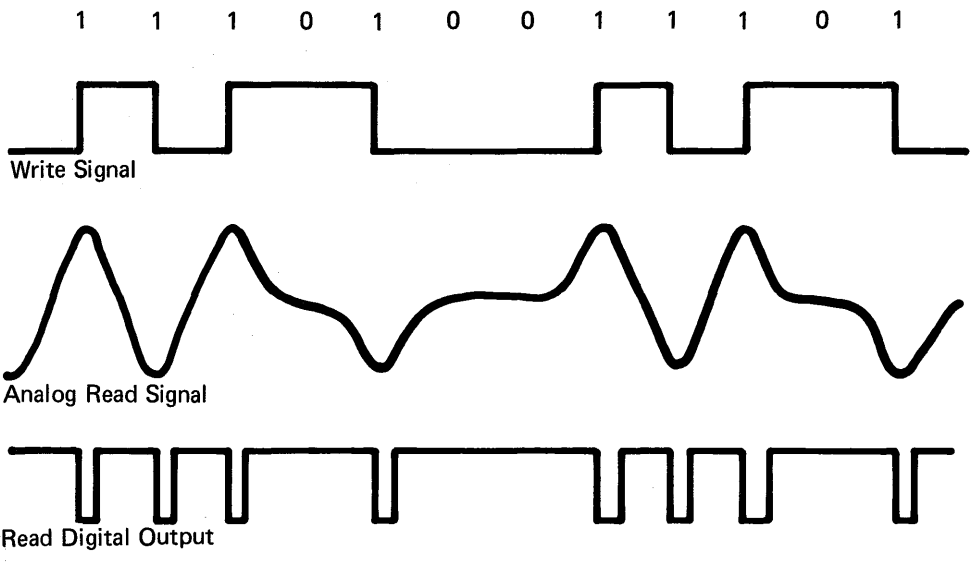
5. Interleaved into the recorded block, after every 158 storage groups, is a resync burst. This burst allows the tape control unit to put back into full operation any track(s) which may have lost synchronization or dead tracked due to tape defects. This action limits dead tracking for greater throughput.

6250 bpi does not relate to actual writing density on tape but to effective data density Actual density (9042 bpi) is greater due to the formatting and encoding, but this formatting and encoding is transparent to the user. The power of the format and encoding method is such that reliable error correction occurs for any two tracks simultaneously in error. Also, tracks are not immediately dequeued or 'dead tracked' when an error occurs as they were in the past. It is thus conceivable that a block could have errors in all nine tracks and appear to the user to be read error-free so long as only two tracks have errors at any given instant.

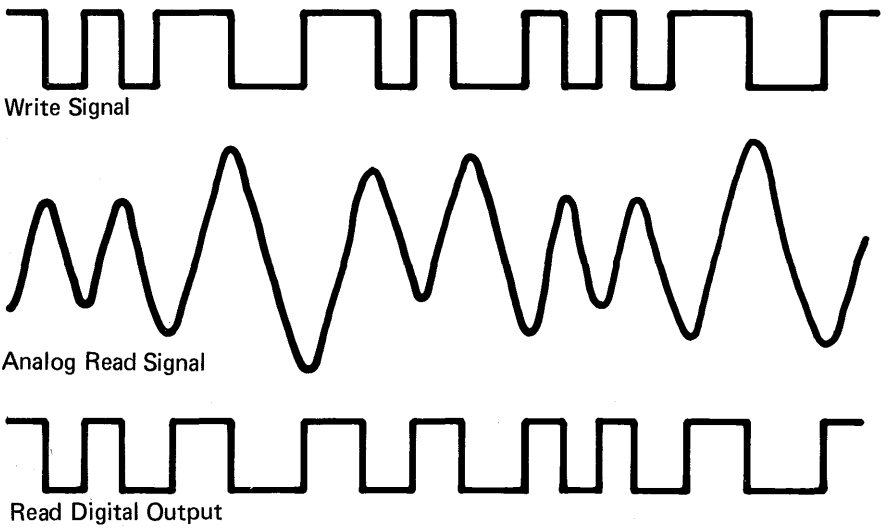
6250 bpi, combined with 0.3 inch IBGs, provides for greatly improved channel data rates and access times.

RECORDING PHILOSOPHY *(continued)*

NRZI (Example A)

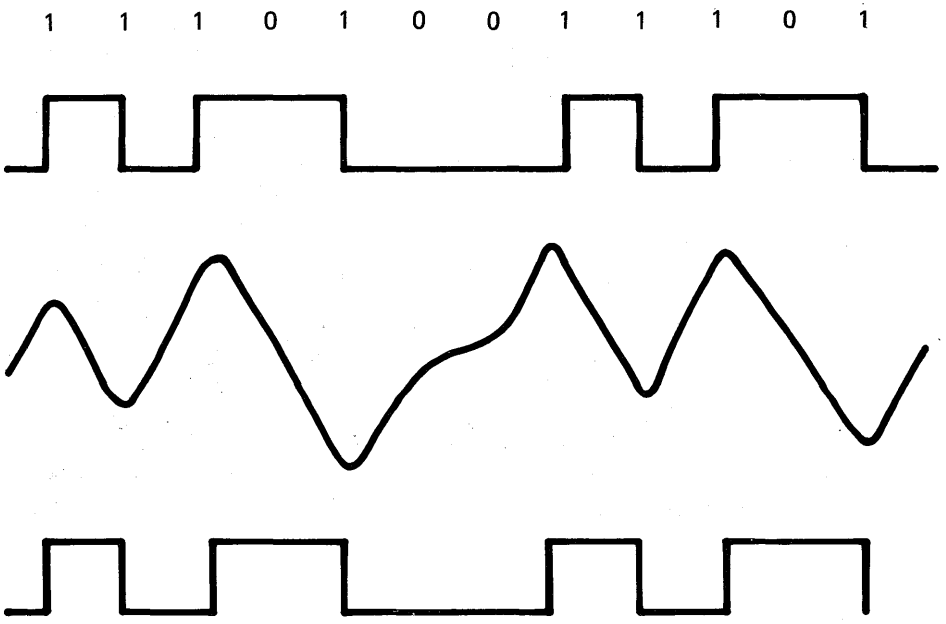


PE (Example B)



RECORDING PHILOSOPHY *(continued)*

GCR (Example C)



Physical Size of a 4K Byte Record

NRZI (800)

PE (1600)

GCR (6250)

UNDERSTANDING EREP1

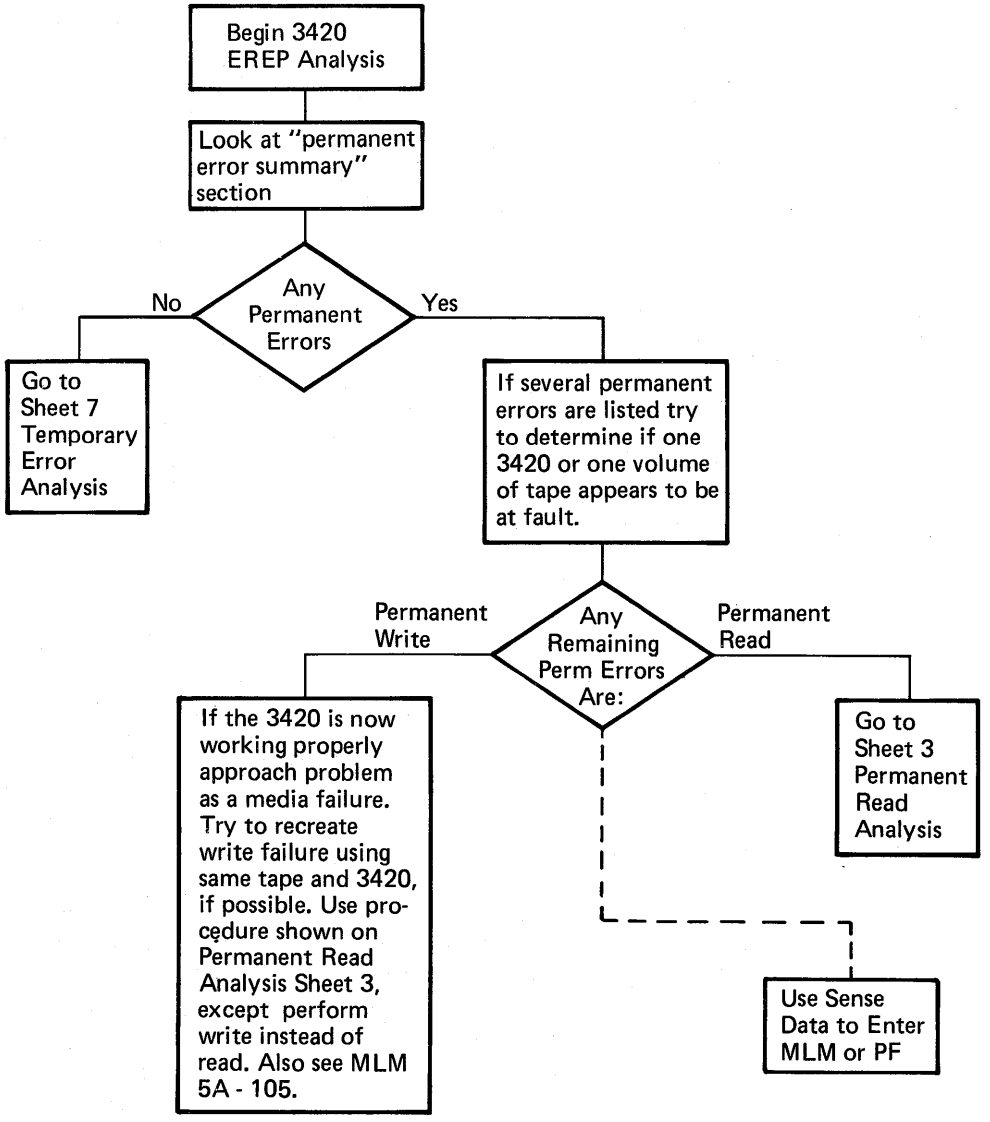
EREP is designed to help you decide if you have a machine problem or defective media, as well as giving you a good idea of how your 3420s are performing. EREP1, with its enhancement package, is even more useful than previous EREP versions. EREP1 guidelines are presented here to assist the CE in managing his 3420 account.

IRD (Information Records Division) is using a criteria of one temporary write error per 5,000 SIOs and one temporary read error per 70,000 SIOs as a reference for an average running 3420/3803 customer account. We agree with these numbers with the understanding that they are intended to be a national average. They are not a certain indication of reliability to be obtained in individual accounts because of the influence of unmeasured variables (ie, customer block size).

The IRD criteria is used in determining temporary read or write error criteria figures on the following flowcharts. EREP1 parameters should be used to produce a 3420/3803 Summary Output with threshold values at one temporary read and fifteen temporary write errors. These are suggested initial threshold values which CE may wish to change later.

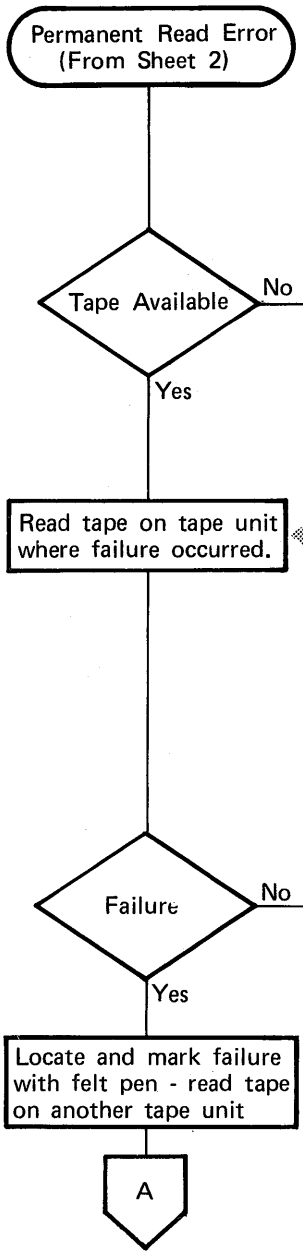
All permanent errors should be investigated to an acceptable conclusion and all temporary error quantities *not meeting criteria figures* should be recorded and tracked to determine cause of outside-criteria conditions.

Sheet 1


Begin 3420 EREP Analysis
Look at "permanent error summary" section
Any Permanent Errors
No
Yes
Go to Sheet 7 Temporary Error Analysis
If several permanent errors are listed try to determine if one 3420 or one volume of tape appears to be at fault.
Any Remaining Perm Errors Are:
Permanent Write
Permanent Read
If the 3420 is now working properly approach problem as a media failure. Try to recreate write failure using same tape and 3420, if possible. Use procedure shown on Permanent Read Analysis Sheet 3, except perform write instead of read. Also see MLM 5A - 105.
Go to Sheet 3 Permanent Read Analysis
Use Sense Data to Enter MLM or PF

Sheet 2

Permanent Read Error



Permanent Read Error Analysis Chart

Reference MLM 00-011

Sheet 3

Customer cooperation is very important when analyzing permanent read errors. If necessary, request your field manager's assistance in obtaining this cooperation. Request customer to furnish the following:

1. Failing tape (ask customer to mark tape reel at approximate area of failure).
2. Address of tape unit on which tape was written.
3. Address of tape unit on which tape failed to read.
4. Job on which failure occurred.

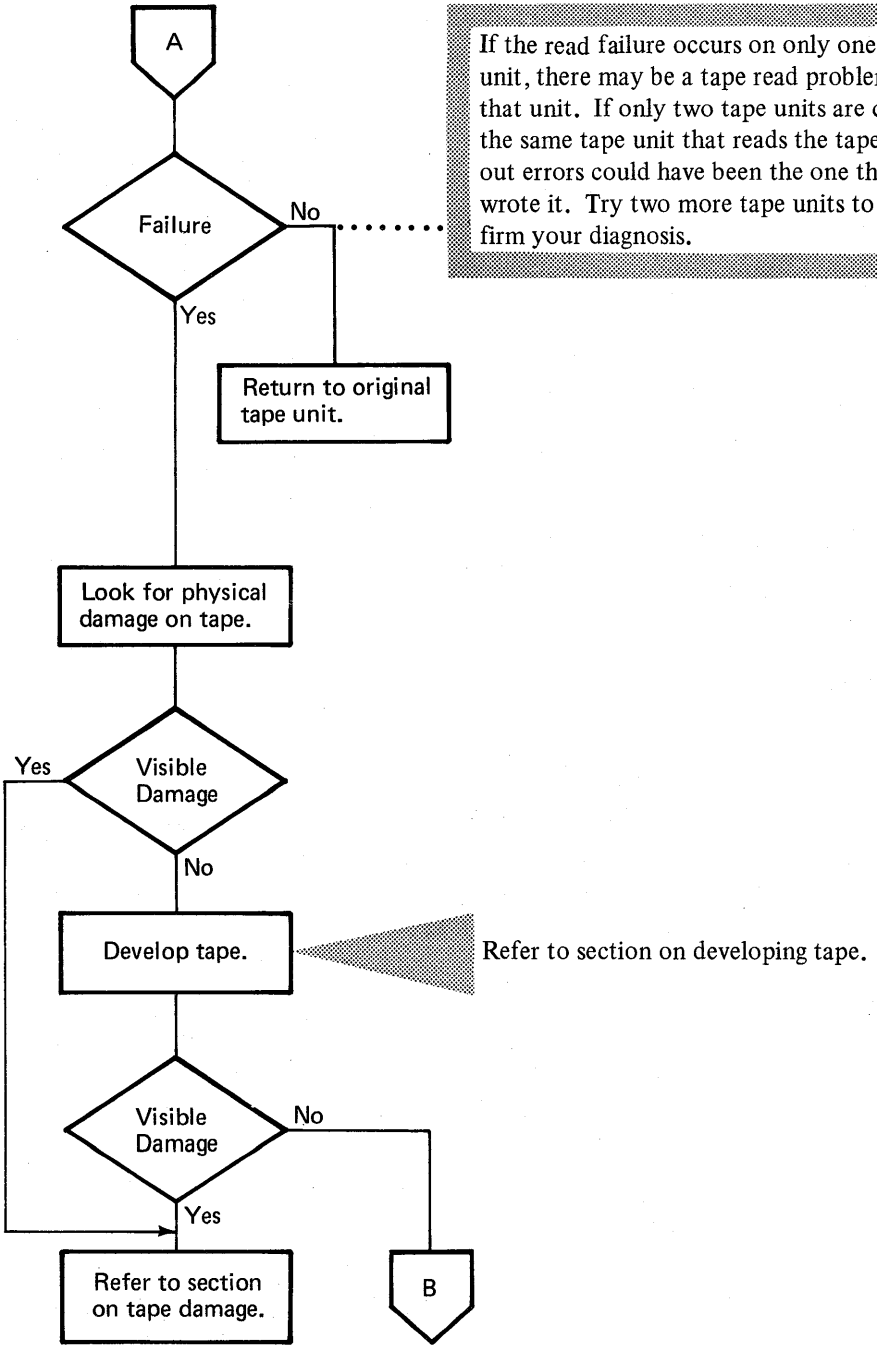
Online: Run "FRIEND" (OLT T0200A) or have customer run "ditto" or equivalent tape-to-tape job using the failing tape as input.

Offline: If 3803 is available perform read command from CE panel. Turn on "stop on data flow check" switch.

Even if you cannot recreate the reported failure, gather and log all available data for future reference. Include the following in the intermittent trouble log:

1. Address of tape unit on which tape was written.
2. Address of tape unit on which tape failed to read.
3. Tape reel number.
4. Console messages defining failure.
5. SER and VES output for the interval involved.

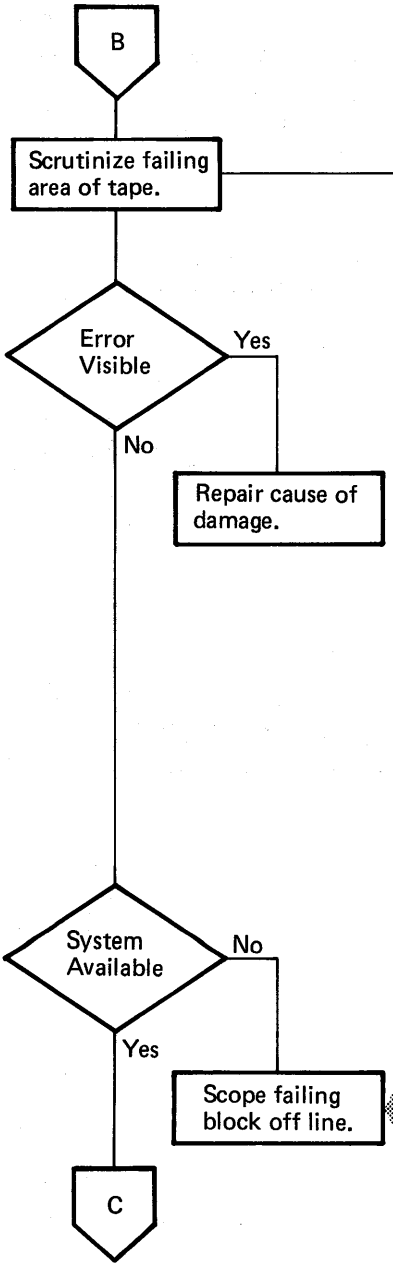
In addition, ensure proper error recovery programming is used, mode and density assignments are correct, and tape cleaner blades are not worn out. Watch for heavy oxide buildup, worn tape, external sources of contamination, or any other factor detracting from tape reliability, and initiate corrective action with the customer.



If the read failure occurs on only one tape unit, there may be a tape read problem on that unit. If only two tape units are checked, the same tape unit that reads the tape without errors could have been the one that wrote it. Try two more tape units to confirm your diagnosis.

Permanent Read Error Analysis Chart

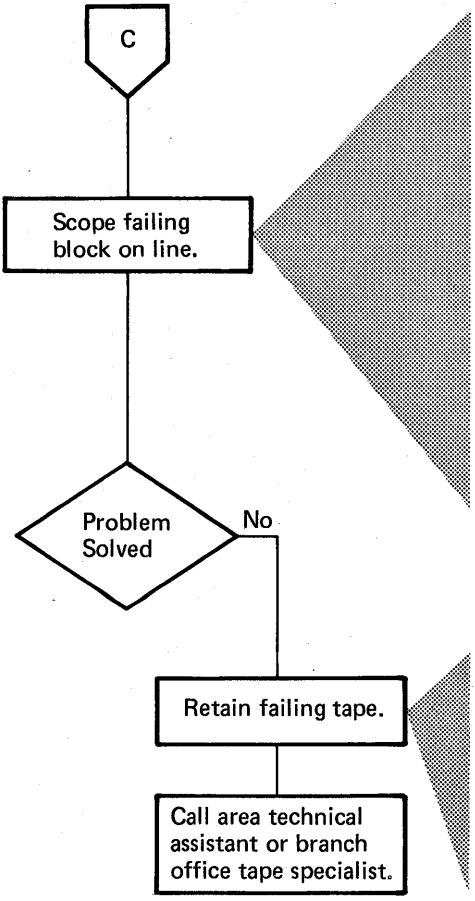
Sheet 4



The purpose of scoping a permanent read error is to locate the failure within the block and determine the cause. Proceed as follows:

1. Locate the failing block offline.
2. Loop on the failing block:
   a. Read forward-backspace on forward read failures.
   b. Read backward-forward space on backward read failures.
3. Refer to MLM 00-012 for more information.

Permanent Read Error Analysis Chart
Sheet 5



Permanent Read Error Analysis Chart
Sheet 6

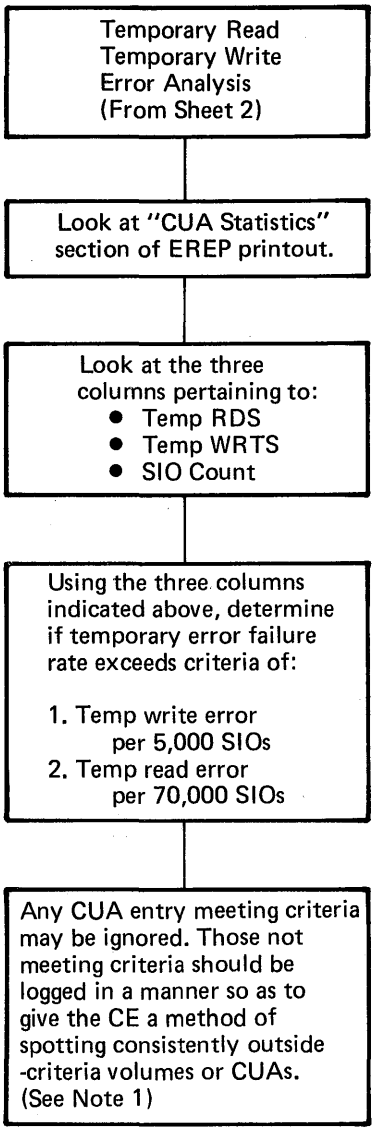
Use the FRIEND program to scope permanent read errors online:

Note: Don't use channel command word (CCW) chains. Reading the bad record breaks the chain.

1. Locate the failing block with the control unit offline.
2. Set up a program loop to read forward-backspace or read backward-forward space whichever is applicable.
3. By altering the channel command word (CCW) byte count, the command-out response to service-in will set the stop trigger in the tape control at any byte chosen. Sync external on the stop trigger to examine any portion of the block in detail.

Note: Detailed observation of a PE block is difficult due to normal distortion of the PE signal and the high amount of skew the PE detection circuits can tolerate. Examine several tracks at comparable points, looking for noticeable differences in levels and waveforms. A record containing excessive phase shift is usually indicated by multi-track error (MTE) or read write register (R/W Reg) vertical redundancy checks (VRC). Check the tape unit that wrote the tape for a possible defective write driver. Refer to MLM 00-012 for more information.

If you cannot determine the cause of the permanent read error, save the tape and any information you have gathered for use by your branch office or region tape specialist. A permanent read error can cost the customer considerable reconstruction and rerun time. There should be NO undefined permanent read errors.



Sheet 7

Note 1:

One logging method would be a grid chart with CUAs plotted along vertical edge and volume IDs plotted along horizontal edge. Number of temporary errors could be entered at appropriate intersections. A consistent horizontal pattern of error entries would indicate a possible tape unit problem-a vertical pattern would indicate a bad volume of tape.

PROCEDURE FOR SCOPING 3420 TAPE UNIT SENSE BITS ON LOGIC BOARD

- Take 3420 offline.
- Disconnect interface connector at 3420.
- Switch online/offline switch to "online".
- Jumper proper TU bus-out bits (one at a time) to ground (D08 pin).
- Scope each sense bit. (Ground Level = Bit On)
  (+4.4V = Bit Off)

TAPE UNIT SENSE BYTES

Sense Bit Scope Points		L2D02	L2D04	L2D05	L2D06	L2D07	L2D09	L2D10	L2D11
Tie to D08	Byte	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
J11	Byte 0	Backward	Not File Protect	EOT	BOT	Write Status	Start	Unit Check	Not Busy
G10	Byte 1	7-Track	Write Current Fail	Dual Density	Alternate Density	Mod 4,6, or 8	011 = 75 ips 100 = 125 ips 101 = 200 ips		
G09	Byte 2	Lamp Failure	Left Col Failure	Right Col Failure	Door Interlock or Reset Key	Data Security Erase	Erase Head Failure	Air Bearing Failure	Load Failure
G08	Byte 3	High and Low Tape Unit Serial Number							
G07	Byte 4								
G05	Byte 5	Air Flow Voltage Check	High-Order Serial Number	High-Order Serial Number	High-Order Serial Number	EC Level of Tape Unit			
G04	Byte 6	Allows Read Bus and Tach Pulses (Crease Tape)							
G03	Byte 7	Load Button Pressed	Left Reel Turning	Right Reel Turning	Tape Present	Reels Loaded	Load Rewind	Load Complete	Load Check

Mod 3, 5, 7 K4 Card

Mod 4, 6, 8 K6 Card

Note: This procedure should be used only when no other method is available. (Example: When EREP is not available and/or 3803 cannot be taken offline.)

3420/3803 STATUS/SENSE BYTES

Status Byte	Bit 0	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7
	Attention	Status Modifier	Control Unit End	Busy	Channel-End	Device-End	Unit Check	Unit Exception
Sense Byte	Bit 0 (8)	Bit 1 (4)	Bit 2 (2)	Bit 3 (1)	Bit 4 (8)	Bit 5 (4)	Bit 6 (2)	Bit 7 (1)
Byte 0	Command Reject 15-020 (U)	Intervention Required 15-010 (U) ►	Bus-Out Check 15-030 (U)	Equipment Check 00-006 (U)	Data Check 00-006 (U)	Overrun 15-040 (U)	Word Count Zero 15-050 (U)	Data Converter Check 15-070 (U)
Byte 1	Noise 17-370 (U) (D)	TU Status A 00-006 ►	TU Status B 00-006 ►	Seven-Track 00-006	Load Point 00-006 ►	Write Status 00-006 ►	File Protected 00-006 ►	Not Capable 15-060 (U
Byte 2	Track in Error 17-007							
Byte 3	Read/Write VRC 17-170 (D)	MTE/LRC 17-110 17-310 (D)	Skew Error 17-160 (D)	End Data Check/CRC 17-530 (D)	VRC/Envelope Check 17-220 17-310 (D)	1600 BPI Set in TU 00-007	Backward 00-007	P-Compare/C-Compare 17-010 (D)
Byte 4	MP Hardware Error 00-007 (E) ►	Reject Tape Unit 00-007 (E)	Tape Indicate 00-007	Write Trigger VRC 17-020 (D)	Spare	Loop Write to Read 00-007	Tape Unit Check 00-007 ►	Reserved for RPQ
Byte 5	New Subsystem 00-007	New Subsystem 00-007	Write Tape Mark Check 17-180 (D)	ID Burst Check 17-050 (U)	Start Read Check 17-070 (D)	Partial Record 17-410 (D)	Postamble Error 17-190 (D)	Reserved for RPQ
Byte 6	Seven Track Tape Unit 00-007	Write Current Failure 15-090 (E) ►	Dual Density 00-007	3420 Not Set to 1600 bpi 00-007	Model 4/6/8 00-007	Tape Unit Model Identification 00-007		
Byte 7	Lamp Failure 15-090 ►	Tape Bottom Left ► 15-090	Tape Bottom Right ► 15-090	Reset Key 15-090 ►	Data Security Erase 15-090	Erase Head Failed 15-090 ►	Air Bearing Pressure ► 15-090	Load Failure 15-090 ►
Byte 8	IBG Detected 17-080 (D)	Spare	Spare	Early Begin Read Back Check 17-100 (E) (D)	SAGC Check 16-220 (E)	Slow Begin Read Back Check 00-007 (D)	Slow End Read Back Check 17-150 (D)	Velocity Retry/Reset 00-007
Byte 9	1 or 2-Track Correction 17-600	Velocity Change During Write 16-180 17-600 (D)	Channel Buffer Check 17-600	CRC III 17-540 17-590	6250 Tape Control 00-007	Spare	Spare	Tape Control Unit Reserved 00-007
Byte 10	Command Status Reject 16-160 (E)	Spare	Control Status Reject 16-210 (E)	No Block Detected on Write/WTM 16-190 (E)	Dynamic Reversal 16-200 (E)	Tach Start Failure 16-170 (E)	Spare	Velocity Check 16-180 (E)
Byte 11	B-Bus Parity Error ALU1 16-030 (B) ►	Spare	Low ROS Parity/Low IC Parity on Branch Instruction 16-010 (B) ►	Hi IC/Br Cond/Hi ROS Register Parity 16-020 (B) ►	Microprogram Detected Hardware Error 16-060 (B) ►	D-Bus Parity ALU1 16-040 (B) ►	Spare	Br Cond Error ALU1 16-050 (B) ►
Byte 12	B-Bus Parity Error ALU2 16-100 (B) ►	Spare	Low ROS Parity/Low IC Parity on Branch Instruction 16-080 (B) ►	Hi IC/Br Cond Error/Hi ROS Register Parity 16-090 (B) ►	Microprogram Detected Hardware Error 16-130 (B) ►	D-Bus Parity ALU2 16-110 (B) ►	Spare	Br Cond Error ALU2 16-120 (B) ►
Byte 13	Tape Control Features		Tape Control Unique Identification (High-Order Serial Number Digits)					
Byte 14	Tape Control Unique Identification (Low-Order Serial Number Digits)							
Byte 15	Tape Unit Unique Identification (High-Order Serial Number Digits)							
Byte 16	Tape Unit Unique Identification (Low-Order Serial Number Digits)							
Byte 17	Tape Control Features				Tape Control EC Level			
Byte 18	Power Check/Air Flow ►	Spare	Spare	Spare	Tape Unit EC Level			
Byte 19	TU 7 Primed for DE ►	TU 6 Primed for DE ►	TU 5 Primed for DE ►	TU 4 Primed for DE ►	TU 3 Primed for DE ►	TU 2 Primed for DE ►	TU 1 Primed for DE ►	TU 0 Primed for DE ►
Byte 20	TU F Primed for DE ►	TU E Primed for DE ►	TU D Primed for DE ►	TU C Primed for DE ►	TU B Primed for DE ►	TU A Primed for DE ►	TU 9 Primed for DE ►	TU 8 Primed for DE ►
Byte 21	Load Button Depressed	Left Reel Turning	Right Reel Turning	Tape Present	Reels Loaded	Load Rewind	Load Complete	Load Check
Byte 22	Field Replaceable Unit Identification ►							
Byte 23	Field Replaceable Unit Identification (See Control/Command Status Reject) ►							

Notes: (B) Sets Bus-Out Check when there are no other bits on in Sense Byte 0. (D) Sets Data Check (E) Sets Equipment Check (U) Sets Unit Check ► May Change Status Between Consecutive Sense Commands

3803-2/3420-3 THROUGH 8 TAPE DRIVE SENSE ANALYSIS (1 of 7)

When troubleshooting the 3803-2/3420 through 8 Subsystem Use:

This chart:

- For Single Drive failures when sense data is available.
- As a supplement to MLM 00-009 and 00-005.

Note: Contamination can appear as a multiple drive failure but it is really drive oriented.
MLM 00-010 is the normal entry point for the Symptom Index.

MLM 00-011 and 00-012;

- For Permanent Read errors plus the tape develop procedure in this package.

MLM 14-000;

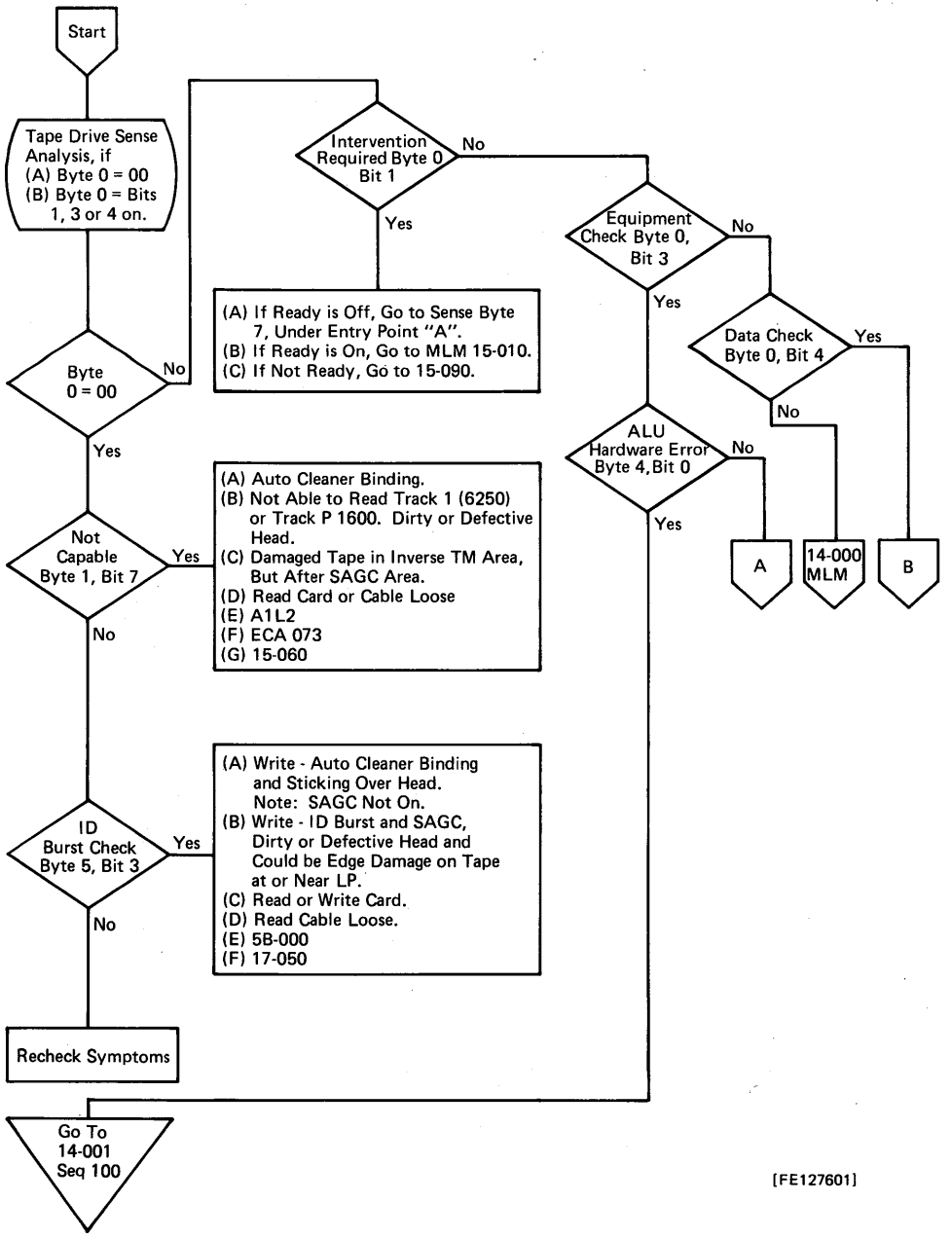
- For 3803-2 problems.

Tips:

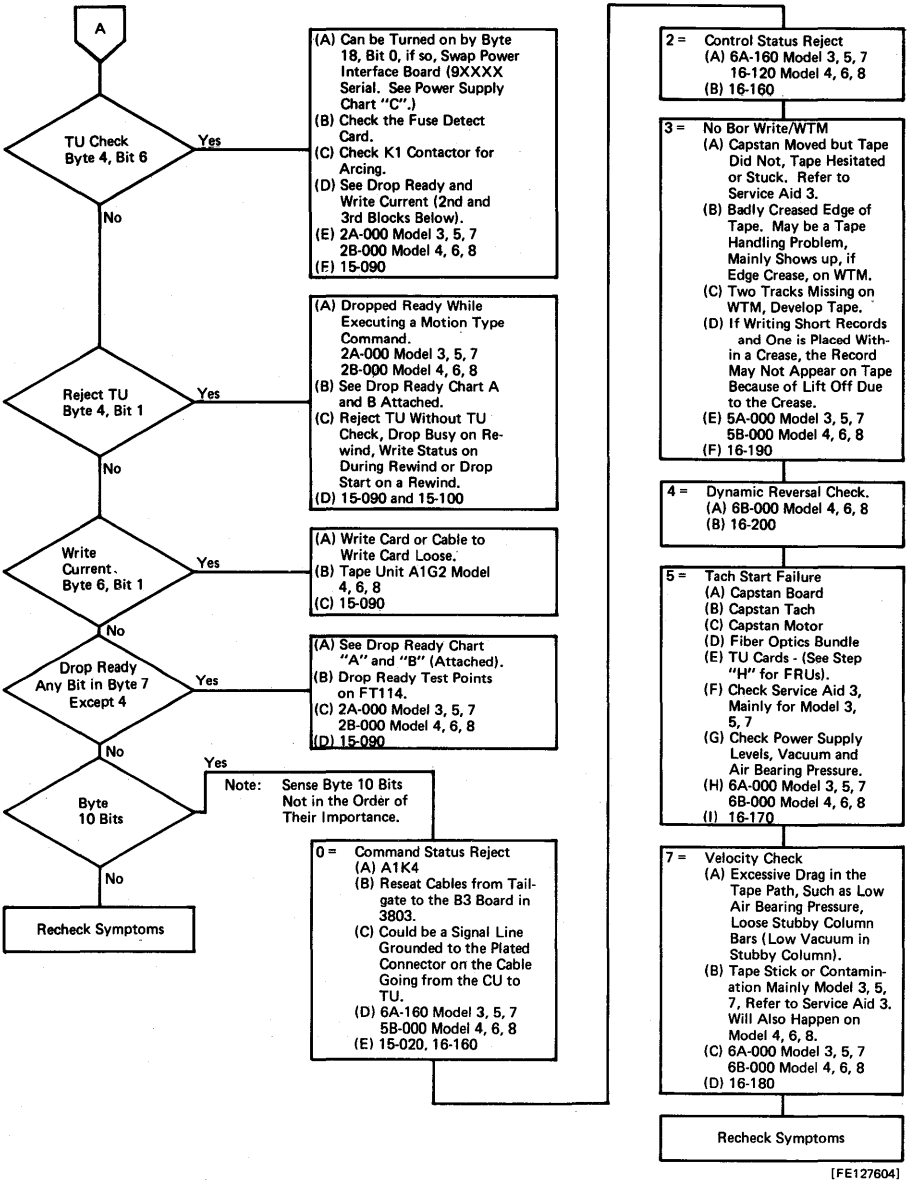
(A) Developing tape can be very helpful to determine what kind of failure really happened.
(B) Review 3803/3420 Service Aids on microfiche.
(C) Always clean the R/W head before adjusting the AMP Sensors. A build up in the head slots can make it difficult to clean thoroughly at times.
(D) R/W card to head plugging, if pins are not making good contact, it may fail with vibrations. The signal ground connection, if not made, will produce intermittent problems in R/W.
(E) Compatibility problems between drives can be caused by tracking out of adjustment. Or if this adjustment is OK, and the tracks are not centered on tape. Develop tape and place it on the viewer to observe. The proper positioning of the head to tape relationship is done by the Skew Plate. A special Skew Plate adjusting tool is necessary to do this (included in the Reference Plate replacement kit, BM 4298806).
(F) Check power supply voltages.

3803-2/3420-3 THROUGH 8 TAPE DRIVE SENSE ANALYSIS
(2 of 7) *(continued)*

Note: Sense byte bits are in the order of their importance except bits in byte 10.

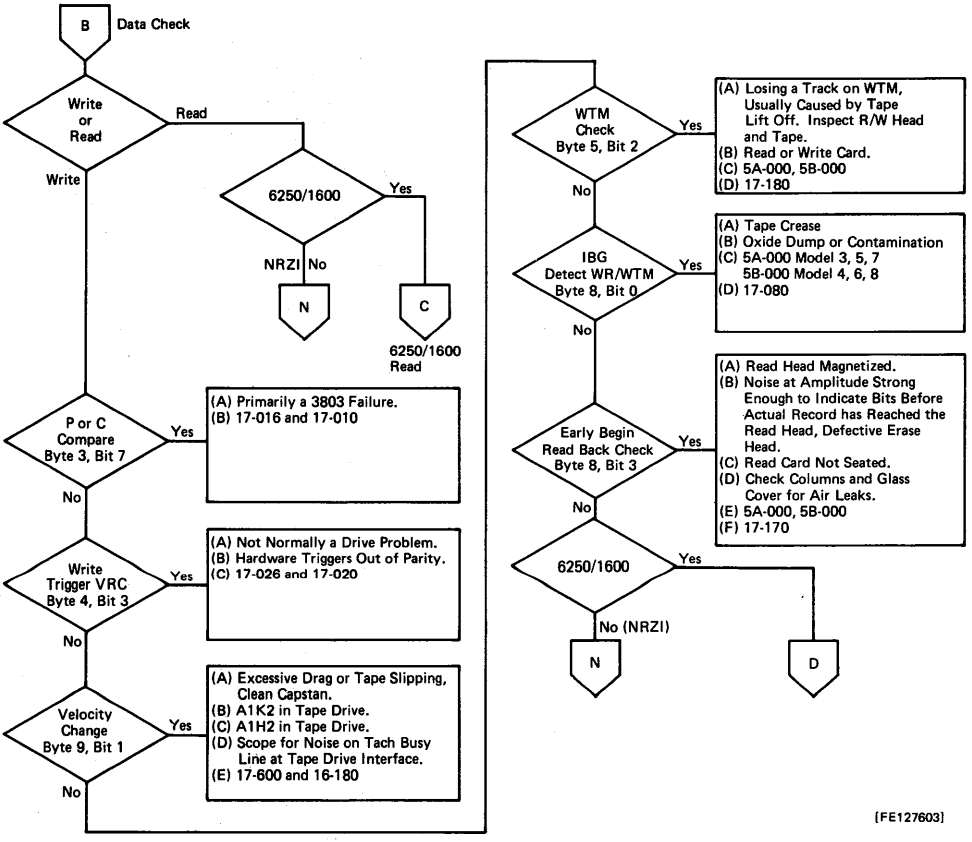


3803-2/3420-3 THROUGH 8 TAPE DRIVE SENSE ANALYSIS
(3 of 7) *(continued)*

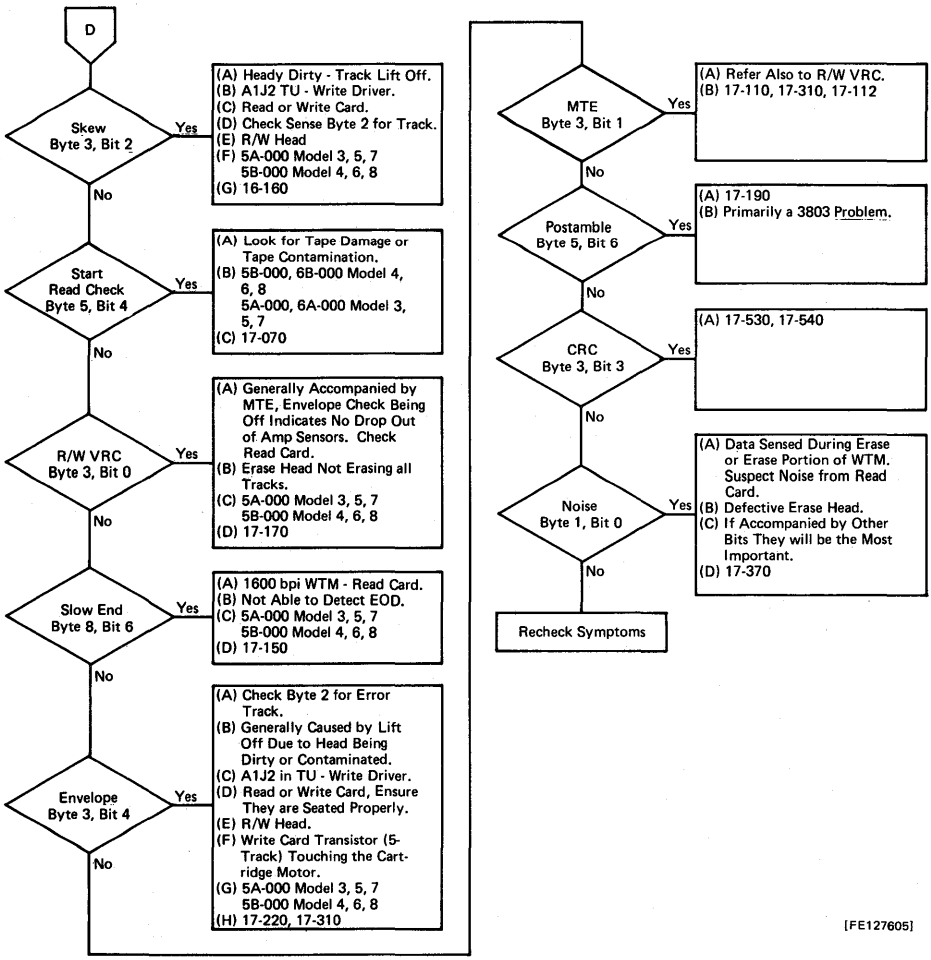


[FE127604]

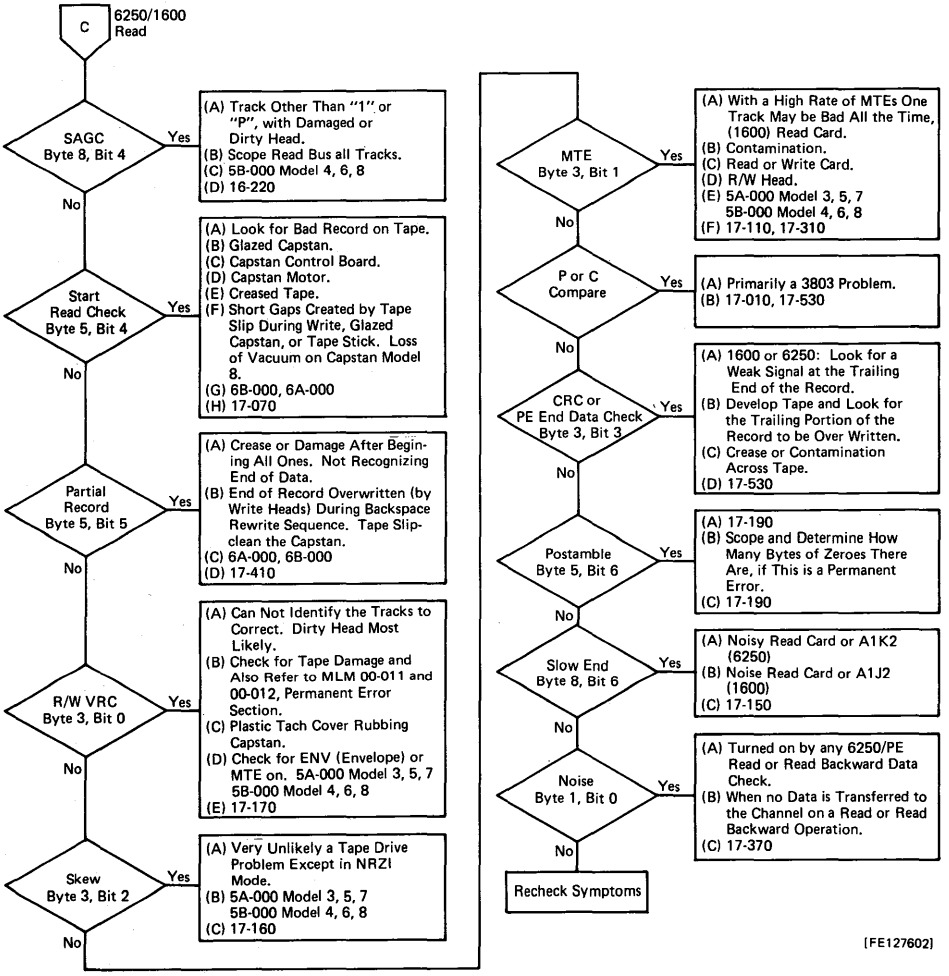
3803-2/3420-3 THROUGH 8 TAPE DRIVE SENSE ANALYSIS
(4 of 7) *(continued)*



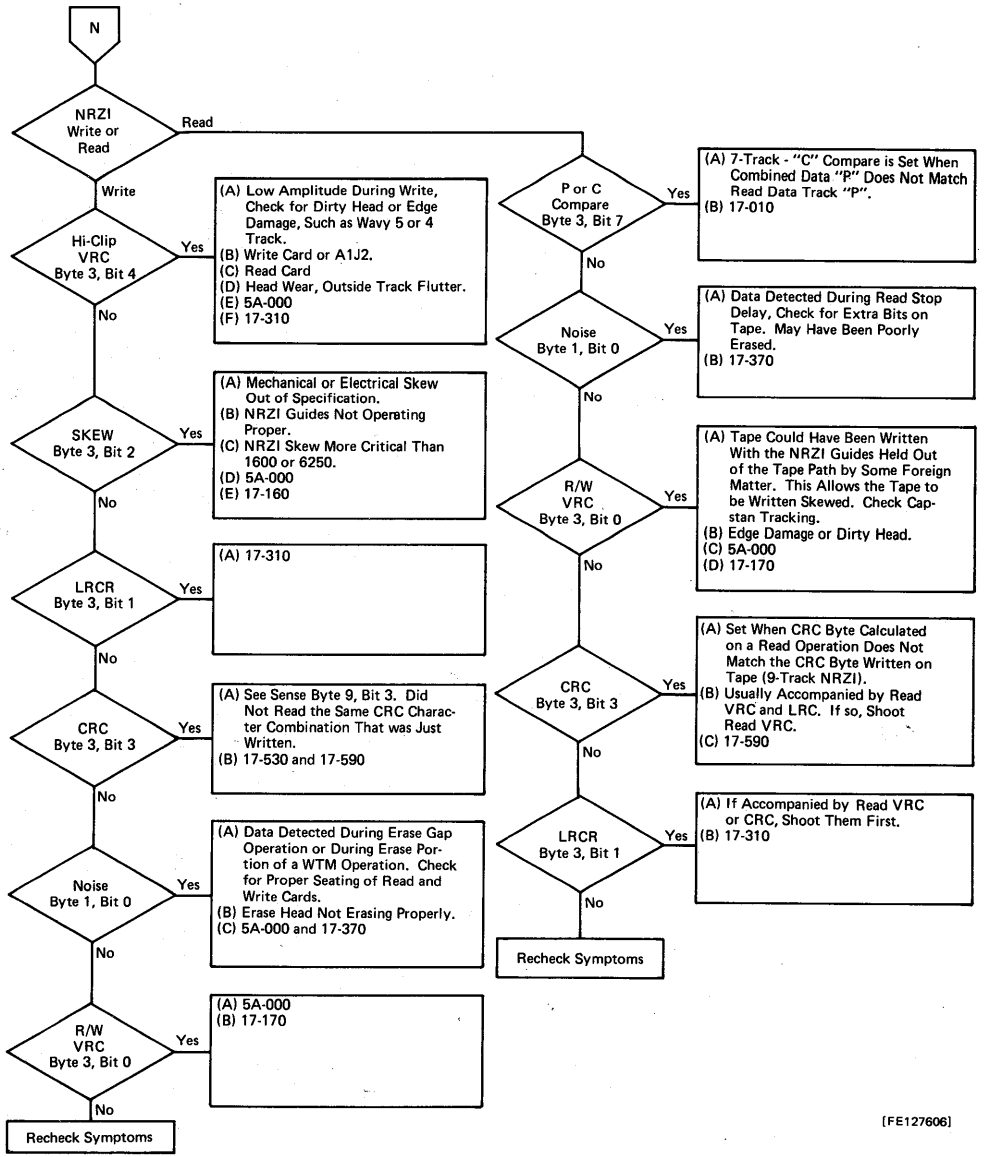
3803-2/3420-3 THROUGH 8 TAPE DRIVE SENSE ANALYSIS
(5 of 7) *(continued)*



3803-2/3420-3 THROUGH 8 TAPE DRIVE SENSE ANALYSIS
(6 of 7) *(continued)*



3803-2/3420-3 THROUGH 8 TAPE DRIVE SENSE ANALYSIS
(7 of 7) *(continued)*



3420/3803 ONLINE TESTS

IBM 3420/3803 Online Tests, Listed by Section

Section		Test Focus	Test Mode	Test Type
A:	CMD Sequence Analysis	Control Unit	PE/6250/NRZI	Diagnostic
B:	Control Unit	Control Unit	PE/6250/NRZI	Functional
C:	Control Unit	Control Unit	PE and 6250	Functional
D:	Channel Buffer R/W & Mode Set	Control Unit	6250/1600/NRZI	Functional
E:	Basic Read and Write	Subsystem	PE/6250/NRZI	Functional
F:	6250 Data Path Verify	Control Unit	6250 Only	Functional
G:	6250 Error Detect/Correct	Control Unit	6250 Only	Functional
H:	PE Diagnostic Mode (Part 1)	Control Unit	PE Only	Functional
I:	PE Diagnostic Mode (Part 2)	Control Unit	PE Only	Functional
J:	PE Diagnostic Mode (Part 3)	Control Unit	PE Only	Functional
K:	PE Diagnostic Mode (Part 4)	Control Unit	PE Only	Functional
L:	Mod 4, 6, 8 Clip Level Check	Tape Unit	PE Only	Functional
M:	NRZI Control Unit	Control Unit	NRZI Only	Functional
N:	NRZI Diagnostic Mode (Part 1)	Control Unit	NRZI Only	Functional
O:	NRZI Diagnostic Mode (Part 2)	Control Unit	NRZI Only	Functional
P:	7-Track Functional Tests	Tape Unit	NRZI Only	Functional
Q;	Long Record Write/RDB/Read	Subsystem	PE/6250/NRZI	Functional
R:	Write Reliability	Subsystem	PE/6250/NRZI	Reliability
RO:	MAPs Analysis	Control Unit	3803-2	Analysis
S:	Read Reliability	Subsystem	PE/6250/NRZI	Reliability
T:	Tach Parameters	Tape Unit	PE/6250/NRZI	Diagnostic
U:	Tach Asymmetry	Tape Unit	PE/6250/NRZI	Diagnostic
V:	Start/Stop	Tape Unit	PE/6250/NRZI	Functional
W:	IBG and Creep	Tape Unit	PE/6250/NRZI	Functional
WR:	MAPs Analysis	Control Unit	3803-2	Analysis
X:	Reel Response	Tape Unit	PE/6250/NRZI	Functional
Y:	Data Access Measure 1	Tape Unit	PE/NRZI	Functional
Z:	Data Access Measure 2	Tape Unit	PE/6250	Functional
AB:	Device Switching	Control Unit	PE/6250/NRZI	Functional
AC:	Control Unit Status	Control Unit	PE/6250/NRZI	Functional
AD:	2-Channel Switch (Part 1)	Control Unit	PE/6250/NRZI	Functional
AE:	2-Channel Switch (Part 2)	Control Unit	PE/6250/NRZI	Functional
AF:	2-Channel Switch (Part 3)	Control Unit	PE/6250/NRZI	Functional
AG:	2-Channel Switch (Part 4)	Control Unit	PE/6250/NRZI	Functional
BA:	Stress Tape 1	Control Unit	6250 Only	Diagnostic
BB:	Stress Tape 2	Control Unit	6250 Only	Diagnostic

3420/3803 ONLINE TESTS *(continued)*

Section RO-WR: Error Analysis

These two OLTs apply to the 3803-2 only. The MAPs and the OLTs are designed as an integrated package. You should start with the MAPs and run the OLTs as indicated when analyzing an error.

All of the 3803-3420 OLTs diagnostics can save the error sense data for later analysis by OLT 3420RO and OLT 3420WR. The error sense data "save" field is a common area for all of the 3803-3420 OLTs. Therefore, if more than one OLT is run and has errors, the sense data from the last error in the last OLT run is available for analysis.

Although the sense data is saved for an error in all of the OLTs, only OLTs A-G, P, Q, R, and S are recommended for FRU analysis. The sense data from the other OLTs can be analyzed, but the results may be misleading. This is due to errors that are forced by the OLTs.

OLT WR has an EXT= option whereby sense data to be analyzed can be entered from the keyboard.

Example: DEV/3420WR/EXT=,SNS=804400
8000002C000008000000C7/

At least the first fourteen bytes (0-13) should be entered. The extent field (EXT=) however, will not permit entry of all 24 bytes.

How to Generate a 'Prewritten' or 'Read Only' Tape

In MAPs, you will note references to a 'Read Only' tape. (In several sections of the User's Guide, you will note references to a 'prewritten tape'. The terms 'prewritten' and 'read only' are synonymous.) This tape is a diagnostic tool which should be generated when the system is operating correctly. You should have a 'Read Only' tape generated in 6250 bpi available for analyzing failures. Sense switch Z which is in OLTs routines A-G generates 'Read Only' data in 6250 bpi.

Note: When changing the EXT= parameter, the program must always be called:

Example: DEV/3420A-G/EXT=Z/
Example: /3420A-Z/EXT=WZ/
not //EXT=Z/.

To generate a 'Read Only' tape (6250 bpi), the OLTs A-G are run with first error option and sense switch Z on.

Example: DEV/3420A-G/FE,EXT=Z/.

When the 'Read Only' tape has been generated without any errors, the tape should be file protected.

False Crease Tape Error - OLT -

OLT	Messages
T3420I	AI0108
T3420L	AI0137
T3420K	AK0106
T3420M	AM0108

If byte 17 (EC) is not plugged correctly on logic AA004.
Prior to EC733843 bit 6 and 7 should be 01
After EC733843 bit 6 and 7 should be 10
After EC734866 bit 6 and 7 should be 11
R060 OLTs reversed test I and M.
If byte 17 is plugged incorrectly the wrong routine will be run.
This is for a 3803 Mod001 only. A 3803 Mod002 will be plugged for bit 6 and 7 = 01.

Stress Tape P/N1848621

A prewritten tape used for diagnosing the operating parameters of the 3803 Mod 2 has been been generated by a unique machine for this purpose and cannot be created or duplicated by any other known method. This tape is used in conjunction with OLT diagnostic T3420BA and T3420BB (stress tape 1 and stress tape 2) and should be ordered from the nearest EPC just prior to converting a 3803 Model 1 to a Model 2. Reference OLT User's Guide dated March 1974 or later for explanation of tests etc. After the tape has been used to check out the converted units the tape is to be returned to its original stocking location for use by other conversion sites. The tape is not intended to be kept at the branch office or customer location. The reason for this is that there are only a limited number of these tapes available. As recertification of the stressed data is not possible, care must be exercised so as not to damage the tape. A damaged tape will have to be replaced with a new one.

The recommended stocking level is three tapes at each emergency parts center (EPC).

WHAT IS WHERE IN THE MLM?

MLM Volume 1

Section	Contents
PLAN	Safety information; table of contents (organization of publication), a list of abbreviations and symbols and the address for ordering the OLTs User's Guide.
00	Notes on how to use the MAPs effectively; training requirements for using the MAPs effectively, method of identifying ECs which affect the MAPs, standard plus and minus voltage levels encountered in the machines, sense byte chart with references to descriptions, a symptom index (page 0-010) for normal entry into the MAPs, a quick index (page 0-009) for entry into the MAPs when you have one of the symptoms listed there and you know whether the problem is in the TU or TCU.
1A-6A	MAPs for 3420 Models 3, 5, and 7 attached to 3803-2. (Same as Path-finder for these models attached to 3803-1.)
1B-6B	MAPs for 3420 Models 4, 6, and 8. Note that Section 1B follows Section 6A, not 1A. Sections 1 through 6 (both A and B) contain MAPs for TU power supply, thread/load, basic motion, unload, read/write and capstan motion control problems, in that order.

WHAT IS WHERE IN THE MLM? *(continued)*

MLM Volume 2

Section	Contents
7	TU interface theory
8	Checks, adjustments, removals and replacements
11	TCU power supply MAPs
12	Procedures for duplicating failures offline and procedures for performing various CE panel functions (extracting sense data, restart on ALU error, etc.)
13	MAP procedures for ALU hangs or loops, channel busy, timeout, or other indications where the microprogram does not appear to be looping normally (possibly also causing channel hang).
14	Manual analysis of sense data using a prioritized scheme.
15	MAP procedures for miscellaneous errors.

WHAT IS WHERE IN THE MLM? *(continued)*

MLM Volume 3

Section	Contents
16	MAP procedures for equipment checks
17	MAP procedures for data checks, including timing charts of various data operations plus second levels of the conditions required to produce the error.
18	Device switch theory and MAPs for problems isolated to the device switch.
19	Board layouts for the TCU and TU boards showing the functions performed for each card to assist in card swapping.
20	Logic net cross-reference list. The MAP scoping procedures allow you to identify a failing line and the FRU from which this line originates. If replacing that FRU does not correct the problem, you may suspect a loading problem at the other end of the line (net). This cross-reference list provides the references to logic for all line (net) names encountered in the MAPs so that you may more easily pursue problems of this nature.
21	OLTEP error message analysis. Used as directed by sense analysis sections 3420RO and WR after certain errors encountered by sections 3420 F and G.

WHAT IS WHERE IN THE MLM? *(continued)*

MLM Volume 4

Section	Contents
40	Subsystem characteristics, features, etc.
50	TCU data flow, MP1/MP2 schematic, ROS1 trap conditions 6250 read/ write service requirements.
52	Microprocessor theory
53	TCU oscillators, clocks, counters and controls, second levels and theory
54	TU selection and priority
55	Loop write to read (LWR) purpose, operation and data flow
57	NRZI data flow and theory
58	Two-channel switch and device switch theory
75	CE panel - description of switches and indicators
80	Tools and test equipment
85	Subsystem preventive maintenance
90	Subsystem installation procedures
Index	

COMMON ABENDS

Reference MLM 00-035

Abends-Theory

Abend 137, 237, 413, 613, and 637 may be caused by missing tape marks.

Missing tape marks are caused by:

- Incorrect forward-backward ratio.
- Loss of signal amplitude causing a failure to recognize the tape mark.
- Excessive crosstalk, indicating that data is fed into a dead zone. Data recorded on any track in a dead zone will prevent reading a tape mark correctly.

To check for loss of amplitude and crosstalk use the failing drive and tape. Find the tape-mark on the tape that was not read correctly. Cycle back and forth across the failing tape mark with the CE panel. Sync on Go Forward (T-A1F2J10) and scope all tracks (read card test points) and ensure that the signal is good on all tracks in zones 1 and 2 (tracks P, 0, 5, and 2, 6, 7).

Measure the amplitude on tracks 1, 3, and 4 (zone 3) and ensure that there is less than 140 mv of signal (Models 4, 6, and 8 only).

Crosstalk is caused by:

- Defective write card.
- Defective read card.
- Defective R/W head.
- Poor tracking. If tracking is out of specifications go to Capstan Dynamic Alignment (see 08-150). The drive that wrote or read the tape, or both, could cause crosstalk.

If the failing tape is not available, write a tape on a working tape drive offline, and use that tape to check for crosstalk on the suspected failing drive.

137/637 Abend

Machine Type	Possible Causes
3803	Defective 01A-A2N2 card
3803	Defective 01A-B2F2

237 Abend

Machine Type	Possible Causes
3420	Large tape creases detected as gaps (check stubby bar clearance).
3420	Short records (80 characters) falling within a tape crease.
3420	Tape edge damage.
3420	E/C 443935 (6250) — Fix for short gap verification during backspace after a write error caused by erratic tape motion, not installed.
3420	R/W head forward-to-backward ratio is out of specifications.
3420	Tape sticking.
3420	Dirty capstan.
3803	Missing Suppress Out, intermittently breaking channel/command word (CCW) chain, updating the count but not losing a record.
3803	Defective 01A-B3F2 inbound tag card XC700.
3803	ECA079 — Unexpected interrupt with status = '00' from a non-two channel switch in multiple CPU 2X, 3X, 4X, installation.

413 Abend

Machine Type	Possible Causes
3420	Defective T-A1C2 MST card.
3420	Reading 6250 tape in 1600 mode. E/C 443890 – Autocleaner sluggish, not installed.
3420	Defective A1H2
3420	Defective T-A1L2
3420 Models 4, 6, 8	E/C 735817 – Delay Ready after rewind to allow autocleaner to return, is not installed.
3420	Damaged tape at load point.
3420	Contamination on the Read/Write head, or the capstan is glazed.
3803	Defective 01A-A2D2 MST card or defective 01A-A2E2 MST card.
3803	Broken CCW chain without Unit Check. Run an I/O software trace for more problem definition.
3803	ECA079 – Prevent busy in middle of CCW chain, not installed.
3803	ROS patch to ALU1 for allocated busy is not installed.

613 Abend

Machine Type	Possible Causes
3420	E/C 443935 – Short gap engineering change not installed.
3420 Models 4, 6, 8	ECA073 – Delay Ready after rewind to allow autocleaner to return, is not installed.
3420	Contaminated Read/Write head.
3420	Damaged tape at or near load point
3420	Read/Write head forward-to-backward ratio not in specifications.
3803	Defective 01A-A2N2 card, extra tape mark.
	Defective 3168/2880 card, high-speed buffer – data compare.
OS/VS2 R017	PTF 70751 not installed.
3803-1	Tape Tracking, leaves a faint TM (where existing files are updated) because of the overwriting of the old EOF TM. In this case the writeheads actually do the erasing of the old TM.
3803-1	Defective 01A-B2F2
3803	Incorrect UCW Plugging

Compatibility problems between drives can be caused by tracking out of adjustment, or if this adjustment is OK, the tracks are not centered on tape. Develop tape and place it on the viewer to observe. The proper positioning of the head to tape relationship is done by the Skew Plate. A special Skew Plate adjusting tool is necessary to do this (included in the Reference Plate replacement kit, BM 4298806 stocked at the (EPC's) E level parts centers). Reference SA 9 and SA 10.

TOOLS AND TEST EQUIPMENT

The tools and test equipment listed in this section are required to properly service 3420 Magnetic Tape Units and 3803 Tape Controls.

Kept at the Regional Office

Part	Name
8216729	ROS Address Tracer
8218343	Variable Frequency Oscillator (VFO)

Kept at the Branch Office

Part	Name
	Master Signal Level Tape (see Notes 1 and 4)
451064	Degausser (see Note 1)
453522	Developing Solution
453585	*Digtec 251 Meter (Digitec 201 Meter, P/N 453046, may be used if it is available)
4169639	Scale, 0 to 6 pounds (belt adjustment)
2515376	Capstan Prealignment Gauge
2515390	Capstan Adjustment Wrench (rear adjustments)
2515401	Reel Motor and Hub Adjustment Tools (see 08-460)
2523723	Capstan Adjustment Wrench (front adjustments)
5861448	7-Track NRZI Threshold Adjustment Card
5861455	PE Threshold Adjustment Card
5861452	Dual Density Threshold Adjustment Card
8215414	ROS Patch Card (see Note 1)

Kept at EPCs

Part	Name
4298806	Reference/Skew Plate Replacement Tool Kit (Ref SA-9 and SA-10)
1848621	6250 BPI Stress Tape (see Note 3)

*Trademark of United Systems Corporation

TOOLS AND TEST EQUIPMENT *(continued)*

Kept at the Customer's Account

Part	Name
8493001	Tape Transport Cleaner
	Scratch Tape
	Oscilloscope (Model 453, 454, 561, 545, 766H or equivalent)
352465	Tape Cleaning Kit
	Master Skew Tape (see Notes 1 and 4)
453500	Manometer 30 inch (two needed for series connection) (See Notes 1 and 2)
453504	Tee and Hose Assembly (see Note 2)
453522	Tape Development Solution
1765342	Tape Unit Tester
1846251	Shim, Right Reel Hub Adjustment
1846252	Hex Wrench, Right Reel Hub
2515745	Adapter Hose (see Note 2)
2513154	Pressure Divider (see Note 2)
2501611	Tape Unit Cleaning Brush
2512063	Crimper (supplied by marketing representative)
2515390	Capstan Box Wrench (rear adjusting capstan only)

Notes:

1. Discussed in more detail in the MLM
2. Not needed if pressure/vacuum gauge P/N 5495384 is available
3. 1848621 stress tape used for model conversions stocked at EPCs. See Also see page 29 for description.
4. Order through IRD per the "Order Processing" section of the IRD Branch Office Manual.

TOOLS AND TEST EQUIPMENT *(continued)*

Master Tapes

Master skew tapes and master signal-level tapes are manufactured to rigid specifications. They are the standards that are used by CEs to obtain optimum tape unit performance.

Because tape unit performance is directly affected by the accuracy of these master tapes, the following precautions should be taken:

1, Use master tapes only for their intended purpose.
2. Handle tapes with care.
3. Make only full-reel passes in order to have even wear throughout the length of the tape.
4. Identify master tapes as such and mark the reels with the letter "m," as a reminder to make full passes only.

Master Skew Tapes

Master skew tapes have a density of 800 fci and are written with one solid bit across the width of the tape. These tapes are written on a specially adapted tape unit at the Tape Test Center with accuracy held to within 0.375 usec total skew between the leading and lagging bits of a 112 ips tape unit.

The master skew tape will run off the reel when reading forward because it is written with no interblock gaps (IBGs). In order to create an IBG and save time during skew adjustments, make the following alterations to the master skew tape:

1. Read the master skew tape forward to the end of tape (EOT) reflective marker.
2. Install a write enable ring.
3. Write one record of any size beyond the EOT marker.
4. Remove the write enable ring.
5. Rewind the tape.

After the preceding one-time preparatory steps, set the tape control CE panel as follows when you use the skew tape:

1. Command 1-Read Forward ('02')
2. Command 2-Read Backward ('0C')
3. Command 3-Read Forward ('02')
4. Command 4-Read Backward ('0C')

The master skew tape will read forward to the end of the reel, read backward, and repeat the cycle. This permits checking skew from the rear of the tape unit without manipulating the controls.

TOOLS AND TEST EQUIPMENT *(continued)*

Master Signal-Level Tapes

Master signal-level tapes have the ability to produce a signal to within ±2% of the primary master. (A primary master, which is established as an IBM standard, is the base for instrument alignment.)

All new master signal-level tapes are checked at 3200 fci and 800 fci. The suffix letter "A" is added to the part number to allow field identification of 3200/800/556 fci tapes as opposed to the former 800/556 fci tapes. Thus, for example, a master signal-level tape checked out at both 3200 fci and 800 fci would have P/N 432152A.

Degausser

CAUTION: Do not use the degausser near magnetic tape of any kind because it erases the information on tape. Power-down the tape unit.

To degauss the read/write head:

1. Remove magnetic tape from the tape unit. Do not place the tape on top of the tape unit.
2. Plug degausser into 110 Vac receptable.
3. Press the pushbutton on the degausser while it is at least one foot (30,5 cm) away from the read/write head and move it slowly toward the head.
4. Hold the degausser against the front surface of the head for about ten seconds.
5. Pull the degausser straight away from the head very slowly to a distance of at least one foot (30,5 cm) and release the pushbutton.

MST Board Ordering

Instructions for ordering a 3803 MST board for field replacement. The following information must be supplied when placing the order.

1. Machine type and serial number
2. Features on the 3803
3. Part number of the MST board
4. EC level of the board
5. REAs installed (if any)
6. Board location (example - B3)
7. Name and phone number of person to contact in case the plant needs further information. Note: There are some 3803 boards with EC733806 written on the sticker. This is a non-existent EC number. The EC number should be EC733801.

TOOLS AND TEST EQUIPMENT *(continued)*

8. Refer to AA005 in the logics for feature wiring before installing the board. (five pages 3803-2 and three pages 3803-1)
9. Have sufficient quantities of resistors on hand. See part numbers below.

3803 MST Flat Cable Replacement - see General CEM 251.
3420 MST Flat Cables Replacement:

P/N 5802133 uses	P/N 5802180 48 in.
	P/N 5802181 64 in.
P/N 5802134 uses	P/N 5802182 48 in.
	P/N 5802183 64 in.

3803 Tie Up/Down Resistors:

P/N		Wire Color	Resistance	Tie to Pin
2520936	Tie-Up	Blue	51Ω	D08
2520942	Tie-Down	Yellow	620Ω	B06

MEDIA

IRD PEP SPECIALIST

If you have reason to believe the customer's tape library contains tapes of poor quality or if you need expert assistance in finding methods of locating bad tapes then consider contacting your IRD PEP Specialist.

The PEP (Performance Evaluation Program) Specialist is a person expertly trained in all phases of magnetic tape evaluation. He can provide assistance in most any area relating to media problems and should be a useful resource for the CE.

Your field manager should be consulted before involving the PEP specialist.

MAGNETIC TAPE

Most of the recording media in today's digital record environment is a polyethylene terephthalate film, (mylar*), coated on one side with a flexible thin layer of ferro-magnetic material. The tape is slit to .498 ± .002" wide and reflective stickers are mounted at each end to mark the beginning and end of the usable area of tape. Tapes come in two standard lengths - 1200 and 2400 feet.

Under normal operating conditions tape should operate at least 40,000 passes before a permanent read error is encountered. This is possible only when tape is stored in the proper environment and handled properly when in use.

Tape can deteriorate due to conditions encountered in storage, handling, or operating on drives. This degradation will show up as an increasing number of temporary write or read errors during its use until the damage gets extensive enough to cause a permanent error.

When storing tape it should be stored in an area where the temperature is between 40 degrees to 90 degrees F (4 degrees to 32 degrees C) and 20 to 80 percent relative humidity (nominally 70 degrees F at 35 percent relative humidity). To operate, tape should be at 60 degrees to 90 degrees F (16 degrees to 32 degrees C) and 20 to 80 percent relative humidity (nominally 75 degrees F at 45 to 50 percent relative humidity). When tape is exposed to temperatures in excess of the above criteria degraded operations may occur. Tape should be acclimated to the operating temperature for at least 24 hours before use if large environmental changes are encountered in storage or use.

When a reel of tape exceeds a specified number of errors it is recommended the tape be removed from service. The specified number will vary from customer to customer. It is dependent on several parameters of this total system operation.

Details of tape properties essential for IBM tape units are found in IBM manual, GA32-0006, tape specifications for IBM one-half inch tape units at: 556, 800, 1600, and 6250 bpi.

*Trademark of E. I. du Pont de Nemours & Co. (Inc)

Tape Quality

Reference GA32-0006, Tape Specifications for IBM One-Half Tape Units.

These paragraphs have been added to provide IBM's recommendations as to what quality a tape should contain when new (paragraphs 1 and 2) and as it exists in the library (paragraph 3).

1. Short-Length Reliability

   Definition – The ability of the tape to withstand the wearing action encountered during repeated references to a short file of data.

   Recommendation – Under the conditions of the following test procedure the tape should average at least 40,000 read passes before a permanent error is encountered.

   Procedure – Write a length of tape from load point with ten, 2000-character records (PE recording). No write skips shall be allowed during the write pass. Then read the ten records (read forward/rewind) repeatedly until a permanent read error occurs. Perform this test with sufficient go-down time (20.0 milliseconds) to ensure that the tape comes to a complete stop for each record.

2. Long-Length Durability

   Definition – The ability of the tape to resist the wearing action encountered while cycling full length on a tape unit. This is not a test for end of life.

Recommendation – At least 90 percent of the tapes tested should meet the following criteria:

Tapes tested for use at 3200 fci should not average more than three write errors per pass, or exceed ten write errors on any single pass, for a minimum of 200 forward passes on any IBM tape unit that operates at 3200 fci.

Procedure – Use the appropriate tape unit and associated tape control for this test. Write a 2400-foot (732m) length of tape in start/stop mode with 2000-character records (PE recording) on each pass. In order to determine the effect of wear particles generated during the test do not clean the tape unit between passes.

3. Library Quality

Definition – A measurement of the quality of tape is its write capabiltiy.

Recommendation – Tapes with more than twenty write skips are not recommended. If tapes of this type are used, more frequent cleaning is recommended.

Procedure – Use the appropriate tape unit and associated tape control for this test. Write a 2400-foot (732m) length of tape in a start/stop mode with an average block length of 1.5 inches (38.1 mm). By use of Volume Error Statistics, a measure of the quality of the tapes and library can be determined. Volume Error Statistics are available in the IBM Operating Systems, OS, DOS, and VS.

COMMON MEDIA RELATED PROBLEMS

Unevenness of Tape Wind (Staggered Wraps)

3420/3803 Service Aid 4

The manner in which a tape stacks on a reel when rewound is a product of three factors: The drive, the tape, and the reel. These all contribute: however, in an individual case, any one of these may be predominant. Some items that are pertinent to this matter are:

1. Some irregularity of wind is to be expected. It is caused by aerodynamics (escaping air forming a cushion between layers), and static electricity which will attract or repel the tape to or from a flange in varying degrees as the tape is wound.

2. A perfectly smooth wind (from a 3420 drive) is not necessarily desireable as it tends to indicate the tape is being forced against one of the flanges or other guiding surfaces.

3. If the wind is irregular, no damage to the tape will result unless poor handling practices are followed; ie, pressure applied to the reel flanges causing a tape edge to be bent over. This may be due to improper stacking of multiple reels not in containers or cartridges designed to be stacked or squeezing the flanges while handling or mounting a tape.

4. The flanges of the reel are not designed to guide the tape or help it wind smoothly. The flanges are there only to protect the tape during shipping and handling, and then only to protect it from something bumping the tape edges, not from pressures of such force as to bend the flanges.

Devices can be developed which will wind the tape smooth. You will note new tapes received by customers have a smooth wind. The field situation does not warrant installing and maintaining such a device on field drives.

With each complaint or concern of staggered wraps, the best approach to the problem is to adjust the drives as accurately as possible, so they are not producing unnecessarily poor winds. Inspect the drives for any possible condition that may indicate wear or interference in the tape path. After it has been determined that the mechanical alignment of the transport is acceptable, the customer should be instructed on proper handling techniques for magnetic tape.

COMMON MEDIA RELATED PROBLEMS *(continued)*

Z-Folds

Loose wraps are usually caused by poor handling or poor leader on tape. When tape is loaded on machine the loose outer wraps are pulled tight against loose wraps further in causing Z-fold.

Z-folds can be avoided by adequate customer controls in tape handling, properly crimping end of tape, and library management. Also, beware of poor temperature control and drives with different rewind tensions.

The IRD representative can provide a complete seminar which provides a comprehensive approach to all areas of magnetic tape care and handling.

Temporary/Permanent Errors

The primary cause of write data checks is the type caused by a loss in signal from the tape on readback during write. On the 3420 tape subsystem when tape is written the amplitude is checked to ensure there is sufficient amplitude written on tape to be read at a later date. This write checking level (threshold) is higher than the threshold at which the tapes will eventually be read. If the amplitude of the read signal goes below the threshold a temporary write error occurs and the error recovery program (ERP) takes control. ERP backs the tape up to the last gap, then performs an erase gap before retrying the write operation. If the write is then error-free one temporary write error is logged and normal operation continues. If the retried write operation again fails another erase gap then write is performed. This is continued until the write is successful or until fourteen tries to write the record have occurred. In that event one loop write-to-read command is tried. If successful, one more erase gap, write is attempted. If it again fails (fifteenth time) a permanent write error is posted (the temporary write errors associated with this failure are then discarded).

If the write command is successful on, for instance, try number 10 EREP would show nine erase gaps (actual number) but only one temporary write error. The reason for this is that write errors occurring while ERP has control are not logged to EREP while *all* erase gaps are.

Several causes of data check on tapes are:

1. Defects in oxide on tape
2. Dirty tape
3. Dirty tape path
4. Edge damage on tape
5. Contamination on head
6. Tape device failures

When excessive errors are encountered on a tape, corrective action should be taken. The first action would be to inspect the tape path for contamination. If any foreign material is present, it should be removed by using normal cleaning procedures. If error persists the tape should be tried on a second tape device (if available) or a different, known good, tape should be put on the failing tape unit. In this way the error condition can be isolated to the tape or to the tape unit. When a tape with large numbers of errors is found in a customer library it should be identified and corrective action by customer should be taken. This can include cleaning and recertification of the tape or removing the tape from the tape library. If a tape shows signs of damage or contamination it should be removed before it can cause damage to, or cause contamination to, other tape in the customer's library.

There are many other types of errors and causes of errors. The several covered in the above text are the most common causes and are the majority of the types of errors the CE will encounter in the field.

Read Amplitude Adjustment (Amp Sensors)

Read amplitudes are adjusted prior to shipment. They should normally be readjusted only if the read/write head or the read card is replaced. Before performing the adjustment procedure: (MLM ref 08-310, 46-8, or 08-290, 3-5-7)

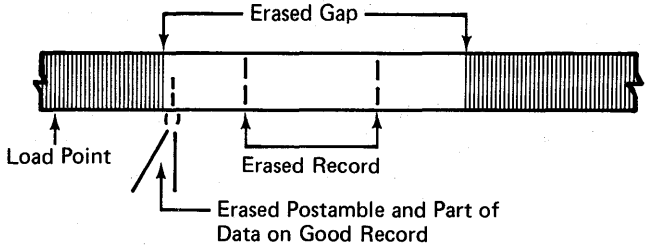
1. Ensure that the –4Vdc and +6 Vdc supplies are correctly adjusted before adjusting the read amplitudes. (See 08-570, DC Power Supply Checks/Adjustments.)

2. Clean the read/write head and tape path before making adjustments.

Tape Slipping

Tape slip usually occurs during dynamic reversal while performing an erase gap command. Tape slip causes the tape to be incorrectly positioned. When the write head becomes active it then erases part of the previous record. (The record before the error record that the erase gap command was supposed to erase.)

Developing the tape shows the postamble missing on the previous record. For details see Tape Developing Procedure in 3420/3803 Reference Guide.



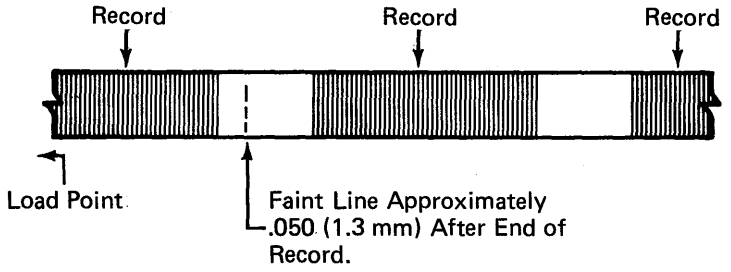
Possible Causes of Tape Slip:

a. Loss of capstan vacuum on Model 8
b. Drag in the tape path.
c. Dirty air bearings.
d. Low air pressure.
e. High or low vacuum.
f. Door glass leakage.
g. Damaged capstan surface.
h. Possible media problem.

Note: Refer to 3420 Tape Motion section as well for tape slip problems.

Noise or Bits in the Interblock Gap

To detect interblock gap errors, sync scope on – Go Forward. Read forward and backward over the failing record. Display the record in both directions and look for noise in the gap (see diagrams on MLM 5A-115 and 5B-025). Developing the tape with noise in the interblock gap shows bits written in the area between two records (sometimes faintly recorded).



Possible Causes:

a. Gaussed or magnetized read/write head.
b. Erase head not working.

Bit Packing

Bit packing is due to varying capstan speed or tape slipping. For scoping procedure see MLM 5A-115 or 5B-025. Also see 3420 Tape Motion Service Techniques.

Possible Causes of Bit Packing:

a. Tape slip when written (glazed capstan).
b. Dented capstan.
c. Vacuum and air pressure out of specification.
d. Plugged air bearing.
e. Improper operation of digital to analog converter (DAC).
f. Defective capstan control board.
g. Binds in capstan motor.

Tape Edge Damage

Scope the outside tracks (4 and 5 on 9-track drives) or (P and 7 on 7-track drives) on the failing record. Look at the amplitude changes.

Developing the tape will show bits that were recorded on the tape and the tape was damaged after it was written. This type of damage is usually caused by improper tape handling.

Example: The tape reel has uneven wraps and the sides of the reel are squeezed creasing the tape.

Read Forward to Backward Ratio Test (Models 3, 5, 7)

Use this test to determine if a read/write head needs replacement.

Verify that the tape is tracking correctly before any head replacement because of the above criteria. Perform Field Tester Accuracy Check on 08-290 before proceeding.

1. Degauss the head (08-280) and the cleaner blade (08-390).

2. Obtain a customer good quality representative tape and write it at 1600 bpi on the unit being checked. Write it from the field tester with frequency switch set to 32.

3. Read forward to the middle of the reel of tape and stop tape.

4. Set the Field tester as follows.

   ALT DIR
   SLOW
   READ
   UP/FWD DN/BKWD. Potentiometers all the way to the back of tester. (Adjust DN/BKWD so tape has a forward creep rather than a backward creep).

5. Sync and scope the Read card test points to determine the fwd to bkwd ratio. Display three or four cycles of read signal and use as much of the scope display as possible for measurements (.2v/cm). For ease of recording, scope J2B13 with another probe, this line will go positive when reading backwards.

6. If there is a read backward problem, and the amplitude in the backward direction is less than that of the forward direction by 50% on any one track, or 60% on the remaining tracks, the read/write head should be replaced. If head replacement is required, perform the removal/replacement procedure on 08-250.

Read Forward/Backward Ratio Test (Tape Unit Models 4, 6, and 8)

Use this test to determine if a read/write head needs replacement:

Verify that the tape is tracking correctly before any head replacement because of the above criteria.

Perform Field Accuracy check on 08-315 before proceeding.

1. Degauss the head (08-280) and the cleaner blade (08-390).

2. Install a jumper from K2P02-M2D06. This forces 6250 mode.

3. Obtain a customer good quality representative tape and write it at 6250 pbi on the unit being checked. Write it from the field tester with the frequency switch set at 64.

4. Read forward to the middle of the tape and remove jumper K2P02-M2D06 while tape is moving, then stop tape.

5. Set the Field tester as follows.

   ALT DIRE
   SLOW
   READ
   UP/FWD DN/BKWD Potentiometers all the way to the back of tester.
   (Adjust DN/BKWD so tape has a forward creep rather than a backward creep).

6. Sync and scope the Read card test points to determine the fwd to bkwd ratio. Display three or four cycles of read signal and use as much of the scope display as possible for measurements (.2v/cm). For ease or recording, scope H2M08 with another probe, this line will go negative when reading backwards.

7. If there is a read backward problem, and the amplitude in one direction is more than double the amplitude in the opposite direction on any one track, replace the read/write head. If read/write head replacement is required, perform the removal/replacement procedure on 08-250, do required adjustments and return to the map that sent you here or 00-030. If replacement is not required return to the map that sent you here or 00-030.

Note: If while making measurements, the tape gets back to load point, (resetting the 6250 latch) the jumper K2P02-M2D06 will have to be reinstalled while at load point and the tape read forward. This keeps the tape unit in 6250 without forcing a SAGC setup on every record. Remove the jumper and continue the test.

Each time the jumper is removed the SAGC may set up at a different ratio, but the ratio will remain the same.

3420 READ/WRITE SERVICE TECHNIQUES *(continued)*

Phase Shift

Definition – A pulse time displacement that occurs at the transition from a low density recorded signal to a higher density, or from a high density signal to a lower density.

When recording at higher densities several problems are encountered. As density increases the preceding and following bits (flux fields) tend to interfere with the middle bit (see Figure 1). This phenomenon is known as phase shift. The resultant data transition at a change in recording density is shifted to the right or left because of the bit crowding effect. This characteristic of PE recording is compensated for by detection techniques.

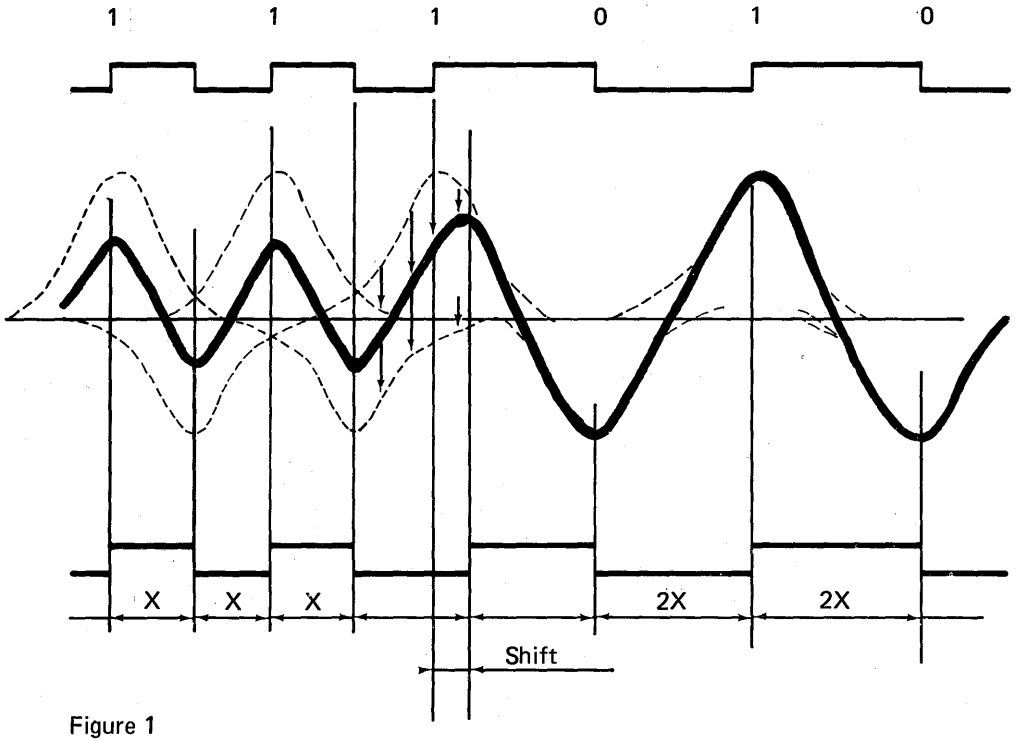


Figure 1

Phase Shift Scoping Procedure

If you are having a high number of temporary write errors with MTE and not ENV errors, use the following procedure to determine if the R/W head is causing phase

Using a good customer tape:

1. Check the SAGC setup. Refer to the MLM page 5B-000 sequence 1.2 and 2A with Figure A on page 5B-001. The SAGC should set up in 2 to 14 steps.

2. Loop write reliability test 3420R in 6250 mode.

Scope the phase pointers:

Logic	Card	Pins	
CD191	Y1M2	G12, J11, J12	Zone 1
CD291	Y1L2	G12, J11, J12	Zone 2
CD391	Y1K2	G12, J11, J12	Zone 3

Sync Points: Crosspoint cards can be used so that only data from the drive you are running OLTs on is displayed (ie, logic XC701 drive 0 A3Q2 D12). Refer to Chart L for your machine configuration. If you have the entire subsystem, sync point (mark 1) logic BW151 A1G3 M12 may be used.

If any phase pointer goes active, in the data area, the head is marginal. This procedure is intended to find new heads that may be marginal but should be used as a check for existing heads. Refer to MLM 08-250 for additional information.

Compatibility

Compatibility problems between drives can be caused by tracking out of adjustment, or if this adjustment is OK, the tracks are not centered on tape. Develop tape and place it on the viewer to observe. The proper positioning of the head to tape relationship is done by the Skew Plate. A special Skew Plate adjusting tool is necessary to do this (included in the Reference Plate replacement kit, BM 4298806 stocked at EPCs. Refer to SA-9 and SA-10).

READ/WRITE FAILURE ANALYSIS

The purpose of this procedure is to provide an effective way to determine what R/W component is failing. The procedure is comprised of three major sections. Initial checks, failure analysis and FRU replacement. This procedure should help you reduce the number of components replaced before fixing the machine.

Initial Checks

Check and adjust as necessary the following:

- –4 and +6 volts (see 08-570)
- Vacuum and pressure (see 08-400, 08-405)
- Tape path obstructions

  Check the following components for wear or oxide buildup.

  – Erase head
  – Filler block
  – Auto cleaner
  – Tape path area

- Clean the head
- Read head card and write head card seating

Failure Analysis

- Sense Data - Sense can be obtained from the following areas:

  – EREP
  – Console messages
  – OLTs

  The sense data can be analyzed using the sense analysis flowchart in this manual.

- OLTs - Tests A-W should be run using a good test tape. If no failures occur use the customer's failing tape, also try another tape drive.

- Scoping - The following items should be scoped to determine failing components.

  Stability - Scope the analog signals on each track, the amplitudes should be constant and about equal between tracks.

  Forward to Backward Ratio - The analog signal amplitude in any track while reading backward should not be less than 50% of the signal amplitude reading forward. Only replace the head if experiencing read backward problems.

SAGC - All tracks should set up between 2 and 14 steps and the tracks should set up within 3 steps of each other. Replace the head only if the track setting up wrong is causing errors.

Phase Errors - Phase errors are indicated by MTE errors without envelope checks.

Scoping is done in the 3803 while writing ripple data with a block length of 2K or larger. This procedure is for model 4, 6, or 8 only. Refer to the phase shift scoping procedure in this manual for complete details.

Tracking Check - Using the master skew tape scope the 4 and 5-tracks. The signals should be equal and opposite between forward and backward. For example if track 4 leads track 5 by one usec in the forward direction, track 4 should lag track 5 in the backward direction. Note: This is a check. **Do not use for adjustment.** (See MLM 08-150, 08-151, 08-160.)

Bit Positioning - Improper bit positioning can be caused by an improperly adjusted skew plate. Failures can appear as system abends and tape mark recognition problems. Replacing the R/W head will appear to fix the problem for a very short time. Note: Reference plate tool kit required. Refer to SA 9 and SA 10.

FRU Replacement/Swapping

The following FRUs are listed in the recommended replacement or swapping sequence. If a part does not fix the drives symptom, return the swapped part to the original drive.

- MST Logic Cards
- Read Head Card
- Write Head Card - Check to ensure that the write head card jumpering is correct.
- Read/Write Head - When a new head is installed for diagnostic purposes, only the AMP sensors need to be adjusted. If the head resolves the problem make certain the Read/Write Adjustment procedures in the MLM (see 08-250) are followed.

READ/WRITE HEAD SERVICE HINTS

Factors that may indicate a failing head:

1. Media
2. System aborts indicating read or write failures
   - Tape runs off end of reel searching for a tape mark
   - No block detected on a write or write tape mark
3. High temporary write errors
4. High forward to backward analog signal ratio
5. Many OLT failures on test T3420F and very few errors on other tests
6. Varying analog signals
7. Making two amp sensor adjustments of .5 volts or greater in a short period of time

Factors that may indicate a failing head when the head is not failing:

1. Low vacuum
2. Tape hitting obstructions in the tape path
   - Erase head
   - Filler block
   - Rewind plunger (3, 5, 7)
   - Auto cleaner
3. Defective read or write head cards
4. Voltages out of adjustment
5. Poor tracking causing tape to buckle
6. Marginal media
7. Visual wear and poor forward to backward ratio
   - Replace only if failures are occurring

Factors that optimize head life:

1. Good tape library maintenance
2. Proper and timely drive cleaning
3. Documenting problems
4. Good capstan tracking
5. Replace the head last

3420 READ/WRITE NTF CHECKLIST

If you have an intermittent read or write problem and can find nothing wrong with the machine, perform the tests/checks indicated below before writing a "No Trouble Found" IR. When completing an NTF IR, try to give information as accurately as possible. Use Major Unit Code 960 instead of 980 whenever possible and include as much detail as necessary in the narrative. Your IRs **are** the performance feedback mechanism we use on the 3420/3803!

Read/Write Problems

Models 3, 5, 7

Most probable causes:

1. Read head card defective
2. Write head card defective
3. T-A1L2, T-A1J2, T-A1M2 (NRZI) defective
4. R/W head defective
5. Erase head defective

Initial checks:

1. Air pressure and vacuum (see 08-400)
2. –4 Vdc and +6 Vdc supply in tolerance (see 08-570)
3. R/W head and cleaner blade must be clean
4. Capstan tachometer timing (see 08-130)
5. Degauss tape transport if problem is recurring

Reference MLM 5A-000

Models 4, 6, 8

Most probable causes:

1. Read head card defective
2. Write head card defective
3. T-A1L2, T-A1J2, T-A1H2 cards defective
4. R/W head defective
5. Erase head defective

3420 READ/WRITE NTF CHECKLIST *(continued)*

Initial checks:

1. Air pressure and vacuum (see 08-400)
2. –4 Vdc and +6 Vdc power supplies in tolerance (see 08-570)
3. R/W head and cleaner blade must be clean (see Note 4 on 5B-001)
4. Capstan tachometer timing (see 08-120)
5. Degauss tape transport if problem is recurring

Reference MLM 5B-000

TAPE DEVELOPING PROCEDURE

Purpose: Gives CE a way of visually examining information recorded on a section of magnetic tape.

Materials Needed:
- Developing solution (P/N 453522)
- "Low-tack" transparent tape (See Note 1.)
- Piece of clear plastic (such as old microfiche card, loose-leaf page cover, etc)
- Felt-tip pen
- Flat surface (small table, etc) which can be moved to area in front of tape unit
- Lint-free cloth (P/N 2108930) dampened with water

Procedure:
- Mount failing tape, without cartridge, and read to error. This is done from 3803 CE panel (offline) or using "FRIEND" (OLT T0200A) or customer utility such as "ditto," etc (online).
- When failure occurs press reset on drive and open front door. While holding "cartridge-present" button pressed, manually bottom tape in right column. This shuts off pneumatics.
- Open vacuum door and put small mark on bottom (non-oxide) side of tape on each side of R/W head with a felt-tip marker.
- Carefully remove enough tape to reach the flat surface table, etc.
- Shake the developing solution, then immerse the affected area of the magnetic tape into solution. Use the felt-tip pen mark to determine suspect area. Rock tape back and forth two or three times being careful not to drag on bottom of can.
- Remove tape from solution and allow liquid to evaporate while still rocking tape gently back and forth.
- Lay tape, oxide up, on the flat surface and use a small piece of transparent tape at each end of developed area to hold in place.
- Tear off an appropriate length of transparent tape and carefully press it onto the developed tape. Try to avoid air bubbles, etc.
- Gently lift the transparent tape back off (peel it at an angle to avoid damage) and place on the clear plastic.
- The plastic with developed image may now be viewed directly or under the microfiche viewer. Since the microfiche viewer magnifies X30 be sure to divide any measured distance by 30.

TAPE DEVELOPING PROCEDURE *(continued)*

- Clean the magnetic tape thoroughly using the cloth dampened with water. Allow it to air dry before rewinding and returning tape to customer for his cleaning procedure.

CAUTION: **Any foreign material left on the tape will damage the drives themselves.**

Conclusions: Some of the more common problems which will be detected by tape developing are:

a. Partially erased records before an ERG. Usually caused by a glazed capstan.
b. Noise in gap (defective erase head, etc).
c. Short gaps (indication of tape motion problem)
d. Damaged tape (oxide voids, etc).

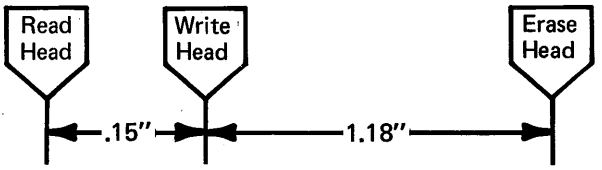
See the following examples.

Note 1: The use of any other than "low-tack" transparent tape is discouraged as it may remove oxide or leave adhesive on tape.

DEVELOPED TAPE SAMPLES

Here are some tips which may be helpful in analyzing the failure on a developed tape:

- Distance Relationships:



- Erase Gap (ERG) Distances:

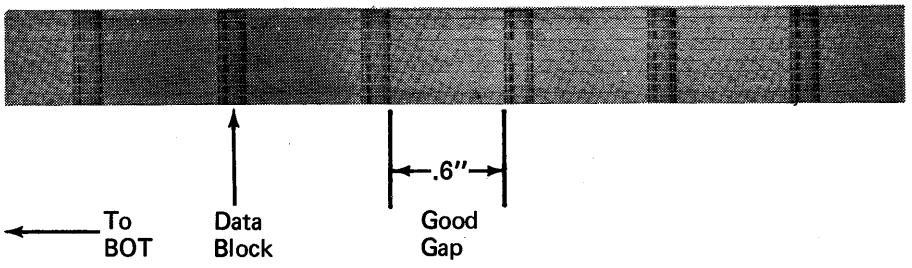
Density	Single ERG	Successive ERGs
6250	3.75"	3.45"
1600	4.2"	3.6"
800	4.2"	3.6"
7-Track	4.5"	3.75"

- Interblock Gap Size:

Density	Nominal (Inches)	Minimum (Inches)
6250	.3	—
1600	.6	.5
800	.6	.5
7-Track	.75	.68

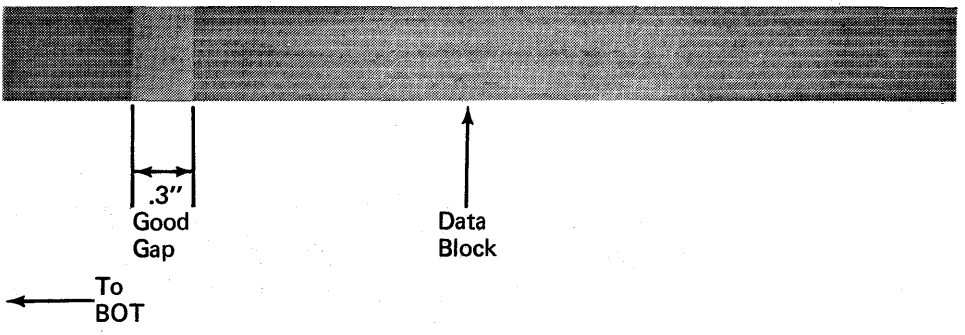
Developed Tape Examples

Good Data at 1600 bpi

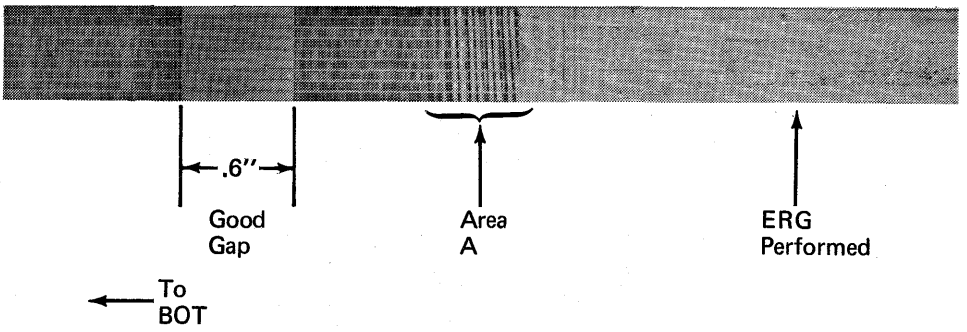


DEVELOPED TAPE SAMPLES *(continued)*

Good Data at 6250 bpi

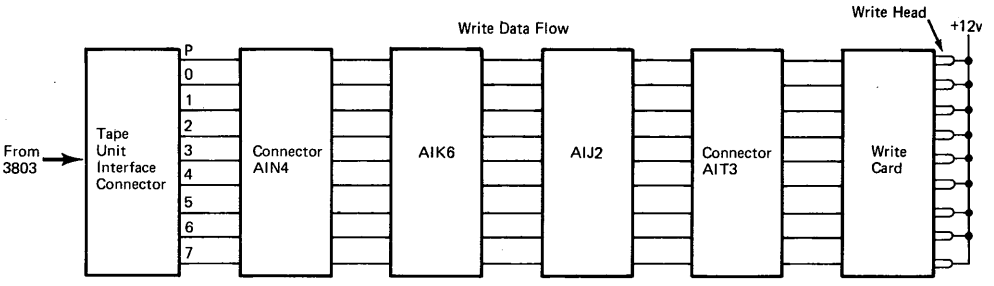


Tape cinch/tape crease (1600 bpi)
caused by loose wraps on tape reel.



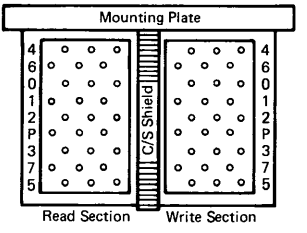
- Drive was writing when "cinched" tape (small Z-folds) area appeared (area A).
- Prior to performing an erase gap the software tried to back tape up to last interblock gap but stopped in creased area instead (thought it was the gap).
- From there a normal ERG command was executed and tape unit logged one temporary write error and continued normally.
- Since damaged area was *not* completely erased by erase gap a permanent read error then occurred when tape was read.

3420 RD/WR DATA FLOW

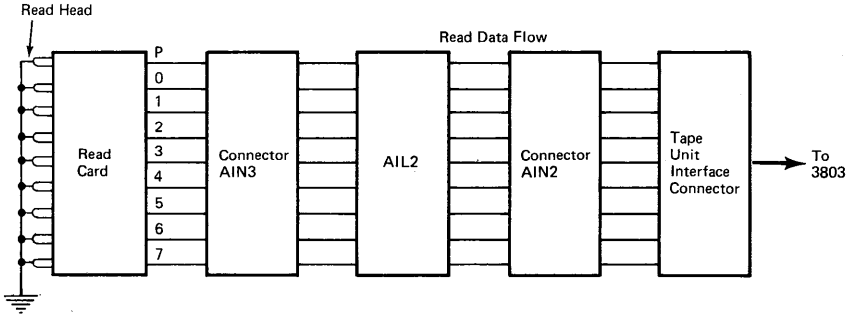


Read and Write Data Flow
Within 3420
– Models 4, 6, 8 Only –
(See MLM 5B-100 For Details)

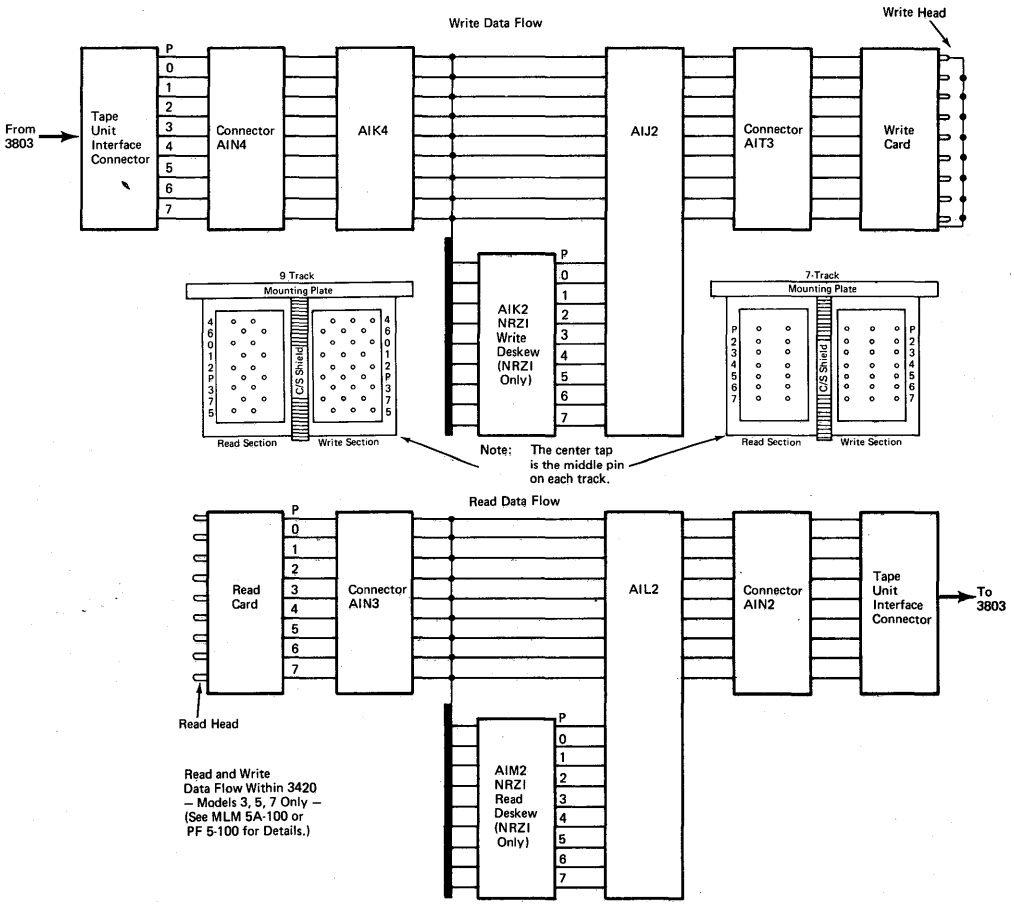
R/W Head Pin Layout
(Models 4, 6, 8 Only)



Note: The center tap is the middle pin on each track.



3420 RD/WR DATA FLOW *(continued)*



3420 TAPE MOTION SERVICE TECHNIQUES

Consider performing the following tests if you are experiencing intermittent 3420 failures relating to tape motion. The symptoms should first be analyzed using MLM/ Pathfinder.

Some of the more common symptoms associated with these service techniques are:

Symptom	Possible Cause
Tape Slip	Glazed Capstan
Partially Erased Records	Glazed Capstan
Permanent R/W Errors	Glazed Capstan
High No. of Temp R/W Errors	Glazed Capstan
Dropping Ready	Leaky Transfer Valve or Column Vacuum Door
No Tape Motion	Open Capstan Motor Segment
Dumping Tape	Open Capstan Motor Segment

Also see 3420 R/W Service Techniques

Glazed Capstan Cleaning

This procedure is performed only if glaze cannot be removed by normal cleaning.

CAUTION: This procedure, if not done properly and with extreme care, can shorten the life of (or damage) the capstan. If the capstan edges are rounded or flat spots are created, tracking adjustments will not be possible.

Verify that this procedure is necessary:

1. Perform Capstan Cleaning-Normal Procedure (see 85-004 if necessary).

2. Perform T3420W OLT diagnostic test.

   - Run OLT T3420W to determine the size of interblock gaps. [0.301 inches is nominal for models 4/6/8 and 0.600 inches in nominal for models 3/5/7.]

3. Check diagnostic printouts for signs of variance.

   - Gap sizes exceed limits specified in OLT.

If the tape is varying, the glazed capstan cleaning procedure may be necessary. Proceed as follows: (Refer to "Tape Slipping" under 3420 Read/Write Service Techniques.)

a. Assemble an abrasive tool using 600 grit paper IBM P/N 460107 attached to a six-inch steel rule with a double back adhesive tape such as 3M Y-9122* or 4282*. You may also use rubber cement or printer carriage tape glue.
b. Remove the left threading channel. Place the steel rule with 600 grit paper squarely on the capstan and then just break the glaze on the capstan with the abrasive tool while rotating the capstan by hand.
   The intent is not to remove the glaze with the tool but to break through the coating to allow the tape cleaning solution to soak under it.
c. Moisten cotton swabs with tape cleaner and scrub the capstan rubber thoroughly, until the capstan attains a dull rubber finish.
d. Follow up with a lint-free cloth moistened with tape cleaner to remove all traces of the cotton swab.
e. Verify the effectiveness of your cleaning by repeating the T3420W OLT test.
f. Repeat the cleaning operation only if step e shows IBG variance.
g. Capstan dynamic alignment (tracking) must now be checked.

Capstan Motor Test

Unplug the capstan motor from the capstan board and measure across the two wires going to the motor with an ohmmeter. Rotate the capstan slowly by hand while watching ohmmeter. The meter will deflect some but should never go to an open condition (open armature segment). If an open condition occurs the capstan motor should be replaced.

Note: In the pneumatics portion of the drive verify normal pressure and vacuum adjustments and checks per MLM 08-400 before performing the following tests.

Column Vacuum Leakage Test

If you suspect a column vacuum leak the following procedure is a good way to check column vacuum level:

– Take drive offline and install tape motion tester.

*Trademark of the 3M Company

- With drive unloaded, disconnect tubing to L3 or R3 vacuum switch.
- Use a "Tee" (P/N 1767025) to insert vacuum gauge (P/N 5495384) in the line.
- Reconnect tubing to L3 or R3 then load tape and read gauge. Vacuum level should be:

Model	Vacuum
3, 4, 5, 6	21±3"
7	27±3"
8	31±2"

- Move tape forward and verify that vacuum level remains within tolerance.
- Move tape backward and verify vacuum level.
- If vacuum levels read low on these tests, clean column-to-glass mating surfaces and check column glass adjustment.

Cracked Pressure Hoses

When analyzing any problem relating to pneumatics check for cracked pressure hoses. The hose between pump and filter should be closely examined. If a hose is found to be cracked replace it. Do not cut the hose back because it will soon crack again.

Transfer Valve Leakage Test

1. Cover the stubby column ports with masking tape. See Figure 1. Do not let the tape overlap the stubby bars.

2. Place an 8-inch piece of magnetic tape in the bottom of the right vacuum column to prevent vacuum from entering the column.

3. Cut a 12-inch piece of magnetic tape and lay it over the left reel tach just below the read/write head. Ensure that the tape loop is approximately in line with the bottom of the capstan. See Figure 1. Bypass the door interlock.

4. With no tape on the right reel, press LOAD REWIND. If the tape strip is pulled into the left column before load check occurs, there is sufficient leakage to cause intermittent problems and the transfer valve must be replaced. Repeat the test several times to ensure that the valve is bad.

5. Remove the masking tape from the stubby column ports and clean the area thoroughly with a cloth dampened with tape cleaner. Remove the magnetic tape from the right and left vacuum columns.

6. If 3420 Drops Ready:

Analyze Sense or Scope Error Latches to Find Reason					
Error Description	**Drive Error Latches (See Note)**	**Error Sense**	**Probable FRUs**	**Further Analysis**	**Notes**
Fiber Optic Lamp Failure	+ At S07 (Note Latched)	Byte 7 Bit 0	• Optic Lamp • A1D2	See Logic FT114	
Tape Bottom or Pull Out of Left Column*	+ At U02	Byte 7 Bit 1	• L4 Vac Switch • L3 Vac Switch • Left Reel Board • Capstan Tach	Go To 3A-110 or 3B-110	Could Be Caused By OV/UV Detection or Capstan Board Cooling Sensor. See Byte 18 Bit 0 Below.
Tape Bottom or Pull Out of Right Column*	+ At U05	Byte 7 Bit 2	• R4 Vac Switch • Right Reel Board • Capstan Tach		
Reset Button or Door Interlock	+ At S03	Byte 7 Bit 3	• Reset Button • Door Inlk Switch • TA1C2 • AB3F2 • AA2D2	See Logic FT114	Could Be Caused By Operator.
Air Bearing Pressure or Right Reel Hub Failure	+ At S04	Byte 7 Bit 6	• Leaking File Hub • Air Bearing or Hub Switch		If A Solid Failure Tape Will Not Dump Into Cols on Load.
OV/UV (Power Check) or No Cooling Air to Capstan Board	– At S02	Byte 18 Bit 0	• Check Voltages • Dirty Filter • Defective Cooling Fan • Check Cooling Air Sensor	Go To 1A-000 or 1B-000	These Errors Cause Reel Board EPO Relays to Drop (Loss of Motor Control). Tape Bottom Will Then Drop Ready
Power-On Reset	+ At M05 (Not Latched)		• A1C2 • A1H2 • Fuse Detect Card	See Logic FT112	These Are Not Normal Drop Ready Conditions. However, Intermittent Failure May Show as a Drop Ready.
Safety Bail Reset	Models 3,5,7 + At E2B09 (Not Latched) Models 4,6,8 + At D4B09 (Not Latched)		Models 3,5,7 • A1C2 • A1E2 Models 4,6,8 • A1K2 • A1D4	See Logic FT283	

NOTE

- Drive error latches are on following card:
  Mod 3, 5, 7 – H2
  Mod 4, 6, 8 – M2
- Voltage Levels are:
  + is – .85
  – is –1.85

*Vacuum switches are high-failure items.

3420 TAPE MOTION NTF CHECKLIST

Perform these checks **precisely** as described in MLM.

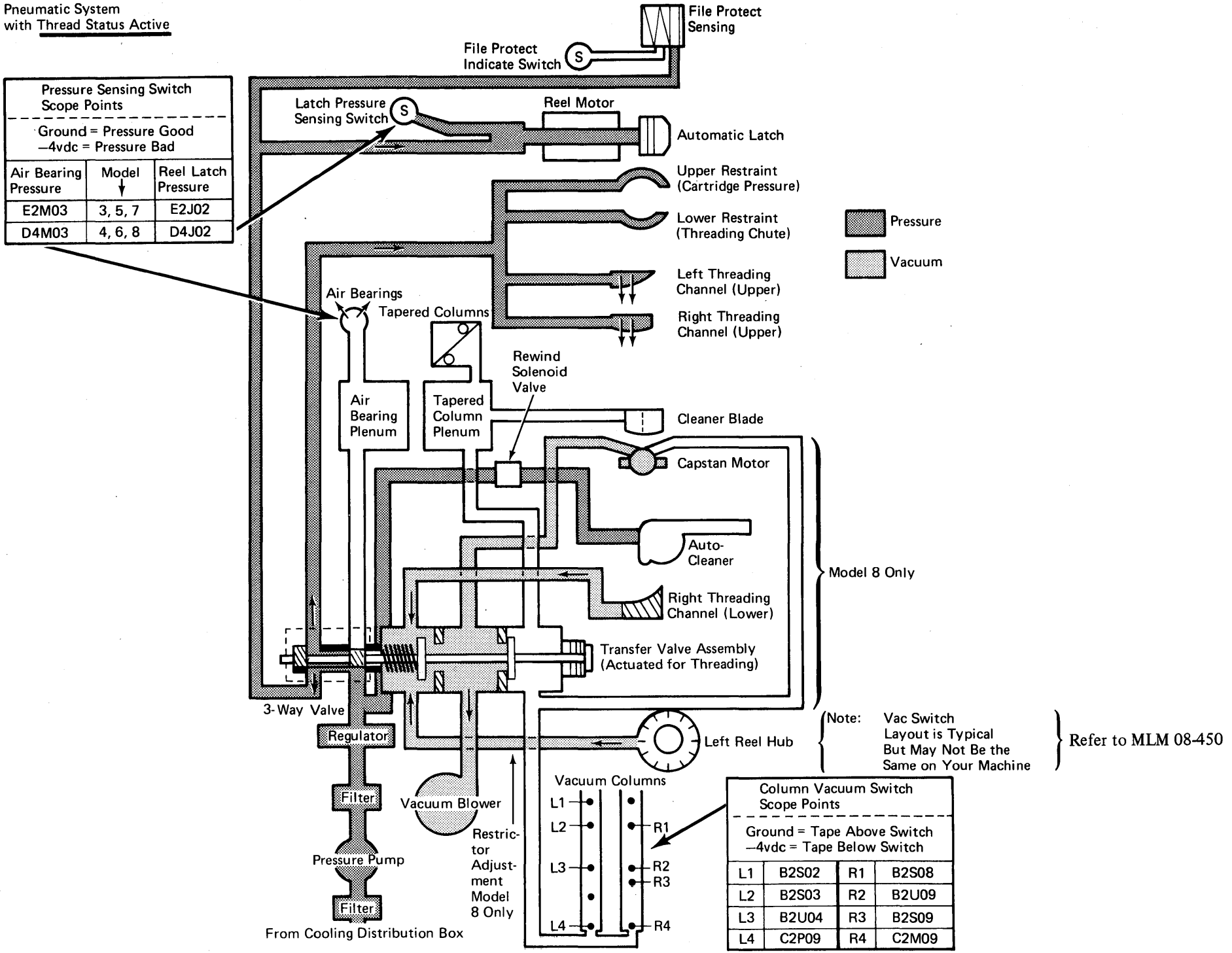
Check, adjust if necessary:

- BOT/EOT (08-580)
- Capstan Tachometer Adjustment (08-120 or 08-130)
- Pneumatics (08-400 [all] and 08-420)

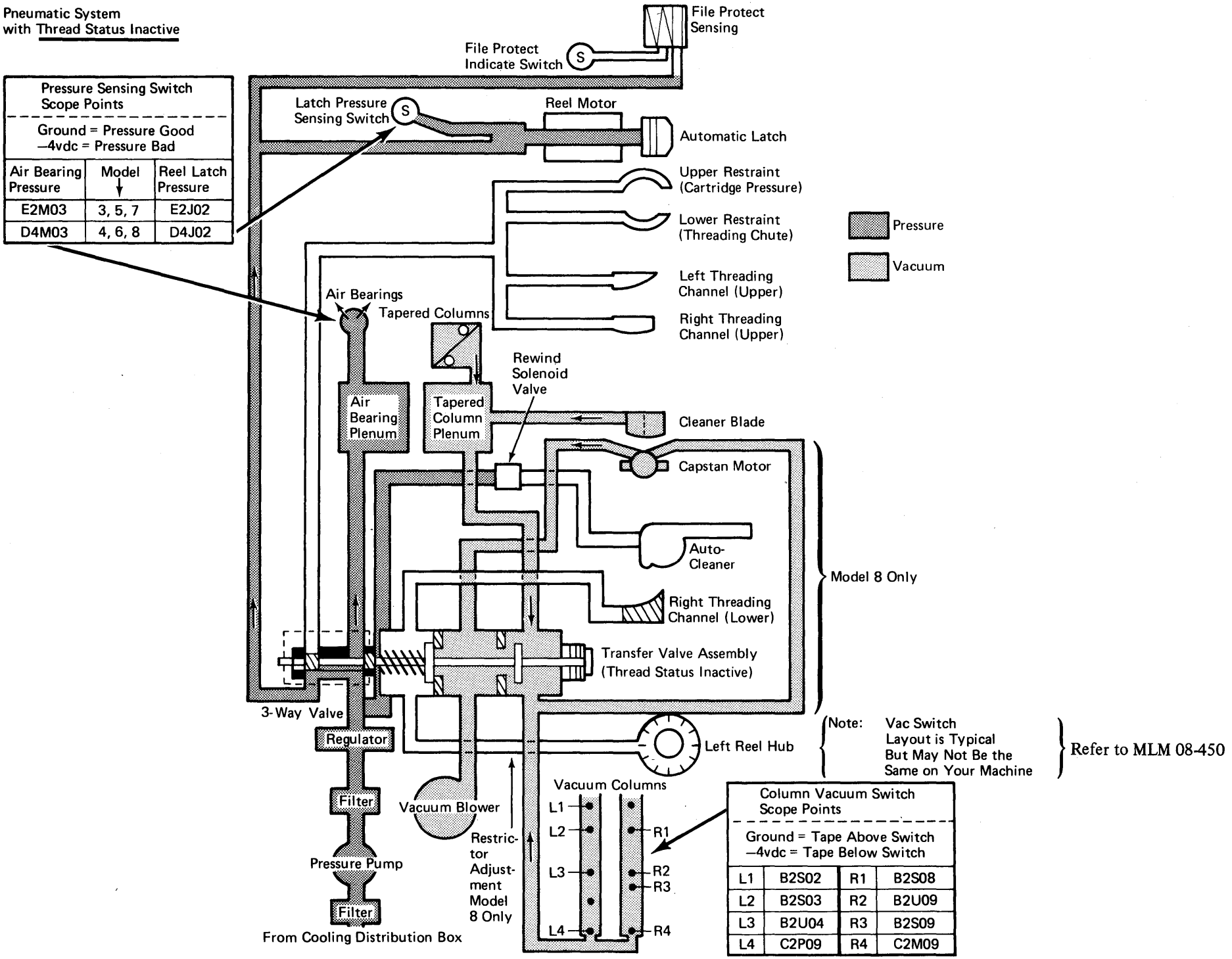
Reference MLM START 1.

3420 TAPE MOTION

Pneumatic System
with Thread Status Active



Pneumatic System
with Thread Status Inactive



Pressure Sensing Switch Scope Points		
Ground = Pressure Good –4vdc = Pressure Bad		
Air Bearing Pressure	Model ↓	Reel Latch Pressure
E2M03	3, 5, 7	E2J02
D4M03	4, 6, 8	D4J02

Column Vacuum Switch Scope Points			
Ground = Tape Above Switch –4vdc = Tape Below Switch			
L1	B2S02	R1	B2S08
L2	B2S03	R2	B2U09
L3	B2U04	R3	B2S09
L4	C2P09	R4	C2M09

3420 POWER SERVICE TECHNIQUES

- When checking DC voltages use all standard safety precautions.

  The +6 Vdc should be adjusted with the 3420 in write status, ready, away from load point, and moving tape.

3420 Power Check, No File Protect or Power Related Problems

After using the MLM without results on power type problems, the following list will give some of the known problems in this area. With power type problems it is a good idea to go over the supplies checking for loose screws, fuse holders, cable connectors, etc. Check supply levels. Vibration may help aggravate failures.

1. Bad connector to power resistor panel. Shows on LOAD.
2. Loose screws on transistors on power interface board. –4V low.
3. R 67 on fuse detect card defective. J6 cable shorted to frame.
4. Bad solder connections to fuses.
5. Power check air flow bit on, command status reject. Loose capacitor screws. Slip on connector to power interface board solder connection bad or rivets loose or dirty filter.
6. Power check light glows dim. –4V return screws loose.
7. Power check light flashes. Phasing bad or TP1-1-2-3 loose.
8. Drops vacuum. Bad solder connection O/V U/V reference card socket.
9. Power check, load check lights flicker. K1 relay on reel board points burn, 48V supply drops. Loose 48V wire from C8 to HS1 on mounting block for CR 11 12 or loose TB1-6-7.
10. Bad connection on J7 socket.
11. Power check when drive selected. Loose wire on power interface board where wire comes through board to transistors.
12. Rewind unload in middle of job. Short from MSC card to cover.
13. Heat sink 1 on 48V supply has loose wire.
14. Bad power interface board. No –4V.
15. Fails to write, dumps tape. Bad 6V supply, or bad connection to fuses on piggy back supply.
16. Fails on write operation. Bad power interface board.
17. Equipment check unload in middle of job. Loose fuses on piggy back supply, has ripple on supplies.
18. Blows fuse 6 and CP 1. Bad SCR card, SCR1, SCR11.
19. Select light after load. Flat cable from J1 on reel board pinched and shorting between frame and power interface board.
20. Equipment check, power check light on dim. Bad monitor card.
21. Bad fuse detect and EPO card.
22. Blows fuse 3 on piggy back supply. Bad write driver card.
23. Damages tape on rewind. Bad reel motor board.

3420 POWER SERVICE TECHNIQUES *(continued)*

24. Bad CB 1, or loose screws on CB.
25. Defective diode board in 4V supply.
26. Frame ground at −12 volts. Erase head shorted to frame.
27. Blows fuse 10 or 12. Loose screws on TB 5-1.
28. 6V high or has ripple, bad power interface board.
29. 6V varies or blows reg card, bad connection J7-7 to J7-8.
30. Reed relay on OV/UV card.
31. Blows fuse 6, MSC card shorted to support bar.
32. Diode assembly on YB020.
33. F13 - PCB board.
34. F12 - Write PCB board.
35. F14 - Shorted write head card.
36. Blows write driver card and F14. Read write cable plugged one pin off.
37. No output +12, −12, 4V or 6V. Shorted cap C11 on XFMR.
38. Blows OV/UV card. HS-1 transistor on power interface board.
39. Load check light flashes - loose fuse 3 or F3 holder.
40. Lights flicker with vibration - suspect any fuse holder.
41. Plus 6 volts ripple or varies . . . CR19, 20, 21, 22 on PC2.
42. Command reject . . . ribbon cable from 01A A1 board smashed between frame and pneumatics cover.
43. ID burst checks . . . loose capacitor screw in power tub.
44. Power check, no −4V or +6V output. Transfer valve picked solid. (9XXXX series drive) power interface board P/N 2515544, bad solder connection at connector number 10.
45. Intermittent channel errors (ALU hangs, ALU errors) or R/W error count high. Scope 4 and 6 volt supplies for excessive ripple during failure if possible. Failures are almost solid while there is ripple and then disappears when the ripple goes away.

3420 POWER NTF CHECKLIST

- Check that air filter is clean and blower is running smoothly.
- Check/adjust DC voltages (watch for excessive ripple content).
- Check for loose power supply screws if problem is recurring.

3420 POWER - DC VOLTAGES

CAUTION: Be sure to use a digital voltmeter, P/Ns 453046, 453585, or equivalent, when making adjustments and use all safety precautions.

Notes:

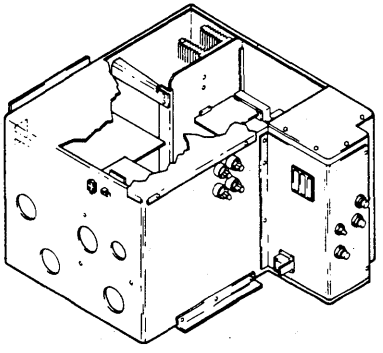
1. Ensure that the tape unit is loaded, ready, and in write status before checking or adjusting +6 V power supply. After check or adjustment, measure the voltage at T-A1 G2B11. If voltage exceeds +6.24 V, check the file protect circuitry for resistance.

2. The maximum allowable ripple voltage is 24 mv peak-to-peak measured at the power supply.

Models 3, 5, and 7

If you have an unmodified power supply, check voltages at the following test points.

Power Supply Value	Test Point	Ground
+6v (±0.05v)(See Note 1 and 2)	T-A1G1E09	T-A1G2D08
–4.05v (±0.05v)(See Note 2)	T-A1N3D02	T-A1N3D08
–48v (+7v, –9v)	TB1-9	TB1-8
+12v (±1v)	TB2-1	TB1-8
–12v (±1v)	TB2-5	TB1-8
+11v (+2v, –1.2v)	TB3-12	TB2-4



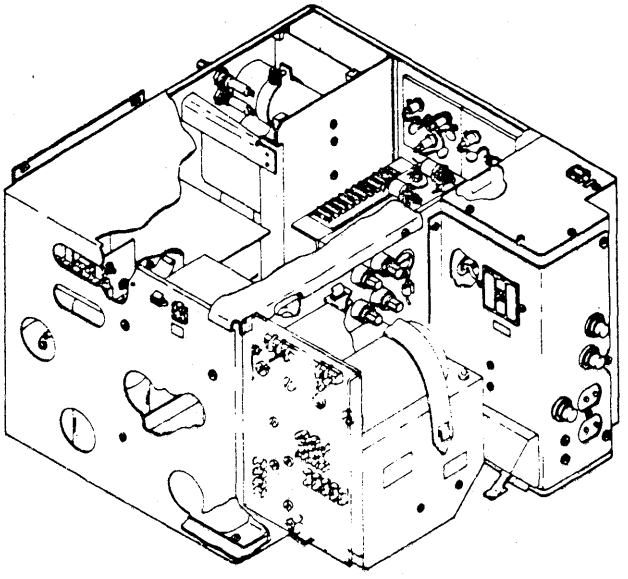
Basic Power Supply

3420 POWER - DC VOLTAGES *(continued)*

If you have a modified power supply, check voltages at the following test points.

Power Supply Value	Test Point	Ground
+6v (±0.05v)(See Note 1 and 2)	T-A1G1E09	T-A1G2D08
+11v (+2v, –1.2v)	TB2-1	TB2-4
–4.05v (±0.05v)(See Note 2)	T-A1N3D02	T-A1N3D08
–48v (+7v, –9v)	TB1-9	TB1-8
+12v (+1v)	TB3-1	TB1-8
–12v (±1v)	TB3-5	TB1-8
+30v (±0.5v)*	TB2-3	TB1-8
–12v (±1v)*	TB2-2	TB1-8
+12v (±1v)*	at Fuse 7	TB1-8

*Used only for OV/UV sense.



Modified Power Supply

3420 POWER - DC VOLTAGES *(continued)*

Models 4, 6, and 8

If you have an unmodified power supply, check voltages at the following points.

Power Supply Value	Test Point	Ground
+6v (±0.1v)(See Note 2)	T-A1G2B11	T-A1G2D08
–4.05v (±0.05v)(See Note 2)	T-A1H1C09	T-A1G2D08
–48v (+9v, –9.6v)	TB1-9	TB1-8
+12v (+1.4v, –0.9v)	TB2-1	TB2-4
–12v (±1.4v)	TB2-5	TB2-7
+11v (+1.7v, –1.1v)	TB3-12	TB2-4

If you have a modified power supply, check voltages at the following points.

Power Supply Value	Test Point	Ground
+6v (±0.1v)(See Note 1)	T-A1G2B11	T-A1G2D08
+11v (+1.7v, –1.1v)	TB2-1	TB2-4
–4.05v (±0.05v)(See Note 2)	T-A1H1C09	T-A1G2D08
–48v (+9v, –9.6v)	TB1-9	TB1-8
+12v (+1.4v, –0.9v)	TB3-1	TB3-4
–12v (±1.1v)	TB3-5	TB3-7

3420/6250 CONVERSION TIPS

The following are some hints for field conversion.

IMPORTANT:

- Follow the instructions in the conversion books very carefully.
- The majority of problems that occur after conversion result from cards or cables not seated correctly and dirty, bent, or recessed pins.

Conversion Kits

Recommended actions prior to installing conversion kit.

A. General

1. The EC check list (3420 ECA 056)

   It is of the utmost importance that the EC checklist be correct. If it isn't, you will get the wrong parts. Do a physical check of each E/C that is supposed to have been installed.

2. The prerequisite E/Cs must be installed on the machine and the machine tested prior to installing the conversion kit.

3. RPQ, features

   - If features and/or RPQs were ordered for the 3803-1, 3420-3, 5, 7 they must be installed and operational before doing the conversion.
   - If features and/or RPQs were ordered for the 3803-2 configuration, they must be installed after the conversion is complete and operational.

4. Recommend the use of a Circuit Test Probe Part 453587 to expedite verification that the adds and deletes are correct.

5. Ensure that you are familiar with the conversion instructions before starting. It is recommended that you read them at least once prior to starting the conversions.

6. Review ITIPs (and data bank) to become aware of problems that may be encountered during conversion.

7. Prior to installing logic cards and connectors make sure there are no broken or bent pins. Inspect for recessed or loose pins on the data cable connectors (channel-to-tape control unit and tape control unit-to-tape unit).

8. All connectors and logic cards installed/replaced as called out in the conversion should be "popped" (eg, seated, removed and re-seated) a few times to assure a good contact.

9. The installation of the tape cleaner does not eliminate the present head cleaning procedure.

B. Only the logic board and logic cards in the conversion kit have been tested on a "slave machine"; cables and jumpers have not.

C. Double check all card plugging to ensure that they reflect the converted status of the machine. The exception is on page 0950 of the TU Conversion book. The original model number of the TU should be plugged, not the new model that it was converted to.

D. 3420 Conversion Hints

After removing "old" fiber optics lamp, clean the ends of light pipes in the horseshoe with a damp, lint-free cloth. After power has been turned on, allow the "new" fiber optics lamp to warm up for 20-30 minutes.

1. Assure that the R/W card cables are connected correctly. It is possible to miss the top pins of the R/W card connector.

2. Before removing the R/W cable guide, observe how it is mounted on cable connector and reassemble it the same way when you have finished modifying the cable.

3. Remove the coating on the R/W cable connector before soldering wires to it.

4. When the tape unit interface adapter shoes are installed correctly you should see the silver plating.

5. Page 0490 of the Tape Unit Conversion book is causing some confusion. The wires are connected to AE1 and AE2 connectors which are located on the small board (PN 4169370) on the side opposite to where the components are mounted.

6. Assure that the vacuum column restrictors are installed properly.

7. If after the conversion you experience R/W problems check the auto cleaner adjustment (page 1080). Also, assure that the auto cleaner is not activated. This can be checked visually by removing the cover of the R/W cards (on the front of the machine). With the columns loaded and looking down towards the head you should see part of the white ribbon used in the auto cleaner.

8. OLT 3420L should be run using the same magnetic tape that you used when you adjusted the amplitude.

Listed below are the major conversion efforts that apply to all models:

1. Replace tachometer assembly and capstan control power board.
2. Replace R/W head.
3. Replace R/W cards.
4. Add new read cable.
5. Rework write cable.
6. Replace logic board.
7. Add six new MST cards.
8. Add new power cable.
9. Remove high-speed rewind plunger.
10. Remove inspection mirror and lamp.
11. Add tape cleaner assembly.
12. Rework write-enable circuit.
13. Rework three logic cables.
14. Rework pneumatic distribution.
15. Rework or replace power supply.
16. Rework or replace power interface (miscellaneous) board.

If converted to a Model 6 or 8:

1. Replace vacuum column glass with one that has a resonator.

The following additional rework is required for conversions to Model 8:

1. Replace the capstan motor.
2. Replace the vacuum pump.
3. Rework the pneumatic supply if the drive motor is not in the middle.
4. Rework the transfer valve.
5. Replace the reel motors and boards if converting from Model 3 or 5.
6. Rework the power door if lower glass was not installed.

Conversion Tips from Data Bank

3420 Reference page 0453 of Conversion Instructions. Do not remove the "O" ring type washer, placed between reference "B" and "F". What should be removed is about 1" - 1½" long and shaped like an "L".

3420 Erratic high-speed rewind - check resistor and cover assembly part P/N. For Model 6 P/N 1845820.

3420/6250 CONVERSION TIPS *(continued)*

3420 Conversion reel motor change - when replacing reel motors of different styles, a cooling hose reducer P/N 2513076 may be required, as well as different anti-rotation screws P/N 0438579 or P/N 0438581.

3420 Tape crease after model change - capstan to stubby bar clearance or a pneumatic pressure check for possible air leaks may need to be done.

3420 Offline tester conversion (6250), check MLM page 90-170.

3420 Fail to load, reels do not turn - booster supply board P/N 2515544 defective.

3420 Velocity check after conversion from a Model 3 to Model 7 - resistors for assembly P/N 2523731 should be 1 Ohm, 1 Ohm, 2 Ohm. They were 2 Ohm, 2 Ohm, and 10 Ohm, even though the correct part number was stamped on the assembly.

3420 No read or write after conversion (to 6250). Open paddle land to AIN7D02 or could be an open solenoid or cable.

3420 Various errors after model change - check ALD page A6106 for proper positioned jumpers (2 pages).

3420 Won't load (any model) reels won't turn, transfer valve or K1 won't pick, but the pneumatic motor runs. Incorrectly connected cable (E1 and E2 connection) to the piggy-back supply board attached to the booster supply.

Compatibility problems between drives can be caused by tracking out of adjustment, or if this adjustment is OK, the tracks are not centered on tape. Develop tape and place it on the viewer to observe. The proper positioning of the head to tape relationship is done by the Skew Plate. A special Skew Plate adjusting tool is necessary to do this (included in the Reference Plate replacement kit, BM 4298806). Reference SA 9 and SA 10.

3420 PM SCHEDULE

Code U	Code R	Location Operation	Frequency	Action
0		Door Slide and Stop Pin	4 months	Lubricate the door slide and the stop pin with IBM #17..
		General Cleaning	4 months	1. Clean front deck and base. 2. Remove tape cleaner block and clean with tape cleaner. 3. Remove air bearing (D-bearing) next to EOT/BOT block and clean. Inspect guide behind bearing and replace if grooved. 4. Clean NRZI guides. 5. Clean EOT/BOT channel mirror. 6. Clean the fiber optic lamp. Use a tissue lightly moistened with water. CAUTION: Allow lamp to cool before cleaning. Remove the manifuld and fiber bundles to provide access to the lamp. Replace the lamp (08-620) if it is not clear. Note: Cleaning or replacement of the fiber optic lamp requires the readjustment of the EOT/BOT and capstan squaring.
		Capstan Tach Squaring Circuit	4 months	Check and adjust Capstan Squaring. See 08-120 or 08-130. Ensure capstan is free from dents and does not bind.
		Capstan Tracking	4 months	Check and adjust Capstan Tracking. See 08-000.
		EOT/BOT	4 months	Check and adjust EOT/BOT. See 08-580.

3420 PM SCHEDULE *(continued)*

Code U	Code R	Location Operation	Frequency	Action
		File Protect Pin	4 months	1. Push plunger in, check for binds. 2. Check that plunger extends in front of the right hub flange. 3. Replace unit if any checks product unsatisfactory results.
		Power Window Safety Bail	4 months	Check for the correct operation of the power window safety bail. If incorrect, tighten the setscrew in the safety bail terminator, and adjust the safety bail switch assembly (see 08-000).
2		Parts Replacement	12 months	Order one of the following B/Ms for required parts. – B/M 8492273 Puralator type filter – B/M 8492274 Cuno type filter
		Tape Cleaner Block	12 months	Replace the tape cleaner block. Supplied with parts replacement B/M.
		Pneumatic Supply Belts	12 months	Check pneumatic supply belts.
		Input Filter	12 months	Replace filter element of the pressure pump input filter. Supplied with parts replacement B/M. Check for Puralator or Cuno type.
		Cooling Filter	12 months	Clean cooling air filter or replace as necessary.
		Air Bearing Cleaning	12 months	1. Remove bearings. 2. Brush each bearing to remove oxide deposits. 3. Install new decorative covers on air bearing. Supplied with parts replacement B/M. 4. Check pressure (see label).
		DC Voltage	12 months	Check the dc voltages. (08-570)

3420 PM SCHEDULE *(continued)*

Code U	Code R	Location Operation	Frequency	Action
		EOT/BOT	12 months	Remove EOT/BOT by removing the two screws and gently move block forward being careful not to damage the fiber bundles. Clean EOT/BOT with a cotton swab dampened with tape cleaner. Replace EOT/BOT block.
		Capstan Motor Mod-8	12 months	Clean screens on back of motor with vacuum cleaner.
		Radius Sense	12 months	Clean the ends of the fiber optic bundle with a damp cloth, see 08-610 for removal. Apply a felt pad to the handle and lightly dampen with tape cleaning fluid. Hold pad to the inside front of left reel flange and spin by hand. This will clean the reflective strips located inside the left reel.
		Reel Tach	12 months	Check reel tachs for glaze. Replace reel tachs if glazed.
		Glass Bead Tape	12 months	Inspect glass bead tape on stubby bar and in vacuum columns. See note. Ensure that stubby bars are not loose and have proper clearance. See 08-000.
		High Speed Rewind Plunger	12 months	Check operation of the High Speed Rewind Plunger. (08-000) Models 3, 5, and 7 only.
		Autocleaner Check	12 months	1. Check operation of autocleaner by marking the ribbon and observing ribbon movement. The ribbon should move from bottom to top. 2. Check the supply of autocleaner ribbon. Order a new autocleaner cartridge when approximately 3/4 inches of ribbon is visible through the cartridge window. Models 4, 6, and 8 only.
		Preamps	12 months	Check and adjust preamps (08-290 or 08-300).

3420 PM SCHEDULE *(continued)*

Code		Location Operation	Frequency	Action
U	R			
3		Pressure Tubing	36 months	Replace pneumatic pressure tubing (order B/M 4416408).
		Output Filter	36 months	Replace with P/N 2524998.
4		Vacuum Tubing	48 months	Replace vacuum tubing (order B/M 4416409).

Note:

Inspect the glass bead surface of the stubby bars and vacuum columns.

Replace if the glass bead is nicked, scratched, burred or has an area obviously worn to the touch. (If not obviously worn, do not replace.)

Run finger on the glass bead surface at the bottom of the vacuum column. This is a good glass bead surface and may be used as a reference.

A worn glass bead surface will cause tape motion problems.

3420 SALES FEATURE CODES

	Feat Code	Description		Model 3 5 7	Model 4 6 8
Functional	3350	Dual Density (1600 + 800)	Choose One and Only One	X	
	6407	Seven-Track		X	
	6631	Single Density (1600 Only)		X	
	6420	6250 Density	Choose Only One		X
	6425	6250/1600 Density			X
Pwr	9903	208 Vac Power	Choose Only One	X	X
	9905	230 Vac Power		X	X
Colors	9041	Red Covers		X	X
	9042	Yellow Covers		X	X
	9043	Blue Covers		X	X
	9045	Gray Covers		X	X
	9046	White Covers		X	X
	9051	Red Machine Reel		X	X
	9053	Blue Machine Reel		X	X
	9054	White Machine Reel		X	X
	If None	Gray Machine Reel (If None Specified)		X	X

3420 (ALL MODELS) STATUS IDENTIFIER

Status	Identification
NRZI Tape Path - New or Converted DD TUs	Check for spring loaded guides attached to the D-bearing and ramp.
Piggy-back Power System 34090 through 37099 43001 through 43084 45000 through 45054 90000 through 99999	Check for a large visible capacitor just below fuses 10-13 on the outside rear of the power supply. (Piggy-back supply)
"Model 3 Only" Capstan Motor	Check rear casting on capstan motor for "Mod 3 Only" markings.

The following 3420 ECA list is current as of the publishing date of this manual. Consult microfiche listing for most up-to-date information.

E = Essential Change
A = As Required Change

3420 ECA CHECKLIST

ECA	EC	E/A	Description	Checkpoint	Machines Affected
001	733966	E	C-Test Exit	Check for an on/off line CE switch	All
002	733999	E	C-Test Exit (14 REAs)	Check for P/N 8218287 in socket location 01A-A1H2	Mods 3, 5, 7
003	734021	A	Logic change to support cost reduced B2 card - paper only -	Check for card P/N 8218286 in 01A-A1B2	All
004	734030	A	Install positive stop control. Prevents short gaps and missing records when running an oscillating sort program. Improves LS rewind performance on Mod 3s. Picks up E003 (picked up by E007)	Check for P/N 8216714 at 01A-A1F2 and P/N 8218290 at 01A-A1G2. Check for EC 734030B.	All
005	734045	E	Prevent erasing tape with a +6 volt splash when loading tape. Route +6 Vdc to write driver card through R/W cable ferrite. (REA 24-22457)	Check for discrete wire routed through the R/W cable ferrite. Some mach may not have it routed this way. It is the wire from TB1-10 on logic gate and should go through ferrite.	Mods 3, 5, 7
006	733698	E	Power supply logic (paper only)	Check logic pages FT265 and FT452.	All
007	734030B	E	Correct mid-tape load failures. (REA 24-23860) paper only - (composites E004)	Check logic pages FT265 and FT452.	Mods 3, 5, 7
008	734062	A	Prevent tape damage. Prevent catch from popping out of lower restraint when using a cartridge. (REA 24-23847)	Check the catch to ensure good retention.	All

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
009	734063	E	High-speed rewind plunger. (REAs 24-23855, 56 and 24-23844) (Replaced by E024)	Check for 16 holes in high-speed rewind plunger	All
010	733704	E	WTC only replace paper capacitors C14 and C15 (to correct an REA problem) (50 Hz only) (REA 24-23866)	Check for disc-type caps C14 and C15 in the 50 Hz power supply	All
011	734061	E	Ensure proper operation of rewind solenoid to prevent high-speed rewind plunger from sticking in the down position.	Check for a 3 psi label then ensure that the spring is removed from the square high-speed rewind solenoid. Marked 3 psi. If 5 psi or round, ECA not required.	All
012	734035	E	Correct loading problem. Added orifice in vacuum column to prevent tape dump during loading. (REAs 24-22487, 471, 473, and 24-22483). (Replaced by EC 734951)	Check for orifice in left vacuum column manifold by removing the vacuum hose. EC 734035 installs 0.750" orifice/EC 734951 installs 0.625" orifice.	All
013	734046	A	Prevent tape damage and tape dump. (REA 24-23866) (picked up by E026)	Check for P/N 8218292 at 01A-A1C2	All
014	734056	E	Prevent velocity checks air bearing collapse due to low air bearing pressure	Check air bearing pressure decal for 83 inches of water on M7 NRZI machines or 69 inches of water on other machines.	Mods 3, 5

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
015	734374	A	Before loading with mini-reels. Vented right threading channel	Check for large (0.38") diameter hole in right threading channel.	All
016	734368	A	Prevent belt turnover by relocating pneumatic supply motor.	Ensure proper belt alignment by checking that the front mounted pneumatic supply motor is in the center position.	Mods 3, 5, 7
017	734231	E	R-C network installed in power supply across channel air solenoid relay contacts to prevent load checks. (REA 24-23903)	Check for large R-C net in ac box.	All
018	734382	E	Add redundant vacuum switches. (REAs 24-23902 and 24-23933). (Note: Mandatory on B03, 5, 7).	Check for parallel vacuum switches. Part of them may be mounted on rear of mounting bracket.	Mods 3, 5, 7 B03 B05 B07
019	734372	E	Improved pneumatic latch (picked up by E033)	Check for leaking reel latch. (Note: Obsoleted by E033 EC 734466 (new latch)	Mods 3, 5, 7 B03 B05 B07
020	734394	E	Corrected logic page ZT023. - paper only -	Check logic page ZT023 for EC 734394.	Mods 3, 5, 7 below S/N: 31659 52401 72075
021	734068	A	Correct PE write current for the P-burst and tape mark.	Check for P/N 8218291 at 01A-A1J2.	Mods 3, 5, 7 B03 B05 B07 W/O 7-Trk

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
022	734280	E	Power supply logic update. - paper only -	Check for EC 734280 on YB036	Mods 3, 5, 7
023	734244	A	Changed heat sink in power supply man status card. (REA 24-23909)	Check EC 734244 label on manual status card in power supply.	All
024	734392	E	High-speed rewind plunger (REA 24-23964) (replaces E009)	Check for an IBM-1 stamp on the 16-hole high-speed rewind plunger.	Mods 3, 5, 7 B03 B05 B07
025	734395	E	Improve threading of crinkled tape leaders. Replaces manifold and orifice.	Check for a one piece threading vacuum hose on 3420-3, 5. Check for an orifice in this hose on 3420-7.	Mods 3, 5, 7 B03 B05 B07
026	734391	A	Activate high-speed field control. Mandatory on machines with EC 734046. Corrects ESD problem caused by E013.	Check for logic card P/N 8218294 at 01A-A1C2.	Mods 3, 5, 7
027	905864	–	World Trade Only	– – – – – – – – –	– –
028	734369	A	Install modified write driver card to prevent write and erase current splash on tape during a mid-tape load. (REAs 24-23889, 24-23874).	Check for EC 734369 on EC 734470 stamped on the 9-track write driver or EC 734038 stamped on the 7-track write driver.	Mods 3, 5, 7
029	734456	E	Add integrator to window closed switch. This EC corrects a safety problem (REA 24-25031)	Check for 1000MF capacitor on power window board.	Mods 3, 5, 7 B03 B05 B07

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
030	734467	E	Improve write reliability by adding a write enable relay to file protect circuit to carry the +6V write current to the write card.	Check for relay assembly close to the file protect pressure switch.	Mods 3, 5, 7 B03 B05 B07
031	734468	E	Install a vented vacuum column to help eliminate mylar* contamination. (Picked up by E041)	Check for ½" gap on column bars between reference plate and vacuum column.	Mods 3, 5, 7
032	734743	–	Obsolete - Replaced by ECA 051.	– – – – – – – – –	– – –
033	734466	E	New reel latch. picks up E019.	Ensure that the reel latch contains plastic rollers.	Mods 3, 5, 7 B03 B05 B07
034	734469	A	New EOT/BOT block modified for better access to cleaner blade. A better photo diode is also installed in this new block. Picks up E032. Replaced by E051.	Check to ensure that the EOT/BOT block does not extend under the flip-down mirror.	Mods 3, 5, 7 B03 B05 B07
035	905956	–	World Trade Only	– – – – – – – – –	– – –
036	734288	E	50 Hz only. Prevents transfer valve solenoid from burning up.	Ensure that the solenoid drops when the pneumatic drops on a load check.	Mods 3, 5, 7
037	734504	E	Installs 15 amp fuse for F12 and F13 instead of 10A. Used for –48V in left & right reel motor.	Check for 15 amp fuse in F12 and F13.	Mods 3, 5, 7

*Trademark of E. I. du Pont de Nemours & Co. (Inc)

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
038	734483	E	Increase ampere rating for F12 and F13 to 15 amp 50/60 Hz	Check for 15 amp fuse in F12 and F13.	Mods 3, 5, 7 B03 B05 B07
039	734507	E	- Safety - insulate –48V on interface boards P/N 2515544, 2524666. (Picked up by E048.)	Check for a clear or rubber coating over land pattern on power interface board for the modified power supply from J3-K to J5-B.	Mods 3, 5, 7 B03 B05 B07
040	734506	E/A	Multiple sense output and OVUV card EC 136690. Essential on new build Mod 7, as required on Mods 3 and 5. Prevents burning relay contacts on reel motor boards.	Check for OVUV output card P/N 375478 and multiple sense card P/N 375451 in all power supplies.	Mods 3, 5, 7
041	734755	A	Vent vacuum columns and prevents mini-reel loading problems associated with ECA E031 (composites E031).	Check for plastic insert in ½" vacuum column vent.	All
042	734754	E	Capstan cover holder	Check for holder inside power door.	Mods 3, 5, 7 B03 B05 B07
043	734470	A	Reduce exposure to picked bit (dual density only). Improve PE write performance.	Check for EC 734470 stamped on dual density read cards.	Mods 3, 5, 7

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
044	734762	E	High-speed rewind plunger shim P/N 1847100. Allows tape to clear read/ write head on a thread or load operation.	Check for shim on mounting screw for HSR plunger.	Mods 3, 5, 7 B03 B05 B07
045	734760	E	Select lamp noise problem. Change lamp and add 150 Ohm –2W res on output of lamp driver. Helps eliminate velocity checks and missing load point.	Check for a 2-watt resistor located on wiring side of MST board from 01A-A1J2B04 to 01A-A1J2D08.	Mods 3, 5, 7 B03 B05 B07
046	734741	A	New ceramic cleaner blade design helps eliminate loss of amplitude due to tape demagnetization and reduces 237 abends due to contamination.	Check for a white ceramic cleaner blade P/N 1848197.	Mods 3, 5, 7 B03 B05 B07
047	734763	A	Vacuum switch lead insulation. Eliminates intermittent shorts (dropping ready) caused by leads shorting to ac ground.	Check for parallel vacuum switch insulator between vacuum switches and mounting plate.	All
048	734532	E	Solder the slip on blade connectors on the power interface board. Decreases power checks. (Composites E039)	Check for rivets soldered to the lands on back of the power interface board. (Modified power systems only)	Mods 3, 5, 7 B03 B05 B07

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoing	Machines Affected
049	734945	E	F.O. lamp bracket to improve light output decreasing equipment checks.	Check for 45 degree bracket holding fiber optics lamp.	Mods 3, 5, 7 B03 B05 B07
050	735881	E	PS logic - replaces parts catalog on power supply.	Check for EC 735881 on power supply logic	Mods 3, 5, 7 B03 B05 B07
051	734941	A	EOT/BOT block W/O bundle (replaces E034)	Refer to ECA E034 checkpoint.	All
052	735643	M	Model 7 power door lower glass safety retainer. (This glass may be installed on a Model 3 or 5 also.)	Mod 7 with vertical plastic retainers, as opposed to metal, holding lower glass in power door. Check for metal retainer under plastic held by second and fourth screws on each side.	Mods 3, 5, 7 B03 B05 B07
053	734952	A	Modify the unload sequence to speed up the power window operation on 3420 Models 3, 5, and 7	Check for wire from 01A-A1B2P09 to 01A-A1E2G07.	Mods 3, 5, 7
054	734953	A	Decrease velocity checks and start tach failures by increasing capstan motor low power drive.	Check that R19 on the capstan motor PCB is a 25 Ohm resistor on 3420 Models 3 and 5 or a 15 Ohm resistor on 3420 Model 7	Mods 3, 5, 7
055	734956	A	Eliminate mechanical noise caused by the file protect pin hitting a file protect sensor on some tape reels.	Check for a recessed file protect plunger.	Mods 3, 5, 7

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
056	734874	A	EC, ECA, Feature Identifier List	None	Mods 3, 5, 7
057	– – –	–	World Trade Only	– – – – – – – – –	– – –
058	734949	A	Improve read reliability on tapes written on some OEM equipment. Modified 7-track read card.	Check for EC 734949 stamped on 7-track read card.	Mods 3, 5, 7 with 7-Track
059	734954	A	Decrease exposure to lost records when sensing voids in tape in a backward operation. By removing the early BOT sense latch.	Check for wire from 01A-A1L2G09 to 01A-A1L2G11	Mods 3, 5, 7
060	736028	A	Increase air bearing pressure to allow use of back coated tape for 3420 Model 7 PE only.	Check for a red transparent pressure manifold.	Mod 7 Only
061	735811	E	System update for factory only on 'C' exit. Mandatory factory only.	3420-4, 6, and 8 check A1F2 card for 8237074 P/N.	Mods 4, 6, 8
062	736036	M	Provide correct location of capstan motor removal instructions.	3420-8 - open vacuum column door and check for a label on the capstan stating "caution". See MLM 08-090, 08-100, and 08-110.	Mod 8 Only
063	736803	E	Remove filler block from actual interference.	3420-4, 6, and 8 - check for an "X" molded into the filler block just to the left of the R/W head.	All 4, 6, 8
064	736932	E	Power logic update	3420-4, 6, and 8 - check logic page YF036 for EC736932.	Mods 4, 6, 8

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
065	735813	A	Provide zero threshold in 1600 bpi read operation during data portion of record.	3420-4, 6, and 8 - check 01A-A1K2 for P/N 8237090.	Mods 4, 6, 8
066	906196	A	World Trade Only	– – – – – – – –	Mods 3, 5, 7 B03 B05 B07
067	736819	A	Improved reel tach asm	3420 all - remove left or right reel tach and look for white dot on the bottom of the housing.	Mod 3, 5, 7 Mod 4, 6, 8
068	735815	–	Cancelled	– – – – – – – –	– – –
069	736031	–	Cancelled	– – – – – – – –	– – –
070	736828	A	Prevent unload failure due to false not tape present indications.	3420 all - check for a capacitor from 01A-AID2B09 (+) to GND (–).	All
071	736992	A	Prevent transistor on write card from shorting on cartridge motor casting.	3420-3, 5, and 7 - remove front head card cover and check for foam strips inside of the cover.	Mods 3, 5, 7 B03 B05 B07
072	735635A	M	Install I/O connectors (ESD problem)	3420-4, 6, and 8 - check for plated I/O shoes on drive.	Mods 4, 6, 8
073	735817	A	Prevent "Not Capable" OK on first Cmd after "load-op" due to auto-cleaner ribbon still on head.	Load drive and hit start before tape reaches LP. There should be a delay of about 3/4 sec after LP is reached and ready light comes on.	Mods 4, 6, 8
074	736683A	E	Install latest level logic page YC031.	3420-4, 6, and 8 - check YC031 for EC 736683A or higher.	Mods 4, 6, 8

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
075	735818C	E	Prevent loss of capstan control and add Cmd tag reset.	3420-4, 6, and 8 - check 01A-A1H2 card for P/N 8237044.	Mods 4, 6, 8
076	735166	E	Correct –4V regulator wire on power supplies.	3420-4, 6, and 8 with piggy-back power supply check for wire No. 1 of cable P/N 1767877 on TB-3-5 on front of the power supply.	All Mods of 4, 6, 8
077	737013	A	Prevent intermittent tape damage on unload op.	3420-3, 5, and 7 - check for P/N 8237109 in location 01A-A1G2.	Mods 3, 5, 7 B03 B05 B07
078	733222	E	Eliminate MISS-plugging of the read cables on the read card.	3420-4, 6, and 8 - check for label on read cable saying "Rd Card Rear."	Mods 4, 6, 8
079	906326	–	World Trade Only	– – – – – – – – –	– – –
080	443868	E	Fiber optic lamp cleaning label.	Check for label attached to MST card gate cover.	All
081	443862	E	Prevent piggy-back power supply regulator diode failure Model 4/6/8 supply	Check for large power diode bolted to small pre-reg card P/N 4169370 4169370 and connected by external leads soldered to land. (See YF060 for location)	Mods 4, 6, 8
082	443870	E	Prevent transfer valve relay R/C network failure.	Check SCRA card located inside ac panel on which mainline CB is mounted for orange sprague "gumdrop" capacitor. (.25μF-600V)	All

3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
083	443864	E	Improved three-way valve and filter deflector to eliminate foil particles in pneumatic system.	Inspect three-way valve attached to end of transfer valve for four screws attaching manifold to body.	All
084	443894	E	Model 4/6/8 field adjustment procedure	No physical checkpoint review IR history.	Mods 4, 6, 8
085	443893	A 3,5,7 E 4,6,8	Rueger vacuum switches eliminate drop ready and load failures.	Inspect switch positions L1, L3, L4, R2 and R3 for round switches and sliced cable connectors. L2, R1, and R4 should be square. (Some very early drives may have all round switches)	Mods 4, 6, 8 and 3, 5, 7
086	443890	E	Model 4/6/8 three-way auto cleaner solenoid. Eliminate PV valve and correct auto cleaner operation.	Check for hose running directly from rewind solenoid to auto cleaner.	Mods 4, 6, 8
087	443911	E	Eliminate Relay and transistor failure on power window board.	Check for 47μF cap attached in parallel to resistor R12. See ALD.	All
088	– – –	–	World Trade Only	– – – – – – – – – –	– – –
089	– – –	–	World Trade Only	– – – – – – – – – –	– – –
090	– – –	–	World Trade Only	– – – – – – – – – –	– – –
091	– – –	–	World Trade Only	– – – – – – – – – –	– – –
092	– – –	–	World Trade Only	– – – – – – – – – –	– – –
093	– – –	–	World Trade Only	– – – – – – – – – –	– – –
094	443899	A	Provides plated I/O cable connectors to minimize ESD problems.	Check for plated I/O connectors.	Mods 3, 5, 7

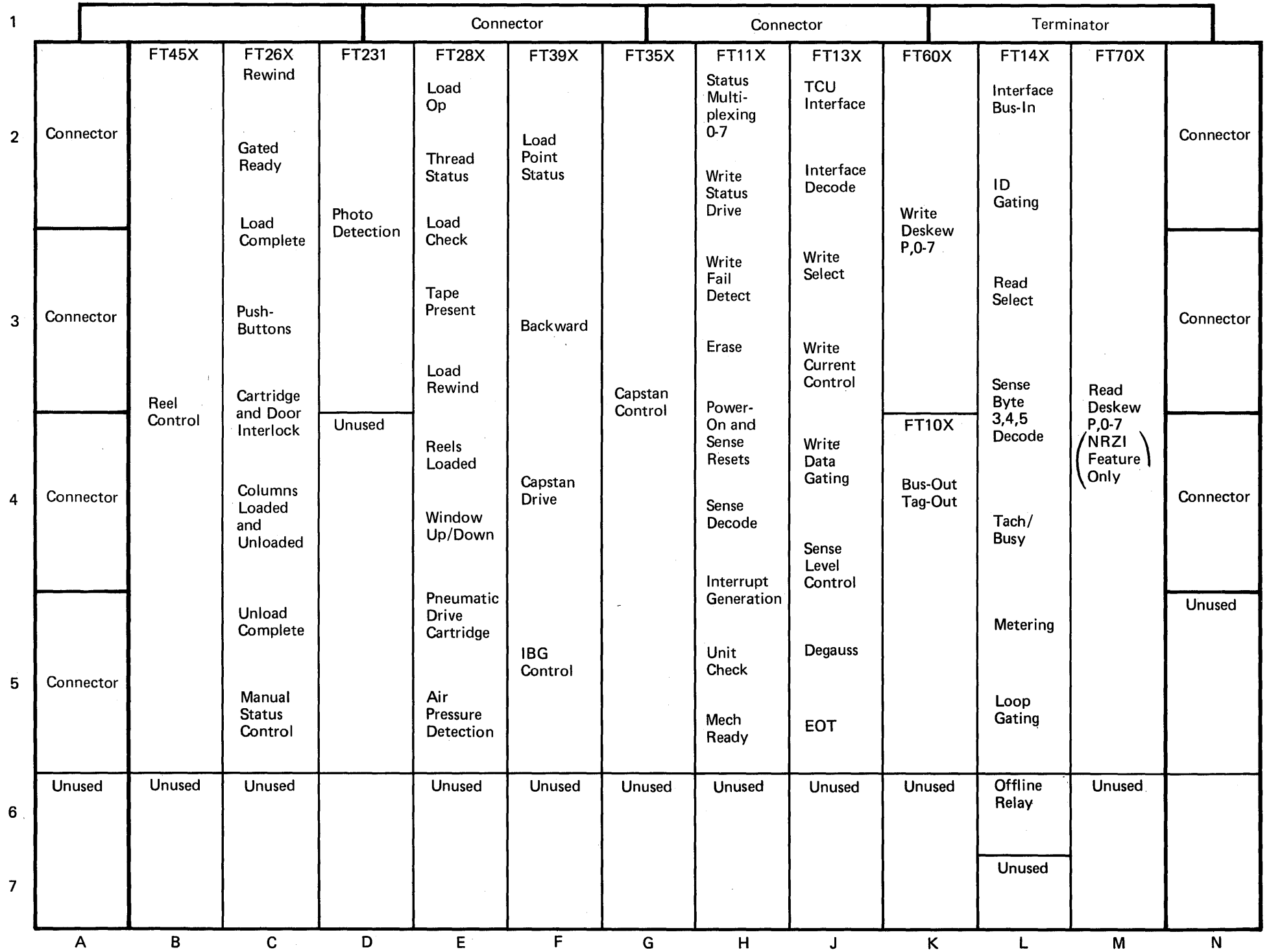
3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
095	449022	E	Replaces RC network associated with transfer valve and adds a new RC network in the same circuit.	Check for RC network (P/N 4169599) on the solenoid contact relay assembly (SCRA) card in the A-C box.	All
096	449014	E	Eliminate drop ready conditions due to vacuum switch failures.	Check for round (grey color) vacuum switches in positions L1, L3, L4, R2 and R3.	Mods 4, 6, 8
097	443935	A	Prevent erasing a good block during error recovery on a write operation causing a 237 abend on the next read op. Also prevents a possible start read check by opening gap control up earlier.	Check for card P/N 8250221 in loc E2 and 8250220 in loc F2.	Mods 4, 6, 8
098	– – –	–	World Trade Only	– – – – – – – – –	– – –
099	– – –	–	World Trade Only	– – – – – – – – –	– – –
100	– – –	–	World Trade Only	– – – – – – – – –	– – –
101	449068	E	To provide a current bypass for an intermittent connection between heat sink and land pattern at the unregulated portion of the 4 and 6-volts on the board.	Check for jumpers from power Intf board terminal E12 to clip on the lower heat sink and terminal E9 to upper heat sink.	B03 B04 B05 B06 B07 B08

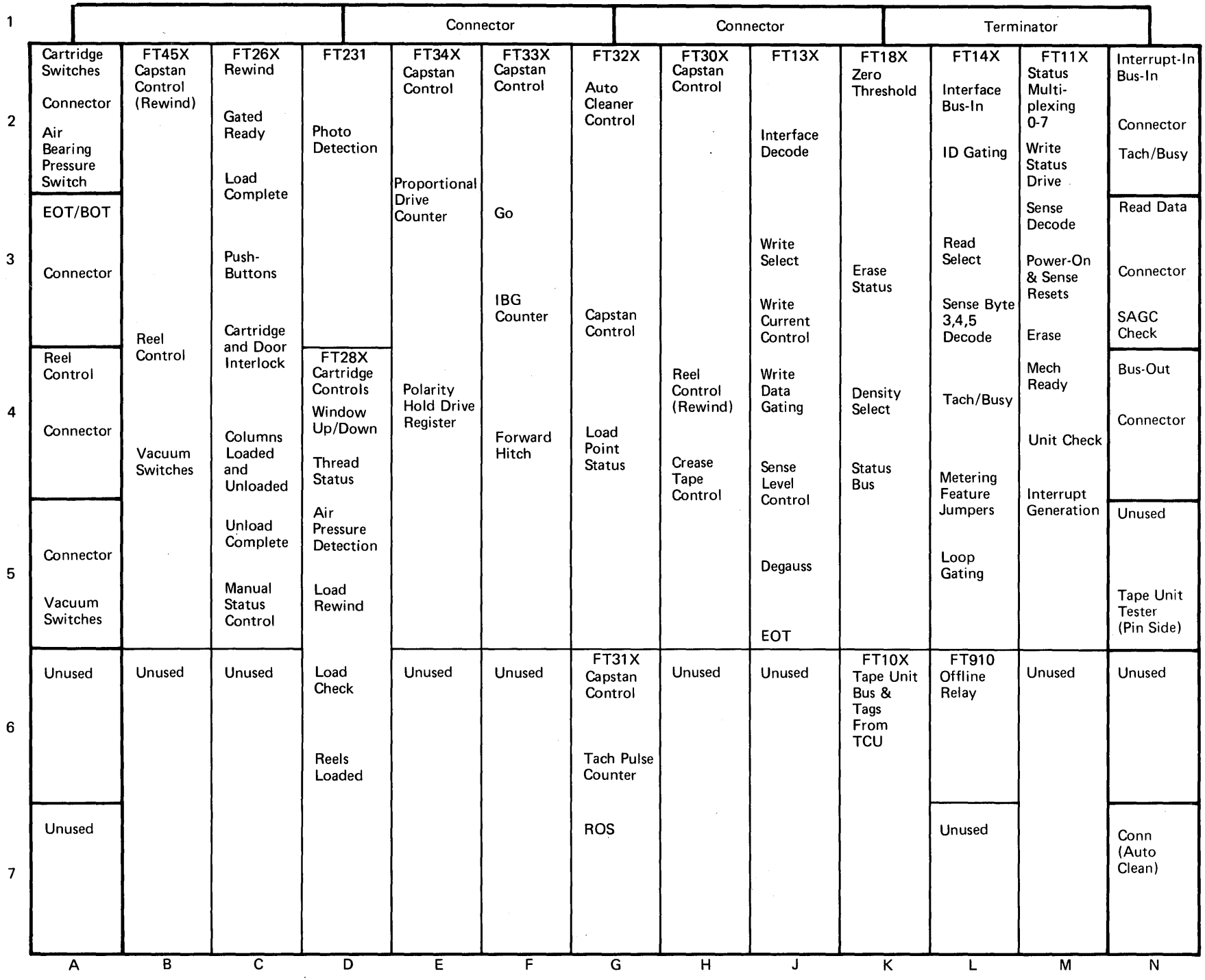
3420 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint	Machines Affected
102	449087	E	Prevent tape dump and drop ready caused by incorrectly installed mod wires on the tape drive logic boards. Also corrects failures on conversion to Mod 4 or 6 from Mod 7 or 8.	If reel motor boards are P/N 373561 or P/N 2524137, no wire B2B12 to B2P10. If other than P/N 373561 or P/N 2524137 there should be a wire from B2B12 to B2P10.	Mods 4, 6
103	845992	E	Corrects power window circuit board failures. Replaces capacitor C3 and relay K8. This EC replaced ECA 087.	Capacitor C3 on the power window circuit board at 100 μF	Mods 3, 5, 7, 4, 6, 8 WTC Only
104	449092	A	Help prevent reel motor board failusers by decreasing a voltage spike that burns out transistor Q8.	Installs a diode across the HS rewind solenoid.	Mods 3, 5
105	846015	E	ECA reserved for the replacement of the cartridge retaining button. Released for recording of time and parts. Cannot be ordered as EC.	Cartridge retaining button should be black in color. If not, order P/N 4169428.	All
106	449093	E	Decrease reel motor circuit board failure. Installs 1.3 ohm reel motor current limiting resistors.	1.3 ohm resistors in the reel motor and capstan motor resistor assembly.	Mods 7, 8

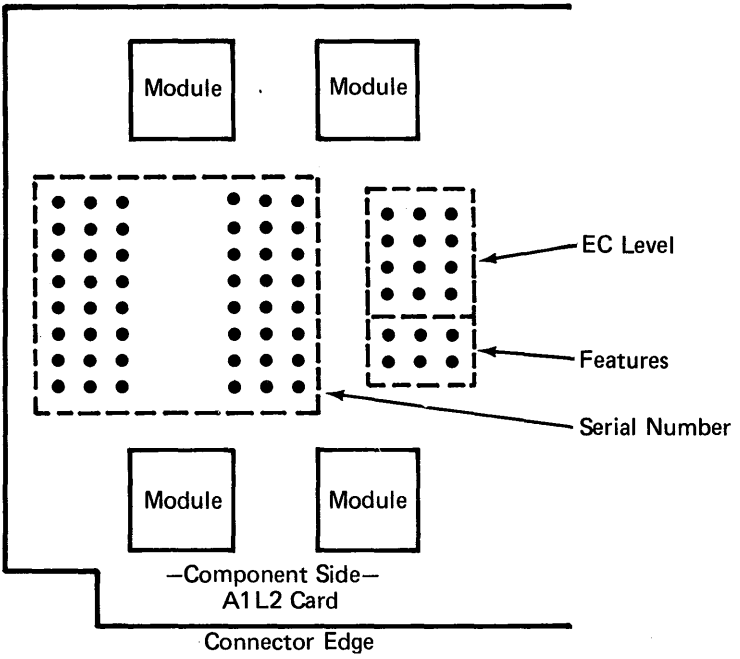
MODELS 3, 5, 7 - A1 BOARD



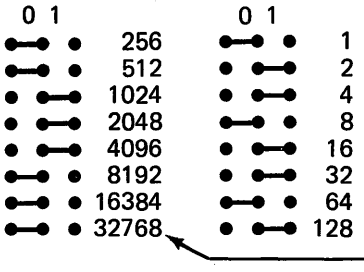
MODELS 4, 6, 8 - A1 BOARD



CARD JUMPERS - MODELS 3, 5, 7



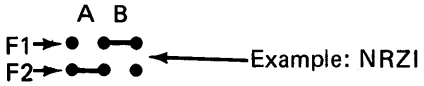
Reference Logic A6106



Serial Number

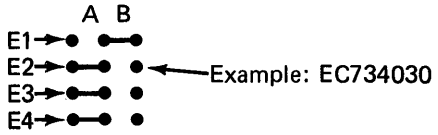
- Multiply Model Number Times 10,000 (Example: Model 3 x 10,000 = 30,000)
- Subtract Number Found Above From Serial Number (Example: Serial No. 37350 - 30000 = 7350)
- Plug for Remaining Number in Step Above (Example: 7350)
- Plug All Other Bits to 0

CARD JUMPERS - MODELS 3, 5, 7 *(continued)*



Features

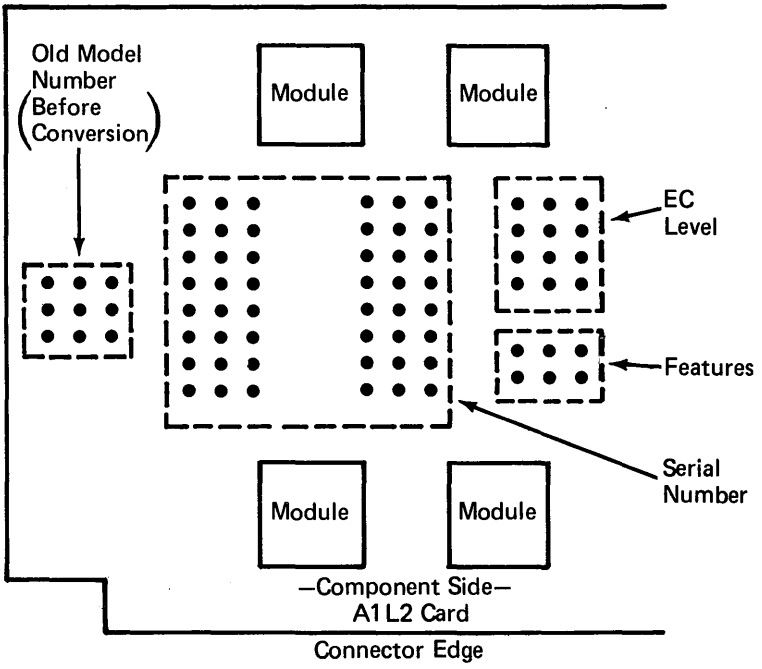
	F1	F2
Basic	A	A
NRZI	B	A
7-Track	A	B

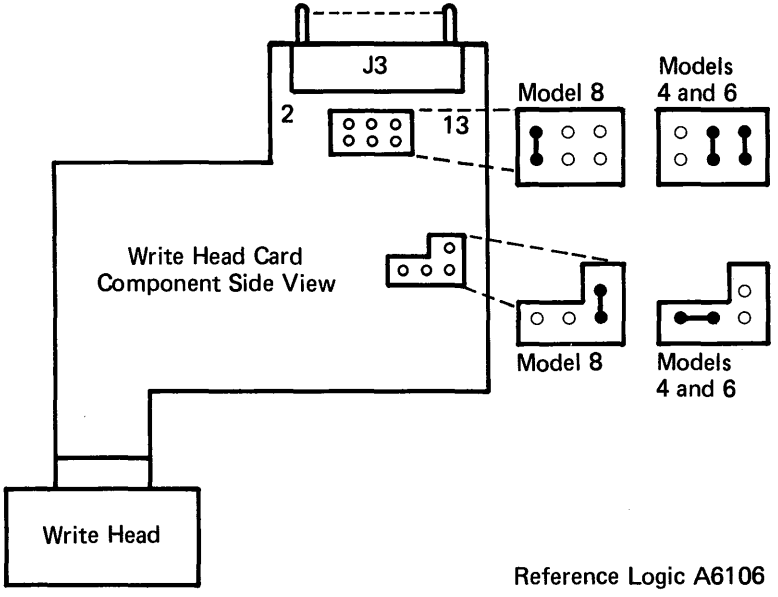


EC Level

	E1	E2	E3	E4
EC 733999	A	A	A	A
EC 734030	B	A	A	A

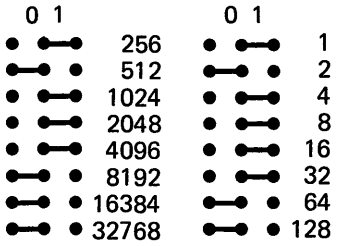
CARD JUMPERS - MODELS 4, 6, 8





Reference Logic A6106

CARD JUMPERS - MODELS 4, 6, 8 *(continued)*



Plug all Bits Either 0 or 1

Serial Number

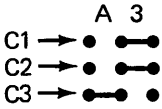
- To plug Serial Number Use Following Formula:

Serial Number
− (10,000 x Original Model No.)
= Number To Be Plugged

Example:
For Serial Number
37485
(Originally Model 3)

Example Plugged

37485 Serial No.
−30000 10,000 x 3
7485 to be Plugged

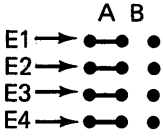


Example:
Model 5

Old Model Number

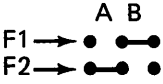
- Plug Original (Before Conversion) Model Number:

Old Mod	C1	C2	C3
3	B	A	B
4	A	A	B
5	B	B	A
6	A	B	A
7	B	A	A
8	A	A	A



EC Level

- Plug E1 Through E4 to A (As Shown) for EC 735810 or Higher



Example Shows
6250/1600

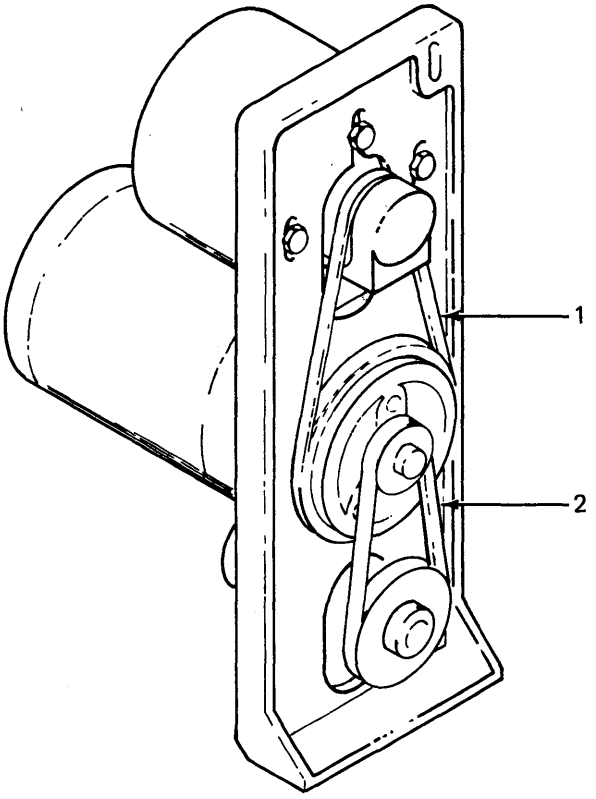
Features

- Plug as Follows:

	F1	F2
Basic	A	A
6250/1600	B	A

COMMON 3420 PART NUMBERS

Pneumatic Belts



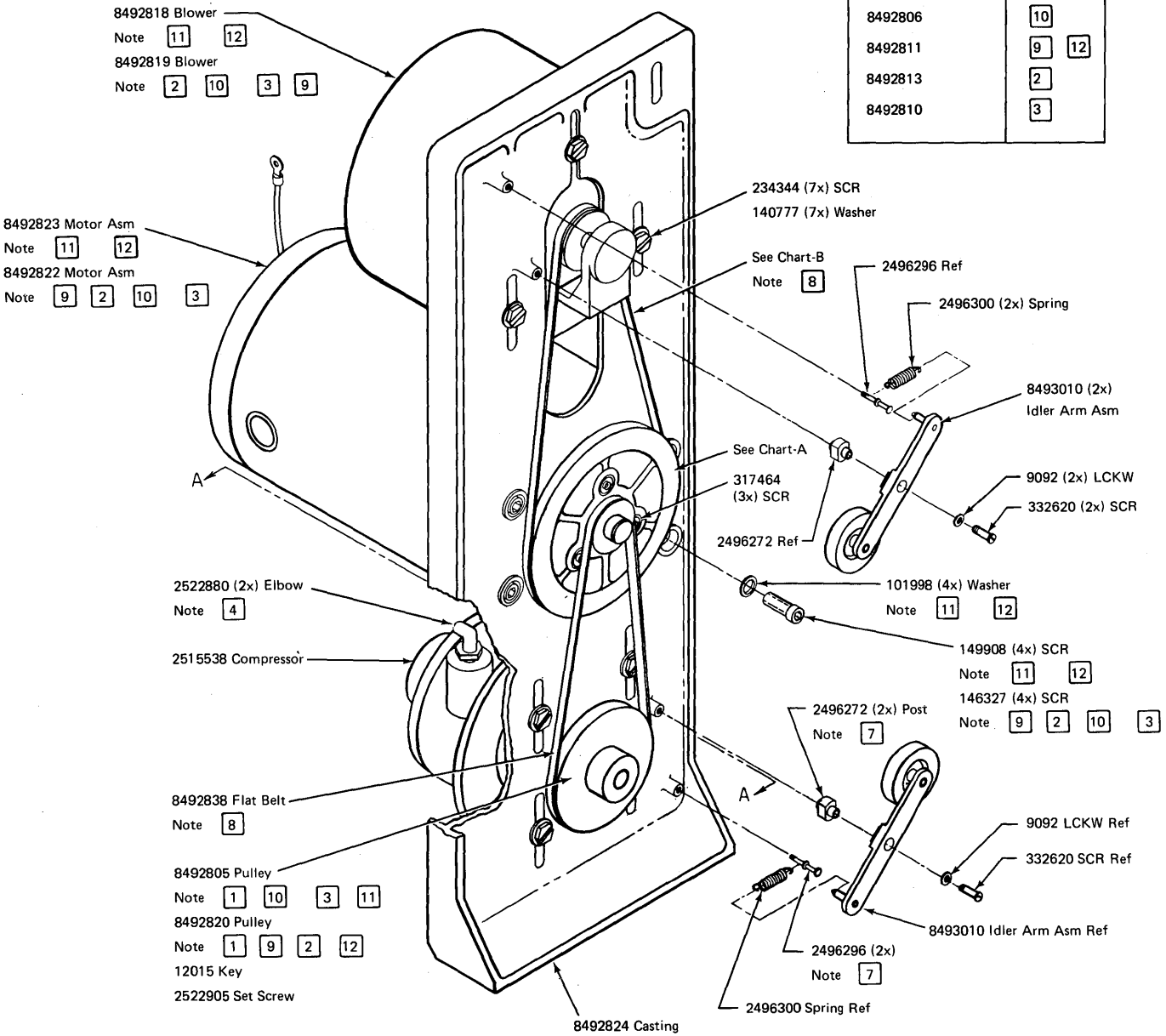
Part No.	Model	Length
(1)		
1767004	3, 4, 5, 6	26.38
1765850	8	25.59
1767005	7	27.95
(2)		
2522882	3, 4, 5, 6, 7, 8	20.28
1765854	8	19.69

Note: If pneumatic belts come off do not reinstall - use new belt. When installing new belts do not roll them onto pulleys. Loosen motor or pump to install new belt. Use procedure described in maintenance documentation.

LOW ALTITUDE *See Note 13

Chart A	
Pulley P/N	Note
8492814	[11]
8492806	[10]
8492811	[9] [12]
8492813	[2]
8492810	[3]

Chart B	
Belt P/N	Note
2496287	[11]
2496287	[10]
2496303	[9] [12]
2496303	[2]
8492977	[3]



Notes

[1] Pully must be seated against shoulder of the pump shaft

[2] B/M 8492827 60 Hz (Mod 3, 4, 5, 6)

[3] B/M 8492829 50 Hz (Mod 3, 4, 5, 6)

[4] Elbow nears IDE pointed away from the casting

[5] Preliminary performance at 75° F (23.9° C) and 25.00 inches (635 mm) Hg for B/M 8492827 and 8492829 vacuum 21.70±1.50 inches (551.2 ± 38 mm) H_2O at 16.70 $^{+1.50}$ SCFM (472.89DM^3M) pressure 5.00–0.00 SCFM (141.58 + 42.48 DM^3M) at 2.50 PSIG (0.0018 KG/MM^2) for B/M 8492835 and B/M 8492337 vacuum 35.00 ± 1.50 inches (889 ± 38.1 mm) H_2O at 36.50 SCFM (1033.57 DM^3M) $^{+2.00}$ Pressure 5.00–0.00 SCFM (141.58 + 56.63 DM^3M) at 2.50 PSIG (0.0018 KG/MM^2) for B/M 8492831 and B/M 8492833 Vacuum 27.80 ± 1.50 inches (704.1 ± 38.1 mm) H_2O at 19.30 SCFM (546.52 DM^3M) pressure $^{+2.00}$ 5.00–0.00 SCFM (141.58 + 56.63 DM^3M) at 2.50 PSIG (0.0018 DG/MM^2)

[6] Either 1765057 filter or 1765653 filter can be used interchangeably

[7] Bond with IBM specification 1703 adhesive

[8] Initial deflection on belt should be .100 ± .030 (2.54 ± 0.76) when idler is contacting belt

[9] B/M 8492831 60 Hz (Mod 7)

[10] B/M 8492833 50 Hz (Mod 7)

[11] B/M 8492835 50 Hz (Mod 8)

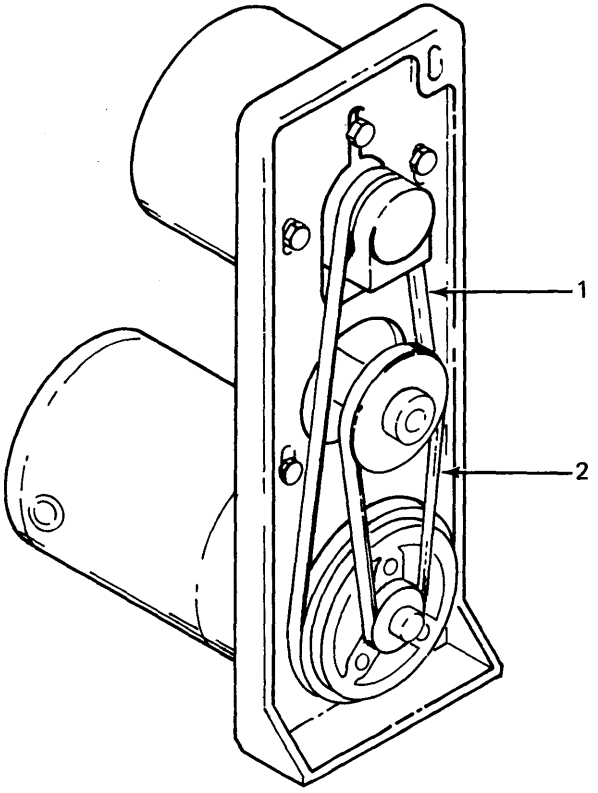
[12] B/M 8492837 60 Hz (Mod 8)

[13] Refer to MLM for high altitude.

[FE12830

FLAT BELT PNEUMATIC SUPPLY

COMMON 3420 PART NUMBERS *(continued)*

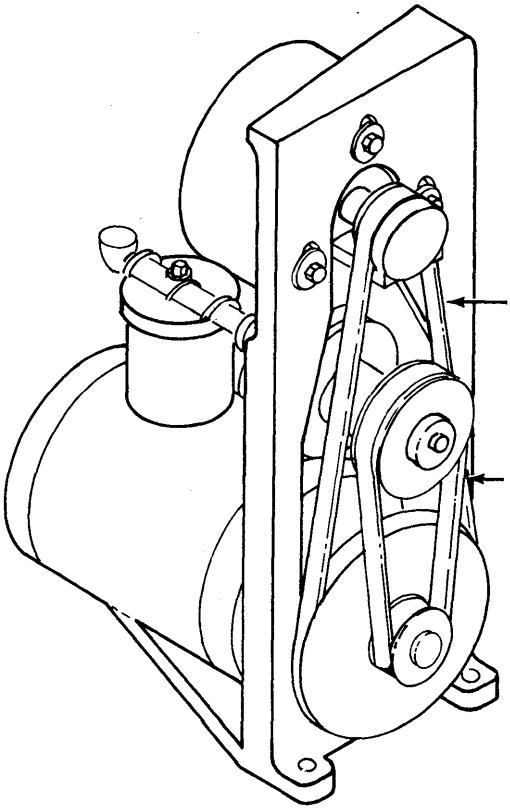


Part No.	Model	Length
(1)		
1847949	3, 4, 5, 6, 7, 8	39.37
1765551	3, 4, 5, 6, 7, 8	39.37
2515350	7, 8	40.55
(2)		
2512762	3, 4, 5, 6, 7, 8	19.17
2522882	3, 4, 5, 6, 7, 8	20.28

BM = Bottom Mounted Motor

Note: If pneumatic belts come off do not reinstall - use new belt. When installing new belts do not roll them onto pulleys. Loosen motor or pump to install new belt. Use procedure described in maintenance documentation.

COMMON 3420 PART NUMBERS *(continued)*



Part No.	Model	Length
(1) 1766517	3, 4, 5, 6, 7, 8	35.43
(2) 1765657	3, 4, 5, 6, 7, 8	17.72

Note: When installing belts, use procedure as described in maintenance documentation.

The following B/Ms are required when changing altitude with a flat belt pneumatic supply.

3420 Models	Altitude 60 Hz 0-4000	Altitude 60 Hz Above 4000	Altitude 50 Hz 0-4000	Altitude 50 Hz Above 4000
3-5	8493017	8493015	8493022	8493019
7	8493018	8493016	8493023	8493020
4-6	8493017	8493015	8493022	8493019
8	8493018	8493016	8493024	8493021

Note: If pneumatic belts come off do not reinstall - use new belt. When installing new belts do not roll them onto pulleys. Loosen motor or pump to install new belt.

Reel Motor and Reel Motor Board Part Number Combinations

POWER SUPPLY	REEL MOTOR	BOARD
2522840 (60 Hz) 1767836 (60 Hz) 2515413 (60 Hz) 2515421 (60 Hz)	2513168 LEFT-[A]	373561-[A]
1767917 (60 Hz) 1767835 (50 Hz) 2522839 (50 Hz) 2522465 (50 Hz) 1767918 (50 Hz) 1766046 (50 Hz)	1765047 LEFT 2523744 RIGHT 2523744 LEFT-[B]	2524137
2522838 (60 Hz) 2515367 (60 Hz) 1767834 (60 Hz) 2515410 (60 Hz) 1767850 (60 Hz) 1767833 (50 Hz) 2522837 (50 Hz) 2524644 (50 Hz) 1766045 (50 Hz) 1767849 (50 Hz)	2513165 LEFT 1765389 LEFT 1765390 LEFT-[B] 2513074 RIGHT 1765390 RIGHT	373065

Note [A] Motor (P/N 2513168) and board (P/N 373561) must be used together and only with each other.

Note [B] WTC Only.

Notes C and D (Applies to all P/Ns) 3420 drives with high-speed reel motor boards P/N 373561 or P/N 2524137 must have wires B2B12 to B2P10 and B2B13 to B2P13 removed. Other motor boards require that wires B2B12 to B2BP10 and B2B13 to B2P13 be installed. Problem may show up as dropping ready and/or dumping of tape.

COMMON 3420 PART NUMBERS *(continued)*

Capstan Motors

Part Number	Model
1766960	3, 5, 7 (9XXXX series)
1766761	4, 6
1846689	4, 6 (9XXXX series)
1766700	8
1845857	8 (9XXXX series)
2522864	3, 5, 7

Transfer Valve - Three-Way Valve and Manifold Assemblies

Valve & Manifold Asm P/N	Manifold Color	Model
4169448	Grey	7 NRZI
4169449	Black	7 PE 3, 5
4169450	Green	4
4169451	Red	6, 8

If the 3420 was ever NRZI or had EC 736028 installed on a Model 7 due to use of back-coated tape, the red manifold must be used.

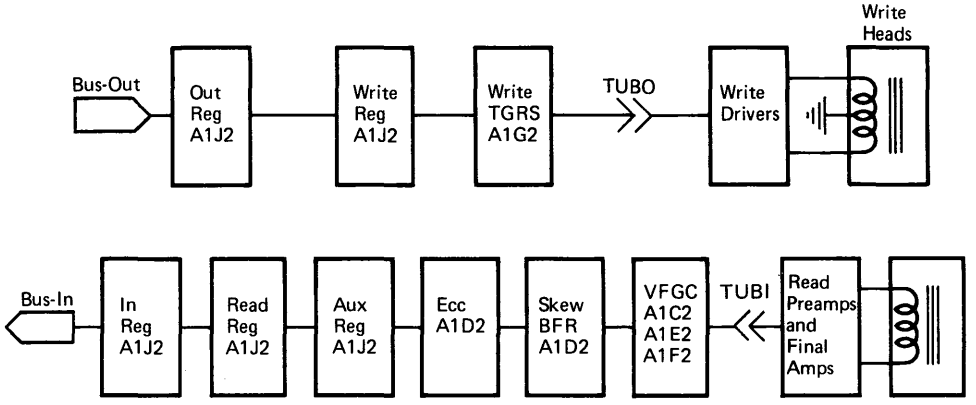
3420

Piggy-back Supply - B0X Series (9XXXX Serial Numbers) and 34090 to 37099

Interface Board – P/N 1767869 4/6 60 Hz (used with 176850 supply)
P/N 1767868 All other 50/60 Hz
P/N 2515544 9XXXX, 34090, to 37099

Pre-regulator – P/N 4169370 (was 1767871)

3803 MODEL 1 DATA FLOW

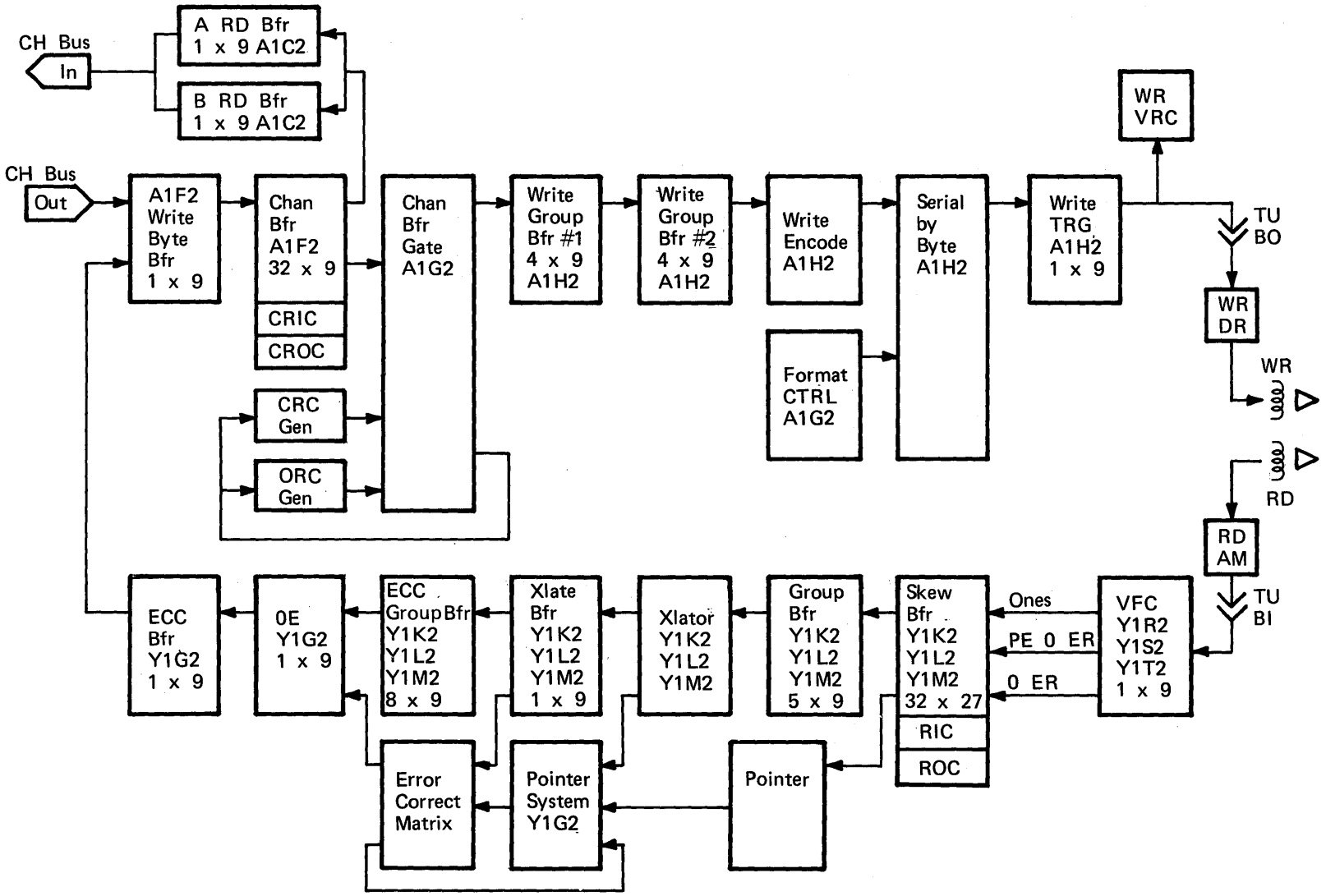


Microprocessor Card Locations

	MP1	MP2
ALU	B2C2	A2N2
ROS	B2H2	A2H2
ROS Reg	B2D2	A2M2
	B2E2	A2L2
Clock	B2F2	B2F2
Instruction Decode	B2D2	A2M2
LSRs	B2C2	A2N2
Xout A	A2T2	A2Q2
Xout B	A2T2	A2Q2
D-Reg	B2C2	A2N2

3803 MODEL 2 DATA FLOW

See MLM 50-XXX for more detail.



3803 MICROPROCESSOR INSTRUCTION FORMAT

Microprocessor instructions have the following format:

[label] OPCODE field1, field2 [comments]

label is a one to eight-character name by which the instruction can be referenced. Branch instructions point to locations in the microprogram by label.

OPCODE is the operation to be performed on the data or addresses in Field 1 or Field 2.

Field 1 is generally an address in the Local Storage Register. In some instructions this field may be a branch condition or ROS page number.

Field 2 is generally a constant, referred to as a decimal number or by a symbolic name. The value of symbolic constants for each microprocessor is listed in the beginning of the listings as EQU statements. In some instructions this field may be a branch address or transfer code.

Field 2 can contain several symbolic constants combined arithmetically, that is, the sum or difference of two or more constants.

For example, the constant in the instruction:

```
ADD WORK1,ONES-174
```

results in the constant hexidecimal FF (ONES) minus the decimal value 174, or a decimal value of 82.

For more detail see MLM 52-030.

3803 MICROPROCESSOR TIPS

ROS Patch Card

The ROS Patch Card, part 8215414:

- Allows emergency repair of defective ROS words. (In this application, the card allows reconstruction of a ROS word that has a single defective bit.)
- Allows application of an emergency REA to the microcode, until production of a new MST-A card can support a field bill-of-material.
- Serves as a diagnostic tool.

This card plugs into A2G2 for MP2, B2J2 for MPI.

Reference MLM 80-030 or PF for a description of patch card plugging.

Microprocessor Card Interchange List

The following is a list of cards that can be interchanged between ALUs.

ALU1	ALU2
B2C2	A2N2
B2D2	A2M2
	(watch for feature jumpers)
B2E2	A2L2
B2F2	A2K2

The following is a list of cards that can be interchanged if the two-channel switch feature is installed:

CAUTION: Removing these cards may cause channel errors, even with power off. Put CPU in single cycle mode before removing cards.

B2Q2	with	B2P2
B2R2	with	B2S2

To Determine the Failing Instruction Address

The best way to get the failing address is to stop the ALU on the error. To do this, turn the Control Check Switch to the ON position. See Stop Procedure on 12-010, Seq 3. When the ALU stops, the Instruction Counter contains the address of the *next* (sometimes second) instruction to be executed. Remember that the Instruction Counter and the ROS Register are updated during the execution of the failing instruction.

It is possible that some red light errors are the result of a failure that took place several instructions earlier. For example, bad parity can be stored in an LSR and not be caught until the LSR is read out. This situation results in a B-bus parity error, but the real problem exists with the action that loaded the LSR or the LSR itself.

To Make the ALU Loop on an Error

There are two positions on the ROS mode switch that can be used to make the ALU loop: the RST/ERR and RST/CMPR.

If the RST/CMPR position is used, the ALU is reset before the instruction at the compare register address is executed.

The RST/ERR position gives a better loop in most cases. When the RST/ERR position is used, the instruction executing during the error is completed before the general reset. It may be necessary to add a jumper from GENERAL RESET to the CE START LATCH (B2Q2S10 to A1T2G05) if an I/O operation is included in the loop. The jumper is not needed if the error occurs during ALU checkout or IDLESCANS.

See MLM 16-000 for more detail.

General Reference Information

The following items should be kept in mind when troubleshooting a microprocessor problem:

- The COMPARE EQUAL line (A1U2U07) goes minus just before the execution of the instruction. The stop-on switches must be OFF to allow a compare.
- If the failure is at address 000, RESET or TRAP ALU2 (A2K2D10, AA011) is a good sync point.

3803 MICROPROCESSOR TIPS *(continued)*

- When displaying ALU execution on the scope, make sure that a complete cycle is shown. The 0 ns taps for the ALU are:

  ALU1 B2F2G12
  ALU2 A2K2G12

- BU, BOC, and ADD instructions require a long cycle, 200 ns. All other instructions execute in a short cycle, 150 ns.

- Slow fall time of a pulse might be caused by a missing external load. Check the tape control ALDs for their locations.

- Always remember that you are troubleshooting lines as well as cards. If you find a bad net and the card or cards driving the line have been ruled out, something else must be wrong within the net.

- If an I/O command is involved in troubleshooting a problem offline, a contingent connection might occur. This condition is apparent if ALU1 stops with address 301 in the instruction counter. To break the connection, follow each failing command with a sense command.

- Random ALU failures can be caused by the ALU oscillator card, A1H2.

- Use the timing charts for a better understanding of an operation, as well as reference when a timing check is called for. Timing chart is on 16-001.

- If cards are changed and the outputs are still bad with good inputs, check for proper voltages at the card socket.

- The CE panel lights indicate the ROS data bits, not the ROS register bits.

See MLM 16-000 for more detail.

3420 Models 3, 5, 7 - 3803 Model 1 Tape Runaway

SYMPTOM
When initial read is given (open, etc) the tape appears to run away. It occurs every time the failing reel is mounted. 3803 has NRZI capability. This runaway will not occur on PE only 3803.

PROBLEM ISOLATION AIDS
If account has 6250 bpi drives or the failing tape could have been written in 6250 bpi mode, develop the tape to see if it has been written in 6250 (ID burst will be in track 1 if 6250). If you find 6250, a patch to ALU 2 can be applied to eliminate the problem. This patch is a four-word patch which tests for IBG (all tracks down) anytime the P-track is tested and not seen. If no IBG, a 6250 tape is assumed (track 1 active) and not capable is set.

FIX
The ALU 2 patch works as follows. (W/O 7-track drives attached):

Word 0000	A001	Bump Counter
Word 0001	6053	Return
Word 0010	2F00	BOC IBG, 0000
Word 0011	6048	Return to Set Not Capable

*******PLUG PATCH CARD AS FOLLOWS*******

1---P	6----A001	11---N
2---1	7---N	12---6048
3---0	8---6053	13---R
4---0	9---R	14---0
5---052	10---2F00	15 through 23 not applicable.

As this patch requires only four words, the four words on the other side of the patch card can be used for velocity, etc.

**** The following fix is for 3803 with 7-track drives attached. This patch is not effective against mounting a 6250 written tape on a 7-track drive. If mounted, the tape will run away. No fix for 7-track is available.**********

CURRENT ALU PATCHES *(continued)*

Word	0000	3003	BOC D-Reg Position 0 Equal 1, 0003
	0001	6057	Return (Set Not Capable)
	0002	Not Used	
	0003	6056	Return (Good NRZI Tape)
	0004	6058	Return (No ALU Carry)
	0005	2104	BOC NALCO,0004
	0006	2F03	BOC IBG,0003
	0007	D780	And, Sense Status 1, Seven-Track

-------PLUG PATCH CARD AS FOLLOWS-------

1.	P	7.	N	13.	R	19.	N
2.	0	8.	6057	14.	0	20.	2F03
3.	0	9.	R	15.	N/A	21.	N
4.	0	10.	N/A	16.	6058	22.	D780
5.	055	11.	N/A	17.	R	23.	N
6.	3003	12.	6056	18.	2104		

Excessive Postamble Error

SYMPTOM
Excessive postamble error on specific tape. Error every record.

PROBLEM ISOLATION AIDS
Tape reads error free on 2803 and may on 3803 Mod 1. 2803 does not check postamble length on a read. 3803 Mod 1 allows about 49 zeros while the 3803 Mod 2 allows about 45.

FIX
Locate and fix the control unit that created the tape containing the records with excessive postamble. If the customer library is badly contaminated with these tapes, and it becomes necessary that the tapes be processed on a 3803 Model 2, a patch can be applied to ALU2 via the patch card. Change the instruction at location 0000A0 from 09E7 to 09XX. XX being the count field. For example, to increase the count by five bytes, make the count E2 instead of E7.

Lost Device-End - Unexpected Interrupt

SYMPTOM
Customer indication - allocated and busy and nothing is happening on the drive, console indicates lost device-end, usually for drive 0 or 4, failures so far have occurred on systems with 3803 2X8, 3X8, or 4X8 configuration. Fails when system tries to stack channel-end after a rewind and interrupt buffers full. Microcode eventually resets drive address, drive 0 committed. Latch will be set, and drive 0 will end up busy until software times out and indicates lost device-end. Also have contingent connection.

This patch may be applicable to 3158 and 30XX systems.

PROBLEM ISOLATION AIDS
Install CE latch to test for the following conditions
'AND' A2R2P10 (FD041) with A1U2U07 (PP021) to set indicator.
Use compare address of 02E4 for 3803-1 or 02DD for 3803-2.
If indicator is set, install following fix to ALU1.

FIX

3803-1	—	Address 02E4 —	Put unconditional branch to next inst
3803-2	—	Address 02DD —	Put unconditional branch to next inst

Also see:

Temporary Reads in 6250 Mode	3803 ECA 111
Extend Velocity Retry Time	3803 RPQ S10112

Settling Time/Write After Read (ALU 2)

Change Loc 744	VER	0089
	REP	0083

Delay write trigger turn on by 6 or 7 tach pulses. Affects 613 ABENDs
3803 Model 2 only.

CURRENT ALU PATCHES *(continued)*

Turnaround Delay (ALU 2)

Change Loc 15B Ver 3480 (Mod 2)
Rep 615C

Adds 11.16 μs of time. Error is unexpected load point.

Postamble Patch (ALU 2)

Change 2B6 Ver 00D8 (Mod 1)
Rep G0D7

Allocated Busy (ALU 1)

Change 02E4 to unconditional branch to next instruction. (Mod 1)
Change 02DD to unconditional branch to next instruction. (Mod 2)

Velocity Patch (RPQ S10112)

3803 - Mod 1

1 – – – P	7 – – – N	13 – – – R
2 – – – O	8 – – – N/A	14 through 23 not applicable
3 – – – O	9 – – – N	
4 – – – O	10 – – – 1300	
5 – – – 202	11 – – – N	
6 – – – N/A	12 – – – 6203	

3803 - Mod 2

1 – – – P	7 – – – N	13 – – – N	19 – – – N
2 – – – 1	8 – – – 6215	14 – – – O	20 – – – 67BA
3 – – – 1	9 – – – R	15 – – – 7B9	21 – – – R
4 – – – O	10 – – – N/A	16 – – – N/A	22 – – – N/A
5 – – – 214	11 – – – N	17 – – – N	23 – – – N
6 – – – 1300	12 – – – N/A	18 – – – 1500	

CURRENT 3420/3803 RELATED SOFTWARE ZAPS

Allow 3803 Sense After Selective Reset (TSI1614)

When the 3803 detects an ALU check, it raises disconnect-in. If it is plugged for 370 operation, this in turn causes an interface control check in the CPU, which signals the CPU to do a selective reset to the 3803 TAU, as it may possibly be hung. The program then will not do a sense command to the 3803 to see where the error was located, as the sense information was supposedly destroyed via the selective reset, which architecture calls for. However, the sense information in sense bytes 11 and 12 have been reserved by 3803 engineering, and these two sense bytes tell what type of equipment check it was originally.

The CE can do one of two things. First, have the customer run the 3803 in hard stop, to see what kind of error it is, but this would probably be disastrous to the customer. Or else, he could apply one of the following three zaps to EREP so that EREP would do a sense and print out the sense bytes, thereby telling what type of error existed. The MVS and VS1 zaps have been tested at the stated levels correctly, but the zap for SVS has not been tested, but should work okay. Be sure and remove the zap after you determine where the error is from EREP printout.

```
          MVS Zap for Release 3.7 PTF Level UZ08355
  Module IGE0000I                  Tape 7701 or 7706
Label D300 is Right Before Address ABC, for Ease of Finding A8C
VER A8C  4780 F5EE                 Branch to Return
REP A8C  47F0 FE04                 Branch to Patch
REP E04  4710 FA90                 Branch to Logout if SDR O'Flo
REP E08  9120 A020                 Test for Bus-Out Check
REP E0C  4780 F5EE                 Branch Zero to Return
REP E10  9601 1001                 Turn on IOS Log Bit
REP E14  47F0 FA90                 Branch to Logout
****End of MVS Zap***  This Zap Tested OK on MVS R037

          SVS Zap Release 017E - - Not Tested at R017E
  Module IGE0300I
VER 31A  9103 A008  4770  F32C
VER 3A4  0008 000A  0000
REP 31E  47F0 F3AA                                  Branch to Patch
REP 3AA  9103 A008                                  Test O'Flo Log Bit
REP 3AE  4770 F32C   9120 A002   4780 F322         Test Sense Byte 0 Bus
         9601 A008   47F0 F32C                      Out Check. Branch NU to
                                                    Error Exception or IMM.
                                                    Branch to OBR.
**** End of Zap****  Not Tested at SVS Level R017E.
```

VS1 Zap Tested for Release 050 and 060

Module IGE0300I

VER	32A	4710	F33A	9103	A008	4770	F340
VER	3B8	0008	000A	0000			
REP	332	47F0	F3C0				
REP	3C0	9103	A008	4770	F340	9120	A002
		4780	F336	9601	A008	47F0	F340

*** End of Zaps*** This Zap Tested at R050 and R060.

System/370 Disconnect In - MP Hardware Error

3803 In Idle Scans - ALU1 or ALU2 Error

1. Disconnect in raised after op-in on next channel initiated sequence.
2. ALUs trap and restart the idle-scan loop. The error is saved in ALU1 local storage.
3. Unit check is presented in initial status of next SIO/TIO if not a sense command.
4. Bus-out check is set at sense time if the control unit is holding ALU error and no other bit is on in sense byte 0.

3803 Connected to the Channel

ALU2 Error:

1. Unit check is presented in initial status of next SIO/TIO if other than a sense command.
2. Disconnect in will not be enabled.
3. Bus-out check will be set at sense time if no other bit is on in sense byte 0.

ALU1 Error: (W/O ALU2 Error)

1. Disconnect-in is raised and an interface control check results. (Channel issues selective reset.)
2. Unit check is presented in initial status on next SIO/TIO if other than a sense command.
3. Bus-out check will be set at sense time if no other bit is on in sense byte 0.

Channel Errors Caused by "Disconnect-In" From 3803

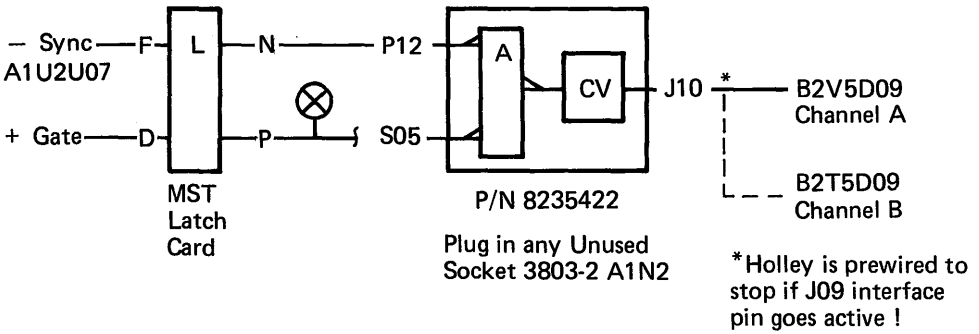
3803-1, 2 - Service Aid 5

The 3803 Models 1 and 2 present "disconnect-in" to the channel under either of the following two conditions provided "disconnect-in handling" is wired active (S/370 - see Installation Manual).

1. Any time an error (sense byte 11) occurs in ALU1.
2. When an error (sense byte 12) occurs in ALU2 while ALU2 is in IDLESCAN.

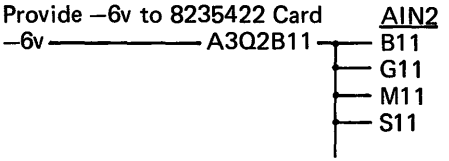
Note: If an ALU2 error occurs while ALU2 is in other than IDLESCAN, equipment check is set and "disconnect-in" is not presented to the channel.

Holley Monitor Trap
3803 Model 1/2



Use Tri-Leads for Backpanel

Provide –6v to 8235422 Card



Stop Holley Recording on Sync

Generally, the "disconnect-in" will not result in a 3803 OBR being logged. Consequently, sense bytes 11 and 12 cannot be observed for the cause of the ALU error.

In order to determine the cause of the ALU errors not logged in an OBR, any of the following can be used dependent upon your particular situation.

1. Enable the CE panel on the 3803 and activate *Stop on Control Check* switch. This will cause the 3803 to hard stop on the ALU error and you can see the cause in the CE panel lights. Set the ALU switch to ALU2 position first. If the customer experiences a "disconnect-in" error and you do not get a stop on the CE panel, set the switch to ALU1 and you should stop on the next hit.

   Note: Be aware that using this method to locate the ALU error will cause the customer to experience a job abort and/or system hang instead of a probable recoverable error when the ALU error occurs.

2. Use MST CE indicator latch card P/N 5851882 (see Tools and Test Equipment CEM 142) to monitor the individual ALU error bits. See 3803 Logic Pages AA461 and AB471.

3. When the 3803 brings up "disconnect-in", it also sets the bus-out check (byte 0, bit 2) and ALU hardware error (byte 4, bit 10) indicators on. These two bits are logged in the SDR counters as temporary errors.

We can therefore, temporarily - zap - the SDR software to assume that one of these two error counters is ready to overflow. This forces an OBR and allows observation of sense bytes 11 and 12. Either the "bus-out" or "ALU hardware" error can be used for the - zap -, however, the ALU hardware error bit is probably the best as errors other than ALU can cause bus-out checks. Shown on the next page are some examples (taken from APAR Y05729) of how such a - zap - has been generated to log on OBR on every bus-out error.

OS R217 and VS2 R016

Name	IGE03001	
VER	30A	4710F31A, 9103A008, 4770F320
VER	398	0008000A0000
REP	30E	47F0F39E
REP	39E	9103A008, 4770F320, 9120A002, 4780F316, 9601A008, 47F0F320

VS1 R030

Name	IGE03001	
VER	316	4710F326, 9103A008, 4770F326
VER	3A4	0008000A0000
REP	314	47F0F3AA
REP	3AA	9103A008, 4770F32C, 9120A002 4780F322, 9601A008, 47F0F32C

This -Zap- should be removed once the problem has been resolved.

3803 DC VOLTAGES

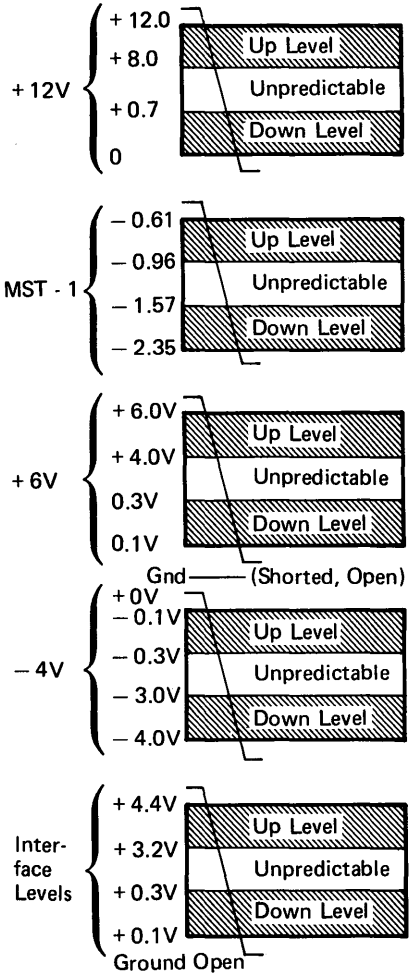
3803 Power Supply

Power Supply Value	Test Point	Ground
– 4V (±0.01V) See Note 1	B2S2M11	B2S2D08
+ 6V (±0.01V) See Note 1	A2T4B06	A2T4D08

Note:
1. Maximum allowable ripple for – 4V is 80 MV peak-to-peak and for + 6V it is 10 MV peak-to-peak.

CAUTION: Be sure to use a digital volt meter, P/Ns 453046, 453585, or equivalent when making adjustments and exercise all standard safety practices.

VOLTAGE SIGNAL LEVELS



MST - 1 Card	
Voltage	Card (Contact Tab)
+ 6	B11, G11, M11, and S11
– 4	B06, G06, M06, and S06
Ground	D08, J08, P08, and U08

ALD pages showing voltage distribution:
TCU = YF - XXX
ZV - XXX (Board Distribution)

Models 3, 5, 7	Models 4, 6, 8
YB - XXX	YF - XXX
ZT - XXX	ZT - XXX

3803 MOD 1 TO 2 - 6250 CONVERSION TIPS

The following are some hints for field conversion.

IMPORTANT:

- Follow the instructions in the conversion books very carefully.
- The majority of problems that occur after conversion result from cards or cables not seated correctly and dirty, bent or recessed pins.

Conversion Kits

I. Recommended actions prior to installing conversion kit.

A. General

1. The EC Checklist (3803 ECA 070)

   It is of the utmost importance that the EC checklist be correct. If it isn't you will get the wrong parts. Do a physical check of each E/C that is supposed to be installed.

2. The prerequisite E/Cs must be installed on the machine and the machine tested prior to installing the conversion kit.

3. RPQ, features

   – If features and/or RPQs were ordered for the 3803-1, 3420-3, 5, 7 they must be installed and operational before doing the conversion.

   – If features and/or RPQs were ordered for the 3803-2 configuration, they must be installed after the conversion is complete and operational.

4. Recommend the use of a Circuit Test Probe Part 453587 expedite verification that the adds and deletes are correct.

5. Ensure that you are familiar with the conversion instructions before starting. It is recommended that you read them at least once prior to starting the conversion.

6. Review ITIPs (and data bank) to become aware of problems that may be encountered during conversion.

7. Prior to installing logic cards and connectors make sure there are no broken or bent pins. Inspect for recessed or loose pins on the data cable connectors (channel-to-tape control unit and tape control unit to tape unit).

8. All connectors and logic cards installed/replaced as called out in the conversion should be "popped" (eg, seated, removed and re-seated) a few times to assure a good contact.

9. The installation of the auto cleaner does not eliminate the present head cleaning procedure.

10. See "Stress Tape P/N 1848621" section, page 21 of this guide.

B. Only the logic board and logic cards in the conversion kit have been tested on a "slave machine;" cables and jumpers have not.

C. Double check all card plugging to ensure that they reflect the converted status of the machine. The original serial number of the TU should be plugged, not the new model that it was converted to.

II. A. 3803 Conversion Hints.

1. If you have the 100 amp feature on the control unit, assure that the phases are wired correctly before applying power.

2. The voltage jumpers between the B2 and B3 boards should be checked to assure that they are not cross-wired before installing them.

3. When the channel interface adapter shoes are installed correctly you should not see the silver plating.

4. The 3803-2 dc voltages are more critical than the 3803-1. Check with a Digitec* voltmeter for:

+6V +0.010 Vdc
–4V +0.010 Vdc

5. The 3803-2 has a higher operating temperature than the 3803-1. Keep the logic board covers closed for better air circulation.

*Trademark of United Systems Corporation

3803 MOD 1 TO 2 - 6250 CONVERSION TIPS *(continued)*

6. When installing the channel flat cables in the B2 board, hold them firmly seated in the logic board while tightening the clamp.

3803 CONVERSION TIPS FROM DATA BANK

Model Conversion

Overrun errors, CRC checks when running from system. Okay offline.

FIX
Tie off had not been removed from data in line going to the interface.

Command status reject (EQ check) - converted Model 2 from Model 1. Tie up resistor P/N 25220936 at 01A-A2Q2 missing or mis-wired. Should be A2Q2U07 to A2Q2U08 per conversion instructions.

Equipment check caused by a command status reject on a 3803 M/D002 converted from a M/D001. Error occurs on any command that requires forward tape motion.

FIX
Tie up resistor P/N2520936 at 01A-A2Q2 missing or miswired. Should be A2Q2U07 to A2Q2U08 per conversion instructions, page 0400 step 45 and ALD Logic page AA411 Note 1.

Power-on reset B-bus parity errors ALU1 microprogram check ALU1=7FF ALU2=7FF when trying to go to drives microprogram check ALU1-301 B-bus parity ALU2=000. Problem could be made solid by varying 4-volt supply to 4.03V.

FIX
Install as required ECA 039 EC733838

The EC is an as required for a Mod 1 but this ECA is not available for a Model 2 3803. Therefore, if it is not installed prior to conversion, you may have this problem after conversion and the EC will be unavailable to you. See 3803 Tip 097 for further information on the card part numbers involved and the interchangeability problems caused by these cards. ECA 106 installs the new LSR cards on a 3803 Model 2.

Jumper assembly P/N 1766191 - there is an exposure that these jumpers may be wired incorrectly. To verify, refer to page 0140 in the 3803-1 to 3803-2 Conversion booklet. Item "G" gives installation details. The cables should be wired as illustrated on page 0140.

Plated channel interface connectors P/N 5529194 and 5529199 have to be installed during model conversion 1 to 2. In two cases we had intermittent microprogram detected errors with the system test ST370. The P/N 5529199 had caused the error. One or more signal connectors had wrongly contacted the plated area. The P/N 5529194 can have the same kind of error because it is the same design.

3803 CONVERSION TIPS FROM DATA BANK *(continued)*

A read command gives solid P comp check after installation of basic conversion B/M1765720. Offline read works okay.

FIX
Risk of error when using rework list 0400 of 3803 Conversion Instruction prior to EC737151. On machines without EC733814 rework of net FC261GL2 on board 01A-B2 should be made as follows:

Delete Probe Side:
K5B03
G5B09
R2D10

Add Nine Inches Long Wire:

From Pin	To Pin
C1D13	G5B09
G5B09	R2D10

SAGC burst is written in too high a density after model conversion. Inversed tape mark is missing.

Sense on write from load point is:

1044000000403B000808000000875A . . . .
Read operation in 6250 mode and read/write operation in PE mode runs error free. Microprogram detected error only on write in GCR mode.

FIX
Board Y1 yellow wire cold flow shortage. Ground level on line BW231GH6 name of signal –6250 mode.

3803 M/D002 Conversion B/M1767973
B/M1767973 calls out a jumper P/N 0184603. This part number is incorrect; it should be P/N 1847603.

Channel control checks channel timeout, CC3, various channel checks after conversion to M/D002.

Scope interface signals during initial selection.

FIX
Short between uninsulated pins in the new plated interface connectors P/N 5529194 and 5529199.

3803 CONVERSION TIPS FROM DATA BANK *(continued)*

3803 Model 1 to Model 2 pre-conversion checklist P/N 902-106 page 2/5 checkpoint information.

The checklists have to be implemented by physically checking the machine, not by checking machine histories.

Complementary checkpoint information is listed here under:

1. EC 733838: Include the following checkpoint to ECA 39 as an "AND" condition. Check resistor A2M2D08 to A2M2D13 and resistor B2E2M11 to B2E2P08.

2. EC 734821: Include the following checkpoint to ECA 42 as an "OR" condition: Power-on reset card P/N 375382 at EC level 136587 or REA 24-24075

3. Delete EC 733834 ECA 42. It is picked up by EC 733843 ECA 46.

4. EC 734289B ECA 64. This prereq EC is needed only when the –4 volts reg asm P/N 2521578 has regulator board with slotted holes for mounting capacitors C1, C2, and C4.

B2M2 P/N incorrect per EC 734874 checklist for conversion to 6250 bpi. Current plug chart in 3803 Volume 1 may reflect B2M2 to be P/N 8218309 at EC 733816, and P/N 8218365 at EC 733814. Your machine may contain P/N 8218307. B2M2 is P/N 8218307 at EC 733816A (ECA 015), and P/N 8218309 at EC 733816 (ECA 018).

Installation of EC 734873, which is prerequisite for 3803 Model 1 to Model 2 conversion may cause D-bus parity checks or microprogram hangup during power-on reset. This problem is corrected by EC 733838 ECA 039 which must be installed concurrently with EC 734873.

AAA – 3803 Model 1 to Model 2 conversion errors in rework instruction:

1. Page 0400 (XE200) salmon color at EC 734116 and REA 24-26625/24-26629. The deleted net FC261GL2 between K5B03 and G5-B09 is not a printed circuit. It is a yellow wire - this error will be corrected at EC 734877

2. Page 410 - board 01AB2 rework - net FC021GA4. Add must be read Q3D06 to P3D06 - Ensure this add is made.

3803 CONVERSION TIPS FROM DATA BANK *(continued)*

Cabling Requirements

The increased data rates of 6250 bpi call for shorter signal cables from the channel to the 3803-2. Intervening control units shorten the cables even more. For each intervening control unit, subtract 20 feet when Model 8 tape units are attached, and subtract 5 feet when Model 6 tape units are attached. When a 2914 channel switch is used to modify channel access to a 3803-2, subtract 40 feet. Measurements are based on a 3803-2 on the specified channel with at least one 3420 of the specified model attached.

Verify that the existing bus and tag cables are the proper lengths. If the cables you have exceed the allowable lengths, or do not match in length, order new cables. Cables of different lengths can cause timing differences.

The total cable length from a 3803 to any 3420 must not exceed 120 feet (tape unit to tape control plus the communicator cable). The maximum cable length from the tape control to the channel is 200 feet when 3420 Models 3, 5, and 7 are attached to a 3803 Model 2.

System	2860 3420-8	2880 3420-8	2860 3420-6	2880 3420-6	2860 3420-4	2880 3420-4
370-195	72	119	200	200	200	200
370-168	72	119	200	200	200	200
370-165-2	72	119	200	200	200	200
370-165	72	119	200	200	200	200
360-195	72	119	200	200	200	200
360-91	72	—	200	—	200	—
360-85	72	119	200	200	200	200
360-75	72	—	200	—	200	—
360-67/65*	72	—	200	—	200	—

	3420-8	3420-6	3420-4
370-158	103	200	200
370-155-2	103	200	200
370-155	103	200	200
370-145*	119	200	200
370-135*	72	200	200
360-50*	—	—	200

3803 PREVENTIVE MAINTENANCE SCHEDULE

3803 Control Unit

Code		Location Operation	Frequency	Action
U	R			
0		Air Filter	2 months	Check cooling air filter for restriction of air flow. Clean or replace as required.
2		dc voltage	6 months	Check dc voltages. Adjust as required to the levels specified on decals.

3803 SALES FEATURE CODES

	Feature Code	Description	Applies To: Model 1	Model 2	Model 3	ALL
Functional	3551	Dual Density	X		X	
	6148	Remote Switch Attachment	X	X		
	6408	Seven Track	X		X	
	8100	Two Channel Switch	X	X		
	9570	Single Density	X		X	
	See Chart A	Tape Switching	X	X		
Covers	9041	Red Covers				X
	9042	Yellow Covers				X
	9043	Blue Covers				X
	9045	Gray Covers				X
	9046	White Covers				X
PWR	9903	208 VAC Power				X
	9905	230 VAC Power				X
Functional	5310	9-TRK NRZI (6250 + 1600 + 800)		X		
	6320 (See Note)	7-TRK NRZI (800 + 556 + 200)		X		
	7850	2860 Channel Attachment		X		
	9181	First 2860 Channel		X		
	9182	Second 2860 Channel		X		
	9183	Third 2860 Channel		X		
PWR	9001	Required if More Than 6 Mod 8s		X		

Note: Feature Code 5310 must be installed prior to installing Feature Code 6320.

3803 SALES FEATURE CODES *(continued)*

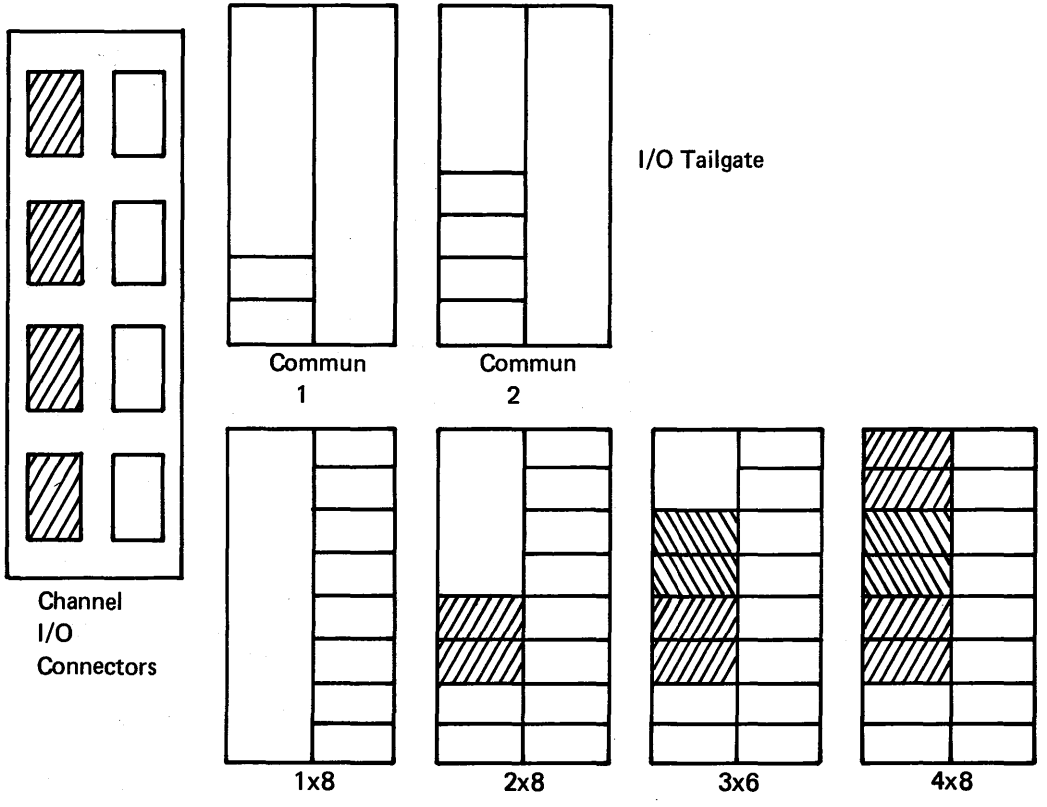
Chart A – Tape Switching Feature

Switch Options	Features Required	Feature Numbers			
		On 1st 3803	On 2nd 3803	On 3rd 3803	On 4th 3803
2 x 8	Communicator 1-2	9071	9071	–	–
	2 Control Switch	1792	–	–	–
3 x 8	Communicator 1-2	9071	9071	9071	–
	3 Control Switch	1793	–	–	–
4 x 8	Communicator 1-2	9071	9071	9071	9071
	4 Control Switch	1794	–	–	–
2 x 16	Communicator 1-2	9071	9071	–	–
	2 Control Switch	1792	1792	–	–
3 x 16	Communicator 1-2	9071	9071	–	–
	Communicator 3-4	–	–	9073	–
	3 Control Switch	1793	1793	–	–
4 x 16	Communicator 1-2	9071	9071	–	–
	Communicator 3-4	–	–	9073	9073
	4 Control Switch	1794	1794	–	–

3803-1 FEATURE IDENTIFIER

Feature	Identification
9-Track NRZI	Check for a card in location A1-N2 with A1 board P/N 2521390
7-Track NRZI	A1 board will have P/N 2521386
2-Channel Switch (MIS) .	Check for 8-channel I/O connectors
Communicator 1	Check for only two light gray I/O connectors on the left side of I/O tailgate
Communicator 2	Check for four light gray I/O connectors on the left side of I/O tailgate
1 x 8	Nothing will be on left side of I/O tailgate
2 x 8	Check for two light and two dark I/O connectors on the left side of I/O tailgate
3 x 8	Check for two light and four dark I/O connectors on the left side of I/O tailgate
4 x 8	Check for two light and six dark I/O connectors on the left side of I/O tailgate

Note: Only RPQ machines may have both the 9-track NRZI and the 7-track NRZI feature.



3803s with RPQs

Machines with RPQs installed have special "version" pages for logics impacted by the RPQ. The following list shows this version number (which is found in the lower right corner of those pages affected), along with a cross-reference to its applicable RPQ number.

Version Number	Title	RPQ Number
007	7 Track Basic	None
054	Remote Channel Switch	870054
069	Force NRZI Write	EB7207
079	7 & 9 Track Compatibility	870046
101	Character Insert (single or dual density)	870053
A17	Character Insert (7 trk machine)	870053
A19	Character Insert (with 9 trk 200 machine)	870053
B11	Character Insert (with 7 and 9 trk)	870053
209	9 trk-200 BPI Read/Write	870043
A27	7 trk-200 BPI Read/Write	870045
A37	7 trk-200 on 7 and 9 trk	870057
409	Set Density	WD1834
100	Read Special Tape Mark	S10079
B37 and 179	Sage Mode on 7 and 9 trk with 7 trk 200	EB7322

3803-1 FEATURE INSTALLATION TIMES

COM1=Communicator 1
COM2=Communicator 2
PE=Phase Encode
7TK=Seven-Track
2X8=2 Control Switch
3X8=3 Control Switch
4X8=4 Control Switch

FC=Feature Code MIS=2-Channel Switch
DD=Dual Density (PE and 9TK NRZI)
SL=Selection Logic (1X8)

3803 Model 1 Feature Times

FC	B/M Number	Title	Mach	Sys
6148	B/M2517155	Install Remote Chan Sw	03.9	0.1
6148	B/M2517163	Remove Remote Channel Sw	03.9	0.1
8100	B/M2520827	DD W/MIS to DD W/O MIS	03.0	0.6
1792	B/M2520832	Convert 1X8 to 2X8 W/COM1	06.0	0.9
1793	B/M2520833	Convert 1X8 to 3X8 W/COM1	07.8	0.9
1794	B/M2520834	Convert 1X8 to 4X8 W/COM1	07.9	0.9
	B/M2520836	7TK W/O MIS to 9TK W/MIS	05.7	0.6
	B/M2520837	7TK W/O MIS to 9TK W/MIS	05.7	0.6
	B/M2520838	9TK W/O MIS to 7TK W/MIS	05.7	0.6
	B/M2520839	DD W/O MIS to PE W/MIS	04.2	0.6
	B/M2520840	PE W/O MIS to 7TK W/MIS	05.7	0.6
8100	B/M2520848	PE W/O MIS to PE W/MIS	04.1	0.9
	B/M2520849	PE W/MIS to PE W/O MIS	03.0	0.6
	B/M2520851	PE W/O MIS to DD W/MIS	04.2	0.6
	B/M2520852	PE W/O MIS to DD W/O MIS	01.7	0.6
	B/M2520853	PE W/MIS to DD W/MIS	01.7	0.6
	B/M2520854	PE W/MIS to DD W/O MIS	04.2	0.6
6408	B/M2520860	PE W/O MIS to 7TK W/O MIS	03.8	0.6
	B/M2521340	PE W/MIS to 7TK W/MIS	03.8	0.6
	B/M2521341	PE W/MIS to 7TK W/O MIS	05.7	0.9
	B/M2521345	DD W/O MIS to DD W/MIS	04.1	0.9
	B/M2521350	COM2 to 2X8 with COM1	10.0	0.9
9073	B/M2521351	COM2 to 3X8 with COM1	09.0	0.9
	B/M2521352	COM2 to 4X8 with COM1	11.4	0.9

3803-1 FEATURE INSTALLATION TIMES *(continued)*

FC	B/M Number	Title	Mach	Sys
9073	B/M2521353	Convert COM2 to SL (1X8)	05.6	0.4
9071	B/M2521354	Convert 1X8 to COM1	03.6	0.4
9073	B/M2521355	Convert 1X8 to COM2	03.6	0.4
	B/M2521356	Convert 2X8 with COM1 to 1X8	04.0	0.9
1793	B/M2521357	Convert 2X8 to 3X8	08.5	1.5
1794	B/M2521358	Convert 2X8 to 4X8	09.0	1.5
9071	B/M2521359	3X8 W/COM to 1X8 W/O COM1	05.4	0.7
1792	B/M2521360	Convert 3X8 to 2X8	05.0	1.3
1794	B/M2521361	Convert 3X8 to 4X8	05.3	0.9
9071	B/M2521362	Convert 4X8 W/COM1 to 1X8	05.7	0.7
1792	B/M2521363	Convert 4X8 to 2X8	05.5	1.3
1793	B/M2521364	Convert 4X8 to 3X8	02.1	0.9
9073	B/M2521365	Remove 2X8 W/COM1, add COM2	03.5	0.9
9073	B/M2521366	Remove 3X8, Install COM2	03.6	0.9
9073	B/M2521367	Remove 4X8, Install COM2	03.7	0.9
	B/M2521368	Convert COM1 to SL (1X8)	05.6	0.4
9073	B/M2521369	Convert COM1 to COM2	02.6	0.4
1792	B/M2521370	Convert COM1 to 2X8	08.5	0.9
1793	B/M2521371	Convert COM1 to 3X8 W/COM1	09.0	0.9
1794	B/M2521372	Convert COM1 to 4X8 W/COM1	11.4	0.9
9071	B/M2521373	Convert COM2 to COM1	02.8	0.2
9071	B/M2521374	Remove 2X8, Install COM1	03.5	0.9
9071	B/M2521375	Remove 3X8, Install COM1	03.5	0.9
1794	B/M2521376	Remove 4X8, Install COM1	03.7	0.9
9570	B/M2521377	DD W/O MIS to PE W/O MIS	01.7	0.6
9570	B/M2521378	DD W/MIS to PE W/MIS	01.7	0.6
9570	B/M2521379	9TK NRZI W/MIS to PE W/O MIS	04.2	0.6
3551	B/M2521639	7TK W/MIS to 9TK W/O MIS	05.7	0.6
8100	B/M2521640	7TK W/O MIS to 7TK W/MIS	04.1	0.9
8100	B/M2521641	7TK W/MIS to 7TK W/O MIS	03.0	0.6
	B/M2521642	Logic for 7TK to 9TK		
6408	B/M2521630	NRZI W/O MIS to 7TK W/O MIS	03.2	0.6
6408	B/M2521631	DD W/MIS to 7TK W/MIS	03.8	0.6
6408	B/M2521632	DD W/MIS to 7TK W/O MIS	05.7	0.6
	B/M2521633	Logic for 9TK to 7TK		
9570	B/M2521634	7TK W/O MIS to PE W/O MIS	03.8	0.6
9570	B/M2521635	7TK W/MIS to PE W/MIS	03.2	0.6
9570	B/M2521636	7TK W/MIS to PE W/O MIS	05.7	0.6
3551	B/M2521637	7TK W/O MIS to DD W/O MIS	03.2	0.6
2551	B/M2521638	7TK W/MIS to DD W/MIS	03.8	0.6

3803-1 FEATURE INSTALLATION TIMES *(continued)*

3803 Model 1 Feature Times W/O EC733814

FC	B/M Number	Title	Mach	Sys
3551	B/M2524289	PE W/MIS to DD W/O MIST	04.2	0.6
6408	B/M2524290	PE W/MIS to 7TK W/O MIS	05.7	0.9
	B/M2524291	DD W/O MIS to DD W/MIS	04.1	0.9
9570	B/M2524292	9TK NRZI W/MIS to PE W/O MIS	04.2	0.6
6408	B/M2524293	DD W/MIS to 7TK W/O MIS	05.7	0.6
9570	B/M2524294	7TK W/MIS to PE W/O MIS	05.7	0.6
3551	B/M2524295	7TK W/MIS to 9 NRZI W/O MIS	05.7	0.6
8100	B/M2524296	7TK W/O MIS to 7TK W/MIS	04.1	0.9
	B/M2524280	DD W/MIS to DD W/O MIS	03.0	0.6
8100	B/M2524281	7TK W/O MIS to 9TK W/MIS	05.7	0.6
8100	B/M2524282	7TK W/O MIS to 9TK PE W/MIS	05.7	0.6
8100	B/M2524283	9TK NRZI W/O MIS to 7TK W/MIS	05.7	0.6
8100	B/M2524284	DD W/O MIS to PE W/MIS	04.2	0.6
	B/M2524285	9TK PE W/O MIS to 7TK W/MIS	05.7	0.6
	B/M2524286	9TK PE W/O MIS to 9 PE W/MIS	04.1	0.9
8100	B/M2524287	PE W/MIS to PE W/O MIS	03.0	0.6
	B/M2524288	PE W/O MIS to DD W/MIS	04.2	0.6
8100	B/M2524297	7TK W/MIS to 7TK W/O MIS	03.0	0.6
	B/M2524611	Voltage Conversion	02.5	0.0

3803-2 FEATURE INSTALLATION TIMES

COM1=Communicator 1
COM2=Communicator 2
PE=Phase Encode
7TK=Seven-Track
2X8=2 Control Switch
3X8=3 Control Switch
4X8=4 Control Switch
FC=Feature Code
DD=Dual Density (PE and 9TK NRZI)
SL=Selection Logic (1X8)
9TK=Nine-Track NRZI
MIS=2-Channel Switch
Aux Gate=Gate on the side of 3803 field converted from a Model 1 to a Model 2. It is one board in size.

3803 Model 2 Features

FC	B/M Number	Title	Mach	Sys
	B/M1766197	Install 100 Amp Service		
	B/M1766249			
	B/M1766250			
	B/M1766257			
	B/M1766259		02.0	0.5
	B/M1766253	Remove 100 Amp Service		
	B/M1766254			
	B/M1766258		02.0	0.5
	B/M2524611	AC Voltage Conversion	02.5	0.2
	B/M1766248	DC Voltage Conversion	03.9	0.2
8100	B/M1767978	Install MIS W/EC733814	04.1	0.9
	B/M1767979	Remove MIS W/EC733814	03.0	0.6
5310	B/M1846295	Install 9TK NRZI	00.7	0.5
	B/M1846297	Remove 9TK NRZI	00.7	0.5
6320	B/M1846298	Add 7TK to 9TK NRZI	00.7	0.5
	B/M1846300	Remove 7TK NRZI	00.7	0.5
9071	B/M1846301	Convert SL (1X8) to COM1	03.6	0.4
9073	B/M1846302	Convert SL (1X8) to COM2	03.6	0.4
1792	B/M1846303	Convert SL to 2X8 with COM1	06.0	0.9
1793	B/M1846304	Convert SL to 3X8 with COM1	08.0	0.9
1793	B/M1846306	Same as above, for Aux Gate	07.3	0.9
1794	B/M1846307	Convert 1X8 to 4X8 with COM1	09.4	0.9
1794	B/M1846309	Same as above, for Aux Gate	07.9	0.9
	B/M1846311	Convert COM1 to (1X8)	05.6	0.4
1792	B/M1846312	Convert COM1 to 2X8 with COM1	08.5	0.9
1793	B/M1846313	Convert COM1 to 3X8 with COM1	11.4	0.9

3803-2 FEATURE INSTALLATION TIMES *(continued)*

FC	B/M Number	Title	Mach	Sys
1793	B/M1846315	Same as above, with Aux Gate	09.9	0.9
1794	B/M1846316	Convert COM1 to 4X8 with COM1	12.9	0.9
1794	B/M1846318	Same as above, with Aux Gate	11.4	0.9
	B/M1846320	Remove MIS W/O EC733814	03.0	0.6
	B/M1846321	Convert COM2 to SL (1X8)	05.6	0.5
1791	B/M1846322	Convert COM2 to 2X8 with COM1	10.0	0.9
1793	B/M1846323	Convert COM2 to 3X8 with COM1	11.4	0.9
1793	B/M1846325	Same as above, with Aux Gate	09.9	0.9
1794	B/M1846326	Convert COM2 to 4X8 with COM1	13.4	0.9
1794	B/M1846328	Same as above, with Aux Gate	11.4	0.9
9071	B/M1846329	Remove 2X8, Install COM1	03.5	0.9
	B/M1846330	2X8 to a 1X8, Remove COM1	04.0	0.9
9073	B/M1846331	Remove 2X8, COM1, Add COM2	03.5	0.9
1793	B/M1846332	Convert 2X8 to 3X8	10.0	1.5
9071	B/M1846333	Convert COM2 to COM1	02.8	0.2
1793	B/M1846334	Same as 1846332 but Aux Gate	08.5	1.5
1794	B/M1846335	Convert 2X8 to 4X8	10.5	1.5
9073	B/M1846336	Convert COM1 to COM2	02.6	0.4
1794	B/M1846337	Same as B/M1846335 but Aux Gate	09.0	1.5
9071	B/M1846338	Remove 3X8, Install COM1	03.6	0.9
	B/M1846339	3X8 to 1X8, Remove COM1	05.4	0.9
	B/M1846340	Remove 3X8 with COM1, Install COM2	03.6	0.9
1792	B/M1846341	Convert 3X8 to 2X8	05.0	1.3
1794	B/M1846342	Convert 3X8 to 4X8	05.3	0.9
9071	B/M1846343	Remove 4X8 + COM1, Add COM1	03.7	0.9
	B/M1846344	Convert 4X8 + COM1 to 1X8	05.7	0.7
9073	B/M1846345	Remove 4X8, Install COM2	03.7	0.9
1792	B/M1846346	Convert 4X8 to 2X8	05.5	1.3
1793	B/M1846347	Convert 4X8 to 3X8	02.1	0.9
	B/M1846348	Install MIS W/O EC733814	04.1	0.9
6148	B/M1848592	Remove Remote Channel Switch	03.9	0.1
	B/M1848603	Install Remote Channel Switch	03.9	0.1

3803 ECA CHECKLIST

ECA	EC	E/A	Description	Checkpoint
001	733766V	E	Release to manufacturing	None
002	733801	E	Basic sys paper cleanup and 24 wire panel rework C-test exit	Check for wire or land from 01A-A2C5D12 to 01A-A2C5D10
003	733820	E	Pathfinder manual update	Check EC level or pathfinder.
004	733821	A	Mechanical (cable retention) provide a more positive clamping system for retention of coaxial I/O cables with EC 733763 (E008)	Check for four U-clamps holding coaxial interface cables plugged into 01A-B2 board.
005	733809	E	Paper only to reflect 7-track	Check EC 733809 on logic page QB101.
006	733700	E	Power on/off sequence decal	Check for mainline switch decal at EC 734700.
007	733810	E	Sys logic update (REAs 24-22893, 24-22906, 24-22907, 908, 909, 911, and 24-22919	Check for wire 01A-A2T2D09 to 01A-A2U5D13.
008	733763C	A	Mechanical brackets (mach prior to 11000)	Check for U-shape bracket cover, above and below B2 board where the interface cables are plugged.
009	733806C	E	Supply one page of micro programming.	Check existence of microcode page 60A of P/N 2521022.
010	733819	A	Provides parts to change rear machine cover roller from brass to rubber and includes slider springs to prevent ESD interference	Check for brass slider springs on rear machine cover.
011	733826	A	MST-A Alt path switching hangup	Check 01A-B2H2 at EC 733816. Refer to card location list for card EC level.
012	733827	A	Correct check character spacing on NRZI write tape mark. (Both 7 and 9-track NRZI)	Check 01A-A2H2. Refer to card location list for card EC level.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
013	733823	A	Mechanical and ESD	Check for ground wire on left side cover (facing wiring side of machine) closest to interface cables from hinge bracket to cover.
014	733804	A	Replace crosspoint switch cards with ones having a more stringent card test, but of the same part number.	None
015	733816A	E	Board wiring (REAs 24-22946, 22937, 22984). Prior to SN 11000.	Check for wire on 01A2 board from H5D11 to H3D05.
016	733815	E	7-track C-test exit. Logic only.	Check EC level of logic page RD171.
017	733147	A	-RPQ machines only- Supply logic pages to machines W/O RPQ 870054.	Check EC level of logic page AA003.
018	733816	E	REAs for emulator, 145 attach, disable ripple at bus in times for CE operation while the interface was enabled, overrun.	Check for wire on 01A1 board from H3B10 to L2B05.
019	733141	A	-RPQ machines only- Supply logic to machines W/O RPQ 870053.	Check for this EC on logic page AA001, AA002, and AA003.
020	733804A	E	New plug list for A3 and B3 boards.	Check for this EC on plug list AA009.
021	733143	A	Supply logic pages AA001 and AA003 to machines W/O RPQ 870045.	Check for this EC on logic page AA001 and AA033. (See ECA notice.)
022	733824	E	7-track C-test exit. Logic only.	Check EC level of logic page RD211.
023	733830	E	Pathfinder manual update.	Check pathfinder EC level.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
024	733814	A	New B2 board to meet 370 requirements.	Check 01A-B2 panel for +6V gold rail connecting B11 pins: with 733814 – B2N2B11 to M2B11 W/O 733814 – B2N2B11 to L2B11.
025	733146	A	- RPQ machines only - Provide logic pages for machines with RPQ 870043.	Check EC level of logic page PR161 P/N 2516824.
026	733835	E	Correct system hang condition for lost device end associated with load check interrupt and anticipated mounts. (Prerequisite to E046.)	Check 01A-A2Q2. Refer to card location list for card EC level.
027	733828	A	Increase PE skew handling capability. (REA 24-24002). (Prerequisite to E046)	Check 01A-A1H2. Refer to card location list for card EC level.
028	733829	E	Correct problem when a one-bit splash occurs in the IBG. (Picked up by E031 and E040.)	Check 01A-A1C2. Refer to card location list for card EC level.
029	734235	E	Improve –4V regulator board (picked up by E035).	Check for resistors R9 and R10 on –4V regulator board A2.
030	733831	A	Basic system - 7 and 9-track NRZI read (REA 24-24012). Correct noise detection on tracks 3, 4, and 6 for NRZI read W/EC 733816.	Check 01A-A1L2. Refer to card location list for card EC level.
031	733833	E	Envelope checks with switching speed or detection from Mod 5 to 3 or 7. W/733810 incorporates E028. (Picked up by E040.)	Check 01A-A1C2. Refer to card location list for card EC level.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
032	733834	A	Prevent ALU2 hang in velocity routine when crease is encountered in preamble of PE data; Gate line 'block' with move tag (REAs 24-24013, 19, 22, and 24-24023). (Prerequisite to ECA 046.)	Check for wire from A2E4D13 to A2U1D13.
033	733148	E	Replaces 7-track and 9-track RPQ cards on machines at 733145 level. RPQ 870046.	Check 01A-A1M2. Refer to card location list for card EC level.
034	733817	E	- Paper only - Supply logic to allow plugging or equivalent imbedded cards.	Check EC level or logic.
035	734247	E	Power supply logic only (composite with E029).	Check for EC 734247 on power supply logic page YF031.
036	733841	E	Tie down unused net to prevent noise from causing ROS errors. (REA 24-24058)	Check for tiedown resistor P/N 2520942 (yellow) from A2H2S10 to A2H2506.
037	733840	E	Pathfinder update	Check EC level of pathfinder.
038	734287	E	Torque screws on capacitors in the power supply.	Assure –4V power supply mounting capacitor screws are tightened.
039	733838	A	Allow plugging of cost reduced ALU cards. (RE (REAs 24-24051 and 24-24054)	Check for resistor from A2M2D08 to A2M2D13, and B2E2M11 to B2E2P08.
040	733839	E	Decrease excessive write errors caused by temperature sensitive cards. Obsolete P/N 8218373 and 8218374. (REAs 24-24081 and 24082) (composites ECA 028 and 031).	Check 01A-A1C2. Refer to card location list for card EC level.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
041	734299	E	Paper only - power supply.	Check logic page YF030 for this EC.
042	734281	E	Correct random power-on resets. Reduce ESD exposure by a capacitor change +6 volt regulator SMS card.	Check for EC 734281 label on top of DC box or check power-on reset card P/N 375382 for EC 136587 or REA 24-24075.
043	733837	A	Clock card tie-ups prevent noise from stopping ALU with EC 733816. Pick up usage of card P/N 8218344. (Picked up by E069).	Check 01A-A2K2. Refer to card location list for card EC level
044	733842	E	Reset RDD by –2 time so as not to set lost byte latch with 7-track W/EC 733824. Also corrects several other problems. (See EC listing.)	Check for yellow wire from: 01A-A1Q2B11 to 01A-A1Q2D07.
045	733152	E	- RPQ machines only - Corrects LRC spacing 200 bpi RPQ 870045.	Check 01A-A1J2. Refer to card location list for card EC level.
046	733843	E	Lost record due to creased tape. (ECAs 026, 027, and 032 are prerequisites)	Check 01A-A2Q2. Refer to card location list for card EC level
047	733844	E	Improve interface ground integrity. (ESD) (REAs 24-24070 electrical REA 24-24077) mechanical add foam in cable raceways.	Check for wire from 01A-B2U5B07 to 01A-B2V5B07. Raw board EC levels of 732387 and 732391 do not have wire. All machines should have foam in raceway.
048	733847	E	Allow device partitioning without stopping data processing (tie up the clock out line device interface). REA 24-24084 (picked up by E050).	Check for tie-up resistor from 01A-B2Q2D08 to 01A-B2Q2B04.
049	733154	E	- RPQ 870053 - Correct lost byte checks on character insert.	Check 01A-A1S2. Refer to card location list for card EC level.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
050	733848	E	Allow enabling of PE ID burst checking. Provide availability to check PE ID burst at the CE's option.	Check for yellow wire from 01A-A1L5D11 to 01A-A1G3B07.
051	733155	A	- RPQ 870046 - 7-track and 9-track 200 bpi paper only.	Check for yellow wire from 01A-A1N2D09 to 01A-A1P3D12.
052	733852	A	Change write timing on LSR store operation. Correct E039. (Picked up by E069.)	Check 01A-A2K2. Refer to card location list for card EC level.
053	– – –	–	World Trade Only (Same as domestic ECA 040.)	– – – – – – – – – – – –
054	734466	E	Released the tools for the installation of the 3420 new reel latch.	Check for the reel latch tools called out in 3420 ECA E033.
055	734501	E	Installs a plastic insulator on top of the fan guards in the power supply.	Check for this insulator.
056	734753	E	Released new tape unit cleaning procedure and updated operator's guide.	Ensure the use of the 3420 cleaning procedure - SY32-5033-0.
057	733853	A	Correct NRZI write lost byte when an oxide void occurs on tape during a write.	Check 01A-A1P2. Refer to card location list for card EC level.
058	733854	E	Update to switch chart and reference pages.	Check EC level of logic page XC701.
059	733853A	A	Correct logic pages released on E057. (Picked up by E063)	Check logic page XN141 for EC 733853A.
060	734503	A	Circuit protector change from 10A to 15A for CP17.	Check CP17 for 15 amp breaker in top of ac box.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
061	733850	E	Pathfinder Manual update.	Check Pathfinder EC level.
062	733856	A	Excessive read VRC errors (NRZI Op) REAs 24-24092 (0 Tk) 24-24093 (imbedded card), 24-24094 (7-track). 24-24095 (RPQ card).	Check 01A-A1Q2. Refer to card location list for card EC level.
063	734867	A	LWR-NRZI diagnostic 'K' fails with read VRC errors (correct 733853) REAs 24-24100 and 24-24101. Mandatory with E057 (composites E057 and E059).	Check 01A-A1P2. Refer to card location list for card EC level.
064	734289B	E	Improve the electrical and mechanical connection of the filter capacitors of the –4V reg board. Mandatory on machines W/O EC 734512.	Check for a zinc coated copper clip in the slotted holes for the mounting of capacitors in the –4V power supply. Round mounting holes do not need EC.
065	734869	A	Clock card-ESD. (Clock ESD) (REA 24-24102) (Picked up by E069).	Check 01A-B2F2. Refer to card location list for card EC level.
066	734866	A	Correct improper handling of creases (or contamination which appears as a crease) during some tape operations. Corrects 733843.	Check 01A-A1H2. Refer to card location list for card EC level.
067	733174	E	Correct intermittent C-compare errors on 3803-1 with RPQ 870046.	Check 01A-A1H2. Refer to card location list for card EC level.
068	734872	A	Rewire 01A-B2 board to meet interface specs on machines with EC 733814.	Check for yellow wire from 01A-B2V2D09 to 01A-B2U2D09.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
069	734873	A	Extend sample of incremented IC address during long ALU cycles to eliminate wrong branches. (Composites E043, E052, and E065)	Check 01A-A2K2. Refer to card location list for card EC level.
070	733874	E/A	EC identifier list essential only for machines requiring the 6250 bpi feature.	None
071	735961A	E	Update logics to include replaceable parts in order that power supply asms can be removed from the parts catalog.	Check for EC 735961 or higher on logic page YF036.
072	733198	E	Eliminate compatibility problems between RPQ ME0704 and basic 3803-1 machine features.	Check for card P/N 8218281 in location A-A1B4 and wire from A-A1L3B03 to A-A1B4B07.
073	905986	–	World Trade Only	– – – – – – – – – – – – –
074	734098	E	Established level of box for 'C' exit.	3803-2 - Check logic for EC 734098 or higher.
075	734112	E	Meet 'C' test exit objectives.	Check MLM for 3803-2 page 90-120 for EC 734112 or higher.
076	734111	E	Reduce ESD, I/O channel connector block.	Look for plated connectors for channel interface shoes.
077	734120	E	Reduce flat cable damage during shipment.	Check for screws in the back of the channel I/O shoes to hold the adaptors in place.
078	734099A	E	World Trade Only	– – – – – – – – – – – – –
079	3803-2 734879 3803-1 734878	E A	Correct 237 abends due to unexpected interrupt with zero status and other conditions.	Check for P/N 8232753 in 01A-A2T2.
080	734875	A	Release RPQ S10112 velocity retry extension.	3803-1 and 3803-2 check for P/N 8232752 in 01A-A2G2.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
081	736697	E	Eliminate false errors when a write tape mark command is issued.	3803-2 - Check for card P/N 8237119 in 01A-A2H2.
082	736699	E	Correct tape runaway condition.	3803-2 - Check for continuity between X-Y1T2B07, X-Y1T3011 and X-Y1T5B02.
083	734877A 734877B	E E	Logic update not picked up on parent E/C 734877.	3803-2 - Check logic page FC261 for EC 734877A or higher level. (It should be a white page.)
084	734882	E	Pathfinder manual update.	3803-1 and 3420 - Check Pathfinder for addendum P/N 2517072 at EC 734882.
085	736693	E	Improve –4V regulation on the power supply.	3803-2 - On 3803-2 1X8, check for .16 Ohm resistor R8 P/N 2521454 on regulator board A2.
086	736698	E	MLM update.	3803-2 and 3420 - Check MLM for EC 736698 or higher on page 00-005.
087	736934	E	Improve –4V regulation.	3803-1 - Jumpers added from heatsink to –4V caps (–) side to C1, C2.
088	736678C	A	Improve electrical connection from the secondary of the ferro transformer to the –4V regulator board assemblies.	3803-1 - Check for round cables from A1 and A2 –4V regulator boards to the ferro transformer.
089	737145 736701	E	Correct subsystem failures (digital information received from tape unit during read track detection). PE clip level controls are changed.	3803-2 - Check for card P/N 8237126 in location X-Y102.
090	– – –	–	World Trade Only	– – – – – – – – – – – –
091	– – –	–	World Trade Only	– – – – – – – – – – – –

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
092	735164	E	MLM update.	3803-2 and 3420 - Check MLM page 00-005 for EC 735144 or higher EC.
093	735170	E	Pathfinder update to reduce maintenance on capstan tachometer.	3803-1 - Check Pathfinder page 6-160 for EC 735170 or higher EC level.
094	736939	E/A	3803-1 as required, 3803-2 essential - Change value of frequency compensating capacitor on +6V and –4V SMS regulator cards. Eliminate 1kHz/120 MV of ripple onset at high temperature.	3803-1 and 2 - Check the –4 and +6V regulator card for EC 736939.
095	736940	E	Provide an improved bracket for the mounting of 20A circuit breaker.	Remove cover to access rear of 20 amp CB located below the power sequence switches. Check for a one piece bracket that encompasses the 20 amp CB.
096	443802	E	MLM udpate.	Check page 00-010 for EC 443802.
097	906517	–	World Trade Only	– – – – – – – – – – – –
098	– – –	–	World Trade Only	– – – – – – – – – – – –
099	443885	–	Cancelled	– – – – – – – – – – – –
100	443901	A	Provides plated connectors in 01T gate for drive cable attachment to minimize ESD problems.	Check for plated connectors in 01T gate (drive connectors).
101	443902	A	Adds plated I/O channel connector block between the internal coax connector and the external channel cable.	Check for plated connector (open 3803 side cover to check).
102	733226	E	Prevents erroneous correction of track 0 when a tie byte of 03 is indicated.	Check for card P/N 8237131 at location Y1D2.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
103	443805	E	MLM update to reflect changes made as a result of ECA 086.	Check MLM 08-350 for EC 443805.
104	443803	E	Replace entire Pathfinder.	Check Pathfinder for EC 443803.
105	449058	E	Safety change provides visual verification of the installation of four jumpers provided by ECA 087.	None
106	449048	E	Eliminates "B"-bus parity errors, IFCCs, ALU1 and ALU2 hangs, and clock card failure indications.	Check for resistors (P/N 2520936) (blue): A-A2M2D13 to A-A2M2D08 A-B2E2M11 to A-B2E2P08
107	448502	–	Established factory first customer ship level for 3803 Model 3. The Model 3 attaches to the 3115/3125 MTA only.	None
108	448503	E	Provides MSTA (ROS 1) cards to update 3803-3 microcode.	Check for card P/N 8252044 in location 01A-B2H2.
109	– – –	–	World Trade Only	– – – – – – – – – – – –
110	443804	E	Update 3803-2 MLM to EC 443804 level.	Check MLM page PLAN 6 for EC 443804.
111	449064	A	Decreases possibility of temporary read errors in 6250 mode when the capstan is not kept properly cleaned. This is an (8) eight-word patch.	Check for microcode patch card (P/N 8215414) in location 01A-A2G2. If none, EC is not installed. If card exists see MLM 80-030. If ⑤ is plugged "7BB" and ⑥ is plugged "67BD" then EC is installed.

3803 ECA CHECKLIST *(continued)*

ECA	EC	E/A	Description	Checkpoint
112	448505	E	Prevents system from locking up when reporting an uncorrectable data error on a channel control check during paging or a halt.	01A-B2M2 is P/N 8252126 and logic AA003 at EC 448505.
113	845987	E	Logic update; replace logic page YF037 at EC 449058 with the correct P/N for the model of 3803.	YF037 at P/N 2521590 for a Mod 1. YF037 at P/N 1766283 for a Mod 2.
114	449066A		World Trade Only	----------
115			Reserved	
116	845958	E	MLM Update	Maintenance Logic Manuals dated 9/1/79 EC 845958.

BIBLIOGRAPHY

IBM 3803-1/3420 Magnetic Tape Subsystems; Component Description, Order Number GA32-0020, for functional descriptions of the IBM 3803-1 Control Unit and the IBM 3420 Magnetic Tape Units, Models 3, 5, and 7.

IBM 3803-2/3420 Magnetic Tape Subsystems; Subsystem Description, Order Number GA32-0021, for functional descriptions of the IBM 3803-2 Control Unit and the IBM 3420 Magnetic Tape Units, Models 4, 6, and 8.

IBM System/360 and System/370 Magnetic Tape Units and Controls; Physical Planning Template, Order Number GX22-6855, for information and diagrams regarding installation of the IBM 3803-3420 Magnetic Tape Subsystem.

IBM 3803-1/3420 Magnetic Tape Subsystem; Installation Manual, Order Number SY32-5026, for information and checklists for field installation and checkout of the subsystem.

IBM 3420 Operator's Guide Card, Order Number G232-0003, for information about operating the tape units.

IBM System/360/370 Reference Data; 2401-2402, 2415, 3410-3411, and 3420 Magnetic Tape Units, Order Number GX35-5001, for guidelines for estimating tape processing times and block capacities.

IBM 3803-1/3420 Magnetic Tape Subsystem; Theory-Diagrams Manual, Order Number SY32-5024, for a training guide for the subsystem's principles of operation and for diagrams relating to training and maintenance.

IBM 3803 Tape Control Model 1 to Model 2 and IBM 3420 Magnetic Tape Models 3 Through 8 Customer Conversion Guide, Order Number GA32-0023.

IBM Field Engineering; Theory of Operation; Tape Subsystem Error Recording and Analysis, Order Number SY32-5015, for an understanding of statistical error data recording programs and their messages.

IBM 3803 Magnetic Tape Subsystem, Illustrated Parts Catalog, Order Number S132-0004, for listing and illustrations of all parts and assemblies in the control unit.

IBM 3420 Magnetic Tape Unit, Models 3, 5, and 7; Parts Catalog, Order Number S132-0005, for listings and illustrations of all parts and assemblies in Models 3, 5, and 7, of the tape unit.

IBM 3420 Magnetic Tape Unit, Models 4, 6, and 8; Parts Catalog, Order Number S132-0007, for listings and illustrations of all parts and assemblies in Models 4, 6, and 8 of the tape unit.

IBM System/360 and System/370 I/O Interface; Channel to Control Unit; Original Equipment Manufacturers' Information, Order Number GA22-6974, for electrical, mechanical, and cabling information about channel/control unit interfaces.

Tape Specifications for IBM One-Half Inch Tape Drives: At 556 and 800 bpi and 3200 fci, Order Number GA32-0006, for specifications and requirements for magnetic tape to be used with IBM magnetic tape units.

IBM System/370 Reference Data, Order Number GX20-1850, for the summary of System/370 operation codes, condition codes, etc.

IBM Field Engineering Handbook; System/360 General, Order Number SY22-2851, for a pocket-sized digest of System/360 operation codes, condition codes, service aids, etc.

These publications are available from the IBM Distribution Center.

Note: Listings of the online-test programs are available (on microfiche) from the IBM Program Information Department (PID). Use IBM Diagnostic Order forms, Order Numbers ZZ25-0506 and ZZ25-0507, to obtain listings, online tests, online test publications, and microfiche. Once an appropriate initial order is placed, listings are automatically updated by distributions from PID.

Abends 35-38
Allocated Busy 152
ALU Patches 149-152
AMP Sensor Adjustment 54
Auto Data Transfer 3

Belt Part Numbers 129-135
Bit Packing 55
Bits in Interblock Gap 55
Board Layout – 3420 . . . . . .117, 119
Board Ordering 42
Buffer, 32-Byte Data 3
Busy, Allocated 152

Cabling Requirements 172
Capstan Cleaning (and Glazed) 73, 74
Capstan Motor 137
Capstan Open Segment 74
Capstan Part Numbers 137
Capstan Test 74
Card Locations, 3803 001 Microprocessor 139
Card Jumpering 121-127
Channel Interface 155-161
Characteristics, Subsystem 1
Codes, Type of Recording 5
Column Vacuum Leakage Test 74
Conversion Tips (3420) 91-94
Conversion Tips (3803) 165-172
Cracked Pressure Hose 75
Crease Tape Error, False (OLT) 21
Crosstalk 27

Damage, Tape 56
Data Flow 3420 Read/Write 71, 72
Data Flow 3803 001 Read/Write 139
Data Flow 3803 002 Read/Write 141
DC Voltages 87-89, 163
Degausser 42
Developed Tape Samples 69, 70
Developing Tape Procedure 67, 68
Device-End, Lost 151

Differences, 3803 001 and 3803 003 3
Disconnect in 153-159
Dropping Ready 73-76
Dumping Tape 73-76

ECA Checklist – 3420 103-116
ECA Checklist – 3803 185-196
Edge Damage, Tape 56
EREP – Understanding EREP 1 9-15
ERP (Error Recovery Program) 53
Erase Gap (ERG), Distance 69
Erase Head, Distance Relationships 69
Error Criteria 9
Error, Permanent Read 10, 11, 53
Error, Permanent Write 10, 53
Error, Temporary Read/Write 15, 53
Excessive Postamble 150, 152

Feature Codes – 3420 99
Feature Codes – 3803 ..... 175, 176
Feature Identifier – 3420 101
Feature Identifier – 3803 Model 1 ..... 177, 178
Feature Installation Times – 3803 Model 1 and 2 179-184
Forward/Backward Ratio Test 56, 57
Friend (OLT TO200A) 11

Glazed Capstan 73
Group Coded Recording (625OBPI) 5, 8

Head, Distance Relationships 69
Head Pin Layout 71, 72
Head Wear Test 56, 57
Holley Monitor Trap 157

Interblock Gap, Noise In 55
Interlock Gap Size 69
Interface, Channel 155-161
Interrupted, Unexpected 151
IRD PEP Specialists 45

Jumpering, AIL2 121-127

Layout, A1 Board 117, 119
Leaking Transfer Valve Leakage Test 75
Leaking Vacuum Column Door 74
Library Quality 49

Locations, Microprocessor Cards – 3803 Model 1 139
Locations, Microprocessor Cards – 3803 Model 2 141

Magnetic Tape Adapter (MTA) 3
Magnetic Tape General Information 47
Master Signal Level Tape 42
Master Skew Tape 41
Media Related Problems 51, 52
Microprocessor Card Interchange List 145
Microprocessor Card Locations – 3803 Model 1 139
Microprocessor Instruction Format 143
MLM, What is Where 31, 34
Model 3 and Model 1 (3803) Differences 3
Monitor, Holley 157
Motion Service Techniques 73-77
MST Board Ordering 42

Noise in Interblock Gap 55
NRZI 3, 5, 7
NRZI Tape Path 101
NTF (No Trouble Found) Checklist, Power 85
NTF, Read/Write 66
NTF, Tape Motion 77

Online Tests (OLTs) 27-29

Part Numbers, Common 129-137
Partially Erased Records 73
Patches 149-152
Patches, Tips 145-147
PE 5, 7
PEP Specialists, IRD 45
Permanent Errors 53
Phase Shift 58-59, 62
PM Schedule – 3420 95-98
PM Schedule – 3803 173
Pneumatic Belts (Part Numbers) 129-135
Pneumatic System Diagrams 79, 81
Postamble, Excessive 150, 152
Power Check 83
Power No Trouble Found Check List 85
Power Service Techniques 83, 84
Power Supplies 87-89
Power Supply DC Voltages 87-89, 157
Power Supply Part Numbers 136
Power System, Modified 90XXX 88, 132
Pressure Hose, Cracked 75

Quality, Tape 49

Ratio Test, Read Forward/Backward 56, 57
Read Amplitude Adjustment 54
Read Data Flow – 3420 ..... 71, 72
Read Data Flow – 3803 Model 1 139
Read Data Flow – 3803 Model 2 141
Read Error, Permanent 10, 11, 53
Read/Write Errors 10, 11, 53
Read/Write Head (Distance Relationships) 69
Read/Write Head (Pin Layout) 71, 72
Read/Write Head (Wear Test) 56, 57
Read/Write No Trouble Found Checklist 66
Read/Write Service Techniques 53-63
Read Only Tape 20
Ready, Dropping 73-76
Recording Philosophy 5-8
Reel Board and Motor Part Numbers 136
Resistor, Tie Up/Tie Down 43
RPQ 178
ROS Patch Card 145
ROS Patches 149-152

SAGC 62
Sales Feature Codes – 3420 99
Scoping Procedures, Phase Shift 58, 59
Scoping Procedures, Sense Bits 17
Sense Bytes 17-19
Sense Analysis 20-26
Service Techniques, Power 83, 84
Service Techniques, Read/Write 53-63
Service Techniques, Tape Motion 73-77
Short Gaps 69
Slipping Tape 54
Software Zaps 153, 154
Staggered Wraps 51
Status Byte 17-19
Status Identifier (All Models) 101
Stress Tape 29, 39, 166
Subsystem Characteristics 1

Tape Damage 56
Tape Developing Procedure 69, 70
Tape, Magnetic 48
Tape Mark, Missing 35
Tape, Master Signal Level 42

Tape, Master Skew 42
Tape Motion No Trouble Found Checklist 77
Tape Motion Service Techniques.....73-76
Tape Runaway 149
Tape Slipping 54
Tape Winds Uneven.....51
Temporary Errors 9, 53
Tie Up/Tie Down Resistors.....43
Tools and Test Equipment 39-43
Transfer Valve Leaking 75
Transfer Valve Leaking – Part Numbers 137
Turn Around Delay.....152

Unexpected Interrupt 151

Vacuum Column Door Leaking.....74
Vacuum Test.....75
Velocity Patch.....152
Voltages DC 87, 89, 163

Write Data Flow – 3420.....71
Write Data Flow – 3803.....139
Write Error 10, 53

Z Folds 52
Zaps, Software 153, 154

3420/3803 REFERENCE GUIDE (Form Number S229-6019-2

Your comments and constructive criticism regarding this publication will help us improve it and will be appreciated. Each comment will be reviewed carefully by those responsible for the publication. Thank you for your cooperation.

Is the level of coverage adequate?

Is there other information that should be included?

Other Comments:

Did you view the companion video package? Was it helpful?

Reader's Comment Form

Fold and Tape | Please Do Not Staple | Fold and Tape

NO POSTAGE
NECESSARY
IF MAILED
IN THE
U.S.A.

BUSINESS REPLY MAIL

FIRST CLASS PERMIT NO. 40 ARMONK, NY

Postage will be paid by addressee

Field Engineering Service Planning
Department 96C, Building 005
Tucson, Arizona 85744

Fold and Tape | Please Do Not Staple | Fold and Tape

International Business Machines Corporation
Field Engineering Division
360 Hamilton Avenue, White Plains, N.Y. 10601

IBM 3420/3803 Magnetic Tape Subsystem Reference Guide Printed in U.S.A. S229-6

S229-6019-2

International Business Machines Corporation